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Report On

Application for Grant of Equipment Authorization of the Nextivity Inc.
Cel-Fi Quatra Cellphone Signal Repeater

FCC CFR 47 Part 2 and 27
RSS-Gen and RSS-130

Report No. SD72113545-0216D **June 2016**

REPORT ON	Radio Testing of the Nextivity Inc. Cellphone Signal Repeater
TEST REPORT NUMBER	SD72113545-0216D
PREPARED FOR	Nextivity Inc. 12230 World Trade Drive, Suite 250 San Diego, CA 92128
CONTACT PERSON	CK Li Sr. Principal Engineer, Regulatory (8588) 829-1692 CKLi@NextivityInc.com
PREPARED BY	Xiaoying Zhang **Name** Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	Juan M. Gonzalez **Name** Authorized Signatory Title: Commercial Wireless EMC Lab Manager
DATED	June 21, 2016

Revision History

SD72113545-0216D Nextivity Inc. Cel-Fi Quatra Cellphone Signal Repeater					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
06/21/16	Initial Release				Juan M Gonzalez

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Nextivity Inc.
Cel-Fi Quatra Cellphone Signal Repeater

1.1 INTRODUCTION

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

- FCC CFR 47 Part 2 and 27
- RSS-Gen and RSS-130.

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 Number(s)	Cel-Fi Quatra
FCC ID	NU: YETQ34-251266NU CU: YETQ34-251266CU
IC Number	NU: 9298A-Q34251266NU CU: 9298A-Q34251266CU
Serial Number(s)	258602000335 (NU) and 25955100346 (CU)
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC CFR 47 Part 2 and 27 (October 1, 2015). • RSS-130 – Mobile Broadband Services (MBS) Equipment Operating in the Frequency Bands 698-756 MHz and 777-787 MHz (Issue 1, October 2013). • RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 4, November 2014).
Start of Test	April 12, 2016
Finish of Test	May 10, 2016
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	• ANSI/TIA-603-C-2004 – 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 v0101 (Guidelines for Determining the Effective Radiated Power (ERP) and Equivalent Isotropically Radiated Power (EIRP) of a RF Transmitting System. • KDB662911 D01 Multiple Transmitter Output v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band • 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 and 27 with cross-reference to the corresponding ISED RSS standard is shown below.

Section	Spec Clause			Test Description	Result
	FCC Part 2	FCC Part 27	RSS-130		
2.1	2.1046	-	4.4	Transmitter Conducted Output Power	Compliant
2.2	-	-	4.4	Equivalent Isotropic Radiated Power	Compliant
	-	27.50 (c)	-	Equivalent Radiated Power	Compliant
2.3	2.1049	27.53 (g)	RSS-Gen 6.6	Occupied Bandwidth	Compliant
2.4	-	-	4.4	Peak-Average Ratio	Compliant
2.5	2.1051	27.53 (9)	4.6.1	Band Edge	Compliant
2.6	2.1051	27.53 (g)	4.6	Conducted Spurious Emissions	Compliant
2.7	2.1053	27.53 (g)	4.6	Field Strength Of Spurious Radiation	Compliant
2.8	2.1055	27.54	4.3	Frequency Stability	Compliant
-	-	-	RSS-Gen 6.0	Receiver Spurious Emissions	N/A*
2.9	-	-	RSS-Gen 8.8	Power Line Conducted Emission	Compliant

N/A* - Not applicable. EUT has no Stand-Alone receiver port

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Nextivity Inc. Cel-Fi Quatra Cellphone Signal Repeater. The EUT is a WCDMA/LTE Signal Booster to improve voice and data cellular performance in large enterprise environments. The EUT consists of two separate units: the Network Unit (NU) and the Coverage Unit (CU). The NU comprises a transmitter and receiver which communicate with the cell tower and the CU. Users place the NU in an area with the strongest signal from the carrier network. The CU is then placed in the centre of the home or office, or in the area where the best signal quality is best needed. The NU and CU are placed at varying distances apart and are communicated via Ethernet cables. Both NU and CU also includes Bluetooth LE connectivity. They are using the same Bluetooth module and antenna. LTE Band 12 function of the EUT was verified in this test report.

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1.3.2 EUT General Description

EUT Description	Cellphone Signal Repeater
Model Name	Cel-Fi Quatra
Model Number(s)	NU: Q34-2/5/12/66NU CU: Q34-2/5/12/66CU
Rated Voltage	NU: 54V DC via external AC/DC adapter CU: 54V DC via POE
Mode Verified	LTE Band 12
Frequency Bands	NU: 699 - 716MHz CU: 729 - 746MHz
Channel Bandwidth	5MHz, 10MHz

Rated Power

Bandwidth (MHz)	Band 12	
	DL (dB)	UL (dB)
5	10.0	20
10	13.0	

Capability	WCDMA (Band 2 and 5), LTE (Band 12 and 4) and BT LE
Primary Unit (EUT)	☐ Production ☒ Pre-Production ☐ Engineering
Manufacturer Declared Temperature Range	0°C to 40°C
Antenna Type	PCB PIFA
Manufacturer	Nextivity Inc.
Antenna Model	N/A

Maximum Antenna Gain

NU	CU
0 dBi	0 dBi

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1.3.3 Transmit Frequency Table

Mode	Channel Bandwidth (MHz)	Tx Frequency (MHz)	Emission Designator	ERP (Part 27)*		EIRP (RSS-130)*	
				Max. Power Avg (dBm)	Max. Power Avg (W)	Max. Power Avg (dBm)	Max. Power Avg (W)
LTE Band 12 Downlink	5	731.5	4M66F9W	11.58	0.007	13.73	0.012
	10	741.0	8M86F9W	14.58	0.015	16.73	0.025
LTE Band 12 Uplink	5	701.5	4M43F9W	20.41	0.055	22.56	0.091
	10	711.0	8M86F9W	20.55	0.063	22.70	0.103

* The ERP and EIPR are the sum of both Top Antenna and Side Antenna

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1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Downlink (CU TX). Input signal is applied to B12 antenna port of NU. Output is monitored from B12 Top antenna port of CU.
B	Uplink (NU TX). Input signal is applied to B12 antenna port of CU. Output is monitored from B12 Top antenna port of NU.
C	Radiated test setup. Downlink (CU TX). Input signal is applied to B12 antenna port of NU. B12 Top antenna port of CU is terminated with a 50Ω load.
D	Radiated test setup. Uplink (NU TX). Input signal is applied to B12 antenna port of CU. B12 Top antenna port of 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 both EUT are connected via USB.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Phihong	AC/DC Adapter (EUT)	M/N: PSA120u-540l6nt-r Rev 02 No. 026, IP: 100-240VAC, 1.6A, 50-60Hz OP: 54VDC, 2.22A
Netgear	Network patch Cable (1x NU to CU)	4.0m, unshielded, Cat5e 24AWG UTP
-	Support USB cable	1.75 meters, shielded Type A to Micro B connector
-	Support USB cable	Custom 1.0 meter shielded USB Type A to Type B for the Shielded Test Enclosure
Lenovo	Support Laptop	M/N: 2912-3VU, S/N: R9-92MH0 10/11
Lenovo	Support Laptop AC Adapter	M/N: 42T4430 S/N: 11S42T4430Z1ZGWE27AA9X
Rhode & Schwarz	Support Wideband Radio Communication Tester	M/N CMW500 S/N 1201.0002K50/103829
Ramsey	Support Shielded Test Enclosure	With custom USB cable

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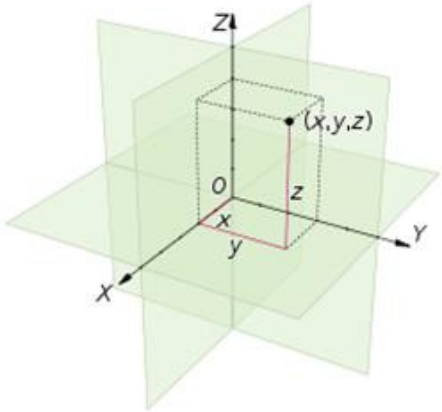
1.4.4 Worst Case Configuration

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 12 Downlink	10MHz	Low Channel 5060	734.0MHz
LTE Band 12 Uplink	10MHz	High Channel 23130	711.0MHz

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 "Z" configuration.



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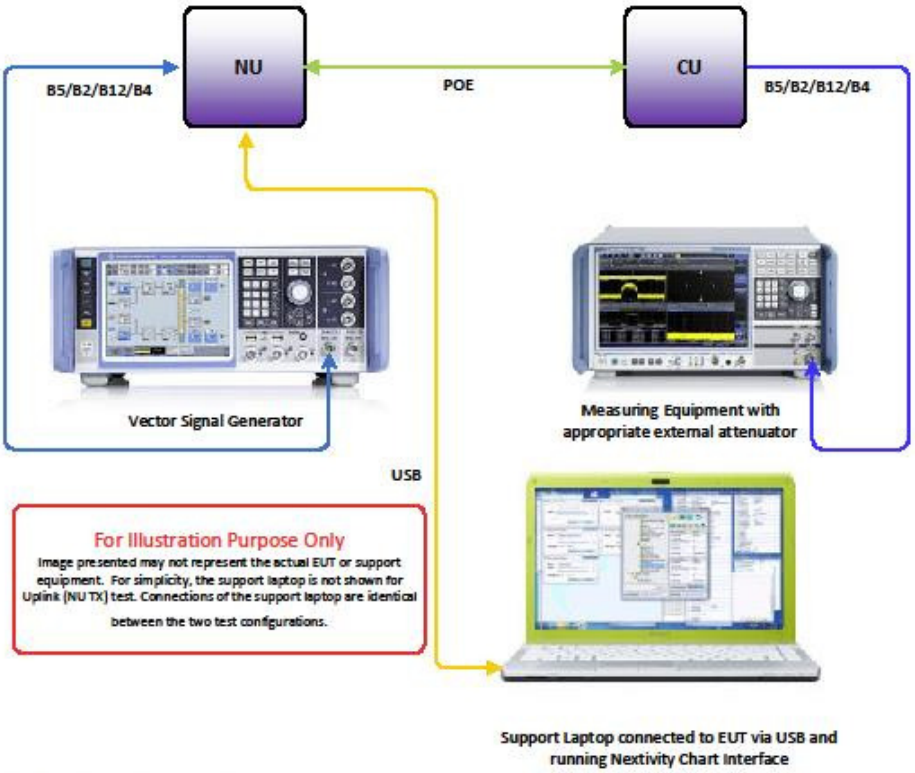
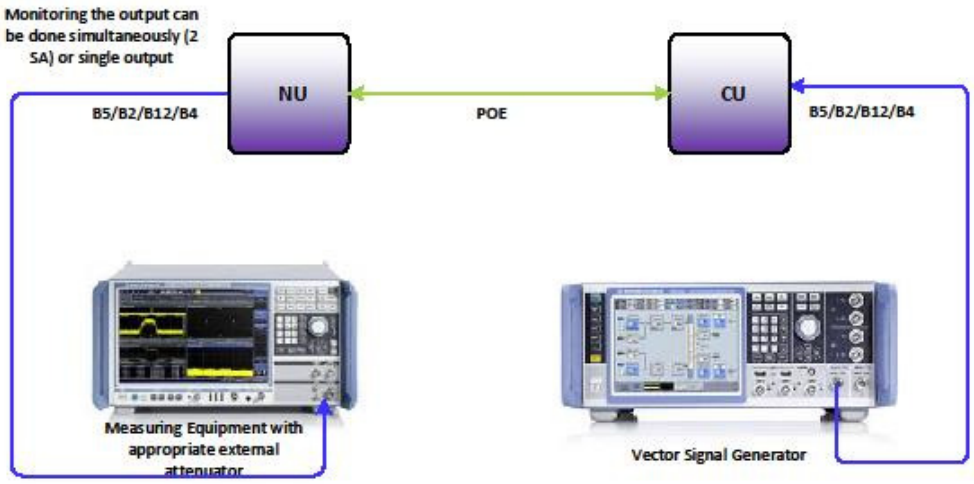
1.4.5 Simplified Test Configuration Diagram

Downlink (CU Tx) Conducted Test



Uplink (NU Tx) Conducted Test



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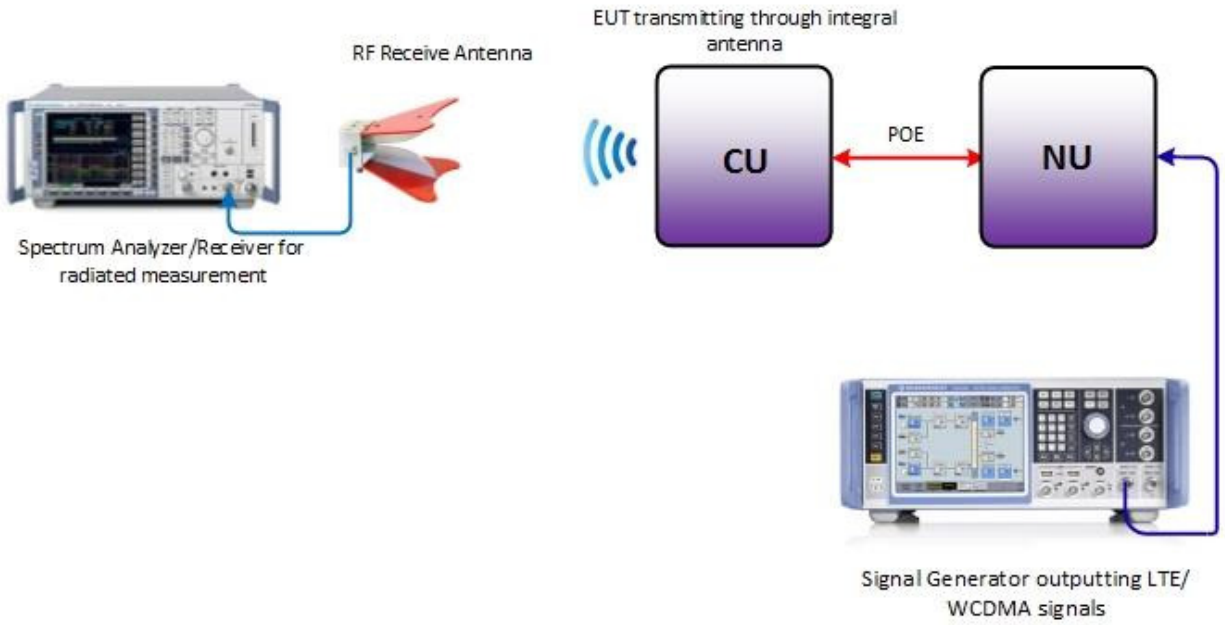
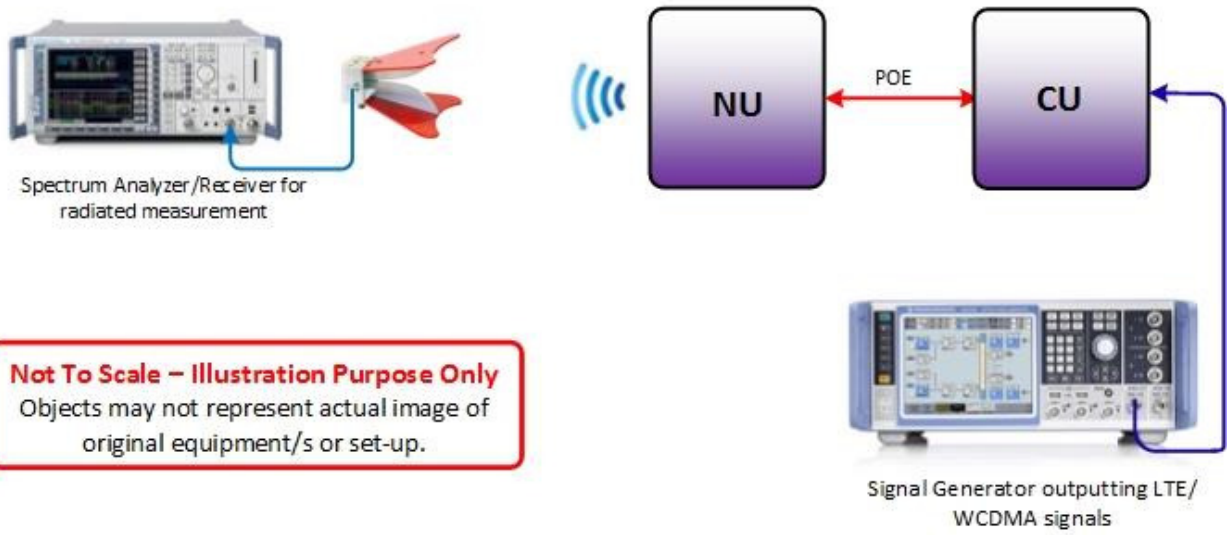
Radiated Testing (Downlink)



Radiated Testing (Uplink)



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

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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: 258602000335 (NU) and 25955100346 (CU)		
N/A	-	-

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)

Building #8, 16530 Via Esprillo, 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 TUV SUD 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.

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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:

P_{EIRP} = -18 dBm + 7.8 dBi – 1dB
= 11.2 dBm
P_{ERP} = P_{EIRP} – 2.15 dB
= 11.2 dBm – 2.15 dB
= 9.05 dBm

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SECTION 2

TEST DETAILS

Radio Testing of the
Nextivity Inc.
Cel-Fi Quatra Cellphone Signal Repeater

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2.1 TRANSMITTER CONDUCTED OUTPUT POWER

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046 (a) and (c)
RSS-130, Clause 4.4

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.

2.1.3 Equipment Under Test and Modification State

Serial No: 258602000335 (NU) and 25955100346 (CU) / Test Configuration A and B

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

April 12, 14 and May 10, 2016/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	24.7 – 27.4°C
Relative Humidity	42.2 – 47.7%
ATM Pressure	98.8 – 99.7kPa

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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.
- Since LTE B12 supports MIMO mode, using the Meausre-and-Sum approach, the output power of both Top Antenna Port and Side Antenna Port were measured, and the total output power were then summed mathematically in linear power units according to FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

2.1.8 Test Results

LTE B12 Downlink								
Bandwidth (MHz)	Channel	Frequency (MHz)	Top Antenna		Side Antenna		Sum	
			Avg Power (dBm)	PK Power (dBm)	Avg Power (dBm)	PK Power (dBm)	Avg Power (dBm)	PK Power (dBm)
5	5035	731.5	10.90	22.73	10.53	20.34	13.73	24.71
	5095	737.5	10.68	21.43	10.37	21.26	13.54	24.36
	5155	743.5	10.78	20.44	10.31	21.31	13.56	23.91
10	5060	734.0	13.93	23.24	13.50	23.22	16.73	26.24
	5095	737.5	13.80	23.13	13.36	23.12	16.60	26.14
	5130	**741.0**	**13.94**	**23.47**	**13.34**	**22.97**	**16.66**	**26.24**

LTE B12 Uplink								
Bandwidth (MHz)	Channel	Frequency (MHz)	Top Antenna		Side Antenna		Sum	
			Avg Power (dBm)	PK Power (dBm)	Avg Power (dBm)	PK Power (dBm)	Avg Power (dBm)	PK Power (dBm)
5	23035	701.5	19.59	29.07	19.50	31.12	22.56	33.23
	23095	707.5	19.54	30.24	19.25	27.96	22.41	32.26
	23155	713.5	19.10	30.93	19.24	28.91	22.18	33.05
10	23060	704.0	19.45	29.27	19.26	28.74	22.37	32.02
	23095	707.5	19.53	29.50	19.45	30.14	22.50	32.84
	23130	**711.0**	**20.13**	**30.69**	**19.20**	**29.00**	**22.70**	**32.94**

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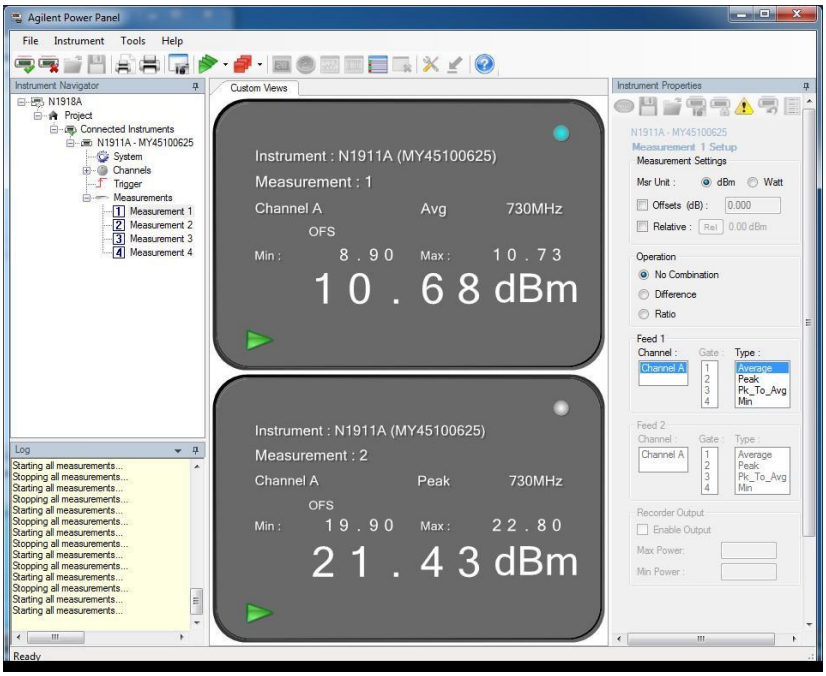
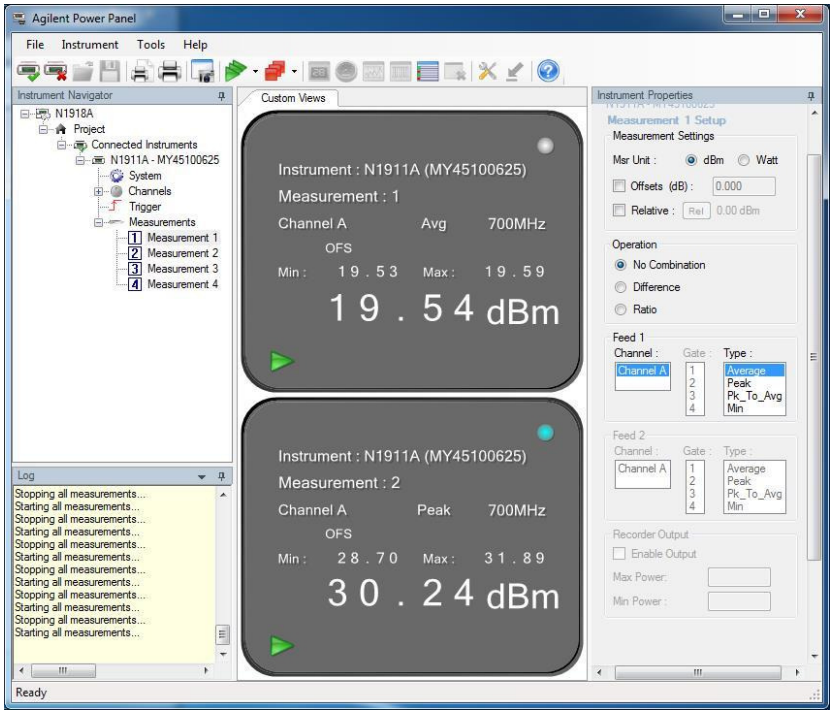
2.1.9 Sample Test Plot



LTE Band 12 DL 5MHz Bandwidth Mid Channel



LTE Band 12 UL 5MHz Bandwidth Mid Channel

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2.2 EFFECTIVE RADIATED POWER

2.2.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.50 (c)
RSS-130, Clause 4.4

2.2.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.50 (c):
(9) Control and mobile stations in the 698–746 MHz band are limited to 30 watts ERP.

RSS-130, Clause 4.4:
The e.i.r.p. shall not exceed 50 watts for mobile equipment or for outdoor fixed subscriber equipment, nor shall it exceed 5 watts for portable equipment or for indoor fixed subscriber equipment.

2.2.3 Equipment Under Test and Modification State

Serial No: 258602000335 (NU) and 25955100346 (CU)

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

April 12 and 14, 2016/XYZ

2.2.5 Additional Observations

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

$$\mathbf{ERP = P_T + G_T - L_C - 2.15dB}$$

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: the -2.15 in the formula is to convert EIRP to ERP);
L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

2.2.6 Sample Computation

ERP = $P_T + G_T - L_C$ - 2.15dB
= 29.87 (Peak) + 0.13 (max. gain) – 3.84 (cable loss) -2.15
= 24.01 dBm

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2.2.7 Test Results

LTE B12 Downlink							
Bandwidth (MHz)	Frequency (MHz)	Avg Power (dBm)		Antenna Gain (dBi)	Sum		Limit (dBm)
		Top Antenna	Side Antenna		ERP (dBm)	EIRP (dBm)	
5	731.5	10.90	10.53	0	11.58	13.73	44.77
	737.5	10.68	10.37	0	11.39	13.54	44.77
	743.5	10.78	10.31	0	11.41	13.56	44.77
10	734.0	13.93	13.50	0	14.58	16.73	44.77
	737.5	13.80	13.36	0	14.45	16.60	44.77
	741.0	13.94	13.34	0	14.51	16.66	44.77

LTE B12 Uplink							
Bandwidth (MHz)	Frequency (MHz)	Avg Power (dBm)		Antenna Gain (dBi)	Sum		Limit (dBm)
		Top Antenna	Side Antenna		ERP (dBm)	EIRP (dBm)	
5	701.5	19.59	19.50	0	20.41	22.56	44.77
	707.5	19.54	19.25	0	20.26	22.41	44.77
	713.5	19.10	19.24	0	20.03	22.18	44.77
10	704.0	19.45	19.26	0	20.22	22.37	44.77
	707.5	19.53	19.45	0	20.35	22.50	44.77
	711.0	20.13	19.20	0	20.55	22.70	44.77

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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.

2.3.3 Equipment Under Test and Modification State

Serial No: 258602000335 (NU) and 25955100346 (CU) / Test Configuration A and B

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

April 12 and 14, 2016/XYZ

2.3.5 Test Equipment Used

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

2.3.6 Environmental Conditions

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

Ambient Temperature	25.3°C
Relative Humidity	47.7 %
ATM Pressure	99.7kPa

2.3.7 Additional Observations

- This is a conducted test. Both 26dB bandwidth and 99% bandwidth presented.
- The transducer factor (TDF) used is from the external attenuators and cables used.
- 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 ≥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.

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- 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.

2.3.8 Test Results

Downlink					
Band	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**OBW (MHz)**	**-26dB BW (MHz)**
LTE Band 12	5	5035	731.5	4.63	5.12
		5095	737.5	4.63	5.12
		5155	743.5	4.66	5.15
	10	5060	734.0	8.86	9.44
		5095	737.5	8.86	9.38
		5130	741.0	8.86	9.38

Uplink					
Band	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**OBW (MHz)**	**-26dB BW (MHz)**
LTE Band 12	5	23035	701.5	4.40	4.78
		23095	707.5	4.43	4.78
		23155	713.5	4.43	4.78
	10	23060	704.0	8.80	9.32
		23095	707.5	8.80	9.38
		23130	711.0	8.86	9.32

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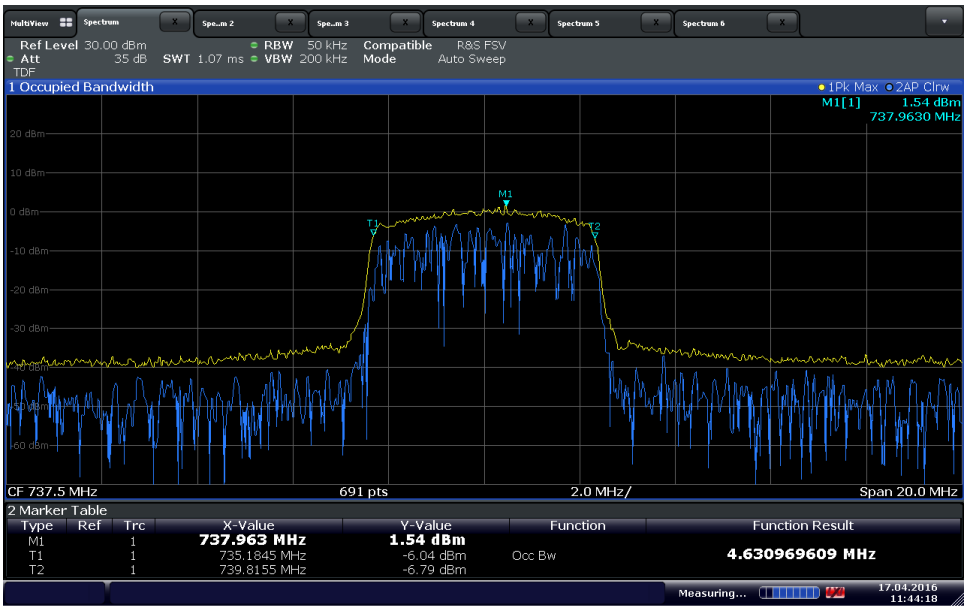
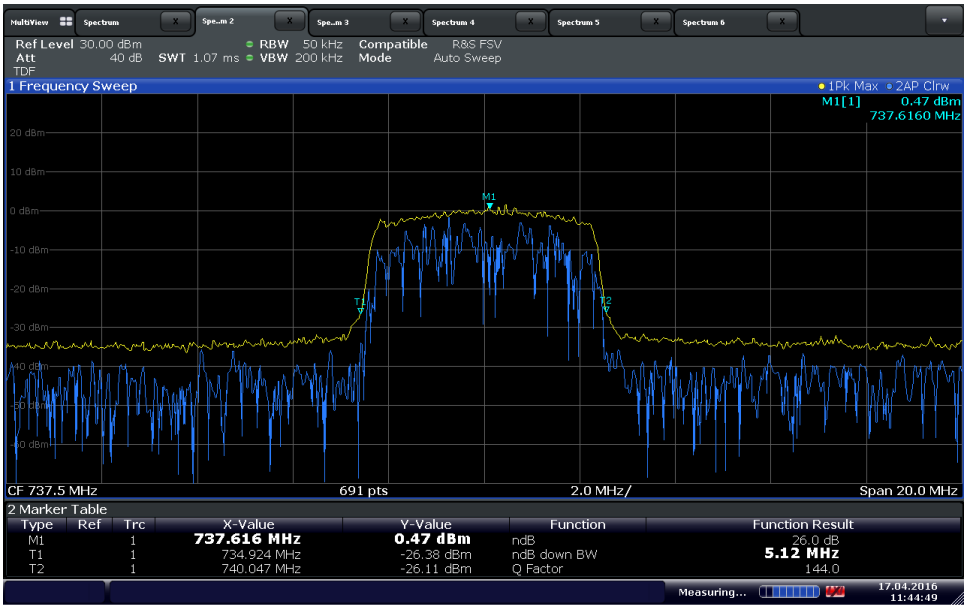
LTE Band 12 Downlink 5MHz Bandwidth Mid Channel 99% OBW



Date: 17.APR.2016 11:44:19

LTE Band 12 Downlink 5MHz Bandwidth Mid Channel -26dB BW



Date: 17.APR.2016 11:44:49

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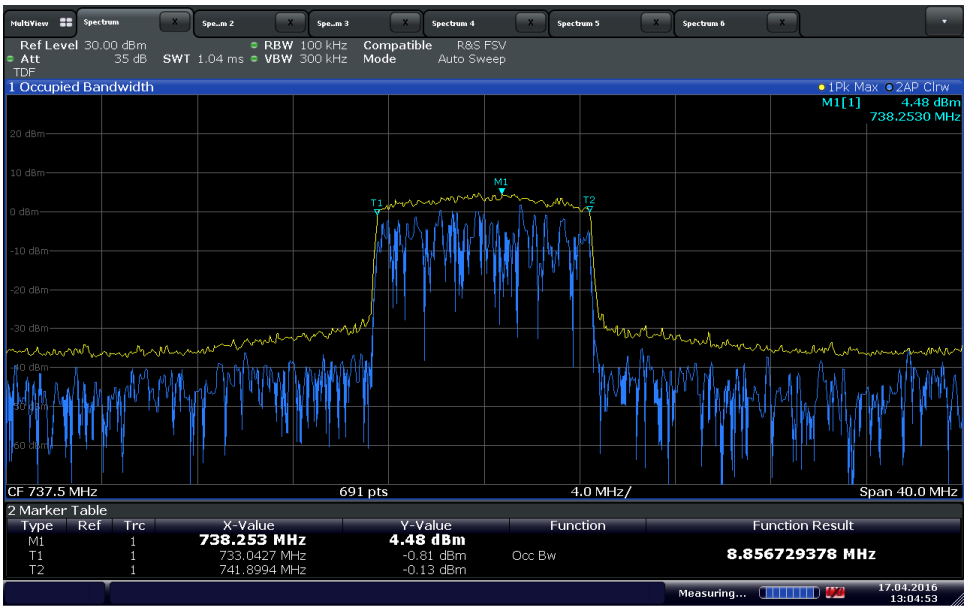
LTE Band 12 Downlink 10MHz Bandwidth Mid Channel 99% OBW



Date: 17.APR.2016 13:04:53

LTE Band 12 Downlink 10MHz Bandwidth Mid Channel -26dB BW

Date: 17.APR.2016 13:04:10

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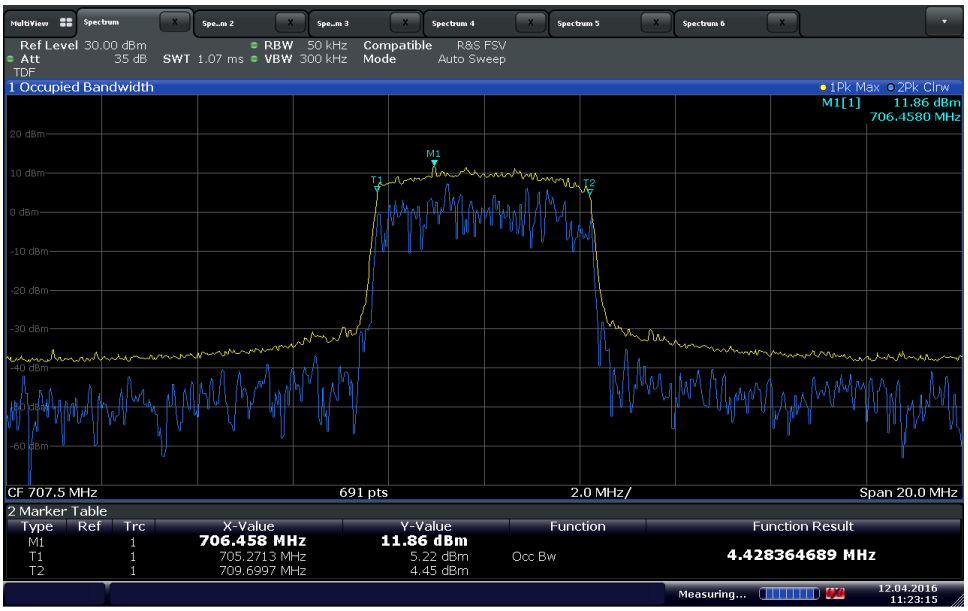
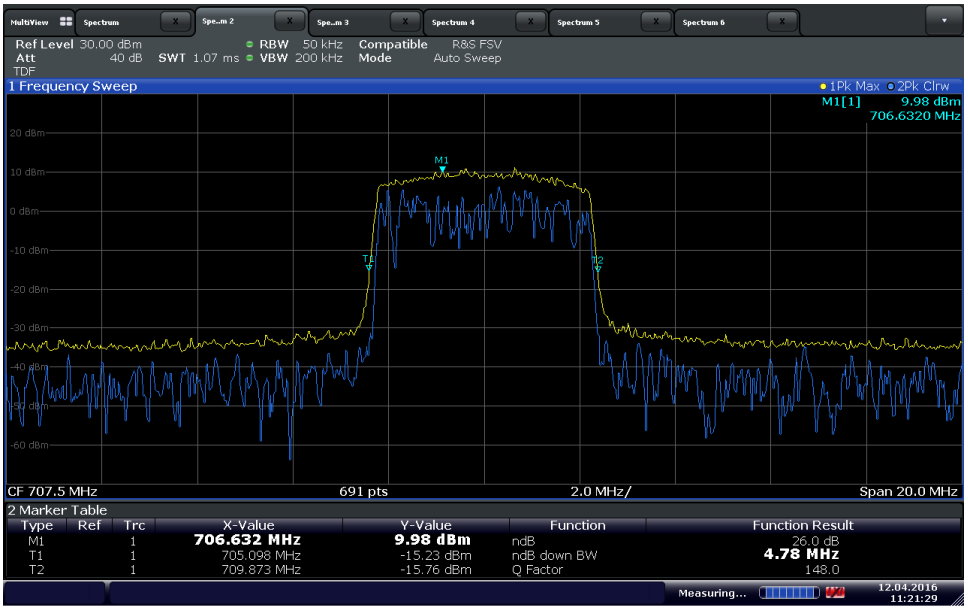
LTE Band 12 Uplink 5MHz Bandwidth Mid Channel 99% OBW



Date: 12.APR.2016 11:23:14

LTE Band 12 Uplink 5MHz Bandwidth Mid Channel -26dB BW



Date: 12.APR.2016 11:21:30

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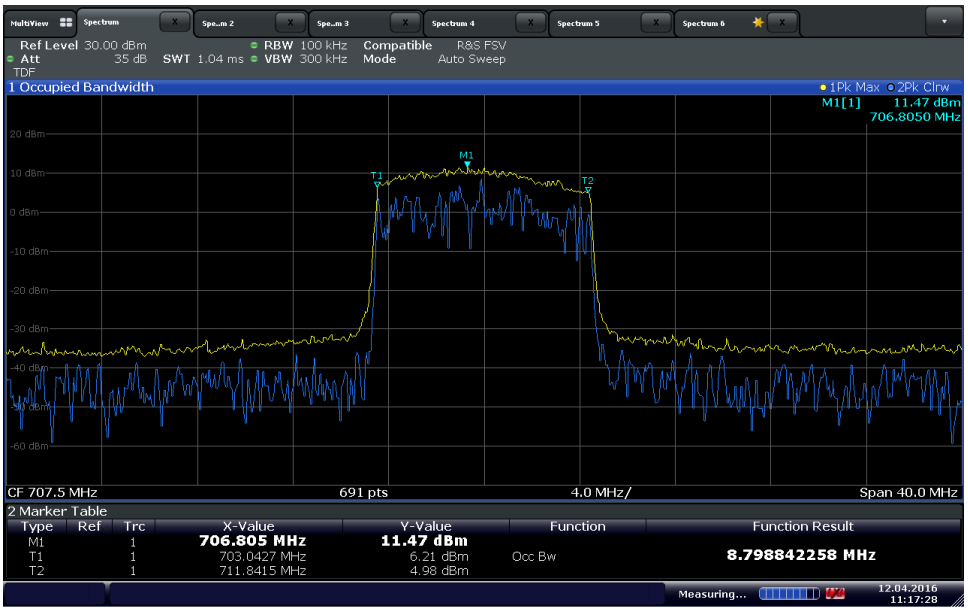
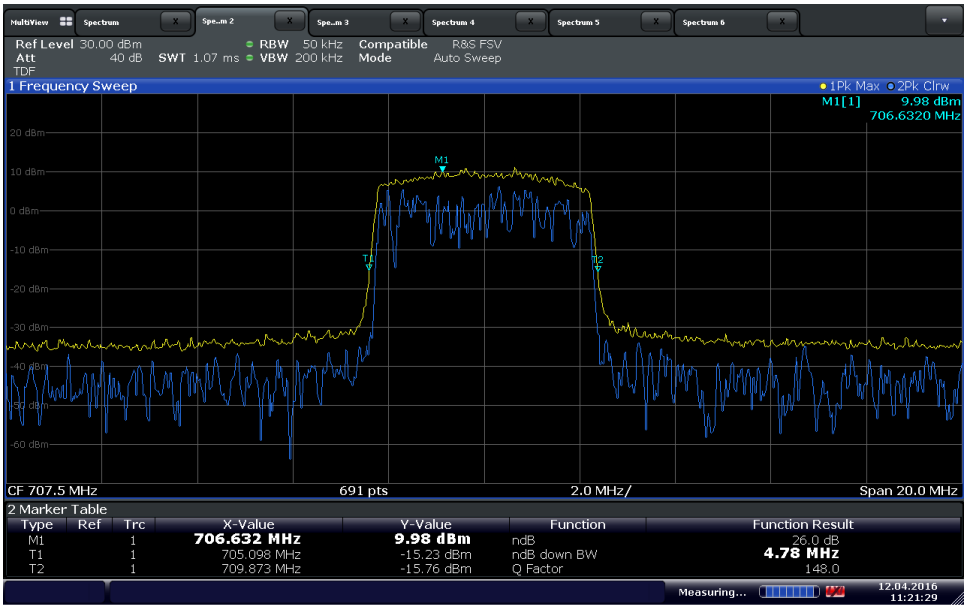
LTE Band 12 Uplink 10MHz Bandwidth Mid Channel 99% OBW



Date: 12.APR.2016 11:17:28

LTE Band 12 Uplink 10MHz Bandwidth Mid Channel -26dB BW



Date: 12.APR.2016 11:21:30

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2.4 PEAK-AVERAGE RATIO

2.4.1 Specification Reference

RSS-130, Clause 4.4

2.4.2 Standard Applicable

The peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

2.4.3 Equipment Under Test and Modification State

Serial No: 258602000335 (NU) and 25955100346 (CU) / Test Configuration A and B

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

April 12 and 17, 2016/XYZ

2.4.5 Test Equipment Used

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

2.4.6 Environmental Conditions

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

Ambient Temperature	25.3 - 27.4°C
Relative Humidity	47.7 - 24.8 %
ATM Pressure	99.0 - 99.7kPa

2.4.7 Additional Observations

- This is a conducted test. Test procedure is per Section 5.7 of KDB971168 (D01 Power Meas License Digital Systems v02r02).
- The transducer factor (TDF) used is from the external attenuators and cables used.
- 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.
- Procedure is per Section 5.7.1 of KDB971168.
- RBW was set to maximum the SA can support.

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- 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.

2.4.8 Test Results

Downlink				
Band	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**PAR (dB)**
LTE Band 12	5	5035	731.5	11.09
		5095	737.5	10.58
		5155	743.5	10.57
	10	5060	734.0	9.85
		5095	737.5	9.67
		5130	741.0	9.51

Uplink				
Band	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**PAR (dB)**
LTE Band 12	5	23035	701.5	9.96
		23095	707.5	10.62
		23155	713.5	11.49
	10	23060	704.0	11.54
		23095	707.5	11.17
		23130	711.0	10.95

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2.4.9 Sample Test Plot

LTE Band 12 Downlink 5MHz Bandwidth Mid Channel -PAR

Date: 17.APR.2016 11:45:15

LTE Band 12 Downlink 10MHz Bandwidth Mid Channel -PAR

Date: 17.APR.2016 13:05:18

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LTE Band 12 Uplink 5MHz Bandwidth Mid Channel -PAR

Date: 12.APR.2016 11:23:44

LTE Band 12 Uplink 10MHz Bandwidth Mid Channel -PAR

Date: 12.APR.2016 11:18:31

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2.5 BAND EDGE

2.5.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.53(g)
RSS-130, Clause 4.6.

2.5.2 Standard Applicable

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

2.5.3 Equipment Under Test and Modification State

Serial No: 258602000335 (NU) and 25955100346 (CU) / Test Configuration A

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

April 12, 14 and 17, 2016/XYZ

2.5.5 Test Equipment Used

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

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.7 - 27.4°C
Relative Humidity	24.8 - 47.7%
ATM Pressure	98.7 - 99.7kPa

2.5.7 Additional Observations

- This is a conducted test. Test guidance is per Section 6.0 of KDB971168 (D01 Power Meas License Digital Systems v02r01).
- The path loss was measured and entered as a level offset.
- The center frequency of the spectrum is the band edge frequency.
- Using a span of 2MHz for Band 12, RBW is set to 30 kHz and VBW is set to >3X RBW.

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- Since LTE B12 supports MIMO mode, the limit should be adjusted with a correction of -3dB [10log(2)] by using the Measure and Add 10log(N) dB technique according to FCC KDB 62911 D01 Multiple Transmitter Output v02r01 accounting for simultaneous transmission from top antenna and side antenna ports.

2.5.8 Test Results

LTE Band 12 Downlink 5MHz Bandwidth Low Channel Band Edge

Date: 17.APR.2016 11:41:02

LTE Band 12 Downlink 5MHz Bandwidth High Channel Band Edge

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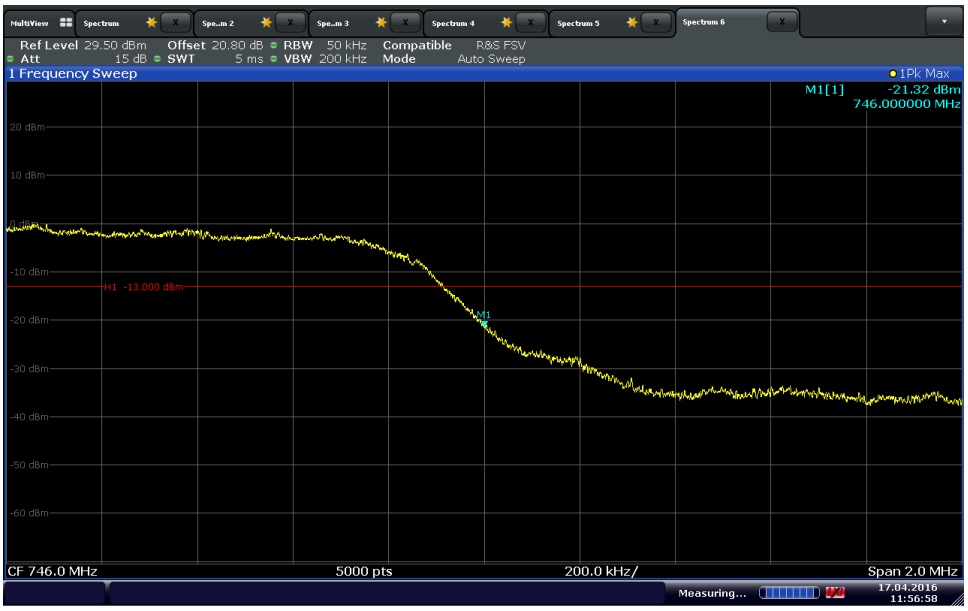
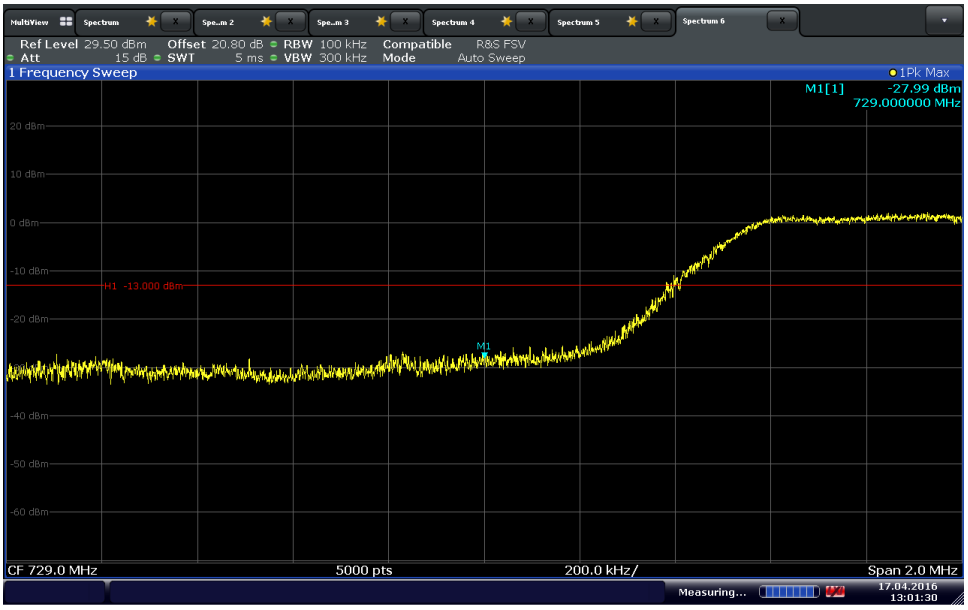


Date: 17.APR.2016 11:56:58

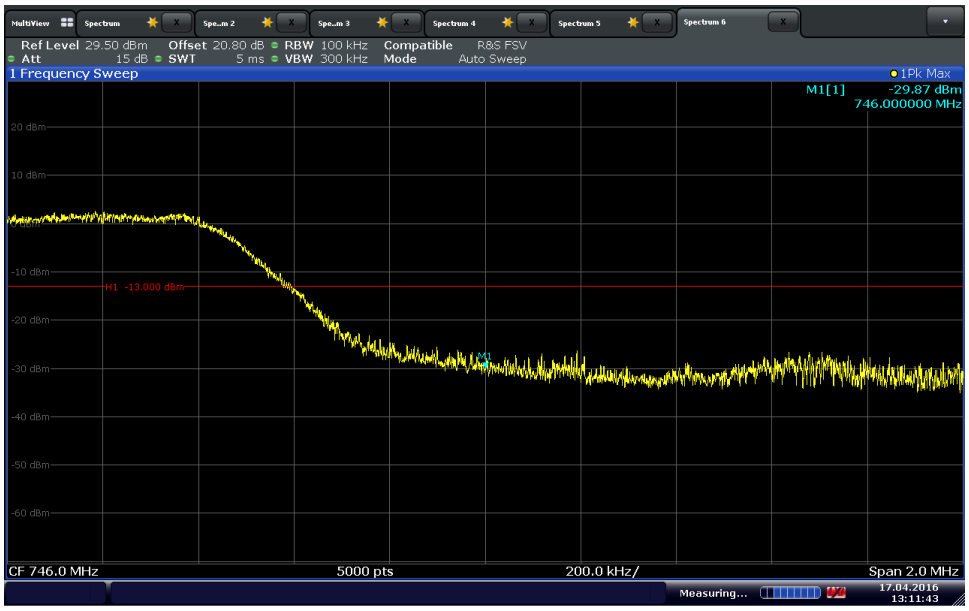
TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

LTE Band 12 Downlink 10MHz Bandwidth Low Channel Band Edge



Date: 17.APR.2016 13:01:31

LTE Band 12 Downlink 10MHz Bandwidth High Channel Band Edge



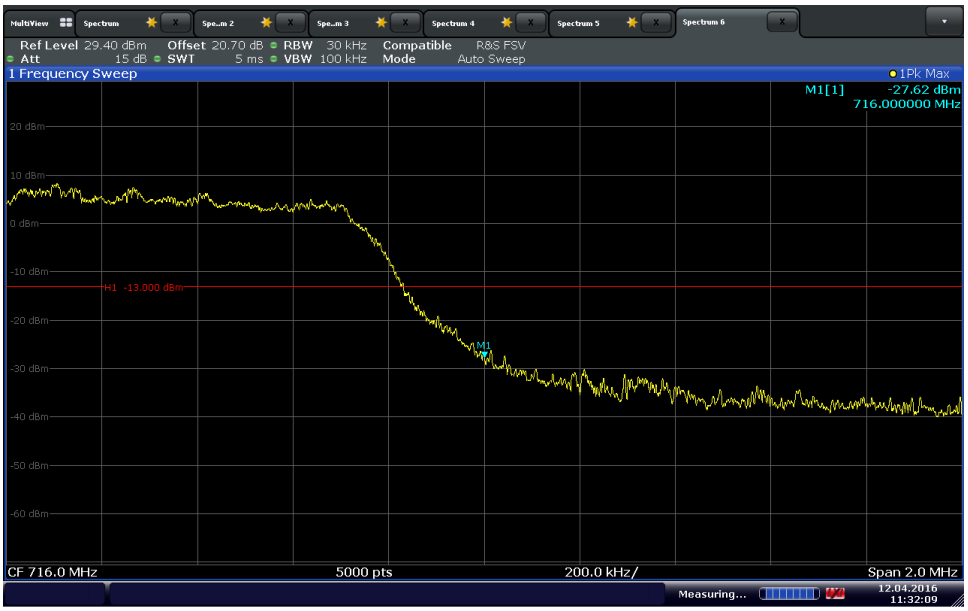
Date: 17.APR.2016 13:11:43

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

LTE Band 12 Uplink 5MHz Bandwidth Low Channel Band Edge

Date: 12.APR.2016 11:33:44

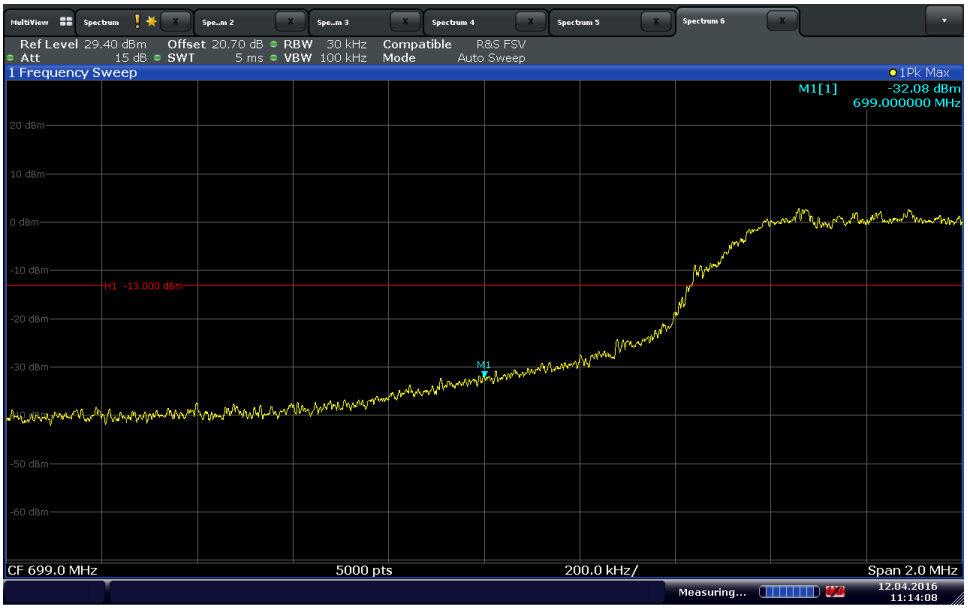
LTE Band 12 Uplink 5MHz Bandwidth High Channel Band Edge



Date: 12.APR.2016 11:32:09

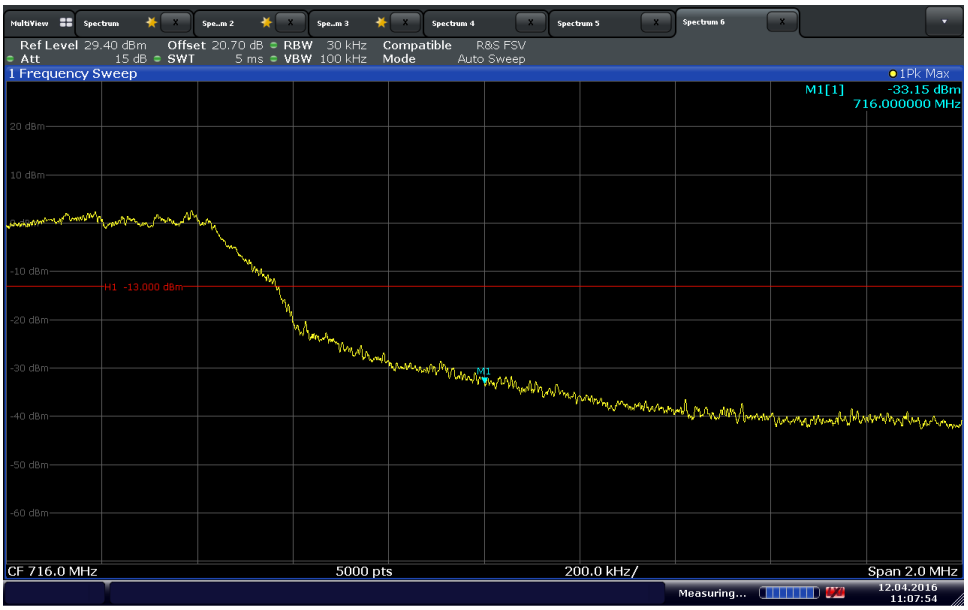
TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

LTE Band 12 Uplink 10MHz Bandwidth Low Channel Band Edge



Date: 12.APR.2016 11:14:08

LTE Band 12 Uplink 10MHz Bandwidth High Channel Band Edge



Date: 12.APR.2016 11:07:54

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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(g)
RSS-130, Clause 4.6

2.6.2 Standard Applicable

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

2.6.3 Equipment Under Test and Modification State

Serial No: 258602000335 (NU) and 25955100346 (CU) / Test Configuration A and B

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

April 12, 14 and 17, 2016/XYZ

2.6.5 Test Equipment Used

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

2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.7 - 27.4°C
Relative Humidity	24.8 - 47.7%
ATM Pressure	98.7 - 99.7kPa

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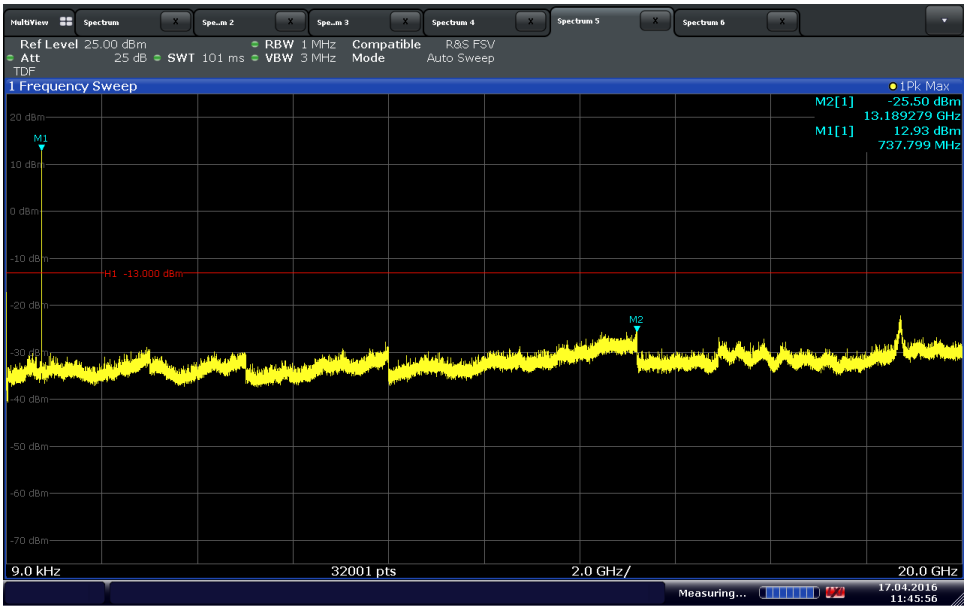
2.6.7 Additional Observations

- 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 20GHz (requirement is up to the 10th harmonic (≤8GHz)).
- All low, middle and high channels were verified. Only test plots for middle channel presented in this test report as the representative configuration.
- Since LTE B12 supports MIMO mode, the limit should be adjusted with a correction of -3dB [10log(2)] by using the Measure and Add 10log(N) dB technique according to FCC KDB 62911 D01 Multiple Transmitter Output v02r01 accounting for simultaneous transmission from top antenna and side antenna ports.

2.6.8 Test Results

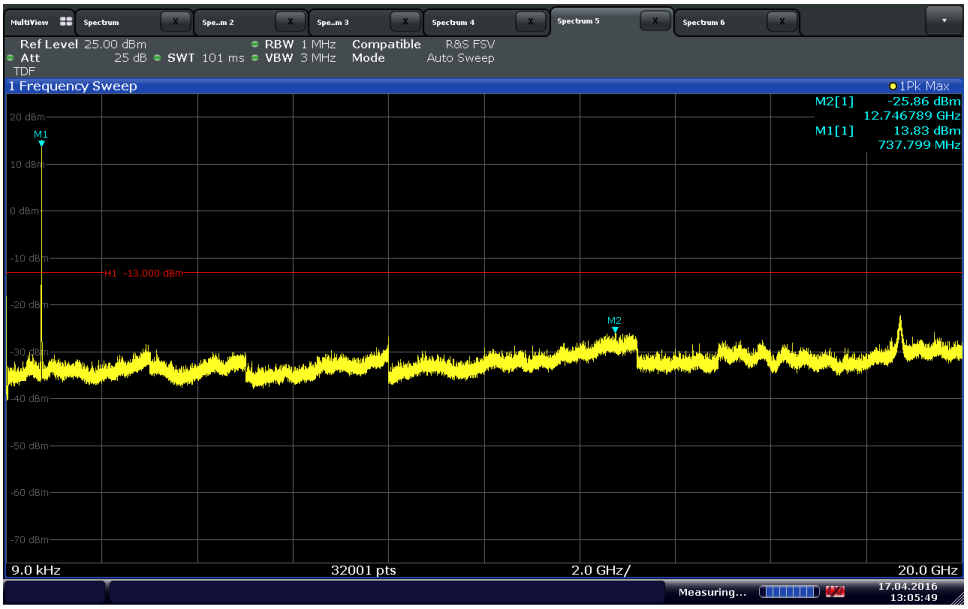
LTE Band 12 Downlink 5MHz Bandwidth Mid Channel Conducted Spurious Emissions



Date: 17.APR.2016 11:45:56

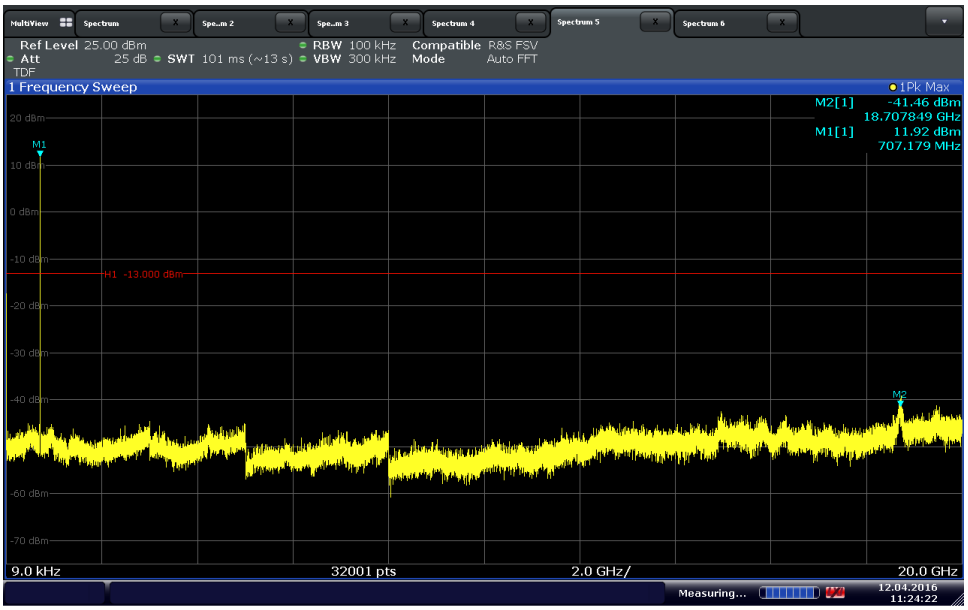
TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

LTE Band 12 Downlink 10MHz Bandwidth Mid Channel Conducted Spurious Emissions



Date: 17.APR.2016 13:05:49

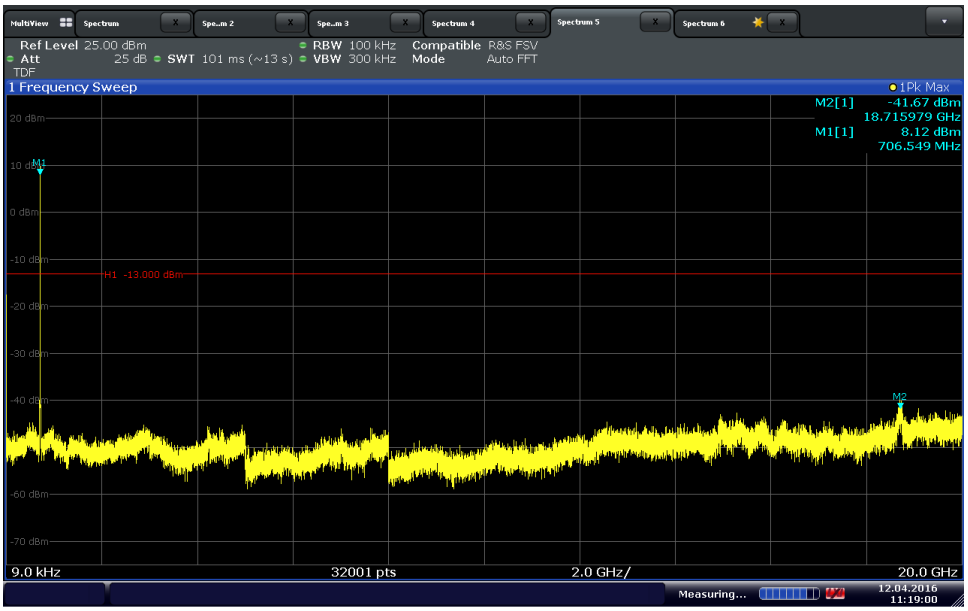
LTE Band 12 Uplink 5MHz Bandwidth Mid Channel Conducted Spurious Emissions



Date: 12.APR.2016 11:24:22

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

LTE Band 12 Uplink 10MHz Bandwidth Mid Channel Conducted Spurious Emissions



Date: 12.APR.2016 11:19:00

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

2.7 FIELD STRENGTH OF SPURIOUS RADIATION

2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 27, Clause 27.53(g)
RSS-130, Clause 4.6

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: 258602000335 (NU) and 25955100346 (CU) / Test Configuration C and D

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

April 18 and 19, 2016/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	22.3 - 27.1°C
Relative Humidity	23.8 - 32.5%
ATM Pressure	99.3 - 99.6kPa

2.7.7 Additional Observations

- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of ANSI/TIA/EIA-603-C 2004, August 17, 2004.
- 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.

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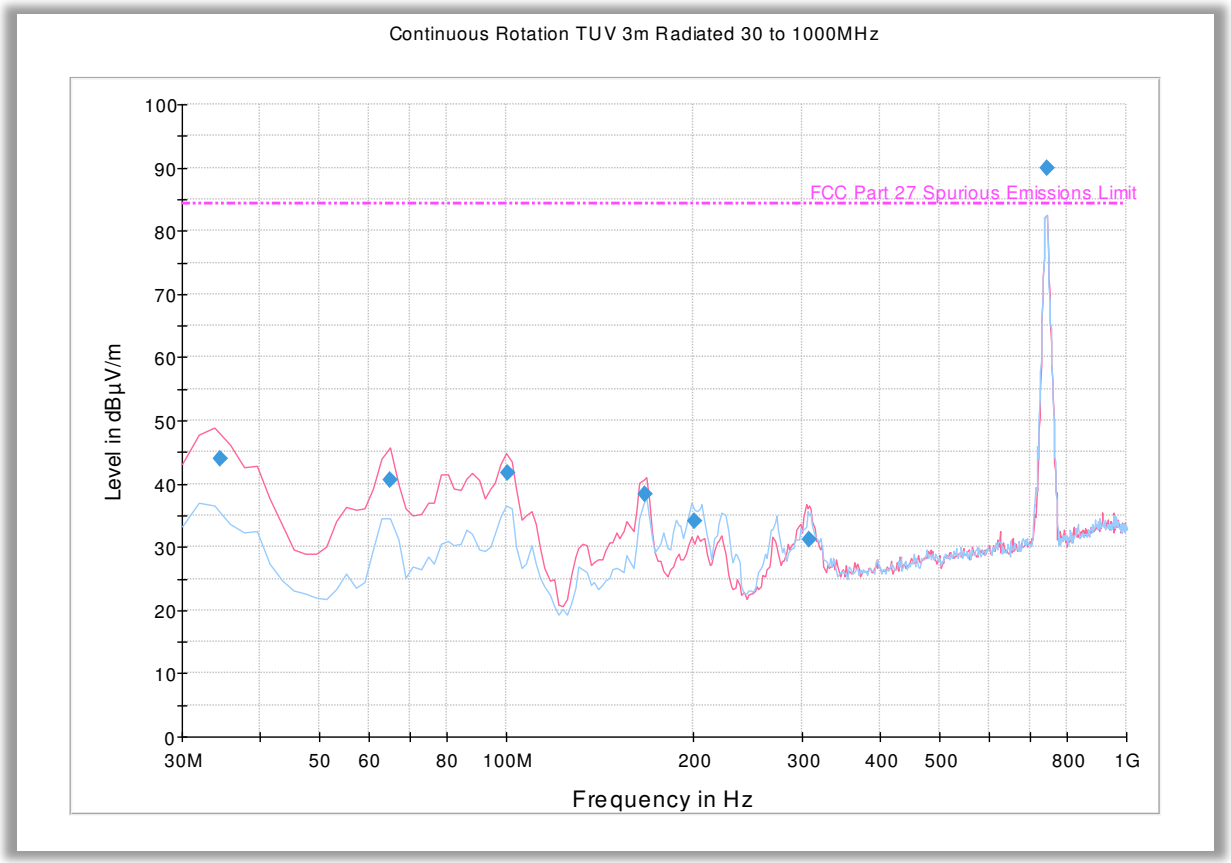
2.7.9 Test Results Below 1GHz (Downlink Worst Case Configuration) - 10MHz Bandwidth High Channel



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
33.887776	46.7	1000.0	100.0	V	305.0	-7.9	37.7	84.4
64.989980	42.9	1000.0	100.0	V	157.0	-16.6	41.5	84.4
99.979960	38.6	1000.0	100.0	V	134.0	-14.2	45.8	84.4
168.016032	33.9	1000.0	100.0	V	243.0	-13.0	50.5	84.4
199.118236	32.5	1000.0	200.0	H	134.0	-11.5	51.9	84.4
306.032064	32.3	1000.0	100.0	H	0.0	-6.7	52.1	84.4
745.350701	82.5	1000.0	200.0	V	0.0	3.2	Fundamental	

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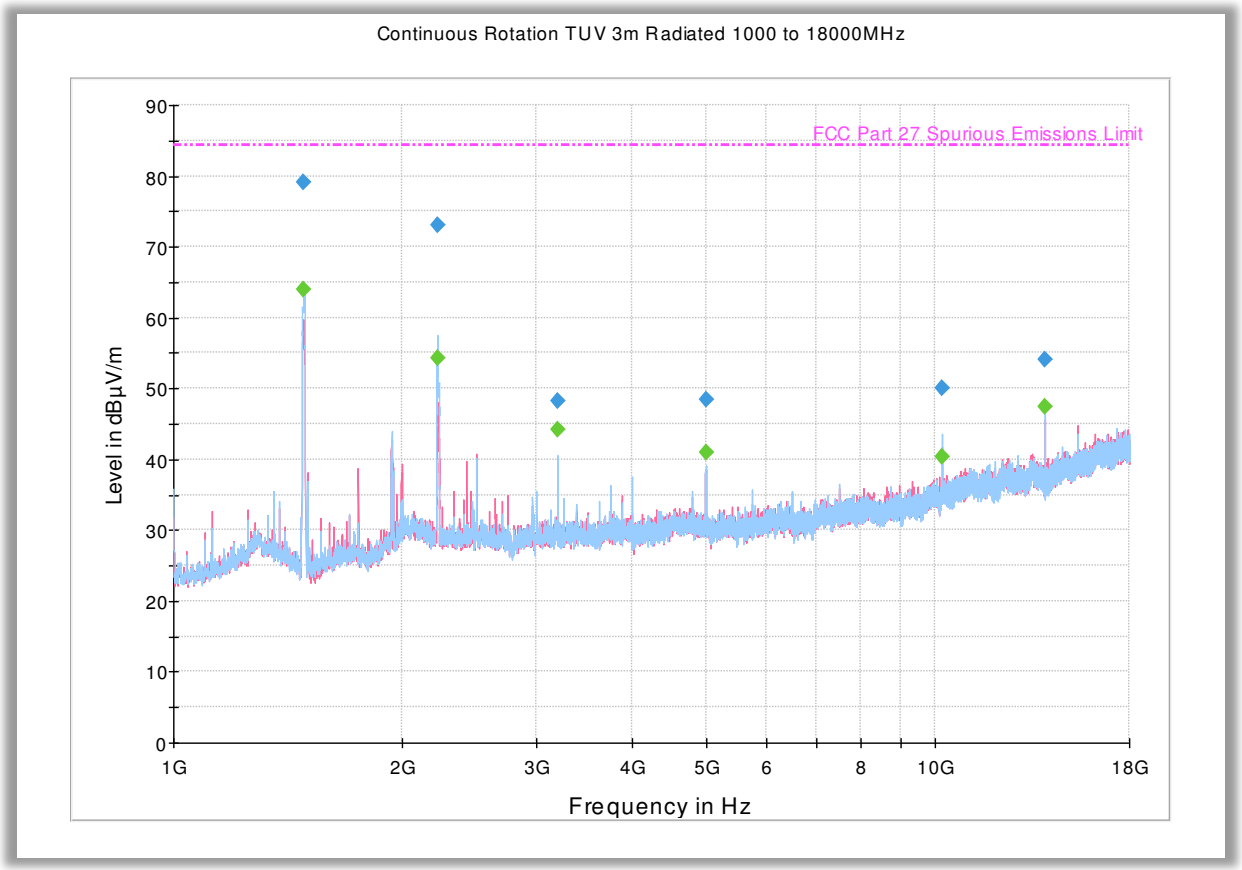
2.7.10 Test Results Above 1GHz (Downlink Worst Case Configuration) - 10MHz Bandwidth High Channel



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1481.633333	79.0	1000.0	1000.000	102.7	H	178.0	-5.8	5.4	84.4
2221.566667	73.0	1000.0	1000.000	103.7	H	180.0	-1.7	11.4	84.4
3200.200000	48.3	1000.0	1000.000	131.7	H	75.0	0.8	36.1	84.4
4999.900000	48.4	1000.0	1000.000	202.3	H	355.0	3.3	36.0	84.4
10200.033333	50.1	1000.0	1000.000	259.3	H	202.0	11.1	34.3	84.4
13922.800000	54.1	1000.0	1000.000	200.5	H	196.0	14.8	30.3	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)
1481.633333	64.0	1000.0	1000.000	102.7	H	178.0	-5.8	20.4	84.4
2221.566667	54.2	1000.0	1000.000	103.7	H	180.0	-1.7	30.2	84.4
3200.200000	44.2	1000.0	1000.000	131.7	H	75.0	0.8	40.2	84.4
4999.900000	40.9	1000.0	1000.000	202.3	H	355.0	3.3	43.5	84.4
10200.033333	40.3	1000.0	1000.000	259.3	H	202.0	11.1	44.1	84.4
13922.800000	47.5	1000.0	1000.000	200.5	H	196.0	14.8	36.9	84.4

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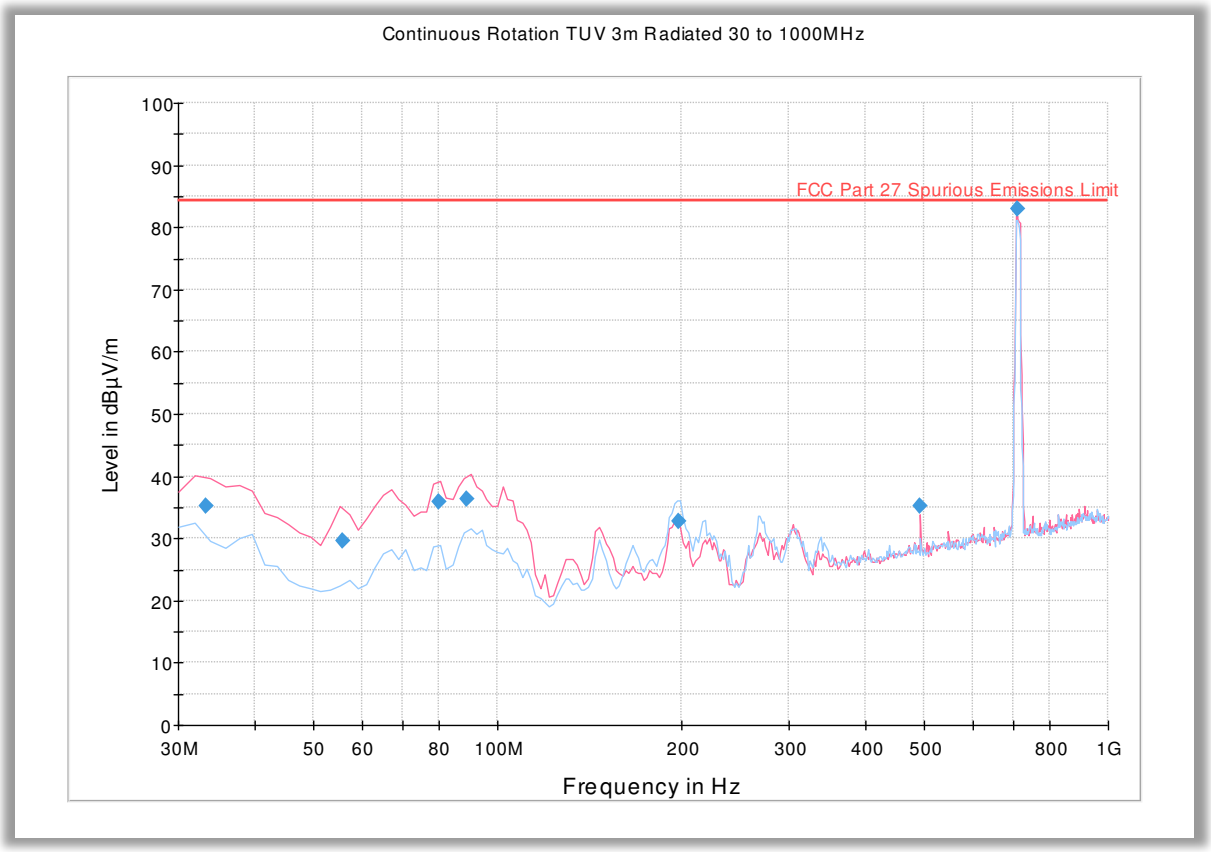
2.7.11 Test Results Below 1GHz (Uplink Worst Case Configuration) - 10MHz Bandwidth High Channel



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)
33.343888	35.3	1000.0	120.000	100.0	V	7.0	-7.6	49.1	84.4
55.790541	29.6	1000.0	120.000	100.0	V	0.0	-15.5	54.8	84.4
80.021082	35.9	1000.0	120.000	120.0	V	224.0	-16.6	48.5	84.4
89.060521	36.3	1000.0	120.000	100.0	V	163.0	-15.5	48.1	84.4
198.334349	32.7	1000.0	120.000	195.0	H	153.0	-11.4	51.7	84.4
491.525291	35.2	1000.0	120.000	109.0	V	-13.0	-1.8	49.2	84.4
710.720721	82.9	1000.0	120.000	117.0	V	302.0	3.2	Fundamental	

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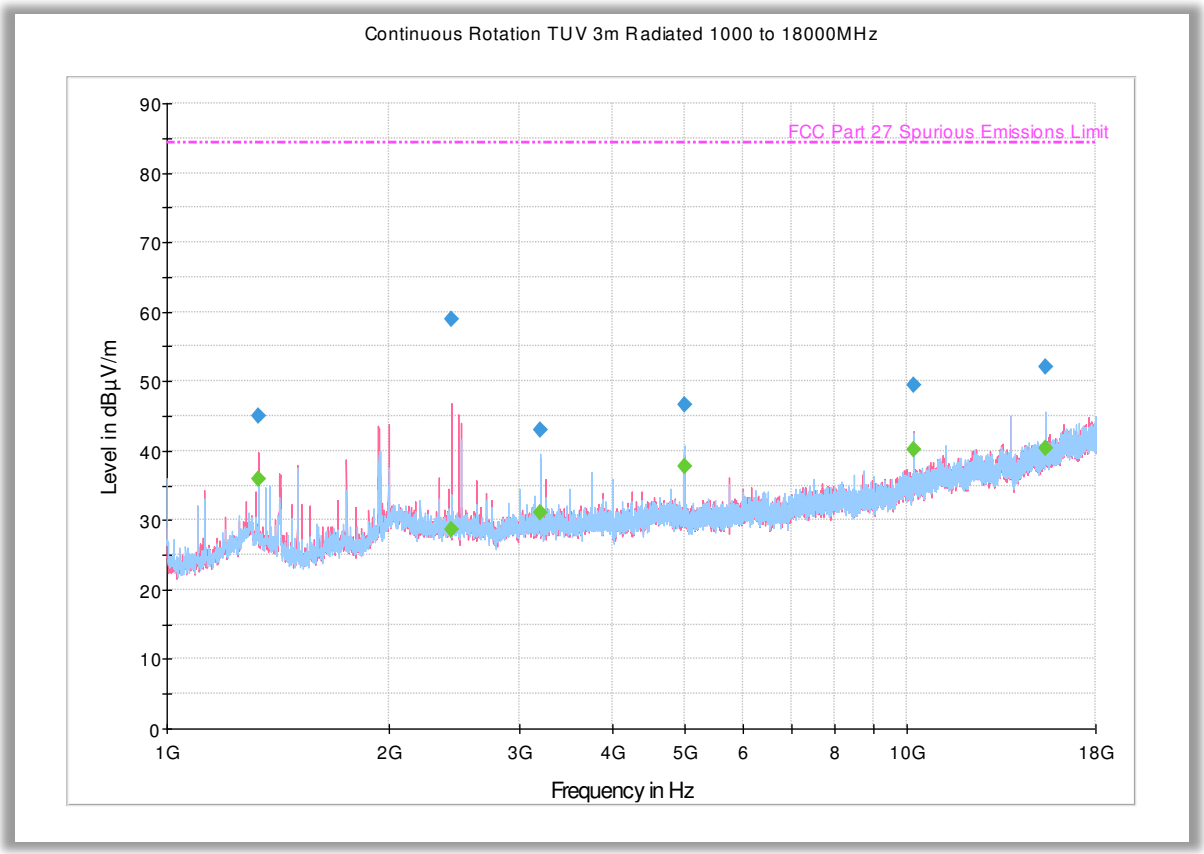
2.7.12 Test Results Above 1GHz (Uplink Worst Case Configuration) - 10MHz Bandwidth High Channel



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1331.700000	45.1	1000.0	1000.000	258.3	V	164.0	-5.2	39.3	84.4
2426.133333	58.9	1000.0	1000.000	156.6	V	212.0	-1.0	25.5	84.4
3199.600000	43.0	1000.0	1000.000	249.3	H	100.0	0.8	41.4	84.4
4999.900000	46.6	1000.0	1000.000	102.7	H	33.0	3.3	37.8	84.4
10200.033333	49.5	1000.0	1000.000	130.7	V	185.0	11.1	34.9	84.4
15374.600000	52.0	1000.0	1000.000	301.6	H	172.0	17.3	32.4	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)
1331.700000	35.9	1000.0	1000.000	258.3	V	164.0	-5.2	48.5	84.4
2426.133333	28.6	1000.0	1000.000	156.6	V	212.0	-1.0	55.8	84.4
3199.600000	31.2	1000.0	1000.000	249.3	H	100.0	0.8	53.2	84.4
4999.900000	37.8	1000.0	1000.000	102.7	H	33.0	3.3	46.6	84.4
10200.033333	40.1	1000.0	1000.000	130.7	V	185.0	11.1	44.3	84.4
15374.600000	40.3	1000.0	1000.000	301.6	H	172.0	17.3	44.1	84.4

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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-130, Clause 4.3

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-130, Clause 4.3:
The transmitter frequency stability limit shall be determined as follows:
(a) The frequency offset shall be measured according to the procedure described in RSS-Gen and recorded;
(b) Using a resolution bandwidth of 1% of the occupied bandwidth, a reference point at the unwanted emission level which complies with the attenuation of 43 + 10 log10 p (watts) on the emission mask of the lowest and highest channel shall be selected, and the frequency at these points shall be recorded as f_L and f_H respectively.

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

2.8.3 Equipment Under Test and Modification State

Serial No: 258602000335 (NU) and 25955100346 (CU) / Test Configuration A and B

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

April 21 and 22, 2016/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 performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	28.4 - 28.6°C
Relative Humidity	23.0 - 34.7%
ATM Pressure	98.8 - 99.0kPa

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2.8.7 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.
- 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 them 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.
- Middle Channel was tested as the representative configuration for Frequency Deviation.
- 5MHz BW was used for frequency range testing.

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2.8.8 Test Results Summary

LTE B12 Downlink		
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 B12 Downlink		
Temperature(°C)	***Voltage(VAC)***	***Frequency Deviation (Hz/ppm)***
20	102	0 / 0
	138	0 / 0

LTE B12 Downlink Frequency Range			
Channel @5MHz BW	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	729.184	-	>729
High Channel	-	745.809	<746

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LTE B12 Uplink		
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 B12 Uplink		
Temperature(°C)	***Voltage(VAC)***	***Frequency Deviation (Hz/ppm)***
20	102	0 / 0
	138	0 / 0

LTE B12 Uplink Frequency Range			
Channel @5MHz BW	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	699.114	-	>699
High Channel	-	715.87	<716

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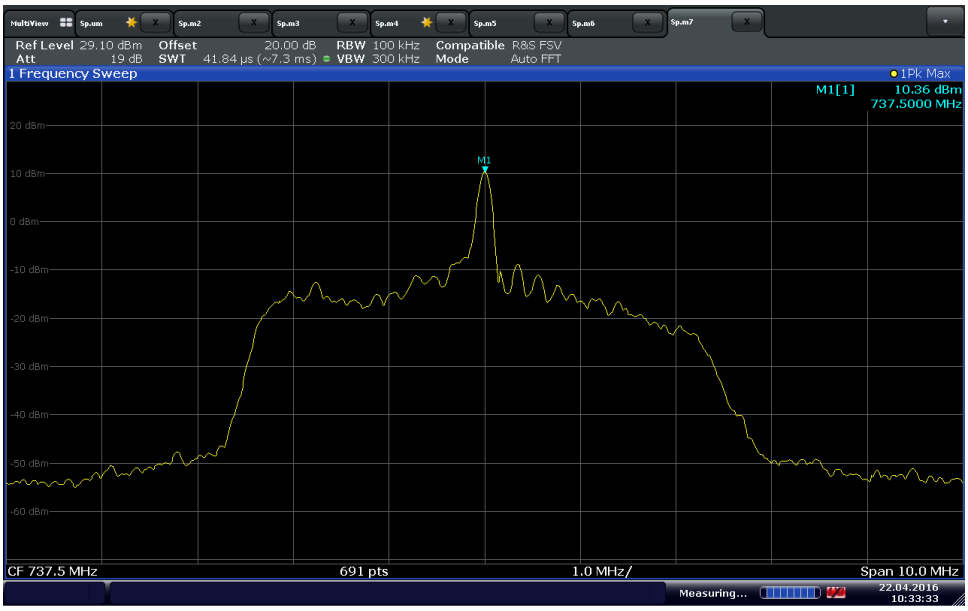
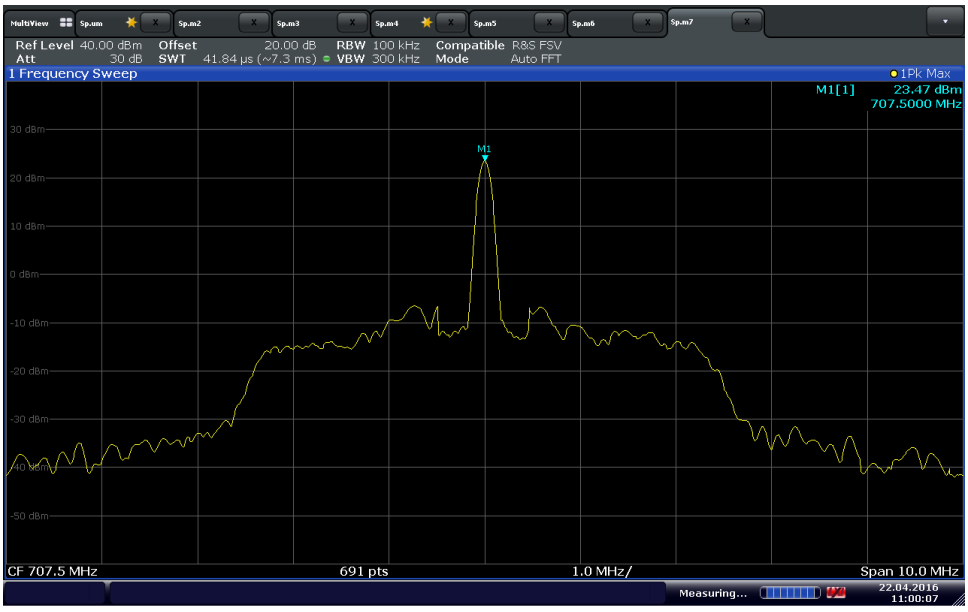
2.8.9 Sample Test Plots



Date: 22.APR.2016 10:33:33

Downlink Mid Channel 120VAC @ 20°C



Date: 22.APR.2016 11:00:07

Uplink Mid Channel 120VAC @ 20°C

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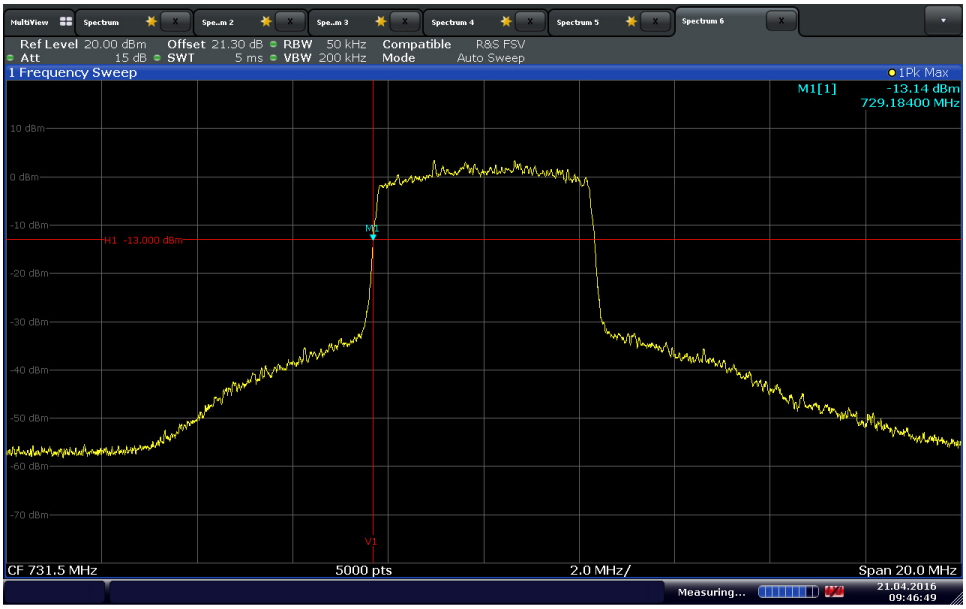
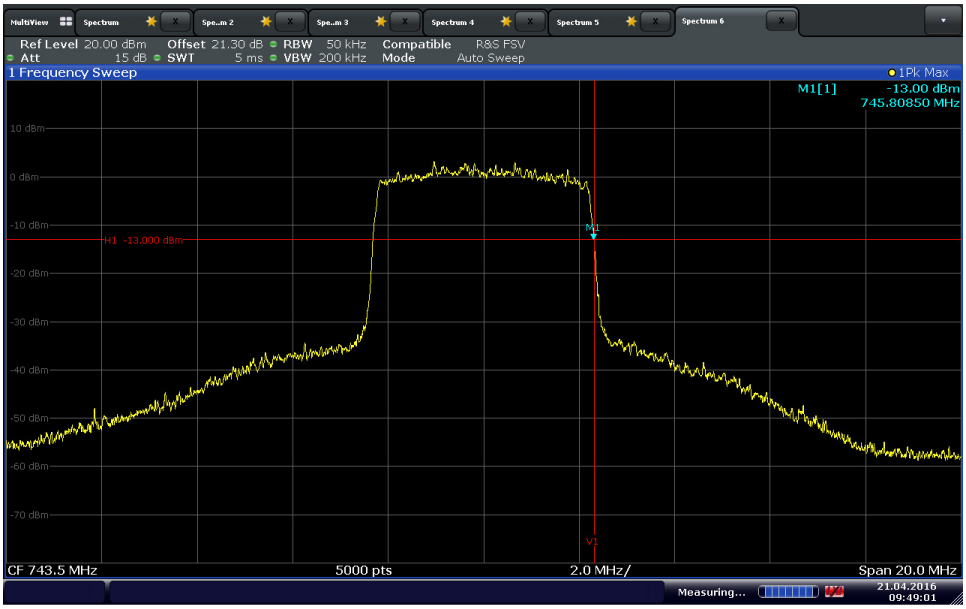


Date: 21.APR.2016 09:46:49

LTE B12 Downlink Low Channel @ 20°C Nominal Voltage



Date: 21.APR.2016 09:49:01

LTE B12 Downlink High Channel @ 20°C Nominal Voltage

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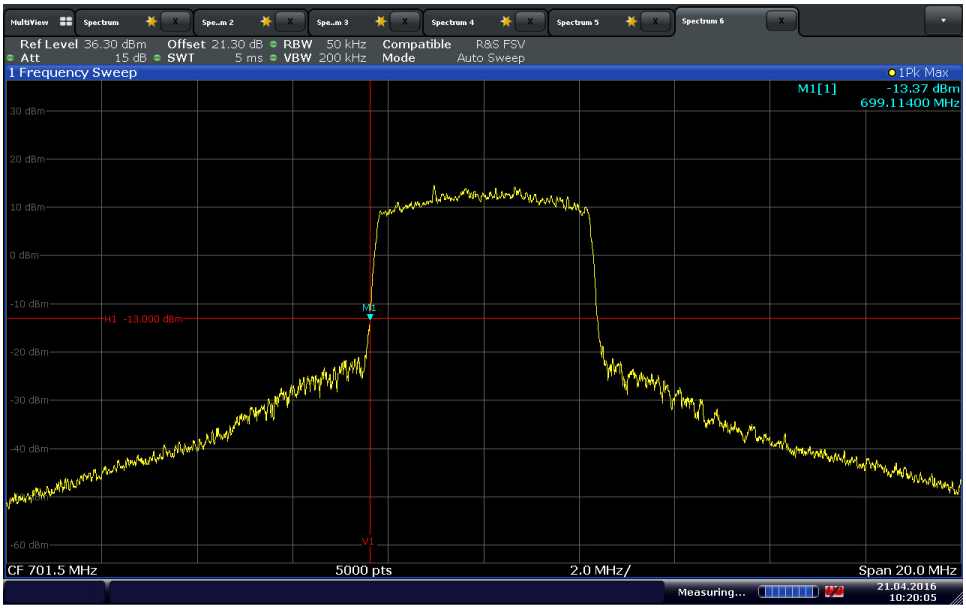
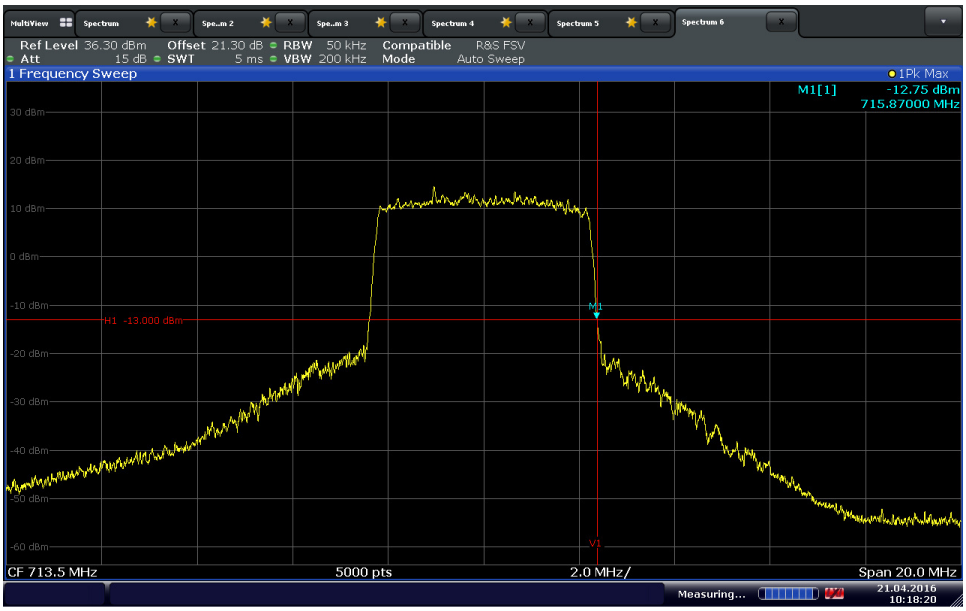


Date: 21.APR.2016 10:20:05

LTE B12 Uplink Low Channel @ 20°C Nominal Voltage



Date: 21.APR.2016 10:18:20

LTE B12 Uplink High Channel @ 20°C Nominal Voltage

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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.*

2.9.3 Equipment Under Test and Modification State

Serial No: 258602000335 (NU) and 25955100346 (CU) / Test Configuration D

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

April 17, 2016/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

Ambient Temperature	27.4°C
Relative Humidity	24.8%
ATM Pressure	99.0kPa

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2.9.7 Additional Observations

- The EUT was verified using AC adapter supplied by the manufacturer..
- EUT (NU) verified using input voltage of 120VAC 60Hz.
- There are no significant variations in test results between each operating modes. Only the normal 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 2.2.8 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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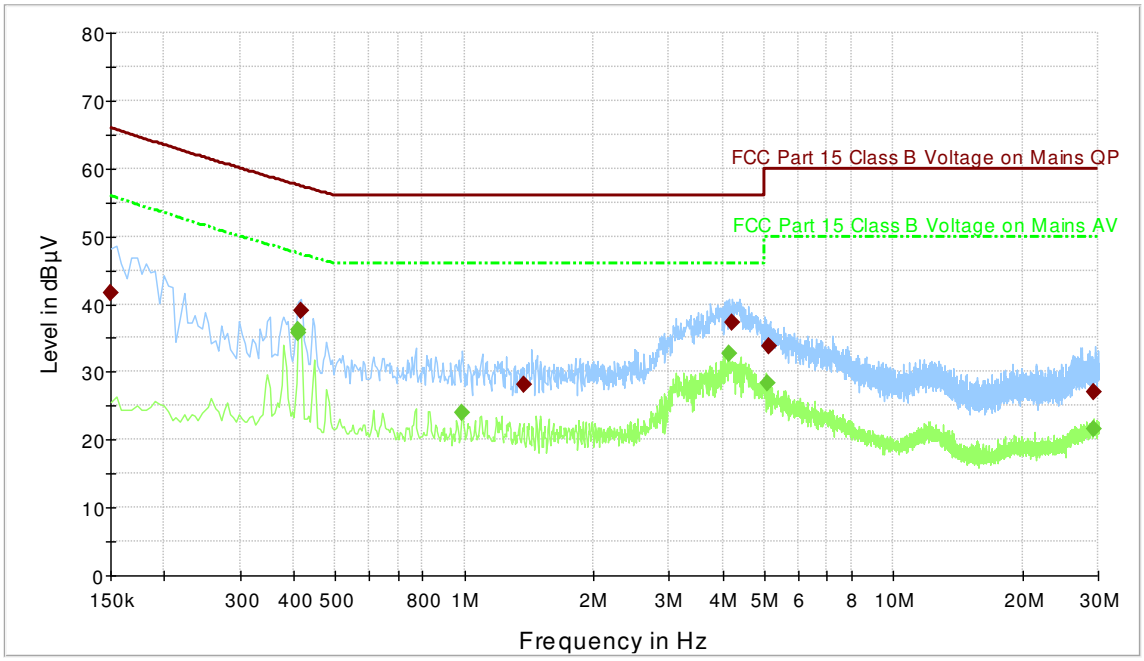
2.9.9 Test Results - Conducted Emissions Line 1 – Hot (NU)



FCC Part 15 Class B Voltage on Mains QP [..\EMI conducted\]
FCC Part 15 Class B Voltage on Mains AV [..\EMI conducted\]
Preview Result 1-PK+ [Preview Result 1.Result:1]
Preview Result 2-AVG [Preview Result 2.Result:2]
Final Result 1-QPK [Final Result 1.Result:1]
Final Result 2-AVG [Final Result 2.Result:1]

Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	41.7	1000.0	9.000	Off	L1	20.2	24.3	66.0
0.415500	39.0	1000.0	9.000	Off	L1	20.0	18.4	57.4
1.378500	28.1	1000.0	9.000	Off	L1	20.0	27.9	56.0
4.204500	37.2	1000.0	9.000	Off	L1	20.1	18.8	56.0
5.122500	33.7	1000.0	9.000	Off	L1	20.1	26.3	60.0
29.391000	27.0	1000.0	9.000	Off	L1	20.5	33.0	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.411000	35.8	1000.0	9.000	Off	L1	20.0	11.7	47.5
0.411000	36.3	1000.0	9.000	Off	L1	20.0	11.2	47.5
0.991500	24.0	1000.0	9.000	Off	L1	20.0	22.0	46.0
4.137000	32.7	1000.0	9.000	Off	L1	20.1	13.3	46.0
5.082000	28.3	1000.0	9.000	Off	L1	20.1	21.7	50.0
29.359500	21.6	1000.0	9.000	Off	L1	20.5	28.4	50.0

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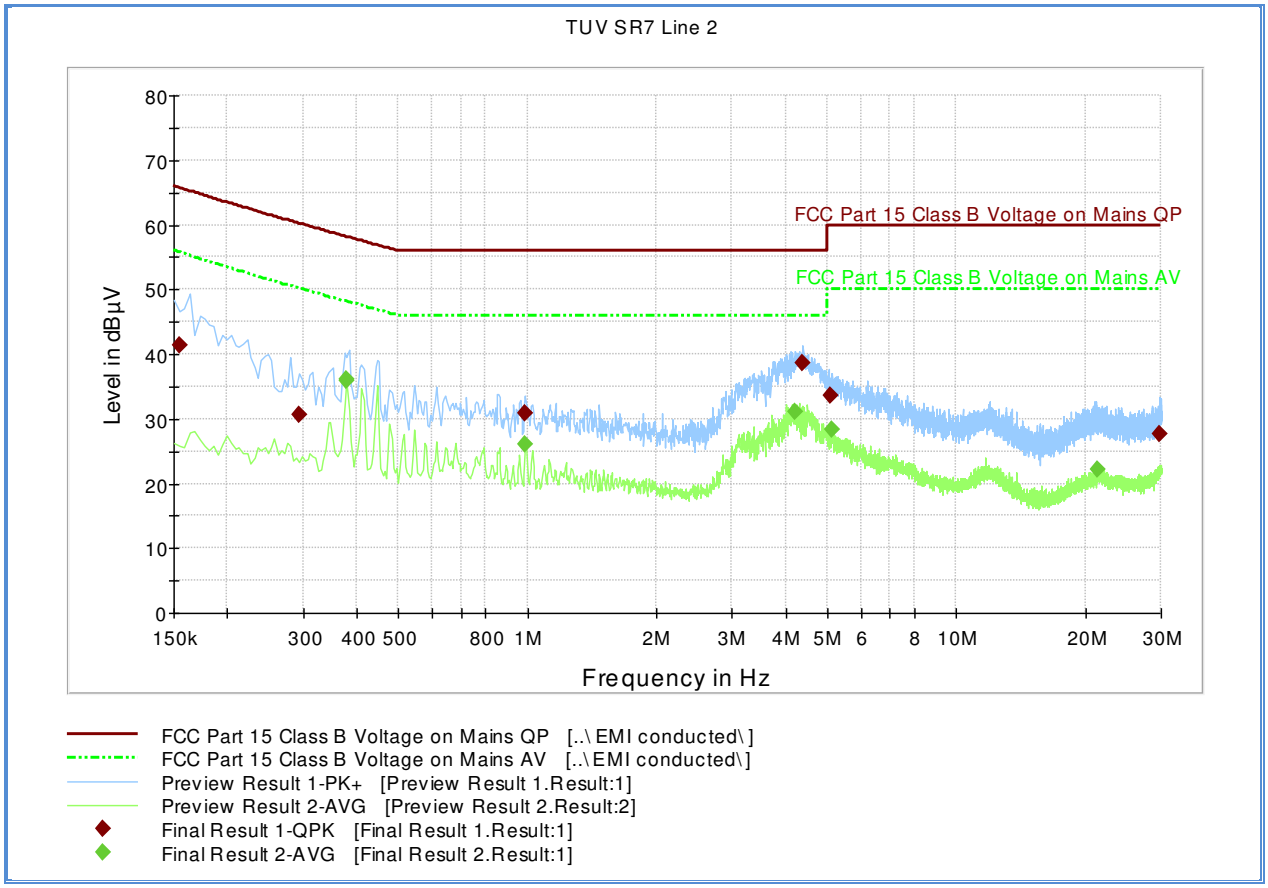
2.9.10 FCC Conducted Emissions Line 2 – Neutral (NU)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.154500	41.5	1000.0	9.000	Off	N	20.2	24.2	65.7
0.294000	30.6	1000.0	9.000	Off	N	20.0	29.6	60.2
0.991500	30.8	1000.0	9.000	Off	N	20.0	25.2	56.0
4.384500	38.6	1000.0	9.000	Off	N	20.1	17.4	56.0
5.109000	33.6	1000.0	9.000	Off	N	20.1	26.4	60.0
29.791500	27.7	1000.0	9.000	Off	N	20.5	32.3	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.379500	36.0	1000.0	9.000	Off	N	20.0	12.1	48.1
0.379500	35.9	1000.0	9.000	Off	N	20.0	12.2	48.1
0.991500	26.0	1000.0	9.000	Off	N	20.0	20.0	46.0
4.204500	31.0	1000.0	9.000	Off	N	20.1	15.0	46.0
5.118000	28.5	1000.0	9.000	Off	N	20.1	21.5	50.0
21.336000	22.1	1000.0	9.000	Off	N	20.4	27.9	50.0

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SECTION 3

TEST EQUIPMENT USED

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

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						
7569	P-Series Power Meter	N1911A P-	MY45100625	Agilent	06/19/15	06/19/16
7605	50MHz-18GHz Wideband Power Sensor	N1921A	MY51100054	Agilent	04/19/16	04/19/17
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	10/05/15	10/05/16
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	07/29/15	07/29/16
7562	Wideband Radio Communication Tester	CMW 500	1201.0002k50 /103829	Rhode & Schwarz	For sigalling	
8825	20dB Attenuator	46-20-34	BK5773	Weinschel Corp.	Verified by 7582 and 7608	
Radiated Emissions						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	11/06/15	11/06/17
1051	Double-ridged waveguide horn antenna	3115	9408-4329	EMCO	03/21/16	03/21/17
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	03/20/16	03/20/17
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	09/29/15	09/29/16
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/11/16	03/11/17
1016	Pre-amplifier	PAM-0202	187	PAM	12/15/15	12/15/16
1153	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	Verified by 7582 and 7608	
8543	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	09/03/15	09/03/16
1151	Pre-amplifier	TS-PR26	100026	Rhode & Schwarz	05/08/15	05/08/16
Conducted Emissions						
7620	EMI Test Receiver	ESU40	100399	Rhode & Schwarz	09/03/15	09/03/16
7567	LISN	FCC-LISN-50-25-2-10	120304	Fischer Custom Comm.	07/14/15	07/14/16
7568	LISN	FCC-LISN-50-25-2-10	120305	Fischer Custom Comm.	10/28/15	10/28/16
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	

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Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/14/15	08/14/16
7560	Barometer/Temperature /Humidity Transmitter	iBTHX-W	1240476	Omega	10/19/15	10/19/16
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

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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

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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

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SECTION 4

DIAGRAM OF TEST SETUP

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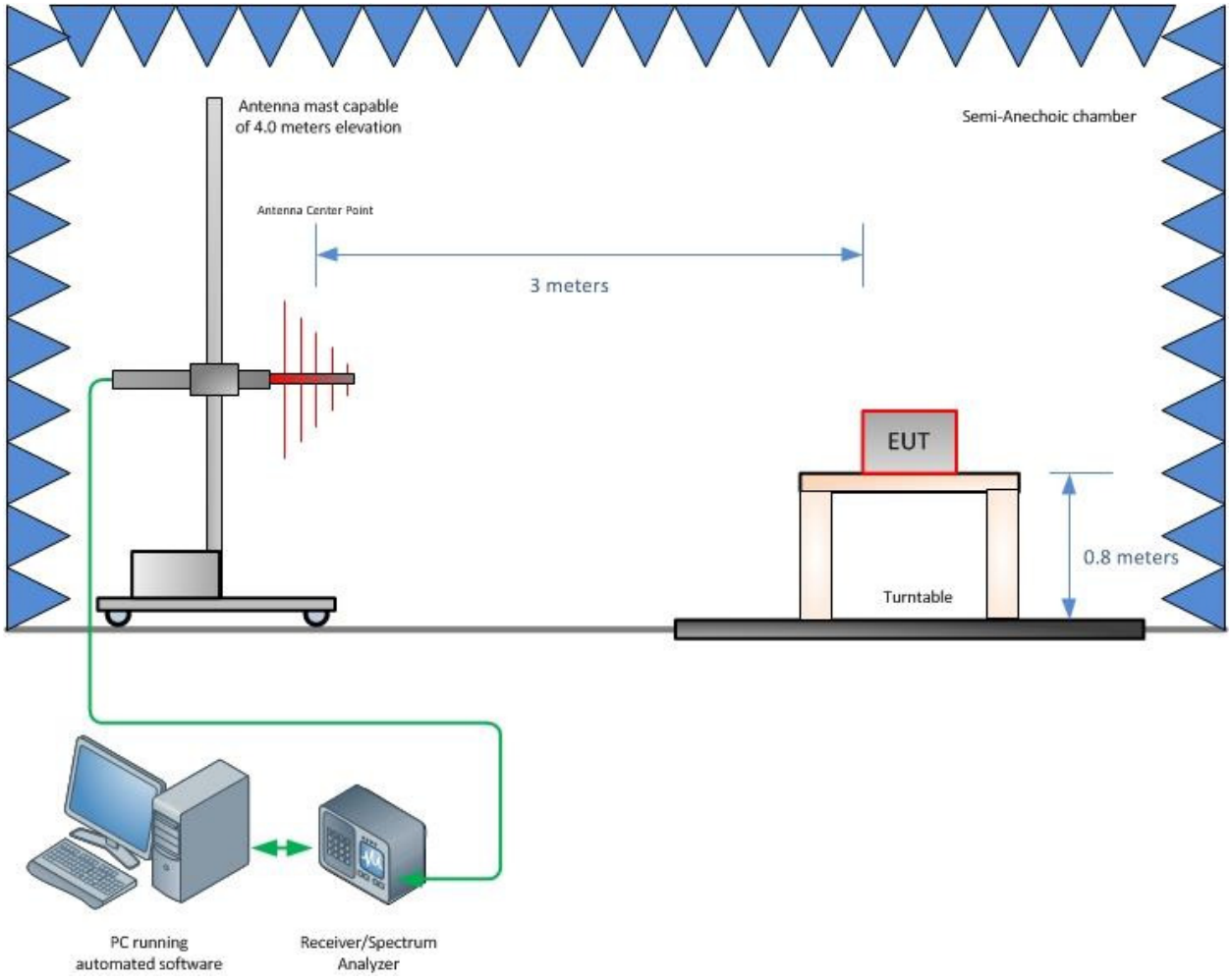
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)

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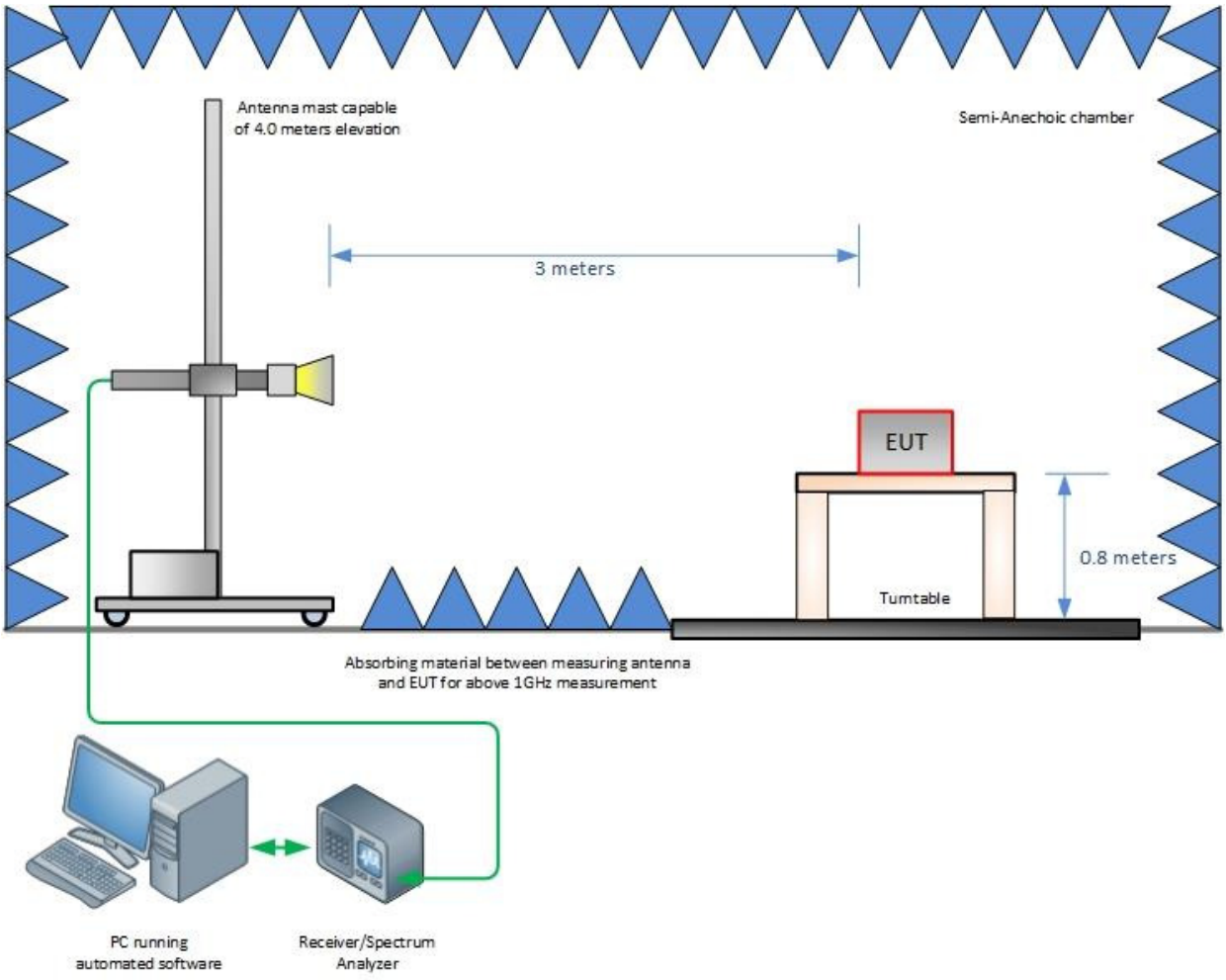

Radiated Emission Test Setup (Above 1GHz)

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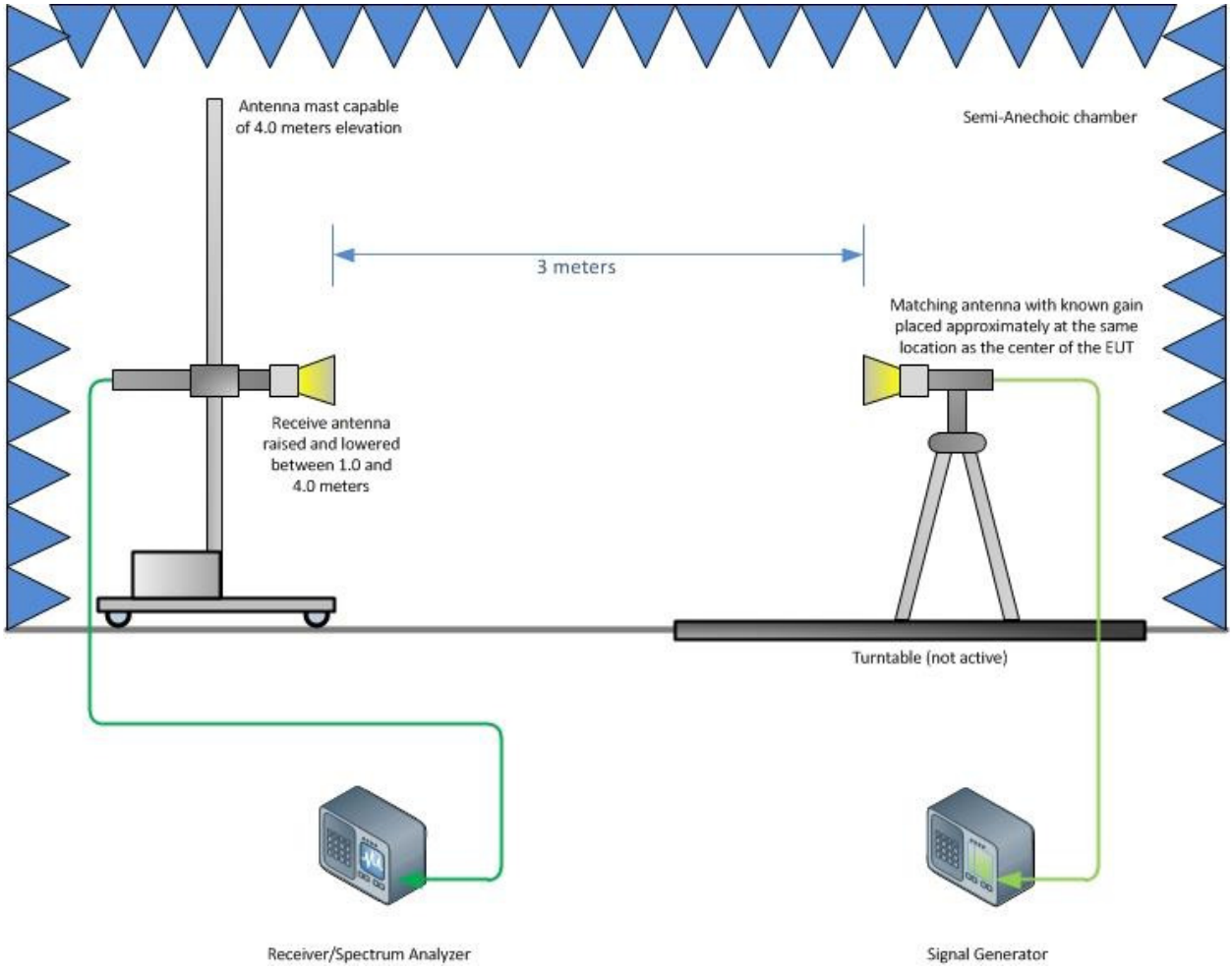

Substitution Test Method (Above 1GHz, if applicable)

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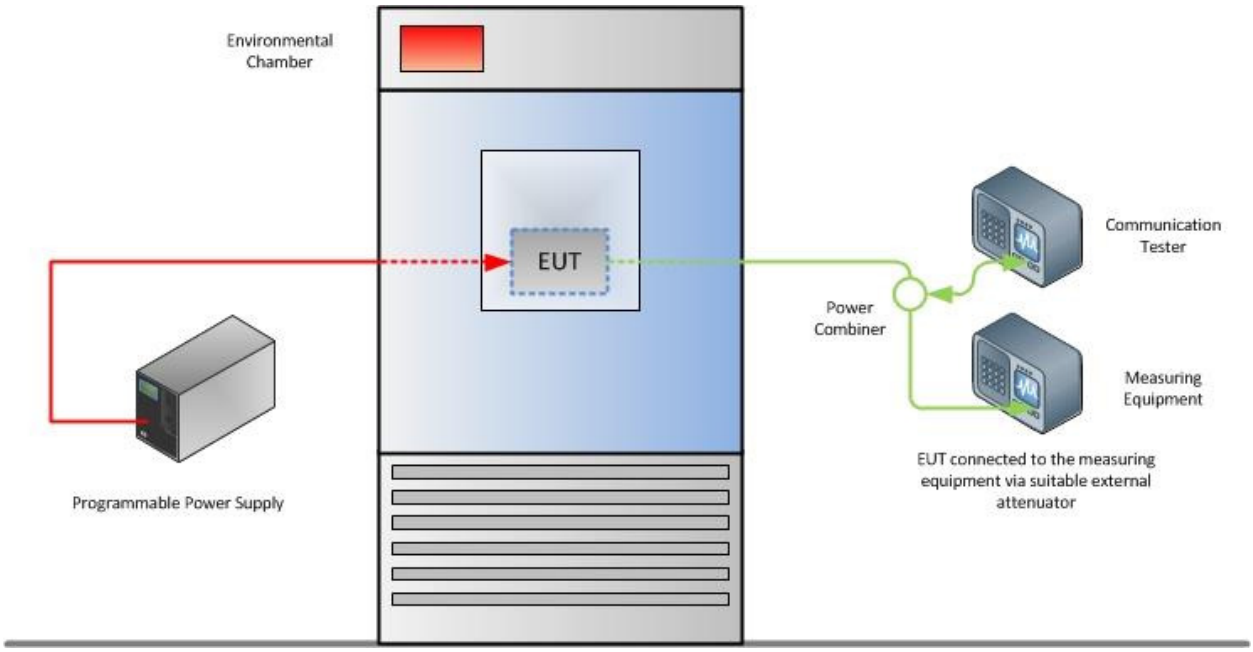

Frequency Stability Test Comfiguration

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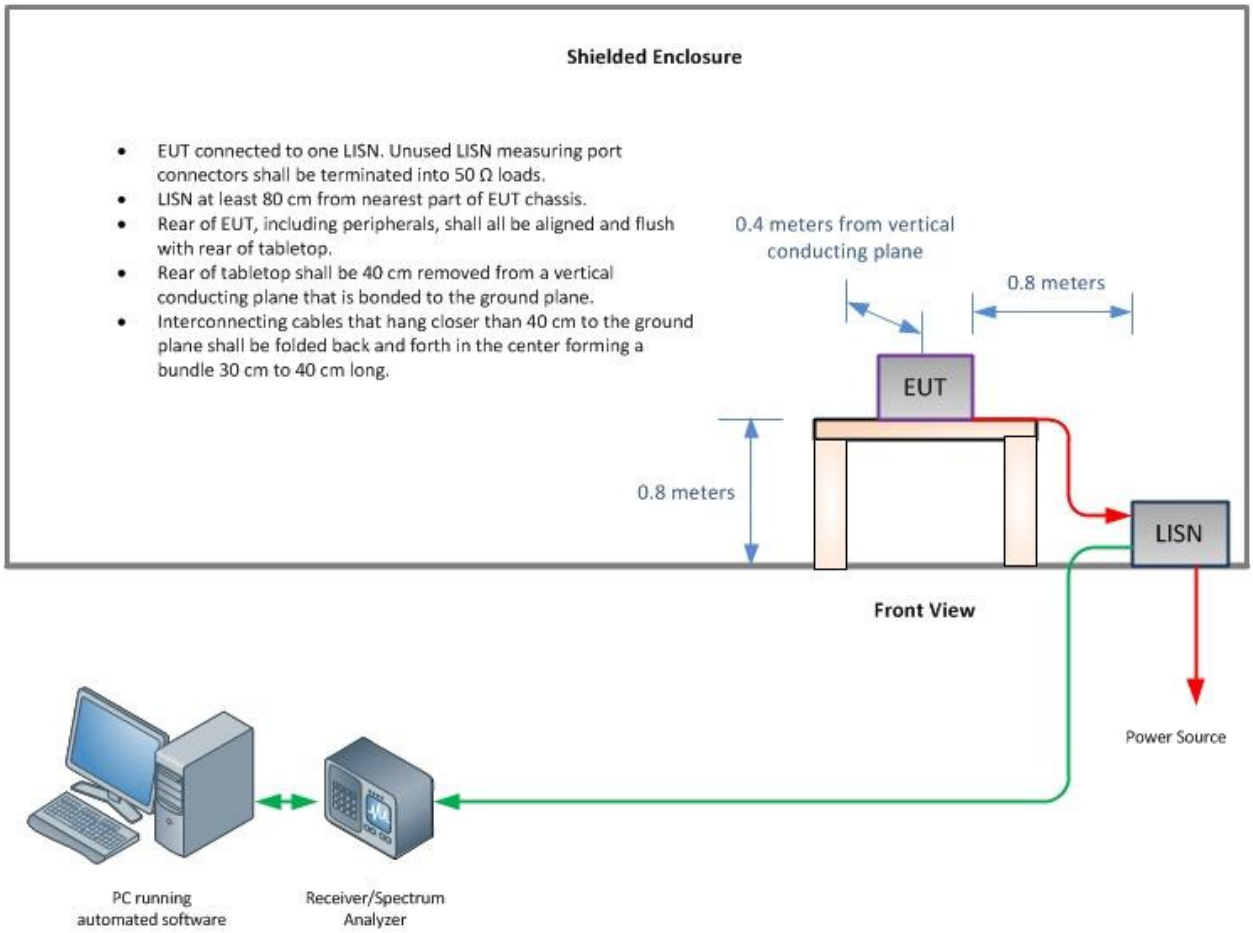

Conducted Emissions Test Configuration (if applicable)

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SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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