**ECL-TA Test Report No.:**
**2022-0016-EMC-TR-22-0028-V02_Andrew_CAP H 23/23/25T/25T F-AC-F1_FCC**

| | |
|---|---|
| Designation: | CAP H 23/23/25T/25T F-AC-F1 |
| Manufacturer: | Andrew |
| Serial No(s): | BGCHFF2136003 |
| ID No. | 7835476-0006 Rev: 00 |
| | |
| Test Specification(s): | ANSI 63.26:2015<br>FCC Rules and Regulations al listed in 47 CFR, Part 20 and Part 27:2022-01-31 |
| | |
| Test Plan: | Measurement of Band 41 (BRS) and Band 30 (WCS 2300) downlink. |
| | |
| **Test Result:** | **Passed** |

| | | | |
|---|---|---|---|
| Date of issue: | 2022-03-07 | | |
| Version: | 02 | Technical Reviewer: | Thomas Hufnagel<br>Test Engineer<br>Digitally signed by Thomas Hufnagel<br>Date: 2022.03.07 14:05:10 +01'00' |
| Date of delivery: | 2022-01 | | |
| Performance date: | 2022-01-27 – 2021-01-31 | Report Reviewer: | Thomas Gerngroß<br>Test Engineer<br>Digitally signed by Thomas Gerngroß<br>DN: cn=Thomas Gerngroß, o=Bureau Veritas CPS Germany GmbH, ou=ECL, email=thomas.gerngross@bureauveritas.com, c=DE<br>Date: 2022.03.07 13:59:51 +01'00' |

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Table of Contents

# 1 Applied Standards and Test Summary

## 1.1 CFR Applied Standards

**Type of Authorization**
Certification for an Industrial Signal Booster.

**Applicable FCC Rules**

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 and 20, 27, (01/31/2022 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 20, Commercial Mobiles Services

§ 20.21 Signal Boosters

Part 27; Miscellaneous Wireless Communications Services
Subpart C – Technical standards

§ 27.50 – Power and duty cycle limits
§ 27.53 – Emission limits

The tests were selected and performed with reference to:

- FCC Public Notice 935210 applying "Signal Boosters Basic Certification Requirements" 935210 D02 v04r02, 2019-04-15.
- FCC Public Notice 935210 applying "Measurement guidance for industrial and non-consumer signal booster, repeater and amplifier devices" 935210 D05 v01r04, 2020-04-03.
- FCC Public Notice 971168 applying "Measurement guidance for certification of licensed digital transmitters" 971168 D01 v03r01,2018-04-09
- ANSI C63.26:2015
- ANSI C63.4:2014

**Summary Test Results:**

**The EUT complied with all performed tests as listed in chapter 1.3 Measurement Summary / Signatures.**

## 1.2 FCC-IC Correlation Table

**Correlation of measurement requirements for Industrial Signal Booster from FCC**

| Measurement | FCC Reference |
|---|---|
| Conducted spurious Emission at Antenna Terminal | §2.1051<br>§27.53 |
| Field strength of spurious radiation | §2.1053<br>§27.53 |

## 1.3 Measurement Summary / Signatures

**47 CFR CHAPTER I FCC PART 27 Subpart C [Base Stations/Repeater]** **§2.1051, §27.53**

Conducted spurious emissions at antenna terminals
The measurement was performed according to ANSI C63.26 **Final Result**

| **OP-Mode**<br>Frequency Band, Test Frequency, Direction, Signal Type | |
|---|---|
| Band 41 BRS (LBS), high, RF downlink, Narrowband | Passed |
| Band 41 BRS (LBS), high, RF downlink, Wideband | Passed |
| Band 41 BRS (LBS), low, RF downlink, Narrowband | Passed |
| Band 41 BRS (LBS), low, RF downlink, Wideband | Passed |
| Band 41 BRS (LBS), mid, RF downlink, Narrowband | Passed |
| Band 41 BRS (LBS), mid, RF downlink, Wideband | Passed |
| Band 41 BRS (MBS), high, RF downlink, Narrowband | Passed |
| Band 41 BRS (MBS), high, RF downlink, Wideband | Passed |
| Band 41 BRS (MBS), low, RF downlink, Narrowband | Passed |
| Band 41 BRS (MBS), low, RF downlink, Wideband | Passed |
| Band 41 BRS (MBS), mid, RF downlink, Narrowband | Passed |
| Band 41 BRS (MBS), mid, RF downlink, Wideband | Passed |
| Band 41 BRS (UBS), high, RF downlink, Narrowband | Passed |
| Band 41 BRS (UBS), high, RF downlink, Wideband | Passed |
| Band 41 BRS (UBS), low, RF downlink, Narrowband | Passed |
| Band 41 BRS (UBS), low, RF downlink, Wideband | Passed |
| Band 41 BRS (UBS), mid, RF downlink, Narrowband | Passed |
| Band 41 BRS (UBS), mid, RF downlink, Wideband | Passed |
| Band 30 WCS 2300, high, RF downlink, Narrowband | Passed |
| Band 30 WCS 2300, high, RF downlink, Wideband | Passed |
| Band 30 WCS 2300, low, RF downlink, Narrowband | Passed |
| Band 30 WCS 2300, low, RF downlink, Wideband | Passed |
| Band 30 WCS 2300, mid, RF downlink, Narrowband | Passed |
| Band 30 WCS 2300, mid, RF downlink, Wideband | Passed |

**47 CFR CHAPTER I FCC PART 27 Subpart C [Base Stations/Repeater]** **§2.1053, §27.53**

Field strength of spurious radiation
The measurement was performed according to ANSI C63.26 and ANSI C63.4 **Final Result**

**OP-Mode**

| Frequency Band, Test Frequency, Direction | |
|---|---|
| Band 41 BRS (MBS), high, RF downlink | Passed |
| Band 41 BRS (MBS), low, RF downlink | Passed |
| Band 41 BRS (MBS), mid, RF downlink | Passed |
| Band 30 WCS, high, RF downlink | Passed |
| Band 30 WCS, low, RF downlink | Passed |
| Band 30 WCS, mid, RF downlink | Passed |

The test case frequency stability was not performed, since the EUT is not equipped with signal processing capabilities.

| **Report version control** | | | |
|---|---|---|---|
| **Version** | **Release date** | **Change Description** | **Version validity** |
| Initial (V01) | 2022-02-11 | -- | unvalid |
| V02 | 2022-03-07 | Supplement of note for using 10 m distance at the measurement "Field strength of spurious radiation" in the frequency range of 30 MHz up to 1 GHz. | valid |

# 2 Administrative Data

## 2.1 Testing Laboratory

| | |
|---|---|
| Company Name: | Bureau Veritas CPS Germany GmbH |
| Address: | Thurn-und-Taxis-Straße 18<br>90411 Nürnberg<br>Germany |

The test facility is accredited by the following accreditation organisation:

| | |
|---|---|
| Laboratory accreditation no: | DAkkS D-PL-12024-06-03,<br>DAkkS D-PL-12024-06-04<br>BNetz-CAB-19/21-20 |
| FCC Designation Number: | DE0023 |
| FCC Test Firm Registration: | 366481 |
| ISED CAB identifier: | DE0016 |
| Responsible for accreditation scope: | Mr. Florian Mosandl |

## 2.2 Project Data

| | |
|---|---|
| Responsible for testing and report: | Mr. Thomas Hufnagel; Mr. Thomas Gerngroß |
| Employees who performed the tests: | Mr. Thomas Hufnagel |

## 2.3 Applicant Data

| | |
|---|---|
| Company Name: | Commscope<br>Andrew Wireless Systems GmbH |
| Address: | Industriering 10<br>86675 Buchdorf Germany |
| Contact Person: | Mr. Frank Futter |

## 2.4 Manufacturer Data

| | |
|---|---|
| Company Name: | Please see applicant data. |

# 3 Test Object Data

## 3.1 General EUT Description

| | |
|---|---|
| Kind of Device product description | Cellular Repeater |
| Product name | Cellular Repeater |
| Type | ION-E System<br>CAP H 23/23/25T/25T F-AC-F1-APE |
| **Declared EUT data by the supplier** | |
| General Product Description | The EUT is an industrial signal booster supporting the following:<br>Band 30 (WCS-2300): 2350 – 2360 MHz<br>Band 41 (BRS-2500), Broadband Radio Service:<br>● Lower Band Segment (LBS): 2496- 2568 MHz<br>● Middle Band Segment (MBS): 2572 – 2614 MHz<br>● Upper Band Segment (UBS): 2618 – 2690 MHz<br><br>A RF operation is only supported for the downlink. |
| Booster Type | Industrial Signal Booster |
| Voltage Type | AC |
| Voltage Level | 100 to 240 V |
| Maximum Output Donor Port [Uplink] | - |
| Maximum Output Server Port [Downlink] (measured) | Band 41 (BRS-2500), Broadband Radio Service:<br>● Lower Band Segment (LBS): 2496- 2568 MHz<br>● Middle Band Segment (MBS): 2572 – 2614 MHz<br>● Upper Band Segment (UBS): 2618 – 2690 MHz<br>Band 30 (WCS-2300): |
| Maximum Gain [Uplink] | - |
| Maximum Gain [Downlink] (measured) | Band 41 (BRS-2500), Broadband Radio Service:<br>● Lower Band Segment (LBS): 2496- 2568 MHz<br>● Middle Band Segment (MBS): 2572 – 2614 MHz<br>● Upper Band Segment (UBS): 2618 – 2690 MHz<br>Band 30 (WCS-2300): |

**The main components of the EUT are listed and described in chapter 3.2 EUT Main components.**

## 3.2 EUT Main components

| **Sample Parameter** | **Value** |
|---|---|
| Serial Number | BGCHFF2136003 |
| HW Version | 7835476-0006 Rev: 00; CAP H 23/23/25T/25T F-AC-F1 |
| SW Version | 4.10.0.10 |
| Comment | - |

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

## 3.3 Ancillary Equipment

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

| **Device** | **Details (Manufacturer, Type Model, OUT Code)** | **Description** |
|---|---|---|
| - | - | - |

## 3.4 Auxiliary Equipment

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

| **Device** | **Details (Manufacturer, S/N)** | **Description** |
|---|---|---|
| AUX1 | GE Energy, 14CS12226993;<br>Cherokee International, psu_12-1_0_1 and psu_1_0 | Power Supply |
| AUX2 | Commscope, SZAEAJ1819A0001 | Subrack |

Explanations of abbreviations:

LBS: lower band segment: This is the BRS band with the customer´s definition "BRS Low"
MBS: middle band segment: This is the BRS band with the customer´s definition "BRS Mid"
UBS: upper band segment: This is the BRS band with the customer´s definition "BRS High"

## 3.5 EUT Setups

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

## 3.6 Operating Modes

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

### 3.6.1 Test Channels

| Band | Direction | Lower Frequency Band Edge [MHz] | Upper Frequency Band Edge [MHz] | Center Frequency [MHz] | Port |
|---|---|---|---|---|---|
| 41 (BRS (UBS) | downlink | 2618 | 2690 | 2654 | Donor |
| 41 (BRS (MBS) | downlink | 2572 | 2614 | 2593 | Donor |
| 41 (BRS (LBS) | downlink | 2496 | 2568 | 2532 | Donor |
| 30 (WCS) | downlink | 2350 | 2360 | 2355 | Donor |

# 4 General Remarks

This DUT version has only changes in the hardware control but not to the RF paths. Therefore only repeating of the tests "Conducted spurious emissions at antenna terminals" and "Field strength of spurious radiation" are necessary and done. This test report supplements the main report "ECL-TA Test Report No.: 19-001" with the DUT type FCC number "FCC ID XS5-CAPH2325".

Unless otherwise noted the tests are done with antenna output port ANT 1 except at determining the output level of the output ports ANT 1 and ANT 2 together (MIMO) at the point "Effective Radiated Power, mean output power and zone enhancer gain".

At the measuring point "Field strength of spurious radiation" the two output ports ANT 1 and ANT 2 are together in function according KDB 935210 D02 v04r02 chapter II (o) (2).

Explanations of abbreviations for the BRS frequency bands:

LBS: lower band segment: This is the BRS band with the customer´s definition "BRS Low"
MBS: middle band segment: This is the BRS band with the customer´s definition "BRS Mid"
UBS: upper band segment: This is the BRS band with the customer´s definition "BRS High"

# 5 Test Results

## 5.1 Conducted spurious emissions at antenna terminals

Standard FCC Part §2.1051, §27.53

**The test was performed according to:**
ANSI C63.26

**Test date**: 2022-01-27

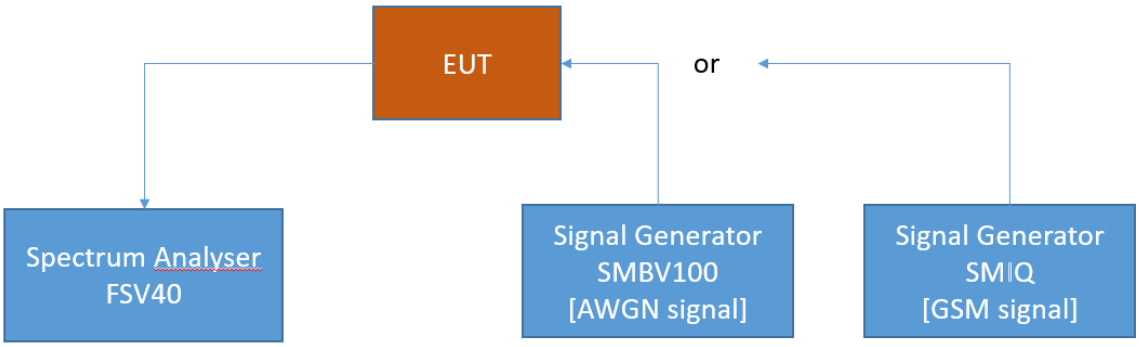
**Environmental conditions**: 23 ° C; 33% r. F.

**Test engineer**: Thomas Hufnagel

### 5.1.1 Test Description

This test case is intended to demonstrate compliance to the signal booster power and gain limits and requirements for industrial signal boosters.

The EUT was connected to the test setup according to the following diagram:




FCC Part 22/24/27/90 Industrial signal booster – Test Setup; RF Output Power / Gain

The attenuation of the measuring and stimulus path are known for each measured frequency and are considered.

The Spectrum Analyzer settings can be directly found in the measurement diagrams.

### 5.1.2 Test Requirements / Limits

**FCC Part 2.1051; Measurement required: Spurious emissions at antenna terminals:**

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

**Part 27; Miscellaneous Wireless Communication Services**

**Subpart C – Technical standards**

**§27.53 – Emission limits**

**Band 30 WCS:**

(a) For operations in the 2305-2320 MHz band and the 2345-2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(1) For base and fixed stations' operations in the 2305-2320 MHz band and the 2345-2360 MHz band:

(i) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than 75 + 10 log (P) dB on all frequencies between 2320 and 2345 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 70 + 10 log (P) dB on all frequencies between 2287.5 and 2300 MHz, 72 + 10 log (P) dB on all frequencies between 2285 and 2287.5 MHz, and 75 + 10 log (P) dB below 2285 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2362.5 MHz, 55 + 10 log (P) dB on all frequencies between 2362.5 and 2365 MHz, 70 + 10 log (P) dB on all frequencies between 2365 and 2367.5 MHz, 72 + 10 log (P) dB on all frequencies between 2367.5 and 2370 MHz, and 75 + 10 log (P) dB above 2370 MHz.

(2) For fixed customer premises equipment (CPE) stations operating in the 2305-2320 MHz band and the 2345-2360 MHz band transmitting with more than 2 watts per 5 megahertz average EIRP:

(i) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than 75 + 10 log (P) dB on all frequencies between 2320 and 2345 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 70 + 10 log (P) dB on all frequencies between 2287.5 and 2300 MHz, 72 + 10 log (P) dB on all frequencies between 2285 and 2287.5 MHz, and 75 + 10 log (P) dB below 2285 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2362.5 MHz, 55 + 10 log (P) dB on all frequencies between 2362.5 and 2365 MHz, 70 + 10 log (P) dB on all frequencies between 2365 and 2367.5 MHz, 72 + 10 log (P) dB on all frequencies between 2367.5 and 2370 MHz, and 75 + 10 log (P) dB above 2370 MHz.

(3) For fixed CPE stations operating in the 2305-2320 MHz and 2345-2360 MHz bands transmitting with 2 watts per 5 megahertz average EIRP or less:

(i) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

(4) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(i) By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

(5) ***Measurement procedure.*** Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the channel blocks at 2305, 2310, 2315, 2320, 2345, 2350, 2355, and 2360 MHz, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.,* 1 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(6) [Reserved]

(7) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power;

(8) Waiver requests of any of the out-of-band emission limits in paragraphs (a)(1) through (a)(7) of this section shall be entertained only if interference protection equivalent to that afforded by the limits is shown;

(9) [Reserved]

(10) The out-of-band emissions limits in paragraphs (a)(1) through (a)(3) of this section may be modified by the private contractual agreement of all affected licensees, who must maintain a copy of the agreement in their station files and disclose it to prospective assignees, transferees, or spectrum lessees and, upon request, to the Commission.

**Band 41BRS (LBS/MBS/UBS):**

(m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

(1) Prior to the transition, and thereafter, solely within the MBS, for analog operations with an EIRP in excess of −9 dBW, the signal shall be attenuated at the channel edges by at least 38 dB relative to the peak visual carrier, then linearly sloping from that level to at least 60 dB of attenuation at 1 MHz below the lower band edge and 0.5 MHz above the upper band edge, and attenuated at least 60 dB at all other frequencies.

(2) For digital base stations, the attenuation shall be not less than 43 + 10 log (P) dB, unless a documented interference complaint is received from an adjacent channel licensee with an overlapping Geographic Service Area. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS No. 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

### 5.1.3 Test Protocol

**Band 41. BRS (LBS). downlink**

| Test Frequency | Signal Type | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Limit [dBm] | Margin to Limit [dB] |
|---|---|---|---|---|---|---|---|
| low | Narrowband | 0.01041 | -51.4 | RMS | 1 | -33 | 18.4 |
| low | Narrowband | 0.15748 | -44.9 | RMS | 10 | -23 | 21.9 |
| low | Narrowband | 126.3 | -34.9 | RMS | 100 | -13 | 21.9 |
| low | Narrowband | 893.4 | -23.9 | RMS | 1000 | -13 | 10.9 |
| low | Narrowband | 2151.9 | -26.6 | RMS | 1000 | -13 | 13.6 |
| low | Narrowband | 2494.8 | -34.4 | RMS | 100 | -23 | 11.4 |
| low | Narrowband | 2575.6 | -35.1 | RMS | 100 | -23 | 12.1 |
| low | Narrowband | 6885.5 | -21.2 | RMS | 1000 | -13 | 8.2 |
| low | Narrowband | 19980 | -21.0 | RMS | 1000 | -13 | 8.0 |
| low | Narrowband | 20345 | -19.9 | RMS | 1000 | -13 | 6.9 |
| mid | Narrowband | 0.00902 | -51.1 | RMS | 1 | -33 | 18.1 |
| mid | Narrowband | 0.06250 | -44.9 | RMS | 10 | -23 | 21.9 |
| mid | Narrowband | 70.4 | -35.5 | RMS | 100 | -13 | 22.5 |
| mid | Narrowband | 899.9 | -25.9 | RMS | 1000 | -13 | 12.9 |
| mid | Narrowband | 1997.9 | -26.8 | RMS | 1000 | -13 | 13.8 |
| mid | Narrowband | 2487.2 | -36.1 | RMS | 100 | -13 | 23.1 |
| mid | Narrowband | 2576.9 | -35.9 | RMS | 100 | -13 | 22.9 |
| mid | Narrowband | 6928.5 | -21.3 | RMS | 1000 | -13 | 8.3 |
| mid | Narrowband | 19525 | -20.6 | RMS | 1000 | -13 | 7.6 |
| mid | Narrowband | 20150 | -20.3 | RMS | 1000 | -13 | 7.3 |
| high | Narrowband | 0.00902 | -50.5 | RMS | 1 | -33 | 17.5 |
| high | Narrowband | 0.05750 | -45.4 | RMS | 10 | -23 | 22.4 |
| high | Narrowband | 122.6 | -35.9 | RMS | 100 | -13 | 22.9 |
| high | Narrowband | 889.4 | -24.8 | RMS | 1000 | -13 | 11.8 |
| high | Narrowband | 2004.9 | -26.4 | RMS | 1000 | -13 | 13.4 |
| high | Narrowband | 2490.1 | -34.2 | RMS | 100 | -23 | 11.2 |
| high | Narrowband | 2569.1 | -32.3 | RMS | 100 | -23 | 9.3 |
| high | Narrowband | 6879.5 | -21.2 | RMS | 1000 | -13 | 8.2 |
| high | Narrowband | 19545 | -20.2 | RMS | 1000 | -13 | 7.2 |
| high | Narrowband | 20284 | -20.2 | RMS | 1000 | -13 | 7.2 |

**Band 41. BRS (LBS). downlink**

| Test Frequency | Signal Type | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Limit [dBm] | Margin to Limit [dB] |
|---|---|---|---|---|---|---|---|
| low | Wideband | 0.011519 | -49.8 | RMS | 1 | -33 | 16.8 |
| low | Wideband | 0.10749 | -43.9 | RMS | 10 | -23 | 20.9 |
| low | Wideband | 119.6 | -35.6 | RMS | 100 | -13 | 22.6 |
| low | Wideband | 890.9 | -24.4 | RMS | 1000 | -13 | 11.4 |
| low | Wideband | 2081.9 | -27.0 | RMS | 1000 | -13 | 14.0 |
| low | Wideband | 2494.7 | -31.7 | RMS | 100 | -23 | 8.7 |
| low | Wideband | 2573.6 | -36.5 | RMS | 100 | -23 | 13.5 |
| low | Wideband | 6861.5 | -21.1 | RMS | 1000 | -13 | 8.1 |
| low | Wideband | 19571 | -20.9 | RMS | 1000 | -13 | 7.9 |
| low | Wideband | 20318 | -20.1 | RMS | 1000 | -13 | 7.1 |
| mid | Wideband | 0.01058 | -50.1 | RMS | 1 | -33 | 17.1 |
| mid | Wideband | 0.06750 | -42.4 | RMS | 10 | -23 | 19.4 |
| mid | Wideband | 120.9 | -35.5 | RMS | 100 | -13 | 22.5 |
| mid | Wideband | 891.9 | -25.1 | RMS | 1000 | -13 | 12.1 |
| mid | Wideband | 2208.3 | -27.0 | RMS | 1000 | -13 | 14.0 |
| mid | Wideband | 2489.7 | -36.0 | RMS | 100 | -13 | 23.0 |
| mid | Wideband | 2573.1 | -35.9 | RMS | 100 | -13 | 22.9 |
| mid | Wideband | 6837.5 | -21.1 | RMS | 1000 | -13 | 8.1 |
| mid | Wideband | 19960 | -20.7 | RMS | 1000 | -13 | 7.7 |
| mid | Wideband | 20335 | -20.0 | RMS | 1000 | -13 | 7.0 |
| high | Wideband | 0.01164 | -50.0 | RMS | 1 | -33 | 17.0 |
| high | Wideband | 0.15248 | -42.9 | RMS | 10 | -23 | 19.9 |
| high | Wideband | 68.6 | -35.3 | RMS | 100 | -13 | 22.3 |
| high | Wideband | 710.5 | -24.7 | RMS | 1000 | -13 | 11.7 |
| high | Wideband | 1735.5 | -26.7 | RMS | 1000 | -13 | 13.7 |
| high | Wideband | 2493.9 | -36.1 | RMS | 100 | -23 | 13.1 |
| high | Wideband | 2569.0 | -33.6 | RMS | 100 | -23 | 10.6 |
| high | Wideband | 6923.5 | -21.2 | RMS | 1000 | -13 | 8.2 |
| high | Wideband | 19540 | -20.8 | RMS | 1000 | -13 | 7.8 |
| high | Wideband | 20314 | -20.3 | RMS | 1000 | -13 | 7.3 |

**Band 41. BRS (MBS). downlink**

| Test Frequency | Signal Type | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Limit [dBm] | Margin to Limit [dB] |
|---|---|---|---|---|---|---|---|
| low | Narrowband | 0.01009 | -50.7 | RMS | 1 | -33 | 17.7 |
| low | Narrowband | 0.08749 | -45.0 | RMS | 10 | -23 | 22.0 |
| low | Narrowband | 67.0 | -35.2 | RMS | 100 | -13 | 22.2 |
| low | Narrowband | 892.4 | -25.1 | RMS | 1000 | -13 | 12.1 |
| low | Narrowband | 2550.3 | -24.8 | RMS | 1000 | -13 | 11.8 |
| low | Narrowband | 2570.9 | -32.9 | RMS | 100 | -23 | 9.9 |
| low | Narrowband | 2618.6 | -35.5 | RMS | 100 | -23 | 12.5 |
| low | Narrowband | 6861.0 | -20.9 | RMS | 1000 | -13 | 7.9 |
| low | Narrowband | 19551 | -21.1 | RMS | 1000 | -13 | 8.1 |
| low | Narrowband | 20302 | -20.2 | RMS | 1000 | -13 | 7.2 |
| mid | Narrowband | 0.00955 | -50.3 | RMS | 1 | -33 | 17.3 |
| mid | Narrowband | 0.05250 | -45.3 | RMS | 10 | -23 | 22.3 |
| mid | Narrowband | 123.0 | -34.3 | RMS | 100 | -13 | 21.3 |
| mid | Narrowband | 895.9 | -24.7 | RMS | 1000 | -13 | 11.7 |
| mid | Narrowband | 2550.3 | -25.3 | RMS | 1000 | -13 | 12.3 |
| mid | Narrowband | 2566.7 | -34.6 | RMS | 100 | -13 | 21.6 |
| mid | Narrowband | 2620.7 | -35.9 | RMS | 100 | -13 | 22.9 |
| mid | Narrowband | 6981.0 | -21.3 | RMS | 1000 | -13 | 8.3 |
| mid | Narrowband | 19957 | -20.6 | RMS | 1000 | -13 | 7.6 |
| mid | Narrowband | 20356 | -19.7 | RMS | 1000 | -13 | 6.7 |
| high | Narrowband | 0.00992 | -50.6 | RMS | 1 | -33 | 17.6 |
| high | Narrowband | 0.05750 | -44.7 | RMS | 10 | -23 | 21.7 |
| high | Narrowband | 118.9 | -35.9 | RMS | 100 | -13 | 22.9 |
| high | Narrowband | 854.4 | -24.8 | RMS | 1000 | -13 | 11.8 |
| high | Narrowband | 2514.3 | -24.5 | RMS | 1000 | -13 | 11.5 |
| high | Narrowband | 2565.7 | -34.6 | RMS | 100 | -23 | 11.6 |
| high | Narrowband | 2615.1 | -32.7 | RMS | 100 | -23 | 9.7 |
| high | Narrowband | 6917.0 | -20.7 | RMS | 1000 | -13 | 7.7 |
| high | Narrowband | 19550 | -20.7 | RMS | 1000 | -13 | 7.7 |
| high | Narrowband | 20280 | -19.8 | RMS | 1000 | -13 | 6.8 |

**Band 41. BRS (MBS). downlink**

| Test Frequency | Signal Type | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Limit [dBm] | Margin to Limit [dB] |
|---|---|---|---|---|---|---|---|
| low | Wideband | 0.009266 | -49.4 | RMS | 1 | -33 | 16.4 |
| low | Wideband | 0.08250 | -43.4 | RMS | 10 | -23 | 20.4 |
| low | Wideband | 66.8 | -35.1 | RMS | 100 | -13 | 22.1 |
| low | Wideband | 850.9 | -24.3 | RMS | 1000 | -13 | 11.3 |
| low | Wideband | 2550.3 | -24.4 | RMS | 1000 | -13 | 11.4 |
| low | Wideband | 2570.2 | -30.9 | RMS | 100 | -23 | 7.9 |
| low | Wideband | 2615.2 | -34.4 | RMS | 100 | -23 | 11.4 |
| low | Wideband | 6944.5 | -21.0 | RMS | 1000 | -13 | 8.0 |
| low | Wideband | 19573 | -20.8 | RMS | 1000 | -13 | 7.8 |
| low | Wideband | 20301 | -20.0 | RMS | 1000 | -13 | 7.0 |
| mid | Wideband | 0.00902 | -48.7 | RMS | 1 | -33 | 15.7 |
| mid | Wideband | 0.14748 | -43.6 | RMS | 10 | -23 | 20.6 |
| mid | Wideband | 119.2 | -35.6 | RMS | 100 | -13 | 22.6 |
| mid | Wideband | 847.9 | -24.6 | RMS | 1000 | -13 | 11.6 |
| mid | Wideband | 2550.8 | -26.0 | RMS | 1000 | -13 | 13.0 |
| mid | Wideband | 2566.6 | -35.0 | RMS | 100 | -13 | 22.0 |
| mid | Wideband | 2615.4 | -35.4 | RMS | 100 | -13 | 22.4 |
| mid | Wideband | 6861.0 | -20.9 | RMS | 1000 | -13 | 7.9 |
| mid | Wideband | 19542 | -20.7 | RMS | 1000 | -13 | 7.7 |
| mid | Wideband | 20270 | -19.9 | RMS | 1000 | -13 | 6.9 |
| high | Wideband | 0.01414 | -50.7 | RMS | 1 | -33 | 17.7 |
| high | Wideband | 0.15748 | -41.6 | RMS | 10 | -23 | 18.6 |
| high | Wideband | 65.9 | -35.6 | RMS | 100 | -13 | 22.6 |
| high | Wideband | 709.0 | -25.5 | RMS | 1000 | -13 | 12.5 |
| high | Wideband | 2550.3 | -25.8 | RMS | 1000 | -13 | 12.8 |
| high | Wideband | 2564.5 | -35.2 | RMS | 100 | -23 | 12.2 |
| high | Wideband | 2615.0 | -32.0 | RMS | 100 | -23 | 9.0 |
| high | Wideband | 6889.5 | -20.9 | RMS | 1000 | -13 | 7.9 |
| high | Wideband | 19562 | -20.5 | RMS | 1000 | -13 | 7.5 |
| high | Wideband | 20272 | -20.5 | RMS | 1000 | -13 | 7.5 |

**Band 41. BRS (UBS). downlink**

| Test Frequency | Signal Type | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Limit [dBm] | Margin to Limit [dB] |
|---|---|---|---|---|---|---|---|
| low | Narrowband | 0.00972 | -51.0 | RMS | 1 | -33 | 18.0 |
| low | Narrowband | 0.06750 | -43.3 | RMS | 10 | -23 | 20.3 |
| low | Narrowband | 71.5 | -35.8 | RMS | 100 | -13 | 22.8 |
| low | Narrowband | 854.9 | -25.5 | RMS | 1000 | -13 | 12.5 |
| low | Narrowband | 2550.3 | -25.2 | RMS | 1000 | -13 | 12.2 |
| low | Narrowband | 2616.9 | -32.5 | RMS | 100 | -23 | 9.5 |
| low | Narrowband | 2691.6 | -36.4 | RMS | 100 | -23 | 13.4 |
| low | Narrowband | 6875.0 | -20.7 | RMS | 1000 | -13 | 7.7 |
| low | Narrowband | 19589 | -20.3 | RMS | 1000 | -13 | 7.3 |
| low | Narrowband | 20307 | -19.9 | RMS | 1000 | -13 | 6.9 |
| mid | Narrowband | 0.01095 | -50.3 | RMS | 1 | -33 | 17.3 |
| mid | Narrowband | 0.15248 | -44.3 | RMS | 10 | -23 | 21.3 |
| mid | Narrowband | 122.6 | -35.2 | RMS | 100 | -13 | 22.2 |
| mid | Narrowband | 891.4 | -24.5 | RMS | 1000 | -13 | 11.5 |
| mid | Narrowband | 2508.8 | -25.9 | RMS | 1000 | -13 | 12.9 |
| mid | Narrowband | 2611.5 | -36.3 | RMS | 100 | -13 | 23.3 |
| mid | Narrowband | 2695.4 | -36.0 | RMS | 100 | -13 | 23.0 |
| mid | Narrowband | 6853.5 | -20.9 | RMS | 1000 | -13 | 7.9 |
| mid | Narrowband | 19932 | -20.7 | RMS | 1000 | -13 | 7.7 |
| mid | Narrowband | 20272 | -20.4 | RMS | 1000 | -13 | 7.4 |
| high | Narrowband | 0.00992 | -50.3 | RMS | 1 | -33 | 17.3 |
| high | Narrowband | 0.05250 | -44.8 | RMS | 10 | -23 | 21.8 |
| high | Narrowband | 326.7 | -35.2 | RMS | 100 | -13 | 22.2 |
| high | Narrowband | 889.9 | -24.3 | RMS | 1000 | -13 | 11.3 |
| high | Narrowband | 2490.3 | -23.8 | RMS | 1000 | -13 | 10.8 |
| high | Narrowband | 2616.7 | -35.3 | RMS | 100 | -23 | 12.3 |
| high | Narrowband | 2691.1 | -33.4 | RMS | 100 | -23 | 10.4 |
| high | Narrowband | 6888.0 | -20.9 | RMS | 1000 | -13 | 7.9 |
| high | Narrowband | 19567 | -20.0 | RMS | 1000 | -13 | 7.0 |
| high | Narrowband | 20308 | -20.2 | RMS | 1000 | -13 | 7.2 |

**Band 41. BRS (UBS). downlink**

| Test Frequency | Signal Type | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Limit [dBm] | Margin to Limit [dB] |
|---|---|---|---|---|---|---|---|
| low | Wideband | 0.00902 | -49.0 | RMS | 1 | -33 | 16.0 |
| low | Wideband | 0.05250 | -42.4 | RMS | 10 | -23 | 19.4 |
| low | Wideband | 121.2 | -35.5 | RMS | 100 | -13 | 22.5 |
| low | Wideband | 710.0 | -24.9 | RMS | 1000 | -13 | 11.9 |
| low | Wideband | 2530.3 | -25.5 | RMS | 1000 | -13 | 12.5 |
| low | Wideband | 2616.7 | -27.3 | RMS | 100 | -23 | 4.3 |
| low | Wideband | 2694.5 | -35.0 | RMS | 100 | -23 | 12.0 |
| low | Wideband | 6899.0 | -21.0 | RMS | 1000 | -13 | 8.0 |
| low | Wideband | 19558 | -20.3 | RMS | 1000 | -13 | 7.3 |
| low | Wideband | 20307 | -19.4 | RMS | 1000 | -13 | 6.4 |
| mid | Wideband | 0.00910 | -49.5 | RMS | 1 | -33 | 16.5 |
| mid | Wideband | 0.13749 | -42.5 | RMS | 10 | -23 | 19.5 |
| mid | Wideband | 118.9 | -35.3 | RMS | 100 | -13 | 22.3 |
| mid | Wideband | 893.9 | -25.5 | RMS | 1000 | -13 | 12.5 |
| mid | Wideband | 2550.3 | -25.4 | RMS | 1000 | -13 | 12.4 |
| mid | Wideband | 2611.7 | -35.5 | RMS | 100 | -13 | 22.5 |
| mid | Wideband | 2692.5 | -35.9 | RMS | 100 | -13 | 22.9 |
| mid | Wideband | 6806.5 | -21.3 | RMS | 1000 | -13 | 8.3 |
| mid | Wideband | 19579 | -20.6 | RMS | 1000 | -13 | 7.6 |
| mid | Wideband | 20115 | -20.0 | RMS | 1000 | -13 | 7.0 |
| high | Wideband | 0.00955 | -49.5 | RMS | 1 | -33 | 16.5 |
| high | Wideband | 0.14748 | -42.9 | RMS | 10 | -23 | 19.9 |
| high | Wideband | 65.9 | -36.1 | RMS | 100 | -13 | 23.1 |
| high | Wideband | 850.4 | -24.7 | RMS | 1000 | -13 | 11.7 |
| high | Wideband | 2587.8 | -25.3 | RMS | 1000 | -13 | 12.3 |
| high | Wideband | 2609.7 | -35.5 | RMS | 100 | -23 | 12.5 |
| high | Wideband | 2691.3 | -28.2 | RMS | 100 | -23 | 5.2 |
| high | Wideband | 6876.0 | -21.3 | RMS | 1000 | -13 | 8.3 |
| high | Wideband | 19997 | -20.4 | RMS | 1000 | -13 | 7.4 |
| high | Wideband | 20291 | -20.0 | RMS | 1000 | -13 | 7.0 |

**Band 30. WCS 2300. downlink**

| Test Frequency | Signal Type | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Limit [dBm] | Margin to Limit [dB] |
|---|---|---|---|---|---|---|---|
| low | Narrowband | 0.01152 | -49.8 | RMS | 1 | -33 | 16.8 |
| low | Narrowband | 0.06750 | -44.3 | RMS | 10 | -23 | 21.3 |
| low | Narrowband | 121.6 | -35.9 | RMS | 100 | -13 | 22.9 |
| low | Narrowband | 850.4 | -24.8 | RMS | 1000 | -13 | 11.8 |
| low | Narrowband | 1820.4 | -27.1 | RMS | 1000 | -13 | 14.1 |
| low | Narrowband | 2301.5 | -34.6 | RMS | 100 | -23 | 11.6 |
| low | Narrowband | 2570.7 | -36.1 | RMS | 100 | -23 | 13.1 |
| low | Narrowband | 6953.0 | -20.6 | RMS | 1000 | -13 | 7.6 |
| low | Narrowband | 19571 | -20.7 | RMS | 1000 | -13 | 7.7 |
| low | Narrowband | 20351 | -19.5 | RMS | 1000 | -13 | 6.5 |
| mid | Narrowband | 0.00910 | -51.7 | RMS | 1 | -33 | 18.7 |
| mid | Narrowband | 0.15248 | -44.0 | RMS | 10 | -23 | 21.0 |
| mid | Narrowband | 119.1 | -34.8 | RMS | 100 | -13 | 21.8 |
| mid | Narrowband | 852.4 | -24.5 | RMS | 1000 | -13 | 11.5 |
| mid | Narrowband | 2120.8 | -26.6 | RMS | 1000 | -13 | 13.6 |
| mid | Narrowband | 2296.7 | -34.0 | RMS | 100 | -13 | 21.0 |
| mid | Narrowband | 2572.5 | -36.1 | RMS | 100 | -13 | 23.1 |
| mid | Narrowband | 6888.0 | -21.1 | RMS | 1000 | -13 | 8.1 |
| mid | Narrowband | 19559 | -20.6 | RMS | 1000 | -13 | 7.6 |
| mid | Narrowband | 20302 | -20.0 | RMS | 1000 | -13 | 7.0 |
| high | Narrowband | 0.01009 | -50.1 | RMS | 1 | -33 | 17.1 |
| high | Narrowband | 0.15748 | -45.1 | RMS | 10 | -23 | 22.1 |
| high | Narrowband | 69.3 | -35.9 | RMS | 100 | -13 | 22.9 |
| high | Narrowband | 897.4 | -25.0 | RMS | 1000 | -13 | 12.0 |
| high | Narrowband | 1771.5 | -26.9 | RMS | 1000 | -13 | 13.9 |
| high | Narrowband | 2300.3 | -37.3 | RMS | 100 | -23 | 14.3 |
| high | Narrowband | 2575.4 | -35.3 | RMS | 100 | -23 | 12.3 |
| high | Narrowband | 6974.5 | -21.0 | RMS | 1000 | -13 | 8.0 |
| high | Narrowband | 19570 | -20.2 | RMS | 1000 | -13 | 7.2 |
| high | Narrowband | 20343 | -20.2 | RMS | 1000 | -13 | 7.2 |

**Band 30. WCS 2300. downlink**

| Test Frequency | Signal Type | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Limit [dBm] | Margin to Limit [dB] |
|---|---|---|---|---|---|---|---|
| low | Wideband | 0.012543 | -49.3 | RMS | 1 | -33 | 16.3 |
| low | Wideband | 0.61741 | -42.2 | RMS | 10 | -23 | 19.2 |
| low | Wideband | 73.4 | -35.0 | RMS | 100 | -13 | 22.0 |
| low | Wideband | 892.4 | -24.6 | RMS | 1000 | -13 | 11.6 |
| low | Wideband | 2083.8 | -26.7 | RMS | 1000 | -13 | 13.7 |
| low | Wideband | 2299.9 | -35.7 | RMS | 100 | -23 | 12.7 |
| low | Wideband | 2574.9 | -36.7 | RMS | 100 | -23 | 13.7 |
| low | Wideband | 6883.5 | -21.4 | RMS | 1000 | -13 | 8.4 |
| low | Wideband | 19566 | -20.7 | RMS | 1000 | -13 | 7.7 |
| low | Wideband | 20360 | -19.9 | RMS | 1000 | -13 | 6.9 |
| mid | Wideband | 0.00992 | -49.0 | RMS | 1 | -33 | 16.0 |
| mid | Wideband | 0.47243 | -41.6 | RMS | 10 | -23 | 18.6 |
| mid | Wideband | 122.7 | -35.2 | RMS | 100 | -13 | 22.2 |
| mid | Wideband | 898.9 | -25.4 | RMS | 1000 | -13 | 12.4 |
| mid | Wideband | 2113.8 | -26.8 | RMS | 1000 | -13 | 13.8 |
| mid | Wideband | 2300.3 | -37.0 | RMS | 100 | -13 | 24.0 |
| mid | Wideband | 2572.6 | -37.3 | RMS | 100 | -13 | 24.3 |
| mid | Wideband | 6814.0 | -21.3 | RMS | 1000 | -13 | 8.3 |
| mid | Wideband | 19969 | -20.3 | RMS | 1000 | -13 | 7.3 |
| mid | Wideband | 20347 | -20.0 | RMS | 1000 | -13 | 7.0 |
| high | Wideband | 0.00972 | -48.6 | RMS | 1 | -33 | 15.6 |
| high | Wideband | 0.14748 | -42.3 | RMS | 10 | -23 | 19.3 |
| high | Wideband | 123.0 | -35.4 | RMS | 100 | -13 | 22.4 |
| high | Wideband | 852.4 | -25.0 | RMS | 1000 | -13 | 12.0 |
| high | Wideband | 1955.9 | -27.0 | RMS | 1000 | -13 | 14.0 |
| high | Wideband | 2299.5 | -36.9 | RMS | 100 | -23 | 13.9 |
| high | Wideband | 2576.2 | -36.3 | RMS | 100 | -23 | 13.3 |
| high | Wideband | 6898.0 | -21.5 | RMS | 1000 | -13 | 8.5 |
| high | Wideband | 19551 | -20.9 | RMS | 1000 | -13 | 7.9 |
| high | Wideband | 20325 | -19.9 | RMS | 1000 | -13 | 6.9 |

Remark: Please see next sub-clause for the measurement plot.

General cosiderations concerning the measurement plots:

From f = 9 kHz up to f < 1 GHz a measurement RBW of f = 100 kHz is requested in general for the limit value of 43 + 10 log (P) dB. For frequencies with f ≥ 1 GHz a measurement RBW of f = 1 MHz is requested in general for the limit value of 43 + 10 log (P) dB. Hereby the border lines in general are each at p = -13 dBm.

At some frequencies it was necessary to modify the requested bandwidth:
At the band edges reducing of measurement bandwidth was necessary to prevent overlaying the RF-signal over the spurious emissions.
Also outside the downlink frequency band at the lower frequencies the measurement bandwidths were reduced to have the possibility to record the spurious emissions at these lower frequencies.

At frequencies where measuring bandwidths were reduced also the border lines were reduced acoording the given formula:

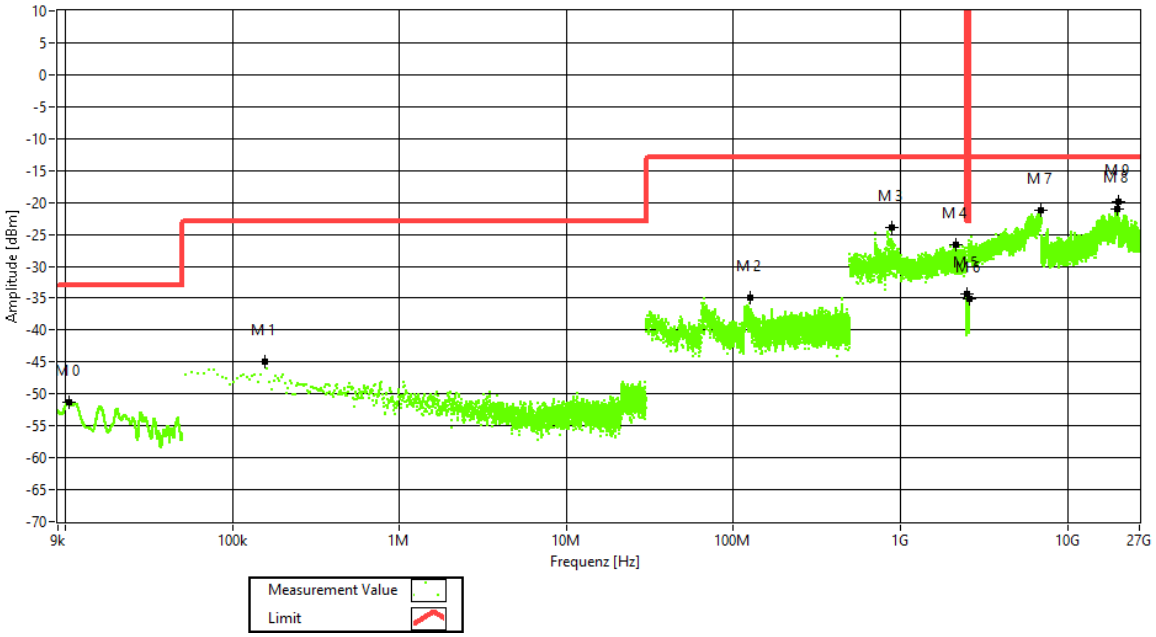
Thas means for the frequencies

$$p\ RBWreduced\ [dBm] = 10 * \log(RBWreduced\ [kHz] \div RBWrequested\ [kHz]) + pRBW\ RBWrequested[dBm]$$

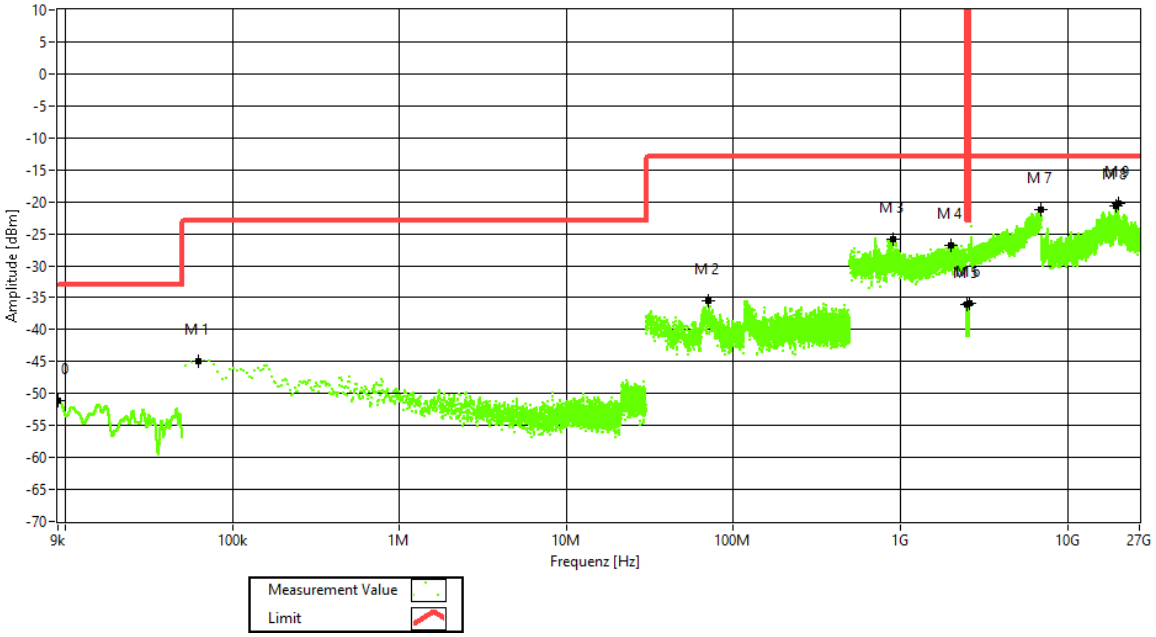
Hereby "p" are the border lines' values.

### 5.1.4 Measurement Plot

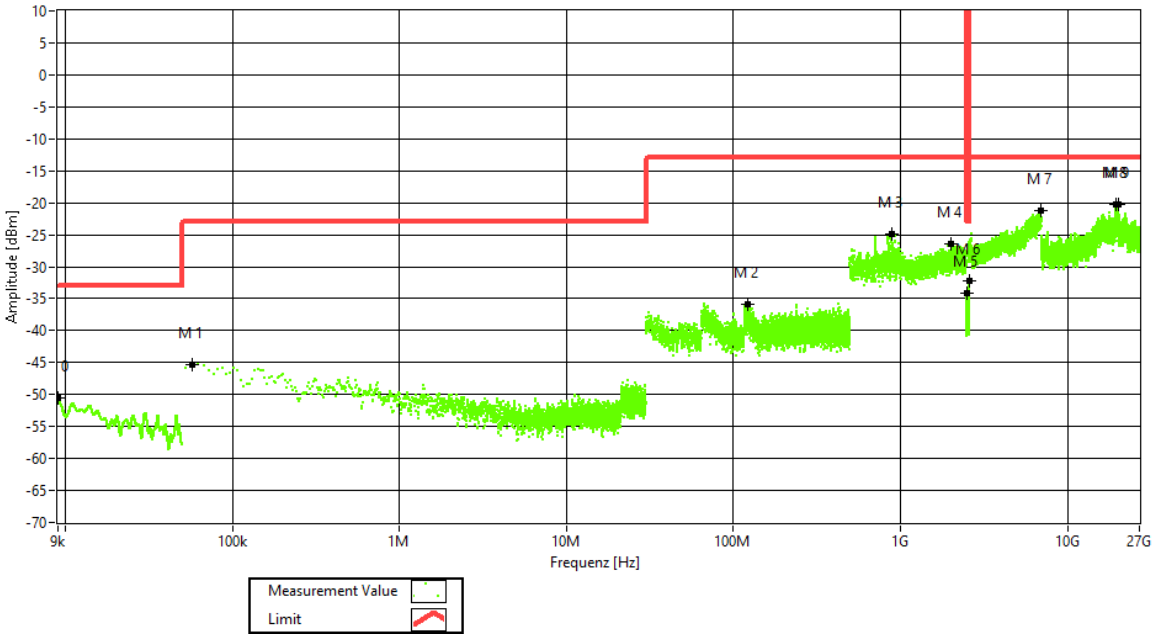
Frequency Band = Band 41 BRS (LBS), Test Frequency = low, Direction = RF downlink, Signal Type = Narrowband



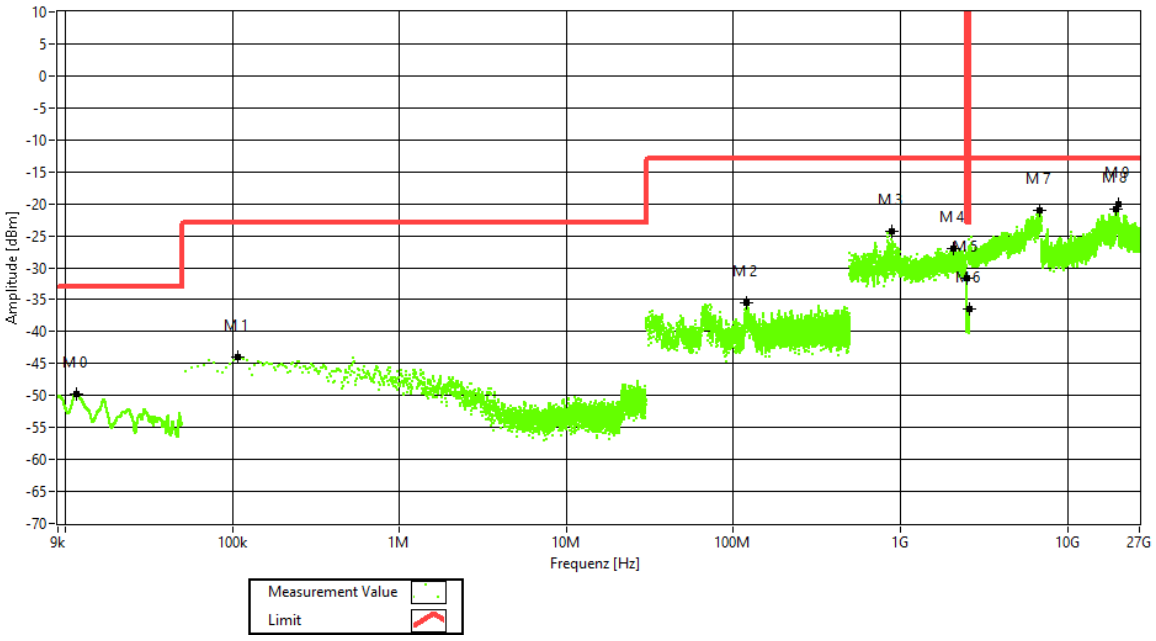

Frequency Band = Band 41 BRS (LBS), Test Frequency = mid, Direction = RF downlink, Signal Type = Narrowband



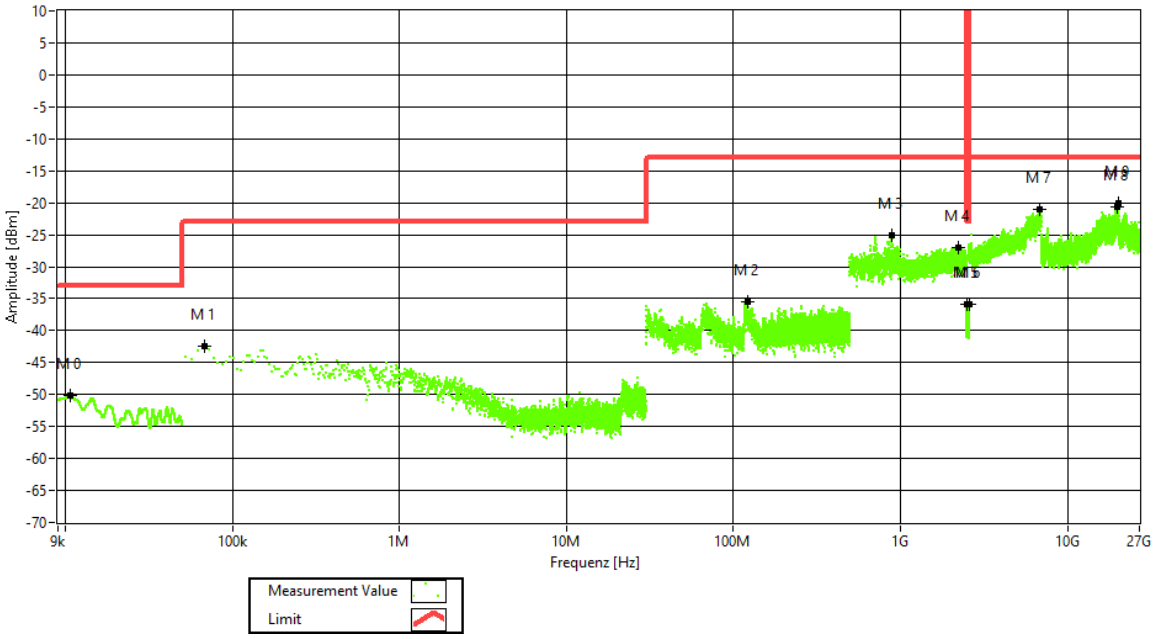
Frequency Band = Band 41 BRS (LBS), Test Frequency = high, Direction = RF downlink, Signal Type = Narrowband



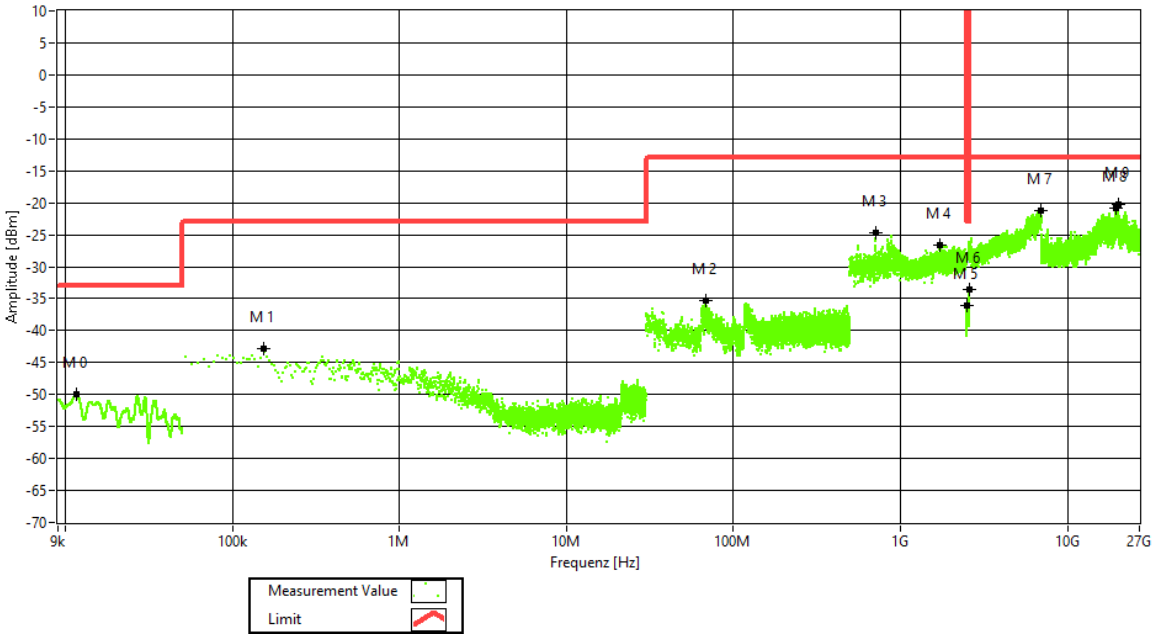
Frequency Band = Band 41 BRS (LBS), Test Frequency = low, Direction = RF downlink, Signal Type = Wideband



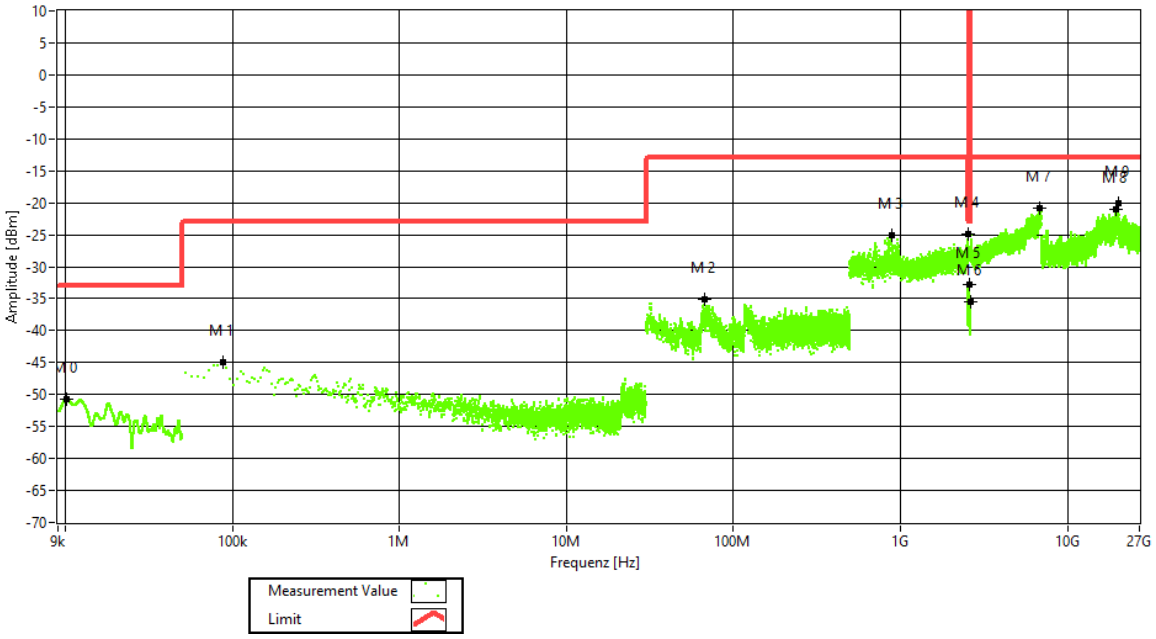

Frequency Band = Band 41 BRS (LBS), Test Frequency = mid, Direction = RF downlink, Signal Type = Wideband



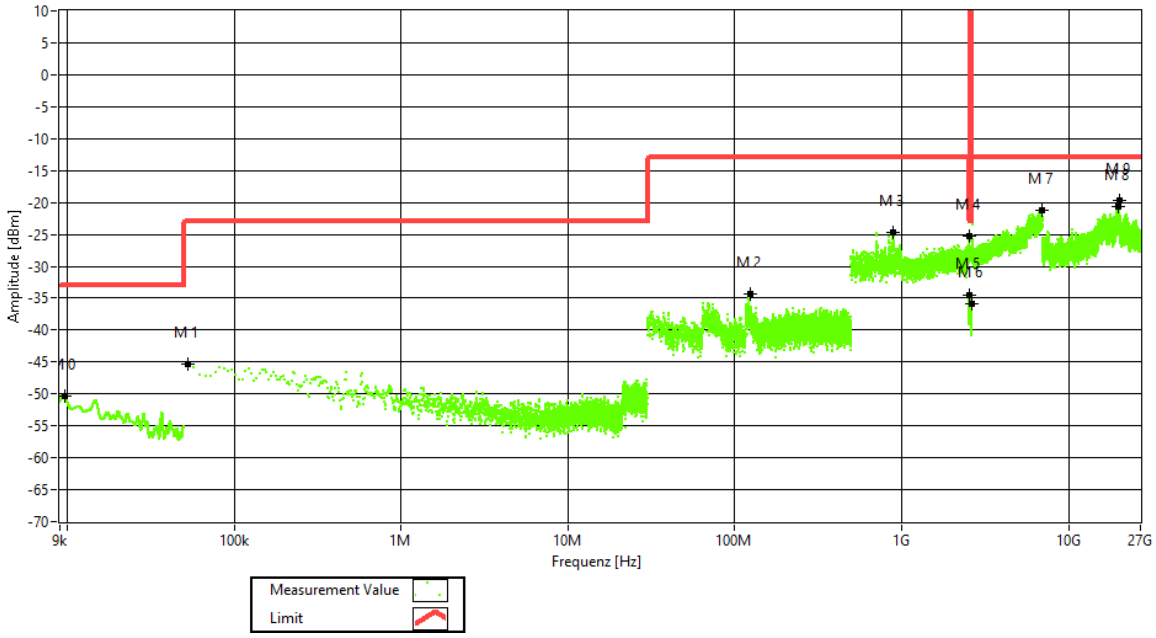
Frequency Band = Band 41 BRS (LBS), Test Frequency = high, Direction = RF downlink, Signal Type = Wideband



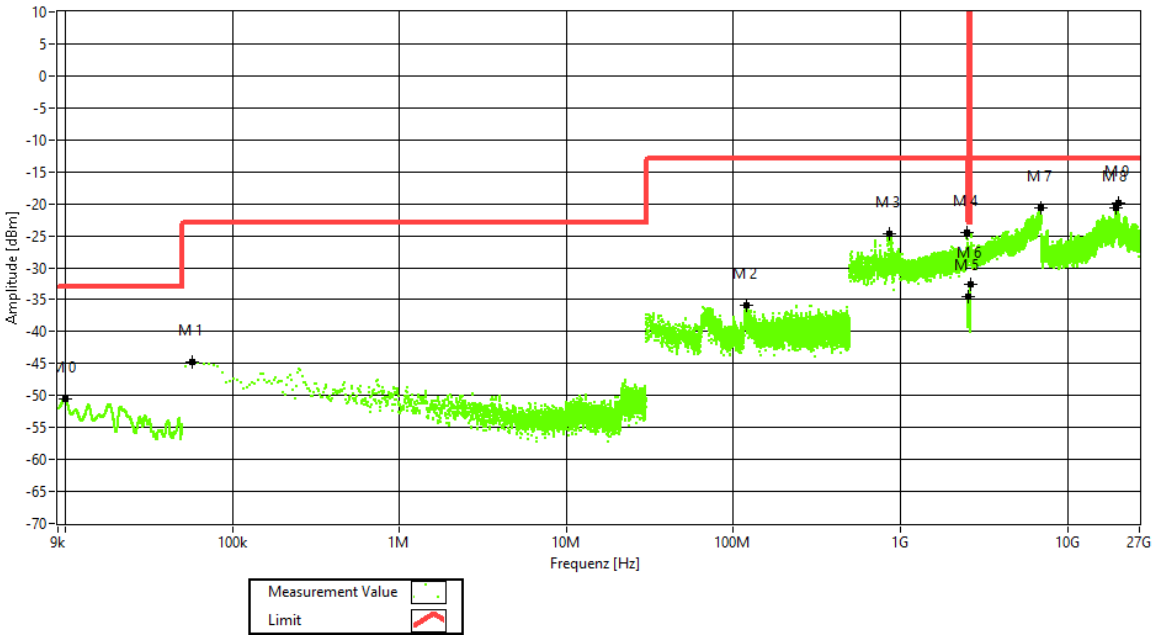
Frequency Band = Band 41 BRS (MBS), Test Frequency = low, Direction = RF downlink, Signal Type = Narrowband



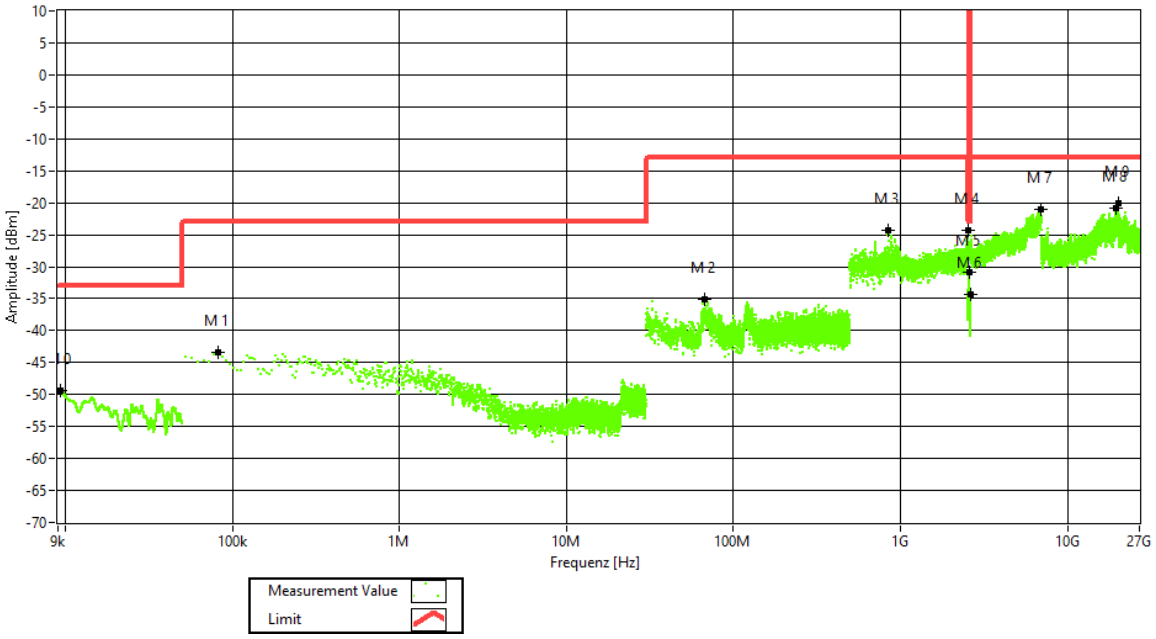

Frequency Band = Band 41 BRS (MBS), Test Frequency = mid, Direction = RF downlink, Signal Type = Narrowband



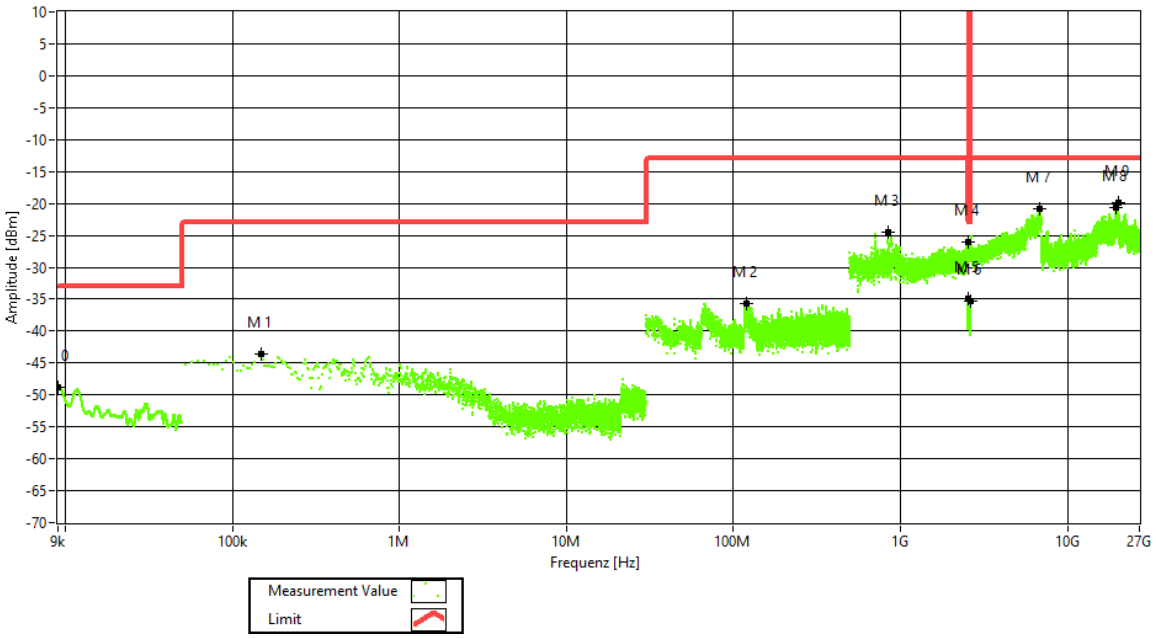
Frequency Band = Band 41 BRS (MBS), Test Frequency = high, Direction = RF downlink, Signal Type = Narrowband



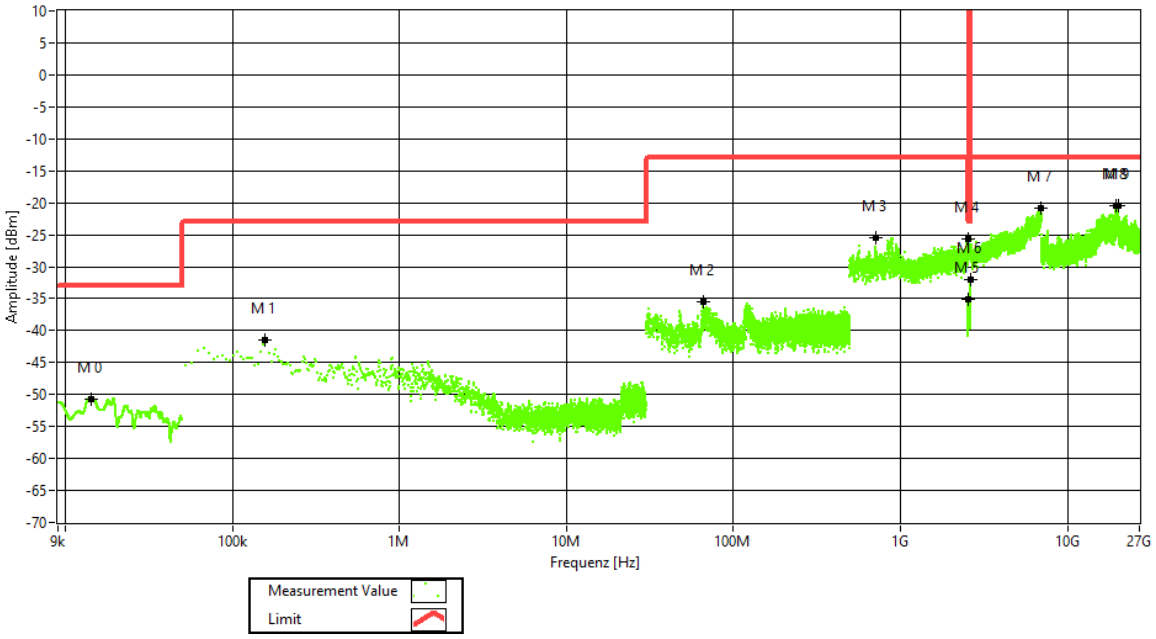
Frequency Band = Band 41 BRS (MBS), Test Frequency = low, Direction = RF downlink, Signal Type = Wideband



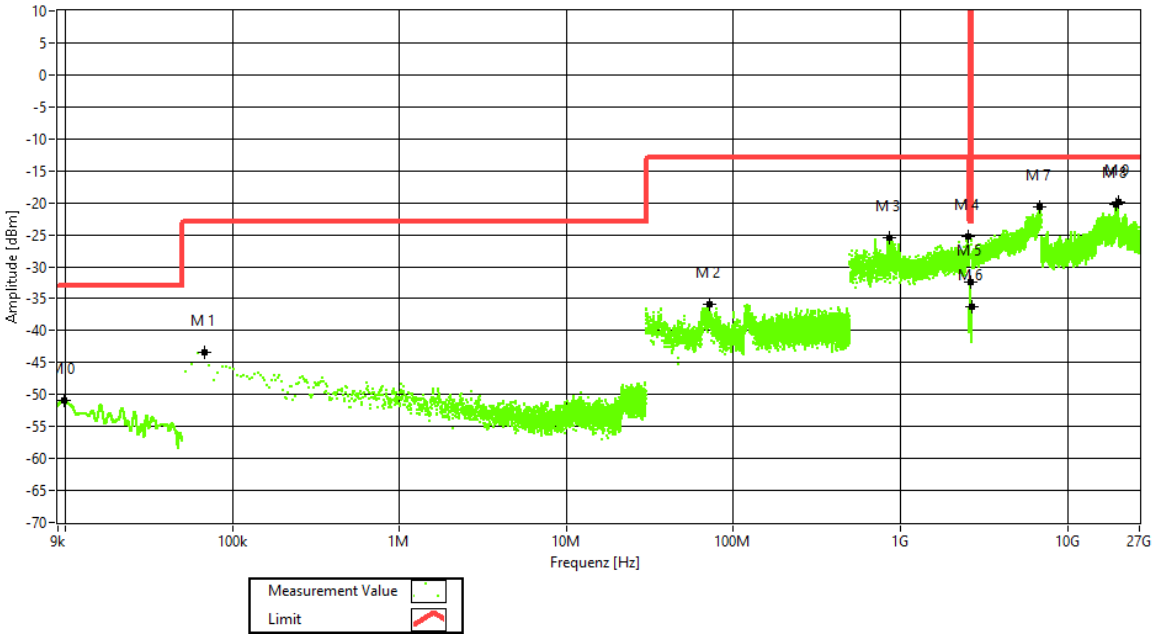

Frequency Band = Band 41 BRS (MBS), Test Frequency = mid, Direction = RF downlink, Signal Type = Wideband



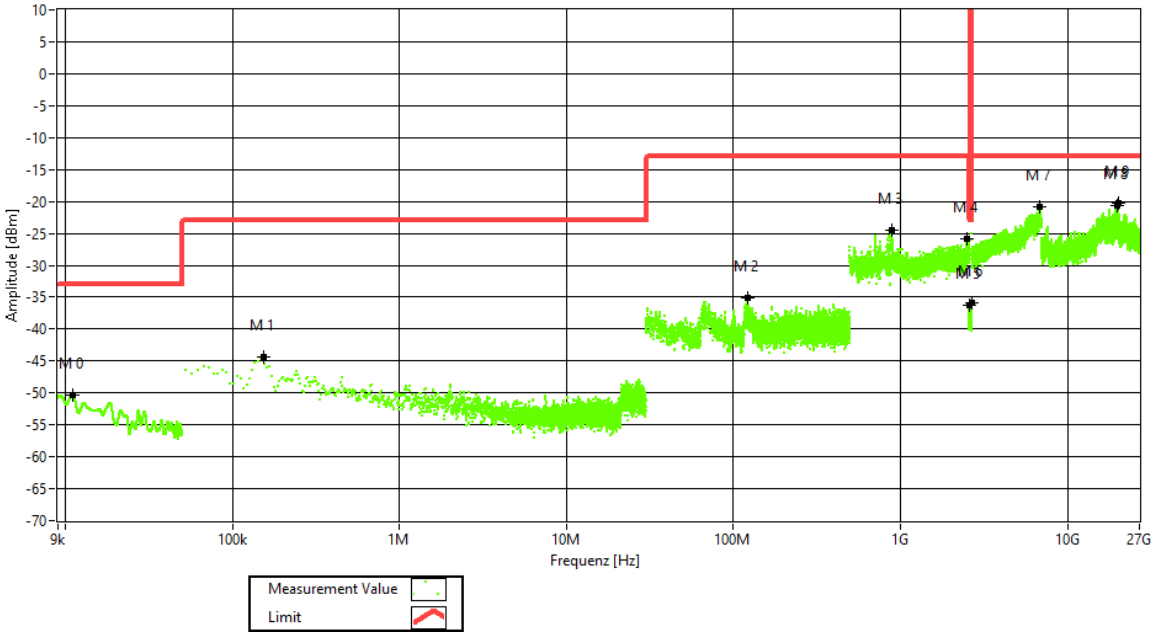
Frequency Band = Band 41 BRS (MBS), Test Frequency = high, Direction = RF downlink, Signal Type = Wideband



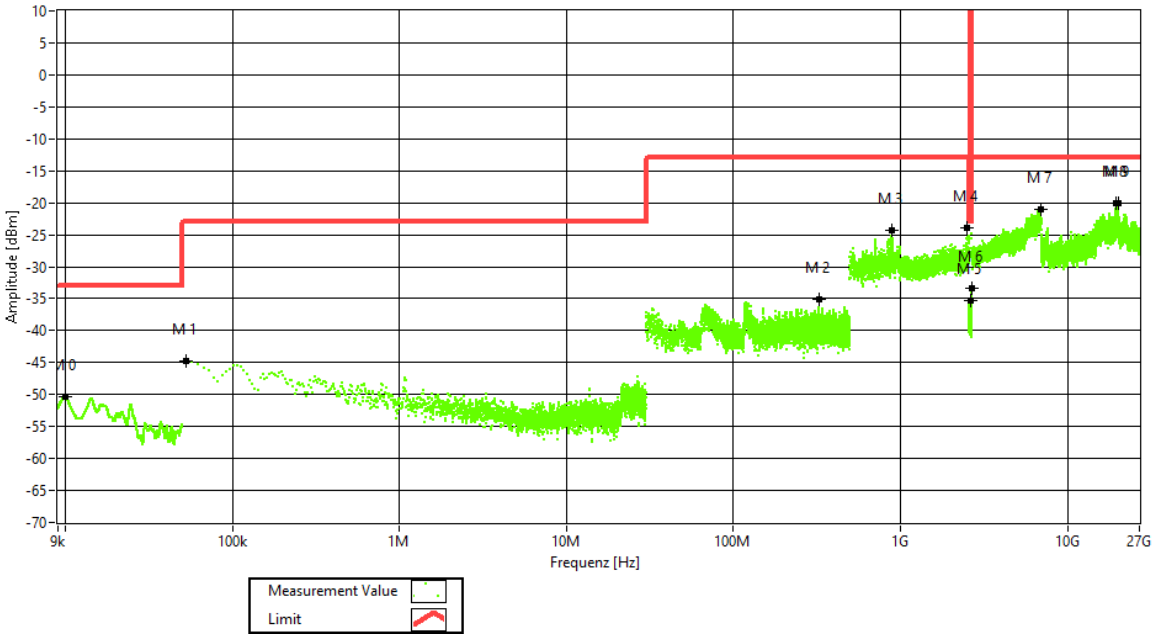
Frequency Band = Band 41 BRS (UBS), Test Frequency = low, Direction = RF downlink, Signal Type = Narrowband



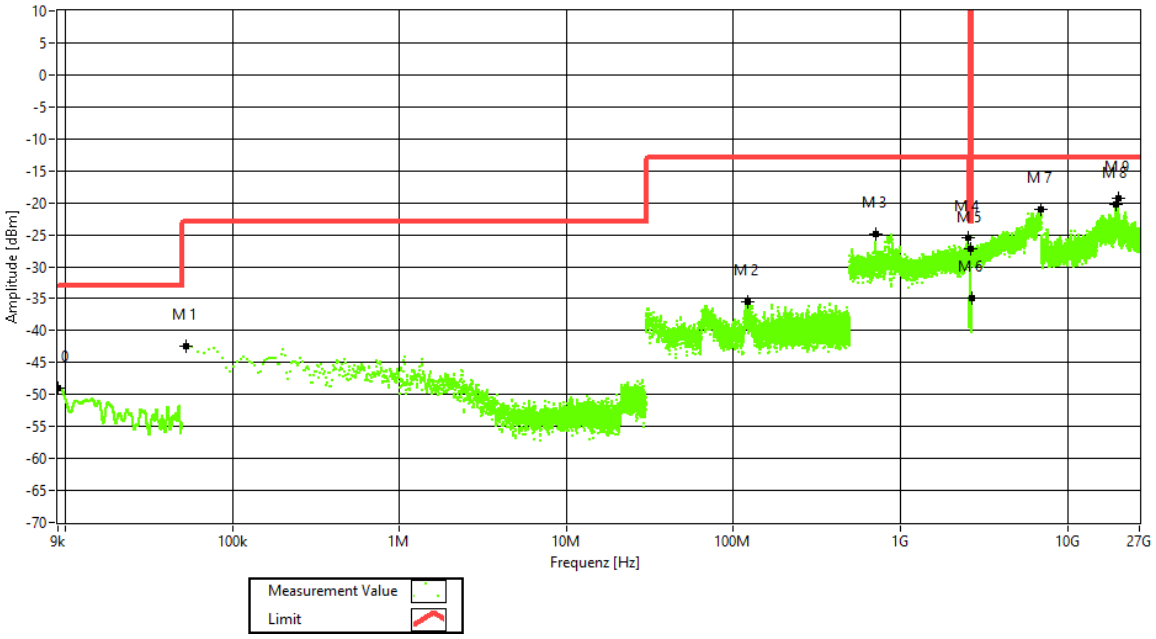

Frequency Band = Band 41 BRS (UBS), Test Frequency = mid, Direction = RF downlink, Signal Type = Narrowband



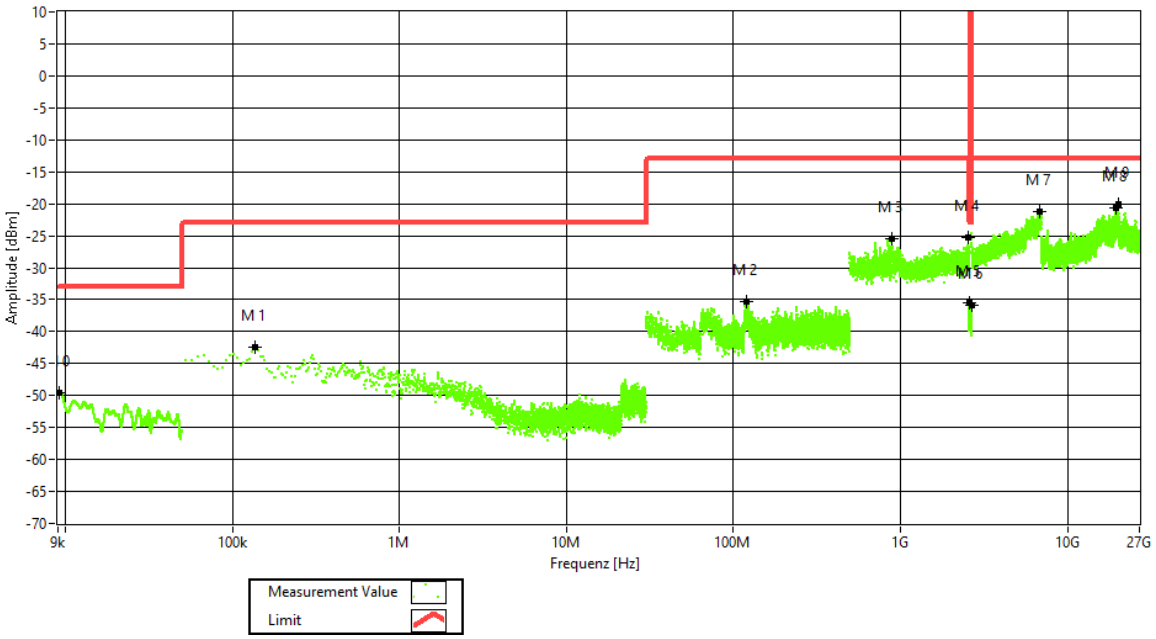
Frequency Band = Band 41 BRS (UBS), Test Frequency = high, Direction = RF downlink, Signal Type = Narrowband



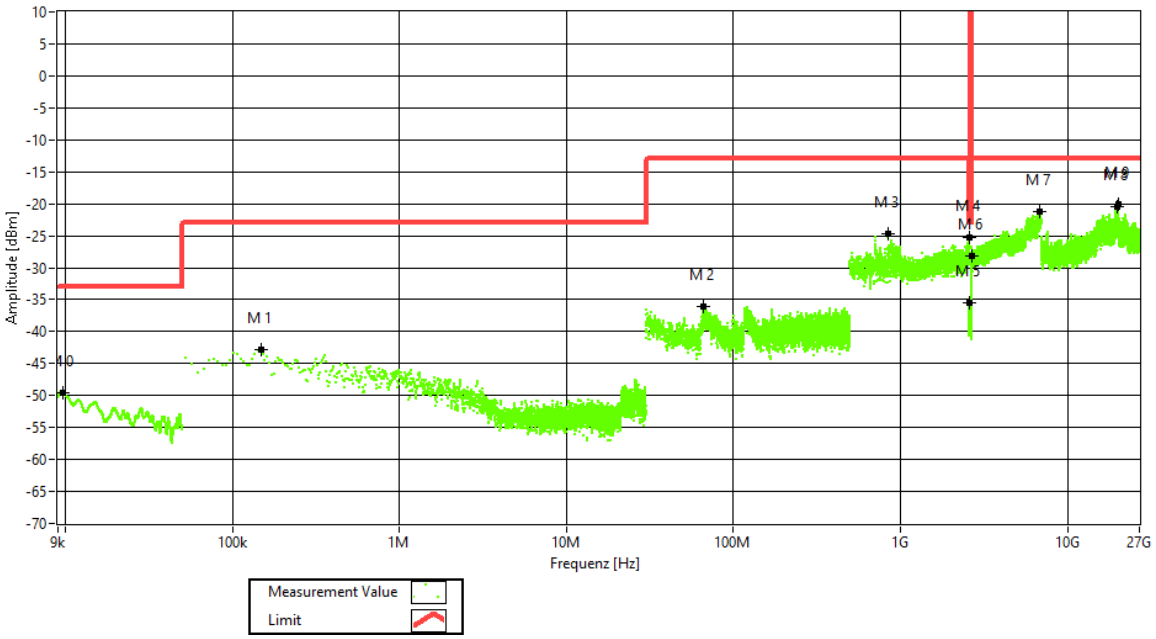
Frequency Band = Band 41 BRS (UBS), Test Frequency = low, Direction = RF downlink, Signal Type = Wideband



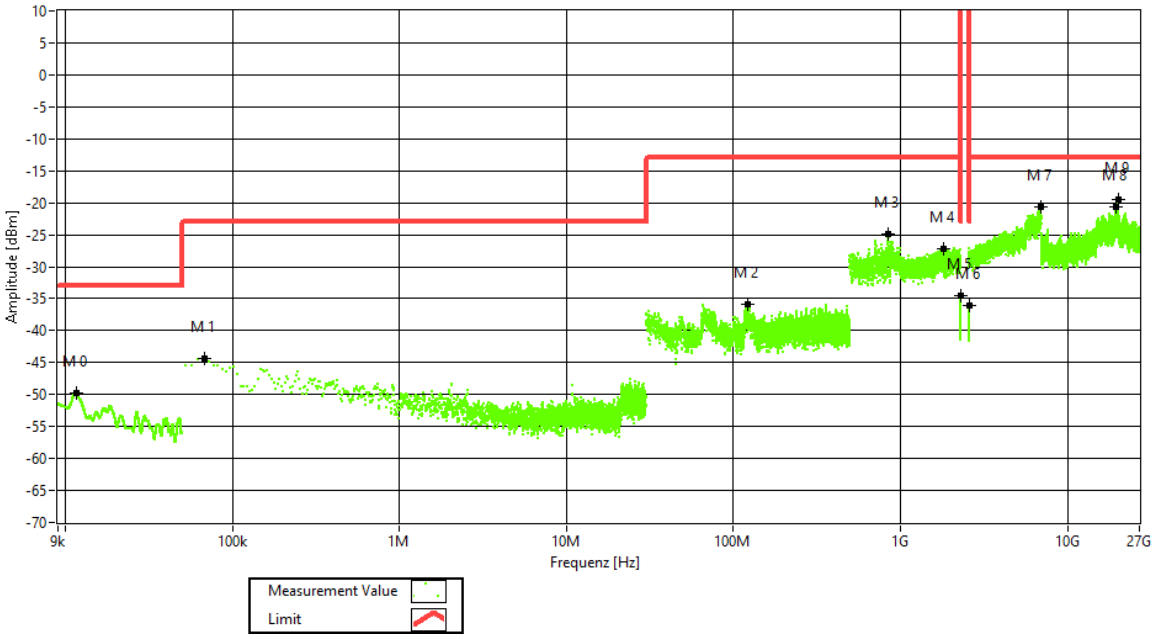

Frequency Band = Band 41 BRS (UBS), Test Frequency = mid, Direction = RF downlink, Signal Type = Wideband



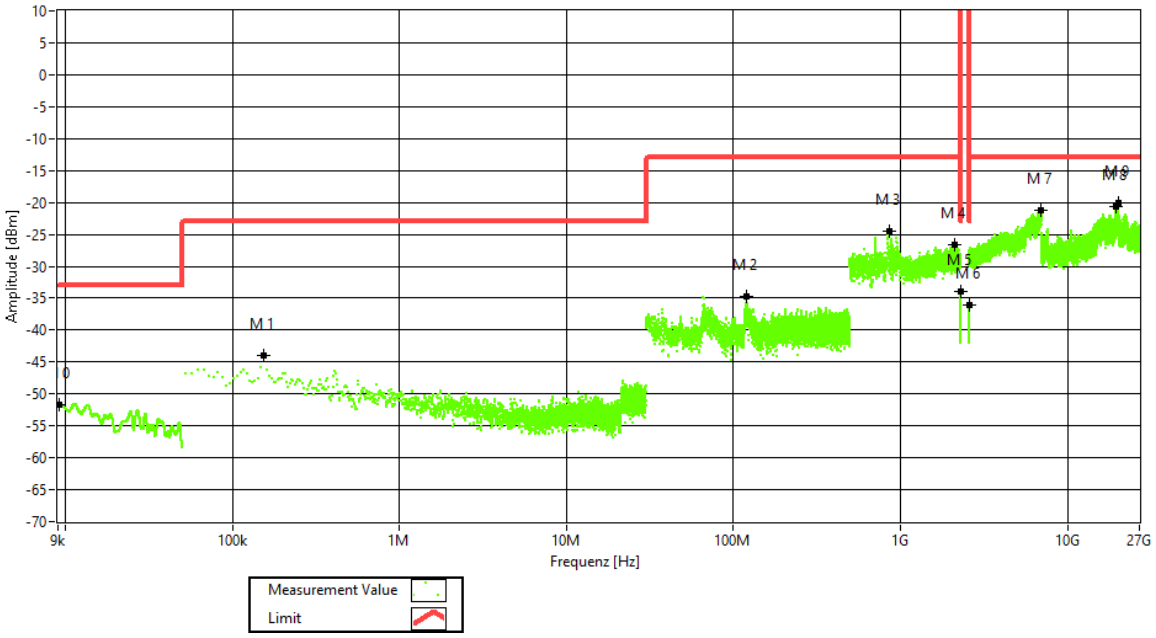
Frequency Band = Band 41 BRS (UBS), Test Frequency = high, Direction = RF downlink, Signal Type = Wideband



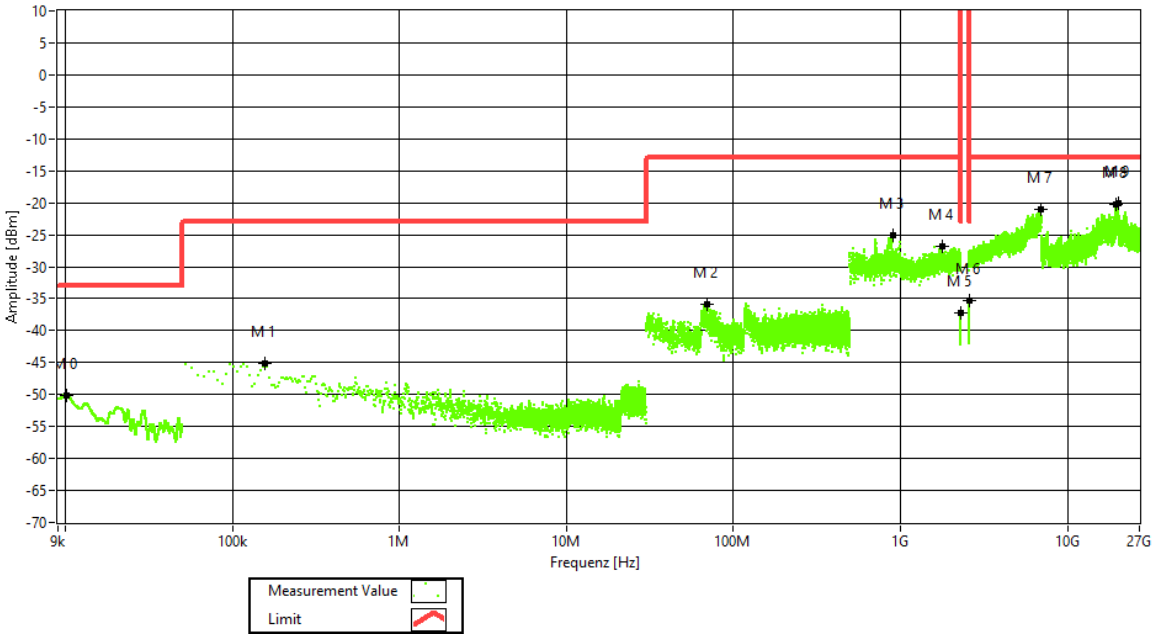
Frequency Band = Band 30 WCS 2300, Test Frequency = low, Direction = RF downlink, Signal Type = Narrowband



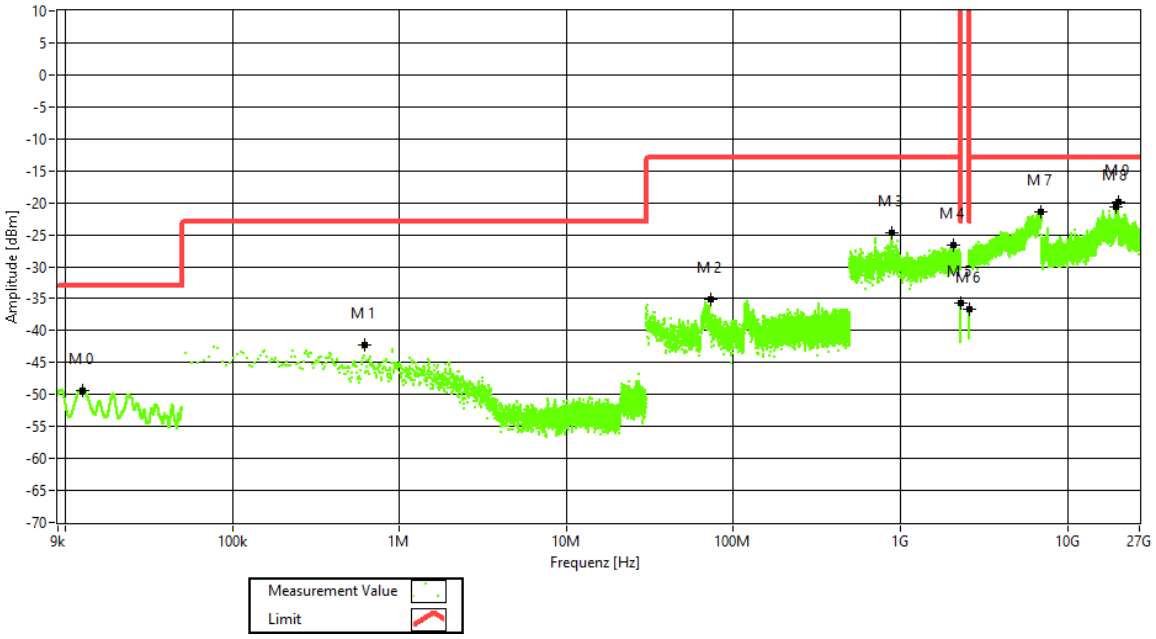

Frequency Band = Band 30 WCS 2300, Test Frequency = mid, Direction = RF downlink, Signal Type = Narrowband



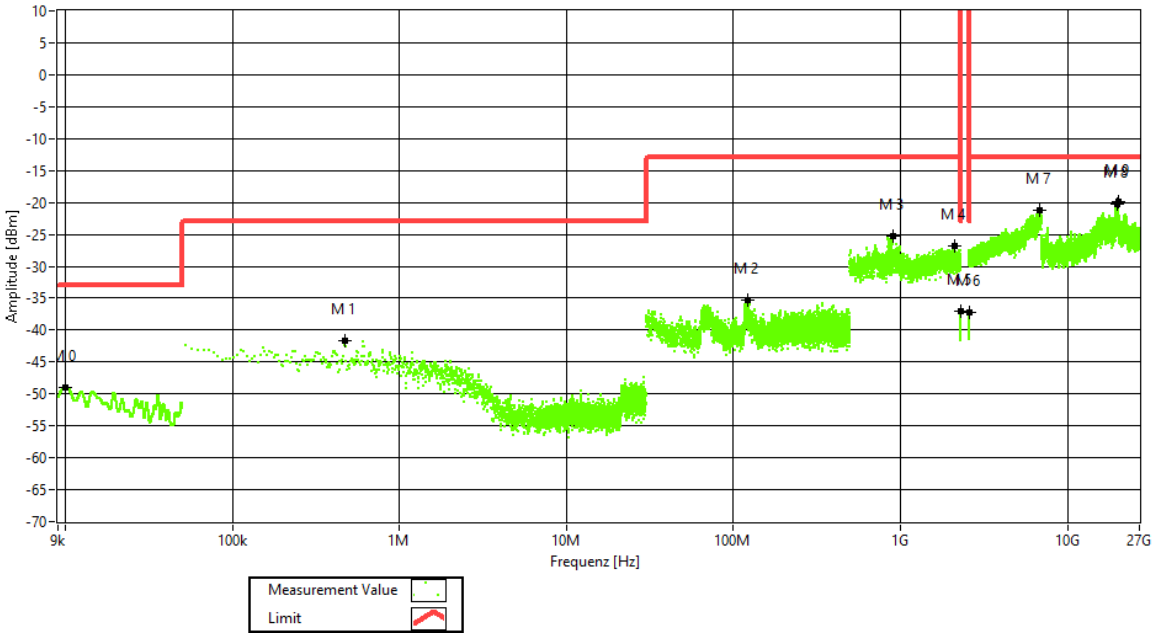
Frequency Band = Band 30 WCS 2300, Test Frequency = high, Direction = RF downlink, Signal Type = Narrowband



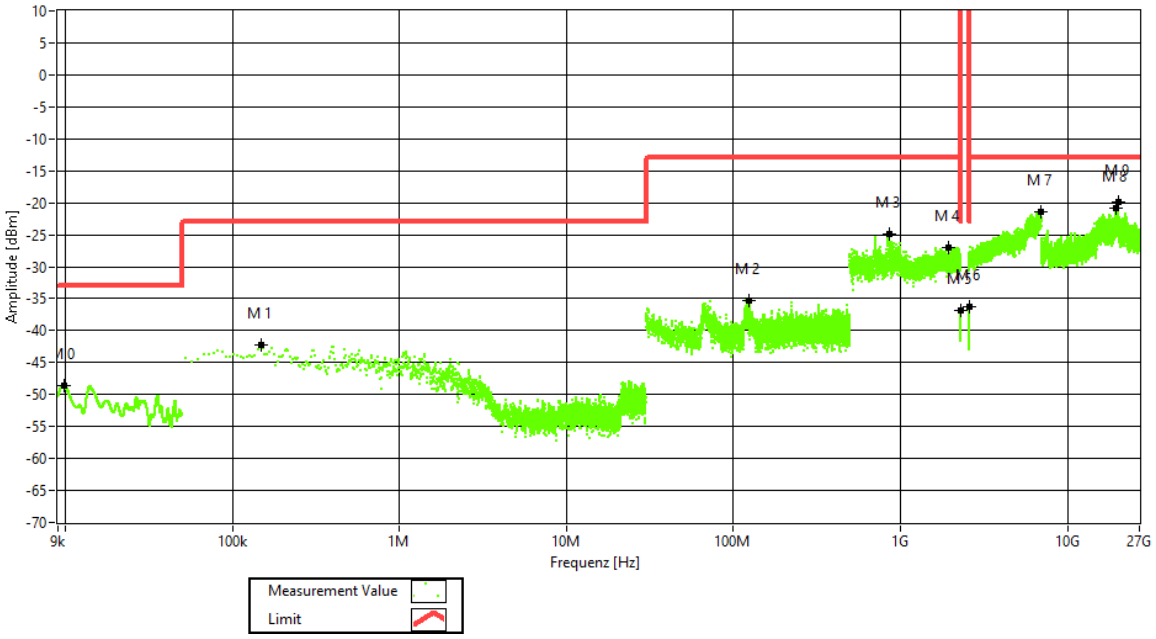
Frequency Band = Band 30 WCS 2300, Test Frequency = low, Direction = RF downlink, Signal Type = Wideband




Frequency Band = Band 30 WCS 2300, Test Frequency = mid, Direction = RF downlink, Signal Type = Wideband



Frequency Band = Band 30 WCS 2300, Test Frequency = high, Direction = RF downlink, Signal Type = Wideband




## 5.2 Product labelling

### 5.2.1 FCC ID label

Please refer to the documentation of the applicant.

### 5.2.2 Location of the label on the EUT

Please refer to the documentation of the applicant.

### 5.2.3 Test Equipment used

- Conducted

## 5.3 Field strength of spurious radiation

Standard FCC Part 27, §27.53; A

**The test was performed according to:**
ANSI C63.26 together with ANSI C63.4

**Test date**: 2022-01-28; 2022-01-29; 2022-01-31

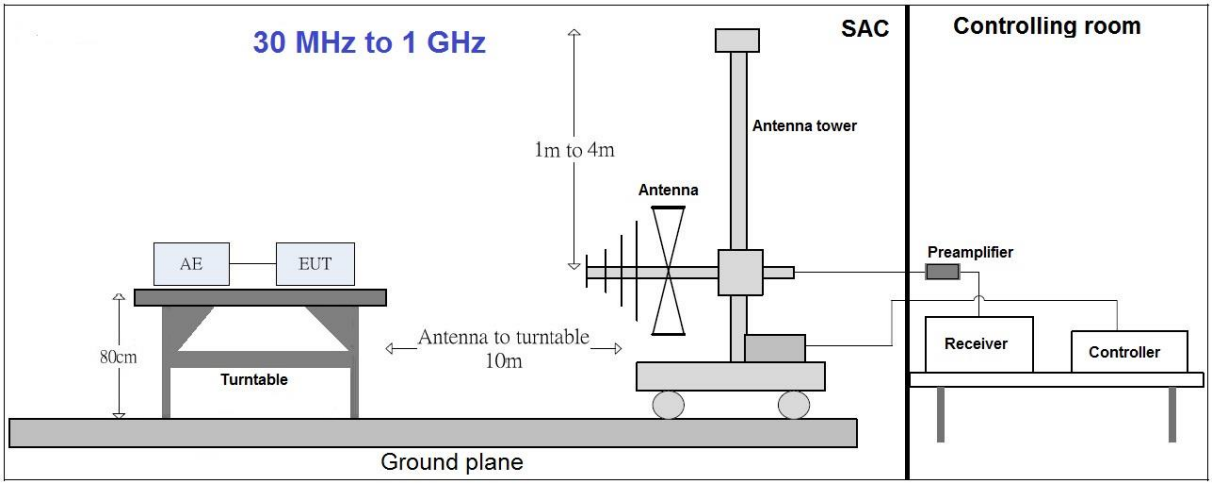
**Environmental conditions**: 21 ° C; 35 % r. F.

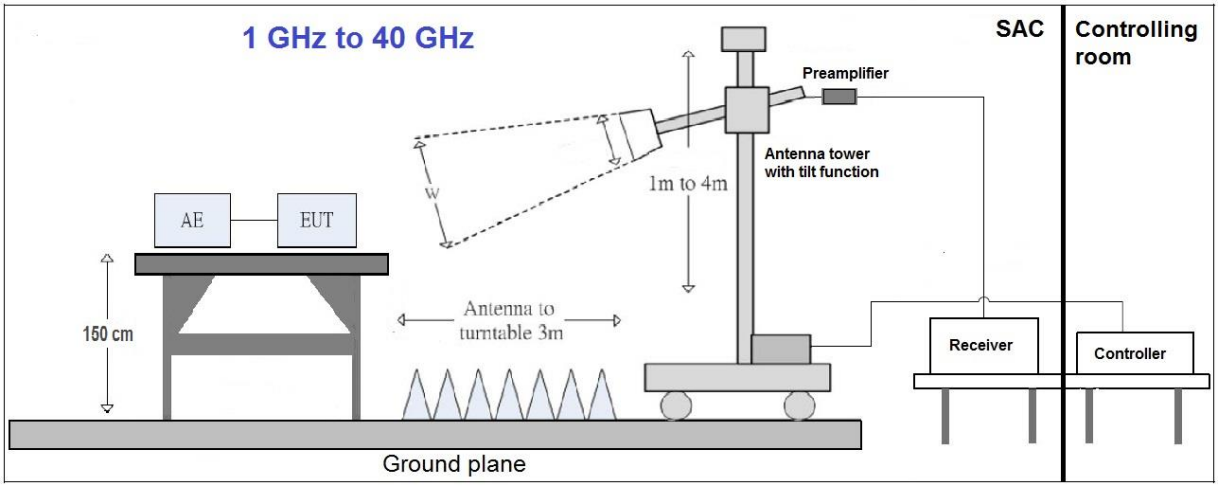
**Test engineer**: Thomas Hufnagel

### 5.3.1 Test Description

This test case is intended to demonstrate compliance to the applicable radiated spurious emission measurements per § 2.1053

The EUT was connected to the test setup according to the following diagram:



The test set-up was made in accordance to the general provisions of ANSI C63.4 in a typical installation configuration. The Equipment Under Test (EUT) was set up on a non-conductive table 1.5 x 1.5 m² in the semi-anechoic chamber, 0.8 meter above the ground or floor-standing arrangement shall be placed on the horizontal ground reference plane.. The influence of the EUT support table that is used between 30–1000 MHz was evaluated. For the initial measurements, the receiving antenna is varied from 1-4 meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. The highest emissions between 30 MHz to 1000 MHz were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions.

The measurement procedure is implemented into the EMI test software BAT EMC from NEXIO. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is also performed at 3 axes. A pre-check is performed while the EUT is powered by a DC power source.

**1. Measurement above 30 MHz and up to 1 GHz**

**Step 1:** Preliminary scan
This is a preliminary test to identify the highest amplitudes relative to the limit.
Settings for step 1:
- Antenna distance: 10 m
- Detector: Peak-Maxhold / Quasipeak (FFT-based)
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 ms
- Turntable angle range: –180° to 180°
- Turntable step size: 15°
- Height variation range: 1 – 4 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

**Note:**

This frequency range was measured with an antenna distance of s = 10 m.

The ANSI C63.26 refers to ANSI C63.4 for allowed test sites for direct field measurements and substitution measurements. The ANSI C63.4 allows in this frequency range an antenna distance of 3 m and 10 m.
The used EMC hall is validated for an antenna distance of s = 10 m and the substitution measurement was performed at the same distance. Therefore this distance was chosen for this frequency measurement range.

**Step 2:** Adjustment measurement
In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.
For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will slowly vary by ± 45° around this value. During this action, the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position, the antenna height will also slowly vary by ± 100 cm around the antenna height determined. During this action, the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: ± 30 ° around the determined value
- Antenna Polarisation: max. value determined in step 1

**Step 3:** Final measurement with PEAK detector
With the settings determined in step 3, the final measurement will be performed:
EMI receiver settings for step 4:
- Detector: Peak / Quasipeak (< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

**3. Measurement above 1 GHz**
The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
**Step 1:**
The Equipment Under Test (EUT) was set up on a non-conductive support at 1.5 m height in the semi-anechoic chamber. Absorbers are placed around and between the turn table and the antenna tower.
All steps were performed with one height (1.5 m) of the receiving antenna only.
The EUT is turned during the preliminary measurement across the elevation axis, with a step size of 30 °.
The turn table step size (azimuth angle) for the preliminary measurement is 15 °.
**Step 2:**
The maximum RFI field strength was determined during the measurement by rotating the turntable (±180 degrees) and varying the height of the receive antenna (h = 1 ... 4 m) with a additional tilt function of the antenna.The turn table azimuth will slowly vary by ± 15°.
EMI receiver settings (for all steps):
- Detector: Peak, Average
- IF Bandwidth = 1 MHz

**Step 3:**
Spectrum analyser settings for step 3:
- Detector: Peak / Average
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 1 MHz
- Measuring time: 1 s

### 5.3.2 Test Requirements / Limits

**FCC Part 2.1053; Measurement required: Field strength of spurious radiation:**

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate.

**Part 27; Miscellaneous Wireless Communication Services**

**Subpart C – Technical standards**

**§27.53 – Emission limits**

**Band 30 WCS:**

(a) For operations in the 2305-2320 MHz band and the 2345-2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(1) For base and fixed stations' operations in the 2305-2320 MHz band and the 2345-2360 MHz band:

(i) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than 75 + 10 log (P) dB on all frequencies between 2320 and 2345 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 70 + 10 log (P) dB on all frequencies between 2287.5 and 2300 MHz, 72 + 10 log (P) dB on all frequencies between 2285 and 2287.5 MHz, and 75 + 10 log (P) dB below 2285 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2362.5 MHz, 55 + 10 log (P) dB on all frequencies between 2362.5 and 2365 MHz, 70 + 10 log (P) dB on all frequencies between 2365 and 2367.5 MHz, 72 + 10 log (P) dB on all frequencies between 2367.5 and 2370 MHz, and 75 + 10 log (P) dB above 2370 MHz.

(2) For fixed customer premises equipment (CPE) stations operating in the 2305-2320 MHz band and the 2345-2360 MHz band transmitting with more than 2 watts per 5 megahertz average EIRP:

(i) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than 75 + 10 log (P) dB on all frequencies between 2320 and 2345 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 70 + 10 log (P) dB on all frequencies between 2287.5 and 2300 MHz, 72 + 10 log (P) dB on all frequencies between 2285 and 2287.5 MHz, and 75 + 10 log (P) dB below 2285 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2362.5 MHz, 55 + 10 log (P) dB on all frequencies between 2362.5 and 2365 MHz, 70 + 10 log (P) dB on all frequencies between 2365 and 2367.5 MHz, 72 + 10 log (P) dB on all frequencies between 2367.5 and 2370 MHz, and 75 + 10 log (P) dB above 2370 MHz.

(3) For fixed CPE stations operating in the 2305-2320 MHz and 2345-2360 MHz bands transmitting with 2 watts per 5 megahertz average EIRP or less:

(i) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

(4) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(i) By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

(5) ***Measurement procedure.*** Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the channel blocks at 2305, 2310, 2315, 2320, 2345, 2350, 2355, and 2360 MHz, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.,* 1 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(6) [Reserved]

(7) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power;

(8) Waiver requests of any of the out-of-band emission limits in paragraphs (a)(1) through (a)(7) of this section shall be entertained only if interference protection equivalent to that afforded by the limits is shown;

(9) [Reserved]

(10) The out-of-band emissions limits in paragraphs (a)(1) through (a)(3) of this section may be modified by the private contractual agreement of all affected licensees, who must maintain a copy of the agreement in their station files and disclose it to prospective assignees, transferees, or spectrum lessees and, upon request, to the Commission.

**Band 41BRS (LBS/MBS/UBS):**

(m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

(1) Prior to the transition, and thereafter, solely within the MBS, for analog operations with an EIRP in excess of −9 dBW, the signal shall be attenuated at the channel edges by at least 38 dB relative to the peak visual carrier, then linearly sloping from that level to at least 60 dB of attenuation at 1 MHz below the lower band edge and 0.5 MHz above the upper band edge, and attenuated at least 60 dB at all other frequencies.

(2) For digital base stations, the attenuation shall be not less than 43 + 10 log (P) dB, unless a documented interference complaint is received from an adjacent channel licensee with an overlapping Geographic Service Area. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS No. 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

### 5.3.3 Test Protocol

At the following tables the maximum peak value in the according band from 1 GHz to 18 GHz.

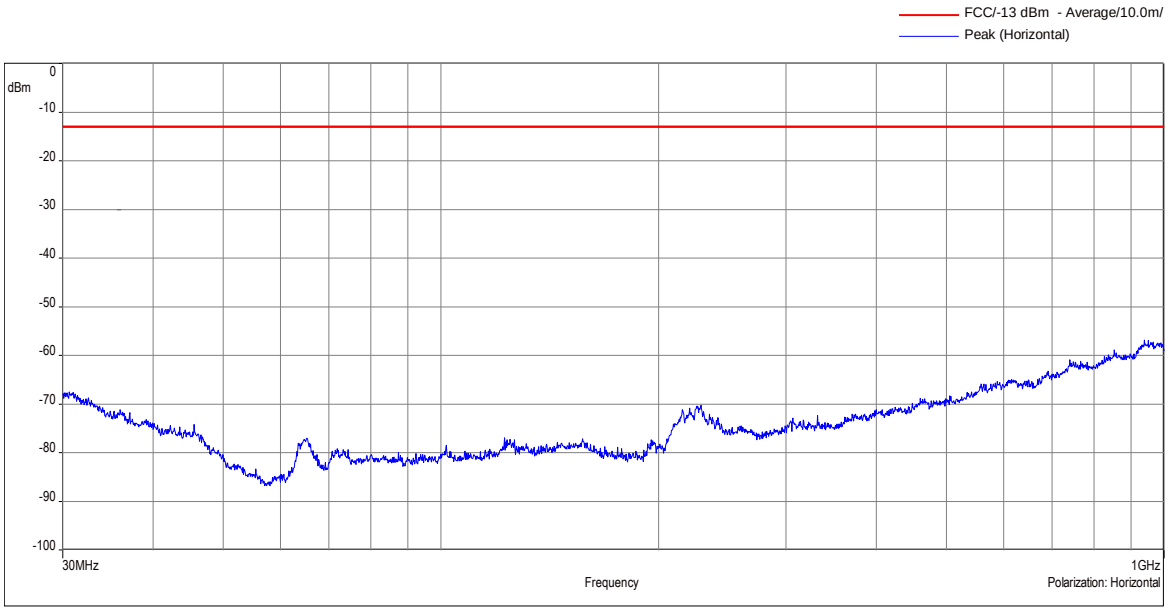
| **Band 41 BRS (MBS), downlink;** | | | | | | |
|---|---|---|---|---|---|---|
| **Spurious Freq. [MHz]** | **Spurious Level [dBm]** | **Pin (Sum Level) [dBm]** | **Detector** | **RBW [kHz]** | **Limit [dBm]** | **Margin to Limit [dB]** |
| 2592.9 | -17.9 | 0.2 | PEAK | 1000 | -13.0 | 4.9 |

| **Band 30 WCS 2300, downlink;** | | | | | | |
|---|---|---|---|---|---|---|
| **Spurious Freq. [MHz]** | **Spurious Level [dBm]** | **Pin (Sum Level) [dBm]** | **Detector** | **RBW [kHz]** | **Limit [dBm]** | **Margin to Limit [dB]** |
| 2359.4 | -27.4 | 0.3 | PEAK | 1000 | -13.0 | 14.4 |

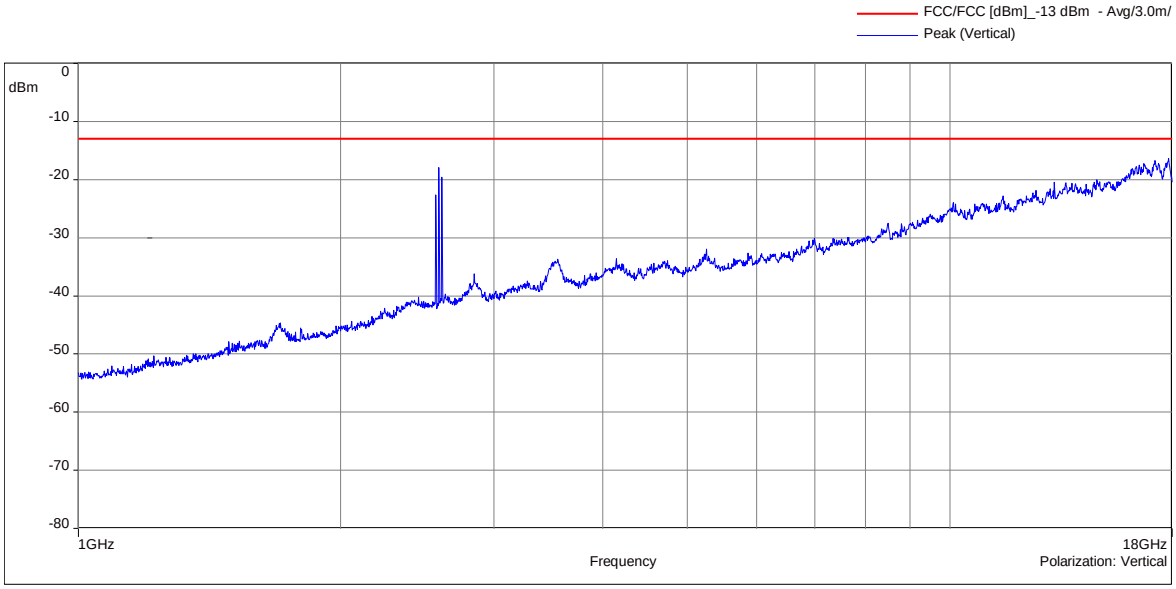
Remark: Please see next sub-clause for the measurement plot.

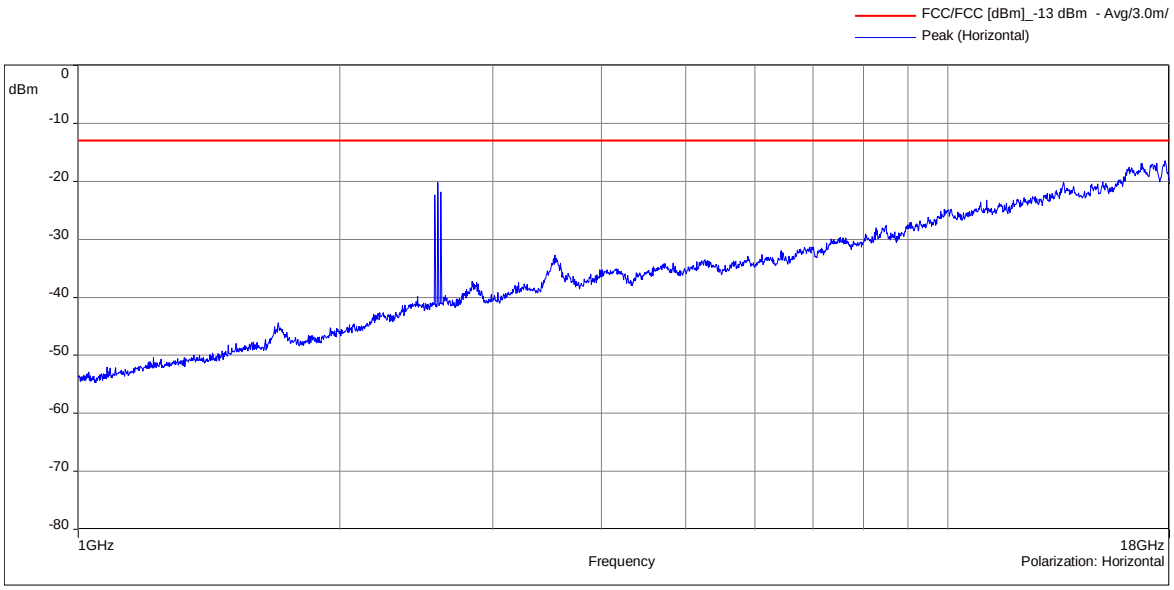
### 5.3.4 Measurement Plot

Frequency Band = Band 41 BRS (MBS); Test Frequencies = low, mid and high;
Direction = RF downlink
30 MHz - 1 GHz

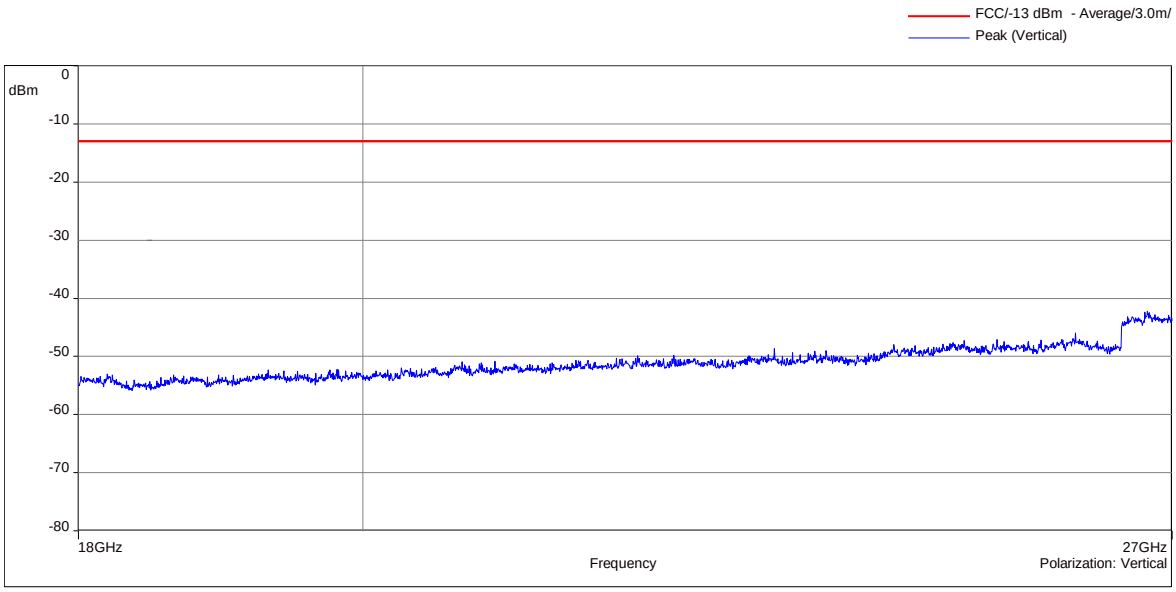


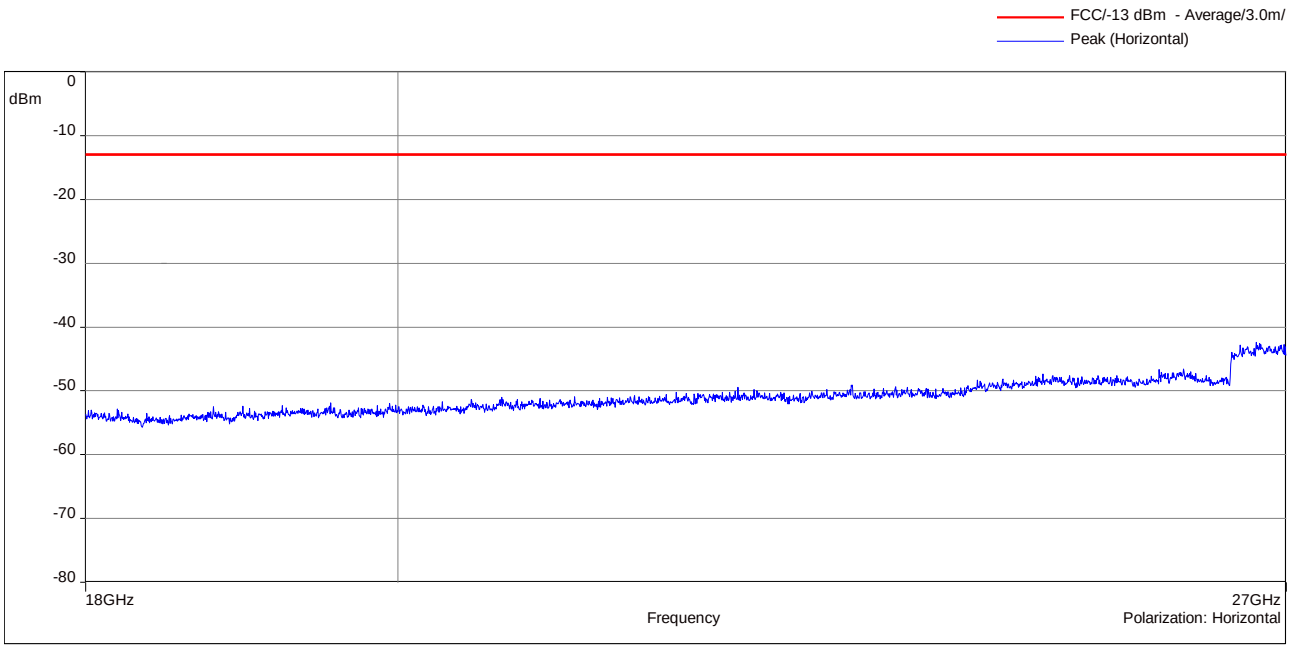
1 GHz - 18 GHz


FCC/FCC [dBm]_-13 dBm - Avg/3.0m/
Peak (Vertical)
dBm
0
-10
-20
-30
-40
-50
-60
-70
-80
1GHz
Frequency
18GHz
Polarization: Vertical


FCC/FCC [dBm]_-13 dBm - Avg/3.0m/
Peak (Horizontal)
dBm
0
-10
-20
-30
-40
-50
-60
-70
-80
1GHz
Frequency
18GHz
Polarization: Horizontal

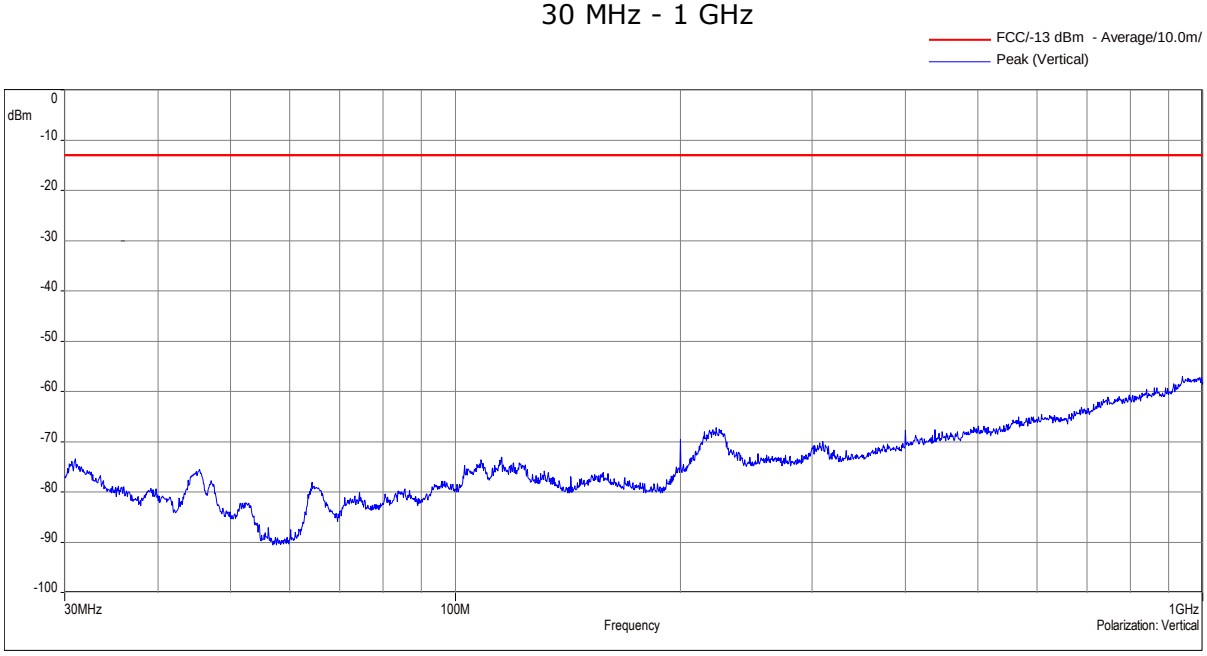
18 GHz - 27 GHz

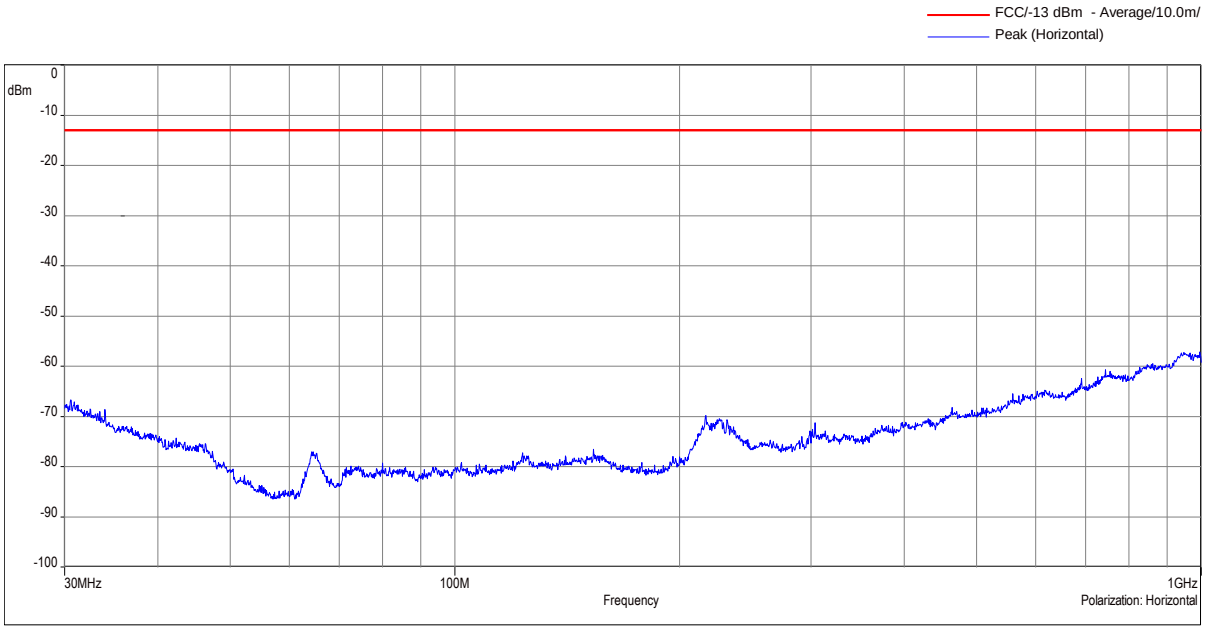

FCC/-13 dBm - Average/3.0m/
Peak (Vertical)
dBm
0
-10
-20
-30
-40
-50
-60
-70
-80
18GHz
Frequency
27GHz
Polarization: Vertical


FCC/-13 dBm - Average/3.0m/
Peak (Horizontal)
dBm
0
-10
-20
-30
-40
-50
-60
-70
-80
18GHz
Frequency
27GHz
Polarization: Horizontal

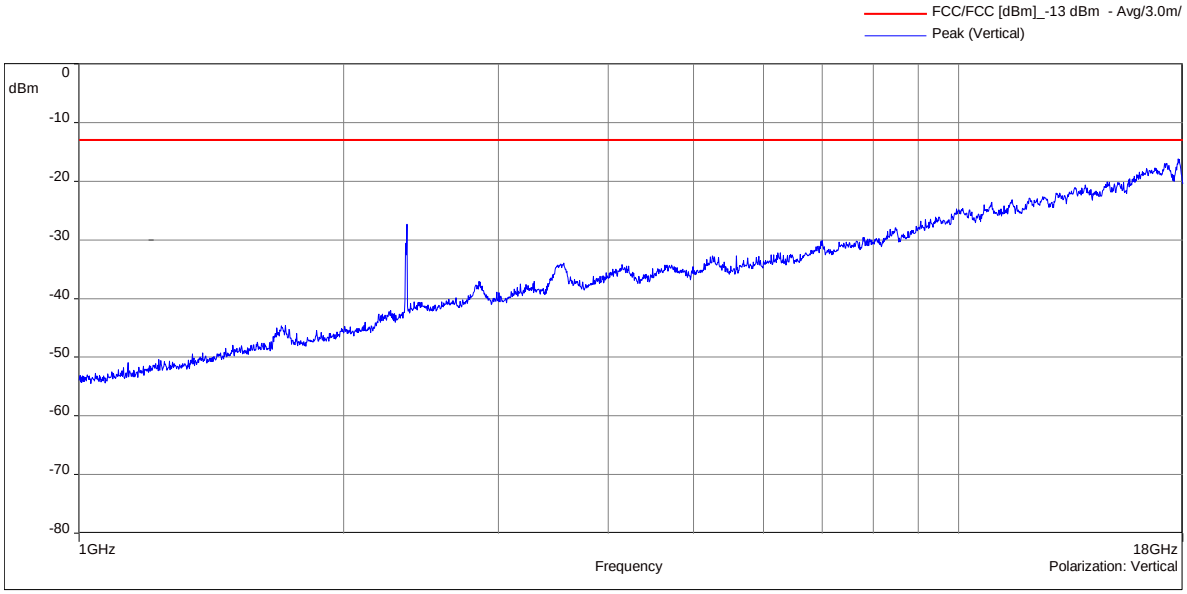
Frequency Band = Band 30 WCS 2300; Test Frequencies = low, mid and high;
Direction = RF downlink

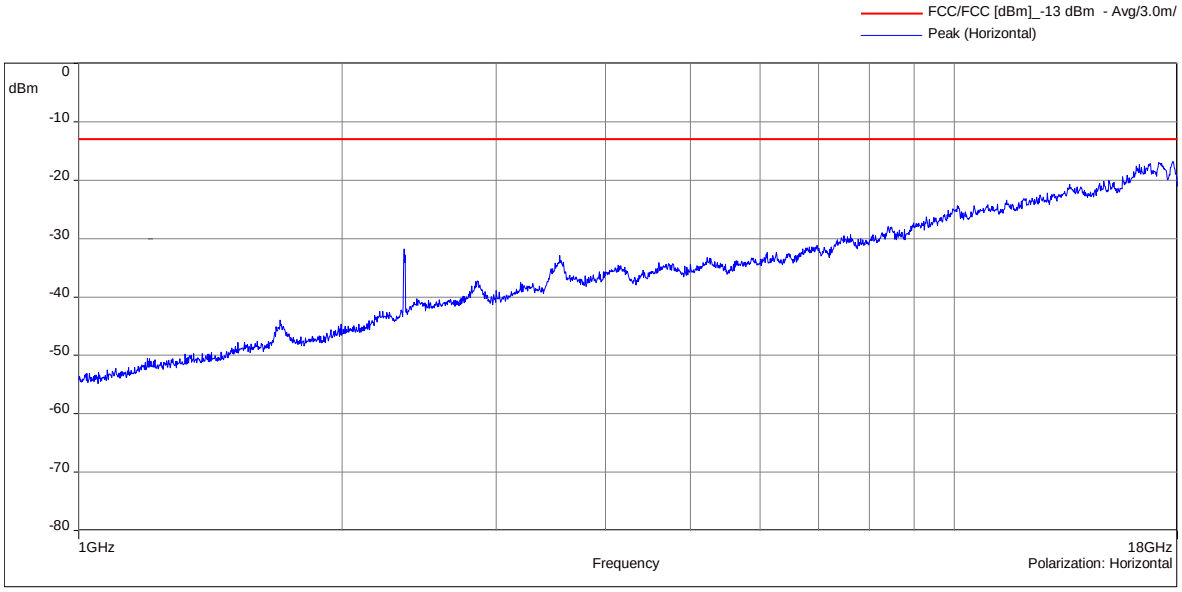
30 MHz - 1 GHz



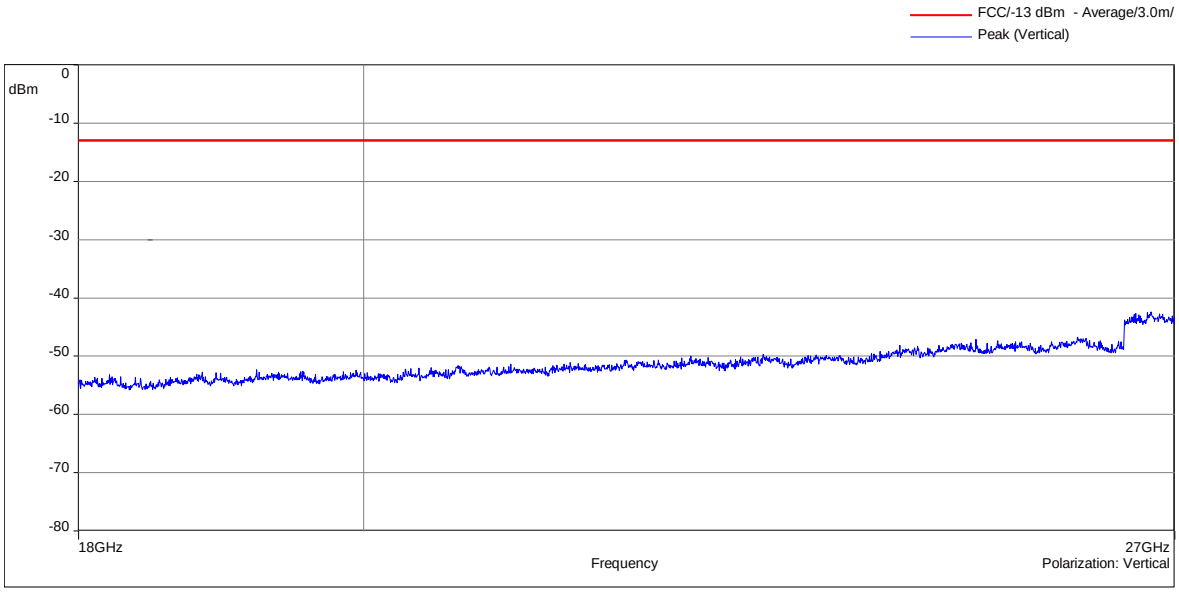



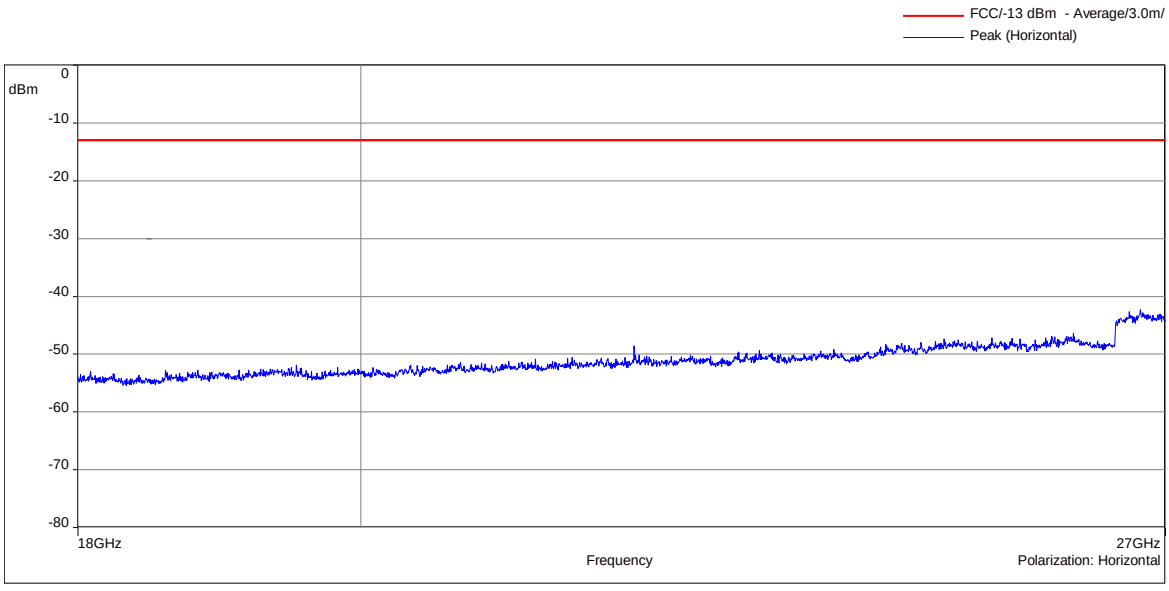
1 GHz - 18 GHz


FCC/FCC [dBm]_-13 dBm - Avg/3.0m/
Peak (Vertical)
dBm
0
-10
-20
-30
-40
-50
-60
-70
-80
1GHz
Frequency
18GHz
Polarization: Vertical


FCC/FCC [dBm]_-13 dBm - Avg/3.0m/
Peak (Horizontal)
dBm
0
-10
-20
-30
-40
-50
-60
-70
-80
1GHz
Frequency
18GHz
Polarization: Horizontal

18 GHz - 27 GHz


FCC/-13 dBm - Average/3.0m/
Peak (Vertical)
dBm
0
-10
-20
-30
-40
-50
-60
-70
-80
18GHz
Frequency
27GHz
Polarization: Vertical


FCC/-13 dBm - Average/3.0m/
Peak (Horizontal)
dBm
0
-10
-20
-30
-40
-50
-60
-70
-80
18GHz
Frequency
27GHz
Polarization: Horizontal

### 5.3.5 Field Strength Calculations

**FS** = SA + AF + CL + PA

Where as:

**FS** = Field strength
**SA** = EMC test receiver reading
**AF** = Antenna factor
**CL** = Cable loss
**PA** = Preamplifier

### 5.3.6 Test Equipment used

- Radiated Emissions

# 6 Test Equipment

## 1 Conducted

| Ref.No. | Type | Description | Manufacturer | Inventory no. | Last Calibration | Calibration Due |
|---|---|---|---|---|---|---|
| 1.1 | FSV40 | Signal Analyzer 10 Hz - 40 GHz | Rohde & Schwarz | E2050 | 2021-10 | 2022-10 |
| 1.2 | SMBV100A | Vector Signal Generator 9 kHz - 6 GHz | Rohde & Schwarz | G2089 | 2020-08 | 2022-08 |
| 1.3 | ESH3-Z5 | Line Impedance Stabilisation Network (LISN) 150 Hz – 30 MHz | Rohde & Schwarz | K794 | 2021-10 | 2022-10 |
| 1.4 | KlimaLogg Pro | Thermo-/Hygrometer | TFA | X543 | 2021-02 | 2022-02 |
| 1.5 | BAT-EMC | Software | Nexio | V3.21.0.15 | --- | --- |

## 2 Radiated Emissions

| Ref.No. | Type | Description | Manufacturer | Inventory no. | Last Calibration | Calibration Due |
|---|---|---|---|---|---|---|
| 2.1 | ESU40 | EMI test receiver 10 Hz - 40 GHz | Rohde & Schwarz | E2025 | 2021-10 | 2022-10 |
| 2.2 | HFH2-Z2 | Antenna 9 kHz – 30 MHz | Rohde & Schwarz | K549 | 2021-10 | 2022-10 |
| 2.3 | CBL 6111C | Antenna 30 MHz – 1 GHz | Chase | K1026 | 2021-02 | 2022-02 |
| 2.4 | HL 025 | Antenna 1 GHz - 18 GHz | Rohde & Schwarz | K1114 | 2022-01 | 2023-01 |
| 2.5 | MWH-1826/B | Antenna 18 GHz – 26.5 GHz | ARA Inc. | K1042 | 2020-10 | 2022-10 |
| 2.6 | MWH-2640/B | Antenna 26 GHz - 40 GHz | ARA Inc. | K1043 | 2020-10 | 2022-10 |
| 2.7 | AM1431 | Pre amplifier 10 kHz – 1 GHz | Miteq | K1721 | 2021-10 | 2022-10 |
| 2.8 | AFS4-00102000 | Preamplifier 100 MHz - 20 GHz | Miteq | K838 | 2021-10 | 2022-10 |
| 2.9 | JS43-1800-4000 | Preamplifier 18 GHz - 40 GHz | Miteq | K1104 | 2021-07 | 2023-07 |
| 2.10 | BAT-EMC | Software | Nexio | V3.21.0.15 | --- | --- |

The calibration interval is the time interval between “Last Calibration” and “Calibration Due”

# 7 Antenna Factors, Cable Loss and Sample Calculations

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

## 7.1 Antenna ANTENNA CHASE CBL 6111C (30 MHZ – 1 GHZ)

**($d_{Limit}$ = 10 m)**

| - | CBL 6111C K1026 | Sum of correction factors of cable losses and pre-amplifier | Cable loss 1 (inside chamber to floor) K1761 | Pre-amplifier K1721 | Cable loss 2 (under chamber) K1121 | Cable loss 3 (Chamber to receiver E-003973 | $d_{used}$ (meas. distance (used) |
|---|---|---|---|---|---|---|---|
| MHz | dB (1/m) | dB | dB | dB | dB | dB | m |
| 30 | 24.65 | -37.7 | 0.06 | -38.2 | 0.37 | 0.05 | 10 |
| 50 | 14.26 | -37.6 | 0.08 | -38.2 | 0.47 | 0.06 | 10 |
| 100 | 15.62 | -37.5 | 0.12 | -38.4 | 0.67 | 0.14 | 10 |
| 150 | 16.65 | -37.6 | 0.14 | -38.6 | 0.81 | 0.06 | 10 |
| 200 | 14,45 | -37.4 | 0.16 | -38.6 | 0.94 | 0.14 | 10 |
| 250 | 18,11 | -37.2 | 0.18 | -38.5 | 1.03 | 0.14 | 10 |
| 300 | 18,83 | -37.1 | 0.20 | -38.5 | 1.15 | 0.07 | 10 |
| 350 | 20,08 | -36.7 | 0.22 | -38.4 | 1.24 | 0.24 | 10 |
| 400 | 21,51 | -36.6 | 0.23 | -38.3 | 1.34 | 0.10 | 10 |
| 450 | 22,43 | -36.2 | 0.24 | -38.0 | 1.40 | 0.19 | 10 |
| 500 | 23,68 | -36.0 | 0.26 | -37.9 | 1.48 | 0.19 | 10 |
| 550 | 24,86 | -36.8 | 0.27 | -38.8 | 1.56 | 0.18 | 10 |
| 600 | 25,58 | -35.8 | 0.28 | -37.9 | 1.64 | 0.23 | 10 |
| 650 | 26,25 | -36.5 | 0.30 | -38.7 | 1.75 | 0.20 | 10 |
| 700 | 26,45 | -35.7 | 0.30 | -38.0 | 1.80 | 0.23 | 10 |
| 750 | 28,04 | -35.4 | 0.32 | -37.8 | 1.83 | 0.25 | 10 |
| 800 | 27,48 | -35.7 | 0.32 | -38.1 | 1.90 | 0.19 | 10 |
| 850 | 29,07 | -35.7 | 0.34 | -38.3 | 1.95 | 0.28 | 10 |
| 900 | 28,94 | -35.8 | 0.35 | -38.4 | 2.00 | 0.25 | 10 |
| 950 | 30,83 | -35.7 | 0.36 | -38.4 | 2.06 | 0.26 | 10 |
| 1000 | 30.09 | -35.5 | 0.37 | -38.3 | 2.12 | 0.33 | 10 |

**Sample calculation**

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

## 7.2 Antenna Rohde & Schwarz Hl 025 (1 GHz – 18 GHz)

| Frequency | AF R&S HL 025 K1114 | Sum of correction factors of cable loss and pre-amplifier | Pre-amp K838 | Cable loss (to receiver) K1910 |
|---|---|---|---|---|
| MHz | dB (1/m) | dB | dB | dB |
| 1000 | 21.2 | -18.7 | -20.7 | 2.01 |
| 2000 | 27.2 | -17.5 | -20.3 | 2.78 |
| 3000 | 30.9 | -16.9 | -20.3 | 3.42 |
| 4000 | 33.1 | -16.4 | -20.4 | 3.99 |
| 5000 | 34.8 | -16.5 | -21.0 | 4.46 |
| 6000 | 37.0 | -16.4 | -21.3 | 4.87 |
| 7000 | 37.5 | -15.7 | -21.0 | 5.35 |
| 8000 | 39.1 | -15.3 | -21.0 | 5.66 |
| 9000 | 40.1 | -14.4 | -20.4 | 6.05 |
| 10000 | 42.4 | -13.7 | -20.2 | 6.46 |
| 11000 | 42.9 | -14.4 | -21.1 | 6.69 |
| 12000 | 43.1 | -14.4 | -21.4 | 7.04 |
| 13000 | 43.2 | -13.8 | -21.2 | 7.36 |
| 14000 | 44.6 | -14.0 | -21.7 | 7.66 |
| 15000 | 45.2 | -14.4 | -22.3 | 7.90 |
| 16000 | 45.6 | -13.7 | -21.9 | 8.20 |
| 17000 | 46.4 | -13.5 | -21.9 | 8.45 |
| 18000 | 45.5 | -14.5 | -23.2 | 8.71 |

**Sample calculation**

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
Tables show an extract of values.

7.3 Antenna ARA Inc. MWH-1826-B (18 GHz – 26. GHz) partially in conjunction with pre-amplifier MITEQ JS43-1800-4000: the use of the pre-amplifier is dependent from the field strength

| Frequency | AF MWH-1826/B K1042 | Sum of correction factors of cable loss and pre-amplifier | Pre-amp K1104 | Cable loss (to receiver) K1910 |
|---|---|---|---|---|
| MHz | dB (1/m) | dB | dB | dB |
| 18000 | 32.4 | -40.4 | -49.1 | 8.71 |
| 18500 | 32.2 | -39.9 | -48.7 | 8.83 |
| 19000 | 32.5 | -39.4 | -48.4 | 9.02 |
| 19500 | 32.7 | -38.9 | -48.0 | 9.14 |
| 20000 | 32.7 | -38.3 | -47.6 | 9.26 |
| 20500 | 33.1 | -37.9 | -47.3 | 9.37 |
| 21000 | 32.9 | -37.6 | -47.0 | 9.41 |
| 21500 | 32.9 | -37.1 | -46.8 | 9.67 |
| 22000 | 33.2 | -36.8 | -46.6 | 9.79 |
| 22500 | 33.2 | -36.8 | -46.6 | 9.83 |
| 23000 | 33.3 | -36.7 | -46.6 | 9.88 |
| 23500 | 33.6 | -36.6 | -46.7 | 10.07 |
| 24000 | 33.6 | -36.7 | -46.9 | 10.17 |
| 24500 | 33.6 | -36.5 | -46.9 | 10.37 |
| 25000 | 33.7 | -36.5 | -47.0 | 10.50 |
| 25500 | 33.9 | -36.8 | -47.3 | 10.51 |
| 26000 | 34.2 | -36.6 | -47.2 | 10.60 |
| 26500 | 34.4 | -36.9 | -47.6 | 10.71 |
| 27000 | 34.4 | -36.9 | -47.8 | 10.89 |

**Sample calculation**

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

# 8 Measurement Uncertainties

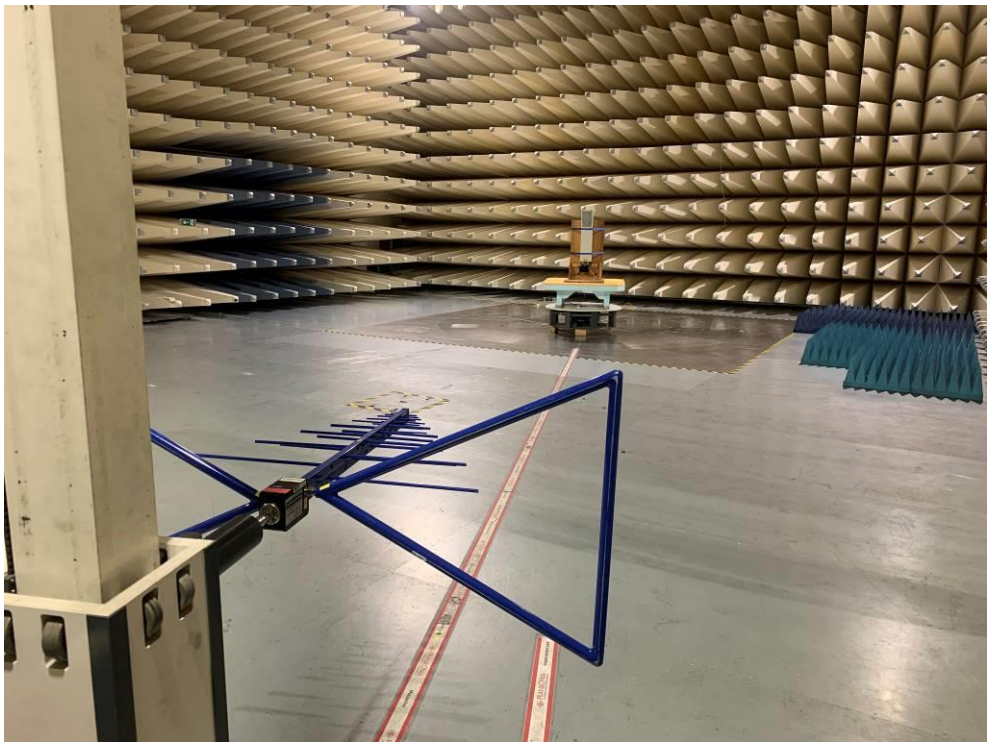
| KDB 935210 D05 | ECL |
|---|---|
| Power measurement | 0.68 dB |
| Measuring AGC threshold level | 0.90 dB |
| Out of band rejection | 0.90 dB |
| Input-versus-output signal comparison | 0.91 dB |
| Mean power output | 0.90 dB |
| Measuring out-of-band/out-of-block (including intermodulation) emissions and spurious emissions | 0.90 dB |
| Out-of-band/out-of-block emissions conducted measurements | 0.90 dB |
| Spurious emissions conducted | 2.18 dB |
| Spurious emissions radiated mesurements | 5.38 dB |
| Total frequency uncertainty | $2 \times 10^{-7}$ |

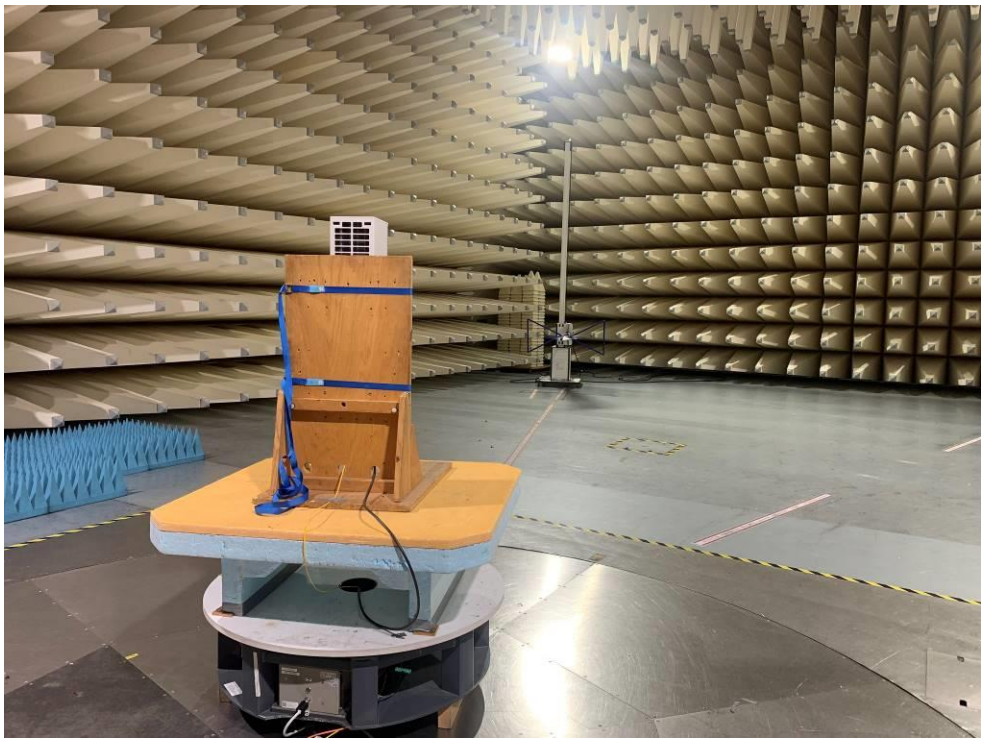
Reference: ECL-MU5.4.6.3-EMC-14-001-V02.00 MU Wireless.xlsx

# 9 Photo Report

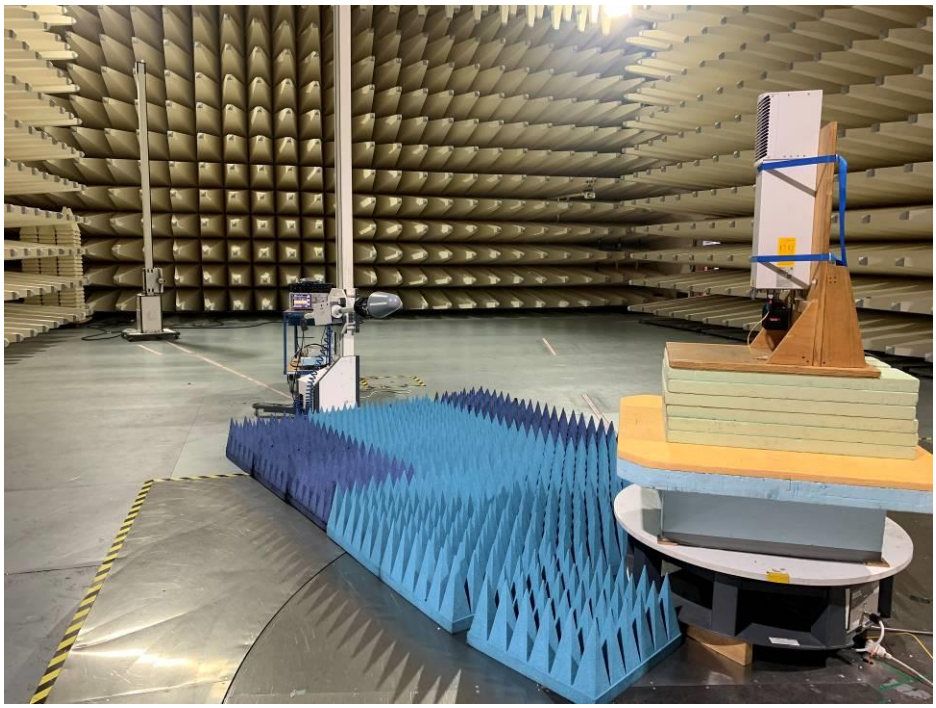
Labeling DUT

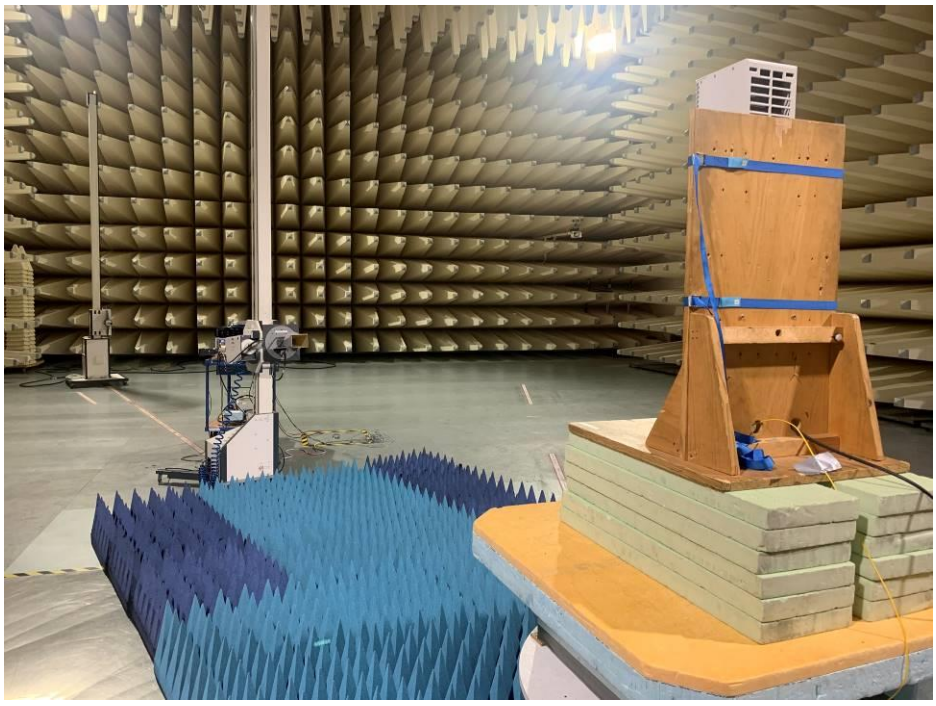
Measuring field strength of spurious radiation, Setup for 30 MHz to 1 GHz





Measuring field strength of spurious radiation, Setup for 1 GHz to 27 GHz





## Annex A: Accreditation certificate (for information)

The accreditation relates to competences stated on the accreditation certificate. The current certificate is available on the homepage of the DAkkS and can be downloaded under accredited bodies with the processing
number:

**https://www.dakks.de**

******** End of test report *******