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Report On

Application for Grant of Equipment Authorization of the
Nextivity Inc.

Cel-Fi GO Cellphone Signal Booster

FCC CFR 47 Part 2, Part 27
IC RSS-Gen and RSS-139

Report No. SD72121023-1016F

March 2017



REPORT ON	EMC Evaluation of the Nextivity Inc. Cel-Fi GO Cellphone Signal Booster
TEST REPORT NUMBER	SD72121023-1016F
TEST REPORT DATE	March 2017
PREPARED FOR	Nextivity Inc. 16550 West Bernardo Drive, Bldg 5, Suite 550, San Diego, CA 92127, USA
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DATED	March 15, 2017



Revision History

SD72121023-1016F Nextivity Inc. M/N G32-2/4/5/12/13 Cel-Fi GO Cellphone Signal Booster					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
03/15/17	Initial Release				Juan M Gonzalez

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Nextivity Inc.
Cel-Fi GO Cellphone Signal Booster



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Nextivity Inc. Cellphone Signal Booster to the requirements of the following:

- FCC CFR 47 Part 2, Part 27
- IC RSS-Gen and RSS-139.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Nextivity Inc.
Model Name	Cel-Fi GO
Model Number(s)	G32-2/4/5/12/13
FCC ID	YETG32-2451213
Serial Number(s)	332633000356, 931703000264 (Fix Unit) and 332633000417 (Mobile Unit)
Number of Samples Tested	3
Test Specification/Issue/Date	• FCC CFR 47 Part 2, Part 27 (October 1, 2016). • RSS-139 - Advanced Wireless Services (AWS) Equipment Operating in the bands 1710-1780 MHz and 2110-2180 MHz (Issue 3, July 2015). • RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 4, November 2014).
Start of Test	December 16, 2016
Finish of Test	February 02, 2017
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	• ANSI/TIA-603-D-2010 – Land Mobile FM or PM – Communications Equipment – Measurement and Performance Standards. • KDB971168 (D01 Power Meas License Digital Systems v02r02) Measurement Guidance For Certification Of Licensed Digital Transmitters • KDB412172 (D01 Determining ERP and EIRP v01r01) Guidelines for Determining the Effective Radiated Power (ERP) and Equivalent Isotropically Radiated Power (EIRP) of a RF Transmitting System. • Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2, Part 27 with cross-reference to the corresponding IC RSS standard is shown below.

Section	Spec Clause			Test Description	Result
	FCC Part 2	FCC Part 27	RSS-139		
2.1	2.1046	27.50 (h)(1)(2)	6.5	Transmitter Conducted Output Power	Compliant
2.2	-	27.50 (h)(1)(2)	6.5	Equivalent Isotropic Radiated Power	Compliant
2.3	2.1049	27.53 (h)	RSS-Gen 6.6	Occupied Bandwidth	Compliant
2.4	-	27.50 (d)(5)	6.5	Peak-Average Ratio	Compliant
2.5	2.1051	27.53 (h)(1),(3)	6.6	Band Edge	Compliant
2.6	2.1051	27.53 (h)(1),(3)	6.6	Conducted Spurious Emissions	Compliant
2.7	2.1053	27.53 (h)(1)	6.6	Field Strength of Spurious Radiation	Compliant
2.8	2.1055	27.54	6.4	Frequency Stability	Compliant
-	-	-	RSS-Gen 7.1	Receiver Spurious Emissions	N/A
2.9	-		RSS-Gen 8.8	Power Line Conducted Emission	Compliant

N/A

Not required as per RSS-Gen 5.3. The EUT however already shows compliance to FCC Subpart B/ICES-003.

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) is a Nextivity Inc. Cel-Fi GO Cellphone Signal Booster. The EUT is a WCDMA/LTE Signal Booster to improve voice and data cellular performance in a variety of mobile (e.g. Vehicle and Marine), Fix (e.g. Home/office and Nomadic), Indoor and Outdoor environments. Both Fix and Mobile Versions are identical except the allowed maximum system gains which are set by firmware during production. The model tested in this report was the Fix sample as the representative unit unless otherwise stated. The unit includes Bluetooth LE connectivity. With the use of Nextivity smartphone application, it allows user to register the product, update software, capture / display details metrics of the system. The LTE Band 4 function of the EUT were verified in this test report.

1.3.2 EUT General Description

EUT Description	Cellphone Signal Booster												
Model Name	Cel-Fi GO												
Model Number(s)	G32-2/4/5/12/13												
Rated Voltage	15V DC via external AC/DC adapter (Fix Unit) 12V DC via CLA (Cigarette Lighter Adaptor) (Mobile Unit)												
Mode Verified	LTE Band 4												
Frequency Bands	Downlink: 2110 - 2155MHz Uplink: 1710 - 1755MHz												
Channel Bandwidth	5MHz, 10MHz, 15MHz and 20MHz												
Rated Power	<table><tr><th rowspan="2">Bandwidth (MHz)</th><th colspan="2">Band 4</th></tr><tr><th>DL (dB)</th><th>UL (dB)</th></tr><tr><td>5</td><td>10.0</td><td rowspan="2">22</td></tr><tr><td>20</td><td>16.0</td></tr></table>			Bandwidth (MHz)	Band 4		DL (dB)	UL (dB)	5	10.0	22	20	16.0
Bandwidth (MHz)	Band 4												
	DL (dB)	UL (dB)											
5	10.0	22											
20	16.0												
Capability	WCDMA (Band 2 and 5), LTE (Band 2, 5, 12, 13 and 4) and BT LE												
Primary Unit (EUT)	☐ Production ☐ Pre-Production ☒ Engineering												
Manufacturer Declared Temperature Range	0°C to 65°C												
Antenna Type	External Antenna												
Manufacturer	N/A												
Antenna Model	N/A												
Maximum Antenna Gain	N/A (Supplied by customer)												

1.3.3 Transmit Frequency Table

Mode	Channel Bandwidth (MHz)	Tx Frequency (MHz)	Emission Designator	EIRP(Part 27)	
				Max. Power (dBm)	Max. Power (W)
LTE Band 4 Downlink	5	2112.5 - 2152.5	4M31F9W	33	2
	10	2115 - 2150	8M86F9W	33	2
	15	2117.5 - 2147.5	13M5F9W	33	2
	20	2120 - 2145	18M0F9W	33	2
LTE Band 4 Uplink	5	1712.5 - 1752.5	4M28F9W	33	2
	10	1715 - 1750	8M80F9W	33	2
	15	1717.5 - 1747.5	13M3F9W	33	2
	20	1720 - 1745	17M7F9W	33	2

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Downlink. Input signal is applied to the antenna port of Donor (NU). Output is monitored from the antenna port of Server (CU).
B	Uplink. Input signal is applied to the antenna port of Server (CU). Output is monitored from the antenna port of Donor (NU).
C	Radiated test setup. Downlink. Input signal is applied to the antenna port of Donor (NU). The antenna port of Server (CU) is terminated with a 50Ω load.
D	Radiated test setup. Uplink. Input signal is applied to the antenna port of Server (CU). The antenna port of Donor (NU) is terminated with a 50Ω load.

1.4.2 EUT Exercise Software

Manufacturer provided a configuration software (ConformanceTest.exe) running from a support laptop where EUT is connected via USB.

1.4.3 Support Equipment and I/O cables

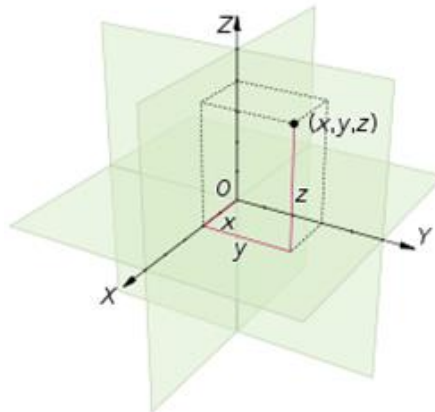
Manufacturer	Equipment/Cable	Description
HON-KWANG	I.T.E Power Supply	Model: HK-AY-150A160-US S/N: GB0000007 Input: 100-240V, 50/60Hz, 0.8A; Output: 15 VDC 1.6A
-	Cigarette Lighter Adaptor (CLA)	Model: 290N035-001 Input: 12.6 – 14.7VDC; Output: 12VDC
Nextivity	Support USB cable	Custom 1.0 meter shielded USB Type A to Type A cable
Nextivity	USB / Interface Box	Unshielded with "Tag-Connect" interface
API Technologies Corp.	DC Block	M/N: 8037
Lenovo	Support Laptop	M/N: 2912-3VU, S/N: R9-92MH0 10/11
Lenovo	Support Laptop AC Adapter	M/N: 42T4430 S/N: 11S42T4430Z1ZGWE27AA9X

1.4.4 Worst Case Configuration

Worst-case configuration used in this test report per Transmitter Conducted Output Power (Section 2.1 of this test report). This is for single channel verification, otherwise all three channels (Low, Mid and High) are verified:

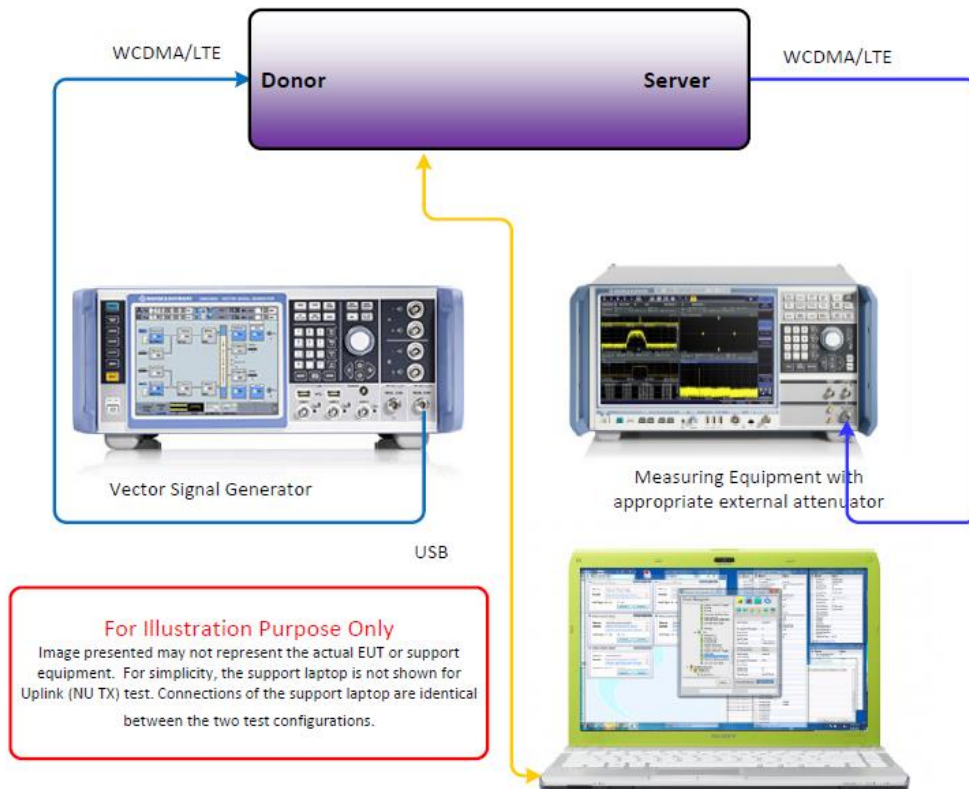
Mode	Bandwidth	Channel No.	Frequency
LTE Band 4 Downlink	20MHz	Top Channel 2300	2145MHz
LTE Band 4 Uplink	15MHz	Middle Channel 20300	1732.5MHz

EUT is a mobile device. Final installation position is unknown at the time of verification. For radiated measurements X, Y and Z orientations were verified. No major variation in emissions observed between the three (3) orientations. Verifications performed using "Y" configuration.

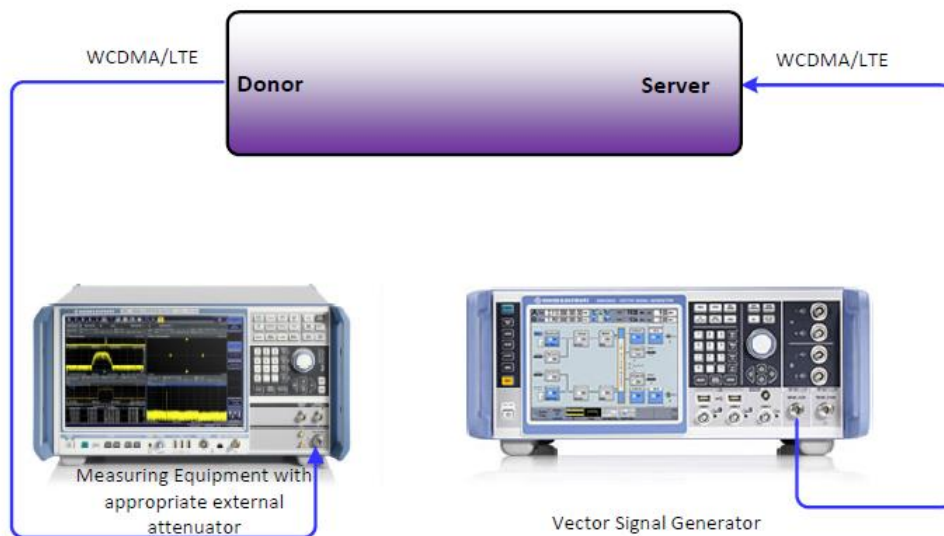


1.4.5 Simplified Test Configuration Diagram

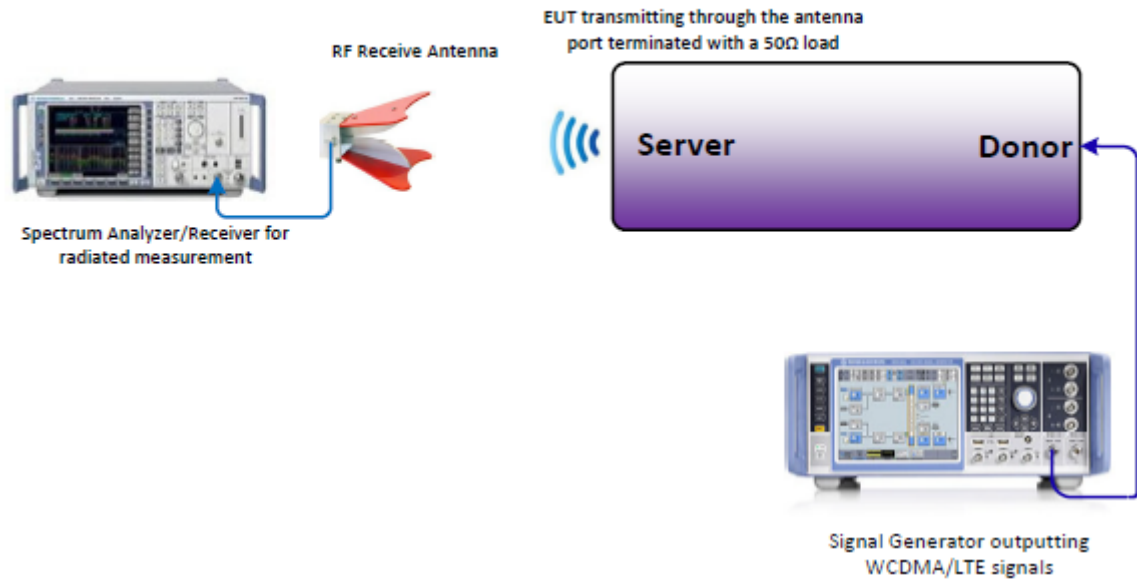
Downlink (Server Port) Conducted Test



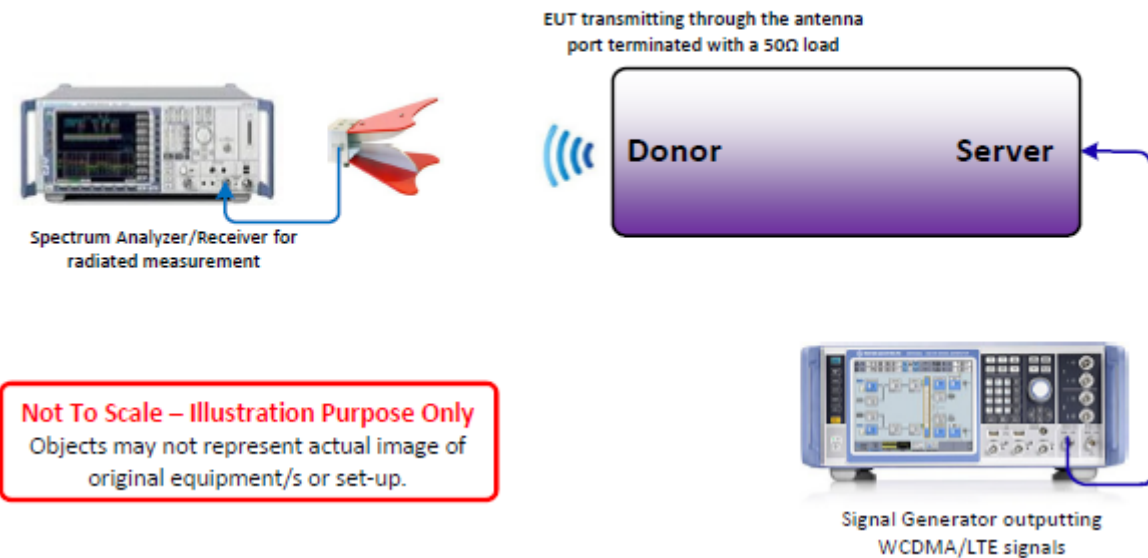
Uplink (Donor Port) Conducted Test



Radiated Testing (Downlink)



Radiated Testing (Uplink)



Not To Scale – Illustration Purpose Only
 Objects may not represent actual image of
 original equipment/s or set-up.

1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number 332633000356 and 931703000264 (Fix Unit) and 332633000417 (Mobile Unit)		
Bias voltage for external antenna use was moved from server (CU) port to donor (NU) port and was changed from 12V to 3.3V.	CK Li	February 01, 2017

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.26 2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

For conducted (if applicable) and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.26-2015. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 678-1400 Fax: 858 546 0364.

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.



1.9.2 Innovation, Science and Economic Development Canada Registration No.: 3067A

The 10m Semi-anechoic chamber of TÜV SÜD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A.

1.10 SAMPLE CALCULATIONS

1.10.1 LTE Emission Designator

Emission Designator = 1M30F9W
 F = Frequency Modulation
 9= Composite Digital Info
 W = Combination (Audio/Data)

1.10.2 Spurious Radiated Emission (below 1GHz)

Measuring equipment raw measurement (dBμV/m) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dBμV/m) @ 30MHz			11.8

1.10.3 Spurious Radiated Emission – Substitution Method

Example = 84dBμV/m @ 1413 MHz (numerical sample only)

The field strength reading of 84dBμV/m @ 1413 MHz (2nd Harmonic of 706.5 MHz) is the maximized measurement when the EUT is on the turntable measured at 3 meters. The gain of the substituted antenna is 7.8dBi while the transmit cable loss is 1.0 dB (cable between signal generator and the substituted antenna). The signal generator level is adjusted until the 84dBμV/m level at the receiving end is replicated (identical test setup, i.e. same antenna, cable/s and preamp). If the adjusted signal generator level is -18dBm, then we have the following for both EIRP and ERP as required:

$$\begin{aligned}
 P_{\text{EIRP}} &= -18 \text{ dBm} + 7.8 \text{ dBi} - 1 \text{ dB} \\
 &= 11.2 \text{ dBm} \\
 P_{\text{ERP}} &= P_{\text{EIRP}} - 2.15 \text{ dB} \\
 &= 11.2 \text{ dBm} - 2.15 \text{ dB} \\
 &= 9.05 \text{ dBm}
 \end{aligned}$$



SECTION 2

TEST DETAILS

Radio Testing of the
Nextivity Inc.
Cel-Fi GO Cellphone Signal Booster



2.1 TRANSMITTER CONDUCTED OUTPUT POWER

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046 (a) and (c)
FCC 47 CFR Part 27, Clause 27.50 (h)(1)(2)
RSS-139, Clause 6.5

2.1.2 Standard Applicable

FCC 47 CFR Part 2, Clause 2.1046:

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

FCC 47 CFR Part 27, Clause 27.50(h):

(1) Main, booster and base stations. (i) The maximum EIRP of a main, booster or base station shall not exceed $33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

2.1.3 Equipment Under Test and Modification State

Serial No: 332633000356 (Fix Unit) / Test Configuration A and B

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

January 16, 2017/XYZ

2.1.5 Test Equipment Used

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

2.1.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature 21.3°C
 Relative Humidity 47.2%
 ATM Pressure 99.0kPa

2.1.7 Additional Observations

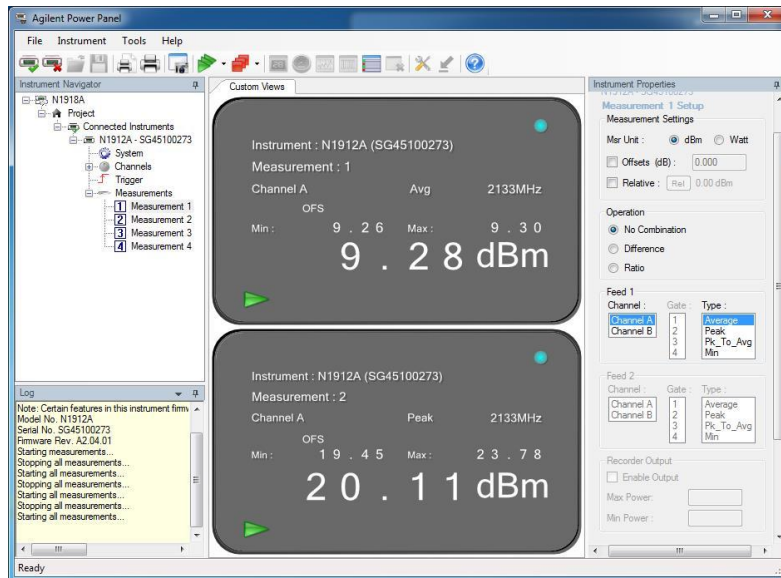
- This is a conducted test using an average power meter.
- The path loss was measured and entered as a level offset.
- Both Peak and Average measurements presented.

2.1.8 Test Results

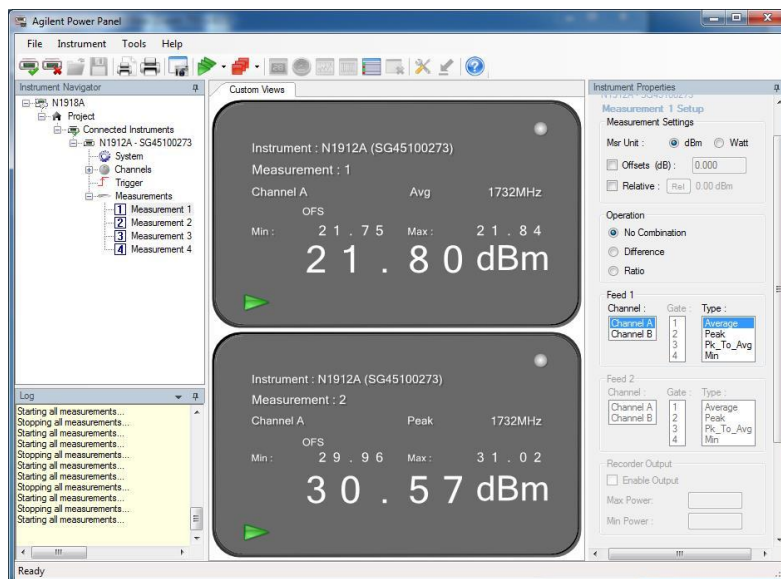
Downlink					
Band	Bandwidth	Channel	Frequency (MHz)	Average Power (dBm)	Peak Power (dBm)
LTE Band 4	5MHz	1975	2112.5	9.53	21.15
		2175	2132.5	9.28	20.11
		2375	2152.5	9.82	20.87
	10MHz	2000	2115	12.03	23.12
		2175	2132.5	11.64	23.36
		2350	2150	12.34	22.76
	15MHz	2025	2117.5	14.41	24.02
		2175	2132.5	14.12	24.51
		2325	2147.5	14.70	23.93
	20MHz	2050	2120	15.59	25.01
		2175	2132.5	15.61	25.24
		2300	2145	15.87	24.20

Uplink					
Band	Bandwidth	Channel	Frequency (MHz)	Average Power (dBm)	Peak Power (dBm)
LTE Band 4	5MHz	19975	1712.5	21.25	30.40
		20175	1732.5	21.80	30.57
		20375	1752.5	21.09	29.99
	10MHz	20000	1715	21.17	30.09
		20175	1732.5	21.18	30.45
		20350	1750	20.48	29.89
	15MHz	20025	1717.5	21.84	30.90
		20175	1732.5	21.99	30.60
		20325	1747.5	21.06	30.69
	20MHz	20050	1720	21.97	31.31
		20175	1732.5	21.96	30.55
		20300	1745	21.19	31.06

2.1.9 Sample Test Plot



LTE Band 4 DL 5MHz Bandwidth Mid Channel



LTE Band 4 UL 5MHz Bandwidth Mid Channel

2.2 EQUIVALENT ISOTROPIC RADIATED POWER

2.2.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.50 (h)(1)(2)
RSS-139, Clause 6.5

2.2.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.50(h):

(1) Main, booster and base stations. (i) The maximum EIRP of a main, booster or base station shall not exceed $33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

2.2.3 Equipment Under Test and Modification State

Serial No: 332633000356 (Fix Unit)

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

January 16, 2017/XYZ

2.2.5 Additional Observations

- EIRP was calculated as per Section 1.3.2 of KDB412172 D01 (Determining ERP and EIRP v01).
- Calculation formula in logarithmic terms:

$$\text{EIRP} = P_T + G_T - L_c$$

Where:

P_T = transmitter conducted output power dBm (Section 2.1 of this test report)

G_T = gain of the transmitting antenna, in dBi (EIRP);

L_c = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

2.2.6 Sample Computation

$$\begin{aligned}\text{ERP} &= P_T + G_T - L_c \\ &= 23.19 \text{ (Average)} + 0.13 \text{ (max. gain)} - 5.28 \text{ (cable loss)} \\ &= 18.04 \text{ dBm}\end{aligned}$$

2.2.7 Test Results

Band 4 Downlink						
Bandwidth	Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)
5.0MHz	1975	2112.5	9.53	<23.47	<33	33
	2175	2132.5	9.28	<23.72	<33	33
	2375	2152.5	9.82	<23.18	<33	33
10MHz	2000	2115	12.03	<20.97	<33	33
	2175	2132.5	11.64	<21.36	<33	33
	2350	2150	12.34	<20.66	<33	33
15MHz	2025	2117.5	14.41	<18.59	<33	33
	2175	2132.5	14.12	<18.88	<33	33
	2325	2147.5	14.70	<18.3	<33	33
20.0MHz	2050	2120	15.59	<17.41	<33	33
	2175	2132.5	15.61	<17.39	<33	33
	2300	2145	15.87	<17.13	<33	33

Band 4 Uplink						
Bandwidth	Channel	Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)
5.0MHz	19975	1712.5	21.25	<11.75	<33	33
	20175	1732.5	21.80	<11.2	<33	33
	20375	1752.5	21.09	<11.91	<33	33
10MHz	20000	1715	21.17	<11.83	<33	33
	20175	1732.5	21.18	<11.82	<33	33
	20350	1750	20.48	<12.52	<33	33
15MHz	20025	1717.5	21.84	<11.16	<33	33
	20175	1732.5	21.99	<11.01	<33	33
	20325	1747.5	21.06	<11.94	<33	33
20.0MHz	20050	1720	21.97	<11.03	<33	33
	20175	1732.5	21.96	<11.04	<33	33
	20300	1745	21.19	<11.81	<33	33

Note: According to the EIRP limit, the External Antenna Gain supplied by customer should be less than 17.13 dBi for Downlink and 11.01 dBi for Uplink.

Please refer to section 2.4.8 in test Report SD72121023-1016G Nextivity FCC IC Part 20 B2 B5 B12 B13 and B4 Test Report.pdf for maximum antenna Gain.

2.3 OCCUPIED BANDWIDTH

2.3.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049
FCC 47 CFR Part 27, Clause 27.53(h)
RSS-GEN Issue 4, Clause 6.6

2.3.2 Standard Applicable

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

2.3.1 Equipment Under Test and Modification State

Serial No: 332633000356 (Fix Unit) / Test Configuration A and B

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

January 16, 2017/XYZ

2.3.3 Test Equipment Used

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

2.3.4 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	21.3°C
Relative Humidity	47.2%
ATM Pressure	99.0kPa

2.3.5 Additional Observations

- This is a conducted test. Both 26dB bandwidth and 99% bandwidth presented.
- All channels for emission bandwidth verification verified.
- The span is between two and five times the anticipated OBW.
- The RBW is set to 1% of the OBW while the VBW is $\geq 3X$ RBW.
- The detector is peak and the trace mode is max hold.
- All low, middle and high channels were verified. Only test plots for middle channel presented in this test report as the representative configuration.
- The SA built-in emission bandwidth measurement feature is utilized. The power level setting is set to 99% while "x dB" is set to -26.

2.3.6 Test Results

<i>Downlink</i>					
Band	Bandwidth	Channel	Frequency (MHz)	OBW (MHz)	-26dB BW (MHz)
LTE Band 4	5MHz	1975	2112.5	4.28	4.75
		2175	2132.5	4.31	4.75
		2375	2152.5	4.28	4.72
	10MHz	2000	2115	8.86	9.49
		2175	2132.5	8.86	9.61
		2350	2150	8.86	9.44
	15MHz	2025	2117.5	13.37	14.41
		2175	2132.5	13.46	14.50
		2325	2147.5	13.29	14.41
	20MHz	2050	2120	17.83	19.45
		2175	2132.5	17.95	19.68
		2300	2145	17.83	19.57

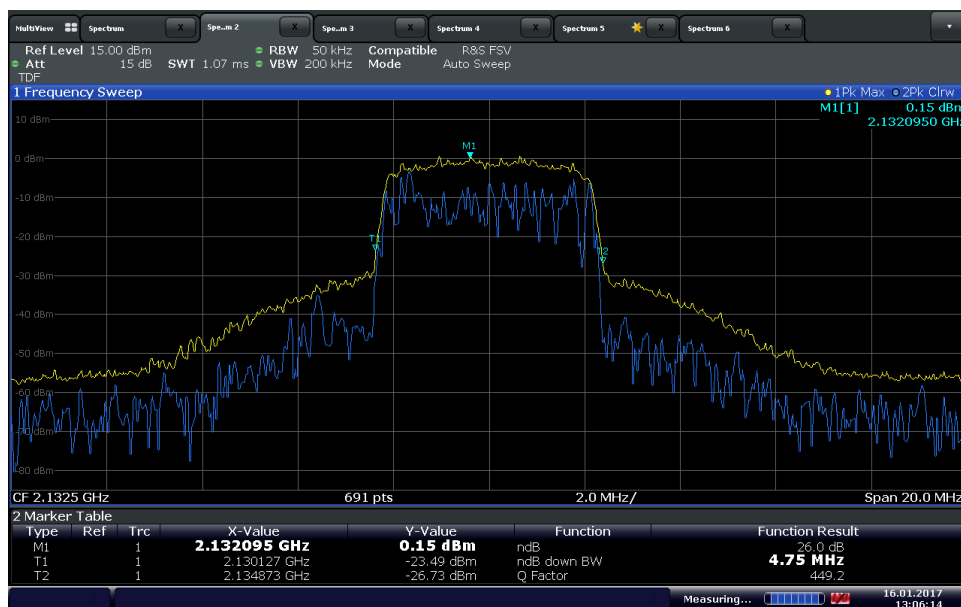
<i>Uplink</i>					
Band	Bandwidth	Channel	Frequency (MHz)	OBW (MHz)	-26dB BW (MHz)
LTE Band 4	5MHz	19975	1712.5	4.28	4.75
		20175	1732.5	4.28	4.72
		20375	1752.5	4.28	4.72
	10MHz	20000	1715	8.80	9.38
		20175	1732.5	8.80	9.38
		20350	1750	8.80	9.38
	15MHz	20025	1717.5	13.29	14.24
		20175	1732.5	13.29	14.33
		20325	1747.5	13.29	14.33
	20MHz	20050	1720	17.71	18.87
		20175	1732.5	17.71	18.64
		20300	1745	17.71	18.87

LTE Band 4 Downlink 5MHz Bandwidth Mid Channel 99% OBW



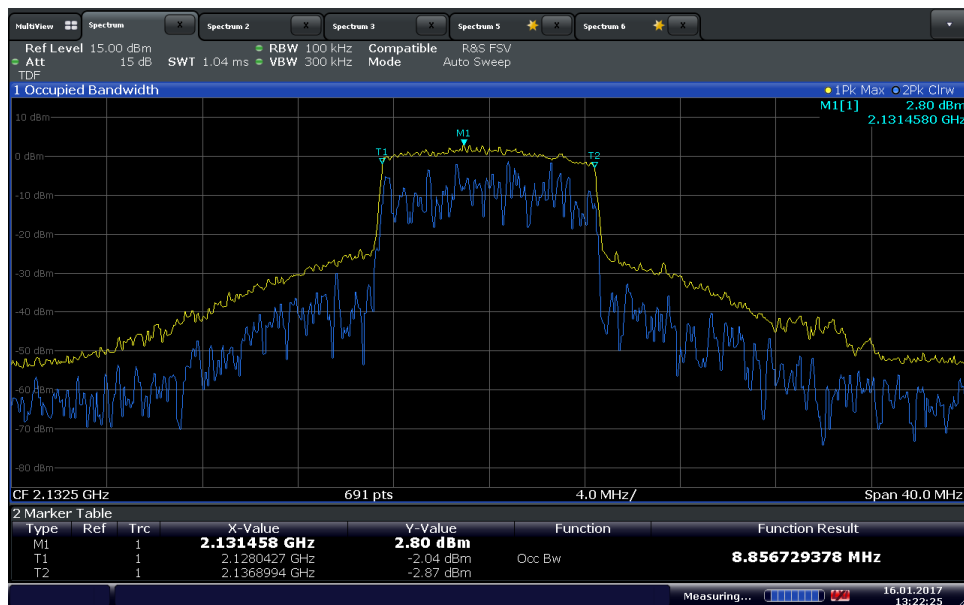
Date: 16. JAN.2017 13:05:52

LTE Band 4 Downlink 5MHz Bandwidth Mid Channel -26dB BW



Date: 16. JAN.2017 13:06:14

LTE Band 4 Downlink 10MHz Bandwidth Mid Channel 99% OBW



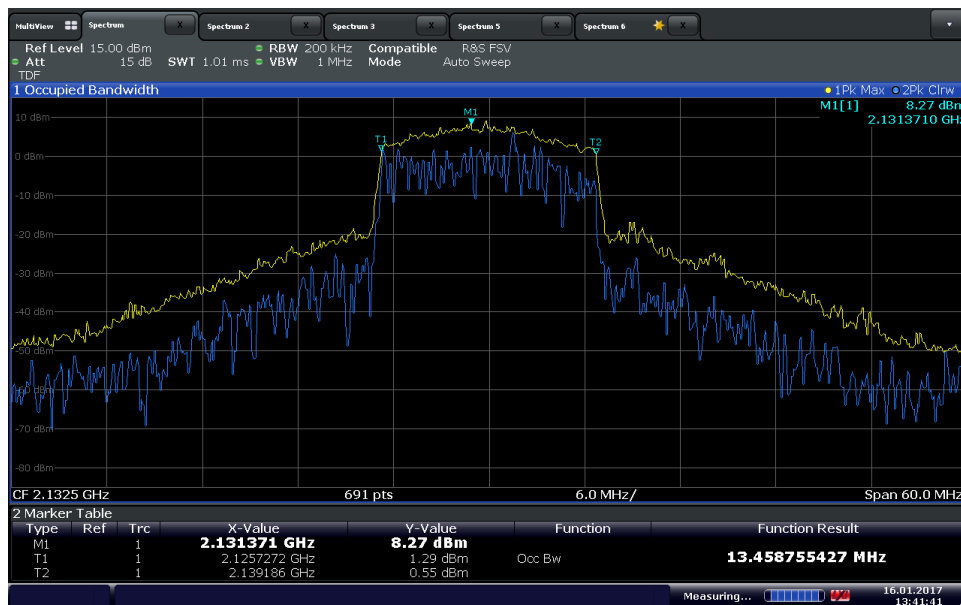
Date: 16 JAN 2017 13:22:25

LTE Band 4 Downlink 10MHz Bandwidth Mid Channel -26dB BW



Date: 16 JAN 2017 13:22:49

LTE Band 4 Downlink 15MHz Bandwidth Mid Channel 99% OBW



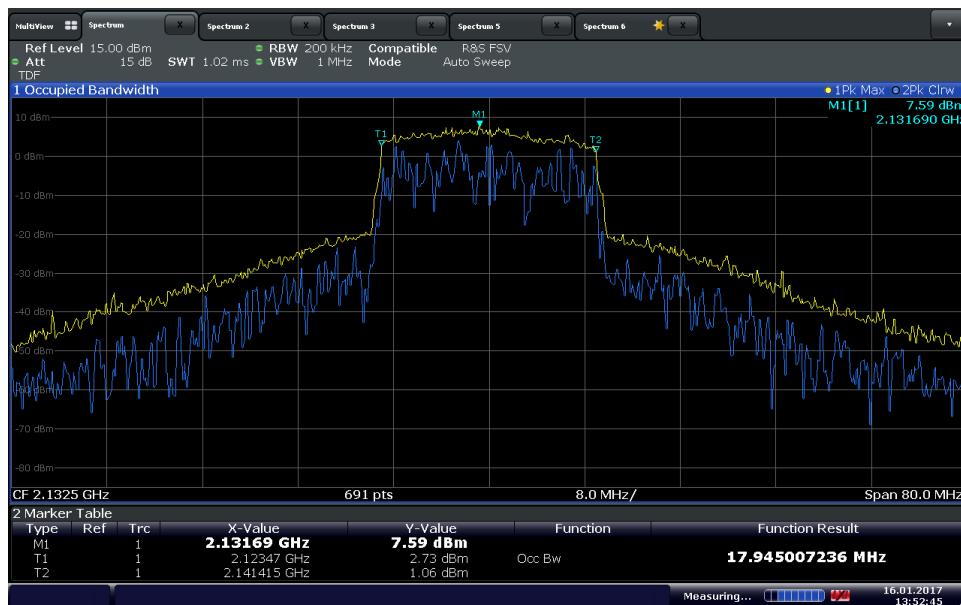
Date: 16. JAN.2017 13:41:40

LTE Band 4 Downlink 15MHz Bandwidth Mid Channel -26dB BW



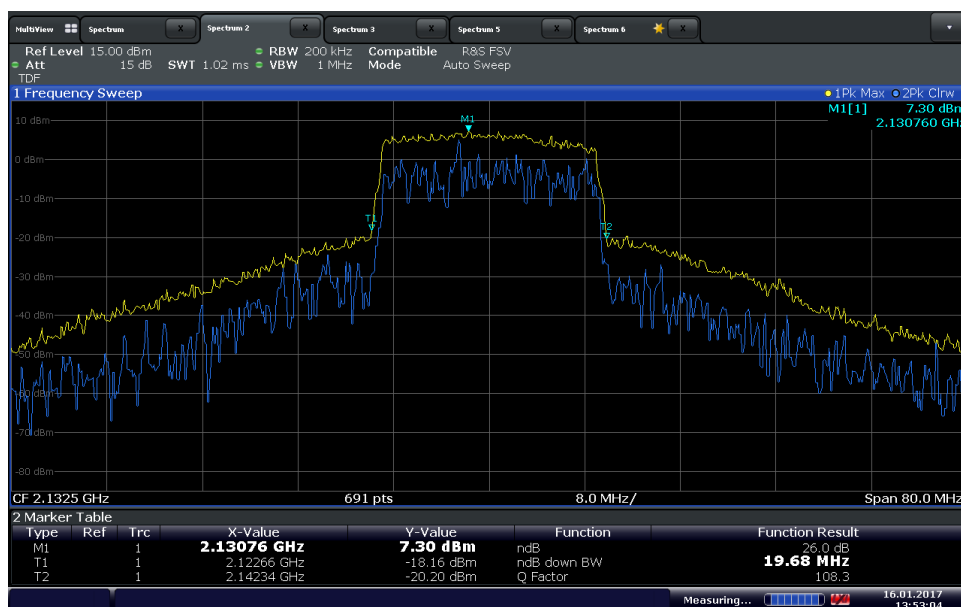
Date: 16. JAN.2017 13:42:01

LTE Band 4 Downlink 20MHz Bandwidth Mid Channel 99% OBW



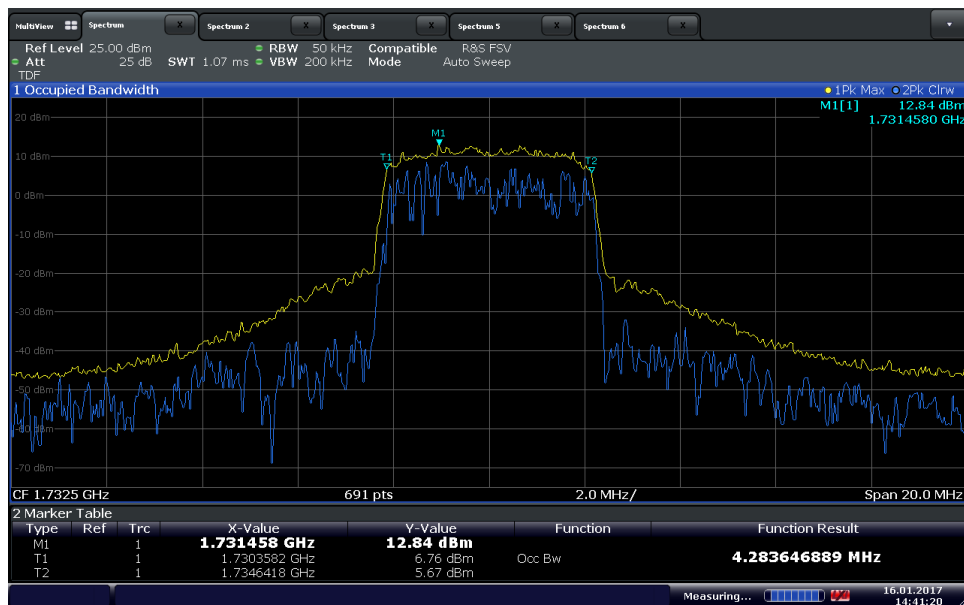
Date: 16 JAN 2017 13:52:44

LTE Band 4 Downlink 20MHz Bandwidth Mid Channel -26dB BW



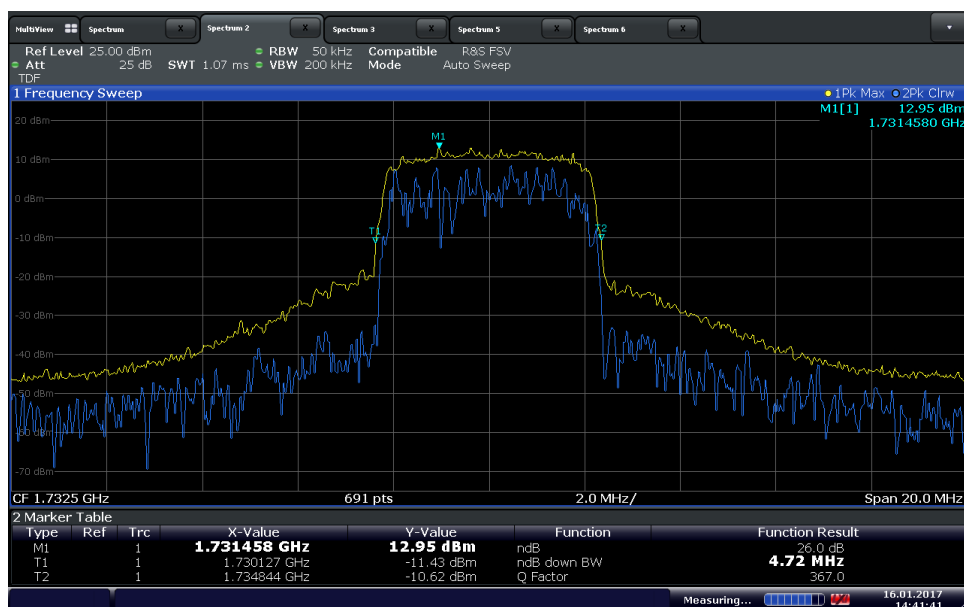
Date: 16 JAN 2017 13:53:04

LTE Band 4 Uplink 5MHz Bandwidth Mid Channel 99% OBW



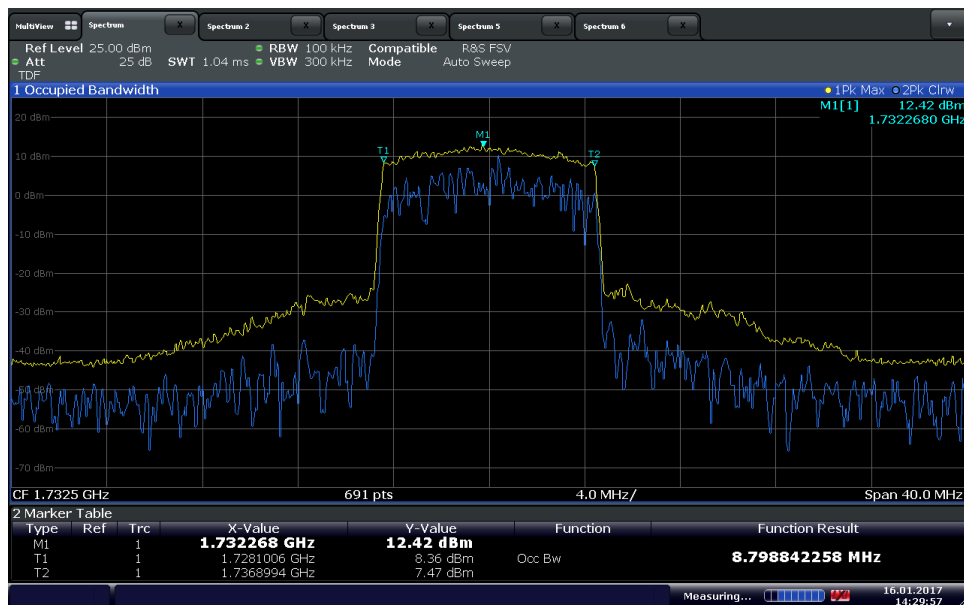
Date: 16 JAN 2017 14:41:20

LTE Band 4 Uplink 5MHz Bandwidth Mid Channel -26dB BW



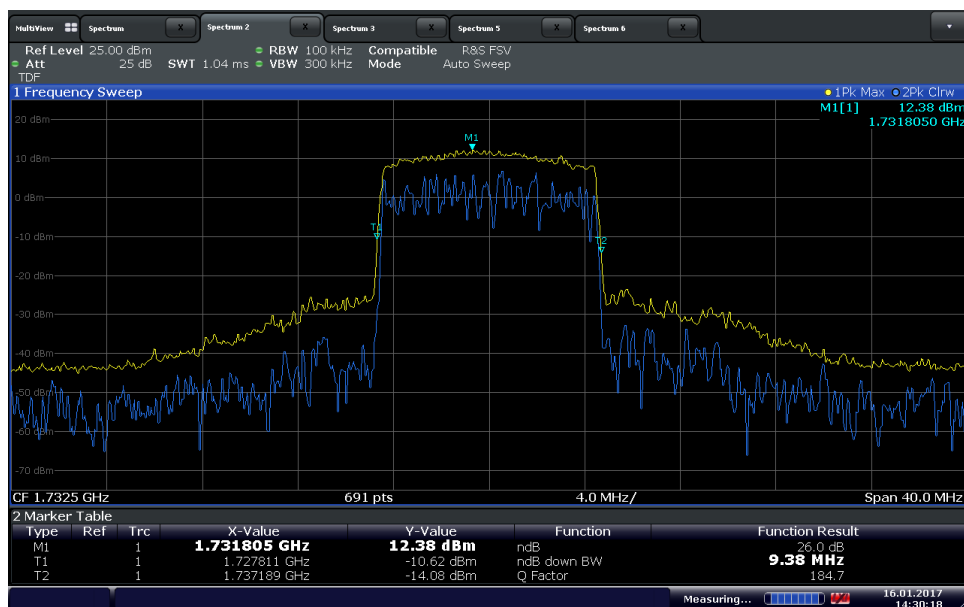
Date: 16 JAN 2017 14:41:42

LTE Band 4 Uplink 10MHz Bandwidth Mid Channel 99% OBW



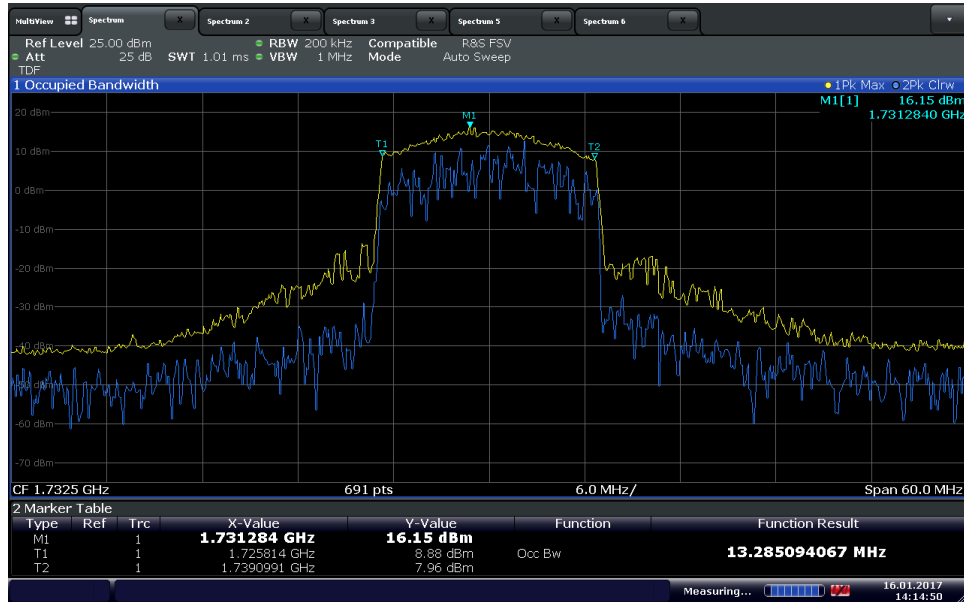
Date: 16 JAN 2017 14:29:56

LTE Band 4 Uplink 10MHz Bandwidth Mid Channel -26dB BW



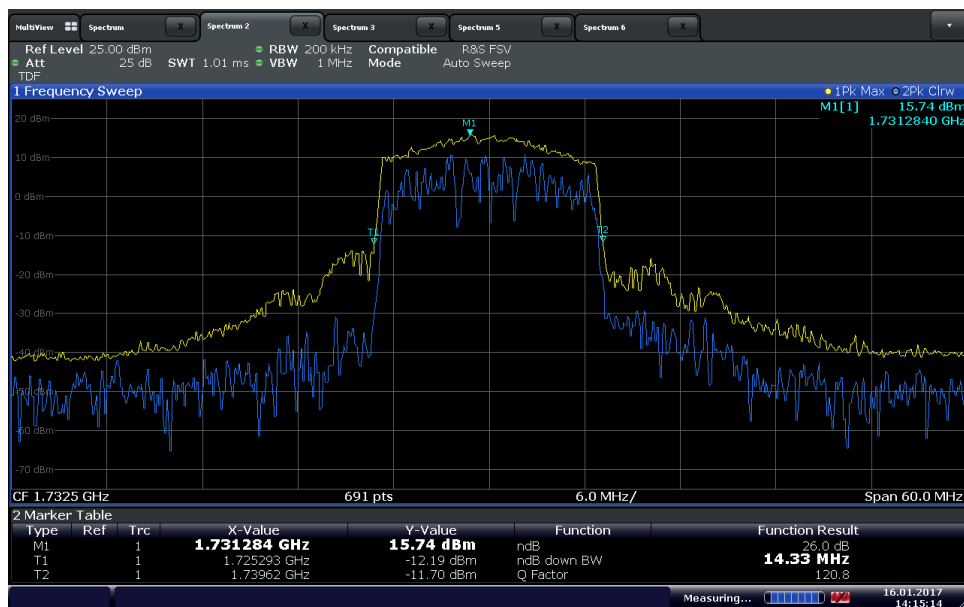
Date: 16 JAN 2017 14:30:18

LTE Band 4 Uplink 15MHz Bandwidth Mid Channel 99% OBW



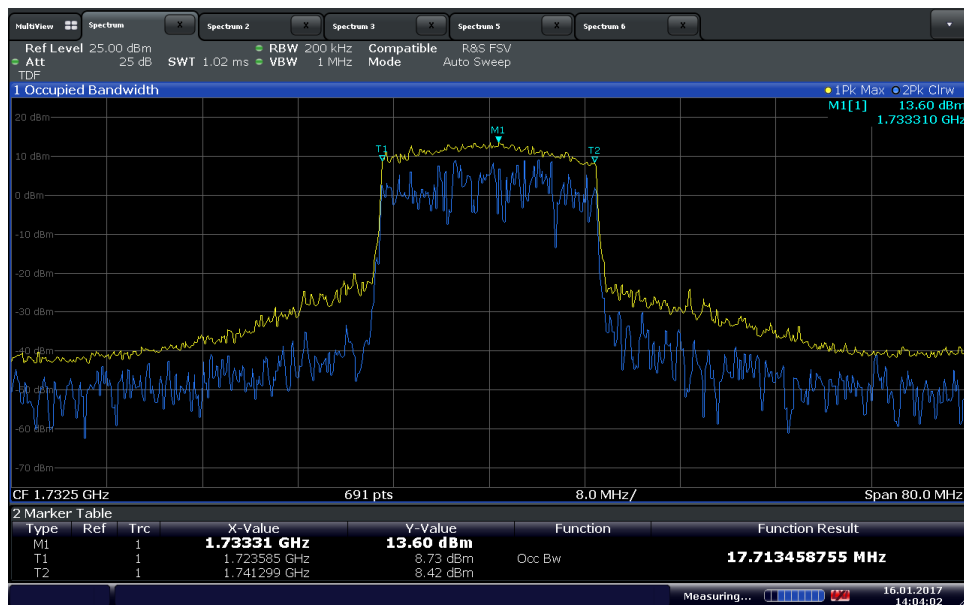
Date: 16 JAN 2017 14:14:50

LTE Band 4 Uplink 15MHz Bandwidth Mid Channel -26dB BW



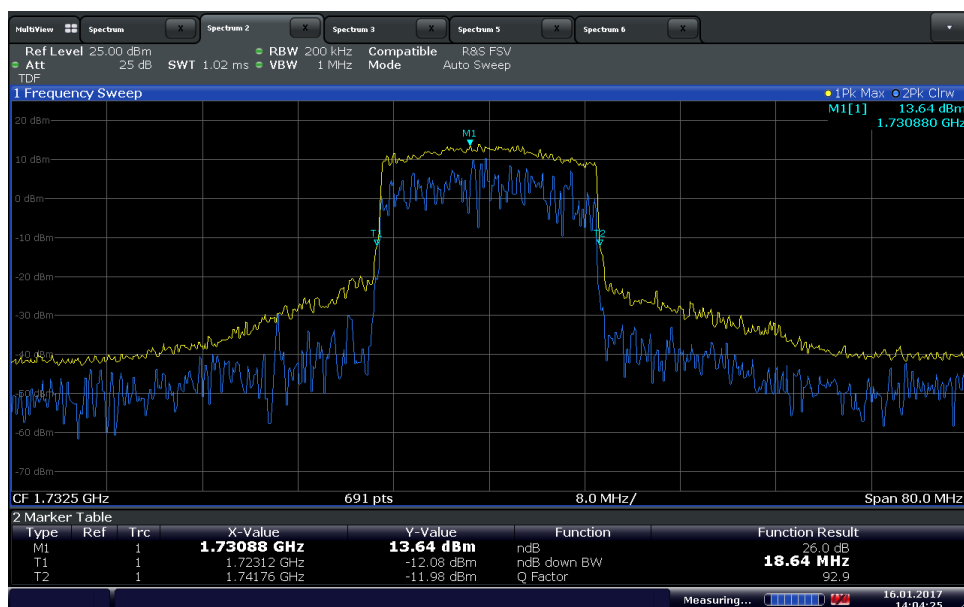
Date: 16 JAN 2017 14:15:15

LTE Band 4 Uplink 20MHz Bandwidth Mid Channel 99% OBW



Date: 16 JAN 2017 14:04:02

LTE Band 4 Uplink 20MHz Bandwidth Mid Channel -26dB BW



Date: 16 JAN 2017 14:04:25

2.4 PEAK-AVERAGE RATIO

2.4.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.50(d)(5)
RSS-139, Clause 6.5

2.4.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.50 (d):

(5) Equipment employed must be authorized in accordance with the provisions of § 24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

RSS-139, Clause 6.5:

The peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

2.4.1 Equipment Under Test and Modification State

Serial No: 332633000356 (Fix Unit) / Test Configuration A and B

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

January 16, 2017/XYZ

2.4.3 Test Equipment Used

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

2.4.4 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	22.3°C
Relative Humidity	47.2%
ATM Pressure	99.0kPa

2.4.5 Additional Observations

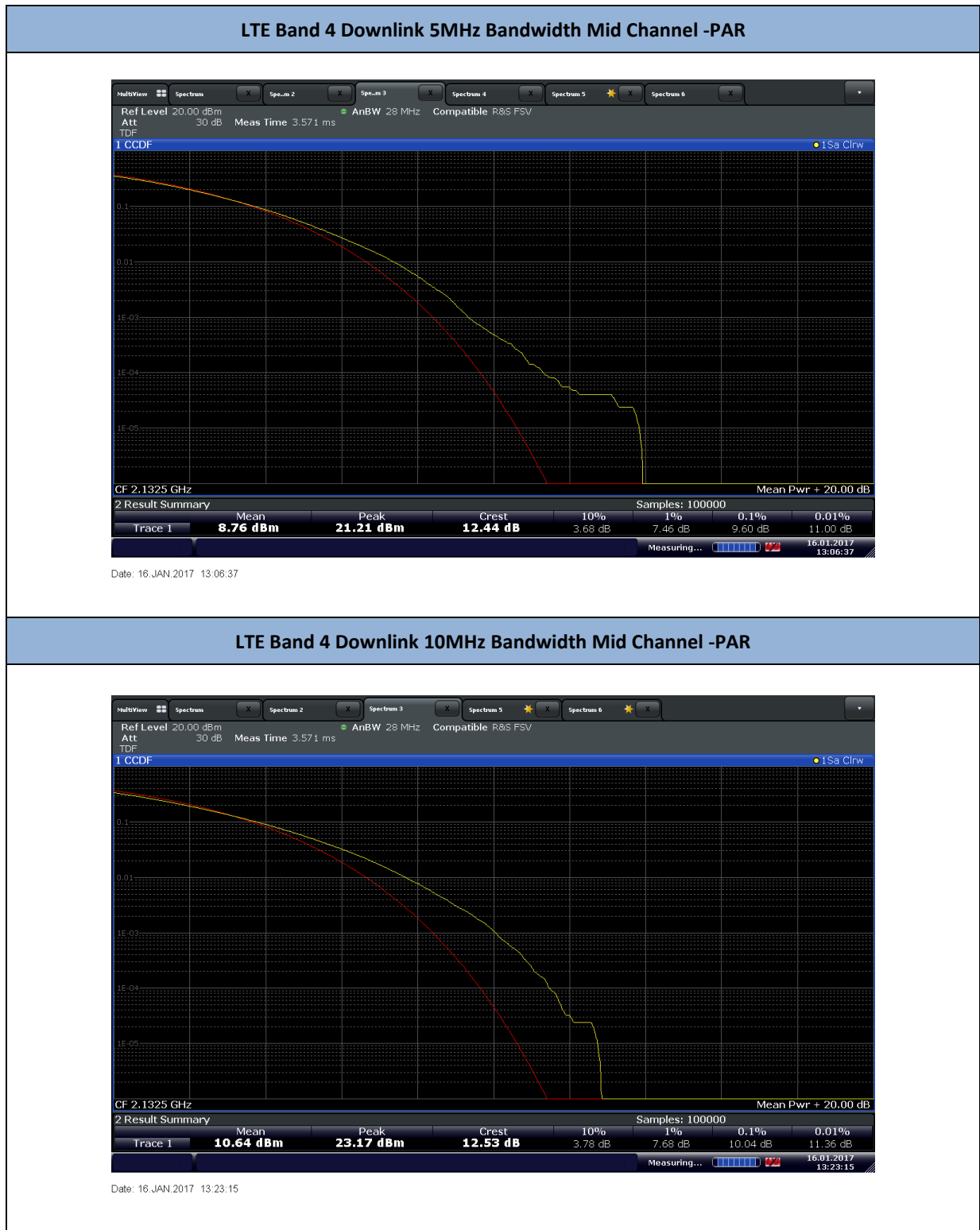
- Test procedure is per Section 5.7 of KDB971168 (D01 Power Meas License Digital Systems v02r02).
- The path loss was measured and entered as a level offset.
- Measurement was done using the Spectrum Analyzer's Complementary Cumulative Distribution Function (CCDF) measurement profile. The built-in function is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth (crest factor or peak-to-average ratio) The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signals spends at or above the level defines the probability for that particular power level.
- RBW was set to maximum the SA can support.
- The maximum PAPR level associated with a probability of 0.1% was recorded.
- All low, middle and high channels were verified. Only test plots for middle channel presented in this test report as the representative configuration.
- There are no measured PAR levels greater than 13dB. EUT complies.

2.4.6 Test Results

<i>Downlink</i>				
Band	Bandwidth	Channel	Frequency (MHz)	PAR (dB)
LTE Band 4	5MHz	1975	2112.5	11.84
		2175	2132.5	12.44
		2375	2152.5	12.68
	10MHz	2000	2115	11.05
		2175	2132.5	12.53
		2350	2150	11.00
	15MHz	2025	2117.5	10.06
		2175	2132.5	11.40
		2325	2147.5	10.20
	20MHz	2050	2120	9.70
		2175	2132.5	10.23
		2300	2145	8.68

<i>Uplink</i>				
Band	Bandwidth	Channel	Frequency (MHz)	PAR (dB)
LTE Band 4	5MHz	19975	1712.5	9.06
		20175	1732.5	9.11
		20375	1752.5	8.89
	10MHz	20000	1715	9.31
		20175	1732.5	9.23
		20350	1750	10.06
	15MHz	20025	1717.5	8.98
		20175	1732.5	9.04
		20325	1747.5	9.77
	20MHz	20050	1720	9.52
		20175	1732.5	9.38
		20300	1745	9.96

2.4.7 Sample Test Plot



LTE Band 4 Downlink 15MHz Bandwidth Mid Channel -PAR



Date: 16. JAN. 2017 13:42:21

LTE Band 4 Downlink 20MHz Bandwidth Mid Channel -PAR



Date: 16. JAN. 2017 13:53:22

LTE Band 4 Uplink 5MHz Bandwidth Mid Channel -PAR



Date: 16.JAN.2017 14:42:00

LTE Band 4 Uplink 10MHz Bandwidth Mid Channel -PAR



Date: 16.JAN.2017 14:31:29

LTE Band 4 Uplink 15MHz Bandwidth Mid Channel -PAR



Date: 16.JAN.2017 14:15:58

LTE Band 4 Uplink 20MHz Bandwidth Mid Channel -PAR



Date: 16.JAN.2017 14:04:49

2.5 BAND EDGE

2.5.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.53 (h)(1),(3)
RSS-139, Clause 6.6

2.5.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.53 (h):

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

RSS-139, Clause 6.6:

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

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

2.5.1 Equipment Under Test and Modification State

Serial No: 332633000356 (Fix Unit) / Test Configuration A and B

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

January 16, 2017/XYZ

2.5.3 Test Equipment Used

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

2.5.4 Environmental Conditions/ Test Location

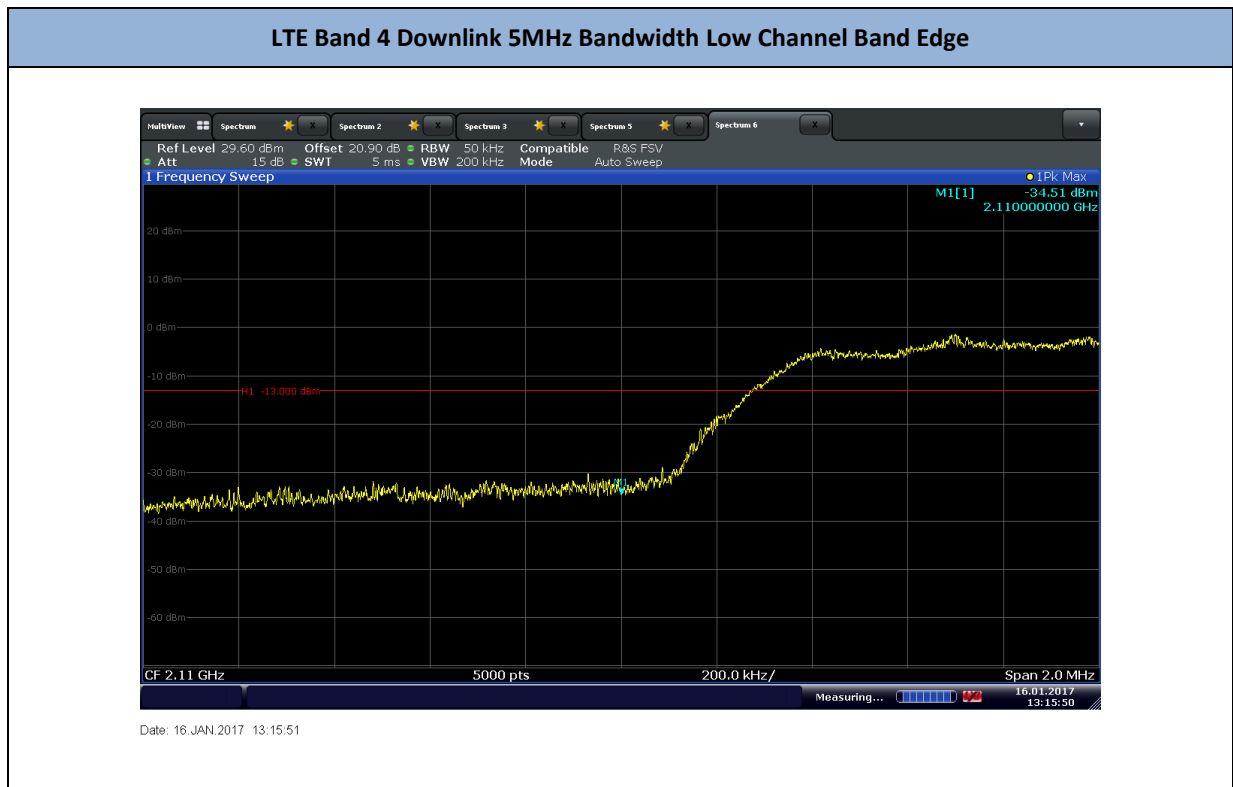
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	21.3°C
Relative Humidity	47.2%
ATM Pressure	99.0kPa

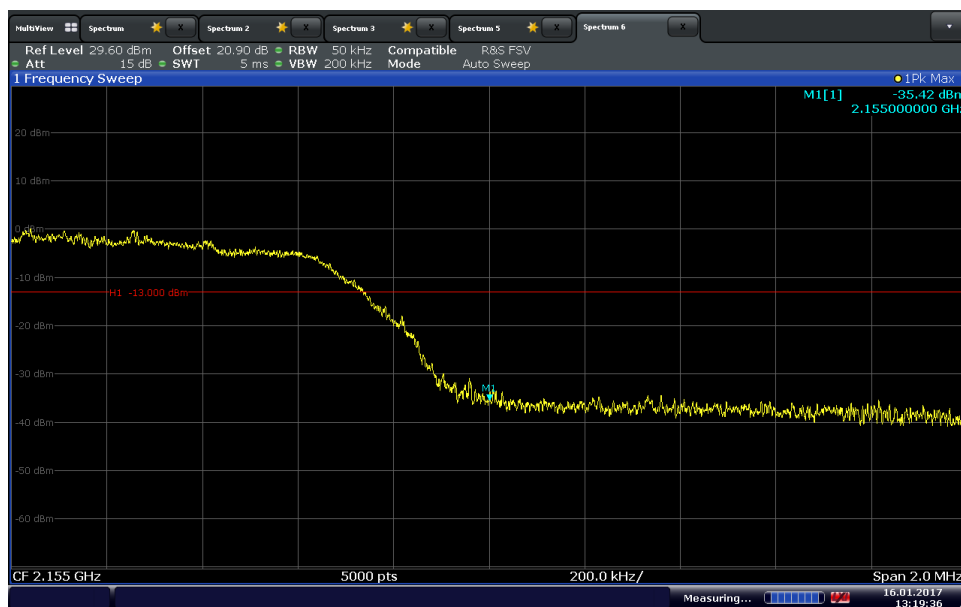
2.5.5 Additional Observations

- This is a conducted test.
- Test guidance is per Section 6 of KDB971168 (D01 Power Meas License Digital Systems v02r02).
- The path loss was measured and entered as a level offset.
- For band edge measurements, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter was employed.
- The limit is set to -13dBm.

2.5.6 Test Results

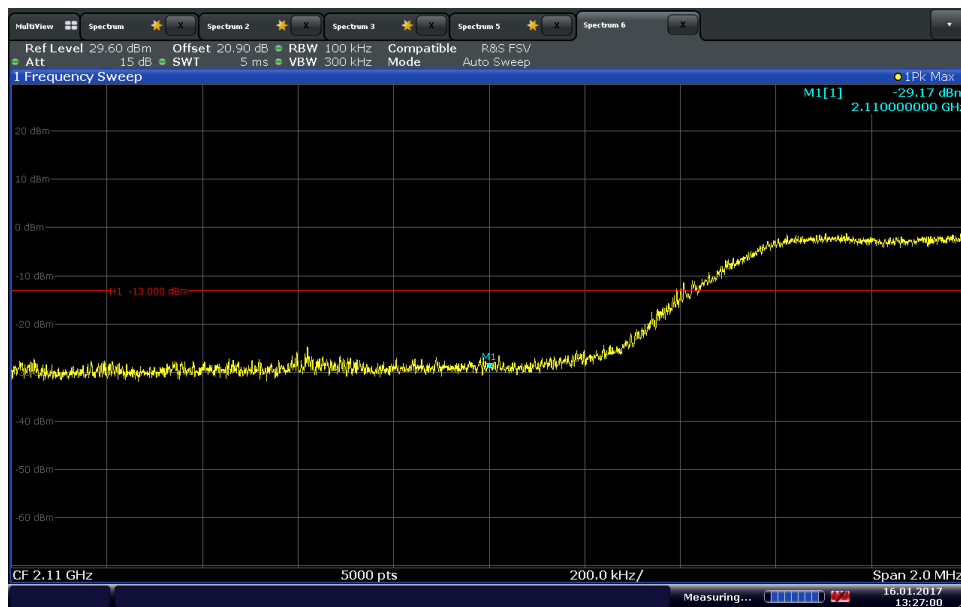


LTE Band 4 Downlink 5MHz Bandwidth High Channel Band Edge



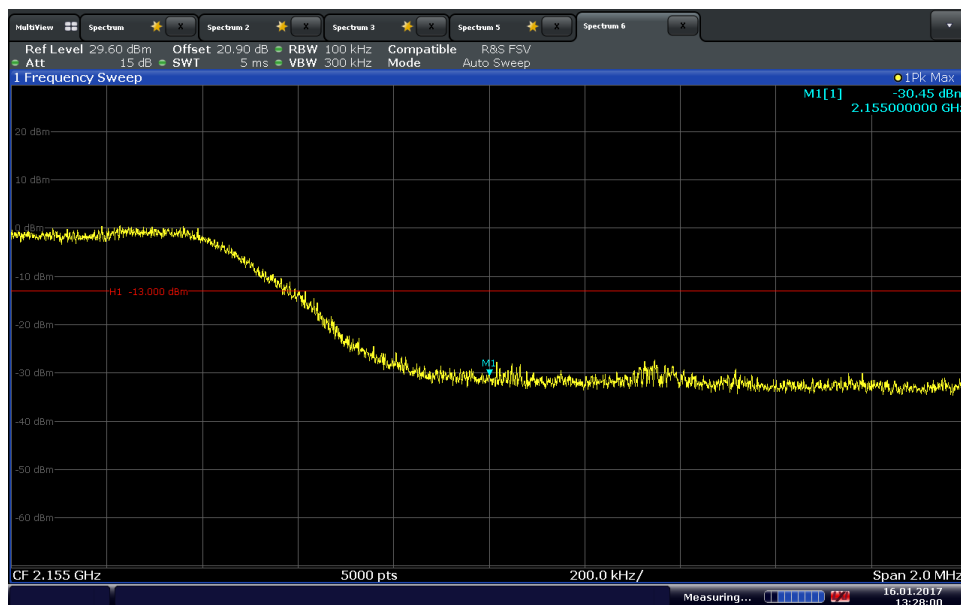
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LTE Band 4 Downlink 10MHz Bandwidth Low Channel Band Edge

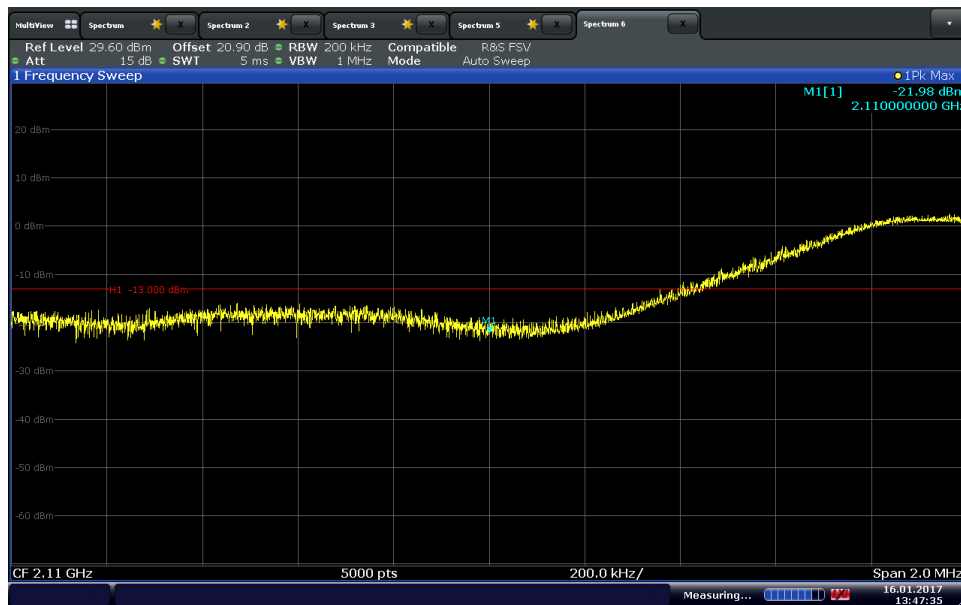


Date: 16.JAN.2017 13:27:00

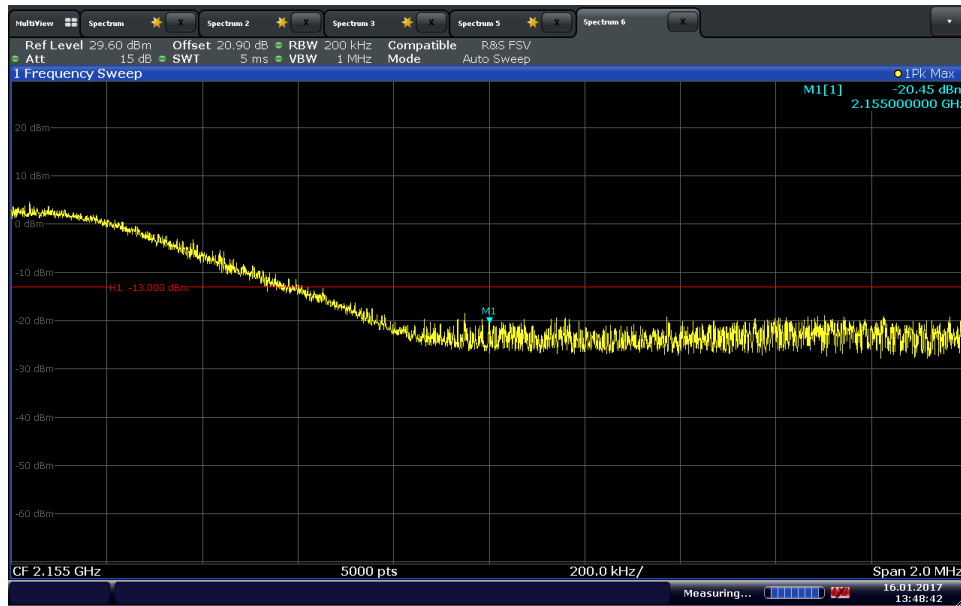
LTE Band 4 Downlink 10MHz Bandwidth High Channel Band Edge



LTE Band 4 Downlink 15MHz Bandwidth Low Channel Band Edge

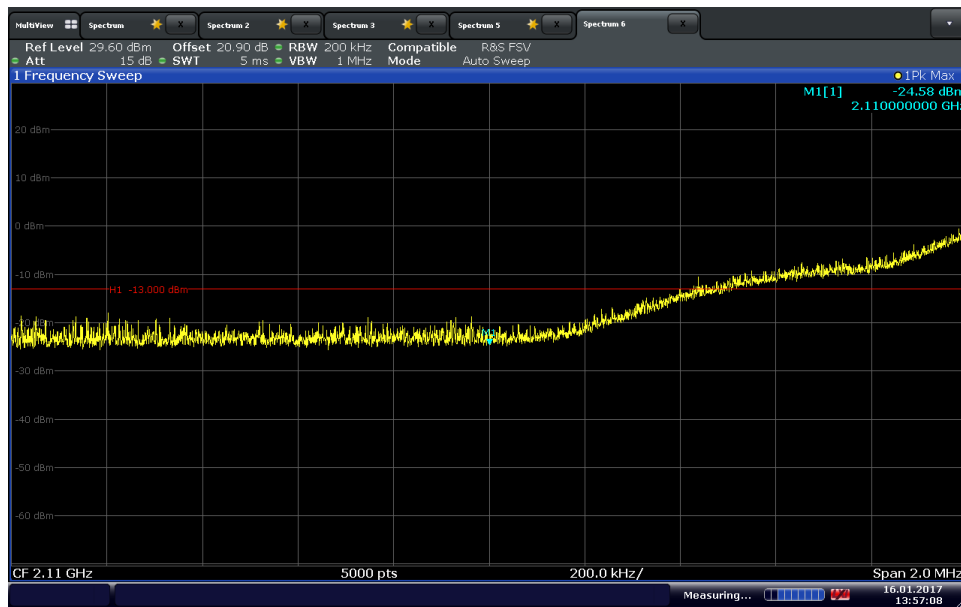


LTE Band 4 Downlink 15MHz Bandwidth High Channel Band Edge



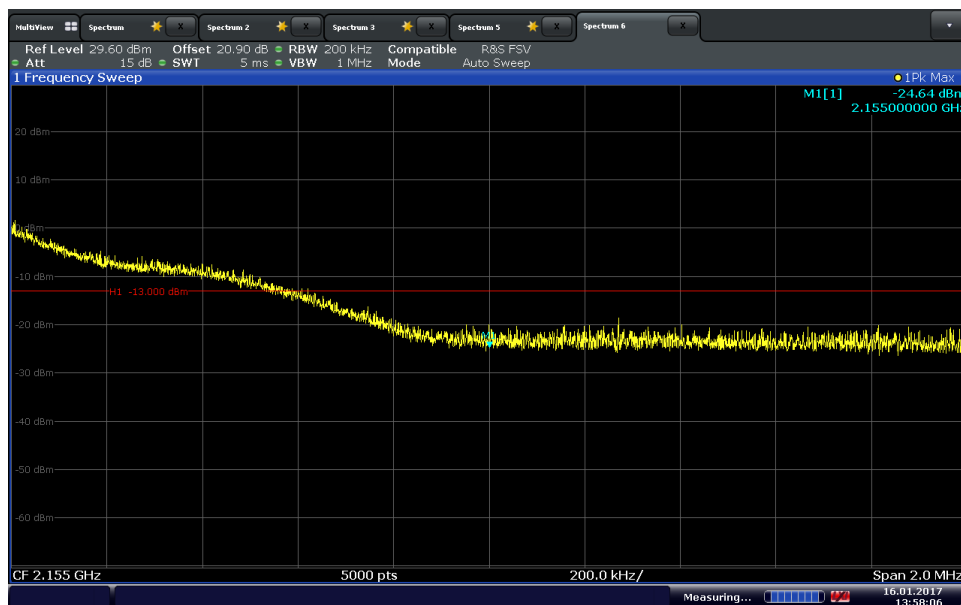
Date: 16.JAN.2017 13:48:42

LTE Band 4 Downlink 20MHz Bandwidth Low Channel Band Edge



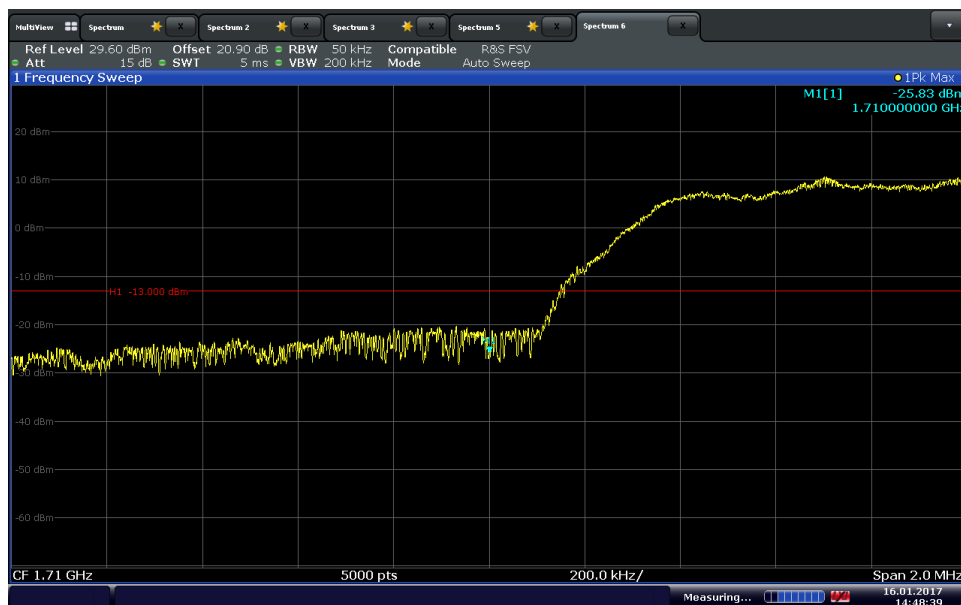
Date: 16.JAN.2017 13:57:09

LTE Band 4 Downlink 20MHz Bandwidth High Channel Band Edge



Date: 16.JAN.2017 13:58:06

LTE Band 4 Uplink 5MHz Bandwidth Low Channel Band Edge



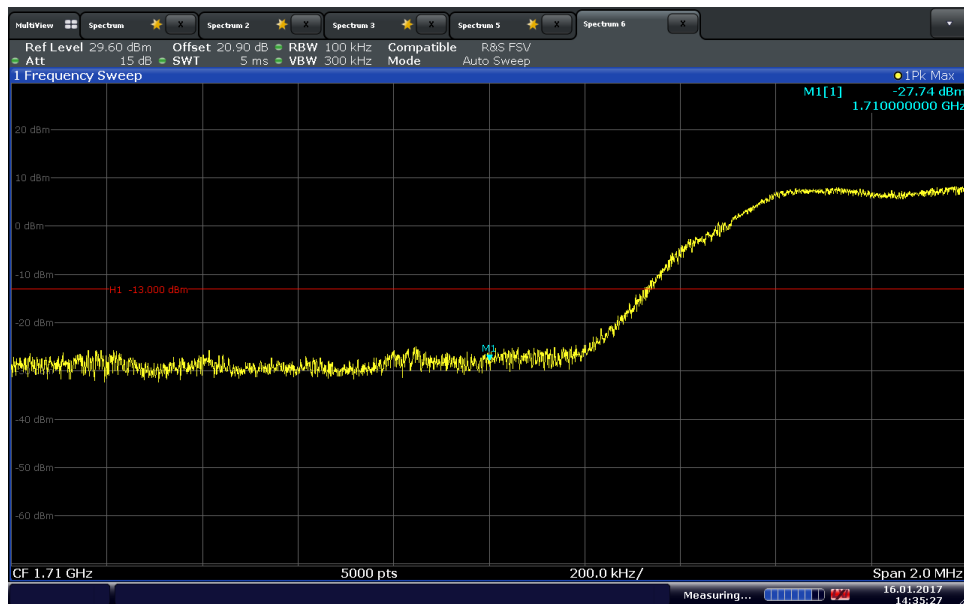
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LTE Band 4 Uplink 5MHz Bandwidth High Channel Band Edge



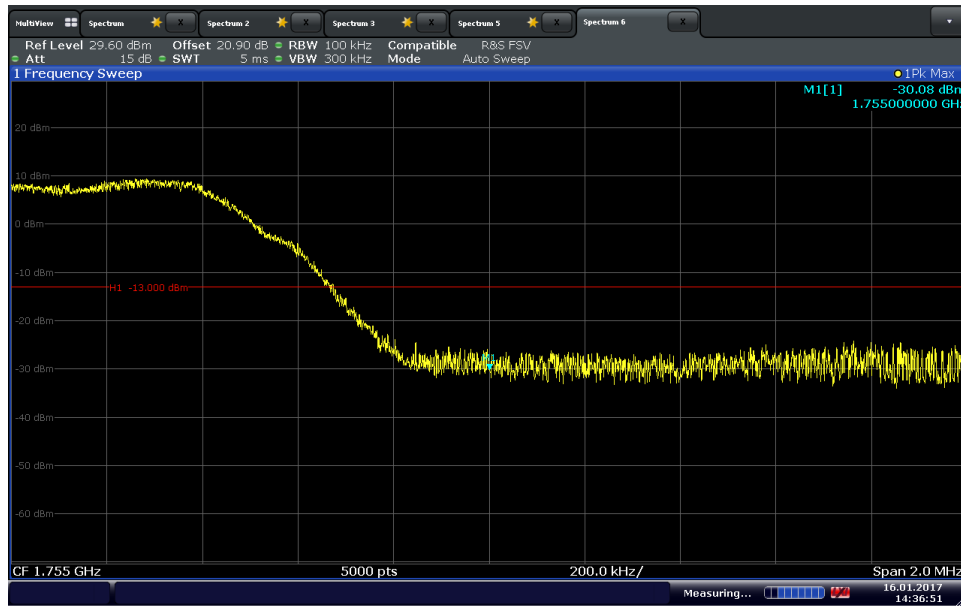
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LTE Band 4 Uplink 10MHz Bandwidth Low Channel Band Edge

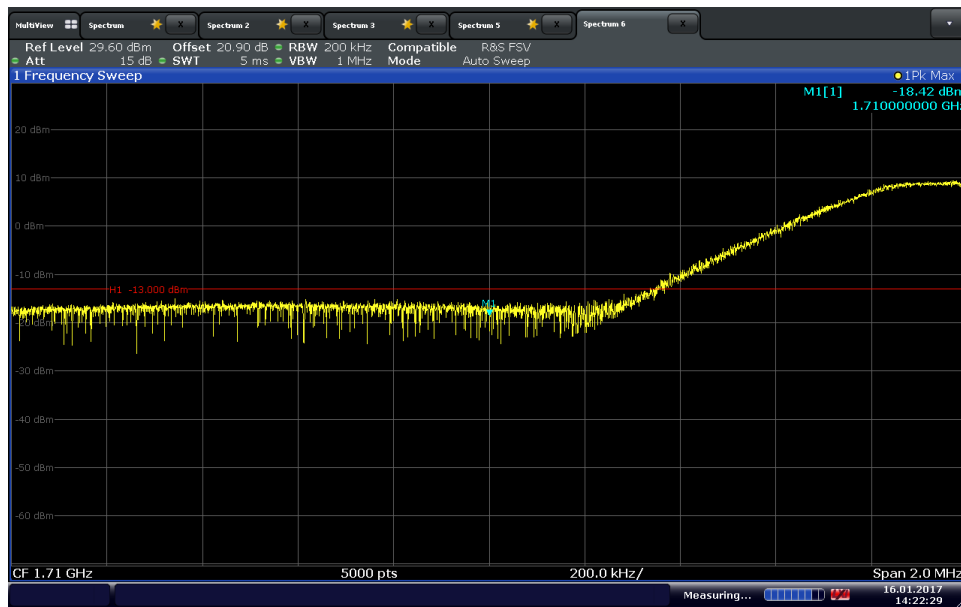


Date: 16. JAN. 2017 14:35:28

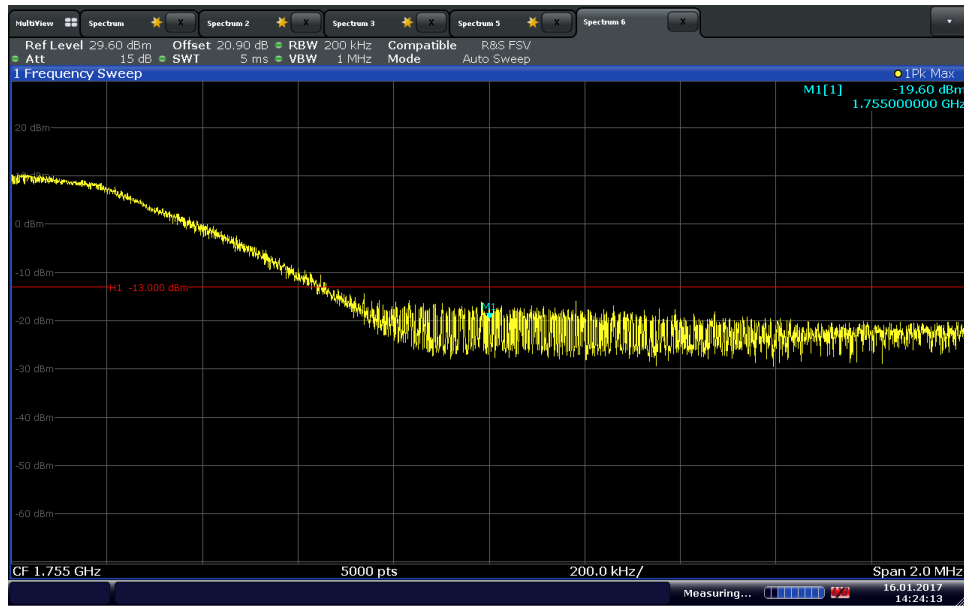
LTE Band 4 Uplink 10MHz Bandwidth High Channel Band Edge



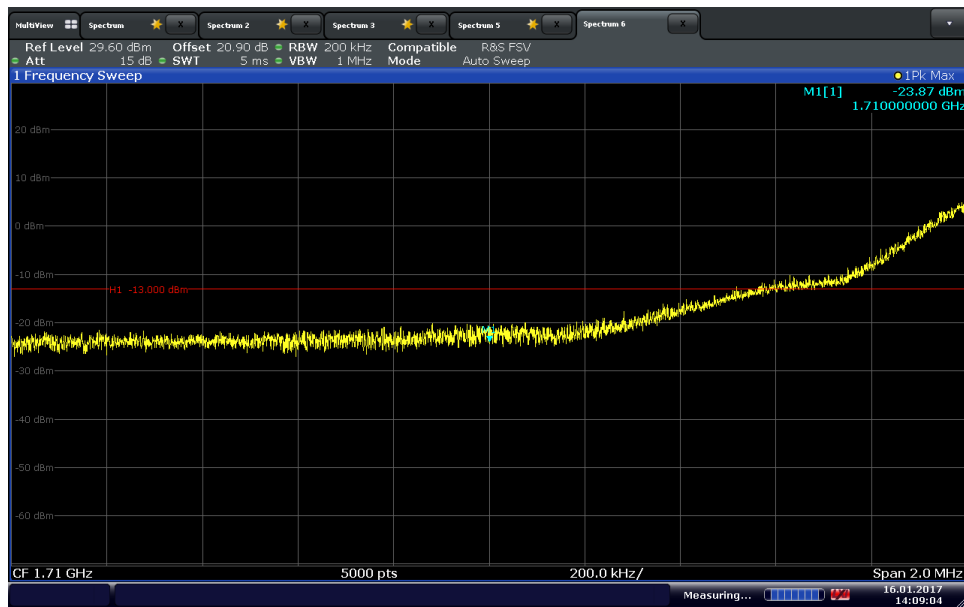
LTE Band 4 Uplink 15MHz Bandwidth Low Channel Band Edge



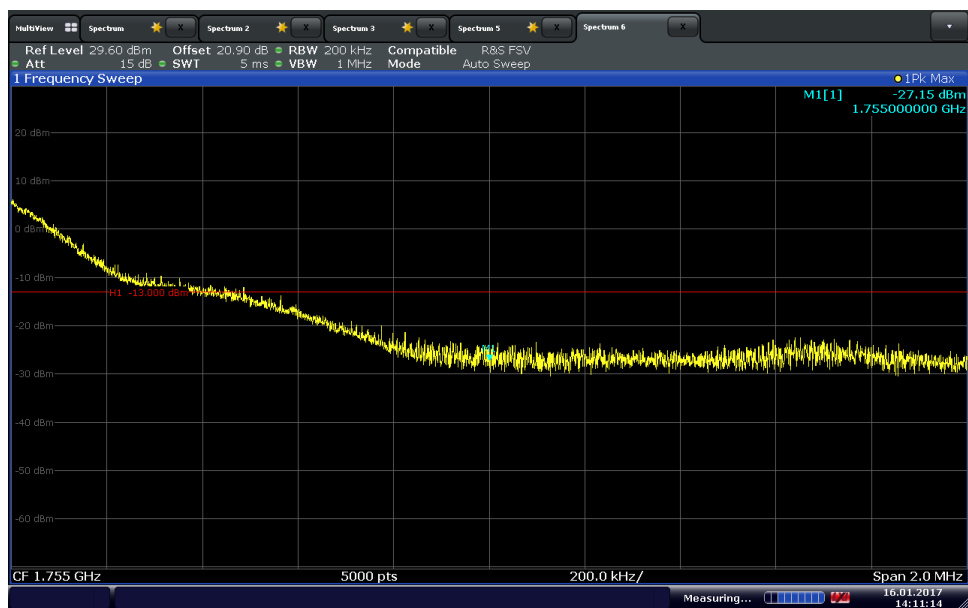
LTE Band 4 Uplink 15MHz Bandwidth High Channel Band Edge



LTE Band 4 Uplink 20MHz Bandwidth Low Channel Band Edge



LTE Band 4 Uplink 20MHz Bandwidth High Channel Band Edge



Date: 16 JAN 2017 14:11:14

2.6 CONDUCTED SPURIOUS EMISSIONS

2.6.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 27, Clause 27.53 (h)(1),(3)
RSS-139, Clause 6.6

2.6.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.53 (h):

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

RSS-139, Clause 6.6:

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

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

2.6.3 Equipment Under Test and Modification State

Serial No: 332633000356 (Fix Unit) / Test Configuration A and B

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

January 16, 2017/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

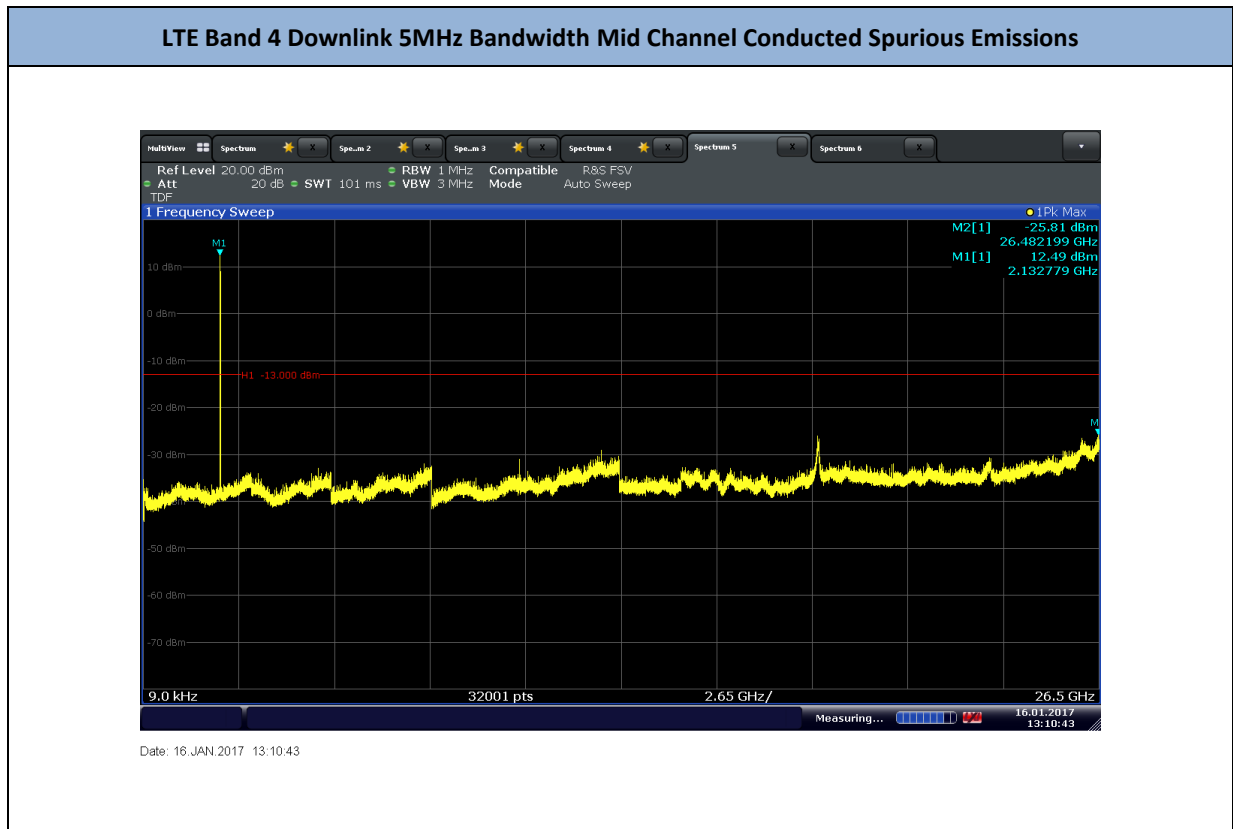
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	21.3°C
Relative Humidity	47.2%
ATM Pressure	99.0kPa

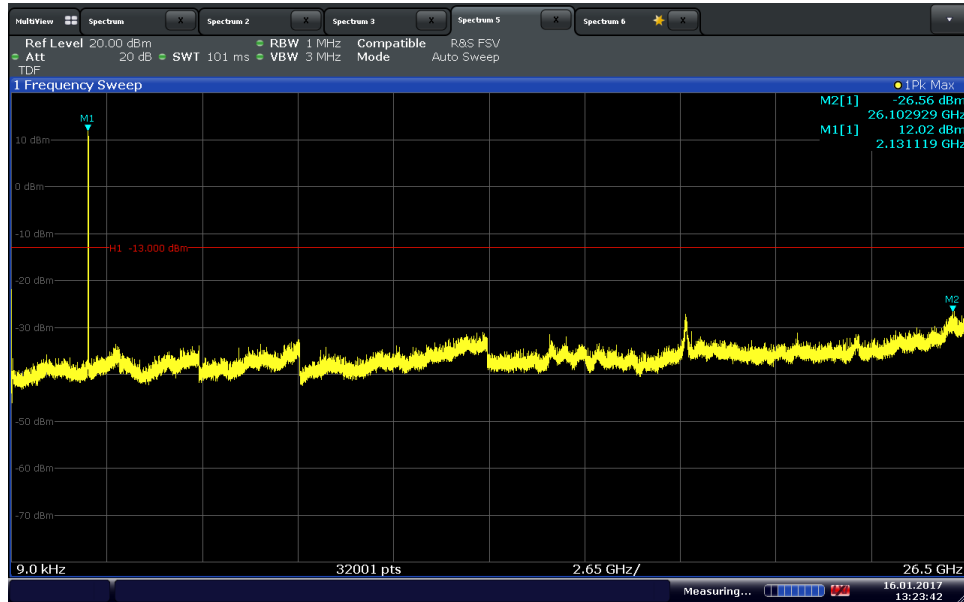
2.6.7 Additional Observations

- This is a conducted test.
- The transducer factor (TDF) used is from the external attenuators and cables used.
- The spectrum was searched from 9 kHz to 26.5GHz (requirement is up to the 10th harmonic).
- Low, Middle and High Channels were verified. Only Middle Channel presented in this test report as the representative configuration.

2.6.8 Test Results

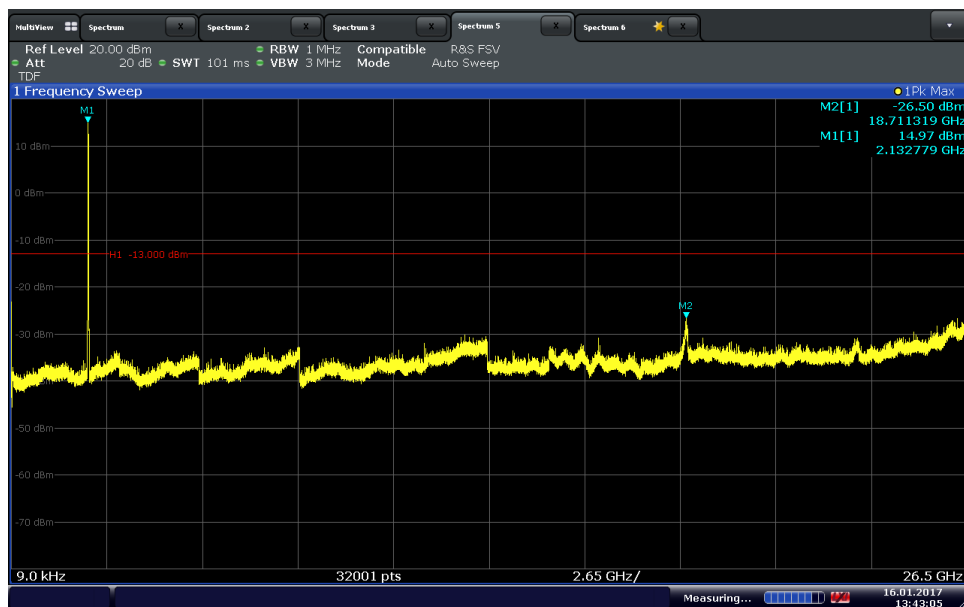


LTE Band 4 Downlink 10MHz Bandwidth Mid Channel Conducted Spurious Emissions



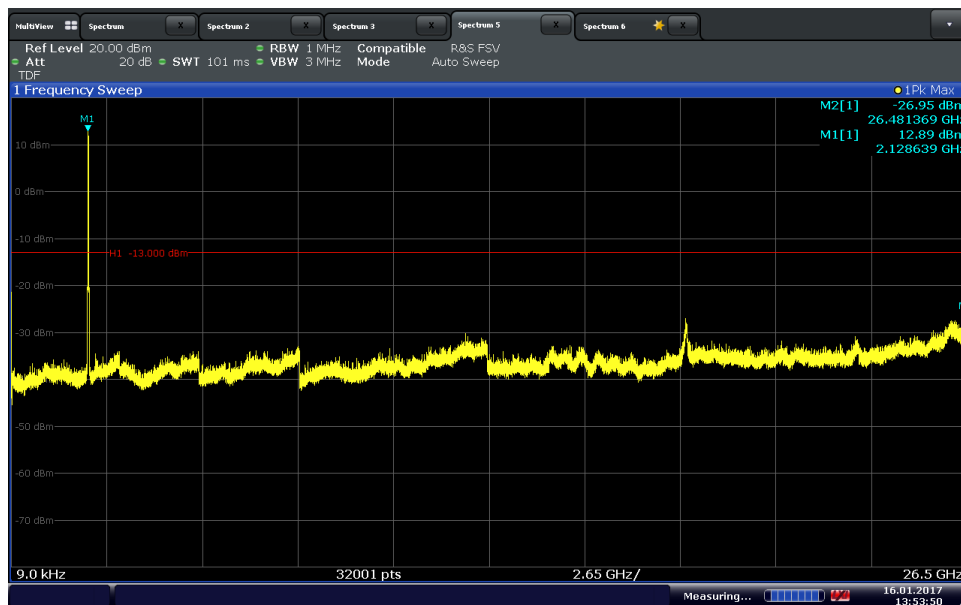
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LTE Band 4 Downlink 15MHz Bandwidth Mid Channel Conducted Spurious Emissions



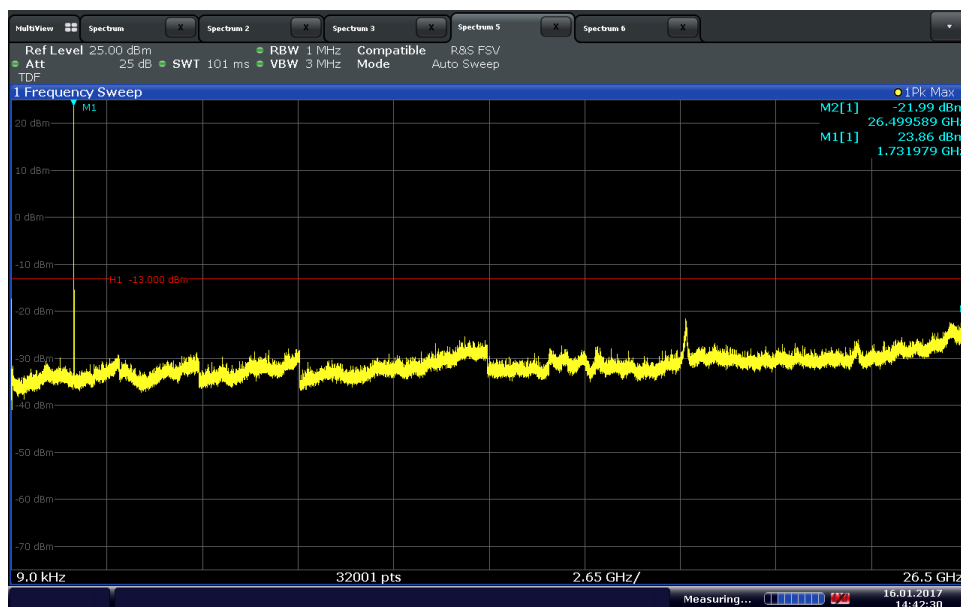
Date: 16 JAN 2017 13:43:05

LTE Band 4 Downlink 20MHz Bandwidth Mid Channel Conducted Spurious Emissions



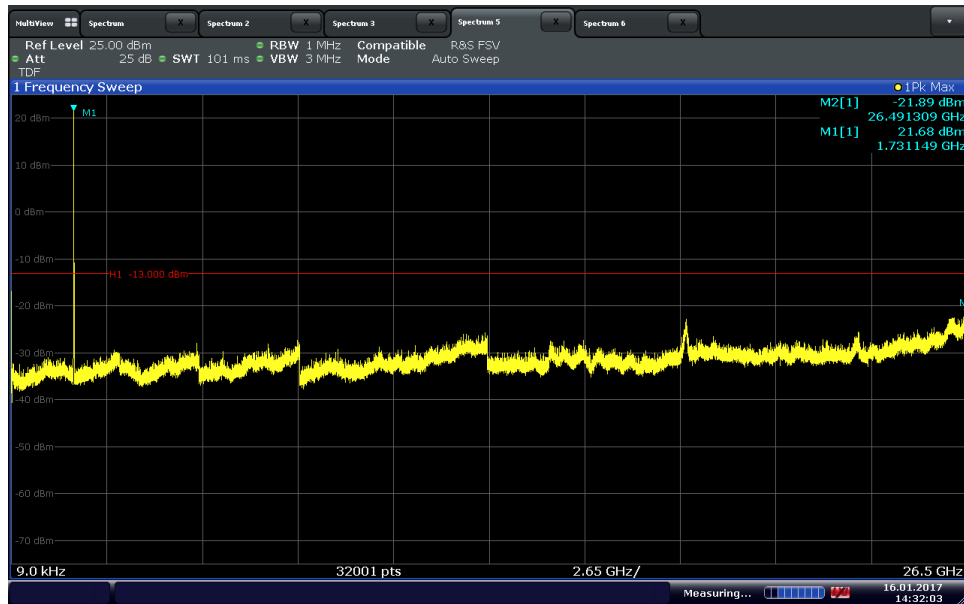
Date: 16 JAN 2017 13:53:50

LTE Band 4 Uplink 5MHz Bandwidth Mid Channel Conducted Spurious Emissions



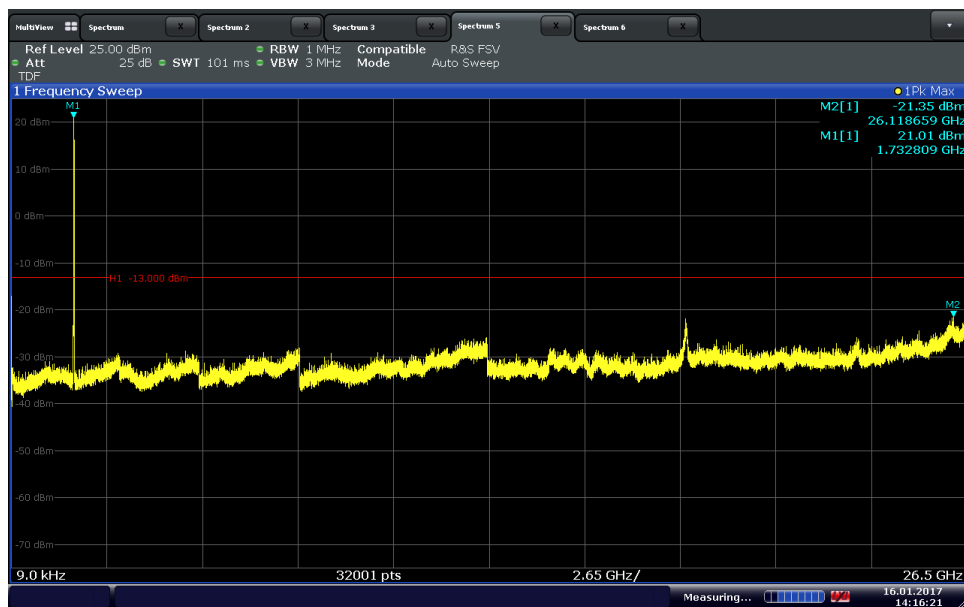
Date: 16 JAN 2017 14:42:30

LTE Band 4 Uplink 10MHz Bandwidth Mid Channel Conducted Spurious Emissions



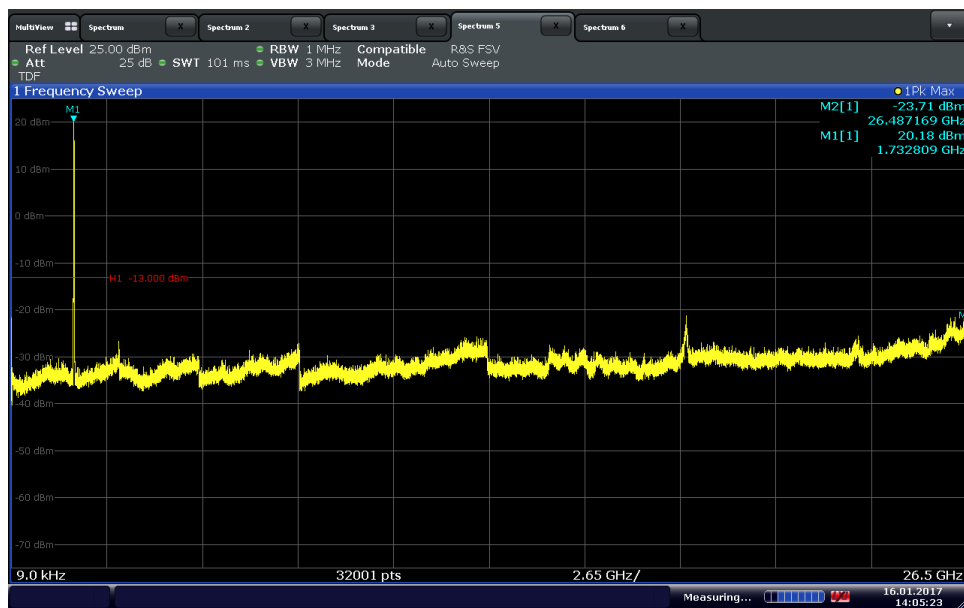
Date: 16.JAN.2017 14:32:03

LTE Band 4 Uplink 15MHz Bandwidth Mid Channel Conducted Spurious Emissions



Date: 16.JAN.2017 14:16:22

LTE Band 4 Uplink 20MHz Bandwidth Mid Channel Conducted Spurious Emissions



Date: 16 JAN 2017 14:05:23

2.7 FIELD STRENGTH OF SPURIOUS RADIATION

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CRF Part 27, Clause 27.53 (h)
RSS-139, Clause 6.6

2.7.2 Standard Applicable

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

2.7.3 Equipment Under Test and Modification State

Serial No: 332633000356 and 931703000264 (Fix Unit) / Test Configuration C and D

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

January 06, 27 and February 02 2017 / 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 performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	21.5 - 23.5 °C
Relative Humidity	27.9 - 53.2 %
ATM Pressure	99.0 - 99.5 kPa

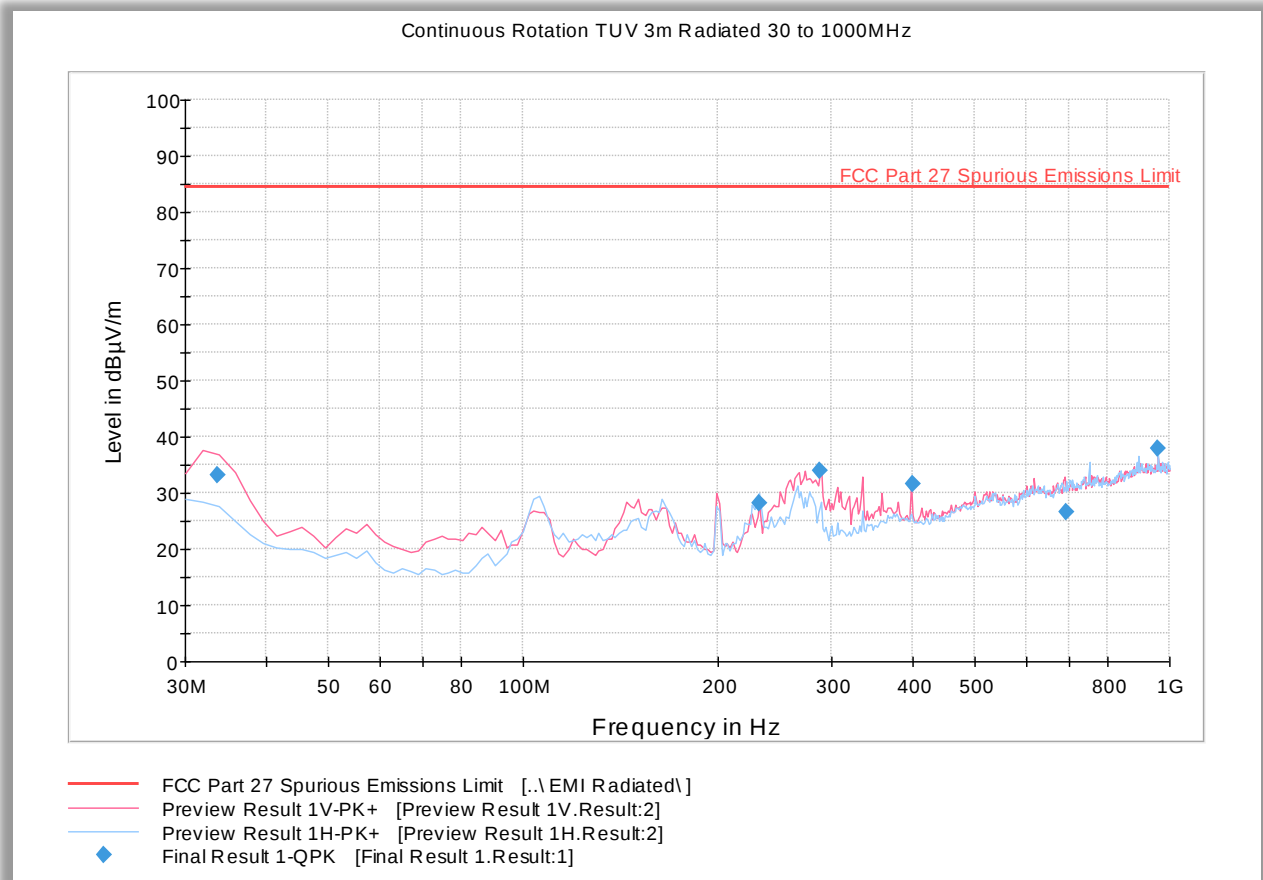
2.7.7 Additional Observations

- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of ANSI/TIA/EIA-603-D 2010, June 24, 2010..
- Only the worst case configuration presented in this test report.
- 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.

2.7.8 Test Results

See attached plots.

2.7.9 Test Results Below 1GHz (Downlink Worst Case Configuration) - 20MHz Bandwidth High Channel

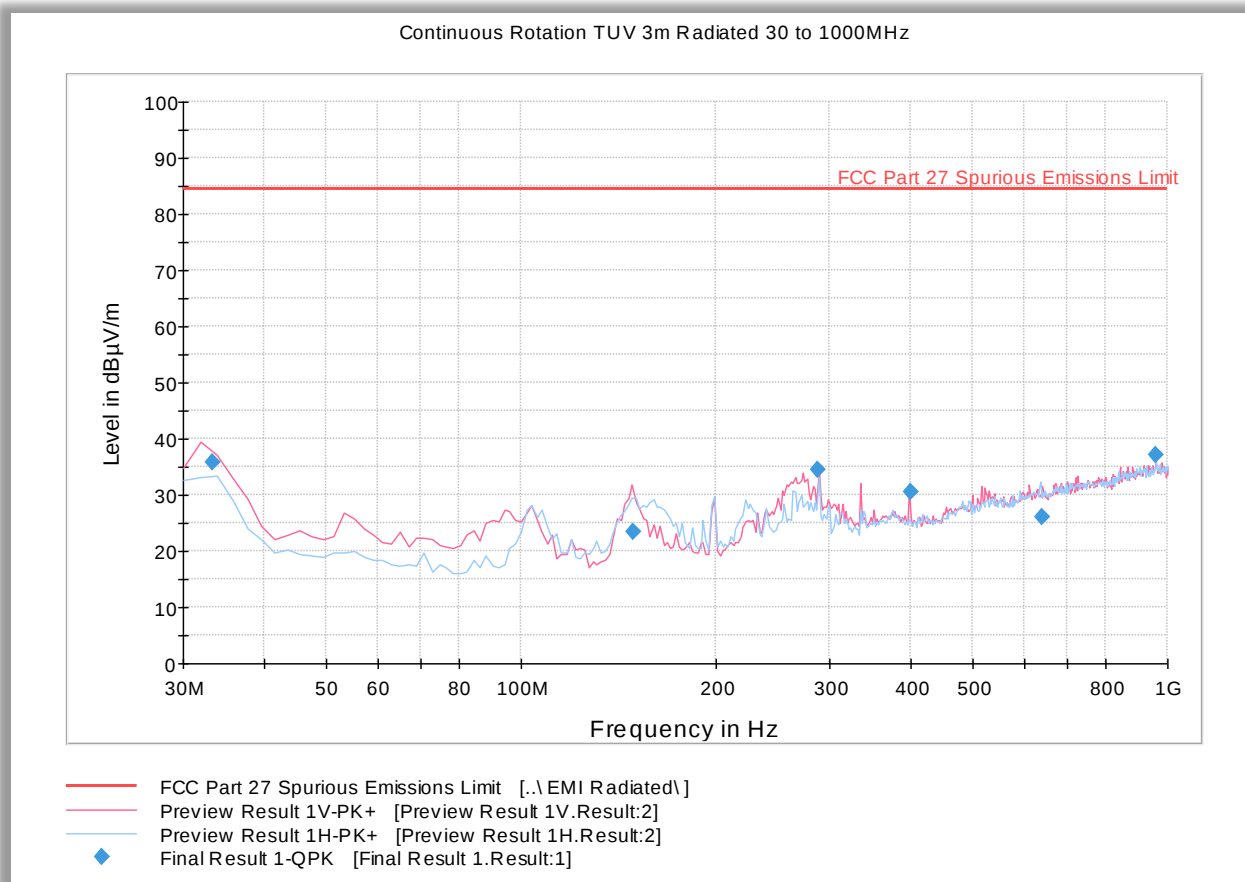


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
33.680000	33.1	1000.0	120.000	120.0	V	15.0	-7.3	51.3	84.4
232.284329	28.2	1000.0	120.000	110.0	H	177.0	-8.0	56.2	84.4
287.977074	33.9	1000.0	120.000	100.0	V	90.0	-6.8	50.5	84.4
400.018677	31.7	1000.0	120.000	106.0	V	178.0	-2.2	52.7	84.4
690.857956	26.7	1000.0	120.000	127.0	V	62.0	5.3	57.7	84.4
960.082244	37.9	1000.0	120.000	100.0	H	61.0	9.7	46.5	84.4

Test Notes: Only the worst case channel presented for spurious emissions below 1GHz. Only case spurious emissions within 20dB of the calculated limit will be proven by substitution method.

2.7.10 Test Results Below 1GHz (Uplink Worst Case Configuration) - 15MHz Bandwidth Middle Channel

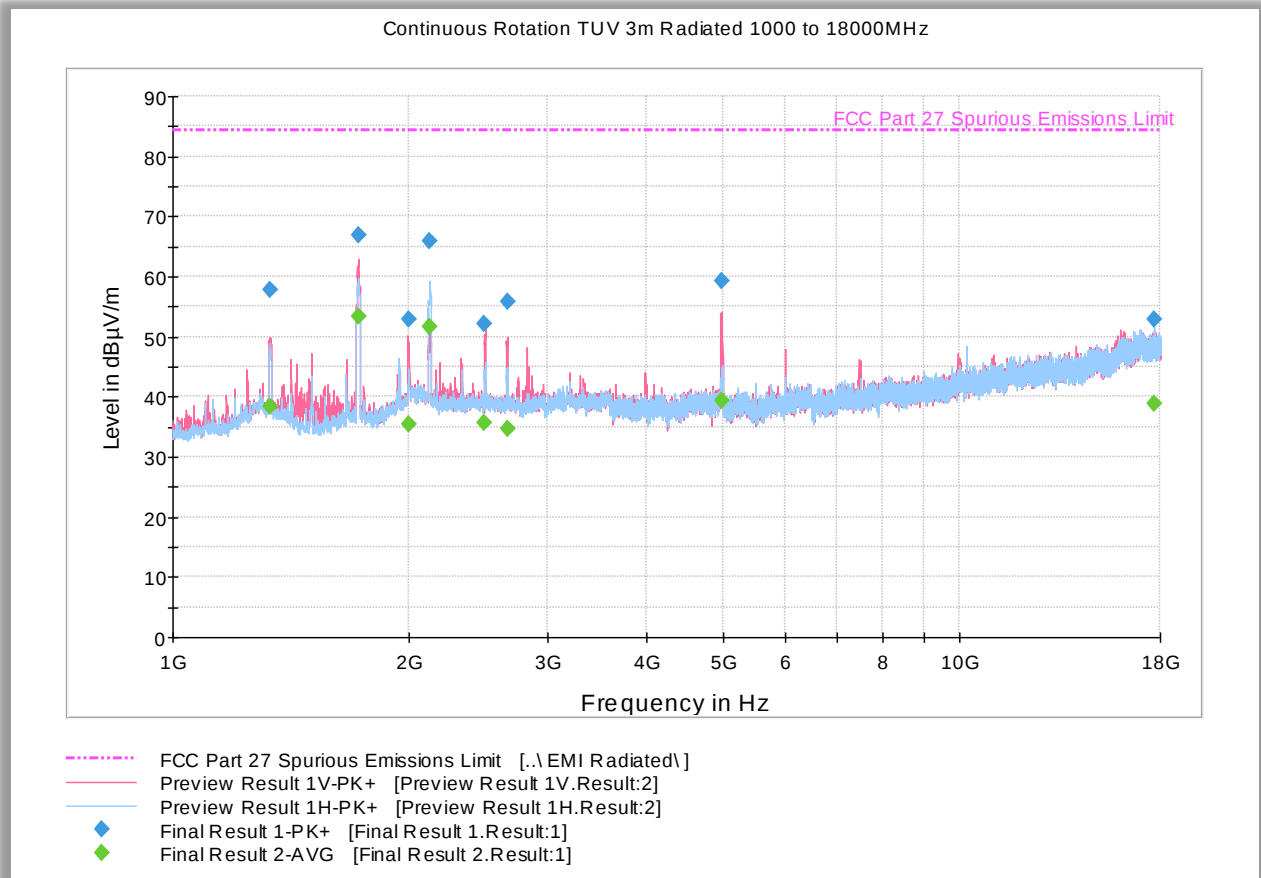


Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
33.400000	35.7	1000.0	120.000	122.0	V	80.0	-7.1	48.7	84.4
149.097154	23.5	1000.0	120.000	100.0	V	221.0	-12.0	60.9	84.4
288.017074	34.4	1000.0	120.000	115.0	V	97.0	-6.8	50.0	84.4
400.018677	30.5	1000.0	120.000	100.0	V	114.0	-2.2	53.9	84.4
638.132986	26.0	1000.0	120.000	231.0	H	-7.0	4.3	58.4	84.4
960.082244	37.2	1000.0	120.000	150.0	H	41.0	9.7	47.2	84.4

Test Notes: Only the worst case channel presented for spurious emissions below 1GHz. Only case spurious emissions within 20dB of the calculated limit will be proven by substitution method.

2.7.11 Test Results Above 1GHz (Downlink Worst Case Configuration) - 20MHz Bandwidth Low Channel



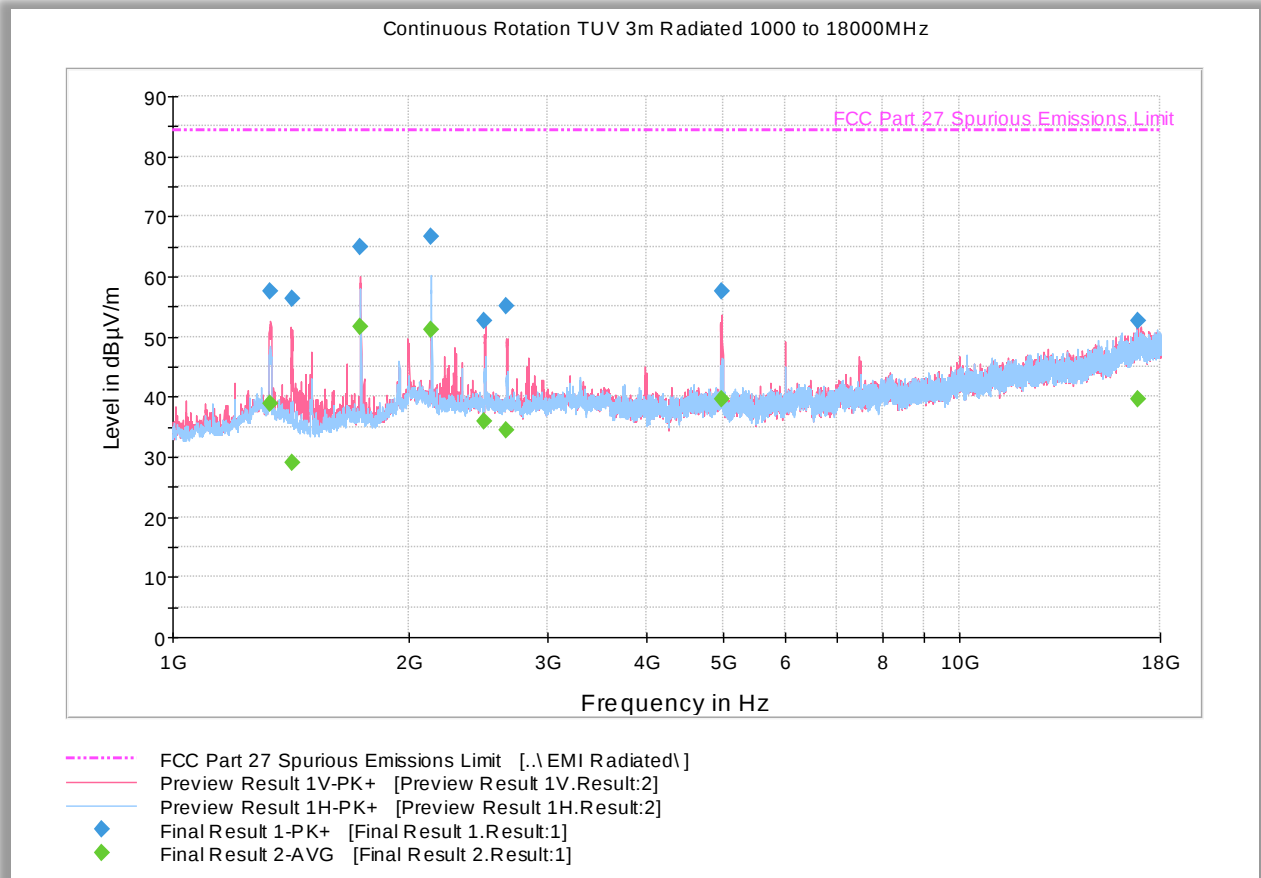
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1327.533333	57.8	1000.0	1000.000	231.4	V	86.0	-4.9	26.6	84.4
1721.033333	66.8	1000.0	1000.000	199.5	V	170.0	-4.0	UL Carrier	
1993.500000	52.9	1000.0	1000.000	142.7	V	58.0	-0.1	31.5	84.4
2122.133333	66.0	1000.0	1000.000	173.6	H	215.0	-1.1	DL Carrier	
2490.200000	52.1	1000.0	1000.000	204.5	V	118.0	-0.7	32.3	84.4
2666.366667	55.9	1000.0	1000.000	240.4	V	80.0	-0.8	28.5	84.4
4996.666667	59.4	1000.0	1000.000	195.5	V	52.0	3.4	25.0	84.4
17668.300000	53.0	1000.0	1000.000	120.7	H	310.0	20.2	31.4	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)
1327.533333	38.4	1000.0	1000.000	231.4	V	86.0	-4.9	46.0	84.4
1721.033333	53.3	1000.0	1000.000	199.5	V	170.0	-4.0	UL Carrier	
1993.500000	35.5	1000.0	1000.000	142.7	V	58.0	-0.1	48.9	84.4
2122.133333	51.7	1000.0	1000.000	173.6	H	215.0	-1.1	DL Carrier	
2490.200000	35.7	1000.0	1000.000	204.5	V	118.0	-0.7	48.7	84.4
2666.366667	34.6	1000.0	1000.000	240.4	V	80.0	-0.8	49.8	84.4
4996.666667	39.4	1000.0	1000.000	195.5	V	52.0	3.4	45.0	84.4
17668.300000	38.9	1000.0	1000.000	120.7	H	310.0	20.2	45.5	84.4

2.7.12 Test Results Above 1GHz (Downlink Worst Case Configuration) - 20MHz Bandwidth Middle Channel



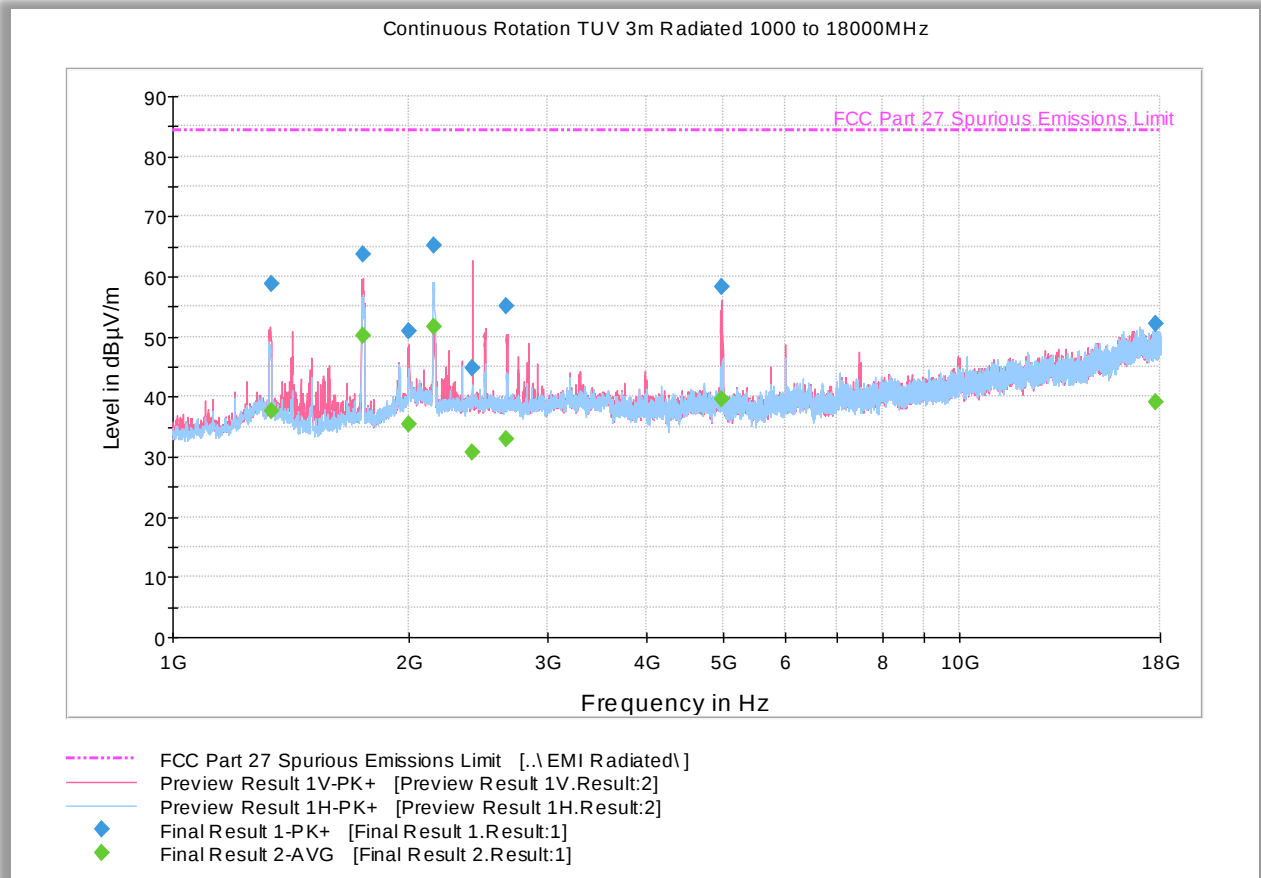
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1332.433333	57.6	1000.0	1000.000	226.4	V	85.0	-5.1	26.8	84.4
1418.000000	56.4	1000.0	1000.000	208.5	V	74.0	-5.6	28.0	84.4
1732.933333	65.0	1000.0	1000.000	199.5	V	172.0	-3.9	UL Carrier	
2132.566667	66.6	1000.0	1000.000	173.6	H	215.0	-1.3	DL Carrier	
2490.333333	52.6	1000.0	1000.000	235.4	V	118.0	-0.7	31.8	84.4
2654.233333	55.2	1000.0	1000.000	250.4	V	83.0	-0.9	29.2	84.4
4986.333333	57.5	1000.0	1000.000	181.6	V	49.0	3.5	26.9	84.4
16839.700000	52.6	1000.0	1000.000	103.7	V	289.0	20.0	31.8	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)
1332.433333	38.9	1000.0	1000.000	226.4	V	85.0	-5.1	45.5	84.4
1418.000000	29.1	1000.0	1000.000	208.5	V	74.0	-5.6	55.3	84.4
1732.933333	51.7	1000.0	1000.000	199.5	V	172.0	-3.9	UL Carrier	
2132.566667	51.3	1000.0	1000.000	173.6	H	215.0	-1.3	DL Carrier	
2490.333333	35.8	1000.0	1000.000	235.4	V	118.0	-0.7	48.6	84.4
2654.233333	34.3	1000.0	1000.000	250.4	V	83.0	-0.9	50.1	84.4
4986.333333	39.5	1000.0	1000.000	181.6	V	49.0	3.5	44.9	84.4
16839.700000	39.5	1000.0	1000.000	103.7	V	289.0	20.0	44.9	84.4

2.7.13 Test Results Above 1GHz (Downlink Worst Case Configuration) - 20MHz Bandwidth High Channel



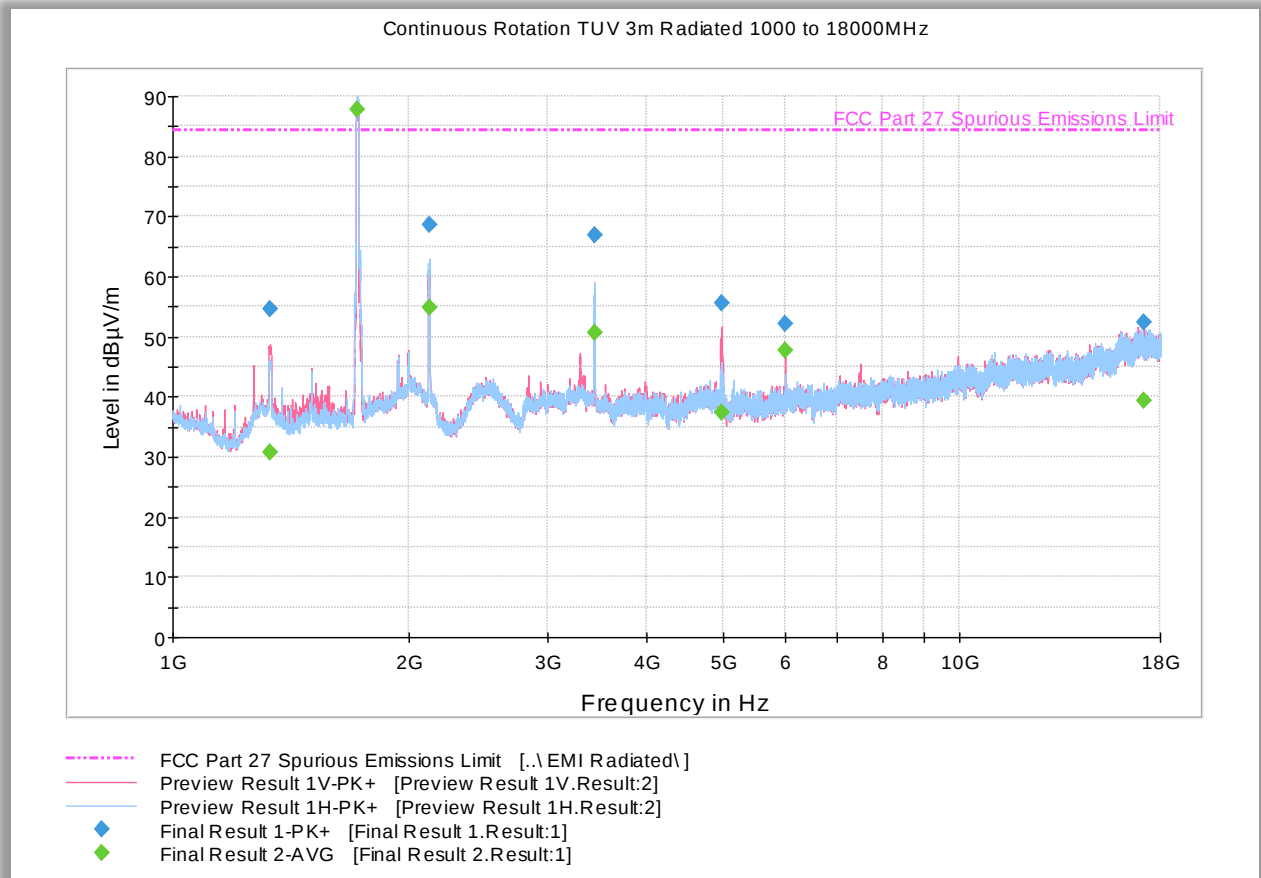
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1332.866667	58.8	1000.0	1000.000	217.4	V	88.0	-5.1	25.6	84.4
1743.500000	63.6	1000.0	1000.000	161.6	V	166.0	-3.8	UL Carrier	
1997.000000	50.9	1000.0	1000.000	199.5	V	73.0	-0.1	33.5	84.4
2144.300000	65.0	1000.0	1000.000	173.6	H	217.0	-1.4	DL Carrier	
2401.333333	44.6	1000.0	1000.000	173.6	V	195.0	-1.1	39.8	84.4
2653.366667	55.1	1000.0	1000.000	236.4	V	90.0	-0.9	29.3	84.4
4979.733333	58.3	1000.0	1000.000	169.6	V	50.0	3.5	26.1	84.4
17782.633333	52.2	1000.0	1000.000	195.5	H	144.0	20.2	32.2	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)
1332.866667	37.7	1000.0	1000.000	217.4	V	88.0	-5.1	46.7	84.4
1743.500000	50.2	1000.0	1000.000	161.6	V	166.0	-3.8	UL Carrier	
1997.000000	35.5	1000.0	1000.000	199.5	V	73.0	-0.1	48.9	84.4
2144.300000	51.7	1000.0	1000.000	173.6	H	217.0	-1.4	DL Carrier	
2401.333333	30.8	1000.0	1000.000	173.6	V	195.0	-1.1	53.6	84.4
2653.366667	33.0	1000.0	1000.000	236.4	V	90.0	-0.9	51.4	84.4
4979.733333	39.5	1000.0	1000.000	169.6	V	50.0	3.5	44.9	84.4
17782.633333	39.0	1000.0	1000.000	195.5	H	144.0	20.2	45.4	84.4

2.7.14 Test Results Above 1GHz (Uplink Worst Case Configuration) - 15MHz Bandwidth Low Channel



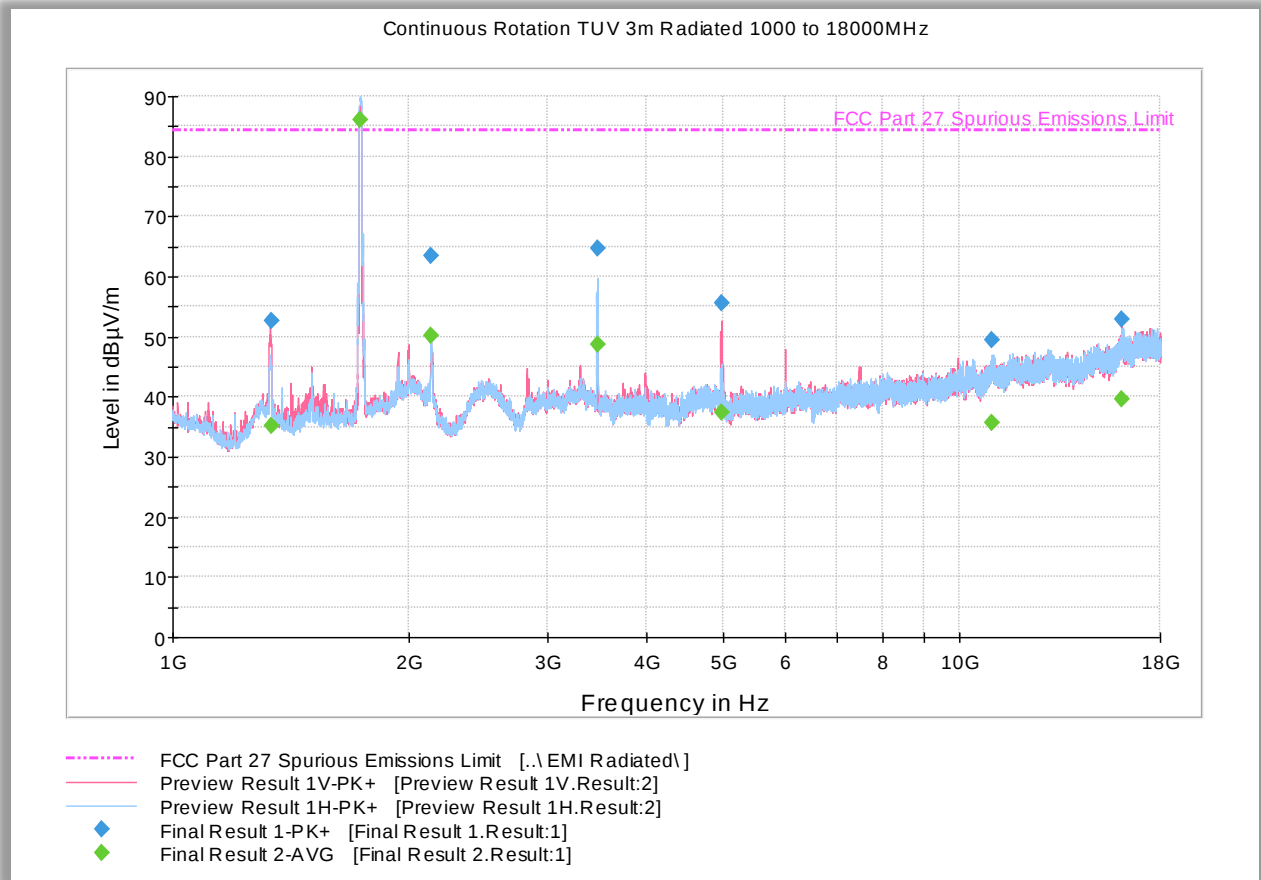
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1328.466667	54.6	1000.0	1000.000	195.5	V	119.0	-5.0	29.8	84.4
1718.900000	99.7	1000.0	1000.000	103.7	H	258.0	-4.0	UL Carrier	
2117.666667	68.5	1000.0	1000.000	174.6	H	78.0	-1.1	DL Carrier	
3436.333333	66.8	1000.0	1000.000	124.7	H	300.0	0.4	17.6	84.4
4990.833333	55.5	1000.0	1000.000	151.6	V	108.0	3.5	28.9	84.4
5999.900000	52.1	1000.0	1000.000	112.7	V	125.0	5.0	32.3	84.4
17193.100000	52.4	1000.0	1000.000	161.6	V	290.0	19.6	32.0	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)
1328.466667	30.7	1000.0	1000.000	195.5	V	119.0	-5.0	53.7	84.4
1718.900000	87.9	1000.0	1000.000	103.7	H	258.0	-4.0	UL Carrier	
2117.666667	54.7	1000.0	1000.000	174.6	H	78.0	-1.1	DL Carrier	
3436.333333	50.6	1000.0	1000.000	124.7	H	300.0	0.4	33.8	84.4
4990.833333	37.3	1000.0	1000.000	151.6	V	108.0	3.5	47.1	84.4
5999.900000	47.8	1000.0	1000.000	112.7	V	125.0	5.0	36.6	84.4
17193.100000	39.3	1000.0	1000.000	161.6	V	290.0	19.6	45.1	84.4

2.7.15 Test Results Above 1GHz (Uplink Worst Case Configuration) - 15MHz Bandwidth Middle Channel



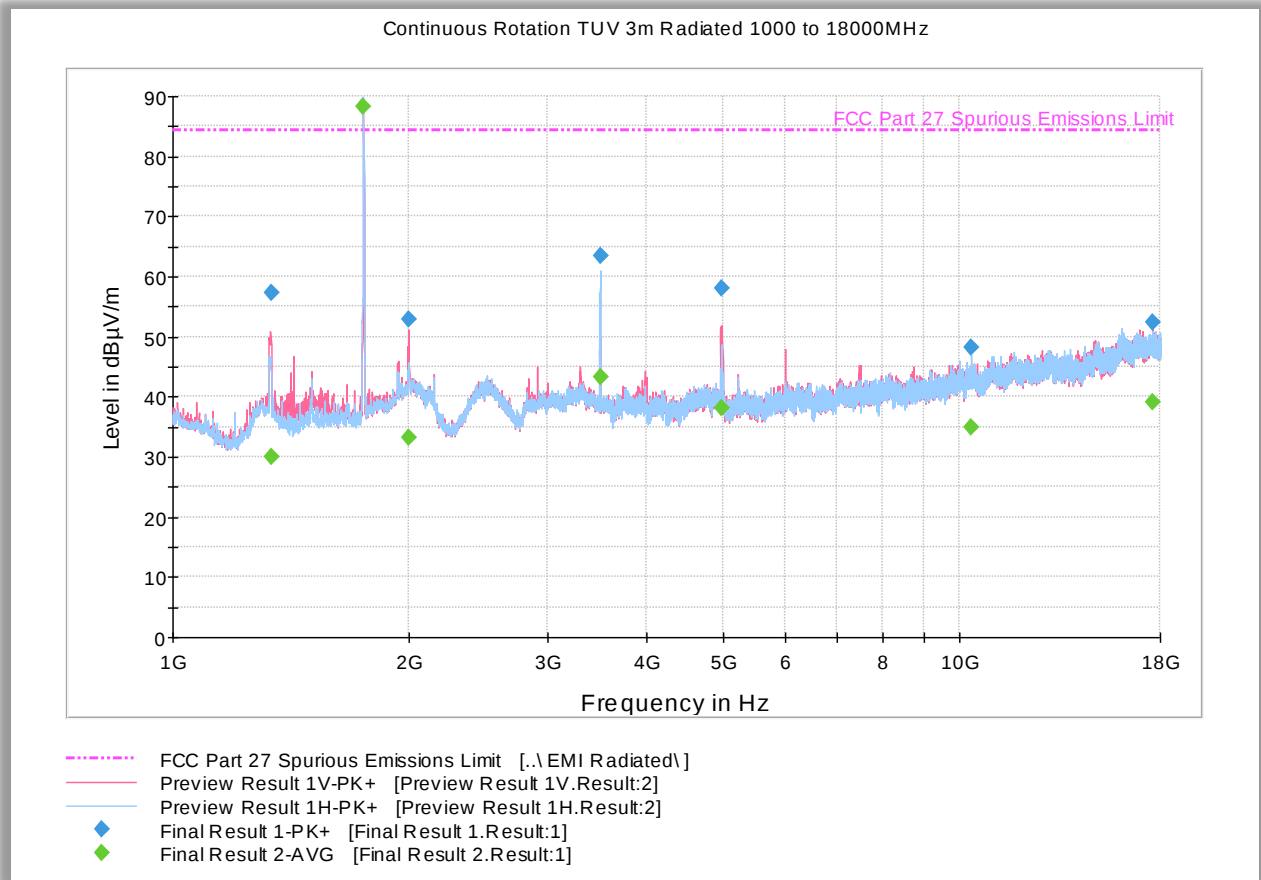
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1332.866667	52.7	1000.0	1000.000	270.3	V	112.0	-5.1	31.7	84.4
1731.700000	98.1	1000.0	1000.000	142.7	H	12.0	-3.9	UL Carrier	
2130.500000	63.3	1000.0	1000.000	103.7	V	82.0	-1.3	DL Carrier	
3465.800000	64.6	1000.0	1000.000	124.7	H	259.0	0.3	19.8	84.4
4979.733333	55.5	1000.0	1000.000	173.6	V	108.0	3.5	28.9	84.4
10979.766667	49.3	1000.0	1000.000	280.2	H	162.0	12.7	35.1	84.4
16112.833333	52.8	1000.0	1000.000	152.2	V	356.0	18.9	31.6	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)
1332.866667	35.1	1000.0	1000.000	270.3	V	112.0	-5.1	49.3	84.4
1731.700000	86.1	1000.0	1000.000	142.7	H	12.0	-3.9	UL Carrier	
2130.500000	50.1	1000.0	1000.000	103.7	V	82.0	-1.3	DL Carrier	
3465.800000	48.7	1000.0	1000.000	124.7	H	259.0	0.3	35.8	84.4
4979.733333	37.3	1000.0	1000.000	173.6	V	108.0	3.5	47.1	84.4
10979.766667	35.7	1000.0	1000.000	280.2	H	162.0	12.7	48.7	84.4
16112.833333	39.5	1000.0	1000.000	152.2	V	356.0	18.9	44.9	84.4

2.7.16 Test Results Above 1GHz (Uplink Worst Case Configuration) - 15MHz 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)
1333.433333	57.4	1000.0	1000.000	307.2	V	104.0	-5.1	27.0	84.4
1747.400000	100.3	1000.0	1000.000	103.7	H	181.0	-3.7	UL Carrier	
1993.900000	52.9	1000.0	1000.000	128.7	V	80.0	-0.1	31.5	84.4
3496.700000	63.6	1000.0	1000.000	143.7	H	182.0	0.6	20.8	84.4
4997.133333	58.0	1000.0	1000.000	200.5	V	81.0	3.4	26.4	84.4
10368.900000	48.2	1000.0	1000.000	252.3	H	177.0	11.9	36.2	84.4
17644.100000	52.3	1000.0	1000.000	312.1	V	229.0	20.1	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)
1333.433333	29.9	1000.0	1000.000	307.2	V	104.0	-5.1	54.5	84.4
1747.400000	88.3	1000.0	1000.000	103.7	H	181.0	-3.7	UL Carrier	
1993.900000	33.3	1000.0	1000.000	128.7	V	80.0	-0.1	51.1	84.4
3496.700000	43.3	1000.0	1000.000	143.7	H	182.0	0.6	41.1	84.4
4997.133333	38.2	1000.0	1000.000	200.5	V	81.0	3.4	46.2	84.4
10368.900000	34.9	1000.0	1000.000	252.3	H	177.0	11.9	49.5	84.4
17644.100000	39.0	1000.0	1000.000	312.1	V	229.0	20.1	45.4	84.4



2.8 FREQUENCY STABILITY

2.8.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1055
FCC 47 CFR Part 27, Clause 27.54
RSS-139, Clause 6.4

2.8.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.54:

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

RSS-139, Clause 6.4:

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

2.8.1 Equipment Under Test and Modification State

Serial No: 332633000356 (Fix Unit) and 332633000417 (Mobile Unit) / Test Configuration A and B

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

December 20 and 21, 2016/XYZ

2.8.3 Test Equipment Used

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

2.8.4 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	21.7 – 22.1°C
Relative Humidity	23.2 - 58.1%
ATM Pressure	99.0 - 99.5kPa

2.8.5 Additional Observations

- This is a conducted test.
- The EUT was operated at 120.0VAC nominal voltage and was placed in the temperature chamber for the series of evaluations performed.
- 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.
- Voltage variation was also performed at 85% and 115% of the nominal voltage on both Fix and Mobile Units.
- 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.

2.8.6 Test Results Summary

LTE B4 Downlink (Fix Unit)		
Voltage (VAC)	Temperature (°C)	Frequency Deviation (Hz/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

LTE B4 Downlink (Fix Unit)		
Temperature (°C)	Voltage (VAC)	Frequency Deviation (Hz/ppm)
20	102	0/0
	138	0/0

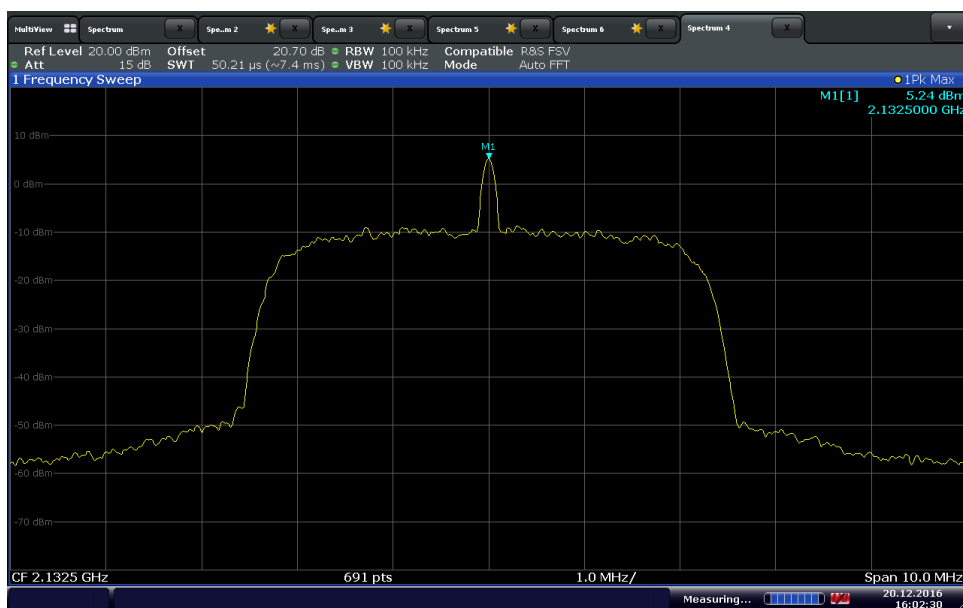
LTE B4 Downlink (Mobile Unit)		
Temperature (°C)	Voltage (VAC)	Frequency Deviation (Hz/ppm)
20	10.2	0/0
	12.0	0/0
	13.8	0/0

LTE B4 Uplink (Fix Unit)		
<i>Voltage (VAC)</i>	<i>Temperature (°C)</i>	<i>Frequency Deviation (Hz/ppm)</i>
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

LTE B4 Uplink (Fix Unit)		
<i>Temperature (°C)</i>	<i>Voltage (VAC)</i>	<i>Frequency Deviation (Hz/ppm)</i>
20	102	0/0
	138	0/0

LTE B4 Uplink (Mobile Unit)		
<i>Temperature (°C)</i>	<i>Voltage (VAC)</i>	<i>Frequency Deviation (Hz/ppm)</i>
20	10.2	0/0
	12.0	0/0
	13.8	0/0

2.8.7 Sample Test Plots



LTE B4 Downlink Middle Channel @ 20°C Nominal Voltage

2.9 POWER LINE CONDUCTED EMISSIONS

2.9.1 Specification Reference

RSS-Gen 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.*

2.9.1 Equipment Under Test and Modification State

Serial No: 332633000356 (Fix Unit) / Test Configuration B

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

December 16, 2016/XYZ

2.9.3 Test Equipment Used

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

2.9.4 Environmental Conditions

Ambient Temperature	22.2 °C
Relative Humidity	56.1 %
ATM Pressure	98.7 kPa

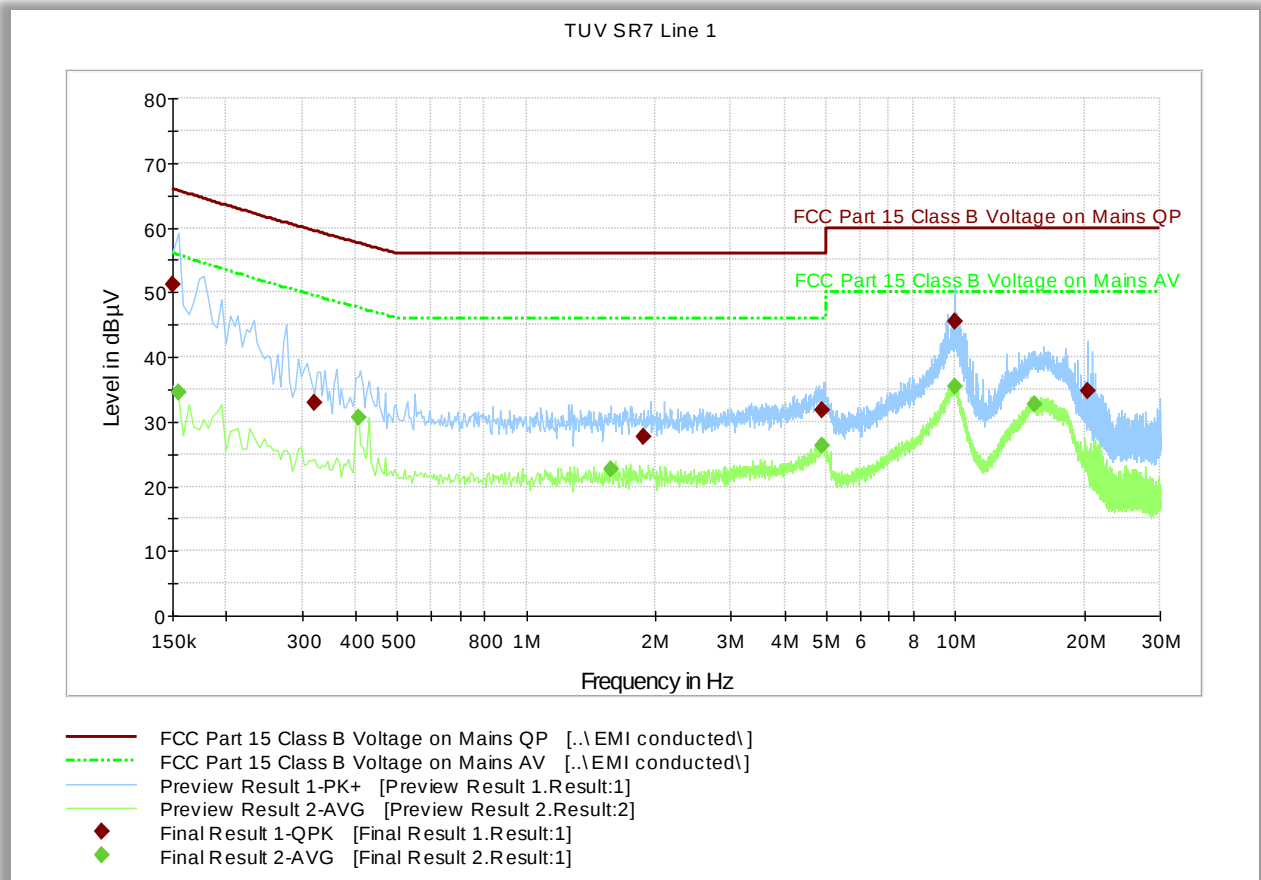
2.9.5 Additional Observations

- 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 each operating modes. Only the Downlink operation mode observed 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.

2.9.6 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# 7567 (LISN)	0.30	
Reported QuasiPeak Final Measurement (db μ V) @ 150kHz			26.2

2.9.7 Test Results - Conducted Emissions Line 1 – Hot



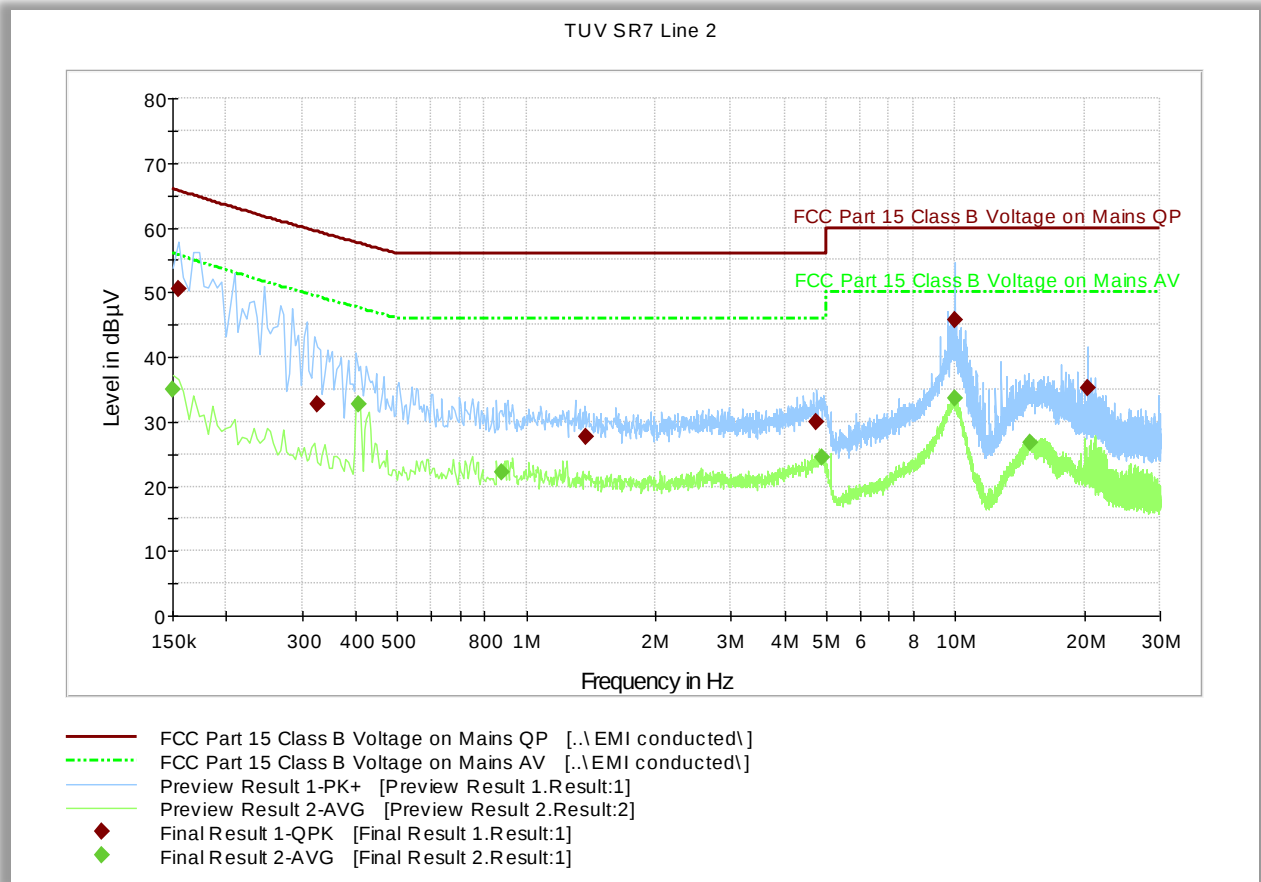
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	51.3	1000.0	9.000	Off	L1	20.2	14.7	66.0
0.321000	32.9	1000.0	9.000	Off	L1	20.0	26.6	59.5
1.869000	27.7	1000.0	9.000	Off	L1	20.0	28.3	56.0
4.897500	31.8	1000.0	9.000	Off	L1	20.1	24.2	56.0
10.000500	45.5	1000.0	9.000	Off	L1	20.2	14.5	60.0
20.400000	34.7	1000.0	9.000	Off	L1	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)
0.154500	34.6	1000.0	9.000	Off	L1	20.2	21.1	55.7
0.406500	30.7	1000.0	9.000	Off	L1	20.0	16.9	47.6
1.572000	22.6	1000.0	9.000	Off	L1	20.0	23.4	46.0
4.902000	26.3	1000.0	9.000	Off	L1	20.1	19.7	46.0
10.005000	35.4	1000.0	9.000	Off	L1	20.2	14.6	50.0
15.333000	32.6	1000.0	9.000	Off	L1	20.3	17.4	50.0

2.9.9 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	50.4	1000.0	9.000	Off	N	20.2	15.3	65.7
0.325500	32.8	1000.0	9.000	Off	N	20.0	26.6	59.4
1.378500	27.6	1000.0	9.000	Off	N	20.0	28.4	56.0
4.749000	29.9	1000.0	9.000	Off	N	20.1	26.1	56.0
10.005000	45.7	1000.0	9.000	Off	N	20.2	14.3	60.0
20.400000	35.1	1000.0	9.000	Off	N	20.4	24.9	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.150000	35.1	1000.0	9.000	Off	N	20.2	20.9	56.0
0.406500	32.7	1000.0	9.000	Off	N	20.0	14.9	47.6
0.874500	22.2	1000.0	9.000	Off	N	20.0	23.8	46.0
4.911000	24.4	1000.0	9.000	Off	N	20.1	21.6	46.0
10.005000	33.7	1000.0	9.000	Off	N	20.2	16.3	50.0
14.982000	26.8	1000.0	9.000	Off	N	20.3	23.2	50.0



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						
7604	P-Series Power Meter	N1912A	SG45100273	Agilent	07/27/16	07/27/17
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	04/19/16	04/19/17
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	10/26/16	10/26/17
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/02/16	09/02/17
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50 /103829	Rhode & Schwarz	For signaling	
8871	20dB Attenuator	18N10W-20dB	-	INMET	Verified by 7582 and 7608	
Radiated Emissions						
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	10/26/16	10/26/17
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/02/16	09/02/17
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	11/06/15	11/06/17
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	05/12/16	05/12/17
1016	Pre-amplifier	PAM-0202	187	PAM	10/17/16	10/17/17
1040	EMI Test Receiver	ESU	100133	Rhode & Schwarz	10/07/16	10/07/17
1151	Pre-amplifier	TS-PR26	100026	Rhode & Schwarz	Verified by 7608 and 7582	
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	
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50 /103829	Rhode & Schwarz	For signalling	
Conducted Emissions						
7620	EMI Test Receiver	ESU40	100399	Rhode & Schwarz	09/09/16	09/09/17
6837	LISN	FCC-LISN-50-25-2	5025	Fischer Custom Comm.	03/29/16	03/29/17
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/29/16	02/28/17
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/29/16	02/28/17
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50 /103829	Rhode & Schwarz	For signalling	



Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/29/16	08/29/17
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Super Scientific	08/22/16	08/22/17
	AC Power Supply	EW801-2-115	972430001	ELGAR	Verified by 6792	
	DC Power Supply	35010M	D102007S	Protek	Verified by 6792	
	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 Measurements

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.36	0.21	0.04
2	Cables	Rectangular	0.50	0.29	0.08
3	LISN	Rectangular	0.66	0.38	0.15
4	Attenuator	Rectangular	0.30	0.17	0.03
5	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					0.80
Coverage Factor (k):					2
Expanded Uncertainty:					1.59

3.2.2 Radiated Measurements (Below 1GHz)

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.78
Coverage Factor (k):					2
Expanded Uncertainty:					3.57

3.2.3 Radiated Emission Measurements (Above 1GHz)

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.78
Coverage Factor (k):					2
Expanded Uncertainty:					3.56

3.2.4 Conducted Antenna Port Measurement

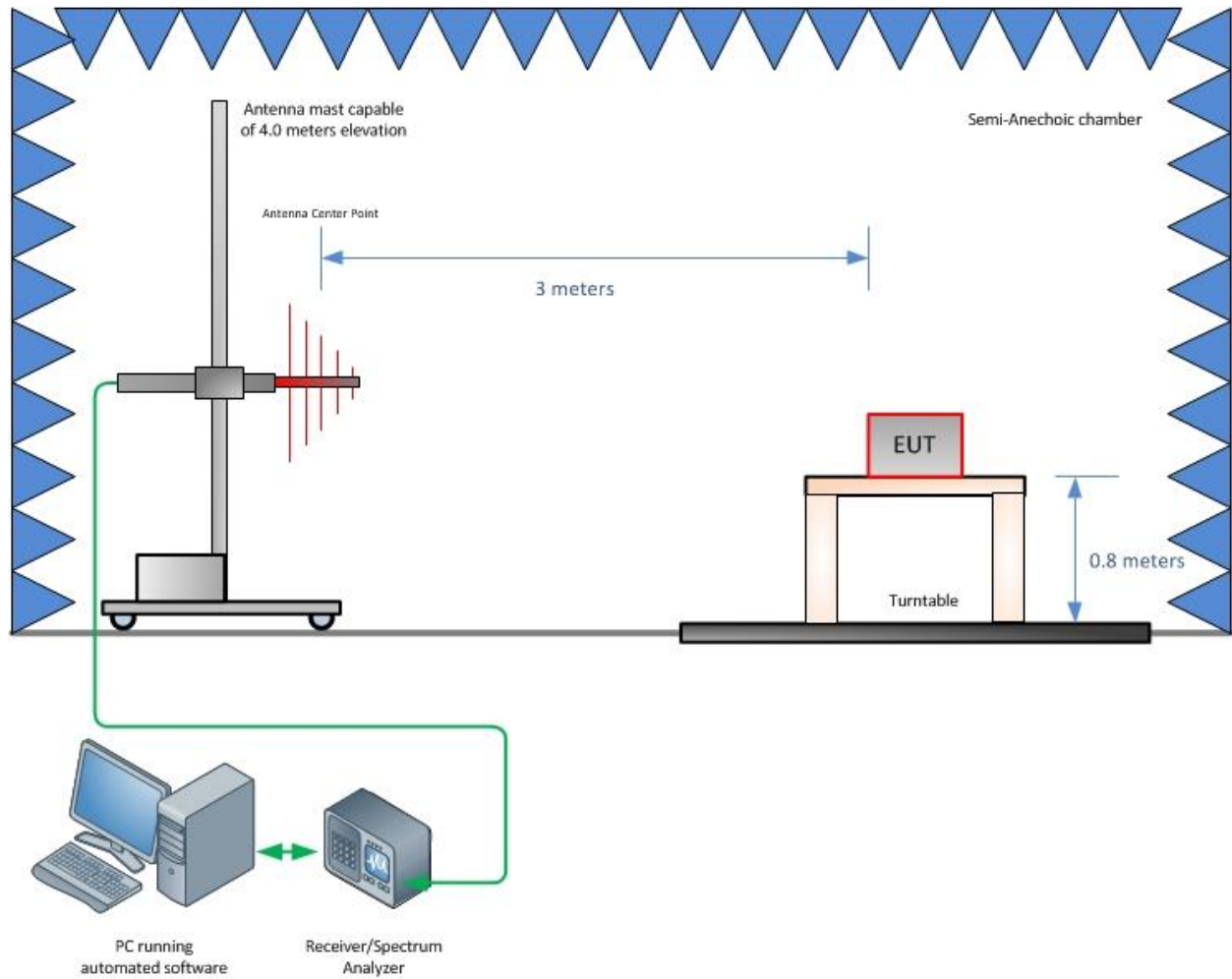
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.50	0.29	0.08
3	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					0.72
Coverage Factor (k):					2
Expanded Uncertainty:					1.45



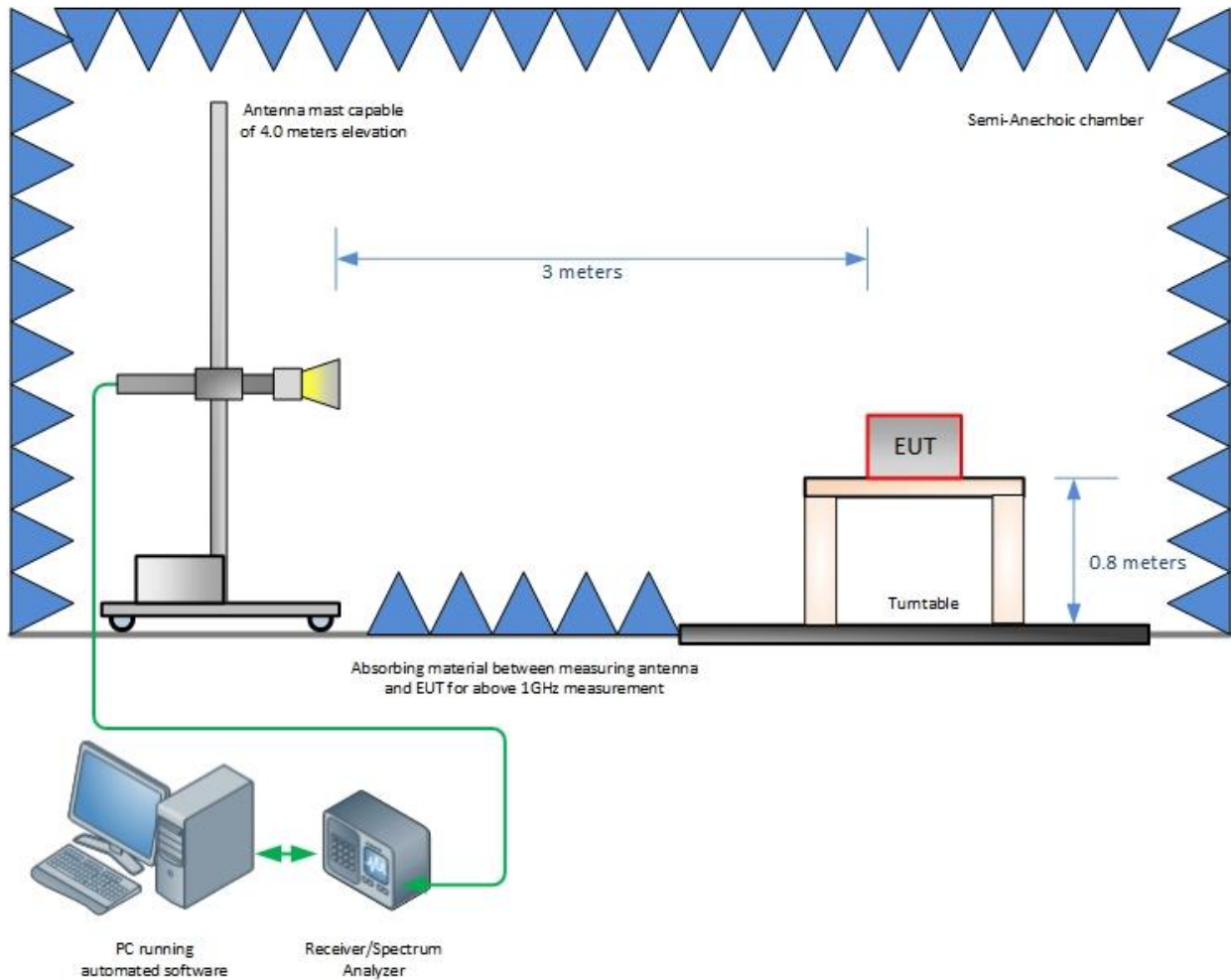
SECTION 4

DIAGRAM OF TEST SETUP

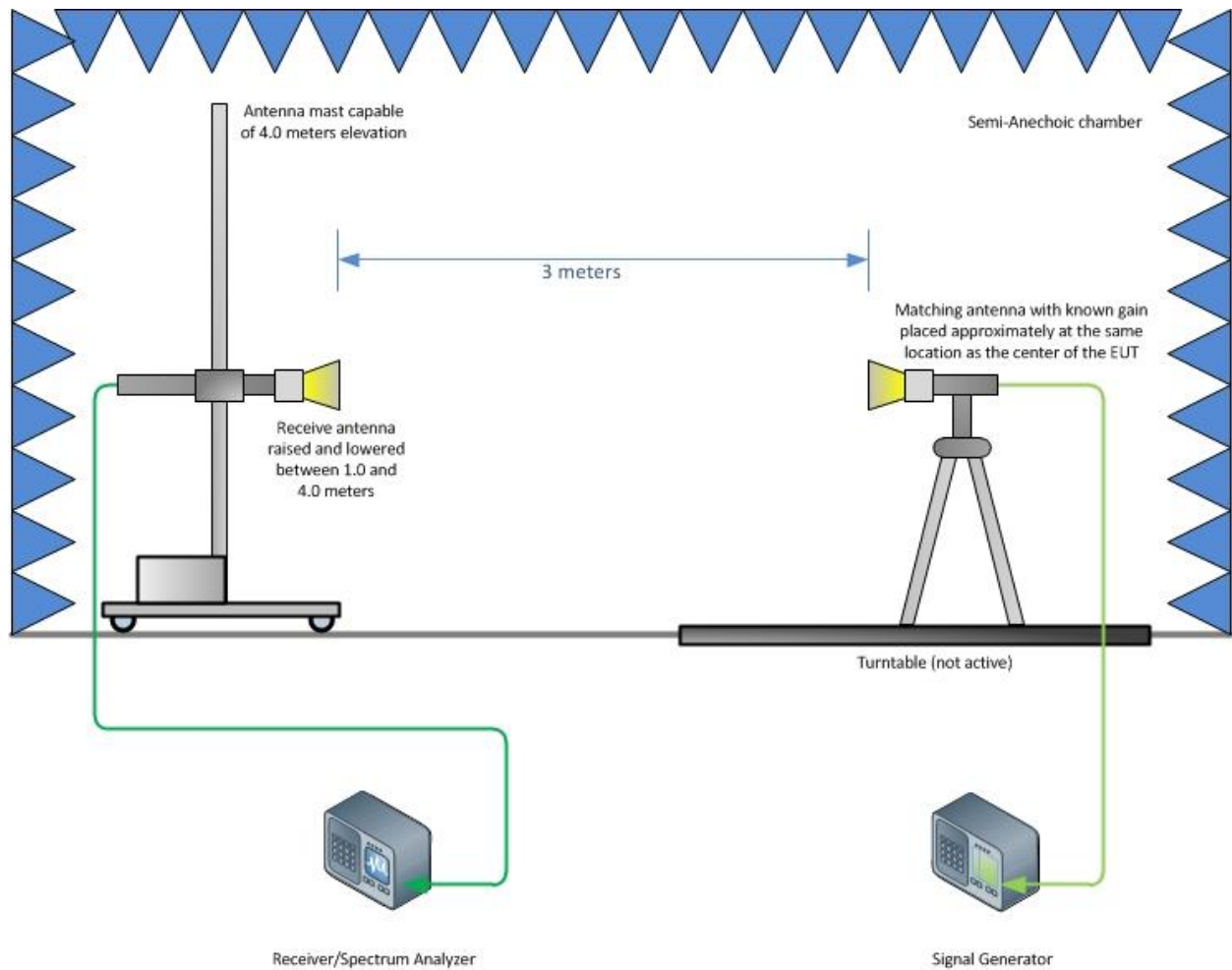
4.1 TEST SETUP DIAGRAM



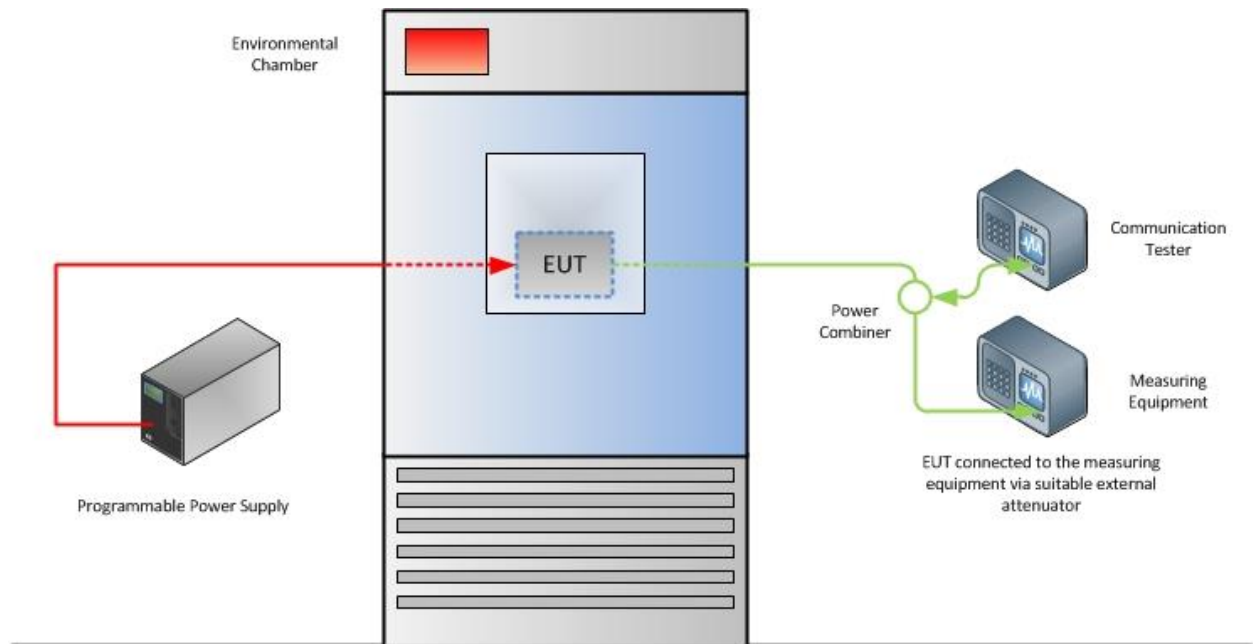
Radiated Emission Test Setup (Below 1GHz)



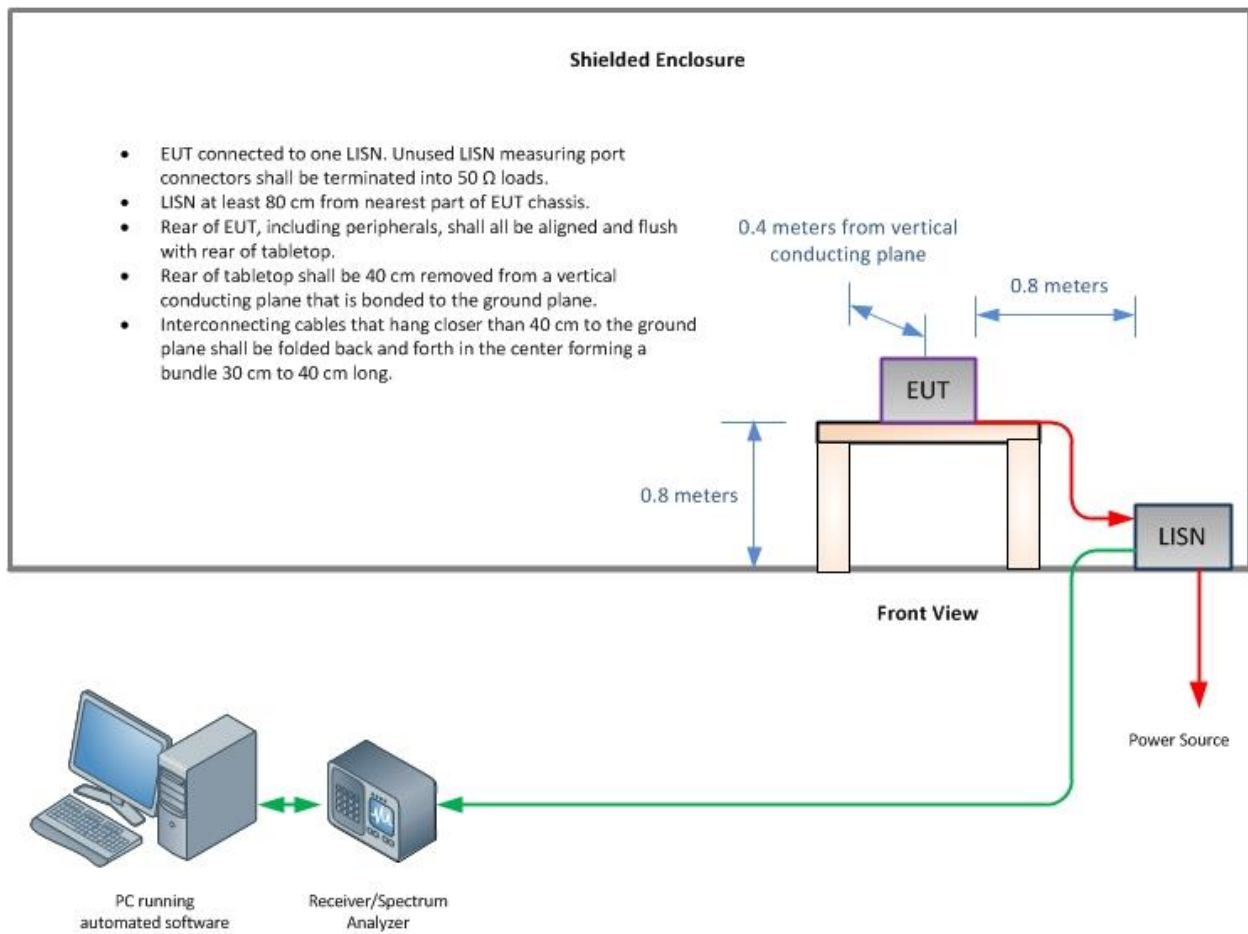
Radiated Emission Test Setup (Above 1GHz)



Substitution Test Method (Above 1GHz, if applicable)



Frequency Stability Test Configuration



Conducted Emissions Test Configuration (if applicable)



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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