



Radio Test Report

Zinwave Ltd

**Zinwave UNItivity 5000 Remote Unit
305-1007**

47 CFR Part 74H Effective Date 1st October 2020

47 CFR Part 2 Effective Date 1st October 2020

Test Date: 14th February to 28th April 2022

Report Number: 03-13344-2-22 Issue 01

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Certificate of Test 13344-2

The equipment noted below has been fully tested by R.N. Electronics Limited and, where appropriate, conforms to the relevant subpart of FCC Part 74H. This is a certificate of test only and should not be confused with an equipment authorisation. Other standards may also apply.

| | |
|---|--|
| Equipment: | Zinwave UNItivity 5000 Remote Unit |
| Model Number: | 305-1007 |
| Unique Serial Number: | 330100000001 (radiated unit) 330100000003 (conducted unit) |
| Applicant: | Zinwave Ltd Harston Mill, Royston Road Harston, Cambridge CB22 7GG |
| Proposed FCC ID | UPO3005-1007 |
| Full measurement results are detailed in Report Number: | 03-13344-2-22 Issue 01 |
| Test Standards: | 47 CFR Part 74H Effective Date 1st October 2020 47 CFR Part 2 Effective Date 1st October 2020 |

NOTE:

Certain tests were not performed based upon manufacturer's declarations. Certain other requirements are subject to manufacturer declaration only and have not been tested/verified. For details refer to section 3 of this report.

This report only pertains to the operation of the equipment to 47CFR part 74H, for details of testing to other rule parts please see RN reports: 03-13344-3-22 (Part 27), 03-13344-1-22 (Parts 22 & 24), and 03-13344-4-22 (Part 90).

DEVIATIONS: No deviations have been applied.

This certificate relates only to the unit tested as identified by a unique serial number and in the condition at the time it was tested. It does not relate to any other similar equipment and performance of the product before or after the test cannot be guaranteed. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of unit not meeting the intentions of the standard or the requirements of the Federal Regulations, particularly under different conditions to those during testing. Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Date Of Test: 14th February to 28th April 2022

Test Engineer:

A rectangular box containing a handwritten signature in black ink, which appears to read 'Charles Blunk'.

Approved By:
Radio Manager

A rectangular box for a signature, currently empty.

Customer Representative:

A rectangular box for a signature, currently empty.



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2 Equipment under test (EUT)

2.1 Equipment specification

| | | |
|---------------------------|--|-------------|
| Applicant | Zinwave Ltd Harston Mill Royston Road Harston Cambridge CB22 7GG | |
| Manufacturer of EUT | Zinwave Ltd | |
| Full Name of EUT | Zinwave UNItivity 5000 Remote Unit | |
| Model Number of EUT | 305-1007 | |
| Serial Number of EUT | 330100000001 (radiated unit) 330100000003 (conducted unit) | |
| Date Received | 11 th February 2022 | |
| Date of Test: | 14 th February 2022 to 28 th April 2022 | |
| Purpose of Test | To demonstrate design compliance to the relevant rules of Chapter 47 of the Code of Federal Regulations. | |
| Date Report Issued | 6 th May 2022 | |
| Main Function | Distributed Antenna remote unit | |
| Information Specification | Height | 250mm |
| | Width | 250mm |
| | Depth | 50mm |
| | Weight | 2kg |
| | Voltage | 48 V DC |
| | Current | < 1 A (35W) |

2.2 Configurations for testing

| General Parameters | |
|------------------------------------|---|
| EUT Normal use position | Wall mounted |
| Choice of model(s) for type tests | Production unit |
| Antenna details | external max 8dBi |
| Antenna port | External: 1x TX; 1x RX (N-type ports) |
| Baseband Data port (yes/no)? | NO |
| Highest Signal generated in EUT | 2690 MHz |
| Lowest Signal generated in EUT | Not stated |
| Hardware Version | 1.0 |
| Software Version | N/A |
| Firmware Version | 4.209 |
| Type of Equipment | Booster, Distributed Antenna System |
| Technology Type | Various – wideband distributed antenna system |
| Geo-location (yes/no) | No |
| TX Parameters | |
| Alignment range – transmitter | 150 - 2690 MHz (470-608 MHz and 614-698 MHz this rule part) |
| EUT Declared Modulation Parameters | FM (+-75kHz Deviation) |
| EUT Declared Power level | +20dBm |
| EUT Declared Signal Bandwidths | 200 kHz |
| EUT Declared Channel Spacing's | 200 kHz |
| EUT Declared Duty Cycle | up to 100% |
| Unmodulated carrier available? | Yes - EUT provides at its output whatever is presented to its input |
| Declared frequency stability | 0ppm (DAS without frequency translation) |
| RX Parameters | |
| Alignment range – receiver | As per Transmitter range |
| EUT Declared RX Signal Bandwidth | As per Transmitter |
| Receiver Signal Level (RSL) | N/A |
| Method of Monitoring Receiver BER | N/A |

2.3 Functional description

The Remote Unit is used as part of the Zinwave UNItivity 5000 system to provide cellular and private radio services within buildings, sports arenas and similar areas.

The system is wideband in nature and can support a wide range of radio services depending upon the system that is connected to the service module of the Primary Hub.

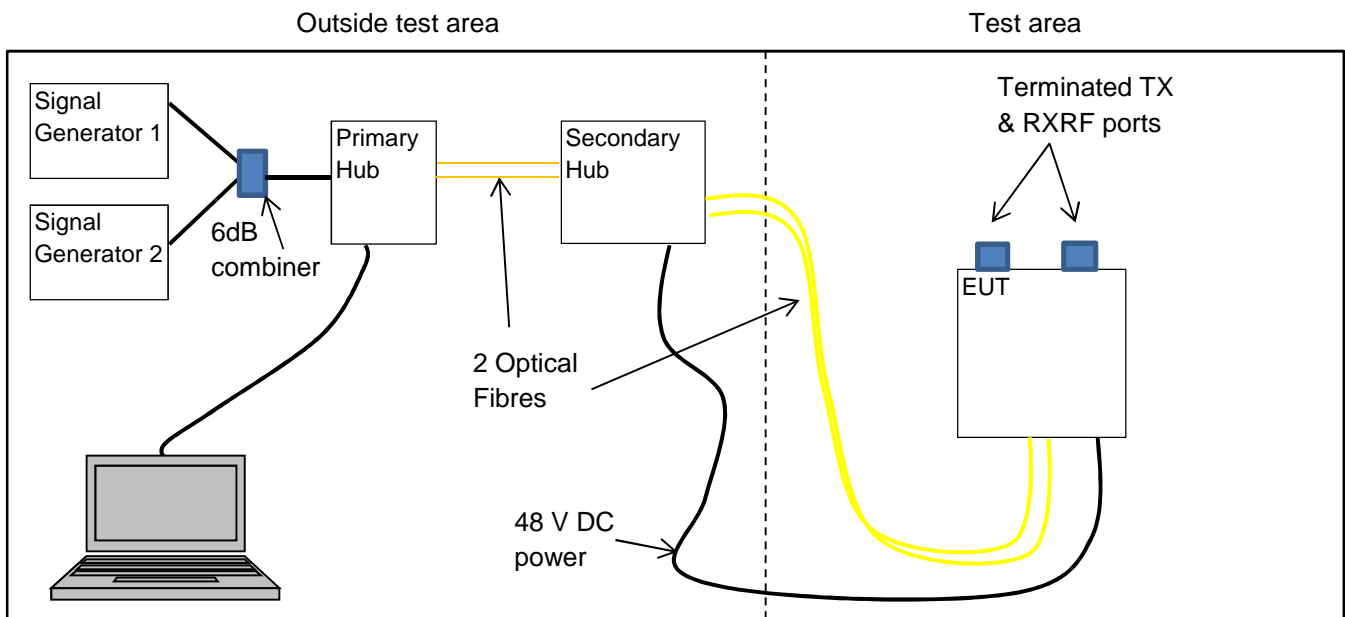
2.4 Modes of operation

| Mode Reference | Description | Used for testing |
|----------------|---|------------------|
| Mode 1 | CW Sweep from 470-608 MHz to determine f0 | Yes |
| Mode 2 | CW Sweep from 614-698 MHz to determine f0 | Yes |
| Mode 3 | EUT Being fed a Signal at f0 (608MHz) using FM modulation and 200kHz channel BW in band 470-608 MHz | Yes |
| Mode 4 | EUT Being fed a Signal at f0 (628.042MHz) using FM modulation and 200kHz channel BW in band 614-698 MHz | Yes |
| Mode 5 | EUT Being fed a Signal at 470.0125MHz using FM modulation and 25kHz channel BW | Yes |
| Mode 6 | EUT Being fed a Signal at 566MHz using FM modulation and 25kHz channel BW | Yes |
| Mode 7 | EUT Being fed a Signal at 606.585MHz using FM modulation and 25kHz channel BW | Yes |
| Mode 8 | EUT Being fed a Signal at 614.0125MHz using FM modulation and 25kHz channel BW | Yes |
| Mode 9 | EUT Being fed a Signal at 654MHz using FM modulation and 25kHz channel BW | Yes |
| Mode 10 | EUT Being fed a Signal at 697.9875MHz using FM modulation and 25kHz channel BW | Yes |

Note: This report only pertains to the operation of the equipment to 47CFR part 74, for details of testing to other rule parts please see RN reports:

03-13344-3-22 (Part 27)
03-13344-1-22 (Parts 22 & 24)
03-13344-4-22 (Part 90).

2.5 Emissions configuration



The unit was powered from the secondary hub at 48V DC. The unit was configured using the supplied network management software using the settings files prepared by Zinwave Ltd, this provided 25dB gain and +20dBm EUT output power in conjunction with the signal generator settings of -5dBm. Any attenuation introduced by the Primary/secondary hub system was also accounted for in the set-up files provided by Zinwave Ltd. Test channels and required modulations were set using the signal generators connected to the primary hub. Single channel operation was provided by generator 1 and dual channel was using two signal generators. Output power of the signal generators was set to provide -5dBm at input to primary hub. The transmit mode was 100% continuous with EUT output power maintained at +20dBm (25dB gain). Test channels and combinations used are stated in test modes section 2.4

For conducted RF tests the RF ports were connected via suitable attenuation and filtering where required and connected directly to a spectrum analyser, with losses accounted for in the measurement results.

The system is designed for operation with antennas having a maximum gain of 8.0 dBi or 5.85 dBd. This is the value used for determining EIRP or ERP where required.

2.5.1 Signal leads

| Port Name | Cable Type | Connected |
|---------------|----------------|-----------|
| DC power | 2 core | Yes |
| Fibre TX | Fibre | Yes |
| Fibre RX | Fibre | Yes |
| Transmit port | N-type coaxial | Yes |
| Receive port | N-type coaxial | Yes |

3 Summary of test results

The Zinwave UNItivity 5000 Remote Unit, 305-1007 was tested for compliance to the following standard(s) :

47 CFR Part 74H Effective Date 1st October 2020
47 CFR Part 2 Effective Date 1st October 2020

Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of equipment not meeting the intentions of the standard or the essential requirements of the directive, particularly under different conditions to those during testing. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

| Title | References | Results |
|---|--|-----------------------------|
| Transmitter Tests | | |
| 1. Antenna power conducted emissions | 47CFR part 74H Clause (e) (6) | PASSED ¹ |
| 2. Maximum Average conducted output power | 47CFR part 74H Clause (e) (1) (ii) | PASSED |
| 3. Frequency stability | 47CFR part 74H Clause 74.861 (e) (4) | NOT APPLICABLE ² |
| 4. Occupied bandwidth | 47CFR part 74H Clause 74.861 (e) (5) | PASSED |
| 5. Radiated emissions | 47CFR part 74H Clause 74.861 (e) (6) (iii) | PASSED ¹ |
| 6. Audio frequency response | 47CFR part 2J Clause 2.1047 | NOT APPLICABLE ³ |
| 7. Modulation limiting | 47CFR part 74H Clause 74.861 (e) (3) | NOT APPLICABLE ³ |
| 8. Determination of fo | KDB 935210 D05 Clause 3.3 | PERFORMED |

¹ Spectrum investigated started at a frequency of 30MHz up to a frequency of 7GHz based on 10 times the highest channel of 698MHz.

² EUT does not contain an oscillator and only reproduces what is provided at its input.

³ EUT provides at its output what it receives at its input, therefore, audio response and mod limiting is controlled by the client/host it is connected to.

4 Specifications

The tests were performed and operated in accordance with R.N. Electronics Ltd procedures and the relevant standards listed below.

4.1 Relevant standards

| Ref. | Standard Number | Version | Description |
|-------|-----------------------|---------|---|
| 4.1.1 | 47CFR part 74H | 2020 | PART 74—EXPERIMENTAL RADIO, AUXILIARY, SPECIAL BROADCAST AND OTHER PROGRAM DISTRIBUTIONAL SERVICES Subpart H - Low Power Auxiliary Stations |
| 4.1.2 | 47CFR part 2J | 2020 | Part 2 – Frequency Allocations and radio treaty matters; General rules and regulations |
| 4.1.3 | KDB 971168 D01 v03r01 | 2018 | Federal Communications Commission Office of Engineering and Technology Laboratory Division; Measurement Guidance for Certification of Licensed Digital Transmitters |
| 4.1.4 | ANSI C63.26 | 2015 | American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services |
| 4.1.5 | KDB 935210 D05 v01r04 | 2020 | Federal Communications Commission Office of Engineering and Technology Laboratory Division; Measurement guidance for Industrial and Non-consumer signal booster, repeater and amplifier devices |
| 4.1.6 | TIA-603-E | 2016 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards, Telecommunications Industry Association, 2016 |

4.2 Deviations

No deviations were applied.

5 Tests, methods and results

5.1 Antenna port conducted spurious emissions

5.1.1 Test methods

| | |
|--------------------|--|
| Test Requirements: | 47CFR part 74H Clause (e) (6) [Reference 4.1.1 of this report] |
| Test Method: | 47CFR part 2J Clause 2.1051 [Reference 4.1.2 of this report] KDB 935210 D05 |
| Limits: | 47CFR part 74H Clause (e) (6) [Reference 4.1.1 of this report] |

5.1.2 Configuration of EUT

EUT was tested on a bench. The EUT RF port under test was connected to a spectrum analyser via suitable attenuation. RX port was terminated into a 50 Ohm load. EUT was tested across Low, Middle and High channels within each applicable band in a single channel input mode and in a dual channel input mode modes are specified in section 2.4 of this report.

5.1.3 Test procedure

The EUT system was set up to maximum gain using the network management software provided. EUT signal level was raised until maximum output power was reached per channel/band setting as required. Measurements were made and plots taken in the required Resolution bandwidths. Measurement performed using RMS detector and sweep averaging method.

Tests were performed in test site N.

5.1.4 Test equipment

F078, H071, E266, E777, E602

See Section 8 for more details

5.1.5 Test results

| | |
|---------------------------------|------------|
| Temperature of test environment | 17-23°C |
| Humidity of test environment | 35-58% |
| Pressure of test environment | 100-103kPa |

For band edge/Mask results please refer to section 5.4 within this report

Single channel results.

Setup Table

| | |
|-----------------|-------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 200 kHz |
| Mod Scheme | 75 kHz FM |
| Low channel | 470.1 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) |
|--------------------------|-------------------------------|--------------------------|
| 940.295 | -27.0 | -14.0 |

| Plots | |
|-----------------|--|
| 470-608_MHz_pt1 | |
| 470-608_MHz_pt2 | |

Setup Table

| | |
|-----------------|-------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 200 kHz |
| Mod Scheme | 75 kHz FM |
| Mid channel | 566 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) |
|--------------------------|-------------------------------|--------------------------|
| 1078 | -28.1 | -15.1 |

| Plots |
|-----------------|
| 470-608_MHz_pt1 |
| 470-608_MHz_pt2 |

Setup Table

| | |
|-----------------|-------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 200 kHz |
| Mod Scheme | 75 kHz FM |
| High channel | 607.9 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) |
|--------------------------|-------------------------------|--------------------------|
| 1215.6 | -27.0 | -14.0 |

| Plots |
|-----------------|
| 470-608_MHz_pt1 |
| 470-608_MHz_pt2 |

Setup Table

| | |
|-----------------|-------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 200 kHz |
| Mod Scheme | 75 kHz FM |
| Low channel | 614.1 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) |
|--------------------------|-------------------------------|--------------------------|
| 1228.1 | -27.5 | -14.5 |

| Plots |
|-----------------|
| 614-698_MHz_pt1 |
| 614-698_MHz_pt2 |

Setup Table

| | |
|-----------------|-------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 200 kHz |
| Mod Scheme | 75 kHz FM |
| Mid channel | 654 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) |
|--------------------------|-------------------------------|--------------------------|
| 1312.1 | -30.6 | -17.6 |

| Plots |
|-----------------|
| 614-698_MHz_pt1 |
| 614-698_MHz_pt2 |

Setup Table

| | |
|-----------------|-------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 200 kHz |
| Mod Scheme | 75 kHz FM |
| High channel | 697.9 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) |
|--------------------------|-------------------------------|--------------------------|
| 1395.7 | -40.1 | -27.1 |

| Plots |
|-----------------|
| 614-698_MHz_pt1 |
| 614-698_MHz_pt2 |

Dual channel results (Out of band)

Following narrow band test method in KDB section 4.7.2 Out-of-band/out-of-block emissions conducted measurements performed with frequencies centred on f0

Setup Table

| | |
|-----------------|-----------------------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| Low channels | 607.8875 MHz + 607.9125 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) |
|--------------------------|-------------------------------|--------------------------|
| 607.8625 | -31.9 | -18.9 |

| Plots |
|------------------------------|
| 470-608_MHz._intermodulation |

Setup Table

| | |
|-----------------|-----------------------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| High channels | 628.0295 MHz + 628.0545 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) |
|--------------------------|-------------------------------|--------------------------|
| 628.0045 | -31.8 | -18.8 |

| Plots |
|-----------------------------|
| 614-698_MHz_intermodulation |

Results are also presented graphically in section 6.

LIMITS:

74.861(e)(6) The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- (i) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
- (ii) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;
- (iii) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43 + 10\log_{10}$ (mean output power in watts) dB.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
<± 2.8 dB

5.2 Maximum Average conducted output power

5.2.1 Test methods

| | |
|--------------------|---|
| Test Requirements: | 47CFR part 74H Clause (e) (1) (ii) [Reference 4.1.1 of this report] |
| Test Method: | 47CFR part 2J Clause 2.1046 [Reference 4.1.2 of this report] |
| Limits: | 47CFR part 74H Clause (e) (1) (ii) [Reference 4.1.1 of this report] |

5.2.2 Configuration of EUT

EUT was tested on a bench. The EUT RF port under test was connected to a spectrum analyser via suitable attenuation. RX port was terminated into a 50 Ohm load. EUT was tested at determined f_0 in each applicable band. Test modes used were, mode 3 and mode 4.

5.2.3 Test procedure

Tests were made in accordance with the test method noted above using the measuring equipment listed in the 'Test Equipment' Section. The EUT system was set up to maximum gain using the network management software provided. EUT signal level was raised until maximum output power was reached per channel/band setting as required and the frequency under test was set to an appropriate channel to include f_0 as determined in section 5.8. An RMS detector was set and a marker placed on the peak of the emitted signal. Plots were taken.

5.2.4 Test equipment

F078, H071, E266, E777, E602

See Section 8 for more details

5.2.5 Test results

| | |
|---------------------------------|------------|
| Temperature of test environment | 18-23°C |
| Humidity of test environment | 35-58% |
| Pressure of test environment | 100-103kPa |

| | |
|-----------------|-------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | N/A |
| Mod Scheme | CW |
| f_0 frequency | 607.9 MHz |

| Test conditions | | Average Power (dBm) |
|-----------------|---------------|---------------------|
| Temp Ambient | Volts Nominal | 20.93 |

| | |
|-----------------|-------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | N/A |
| Mod Scheme | CW |
| f_0 frequency | 628.042MHz |

| Test conditions | | Average Power (dBm) |
|-----------------|---------------|---------------------|
| Temp Ambient | Volts Nominal | 20.59 |

Results are also presented graphically in section 6

LIMITS:

74.861(e) For low power auxiliary stations operating in the 600 MHz duplex gap and the bands allocated for TV broadcasting, the following technical requirements apply: (ii) 470-608 and 614-698: 250 mW conducted power (+24dBm).

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
< ± 1 dB.

5.3 Frequency stability

NOT APPLICABLE: EUT does not contain an oscillator and only reproduces what is provided at its input.

5.4 Occupied bandwidth and bandwidth mask

5.4.1 Test methods

| | |
|--------------------|--|
| Test Requirements: | 47CFR part 74H Clause 74.861 (e)(6) [Reference 4.1.1 of this report] |
| Test Method: | 47CFR part 2J Clause 2.1049 [Reference 4.1.2 of this report] |
| Limits: | 47CFR part 74H Clause 74.861 (e)(6)(i)(ii)(iii) [Reference 4.1.1 of this report] and 74861(e)(7) |

5.4.2 Configuration of EUT

EUT was tested on a bench. The EUT RF port under test was connected to a spectrum analyser via suitable attenuation. RX port was terminated into a 50 Ohm load. EUT was tested at determined f_0 for each applicable band

5.4.3 Test procedure

Tests were made in accordance with the test method noted above using the measuring equipment listed in the 'Test Equipment' Section. The EUT system was set up to maximum gain using the network management software provided. EUT signal level was raised until maximum output power was reached per channel/band setting as required and the frequency under test was set to an appropriate channel to include f_0 as determined in section 5.8. A peak detector was set and sweeps made comparing the input and the output signals and applicable mask points indicated on the plots taken. For FM measurements a deviation of ± 75 kHz was used.

5.4.4 Test equipment

F078, H071, E266, E777, E602

See Section 8 for more details

5.4.5 Test results

| | |
|---------------------------------|------------|
| Temperature of test environment | 18-24°C |
| Humidity of test environment | 35-58% |
| Pressure of test environment | 100-103kPa |

| | |
|-----------------|-----------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 200 kHz |
| Mod Scheme | ± 75 kHz FM |
| f_0 frequency | 607.9 MHz |

| | |
|----------------|---|
| Plot reference | 607.9MHz_OBW 470-608 MHz band EN 300 422-1 v1.4.2 mask |
|----------------|---|

| | |
|-----------------|-----------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 200 kHz |
| Mod Scheme | ± 75 kHz FM |
| Frequency | 628.042 MHz |

| | |
|----------------|--|
| Plot reference | 628.042 MHz_OBW 614-698 MHz band EN 300 422-1 v1.4.2 mask |
|----------------|--|

Results are also presented graphically in section 6

LIMITS:

74.861(e)(5) The operating bandwidth shall not exceed 200 kHz.

74.861(e)(6) The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- (i) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
- (ii) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;
- (iii) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43 + 10\log_{10}$ (mean output power in watts) dB.

74.861(e)(7) : section 8.3.2.2 (Figure 4) of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08),

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
< ± 1.9%

5.5 Radiated emissions

5.5.1 Test methods

| | |
|--------------------|---|
| Test Requirements: | 47CFR part 74H Clause 74.861 (e) (6) (iii) [Reference 4.1.1 of this report] |
| Test Method: | 47CFR part 2J Clause 2.1053 [Reference 4.1.2 of this report] |
| Limits: | 47CFR part 74H Clause 74.861 (e) (6) (iii) [Reference 4.1.1 of this report] |

5.5.2 Configuration of EUT

The EUT was tested in an ALSE and ambient conditions were monitored. The EUT was examined in its declared normal use position. The transmit port was terminated into a 30dB Attenuator and a 50 Ohm load. RX port was terminated into a 50 Ohm load. EUT was tested across all required modes as specified in section 2.4 of this report.

5.5.3 Test procedure

Tests were made in accordance with the test method noted above using the measuring equipment listed in the 'Test Equipment' Section. The EUT system was set up to maximum gain using the network management software provided. EUT signal level was raised until maximum output power was reached. Peak field strength pre-scans using the field strength method were performed. The EUT's emissions were maximised by rotating it 360 degrees. This method was used to determine any signals for substitution. An RMS detector was used for any final measurements.

30MHz - 1GHz.

The measuring antenna was scanned 1 - 4m in both Horizontal and Vertical polarisations. Where required a Substitution method was performed using tuned dipoles / a calibrated bi-conical antenna. Measurement distance of 3metres was used.

1GHz – 7GHz.

The measuring antenna was used in both Horizontal and Vertical polarisations. Where required a Substitution method was performed using standard gain horn antennas. Measurement distances used were: 1 – 6 GHz at 3metres and 6 – 7 GHz at 1.2metres.

Tests were performed in test sites B & M.

5.5.4 Test equipment

E624, E411, LPE364, E743, E136, TMS82, E602, E268, Cal07, E463, E478, F031, E621, E412, E296-2, E330

See Section 8 for more details

5.5.5 Test results

| | |
|---------------------------------|------------|
| Temperature of test environment | 13-18°C |
| Humidity of test environment | 51-68% |
| Pressure of test environment | 100-102kPa |

Single channel results.

Setup Table

| | |
|-----------------|--------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| Low channel | 470.0125 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) | Antenna Polarisation | EUT Polarisation |
|--|-------------------------------|--------------------------|----------------------|------------------|
| No spurious emissions observed within 20dB of limits | | | | |

Setup Table

| | |
|-----------------|-------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| Mid channel | 566 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) | Antenna Polarisation | EUT Polarisation |
|--|-------------------------------|--------------------------|----------------------|------------------|
| No spurious emissions observed within 20dB of limits | | | | |

Setup Table

| | |
|-----------------|--------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| High channel | 607.9875 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) | Antenna Polarisation | EUT Polarisation |
|--|-------------------------------|--------------------------|----------------------|------------------|
| No spurious emissions observed within 20dB of limits | | | | |

Setup Table

| | |
|-----------------|--------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| Low channel | 614.0125 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) | Antenna Polarisation | EUT Polarisation |
|--|-------------------------------|--------------------------|----------------------|------------------|
| No spurious emissions observed within 20dB of limits | | | | |

Setup Table

| | |
|-----------------|-------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| Mid channel | 654 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) | Antenna Polarisation | EUT Polarisation |
|--|-------------------------------|--------------------------|----------------------|------------------|
| No spurious emissions observed within 20dB of limits | | | | |

Setup Table

| | |
|-------------|-------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |

| | |
|-----------------|--------------|
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| High channel | 697.9875 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) | Antenna Polarisation | EUT Polarisation |
|--|-------------------------------|--------------------------|----------------------|------------------|
| No spurious emissions observed within 20dB of limits | | | | |

DUAL CHANNEL RESULTS.

Setup Table

| | |
|-----------------|-----------------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| Low channels | 566 MHz + 566.025 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) | Antenna Polarisation | EUT Polarisation |
|--|-------------------------------|--------------------------|----------------------|------------------|
| No spurious emissions observed within 20dB of limits | | | | |

Setup Table

| | |
|-----------------|-----------------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | 25 kHz |
| Mod Scheme | CW |
| High channels | 654 MHz + 654.025 MHz |

| Spurious Frequency (MHz) | Measured Spurious Level (dBm) | Difference to Limit (dB) | Antenna Polarisation | EUT Polarisation |
|--|-------------------------------|--------------------------|----------------------|------------------|
| No spurious emissions observed within 20dB of limits | | | | |

LIMITS:

74.861(e)(6) The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(iii) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43 + 10\log_{10}$ (mean output power in watts) dB. (-13dBm).

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
30MHz - 1GHz ± 3.9 dB, 1 – 18 GHz ± 3.5 dB

5.6 Audio frequency response

NOT APPLICABLE: EUT provides at its output what it receives at its input, therefore, audio response and modulation limiting is controlled by the client/host it is connected to.

5.7 Modulation limiting

NOT APPLICABLE: EUT provides at its output what it receives at its input, therefore, audio response and modulation limiting is controlled by the client/host it is connected to.

5.8 Determination of f_0

5.8.1 Test methods

Test Requirements: KDB 935210 D05 Clause 3.3 / 4.3 [Reference 4.1.5 of this report]
 Test Method: ANSI C63.26 2015 Clause 5.5 [Reference 4.1.4 of this report]
 KDB 935210 D05 Clause 3.3 / 4.3 [Reference 4.1.5 of this report]
 Limits: None.

5.8.2 Configuration of EUT

EUT was tested on a bench. The EUT RF port under test was connected to a spectrum analyser via suitable attenuation. RX port was terminated into a 50 Ohm load. EUT was swept across the 4 operational bands with a CW signal to determine the frequency of highest power in the band. Test performed in **modes 1** and **2**.

5.8.3 Test procedure

Tests were made in accordance with the test method noted above using the measuring equipment listed in the 'Test Equipment' Section. The EUT system was set up to maximum gain using the network management software provided. EUT signal level was raised until maximum output power was reached. The EUT input signal was then swept across the applicable service band frequency and plots taken showing the frequency of highest power in the band (f_0).

5.8.4 Test equipment

F078, H071, E266, E777, E602

See Section 8 for more details

5.8.5 Test results

Temperature of test environment 17-23°C
 Humidity of test environment 35-56%
 Pressure of test environment 100-103kPa

| | |
|-----------------|-------------|
| Band | 470-608 MHz |
| Power Level | 20 dBm |
| Channel Spacing | N/A |
| Mod Scheme | CW |

| Band (MHz) | f_0 determined(MHz) |
|------------|-----------------------|
| 470-608 | 608 |
| Plot ref | 470-608_MHZ_f0 |

Note: Measurement was performed over the service band frequency range only.

| | |
|-----------------|-------------|
| Band | 614-698 MHz |
| Power Level | 20 dBm |
| Channel Spacing | N/A |
| Mod Scheme | CW |

| Band (MHz) | f_0 determined (MHz) |
|------------|------------------------|
| 614-698 | 628.042 |
| Plot ref | 614-698_MHZ_f0 |

Note: Measurement was performed over the service band frequency range only.

Results are also presented graphically in section 6.

LIMITS:

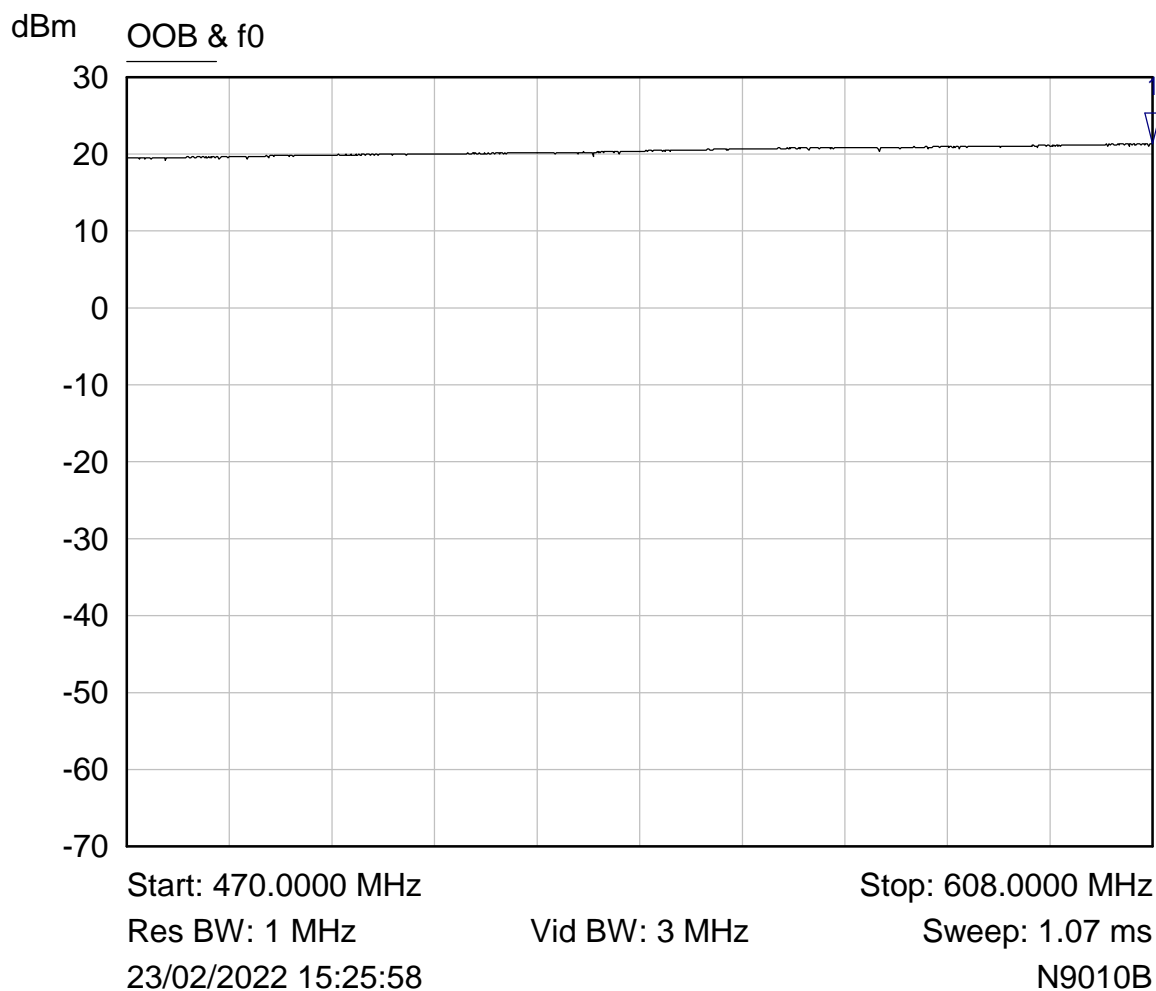
None.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
<± 1 dB

6 Plots/Graphical results

6.1 Determination of f0

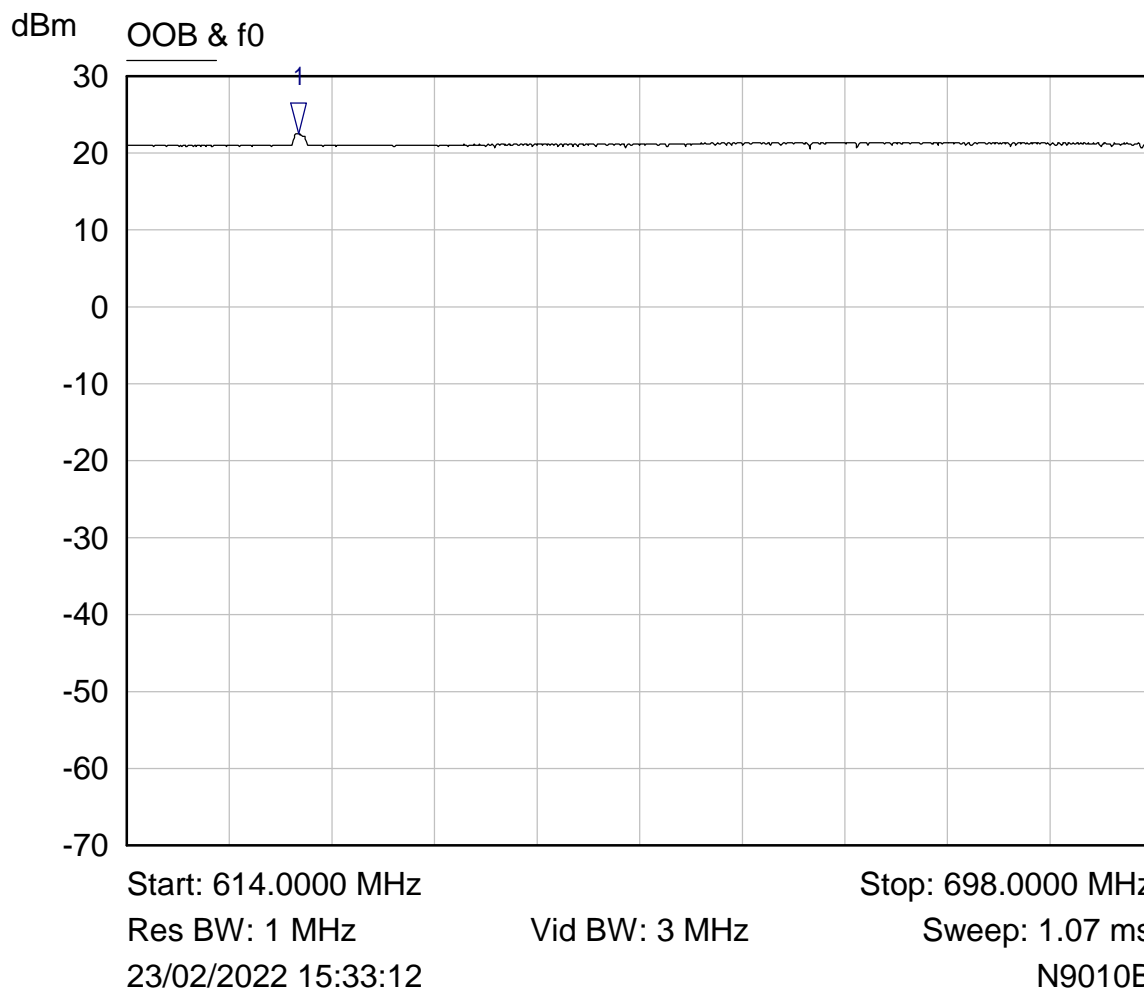
RF Parameters: Band 470-608 MHz, Power +20 dBm, Channel Spacing N/A, Modulation N/A,
Channel N/A



| Mkr | Trace | X-Axis | Value | Notes |
|-----|----------|--------------|-----------|-------|
| 1 ▾ | OOB & f0 | 608.0000 MHz | 21.33 dBm | f0 |

Plot of f0 determined in band 470-608 MHz.

RF Parameters: Band 614-698 MHz, Power +20 dBm, Channel Spacing N/A, Modulation N/A,
Channel N/A

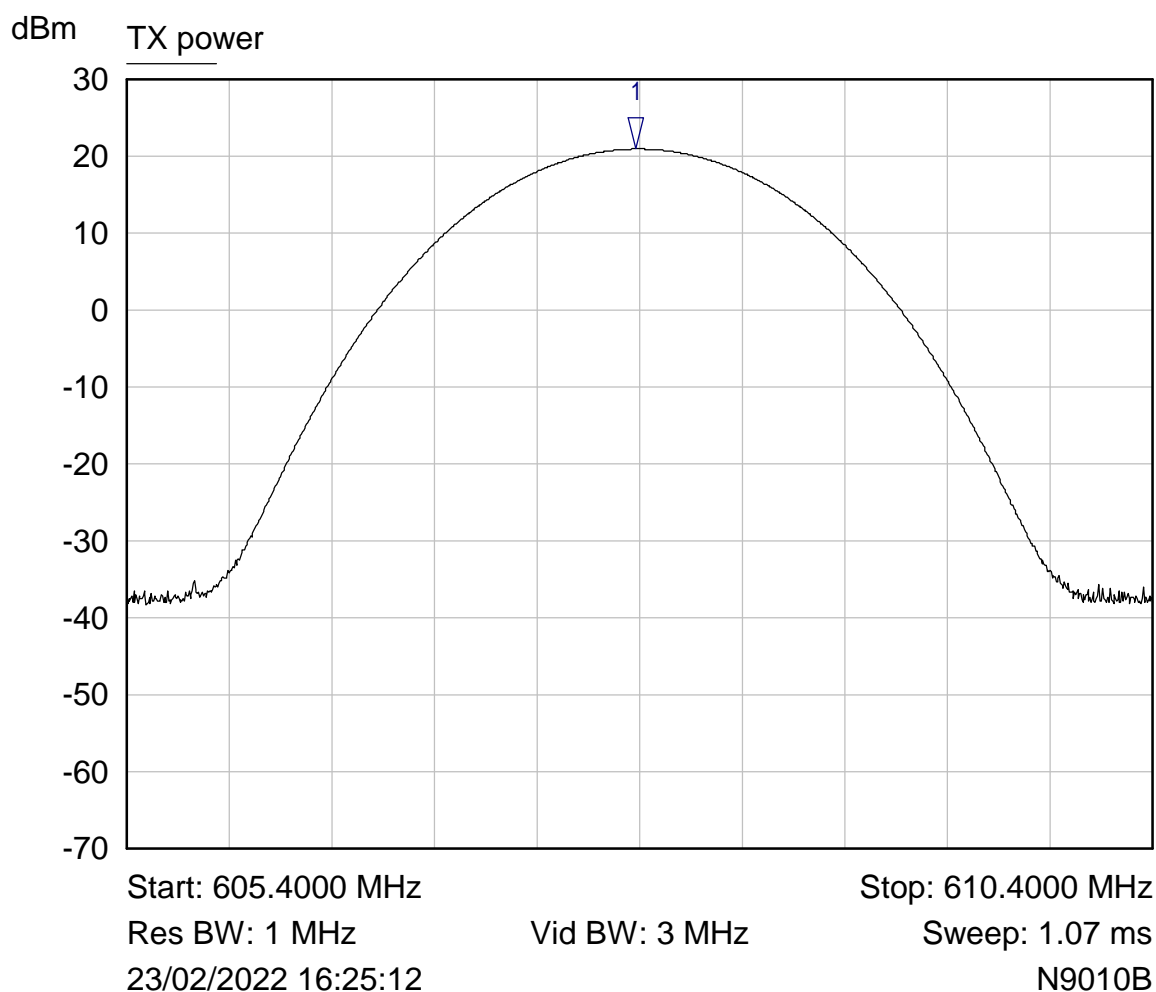


| Mkr | Trace | X-Axis | Value | Notes |
|-----|----------|--------------|-----------|-------|
| 1 ▽ | OOB & f0 | 628.0420 MHz | 22.48 dBm | f0 |

Plot of f0 determined in band 614-698 MHz.

6.2 RF Power Output

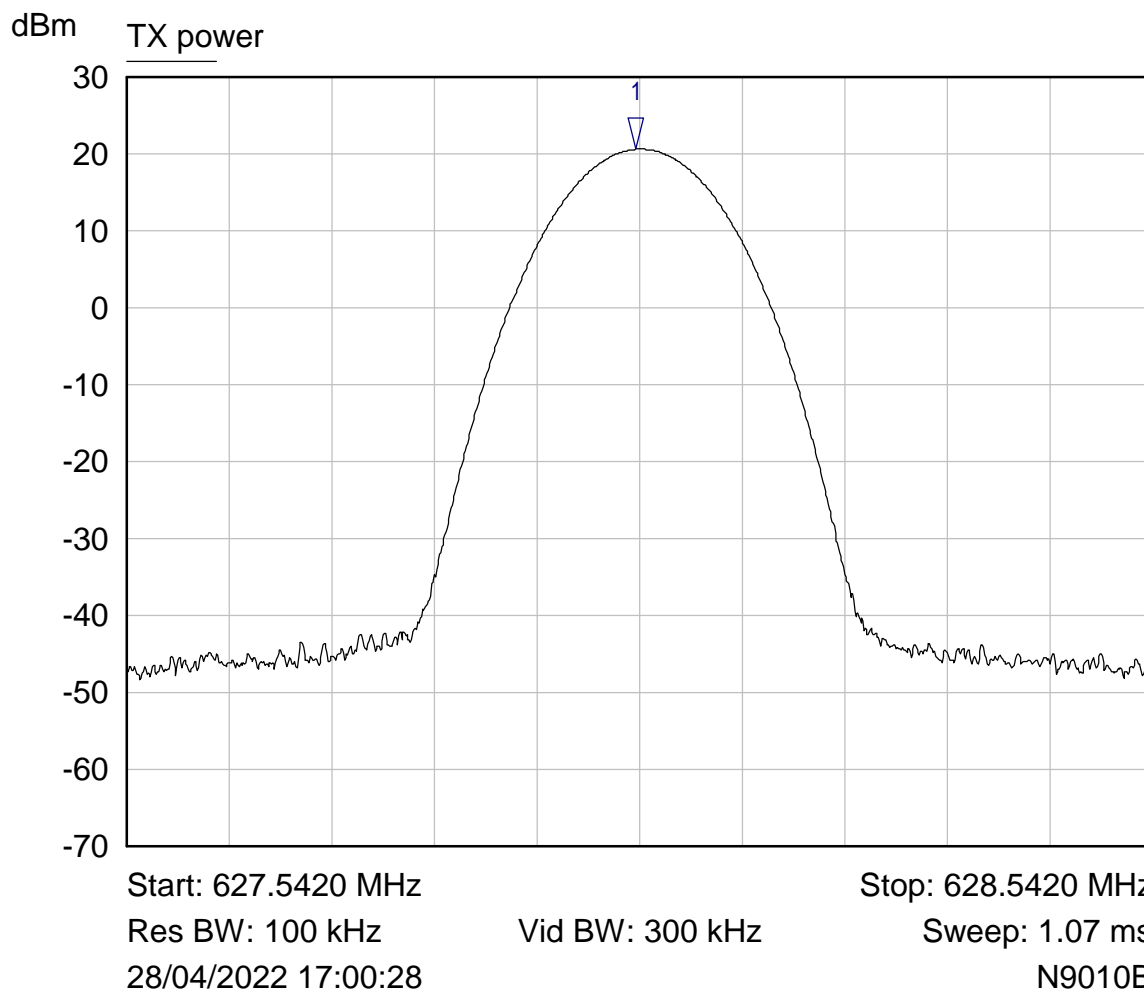
RF Parameters: Band 470-608 MHz, Power +20 dBm, Channel Spacing N/A, Modulation CW,
Channel 607.9 MHz (channel centre near determined f_0 608 MHz)



| Mkr | Trace | X-Axis | Value | Notes |
|-----|----------|--------------|-----------|-------|
| 1 ▽ | TX power | 607.8825 MHz | 20.93 dBm | |

Plot of Channel power at determined f_0 in band 470-608 MHz

RF Parameters: Band 614-698 MHz, Power +20 dBm, Channel Spacing N/A, Modulation CW,
628.042 MHz determined f_0

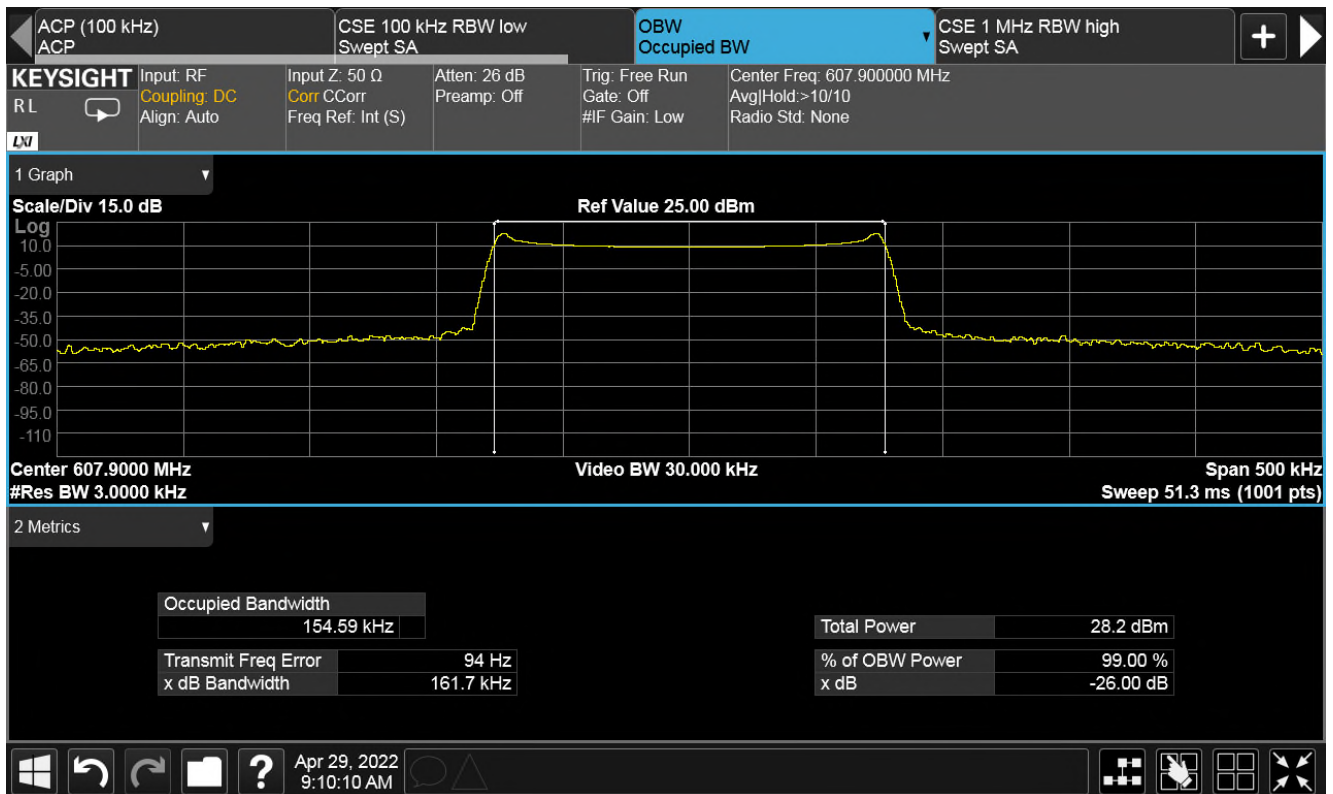


| Mkr | Trace | X-Axis | Value | Notes |
|-----|----------|--------------|-----------|-------|
| 1 ▽ | TX power | 628.0385 MHz | 20.59 dBm | |

Plot of Channel power at determined f_0 in band 614-698 MHz

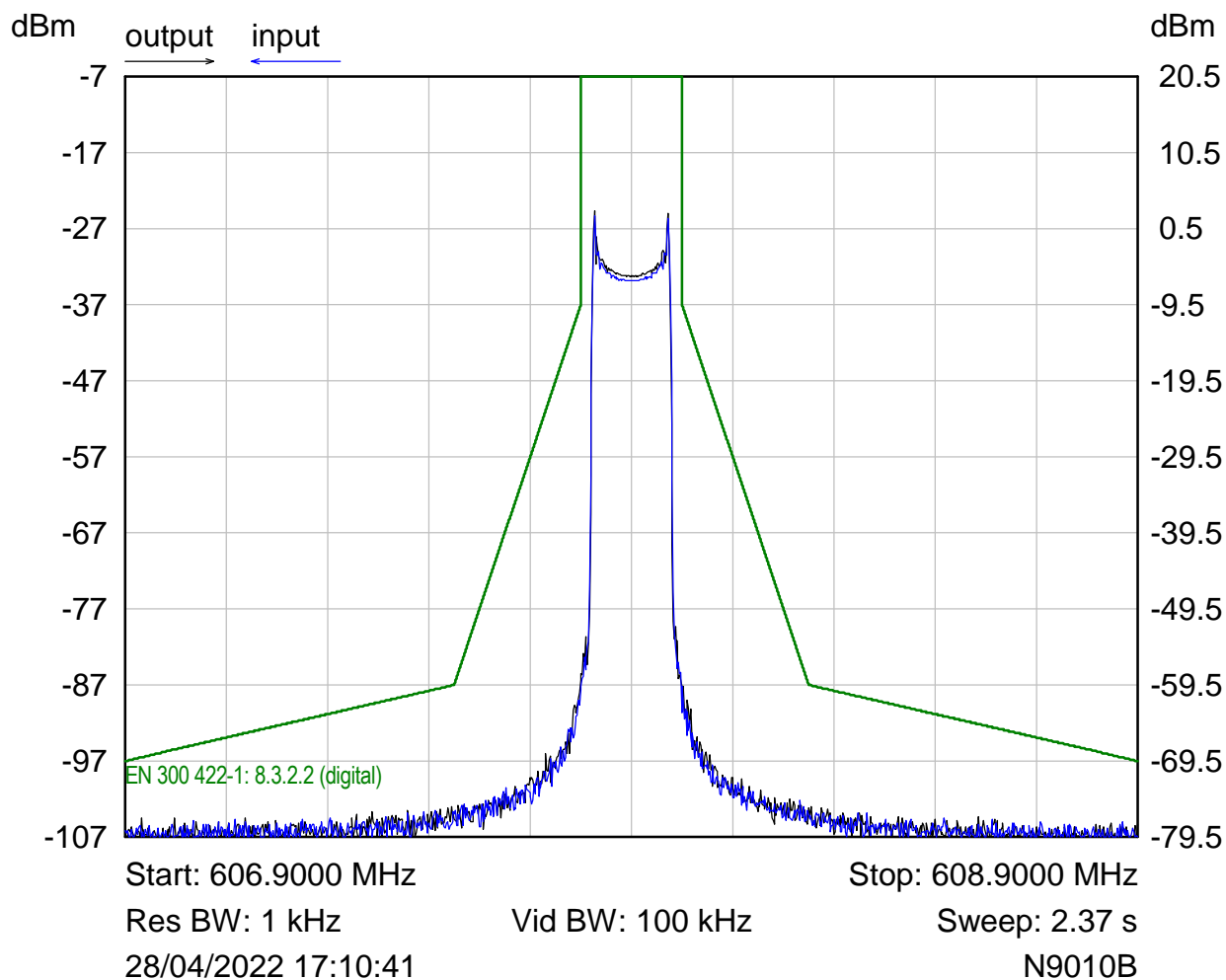
6.3 Occupied bandwidth / Input versus output signal / Mask

RF Parameters: Band 470-608 MHz, Power +20 dBm, Channel Spacing 200kHz, Modulation FM,
Channel 607.9 MHz (channel centre near determined f_0 608 MHz)



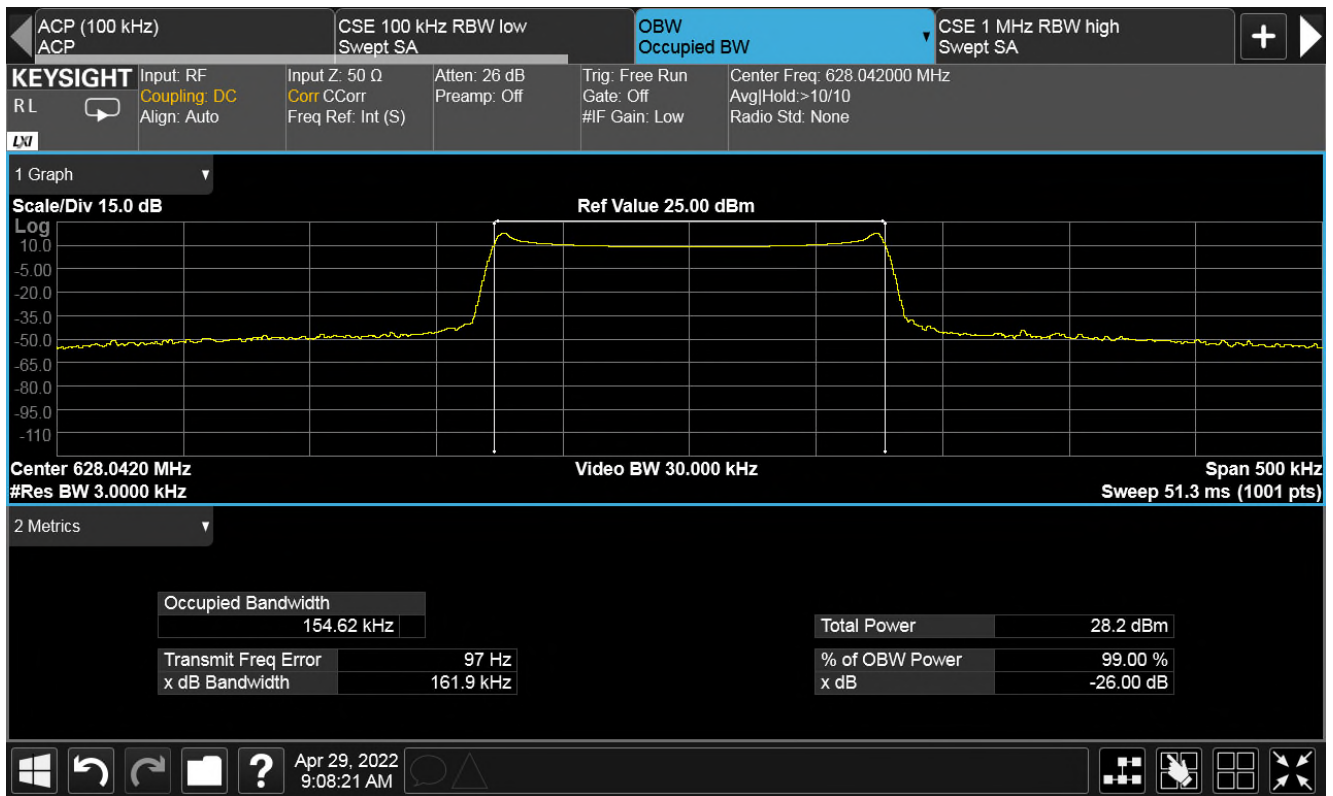
Occupied Bandwidth 607.9 MHz

RF Parameters: Band 470-608 MHz, Maximum power, Modulation FM,
Channel 607.9 MHz (channel centre near determined f_0 608 MHz)
470-608 MHz band EN 300 422-1 v1.4.2 mask



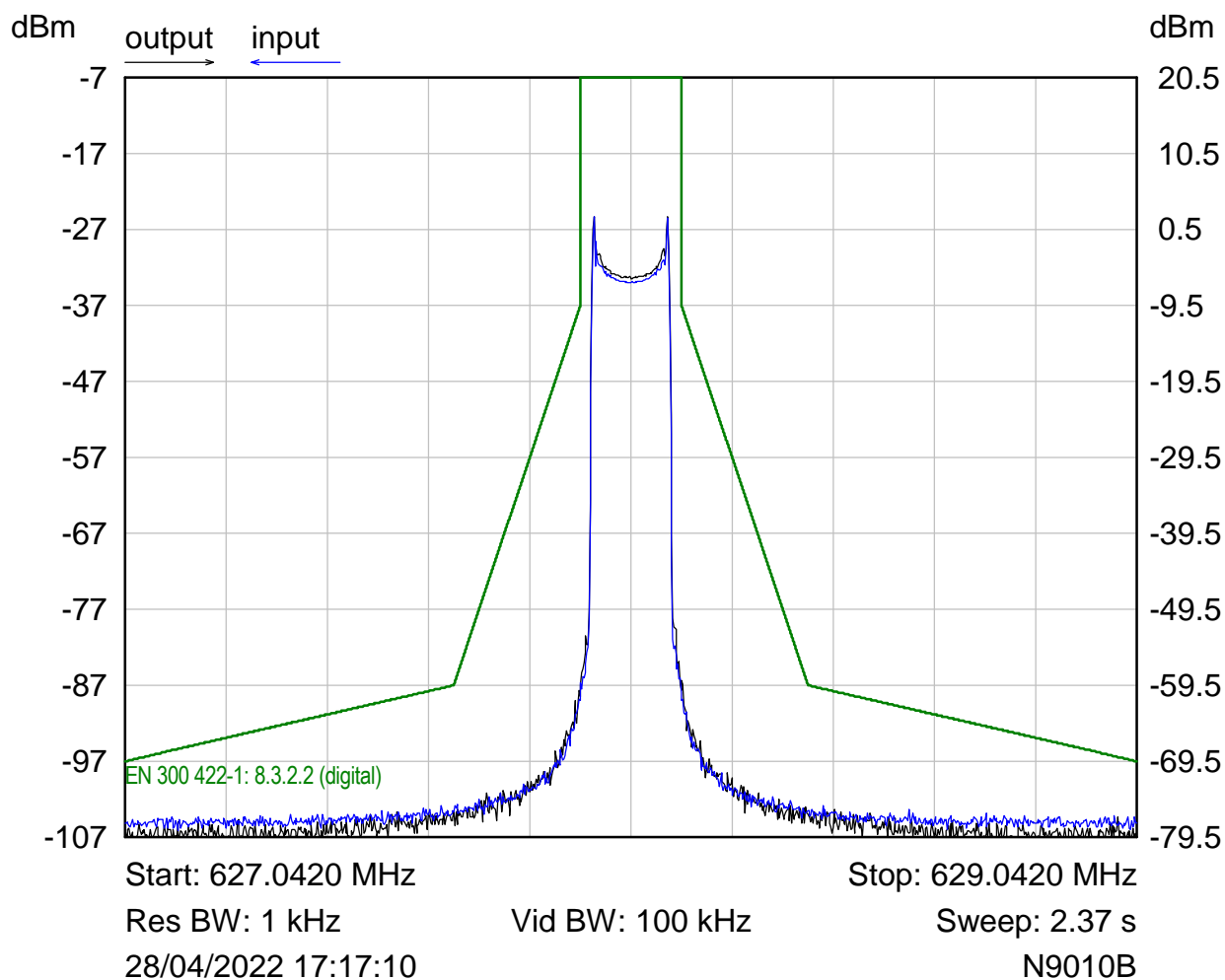
Input vs output graph for ETSI EN 300 422-1 v1.4.2 mask at 607.9 MHz

RF Parameters: Band 614-698 MHz, Power +20 dBm, Channel Spacing 25kHz, Modulation FM,
628.042 MHz determined f_0



Occupied Bandwidth 628.042 MHz

RF Parameters: Band 614-698 MHz, Maximum power, Modulation FM, 628.042 MHz determined f_0
614-698 MHz band EN 300 422-1 v1.4.2 mask

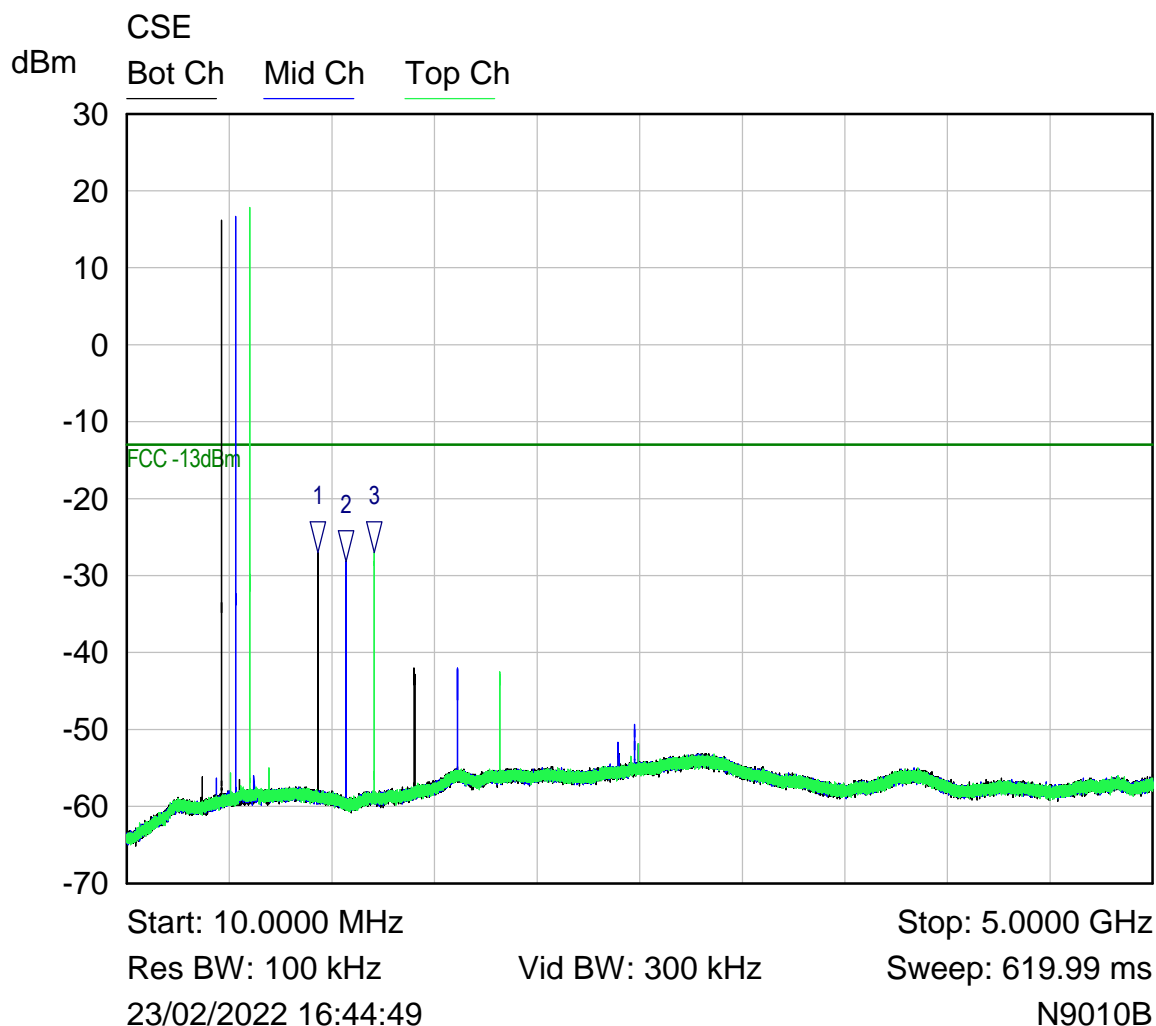


Input vs output graph for ETSI EN 300 422-1 v1.4.2 mask at 628.042 MHz

6.4 Spurious emissions at antenna terminals

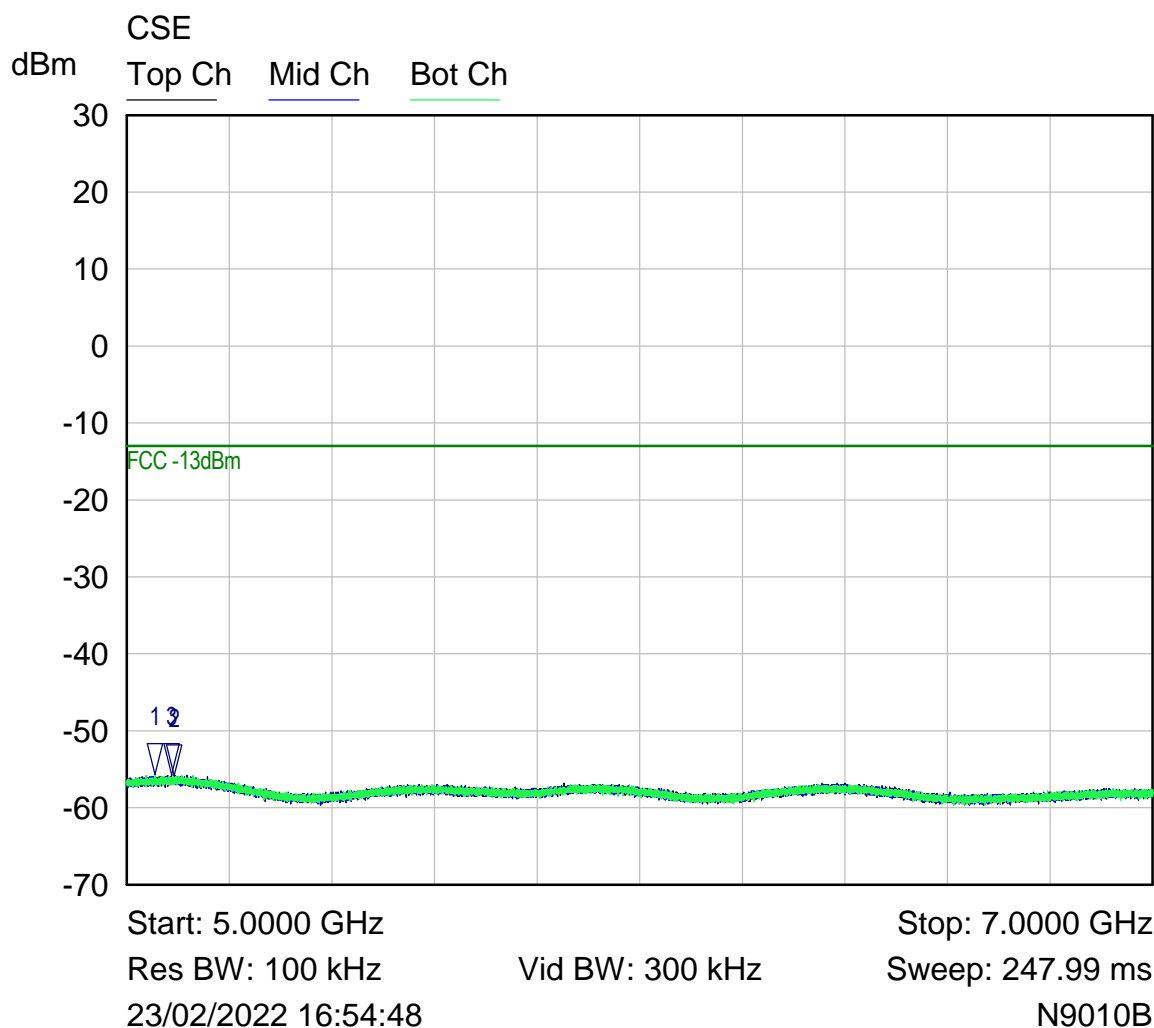
Note: Low, Mid and high channels are shown (overlaid) on a single plot.

RF Parameters: Band 470-608 MHz, Power +20 dBm, Channel Spacing 200 kHz, Modulation FM,
Channels 470.1 MHz, 566 MHz and 469.9 MHz, Single channel mode



| Mkr | Trace | X-Axis | Value | Notes |
|-----|--------|--------------|------------|-------|
| 1 ▽ | Bot Ch | 940.2950 MHz | -26.98 dBm | |
| 2 ▽ | Mid Ch | 1.0780 GHz | -28.10 dBm | |
| 3 ▽ | Top Ch | 1.2156 GHz | -26.99 dBm | |

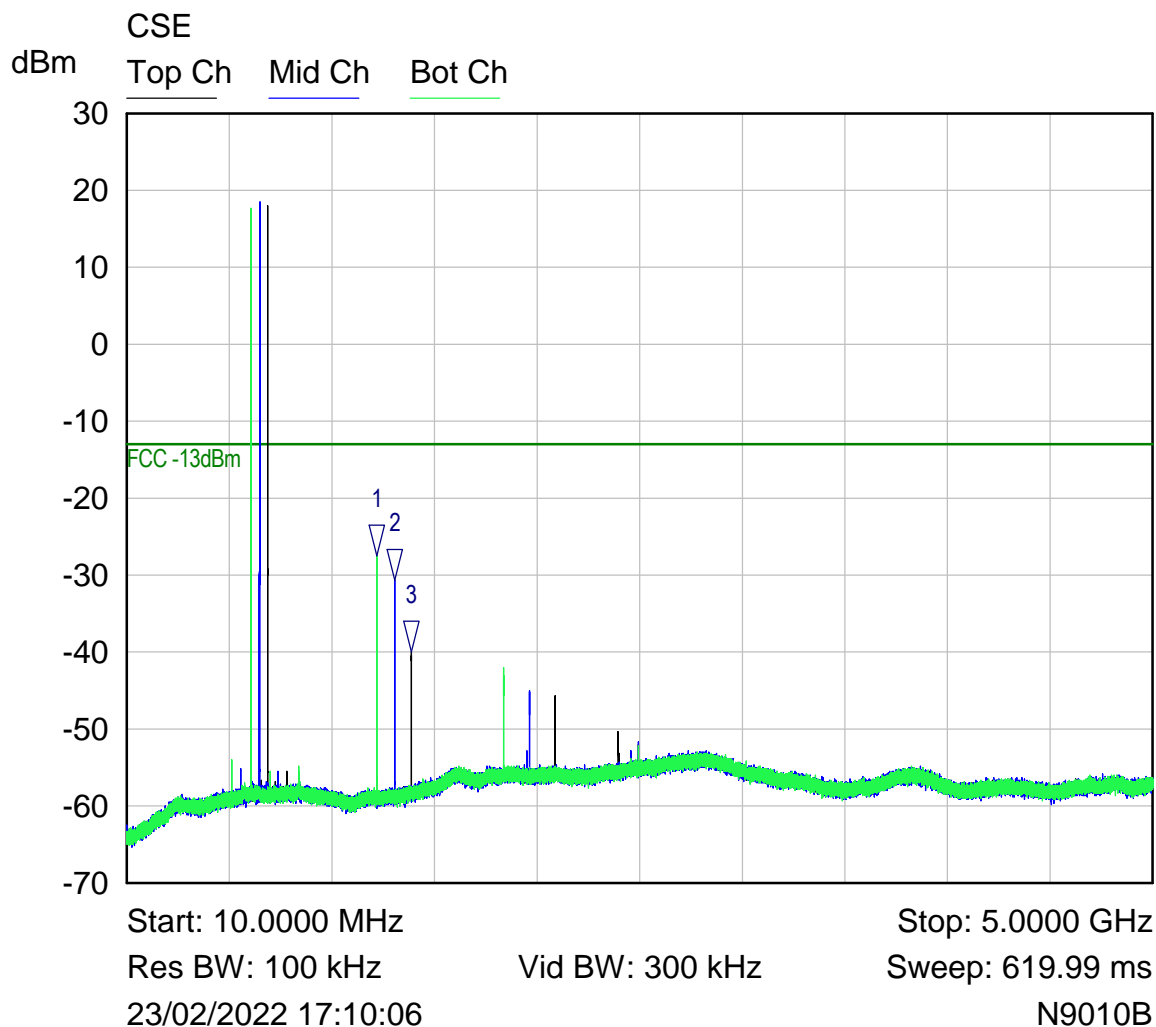
Plot of conducted emissions single Low, Mid and High channels (470-608 MHz band) 10 – 5000 MHz range



| Mkr | Trace | X-Axis | Value | Notes |
|-----|--------|------------|------------|-------|
| 1 ▽ | Bot Ch | 5.0550 GHz | -55.61 dBm | |
| 2 ▽ | Mid Ch | 5.0931 GHz | -55.76 dBm | |
| 3 ▽ | Top Ch | 5.0880 GHz | -55.74 dBm | |

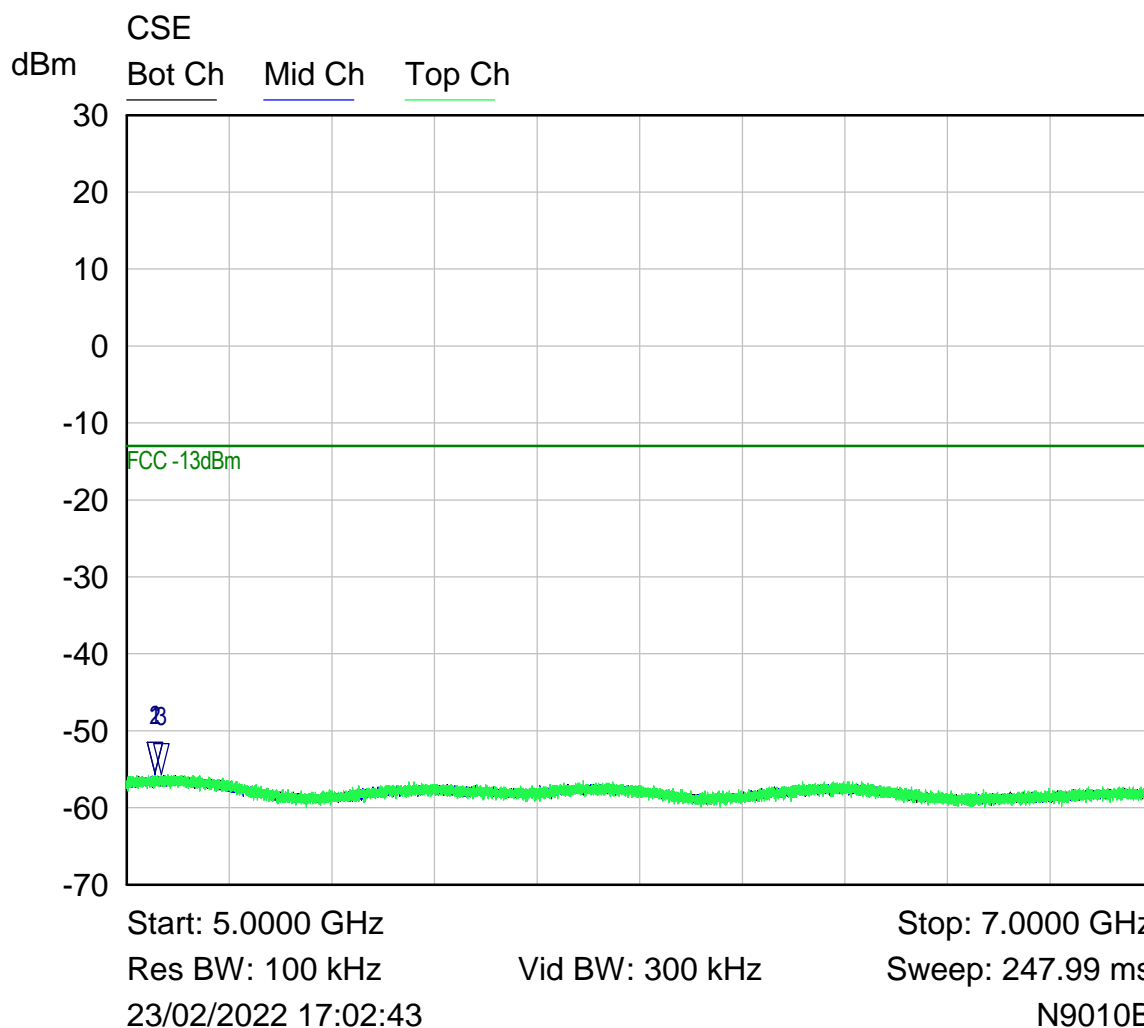
Plot of conducted emissions single Low, Mid and High channels (470-608 MHz band) 5 – 7 GHz range

RF Parameters: Band 614-698 MHz, Power +20 dBm, Channel Spacing 200 kHz, Modulation FM,
Channels 614.1 MHz, 654 MHz and 697.9 MHz, Single channel mode



| Mkr | Trace | X-Axis | Value | Notes |
|-----|--------|------------|------------|-------|
| 1 ▽ | Bot Ch | 1.2281 GHz | -27.49 dBm | |
| 2 ▽ | Mid Ch | 1.3121 GHz | -30.64 dBm | |
| 3 ▽ | Top Ch | 1.3957 GHz | -40.07 dBm | |

Plot of conducted emissions single Low, Mid and High channels (614-698 MHz band) 10 – 5000 MHz range



| Mkr | Trace | X-Axis | Value | Notes |
|-----|--------|------------|------------|-------|
| 1 ▽ | Bot Ch | 5.0550 GHz | -55.49 dBm | |
| 2 ▽ | Mid Ch | 5.0550 GHz | -55.57 dBm | |
| 3 ▽ | Top Ch | 5.0672 GHz | -55.62 dBm | |

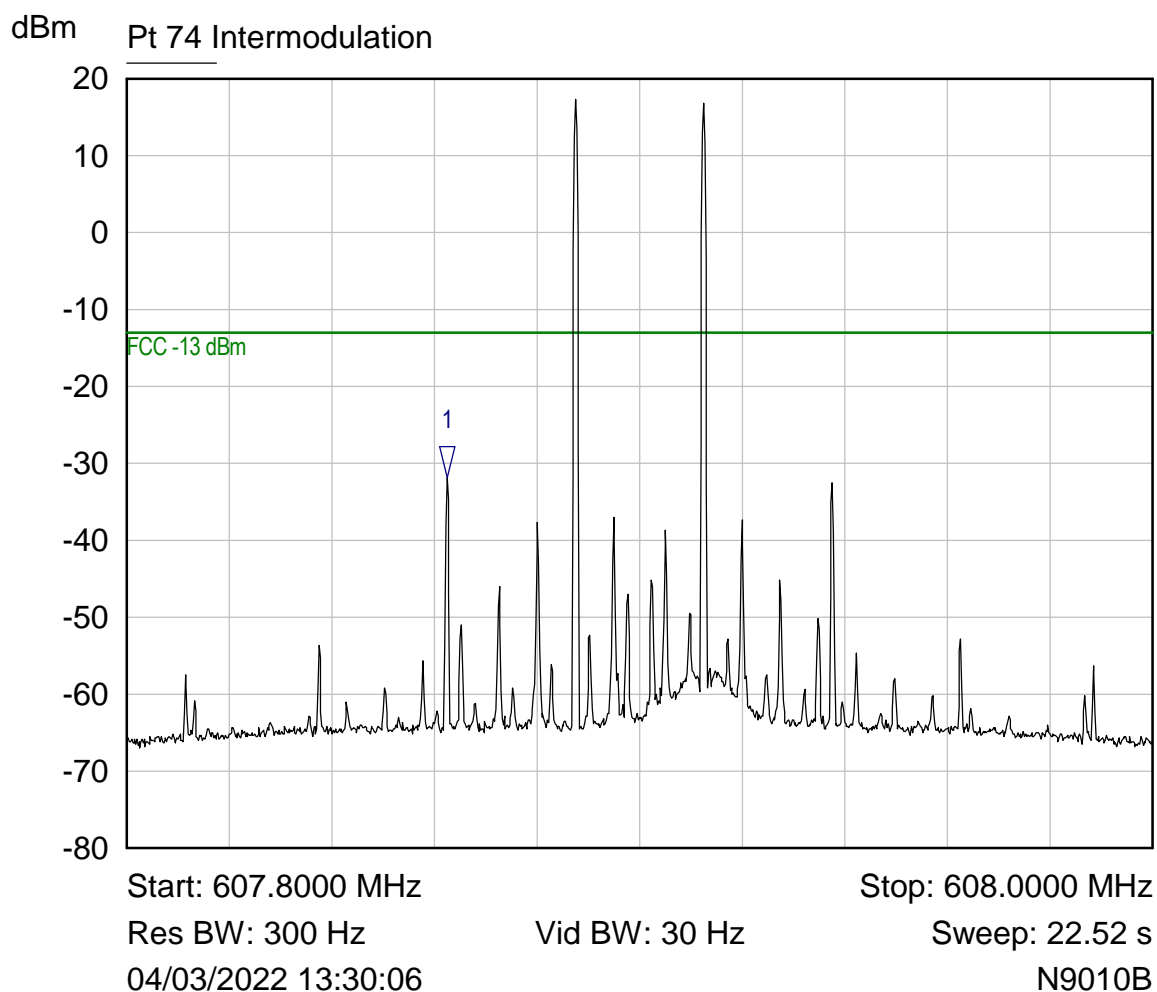
Plot of conducted emissions single Low, Mid and High channels (614-698 MHz band) 5 – 7 GHz range

6.5 Out of band dual channel emissions

Please refer to section 6.3 for Mask emissions results.

Below plots are for Narrowband dual channel tests.

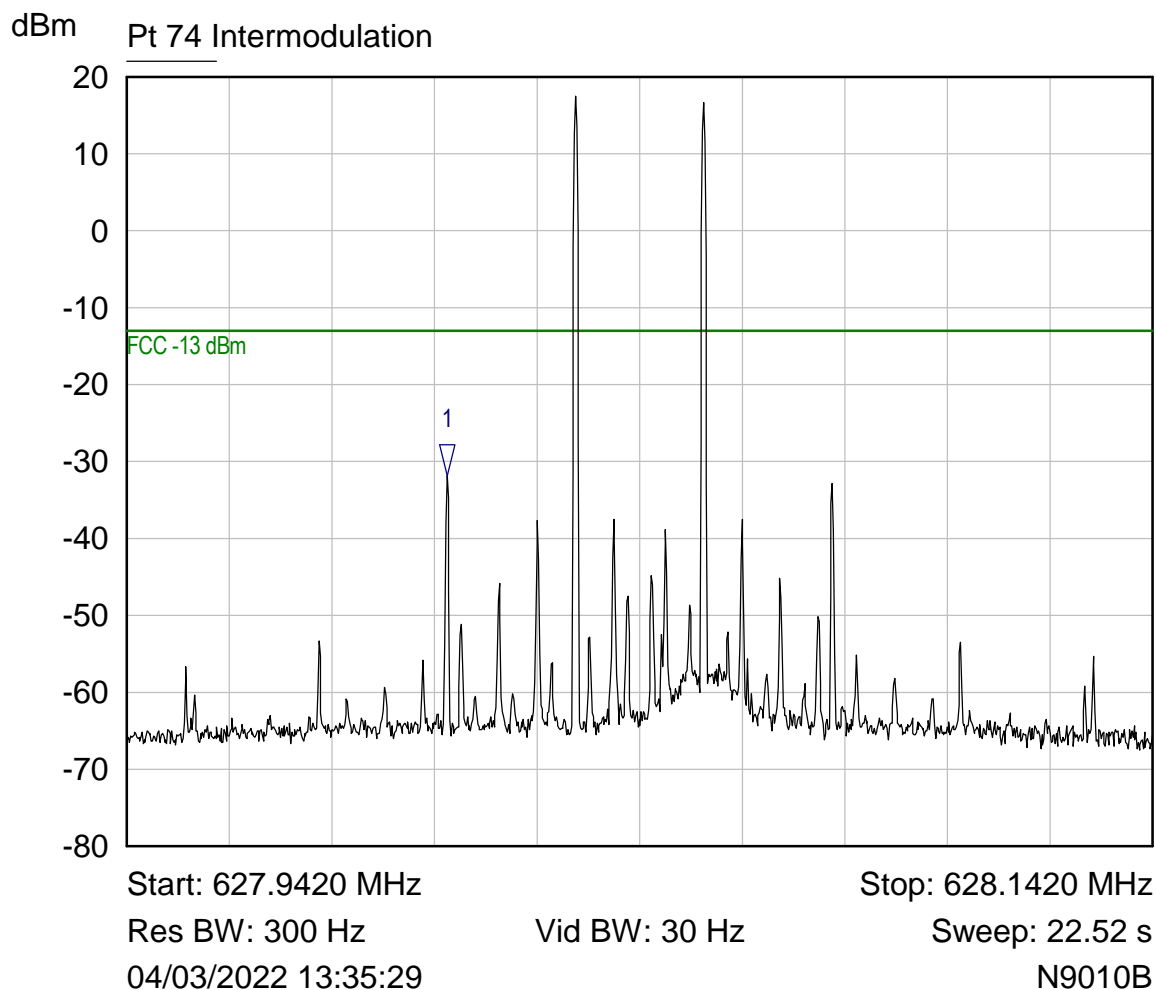
RF Parameters: Band 470-608 MHz, Power +20 dBm, Channel Spacing 25kHz, Modulation CW,
Channel 607.8875 MHz + 607.9125 MHz, Dual channel mode



| Mkr | Trace | X-Axis | Value | Notes |
|-----|-----------------------|--------------|------------|-------|
| 1 ▽ | Pt 74 Intermodulation | 607.8625 MHz | -31.88 dBm | |

Plot of 2 channel intermodulation for 470-608 MHz band
(Note: centre frequency is the 200 kHz channel nearest to f0 within the band of operation)

RF Parameters: Band 614-698 MHz, Power +20 dBm, Channel Spacing 25kHz, Modulation CW,
Channel 628.0295 MHz + 628.0545 MHz, Dual channel mode



| Mkr | Trace | X-Axis | Value | Notes |
|-----|-----------------------|--------------|------------|-------|
| 1 ▽ | Pt 74 Intermodulation | 628.0045 MHz | -31.83 dBm | |

Plot of 2 channel intermodulation for 614-698 MHz band

7 Photographs

For confidentiality purposes, photographs are not included at client's request.

8 Test equipment calibration list

The following is a list of the test equipment used by R.N. Electronics Ltd to test the unit detailed within this report. In line with our procedures, the equipment was within calibration for the period during which testing was carried out.

| RN No. | Model No. | Description | Manufacturer | Calibration date | Cal period |
|--------|--------------------------|-------------------------------------|-----------------------|------------------|------------|
| CAL07 | MWX221 | Cable N Type to SMA Blue 2m | Junflon | 14-Dec-2021 | 6 months |
| E136 | 3105 | Horn Antenna 1 - 12.5 GHz | EMCO | #02-Apr-2022 | 12 months |
| E266 | 2032 | Signal Generator 10kHz - 5.4GHz | Marconi Instruments | 24-Jan-2022 | 12 months |
| E268 | BHA 9118 | Horn Antenna 1 - 18 GHz | Schaffner | #02-Apr-2022 | 12 months |
| E296-2 | 11970A | Harmonic Mixer 26.5-40GHz | Hewlett Packard | 07-Jul-2021 | 12 months |
| E330 | 2224-20 | Horn Antenna 26.5-40GHz | Flann (FMI) | #22-Apr-2022 | 12 months |
| E411 | N9039A | 9 kHz - 1 GHz RF Filter Section | Agilent Technologies | 08-Jul-2021 | 12 months |
| E412 | E4440A | PSA 3 Hz - 26.5 GHz | Agilent Technologies | 30-Jun-2020 | 24 months |
| E463 | 8431A | Filter Band pass 2-4 GHz | Hewlett Packard | 25-Oct-2021 | 12 months |
| E478 | LQ2992/H | Filter Band pass 1-3GHz | RACAL-MESL | #11-Mar-2022 | 12 months |
| E602 | MG3692A | Signal Generator 10 MHz - 20 GHz | Anritsu | #21-Feb-2022 | 12 months |
| E621 | 360B | Filter Low Pass Filter 1200 MHz | Hewlett Packard | N/A | N/A |
| E624 | E4440A | PSA 3 Hz - 26.5 GHz | Agilent Technologies | 08-Jul-2021 | 24 months |
| E743 | 2017 4/2dB | Attenuator 4/2dB 30-1000MHz | RN Electronics | #10-Mar-2022 | 12 months |
| E777 | MG3695B | Signal Generator 8 MHz - 50 GHz | Anritsu | 14-Jun-2021 | 12 months |
| F031 | X6L120-1250-0017-0001-00 | Filter Low Pass 1250MHz | K&L Microwave Inc | N/A | N/A |
| F078 | AA18-10H | Attenuator SMA 10dB 18GHz | AtlanTecRF | 30-Jul-2021 | 12 months |
| H071 | N9010B | EXA Signal Analyser 10 Hz to 44 GHz | Keysight Technologies | 09-Nov-2020 | 24 months |
| LPE364 | CBL6112A | Antenna BiLog 30MHz - 2GHz | Chase Electronics Ltd | #28-Mar-2022 | 24 months |
| TMS82 | 8449B | Pre-Amplifier 1GHz - 26.5GHz | Agilent Technologies | 16-Dec-2021 | 12 months |

Equipment was within calibration dates for tests and has been re-calibrated since/during date of tests.

9 Auxiliary and peripheral equipment

9.1 Customer supplied equipment

| Item No. | Model No. | Description | Manufacturer | Serial No. |
|----------|-----------|-------------------------------|---------------|--------------|
| 1 | N5172B | EXG signal generator | Agilent | MY53050810 |
| 2 | N5172B | EXG signal generator | Keysight | MY53050728 |
| 3 | 15542 | 30 dB attenuator | Mini-Circuits | VUU78901032 |
| 4 | UNAT-20+ | 20 dB attenuator | Mini-Circuits | - |
| 5 | UNAT-20+ | 20 dB attenuator | Mini-Circuits | - |
| 6 | 305-0001 | UNItivity 5000 Primary Hub | Zinwave Ltd | 650110010101 |
| 7 | 305-0004 | Zinwave Secondary Hub | Zinwave Ltd | 621100002218 |
| 8 | E4433B | ESG-D signal generator | Keysight | GB38450326 |
| 9 | E4433B | ESG-D signal generator | Keysight | GB39340714 |
| 10 | - | Dual long fibre optic cables | - | - |
| 11 | - | DC power cable | - | - |
| 12 | - | Male to Male N RF cables (x4) | - | - |
| 13 | 305-0001 | UNItivity 5000 primary hub | Zinwave Ltd | 650110010102 |
| 14 | 305-0004 | Zinwave Secondary Hub | Zinwave Ltd | 620110000204 |

9.2 RN Electronics supplied equipment

| RN No. | Model No. | Description | Manufacturer | Serial No |
|--------|-------------|---------------------|--------------|-----------|
| E558 | 18N20W-30dB | Attenuator 30dB 20W | Inmet | - |

10 Condition of the equipment tested

In order for the EUT to produce the results shown within this report the following modifications, if any, were implemented.

10.1 Modifications before test

No modifications were made before test by RN Electronics Ltd.

10.2 Modifications during test

No modifications were made during test by RN Electronics Ltd.

11 Description of test sites

| | |
|-----------|--|
| Site A | Radio Laboratory and Anechoic Chamber |
| Site B | Semi-Anechoic Chamber and Control Room FCC Registration No. 293246, ISED Registration No. 5612A-4 |
| Site C | Transient Laboratory |
| Site D | Screened Room (Conducted Immunity) |
| Site E | Screened Room (Control Room for Site D) |
| Site F | Screened Room (Conducted Emissions) |
| Site G | Screened Room (Control Room for Site H) |
| Site H | 3m Semi-Anechoic Chamber (indoor OATS) FCC Registration No. 293246, ISED Registration No. 5612A-2, VCCI Registration No. 4065 |
| Site J | Transient Laboratory |
| Site K | Screened Room (Control Room for Site M) |
| Site M | 3m Semi-Anechoic Chamber (indoor OATS) FCC Registration No. 293246, ISED Registration No. 5612A-3 |
| Site N | Radio Laboratory |
| Site Q | Fully-Anechoic Chamber |
| Site OATS | 3m and 10m Open Area Test Site FCC Registration No. 293246, ISED Registration No. 5612A-1 |
| Site R | Screened Room (Conducted Immunity) |
| Site S | Safety Laboratory |
| Site T | Transient Laboratory |

RN Electronics CAB identifier as issued by Innovation, Science and Economic Development Canada is UK0002
RN Electronics CAB identifier as issued by FCC is UK0015

12 Abbreviations and units

| | | | |
|--------|--|--------|--|
| % | Percent | LBT | Listen Before Talk |
| µA/m | microAmps per metre | LO | Local Oscillator |
| µV | microVolts | mA | milliAmps |
| µW | microWatts | max | maximum |
| AC | Alternating Current | kPa | Kilopascal |
| ALSE | Absorber Lined Screened Enclosure | Mbit/s | MegaBits per second |
| AM | Amplitude Modulation | MHz | MegaHertz |
| Amb | Ambient | mic | Microphone |
| ATPC | Automatic Transmit Power Control | min | minimum |
| BER | Bit Error Rate | mm | milliMetres |
| °C | Degrees Celsius | ms | milliSeconds |
| C/I | Carrier / Interferer | mW | milliWatts |
| CEPT | European Conference of Postal and Telecommunications Administrations | NA | Not Applicable |
| COFDM | Coherent OFDM | nom | Nominal |
| CS | Channel Spacing | nW | nanoWatt |
| CW | Continuous Wave | OATS | Open Area Test Site |
| dB | decibels | OFDM | Orthogonal Frequency Division Multiplexing |
| dBµA/m | decibels relative to 1µA/m | ppm | Parts per million |
| dBµV | decibels relative to 1µV | PRBS | Pseudo Random Bit Sequence |
| dBc | decibels relative to Carrier | QAM | Quadrature Amplitude Modulation |
| dBm | decibels relative to 1mW | QPSK | Quadrature Phase Shift Keying |
| DC | Direct Current | R&TTE | Radio and Telecommunication Terminal Equipment |
| DTA | Digital Transmission Analyser | Ref | Reference |
| EIRP | Equivalent Isotropic Radiated Power | RF | Radio Frequency |
| ERP | Effective Radiated Power | RFC | Remote Frequency Control |
| EU | European Union | RSL | Received Signal Level |
| EUT | Equipment Under Test | RTP | Room Temperature and Pressure |
| FM | Frequency Modulation | RTPC | Remote Transmit Power Control |
| FSK | Frequency Shift Keying | Rx | Receiver |
| g | Grams | s | Seconds |
| GHz | GigaHertz | SINAD | Signal to Noise And Distortion |
| Hz | Hertz | Tx | Transmitter |
| IF | Intermediate Frequency | V | Volts |
| kHz | kiloHertz | | |