



2.6 CONDUCTED SPURIOUS EMISSIONS

2.6.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 27, Clause 27.53(h)(1)(3)
FCC 47 CFR Part 27, Clause 27.53(g)
FCC 47 CFR Part 27, Clause 27.53(m)(4)(6)
FCC 47 CFR Part 27, Clause 27.53(c)(2)(4)(5)(f)
RSS-139, Clause 6.6
RSS-130, Clause 4.7.1
RSS-199, Clause 4.5

2.6.2 Standard Applicable

FCC 47 CFR Part 27.53

(h) AWS emission limits – (1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

(g) For operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC 47 CFR Part 27.53

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

(4) For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log(P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log(P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log(P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.



(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10\log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

(f) For operations in the 746-758 MHz and 775-788 MHz and 805-806 MHz bands, emissions in the band 1559-1610 MHz be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

RSS-139, Clause 6.6:

(i) In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (dBW), by at least $43 + 10 \log_{10} p$ (watts) dB.

(ii) After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (dBW), by at least $43 + 10 \log_{10} p$ (watts) dB.

RSS-130:

4.7.1 The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

RSS-199, Clause 4.5:

In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used.

(b) for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

(i) $40 + 10 \log_{10} p$ from the channel edges to 5 MHz away.

(ii) $43 + 10 \log_{10} p$ between 5 MHz and X MHz from the channel edges, and

(iii) $55 + 10 \log_{10} p$ at X MHz and beyond from the channel edges

Note: X is 6 MHz or the equipment occupied bandwidth, whichever is greater

In addition, the attenuation shall not be less than $43 + 10 \log(P)$ on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log(P)$ dB at or below 2490.5 MHz.

2.6.3 Equipment Under Test and Modification State

Serial No: FJ220819C00056 / Test Configuration A

2.6.4 Date of Test/Initial of test personnel who performed the test

October 11, 2019 / AC



2.6.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.6 Environmental Conditions/ Test Location

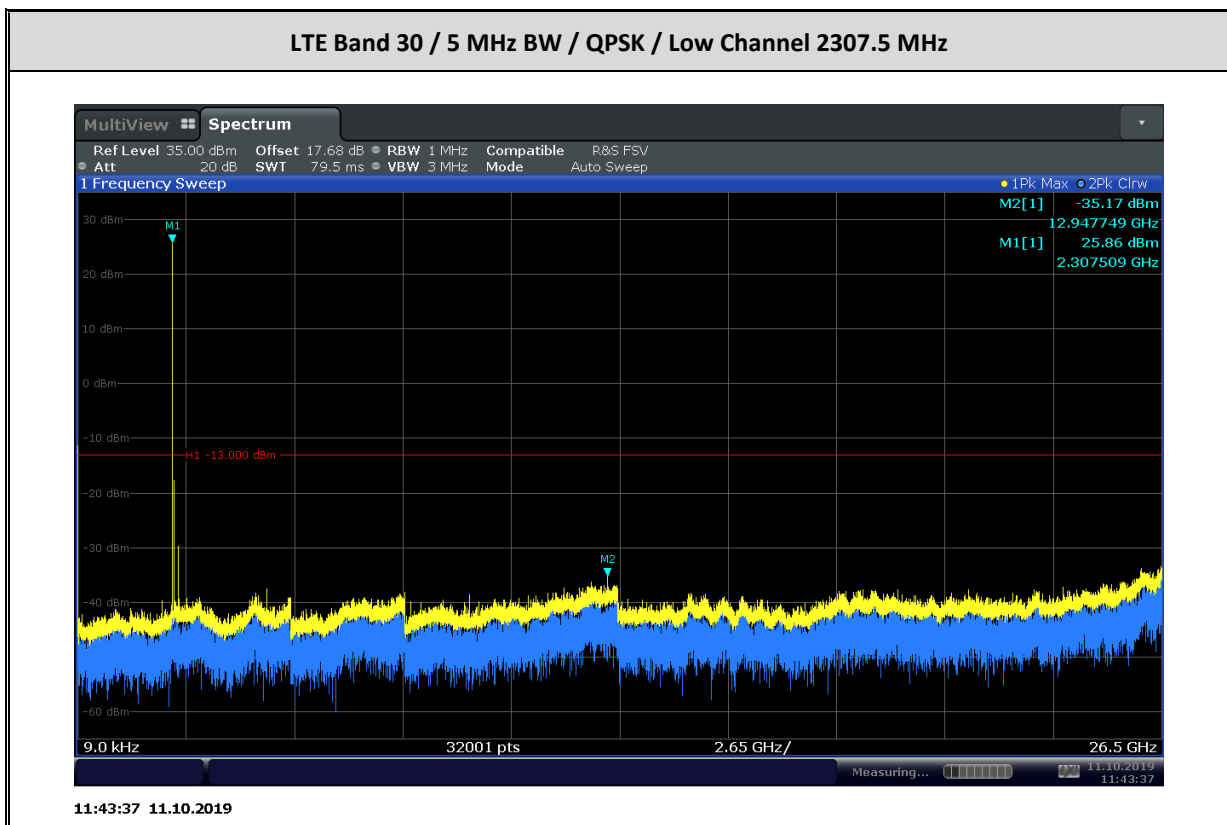
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature 21.2 °C
Relative Humidity 35.0 %
ATM Pressure 98.5 kPa

2.6.7 Additional Observations

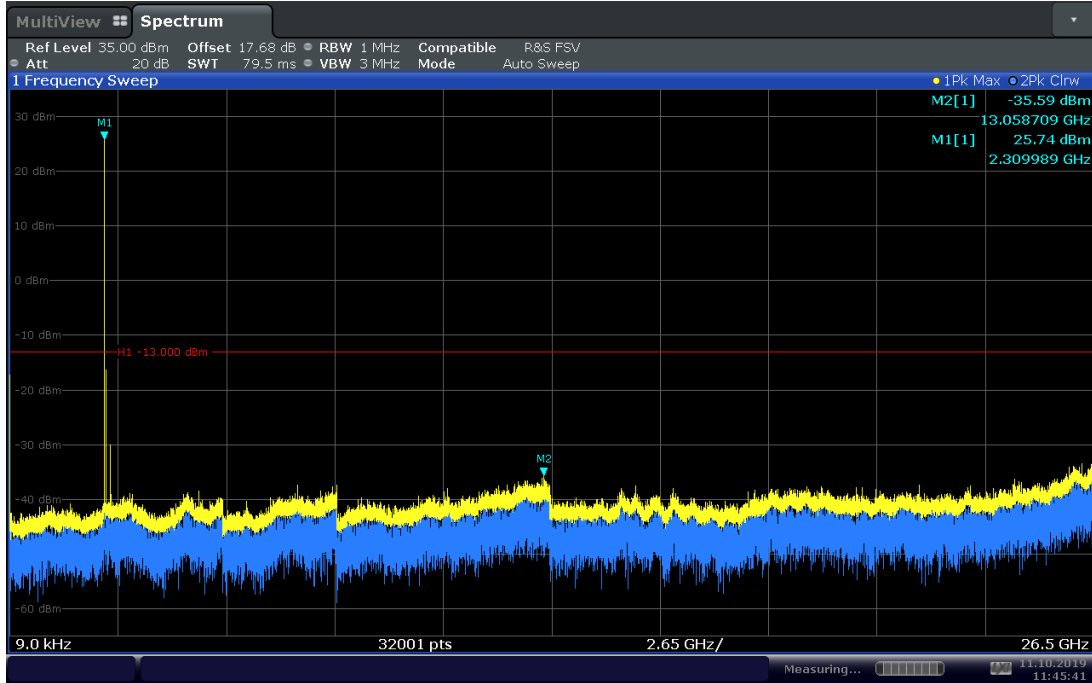
- This is a conducted test.
- The spectrum was searched from 9 kHz to the 10th harmonic.
- The path loss was measured and entered as a level offset.
- Low, Middle and High channels on all channel bandwidth and modulation are verified. Only the worst case channel of each band presented.

2.6.8 Test Results



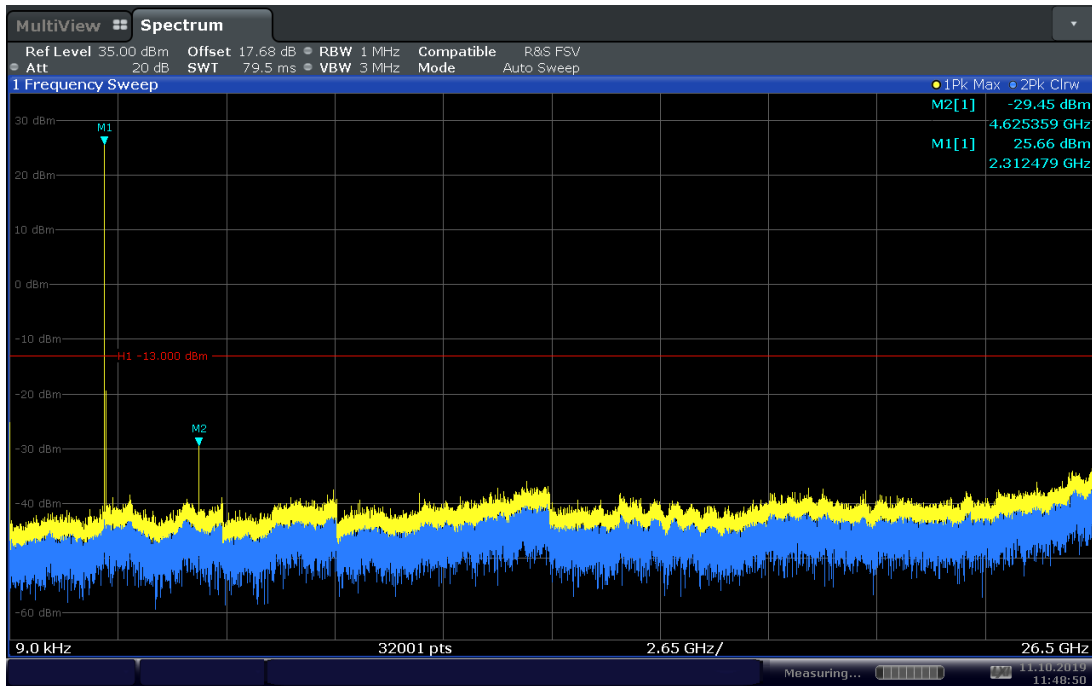


LTE Band 30 / 5 MHz BW / QPSK / Mid Channel 2310 MHz

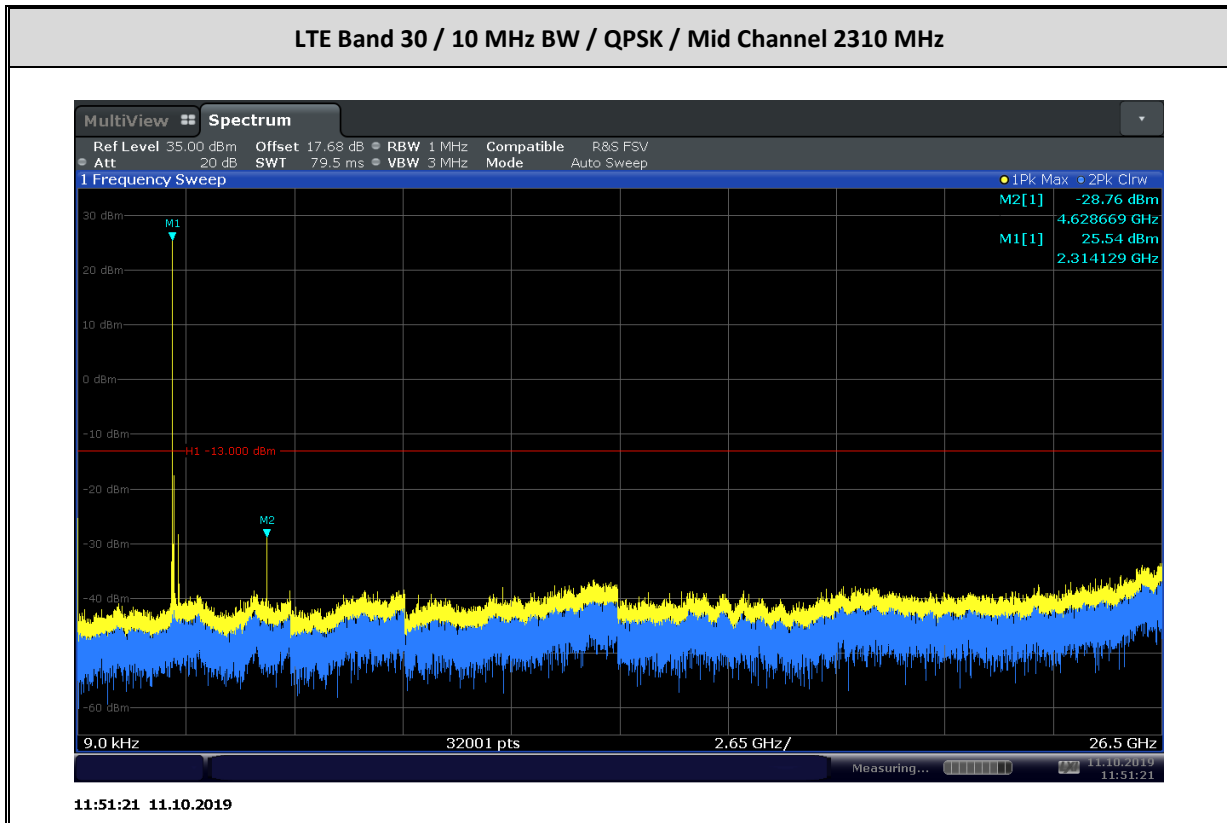


11:45:42 11.10.2019

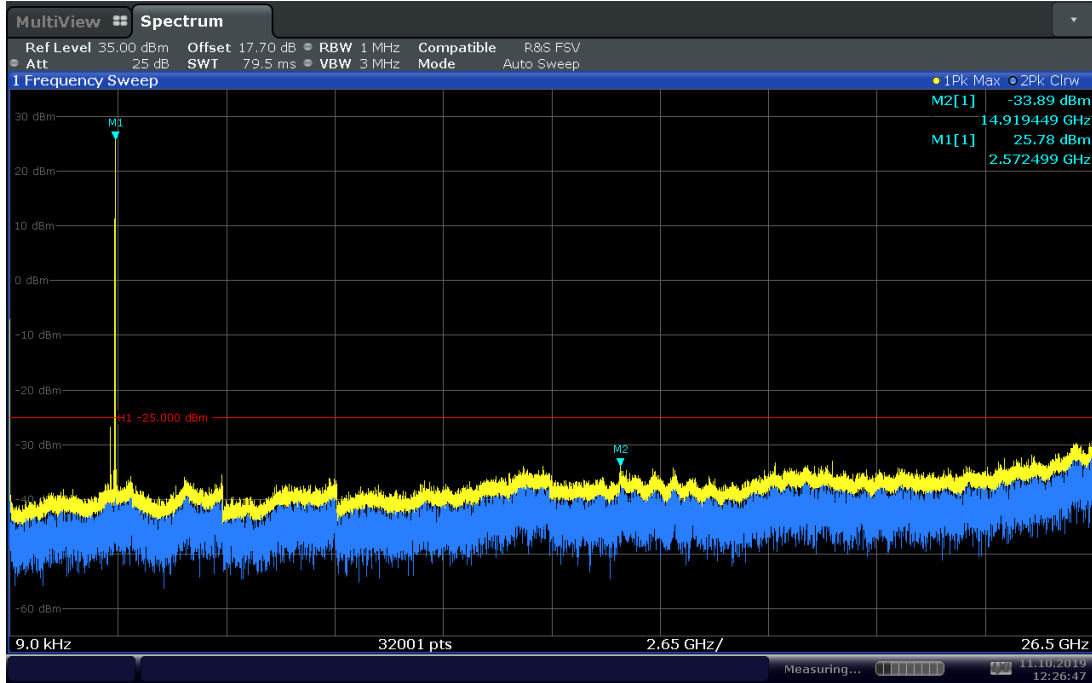
LTE Band 30 / 5 MHz BW / QPSK / High Channel 2312.5 MHz



11:48:50 11.10.2019

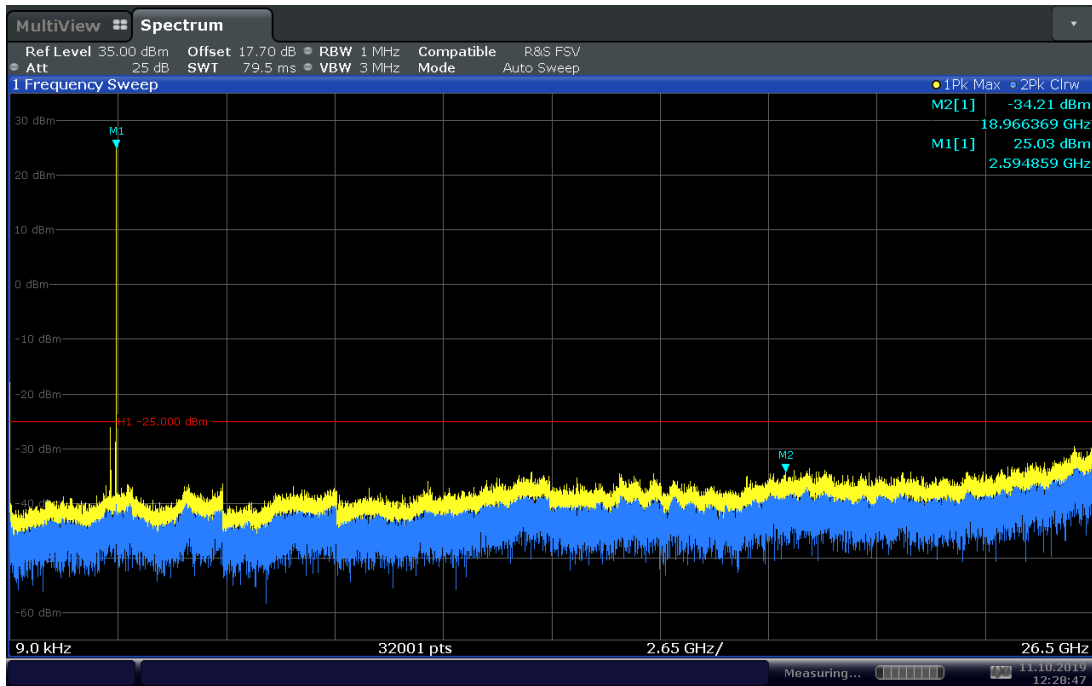


LTE Band 38 / 5 MHz BW / QPSK / Low Channel 2572.5 MHz



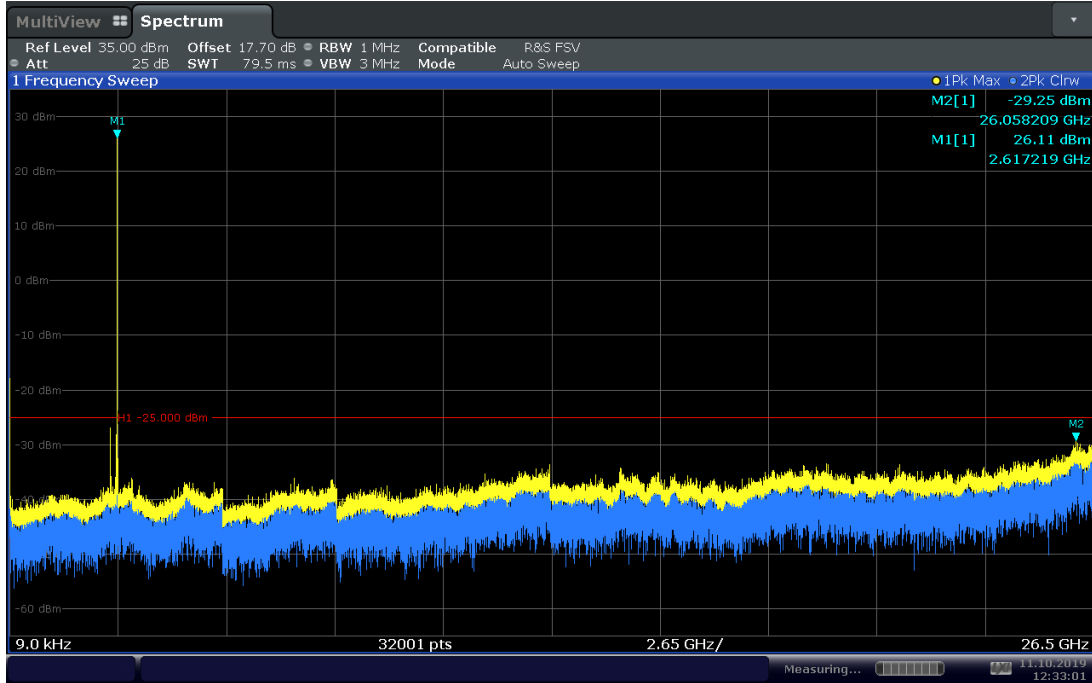
12:26:48 11.10.2019

LTE Band 38 / 5 MHz BW / QPSK / Mid Channel 2595 MHz



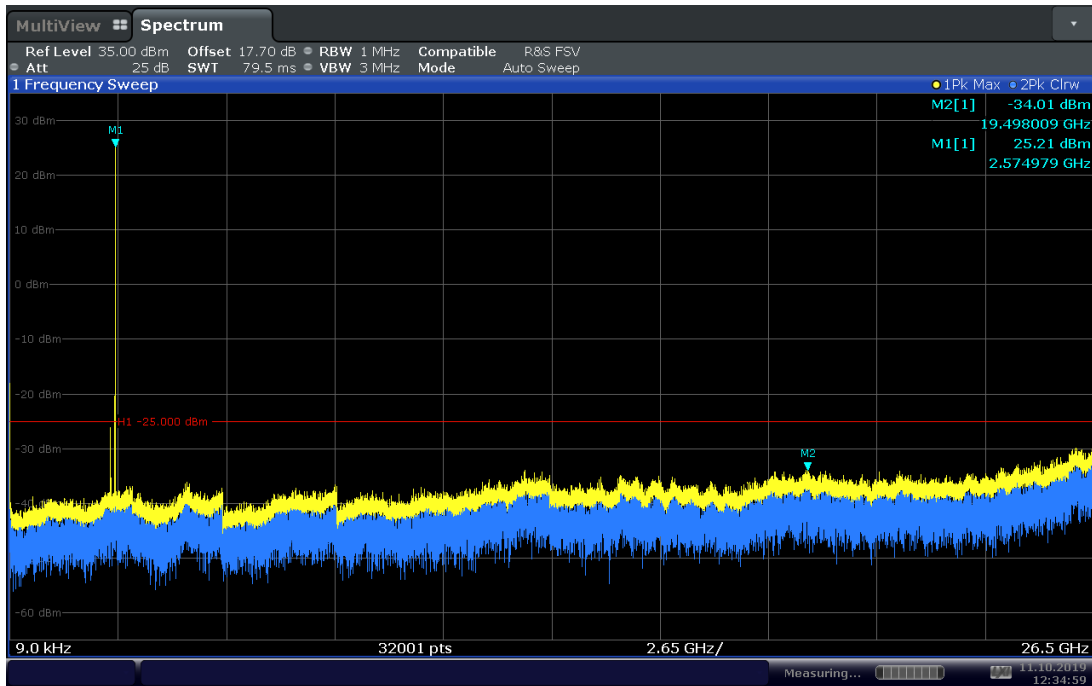
12:28:47 11.10.2019

LTE Band 38 / 5 MHz BW / QPSK / High Channel 2617.5 MHz



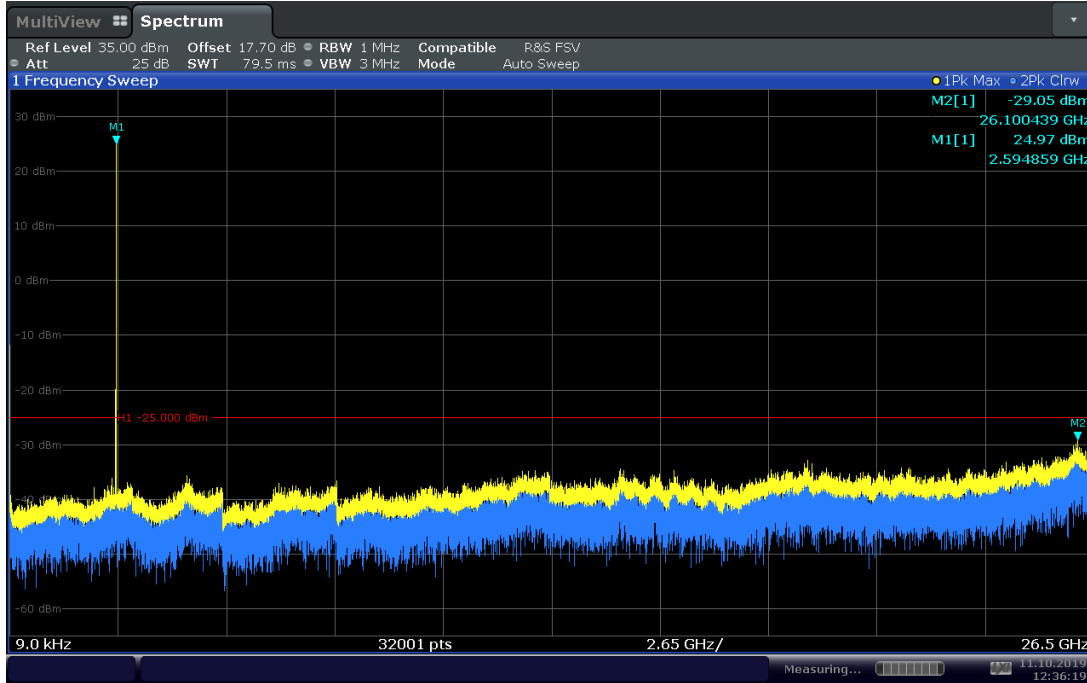
12:33:02 11.10.2019

LTE Band 38 / 10 MHz BW / QPSK / Low Channel 2575 MHz



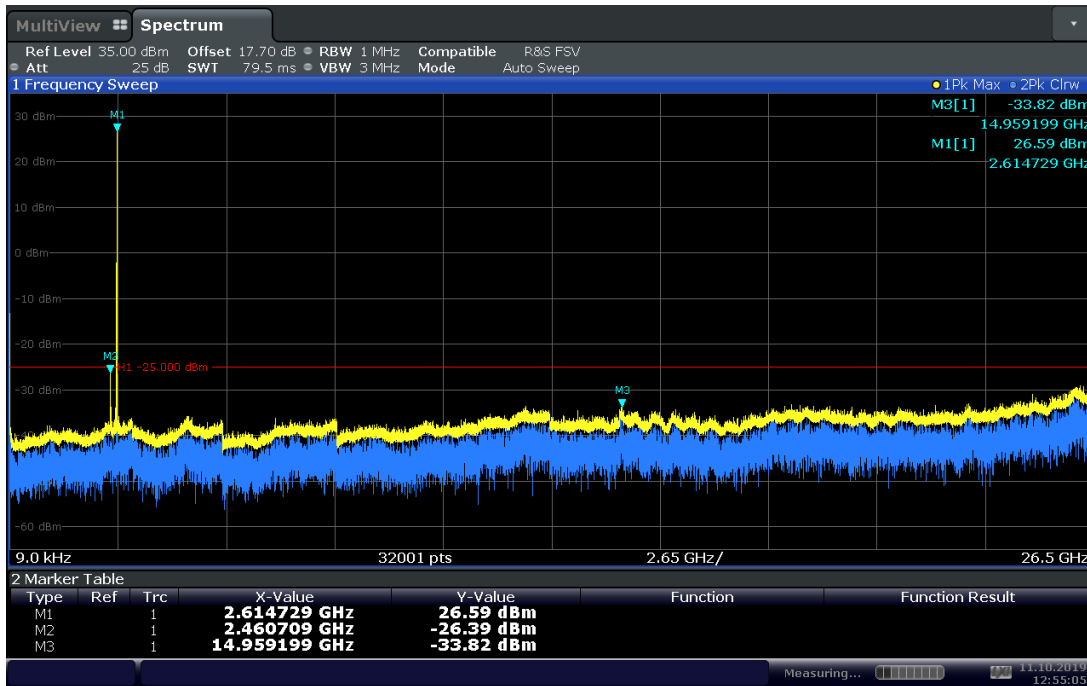
12:35:00 11.10.2019

LTE Band 38 / 10 MHz BW / QPSK / Mid Channel 2595 MHz



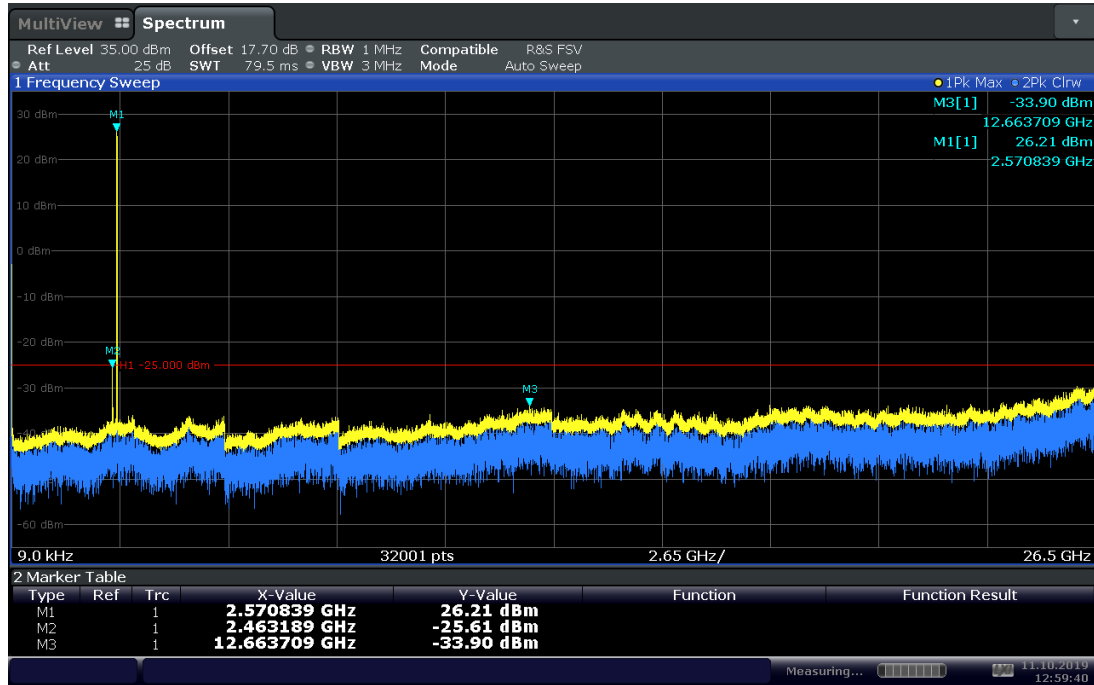
12:36:19 11.10.2019

LTE Band 38 / 10 MHz BW / QPSK / High Channel 2615 MHz



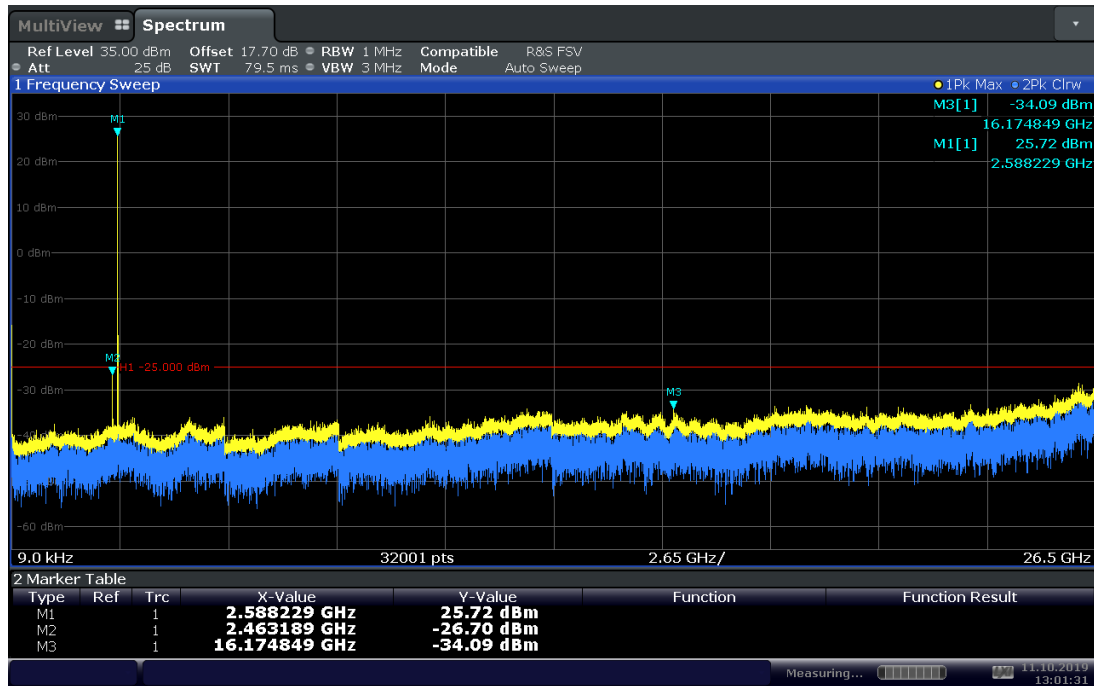
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LTE Band 38 / 15 MHz BW / QPSK / Low Channel 2577.5 MHz



12:59:41 11.10.2019

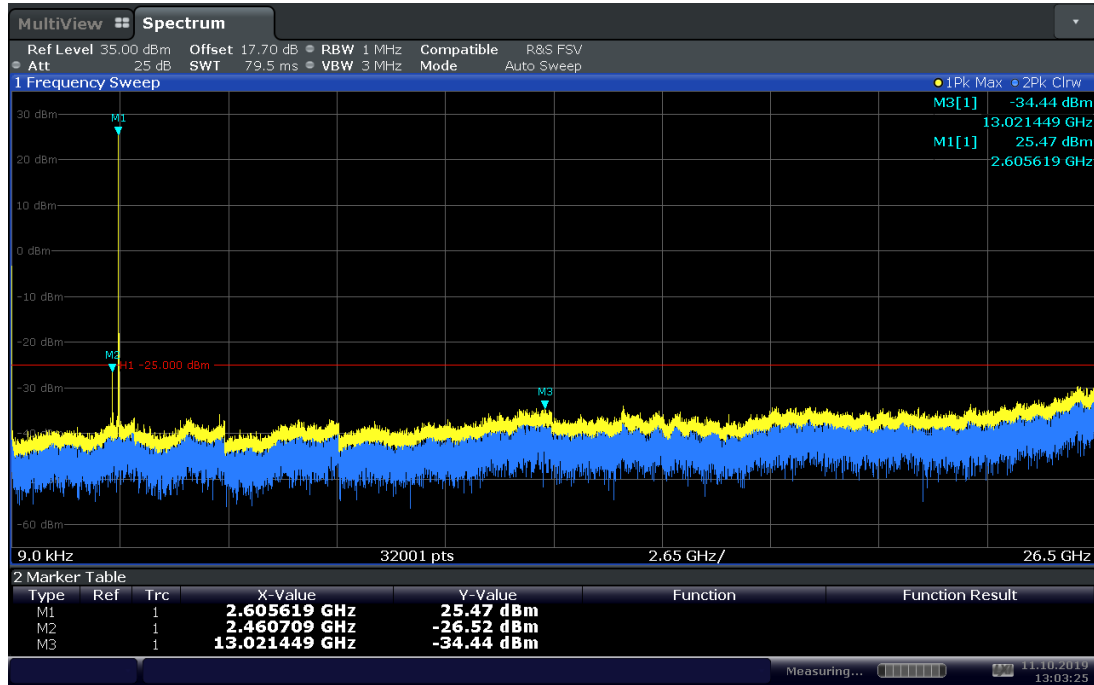
LTE Band 38 / 15 MHz BW / QPSK / Mid Channel 2595 MHz



13:01:32 11.10.2019

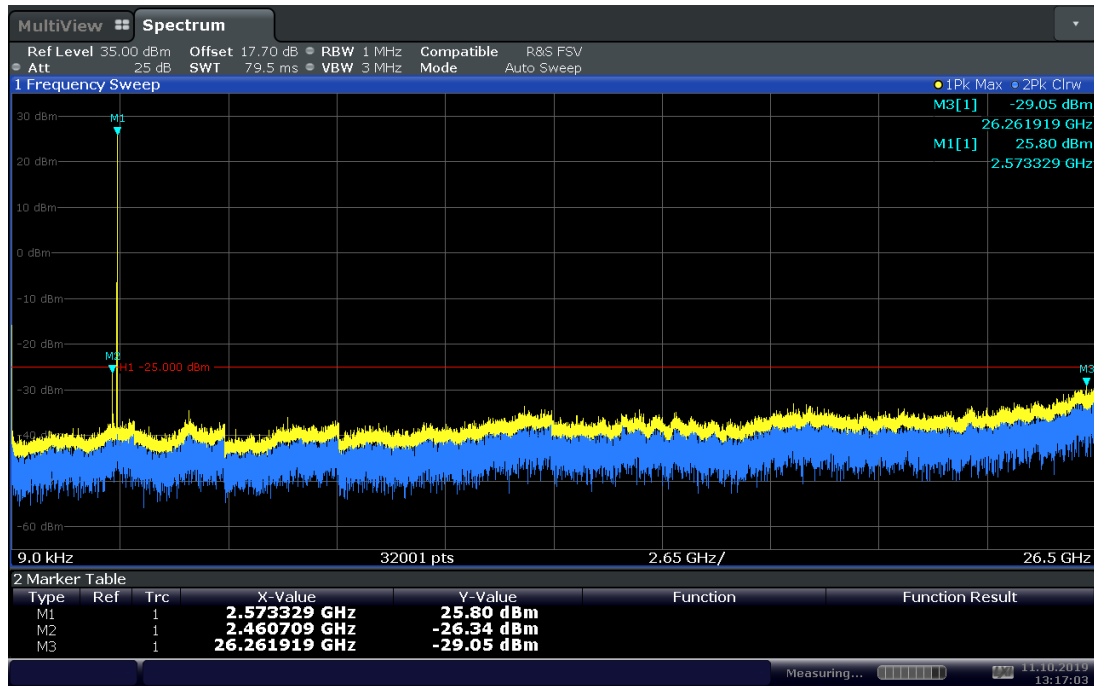


LTE Band 38 / 15 MHz BW / QPSK / High Channel 2612.5 MHz



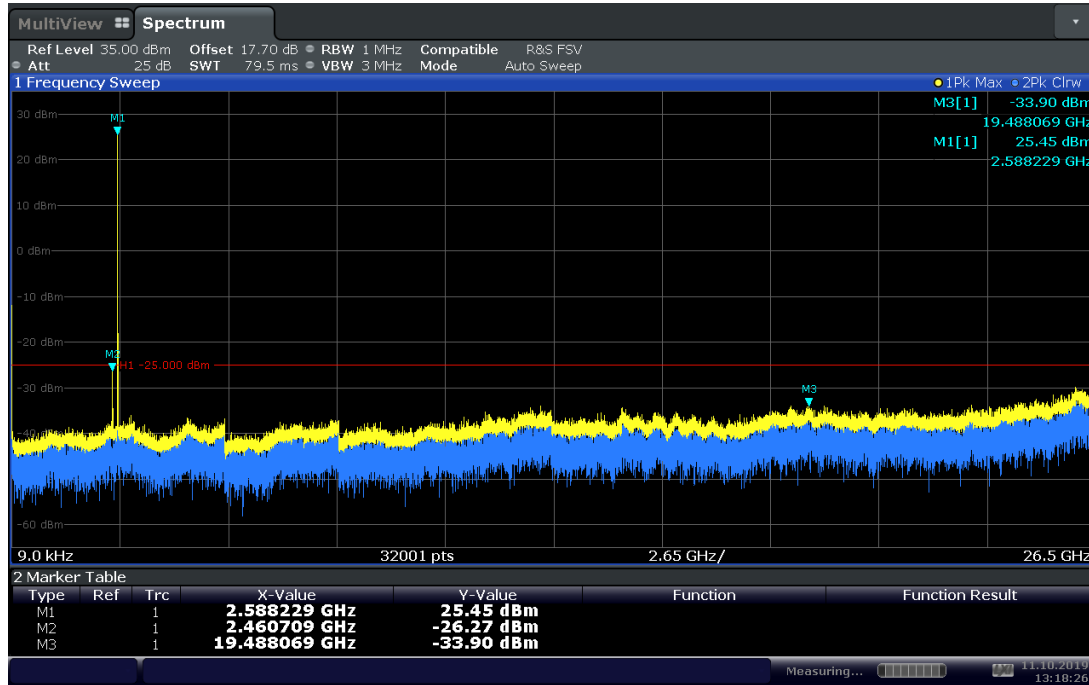
13:03:25 11.10.2019

LTE Band 38 / 20 MHz BW / QPSK / Low Channel 2580 MHz



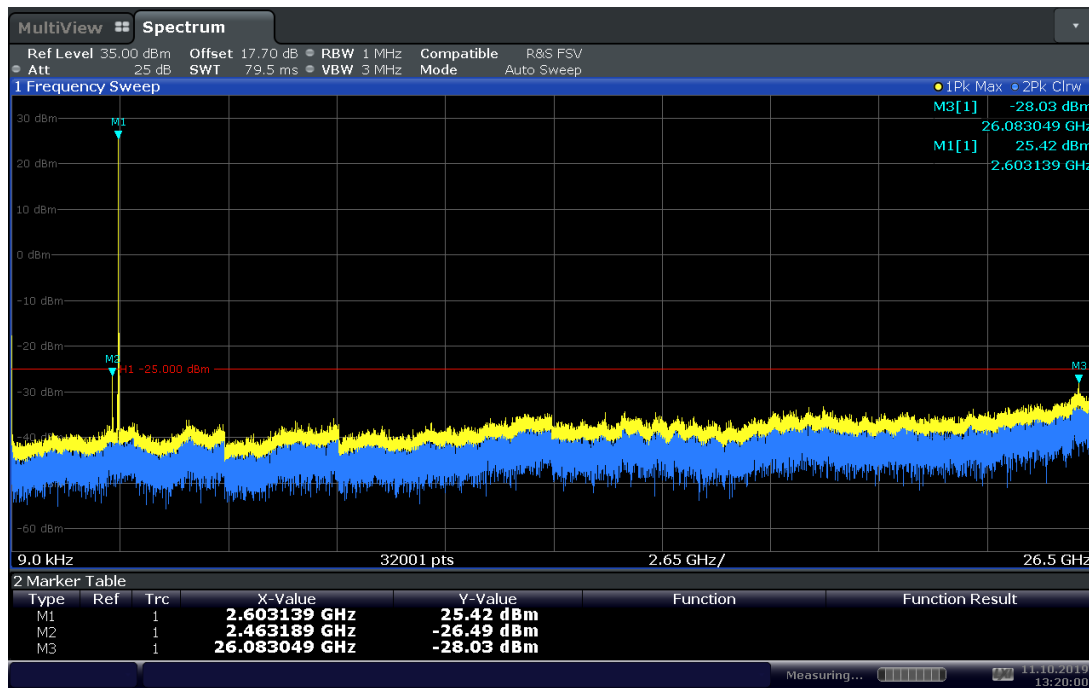
13:17:03 11.10.2019

LTE Band 38 / 20 MHz BW / QPSK / Mid Channel 2595 MHz



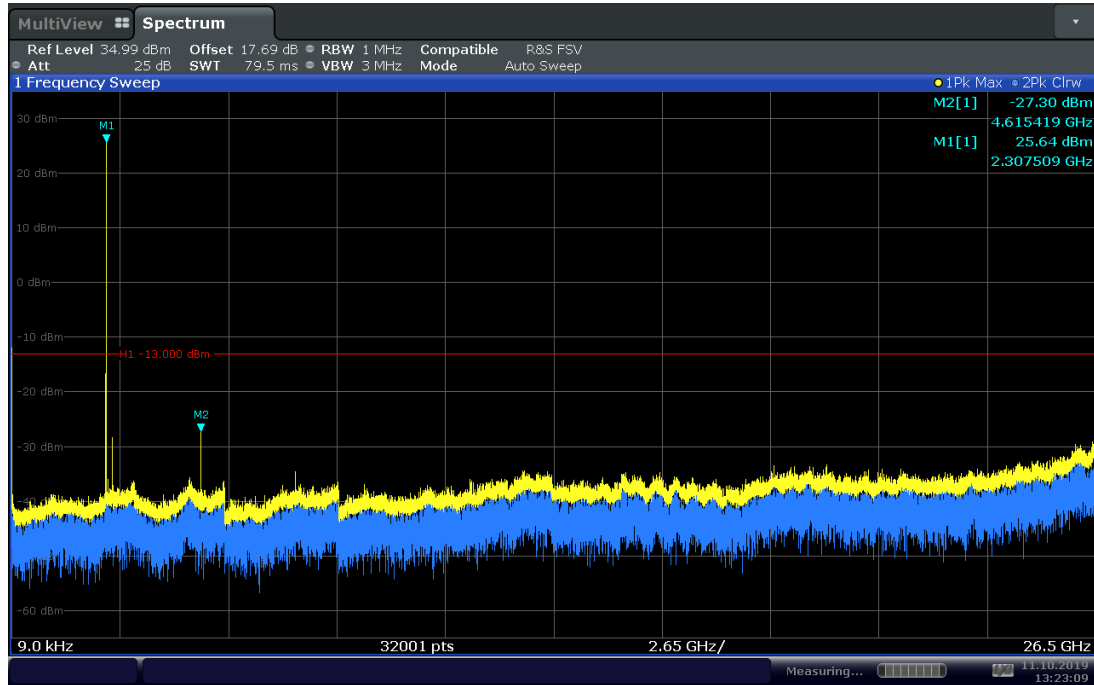
13:18:26 11.10.2019

LTE Band 38 / 20 MHz BW / QPSK / High Channel 2610 MHz



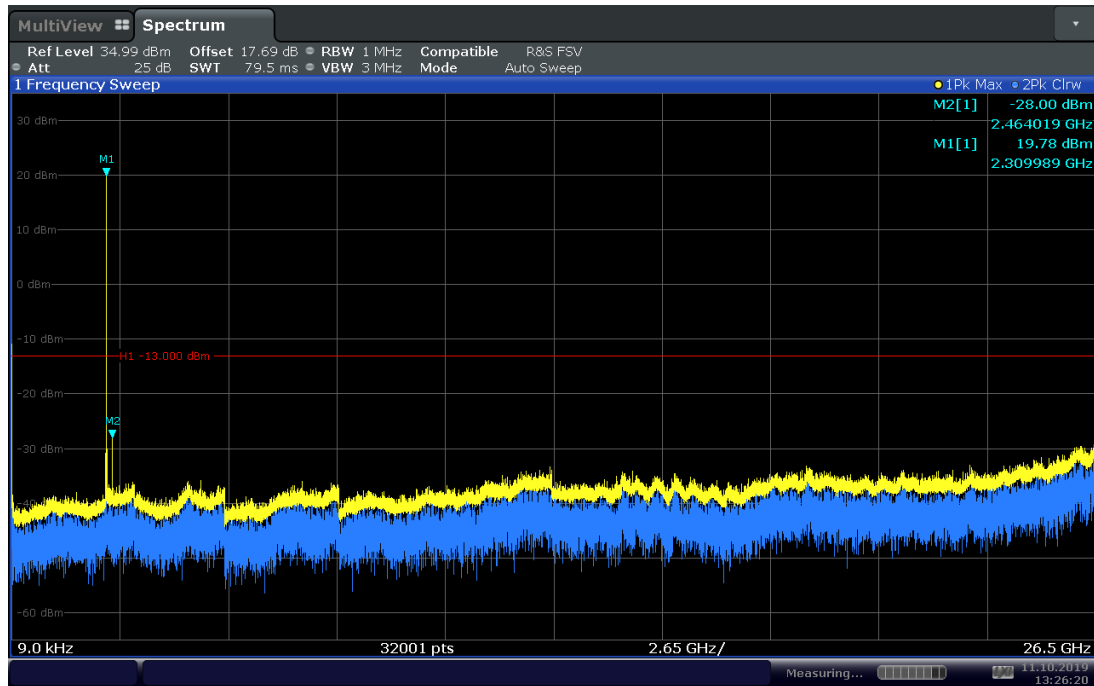
13:20:00 11.10.2019

LTE Band 40 (2305-2315 MHz Range) / 5 MHz BW / QPSK / Low Channel 2307.5 MHz

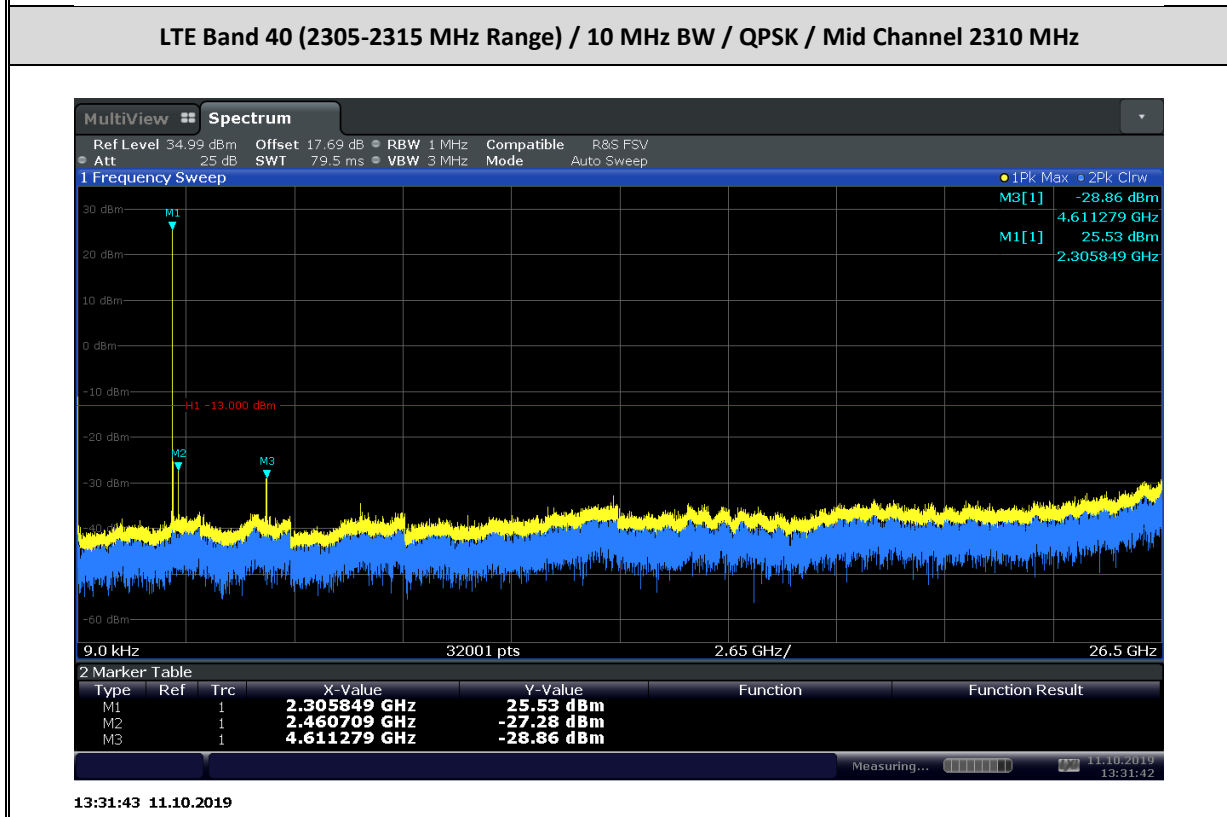
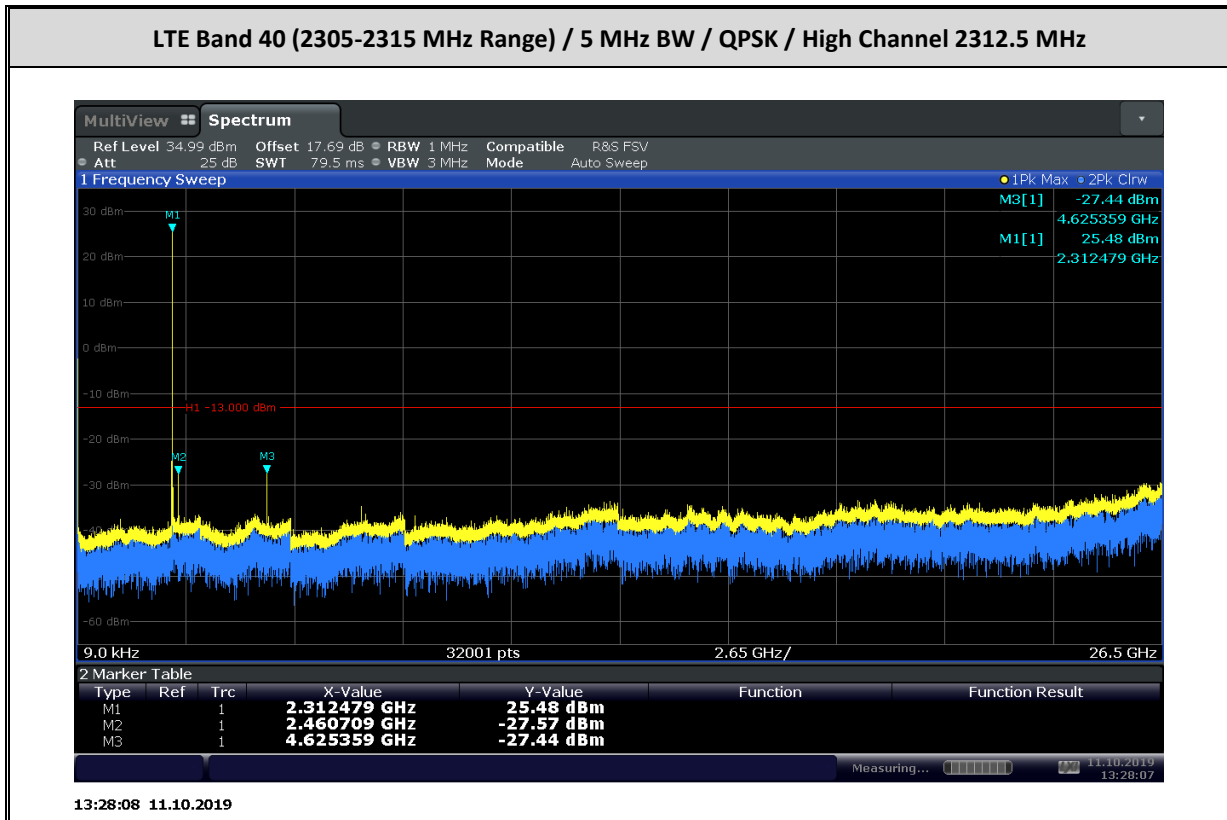


13:23:09 11.10.2019

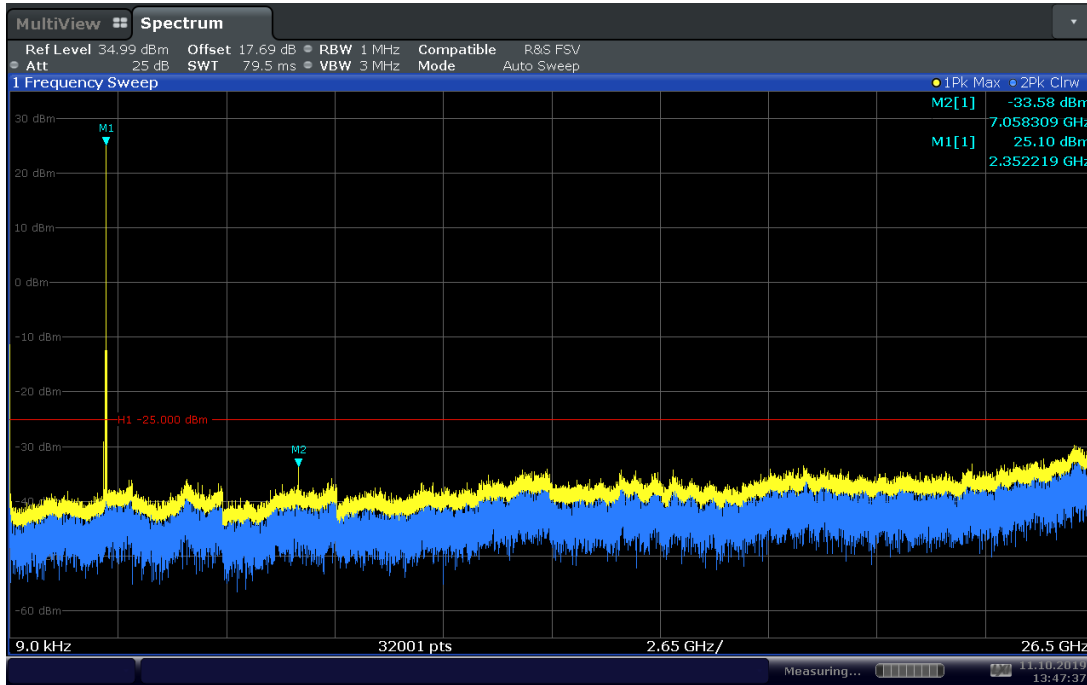
LTE Band 40 (2305-2315 MHz Range) / 5 MHz BW / QPSK / Mid Channel 2310 MHz



13:26:20 11.10.2019

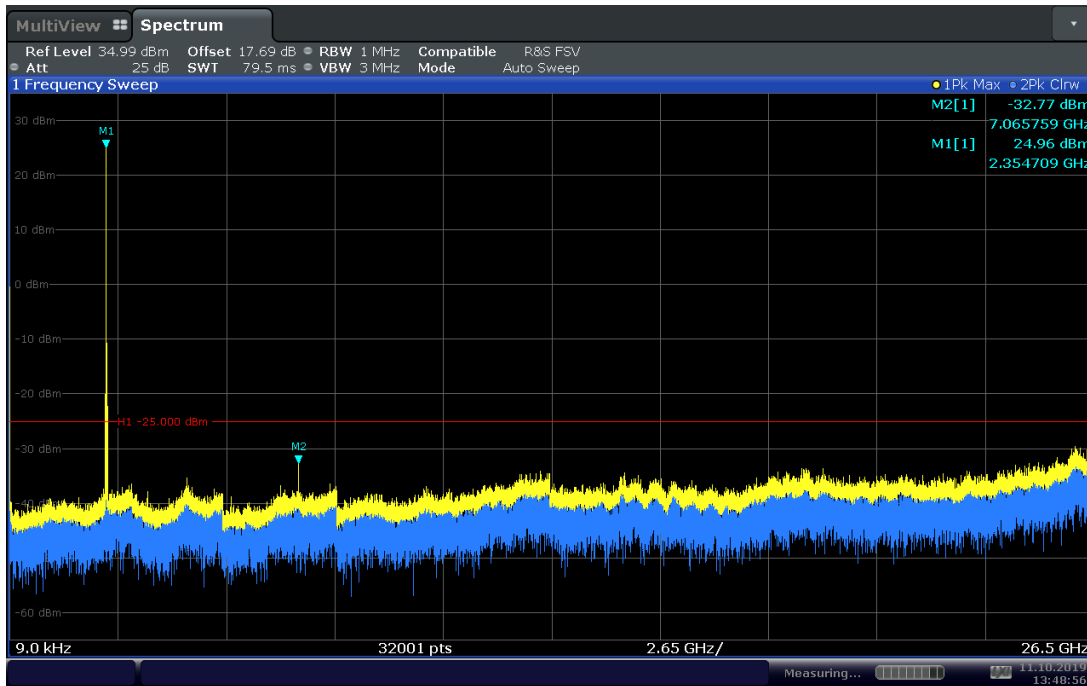


LTE Band 40 (2350-2360 MHz Range) / 5 MHz BW / QPSK / Low Channel 2352.5 MHz



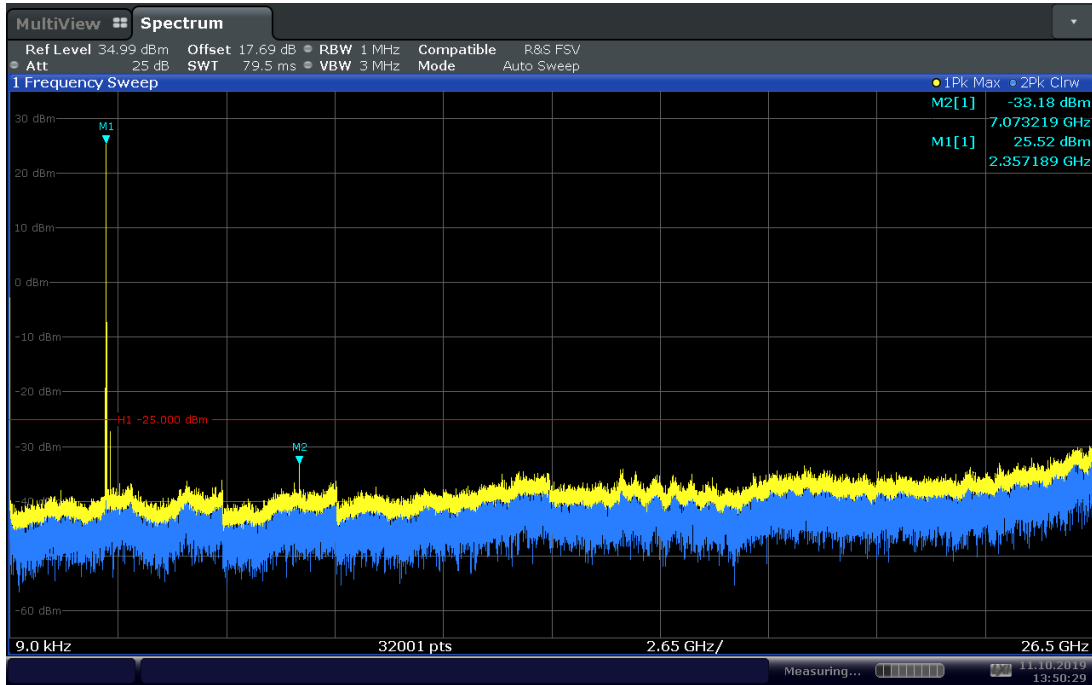
13:47:38 11.10.2019

LTE Band 40 (2350-2360 MHz Range) / 5 MHz BW / QPSK / Mid Channel 2355 MHz



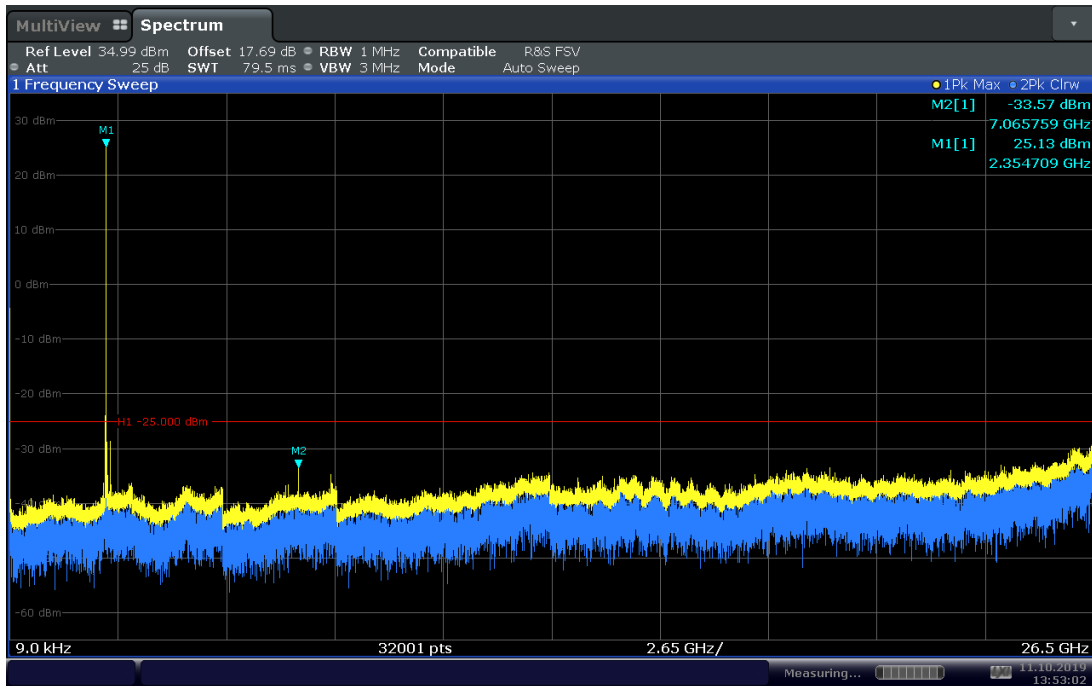
13:48:57 11.10.2019

LTE Band 40 (2350-2360 MHz Range) / 5 MHz BW / QPSK / High Channel 2357.5 MHz



13:50:29 11.10.2019

LTE Band 40 (2350-2360 MHz Range) / 10 MHz BW / QPSK / Mid Channel 2355 MHz



13:53:02 11.10.2019



2.7 FIELD STRENGTH OF SPURIOUS RADIATION

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 27, Clause 27.53(h)(1)
FCC 47 CFR Part 27, Clause 27.53(g)
FCC 47 CFR Part 27, Clause 27.53(m)(4)
FCC 47 CFR Part 27, Clause 27.53(c)(2)
RSS-139, Clause 6.6
RSS-130, Clause 4.7.1
RSS-199, Clause 4.5

2.7.2 Standard Applicable

FCC 47 CFR Part 27.53

(h)(1) AWS emission limits – (1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

(g) For operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(m)(4) For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log(P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section.

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

RSS-139, Clause 6.6:

(i) In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (dBW), by at least $43 + 10 \log_{10} p$ (watts) dB.

(ii) After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (dBW), by at least $43 + 10 \log_{10} p$ (watts) dB.



RSS-130:

4.7.1 The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

RSS-199, Clause 4.5:

In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used.

(b) for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

- (i) $40 + 10 \log_{10} p$ from the channel edges to 5 MHz away.
- (ii) $43 + 10 \log_{10} p$ between 5 MHz and X MHz from the channel edges, and
- (iii) $55 + 10 \log_{10} p$ at X MHz and beyond from the channel edges

2.7.3 Equipment Under Test and Modification State

Serial No: FJ220819C00056 / Test Configuration B

2.7.4 Date of Test/Initial of test personnel who performed the test

September 25 to October 14, 2019 / AC

2.7.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.7 - 25.9 °C
Relative Humidity	49.7 - 57.2 %
ATM Pressure	98.7 - 99.1 kPa

2.7.7 Additional Observations

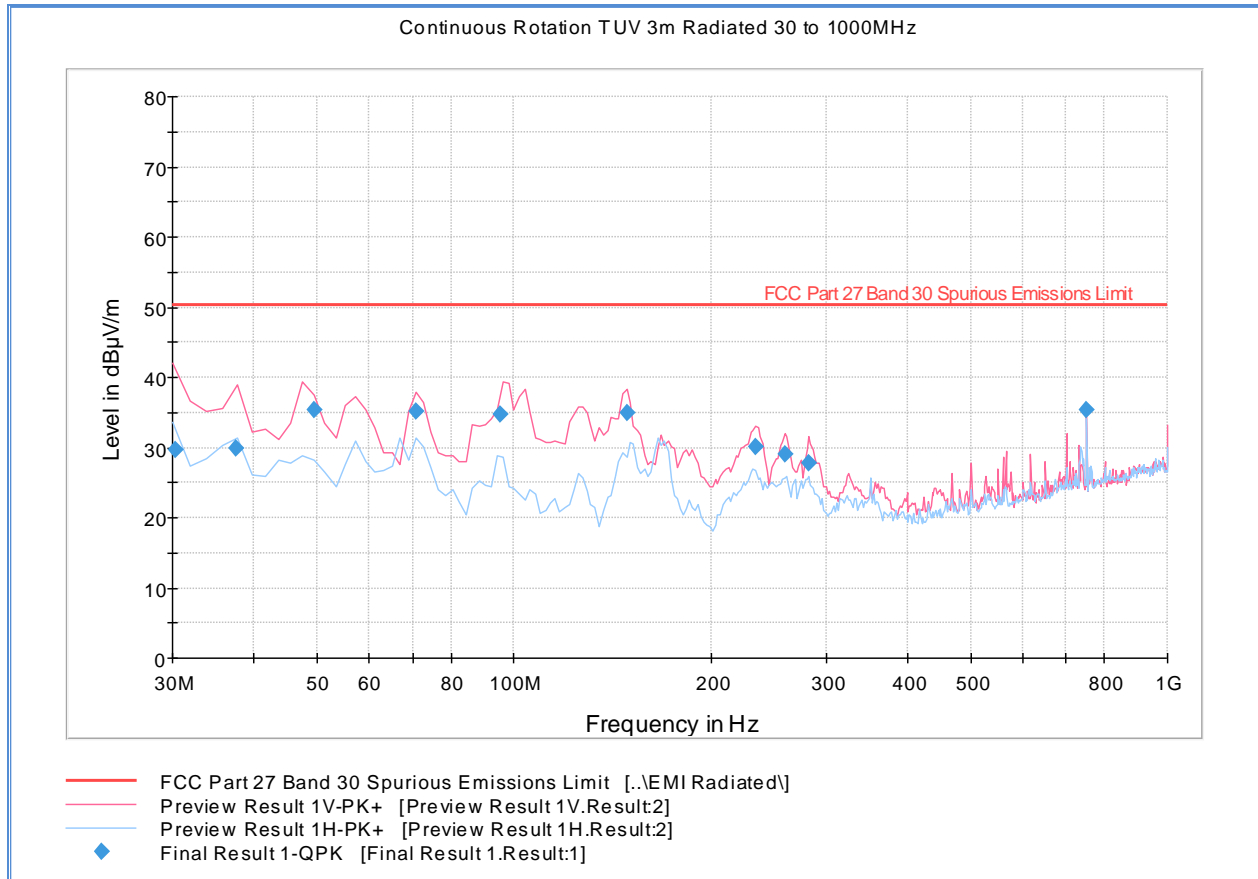
- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of ANSI/TIA/EIA-603-C 2004, August 17, 2004.
- This is cabinet spurious emissions testing. Main antenna port was terminated during the test. Fundamental frequency measurement will be ignored for this test.
- Emissions within 6dB of the limit will be proven by substitution method.
- Only the worst case configuration presented in this test report.
- Only noise floor measurements observed above 18GHz.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.



2.7.8 Test Results

Compliant. See attached plots.

2.7.9 Radiated Emission Test Results Below 1GHz – Worst Case LTE Band 30_Low Channel 2307.5 MHz

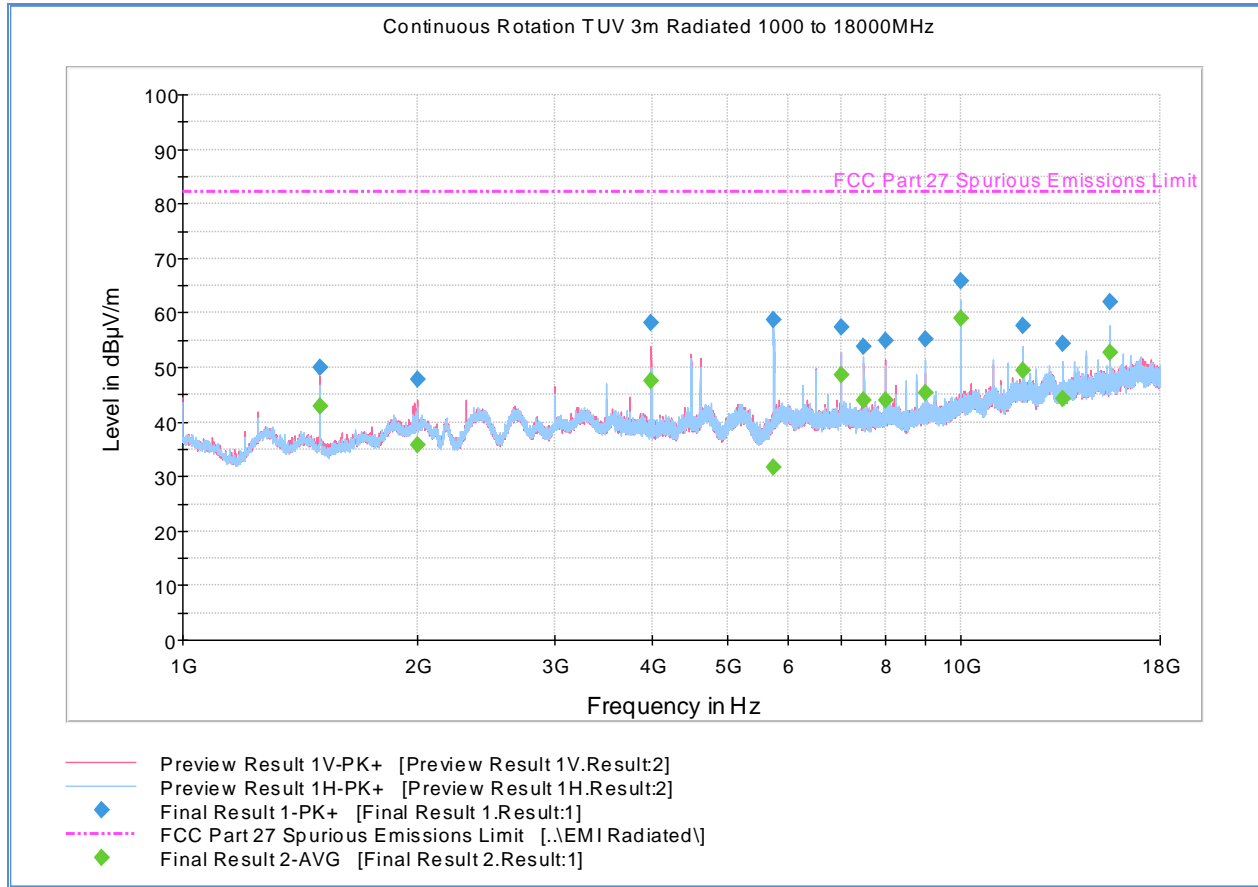


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.240000	29.7	1000.0	120.000	100.0	V	109.0	-8.4	20.5	50.2
37.455551	29.9	1000.0	120.000	100.0	V	174.0	-13.5	20.4	50.2
49.494990	35.3	1000.0	120.000	100.0	V	194.0	-15.4	14.9	50.2
70.861643	35.2	1000.0	120.000	100.0	V	30.0	-18.0	15.0	50.2
95.012184	34.7	1000.0	120.000	100.0	V	86.0	-14.1	15.5	50.2
149.137154	34.8	1000.0	120.000	100.0	V	203.0	-14.1	15.4	50.2
233.932104	30.1	1000.0	120.000	100.0	V	117.0	-10.3	20.1	50.2
259.922645	29.0	1000.0	120.000	100.0	V	131.0	-9.3	21.2	50.2
282.465411	27.8	1000.0	120.000	100.0	V	130.0	-9.3	22.4	50.2
749.982365	35.5	1000.0	120.000	150.0	V	93.0	1.6	14.8	50.2



2.7.10 Radiated Emission Test Results Above 1GHz – LTE Band 30_Low Channel 2307.5 MHz



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	49.9	1000.0	1000.000	104.8	V	215.0	-6.1	32.3	82.2
2000.000000	47.8	1000.0	1000.000	165.6	V	350.0	-2.2	34.4	82.2
3999.766667	58.3	1000.0	1000.000	152.7	V	12.0	2.5	23.9	82.2
5743.800000	58.8	1000.0	1000.000	302.2	H	303.0	5.3	23.4	82.2
7000.066667	57.4	1000.0	1000.000	269.3	H	-8.0	6.7	24.8	82.2
7499.866667	53.9	1000.0	1000.000	184.6	H	54.0	6.8	28.3	82.2
7999.866667	54.9	1000.0	1000.000	103.7	V	40.0	6.9	27.3	82.2
9000.000000	55.1	1000.0	1000.000	294.3	H	339.0	7.6	27.1	82.2
10000.000000	65.8	1000.0	1000.000	196.5	H	133.0	9.6	16.4	82.2
11999.966667	57.7	1000.0	1000.000	200.5	H	144.0	13.5	24.5	82.2
13499.900000	54.4	1000.0	1000.000	252.4	H	29.0	14.2	27.8	82.2
15500.066667	62.0	1000.0	1000.000	279.3	H	143.0	16.1	20.2	82.2



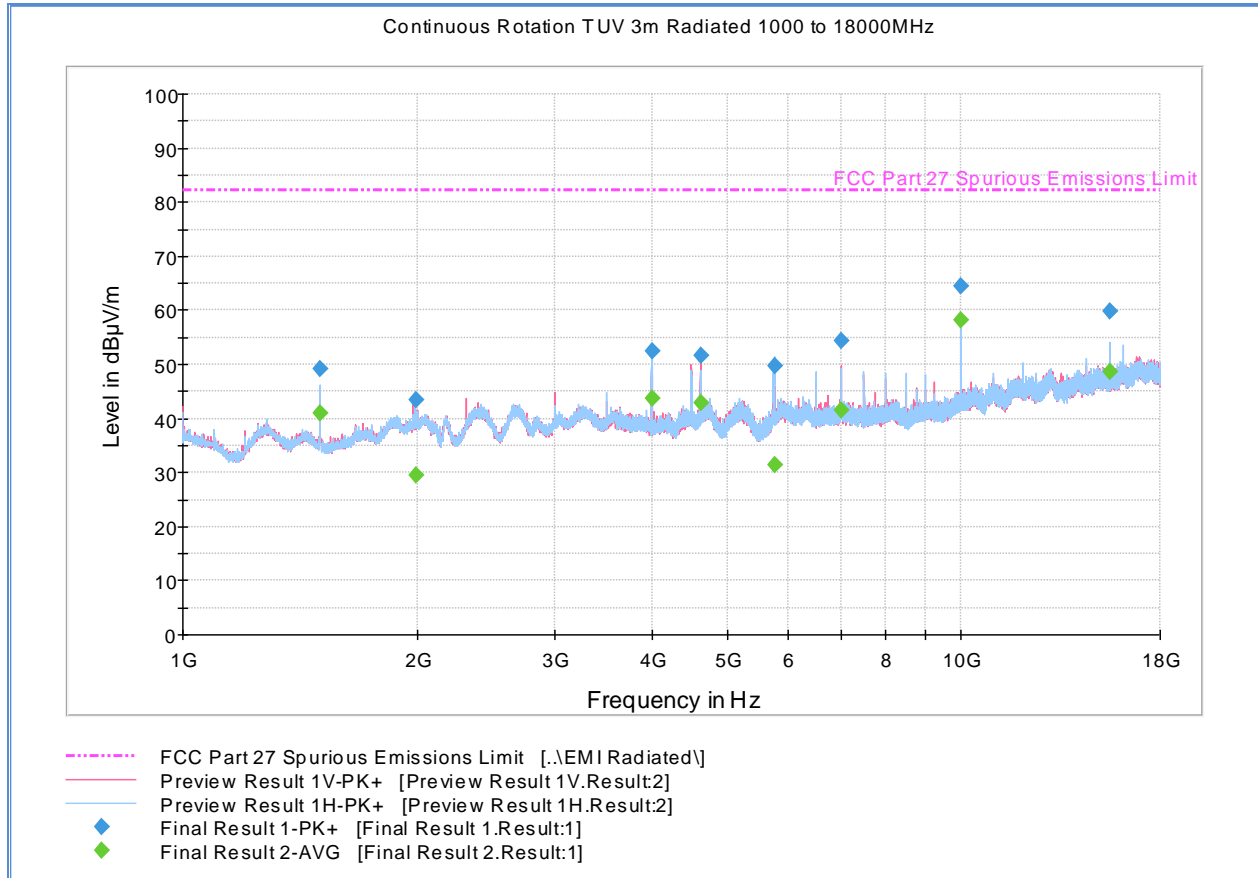
Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	42.8	1000.0	1000.000	104.8	V	215.0	-6.1	39.4	82.2
2000.000000	35.8	1000.0	1000.000	165.6	V	350.0	-2.2	46.4	82.2
3999.766667	47.6	1000.0	1000.000	152.7	V	12.0	2.5	34.6	82.2
5743.800000	31.7	1000.0	1000.000	302.2	H	303.0	5.3	50.5	82.2
7000.066667	48.7	1000.0	1000.000	269.3	H	-8.0	6.7	33.5	82.2
7499.866667	43.9	1000.0	1000.000	184.6	H	54.0	6.8	38.3	82.2
7999.866667	43.9	1000.0	1000.000	103.7	V	40.0	6.9	38.3	82.2
9000.000000	45.3	1000.0	1000.000	294.3	H	339.0	7.6	36.9	82.2
10000.000000	59.1	1000.0	1000.000	196.5	H	133.0	9.6	23.1	82.2
11999.966667	49.4	1000.0	1000.000	200.5	H	144.0	13.5	32.8	82.2
13499.900000	44.3	1000.0	1000.000	252.4	H	29.0	14.2	37.9	82.2
15500.066667	52.7	1000.0	1000.000	279.3	H	143.0	16.1	29.5	82.2

* 2GHz – 3GHz and 5.8GHz notch filters were used during evaluation.



2.7.11 Radiated Emission Test Results Above 1GHz – LTE Band 30_Mid Channel 2310 MHz



Peak Data

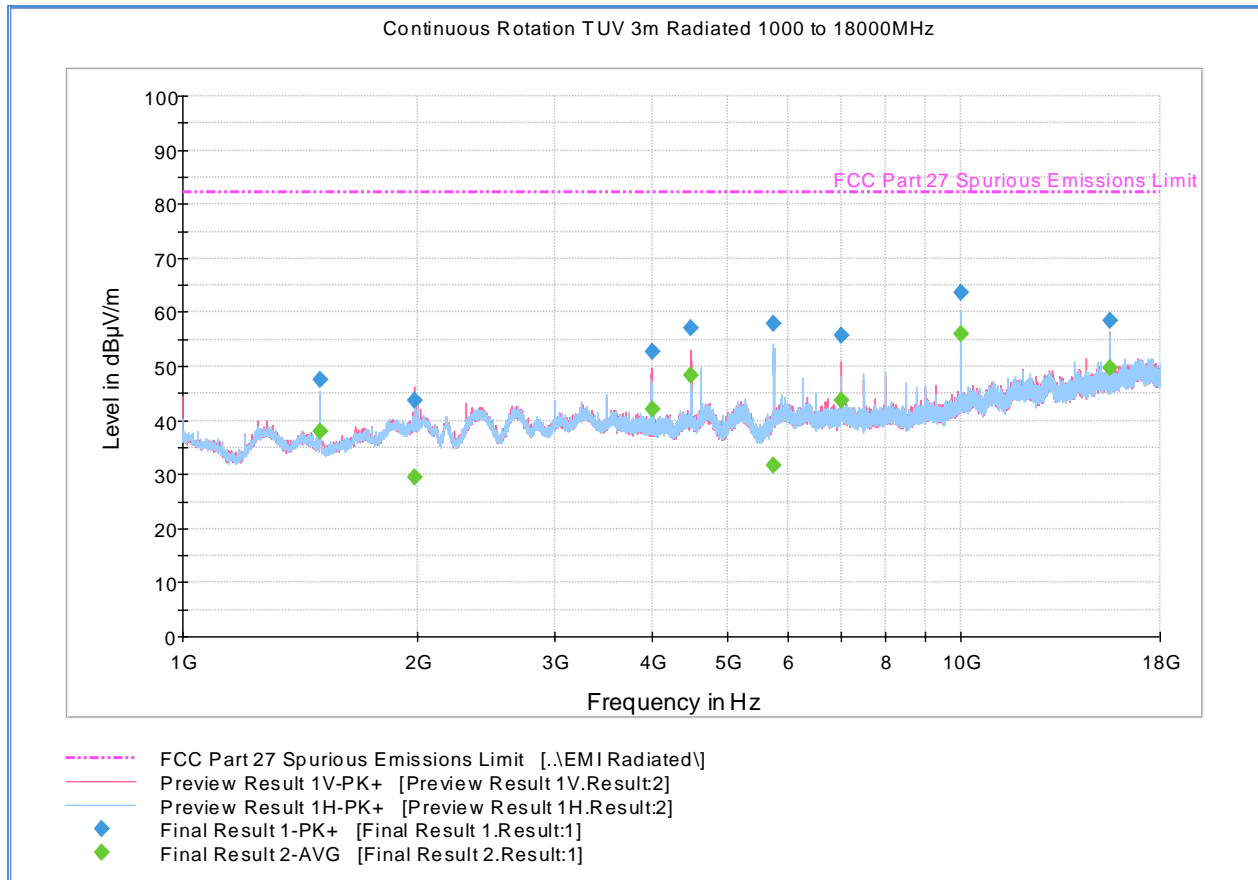
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	49.1	1000.0	1000.000	131.7	H	346.0	-6.1	33.1	82.2
1989.266667	43.6	1000.0	1000.000	305.2	H	177.0	-2.3	38.6	82.2
4000.133333	52.5	1000.0	1000.000	188.5	H	37.0	2.5	29.7	82.2
4620.266667	51.6	1000.0	1000.000	103.7	V	11.0	3.6	30.6	82.2
5751.133333	49.6	1000.0	1000.000	147.7	H	180.0	5.3	32.6	82.2
7000.066667	54.4	1000.0	1000.000	395.0	V	76.0	6.7	27.8	82.2
10000.000000	64.4	1000.0	1000.000	300.2	H	35.0	9.6	17.8	82.2
15499.833333	59.7	1000.0	1000.000	403.0	H	55.0	16.1	22.5	82.2

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	41.1	1000.0	1000.000	131.7	H	346.0	-6.1	41.1	82.2
1989.266667	29.4	1000.0	1000.000	305.2	H	177.0	-2.3	52.8	82.2
4000.133333	43.6	1000.0	1000.000	188.5	H	37.0	2.5	38.6	82.2
4620.266667	43.0	1000.0	1000.000	103.7	V	11.0	3.6	39.2	82.2
5751.133333	31.5	1000.0	1000.000	147.7	H	180.0	5.3	50.7	82.2
7000.066667	41.6	1000.0	1000.000	395.0	V	76.0	6.7	40.6	82.2
10000.000000	58.1	1000.0	1000.000	300.2	H	35.0	9.6	24.1	82.2
15499.833333	48.6	1000.0	1000.000	403.0	H	55.0	16.1	33.6	82.2



2.7.12 Radiated Emission Test Results Above 1GHz – LTE Band 30_High Channel 2312.5 MHz



Peak Data

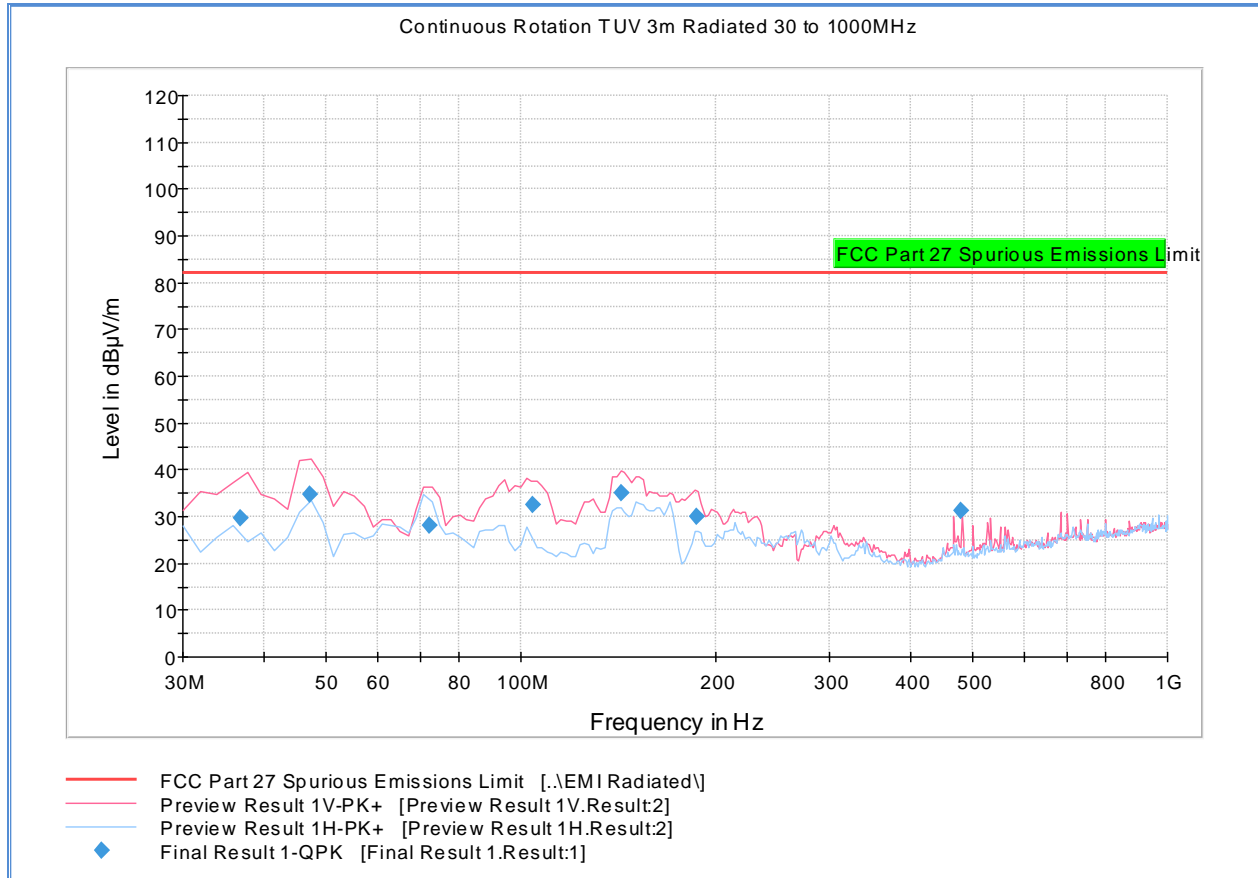
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	47.6	1000.0	1000.000	327.2	H	32.0	-6.1	34.6	82.2
1987.500000	43.7	1000.0	1000.000	311.2	V	188.0	-2.3	38.5	82.2
4000.133333	52.7	1000.0	1000.000	352.7	V	-1.0	2.5	29.5	82.2
4499.933333	57.2	1000.0	1000.000	120.7	V	-1.0	3.7	25.0	82.2
5743.233333	58.0	1000.0	1000.000	112.7	H	-10.0	5.3	24.2	82.2
7000.066667	55.7	1000.0	1000.000	315.2	V	55.0	6.7	26.5	82.2
10000.000000	63.5	1000.0	1000.000	295.2	H	39.0	9.6	18.7	82.2
15500.066667	58.6	1000.0	1000.000	394.0	V	54.0	16.1	23.6	82.2

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	37.9	1000.0	1000.000	327.2	H	32.0	-6.1	44.3	82.2
1987.500000	29.6	1000.0	1000.000	311.2	V	188.0	-2.3	52.6	82.2
4000.133333	42.1	1000.0	1000.000	352.7	V	-1.0	2.5	40.1	82.2
4499.933333	48.4	1000.0	1000.000	120.7	V	-1.0	3.7	33.8	82.2
5743.233333	31.7	1000.0	1000.000	112.7	H	-10.0	5.3	50.5	82.2
7000.066667	43.7	1000.0	1000.000	315.2	V	55.0	6.7	38.5	82.2
10000.000000	56.1	1000.0	1000.000	295.2	H	39.0	9.6	26.1	82.2
15500.066667	49.6	1000.0	1000.000	394.0	V	54.0	16.1	32.6	82.2



2.7.13 Radiated Emission Test Results Below 1GHz – Worst Case LTE Band 38_Low Channel 2595 MHz

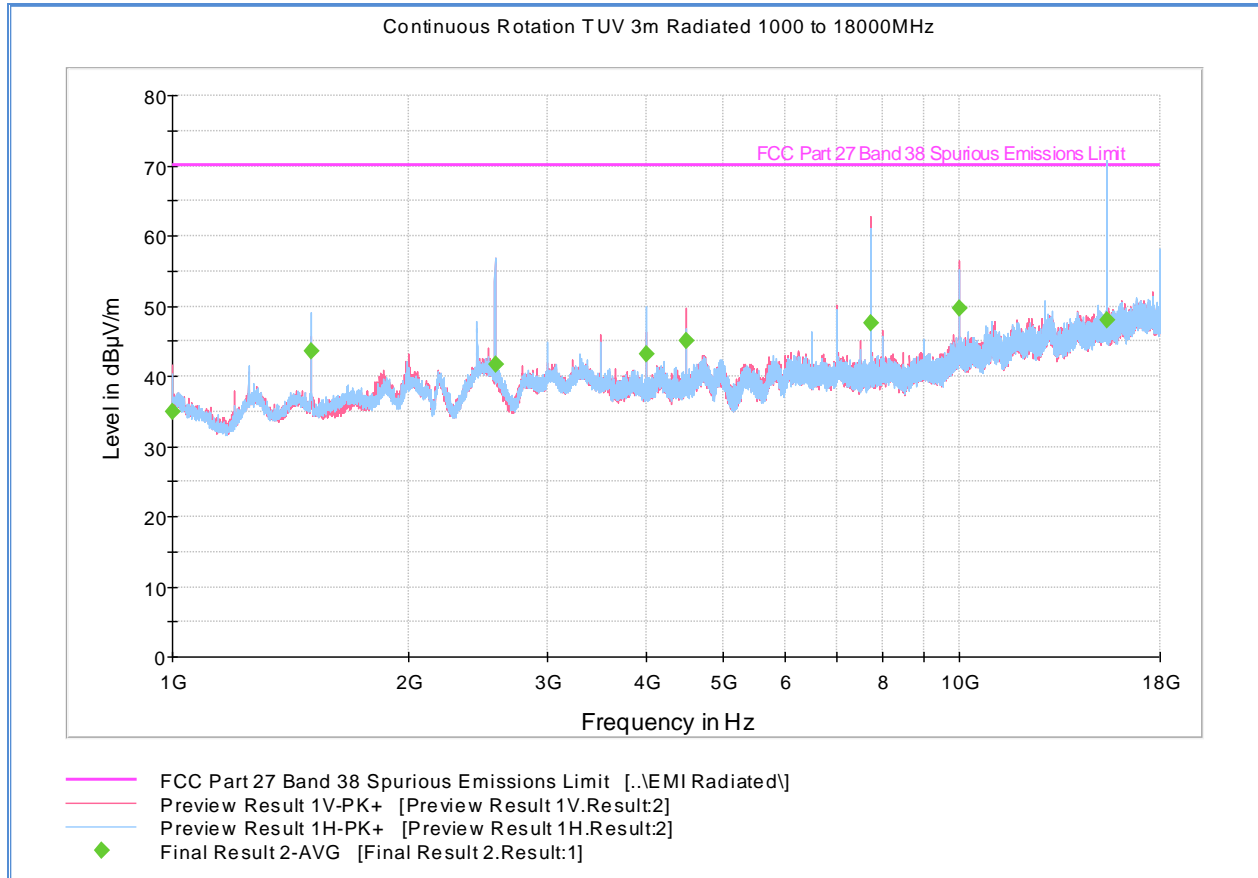


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
36.735551	29.6	1000.0	120.000	100.0	V	242.0	-10.7	52.6	82.2
47.094990	34.6	1000.0	120.000	138.0	V	219.0	-14.2	47.6	82.2
72.245531	28.0	1000.0	120.000	100.0	V	229.0	-17.2	54.2	82.2
104.483848	32.4	1000.0	120.000	100.0	V	117.0	-13.2	49.8	82.2
142.665491	35.1	1000.0	120.000	106.0	V	247.0	-14.0	47.1	82.2
186.711022	30.1	1000.0	120.000	100.0	V	-8.0	-11.3	52.1	82.2
479.981964	31.3	1000.0	120.000	100.0	V	121.0	-1.9	50.9	82.2



2.7.14 Radiated Emission Test Results Above 1GHz – LTE Band 38_Low Channel 2580 MHz

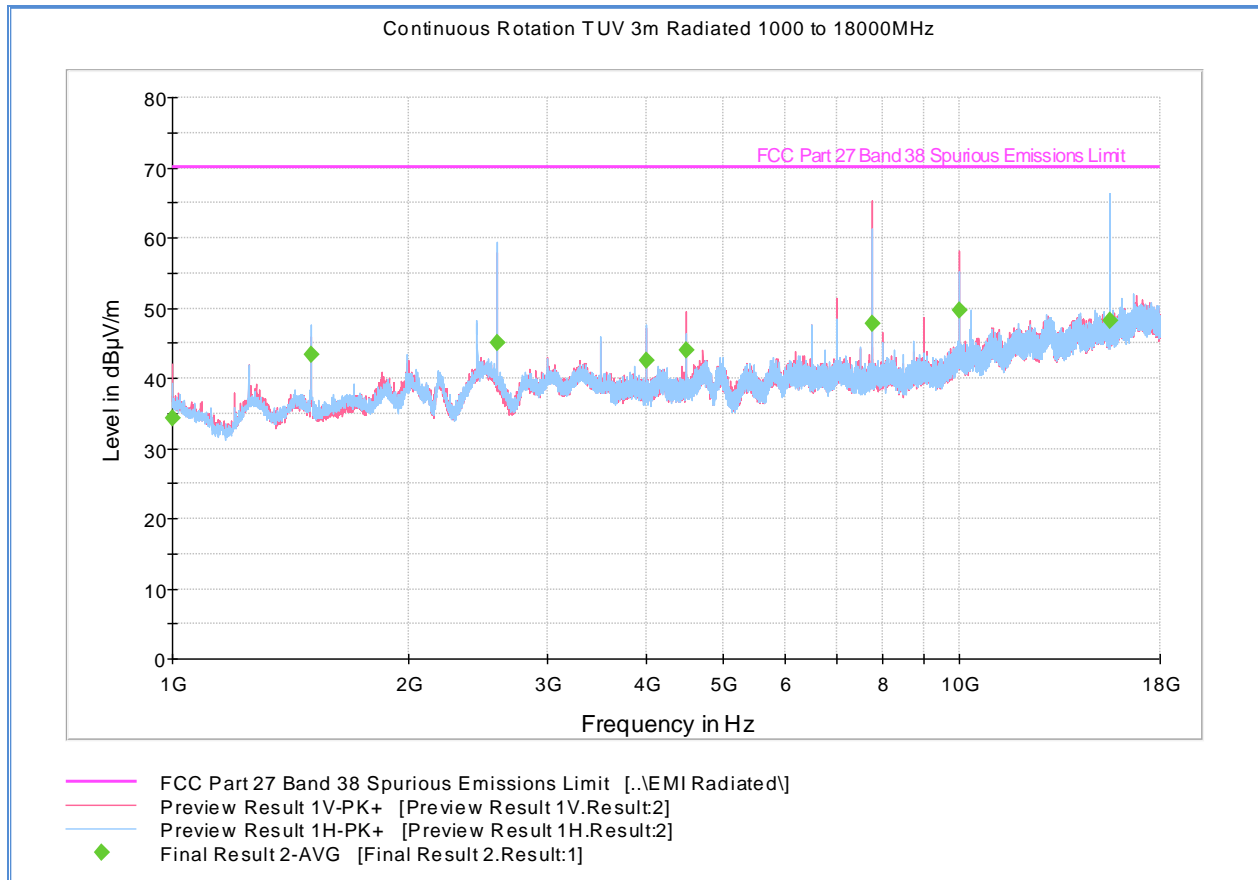


Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	34.9	1000.0	1000.000	150.7	V	195.0	-6.9	35.3	70.2
1500.000000	43.6	1000.0	1000.000	179.5	H	49.0	-6.1	26.6	70.2
2571.000000	41.6	1000.0	1000.000	150.7	V	295.0	-0.3	28.6	70.2
4000.133333	43.2	1000.0	1000.000	213.4	H	68.0	2.5	27.0	70.2
4499.933333	45.0	1000.0	1000.000	142.7	V	-7.0	3.7	25.2	70.2
7713.100000	47.5	1000.0	1000.000	204.5	V	0.0	7.2	22.7	70.2
10000.000000	49.8	1000.0	1000.000	250.5	V	67.0	9.6	20.4	70.2
15426.566667	48.0	1000.0	1000.000	174.6	H	273.0	16.1	22.2	70.2



2.7.15 Radiated Emission Test Results Above 1GHz – LTE Band 38_Mid Channel 2595 MHz

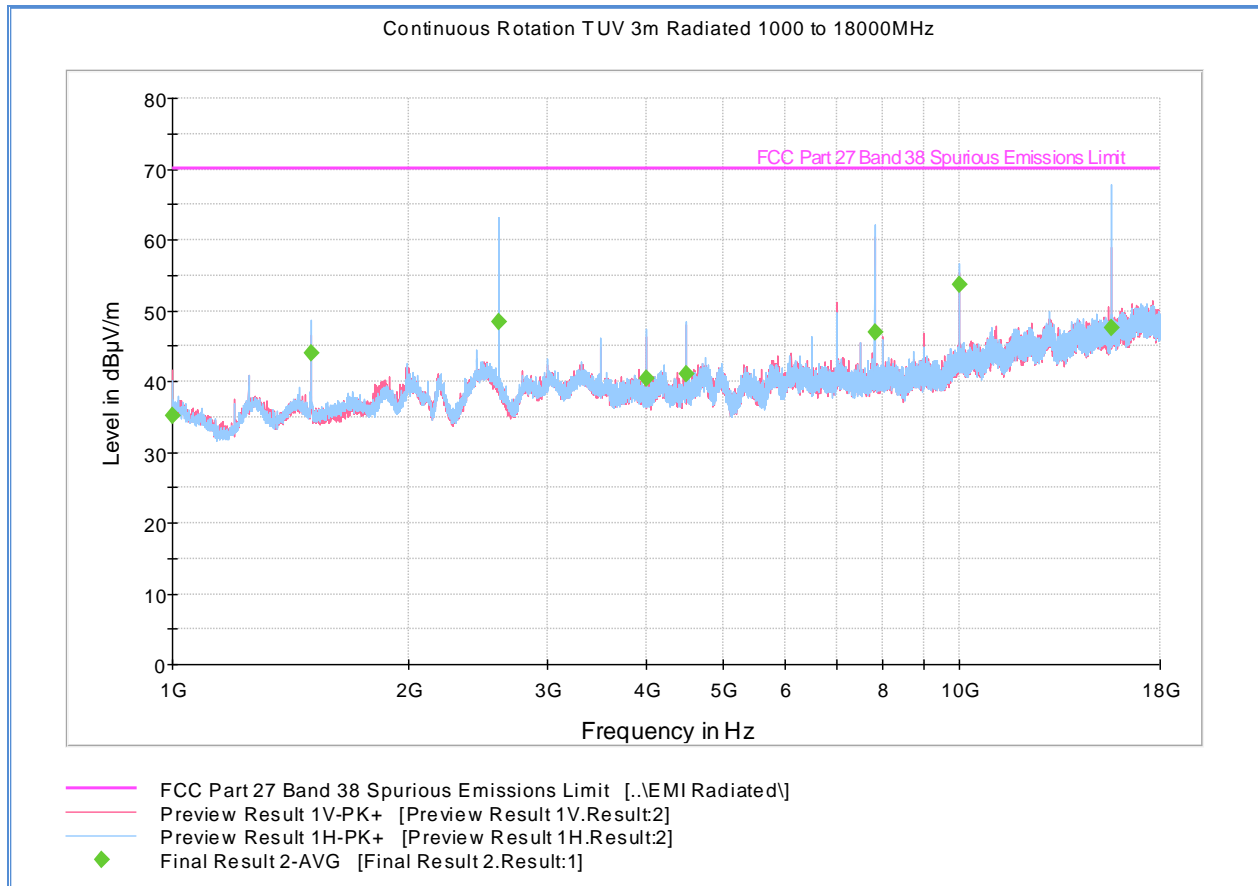


Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	34.4	1000.0	1000.000	167.6	V	182.0	-6.9	35.8	70.2
1500.000000	43.4	1000.0	1000.000	138.7	H	150.0	-6.1	26.8	70.2
2585.933333	45.1	1000.0	1000.000	149.6	H	289.0	-0.3	25.1	70.2
4000.166667	42.6	1000.0	1000.000	201.3	H	64.0	2.5	27.6	70.2
4499.933333	44.0	1000.0	1000.000	196.5	V	350.0	3.7	26.2	70.2
7758.266667	47.8	1000.0	1000.000	191.5	V	-4.0	7.1	22.4	70.2
10000.000000	49.7	1000.0	1000.000	250.5	V	67.0	9.6	20.5	70.2
15516.666667	48.1	1000.0	1000.000	163.6	H	262.0	16.1	22.1	70.2



2.7.16 Radiated Emission Test Results Above 1GHz – LTE Band 38_High Channel 2610 MHz



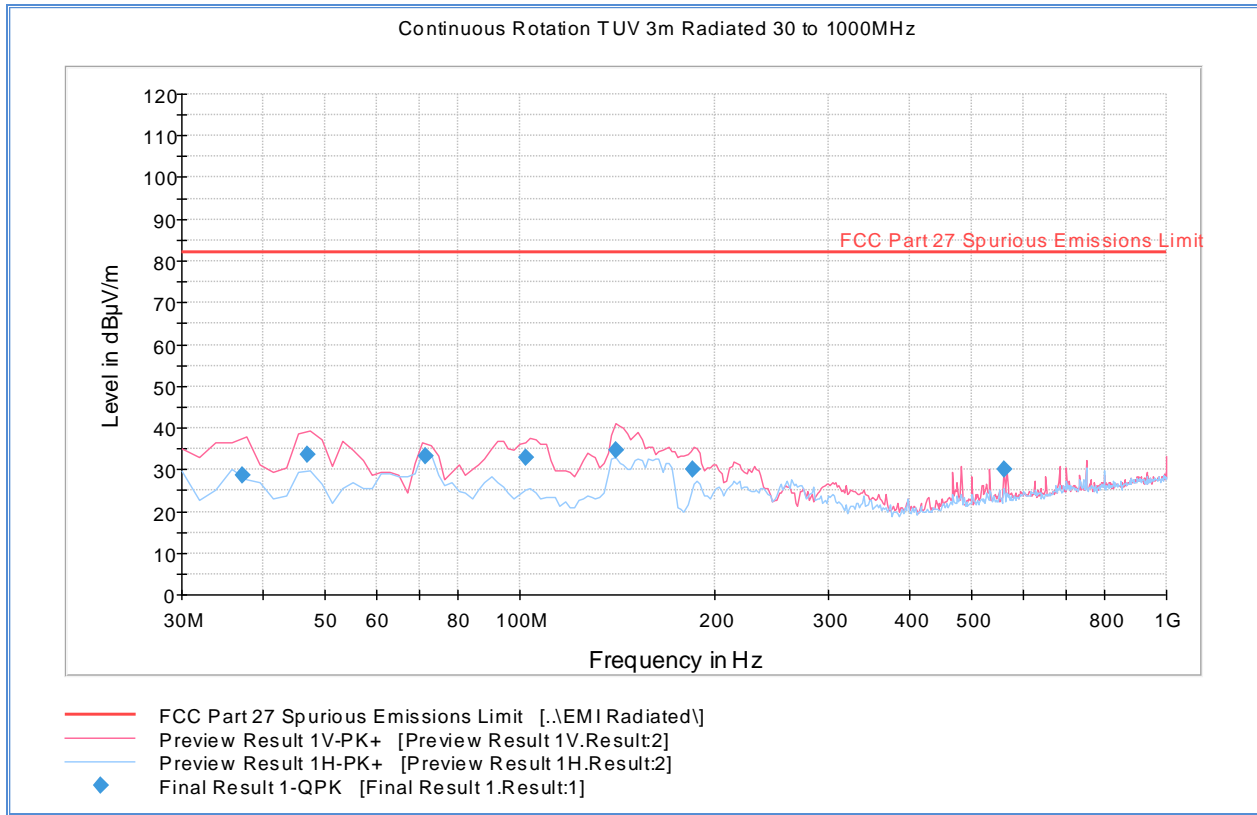
Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	35.2	1000.0	1000.000	163.6	V	93.0	-6.9	35.0	70.2
1500.000000	43.9	1000.0	1000.000	200.5	H	49.0	-6.1	26.3	70.2
2601.033333	48.5	1000.0	1000.000	176.6	H	227.0	-0.3	21.7	70.2
4000.133333	40.4	1000.0	1000.000	250.5	H	303.0	2.5	29.8	70.2
4499.933333	41.0	1000.0	1000.000	159.6	H	36.0	3.7	29.2	70.2
7803.233333	46.9	1000.0	1000.000	181.6	H	8.0	7.1	23.3	70.2
10000.000000	53.7	1000.0	1000.000	250.5	H	41.0	9.6	16.5	70.2
15606.366667	47.7	1000.0	1000.000	153.7	H	252.0	16.3	22.5	70.2



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2.7.17 Radiated Emission Test Results Below 1GHz – Worst Case LTE Band 40 (2305-2315MHz Range)_Low Channel 2307.5 MHz

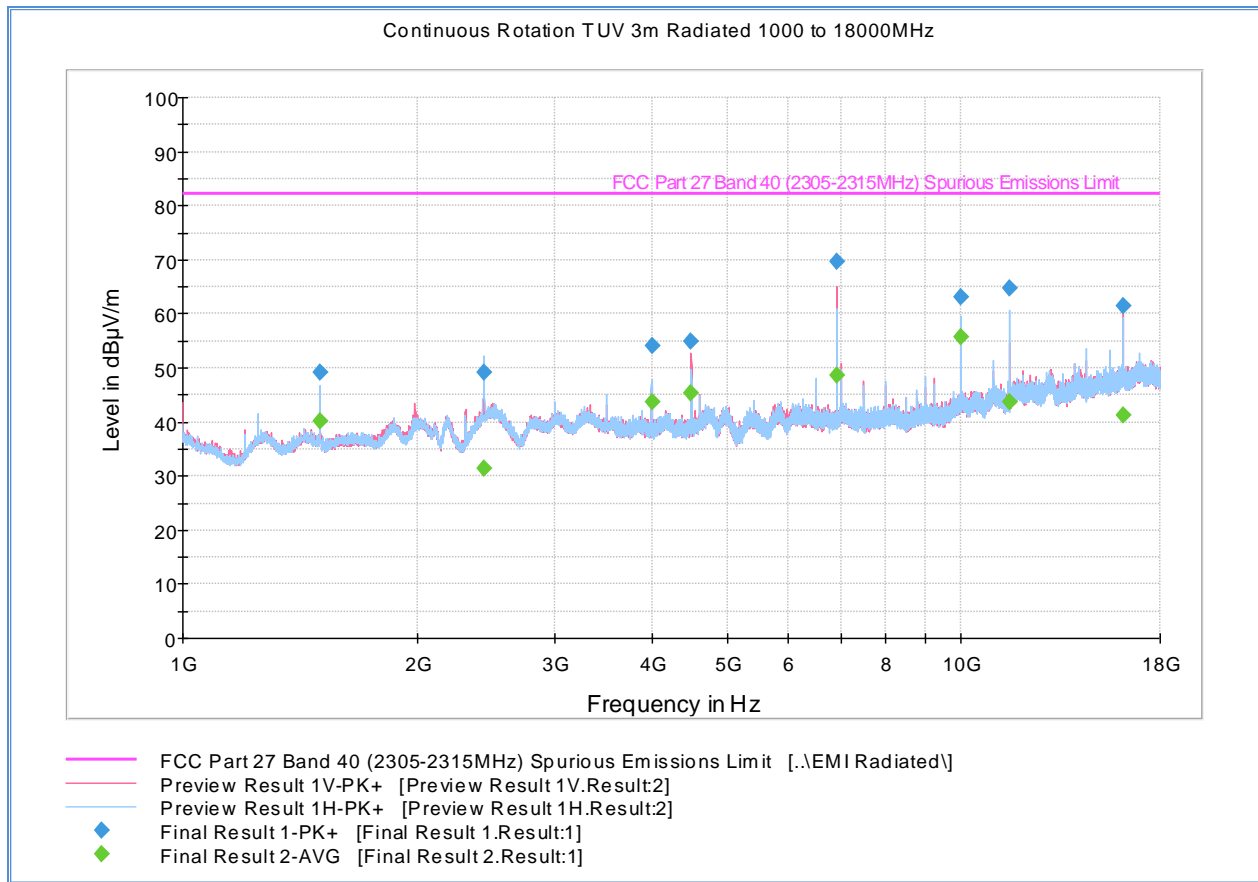


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
37.215551	28.8	1000.0	120.000	100.0	V	269.0	-10.9	53.4	82.2
47.014990	33.7	1000.0	120.000	116.0	V	36.0	-14.2	48.5	82.2
71.341643	33.2	1000.0	120.000	100.0	V	69.0	-17.2	49.0	82.2
101.987735	32.9	1000.0	120.000	100.0	V	86.0	-13.2	49.3	82.2
141.041603	34.7	1000.0	120.000	100.0	V	216.0	-14.1	47.5	82.2
185.191022	30.2	1000.0	120.000	100.0	V	350.0	-11.3	52.0	82.2
560.001363	30.1	1000.0	120.000	100.0	V	137.0	-1.0	52.1	82.2



**2.7.18 Radiated Emission Test Results Above 1GHz – LTE Band 40 (2305-2315MHz Range)_Low Channel
 2307.5 MHz**



Peak Data

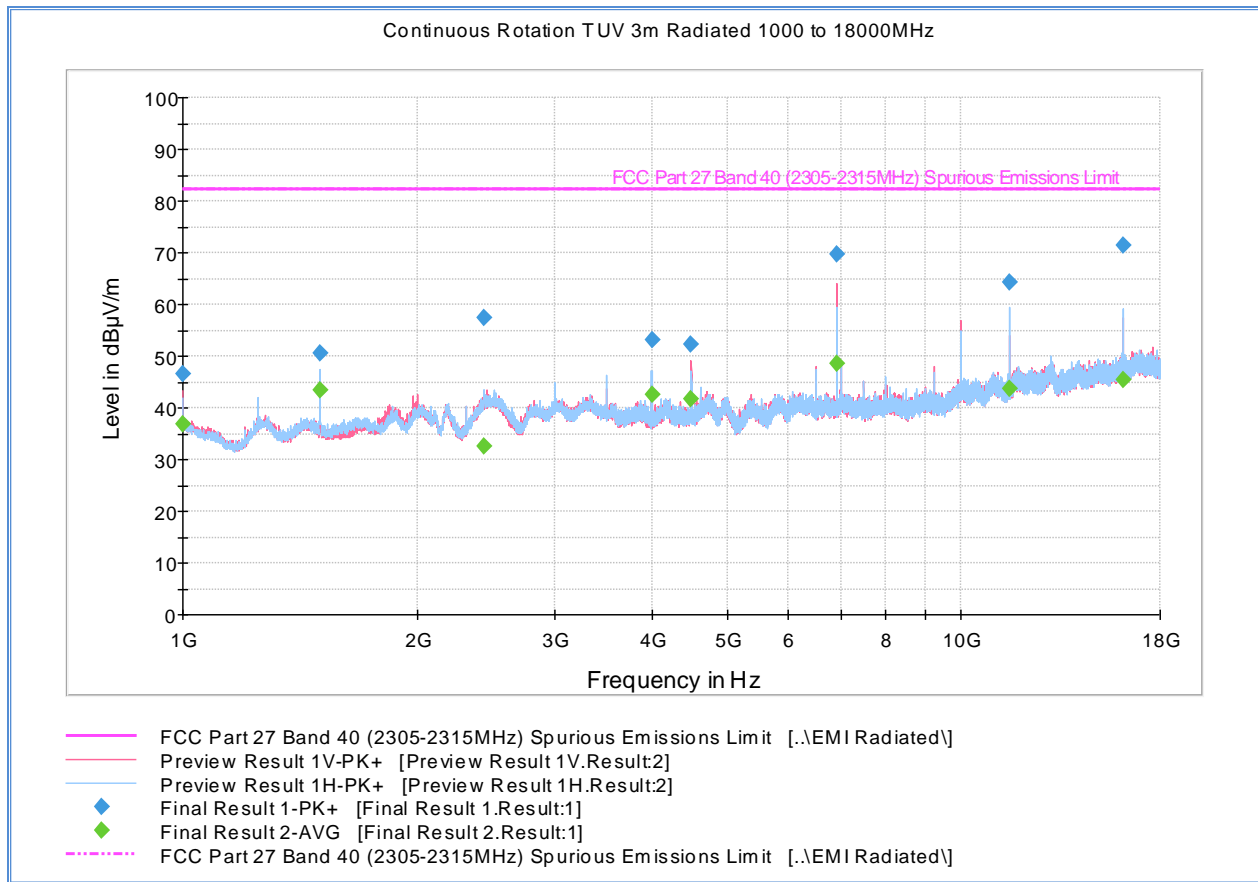
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	49.3	1000.0	1000.000	176.6	H	206.0	-6.1	32.9	82.2
2435.966667	49.3	1000.0	1000.000	341.2	H	227.0	-0.7	33.0	82.2
4000.133333	54.1	1000.0	1000.000	215.5	H	69.0	2.5	28.1	82.2
4499.933333	54.8	1000.0	1000.000	103.7	V	0.0	3.7	27.4	82.2
6923.000000	69.7	1000.0	1000.000	225.4	V	23.0	6.7	12.5	82.2
10000.000000	63.1	1000.0	1000.000	299.3	H	32.0	9.6	19.1	82.2
11538.500000	64.8	1000.0	1000.000	132.7	H	225.0	12.9	17.4	82.2
16153.600000	61.4	1000.0	1000.000	384.1	V	338.0	16.7	20.8	82.2

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1500.000000	40.3	1000.0	1000.000	176.6	H	206.0	-6.1	42.0	82.2
2435.966667	31.5	1000.0	1000.000	341.2	H	227.0	-0.7	50.8	82.2
4000.133333	43.6	1000.0	1000.000	215.5	H	69.0	2.5	38.6	82.2
4499.933333	45.4	1000.0	1000.000	103.7	V	0.0	3.7	36.8	82.2
6923.000000	48.6	1000.0	1000.000	225.4	V	23.0	6.7	33.6	82.2
10000.000000	55.9	1000.0	1000.000	299.3	H	32.0	9.6	26.4	82.2
11538.500000	43.6	1000.0	1000.000	132.7	H	225.0	12.9	38.6	82.2
16153.600000	41.3	1000.0	1000.000	384.1	V	338.0	16.7	41.0	82.2



2.7.19 Radiated Emission Test Results Above 1GHz – LTE Band 40 (2305-2315MHz Range)_Mid Channel 2310 MHz



Peak Data

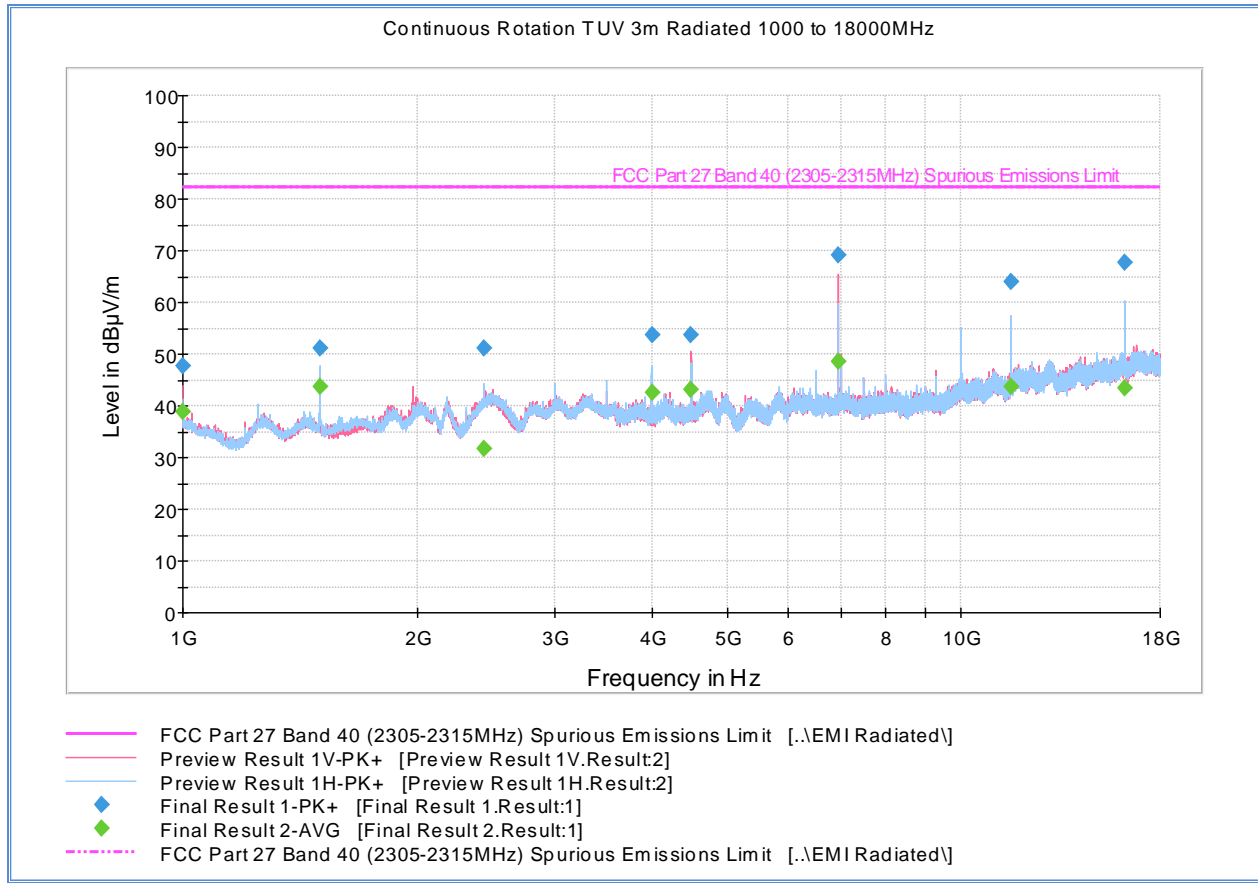
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	46.7	1000.0	1000.000	142.7	V	201.0	-6.9	35.5	82.2
1500.000000	50.5	1000.0	1000.000	211.4	H	47.0	-6.1	31.7	82.2
2438.200000	57.4	1000.0	1000.000	250.5	H	20.0	-0.7	24.9	82.2
4000.133333	53.1	1000.0	1000.000	174.6	H	67.0	2.5	29.2	82.2
4499.933333	52.4	1000.0	1000.000	199.5	V	22.0	3.7	29.9	82.2
6930.766667	69.6	1000.0	1000.000	168.6	V	344.0	6.7	12.6	82.2
11550.966667	64.4	1000.0	1000.000	120.7	H	224.0	12.9	17.9	82.2
16171.333333	71.3	1000.0	1000.000	174.6	H	280.0	16.7	10.9	82.2

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	37.0	1000.0	1000.000	142.7	V	201.0	-6.9	45.3	82.2
1500.000000	43.5	1000.0	1000.000	211.4	H	47.0	-6.1	38.8	82.2
2438.200000	32.5	1000.0	1000.000	250.5	H	20.0	-0.7	49.7	82.2
4000.133333	42.6	1000.0	1000.000	174.6	H	67.0	2.5	39.6	82.2
4499.933333	41.7	1000.0	1000.000	199.5	V	22.0	3.7	40.6	82.2
6930.766667	48.6	1000.0	1000.000	168.6	V	344.0	6.7	33.7	82.2
11550.966667	43.8	1000.0	1000.000	120.7	H	224.0	12.9	38.4	82.2
16171.333333	45.5	1000.0	1000.000	174.6	H	280.0	16.7	36.7	82.2



2.7.20 Radiated Emission Test Results Above 1GHz – LTE Band 40 (2305-2315MHz Range)_High Channel 2312.5 MHz



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	47.7	1000.0	1000.000	103.7	V	106.0	-6.9	34.5	82.2
1500.000000	51.0	1000.0	1000.000	194.5	H	48.0	-6.1	31.2	82.2
2438.566667	51.0	1000.0	1000.000	151.6	H	15.0	-0.7	31.2	82.2
4000.133333	53.7	1000.0	1000.000	199.5	H	72.0	2.5	28.5	82.2
4499.933333	53.6	1000.0	1000.000	200.5	V	182.0	3.7	28.6	82.2
6937.900000	69.2	1000.0	1000.000	192.5	V	-15.0	6.7	13.0	82.2
11563.433333	64.1	1000.0	1000.000	103.7	H	224.0	12.8	18.1	82.2
16188.900000	67.6	1000.0	1000.000	139.7	H	120.0	16.7	14.6	82.2

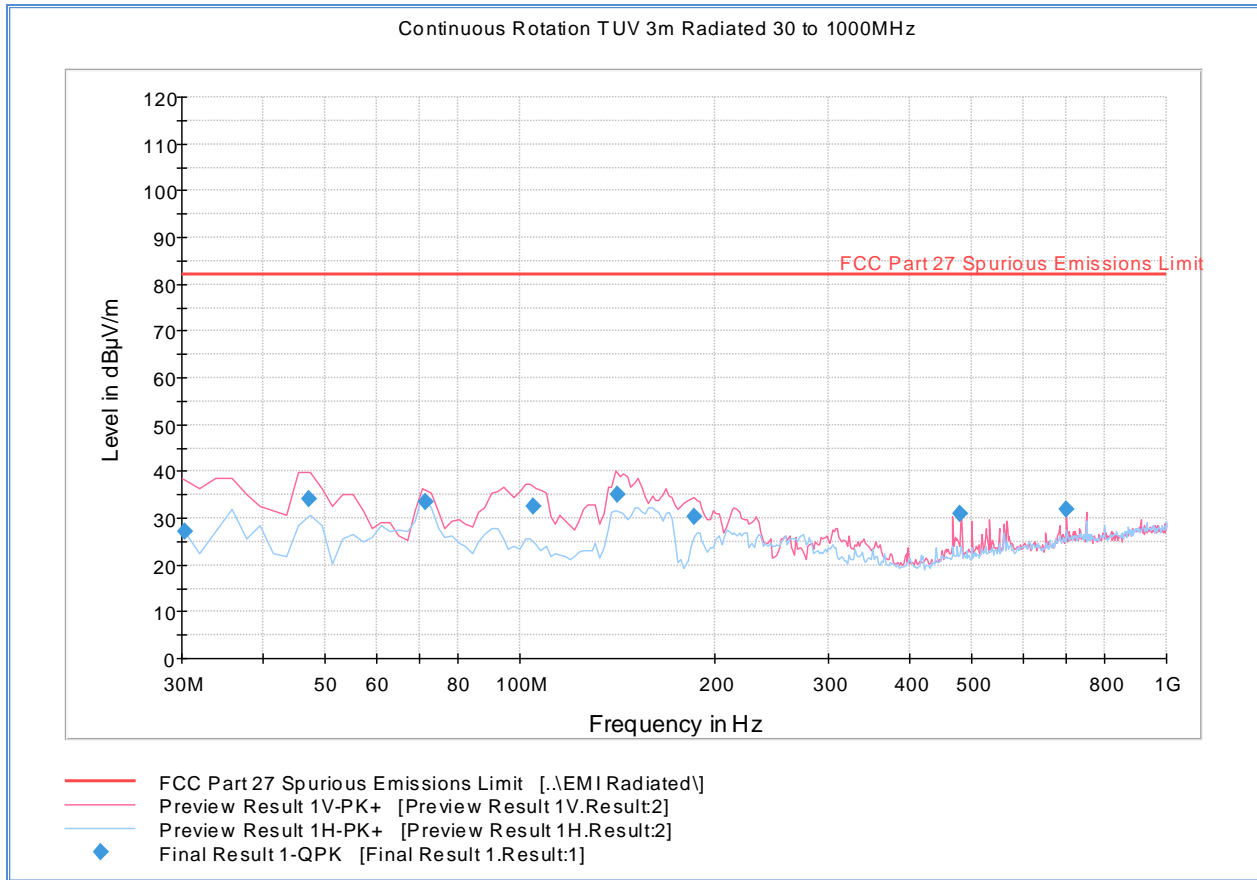
Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	39.0	1000.0	1000.000	103.7	V	106.0	-6.9	43.3	82.2
1500.000000	43.8	1000.0	1000.000	194.5	H	48.0	-6.1	38.5	82.2
2438.566667	31.6	1000.0	1000.000	151.6	H	15.0	-0.7	50.6	82.2
4000.133333	42.5	1000.0	1000.000	199.5	H	72.0	2.5	39.7	82.2
4499.933333	43.1	1000.0	1000.000	200.5	V	182.0	3.7	39.1	82.2
6937.900000	48.5	1000.0	1000.000	192.5	V	-15.0	6.7	33.8	82.2
11563.433333	43.8	1000.0	1000.000	103.7	H	224.0	12.8	38.4	82.2
16188.900000	43.4	1000.0	1000.000	139.7	H	120.0	16.7	38.8	82.2



America

2.7.21 Radiated Emission Test Results Below 1GHz – Worst Case LTE Band 40 (2350-2360MHz Range)_Low Channel 2352.5 MHz

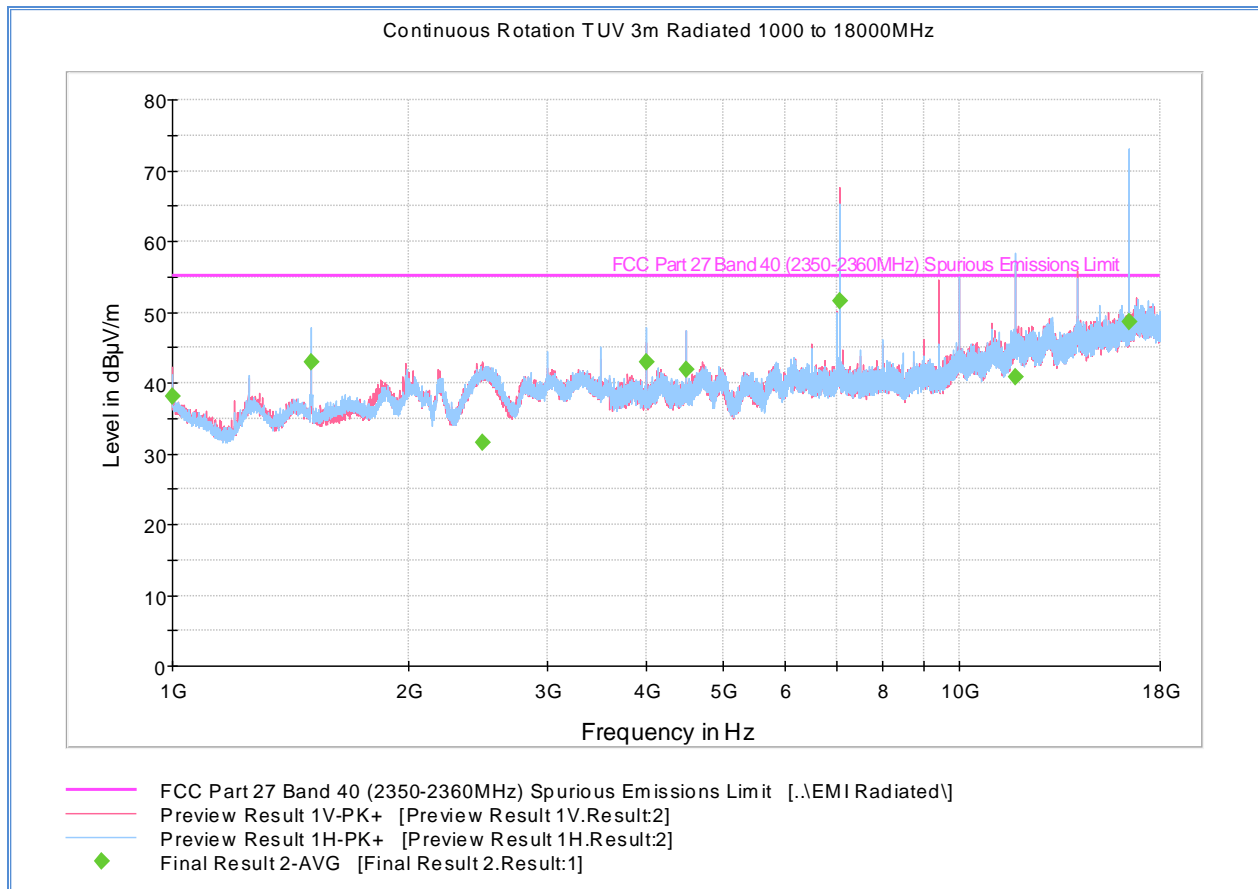


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.280000	27.2	1000.0	120.000	100.0	V	197.0	-8.0	55.0	82.2
47.134990	34.1	1000.0	120.000	105.0	V	128.0	-14.2	48.1	82.2
71.541643	33.5	1000.0	120.000	105.0	V	32.0	-17.2	48.7	82.2
104.827735	32.6	1000.0	120.000	100.0	V	104.0	-13.2	49.6	82.2
141.601603	34.9	1000.0	120.000	100.0	V	254.0	-14.1	47.3	82.2
186.351022	30.4	1000.0	120.000	100.0	V	343.0	-11.3	51.8	82.2
479.981964	30.9	1000.0	120.000	100.0	V	120.0	-1.9	51.3	82.2
700.001283	31.9	1000.0	120.000	100.0	V	117.0	2.6	50.3	82.2



2.7.22 Radiated Emission Test Results Above 1GHz – LTE Band 40 (2350-2360MHz Range)_Low Channel 2352.5 MHz



Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	38.1	1000.0	1000.000	120.7	V	105.0	-6.9	17.1	55.2
1500.000000	42.9	1000.0	1000.000	222.4	H	44.0	-6.1	12.3	55.2
2479.533333	31.6	1000.0	1000.000	230.4	V	223.0	-0.5	23.6	55.2
4000.133333	43.0	1000.0	1000.000	204.5	H	66.0	2.5	12.2	55.2
4499.933333	41.9	1000.0	1000.000	204.5	V	159.0	3.7	13.3	55.2
7058.033333	51.5	1000.0	1000.000	199.5	V	20.0	6.9	3.7	55.2
11763.466667	40.9	1000.0	1000.000	231.4	H	188.0	13.0	14.3	55.2
16468.666667	48.7	1000.0	1000.000	191.5	H	287.0	17.2	6.5	55.2

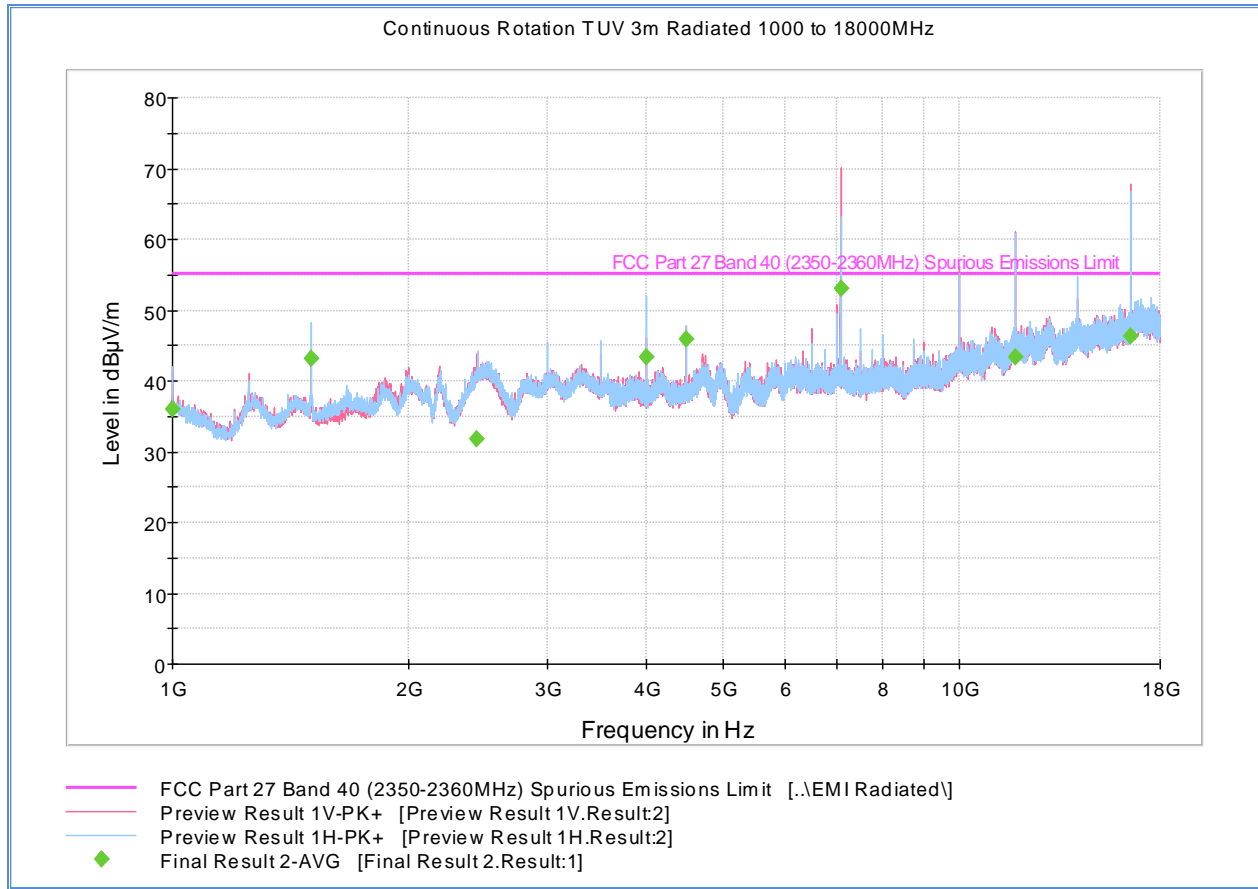
Substitution Data

Frequency (MHz)	Field Strength @ 3 meters (dBµV/m)	Cable Loss (dB)	Substitution Antenna Gain (dBi)	Signal Generator Level (dBm)	Substitution Data SGL+AG-CL (dBm)	Limit (dBm)	Compliance
7058.033333	51.5	-7.1	11.99	-48.5	-43.61	-25	Yes



America

2.7.23 Radiated Emission Test Results Above 1GHz – LTE Band 40 (2350-2360MHz Range)_Mid Channel 2355 MHz



Average Data

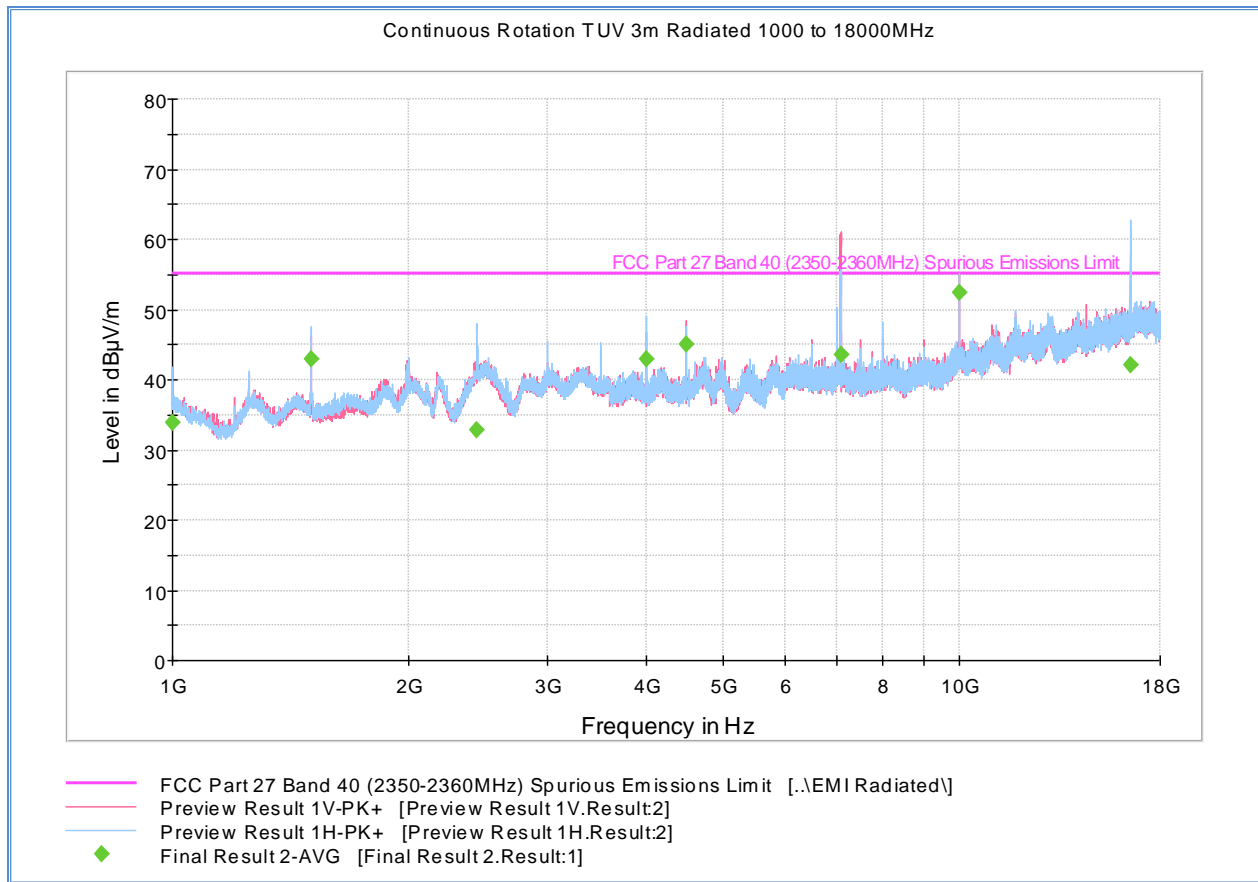
Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	35.9	1000.0	1000.000	187.5	H	183.0	-6.9	19.3	55.2
1500.000000	43.2	1000.0	1000.000	227.4	H	44.0	-6.1	12.0	55.2
2440.033333	31.7	1000.0	1000.000	155.6	H	57.0	-0.7	23.5	55.2
4000.133333	43.3	1000.0	1000.000	232.4	H	65.0	2.5	11.9	55.2
4499.933333	45.9	1000.0	1000.000	162.6	H	37.0	3.7	9.4	55.2
7065.400000	53.0	1000.0	1000.000	167.6	V	-8.0	6.9	2.2	55.2
11776.133333	43.3	1000.0	1000.000	162.6	V	331.0	13.1	11.9	55.2
16485.833333	46.3	1000.0	1000.000	181.6	V	160.0	17.3	9.0	55.2

Substitution Data

Frequency (MHz)	Field Strength @ 3 meters (dBµV/m)	Cable Loss (dB)	Substitution Antenna Gain (dBi)	Signal Generator Level (dBm)	Substitution Data SGL+AG-CL (dBm)	Limit (dBm)	Compliance
7065.400000	53.0	-7.1	11.99	-47.0	-42.11	-25	Yes



2.7.24 Radiated Emission Test Results Above 1GHz – LTE Band 40 (2350-2360MHz Range)_High Channel 2357.5 MHz



Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	33.9	1000.0	1000.000	103.7	H	309.0	-6.9	21.4	55.2
1500.000000	43.0	1000.0	1000.000	154.6	H	147.0	-6.1	12.2	55.2
2438.200000	32.8	1000.0	1000.000	201.3	H	33.0	-0.7	22.4	55.2
4000.133333	42.9	1000.0	1000.000	201.3	H	63.0	2.5	12.4	55.2
4499.933333	45.1	1000.0	1000.000	143.7	V	354.0	3.7	10.1	55.2
7065.233333	43.6	1000.0	1000.000	195.5	V	-15.0	6.9	11.6	55.2
10000.000000	52.5	1000.0	1000.000	208.5	H	200.0	9.6	2.7	55.2
16484.366667	42.0	1000.0	1000.000	200.5	H	296.0	17.2	13.2	55.2

Substitution Data

Frequency (MHz)	Field Strength @ 3 meters (dBµV/m)	Cable Loss (dB)	Substitution Antenna Gain (dBi)	Signal Generator Level (dBm)	Substitution Data SGL+AG-CL (dBm)	Limit (dBm)	Compliance
10000.000000	52.5	-9.1	12.11	-45.5	-42.49	-25	Yes

2.8 FREQUENCY STABILITY

2.8.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1055
FCC 47 CFR Part 27, Clause 27.54
RSS-139, Clause 6.4
RSS-130, Clause 4.5
RSS-199, Clause 4.3

2.8.2 Standard Applicable

FCC Part 27, Clause 27.54:

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

RSS-139, Clause 6.4:

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

RSS-130, Clause 4.5:

The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.

RSS-199, Clause 4.3:

The transmitter frequency stability limit shall be determined as follows:

- (a) The frequency offset shall be measured according to the procedure described in RSS-Gen and recorded;
- (b) Using a resolution bandwidth equal to that permitted within the 1 MHz band immediately outside the channel edge, as found in section 4.5, reference points will be selected at the unwanted emission limits, which comply with the attenuation specified in section 4.5 for the type of device under test, on the emission mask of the lowest and highest channels. The frequency points shall be recorded as f_L and f_H respectively.

The applicant shall ensure compliance with frequency stability requirements by showing that f_L minus the frequency offset and f_H plus the frequency offset is within the frequency range in which the equipment is designed to operate.

2.8.3 Equipment Under Test and Modification State

Serial No: FJ220819C00056 / Test Configuration A

2.8.4 Date of Test/Initial of test personnel who performed the test

October 09 and 10, 2019 / AC



2.8.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.5 - 25.6°C
Relative Humidity	40.6 - 47.6%
ATM Pressure	98.9 - 99.1 kPa

2.8.7 Additional Observations

- This is a conducted test. The EUT was operated at 3.7VDC nominal voltage and was placed in the temperature chamber for this evaluation. The EUT was controlled by a CMW500 and utilizing a spectrum analyzer for measurement.
- Test performed in 5 MHz Bandwidth Middle channel as the representative configuration.
- Measurement was done using the CMW 500 measurement function.
- The EUT was tested over the temperature -30°C to +50°C in 10°C steps and allowed to sit for 1 hour to allow the equipment and chamber temperature to stabilize. The measurements were then performed.
- Voltage variation was also performed at voltage 3.3VDC and higher 4.3VDC of the nominal voltage at 20°C.



2.8.8 Test Results

LTE Band 30 – QPSK 5 MHz BW-Middle Channel 2310 MHz				
Voltage (VDC)	Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)*
3.7	-30	-24.44	-0.011	± 0.1
	-20	-24.44	-0.011	± 0.1
	-10	27.13	0.012	± 0.1
	0	32.62	0.014	± 0.1
	+10	-25.50	-0.011	± 0.1
	+20	-22.01	-0.010	± 0.1
	+30	15.96	0.007	± 0.1
	+40	19.56	0.008	± 0.1
	+50	19.16	0.008	± 0.1
3.3	20	15.60	0.007	± 0.1
4.3		20.05	0.009	± 0.1

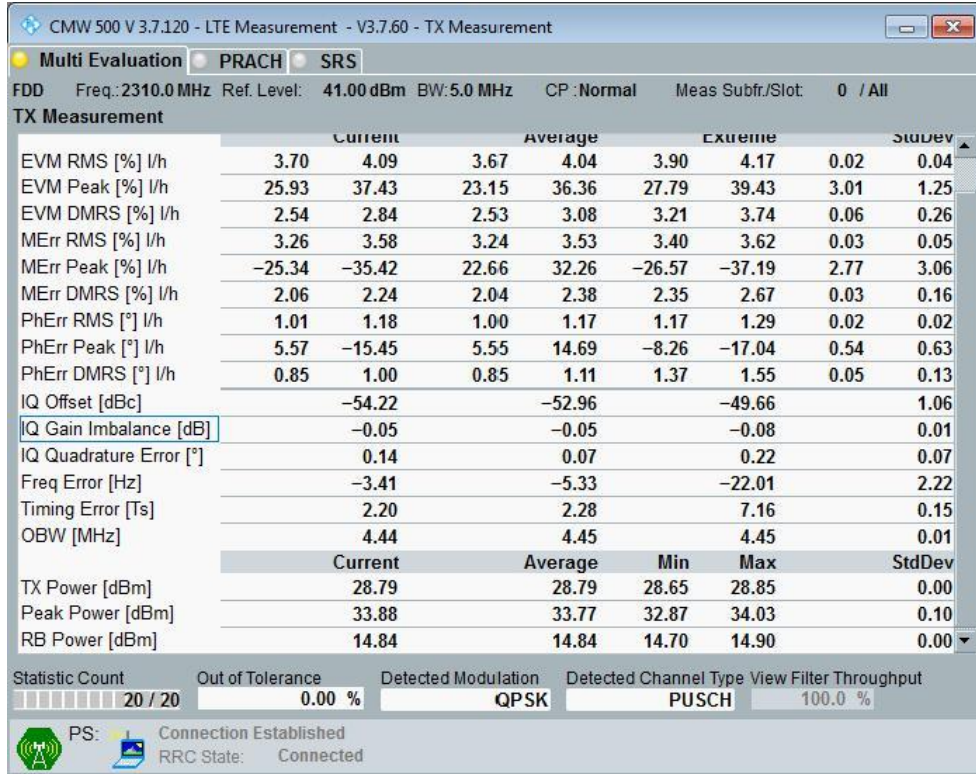
LTE Band 38 – QPSK 5 MHz BW-Middle Channel 2595 MHz				
Voltage (VDC)	Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)*
3.7	-30	-24.24	-0.009	± 0.1
	-20	-24.83	-0.010	± 0.1
	-10	-33.54	-0.013	± 0.1
	0	-29.05	-0.011	± 0.1
	+10	-24.24	-0.009	± 0.1
	+20	-26.27	-0.010	± 0.1
	+30	-25.65	-0.010	± 0.1
	+40	-23.68	-0.009	± 0.1
	+50	-24.05	-0.009	± 0.1
3.3	20	-24.08	-0.009	± 0.1
4.3		-15.31	-0.006	± 0.1



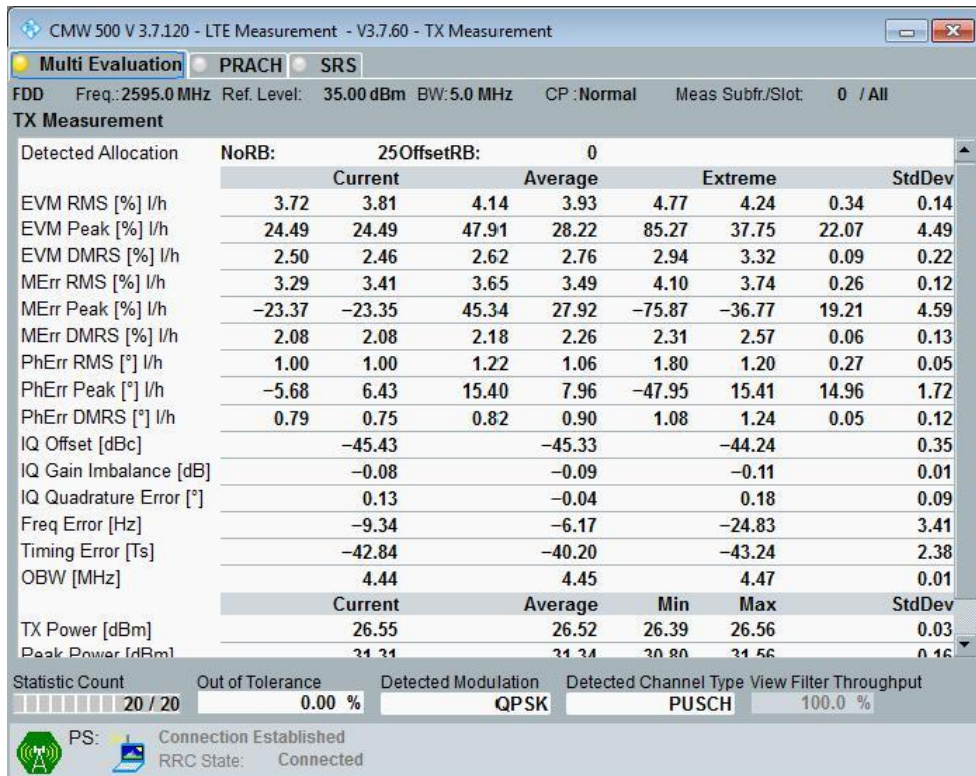
LTE Band 40 – QPSK 5 MHz BW-Middle Channel 2310 MHz				
Voltage (VDC)	Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)*
3.7	-30	-20.64	-0.009	± 0.1
	-20	-28.08	-0.012	± 0.1
	-10	-46.87	-0.020	± 0.1
	0	-21.74	-0.009	± 0.1
	+10	-31.75	-0.014	± 0.1
	+20	-37.60	-0.016	± 0.1
	+30	-38.26	-0.017	± 0.1
	+40	-32.54	-0.014	± 0.1
3.3	20	-31.88	-0.014	± 0.1
4.3		-25.29	-0.011	± 0.1

LTE Band 40 – QPSK 5 MHz BW-Middle Channel 2355 MHz				
Voltage (VDC)	Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)*
3.7	-30	-30.21	-0.013	± 0.1
	-20	-30.89	-0.013	± 0.1
	-10	-49.03	-0.021	± 0.1
	0	58.97	0.025	± 0.1
	+10	-33.38	-0.014	± 0.1
	+20	-45.05	-0.019	± 0.1
	+30	-37.67	-0.016	± 0.1
	+40	-27.37	-0.012	± 0.1
	+50	-33.97	-0.014	± 0.1
3.3	20	-29.46	-0.013	± 0.1
4.3		-25.93	-0.011	± 0.1

2.8.9 Sample Test plot



LTE Band 30_Middle Channel @20°C



LTE Band 38_Middle Channel @20°C



CMW 500 V 3.7.120 - LTE Measurement - V3.7.60 - TX Measurement

Multi Evaluation PRACH SRS

FDD Freq.: 2310.0 MHz Ref. Level: 35.00 dBm BW: 5.0 MHz CP: Normal Meas Subfr./Slot: 0 / All

TX Measurement

Detected Allocation NoRB: 25 OffsetRB: 0

	Current		Average		Extreme		StdDev	
EVM RMS [%] I/h	3.42	3.54	3.84	3.58	4.39	3.83	0.31	0.13
EVM Peak [%] I/h	23.32	23.35	47.10	26.06	81.17	31.47	21.92	3.00
EVM DMRS [%] I/h	2.28	2.20	2.34	2.44	2.64	2.96	0.12	0.17
MErr RMS [%] I/h	2.87	3.01	3.27	3.05	3.62	3.28	0.27	0.13
MErr Peak [%] I/h	-23.23	-23.25	45.12	26.01	-72.82	-31.42	19.36	3.00
MErr DMRS [%] I/h	1.87	1.84	1.87	1.94	2.09	2.11	0.11	0.05
PhErr RMS [°] I/h	1.07	1.08	1.24	1.09	1.69	1.16	0.20	0.03
PhErr Peak [°] I/h	5.39	-8.41	14.94	7.72	-41.64	-10.34	12.56	1.20
PhErr DMRS [°] I/h	0.74	0.69	0.80	0.84	1.11	1.24	0.06	0.13
IQ Offset [dBc]		-56.46		-52.67		-50.24		1.50
IQ Gain Imbalance [dB]		-0.06		-0.07		-0.09		0.01
IQ Quadrature Error [°]		-0.25		-0.34		-0.44		0.06
Freq Error [Hz]		-0.64		-7.17		-37.60		6.04
Timing Error [Ts]		-43.08		-40.94		-43.65		2.32
OBW [MHz]		4.44		4.45		4.47		0.01
		Current		Average		Min		Max
TX Power [dBm]		25.68		25.66		25.54		25.71
Peak Power [dBm]		30.66		30.72		30.08		31.41

Statistic Count: 20 / 20 Out of Tolerance: 0.00 % Detected Modulation: QPSK Detected Channel Type: PUSCH View Filter Throughput: 100.0 %

PS: Connection Established RRC State: Connected

LTE Band 40(2305-2315 MHz Range)_Middle Channel @20°C

CMW 500 V 3.7.120 - LTE Measurement - V3.7.60 - TX Measurement

Multi Evaluation PRACH SRS

FDD Freq.: 2355.0 MHz Ref. Level: 35.00 dBm BW: 5.0 MHz CP: Normal Meas Subfr./Slot: 0 / All

TX Measurement

Detected Allocation NoRB: 25 OffsetRB: 0

	Current		Average		Extreme		StdDev	
EVM RMS [%] I/h	3.61	4.73	3.29	4.11	3.72	5.19	0.21	0.63
EVM Peak [%] I/h	25.35	86.23	22.24	62.00	25.96	108.24	2.14	34.71
EVM DMRS [%] I/h	2.30	2.96	2.10	2.36	2.91	3.17	0.20	0.35
MErr RMS [%] I/h	3.16	4.22	2.82	3.58	3.21	4.55	0.22	0.61
MErr Peak [%] I/h	-25.13	-78.53	21.90	57.17	-25.76	-98.09	2.13	31.68
MErr DMRS [%] I/h	1.89	2.26	1.63	1.80	2.14	2.40	0.20	0.30
PhErr RMS [°] I/h	1.01	1.59	0.98	1.77	1.21	3.81	0.03	0.66
PhErr Peak [°] I/h	4.97	-45.21	4.80	40.98	7.33	152.52	0.63	35.03
PhErr DMRS [°] I/h	0.74	1.09	0.75	0.87	1.42	1.44	0.08	0.13
IQ Offset [dBc]		-60.12		-55.06		-50.18		3.06
IQ Gain Imbalance [dB]		-0.10		-0.07		-0.10		0.02
IQ Quadrature Error [°]		-0.19		-0.22		-0.33		0.05
Freq Error [Hz]		-11.23		-16.92		-45.05		6.46
Timing Error [Ts]		-5.70		-5.05		-6.57		0.82
OBW [MHz]		4.45		4.45		4.45		0.01
		Current		Average		Min		Max
TX Power [dBm]		25.89		25.89		25.78		25.97
Peak Power [dBm]		31.02		30.85		30.10		31.39

Statistic Count: 20 / 20 Out of Tolerance: 0.00 % Detected Modulation: QPSK Detected Channel Type: PUSCH View Filter Throughput: 100.0 %

PS: Connection Established RRC State: Connected

LTE Band 40(2350-2360 MHz Range)_Middle Channel @20°C



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB/ FRGE)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Antenna Conducted Port Setup						
7662	P-Series Power Meter	N1911A	MY45100951	Agilent	06/28/19	06/28/20
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	07/24/19	07/24/20
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	01/07/19	01/07/20
40813	Wideband Radio Communication Tester	CMW500	145913-RH	Rhode & Schwarz	04/22/19	04/22/20
41535	10dB Attenuator with Blue RF Cable	8772	606-10-1F4/DR and W17.02	MECA	08/16/19	08/16/20
8801	Power Divider	1506A	RR003	Aeroflex Weinschel	Verified by 7608 and 7582	
43135	RF Cable	SMA Cable	JX50013-48	RF Precision Cables	09/09/19	09/09/20
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	10/18/18	10/18/19
6006	Spectrum Analyzer (9kHz – 6GHz)	FSL6	100346	Rhode & Schwarz	05/23/19	05/23/20
Radiated Test Setup						
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	01/07/19	01/07/20
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	10/18/18	10/18/19
1033	Bilog Antenna	3142C	00044556	EMCO	09/05/19	09/05/21
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	06/16/18	06/16/20
1016	Pre-amplifier	PAM-0202	187	PAM	03/08/19	03/08/20
8921	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	Verified by 7608 and 7582	
8923	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	Verified by 7608 and 7582	
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/25/17	10/25/18
8628	Pre-amplifier	QLI-01182835-JO	8986002	Quinstar	02/06/18	02/06/19
40813	Wideband Radio Communication Tester	CMW500	145913-RH	Rhode & Schwarz	04/22/19	04/22/20
Miscellaneous						
43003	True RMS Multimeter	85 III	96880143	Fluke	10/07/19	10/07/20
7579	Temperature Chamber	115	151617	TestQuity	09/09/19	09/09/20
7619	Temp & Humidity Sensor	iBTHX-W	15050268	Omega	06/18/19	06/18/20
—	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Conducted Antenna Port Measurement

	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Cable attenuation	1.00 dB	Normal, k=2	2.000	0.50	0.25
3	Receiver sinewave accuracy	0.08 dB	Normal, k=2	2.000	0.04	0.00
4	Receiver pulse amplitude	0.00 dB	Rectangular	1.732	0.00	0.00
5	Receiver pulse repetition rate	0.00 dB	Rectangular	1.732	0.00	0.00
6	Noise floor proximity	0.00 dB	Rectangular	1.732	0.00	0.00
7	Frequency interpolation	0.10 dB	Rectangular	1.732	0.06	0.00
8	Mismatch	0.07 dB	U-shaped	1.414	0.05	0.00
		Combined standard uncertainty	Normal	0.52 dB		
		Expanded uncertainty	Normal, k=2	1.03 dB		

3.2.2 Radiated Emission Measurement 30 MHz – 1000 MHz at a distance of 3 m

	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20 dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.75 dB	Normal, k=2	2.000	0.38	0.14
4	Receiver sinewave accuracy	0.45 dB	Normal, k=2	2.000	0.23	0.05
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50 dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95 dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30 dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10 dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12 dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00 dB	Rectangular	1.732	0.58	0.33
13	Cross-polarization	0.90 dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00 dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.76 dB	Triangular	2.449	1.54	2.36
16	Separation distance at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.77 dB	Rectangular	1.732	0.44	0.20
18	Table height at 3 m	0.10 dB	Normal, k=2	2.000	0.05	0.00
19	Near-field effects	0.00 dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00 dB				0.00
		Combined standard uncertainty	Normal	2.95 dB		
		Expanded uncertainty	Normal, k=2	5.90 dB		



3.2.3 Radiated Emission Measurements Above 1GHz at a distance of 3 m

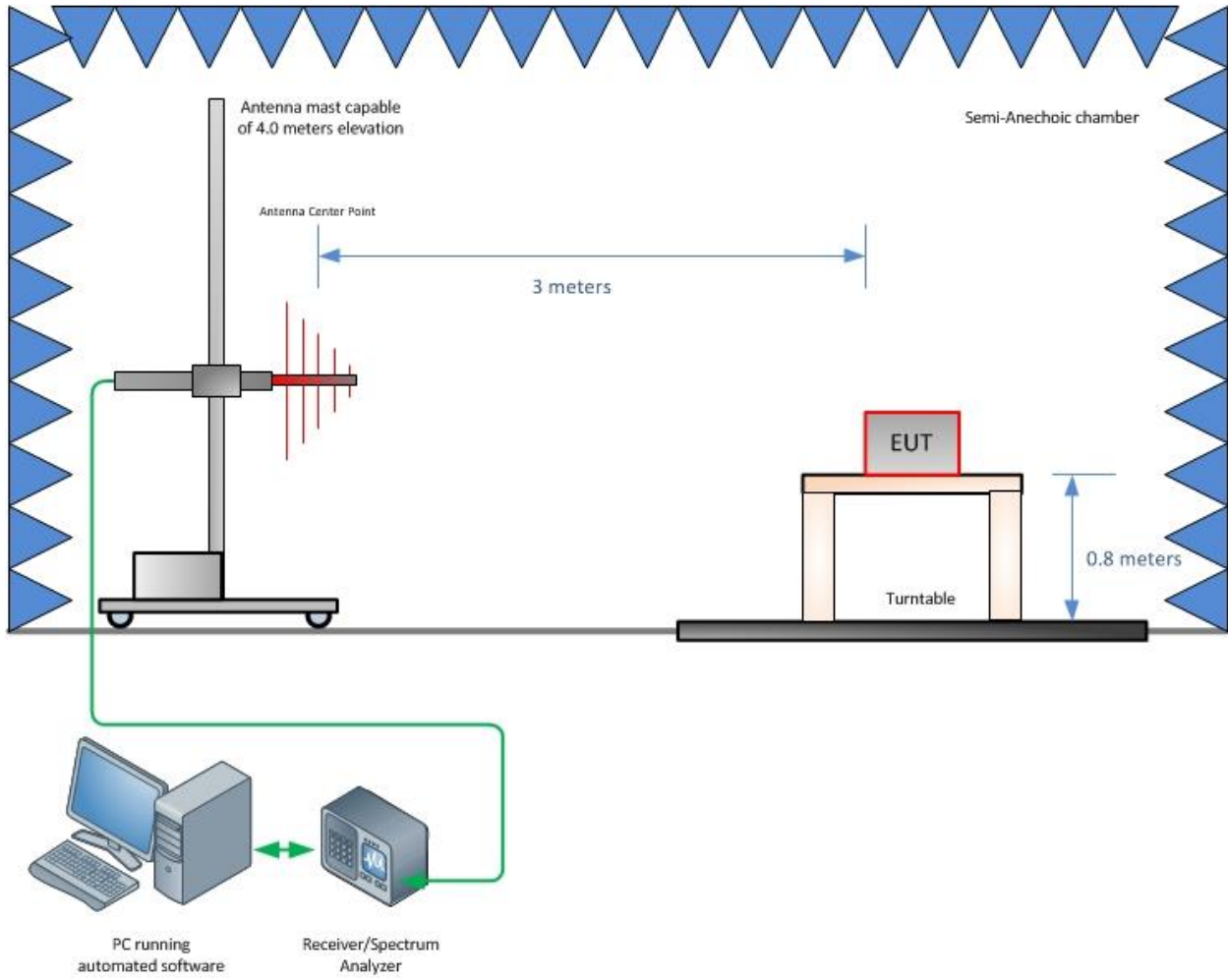
	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.30 dB	Normal, k=2	2.000	0.15	0.02
3	Preamplifier Gain	0.20 dB	Normal, k=2	2.000	0.10	0.01
4	Antenna factor AF	0.37 dB	Normal, k=2	2.000	0.19	0.03
5	Sinewave accuracy	0.57 dB	Normal, k=2	2.000	0.29	0.08
6	Instability of preamp gain	1.21 dB	Rectangular	1.732	0.70	0.49
7	Noise floor proximity	0.70 dB	Rectangular	1.732	0.40	0.16
8	Mismatch: antenna-preamplifier	1.41 dB	U-shaped	1.414	1.00	0.99
9	Mismatch: preamplifier-receiver	1.30 dB	U-shaped	1.414	0.92	0.85
10	AF frequency interpolation	0.30 dB	Rectangular	1.732	0.17	0.03
11	Directivity difference at 3 m	1.50 dB	Rectangular	1.732	0.87	0.75
12	Phase center location at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03
13	Cross-polarization	0.90 dB	Rectangular	1.732	0.52	0.27
14	Site imperfections VSWR (Method 2)	3.00 dB	Triangular	2.449	1.22	1.50
15	Effect of setup table material	1.50 dB	Rectangular	1.732	0.87	0.75
16	Separation distance at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03
17	Table height at 3 m	0.00 dB	Normal, k=2	2.000	0.00	0.00
Combined standard uncertainty			Normal	2.45	dB	
Expanded uncertainty			Normal, k=2	4.90	dB	



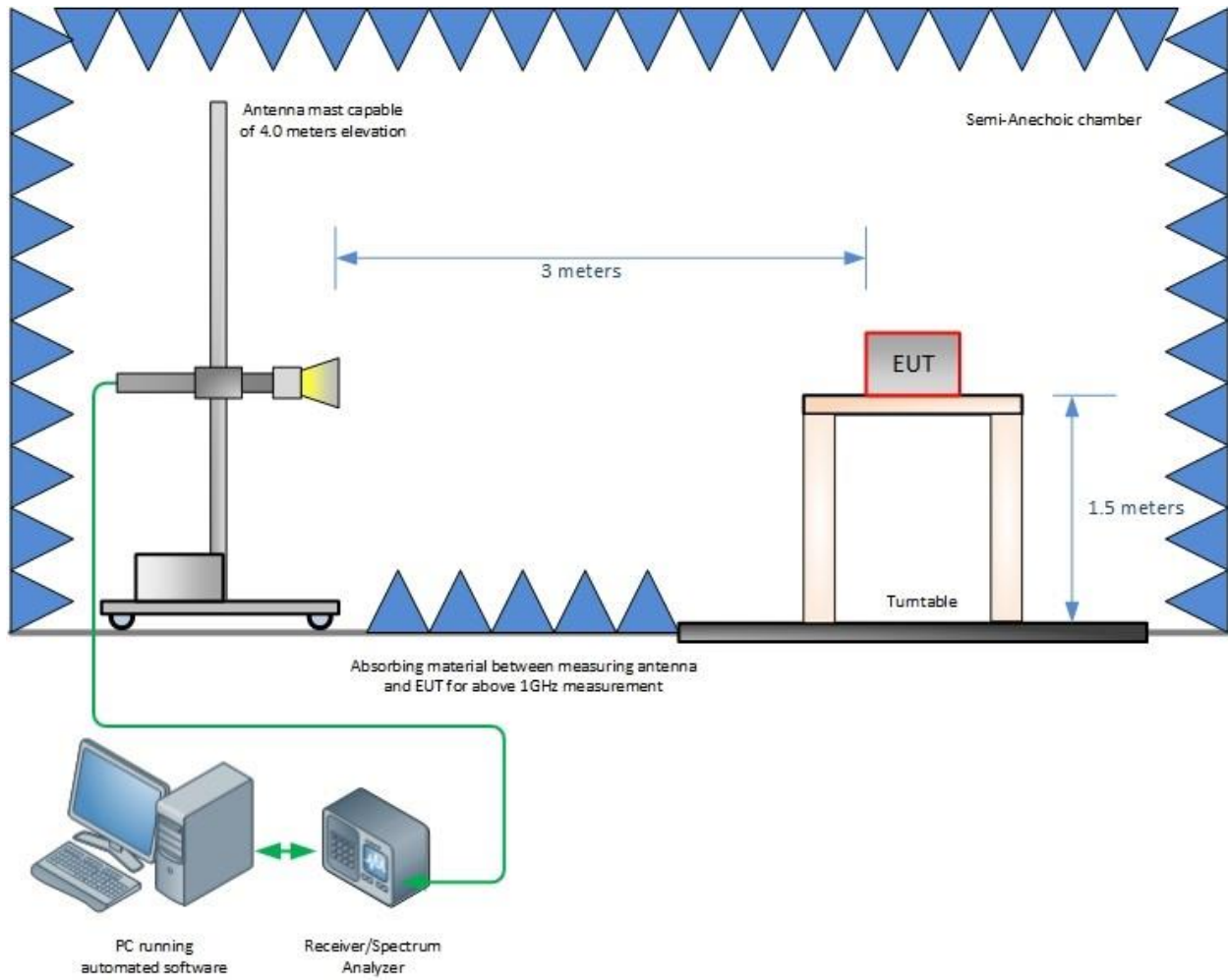
SECTION 4

DIAGRAM OF TEST SETUP

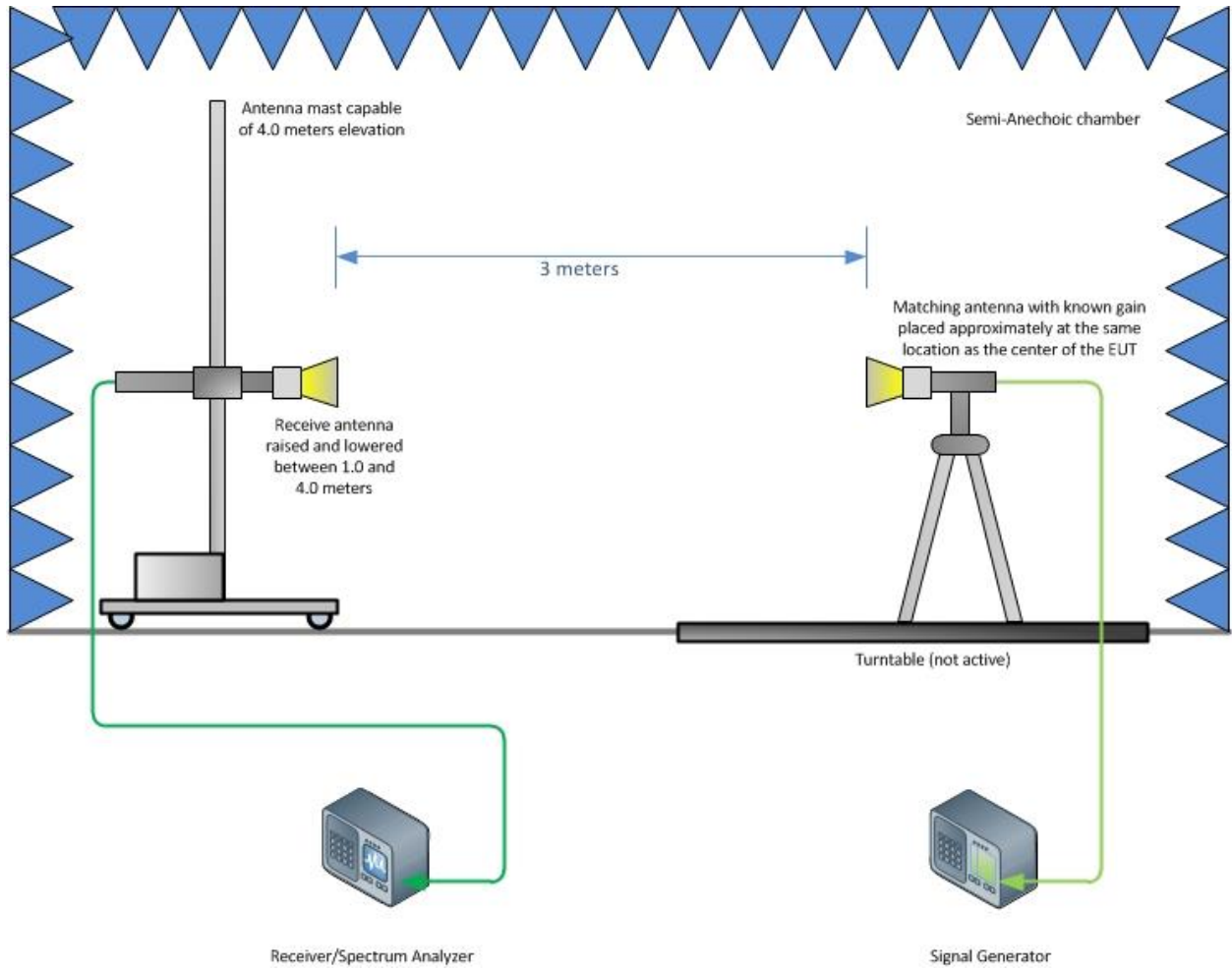
4.1 TEST SETUP DIAGRAM



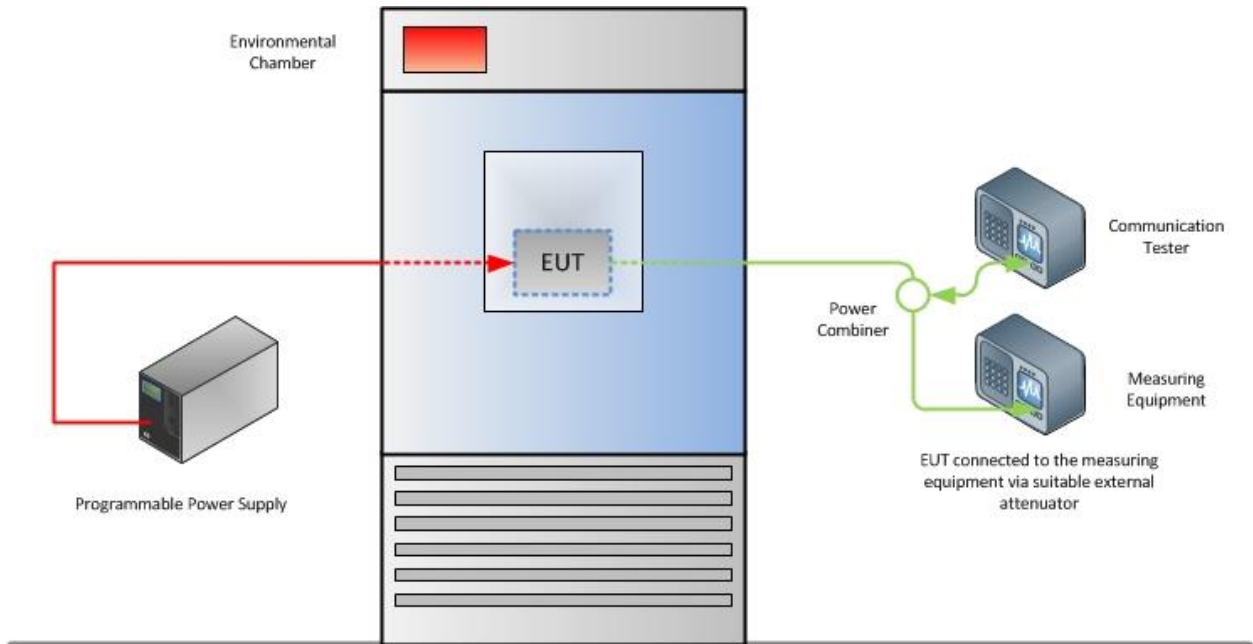
Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Substitution Test Method (Above 1GHz)



Frequency Stability Test Configuration



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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