Report On

Application for Grant of Equipment Authorization of the
Nextivity Inc.
Cel-Fi GO RED Industrial Signal Booster

FCC CFR 47 Part 2 and 27
RSS-Gen and RSS-130 and RSS-131
FCC CFR 47 Part 20.21(c)

Report No. 72141009A **November 2018**

REPORT ON	Radio Testing of the Nextivity Inc. Cel-Fi GO RED Industrial Signal Booster
TEST REPORT NUMBER	72141009A
TEST REPORT DATE	November 2018
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 CLi@NextivityInc.com (858) 485-9442
PREPARED BY	Xiaoying Zhang **Name** Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: Senior EMC Test Engineer/Wireless Team Lead
DATED	November 01, 2018

Revision History

72141009A Nextivity Inc. Cel-Fi GO RED Industrial Signal Booster					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
11/01/18	Initial Release				Ferdinand S. Custodio

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SECTION 1

REPORT SUMMARY

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

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Nextivity Inc. Cel-Fi GO RED G32-12/14 Industrial Signal Booster to the requirements of the following:

- FCC CFR 47 Part 2 and 27 and 20.21(c)
- RSS-Gen Issue 5 April 2018
- RSS-130 Issue 1 October 2013
- RSS-131 Issue 3 May 2017

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.
Product Marketing Name	Cel-Fi GO RED
Model Number(s)	G32-12/14
FCC ID	YETG32-1214
IC Number	N/A
Serial Number(s)	382829000271 and 382829000042
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC CFR 47 Part 2 and 27 and 20.21(c) (October 1, 2017). • KDB 935210 D05 Indus Booster Basic Meas v01r02 (October 27, 2017) • RSS-130 - Mobile Broadband Services (MBS) Equipment Operating in the Frequency Bands 698-756 MHz and 777-787 MHz (Issue 1, October 2013). • SRSP-518 - Technical Requirements for Mobile Broadband Services (MBS) in the bands 698-756 MHz and 777-787 MHz (Issue 1, October 2013). • RSS-131 - Zone Enhancer (Issue 3, May 2017) • RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 4, November 2014). • ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
Start of Test	September 21, 2018
Finish of Test	October 16, 2018
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	• KDB412172 D01 Determining ERP and EIRP v01r01 August 07, 2015: Guidelines for determining the Effective Radiated Power (ERP) and Equivalent Isotropically Radiated Power (EIRP) of an RF transmitting system • KDB971168 D01 Power Meas License Digital Systems v03r01: April 9 2018: Measurement guidance for certification of licensed digital transmitters

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2 and 27 and 20.21(c) with cross-reference to the corresponding ISED RSS standards is shown below.

Section	Spec Clause					Test Description	Result
	FCC Part 2	FCC Part 27	KDB 935210 D05	RSS-130	RSS-131		
2.1	2.1046	-	-	-	-	Transmitter Conducted Output Power	Compliant
2.2	-	-	-	4.4	-	Equivalent Isotropic Radiated Power	Compliant
	-	27.50 (c)(3)	-	-	-	Equivalent Radiated Power	Compliant
2.3	2.1049	-	-	RSS-Gen 6.7	-	Occupied Bandwidth	Compliant
2.4	-	-	-	4.4	-	Peak-Average Ratio	Compliant
2.5	2.1051	27.53 (g)	-	4.6.1	-	Band Edge	Compliant
2.6	2.1051	27.53 (g)	3.6.3	4.6	-	Conducted Spurious Emissions	Compliant
2.7	2.1053	27.53 (g)	3.8	4.6	-	Field Strength of Spurious Radiation	Compliant
2.8	2.1055	27.54	3.7	4.3	5.2.4	Frequency Stability	Compliant
-	-	-	-	RSS-Gen 7.1	-	Receiver Spurious Emissions	N/A
2.9	15.207 (a)	-	-	RSS-Gen 8.8	-	Power Line Conducted Emission	Compliant
2.10	-	-	3.2	-	-	ACG Threshold Level	Compliant
2.11	-	-	3.3	-	5.2.1	Out of Band Rejection	Compliant
2.12	-	-	3.4	-	5.2.2	Input-versus-output signal comparison	Compliant
2.13	-	-	3.5	-	5.2.3	Mean Output Power and Amplifier/booster Gain	Compliant
-	-	-	3.6.2	-	-	Intermodulation	N/A*

N/A: Not required as per RSS-GEN 5.2. EUT is not a Stand-Alone receiver.
N/A: Not applicable. Intermodulation-product spurious emission measurements are not required for single-channel boosters that can not accommodated two simultaneous signals within the pass band.*

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) is a Nextivity Inc. Cel-Fi GO RED G32-12/14 Industrial Signal Booster. The EUT is a LTE Distributed Antenna System (DAS) to improve voice and data cellular performance in a Fix Indoor environment. The unit includes Bluetooth LE connectivity. With the use of Nextivity smartphone application, it allows user to register the product, updated software, capture/display details metrics of the system. Only the LTE Band 12 function of the EUT was verified in this test report.

1.3.2 EUT General Description

EUT Description	Industrial Signal Booster
Product Marketing Name	Cel-Fi GO RED
Model Number(s)	G32-12/14
Rated Voltage	15V DC via external AC/DC adapter
Mode Verified	LTE Band 12
Frequency Bands	Uplink: 699 - 716MHz Downlink: 729 - 746MHz

Product Specifications

Frequency Band	Band 12
Technology	LTE
Booster Bandwidth	10 MHz
Downlink Output Power	16 dBm
Uplink Output Power	24 dBm
Max. Antenna Gain (dBi)	External Antenna (Supplied by customer)

Capability	LTE (Band 12 and 14) and BT LE
Primary Unit (EUT)	☒ Production ☐ Pre-Production ☐ Engineering
Environment	Fix, Indoor
Manufacturer Declared Temperature Range	-20°C to 65°C

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	10	729 - 746	8M80F9W	34.84	3.05	36.99	5.0
LTE Band 12 Uplink	10	699 - 716	8M83F9W	34.84	3.05	36.99	5.0

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 antenna port of CU.
B	Uplink (NU TX). Input signal is applied to B12 antenna port of CU. Output is monitored from B12 antenna port of NU.
C	Radiated test setup. Downlink (CU TX). Input signal is applied to B12 antenna port of NU. B12 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 antenna port of NU is terminated with a 50Ω load.

1.4.2 EUT Exercise Software

Manufacturer provided configuration software (ConformanceTest.exe v5.1.331) and Nextivity Chart Interface v2.0.0.16 (for Out of Band Rejection test only) running from a support laptop where both EUT are connected via USB.

1.4.3 Support Equipment and I/O cables

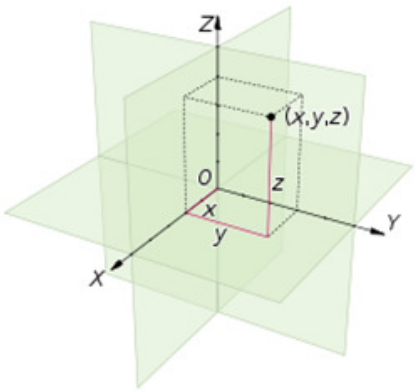
Manufacturer	Equipment/Cable	Description
Sony	Support Laptop	M/N PCG-31311L S/N 27545534 3006488
Sony	Support Laptop AC Adapter	M/N PCGA-AC19V9 S/N 147839091 0023259
HON-KWANG	I.T.E Power Supply	Model: HK-AY-150A160-US S/N: KH30000031 Input: 100-240V, 50/60Hz, 0.8A; Output: 15 VDC 1.6A
API Technologies Corp.	DC Block	M/N: 8037
-	Omni Whip Antenna	Model A21-V33-100 Max. gain 3.0 dBi
-	Omni Whip Antenna	Model A41-V30-100 Max. Gain 2.5 dBi

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:

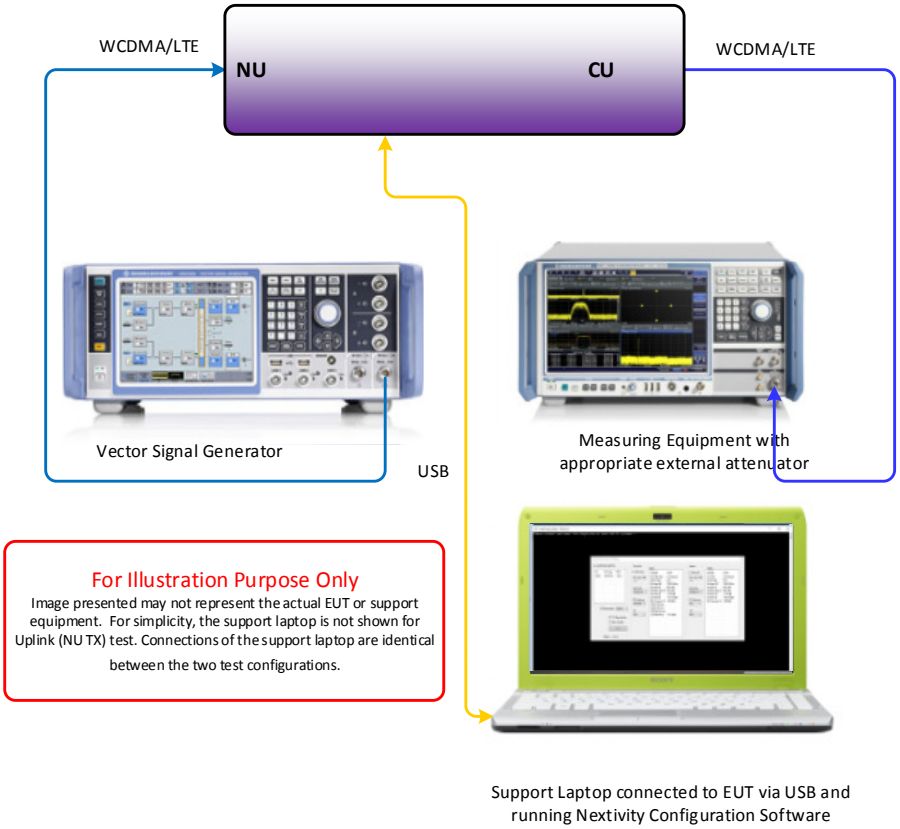
Mode	Bandwidth	Channel No.	Frequency
LTE Band 12 Downlink	10MHz	High Channel 5130	741.0MHz
LTE Band 12 Uplink	10MHz	Middle Channel 23095	707.5MHz

For radiated measurements X, Y, and Z orientations were verified. The verification was determined "Y" as worst case configuration.

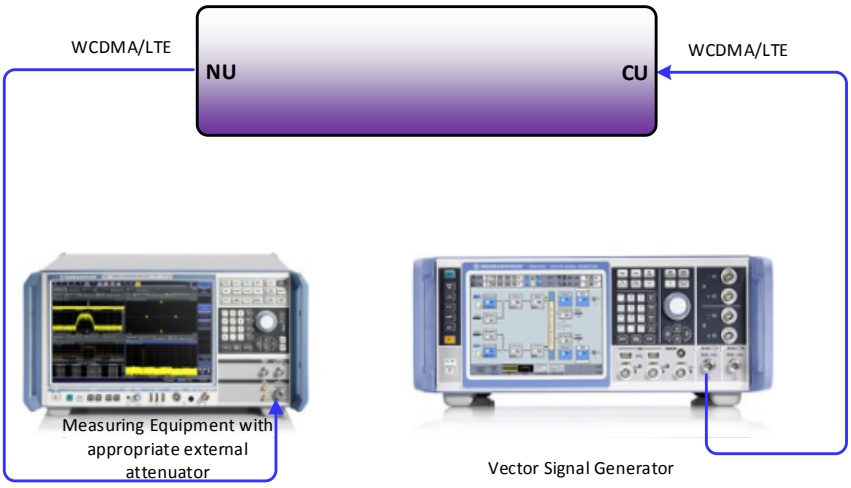


1.4.5 Simplified Test Configuration Diagram

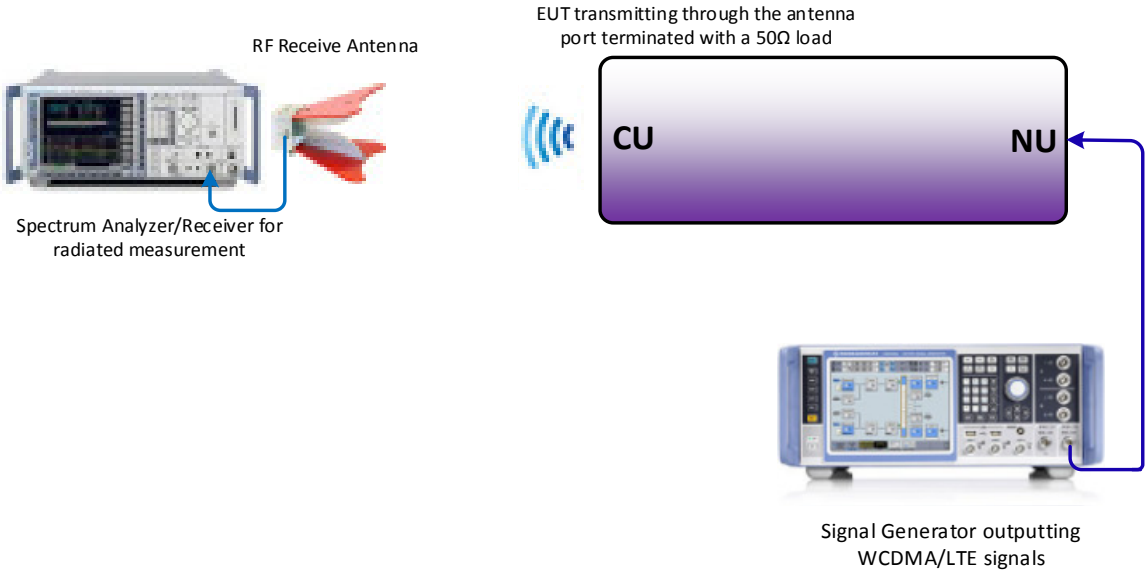
Downlink (CU Port) Conducted Test



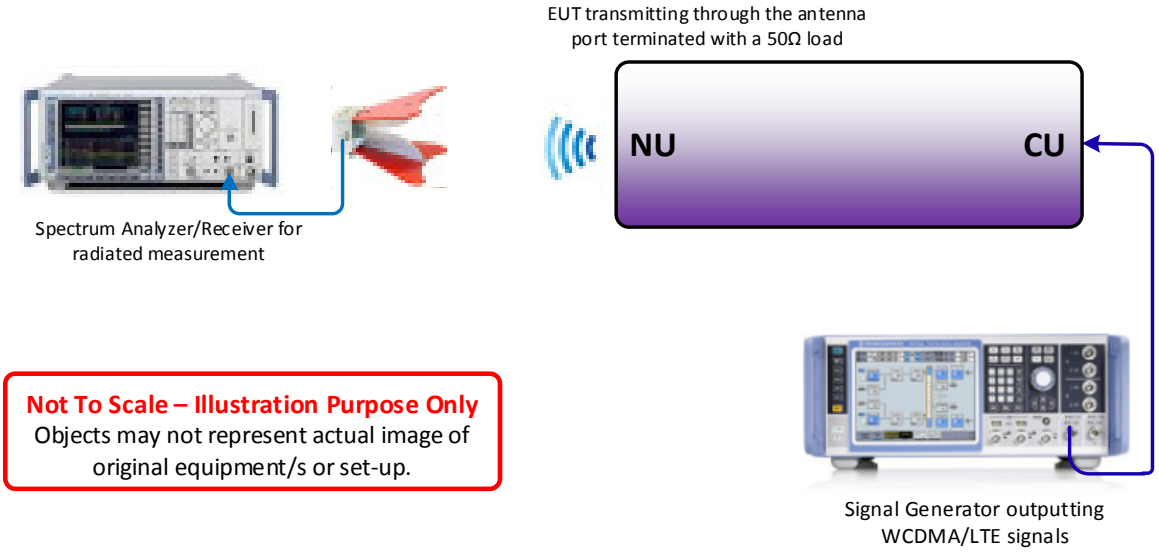
Uplink (NU Port) Conducted Test



Radiated Testing (Downlink)



Radiated Testing (Uplink)



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

1.5 DEVIATIONS FROM THE STANDARD

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

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: 382829000271 and 382829000042		
None	—	—

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 – Designation 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 (IC) Registration No.: 3067A-1 & 22806-1

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.

1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)

TUV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

1.9.4 NCC (National Communications Commission - US0102)

TUV SUD America Inc. (San Diego) is listed as a Foreign Recognized Telecommunication Equipment Testing Laboratory and is accredited to ISO/IEC 17025 (A2LA Certificate No.2955.13) which under APEC TEL MRA Phase 1 was designated as a Conformity Assessment Body competent to perform testing of equipment subject to the Technical Regulations covered under its scope of accreditation including RTTE01, PLMN01 and PLMN08 for TTE type of testing and LP002 for Low-Power RF Device type of testing.

1.9.5 VCCI – Registration No. A-0280 and A-0281

TUV SUD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.

1.9.6 RRA – Identification No. US0102

TUV SUD America Inc. (San Diego) is National Radio Research Agency (RRA) recognized laboratory under Phase I of the APEC Tel MRA.

1.9.7 OFCA – U.S. Identification No. US0102

TUV SUD America Inc. (San Diego) is recognized by Office of the Communications Authority (OFCA) under Appendix B, Phase I of the APEC Tel MRA.

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

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

SECTION 2

TEST DETAILS

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

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

2.1 TRANSMITTER CONDUCTED OUTPUT POWER

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046

2.1.2 Standard Applicable

The conducted power mesurements were made in accordance to FCC Part 2 Clasue 2.1046.

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: 382829000271 / Test Configuration A and B

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

September 21, 2018 / 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 Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.2°C
Relative Humidity	54.6%
ATM Pressure	99. 1kPa

2.1.7 Additional Observations

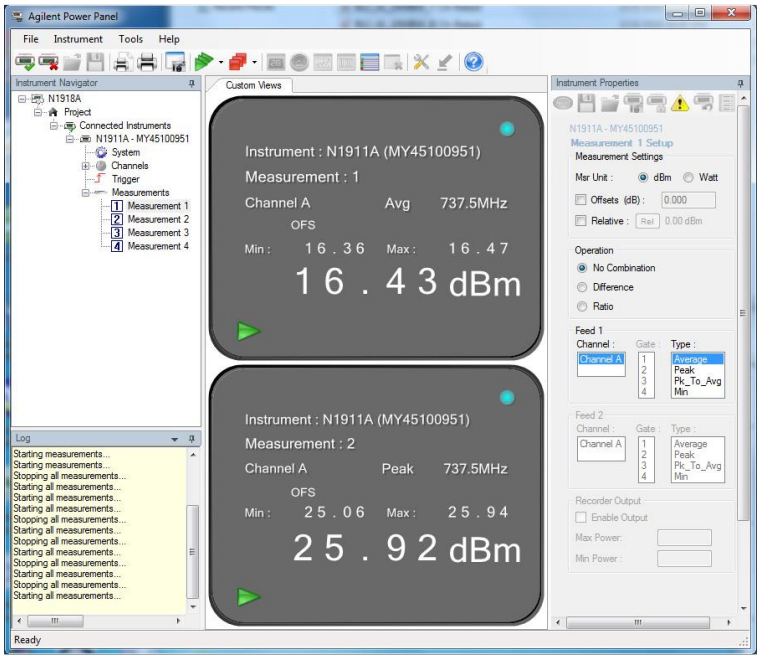
- This is a conducted test using power meter.
- The path loss was measured and entered as a level offset.
- Both Peak and Average measurements presented.
- Low, Middle and High channels for all bandwidths were verified and reported.

2.1.8 Test Results

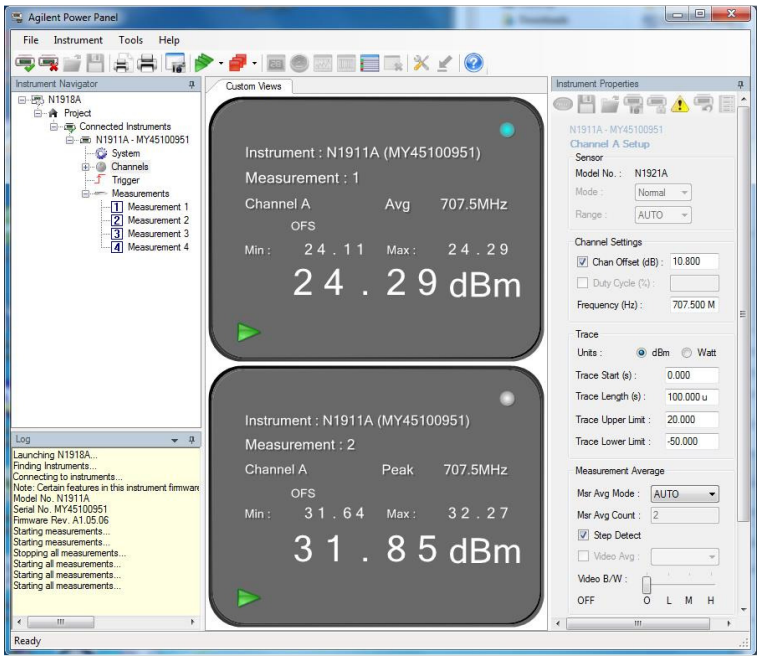
LTE Band 12 Downlink						
Bandwidth (MHz)	Channel	Frequency (MHz)	Average Power		PK Power	
			(dBm)	(W)	(dBm)	(W)
10	5060	734.0	16.43	0.044	25.29	0.338
	5095	737.5	16.43	0.044	25.92	0.391
	5130	**741.0**	**16.47**	**0.044**	**25.31**	**0.340**

LTE Band 12 Uplink						
Bandwidth (MHz)	Channel	Frequency (MHz)	Average Power		PK Power	
			(dBm)	(W)	(dBm)	(W)
10	23060	704.0	24.14	0.259	31.67	1.469
	23095	**707.5**	**24.29**	**0.269**	**31.85**	**1.531**
	23130	711.0	23.81	0.240	32.12	1.629

2.1.9 Sample Test Plot



LTE Band 12 DL 10MHz Bandwidth Middle Channel



LTE Band 12 UL 10MHz Bandwidth Middle Channel

2.2 EFFECTIVE RADIATED POWER AND EFFECTIVE ISOTROPIC RADIATED POWER

2.2.1 Specification Reference

FCC 47 CFR Part 27, Clause 27.50 (c)(3)
RSS-130, Clause 4.4

2.2.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.50 (c):
(3) Fixed and base stations transmitting a signal within an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna height greater than 305 m HAAT ar permited if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section.

TABLE 3 TO § 27.50—PERMISSIBLE POWER AND ANTENNA HEIGHTS FOR BASE AND FIXED STATIONS IN THE 600 MHZ, 698–757 MHZ, 758–763 MHZ, 776–787 MHZ AND 788–793 MHZ BANDS TRANSMITTING A SIGNAL WITH AN EMISSION BANDWIDTH GREATER THAN 1 MHZ

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) per MHz (watts/MHz)
Above 1372 (4500)	65
Above 1220 (4000) To 1372 (4500)	70
Above 1067 (3500) To 1220 (4000)	75
Above 915 (3000) To 1067 (3500)	100
Above 763 (2500) To 915 (3000)	140
Above 610 (2000) To 763 (2500)	200
Above 458 (1500) To 610 (2000)	350
Above 305 (1000) To 458 (1500)	600
Up to 305 (1000)	1000

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: 382829000271 (Calculation only)

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

September 21, 2018 / XYZ

2.2.5 Additional Observations

- ERP and EIRP were calculated as per Section 1.2 and 1.3 of KDB412172 D01 (Determining ERP and EIRP v01).
- Calculation formula in logarithmic terms:

$$\textbf{ERP or EIRP} = P_T + G_T - L_C$$

Where:

P_T = transmitter output power, expressed in dBm (Section 2.1 of this test report)

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

$$G_T(\text{dBd}) = G_T(\text{dBi}) - 2.15\ \text{dB}$$

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

2.2.6 Sample Computation

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

EIRP $= P_T + G_T - L_C$
$= 29.87\ (\text{Peak}) + 0.13\ (\text{max. gain}) - 3.84\ (\text{cable loss})$
$= 26.16\ \text{dBm}$

2.2.7 Test Results

LTE Band 12 Downlink					
Bandwidth (MHz)	**Frequency (MHz)**	**Max Power Average (dBm)**	**Antenna Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**
10	734.0	16.43	< 20.56	< 36.99	36.99
	737.5	16.43	< 20.56	< 36.99	36.99
	741.0	**16.47**	**< 20.52**	**< 36.99**	**36.99**

LTE Band 12 Uplink					
Bandwidth (MHz)	**Frequency (MHz)**	**Max Power Average (dBm)**	**Antenna Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**
10	704.0	24.14	< 12.85	<36.99	36.99
	707.5	**24.29**	**< 12.70**	**<36.99**	**36.99**
	711.0	23.81	< 13.18	<36.99	36.99

LTE Band 12 Downlink					
Bandwidth (MHz)	**Frequency (MHz)**	**Max Power Average (dBm)**	**Antenna Gain (dBd)**	**ERP (dBm)**	**Limit* (dBm)**
10	734.0	16.43	< 18.41	< 34.84	34.84
	737.5	16.43	< 18.41	< 34.84	34.84
	741.0	**16.47**	**< 18.37**	**< 34.84**	**34.84**

LTE Band 12 Uplink					
Bandwidth (MHz)	**Frequency (MHz)**	**Max Power Average (dBm)**	**Antenna Gain (dBd)**	**ERP (dBm)**	**Limit* (dBm)**
10	704.0	24.14	< 10.70	< 34.84	34.84
	707.5	**24.29**	**< 10.55**	< 34.84	34.84
	711.0	23.81	< 11.03	**< 34.84**	**34.84**

* ERP Limit = EIRP Limit – 2.15 dB

2.3 OCCUPIED BANDWIDTH

2.3.1 Specification Reference

FCC 47 CFR Part 2. Clause 2.1049
RSS-GEN Issue 5, Clause 6.7

2.3.2 Standard Applicable

The transmitted signal bandwidth shall be reported as the 99% emission bandwidth, that is the frequency bandwidth suuch that, below its lower and above its upper frequency limits, the mean powers radiated are eqch equal to 0.5 percent of the total mean power radiated by a give emission.

26dB 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 by at least 26 dB below the transmitter power.

Using the occupied bandwidth meansurement function in the spectrum analyzer, the 99% occupied bandwith was measured.

In addition, the 26dB bandwidth was measured in accorance with FCC KDB 971168 D01 V0202 Clause 4.1 using the ndB measurement function in the spectrum analyzer.

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be at least 3x RBW.

2.3.3 Equipment Under Test and Modification State

Serial No: 382829000271 / Test Configuration A and B

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

September 24, 2018/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	24.6°C
Relative Humidity	60.2%
ATM Pressure	98.8kPa

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.
- Using the occupied bandwidth meansurement function in the spectrum analyzer, the 99% occupied bandwith was measured.
- The 26dB bandwidth was measured in accorance with ANSI C63.26 clause 5.4.3 using the ndB measurement function in the spectrum analyzer.
- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- 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.

2.3.8 Test Results and Sample Test Plot

Downlink					
Band	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**OBW (MHz)**	**-26dB BW (MHz)**
LTE Band 12	10	5060	734.0	8.80	9.38
		5095	737.5	8.80	9.38
		5130	741.0	8.80	9.42

Uplink					
Band	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**OBW (MHz)**	**-26dB BW (MHz)**
LTE Band 12	10	23060	704.0	8.82	9.46
		23095	707.5	8.81	9.42
		23130	711.0	8.83	9.42

LTE Band 12 Downlink (10 MHz BW) / Middle Channel Middle Channel 737.5 MHz / 99%OBW

12:30:52 24.09.2018

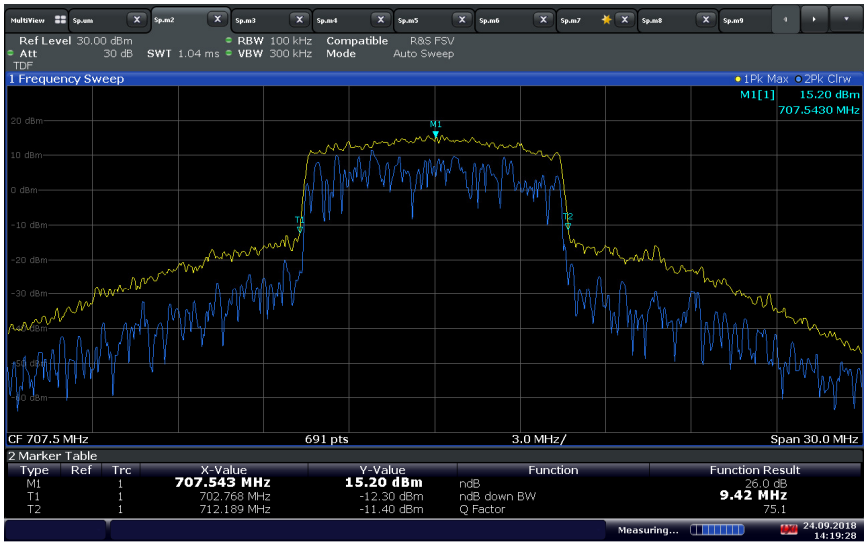
LTE Band 12 Downlink (10 MHz BW) / Middle Channel Middle Channel 737.5 MHz / 26dB BW

12:31:29 24.09.2018

LTE Band 12 Uplink (10 MHz BW) / Middle Channel Middle Channel 707.5 MHz / 99%OBW

14:20:19 24.09.2018

LTE Band 12 Uplink (10 MHz BW) / Middle Channel Middle Channel 707.5 MHz / 26dB BW



14:19:28 24.09.2018

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: 382829000271 / Test Configuration A and B

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

September 24, 2018/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	24.6°C
Relative Humidity	60.2%
ATM Pressure	98.8kPa

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

2.4.7 Additional Observations

- This is a conducted test.
- As per FCC KDB 971168 D01 v03r01 clause 5.7, the PAPR was measured in accorance with ANSI C63.26 clause 5.2.3.4.
- 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) A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth.
- Low, Middle and High channels for all bandwidths were verified.
- RBW was set to maximum the SA can support.
- There are no measured PAR levels greater than 13dB.

2.4.8 Test Results

Downlink				
Band	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**PAR (dB)**
LTE Band 12	10	5060	734.0	10.11
		5095	737.5	9.66
		5130	741.0	10.07

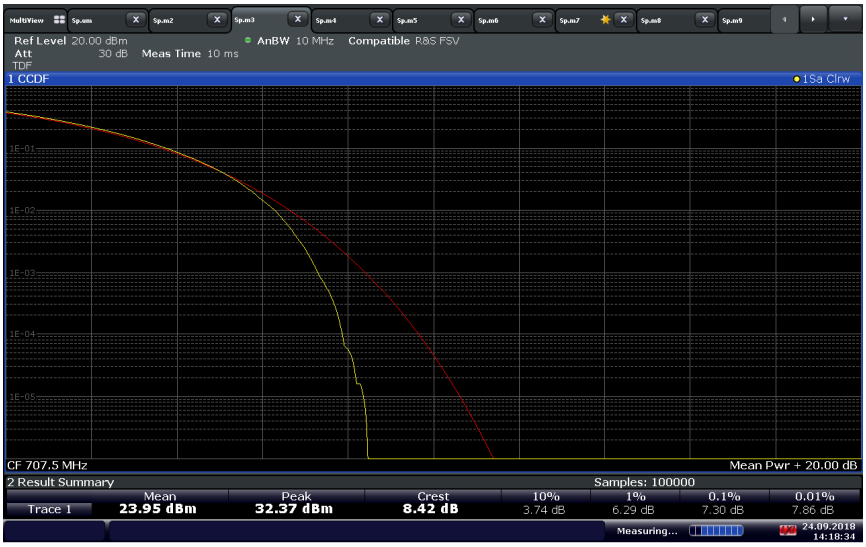
Uplink				
Band	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**PAR (dB)**
LTE Band 12	10	23060	704.0	8.67
		23095	707.5	8.42
		23130	711.0	8.38

2.4.9 Sample Test Plot

LTE Band 12 Downlink (10 MHz BW) / Middle Channel 737.5 MHz

12:28:41 24.09.2018

LTE Band 12 Uplink (10 MHz BW) / Middle Channel 707.5 MHz



14:18:35 24.09.2018

2.5 BAND EDGE

2.5.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 27, Clause 27.53(g)
RSS-130, Clause 4.6.1

2.5.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.53:
(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: 382829000271 / Test Configuration A and B

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

September 24, 2018/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

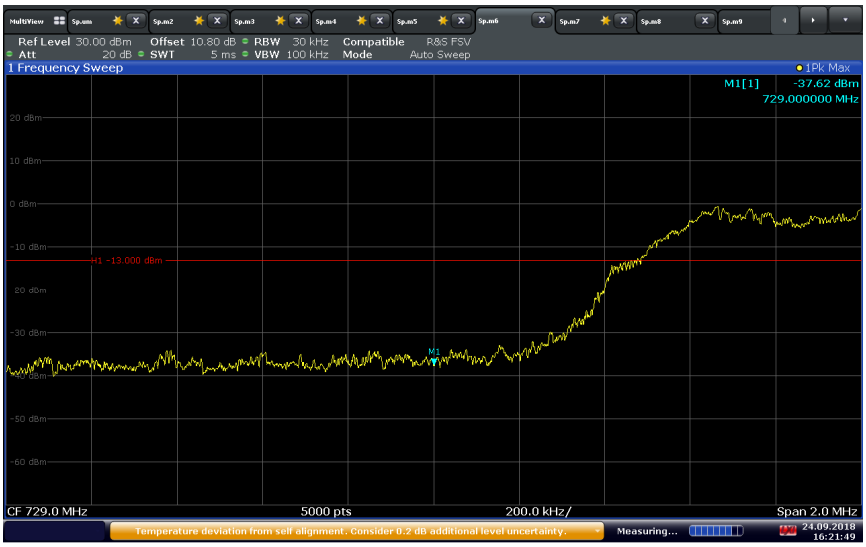
Ambient Temperature	24.6°C
Relative Humidity	60.2%
ATM Pressure	98.8kPa

2.5.7 Additional Observations

- This is a conducted test. Test guidance is per Section 6.1 of KDB971168 (D01 Power Meas License Digital Systems v03r01).
- 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 30 kHz and VBW is set to ≥3X RBW.

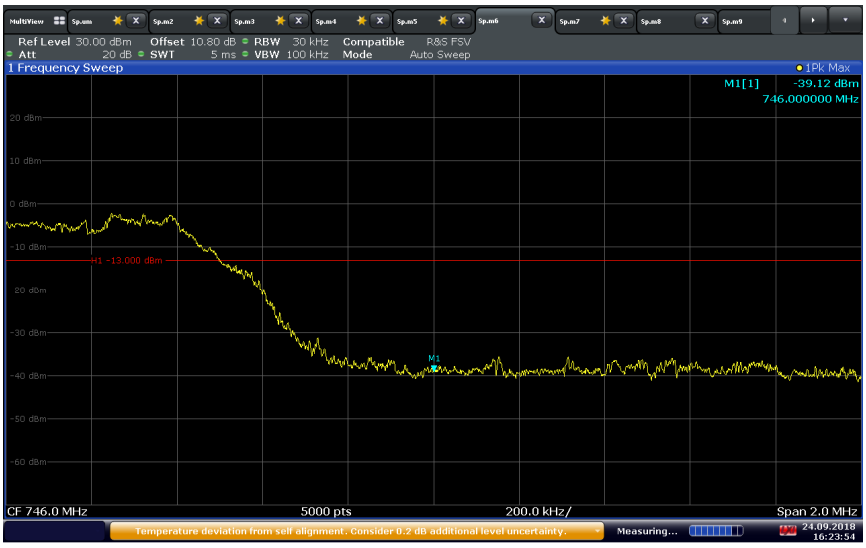
2.5.8 Test Results

LTE Band 12 Downlink 10MHz Bandwidth Low Channel Band Edge

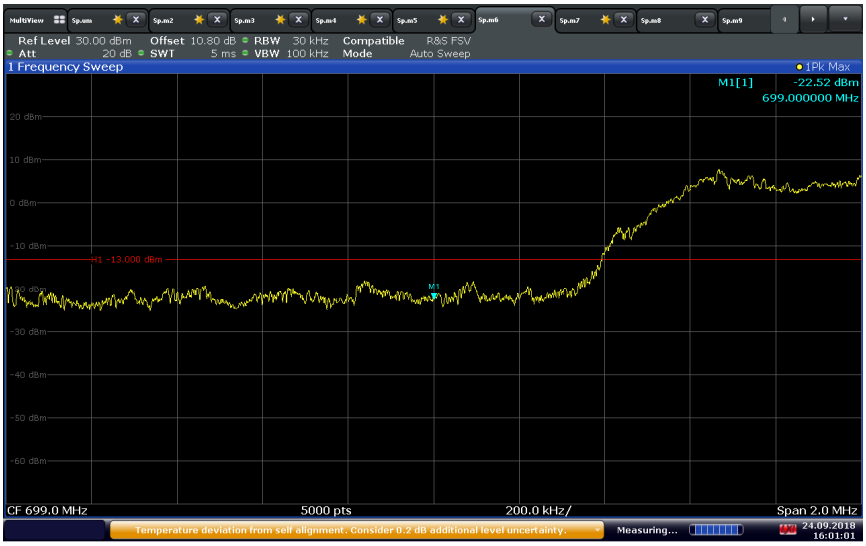
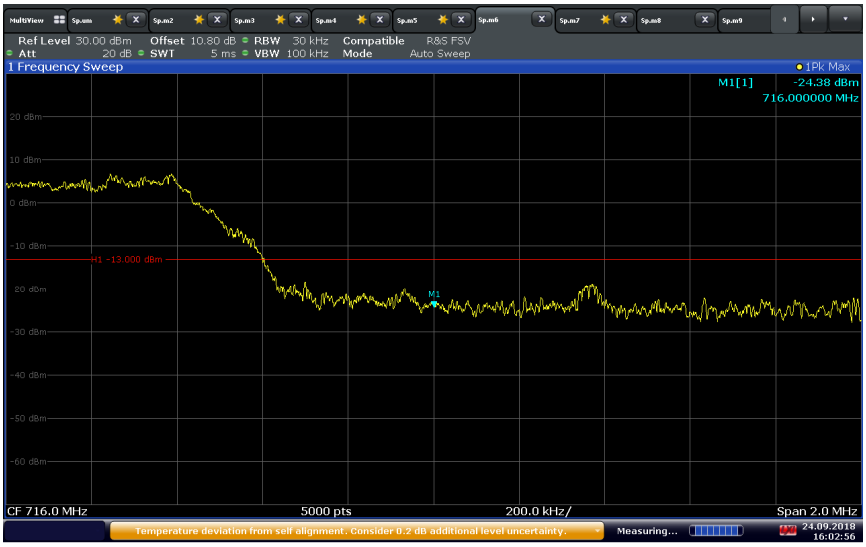


16:21:49 24.09.2018

LTE Band 12 Downlink 10MHz Bandwidth High Channel Band Edge



16:23:55 24.09.2018

LTE Band 12 Uplink 10MHz Bandwidth Low Channel Band Edge
 16:01:02 24.09.2018
LTE Band 12 Uplink 10MHz Bandwidth High Channel Band Edge
 16:02:57 24.09.2018

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)
KDB 935210 D05, Clause 3.6.3
RSS-130, Clause 4.6

2.6.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.53:
(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: 382829000271 and 382829000042 / Test Configuration A and B

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

October 12, 2018/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	24.1°C
Relative Humidity	44.6%
ATM Pressure	98.4kPa

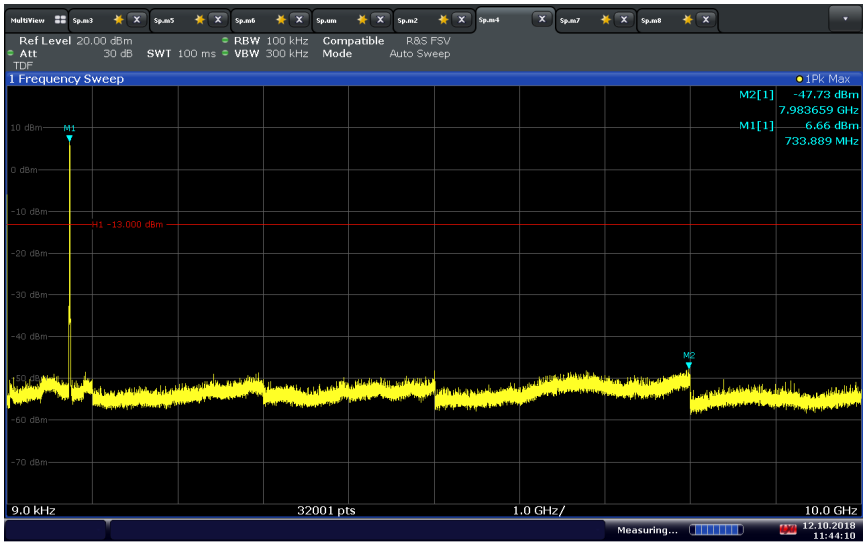
TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

2.6.7 Additional Observations

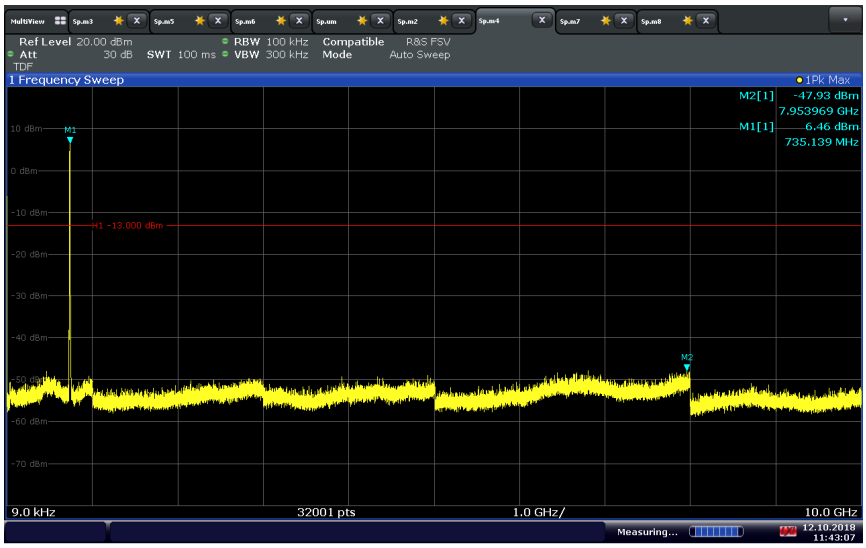
- This is a conducted test. Test guidance is per Section 6.1 of KDB971168 (D01 Power Meas License Digital Systems v03r01).
- The transducer factor (TDF) used is from the external attenuators and cables used.
- Detector is peak and trace is set to max hold as the worst case setting.
- The spectrum was searched from 9 kHz to 10GHz (requirement is up to the 10th harmonic (≤ 8GHz)).
- Both broadband (LTE 10 MHz) and narrowband input signal (representative of a GSM signal) were tested.
- All low, middle and high channels were verified and presented in this test report.

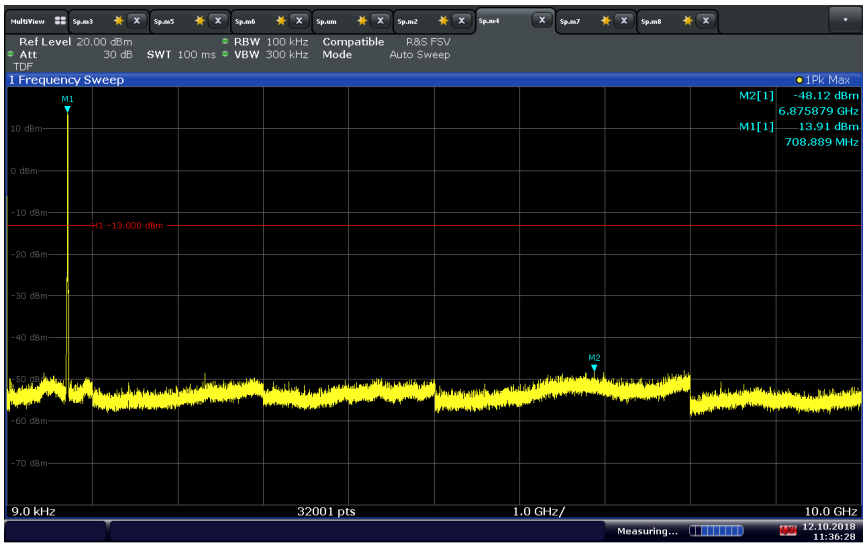
2.6.8 Test Results

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

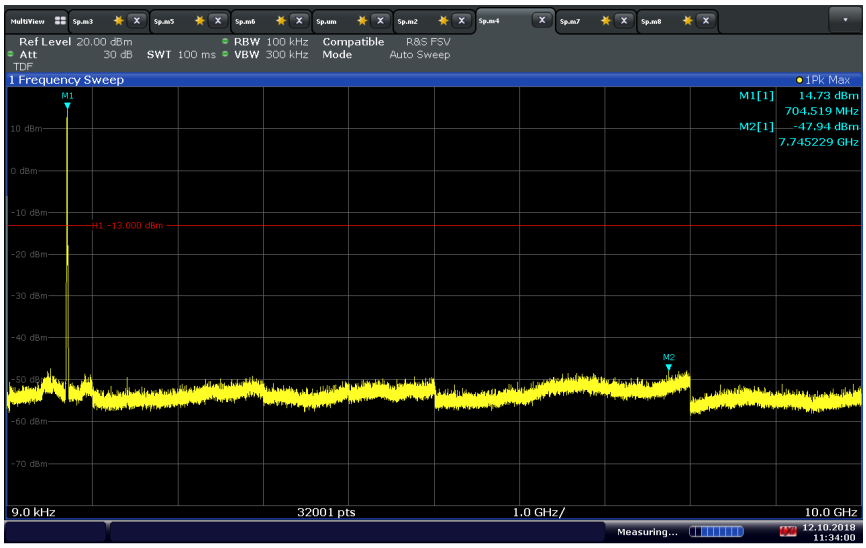


11:44:11 12.10.2018

LTE Band 12 Downlink 10MHz Bandwidth Mid Channel Conducted Spurious Emissions
 11:43:08 12.10.2018

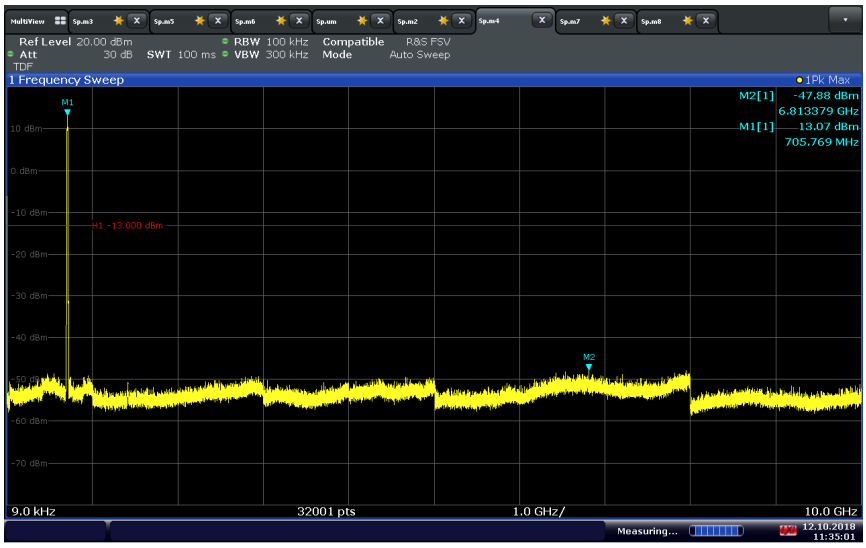
LTE Band 12 Downlink 10MHz Bandwidth High Channel Conducted Spurious Emissions
 11:36:28 12.10.2018

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

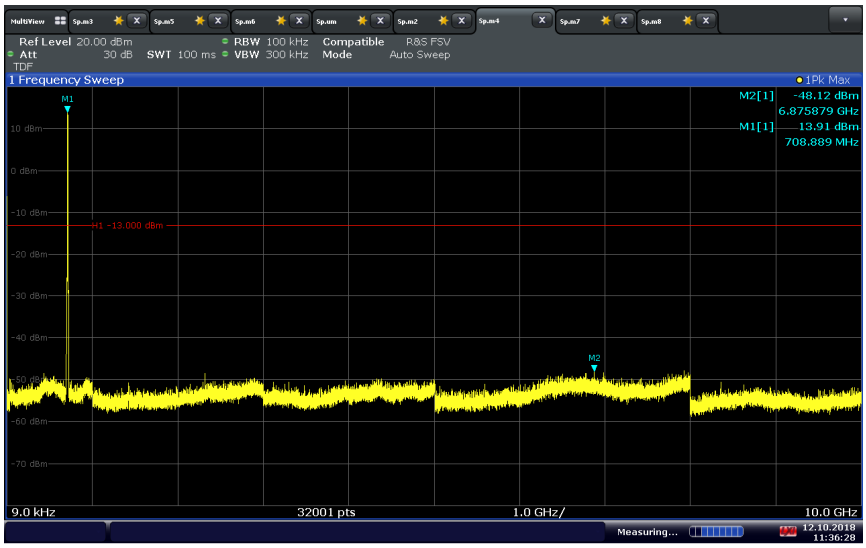
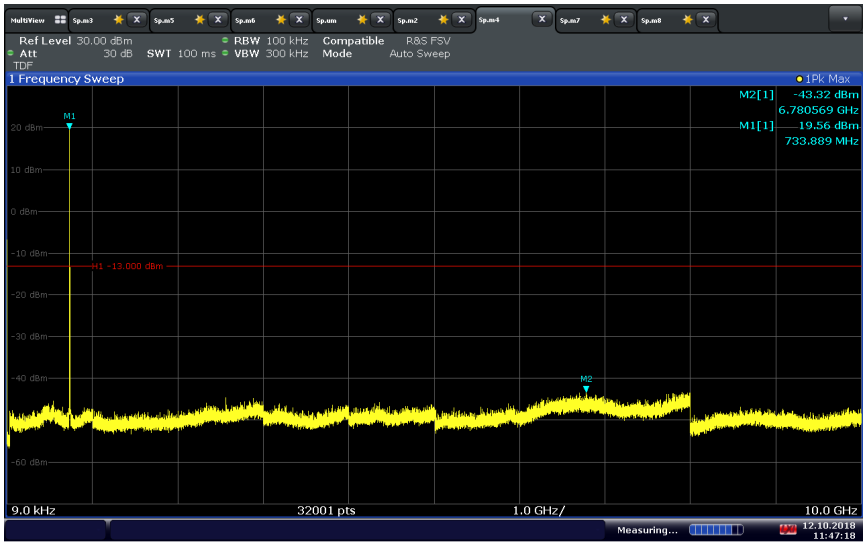


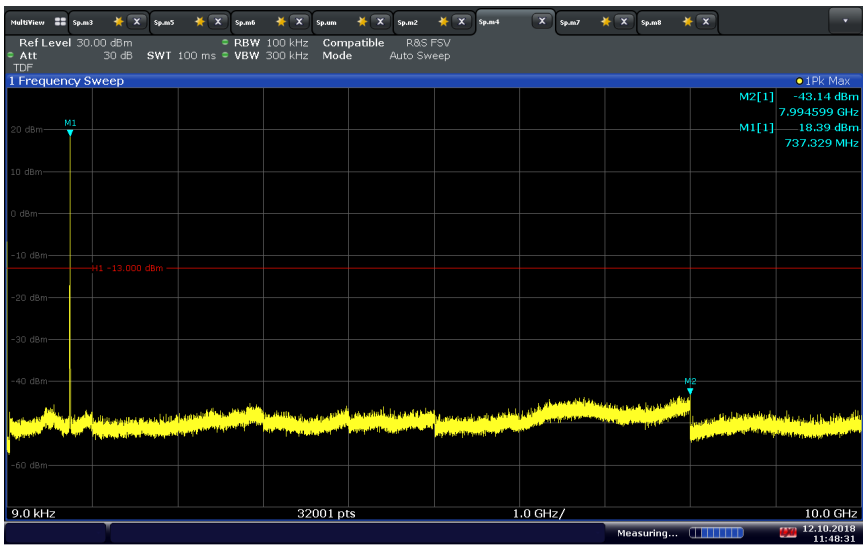
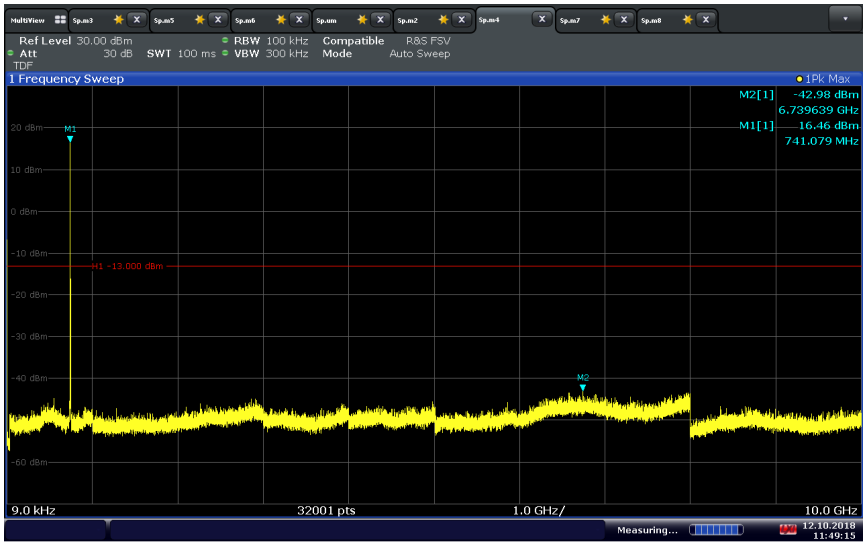
11:34:00 12.10.2018

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

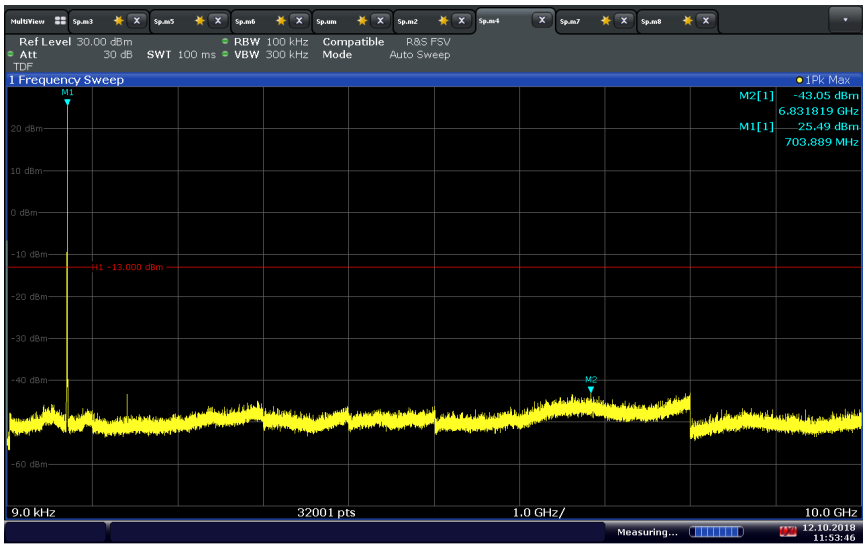


11:35:02 12.10.2018

LTE Band 12 Uplink 10MHz Bandwidth High Channel Conducted Spurious Emissions
 11:36:28 12.10.2018
LTE Band 12 Downlink 10MHz Bandwidth Low Channel Conducted Spurious Emissions with Narrowband Signal Input
 11:47:18 12.10.2018

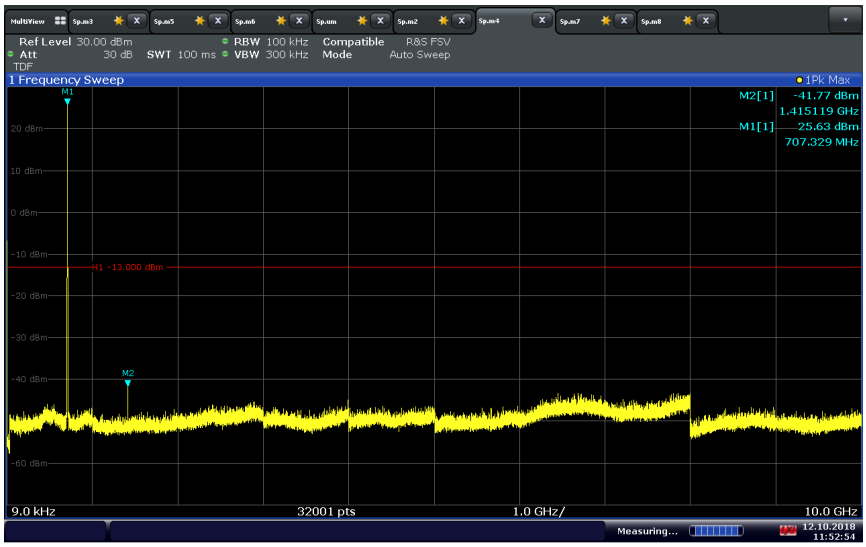
LTE Band 12 Downlink 10MHz Bandwidth Mid Channel Conducted Spurious Emissions with Narrowband Signal Input
 11:48:31 12.10.2018
LTE Band 12 Downlink 10MHz Bandwidth High Channel Conducted Spurious Emissions with Narrowband Signal Input
 11:49:15 12.10.2018

LTE Band 12 Uplink 10MHz Bandwidth Low Channel Conducted Spurious Emissions with Narrowband Signal Input



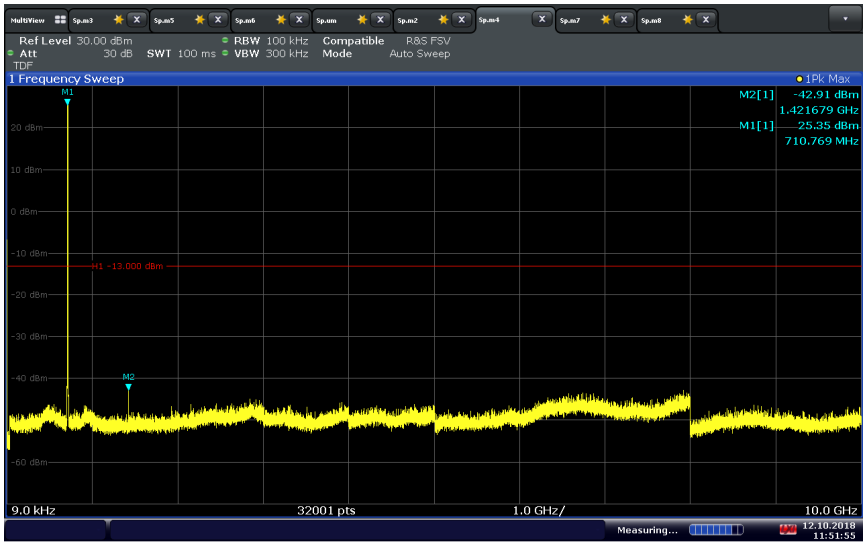
11:53:47 12.10.2018

LTE Band 12 Uplink 10MHz Bandwidth Mid Channel Conducted Spurious Emissions with Narrowband Signal Input



11:52:55 12.10.2018

LTE Band 12 Uplink 10MHz Bandwidth High Channel Conducted Spurious Emissions with Narrowband Signal Input



11:51:56 12.10.2018

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)
KDB 935210 D05, Clause 3.8
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: 382829000271 and 382829000042 / Test Configuration C and D

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

September 26 and October 8, 9, 2018/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	23.5 - 25.0°C
Relative Humidity	50.3 - 55.5%
ATM Pressure	98.6 - 99.0kPa

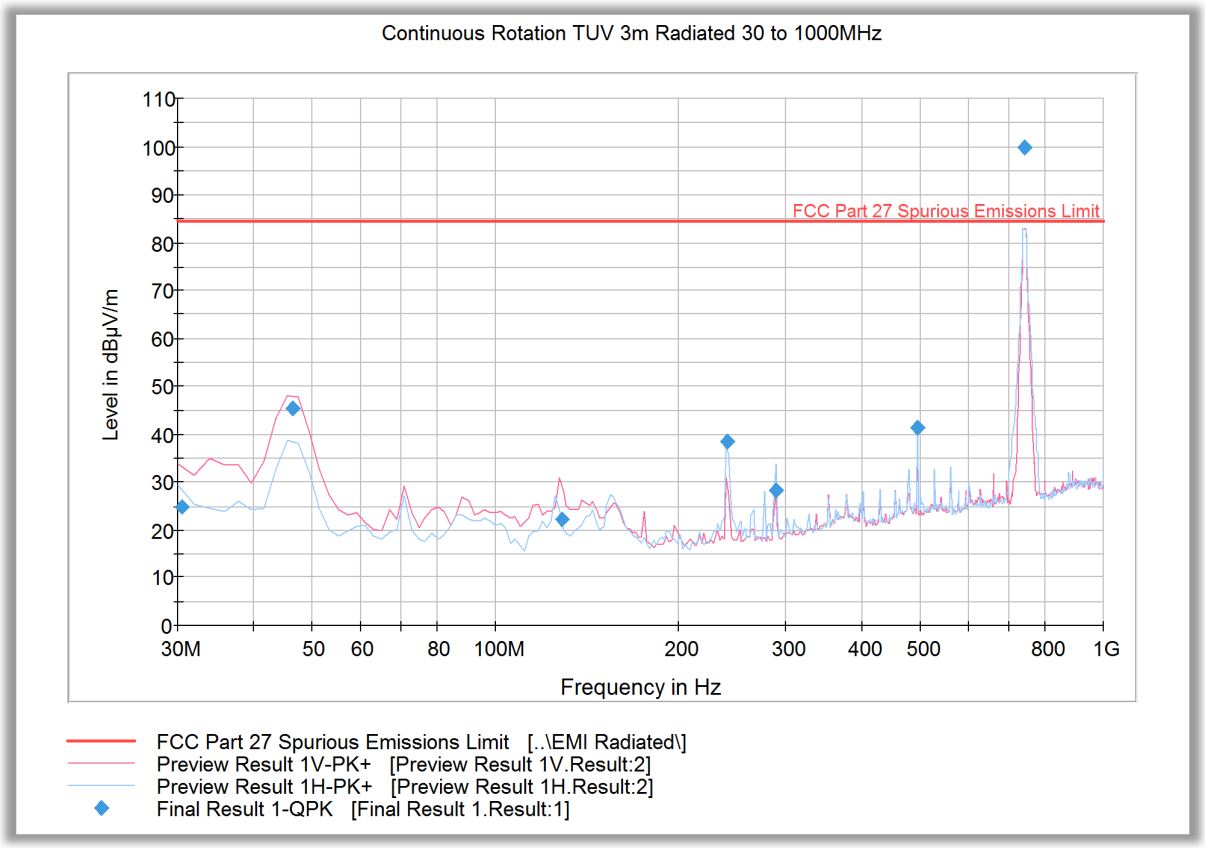
2.7.7 Additional Observations

- This is a radiated test using substitution method as per Unwanted Emissions: Radiated Spurious method of measurement of C63.26 2015.
- Emissions within 6dB of the limit will be proven by substitution method.
- This is cabinet spurious emissions testing. Main antenna port was terminated during the test. Fundamental frequency measurement will be ignored for this test.
- Only the worst case configuration presented in this test report.
- Measurement was done using EMC32 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

Compliant. See attached plots.

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



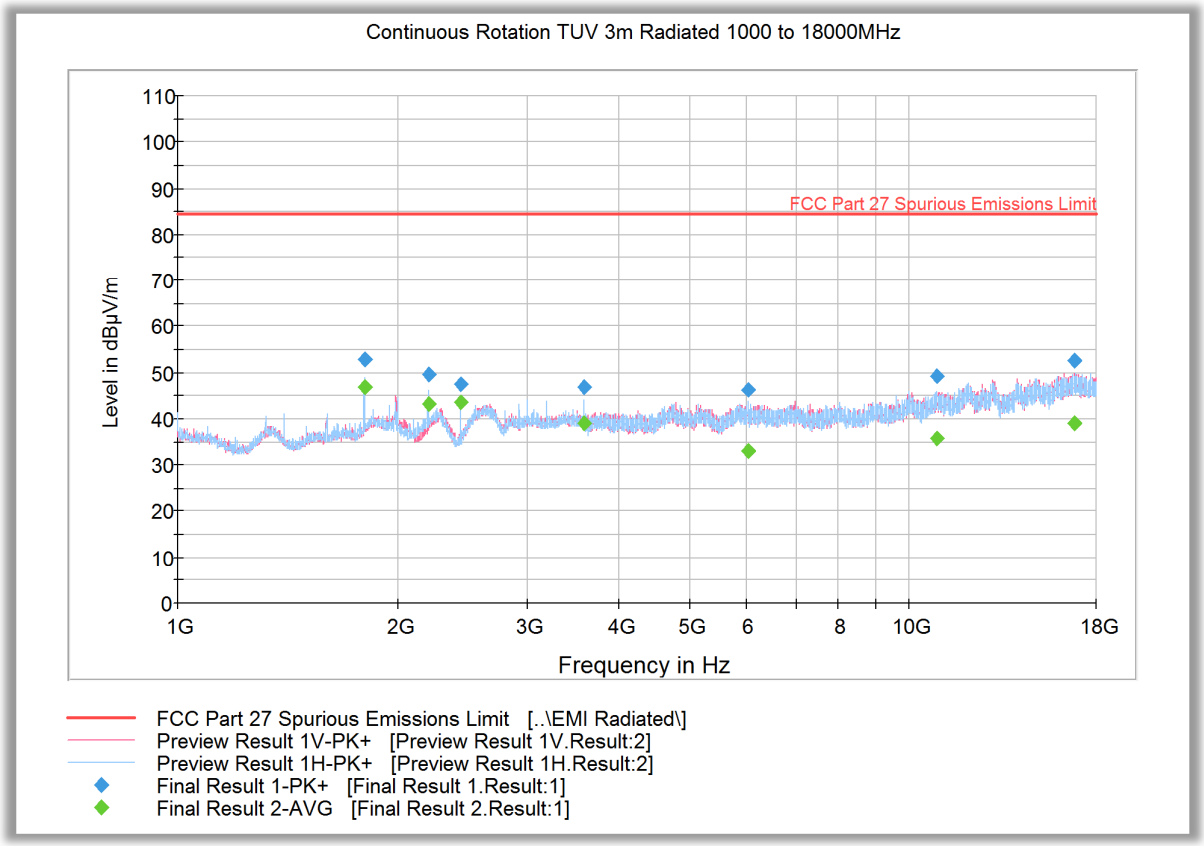
Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.447776	25.0	1000.0	120.000	150.0	V	289.0	-6.7	59.4	84.4
46.391102	45.4	1000.0	120.000	100.0	V	292.0	-14.2	39.0	84.4
128.554389	22.4	1000.0	120.000	100.0	V	18.0	-16.0	62.0	84.4
241.059880	38.6	1000.0	120.000	150.0	H	202.0	-9.7	45.8	84.4
289.297074	28.2	1000.0	120.000	100.0	V	122.0	-9.2	56.2	84.4
494.989178	41.3	1000.0	120.000	100.0	H	331.0	-1.6	43.1	84.4
741.806814	100.0	1000.0	120.000	100.0	H	222.0	3.6	Fundamental Carrier*	

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

Note: Bluetooth LE was enabled as the worst case configuration when testing.

2.7.10 Test Results Above 1GHz (Downlink) - 10MHz Bandwidth Low Channel



Peak Data

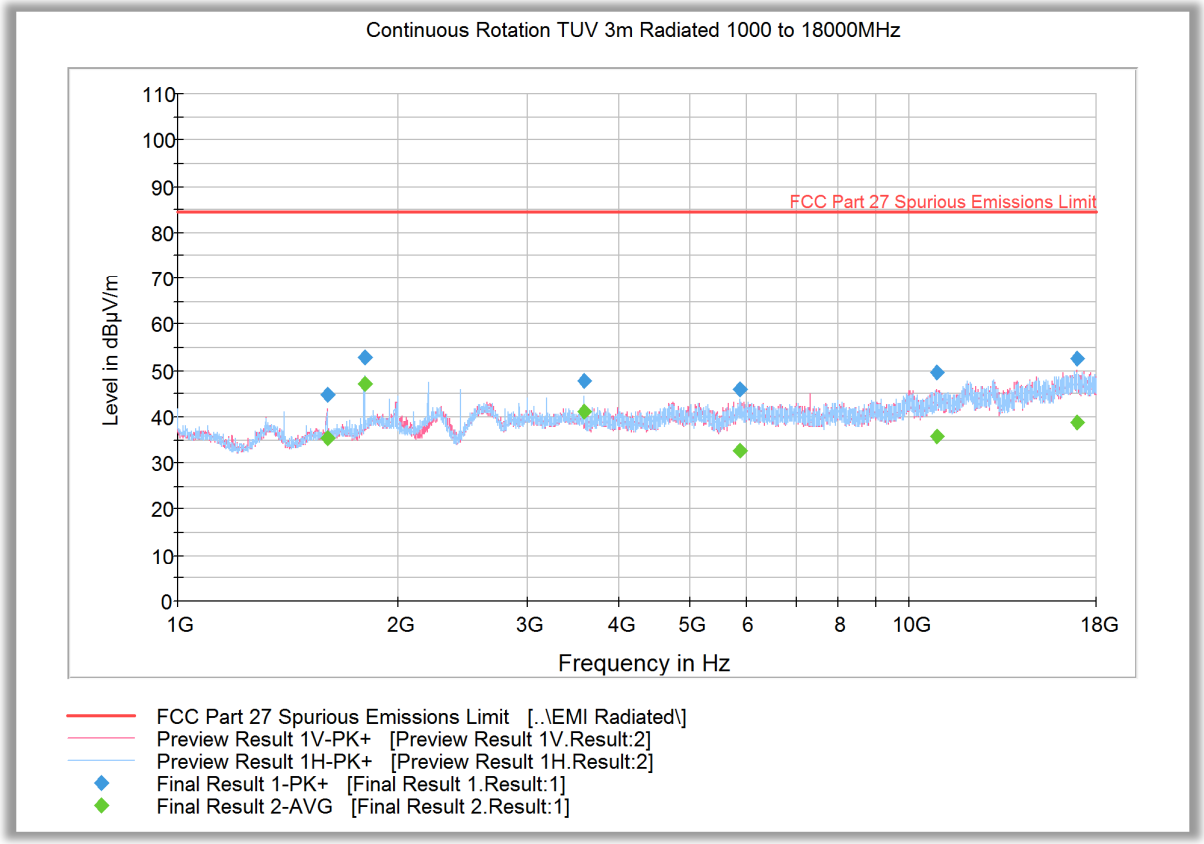
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1800.166667	52.9	1000.0	1000.000	143.7	H	302.0	-3.5	31.5	84.4
2200.033333	49.5	1000.0	1000.000	196.5	H	317.0	-1.7	34.9	84.4
2439.866667	47.5	1000.0	1000.000	116.7	H	186.0	-0.8	36.9	84.4
3600.300000	46.9	1000.0	1000.000	205.5	H	164.0	1.5	37.5	84.4
6006.166667	46.3	1000.0	1000.000	103.7	H	202.0	5.5	38.1	84.4
10908.733333	49.4	1000.0	1000.000	252.3	H	233.0	11.5	35.0	84.4
16775.800000	52.4	1000.0	1000.000	135.7	V	271.0	17.8	32.0	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1800.166667	47.0	1000.0	1000.000	143.7	H	302.0	-3.5	37.4	84.4
2200.033333	43.2	1000.0	1000.000	196.5	H	317.0	-1.7	41.2	84.4
2439.866667	43.4	1000.0	1000.000	116.7	H	186.0	-0.8	41.0	84.4
3600.300000	39.0	1000.0	1000.000	205.5	H	164.0	1.5	45.4	84.4
6006.166667	32.9	1000.0	1000.000	103.7	H	202.0	5.5	51.5	84.4
10908.733333	35.9	1000.0	1000.000	252.3	H	233.0	11.5	48.5	84.4
16775.800000	39.1	1000.0	1000.000	135.7	V	271.0	17.8	45.3	84.4

Note: Bluetooth LE was enabled as the worst case configuration when testing. Measurement was performed with a 2.4GHz Notch Filter.

2.7.11 Test Results Above 1GHz (Downlink) - 10MHz Bandwidth Middle Channel



Peak Data

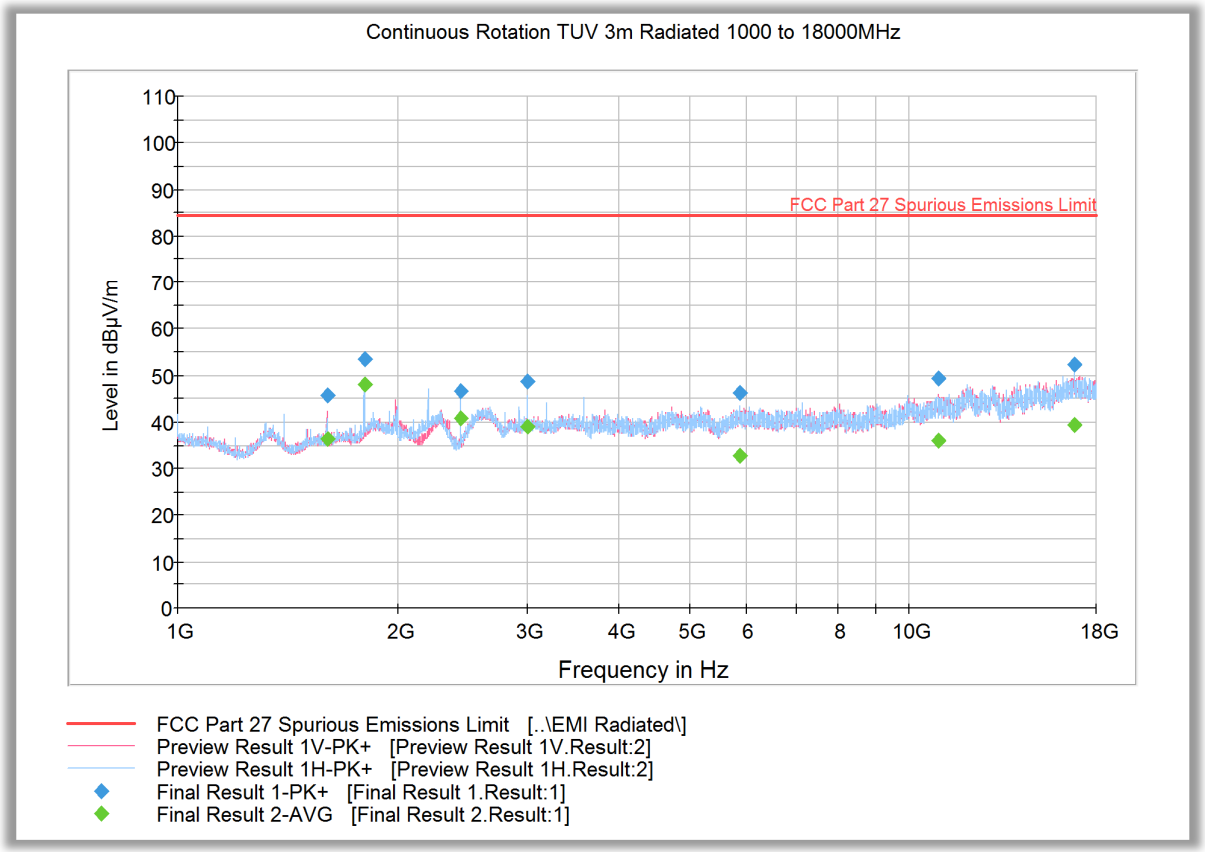
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1600.133333	44.9	1000.0	1000.000	151.6	V	344.0	-5.8	39.5	84.4
1799.933333	52.8	1000.0	1000.000	139.7	H	301.0	-3.5	31.6	84.4
3600.100000	47.9	1000.0	1000.000	200.5	H	166.0	1.5	36.5	84.4
5857.266667	46.1	1000.0	1000.000	182.6	H	354.0	5.4	38.3	84.4
10914.400000	49.7	1000.0	1000.000	212.4	V	137.0	11.5	34.7	84.4
16916.366667	52.6	1000.0	1000.000	250.5	V	20.0	17.9	31.8	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1600.133333	35.4	1000.0	1000.000	151.6	V	344.0	-5.8	49.0	84.4
1799.933333	47.3	1000.0	1000.000	139.7	H	301.0	-3.5	37.1	84.4
3600.100000	41.3	1000.0	1000.000	200.5	H	166.0	1.5	43.1	84.4
5857.266667	32.7	1000.0	1000.000	182.6	H	354.0	5.4	51.7	84.4
10914.400000	35.9	1000.0	1000.000	212.4	V	137.0	11.5	48.5	84.4
16916.366667	38.9	1000.0	1000.000	250.5	V	20.0	17.9	45.5	84.4

Note: Bluetooth LE was enabled as the worst case configuration when testing. Measurement was performed with a 2.4GHz Notch Filter.

2.7.12 Test Results Above 1GHz (Downlink) - 10MHz Bandwidth High Channel



Peak Data

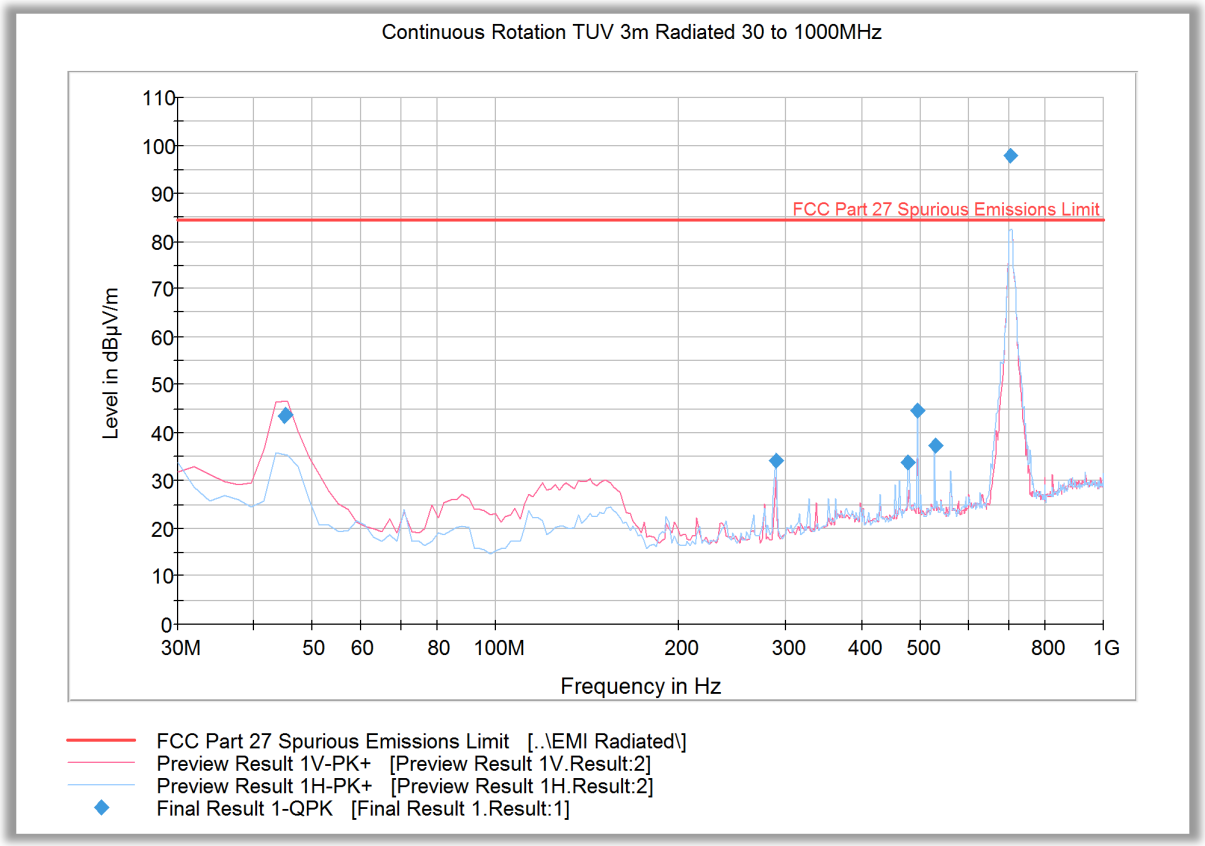
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1599.933333	45.6	1000.0	1000.000	151.6	V	339.0	-5.8	38.8	84.4
1799.966667	53.5	1000.0	1000.000	144.7	H	305.0	-3.5	30.9	84.4
2439.733333	46.7	1000.0	1000.000	151.6	H	183.0	-0.8	37.7	84.4
2999.966667	48.8	1000.0	1000.000	103.7	H	338.0	0.8	35.6	84.4
5858.733333	46.2	1000.0	1000.000	151.6	H	8.0	5.4	38.2	84.4
10953.066667	49.3	1000.0	1000.000	136.7	V	297.0	11.5	35.1	84.4
16766.166667	52.3	1000.0	1000.000	250.5	H	47.0	17.8	32.1	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1599.933333	36.4	1000.0	1000.000	151.6	V	339.0	-5.8	48.0	84.4
1799.966667	48.2	1000.0	1000.000	144.7	H	305.0	-3.5	36.2	84.4
2439.733333	40.8	1000.0	1000.000	151.6	H	183.0	-0.8	43.6	84.4
2999.966667	39.1	1000.0	1000.000	103.7	H	338.0	0.8	45.3	84.4
5858.733333	32.8	1000.0	1000.000	151.6	H	8.0	5.4	51.6	84.4
10953.066667	35.9	1000.0	1000.000	136.7	V	297.0	11.5	48.5	84.4
16766.166667	39.2	1000.0	1000.000	250.5	H	47.0	17.8	45.2	84.4

Note: Bluetooth LE was enabled as the worst case configuration when testing. Measurement was performed with a 2.4GHz Notch Filter.

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



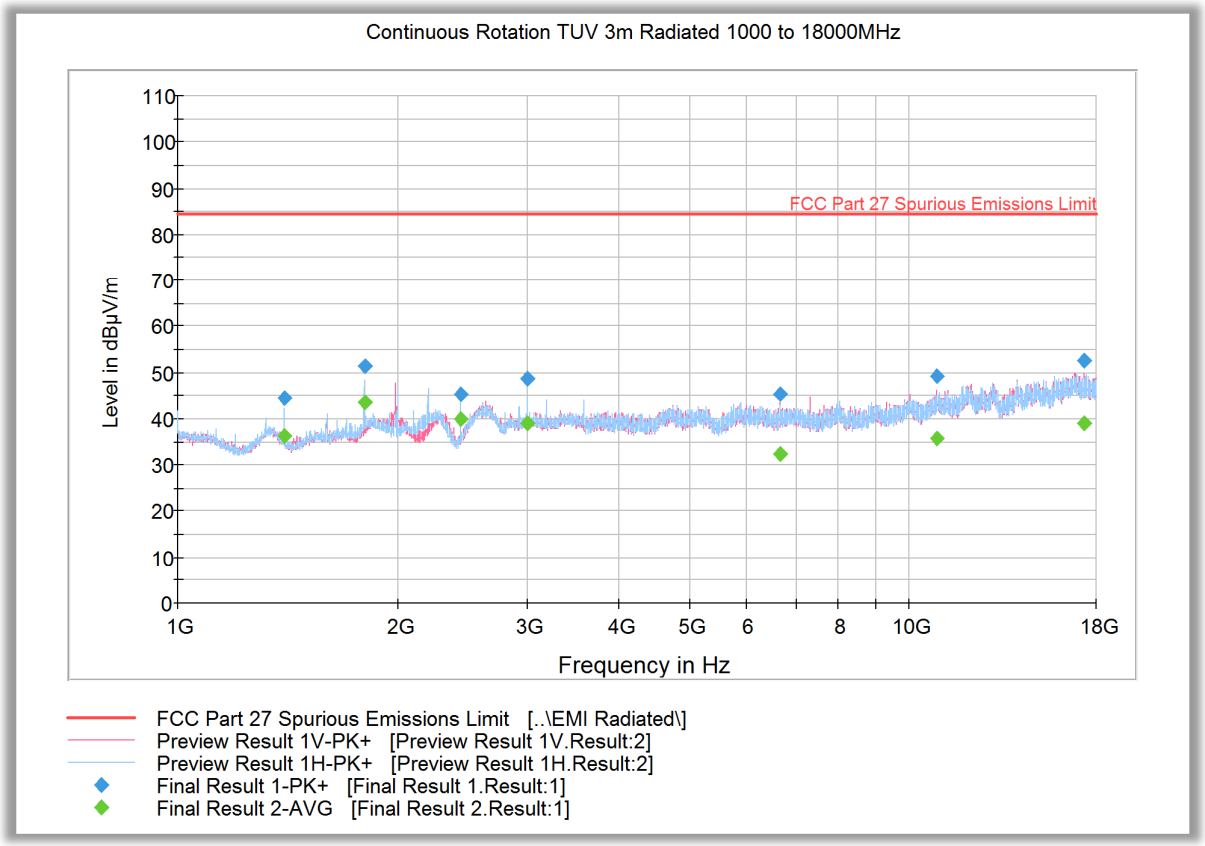
Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
45.023327	43.4	1000.0	120.000	105.0	V	245.0	-14.0	41.0	84.4
45.151102	43.7	1000.0	120.000	100.0	V	284.0	-14.1	40.7	84.4
288.497074	34.2	1000.0	120.000	115.0	H	202.0	-9.2	50.2	84.4
477.694188	33.9	1000.0	120.000	100.0	H	10.0	-1.4	50.5	84.4
494.989178	44.5	1000.0	120.000	100.0	H	340.0	-1.6	39.9	84.4
527.995271	37.3	1000.0	120.000	100.0	H	-13.0	-0.4	47.1	84.4
707.705170	97.9	1000.0	120.000	250.0	H	191.0	3.0	Fundamental Carrier*	

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

Note: Bluetooth LE was enabled as the worst case configuration when testing.

2.7.14 Test Results Above 1GHz (Uplink) - 10MHz Bandwidth Low Channel



Peak Data

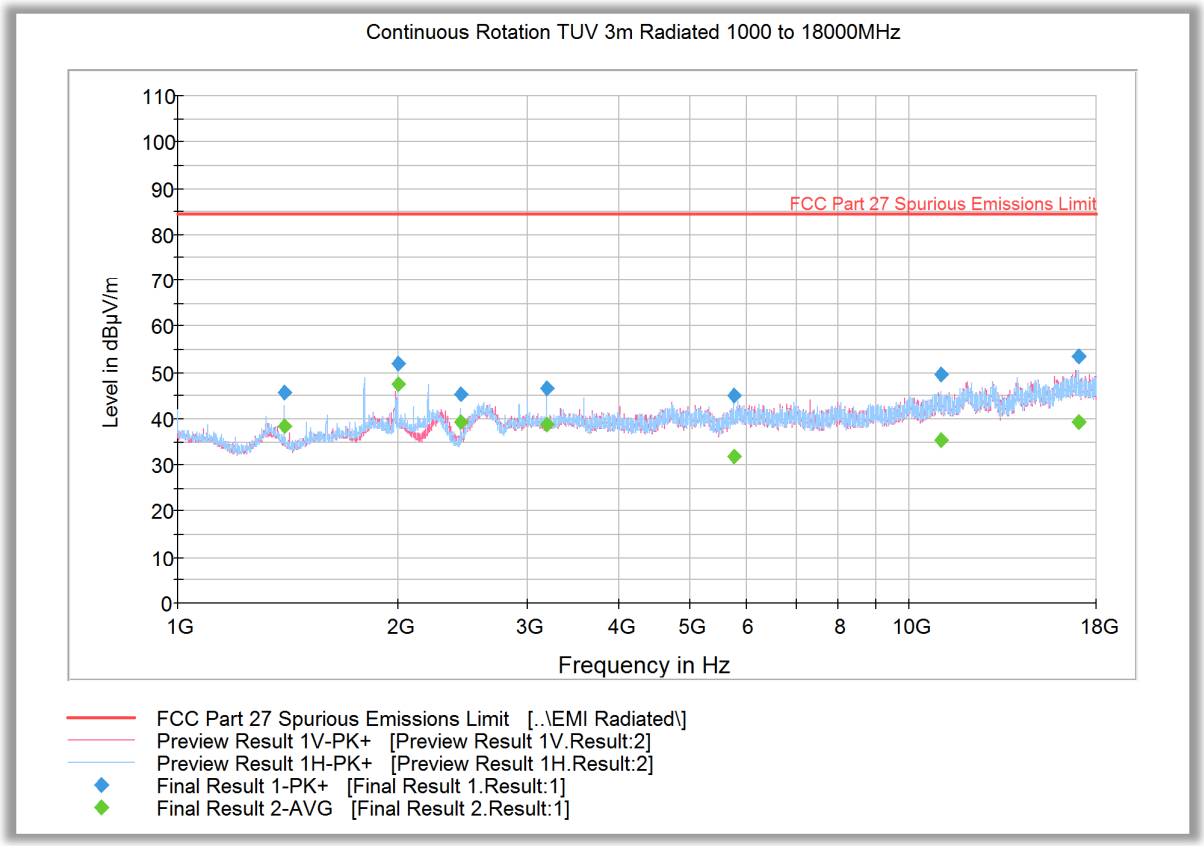
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1400.300000	44.6	1000.0	1000.000	144.7	H	142.0	-5.7	39.8	84.4
1799.966667	51.3	1000.0	1000.000	102.7	H	155.0	-3.5	33.1	84.4
2439.933333	45.5	1000.0	1000.000	174.6	H	168.0	-0.8	38.9	84.4
2999.966667	48.6	1000.0	1000.000	103.7	H	338.0	0.8	35.8	84.4
6639.466667	45.3	1000.0	1000.000	352.7	V	157.0	6.0	39.1	84.4
10901.933333	49.3	1000.0	1000.000	234.4	V	132.0	11.5	35.2	84.4
17287.166667	52.6	1000.0	1000.000	103.7	V	344.0	17.5	31.8	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1400.300000	36.3	1000.0	1000.000	144.7	H	142.0	-5.7	48.1	84.4
1799.966667	43.7	1000.0	1000.000	102.7	H	155.0	-3.5	40.7	84.4
2439.933333	40.1	1000.0	1000.000	174.6	H	168.0	-0.8	44.3	84.4
2999.966667	39.2	1000.0	1000.000	103.7	H	338.0	0.8	45.2	84.4
6639.466667	32.3	1000.0	1000.000	352.7	V	157.0	6.0	52.1	84.4
10901.933333	35.7	1000.0	1000.000	234.4	V	132.0	11.5	48.7	84.4
17287.166667	39.1	1000.0	1000.000	103.7	V	344.0	17.5	45.3	84.4

Note: Bluetooth LE was enabled as the worst case configuration when testing. Measurement was performed with a 2.4GHz Notch Filter.

2.7.15 Test Results Above 1GHz (Uplink) - 10MHz Bandwidth Middle Channel



Peak Data

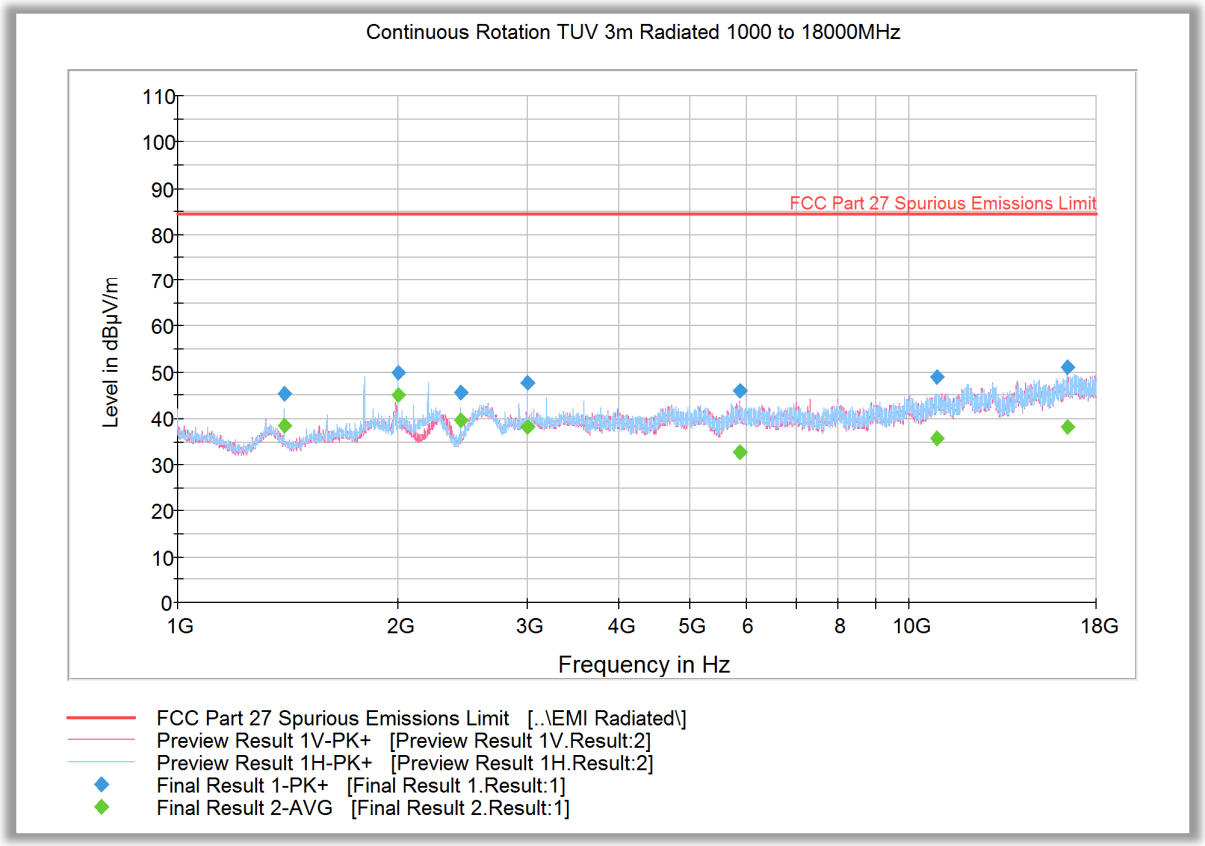
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.900000	45.8	1000.0	1000.000	144.6	H	149.0	-5.7	38.6	84.4
2000.000000	51.9	1000.0	1000.000	200.5	H	153.0	-2.2	32.5	84.4
2440.133333	45.3	1000.0	1000.000	120.7	H	165.0	-0.8	39.1	84.4
3200.400000	46.4	1000.0	1000.000	151.6	H	149.0	1.0	38.0	84.4
5761.933333	45.1	1000.0	1000.000	128.7	H	243.0	5.1	39.3	84.4
11041.133333	49.5	1000.0	1000.000	276.2	H	232.0	11.5	34.9	84.4
17004.800000	53.6	1000.0	1000.000	317.1	H	95.0	17.7	30.8	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.900000	38.4	1000.0	1000.000	144.6	H	149.0	-5.7	46.0	84.4
2000.000000	47.6	1000.0	1000.000	200.5	H	153.0	-2.2	36.8	84.4
2440.133333	39.2	1000.0	1000.000	120.7	H	165.0	-0.8	45.2	84.4
3200.400000	38.7	1000.0	1000.000	151.6	H	149.0	1.0	45.7	84.4
5761.933333	31.9	1000.0	1000.000	128.7	H	243.0	5.1	52.5	84.4
11041.133333	35.5	1000.0	1000.000	276.2	H	232.0	11.5	48.9	84.4
17004.800000	39.5	1000.0	1000.000	317.1	H	95.0	17.7	44.9	84.4

Note: Bluetooth LE was enabled as the worst case configuration when testing. Measurement was performed with a 2.4GHz Notch Filter.

2.7.16 Test Results Above 1GHz (Uplink) - 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)
1399.900000	45.5	1000.0	1000.000	151.2	H	164.0	-5.7	38.9	84.4
1999.800000	49.8	1000.0	1000.000	204.4	H	147.0	-2.2	34.6	84.4
2439.733333	45.6	1000.0	1000.000	113.7	H	186.0	-0.8	38.8	84.4
2999.766667	47.9	1000.0	1000.000	99.7	H	332.0	0.8	36.5	84.4
5857.100000	45.9	1000.0	1000.000	252.3	V	36.0	5.4	38.5	84.4
10902.500000	49.1	1000.0	1000.000	161.6	V	107.0	11.5	35.3	84.4
16438.800000	51.1	1000.0	1000.000	103.7	H	221.0	17.1	33.3	84.4

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1399.900000	38.4	1000.0	1000.000	151.2	H	164.0	-5.7	46.0	84.4
1999.800000	45.1	1000.0	1000.000	204.4	H	147.0	-2.2	39.3	84.4
2439.733333	39.7	1000.0	1000.000	113.7	H	186.0	-0.8	44.7	84.4
2999.766667	38.0	1000.0	1000.000	99.7	H	332.0	0.8	46.4	84.4
5857.100000	32.8	1000.0	1000.000	252.3	V	36.0	5.4	51.6	84.4
10902.500000	35.7	1000.0	1000.000	161.6	V	107.0	11.5	48.7	84.4
16438.800000	38.1	1000.0	1000.000	103.7	H	221.0	17.1	46.3	84.4

Note: Bluetooth LE was enabled as the worst case configuration when testing. Measurement was performed with a 2.4GHz Notch Filter.

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
KDB 93520 D05, Clause 3.7
RSS-130, Clause 4.3
RSS-131, Clause 5.2.4

2.8.2 Standard Applicable

FCC 47 CFR Part 27, Clause 27.54:
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

RSS-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.

RSS-131, Clause 5.2.4
Industrial zone enhancers shall comply with the frequency stability given in the RSS that applies to the equipment with which the zone enhancer is to be used. In cases where the frequency stability limit is not given in the applicable RSS, the equipment shall comply with a frequency stability of ± 1.5 ppm.

2.8.3 Equipment Under Test and Modification State

Serial No: 382829000271 / Test Configuration A and B

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

September 25 and 26, 2018/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	24.5 - 25.0°C
Relative Humidity	50.3 - 53.8%
ATM Pressure	98.9 - 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.
- Test performed in 10 MHz Bandwidth Middle channel as the representative configuration.
- Input Type "Tones" was selected and the EUT was injected a CW signal from a Signal Generator and maximum frequency error was monitored using the spectrum analyzer.
- The Temperature was reduced to -30°C and allowed to sit for 1 hour to allow the equipment and chamber temperature to stabilize. The measurements on both downlink and uplink were then performed. The temperature was then increased by 10°C steps and allowed to settle before taking the next set of measurements. The EUT was tested over the temperature -30°C to +50°C.
- Voltage variation was also performed at 85% and 115% of the nominal voltage.

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

2.8.8 Test Results Summary

LTE B12 Downlink – 10 MHz BW Middle Channel 737.5 MHz				
Voltage (VDC)	**Temperature (°C)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
120	-30	0	0	± 1.5
	-20	0	0	± 1.5
	-10	0	0	± 1.5
	0	0	0	± 1.5
	+10	0	0	± 1.5
	+20	0	0	± 1.5
	+30	0	0	± 1.5
	+40	0	0	± 1.5
	+50	0	0	± 1.5
102	+20	0	0	± 1.5
138		0	0	± 1.5

LTE B12 Downlink Frequency Range – 10 MHz BW					
Channel @5MHz BW	***Temperature (°C)***	***Voltage (VAC)***	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	-30	120	729.2426	-	>729
	+20	102	729.2289	-	
		120	729.1864	-	
		138	729.2376	-	
	+50	120	729.2301	-	
High Channel	-30	120	-	745.7572	<746
	+20	102	-	745.7448	
		120	-	745.7510	
		138	-	745.7585	
	+50	120	-	745.7522	

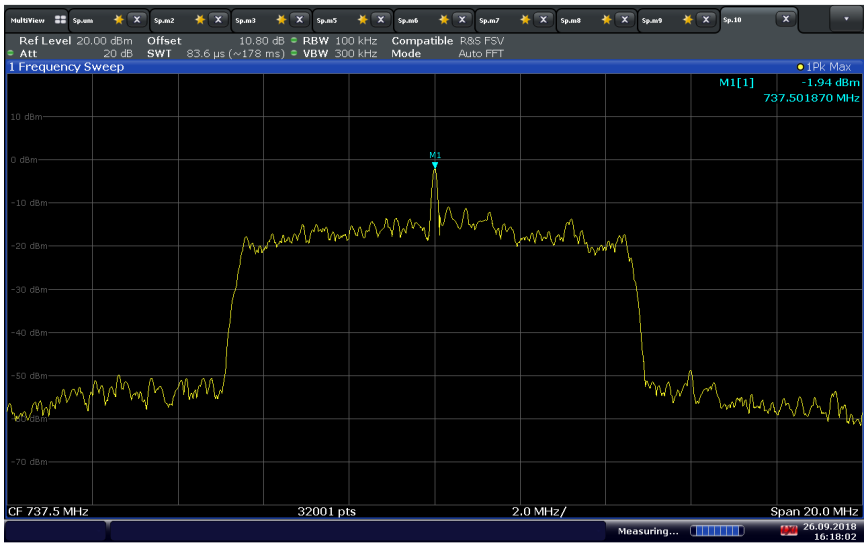
The frequency stability of the EUT is sufficient to keep it within the authorised frequency ranges at any temperature interval and voltage variations across the measured range.

LTE B12 Uplink – 10 MHz BW Middle Channel 707.5 MHz				
Voltage (VDC)	**Temperature (°C)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
120	-30	0	0	± 1.5
	-20	0	0	± 1.5
	-10	0	0	± 1.5
	0	0	0	± 1.5
	+10	0	0	± 1.5
	+20	0	0	± 1.5
	+30	0	0	± 1.5
	+40	0	0	± 1.5
	+50	0	0	± 1.5
102	+20	0	0	± 1.5
138		0	0	± 1.5

LTE B12 Uplink Frequency Range – 10 MHz BW					
Channel @5MHz BW	***Temperature (°C)***	***Voltage (VAC)***	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	-30	120	699.1268	-	>699
	+20	102	699.1543	-	
		120	699.1168	-	
		138	699.1593	-	
	+50	120	699.1105	-	
High Channel	-30	120	-	715.8423	<716
	+20	102	-	715.8498	
		120	-	715.8523	
		138	-	715.8461	
	+50	120	-	715.8473	

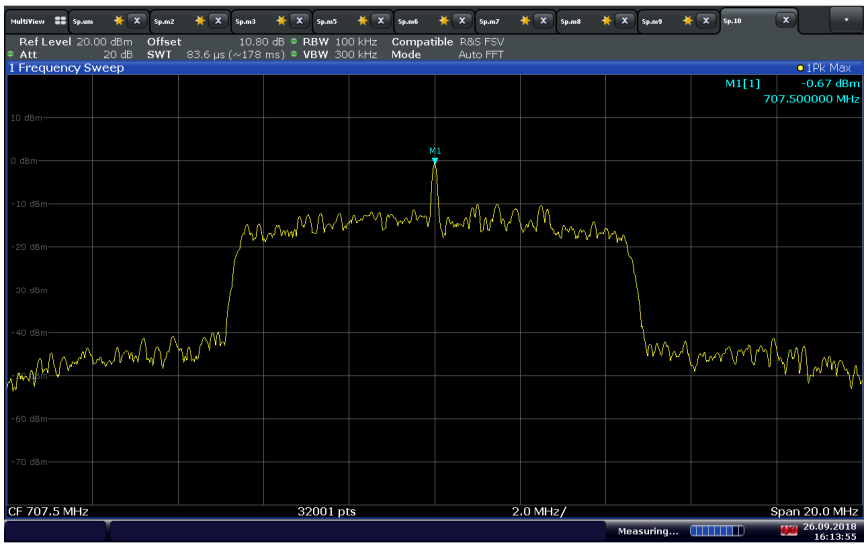
The frequency stability of the EUT is sufficient to keep it within the authorised frequency ranges at any temperature interval and voltage variations across the measured range.

2.8.9 Sample Test Plots



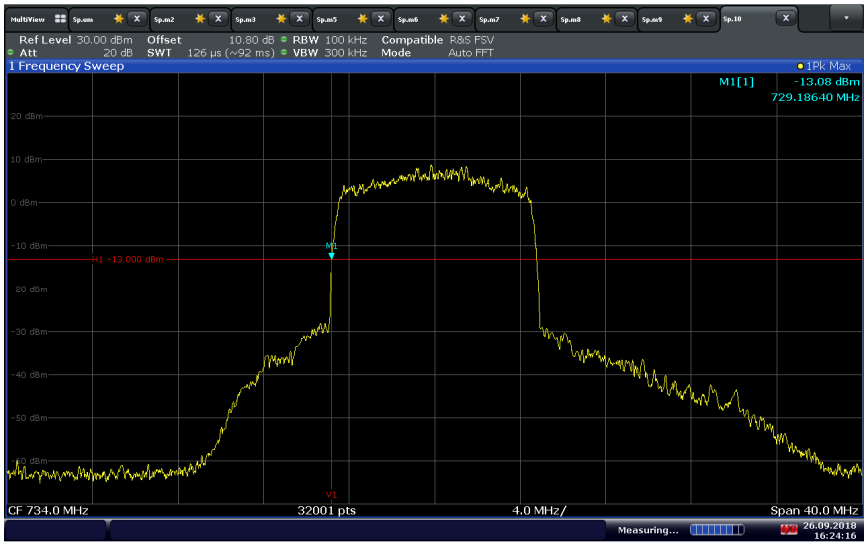
16:18:02 26.09.2018

Downlink Middle Channel 120VAC @ 20°C

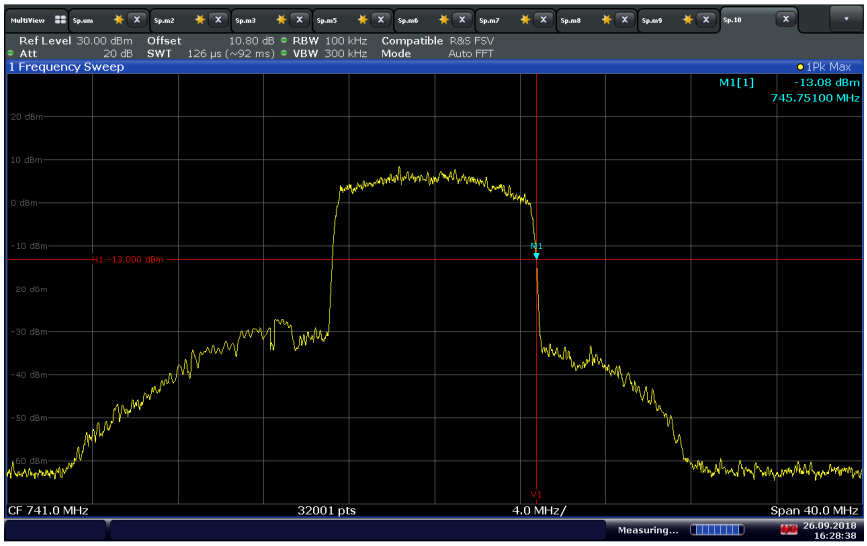


16:13:55 26.09.2018

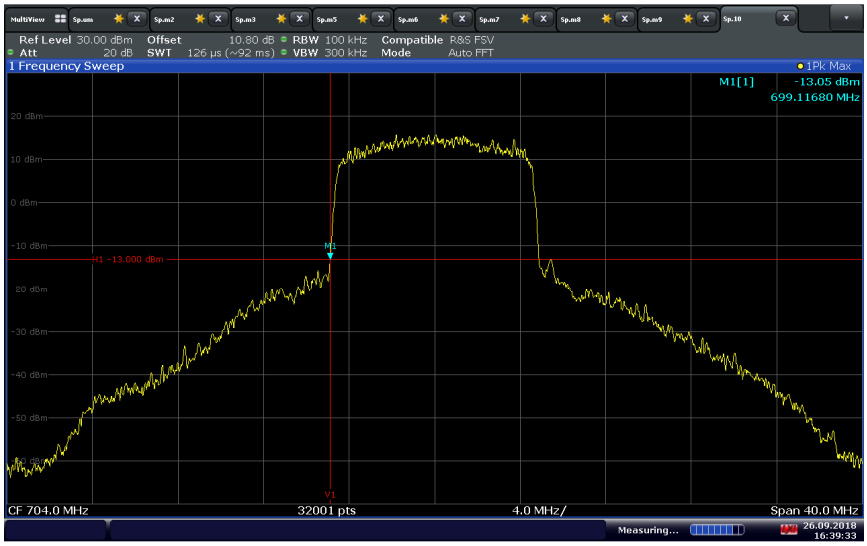
Uplink Middle Channel 120VAC @ 20°C



LTE B12 Downlink Low Channel @ 20°C Nominal Voltage

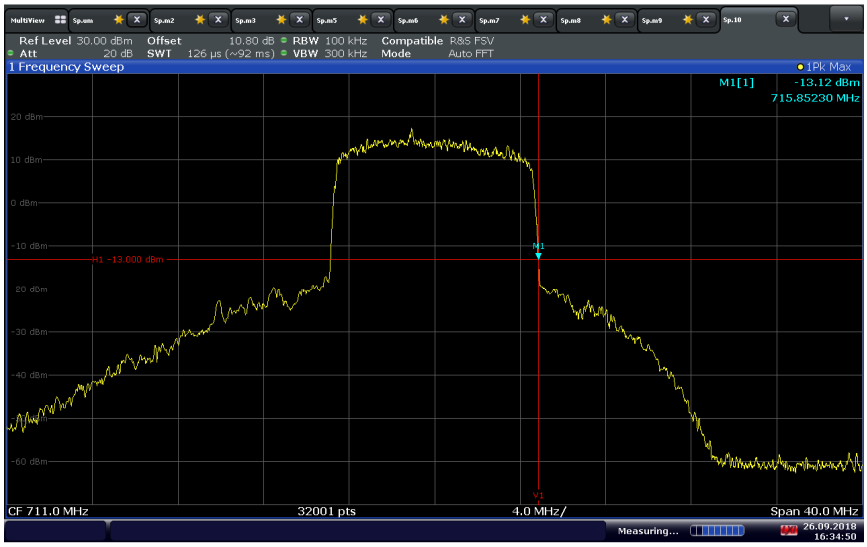


LTE B12 Downlink High Channel @ 20°C Nominal Voltage



16:39:34 26.09.2018

LTE B12 Uplink Low Channel @ 20°C Nominal Voltage



16:34:51 26.09.2018

LTE B12 Uplink High Channel @ 20°C Nominal Voltage

2.9 POWER LINE CONDUCTED EMISSIONS

2.9.1 Specification Reference

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

2.9.2 Standard Applicable

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

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: 382829000271/Test Configuration B

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

September 19, 2018/XYZ

2.9.5 Test Equipment Used

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

2.9.6 Environmental Conditions

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

Ambient Temperature	25.2 °C
Relative Humidity	50.3 %
ATM Pressure	98.8 kPa

2.9.7 Additional Observations

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. See Section 2.1.8 for sample computation.

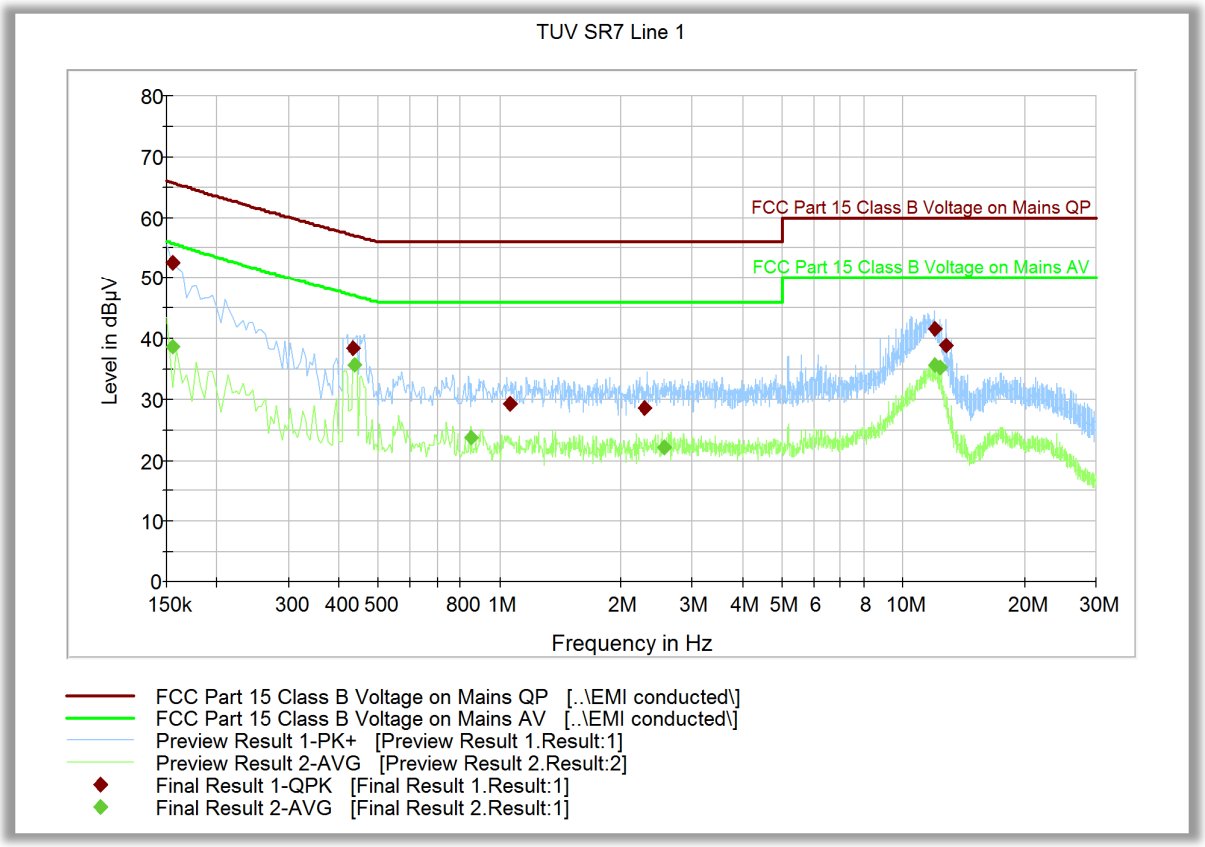
2.9.8 Sample Computation (Conducted Emission – Quasi Peak)

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# 7568 (LISN)	0.30	
Reported QuasiPeak Final Measurement (dbµV) @ 150kHz			**26.2**

2.9.9 Test Results

Compliant. See attached plots and tables.

2.9.1 Test Results - Conducted Emissions Line 1 – Hot



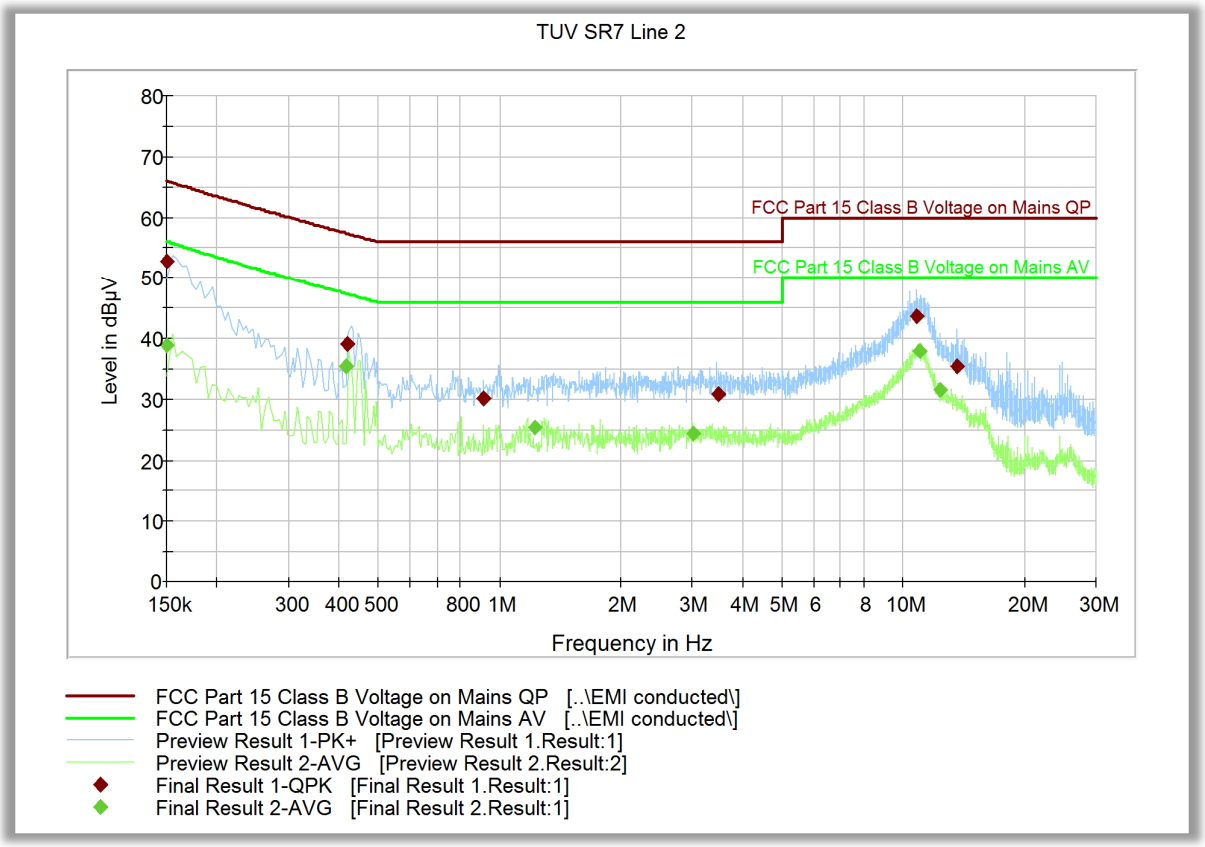
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.154500	52.7	1000.0	9.000	Off	L1	20.3	13.1	65.7
0.433500	38.5	1000.0	9.000	Off	L1	20.3	18.6	57.1
1.063500	29.3	1000.0	9.000	Off	L1	20.1	26.7	56.0
2.292000	28.6	1000.0	9.000	Off	L1	20.5	27.4	56.0
11.998500	41.7	1000.0	9.000	Off	L1	20.7	18.3	60.0
12.799500	39.0	1000.0	9.000	Off	L1	20.7	21.0	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.154500	38.7	1000.0	9.000	Off	L1	20.3	17.0	55.7
0.438000	35.6	1000.0	9.000	Off	L1	20.3	11.4	47.0
0.847500	23.8	1000.0	9.000	Off	L1	20.2	22.2	46.0
2.548500	22.3	1000.0	9.000	Off	L1	20.3	23.7	46.0
11.998500	35.7	1000.0	9.000	Off	L1	20.7	14.3	50.0
12.399000	35.3	1000.0	9.000	Off	L1	20.7	14.7	50.0

2.9.2 Test Result - Conducted Emissions Line 2 – Neutral



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.150000	52.7	1000.0	9.000	Off	N	20.3	13.3	66.0
0.420000	39.0	1000.0	9.000	Off	N	20.3	18.4	57.3
0.915000	30.2	1000.0	9.000	Off	N	20.2	25.8	56.0
3.475500	30.9	1000.0	9.000	Off	N	20.5	25.1	56.0
10.797000	43.7	1000.0	9.000	Off	N	20.6	16.3	60.0
13.591500	35.5	1000.0	9.000	Off	N	20.7	24.5	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.150000	38.9	1000.0	9.000	Off	N	20.3	17.1	56.0
0.415500	35.5	1000.0	9.000	Off	N	20.3	12.0	47.4
1.221000	25.3	1000.0	9.000	Off	N	20.3	20.7	46.0
3.007500	24.5	1000.0	9.000	Off	N	20.5	21.5	46.0
10.986000	37.9	1000.0	9.000	Off	N	20.6	12.1	50.0
12.399000	31.4	1000.0	9.000	Off	N	20.7	18.6	50.0

2.10 AGC THRESHOLD LEVEL

2.10.1 Specification Reference

KDB 935210 D05, Clause 3.2

2.10.2 Standard Applicable

The AGC threshold level is determined by applying KDB 935210 D05, Clause 3.2.

2.10.3 Equipment Under Test and Modification State

Serial No: 382829000271 / Test Configuration A and B

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

October 09, 2018 / ZXY

2.10.5 Test Equipment Used

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

2.10.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.5°C
Relative Humidity	54.9%
ATM Pressure	98.7kPa

2.10.7 Additional Observations

- This is a conducted test.
- When testing output power of the EUT, a power meter was used according to method 3.5.4 of this KDB.
- LTE 10 MHz Signal was used as the applicable test signal type.
- The AGC threshold level was recorded when increase the input level until a 1 dB increase in the input signal power no longer causes a 1 dB increase in the output signal power.
- Both downlink and uplink are tested.

2.10.8 Test Results

LTE Band 12						
Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Average Power		AGC Threshold Level (dBm)
				(dBm)	(W)	
Downlink	10	5095	737.5	16.72	0.047	-78.0
Uplink	10	23095	707.5	24.34	0.272	-71.45

2.11 OUT-OF-BAND REJECTION

2.11.1 Specification Reference

KDB 935210 D05, Clause 3.3
RSS-131, Clause 5.2.1

2.11.2 Standard Applicable

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

Out-of-Band Rejection is tested according to KDB 935210 D05, Clause 3.3.

2.11.3 Equipment Under Test and Modification State

Serial No: 382829000042 / Test Configuration A and B

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

October 15, 2018 / ZXY

2.11.5 Test Equipment Used

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

2.11.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.7°C
Relative Humidity	21.0%
ATM Pressure	98.9kPa

2.11.7 Additional Observations

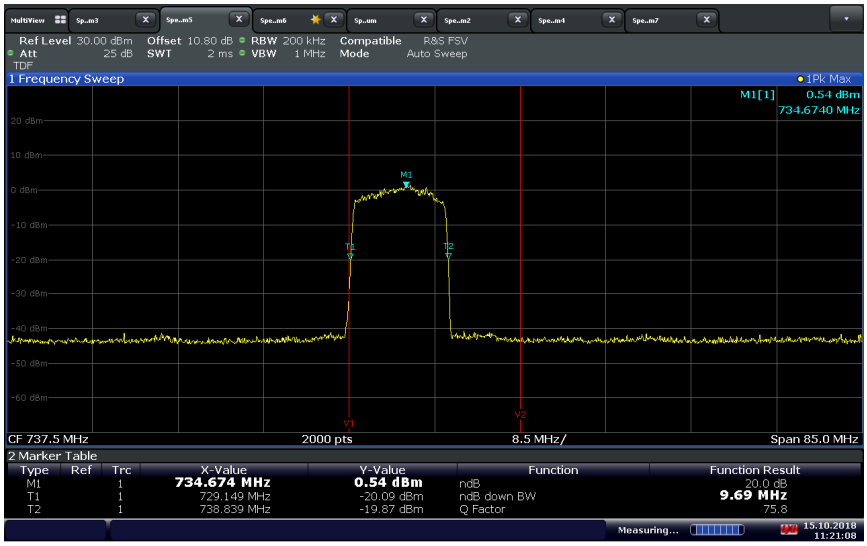
- This is a conducted test.
- The path loss was measured and entered as an offset.
- A swept CW signal whose frequency range is ±250% of the manufacturer's specified pass band is configured for the testing.
- The CW is 3 dB below the ACG threshold (determined according to section 3.2 of the current KDB), and doesn't activate the AGC threshold throughout the test.
- Dwell time is 10 ms.
- Frequency Step is 50 kHz.
- RBW is between 1% and 5% of the manufacturer's rated pass band.
- VBW is 3 x RBW.
- Detector is peak and trace is max hold.

- The peak amplitude frequency f_0 is determined and two additional -20 dB markers are determined using the marker-delta method).
- The 20dB Bandwidth plot is recorded as the out-of-band rejection frequency response.
- Both downlink and uplink are tested.

2.11.8 Test Results

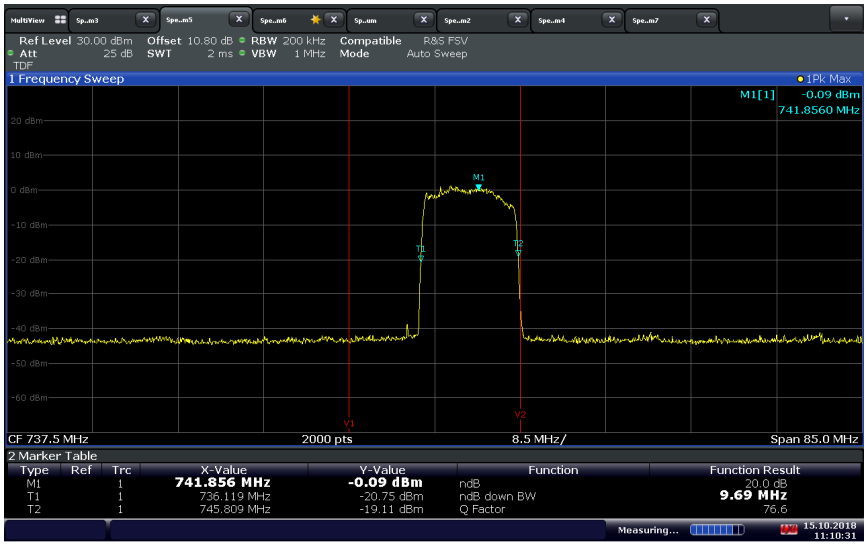
LTE Band 12							
Mode		Bandwidth (MHz)	Channel	Frequency (MHz)	-20 dBc Point		20 dB BW (MHz)
					T1 (MHz)	T2 (MHz)	
Downlink	Low Channel	10	5060	734.0	729.149	738.839	9.69
	High Channel	10	5130	741.0	736.119	745.809	9.69
Uplink	Low Channel	10	23060	704.0	699.191	708.839	9.61
	High Channel	10	23130	711.0	706.161	715.809	9.56

LTE Band 12 Downlink (10 MHz BW) B Channel / Out-of-Band Rejection



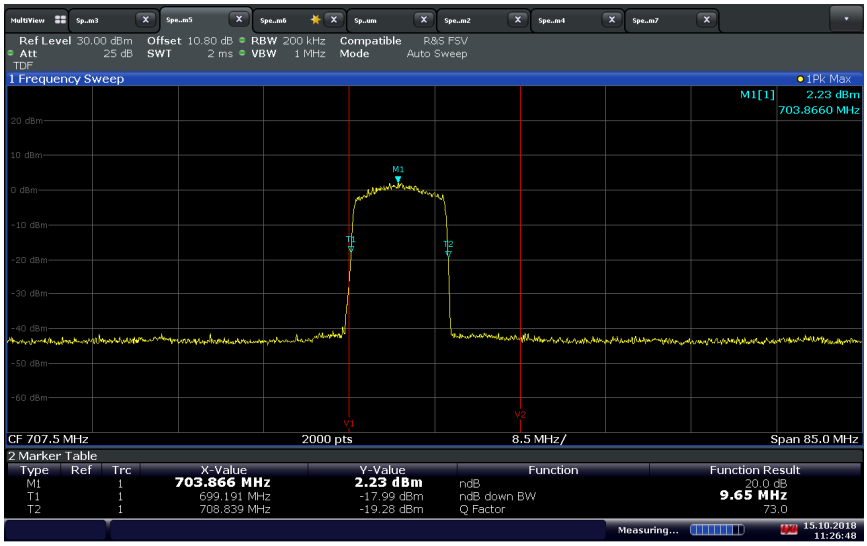
11:21:09 15.10.2018

LTE Band 12 Downlink (10 MHz BW) T Channel / Out-of-Band Rejection



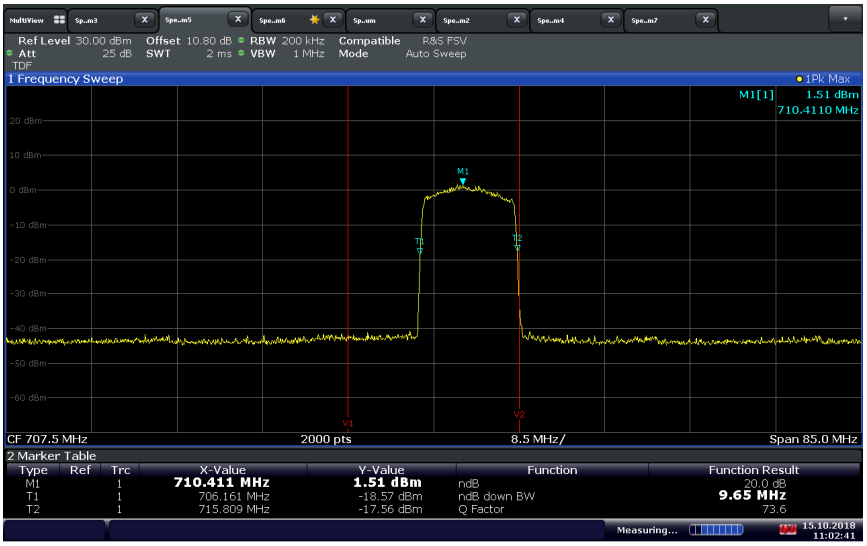
11:10:32 15.10.2018

LTE Band 12 Uplink (10 MHz BW) B Channel / Out-of-Band Rejection



11:26:48 15.10.2018

LTE Band 12 Uplink (10 MHz BW) T Channel / Out-of-Band Rejection



11:02:42 15.10.2018

2.12 INPUT-VERSUS-OUTPUT SIGNAL COMPARISON

2.12.1 Specification Reference

KDB 935210 D05, Clause 3.4
RSS-131, Clause 5.2.2

2.12.2 Standard Applicable

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

Input-versus-Output Signal Comparison is tested according to KDB 935210 D05, Clause 3.4.

2.12.3 Equipment Under Test and Modification State

Serial No: 382829000042 / Test Configuration A and B

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

October 10, 2018 / ZXY

2.12.5 Test Equipment Used

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

2.12.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.9°C
Relative Humidity	50.4%
ATM Pressure	98.5kPa

2.12.7 Additional Observations

- This is a conducted test.
- The path loss was measured and entered as an offset.
- The EUT only support LTE 10 MHz Bandwidth, so the signal generator is configured to transmit the applicable signal type: 10 MHz LTE.
- The signal amplitude is just below the ACG threshold (determined according to section 3.2 of the current KDB), and not more than 0.5 dB below.
- Span is between 2 times to 5 times the emission bandwidth (EBW) or alternatively, the OBW.
- RBW is between 1% and 5% of the anticipated OBW
- VBW is ≥ 3 x RBW.

- Set the reference level of spectrum analyzer so that the peak of the spectral envelope is more than 10log (OBW/RBW) below the reference level.
- The noise floor of the spectrum analyzer at the selected RBW is at least 36 dB below the reference level.
- Detector is positive peak and trace is max hold.

- The peak amplitude frequency f_0 is determined and two additional -26 dB markers are determined and -26 dB EBW is determined using n dB function of spectrum analyzer.
- Repeat the testing with the input signal connected directly to the spectrum analyzer.
- Compare the spectral plot of the input signal to the output signal.
- Repeat the testing with input signal amplitude set to 3 dB above AGC threshold and Narrowband signal (representative of a GSM signal).
- Both downlink and uplink are tested.

2.12.8 Test Results

Compliant. The spectral growth of 26 dB bandwidth of the output signal is less than 5% of the input signal spectrum.

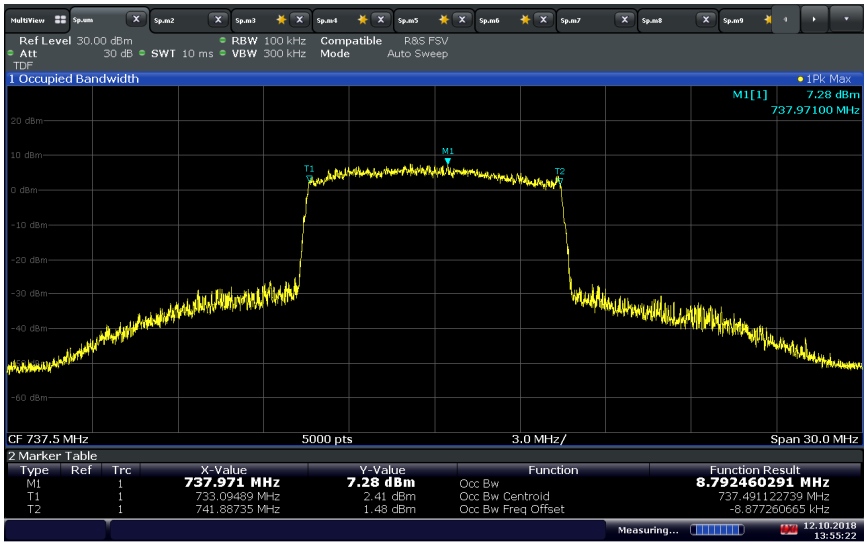
LTE Band 14 Downlink							
Signal Type / Level	Bandwidth (MHz)	Channel	Frequency (MHz)	99% OBW (MHz)		-26 dB BW (MHz)	
				Output	Input*	Output	Input*
LTE 10 MHz BW signal at AGC Threshold Level	10	5095	737.5	8.792	8.964	9.35	9.82
LTE 10 MHz BW signal at AGC + 3 dB Level				8.787	8.964	9.34	9.82
Narrowband signal at AGC Threshold Level				0.261	0.254	0.301	0.301
Narrowband signal at AGC + 3 dB Level				0.253	0.254	0.296	0.301

* Since the AGC Threshold level and AGC + 3 dB level for downlink are as low as -75 dBm, which is about the noise floor, the input levels are adjusted in order to get the right input 99% OBW and -26 dB BW when testing.

LTE Band 14 Uplink							
Signal Type / Level	Bandwidth (MHz)	Channel	Frequency (MHz)	99% OBW (MHz)		-26 dB BW (MHz)	
				Output	Input*	Output	Input*
LTE 10 MHz BW signal at AGC Threshold Level	10	23095	707.5	8.777	8.971	9.35	9.91
LTE 10 MHz BW signal at AGC + 3 dB Level				8.771	8.971	9.34	9.91
Narrowband signal at AGC Threshold Level				0.249	0.253	0.278	0.283
Narrowband signal at AGC + 3 dB Level				0.249	0.253	0.278	0.283

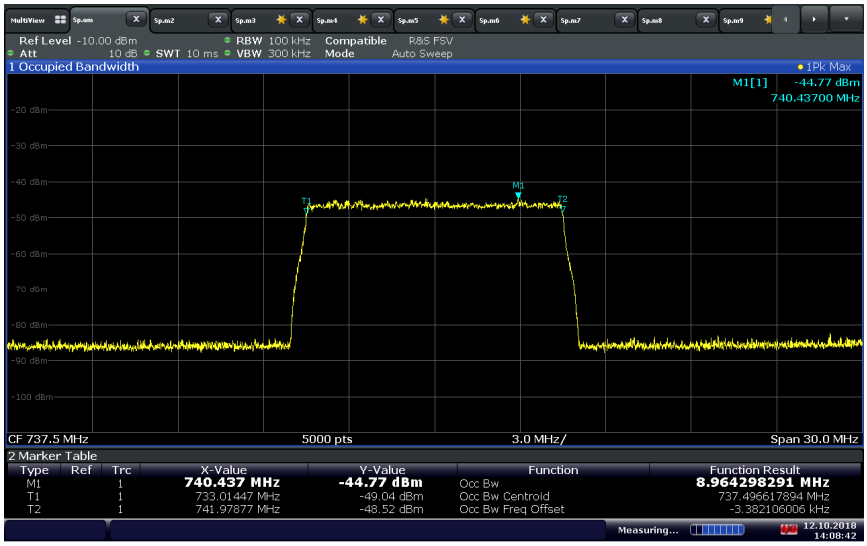
* Since the AGC Threshold level and AGC + 3 dB level for Uplink are as low as -65 dBm, which is close to the noise floor, the input levels are adjusted in order to get the right input 99% OBW and -26 dB BW when testing.

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 99% OBW at Output port with LTE 10 MHz BW input Signal at AGC Threshold Level

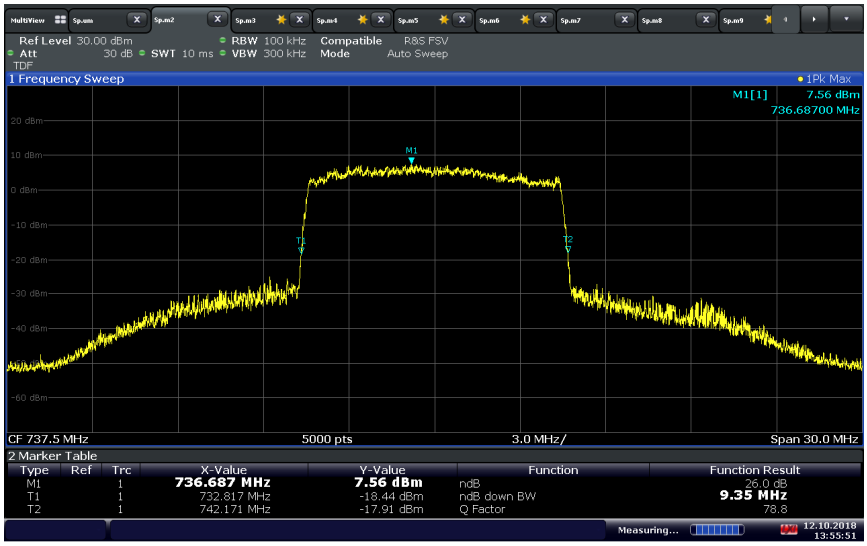


13:55:22 12.10.2018

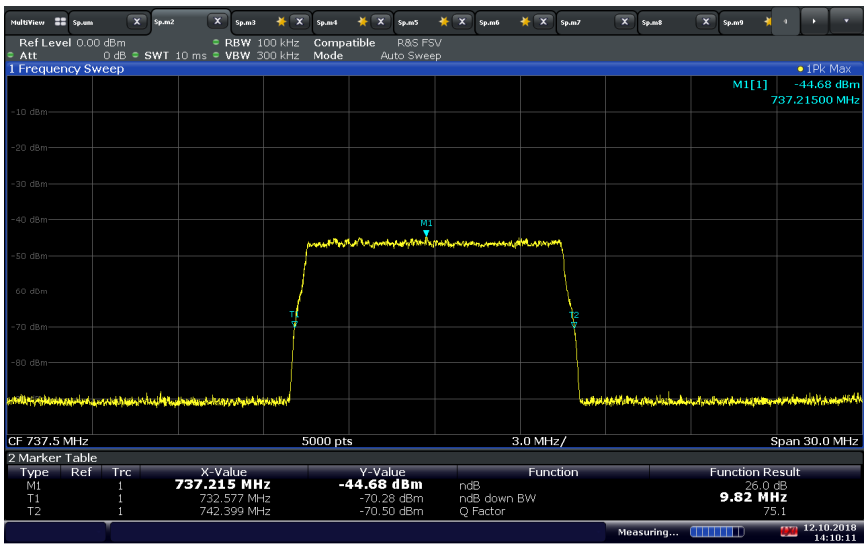
LTE Band 12 Downlink (10 MHz BW) Mid Channel / 99% OBW at Input port (LTE 10 MHz BW Signal at Adjusted Level)



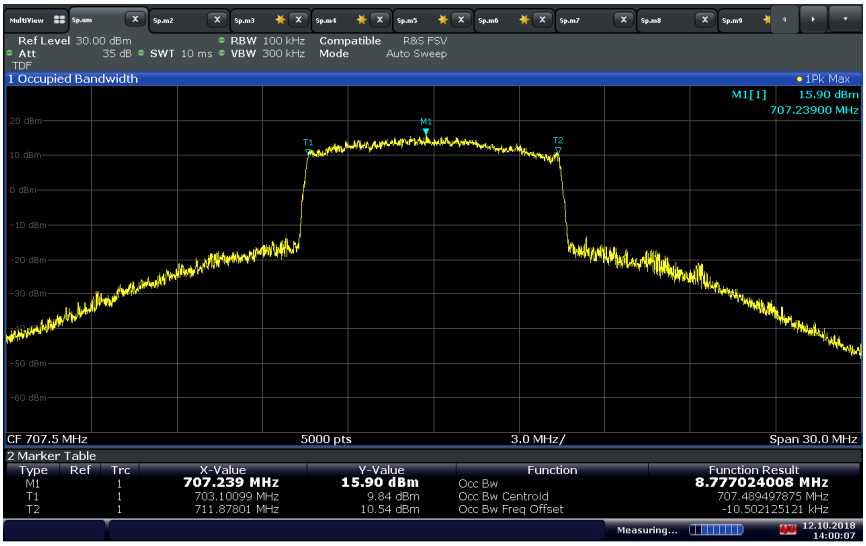
14:08:42 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Output port with LTE 10 MHz BW Input Signal at AGC Threshold Level


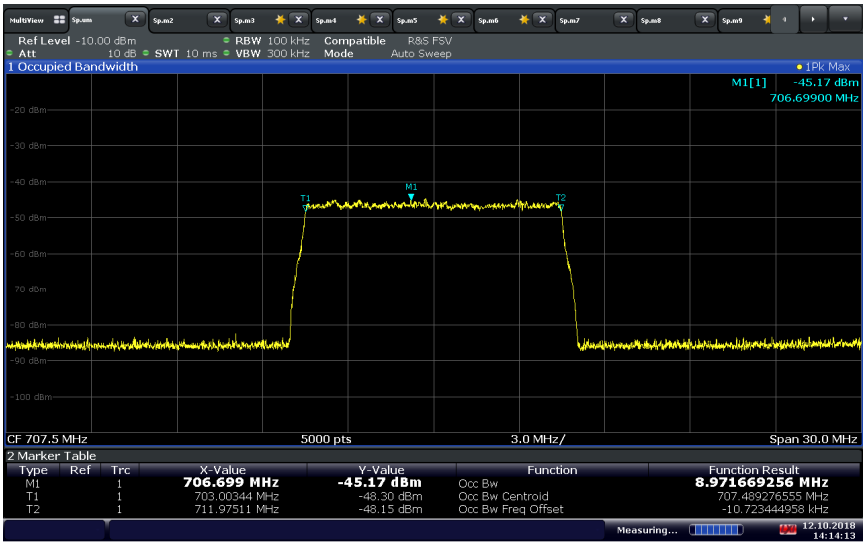
13:55:51 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Input port (LTE 10 MHz BW Signal at Adjusted Level)


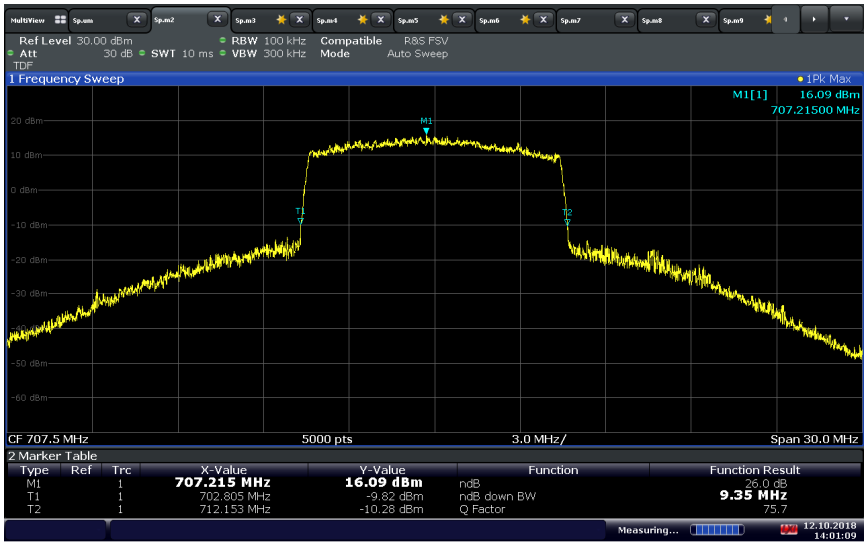
14:10:12 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 99% OBW at Output port with LTE 10 MHz BW Input Signal at AGC Threshold Level


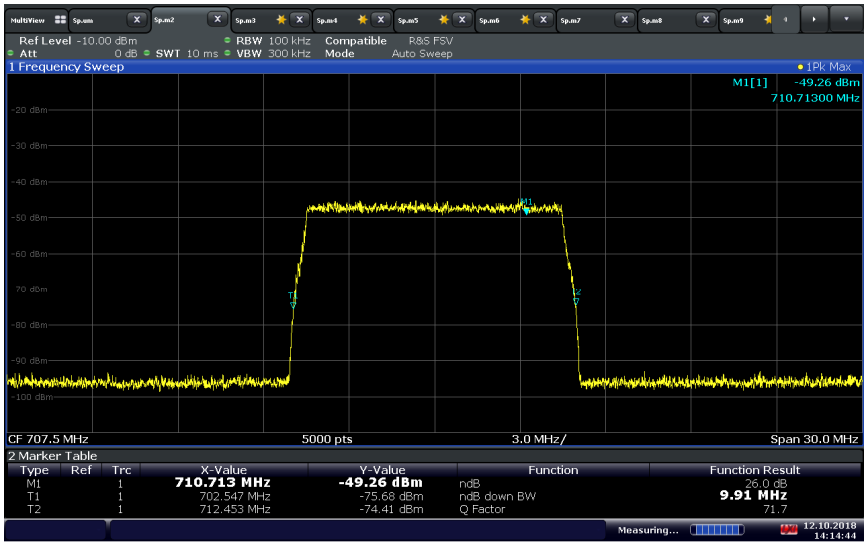
14:00:08 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 99% OBW at Input port (LTE 10 MHz BW Signal at Adjusted Level)


14:14:14 12.10.2018

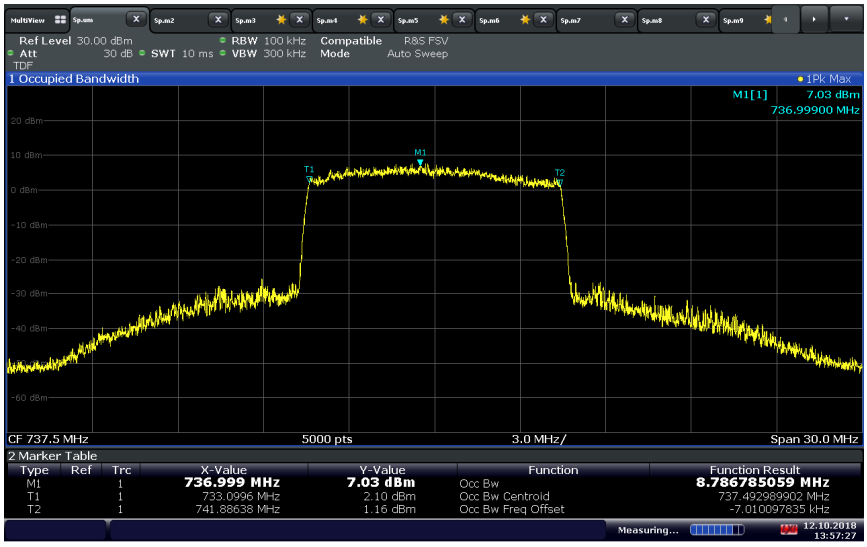
LTE Band 12 Uplink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Output port with LTE 10 MHz BW Input Signal at AGC Threshold Level


14:01:11 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Input port (LTE 10 MHz BW Signal at Adjusted Level)


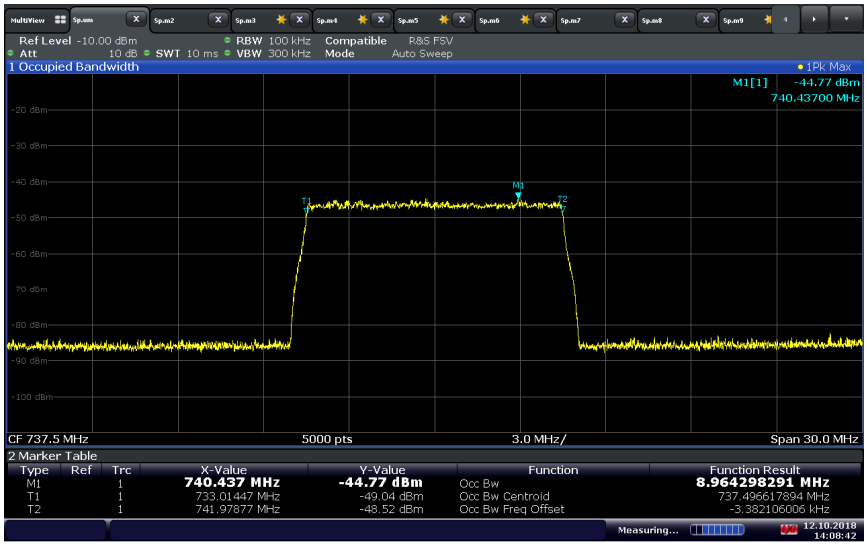
14:14:44 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 99% OBW at Output port with LTE 10 MHz BW Input Signal at AGC + 3 dB Level



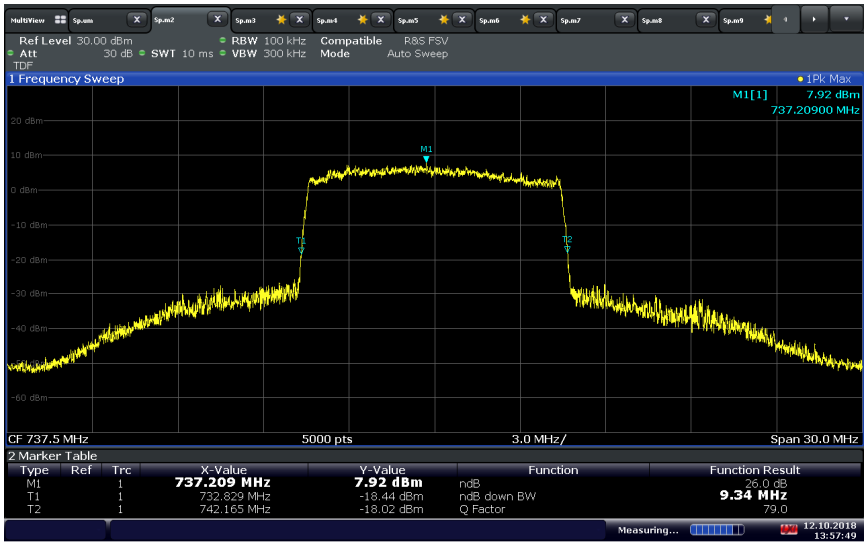
13:57:28 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 99% OBW at Input port (LTE 10 MHz BW Signal at Adjusted Level)



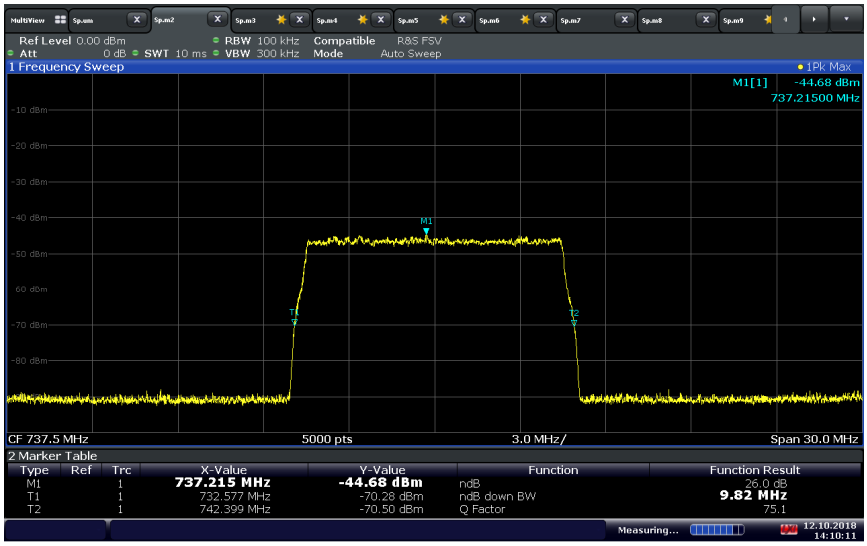
14:08:42 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Output port with LTE 10 MHz BW Input Signal at AGC + 3 dB level



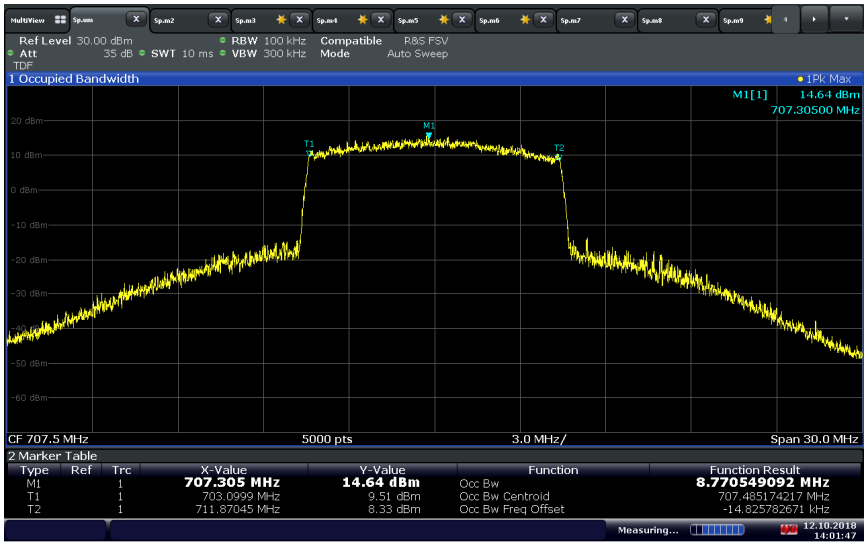
13:57:49 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Input port (LTE 10 MHz BW Signal at Adjusted Level)



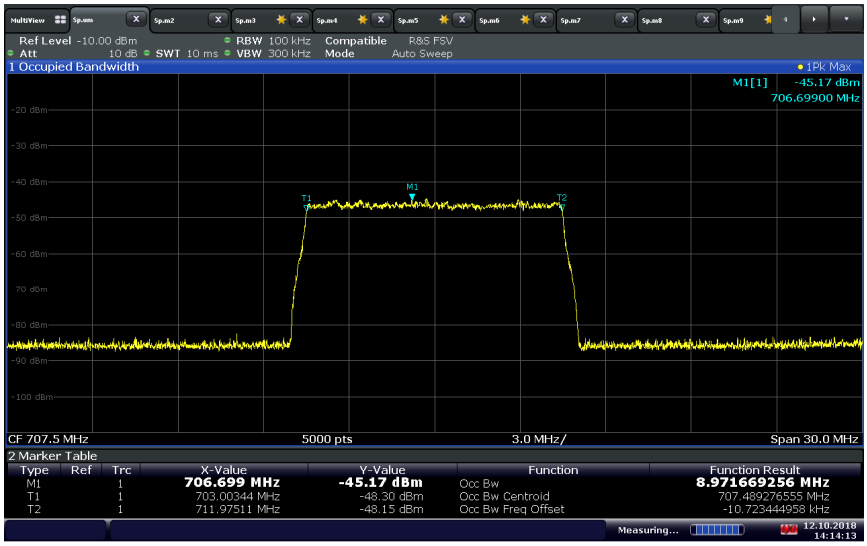
14:10:12 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 99% OBW at Output port with LTE 10 MHz BW Input Signal at AGC + 3 dB Level

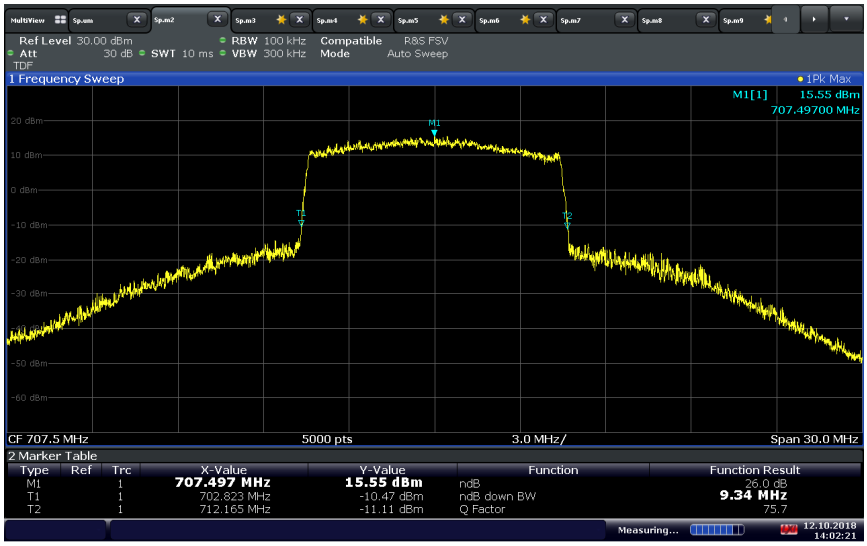
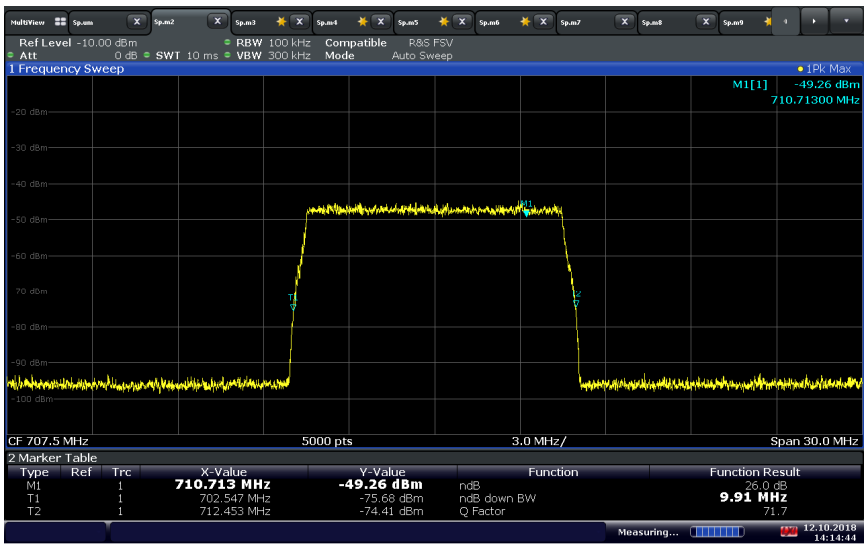


14:01:48 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 99% OBW at Input port (LTE 10 MHz BW Signal at Adjusted Level)



14:14:14 12.10.2018

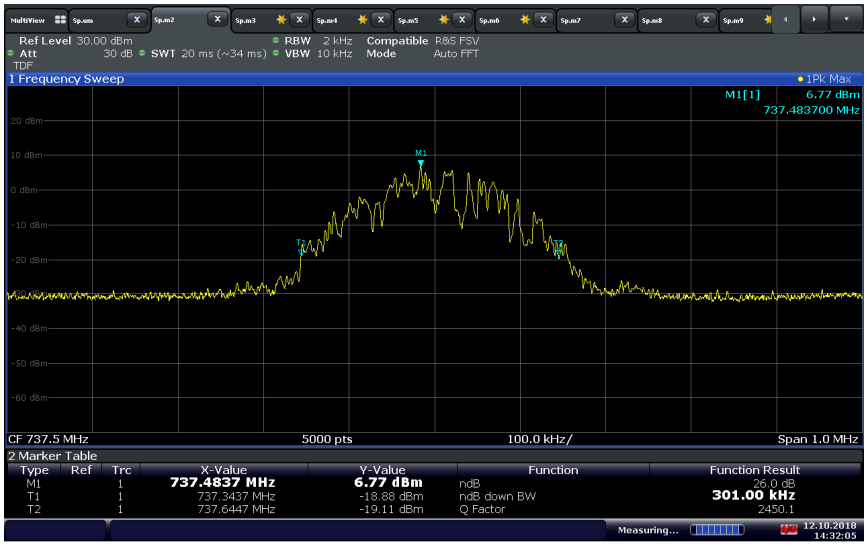
LTE Band 12 Uplink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Output port with LTE 10 MHz BW Input Signal at AGC + 3 dB Level
 14:02:22 12.10.2018
LTE Band 12 Uplink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Input port (LTE 10 MHz BW Signal at Adjusted Level)
 14:14:44 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 99% OBW at Output port with Narrowband Input signal at AGC Threshold Level

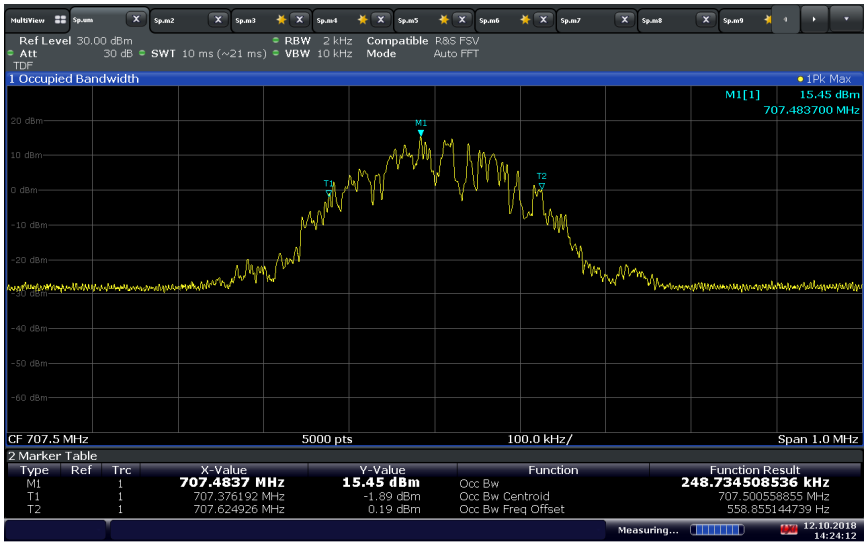
14:29:29 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 99% OBW at Input port (Narrowband signal at Adjusted Level)

14:41:09 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Output port with Narrowband Input signal at AGC Threshold Level
 14:32:06 12.10.2018
LTE Band 12 Downlink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Input port (Narrowband signal at Adjusted Level)
 14:40:24 12.10.2018

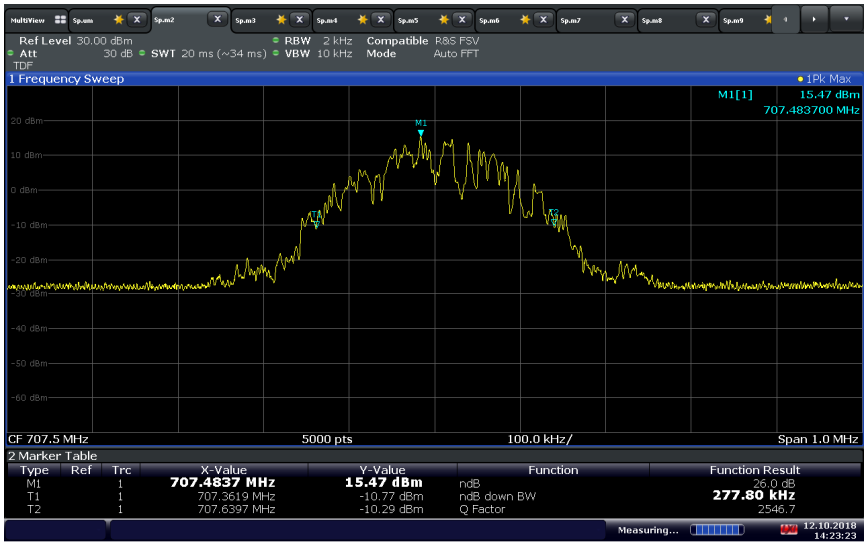
LTE Band 12 Uplink (10 MHz BW) Mid Channel / 99% OBW at Output port with Narrowband Input signal at AGC Threshold Level



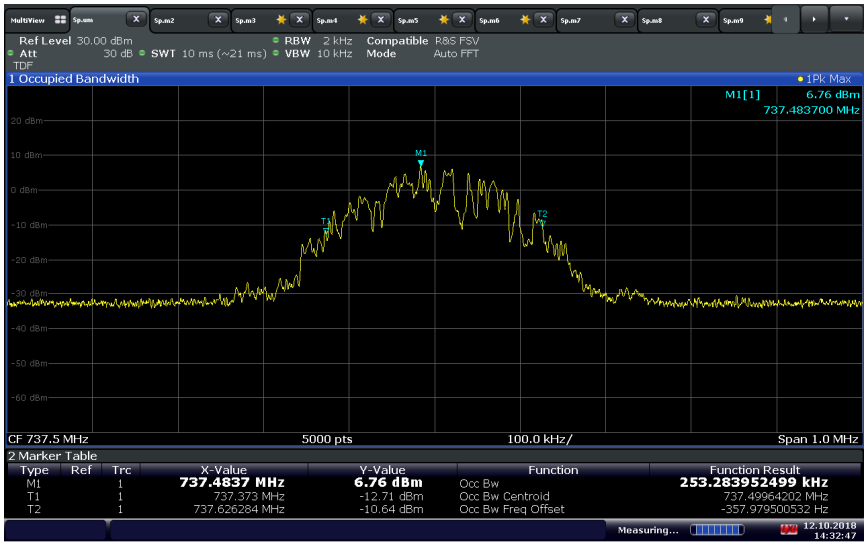
14:24:12 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 99% OBW at Input port (Narrowband signal at Adjusted Level)

14:42:45 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Output port with Narrowband Input signal at AGC Threshold Level
 14:23:23 12.10.2018
LTE Band 12 Uplink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Input port (Narrowband signal at Adjusted Level)
 14:44:21 12.10.2018

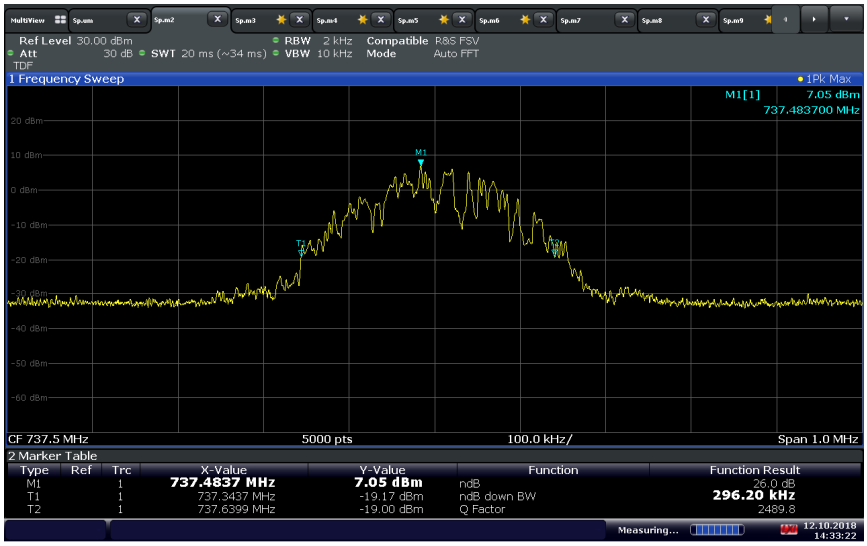
LTE Band 12 Downlink (10 MHz BW) Mid Channel / 99% OBW at Output port with Narrowband Input signal at AGC + 3 dB Level



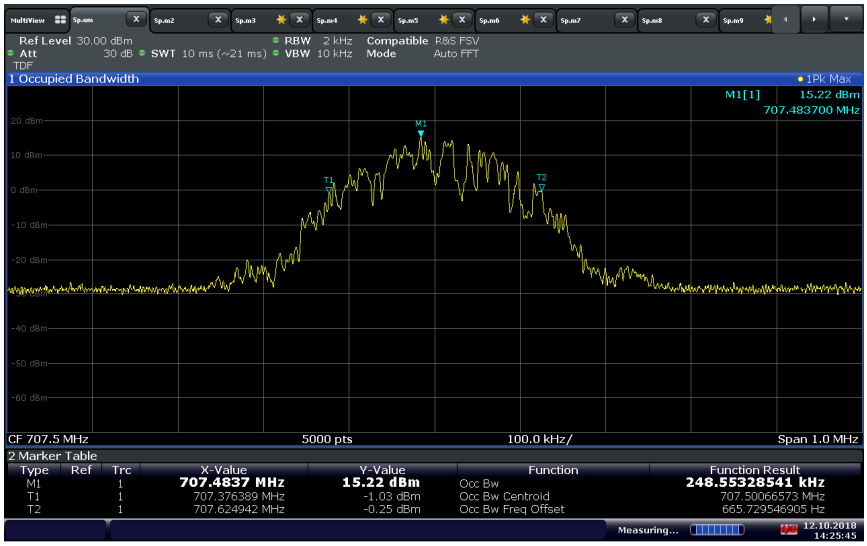
14:32:47 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 99% OBW at Input port (Narrowband signal at Adjusted Level)

14:41:09 12.10.2018

LTE Band 12 Downlink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Output port with Narrowband Input signal at AGC + 3 dB Level
 14:33:23 12.10.2018
LTE Band 12 Downlink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Input port (Narrowband signal at Adjusted Level)
 14:40:24 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 99% OBW at Output port with Narrowband Input signal at AGC + 3 dB Level

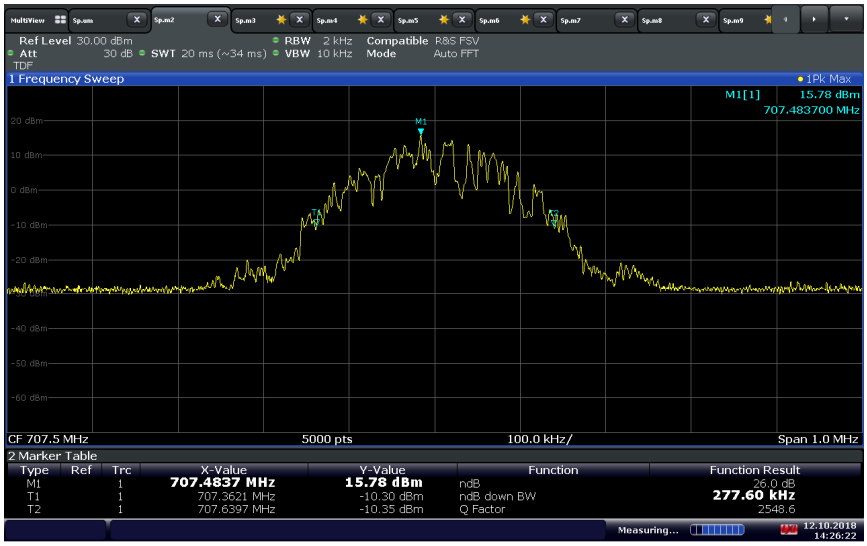


14:25:46 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 99% OBW at Input port (Narrowband signal at Adjusted Level)

14:42:45 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Output port with Narrowband Input signal at AGC + 3 dB Level



14:26:23 12.10.2018

LTE Band 12 Uplink (10 MHz BW) Mid Channel / 26 dB Bandwidth at Input port (Narrowband signal at Adjusted Level)

14:44:21 12.10.2018

2.13 INPUT AND OUTPUT POWER AND AMPLIFIER/BOOSTER GAIN

2.13.1 Specification Reference

KDB 935210 D05, Clause 3.5
RSS-131, Clause 5.2.3

2.13.2 Standard Applicable

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

Input and Output Power and Amplifier/Booster Gain is tested according to KDB 935210 D05, Clause 3.5.

2.13.3 Equipment Under Test and Modification State

Serial No: 382829000042 / Test Configuration A and B

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

October 10, 2018 / ZXY

2.13.5 Test Equipment Used

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

2.13.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.9°C
Relative Humidity	50.4%
ATM Pressure	98.5kPa

2.13.7 Additional Observations

- This is a conducted test.
- The path loss was measured and entered as an offset.
- The internal gain control of the EUT is adjusted to the maximum gain.
- The input power levels (uplink and downlink) are set to maximum input ratings, and confirm the device is not capable of operating in saturation (non-linear mode) during the test.
- The signal generator is configured for AWGN (broadband) operation and narrowband test signal (representative of a GSM signal)
- A spectrum analyzer is used to test the input/output power according to clause 3.5.3 which refers to C63.26: 2015 Clause 5.2.4.4.1.
- Span is 2 x to 3 x the OBW.
- RBW is 1% to 5% of the OBW.

- VBW ≥ 3 x RBW.
- Detector is RMS and trace average at least 100 traces.
- Sweep time is auto.
- Number of measurement points in sweep ≥ 2 x span / RBW.
- Compute the power by integrating the spectrum across the OBW of the signal using channel power measurement function.
- The input power is tested with the signal generator connect to the power directly.
- The output power is tested with the EUT in place.
- Both downlink and uplink are tested.

2.13.8 Test Results

Compliant. The booster gain does not exceed the nominal gain (95 dB) by more than 1.0 dB.

LTE Band 12 Downlink						
Signal Type / Level	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**
LTE 10 MHz BW signal at AGC Threshold Level	10	5095	737.5	-79.65	14.71	94.36
LTE 10 MHz BW signal at AGC + 3 dB Level				-77.01	14.77	91.78
Narrowband signal at AGC Threshold Level				-101.2	-5.58	95.62
Narrowband signal at AGC + 3 dB Level				-100.25	-6.81	93.44

LTE Band 12 Uplink						
Signal Type / Level	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**Input Power (dBm)**	**Output Power (dBm)**	**Gain (dB)**
LTE 10 MHz BW signal at AGC Threshold Level	10	23095	707.5	-72.40	22.35	94.75
LTE 10 MHz BW signal at AGC + 3 dB Level				-69.36	22.37	91.73
Narrowband signal at AGC Threshold Level				-95.89	-0.75	95.14
Narrowband signal at AGC + 3 dB Level				-95.65	-0.90	94.75

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						
7662	P-Series Power Meter	N1911A	MY45100951	Agilent	06/15/18	06/15/19
7661	50MHz-18GHz Wideband Power Sensor	N1921A	MY45241383	Agilent	06/15/18	06/15/19
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/19/17	09/19/19
7610	DFS Radar Simulator and Analyzer*	Aeroflex 3005	30050A/09L	Aeroflex international LTD. UK	11/13/18	11/13/19
7611	Signal/Spectrum Analyzer	FSW26	102017	Rhode & Schwarz	05/09/18	05/09/19
-	20dB Attenuator	BW-S20W5+5W	N/A	MCL	Verified by 7608 and 7611	
8710	10dB Attenuator	HAT-10+	-	Mini Circuit	Verified by 7608 and 7611	
AC Conducted Emissions						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	09/19/18	09/19/19
7567	LISN	FCC-LISN-50-25-2	120304	Fischer Custom Comm.	12/14/17	12/14/19
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	03/06/18	03/06/19
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	03/06/18	03/06/19
7611	Signal/Spectrum Analyzer	FSW26	102017	Rhode & Schwarz	05/09/18	05/09/19
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/19/17	09/19/19
Radiated Emission						
7611	Signal/Spectrum Analyzer	FSW26	102017	Rhode & Schwarz	05/09/18	05/09/19
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	09/19/17	09/19/19
1002	Bilog Antenna	3142C	00058717	EMCO	11/20/17	11/20/18
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	06/16/18	06/16/20
1193	Pre-amplifier	PAM-0202	185	A.H. Systems, Inc.	04/11/18	04/11/19
8921	High-frequency cable	SucoFlex 100 SX	N/A	Suhner	Verified by 7608 and 7611	
8923	High-frequency cable	Micropore 19057793	N/A	United Microwave Products	Verified by 7608 and 7611	
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/15/18	10/15/19
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	07/13/18	07/13/19
8628	Pre-amplifier	QLI-01182835-JO	8986002	Quinstar	02/06/18	02/06/19
6815	2.4GHz Band Notch Filter	BRM50702	008	Micro-Tronics	Verified by 1049	

Miscellaneous						
6708	Multimeter	34401A	US36086974	Hewlett Packard	07/18/18	07/18/19
7579	Temperature Chamber	115	151617	TestQuity	08/24/18	08/24/19
11312	Mini Environmental Quality Meter	850027	CF099-56010-340	Sper Scientific	02/26/28	02/26/19
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Emission 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	3.52	1.44	2.07
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (uc):	1.68
				Coverage Factor (k):	2
				Expanded Uncertainty:	3.36

3.2.2 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	3.00	1.22	1.50
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	1.49
				Coverage Factor (k):	2
				Expanded Uncertainty:	2.99

3.2.3 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	0.34	0.20	0.04
2	Cables	Rectangular	0.30	0.17	0.03
3	EUT Setup	Rectangular	0.50	0.29	0.08
				Combined Uncertainty (u_c):	0.39
				Coverage Factor (k):	1.96
				Expanded Uncertainty:	0.76

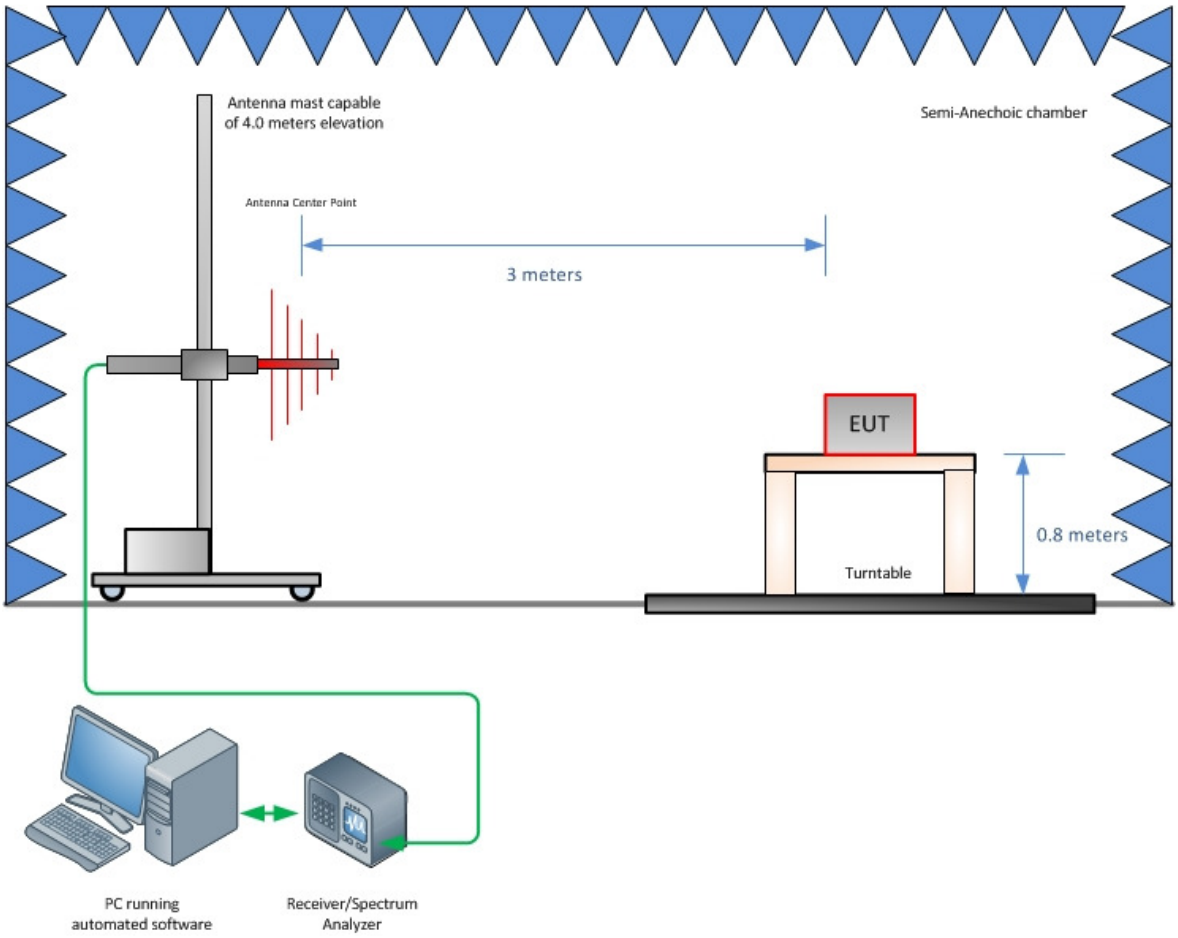
3.2.4 AC Conducted Emissions

	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

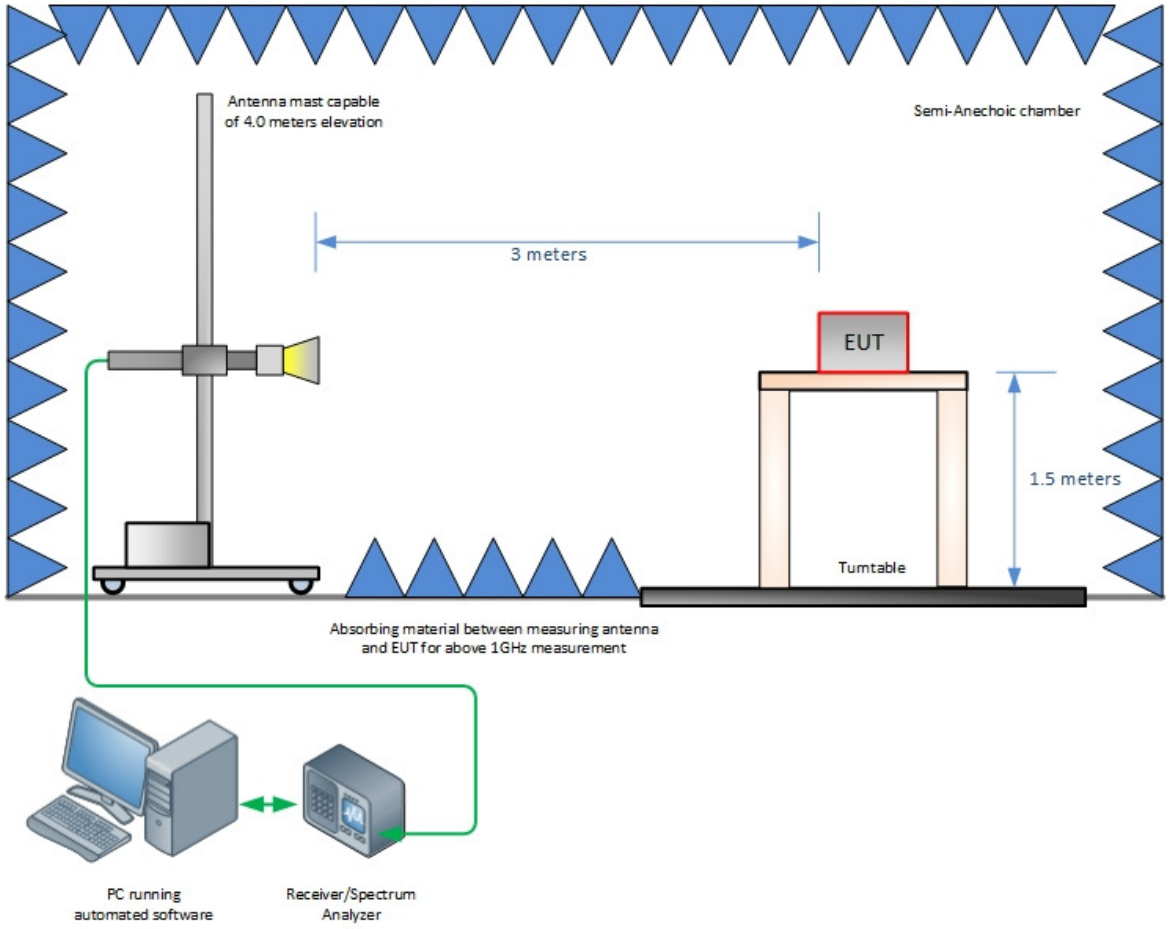
SECTION 4

DIAGRAM OF TEST SETUP

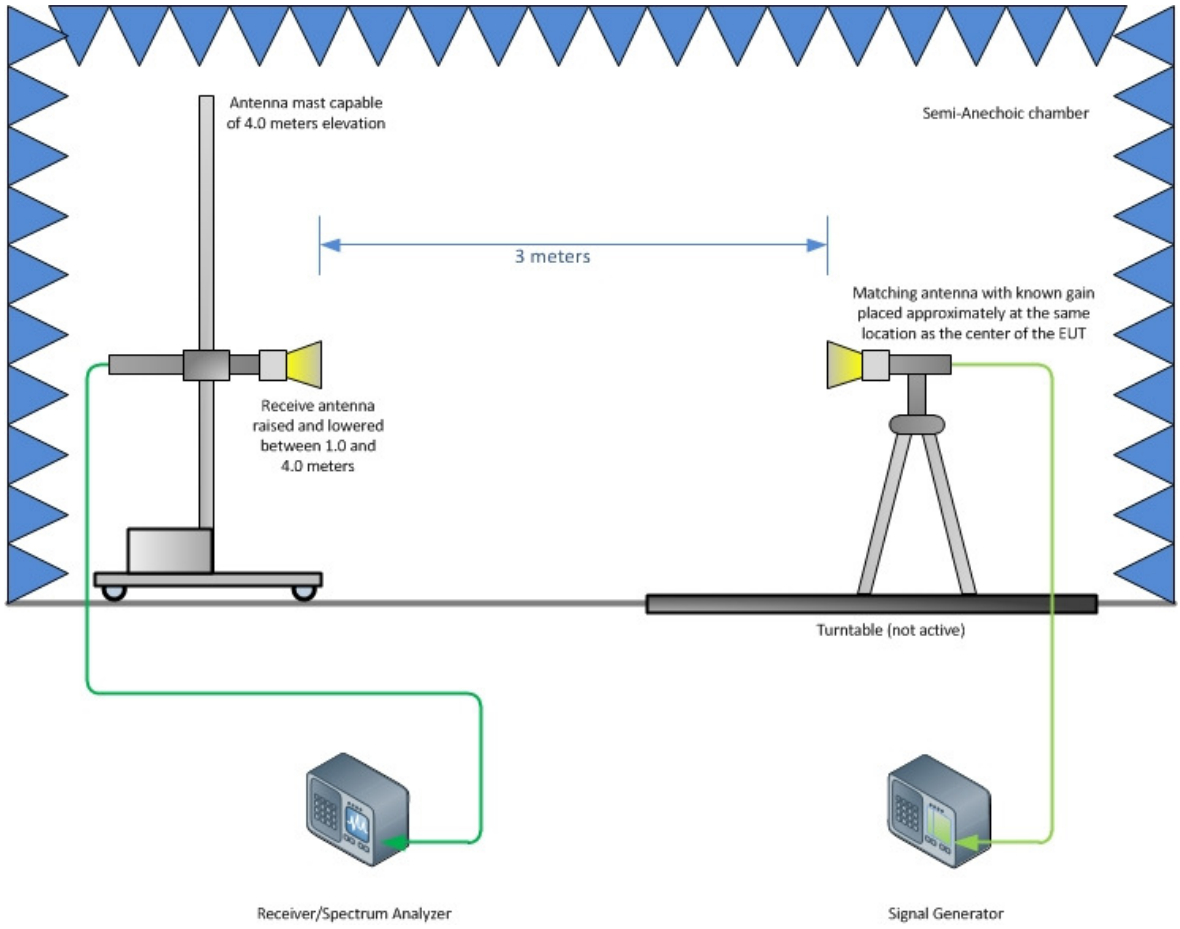
4.1 TEST SETUP DIAGRAM



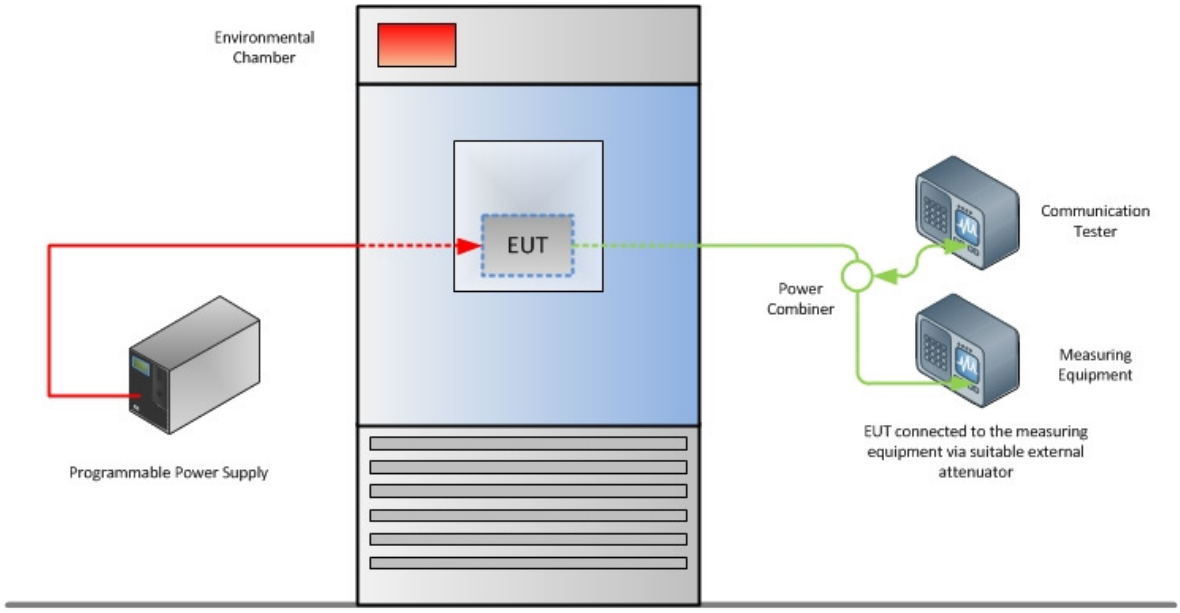
Radiated Emission Test Setup (Below 1GHz)



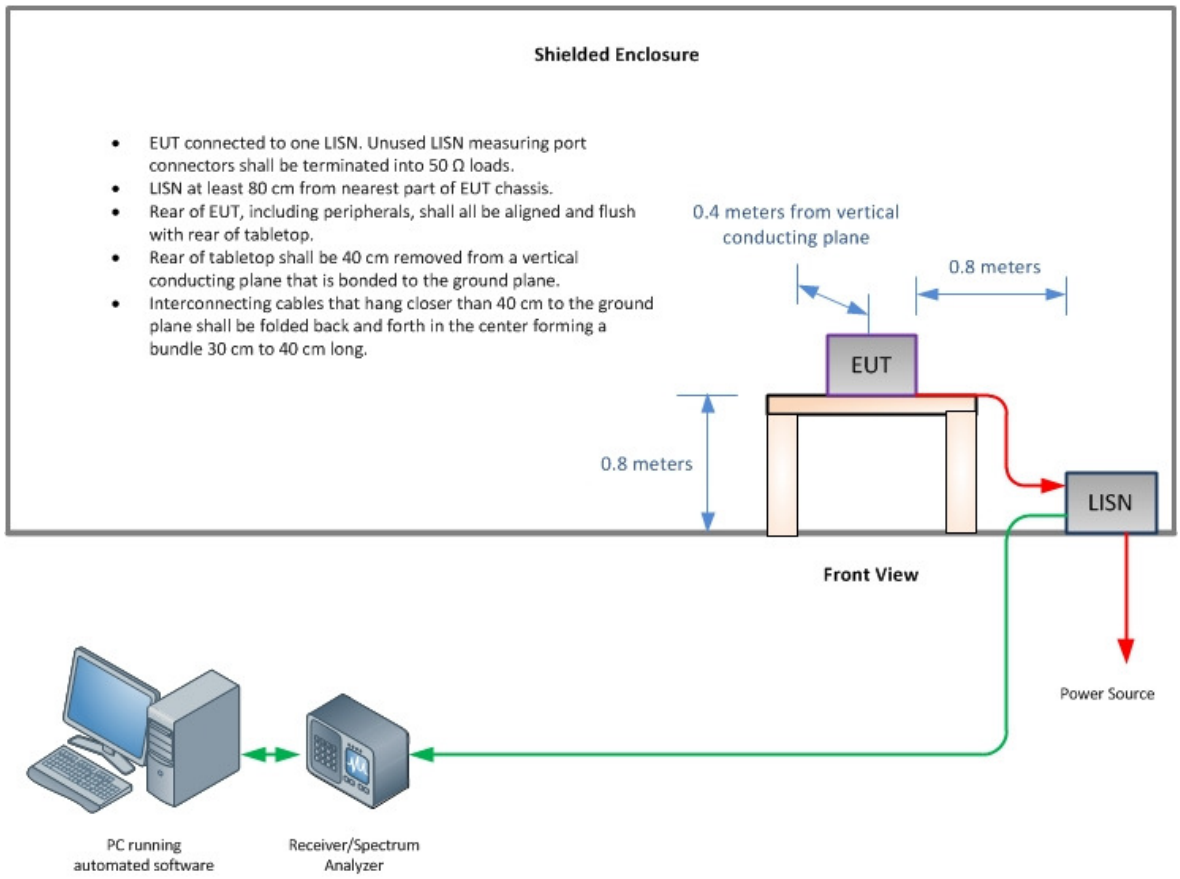
Radiated Emission Test Setup (Above 1GHz)



Substitution Test Method (Above 1GHz, if applicable)



Frequency Stability Test Comfiguration



Conducted Emissions Test Configuration (if applicable)

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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