

# FCC Measurement/Technical Report on

## Industrial WLAN Access Point / Client SCALANCE W700 / MSAX MSAX65-W1-M12-E2

FCC ID: LYHMSAX65V1  
IC: 267AA-MSAX65V1

**Test Report Reference:** MDE\_SIEM\_1911\_FCC\_06

**Test Laboratory:**

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Deutsche  
Akkreditierungsstelle  
D-PL-12140-01-01  
D-PL-12140-01-02  
D-PL-12140-01-03

**Note:**

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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## 1 APPLIED STANDARDS AND TEST SUMMARY

### 1.1 APPLIED STANDARDS

#### **Type of Authorization**

Certification for an Intentional Radiator (Digital Device / Spread Spectrum).

#### **Applicable FCC Rules**

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-21 Edition) and 15 (10-1-21 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

Part 15, Subpart E – Unlicensed National Information Infrastructure Devices

§ 15.403 Definitions

§ 15.407 General technical requirements

#### **Note:**

The tests were selected and performed with reference to KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02, 2016-04-08 "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

## 1.2 FCC-IC CORRELATION TABLE

### Correlation of measurement requirements for UNII / LE-LAN (e.g. WLAN 5 GHz) equipment from FCC and IC

#### UNII equipment

| Measurement                                                                              | FCC reference                                 | IC reference                                                                                            |
|------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Conducted emissions on AC Mains                                                          | § 15.207                                      | RSS-Gen Issue 5: 8.8                                                                                    |
| Occupied bandwidth                                                                       | § 15.403 (i) (26 dB) /<br>§ 15.407 (e) (6 dB) | RSS-247 Issue 2: 6.2.1.1,<br>6.2.2.1, 6.2.3.1 (99%)<br>RSS-247 Issue 2: 6.2.4.1 (6<br>dB)               |
| Maximum conducted output power                                                           | § 15.407 (a)<br>(1),(2),(3),(4)               | RSS-247 Issue 2: 6.2.1.1,<br>6.2.2.1, 6.2.3.1, 6.2.4.1                                                  |
| Maximum power spectral density                                                           | § 15.407 (a)<br>(1),(2),(3),(5)               | RSS-247 Issue 2: 6.2.1.1,<br>6.2.2.1, 6.2.3.1, 6.2.4.1                                                  |
| Transmitter undesirable emissions;<br>General Field Strength Limits,<br>Restricted Bands | § 15.407 (b)<br>§ 15.209 (a)                  | RSS-Gen Issue 5:<br>6.13/8.9/8.10;<br>RSS-247 Issue 2: 3.3/6.2<br>6.2.1.2, 6.2.2.2, 6.2.3.2,<br>6.2.4.2 |
| Frequency stability                                                                      | § 15.407 (g)                                  | RSS-Gen Issue 5: 6.11/8.11                                                                              |
| Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS)                       | § 15.407 (h)                                  | RSS-247 Issue 2: 6.2.2.1,<br>6.2.3.1, 6.3                                                               |
| Antenna requirement                                                                      | § 15.203 / 15.204                             | RSS-Gen Issue 5: 8.3                                                                                    |
| Receiver spurious emissions                                                              | -                                             | -                                                                                                       |

### 1.3 MEASUREMENT SUMMARY

#### **47 CFR CHAPTER I FCC PART 15 Subpart E §15.407** **FCC §15.31, §15.407 (h)**

Dynamic Frequency Selection, U-NII Detection Bandwidth

The measurement was performed according to KDB 905462 D02

**Final Result**

| <b>OP-Mode</b>                        | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|---------------------------------------|--------------|-------------|------------|-----------|
| Radio Technology, Operating Frequency |              |             |            |           |
| WLAN a 20 MHz, 5500 MHz               | S01_AJ03     | 2022-08-31  | Passed     | Passed    |
| WLAN ac 40 MHz, 5510 MHz              | S01_AJ03     | 2022-08-31  | Passed     | Passed    |

#### **47 CFR CHAPTER I FCC PART 15 Subpart E §15.407** **FCC §15.31, §15.407 (h)**

Dynamic Frequency Selection, Channel Availability Check Time

The measurement was performed according to KDB 905462 D02

**Final Result**

| <b>OP-Mode</b>                 | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|--------------------------------|--------------|-------------|------------|-----------|
| Bandwidth, Operating Frequency |              |             |            |           |
| WLAN ax 20 MHz, 5500 MHz       | S01_AJ03     | 2022-08-31  | Passed     | Passed    |

#### **47 CFR CHAPTER I FCC PART 15 Subpart E §15.407** **FCC §15.31, §15.407 (h)**

Dynamic Frequency Selection, In-Service Monitoring for Channel Move Time,

Channel Closing Transmission Time and Non-Occupancy Period

The measurement was performed according to KDB 905462 D02

**Final Result**

| <b>OP-Mode</b>                 | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|--------------------------------|--------------|-------------|------------|-----------|
| Bandwidth, Operating Frequency |              |             |            |           |
| WLAN ax 40 MHz, 5510 MHz       | S01_AJ03     | 2022-08-31  | Passed     | Passed    |

#### **47 CFR CHAPTER I FCC PART 15 Subpart E §15.407** **FCC §15.31, §15.407 (h)**

Dynamic Frequency Selection, Statistical Performance Check

The measurement was performed according to KDB 905462 D02

**Final Result**

| <b>OP-Mode</b>                 | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|--------------------------------|--------------|-------------|------------|-----------|
| Bandwidth, Operating Frequency |              |             |            |           |
| WLAN ax 20 MHz, 5500 MHz       | S01_AJ03     | 2022-09-01  | Passed     | Passed    |
| WLAN ax 40 MHz, 5510 MHz       | S01_AJ03     | 2022-09-02  | Passed     | Passed    |

N/A: Not applicable

N/P: Not performed

## 2 REVISION HISTORY / SIGNATURES

| Report version control |              |                    |                  |
|------------------------|--------------|--------------------|------------------|
| Version                | Release date | Change Description | Version validity |
| initial                | 2023-04-24   | --                 | valid            |
| --                     | --           | --                 | --               |

COMMENT: This report is a DFS report only. The other applicable tests are not part of this report.



(responsible for accreditation scope)  
Dipl.-Ing. Marco Kullik



(responsible for testing and report)  
Dipl.-Ing. Daniel Gall



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### 3 ADMINISTRATIVE DATA

#### 3.1 TESTING LABORATORY

Company Name: 7layers GmbH  
Address: Borsigstr. 11  
40880 Ratingen  
Germany

The test facility is accredited by the following accreditation organisation:

Laboratory accreditation no: DAKKS D-PL-12140-01-01 | -02 | -03  
FCC Designation Number: DE0015  
FCC Test Firm Registration: 929146  
ISED CAB Identifier: DE0007; ISED#: 3699A

Responsible for accreditation scope: Dipl.-Ing. Marco Kullik  
Report Template Version: 2021-01-13

#### 3.2 PROJECT DATA

Responsible for testing and report: Dipl.-Ing. Daniel Gall  
Employees who performed the tests: documented internally at 7Layers  
Date of Report: 2023-04-24  
Testing Period: 2022-08-30 to 2022-09-02

#### 3.3 APPLICANT DATA

Company Name: SIEMENS AG  
Address: Östliche Rheinbrückenstr. 50  
76187 Karlsruhe  
Germany  
Contact Person: Dr. Malgorzata Janson

### 3.4 MANUFACTURER DATA

Company Name: SIEMENS AG

Address: 76181 Karlsruhe  
Germany

Contact Person: Mr. Kilian Löser

## 4 TEST OBJECT DATA

### 4.1 GENERAL EUT DESCRIPTION

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kind of Device<br>product description    | Industrial Access Point / Client                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Product name                             | SCALANCE W700 / MSAX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Type                                     | MSAX65-W1-M12-E2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Declared EUT data by the supplier</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Voltage Type                             | DC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Voltage Level                            | 24.0 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Tested Modulation Type                   | OFDM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Specific product<br>description          | <p>The MSAX65-W1-M12-E2 device is a wireless LAN access point / client for industrial applications supporting following WLAN modes and frequency bands:</p> <ul style="list-style-type: none"> <li>• 802.11 ax/ac/a/h/n Mode: 5.15 - 5.35 GHz and 5.47 - 5.85 GHz</li> <li>• 802.11 ax/b/g/n Mode: 2400 - 2483.5 MHz</li> </ul> <p>2 N connectors are available for usage with external antennas. 2x2 MIMO operation is possible in both bands. Simultaneous operation of the device in both frequency bands is supported. Module may be used either as Master or as Client WLAN device.</p> <p>The device supports 10/100/1000 Mbit/s Ethernet. Additionally, the device features one digital input and one digital output signalling line, a configuration/licensing plug and a sleep timer. Supply power is 24Vdc, also PoE on the ethernet interface is available.</p> <p>In the relevant DFS bands 5250 -5350 and 5470 -5725 MHz 20 and 40 MHz Bandwidth are supported.</p> |
| Ports of the device                      | <ul style="list-style-type: none"> <li>• Enclosure</li> <li>• DC port: cable length appr. 1.0m</li> <li>• Digital I/O port: cable length 2.0m (terminated with DIDO box), only for radiated tests</li> <li>• LAN port: cable length (shielded), appr. 3.0m, only for radiated tests</li> <li>• USB C service port: cable length, appr. 2.0m, only for conducted tests</li> </ul> <p>2 Antenna ports, N-connector, appr. 1.0 m &amp; antenna</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Data Rates                               | <p>WLAN a: up to 54 Mbit/s</p> <p>WLAN n: up to 300 Mbit/s</p> <p>WLAN ac: up to 866.7 Mbit/s</p> <p>WLAN ax: up to 1201 Mbit/s</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Antennas                                 | External                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Antenna Connector<br>Impedance           | 50 Ohms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                   |                                                                                                                                  |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Special software used for testing | The test modes were set by command line commands provided by the applicant.                                                      |
| Transmit Power Control            | Supported                                                                                                                        |
| Power level of the EUT (E.I.R.P.) | 30 dBm, 17 dBm/MHz                                                                                                               |
| User Access Restriction           | The manufacturer confirms that information regarding the parameters of the detected waveforms is not accessible to the end user. |
| Channel Loading System Type       | IP based system                                                                                                                  |

| <b>Declared data by the laboratory</b>             |                                                                                    |
|----------------------------------------------------|------------------------------------------------------------------------------------|
| Used antenna ports during testing                  | Both antenna ports were connected to the test setup.                               |
| Antenna Assembly gain used for DFS Threshold Level | 0 dBi                                                                              |
| Used threshold level                               | -64 dBm (EIRP > 200 mW and power spectral density > 10 dBm/MHz)                    |
| Channel loading                                    | Video Streaming from laptop connected to EUT to Laptop connected to Client device. |
| Pulse Type Generation                              | Pulses were randomly generated using Rohde & Schwarz K6 Pulse sequencer.           |

#### 4.2 EUT MAIN COMPONENTS

| <b>Sample Name</b>      | <b>Sample Code</b> | <b>Description</b> |
|-------------------------|--------------------|--------------------|
| EUT aj03                | DE1039028aj03      |                    |
| <b>Sample Parameter</b> | <b>Value</b>       |                    |
| Serial No.              | VPN4200421         |                    |
| HW Version              | 02                 |                    |
| SW Version              | V02.00.00          |                    |
| Comment                 | EUT used as Master |                    |

| <b>Sample Name</b>      | <b>Sample Code</b> | <b>Description</b> |
|-------------------------|--------------------|--------------------|
| EUT ah03                | DE10039028ah03     |                    |
| <b>Sample Parameter</b> | <b>Value</b>       |                    |
| Serial No.              | VPN4200423         |                    |
| HW Version              | 02                 |                    |
| SW Version              | V02.00.00          |                    |
| Comment                 | EUT used as Client |                    |

NOTE: The short description is used to simplify the identification of the EUT in this test report.

#### 4.3 ANCILLARY EQUIPMENT

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

| <b>Device</b> | <b>Details (Manufacturer, Type Model, HW, SW, S/N)</b> | <b>Description</b> |
|---------------|--------------------------------------------------------|--------------------|
| -             | -                                                      | -                  |

#### 4.4 AUXILIARY EQUIPMENT

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

| Device | Details<br>(Manufacturer, Type Model, HW,<br>SW, S/N)                     | Description                                            |
|--------|---------------------------------------------------------------------------|--------------------------------------------------------|
| AUX1   | Fujitsu, Lifebook E series E782, 2012-08,<br>Win7 Prof. Engl., DSCM004672 | Laptop Computer                                        |
| AUX2   | Fujitsu, Lifebook E series E781, 2012-03,<br>Win10 Pro Engl., DSCK013809  | Laptop Computer                                        |
| AUX3   | Siemens, -, -, -, -                                                       | DEBUG BOX CLP for<br>sending DFS test mode<br>commands |

#### 4.5 EUT SETUPS

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

| Setup    | Combination of EUTs                  | Description and Rationale |
|----------|--------------------------------------|---------------------------|
| S01_AJ03 | EUT aj03, EUT ah03, AUX1, AUX2, AUX3 | Conducted DFS Setup       |

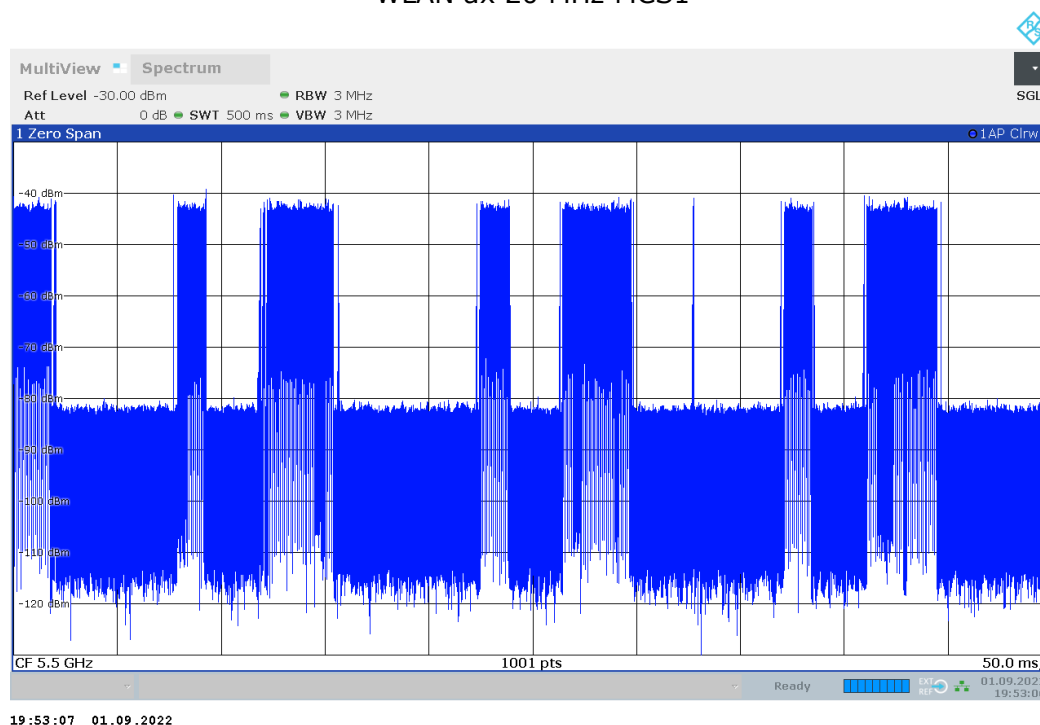
## 4.6 OPERATING MODES / TEST CHANNELS

This chapter describes the operating modes of the EUTs used for testing.

| U-NII-Subband 2A<br>5250 - 5350 MHz |     |      | U-NII-Subband 2C<br>5470 - 5725 MHz |     |      | Nom.<br>BW |
|-------------------------------------|-----|------|-------------------------------------|-----|------|------------|
| low                                 | mid | high | low                                 | mid | high | 20 MHz     |
| -                                   | -   | -    | 100                                 | -   | -    | Ch.-No.    |
| -                                   | -   | -    | 5500                                | -   | -    | MHz        |
|                                     |     |      |                                     |     |      |            |
| low                                 | mid | high | low                                 | mid | high | 40 MHz     |
| -                                   | -   | -    | 102                                 | -   | -    | Ch.-No.    |
| -                                   | -   | -    | 5510                                | -   | -    | MHz        |

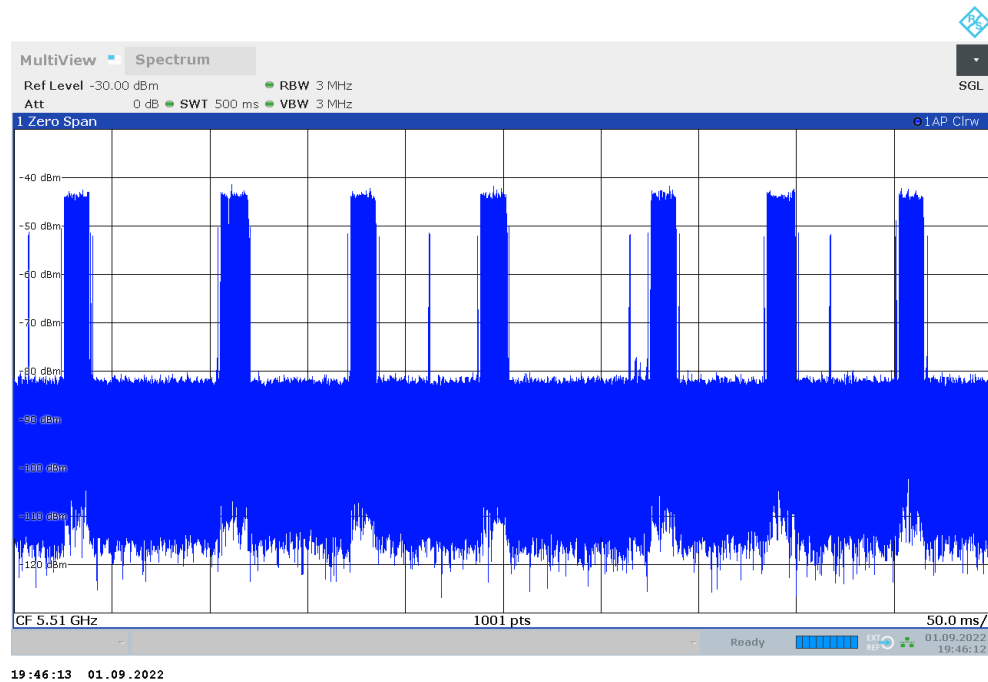
### Channel Loading Duty Cycle

WLAN ax 20 MHz MCS1



Comment: 342 points above -60 dBm corresponds to 34 % DC

## WLAN ac 40 MHz MCS1



Comment: 218 points above -60 dBm corresponds to 22 % DC

## 4.7 PRODUCT LABELLING

### 4.7.1 FCC ID LABEL

Please refer to the documentation of the applicant.

### 4.7.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

## 5 TEST RESULTS

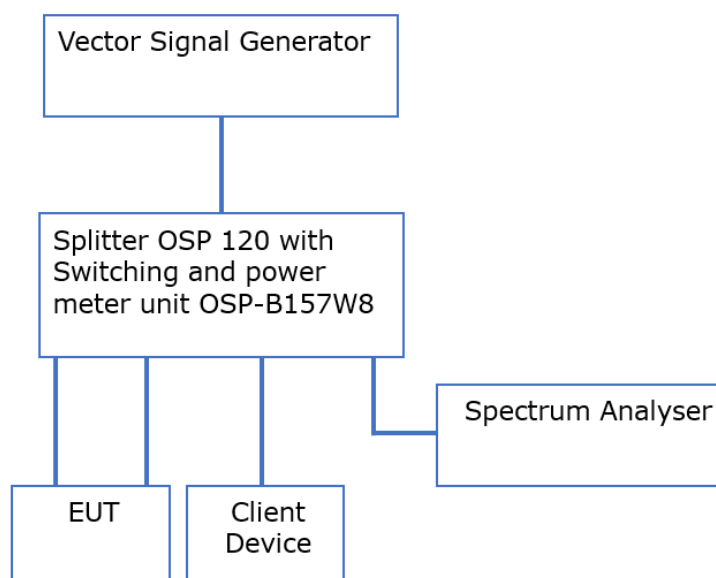
### 5.1 DYNAMIC FREQUENCY SELECTION, U-NII DETECTION BANDWIDTH

Standard **FCC Part 15 Subpart E**

**The test was performed according to:**  
KDB 905462 D02

#### 5.1.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room for the DFS measurements.



Since the DFS Master shall be tested stand alone, the DFS Client was connected but not activated.

After activating the EUT, a radar pulse of type 0 was send on mid channel frequency from the radar signal generator and the response was noted. This was repeated 9 further times.

If at least 9 of the 10 pulses were recognized by the device, the radar pulse frequency was increased or decreased by 5 MHz and the test was repeated. If the detection rate falls below 9 pulses, the step size is reduced to 1 MHz from the previous 5 MHz step until detection rate falls below 9 again. The result is compared to the 99 % Bandwidth.

### 5.1.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E, §15.407 (h) (2)

The device must sense for radar signals at 100 percent of its emission bandwidth.

The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is –64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is –62 dBm.

The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna.

### 5.1.3 TEST PROTOCOL

Ambient temperature: 24 °C

Air Pressure: 990 hPa

Humidity: 30 %

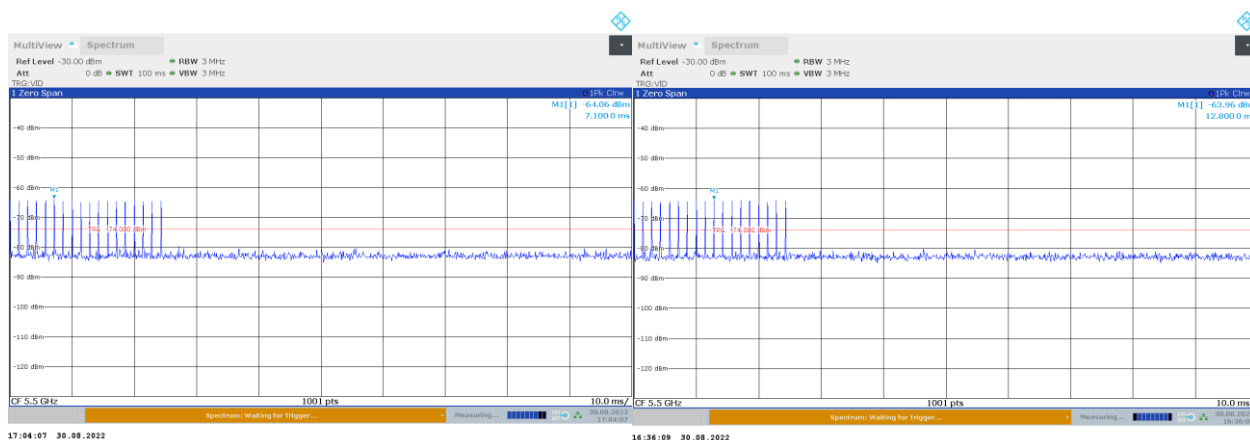
| Mode           | TX<br>Frequency<br>[MHz] | Channel<br>BW<br>[MHz] | Radar Test<br>Signal # | F <sub>L</sub><br>[MHz] | F <sub>H</sub><br>[MHz] | Detection<br>BW<br>[MHz] | 99 % BW<br>[MHz] |
|----------------|--------------------------|------------------------|------------------------|-------------------------|-------------------------|--------------------------|------------------|
| WLAN a 20 MHz  | 5500                     | 20                     | Radar Type 0           | 5490                    | 5510                    | 20                       | 19.2             |
| WLAN ac 40 MHz | 5510                     | 40                     | Radar Type 0           | 5490                    | 5530                    | 40                       | 38.4             |

Remark: Detection of radar pulses is monitored by console interface.  
No plots are recorded.

#### 5.1.4 MEASUREMENT RESULT

| MHz from Centre | TX Frequency [MHz] | Channel BW [MHz] | Detected | TX Freq. [MHz] | Channel BW [MHz] | Detected |
|-----------------|--------------------|------------------|----------|----------------|------------------|----------|
| -20             |                    |                  |          | 5510           | 40               | 10       |
| -19             |                    |                  |          | 5510           | 40               |          |
| -18             |                    |                  |          | 5510           | 40               |          |
| -17             |                    |                  |          | 5510           | 40               |          |
| -16             |                    |                  |          | 5510           | 40               |          |
| -15             |                    |                  |          | 5510           | 40               | 10       |
| -10             | 5500               | 20               | 10       | 5510           | 40               | 10       |
| -9              | 5500               | 20               |          | 5510           | 40               |          |
| -8              | 5500               | 20               |          | 5510           | 40               |          |
| -7              | 5500               | 20               |          | 5510           | 40               |          |
| -6              | 5500               | 20               |          | 5510           | 40               |          |
| -5              | 5500               | 20               | 10       | 5510           | 40               | 10       |
| 0               | 5500               | 20               | 10       | 5510           | 40               | 10       |
| 5               | 5500               | 20               | 10       | 5510           | 40               | 10       |
| 6               | 5500               | 20               |          | 5510           | 40               |          |
| 7               | 5500               | 20               |          | 5510           | 40               |          |
| 8               | 5500               | 20               |          | 5510           | 40               |          |
| 9               | 5500               | 20               |          | 5510           | 40               |          |
| 10              | 5500               | 20               | 10       | 5510           | 40               | 10       |
| 15              |                    |                  |          | 5510           | 40               | 10       |
| 16              |                    |                  |          | 5510           | 40               |          |
| 17              |                    |                  |          | 5510           | 40               |          |
| 18              |                    |                  |          | 5510           | 40               |          |
| 19              |                    |                  |          | 5510           | 40               |          |
| 20              |                    |                  |          | 5510           | 40               | 10       |

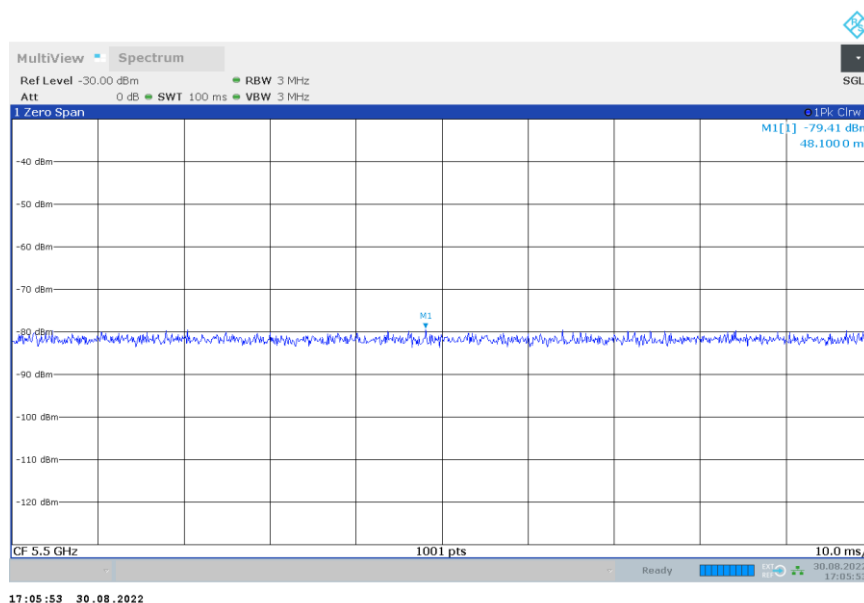
## Radar Pulse Level Calibration



Antenna Port 1

Antenna Port 2

## Radar Pulse level



Noise Level

### 5.1.5 TEST EQUIPMENT USED

- R&S TS8997

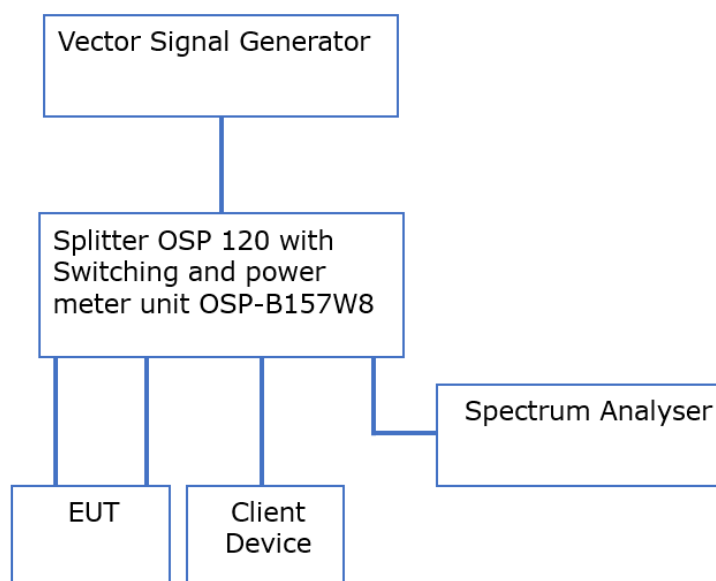
## 5.2 DYNAMIC FREQUENCY SELECTION, CHANNEL AVAILABILITY CHECK TIME

Standard **FCC Part 15 Subpart E**

**The test was performed according to:**  
KDB 905462 D02

### 5.2.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room for the DFS measurements.



The blocked channel list is reset and the EUT restarted by software commands.

When the console interface indicates the restart, the measurement sweep on the spectrum analyser is started.

Analyzer settings:

- Resolution Bandwidth (RBW): 3 MHz
- Video Bandwidth (VBW): 3 MHz
- Trace: Clear/Write
- Sweeps: Single Sweep
- Sweeptime: 150 s
- Detector: Peak

## 5.2.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E, §15.407 (h) (2) (ii)

Channel Availability Check Time. A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this section, is detected within 60 seconds.

FCC Part 15, Subpart E, §15.407 (h) (2)

The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is -64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is -62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna.

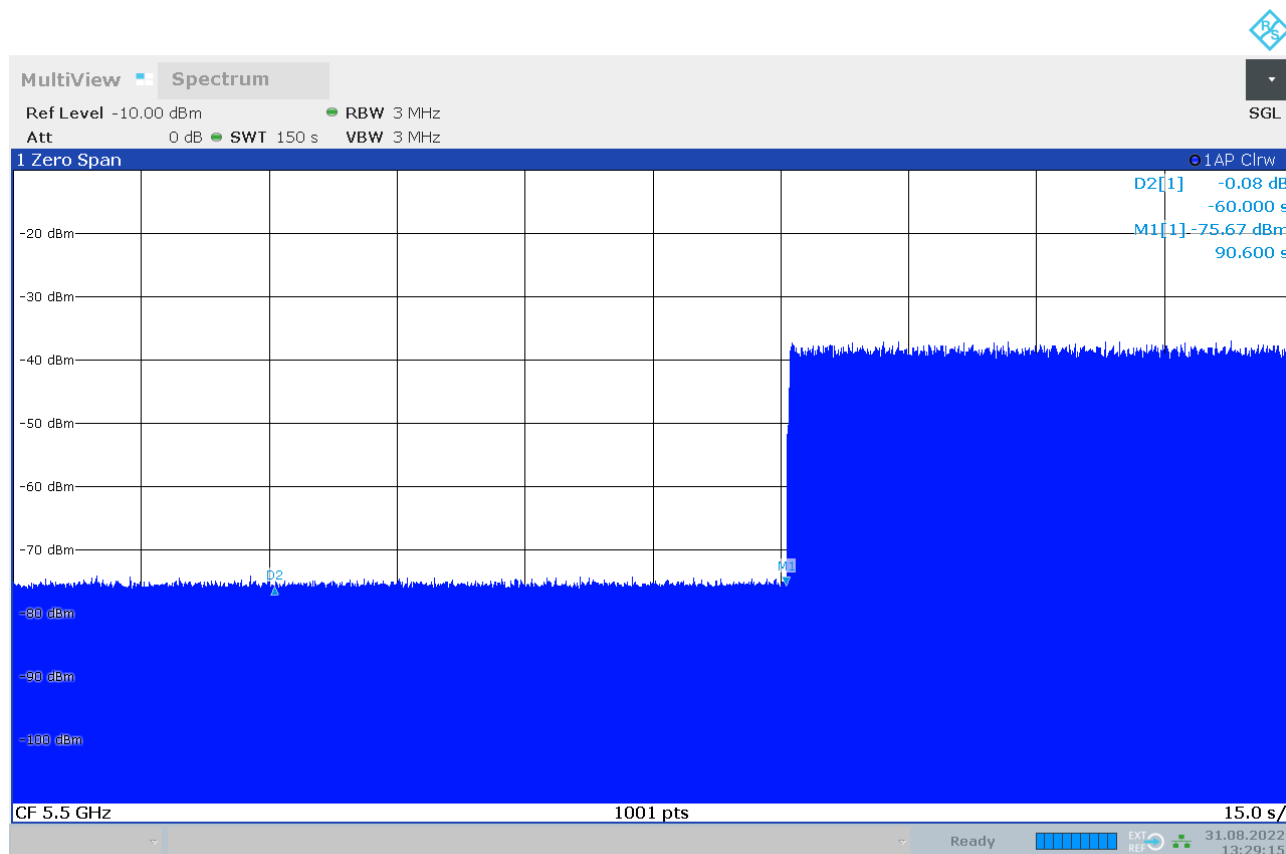
### 5.2.3 TEST PROTOCOL

Ambient temperature: 24 °C  
 Air Pressure: 990 hPa  
 Humidity: 30 %

| Mode           | TX Frequency [MHz] | Radar Test Signal # | Detected? | Transmissions within 150 s? |
|----------------|--------------------|---------------------|-----------|-----------------------------|
| WLAN ax 20 MHz | 5530               | Type 0 @ 0 to 6 s   | Yes       | No                          |
| WLAN ax 20 MHz | 5530               | Type 0 @ 54 to 60 s | Yes       | No                          |

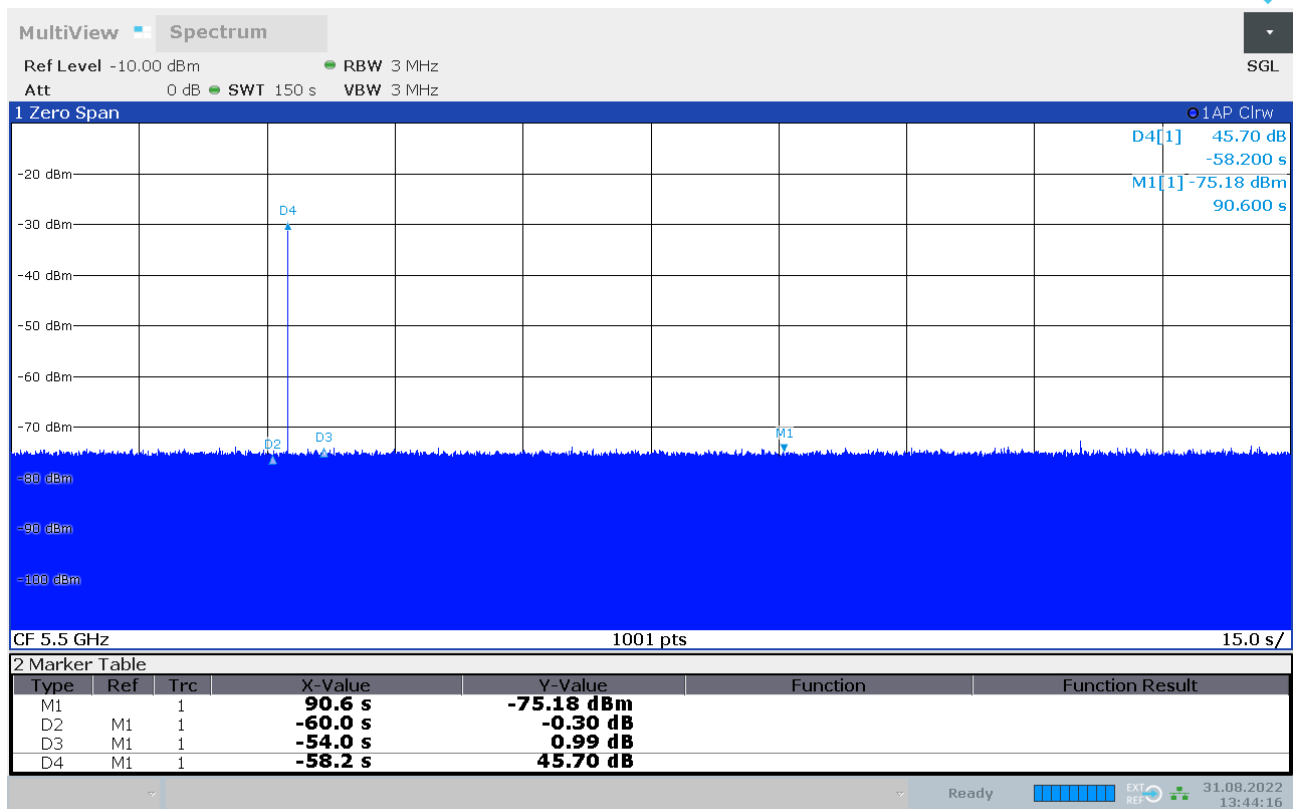
Remark: Please see next sub-clause for the measurement plot.  
 For radar pulse calibration see test case U-NII detection BW.

### 5.2.4 MEASUREMENT PLOT



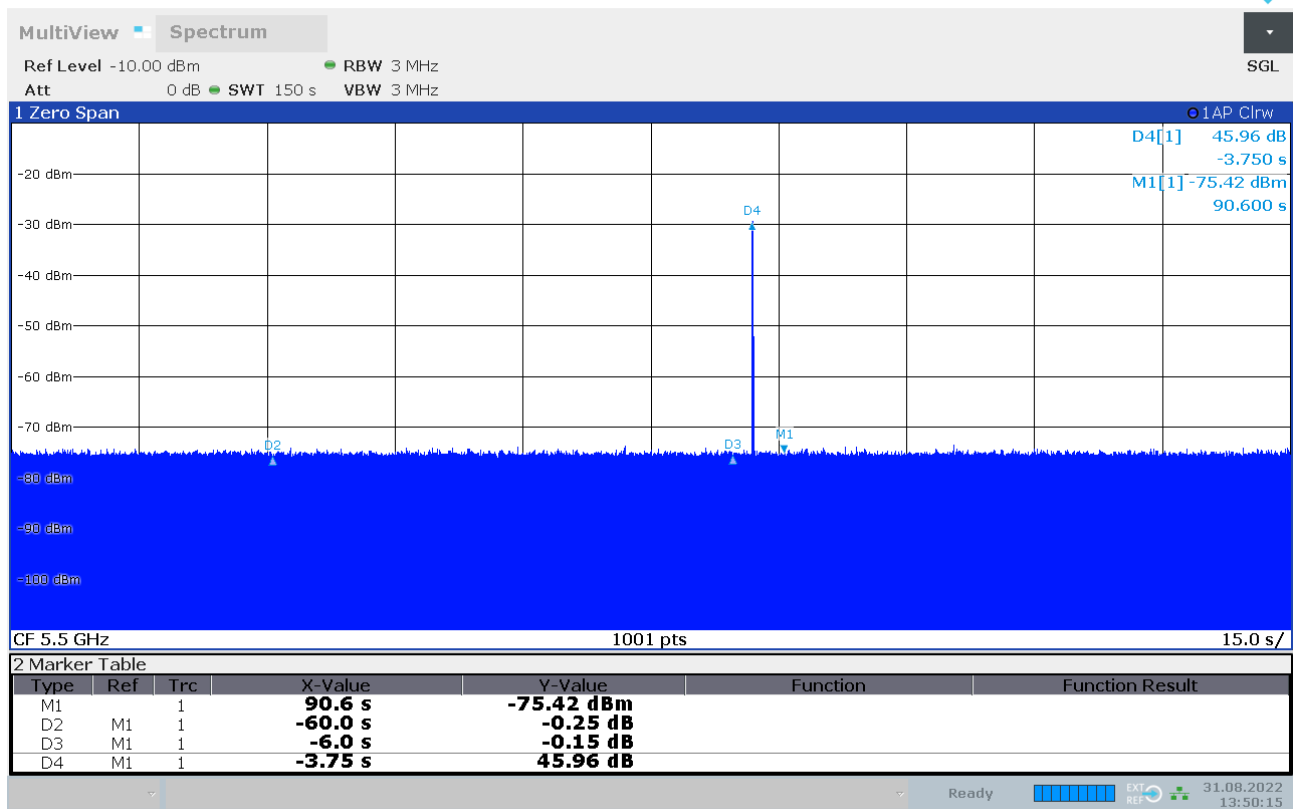
13:29:16 31.08.2022

Determination of startup time (no radar pulse send)  
 Resulting start up time: 90.6 s (Marker 1) – 60 s = 30.6 s (Marker D2)



13:44:17 31.08.2022

Radar Pulse at beginning of CAC period.  
 Emission of radar pulse at 1.8s after calculated startup (Marker D4)



13:50:15 31.08.2022

Radar Pulse at end of CAC period.  
Emission of radar pulse at 56.25s after calculated startup (Marker D4)

## 5.2.5 TEST EQUIPMENT USED

- R&S TS8997

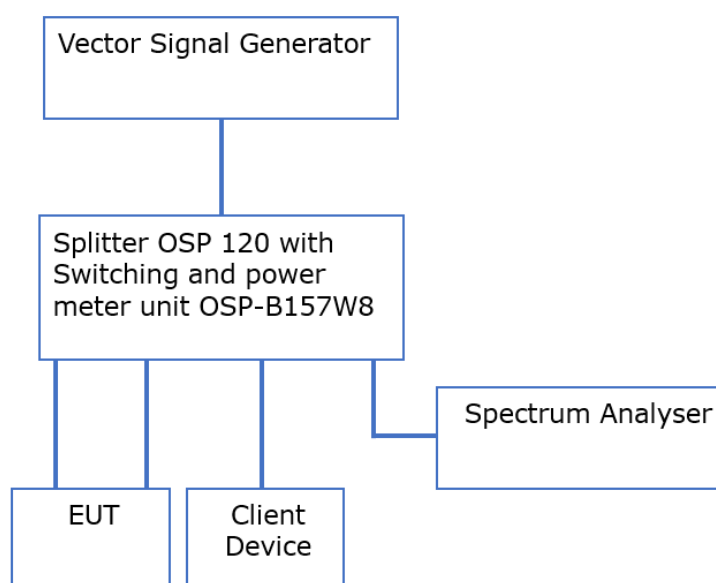
### 5.3 DYNAMIC FREQUENCY SELECTION, IN-SERVICE MONITORING FOR CHANNEL MOVE TIME, CHANNEL CLOSING TRANSMISSION TIME AND NON-OCCUPANCY PERIOD

Standard **FCC Part 15 Subpart E**

**The test was performed according to:**  
 KDB 905462 D02

#### 5.3.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room for the DFS measurements.



The Master and Client EUT were powered together with the laptops for traffic generation. Afterwards the master and client were configured for connection on a DFS channel using the maximum supported bandwidth. Once the Channel Availability Check was completed and connection was established, the video streaming was started.

With established connection, a radar pulse of type 0 was send from the radar pulse generator. At the same time the spectrum analyser is triggered by the radar signal generator and a trace is recorded:

Analyzer settings:

- Resolution Bandwidth (RBW): 3 MHz
- Video Bandwidth (VBW): 3 MHz
- Trace: Clear/Write
- Sweeps: Single Sweep
- Sweeptime: 20 s
- Detector: Peak
- Trigger: External

In addition to the plot also the trace data is recorded to calculate the Channel Closing Time.

Afterwards the test is repeated with a sweep time of 32 minutes to monitor the Non-occupancy period.

### 5.3.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E, §15.407 (h) (2) (iii)

Channel Move Time. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

FCC Part 15, Subpart E, §15.407 (h) (2) (iii)

Non-occupancy Period. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

Limits according KDB 905462 D02 UNII DFS Compliance Procedures New Rules

| Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Value                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <i>Non-occupancy period</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Minimum 30 minutes                                                                                        |
| <i>Channel Availability Check Time</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 60 seconds                                                                                                |
| <i>Channel Move Time</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 10 seconds<br>See Note 1.                                                                                 |
| <i>Channel Closing Transmission Time</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.<br>See Notes 1 and 2. |
| Note 1: <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.<br>Note 2: The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. |                                                                                                           |

### 5.3.3 TEST PROTOCOL

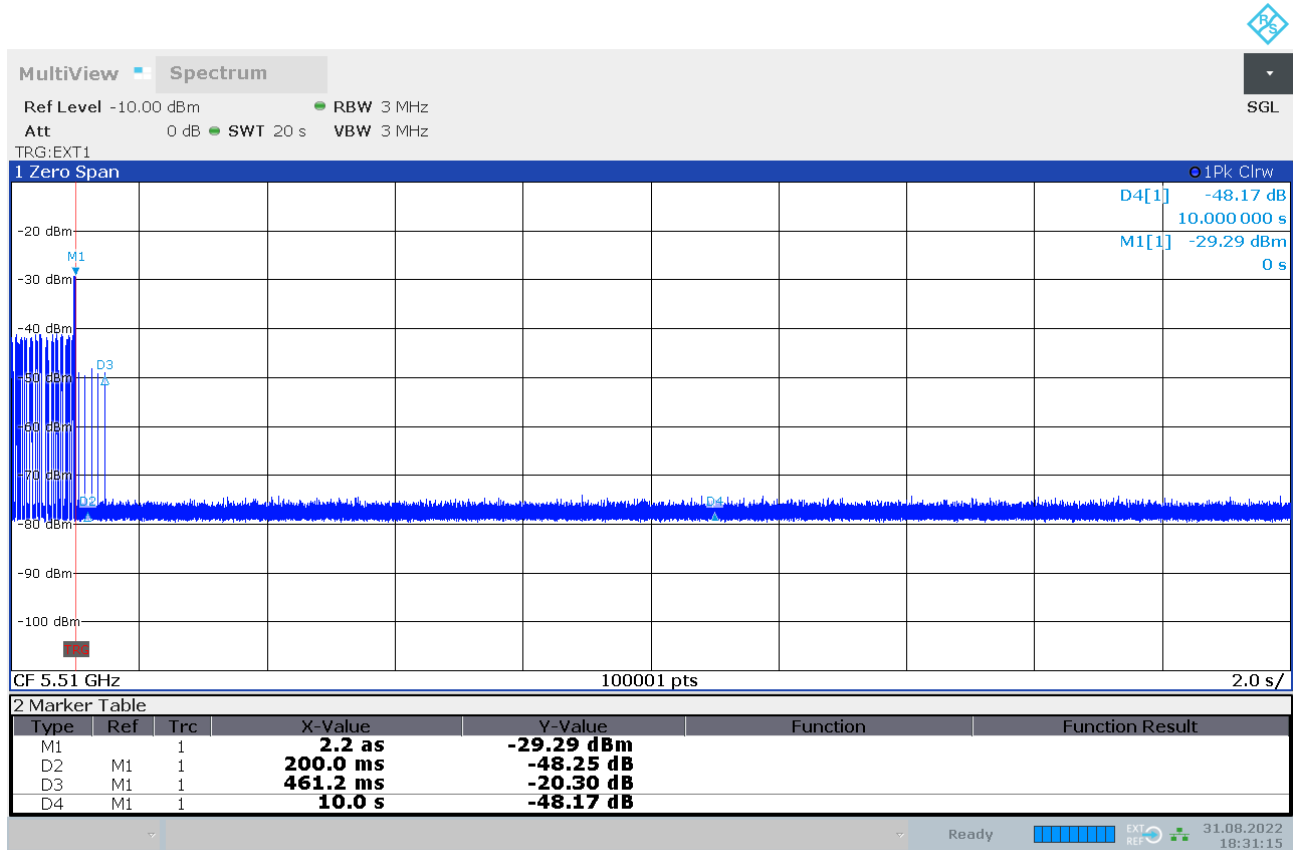
#### Master

Ambient temperature: 25 °C  
 Air Pressure: 990 hPa  
 Humidity: 30 %

| WLAN ax 40 MHz                    |                                    |                                                           |                       |                                          |                      |                                                            |
|-----------------------------------|------------------------------------|-----------------------------------------------------------|-----------------------|------------------------------------------|----------------------|------------------------------------------------------------|
| <b>TX<br/>Frequency<br/>[MHz]</b> | <b>Radar<br/>Test<br/>Signal #</b> | <b>Channel<br/>Closing<br/>Transmission<br/>Time [ms]</b> | <b>Limit<br/>[ms]</b> | <b>Channel<br/>Move<br/>Time<br/>[s]</b> | <b>Limit<br/>[s]</b> | <b>Transmissions<br/>in Non-<br/>Occupancy<br/>Period?</b> |
| <b>5510</b>                       | Type 0                             | 200 + 3                                                   | 200 + 60              | 0.46                                     | 10                   | None                                                       |

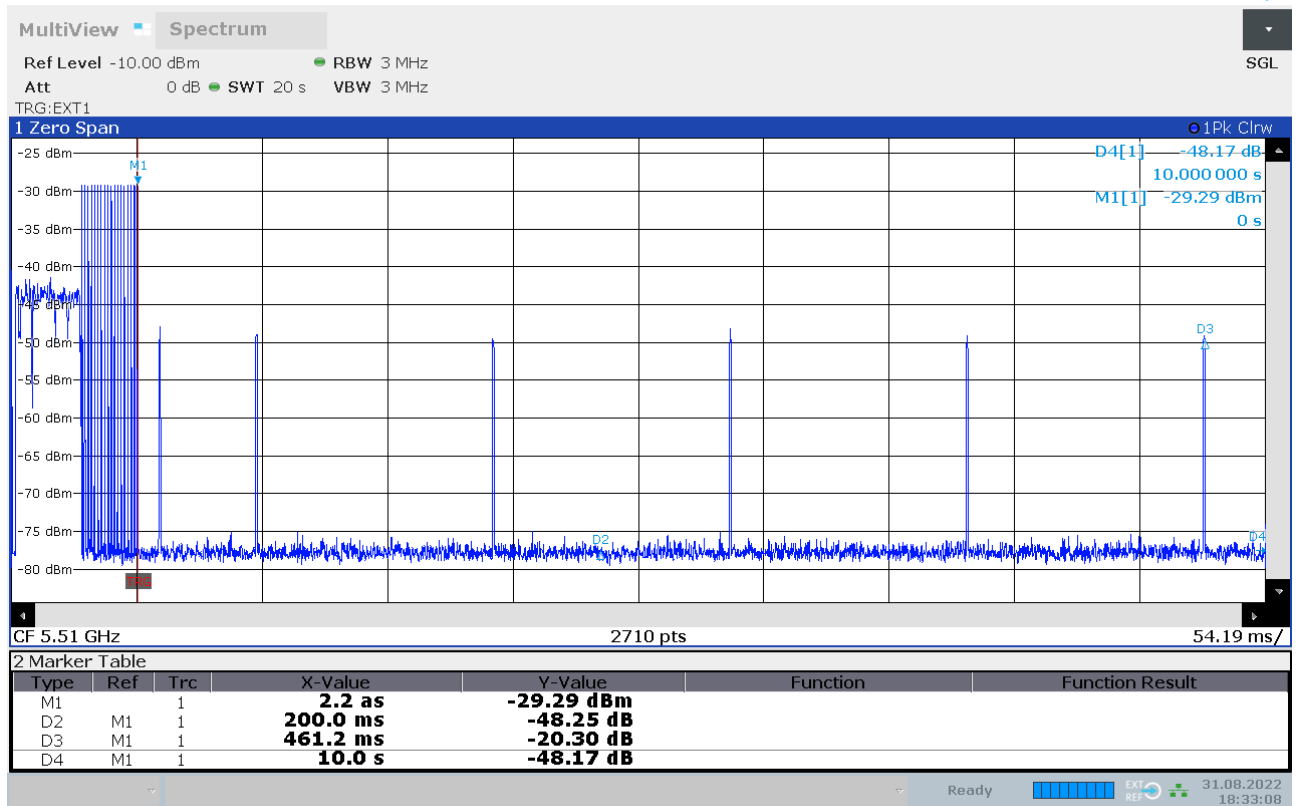
Remark: Please see next sub-clause for the measurement plot.  
 For radar pulse calibration see test case U-NII detection BW.

### 5.3.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)



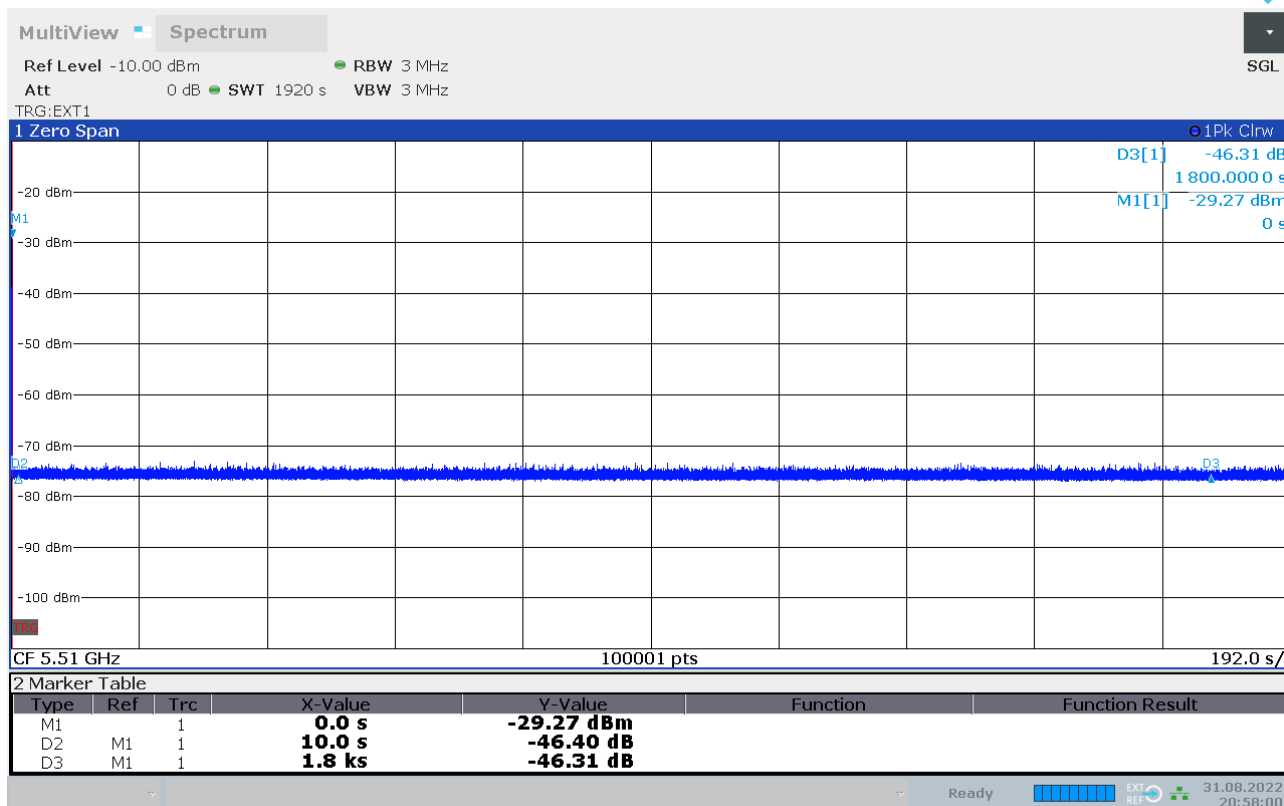
18:31:16 31.08.2022

M1 = Radar Pulse, D2 = 200 ms after Radar Pulse end, D3 = Last Transmission end



18:33:09 31.08.2022

Zoomed into trace data of channel move and channel closing time plot.



20:58:00 31.08.2022

Non Occupancy Period

### 5.3.5 TEST EQUIPMENT USED

- R&S TS8997

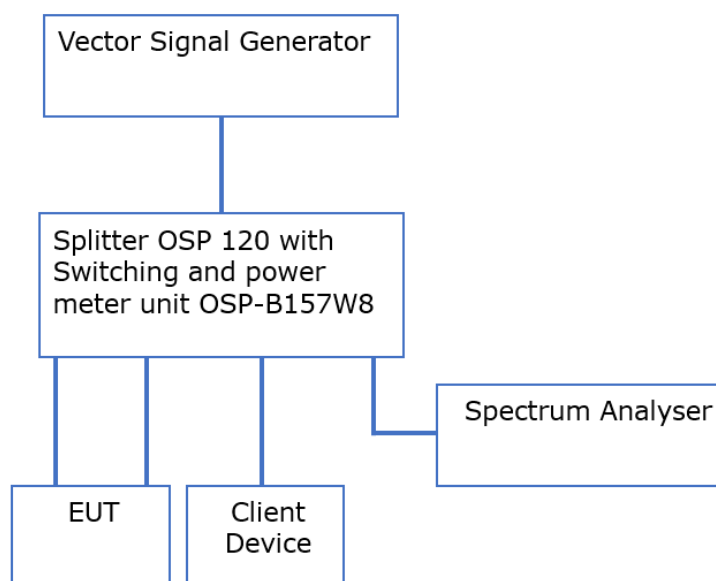
## 5.4 DYNAMIC FREQUENCY SELECTION, STATISTICAL PERFORMANCE CHECK

Standard **FCC Part 15 Subpart E**

**The test was performed according to:**  
 KDB 905462 D02

### 5.4.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room for the DFS measurements.



The Master and Client EUT were powered together with the laptops for traffic generation. Afterwards the master and client were configured for connection on a DFS channel. Once the Channel Availability Check was completed and connection was established, the video streaming was started.

Using command line commands provided by the customer, the device's channel change functionality was deactivated and non-occupancy period reduced to 1 s to reduce testing time.

Detection of radar pulse is monitored by console interface.

30 unique pulses of radar type 1 to 6 are send while for each type 10 pulses are send at the lower end of the 99 % detection BW, 10 pulses at the higher end of the detection BW and 10 are send mid channel.

For each send pulse detection is recorded.

Testing is repeated for all supported channel bandwidths.

## 5.4.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart E, §15.407 (h) (2)

U-NII devices operating with any part of its 26 dB emission bandwidth in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. Operators shall only use equipment with a DFS mechanism that is turned on when operating in these bands. The device must sense for radar signals at 100 percent of its emission bandwidth. The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is –64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is –62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna.

Limits according KDB 905462 D02 UNII DFS Compliance Procedures New Rules

**Table 5 – Short Pulse Radar Test Waveforms**

| Radar Type                                                                                                                                  | Pulse Width (μsec) | PRI (μsec)                                                                                                                                                                                                                                                     | Number of Pulses                                                                                                 | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------|
| 0                                                                                                                                           | 1                  | 1428                                                                                                                                                                                                                                                           | 18                                                                                                               | See Note 1                                 | See Note 1               |
| 1                                                                                                                                           | 1                  | Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a<br><br>Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A | Roundup $\left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{PRI_{\mu sec}} \right) \right\}$ | 60%                                        | 30                       |
| 2                                                                                                                                           | 1-5                | 150-230                                                                                                                                                                                                                                                        | 23-29                                                                                                            | 60%                                        | 30                       |
| 3                                                                                                                                           | 6-10               | 200-500                                                                                                                                                                                                                                                        | 16-18                                                                                                            | 60%                                        | 30                       |
| 4                                                                                                                                           | 11-20              | 200-500                                                                                                                                                                                                                                                        | 12-16                                                                                                            | 60%                                        | 30                       |
| Aggregate (Radar Types 1-4)                                                                                                                 |                    |                                                                                                                                                                                                                                                                |                                                                                                                  | 80%                                        | 120                      |
| <b>Note 1:</b> Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests. |                    |                                                                                                                                                                                                                                                                |                                                                                                                  |                                            |                          |

**Table 6 – Long Pulse Radar Test Waveform**

| Radar Type | Pulse Width (μsec) | Chirp Width (MHz) | PRI (μsec) | Number of Pulses per Burst | Number of Bursts | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|-------------------|------------|----------------------------|------------------|--------------------------------------------|--------------------------|
| 5          | 50-100             | 5-20              | 1000-2000  | 1-3                        | 8-20             | 80%                                        | 30                       |

**Table 7 – Frequency Hopping Radar Test Waveform**

| Radar Type | Pulse Width (μsec) | PRI (μsec) | Pulses per Hop | Hopping Rate (kHz) | Hopping Sequence Length (msec) | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|------------|----------------|--------------------|--------------------------------|--------------------------------------------|--------------------------|
| 6          | 1                  | 333        | 9              | 0.333              | 300                            | 70%                                        | 30                       |

### 5.4.3 TEST PROTOCOL

Ambient temperature: 25 °C  
 Air Pressure: 990 hPa  
 Humidity: 30 %

| Radio Technology    | TX Frequency [MHz] | Radar Test Signal # | Number of send pulses | Number of detected pulses | Successful Detection Percentage [%] | Limit [%] | Margin to Limit [%] |
|---------------------|--------------------|---------------------|-----------------------|---------------------------|-------------------------------------|-----------|---------------------|
| WLAN ax 20 MHz MIMO | 5500               | Type 1              | 30                    | 25                        | 83                                  | 60        | 23                  |
| WLAN ax 20 MHz MIMO | 5500               | Type 2              | 30                    | 26                        | 87                                  | 60        | 27                  |
| WLAN ax 20 MHz MIMO | 5500               | Type 3              | 30                    | 23                        | 77                                  | 60        | 17                  |
| WLAN ax 20 MHz MIMO | 5500               | Type 4              | 30                    | 26                        | 87                                  | 60        | 27                  |
| WLAN ax 20 MHz MIMO | 5500               | Aggregate 1-4       | 120                   | 100                       | 83                                  | 80        | 3                   |
| WLAN ax 20 MHz MIMO | 5500               | Type 5              | 30                    | 28                        | 93                                  | 80        | 13                  |
| WLAN ax 20 MHz MIMO | 5500               | Type 6              | 30                    | 30                        | 100                                 | 70        | 30                  |
| WLAN ax 40 MHz MIMO | 5510               | Type 1              | 30                    | 29                        | 97                                  | 60        | 37                  |
| WLAN ax 40 MHz MIMO | 5510               | Type 2              | 30                    | 28                        | 93                                  | 60        | 33                  |
| WLAN ax 40 MHz MIMO | 5510               | Type 3              | 30                    | 27                        | 90                                  | 60        | 30                  |
| WLAN ax 40 MHz MIMO | 5510               | Type 4              | 30                    | 26                        | 87                                  | 60        | 27                  |
| WLAN ax 40 MHz MIMO | 5510               | Aggregate 1-4       | 120                   | 110                       | 92                                  | 80        | 12                  |
| WLAN ax 40 MHz MIMO | 5510               | Type 5              | 30                    | 26                        | 87                                  | 80        | 7                   |
| WLAN ax 40 MHz MIMO | 5510               | Type 6              | 30                    | 30                        | 100                                 | 70        | 30                  |

Remark: Detection of radar pulses is monitored by console interface.  
 No plots are recorded.

#### 5.4.4 MEASUREMENT RESULT

### 20 MHz Bandwidth Pulse Types 1 to 4 and 6

| RADAR TYPE 1 Table 5a |                            |                    |          |                    | RADAR TYPE 1 Random |                            |                    |          |                    |
|-----------------------|----------------------------|--------------------|----------|--------------------|---------------------|----------------------------|--------------------|----------|--------------------|
| Trial #               | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) | Trial #             | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) |
| 1                     | 102                        | 1                  | 518      | yes                | 1                   | 20                         | 1                  | 2692     | yes                |
| 2                     | 99                         | 1                  | 538      | yes                | 2                   | 19                         | 1                  | 2900     | yes                |
| 3                     | 95                         | 1                  | 558      | yes                | 3                   | 53                         | 1                  | 1004     | yes                |
| 4                     | 92                         | 1                  | 578      | no                 | 4                   | 24                         | 1                  | 2227     | yes                |
| 5                     | 89                         | 1                  | 598      | yes                | 5                   | 30                         | 1                  | 1806     | no                 |
| 6                     | 86                         | 1                  | 618      | yes                | 6                   | 86                         | 1                  | 619      | yes                |
| 7                     | 83                         | 1                  | 638      | yes                | 7                   | 22                         | 1                  | 2498     | no                 |
| 8                     | 81                         | 1                  | 658      | yes                | 8                   | 56                         | 1                  | 943      | yes                |
| 9                     | 78                         | 1                  | 678      | yes                | 9                   | 21                         | 1                  | 2609     | yes                |
| 10                    | 76                         | 1                  | 698      | yes                | 10                  | 63                         | 1                  | 845      | yes                |
| 11                    | 74                         | 1                  | 718      | no                 | 11                  | 59                         | 1                  | 1097     | yes                |
| 12                    | 72                         | 1                  | 738      | yes                | 12                  | 24                         | 1                  | 2271     | yes                |
| 13                    | 70                         | 1                  | 758      | yes                | 13                  | 18                         | 1                  | 3041     | yes                |
| 14                    | 68                         | 1                  | 778      | yes                | 14                  | 56                         | 1                  | 956      | yes                |
| 15                    | 67                         | 1                  | 798      | yes                | 15                  | 36                         | 1                  | 1503     | no                 |
| RADAR TYPE 2          |                            |                    |          |                    | RADAR TYPE 3        |                            |                    |          |                    |
| Trial #               | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) | Trial #             | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) |
| 1                     | 28                         | 1.2                | 181      | yes                | 1                   | 18                         | 7.4                | 422      | yes                |
| 2                     | 29                         | 4.1                | 199      | yes                | 2                   | 17                         | 9.6                | 457      | yes                |
| 3                     | 23                         | 5                  | 206      | yes                | 3                   | 17                         | 6.1                | 426      | yes                |
| 4                     | 24                         | 2.5                | 196      | yes                | 4                   | 16                         | 9.1                | 353      | yes                |
| 5                     | 24                         | 2.3                | 216      | yes                | 5                   | 16                         | 8.3                | 342      | yes                |
| 6                     | 24                         | 3.1                | 159      | yes                | 6                   | 17                         | 7.3                | 475      | no                 |
| 7                     | 27                         | 2.8                | 228      | no                 | 7                   | 16                         | 6.6                | 412      | no                 |
| 8                     | 26                         | 2.4                | 163      | yes                | 8                   | 17                         | 9.8                | 322      | yes                |
| 9                     | 29                         | 2.4                | 203      | yes                | 9                   | 17                         | 8.4                | 352      | yes                |
| 10                    | 26                         | 4.4                | 183      | yes                | 10                  | 17                         | 7.6                | 432      | yes                |
| 11                    | 28                         | 3.9                | 196      | yes                | 11                  | 16                         | 8.1                | 371      | yes                |
| 12                    | 25                         | 3.9                | 175      | yes                | 12                  | 17                         | 7.4                | 285      | yes                |
| 13                    | 24                         | 1.7                | 184      | yes                | 13                  | 18                         | 8.3                | 414      | yes                |
| 14                    | 28                         | 4.7                | 163      | yes                | 14                  | 17                         | 6.3                | 215      | no                 |
| 15                    | 24                         | 2.5                | 170      | no                 | 15                  | 16                         | 8                  | 443      | yes                |
| 16                    | 25                         | 4.9                | 188      | yes                | 16                  | 17                         | 9.7                | 205      | yes                |
| 17                    | 25                         | 3.4                | 217      | yes                | 17                  | 17                         | 8                  | 445      | yes                |
| 18                    | 29                         | 3.6                | 218      | no                 | 18                  | 17                         | 7.3                | 321      | yes                |
| 19                    | 27                         | 2.3                | 159      | yes                | 19                  | 17                         | 6.3                | 446      | no                 |
| 20                    | 28                         | 2.7                | 161      | yes                | 20                  | 16                         | 9                  | 386      | yes                |
| 21                    | 29                         | 3.2                | 224      | yes                | 21                  | 18                         | 7.2                | 200      | yes                |
| 22                    | 28                         | 2.7                | 185      | yes                | 22                  | 17                         | 9.6                | 257      | yes                |
| 23                    | 23                         | 5                  | 207      | no                 | 23                  | 16                         | 6                  | 245      | no                 |
| 24                    | 23                         | 1.9                | 217      | yes                | 24                  | 17                         | 9.9                | 415      | yes                |
| 25                    | 26                         | 1.3                | 197      | yes                | 25                  | 17                         | 9.8                | 384      | yes                |
| 26                    | 24                         | 1.8                | 203      | yes                | 26                  | 17                         | 9.9                | 434      | yes                |
| 27                    | 26                         | 3.6                | 170      | yes                | 27                  | 17                         | 6.8                | 438      | yes                |
| 28                    | 25                         | 3.9                | 170      | yes                | 28                  | 16                         | 7                  | 341      | no                 |
| 29                    | 25                         | 3.2                | 194      | yes                | 29                  | 16                         | 7.9                | 350      | yes                |
| 30                    | 27                         | 3.5                | 178      | yes                | 30                  | 18                         | 8.7                | 489      | no                 |

| RADAR TYPE 4 |                            |                    |          |                    | RADAR TYPE 6 |                          |                    |          |                    |
|--------------|----------------------------|--------------------|----------|--------------------|--------------|--------------------------|--------------------|----------|--------------------|
| Trial #      | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) | Trial #      | Number of Pulses per Hop | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) |
| 1            | 14                         | 14.4               | 446      | yes                | 1            | 9                        | 1                  | 333      | yes                |
| 2            | 13                         | 14.9               | 299      | yes                | 2            | 9                        | 1                  | 333      | yes                |
| 3            | 16                         | 19                 | 500      | yes                | 3            | 9                        | 1                  | 333      | yes                |
| 4            | 15                         | 18.1               | 449      | yes                | 4            | 9                        | 1                  | 333      | yes                |
| 5            | 15                         | 11.4               | 285      | yes                | 5            | 9                        | 1                  | 333      | yes                |
| 6            | 13                         | 19.5               | 435      | yes                | 6            | 9                        | 1                  | 333      | yes                |
| 7            | 15                         | 16.5               | 220      | yes                | 7            | 9                        | 1                  | 333      | yes                |
| 8            | 13                         | 17.5               | 277      | yes                | 8            | 9                        | 1                  | 333      | yes                |
| 9            | 12                         | 11.8               | 253      | yes                | 9            | 9                        | 1                  | 333      | yes                |
| 10           | 13                         | 14.3               | 413      | yes                | 10           | 9                        | 1                  | 333      | yes                |
| 11           | 14                         | 18.2               | 307      | yes                | 11           | 9                        | 1                  | 333      | yes                |
| 12           | 16                         | 15.8               | 485      | yes                | 12           | 9                        | 1                  | 333      | yes                |
| 13           | 13                         | 12.8               | 471      | yes                | 13           | 9                        | 1                  | 333      | yes                |
| 14           | 13                         | 15.5               | 212      | yes                | 14           | 9                        | 1                  | 333      | yes                |
| 15           | 14                         | 18.3               | 393      | no                 | 15           | 9                        | 1                  | 333      | yes                |
| 16           | 14                         | 11.6               | 261      | yes                | 16           | 9                        | 1                  | 333      | yes                |
| 17           | 15                         | 16.6               | 277      | yes                | 17           | 9                        | 1                  | 333      | yes                |
| 18           | 13                         | 18.4               | 292      | yes                | 18           | 9                        | 1                  | 333      | yes                |
| 19           | 13                         | 15.8               | 359      | yes                | 19           | 9                        | 1                  | 333      | yes                |
| 20           | 13                         | 14.3               | 333      | yes                | 20           | 9                        | 1                  | 333      | yes                |
| 21           | 15                         | 11.1               | 391      | no                 | 21           | 9                        | 1                  | 333      | yes                |
| 22           | 12                         | 14.6               | 435      | yes                | 22           | 9                        | 1                  | 333      | yes                |
| 23           | 14                         | 19.2               | 473      | yes                | 23           | 9                        | 1                  | 333      | yes                |
| 24           | 14                         | 18.2               | 400      | yes                | 24           | 9                        | 1                  | 333      | yes                |
| 25           | 15                         | 13                 | 282      | yes                | 25           | 9                        | 1                  | 333      | yes                |
| 26           | 16                         | 14.2               | 455      | no                 | 26           | 9                        | 1                  | 333      | yes                |
| 27           | 14                         | 18.2               | 334      | yes                | 27           | 9                        | 1                  | 333      | yes                |
| 28           | 12                         | 12.4               | 369      | yes                | 28           | 9                        | 1                  | 333      | yes                |
| 29           | 15                         | 19.6               | 460      | yes                | 29           | 9                        | 1                  | 333      | yes                |
| 30           | 12                         | 19.5               | 407      | no                 | 30           | 9                        | 1                  | 333      | yes                |

## 40 MHz Bandwidth Pulse Types 1 to 4 and 6

| RADAR TYPE 1 Table 5a |                            |                    |          |                    | RADAR TYPE 1 |                            |                    |          |                    |
|-----------------------|----------------------------|--------------------|----------|--------------------|--------------|----------------------------|--------------------|----------|--------------------|
| Trial #               | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) | Trial #      | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) |
| 1                     | 102                        | 1                  | 518      | yes                | 1            | 22                         | 1                  | 2502     | yes                |
| 2                     | 99                         | 1                  | 538      | yes                | 2            | 23                         | 1                  | 2317     | yes                |
| 3                     | 95                         | 1                  | 558      | yes                | 3            | 69                         | 1                  | 767      | yes                |
| 4                     | 92                         | 1                  | 578      | yes                | 4            | 34                         | 1                  | 1592     | no                 |
| 5                     | 89                         | 1                  | 598      | yes                | 5            | 29                         | 1                  | 1842     | yes                |
| 6                     | 86                         | 1                  | 618      | yes                | 6            | 40                         | 1                  | 1324     | yes                |
| 7                     | 83                         | 1                  | 638      | yes                | 7            | 20                         | 1                  | 2751     | yes                |
| 8                     | 81                         | 1                  | 658      | yes                | 8            | 27                         | 1                  | 2000     | yes                |
| 9                     | 78                         | 1                  | 678      | yes                | 9            | 26                         | 1                  | 2065     | yes                |
| 10                    | 76                         | 1                  | 698      | yes                | 10           | 19                         | 1                  | 2888     | yes                |
| 11                    | 74                         | 1                  | 718      | yes                | 11           | 44                         | 1                  | 1208     | yes                |
| 12                    | 72                         | 1                  | 738      | yes                | 12           | 20                         | 1                  | 2698     | yes                |
| 13                    | 70                         | 1                  | 758      | yes                | 13           | 24                         | 1                  | 2227     | yes                |
| 14                    | 68                         | 1                  | 778      | yes                | 14           | 18                         | 1                  | 3007     | yes                |
| 15                    | 67                         | 1                  | 798      | yes                | 15           | 83                         | 1                  | 642      | yes                |
| RADAR TYPE 2          |                            |                    |          |                    | RADAR TYPE 3 |                            |                    |          |                    |
| Trial #               | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) | Trial #      | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) |
| 1                     | 28                         | 1.2                | 181      | yes                | 1            | 18                         | 7.4                | 422      | yes                |
| 2                     | 29                         | 4.1                | 199      | yes                | 2            | 17                         | 9.6                | 457      | no                 |
| 3                     | 23                         | 5                  | 206      | yes                | 3            | 17                         | 6.1                | 426      | yes                |
| 4                     | 24                         | 2.5                | 196      | yes                | 4            | 16                         | 9.1                | 353      | yes                |
| 5                     | 24                         | 2.3                | 216      | yes                | 5            | 16                         | 8.3                | 342      | yes                |
| 6                     | 24                         | 3.1                | 159      | yes                | 6            | 17                         | 7.3                | 475      | yes                |
| 7                     | 27                         | 2.8                | 228      | yes                | 7            | 16                         | 6.6                | 412      | yes                |
| 8                     | 26                         | 2.4                | 163      | yes                | 8            | 17                         | 9.8                | 322      | yes                |
| 9                     | 29                         | 2.4                | 203      | yes                | 9            | 17                         | 8.4                | 352      | yes                |
| 10                    | 26                         | 4.4                | 183      | yes                | 10           | 17                         | 7.6                | 432      | yes                |
| 11                    | 28                         | 3.9                | 196      | no                 | 11           | 16                         | 8.1                | 371      | yes                |
| 12                    | 25                         | 3.9                | 175      | yes                | 12           | 17                         | 7.4                | 285      | no                 |
| 13                    | 24                         | 1.7                | 184      | yes                | 13           | 18                         | 8.3                | 414      | yes                |
| 14                    | 28                         | 4.7                | 163      | yes                | 14           | 17                         | 6.3                | 215      | yes                |
| 15                    | 24                         | 2.5                | 170      | yes                | 15           | 16                         | 8                  | 443      | yes                |
| 16                    | 25                         | 4.9                | 188      | yes                | 16           | 17                         | 9.7                | 205      | yes                |
| 17                    | 25                         | 3.4                | 217      | yes                | 17           | 17                         | 8                  | 445      | yes                |
| 18                    | 29                         | 3.6                | 218      | yes                | 18           | 17                         | 7.3                | 321      | yes                |
| 19                    | 27                         | 2.3                | 159      | yes                | 19           | 17                         | 6.3                | 446      | yes                |
| 20                    | 28                         | 2.7                | 161      | yes                | 20           | 16                         | 9                  | 386      | yes                |
| 21                    | 29                         | 3.2                | 224      | yes                | 21           | 18                         | 7.2                | 200      | yes                |
| 22                    | 28                         | 2.7                | 185      | yes                | 22           | 17                         | 9.6                | 257      | yes                |
| 23                    | 23                         | 5                  | 207      | yes                | 23           | 16                         | 6                  | 245      | yes                |
| 24                    | 23                         | 1.9                | 217      | yes                | 24           | 17                         | 9.9                | 415      | yes                |
| 25                    | 26                         | 1.3                | 197      | yes                | 25           | 17                         | 9.8                | 384      | no                 |
| 26                    | 24                         | 1.8                | 203      | yes                | 26           | 17                         | 9.9                | 434      | yes                |
| 27                    | 26                         | 3.6                | 170      | yes                | 27           | 17                         | 6.8                | 438      | yes                |
| 28                    | 25                         | 3.9                | 170      | yes                | 28           | 16                         | 7                  | 341      | yes                |
| 29                    | 25                         | 3.2                | 194      | yes                | 29           | 16                         | 7.9                | 350      | yes                |
| 30                    | 27                         | 3.5                | 178      | yes                | 30           | 18                         | 8.7                | 489      | yes                |

| RADAR TYPE 4 |                            |                    |          |                    | RARAR TYPE 6 |                          |                    |          |                    |
|--------------|----------------------------|--------------------|----------|--------------------|--------------|--------------------------|--------------------|----------|--------------------|
| Trial #      | Number of Pulses per Burst | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) | Trial #      | Number of Pulses per Hop | Pulse Width (μsec) | PRI (μs) | Detection (yes/no) |
| 1            | 14                         | 14.4               | 446      | yes                | 1            | 9                        | 1                  | 333      | yes                |
| 2            | 13                         | 14.9               | 299      | yes                | 2            | 9                        | 1                  | 333      | yes                |
| 3            | 16                         | 19                 | 500      | yes                | 3            | 9                        | 1                  | 333      | yes                |
| 4            | 15                         | 18.1               | 449      | yes                | 4            | 9                        | 1                  | 333      | yes                |
| 5            | 15                         | 11.4               | 285      | yes                | 5            | 9                        | 1                  | 333      | yes                |
| 6            | 13                         | 19.5               | 435      | yes                | 6            | 9                        | 1                  | 333      | yes                |
| 7            | 15                         | 16.5               | 220      | yes                | 7            | 9                        | 1                  | 333      | yes                |
| 8            | 13                         | 17.5               | 277      | no                 | 8            | 9                        | 1                  | 333      | yes                |
| 9            | 12                         | 11.8               | 253      | yes                | 9            | 9                        | 1                  | 333      | yes                |
| 10           | 13                         | 14.3               | 413      | yes                | 10           | 9                        | 1                  | 333      | yes                |
| 11           | 14                         | 18.2               | 307      | yes                | 11           | 9                        | 1                  | 333      | yes                |
| 12           | 16                         | 15.8               | 485      | no                 | 12           | 9                        | 1                  | 333      | yes                |
| 13           | 13                         | 12.8               | 471      | yes                | 13           | 9                        | 1                  | 333      | yes                |
| 14           | 13                         | 15.5               | 212      | yes                | 14           | 9                        | 1                  | 333      | yes                |
| 15           | 14                         | 18.3               | 393      | yes                | 15           | 9                        | 1                  | 333      | yes                |
| 16           | 14                         | 11.6               | 261      | yes                | 16           | 9                        | 1                  | 333      | yes                |
| 17           | 15                         | 16.6               | 277      | no                 | 17           | 9                        | 1                  | 333      | yes                |
| 18           | 13                         | 18.4               | 292      | yes                | 18           | 9                        | 1                  | 333      | yes                |
| 19           | 13                         | 15.8               | 359      | yes                | 19           | 9                        | 1                  | 333      | yes                |
| 20           | 13                         | 14.3               | 333      | yes                | 20           | 9                        | 1                  | 333      | yes                |
| 21           | 15                         | 11.1               | 391      | yes                | 21           | 9                        | 1                  | 333      | yes                |
| 22           | 12                         | 14.6               | 435      | yes                | 22           | 9                        | 1                  | 333      | yes                |
| 23           | 14                         | 19.2               | 473      | yes                | 23           | 9                        | 1                  | 333      | yes                |
| 24           | 14                         | 18.2               | 400      | yes                | 24           | 9                        | 1                  | 333      | yes                |
| 25           | 15                         | 13                 | 282      | yes                | 25           | 9                        | 1                  | 333      | yes                |
| 26           | 16                         | 14.2               | 455      | yes                | 26           | 9                        | 1                  | 333      | yes                |
| 27           | 14                         | 18.2               | 334      | yes                | 27           | 9                        | 1                  | 333      | yes                |
| 28           | 12                         | 12.4               | 369      | yes                | 28           | 9                        | 1                  | 333      | yes                |
| 29           | 15                         | 19.6               | 460      | yes                | 29           | 9                        | 1                  | 333      | yes                |
| 30           | 12                         | 19.5               | 407      | no                 | 30           | 9                        | 1                  | 333      | yes                |

## Pulse Type 5

| TYPE 5 20 MHz |                    |                         | TYPE 5 40 MHz |                    |                         |
|---------------|--------------------|-------------------------|---------------|--------------------|-------------------------|
| Trial #       | Detection (yes/no) | Radar Pulse Freq. [MHz] | Trial #       | Detection (yes/no) | Radar Pulse Freq. [MHz] |
| 1             | yes                | 5500                    | 1             | yes                | 5500                    |
| 2             | yes                | 5500                    | 2             | no                 | 5500                    |
| 3             | yes                | 5500                    | 3             | yes                | 5500                    |
| 4             | yes                | 5500                    | 4             | yes                | 5500                    |
| 5             | yes                | 5500                    | 5             | yes                | 5500                    |
| 6             | yes                | 5500                    | 6             | yes                | 5500                    |
| 7             | yes                | 5500                    | 7             | yes                | 5500                    |
| 8             | yes                | 5500                    | 8             | yes                | 5500                    |
| 9             | yes                | 5500                    | 9             | yes                | 5500                    |
| 10            | yes                | 5500                    | 10            | yes                | 5500                    |
| 11            | no                 | 5497.2                  | 11            | yes                | 5497.6                  |
| 12            | yes                | 5493.6                  | 12            | yes                | 5494.0                  |
| 13            | yes                | 5494.4                  | 13            | yes                | 5494.8                  |
| 14            | yes                | 5496.8                  | 14            | no                 | 5497.2                  |
| 15            | yes                | 5494.8                  | 15            | yes                | 5495.2                  |
| 16            | yes                | 5492.8                  | 16            | yes                | 5493.2                  |
| 17            | yes                | 5493.6                  | 17            | yes                | 5494.0                  |
| 18            | yes                | 5493.2                  | 18            | yes                | 5493.6                  |
| 19            | yes                | 5492.8                  | 19            | yes                | 5493.2                  |
| 20            | yes                | 5494.4                  | 20            | yes                | 5494.8                  |
| 21            | yes                | 5503.2                  | 21            | yes                | 5522.8                  |
| 22            | yes                | 5502.0                  | 22            | no                 | 5521.6                  |
| 23            | yes                | 5504.0                  | 23            | yes                | 5523.6                  |
| 24            | yes                | 5504.4                  | 24            | yes                | 5524.0                  |
| 25            | yes                | 5502.4                  | 25            | yes                | 5522.0                  |
| 26            | yes                | 5507.2                  | 26            | yes                | 5526.8                  |
| 27            | yes                | 5505.2                  | 27            | yes                | 5524.8                  |
| 28            | yes                | 5505.6                  | 28            | yes                | 5525.2                  |
| 29            | yes                | 5502.8                  | 29            | yes                | 5522.4                  |
| 30            | no                 | 5501.6                  | 30            | no                 | 5521.2                  |

| Trial Number : 1    |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 8  |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 67.2               | 7                 | 1094                        |                             | 23                                    |
| 2                   | 1                | 98.1               | 7                 |                             |                             | 1022                                  |
| 3                   | 1                | 80.8               | 7                 |                             |                             | 1262                                  |
| 4                   | 2                | 95.2               | 7                 | 915                         |                             | 852                                   |
| 5                   | 2                | 74.4               | 7                 | 1603                        |                             | 865                                   |
| 6                   | 3                | 70.5               | 7                 | 1766                        | 953                         | 1098                                  |
| 7                   | 2                | 92.4               | 7                 | 1887                        |                             | 737                                   |
| 8                   | 2                | 51.1               | 7                 | 1751                        |                             | 1068                                  |
| Trial Number : 2    |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 9  |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 50.4               | 19                | 1301                        |                             | 345                                   |
| 2                   | 3                | 76.8               | 19                | 1435                        | 1830                        | 161                                   |
| 3                   | 1                | 61.6               | 19                |                             |                             | 1074                                  |
| 4                   | 2                | 79.8               | 19                | 1467                        |                             | 182                                   |
| 5                   | 2                | 73.5               | 19                | 1713                        |                             | 1259                                  |
| 6                   | 3                | 51.1               | 19                | 1738                        | 1061                        | 785                                   |
| 7                   | 3                | 96.8               | 19                | 1184                        | 1082                        | 230                                   |
| 8                   | 2                | 89.6               | 19                | 1083                        |                             | 268                                   |
| 9                   | 3                | 56.1               | 19                | 1801                        | 1511                        | 1195                                  |
| Trial Number : 3    |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 10 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 88.4               | 15                | 1291                        |                             | 390                                   |
| 2                   | 3                | 66                 | 15                | 1240                        | 1597                        | 391                                   |
| 3                   | 2                | 97.6               | 15                | 916                         |                             | 226                                   |
| 4                   | 2                | 50.2               | 15                | 1619                        |                             | 319                                   |
| 5                   | 3                | 84.7               | 15                | 1731                        | 1854                        | 1037                                  |
| 6                   | 2                | 92.9               | 15                | 1298                        |                             | 480                                   |
| 7                   | 3                | 50                 | 15                | 1526                        | 1374                        | 408                                   |
| 8                   | 1                | 76.9               | 15                |                             |                             | 80                                    |
| 9                   | 2                | 71.2               | 15                | 1338                        |                             | 336                                   |
| 10                  | 3                | 81.8               | 15                | 932                         | 1172                        | 589                                   |

| Trial Number : 4    |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 11 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 74.8               | 6                 | 1216                        | 1187                        | 158                                   |
| 2                   | 2                | 84.4               | 6                 | 1118                        |                             | 868                                   |
| 3                   | 2                | 53.8               | 6                 | 1135                        |                             | 585                                   |
| 4                   | 2                | 94.9               | 6                 | 1140                        |                             | 574                                   |
| 5                   | 3                | 64.7               | 6                 | 1769                        | 1051                        | 825                                   |
| 6                   | 3                | 61.4               | 6                 | 1503                        | 1114                        | 272                                   |
| 7                   | 1                | 50.3               | 6                 |                             |                             | 532                                   |
| 8                   | 3                | 97.3               | 6                 | 1206                        | 1077                        | 28                                    |
| 9                   | 1                | 80.8               | 6                 |                             |                             | 1045                                  |
| 10                  | 2                | 65.4               | 6                 | 1552                        |                             | 214                                   |
| 11                  | 1                | 65.7               | 6                 |                             |                             | 45                                    |
| Trial Number : 5    |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 12 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 85.9               | 15                | 1091                        |                             | 904                                   |
| 2                   | 1                | 91.1               | 15                |                             |                             | 66                                    |
| 3                   | 1                | 95.1               | 15                |                             |                             | 548                                   |
| 4                   | 3                | 83.6               | 15                | 1791                        | 1747                        | 764                                   |
| 5                   | 2                | 70.1               | 15                | 1764                        |                             | 764                                   |
| 6                   | 2                | 67.5               | 15                | 1611                        |                             | 490                                   |
| 7                   | 1                | 50.1               | 15                |                             |                             | 195                                   |
| 8                   | 1                | 60.9               | 15                |                             |                             | 903                                   |
| 9                   | 2                | 81.9               | 15                | 1020                        |                             | 108                                   |
| 10                  | 2                | 56.2               | 15                | 1596                        |                             | 952                                   |
| 11                  | 3                | 83.3               | 15                | 1565                        | 1375                        | 942                                   |
| 12                  | 1                | 69.7               | 15                |                             |                             | 54                                    |
| Trial Number : 6    |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 13 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 1                | 52.8               | 14                |                             |                             | 636                                   |
| 2                   | 1                | 90.7               | 14                |                             |                             | 231                                   |
| 3                   | 2                | 58.2               | 14                | 1856                        |                             | 548                                   |
| 4                   | 2                | 94                 | 14                | 1358                        |                             | 701                                   |
| 5                   | 3                | 72.6               | 14                | 1156                        | 1644                        | 165                                   |
| 6                   | 2                | 56.1               | 14                | 1030                        |                             | 828                                   |
| 7                   | 2                | 99                 | 14                | 1097                        |                             | 6                                     |
| 8                   | 3                | 53.7               | 14                | 1696                        | 1782                        | 378                                   |
| 9                   | 3                | 90.3               | 14                | 1040                        | 1373                        | 753                                   |
| 10                  | 2                | 74.6               | 14                | 1440                        |                             | 811                                   |
| 11                  | 3                | 66.1               | 14                | 1573                        | 1231                        | 820                                   |
| 12                  | 2                | 89.1               | 14                | 1550                        |                             | 227                                   |
| 13                  | 2                | 62.3               | 14                | 1912                        |                             | 637                                   |

| Trial Number : 7    |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 14 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 86.9               | 8                 | 1046                        | 1862                        | 287                                   |
| 2                   | 2                | 94.2               | 8                 | 1590                        |                             | 104                                   |
| 3                   | 2                | 72.2               | 8                 | 972                         |                             | 219                                   |
| 4                   | 1                | 84                 | 8                 |                             |                             | 609                                   |
| 5                   | 2                | 62                 | 8                 | 1213                        |                             | 451                                   |
| 6                   | 2                | 71.1               | 8                 | 1816                        |                             | 455                                   |
| 7                   | 1                | 58.8               | 8                 |                             |                             | 519                                   |
| 8                   | 2                | 57.7               | 8                 | 1883                        |                             | 158                                   |
| 9                   | 1                | 71.5               | 8                 |                             |                             | 649                                   |
| 10                  | 1                | 53.8               | 8                 |                             |                             | 711                                   |
| 11                  | 1                | 74.4               | 8                 |                             |                             | 140                                   |
| 12                  | 2                | 64.4               | 8                 | 1219                        |                             | 586                                   |
| 13                  | 2                | 66.8               | 8                 | 1603                        |                             | 86                                    |
| 14                  | 2                | 82                 | 8                 | 1763                        |                             | 115                                   |
| Trial Number : 8    |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 15 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 96.7               | 5                 | 1410                        |                             | 171                                   |
| 2                   | 2                | 67.4               | 5                 | 1570                        |                             | 377                                   |
| 3                   | 2                | 79.7               | 5                 | 1725                        |                             | 240                                   |
| 4                   | 1                | 86.7               | 5                 |                             |                             | 23                                    |
| 5                   | 2                | 87.5               | 5                 | 1780                        |                             | 134                                   |
| 6                   | 2                | 54.9               | 5                 | 1294                        |                             | 682                                   |
| 7                   | 3                | 91                 | 5                 | 1212                        | 1312                        | 158                                   |
| 8                   | 3                | 100                | 5                 | 1045                        | 1155                        | 283                                   |
| 9                   | 2                | 93.3               | 5                 | 1636                        |                             | 713                                   |
| 10                  | 2                | 97.5               | 5                 | 1155                        |                             | 636                                   |
| 11                  | 2                | 70.6               | 5                 | 1901                        |                             | 358                                   |
| 12                  | 3                | 55                 | 5                 | 1379                        | 1739                        | 471                                   |
| 13                  | 2                | 63.8               | 5                 | 1742                        |                             | 606                                   |
| 14                  | 1                | 50.9               | 5                 |                             |                             | 51                                    |
| 15                  | 2                | 94                 | 5                 | 1695                        |                             | 493                                   |
| Trial Number : 9    |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 16 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 98.8               | 14                | 1337                        |                             | 67                                    |
| 2                   | 2                | 96.3               | 14                | 1833                        |                             | 698                                   |
| 3                   | 2                | 56.2               | 14                | 1700                        |                             | 151                                   |
| 4                   | 3                | 72.1               | 14                | 981                         | 1311                        | 28                                    |
| 5                   | 1                | 63.7               | 14                |                             |                             | 528                                   |
| 6                   | 2                | 73.9               | 14                | 1033                        |                             | 343                                   |
| 7                   | 2                | 90.7               | 14                | 1655                        |                             | 520                                   |
| 8                   | 2                | 98.9               | 14                | 1565                        |                             | 735                                   |
| 9                   | 3                | 71.9               | 14                | 1076                        | 1168                        | 325                                   |
| 10                  | 2                | 75.2               | 14                | 1413                        |                             | 92                                    |
| 11                  | 1                | 89.6               | 14                |                             |                             | 519                                   |
| 12                  | 1                | 78.9               | 14                |                             |                             | 630                                   |
| 13                  | 3                | 77.3               | 14                | 1090                        | 1901                        | 695                                   |
| 14                  | 3                | 50.7               | 14                | 1471                        | 970                         | 343                                   |
| 15                  | 2                | 93.8               | 14                | 1622                        |                             | 676                                   |
| 16                  | 1                | 97.8               | 14                |                             |                             | 535                                   |

| Trial Number : 10   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 17 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 89.6               | 12                | 1093                        |                             | 89                                    |
| 2                   | 2                | 88.5               | 12                | 1836                        |                             | 681                                   |
| 3                   | 1                | 52.6               | 12                |                             |                             | 423                                   |
| 4                   | 3                | 59.9               | 12                | 1895                        | 1592                        | 81                                    |
| 5                   | 1                | 56.4               | 12                |                             |                             | 599                                   |
| 6                   | 1                | 51                 | 12                |                             |                             | 596                                   |
| 7                   | 3                | 67                 | 12                | 1490                        | 1777                        | 389                                   |
| 8                   | 2                | 76.2               | 12                | 1075                        |                             | 250                                   |
| 9                   | 3                | 94.7               | 12                | 1784                        | 1259                        | 432                                   |
| 10                  | 3                | 84.3               | 12                | 1867                        | 1860                        | 671                                   |
| 11                  | 2                | 61.6               | 12                | 989                         |                             | 466                                   |
| 12                  | 3                | 55.7               | 12                | 1490                        | 1673                        | 638                                   |
| 13                  | 3                | 72.5               | 12                | 1474                        | 977                         | 663                                   |
| 14                  | 3                | 87.2               | 12                | 1346                        | 1566                        | 692                                   |
| 15                  | 3                | 91.8               | 12                | 1074                        | 1474                        | 144                                   |
| 16                  | 2                | 76.1               | 12                | 1733                        |                             | 406                                   |
| 17                  | 3                | 86.8               | 12                | 1576                        | 1801                        | 12                                    |

| Trial Number : 11   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 18 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 56.4               | 17                | 1044                        | 1131                        | 575                                   |
| 2                   | 3                | 94.3               | 17                | 1459                        | 1482                        | 43                                    |
| 3                   | 3                | 91                 | 17                | 1527                        | 1775                        | 268                                   |
| 4                   | 2                | 51.9               | 17                | 1031                        |                             | 343                                   |
| 5                   | 2                | 64.5               | 17                | 1783                        |                             | 170                                   |
| 6                   | 3                | 97.6               | 17                | 1223                        | 1132                        | 551                                   |
| 7                   | 2                | 56.5               | 17                | 1465                        |                             | 217                                   |
| 8                   | 2                | 65.3               | 17                | 1025                        |                             | 27                                    |
| 9                   | 3                | 83.2               | 17                | 1764                        | 1321                        | 617                                   |
| 10                  | 2                | 99.1               | 17                | 1094                        |                             | 206                                   |
| 11                  | 2                | 90.4               | 17                | 1582                        |                             | 392                                   |
| 12                  | 2                | 58.6               | 17                | 1862                        |                             | 227                                   |
| 13                  | 2                | 82.8               | 17                | 1494                        |                             | 551                                   |
| 14                  | 1                | 86.5               | 17                |                             |                             | 361                                   |
| 15                  | 2                | 86.1               | 17                | 1443                        |                             | 579                                   |
| 16                  | 3                | 81.2               | 17                | 1048                        | 1344                        | 592                                   |
| 17                  | 1                | 79.1               | 17                |                             |                             | 289                                   |
| 18                  | 2                | 92                 | 17                | 1288                        |                             | 516                                   |

| Trial Number : 12   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 19 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 1                | 68.8               | 8                 |                             |                             | 12                                    |
| 2                   | 2                | 94.4               | 8                 | 1195                        |                             | 364                                   |
| 3                   | 2                | 99                 | 8                 | 1651                        |                             | 512                                   |
| 4                   | 1                | 94                 | 8                 |                             |                             | 601                                   |
| 5                   | 2                | 69.9               | 8                 | 1716                        |                             | 270                                   |
| 6                   | 1                | 88.3               | 8                 |                             |                             | 297                                   |
| 7                   | 1                | 72.8               | 8                 |                             |                             | 215                                   |
| 8                   | 2                | 84.7               | 8                 | 1350                        |                             | 615                                   |
| 9                   | 3                | 94.1               | 8                 | 1424                        | 1105                        | 192                                   |
| 10                  | 2                | 99.6               | 8                 | 1544                        |                             | 601                                   |
| 11                  | 2                | 88                 | 8                 | 1034                        |                             | 559                                   |
| 12                  | 1                | 71.4               | 8                 |                             |                             | 203                                   |
| 13                  | 2                | 79                 | 8                 | 1220                        |                             | 608                                   |
| 14                  | 3                | 81.2               | 8                 | 1548                        | 1656                        | 76                                    |
| 15                  | 3                | 54.8               | 8                 | 1024                        | 1909                        | 182                                   |
| 16                  | 3                | 88                 | 8                 | 998                         | 1435                        | 16                                    |
| 17                  | 3                | 85.5               | 8                 | 1620                        | 989                         | 137                                   |
| 18                  | 2                | 61.8               | 8                 | 1501                        |                             | 372                                   |
| 19                  | 2                | 72.2               | 8                 | 1719                        |                             | 371                                   |

| Trial Number : 13   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 20 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 1                | 64                 | 10                |                             |                             | 453                                   |
| 2                   | 2                | 56.4               | 10                | 1310                        |                             | 404                                   |
| 3                   | 1                | 95.4               | 10                |                             |                             | 560                                   |
| 4                   | 2                | 94.9               | 10                | 997                         |                             | 165                                   |
| 5                   | 2                | 57.6               | 10                | 1510                        |                             | 452                                   |
| 6                   | 2                | 94.2               | 10                | 1778                        |                             | 225                                   |
| 7                   | 2                | 72.7               | 10                | 1252                        |                             | 439                                   |
| 8                   | 2                | 78.7               | 10                | 1510                        |                             | 516                                   |
| 9                   | 2                | 90.8               | 10                | 1382                        |                             | 81                                    |
| 10                  | 2                | 83.2               | 10                | 1757                        |                             | 282                                   |
| 11                  | 2                | 91.4               | 10                | 978                         |                             | 62                                    |
| 12                  | 2                | 85.7               | 10                | 1680                        |                             | 368                                   |
| 13                  | 2                | 94.8               | 10                | 1404                        |                             | 208                                   |
| 14                  | 1                | 87.6               | 10                |                             |                             | 443                                   |
| 15                  | 1                | 85.5               | 10                |                             |                             | 491                                   |
| 16                  | 2                | 68.1               | 10                | 1287                        |                             | 314                                   |
| 17                  | 2                | 90.4               | 10                | 986                         |                             | 590                                   |
| 18                  | 3                | 81.1               | 10                | 1784                        | 1594                        | 54                                    |
| 19                  | 2                | 93.5               | 10                | 1335                        |                             | 429                                   |
| 20                  | 2                | 97.2               | 10                | 1112                        |                             | 146                                   |

| Trial Number : 14   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 8  |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 91                 | 16                | 1869                        | 1720                        | 731                                   |
| 2                   | 2                | 88.8               | 16                | 1430                        |                             | 90                                    |
| 3                   | 2                | 58.2               | 16                | 1705                        |                             | 75                                    |
| 4                   | 2                | 68.7               | 16                | 1071                        |                             | 442                                   |
| 5                   | 1                | 97.9               | 16                |                             |                             | 726                                   |
| 6                   | 2                | 68                 | 16                | 1198                        |                             | 926                                   |
| 7                   | 2                | 81.1               | 16                | 925                         |                             | 1053                                  |
| 8                   | 3                | 70.1               | 16                | 1249                        | 1400                        | 961                                   |
| Trial Number : 15   |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 9  |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 1                | 74.1               | 11                |                             |                             | 586                                   |
| 2                   | 2                | 98.1               | 11                | 1554                        |                             | 862                                   |
| 3                   | 3                | 88.9               | 11                | 1807                        | 1566                        | 489                                   |
| 4                   | 2                | 52.2               | 11                | 1458                        |                             | 1142                                  |
| 5                   | 2                | 69.3               | 11                | 1895                        |                             | 12                                    |
| 6                   | 1                | 76.2               | 11                |                             |                             | 623                                   |
| 7                   | 1                | 63.9               | 11                |                             |                             | 1144                                  |
| 8                   | 3                | 65.6               | 11                | 1212                        | 1421                        | 1016                                  |
| 9                   | 1                | 61.4               | 11                |                             |                             | 1274                                  |
| Trial Number : 16   |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 10 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 1                | 89.3               | 6                 |                             |                             | 392                                   |
| 2                   | 2                | 97                 | 6                 | 1894                        |                             | 667                                   |
| 3                   | 1                | 55.1               | 6                 |                             |                             | 1058                                  |
| 4                   | 2                | 74.7               | 6                 | 1151                        |                             | 790                                   |
| 5                   | 2                | 56.9               | 6                 | 1369                        |                             | 1155                                  |
| 6                   | 1                | 52.8               | 6                 |                             |                             | 570                                   |
| 7                   | 2                | 78                 | 6                 | 1228                        |                             | 394                                   |
| 8                   | 2                | 54.9               | 6                 | 1687                        |                             | 947                                   |
| 9                   | 2                | 90                 | 6                 | 1780                        |                             | 1115                                  |
| 10                  | 3                | 86                 | 6                 | 1357                        | 1463                        | 77                                    |

| Trial Number : 17   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 11 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 83.5               | 8                 | 1558                        | 1650                        | 293                                   |
| 2                   | 3                | 60.1               | 8                 | 1498                        | 1495                        | 239                                   |
| 3                   | 2                | 75.7               | 8                 | 1469                        |                             | 561                                   |
| 4                   | 2                | 60.6               | 8                 | 1562                        |                             | 645                                   |
| 5                   | 3                | 59.6               | 8                 | 1091                        | 1329                        | 442                                   |
| 6                   | 2                | 98.9               | 8                 | 1830                        |                             | 264                                   |
| 7                   | 2                | 64.6               | 8                 | 970                         |                             | 399                                   |
| 8                   | 1                | 81                 | 8                 |                             |                             | 35                                    |
| 9                   | 3                | 70.8               | 8                 | 1583                        | 1654                        | 836                                   |
| 10                  | 2                | 69.3               | 8                 | 1451                        |                             | 1066                                  |
| 11                  | 2                | 93.3               | 8                 | 1384                        |                             | 569                                   |
| Trial Number : 18   |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 12 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 71.9               | 7                 | 1424                        |                             | 209                                   |
| 2                   | 1                | 63.4               | 7                 |                             |                             | 167                                   |
| 3                   | 2                | 53.6               | 7                 | 1186                        |                             | 711                                   |
| 4                   | 2                | 81.9               | 7                 | 1570                        |                             | 850                                   |
| 5                   | 2                | 60.5               | 7                 | 947                         |                             | 852                                   |
| 6                   | 2                | 99.5               | 7                 | 1374                        |                             | 980                                   |
| 7                   | 1                | 62.5               | 7                 |                             |                             | 647                                   |
| 8                   | 1                | 59                 | 7                 |                             |                             | 36                                    |
| 9                   | 1                | 90                 | 7                 |                             |                             | 819                                   |
| 10                  | 1                | 64.5               | 7                 |                             |                             | 958                                   |
| 11                  | 1                | 82.3               | 7                 |                             |                             | 307                                   |
| 12                  | 3                | 65.6               | 7                 | 1212                        | 1472                        | 6                                     |
| Trial Number : 19   |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 13 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 60.6               | 6                 | 1925                        | 1036                        | 426                                   |
| 2                   | 2                | 68                 | 6                 | 1924                        |                             | 758                                   |
| 3                   | 2                | 55.7               | 6                 | 962                         |                             | 790                                   |
| 4                   | 2                | 80.9               | 6                 | 952                         |                             | 367                                   |
| 5                   | 2                | 54.5               | 6                 | 1065                        |                             | 217                                   |
| 6                   | 2                | 69.4               | 6                 | 1190                        |                             | 506                                   |
| 7                   | 1                | 50.9               | 6                 |                             |                             | 886                                   |
| 8                   | 2                | 69.6               | 6                 | 961                         |                             | 604                                   |
| 9                   | 3                | 74.5               | 6                 | 1685                        | 1557                        | 743                                   |
| 10                  | 2                | 69                 | 6                 | 1898                        |                             | 361                                   |
| 11                  | 2                | 77.1               | 6                 | 1236                        |                             | 538                                   |
| 12                  | 2                | 54.8               | 6                 | 1743                        |                             | 288                                   |
| 13                  | 2                | 67.6               | 6                 | 1796                        |                             | 288                                   |

| Trial Number : 20   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 14 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 64.2               | 10                | 1583                        |                             | 24                                    |
| 2                   | 1                | 64.8               | 10                |                             |                             | 326                                   |
| 3                   | 2                | 57.9               | 10                | 1500                        |                             | 701                                   |
| 4                   | 2                | 63.3               | 10                | 1136                        |                             | 242                                   |
| 5                   | 2                | 82.9               | 10                | 1530                        |                             | 512                                   |
| 6                   | 1                | 68.2               | 10                |                             |                             | 224                                   |
| 7                   | 3                | 88.5               | 10                | 1185                        | 1585                        | 115                                   |
| 8                   | 2                | 99.5               | 10                | 1285                        |                             | 642                                   |
| 9                   | 3                | 84.3               | 10                | 1698                        | 1346                        | 323                                   |
| 10                  | 3                | 60.3               | 10                | 1678                        | 1189                        | 216                                   |
| 11                  | 3                | 50.2               | 10                | 1210                        | 1364                        | 265                                   |
| 12                  | 2                | 59.6               | 10                | 1029                        |                             | 715                                   |
| 13                  | 3                | 73.9               | 10                | 1913                        | 1679                        | 243                                   |
| 14                  | 3                | 85.5               | 10                | 1243                        | 1603                        | 179                                   |
| Trial Number : 21   |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 15 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 80.5               | 16                | 1598                        | 1324                        | 110                                   |
| 2                   | 2                | 68.7               | 16                | 1150                        |                             | 179                                   |
| 3                   | 1                | 76.5               | 16                |                             |                             | 292                                   |
| 4                   | 3                | 84.7               | 16                | 1727                        | 1449                        | 470                                   |
| 5                   | 2                | 94.6               | 16                | 1257                        |                             | 648                                   |
| 6                   | 3                | 91                 | 16                | 1523                        | 911                         | 588                                   |
| 7                   | 3                | 77.2               | 16                | 1910                        | 1501                        | 511                                   |
| 8                   | 3                | 57.9               | 16                | 1421                        | 1721                        | 225                                   |
| 9                   | 1                | 68.7               | 16                |                             |                             | 538                                   |
| 10                  | 3                | 75.1               | 16                | 1714                        | 1885                        | 706                                   |
| 11                  | 1                | 88.5               | 16                |                             |                             | 214                                   |
| 12                  | 1                | 58.8               | 16                |                             |                             | 96                                    |
| 13                  | 3                | 74.7               | 16                | 1369                        | 1877                        | 682                                   |
| 14                  | 1                | 70.6               | 16                |                             |                             | 223                                   |
| 15                  | 2                | 82.9               | 16                | 1811                        |                             | 76                                    |
| Trial Number : 22   |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 16 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 57.8               | 19                | 1250                        |                             | 433                                   |
| 2                   | 1                | 91.2               | 19                |                             |                             | 516                                   |
| 3                   | 2                | 69.9               | 19                | 1120                        |                             | 102                                   |
| 4                   | 3                | 74.6               | 19                | 1127                        | 1850                        | 65                                    |
| 5                   | 1                | 54                 | 19                |                             |                             | 561                                   |
| 6                   | 2                | 63                 | 19                | 1466                        |                             | 708                                   |
| 7                   | 2                | 79                 | 19                | 1218                        |                             | 719                                   |
| 8                   | 2                | 65.6               | 19                | 1774                        |                             | 182                                   |
| 9                   | 1                | 98.1               | 19                |                             |                             | 352                                   |
| 10                  | 2                | 55.7               | 19                | 1596                        |                             | 346                                   |
| 11                  | 1                | 71.8               | 19                |                             |                             | 234                                   |
| 12                  | 1                | 64.5               | 19                |                             |                             | 108                                   |
| 13                  | 2                | 68.2               | 19                | 1787                        |                             | 502                                   |
| 14                  | 1                | 63.7               | 19                |                             |                             | 276                                   |
| 15                  | 2                | 75                 | 19                | 997                         |                             | 721                                   |
| 16                  | 3                | 52                 | 19                | 1825                        | 1832                        | 420                                   |

| Trial Number : 23   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 17 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 93.6               | 14                | 1343                        |                             | 325                                   |
| 2                   | 3                | 60.2               | 14                | 1473                        | 1490                        | 185                                   |
| 3                   | 1                | 95.1               | 14                |                             |                             | 203                                   |
| 4                   | 3                | 51.2               | 14                | 1430                        | 1786                        | 448                                   |
| 5                   | 1                | 92.3               | 14                |                             |                             | 604                                   |
| 6                   | 2                | 70.3               | 14                | 1825                        |                             | 185                                   |
| 7                   | 2                | 64.2               | 14                | 1324                        |                             | 115                                   |
| 8                   | 2                | 54                 | 14                | 1568                        |                             | 488                                   |
| 9                   | 1                | 61.9               | 14                |                             |                             | 76                                    |
| 10                  | 2                | 97.6               | 14                | 1737                        |                             | 209                                   |
| 11                  | 3                | 88.9               | 14                | 1425                        | 1493                        | 75                                    |
| 12                  | 1                | 86.6               | 14                |                             |                             | 184                                   |
| 13                  | 2                | 52.2               | 14                | 1785                        |                             | 134                                   |
| 14                  | 2                | 66.4               | 14                | 1506                        |                             | 169                                   |
| 15                  | 1                | 66.7               | 14                |                             |                             | 327                                   |
| 16                  | 2                | 63.1               | 14                | 978                         |                             | 32                                    |
| 17                  | 2                | 60.6               | 14                | 1781                        |                             | 125                                   |

| Trial Number : 24   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 18 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 71.9               | 13                | 1022                        |                             | 356                                   |
| 2                   | 3                | 83.8               | 13                | 990                         | 1243                        | 572                                   |
| 3                   | 2                | 87.8               | 13                | 1534                        |                             | 601                                   |
| 4                   | 3                | 54.1               | 13                | 1155                        | 1765                        | 154                                   |
| 5                   | 2                | 71                 | 13                | 1873                        |                             | 617                                   |
| 6                   | 3                | 52.6               | 13                | 1155                        | 966                         | 319                                   |
| 7                   | 2                | 90.4               | 13                | 1190                        |                             | 139                                   |
| 8                   | 3                | 73.8               | 13                | 964                         | 1605                        | 397                                   |
| 9                   | 2                | 51.4               | 13                | 976                         |                             | 27                                    |
| 10                  | 2                | 66.9               | 13                | 1692                        |                             | 12                                    |
| 11                  | 2                | 69.6               | 13                | 1119                        |                             | 333                                   |
| 12                  | 3                | 84.3               | 13                | 1651                        | 1390                        | 269                                   |
| 13                  | 1                | 76.6               | 13                |                             |                             | 278                                   |
| 14                  | 3                | 57.6               | 13                | 1553                        | 1599                        | 25                                    |
| 15                  | 1                | 70.7               | 13                |                             |                             | 185                                   |
| 16                  | 3                | 60.4               | 13                | 1073                        | 1644                        | 494                                   |
| 17                  | 3                | 74.8               | 13                | 1225                        | 1514                        | 218                                   |
| 18                  | 2                | 66.2               | 13                | 1747                        |                             | 429                                   |

| Trial Number : 25   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 19 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 58.2               | 18                | 1128                        | 1814                        | 549                                   |
| 2                   | 3                | 89.3               | 18                | 1753                        | 999                         | 59                                    |
| 3                   | 2                | 92.3               | 18                | 1848                        |                             | 425                                   |
| 4                   | 3                | 76.5               | 18                | 1041                        | 1329                        | 396                                   |
| 5                   | 2                | 78.3               | 18                | 1214                        |                             | 436                                   |
| 6                   | 3                | 56.4               | 18                | 1658                        | 1290                        | 489                                   |
| 7                   | 1                | 98                 | 18                |                             |                             | 313                                   |
| 8                   | 1                | 54.5               | 18                |                             |                             | 360                                   |
| 9                   | 1                | 61.4               | 18                |                             |                             | 546                                   |
| 10                  | 2                | 85.8               | 18                | 1591                        |                             | 145                                   |
| 11                  | 2                | 98                 | 18                | 1201                        |                             | 14                                    |
| 12                  | 2                | 66                 | 18                | 1906                        |                             | 445                                   |
| 13                  | 2                | 77.9               | 18                | 1336                        |                             | 383                                   |
| 14                  | 2                | 99.1               | 18                | 968                         |                             | 510                                   |
| 15                  | 2                | 68.8               | 18                | 1751                        |                             | 115                                   |
| 16                  | 2                | 60.6               | 18                | 1166                        |                             | 147                                   |
| 17                  | 2                | 51                 | 18                | 1167                        |                             | 367                                   |
| 18                  | 2                | 98.7               | 18                | 1251                        |                             | 217                                   |
| 19                  | 3                | 66.6               | 18                | 1014                        | 1231                        | 163                                   |
| Trial Number : 26   |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 20 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 94.9               | 6                 | 1429                        | 1682                        | 119                                   |
| 2                   | 1                | 50                 | 6                 |                             |                             | 249                                   |
| 3                   | 2                | 99.7               | 6                 | 1728                        |                             | 409                                   |
| 4                   | 2                | 63.4               | 6                 | 1072                        |                             | 403                                   |
| 5                   | 2                | 59.5               | 6                 | 1108                        |                             | 92                                    |
| 6                   | 1                | 88.6               | 6                 |                             |                             | 164                                   |
| 7                   | 1                | 96.2               | 6                 |                             |                             | 12                                    |
| 8                   | 2                | 55.9               | 6                 | 1379                        |                             | 586                                   |
| 9                   | 3                | 55.1               | 6                 | 952                         | 1688                        | 365                                   |
| 10                  | 1                | 88.1               | 6                 |                             |                             | 338                                   |
| 11                  | 2                | 83.3               | 6                 | 924                         |                             | 496                                   |
| 12                  | 2                | 96.5               | 6                 | 1223                        |                             | 511                                   |
| 13                  | 2                | 82.6               | 6                 | 1122                        |                             | 488                                   |
| 14                  | 3                | 65.9               | 6                 | 1192                        | 1816                        | 203                                   |
| 15                  | 2                | 66.2               | 6                 | 1718                        |                             | 71                                    |
| 16                  | 2                | 76.3               | 6                 | 1179                        |                             | 127                                   |
| 17                  | 2                | 50.1               | 6                 | 1804                        |                             | 464                                   |
| 18                  | 1                | 61.2               | 6                 |                             |                             | 169                                   |
| 19                  | 3                | 59.6               | 6                 | 1777                        | 1764                        | 487                                   |
| 20                  | 3                | 55.1               | 6                 | 1636                        | 1415                        | 541                                   |

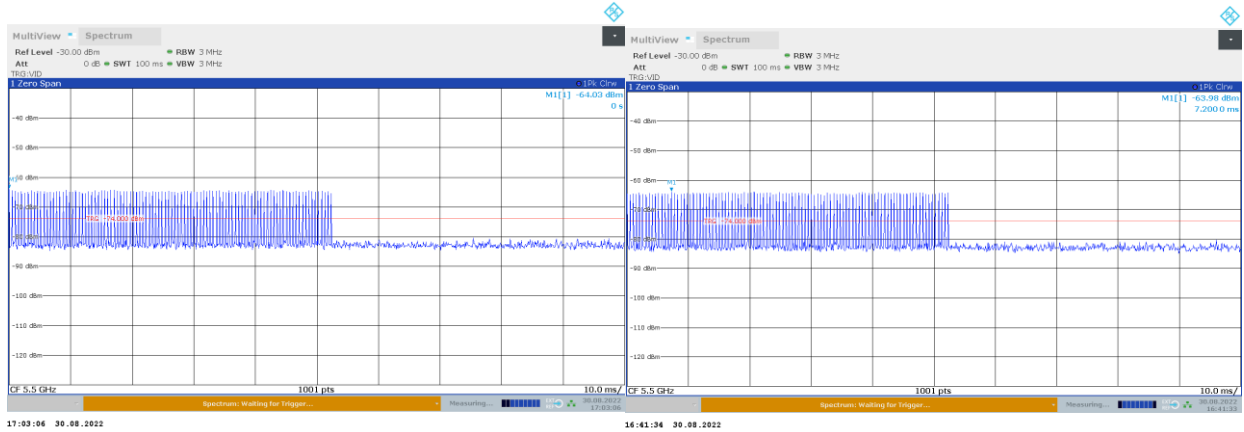
| Trial Number : 27   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 12 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 65.5               | 11                | 1628                        |                             | 54                                    |
| 2                   | 2                | 68.7               | 11                | 1074                        |                             | 574                                   |
| 3                   | 2                | 50.1               | 11                | 1810                        |                             | 804                                   |
| 4                   | 2                | 71.8               | 11                | 1150                        |                             | 735                                   |
| 5                   | 2                | 82.3               | 11                | 1704                        |                             | 134                                   |
| 6                   | 3                | 79.6               | 11                | 1767                        | 1211                        | 772                                   |
| 7                   | 3                | 70.7               | 11                | 1635                        | 1711                        | 216                                   |
| 8                   | 3                | 67.8               | 11                | 1163                        | 1598                        | 387                                   |
| 9                   | 2                | 64.1               | 11                | 961                         |                             | 621                                   |
| 10                  | 2                | 84.8               | 11                | 1688                        |                             | 832                                   |
| 11                  | 3                | 85.3               | 11                | 1089                        | 1309                        | 176                                   |
| 12                  | 2                | 85.9               | 11                | 1586                        |                             | 724                                   |
| Trial Number : 28   |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 13 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 1                | 58.9               | 10                |                             |                             | 790                                   |
| 2                   | 3                | 74.3               | 10                | 1775                        | 1518                        | 66                                    |
| 3                   | 2                | 57.9               | 10                | 1130                        |                             | 221                                   |
| 4                   | 3                | 94.4               | 10                | 1367                        | 1704                        | 847                                   |
| 5                   | 2                | 71.5               | 10                | 1816                        |                             | 802                                   |
| 6                   | 2                | 64.5               | 10                | 1578                        |                             | 565                                   |
| 7                   | 3                | 57.3               | 10                | 1135                        | 1836                        | 419                                   |
| 8                   | 3                | 78.4               | 10                | 1419                        | 1293                        | 774                                   |
| 9                   | 2                | 67.3               | 10                | 1226                        |                             | 599                                   |
| 10                  | 2                | 80                 | 10                | 1530                        |                             | 260                                   |
| 11                  | 2                | 58.7               | 10                | 1645                        |                             | 884                                   |
| 12                  | 1                | 73.5               | 10                |                             |                             | 368                                   |
| 13                  | 1                | 61.6               | 10                |                             |                             | 861                                   |
| Trial Number : 29   |                  |                    |                   |                             |                             |                                       |
| Bursts in Trial: 14 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 2                | 96.8               | 17                | 1615                        |                             | 523                                   |
| 2                   | 1                | 68.7               | 17                |                             |                             | 379                                   |
| 3                   | 3                | 88.3               | 17                | 1385                        | 1533                        | 46                                    |
| 4                   | 2                | 99.3               | 17                | 1426                        |                             | 563                                   |
| 5                   | 2                | 72.4               | 17                | 1182                        |                             | 439                                   |
| 6                   | 2                | 79.9               | 17                | 1901                        |                             | 479                                   |
| 7                   | 2                | 80.3               | 17                | 1428                        |                             | 302                                   |
| 8                   | 1                | 71.5               | 17                |                             |                             | 139                                   |
| 9                   | 3                | 87.7               | 17                | 1287                        | 1673                        | 25                                    |
| 10                  | 3                | 60.1               | 17                | 1612                        | 1783                        | 275                                   |
| 11                  | 3                | 60.7               | 17                | 1594                        | 1386                        | 169                                   |
| 12                  | 1                | 71.7               | 17                |                             |                             | 182                                   |
| 13                  | 2                | 98.8               | 17                | 1185                        |                             | 570                                   |
| 14                  | 2                | 52.2               | 17                | 1064                        |                             | 246                                   |

| Trial Number : 30   |                  |                    |                   |                             |                             |                                       |
|---------------------|------------------|--------------------|-------------------|-----------------------------|-----------------------------|---------------------------------------|
| Bursts in Trial: 15 |                  |                    |                   |                             |                             |                                       |
| Burst               | Number of Pulses | Pulse Width (μsec) | Chirp Width (MHz) | Pulse 1-to-2 Spacing (μsec) | Pulse 2-to-3 Spacing (μsec) | Start Location Within Interval (msec) |
| 1                   | 3                | 99.8               | 20                | 1844                        | 939                         | 509                                   |
| 2                   | 3                | 95.3               | 20                | 990                         | 998                         | 514                                   |
| 3                   | 3                | 62.4               | 20                | 1742                        | 1866                        | 661                                   |
| 4                   | 2                | 66.8               | 20                | 1391                        |                             | 73                                    |
| 5                   | 1                | 55.7               | 20                |                             |                             | 591                                   |
| 6                   | 1                | 80.2               | 20                |                             |                             | 108                                   |
| 7                   | 2                | 72.6               | 20                | 1287                        |                             | 150                                   |
| 8                   | 3                | 92.5               | 20                | 1391                        | 1837                        | 123                                   |
| 9                   | 2                | 93.5               | 20                | 1425                        |                             | 245                                   |
| 10                  | 2                | 82                 | 20                | 1294                        |                             | 477                                   |
| 11                  | 2                | 52.8               | 20                | 999                         |                             | 25                                    |
| 12                  | 1                | 74.7               | 20                |                             |                             | 340                                   |
| 13                  | 3                | 92.5               | 20                | 1441                        | 1670                        | 288                                   |
| 14                  | 1                | 86.8               | 20                |                             |                             | 66                                    |
| 15                  | 2                | 61.8               | 20                | 1046                        |                             | 422                                   |

### Pulse Type 6

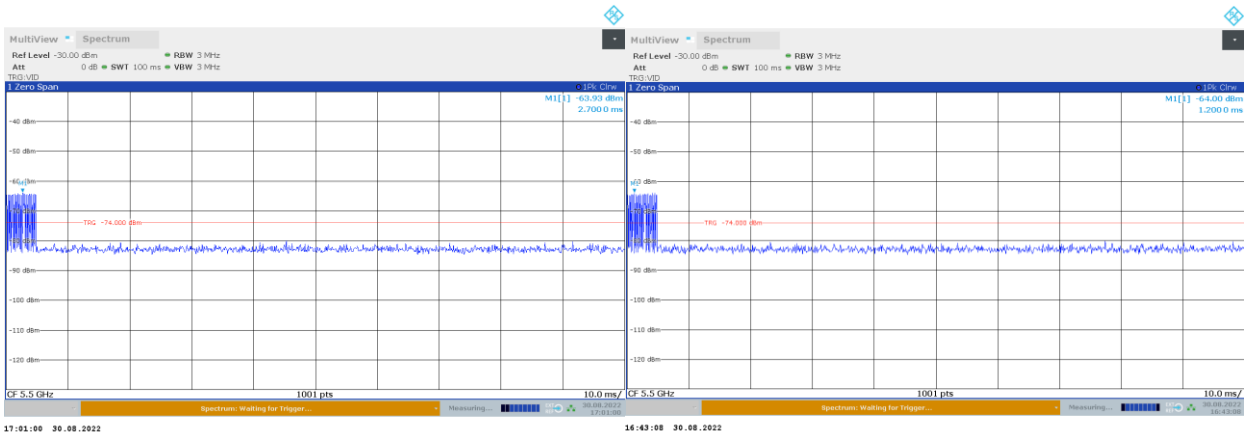
| Radar Type | Pulse Width (μsec) | PRI (μsec) | Pulses per Hop | Hopping Rate (kHz) | Hopping Sequence Length (msec) | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|------------|--------------------|------------|----------------|--------------------|--------------------------------|--------------------------------------------|--------------------------|
| 6          | 1                  | 333        | 9              | 0.333              | 300                            | 70%                                        | 30                       |

## Radar Pulse Calibrations



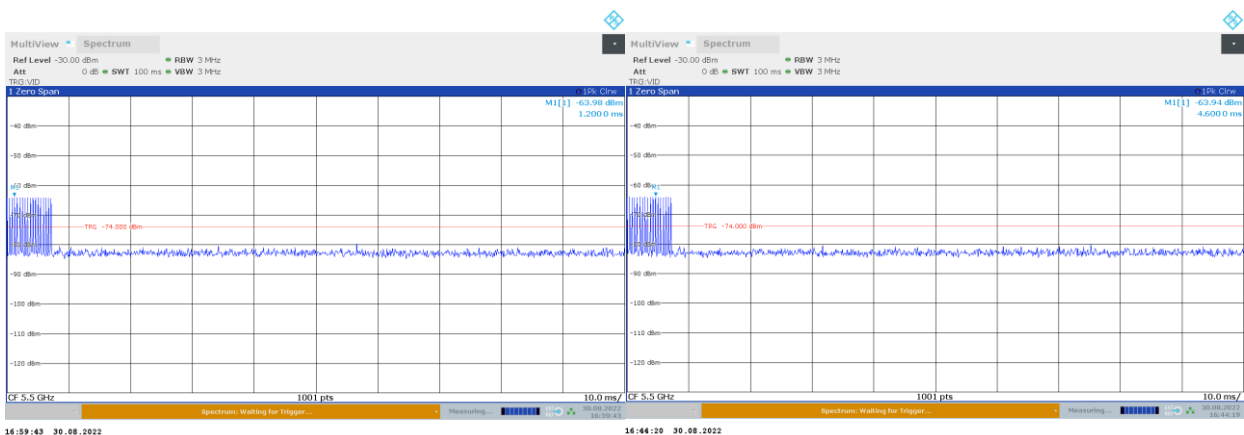
Pulse Type 1 Antenna 1

Pulse Type 1 Antenna 2



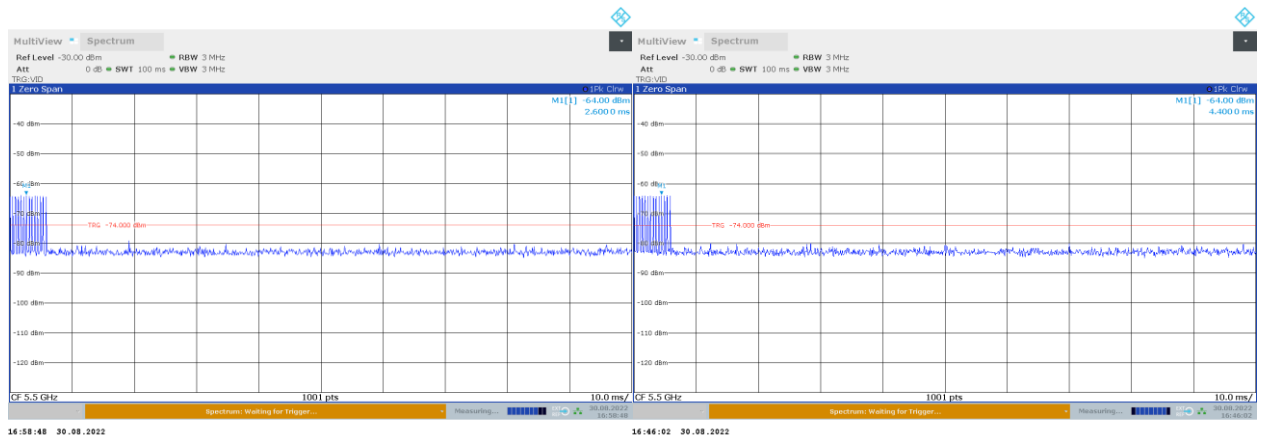
Pulse Type 2 Antenna 1

Pulse Type 2 Antenna 2



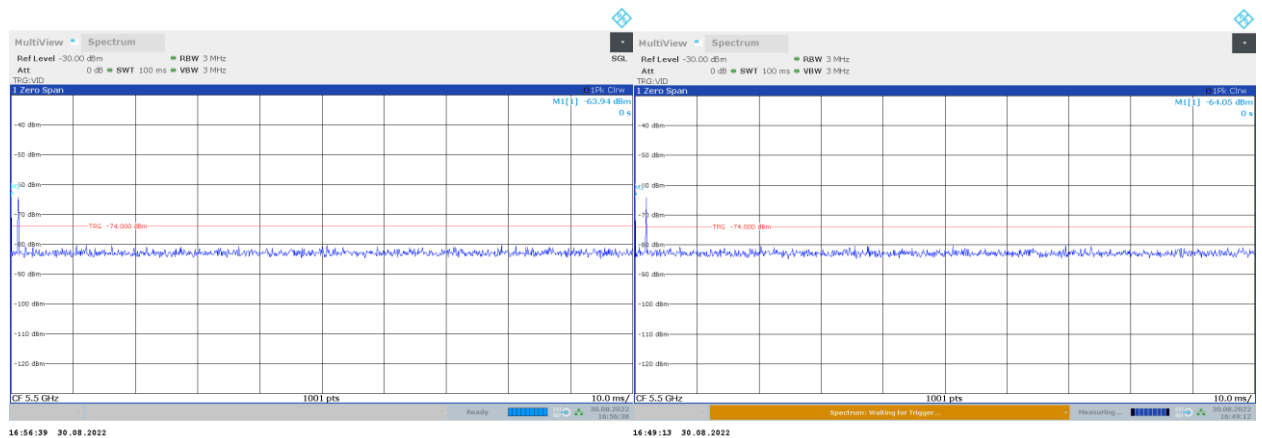
Pulse Type 3 Antenna 1

Pulse Type 3 Antenna 2



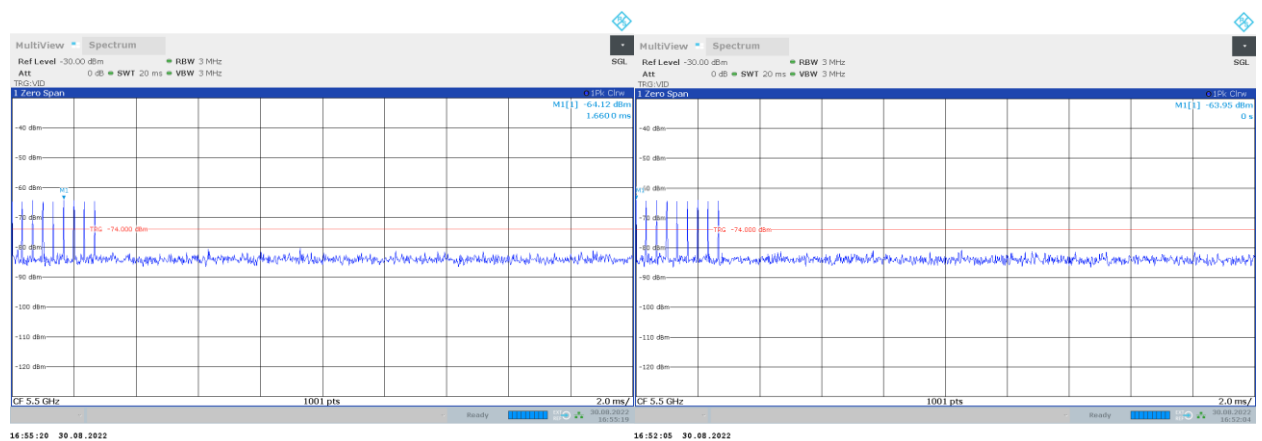
Pulse Type 4 Antenna 1

Pulse Type 4 Antenna 2



Pulse Type 5 Antenna 1

Pulse Type 5 Antenna 2



Pulse Type 6 Antenna 1

Pulse Type 6 Antenna 2

## 5.4.5 TEST EQUIPMENT USED

- R&S TS8997

## 6 TEST EQUIPMENT

- 1 R&S TS8997  
2.4 and 5 GHz Bands Conducted Test Lab

| Ref.No. | Device Name          | Description                                        | Manufacturer                      | Serial Number | Last Calibration | Calibration Due |
|---------|----------------------|----------------------------------------------------|-----------------------------------|---------------|------------------|-----------------|
| 1.1     | FSW43                | Signal analyser                                    | Rohde & Schwarz GmbH & Co. KG     | 102013        | 2021-06          | 2023-06         |
| 1.2     | Opus10 THI (8152.00) | T/H Logger 13                                      | Lufth Mess- und Regeltechnik GmbH | 13936         | 2021-10          | 2023-10         |
| 1.3     | Opus10 THI (8152.00) | T/H Logger 14                                      | Lufth Mess- und Regeltechnik GmbH | 13993         | 2021-08          | 2023-08         |
| 1.4     | SMBV100A             | Vector Signal Generator 9 kHz - 6 GHz              | Rohde & Schwarz                   | 259291        | 2019-11          | 2022-11         |
| 1.5     | OSP120               | Contains Power Meter and Switching Unit OSP-B157W8 | Rohde & Schwarz                   | 101158        | 2021-08          | 2024-08         |

The calibration interval is the time interval between "Last Calibration" and "Calibration Due"

## 7 ANTENNA FACTORS, CABLE LOSS AND SAMPLE CALCULATIONS

This chapter contains the antenna factors with their corresponding path loss of the used measurement path for all antennas as well as the insertion loss of the LISN.

### 7.1 LISN R&S ESH3-Z5 (150 KHZ – 30 MHZ)

| Frequency |  | Corr. | LISN<br>insertion<br>loss<br>ESH3-<br>Z5 | cable<br>loss<br>(incl. 10<br>dB<br>atten-<br>uator) |
|-----------|--|-------|------------------------------------------|------------------------------------------------------|
| MHz       |  | dB    | dB                                       | dB                                                   |
| 0.15      |  | 10.1  | 0.1                                      | 10.0                                                 |
| 5         |  | 10.3  | 0.1                                      | 10.2                                                 |
| 7         |  | 10.5  | 0.2                                      | 10.3                                                 |
| 10        |  | 10.5  | 0.2                                      | 10.3                                                 |
| 12        |  | 10.7  | 0.3                                      | 10.4                                                 |
| 14        |  | 10.7  | 0.3                                      | 10.4                                                 |
| 16        |  | 10.8  | 0.4                                      | 10.4                                                 |
| 18        |  | 10.9  | 0.4                                      | 10.5                                                 |
| 20        |  | 10.9  | 0.4                                      | 10.5                                                 |
| 22        |  | 11.1  | 0.5                                      | 10.6                                                 |
| 24        |  | 11.1  | 0.5                                      | 10.6                                                 |
| 26        |  | 11.2  | 0.5                                      | 10.7                                                 |
| 28        |  | 11.2  | 0.5                                      | 10.7                                                 |
| 30        |  | 11.3  | 0.5                                      | 10.8                                                 |

#### Sample calculation

$$U_{\text{LISN}} (\text{dB } \mu\text{V}) = U (\text{dB } \mu\text{V}) + \text{Corr. (dB)}$$

U = Receiver reading

LISN Insertion loss = Voltage Division Factor of LISN

Corr. = sum of single correction factors of used LISN, cables, switch units (if used)

Linear interpolation will be used for frequencies in between the values in the table.

## 7.2 ANTENNA R&S HFH2-Z2 (9 KHZ – 30 MHZ)

| Frequency | AF       | Corr. | cable loss 1     | cable loss 2      | cable loss 3  | cable loss 4  | distance corr.  | d <sub>Limit</sub>       | d <sub>used</sub>       |
|-----------|----------|-------|------------------|-------------------|---------------|---------------|-----------------|--------------------------|-------------------------|
| MHz       | dB (1/m) | dB    | (inside chamber) | (outside chamber) | (switch unit) | (to receiver) | (-40 dB/decade) | (meas. distance (limit)) | (meas. distance (used)) |
|           |          |       | dB               | dB                | dB            | dB            | dB              | m                        | m                       |
| 0.009     | 20.50    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.01      | 20.45    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.015     | 20.37    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.02      | 20.36    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.025     | 20.38    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.03      | 20.32    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.05      | 20.35    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.08      | 20.30    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.1       | 20.20    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.2       | 20.17    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.3       | 20.14    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.49      | 20.12    | -79.6 | 0.1              | 0.1               | 0.1           | 0.1           | -80             | 300                      | 3                       |
| 0.490001  | 20.12    | -39.6 | 0.1              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 0.5       | 20.11    | -39.6 | 0.1              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 0.8       | 20.10    | -39.6 | 0.1              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 1         | 20.09    | -39.6 | 0.1              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 2         | 20.08    | -39.6 | 0.1              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 3         | 20.06    | -39.6 | 0.1              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 4         | 20.05    | -39.5 | 0.2              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 5         | 20.05    | -39.5 | 0.2              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 6         | 20.02    | -39.5 | 0.2              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 8         | 19.95    | -39.5 | 0.2              | 0.1               | 0.1           | 0.1           | -40             | 30                       | 3                       |
| 10        | 19.83    | -39.4 | 0.2              | 0.1               | 0.2           | 0.1           | -40             | 30                       | 3                       |
| 12        | 19.71    | -39.4 | 0.2              | 0.1               | 0.2           | 0.1           | -40             | 30                       | 3                       |
| 14        | 19.54    | -39.4 | 0.2              | 0.1               | 0.2           | 0.1           | -40             | 30                       | 3                       |
| 16        | 19.53    | -39.3 | 0.3              | 0.1               | 0.2           | 0.1           | -40             | 30                       | 3                       |
| 18        | 19.50    | -39.3 | 0.3              | 0.1               | 0.2           | 0.1           | -40             | 30                       | 3                       |
| 20        | 19.57    | -39.3 | 0.3              | 0.1               | 0.2           | 0.1           | -40             | 30                       | 3                       |
| 22        | 19.61    | -39.3 | 0.3              | 0.1               | 0.2           | 0.1           | -40             | 30                       | 3                       |
| 24        | 19.61    | -39.3 | 0.3              | 0.1               | 0.2           | 0.1           | -40             | 30                       | 3                       |
| 26        | 19.54    | -39.3 | 0.3              | 0.1               | 0.2           | 0.1           | -40             | 30                       | 3                       |
| 28        | 19.46    | -39.2 | 0.3              | 0.1               | 0.3           | 0.1           | -40             | 30                       | 3                       |
| 30        | 19.73    | -39.1 | 0.4              | 0.1               | 0.3           | 0.1           | -40             | 30                       | 3                       |

### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

distance correction =  $-40 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values

### 7.3 ANTENNA R&S HL562 (30 MHZ – 1 GHZ)

( $d_{\text{Limit}} = 3 \text{ m}$ )

| Frequency | AF<br>R&S<br>HL562 | Corr. |
|-----------|--------------------|-------|
| MHz       | dB (1/m)           | dB    |
| 30        | 18.6               | 0.6   |
| 50        | 6.0                | 0.9   |
| 100       | 9.7                | 1.2   |
| 150       | 7.9                | 1.6   |
| 200       | 7.6                | 1.9   |
| 250       | 9.5                | 2.1   |
| 300       | 11.0               | 2.3   |
| 350       | 12.4               | 2.6   |
| 400       | 13.6               | 2.9   |
| 450       | 14.7               | 3.1   |
| 500       | 15.6               | 3.2   |
| 550       | 16.3               | 3.5   |
| 600       | 17.2               | 3.5   |
| 650       | 18.1               | 3.6   |
| 700       | 18.5               | 3.6   |
| 750       | 19.1               | 4.1   |
| 800       | 19.6               | 4.1   |
| 850       | 20.1               | 4.4   |
| 900       | 20.8               | 4.7   |
| 950       | 21.1               | 4.8   |
| 1000      | 21.6               | 4.9   |

| cable<br>loss 1<br>(inside<br>chamber) | cable<br>loss 2<br>(outside<br>chamber) | cable<br>loss 3<br>(switch<br>unit) | cable<br>loss 4<br>(to<br>receiver) | distance<br>corr.<br>(-20 dB/<br>decade) | $d_{\text{Limit}}$<br>(meas.<br>distance<br>(limit)) | $d_{\text{used}}$<br>(meas.<br>distance<br>(used)) |
|----------------------------------------|-----------------------------------------|-------------------------------------|-------------------------------------|------------------------------------------|------------------------------------------------------|----------------------------------------------------|
| dB                                     | dB                                      | dB                                  | dB                                  | dB                                       | m                                                    | m                                                  |
| 0.29                                   | 0.04                                    | 0.23                                | 0.02                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.39                                   | 0.09                                    | 0.32                                | 0.08                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.56                                   | 0.14                                    | 0.47                                | 0.08                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.73                                   | 0.20                                    | 0.59                                | 0.12                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.84                                   | 0.21                                    | 0.70                                | 0.11                                | 0.0                                      | 3                                                    | 3                                                  |
| 0.98                                   | 0.24                                    | 0.80                                | 0.13                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.04                                   | 0.26                                    | 0.89                                | 0.15                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.18                                   | 0.31                                    | 0.96                                | 0.13                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.28                                   | 0.35                                    | 1.03                                | 0.19                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.39                                   | 0.38                                    | 1.11                                | 0.22                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.44                                   | 0.39                                    | 1.20                                | 0.19                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.55                                   | 0.46                                    | 1.24                                | 0.23                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.59                                   | 0.43                                    | 1.29                                | 0.23                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.67                                   | 0.34                                    | 1.35                                | 0.22                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.67                                   | 0.42                                    | 1.41                                | 0.15                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.87                                   | 0.54                                    | 1.46                                | 0.25                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.90                                   | 0.46                                    | 1.51                                | 0.25                                | 0.0                                      | 3                                                    | 3                                                  |
| 1.99                                   | 0.60                                    | 1.56                                | 0.27                                | 0.0                                      | 3                                                    | 3                                                  |
| 2.14                                   | 0.60                                    | 1.63                                | 0.29                                | 0.0                                      | 3                                                    | 3                                                  |
| 2.22                                   | 0.60                                    | 1.66                                | 0.33                                | 0.0                                      | 3                                                    | 3                                                  |
| 2.23                                   | 0.61                                    | 1.71                                | 0.30                                | 0.0                                      | 3                                                    | 3                                                  |

( $d_{\text{Limit}} = 10 \text{ m}$ )

|      |      |      |
|------|------|------|
| 30   | 18.6 | -9.9 |
| 50   | 6.0  | -9.6 |
| 100  | 9.7  | -9.2 |
| 150  | 7.9  | -8.8 |
| 200  | 7.6  | -8.6 |
| 250  | 9.5  | -8.3 |
| 300  | 11.0 | -8.1 |
| 350  | 12.4 | -7.9 |
| 400  | 13.6 | -7.6 |
| 450  | 14.7 | -7.4 |
| 500  | 15.6 | -7.2 |
| 550  | 16.3 | -7.0 |
| 600  | 17.2 | -6.9 |
| 650  | 18.1 | -6.9 |
| 700  | 18.5 | -6.8 |
| 750  | 19.1 | -6.3 |
| 800  | 19.6 | -6.3 |
| 850  | 20.1 | -6.0 |
| 900  | 20.8 | -5.8 |
| 950  | 21.1 | -5.6 |
| 1000 | 21.6 | -5.6 |

|      |      |      |      |       |    |   |
|------|------|------|------|-------|----|---|
| 0.29 | 0.04 | 0.23 | 0.02 | -10.5 | 10 | 3 |
| 0.39 | 0.09 | 0.32 | 0.08 | -10.5 | 10 | 3 |
| 0.56 | 0.14 | 0.47 | 0.08 | -10.5 | 10 | 3 |
| 0.73 | 0.20 | 0.59 | 0.12 | -10.5 | 10 | 3 |
| 0.84 | 0.21 | 0.70 | 0.11 | -10.5 | 10 | 3 |
| 0.98 | 0.24 | 0.80 | 0.13 | -10.5 | 10 | 3 |
| 1.04 | 0.26 | 0.89 | 0.15 | -10.5 | 10 | 3 |
| 1.18 | 0.31 | 0.96 | 0.13 | -10.5 | 10 | 3 |
| 1.28 | 0.35 | 1.03 | 0.19 | -10.5 | 10 | 3 |
| 1.39 | 0.38 | 1.11 | 0.22 | -10.5 | 10 | 3 |
| 1.44 | 0.39 | 1.20 | 0.19 | -10.5 | 10 | 3 |
| 1.55 | 0.46 | 1.24 | 0.23 | -10.5 | 10 | 3 |
| 1.59 | 0.43 | 1.29 | 0.23 | -10.5 | 10 | 3 |
| 1.67 | 0.34 | 1.35 | 0.22 | -10.5 | 10 | 3 |
| 1.67 | 0.42 | 1.41 | 0.15 | -10.5 | 10 | 3 |
| 1.87 | 0.54 | 1.46 | 0.25 | -10.5 | 10 | 3 |
| 1.90 | 0.46 | 1.51 | 0.25 | -10.5 | 10 | 3 |
| 1.99 | 0.60 | 1.56 | 0.27 | -10.5 | 10 | 3 |
| 2.14 | 0.60 | 1.63 | 0.29 | -10.5 | 10 | 3 |
| 2.22 | 0.60 | 1.66 | 0.33 | -10.5 | 10 | 3 |
| 2.23 | 0.61 | 1.71 | 0.30 | -10.5 | 10 | 3 |

#### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + \text{AF (dB 1/m)} + \text{Corr. (dB)}$   
 U = Receiver reading  
 AF = Antenna factor  
 Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)  
 distance correction =  $-20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$   
 Linear interpolation will be used for frequencies in between the values in the table.  
 Tables show an extract of values.

## 7.4 ANTENNA R&S HF907 (1 GHZ – 18 GHZ)

| Frequency | AF<br>R&S<br>HF907 | Corr. |
|-----------|--------------------|-------|
| MHz       | dB (1/m)           | dB    |
| 1000      | 24.4               | -19.4 |
| 2000      | 28.5               | -17.4 |
| 3000      | 31.0               | -16.1 |
| 4000      | 33.1               | -14.7 |
| 5000      | 34.4               | -13.7 |
| 6000      | 34.7               | -12.7 |
| 7000      | 35.6               | -11.0 |

| cable<br>loss 1<br>(relay +<br>cable<br>inside<br>chamber) | cable<br>loss 2<br>(outside<br>chamber) | cable<br>loss 3<br>(switch<br>unit,<br>atten-<br>uator &<br>pre-amp) | cable<br>loss 4 (to<br>receiver) |  |  |
|------------------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------|----------------------------------|--|--|
| dB                                                         | dB                                      | dB                                                                   | dB                               |  |  |
| 0.99                                                       | 0.31                                    | -21.51                                                               | 0.79                             |  |  |
| 1.44                                                       | 0.44                                    | -20.63                                                               | 1.38                             |  |  |
| 1.87                                                       | 0.53                                    | -19.85                                                               | 1.33                             |  |  |
| 2.41                                                       | 0.67                                    | -19.13                                                               | 1.31                             |  |  |
| 2.78                                                       | 0.86                                    | -18.71                                                               | 1.40                             |  |  |
| 2.74                                                       | 0.90                                    | -17.83                                                               | 1.47                             |  |  |
| 2.82                                                       | 0.86                                    | -16.19                                                               | 1.46                             |  |  |

| Frequency | AF<br>R&S<br>HF907 | Corr. |
|-----------|--------------------|-------|
| MHz       | dB (1/m)           | dB    |
| 3000      | 31.0               | -23.4 |
| 4000      | 33.1               | -23.3 |
| 5000      | 34.4               | -21.7 |
| 6000      | 34.7               | -21.2 |
| 7000      | 35.6               | -19.8 |

| cable<br>loss 1<br>(relay<br>inside<br>chamber) | cable<br>loss 2<br>(inside<br>chamber) | cable<br>loss 3<br>(outside<br>chamber) | cable<br>loss 4<br>(switch<br>unit,<br>atten-<br>uator &<br>pre-amp) | cable<br>loss 5 (to<br>receiver) | used<br>for<br>FCC<br>15.247 |
|-------------------------------------------------|----------------------------------------|-----------------------------------------|----------------------------------------------------------------------|----------------------------------|------------------------------|
| dB                                              | dB                                     | dB                                      | dB                                                                   | dB                               |                              |
| 0.47                                            | 1.87                                   | 0.53                                    | -27.58                                                               | 1.33                             |                              |
| 0.56                                            | 2.41                                   | 0.67                                    | -28.23                                                               | 1.31                             |                              |
| 0.61                                            | 2.78                                   | 0.86                                    | -27.35                                                               | 1.40                             |                              |
| 0.58                                            | 2.74                                   | 0.90                                    | -26.89                                                               | 1.47                             |                              |
| 0.66                                            | 2.82                                   | 0.86                                    | -25.58                                                               | 1.46                             |                              |

| Frequency | AF<br>R&S<br>HF907 | Corr. |
|-----------|--------------------|-------|
| MHz       | dB (1/m)           | dB    |
| 7000      | 35.6               | -57.3 |
| 8000      | 36.3               | -56.3 |
| 9000      | 37.1               | -55.3 |
| 10000     | 37.5               | -56.2 |
| 11000     | 37.5               | -55.3 |
| 12000     | 37.6               | -53.7 |
| 13000     | 38.2               | -53.5 |
| 14000     | 39.9               | -56.3 |
| 15000     | 40.9               | -54.1 |
| 16000     | 41.3               | -54.1 |
| 17000     | 42.8               | -54.4 |
| 18000     | 44.2               | -54.7 |

| cable<br>loss 1<br>(relay<br>inside<br>chamber) | cable<br>loss 2<br>(High<br>Pass) | cable<br>loss 3<br>(pre-<br>amp) | cable<br>loss 4<br>(inside<br>chamber) | cable<br>loss 5<br>(outside<br>chamber) | cable<br>loss 6<br>(to<br>receiver) |
|-------------------------------------------------|-----------------------------------|----------------------------------|----------------------------------------|-----------------------------------------|-------------------------------------|
| dB                                              | dB                                | dB                               | dB                                     | dB                                      | dB                                  |
| 0.56                                            | 1.28                              | -62.72                           | 2.66                                   | 0.94                                    | 1.46                                |
| 0.69                                            | 0.71                              | -61.49                           | 2.84                                   | 1.00                                    | 1.53                                |
| 0.68                                            | 0.65                              | -60.80                           | 3.06                                   | 1.09                                    | 1.60                                |
| 0.70                                            | 0.54                              | -61.91                           | 3.28                                   | 1.20                                    | 1.67                                |
| 0.80                                            | 0.61                              | -61.40                           | 3.43                                   | 1.27                                    | 1.70                                |
| 0.84                                            | 0.42                              | -59.70                           | 3.53                                   | 1.26                                    | 1.73                                |
| 0.83                                            | 0.44                              | -59.81                           | 3.75                                   | 1.32                                    | 1.83                                |
| 0.91                                            | 0.53                              | -63.03                           | 3.91                                   | 1.40                                    | 1.77                                |
| 0.98                                            | 0.54                              | -61.05                           | 4.02                                   | 1.44                                    | 1.83                                |
| 1.23                                            | 0.49                              | -61.51                           | 4.17                                   | 1.51                                    | 1.85                                |
| 1.36                                            | 0.76                              | -62.36                           | 4.34                                   | 1.53                                    | 2.00                                |
| 1.70                                            | 0.53                              | -62.88                           | 4.41                                   | 1.55                                    | 1.91                                |

### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Tables show an extract of values.

## 7.5 ANTENNA EMCO 3160-09 (18 GHZ – 26.5 GHZ)

| Frequency | AF<br>EMCO<br>3160-09 | Corr. | cable<br>loss 1<br>(inside<br>chamber) | cable<br>loss 2<br>(pre-<br>amp) | cable<br>loss 3<br>(inside<br>chamber) | cable<br>loss 4<br>(switch<br>unit) | cable<br>loss 5<br>(to<br>receiver) |
|-----------|-----------------------|-------|----------------------------------------|----------------------------------|----------------------------------------|-------------------------------------|-------------------------------------|
| MHz       | dB (1/m)              | dB    | dB                                     | dB                               | dB                                     | dB                                  | dB                                  |
| 18000     | 40.2                  | -23.5 | 0.72                                   | -35.85                           | 6.20                                   | 2.81                                | 2.65                                |
| 18500     | 40.2                  | -23.2 | 0.69                                   | -35.71                           | 6.46                                   | 2.76                                | 2.59                                |
| 19000     | 40.2                  | -22.0 | 0.76                                   | -35.44                           | 6.69                                   | 3.15                                | 2.79                                |
| 19500     | 40.3                  | -21.3 | 0.74                                   | -35.07                           | 7.04                                   | 3.11                                | 2.91                                |
| 20000     | 40.3                  | -20.3 | 0.72                                   | -34.49                           | 7.30                                   | 3.07                                | 3.05                                |
| 20500     | 40.3                  | -19.9 | 0.78                                   | -34.46                           | 7.48                                   | 3.12                                | 3.15                                |
| 21000     | 40.3                  | -19.1 | 0.87                                   | -34.07                           | 7.61                                   | 3.20                                | 3.33                                |
| 21500     | 40.3                  | -19.1 | 0.90                                   | -33.96                           | 7.47                                   | 3.28                                | 3.19                                |
| 22000     | 40.3                  | -18.7 | 0.89                                   | -33.57                           | 7.34                                   | 3.35                                | 3.28                                |
| 22500     | 40.4                  | -19.0 | 0.87                                   | -33.66                           | 7.06                                   | 3.75                                | 2.94                                |
| 23000     | 40.4                  | -19.5 | 0.88                                   | -33.75                           | 6.92                                   | 3.77                                | 2.70                                |
| 23500     | 40.4                  | -19.3 | 0.90                                   | -33.35                           | 6.99                                   | 3.52                                | 2.66                                |
| 24000     | 40.4                  | -19.8 | 0.88                                   | -33.99                           | 6.88                                   | 3.88                                | 2.58                                |
| 24500     | 40.4                  | -19.5 | 0.91                                   | -33.89                           | 7.01                                   | 3.93                                | 2.51                                |
| 25000     | 40.4                  | -19.3 | 0.88                                   | -33.00                           | 6.72                                   | 3.96                                | 2.14                                |
| 25500     | 40.5                  | -20.4 | 0.89                                   | -34.07                           | 6.90                                   | 3.66                                | 2.22                                |
| 26000     | 40.5                  | -21.3 | 0.86                                   | -35.11                           | 7.02                                   | 3.69                                | 2.28                                |
| 26500     | 40.5                  | -21.1 | 0.90                                   | -35.20                           | 7.15                                   | 3.91                                | 2.36                                |

### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

## 7.6 ANTENNA EMCO 3160-10 (26.5 GHZ – 40 GHZ)

| Frequency<br>GHz | AF<br>EMCO<br>3160-10<br>dB (1/m) | Corr.<br>dB | cable<br>loss 1<br>(inside<br>chamber)<br>dB | cable<br>loss 2<br>(outside<br>chamber)<br>dB | cable<br>loss 3<br>(switch<br>unit)<br>dB | cable<br>loss 4<br>(to<br>receiver)<br>dB | distance<br>corr.<br>(-20 dB/<br>decade)<br>dB | d <sub>Limit</sub><br>(meas.<br>distance<br>(limit)<br>m | d <sub>used</sub><br>(meas.<br>distance<br>(used)<br>m |
|------------------|-----------------------------------|-------------|----------------------------------------------|-----------------------------------------------|-------------------------------------------|-------------------------------------------|------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------|
| 26.5             | 43.4                              | -11.2       | 4.4                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 27.0             | 43.4                              | -11.2       | 4.4                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 28.0             | 43.4                              | -11.1       | 4.5                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 29.0             | 43.5                              | -11.0       | 4.6                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 30.0             | 43.5                              | -10.9       | 4.7                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 31.0             | 43.5                              | -10.8       | 4.7                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 32.0             | 43.5                              | -10.7       | 4.8                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 33.0             | 43.6                              | -10.7       | 4.9                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 34.0             | 43.6                              | -10.6       | 5.0                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 35.0             | 43.6                              | -10.5       | 5.1                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 36.0             | 43.6                              | -10.4       | 5.1                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 37.0             | 43.7                              | -10.3       | 5.2                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 38.0             | 43.7                              | -10.2       | 5.3                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 39.0             | 43.7                              | -10.2       | 5.4                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |
| 40.0             | 43.8                              | -10.1       | 5.5                                          |                                               |                                           |                                           | -9.5                                           | 3                                                        | 1.0                                                    |

### Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

distance correction =  $-20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

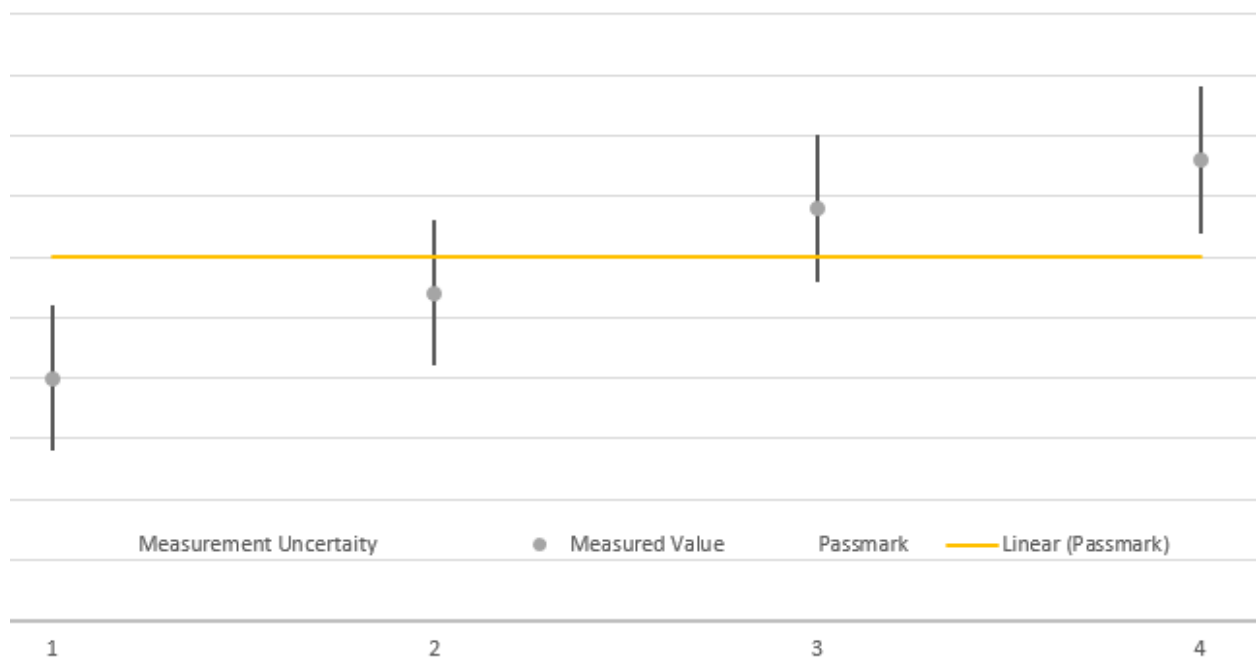
Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

## 8 MEASUREMENT UNCERTAINTIES

| Test Case                            | Parameter          | Uncertainty                    |
|--------------------------------------|--------------------|--------------------------------|
| AC Power Line                        | Power              | $\pm 3.4$ dB                   |
| Field Strength of spurious radiation | Power              | $\pm 5.5$ dB                   |
| 6 dB / 26 dB / 99% Bandwidth         | Power<br>Frequency | $\pm 2.9$ dB<br>$\pm 11.2$ kHz |
| Conducted Output Power               | Power              | $\pm 2.2$ dB                   |
| Band Edge Compliance                 | Power<br>Frequency | $\pm 2.2$ dB<br>$\pm 11.2$ kHz |
| Frequency Stability                  | Frequency          | $\pm 25$ Hz                    |
| Power Spectral Density               | Power              | $\pm 2.2$ dB                   |

The measurement uncertainties for all parameters are calculated with an expansion factor (coverage factor)  $k = 1.96$ . This means, that the true value is in the corresponding interval with a probability of 95 %.



The verdicts in this test report are given according the above diagram:

| Case | Measured Value  | Uncertainty Range | Verdict |
|------|-----------------|-------------------|---------|
| 1    | below pass mark | below pass mark   | Passed  |
| 2    | below pass mark | within pass mark  | Passed  |
| 3    | above pass mark | within pass mark  | Failed  |
| 4    | above pass mark | above pass mark   | Failed  |

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so called shared risk principle.

## 9 PHOTO REPORT

Please see separate photo report.