



2.5 CONDUCTED SPURIOUS EMISSIONS

2.5.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 96, Clause 96.41(e)(1)(2)(3)
FCC 47 CFR Part 90, Clause 90.1323(a)
RSS-192, Clause 5.5
RSS-197, Clause 5.7

2.5.2 Standard Applicable

FCC 47 CFR Part 96.41:

(e) 3.5 GHz Emissions and Interference Limits - (1) General protection levels. Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by the SAS to CBSDs, the conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz. The upper and lower SAS assigned channel edges are the upper and lower limits of any channel assigned to a CBSD by an SAS, or in the case of multiple contiguous channels, the upper and lower limits of the combined contiguous channels.

(2) Additional protection levels: Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz.

RSS-192, Clause 5.5:

The unwanted emissions shall comply with the following limits:

(i) In any 30 kHz bandwidth, the unwanted emission spectral density that is relative to the inband spectral density shall be attenuated at least to the limits shown in Table 1 according to the equipment modulation. The attenuation shall be linearly interpolated between the turning point attenuation limits.



Table 1: Attenuation of Unwanted Emission Limits for Various Access Schemes

Orthogonal Frequency Division Multiple Access (OFDMA)

Turning Point (F/ChS)	0	0.21	0.56	1.5	2
EMO = 2	8 dB	25 dB	27 dB	50 dB	50 dB
EMO = 4	8 dB	27 dB	32 dB	50 dB	50 dB
EMO = 6	8 dB	32 dB	38 dB	50 dB	50 dB

Code Division Multiple Access (CDMA)

Turning Point (F/ChS)	0	0.3	0.5	1	2
EMO Not applicable	0 dB	25 dB	25 dB	45 dB	45 dB

Frequency Division Multiple Access (FDMA)

Turning Point (F/ChS)	0	0.1	0.35	1	2
EMO = 2	23 dB	25 dB	25 dB	45 dB	45 dB
EMO = 3	27 dB	29 dB	29 dB	45 dB	45 dB
EMO = 4 or 6	31 dB	33 dB	33 dB	45 dB	45 dB

Time Division Multiple Access (TDMA)

Turning Point (F/ChS)	0	0.3	0.56	1.5	2
EMO = 2	Not applicable	25 dB	25 dB	45 dB	45 dB
EMO = 4	Not applicable	32 dB	37 dB	45 dB	45 dB
EMO = 6	13 dB	34 dB	42 dB	45 dB	45 dB

The offset frequency from the block edge, F, at each turning point can be determined as follows:
 $F = ChS * (\text{Turning Point})$; where ChS is defined as the frequency spacing between the centre frequencies of two adjacent channels.

EMO is the equivalent modulation order of the transmitter, defined as $\log_2(\text{number of discrete states which may be assigned to each symbol})$. For example, for quadrature amplitude modulation (QAM):

- 2 = 4 QAM
- 4 = 16 QAM
- 6 = 64 QAM

(ii) In any 1.0 MHz band that is removed from the assigned centre frequency by more than $\pm 250\%$ of the necessary bandwidth, the power of any emission must be attenuated below P_{mean} by at least $43 + 10 \log_{10}(P_{\text{mean}})$ dB, or 70 dB, whichever is less stringent. P_{mean} is the mean output power of the transmitter in watts.



FCC 47 CFR Part 90.1323:

(a) 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 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

RSS-197, Clause 5.7:

The unwanted emissions shall be measured at the frequencies of the highest and lowest channel of all bandwidths and types of modulation that the equipment can operate with a resolution bandwidth of 1 MHz or less, but at least 1% of the occupied bandwidth of the transmitter, provided that the measured power is integrated over a 1 MHz bandwidth.

The power of any emissions outside the frequency band 3650-3700 MHz shall be attenuated below the channel transmitter power P (dBW) by $43 + 10 \log (p)$, where p is measured in watts.

2.5.3 Equipment Under Test and Modification State

Serial No: 990013090027496 and 990013090023966 (IMEI) / Test Configuration A

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

May 20, 2019 / ZXY

2.5.5 Test Equipment Used

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

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

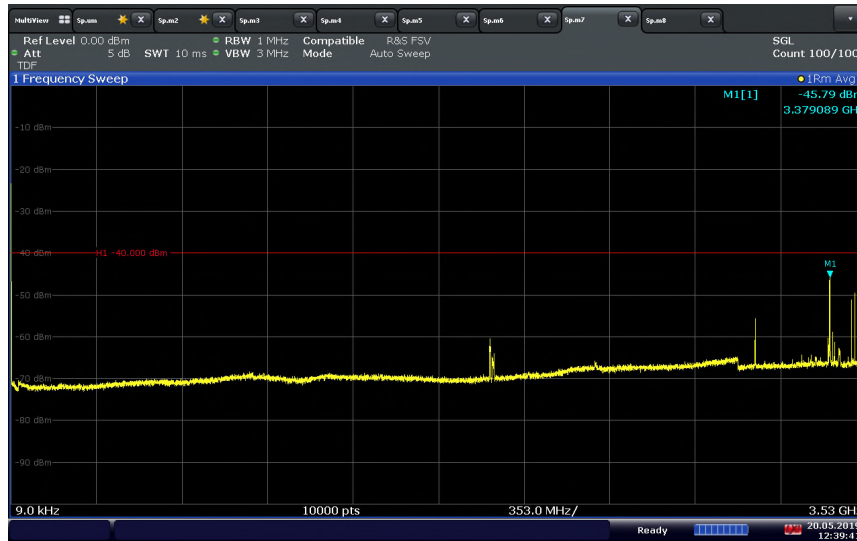
Ambient Temperature	25.1 °C
Relative Humidity	44.8 %
ATM Pressure	98.8 kPa

2.5.7 Additional Observations

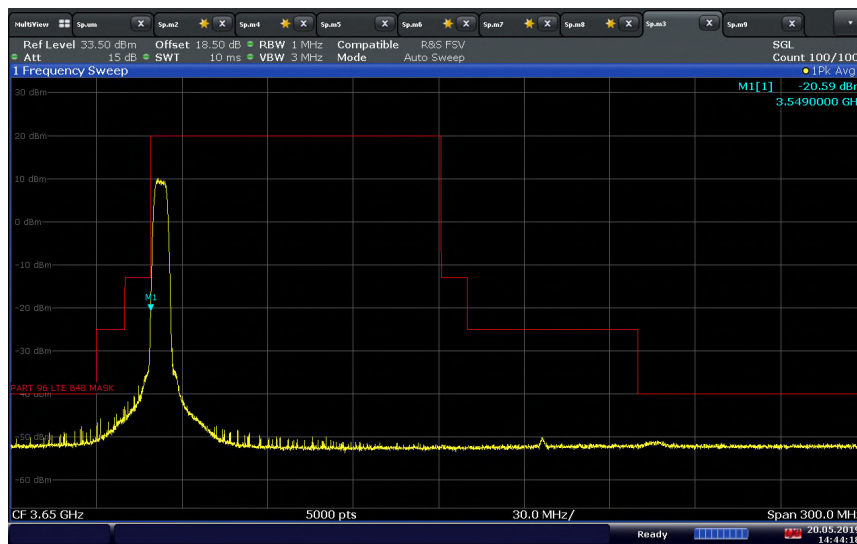
- This is a conducted test.
- The spectrum was searched from 30MHz to the 10th harmonic.
- Only noise floor measurements observed above 26.5 GHz.
- Low, Middle and High channels on all channel bandwidth and modulation are verified. Only the worst case channel of each band presented.

2.5.8 Test Results

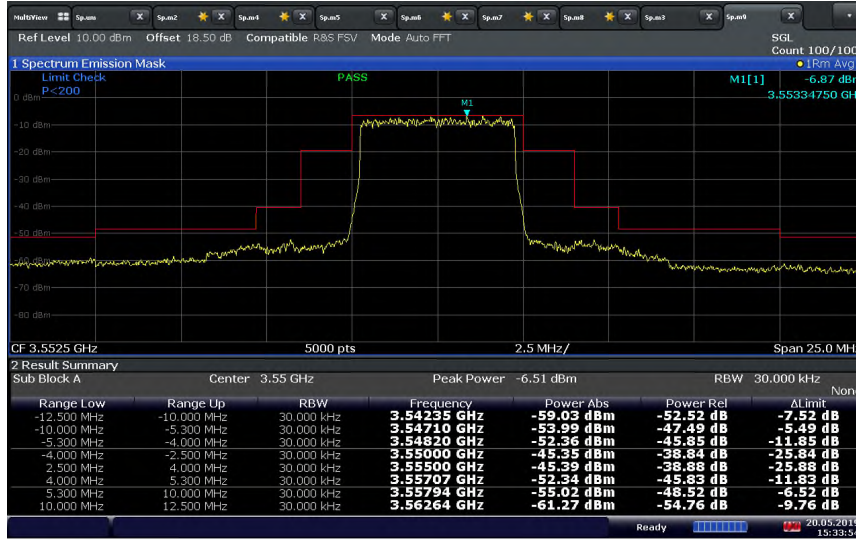
LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / Low Channel 3552.5 MHz
9 kHz - 3530 MHz



LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / Low Channel 3552.5 MHz Full RB
3500 kHz - 3800 MHz according to FCC Part 96

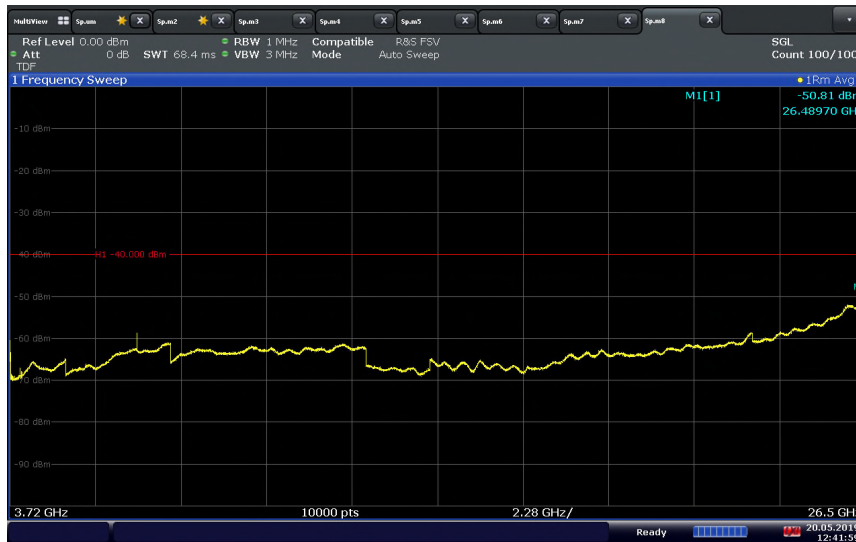


**LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / Low Channel 3552.5 MHz Full RB
 unwanted emission spectral density Mask according to RSS-192**



15:33:54 20.05.2019

**LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / Low Channel 3552.5 MHz
 3720 MHz - 26.5 GHz**

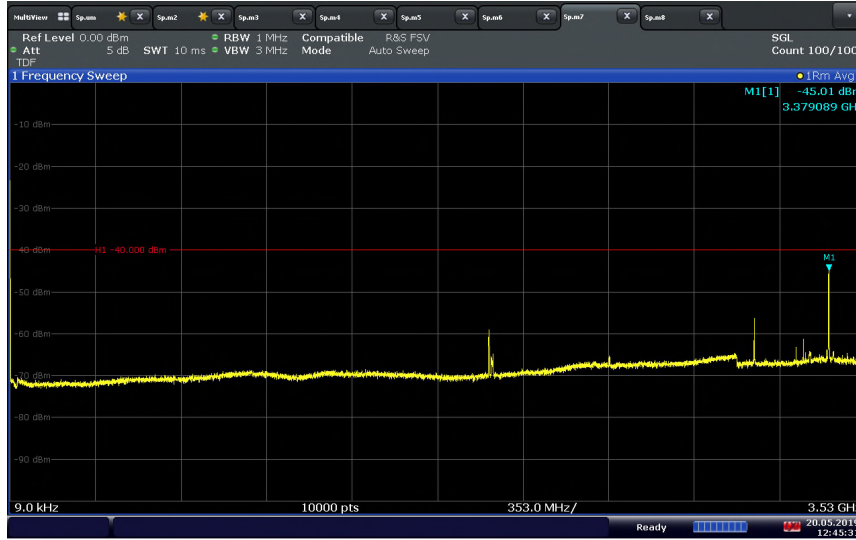


12:41:59 20.05.2019

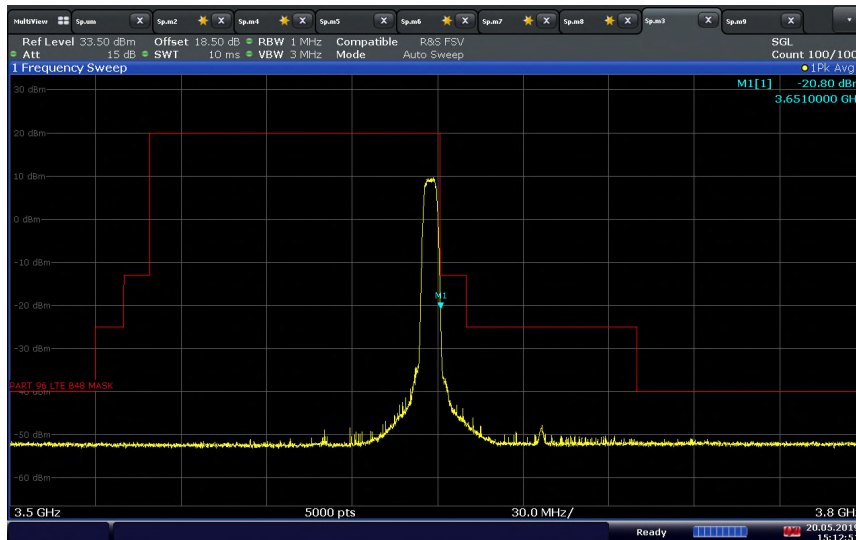


America

**LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / High Channel 3647.5 MHz
9 kHz - 3530 MHz**

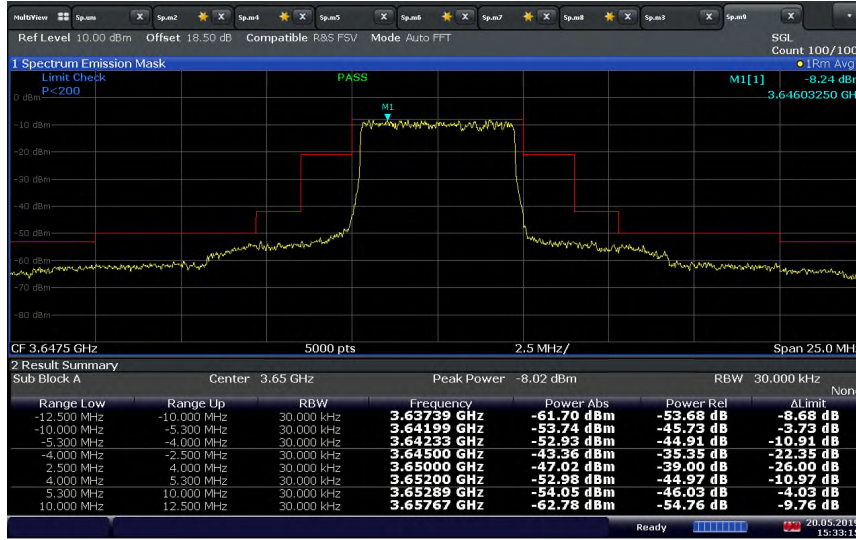


**LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / High Channel 3647.5 MHz Full RB
3530 kHz - 3720 MHz according to FCC Part 96**





**LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / High Channel 3647.5 MHz
 unwanted emission spectral density Mask according to RSS-192**



15:33:16 20.05.2019

**LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / High Channel 3647.5 MHz
 3720 MHz - 26.5 GHz**

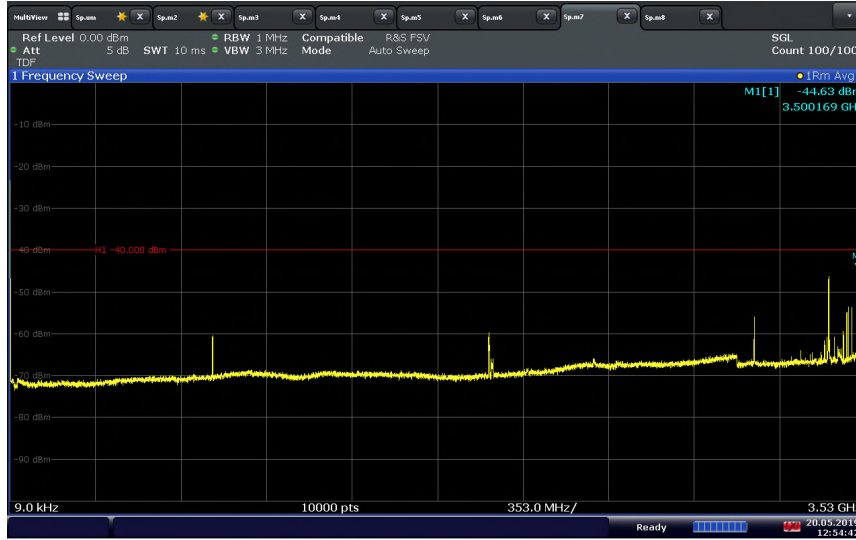


12:44:48 20.05.2019



America

LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / Low Channel 3555 MHz
9 kHz - 3530 MHz



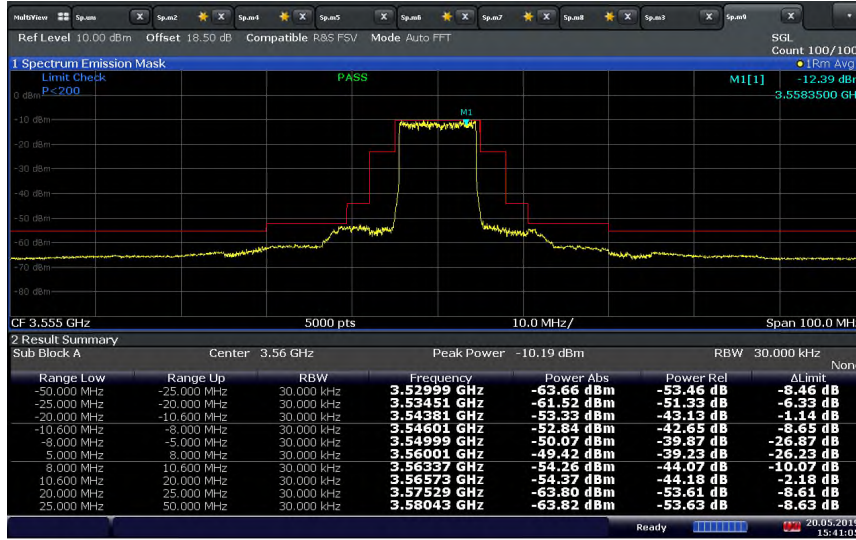
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LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / Low Channel 3555 MHz Full RB
3530 kHz - 3720 MHz according to FCC Part 96



15:24:22 20.05.2019

**LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / Low Channel 3555 MHz full RB
 unwanted emission spectral density Mask according to RSS-192**



15:41:05 20.05.2019

**LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / Low Channel 3555 MHz
 3720 MHz - 26.5 GHz**

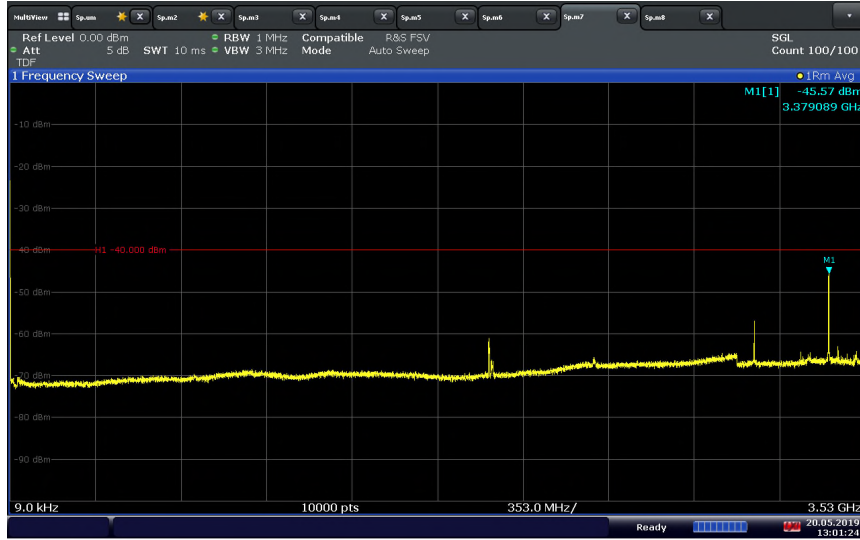


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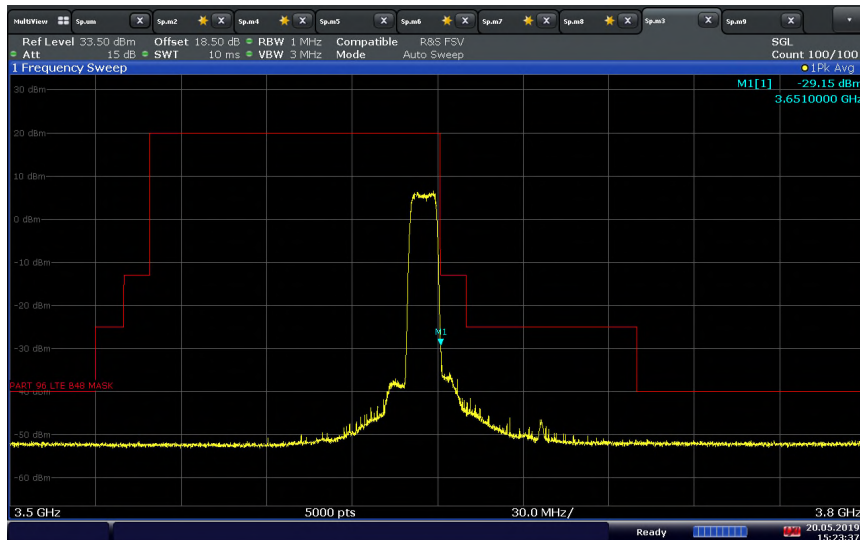


America

LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / High Channel 3645 MHz
9 kHz - 3530 MHz

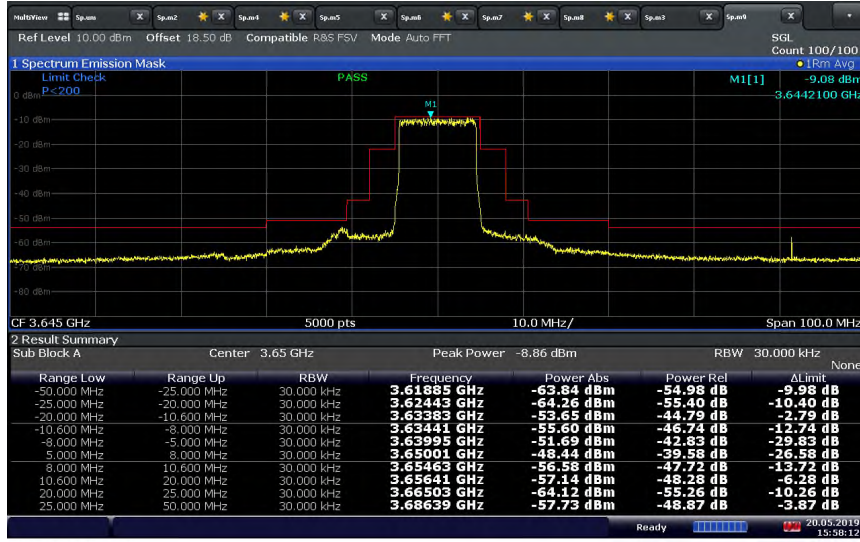


LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / High Channel 3645 MHz Full RB
3530 kHz - 3720 MHz according to FCC Part 96



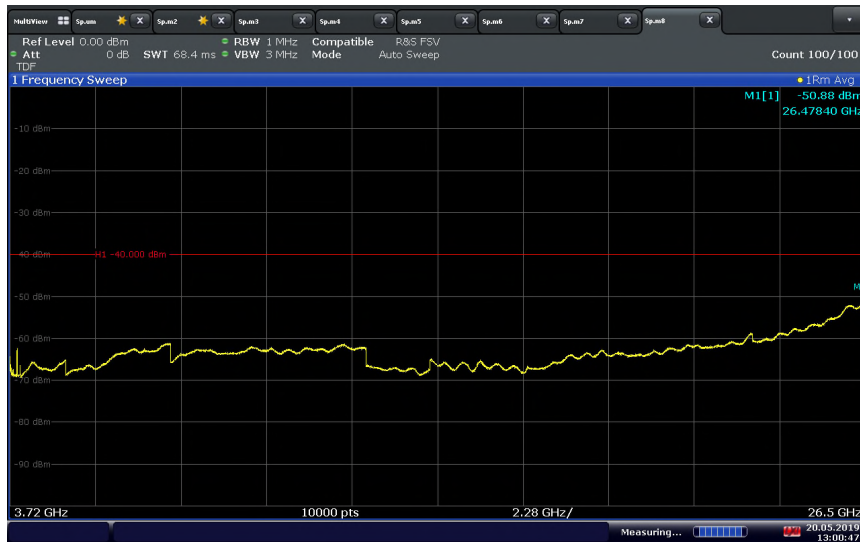


LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / High Channel 3645 MHz full RB unwanted emission spectral density Mask according to RSS-192



15:58:12 20.05.2019

LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / High Channel 3645 MHz 3720 MHz - 26.5 GHz

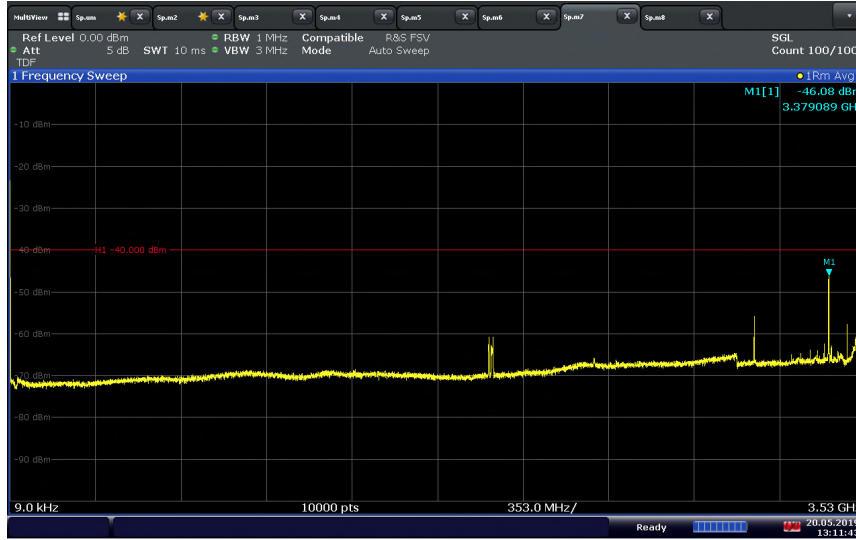


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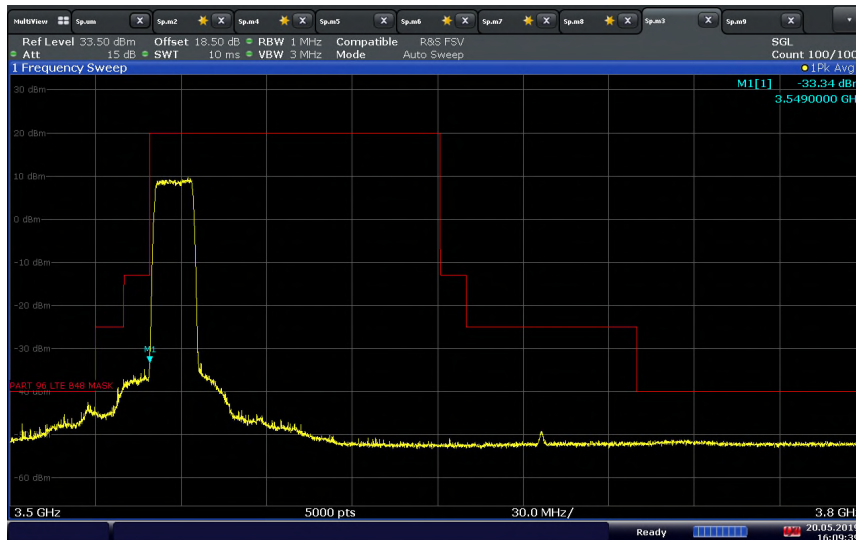


America

**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / Low Channel 3557.5 MHz
9 kHz - 3530 MHz**

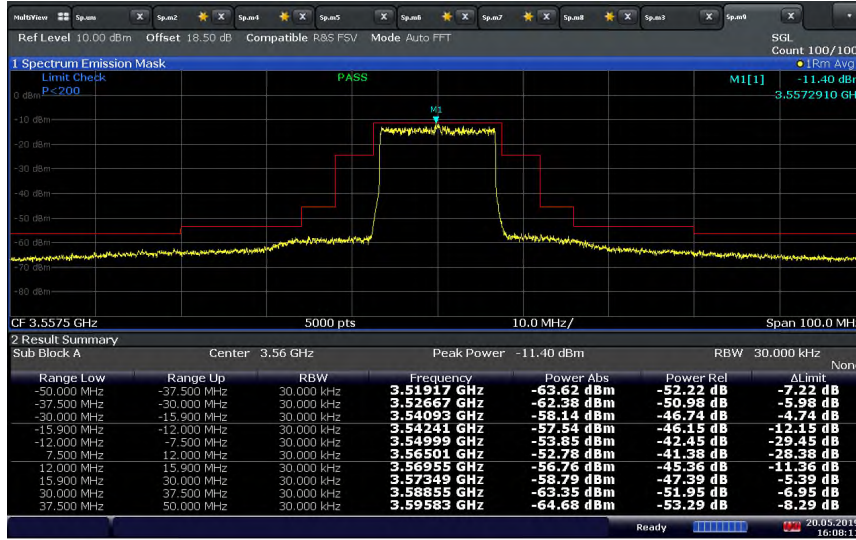


**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / Low Channel 3557.5 MHz 1RB 0 offset
3530 kHz - 3720 MHz according to FCC Part 96**





**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / Low Channel 3557.5 MHz full RB
 unwanted emission spectral density Mask according to RSS-192**



16:08:12 20.05.2019

**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / Low Channel 3557.5 MHz
 3720 MHz - 26.5 GHz**

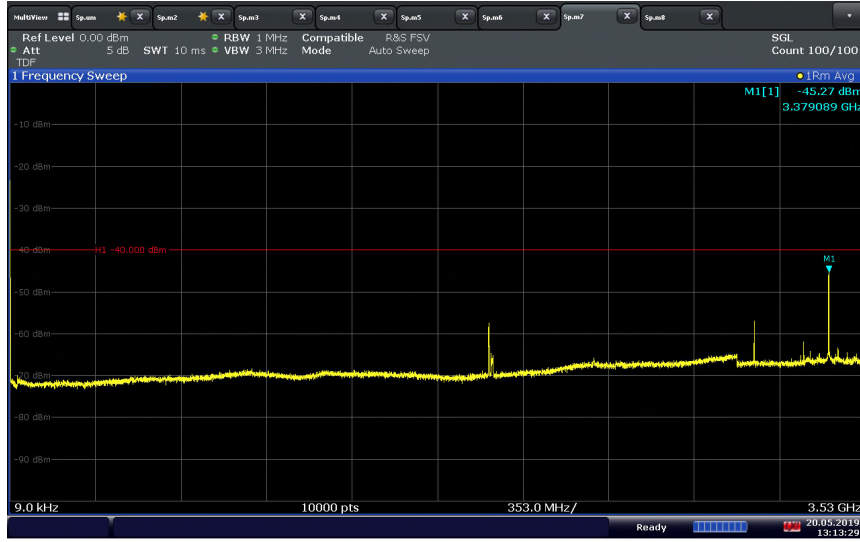


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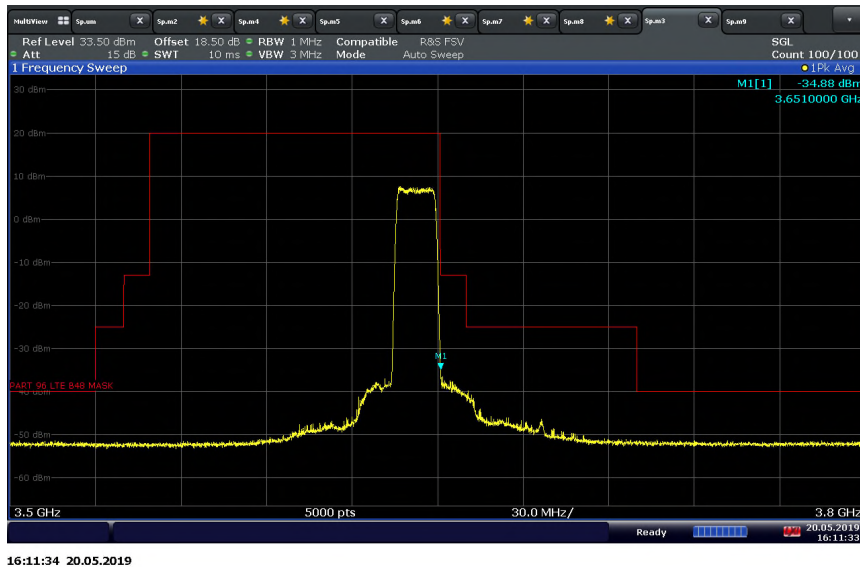


America

**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / High Channel 3642.5 MHz
9 kHz - 3530 MHz**

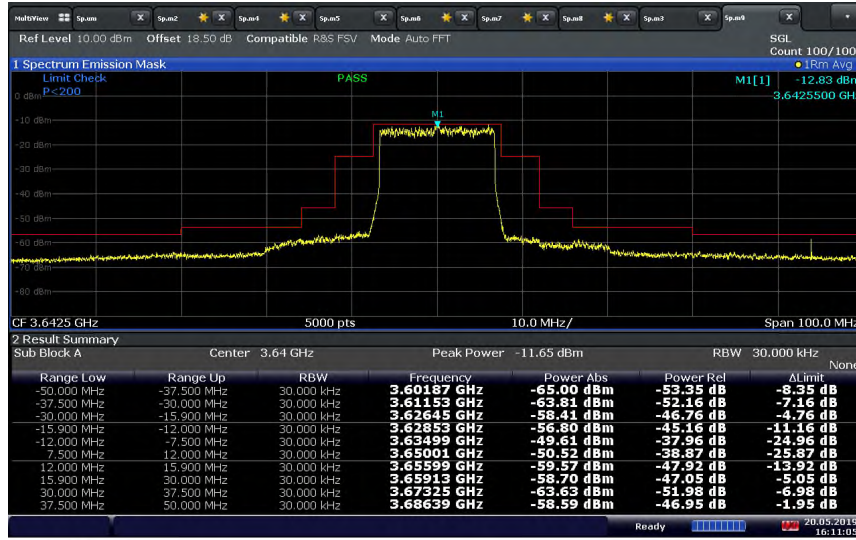


**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / High Channel 3642.5 MHz 1RB 0 offset
3530 kHz - 3720 MHz according to FCC Part 96**



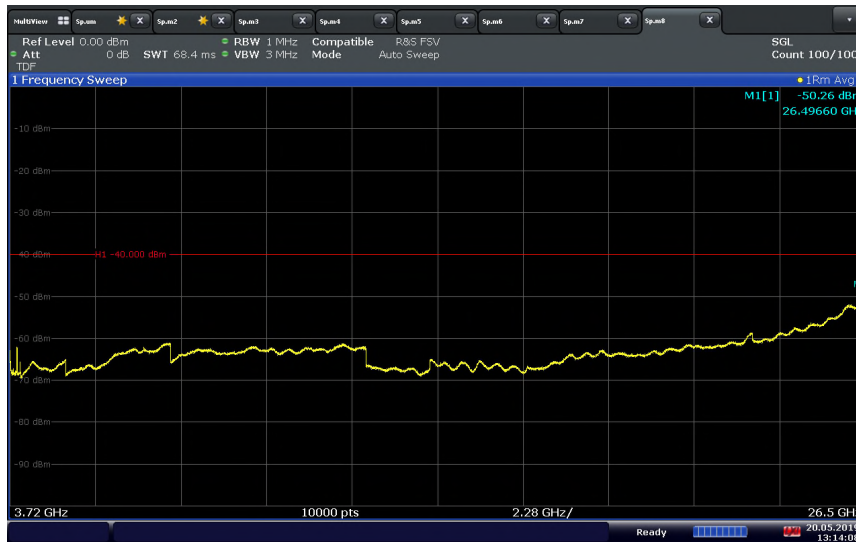


**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / High Channel 3642.5 MHz full RB
 unwanted emission spectral density Mask according to RSS-192**



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**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / High Channel 3642.5 MHz
 3720 MHz - 26.5 GHz**

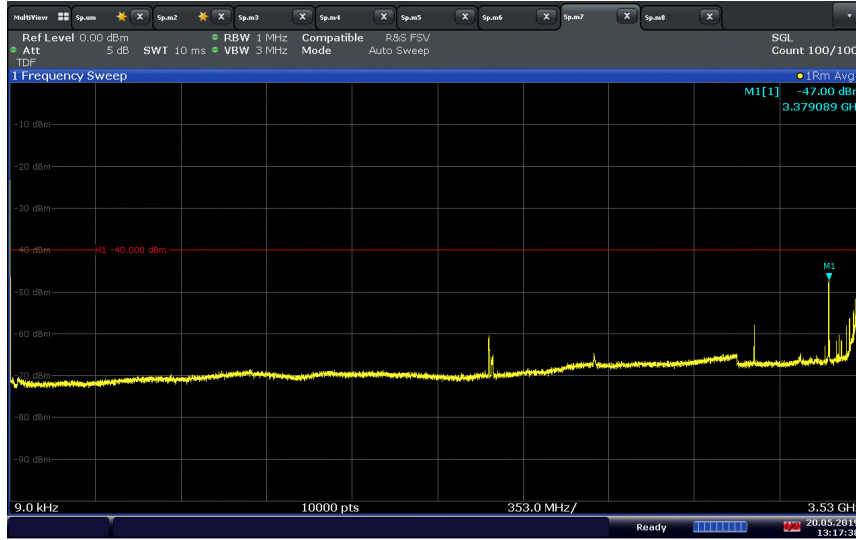


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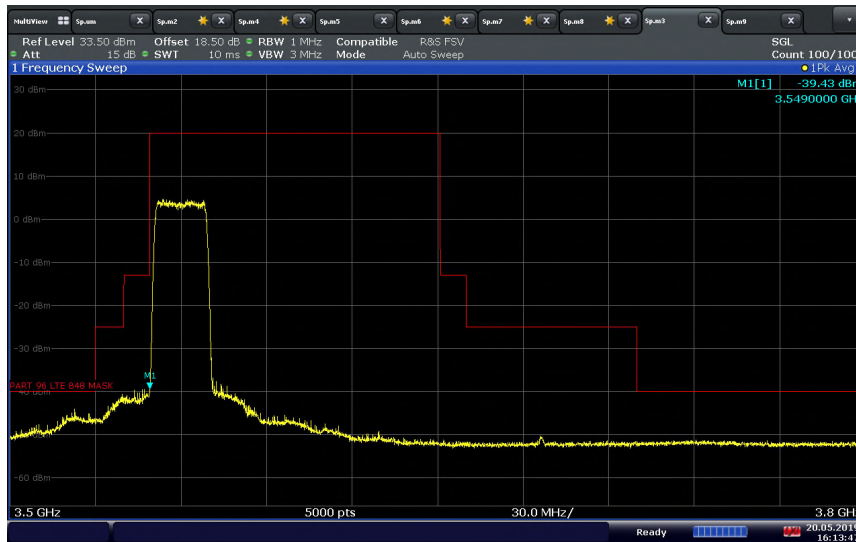
America

LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / Low Channel 3560 MHz
9 kHz - 3530 MHz



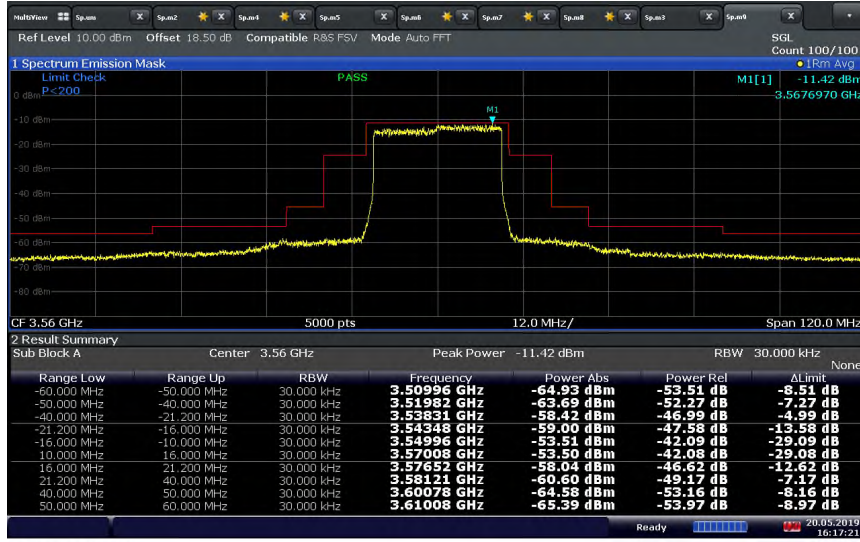
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LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / Low Channel 3560 MHz full RB
3530 kHz - 3720 MHz according to FCC Part 96



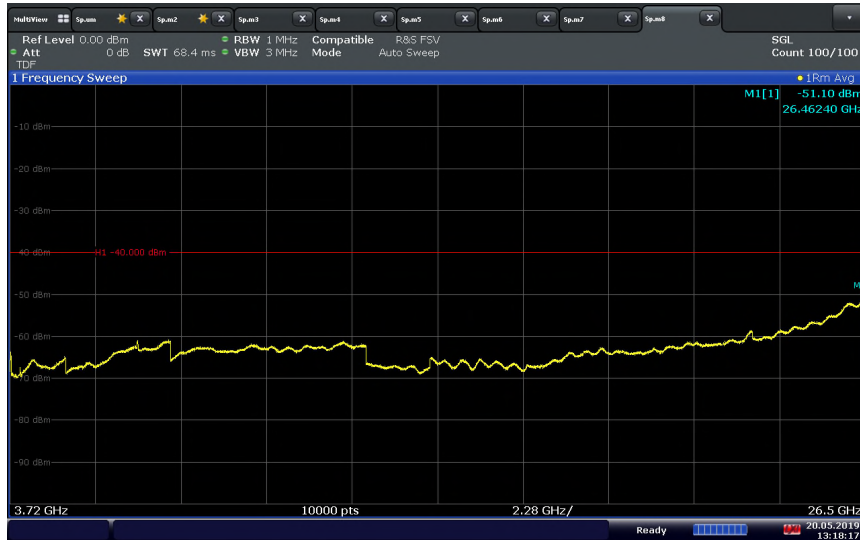
16:13:48 20.05.2019

**LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / Low Channel 3560 MHz full RB
 unwanted emission spectral density Mask according to RSS-192**



16:17:22 20.05.2019

**LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / Low Channel 3560 MHz
 3720 MHz - 26.5 GHz**

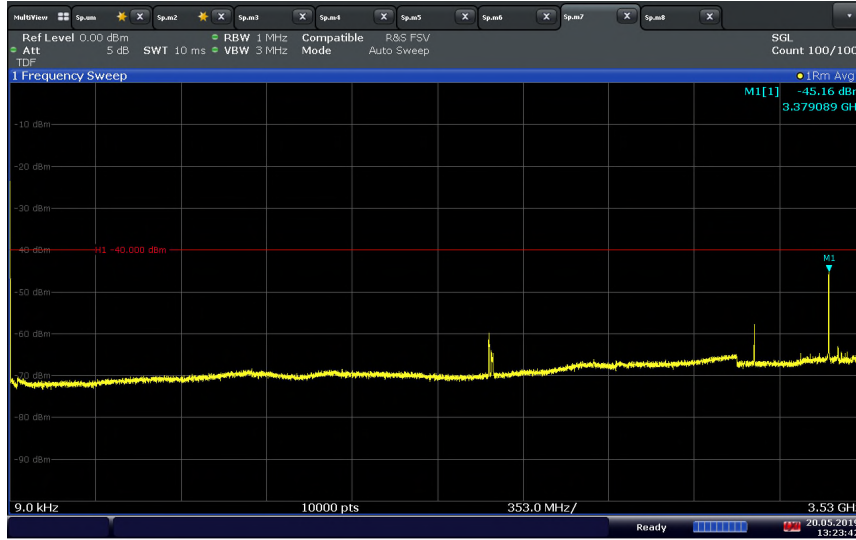


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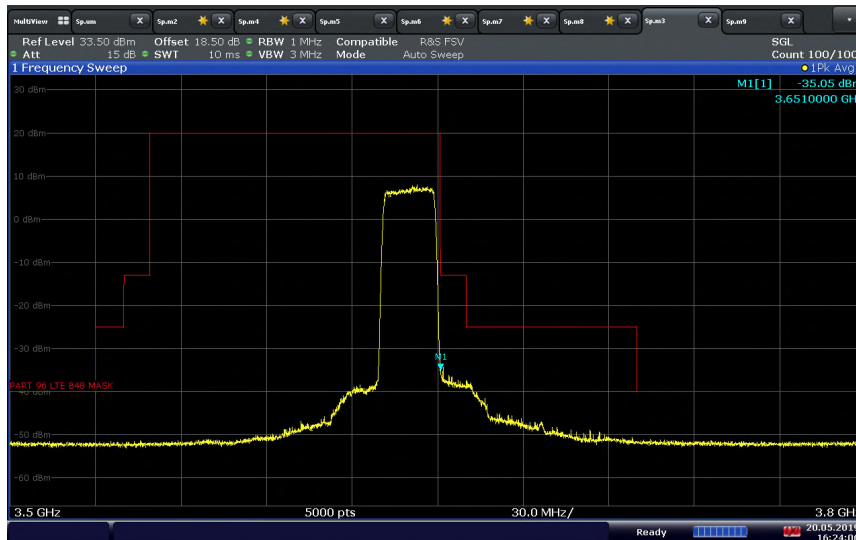
America

LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / High Channel 3640 MHz
9 kHz - 3530 MHz



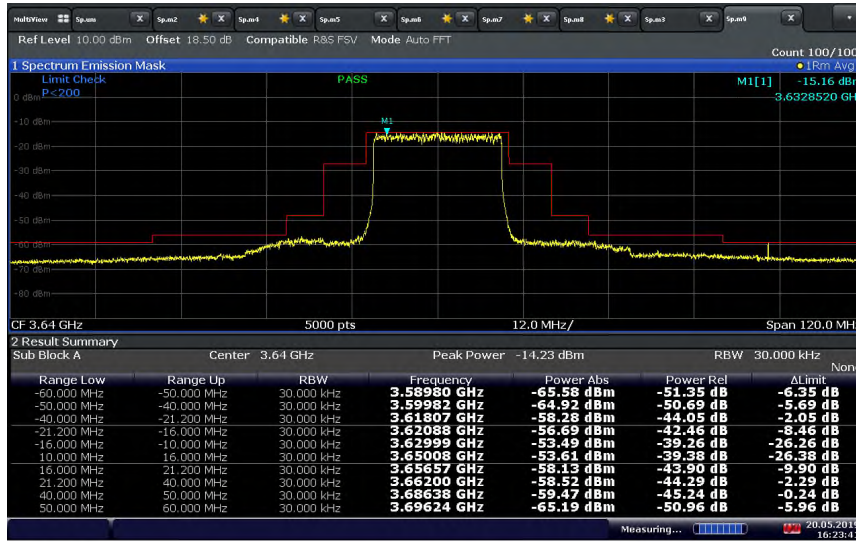
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LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / High Channel 3640 MHz full RB
3530 kHz - 3720 MHz according to FCC Part 96



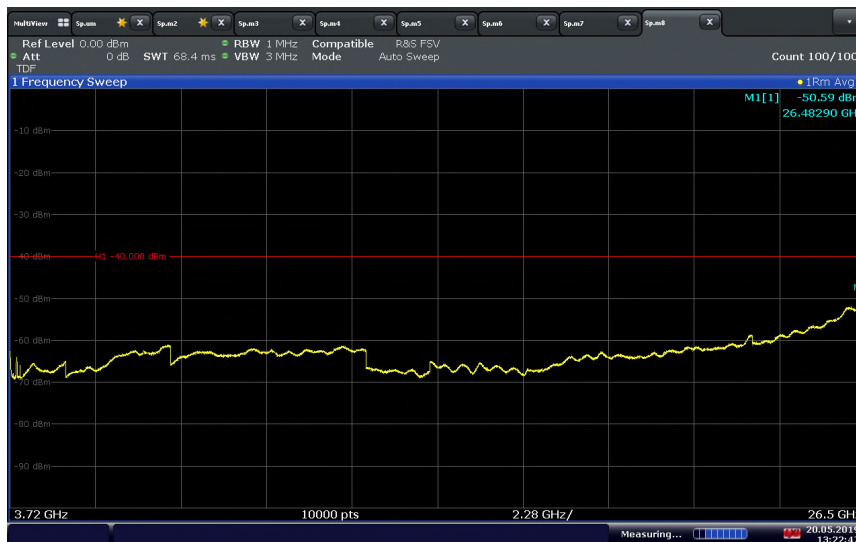
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**LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / High Channel 3640 MHz full RB
 unwanted emission spectral density Mask according to RSS-192**



16:23:41 20.05.2019

**LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / High Channel 3640 MHz
 3720 MHz - 26.5 GHz**

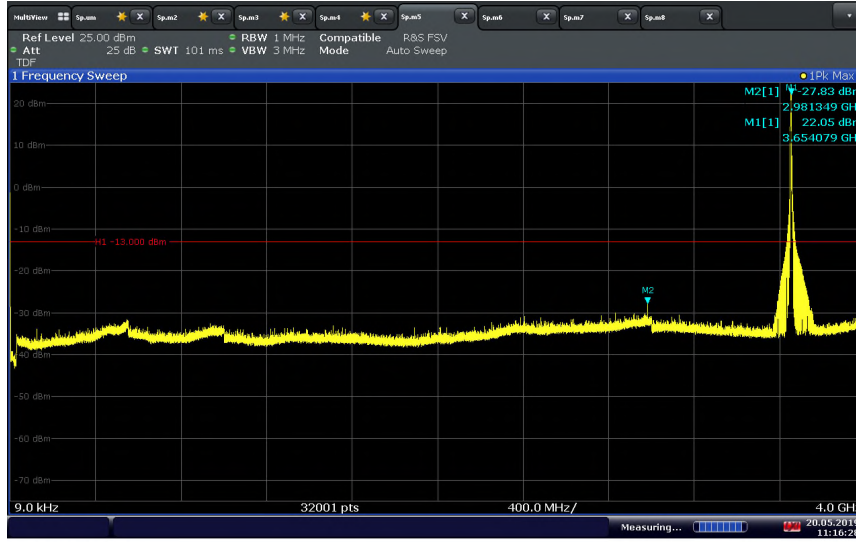


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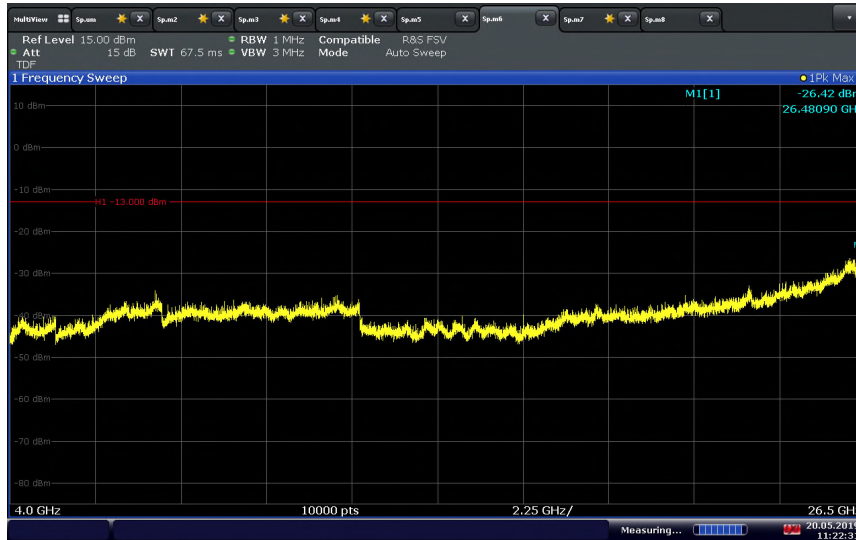
America

LTE Band 48 (3650 – 3700 MHz)_5 MHz BW / QPSK / Low Channel 3652.5 MHz
9 kHz - 4 GHz



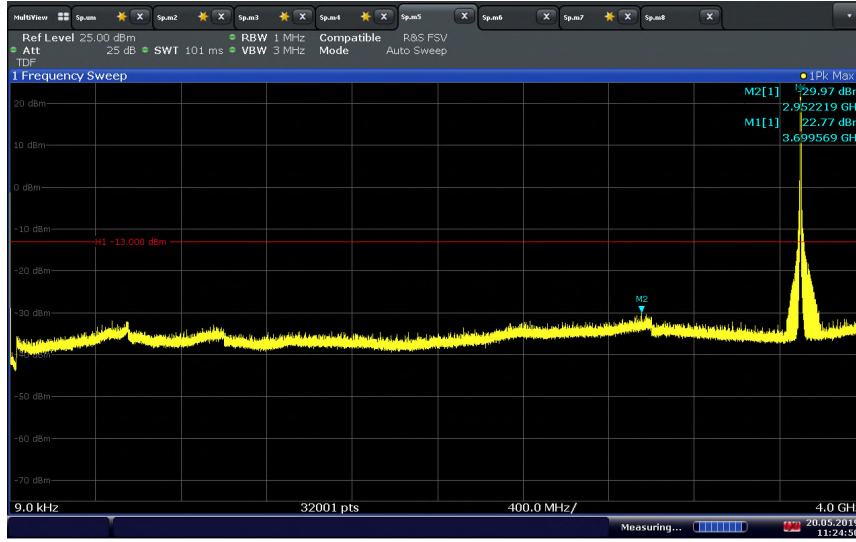
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LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / Low Channel 3652.5 MHz
4 GHz - 26.5 GHz

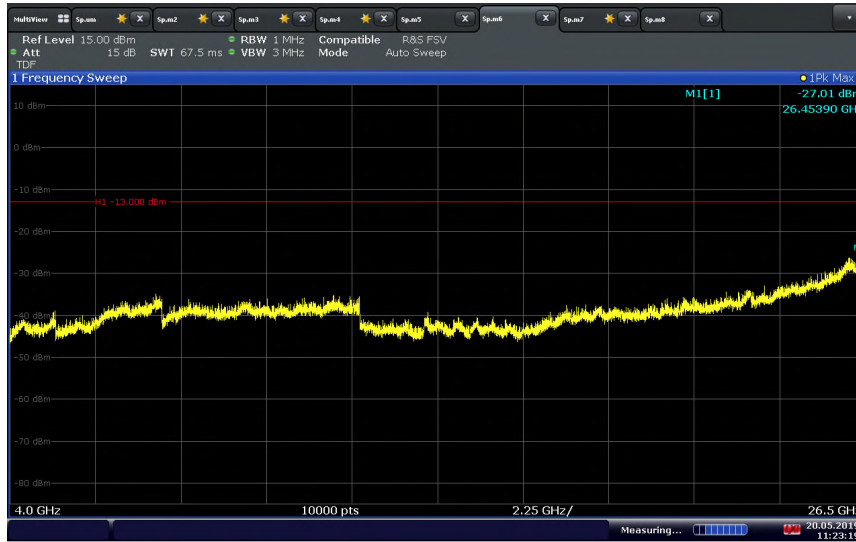


11:22:31 20.05.2019

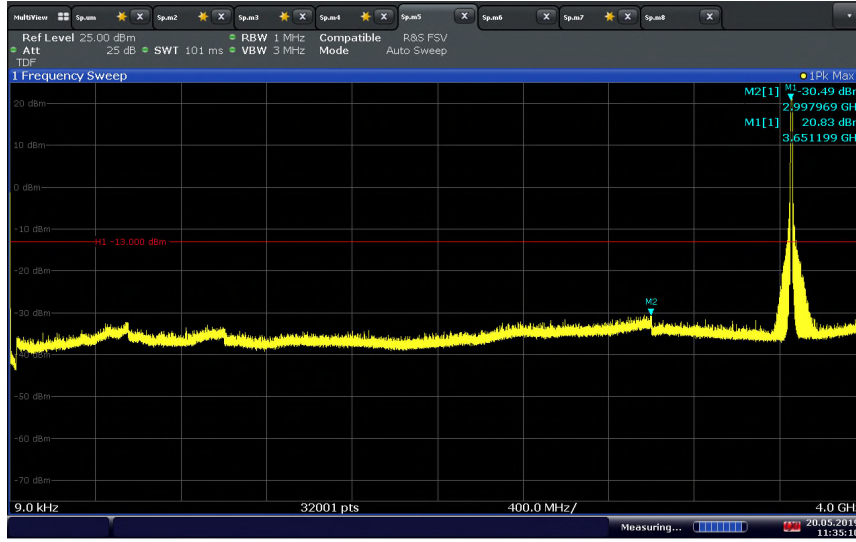
LTE Band 48 (3650 – 3700 MHz)_5 MHz BW / QPSK / High Channel 3697.5 MHz
9 kHz - 4 GHz



LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / High Channel 3697.5 MHz
4 GHz - 26.5 GHz

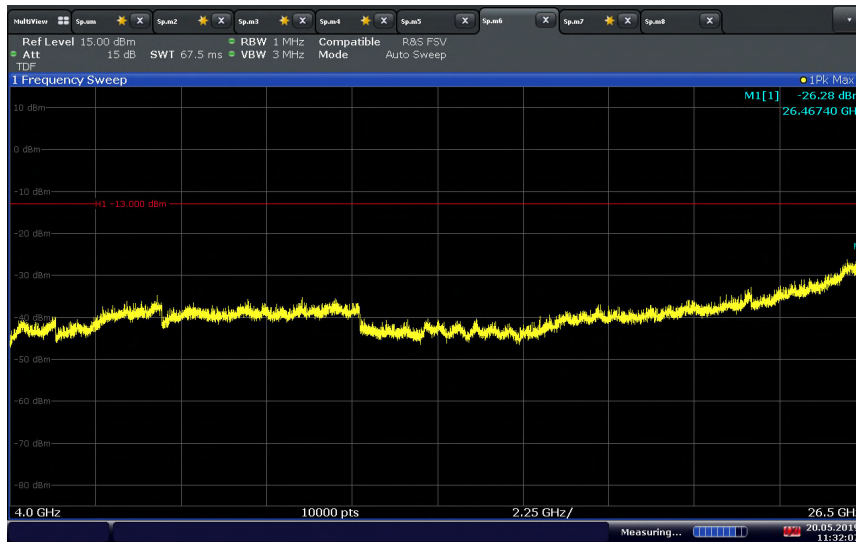


LTE Band 48 (3650 – 3700 MHz)_10 MHz BW / QPSK / Low Channel 3655 MHz
9 kHz - 4 GHz



11:35:11 20.05.2019

LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / Low Channel 3655 MHz
4 GHz - 26.5 GHz

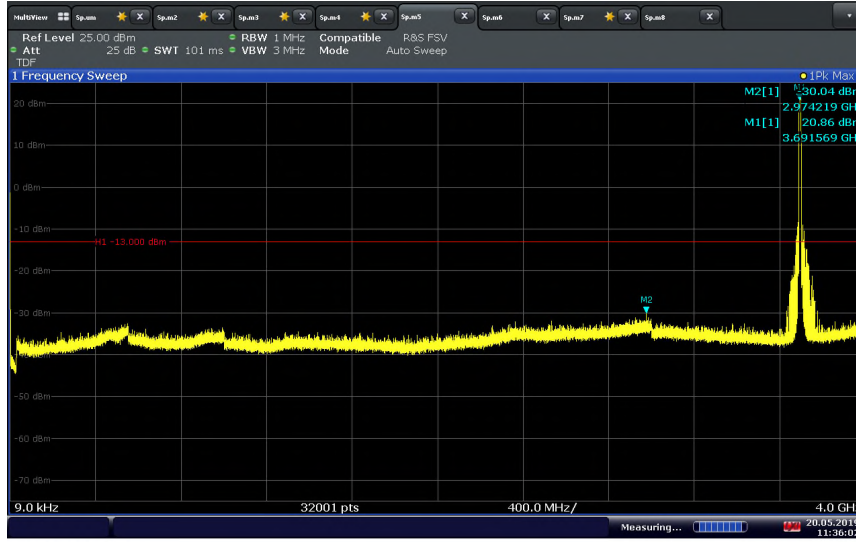


11:32:08 20.05.2019



America

LTE Band 48 (3650 – 3700 MHz)_10 MHz BW / QPSK / High Channel 3695 MHz
9 kHz - 4 GHz



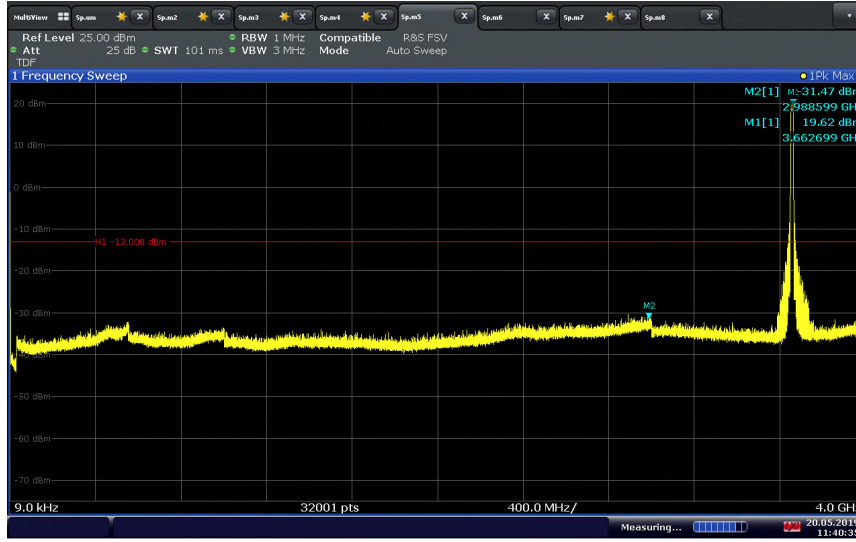
LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / High Channel 3695 MHz
4 GHz - 26.5 GHz



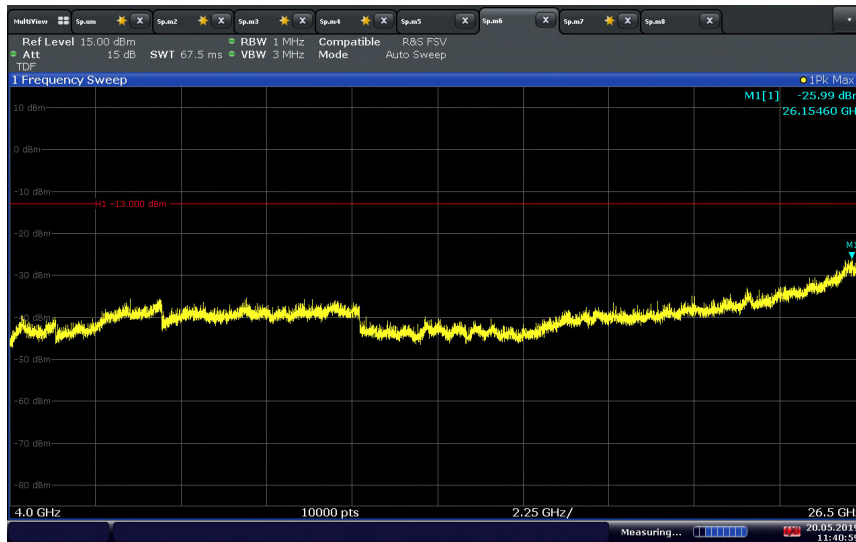


America

LTE Band 48 (3650 – 3700 MHz)_15 MHz BW / QPSK / Low Channel 3657.5 MHz
9 kHz - 4 GHz



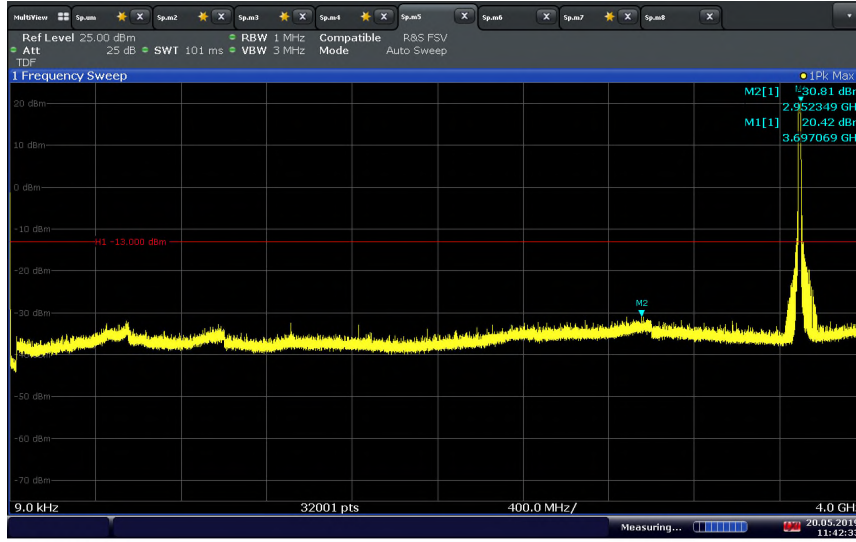
LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / Low Channel 3657.5 MHz
4 GHz - 26.5 GHz





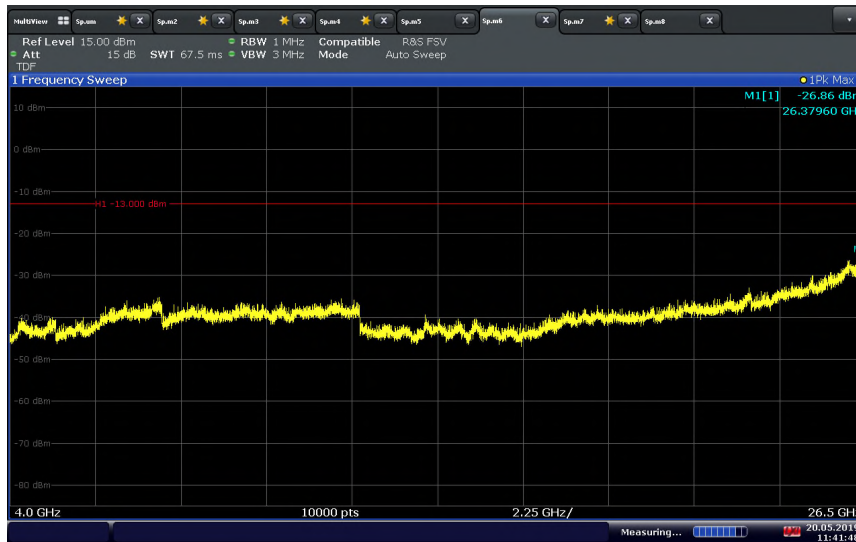
America

LTE Band 48 (3650 – 3700 MHz)_15 MHz BW / QPSK / High Channel 3692.5 MHz
9 kHz - 4 GHz



11:42:33 20.05.2019

LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / High Channel 3692.5 MHz
4 GHz - 26.5 GHz

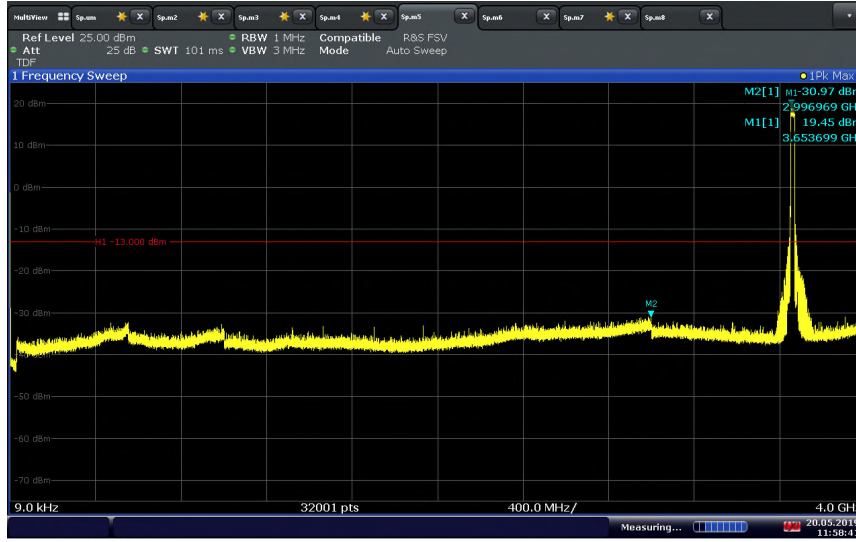


11:41:48 20.05.2019

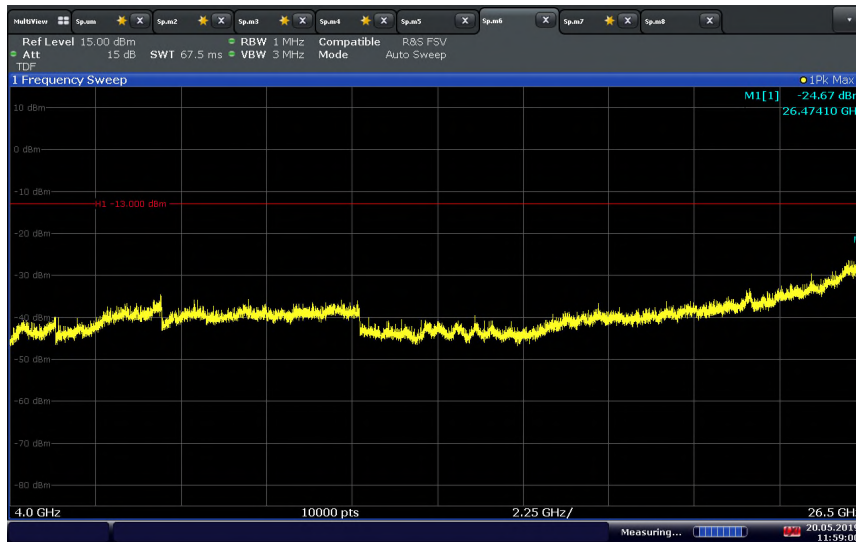


America

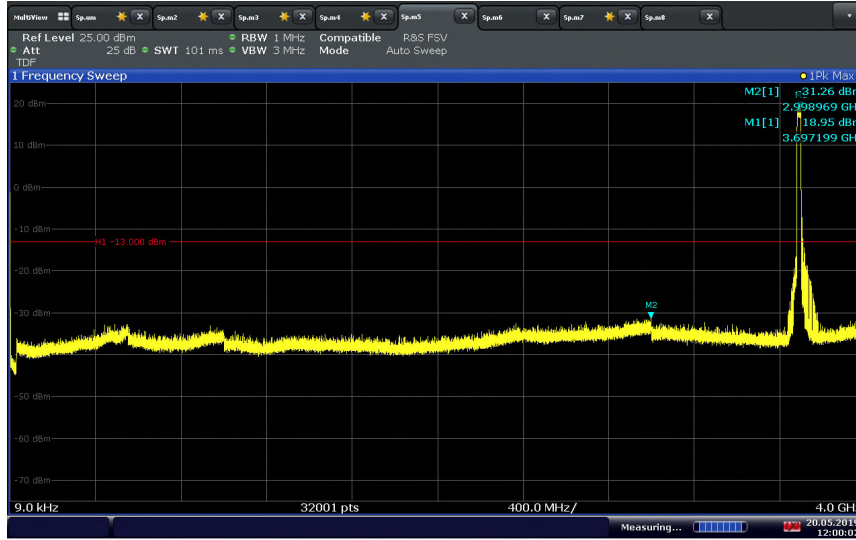
LTE Band 48 (3650 – 3700 MHz)_20 MHz BW / QPSK / Low Channel 3660 MHz
9 kHz - 4 GHz



LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / Low Channel 3660 MHz
4 GHz - 26.5 GHz

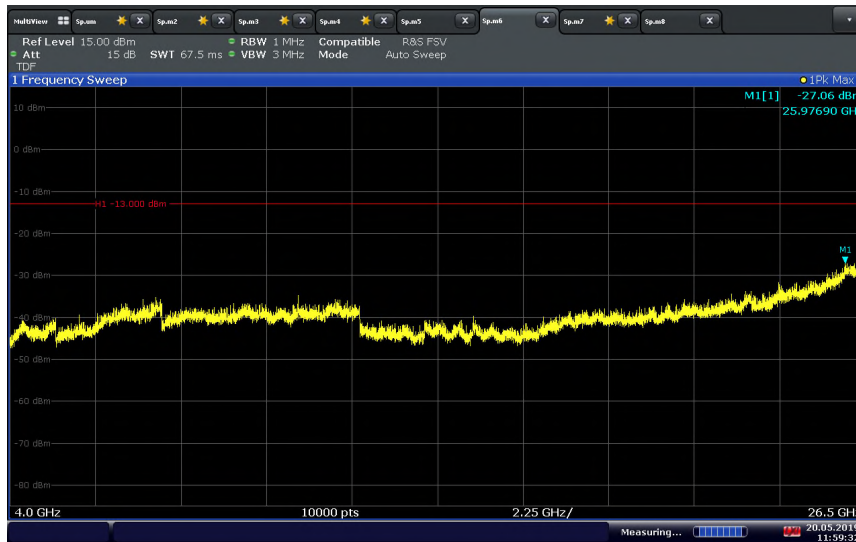


LTE Band 48 (3650 – 3700 MHz)_20 MHz BW / QPSK / High Channel 3690 MHz
9 kHz - 4 GHz



12:00:02 20.05.2019

LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / High Channel 3690 MHz
4 GHz - 26.5 GHz



11:59:32 20.05.2019



2.6 FIELD STRENGTH OF SPURIOUS RADIATION

2.6.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 96, Clause 96.41(e)
FCC 47 CFR Part 90, Clause 90.1323(a)
RSS-192, Clause 5.5
RSS-197, Clause 5.7

2.6.2 Standard Applicable

FCC 47 CFR Part 96.41:

(e) 3.5 GHz Emissions and Interference Limits - (1) General protection levels. Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by the SAS to CBSDs, the conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz. The upper and lower SAS assigned channel edges are the upper and lower limits of any channel assigned to a CBSD by an SAS, or in the case of multiple contiguous channels, the upper and lower limits of the combined contiguous channels.

(2) Additional protection levels: Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz.

RSS-192, Clause 5.5:

(ii) In any 1.0 MHz band that is removed from the assigned centre frequency by more than $\pm 250\%$ of the necessary bandwidth, the power of any emission must be attenuated below P_{mean} by at least $43 + 10 \log_{10}(P_{\text{mean}})$ dB, or 70 dB, whichever is less stringent. P_{mean} is the mean output power of the transmitter in watts.



FCC 47 CFR Part 90.1323:

(a) 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 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

RSS-197, Clause 5.7:

The unwanted emissions shall be measured at the frequencies of the highest and lowest channel of all bandwidths and types of modulation that the equipment can operate with a resolution bandwidth of 1 MHz or less, but at least 1% of the occupied bandwidth of the transmitter, provided that the measured power is integrated over a 1 MHz bandwidth.

The power of any emissions outside the frequency band 3650-3700 MHz shall be attenuated below the channel transmitter power P (dBW) by $43 + 10 \log (p)$, where p is measured in watts.

2.6.3 Equipment Under Test and Modification State

Serial No: 990013090027496 and 990013090023966 (IMEI) / Test Configuration B

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

May 23, 2019 / XYZ

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	25.3 °C
Relative Humidity	42.1 %
ATM Pressure	98.9 kPa

2.6.7 Additional Observations

- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of Sub clause 5.5 of ANSI C63.16-2015.
- 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 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

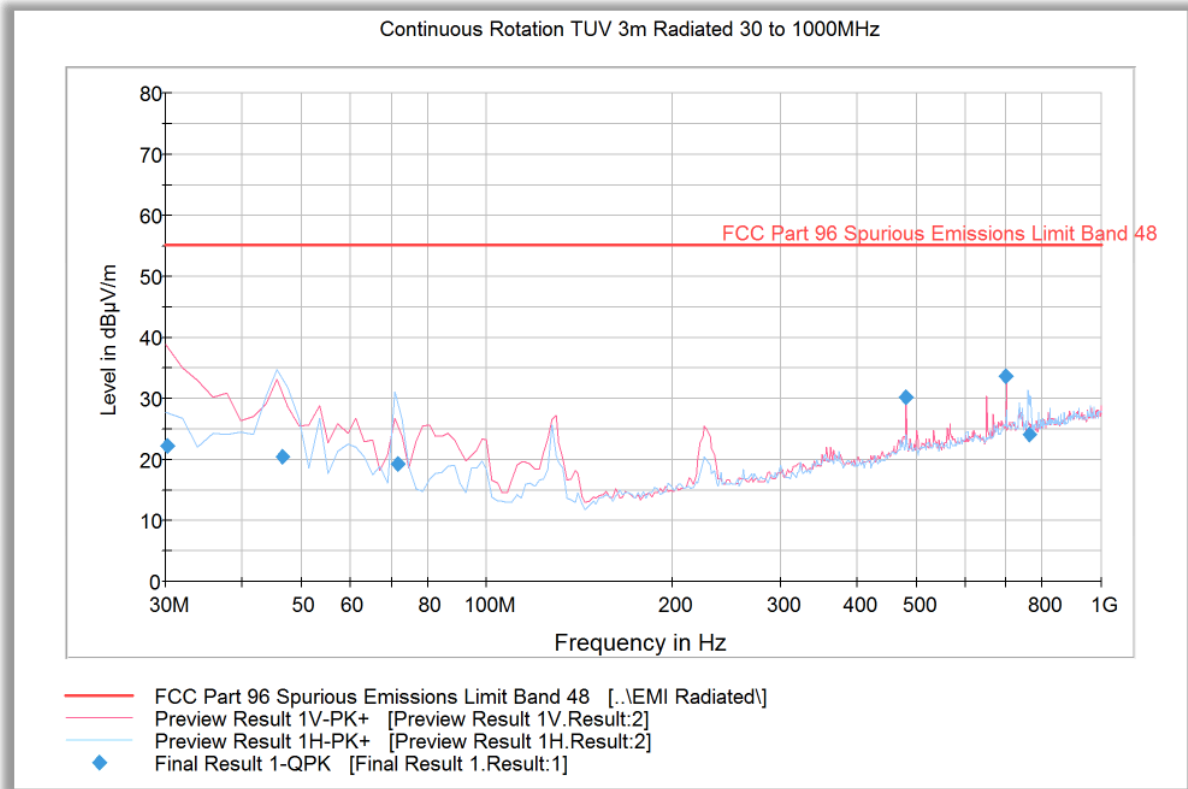
2.6.8 Test Results

See attached plots.



America

**2.6.9 Radiated Emission Test Results Below 1GHz – Worst Case Band 48 (3550 – 3650 MHz)_QPSK_5 MHz
 BW 1RB 12 offset_High Channel 3647.5 MHz**



Quasi Peak Data

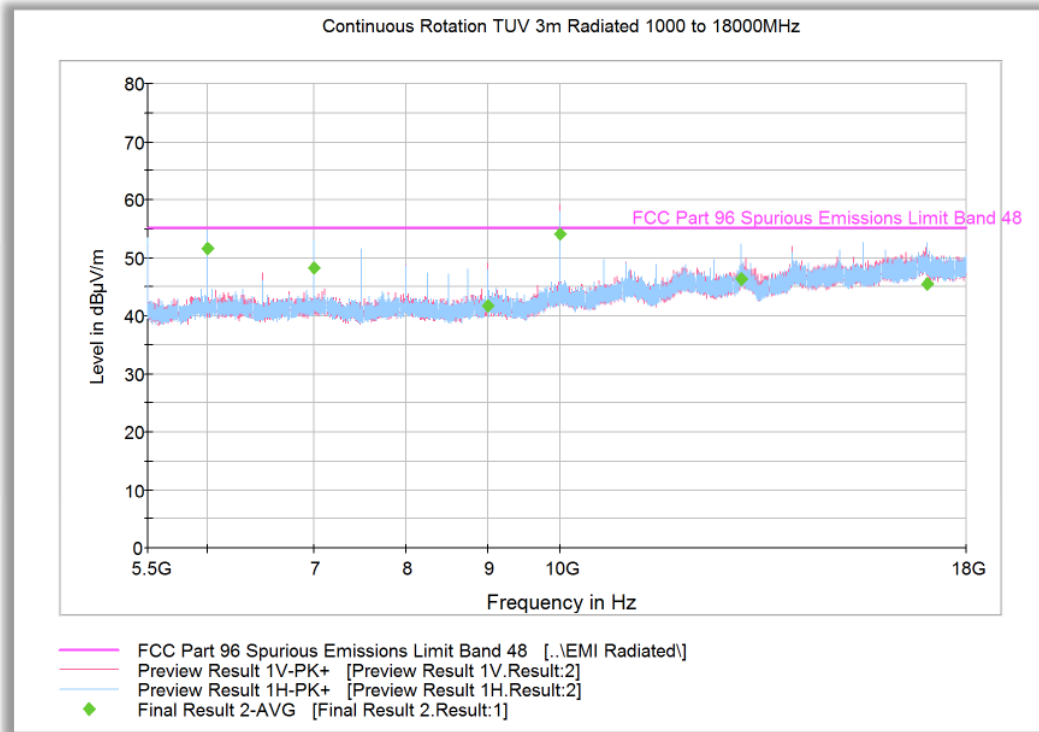
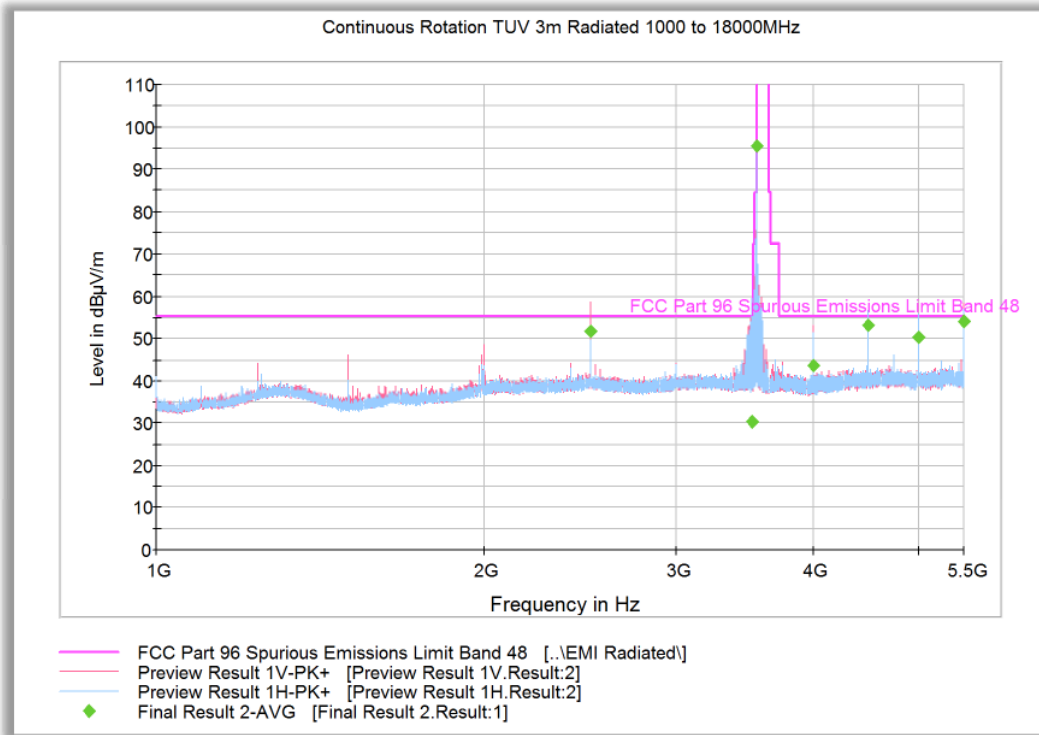
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.080000	22.3	1000.0	120.000	100.0	V	248.0	-7.8	32.9	55.2
46.351102	20.4	1000.0	120.000	302.0	H	15.0	-14.0	34.8	55.2
71.621643	19.3	1000.0	120.000	300.0	H	341.0	-17.2	35.9	55.2
479.981964	30.2	1000.0	120.000	100.0	V	218.0	-1.9	25.0	55.2
700.001283	33.6	1000.0	120.000	100.0	V	213.0	2.3	21.6	55.2
764.261804	24.0	1000.0	120.000	150.0	H	207.0	2.7	31.2	55.2

Test Notes: Only worst case modulation/bandwidth/channel presented for spurious emissions below 1GHz.



America

**2.6.10 Radiated Emission Test Results Above 1GHz – Worst Case Band 48 (3550 – 3650 MHz)_QPSK_5 MHz
 BW 1RB 12 offset_Low Channel 3552.5 MHz**





Average Data

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Peak Margin (dB)	Limit (dBμV/m)
2499.950000	52.0	1000.0	1000.000	103.7	V	182.0	-0.3	3.2	55.2
3519.000000	30.4	1000.0	1000.000	103.7	H	331.0	1.2	24.8	55.2
3552.750000	95.5	1000.0	1000.000	129.7	V	277.0	1.6	* Fundamental Freq.	
4000.200000	43.8	1000.0	1000.000	99.7	V	232.0	2.5	11.4	55.2
4500.250000	53.2	1000.0	1000.000	151.2	H	48.0	3.7	2.0	55.2
5000.100000	50.3	1000.0	1000.000	208.5	H	64.0	3.8	4.9	55.2
5500.000000	54.0	1000.0	1000.000	306.2	V	101.0	5.0	1.2	55.2
5999.983333	51.6	1000.0	1000.000	166.6	H	93.0	5.7	3.6	55.2
7000.200000	48.3	1000.0	1000.000	120.7	H	137.0	6.7	6.9	55.2
9000.200000	41.6	1000.0	1000.000	191.5	V	109.0	7.6	13.6	55.2
9999.800000	54.0	1000.0	1000.000	275.3	V	127.0	9.6	1.2	55.2
13000.200000	46.2	1000.0	1000.000	205.5	H	130.0	13.6	9.0	55.2
16999.833333	45.5	1000.0	1000.000	201.5	H	135.0	17.9	9.7	55.2

* This is the fundamental frequency not part of spurious emission evaluation. Data provided for information purpose only.
 Measurement for above 5.5GHz was performed with a 5.5GHz High pass filter. No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.

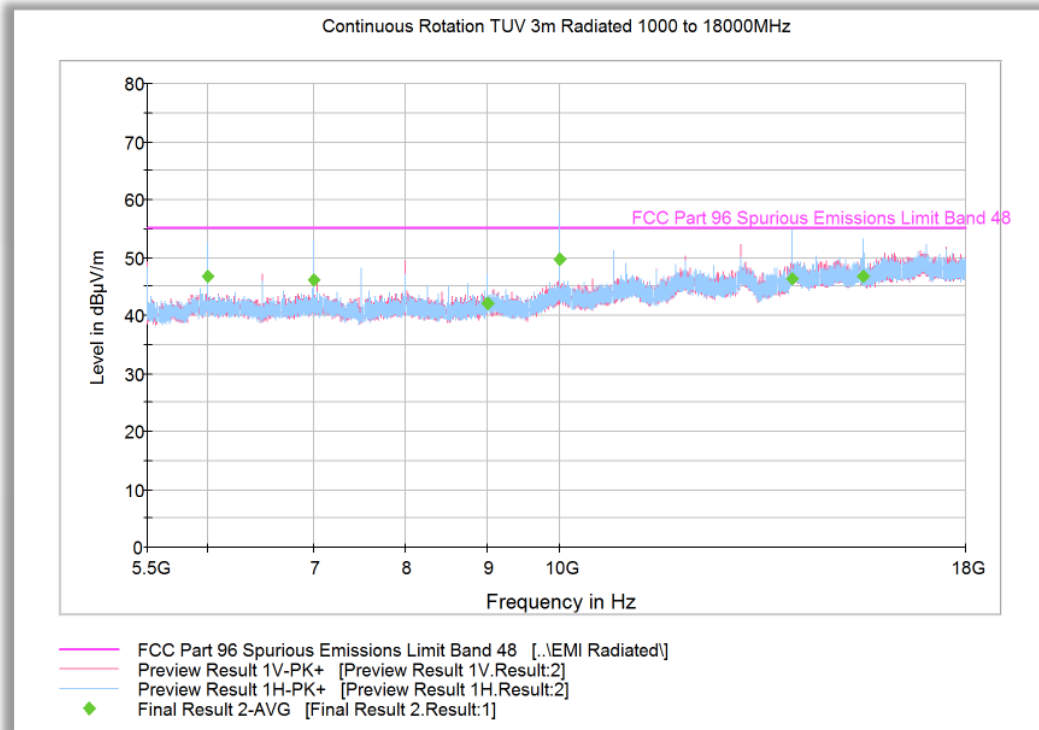
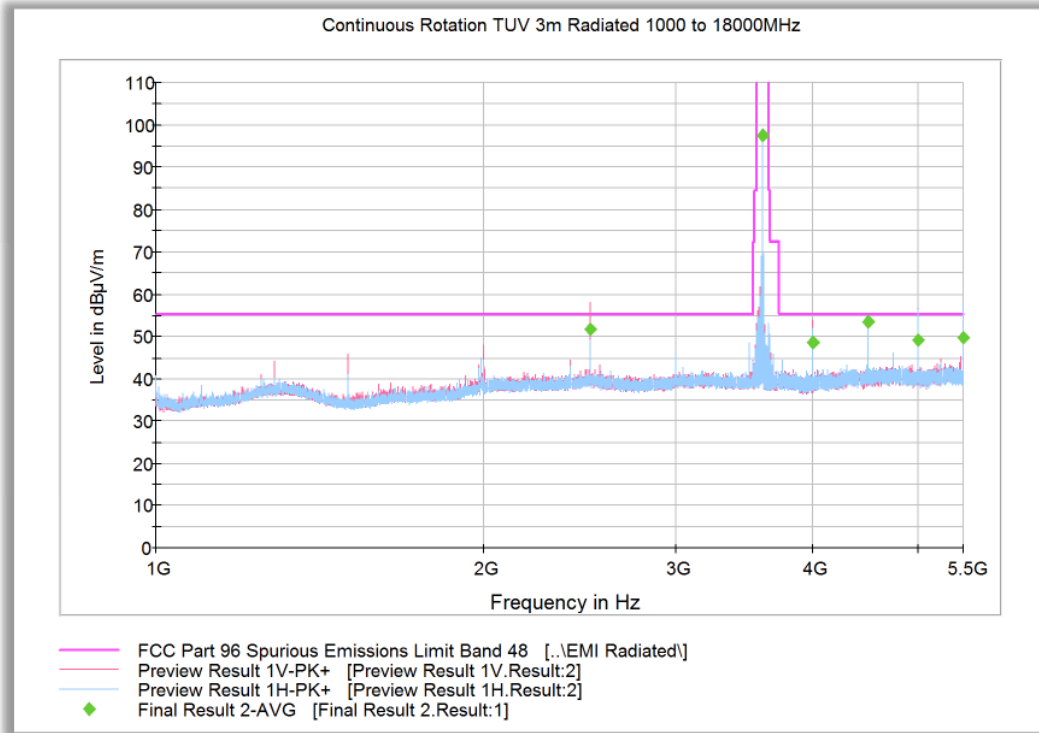
Substitution Data

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
2499.950000	52.0	3.8	9.5	-49.8	-44.1	-40	Yes
4500.250000	53.2	3.8	11.1	-49.9	-42.6	-40	Yes
5000.100000	50.3	5.1	11.0	-51.5	-45.6	-40	Yes
5500.000000	54.0	5.7	10.9	-47.1	-41.9	-40	Yes
5999.983333	51.6	6.4	11.7	-48.4	-43.1	-40	Yes
9999.800000	54.0	9.1	12.2	-45.0	-41.9	-40	Yes



America

**2.6.11 Radiated Emission Test Results Above 1GHz – Worst Case Band 48 (3550 – 3650 MHz)_QPSK_5 MHz
BW 1RB 12 offset_Middle Channel 3600 MHz**





Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Peak Margin (dB)	Limit (dBµV/m)
2499.950000	51.7	1000.0	1000.000	99.7	V	182.0	-0.3	3.5	55.2
3600.050000	97.6	1000.0	1000.000	125.7	V	278.0	1.7	* Fundamental Freq.	
4000.200000	48.5	1000.0	1000.000	103.7	V	169.0	2.5	6.7	55.2
4500.050000	53.5	1000.0	1000.000	169.6	H	52.0	3.7	1.7	55.2
5000.100000	49.2	1000.0	1000.000	204.5	H	63.0	3.8	6.0	55.2
5499.900000	49.8	1000.0	1000.000	128.7	H	353.0	5.0	5.4	55.2
5999.800000	46.8	1000.0	1000.000	200.5	H	68.0	5.7	8.4	55.2
7000.200000	46.0	1000.0	1000.000	152.2	H	114.0	6.7	9.2	55.2
8999.800000	42.1	1000.0	1000.000	103.7	H	8.0	7.6	13.1	55.2
10000.200000	49.6	1000.0	1000.000	252.3	H	68.0	9.6	5.6	55.2
13999.800000	46.3	1000.0	1000.000	205.5	H	99.0	14.7	8.9	55.2
15499.800000	46.7	1000.0	1000.000	165.6	H	10.0	16.1	8.5	55.2

* This is the fundamental frequency not part of spurious emission evaluation. Data provided for information purpose only.

Measurement for above 5.5GHz was performed with a 5.5GHz High pass filter. No significant emisissions observed above 18GHz. Measurements above 18GHz are noise floor figures.

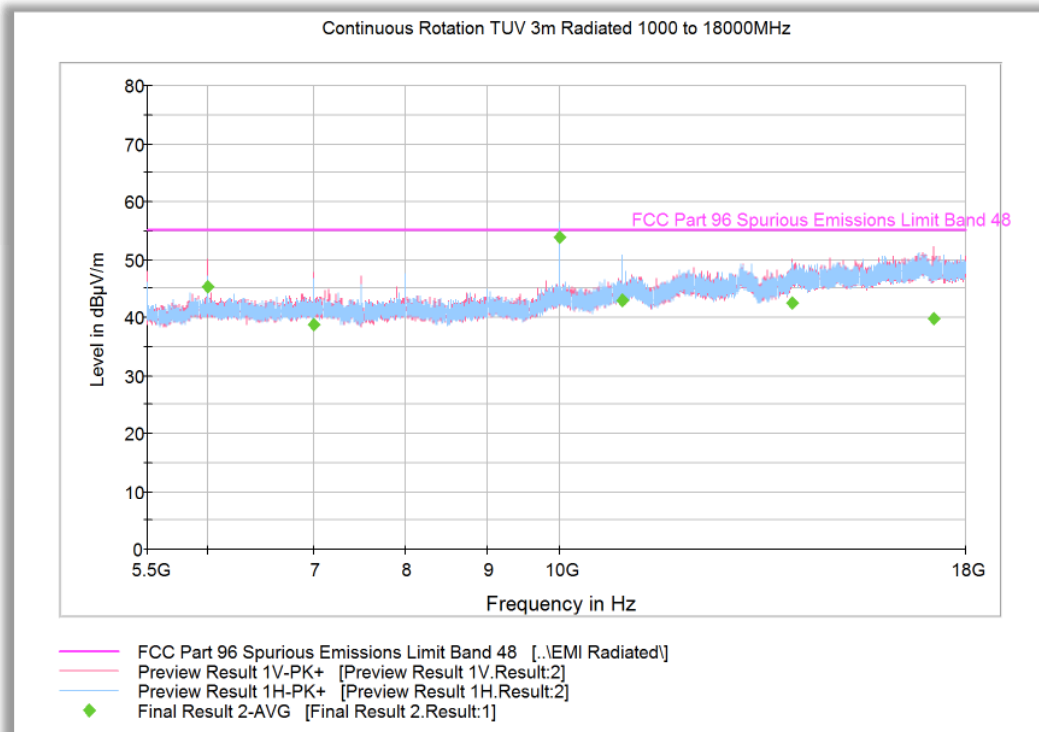
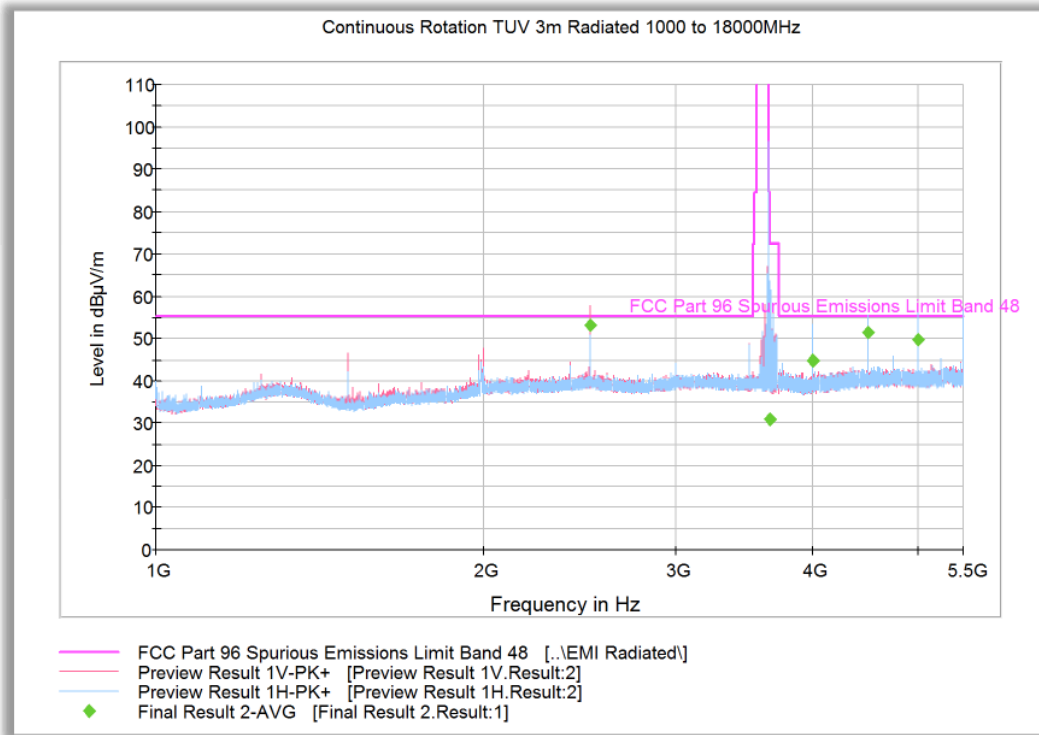
Substitution Data

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
2499.950000	51.7	3.8	9.5	-49.6	-43.9	-40	Yes
4500.050000	53.5	3.8	11.1	-49.5	-42.2	-40	Yes
5499.900000	49.8	5.7	10.9	-51.7	-46.5	-40	Yes
10000.200000	49.6	9.1	12.1	-49.1	-46.1	-40	Yes



America

**2.6.12 Radiated Emission Test Results Above 1GHz – Worst Case Band 48 (3550 – 3650 MHz)_QPSK_5 MHz
 BW 1RB 12 offset_High Channel 3647.5 MHz**





Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Peak Margin (dB)	Limit (dBµV/m)
2500.050000	53.3	1000.0	1000.000	103.7	V	186.0	-0.3	1.9	55.2
3661.050000	31.1	1000.0	1000.000	200.5	H	254.0	1.8	41.2	72.2
4000.050000	45.0	1000.0	1000.000	151.2	H	206.0	2.5	10.2	55.2
4500.150000	51.6	1000.0	1000.000	128.7	H	49.0	3.7	3.6	55.2
5000.100000	49.7	1000.0	1000.000	191.5	H	236.0	3.8	5.5	55.2
5999.983333	45.2	1000.0	1000.000	199.5	V	112.0	5.7	10.0	55.2
7000.200000	38.7	1000.0	1000.000	152.2	V	66.0	6.7	16.5	55.2
9999.800000	53.9	1000.0	1000.000	151.2	H	99.0	9.6	1.3	55.2
10943.100000	43.1	1000.0	1000.000	318.2	H	301.0	11.9	12.1	55.2
13999.800000	42.6	1000.0	1000.000	232.4	V	112.0	14.7	12.6	55.2
17176.866667	39.7	1000.0	1000.000	151.6	V	178.0	17.5	15.5	55.2

* This is the fundamental frequency not part of spurious emission evaluation. Data provided for information purpose only.

Measurement for above 5.5GHz was performed with a 5.5GHz High pass filter. No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.

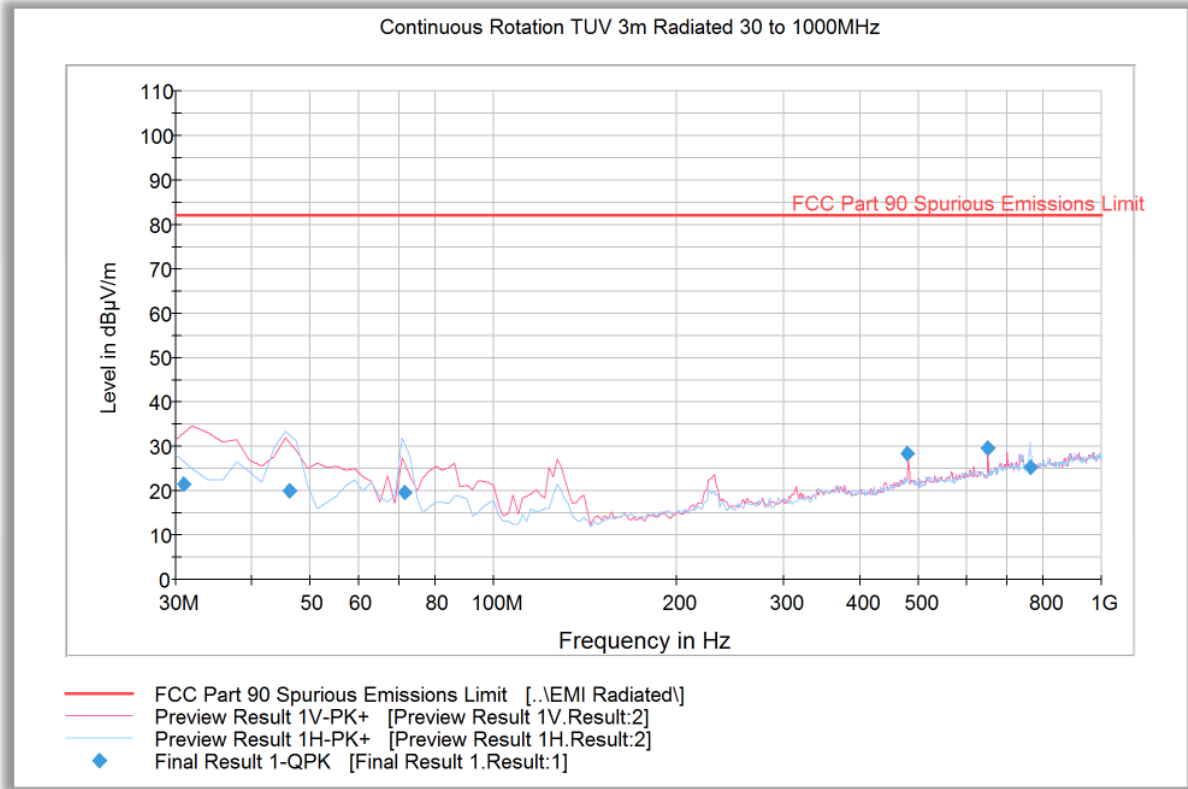
Substitution Data

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
2500.050000	53.3	3.8	9.8	-48.2	-42.2	-40	Yes
4500.150000	51.6	3.8	11.1	-50.0	-42.7	-40	Yes
5000.100000	49.7	5.1	11.0	-51.9	-46.0	-40	Yes
9999.800000	53.9	9.1	12.2	-45.0	-41.9	-40	Yes



America

2.6.13 Radiated Emission Test Results Below 1GHz – Worst Case Band 48 (3650 – 3700 MHz)_QPSK_15 MHz BW 1RB 37 offset_Middle Channel 3675 MHz



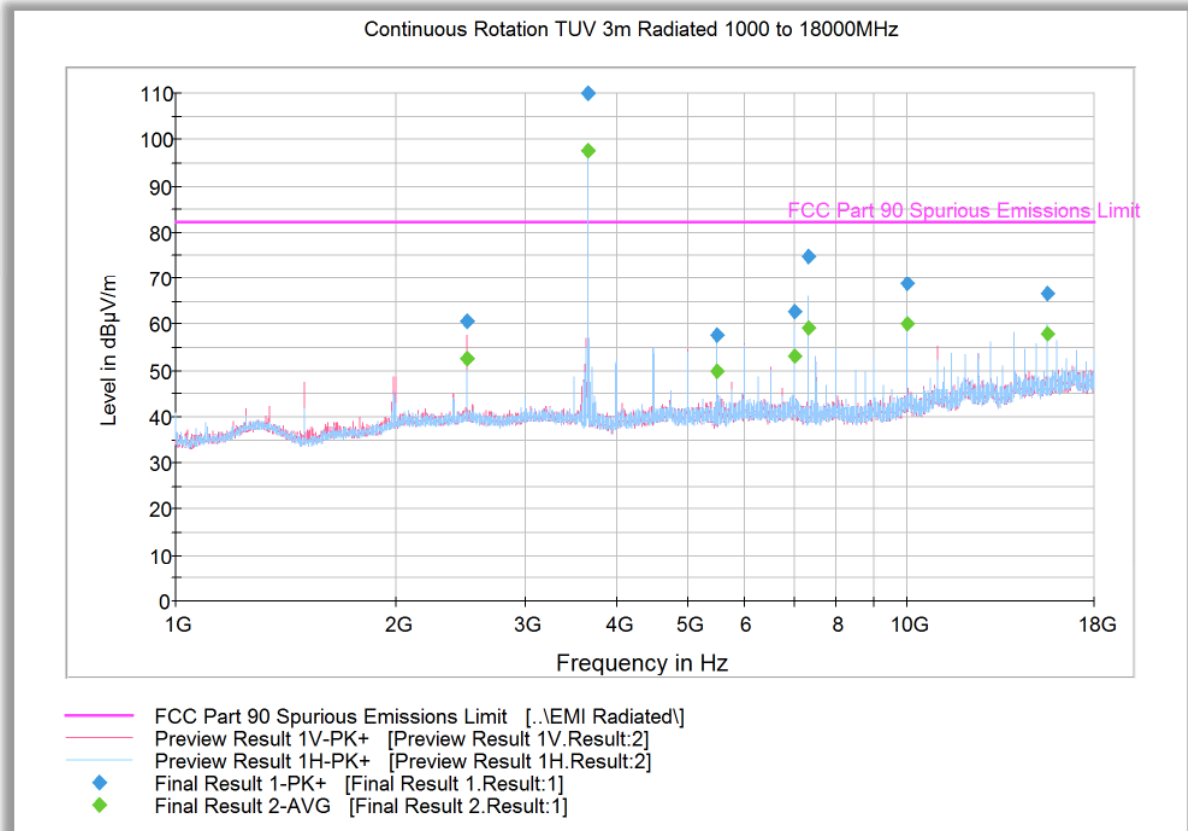
Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.920000	21.6	1000.0	120.000	133.0	V	182.0	-8.2	60.6	82.2
46.151102	20.1	1000.0	120.000	219.0	H	15.0	-13.9	62.1	82.2
71.541643	19.7	1000.0	120.000	300.0	H	352.0	-17.2	62.5	82.2
479.981964	28.4	1000.0	120.000	100.0	V	212.0	-1.9	53.8	82.2
649.980200	29.7	1000.0	120.000	100.0	V	216.0	0.5	52.5	82.2
764.309579	25.3	1000.0	120.000	150.0	H	108.0	2.7	56.9	82.2

Test Notes: Only worst case modulation/bandwidth/channel presented for spurious emissions below 1GHz.



**2.6.14 Radiated Emission Test Results Above 1GHz – Worst Case Band 48 (3650 – 3700 MHz)_QPSK_15 MHz
 BW 1RB 37 offset_Low Channel 3657.5 MHz**



Peak Data

Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Peak Margin (dB)	Limit (dBµV/m)
2500.200000	60.6	1000.0	1000.000	103.7	V	186.0	-0.3	21.6	82.2
3657.866667	110.0	1000.0	1000.000	152.2	H	282.0	1.8	* Fundamental Freq.	
5500.100000	57.8	1000.0	1000.000	130.7	H	-7.0	5.0	24.4	82.2
7000.066667	62.7	1000.0	1000.000	120.7	H	45.0	6.7	19.5	82.2
7315.300000	74.7	1000.0	1000.000	103.7	H	240.0	6.8	7.5	82.2
10000.000000	68.8	1000.0	1000.000	200.5	H	20.0	9.6	13.4	82.2
15499.833333	66.7	1000.0	1000.000	182.6	H	14.0	16.1	15.5	82.2

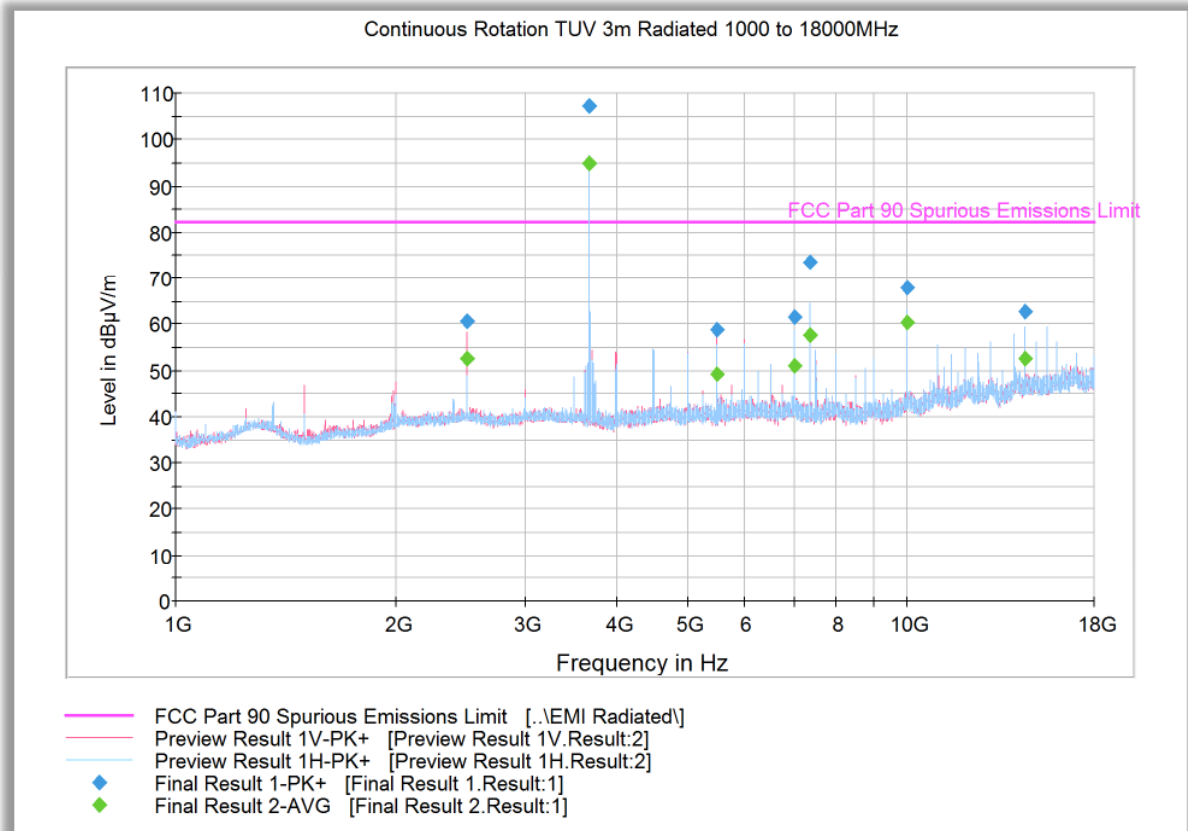
Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Peak Margin (dB)	Limit (dBµV/m)
2500.200000	52.5	1000.0	1000.000	103.7	V	186.0	-0.3	29.7	82.2
3657.866667	97.6	1000.0	1000.000	152.2	H	282.0	1.8	* Fundamental Freq.	
5500.100000	49.8	1000.0	1000.000	130.7	H	-7.0	5.0	32.4	82.2
7000.066667	53.1	1000.0	1000.000	120.7	H	45.0	6.7	29.1	82.2
7315.300000	59.2	1000.0	1000.000	103.7	H	240.0	6.8	23.0	82.2
10000.000000	60.0	1000.0	1000.000	200.5	H	20.0	9.6	22.2	82.2
15499.833333	58.1	1000.0	1000.000	182.6	H	14.0	16.1	24.1	82.2

* This is the fundamental frequency not part of spurious emission evaluation. Data provided for information purpose only. No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.



2.6.15 Radiated Emission Test Results Above 1GHz – Worst Case Band 48 (3650 – 3700 MHz)_QPSK_15 MHz BW 1RB 37 offset_Middle Channel 3675 MHz



Peak Data

Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Peak Margin (dB)	Limit (dBµV/m)
2500.200000	60.8	1000.0	1000.000	103.7	V	188.0	-0.3	21.4	82.2
3675.066667	107.3	1000.0	1000.000	120.7	V	272.0	1.9	* Fundamental Freq.	
5500.100000	59.0	1000.0	1000.000	169.6	V	198.0	5.0	23.2	82.2
7000.066667	61.7	1000.0	1000.000	200.5	V	232.0	6.7	20.5	82.2
7350.433333	73.5	1000.0	1000.000	152.2	H	238.0	6.9	8.7	82.2
10000.000000	67.9	1000.0	1000.000	290.2	H	213.0	9.6	14.3	82.2
14500.066667	62.9	1000.0	1000.000	195.5	H	14.0	15.4	19.3	82.2

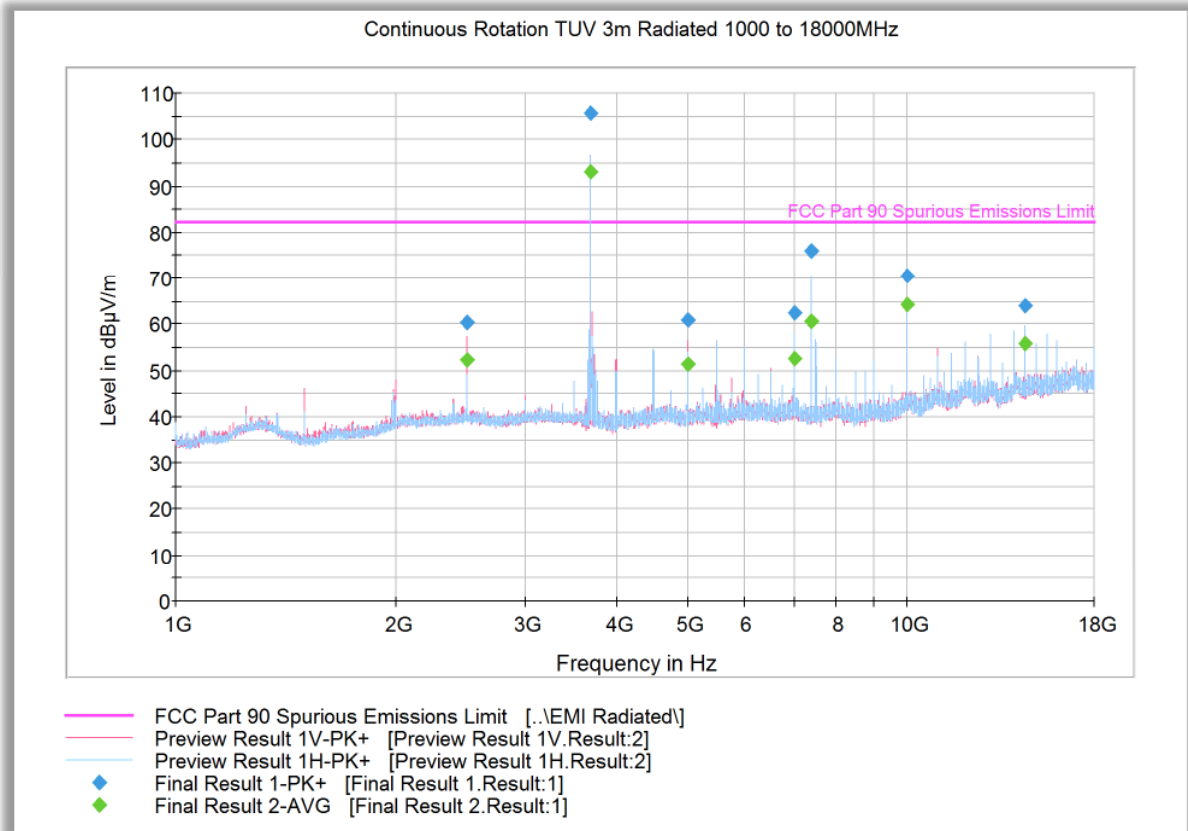
Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Peak Margin (dB)	Limit (dBµV/m)
2500.200000	52.6	1000.0	1000.000	103.7	V	188.0	-0.3	29.6	82.2
3675.066667	95.0	1000.0	1000.000	120.7	V	272.0	1.9	* Fundamental Freq.	
5500.100000	49.2	1000.0	1000.000	169.6	V	198.0	5.0	33.0	82.2
7000.066667	51.0	1000.0	1000.000	200.5	V	232.0	6.7	31.2	82.2
7350.433333	57.8	1000.0	1000.000	152.2	H	238.0	6.9	24.4	82.2
10000.000000	60.4	1000.0	1000.000	290.2	H	213.0	9.6	21.8	82.2
14500.066667	52.7	1000.0	1000.000	195.5	H	14.0	15.4	29.5	82.2

* This is the fundamental frequency not part of spurious emission evaluation. Data provided for information purpose only. No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.



2.6.16 Radiated Emission Test Results Above 1GHz – Worst Case Band 48 (3650 – 3700 MHz)_QPSK_15 MHz BW 1RB 37 offset_Middle Channel 3692.5 MHz



Peak Data

Frequency (MHz)	Max Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Peak Margin (dB)	Limit (dBµV/m)
2499.800000	60.4	1000.0	1000.000	103.7	V	185.0	-0.3	21.8	82.2
3692.633333	105.7	1000.0	1000.000	124.7	H	234.0	2.0	* Fundamental Freq.	
4999.933333	60.9	1000.0	1000.000	307.2	V	174.0	3.8	21.3	82.2
7000.100000	62.4	1000.0	1000.000	196.5	H	26.0	6.7	19.8	82.2
7385.400000	76.2	1000.0	1000.000	124.7	H	240.0	7.2	6.0	82.2
10000.000000	70.5	1000.0	1000.000	152.2	H	202.0	9.6	11.7	82.2
14500.066667	64.1	1000.0	1000.000	205.5	H	19.0	15.4	18.1	82.2

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Peak Margin (dB)	Limit (dBµV/m)
2499.800000	52.2	1000.0	1000.000	103.7	V	185.0	-0.3	30.0	82.2
3692.633333	93.2	1000.0	1000.000	124.7	H	234.0	2.0	* Fundamental Freq.	
4999.933333	51.5	1000.0	1000.000	307.2	V	174.0	3.8	30.7	82.2
7000.100000	52.7	1000.0	1000.000	196.5	H	26.0	6.7	29.5	82.2
7385.400000	60.6	1000.0	1000.000	124.7	H	240.0	7.2	21.6	82.2
10000.000000	64.2	1000.0	1000.000	152.2	H	202.0	9.6	18.0	82.2
14500.066667	55.9	1000.0	1000.000	205.5	H	19.0	15.4	26.3	82.2

* This is the fundamental frequency not part of spurious emission evaluation. Data provided for information purpose only. No significant emissions observed above 18GHz. Measurements above 18GHz are noise floor figures.



2.7 FREQUENCY STABILITY

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1055
FCC 47 CFR Part 90, Clause 90.213
RSS-192, Clause 5.3
RSS-197, Clause 5.3

2.7.2 Standard Applicable

RSS-192, Clause 5.3
The carrier frequency shall not depart from the reference frequency in excess of ± 20 ppm.

RSS-197, Clause 5.3

(a) The frequency offset shall be measured according to the procedure described in RSS-Gen and recorded;

(b) Using a resolution bandwidth of 1% of the occupied bandwidth, a reference point at the unwanted emission level which complies with the attenuation of $43 + 10 \log_{10} p$ (watts) on the emission mask of the lowest and highest channel shall be selected, and the frequency at these points shall be recorded as f_L and f_H respectively.

The applicant shall ensure frequency stability by showing that f_L minus the frequency offset and f_H plus the frequency offset shall be within 3650 – 3700 MHz.

2.7.3 Equipment Under Test and Modification State

Serial No: 990013090027496 (IMEI) / Test Configuration A

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

May 22, 2019 / XYZ

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	24.5 °C
Relative Humidity	42.3 %
ATM Pressure	98.3 kPa



2.7.7 Additional Observations

- This is a conducted test. The EUT was operated at 3.7 VDC nominal voltage and was placed in the temperature chamber for this evaluation. The EUT was controlled by a CMW500 and utilizing a spectrum analyser 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.
- The maximum frequency deviation for LTE Band 48 was verified against the frequency band edges using reference points F_L and F_H at the unwanted emission level which complies with the attenuation of $43 + 10 \log_{10} p$ (watts) on the emission mask of the lowest and highest channel.

2.7.8 Test Results

LTE Band 48 (3550-3650 MHz) – QPSK 5 MHz BW-Middle Channel 3600 MHz				
Voltage (VDC)	Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
3.7	-30	-20.78	-0.00577	20
	-20	-19.04	-0.00529	20
	-10	-19.90	-0.00553	20
	0	-20.55	-0.00571	20
	+10	20.80	0.00578	20
	+20	18.53	0.00515	20
	+30	-29.94	-0.00832	20
	+40	-20.64	-0.00573	20
3.3	20	-19.23	-0.00534	20
		4.3	18.05	-0.00501

LTE Band 48 (3550-3650 MHz) – QPSK 5 MHz BW						
Voltage (VDC)	Temperature (°C)	F_L (MHz)	$F_L - \text{Freq Error}$ (MHz)	F_H (MHz)	$F_L + \text{Freq Error}$ (MHz)	Compliance
3.7	-30	3550.0805	3550.08048	3649.9375	3649.93752	Yes
	+20	3550.1075	3550.10748	3649.9255	3649.92552	Yes
	+50	3550.1165	3550.11648	3649.9345	3649.93452	Yes
3.3	20	3550.0685	3550.06848	3649.9015	3649.90152	Yes
4.3		3550.1015	3550.10148	3649.8955	3649.89552	Yes



LTE Band 48 (3650-3700 MHz) – QPSK 5 MHz BW-Middle Channel 3675 MHz			
Voltage (VDC)	Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
3.7	-30	-22.29	-0.00607
	-20	-23.93	-0.00651
	-10	-23.18	-0.00631
	0	-25.79	-0.00702
	+10	-24.66	-0.00671
	+20	-23.20	-0.00631
	+30	-22.91	-0.00623
	+40	23.58	0.00642
3.3	20	-21.04	-0.00573
4.3		22.01	0.00599

LTE Band 48 (3650-3700 MHz) – QPSK 5 MHz BW						
Voltage (VDC)	Temperature (°C)	F _L (MHz)	F _L – Freq Error (MHz)	F _H (MHz)	F _L + Freq Error (MHz)	Compliance
3.7	-30	3650.1145	3650.11448	3699.8835	3699.88352	Yes
	+20	3650.0895	3650.08948	3699.9375	3699.93752	Yes
	+50	3650.0965	3650.09648	3699.9075	3699.90752	Yes
3.3	20	3650.1015	3650.10148	3699.9405	3699.94052	Yes
4.3		3650.0925	3650.09248	3699.9225	3699.92252	Yes

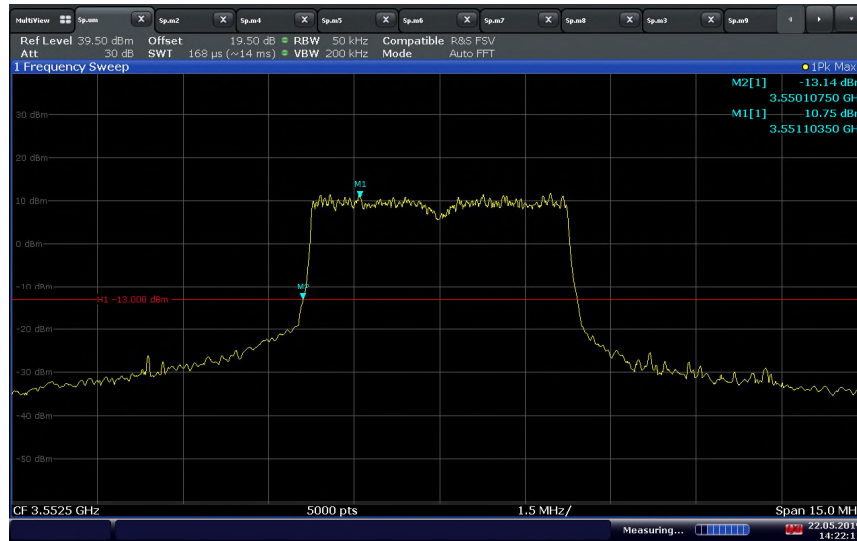
2.7.9 Sample Test Results

CMW 500 V 3.7.120 - LTE Measurement - V3.7.60 - TX Measurement										LTE
Multi Evaluation PRACH SRS										Multi Evaluation
TDD Freq.: 3600.0 MHz Ref. Level: 43.20 dBm BW: 5.0 MHz CP: Normal Meas Subfr./Slot: 2 / All										RUN
TX Measurement										RF Settings
Detected Allocation	NoRB:	25OffsetRB:		0						Trigger
		Current	Average	Extreme	StdDev					Display
EVM RMS [%] /h		1.70	2.22	1.99	2.40	2.85	3.05	0.28	0.23	
EVM Peak [%] /h		14.18	26.09	33.79	30.60	71.89	38.31	22.09	5.08	
EVM DMRS [%] /h		1.28	2.36	1.33	2.12	2.00	2.70	0.11	0.24	
MErr RMS [%] /h		1.35	1.80	1.68	1.97	2.52	2.55	0.32	0.20	
MErr Peak [%] /h		-14.01	-23.27	33.62	29.12	-71.88	-38.31	22.22	6.32	
MErr DMRS [%] /h		0.88	1.68	0.92	1.50	1.41	1.96	0.07	0.16	
PhErr RMS [°] /h		0.59	0.77	0.61	0.81	0.84	1.04	0.04	0.07	
PhErr Peak [°] /h		3.21	9.66	3.07	11.00	-7.23	16.32	0.56	2.62	
PhErr DMRS [°] /h		0.53	0.95	0.55	0.86	1.02	1.17	0.06	0.11	
IQ Offset [dBc]		-48.14		-48.47		-46.11		0.70		
IQ Gain Imbalance [dB]		-0.02		-0.01		-0.03		0.01		
IQ Quadrature Error [°]		-0.14		-0.11		-0.19		0.03		
Freq Error [Hz]		-6.49		-6.46		18.53		6.24		
Timing Error [Ts]		2.42		2.52		5.01		0.31		
OBW [MHz]		4.47		4.45		4.47		0.01		
		Current	Average	Min	Max	StdDev				Signaling Parameter
TX Power [dBm]		21.49	21.48	21.37	21.54	0.03				
Peak Power [dBm]		27.41	27.21	26.33	27.65	0.18				
Statistic Count: 20 / 20 Out of Tolerance: 0.00 % Detected Modulation: QPSK Detected Channel Type: PUSCH View Filter Throughput: 100.0 %										LTE Signaling
PS: Connection Established RRC State: Connected										ON
Repetition ...	Stop Condition ...	Statistic Count ...	Channel Bandwidth ...	Measurement Subframes ...	Assign Views	Config ...				

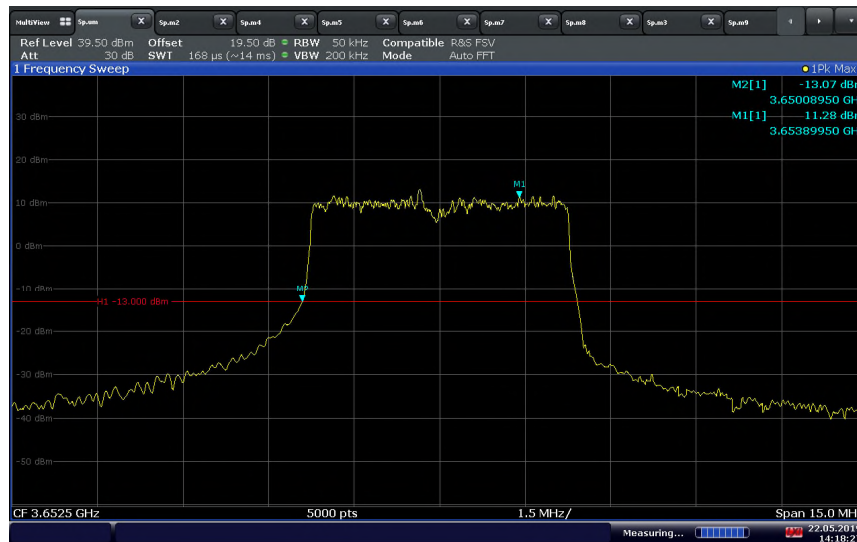
LTE Band 48 (3550-3650 MHz) – QPSK 5 MHz BW-Middle Channel 3600 MHz at Normal Voltage 20°C

CMW 500 V 3.7.120 - LTE Measurement - V3.7.60 - TX Measurement										LTE
Multi Evaluation PRACH SRS										Multi Evaluation
TDD Freq.: 3675.0 MHz Ref. Level: 43.20 dBm BW: 5.0 MHz CP: Normal Meas Subfr./Slot: 2 / All										RUN
TX Measurement										RF Settings
Detected Allocation	NoRB:	25OffsetRB:		0						Trigger
		Current	Average	Extreme	StdDev					Display
EVM RMS [%] /h		1.99	2.10	2.33	2.24	3.58	2.69	0.45	0.17	
EVM Peak [%] /h		16.81	20.44	44.55	26.12	100.33	32.76	29.94	3.39	
EVM DMRS [%] /h		1.87	1.76	1.50	1.84	2.11	2.70	0.25	0.42	
MErr RMS [%] /h		1.63	1.78	1.87	1.83	2.78	2.32	0.29	0.12	
MErr Peak [%] /h		-16.73	-19.19	37.47	24.93	-90.83	-32.31	23.01	3.67	
MErr DMRS [%] /h		1.34	1.23	1.02	1.29	1.47	1.96	0.20	0.33	
PhErr RMS [°] /h		0.65	0.65	0.97	0.76	2.20	0.97	0.41	0.09	
PhErr Peak [°] /h		5.76	-6.50	19.35	9.26	-83.54	15.97	21.09	2.92	
PhErr DMRS [°] /h		0.75	0.72	0.62	0.75	1.07	1.15	0.11	0.16	
IQ Offset [dBc]		-48.67		-48.74		-45.76		0.75		
IQ Gain Imbalance [dB]		-0.03		-0.02		-0.04		0.01		
IQ Quadrature Error [°]		-0.03		-0.04		-0.13		0.02		
Freq Error [Hz]		8.02		4.98		-23.20		3.03		
Timing Error [Ts]		1.74		2.05		5.04		0.63		
OBW [MHz]		4.47		4.46		4.47		0.01		
		Current	Average	Min	Max	StdDev				Signaling Parameter
TX Power [dBm]		21.52	21.53	21.48	21.65	0.01				
Peak Power [dBm]		27.36	27.37	26.49	27.77	0.17				
Statistic Count: 20 / 20 Out of Tolerance: 0.00 % Detected Modulation: QPSK Detected Channel Type: PUSCH View Filter Throughput: 100.0 %										LTE Signaling
PS: Connection Established RRC State: Connected										ON
Repetition ...	Stop Condition ...	Statistic Count ...	Channel Bandwidth ...	Measurement Subframes ...	Assign Views	Config ...				

LTE Band 48 (3650-3700 MHz) – QPSK 5 MHz BW-Middle Channel 3675 MHz at Normal Voltage 20°C



Band 48 (3550-3650 MHz) – QPSK 5 MHz BW Low Channel F_L at Normal Voltage 20°C



LTE Band 48 (3650-3700 MHz) – QPSK 5 MHz BW Low Channel F_L at Normal Voltage 20°C



2.8 CONDUCTED EMISSIONS

2.8.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.207(a)
 RSS-Gen, Section 8.8

2.8.2 Standard Applicable

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

**Decreases with the logarithm of the frequency.*

2.8.3 Equipment Under Test and Modification State

Serial No: 990013090027496 (IMEI) / Test Configuration B

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

April 26, 2019/XYZ

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	23.1 °C
Relative Humidity	53.6 %
ATM Pressure	99.1 kPa

2.8.7 Additional Observations

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. See Section 2.8.8 for sample computation.



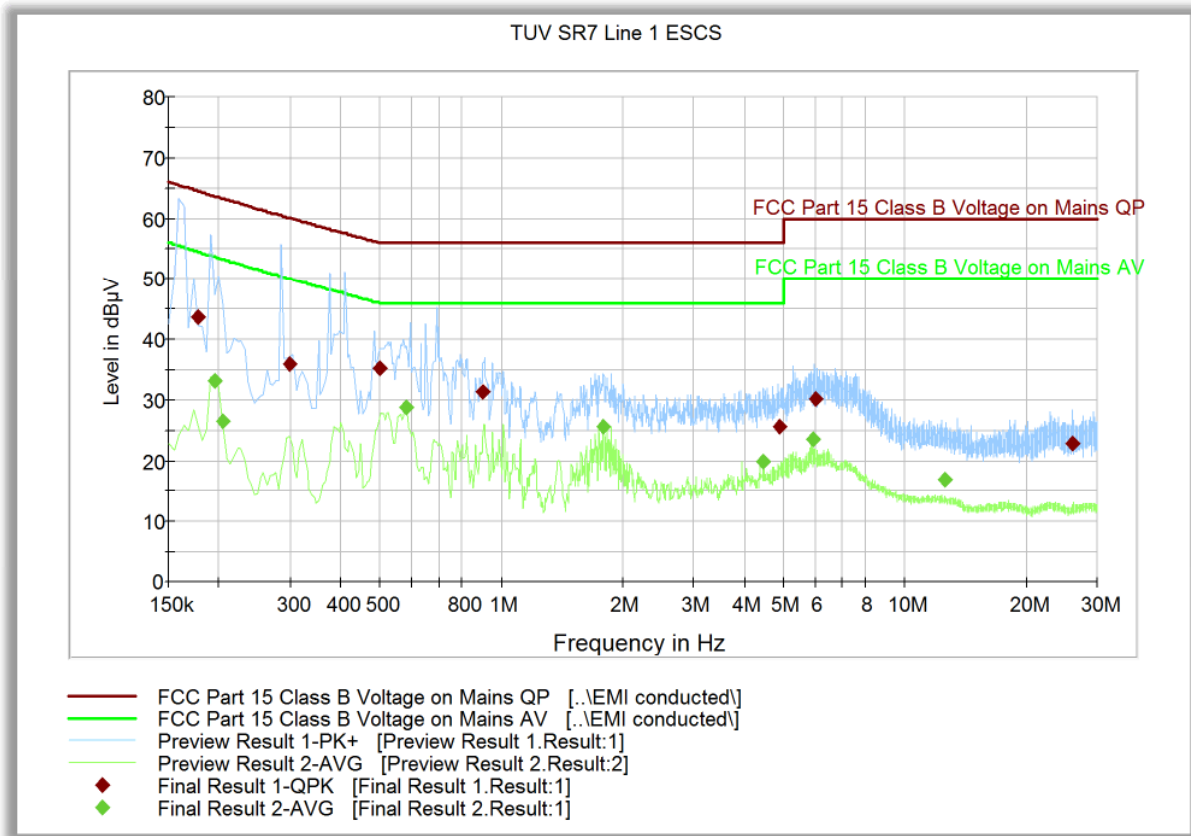
2.8.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (db μ V) @ 150kHz			5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9	20.7
	Asset# 1177 (cable)	0.15	
	Asset# 1176 (cable)	0.35	
	Asset# 7568 (LISN)	0.30	
Reported QuasiPeak Final Measurement (db μ V) @ 150kHz			26.2

2.8.9 Test Results

Compliant. See attached plots and tables.

2.8.10 M1000 120VAC 60Hz (Line 1)



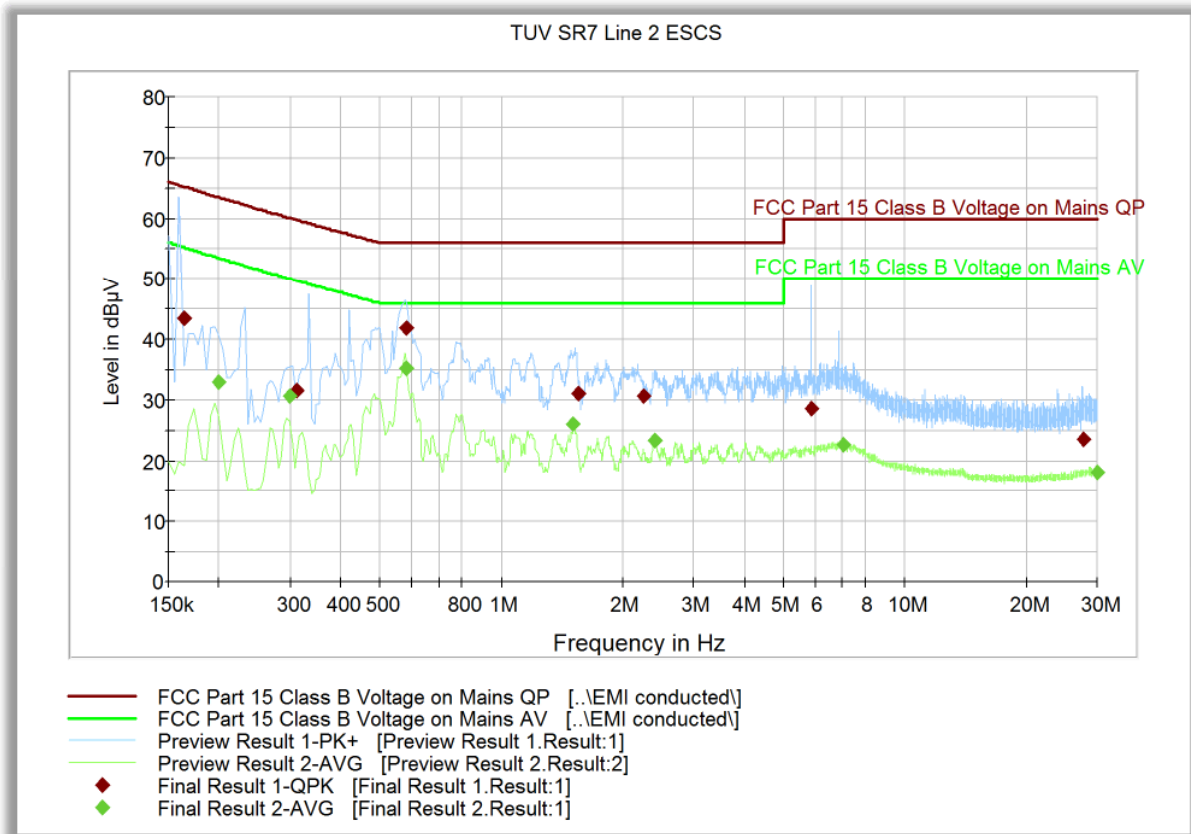
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.177000	43.6	1000.0	9.000	Off	L1	20.2	20.9	64.5
0.298500	35.8	1000.0	9.000	Off	L1	20.2	24.3	60.1
0.501000	35.2	1000.0	9.000	Off	L1	20.1	20.8	56.0
0.901500	31.4	1000.0	9.000	Off	L1	20.2	24.6	56.0
4.902000	25.5	1000.0	9.000	Off	L1	20.5	30.5	56.0
5.991000	30.1	1000.0	9.000	Off	L1	20.4	29.9	60.0
25.953000	23.0	1000.0	9.000	Off	N	20.7	37.0	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.195000	33.1	1000.0	9.000	Off	L1	20.2	20.5	53.7
0.204000	26.4	1000.0	9.000	Off	L1	20.2	26.8	53.3
0.582000	28.8	1000.0	9.000	Off	L1	20.2	17.2	46.0
1.783500	25.5	1000.0	9.000	Off	L1	20.1	20.5	46.0
4.465500	19.8	1000.0	9.000	Off	L1	20.4	26.2	46.0
5.914500	23.5	1000.0	9.000	Off	L1	20.4	26.5	50.0
12.529500	16.9	1000.0	9.000	Off	N	20.7	33.1	60.0

2.8.11 M1000 120VAC 60Hz (Line 2)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.163500	43.4	1000.0	9.000	Off	N	20.1	21.9	65.2
0.312000	31.6	1000.0	9.000	Off	N	20.1	28.1	59.7
0.582000	41.8	1000.0	9.000	Off	N	20.1	14.2	56.0
1.554000	31.2	1000.0	9.000	Off	N	20.1	24.8	56.0
2.251500	30.6	1000.0	9.000	Off	N	20.4	25.4	56.0
5.887500	28.6	1000.0	9.000	Off	N	20.4	31.4	60.0
27.672000	23.6	1000.0	9.000	Off	N	20.7	36.4	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.163500	43.4	1000.0	9.000	Off	N	20.1	21.9	65.2
0.312000	31.6	1000.0	9.000	Off	N	20.1	28.1	59.7
0.582000	41.8	1000.0	9.000	Off	N	20.1	14.2	56.0
1.554000	31.2	1000.0	9.000	Off	N	20.1	24.8	56.0
2.251500	30.6	1000.0	9.000	Off	N	20.4	25.4	56.0
5.887500	28.6	1000.0	9.000	Off	N	20.4	31.4	60.0
27.672000	23.6	1000.0	9.000	Off	N	20.7	36.4	60.0



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)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Antenna Conducted Port Setup						
7662	P-Series Power Meter	N1911A	MY45100951	Agilent	06/15/18	06/15/19
7661	50MHz-18GHz Wideband Power Sensor	N1921A	MY45241383	Agilent	06/15/18	06/15/19
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/19/17	09/19/19
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	01/07/19	01/07/20
-	Wideband Radio Communication Tester	CMW 500	158164	Rhode & Schwarz	11/16/18	11/16/19
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 7608 and 7582	
-	10dB Attenuator	VAT-10W2+2W	N/A	MCL	Verified by 7608 and 7582	
AC Conducted Emissions Test Setup						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	09/19/18	09/19/19
7567	LISN	FCC-LISN-50-25-2	120304	Fischer Custom Comm.	12/14/17	12/14/19
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	Verified by 7608 and 7582	
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	Verified by 7608 and 7582	
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	01/07/19	01/07/20
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/19/17	09/19/19
-	Wideband Radio Communication Tester	CMW 500	158164	Rhode & Schwarz	11/16/18	11/16/19
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	09/19/17	09/19/19
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	11/20/17	11/20/19
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	06/16/18	06/16/20
1016	Pre-amplifier	PAM-0202	187	A.H. Systems, Inc.	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	10/15/18	10/15/19
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	07/13/18	07/13/19
8628	Pre-amplifier	QLI-01182835-JO	8986002	Quinstar	03/07/19	03/07/20
-	Wideband Radio Communication Tester	CMW 500	158164	Rhode & Schwarz	11/16/18	11/16/19



Miscellaneous						
6708	Multimeter	34401A	US36086974	Hewlett Packard	07/18/18	07/18/19
7579	Temperature Chamber	115	151617	TestQuity	08/24/18	08/24/19
7554	Barometer/Temperature /Humidity Transmitter	iBTHX-W	0400706	Omega	05/25/18	05/25/19
	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 Measurements (Below 1GHz)

	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-polarisation	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)

	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-polarisation	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	3.25 dB	Triangular	2.449	1.33	1.76
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	2.85 dB	
Expanded uncertainty				Normal, k=2	5.70 dB	

3.2.4 Conducted Measurements

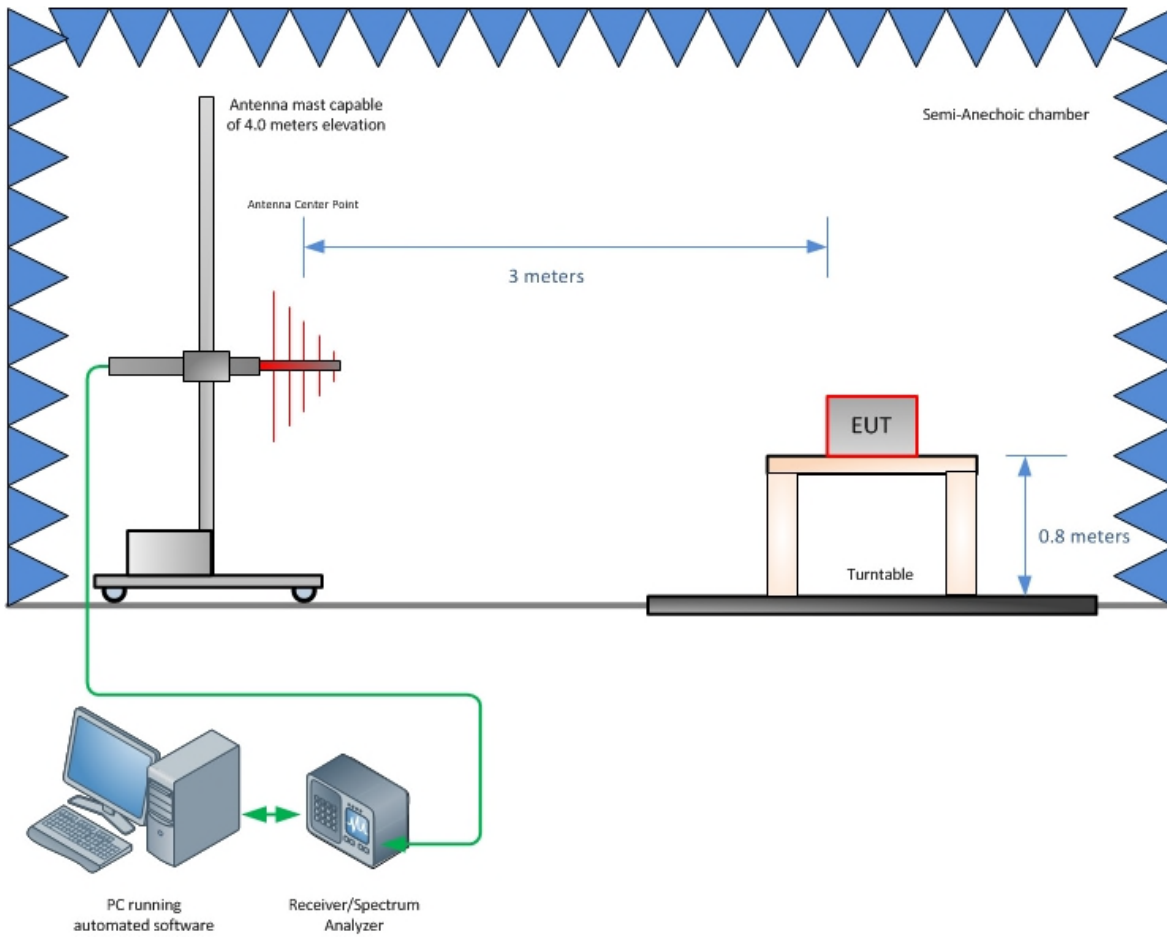
	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	LISN-receiver attenuation	0.10 dB	Normal, k=2	2.000	0.05	0.00
3	LISN voltage division factor	0.30 dB	Normal, k=2	2.000	0.15	0.02
4	Receiver sinewave accuracy	0.36 dB	Normal, k=2	2.000	0.18	0.03
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	0.00 dB	Rectangular	1.732	0.00	0.00
8	AMN VDF frequency interpolation	0.10 dB	Rectangular	1.732	0.06	0.00
9	Mismatch	0.07 dB	U-shaped	1.414	0.05	0.00
10	LISN impedance	2.65 dB	Triangular	2.449	1.08	1.17
11	Effect of mains disturbance	0.00 dB			0.00	0.00
12	Effect of the environment					
Combined standard uncertainty				Normal	1.66 dB	
Expanded uncertainty				Normal, k=2	3.31 dB	



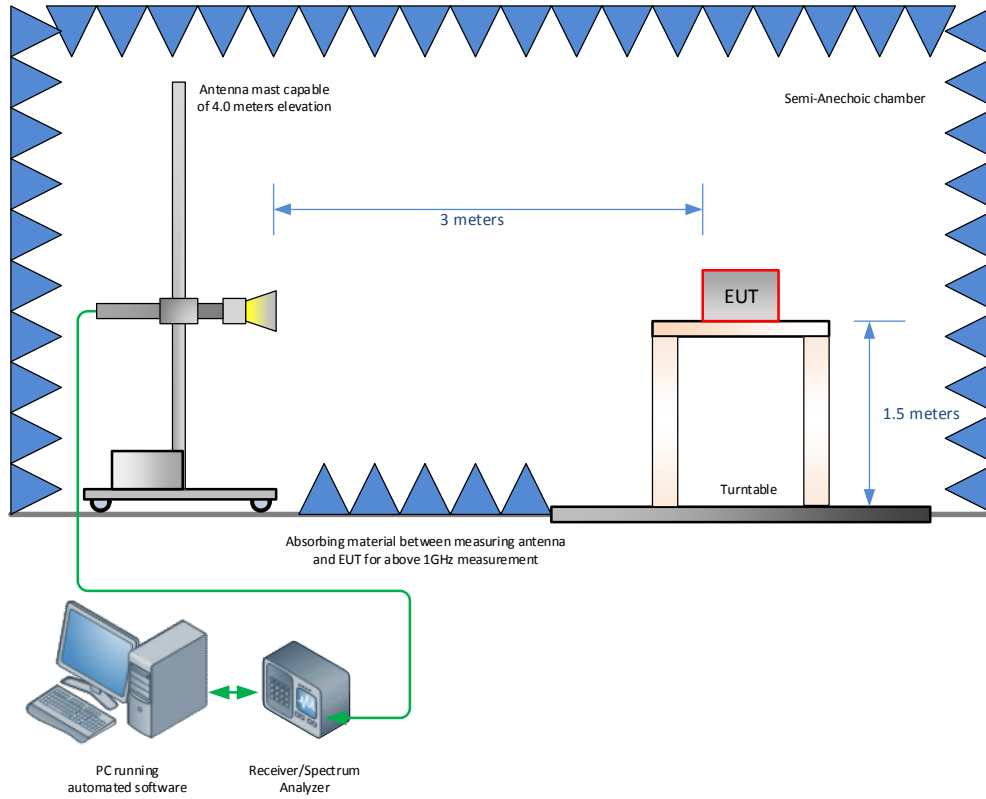
SECTION 4

DIAGRAM OF TEST SETUP

4.1 TEST SETUP DIAGRAM



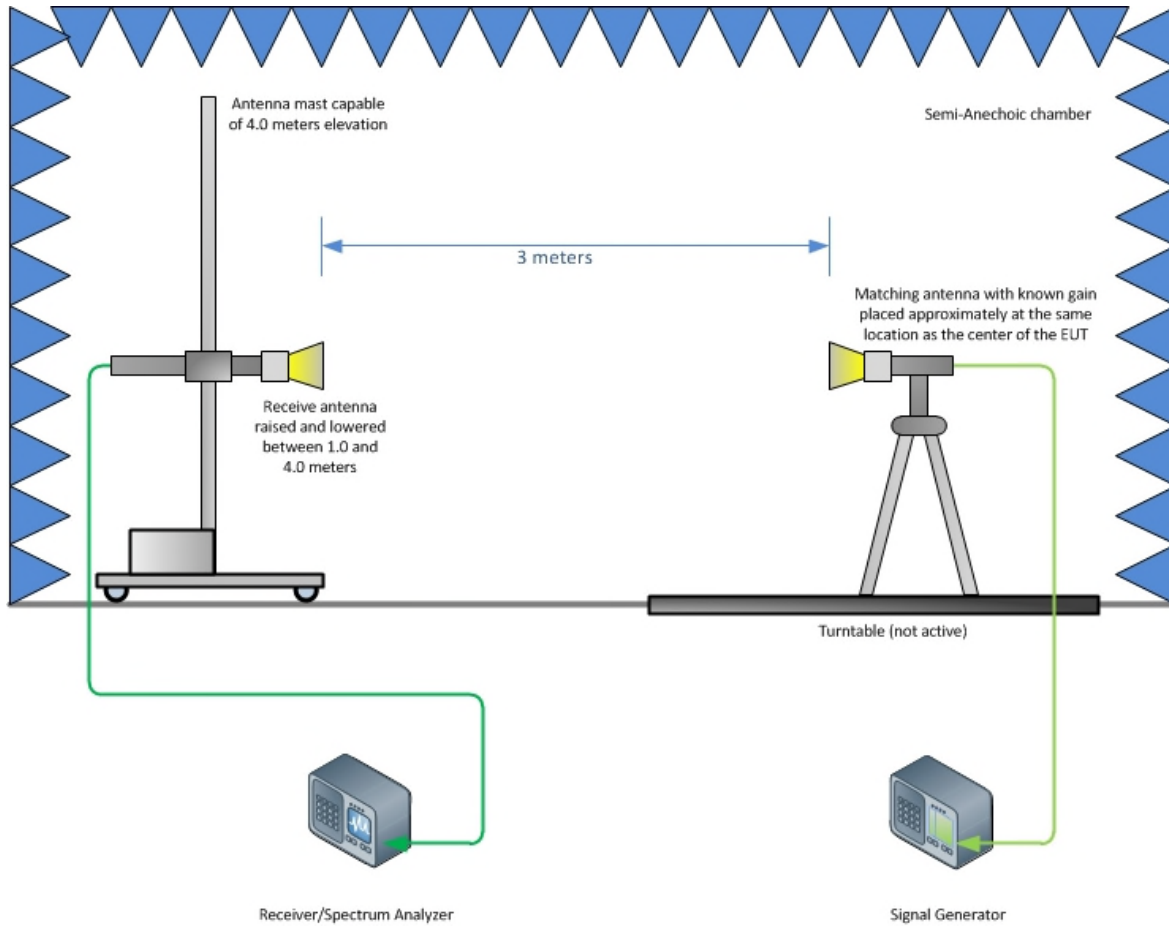
Radiated Emission Test Setup (Below 1GHz)



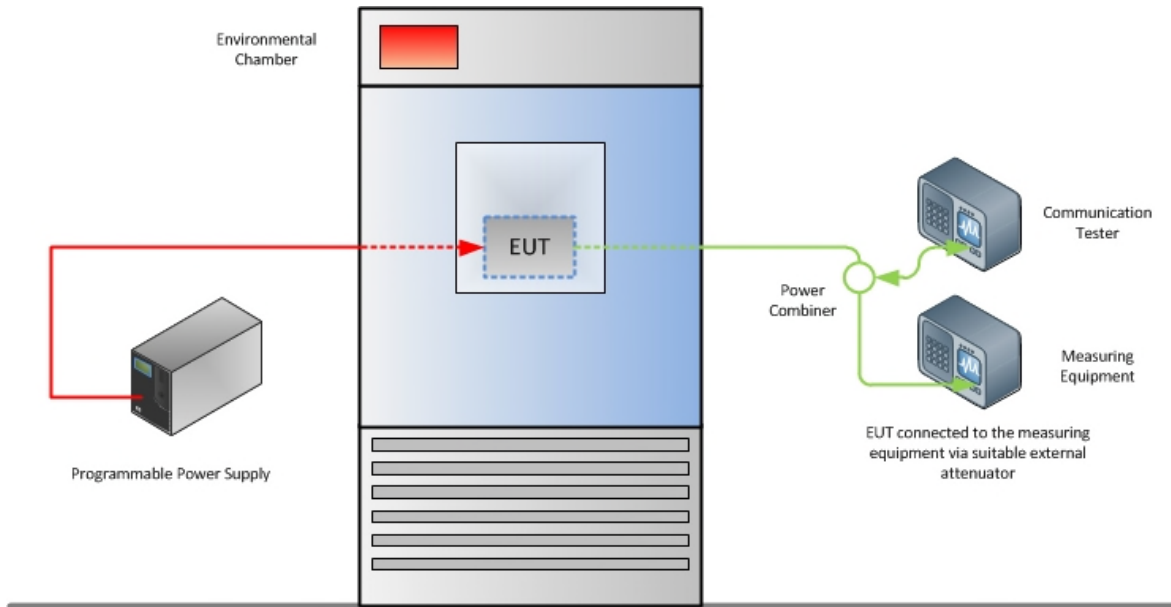
Radiated Emission Test Setup (Above 1GHz)



America



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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