Report On

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

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

Report No. SD72121022-1016F **January 2017**

REPORT ON	Radio Testing of the Nextivity Inc. Cellphone Signal Repeater
TEST REPORT NUMBER	SD72121022-1016F
PREPARED FOR	Nextivity Inc. 16550 West Bernardo Drive, Bldg 5, Suite 550, San Diego, CA 92127, USA
CONTACT PERSON	CK Li Sr. Principal Engineer, Regulatory (858) 485-9442 CLi@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	January 03, 2017

Revision History

SD72121022-1016F Nextivity Inc. Cel-Fi Quatra Cellphone Signal Repeater					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
01/03/17	Initial Release				Juan M Gonzalez

CONTENTS

SECTION 1

1REPORT 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, Part 27
- 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 Quatra
Model Number(s)	NU: Q34-2/5/13/66NU CU: Q34-2/5/13/66CU
FCC ID	NU: YETQ34-251366NU CU: YETQ34-251366CU
IC Number	NU: 9298A-Q34251366NU CU: 9298A-Q34251366CU
Serial Number(s)	258602000335 (NU) and 25955100346 (CU)
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC CFR 47 Part 2, Part 27 (October 1, 2015). • 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	April 11, 2016
Finish of Test	May 31, 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 v01r01) 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, Part 27 with cross-reference to the corresponding 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)	6.5	Transmitter Conducted Output Power	Compliant*
2.2	-	27.50 (h)(1)	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	Receiver Spurious Emissions	N/A*
2.9	-	-	RSS-Gen 8.8	Power Line Conducted Emission	Compliant*

*Compliant** *A variant of the EUT was previously approved under FCC IDs YETQ34-251266NU and YETQ34-251266CU under Model Numbers Q34-2/5/12/66NU and Q34-2/5/12/66CU. The EUT is identical with this model with the exception of LTE Band 12 support. The testing were from this variant and covered under test report SD72113545-0216G Nextivity Quatra FCC IC Part 27 B4 Test Report.*

*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 4 function of the EUT were verified in this test report.

1.3.2 EUT General Description

EUT Description	Cellphone Signal Repeater
Model Name	Cel-Fi Quatra
Model Number(s)	NU: Q34-2/5/13/66NU CU: Q34-2/5/13/66CU
Rated Voltage	NU: 54V DC via external AC/DC adapter CU: 54V DC via POE
Mode Verified	LTE Band 4
Frequency Bands	NU: 1710 - 1755MHz CU: 2110 - 2155MHz
Channel Bandwidth	5MHz, 10MHz, 15MHz and 20MHz

Rated Power

Bandwidth (MHz)	DL (dB)	UL (dB)
5	10.0	22
10	13.0	
15	14.8	
20	16.0	

Capability	WCDMA (Band 2 and 5), LTE (Band 13 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

Antenna Gain

NU	CU
2 dBi	2 dBi

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1.3.3 Transmit Frequency Table

Mode	Channel Bandwidth (MHz)	Tx Frequency (MHz)	Emission Designator	EIRP*	
				Max. Power Avg (dBm)	Max. Power Avg (W)
LTE Band 4 Downlink	5	2112.5 - 2152.5	4M46F9W	14.70	0.030
	10	2115 - 2150	8M86F9W	17.55	0.057
	15	2117.5 - 2147.5	13M5F9W	18.58	0.072
	20	2120 - 2145	15M3F9W	20.45	0.111
LTE Band 4 Uplink	5	1712.5 - 1752.5	4M43F9W	25.34	0.342
	10	1715 - 1750	8M86F9W	25.30	0.339
	15	1717.5 - 1747.5	13M3F9W	25.29	0.339
	20	1720 - 1745	15M2F9W	25.07	0.321

* The EIRP is the sum of both Top Antenna and Side Antenna output power.

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Downlink (CU TX). Input signal is applied to B4 antenna port of NU. Output is monitored from B4 Top antenna port of CU.
B	Uplink (NU TX). Input signal is applied to B4 antenna port of CU. Output is monitored from B4 Top antenna port of NU.
C	Radiated test setup. Downlink (CU TX). Input signal is applied to B4 antenna port of NU. B4 Top antenna port of CU is terminated with a 50Ω load.
D	Radiated test setup. Uplink (NU TX). Input signal is applied to B4 antenna port of CU. B4 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

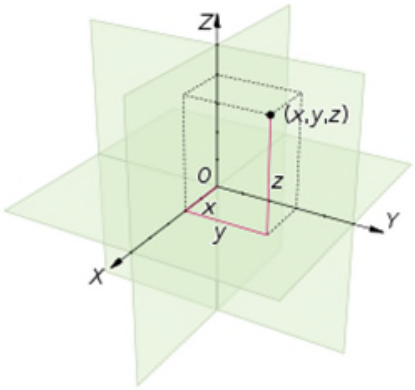
Manufacturer	Equipment/Cable	Description
Phihong	AC/DC Adapter (EUT)	M/N: PSA120u-540l6nt-r Rev 02 No. 026, IP: 100-240VAC, 1.6A, 50-60Hz OP: 54VDC, 2.22A
Netgear	Network patch Cable (1x NU to CU)	4.0m, unshielded, Cat5e 24AWG UTP
-	Support USB cable	1.75 meters, shielded Type A to Micro B connector
-	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

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	High Channel 2300	2145MHz
LTE Band 4 Uplink	10MHz	Low Channel 20000	1715MHz

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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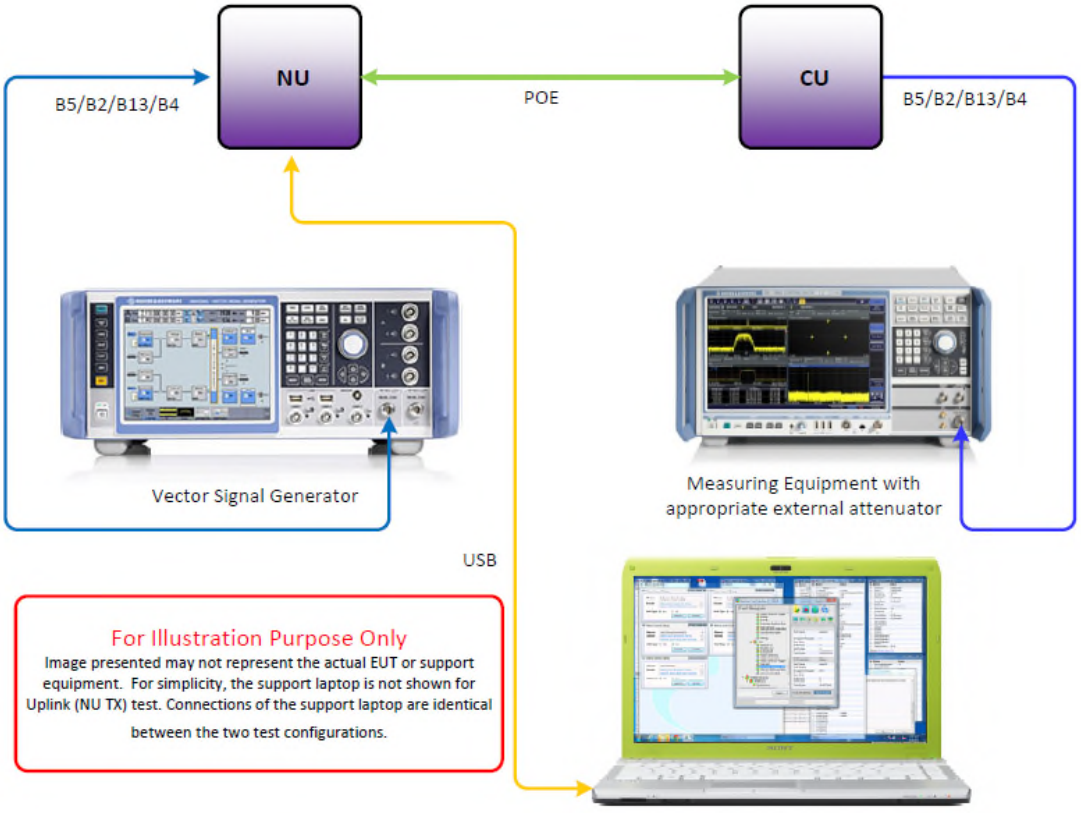
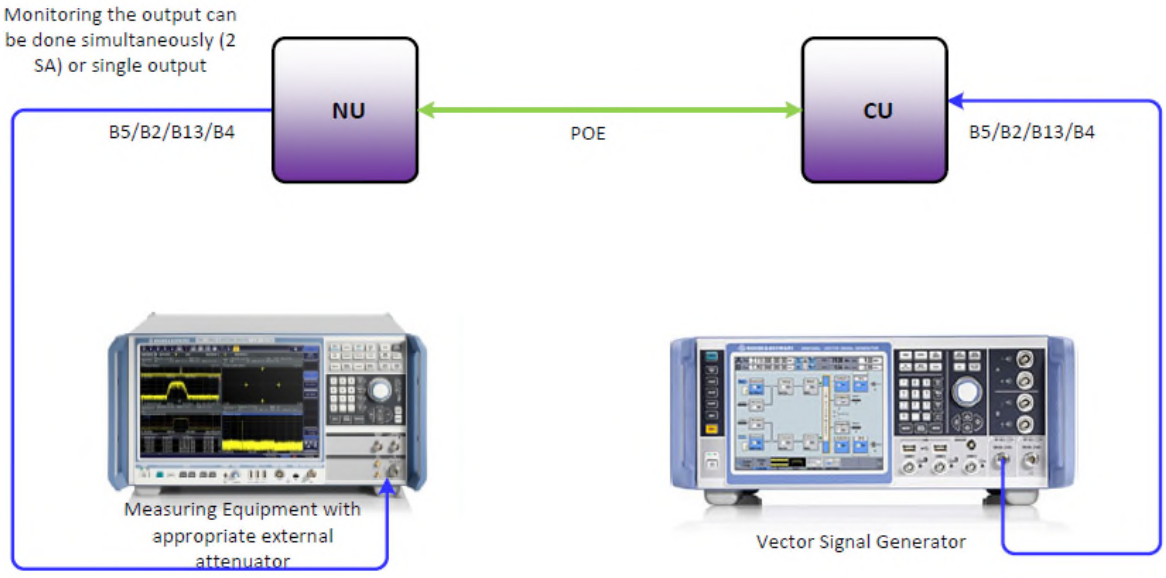
1.4.5 Simplified Test Configuration Diagram

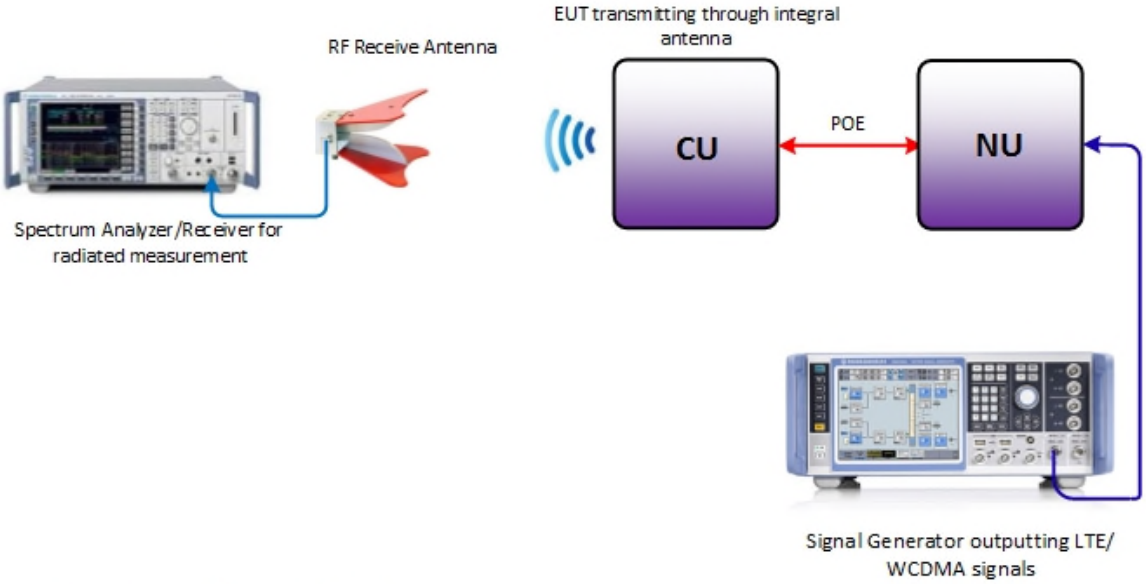
Downlink (CU Tx) Conducted Test



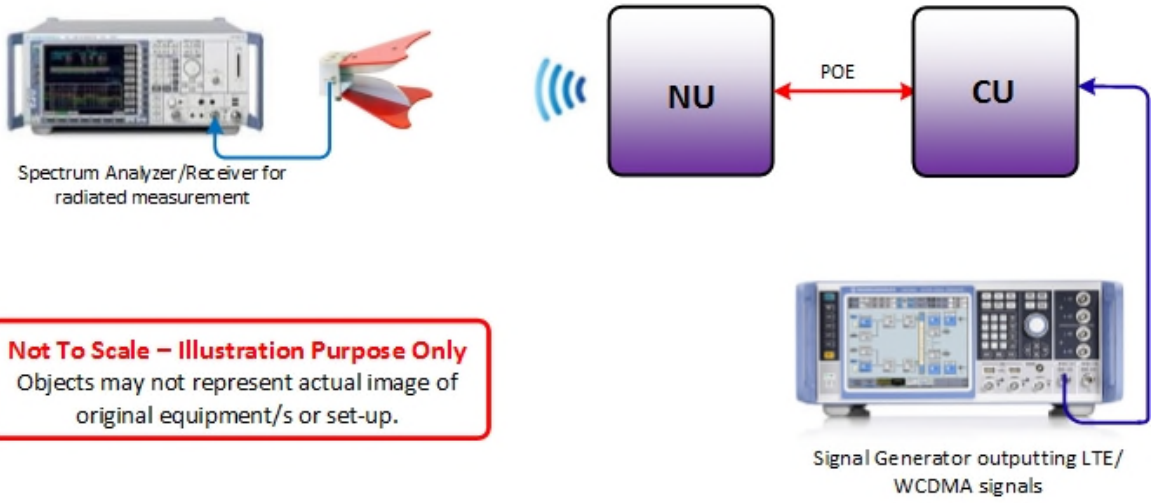
Uplink (NU Tx) Conducted Test



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 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)

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 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

2TEST DETAILS

Radio Testing of the
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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)
FCC 47 CFR Part 27, Clause 27.50 (d)(2)
FCC 47 CFR Part 27, Clause 27.50 (d)(4)
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, Clause27.50(h)(1):
Main, booster and base stations. (i) The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + 10log(X/Y) 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.

2.1.3 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 27, 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	40.3 – 47.7%
ATM Pressure	98.8 – 99.7 kPa

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 B4 supports MIMO mode, using the Measure-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 B4 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	1975	2112.5	9.81	19.76	9.33	19.96	12.59	22.87
	2175	2132.5	8.84	19.35	8.85	19.6	11.86	22.49
	2375	2152.5	9.71	20.33	9.67	20.65	12.70	23.50
10	2000	2115	12.77	22.11	12.29	22.58	15.55	25.36
	2175	2132.5	11.63	22.07	11.70	22.16	14.68	25.13
	2350	2150	12.29	22.91	12.19	22.95	15.25	25.94
15	2025	2117.5	13.77	22.85	13.03	21.69	16.43	25.32
	2175	2132.5	12.94	22.97	12.87	22.80	15.92	25.90
	2325	2147.5	13.59	25.70	13.54	25.15	16.58	28.44
20	2050	2120	15.30	23.91	14.31	23.50	17.84	26.72
	2175	2132.5	15.02	24.74	15.06	24.65	18.05	27.71
	2300	**2145**	**15.45**	**25.83**	**15.43**	**25.34**	**18.45**	**28.60**

LTE B4 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	19975	1712.5	20.20	30.45	19.73	29.15	22.98	32.86
	20175	1732.5	20.32	29.92	20.34	29.89	23.34	32.92
	20375	1752.5	19.90	30.44	19.86	29.64	22.89	33.07
10	**20000**	**1715**	**20.54**	**30.37**	**20.02**	**30.85**	**23.30**	**33.63**
	20175	1732.5	20.16	30.30	20.10	20.13	23.14	30.70
	20350	1750	20.15	30.95	20.11	30.13	23.14	33.57
15	20025	1717.5	19.96	29.57	19.82	30.34	22.90	32.98
	20175	1732.5	20.31	30.91	20.24	30.79	23.29	33.86
	20325	1747.5	19.62	29.20	19.56	29.34	22.60	32.28
20	20050	1720	20.26	30.76	19.24	28.91	22.79	32.94
	20175	1732.5	20.01	30.08	20.11	29.98	23.07	33.04
	20300	1745	20.16	30.27	19.11	28.98	22.68	32.68

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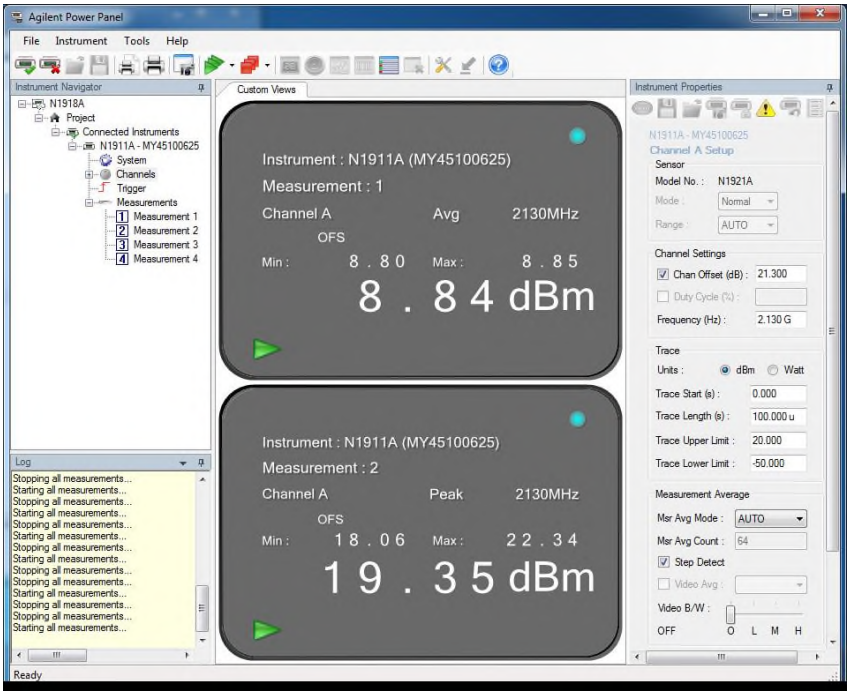
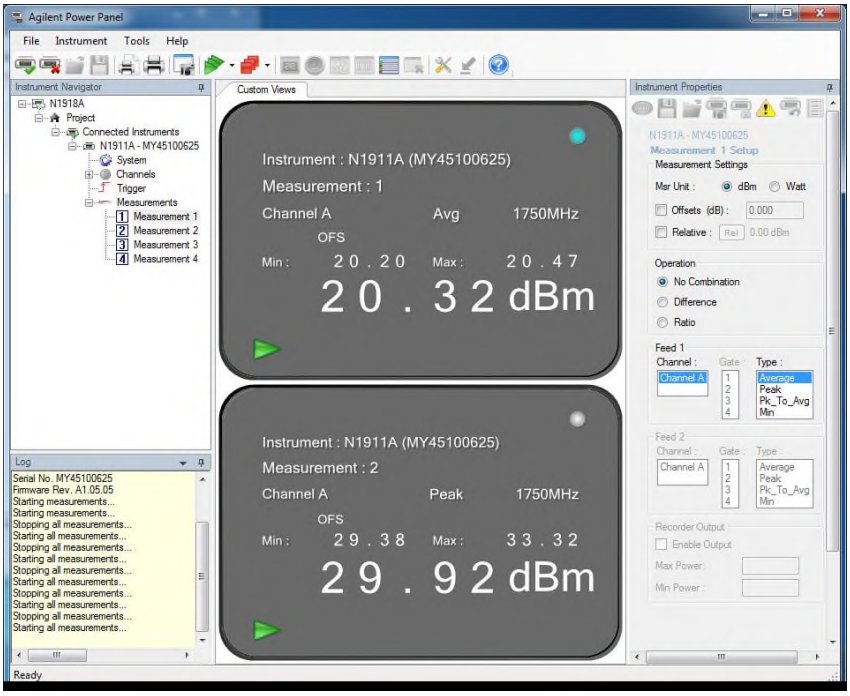
2.1.9 Sample Test Plot



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 2, Clause 2.1046
FCC 47 CFR Part 27, Clause27.50(h)(1)
RSS-139, Clause 6.5

2.2.2 Standard Applicable

FCC 47 CFR Part 27, Clause27.50(h)(1):
Main, booster and base stations. (i) The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + 10log(X/Y) 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.

RSS-139, Clause 6.5:
The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt.

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, 14 and May 27, 2016/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:

$$\mathbf{EIRP = P_T + G_T - L_C}$$

Where:

$\mathbf{P_T}$ = transmitter conducted output power dBm (Section 2.1 of this test report)
$\mathbf{G_T}$ = gain of the transmitting antenna, in dBi (EIRP);
$\mathbf{L_C}$ = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

2.2.6 Sample Computation

ERP = $P_T + G_T - L_C$
= 23.19 (Average) + 0.13 (max. gain) – 5.28 (cable loss)
= 18.04 dBm

2.2.7 Test Results

Band 4 Downlink						
Bandwidth (MHz)	Frequency (MHz)	Average Power (dBm)		Antenna Gain (dBi)	Sum EIRP (dBm)	Limit (dBm)
		Top Antenna	Side Antenna			
5	2112.5	9.81	9.33	2	14.59	33
	2132.5	8.84	8.85	2	13.86	33
	2152.5	9.71	9.67	2	14.70	33
10	2115	12.77	12.29	2	17.55	33
	2132.5	11.63	11.70	2	16.68	33
	2150	12.29	12.19	2	17.25	33
15	2117.5	13.77	13.03	2	18.43	33
	2132.5	12.94	12.87	2	17.92	33
	2147.5	13.59	13.54	2	18.58	33
20	2120	15.30	14.31	2	19.84	33
	2132.5	15.02	15.06	2	20.05	33
	2145	15.45	15.43	2	20.45	33

Band 4 Uplink						
Bandwidth (MHz)	Frequency (MHz)	Average Power (dBm)		Antenna Gain (dBi)	Sum EIRP (dBm)	Limit (dBm)
		Top Antenna	Side Antenna			
5	1712.5	20.20	19.73	2	24.98	33
	1732.5	20.32	20.34	2	25.34	33
	1752.5	19.90	19.86	2	24.89	33
10	1715	20.54	20.02	2	25.30	33
	1732.5	20.16	20.10	2	25.14	33
	1750	20.15	20.11	2	25.14	33
15	1717.5	19.96	19.82	2	24.90	33
	1732.5	20.31	20.24	2	25.29	33
	1747.5	19.62	19.56	2	24.60	33
20	1712.5	20.26	19.24	2	24.79	33
	1732.5	20.01	20.11	2	25.07	33
	1752.5	20.16	19.11	2	24.68	33

2.3 OCCUPIED BANDWIDTH

2.3.1 Specification Reference

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

2.3.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.53(h)(3)
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 12,14 and May 27, 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	24.7 – 26.9°C
Relative Humidity	40.3 - 45.5%
ATM Pressure	98.7 - 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.
- Only test plots for middle channel were presented 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.

2.3.8 Test Results

Downlink					
Band	**Bandwidth**	**Channel**	**Frequency (MHz)**	**OBW (MHz)**	**-26dB BW (MHz)**
LTE Band 4	5MHz	1975	2112.5	4.46	4.83
		2175	2132.5	4.46	4.83
		2375	2152.5	4.46	4.80
	10MHz	2000	2115	8.80	9.49
		2175	2132.5	8.86	9.49
		2350	2150	8.86	9.44
	15MHz	2025	2117.5	13.37	14.50
		2175	2132.5	13.37	14.50
		2325	2147.5	13.46	14.33
	20MHz	2050	2120	15.17	16.44
		2175	2132.5	15.17	16.44
		2300	2145	15.28	16.44

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Uplink					
Band	**Bandwidth**	**Channel**	**Frequency (MHz)**	**OBW (MHz)**	**-26dB BW (MHz)**
LTE Band 4	5MHz	19975	1712.5	4.43	4.83
		20175	1732.5	4.43	4.78
		20375	1752.5	4.43	4.78
	10MHz	20000	1715	8.86	9.38
		20175	1732.5	8.86	9.38
		20350	1750	8.86	9.49
	15MHz	20025	1717.5	13.29	14.24
		20175	1732.5	13.29	14.24
		20325	1747.5	13.29	14.15
	20MHz	20050	1720	15.05	16.21
		20175	1732.5	15.05	16.32
		20300	1745	15.17	16.32

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

Date: 27.MAY.2016 16:28:35

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

Date: 27.MAY.2016 16:29:02

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

Date: 27.MAY.2016 16:25:14

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

Date: 27.MAY.2016 16:25:40

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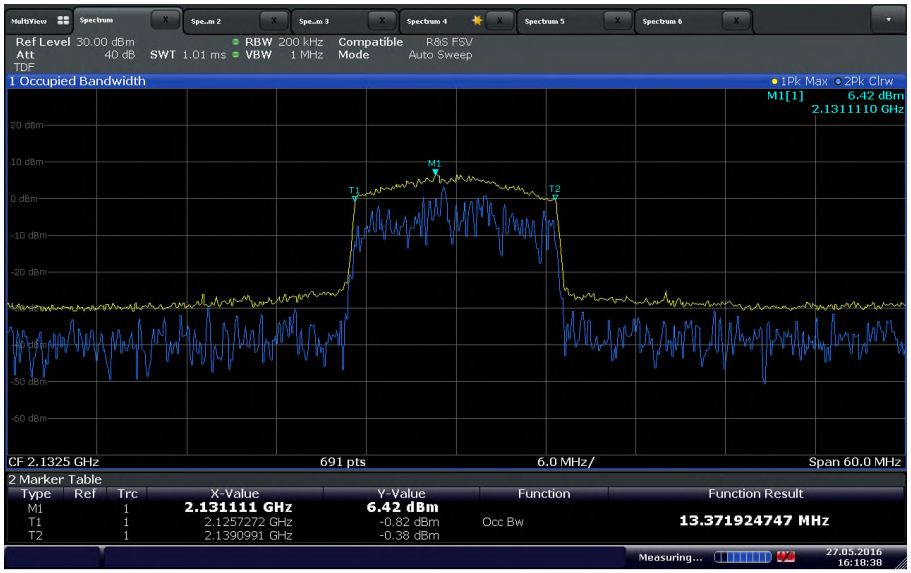
LTE Band 4 Downlink 15MHz Bandwidth Mid Channel 99% OBW



Date: 27.MAY.2016 16:18:38

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

Date: 27.MAY.2016 16:22:23

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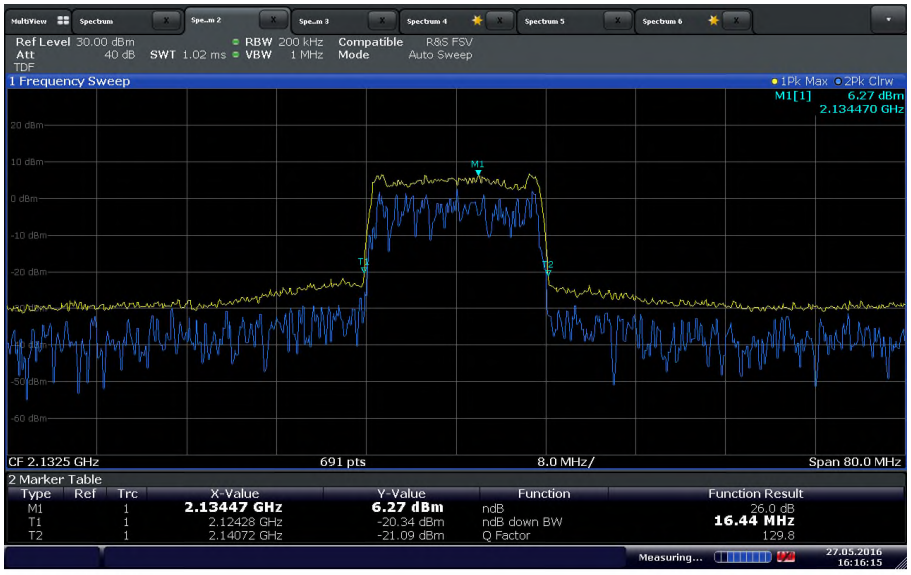
LTE Band 4 Downlink 20MHz Bandwidth Mid Channel 99% OBW

Date: 27.MAY.2016 16:15:35

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



Date: 27.MAY.2016 16:16:14

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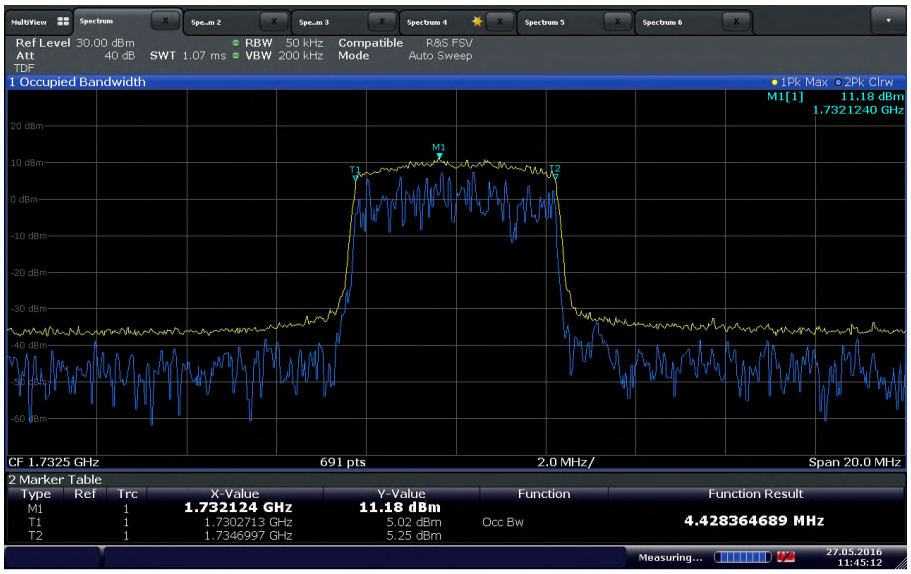
LTE Band 4 Uplink 5MHz Bandwidth Mid Channel 99% OBW

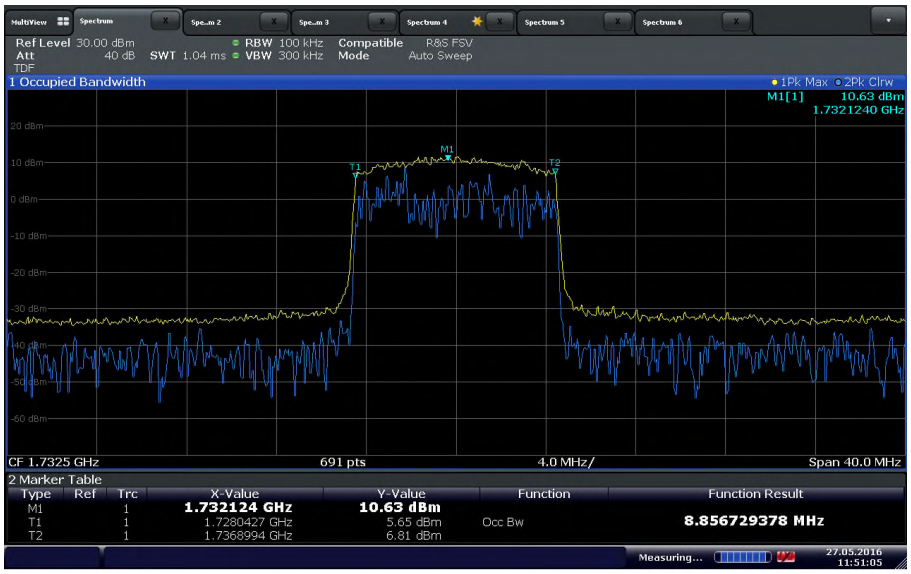


Date: 27.MAY.2016 11:45:12

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

Date: 27.MAY.2016 11:44:40

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

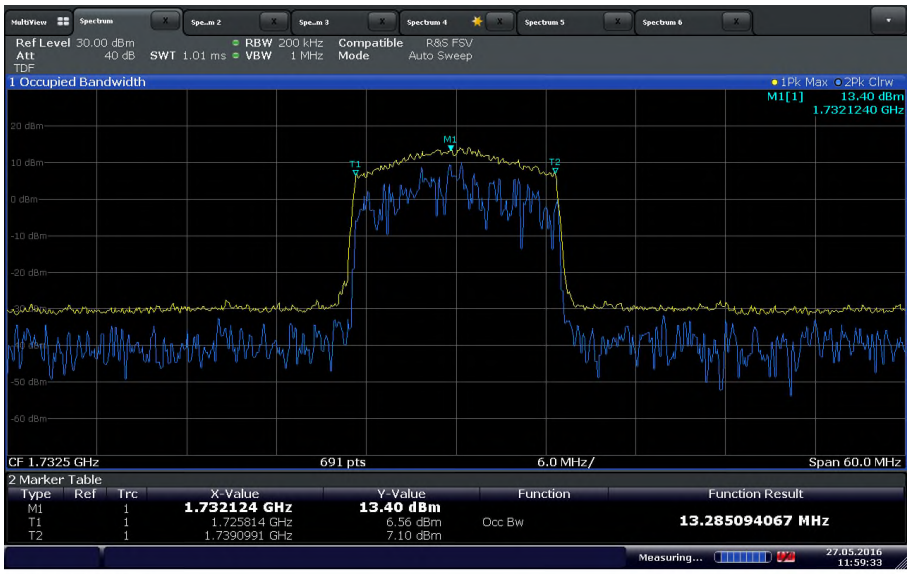


Date: 27.MAY.2016 11:51:05

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

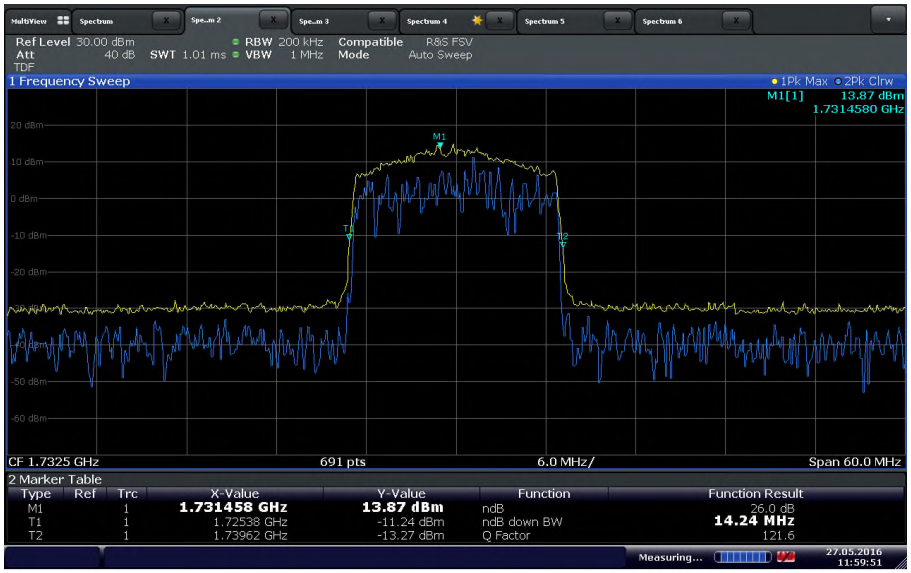
Date: 27.MAY.2016 11:51:28

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



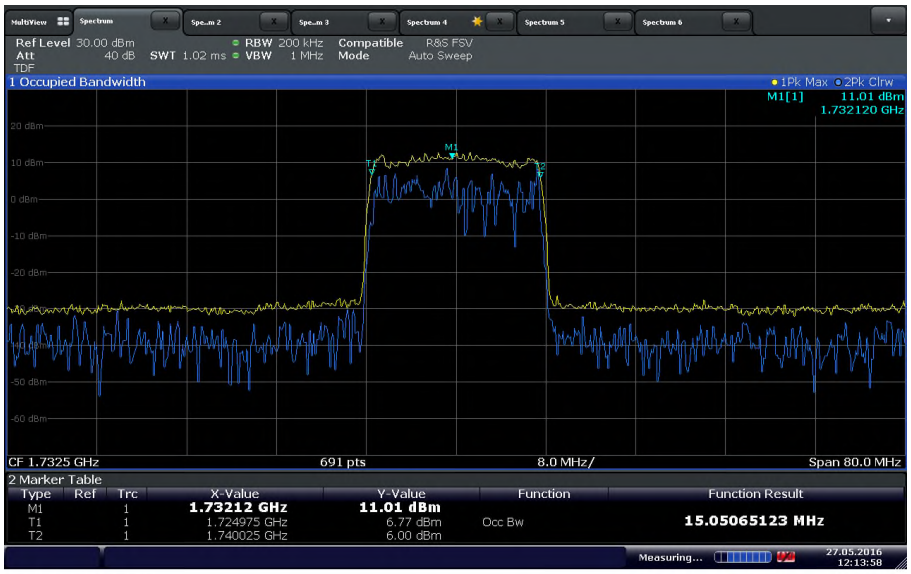
Date: 27.MAY.2016 11:59:33

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



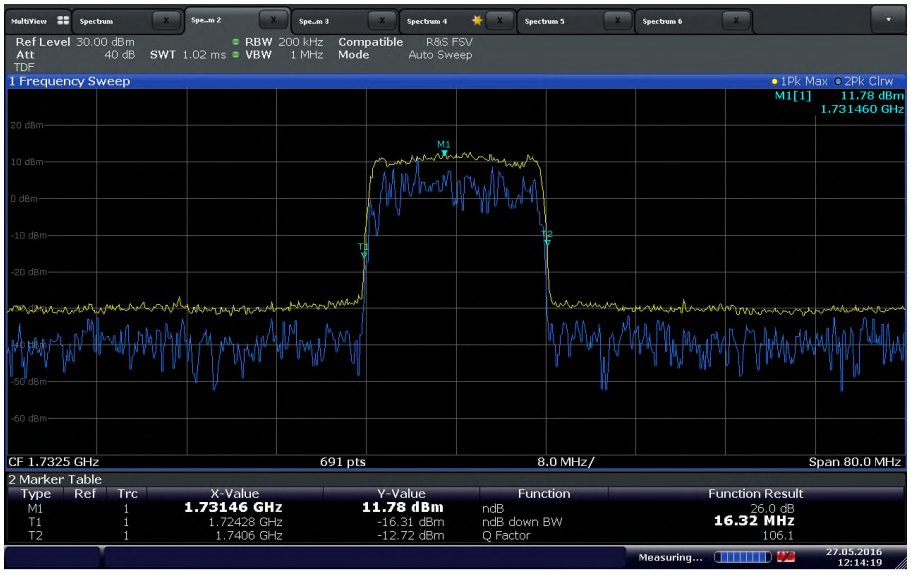
Date: 27.MAY.2016 11:59:51

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



Date: 27.MAY.2016 12:13:58

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



Date: 27.MAY.2016 12:14:19

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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

(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.

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, 14 and May 27, 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	24.7 – 26.9°C
Relative Humidity	40.3 - 45.5%
ATM Pressure	98.7 - 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.
- 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.

2.4.8 Test Results

Downlink				
Band	**Bandwidth**	**Channel**	***Frequency (MHz)***	**PAR (dB)**
LTE Band 4	5MHz	1975	2112.5	10.0
		2175	2132.5	10.77
		2375	2152.5	11.17
	10MHz	2000	2115	9.91
		2175	2132.5	10.98
		2350	2150	11.98
	15MHz	2025	2117.5	9.86
		2175	2132.5	12.5
		2325	2147.5	12.02
	20MHz	2050	2120	8.86
		2175	2132.5	11.04
		2300	2145	11.3

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Uplink				
Band	**Bandwidth**	**Channel**	***Frequency (MHz)***	**PAR (dB)**
LTE Band 4	5MHz	19975	1712.5	11.37
		20175	1732.5	12.47
		20375	1752.5	12.79
	10MHz	20000	1715	11.80
		20175	1732.5	11.62
		20350	1750	12.20
	15MHz	20025	1717.5	10.31
		20175	1732.5	10.63
		20325	1747.5	10.66
	20MHz	20050	1720	10.48
		20175	1732.5	11.19
		20300	1745	11.14

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2.4.9 Sample Test Plot

LTE Band 4 Downlink 5MHz Bandwidth Mid Channel -PAR

Date: 27.MAY.2016 16:29:47

LTE Band 4 Downlink 10MHz Bandwidth Mid Channel -PAR

Date: 27.MAY.2016 16:26:11

LTE Band 4 Downlink 15MHz Bandwidth Mid Channel -PAR

Date: 27.MAY.2016 16:22:51

LTE Band 4 Downlink 20MHz Bandwidth Mid Channel -PAR

Date: 27.MAY.2016 16:16:53

LTE Band 4 Uplink 5MHz Bandwidth Mid Channel -PAR

Date: 27.MAY.2016 11:44:06

LTE Band 4 Uplink 10MHz Bandwidth Mid Channel -PAR

Date: 27.MAY.2016 11:51:56

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LTE Band 4 Uplink 15MHz Bandwidth Mid Channel -PAR

Date: 27.MAY.2016 12:00:21

LTE Band 4 Uplink 20MHz Bandwidth Mid Channel -PAR

Date: 27.MAY.2016 12:13:18

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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

(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.

2.5.3 Equipment Under Test and Modification State

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

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

April 12, 14 and May 27, 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 – 26.9°C
Relative Humidity	40.3 - 45.5%
ATM Pressure	98.7 - 99.7kPa

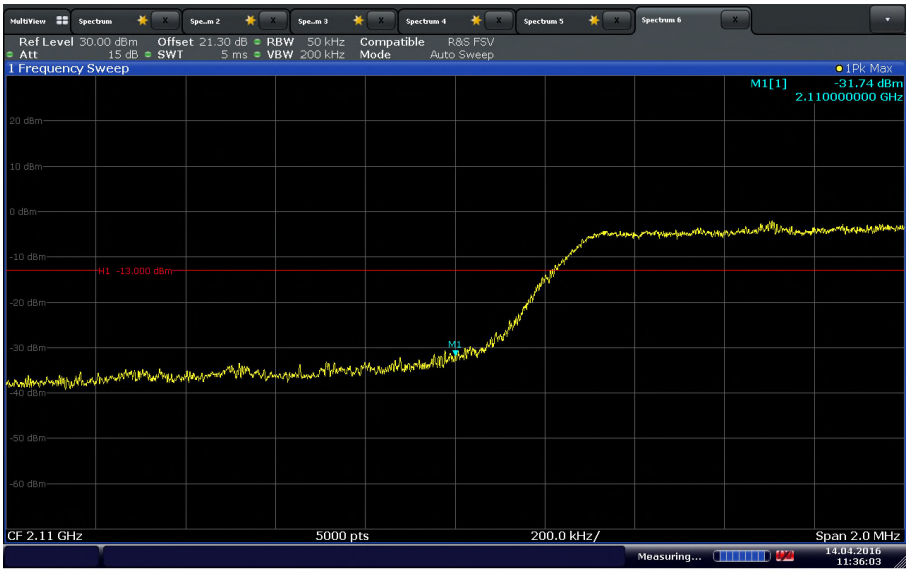
2.5.7 Additional Observations

- 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, RBW is set to 1% of emission bandwidth and VBW is set to >3X RBW.

- Since LTE B4 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.

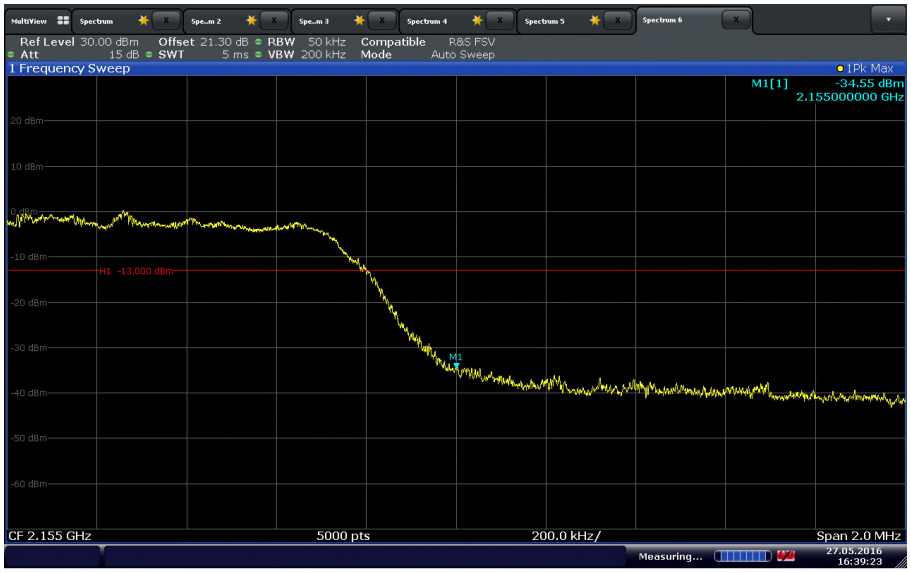
2.5.8 Test Results

LTE Band 4 Downlink 5MHz Bandwidth Low Channel Band Edge



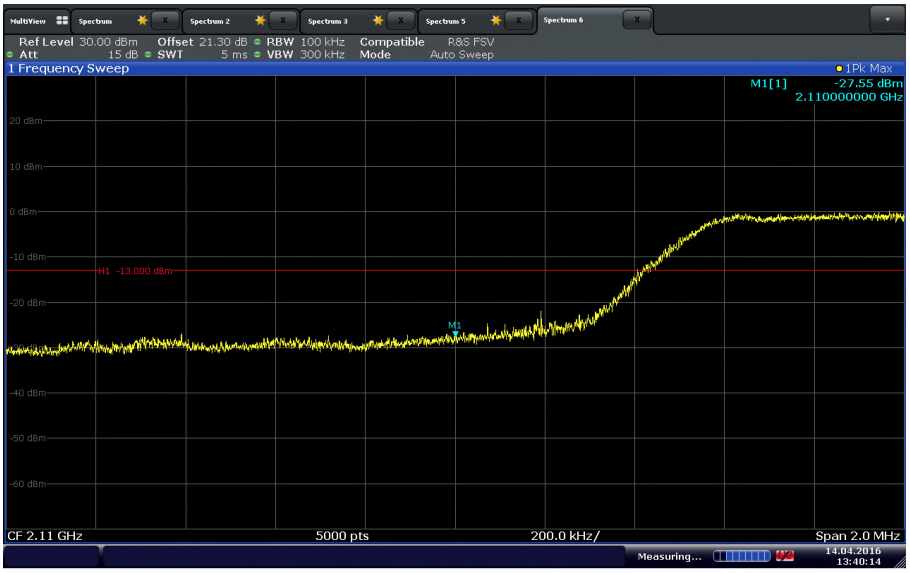
Date: 14.APR.2016 11:36:04

LTE Band 4 Downlink 5MHz Bandwidth High Channel Band Edge



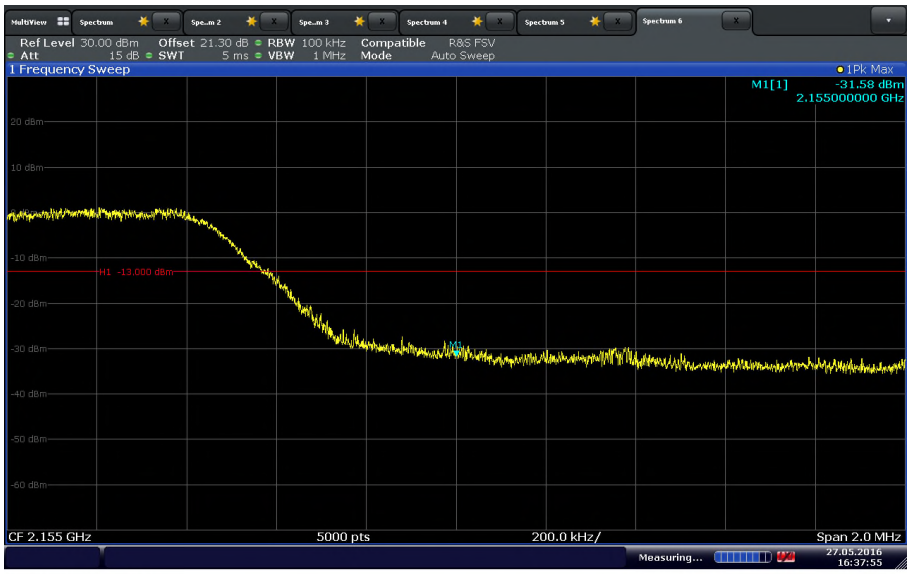
Date: 27.MAY.2016 16:39:23

LTE Band 4 Downlink 10MHz Bandwidth Low Channel Band Edge



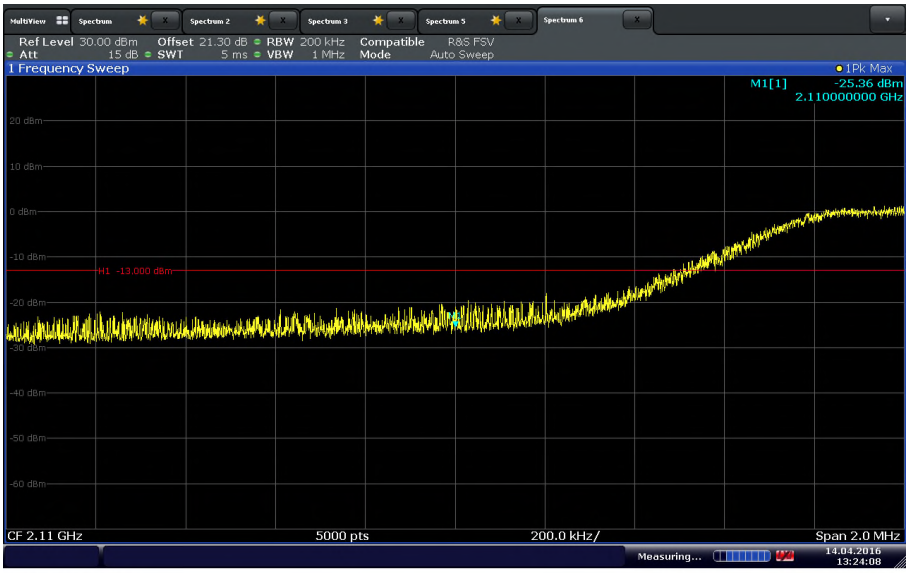
Date: 14.APR.2016 13:40:14

LTE Band 4 Downlink 10MHz Bandwidth High Channel Band Edge



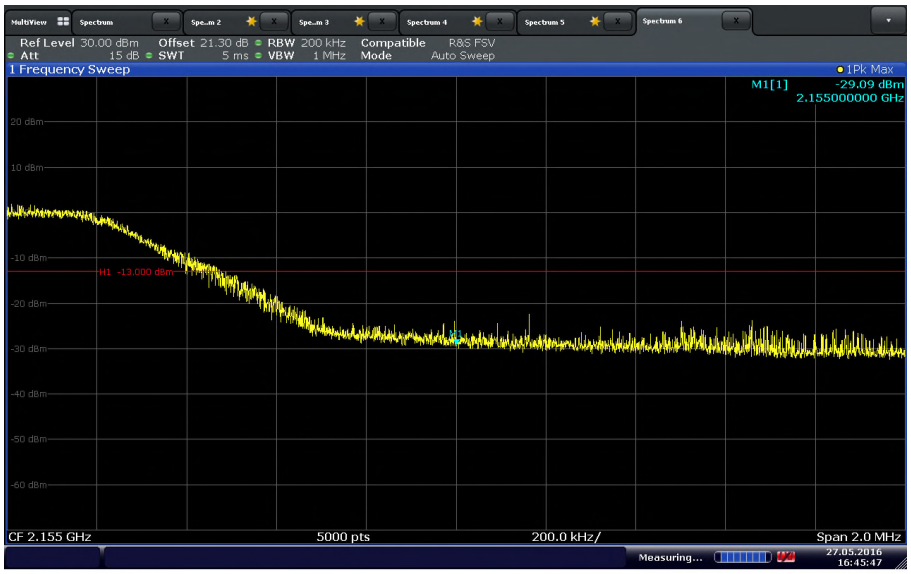
Date: 27.MAY.2016 16:37:55

LTE Band 4 Downlink 15MHz Bandwidth Low Channel Band Edge



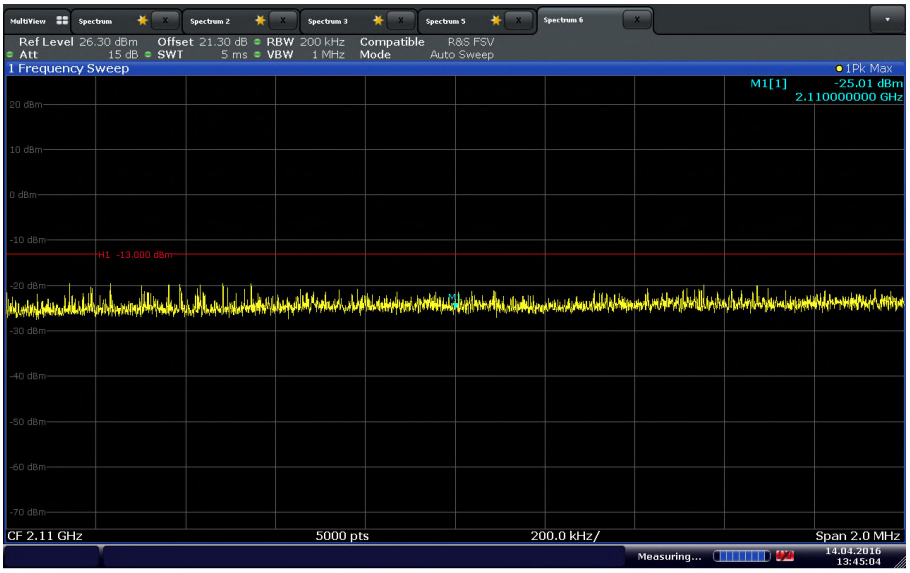
Date: 14.APR.2016 13:24:07

LTE Band 4 Downlink 15MHz Bandwidth High Channel Band Edge



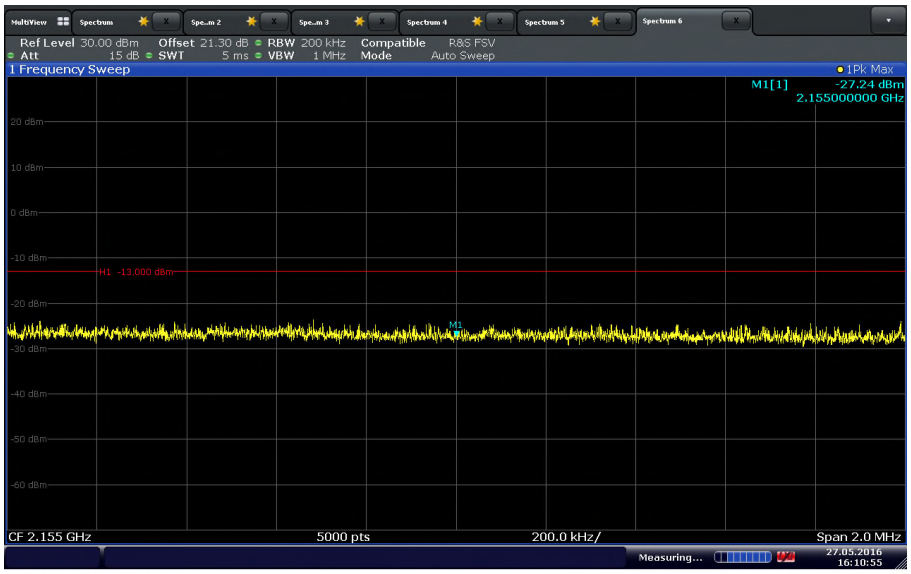
Date: 27.MAY.2016 16:45:47

LTE Band 4 Downlink 20MHz Bandwidth Low Channel Band Edge



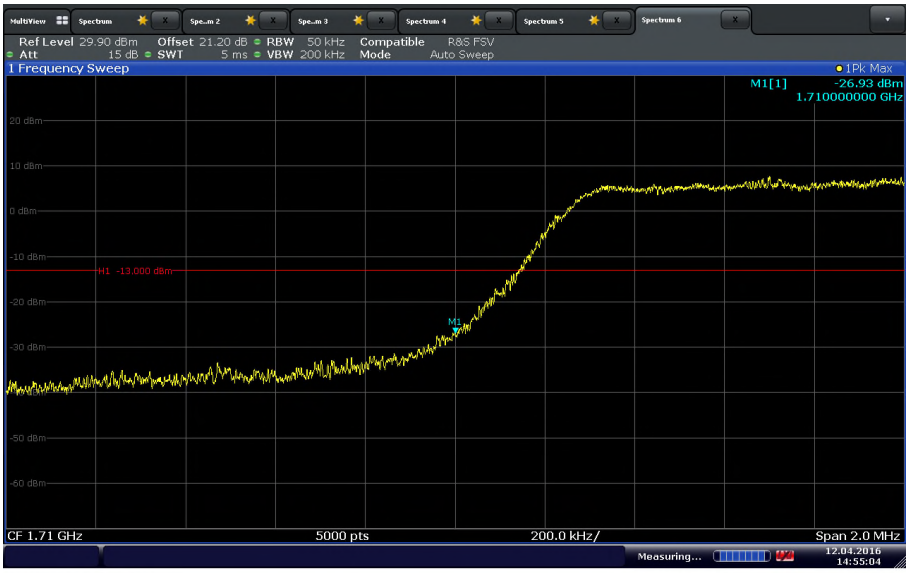
Date: 14.APR.2016 13:45:04

LTE Band 4 Downlink 20MHz Bandwidth High Channel Band Edge



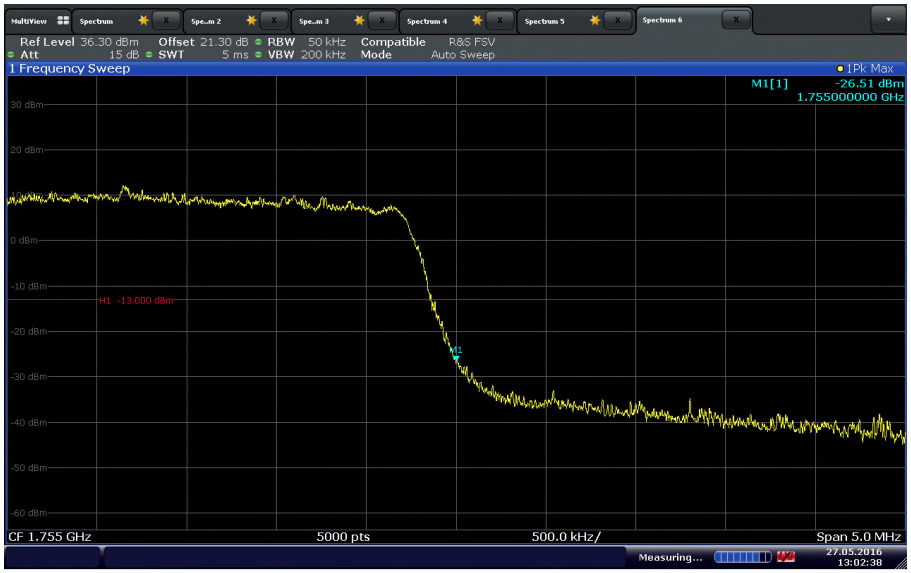
Date: 27.MAY.2016 16:10:56

LTE Band 4 Uplink 5MHz Bandwidth Low Channel Band Edge



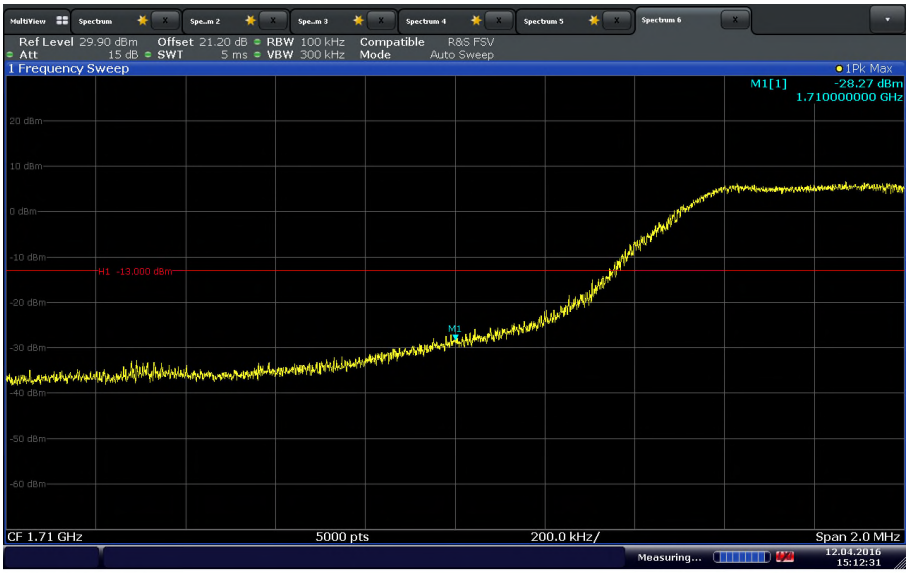
Date: 12.APR.2016 14:55:05

LTE Band 4 Uplink 5MHz Bandwidth High Channel Band Edge



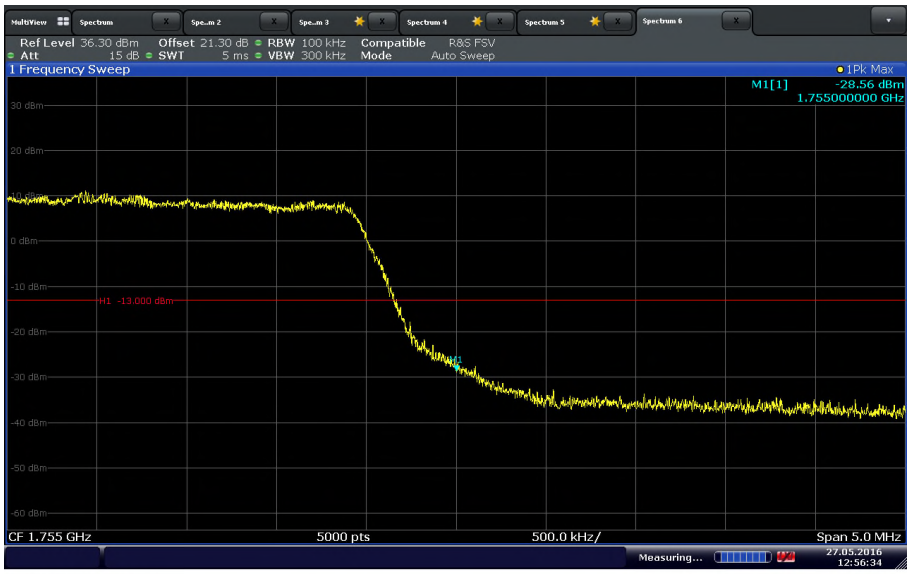
Date: 27.MAY.2016 13:02:38

LTE Band 4 Uplink 10MHz Bandwidth Low Channel Band Edge



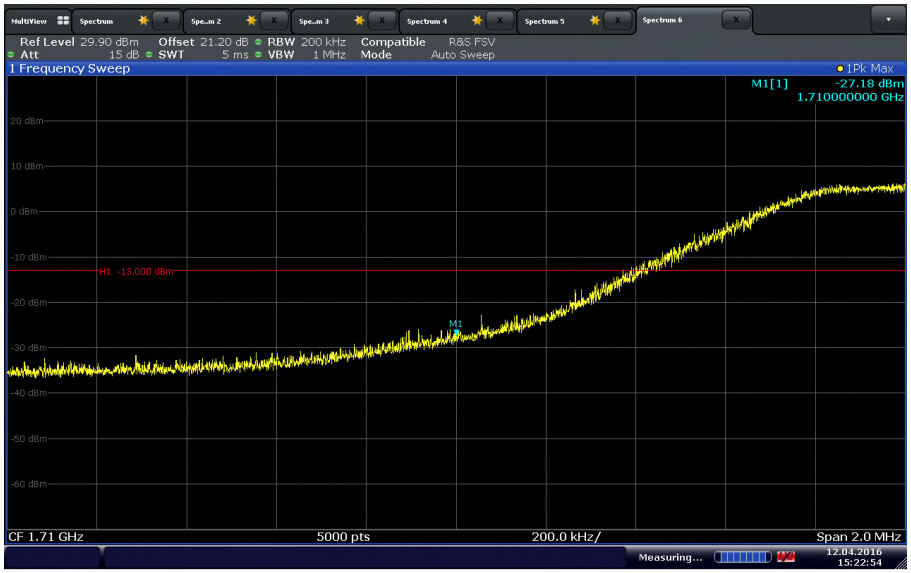
Date: 12.APR.2016 15:12:30

LTE Band 4 Uplink 10MHz Bandwidth High Channel Band Edge



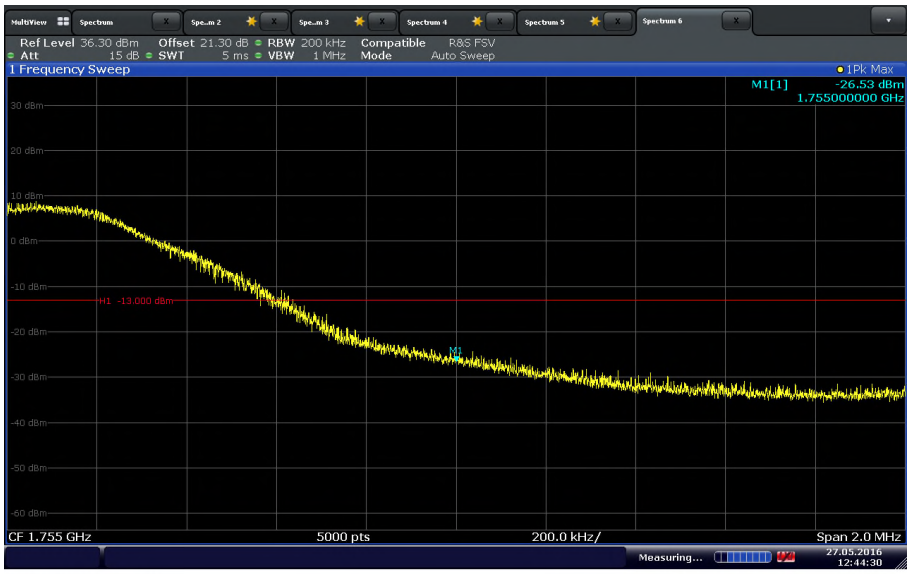
Date: 27.MAY.2016 12:56:34

LTE Band 4 Uplink 15MHz Bandwidth Low Channel Band Edge



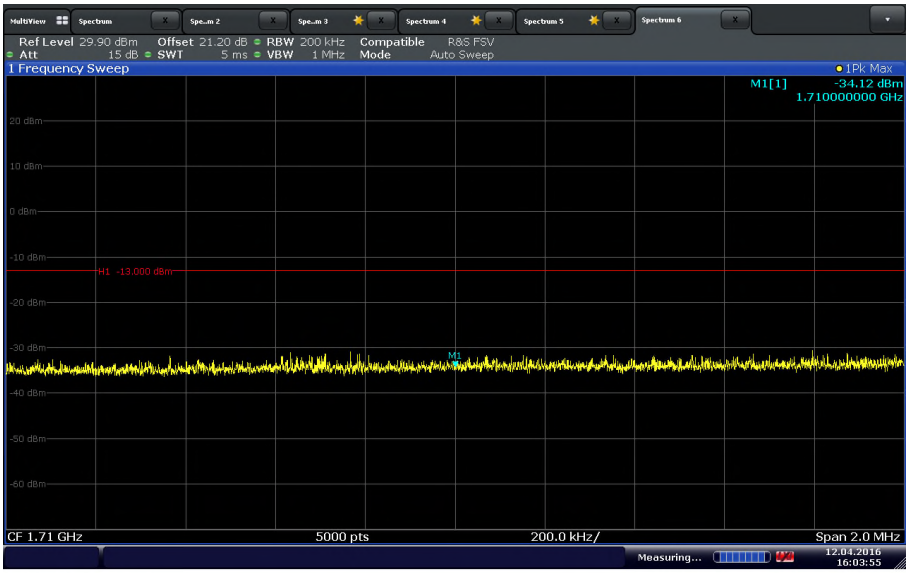
Date: 12.APR.2016 15:22:55

LTE Band 4 Uplink 15MHz Bandwidth High Channel Band Edge



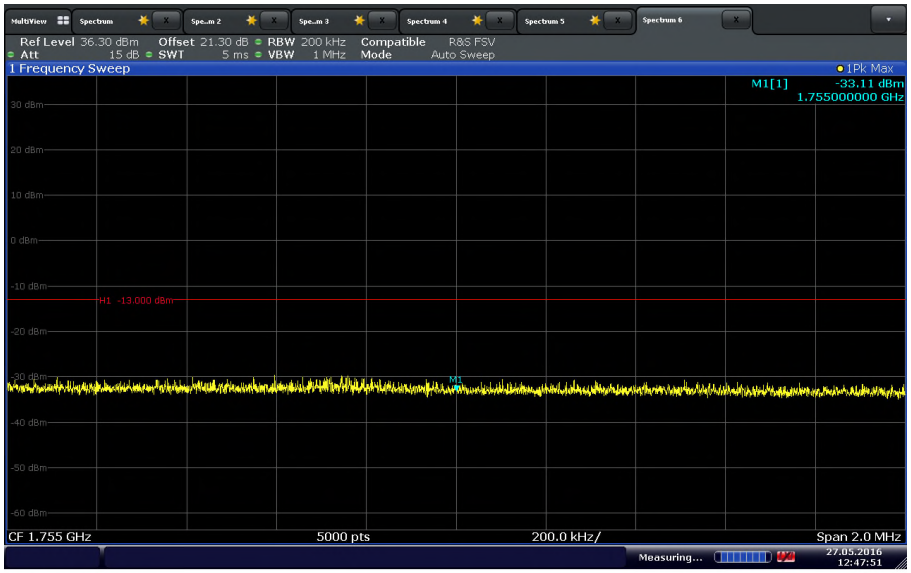
Date: 27.MAY.2016 12:44:30

LTE Band 4 Uplink 20MHz Bandwidth Low Channel Band Edge



Date: 12.APR.2016 16:03:55

LTE Band 4 Uplink 20MHz Bandwidth High Channel Band Edge



Date: 27.MAY.2016 12:47:51

2.6 CONDUCTED SPURIOUS EMISSIONS

2.6.1 Specification Reference

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

2.6.2 Standard Applicable

(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.

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 May 27, 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 performed at TÜV SÜD America Inc. Rancho Bernardo facility.

Ambient Temperature	24.7 – 26.9°C
Relative Humidity	40.3 - 45.5%
ATM Pressure	98.7 - 99.7kPa

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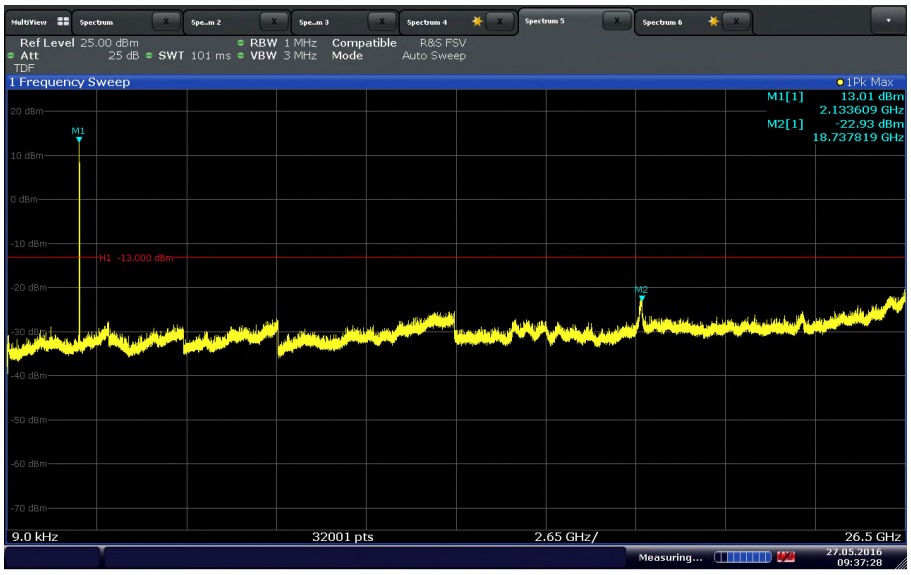
2.6.7 Additional Observations

- 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 B4 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.

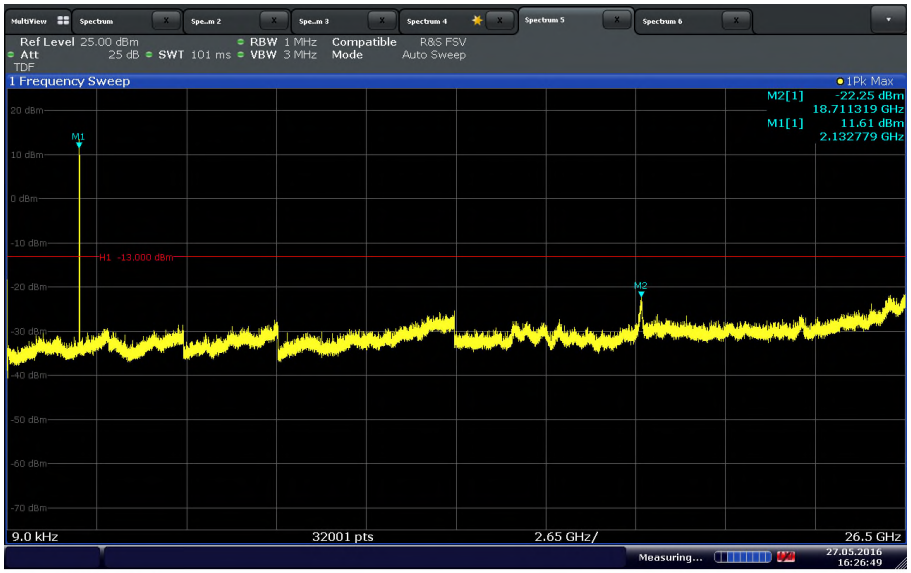
2.6.8 Test Results

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



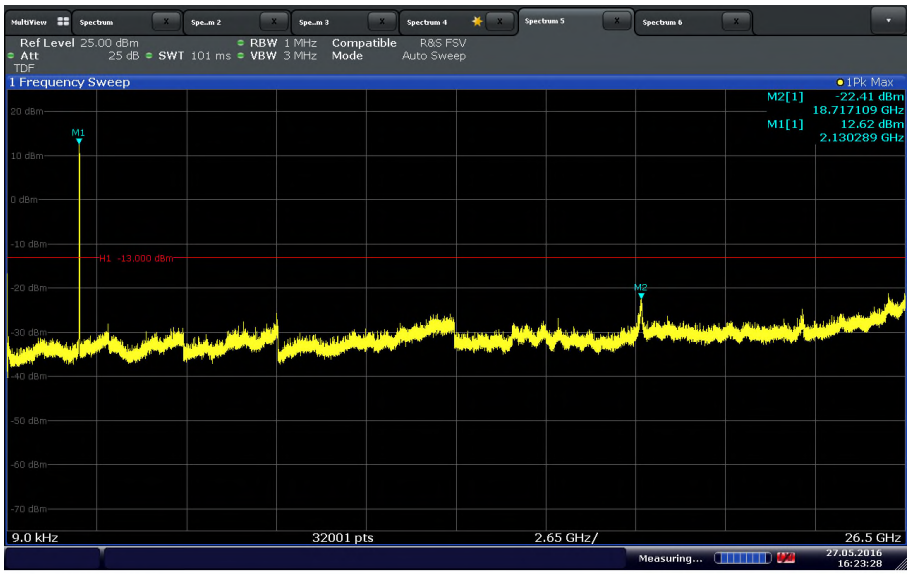
Date: 27.MAY.2016 09:37:28

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



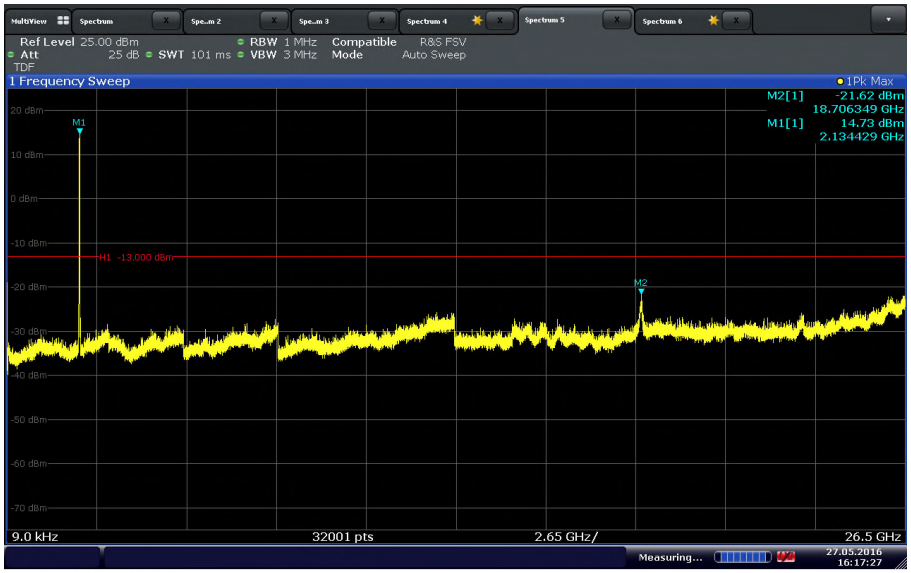
Date: 27.MAY.2016 16:26:49

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



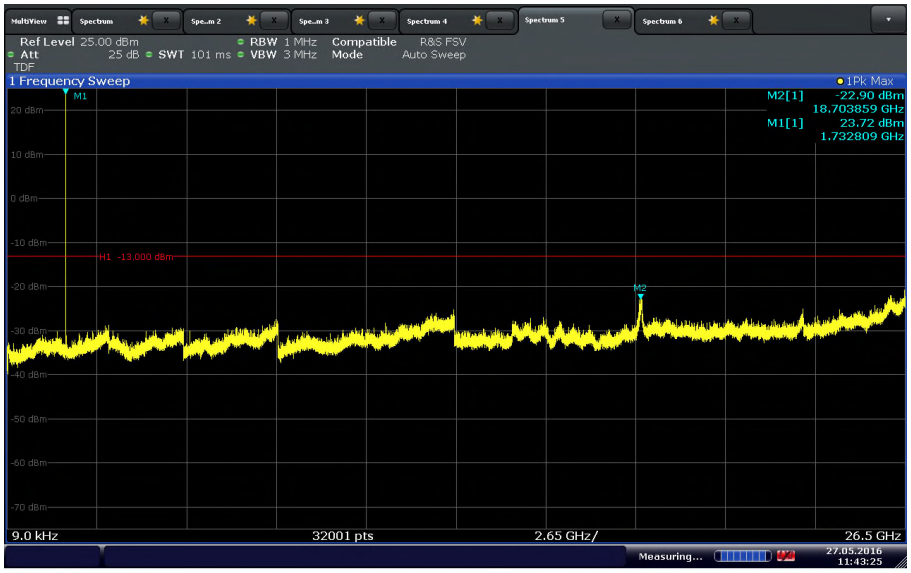
Date: 27.MAY.2016 16:23:28

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



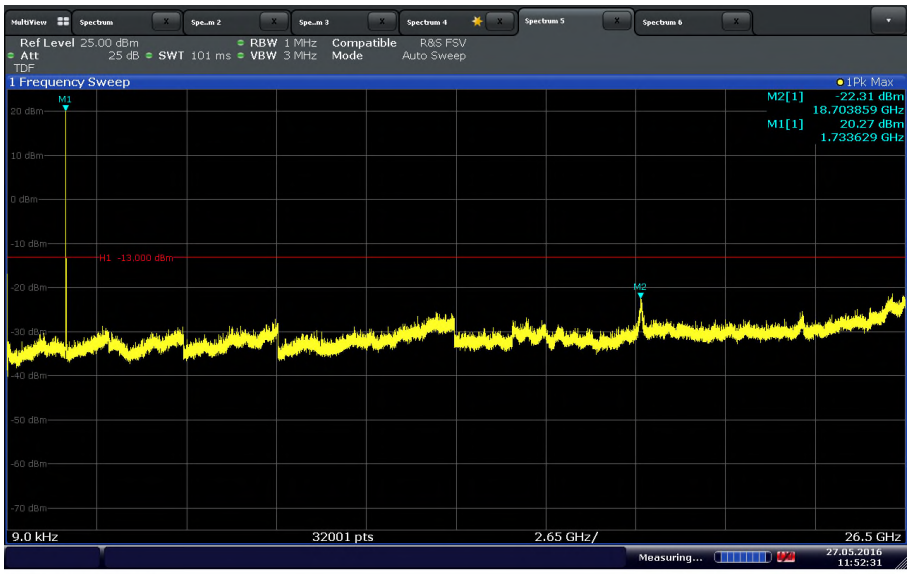
Date: 27.MAY.2016 16:17:27

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



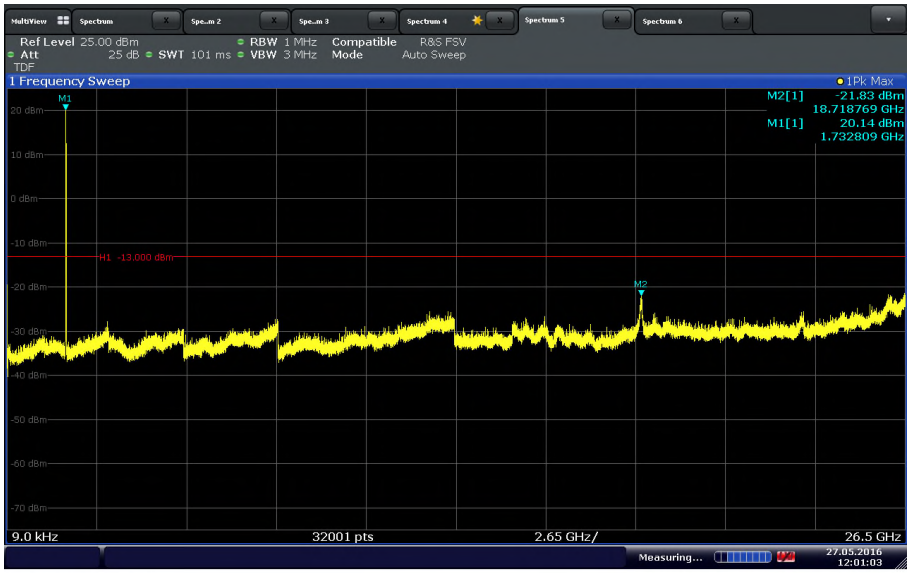
Date: 27.MAY.2016 11:43:25

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



Date: 27.MAY.2016 11:52:31

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



Date: 27.MAY.2016 12:01:03

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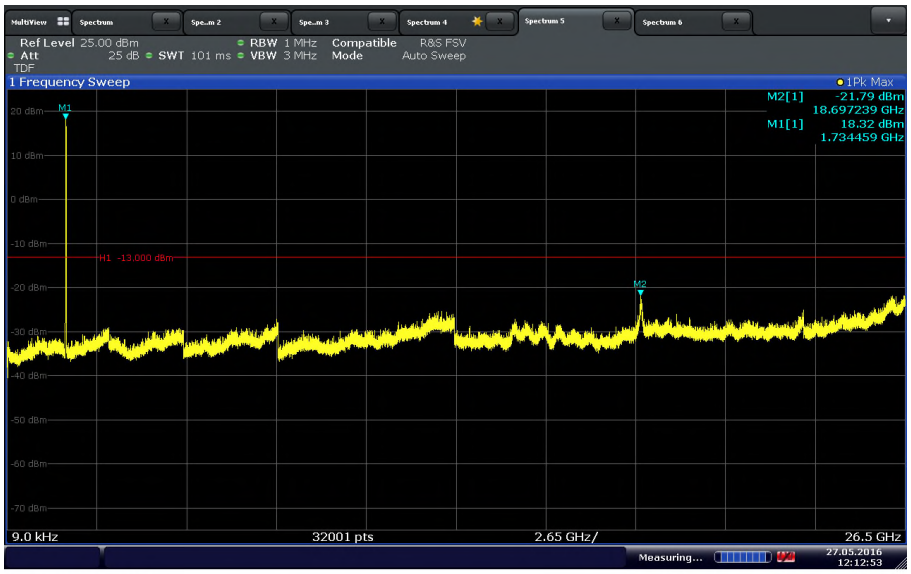
LTE Band 4 Uplink 20MHz Bandwidth Mid Channel Conducted Spurious Emissions



Date: 27.MAY.2016 12:12:53

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 CRF Part 22, Clause 24.238(a)
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: 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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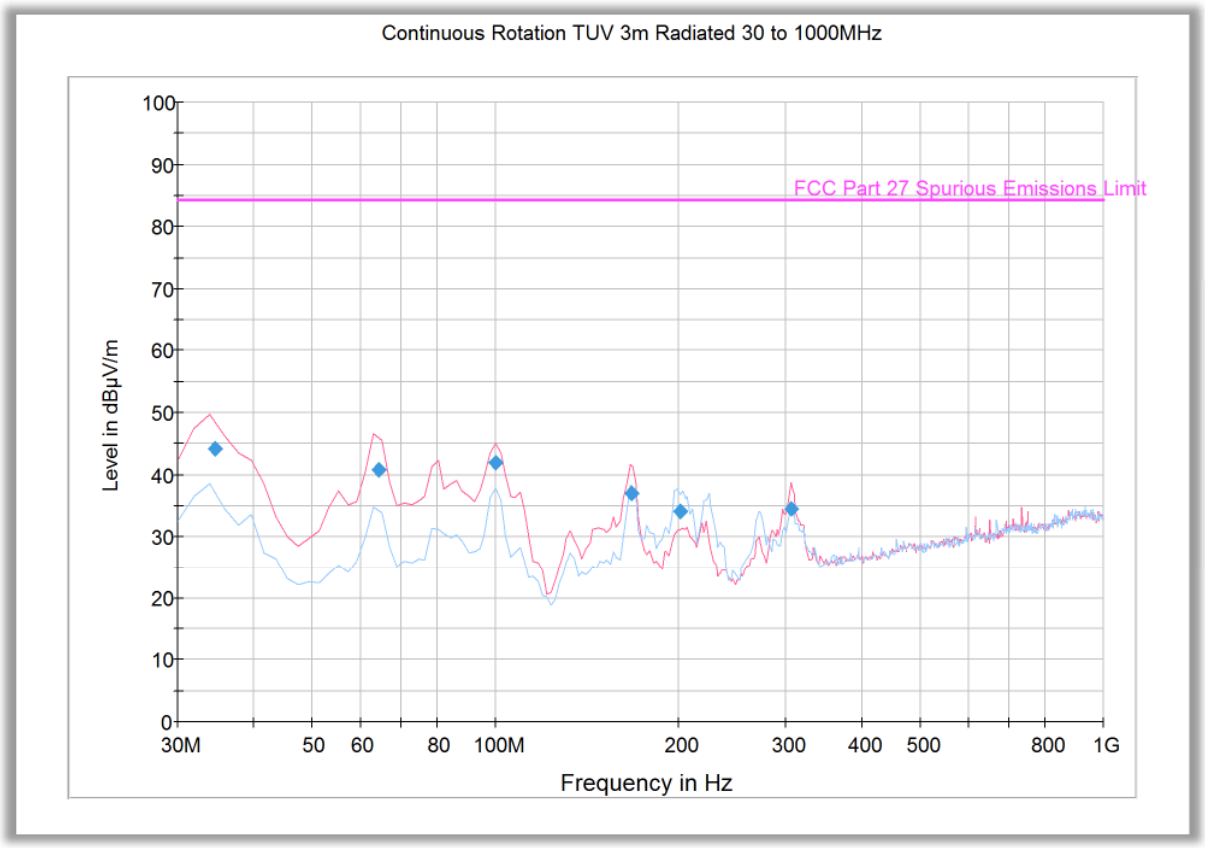
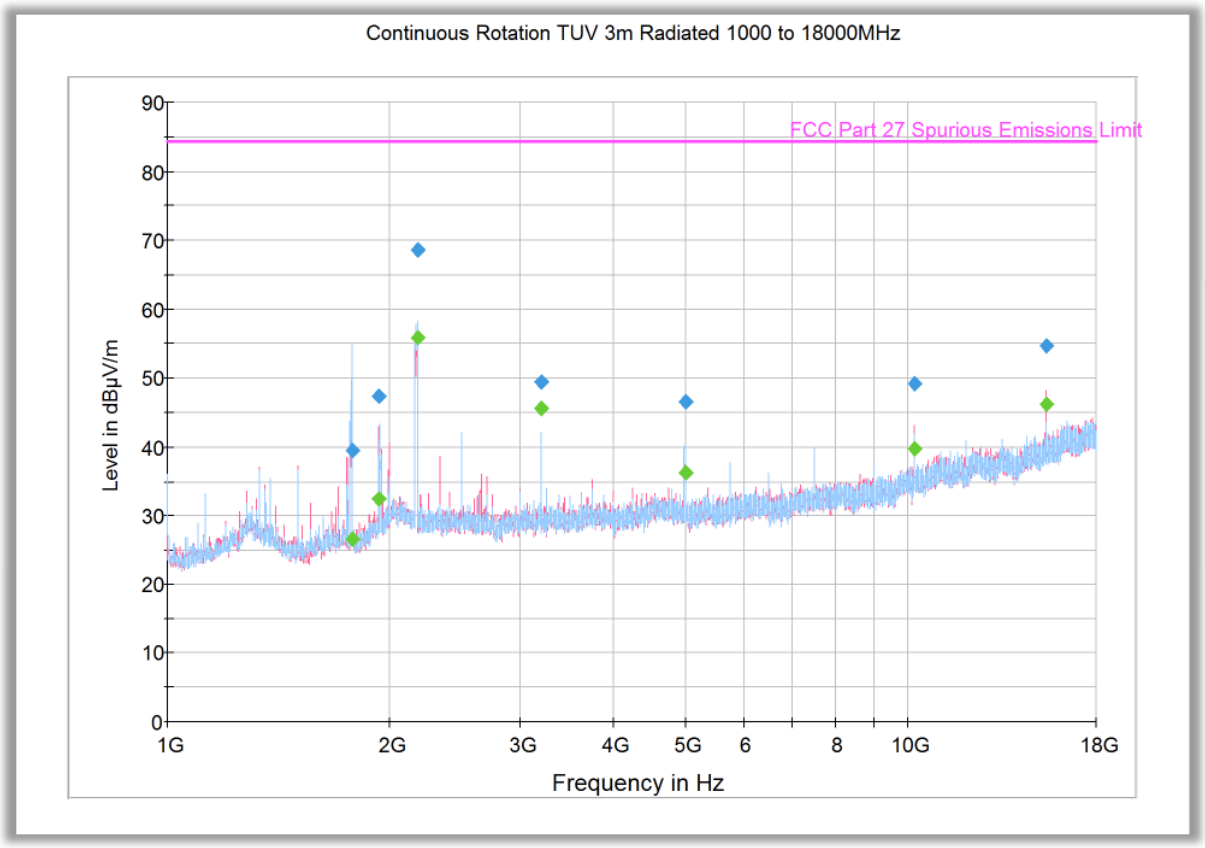
2.7.9 Test Results Below 1GHz (Downlink Worst Case Configuration) - 20MHz Bandwidth High Channel



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)
33.887776	47.0	1000.0	120.000	100.0	V	279.0	-7.9	37.4	84.4
63.046092	41.1	1000.0	120.000	200.0	V	77.0	-16.5	43.3	84.4
99.979960	39.1	1000.0	120.000	100.0	V	124.0	-14.2	45.3	84.4
166.072144	33.1	1000.0	120.000	100.0	V	303.0	-13.0	51.3	84.4
199.118236	32.7	1000.0	120.000	200.0	H	158.0	-11.5	51.7	84.4
306.032064	35.6	1000.0	120.000	100.0	V	0.0	-6.7	48.8	84.4

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



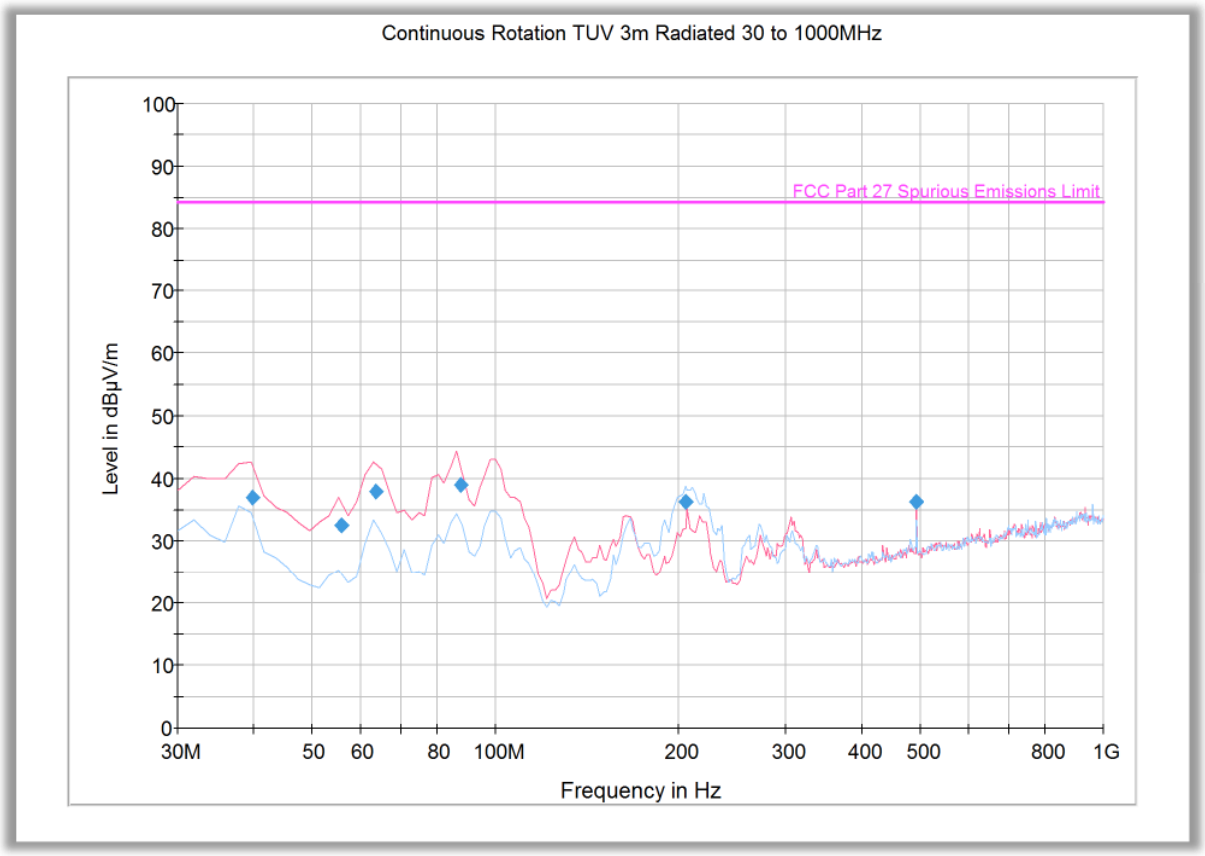
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1773.733333	39.5	1000.0	1000.000	116.7	H	187.0	-3.6	44.9	84.4
1932.533333	47.4	1000.0	1000.000	348.1	V	51.0	-1.1	37.0	84.4
2176.200000	68.7	1000.0	1000.000	207.5	H	242.0	-1.6	Fundamental	
3200.000000	49.5	1000.0	1000.000	148.7	H	79.0	0.8	34.9	84.4
5000.300000	46.6	1000.0	1000.000	249.3	H	118.0	3.3	37.8	84.4
10200.033333	49.3	1000.0	1000.000	146.7	V	10.0	11.1	35.1	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)
1773.733333	26.6	1000.0	1000.000	116.7	H	187.0	-3.6	57.8	84.4
1932.533333	32.4	1000.0	1000.000	348.1	V	51.0	-1.1	52.0	84.4
2176.200000	55.8	1000.0	1000.000	207.5	H	242.0	-1.6	Fundamental	
3200.000000	45.7	1000.0	1000.000	148.7	H	79.0	0.8	38.7	84.4
5000.300000	36.4	1000.0	1000.000	249.3	H	118.0	3.3	48.0	84.4
10200.033333	39.8	1000.0	1000.000	146.7	V	10.0	11.1	44.6	84.4

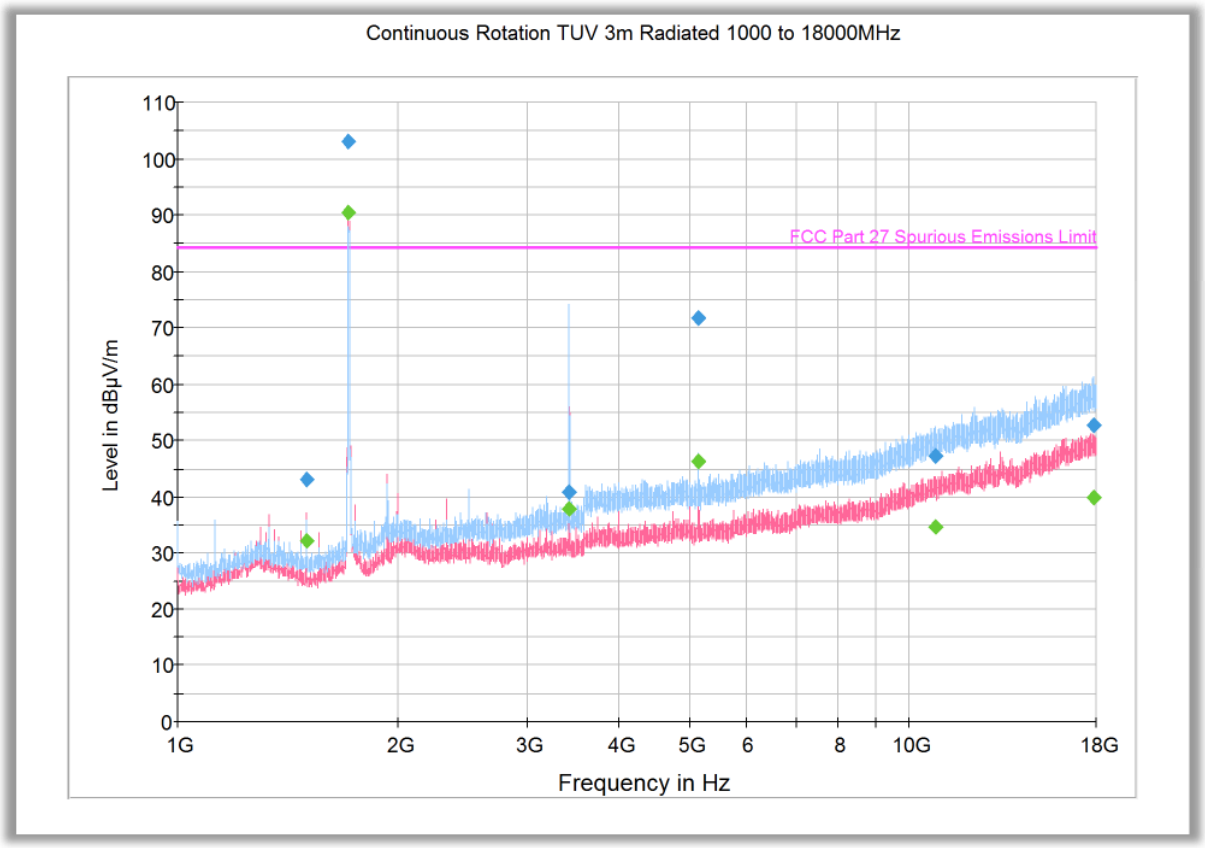
2.7.11 Test Results Below 1GHz (Uplink Worst Case Configuration) - 10MHz Bandwidth Low Channel



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)
39.719439	41.3	1000.0	120.000	100.0	V	290.0	-11.1	43.1	84.4
55.270541	34.3	1000.0	120.000	100.0	V	171.0	-15.4	50.1	84.4
63.046092	39.8	1000.0	120.000	100.0	V	0.0	-16.5	44.6	84.4
86.372745	41.7	1000.0	120.000	100.0	V	163.0	-15.9	42.7	84.4
204.949900	30.7	1000.0	120.000	200.0	H	164.0	-11.1	53.7	84.4
492.645291	34.2	1000.0	120.000	100.0	V	353.0	-1.8	50.2	84.4

2.7.12 Test Results Above 1GHz (Uplink Worst Case Configuration) - 10MHz 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)
1500.000000	43.3	1000.0	1000.000	174.6	V	191.0	-6.2	41.1	84.4
1713.400000	103.0	1000.0	1000.000	198.4	V	9.0	-3.9	Fundamental	
3429.100000	40.9	1000.0	1000.000	328.2	H	-3.0	0.5	43.5	84.4
5147.066667	71.9	1000.0	1000.000	233.4	H	262.0	3.5	12.5	84.4
10826.933333	47.5	1000.0	1000.000	237.4	H	301.0	12.7	36.9	84.4
17854.400000	52.8	1000.0	1000.000	301.6	H	188.0	20.4	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)
1500.000000	32.3	1000.0	1000.000	174.6	V	191.0	-6.2	52.1	84.4
1713.400000	90.5	1000.0	1000.000	198.4	V	9.0	-3.9	Fundamental	
3429.100000	38.1	1000.0	1000.000	328.2	H	-3.0	0.5	46.3	84.4
5147.066667	46.4	1000.0	1000.000	233.4	H	262.0	3.5	38.0	84.4
10826.933333	34.8	1000.0	1000.000	237.4	H	301.0	12.7	49.6	84.4
17854.400000	40.0	1000.0	1000.000	301.6	H	188.0	20.4	44.4	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

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

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

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 analyser.

- 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.

2.8.8 Test Results Summary

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

LTE B4 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 B4 Uplink		
Temperature (°C)	***Voltage (VAC)***	***Frequency Deviation (Hz/ppm)***
20	102	0 / 0
	138	0 / 0

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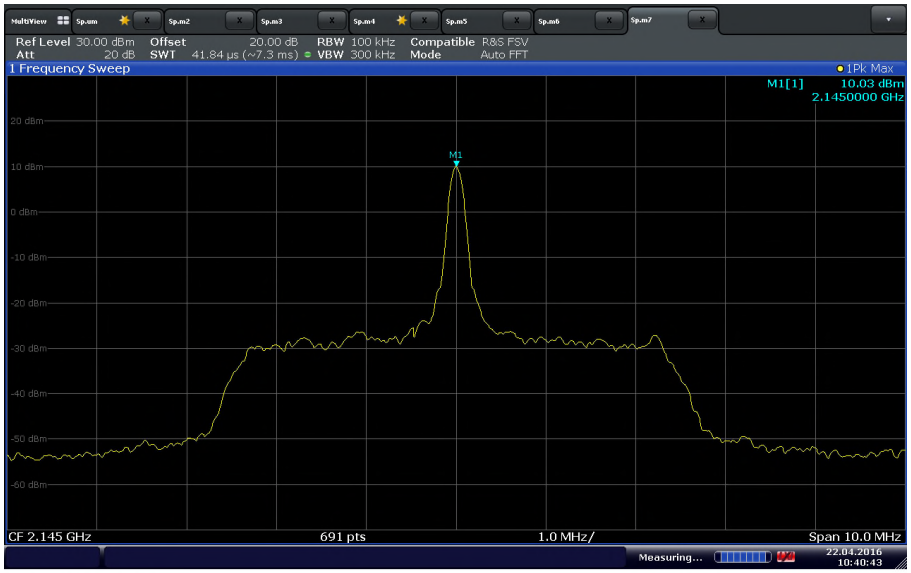
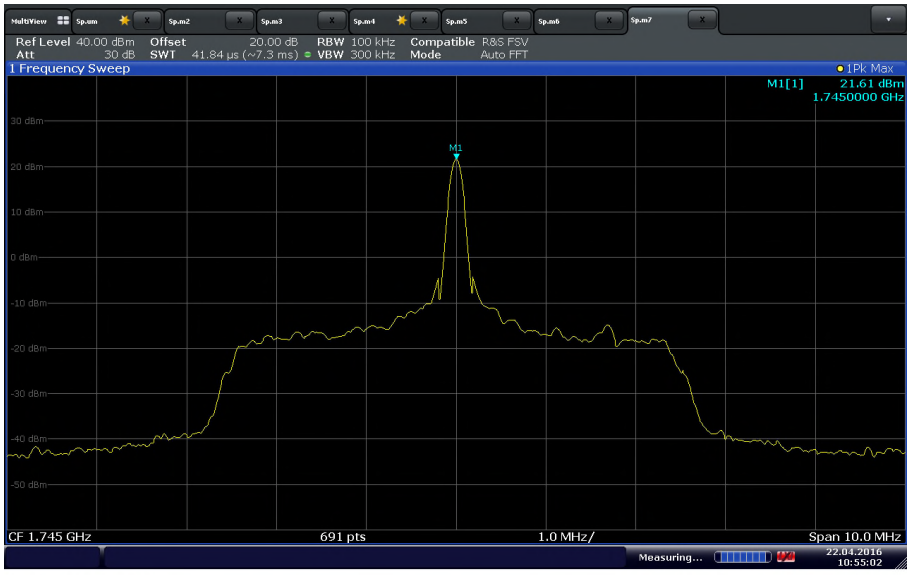
2.8.9 Sample Test Plots



Date: 22.APR.2016 10:40:43

LTE B4 Downlink (Middle Channel) 120VDC @ 20°C



Date: 22.APR.2016 10:55:03

LTE B4 Uplink (Middle Channel) 120VDC @ 20°C

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) / Default Test Configuration

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

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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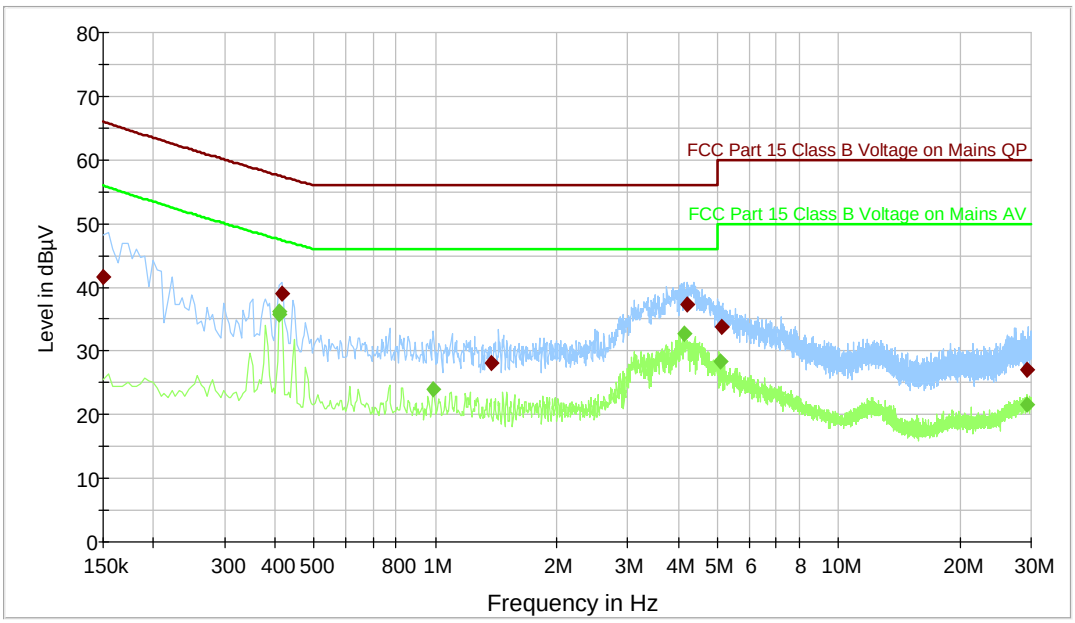
2.9.9 Test Results - Conducted Emissions Line 1 – Hot (NU)



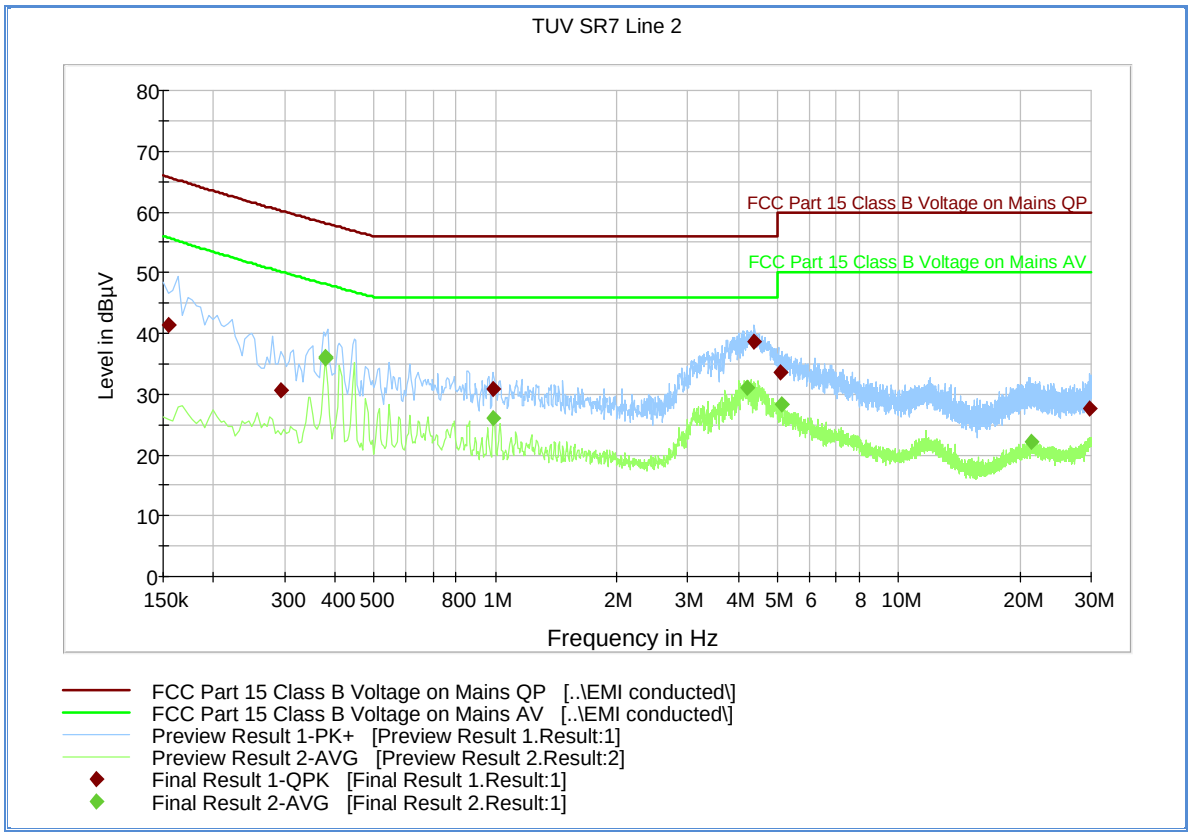
Quasi Peak

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

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

SECTION 3

3TEST 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						
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	

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	

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

4DIAGRAM OF TEST SETUP

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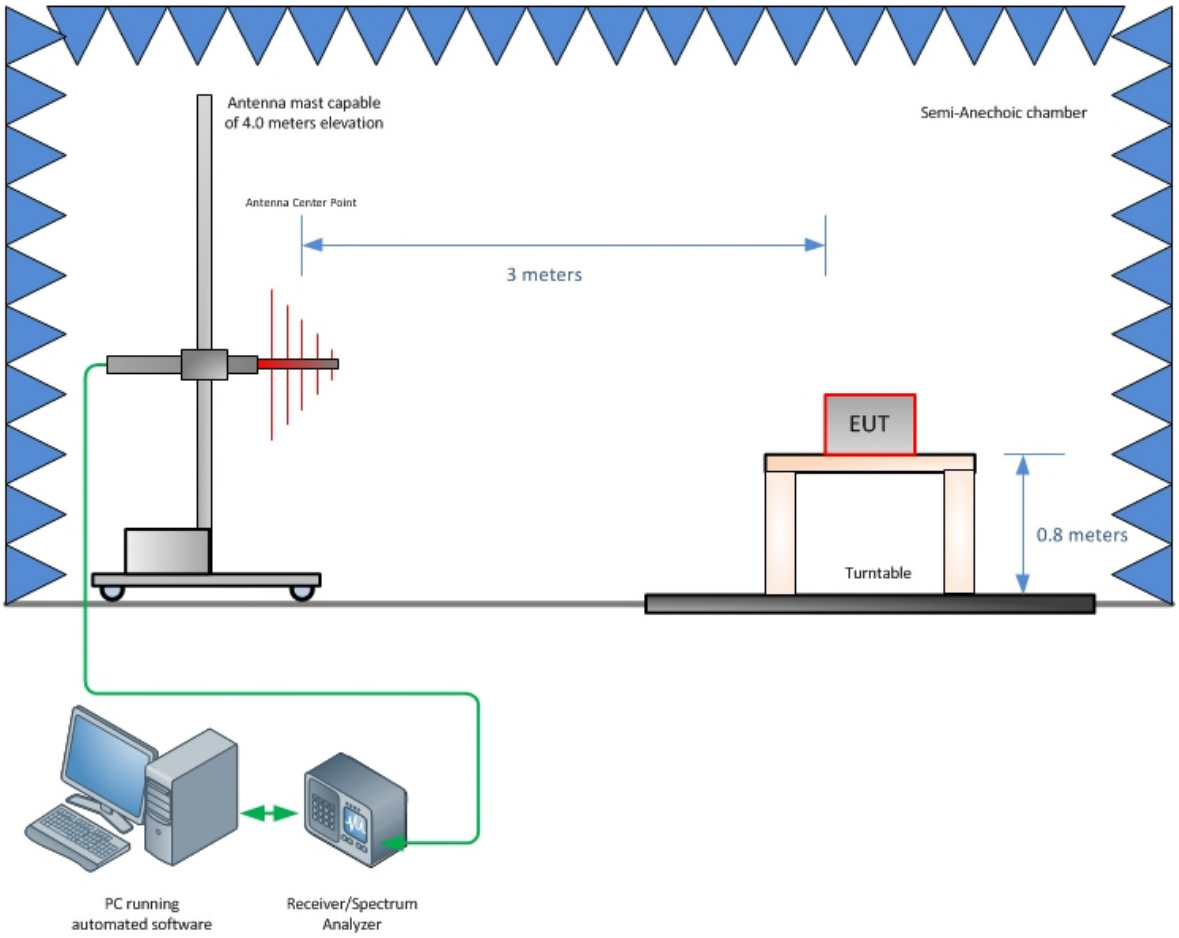
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)

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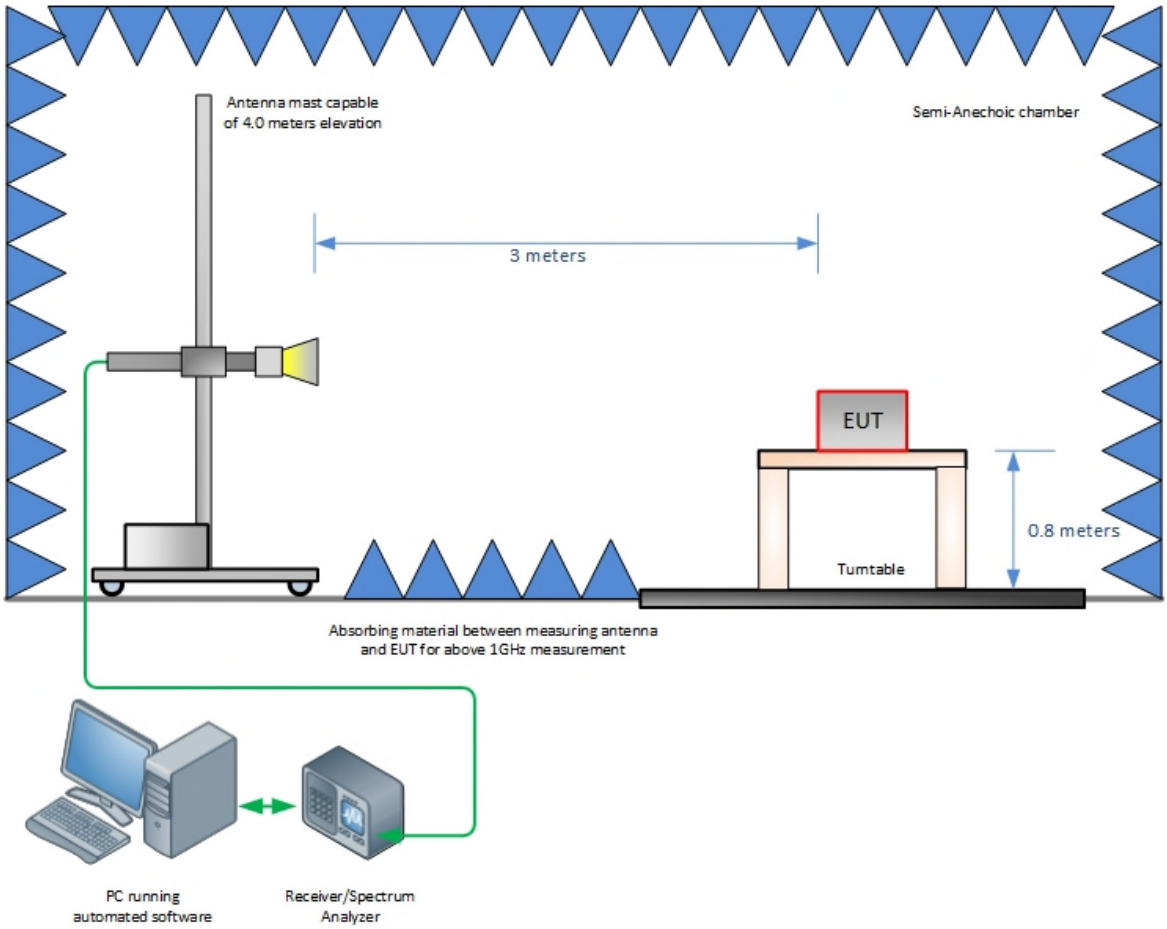
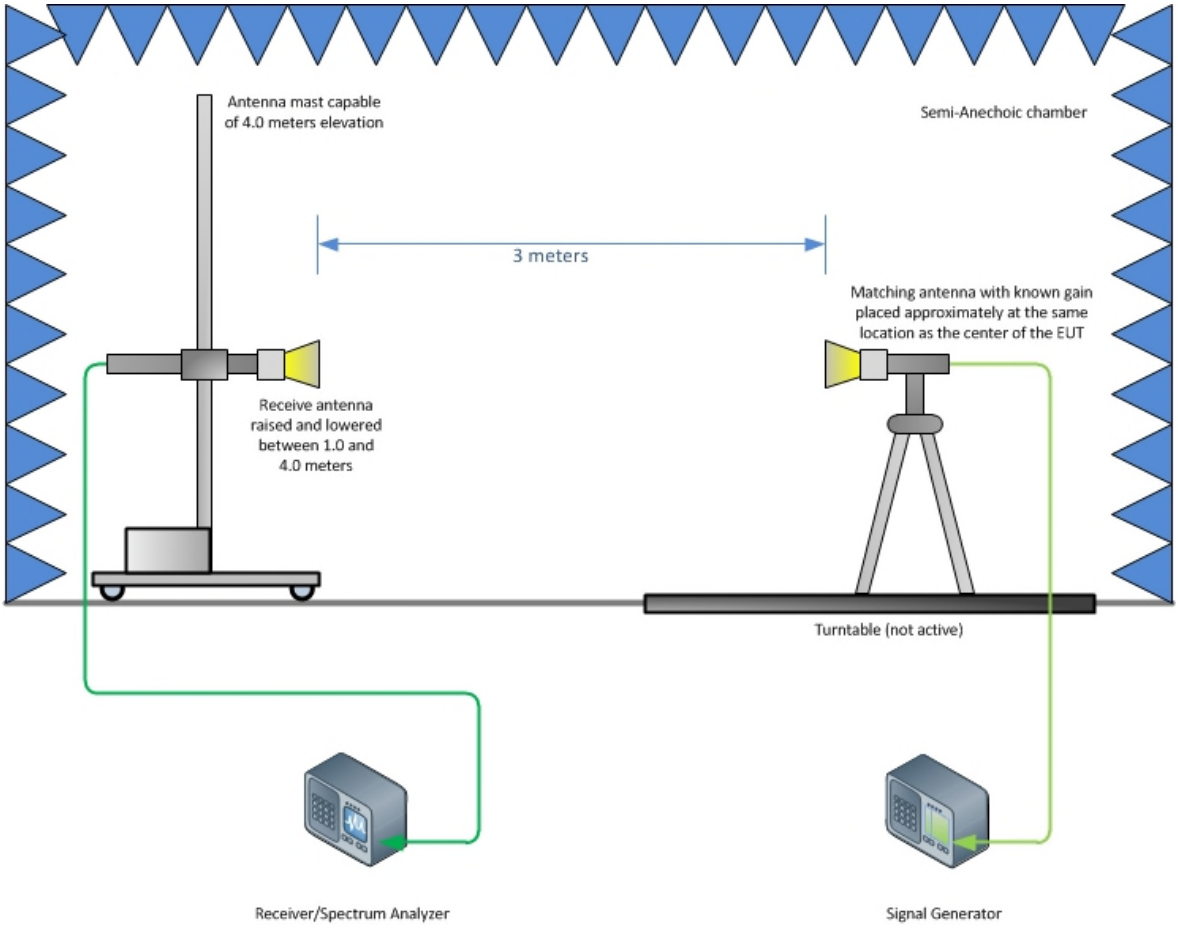


Radiated Emission Test Setup (Above 1GHz)



Substitution Test Method (Above 1GHz, if applicable)

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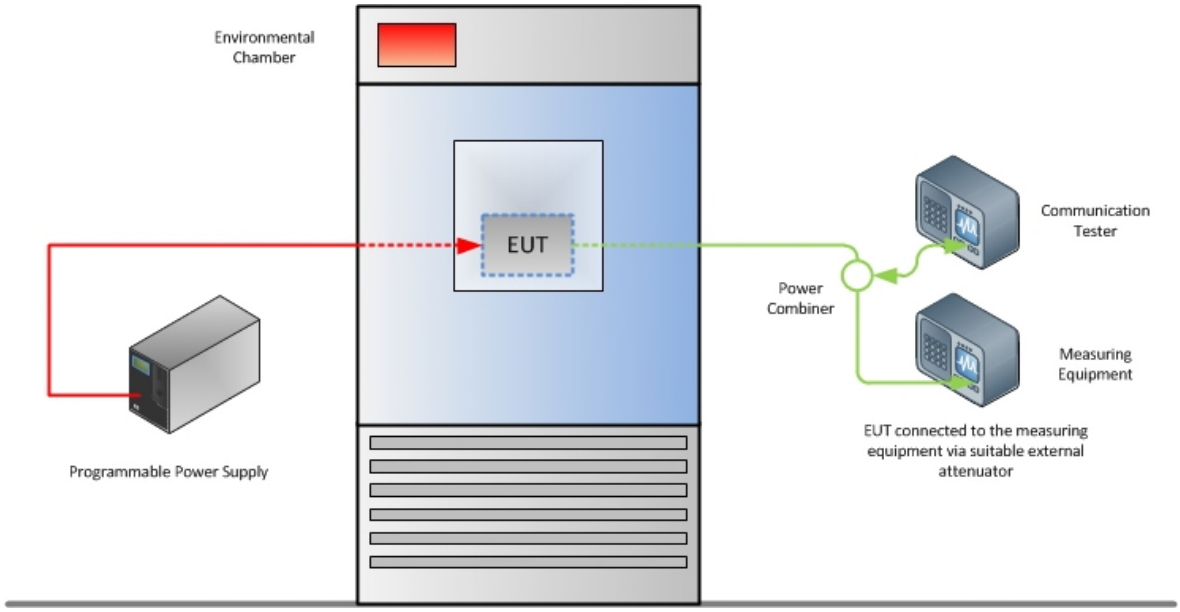

Frequency Stability Test Comfiguration

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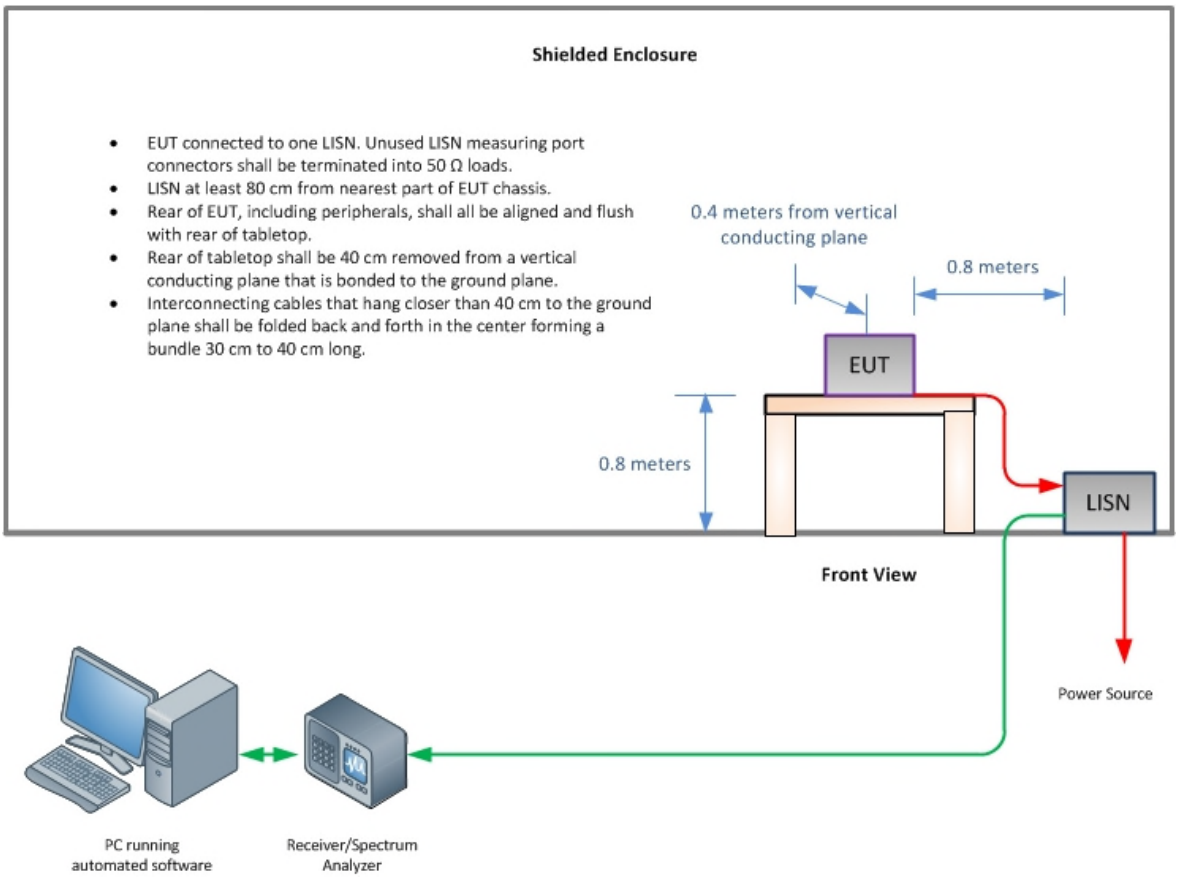

Conducted Emissions Test Configuration (if applicable)

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SECTION 5

5ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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