

EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

4.4 CONDUCTED SPURIOUS EMISSIONS AT ANTENNA TERMINALS

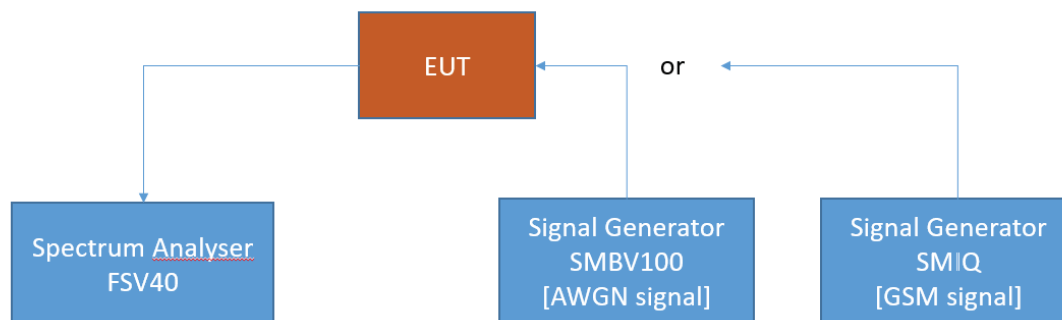
Standard FCC Part §2.1051. §27.53

The test was performed according to:
ANSI C63.26**Test date:** 2022-09-18 - 2022-09-19 and 2022-11-22 – 2022-11-25**Environmental conditions:** 23 ° C ± 5 K; 40 % r. F. ± 20 % r. F.**Test engineer:** Thomas Hufnagel, Thomas Gerngroß

4.4.1 TEST DESCRIPTION

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

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



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

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

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

4.4.2 TEST REQUIREMENTS/LIMITS

FCC Part 2.1051; Measurement required: Spurious emissions at antenna terminal:

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

Part 27; Miscellaneous Wireless Communication Services

Subpart C – Technical standards

§27.53 – Emission limits

- (I) **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 emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (I)(1) 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, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.
 - (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 (I)(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.



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4.4.3 TEST PROTOCOL

General considerations concerning the limits:

The measuring bandwidth of 1 MHz was chosen according the test requirements except at the band edges: At the band edges reducing of measurement bandwidth was necessary to prevent overlaying the RF-signal over the spurious emissions.

Also outside the downlink frequency band at lower frequencies the measurement bandwidths were reduced to have the possibility to record the spurious emissions at these lower frequencies.

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

$$p_{RBWreduced} [dBm] = 10 * \log \left(RBWreduced [kHz] - 1000 \text{ kHz} \right) + p_{RBW 1000 \text{ kHz}} [dBm]$$

Hereby "p" are the limit lines' values.

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C-Band. segment 1. downlink							
Test Frequency	Signal Type	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
low	Wideband 1	0.011027	-67.6	RMS	1	-43.0	24.6
low	Wideband 1	0.062498	-62.0	RMS	10	-33.0	29.0
low	Wideband 1	479.6	-41.9	RMS	1000	-13.0	28.9
low	Wideband 1	854.4	-39.3	RMS	1000	-13.0	26.3
low	Wideband 1	3690.3	-38.2	RMS	1000	-13.0	25.2
low	Wideband 1	3698.7	-27.1	RMS	100	-23.0	4.1
low	Wideband 1	3805.0	-48.8	RMS	100	-23.0	25.8
low	Wideband 1	6982.0	-35.0	RMS	1000	-13.0	22.0
low	Wideband 1	19540.3	-39.4	RMS	1000	-13.0	26.4
low	Wideband 1	20283.2	-39.3	RMS	1000	-13.0	26.3
low	Wideband 1	31321.9	-37.7	RMS	1000	-13.0	24.7
low	Wideband 1	38445.4	-31.9	RMS	1000	-13.0	18.9
mid	Wideband 1	0.00902	-67.5	RMS	1	-43.0	24.5
mid	Wideband 1	0.087494	-62.5	RMS	10	-33.0	29.5
mid	Wideband 1	320.9	-43.0	RMS	1000	-13.0	30.0
mid	Wideband 1	711.5	-40.4	RMS	1000	-13.0	27.4
mid	Wideband 1	3681.8	-40.0	RMS	1000	-13.0	27.0
mid	Wideband 1	3698.8	-49.0	RMS	100	-23.0	26.0
mid	Wideband 1	3806.2	-49.1	RMS	100	-23.0	26.1
mid	Wideband 1	6911.0	-35.4	RMS	1000	-13.0	22.4
mid	Wideband 1	19529.3	-39.0	RMS	1000	-13.0	26.0
mid	Wideband 1	20308.7	-39.6	RMS	1000	-13.0	26.6
mid	Wideband 1	30877.9	-38.1	RMS	1000	-13.0	25.1
mid	Wideband 1	38481.9	-32.1	RMS	1000	-13.0	19.1
high	Wideband 1	0.014878	-67.7	RMS	1	-43.0	24.7
high	Wideband 1	0.0525	-61.8	RMS	10	-33.0	28.8
high	Wideband 1	378.6	-42.4	RMS	1000	-13.0	29.4
high	Wideband 1	891.9	-38.8	RMS	1000	-13.0	25.8
high	Wideband 1	3683.8	-40.0	RMS	1000	-13.0	27.0
high	Wideband 1	3694.4	-49.4	RMS	100	-23.0	26.4
high	Wideband 1	3802.3	-47.3	RMS	100	-23.0	24.3
high	Wideband 1	6834.5	-35.1	RMS	1000	-13.0	22.1
high	Wideband 1	19555.3	-39.4	RMS	1000	-13.0	26.4
high	Wideband 1	20298.2	-39.0	RMS	1000	-13.0	26.0
high	Wideband 1	31360.4	-37.9	RMS	1000	-13.0	24.9
high	Wideband 1	38471.9	-31.9	RMS	1000	-13.0	18.9

The test results relate only to the tested item. The sample has been provided by the client.

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C-Band. segment 1. downlink							
Test Frequency	Signal Type	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
mid	Wideband 2	0.013813	-61.5	RMS	1	-43.0	18.5
mid	Wideband 2	0.152483	-56.1	RMS	10	-33.0	23.1
mid	Wideband 2	73.9	-37.4	RMS	1000	-13.0	24.4
mid	Wideband 2	900.8	-35.5	RMS	1000	-13.0	22.5
mid	Wideband 2	3454.8	-35.6	RMS	1000	-13.0	22.6
mid	Wideband 2	3696.2	-44.6	RMS	100	-23.0	21.6
mid	Wideband 2	3802.8	-43.5	RMS	100	-23.0	20.5
mid	Wideband 2	6816.5	-31.4	RMS	1000	-13.0	18.4
mid	Wideband 2	19541.3	-30.2	RMS	1000	-13.0	17.2
mid	Wideband 2	20309.7	-30.0	RMS	1000	-13.0	17.0
mid	Wideband 2	30690.9	-29.3	RMS	1000	-13.0	16.3
mid	Wideband 2	39991.3	-20.9	RMS	1000	-13.0	7.9

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C-Band. segment 1. downlink							
Test Frequency	Signal Type	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
low	Narrowband	0.013362	-66.9	RMS	1	-43.0	23.9
low	Narrowband	0.0525	-61.4	RMS	10	-33.0	28.4
low	Narrowband	459.4	-42.4	RMS	1000	-13.0	29.4
low	Narrowband	853.4	-38.7	RMS	1000	-13.0	25.7
low	Narrowband	3543.8	-39.9	RMS	1000	-13.0	26.9
low	Narrowband	3696.3	-49.0	RMS	100	-23.0	26.0
low	Narrowband	3806.9	-48.8	RMS	100	-23.0	25.8
low	Narrowband	6849.0	-35.4	RMS	1000	-13.0	22.4
low	Narrowband	19583.8	-39.2	RMS	1000	-13.0	26.2
low	Narrowband	20305.2	-39.1	RMS	1000	-13.0	26.1
low	Narrowband	30871.4	-37.5	RMS	1000	-13.0	24.5
low	Narrowband	38489.4	-31.2	RMS	1000	-13.0	18.2
mid	Narrowband	0.015861	-67.4	RMS	1	-43.0	24.4
mid	Narrowband	0.0525	-62.0	RMS	10	-33.0	29.0
mid	Narrowband	496.9	-42.3	RMS	1000	-13.0	29.3
mid	Narrowband	709.5	-39.9	RMS	1000	-13.0	26.9
mid	Narrowband	3531.8	-40.2	RMS	1000	-13.0	27.2
mid	Narrowband	3692.4	-48.1	RMS	100	-23.0	25.1
mid	Narrowband	3804.7	-49.2	RMS	100	-23.0	26.2
mid	Narrowband	6986.5	-35.4	RMS	1000	-13.0	22.4
mid	Narrowband	19557.8	-39.8	RMS	1000	-13.0	26.8
mid	Narrowband	20265.7	-39.4	RMS	1000	-13.0	26.4
mid	Narrowband	31355.9	-37.9	RMS	1000	-13.0	24.9
mid	Narrowband	38496.4	-31.6	RMS	1000	-13.0	18.6
high	Narrowband	0.009266	-67.1	RMS	1	-43.0	24.1
high	Narrowband	0.0525	-61.6	RMS	10	-33.0	28.6
high	Narrowband	238.2	-41.4	RMS	1000	-13.0	28.4
high	Narrowband	894.9	-39.8	RMS	1000	-13.0	26.8
high	Narrowband	3595.3	-40.0	RMS	1000	-13.0	27.0
high	Narrowband	3697.6	-48.9	RMS	100	-23.0	25.9
high	Narrowband	3801.1	-47.1	RMS	100	-23.0	24.1
high	Narrowband	6880.0	-35.0	RMS	1000	-13.0	22.0
high	Narrowband	19537.3	-39.7	RMS	1000	-13.0	26.7
high	Narrowband	20292.7	-39.0	RMS	1000	-13.0	26.0
high	Narrowband	30709.4	-37.8	RMS	1000	-13.0	24.8
high	Narrowband	38461.4	-31.7	RMS	1000	-13.0	18.7

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C-Band. segment 2. downlink							
Test Frequency	Signal Type	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
low	Wideband 1	0.009266	-66.3	RMS	1	-43.0	23.3
low	Wideband 1	26.933012	-63.4	RMS	10	-33.0	30.4
low	Wideband 1	225.6	-42.2	RMS	1000	-13.0	29.2
low	Wideband 1	714.5	-40.5	RMS	1000	-13.0	27.5
low	Wideband 1	3613.3	-39.4	RMS	1000	-13.0	26.4
low	Wideband 1	3788.2	-47.9	RMS	100	-23.0	24.9
low	Wideband 1	3892.1	-49.1	RMS	100	-23.0	26.1
low	Wideband 1	6830.5	-35.5	RMS	1000	-13.0	22.5
low	Wideband 1	19543.8	-39.5	RMS	1000	-13.0	26.5
low	Wideband 1	20310.2	-39.4	RMS	1000	-13.0	26.4
low	Wideband 1	30762.4	-37.8	RMS	1000	-13.0	24.8
low	Wideband 1	38506.9	-31.7	RMS	1000	-13.0	18.7
mid	Wideband 1	0.011027	-66.7	RMS	1	-43.0	23.7
mid	Wideband 1	0.0525	-61.5	RMS	10	-33.0	28.5
mid	Wideband 1	183.3	-42.8	RMS	1000	-13.0	29.8
mid	Wideband 1	891.4	-39.8	RMS	1000	-13.0	26.8
mid	Wideband 1	3758.3	-39.5	RMS	1000	-13.0	26.5
mid	Wideband 1	3788.6	-49.1	RMS	100	-23.0	26.1
mid	Wideband 1	3894.3	-48.7	RMS	100	-23.0	25.7
mid	Wideband 1	6944.5	-35.4	RMS	1000	-13.0	22.4
mid	Wideband 1	19543.3	-39.5	RMS	1000	-13.0	26.5
mid	Wideband 1	20303.2	-39.0	RMS	1000	-13.0	26.0
mid	Wideband 1	30761.9	-37.9	RMS	1000	-13.0	24.9
mid	Wideband 1	38466.9	-31.8	RMS	1000	-13.0	18.8
high	Wideband 1	0.010823	-67.1	RMS	1	-43.0	24.1
high	Wideband 1	0.192476	-62.8	RMS	10	-33.0	29.8
high	Wideband 1	309.1	-42.3	RMS	1000	-13.0	29.3
high	Wideband 1	891.9	-39.7	RMS	1000	-13.0	26.7
high	Wideband 1	3708.3	-39.5	RMS	1000	-13.0	26.5
high	Wideband 1	3788.5	-48.4	RMS	100	-23.0	25.4
high	Wideband 1	3891.1	-47.3	RMS	100	-23.0	24.3
high	Wideband 1	6880.5	-35.4	RMS	1000	-13.0	22.4
high	Wideband 1	19579.3	-39.4	RMS	1000	-13.0	26.4
high	Wideband 1	20311.7	-39.1	RMS	1000	-13.0	26.1
high	Wideband 1	30754.4	-37.8	RMS	1000	-13.0	24.8
high	Wideband 1	38476.4	-31.6	RMS	1000	-13.0	18.6

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C-Band. segment 2. downlink							
Test Frequency	Signal Type	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
mid	Wideband 2	0.01201	-61.8	RMS	1	-43.0	18.8
mid	Wideband 2	0.0525	-54.5	RMS	10	-33.0	21.5
mid	Wideband 2	404.5	-38.1	RMS	1000	-13.0	25.1
mid	Wideband 2	847.9	-34.9	RMS	1000	-13.0	21.9
mid	Wideband 2	3671.3	-35.0	RMS	1000	-13.0	22.0
mid	Wideband 2	3783.6	-44.3	RMS	100	-23.0	21.3
mid	Wideband 2	3896.8	-44.8	RMS	100	-23.0	21.8
mid	Wideband 2	6874.0	-31.0	RMS	1000	-13.0	18.0
mid	Wideband 2	19566.3	-30.4	RMS	1000	-13.0	17.4
mid	Wideband 2	20276.7	-30.2	RMS	1000	-13.0	17.2
mid	Wideband 2	31245.4	-29.3	RMS	1000	-13.0	16.3
mid	Wideband 2	39991.3	-20.9	RMS	1000	-13.0	7.9

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C-Band. segment 2. downlink							
Test Frequency	Signal Type	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
low	Narrowband	0.009922	-66.4	RMS	1	-43.0	23.4
low	Narrowband	0.0525	-60.4	RMS	10	-33.0	27.4
low	Narrowband	432.2	-42.3	RMS	1000	-13.0	29.3
low	Narrowband	852.4	-38.7	RMS	1000	-13.0	25.7
low	Narrowband	3712.3	-40.1	RMS	1000	-13.0	27.1
low	Narrowband	3787.8	-47.7	RMS	100	-23.0	24.7
low	Narrowband	3891.3	-49.5	RMS	100	-23.0	26.5
low	Narrowband	6883.5	-35.0	RMS	1000	-13.0	22.0
low	Narrowband	19547.3	-39.4	RMS	1000	-13.0	26.4
low	Narrowband	20293.2	-39.3	RMS	1000	-13.0	26.3
low	Narrowband	30875.4	-37.5	RMS	1000	-13.0	24.5
low	Narrowband	38515.9	-31.1	RMS	1000	-13.0	18.1
mid	Narrowband	0.00943	-66.6	RMS	1	-43.0	23.6
mid	Narrowband	0.0525	-61.3	RMS	10	-33.0	28.3
mid	Narrowband	421.8	-42.9	RMS	1000	-13.0	29.9
mid	Narrowband	711.5	-40.3	RMS	1000	-13.0	27.3
mid	Narrowband	3637.3	-38.7	RMS	1000	-13.0	25.7
mid	Narrowband	3785.8	-48.9	RMS	100	-23.0	25.9
mid	Narrowband	3898.1	-49.0	RMS	100	-23.0	26.0
mid	Narrowband	6928.0	-35.1	RMS	1000	-13.0	22.1
mid	Narrowband	19539.3	-39.8	RMS	1000	-13.0	26.8
mid	Narrowband	20305.7	-39.6	RMS	1000	-13.0	26.6
mid	Narrowband	30384.5	-37.6	RMS	1000	-13.0	24.6
mid	Narrowband	38512.4	-31.7	RMS	1000	-13.0	18.7
high	Narrowband	0.009758	-67.2	RMS	1	-43.0	24.2
high	Narrowband	0.0525	-62.4	RMS	10	-33.0	29.4
high	Narrowband	492.3	-42.8	RMS	1000	-13.0	29.8
high	Narrowband	850.4	-40.5	RMS	1000	-13.0	27.5
high	Narrowband	3761.8	-39.8	RMS	1000	-13.0	26.8
high	Narrowband	3783.2	-49.0	RMS	100	-23.0	26.0
high	Narrowband	3891.0	-45.6	RMS	100	-23.0	22.6
high	Narrowband	6995.5	-34.6	RMS	1000	-13.0	21.6
high	Narrowband	19554.8	-39.6	RMS	1000	-13.0	26.6
high	Narrowband	20313.7	-38.7	RMS	1000	-13.0	25.7
high	Narrowband	30769.9	-37.8	RMS	1000	-13.0	24.8
high	Narrowband	38465.9	-31.8	RMS	1000	-13.0	18.8

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C-Band. segment 3. downlink							
Test Frequency	Signal Type	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
low	Wideband 1	0.00902	-66.9	RMS	1	-43.0	23.9
low	Wideband 1	0.127487	-61.7	RMS	10	-33.0	28.7
low	Wideband 1	382.9	-42.3	RMS	1000	-13.0	29.3
low	Wideband 1	712.0	-39.7	RMS	1000	-13.0	26.7
low	Wideband 1	3817.8	-39.2	RMS	1000	-13.0	26.2
low	Wideband 1	3878.4	-45.0	RMS	100	-23.0	22.0
low	Wideband 1	3986.8	-48.5	RMS	100	-23.0	25.5
low	Wideband 1	6958.0	-35.3	RMS	1000	-13.0	22.3
low	Wideband 1	19552.8	-39.4	RMS	1000	-13.0	26.4
low	Wideband 1	20260.2	-39.8	RMS	1000	-13.0	26.8
low	Wideband 1	30692.4	-38.0	RMS	1000	-13.0	25.0
low	Wideband 1	38502.4	-31.7	RMS	1000	-13.0	18.7
mid	Wideband 1	0.00902	-67.2	RMS	1	-43.0	24.2
mid	Wideband 1	0.067497	-62.1	RMS	10	-33.0	29.1
mid	Wideband 1	376.7	-43.0	RMS	1000	-13.0	30.0
mid	Wideband 1	848.4	-40.0	RMS	1000	-13.0	27.0
mid	Wideband 1	3832.8	-39.3	RMS	1000	-13.0	26.3
mid	Wideband 1	3878.9	-48.2	RMS	100	-23.0	25.2
mid	Wideband 1	3982.1	-48.9	RMS	100	-23.0	25.9
mid	Wideband 1	6996.0	-35.5	RMS	1000	-13.0	22.5
mid	Wideband 1	19567.8	-39.2	RMS	1000	-13.0	26.2
mid	Wideband 1	20347.7	-39.4	RMS	1000	-13.0	26.4
mid	Wideband 1	30695.4	-37.7	RMS	1000	-13.0	24.7
mid	Wideband 1	38472.4	-31.7	RMS	1000	-13.0	18.7
high	Wideband 1	0.00902	-66.5	RMS	1	-43.0	23.5
high	Wideband 1	0.062498	-62.9	RMS	10	-33.0	29.9
high	Wideband 1	321.8	-42.2	RMS	1000	-13.0	29.2
high	Wideband 1	848.9	-39.4	RMS	1000	-13.0	26.4
high	Wideband 1	3528.8	-39.4	RMS	1000	-13.0	26.4
high	Wideband 1	3872.5	-48.7	RMS	100	-23.0	25.7
high	Wideband 1	3981.4	-45.6	RMS	100	-23.0	22.6
high	Wideband 1	6882.0	-34.9	RMS	1000	-13.0	21.9
high	Wideband 1	19546.8	-39.4	RMS	1000	-13.0	26.4
high	Wideband 1	20336.7	-39.1	RMS	1000	-13.0	26.1
high	Wideband 1	31390.9	-37.6	RMS	1000	-13.0	24.6
high	Wideband 1	38510.4	-31.1	RMS	1000	-13.0	18.1

The test results relate only to the tested item. The sample has been provided by the client.

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**EMC Test Report No.: 22-0178**

EMC tests on Andrew CAP L2 C-Band F-DC

**BUREAU
VERITAS**

C-Band. segment 3. downlink							
Test Frequency	Signal Type	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
mid	Wideband 2	0.00902	-60.5	RMS	1	-43.0	17.5
mid	Wideband 2	0.072496	-56.0	RMS	10	-33.0	23.0
mid	Wideband 2	348.1	-37.6	RMS	1000	-13.0	24.6
mid	Wideband 2	894.9	-35.2	RMS	1000	-13.0	22.2
mid	Wideband 2	3796.3	-34.6	RMS	1000	-13.0	21.6
mid	Wideband 2	3877.7	-44.6	RMS	100	-23.0	21.6
mid	Wideband 2	3981.9	-44.4	RMS	100	-23.0	21.4
mid	Wideband 2	6833.5	-31.5	RMS	1000	-13.0	18.5
mid	Wideband 2	19576.8	-30.4	RMS	1000	-13.0	17.4
mid	Wideband 2	20287.7	-29.8	RMS	1000	-13.0	16.8
mid	Wideband 2	30749.9	-29.7	RMS	1000	-13.0	16.7
mid	Wideband 2	39960.8	-20.7	RMS	1000	-13.0	7.7

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C-Band. segment 3. downlink							
Test Frequency	Signal Type	Spurious Freq. [MHz]	Spurious Level [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
low	Narrowband	0.011806	-67.1	RMS	1	-43.0	24.1
low	Narrowband	0.097492	-61.4	RMS	10	-33.0	28.4
low	Narrowband	467.4	-42.6	RMS	1000	-13.0	29.6
low	Narrowband	892.9	-39.8	RMS	1000	-13.0	26.8
low	Narrowband	3738.3	-39.1	RMS	1000	-13.0	26.1
low	Narrowband	3879.0	-47.7	RMS	100	-23.0	24.7
low	Narrowband	3984.9	-48.3	RMS	100	-23.0	25.3
low	Narrowband	6849.5	-34.9	RMS	1000	-13.0	21.9
low	Narrowband	19598.3	-39.6	RMS	1000	-13.0	26.6
low	Narrowband	20280.2	-39.6	RMS	1000	-13.0	26.6
low	Narrowband	30848.4	-37.8	RMS	1000	-13.0	24.8
low	Narrowband	38483.9	-31.4	RMS	1000	-13.0	18.4
mid	Narrowband	0.00902	-65.9	RMS	1	-43.0	22.9
mid	Narrowband	0.072496	-62.1	RMS	10	-33.0	29.1
mid	Narrowband	224.6	-42.7	RMS	1000	-13.0	29.7
mid	Narrowband	856.4	-40.5	RMS	1000	-13.0	27.5
mid	Narrowband	3812.8	-39.6	RMS	1000	-13.0	26.6
mid	Narrowband	3873.2	-48.5	RMS	100	-23.0	25.5
mid	Narrowband	3981.6	-49.1	RMS	100	-23.0	26.1
mid	Narrowband	6932.0	-35.0	RMS	1000	-13.0	22.0
mid	Narrowband	19558.3	-39.6	RMS	1000	-13.0	26.6
mid	Narrowband	20277.7	-39.4	RMS	1000	-13.0	26.4
mid	Narrowband	28931.1	-37.6	RMS	1000	-13.0	24.6
mid	Narrowband	38513.4	-31.3	RMS	1000	-13.0	18.3
high	Narrowband	0.009594	-67.5	RMS	1	-43.0	24.5
high	Narrowband	0.162481	-62.4	RMS	10	-33.0	29.4
high	Narrowband	304.4	-42.8	RMS	1000	-13.0	29.8
high	Narrowband	891.9	-39.1	RMS	1000	-13.0	26.1
high	Narrowband	3813.3	-39.5	RMS	1000	-13.0	26.5
high	Narrowband	3871.9	-49.1	RMS	100	-23.0	26.1
high	Narrowband	3981.2	-48.6	RMS	100	-23.0	25.6
high	Narrowband	6828.5	-34.9	RMS	1000	-13.0	21.9
high	Narrowband	19574.3	-39.4	RMS	1000	-13.0	26.4
high	Narrowband	20347.2	-39.2	RMS	1000	-13.0	26.2
high	Narrowband	30715.9	-37.9	RMS	1000	-13.0	24.9
high	Narrowband	38453.4	-31.7	RMS	1000	-13.0	18.7

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

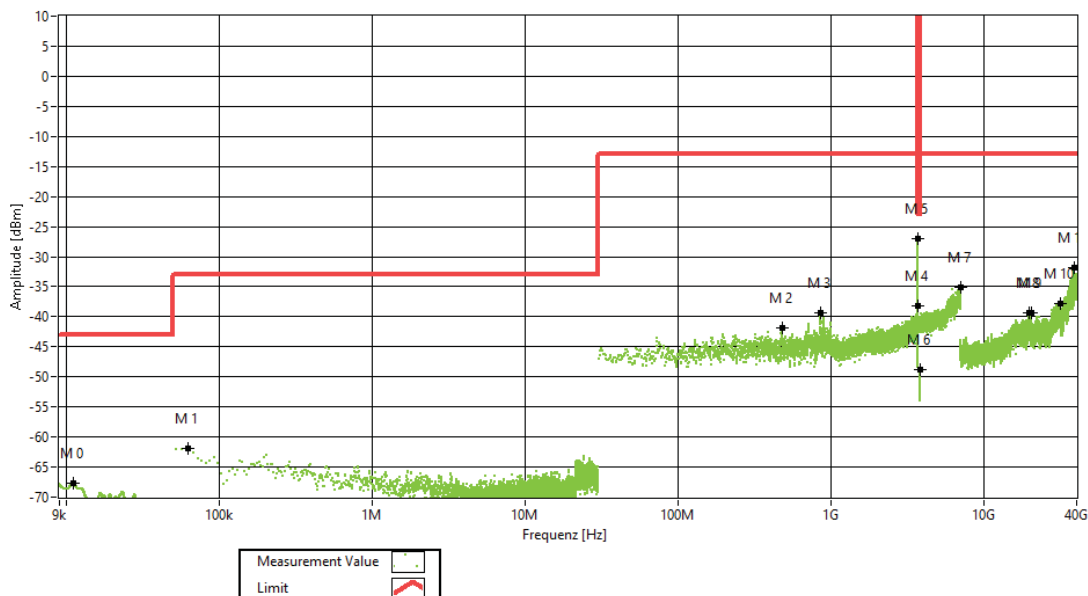
The test results relate only to the tested item. The sample has been provided by the client.

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4.4.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE. "WORST CASE")

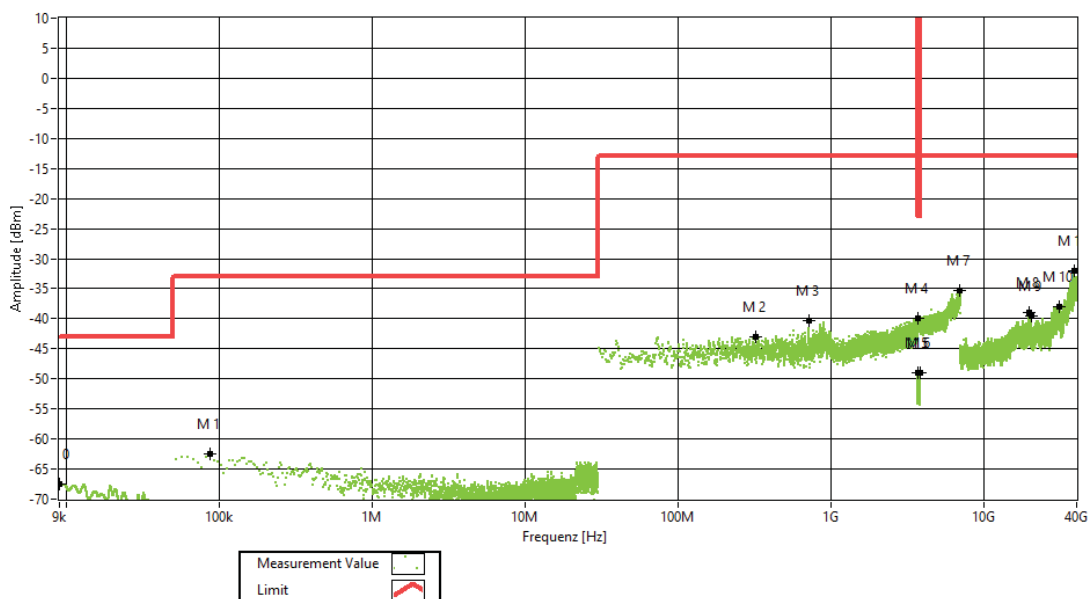
Frequency Band = C-Band. Segment 1. Test Frequency = low. Direction = RF downlink.

Signal Type = Wideband 1



Frequency Band = C-Band. Segment 1. Test Frequency = mid. Direction = RF downlink.

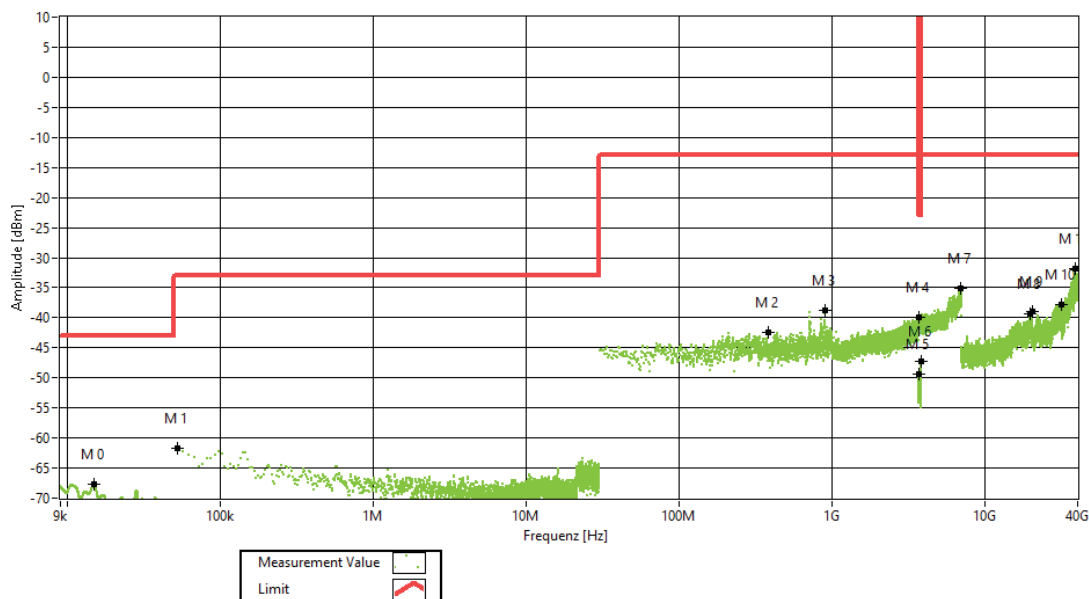
Signal Type = Wideband 1



The test results relate only to the tested item. The sample has been provided by the client.

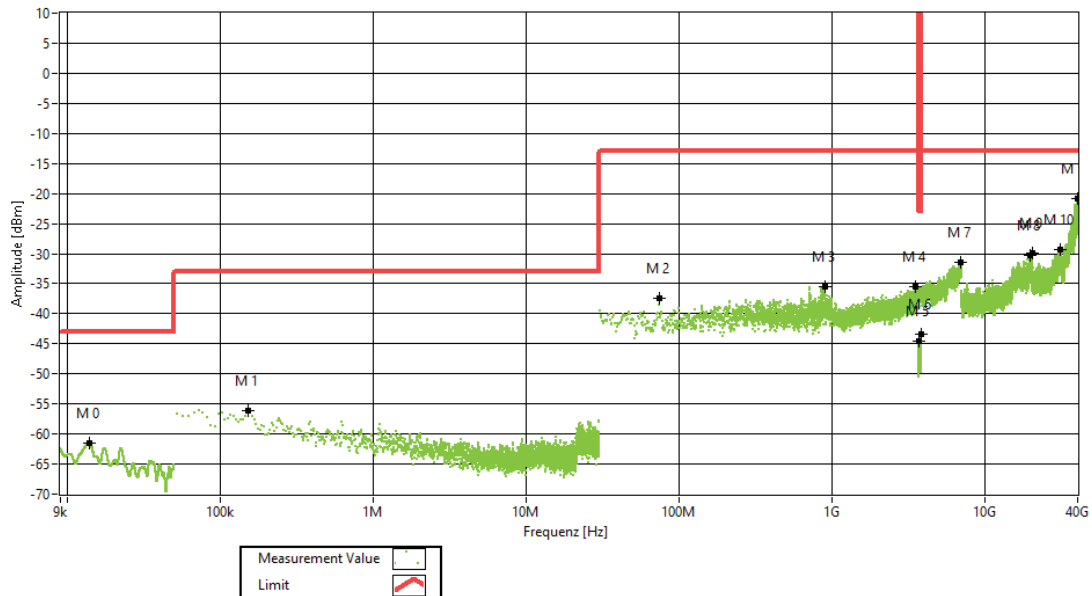
Without the written consent of Bureau Veritas Consumer Products Services Germany GmbH excerpts of this report shall not be reproduced.

Frequency Band = C-Band. Segment 1. Test Frequency = high. Direction = RF downlink.
Signal Type = Wideband 1



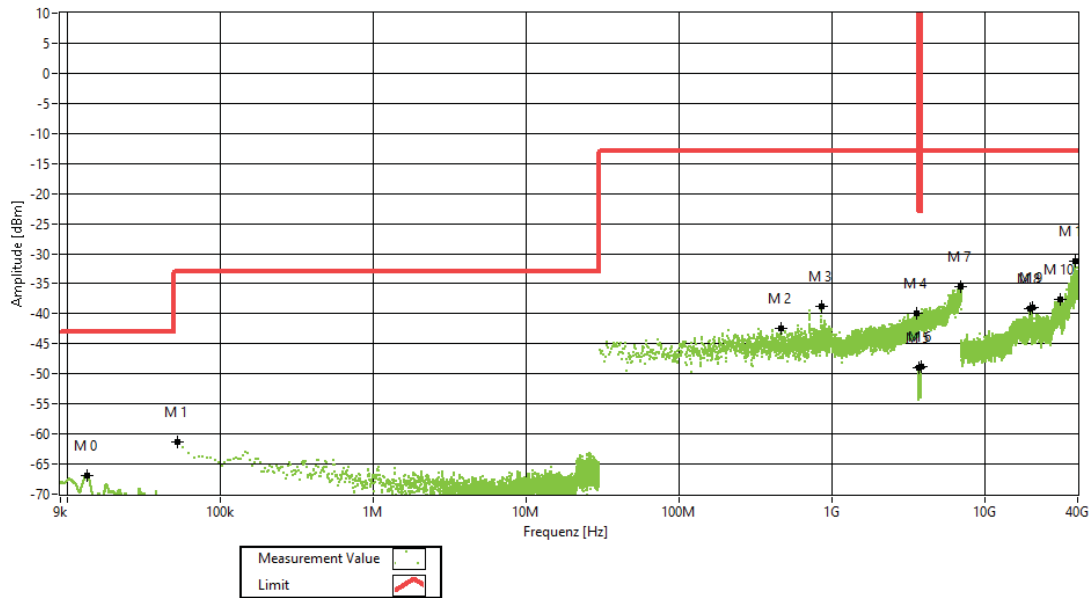
The test results relate only to the tested item. The sample has been provided by the client.
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Frequency Band = C-Band. Segment 1. Test Frequency = mid. Direction = RF downlink.
Signal Type = Wideband 2

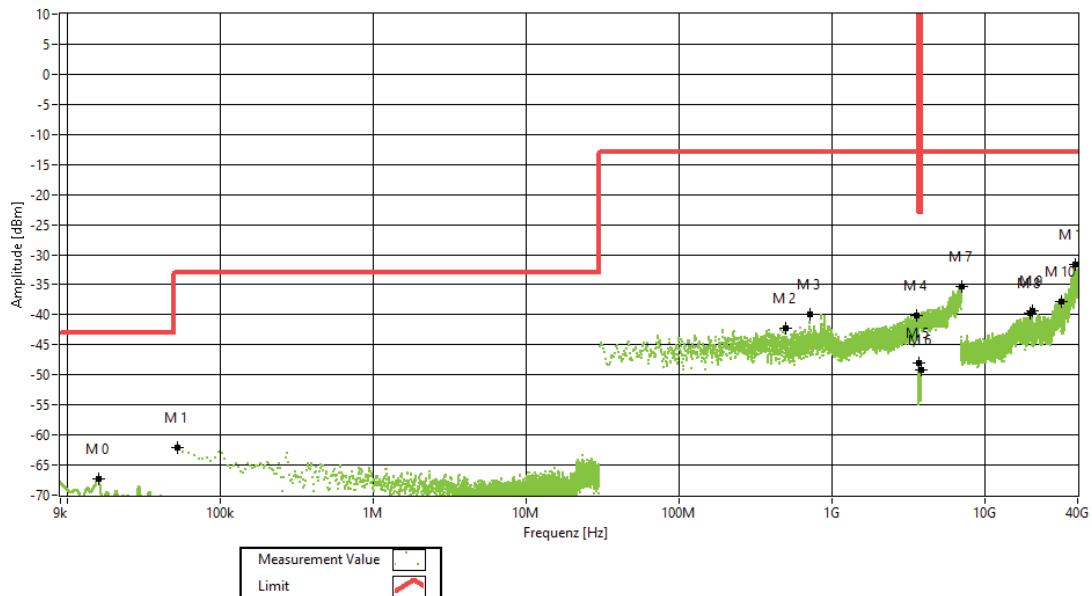


The test results relate only to the tested item. The sample has been provided by the client.
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Frequency Band = C-Band. Segment 1. Test Frequency = low. Direction = RF downlink.
Signal Type = Narrowband

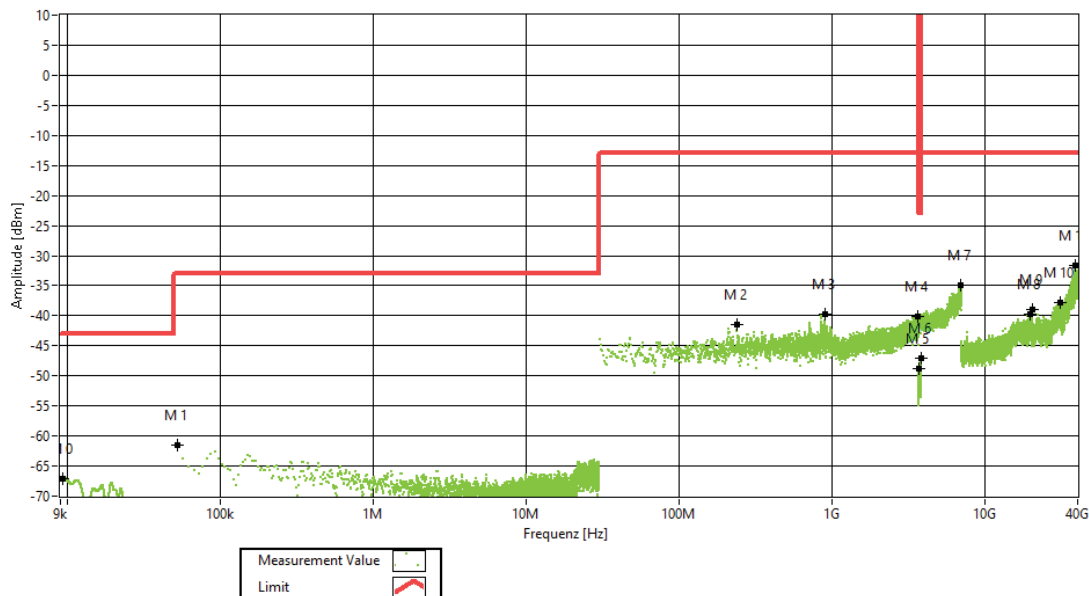


Frequency Band = C-Band. Segment 1. Test Frequency = mid. Direction = RF downlink.
Signal Type = Narrowband



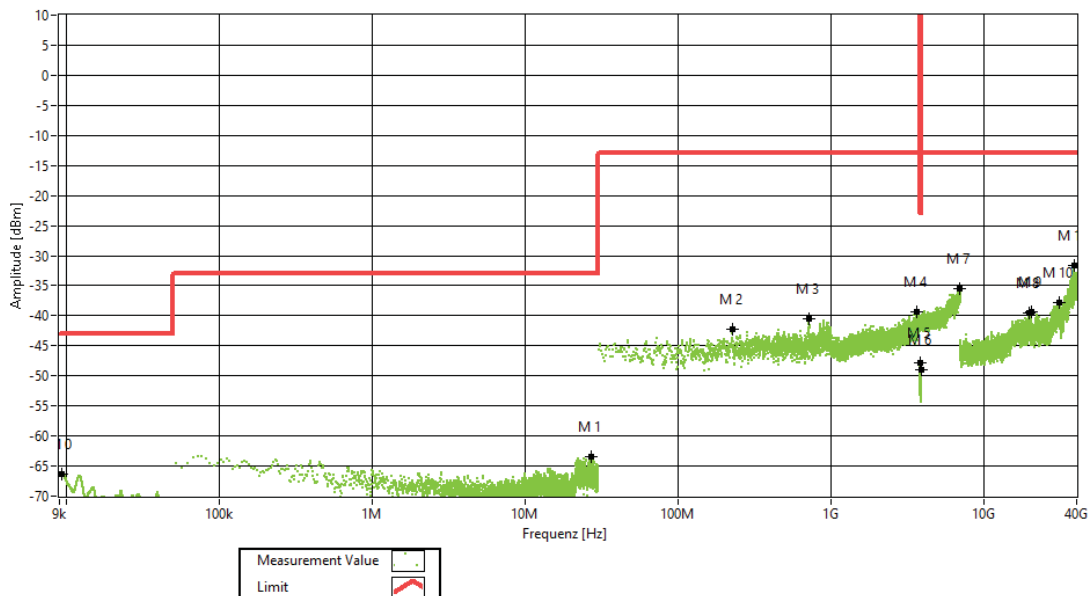
The test results relate only to the tested item. The sample has been provided by the client.
Without the written consent of Bureau Veritas Consumer Products Services Germany GmbH excerpts of this report shall not be reproduced.

Frequency Band = C-Band. Segment 1. Test Frequency = high. Direction = RF downlink.
Signal Type = Narrowband

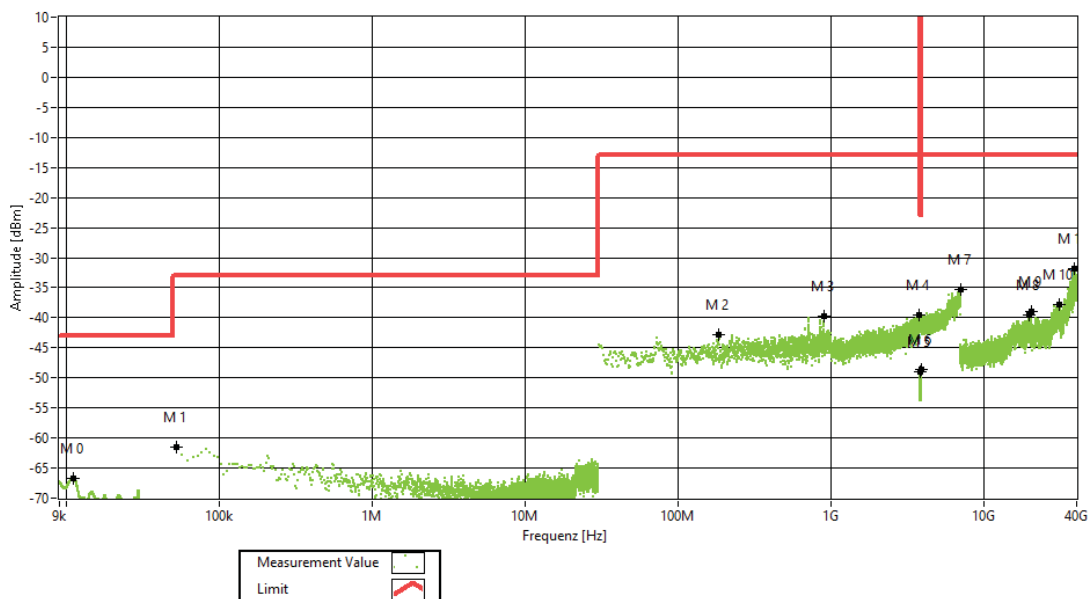


The test results relate only to the tested item. The sample has been provided by the client.
Without the written consent of Bureau Veritas Consumer Products Services Germany GmbH excerpts of this report shall not be reproduced.

Frequency Band = C-Band. Segment 2. Test Frequency = low. Direction = RF downlink.
Signal Type = Wideband 1

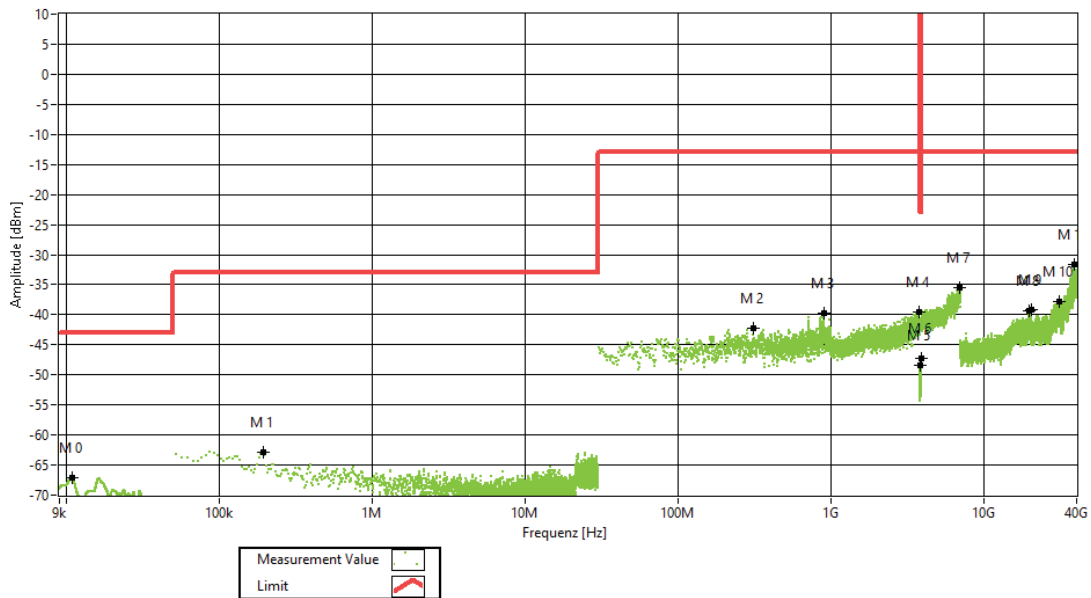


Frequency Band = C-Band. Segment 2. Test Frequency = mid. Direction = RF downlink.
Signal Type = Wideband 1



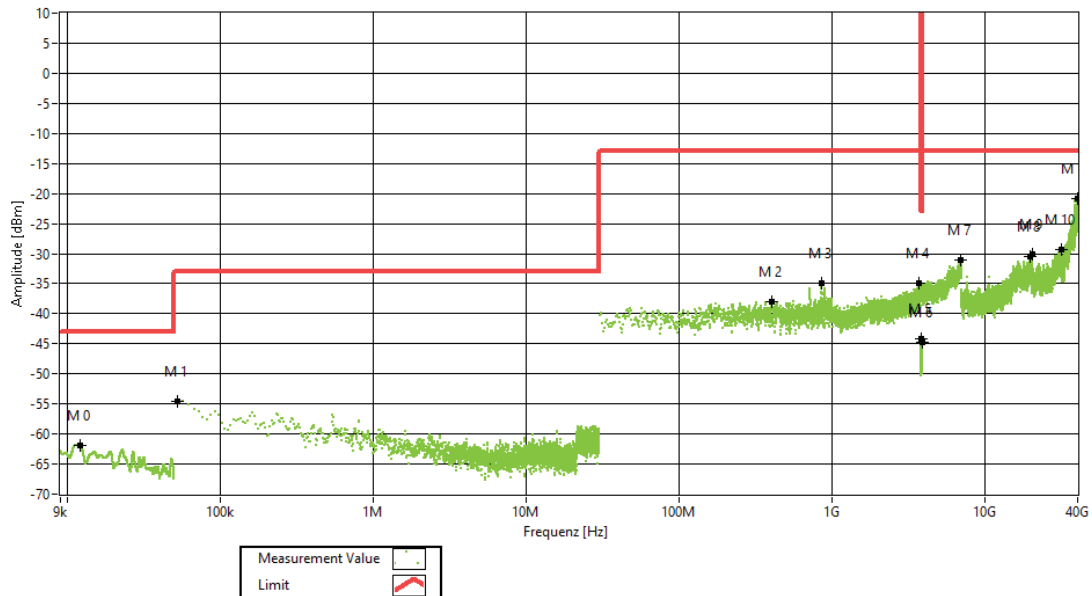
The test results relate only to the tested item. The sample has been provided by the client.
Without the written consent of Bureau Veritas Consumer Products Services Germany GmbH excerpts of this report shall not be reproduced.

Frequency Band = C-Band. Segment 2. Test Frequency = high. Direction = RF downlink.
Signal Type = Wideband 1



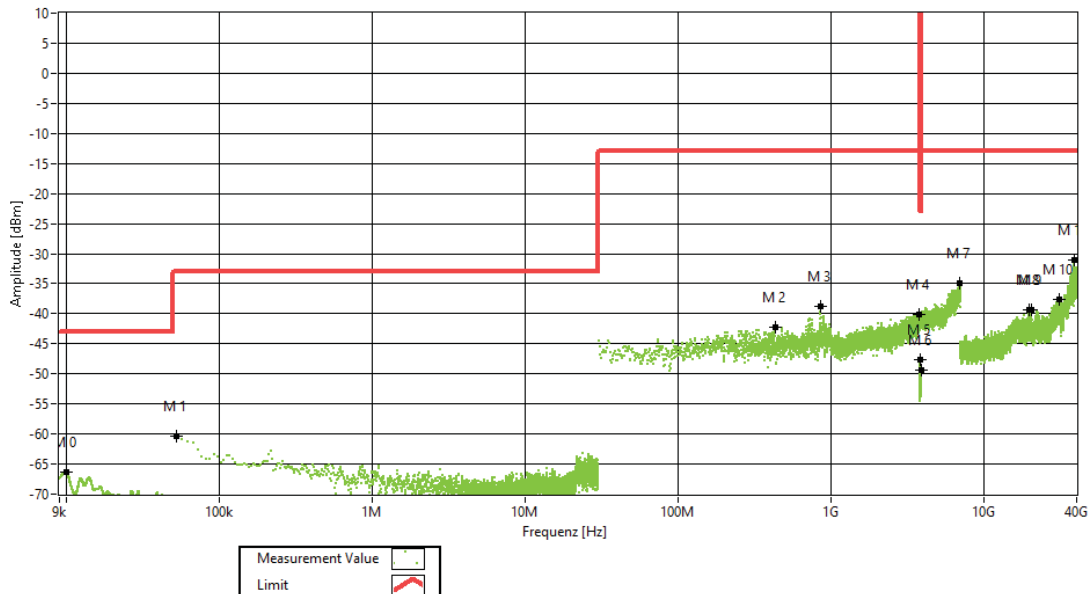
The test results relate only to the tested item. The sample has been provided by the client.
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Frequency Band = C-Band. Segment 2. Test Frequency = mid. Direction = RF downlink.
Signal Type = Wideband 2

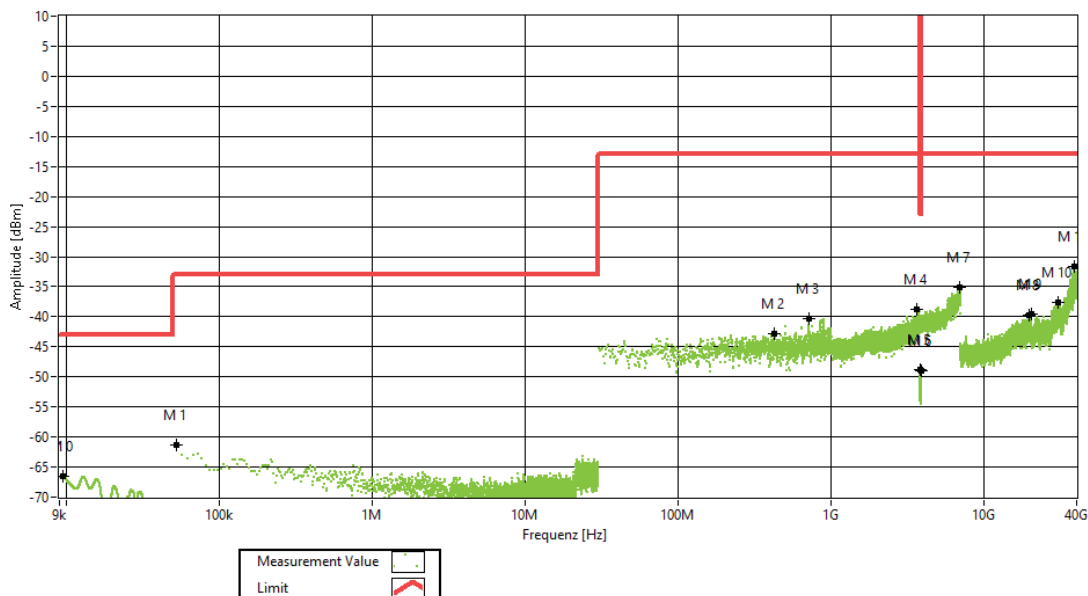


The test results relate only to the tested item. The sample has been provided by the client.
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Frequency Band = C-Band. Segment 2. Test Frequency = low. Direction = RF downlink.
Signal Type = Narrowband



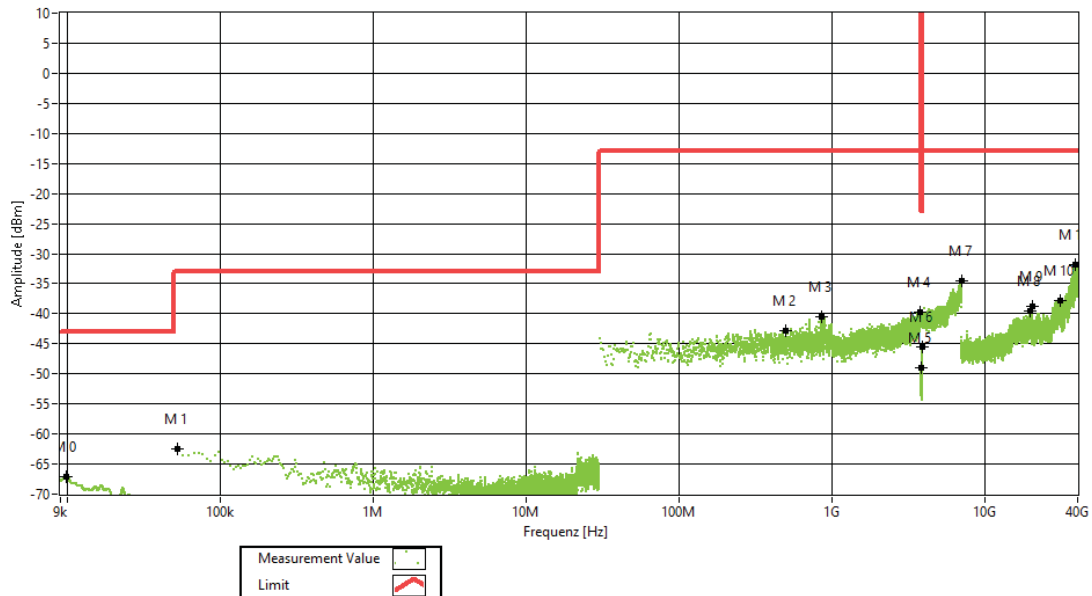
Frequency Band = C-Band. Segment 2. Test Frequency = mid. Direction = RF downlink.
Signal Type = Narrowband



The test results relate only to the tested item. The sample has been provided by the client.

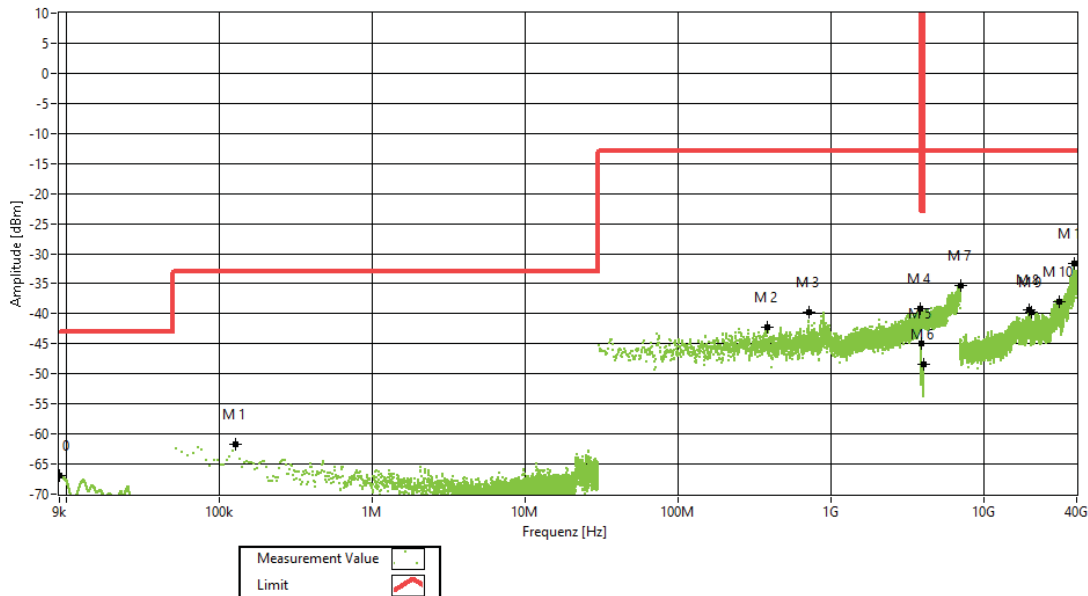
Without the written consent of Bureau Veritas Consumer Products Services Germany GmbH excerpts of this report shall not be reproduced.

Frequency Band = C-Band. Segment 2. Test Frequency = high. Direction = RF downlink.
Signal Type = Narrowband

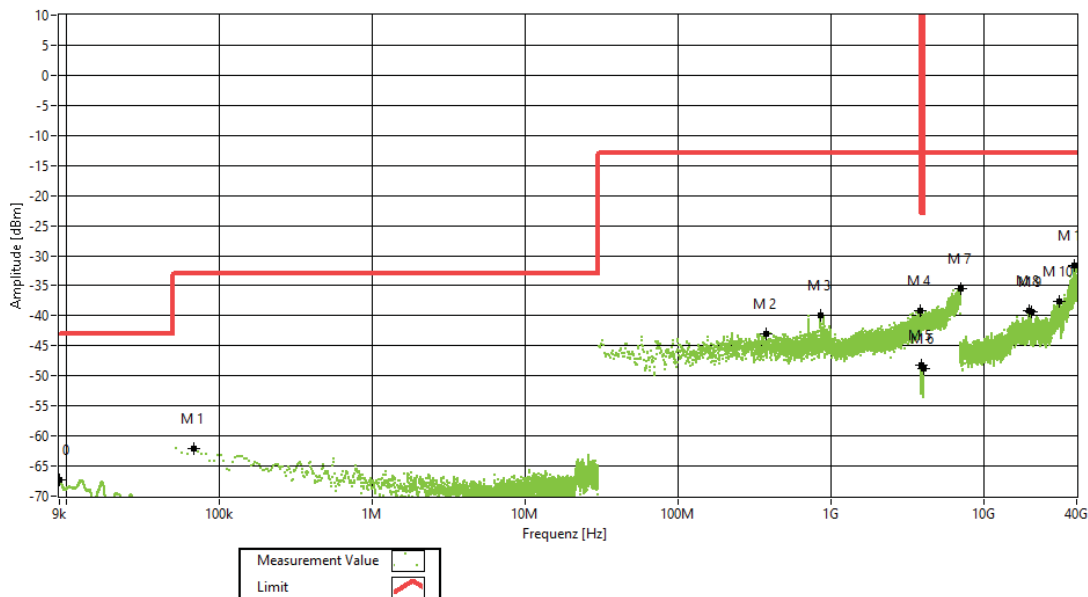


The test results relate only to the tested item. The sample has been provided by the client.
Without the written consent of Bureau Veritas Consumer Products Services Germany GmbH excerpts of this report shall not be reproduced.

Frequency Band = C-Band. Segment 3. Test Frequency = low. Direction = RF downlink.
Signal Type = Wideband 1



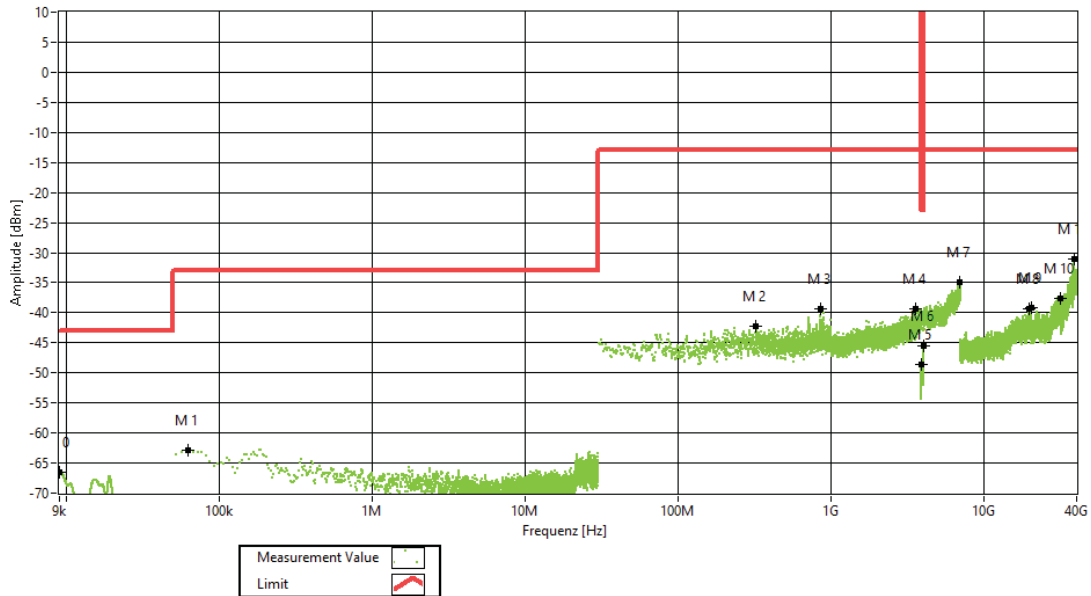
Frequency Band = C-Band. Segment 3. Test Frequency = mid. Direction = RF downlink.
Signal Type = Wideband 1



The test results relate only to the tested item. The sample has been provided by the client.

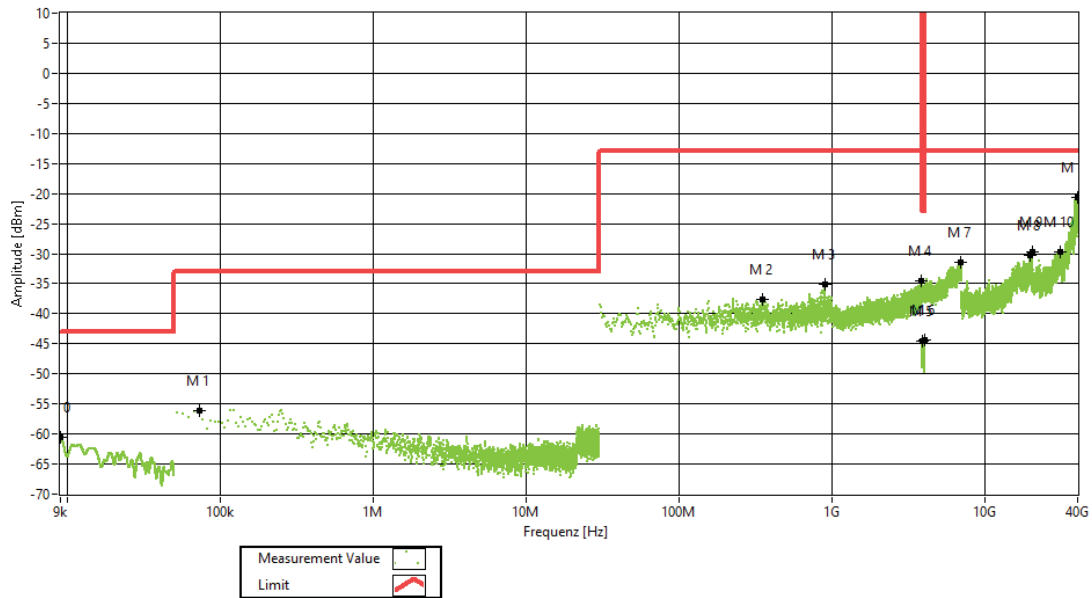
Without the written consent of Bureau Veritas Consumer Products Services Germany GmbH excerpts of this report shall not be reproduced.

Frequency Band = C-Band. Segment 3. Test Frequency = high. Direction = RF downlink.
Signal Type = Wideband 1



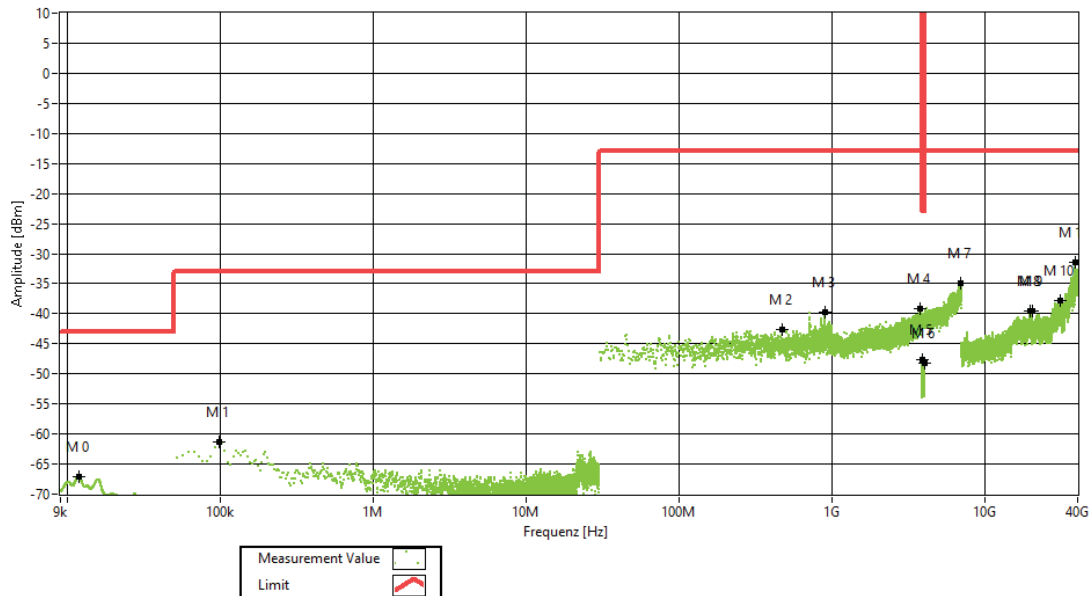
The test results relate only to the tested item. The sample has been provided by the client.
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Frequency Band = C-Band. Segment 3. Test Frequency = mid. Direction = RF downlink.
Signal Type = Wideband 2

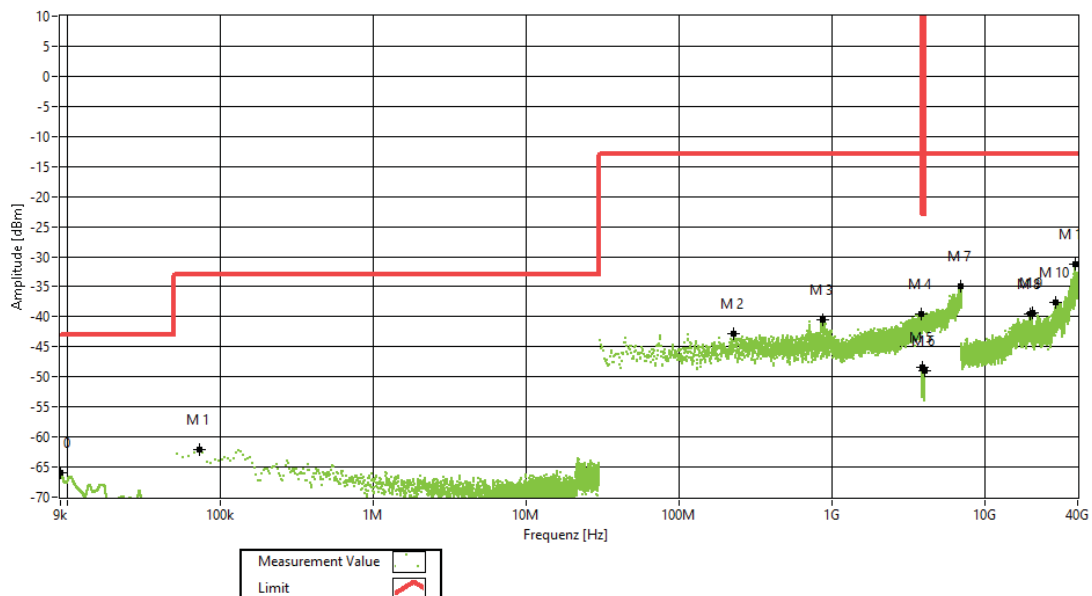


The test results relate only to the tested item. The sample has been provided by the client.
Without the written consent of Bureau Veritas Consumer Products Services Germany GmbH excerpts of this report shall not be reproduced.

Frequency Band = C-Band. Segment 3. Test Frequency = low. Direction = RF downlink.
Signal Type = Narrowband



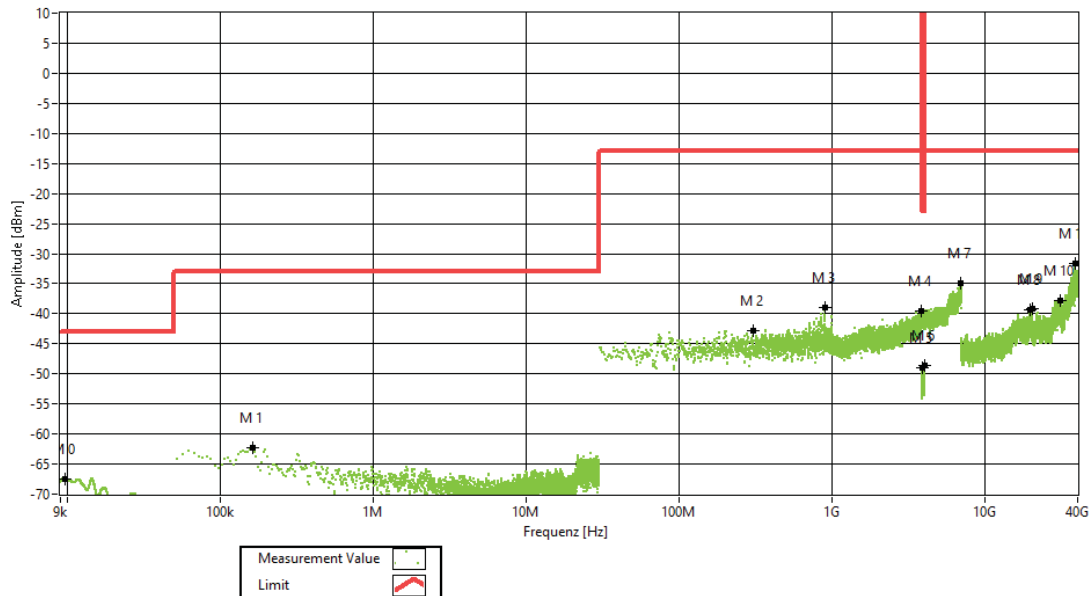
Frequency Band = C-Band. Segment 3. Test Frequency = mid. Direction = RF downlink.
Signal Type = Narrowband



The test results relate only to the tested item. The sample has been provided by the client.

Without the written consent of Bureau Veritas Consumer Products Services Germany GmbH excerpts of this report shall not be reproduced.

Frequency Band = C-Band. Segment 3. Test Frequency = high. Direction = RF downlink.
Signal Type = Narrowband



4.4.5 TEST EQUIPMENT USED

- Conducted

4.5 OUT-OF-BAND EMISSION LIMITS

Standard FCC Part §2.1051. §27.53

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

Test date: 2022-09-16 – 18.09.2022 and 2022-11-22 – 2022-11-25

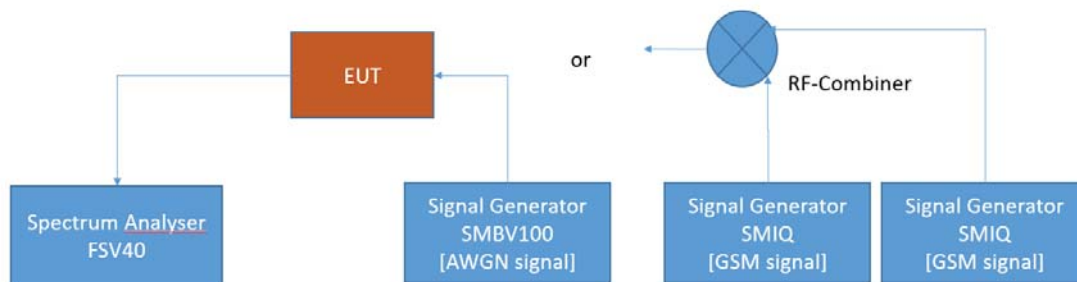
Environmental conditions: 23 ° C ± 5 K; 40 % r. F. ± 20 % r. F.

Test engineer: Thomas Hufnagel. Thomas Gerngroß

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:



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.

4.5.2 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 emission outside 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 resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.
 - (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.

4.5.3 TEST PROTOCOL

General considerations concerning the limits:

The measuring bandwidth of 1 MHz is chosen for the wideband 1 and the narrowband. The limit here is at
 $p = -13 \text{ dBm}$

For the wideband 2 a bandwidth of 100 kHz is necessary. Therefore the limit here is -23 dBm, according
the given formula:

$$p_{RBWreduced} [\text{dBm}] = 10 * \log \left(RBWreduced [\text{kHz}] - 1000 \text{ kHz} \right) + p_{RBW 1000 \text{ kHz}} [\text{dBm}]$$

Hereby "p" are the limit lines' values.

**EMC Test Report No.: 22-0178**

EMC tests on Andrew CAP L2 C-Band F-DC



C-Band. segment 1. 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 1	0.3 dB < AGC	upper	3797.50	-5.1	-39.6	-13.0	26.6
Wideband 1	3 dB > AGC	upper	3797.50	-1.8	-39.5	-13.0	26.5
Wideband 2	0.3 dB < AGC	upper	3750.00	-4.1	-41.1	-23.0	18.1
Wideband 2	3 dB > AGC	upper	3750.00	-0.8	-41.0	-23.0	18
Narrowband	0.3 dB < AGC	upper	3799.80	-3.3	-37.2	-13.0	24.2
Narrowband	3 dB > AGC	upper	3799.80	0.0	-37.3	-13.0	24.3
Wideband 1	0.3 dB < AGC	lower	3702.50	-4.7	-40.3	-13.0	27.3
Wideband 1	3 dB > AGC	lower	3702.50	-1.4	-40.2	-13.0	27.2
Wideband 2	0.3 dB < AGC	lower	3750.00	-4.1	-41.6	-23.0	18.6
Wideband 2	3 dB > AGC	lower	3750.00	-0.8	-41.2	-23.0	18.2
Narrowband	0.3 dB < AGC	lower	3700.20	-3.1	-38.8	-13.0	25.8
Narrowband	3 dB > AGC	lower	3700.20	0.2	-38.4	-13.0	25.4

C-Band. segment 1. 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	3797.50	3795.00	-5.1	-40.2	-13.0	27.2
WB	3 dB > AGC	upper	3797.50	3795.00	-1.8	-39.9	-13.0	26.9
NB	0.3 dB < AGC	upper	3799.80	3799.60	-3.7	-39.3	-13.0	26.3
NB	3 dB > AGC	upper	3799.80	3799.60	-0.4	-39.3	-13.0	26.3
WB	0.3 dB < AGC	lower	3702.50	3705.00	-4.9	-40.4	-13.0	27.4
WB	3 dB > AGC	lower	3702.50	3705.00	-1.6	-40.4	-13.0	27.4
NB	0.3 dB < AGC	lower	3700.20	3700.40	-3.5	-41.0	-13.0	28.0
NB	3 dB > AGC	lower	3700.20	3700.40	-0.2	-41.7	-13.0	28.7

The test results relate only to the tested item. The sample has been provided by the client.

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**EMC Test Report No.: 22-0178**

EMC tests on Andrew CAP L2 C-Band F-DC



C-Band. segment 2. 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 1	0.3 dB < AGC	upper	3887.50	-5.3	-39.9	-13.0	26.9
Wideband 1	3 dB > AGC	upper	3887.50	-2.0	-40.1	-13.0	27.1
Wideband 2	0.3 dB < AGC	upper	3840.00	-4.3	-41.0	-23.0	18.0
Wideband 2	3 dB > AGC	upper	3840.00	-1.0	-41.1	-23.0	18.1
Narrowband	0.3 dB < AGC	upper	3889.80	-3.7	-37.6	-13.0	24.6
Narrowband	3 dB > AGC	upper	3889.80	-0.4	-38.1	-13.0	25.1
Wideband 1	0.3 dB < AGC	lower	3792.50	-5.9	-39.8	-13.0	26.8
Wideband 1	3 dB > AGC	lower	3792.50	-2.6	-39.7	-13.0	26.7
Wideband 2	0.3 dB < AGC	lower	3840.00	-4.3	-40.8	-23.0	17.8
Wideband 2	3 dB > AGC	lower	3840.00	-1.0	-40.9	-23.0	17.9
Narrowband	0.3 dB < AGC	lower	3790.20	-4.7	-37.1	-13.0	24.1
Narrowband	3 dB > AGC	lower	3790.20	-1.4	-37.6	-13.0	24.6

C-Band. segment 2. 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	3887.50	3885.00	-5.1	-40.2	-13.0	27.2
WB	3 dB > AGC	upper	3887.50	3885.00	-1.8	-40.3	-13.0	27.3
NB	0.3 dB < AGC	upper	3889.80	3889.60	-4.3	-39.9	-13.0	26.9
NB	3 dB > AGC	upper	3889.80	3889.60	-1.0	-39.9	-13.0	26.9
WB	0.3 dB < AGC	lower	3792.50	3795.00	-5.9	-39.9	-13.0	26.9
WB	3 dB > AGC	lower	3792.50	3795.00	-2.6	-40.1	-13.0	27.1
NB	0.3 dB < AGC	lower	3790.20	3790.40	-4.7	-39.1	-13.0	26.1
NB	3 dB > AGC	lower	3790.20	3790.40	-1.4	-39.9	-13.0	26.9

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C-Band. 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 1	0.3 dB < AGC	upper	3977.50	-5.5	-42.4	-13.0	29.4
Wideband 1	3 dB > AGC	upper	3977.50	-2.2	-43.0	-13.0	30.0
Wideband 2	0.3 dB < AGC	upper	3930.00	-4.1	-41.0	-23.0	18.0
Wideband 2	3 dB > AGC	upper	3930.00	0.8	-41.1	-23.0	18.1
Narrowband	0.3 dB < AGC	upper	3979.80	-3.9	-38.2	-13.0	25.2
Narrowband	3 dB > AGC	upper	3979.80	-0.6	-38.6	-13.0	25.6
Wideband 1	0.3 dB < AGC	lower	3882.50	-5.5	-42.6	-13.0	29.6
Wideband 1	3 dB > AGC	lower	3882.50	-2.2	-42.9	-13.0	29.9
Wideband 2	0.3 dB < AGC	lower	3930.00	-4.1	-41.1	-23.0	18.1
Wideband 2	3 dB > AGC	lower	3930.00	0.8	-40.9	-23.0	17.9
Narrowband	0.3 dB < AGC	lower	3880.20	-4.5	-36.7	-13.0	23.7
Narrowband	3 dB > AGC	lower	3880.20	-1.2	-37.2	-13.0	24.2

C-Band. 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	-1.2	-44.0	-13.0	31.0
WB	3 dB > AGC	upper	3977.50	3975.00	-5.5	-44.0	-13.0	31.0
NB	0.3 dB < AGC	upper	3979.80	3979.60	-2.2	-40.5	-13.0	27.5
NB	3 dB > AGC	upper	3979.80	3979.60	-4.3	-43.9	-13.0	30.9
WB	0.3 dB < AGC	lower	3882.50	3885.00	-1.0	-43.9	-13.0	30.9
WB	3 dB > AGC	lower	3882.50	3885.00	-5.5	-43.8	-13.0	30.8
NB	0.3 dB < AGC	lower	3880.20	3880.40	-2.2	-39.4	-13.0	26.4
NB	3 dB > AGC	lower	3880.20	3880.40	-4.5	-40.0	-13.0	27.0

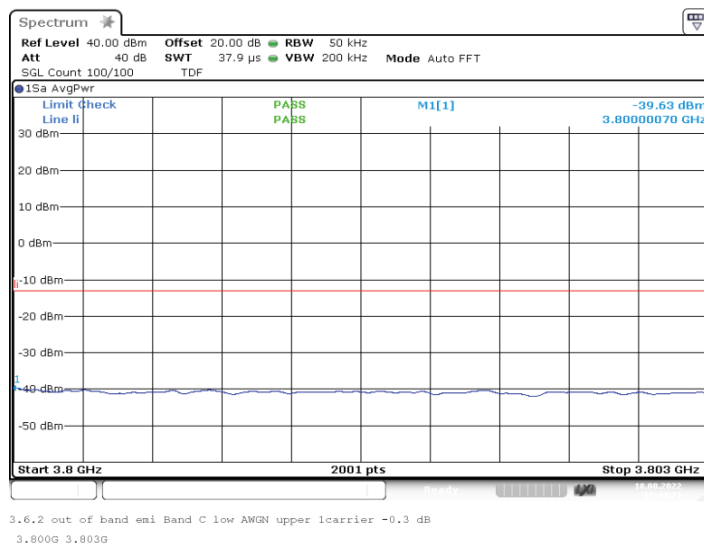
Remark: Please see next sub-clause for the measurement plot.

The test results relate only to the tested item. The sample has been provided by the client.

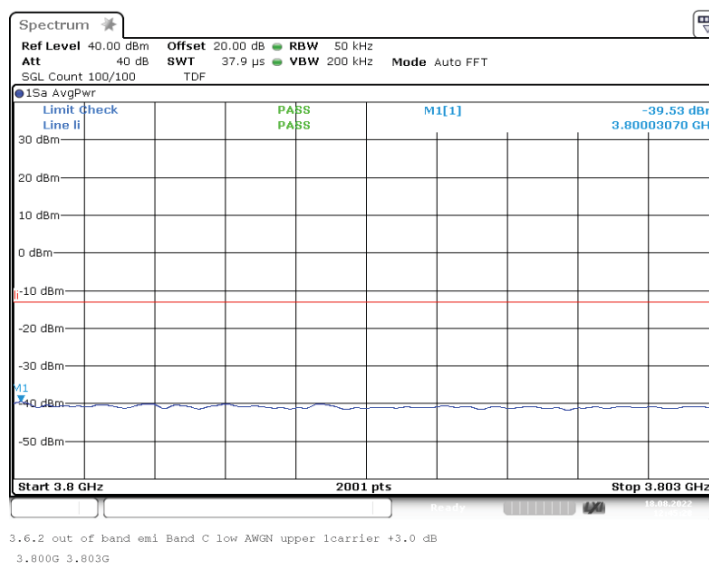
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4.5.4 MEASUREMENT PLOT

Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 1



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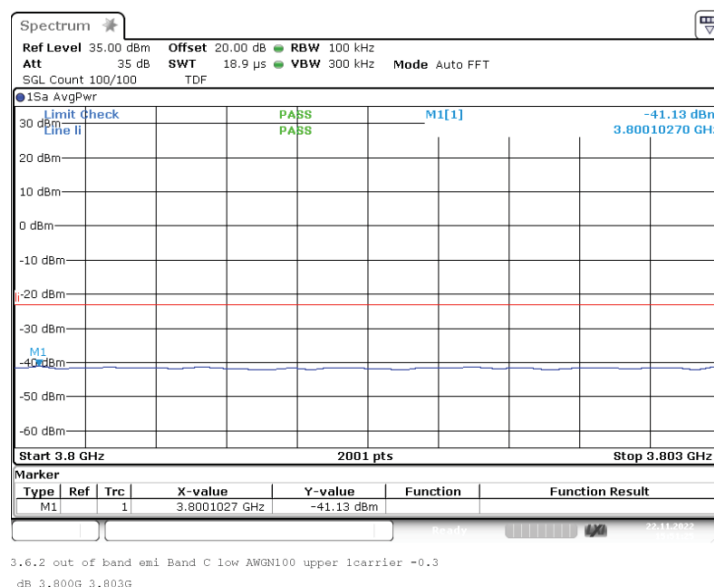


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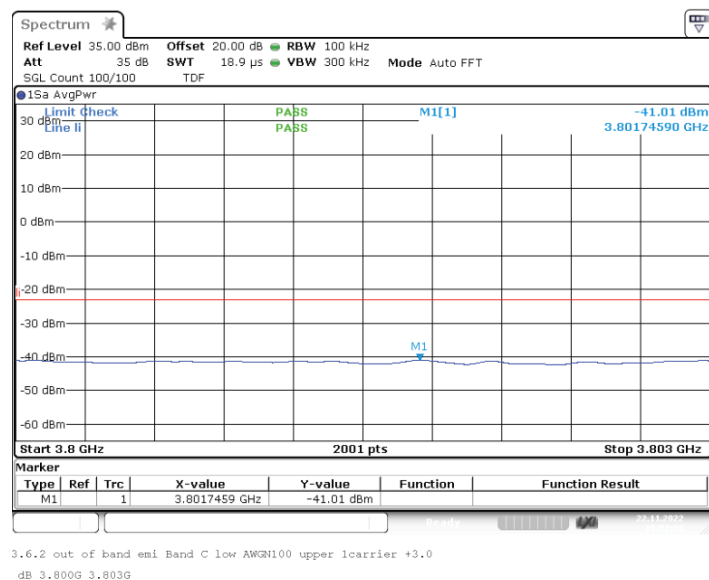
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Wideband 2;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Wideband 2;
Input Power = 3 dB > AGC; Number of signals 1



The test results relate only to the tested item. The sample has been provided by the client.

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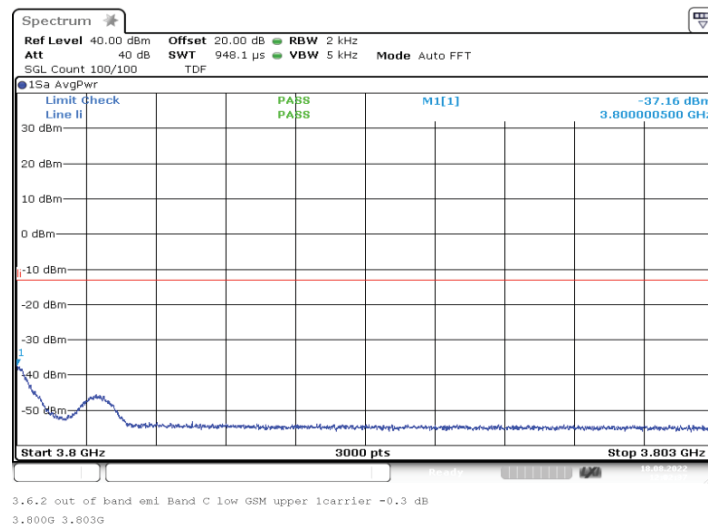


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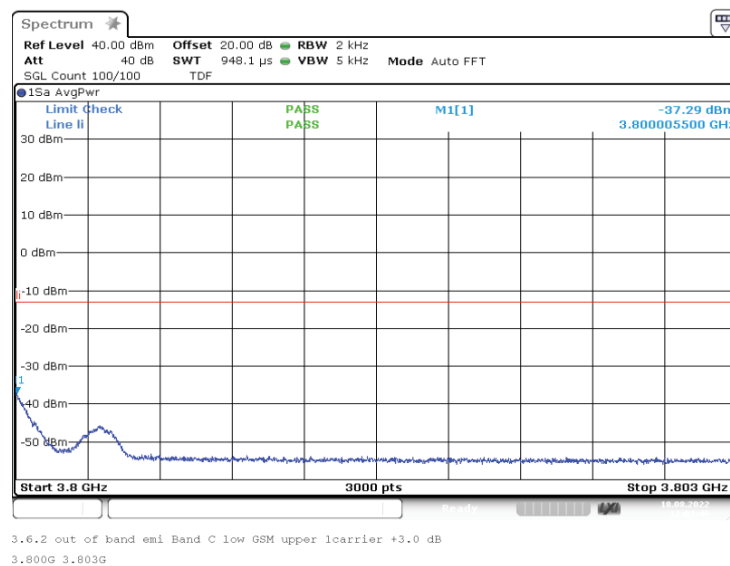
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 1



The test results relate only to the tested item. The sample has been provided by the client.
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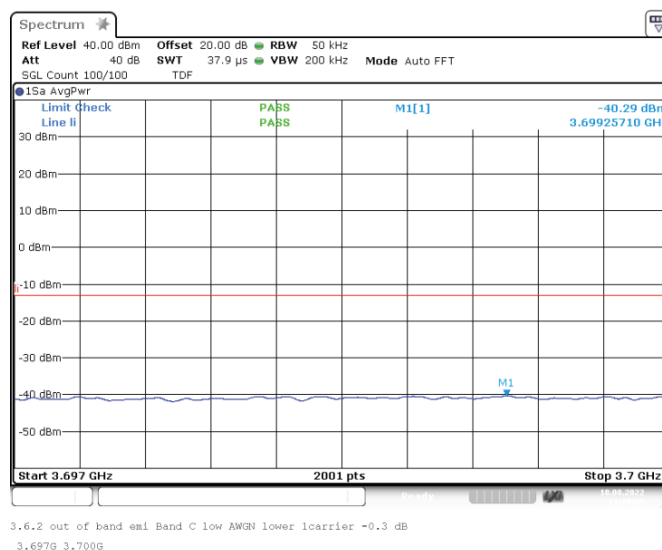


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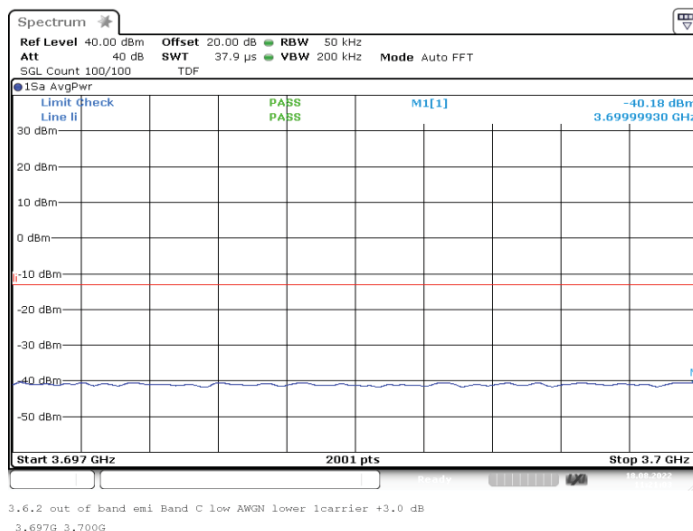
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 1



The test results relate only to the tested item. The sample has been provided by the client.
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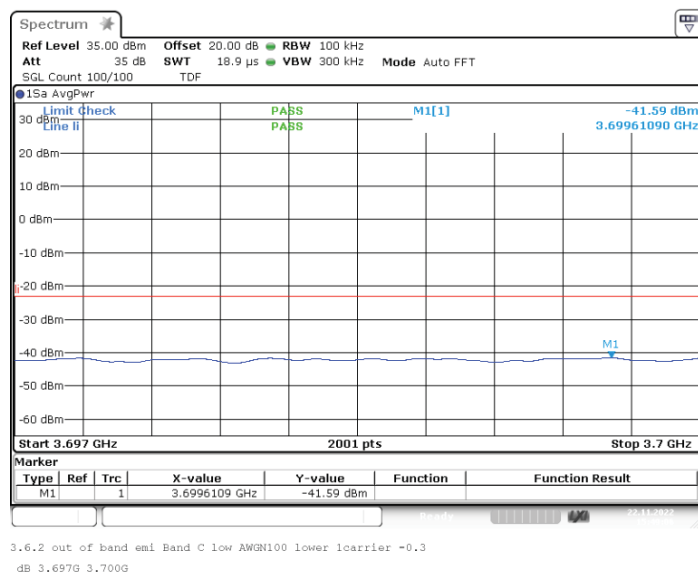


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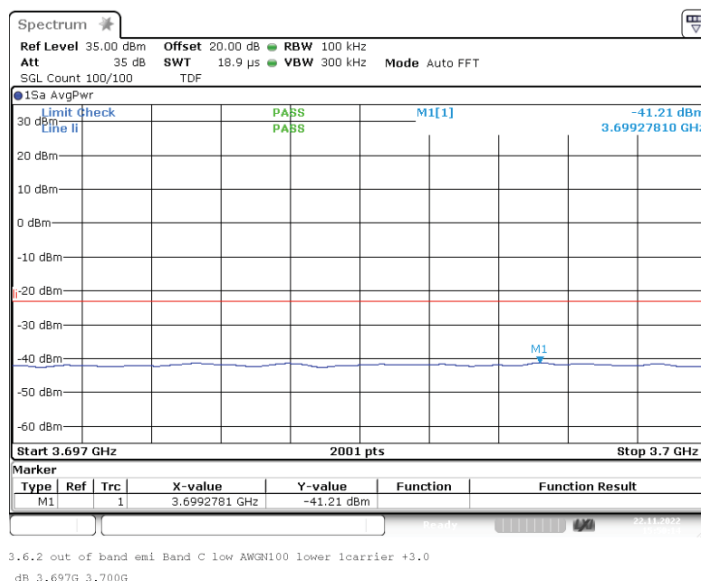
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Wideband 2;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Wideband 2;
Input Power = 3 dB > AGC; Number of signals 1



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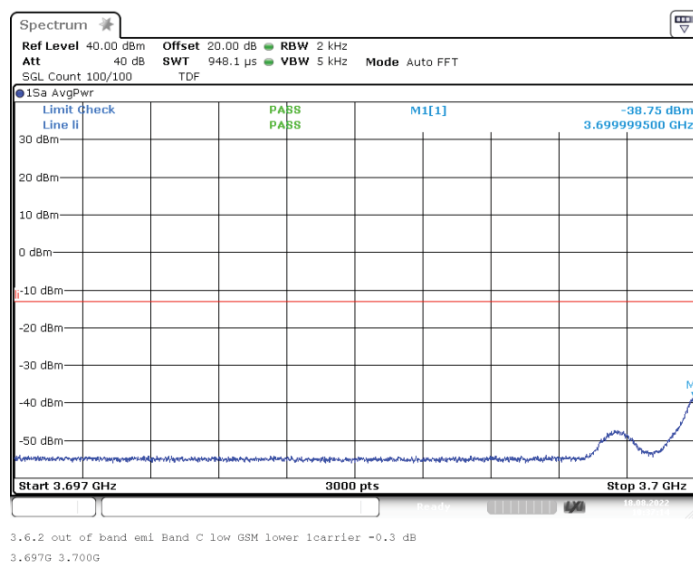


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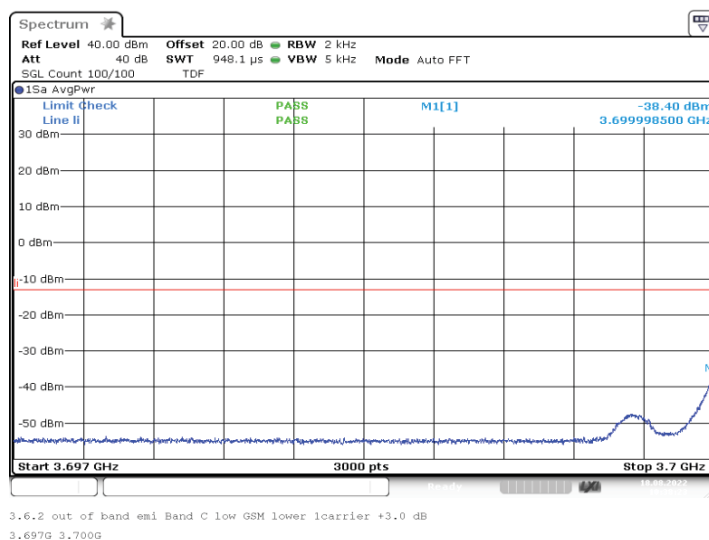
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 1



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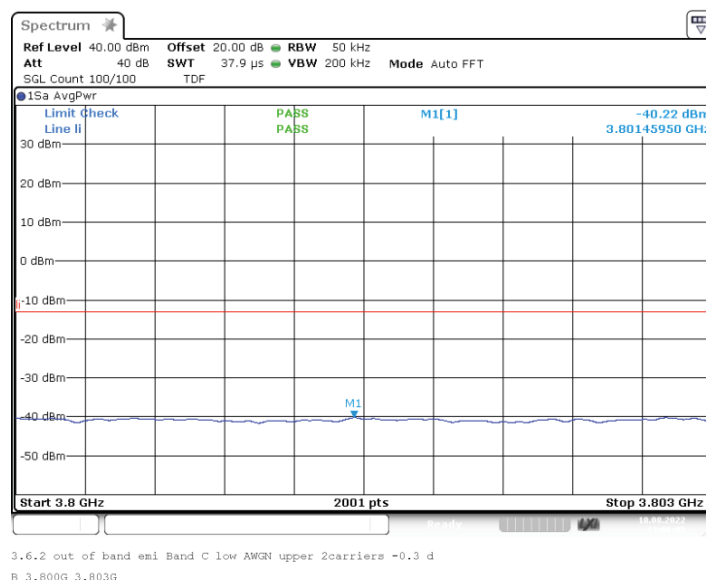


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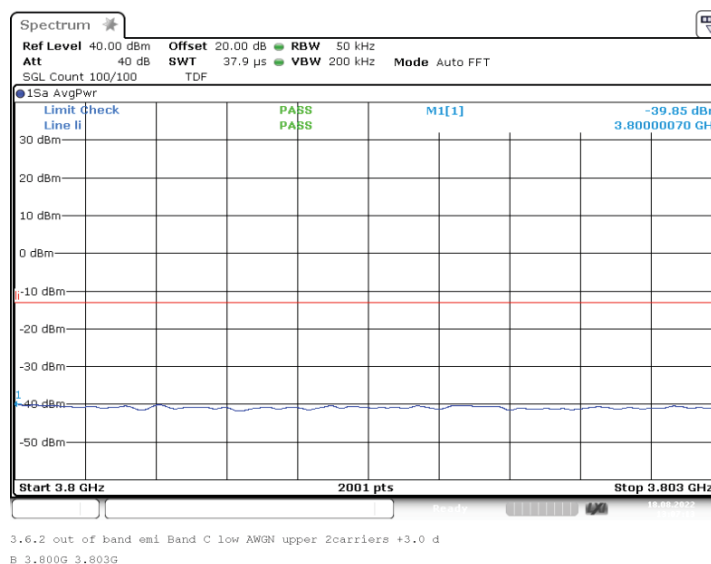
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 2

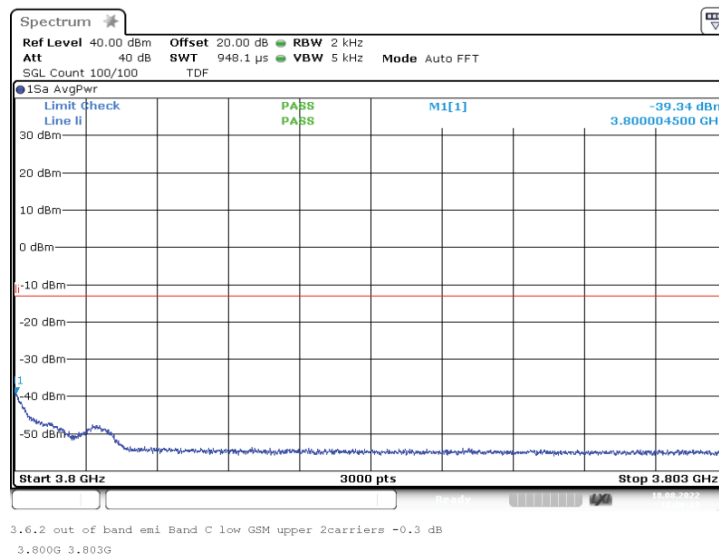


Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 2

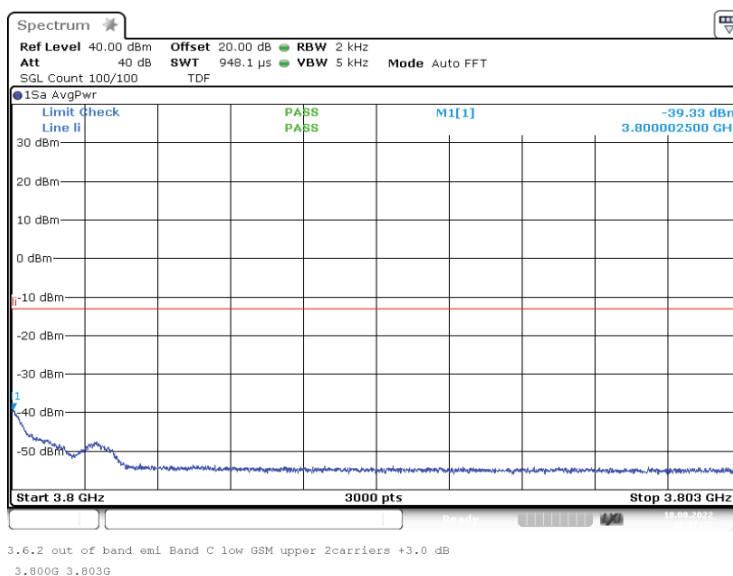


The test results relate only to the tested item. The sample has been provided by the client.
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Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 2



Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 2



The test results relate only to the tested item. The sample has been provided by the client.
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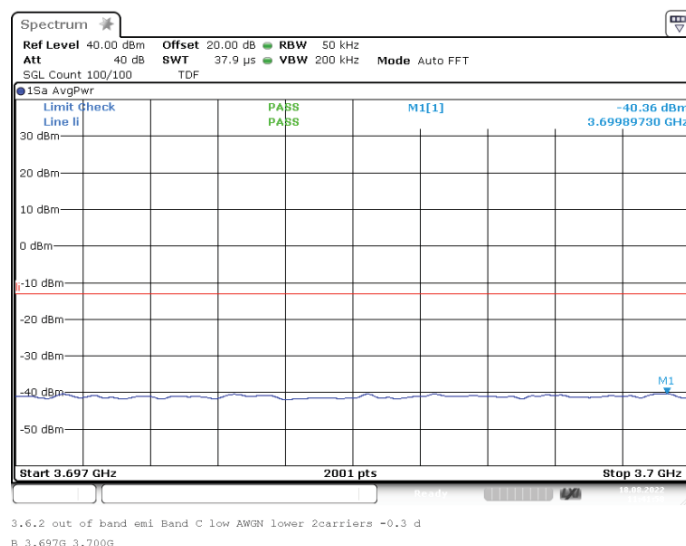


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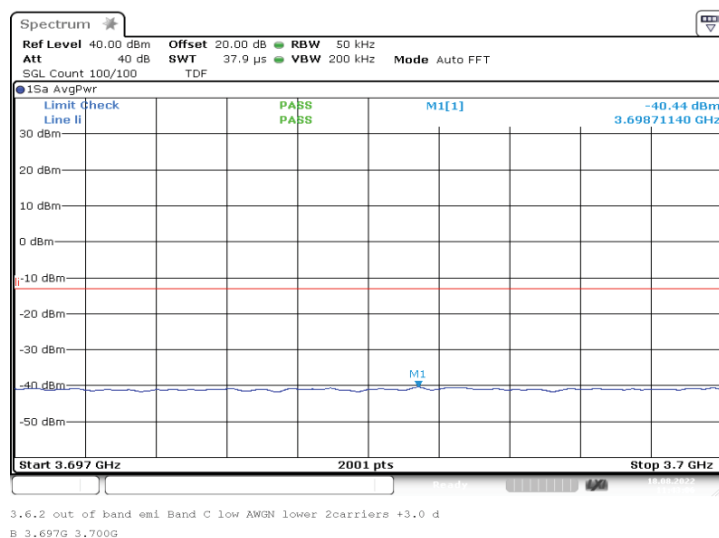
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 2



Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 2



The test results relate only to the tested item. The sample has been provided by the client.
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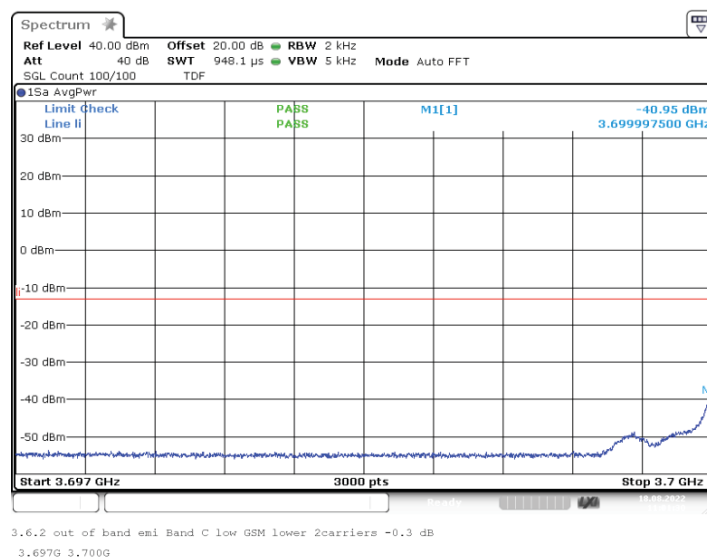


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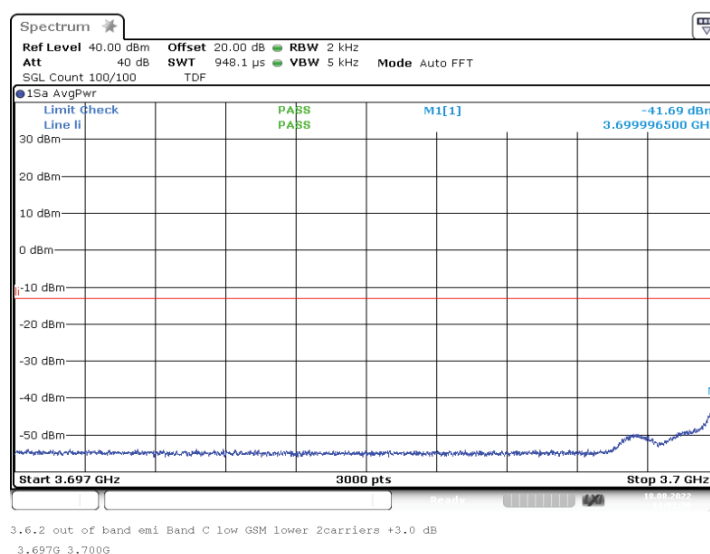
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 2



Band C. Segment 1; Frequency: 3.7000 GHz to 3.8000 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 2



The test results relate only to the tested item. The sample has been provided by the client.
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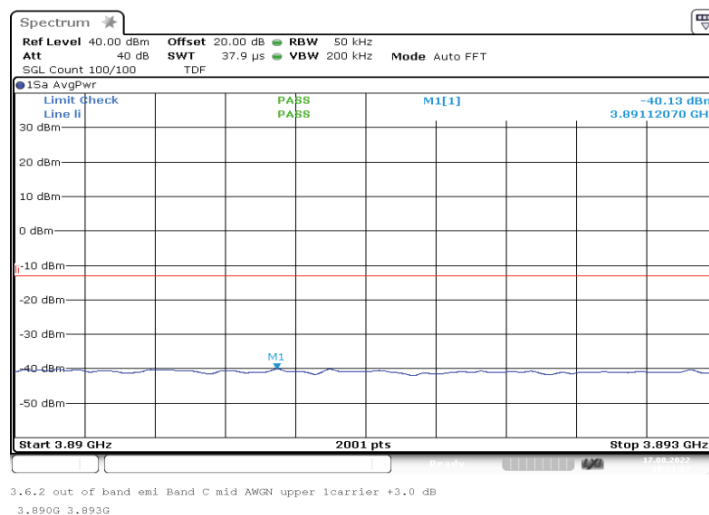
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 1



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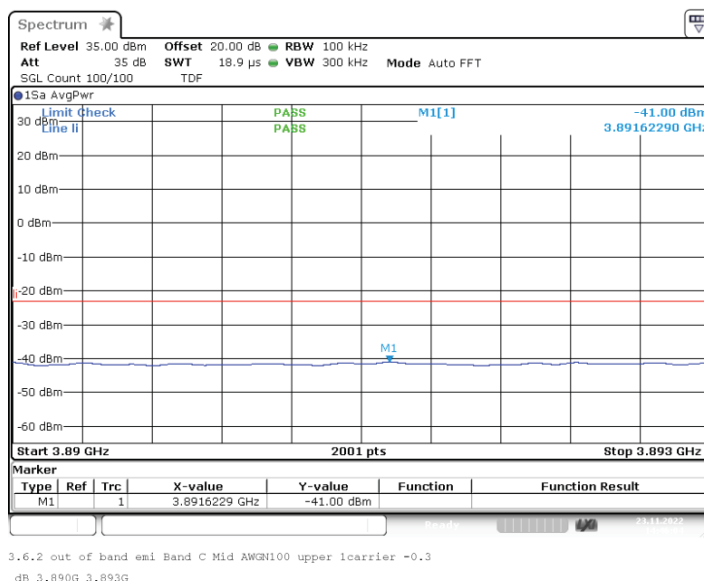


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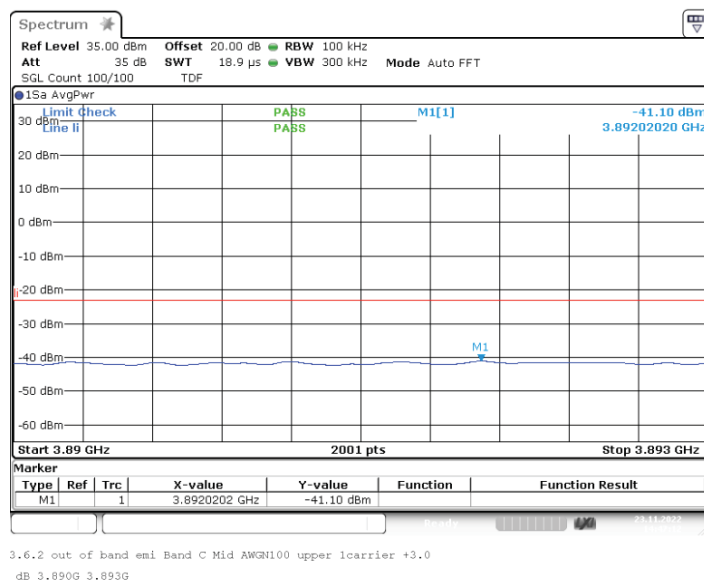
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

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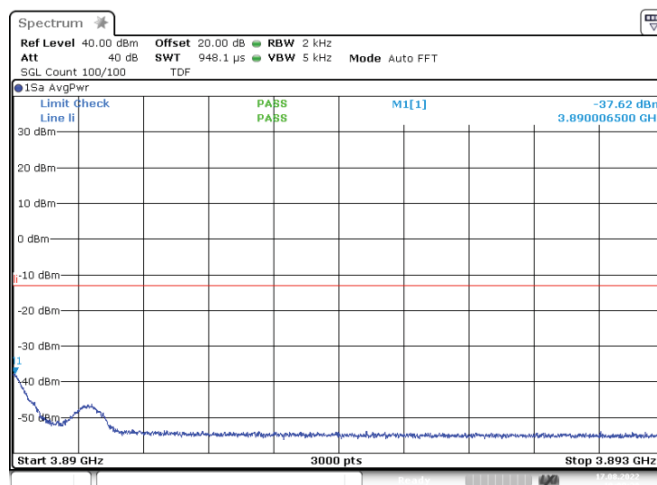


Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: Wideband 2;
Input Power = 3 dB > AGC; Number of signals 1



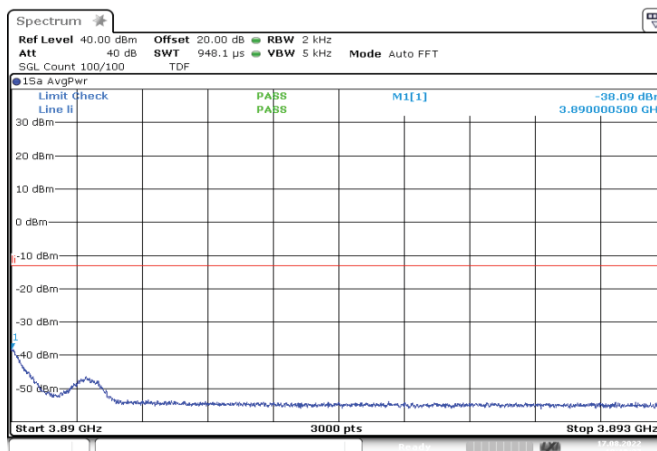
The test results relate only to the tested item. The sample has been provided by the client.
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Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 1



3.6,2 out of band emi Band C mid GSM upper lcarrier -0.3 dB
3.8900 3.8930

Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 1



3.6,2 out of band emi Band C mid GSM upper lcarrier +3.0 dB
3.8900 3.8930

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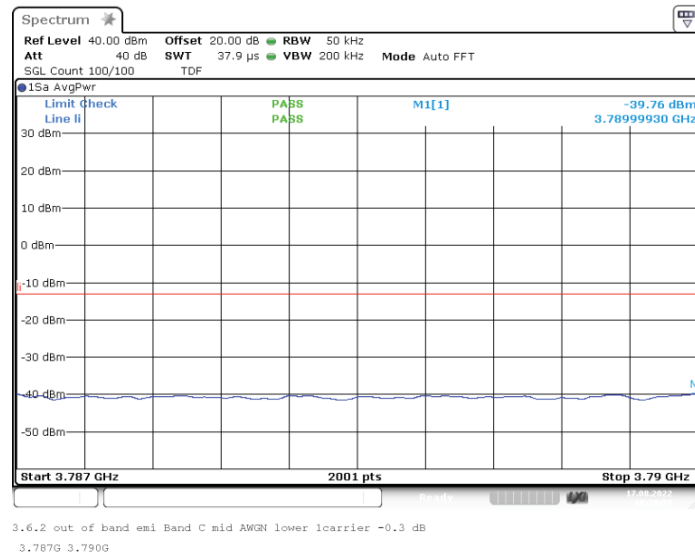


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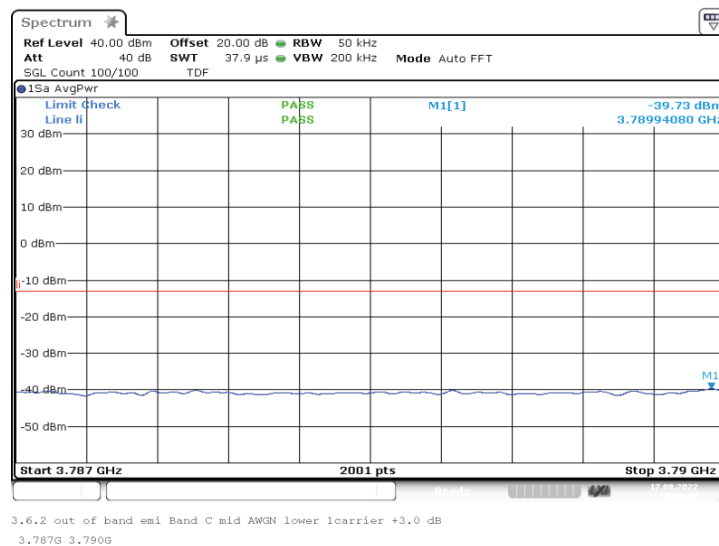
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 1



The test results relate only to the tested item. The sample has been provided by the client.
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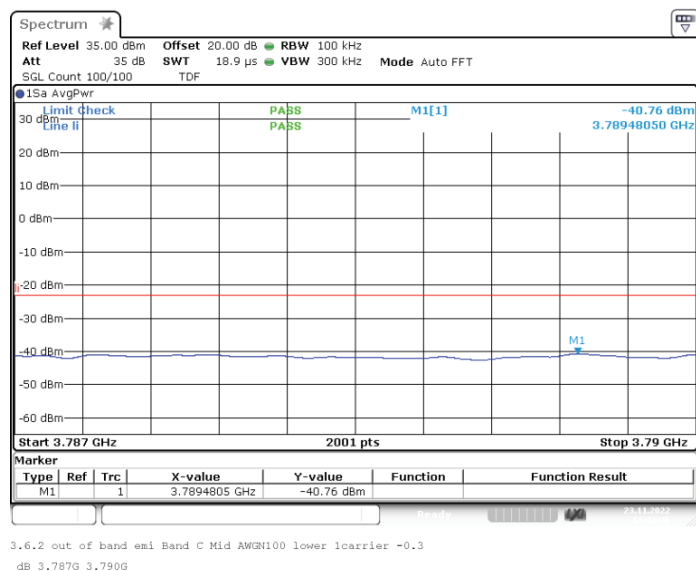


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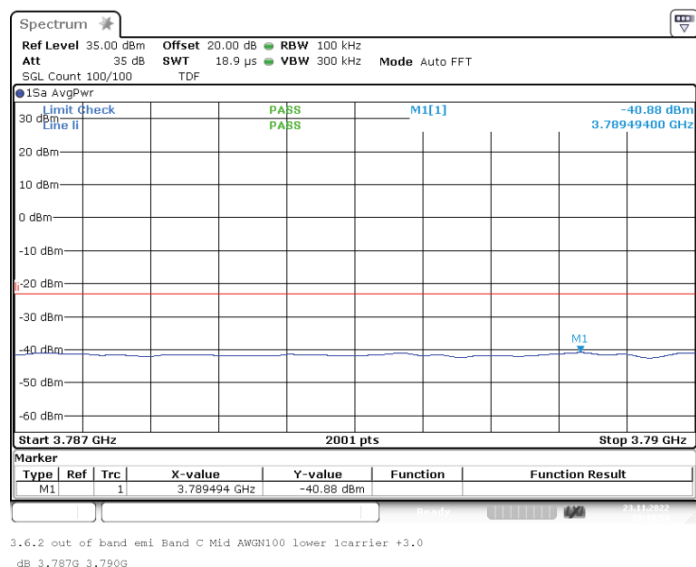
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Wideband 2;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Wideband 2;
Input Power = 3 dB > AGC; Number of signals 1



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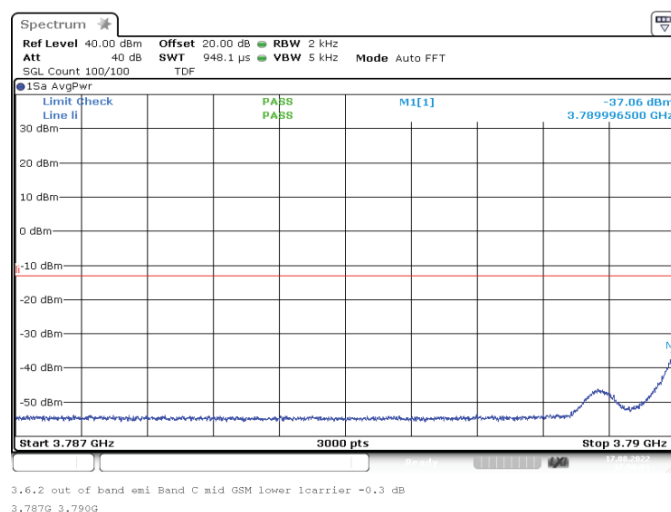


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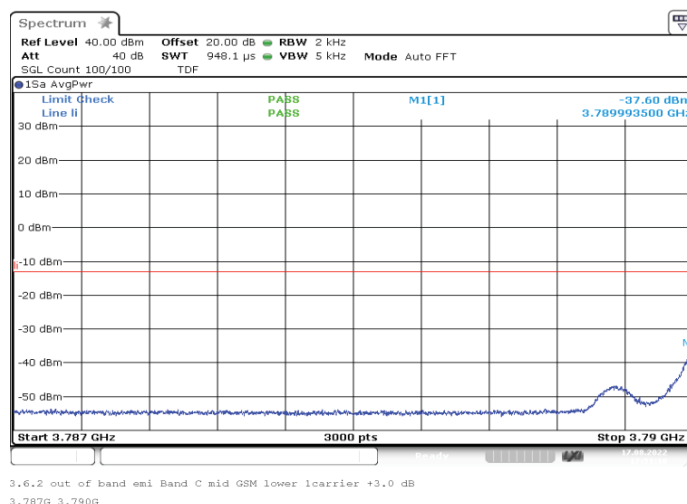
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 1

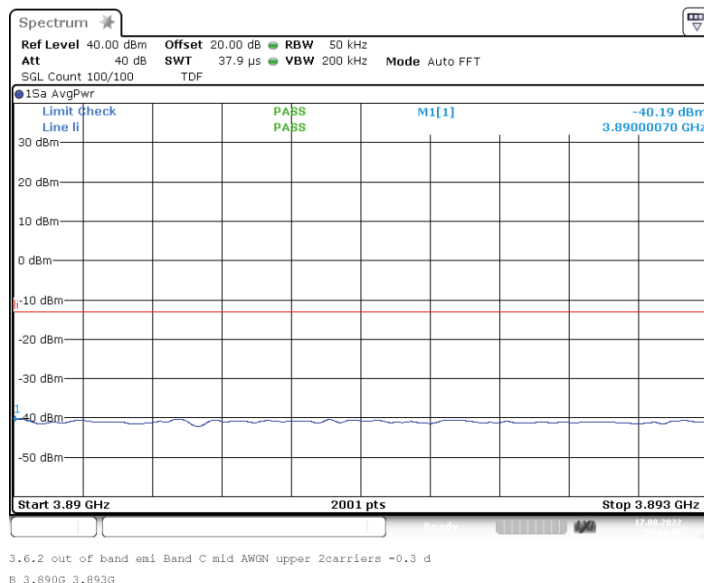


Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 1

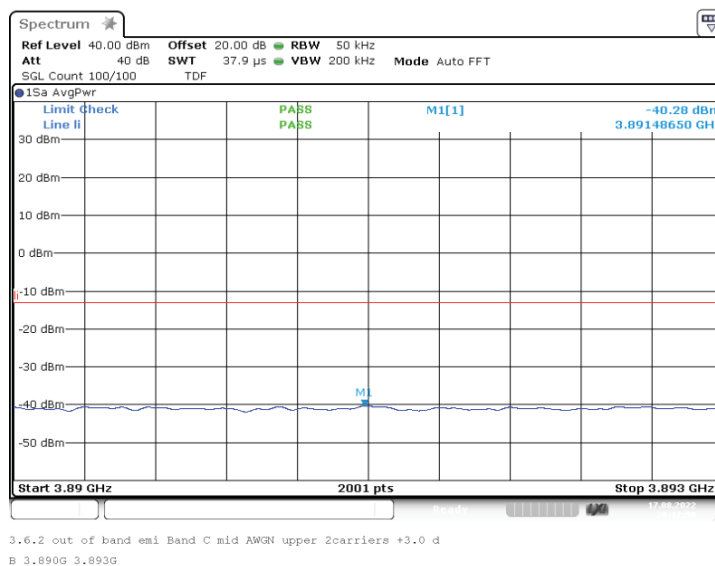


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Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 2

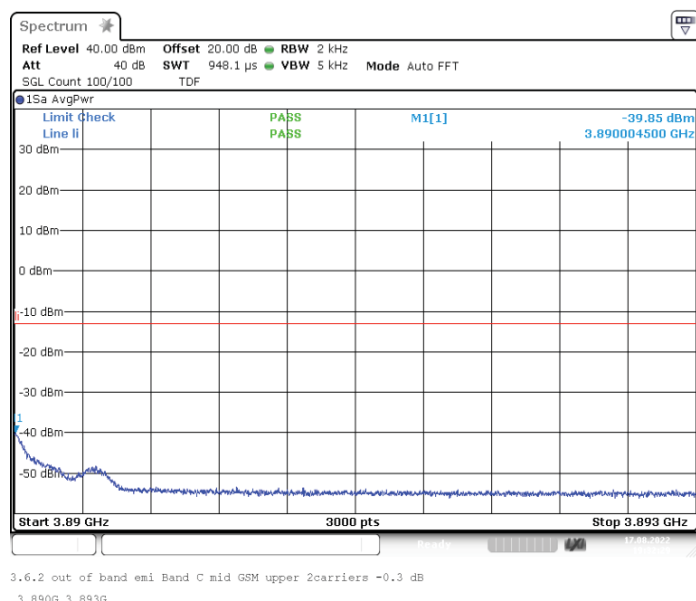


Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 2

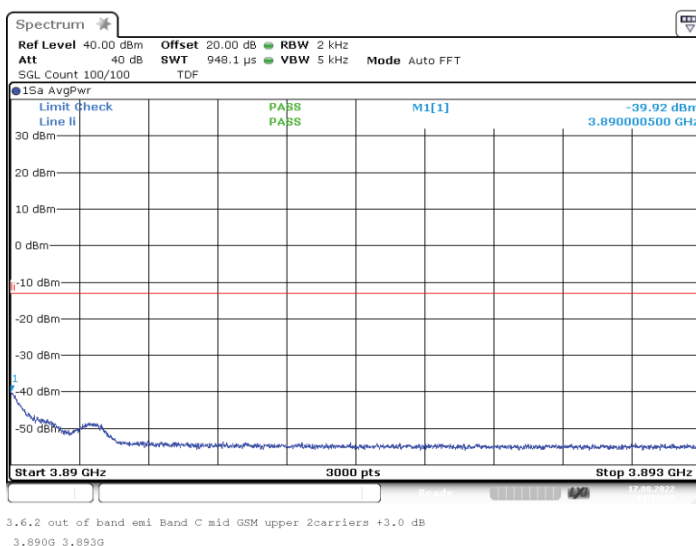


The test results relate only to the tested item. The sample has been provided by the client.
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Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 2



Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 2



The test results relate only to the tested item. The sample has been provided by the client.
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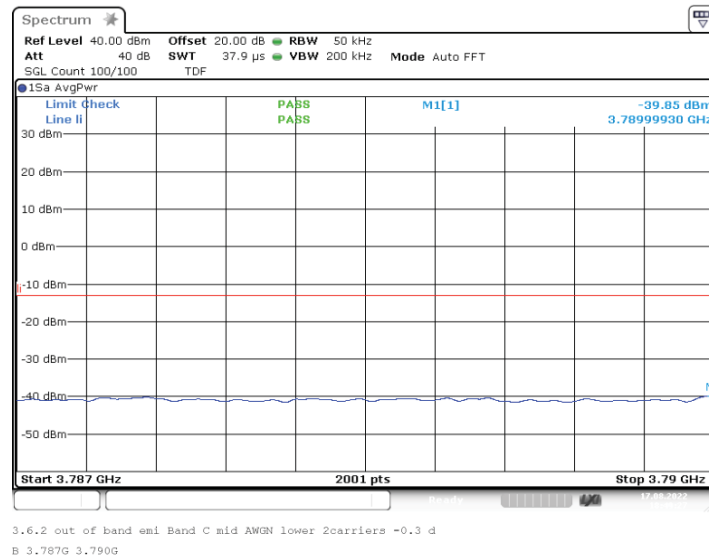


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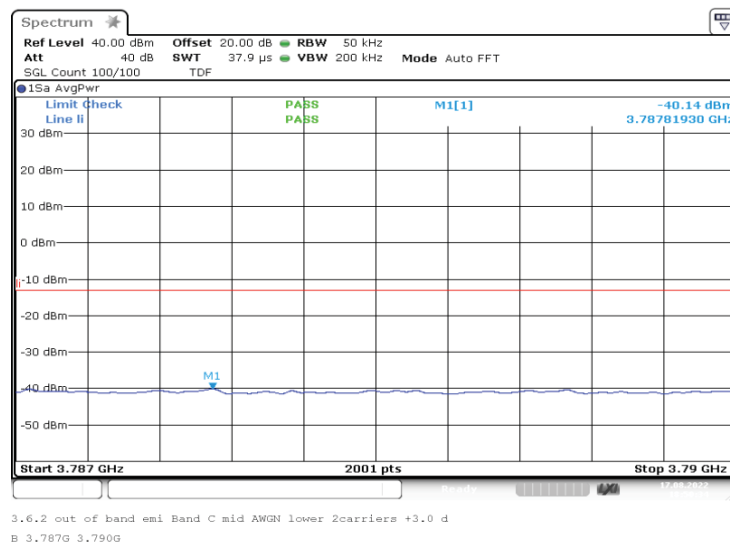
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 2

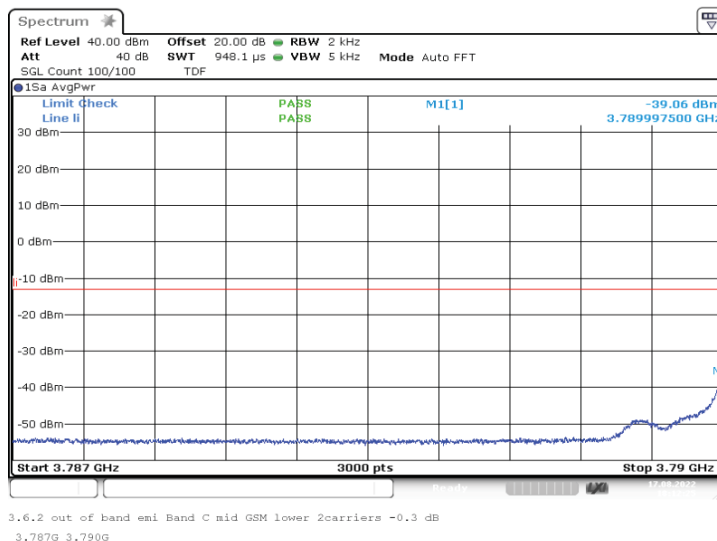


Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 2

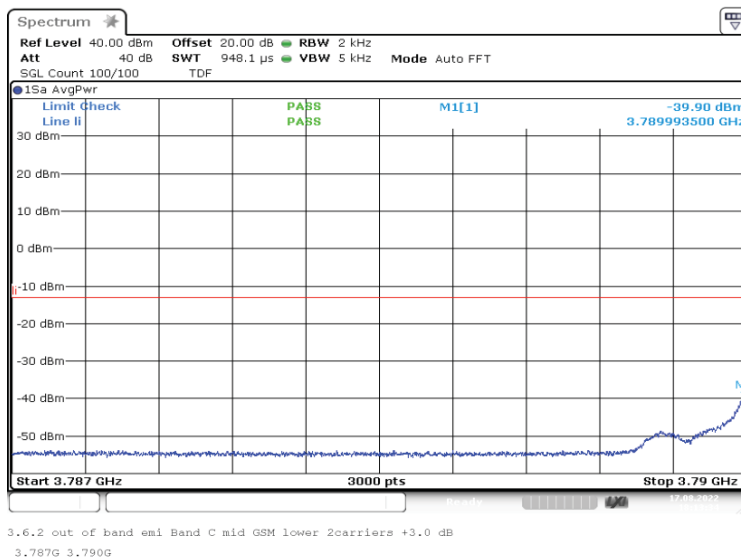


The test results relate only to the tested item. The sample has been provided by the client.
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Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 2



Band C. Segment 2; Frequency: 3.7900 GHz to 3.8900 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 2



The test results relate only to the tested item. The sample has been provided by the client.
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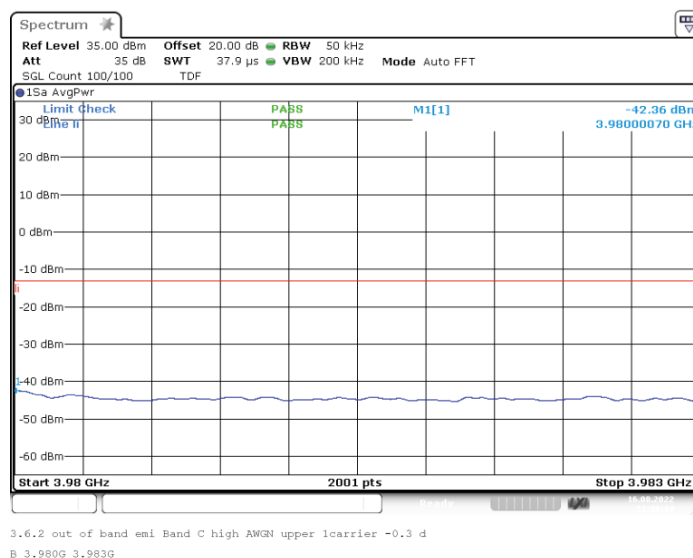


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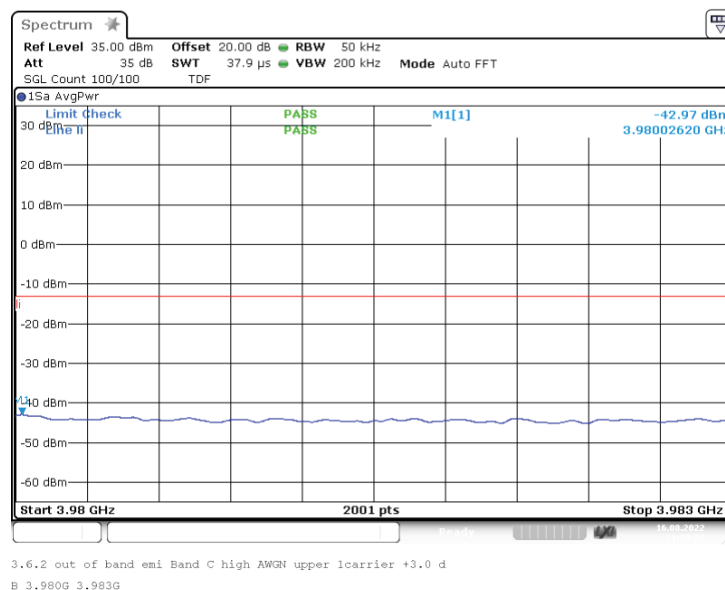
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 1



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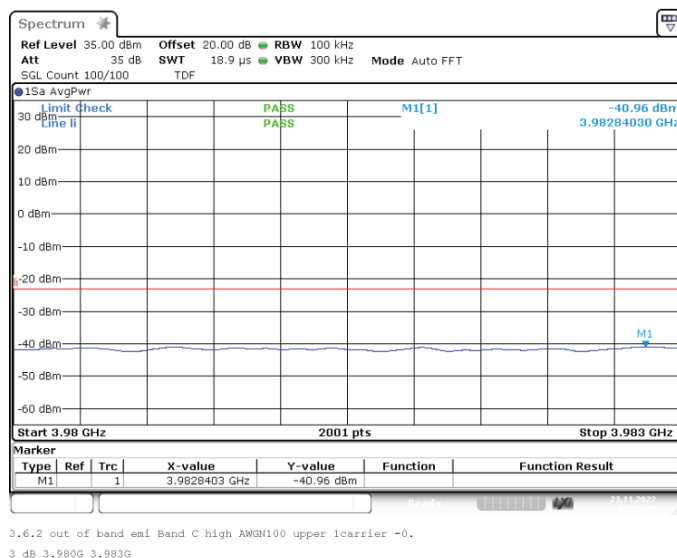


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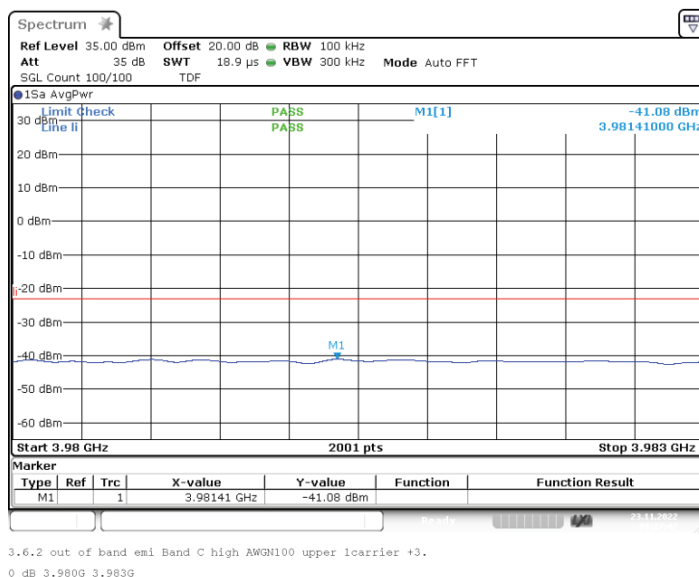
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Wideband 2;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Wideband 2;
Input Power = 3 dB > AGC; Number of signals 1



The test results relate only to the tested item. The sample has been provided by the client.
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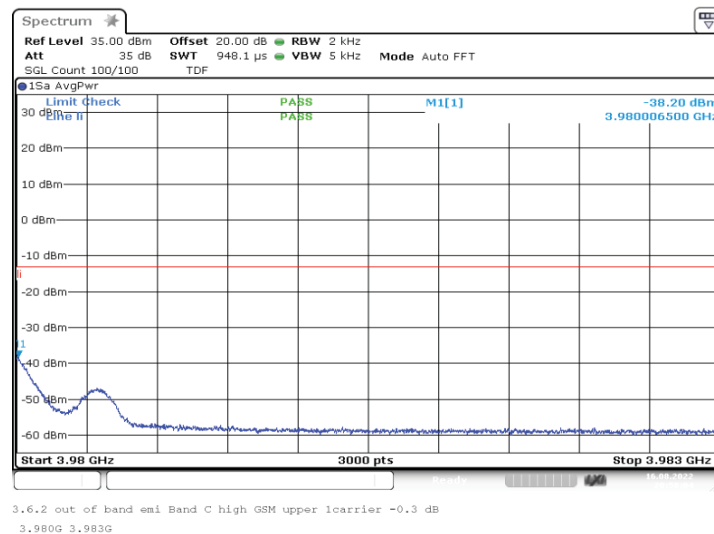


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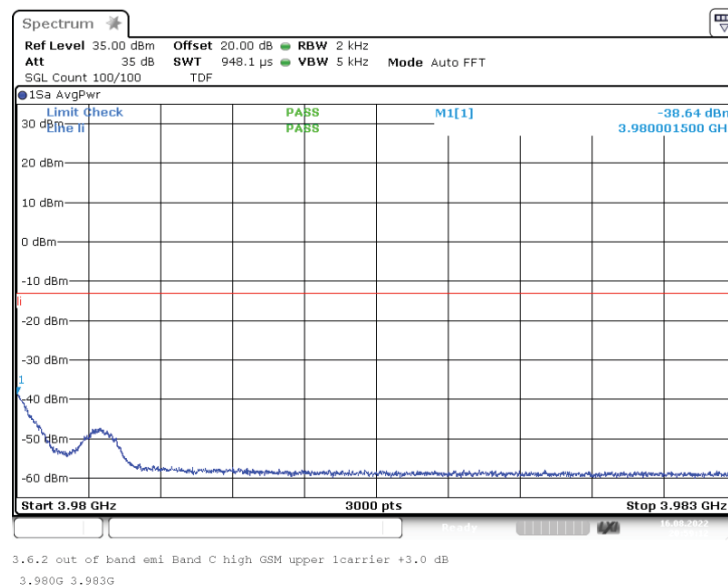
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 1



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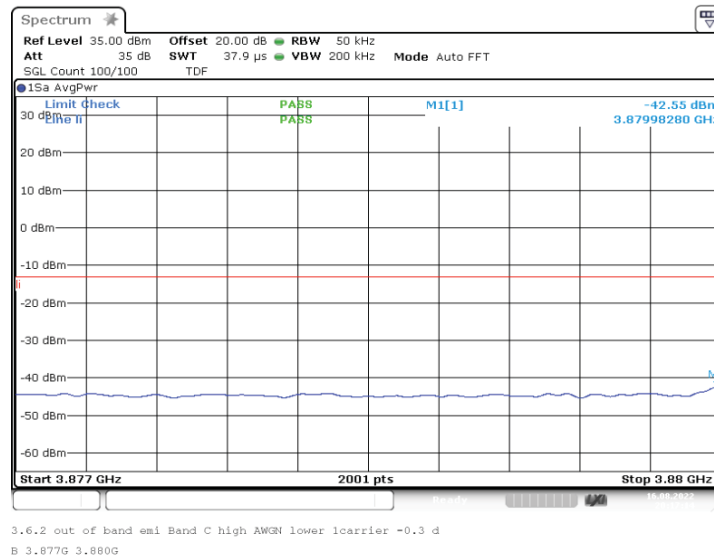


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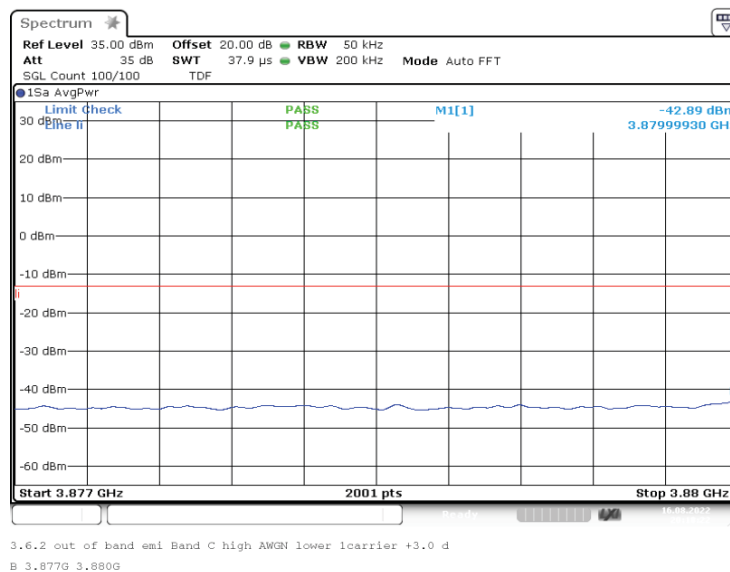
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 1



The test results relate only to the tested item. The sample has been provided by the client.
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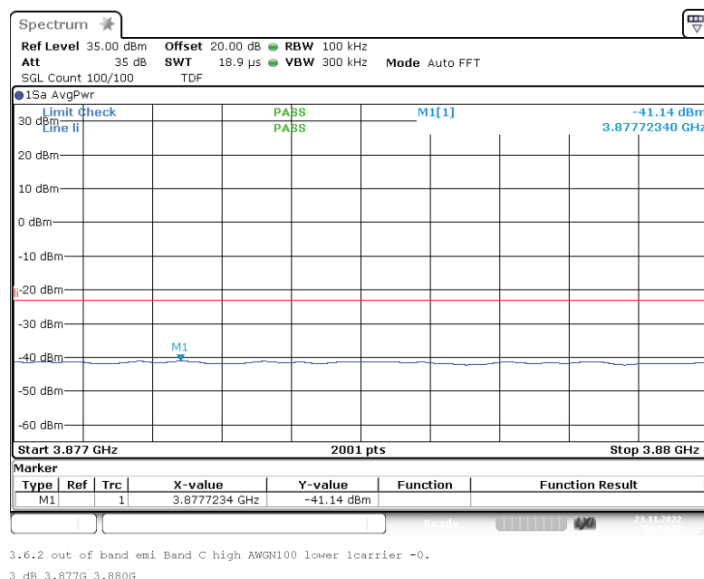


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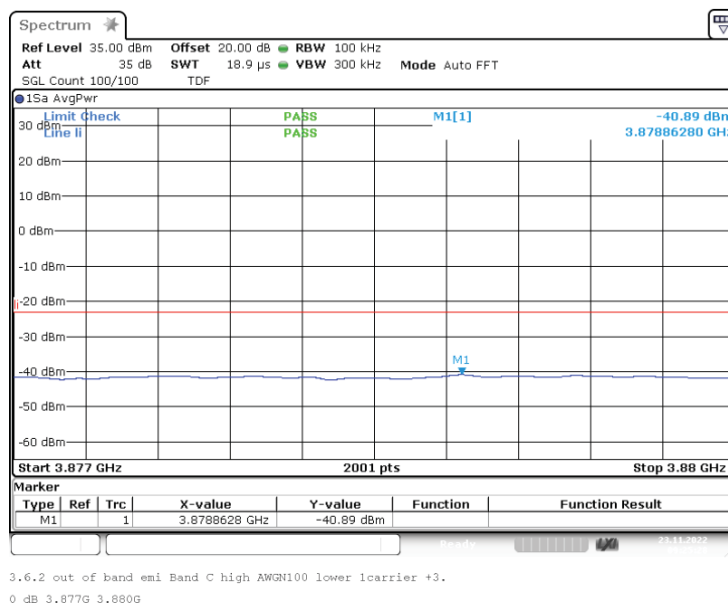
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Wideband 2;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Wideband 2;
Input Power = 3 dB > AGC; Number of signals 1



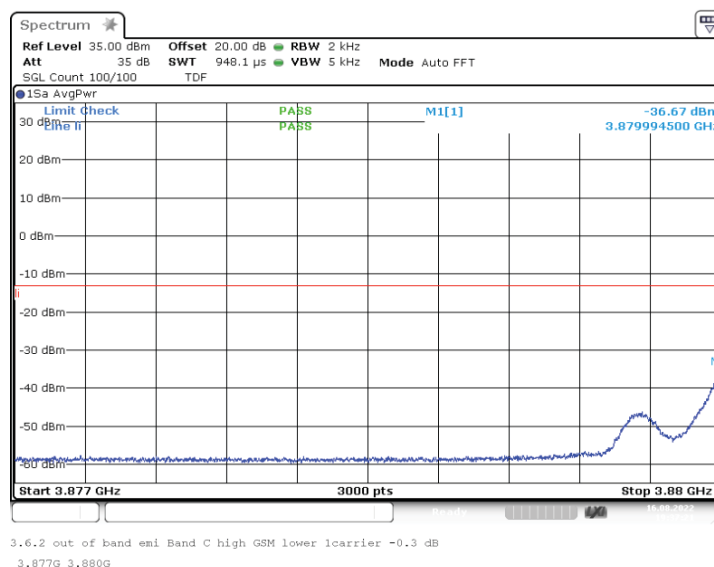
The test results relate only to the tested item. The sample has been provided by the client.

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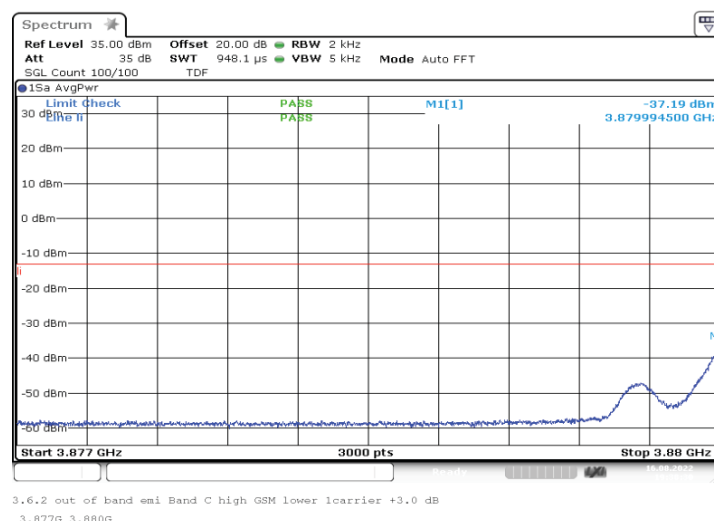
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 1



Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 1



The test results relate only to the tested item. The sample has been provided by the client.
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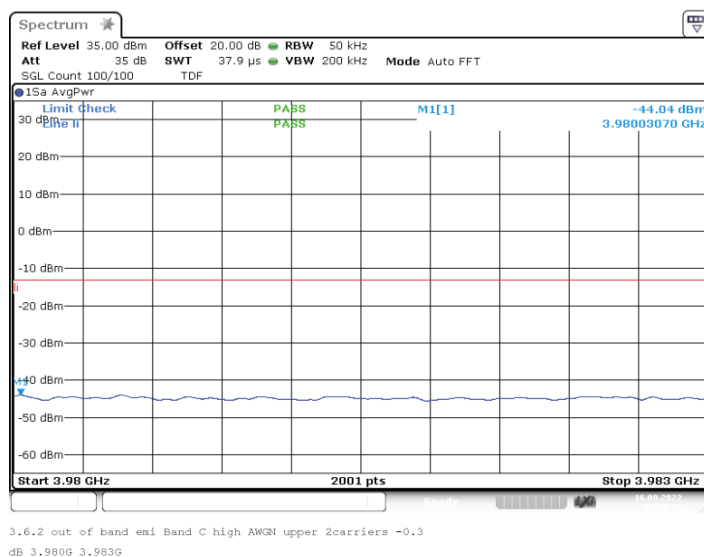


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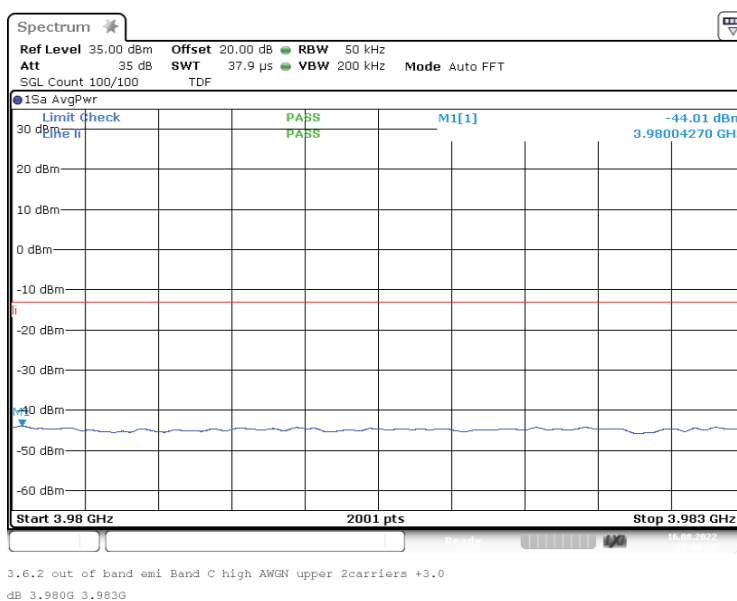
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 2

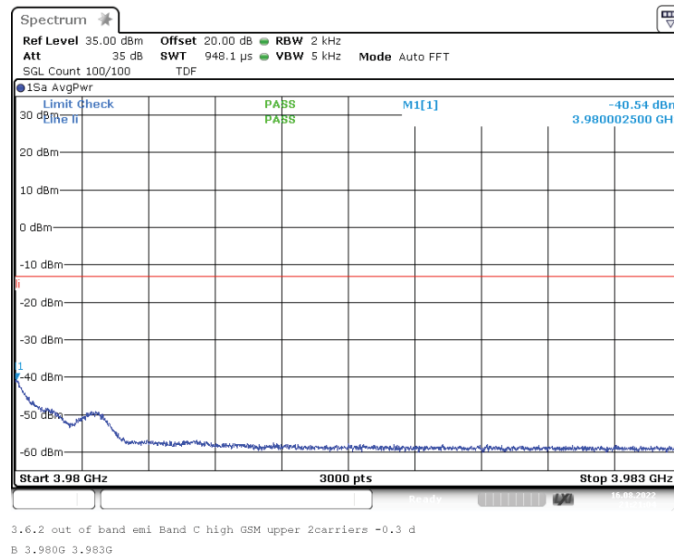


Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 2

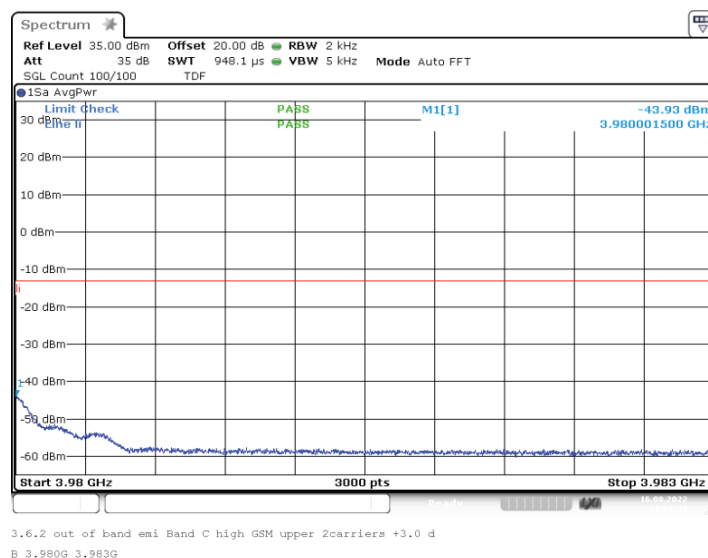


The test results relate only to the tested item. The sample has been provided by the client.
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Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 2



Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: upper; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 2



The test results relate only to the tested item. The sample has been provided by the client.
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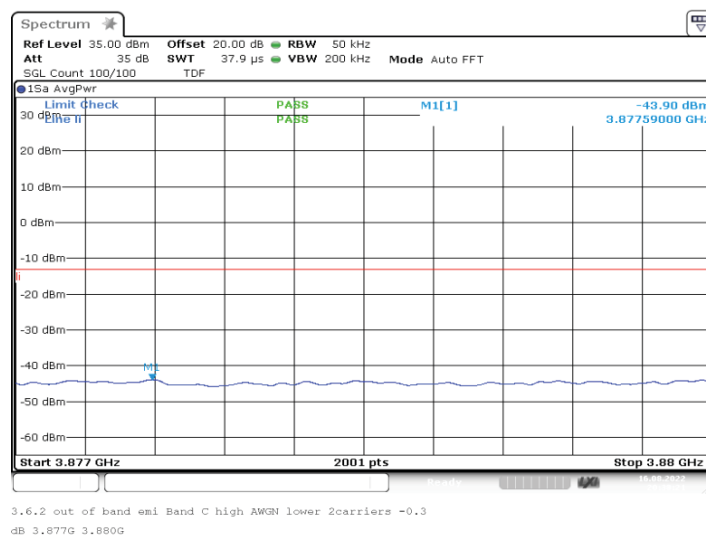


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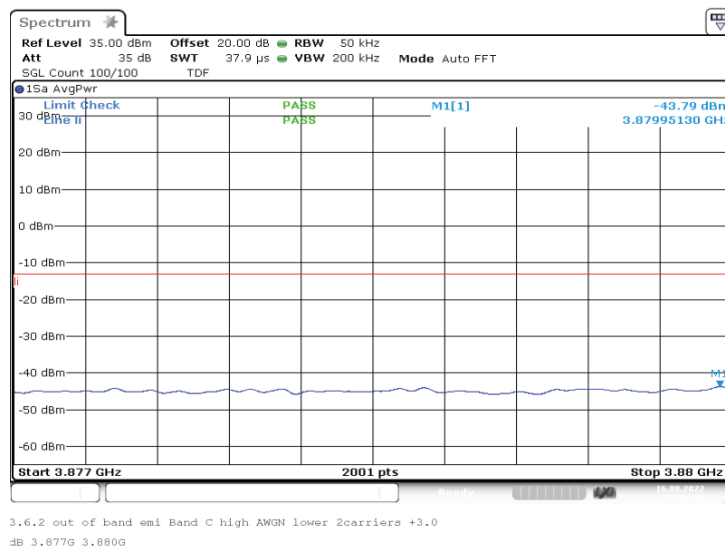
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 0.3 dB < AGC; Number of signals 2



Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Wideband 1;
Input Power = 3 dB > AGC; Number of signals 2

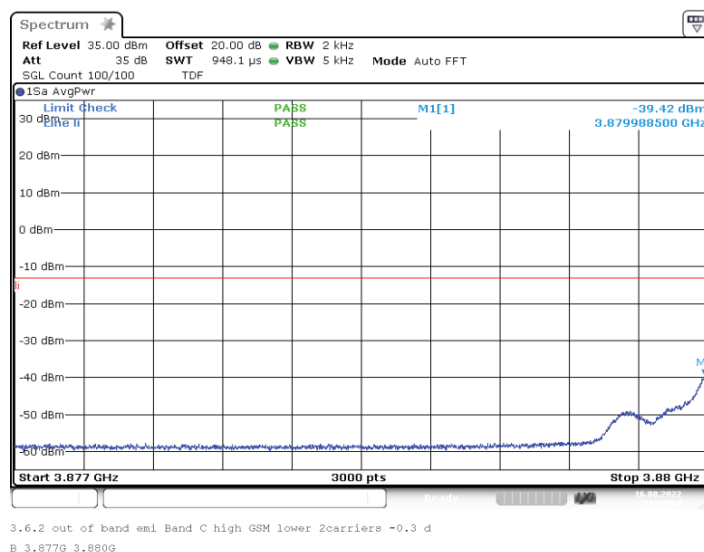


The test results relate only to the tested item. The sample has been provided by the client.
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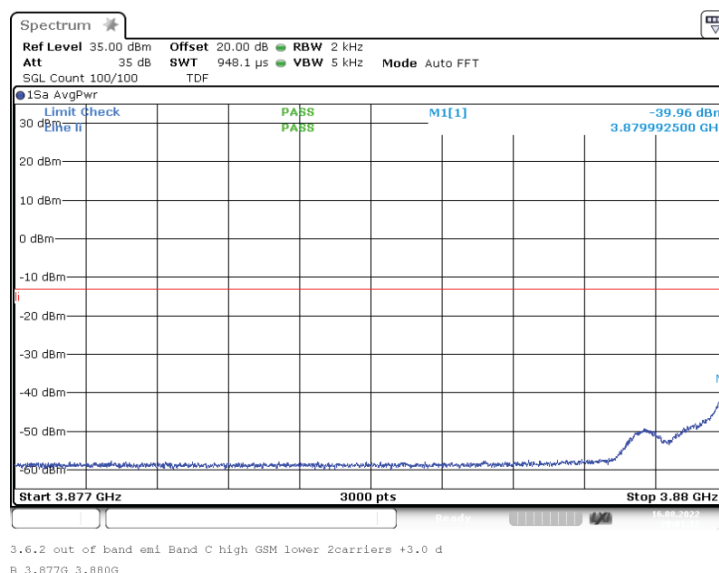
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 0.3 dB < AGC; Number of signals 2



Band C. Segment 3; Frequency: 3.8800 GHz to 3.9800 GHz; Band Edge: lower; Mod: Narrowband;
Input Power = 3 dB > AGC; Number of signals 2



4.5.5 TEST EQUIPMENT USED

- Conducted

The test results relate only to the tested item. The sample has been provided by the client.
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EMC tests on Andrew CAP L2 C-Band F-DC

4.6 OUT-OF-BAND REJECTION

Standard FCC Part 27

The test was performed according to:
ANSI C63.26

Test date: 2022-09-16 - 2022-09-17

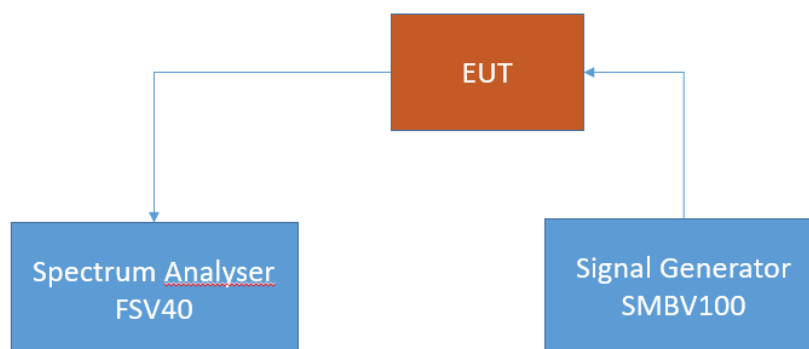
Environmental conditions: 23 ° C ± 5 K; 40 % r. F. ± 20 % r. F.

Test engineer: Thomas Hufnagel. Thomas Gerngroß

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:



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.

4.6.2 TEST REQUIREMENTS/LIMITS

For this test case exists no applicable limit

4.6.3 TEST PROTOCOL

C-Band. 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]
3794.00	12.78	3696.475	3803.725	107.25

C-Band. 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]
3796.30	13.10	3786.275	3893.675	107.40

C-Band. 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]
3886.50	13.16	3876.275	3983.765	107.40

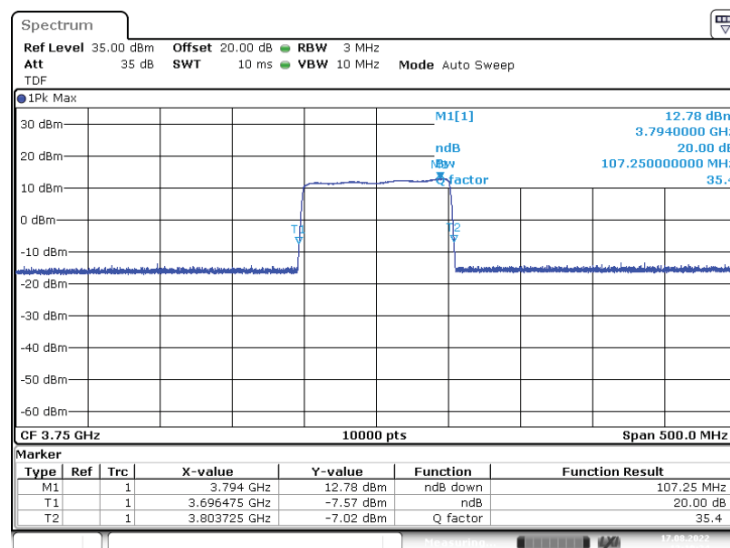
Remark: Please see next sub-clause for the measurement plots.

EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

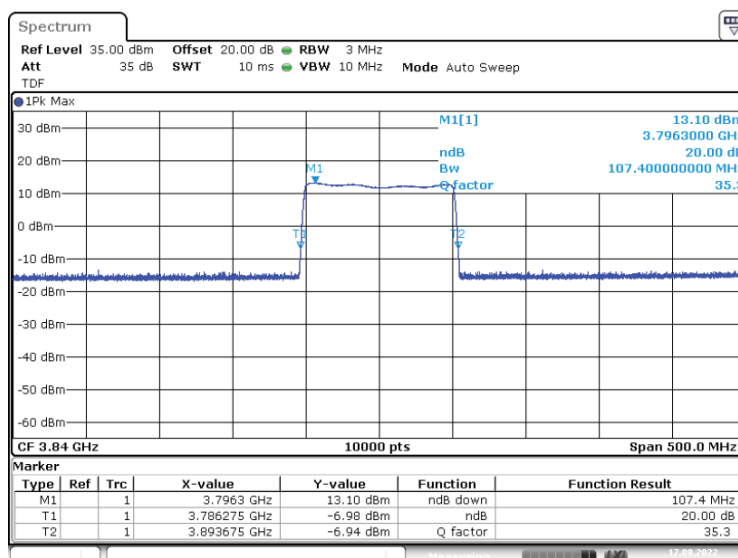
4.6.4 MEASUREMENT PLOTS

Frequency band = C-Band. segment 1. Direction = RF downlink



3.3 Out of band rejection Band C low 3.75000G
 _20dB

Frequency band = C-Band. segment 2. Direction = RF downlink

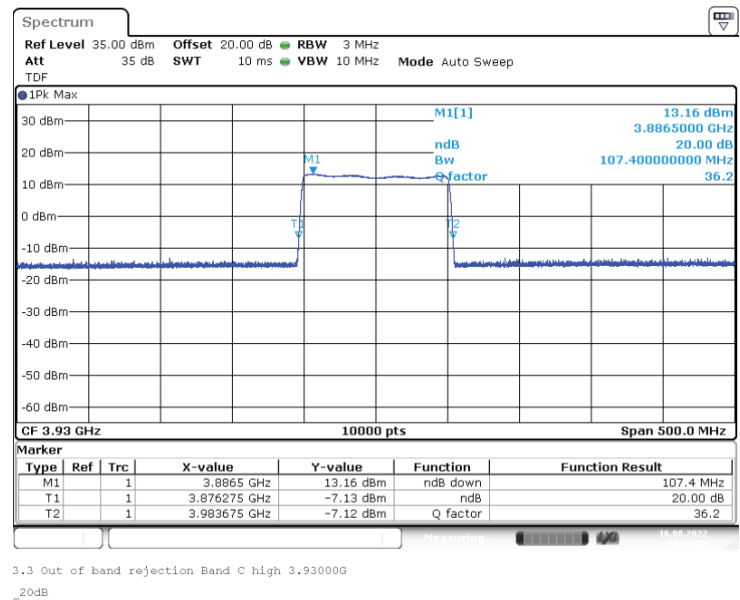


3.3 Out of band rejection Band C mid 3.84000G
 _20dB

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Frequency band = C-Band. segment 3. Direction = RF downlink



4.6.5 TEST EQUIPMENT USED

- Conducted

4.7 FIELD STRENGTH OF SPURIOUS RADIATION

Standard FCC Part 27. §27.53

The test was performed according to:
ANSI C63.26

Test date: 2022-09-20. 2022-09-21

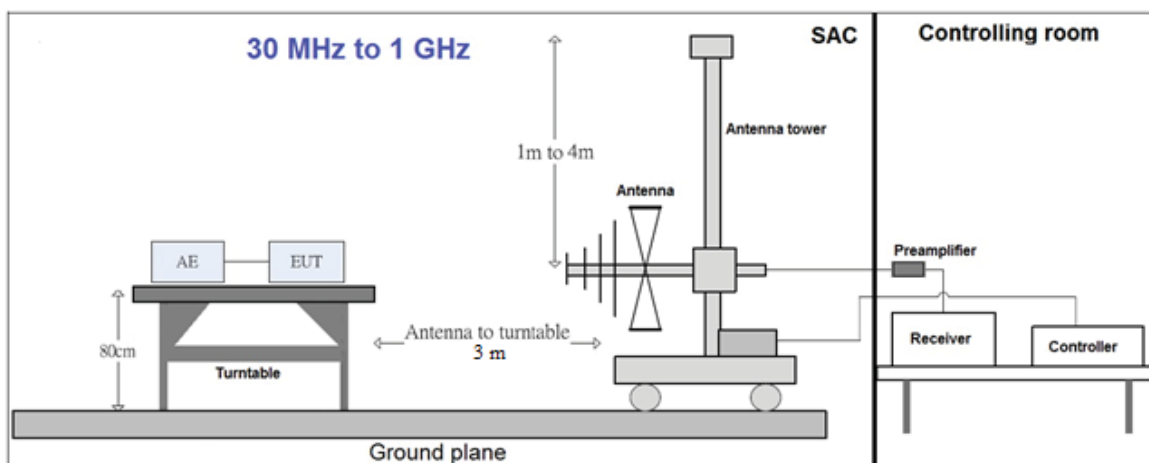
Environmental conditions: 23 ° C $\pm$ 5 K; 40 % r. F. $\pm$ 20 % r. F.

Test engineer: Thomas Hufnagel. Gerhard Gass

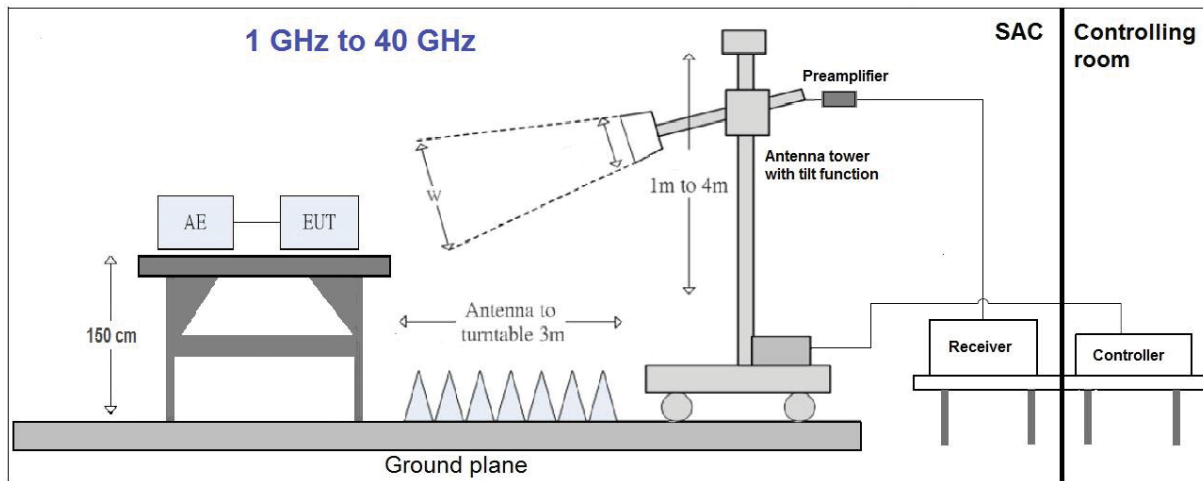
4.7.1 TEST DESCRIPTION

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 results relate only to the tested item. The sample has been provided by the client.
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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 $1.5 \times 1.5 \text{ m}^2$ 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: 120 kHz
- Turntable angle range: -180° to 180°
- Turntable step size: 15°
- Height variation range: 1 – 4 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

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

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 $\pm 45^{\circ}$ 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: 120 kHz
- Turntable angle range: $\pm 30^{\circ}$ 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: 120 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 30 °.

The turn table step size (azimuth angle) for the preliminary measurement is 15 °.

Step 2:

The maximum RFI field strength was determined during the measurement by rotating the turntable (± 180 degrees) and varying the height of the receive antenna ($h = 1 \dots 4$ m) with a additional tilt function of the antenna. The turn table azimuth will slowly vary by $\pm 15^\circ$.

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

4.7.2 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

- (I) **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 emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (I)(1) 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, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.
 - (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 (I)(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.

4.7.3 TEST PROTOCOL

General considerations concerning the limits:

The measuring bandwidth of 1 MHz was chosen according the test requirements except 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 where measuring bandwidths were reduced also the limit lines were reduced according the given formula:

$$p_{RBWreduced} [dBm] = 10 * \log \left(RBWreduced [kHz] - 1000 kHz \right) + p_{RBW 1000 kHz} [dBm]$$

Hereby "p" are the limit lines' values.

Considerations to MIMO operation:

At this test the four output ports ANT 1 to ANT 4 are together in function according KDB 935210 D02 v04r02 chapter II (o) (2).

**EMC Test Report No.: 22-0178**

EMC tests on Andrew CAP L2 C-Band F-DC



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

C-Band. segment 1. downlink;						
Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
194.8/vert.	-61.0	-4.8	PEAK	120	-22.2	38.9
17755/hor.	-20.6	-4.8	PEAK	1000	-13.0	7.6
26772/vert.	-47.7	-4.8	PEAK	1000	-13.0	34.7
39926/hor.	-21.6	-4.8	PEAK	1000	-13.0	8.6

C-Band. segment 2. downlink;						
Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
195.3/vert.	-59.0	-4.8	PEAK	120	-22.2	36.8
17240/vert.	-20.5	-4.8	PEAK	1000	-13.0	7.5
26964/hor.	-47.4	-4.8	PEAK	1000	-13.0	34.4
39876/hor.	-21.7	-4.8	PEAK	1000	-13.0	8.7

C-Band. segment 3. downlink;						
Spurious Freq. [MHz]	Spurious Level [dBm]	Pin [dBm]	Detector	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
195.7/vert.	-60.0	-4.8	PEAK	120	-22.2	37.8
17229/hor.	-19.8	-4.8	PEAK	1000	-13.0	6.8
26790/vert.	-47.9	-4.8	PEAK	1000	-13.0	34.9
39929/hor.	-21.5	-4.8	PEAK	1000	-13.0	8.5

Abbreviations:

Hor.: horizontal position

Vert.: vertical position

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

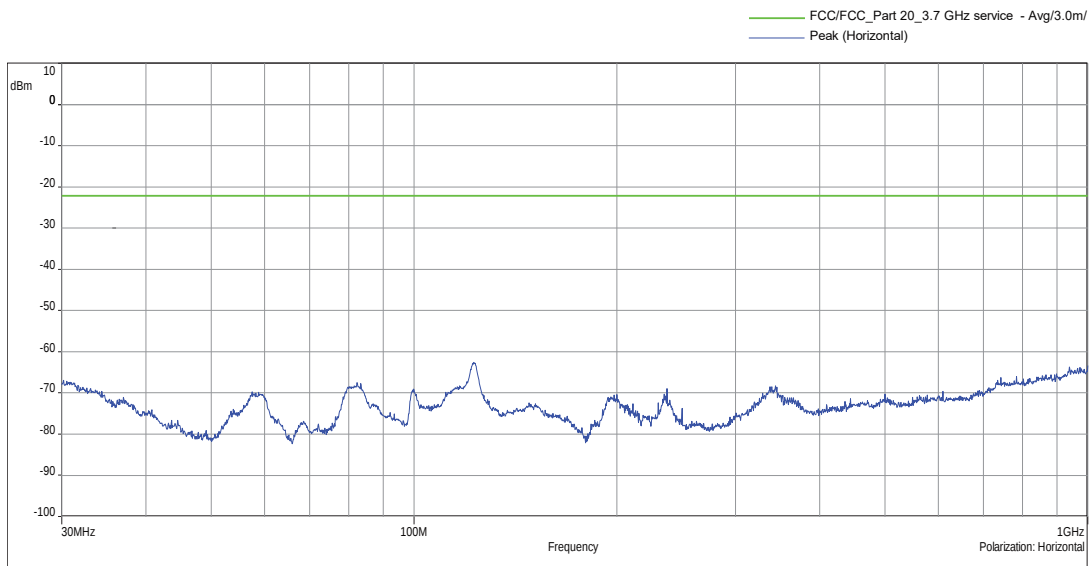
The test results relate only to the tested item. The sample has been provided by the client.
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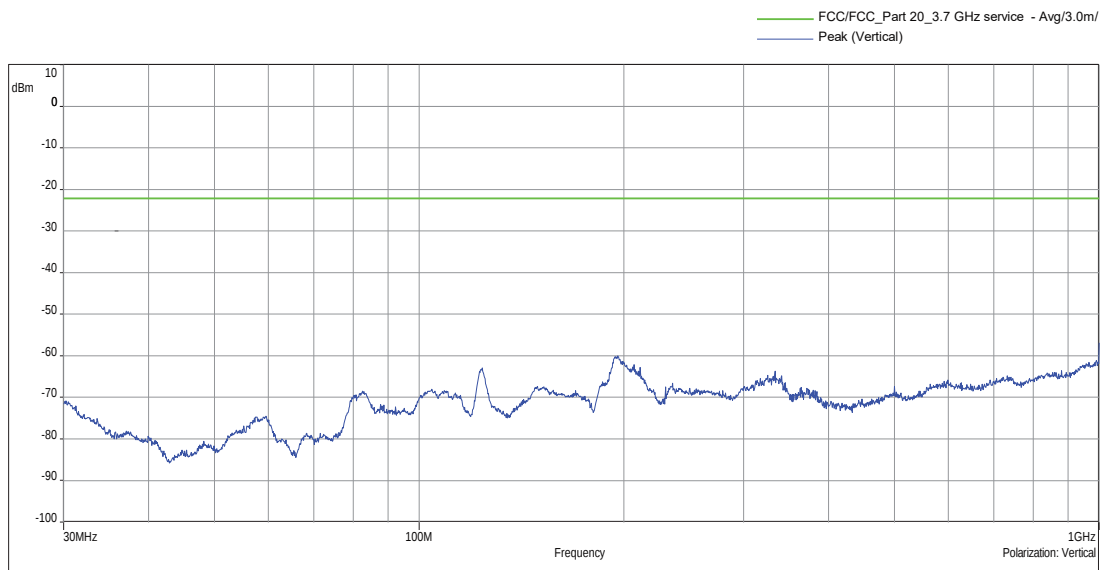
4.7.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE. "WORST CASE")

4.7.4.1 Frequency Band = C-Band. Segment 1. ANT 1 to ANT 4. Direction = RF downlink

30 MHz - 1 GHz. horizontal



30 MHz - 1 GHz. vertical



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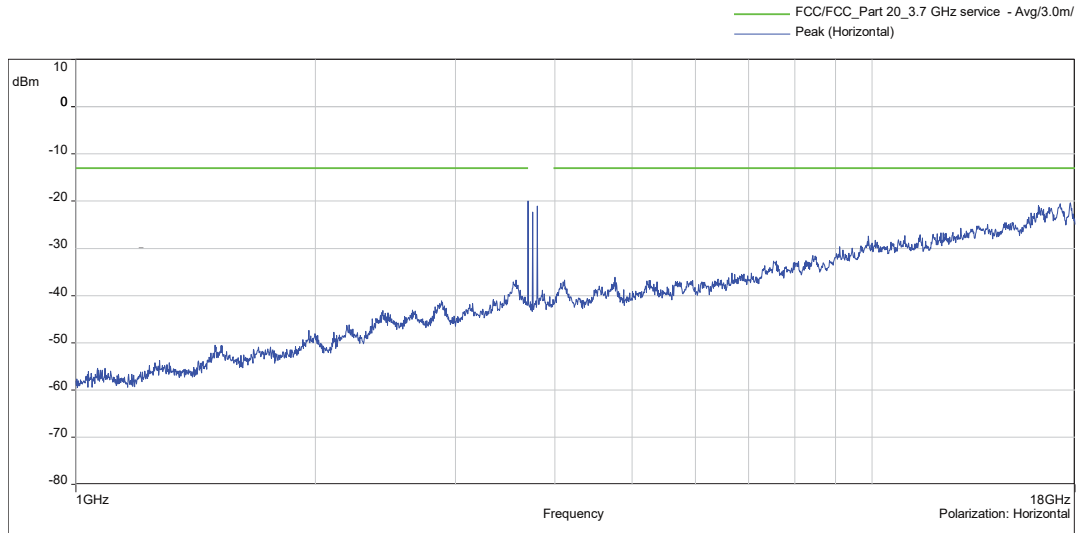


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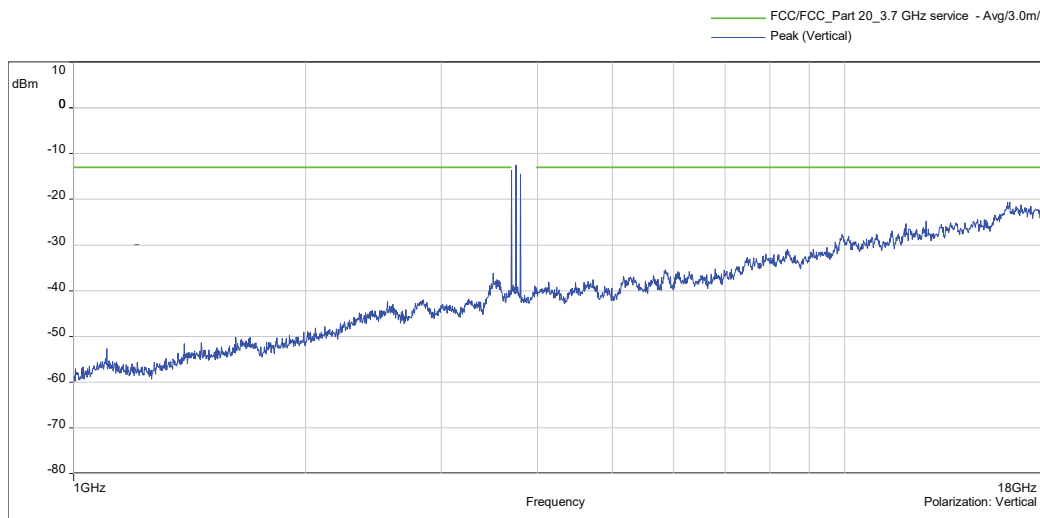
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

1 GHz - 18 GHz. horizontal



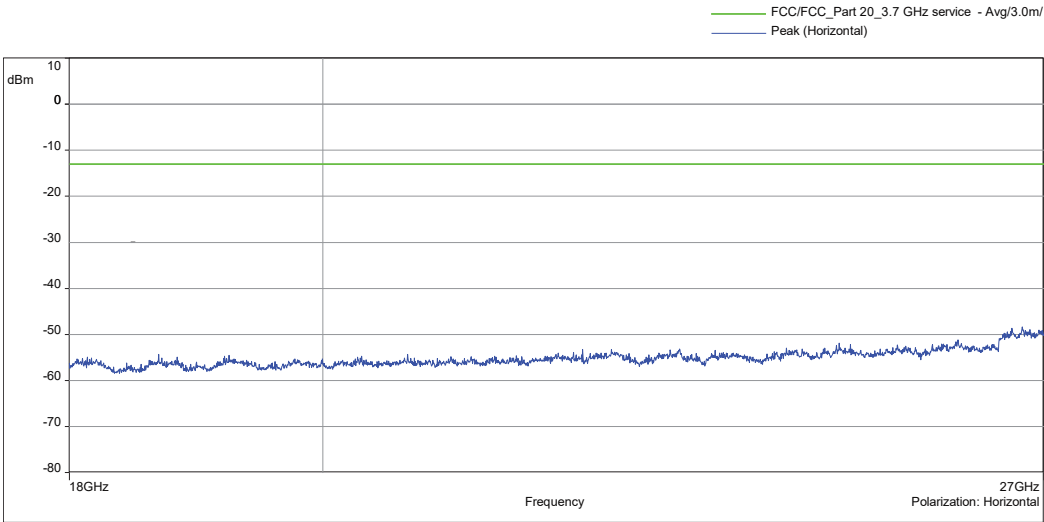
1 GHz - 18 GHz. vertical



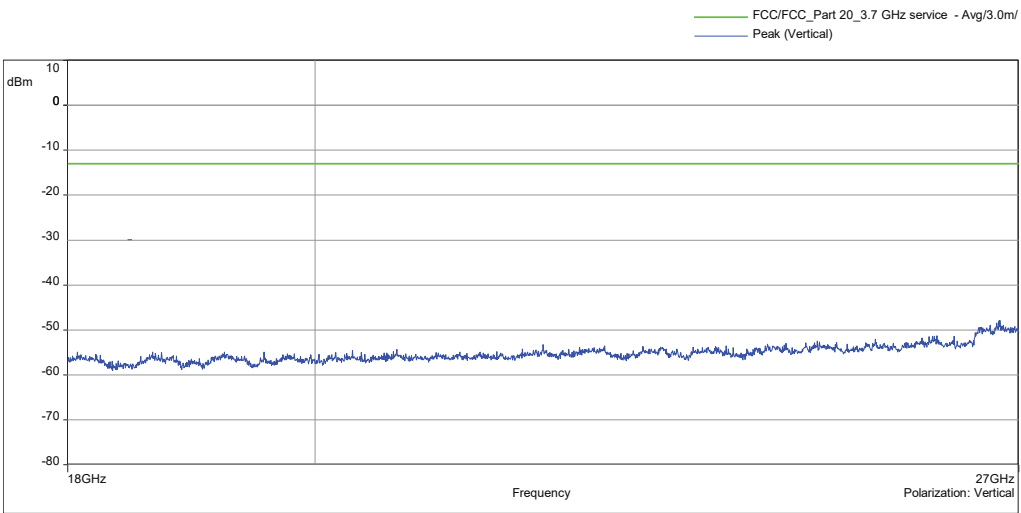
The test results relate only to the tested item. The sample has been provided by the client.
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18 GHz - 27 GHz. horizontal



18 GHz - 27 GHz. vertical



The test results relate only to the tested item. The sample has been provided by the client.
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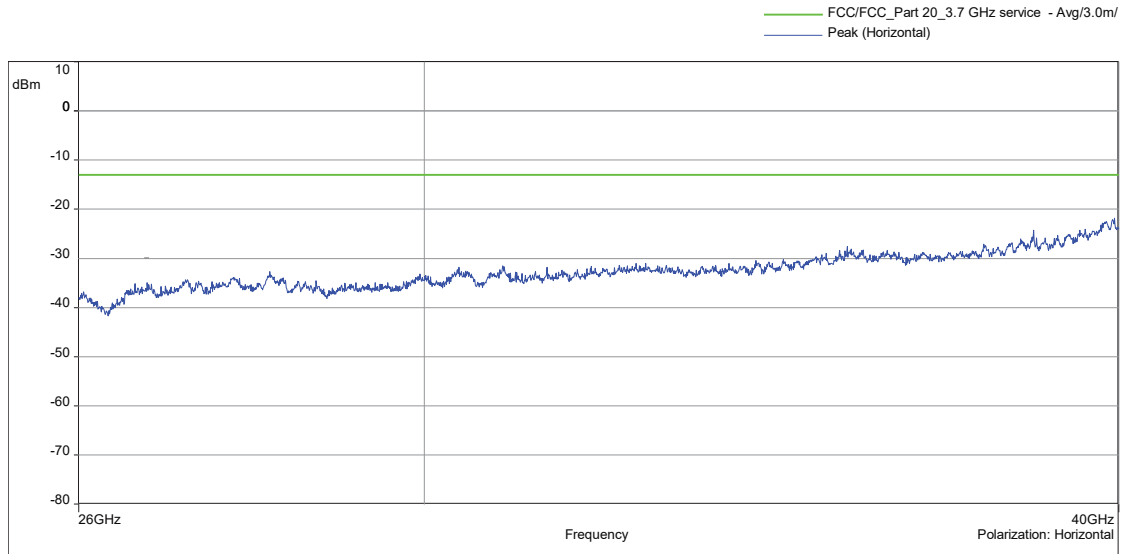


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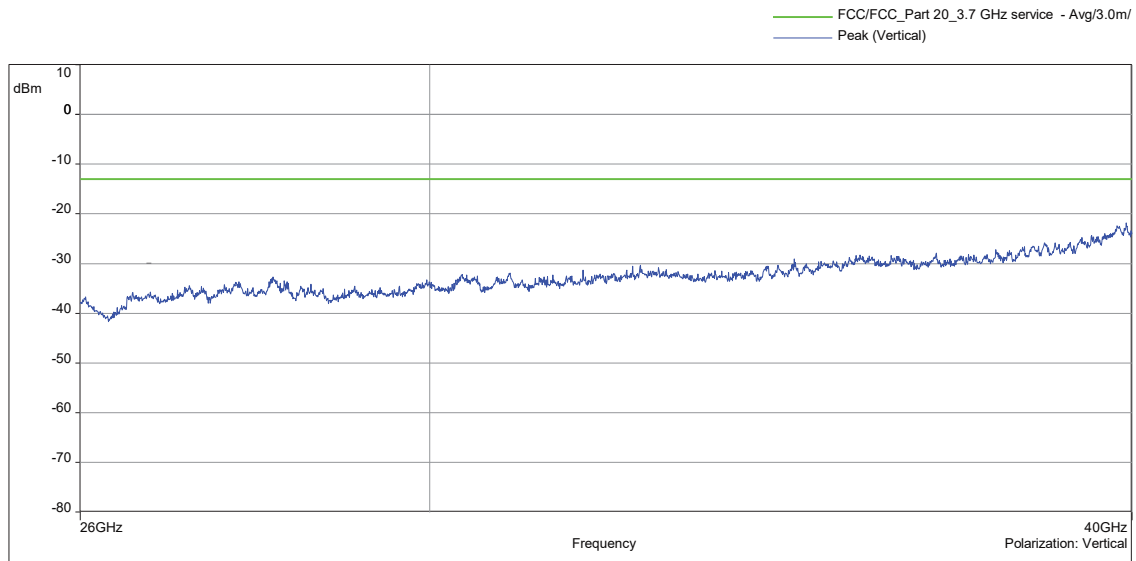
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

26 GHz - 40 GHz. horizontal



26 GHz - 40 GHz. vertical

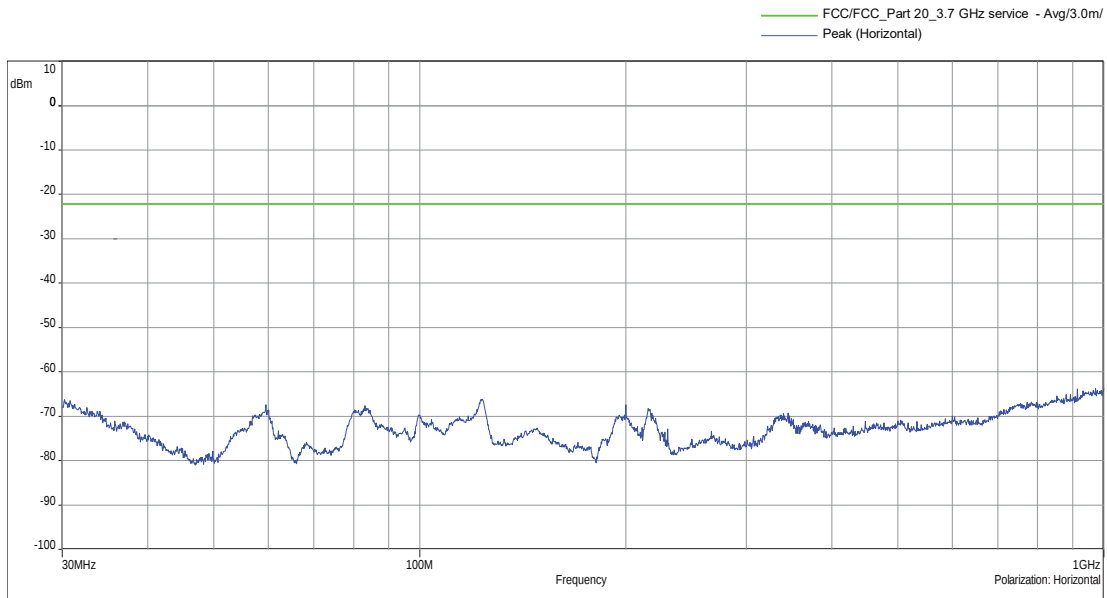


The test results relate only to the tested item. The sample has been provided by the client.
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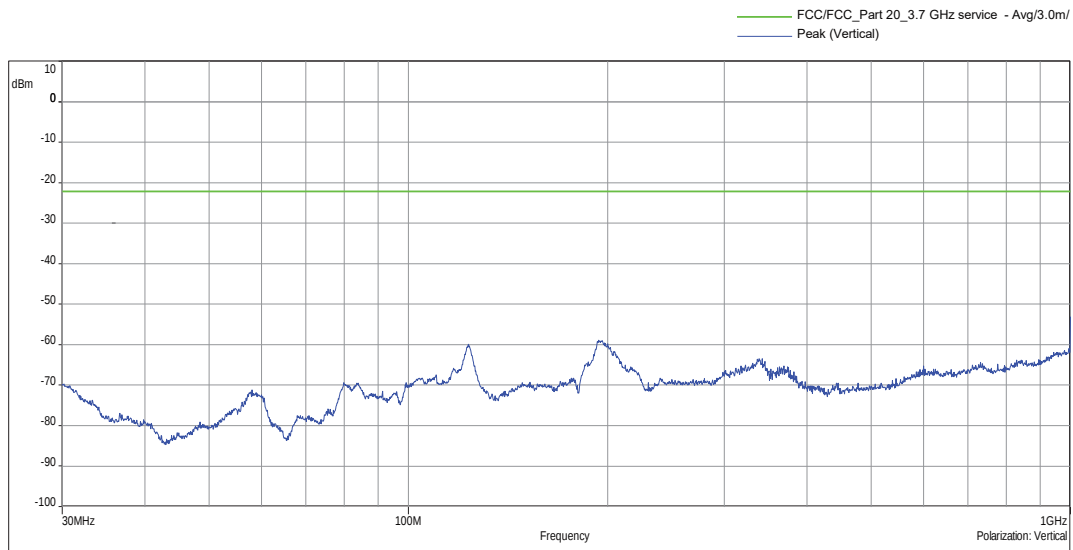


4.7.4.2 Frequency Band = C-Band. Segment 2. ANT 1 to ANT 4. Direction = RF downlink

30 MHz - 1 GHz. horizontal



30 MHz - 1 GHz. vertical



The test results relate only to the tested item. The sample has been provided by the client.
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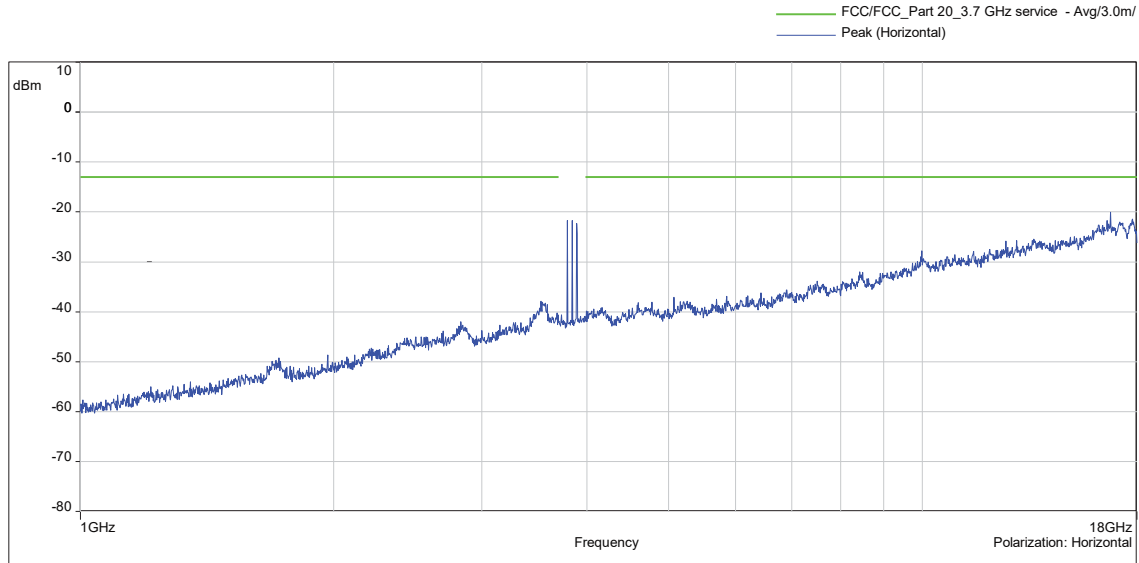


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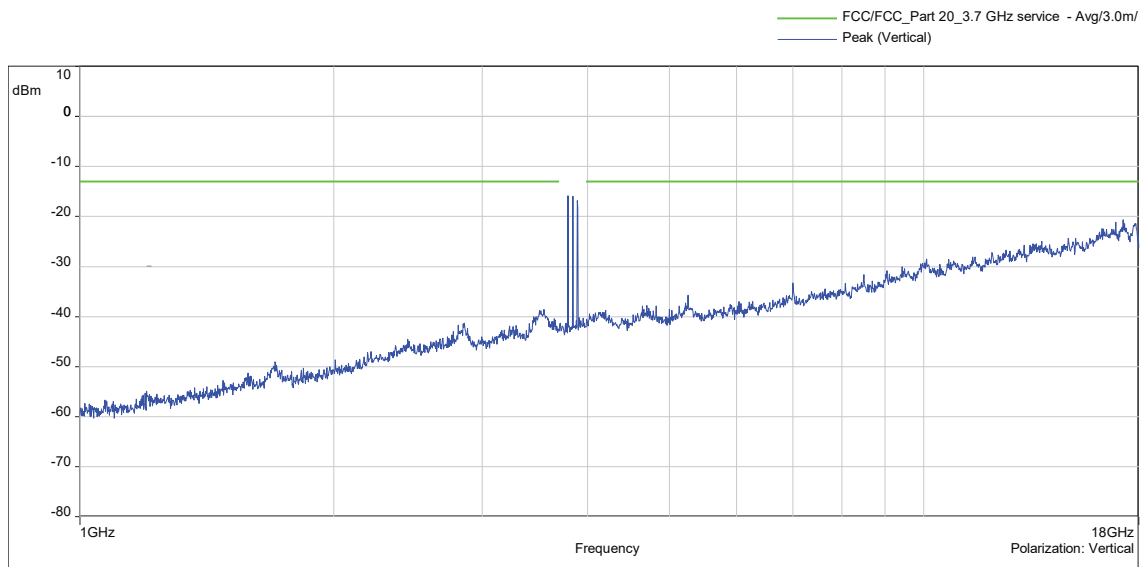
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

1 GHz - 18 GHz. horizontal



1 GHz - 18 GHz. vertical

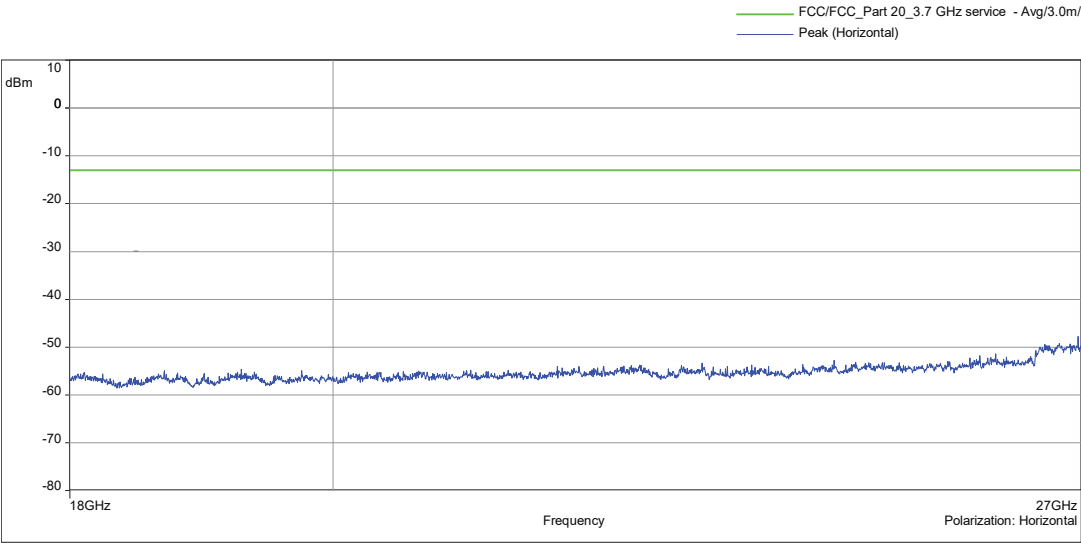


The test results relate only to the tested item. The sample has been provided by the client.
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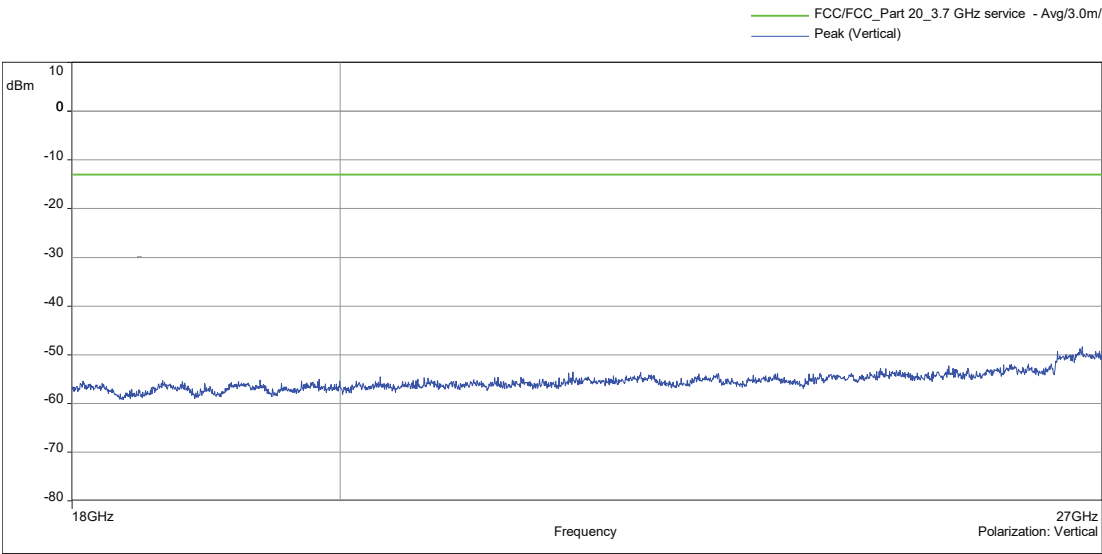
2022-0535-EMC-TR-22-0178-V03



18 GHz - 27 GHz. horizontal



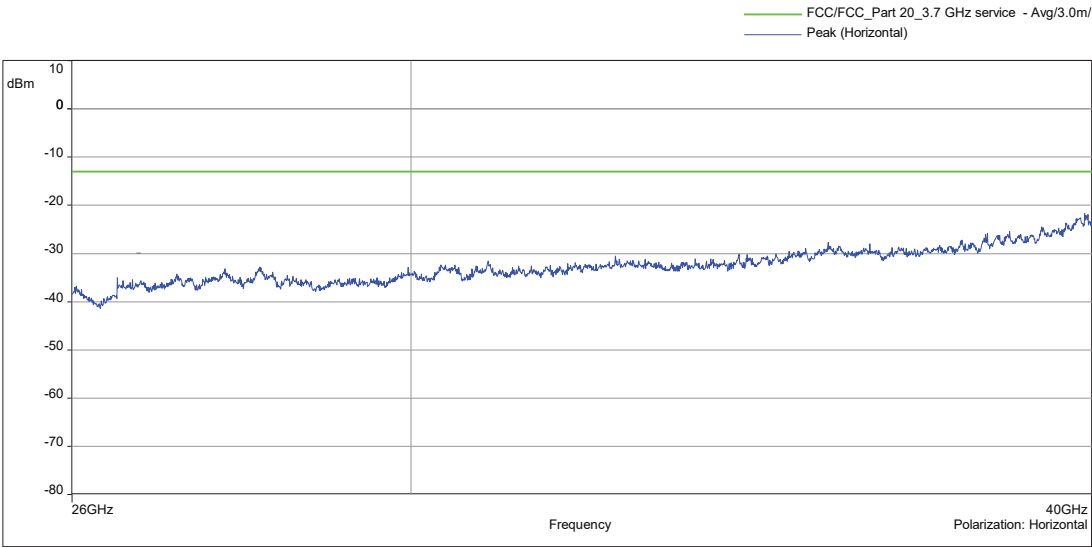
18 GHz - 27 GHz. vertical



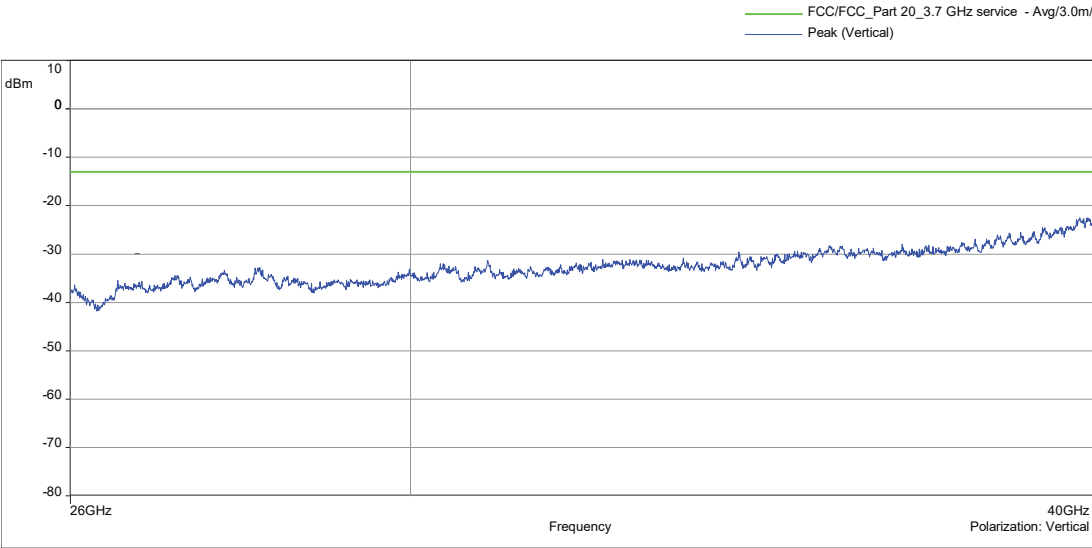
The test results relate only to the tested item. The sample has been provided by the client.
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26 GHz - 40 GHz. horizontal



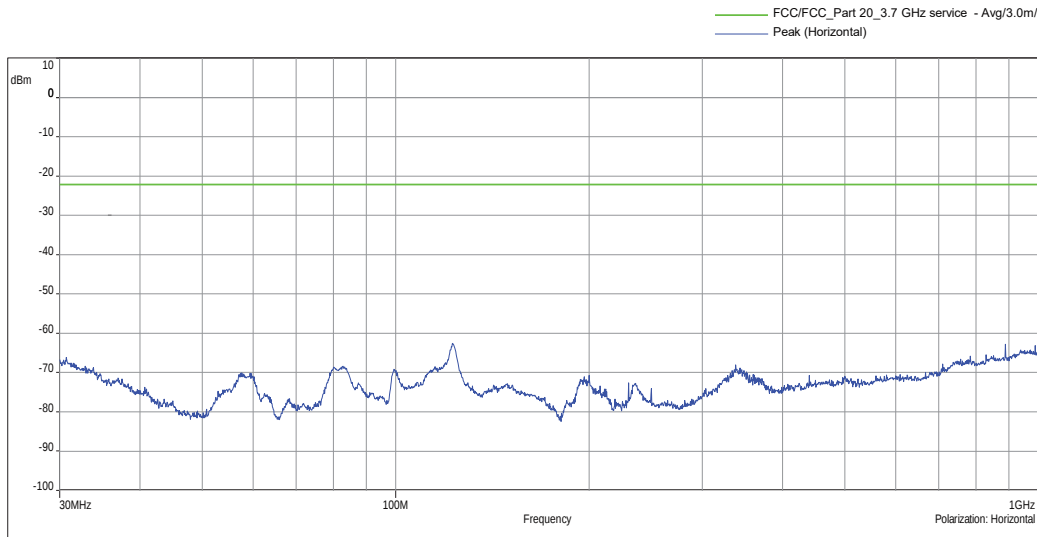
26 GHz - 40 GHz. vertical



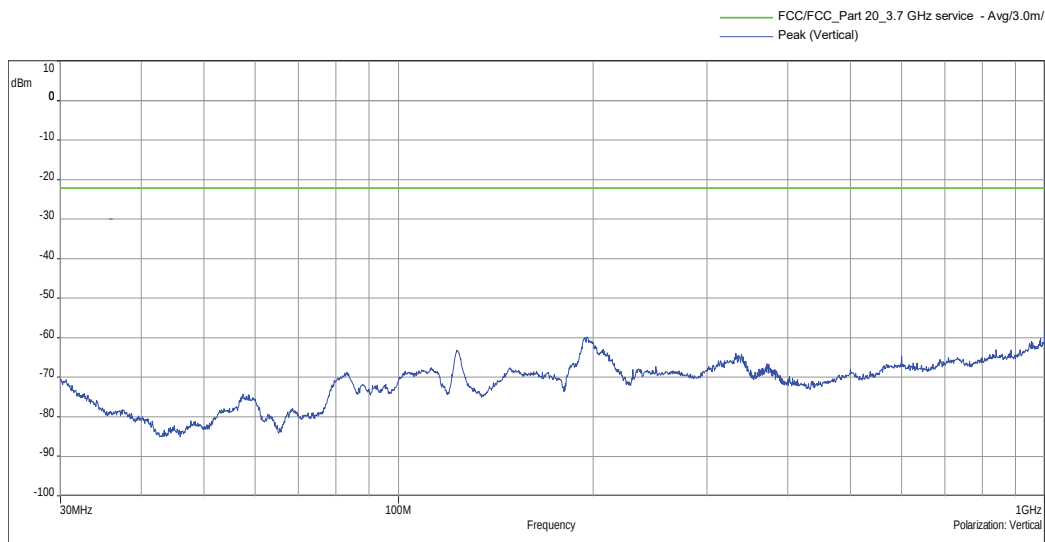
The test results relate only to the tested item. The sample has been provided by the client.
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4.7.4.3 Frequency Band = C-Band. Segment 3. ANT 1 to ANT 4. Direction = RF downlink

30 MHz - 1 GHz. horizontal



30 MHz - 1 GHz. vertical



The test results relate only to the tested item. The sample has been provided by the client.
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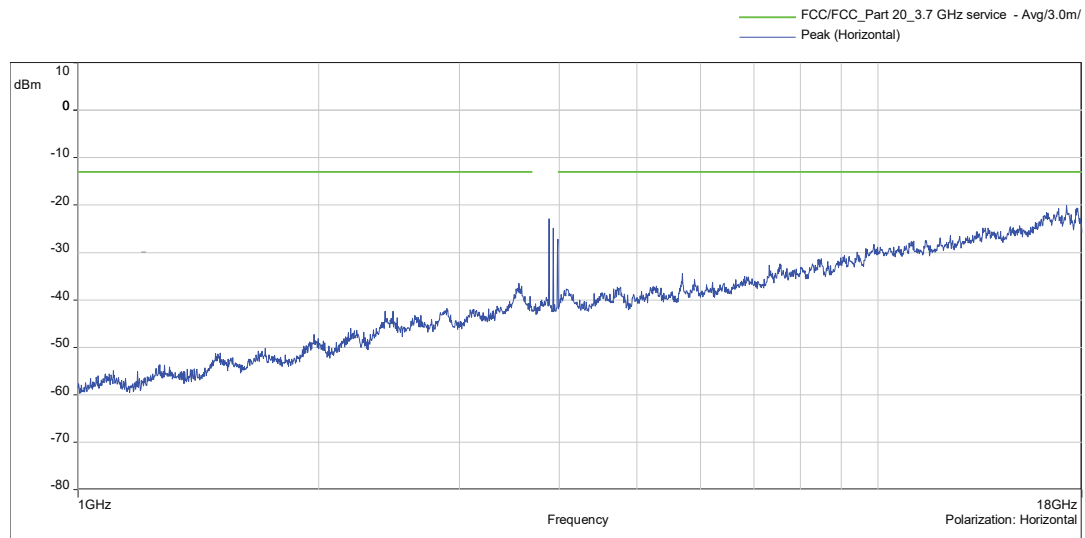


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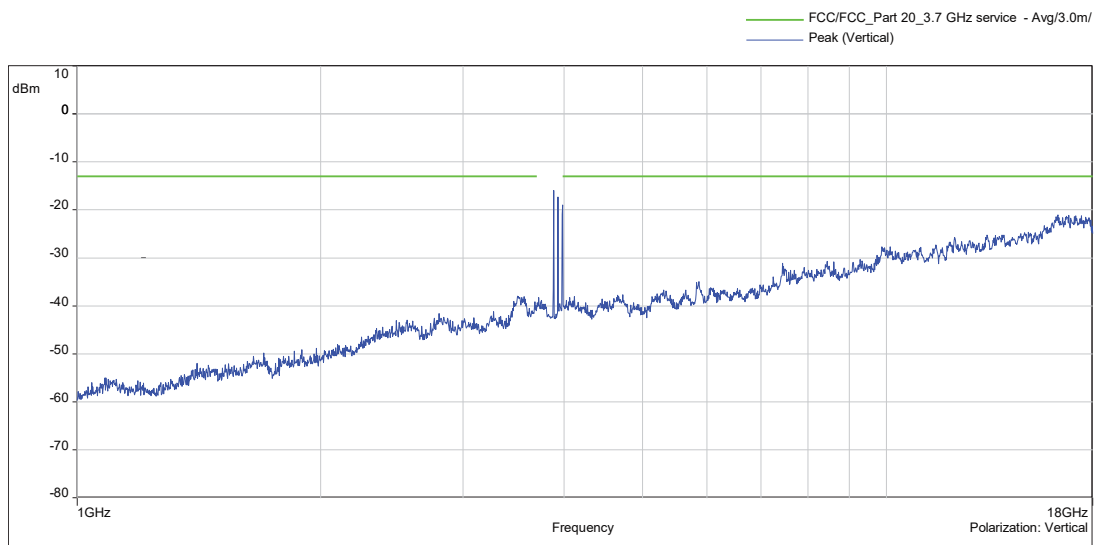
EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

1 GHz - 18 GHz. horizontal



1 GHz - 18 GHz. vertical

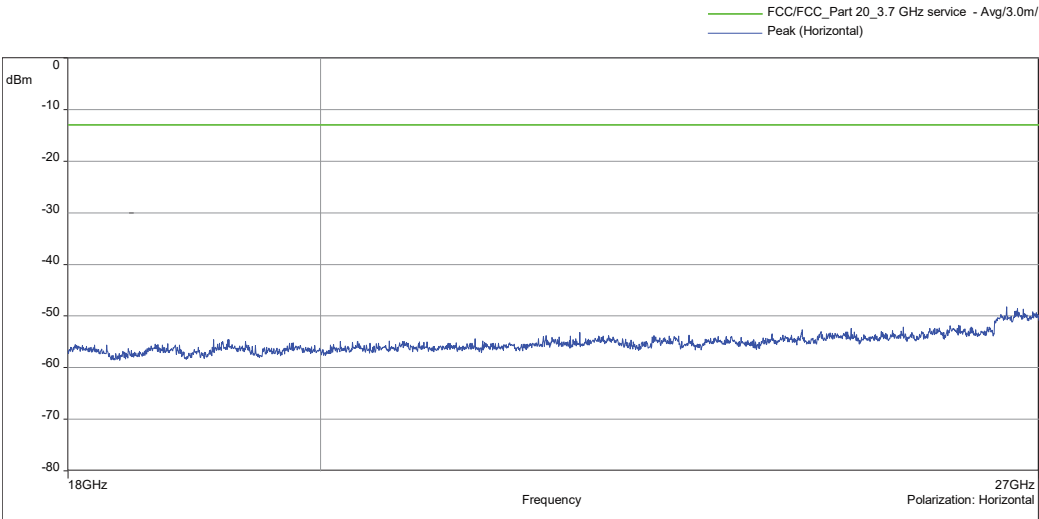


The test results relate only to the tested item. The sample has been provided by the client.
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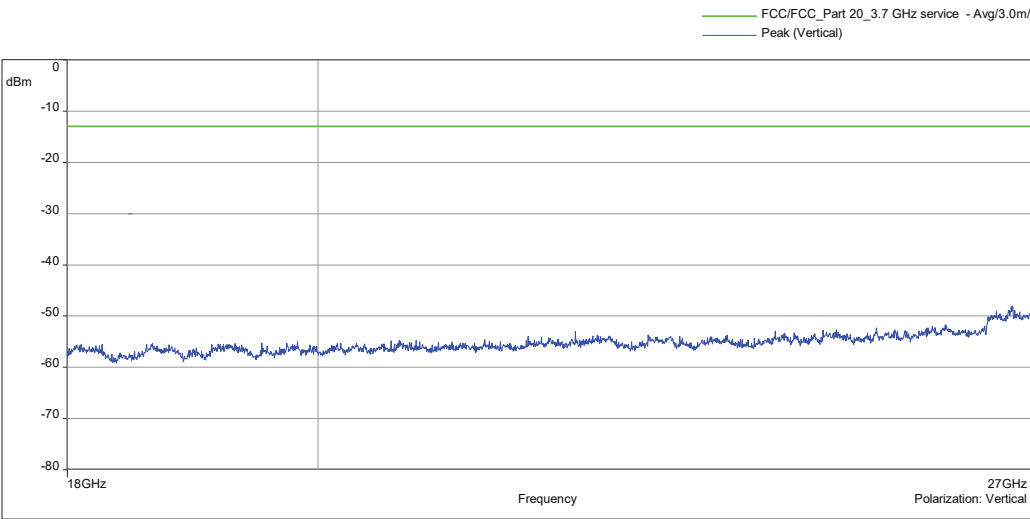
2022-0535-EMC-TR-22-0178-V03



18 GHz - 27 GHz. horizontal



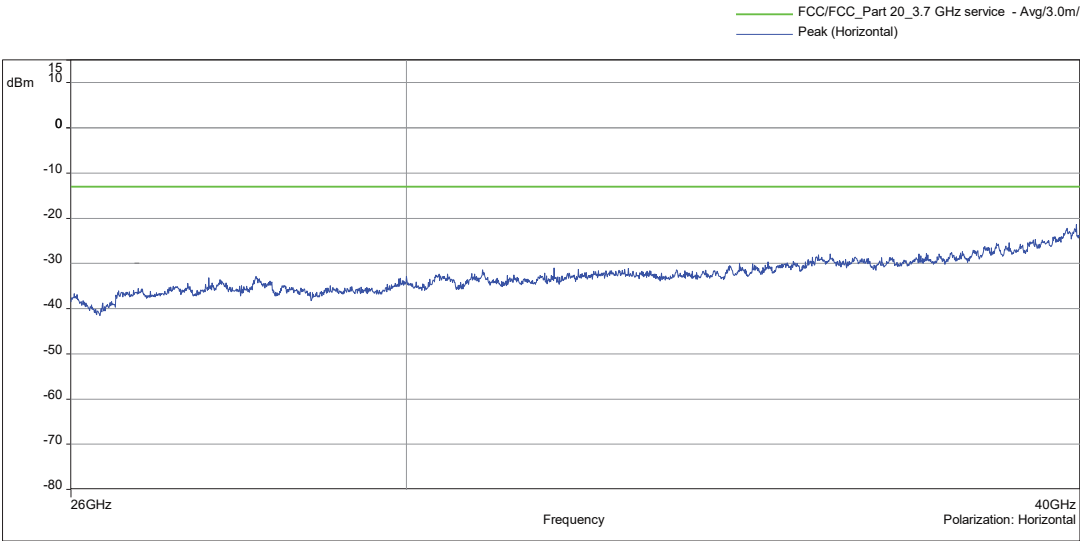
18 GHz - 27 GHz. vertical



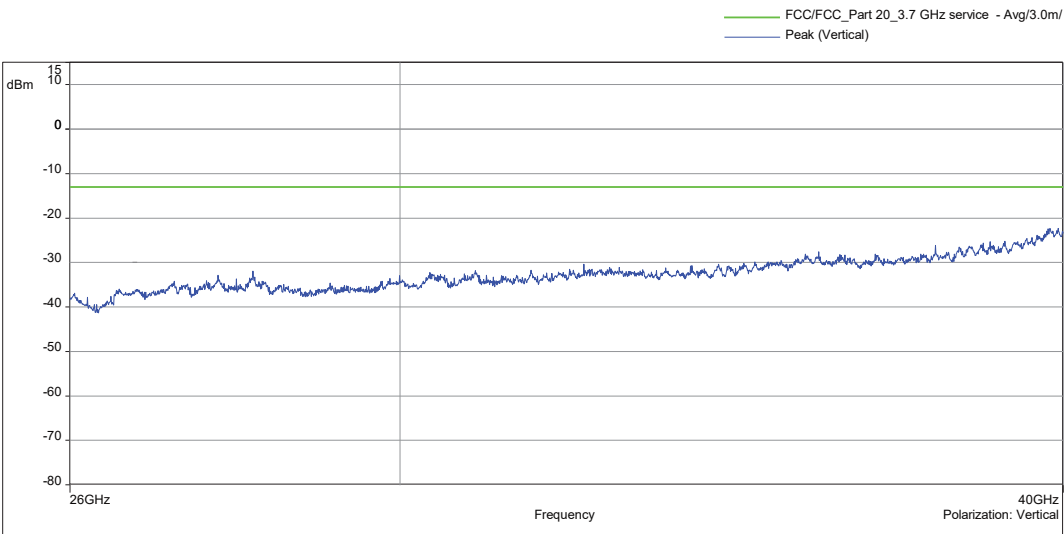
The test results relate only to the tested item. The sample has been provided by the client.
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26 GHz - 40 GHz. horizontal



26 GHz - 40 GHz. vertical



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4.7.5 FIELD STRENGTH CALCULATIONS

$$\mathbf{FS} = \mathbf{SA} + \mathbf{AF} + \mathbf{CL} + \mathbf{PA}$$

Where as:

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

4.7.6 TEST EQUIPMENT USED

- Radiated Emissions



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EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

5 TEST EQUIPMENT

5.1 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	2022-10	2023-10
1.2	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	E-003206	2020-08	2023-08
1.3	BAT-EMC	Software	Nexio	V 2022.0.9.0	---	---

5.2 RADIATED EMISSIONS

Ref.No.	Type	Description	Manufacturer	Inventory no.	Last Calibration	Calibration Due
1.4	ESU40	EMI test receiver 10 Hz - 40 GHz	Rohde & Schwarz	E-003138	2022-10	2023-10
1.5	CBL 6111C	Antenna 30 MHz - 1 GHz	Chase	E-003226	2021-10	2024-10
1.6	HL 025	Antenna 1 GHz - 18 GHz	Rohde & Schwarz	E-003259	2022-01	2023-01
1.7	MWH-1826/B	Antenna 18 GHz - 26.5 GHz	ARA Inc.	E-003233	2020-10	2022-10
1.8	MWH-2640/B	Antenna 26 GHz - 40 GHz	ARA Inc.	E-003234	2020-10	2022-10
1.9	AM1431	Pre amplifier 10 kHz - 1 GHz	Miteq	E-003365	2022-10	2023-10
1.10	AFS4-00102000	Preamplifier 100 MHz - 20 GHz	Miteq	E-003633	2022-10	2023-10
1.11	AMP-2000-43000-50-10-2.9-F	Preamplifier 2 GHz - 43 GHz	Miteq	E-003999	2022-10	2023-10
1.12	CO3000	Controller SAC	Innco systems GmbH	E-003052 with Software 1.02.62	---	---
1.13	BAT-EMC	Software	Nexio	V 2022.0.9.0	---	---

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

The test results relate only to the tested item. The sample has been provided by the client.
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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 ANTENNA CHASE CBL 6111C (30 MHZ – 1 GHZ)

($d_{\text{Limit}} = 3 \text{ m}$)

Frequency	AF	Corr.
MHz	dB (1/m)	dB
30	18.6	0.6
50	6.0	0.9
100	9.7	1.2
150	7.9	1.6
200	7.6	1.9
250	9.5	2.1
300	11.0	2.3
350	12.4	2.6
400	13.6	2.9
450	14.7	3.1
500	15.6	3.2
550	16.3	3.5
600	17.2	3.5
650	18.1	3.6
700	18.5	3.6
750	19.1	4.1
800	19.6	4.1
850	20.1	4.4
900	20.8	4.7
950	21.1	4.8
1000	21.6	4.9

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
0.29	0.04	0.23	0.02	0.0	3	3
0.39	0.09	0.32	0.08	0.0	3	3
0.56	0.14	0.47	0.08	0.0	3	3
0.73	0.20	0.59	0.12	0.0	3	3
0.84	0.21	0.70	0.11	0.0	3	3
0.98	0.24	0.80	0.13	0.0	3	3
1.04	0.26	0.89	0.15	0.0	3	3
1.18	0.31	0.96	0.13	0.0	3	3
1.28	0.35	1.03	0.19	0.0	3	3
1.39	0.38	1.11	0.22	0.0	3	3
1.44	0.39	1.20	0.19	0.0	3	3
1.55	0.46	1.24	0.23	0.0	3	3
1.59	0.43	1.29	0.23	0.0	3	3
1.67	0.34	1.35	0.22	0.0	3	3
1.67	0.42	1.41	0.15	0.0	3	3
1.87	0.54	1.46	0.25	0.0	3	3
1.90	0.46	1.51	0.25	0.0	3	3
1.99	0.60	1.56	0.27	0.0	3	3
2.14	0.60	1.63	0.29	0.0	3	3
2.22	0.60	1.66	0.33	0.0	3	3
2.23	0.61	1.71	0.30	0.0	3	3

Sample calculation

$$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + \text{Corr. (dB)}$$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

distance correction = $-20 \cdot \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

Linear interpolation will be used for frequencies in between the values in the table.

Tables show an extract of values.

6.2 ANTENNA ROHDE & SCHWARZ HL 025 (1 GHz – 18 GHz)

Frequency	AF	Corr.
MHz	dB (1/m)	dB
1000	24.4	-19.4
2000	28.5	-17.4
3000	31.0	-16.1
4000	33.1	-14.7
5000	34.4	-13.7
6000	34.7	-12.7
7000	35.6	-11.0

cable loss 1 (relay + cable inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit, attenuator & pre-amp)	cable loss 4 (to receiver)		
dB	dB	dB	dB		
0.99	0.31	-21.51	0.79		
1.44	0.44	-20.63	1.38		
1.87	0.53	-19.85	1.33		
2.41	0.67	-19.13	1.31		
2.78	0.86	-18.71	1.40		
2.74	0.90	-17.83	1.47		
2.82	0.86	-16.19	1.46		

Frequency	AF	Corr.
MHz	dB (1/m)	dB
3000	31.0	-23.4
4000	33.1	-23.3
5000	34.4	-21.7
6000	34.7	-21.2
7000	35.6	-19.8

cable loss 1 (relay inside chamber)	cable loss 2 (inside chamber)	cable loss 3 (outside chamber)	cable loss 4 (switch unit, attenuator & pre-amp)	cable loss 5 (to receiver)	used for FCC 15.247
dB	dB	dB	dB	dB	
0.47	1.87	0.53	-27.58	1.33	
0.56	2.41	0.67	-28.23	1.31	
0.61	2.78	0.86	-27.35	1.40	
0.58	2.74	0.90	-26.89	1.47	
0.66	2.82	0.86	-25.58	1.46	

Frequency	AF	Corr.
MHz	dB (1/m)	dB
7000	35.6	-57.3
8000	36.3	-56.3
9000	37.1	-55.3
10000	37.5	-56.2
11000	37.5	-55.3
12000	37.6	-53.7
13000	38.2	-53.5
14000	39.9	-56.3
15000	40.9	-54.1
16000	41.3	-54.1
17000	42.8	-54.4
18000	44.2	-54.7

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)
dB	dB	dB	dB	dB	dB
0.56	1.28	-62.72	2.66	0.94	1.46
0.69	0.71	-61.49	2.84	1.00	1.53
0.68	0.65	-60.80	3.06	1.09	1.60
0.70	0.54	-61.91	3.28	1.20	1.67
0.80	0.61	-61.40	3.43	1.27	1.70
0.84	0.42	-59.70	3.53	1.26	1.73
0.83	0.44	-59.81	3.75	1.32	1.83
0.91	0.53	-63.03	3.91	1.40	1.77
0.98	0.54	-61.05	4.02	1.44	1.83
1.23	0.49	-61.51	4.17	1.51	1.85
1.36	0.76	-62.36	4.34	1.53	2.00
1.70	0.53	-62.88	4.41	1.55	1.91

Sample calculation

$$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$$

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.

6.3 ANTENNA ARA INC. MWH-1826-B (18 GHZ – 26.5 GHZ) PARTIALLY IN CONJUNCTION WITH PRE-AMPLIFIER MITEQ JS43-1800-4000: THE USE OF THE PRE-AMPLIFIER IS DEPENDENT FROM THE FIELD STRENGTH

Frequency	AF	Corr.	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)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB
18000	40.2	-23.5	0.72	-35.85	6.20	2.81	2.65
18500	40.2	-23.2	0.69	-35.71	6.46	2.76	2.59
19000	40.2	-22.0	0.76	-35.44	6.69	3.15	2.79
19500	40.3	-21.3	0.74	-35.07	7.04	3.11	2.91
20000	40.3	-20.3	0.72	-34.49	7.30	3.07	3.05
20500	40.3	-19.9	0.78	-34.46	7.48	3.12	3.15
21000	40.3	-19.1	0.87	-34.07	7.61	3.20	3.33
21500	40.3	-19.1	0.90	-33.96	7.47	3.28	3.19
22000	40.3	-18.7	0.89	-33.57	7.34	3.35	3.28
22500	40.4	-19.0	0.87	-33.66	7.06	3.75	2.94
23000	40.4	-19.5	0.88	-33.75	6.92	3.77	2.70
23500	40.4	-19.3	0.90	-33.35	6.99	3.52	2.66
24000	40.4	-19.8	0.88	-33.99	6.88	3.88	2.58
24500	40.4	-19.5	0.91	-33.89	7.01	3.93	2.51
25000	40.4	-19.3	0.88	-33.00	6.72	3.96	2.14
25500	40.5	-20.4	0.89	-34.07	6.90	3.66	2.22
26000	40.5	-21.3	0.86	-35.11	7.02	3.69	2.28
26500	40.5	-21.1	0.90	-35.20	7.15	3.91	2.36

Sample calculation

$$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$$

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.

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EMC tests on Andrew CAP L2 C-Band F-DC

**6.4 ANTENNA ARA INC. MWH-2640-B (26 GHz – 40 GHz)) PARTIALLY IN CONJUNCTION WITH PRE-AMPLIFIER MITEQ JS43-1800-4000: THE USE OF THE PRE-AMPLIFIER IS DEPENDENT FROM THE FIELD STRENGTH**

Frequency	AF	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))
GHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
26.5	43.4	-11.2	4.4				-9.6	3	1.0
27.0	43.4	-11.2	4.4				-9.6	3	1.0
28.0	43.4	-11.1	4.5				-9.6	3	1.0
29.0	43.5	-11.0	4.6				-9.6	3	1.0
30.0	43.5	-10.9	4.7				-9.6	3	1.0
31.0	43.5	-10.8	4.7				-9.6	3	1.0
32.0	43.5	-10.7	4.8				-9.6	3	1.0
33.0	43.6	-10.7	4.9				-9.6	3	1.0
34.0	43.6	-10.6	5.0				-9.6	3	1.0
35.0	43.6	-10.5	5.1				-9.6	3	1.0
36.0	43.6	-10.4	5.1				-9.6	3	1.0
37.0	43.7	-10.3	5.2				-9.6	3	1.0
38.0	43.7	-10.2	5.3				-9.6	3	1.0
39.0	43.7	-10.2	5.4				-9.6	3	1.0
40.0	43.8	-10.1	5.5				-9.6	3	1.0

Sample calculation

$$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$$

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 = $-20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

The test results relate only to the tested item. The sample has been provided by the client.

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EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC

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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
Spurious emissions conducted	2.18 dB
Spurious emissions radiated measurements	5.38 dB
Total frequency uncertainty	2×10^{-7}

Reference :

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

The test results relate only to the tested item. The sample has been provided by the client.
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8 PHOTO REPORT

Please see separate photo report.

EMC Test Report No.: 22-0178

EMC tests on Andrew CAP L2 C-Band F-DC



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 *****