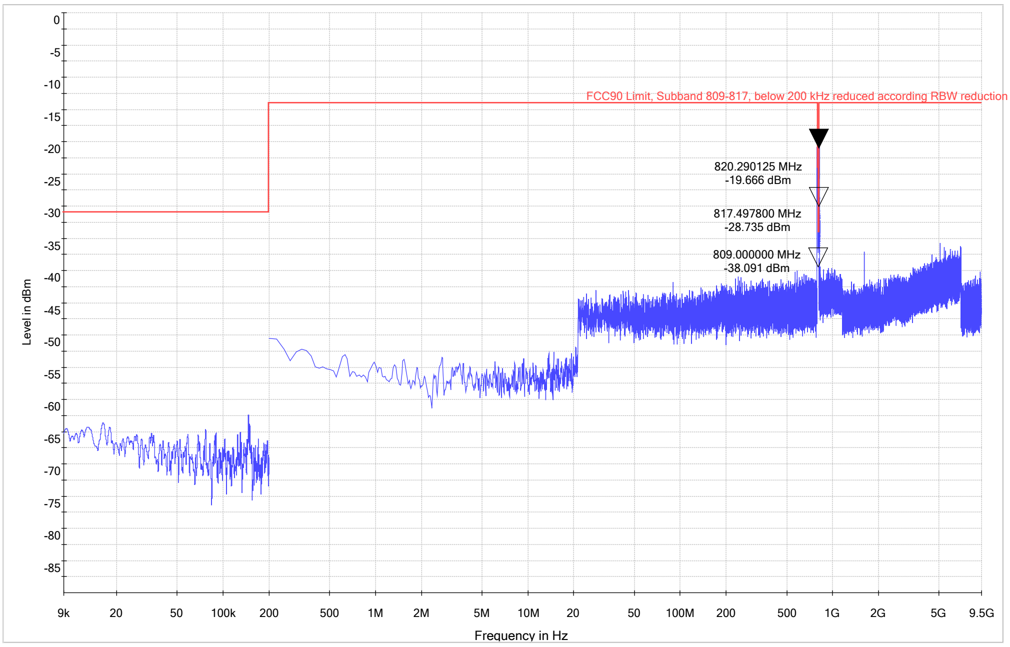
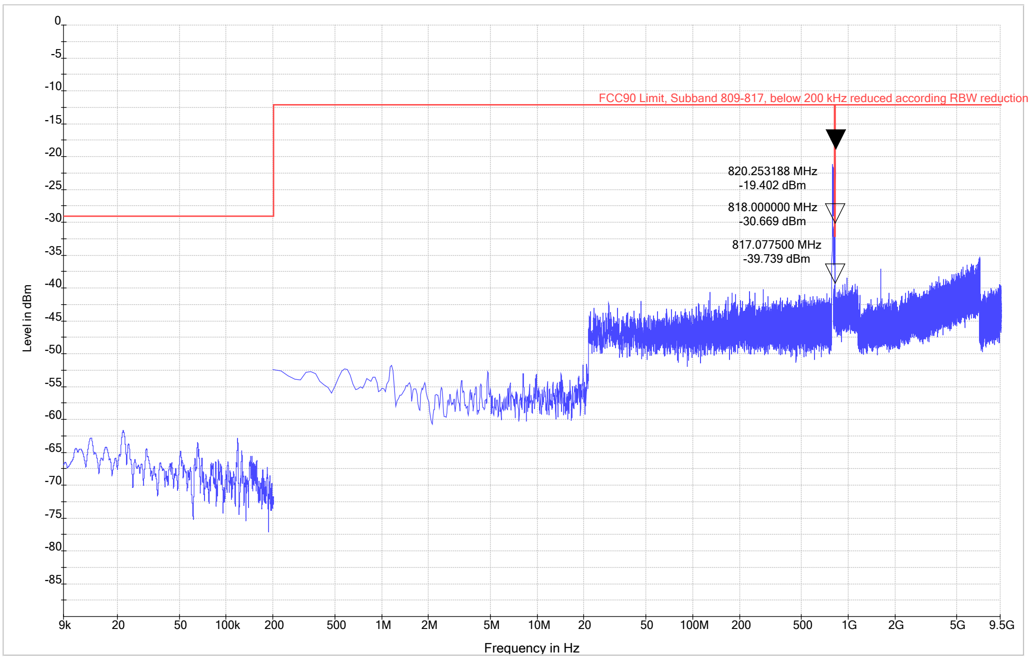
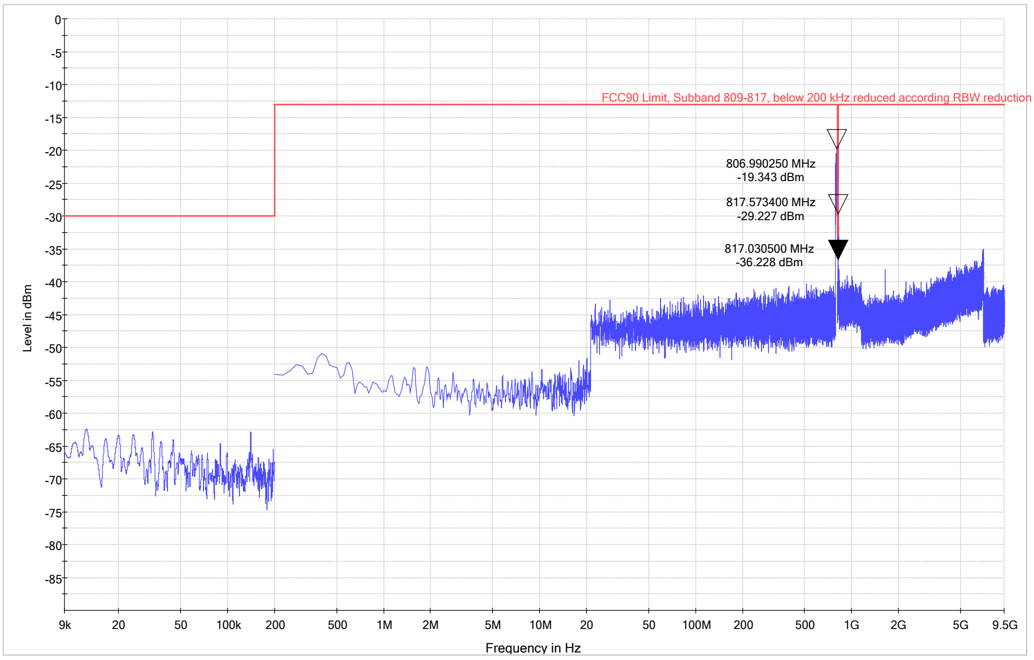
Frequency Band = Band 809 – 817 MHz, Test Frequency = low, Direction = RF uplink, Signal Type = CW
(S01_AA01)



Frequency Band = Band 809 – 817 MHz, Test Frequency = mid, Direction = RF uplink, Signal Type = CW
(S01_AA01)



Frequency Band = Band 809 – 817 MHz, Test Frequency = high, Direction = RF uplink, Signal Type = CW
(S01_AA01)



4.4.5 TEST EQUIPMENT USED

- R&S TS8997

4.5 OUT-OF-BAND EMISSION LIMITS

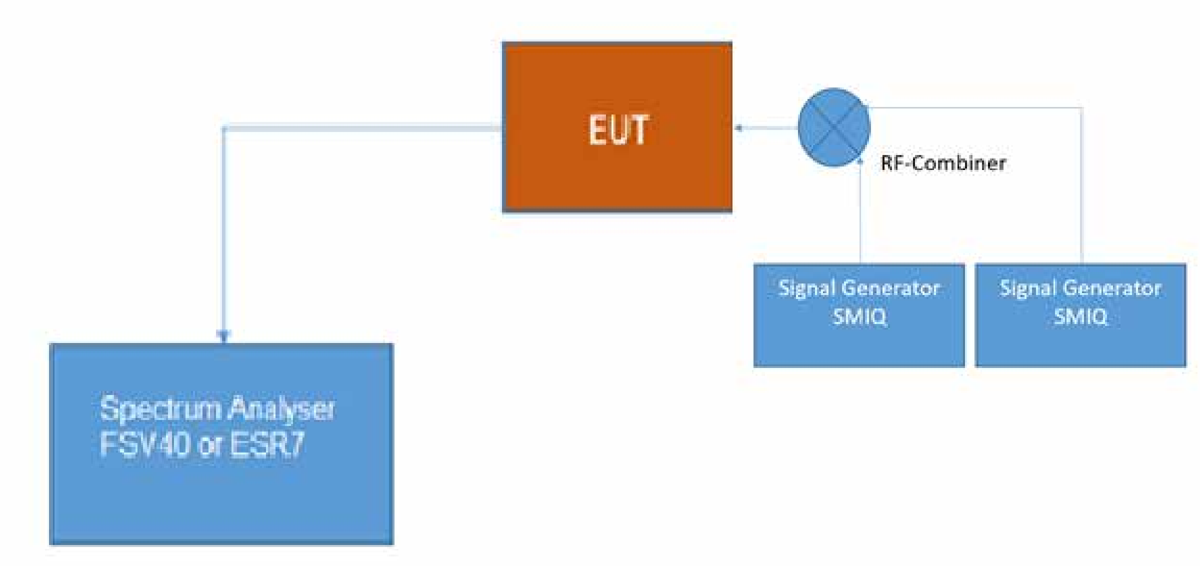
Standard FCC Part 90; §90.219

The test was performed according to:
ANSI C63.26, KDB 935210 D05 v01r03: 3.6

4.5.1 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:



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

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

4.5.2 TEST REQUIREMENTS / LIMITS

Part 90, Subpart I

§90.219 Use of signal boosters.

This section contains technical and operational rules allowing the use of signal boosters in the Private Land Mobile Radio Services (PLMRS). Rules for signal booster operation in the Commercial Mobile Radio Services under part 90 are found in §20.21 of this chapter.
....

(d) *Deployment rules.* Deployment of signal boosters must be carried out in accordance with the rules in this paragraph.

(6) Good engineering practice must be used in regard to the radiation of intermodulation products and noise, such that interference to licensed communications systems is avoided. In the event of harmful interference caused by any given deployment, the FCC may require additional attenuation or filtering of the emissions and/or noise from signal boosters or signal booster systems, as necessary to eliminate the interference.

(i) In general, the ERP of intermodulation products should not exceed −30 dBm in 10 kHz measurement bandwidth.

4.5.3 TEST PROTOCOL

Band 758 MHz – 768 MHz, Downlink, Number of input signals = 2					
Emission Designator with Channel Bandwidth [MHz]	**Input Power**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Intermodulation Power [dBm]**
CW at 5	0.3 dB < AGC	762.1640	767.1640	-57.5	-28.7
CW at 5	3 dB > AGC	762.1640	767.1640	-54.2	-28.8

Band 769 MHz – 775 MHz, Downlink, Number of input signals = 2					
Emission Designator with Channel Bandwidth [kHz]	**Input Power**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Intermodulation Power [dBm]]**
CW at 6.25	0.3 dB < AGC	771.8625	771.8688	-58.3	-24.8
CW at 6.25	3 dB > AGC	771.8625	771.8688	-55.1	-24.1
CW at 12.5	0.3 dB < AGC	771.8625	771.8750	-58.3	-26.0
CW at 12.5	3 dB > AGC	771.8625	771.8750	-55.1	-25.6
CW at 25	0.3 dB < AGC	771.8563	771.8813	-58.3	-24.5
CW at 25	3 dB > AGC	771.8563	771.8813	-55.1	-24.0

Band 851 MHz – 854 MHz, Downlink, Number of input signals = 2					
Emission Designator with Channel Bandwidth [kHz]	**Input Power**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Intermodulation Power [dBm]]**
CW at 12.5	0.3 dB < AGC	852.9000	852.9125	-57.1	-24.4
CW at 12.5	3 dB > AGC	852.9000	852.9125	-53.8	-22.6

Band 854 MHz – 862 MHz, Downlink, Number of input signals = 2					
Emission Designator with Channel Bandwidth [kHz]	**Input Power**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Intermodulation Power [dBm]**
CW at 12.5	0.3 dB < AGC	856.8000	856.8125	-58.5	-24.3
CW at 12.5	3 dB > AGC	856.8000	856.8125	-55.2	-23.1

Band 788 MHz – 798 MHz, Uplink, Number of input signals = 2					
Emission Designator with Channel Bandwidth [MHz]	**Input Power**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Intermodulation Power [dBm]**
CW at 5	0.3 dB < AGC	788.6040	793.6040	-64.3	-31.0
CW at 5	3 dB > AGC	788.6040	793.6040	-61.1	-30.1

Band 799 MHz – 805 MHz, Uplink, Number of input signals = 2					
Emission Designator with Channel Bandwidth [kHz]	**Input Power**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Intermodulation Power [dBm]**
CW at 6.25	0.3 dB < AGC	799.5875	799.5938	-63.5	-25.1
CW at 6.25	3 dB > AGC	799.5875	799.5938	-60.3	-25.2
CW at 12.5	0.3 dB < AGC	799.5875	799.6000	-63.5	-25.7
CW at 12.5	3 dB > AGC	799.5875	799.6000	-60.3	-25.3
CW at 25	0.3 dB < AGC	799.5813	799.6063	-63.5	-26.1
CW at 25	3 dB > AGC	799.5813	799.6063	-60.3	-25.3

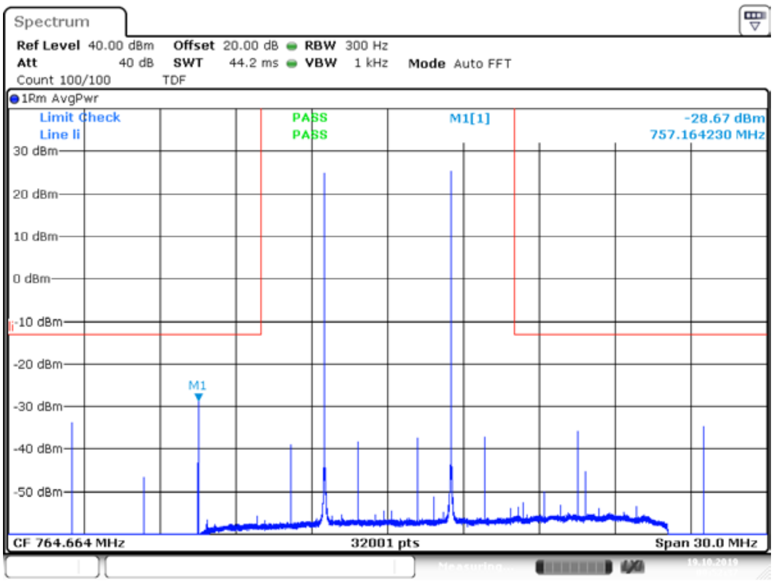
Band 806 MHz – 809 MHz, Uplink, Number of input signals = 2					
Emission Designator with Channel Bandwidth [kHz]	**Input Power**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Intermodulation Power [dBm]**
CW at 12.5	0.3 dB < AGC	806.7875	806.8000	-64.9	-24.8
CW at 12.5	3 dB > AGC	806.7875	806.8000	-61.6	-24.6

Band 809 MHz – 817 MHz, Uplink, Number of input signals = 2					
Emission Designator with Channel Bandwidth [kHz]	**Input Power**	**Signal Frequency f1 [MHz]**	**Signal Frequency f2 [MHz]**	**Input Power [dBm]**	**Maximum Intermodulation Power [dBm]**
CW at 12.5	0.3 dB < AGC	816.8250	816.8375	-64.1	-25.8
CW at 12.5	3 dB > AGC	816.8250	816.8375	-60.8	-25.7

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

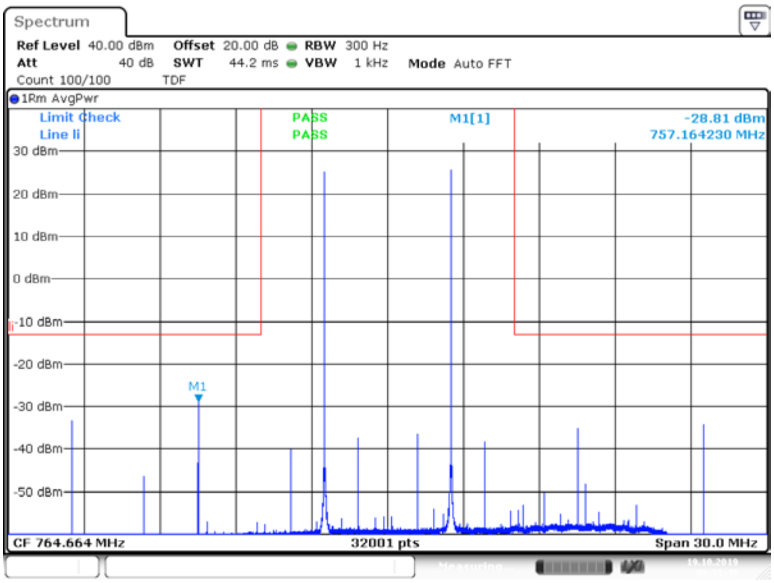
4.5.4 MEASUREMENT PLOTS

Frequency band = 758 MHz – 768 MHz, Channel bandwidth = 5 MHz, Number of signals = 2, Direction = RF downlink, Input power = = 0.3 dB < AGC, Emission designator = 5M00G7D



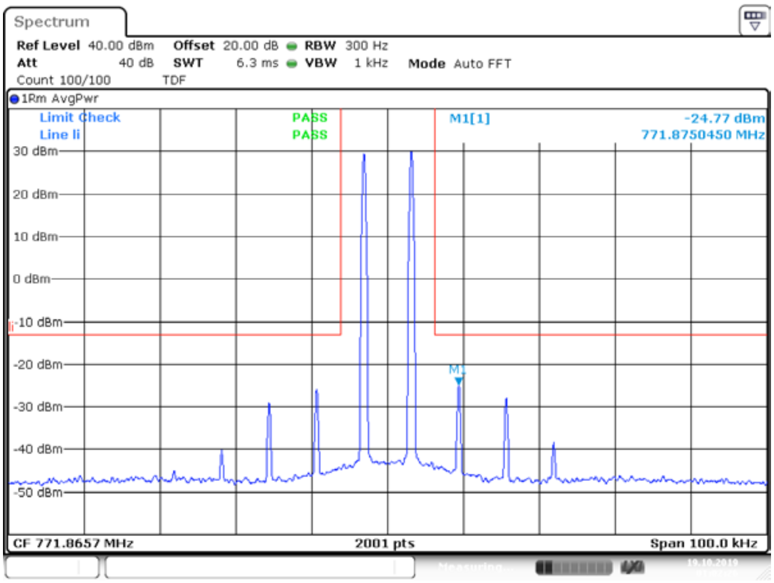
out of band emi;CW;2 carrier -0.3 dB;764.66400M;30.000M; CB5 .00M

Frequency band = 758 MHz – 768 MHz, Channel bandwidth = 5 MHz, Number of signals = 2, Direction = RF downlink, Input power = = 3 dB > AGC, Emission designator = 5M00G7D



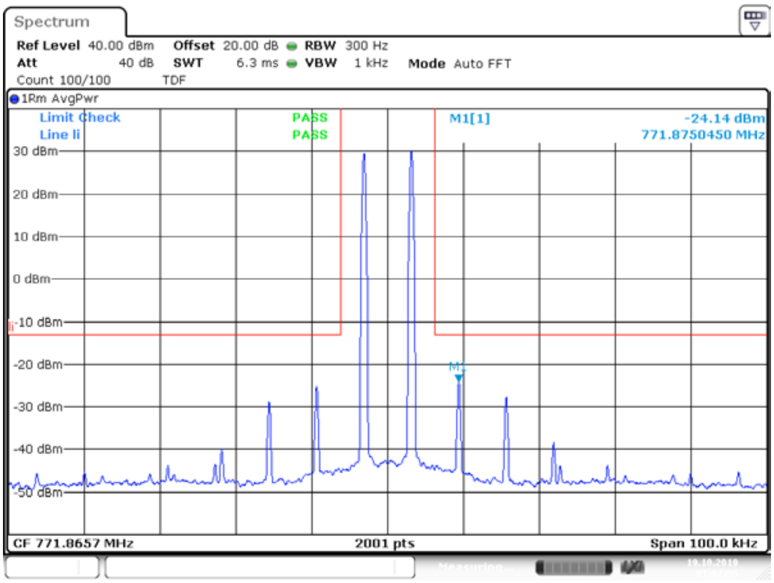
out of band emi;CW;2 carrier +3 dB;764.66400M;30.000M; CB5.0 0M

Frequency band = 769 MHz – 775 MHz, Channel bandwidth = 6.25 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 0.3 dB < AGC,
Emission designator = 4K00F3E



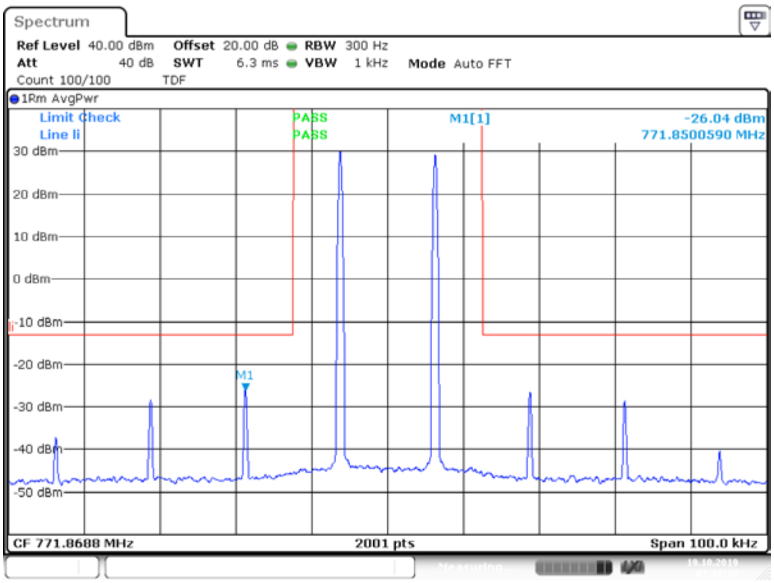
out of band emi;CW;2 carrier -0.3 dB;771.86570M;100.000k; CB
6.25k

Frequency band = 769 MHz – 775 MHz, Channel bandwidth = 6.25 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 3 dB > AGC,
Emission designator = 4K00F3E



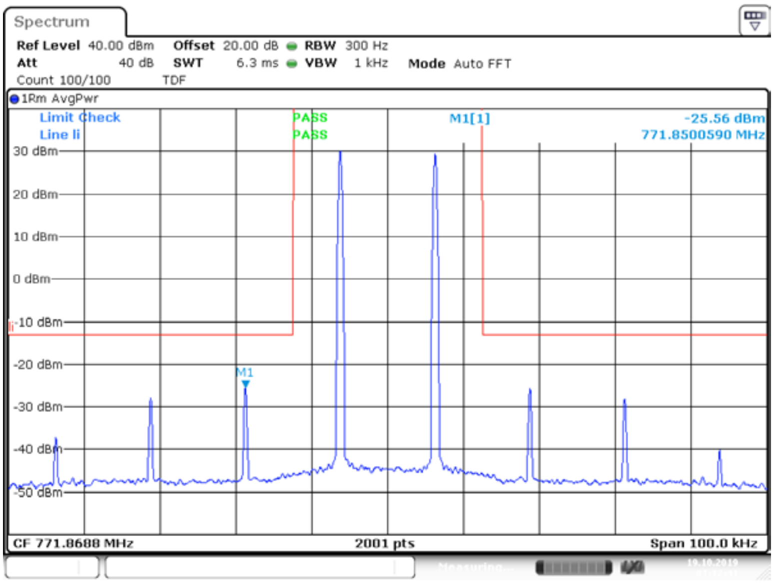
out of band emi;CW;2 carrier +3 dB;771.86570M;100.000k; CB6.
25k

Frequency band = 769 MHz – 775 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 0.3 dB < AGC,
Emission designators = 11K3F3E, 8K10F1D and 9K80D7W



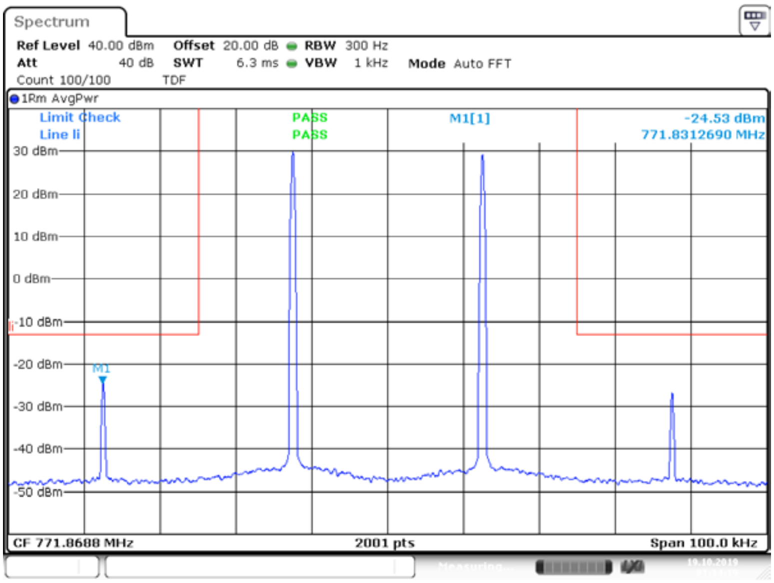
out of band emi;CW;2 carrier -0.3 dB;771.86880M;100.000k; CB
12.50k

Frequency band = 769 MHz – 775 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 3 dB > AGC,
Emission designators = 11K3F3E, 8K10F1D and 9K80D7W



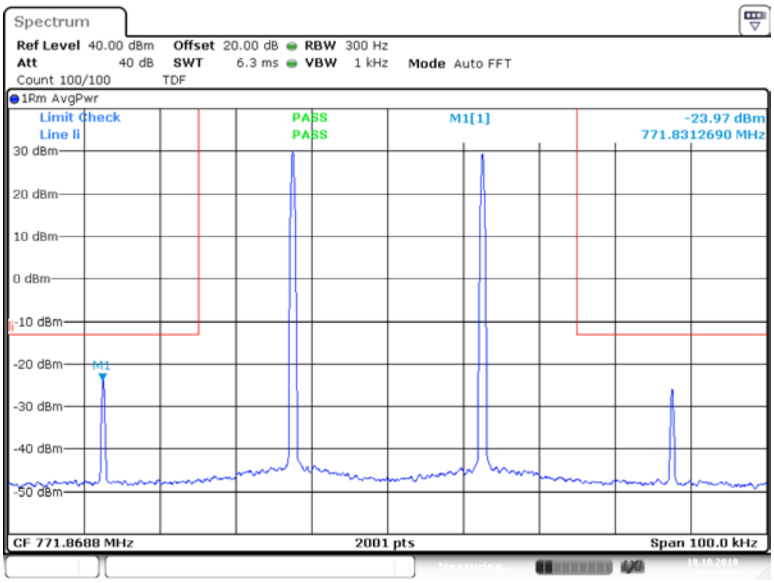
out of band emi;CW;2 carrier +3 dB;771.86880M;100.000k; CB12
.50k

Frequency band = 769 MHz – 775 MHz, Channel bandwidth = 25 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 0.3 dB < AGC,
Emission designator = 16K0F3E



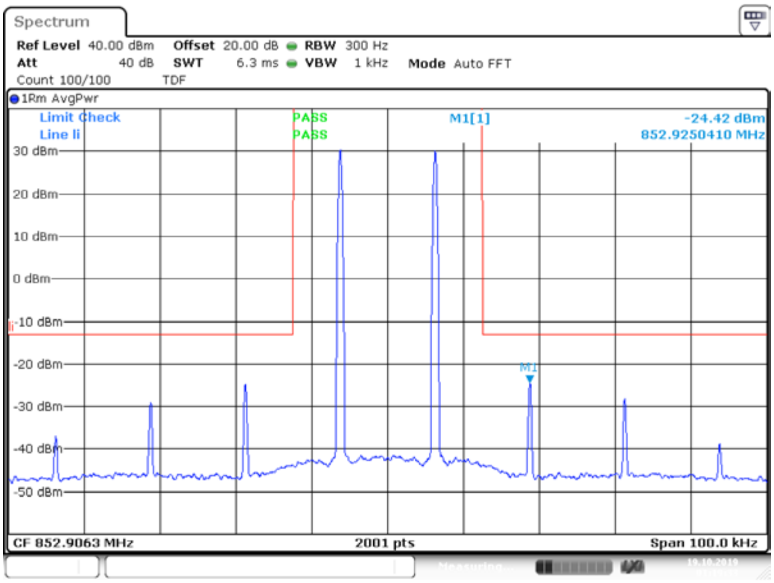
out of band emi;CW;2 carrier -0.3 dB;771.86880M;100.000k; CB
25.00k

Frequency band = 769 MHz – 775 MHz, Channel bandwidth = 25 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 3 dB > AGC,
Emission designator = 16K0F3E



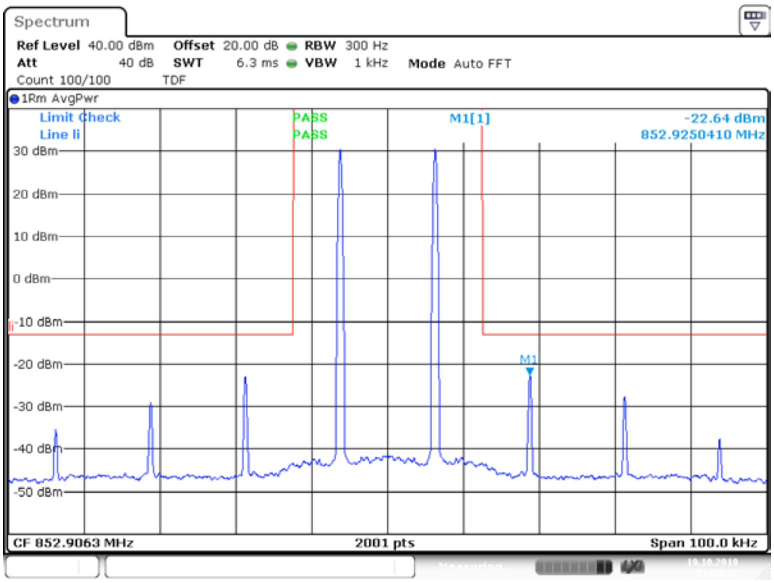
out of band emi;CW;2 carrier +3 dB;771.86880M;100.000k; CB25
.00k

Frequency band = 851 MHz – 854 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 0.3 dB < AGC,
Emission designators = 4K00F3E, 11K3F3E, 8K10F1D and 9K80D7W



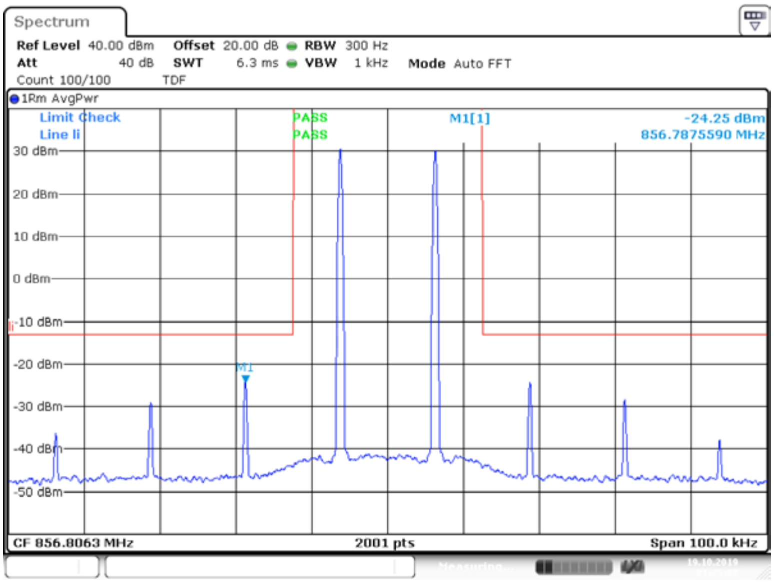
out of band emi;CW;2 carrier -0.3 dB;852.90630M;100.000k; CB
12.50k

Frequency band = 851 MHz – 854 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 3 dB > AGC,
Emission designators = 4K00F3E, 11K3F3E, 8K10F1D and 9K80D7W



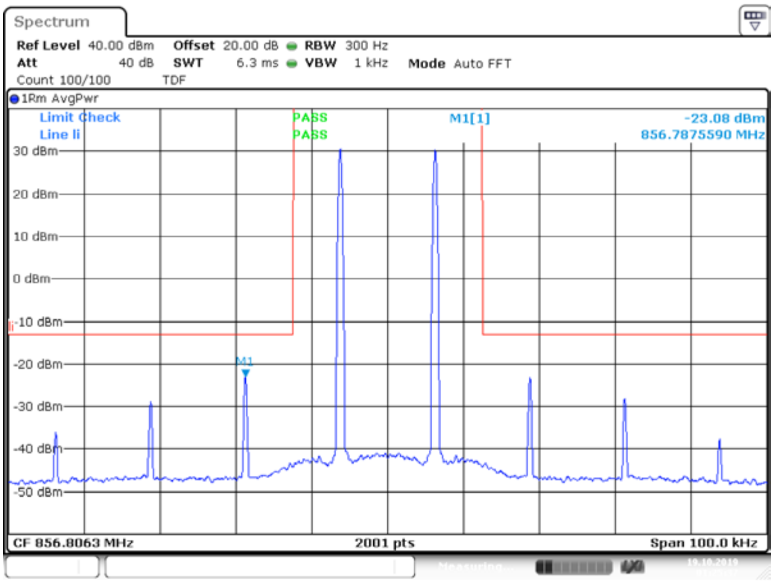
out of band emi;CW;2 carrier +3 dB;852.90630M;100.000k; CB12
.50k

Frequency band = 854 MHz – 862 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 0.3 dB < AGC,
Emission designators = 4K00F3E, 11K3F3E, 8K10F1D and 9K80D7W



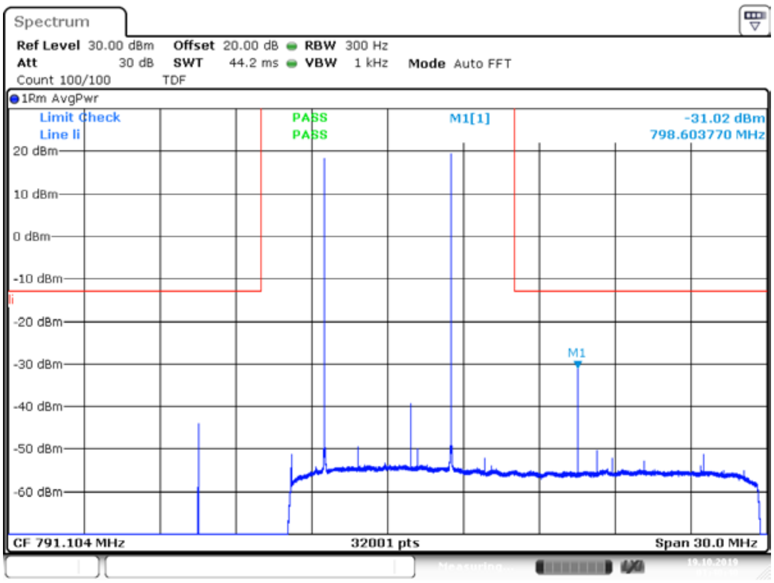
out of band emi;CW;2 carrier -0.3 dB;856.80630M;100.000k; CB 12.50k

Frequency band = 854 MHz – 862 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF downlink, Input power = = 3 dB > AGC,
Emission designators = 4K00F3E, 11K3F3E, 8K10F1D and 9K80D7W



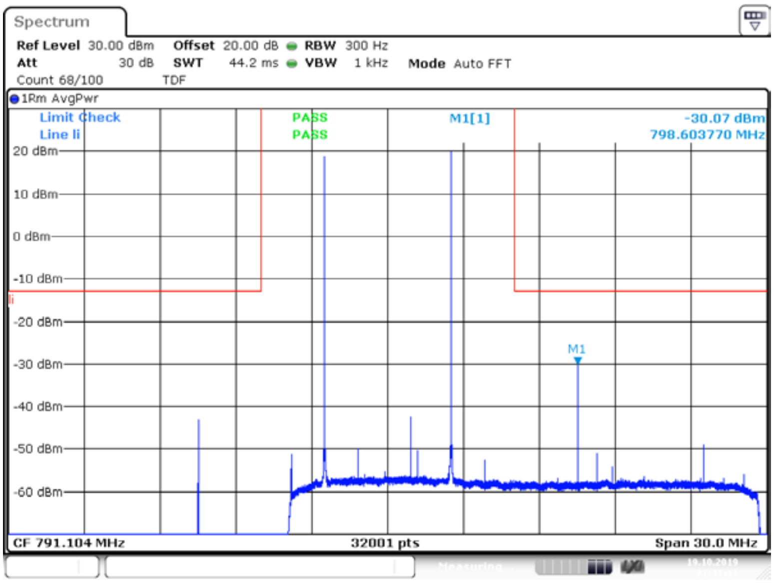
out of band emi;CW;2 carrier +3 dB;856.80630M;100.000k; CB12 .50k

Frequency band = 788 MHz – 798 MHz, Channel bandwidth = 5 MHz, Number of signals = 2, Direction = RF downlink, Input power = = 0.3 dB < AGC, Emission designator = 5M00G7D



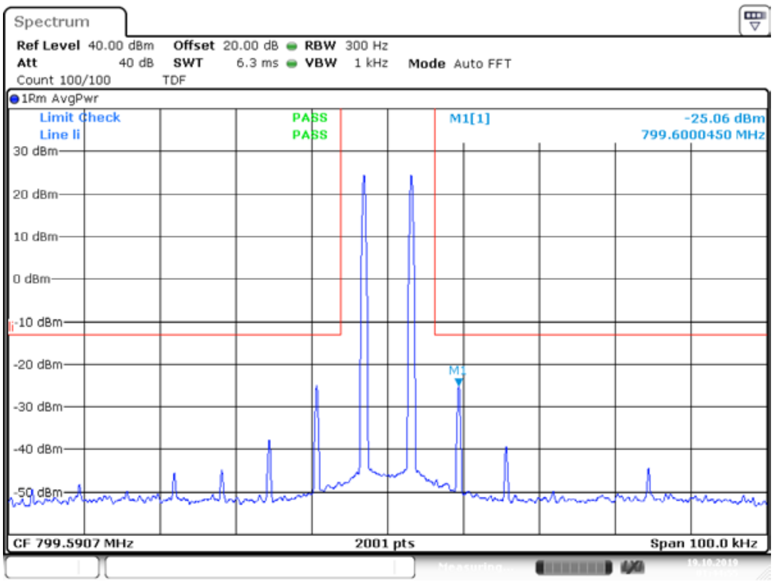
out of band emi;CW;2 carrier -0.3 dB;791.10400M;30.000M; CB5
.00M

Frequency band = 788 MHz – 798 MHz, Channel bandwidth = 5 MHz, Number of signals = 2, Direction = RF downlink, Input power = = 3 dB > AGC, Emission designator = 5M00G7D



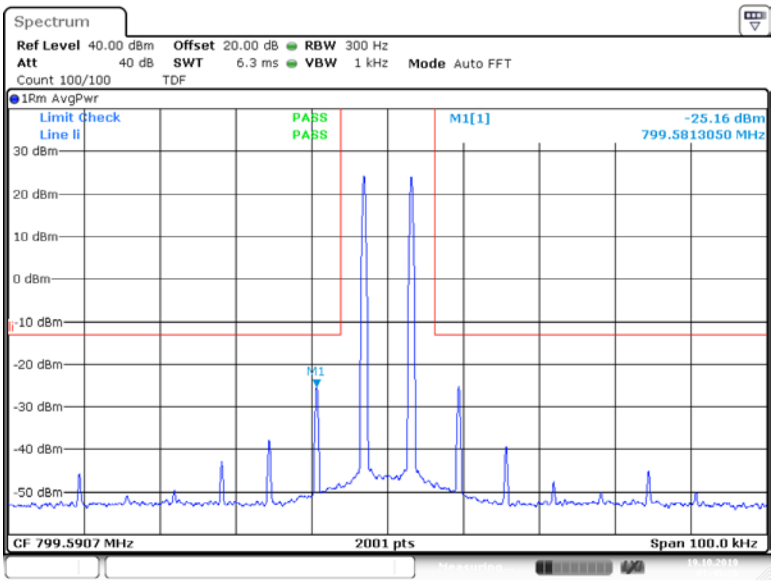
out of band emi;CW;2 carrier +3 dB;791.10400M;30.000M; CB5.0
0M

Frequency band = 799 MHz – 805 MHz, Channel bandwidth = 6.25 kHz,
Number of signals = 2, Direction = RF uplink, Input power = = 0.3 dB < AGC,
Emission designator = 4K00F3E



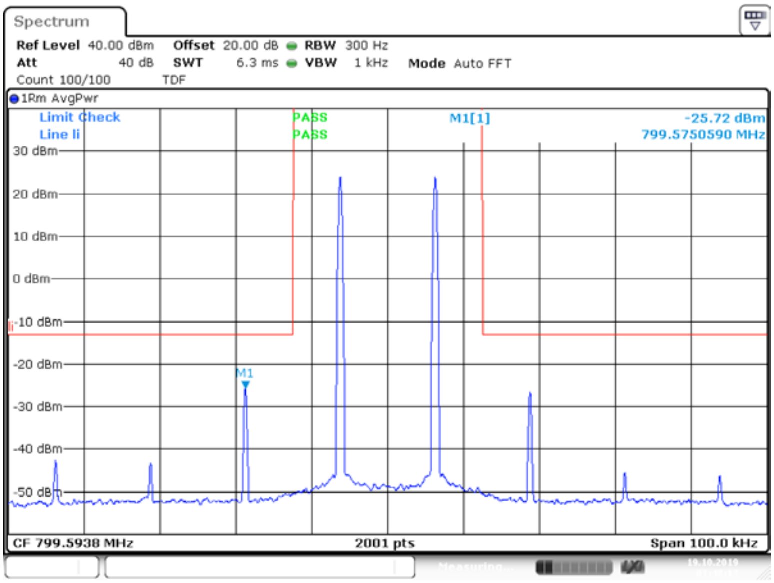
out of band emi;CW;2 carrier -0.3 dB;799.59070M;100.000k; CB
6.25k

Frequency band = 799 MHz – 805 MHz, Channel bandwidth = 6.25 kHz,
Number of signals = 2, Direction = RF uplink, Input power = = 3 dB > AGC,
Emission designator = 4K00F3E



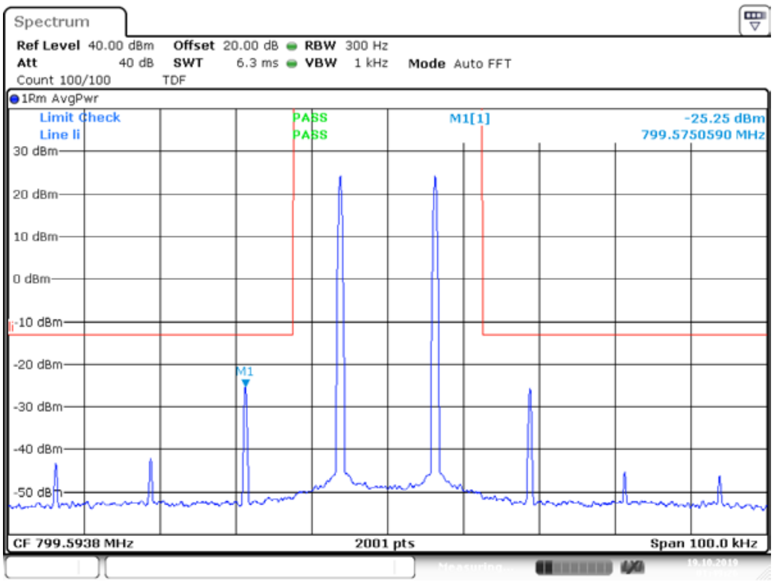
out of band emi;CW;2 carrier +3 dB;799.59070M;100.000k; CB6.
25k

Frequency band = 799 MHz – 805 MHz, Channel bandwidth = 12.5 kHz, Number of signals = 2, Direction = RF uplink, Input power = = 0.3 dB < AGC, Emission designators = 11K3F3E, 8K10F1D and 9K80D7W



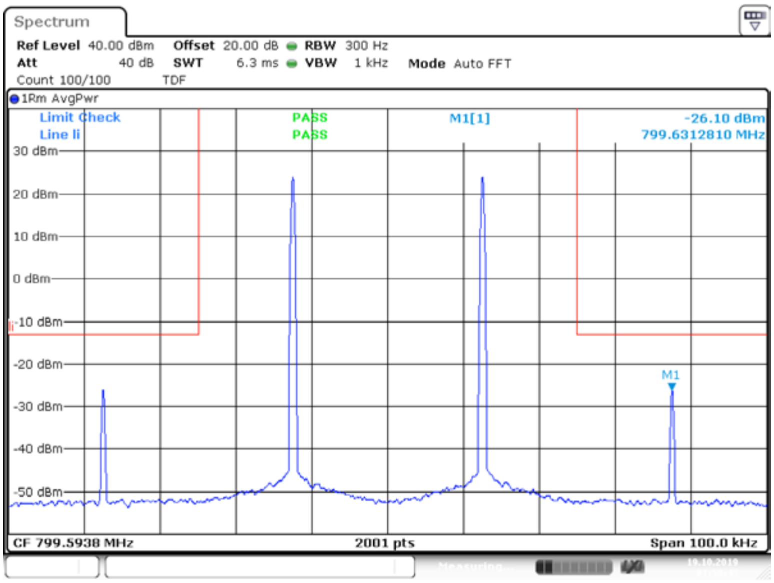
out of band emi;CW;2 carrier -0.3 dB;799.59380M;100.000k; CB 12.50k

Frequency band = 799 MHz – 805 MHz, Channel bandwidth = 12.5 kHz, Number of signals = 2, Direction = RF uplink, Input power = = 3 dB > AGC, Emission designators = 11K3F3E, 8K10F1D and 9K80D7W



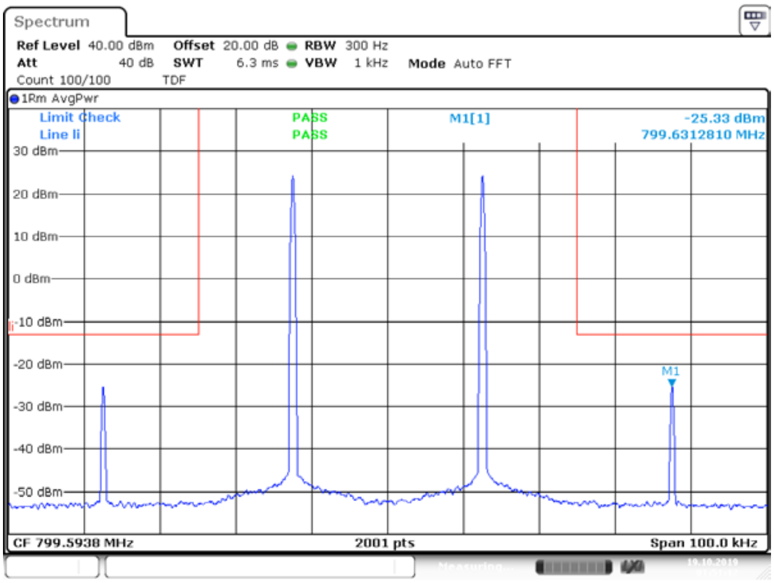
out of band emi;CW;2 carrier +3 dB;799.59380M;100.000k; CB12 .50k

Frequency band = 799 MHz – 805 MHz, Channel bandwidth = 25 kHz,
Number of signals = 2, Direction = RF uplink, Input power = = 0.3 dB < AGC,
Emission designator = 16K0F3E



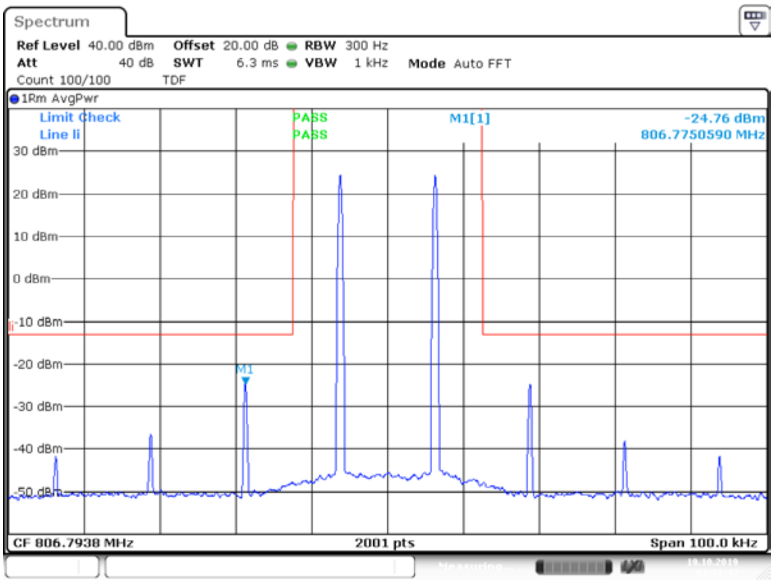
out of band emi;CW;2 carrier -0.3 dB;799.59380M;100.000k; CB
25.00k

Frequency band = 799 MHz – 805 MHz, Channel bandwidth = 25 kHz,
Number of signals = 2, Direction = RF uplink, Input power = = 3 dB > AGC,
Emission designator = 16K0F3E



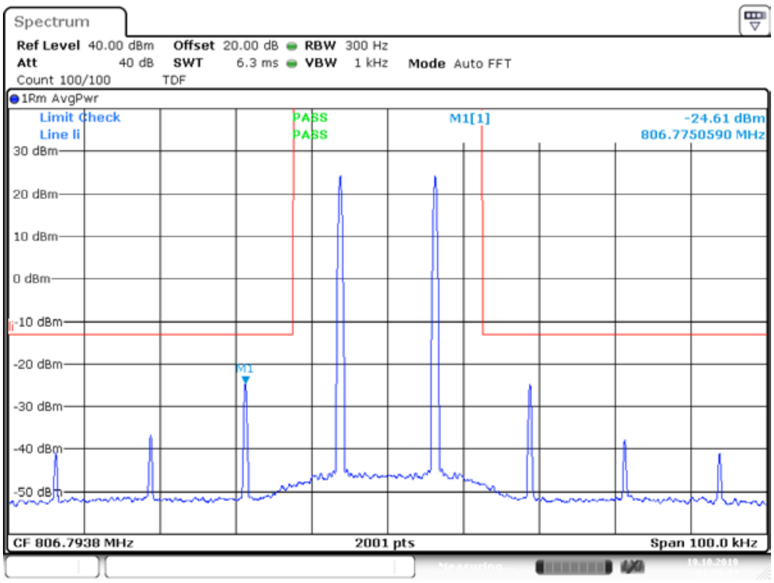
out of band emi;CW;2 carrier +3 dB;799.59380M;100.000k; CB25
.00k

Frequency band = 806 MHz – 809 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF uplink, Input power = = 0.3 dB < AGC,
Emission designators = 4K00F3E, 11K3F3E, 8K10F1D and 9K80D7W



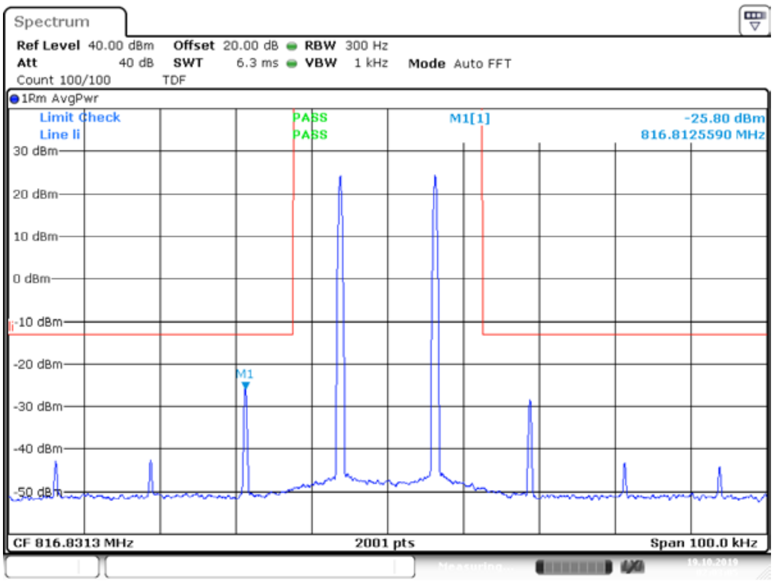
out of band emi;CW;2 carrier -0.3 dB;806.79380M;100.000k; CB
12.50k

Frequency band = 806 MHz – 809 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF uplink, Input power = = 3 dB > AGC,
Emission designators = 4K00F3E, 11K3F3E, 8K10F1D and 9K80D7W



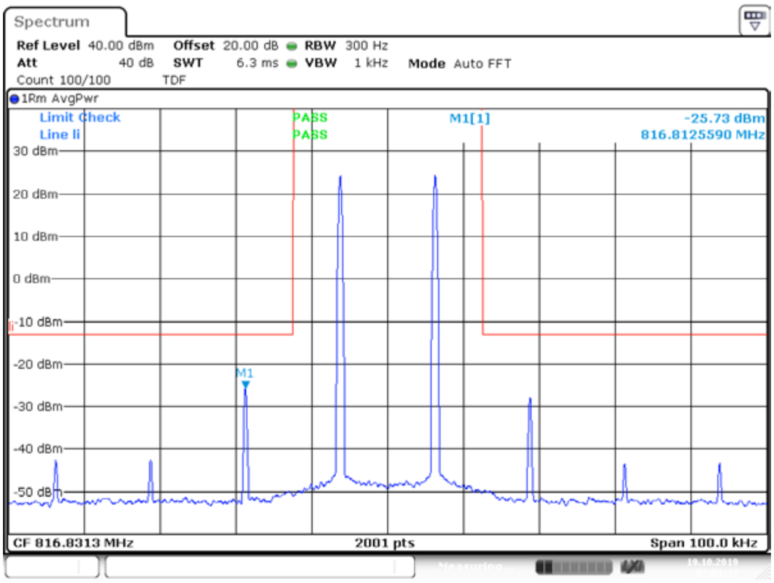
out of band emi;CW;2 carrier +3 dB;806.79380M;100.000k; CB12
.50k

Frequency band = 809 MHz – 817 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF uplink, Input power = = 0.3 dB < AGC,
Emission designators = 4K00F3E, 11K3F3E, 8K10F1D and 9K80D7W



out of band emi;CW;2 carrier -0.3 dB;816.83130M;100.000k; CB 12.50k

Frequency band = 809 MHz – 817 MHz, Channel bandwidth = 12.5 kHz,
Number of signals = 2, Direction = RF uplink, Input power = = 3 dB > AGC,
Emission designators = 4K00F3E, 11K3F3E, 8K10F1D and 9K80D7W



out of band emi;CW;2 carrier +3 dB;816.83130M;100.000k; CB12 .50k

4.5.5 TEST EQUIPMENT USED

- FCC cond. Test Lab, BV Nbg

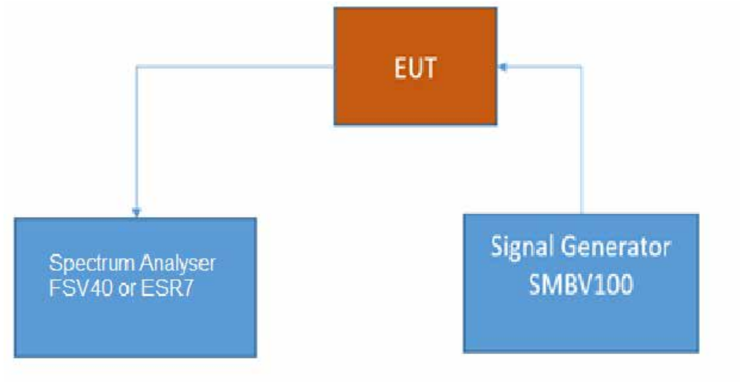
4.6 OUT-OF-BAND REJECTION

Standard KDB 935210 D05

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

4.6.1 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:



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

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

4.6.2 TEST REQUIREMENTS / LIMITS

There are no available limits.

4.6.3 TEST PROTOCOL

Band 758 MHz – 768 MHz, 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]
764.6640	29.96	757.0106	775.9737	18.9631

Band 769 MHz – 775 MHz, 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]
771.8650	29.76	757.0095	775.9716	18.9621

Band 851 MHz – 854 MHz, 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]
852.9035	29.76	850.5147	869.4878	18.9731

Band 854 MHz – 862 MHz, 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]
856.8011	31.17	850.5207	869.4774	18.9566

Band 788 MHz – 798 MHz, uplink				
Highest Power Frequency [MHz]	Output Power [dBm]	Lower Highest Power -13 dB Frequency [MHz]	Upper Highest Power -2.9 dB Frequency [MHz]	2.9 dB Bandwidth [MHz]
791.1040	24.95	787.7255	805.4238	17.6982

Band 799 MHz – 805 MHz, uplink				
Highest Power Frequency [MHz]	Output Power [dBm]	Lower Highest Power -17 dB Frequency [MHz]	Upper Highest Power -3.4 dB Frequency [MHz]	3.4 dB Bandwidth [MHz]
799.5909	24.74	787.6764	805.4227	17.7462

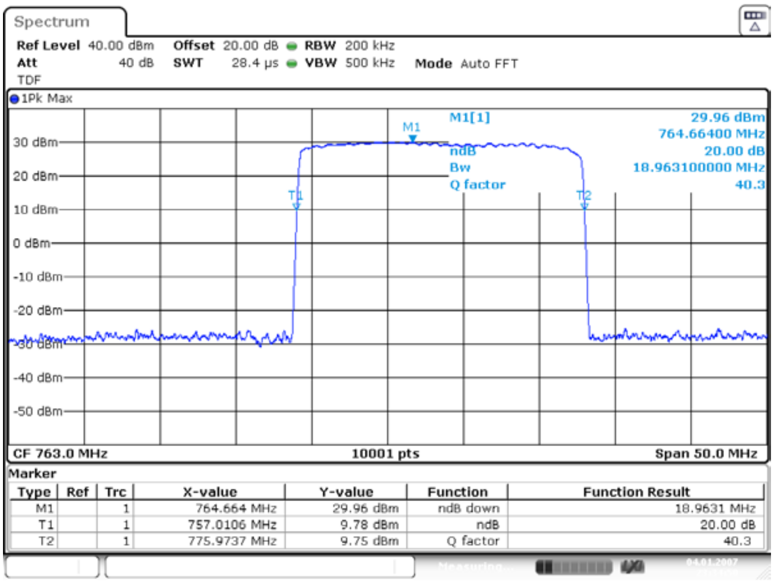
Band 806 MHz – 809 MHz, uplink				
Highest Power Frequency [MHz]	Output Power [dBm]	Lower Highest Power -20 dB Frequency [MHz]	Upper Highest Power -20 dB Frequency [MHz]	20 dB Bandwidth [MHz]
806.7947	18.45	805.5147	824.4878	18.9731

Band 809 MHz – 817 MHz, uplink				
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]
816.8350	19.22	805.5152	824.4829	18.9676

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

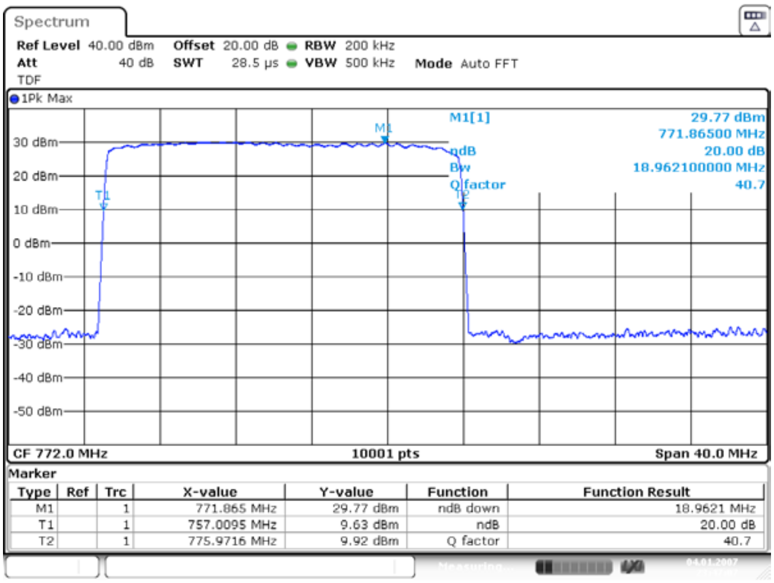
4.6.4 MEASUREMENT PLOTS

Frequency Band = Band 758 MHz – 768 MHz, Direction = RF downlink



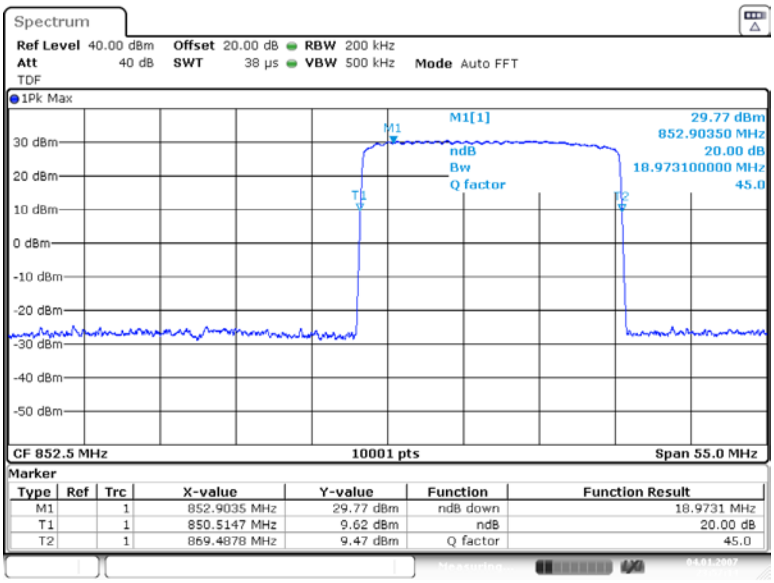
Out of band rejection 763.00000M
_20dB

Frequency Band = Band 769 MHz – 775 MHz, Direction = RF downlink



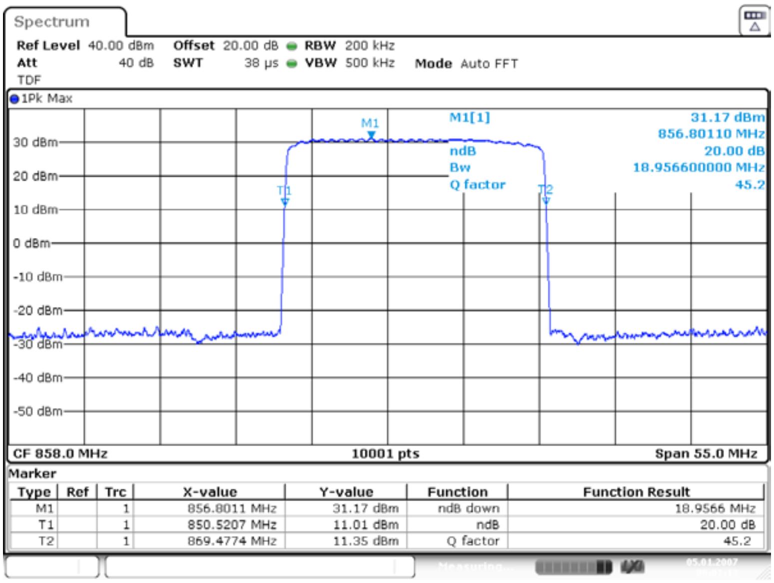
Out of band rejection 772.00000M
_20dB

Frequency Band = Band 851 MHz – 854 MHz, Direction = RF downlink



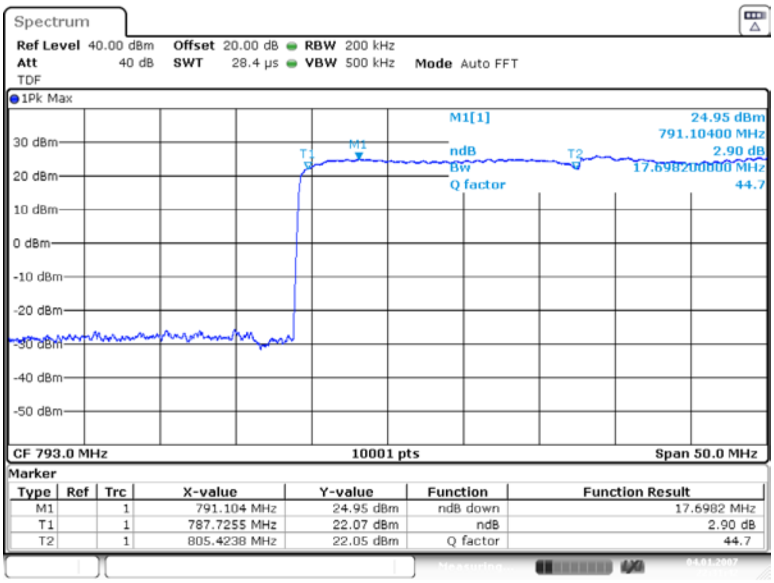
Out of band rejection 852.50000M
_20dB

Frequency Band = Band 854 MHz – 862 MHz, Direction = RF downlink



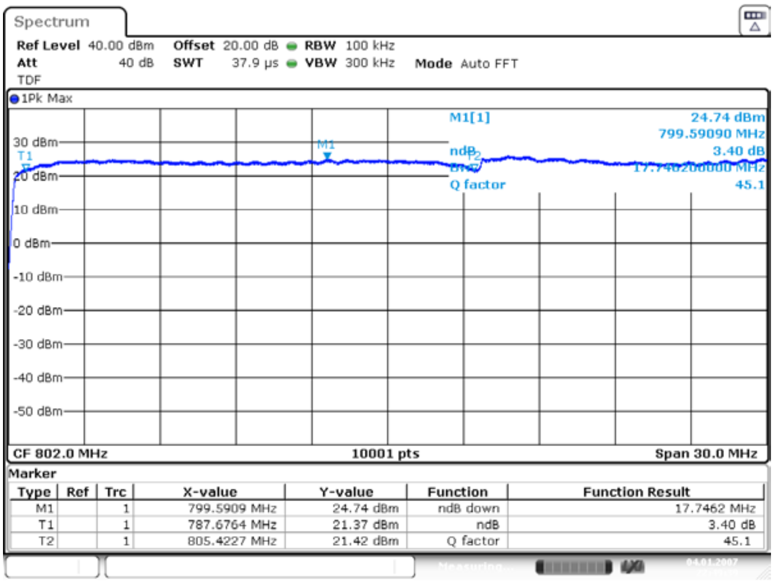
Out of band rejection 858.00000M
_20dB

Frequency Band = Band 788 MHz – 798 MHz, Direction = RF uplink



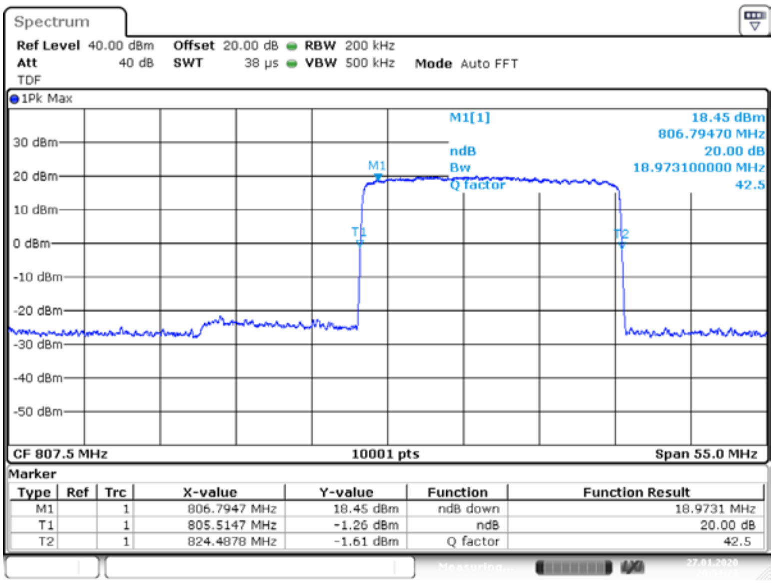
Out of band rejection 793.00000M
_20dB

Frequency Band = Band 799 MHz – 805 MHz, Direction = RF uplink



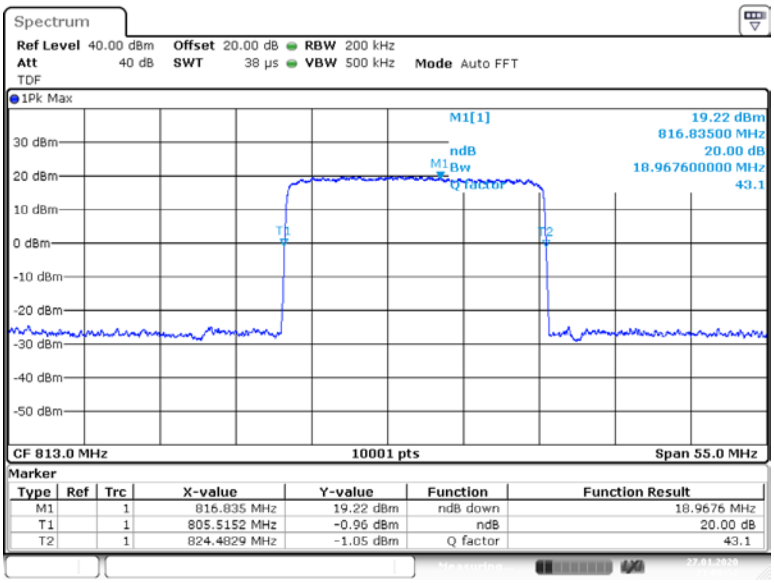
Out of band rejection 802.00000M
_20dB

Frequency Band = Band 806 MHz – 809 MHz, Direction = RF uplink



Out of band rejection 807.50000M
_20dB

Frequency Band = Band 809 MHz – 817 MHz, Direction = RF uplink



Out of band rejection 813.00000M
_20dB

4.6.5 TEST EQUIPMENT USED

- FCC cond. Test Lab, BV Nbg

4.7 NOISE FIGURE

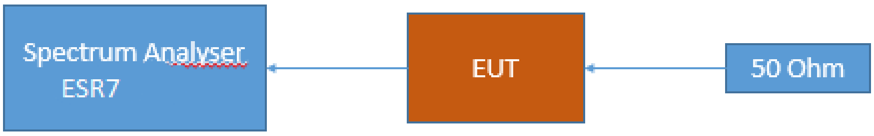
Standard FCC Part 90, §90.219

The test was performed according to:
ANSI C63.26

4.7.1 TEST DESCRIPTION

This test case is intended to demonstrate compliance to noise 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; Noise

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

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

4.7.2 TEST REQUIREMENTS / LIMITS

Part 90, Subpart I

§90.219 – Use of signal boosters

(e)(2) The noise figure of a signal booster must not exceed 9 dB in either direction.

Remarks of the test laboratory:

With thermal noise of -174 dBm/Hz at 300 K and measurement bandwidth of 1 MHz the noise value is -114 dBm. Adding the gain of 88 dB (89 dB, dependent from the frequency range), as well as 9 dB for noise figure, the limit for the border line is -16 dBm respectively -15 dBm.

According the used KDB 932210 05 paragraph 4.6 during the measurements the repeater's AGC is switched off.

4.7.3 TEST PROTOCOL

Band 758 MHz – 775 MHz, downlink	
Test step	**Noise level below theoretical noise level plus 9 dB noise figure?**
Passband	Yes

Band 851 MHz – 862 MHz, downlink	
Test step	**Noise level below theoretical noise level plus 9 dB noise figure?**
Passband	Yes

Band 788 MHz – 805 MHz, uplink	
Test step	**Noise level below theoretical noise level plus 9 dB noise figure?**
Passband	Yes

Band 806 MHz – 817 MHz, uplink	
Test step	**Noise level below theoretical noise level plus 9 dB noise figure?**
Passband	Yes

Remarks:

To stimulate noise production in the uplink bands, in the according band as CW signal (the first CW signal per band) is applied within the passband. The according CW signal is spared out of the data line limit.

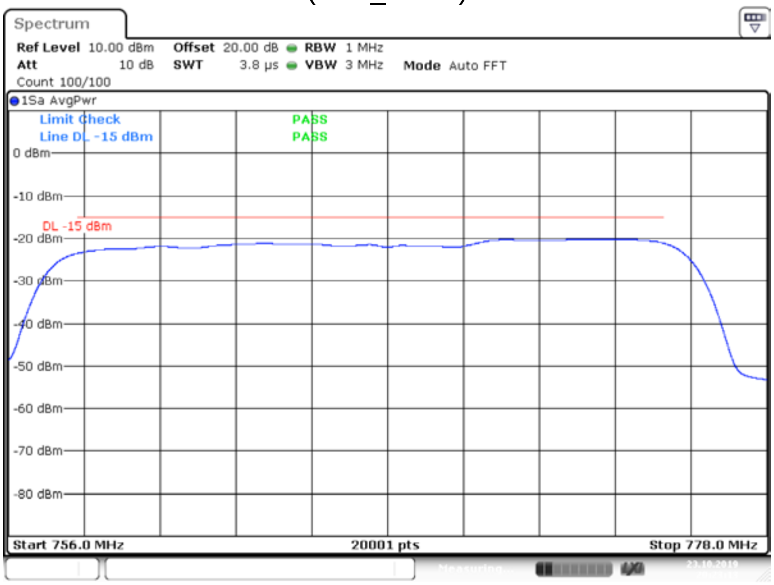
To prove that in the spared out part is no hidden noise in this first CW signal per band the measurements are done in the according bands with a second CW signal with another frequency than the first CW.

In the cases of stimulating the noise production the 50 Ohms termination shown in the test description setup diagram is substituted by a signal generator for producing CWs.

In the measurement plot the measuring curves of all possible bands supported by the hardware are shown. In the final product only the bands which are part of this report are activated.

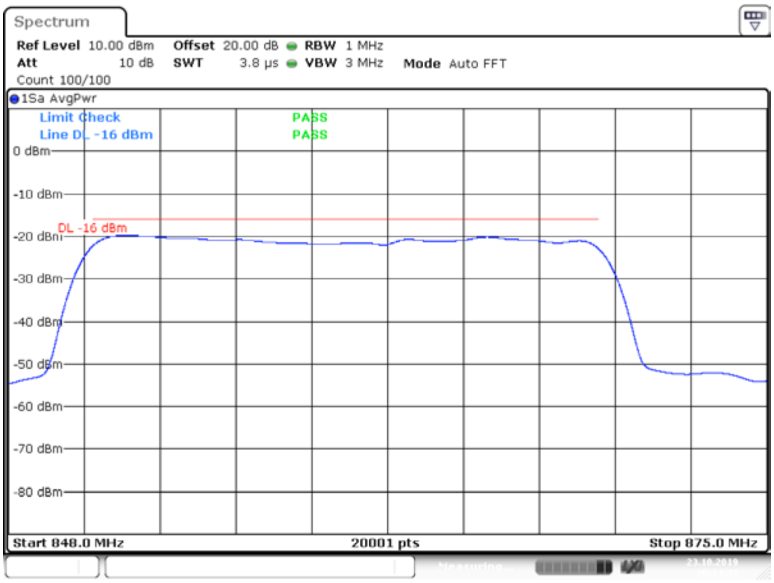
4.7.4 MEASUREMENT PLOTS

Frequency Band = Band 758 MHz to 775 MHz, Direction = RF downlink, Test Step = passband (S01_AA01)



758 MHz to 775 MHz, AGC switched off

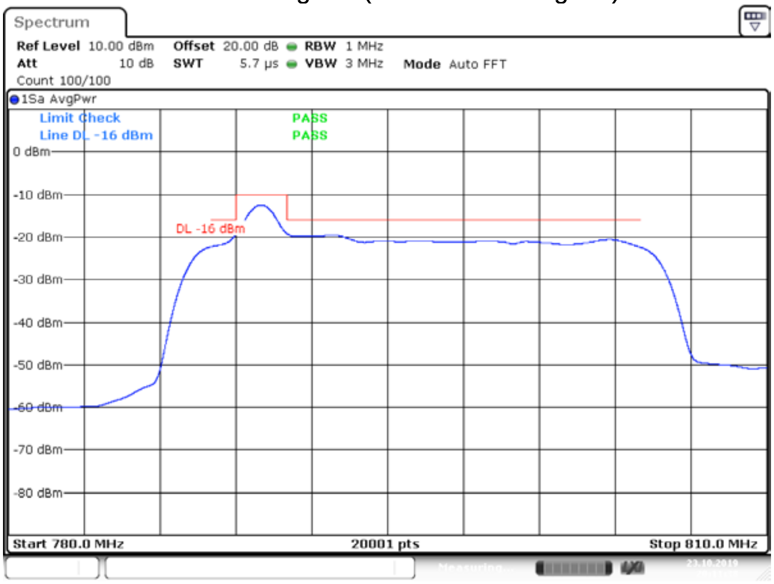
Frequency Band = Band 851 MHz to 862 MHz, Direction = RF downlink, Test Step = passband (S01_AA01)



851 MHz to 869 MHz, AGC switched off

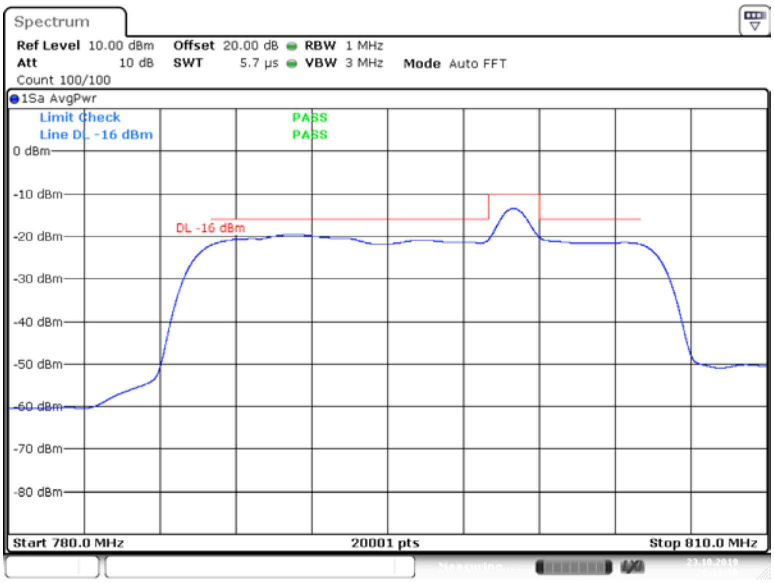
Frequency Band = Band 788 MHz to 805 MHz, Direction = RF uplink, Test Step = passband (S01_AA01)

First CW signal (stimulation signal)



788 MHz to 805 MHz, AGC switched off

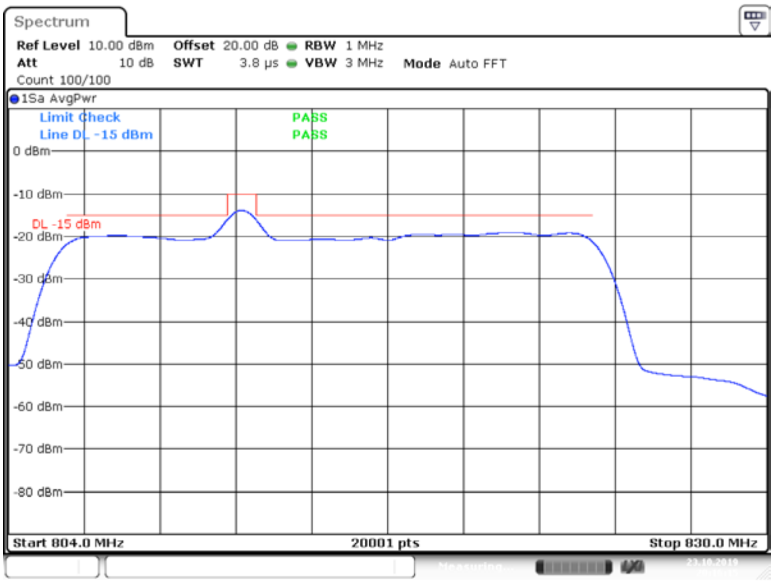
Second CW signal (stimulation signal)



788 MHz to 805 MHz, AGC switched off

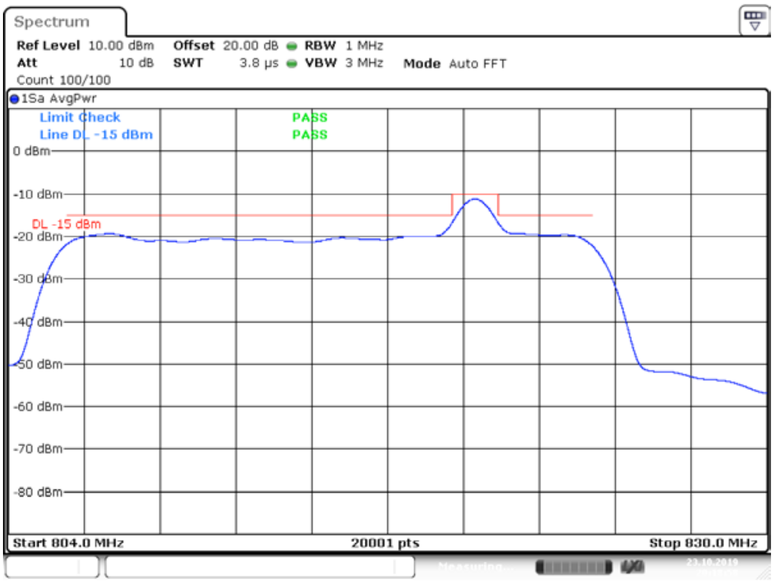
Frequency Band = Band 806 MHz to 817 MHz, Direction = RF uplink, Test Step = passband (S01_AA01)

First CW signal (stimulation signal)



806 MHz to 824 MHz, AGC switched off

Second CW signal (stimulation signal)



806 MHz to 824 MHz, AGC switched off

4.7.5 TEST EQUIPMENT USED

- FCC cond. Test Lab, BV Nbg

4.8 FIELD STRENGTH OF SPURIOUS RADIATION

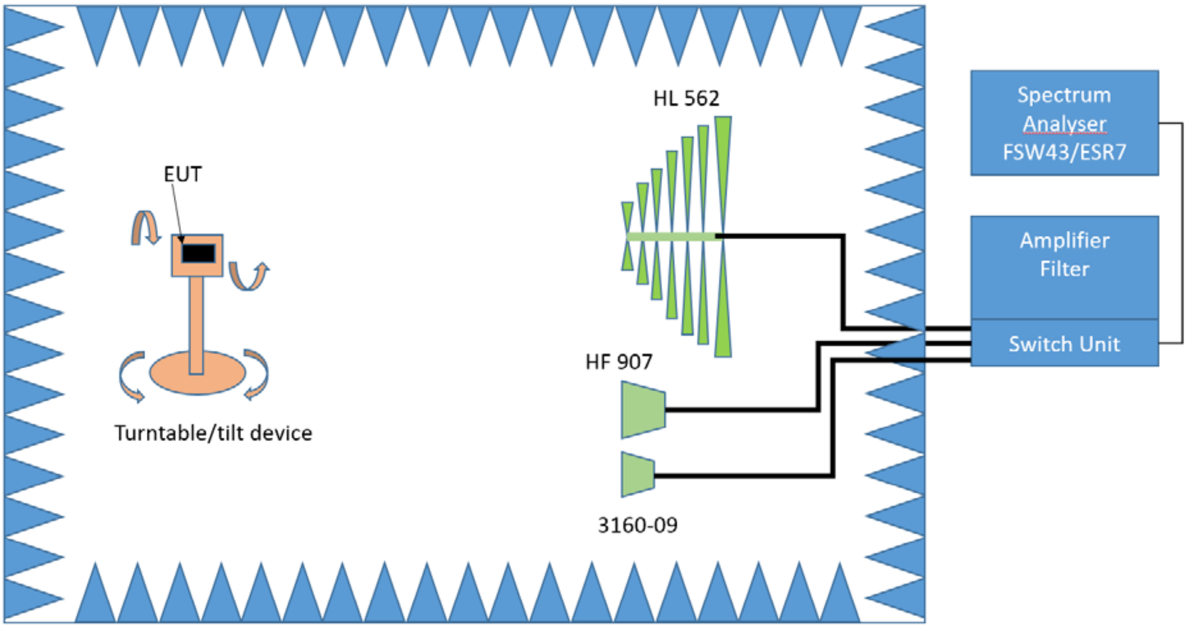
Standard FCC Part 90, §90.219

The test was performed according to:
ANSI C63.26

4.8.1 TEST DESCRIPTION

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

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



FCC Part 22/24/27/90; Industrial Signal Booster – Test Setup; Field Strength of Spurious Radiation

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 1.0 x 2.0 m² in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.
The measurement procedure is implemented into the EMI test software EMC32 from R&S.
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 from 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-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 90°
- Turntable step size: 90°
- Height variation range: 1 – 3 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.

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: ± 45 ° around the determined value
- Height variation range: ± 100 cm around the determined value
- Antenna Polarisation: max. value determined in step 1

Step 3: Final measurement with QP detector
With the settings determined in step 3, the final measurement will be performed:
EMI receiver settings for step 4:
- Detector: Quasi-Peak (< 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 (tilt device) at 1.5 m height in the fully-anechoic chamber.

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 90 °.

The turn table step size (azimuth angle) for the preliminary measurement is 45 °.

Step 2:

Due to the fact, that in this frequency range the test is performed in a fully anechoic room, the height scan of the receiving antenna instep 2 is omitted. Instead of this, a maximum search with a step size ± 45° for the elevation axis is performed.

The turn table azimuth will slowly vary by ± 22.5°.

The elevation angle will slowly vary by ± 45°

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

4.8.2 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.

§90.219 Use of signal boosters.

This section contains technical and operational rules allowing the use of signal boosters in the Private Land Mobile Radio Services (PLMRS). Rules for signal booster operation in the Commercial Mobile Radio Services under part 90 are found in §20.21 of this chapter.
....

(e) *Device Specifications.* In addition to the general rules for equipment certification in §90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.

(3) Spurious emissions from a signal booster must not exceed −13 dBm within any 100 kHz measurement bandwidth.

4.8.3 TEST PROTOCOL

Band 758 – 768 MHz, downlink						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
-	-	-4.3	RMS	100	-13.0	- - -
-	-	-4.3	RMS	100	-13.0	- - -

Band 788 – 798 MHz, uplink						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
-	-	-4.3	RMS	100	-13.0	- - -
-	-	-4.3	RMS	100	-13.0	- - -

Band 769 – 775 MHz, downlink						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
-	-	-4.3	RMS	100	-13.0	- - -
-	-	-4.3	RMS	100	-13.0	- - -

Band 799 – 805 MHz, uplink						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
-	-	-4.3	RMS	100	-13.0	- - -
-	-	-4.3	RMS	100	-13.0	- - -

Band 851 – 854 MHz, downlink						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
-	-	-4.3	RMS	100	-13.0	- - -
-	-	-4.3	RMS	100	-13.0	- - -

Band 806 – 809 MHz, uplink						
Spurious Freq. [MHz]	**Spurious Level [dBm]**	**Pin [dBm]**	**Detector**	**RBW [kHz]**	**Limit [dBm]**	**Margin to Limit [dB]**
-	-	-4.3	RMS	100	-13.0	- - -
-	-	-4.3	RMS	100	-13.0	- - -

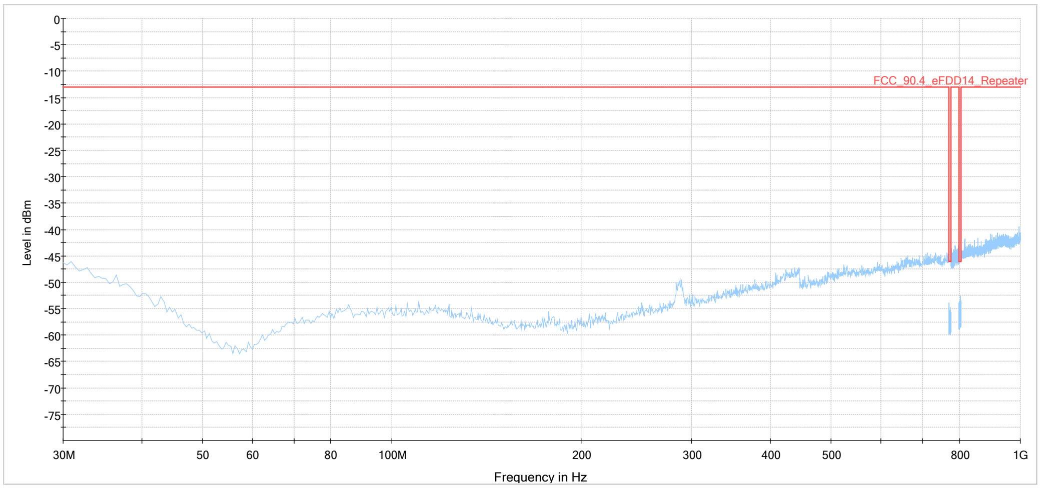
Band 854 – 862 MHz, downlink						
Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
-	-	-4.3	RMS	100	-13.0	- - -
-	-	-4.3	RMS	100	-13.0	- - -

Band 809 – 817 MHz, uplink						
Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
-	-	-4.3	RMS	100	-13.0	- - -
-	-	-4.3	RMS	100	-13.0	- - -

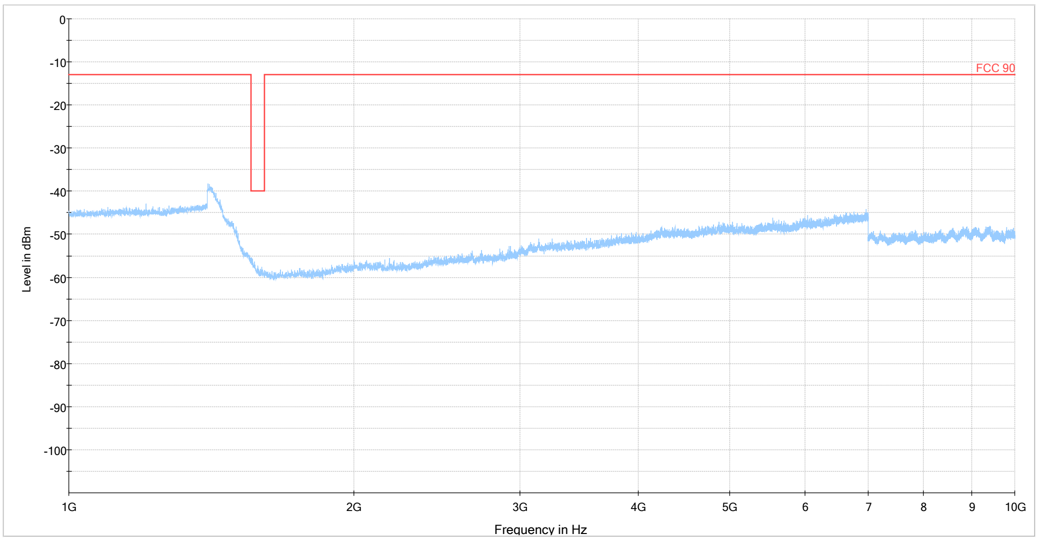
Remark: Please see next sub-clause for the measurement plot.
The three required test frequencies (low, mid, high) were injected simultaneously into the EUT.

4.8.4 MEASUREMENT PLOTS

Frequency Band = Band 758 – 768 MHz, Direction = RF downlink
(S01_AA01)

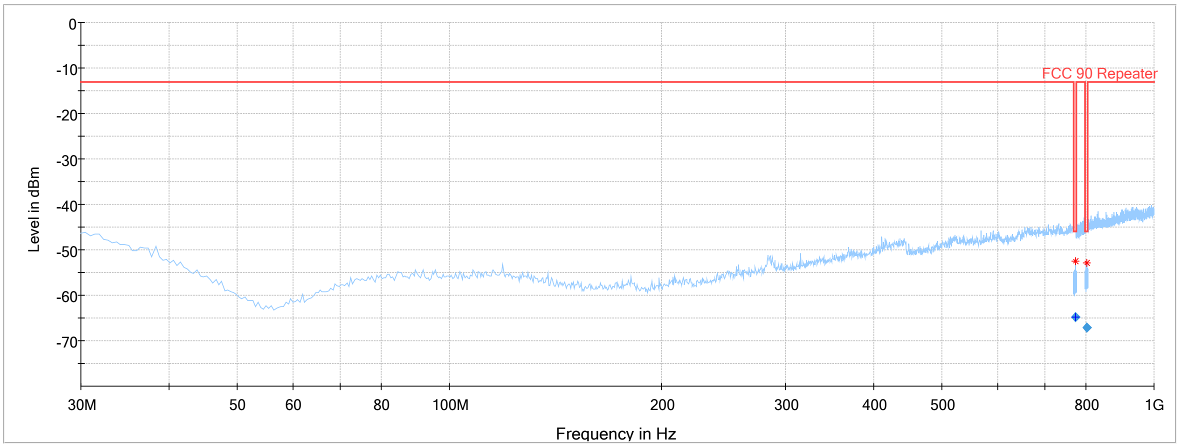


30 MHz - 1 GHz

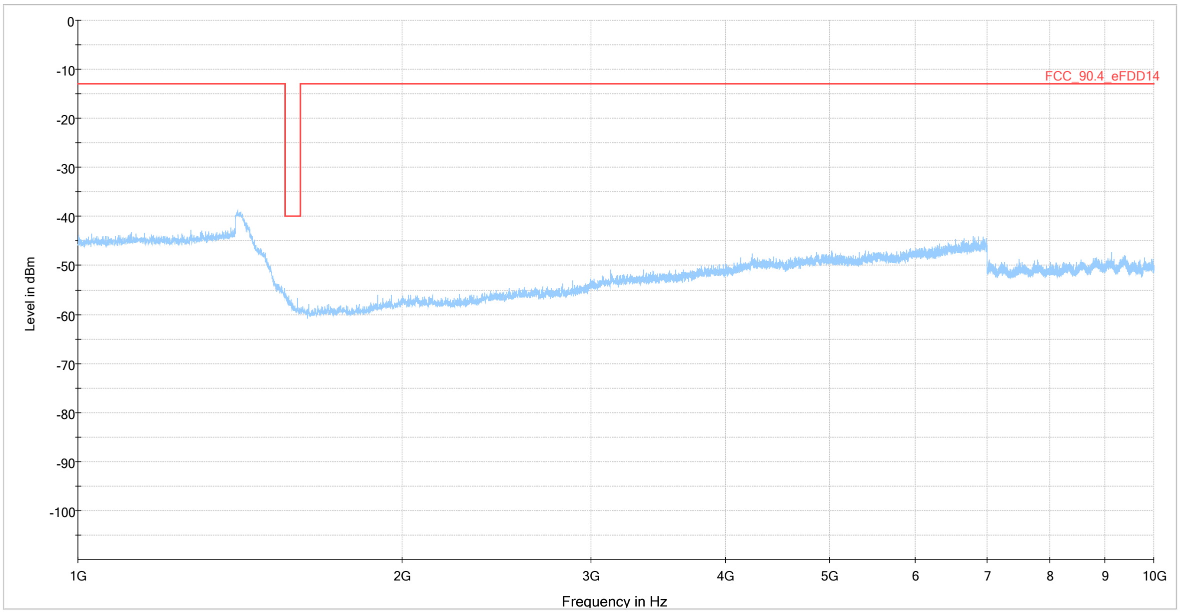


1 GHz - 10 GHz

Frequency Band = Band 788 – 798 MHz, Direction = RF uplink
(S01_AA01)

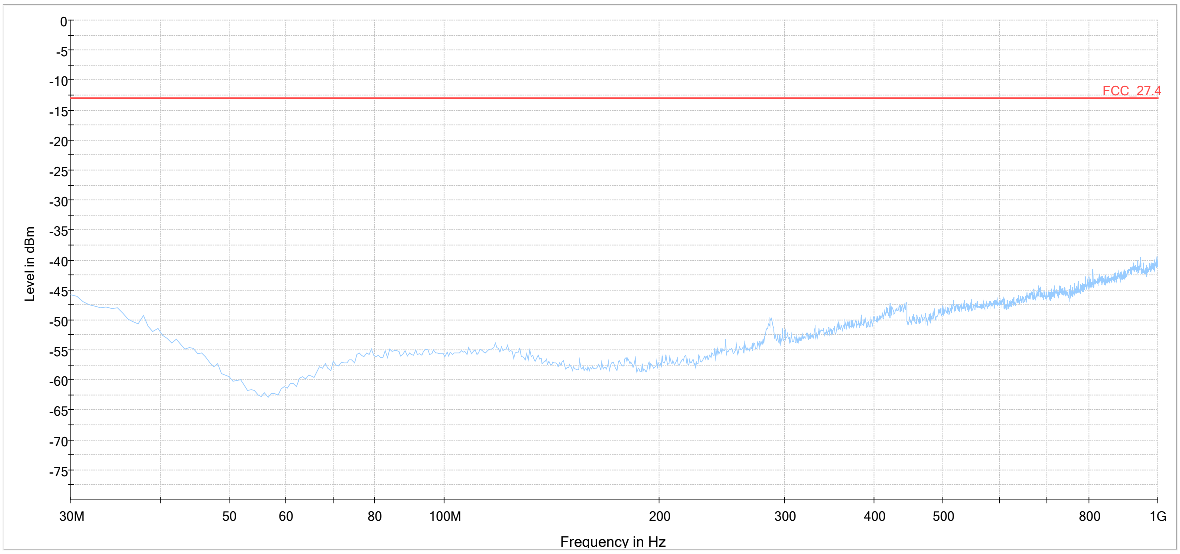


30 MHz - 1 GHz

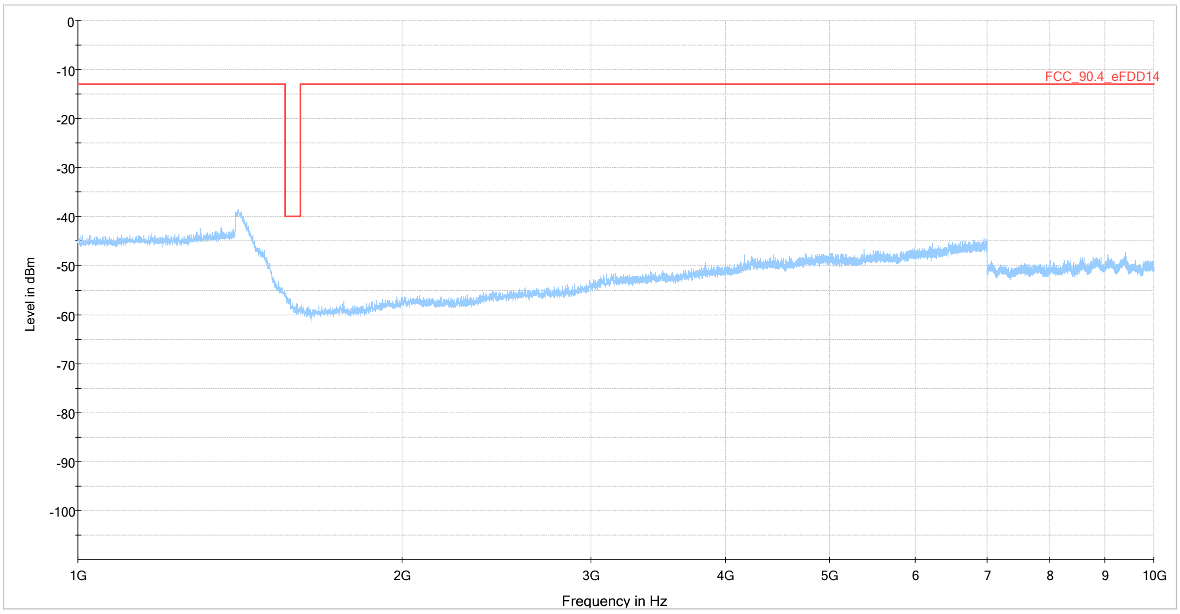


1 GHz - 10 GHz

Frequency Band = Band 769 – 775 MHz, Direction = RF downlink
(S01_AA01)

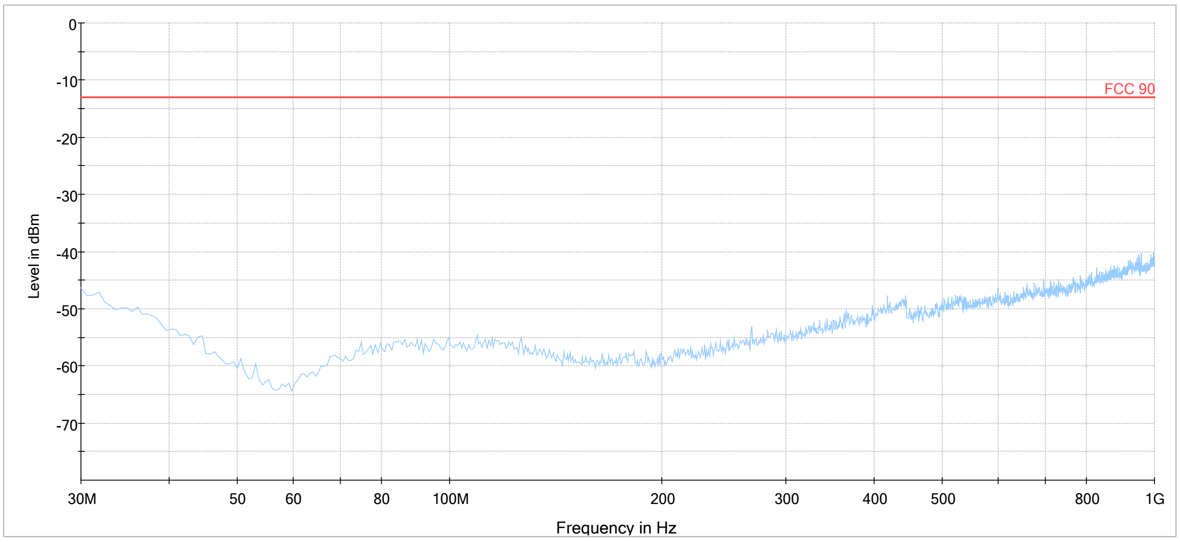


30 MHz - 1 GHz

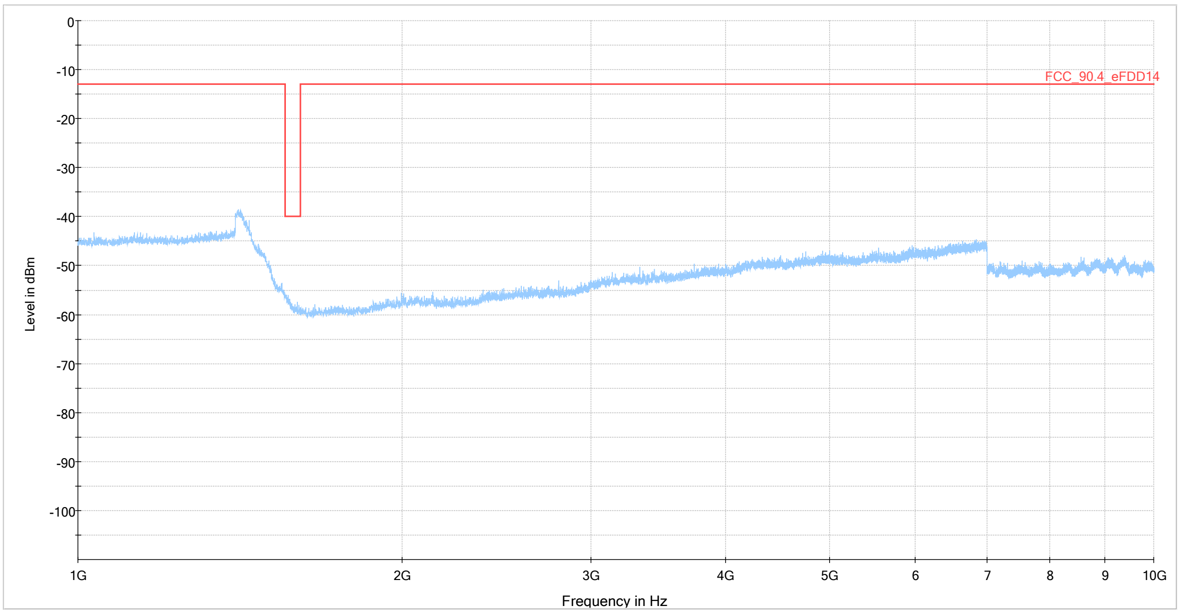


1 GHz - 10 GHz

Frequency Band = Band 799 – 805 MHz, Direction = RF uplink
(S01_AA01)

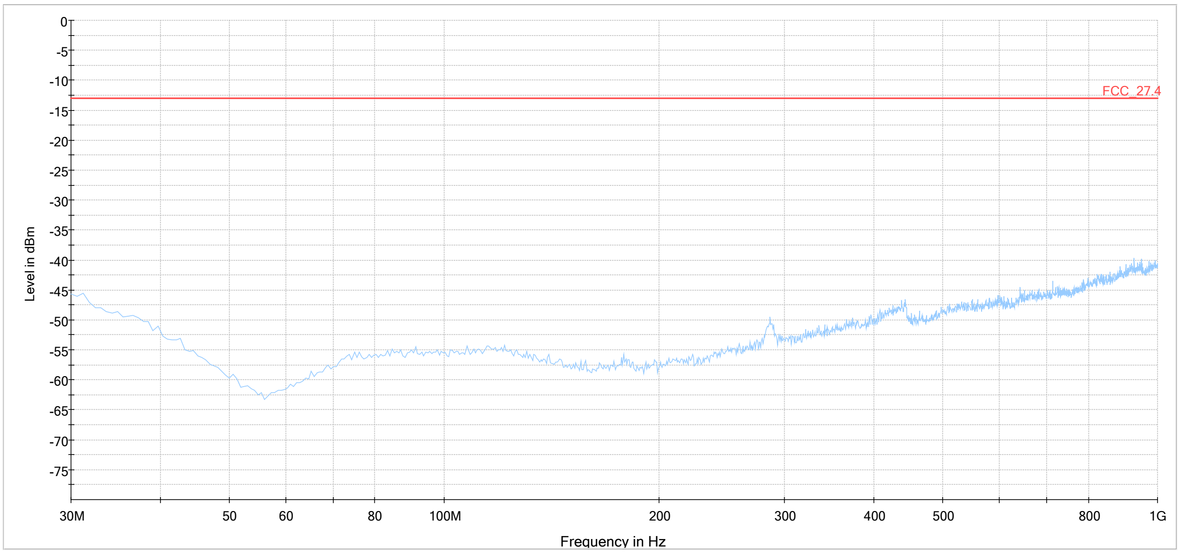


30 MHz - 1 GHz

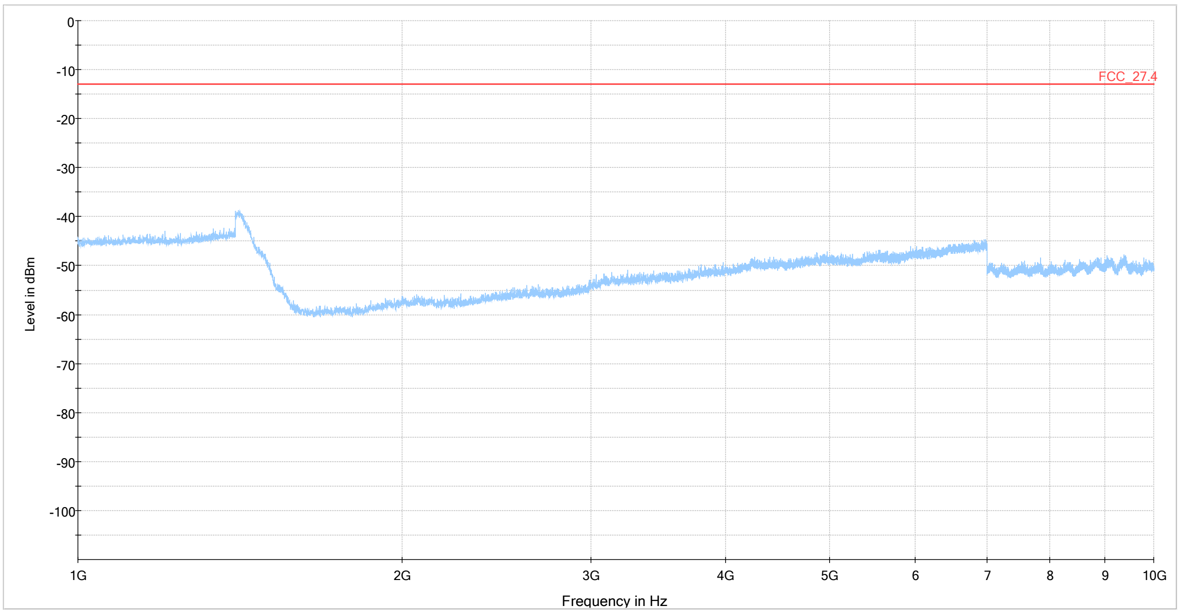


1 GHz - 10 GHz

Frequency Band = Band 851 – 854 MHz, Direction = RF downlink (S01_AA01)

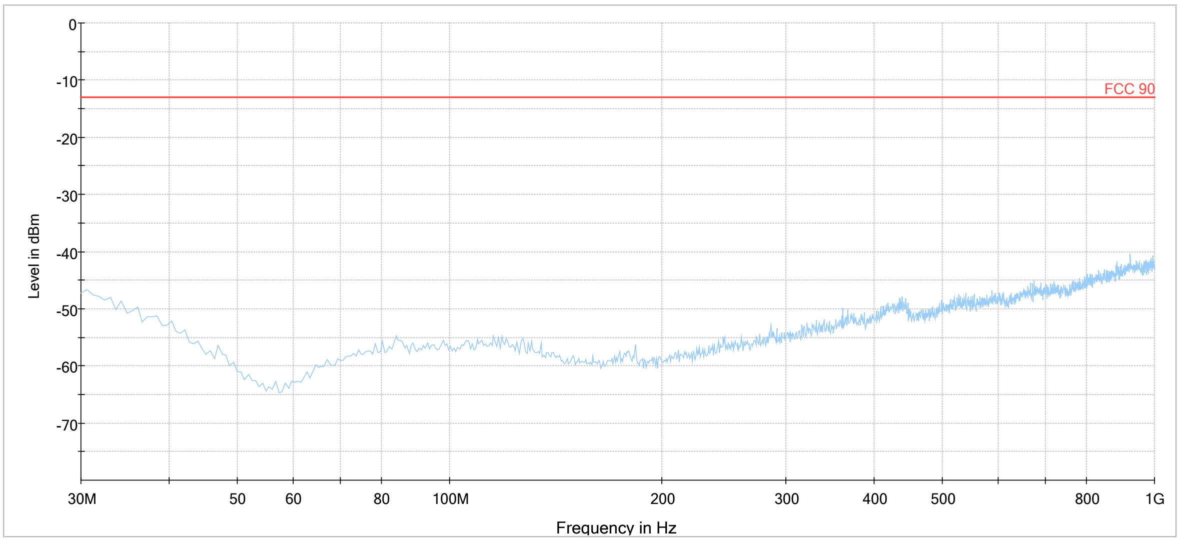


30 MHz - 1 GHz

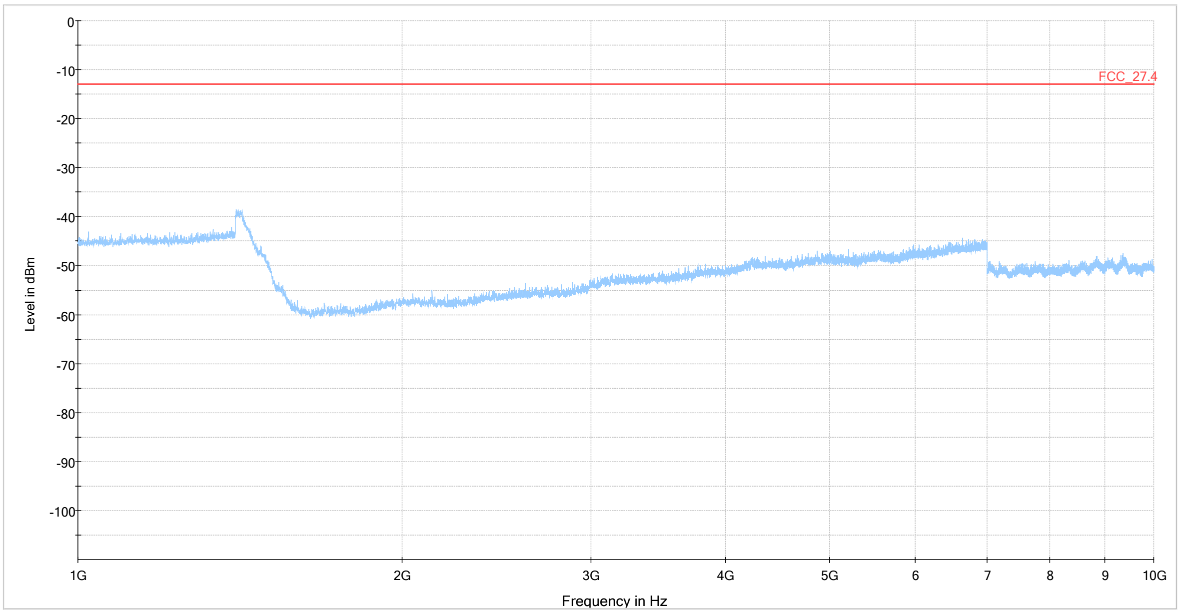


1 GHz - 10 GHz

Frequency Band = Band 806 – 809 MHz, Direction = RF uplink
(S01_AA01)

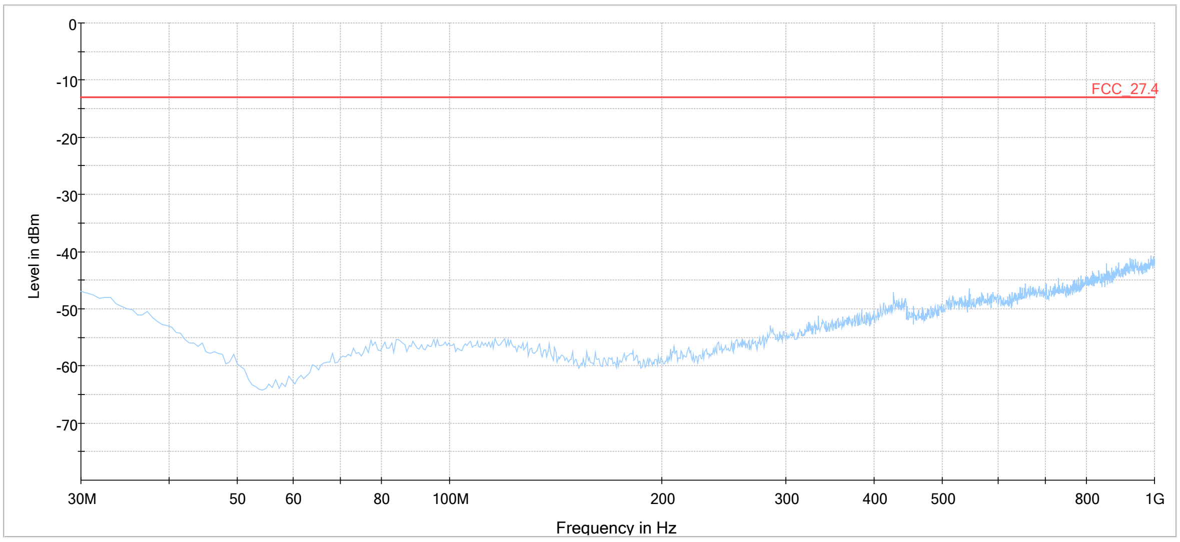


30 MHz - 1 GHz

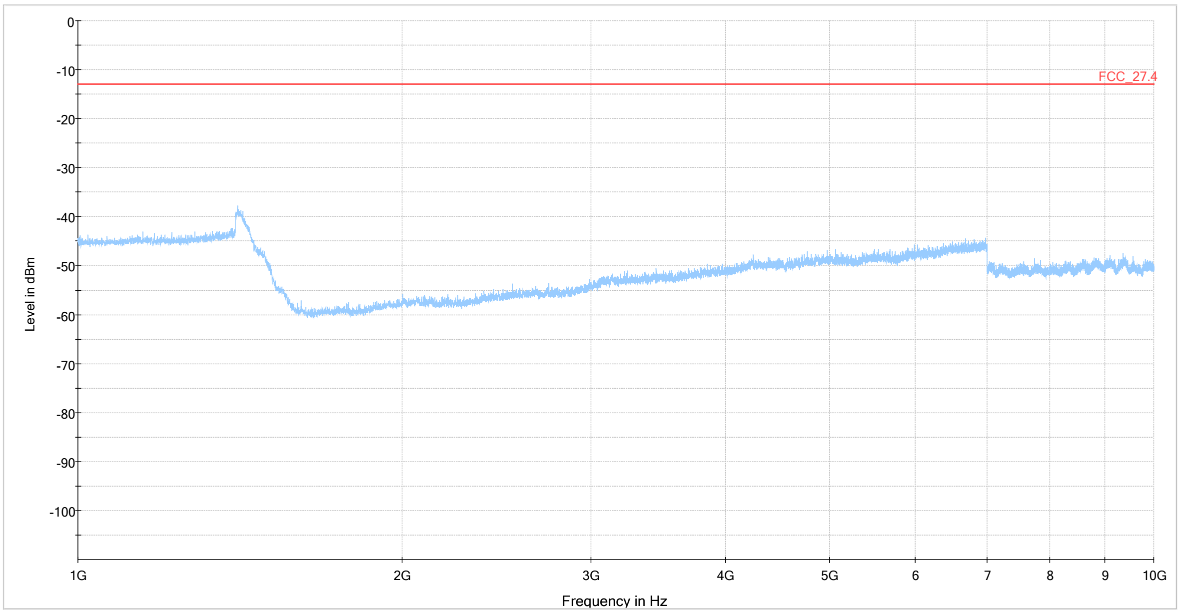


1 GHz - 10 GHz

Frequency Band = Band 854 – 862 MHz, Direction = RF downlink
(S01_AA01)

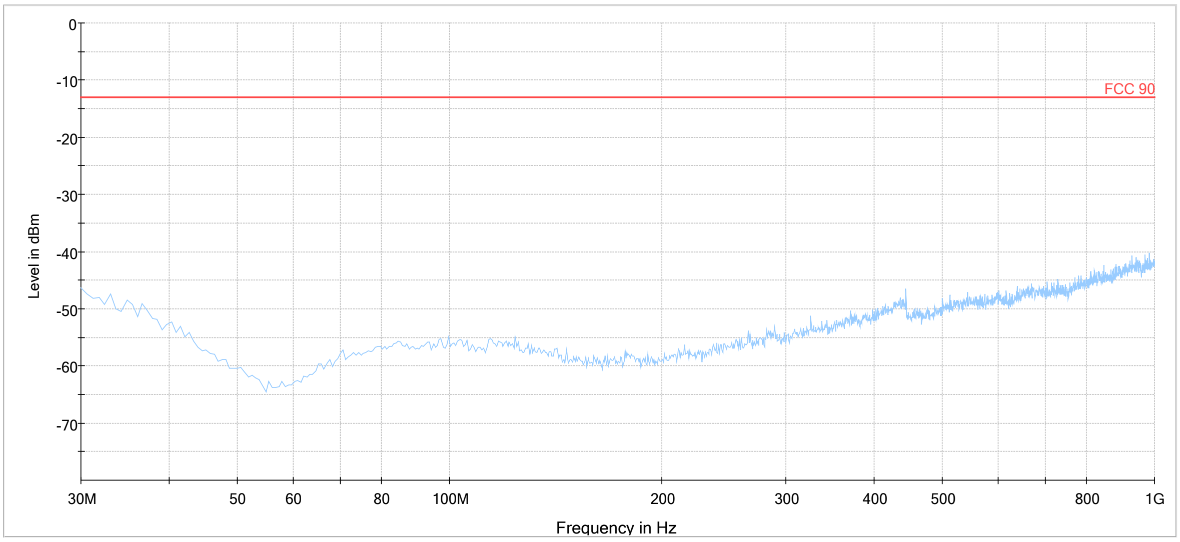


30 MHz - 1 GHz

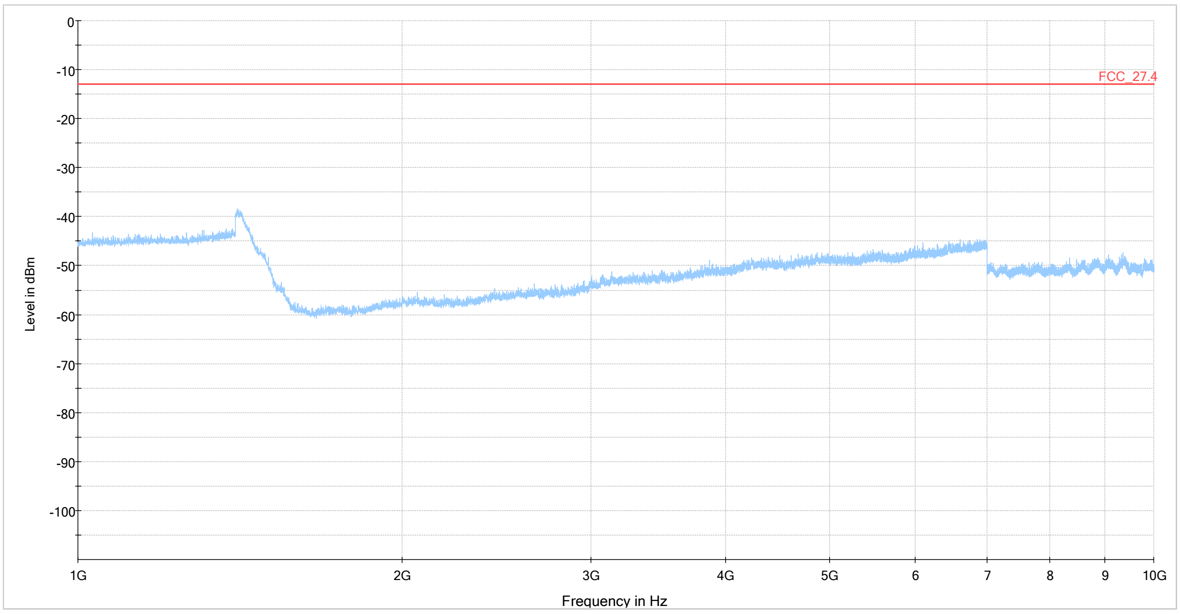


1 GHz - 10 GHz

Frequency Band = Band 809 – 817 MHz, Direction = RF uplink
(S01_AA01)



30 MHz - 1 GHz



1 GHz - 10 GHz

4.8.5 TEST EQUIPMENT USED

- Radiated Emissions

5 TEST EQUIPMENT

1 R&S TS8997
EN300328/301893/FCC cond. Test Lab

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	SMB100A	Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	107695	2017-07	2020-07
1.2	MFS	Rubidium Frequency Standard	Datum-Beverly	5489/001	2018-07	2020-07
1.3	1515 / 93459	Broadband Power Divider SMA (Aux)	Weinschel Associates	LN673		
1.4	FSV30	Signal Analyzer 10 Hz - 30 GHz	Rohde & Schwarz	103005	2018-04	2020-04
1.5	Fluke 177	Digital Multimeter 03 (Multimeter)	Fluke Europe B.V.	86670383	2018-04	2020-04
1.6	VT 4002	Climatic Chamber	Vötsch	58566002150010	2018-04	2020-04
1.7	A8455-4	4 Way Power Divider (SMA)		-		
1.8	Opus10 THI (8152.00)	ThermoHygro Datalogger 03 (Environ)	Lufft Mess- und Regeltechnik GmbH	7482	2019-06	2021-03
1.9	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	259291	2016-10	2019-10
1.10	OSP120	Switching Unit with integrated power meter	Rohde & Schwarz	101158	2018-05	2021-05

2 Radiated Emissions
Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.1	NRV-Z1	Sensor Head A	Rohde & Schwarz	827753/005	2018-07 2019-08	2019-07 2020-08
2.2	MFS	Rubidium Frequency Normal MFS	Datum GmbH	002	2018-10	2020-10
2.3	Opus10 TPR (8253.00)	ThermoAirpressure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936	2019-05	2021-05
2.4	ESW44	EMI Test Receiver	Rohde & Schwarz	101603	2018-05	2020-05
2.5	Anechoic Chamber	10.38 x 6.38 x 6.00 m^3	Frankonia	none	2018-06	2020-06
2.6	HL 562	Ultralog new biconicals	Rohde & Schwarz	830547/003	2018-07	2021-07
2.7	5HC2700/12750-1.5-KK	High Pass Filter	Trilithic	9942012		

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.8	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-		
2.9	Fully Anechoic Room	8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	2018-06	2020-06
2.10	Fluke 177	Digital Multimeter 03 (Multimeter)	Fluke Europe B.V.	86670383	2018-04	2020-04
2.11	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785		
2.12	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2019-02	2021-02
2.13	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronic GmbH	00083069		
2.14	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright	09		
2.15	4HC1600/12750-1.5-KK	High Pass Filter	Trilithic	9942011		
2.16	Chroma 6404	AC Power Source	Chroma ATE INC.	64040001304		
2.17	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368		
2.18	TT 1.5 WI	Turn Table	Maturo GmbH	-		
2.19	HL 562 Ultralog	Log.-per. Antenna	Rohde & Schwarz	100609	2019-05	2022-05
2.20	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronic GmbH	00086675		
2.21	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008		
2.22	Opus10 THI (8152.00)	ThermoHygro Datalogger 12 (Environ)	Lufft Mess- und Regeltechnik GmbH	12482	2019-06	2021-06
2.23	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2019-01	2020-01
2.24	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037		
2.25	AS 620 P	Antenna mast	HD GmbH	620/37		
2.26	Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	Maturo GmbH	TD1.5-10kg/024/3790709		
2.27	PAS 2.5 - 10 kg	Antenna Mast	Maturo GmbH	-		
2.28	AM 4.0	Antenna mast	Maturo GmbH	AM4.0/180/11920513		
2.29	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2018-07	2021-07

3 ID FCC Conducted Base Station / Repeater
FCC cond. Test Lab, BV Nbg

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
3.1	FSV40	Signal Analyzer 10 Hz - 40 GHz	Rohde & Schwarz	100886	2018-10 2019-10	2019-10 2020-10
3.2	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	255975	2017-08	2020-08
3.3	SMIQ	Vector Signal Generator 9 kHz – 3.3 GHz	Rohde & Schwarz	831389/062	2018-10	2020-10

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

In the testing period from 2019-08-23 to 2020-01-28 for ID 7831758-0011 with SN 190729AA0005 the whole equipment was used.

In the testing period from 2020-06-26 to 2020-07-02 for ID 7831758-0001 with SN 190805AA0006 only the equipment with the ref. numbers 3.1 and 3.2 was used.

6 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.

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

Frequency		Corr.
MHz		dB
0.15		10.1
5		10.3
7		10.5
10		10.5
12		10.7
14		10.7
16		10.8
18		10.9
20		10.9
22		11.1
24		11.1
26		11.2
28		11.2
30		11.3

LISN insertion loss ESH3-Z5	cable loss (incl. 10 dB atten-uator)
dB	dB
0.1	10.0
0.1	10.2
0.2	10.3
0.2	10.3
0.3	10.4
0.3	10.4
0.4	10.4
0.4	10.5
0.4	10.5
0.5	10.6
0.5	10.6
0.5	10.7
0.5	10.7
0.5	10.8

Sample calculation

U_{LISN} (dB µV) = U (dB µV) + Corr. (dB)
U = Receiver reading
LISN Insertion loss = Voltage Division Factor of LISN
Corr. = sum of single correction factors of used LISN, cables, switch units (if used)
Linear interpolation will be used for frequencies in between the values in the table.

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

Frequency	AF HFH-Z2)	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-40 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
0.009	20.50	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.01	20.45	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.015	20.37	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.02	20.36	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.025	20.38	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.03	20.32	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.05	20.35	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.08	20.30	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.1	20.20	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.2	20.17	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.3	20.14	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.49	20.12	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.490001	20.12	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.5	20.11	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.8	20.10	-39.6	0.1	0.1	0.1	0.1	-40	30	3
1	20.09	-39.6	0.1	0.1	0.1	0.1	-40	30	3
2	20.08	-39.6	0.1	0.1	0.1	0.1	-40	30	3
3	20.06	-39.6	0.1	0.1	0.1	0.1	-40	30	3
4	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
5	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
6	20.02	-39.5	0.2	0.1	0.1	0.1	-40	30	3
8	19.95	-39.5	0.2	0.1	0.1	0.1	-40	30	3
10	19.83	-39.4	0.2	0.1	0.2	0.1	-40	30	3
12	19.71	-39.4	0.2	0.1	0.2	0.1	-40	30	3
14	19.54	-39.4	0.2	0.1	0.2	0.1	-40	30	3
16	19.53	-39.3	0.3	0.1	0.2	0.1	-40	30	3
18	19.50	-39.3	0.3	0.1	0.2	0.1	-40	30	3
20	19.57	-39.3	0.3	0.1	0.2	0.1	-40	30	3
22	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
24	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
26	19.54	-39.3	0.3	0.1	0.2	0.1	-40	30	3
28	19.46	-39.2	0.3	0.1	0.3	0.1	-40	30	3
30	19.73	-39.1	0.4	0.1	0.3	0.1	-40	30	3

Sample calculation

E (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 = -40 * 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

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

(d_{Limit} = 3 m)

Frequency	AF R&S HL562	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
30	18.6	0.6	0.29	0.04	0.23	0.02	0.0	3	3
50	6.0	0.9	0.39	0.09	0.32	0.08	0.0	3	3
100	9.7	1.2	0.56	0.14	0.47	0.08	0.0	3	3
150	7.9	1.6	0.73	0.20	0.59	0.12	0.0	3	3
200	7.6	1.9	0.84	0.21	0.70	0.11	0.0	3	3
250	9.5	2.1	0.98	0.24	0.80	0.13	0.0	3	3
300	11.0	2.3	1.04	0.26	0.89	0.15	0.0	3	3
350	12.4	2.6	1.18	0.31	0.96	0.13	0.0	3	3
400	13.6	2.9	1.28	0.35	1.03	0.19	0.0	3	3
450	14.7	3.1	1.39	0.38	1.11	0.22	0.0	3	3
500	15.6	3.2	1.44	0.39	1.20	0.19	0.0	3	3
550	16.3	3.5	1.55	0.46	1.24	0.23	0.0	3	3
600	17.2	3.5	1.59	0.43	1.29	0.23	0.0	3	3
650	18.1	3.6	1.67	0.34	1.35	0.22	0.0	3	3
700	18.5	3.6	1.67	0.42	1.41	0.15	0.0	3	3
750	19.1	4.1	1.87	0.54	1.46	0.25	0.0	3	3
800	19.6	4.1	1.90	0.46	1.51	0.25	0.0	3	3
850	20.1	4.4	1.99	0.60	1.56	0.27	0.0	3	3
900	20.8	4.7	2.14	0.60	1.63	0.29	0.0	3	3
950	21.1	4.8	2.22	0.60	1.66	0.33	0.0	3	3
1000	21.6	4.9	2.23	0.61	1.71	0.30	0.0	3	3

(d_{Limit} = 10 m)

30	18.6	-9.9	0.29	0.04	0.23	0.02	-10.5	10	3
50	6.0	-9.6	0.39	0.09	0.32	0.08	-10.5	10	3
100	9.7	-9.2	0.56	0.14	0.47	0.08	-10.5	10	3
150	7.9	-8.8	0.73	0.20	0.59	0.12	-10.5	10	3
200	7.6	-8.6	0.84	0.21	0.70	0.11	-10.5	10	3
250	9.5	-8.3	0.98	0.24	0.80	0.13	-10.5	10	3
300	11.0	-8.1	1.04	0.26	0.89	0.15	-10.5	10	3
350	12.4	-7.9	1.18	0.31	0.96	0.13	-10.5	10	3
400	13.6	-7.6	1.28	0.35	1.03	0.19	-10.5	10	3
450	14.7	-7.4	1.39	0.38	1.11	0.22	-10.5	10	3
500	15.6	-7.2	1.44	0.39	1.20	0.19	-10.5	10	3
550	16.3	-7.0	1.55	0.46	1.24	0.23	-10.5	10	3
600	17.2	-6.9	1.59	0.43	1.29	0.23	-10.5	10	3
650	18.1	-6.9	1.67	0.34	1.35	0.22	-10.5	10	3
700	18.5	-6.8	1.67	0.42	1.41	0.15	-10.5	10	3
750	19.1	-6.3	1.87	0.54	1.46	0.25	-10.5	10	3
800	19.6	-6.3	1.90	0.46	1.51	0.25	-10.5	10	3
850	20.1	-6.0	1.99	0.60	1.56	0.27	-10.5	10	3
900	20.8	-5.8	2.14	0.60	1.63	0.29	-10.5	10	3
950	21.1	-5.6	2.22	0.60	1.66	0.33	-10.5	10	3
1000	21.6	-5.6	2.23	0.61	1.71	0.30	-10.5	10	3

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.

6.4 ANTENNA R&S HF907 (1 GHZ – 18 GHZ)

Frequency	AF R&S HF907	Corr.	cable loss 1 (relay + cable inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit, atten-uator & pre-amp)	cable loss 4 (to receiver)		
MHz	dB (1/m)	dB	dB	dB	dB	dB		
1000	24.4	-19.4	0.99	0.31	-21.51	0.79		
2000	28.5	-17.4	1.44	0.44	-20.63	1.38		
3000	31.0	-16.1	1.87	0.53	-19.85	1.33		
4000	33.1	-14.7	2.41	0.67	-19.13	1.31		
5000	34.4	-13.7	2.78	0.86	-18.71	1.40		
6000	34.7	-12.7	2.74	0.90	-17.83	1.47		
7000	35.6	-11.0	2.82	0.86	-16.19	1.46		

Frequency	AF R&S HF907	Corr.	cable loss 1 (relay inside chamber)	cable loss 2 (inside chamber)	cable loss 3 (outside chamber)	cable loss 4 (switch unit, atten-uator & pre-amp)	cable loss 5 (to receiver)	used for FCC 15.247
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	
3000	31.0	-23.4	0.47	1.87	0.53	-27.58	1.33	
4000	33.1	-23.3	0.56	2.41	0.67	-28.23	1.31	
5000	34.4	-21.7	0.61	2.78	0.86	-27.35	1.40	
6000	34.7	-21.2	0.58	2.74	0.90	-26.89	1.47	
7000	35.6	-19.8	0.66	2.82	0.86	-25.58	1.46	

Frequency	AF R&S HF907	Corr.	cable loss 1 (relay inside chamber)	cable loss 2 (High Pass)	cable loss 3 (pre-amp)	cable loss 4 (inside chamber)	cable loss 5 (outside chamber)	cable loss 6 (to receiver)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	dB
7000	35.6	-57.3	0.56	1.28	-62.72	2.66	0.94	1.46
8000	36.3	-56.3	0.69	0.71	-61.49	2.84	1.00	1.53
9000	37.1	-55.3	0.68	0.65	-60.80	3.06	1.09	1.60
10000	37.5	-56.2	0.70	0.54	-61.91	3.28	1.20	1.67
11000	37.5	-55.3	0.80	0.61	-61.40	3.43	1.27	1.70
12000	37.6	-53.7	0.84	0.42	-59.70	3.53	1.26	1.73
13000	38.2	-53.5	0.83	0.44	-59.81	3.75	1.32	1.83
14000	39.9	-56.3	0.91	0.53	-63.03	3.91	1.40	1.77
15000	40.9	-54.1	0.98	0.54	-61.05	4.02	1.44	1.83
16000	41.3	-54.1	1.23	0.49	-61.51	4.17	1.51	1.85
17000	42.8	-54.4	1.36	0.76	-62.36	4.34	1.53	2.00
18000	44.2	-54.7	1.70	0.53	-62.88	4.41	1.55	1.91

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.

6.5 ANTENNA EMCO 3160-09 (18 GHZ – 26.5 GHZ)

Frequency	AF EMCO 3160-09	Corr.
MHz	dB (1/m)	dB
18000	40.2	-23.5
18500	40.2	-23.2
19000	40.2	-22.0
19500	40.3	-21.3
20000	40.3	-20.3
20500	40.3	-19.9
21000	40.3	-19.1
21500	40.3	-19.1
22000	40.3	-18.7
22500	40.4	-19.0
23000	40.4	-19.5
23500	40.4	-19.3
24000	40.4	-19.8
24500	40.4	-19.5
25000	40.4	-19.3
25500	40.5	-20.4
26000	40.5	-21.3
26500	40.5	-21.1

cable loss 1 (inside chamber)	cable loss 2 (pre-amp)	cable loss 3 (inside chamber)	cable loss 4 (switch unit)	cable loss 5 (to receiver)
dB	dB	dB	dB	dB
0.72	-35.85	6.20	2.81	2.65
0.69	-35.71	6.46	2.76	2.59
0.76	-35.44	6.69	3.15	2.79
0.74	-35.07	7.04	3.11	2.91
0.72	-34.49	7.30	3.07	3.05
0.78	-34.46	7.48	3.12	3.15
0.87	-34.07	7.61	3.20	3.33
0.90	-33.96	7.47	3.28	3.19
0.89	-33.57	7.34	3.35	3.28
0.87	-33.66	7.06	3.75	2.94
0.88	-33.75	6.92	3.77	2.70
0.90	-33.35	6.99	3.52	2.66
0.88	-33.99	6.88	3.88	2.58
0.91	-33.89	7.01	3.93	2.51
0.88	-33.00	6.72	3.96	2.14
0.89	-34.07	6.90	3.66	2.22
0.86	-35.11	7.02	3.69	2.28
0.90	-35.20	7.15	3.91	2.36

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.

6.6 ANTENNA EMCO 3160-10 (26.5 GHZ – 40 GHZ)

Frequency	AF EMCO 3160-10	Corr.
GHz	dB (1/m)	dB
26.5	43.4	-11.2
27.0	43.4	-11.2
28.0	43.4	-11.1
29.0	43.5	-11.0
30.0	43.5	-10.9
31.0	43.5	-10.8
32.0	43.5	-10.7
33.0	43.6	-10.7
34.0	43.6	-10.6
35.0	43.6	-10.5
36.0	43.6	-10.4
37.0	43.7	-10.3
38.0	43.7	-10.2
39.0	43.7	-10.2
40.0	43.8	-10.1

cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
dB	dB	dB	dB	dB	m	m
4.4				-9.6	3	1.0
4.4				-9.6	3	1.0
4.5				-9.6	3	1.0
4.6				-9.6	3	1.0
4.7				-9.6	3	1.0
4.7				-9.6	3	1.0
4.8				-9.6	3	1.0
4.9				-9.6	3	1.0
5.0				-9.6	3	1.0
5.1				-9.6	3	1.0
5.1				-9.6	3	1.0
5.2				-9.6	3	1.0
5.3				-9.6	3	1.0
5.4				-9.6	3	1.0
5.5				-9.6	3	1.0

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

Test Case(s)	Parameter	Uncertainty
- Field strength of spurious radiation	Power	± 5.5 dB
- Out-of-band rejection - Occupied Bandwidth - Input versus output spectrum	Power Frequency	± 2.9 dB ± 11.2 kHz
- Effective radiated power, mean output power and zone enhancer gain - Peak to Average Ratio	Power	± 2.2 dB
- Out-of-band emission limits - Conducted Spurious Emissions at Antenna Terminal	Power Frequency	± 2.2 dB ± 11.2 kHz

8 PHOTO REPORT

Please see separate photo report.