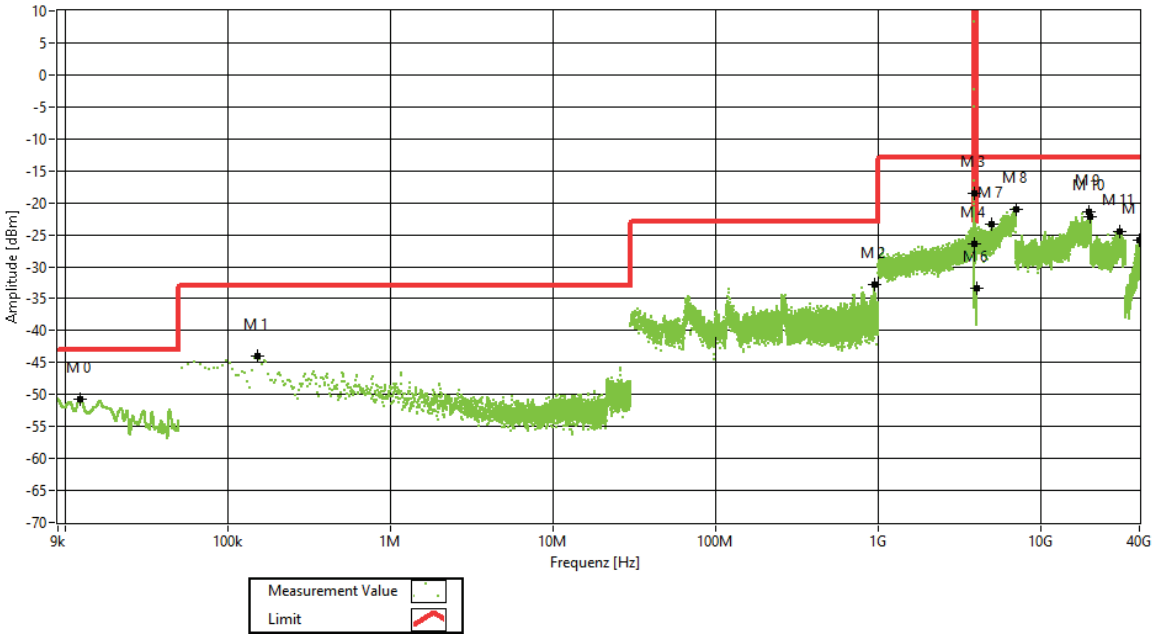
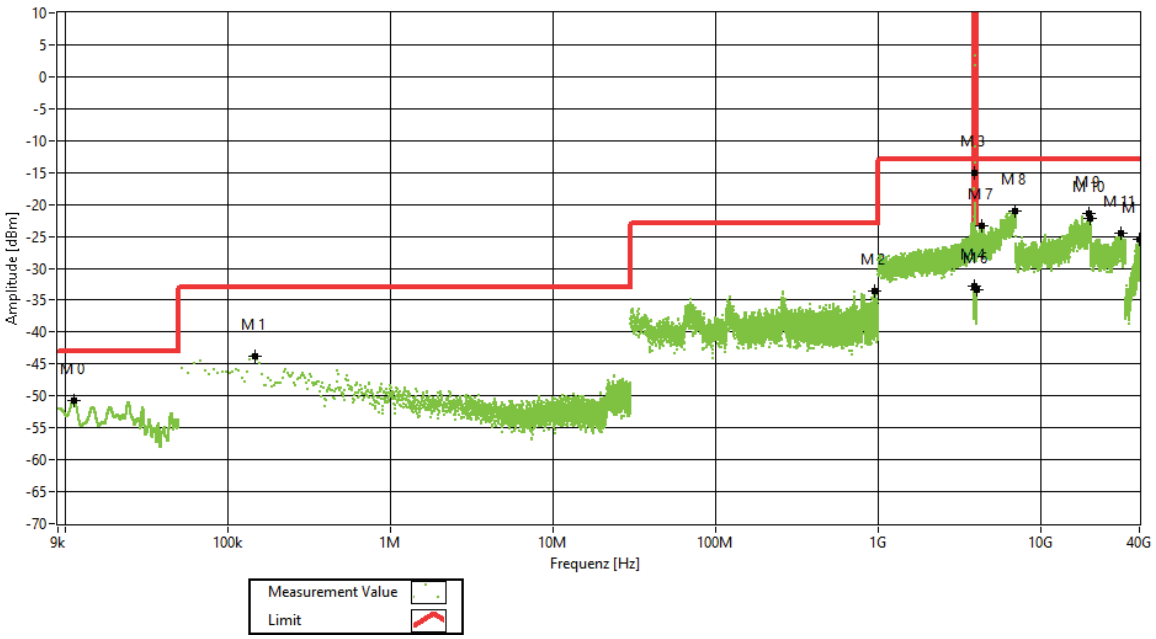
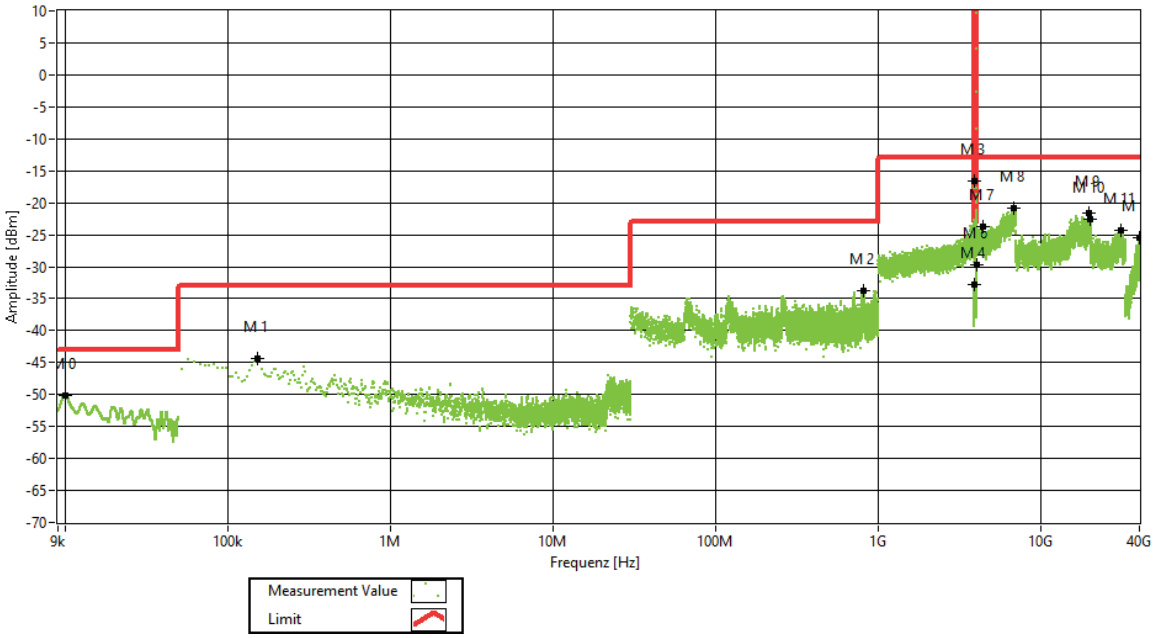
Frequency Band = 37 TDD. Segment 3. Test Frequency = low. Direction = RF downlink.
Signal Type = Wideband



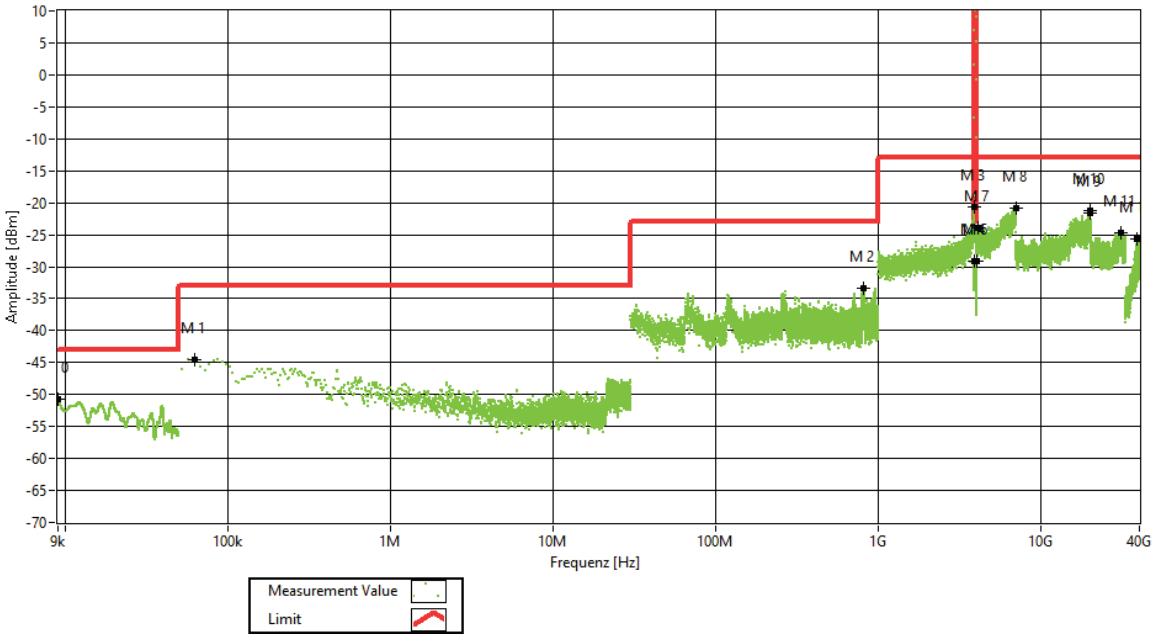
Frequency Band = 37 TDD. Segment 3. Test Frequency = mid. Direction = RF downlink.
Signal Type = Wideband



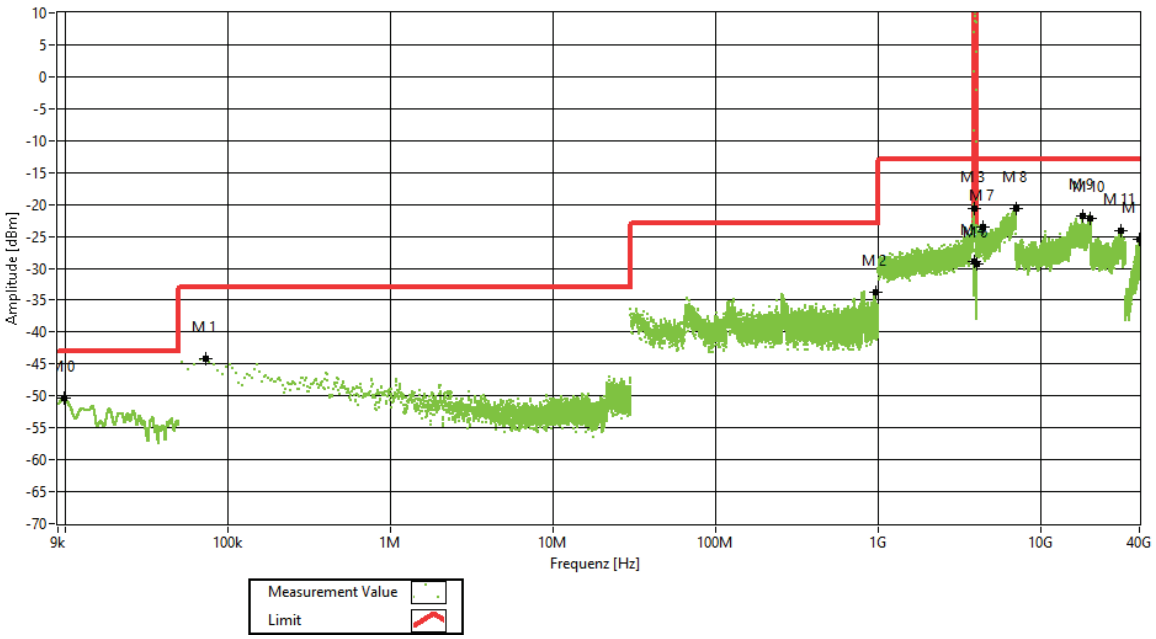
Frequency Band = 37 TDD. Segment 3. Test Frequency = high. Direction = RF downlink.
Signal Type = Wideband



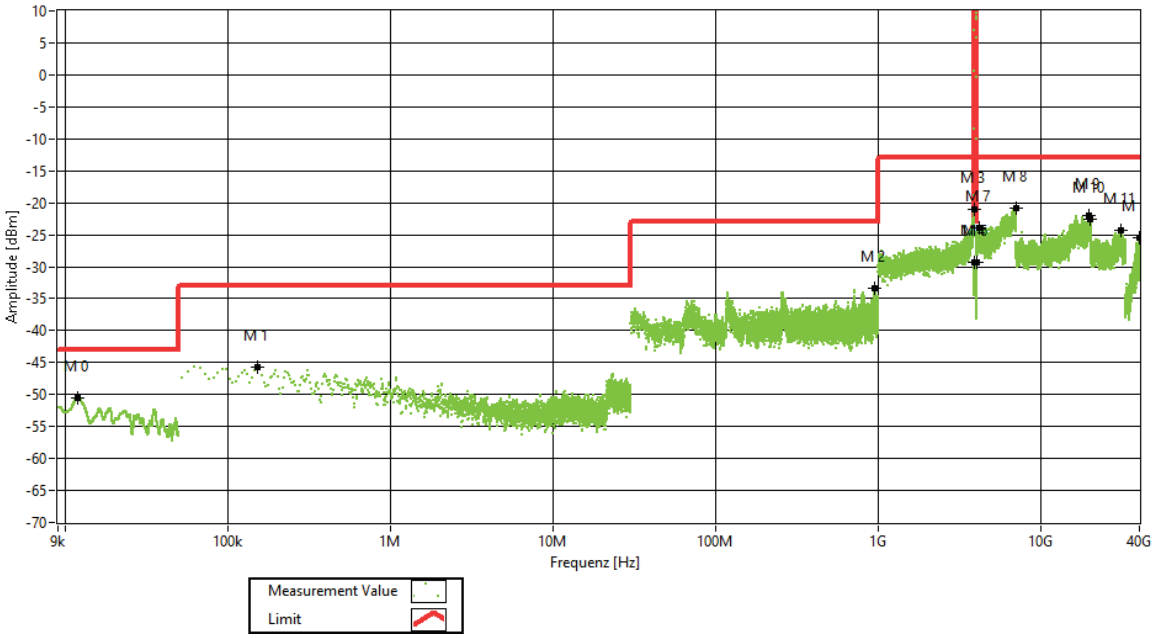
Frequency Band = 37 TDD. Segment 3. Test Frequency = low. Direction = RF downlink.
Signal Type = Wideband 5G



Frequency Band = 37 TDD. Segment 3. Test Frequency = mid. Direction = RF downlink.
Signal Type = Wideband 5G



Frequency Band = 37 TDD. Segment 3. Test Frequency = high. Direction = RF downlink.
Signal Type = Wideband 5G



5.4.5 TEST EQUIPMENT USED

- Conducted

5.5 OUT-OF-BAND EMISSION LIMITS

Standard FCC Part §2.1051. §27.53

The test was performed according to:
ANSI C63.26. KDB 935210 D05 v01r04: 3.6

Test date: 2024-11-29 – 2024-12-01

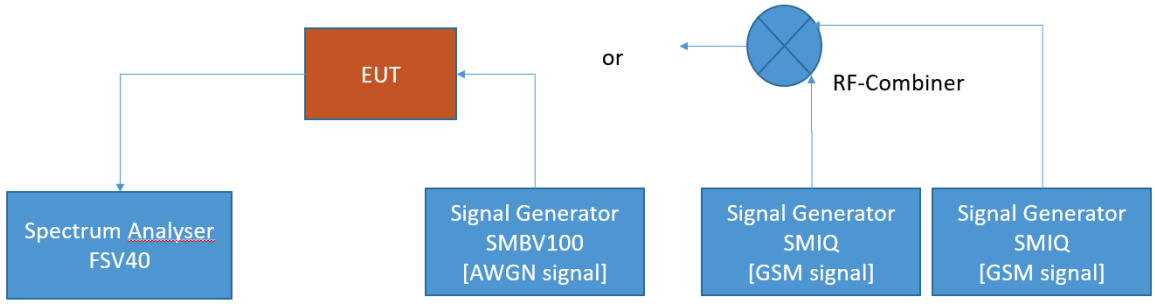
Environmental conditions: 24.7 °C; 20 % r. F.

Test engineer: Thomas Hufnagel

5.5.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the out-of-band emission limit for industrial signal boosters. The limits itself come from the applicable rule part for each operating band.

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



FCC Part 22/24/27/90 Industrial signal booster – Test Setup; Out-of-band emissions

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.

5.5.2 TEST REQUIREMENTS/LIMITS

Part 27; Miscellaneous Wireless Communication Services

Subpart C – Technical standards

§27.53 – Emission limits

(l) **3.7 GHz Service**.
The following emission limits apply to stations transmitting in the 3700-3980 MHz band:

(1) For base station operations in the 3700-3980 MHz band. the conducted power of any emissionoutside the licensee's authorized bandwidth shall not exceed –13 dBm/MHz. Compliance with this paragraph (l)(1) is based on the use of measurement instrumentation employing a resolutionbandwidth of 1 megahertz or greater. However. in the 1 megahertz bands immediately outside andadjacent to the licensee's frequency block. a resolution bandwidth of at least one percent of theemission bandwidth of the fundamental emission of the transmitter may be employed. The emissionbandwidth is defined as the width of the signal between two points. one below the carrier centerfrequency and one above the carrier center frequency. outside of which all emissions are attenuatedat least 26 dB below the transmitter power.

(2) For mobile operations in the 3700-3980 MHz band. the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed –13 dBm/MHz. Compliance with this paragraph (l)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However. in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block. the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block. the minimum resolution bandwidth for the measurement shall be 500 kHz. 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.

5.5.3 TEST PROTOCOL

TDD 37. segment 1 / low. downlink. Number of input signals = 1							
Signal Type	**Input Power**	**Band Edge**	**Signal Frequency [MHz]**	**Input Power [dBm]**	**Maximum Out-of-band Power [dBm]**	**Limit Out-of-band Power [dBm]**	**Margin to Limit [dB]**
Wideband	0.3 dB < AGC	upper	3797.5	-3.3	-24.6	-13.0	11.6
Wideband	3 dB > AGC	upper	3797.5	0.0	-23.2	-13.0	10.2
Wideband 5G	0.3 dB < AGC	upper	3750.0	-3.6	-22.6	-13.0	9.6
Wideband 5G	3 dB > AGC	upper	3750.0	-0.6	-22.1	-13.0	9.1
Wideband	0.3 dB < AGC	lower	3702.5	-3.3	-24.8	-13.0	11.8
Wideband	3 dB > AGC	lower	3702.5	0.0	-22.2	-13.0	9.2
Wideband 5G	0.3 dB < AGC	lower	3750.0	-3.6	-22.7	-13.0	9.7
Wideband 5G	3 dB > AGC	lower	3750.0	-0.6	-22.5	-13.0	9.5

TDD 37. segment 1 / low. downlink. Number of input signals = 2								
Signal Type	**Input Power**	**Band Edge**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Out-of-band Power [dBm]**	**Limit Out-of-band Power [dBm]**	**Margin to Limit [dB]**
WB*	0.3 dB < AGC	upper	3797.5	3795.0	-3.3	-27.3	-13.0	14.3
WB*	3 dB > AGC	upper	3797.5	3795.0	0.0	-27.6	-13.0	14.6
WB*	0.3 dB < AGC	lower	3702.5	3705.0	-3.3	-27.3	-13.0	14.3
WB*	3 dB > AGC	lower	3702.5	3705.0	0.0	-26.5	-13.0	13.5

*: Explanations concering table with two input signals:

"WB" means Wideband.

TDD 37. segment 2 / mid. downlink. Number of input signals = 1							
Signal Type	**Input Power**	**Band Edge**	**Signal Frequency [MHz]**	**Input Power [dBm]**	**Maximum Out-of-band Power [dBm]**	**Limit Out-of-band Power [dBm]**	**Margin to Limit [dB]**
Wideband	0.3 dB < AGC	upper	3887.5	-3.7	-26.1	-13.0	13.1
Wideband	3 dB > AGC	upper	3887.5	-0.4	-24.7	-13.0	11.7
Wideband 5G	0.3 dB < AGC	upper	3840.0	-4.0	-22.3	-13.0	9.3
Wideband 5G	3 dB > AGC	upper	3840.0	-1.0	-21.8	-13.0	8.8
Wideband	0.3 dB < AGC	lower	3792.0	-3.3	-24.0	-13.0	11.0
Wideband	3 dB > AGC	lower	3792.0	0.0	-22.6	-13.0	9.6
Wideband 5G	0.3 dB < AGC	lower	3840.0	-3.6	-22.0	-13.0	9.0
Wideband 5G	3 dB > AGC	lower	3840.0	-0.6	-22.3	-13.0	9.3

TDD 37. segment 2 / mid. downlink. Number of input signals = 2								
Signal Type	**Input Power**	**Band Edge**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Out-of-band Power [dBm]**	**Limit Out-of-band Power [dBm]**	**Margin to Limit [dB]**
WB*	0.3 dB < AGC	upper	3887.5	3885.0	-3.5	-26.8	-13.0	13.8
WB*	3 dB > AGC	upper	3887.5	3885.0	-0.2	-26.2	-13.0	13.2
WB*	0.3 dB < AGC	lower	3792.0	3795.0	-3.3	-25.9	-13.0	12.9
WB*	3 dB > AGC	lower	3792.0	3795.0	0.0	-24.8	-13.0	11.8

*: Explanations concering table with two input signals:

"WB" means Wideband.

TDD 37. segment 3. downlink. Number of input signals = 1							
Signal Type	**Input Power**	**Band Edge**	**Signal Frequency [MHz]**	**Input Power [dBm]**	**Maximum Out-of-band Power [dBm]**	**Limit Out-of-band Power [dBm]**	**Margin to Limit [dB]**
Wideband	0.3 dB < AGC	upper	3977.50	-3.3	-23.5	-13.0	10.5
Wideband	3 dB > AGC	upper	3977.50	0.0	-23.0	-13.0	10.0
Wideband 5G	0.3 dB < AGC	upper	3930.00	-3.6	-22.1	-13.0	9.1
Wideband 5G	3 dB > AGC	upper	3930.00	-0.6	-21.7	-13.0	8.7
Wideband	0.3 dB < AGC	lower	3882.50	-3.1	-21.7	-13.0	8.7
Wideband	3 dB > AGC	lower	3882.50	0.2	-21.4	-13.0	8.4
Wideband 5G	0.3 dB < AGC	lower	3930.00	-3.4	-21.9	-13.0	8.9
Wideband 5G	3 dB > AGC	lower	3930.00	-0.4	-21.8	-13.0	8.8

TDD 37. segment 3. downlink. Number of input signals = 2								
Signal Type	**Input Power**	**Band Edge**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Out-of-band Power [dBm]**	**Limit Out-of-band Power [dBm]**	**Margin to Limit [dB]**
WB*	0.3 dB < AGC	upper	3977.50	3975.00	-3.1	-25.5	-13.0	12.5
WB*	3 dB > AGC	upper	3977.50	3975.00	0.2	-27.1	-13.0	14.1
WB*	0.3 dB < AGC	lower	3882.50	3885.00	-3.1	-23.9	-13.0	10.9
WB*	3 dB > AGC	lower	3882.50	3885.00	0.2	-23.8	-13.0	10.8

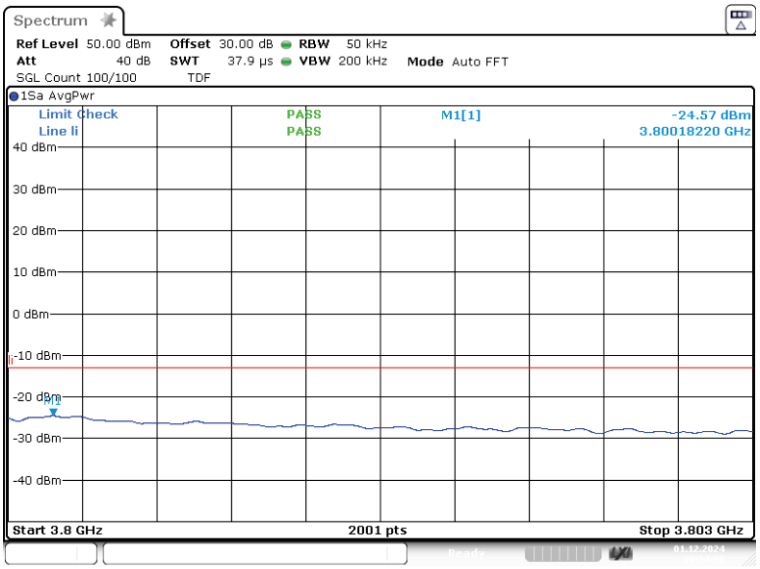
Remark: Please see next sub-clause for the measurement plot.

*: Explanations concering table with two input signals:

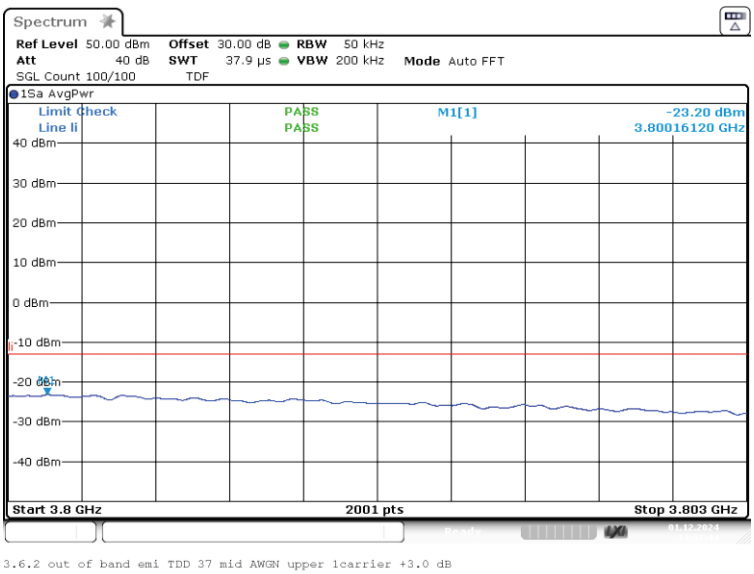
"WB" means Wideband.

5.5.4 MEASUREMENT PLOT

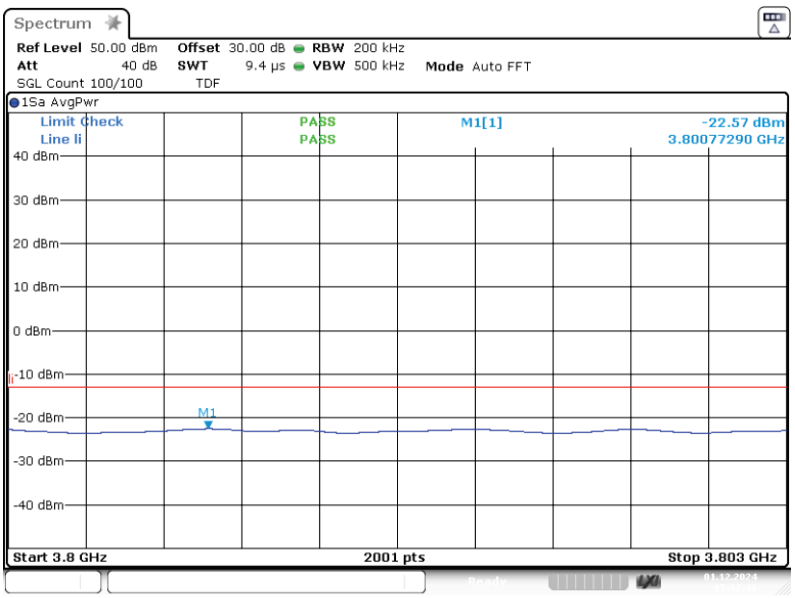
Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 1

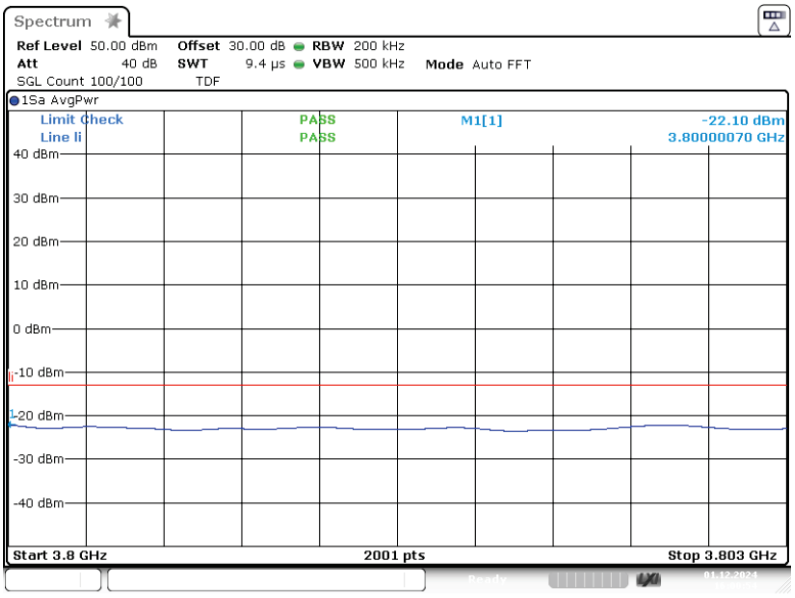


Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper;
Mod: AWGN100; Input Power = 0.3 dB < AGC; Number of signals 1



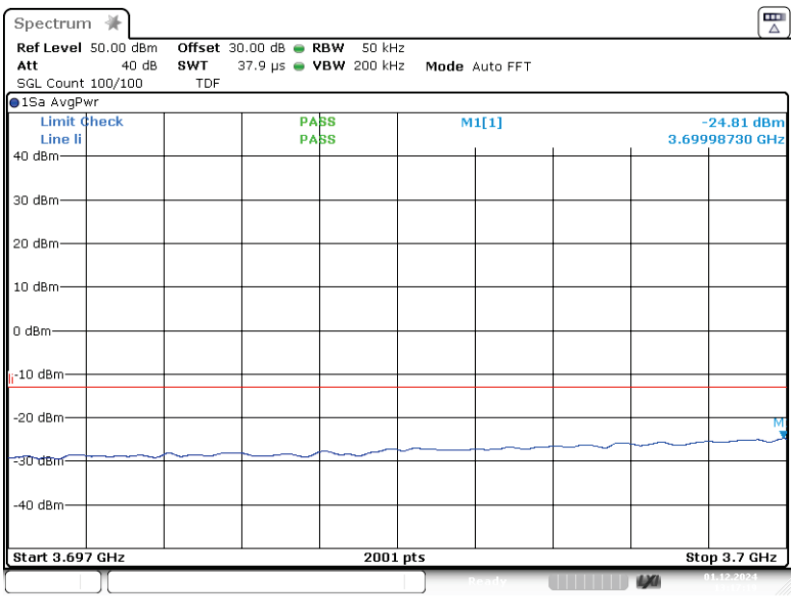
3.6.2 out of band emi TDD 37 mid AWGN100 upper 1carrier -0.3 dB 3.800G 3.803G

Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper;
Mod: AWGN100; Input Power = 3 dB > AGC; Number of signals 1



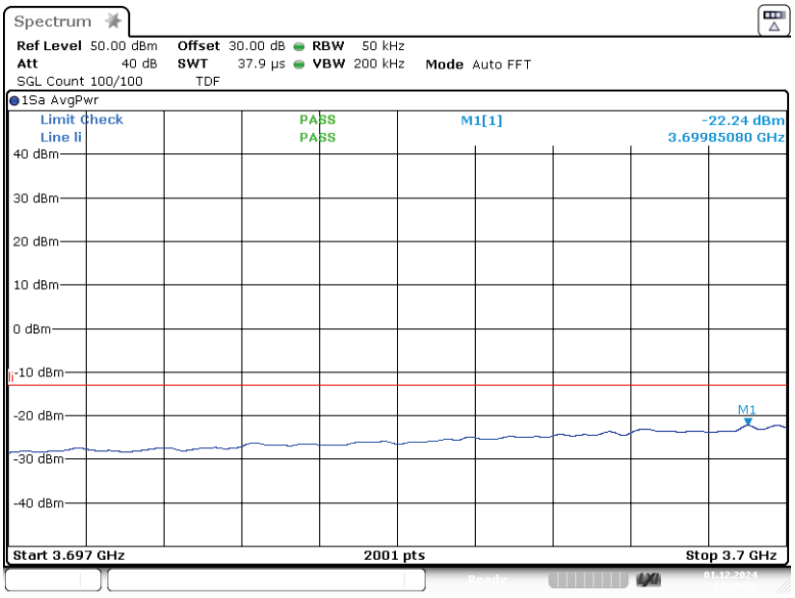
3.6.2 out of band emi TDD 37 mid AWGN100 upper 1carrier +3.0 dB 3.800G 3.803G

Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



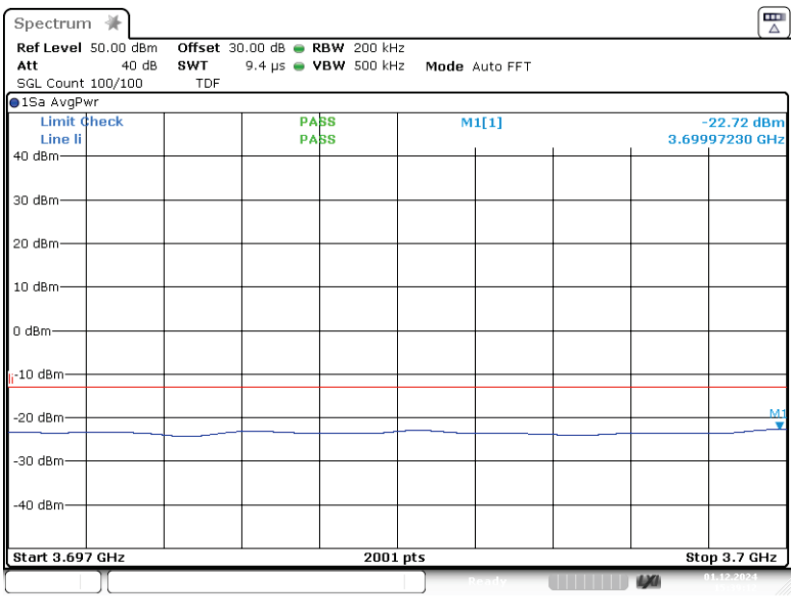
3.6.2 out of band emi TDD 37 mid AWGN lower 1carrier -0.3 dB
3.697G 3.700G

Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 1



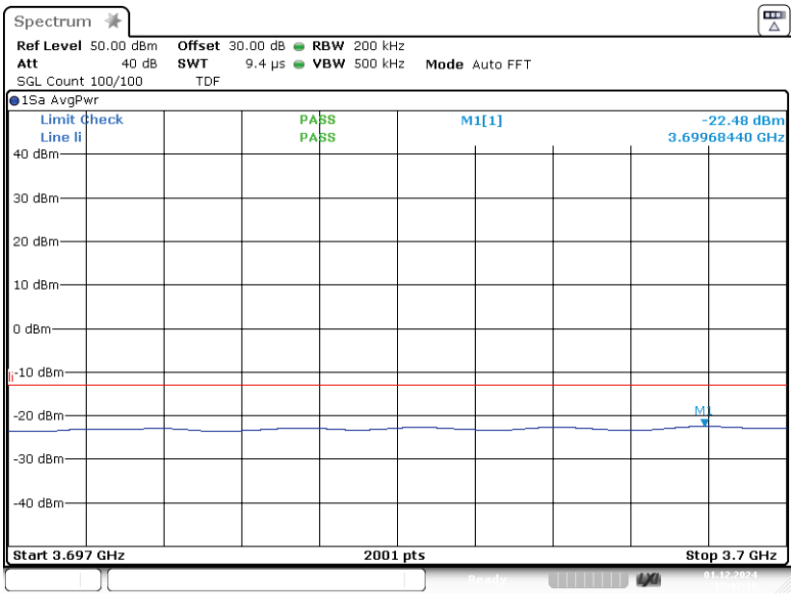
3.6.2 out of band emi TDD 37 mid AWGN lower 1carrier +3.0 dB
3.697G 3.700G

Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower;
Mod: AWGN100; Input Power = 0.3 dB < AGC; Number of signals 1



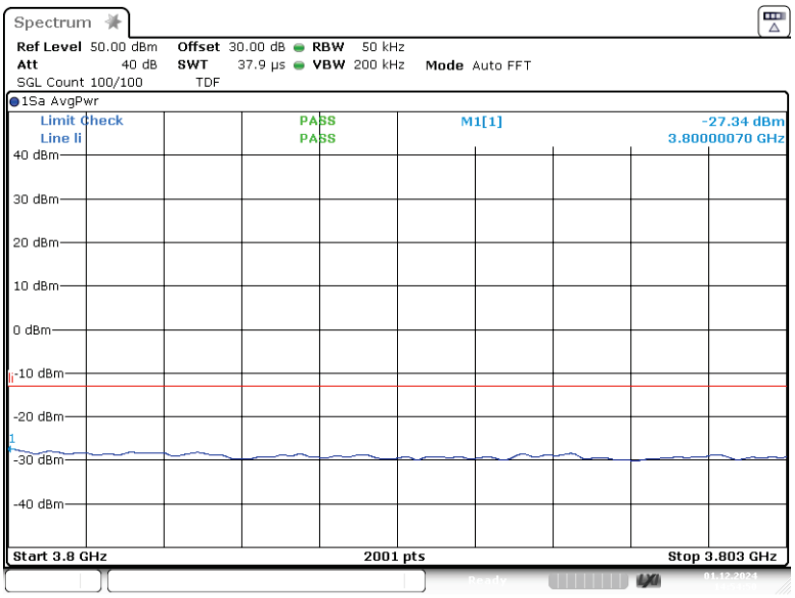
3.6.2 out of band emi TDD 37 mid AWGN100 lower 1carrier -0.3 dB 3.697G 3.700G

Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower;
Mod: AWGN100; Input Power = 3 dB > AGC; Number of signals 1



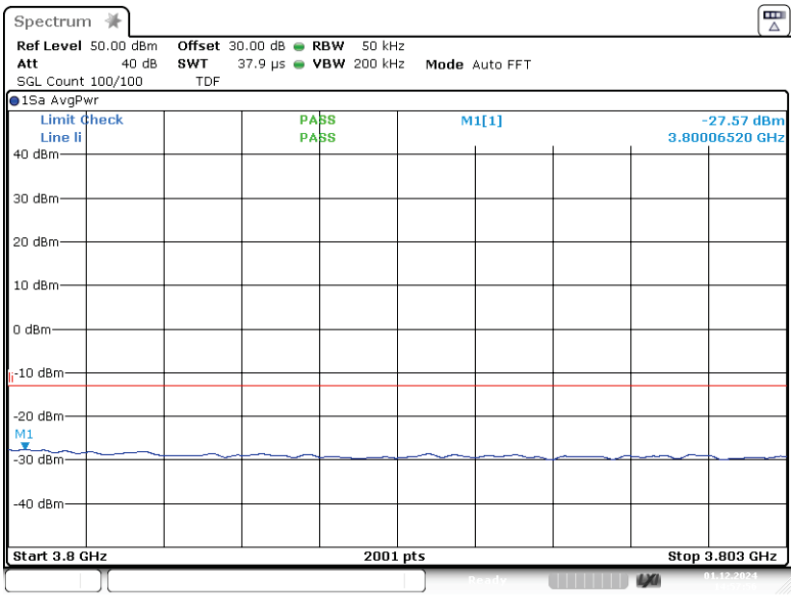
3.6.2 out of band emi TDD 37 mid AWGN100 lower 1carrier +3.0 dB 3.697G 3.700G

Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



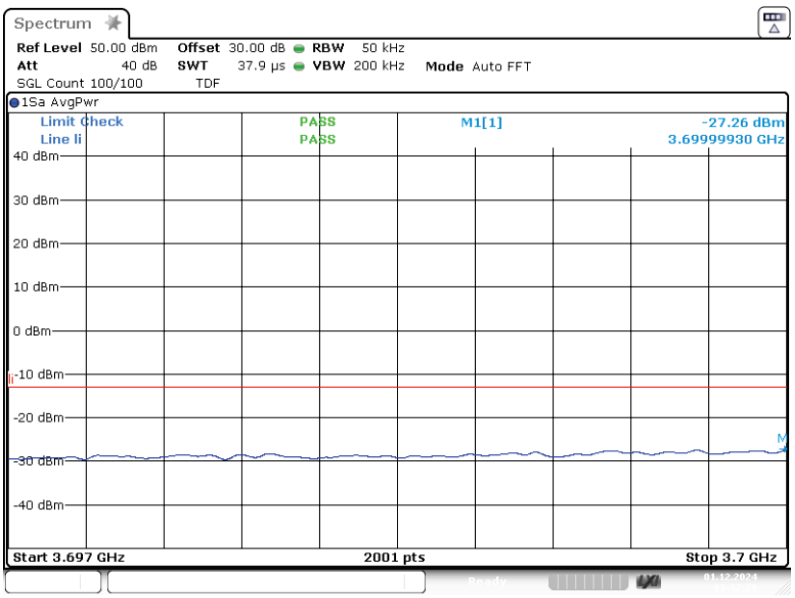
3.6.2 out of band emi TDD 37 mid AWGN upper 2carriers -0.3 d
B 3.800G 3.803G

Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



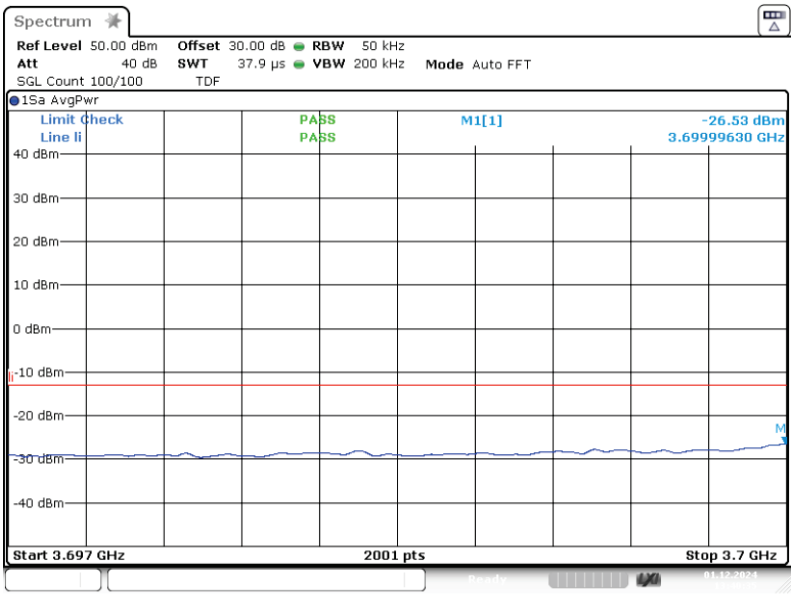
3.6.2 out of band emi TDD 37 mid AWGN upper 2carriers +3.0 d
B 3.800G 3.803G

Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



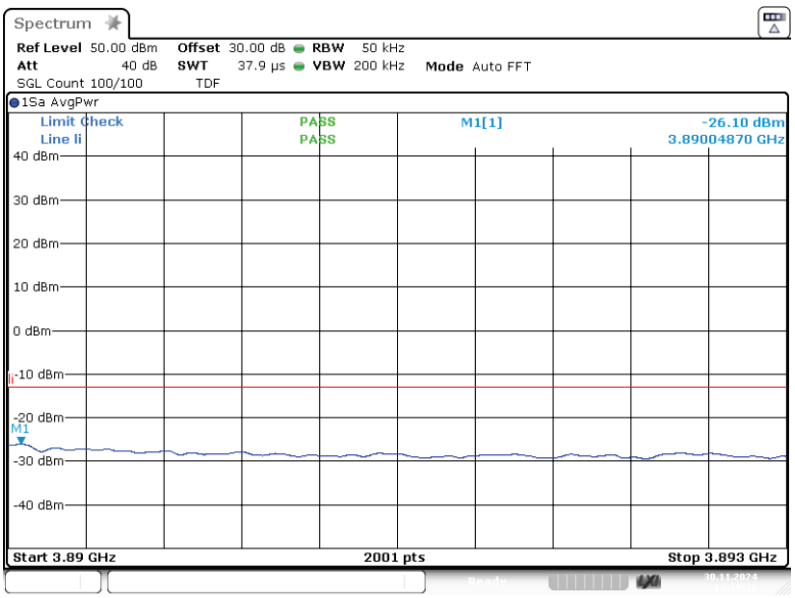
3.6.2 out of band emi TDD 37 mid AWGN lower 2carriers -0.3 d
B 3.697G 3.700G

Band: TDD 37 low; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



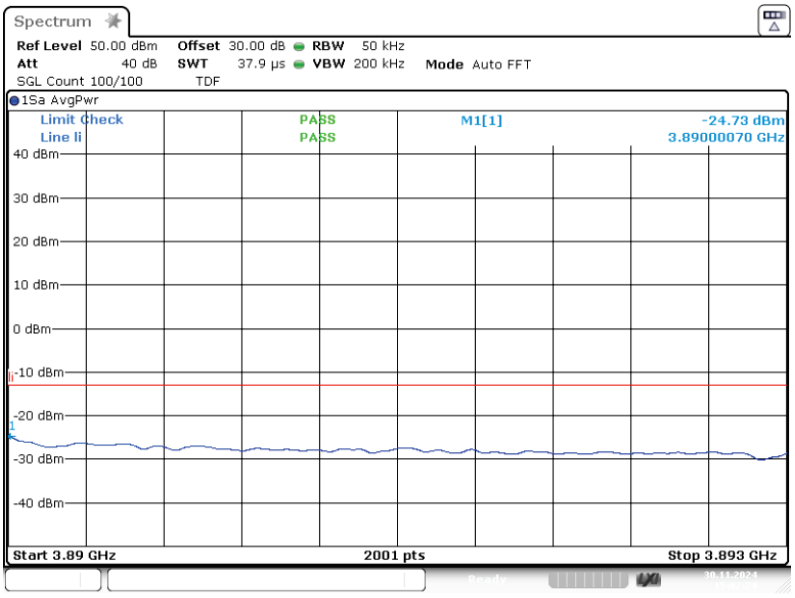
3.6.2 out of band emi TDD 37 mid AWGN lower 2carriers +3.0 d
B 3.697G 3.700G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



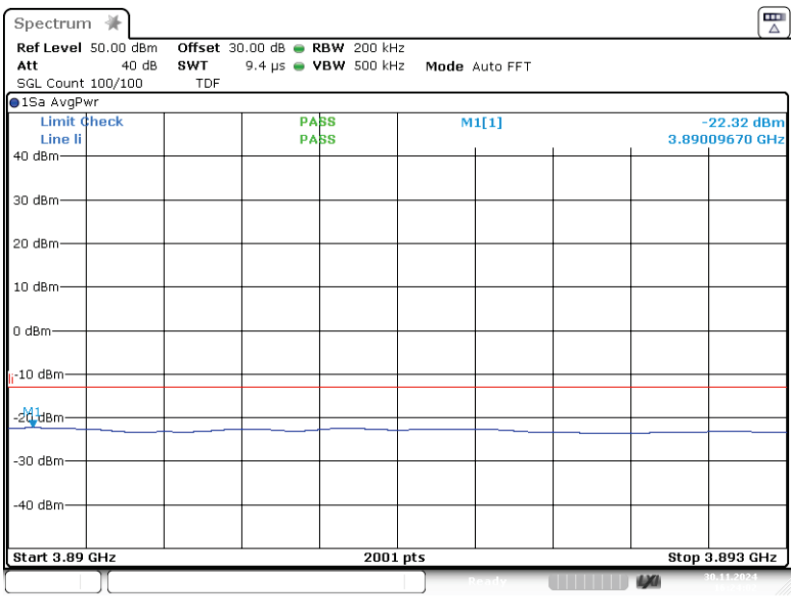
3.6.2 out of band emi TDD 37 mid AWGN upper 1carrier -0.3 dB
3.890G 3.893G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 1



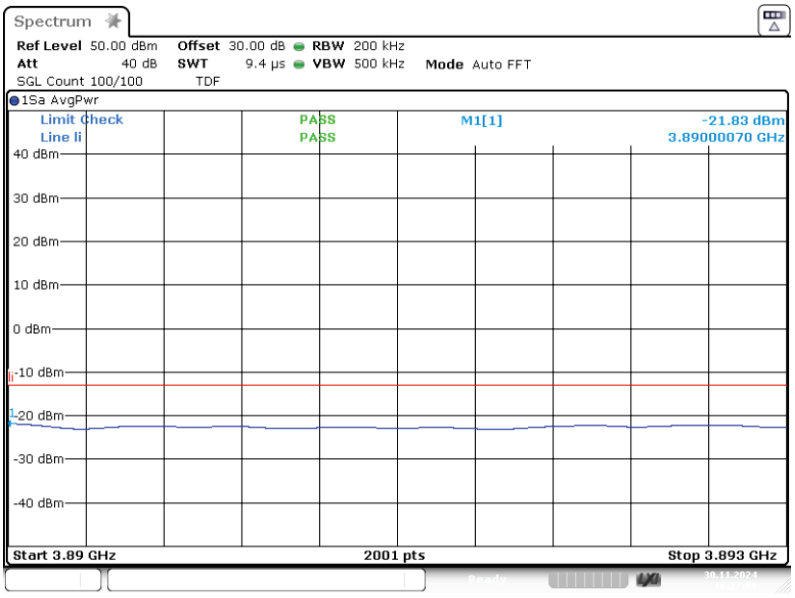
3.6.2 out of band emi TDD 37 mid AWGN upper 1carrier +3.0 dB
3.890G 3.893G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper;
Mod: AWGN100; Input Power = 0.3 dB < AGC; Number of signals 1



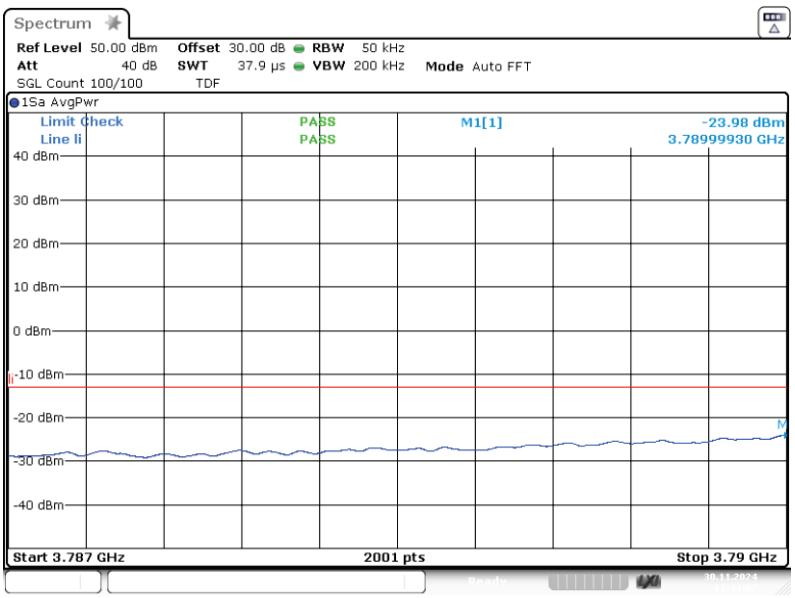
3.6.2 out of band emi TDD 37 mid AWGN100 upper 1carrier -0.3 dB 3.890G 3.893G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper;
Mod: AWGN100; Input Power = 3 dB > AGC; Number of signals 1



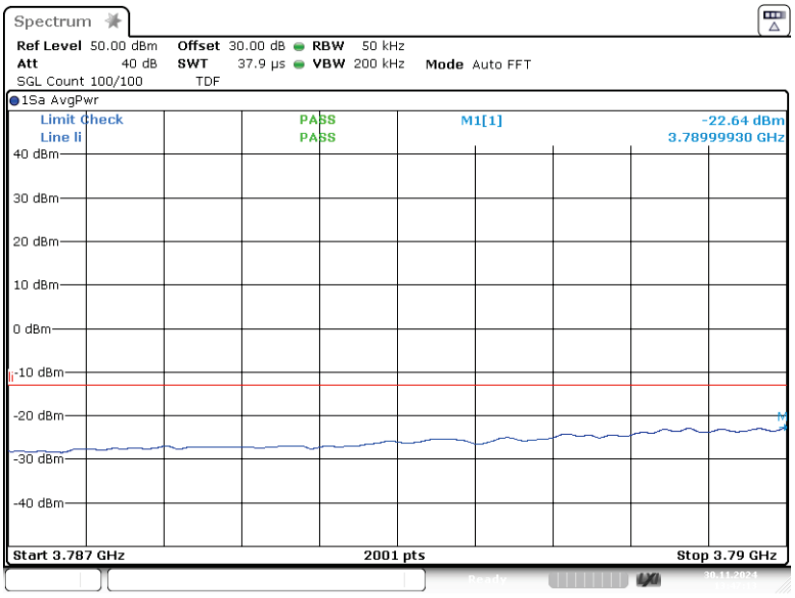
3.6.2 out of band emi TDD 37 mid AWGN100 upper 1carrier +3.0 dB 3.890G 3.893G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



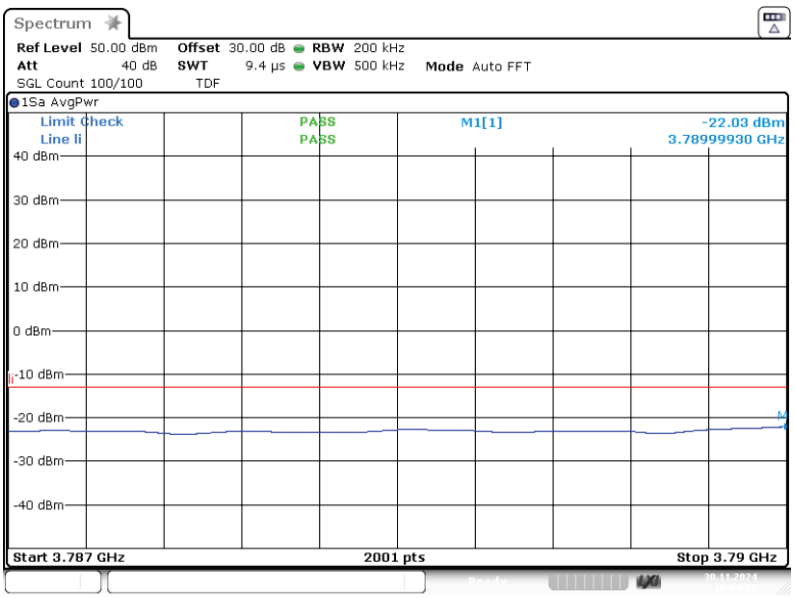
3.6.2 out of band emi TDD 37 mid AWGN lower 1carrier -0.3 dB
3.787G 3.790G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 1



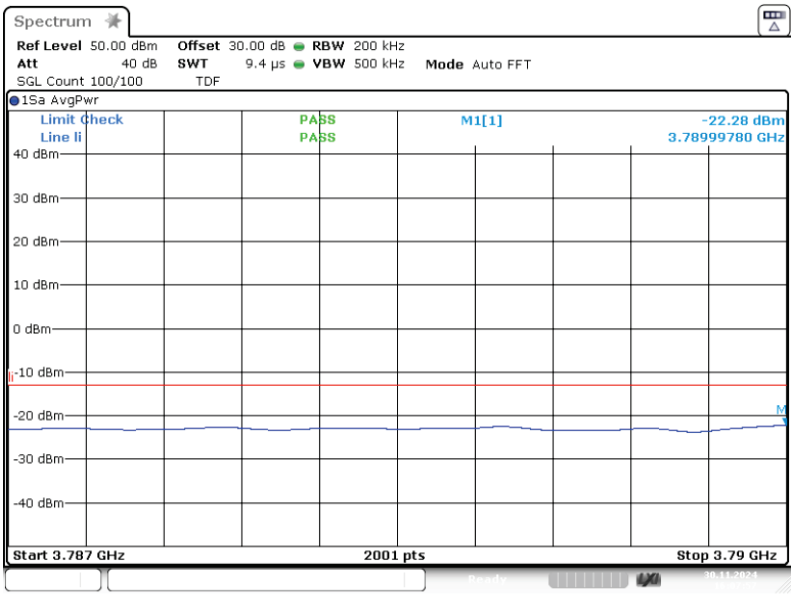
3.6.2 out of band emi TDD 37 mid AWGN lower 1carrier +3.0 dB
3.787G 3.790G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower;
Mod: AWGN100; Input Power = 0.3 dB < AGC; Number of signals 1



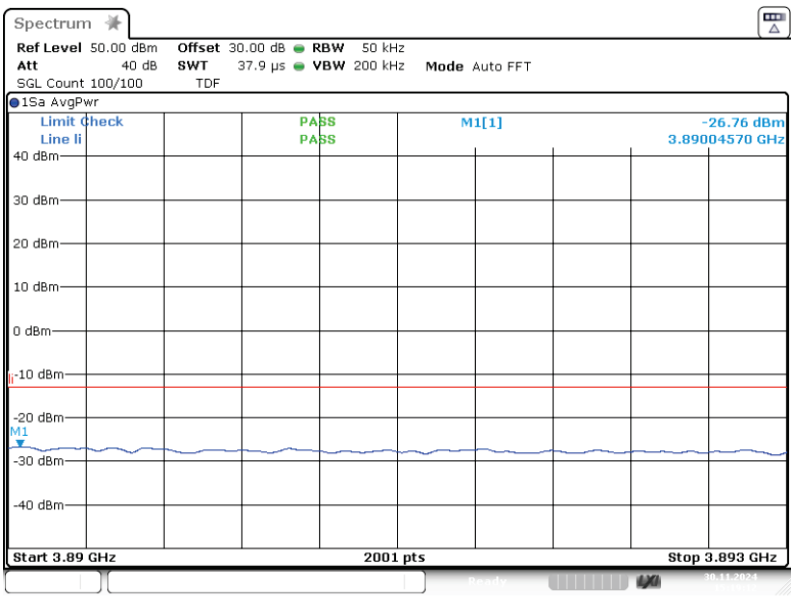
3.6.2 out of band emi TDD 37 mid AWGN100 lower 1carrier -0.3 dB 3.787G 3.790G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower;
Mod: AWGN100; Input Power = 3 dB > AGC; Number of signals 1



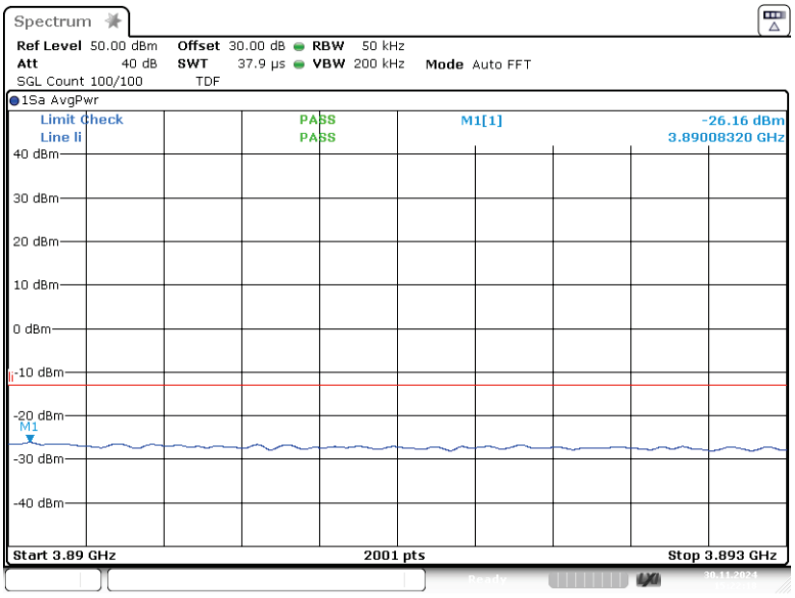
3.6.2 out of band emi TDD 37 mid AWGN100 lower 1carrier +3.0 dB 3.787G 3.790G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



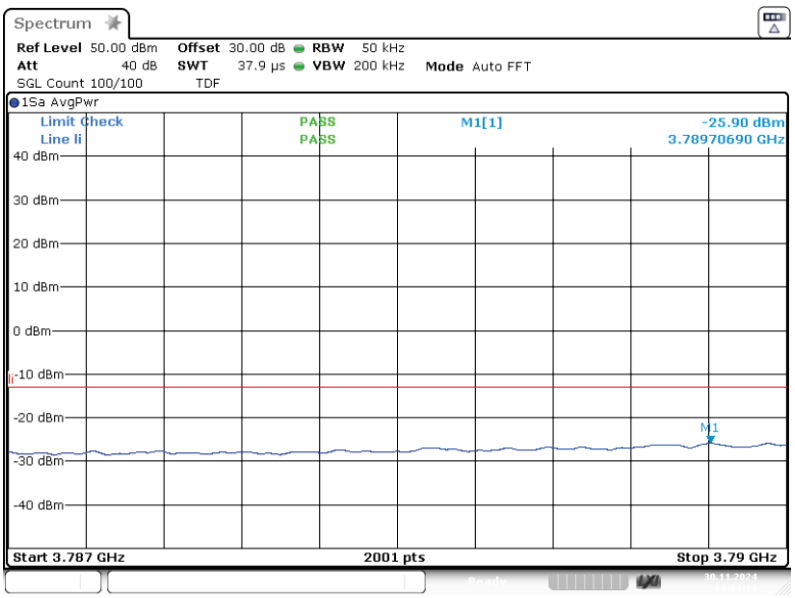
3.6.2 out of band emi TDD 37 mid AWGN upper 2carriers -0.3 d
B 3.890G 3.893G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



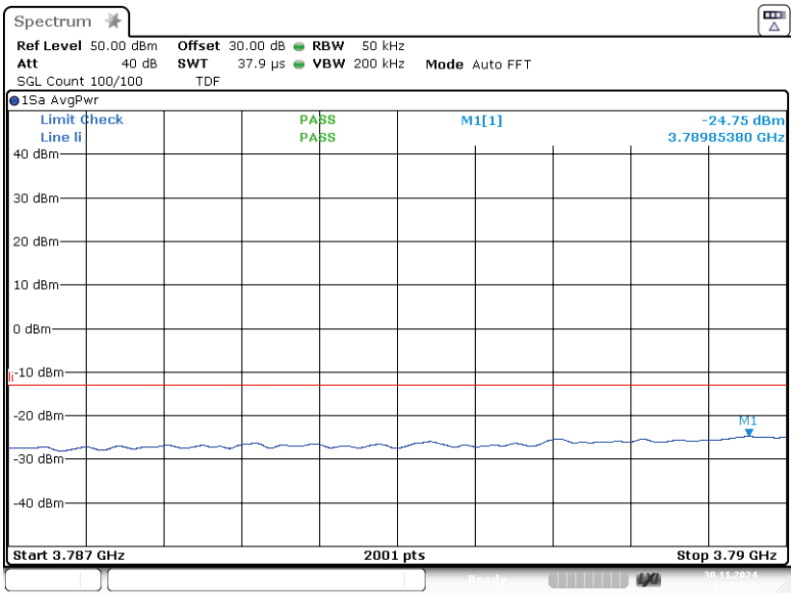
3.6.2 out of band emi TDD 37 mid AWGN upper 2carriers +3.0 d
B 3.890G 3.893G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



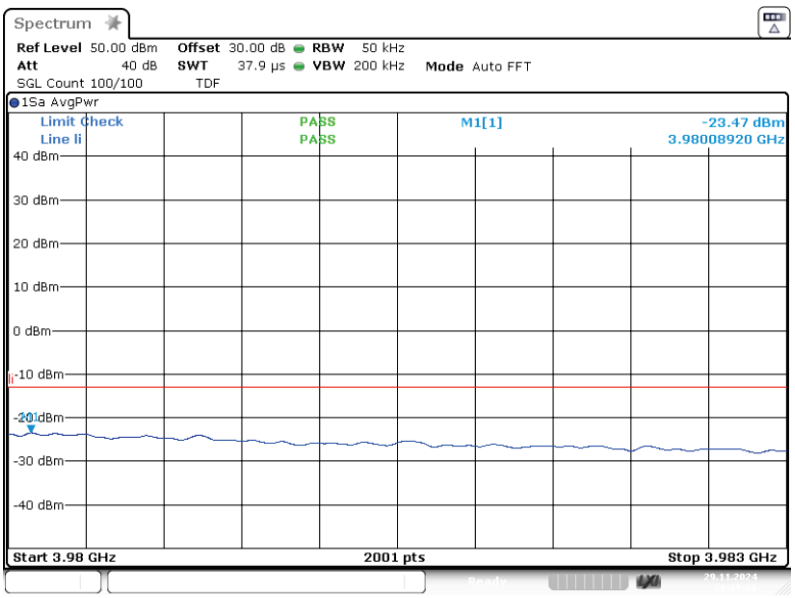
3.6.2 out of band emi TDD 37 mid AWGN lower 2carriers -0.3 d
B 3.787G 3.790G

Band: TDD 37 mid; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



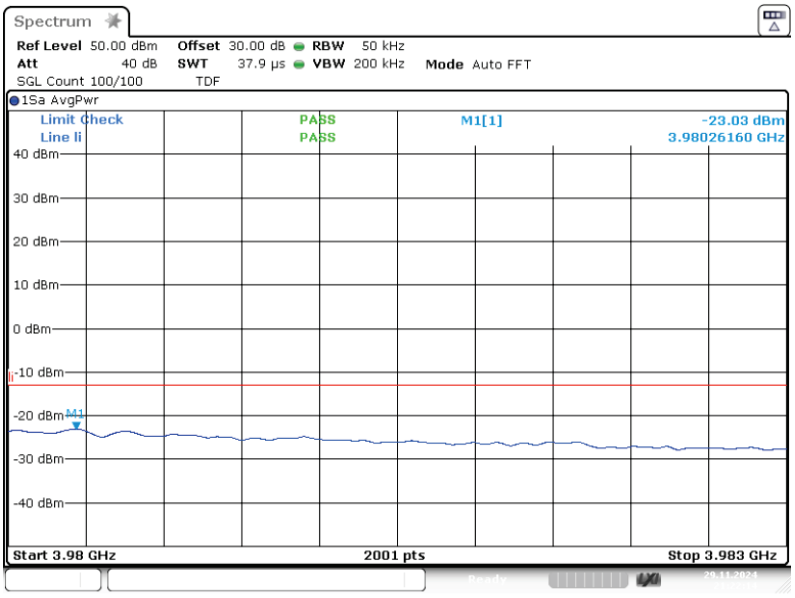
3.6.2 out of band emi TDD 37 mid AWGN lower 2carriers +3.0 d
B 3.787G 3.790G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



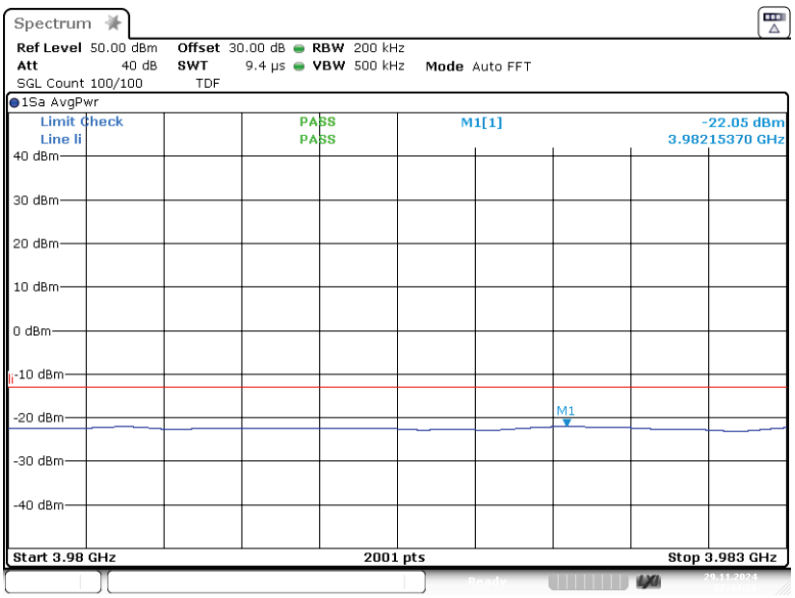
3.6.2 out of band emi TDD 37 upper AWGN upper 1carrier -0.3 dB 3.980G 3.983G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 1



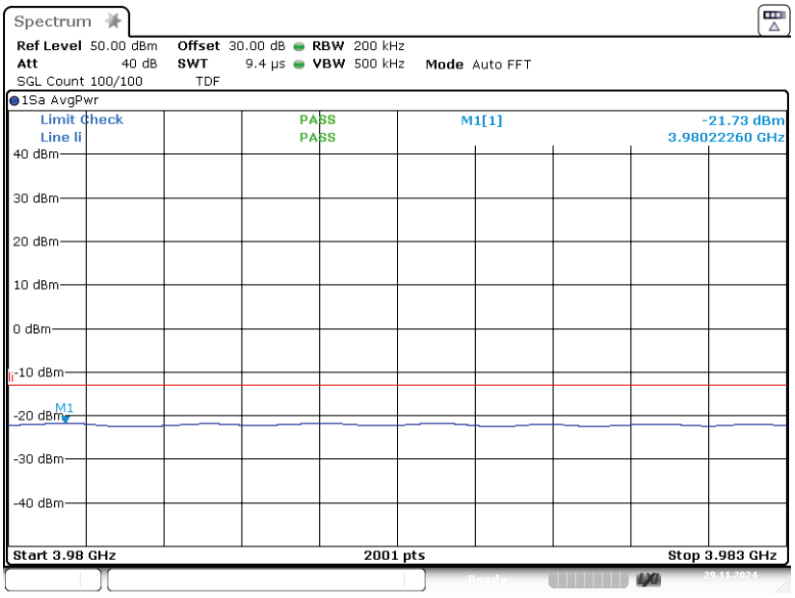
3.6.2 out of band emi TDD 37 upper AWGN upper 1carrier +3.0 dB 3.980G 3.983G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper;
Mod: AWGN100; Input Power = 0.3 dB < AGC; Number of signals 1



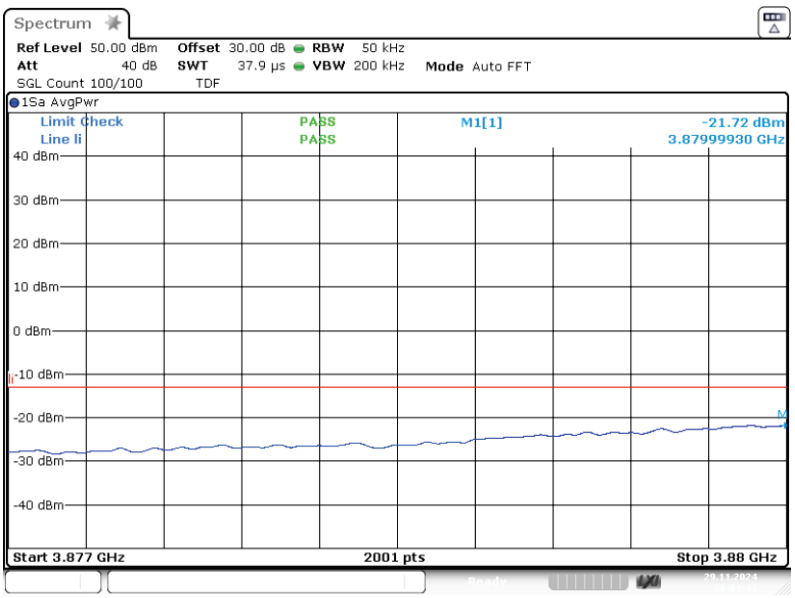
3.6.2 out of band emi TDD 37 upper AWGN100 upper 1carrier -0
.3 dB 3.980G 3.983G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper;
Mod: AWGN100; Input Power = 3 dB > AGC; Number of signals 1



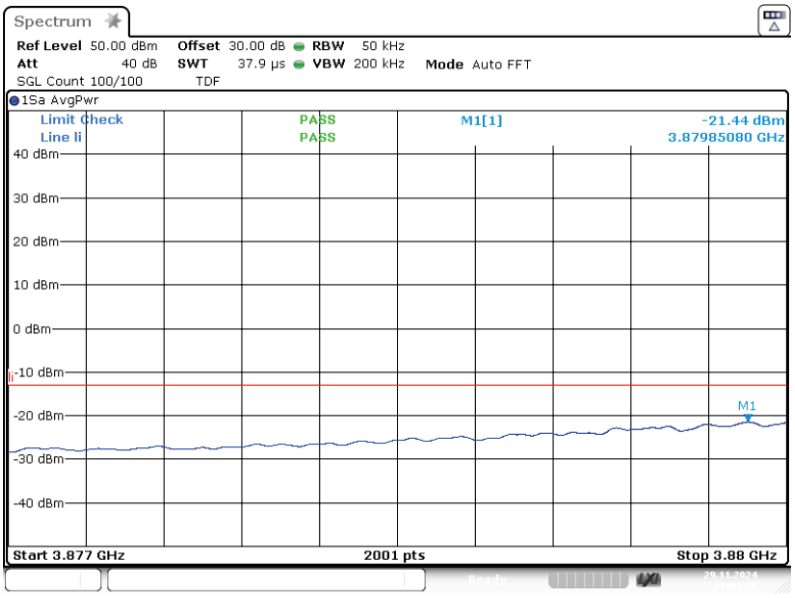
3.6.2 out of band emi TDD 37 upper AWGN100 upper 1carrier +3
.0 dB 3.980G 3.983G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 1



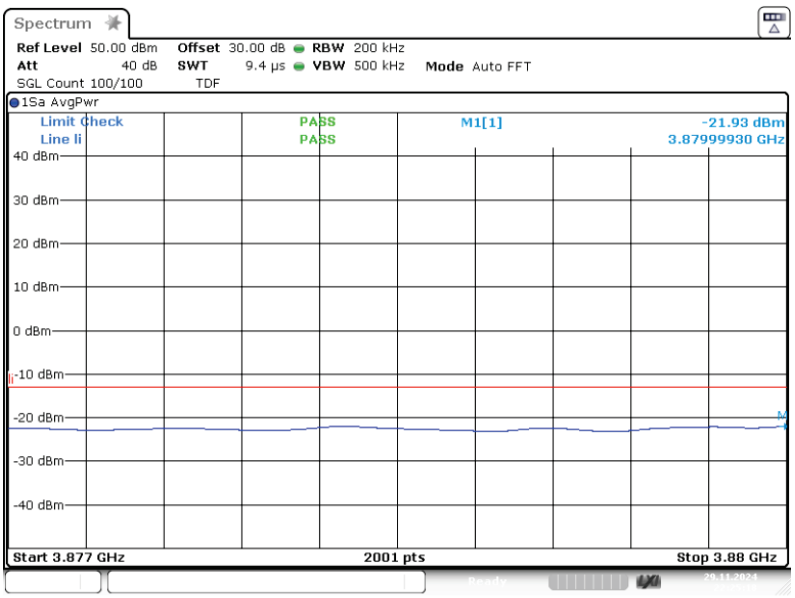
3.6.2 out of band emi TDD 37 upper AWGN lower 1carrier -0.3 dB 3.877G 3.880G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 1



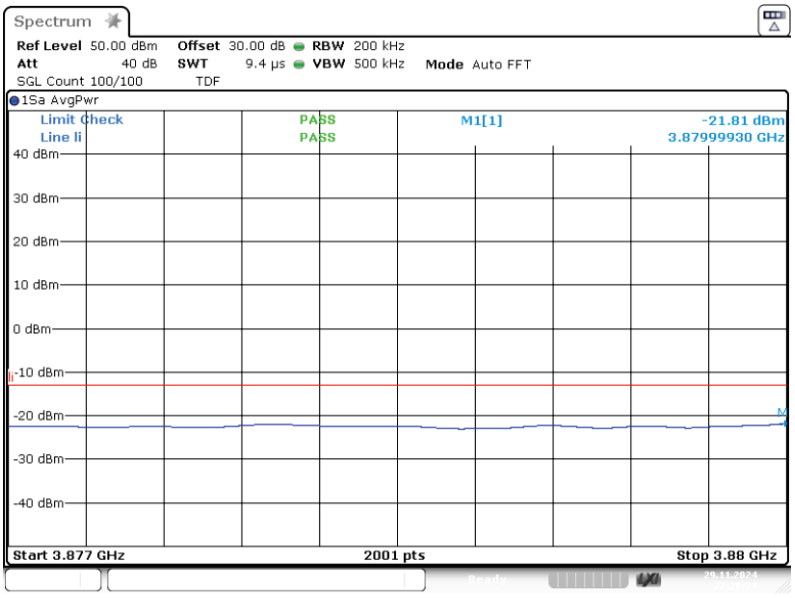
3.6.2 out of band emi TDD 37 upper AWGN lower 1carrier +3.0 dB 3.877G 3.880G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower;
Mod: AWGN100; Input Power = 0.3 dB < AGC; Number of signals 1



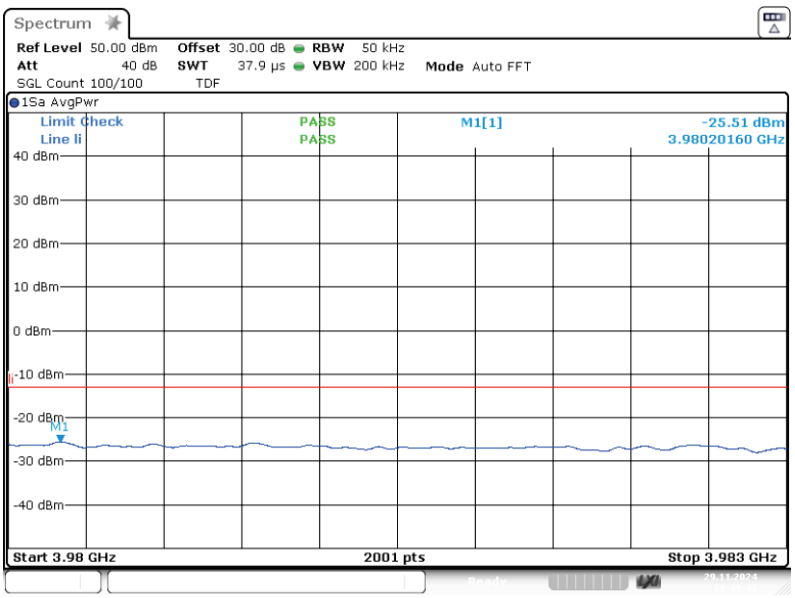
3.6.2 out of band emi TDD 37 upper AWGN100 lower 1carrier -0
.3 dB 3.877G 3.880G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower;
Mod: AWGN100; Input Power = 3 dB > AGC; Number of signals 1



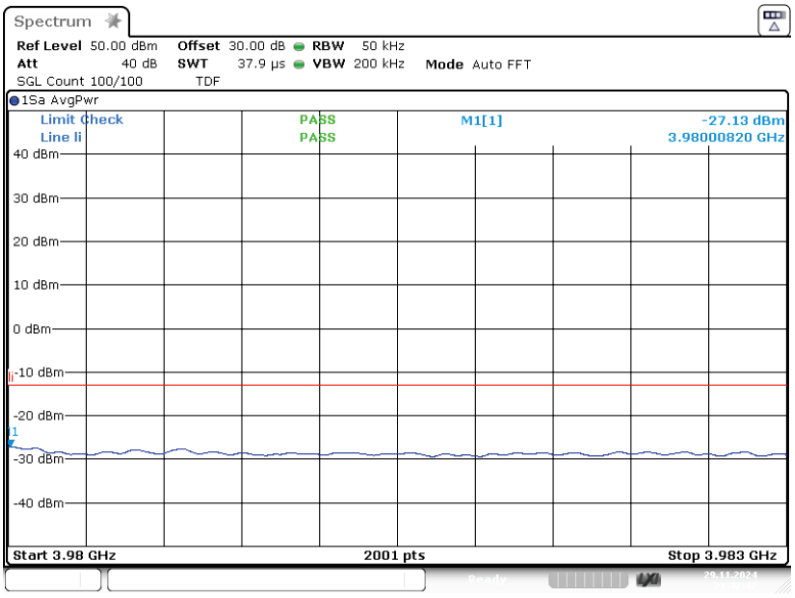
3.6.2 out of band emi TDD 37 upper AWGN100 lower 1carrier +3
.0 dB 3.877G 3.880G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



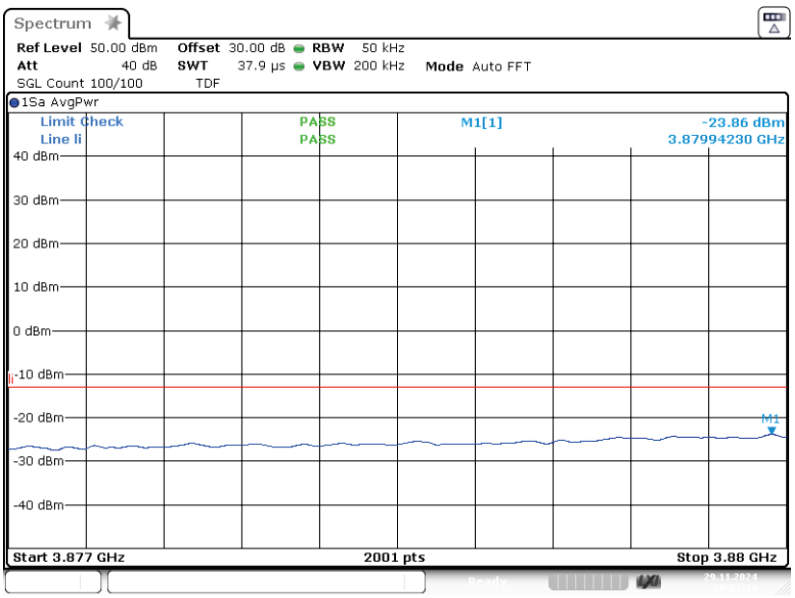
3.6.2 out of band emi TDD 37 upper AWGN upper 2carriers -0.3 dB 3.980G 3.983G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



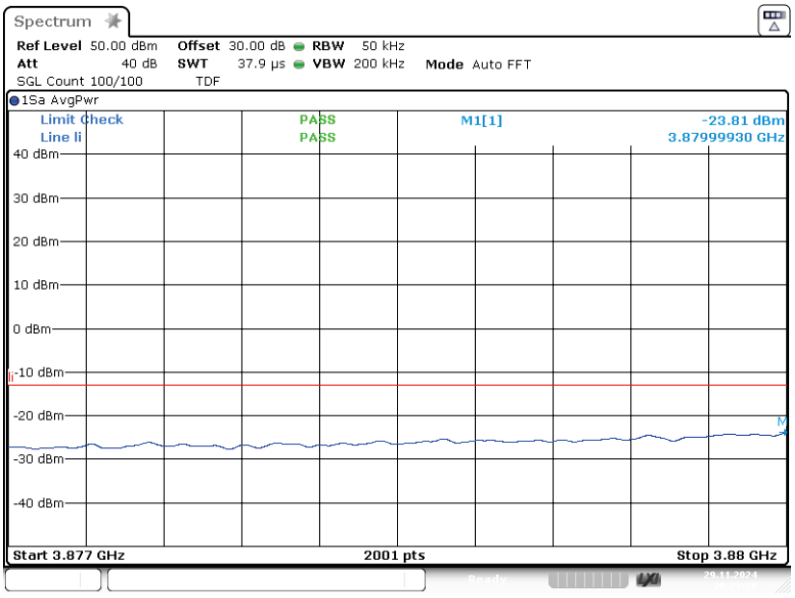
3.6.2 out of band emi TDD 37 upper AWGN upper 2carriers +3.0 dB 3.980G 3.983G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: AWGN; Input Power = 0.3 dB < AGC; Number of signals 2



3.6.2 out of band emi TDD 37 upper AWGN lower 2carriers -0.3 dB 3.877G 3.880G

Band: TDD 37 upper; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: AWGN; Input Power = 3 dB > AGC; Number of signals 2



3.6.2 out of band emi TDD 37 upper AWGN lower 2carriers +3.0 dB 3.877G 3.880G

5.5.5 TEST EQUIPMENT USED

- Conducted

5.6 OUT-OF-BAND REJECTION

Standard FCC Part 27

The test was performed according to:
ANSI C63.26

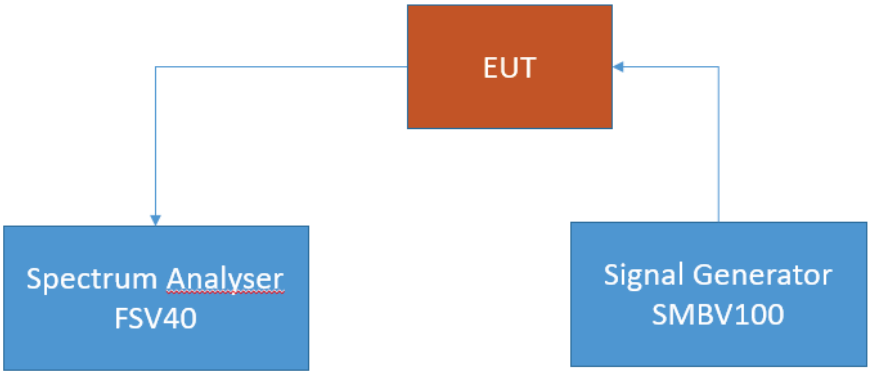
Test date: 2024-11-07 ; 2024-11-30 ; 2024-12-01

Environmental conditions: 26.0 °C; 27 % r. F. and 24.7 °C; 20 % r. F

Test engineer: Thomas Hufnagel

5.6.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to the out-of-band rejection test case 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; Out-of-band rejection

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.

5.6.2 TEST REQUIREMENTS/LIMITS

For this test case exists no applicable limit

5.6.3 TEST PROTOCOL

TDD 37, segment 1; downlink				
Highest Power Frequency [MHz]	**Output Power [dBm]**	**Lower Highest Power -20 dB Frequency [MHz]**	**Upper Highest Power -20 dB Frequency [MHz]**	**20 dB Bandwidth [MHz]**
3797.0	32.65	3696.175	3803.975	107.80

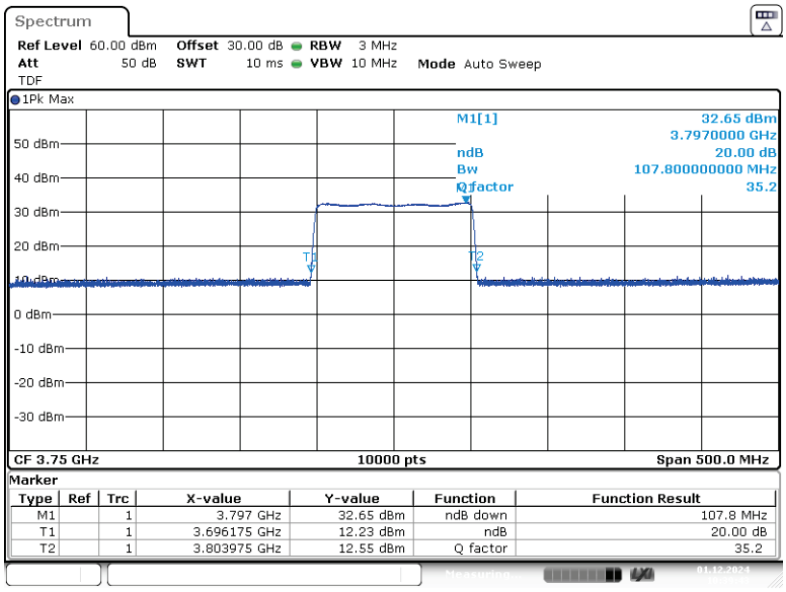
TDD 37, segment 2; downlink				
Highest Power Frequency [MHz]	**Output Power [dBm]**	**Lower Highest Power -20 dB Frequency [MHz]**	**Upper Highest Power -20 dB Frequency [MHz]**	**20 dB Bandwidth [MHz]**
3792.0	32.78	3786.075	3893.925	107.85

TDD 37, segment 3; downlink				
Highest Power Frequency [MHz]	**Output Power [dBm]**	**Lower Highest Power -20 dB Frequency [MHz]**	**Upper Highest Power -20 dB Frequency [MHz]**	**20 dB Bandwidth [MHz]**
3882.6	32.91	3876.175	3983.725	107.55

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

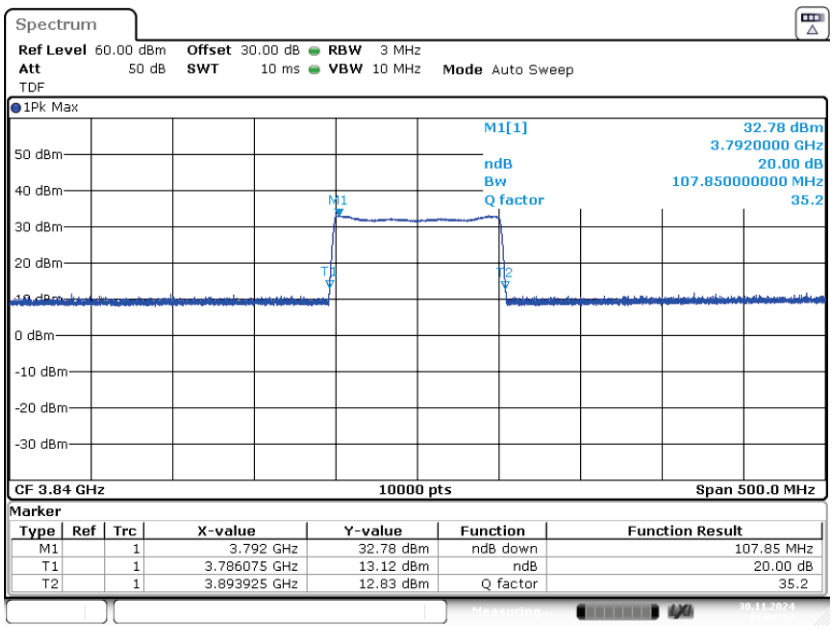
5.6.4 MEASUREMENT PLOT

Frequency band = TDD 37. segment 1. Direction = RF downlink



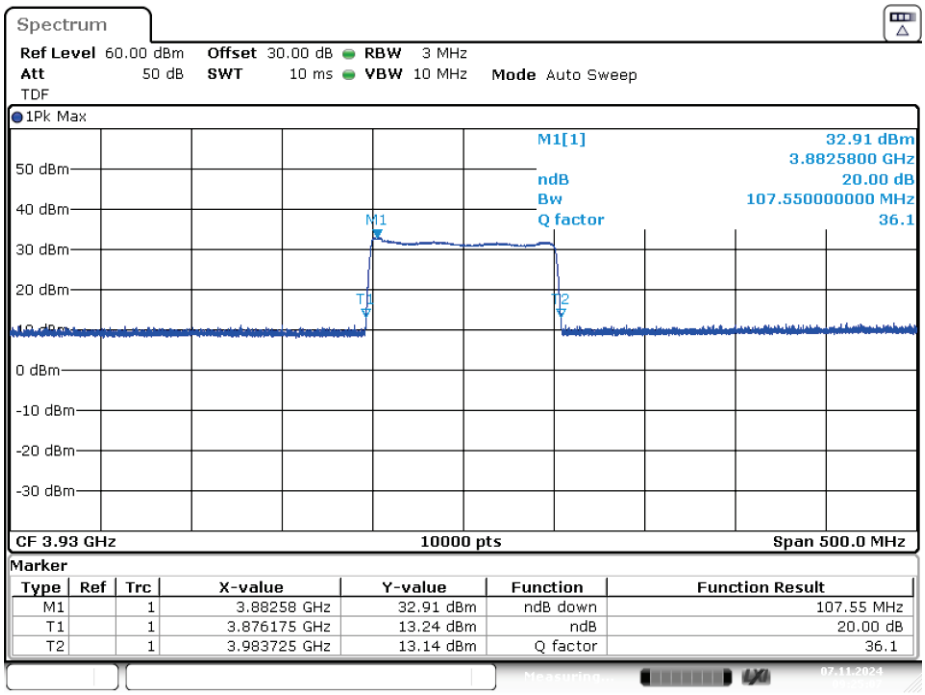
3.3 Out of band rejection TDD 37 mid 3.75000G
_20dB

Frequency band = TDD 37. segment 2. Direction = RF downlink



3.3 Out of band rejection TDD 37 mid 3.84000G
_20dB

Frequency band = TDD 37. segment 3. Direction = RF downlink



3.3 Out of band rejection TDD 37 upper 3.93000G
_20dB

5.6.5 TEST EQUIPMENT USED

- Conducted

5.7 FREQUENCY STABILITY

The frequency stability test case was not carried out, as any frequency errors are eliminated by the given system architecture. This is achieved by generating the LOs in the head-end station and the LOs in the remote unit with a common reference clock. This reference clock is transmitted from the head-end station to the remote unit and regenerated there. This means that the same reference frequency is used for all signal conversions (up- and down-conversion as well as analog-to-digital and digital-to-analog conversion) and any frequency error in the reference clock is compensated therefore. This is already clear from the measurement markings for the occupied bandwidth (26dB bandwidth). It can be seen that the DUT has no influence on the frequency (comparison between input and output signal). In addition, it is operationally necessary for the frequency deviation to be significantly smaller than the spectral distance between the transmission bandwidth edge and the channel bandwidth edge in order to meet the signal quality requirement (signal purity) and such ensure that the fundamental emissions remain within the authorized bands of operation.

5.8 FIELD STRENGTH OF SPURIOUS RADIATION

Standard FCC Part 27. §27.53

The test was performed according to:
ANSI C63.26

Test date: 2024-11-15; 2024-11-19 - 2024-11-20

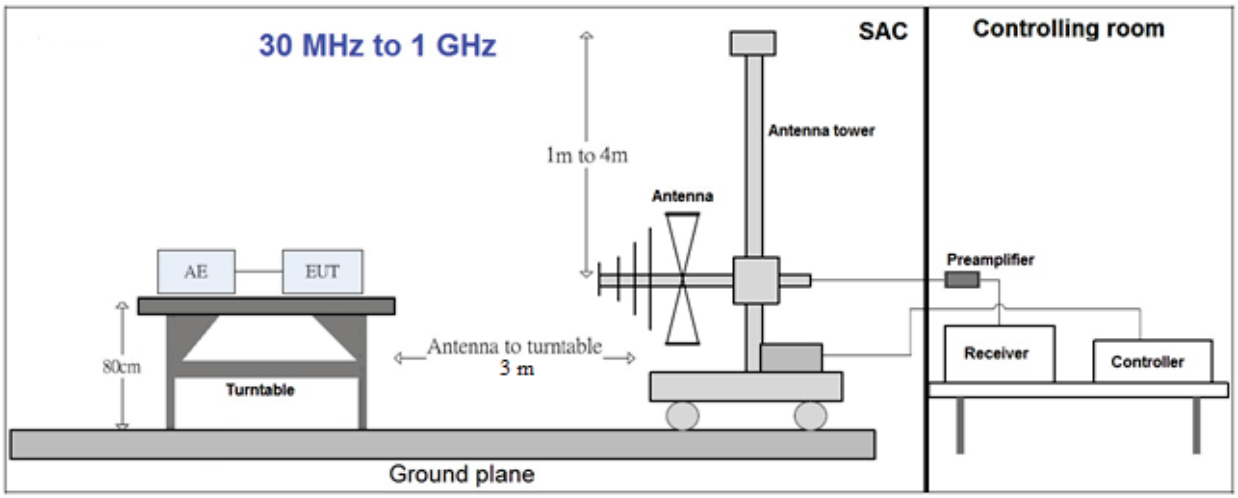
Environmental conditions: 19.7 °C%; f39 % r. F. and 19.2 ° C; 39 % r. F.

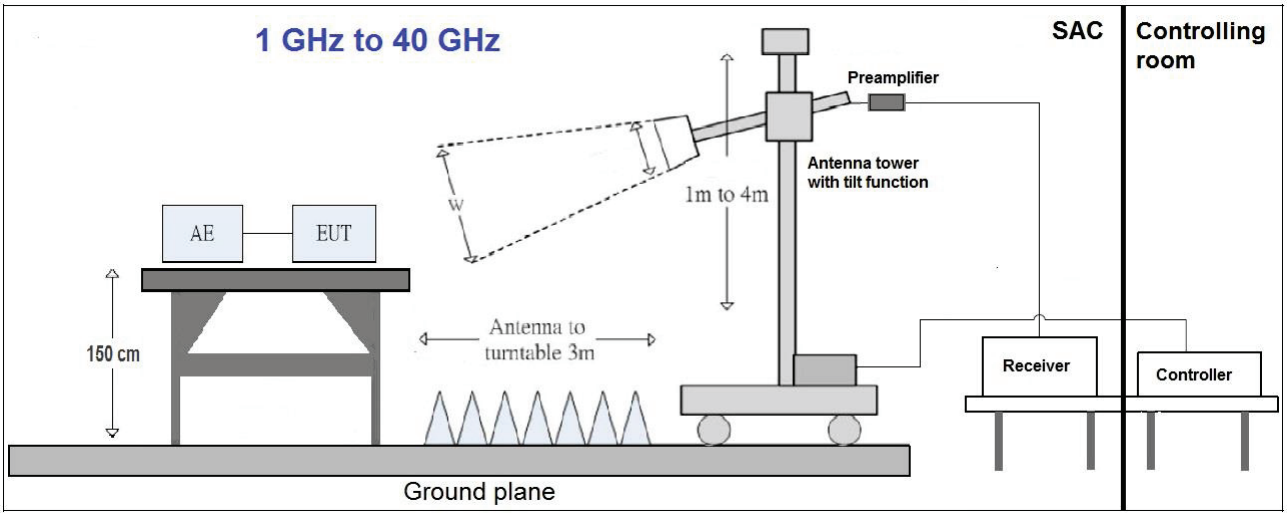
Test engineer: Thomas Hufnagel, Anh Bui

5.8.1 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: 3 m
- Detector: PEAK
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF–Bandwidth: 100 kHz
- Turntable angle range: –180° to 180°
- Turntable step size: 15°
- Height variation range: 1 – 4 m
- Height variation step size: 1 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.

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 ±15° 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
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 100 kHz
- Turntable angle range: ±15 ° 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 (< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 100 kHz

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 15 °.
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
- IF Bandwidth = 1 MHz

Step 3:

Spectrum analyser settings for step 3:
- Detector: PEAK
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 1 MHz

5.8.2 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

(l) **3.7 GHz Service**.
The following emission limits apply to stations transmitting in the 3700-3980 MHz band:

(1) For base station operations in the 3700-3980 MHz band. the conducted power of any emissionoutside the licensee's authorized bandwidth shall not exceed –13 dBm/MHz. Compliance with this paragraph (l)(1) is based on the use of measurement instrumentation employing a resolutionbandwidth of 1 megahertz or greater. However. in the 1 megahertz bands immediately outside andadjacent to the licensee's frequency block. a resolution bandwidth of at least one percent of theemission bandwidth of the fundamental emission of the transmitter may be employed. The emissionbandwidth is defined as the width of the signal between two points. one below the carrier centerfrequency and one above the carrier center frequency. outside of which all emissions are attenuatedat least 26 dB below the transmitter power.

(2) For mobile operations in the 3700-3980 MHz band. the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed –13 dBm/MHz. Compliance with this paragraph (l)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However. in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block. the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block. the minimum resolution bandwidth for the measurement shall be 500 kHz. 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.

5.8.3 TEST PROTOCOL

General considerations concerning the limits:

The measuring bandwidth of 1 MHz was chosen according the test requirements exept at the bands from 30 MHz to 1 GHz: At these bands reducing of measurement bandwidth was done.
Also outside the downlink frequency band at lower frequencies the measurement bandwidths were reduced to have the possibility to record the spurious emissions at these lower frequencies.

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

$$p\ RBWreduced\ [dBm] = 10 * \log\left(RBWreduced\ [kHz] \quad / \quad 1000\ kHz\right) + pRBW\ 1000\ kHz[dBm]$$

Hereby "p" are the limit lines' values.

Considerations to MIMO operation:

At this test the two output ports ANT 1and ANT 2 are together in function according KDB 935210 D02 v04r02 chapter II (o) (2).

Measurement tables with one antenna

At this tables the highest peak value of spurious radiation per frequency test band is shown.

TDD 37, segment 1; downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
166.2/hor.	-81.3	-4.4	RMS	100	-23.0	58.3
168.7/vert.	-80.4	-6.2	RMS	100	-23.0	57.4
3750.0/hor.	-37.3	-4.4	RMS	1000	-13.0	24.3
3750.0/vert.	-34.5	-4.4	RMS	1000	-13.0	21.0
20625/hor.	-69.1	-4.4	RMS	1000	-13.0	55.1
20625/vert.	-65.1	-4.4	RMS	1000	-13.0	52.1
38967/hor.	-66.5	-4.4	RMS	1000	-13.0	53.5
39138/vert.	-65.9	-4.4	RMS	1000	-13.0	52.9

TDD 37, segment 2; downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
174.7/hor.	-62.0	-3.8	RMS	100	-23.0	59.0
165.8/vert.	-61.4	-3.8	RMS	100	-23.0	58.4
3889.4/hor.	-23.3	-3.8	RMS	1000	-13.0	10.3
3889.4/vert.	-23.0	-3.8	RMS	1000	-13.0	10.0
20625/hor.	-64.2	-3.8	RMS	1000	-13.0	51.2
20625/vert.	.60.9	-3.8	RMS	1000	-13.0	47.9
36915/hor.	-66.8	-3.8	RMS	1000	-13.0	53.8
36897/vert.	-66.3	-3.8	RMS	1000	-13.0	53.3

TDD 37, segment 3; downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
166.2/hor.	-90.9	-3.7	RMS	100	-23.0	67.9
168.7/vert.	-82.7	-3.7	RMS	100	-23.0	59.7
3879.8/hor.	-25.7	-3.7	RMS	1000	-13.0	12.7
3879.8/vert.	-23.3	-3.7	RMS	1000	-13.0	10.3
20625/hor.	-61.6	-3.7	RMS	1000	-13.0	48.6
20625/vert.	-68.3	-3.7	RMS	1000	-13.0	65.3
38744/hor.	-66.8	-3.7	RMS	1000	-13.0	53.8
36890/vert.	-66.5	-3.7	RMS	1000	-13.0	53.5

Abbreviations:
Hor.: horizontal position
Vert.: vertical position

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

Measurement tables with two antennas (MIMO)

At this tables the highest peak value of spurious radiation per frequency test band is shown.

TDD 37, segment 1; downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
165.8/hor.	-79.8	-4.4	RMS	100	-23.0	57.8
142.2/vert.	-80.3	-4.4	RMS	100	-23.0	57.3
3750.0/hor.	-26.1	-4.4	RMS	1000	-13.0	13.1
3750.0/vert.	-24.7	-4.4	RMS	1000	-13.0	11.7
22841/hor.	-69.0	-4.4	RMS	1000	-13.0	56.0
20625/vert.	-65.9	-4.4	RMS	1000	-13.0	52.9
39134/hor.	-66.8	-4.4	RMS	1000	-13.0	53.8
38777/vert.	-66.0	-4.4	RMS	1000	-13.0	53.0

TDD 37, segment 2; downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
166.8/hor.	-81.0	-3.8	RMS	100	-23.0	58.0
142.2/vert.	-80.9	-3.8	RMS	100	-23.0	56.9
3889.4/hor.	-24.1	-3.8	RMS	1000	-13.0	11.1
3889.4/vert.	-22.0	-3.8	RMS	1000	-13.0	9.0
20625/hor.	-65.8	-3.8	RMS	1000	-13.0	52.8
20625/vert.	-63.2	-3.8	RMS	1000	-13.0	50.2
35930/hor.	-67.0	-3.8	RMS	1000	-13.0	54.0
36356/vert.	-66.6	-3.8	RMS	1000	-13.0	53.6

TDD 37, segment 3; downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
167.0/hor.	-86.2	-3.7	RMS	100	-23.0	63.2
166.9/vert.	-80.3	-3.7	RMS	100	-23.0	57.3
3879.8/hor.	-25.4	-3.7	RMS	100	-23.0	12.4
3879.8/vert.	-22.1	-3.7	RMS	1000	-13.0	9.7
20625/hor.	-68.1	-3.7	RMS	1000	-13.0	55.1
20625/vert.	-67.5	-3.7	RMS	1000	-13.0	54.5
38552/hor.	-66.9	-3.7	RMS	1000	-13.0	53.9
39084/vert.	-66.5	-3.7	RMS	1000	-13.0	53.5

Abbreviations:
Hor.: horizontal position
Vert.: vertical position

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

Measurement tables (showing the highest value with two antennas (MIMO)

At this tables the highest peak value of spurious radiation per frequency test band is shown.

TDD 37, segment 1; downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
205.7/vert.	-57.4	-5.2	RMS	100	-23.0	34.4
274.5/hor.	-56.6	-5.2	RMS	100	-23.0	33.6
500/vert.	-62.1	-5.2	RMS	100	-23.0	39.1
17737/vert.	-23.5	-5.2	RMS	1000	-13.0	10.5
39167/hor.	-46.1	-5.2	RMS	1000	-13.0	33.1

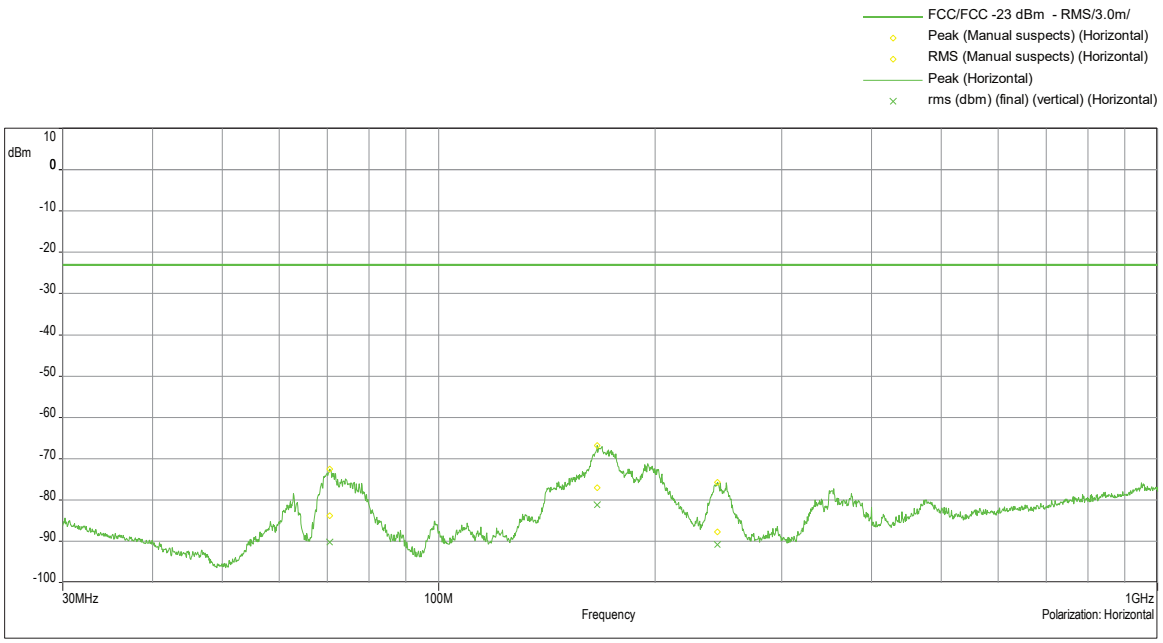
TDD 37, segment 2; downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
168.5/hor.	-63.1	-5.0	RMS	100	-23.0	40.1
204.4/vert.	-63.1	-5.0	RMS	100	-23.0	40.1
500/hor.	-65.5	-5.0	RMS	100	-23.0	42.4
17198/vert.	-23.7	-5.0	RMS	1000	-13.0	10.7
39896/hor.	-45.7	-5.0	RMS	1000	-13.0	32.7

TDD 37, segment 3; downlink;						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
168.3/hor.	-62.8	-4.2	RMS	100	-23.0	39.8
204.4/vert.	-65.6	-4.2	RMS	100	-23.0	42.6
500/vert.	-64.3	-4.2	RMS	100	-23.0	41.3
16296/vert.	-23.8	-4.2	RMS	1000	-13.0	10.8
39894/hor.	-45.6	-4.2	RMS	1000	-13.0	32.6

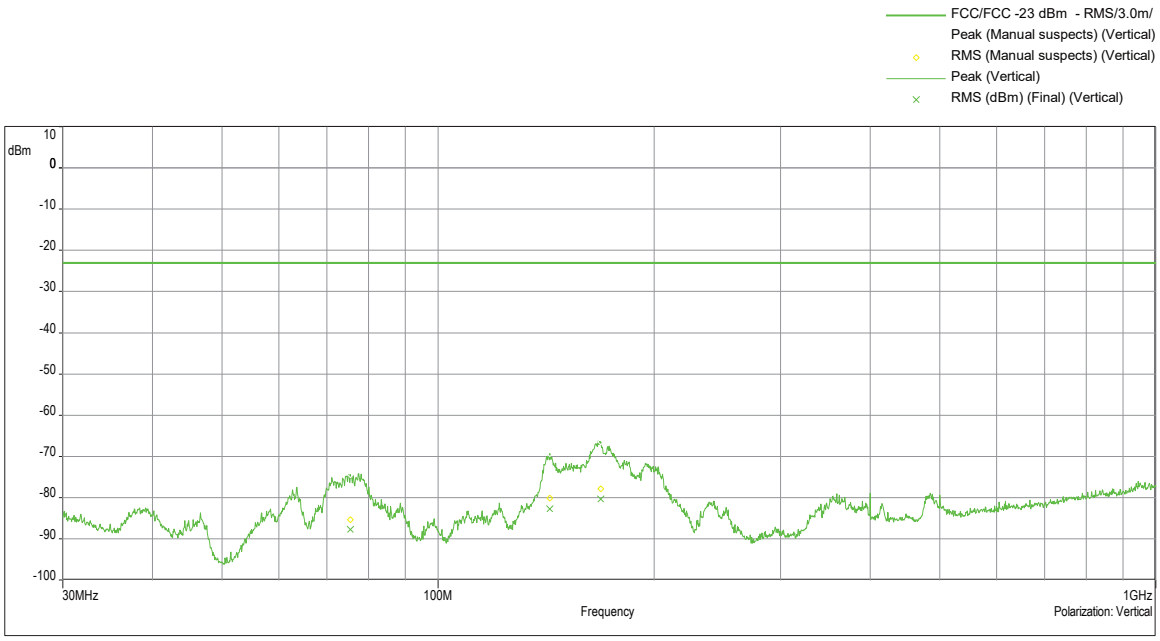
5.8.4 MEASUREMENT PLOT WITH ONE ANTENNA

5.8.4.1 Frequency Band = TDD 37, segment 1; ANT 1; direction = RF downlink

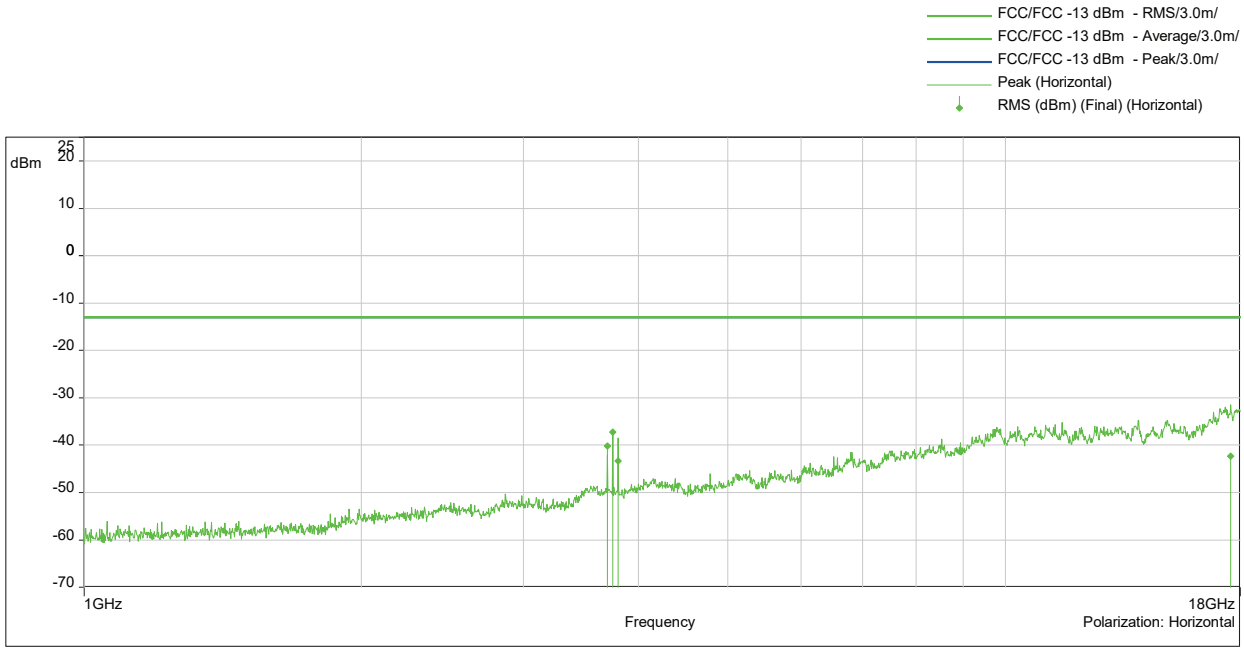
30 MHz - 1 GHz. horizontal



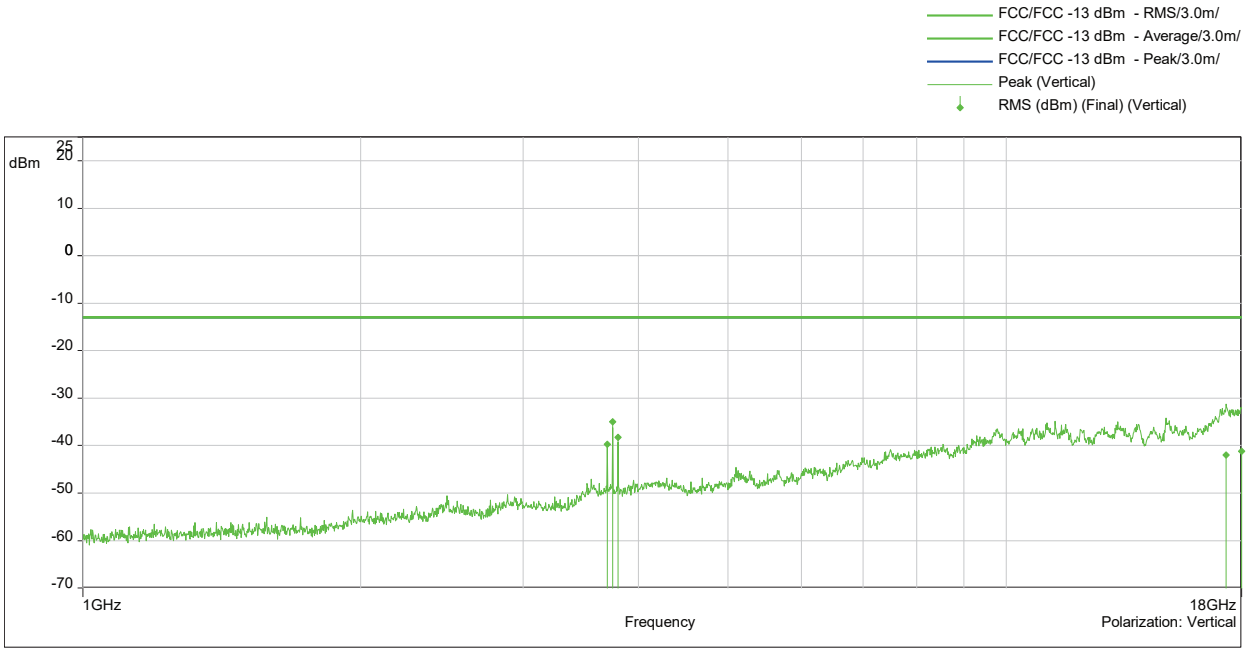
30 MHz - 1 GHz. vertical



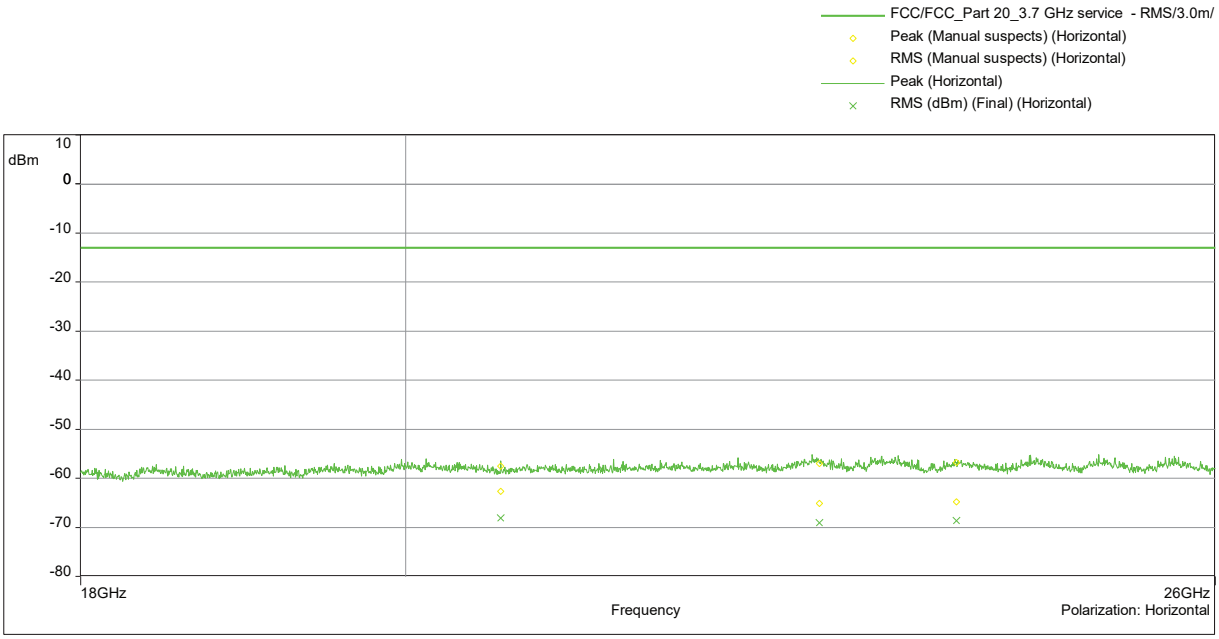
1 GHz - 18 GHz. horizontal



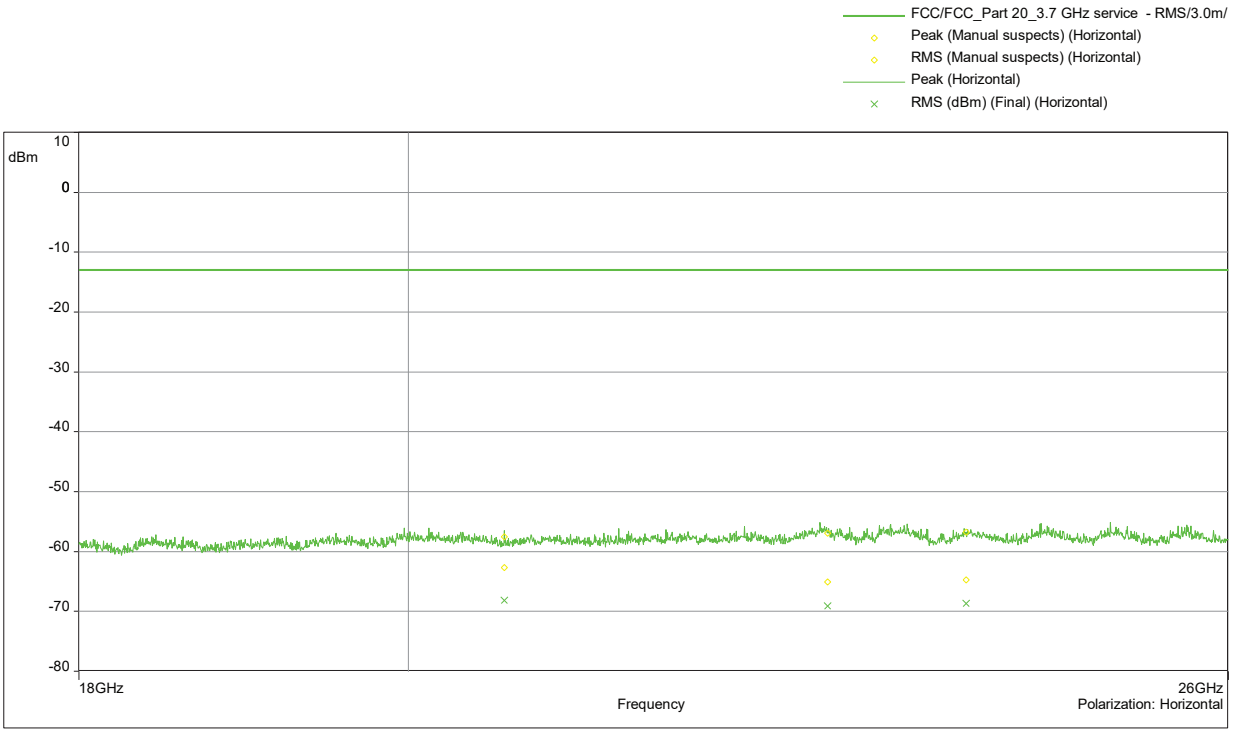
1 GHz - 18 GHz. vertical



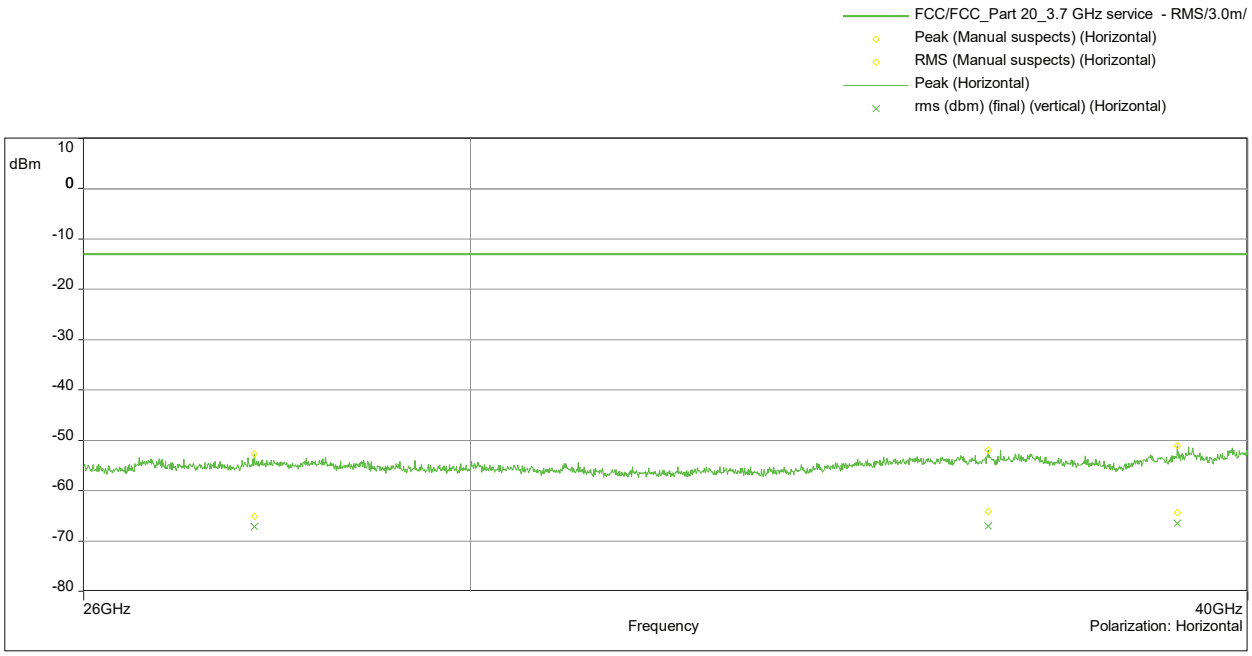
18 GHz - 26 GHz. horizontal



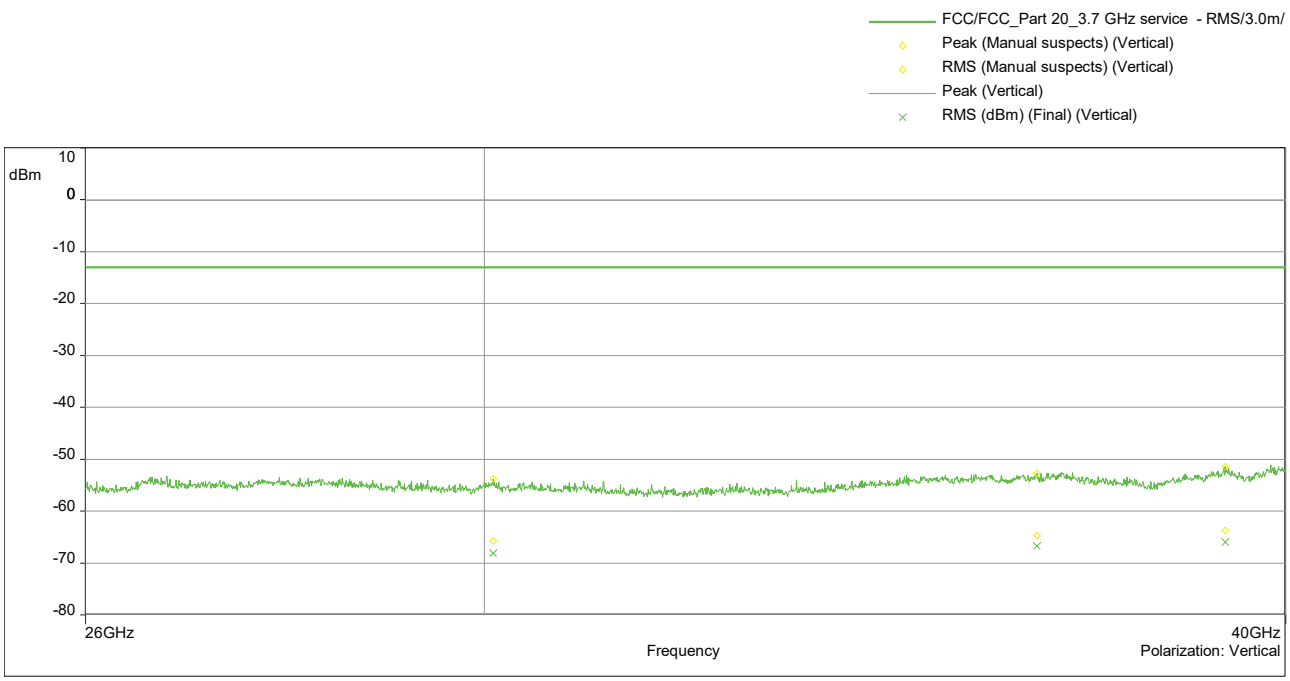
18 GHz - 26 GHz. vertical



26 GHz - 40 GHz. horizontal

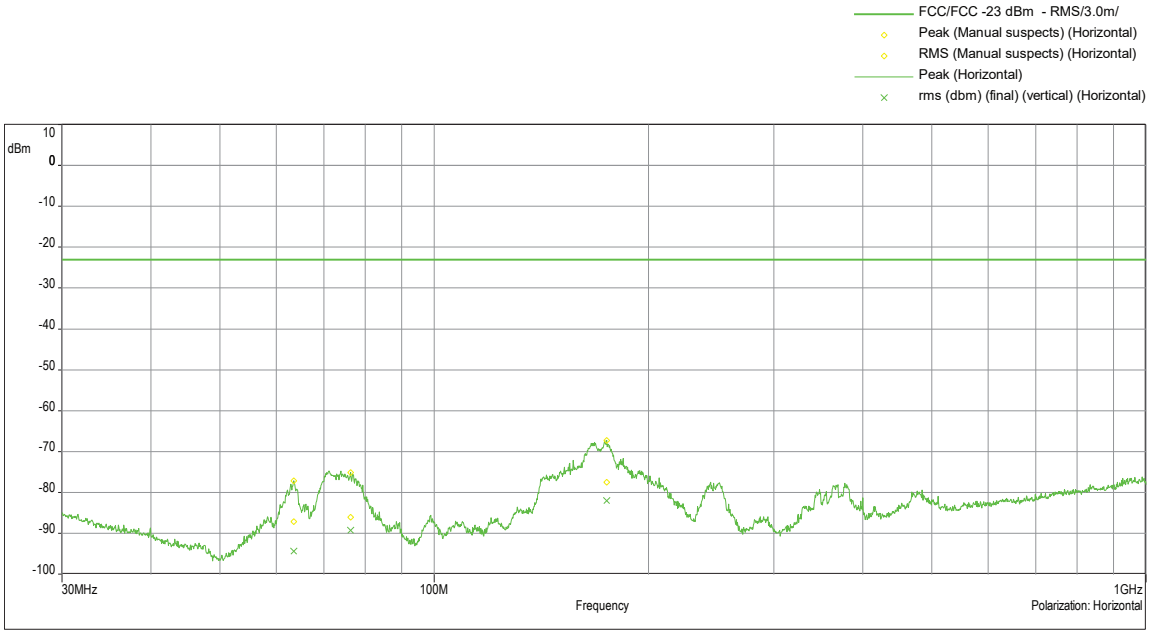


26 GHz - 40 GHz. vertical

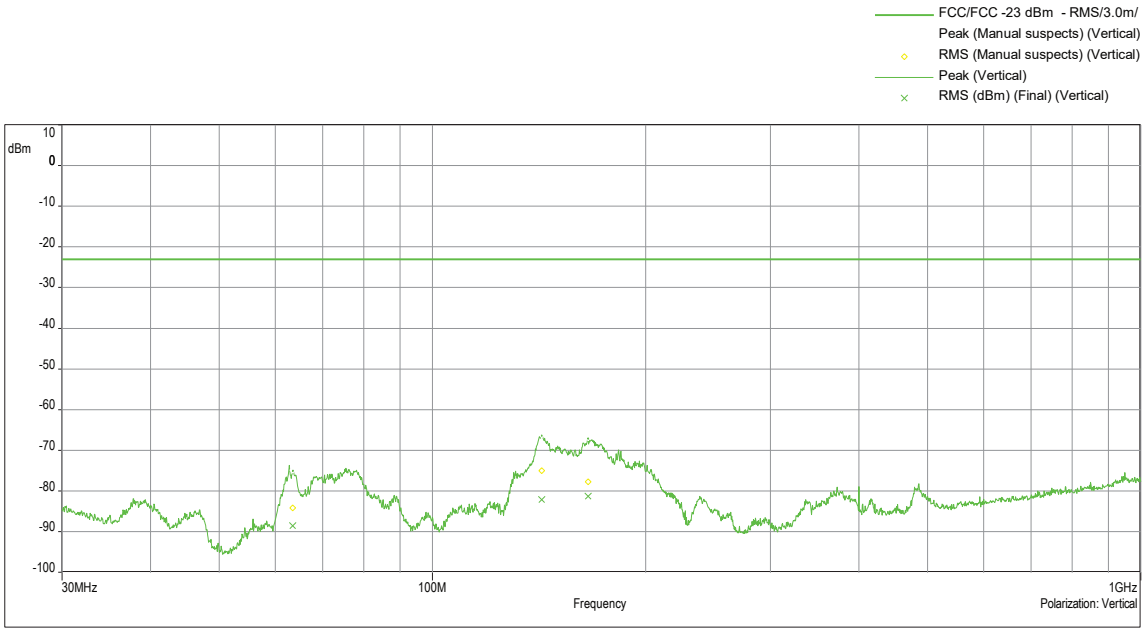


5.8.4.2 Frequency Band = TDD 37, segment 2; ANT 1; direction = RF downlink

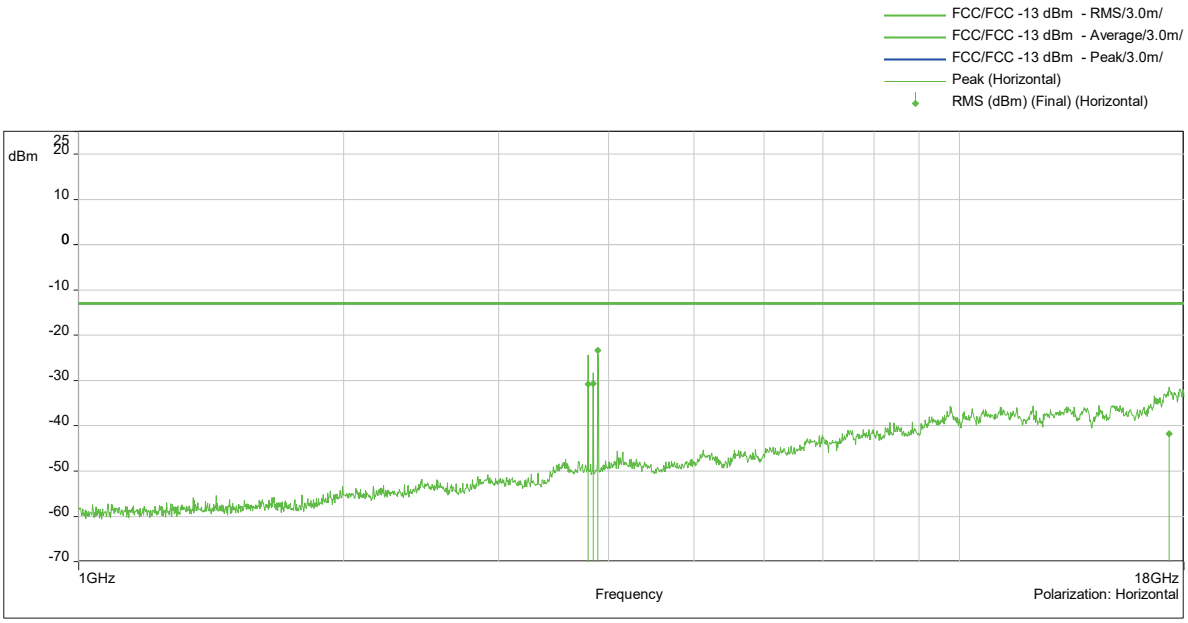
30 MHz - 1 GHz. horizontal



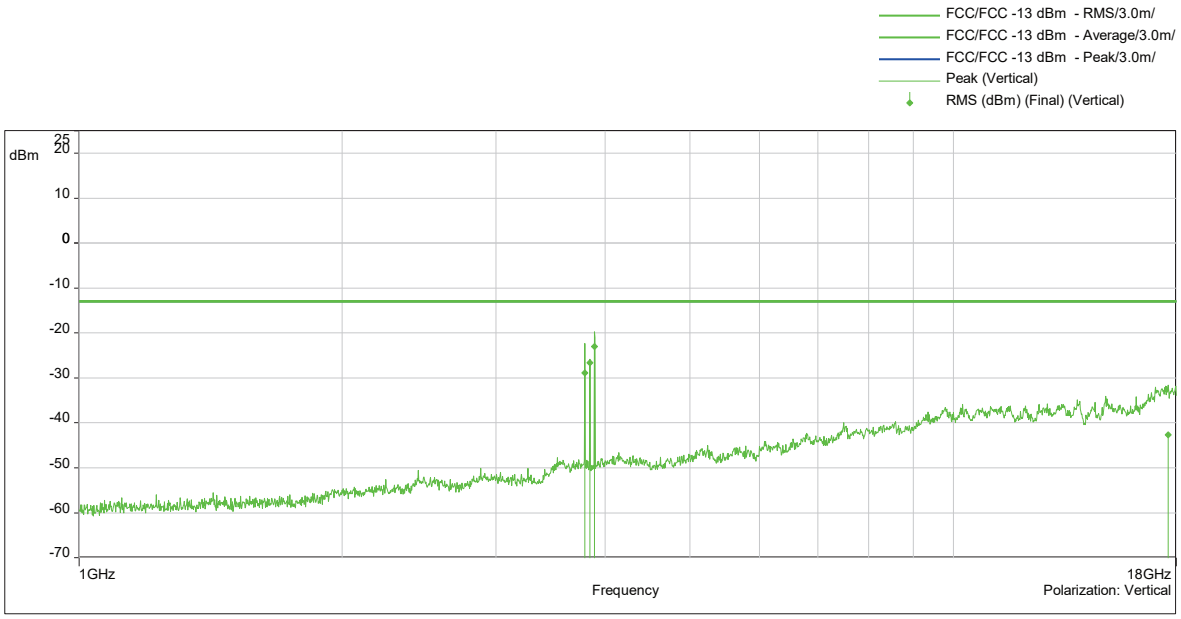
30 MHz - 1 GHz. vertical



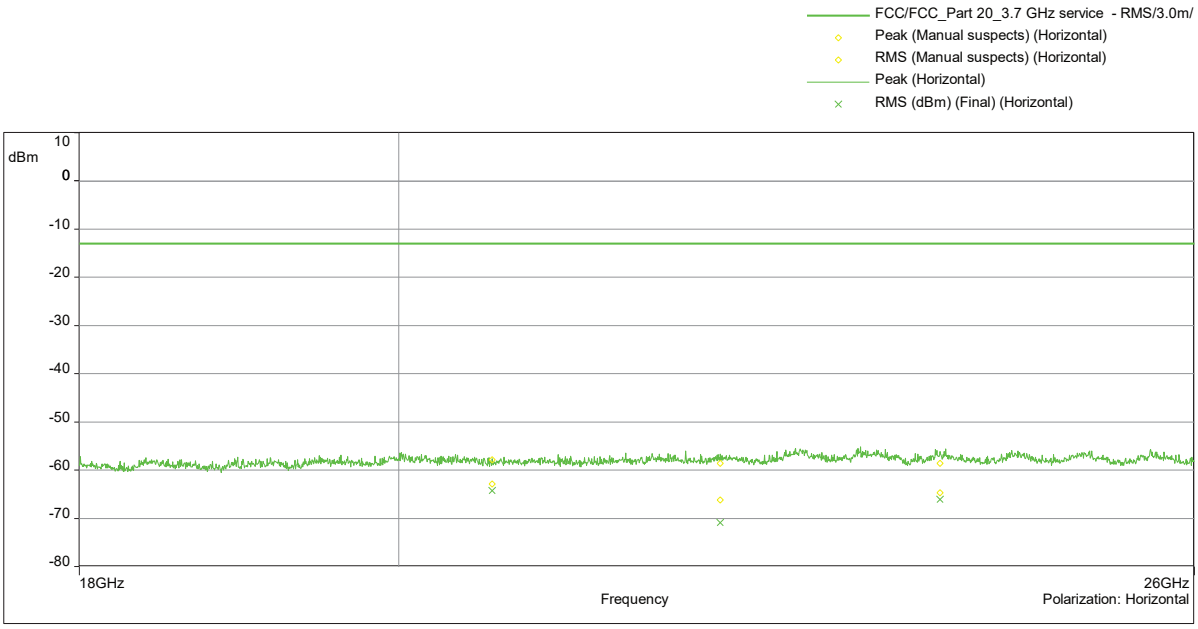
1 GHz - 18 GHz. horizontal



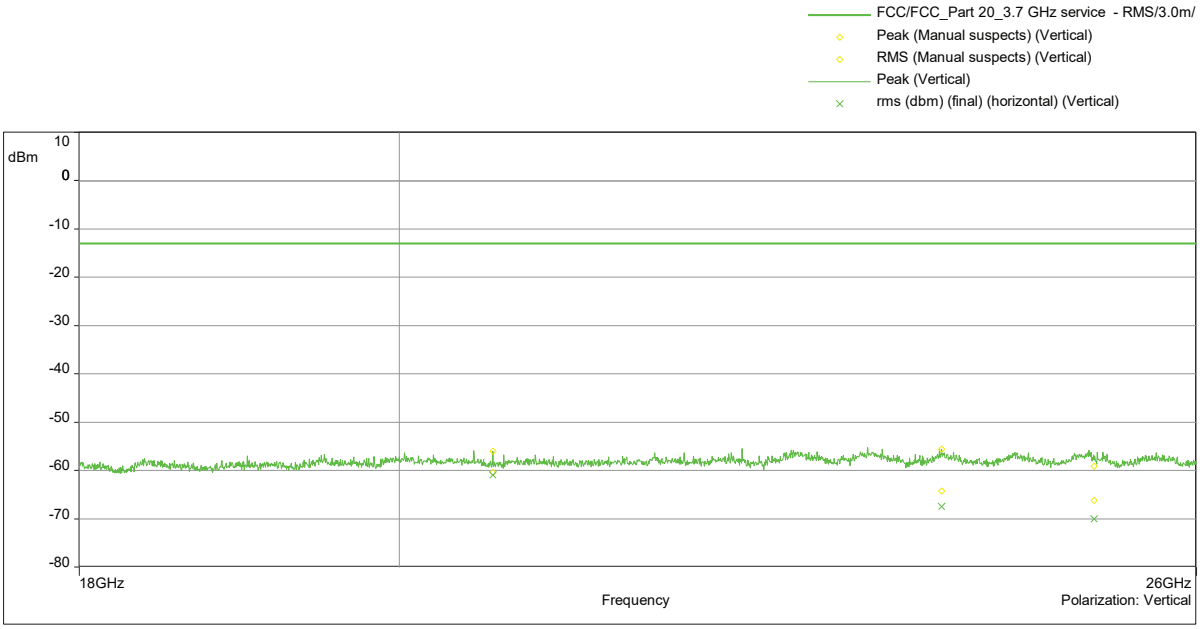
1 GHz - 18 GHz. vertical



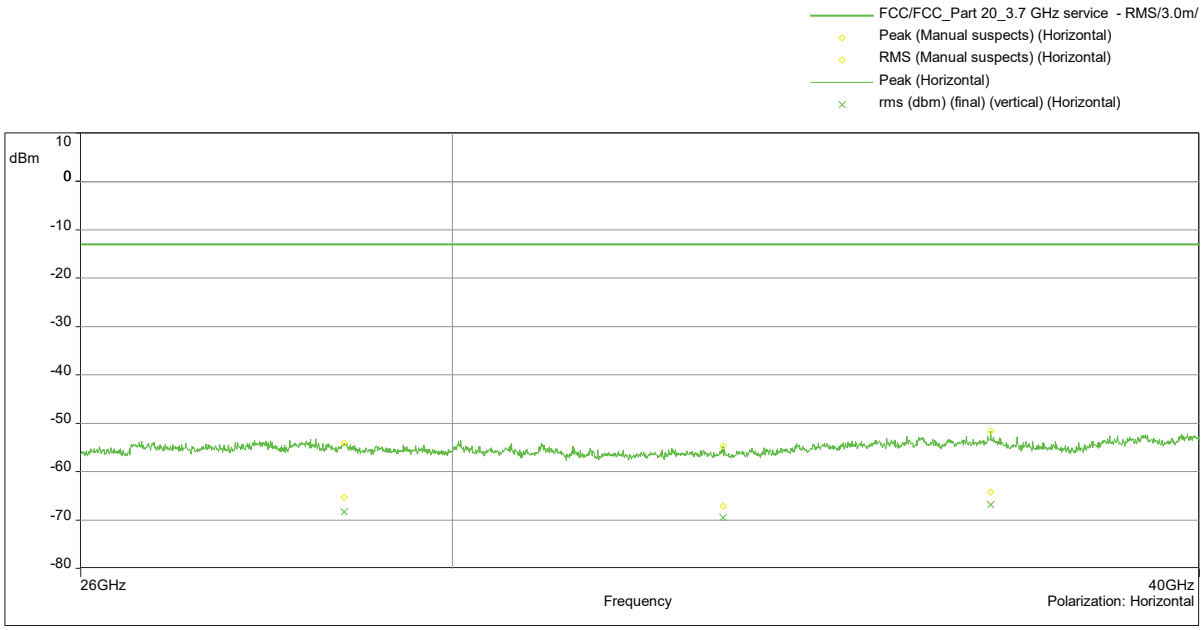
18 GHz - 26 GHz. horizontal



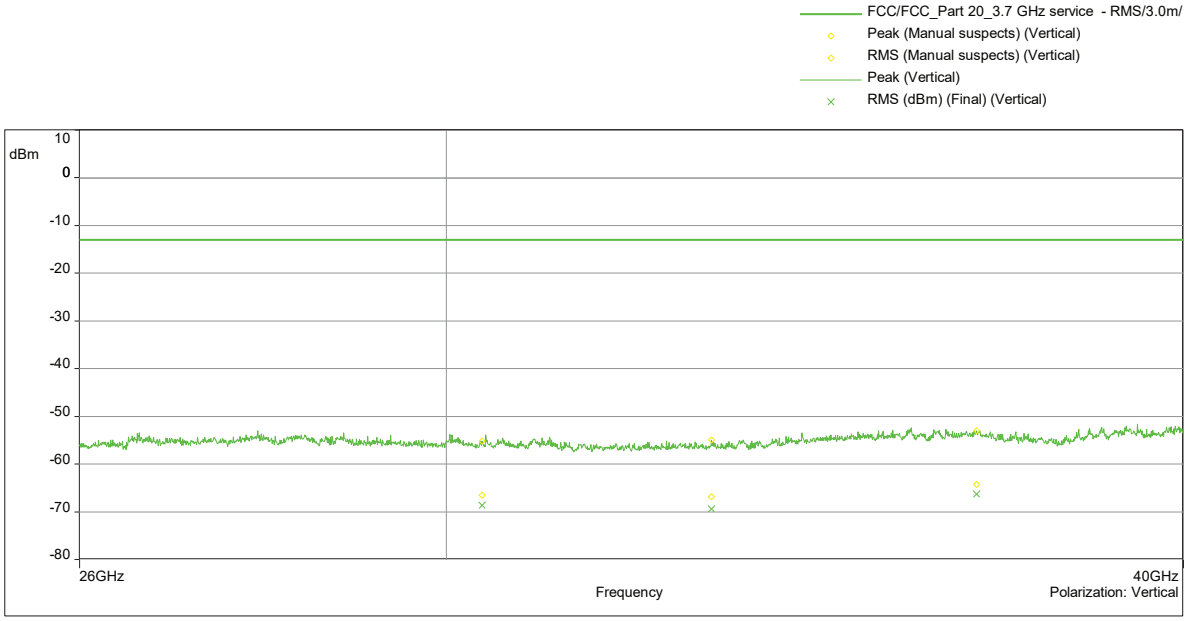
18 GHz - 26 GHz. vertical



26 GHz - 40 GHz. horizontal

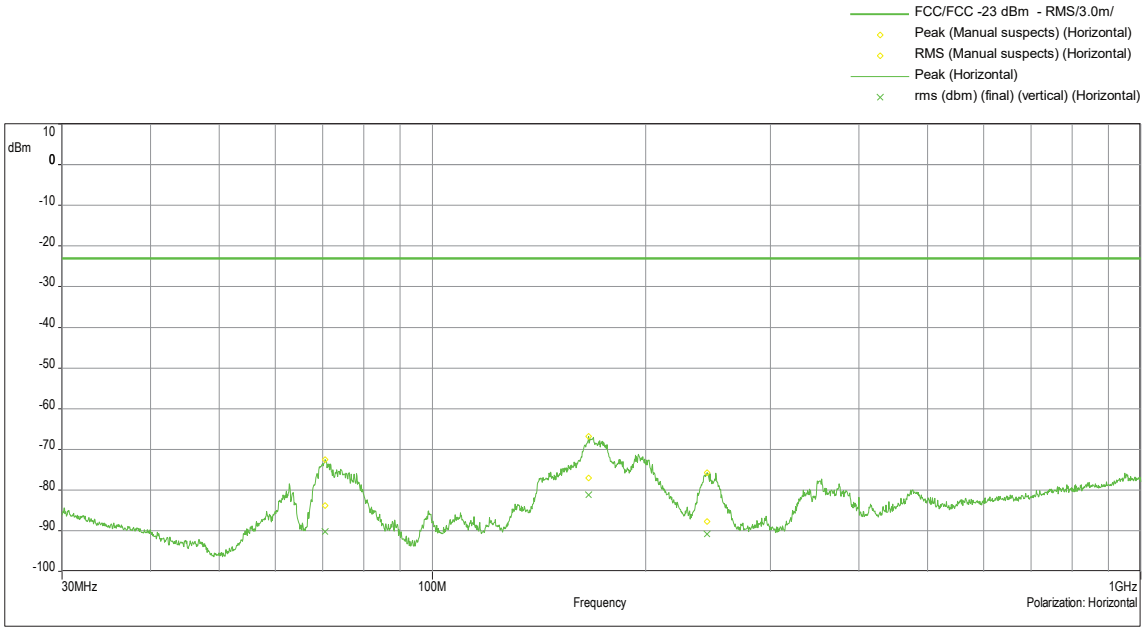


26 GHz - 40 GHz. vertical

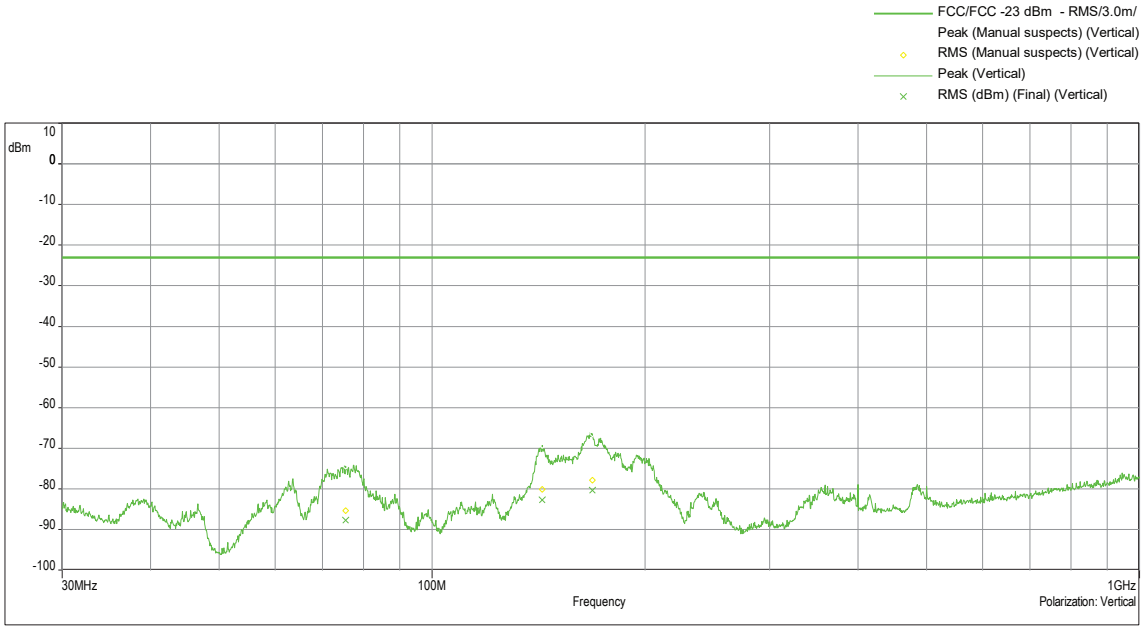


5.8.4.3 Frequency Band = TDD 37, segment 3; ANT 1; direction = RF downlink

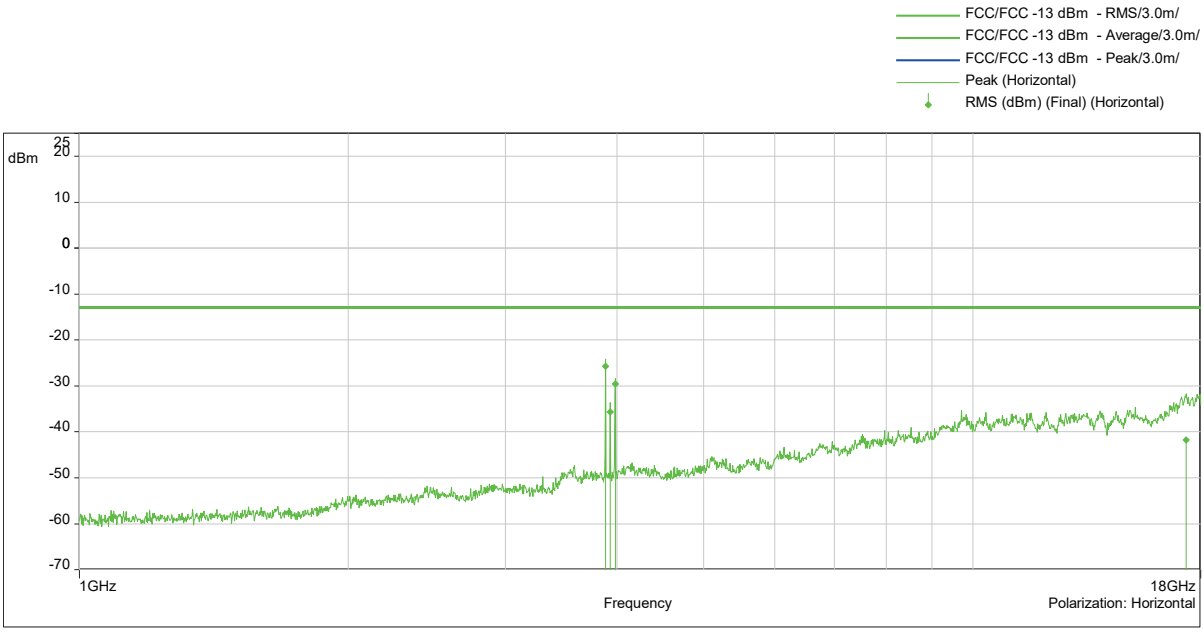
30 MHz - 1 GHz. horizontal



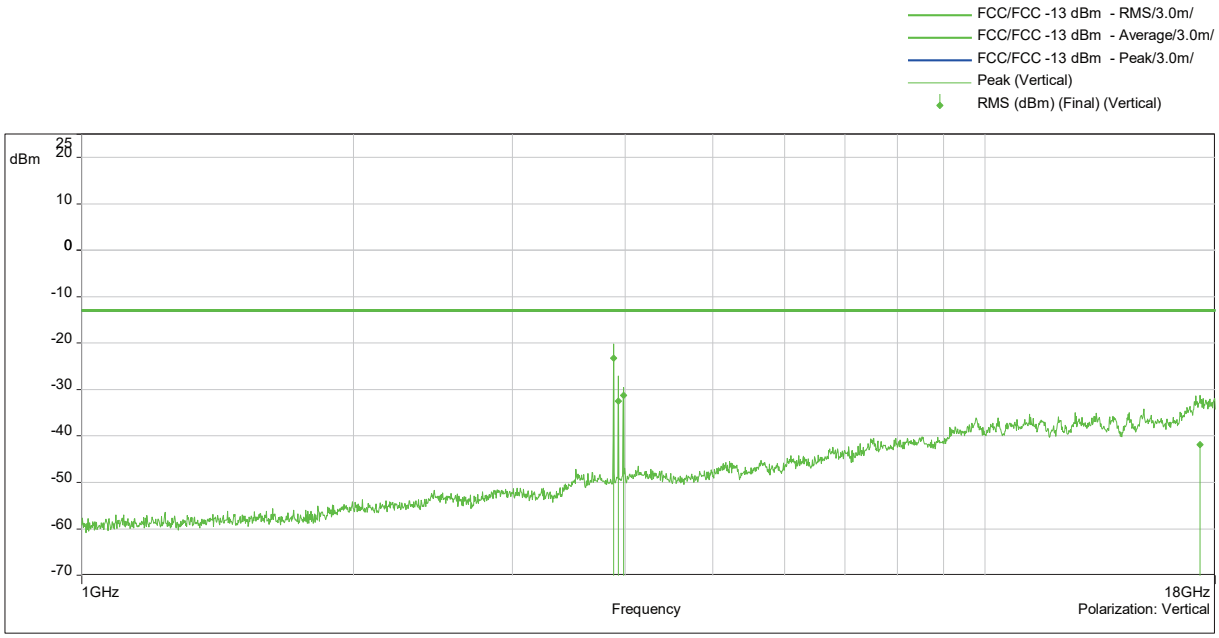
30 MHz - 1 GHz. vertical



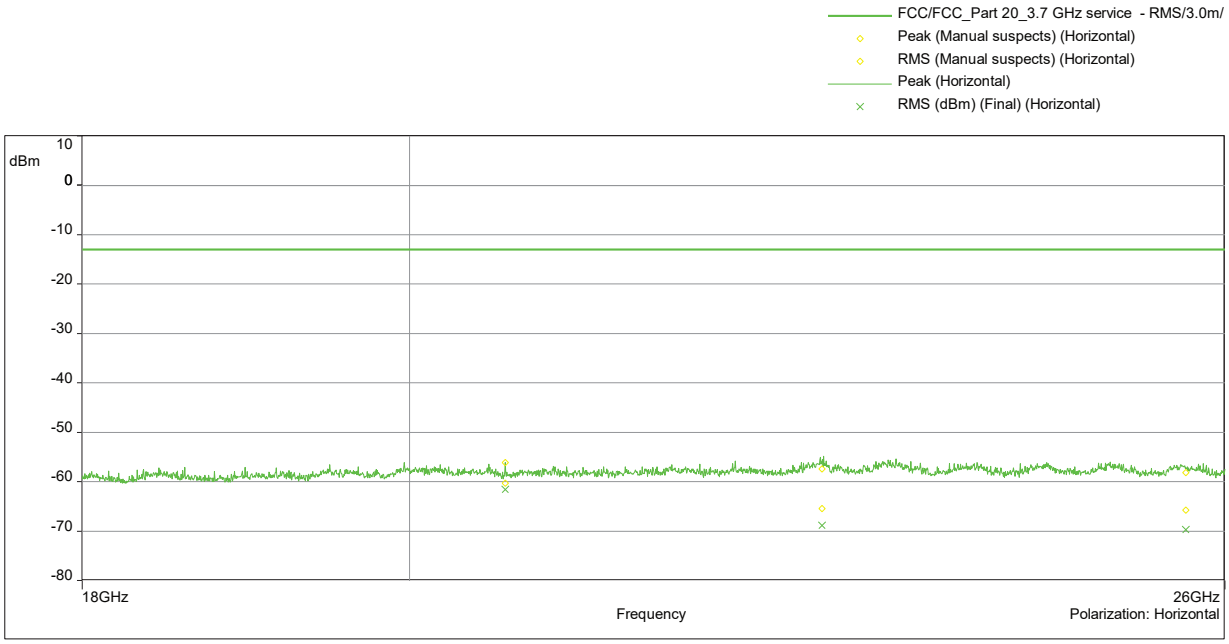
1 GHz - 18 GHz. horizontal



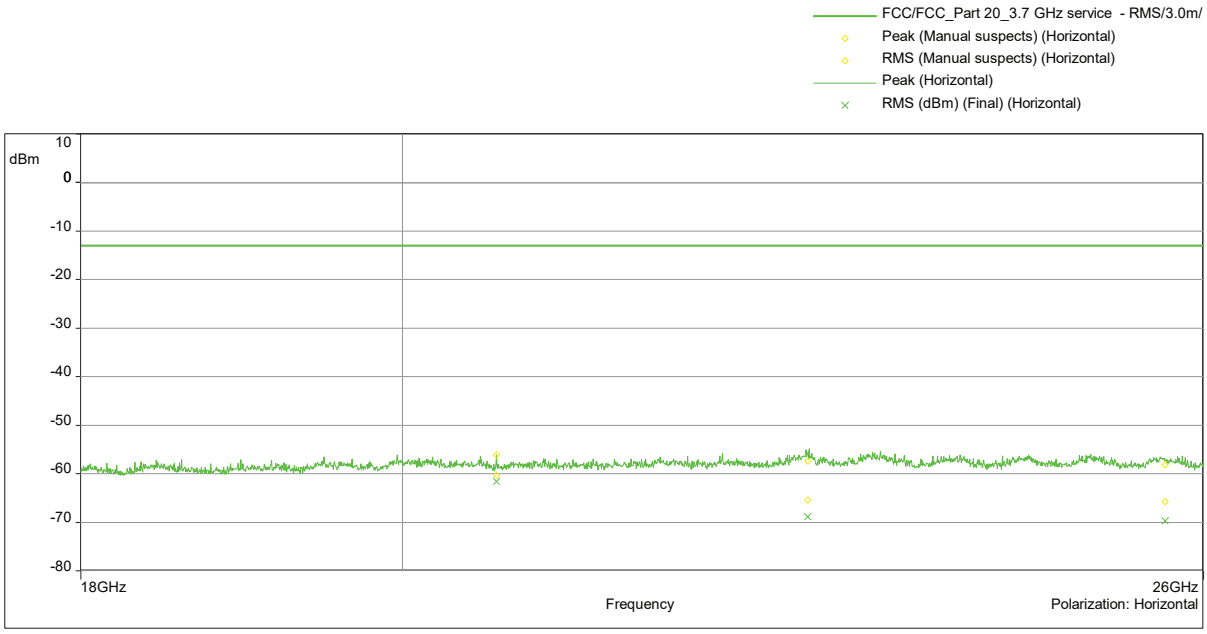
1 GHz - 18 GHz. vertical



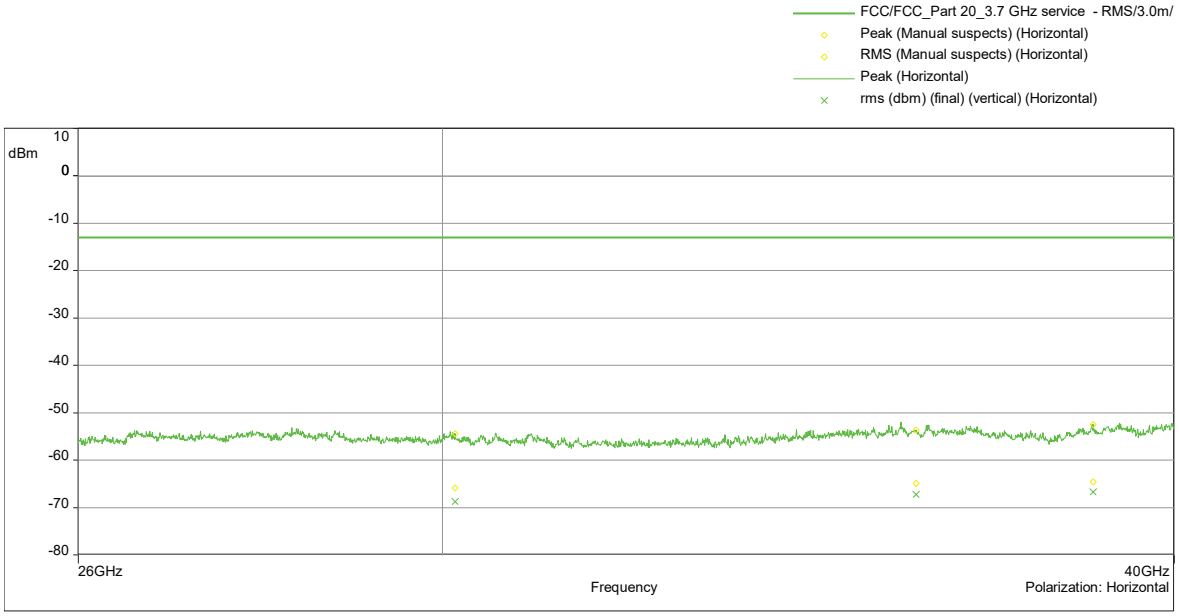
18 GHz - 26 GHz. horizontal



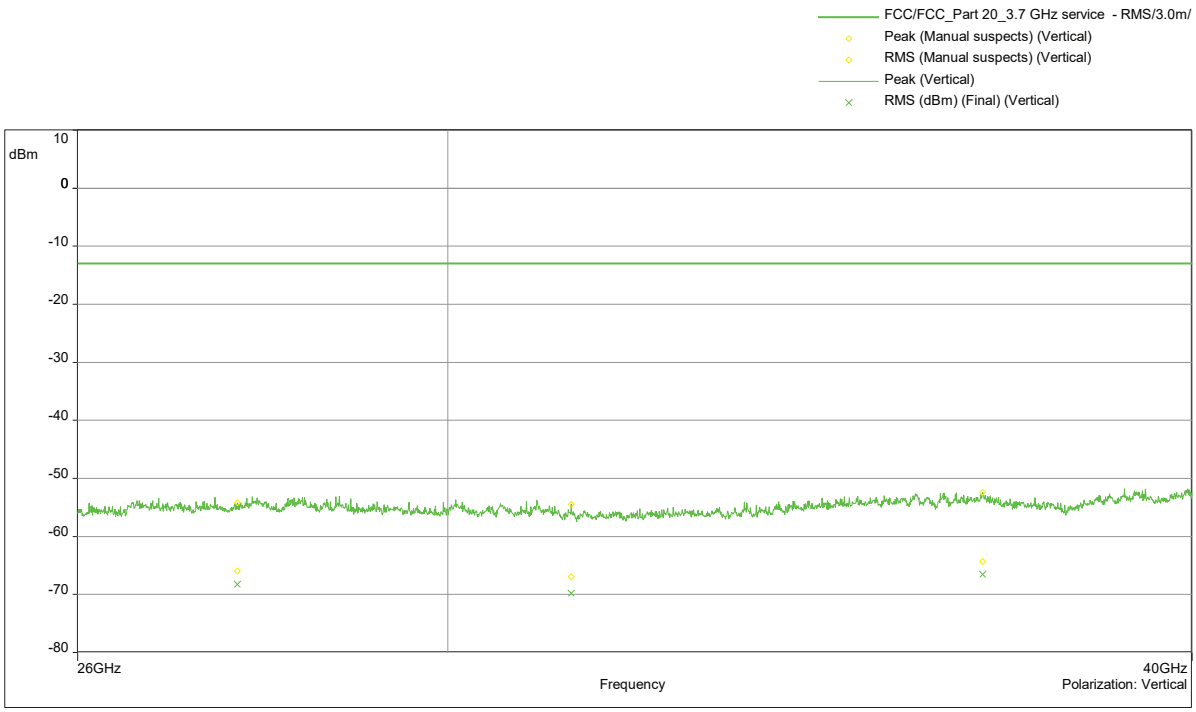
18 GHz - 26 GHz. vertical



26 GHz - 40 GHz. horizontal



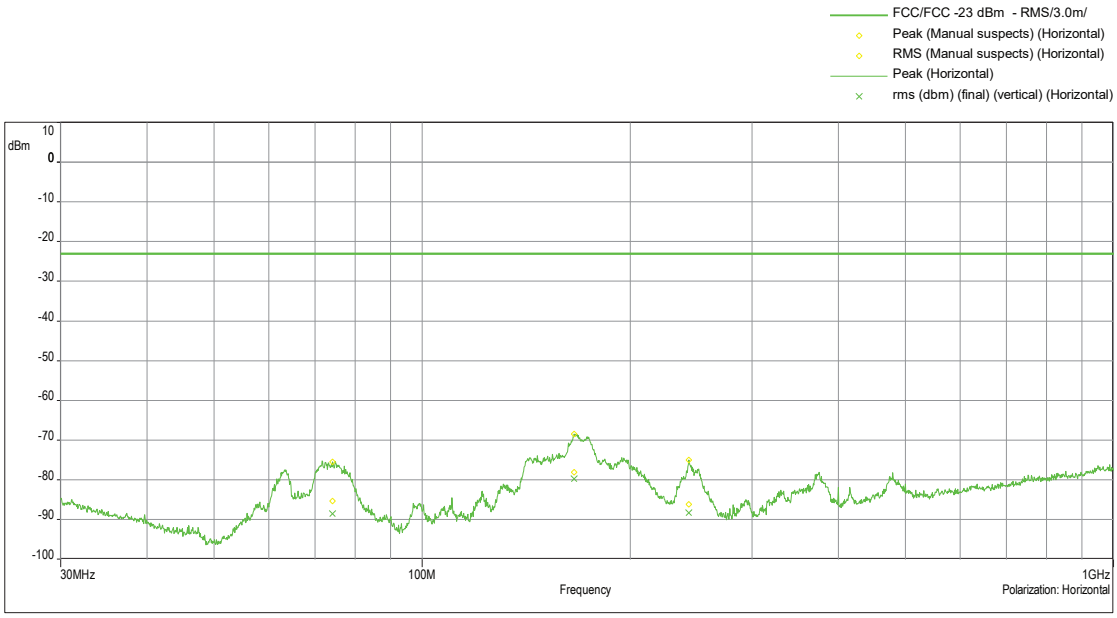
26 GHz - 40 GHz. vertical



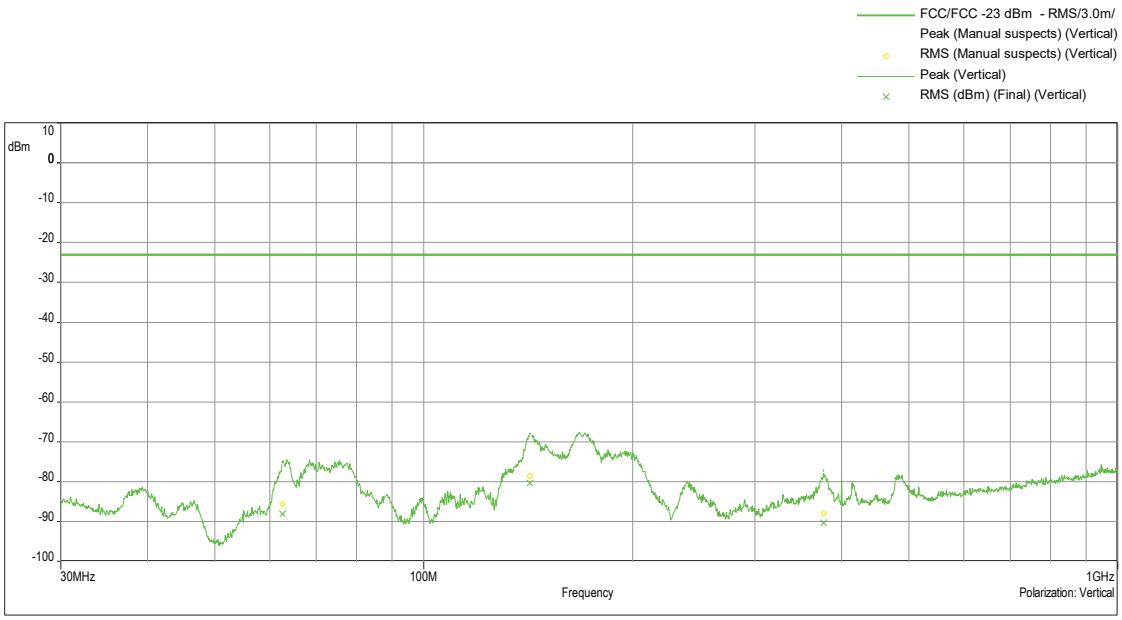
5.8.5 MEASUREMENT PLOT WITH TWO ANTENNAS (MIMO)

5.8.5.1 Frequency band = TDD 37, segment 1: ANT 1 and 2 (MIMO); direction = RF downlink

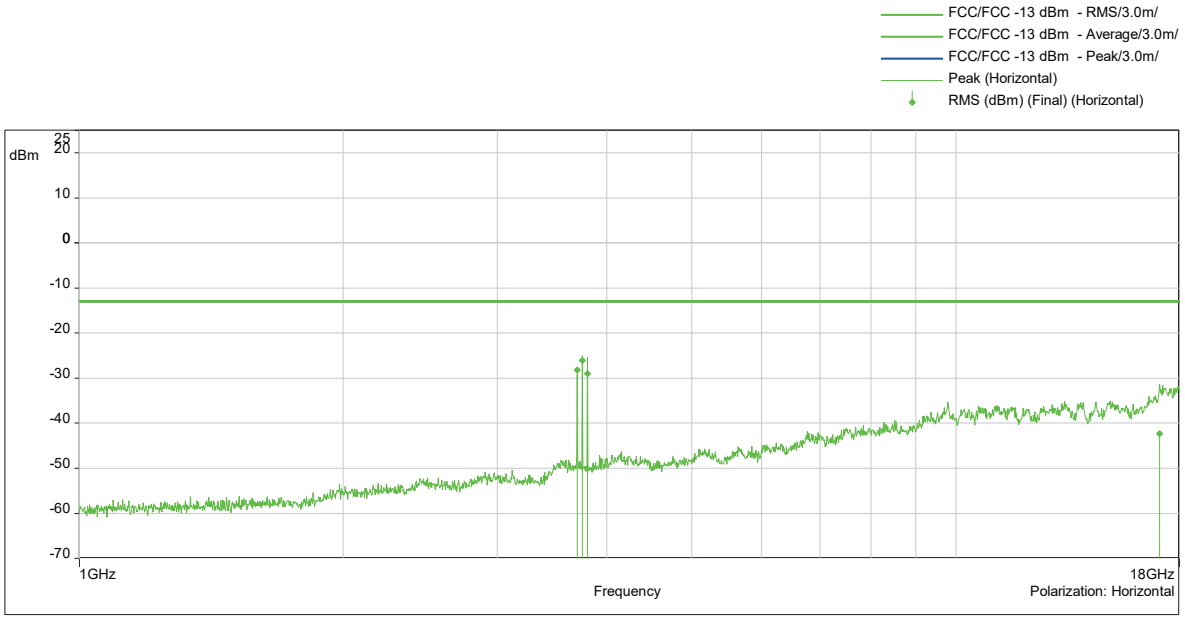
30 MHz - 1 GHz. horizontal



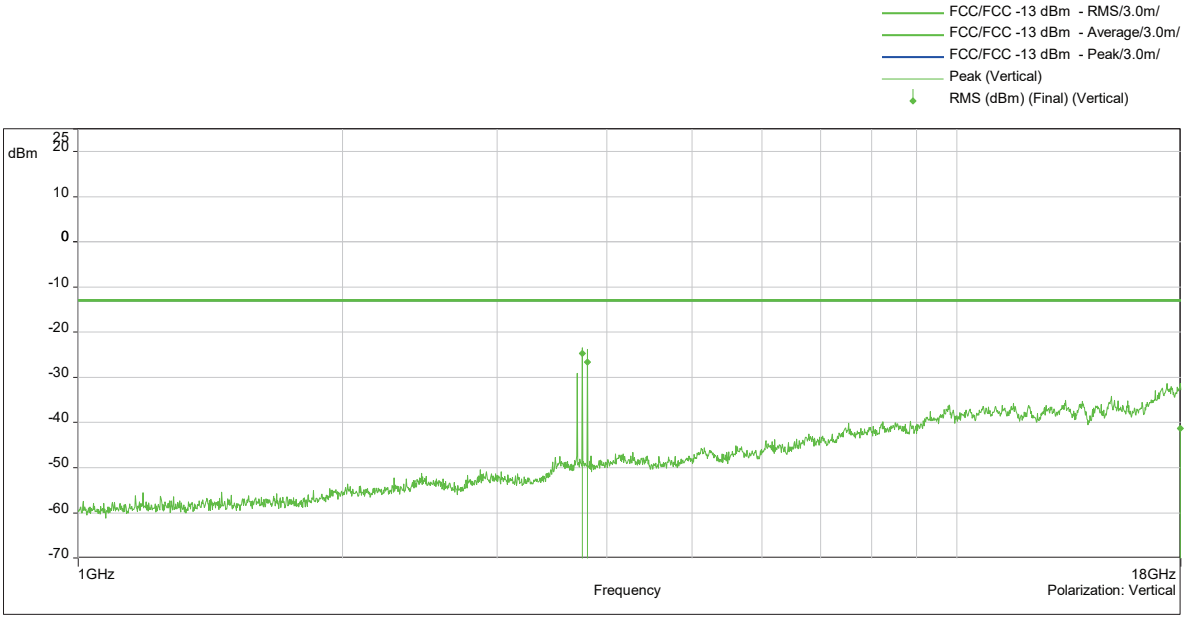
30 MHz - 1 GHz. vertical



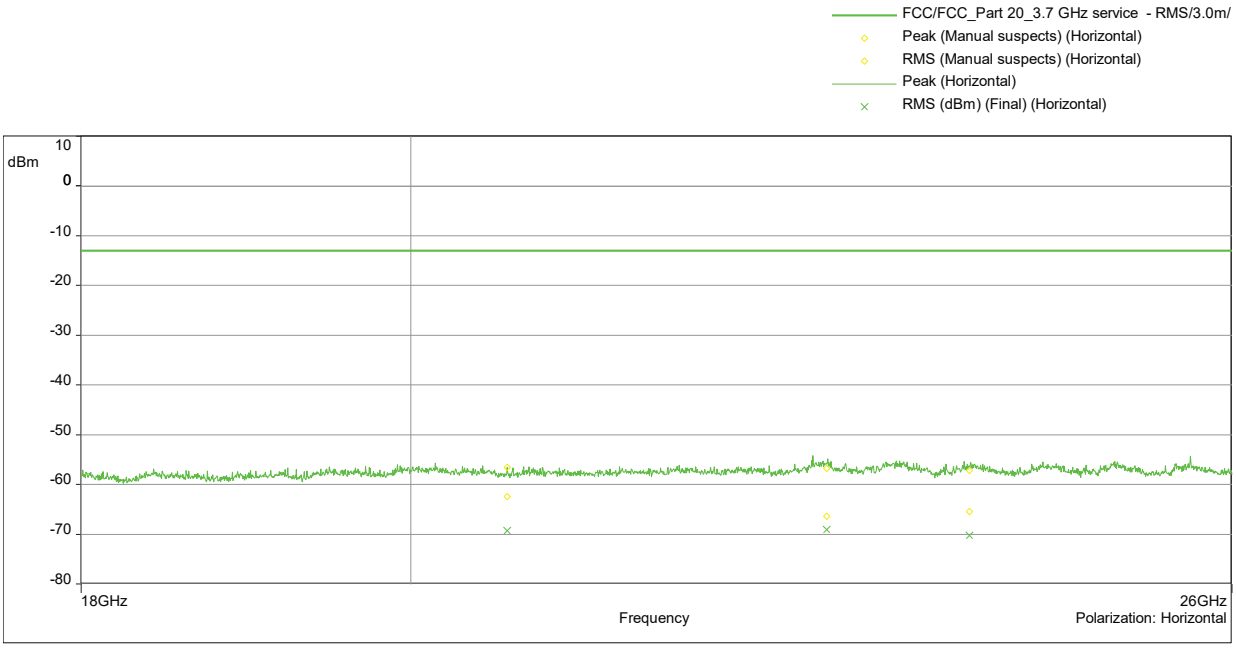
1 GHz - 18 GHz. horizontal



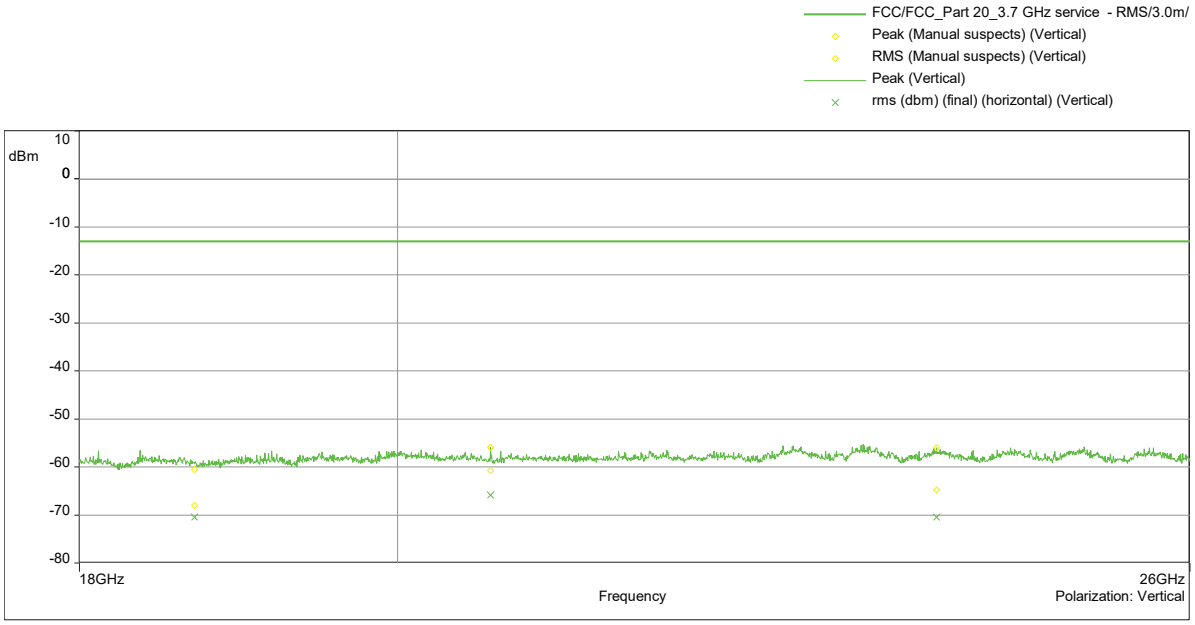
1 GHz - 18 GHz. vertical



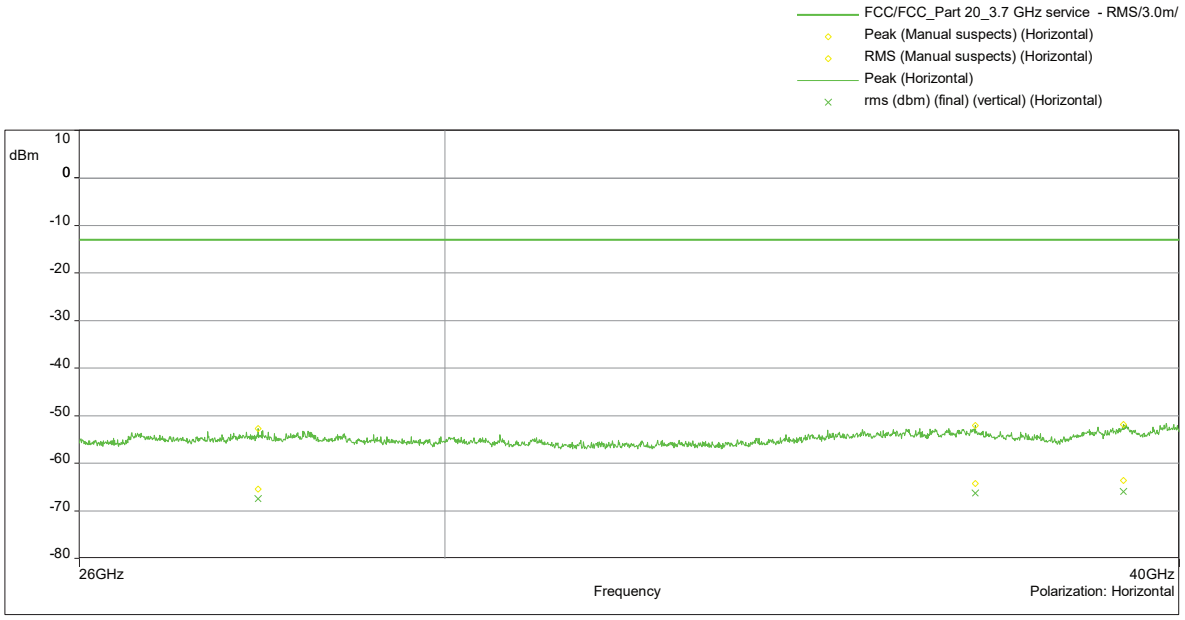
18 GHz - 26 GHz. horizontal



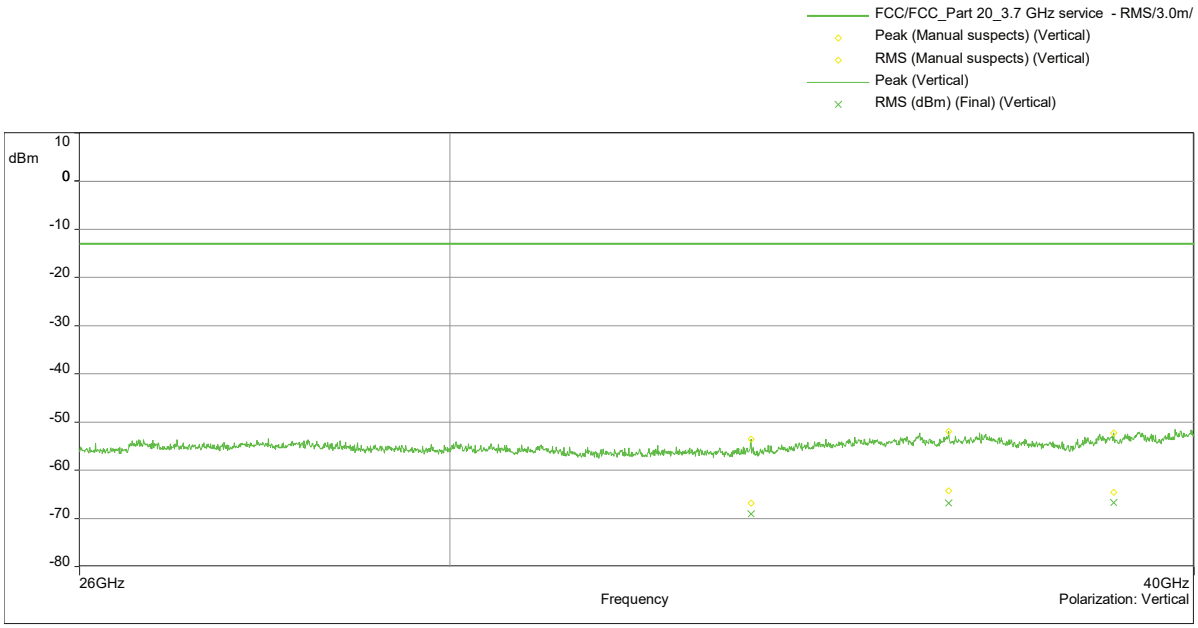
18 GHz - 26 GHz. vertical



26 GHz - 40 GHz. horizontal

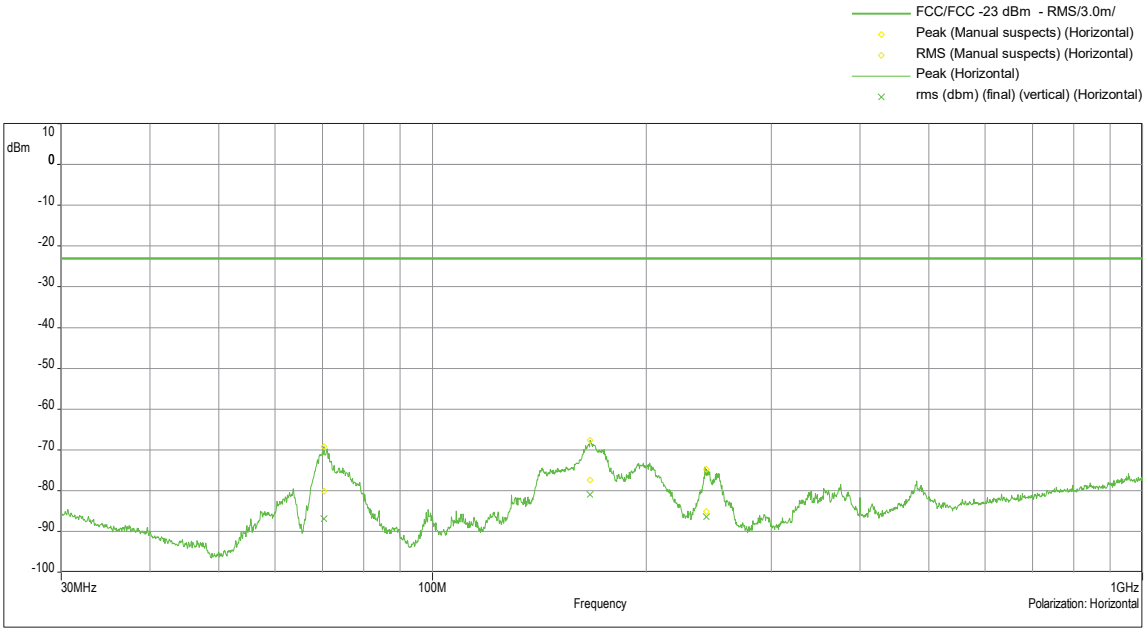


26 GHz - 40 GHz. vertical

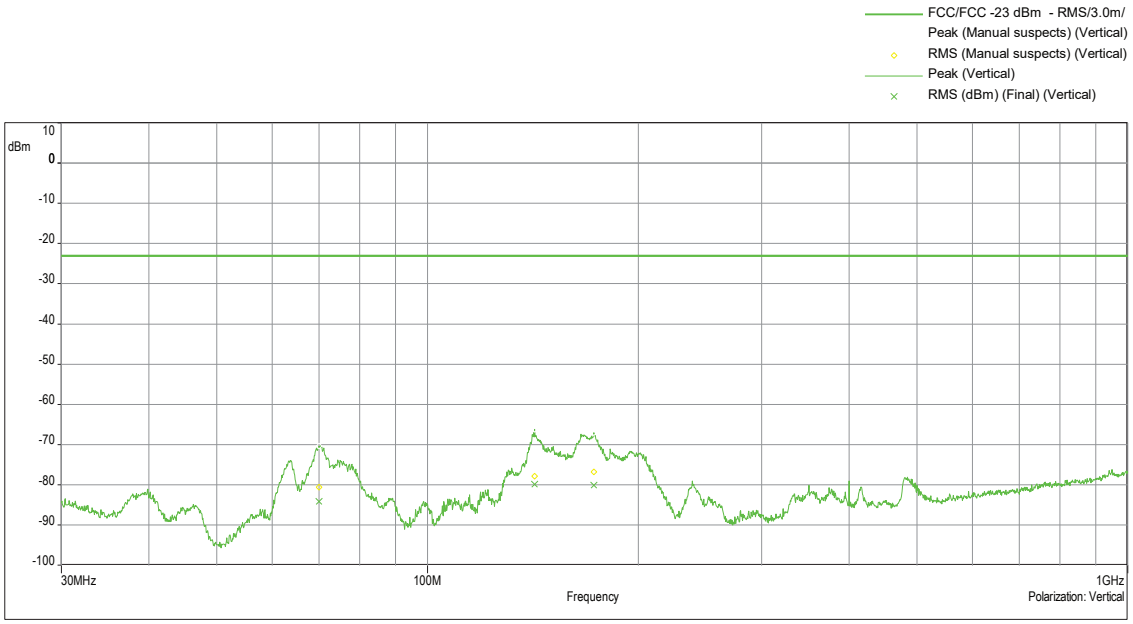


5.8.5.3 Frequency band = TDD 37, segment 2: ANT 1 and 2 (MIMO); direction = RF downlink

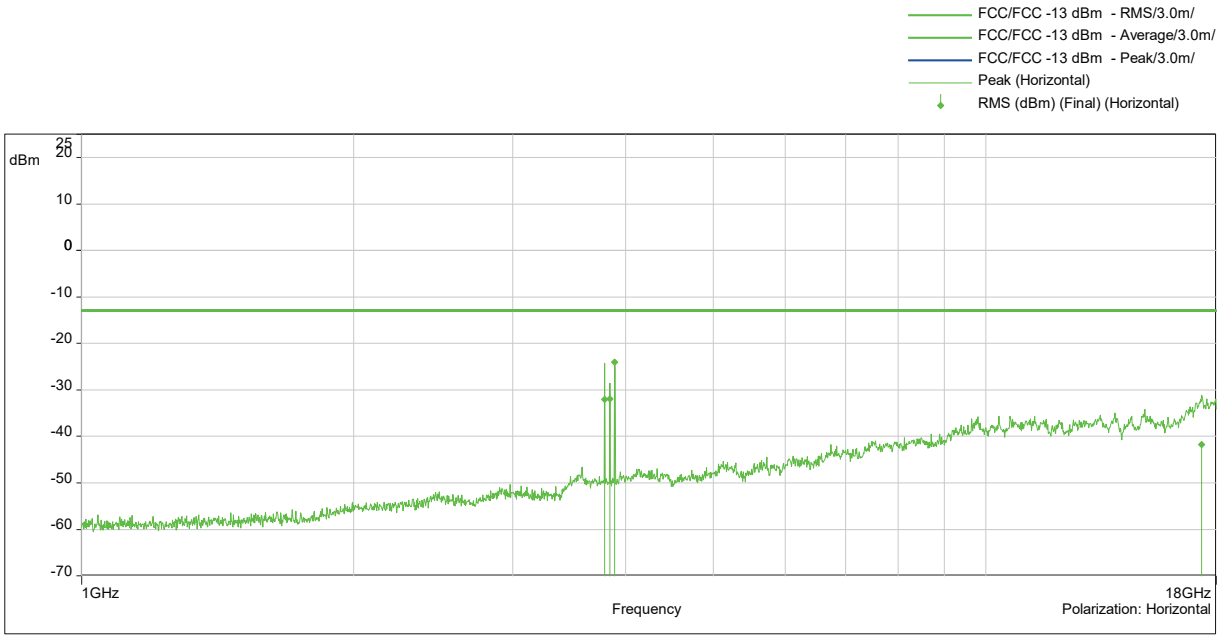
30 MHz - 1 GHz. horizontal



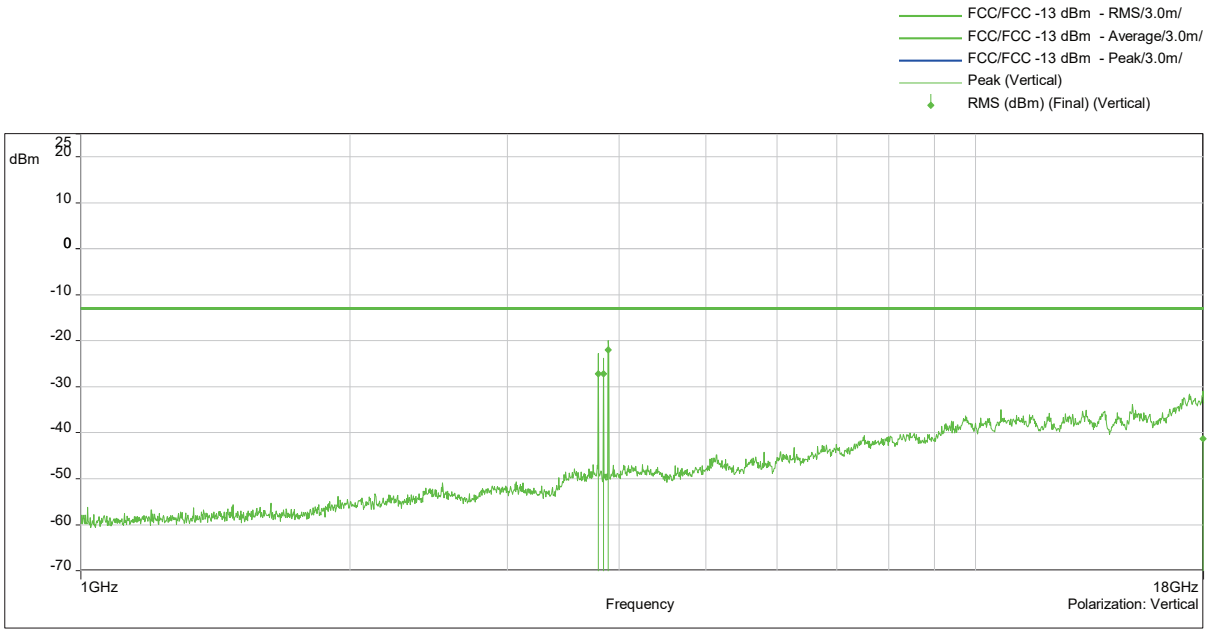
30 MHz - 1 GHz. vertical



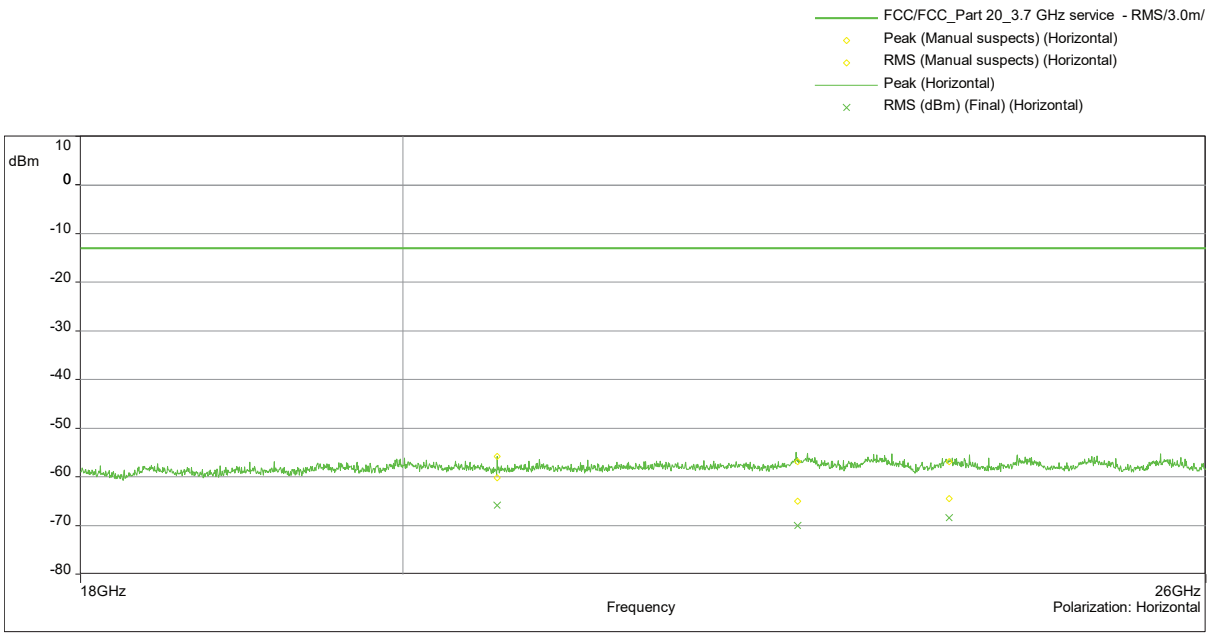
1 GHz - 18 GHz. horizontal



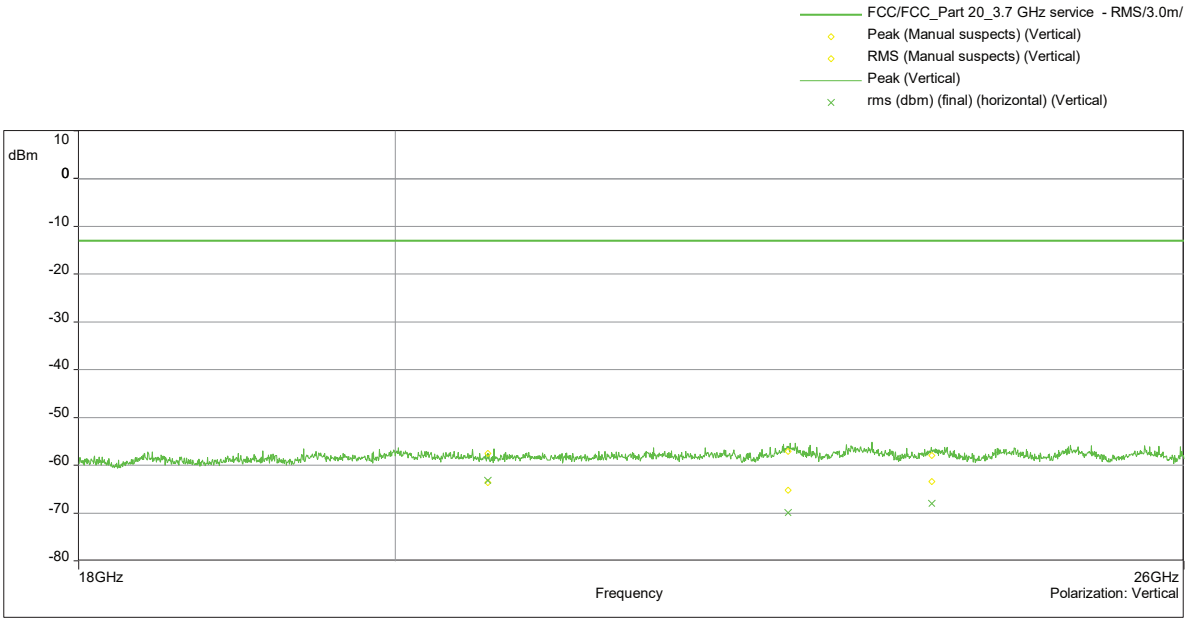
1 GHz - 18 GHz. vertical



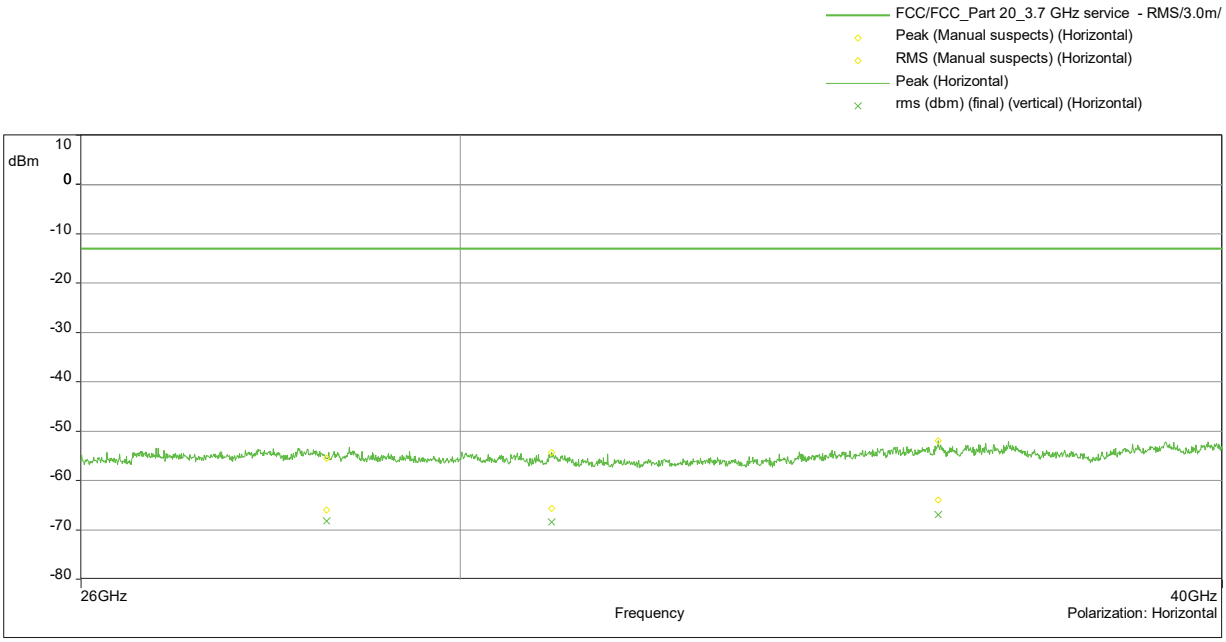
18 GHz - 26 GHz. horizontal



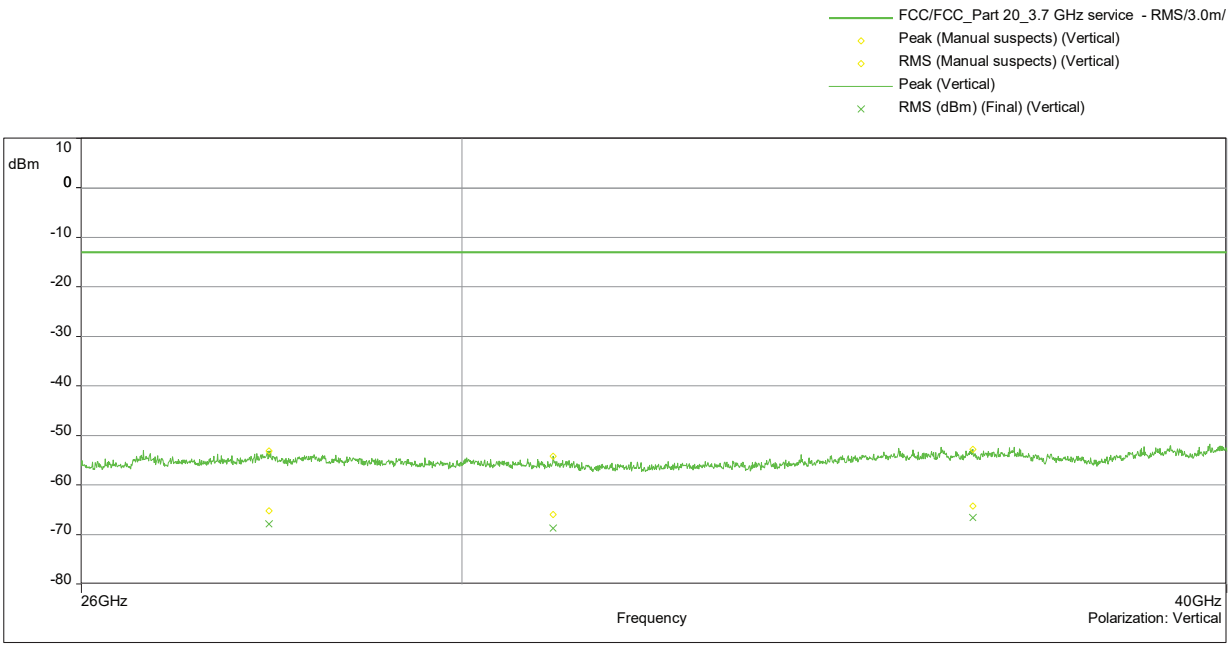
18 GHz - 26 GHz. vertical



26 GHz - 40 GHz. horizontal

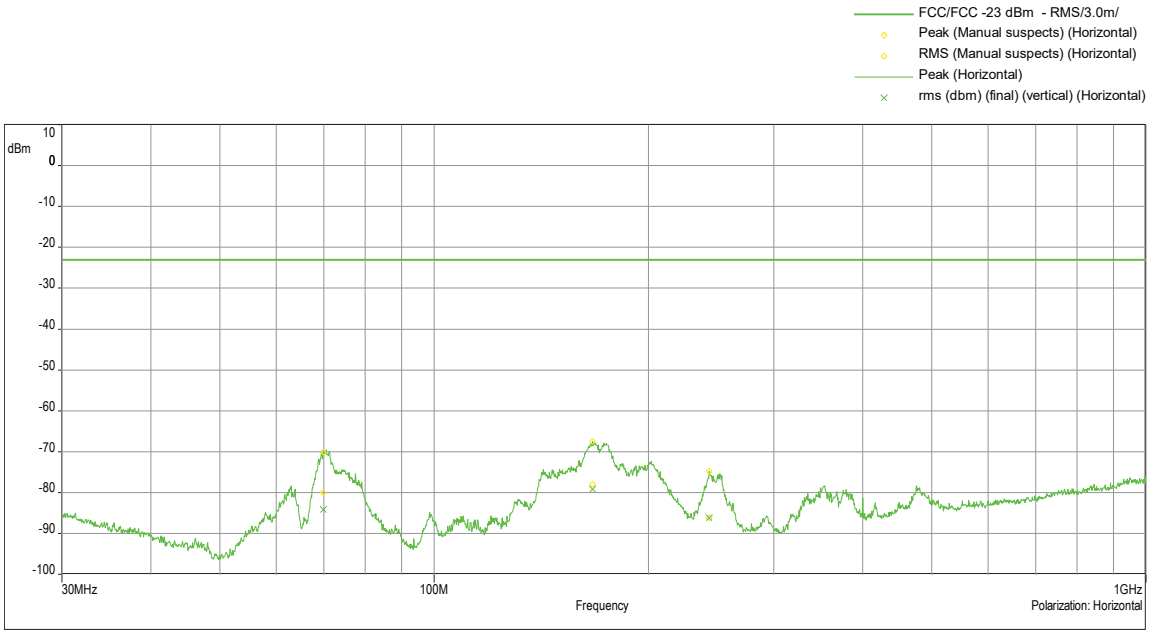


26 GHz - 40 GHz. vertical

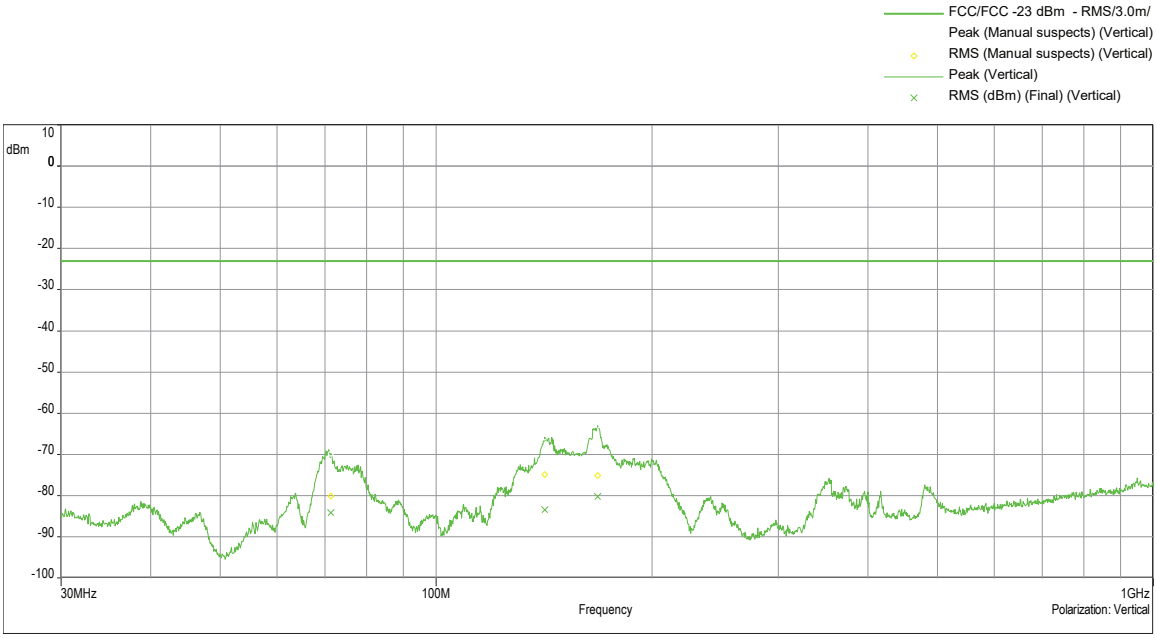


5.8.5.4 Frequency band = TDD 37, segment 3: ANT 1 and 2 (MIMO); direction = RF downlink

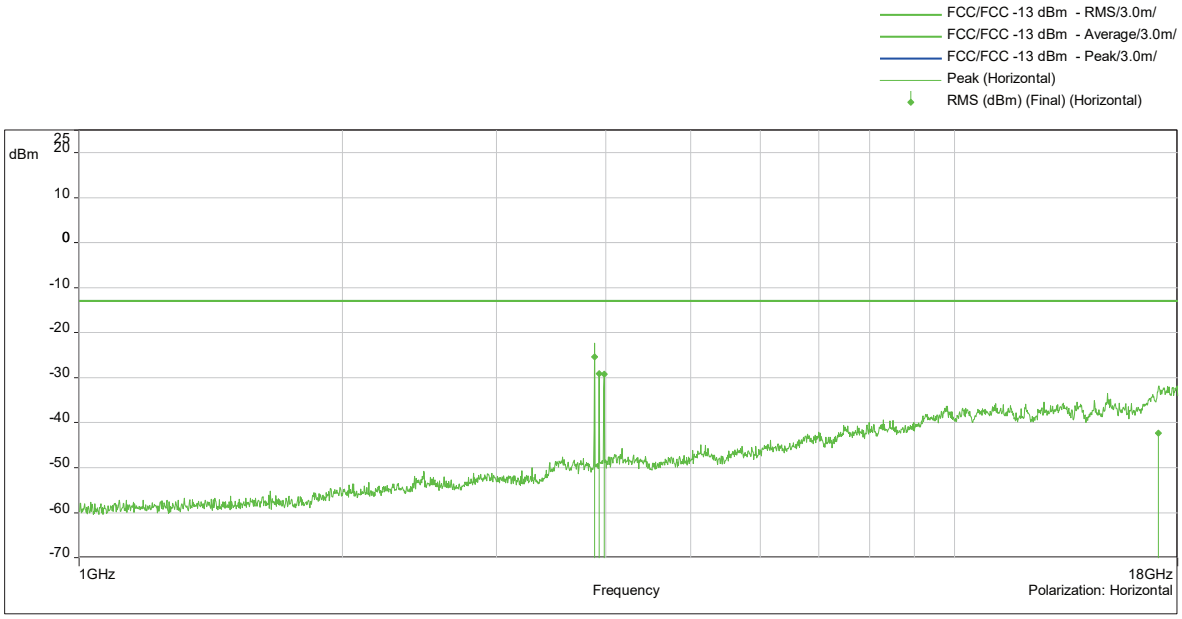
30 MHz - 1 GHz. horizontal



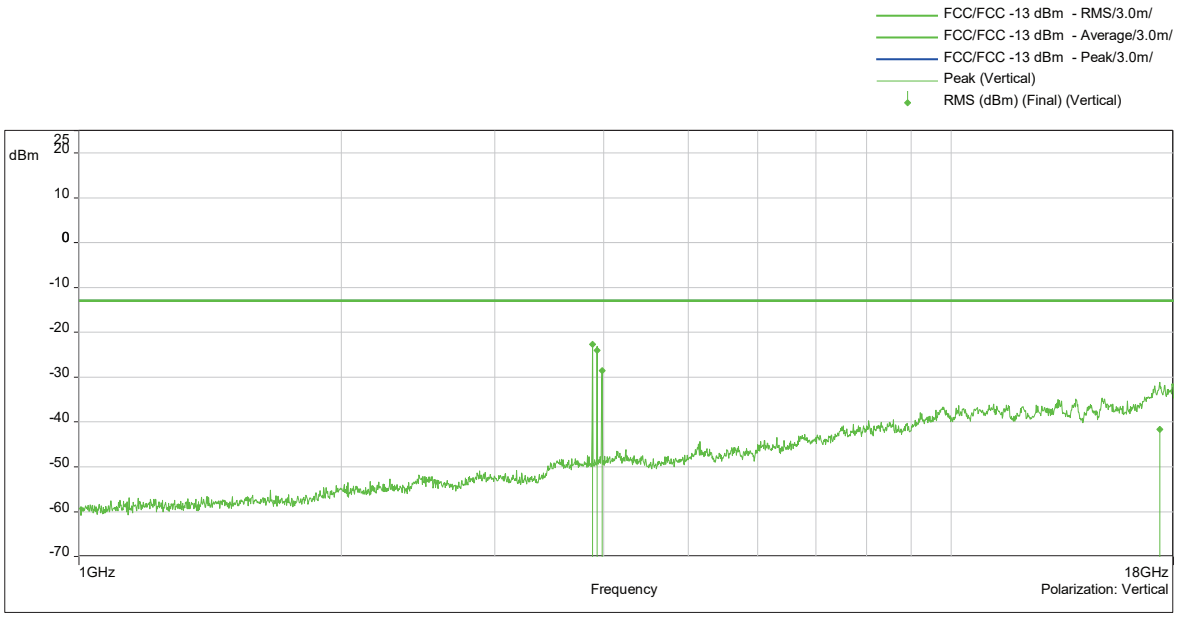
30 MHz - 1 GHz. vertical



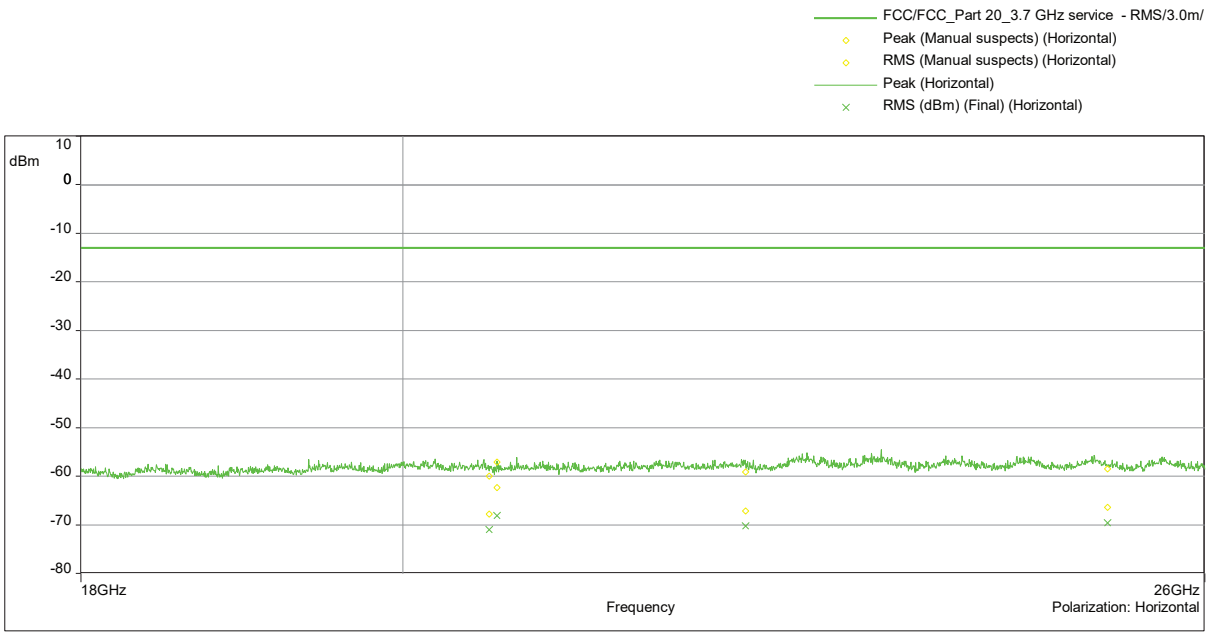
1 GHz - 18 GHz. horizontal



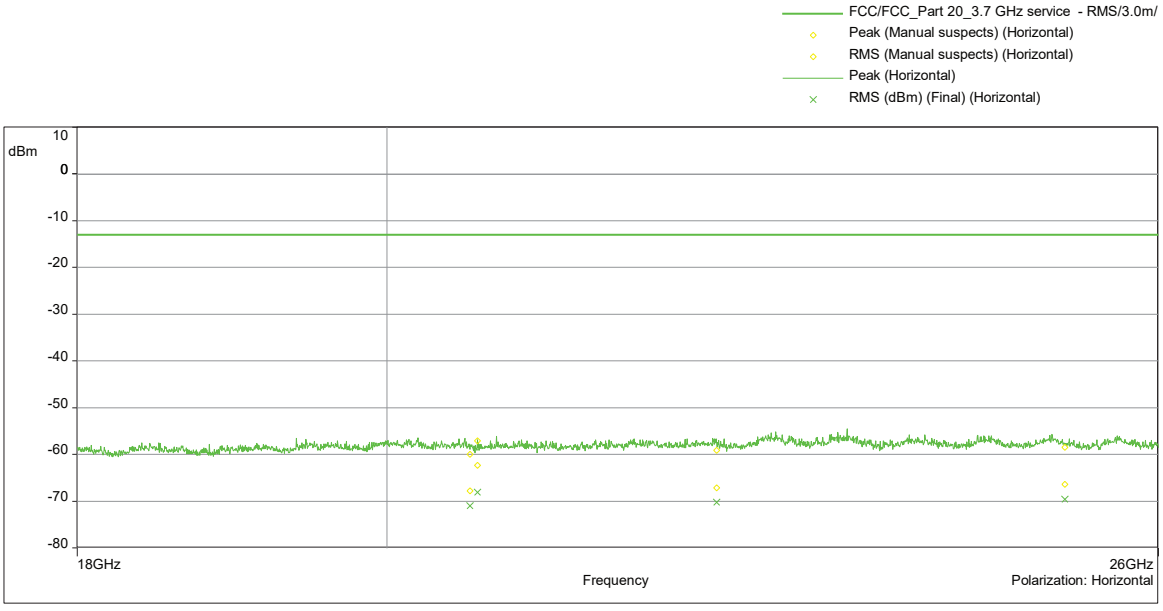
1 GHz - 18 GHz. vertical



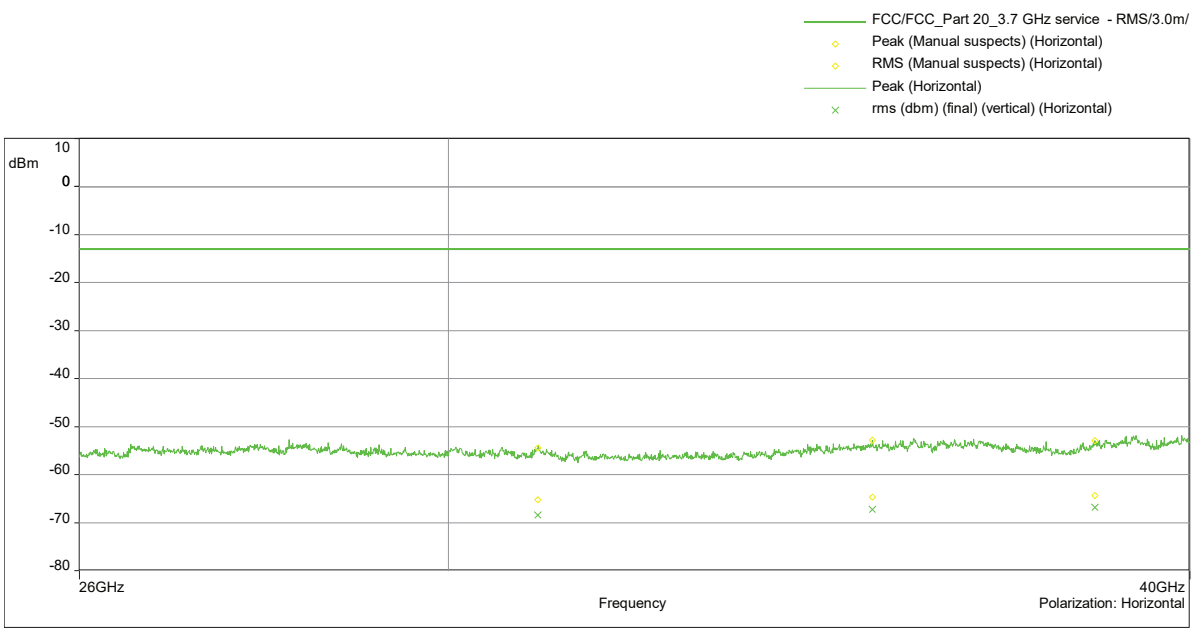
18 GHz - 26 GHz. horizontal



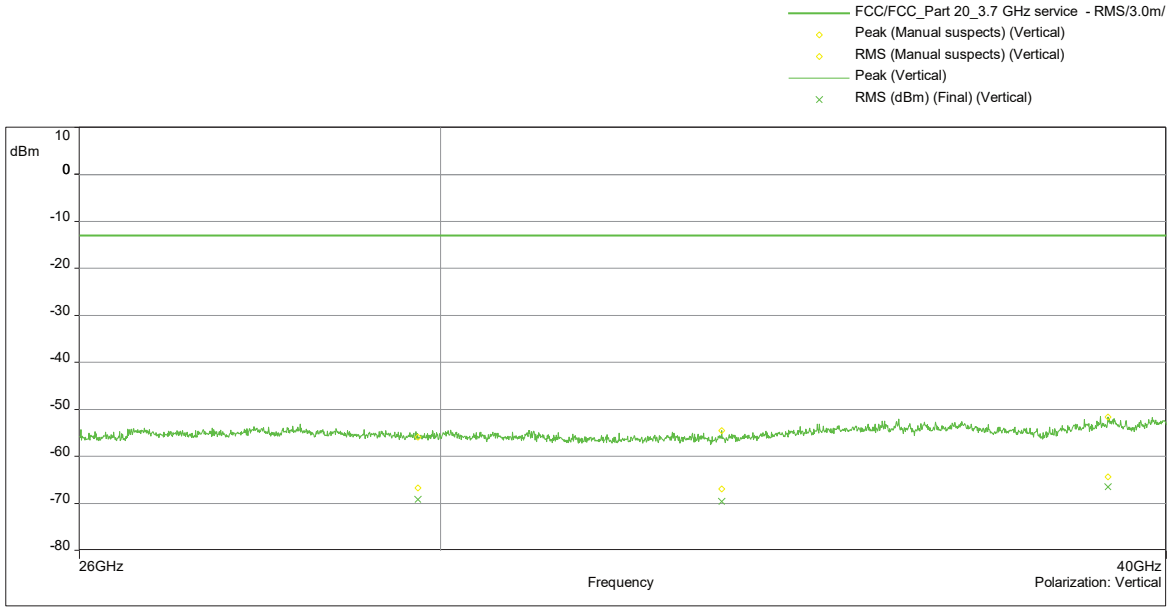
18 GHz - 26 GHz. vertical



26 GHz - 40 GHz. horizontal



26 GHz - 40 GHz. vertical



5.8.6 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

5.8.7 TEST EQUIPMENT USED

- Radiated Emissions

6 TEST EQUIPMENT

6.1 CONDUCTED EMISSIONS

Ref.No.	Type	Description	Manufacturer	Inventory no.	Last Calibration	Calibration Due
1.1	FSV40	Signal Analyzer 10 Hz - 40 GHz	Rohde & Schwarz	E-003138	2023-10	2025-10
1.2	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	E-003206	2023-01	2026-01
1.3	Arduino & HTY939	Thermo-Hygrometer	Bureau Veritas	E-003998	2024-02	2025-02
1.4	Auto Messung 1 Channel V8.1	Software	Bureau Veritas	Software V8.1	---	---

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

6.2 RADIATED EMISSIONS

Ref.No.	Type	Description	Manufacturer	Inventory no.	Last Calibration	Calibration Due
1.5	ESU40 *	EMI test receiver 10 Hz - 40 GHz	Rohde & Schwarz	E-003138	2024-10	2025-10
1.6	CBL 6111C	Antenna 30 MHz – 1 GHz	Chase	E-003226	2024-02	2026-02
1.7	LB-8180-SF	Antenna 0.8 GHz - 18 GHz	A-Info Inc.	E-004052	2024-08	2025-08
1.8	MWH-1826/B	Antenna 18 GHz – 26.5 GHz	ARA Inc.	E-004043	2024-09	2025-09
1.9	MWH-2640/B	Antenna 26 GHz - 40 GHz	ARA Inc.	E-004046	2024-05	2025-05
1.10	AM1431 *	Pre amplifier 10 kHz – 1 GHz	Miteq	E-003365	2024-10	2025-10
1.11	AFS4-00102000 *	Preamplifier 100 MHz - 20 GHz	Miteq	E-003633	2024-10	2025-10
1.12	AMP-2000-43000-50-10-2.9-F *	Preamplifier 2 GHz - 43 GHz	Miteq	E-004003	2024-10	2025-10
1.13	CO3000	Controller SAC	Innco systems GmbH	E-003052 with Software 1.02.62	---	---
1.14	Arduino & HTY939	Thermo-Hygrometer	Bureau Veritas	E-004027	2024-02	2025-02
1.15	BAT-EMC	Software	Nexio	V 2024.0.5.2	---	---

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

ANTENNA FACTORS. CABLE LOSS AND SAMPLE CALCULATION

The used factors for antennas, cables etc. are deposited in the used test systems (LabView program and BAT EMC programm). They are actualised by the returing calibration control.

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.
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

7 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
Spuriousemissionsconducted	2.18 dB
Spurious emissions radiated mesurements	5.38 dB
Total frequency uncertainty	2 x 10^{-7}

Reference : ECL-MU5.4.6.3-EMC-14-001-V03.00 MU Wireless.xlsx

8 PHOTO REPORT

Please see separate photo report.

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/en

Annex B: Additional information provided by client

None.

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