



# RADIO TEST REPORT –REP009236

Type of assessment:

**Final product testing**

Applicant:

**Texa Spa**

**Via I Maggio, 9**

**31050 Monastier di Treviso (TV) – Italy**

Product:

**Vehicle diagnostic system with Bluetooth connectivity**

Model:

**DP2.2-488**

FCC ID:

**T8RDP22**

IC Registration number:

**23618-DP22**

Specifications:

- ◆ FCC 47 CFR Part 15 Subpart C, §15.247
- ◆ RSS-247, Issue 2, Feb 2017, Section 5
- ◆ RSS-Gen, Issue 5, April 2018 - Amendment 1 (March 2019) - Amendment 2 (February 2021)

Date of issue: April 21, 2023

D. Guarnone

Tested by

Signature

P. Barbieri

Reviewed by

Signature

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#### Lab locations

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|              |                                                     |
|--------------|-----------------------------------------------------|
| Company name | Nemko Spa                                           |
| Address      | Via del Carroccio, 4                                |
| City         | Biassono                                            |
| Province     | MB                                                  |
| Postal code  | 20853                                               |
| Country      | Italy                                               |
| Telephone    | +39 039 220 12 01                                   |
| Facsimile    | +39 039 220 12 21                                   |
| Website      | www.nemko.com                                       |
| ISED number  | FCC: 682159; IC: 9109A (10 m semi anechoic chamber) |

#### Limits of responsibility

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Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report. This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Spa ISO/IEC 17025 accreditation.

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## Section 1 Report summary

### 1.1 Test specifications

|                                                                                             |                                                                                                                              |
|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| RSS-247, Issue 2, Feb 2017, Section 5                                                       | Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices |
| RSS-Gen, Issue 5, April 2018 –<br>Amendment 1 (March 2019) –<br>Amendment 2 (February 2021) | General Requirements for Compliance of Radio Apparatus                                                                       |
| FCC 47 CFR Part 15 Subpart C, §15.247                                                       | Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.                                                  |

### 1.2 Test methods

|                                                                      |                                                                                                |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| DA 00-705, Released March 30, 2000                                   | Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems                |
| ANSI C63.10 v2013                                                    | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |
| RSS-102, Issue 5, March 19, 2015 -<br>Amendment 1 (February 2, 2021) | Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) |

### 1.3 Exclusions

None

### 1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.3 above. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

### 1.5 Test report revision history

**Table 1.5-1:** Test report revision history

| Revision # | Date of issue  | Details of changes made to test report |
|------------|----------------|----------------------------------------|
| REP009236  | April 21, 2023 | Original report issued                 |

## Section 2 Engineering considerations

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### 2.1 Modifications incorporated in the EUT for compliance

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There were no modifications performed to the EUT during this assessment.

### 2.2 Technical judgment

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None

### 2.3 Deviations from laboratory tests procedures

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No deviations were made from laboratory procedures.

## Section 3 Test conditions

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### 3.1 Atmospheric conditions

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|                   |                                         |
|-------------------|-----------------------------------------|
| Temperature       | 15 °C – 35 °C                           |
| Relative humidity | 20 % – 75 %                             |
| Air pressure      | 86 kPa (860 mbar) – 106 kPa (1060 mbar) |

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

The following instruments are used to monitor the environmental conditions:

| Equipment                      | Manufacturer | Model no. | Asset no.    | Cal date | Next cal. |
|--------------------------------|--------------|-----------|--------------|----------|-----------|
| Thermo-hygrometer data loggers | Testo        | 175-H2    | 20012380/305 | 2022-04  | 2023-04   |
| Thermo-hygrometer data loggers | Testo        | 175-H2    | 38203337/703 | 2022-12  | 2024-12   |
| Barometer                      | Castle       | GPB 3300  | 072015       | 2022-12  | 2024-12   |

### 3.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5\%$ , for which the equipment was designed.

## Section 4 Measurement uncertainty

### 4.1 Uncertainty of measurement

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2 and other specific test standard and is documented in Nemko Spa working manual WML1002.

The assessment of conformity for each test performed on the equipment is performed not taking into account the measurement uncertainty. The two following possible verdicts are stated in the report:

P (Pass) - The measured values of the equipment respect the specification limit at the points tested. The specific risk of false accept is up to 50% when the measured result is close to the limit.

F (Fail) - One or more measured values of the equipment do not respect the specification limit at the points tested. The specific risk of false reject is up to 50% when the measured result is close to the limit.

Hereafter Nemko's measurement uncertainties are reported:

| EUT         | Type      | Test                                                                                    | Range                | Measurement Uncertainty | Notes |
|-------------|-----------|-----------------------------------------------------------------------------------------|----------------------|-------------------------|-------|
| Transmitter | Conducted | Frequency error                                                                         | 0.001 MHz ÷ 40 GHz   | 0.08 ppm                | (1)   |
|             |           | Carrier power<br>RF Output Power                                                        | 0.009 MHz ÷ 30 MHz   | 1.1 dB                  | (1)   |
|             |           |                                                                                         | 30 MHz ÷ 18 GHz      | 1.5 dB                  | (1)   |
|             |           |                                                                                         | 18 MHz ÷ 40 GHz      | 3.0 dB                  | (1)   |
|             |           |                                                                                         | 40 MHz ÷ 140 GHz     | 5.0 dB                  | (1)   |
|             |           | Adjacent channel power                                                                  | 1 MHz ÷ 18 GHz       | 1.4 dB                  | (1)   |
|             |           | Conducted spurious emissions                                                            | 0.009 MHz ÷ 18 GHz   | 3.0 dB                  | (1)   |
|             |           |                                                                                         | 18 GHz ÷ 40 GHz      | 4.2 dB                  | (1)   |
|             |           |                                                                                         | 40 GHz ÷ 220 GHz     | 6.0 dB                  | (1)   |
|             |           | Intermodulation attenuation                                                             | 1 MHz ÷ 18 GHz       | 2.2 dB                  | (1)   |
|             |           | Attack time – frequency behaviour                                                       | 1 MHz ÷ 18 GHz       | 2.0 ms                  | (1)   |
|             |           | Attack time – power behaviour                                                           | 1 MHz ÷ 18 GHz       | 2.5 ms                  | (1)   |
|             |           | Release time – frequency behaviour                                                      | 1 MHz ÷ 18 GHz       | 2.0 ms                  | (1)   |
|             |           | Release time – power behaviour                                                          | 1 MHz ÷ 18 GHz       | 2.5 ms                  | (1)   |
|             |           | Transient behaviour of the transmitter– Transient frequency behaviour                   | 1 MHz ÷ 18 GHz       | 0.2 kHz                 | (1)   |
|             |           | Transient behaviour of the transmitter – Power level slope                              | 1 MHz ÷ 18 GHz       | 9%                      | (1)   |
|             |           | Frequency deviation - Maximum permissible frequency deviation                           | 0.001 MHz ÷ 18 GHz   | 1.3%                    | (1)   |
|             |           | Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz | 0.001 MHz ÷ 18 GHz   | 0.5 dB                  | (1)   |
|             |           | Dwell time                                                                              | -                    | 3%                      | (1)   |
|             |           | Hopping Frequency Separation                                                            | 0.01 MHz ÷ 18 GHz    | 1%                      | (1)   |
|             |           | Occupied Channel Bandwidth                                                              | 0.01 MHz ÷ 18 GHz    | 2%                      | (1)   |
|             |           | Modulation Bandwidth                                                                    | 0.01 MHz ÷ 18 GHz    | 2%                      | (1)   |
|             | Radiated  | Radiated spurious emissions                                                             | 0.009 MHz ÷ 26.5 GHz | 6.0 dB                  | (1)   |
|             |           |                                                                                         | 26.5 GHz ÷ 66 GHz    | 8.0 dB                  | (1)   |
|             |           |                                                                                         | 66 GHz ÷ 220 GHz     | 10 dB                   | (1)   |
|             |           | Effective radiated power transmitter                                                    | 10 kHz ÷ 26.5 GHz    | 6.0 dB                  | (1)   |
|             |           |                                                                                         | 26.5 GHz ÷ 66 GHz    | 8.0 dB                  | (1)   |
|             |           |                                                                                         | 66 GHz ÷ 220 GHz     | 10 dB                   | (1)   |

#### NOTES:

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2$ , which for a normal distribution corresponds to a coverage probability of approximately 95 %

## Section 5 Information provided by the applicant

### 5.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results contained within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

### 5.2 Applicant/Manufacture

|                     |                                                           |
|---------------------|-----------------------------------------------------------|
| Applicant name      | Texa Spa                                                  |
| Applicant address   | Via I Maggio, 9 – 31050 Monastier di Treviso (TV) – Italy |
| Manufacture name    | Same as applicant                                         |
| Manufacture address | Same as applicant                                         |

### 5.3 EUT information

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product                                     | Device to gain useful information for the driver and mechanical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Model                                       | DP2.2-488                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Serial number                               | TONPY000056                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Power supply requirements                   | 12 V DC, 80 mA max                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Product description and theory of operation | The EUT is a compact device that, during normal vehicle operation, can acquire information useful both to the driver and the mechanic. The data acquired is useful to detect problems connected to the vehicle's management and its maintenance status. The device must be connected to a specific diagnostic socket called OBD socket. The device communicates with the vehicle's control unit through the OBD socket and acquires the required data. The device is able to acquire the required data from the vehicle and to transmit it in real time via Bluetooth to the smartphone selected as a display unit. For this to occur, a specific app must be installed in the display unit. |

### 5.4 Radio technical information

|                                                  |                                                                                                                                                                                                 |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Category of Wideband Data Transmission equipment | <input checked="" type="checkbox"/> Frequency Hopping Spread Spectrum (FHSS) equipment<br><input type="checkbox"/> Other types of Wideband Data Transmission equipment (e.g. DSSS, OFDM, etc.). |
| Frequency band                                   | 2400–2483.5 MHz                                                                                                                                                                                 |
| Frequency Min (MHz)                              | 2402 MHz                                                                                                                                                                                        |
| Frequency Max (MHz)                              | 2480 MHz                                                                                                                                                                                        |
| Channel numbers                                  | 0–79                                                                                                                                                                                            |
| RF power Max (W), Conducted                      | 0.24 mW (-6.18 dBm)                                                                                                                                                                             |
| Field strength, dBμV/m @ 3 m                     | 90.68 dBμV/m                                                                                                                                                                                    |
| Measured BW (kHz), 99% OBW                       | 1332 kHz                                                                                                                                                                                        |
| Type of modulation                               | GFSK<br>π/4-DQPSK<br>8-DPSK                                                                                                                                                                     |
| Emission classification                          | F1D                                                                                                                                                                                             |
| Transmitter spurious, dBμV/m @ 3 m               | 42.67 dBμV/m @ 4959 MHz (Peak)                                                                                                                                                                  |
| Antenna information                              | PCB antenna Part No. M310221 ETHERTRONICS with gain of 1.7 dBi                                                                                                                                  |

## 5.5 EUT setup details

### 5.5.1 Radio exercise details

#### Operating conditions

The EUT has been tested with the Bluetooth\_test\_V2 software provided by the applicant, as following:

| Parameter         | Value         |
|-------------------|---------------|
| Local_Device_B... | 000000000000  |
| Hopping_Mode      | 79 channel    |
| Frequency         | 2402 MHz      |
| Modulation_Type   | PRBS9 Pattern |
| Logical_Channel   | ACL Basic     |
| BB_Packet_Type    | DH5 / 3-DH5   |
| BB_Packet_Len...  | 0xFFFF        |
| Tx_Power_Level    | 0 dBm         |
| Transmit_Power... | 0             |
| Transmit_Power... | 0x7           |

| Log                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COM4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Frequency = 0x0 (0, "2402 MHz")<br>Modulation_Type = 0x4 (4, "PRBS9 Pattern")<br>Logical_Channel = 0x1 (1, "ACL Basic")<br>BB_Packet_Type = 0xF (15, "DH5 / 3-DH5")<br>BB_Packet_Length = 0xFFFF (65535, Firmware will limit len to max for BB_Packet_Type)<br>Tx_Power_Level = 0x0 (0, "0 dBm")<br>Transmit_Power_dBm = 0x0 (0, dBm)<br>Transmit_Power_Table_Index = 0x0 (0)                                                                                                                                                                                                                                                           |
| 04/21/23 11:31:09.965 com4 <c Tx_Test<br>HCI Command Complete Event<br>com4@115200<br>[0E 04]: 01 51 FC 00<br>event = 0x0E (14, "Command Complete")<br>Num_HCI_Command_Packets = 0x1 (1)<br>Command_Opcode = 0xFC51 (64593, "Tx_Test")<br>Status = 0x0 (0, "Success", "Success")                                                                                                                                                                                                                                                                                                                                                        |
| 04/21/23 11:32:37.887 com4 c> Tx_Test<br>HCI Command<br>com4@115200<br>[51 FC 10]: 00 00 00 00 00 00 00 04 01 0F FF FF 00 00 00<br>opcode = 0xFC51 (64593, "Tx_Test")<br>Local_Device_BD_ADDR = "000000000000"<br>Hopping_Mode = 0x0 (0, "79 channel")<br>Frequency = 0x0 (0, "2402 MHz")<br>Modulation_Type = 0x4 (4, "PRBS9 Pattern")<br>Logical_Channel = 0x1 (1, "ACL Basic")<br>BB_Packet_Type = 0xF (15, "DH5 / 3-DH5")<br>BB_Packet_Length = 0xFFFF (65535, Firmware will limit len to max for BB_Packet_Type)<br>Tx_Power_Level = 0x0 (0, "0 dBm")<br>Transmit_Power_dBm = 0x0 (0, dBm)<br>Transmit_Power_Table_Index = 0x0 (0) |
| 04/21/23 11:32:38.572 com4 <c Tx_Test<br>HCI Command Complete Event                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

#### Operating conditions (continued)

BB Packet type used: DM1, 2-DH5, 3-DH5

#### Transmitter state

TX Power used: 0 dBm

Transmitter set into continuous mode.

## 5.5.2 EUT setup configuration

Table 5.5-1: EUT sub assemblies

| Description | Brand name | Model, Part number, Serial number, Revision level |
|-------------|------------|---------------------------------------------------|
| --          | --         | --                                                |

Table 5.5-2: EUT interface ports

| Description   | Qty. |
|---------------|------|
| ODB connector | 1    |

Table 5.5-3: Support equipment

| Description | Brand name | Model, Part number, Serial number, Revision level |
|-------------|------------|---------------------------------------------------|
| Test Bench  | Texa Spa   | BT certification bench                            |
| Notebook    | Dell       | Latitude 7480                                     |

Table 5.5-4: Inter-connection cables

| Cable description | From       | To           | Length (m) |
|-------------------|------------|--------------|------------|
| ODB cable         | EUT        | Test Bench   | 1.4        |
| USB cable         | Test Bench | PC           | 1.8        |
| DC cable          | Test Bench | Power supply | 2.3        |

EUT setup configuration, continued

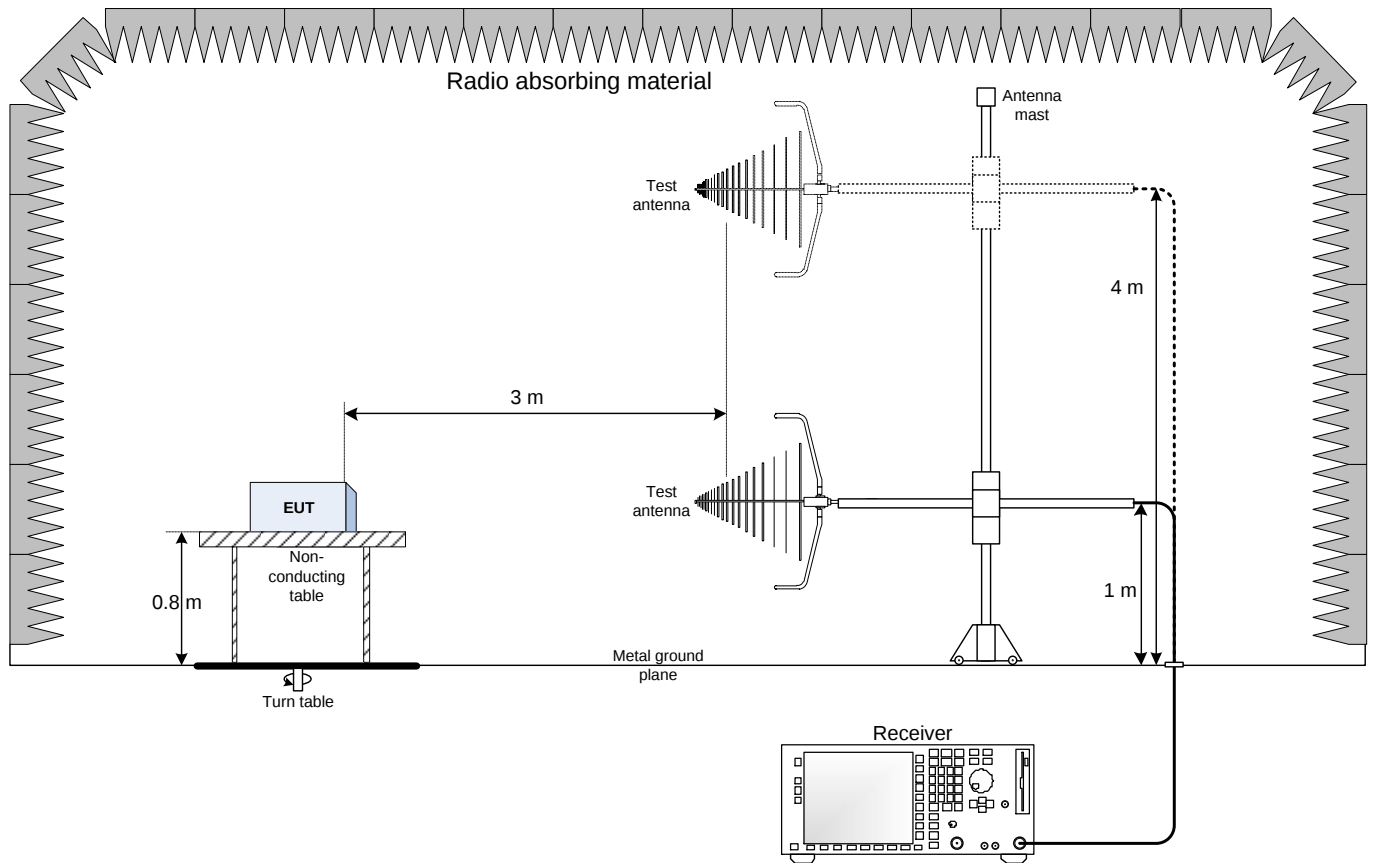
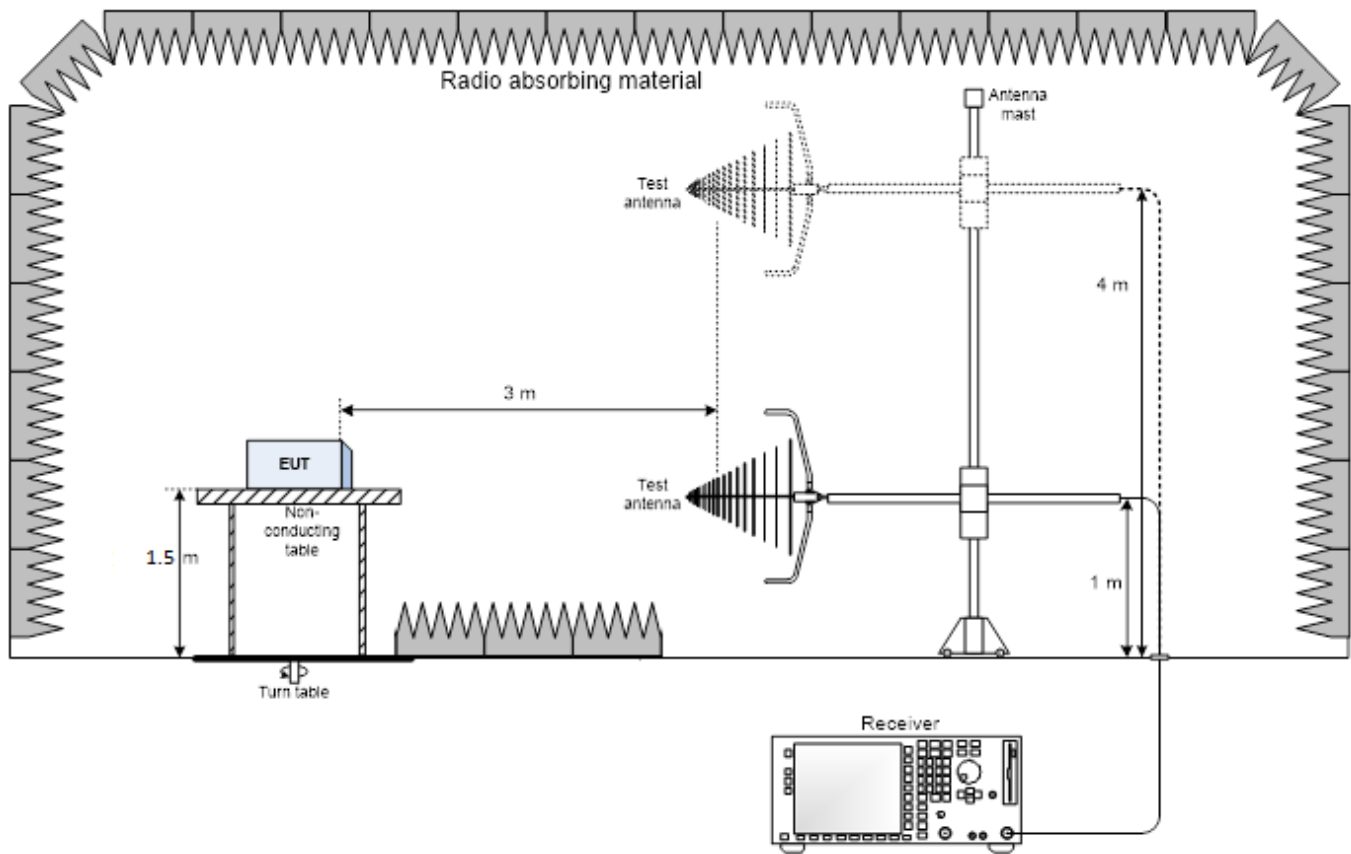


Figure 5.5-1: Radiated testing block diagram (below 1 GHz)



**Figure 5.5-2:** Radiated testing block diagram (above 1 GHz)

## Section 6 Summary of test results

### 6.1 Testing location

|                   |                                                                      |
|-------------------|----------------------------------------------------------------------|
| Test location (s) | Nemko S.p.A.<br>Via Del Carroccio, 4<br>20853 Biassono (MB)<br>Italy |
|-------------------|----------------------------------------------------------------------|

### 6.2 Testing period

|                 |                |               |                |
|-----------------|----------------|---------------|----------------|
| Test start date | March 17, 2023 | Test end date | April 14, 2023 |
|-----------------|----------------|---------------|----------------|

### 6.3 Sample information

|              |                |                           |            |
|--------------|----------------|---------------------------|------------|
| Receipt date | March 17, 2023 | Nemko sample ID number(s) | 4710790001 |
|--------------|----------------|---------------------------|------------|

### 6.4 ISED RSS-Gen, Issue 5, test results

**Table 6.4-1: RSS-Gen requirements results**

| Part   | Test description                                                                                                                                                                                                                                       | Verdict        |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 7.3    | Receiver radiated emission limits                                                                                                                                                                                                                      | Not applicable |
| 7.4    | Receiver conducted emission limits                                                                                                                                                                                                                     | Not applicable |
| 6.9    | Operating bands and selection of test frequencies                                                                                                                                                                                                      | Pass           |
| 8.8    | AC power-line conducted emissions limits                                                                                                                                                                                                               | Not applicable |
| Notes: | <sup>1</sup> According to sections 5.2 and 5.3 of RSS-Gen, Issue 5 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.<br>The EUT is a DC powered device supply by the vehicle battery |                |

## 6.5 ISED RSS-247, Issue 2, test results for frequency hopping spread spectrum systems (FHSS)

**Table 6.5-1: ISED FHSS requirements results**

| Part    | Test description                                                                       | Verdict        |
|---------|----------------------------------------------------------------------------------------|----------------|
| 5.1 (a) | Bandwidth of a frequency hopping channel                                               | Pass           |
| 5.1 (b) | Minimum channel spacing                                                                | Pass           |
| 5.1 (c) | Systems operating in the 902–928 MHz band                                              | Not applicable |
| 5.1 (d) | Systems operating in the 2400–2483.5 MHz band                                          | Pass           |
| 5.1 (e) | Systems operating in the 5725–5850 MHz band                                            | Not applicable |
| 5.3     | Hybrid Systems                                                                         |                |
| 5.3 (a) | Digital modulation turned off                                                          | Not applicable |
| 5.3 (b) | Frequency hopping turned off                                                           | Not applicable |
| 5.4     | Transmitter output power and e.i.r.p. requirements                                     |                |
| 5.4 (a) | Systems operating in the 902–928 MHz band                                              | Not applicable |
| 5.4 (b) | Systems operating in the 2400–2483.5 MHz band                                          | Pass           |
| 5.4 (c) | Systems operating in the 5725–5850 MHz                                                 | Not applicable |
| 5.4 (e) | Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band                       | Not applicable |
| 5.4 (f) | Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams | Not applicable |
| 5.5     | Unwanted emissions                                                                     | Pass           |

Notes: --

## 6.6 ISED RSS-247, Issue 2, test results for digital transmission systems (DTS)

**Table 6.6-1: ISED DTS requirements results**

| Part    | Test description                                                                       | Verdict        |
|---------|----------------------------------------------------------------------------------------|----------------|
| 5.2 (a) | Minimum 6 dB bandwidth                                                                 | Not applicable |
| 5.2 (b) | Maximum power spectral density                                                         | Not applicable |
| 5.3     | Hybrid Systems                                                                         |                |
| 5.3 (a) | Digital modulation turned off                                                          | Not applicable |
| 5.3 (b) | Frequency hopping turned off                                                           | Not applicable |
| 5.4     | Transmitter output power and e.i.r.p. requirements                                     |                |
| 5.4 (d) | Systems employing digital modulation techniques                                        | Not applicable |
| 5.4 (e) | Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band                       | Not applicable |
| 5.4 (f) | Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams | Not applicable |
| 5.5     | Unwanted emissions                                                                     | Not applicable |

Notes: --

## 6.7 FCC Part 15 Subpart C, intentional radiators test results for frequency hopping spread spectrum systems (FHSS)

| Part               | Test description                                                                                                           | Verdict        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------|----------------|
| §15.247(a)(1)(i)   | Frequency hopping systems operating in the 902–928 MHz band                                                                | Not applicable |
| §15.247(a)(1)(ii)  | Frequency hopping systems operating in the 5725–5850 MHz band                                                              | Not applicable |
| §15.247(a)(1)(iii) | Frequency hopping systems operating in the 2400–2483.5 MHz band                                                            | Pass           |
| §15.247(a)(2)      | Minimum 6 dB bandwidth for systems using digital modulation techniques                                                     | Pass           |
| §15.247(b)(1)      | Maximum peak output power of frequency hopping systems operating in the 2400–2483.5 MHz band and 5725–5850 MHz band        | Pass           |
| §15.247(b)(2)      | Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band                                   | Not applicable |
| §15.247(b)(3)      | Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands | Pass           |
| §15.247(c)(1)      | Fixed point-to-point operation with directional antenna gains greater than 6 dBi                                           | Not applicable |
| §15.247(c)(2)      | Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams                                    | Not applicable |
| §15.247(d)         | Spurious emissions                                                                                                         | Pass           |
| §15.247(e)         | Power spectral density for digitally modulated devices                                                                     | Pass           |
| §15.247(f)         | Time of occupancy for hybrid systems                                                                                       | Not applicable |

## Section 7 Test equipment

### 7.1 Test equipment list

**Table 7.1-1: Equipment list**

| Equipment                   | Manufacturer                | Model no.                 | Asset no.     | Cal cycle | Next cal. |
|-----------------------------|-----------------------------|---------------------------|---------------|-----------|-----------|
| Spectrum Analyzer           | Rohde & Schwarz             | FSW43                     | 101767        | 2023-01   | 2024-01   |
| EMI Receiver                | Rohde & Schwarz             | ESW44                     | 101620        | 2022-08   | 2023-08   |
| Antenna Trilog 25MHz - 8GHz | Schwarzbeck Mess-Elektronik | VULB9162                  | 9162-025      | 2021-07   | 2024-07   |
| Antenna 1 - 18 GHz          | Schwarzbeck Mess-Elektronik | STLP9148                  | STLP 9148-152 | 2021-09   | 2024-09   |
| Double Ridge Horn Antenna   | RFSpin                      | DRH40                     | 061106A40     | 2020-04   | 2023-04   |
| Broadband Amplifier         | Schwarzbeck Mess-Elektronik | BBV9718C                  | 00121         | 2023-03   | 2024-03   |
| Controller                  | Maturo                      | FCU3.0                    | 10041         | NCR       | NCR       |
| Tilt antenna mast           | Maturo                      | TAM4.0-E                  | 10042         | NCR       | NCR       |
| Turntable                   | Maturo                      | TT4.0-5T                  | 2.527         | NCR       | NCR       |
| Semi-anechoic chamber       | Nemko S.p.a.                | 10m semi-anechoic chamber | 530           | 2021-09   | 2023-09   |

Notes: NCR - no calibration required, VOU - verify on use

## Section 8   Testing data

### 8.1    Number of frequencies

#### 8.1.1    References, definitions and limits

##### RSS-Gen, Clause 6.9:

Except where otherwise specified, measurements shall be performed for each frequency band of operation for which the radio apparatus is to be certified, with the device operating at the frequencies in each band of operation shown in table below. The frequencies selected for measurements shall be reported in the test report.

**Table 8.1-1: Frequency Range of Operation**

| Frequency range over which the device operates (in each band) | Number of test frequencies required | Location of measurement frequency inside the operating frequency range |
|---------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------|
| 1 MHz or less                                                 | 1                                   | Center (middle of the band)                                            |
| 1–10 MHz                                                      | 2                                   | 1 near high end, 1 near low end                                        |
| Greater than 10 MHz                                           | 3                                   | 1 near high end, 1 near center and 1 near low end                      |

Notes:      “near” means as close as possible to or at the centre / low end / high end of the frequency range over which the device operates.

#### 8.1.2    Test summary

|           |             |           |                |
|-----------|-------------|-----------|----------------|
| Verdict   | Pass        |           |                |
| Tested by | D. Guarnone | Test date | March 23, 2023 |

#### 8.1.3    Observations, settings and special notes

##### ANSI C63.10, Clause 5.6.2.1:

The number of channels tested can be reduced by measuring the center channel bandwidth first and then applying the following relaxations as appropriate:

- For each operating mode, if the measured channel bandwidth on the middle channel is at least 150% of the minimum permitted bandwidth, then it is not necessary to measure the bandwidth on the high and low channels.
- For multiple-input multiple-output (MIMO) systems, if the measured channel bandwidth on testing the middle channel exceeds the minimum permitted bandwidth by more than 50% on one transmit chain, then it is not necessary to repeat testing on the other chains.
- If the measured channel bandwidth on the middle channel is less than 50% of the maximum permitted bandwidth, then it is not necessary to measure the bandwidth on the high and low channels.

##### ANSI C63.10, Clause 5.6.2.2:

For devices with multiple operating modes, measurements on the middle channel can be used to determine the worst-case mode(s). The worst-case modes are as follows:

- Band edge requirements—Measurements on the mode with the widest bandwidth can be used to cover the same channel (center frequency) on modes with narrower bandwidth that have the same or lower output power for each modulation family (e.g., OFDM and direct sequence spread spectrum).
- Spurious emissions—Measure the mode with the highest output power and the mode with the highest output power spectral density for each modulation family (e.g., OFDM and direct sequence spread spectrum).
- In-band PSD—Measurements on the mode with the narrowest bandwidth can be used to cover all modes within the same modulation family of an equal or lower output power provided the result is less than 50% of the limit.

8.1.4      Test data

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**Table 8.1-2:** *Test channels selection*

| Start of Frequency<br>range, MHz | End of Frequency<br>range, MHz | Frequency range<br>bandwidth, MHz | Low channel, MHz | Mid channel, MHz | High channel, MHz |
|----------------------------------|--------------------------------|-----------------------------------|------------------|------------------|-------------------|
| 2400                             | 2483.5                         | 83.5                              | 2402             | 2441             | 2480              |

## 8.2 Antenna requirement

### 8.2.1 References, definitions and limits

#### RSS-Gen, Clause 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report.

### 8.2.2 Test summary

|           |             |           |                |
|-----------|-------------|-----------|----------------|
| Verdict   | Pass        |           |                |
| Tested by | D. Guarnone | Test date | March 23, 2023 |

### 8.2.3 Observations, settings and special notes

None

### 8.2.4 Test data

Must the EUT be professionally installed? ☐ YES ☒ NO  
Does the EUT have detachable antenna(s)? ☐ YES ☒ NO  
If detachable, is the antenna connector(s) non-standard? ☐ YES ☐ NO ☒ N/A

**Table 8.2-1: Antenna information**

| Antenna type | Manufacturer | Model number | Maximum gain | Connector type |
|--------------|--------------|--------------|--------------|----------------|
| PCB          | ETHERTRONICS | M310221      | 1.7 dBi      | --             |

## 8.3 Frequency Hopping Systems requirements, 2 GHz operation

### 8.3.1 References, definitions and limits

**FCC:**

- (1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.
- (iii) Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
- d) ay be avoided or suppressed provided that at least 15 hopping channels are used.

**RSS-247, Clause 5.1:**

- a. The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system's radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.
- b. FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400–2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.
- d. FHSs operating in the band 2400–2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

**RSS-247, Clause 5.3:**

Hybrid systems employ a combination of both frequency hopping and digital transmission techniques and shall comply with the following:

- a. With the digital transmission operation of the hybrid system turned off, the frequency hopping operation shall have an average time of occupancy on any frequency not exceeding 0.4 seconds within a duration in seconds equal to the number of hopping frequencies multiplied by 0.4.

### 8.3.2 Test summary

|           |             |           |                |
|-----------|-------------|-----------|----------------|
| Verdict   | Pass        |           |                |
| Tested by | D. Guarnone | Test date | March 23, 2023 |

### 8.3.3      Observations, settings and special notes

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Carrier frequency separation was tested per ANSI C63.10 subclause 7.8.2. Spectrum analyser settings:

|                      |                                                                                                                                                 |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Resolution bandwidth | Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. |
| Video bandwidth      | ≥ RBW                                                                                                                                           |
| Frequency span       | Wide enough to capture the peaks of two adjacent channels                                                                                       |
| Detector mode        | Peak                                                                                                                                            |
| Trace mode           | Max Hold                                                                                                                                        |

Number of hopping frequencies was tested per ANSI C63.10 subclause 7.8.3. Spectrum analyser settings:

|                      |                                                                                                                                                                                                                                      |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resolution bandwidth | To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.                                                                                       |
| Video bandwidth      | ≥ RBW                                                                                                                                                                                                                                |
| Frequency span       | The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen. |
| Detector mode        | Peak                                                                                                                                                                                                                                 |
| Trace mode           | Max Hold                                                                                                                                                                                                                             |

## Observations, settings and special notes, continued

Time of occupancy (dwell time) was tested per ANSI C63.10 subclause 7.8.4. Spectrum analyser settings:

|                      |                                                                                                                                  |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Resolution bandwidth | shall be $\leq$ channel spacing and where possible RBW should be set $\gg 1/T$ , where T is the expected dwell time per channel. |
| Video bandwidth      | $\geq$ RBW                                                                                                                       |
| Frequency span       | Zero span, centered on a hopping channel.                                                                                        |
| Detector mode        | Peak                                                                                                                             |
| Trace mode           | Max Hold                                                                                                                         |

20 dB bandwidth was tested per ANSI C63.10 subclause 6.9.2. Spectrum analyser settings:

|                      |                                                                               |
|----------------------|-------------------------------------------------------------------------------|
| Resolution bandwidth | $\geq 1-5\%$ of the 20 dB bandwidth                                           |
| Video bandwidth      | $\geq$ RBW                                                                    |
| Frequency span       | approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel |
| Detector mode        | Peak                                                                          |
| Trace mode           | Max Hold                                                                      |

### 8.3.4 Test equipment used

| Equipment             | Manufacturer                | Model no.                 | Asset no.     |
|-----------------------|-----------------------------|---------------------------|---------------|
| EMI Receiver          | Rohde & Schwarz             | ESW44                     | 101620        |
| Spectrum Analyzer     | Rohde & Schwarz             | FSW43                     | 101767        |
| Antenna 1 - 18 GHz    | Schwarzbeck Mess-Elektronik | STLP9148                  | STLP 9148-152 |
| Controller            | Maturo                      | FCU3.0                    | 10041         |
| Tilt antenna mast     | Maturo                      | TAM4.0-E                  | 10042         |
| Turntable             | Maturo                      | TT4.0-ST                  | 2.527         |
| Semi-anechoic chamber | Nemko S.p.a.                | 10m semi-anechoic chamber | 530           |

### 8.3.5 Test data

**Table 8.3-1: 20 dB bandwidth results**

| Frequency, MHz | Modulation     | 20 dB bandwidth, MHz |
|----------------|----------------|----------------------|
| 2402           | GFSK           | 1.024                |
| 2441           | GFSK           | 1.019                |
| 2480           | GFSK           | 0.725                |
| 2402           | $\pi/4$ -DQPSK | 1.29                 |
| 2441           | $\pi/4$ -DQPSK | 1.24                 |
| 2480           | $\pi/4$ -DQPSK | 1.24                 |
| 2402           | 8-DPSK         | 1.28                 |
| 2441           | 8-DPSK         | 1.26                 |
| 2480           | 8-DPSK         | 1.27                 |

Test data, continued

**Table 8.3-2:** 99% occupied bandwidth results

| Frequency, MHz | Modulation     | 99% occupied bandwidth, kHz |
|----------------|----------------|-----------------------------|
| 2402           | GFSK           | 937.5                       |
| 2441           | GFSK           | 932.7                       |
| 2480           | GFSK           | 961.5                       |
| 2402           | $\pi/4$ -DQPSK | 1255                        |
| 2441           | $\pi/4$ -DQPSK | 1221                        |
| 2480           | $\pi/4$ -DQPSK | 1284                        |
| 2402           | 8-DPSK         | 1269                        |
| 2441           | 8-DPSK         | 1207                        |
| 2480           | 8-DPSK         | 1332                        |

Notes: There is no 99% occupied bandwidth limit in the standard's requirements the measurement results provided for information purposes only.

**Table 8.3-3:** Carrier frequency separation results

| Carrier frequency separation, kHz | Minimum limit, kHz | Margin, kHz |
|-----------------------------------|--------------------|-------------|
| 1000                              | 833 kHz            | -167        |

Notes: The limit is two thirds of the 20 dB bandwidth =  $2/3$  of 1.25 MHz = 833 kHz

**Table 8.3-4:** Number of hopping frequencies results

| Number of hopping frequencies | Minimum limit | Margin |
|-------------------------------|---------------|--------|
| 79                            | 15            | -64    |

**Table 8.3-5:** Average time of occupancy results for DM1 BB packet type

| Dwell time of each pulse, ms | Number of pulses within period | Total dwell time within period, ms | Limit, ms | Margin, ms |
|------------------------------|--------------------------------|------------------------------------|-----------|------------|
| 0.308                        | 500                            | 154                                | 400       | -246       |

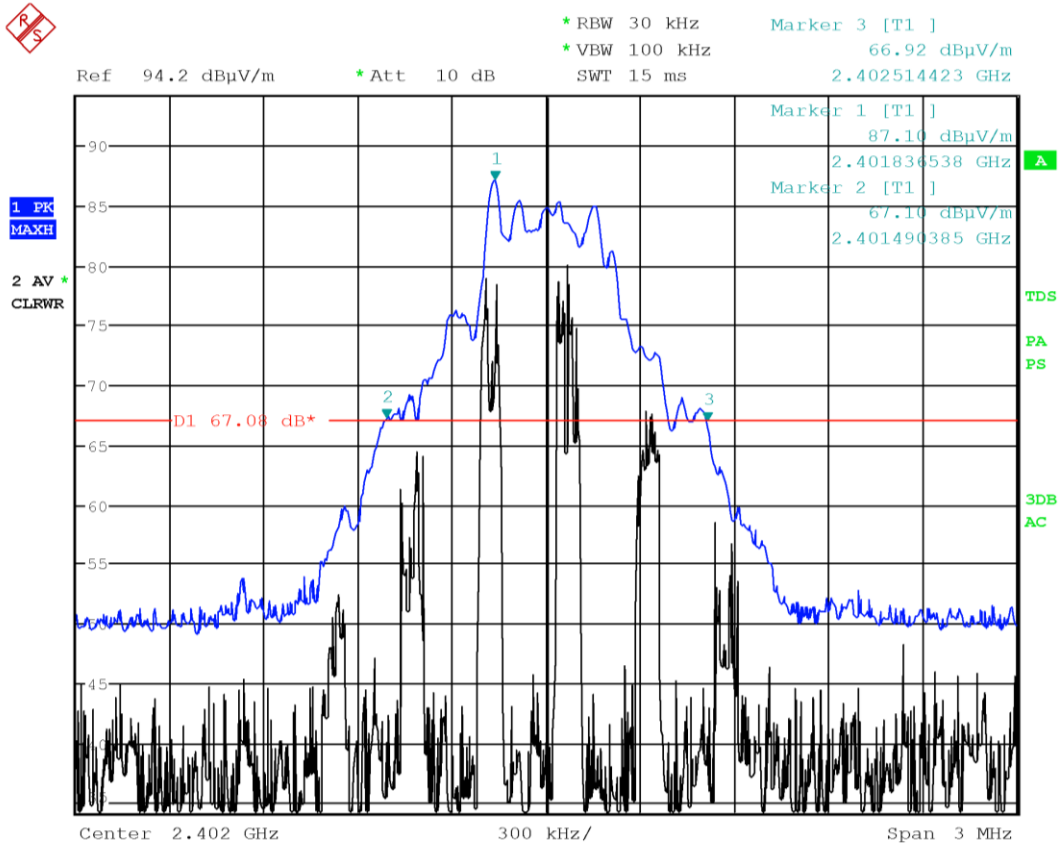
Notes: Measurement Period is 31.6 s

**Table 8.3-6:** Average time of occupancy results for 3-DH5 BB packet type

| Dwell time of each pulse, ms | Number of pulses within period | Total dwell time within period, ms | Limit, ms | Margin, ms |
|------------------------------|--------------------------------|------------------------------------|-----------|------------|
| 3.028                        | 112                            | 339                                | 400       | -61        |

Notes: Measurement Period is 31.6 s

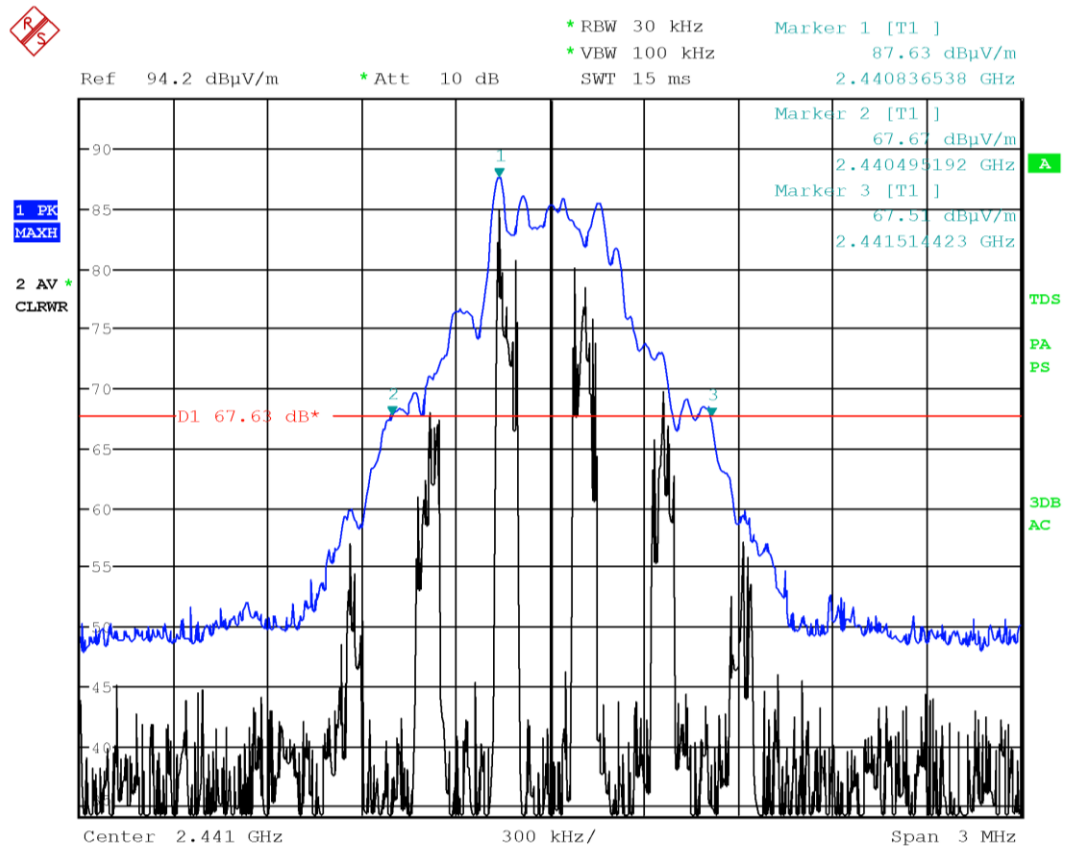
Test data, continued



Date: 23.MAR.2023 17:40:48

**Figure 8.3-1:** 20 dB bandwidth on low channel with GFSK modulation

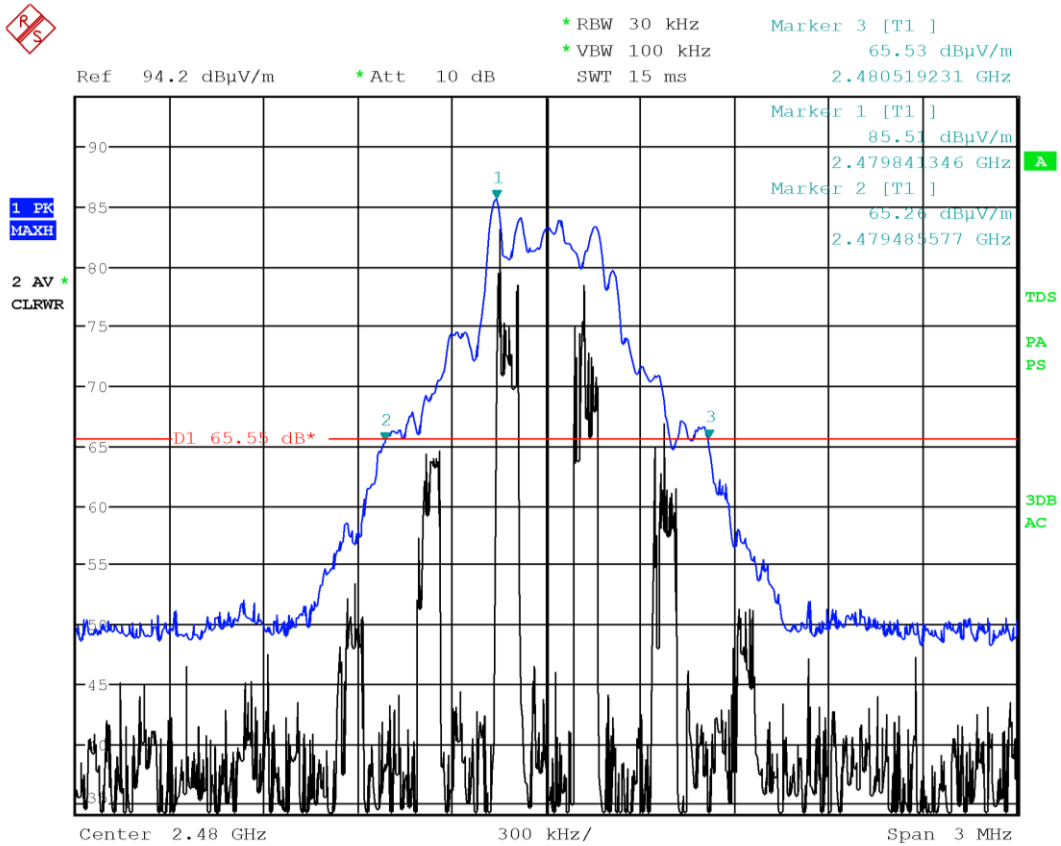
Test data, continued



Date: 23.MAR.2023 17:28:36

**Figure 8.3-2:** 20 dB bandwidth on mid channel with GFSK modulation

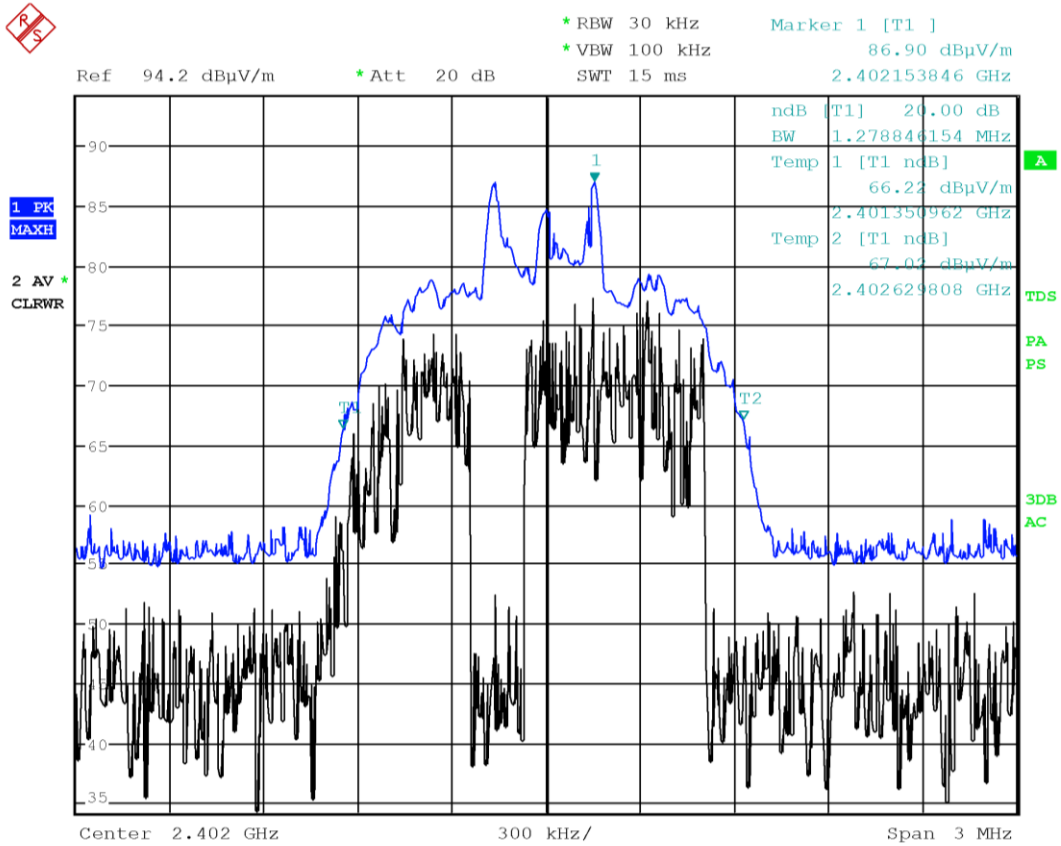
Test data, continued



Date: 23.MAR.2023 17:25:15

Figure 8.3-3: 20 dB bandwidth on high channel with GFSK modulation

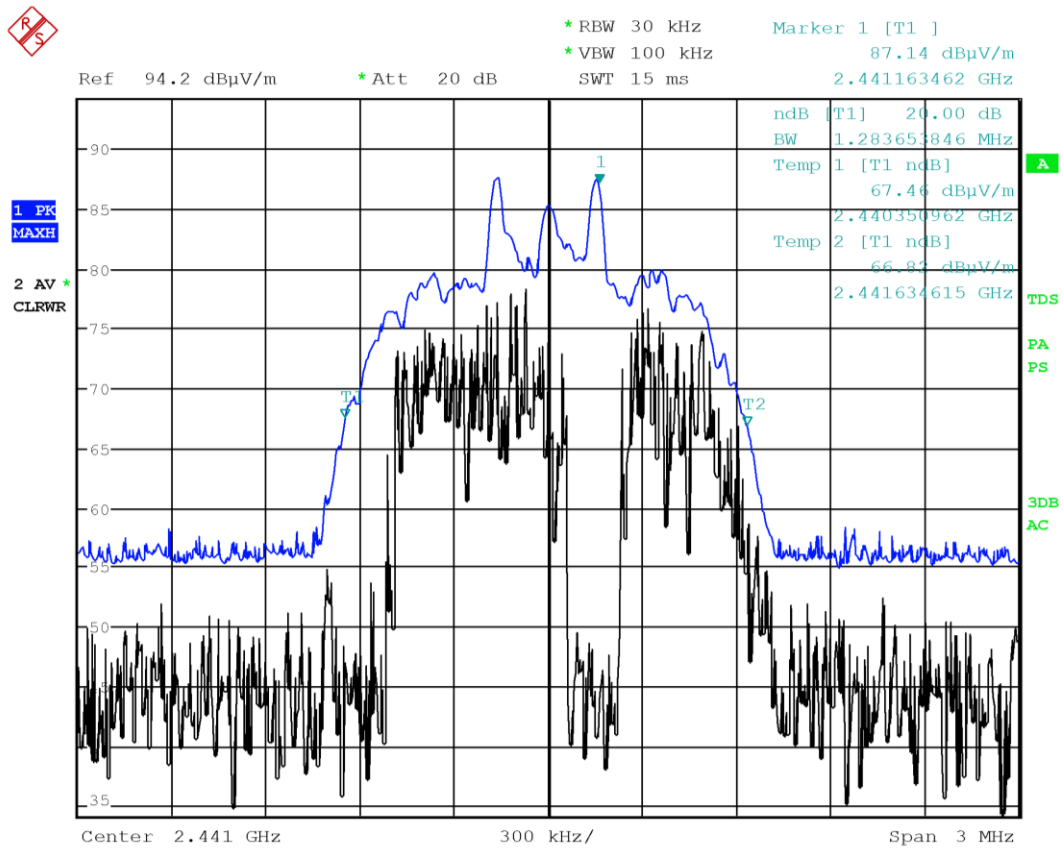
Test data, continued



Date: 23.MAR.2023 16:38:59

**Figure 8.3-4:** 20 dB bandwidth on low channel with 8-DPSK modulation

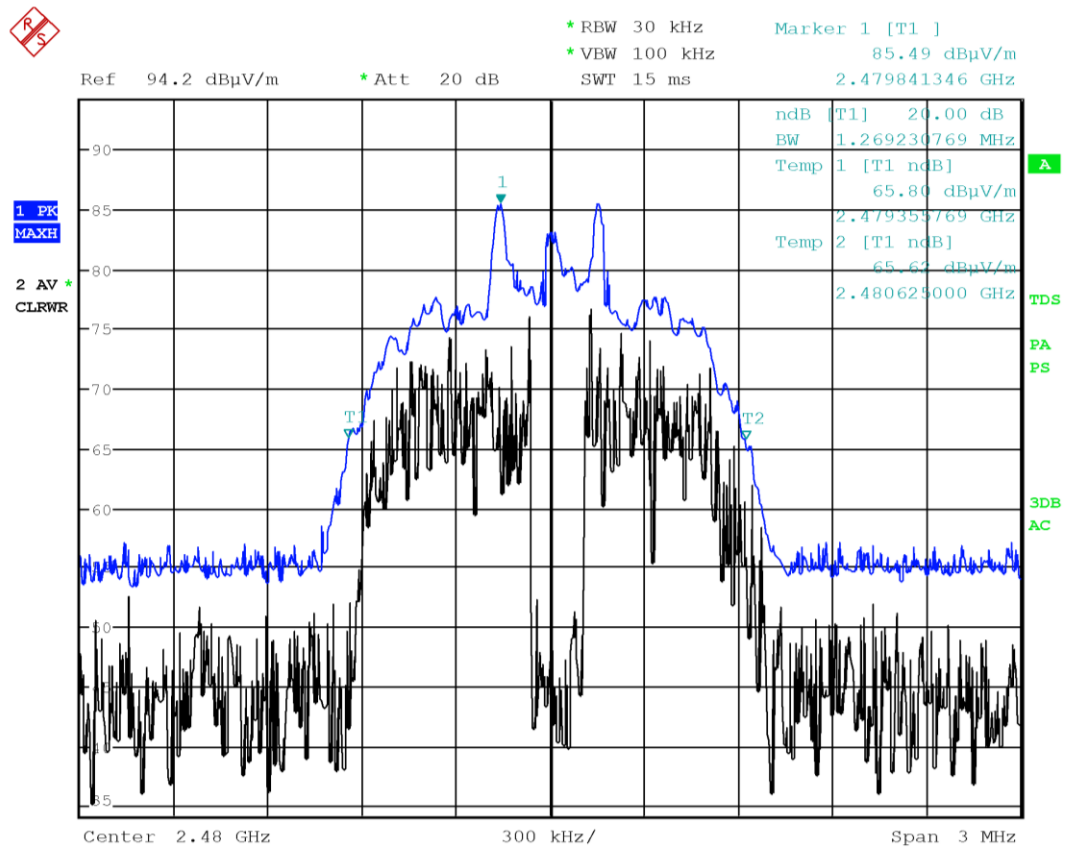
Test data, continued



Date: 23.MAR.2023 16:33:15

Figure 8.3-5: 20 dB bandwidth on mid channel with 8-DPSK modulation

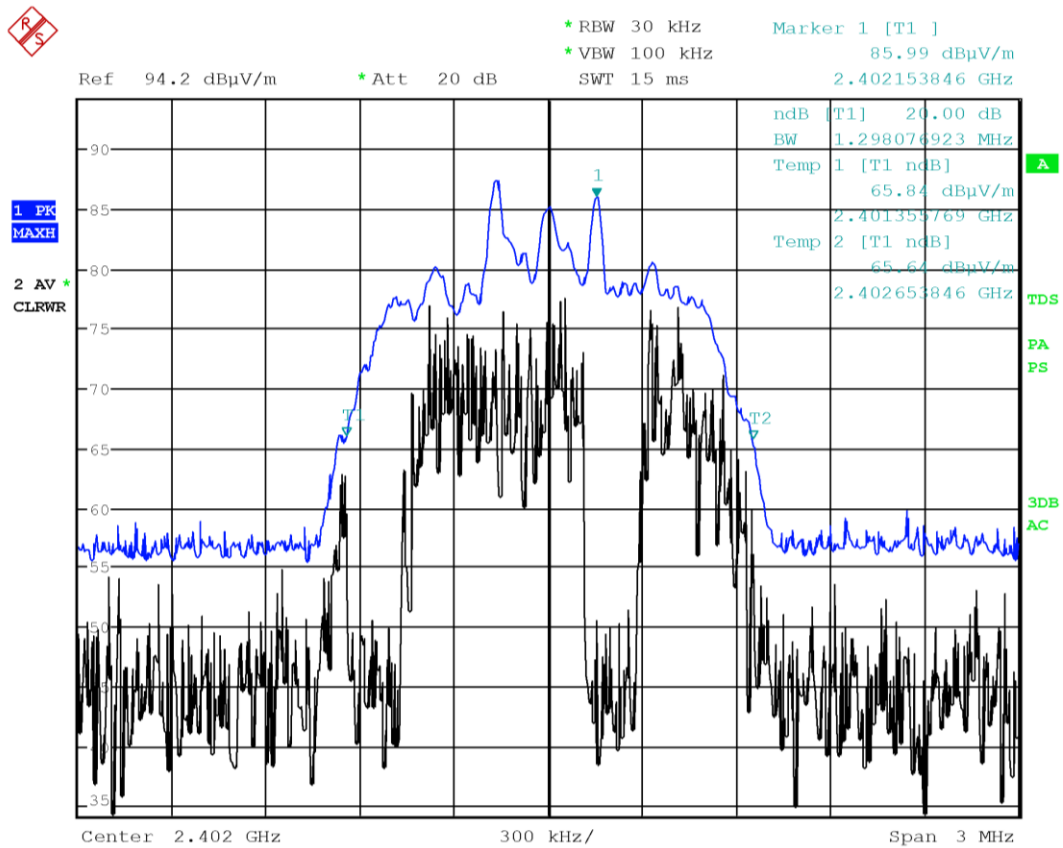
Test data, continued



Date: 23.MAR.2023 16:29:26

**Figure 8.3-6:** 20 dB bandwidth on high channel with 8-DPSK modulation

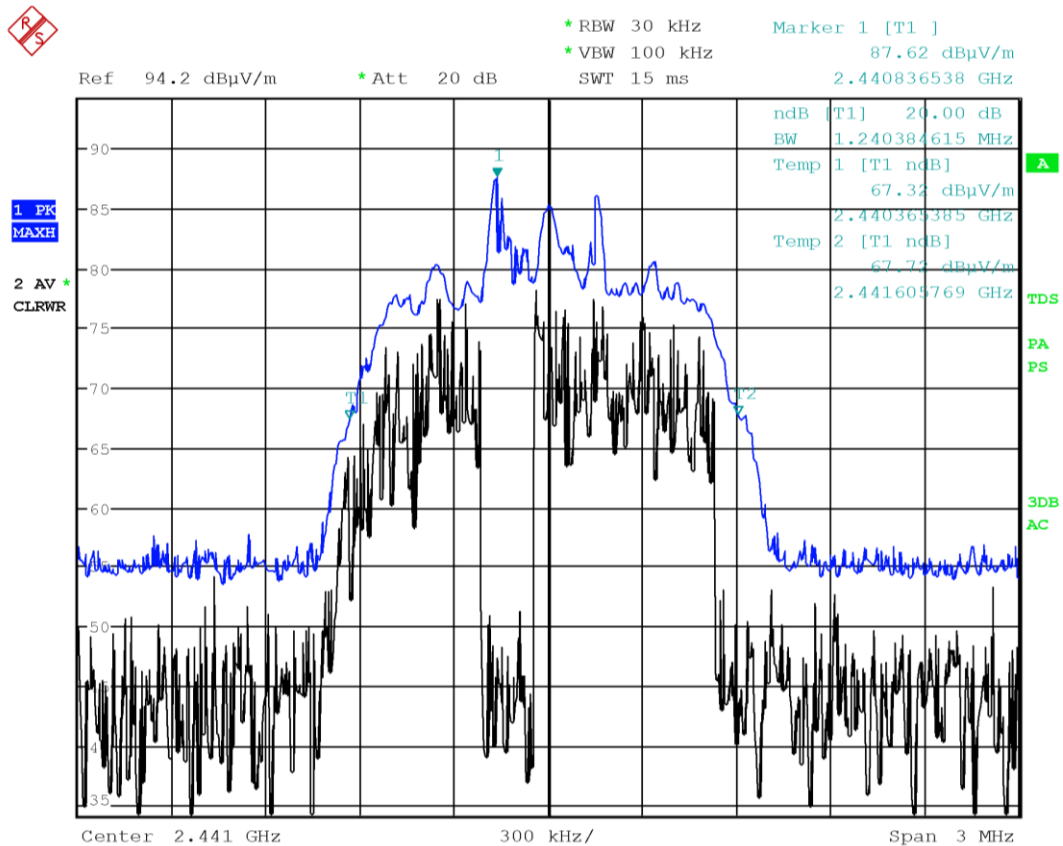
Test data, continued



Date: 23.MAR.2023 17:03:20

**Figure 8.3-7:** 20 dB bandwidth on low channel with  $\pi/4$ -DQPSK modulation

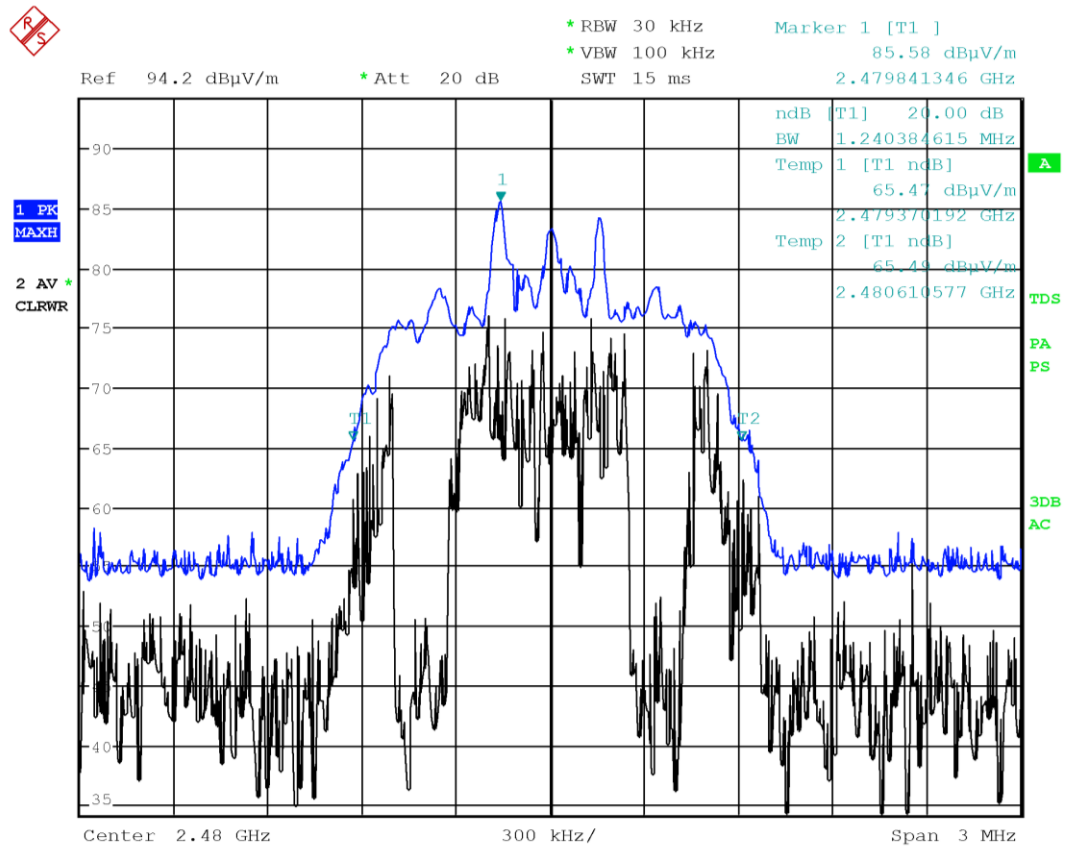
Test data, continued



Date: 23.MAR.2023 17:10:51

**Figure 8.3-8:** 20 dB bandwidth on mid channel with  $\pi/4$ -DQPSK modulation

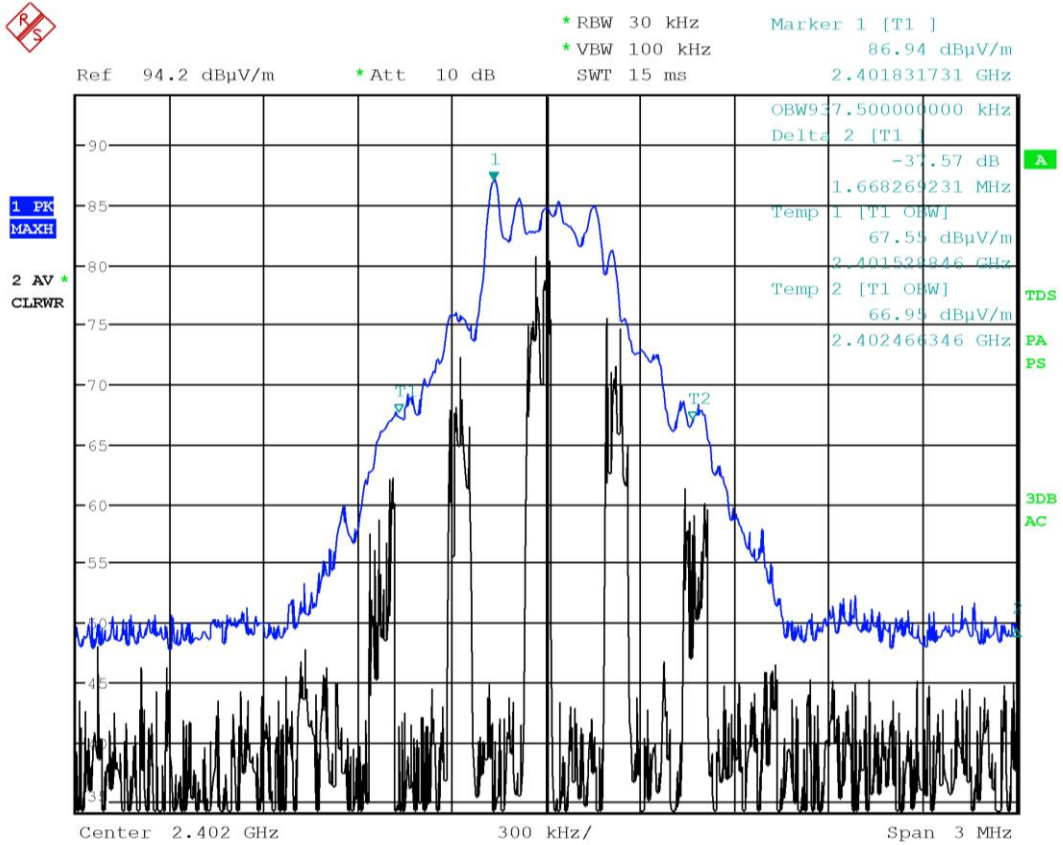
Test data, continued



Date: 23.MAR.2023 17:13:12

**Figure 8.3-9: 20 dB bandwidth on high channel with  $\pi/4$ -DQPSK modulation**

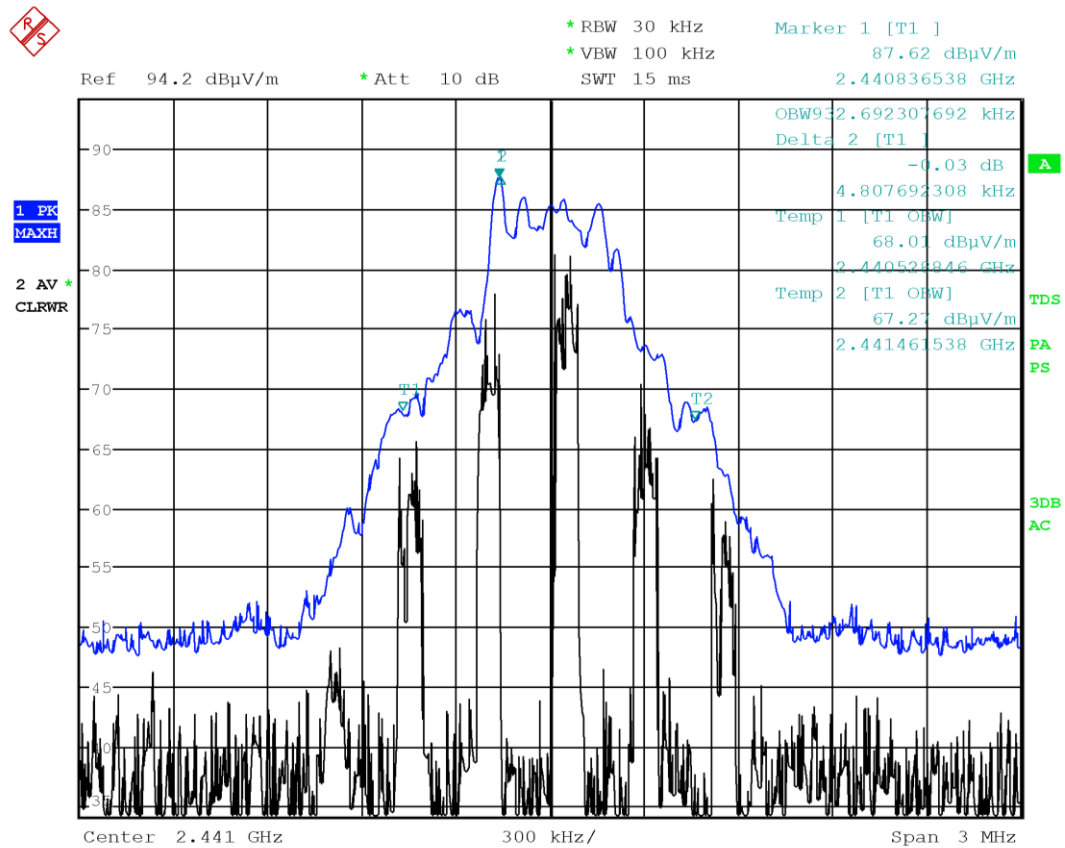
Test data, continued



Date: 23.MAR.2023 17:37:50

Figure 8.3-10: 99% bandwidth on low channel with GFSK modulation

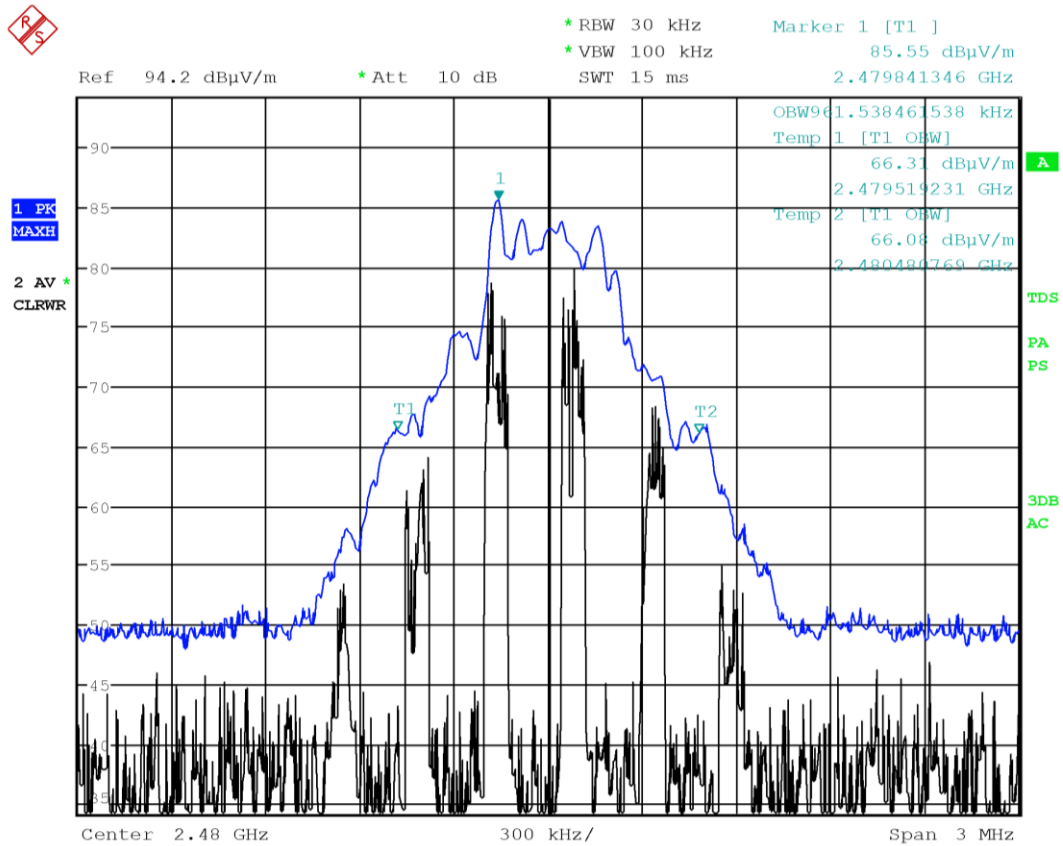
Test data, continued



Date: 23.MAR.2023 17:32:10

**Figure 8.3-11:** 99% bandwidth on mid channel with GFSK modulation

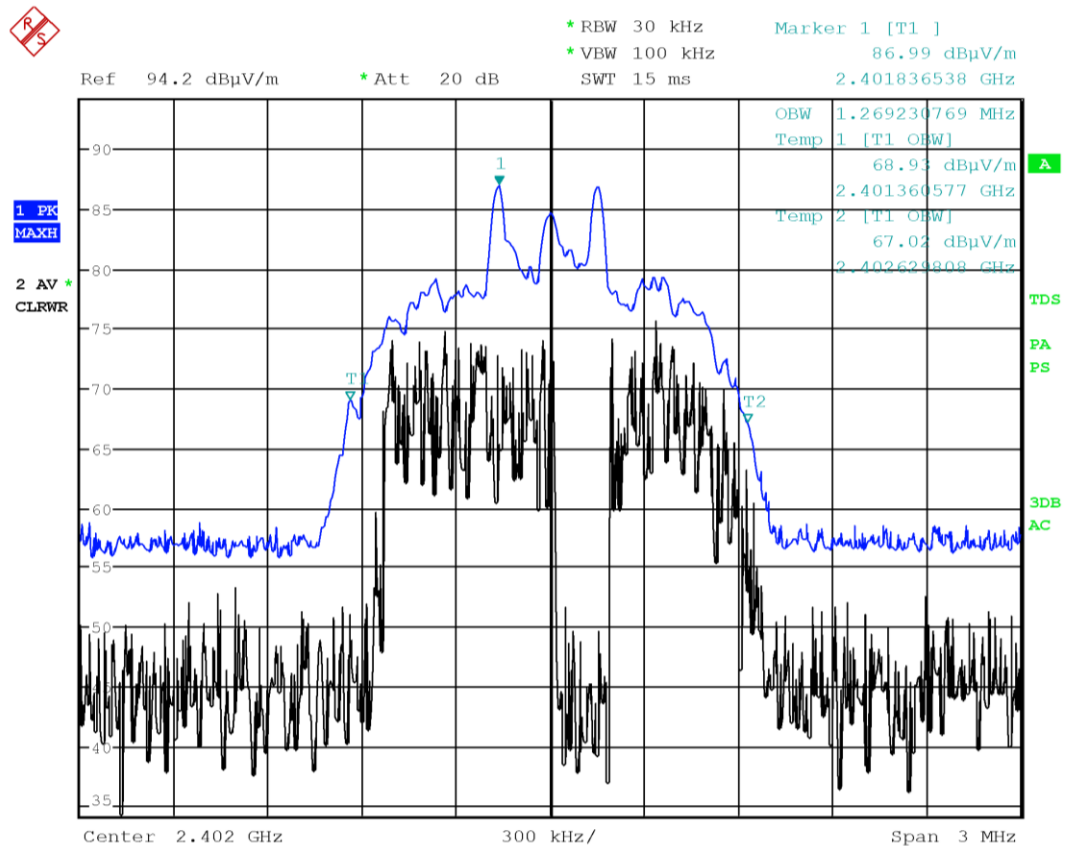
Test data, continued



Date: 23.MAR.2023 17:18:27

**Figure 8.3-12:** 99% bandwidth on high channel with GFSK modulation

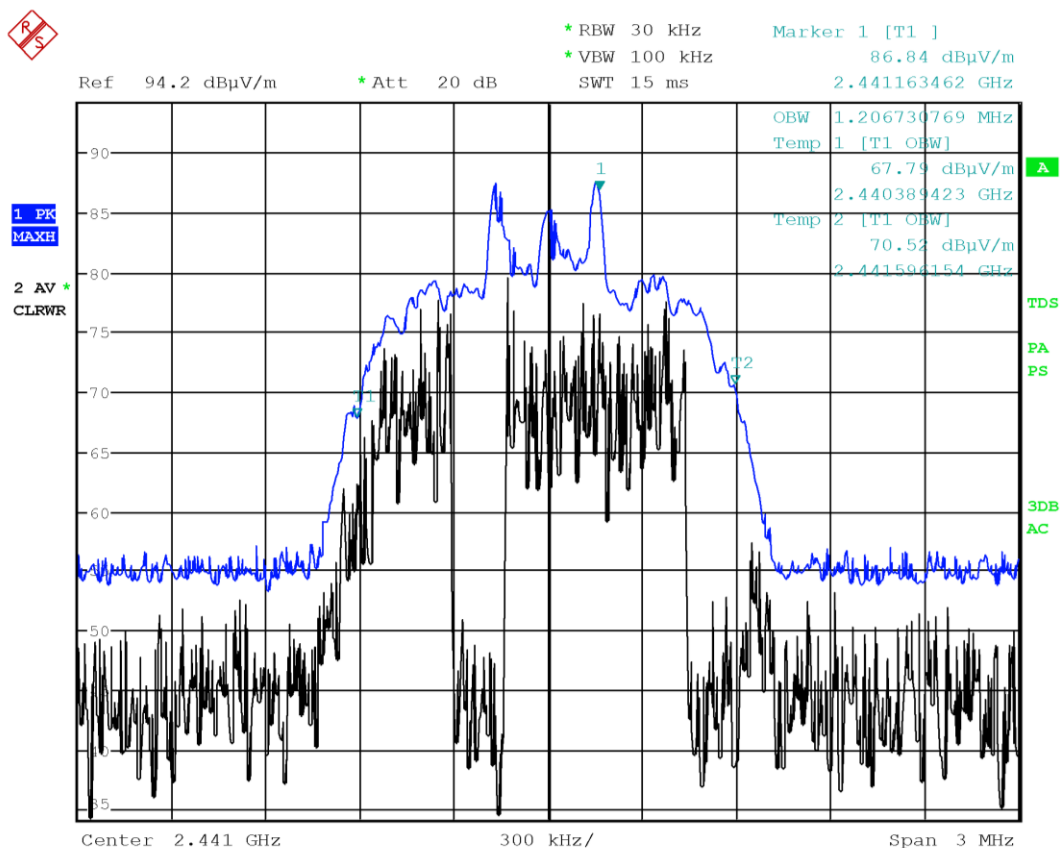
Test data, continued



Date: 23.MAR.2023 16:37:57

**Figure 8.3-13:** 99% bandwidth on low channel with 8-DPSK modulation

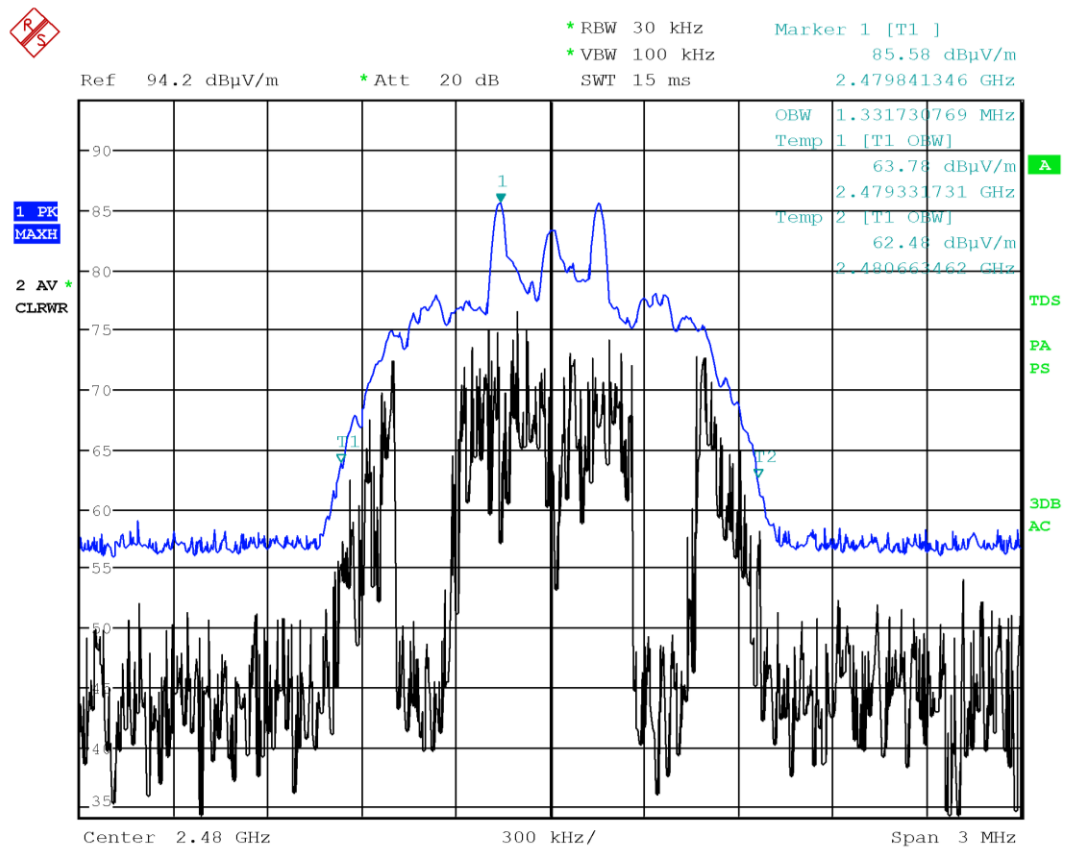
## Test data, continued



Date: 23.MAR.2023 16:34:15

**Figure 8.3-14:** 99% bandwidth on mid channel with 8-DPSK modulation

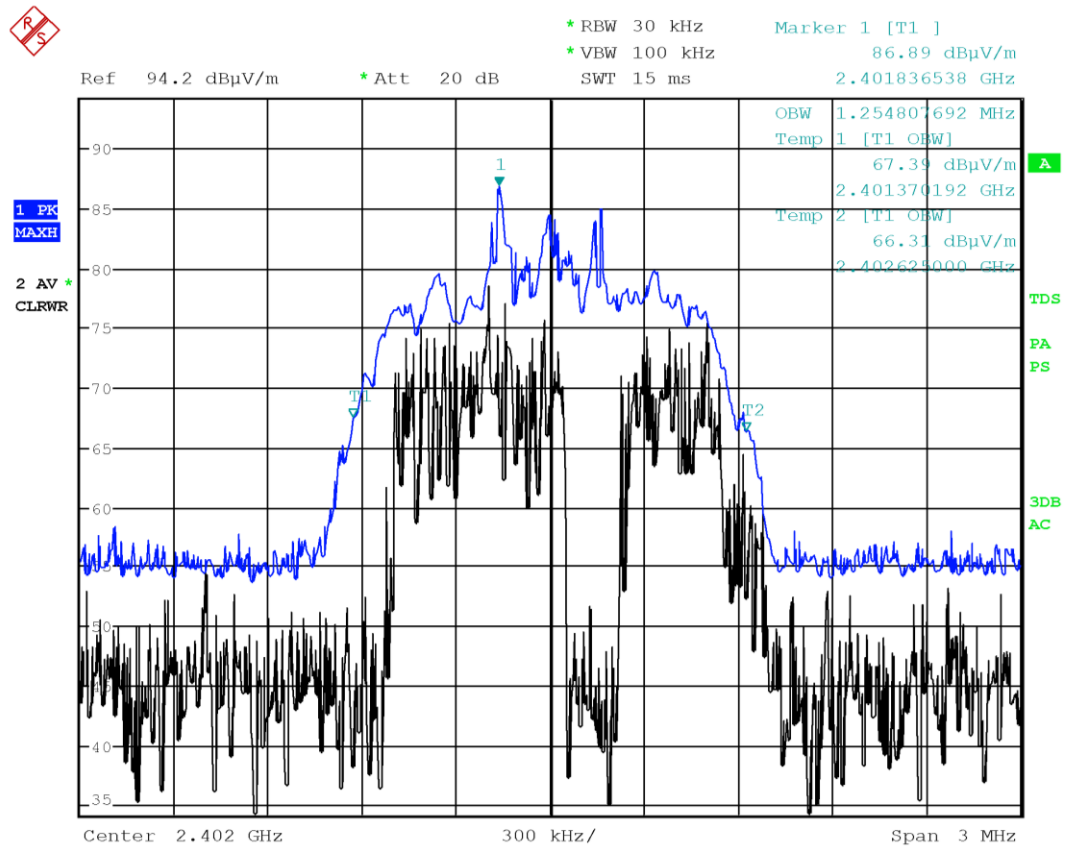
Test data, continued



Date: 23.MAR.2023 16:21:42

**Figure 8.3-15:** 99% bandwidth on high channel with 8-DPSK modulation

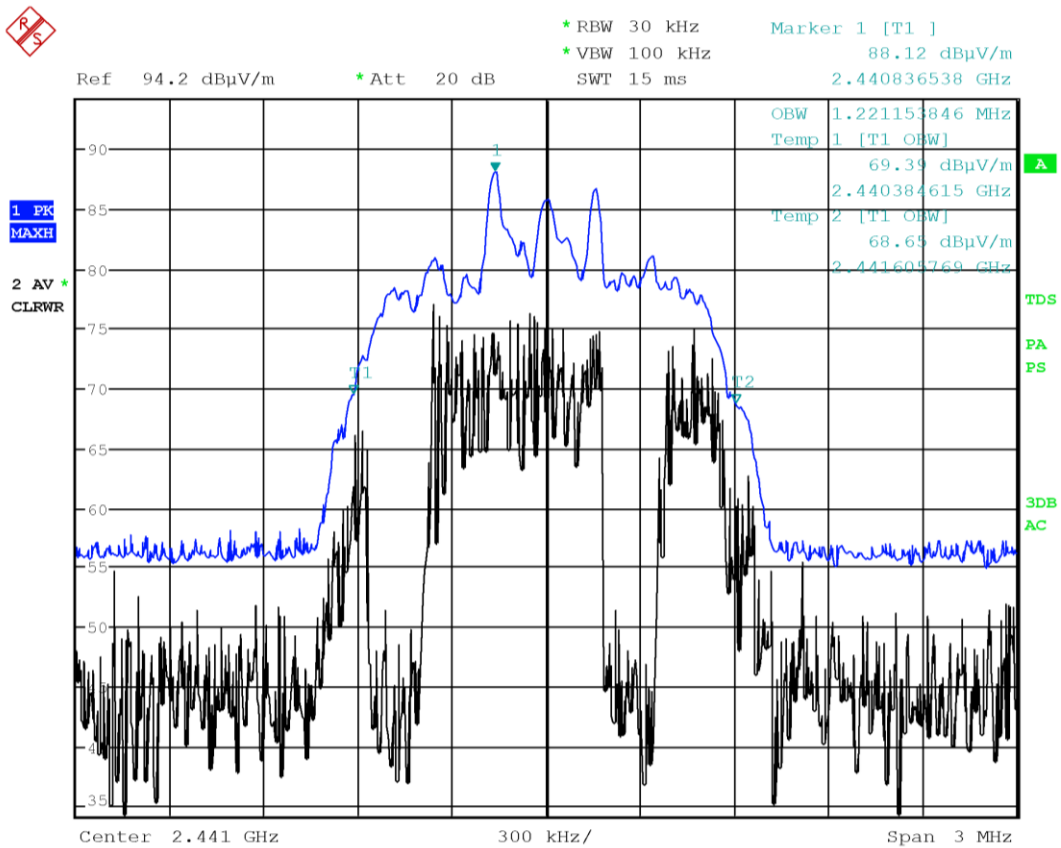
Test data, continued



Date: 23.MAR.2023 17:04:44

Figure 8.3-16: 99% bandwidth on low channel with  $\pi/4$ -DQPSK modulation

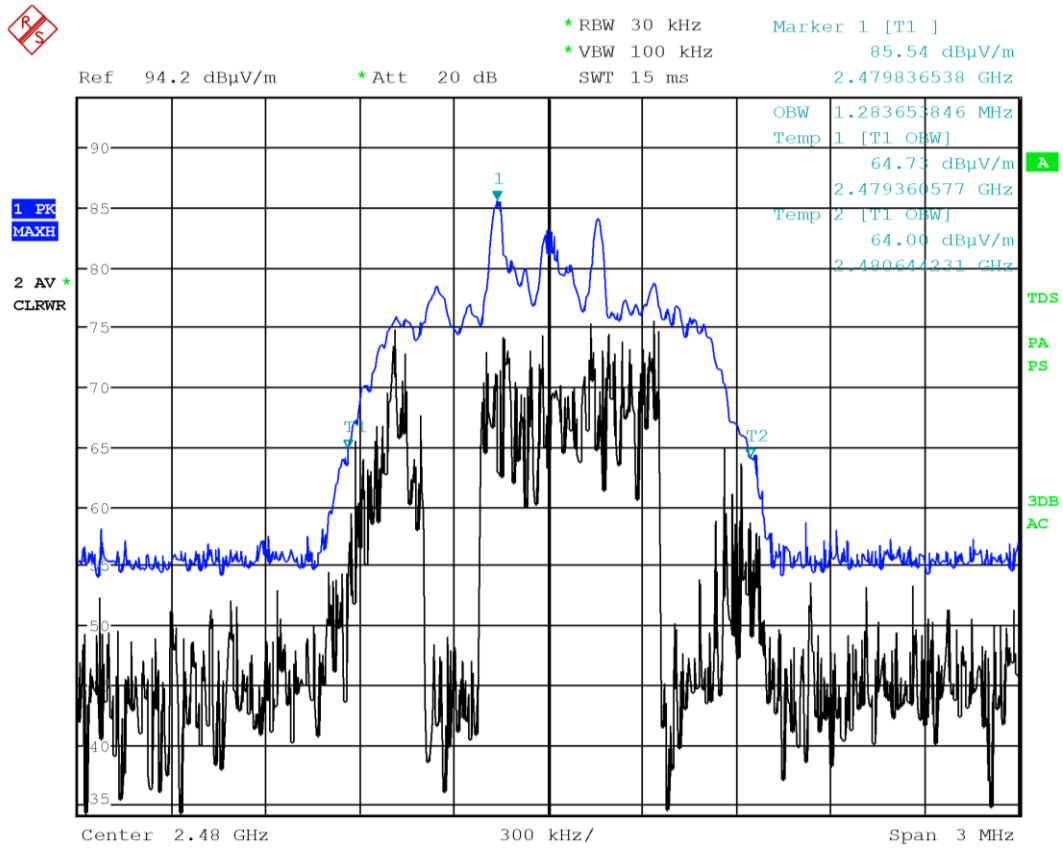
Test data, continued



Date: 23.MAR.2023 17:09:56

Figure 8.3-17: 99% bandwidth on mid channel with  $\pi/4$ -DQPSK modulation

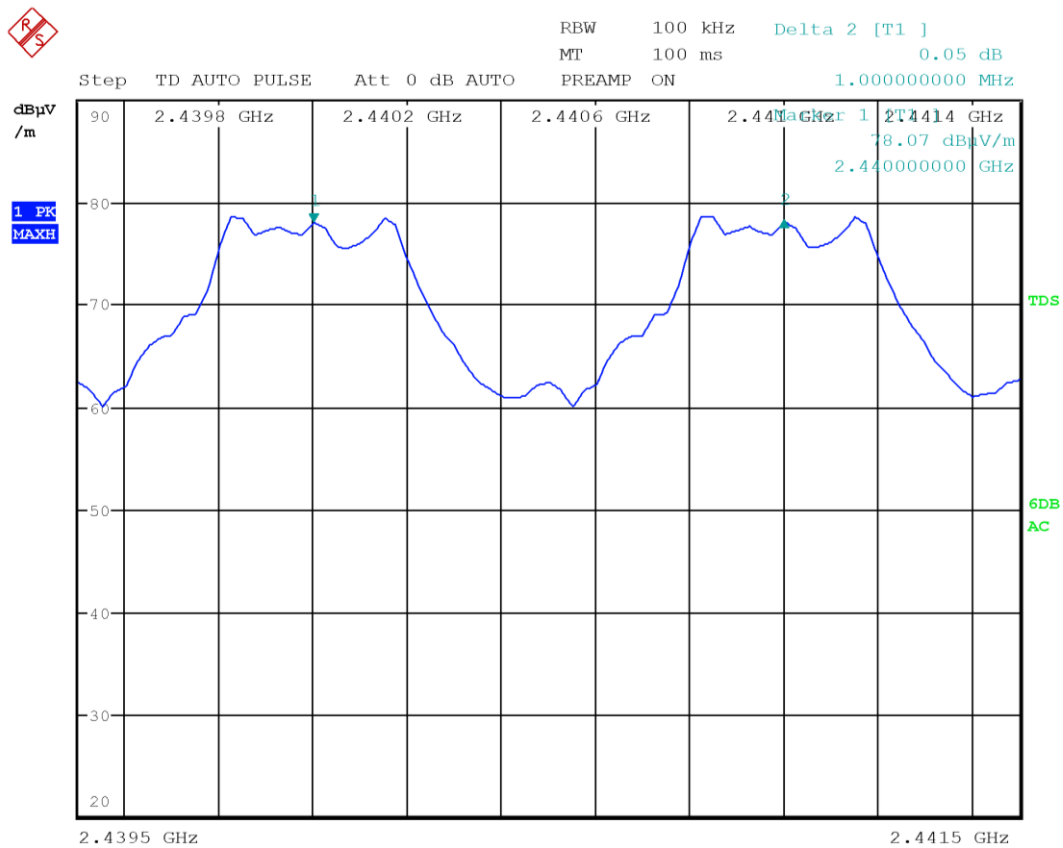
Test data, continued



Date: 23.MAR.2023 17:14:35

**Figure 8.3-18:** 99% bandwidth on high channel with  $\pi/4$ -DQPSK modulation

Test data, continued



Date: 24.MAR.2023 16:31:13

**Figure 8.3-19: Carrier frequency separation**

Test data, continued

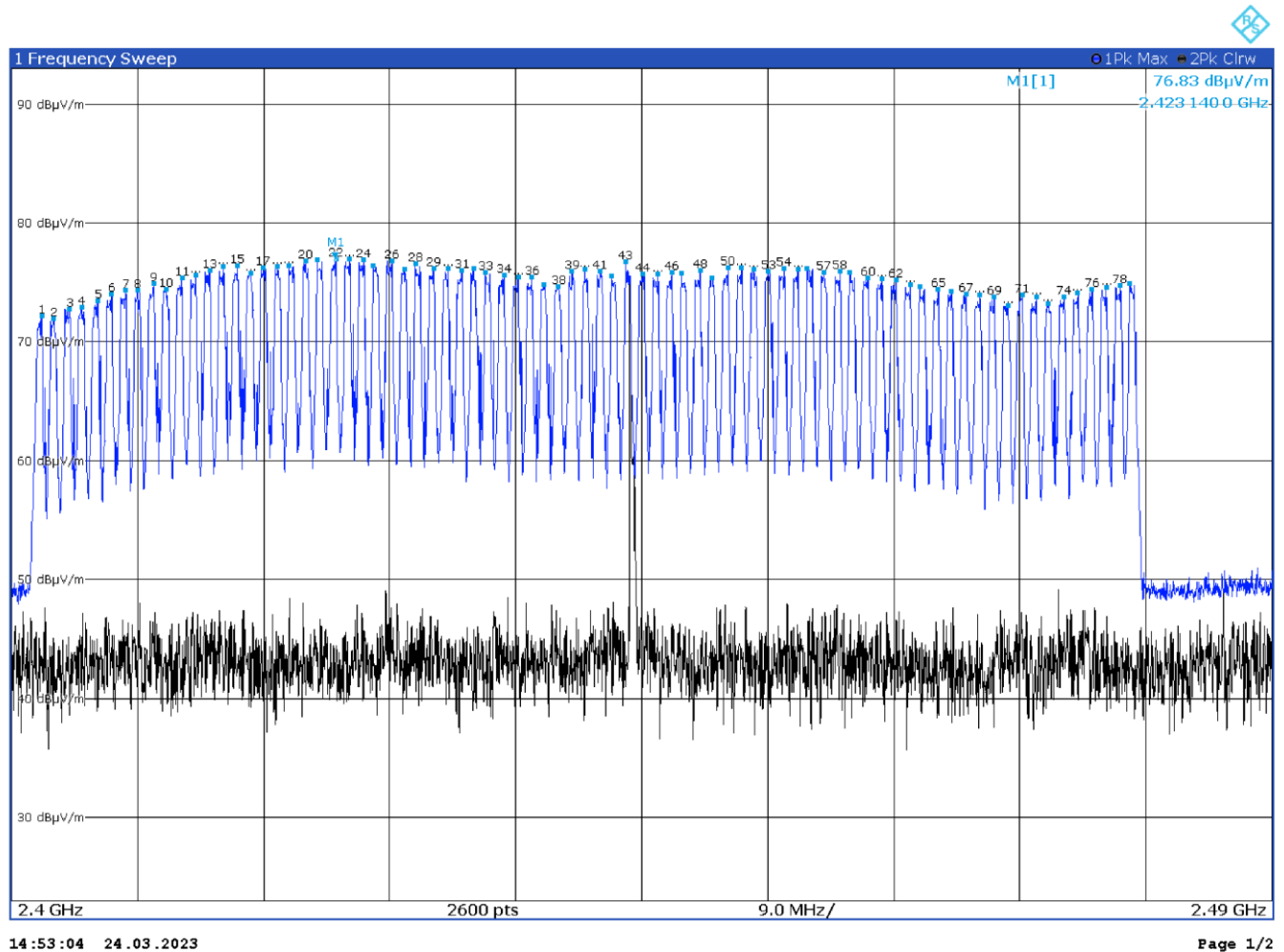
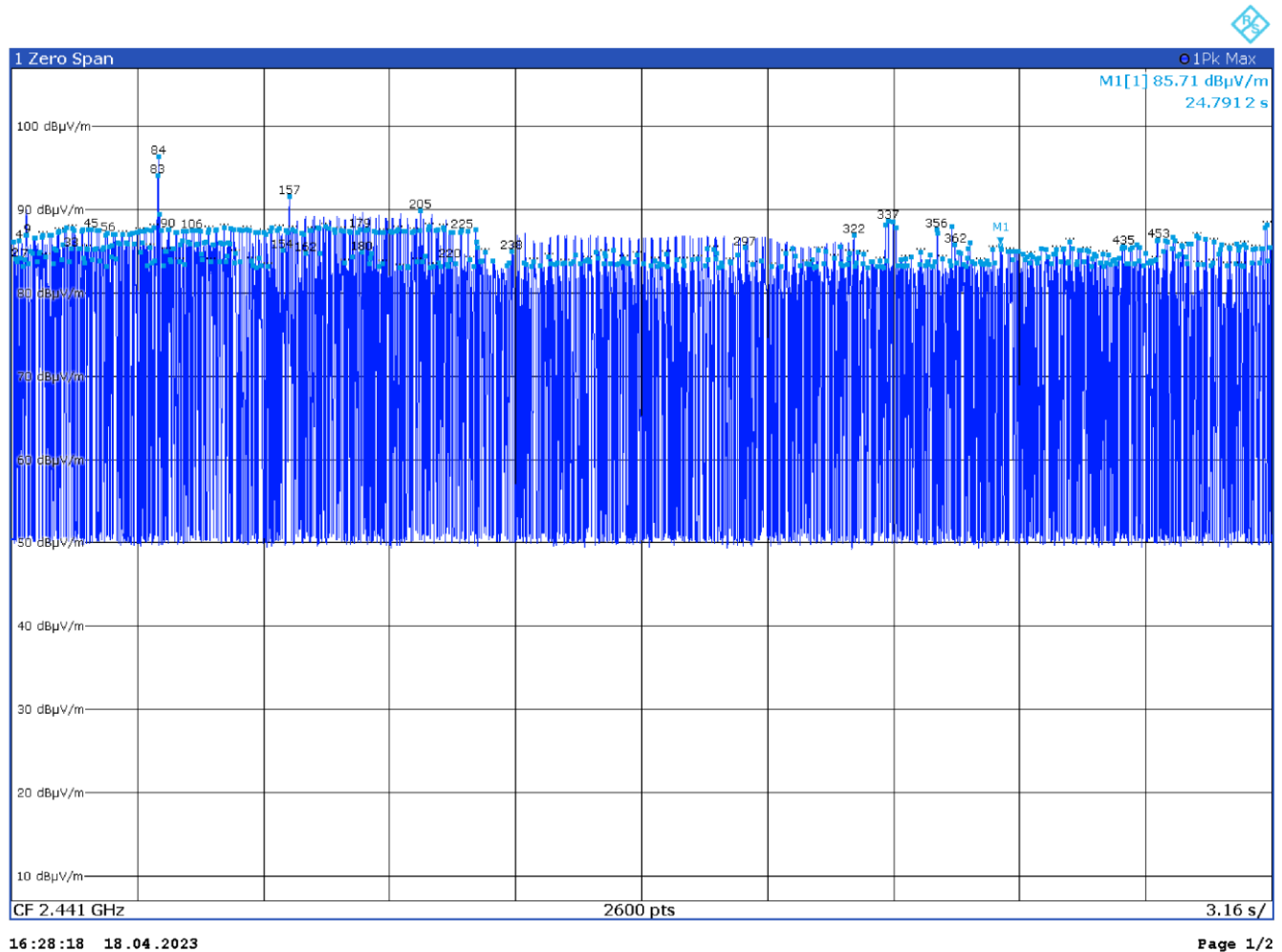


Figure 8.3-20: Number of hopping channels

Test data, continued



|     |              |               |     |              |               |
|-----|--------------|---------------|-----|--------------|---------------|
| 244 | 13.471 643 s | 84.309 dBμV/m | 494 | 31.332 513 s | 85.348 dBμV/m |
| 245 | 13.508 119 s | 83.522 dBμV/m | 495 | 31.381 147 s | 85.347 dBμV/m |
| 246 | 13.641 862 s | 83.409 dBμV/m | 496 | 31.429 781 s | 87.904 dBμV/m |
| 247 | 13.678 338 s | 83.687 dBμV/m | 497 | 31.478 415 s | 88.237 dBμV/m |
| 248 | 13.824 240 s | 83.530 dBμV/m | 498 | 31.514 890 s | 83.894 dBμV/m |
| 249 | 13.872 874 s | 83.665 dBμV/m | 499 | 31.551 366 s | 85.431 dBμV/m |
| 250 | 14.018 776 s | 83.554 dBμV/m | 500 | 31.575 683 s | 85.458 dBμV/m |

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Figure 8.3-21: Number of pulses within period for DM1 BB Packet type

Test data, continued

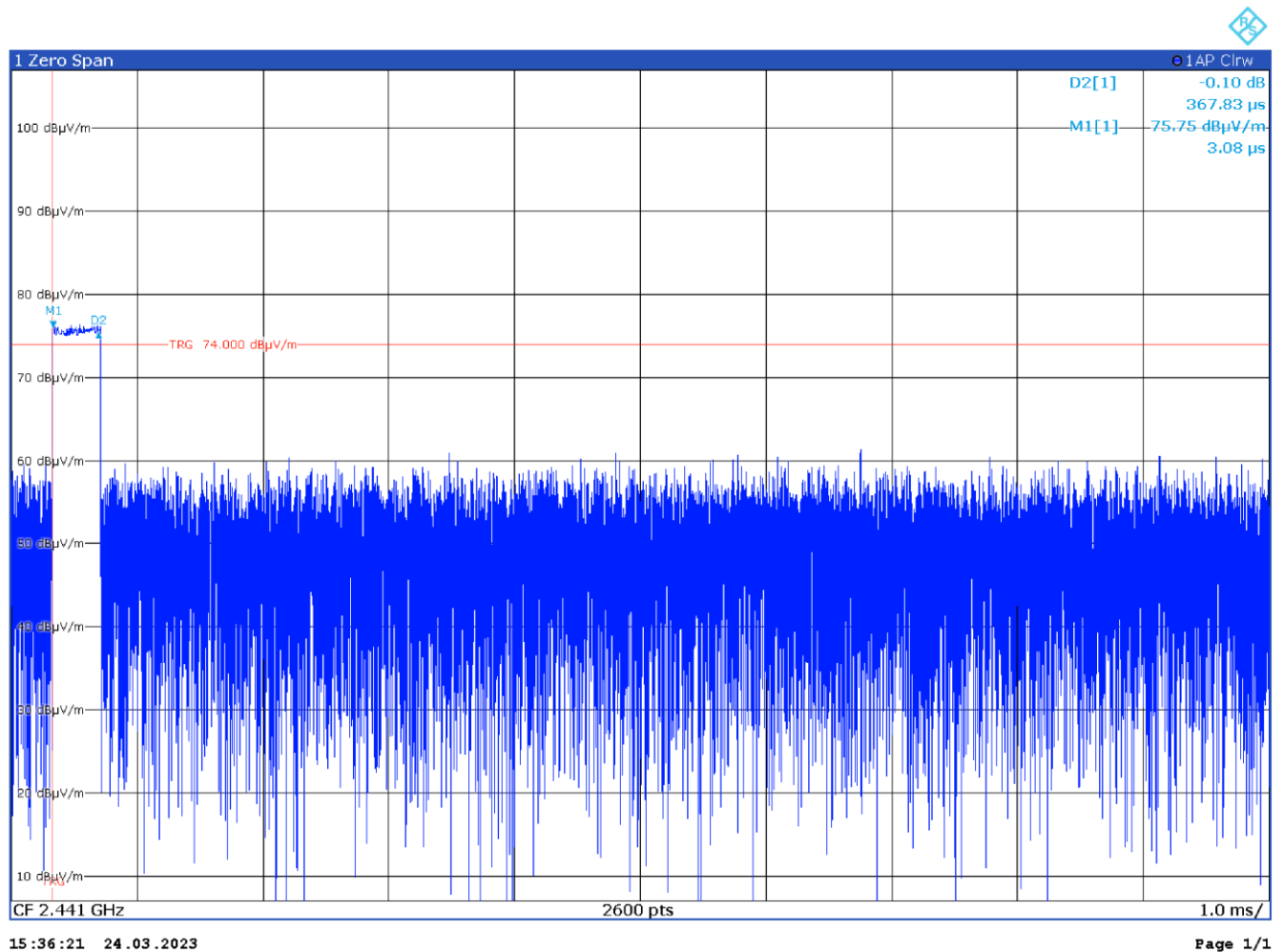
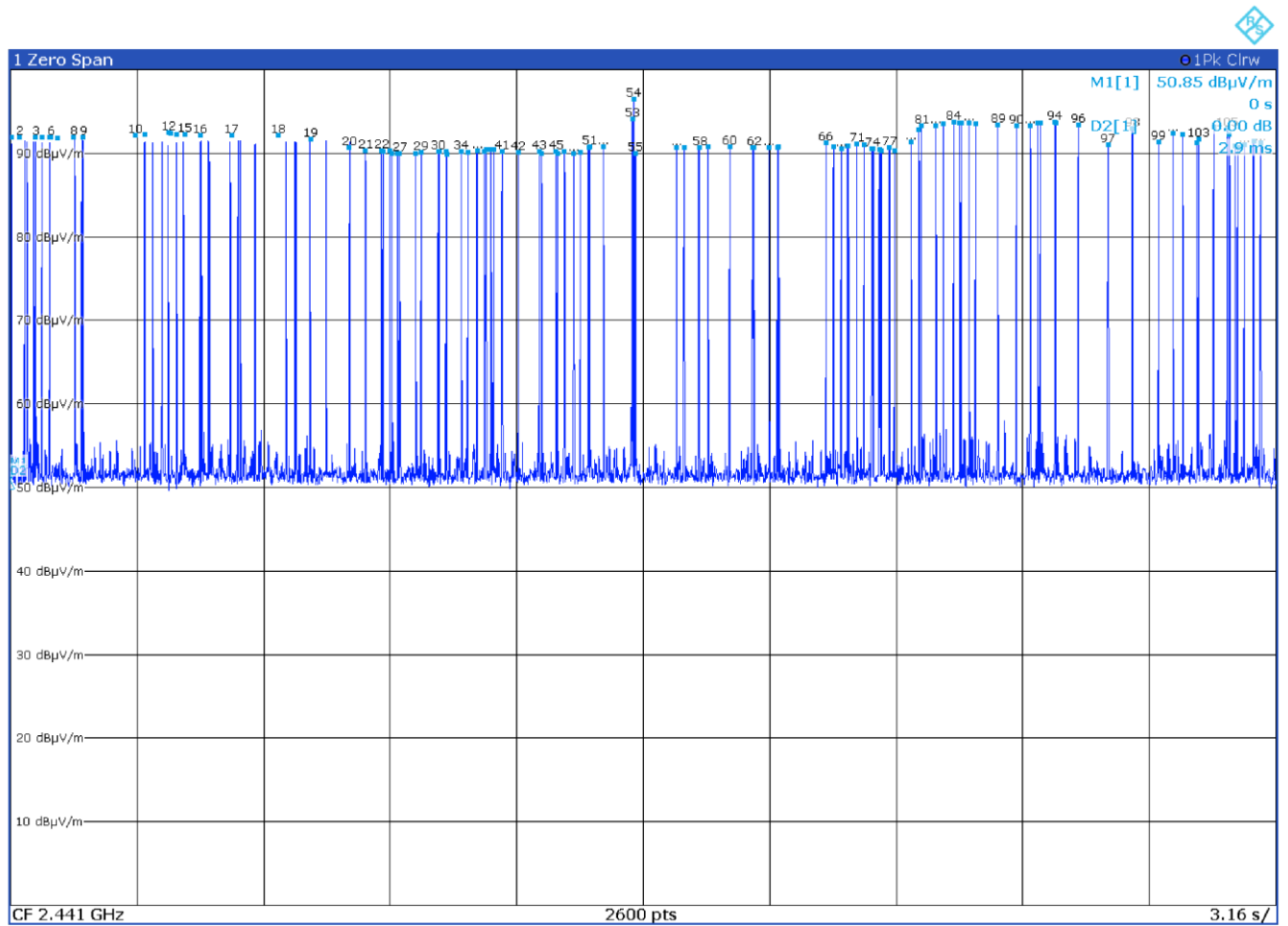


Figure 8.3-22: Dwell time for DM1 BB Packet type

Test data, continued



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|    |            |               |     |             |               |
|----|------------|---------------|-----|-------------|---------------|
| 34 | 5.218000 s | 92.200 dBμV/m | 134 | 19.137314 s | 91.225 dBμV/m |
| 35 | 5.252482 s | 91.440 dBμV/m | 135 | 19.502270 s | 90.759 dBμV/m |
| 36 | 5.872566 s | 91.182 dBμV/m | 136 | 19.550904 s | 91.097 dBμV/m |
| 37 | 5.909042 s | 91.535 dBμV/m | 137 | 19.684648 s | 90.846 dBμV/m |
| 38 | 6.456175 s | 92.376 dBμV/m | 138 | 19.757599 s | 91.102 dBμV/m |
| 39 | 6.589919 s | 92.530 dBμV/m | 139 | 19.891343 s | 90.719 dBμV/m |
| 40 | 6.784456 s | 92.391 dBμV/m | 140 | 19.927818 s | 90.981 dBμV/m |
| 41 | 6.833090 s | 92.466 dBμV/m | 141 | 20.280416 s | 90.654 dBμV/m |
| 42 | 6.881724 s | 91.518 dBμV/m | 142 | 20.924817 s | 91.048 dBμV/m |
| 43 | 7.112736 s | 91.442 dBμV/m | 143 | 21.034244 s | 90.618 dBμV/m |
| 44 | 7.222162 s | 92.487 dBμV/m | 144 | 21.180146 s | 90.721 dBμV/m |
| 45 | 7.611235 s | 92.524 dBμV/m | 145 | 21.265256 s | 90.635 dBμV/m |
| 46 | 8.146210 s | 92.570 dBμV/m | 146 | 21.678646 s | 91.509 dBμV/m |
| 47 | 8.243478 s | 91.613 dBμV/m | 147 | 21.848865 s | 90.682 dBμV/m |
| 48 | 8.608234 s | 91.720 dBμV/m | 148 | 21.909658 s | 91.476 dBμV/m |
| 49 | 8.669027 s | 91.769 dBμV/m | 149 | 22.055560 s | 91.479 dBμV/m |

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Figure 8.3-23: Number of pulses within period for DH5 BB Packet type

Test data, continued

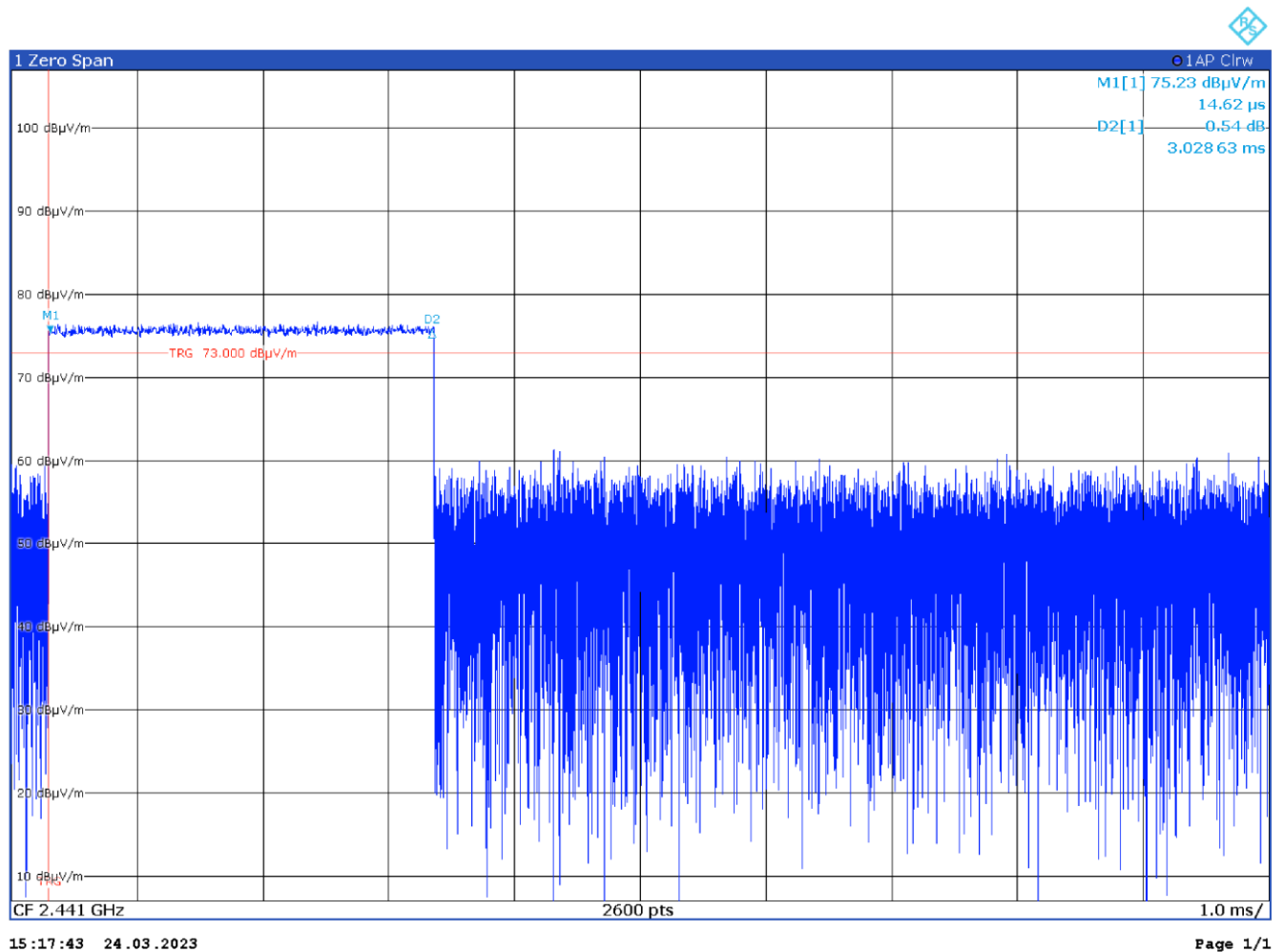


Figure 8.3-24: Dwell time for DH5 BB Packet type

## 8.4 Transmitter output power and e.i.r.p. requirements for FHSS 2 GHz

### 8.4.1 References, definitions and limits

#### RSS-247, Clause 5.4:

Devices shall comply with the following requirements, where applicable:

- b. For FHSs operating in the band 2400–2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W (30 dBm) if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W (21 dBm) if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W (36 dBm), except as provided in section 5.4(e).
- e. Fixed point-to-point systems in the bands 2400–2483.5 MHz and 5725–5850 MHz are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding an e.i.r.p. of 4 W.

### 8.4.2 Test summary

|           |             |           |                |
|-----------|-------------|-----------|----------------|
| Verdict   | Pass        |           |                |
| Tested by | D. Guarnone | Test date | March 23, 2023 |

### 8.4.3 Observations, settings and special notes

Conducted output power was tested per ANSI C63.10 subclause 7.8.5. The hopping shall be disabled for this test. Spectrum analyser settings:

|                      |                                                                          |
|----------------------|--------------------------------------------------------------------------|
| Resolution bandwidth | > 20 dB bandwidth of the emission being measured                         |
| Video bandwidth      | ≥ RBW                                                                    |
| Frequency span       | approximately 5 times the 20 dB bandwidth, centered on a hopping channel |
| Detector mode        | Peak                                                                     |
| Trace mode           | Max Hold                                                                 |

### 8.4.4 Test equipment used

| Equipment             | Manufacturer                | Model no.                 | Asset no.     |
|-----------------------|-----------------------------|---------------------------|---------------|
| EMI Receiver          | Rohde & Schwarz             | ESW44                     | 101620        |
| Spectrum Analyzer     | Rohde & Schwarz             | FSW43                     | 101767        |
| Antenna 1 - 18 GHz    | Schwarzbeck Mess-Elektronik | STLP9148                  | STLP 9148-152 |
| Controller            | Maturo                      | FCU3.0                    | 10041         |
| Tilt antenna mast     | Maturo                      | TAM4.0-E                  | 10042         |
| Turntable             | Maturo                      | TT4.0-5T                  | 2.527         |
| Semi-anechoic chamber | Nemko S.p.a.                | 10m semi-anechoic chamber | 530           |

## 8.4.5 Test data

**Table 8.4-1:** Output power and EIRP results for GFSK (radiated measurement)

| Frequency,<br>MHz | Field<br>strength,<br>dBμV/m | EIRP, dBm | EIRP limit,<br>dBm | EIRP margin,<br>dB | Antenna<br>gain, dBi | Output<br>power, dBm | Output<br>power limit,<br>dBm | Output<br>power<br>margin, dB |
|-------------------|------------------------------|-----------|--------------------|--------------------|----------------------|----------------------|-------------------------------|-------------------------------|
| 2402              | 88.93                        | -6.23     | 36                 | -42.23             | 1.7                  | -7.93                | 30                            | -37.93                        |
| 2440              | 90.62                        | -4.54     | 36                 | -40.54             | 1.7                  | -6.24                | 30                            | -36.24                        |
| 2480              | 89.06                        | -6.10     | 36                 | -42.10             | 1.7                  | -7.80                | 30                            | -37.80                        |

Note: EIRP [dBm] = Field Strength [dBμV/m] – 95.23 [dB]; Output power [dBm] = EIRP [dBm] – Antenna gain [dBi]

**Table 8.4-2:** Output power and EIRP results for π/4-DQPSK (radiated measurement)

| Frequency,<br>MHz | Field<br>strength,<br>dBμV/m | EIRP, dBm | EIRP limit,<br>dBm | EIRP margin,<br>dB | Antenna<br>gain, dBi | Output<br>power, dBm | Output<br>power limit,<br>dBm | Output<br>power<br>margin, dB |
|-------------------|------------------------------|-----------|--------------------|--------------------|----------------------|----------------------|-------------------------------|-------------------------------|
| 2402              | 90.07                        | -5.09     | 36                 | -41.09             | 1.7                  | -6.79                | 30                            | -36.79                        |
| 2440              | 90.54                        | -4.62     | 36                 | -40.62             | 1.7                  | -6.32                | 30                            | -36.32                        |
| 2480              | 88.79                        | -6.37     | 36                 | -42.37             | 1.7                  | -8.07                | 30                            | -38.07                        |

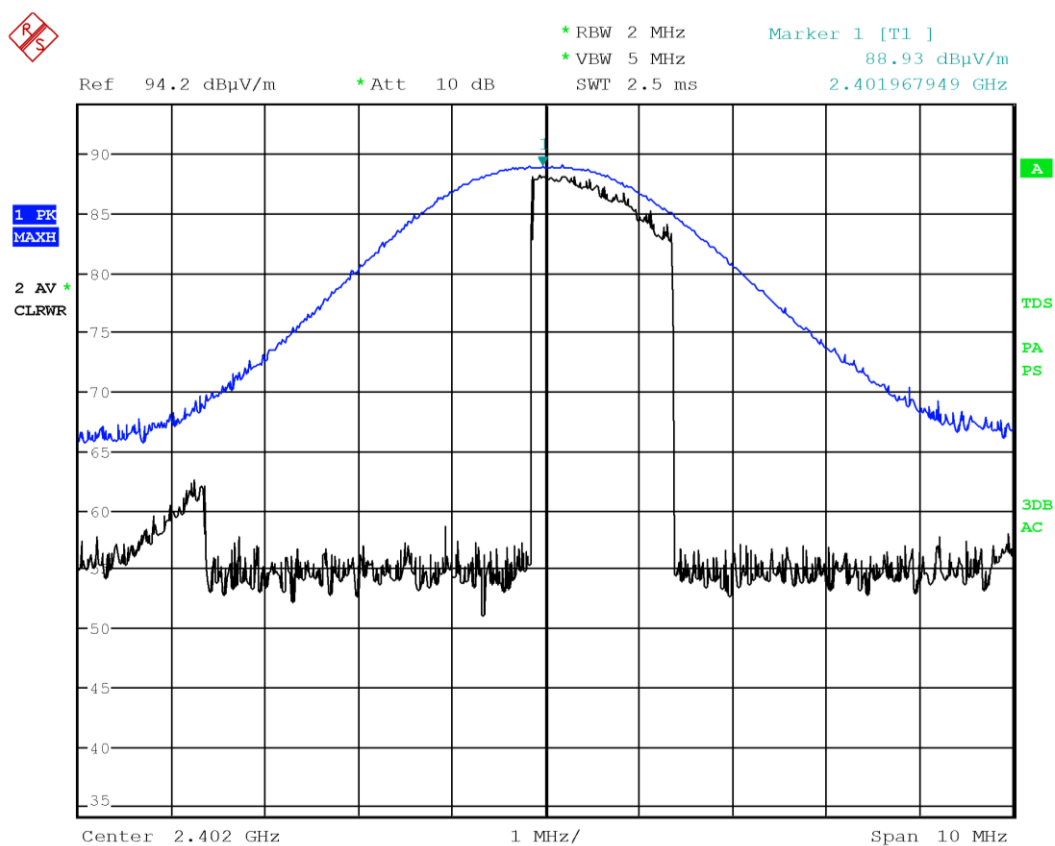
Note: EIRP [dBm] = Field Strength [dBμV/m] – 95.23 [dB]; Output power [dBm] = EIRP [dBm] – Antenna gain [dBi]

**Table 8.4-3:** Output power and EIRP results for 8-DPSK (radiated measurement)

| Frequency,<br>MHz | Field<br>strength,<br>dBμV/m | EIRP, dBm | EIRP limit,<br>dBm | EIRP margin,<br>dB | Antenna<br>gain, dBi | Output<br>power, dBm | Output<br>power limit,<br>dBm | Output<br>power<br>margin, dB |
|-------------------|------------------------------|-----------|--------------------|--------------------|----------------------|----------------------|-------------------------------|-------------------------------|
| 2402              | 90.65                        | -4.51     | 36                 | -40.51             | 1.7                  | -6.21                | 30                            | -36.21                        |
| 2440              | 90.68                        | -4.47     | 36                 | -40.47             | 1.7                  | -6.18                | 30                            | -36.18                        |
| 2480              | 89.04                        | -6.12     | 36                 | -42.12             | 1.7                  | -7.82                | 30                            | -37.82                        |

Note: EIRP [dBm] = Field Strength [dBμV/m] – 95.23 [dB]; Output power [dBm] = EIRP [dBm] – Antenna gain [dBi]

## Test data, continued



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**Figure 8.4-1: Output power on low channel for GFSK modulation**