DEKRA Certification, Inc.
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Sterling, VA 20164
United States of America

DEKRA

ACCREDITED
Test Lab
Cert 2764.01

FCC LISTED, REGISTRATION NUMBER: 2764.01

ISED LISTED REGISTRATION NUMBER: 23595-1

Test report No:
2569ERM.002A3

Test report

REFERENCE STANDARD:
USA FCC Part 22
CANADA ISED RSS-132

Identification of item tested	Cellular communication module
Trademark	Sequans Communications
Model and /or type reference	SKY66430
Other identification of the product	FCC ID: 2AAGM66430 IC: 12732A-66430
Features	LTE-M, 3GPP E-UTRA Release 13 compliant
Manufacturer	SKYWORKS SOLUTIONS INC 20 SYLVAN RD, WOBURN, MA 01801, USA
Test method requested, standard	USA FCC Part 22 10-1-18 Edition CANADA IC RSS-132 Issue 3, Jan. 2013. Measurement Guidance 971168 D01 v02r02 for certification of Licensed Digital Transmitters. ANSI C63.26 – 2015.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, o=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US Date: 2019.11.25 21:51:03 -05'00'
Date of issue	11-25-2019
Report template No	FDT08_21

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Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01.

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Certification internal document PODT000.

Frequency (MHz)	U(k=2)	Units
30-180	3.82	dB
180-1000	2.61	dB
1000-18000	2.92	dB
18000-40000	2.15	dB

Data provided by the client

The SKY66430 is a multi-band module supporting cellular LTE-M/NB-IoT (half-duplex FDD) platforms

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
2569.003	Cellular Module (LTE Cat M Radio)	SKY66430	SKY-19-16-0014	6/27/2019
2569.005	Antenna	90200	62844	6/27/2019
2569.010	Connector (for DC power)	-	-	6/27/2019

1. Sample S/01 was used for the following test(s):

   All conducted and radiated tests indicated in appendix A.

Test sample description

Ports…… :	Port name and description	Cable			
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)
	USB port X	2	☒	☐	☐
	USB port Y		☐	☐	☐
Supplementary information to the ports…… :	No Data provided				

Rated power supply.....:	Voltage and Frequency		Reference poles			
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 5V USB port					
	☐	DC:					

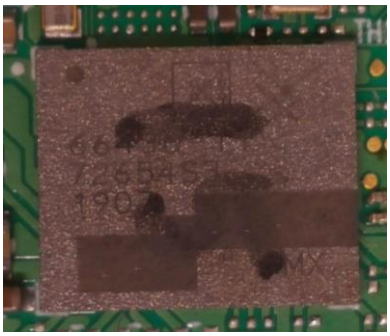
Rated Power.....:	No Data provided
Clock frequencies .....:	No Data provided
Other parameters .....:	No Data provided
Software version.....:	5.2.1.0(42790)
Hardware version .....:	SKY66430-11
Dimensions in cm (W x H x D).....:	No Data provided

Mounting position .....:	☒	Table top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held equipment
	☐	Other: Car Equipment

Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	SKY66430 EK	Eval Kit	Skyworks

Accessories (not part of the test item) .....:	Description	Type	Manufacturer
	USB cable		
	Antenna http://www.aaronia.com/Datasheets/Antennas/Aaronia_Broadband_Antenna_OmniLOG_90200_datasheet.pdf		
Documents as provided by the applicant .....:	Description	File name	Issue date
	FDT30_15 Data Declaration Equipment Data	FDT30_15 Declaration Equipment Data v1.1-SKY66430	
	EK User Manual	SKY66430-11_205375A_AN_EVB_User_Manual.pdf	May 6 2019

Copy of marking plate:



Identification of the client

SEQUANS COMMUNICATIONS

55 Boulevard Charles de Gaulle, 92700 Colombes

Testing period and place

Test Location	DEKRA Certification, Inc.
Date (start)	07-01-2019
Date (finish)	11-14-2019

Document history

Report number	Date	Description
2569ERM.002	09-20-2019	First release
2569ERM.002A1	10-10-2019	Second release
2569ERM.002A2	11-15-2019	Third release
2569ERM.002A3	11-25-2019	Fourth release

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 2569ERM.002A2 related with the same samples, in the next clauses and sub-clauses:

Clauses/ Sub-Clauses	Modification	Justification
TEST A.6: Spurious Emissions at antenna terminals at Block Edges	All plots were replaced	To comply with RB configuration requirement

This modification test report cancels and replaces the test report 2569ERM.002A2

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semi anechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Sravani Gollamudi, Poojita Bhattu, and Koji Nishimoto.

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

FCC PART 22 / IC RSS-132 PARAGRAPH					
Report Section	**FCC Spec Clause**	**RSS Spec Clause**	**Test Description**	**Verdict**	**Remark**
A.1	§2.1046 and §22.913	RSS-132 Clause 5.4	RF Output power	P	N/A
A.2	§2.1047	RSS-132 Clause 5.2	Modulation characteristics	P	N/A
A.3	§2.1055 and §22.355	RSS-132 Clause 5.3	Frequency stability	P	N/A
A.4	§2.1049	RSS-132 Clause 5.1	Occupied Bandwidth	P	N/A
A.5	§2.1051 and §22.917	RSS-132 Clause 5.5	Spurious emissions at antenna terminals	P	N/A
A.6	§22.917	RSS-132 Clause 5.5	Spurious emissions at antenna terminals at Block edges	P	N/A
A.7	§2.1053 and §22.917	RSS-132 Clause 5.5	Radiated emissions	P	N/A
Supplementary information and remarks: N/A					

List of equipment used during the test

Conducted Measurements

CONTROL NUMBER	DESCRIPTION	LAST CALIBRATION	NEXT CALIBRATION
1039	Signal analyzer Rohde & Schwarz FSV40	2018/10	2020/10
1149	Wideband Radio Communication Tester Rohde & Schwarz CMW 500	2018/07	2020/07
1041	EMI Test Receiver Rohde & Schwarz ESR 7	2017/04	2019/10
101	Climatic chamber Espec	2019/10	2020/10

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	LAST CALIBRATION	NEXT CALIBRATION
1179	Semi anechoic Absorber Lined Chamber Frankonia SAC 3 plus “L”	N/A	N/A
1064	BiconicalLog antenna ETS LINDGREN 3142E	2018/01	2021/01
1057	Double-ridge Waveguide Horn antenna 1-18 GHz	2017/03	2020/03
1012	Spectrum analyzer Rohde & Schwarz ESR26	2018/09	2020/09
1014	Spectrum analyzer Rohde & Schwarz FSV40	2019/04	2021/04

Appendix A: Test Results for FCC Part 22/ IC RSS-132

Appendix A Content

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PRODUCT INFORMATION

The following information is provided by the client

Information	Description
Modulation	LTE: QPSK, QAM
Maximum RF Output Power	LTE: 23 dBm
Operation mode:	
- Operating Frequency Range	LTE: Band 5
- Nominal Channel Bandwidth	LTE Band 5: 5 / 10 MHz
Extreme operating conditions	
- Temperature range	T_{nom} = +15 to + 25 T_{min} = -30 T_{max} = +50
Antenna type	Radial Isotropic Antenna.
Antenna gain	2 dBi
Nominal Voltage	
- Supply Voltage	3.8 Vdc
- Type of power source	DC voltage from power supply.

DESCRIPTION OF TEST CONDITIONS

The worst case was found when positioned as the table below. Following channel(s) was (were selected for the final test as listed below:

<table>
<tr><th>TEST CONDITIONS</th><th>DESCRIPTION</th></tr>
<tr><td>TC#01
LTE Band 5</td><td>
<u>Power supply (V):</u>
$V_{nominal}$ = 3.8 Vdc

<u>Test Frequencies for Conducted tests:</u>

<u>5 MHz Bandwidth</u>:
-Lowest Channel: 20425 (826.5 MHZ)
-Middle Channel: 20525 (836.5 MHz)
-Highest Channel: 20625 (846.5 MHz)
<u>10 MHz Bandwidth</u>:
-Lowest Channel: 20450 (829 MHZ)
-Middle Channel: 20525 (836.5 MHz)
-Highest Channel: 20600 (844 MHz)

<u>Test Frequencies for Radiated tests:</u>
<table>
<tr><th>Available Frequencies</th><th>Tested Frequency</th><th>Channel Bandwidth</th><th>Modulation</th><th>Mode</th></tr>
<tr><td>824 to 849 MHz</td><td>826.5 MHz
836.5 MHz
846.5 MHz</td><td>5 MHz</td><td>QPSK</td><td>1 RB</td></tr>
</table>
Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case found in QPSK modulation.
</td></tr>
</table>

TEST A.1: RF OUTPUT POWER

LIMITS:	Product standard:	FCC Part 22 / IC RSS-132
	Test standard:	FCC §2.1046 and §22.913 / RSS-132 Clause 5.4

LIMITS

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

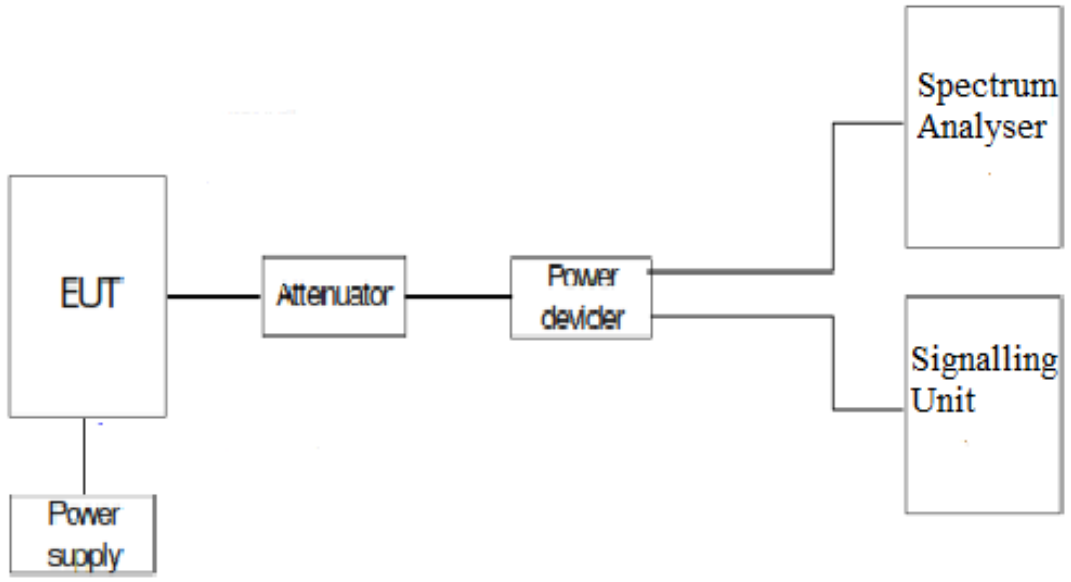
The peak-to-average ratio (PAR) of the transmission shall not exceed 13 dB.

RSS-132 Clause 5.4

The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts. Refer to SRSP-503 for base station e.i.r.p. limits.

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

TEST SETUP



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

LTE QPSK AND 16QAM MODULATION. Bandwidth = 5 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)	PAPR (dB)
Lowest	23.15	2.0	25.15	6.46
Middle	22.41	2.0	24.41	8.55
Highest	22.49	2.0	24.49	8.12
Measurement uncertainty (dB)			<±0.95	

LTE QPSK AND 16QAM MODULATION. Bandwidth = 10 MHz

Channel	Average power at antenna port (dBm)	Maximum declared antenna gain (dBi)	Maximum E.I.R.P. average power (dBm)	PAPR (dB)
Lowest	22.57	2.0	24.57	7.25
Middle	22.50	2.0	24.50	7.33
Highest	22.54	2.0	24.54	9.86
Measurement uncertainty (dB)			<±0.95	

TEST RESULTS (Cont):

Band	Channel / Freq. (MHz)	Modulation	RB No.	RB offset	Conducted Output Power (dBm)	PAPR
Band 5 5 MHz	20425 826.5	QPSK	1	0	21.38	6.46
			6	0	23.15	
		16-QAM	1	0	21.95	6.41
			1	5	22.45	
			5	0	20.45	
			5	1	20.45	
	20525 836.5	QPSK	1	0	21.63	5.88
			6	0	22.41	
		16-QAM	1	0	21.41	8.55
			1	5	22.20	
			5	0	20.53	
			5	1	20.50	
	20625 846.5	QPSK	1	0	22.49	8.12
			6	0	21.57	
		16-QAM	1	0	22.38	7.62
			1	5	22.37	
			5	0	20.72	
			5	1	20.64	

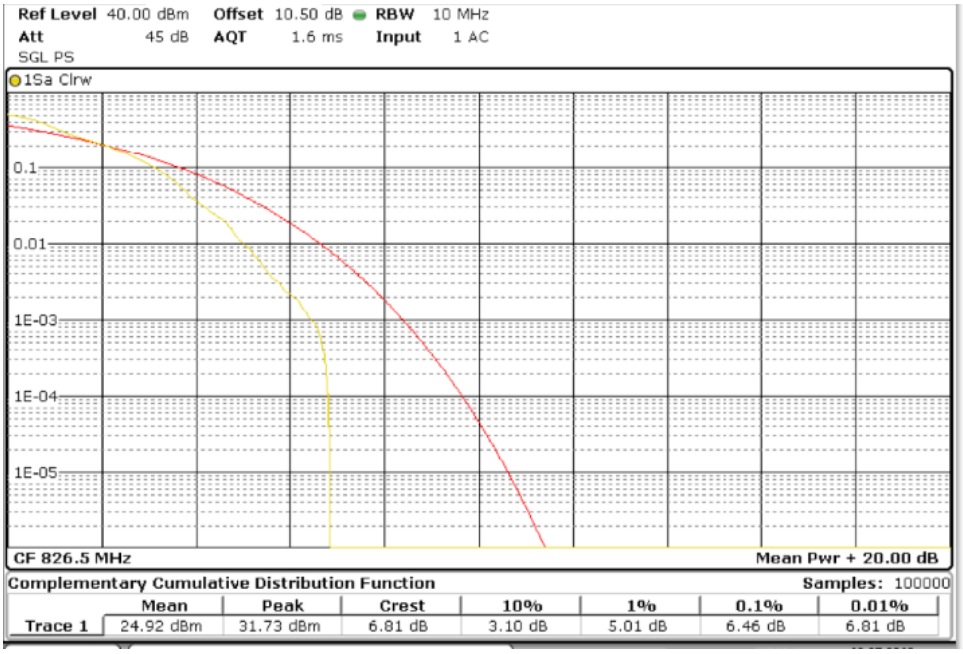
TEST RESULTS (Cont):

Band	Channel / Freq. (MHz)	Modulation	RB No.	RB offset	Conducted Output Power (dBm)	PAPR
Band 5 10 MHz	20450 829	QPSK	1	0	22.50	5.22
			6	0	21.56	
		16-QAM	1	0	22.53	7.25
			1	5	22.57	
			5	0	21.55	
			5	1	21.55	
	20525 836.5	QPSK	1	0	22.46	7.16
			6	0	21.63	
		16-QAM	1	0	22.50	7.33
			1	5	22.49	
			5	0	21.62	
			5	1	21.64	
	20600 844	QPSK	1	0	22.54	7.07
			6	0	21.68	
		16-QAM	1	0	22.61	9.86
			1	5	22.54	
			5	0	21.54	
			5	1	21.53	

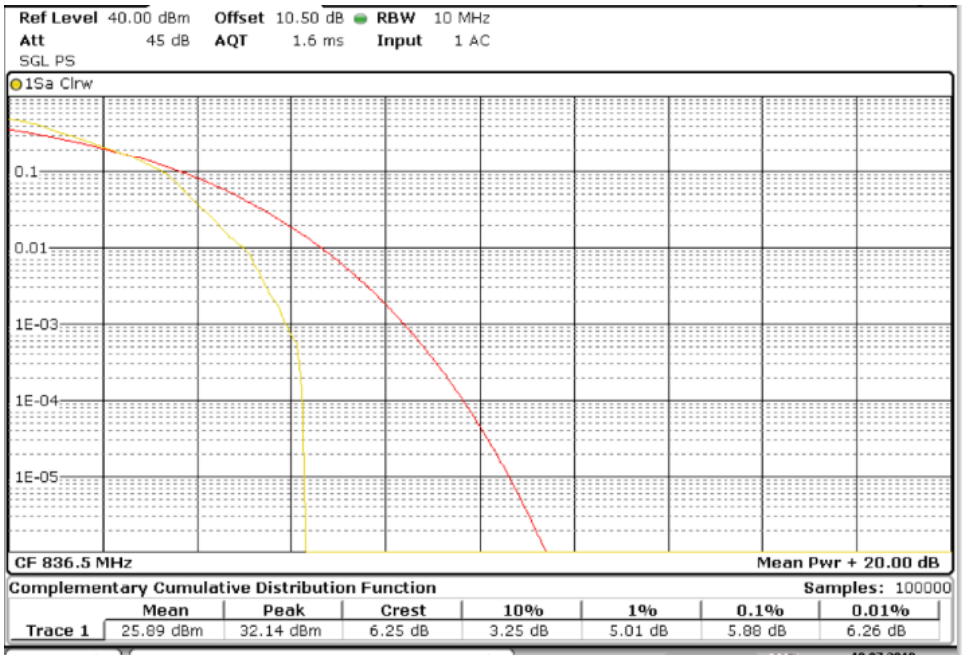
TEST RESULTS (Cont):	

PAPR
Bandwidth = 5 MHz Modulation QPSK. RB Size: 1. RB Offset: 0.

Lowest channel

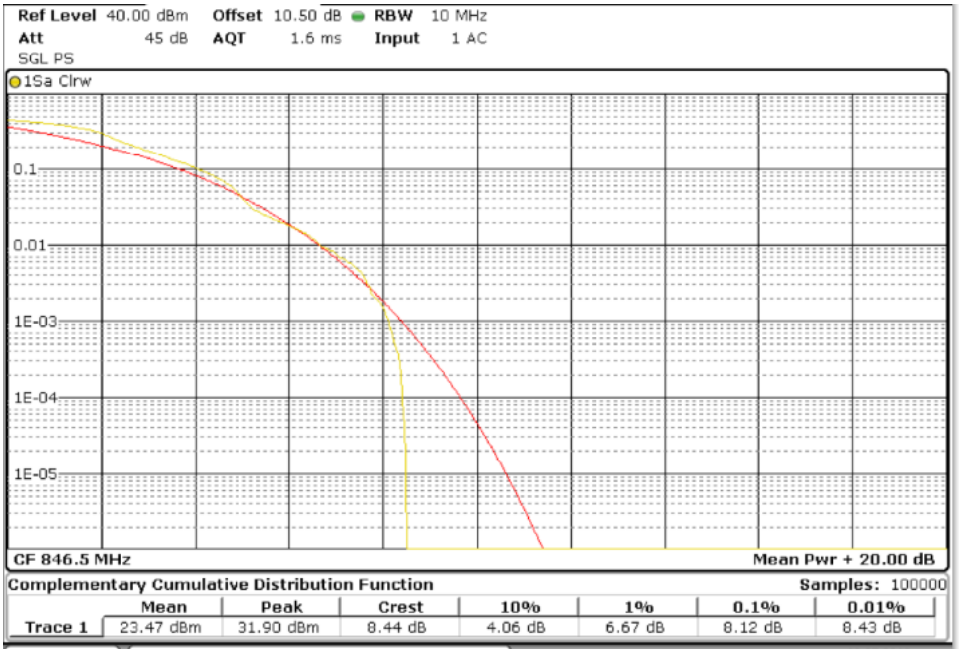


Middle channel



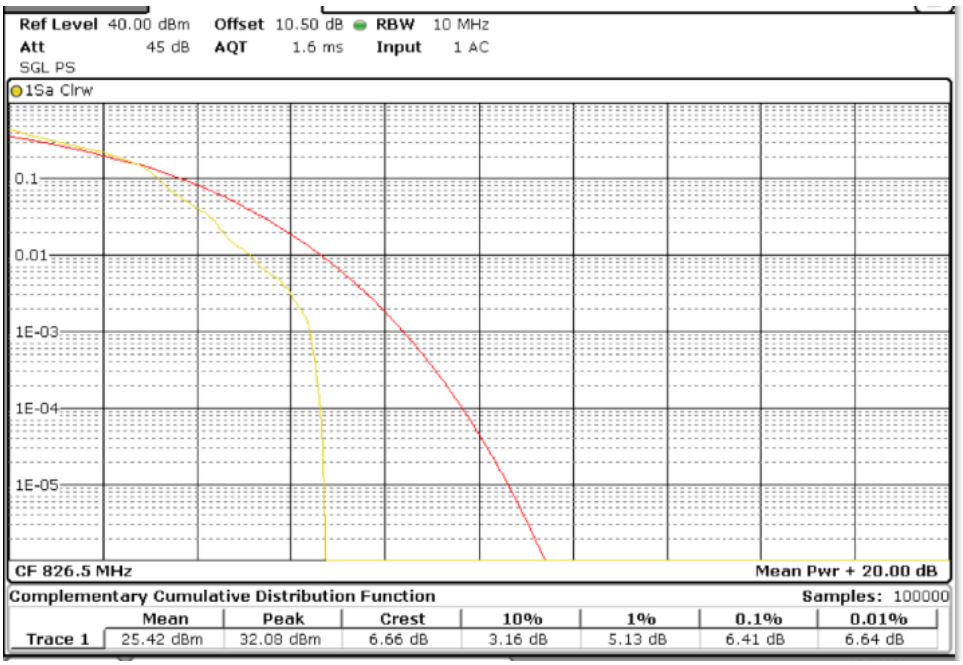
TEST RESULTS (Cont):	

Highest channel



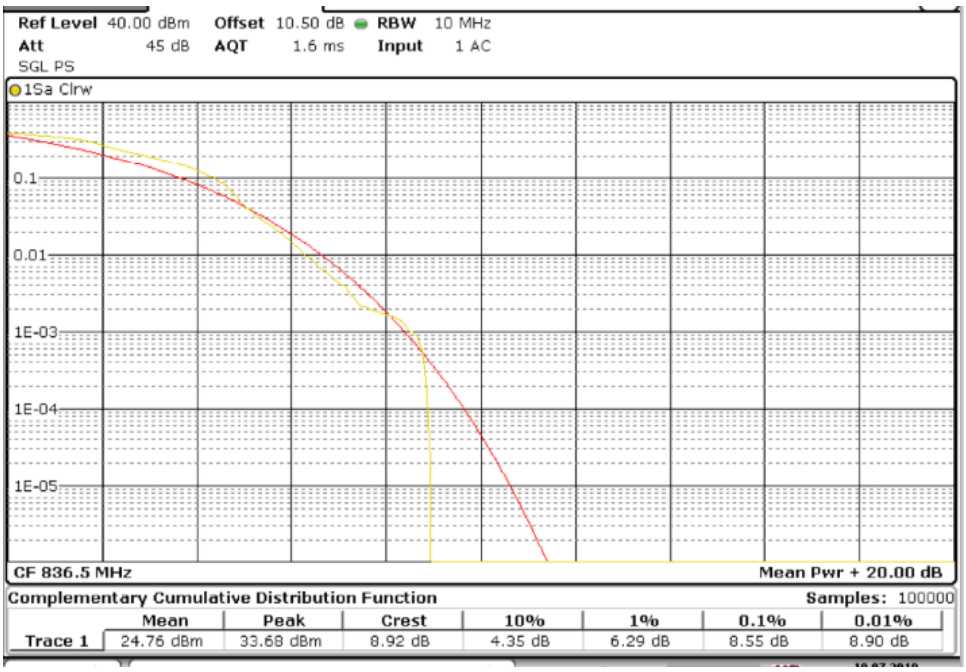
Bandwidth = 5 MHz Modulation 16QAM. RB Size: 1. RB Offset: 0.

Lowest channel

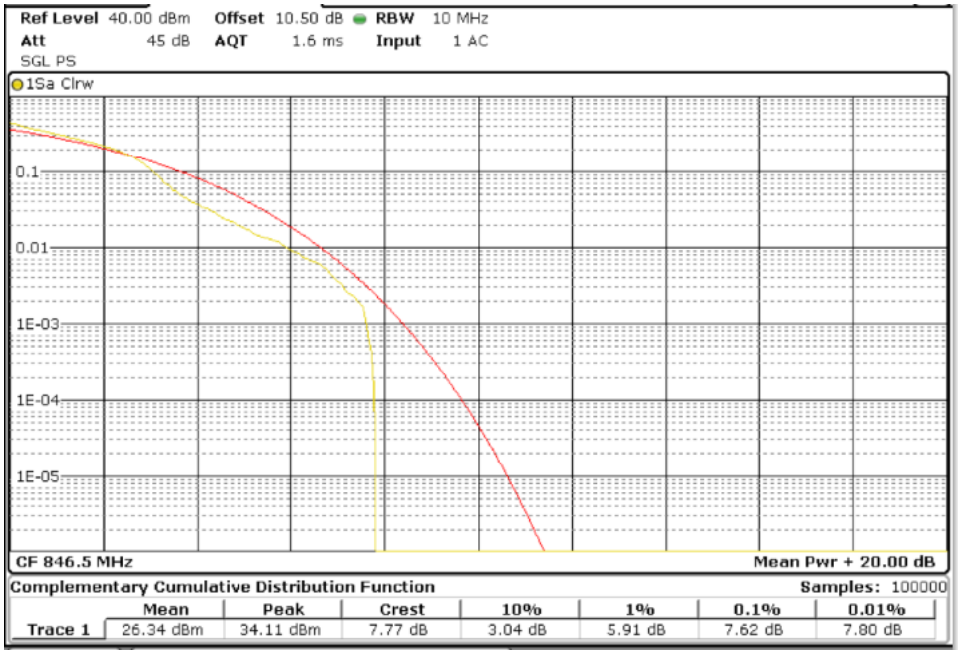


TEST RESULTS (Cont):	

Middle channel



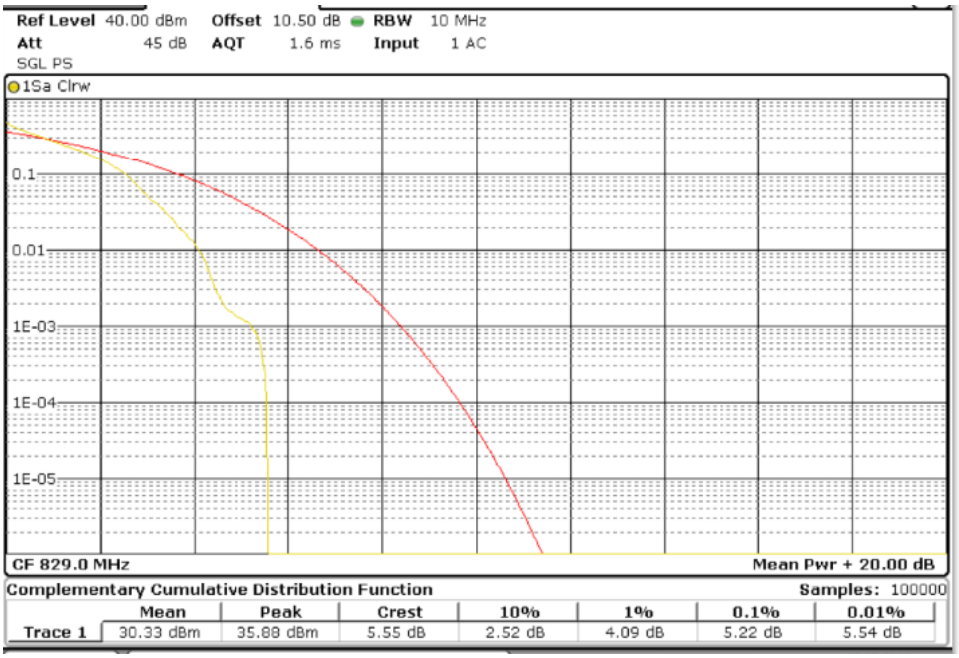
Highest channel



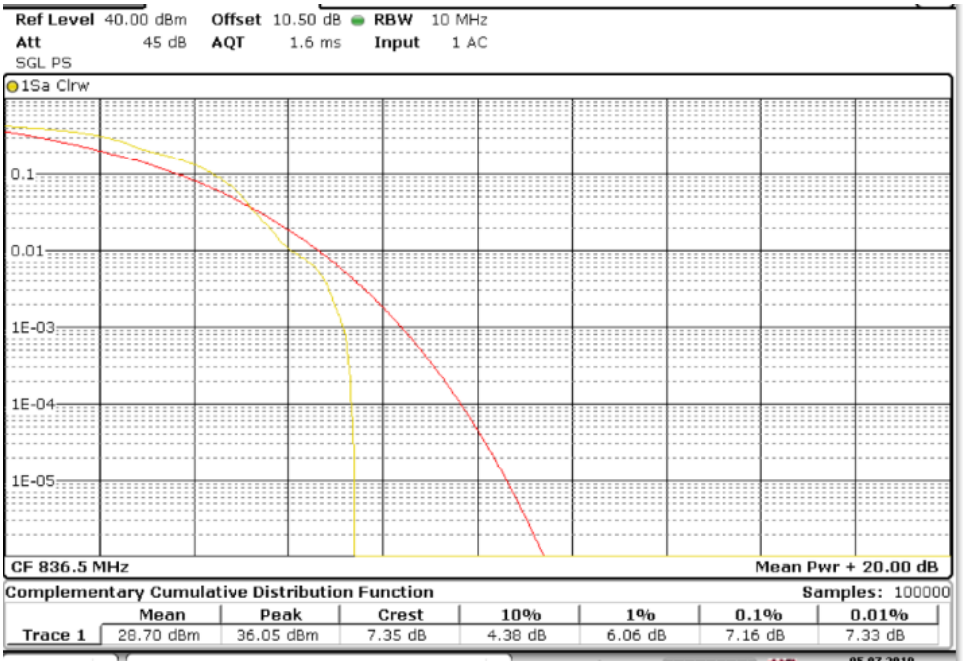
TEST RESULTS (Cont):	

Bandwidth = 10 MHz Modulation QPSK. RB Size: 1. RB Offset: 0.

Lowest channel

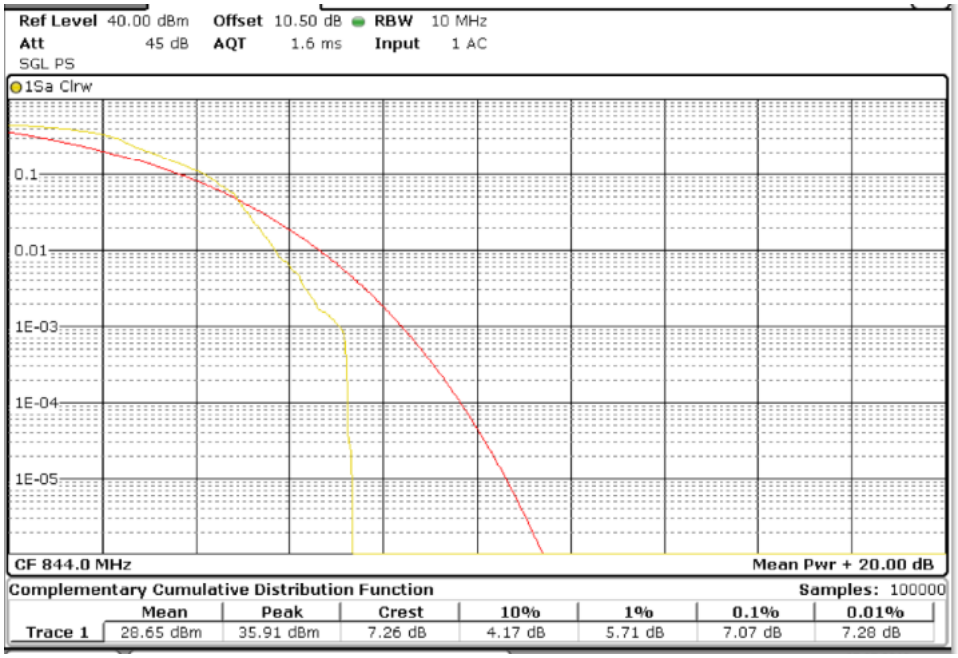


Middle channel



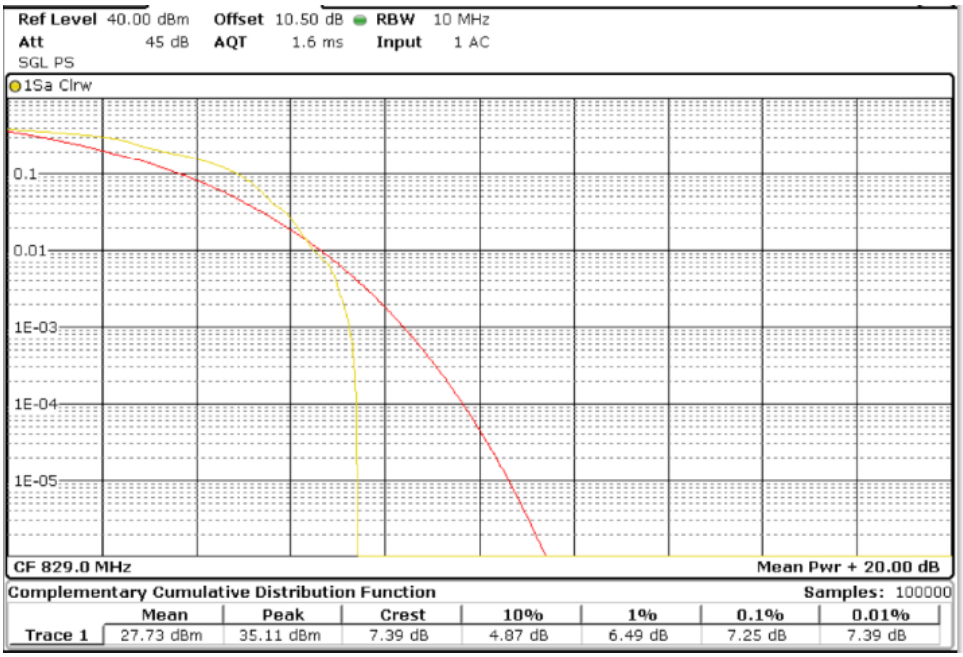
TEST RESULTS (Cont):	

Highest channel



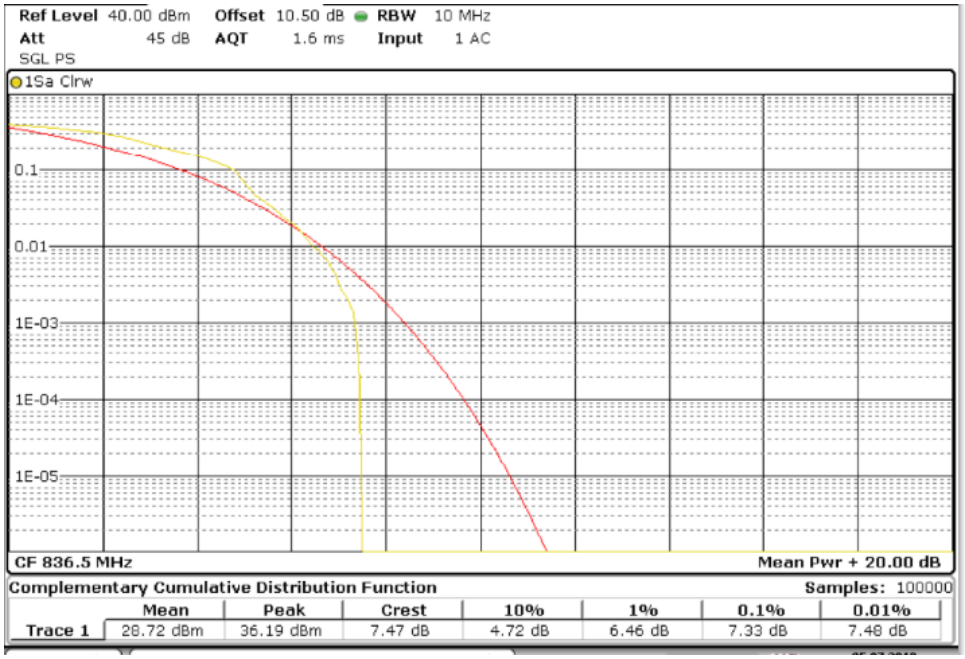
Bandwidth = 10 MHz Modulation 16QAM. RB Size: 1. RB Offset: 0.

Lowest channel

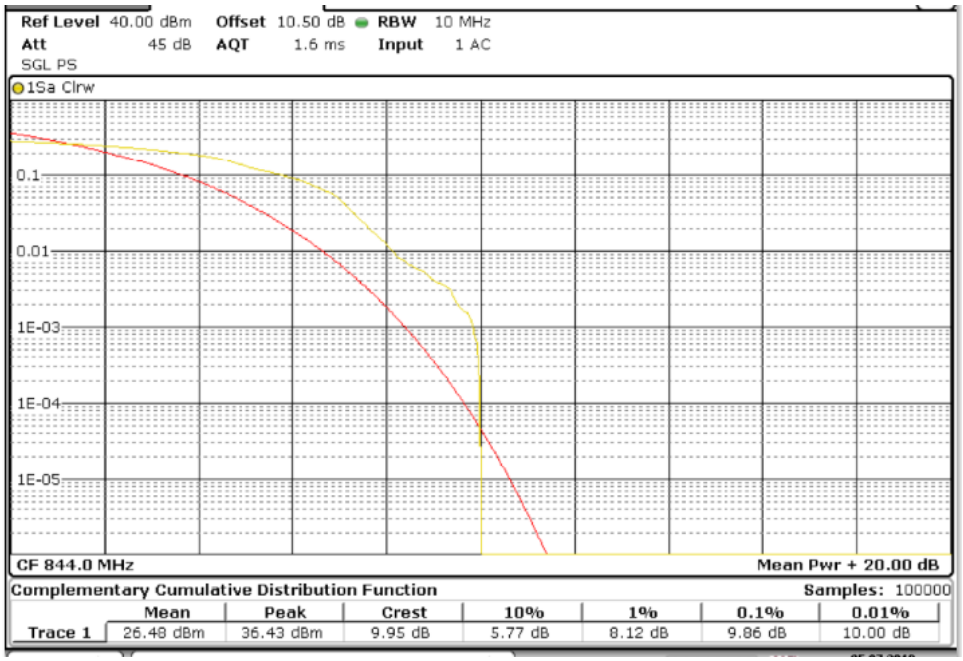


TEST RESULTS (Cont):	

Middle channel



Highest channel



TEST A.2: MODULATION CHARACTERISTICS

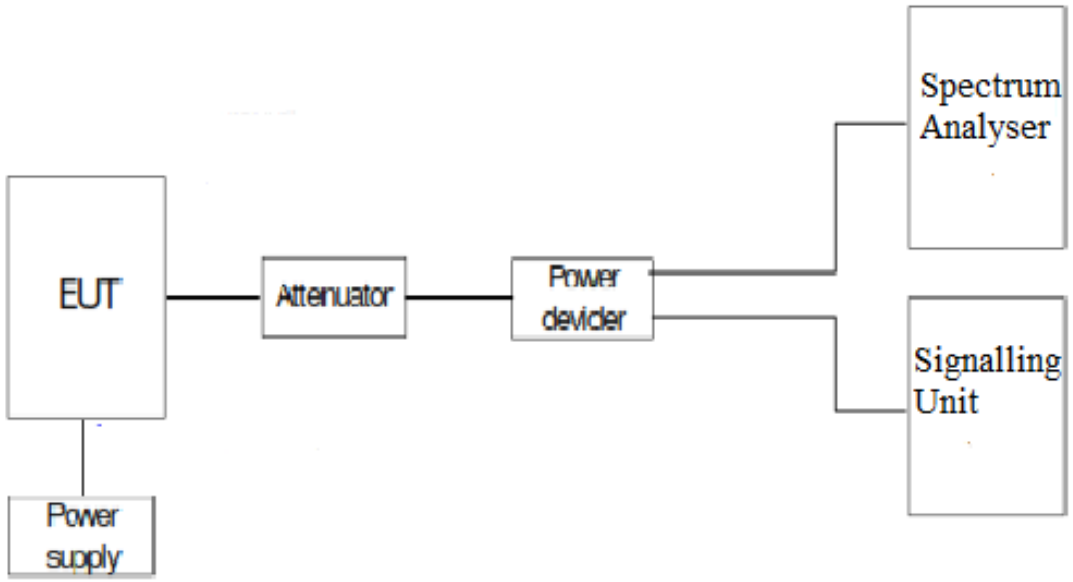
LIMITS:	Product standard:	FCC Part 22 / IC RSS-132
	Test standard:	FCC §2.1047 / RSS-132 Clause 5.2

LIMITS

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

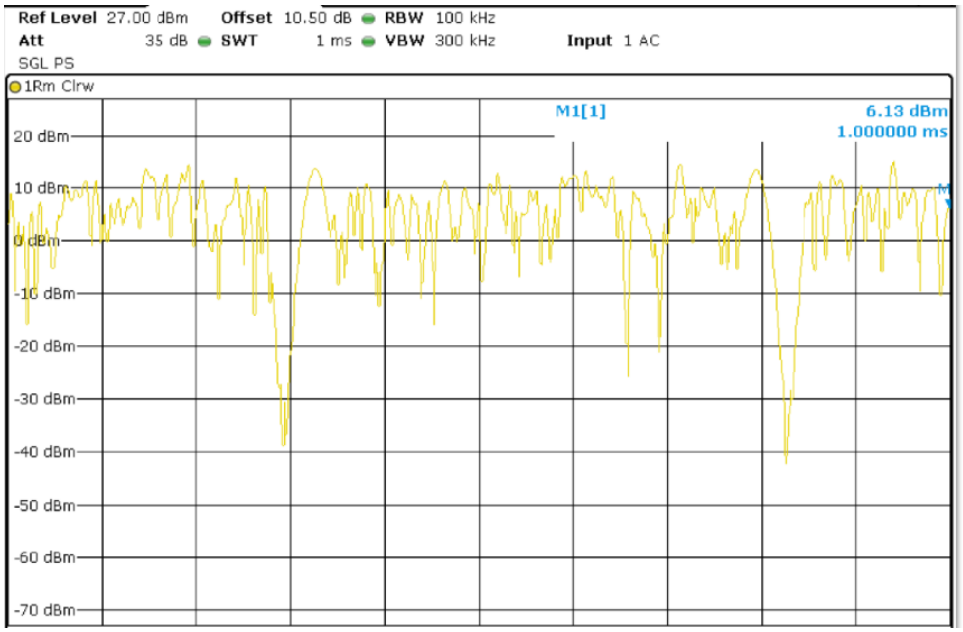
TEST SETUP	

For LTE the EUT operates with QPSK and 16QAM modulation modes in which the information is digitized and coded into a bit stream. The RF transmission is multiplexed using Orthogonal Frequency Division Multiplexing (OFDM) using different possible arrangement of subcarriers (Resource Blocks RB).

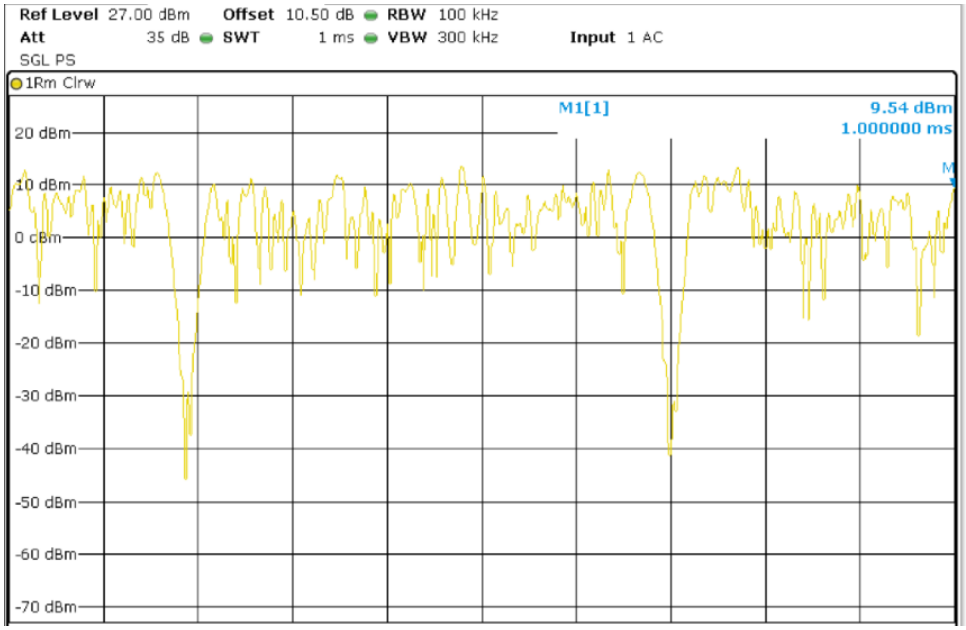


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

QPSK Modulation



16QAM Modulation



TEST A.3: FREQUENCY STABILITY

LIMITS:	Product standard:	FCC Part 22 / IC RSS-132
	Test standard:	FCC §2.1055 and § 22.355 / RSS-132 Clause 5.3

LIMITS

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

TEST SETUP	

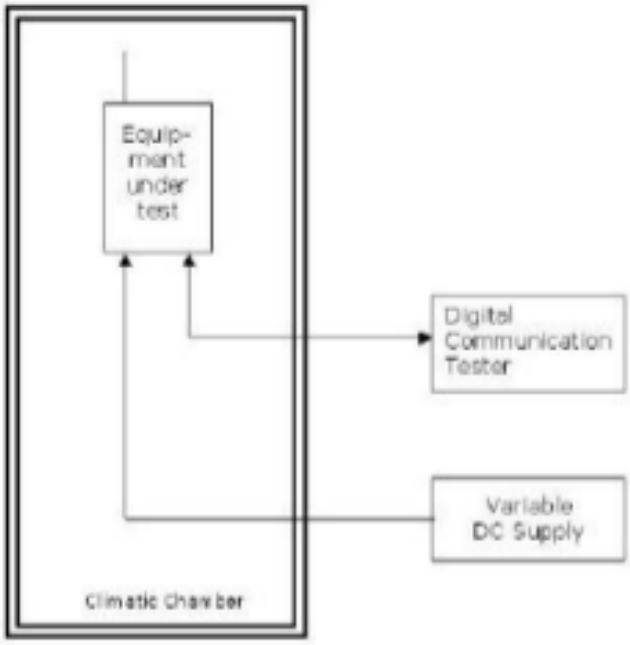
The frequency tolerance measurements over temperature variations were made over the temperature range of

–30ºC to +50ºC. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10ºC steps from –30ºC up to +50ºC.

The supply voltage was varied between 85% and 115% of nominal voltage.

The EUT was set in “call mode” in the middle channel using the Universal Radio Communication Tester R&S CMW500 and the maximum frequency error was measured using the built-in calibrated frequency meter.

For LTE mode the QPSK modulation was used for the test as it is the worst case for conducted power.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

LTE QPSK MODULATION. BW = 5 MHz

Frequency stability over temperature variations

Temperature (ºC)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
50	2.80	0.0033	0.00000033
40	-3.02	-0.0036	-0.00000036
30	-4.61	-0.0055	-0.00000055
20	-2.79	-0.0033	-0.00000033
10	-1.80	-0.0022	-0.00000022
0	-1.10	-0.0013	-0.00000013
-10	3.12	0.0037	0.00000037
-20	1.80	0.0022	0.00000022
-30	-3.28	-0.0039	-0.00000039

Frequency stability over voltage variations

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	Frequency Error (%)
Vmax	4.37	1.47	0.0018	0.00000018
Vmin	3.23	0.79	0.0009	0.00000009

TEST A.4: OCCUPIED BANDWIDTH

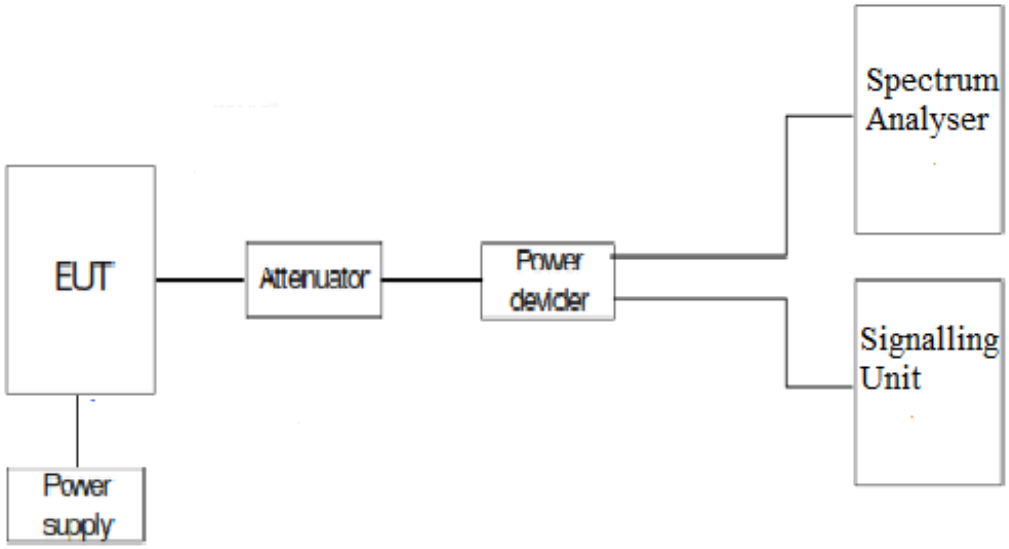
LIMITS:	Product standard:	FCC Part 22 / IC RSS-132
	Test standard:	FCC § 2.1049/ RSS-132 Clause 5.1

LIMITS

Reference only.

TEST SETUP	

The occupied bandwidth measurement was performed at the output terminals of the EUT using an attenuator, power splitter and spectrum analyzer. The EUT was controlled via the Universal Radio Communication Tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation. The 99% occupied bandwidth and the -26 dBc bandwidth were measured directly using the built-in bandwidth measuring option of spectrum analyzer.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

LTE QPSK MODULATION. BW = 5 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.10	1.11	1.11
-26 dBc bandwidth (MHz)	1.41	1.43	1.39

LTE 16QAM MODULATION. BW = 5 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.11	1.11	1.11
-26 dBc bandwidth (MHz)	1.44	1.43	1.43

LTE QPSK MODULATION. BW = 10 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.12	1.11	1.10
-26 dBc bandwidth (MHz)	1.40	1.44	1.42

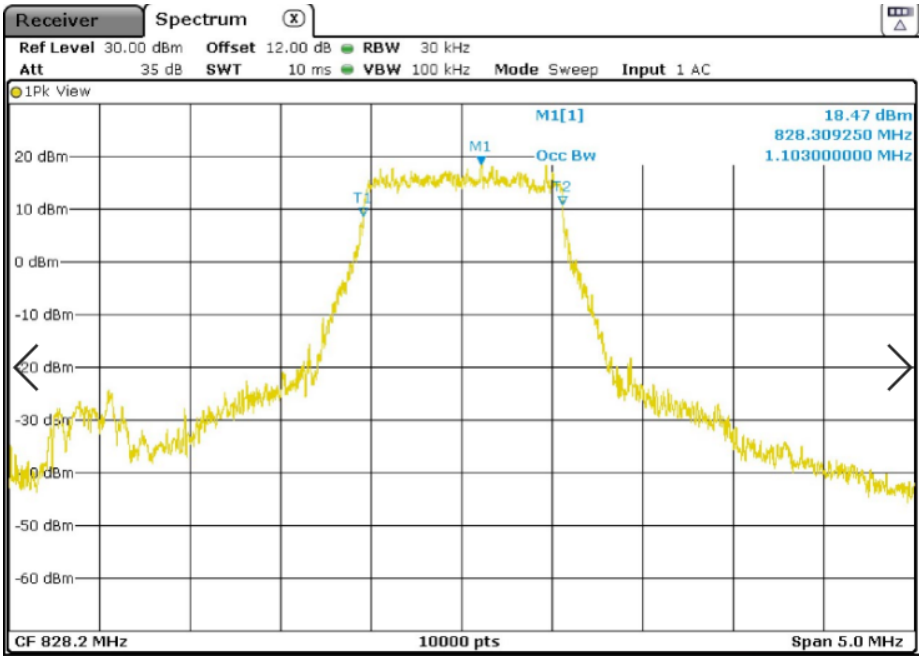
LTE 16QAM MODULATION. BW = 10 MHz

Channel	Lowest	Middle	Highest
99% Occupied bandwidth (MHz)	1.11	1.11	1.11
-26 dBc bandwidth (MHz)	1.44	1.44	1.44

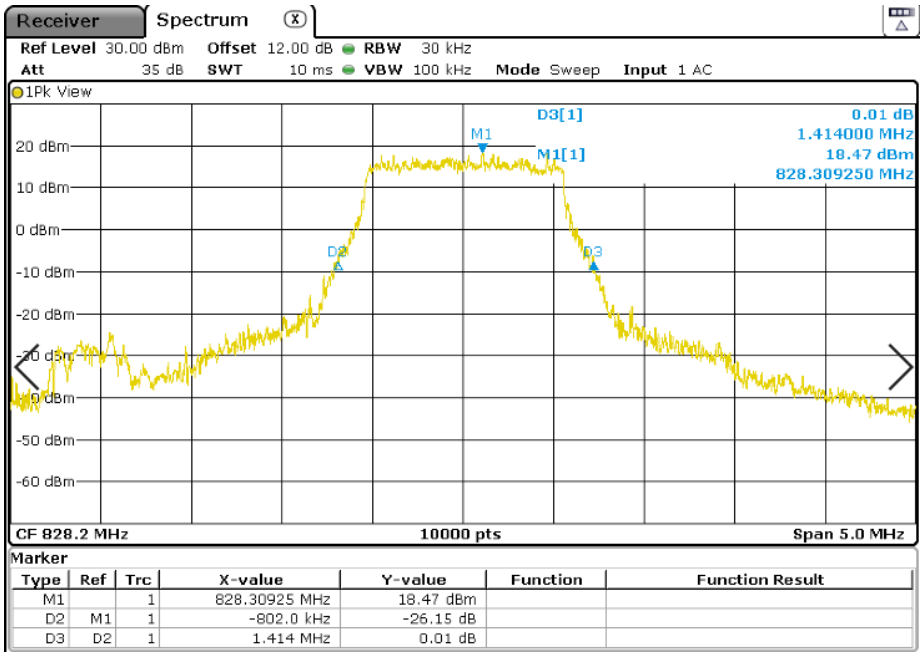
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 5 MHz

Lowest Channel 99% Occupied Bandwidth

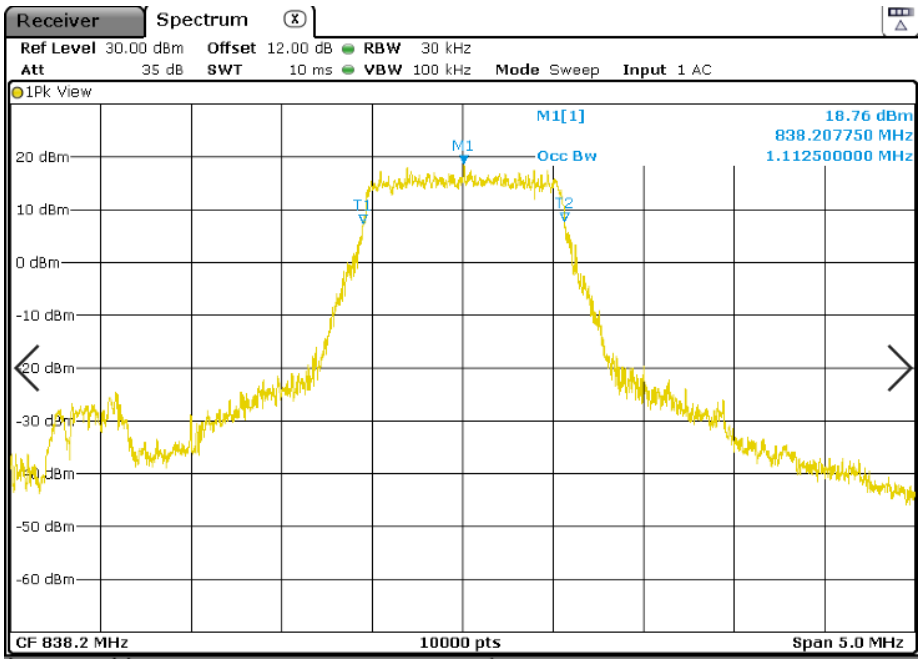


Lowest Channel 26dBc Bandwidth

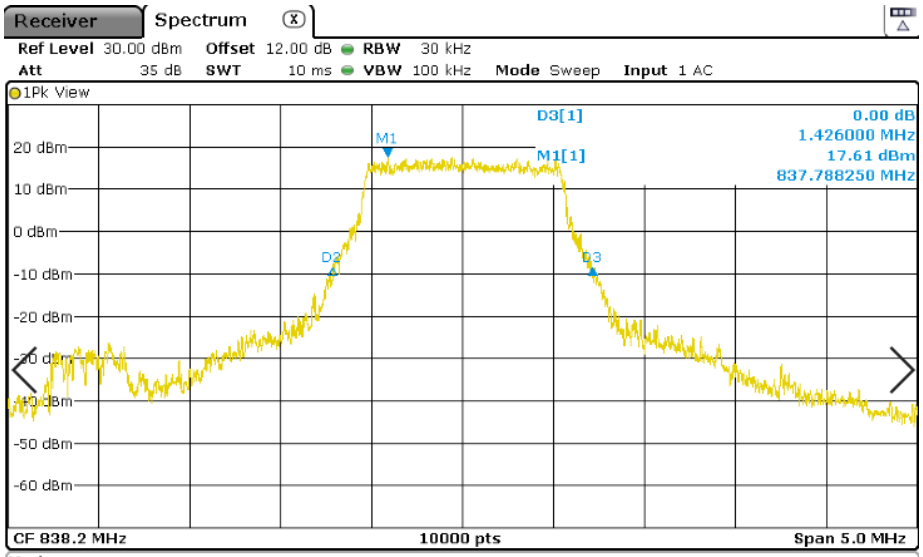


TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth



Middle Channel 26dBc Bandwidth

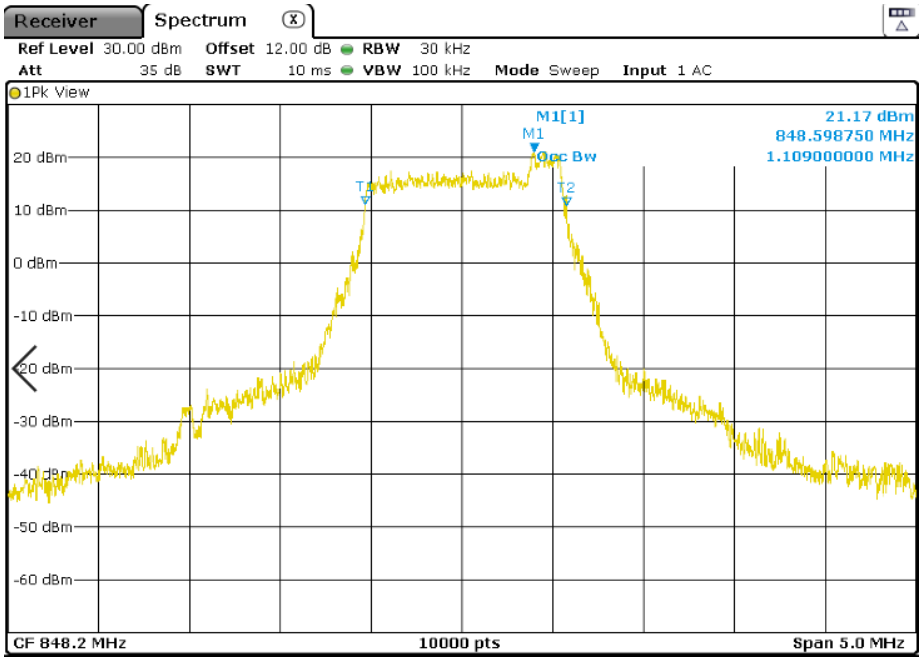


Marker

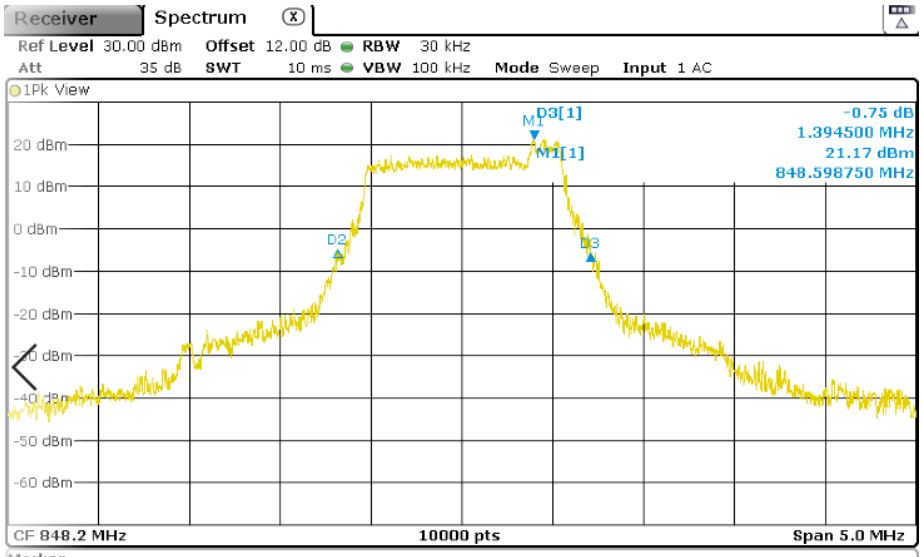
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	837.78825 MHz	17.61 dBm		
D2	M1	1	-302.0 kHz	-26.02 dB		
D3	D2	1	1.426 MHz	0.00 dB		

TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



Highest Channel 26dBc Bandwidth



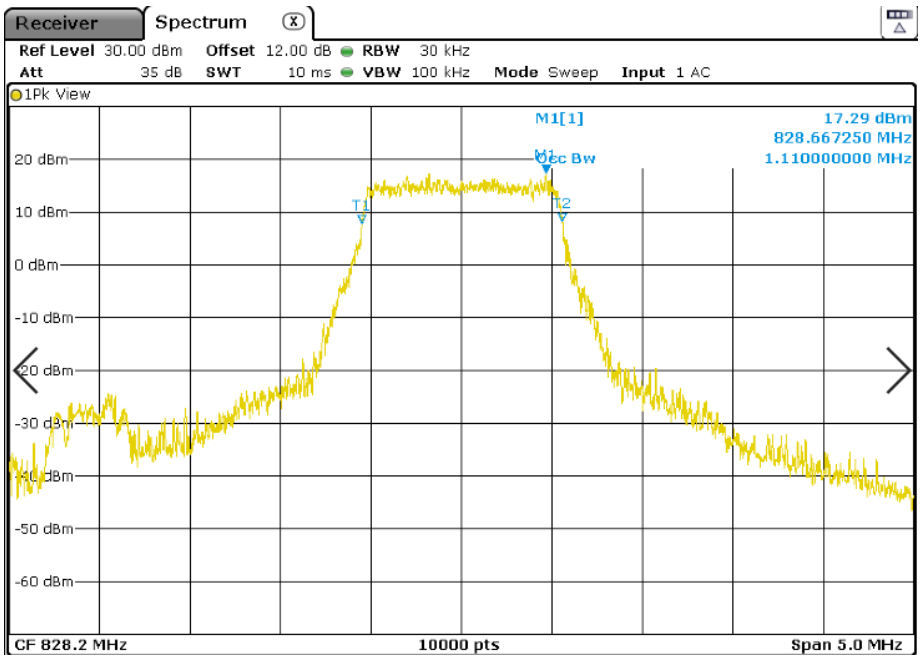
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	848.59875 MHz	21.17 dBm		
D2	M1	1	-1.0845 MHz	-26.17 dB		
D3	D2	1	1.3945 MHz	-0.75 dB		

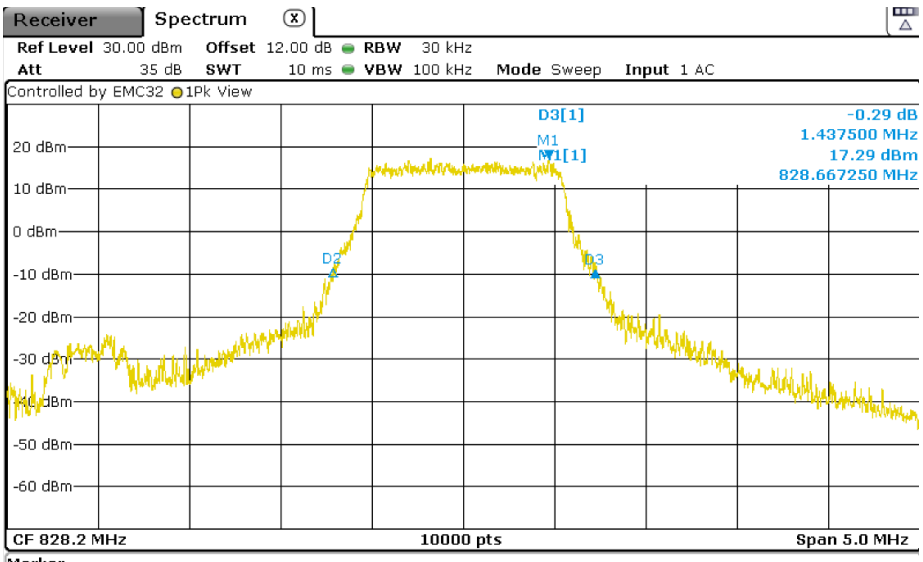
TEST RESULTS (Cont):	

LTE 16QAM MODULATION. BW = 5 MHz

Lowest Channel 99% Occupied Bandwidth



Lowest Channel 26dBc Bandwidth

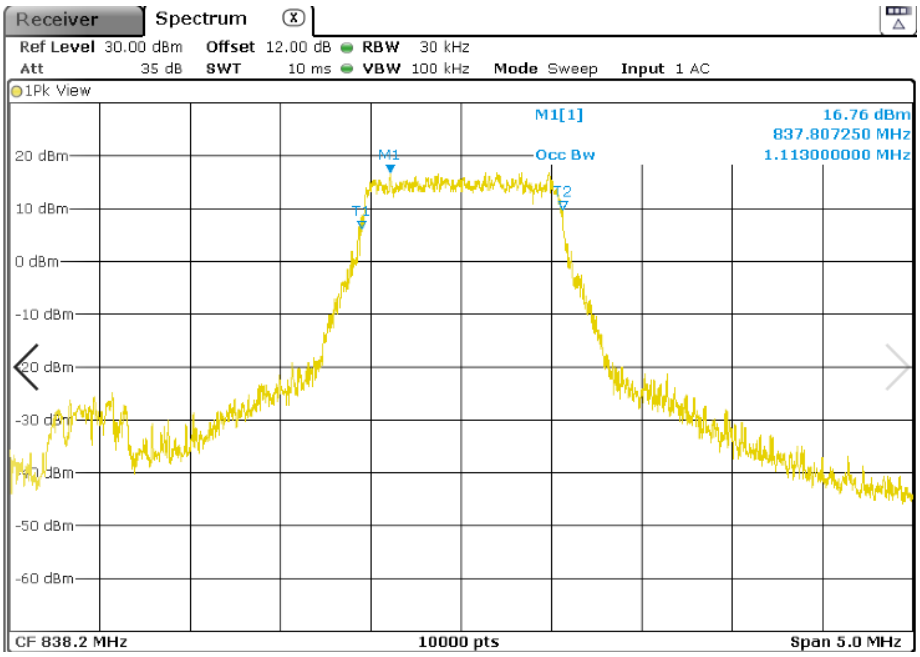


Marker

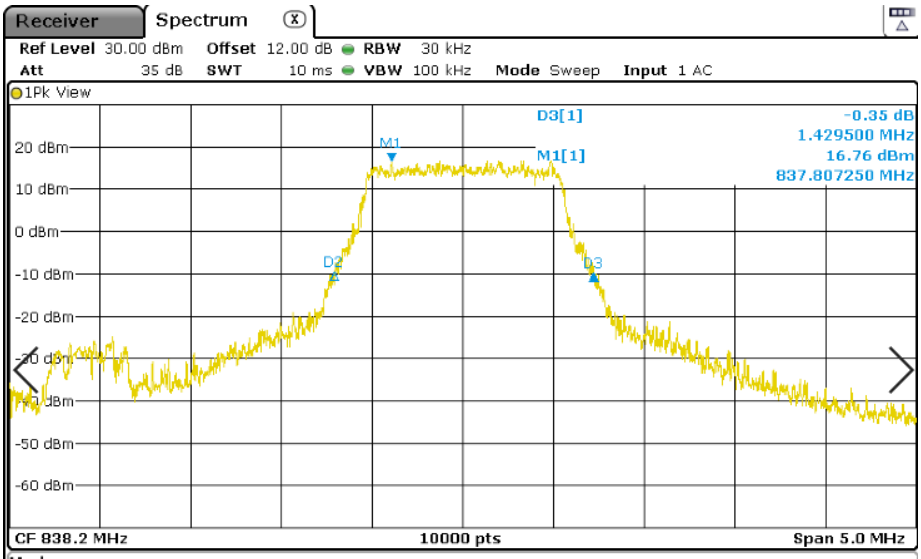
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	828.66725 MHz	17.29 dBm		
D2	M1	1	-1.1825 MHz	-26.04 dB		
D3	D2	1	1.4375 MHz	-0.29 dB		

TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth



Middle Channel 26dBc Bandwidth

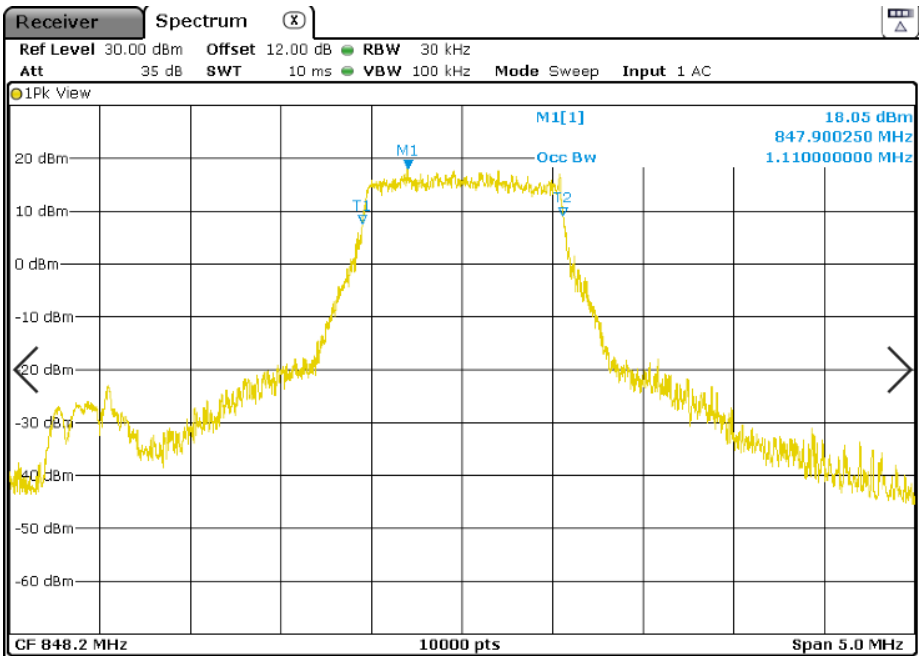


Marker

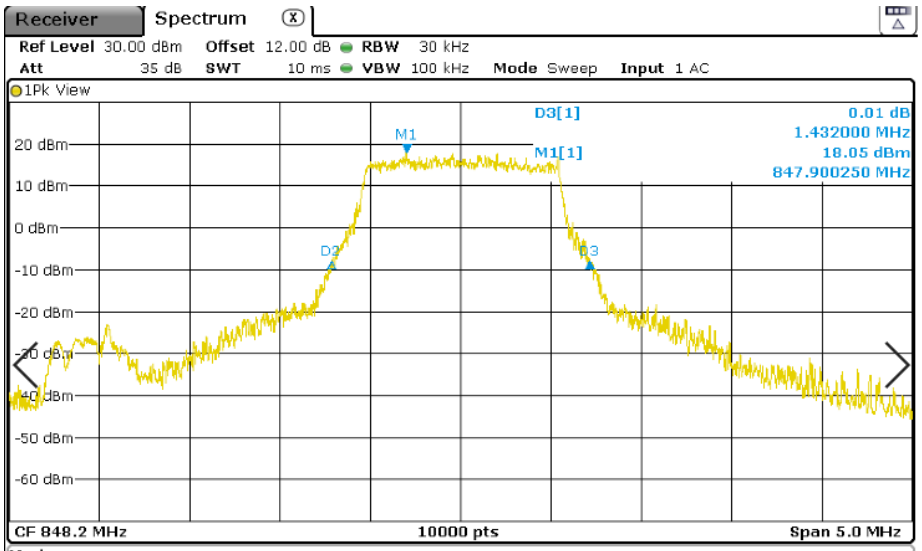
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	837.80725 MHz	16.76 dBm		
D2	M1	1	-315.0 kHz	-26.14 dB		
D3	D2	1	1.4295 MHz	-0.35 dB		

TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



Highest Channel 26dBc Bandwidth



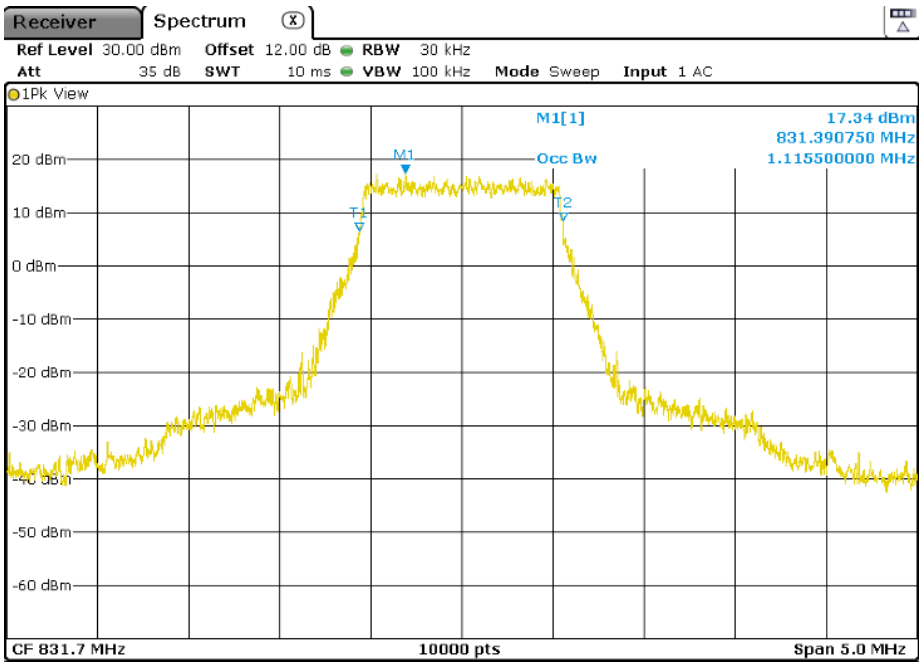
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	847.90025 MHz	18.05 dBm		
D2	M1	1	-418.5 kHz	-26.04 dB		
D3	D2	1	1.432 MHz	0.01 dB		

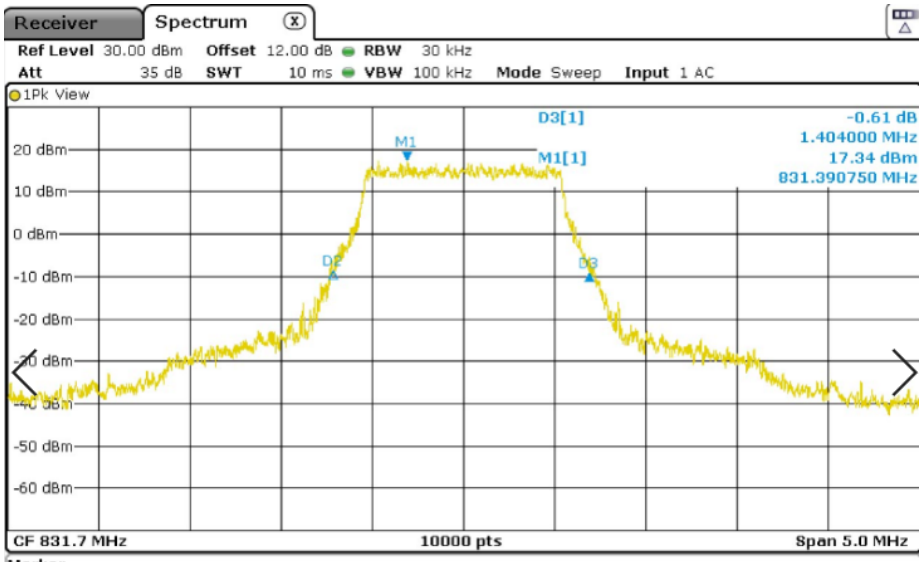
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 10 MHz

Lowest Channel 99% Occupied Bandwidth



Lowest Channel 26dBc Bandwidth

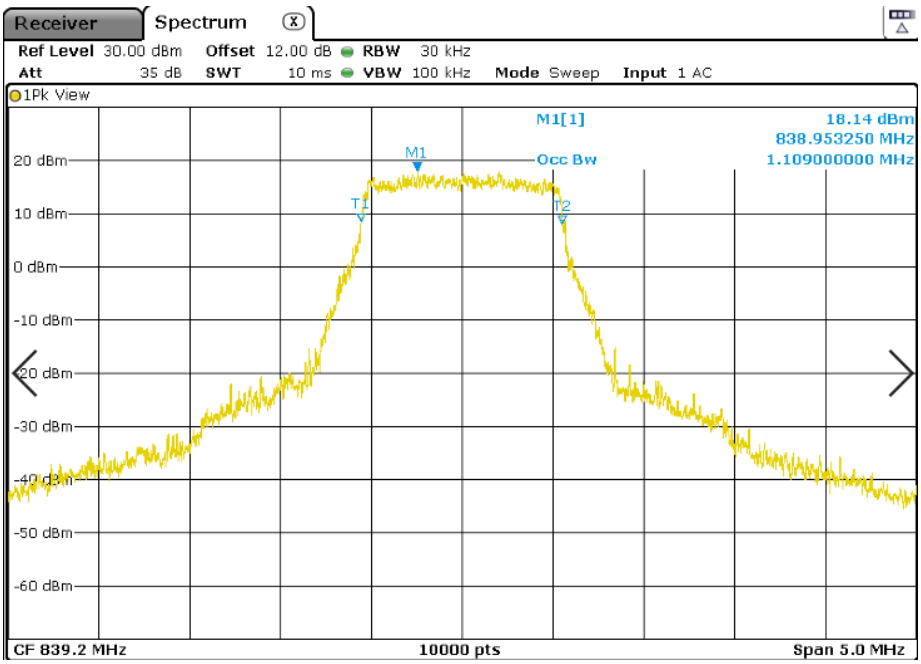


Marker

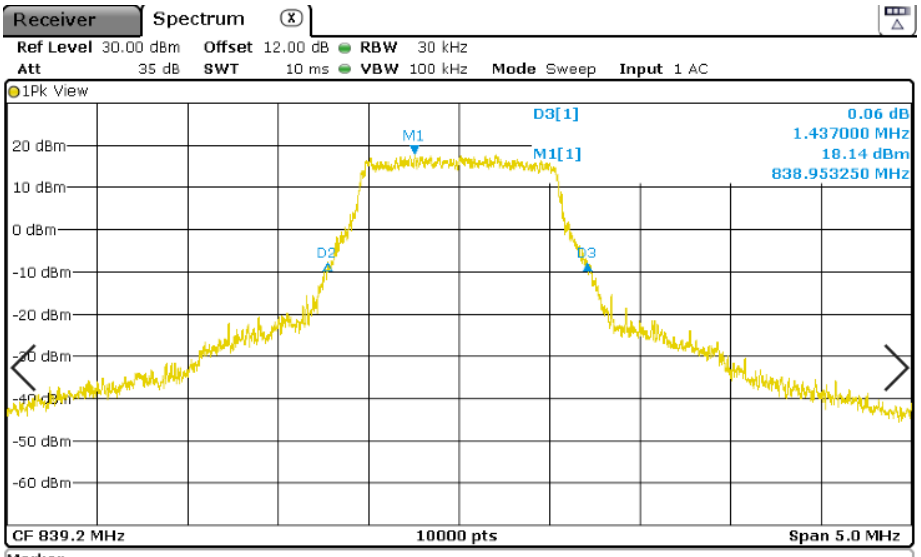
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	831.39075 MHz	17.34 dBm		
D2	M1	1	-403.0 kHz	-26.07 dB		
D3	D2	1	1.404 MHz	-0.61 dB		

TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth



Middle Channel 26dBc Bandwidth

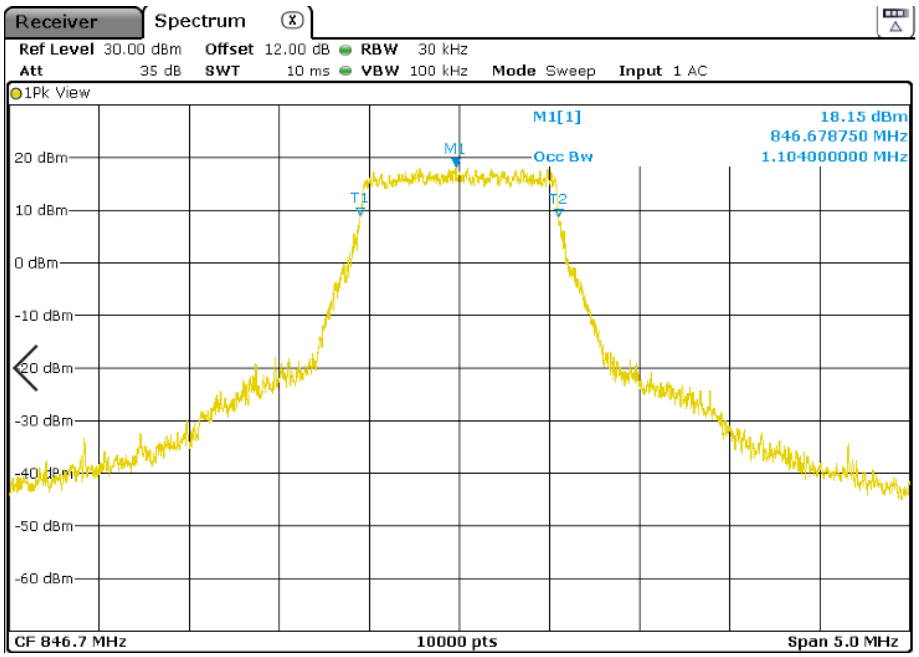


Marker

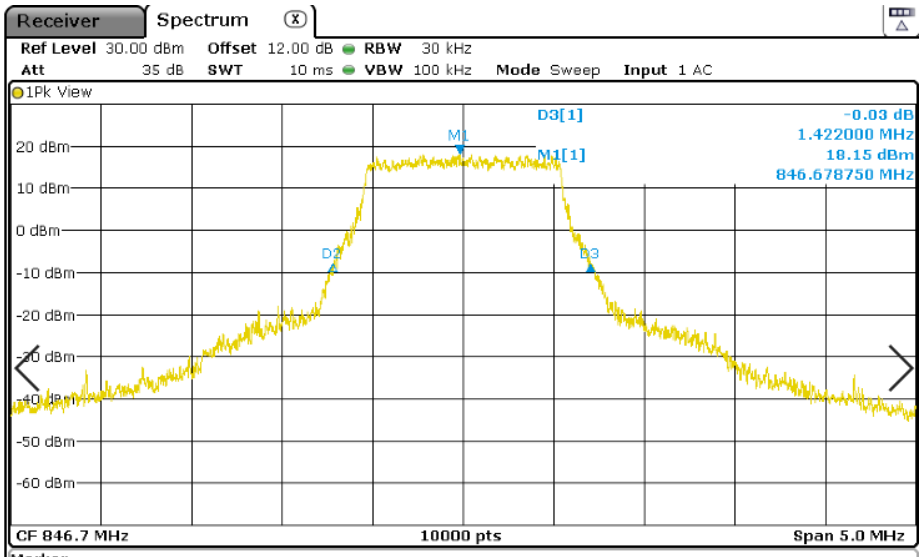
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	838.95325 MHz	18.14 dBm		
D2	M1	1	-481.0 kHz	-26.12 dB		
D3	D2	1	1.437 MHz	0.06 dB		

TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



Highest Channel 26dBc Bandwidth



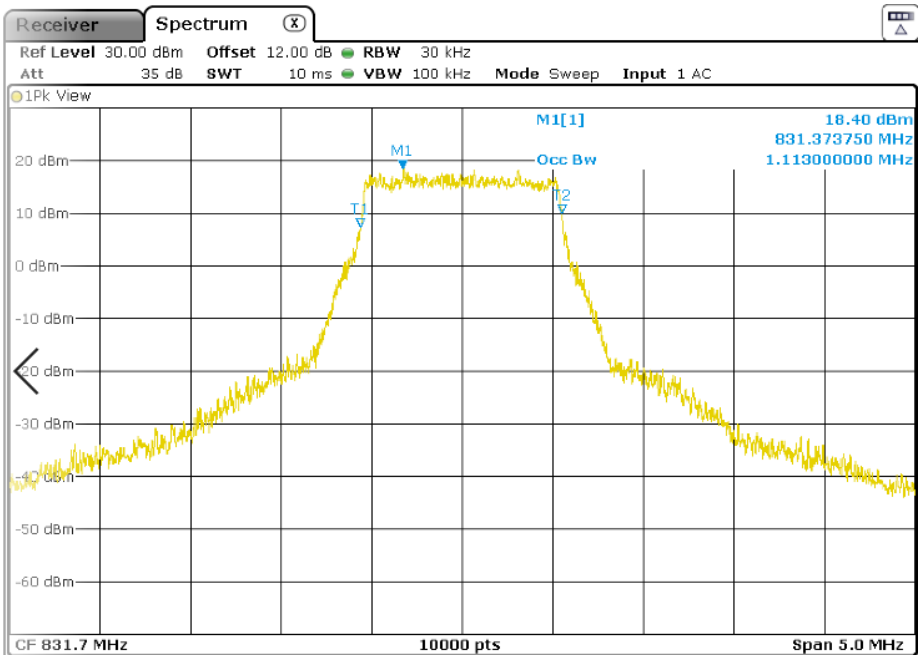
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	846.67875 MHz	18.15 dBm		
D2	M1	1	-697.5 kHz	-26.01 dB		
D3	D2	1	1.422 MHz	-0.03 dB		

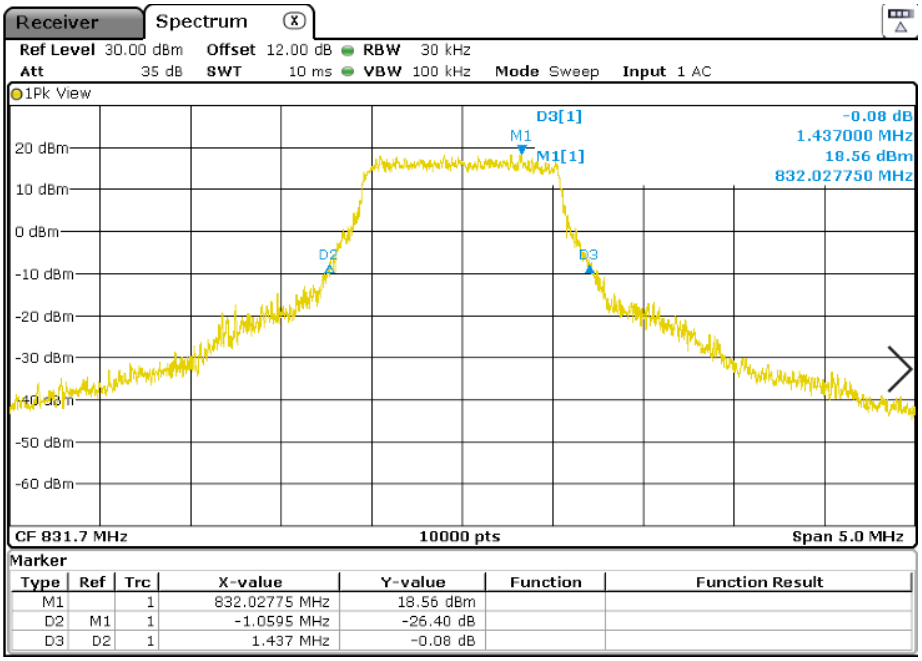
TEST RESULTS (Cont):	

LTE 16QAM MODULATION. BW = 10 MHz

Lowest Channel 99% Occupied Bandwidth

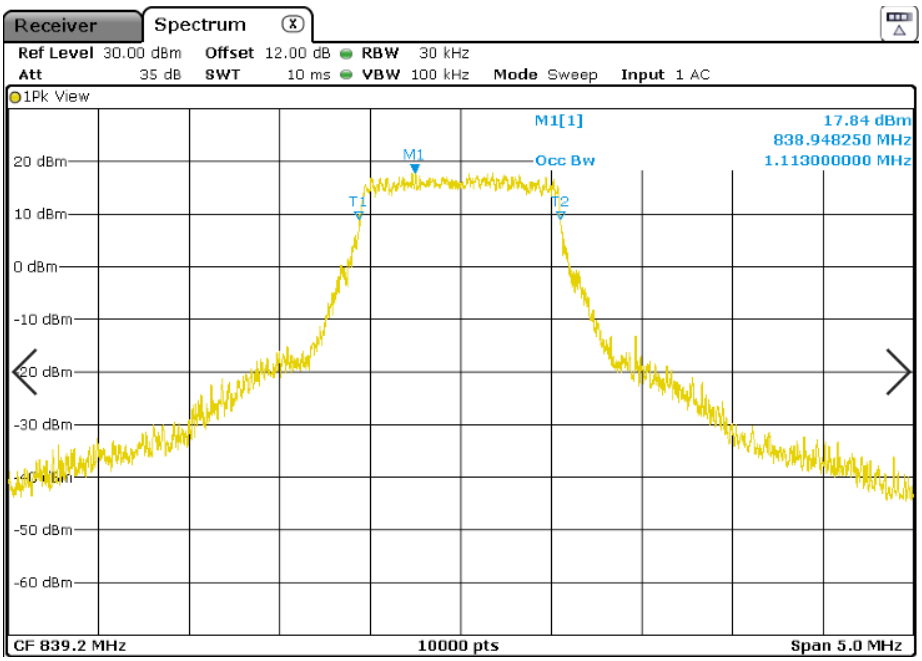


Lowest Channel 26dBc Bandwidth

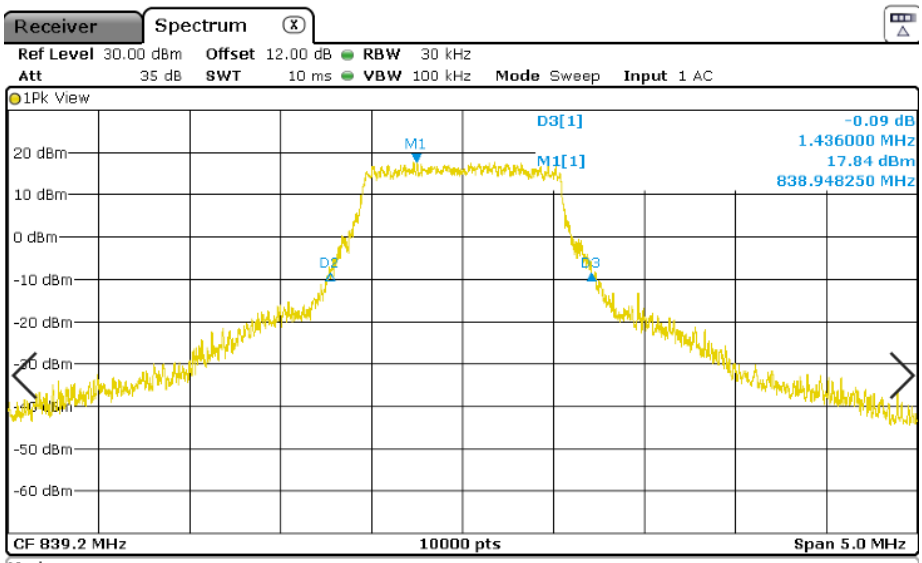


TEST RESULTS (Cont):	

Middle Channel 99% Occupied Bandwidth



Middle Channel 26dBc Bandwidth

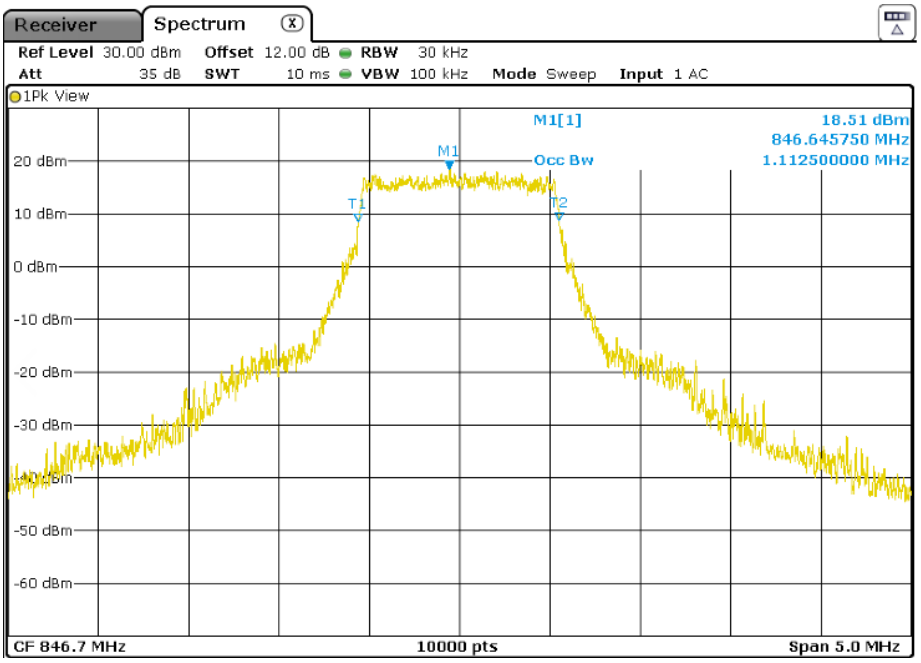


Marker

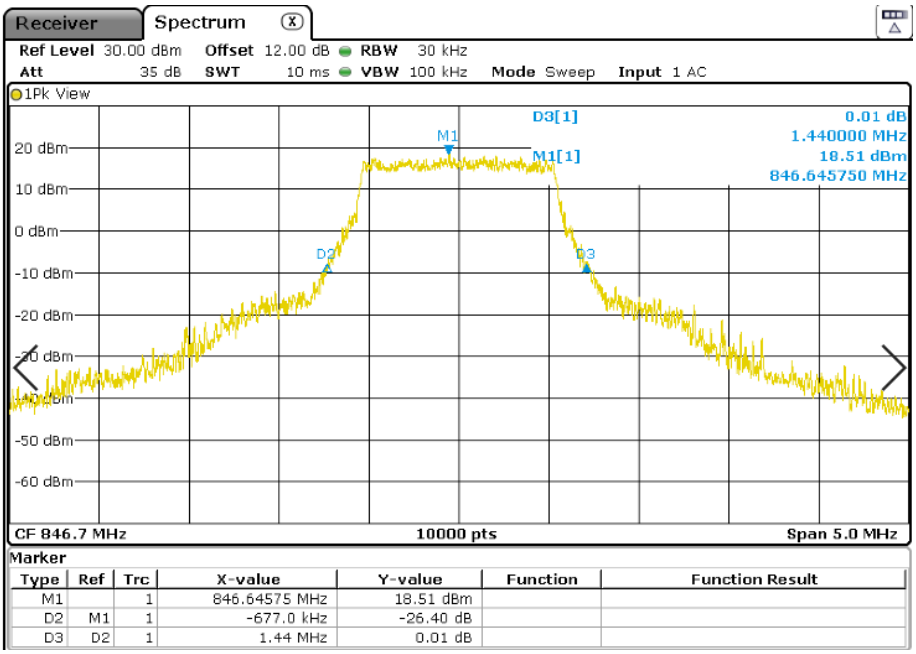
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	838.94825 MHz	17.84 dBm		
D2	M1	1	-475.0 kHz	-26.26 dB		
D3	D2	1	1.436 MHz	-0.09 dB		

TEST RESULTS (Cont):	

Highest Channel 99% Occupied Bandwidth



Highest Channel 26dBc Bandwidth



TEST A.5: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

LIMITS:	Product standard:	FCC Part 22 / IC RSS-132
	Test standard:	FCC §2.1051 and § 22.917 / RSS-132 Clause 5.5

LIMITS

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. P in watts.

At Po transmitting power of 2 watts (33 dBm), the specified minimum attenuation becomes 43+10log (Po). and the level in dBm relative to Po becomes:

Po (dBm) – [43 + 10 log (Po in watts)] = -13 dBm

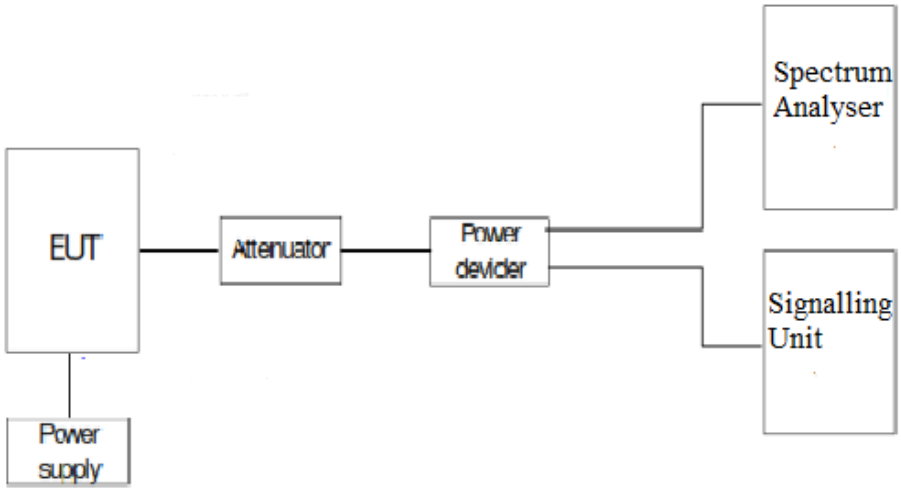
TEST SETUP

The EUT RF output connector was connected to a spectrum analyzer and to the Universal Radio Communication Tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50-ohm attenuator and a power splitter.

The spectrum was investigated from 9 kHz to 18 GHz for LTE Band V.
The spectrum was investigated from 9 kHz to 18 GHz for 2G GPRS Band 850.
The spectrum was investigated from 9 kHz to 18 GHz for WCDMA and HSUPA Band V.

The reading of the spectrum analyzer is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyzer.

For LTE mode the configuration of Resource Blocks and modulation which is the worst case for conducted power was used.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

Frequency range 9 kHz – 20 GHz

LTE QPSK MODULATION. BW = 5 MHz

No spurious signal was found in the frequency range for Lowest, Middle, and Highest channels.

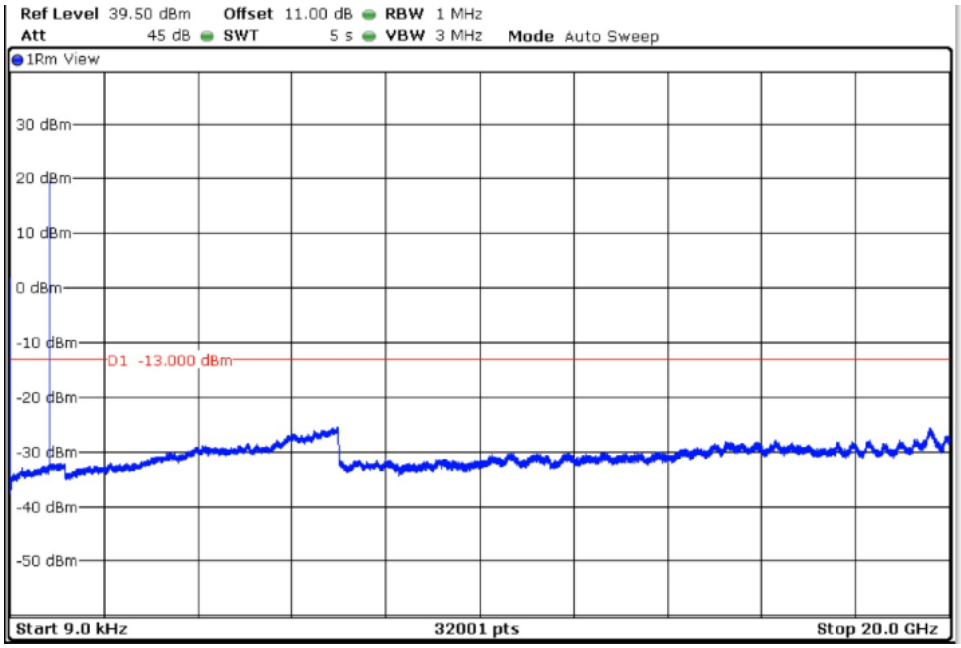
LTE QPSK MODULATION. BW = 10 MHz

No spurious signal was found in the frequency range for Lowest, Middle, and Highest channels.

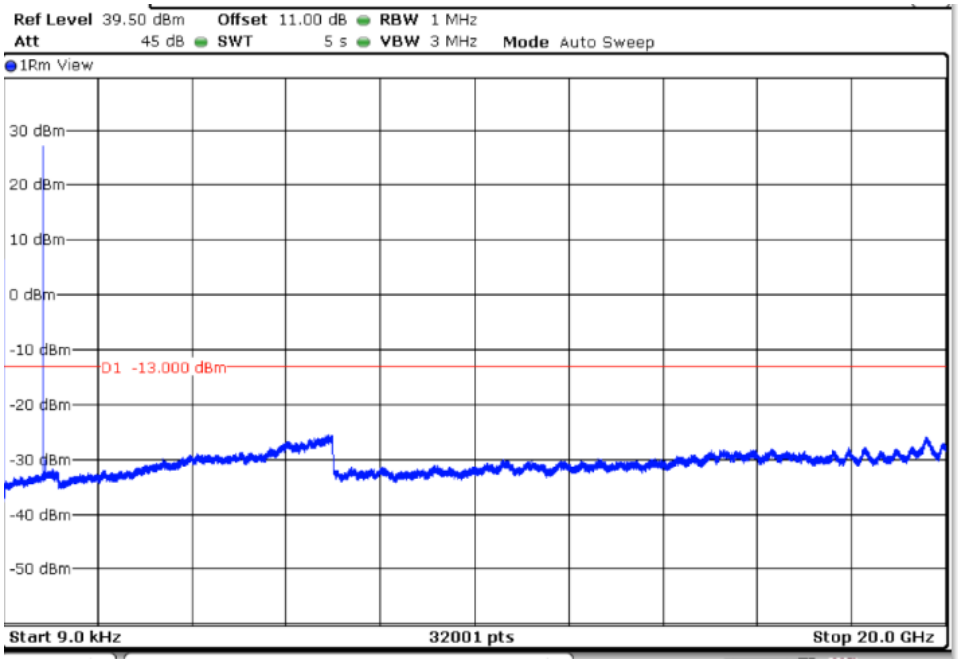
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 5 MHz

Lowest Channel

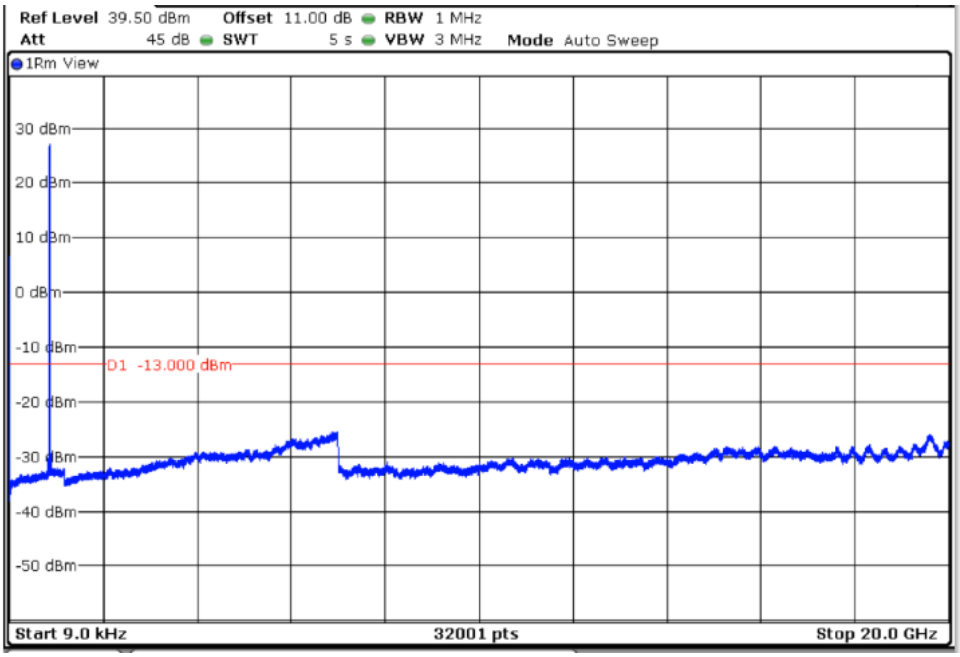


Middle Channel



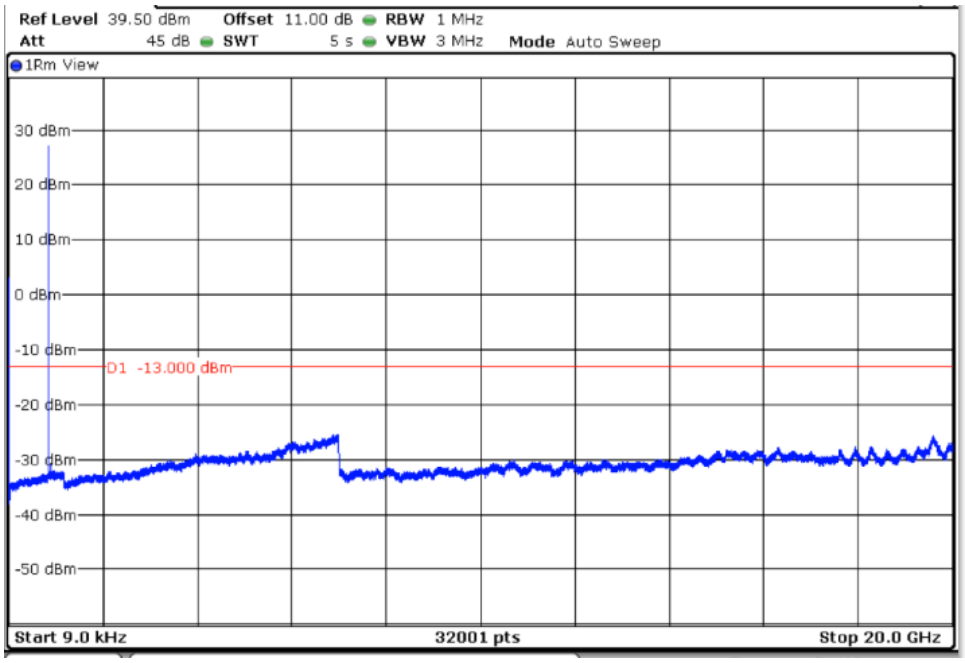
TEST RESULTS (Cont):	

Highest Channel



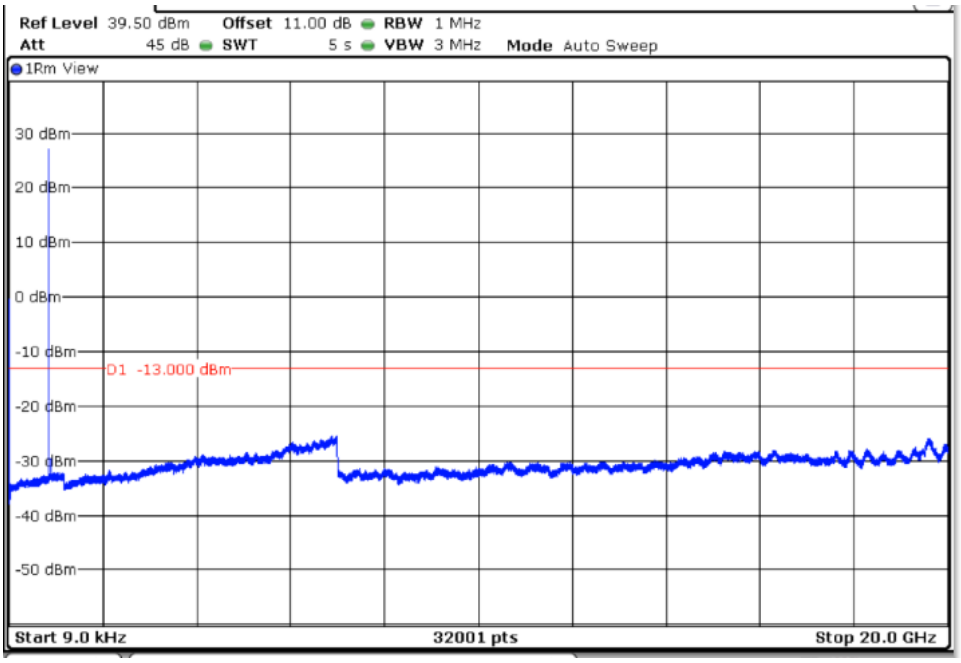
LTE QPSK MODULATION. BW = 10 MHz

Lowest Channel

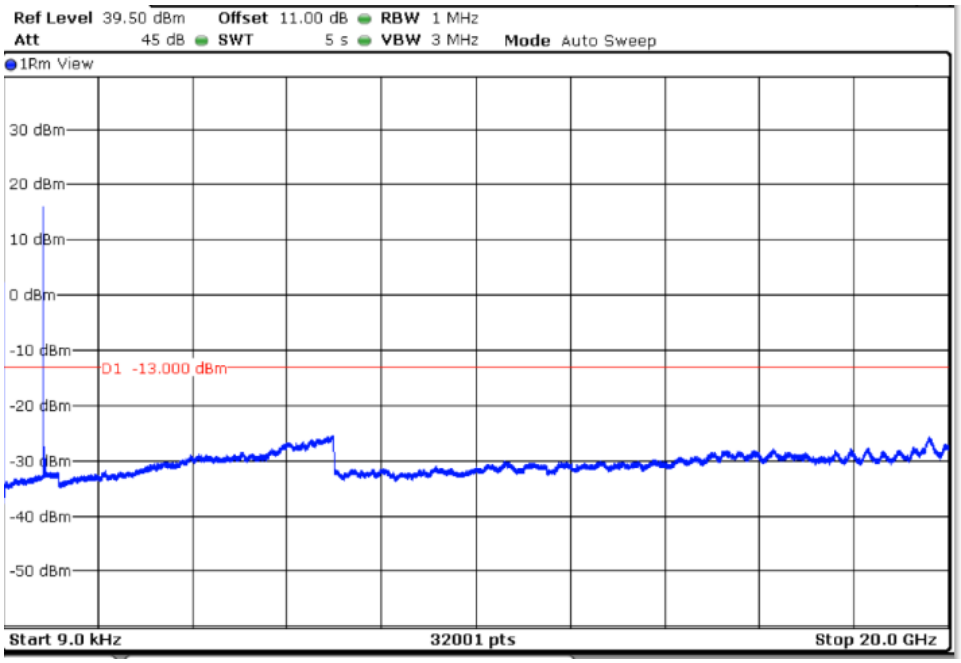


TEST RESULTS (Cont):	

Middle Channel



Highest Channel



TEST A.6: SPURIOUS EMISSIONS AT ANTENNA TERMINALS AT BLOCK EDGES

LIMITS:	Product standard:	FCC Part 22 / IC RSS-132
	Test standard:	FCC §2.1051 and 22.917 / RSS- Clause 5.5.

LIMITS

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. P in watts.

At Po transmitting power of 2 watts (33 dBm), the specified minimum attenuation becomes 43+10log (Po). and the level in dBm relative to Po becomes:

Po (dBm) – [43 + 10 log (Po in watts)] = -13 dBm

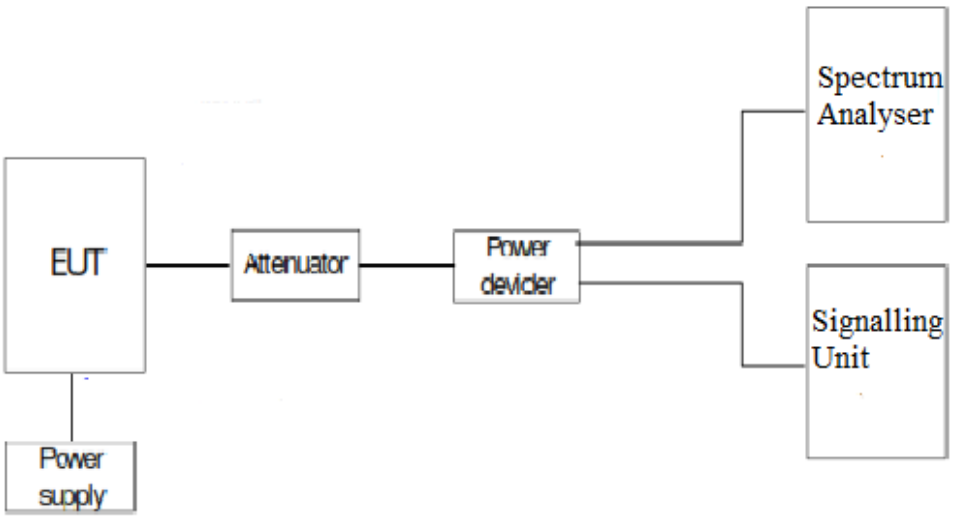
TEST SETUP

The EUT RF output connector was connected to a spectrum analyzer and to the Universal Radio Communication Tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50-ohm attenuator and a power splitter.

The reading of the spectrum analyzer is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyzer.

For LTE mode the configuration of modulation which is the worst case for conducted power was used.

As indicated in FCC part 22, in the 1 MHz bands immediately outside and adjacent to the licensee's frequency block or band, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

LTE QPSK MODULATION	RB=1. Offset =0 BW = 5 MHz	RB=1 Offset =0 BW = 10 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-16.76	-29.86

LTE QPSK MODULATION	RB=6 Offset =0 BW = 5 MHz	RB=6 Offset =0 BW = 10 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-24.49	-27.76

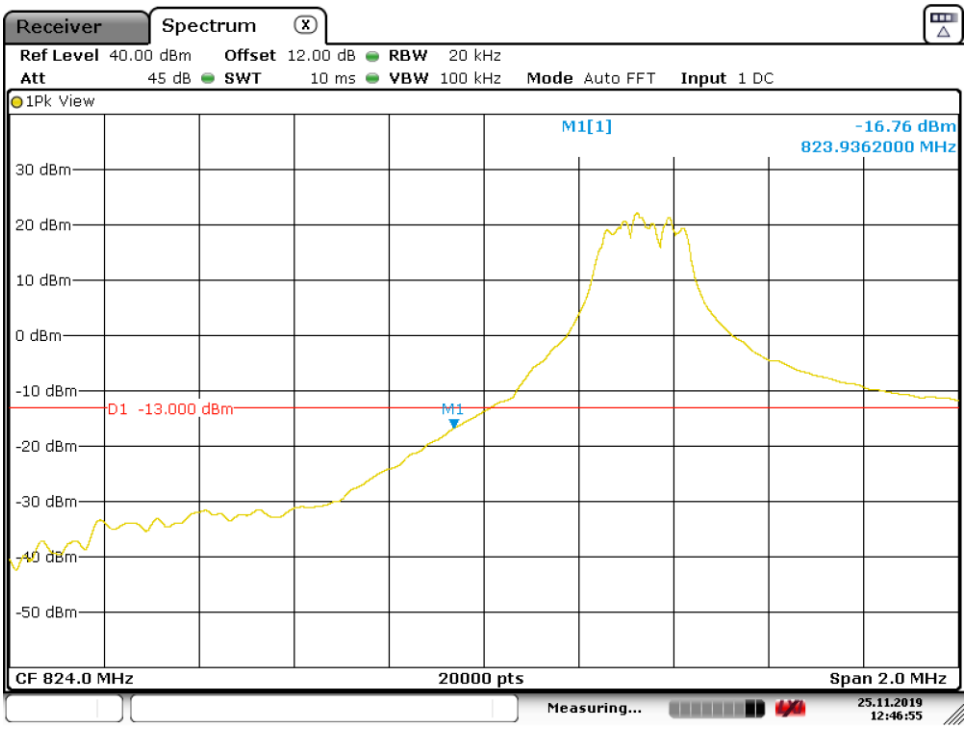
LTE QPSK MODULATION	RB=1 Offset =5 BW = 5 MHz	RB=1 Offset =5 BW = 10 MHz
Maximum measured level at Highest Block Edge at antenna port (dBm)	-22.37	-27.75

LTE QPSK MODULATION	RB=6 Offset =0 BW = 5 MHz	RB=6 Offset =0 BW = 10 MHz
Maximum measured level at Highest Block Edge at antenna port (dBm)	-22.28	-37.83

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 5 MHz

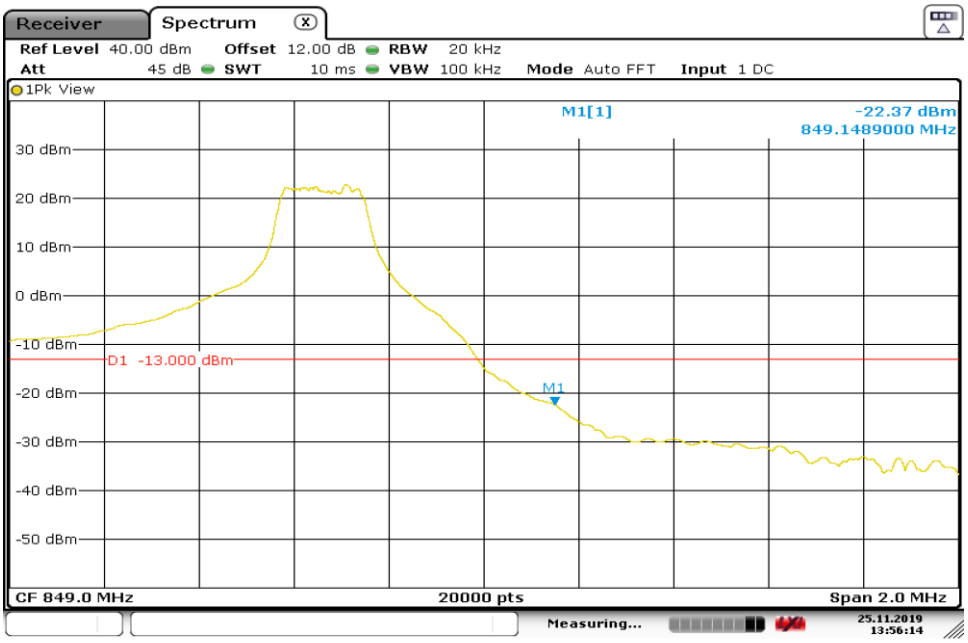
Lowest Channel



Date: 25.NOV.2019 12:46:55

LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 5 MHz

Highest Channel

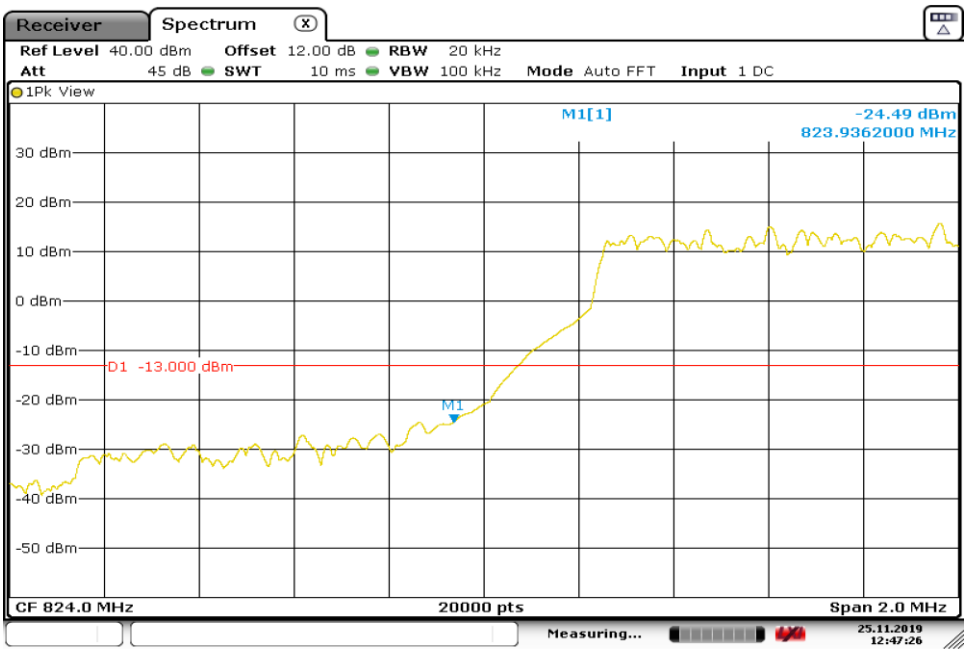


Date: 25.NOV.2019 13:56:14

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 5 MHz

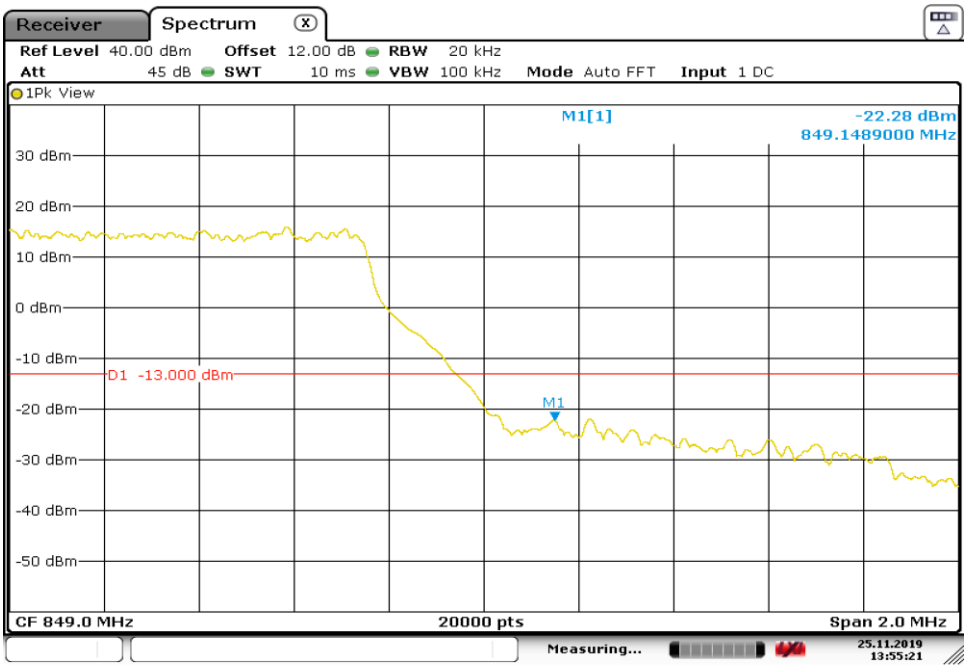
Lowest Channel



Date: 25.NOV.2019 12:47:26

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 5 MHz

Highest Channel

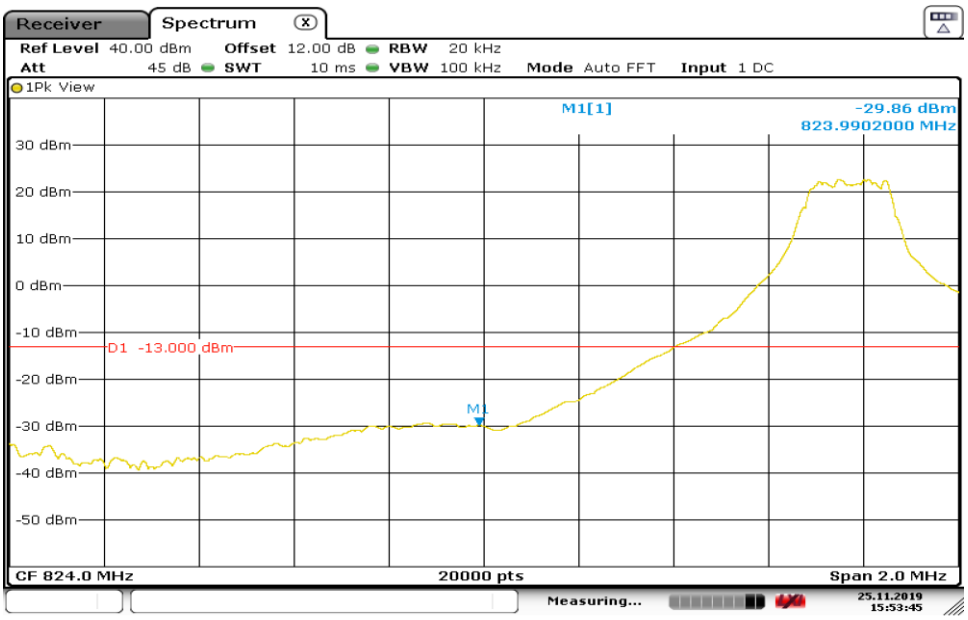


Date: 25.NOV.2019 13:55:22

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 10 MHz

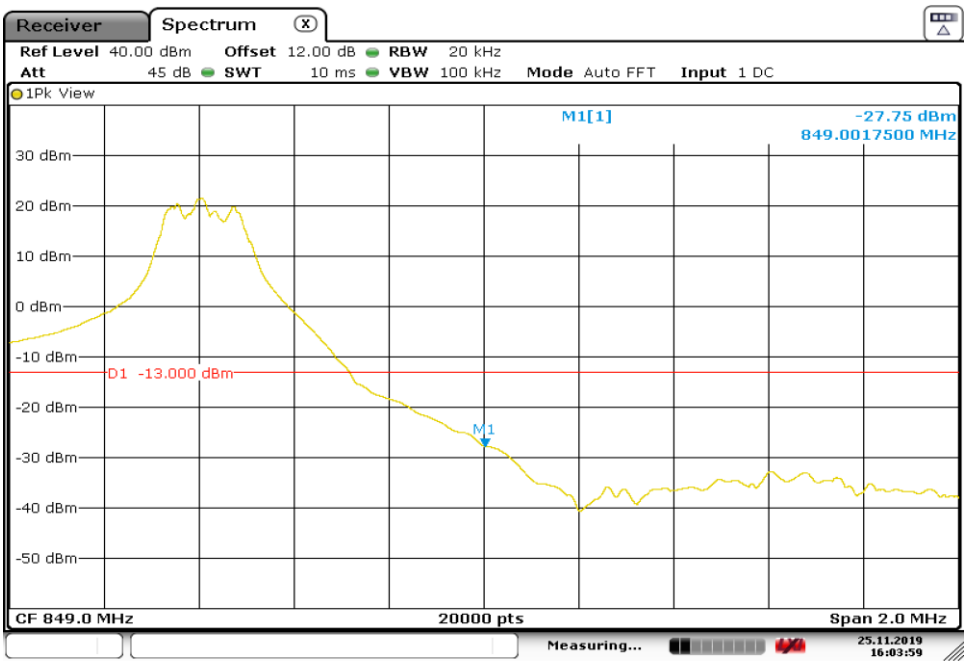
Lowest Channel



Date: 25.NOV.2019 15:53:46

LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 10 MHz

Highest Channel

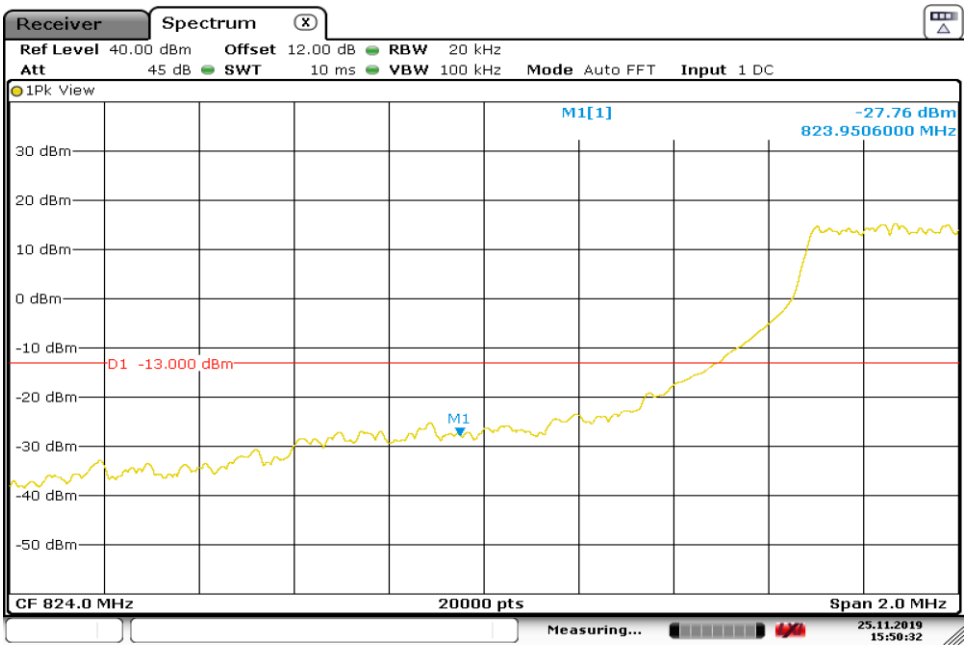


Date: 25.NOV.2019 16:03:59

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 10 MHz

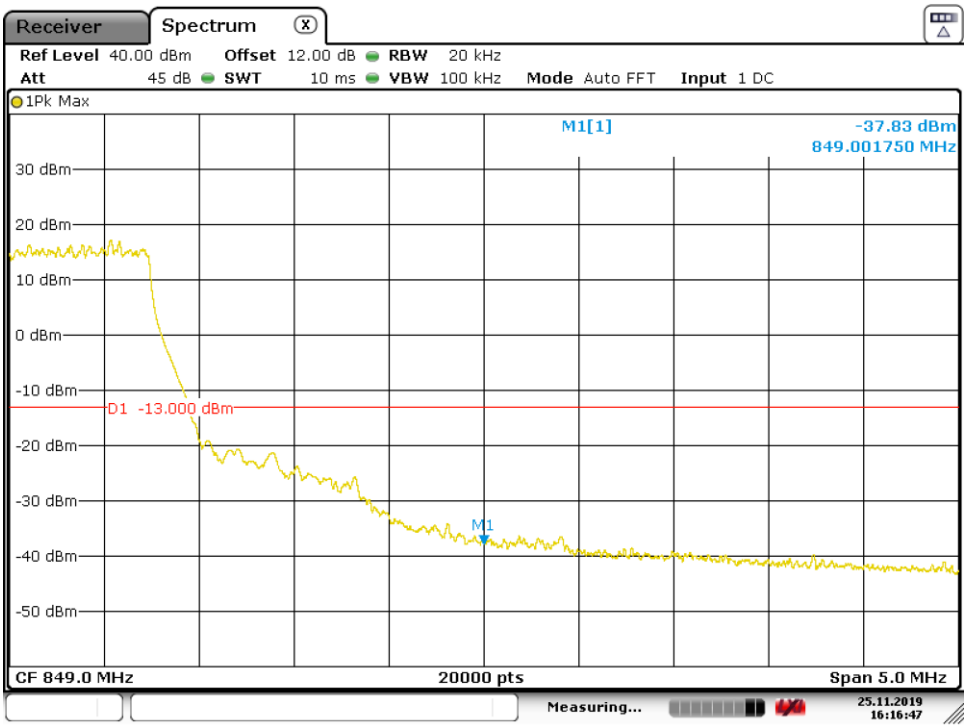
Lowest Channel



Date: 25.NOV.2019 15:50:32

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 10 MHz

Highest Channel



Date: 25.NOV.2019 16:16:47

TEST A.7: RADIATED EMISSIONS

LIMITS:	Product standard:	FCC Part 22 / IC RSS-132.
	Test standard:	FCC §2.1053 and §22.917 / RSS-132 Clause 5.5.

LIMITS

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. P in watts.

At Po transmitting power of 2 watts (33 dBm), the specified minimum attenuation becomes 43+10log (Po). and the level in dBm relative to Po becomes:

Po (dBm) – [43 + 10 log (Po in watts)] = -13 dBm

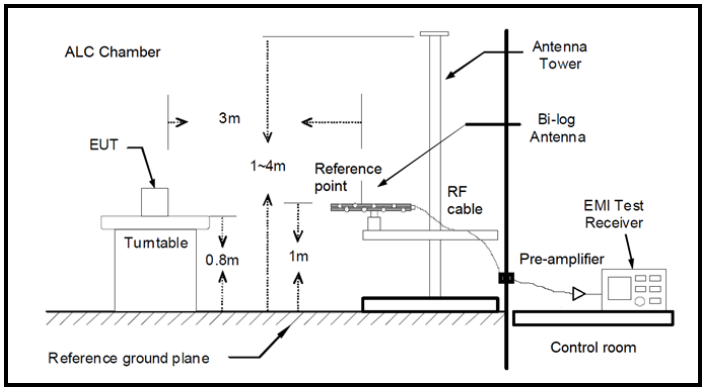
TEST SETUP	

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

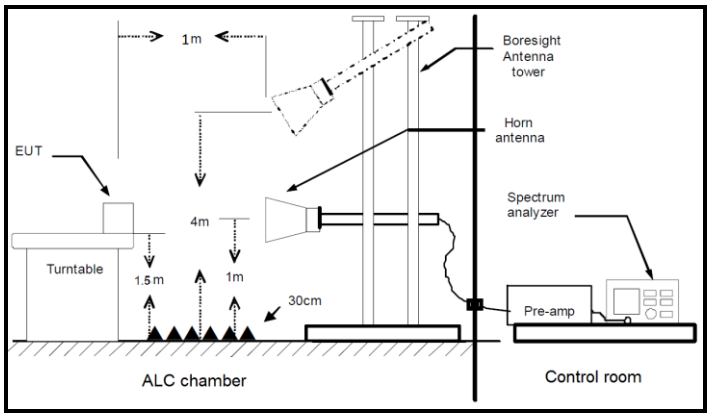
The EUT was placed on a non-conductive stand at a 3-meter distance from the measuring antenna for measurements below 1 GHz and at 1-meter distance for measurements above 1 GHz.

Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum reading was recorded.

Radiated measurements < 1GHz



Radiated measurements > 1GHz



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

RESULTS

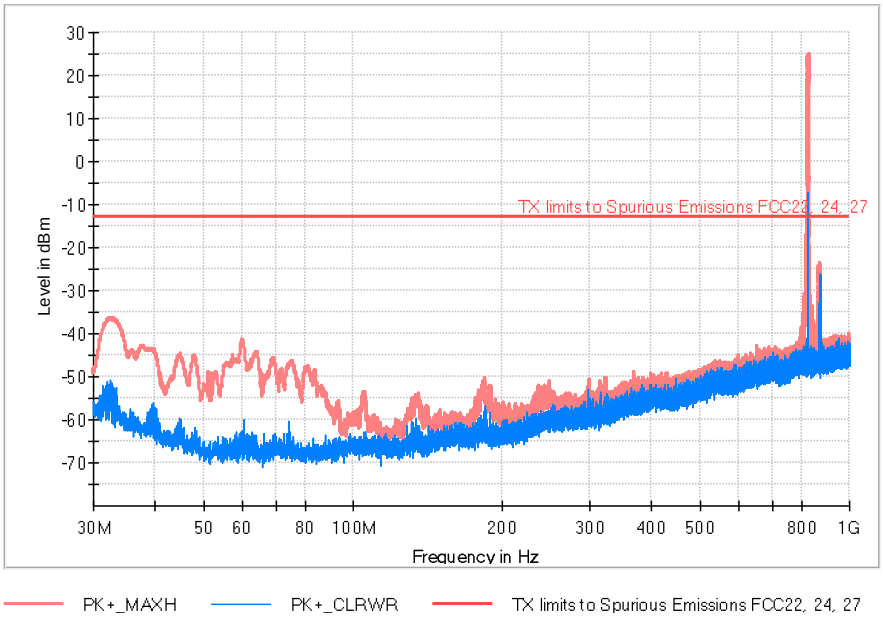
A preliminary scan determined the QPSK 3 MHz bandwidth as the worst case. The configuration of Resource Blocks which is the worst case for conducted power was used.

The following plots show the results for this configuration.

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 5 MHz

TEST RESULTS (Cont):	Lowest Channel

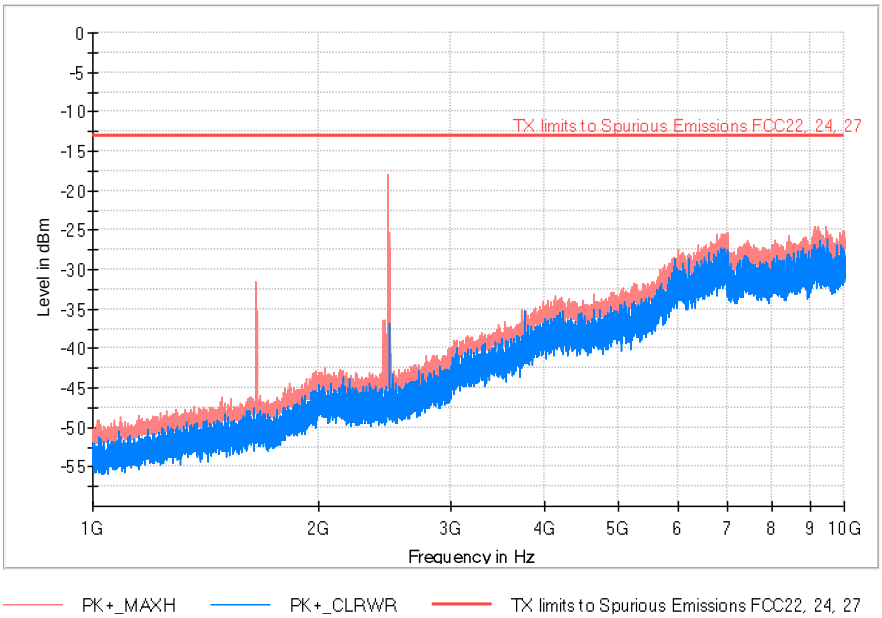
FREQUENCY RANGE: 30-1000 MHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
32.748333	-60.56	-36.37	
59.682000	-65.64	-41.47	
824.624000	-46.15	24.60	Fundamental
870.020000	-44.44	-24.36	

TEST RESULTS (Cont):	Lowest Channel

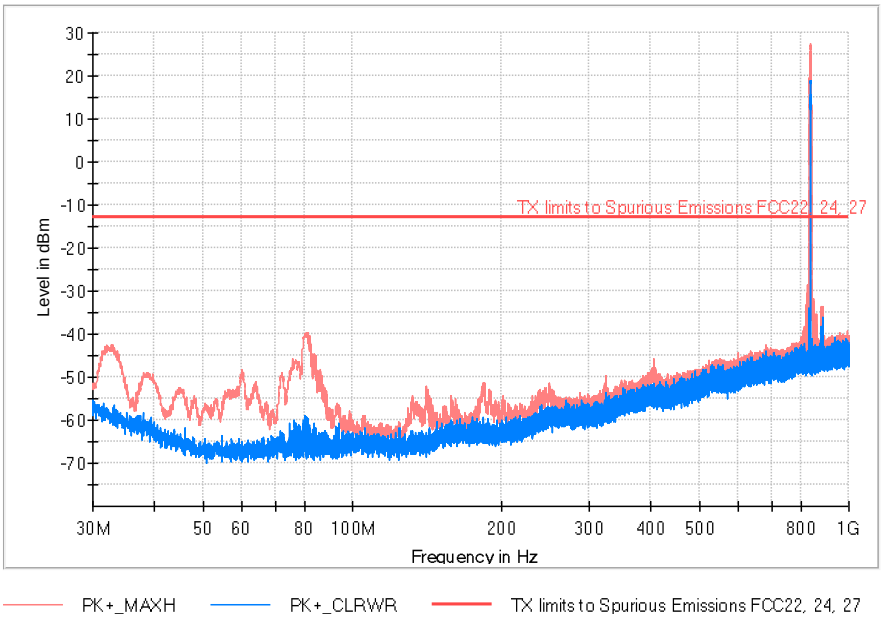
FREQUENCY RANGE: 1-10 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
1649.000000	-49.59	-31.47	
2474.000000	-46.78	-17.97	

TEST RESULTS (Cont):	Middle Channel

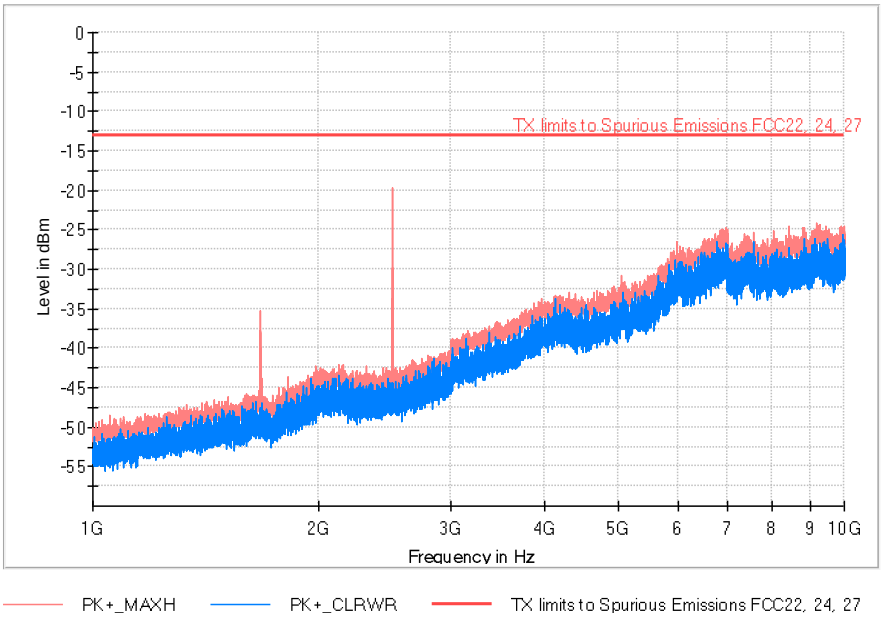
FREQUENCY RANGE: 30 MHz-1 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
81.280667	-59.52	-39.53	
404.872667	-56.89	-45.76	
834.809000	-47.53	27.54	Fundamental
883.212000	-37.05	-33.54	

TEST RESULTS (Cont):	Middle Channel

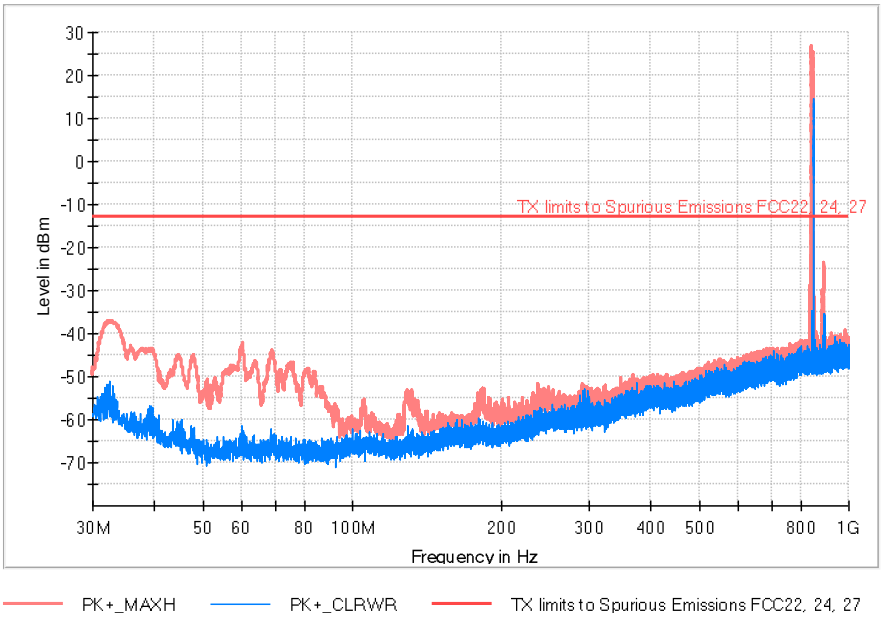
FREQUENCY RANGE: 1-10 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
1670.000000	-49.71	-35.21	
2503.600000	-44.45	-19.64	

TEST RESULTS (Cont):	Highest Channel

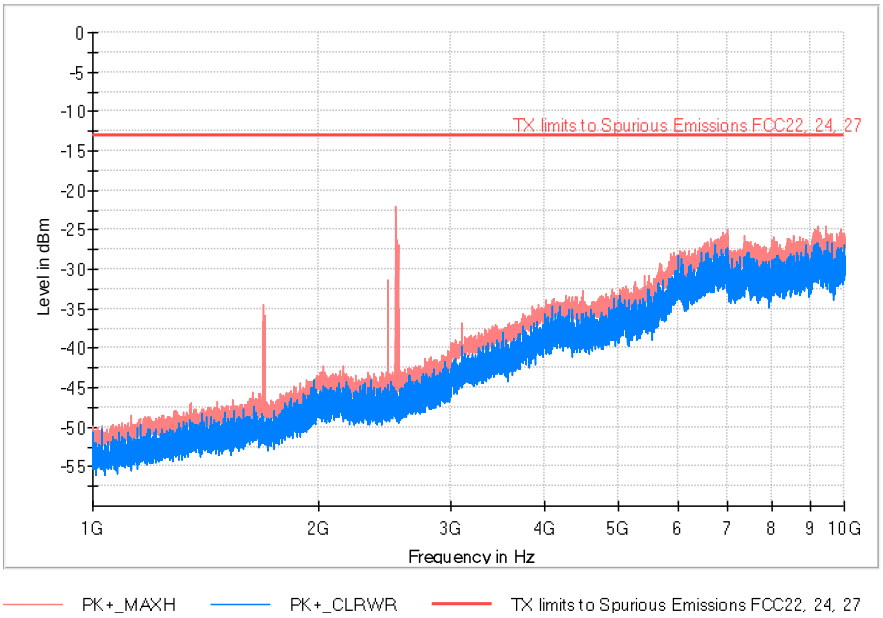
FREQUENCY RANGE: 30 MHz-1 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
32.780667	-55.68	-37.11	
60.134667	-62.55	-42.19	
844.961667	-47.85	26.61	Fundamental
892.976667	-36.67	-23.68	

TEST RESULTS (Cont):	Highest Channel

FREQUENCY RANGE: 1-10 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
1690.200000	-50.79	-34.50	
2470.400000	-46.66	-31.40	
2534.400000	-47.15	-21.99	