2.7 FIELD STRENGTH OF SPURIOUS RADIATION

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 90, Clause 90.219(e)
FCC 47 CFR Part 90, Clause 90.543(e)(1)(3)(f)
RSS-140 issue 1, Clause 4.4
KDB935210 D05, Clause 4.9

2.7.2 Standard Applicable

FCC 47 CFR Part 90, Clause 90.219(e):
(3) Spurious emissions from a signal booter must not exceed -13 dBm within any 100 kHz measurement bandwidth.

FCC 47 CFR Part 90, Clause 90.543:
(e) For operations in the 758–768 MHz and the 788–798 MHz bands, 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:
(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(3) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(f) For operations in the 758–775 MHz and 788–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

RSS-140:
4.4 Transmitter unwanted emissions limits
The power of any unwanted emission outside the bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitter output power P in dBW as follows, where p is the transmitter output power in watts:
a. For any frequency between 769-775 MHz and 799-806 MHz:
i 76 + 10 log (p), dB in a 6.25 kHz band for fixed and base station equipment
ii 65 + 10 log (p), dB in a 6.25 kHz band for mobile and portable/hand-held equipment

b For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz: 43 + 10 log (p), dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

In addition, the equivalent isotropically radiated power (e.i.r.p.) of all emissions, including harmonics in the band 1559-1610 MHz, shall not exceed −70 dBW/MHz for wideband emissions, and −80 dBW/kHz for discrete emissions of less than 700 Hz bandwidth.

2.7.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration C and D

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

October 09, 2020 / 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	23.8°C
Relative Humidity	41.4%
ATM Pressure	98.7kPa

2.7.7 Additional Observations

- This is a radiated test using the Direct Radiated Field Strength method of C63.26 2015.
- This is cabinet spurious emissions testing. Main antenna port was terminated during the test. Fundamental frequency measurement will be ignored for this test.
- Only the worst case configuration presented in this test report.
- 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.

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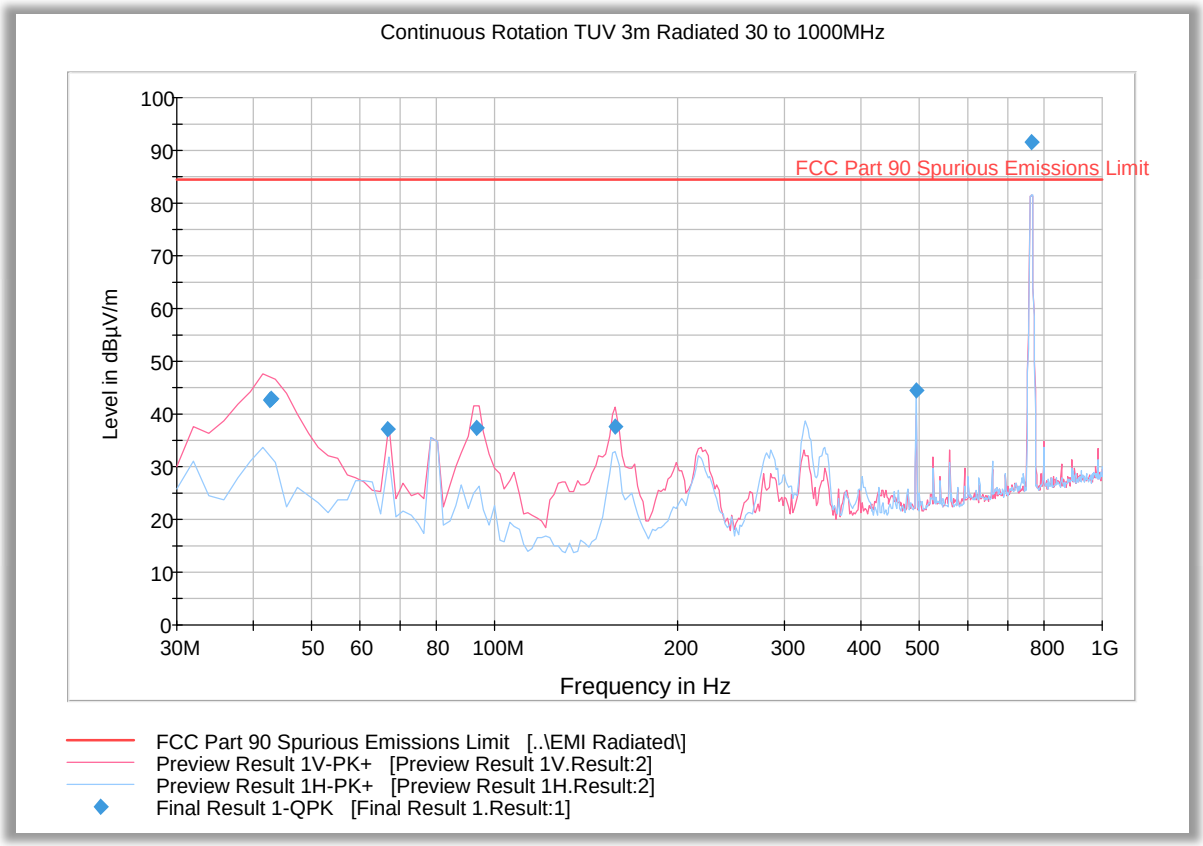
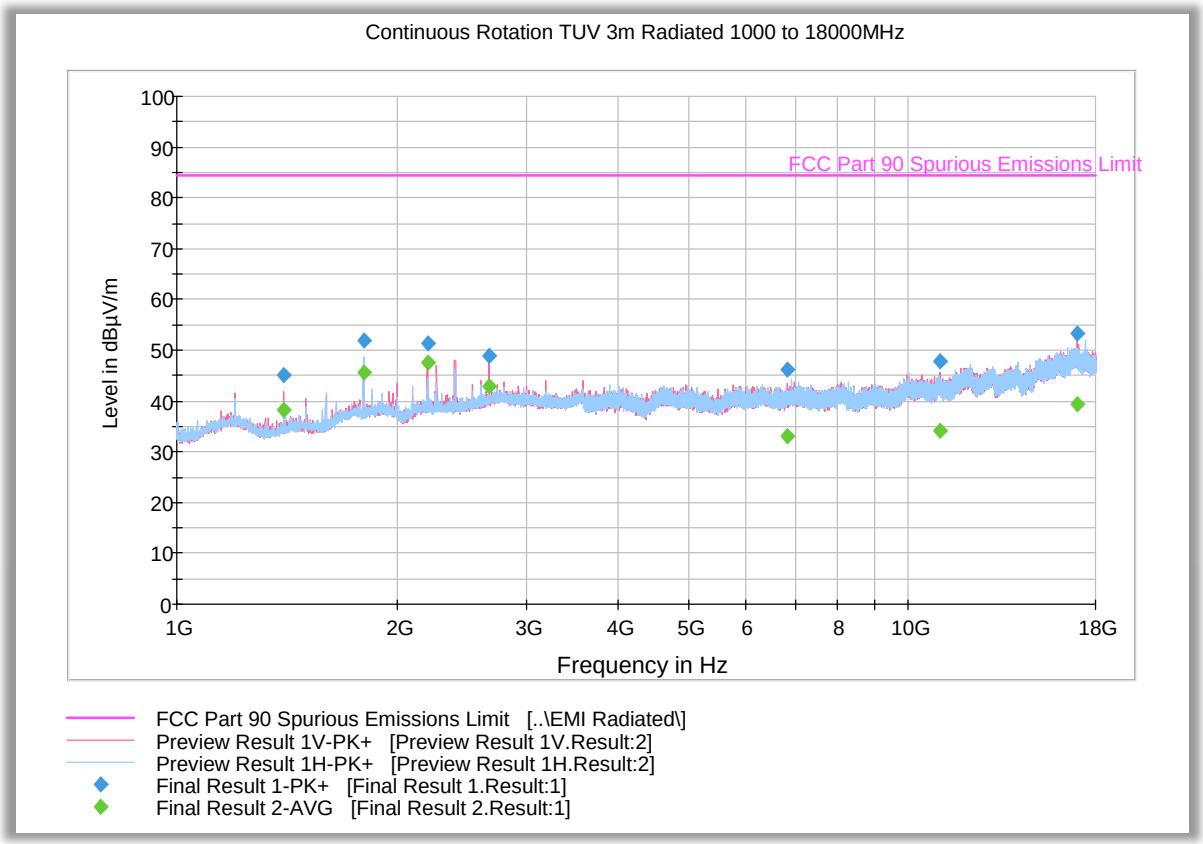
2.7.9 Test Results Below 1GHz (LTE Band 14 Downlink Worst Case Configuration) - 10MHz Bandwidth Middle Channel



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)
42.647214	42.5	1000.0	120.000	100.0	V	148.0	-14.5	41.9	84.4
42.783327	42.8	1000.0	120.000	100.0	V	159.0	-14.5	41.6	84.4
66.533868	37.2	1000.0	120.000	138.0	V	71.0	-18.1	47.2	84.4
93.308297	37.3	1000.0	120.000	100.0	V	227.0	-14.6	47.1	84.4
157.776593	37.5	1000.0	120.000	100.0	V	54.0	-13.3	46.9	84.4
494.989178	44.4	1000.0	120.000	134.0	H	334.0	-2.6	40.0	84.4
763.253467	91.5	1000.0	120.000	250.0	H	136.0	1.9	Fundamental Carrier	

2.7.10 Test Results Above 1GHz (LTE Band 14 Downlink Worst Case Configuration) - 10MHz Bandwidth Middle Channel



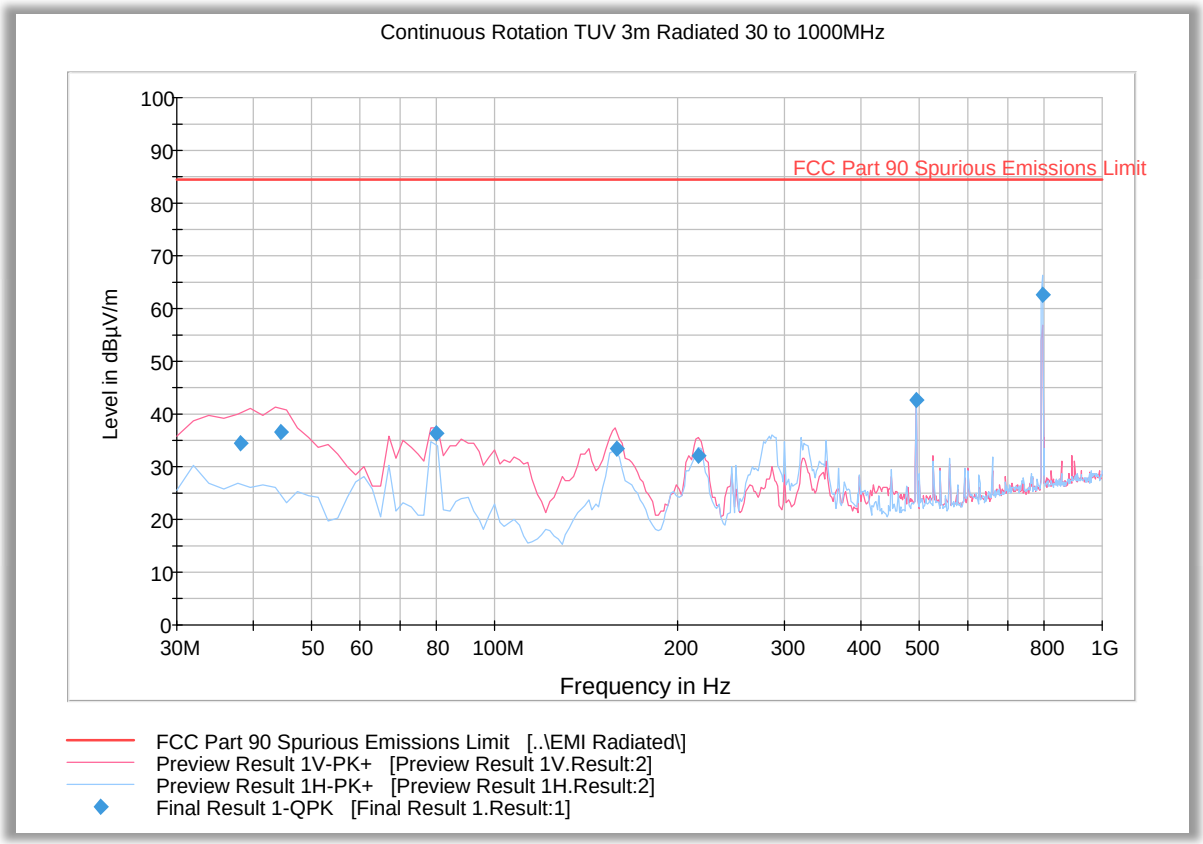
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.866667	45.2	1000.0	1000.000	221.4	V	169.0	-5.7	39.2	84.4
1799.933333	51.8	1000.0	1000.000	190.5	H	139.0	-3.6	32.6	84.4
2200.000000	51.3	1000.0	1000.000	220.4	V	26.0	-1.1	33.1	84.4
2666.766667	49.0	1000.0	1000.000	103.7	V	349.0	0.4	35.4	84.4
6821.733333	46.2	1000.0	1000.000	352.7	V	248.0	7.2	38.2	84.4
11025.30000	47.9	1000.0	1000.000	234.4	V	125.0	11.3	36.5	84.4
16976.00000	53.1	1000.0	1000.000	143.7	V	301.0	18.4	31.3	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.866667	38.1	1000.0	1000.000	221.4	V	169.0	-5.7	46.3	84.4
1799.933333	45.5	1000.0	1000.000	190.5	H	139.0	-3.6	38.9	84.4
2200.000000	47.6	1000.0	1000.000	220.4	V	26.0	-1.1	36.8	84.4
2666.766667	43.0	1000.0	1000.000	103.7	V	349.0	0.4	41.4	84.4
6821.733333	33.0	1000.0	1000.000	352.7	V	248.0	7.2	51.4	84.4
11025.30000	34.3	1000.0	1000.000	234.4	V	125.0	11.3	50.1	84.4
16976.00000	39.5	1000.0	1000.000	143.7	V	301.0	18.4	44.9	84.4

2.7.11 Test Results Below 1GHz (LTE Band 14 Uplink Worst Case Configuration) - 5MHz Bandwidth Top Channel



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)
38.159439	34.6	1000.0	120.000	106.0	V	170.0	-13.7	49.8	84.4
44.527214	36.5	1000.0	120.000	100.0	V	240.0	-14.8	47.9	84.4
79.997194	36.3	1000.0	120.000	105.0	V	332.0	-17.6	48.1	84.4
158.976593	33.4	1000.0	120.000	115.0	V	287.0	-13.2	51.0	84.4
216.533226	32.0	1000.0	120.000	110.0	V	311.0	-11.4	52.4	84.4
494.989178	42.8	1000.0	120.000	109.0	V	322.0	-2.6	41.6	84.4
796.171784	62.5	1000.0	120.000	100.0	H	305.0	2.9	Fundamental Carrier	

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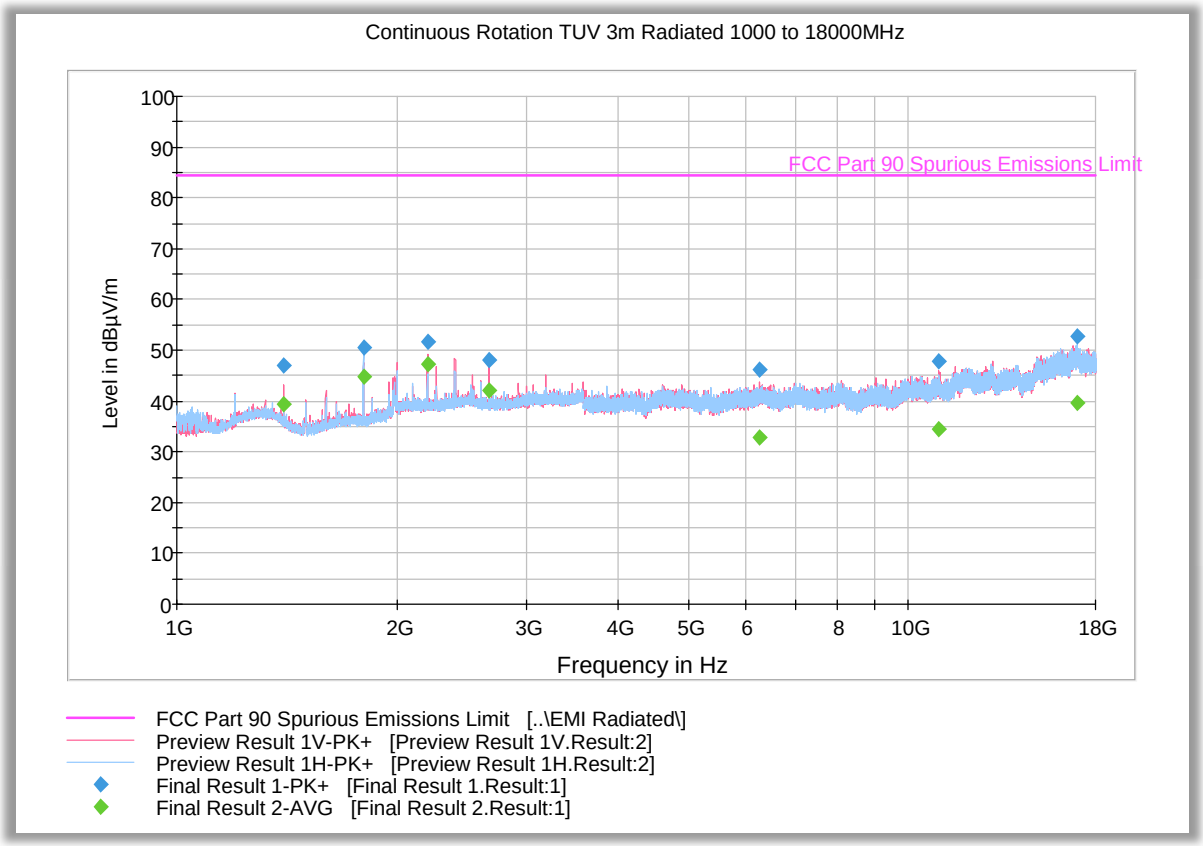
2.7.12 Test Results Above 1GHz (LTE Band 14 Uplink Worst Case Configuration) - 5MHz Bandwidth Low Channel



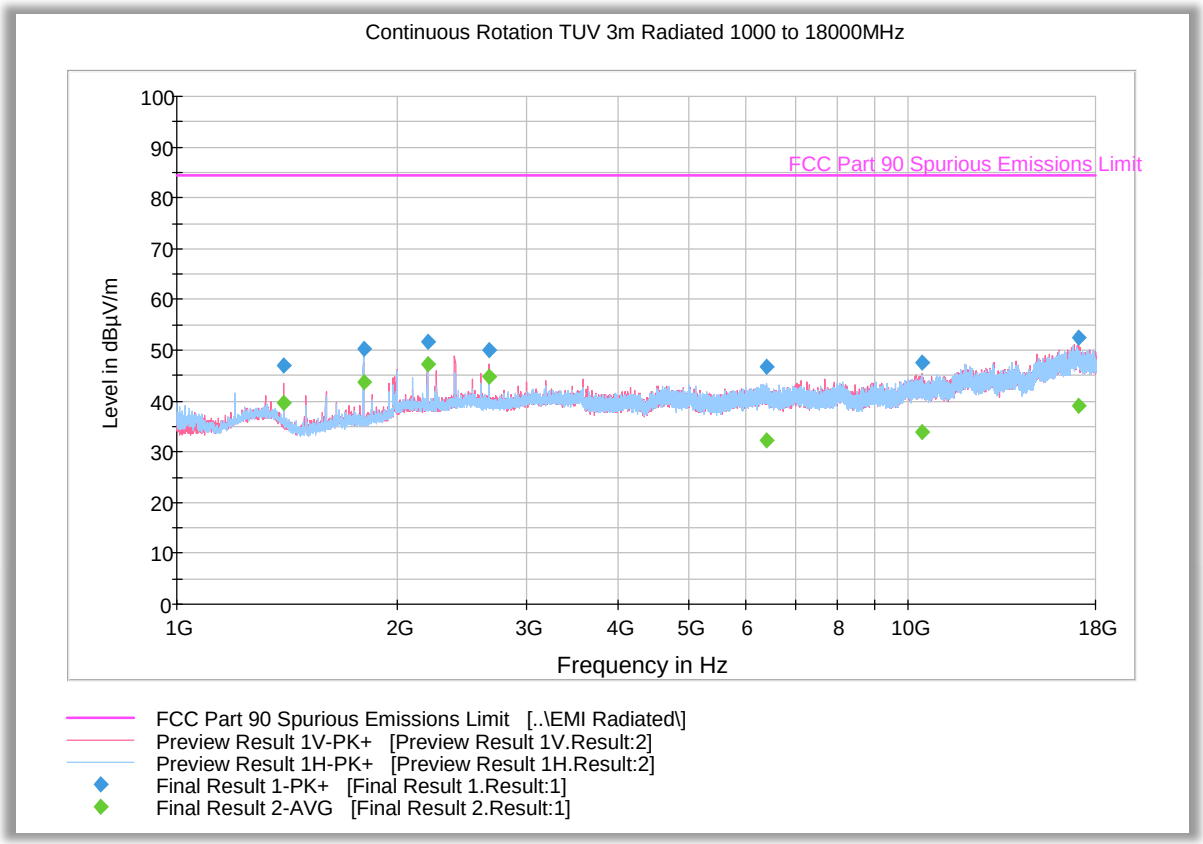
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.900000	47.0	1000.0	1000.000	220.4	V	154.0	-5.7	37.4	84.4
1799.966667	50.5	1000.0	1000.000	207.5	H	169.0	-3.6	33.9	84.4
2200.000000	51.7	1000.0	1000.000	212.4	V	25.0	-1.1	32.7	84.4
2666.766667	48.1	1000.0	1000.000	103.7	V	-14.0	0.4	36.3	84.4
6256.833333	46.1	1000.0	1000.000	306.2	V	251.0	6.7	38.3	84.4
11003.16666	47.8	1000.0	1000.000	103.7	V	158.0	11.3	36.6	84.4
17004.00000	52.9	1000.0	1000.000	182.6	H	357.0	18.4	31.5	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.900000	39.3	1000.0	1000.000	220.4	V	154.0	-5.7	45.1	84.4
1799.966667	44.8	1000.0	1000.000	207.5	H	169.0	-3.6	39.6	84.4
2200.000000	47.3	1000.0	1000.000	212.4	V	25.0	-1.1	37.1	84.4
2666.766667	42.1	1000.0	1000.000	103.7	V	-14.0	0.4	42.3	84.4
6256.833333	32.8	1000.0	1000.000	306.2	V	251.0	6.7	51.6	84.4
11003.16666	34.3	1000.0	1000.000	103.7	V	158.0	11.3	50.1	84.4
17004.00000	39.7	1000.0	1000.000	182.6	H	357.0	18.4	44.7	84.4

2.7.13 Test Results Above 1GHz (LTE Band 14 Uplink Worst Case Configuration) - 5MHz Bandwidth Middle Channel



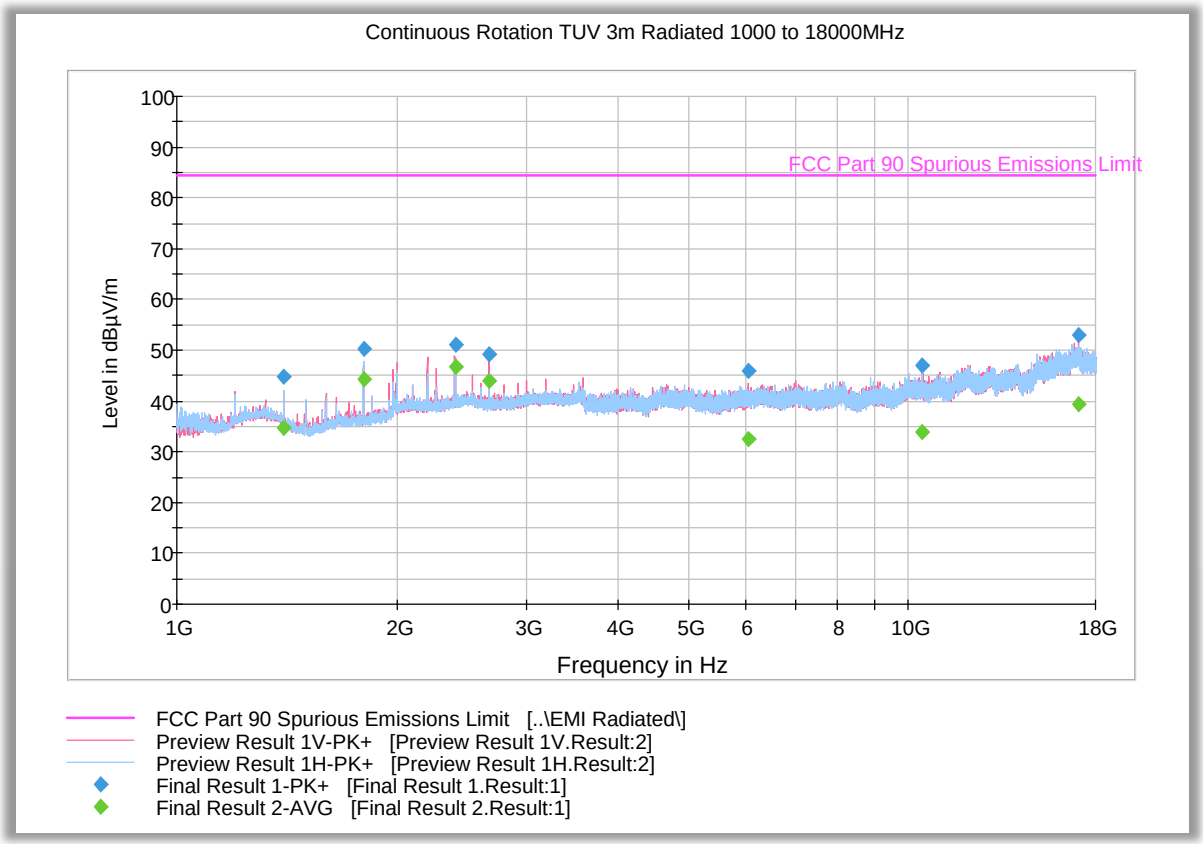
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.900000	47.0	1000.0	1000.000	217.4	V	153.0	-5.7	37.4	84.4
1800.166667	50.3	1000.0	1000.000	217.4	H	165.0	-3.6	34.1	84.4
2199.833333	51.6	1000.0	1000.000	212.4	V	172.0	-1.1	32.8	84.4
2666.766667	49.9	1000.0	1000.000	103.7	V	-8.0	0.4	34.5	84.4
6402.966667	46.6	1000.0	1000.000	112.7	H	38.0	6.8	37.8	84.4
10438.76666	47.6	1000.0	1000.000	135.7	V	28.0	10.5	36.8	84.4
17090.90000	52.3	1000.0	1000.000	161.6	V	193.0	18.4	32.1	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.900000	39.5	1000.0	1000.000	217.4	V	153.0	-5.7	44.9	84.4
1800.166667	43.7	1000.0	1000.000	217.4	H	165.0	-3.6	40.7	84.4
2199.833333	47.2	1000.0	1000.000	212.4	V	172.0	-1.1	37.2	84.4
2666.766667	44.9	1000.0	1000.000	103.7	V	-8.0	0.4	39.5	84.4
6402.966667	32.3	1000.0	1000.000	112.7	H	38.0	6.8	52.1	84.4
10438.76666	33.9	1000.0	1000.000	135.7	V	28.0	10.5	50.5	84.4
17090.90000	39.2	1000.0	1000.000	161.6	V	193.0	18.4	45.3	84.4

2.7.14 Test Results Above 1GHz (LTE Band 14 Uplink Worst Case Configuration) - 5MHz Bandwidth High Channel



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.700000	44.8	1000.0	1000.000	102.7	H	159.0	-5.7	39.6	84.4
1799.766667	50.2	1000.0	1000.000	209.4	H	170.0	-3.6	34.2	84.4
2399.866667	51.0	1000.0	1000.000	116.7	V	132.0	-0.3	33.4	84.4
2666.766667	49.3	1000.0	1000.000	103.7	V	-12.0	0.4	35.1	84.4
6046.533333	45.8	1000.0	1000.000	221.4	V	97.0	6.5	38.6	84.4
10427.03333	46.9	1000.0	1000.000	151.2	H	-8.0	10.5	37.5	84.4
17095.63333	53.1	1000.0	1000.000	352.7	V	310.0	18.4	31.3	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.700000	34.7	1000.0	1000.000	102.7	H	159.0	-5.7	49.7	84.4
1799.766667	44.4	1000.0	1000.000	209.4	H	170.0	-3.6	40.0	84.4
2399.866667	46.7	1000.0	1000.000	116.7	V	132.0	-0.3	37.7	84.4
2666.766667	43.9	1000.0	1000.000	103.7	V	-12.0	0.4	40.5	84.4
6046.533333	32.6	1000.0	1000.000	221.4	V	97.0	6.5	51.8	84.4
10427.03333	33.8	1000.0	1000.000	151.2	H	-8.0	10.5	50.6	84.4
17095.63333	39.3	1000.0	1000.000	352.7	V	310.0	18.4	45.1	84.4

2.8 FREQUENCY STABILITY

2.8.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1055
FCC 47 CFR Part 90, Clause 90.213
RSS-140 issue 1, Clause 4.2
RSS-131 issue 3, Clause 5.2.4
KDB935210 D05, Clause 4.8

2.8.2 Standard Applicable

FCC 47 CFR Part 2, Clause 2.1055:
(a) The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From -30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

FCC 47 CFR Part 90, Clause 90.213:
(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table:

MINIMUM FREQUENCY STABILITY

[Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	[1 2 3] 100	100	200
25–50	20	20	50
72–76	5	.....	50
150–174	[5 11] 5	[6] 5	[4 6] 50
216–220	1.0	.....	1.0
220–222 [12]	0.1	1.5	1.5
421–512	[7 11 14] 2.5	[8] 5	[8] 5
806–809	[14] 1.0	1.5	1.5
809–824	[14] 1.5	2.5	2.5
851–854	1.0	1.5	1.5
854–869	1.5	2.5	2.5
896–901	[14] 0.1	1.5	1.5
902–928	2.5	2.5	2.5
902–928 [13]	2.5	2.5	2.5
929–930	1.5	.....	.....
935–940	0.1	1.5	1.5
1427–1435	[9] 300	300	300
Above 2450 [10]	.....	.....	.....

RSS-140, Clause 4.2:
The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the tmperature and supply voltage variations specified in RSS-Gen.

2.8.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration A and B

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

October 07, 2020 / 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	23.6°C
Relative Humidity	44.7%
ATM Pressure	99.0kPa

2.8.7 Additional Observations

- This is a conducted test.
- EUT Downlink transmits on two internal antennas and uplink transmits on two external antennas simultaneously in the same frequency range, i.e. TX MIMO mode. However, there is no much differernce between two antenna ports and the measurement was performed on one antenna port as representative configuration.
- The EUT was operated at 120.0VAC nominal voltage and was placed in the temperature chamber for the series of evaluations performed.
- Test was performed on 5 MHz Bandwidth Mid channel as the representative configuration. Input Type "Tones" was selected and the EUT was injected a CW signal from a Signal Generator and maximum frequency error was monitored using the spectrum analyzer.
- The Temperature was reduced to -30°C and allowed to sit for 1 hour to allow the equipment and chamber temperature to stabilize. The measurements on both downlink and uplink were then performed. The temperature was then increased by 10°C steps and allowed to settle before taking the next set of measurements. The EUT was tested over the temperature -30°C to +50°C.
- Voltage variation was also performed at 85% and 115% of the nominal voltage.

2.8.8 Test Results Summary

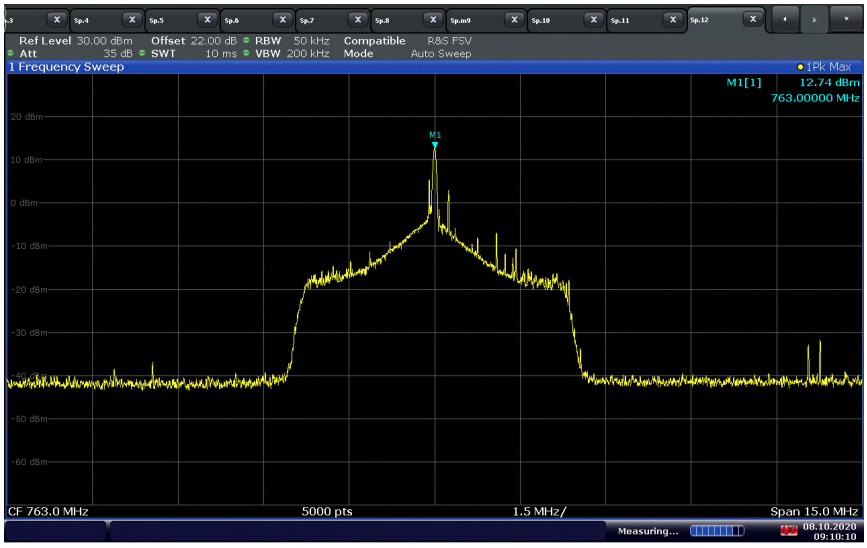
LTE B14 Downlink – 5 MHz BW Middle Channel				
Voltage (VDC)	**Temperature (°C)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
120	-30	0	0	-
	-20	0	0	-
	-10	0	0	-
	0	0	0	-
	+10	0	0	-
	+20	0	0	-
	+30	0	0	-
	+40	0	0	-
	+50	0	0	-
102	+20	0	0	-
138		0	0	-

The frequency stability of the EUT is sufficient to keep it within the authorised frequency ranges at any temperature interval and voltage variations across the measured range.

LTE B14 Uplink – 5 MHz BW Middle Channel				
Voltage (VDC)	**Temperature (°C)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
120	-30	0	0	-
	-20	0	0	-
	-10	0	0	-
	0	0	0	-
	+10	0	0	-
	+20	0	0	-
	+30	0	0	-
	+40	0	0	-
	+50	0	0	-
102	+20	0	0	-
138		0	0	-

The frequency stability of the EUT is sufficient to keep it within the authorised frequency ranges at any temperature interval and voltage variations across the measured range.

2.8.9 Sample Test Plots



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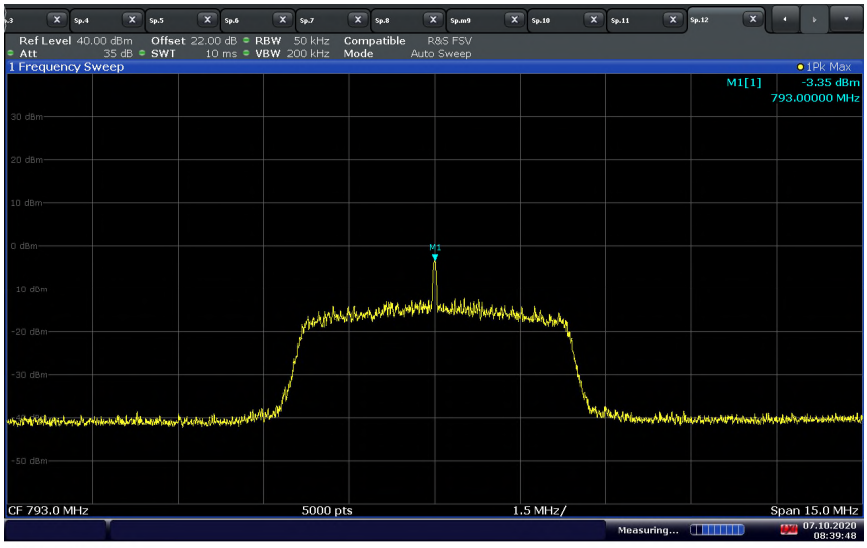
LTE Band 14 Downlink 5MHz Bandwidth Middle Channel 120VAC @ 20°C



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LTE Band 14 Uplink 5MHz Bandwidth Middle Channel 120VAC @ 20°C

2.9 POWER LINE CONDUCTED EMISSIONS

2.9.1 Specification Reference

RSS-Gen, Clause 8.8

2.9.2 Standard Applicable

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in table below.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in table below. The more stringent limit applies at the frequency range boundaries.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	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.*

2.9.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration E

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

October 12, 2020 / XYZ

2.9.5 Test Equipment Used

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

2.9.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.2 °C
Relative Humidity	48.7 %
ATM Pressure	98.7 kPa

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2.9.7 Additional Observations

- The EUT was verified using AC adapter supplied by the manufacturer.
- EUT verified using input voltage of 120VAC 60Hz.
- There are no significant variations in test results between different operating modes. Only the one worst operation mode is presented.
- 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 2.9.8 for sample computation.

2.9.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (dbµV) @ 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# 7567 (LISN)	0.30	
Reported QuasiPeak Final Measurement (dbµV) @ 150kHz			**26.2**

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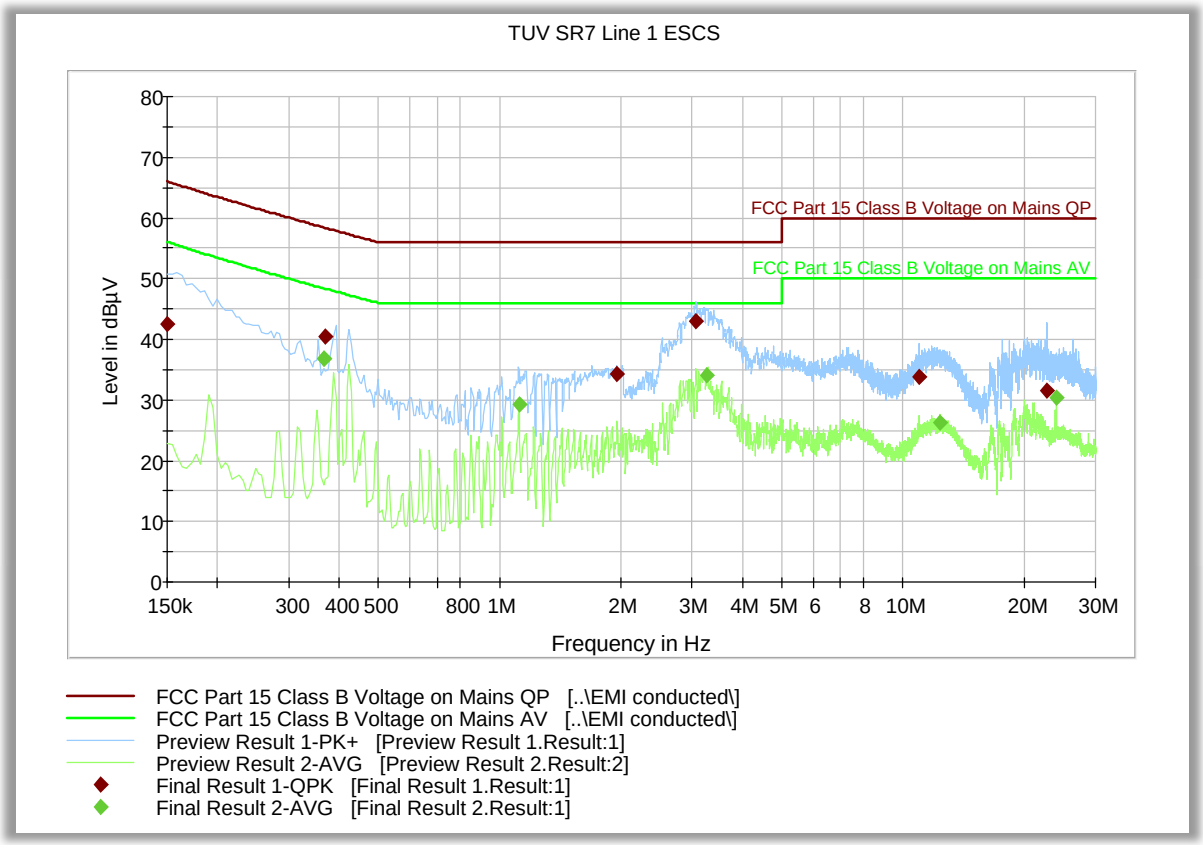
2.9.9 Test Results - Conducted Emissions Line 1 - Hot



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin – QPK (dB)	Limit - QPK (dBµV)
0.150000	42.4	1000.0	9.000	Off	L1	20.4	23.6	66.0
0.370500	40.5	1000.0	9.000	Off	L1	20.4	17.8	58.3
1.954500	34.3	1000.0	9.000	Off	L1	20.4	21.7	56.0
3.070500	43.1	1000.0	9.000	Off	L1	20.2	12.9	56.0
10.981500	33.8	1000.0	9.000	Off	L1	20.4	26.2	60.0
22.794000	31.6	1000.0	9.000	Off	L1	20.7	28.4	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin – Ave (dB)	Limit - Ave (dBµV)
0.366000	36.7	1000.0	9.000	Off	L1	20.4	11.7	48.4
0.366000	36.8	1000.0	9.000	Off	L1	20.4	11.6	48.4
1.117500	29.3	1000.0	9.000	Off	L1	20.4	16.7	46.0
3.264000	34.0	1000.0	9.000	Off	L1	20.3	12.0	46.0
12.354000	26.4	1000.0	9.000	Off	L1	20.4	23.6	50.0
24.000000	30.3	1000.0	9.000	Off	L1	20.6	19.7	50.0

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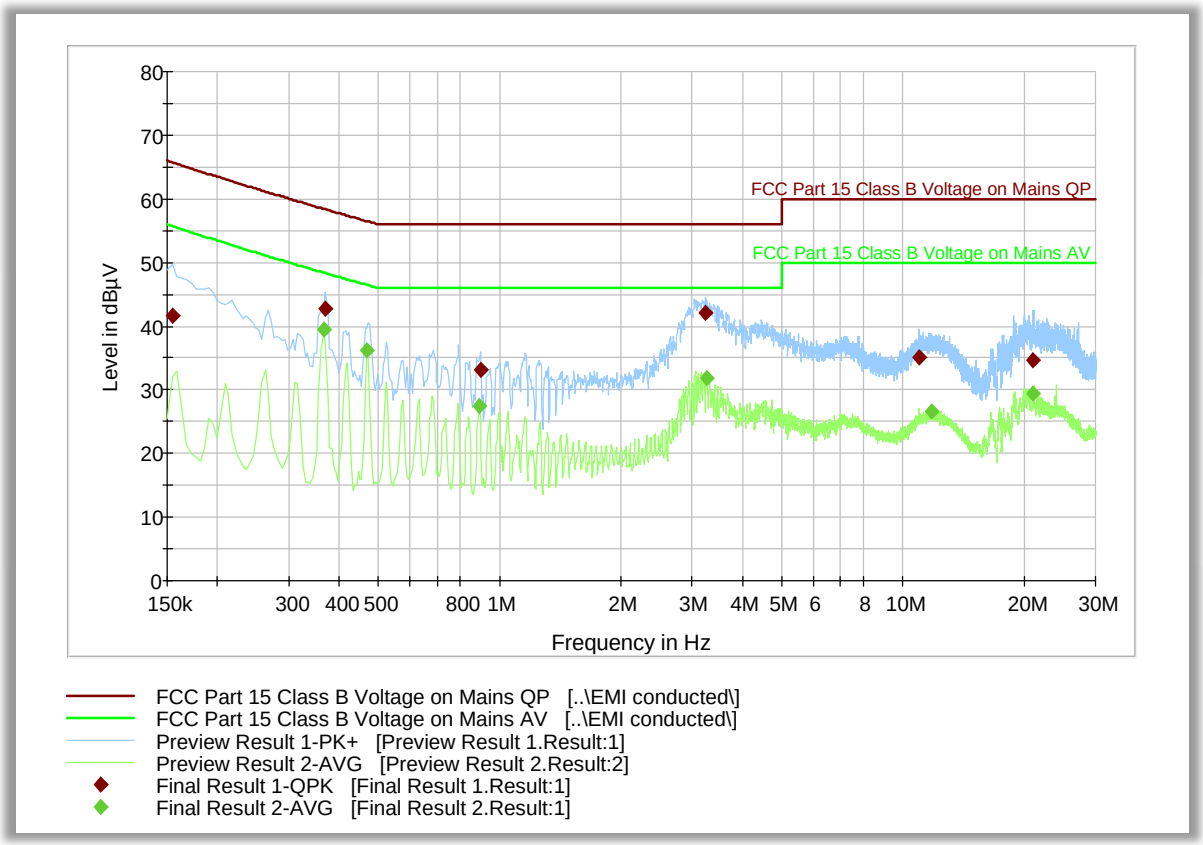
2.9.10 FCC Conducted Emissions Line 2 – Neutral



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin – QPK (dB)	Limit - QPK (dBµV)
0.154500	41.7	1000.0	9.000	Off	N	20.3	24.0	65.7
0.370500	42.7	1000.0	9.000	Off	N	20.4	15.6	58.3
0.897000	33.0	1000.0	9.000	Off	N	20.4	23.0	56.0
3.241500	42.0	1000.0	9.000	Off	N	20.3	14.0	56.0
10.959000	35.2	1000.0	9.000	Off	N	20.4	24.8	60.0
20.953500	34.7	1000.0	9.000	Off	N	20.4	25.3	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin – Ave (dB)	Limit - Ave (dBµV)
0.366000	39.4	1000.0	9.000	Off	N	20.4	9.0	48.4
0.469500	36.1	1000.0	9.000	Off	N	20.3	10.4	46.5
0.892500	27.6	1000.0	9.000	Off	N	20.4	18.4	46.0
3.264000	31.8	1000.0	9.000	Off	N	20.3	14.2	46.0
11.787000	26.6	1000.0	9.000	Off	N	20.3	23.4	50.0
21.066000	29.4	1000.0	9.000	Off	N	20.4	20.6	50.0

2.10 AGC THRESHOLD LEVEL

2.10.1 Specification Reference

KDB 935210 D05, Clause 4.2

2.10.2 Standard Applicable

AGC Threshold Level is tested according to KDB 935210 D05, Clause 4.2:

The AGC threshold shall be determined by applying the procedure of 4.2 (of the current KDB), but with the signal generator configured to produce a test signal defined in Table 1, a CW input signal or a digitally modulated signal, consistent with the discussion about signal type in 4.1.

Devices intended for used in 700 MHz Public Safety Broadband spectrum shall be tested using representative band-limited AWGN signal (99% OBW of 4.1 MHz) or the applicable signal type (e.g., LTE)

2.10.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration A and B

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

September 27 and 28, 2020 / XYZ

2.10.5 Test Equipment Used

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

2.10.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	21.8 - 22.3 °C
Relative Humidity	49.8 - 51.6 %
ATM Pressure	98.7 kPa

2.10.7 Additional Observations

- This is a conducted test.
- EUT Downlink transmits on two internal antennas and uplink transmits on two external antennas simultaneously in the same frequency range, i.e. TX MIMO mode. However, there is no much differernce between two antenna ports and the measurement was performed on one antenna port as representative configuration.
- LTE 5 MHz bandwidth Signal was used as the applicable intended operating signal type.
- When testing output power of the EUT using a power meter was used according to method 4.5.4 of this KDB, and a spectrum analyser was used according to method 3.5.3 which is for broadband signal power testing instead of 4.5.3 which is for narrowband signal power testing with setting as below when testing input power of the EUT:
  - RBW = 1% to 5% of OBW
  - VBW ≥ 3 x RBW
  - RMS Detector
  - Trace average at least 100 traces
  - Span is 2 x to 3 x the OBW
- The AGC threshold level was recorded when increasing the input level until a 1 dB increase in the input signal power no longer causes a 1 dB increase in the output signal power.
- Both downlink and uplink are tested.

2.10.8 Test Results

AGC Threshold Level						
Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Average Power		AGC Threshold Level (dBm)
				(dBm)	(W)	
Downlink	10	5330	763.0	10.42	0.01	-83.54
Uplink	10	23330	793.0	21.96	0.16	-78.83

2.11 OUT-OF-BAND REJECTION

2.11.1 Specification Reference

RSS-131 issue 3, Clause 5.2.1
KDB 935210 D05, Clause 4.3

2.11.2 Standard Applicable

RSS-131, Clause 5.2.1:
The gain-versus-frequency response and the 20 dB bandwidth of the zone enhancer shall be reported. The zone enhancer shall reject amplification of other signals outside the passband of the zone enhancer.

Out-of-Band Rejection is tested according to KDB 935210 D05, Clause 4.3.

2.11.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration A and B

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

October 06, 2020 / XYZ

2.11.5 Test Equipment Used

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

2.11.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.8 °C
Relative Humidity	31.4 %
ATM Pressure	99.0 kPa

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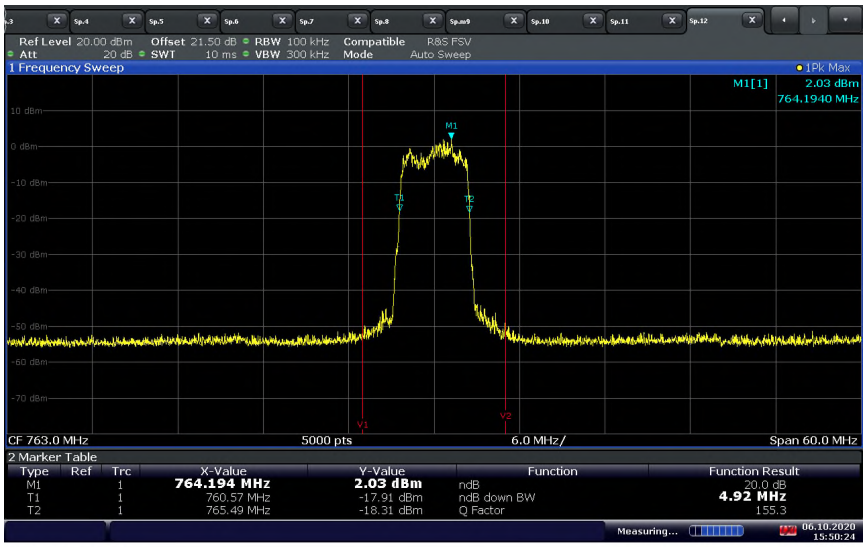
2.11.7 Additional Observations

- This is a conducted test.
- EUT Downlink transmits on two internal antennas and uplink transmits on two external antennas simultaneously in the same frequency range, i.e. TX MIMO mode. However, there is no much differernce between two antenna ports and the measurement was performed on one antenna port as representative configuration.
- LTE 5 MHz bandwidth Signal was used as the applicable intended operating signal type.
- The path loss was measured and entered as an offset.
- A swept CW signal whose frequency range is ±250% of the manufacturer's specified pass band is configured for the testing.
- The internal gain control of the EUT is set to the maximum gain. The input signal type is set to tones (CW).
- The CW is 3 dB below the ACG threshold (determined according to section 3.2 and 4.2 of the current KDB), and doesn't activate the AGC threshold throughout the test.
- Dwell time is 10 ms.
- Frequency Step is 50 kHz.
- RBW is between 1% and 5% of the manufacturer's rated pass band.
- VBW is 3 x RBW.
- Detector is peak and trace is max hold.
- The peak amplitude frequency f_0 is determined and two additional -20 dB markers are determined using the marker-delta method).
- The 20dB Bandwidth plot is recorded as the out-of-band rejection frequency response.
- Both downlink and uplink are tested.

2.11.8 Test Results

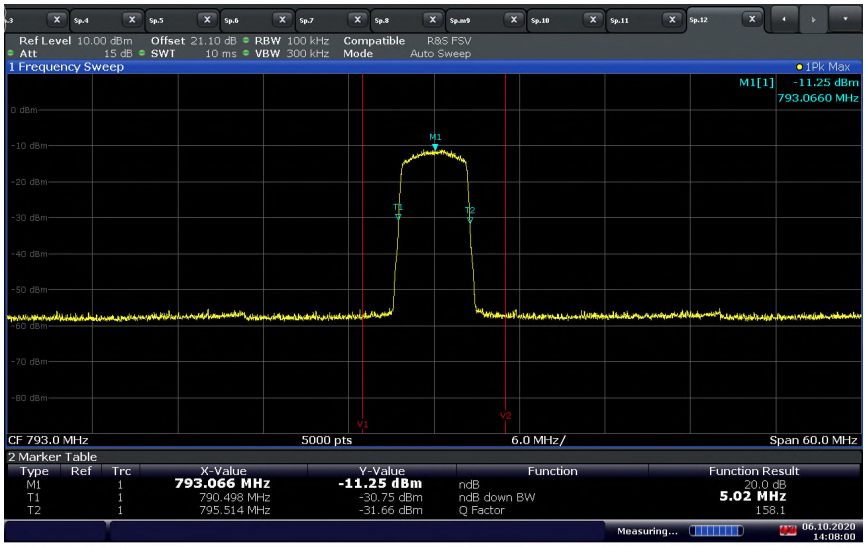
LTE Band 14						
Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	-20 dBc Point		20 dB BW (MHz)
				T1 (MHz)	T2 (MHz)	
Downlink	5	5330	763.0	760.57	765.49	4.92
Uplink	5	23330	793.0	790.498	795.514	5.02

LTE Band 14 Downlink (5 MHz BW) Middle Channel / Out-of-Band Rejection



15:50:25 06.10.2020

LTE Band 14 Uplink (5 MHz BW) M Channel / Out-of-Band Rejection



14:08:01 06.10.2020

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2.12 INPUT-VERSUS-OUTPUT SIGNAL COMPARISON

2.12.1 Specification Reference

FCC 47 CFR Part 90, Clause 90.219 (e)(4)(ii)
RSS-131 issue 3, Clause 5.2.2
KDB 935210 D05, Clause 4.4

2.12.2 Standard Applicable

FCC 47 CFR Part 90, Clause 90.219 (e)(4):
(ii) There is no change in the occupied bandwidth of the retransmitted signals.

RSS-131, Clause 5.2.2:
The spectral growth of the 26 dB bandwidth of the output signal shall be less than 5% of the input signal spectrum.

Input-versus-Output Signal Comparison is tested according to KDB 935210 D05, Clause 4.4.

2.12.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration A and B

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

September 29 and 30, 2020 / XYZ

2.12.5 Test Equipment Used

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

2.12.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.0 °C
Relative Humidity	39.1 - 57.6 %
ATM Pressure	98.8 - 98.9 kPa

2.12.7 Additional Observations

- This is a conducted test.
- EUT Downlink transmits on two internal antennas and uplink transmits on two external antennas simultaneously in the same frequency range, i.e. TX MIMO mode. However, there is no much differernce between two antenna ports and the measurement was performed on one antenna port as representative configuration.
- The path loss was measured and entered as an offset.
- The signal generator is configured to transmit LTE 5 MHz Bandwidth signal as applicable intended operating signal type.
- The signal amplitude is just below the ACG threshold (determined according to section 4.2 of the current KDB), and not more than 0.5 dB below.

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- Span is between 2 times to 5 times the emission bandwidth (EBW) or alternatively, the OBW.
- RBW is 1% to 5% of the anticipated OBW, VBW is > 3 x RBW.
- Set the reference level of spectrum analyser to accommodate the maximum input amplitude level.
- The noise floor of the spectrum analyser is at least 36 dB below the reference level.
- Detector is positive peak and trace is max hold.
- The peak amplitude frequency f_0 is determined and the 99% occupied bandwidth was measured with the OBW function of spectrum analyser.
- Repeat the testing with the input signal connected directly to the spectrum analyser.
- Compare the spectral plot of the input signal to the output signal.
- Repeat the testing with input signal amplitude set to 3 dB above AGC threshold.
- Both downlink and uplink are tested.

2.12.8 Test Results

Compliant. There is no spectral growth of OBW and 26 dB bandwidth that is more than than 5% of the input signal spectrum.

LTE Band 14 Downlink							
Signal Level	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**99% OBW (MHz)**		**-26 dB BW (MHz)**	
				Output	**Input***	**Output**	**Input***
AGC Threshold Level	5	5330	763.0	4.44	4.47	4.87	4.95
AGC + 3 dB Level				4.43	4.47	4.82	4.95

* Since the AGC Threshold level and AGC + 3 dB level for downlink are as low as -80 dBm, which is about the noise floor, the input levels are adjusted in order to get the right input 99% OBW and -26 dB BW when testing.

LTE Band 14 Uplink							
Signal Level	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**99% OBW (MHz)**		**-26 dB BW (MHz)**	
				Output	**Input***	**Output**	**Input***
AGC Threshold Level	5	23330	793.0	4.41	4.47	4.72	4.93
AGC + 3 dB Level				4.41	4.47	4.72	4.93

* Since the AGC Threshold level and AGC + 3 dB level for Uplink are as low as -70 dBm, which is close to the noise floor, the input levels are adjusted in order to get the right input 99% OBW and -26 dB BW when testing.

LTE Band 14 Downlink (5 MHz BW) Mid Channel / 99% OBW at Output port with Input signal at AGC Threshold Level
   10:47:20 29.09.2020
LTE Band 14 Downlink (5 MHz BW) Mid Channel / 99% OBW at Input port (Adjusted Level)
   11:54:50 30.09.2020

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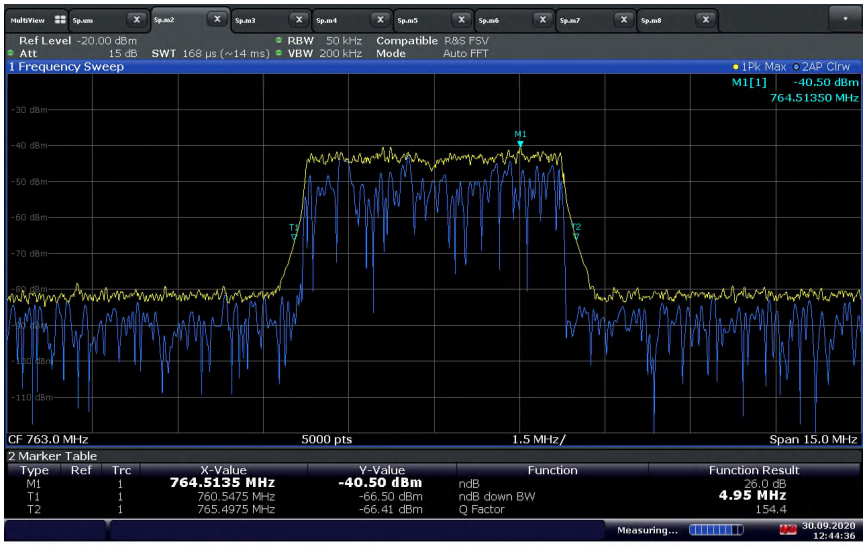
LTE Band 14 Downlink (5 MHz BW) Mid Channel / 26 dB BW at Output port with Input signal at AGC Threshold Level

10:48:08 29.09.2020

LTE Band 14 Downlink (5 MHz BW) Mid Channel / 26 dB BW at Input port (Adjusted Level)



12:44:37 30.09.2020

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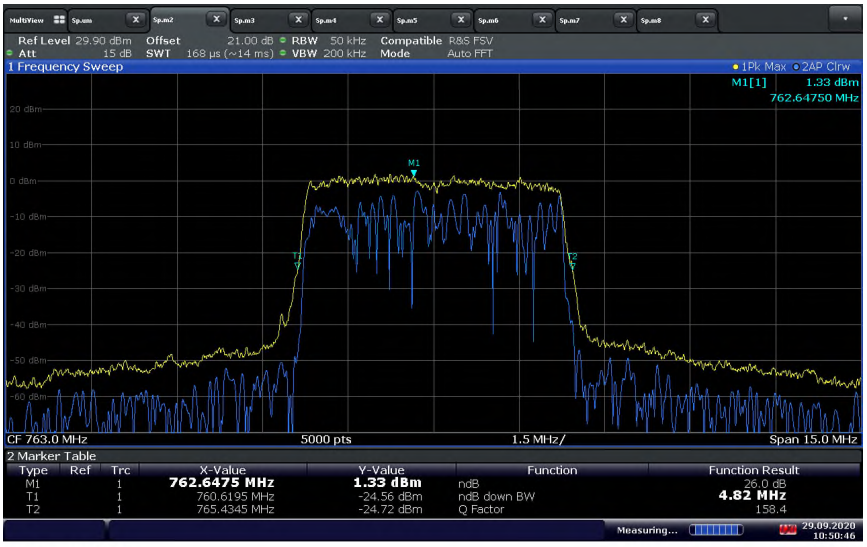
LTE Band 14 Downlink (5 MHz BW) Mid Channel / 99% OBW at Output port with Input signal at AGC + 3 dB Level

10:49:45 29.09.2020

LTE Band 14 Downlink (5 MHz BW) Mid Channel / 99% OBW at Input port (Adjusted Level)

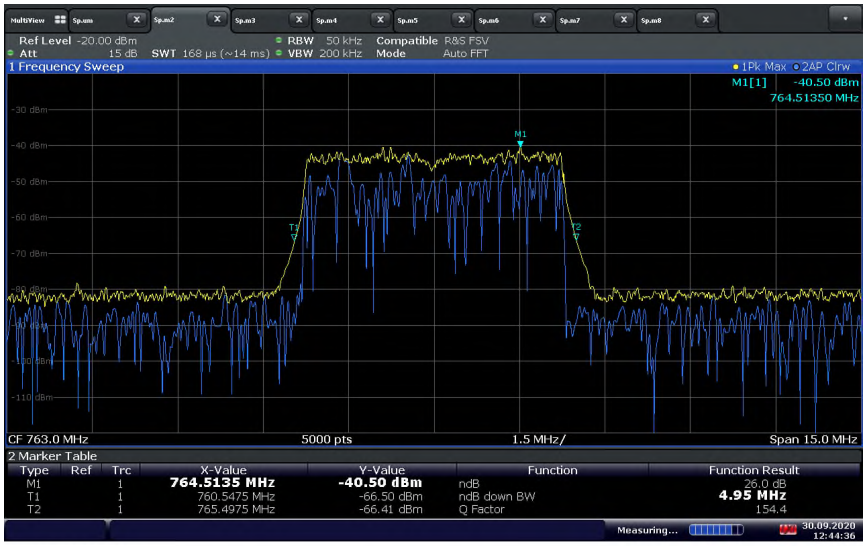
11:54:50 30.09.2020

LTE Band 14 Downlink (5 MHz BW) Mid Channel / 26 dB BW at Output port with Input signal at AGC + 3 dB Level



10:50:47 29.09.2020

LTE Band 14 Downlink (5 MHz BW) Mid Channel / 26 dB BW at Input port (Adjusted Level)

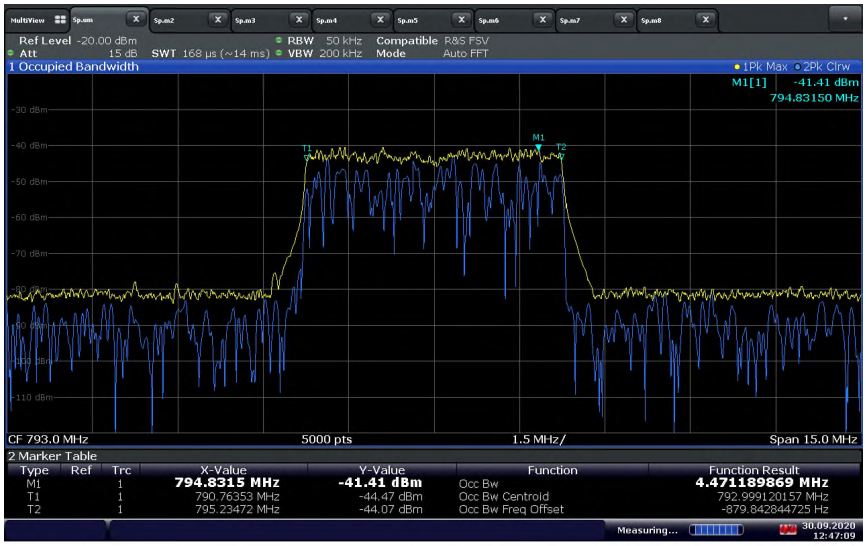


12:44:37 30.09.2020

LTE Band 14 Uplink (5 MHz BW) Mid Channel / 99% OBW at Output port with Input signal at AGC Threshold Level

09:48:04 29.09.2020

LTE Band 14 Uplink (5 MHz BW) Mid Channel / 99% OBW at Input port (Adjusted Level)



12:47:10 30.09.2020

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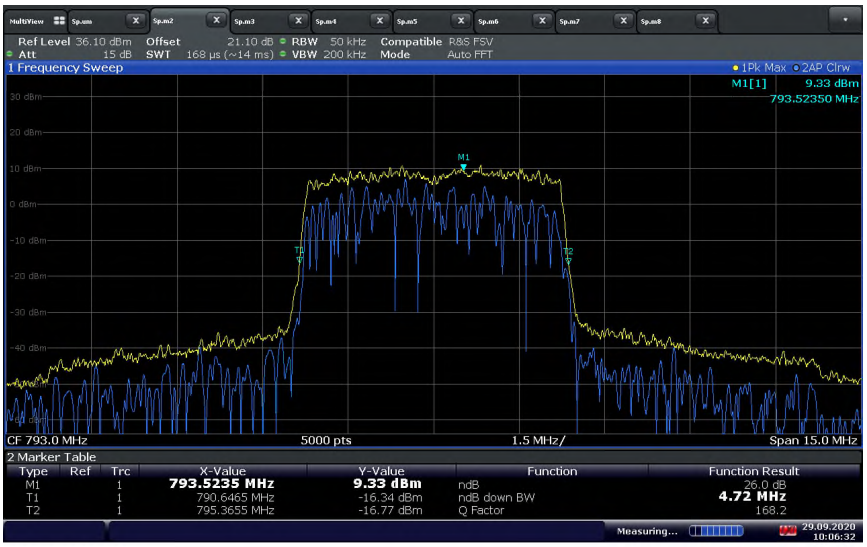
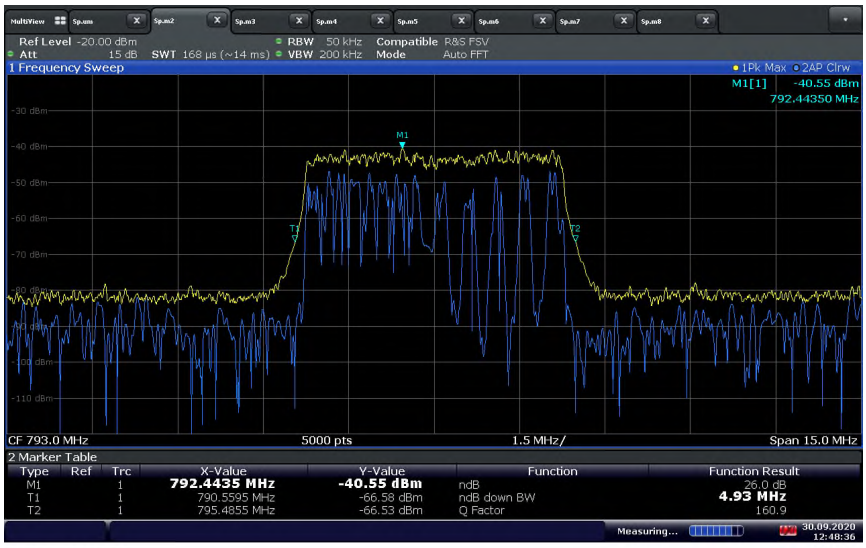
LTE Band 14 Uplink (5 MHz BW) Mid Channel / 26 dB BW at Output port with Input signal at AGC Threshold Level
   10:06:33 29.09.2020
LTE Band 14 Uplink (5 MHz BW) Mid Channel / 26 dB BW at Input port (Adjusted Level)
   12:48:36 30.09.2020

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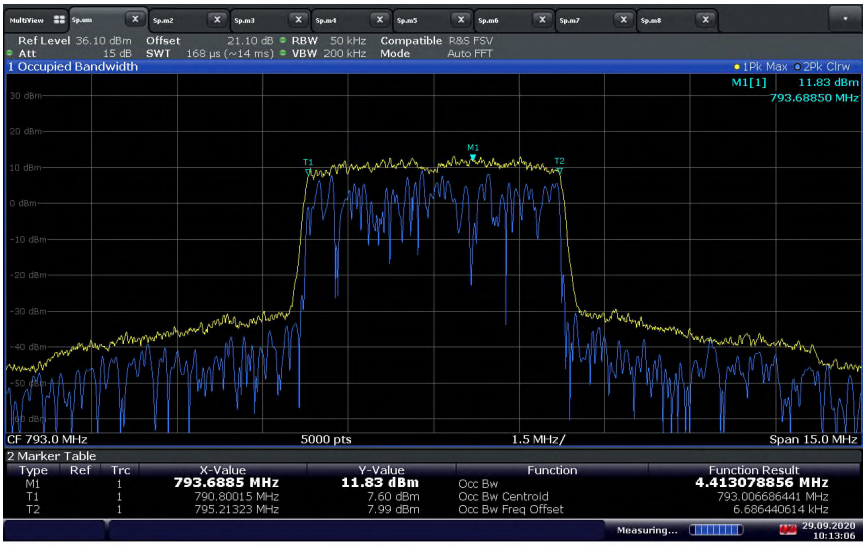
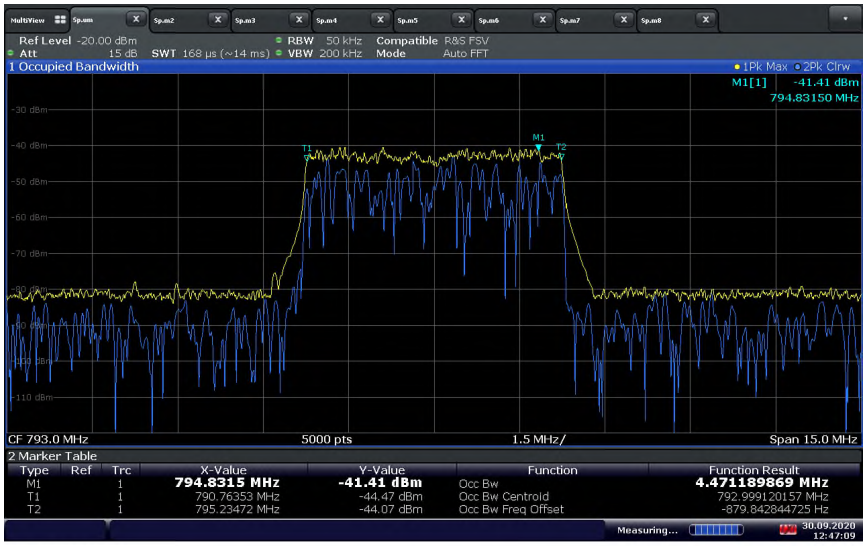
LTE Band 14 Uplink (5 MHz BW) Mid Channel / 99% OBW at Output port with Input signal at AGC + 3 dB Level



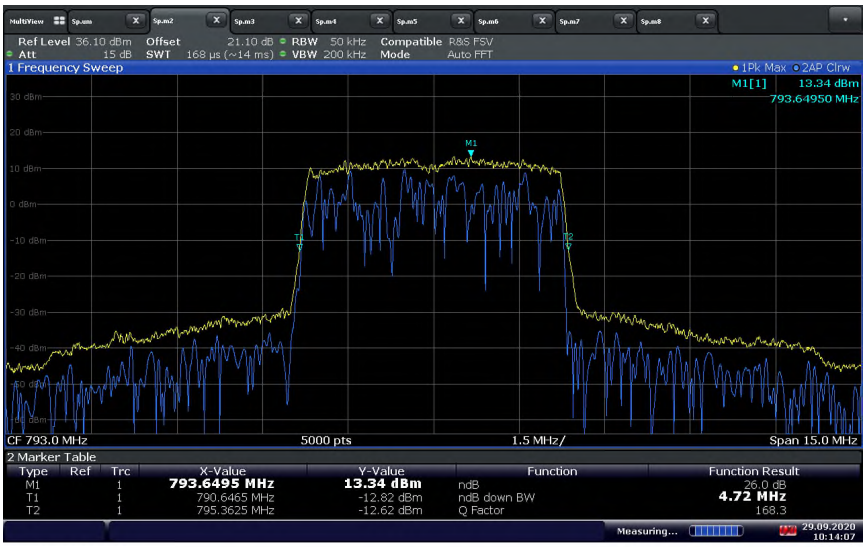
10:13:07 29.09.2020

LTE Band 14 Uplink (5 MHz BW) Mid Channel / 99% OBW at Input port (Adjusted Level)



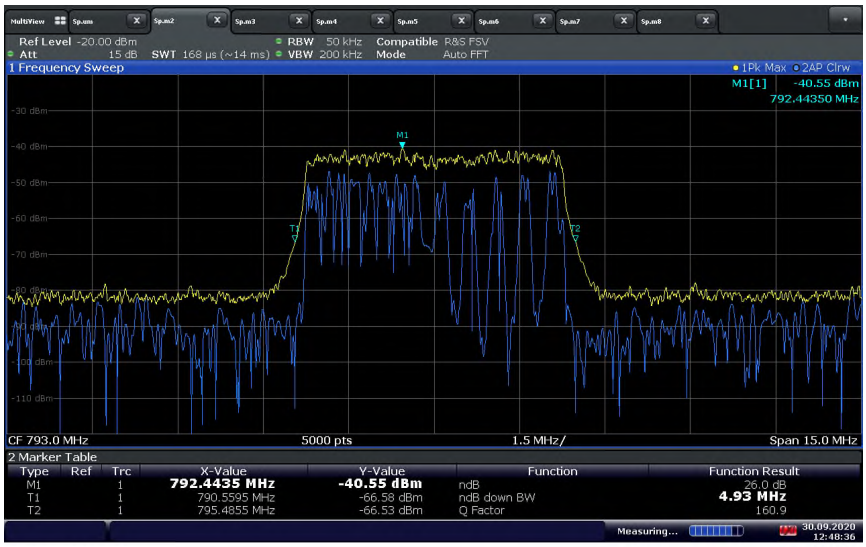
12:47:10 30.09.2020

LTE Band 14 Uplink (5 MHz BW) Mid Channel / 26 dB BW at Output port with Input signal at AGC + 3 dB Level



10:14:07 29.09.2020

LTE Band 14 Uplink (5 MHz BW) Mid Channel / 26 dB BW at Input port (Adjusted Level)



12:48:36 30.09.2020

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2.13 EMISSION MASK AND ADJACENT CHANNEL POWER

2.13.1 Specification Reference

FCC 47 CFR Part 90, Clause 90.219 (e)(4)(iii)
FCC 47 CFR Part 90, Clause 90.210
KDB 935210 D05, Clause 4.4

2.13.2 Standard Applicable

FCC Part 90.219 (e)(4):
(iii) The retransmitted signals continue to meet the unwanted emissions limits of § 90.210 applicable to the corresponding received signals (assuming that these received signals meet the applicable unwanted emissions limits by a reasonable margin).

FCC Part 90.210:

APPLICABLE EMISSION MASKS

Frequency band (MHz)	Mask for equipment with audio low pass filter	Mask for equipment without audio low pass filter
Below 25[1]	A or B	A or C
25–50	B	C
72–76	B	C
150–174[2]	B, D, or E	C, D or E
150 paging only	B	C
220–222	F	F
421–512[2 5]	B, D, or E	C, D, or E
450 paging only	B	G
806–809/851–854[6]	B	H
809–824/854–869[3 5]	B	G
896–901/935–940	I	J
902–928	K	K
929–930	B	G
4940–4990 MHz	L or M	L or M
5850–5925[4].		
All other bands	B	C

[1] Equipment using single sideband J3E emission must meet the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
[2] Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth must meet the requirements of Emission Mask E.
[3] Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of §90.691 of this chapter.
[4] DSRCS Roadside Units equipment in the 5850–5925 MHz band is governed under subpart M of this part.
[5] Equipment may alternatively meet the Adjacent Channel Power limits of §90.221.
[6] Transmitters utilizing analog emissions that are equipped with an audio low-pass filter must meet Emission Mask B. All transmitters utilizing digital emissions and those transmitters using analog emissions without an audio low-pass filter must meet Emission Mask H.

(c) *Emission Mask C*. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:
1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz, but not more than 10 kHz: at least 83 log(f_d/5) dB;
2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (f_d^2/11)dB or 50 dB, which ever is the lesser attenuation;
3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

2.13.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration A and B

2.13.4 Justification

According to FCC Part 90.219 (e)(4)(iii), the retransmitted signals continue to meet the unwanted emissions limits of § 90.210 applicable to the corresponding received signals (assuming that these received signals meet the applicable unwanted emissions limits by a reasonable margin). As a equipment without audio low pass filter, Emission Mask C applies.

However, the EUT is an equipment without audio low pass filter and mask C applies. The received signal is wideband LTE Band14 signal, and it does not meet the unwanted Emission Mask C limits of § 90.210 which is for narrow band. Therefore, emission mask is not applicable to the retransmitted output signals.

2.14 INPUT AND OUTPUT POWER AND AMPLIFIER/BOOSTER GAIN

2.14.1 Specification Reference

FCC 47 CFR Part 90, Clause 90.219(e)(1)
RSS-131 issue 3, Clause 5.2.3
KDB 935210 D05, Clause 4.5

2.14.2 Standard Applicable

FCC 47 CFR Part 90, Clause 90.219(e):
(1) The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

RSS-131, Clause 5.2.3:
The zone enhancer gain shall not exceed the nominal gain by more than 1.0 dB.

2.14.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration A and B

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

October 12, 2020 / XYZ

2.14.5 Test Equipment Used

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

2.14.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.2 °C
Relative Humidity	48.7 %
ATM Pressure	98.7 kPa

2.14.7 Additional Observations

- This is a conducted test.
- EUT Downlink transmits on two internal antennas and uplink transmits on two external antennas simultaneously in the same frequency range, i.e. TX MIMO mode. However, there is no much differernce between two antenna ports and the measurement was performed on one antenna port as representative configuration.
- The path loss was measured and entered as an offset.
- The internal gain control of the EUT is adjusted to the maximum gain (100 dB).
- The input power levels (uplink and downlink) are set to maximum input ratings, and confirm the device is not capable of operating in saturation (non-linear mode) during the test.

- The signal generator was configured to LTE 5 MHz signal as the typical signal type.
- A power meter or was used to measure the output power and a spectrum analyzer was used to measure the input power according to KDB 935210 D05 clause 3.5.3 which is for broadband signal power testing instead of 4.5.3 which is for narrowband signal power testing.
- Both downlink and uplink are tested.

2.14.8 Test Results

Compliant. The booster gain does not exceed the nominal gain (100 dB) by more than 1.0 dB.

LTE Band 14 Input and Output Power and Gain						
Mode	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**AGC Threshold Input (dBm)**	**Output Power (dBm)**	**Booster Gain (dB)**
Downlink	5	5330	763.0	-88.25	10.82	99.07
Uplink	5	23330	793.0	-78.83	21.96	100.79

LTE Band 14 Input and Output Power and Gain						
Mode	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**AGC Threshold + 3dB Input (dBm)**	**Output Power (dBm)**	**Booster Gain (dB)**
Downlink	5	5330	763.0	-86.08	10.93	97.01
Uplink	5	23330	793.0	-75.96	21.96	97.92

Limit	
Band	**System Gain (dB)**
LTE Band 14	100

2.15 NOISE FIGURE

2.15.1 Specification Reference

FCC 47 CFR Part 90, Clause 90.219 (e)(2)
KDB 935210 D05, Clause 4.6

2.15.2 Standard Applicable

FCC Part 90.219 (e)(2):
The noise figure of a signal booster must not exceed 9 dB in either direction.

2.15.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration A and B

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

October 12, 2020 / XYZ

2.15.5 Test Equipment Used

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

2.15.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.2 °C
Relative Humidity	48.7 %
ATM Pressure	98.7 kPa

2.15.7 Additional Observations

- This is a conducted test.
- EUT Downlink transmits on two internal antennas and uplink transmits on two external antennas simultaneously in the same frequency range, i.e. TX MIMO mode. However, there is no much differernce between two antenna ports and the measurement was performed on one antenna port as representative configuration.
- The path loss was measured and entered as an offset.
- 5 MHz Bandwidth LTE was tested as representative configuration. The Downlink and Uplink Gains are measured with a LTE signal injected to the device under test.
- The input of the EUT is terminated when measuring the noise output.
- The spectrum analyser was set to 100 trace average in RMS mode.
- RBW is 1 MHz, VBW is > 3 x RBW.
- Channel power was recorded.

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- The noise figure was calculated using the following formula:

  Noise Figure (NF) = N – Gain + 174 dB – $10lg_{10}$(B)

  - N = Noise Power Output in dBm/MHz
  - Gain = Gain of the device under test
  - B = Resolution Bandwidth of spectrum analyzer in Hz
  - 174 = Thermal noise for 1 Hz RBW at room temperature

- Both Downlink and Uplink are tested.

2.15.8 Test Results

LTE Band 14 Booster Gain					
Mode	**Bandwidth (MHz)**	**Frequency (MHz)**	**Input Power (dBm)**	**Output Power (dBm/MHz)**	**Gain (dB)**
Downlink	5	763.0	-88.25	10.82	99.07
Uplink	5	793.0	-78.83	21.96	100.79

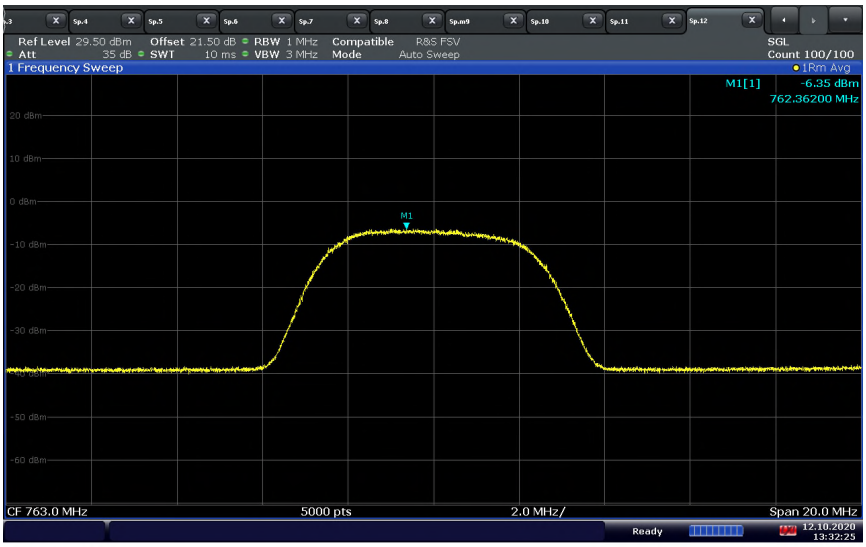
LTE Band 14 Noise Figure							
Mode	**Bandwidth (MHz)**	**Frequency (MHz)**	**RBW (MHz)**	**Noise Output (dBm/MHz)**	**Booster Gain (dB)**	**Noise Figure (dB)**	**Limit (dB)**
Downlink	5	763.0	1	-6.53	99.07	8.58	9
Uplink	5	793.0	1	-7.67	100.80	5.53	9

.

Downlink Noise Figure = N – Gain + 174 dB – $10lg_{10}$(B)
= -6.35 – 99.07 + 174 dB – $10lg_{10}$(B)
= 8.58 dB

Uplink Noise Figure = N – Gain + 174 dB – $10lg_{10}$(B)
= -7.67 – 100.79 + 174 dB – $10lg_{10}$(B)
= 5.54 dB

LTE Band 14 Downlink (5 MHz BW) Middle Channel / Noise Output



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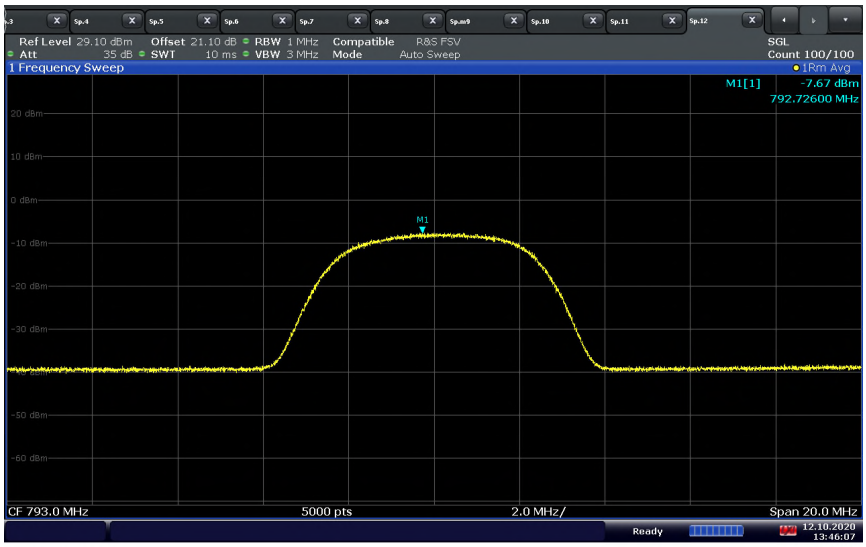
LTE Band 14 Uplink (5 MHz BW) Middle Channel / Noise Output



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2.16 OUT-OF-BAND/OUT-OF-BLOCK (INTERMODULATION) AND SPURIOUS EMISSIONS

2.16.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 90, Clause 90.219(e)(3)
RSS-140 issue 1, Clause 4.4
KDB 935210 D05, Clause 4.7

2.16.2 Standard Applicable

FCC 47 CFR Part 90.219(e):
(3) Spurious emission from a signal booster must not exceed -13 dBm within any 100kHz measureemnt bandwith.

RSS-140, Clause 4.4 Transmitter unwanted emissions limits:
The power of any unwanted emission outside the bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitter output power P in dBW as follows, where p is the transmitter output power in watts:
a. For any frequency between 769-775 MHz and 799-806 MHz:
i 76 + 10 log (p), dB in a 6.25 kHz band for fixed and base station equipment
ii 65 + 10 log (p), dB in a 6.25 kHz band for mobile and portable/hand-held equipment

b For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz: 43 + 10 log (p), dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

In addition, the equivalent isotropically radiated power (e.i.r.p.) of all emissions, including harmonics in the band 1559-1610 MHz, shall not exceed −70 dBW/MHz for wideband emissions, and −80 dBW/kHz for discrete emissions of less than 700 Hz bandwidth.
For LTE Band 41, out-of-Band/Out-of-Block and spurious emissions is tested according to KDB 935210 D05, Clause 3.6.

2.16.3 Equipment Under Test and Modification State

Serial No: NU: 976036000256 and CU: 977036000055 / Test Configuration A and B

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

October 02, 2020 / XYZ

2.16.5 Test Equipment Used

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

2.16.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.5°C
Relative Humidity	30.7%
ATM Pressure	98.7kPa

2.16.7 Additional Observations

- This is a conducted test.
- The path loss or the transducer factor (TDF) from the external attenuators and cables was measured and entered as an offset.
- EUT Downlink transmits on two internal antennas and uplink transmits on two external antennas simultaneously in the same frequency range, i.e. TX MIMO mode. However, there is no much differernce between two antenna ports and the measurement was performed on one antenna port as representative configuration. The limit was adjusted with a correction of -3 dB [10Log(2)] by using Measure and Add 10Log(N) dB technique according to FCC KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from two internal or external antenna ports.
- The signal generator is configured for LTE signal and 5 MHz Bandwidth was tested as representative configuration.
- For spurious emissions, the spectrum analyser was set to peak detector and trace is max hold.
- RBW is 100 kHz, VBW is > 3 x RBW.
- Both Downlink and Uplink are tested.
- Intermodulation-product spurious emission measurements are not required for single-channel boosters that can't accommodate two simultaneous signals within the pass band.

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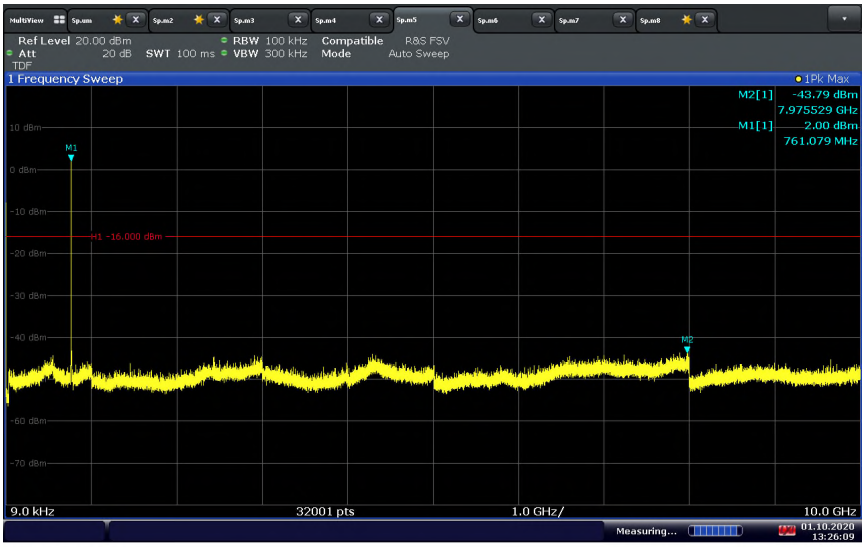
2.16.8 Test Results

LTE Band 14 Downlink (5 MHz BW) Middle Channel / Spurious Emissions



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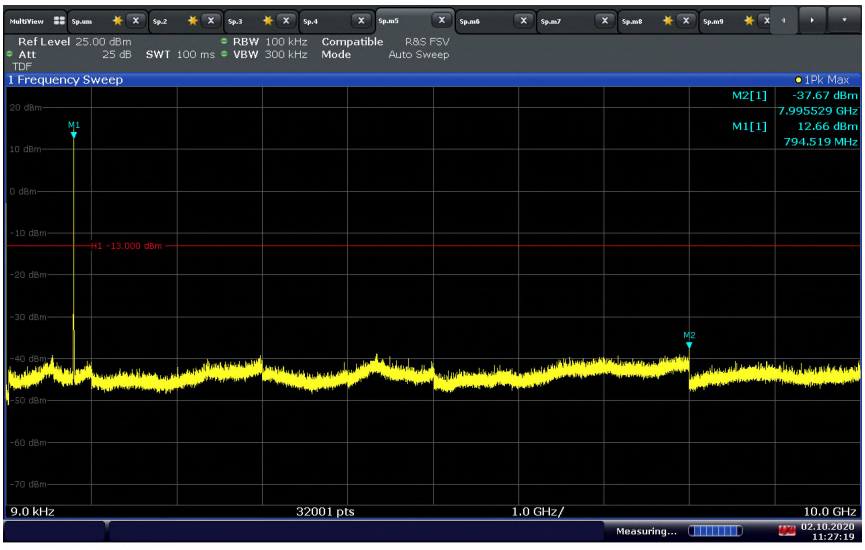
LTE Band 14 Uplink (5 MHz BW) Middle Channel / Spurious Emissions



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The limit should be adjusted with a correction of -3 dB [10Log(2)]
accounting for MIMO transmission on both external antennas
Limit = -13 - 3 = -16 dBm

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SECTION 4

TEST EQUIPMENT USED

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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	08/18/20	08/18/21
50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	50MHz-18GHz Wideband Power Sensor	09/10/20	09/10/21
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	10/10/19	10/10/21
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	01/22/20	01/22/21
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 7608 and 7582	
Radiated Test Setup						
1033	Bilog Antenna	3142C	00044556	EMCO	09/05/19	09/05/21
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	06/22/20	06/22/22
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	02/26/20	02/26/21
1016	Pre-amplifier	PAM-0202	187	A.H. Systems, Inc.	02/26/20	02/26/21
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/11/19	10/11/20*
7620	EMI Test Receiver	ESU	100399	Rhode & Schwarz	10/18/19	10/18/20
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	10/10/19	10/10/21
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	01/22/20	01/22/21
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	Verified by 7608 and 7582	
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	Verified by 7608 and 7582	
AC Conducted Emissions Setup						
7620	EMI Test Receiver	ESU40	100399	Rhode & Schwarz	10/18/19	10/18/20
7567	LISN	FCC-LISN-50-25-2-10	120304	Fisher Custom Comm	01/27/20	01/27/21
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/26/20	02/26/21
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/26/20	02/26/21
Miscellaneous						
6737	Multimeter Digital	87V	36740294	Fluke	08/11/20	08/11/21
7579	Temperature Chamber	115	151617	TestQuity	Verified by 11312	
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Sper Scientific	05/22/20	05/22/21
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

* The equipment was still within calibration when testing.

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	Received sinewave accuracy	0.07	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 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**

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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**		

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SECTION 5

DIAGRAM OF TEST SETUP

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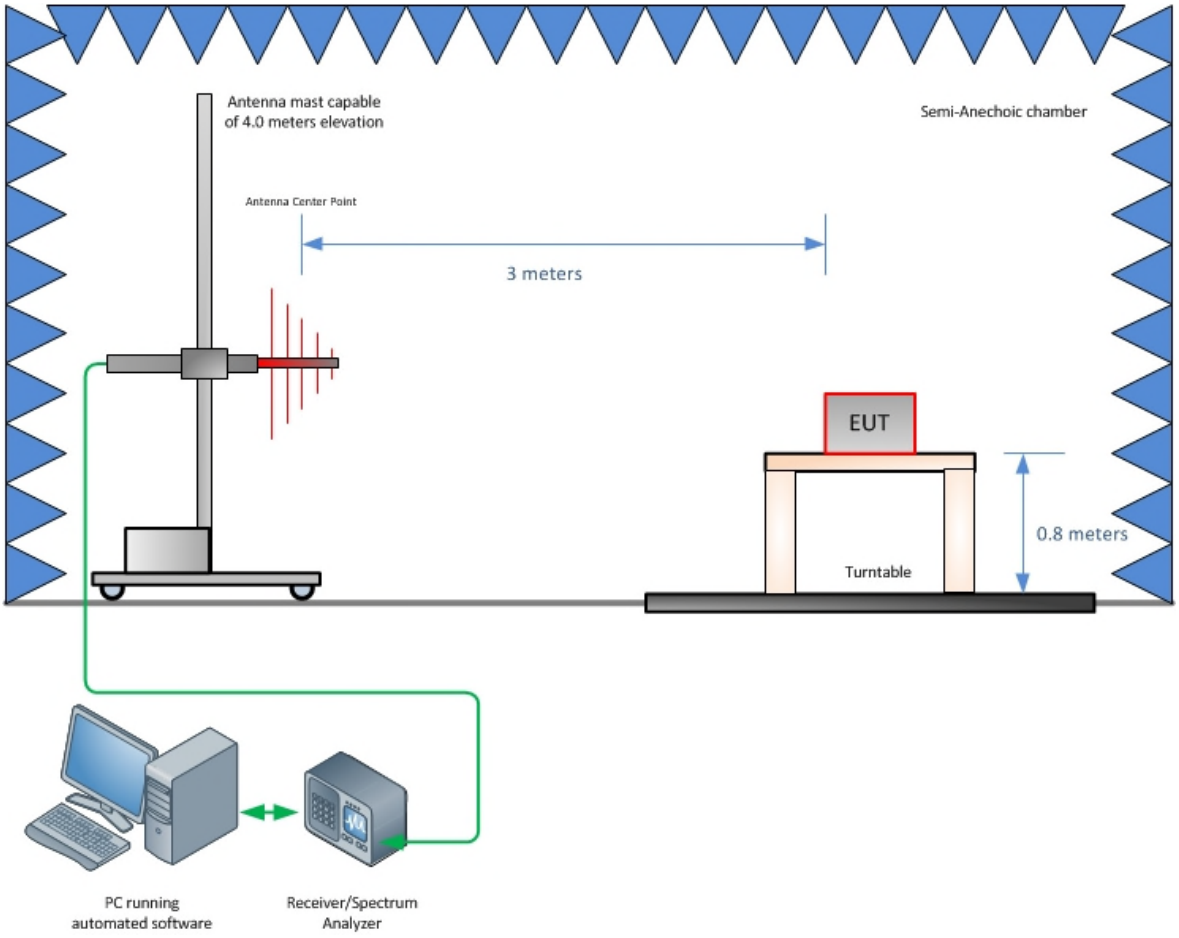
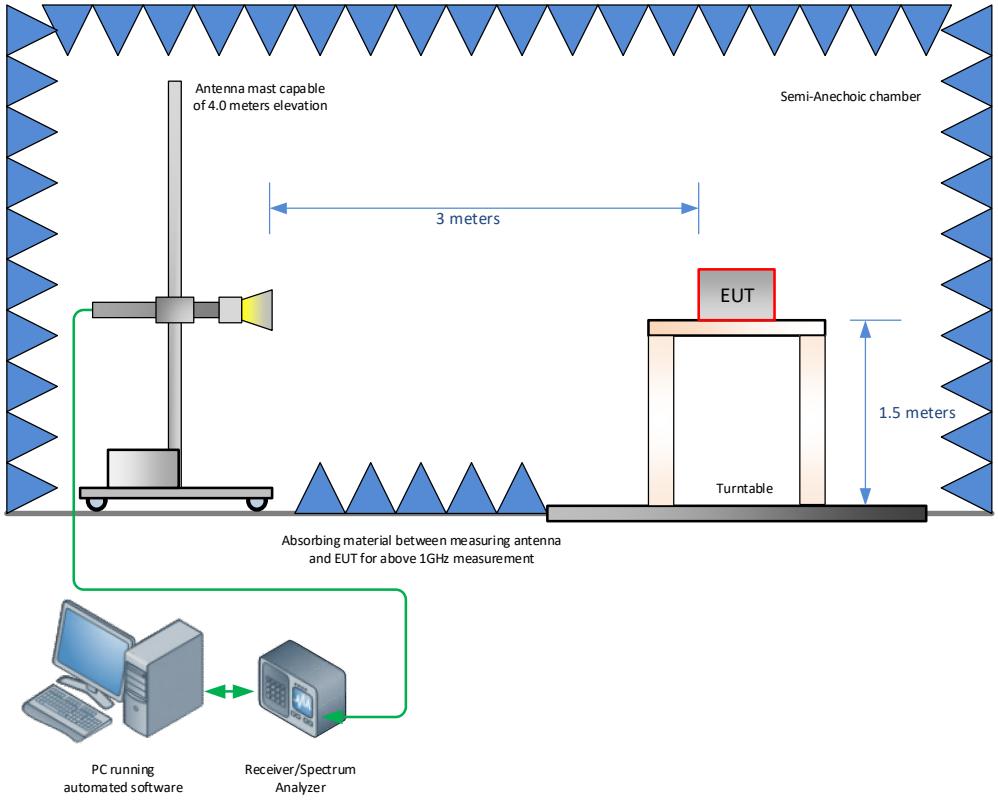
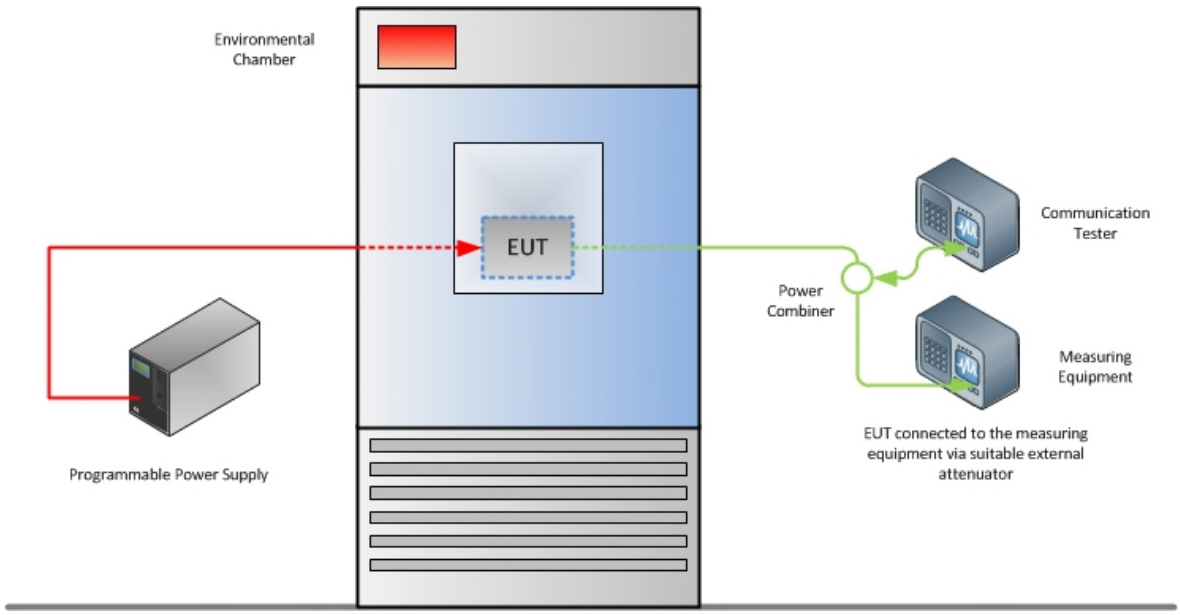
4.1 TEST SETUP DIAGRAM



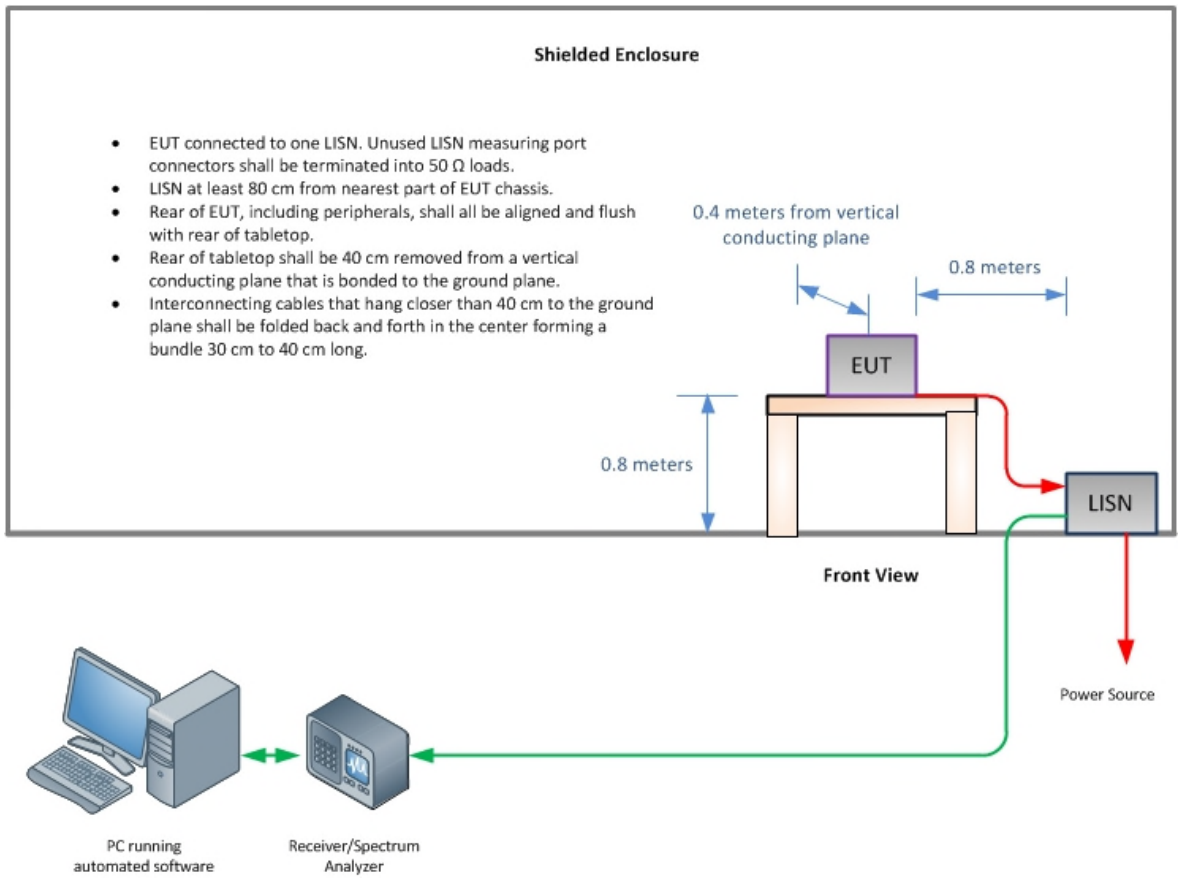
Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Frequency Stability Test Comfiguration



Conducted Emissions Test Configuration (if applicable)

SECTION 6

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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