

FCC REPORT

(LTE)

Applicant: OASYS CYBERNETICS PRIVATE LIMITED

Address of Applicant: OAS TOWERS, No.3, STRINGERS STREET, VEPERY,
CHENNAI, TAMILNADU, India – 600003.

Equipment Under Test (EUT)

Product Name: Tablet PC

Model No.: MT02, MT02A, MT04, MT03

Trade mark: OASYS

FCC ID: 2AYKQMT02

Applicable standards: FCC CFR Title 47 Part 2
FCC CFR Title 47 Part 22 Subpart H

Date of sample receipt: 01 Dec., 2020

Date of Test: 01 Dec., 2020 to 26 Jan., 2021

Date of report issued: 27 Jan., 2021

Test Result: PASS*

*In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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2. Version

Version No.	Date	Description
00	27 Jan., 2021	Original

Tested by:

Tanet Wei
Test Engineer

Date:

27 Jan., 2021

Reviewed by:

Winner Zhang
Project Engineer

Date:

27 Jan., 2021

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4. Test Summary

Test Items	Section in CFR 47	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1093	Passed (Please refer to SAR Report)
RF Output Power	Part 2.1046 Part 22.913 (a)(5)	Pass
Peak-to-Average Ratio	/	Pass
Modulation Characteristics	Part 2.1047	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917(b)	Pass
Out of band emission at antenna terminals	Part 2.1053 Part 22.917(a)	Pass
Field strength of spurious radiation	Part 22.917(a)	Pass
Frequency stability vs. temperature	Part 22.355 Part 24.235 Part 27.54 Part 2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	Part 22.355 Part 24.235 Part 27.54 Part 2.1055(d)(2)	Pass
Remark: 1. Pass: The EUT complies with the essential requirements in the standard. 2. The cable insertion loss used by "RF Output Power" and other conduction measurement items is 0.5dB(Fundamental Frequency below 1GHz)/1.0dB(Fundamental Frequency above 1GHz) (provided by the customer).		
Test Method:	ANSI/TIA-603-E-2016 ANSI C63.26-2015	

5. General Information

5.1 Client Information

Applicant:	OASYS CYBERNETICS PRIVATE LIMITED
Address:	OAS TOWERS, No.3, STRINGERS STREET, VEPERY, CHENNAI, TAMILNADU, India – 600003.
Manufacturer/ Factory:	OASYS CYBERNETICS PRIVATE LIMITED
Address:	OAS TOWERS, No.3, STRINGERS STREET, VEPERY, CHENNAI, TAMILNADU, India – 600003.

5.2 General Description of E.U.T.

Product Name:	Tablet PC		
Model No.:	MT02, MT02A, MT04, MT03		
Operation Frequency range:	LTE Band 5: TX: 824MHz-849MHz RX: 869MHz-894MHz		
Modulation type:	☒ QPSK	☒ 16QAM	☒ 64QAM
Antenna type:	Internal Antenna		
Antenna gain:	LTE Band 5: 1.46 dBi(declare by Applicant)		
Power supply:	Rechargeable Li-ion Battery DC7.4V, 2500mAh		
AC adapter:	Model: YHY-12002000 Input: AC100-220V, 50/60Hz, 1.0A Output: DC 12.0V, 2000mA		
Remark:	Model No.: MT02, MT02A, MT04, MT03 were identical inside, the electrical circuit design, layout, components used and internal wiring, with only difference being model name.		
Test Sample Condition:	The applicant provided engineering samples for staying in continuously transmitting for testing.		

Operation Frequency List:

LTE Band 5 (1.4MHz)		LTE Band 5 (3MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
20407	824.70	20415	825.50
20408	824.80	20416	825.60
....			
20524	836.40	20524	836.40
20525	836.50	20525	836.50
20526	836.60	20526	836.60
...	...	...	...
20642	848.20	20634	847.40
20643	848.30	20635	847.50
LTE Band 5 (5MHz)		LTE Band 5 (10MHz)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
20425	826.50	20450	829.00
20426	826.60	20451	829.10
....			
20524	836.40	20524	836.40
20525	836.50	20525	836.50
20526	836.60	20526	836.60
...	...	...	...
20624	846.40	20599	839.90
20625	846.50	20600	844.00

Regards to the operating frequency range, the lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channels as below:

LTE Band 5 (1.4MHz)			LTE Band 5 (3MHz)		
Channel:		Frequency (MHz)	Channel		Frequency (MHz)
Lowest channel	20407	824.70	Lowest channel	20415	825.50
Middle channel	20525	836.50	Middle channel	20525	836.50
Highest channel	20643	848.30	Highest channel	20635	847.50
LTE Band 5 (5MHz)			LTE Band 5 (10MHz)		
Channel		Frequency (MHz)	Channel		Frequency (MHz)
Lowest channel	20425	826.50	Lowest channel	20450	829.00
Middle channel	20525	836.50	Middle channel	20525	836.50
Highest channel	20625	846.50	Highest channel	20600	844.00

5.3 Test environment and mode

Operating Environment:	
Temperature:	Normal: 15°C ~ 35°C, Extreme: -30°C ~ +50°C
Humidity:	20 % ~ 75 % RH
Atmospheric Pressure:	1008 mbar
Voltage:	Nominal: 7.4Vdc, Extreme: Low 6.29Vdc, High 8.51Vdc
Test mode:	
LTE QPSK mode	Keep the EUT communication with simulated station in QPSK mode
LTE 16-QAM mode	Keep the EUT communication with simulated station in 16-QAM mode
Remark: The EUT has been tested under continuous transmitting mode. Channel Low, Mid and High for each type band with rated data rate were chosen for full testing. The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for these modes. Just the worst case position (H mode) shown in report.	

5.4 Description of Support Units

Test Equipment	Manufacturer	Model No.	Serial No.
Simulated Station	Anritsu	MT8820C	6201026545

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.16 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.20 dB (k=2)

5.6 Related Submittal(s) / Grant (s)

This is an original grant, no related submittals and grants.
--

5.7 Additions to, deviations, or exclusions from the method

No

5.8 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC - Designation No.: CN1211**

JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The test firm Registration No. is 727551.

● **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

● **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

5.9 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.

Address: No.110~116, Building B, Jinyuan Business Building, Xixiang Road, Bao'an District, Shenzhen, Guangdong, China

Tel: +86-755-23118282, Fax: +86-755-23116366

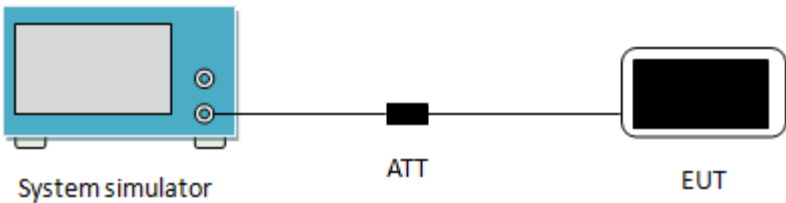
Email: info@ccis-cb.com, Website: <http://www.ccis-cb.com>

5.10 Test Instruments list

Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2020	07-21-2021
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-07-2020	03-06-2021
Biconical Antenna	SCHWARZBECK	VUBA9117	359	06-22-2020	06-21-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-07-2020	03-06-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2020	06-21-2021
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-18-2020	11-17-2021
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-07-2020	03-06-2021
Pre-amplifier	CD	PAP-1G18	11804	03-07-2020	03-06-2021
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-05-2020	03-04-2021
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-18-2020	11-17-2021
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-05-2020	03-04-2021
Spectrum Analyzer	Agilent	N9020A	MY50510123	11-18-2020	11-17-2021
Signal Generator	Rohde & Schwarz	SMX	835454/016	03-05-2020	03-04-2021
Signal Generator	R&S	SMR20	1008100050	03-05-2020	03-04-2021
RF Switch Unit	MWRFTTEST	MW200	N/A	N/A	N/A
Test Software	MWRFTTEST	MTS8200	Version: 2.0.0.0		
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-07-2020	03-06-2021
Cable	MICRO-COAX	MFR64639	K10742-5	03-07-2020	03-06-2021
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-07-2020	03-06-2021
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	09-25-2020	09-24-2021
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	11-01-2020	11-31-2021
Simulated Station	Rohde & Schwarz	CMW500	140493	07-22-2020	07-21-2021

6. Test results

6.1 Conducted Output Power, ERP and EIRP

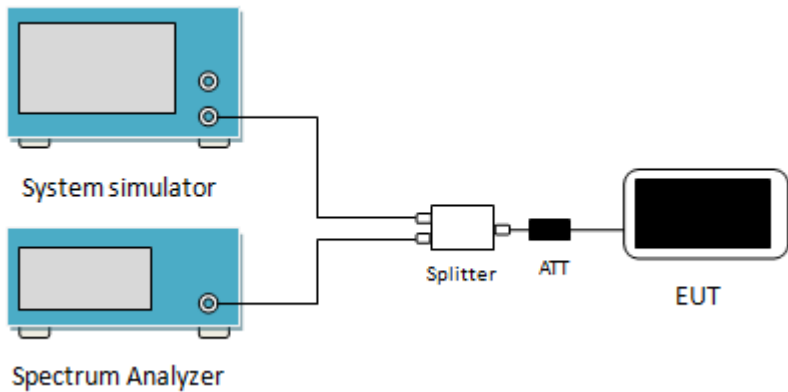
Test Requirement:	Part 22.913(a)(5)
Limit:	LTE Band 5: 7W
Test Setup:	 The diagram illustrates the test setup. On the left is a blue rectangular box labeled 'System simulator'. A red line connects its right side to a small black rectangle labeled 'ATT' (attenuator). Another red line connects the right side of the 'ATT' to a black rectangular box labeled 'EUT' (Equipment Under Test).
Test Procedure:	The transmitter output was connected to a calibrated attenuator, the other end of which was connected to the CMW500. Transmitter output power was read off in dBm.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

LTE Band	Bandwidth (MHz)	Modulation	RB Size	RB Offset	Average Power (dBm)			
					20407	20525	20643	
					824.7MHz	836.5MHz	848.3MHz	
5	1.4	QPSK	1	0	21.86	21.76	21.71	
			1	2	21.91	21.88	21.95	
			1	5	21.75	21.77	21.77	
			3	0	20.96	20.93	20.88	
			3	1	20.95	20.99	20.87	
			3	2	20.92	20.94	20.85	
			6	0	20.90	20.87	20.91	
		Antenna Gain(dBi):				1.46		
		Max. ERP (dBm):				21.26		
		ERP Limit (dBm):				38.45		
		16QAM	1	0	21.01	21.23	21.22	
			1	2	21.18	21.11	21.13	
			1	5	21.14	21.14	21.18	
			3	0	20.07	20.05	20.06	
			3	1	20.11	20.10	20.04	
			3	2	20.05	20.02	20.07	
			6	0	20.03	19.91	19.89	
		Antenna Gain(dBi):				1.46		
		Max. ERP (dBm):				20.54		
		ERP Limit (dBm):				38.45		
LTE Band	Bandwidth (MHz)	Modulation	RB Size	RB Offset	Average Power (dBm)			
					20415	20525	20635	
					825.5MHz	836.5MHz	847.50MHz	
5	3	QPSK	1	0	21.80	21.90	21.91	
			1	7	21.87	21.80	21.90	
			1	14	21.86	21.77	21.78	
			8	0	20.86	20.90	20.81	
			8	4	20.85	20.83	20.80	
			8	7	20.99	20.82	20.87	
			15	0	20.90	20.80	20.72	
		Antenna Gain(dBi):				1.46		
		Max. ERP (dBm):				21.22		
		ERP Limit (dBm):				38.45		
		16QAM	1	0	21.03	21.21	21.25	
			1	7	21.29	21.17	21.19	
			1	14	21.08	21.22	21.03	
			8	0	20.12	20.07	19.85	
			8	4	20.10	20.04	19.87	
			8	7	20.11	20.03	19.93	
			15	0	19.92	19.82	19.78	
		Antenna Gain(dBi):				1.46		
		Max. ERP (dBm):				20.60		
		ERP Limit (dBm):				38.45		
Note: EIRP (dBm) = Average power (dBm) + Antenna Gain (dBi). ERP (dBm) = EIRP (dBm) - 2.15 (dB).								

LTE Band	Bandwidth (MHz)	Modulation	RB Size	RB Offset	Average Power (dBm)			
					20425	20525	20625	
					826.5MHz	836.5MHz	846.5MHz	
5	5	QPSK	1	0	21.82	21.70	21.70	
			1	12	21.92	21.78	21.68	
			1	24	21.77	21.59	21.58	
			12	0	20.90	20.82	20.85	
			12	6	20.88	20.88	20.83	
			12	11	20.86	20.73	20.78	
			25	0	20.93	20.86	20.77	
		Antenna Gain(dBi):				1.46		
		Max. ERP (dBm):				21.23		
		ERP Limit (dBm):				38.45		
		16QAM	1	0	21.28	21.19	21.11	
			1	12	21.05	21.17	21.00	
			1	24	21.12	21.08	21.01	
			12	0	19.98	19.95	19.81	
			12	6	19.97	19.85	19.87	
			12	11	19.93	19.73	19.76	
			25	0	19.88	19.77	19.79	
		Antenna Gain(dBi):				1.46		
		Max. ERP (dBm):				20.59		
ERP Limit (dBm):				38.45				
LTE Band	Bandwidth (MHz)	Modulation	RB Size	RB Offset	Average Power (dBm)			
					20450	20525	20600	
					829.0MHz	836.5MHz	844.0MHz	
5	10	QPSK	1	0	21.93	21.88	21.84	
			1	24	21.96	21.89	21.89	
			1	49	21.76	21.71	21.77	
			25	0	20.97	20.84	20.93	
			25	12	20.91	20.80	20.88	
			25	24	20.90	20.83	20.80	
			50	0	20.95	20.89	20.89	
		Antenna Gain(dBi):				1.46		
		Max. ERP (dBm):				21.27		
		ERP Limit (dBm):				38.45		
		16QAM	1	0	21.00	21.28	21.22	
			1	24	21.28	21.31	21.08	
			1	49	21.31	21.03	21.17	
			25	0	19.95	19.89	19.85	
			25	12	19.91	19.87	19.90	
			25	24	19.93	19.81	19.77	
			50	0	19.92	19.80	19.80	
		Antenna Gain(dBi):				1.46		
		Max. ERP (dBm):				20.62		
ERP Limit (dBm):				38.45				
Note: EIRP (dBm) = Average power (dBm) + Antenna Gain (dBi). ERP (dBm) = EIRP (dBm) - 2.15 (dB).								

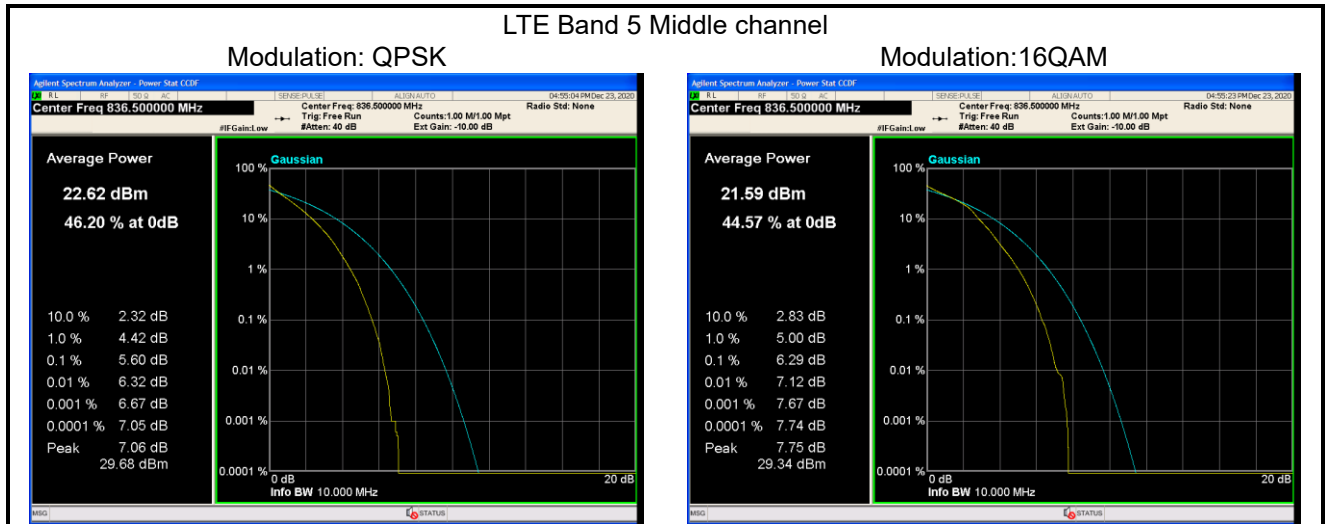
6.2 Peak-to-Average Ratio

Test Requirement:	Part 24.232 (d), Part 27.50(d)(5)
Limit:	The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.
Test Setup:	 The diagram shows a test setup for measuring Peak-to-Average Ratio (PAR). A System simulator and a Spectrum Analyzer are connected to a Splitter. The Splitter is connected to an ATT (Attenuator), which is then connected to the EUT (Equipment Under Test).
Test Procedure:	1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 Set the CCDF option in spectrum analyzer, $RBW \geq OBW$, 3 Set the EUT working in highest power level, measured and recorded the 0.1% as PAPR level. 4 Repeat step 1~3 at other frequency and modulations.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

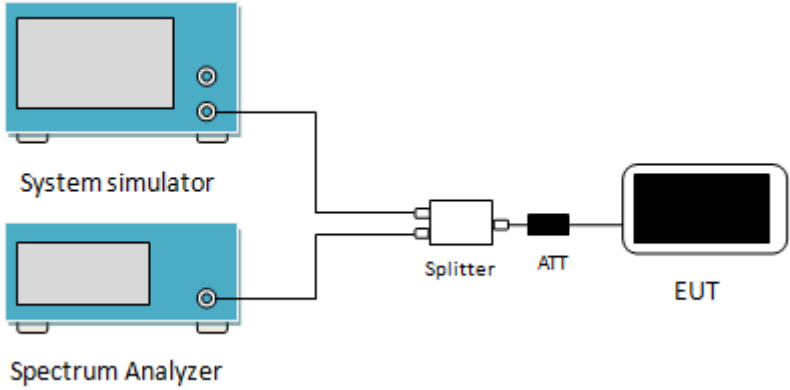
Measurement Data (Worst case):

Bandwidth	Modulation	RB Size	RB Offset	PAPR
LTE Band 5 (Middle Channel)				
10MHz	QPSK	50	0	5.60
	16QAM	50	0	6.29

Test plots as below:



6.3 Occupy Bandwidth

Test Requirement:	Part 22.917(b)
Test Setup:	 The diagram illustrates the test setup. On the left, there are two blue rectangular units: the top one is labeled 'System simulator' and the bottom one is labeled 'Spectrum Analyzer'. Both have a single output port. These two ports are connected to a single input port of a white rectangular unit labeled 'Splitter'. The 'Splitter' has two output ports. One output port is connected to a black rectangular unit labeled 'ATT' (Attenuator). The other output port is connected to a white rectangular unit with a black screen labeled 'EUT' (Equipment Under Test).
Test Procedure:	1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer 2. RBW was set to about 1% ~ 5% of emission BW, VBW= 3 times RBW. 3. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

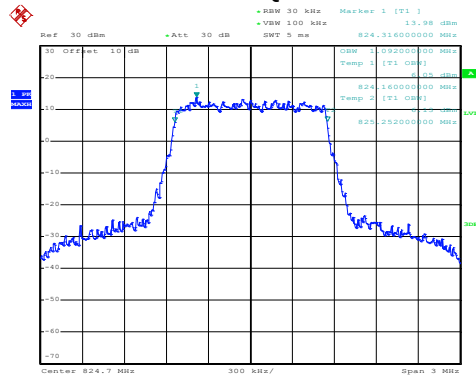
TE Band 5					
Bandwidth	Channel	Frequency (MHz)	Modulation	99% OBW (kHz)	-26dBcEBW (kHz)
1.4MHz	20407	824.7	16QAM	1092	1272
			QPSK	1098	1284
	20525	836.5	16QAM	1092	1278
			QPSK	1098	1272
	20643	848.3	16QAM	1086	1278
			QPSK	1092	1284
3MHz	20415	825.5	16QAM	2712	2952
			QPSK	2736	3000
	20525	836.50	16QAM	2700	2952
			QPSK	2712	3000
	20635	847.50	16QAM	2712	2964
			QPSK	2724	3000
5MHz	20425	826.50	16QAM	4500	5020
			QPSK	4520	5020
	20525	836.50	16QAM	4520	5040
			QPSK	4520	4980
	20625	846.50	16QAM	4500	5020
			QPSK	4500	5020
10MHz	20450	829.00	16QAM	9080	10200
			QPSK	9120	10240
	20525	836.50	16QAM	9120	10320
			QPSK	9160	10400
	20600	844.00	16QAM	9080	10040
			QPSK	9120	10400

Test plot as follows:

LTE Band 5 part:

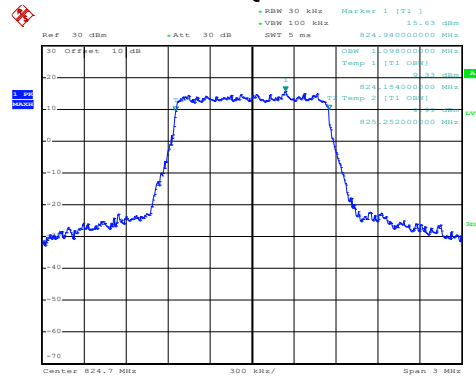
LTE Band 5: 99% Occupancy bandwidth
BW: 1.4MHz

16QAM



Date: 1.DEC.2020 14:31:07

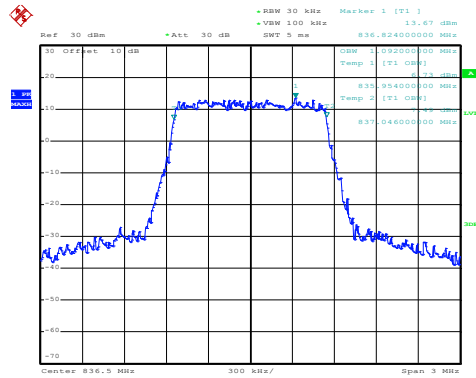
QPSK



Date: 1.DEC.2020 14:31:00

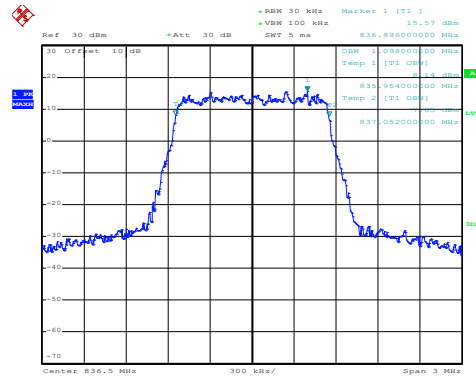
Lowest channel

16QAM



Date: 1.DEC.2020 14:31:45

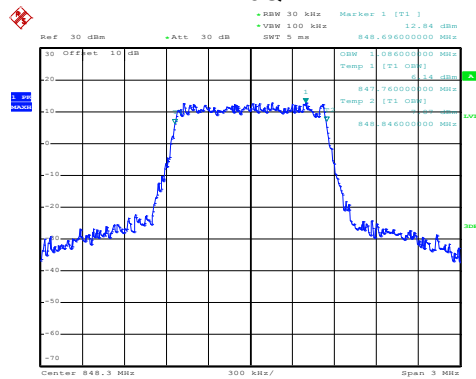
QPSK



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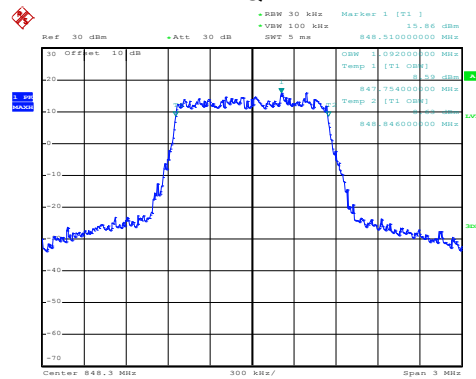
Middle channel

16QAM



Date: 1.DEC.2020 14:32:01

QPSK

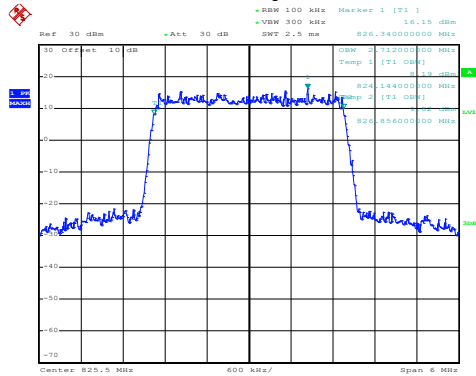


Date: 1.DEC.2020 14:31:58

Highest channel

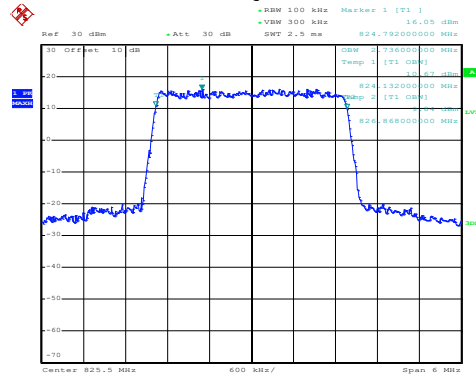
LTE Band 5: 99% Occupancy bandwidth
BW: 3MHz

16QAM



Date: 1.DEC.2020 14:33:45

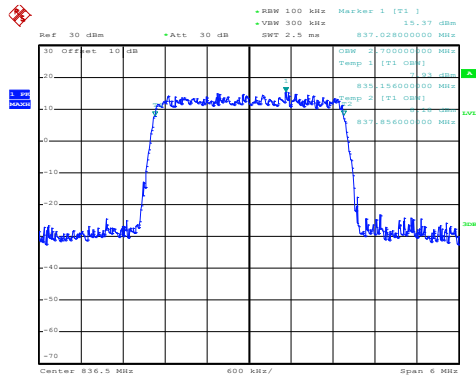
QPSK



Date: 1.DEC.2020 14:33:42

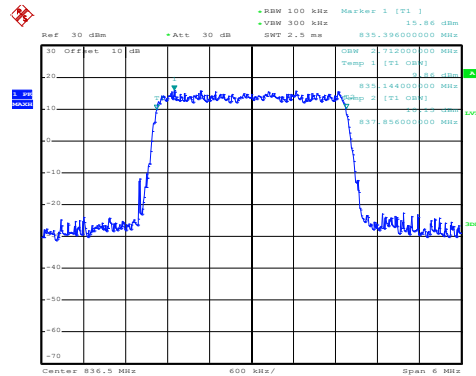
Lowest channel

16QAM



Date: 1.DEC.2020 14:33:08

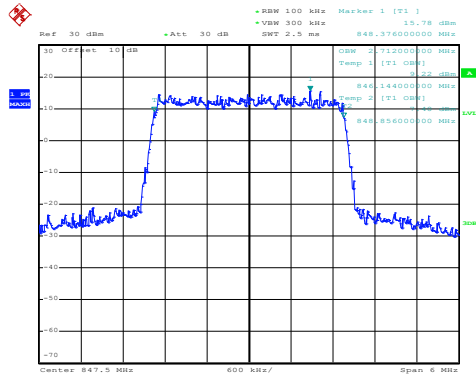
QPSK



Date: 1.DEC.2020 14:33:04

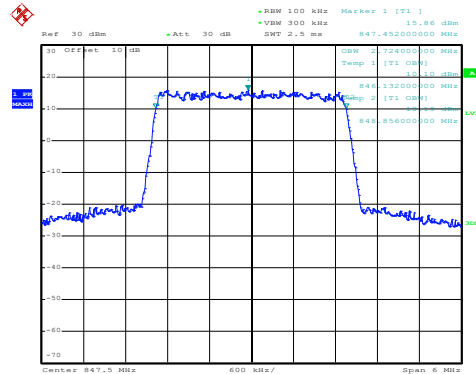
Middle channel

16QAM



Date: 1.DEC.2020 14:32:55

QPSK

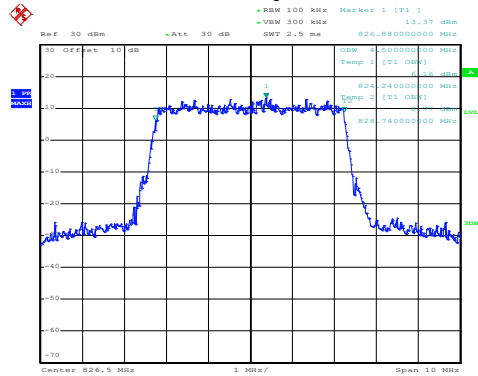


Date: 1.DEC.2020 14:32:52

Highest channel

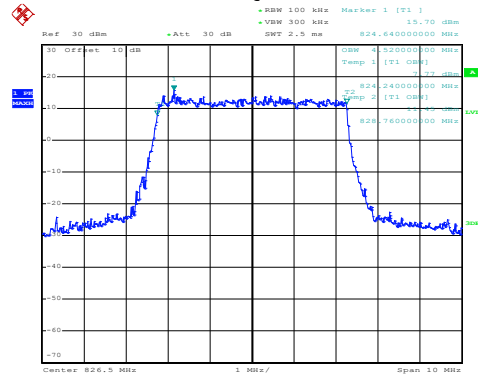
LTE Band 5: 99% Occupancy bandwidth BW: 5MHz

16QAM



Date: 1.DEC.2020 14:34:14

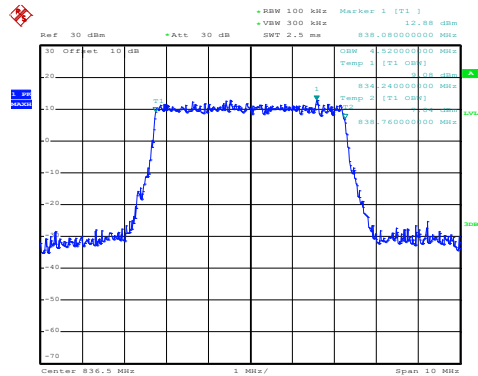
QPSK



Date: 1.DEC.2020 14:34:10

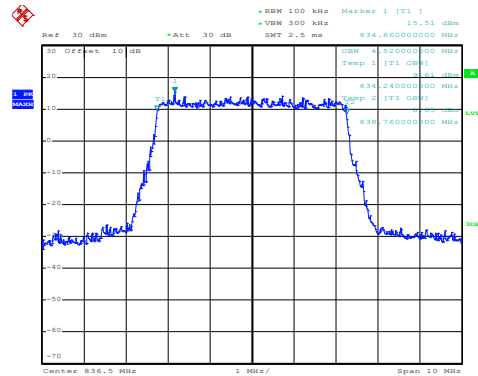
Lowest channel

16QAM



Date: 1.DEC.2020 14:34:53

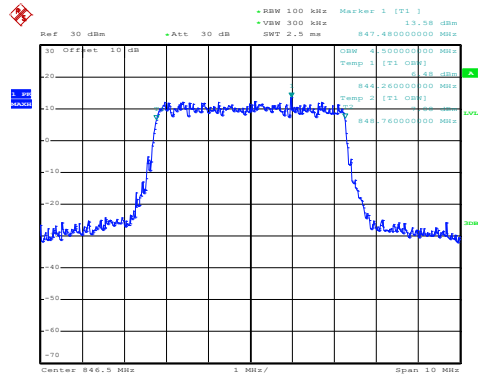
QPSK



Date: 1.DEC.2020 14:34:48

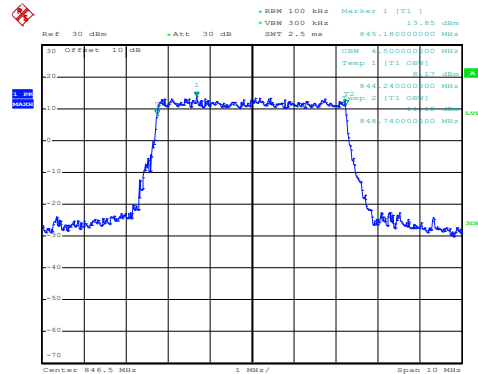
Middle channel

16QAM



Date: 1.DEC.2020 14:35:08

QPSK

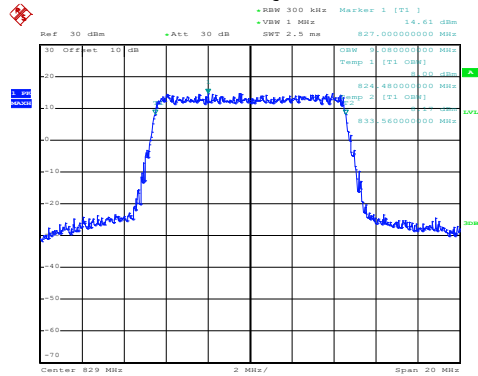


Date: 1.DEC.2020 14:35:04

Highest channel

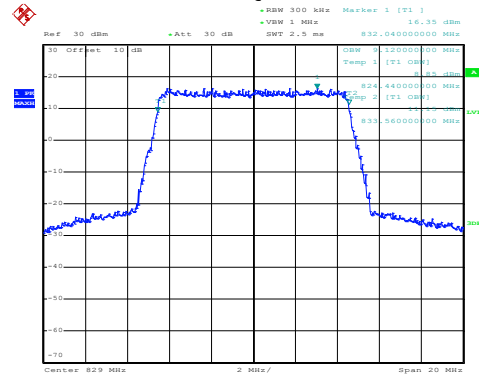
LTE Band 5: 99% Occupancy bandwidth BW: 10MHz

16QAM



Date: 1.DEC.2020 14:36:44

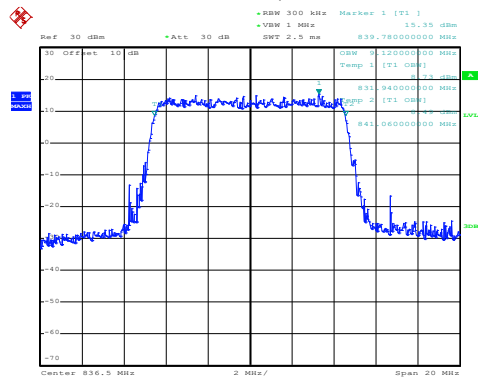
QPSK



Date: 1.DEC.2020 14:36:40

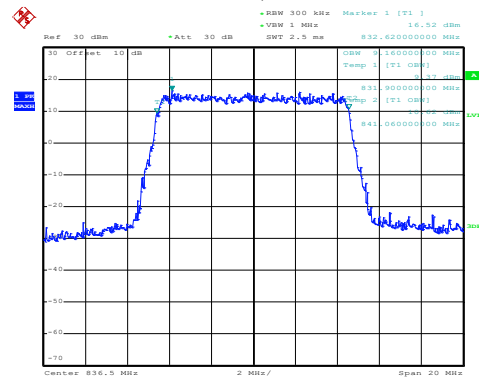
Lowest channel

16QAM



Date: 1.DEC.2020 14:36:06

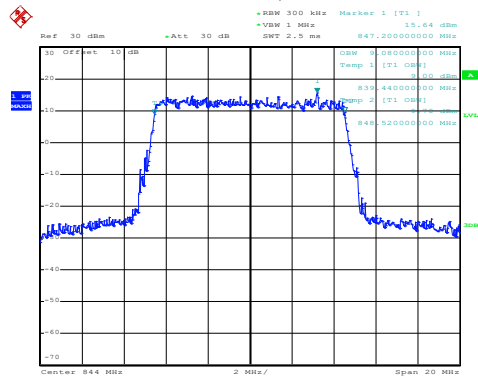
QPSK



Date: 1.DEC.2020 14:36:03

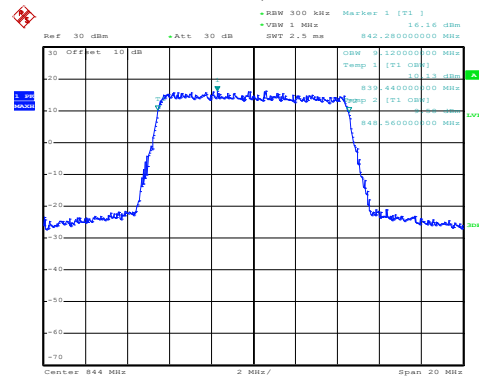
Middle channel

16QAM



Date: 1.DEC.2020 14:35:54

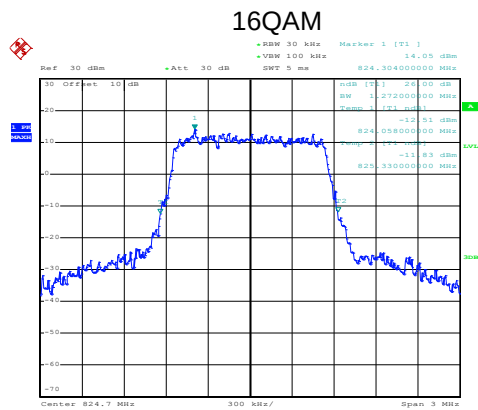
QPSK



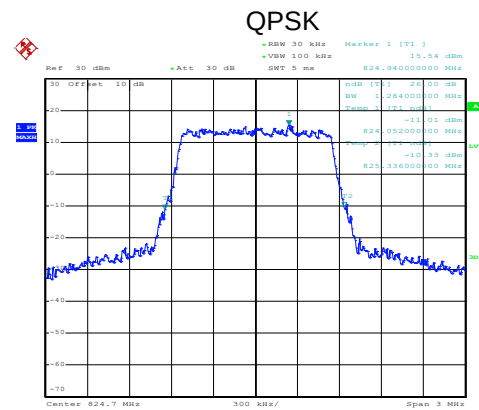
Date: 1.DEC.2020 14:35:51

Highest channel

LTE Band 5: -26dBc bandwidth
BW: 1.4MHz

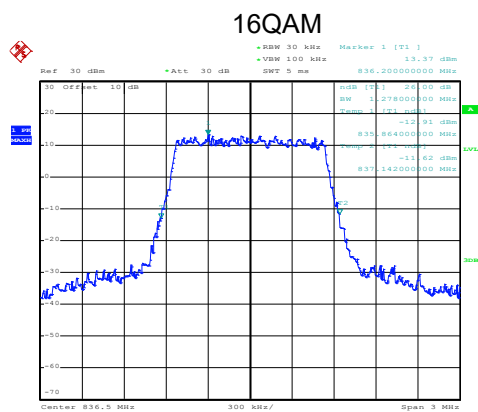


Date: 1.DEC.2020 14:31:20

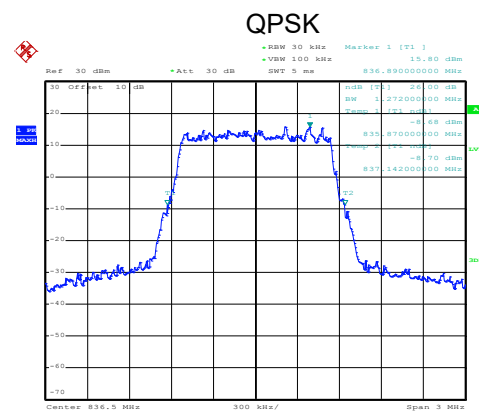


Date: 1.DEC.2020 14:31:15

Lowest channel

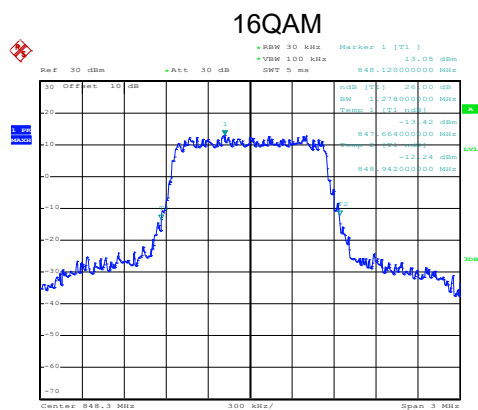


Date: 1.DEC.2020 14:31:34

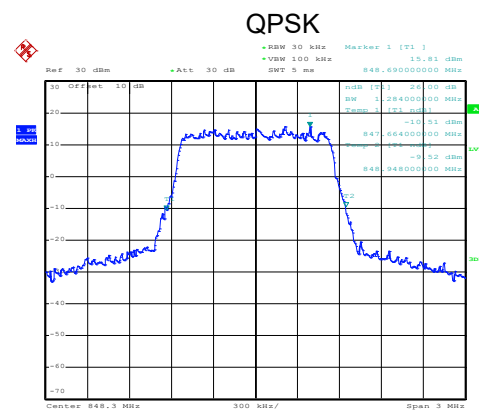


Date: 1.DEC.2020 14:31:30

Middle channel



Date: 1.DEC.2020 14:32:12

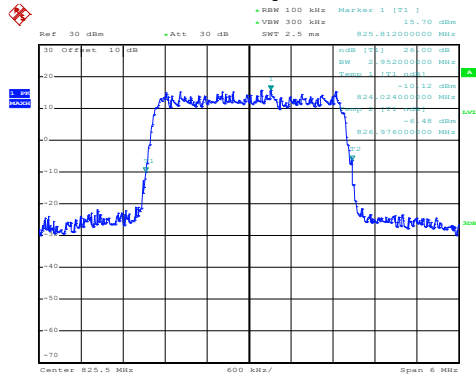


Date: 1.DEC.2020 14:32:09

Highest channel

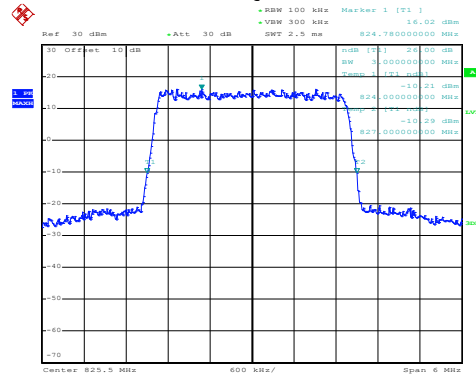
LTE Band 5: -26dBc bandwidth BW: 3MHz

16QAM



Date: 1.DEC.2020 14:33:32

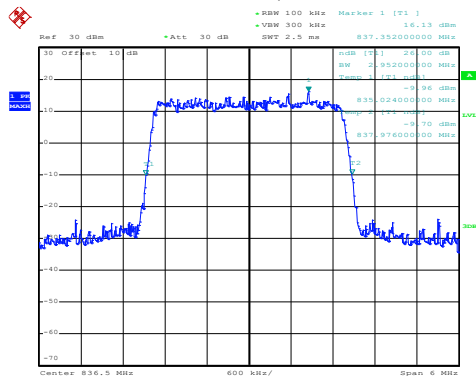
QPSK



Date: 1.DEC.2020 14:33:28

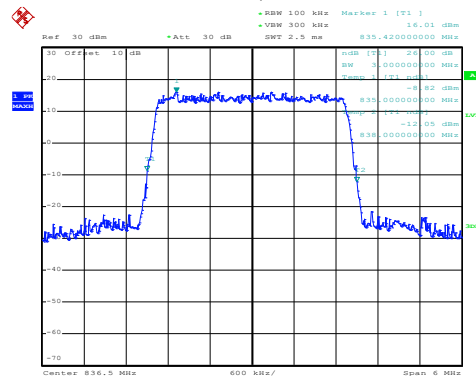
Lowest channel

16QAM



Date: 1.DEC.2020 14:33:17

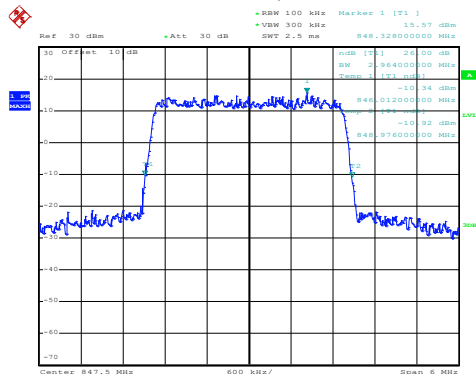
QPSK



Date: 1.DEC.2020 14:33:14

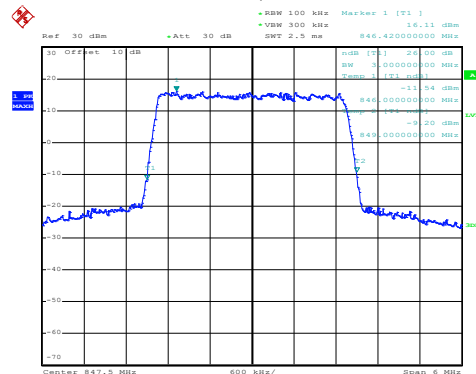
Middle channel

16QAM



Date: 1.DEC.2020 14:32:45

QPSK

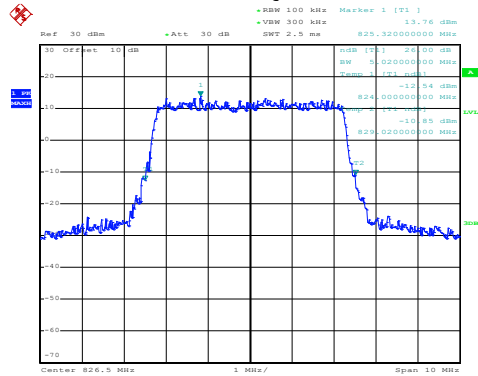


Date: 1.DEC.2020 14:32:41

Highest channel

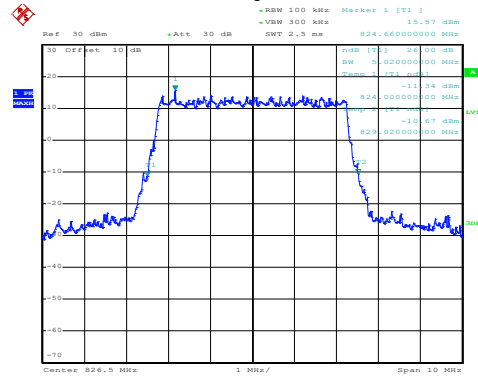
LTE Band 5: -26dBc bandwidth BW: 5MHz

16QAM



Date: 1.DEC.2020 14:34:25

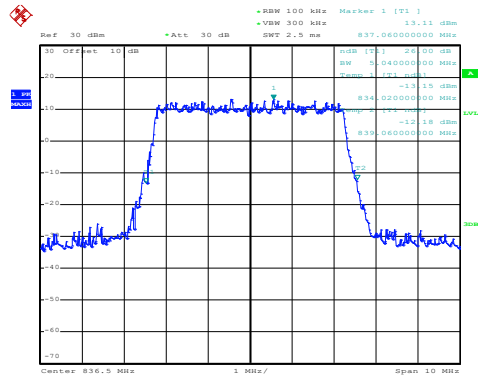
QPSK



Date: 1.DEC.2020 14:34:20

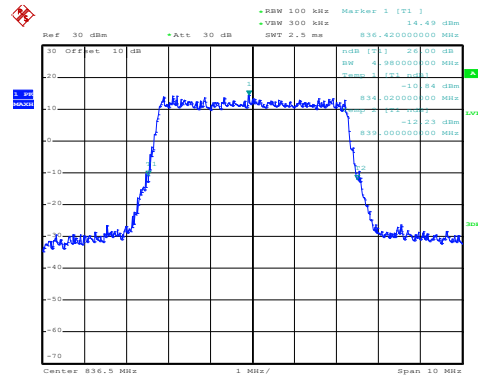
Lowest channel

16QAM



Date: 1.DEC.2020 14:34:41

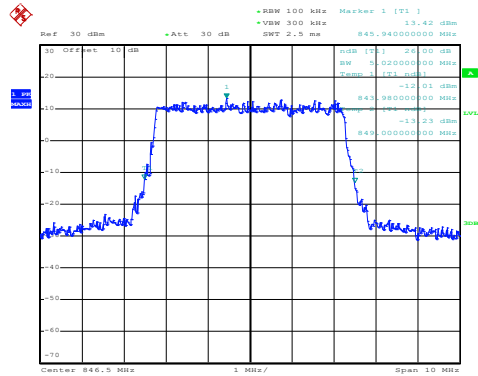
QPSK



Date: 1.DEC.2020 14:34:36

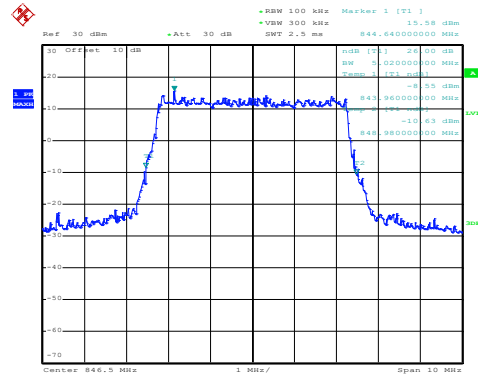
Middle channel

16QAM



Date: 1.DEC.2020 14:35:19

QPSK

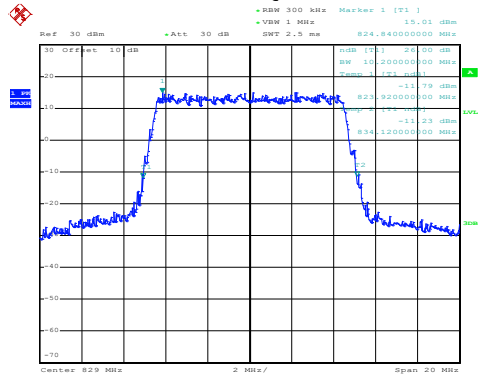


Date: 1.DEC.2020 14:35:15

Highest channel

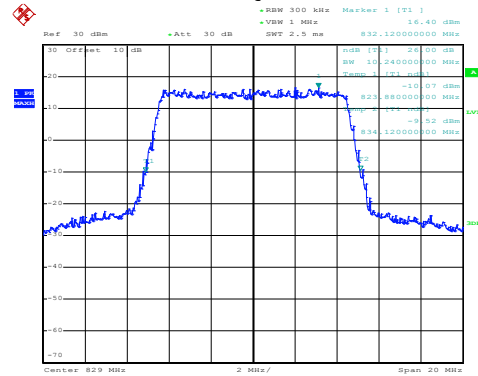
LTE Band 5: -26dBc bandwidth
BW: 10MHz

16QAM



Date: 1.DEC.2020 14:36:31

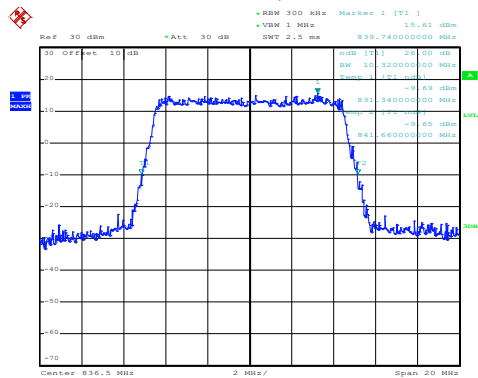
QPSK



Date: 1.DEC.2020 14:36:27

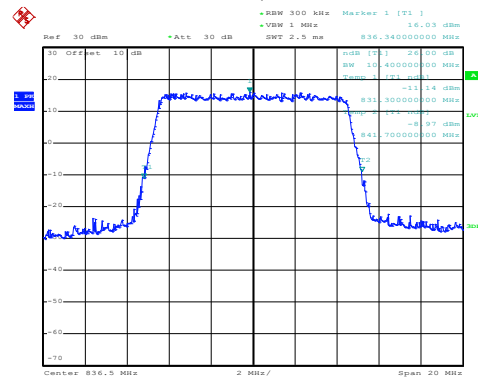
Lowest channel

16QAM



Date: 1.DEC.2020 14:36:17

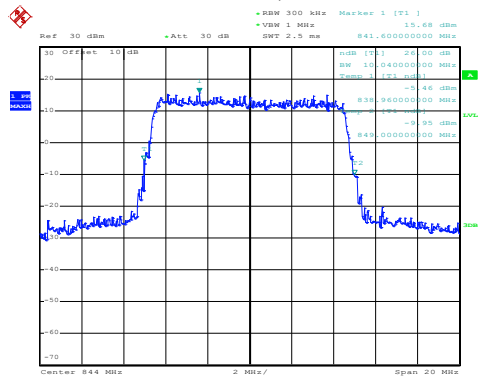
QPSK



Date: 1.DEC.2020 14:36:13

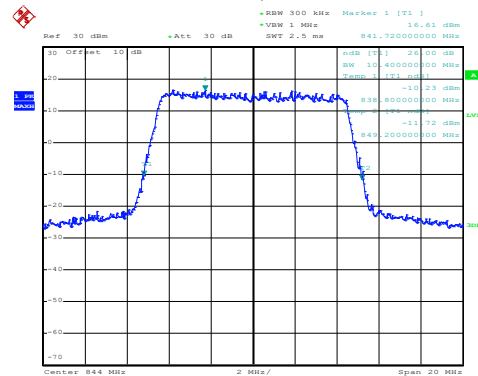
Middle channel

16QAM



Date: 1.DEC.2020 14:35:45

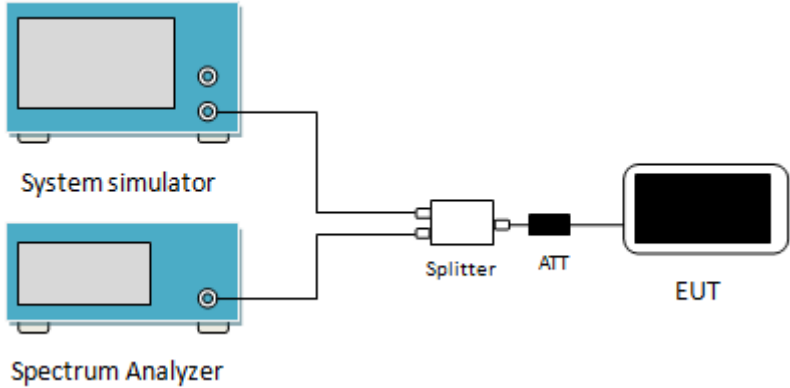
QPSK



Date: 1.DEC.2020 14:35:42

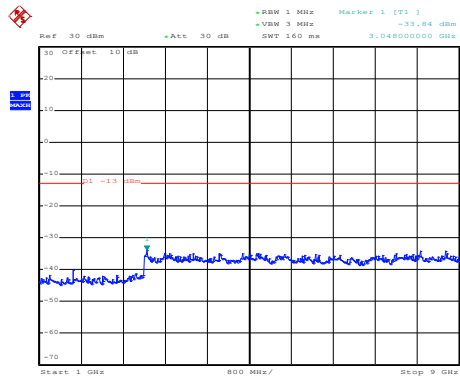
Highest channel

6.4 Out of band emission at antenna terminals

Test Requirement:	Part 22.917(a)
Limit:	LTE Band 5: The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB (-13 dBm).
Test Setup:	 The diagram shows a test setup for out-of-band emission testing. A System simulator and a Spectrum Analyzer are connected to a Splitter. The Splitter is connected to an ATT (Attenuator) and then to the EUT (Equipment Under Test).
Test Procedure:	1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 For the out of band: For Band 5 & 12 & 17 set the RBW=100 kHz, VBW=300 kHz and for Band 2 & 4 & 7 set the RBW=1 MHz, VBW=3 MHz when below 1 GHz, RBW =1 MHz, VBW=3 MHz when above 1 GHz, Start=30MHz, Stop= 10th harmonic. 3 Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	Pre-scan all RB Size and offset, and found the RB Size and offset of worst case, so the report shows only the worst case test data.

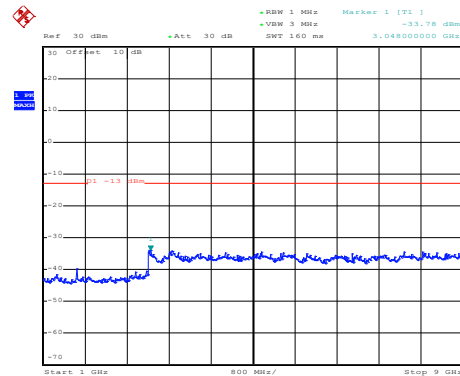
Test plots as follows (Conducted spurious emission) (worst case):
LTE Band 5 part:

LTE Band 5: 16 QAM & RB Size 1
BW: 1.4MHz
Lowest channel



Date: 1.DEC.2020 14:28:18

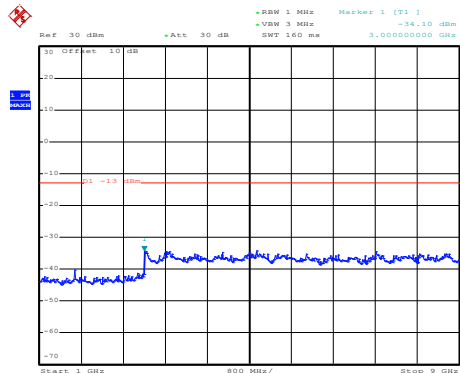
30MHz~1GHz



Date: 1.DEC.2020 14:28:11

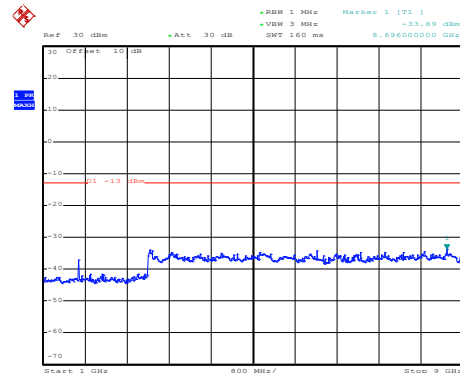
1GHz~9GHz

Middle channel



Date: 1.DEC.2020 14:28:34

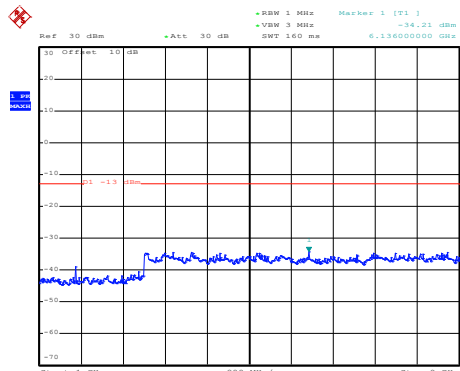
30MHz~1GHz



Date: 1.DEC.2020 14:28:27

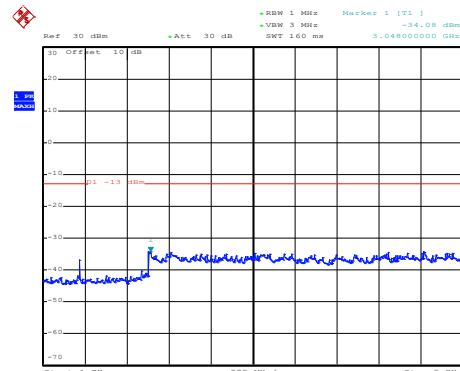
1GHz~9GHz

High channel



Date: 1.DEC.2020 14:29:06

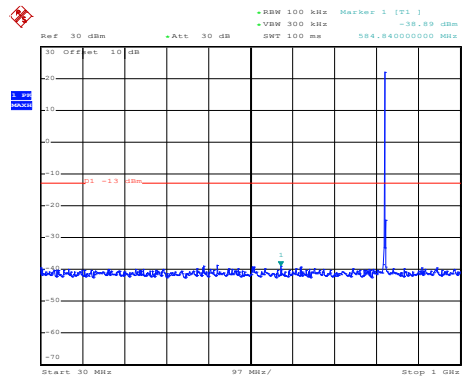
30MHz~1GHz



Date: 1.DEC.2020 14:29:00

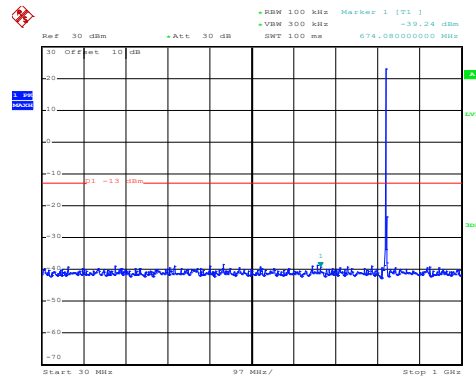
1GHz~9GHz

LTE Band 5: QPSK & RB Size 1
BW: 1.4MHz
Lowest channel



Date: 1.DEC.2020 14:30:30

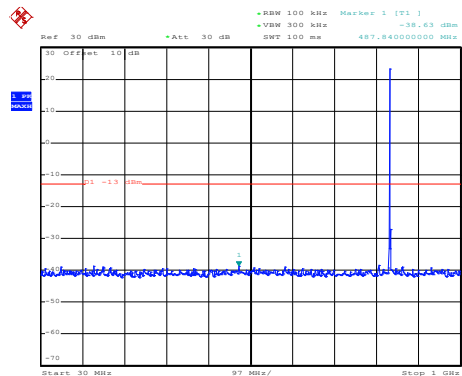
30MHz~1GHz



Date: 1.DEC.2020 14:30:19

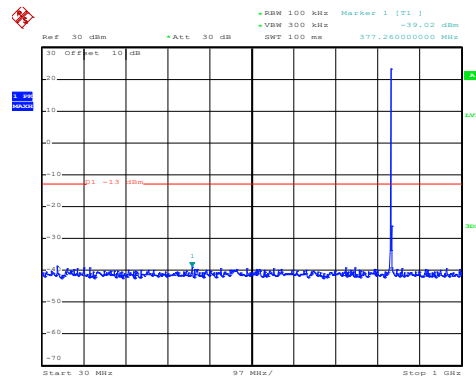
1GHz~9GHz

Middle channel



Date: 1.DEC.2020 14:30:04

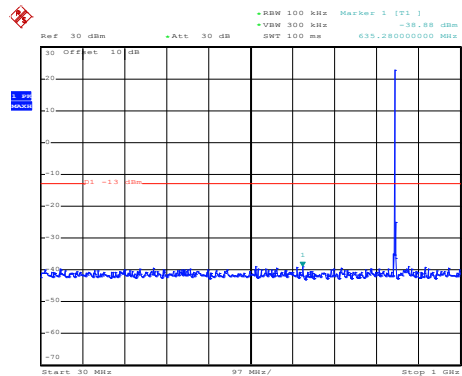
30MHz~1GHz



Date: 1.DEC.2020 14:29:50

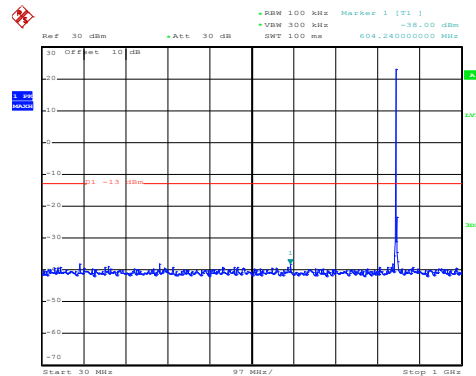
1GHz~9GHz

High channel



Date: 1.DEC.2020 14:29:38

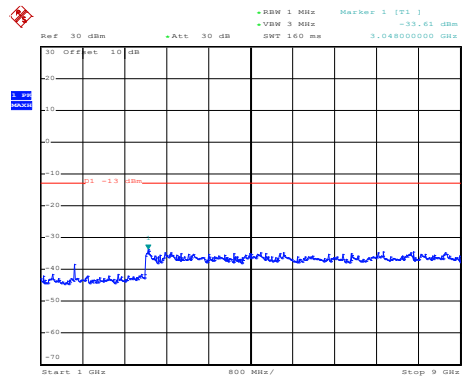
30MHz~1GHz



Date: 1.DEC.2020 14:29:30

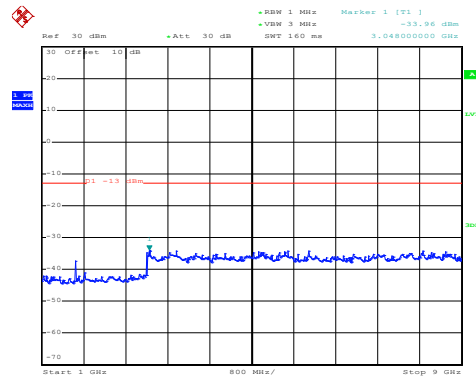
1GHz~9GHz

LTE Band 5: 16 QAM & RB Size 1
BW: 10MHz
Lowest channel



Date: 1.DEC.2020 14:27:45

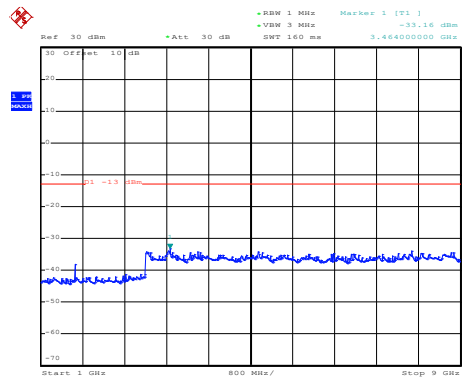
30MHz~1GHz



Date: 1.DEC.2020 14:27:37

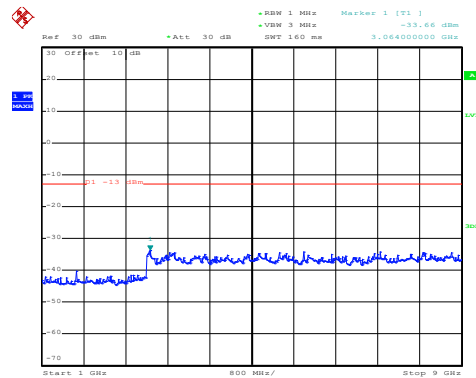
1GHz~9GHz

Middle channel



Date: 1.DEC.2020 14:27:25

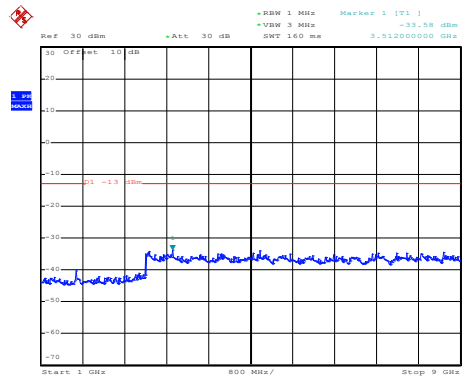
30MHz~1GHz



Date: 1.DEC.2020 14:27:16

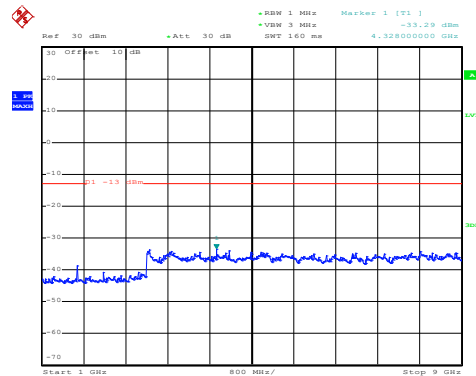
1GHz~9GHz

High channel



Date: 1.DEC.2020 14:27:07

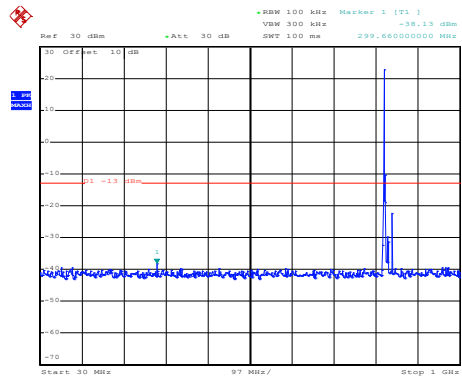
30MHz~1GHz



Date: 1.DEC.2020 14:27:01

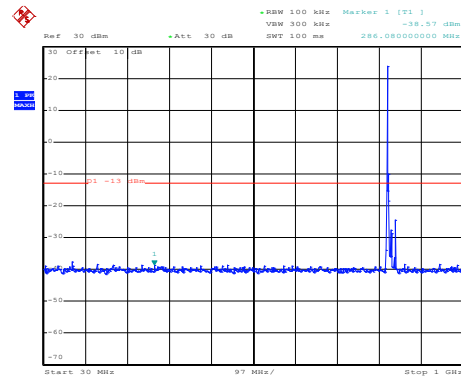
1GHz~9GHz

LTE Band 5: QPSK & RB Size 1 BW: 10MHz Lowest channel



Date: 1.DEC.2020 14:26:03

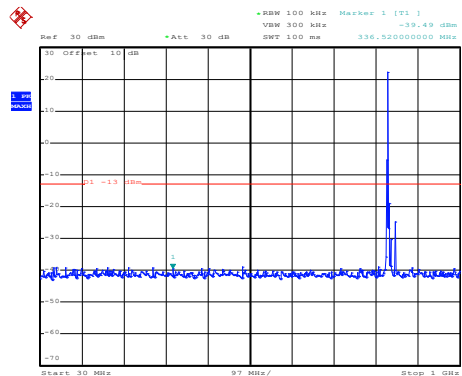
30MHz~1GHz



Date: 1.DEC.2020 14:25:53

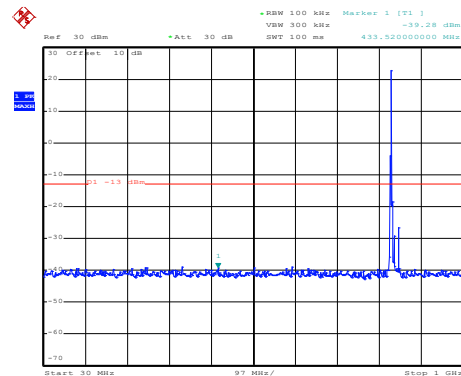
1GHz~9GHz

Middle channel



Date: 1.DEC.2020 14:26:28

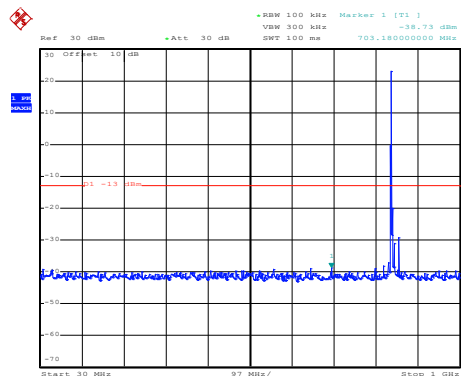
30MHz~1GHz



Date: 1.DEC.2020 14:26:20

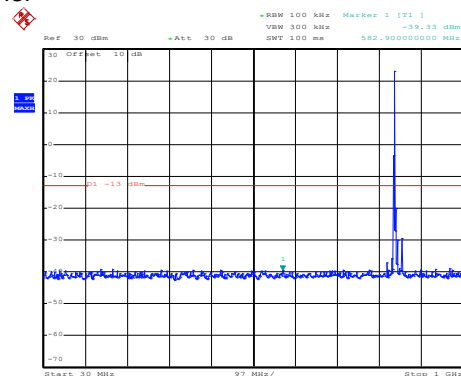
1GHz~9GHz

High channel



Date: 1.DEC.2020 14:26:48

30MHz~1GHz



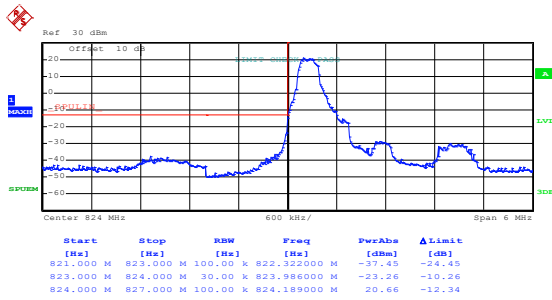
Date: 1.DEC.2020 14:26:41

1GHz~9GHz

Band edge emission:

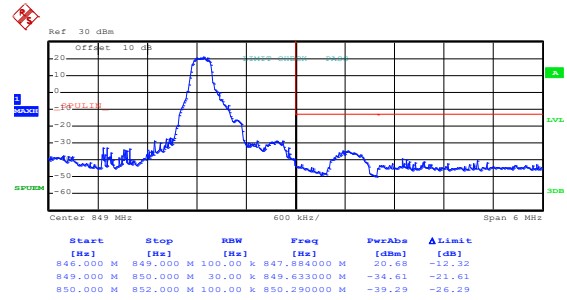
LTE Band 5 part:

**LTE Band 5, BW: 1.4MHz
16QAM & RB Size 1**



Date: 1.DEC.2020 14:22:28

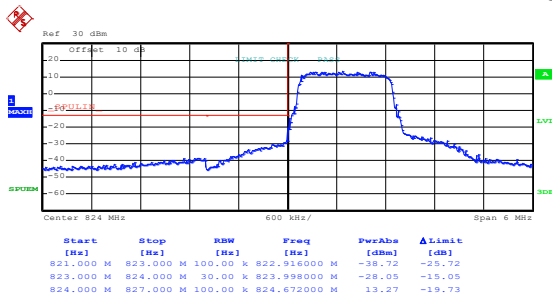
Lowest channel



Date: 1.DEC.2020 14:23:13

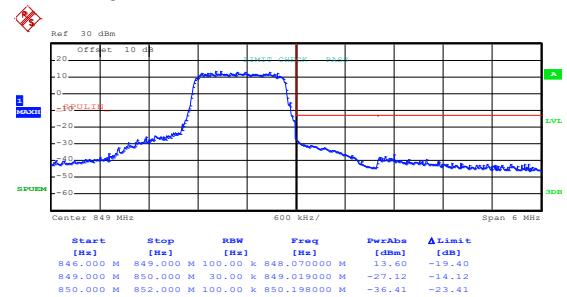
Highest channel

16QAM & RB Size 6



Date: 1.DEC.2020 14:22:42

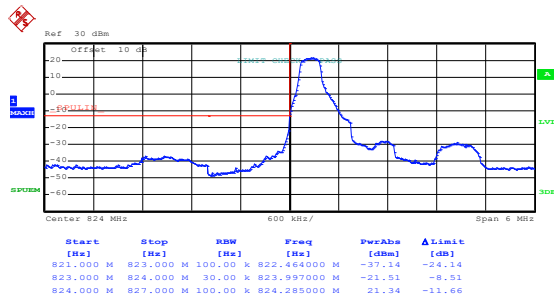
Lowest channel



Date: 1.DEC.2020 14:22:58

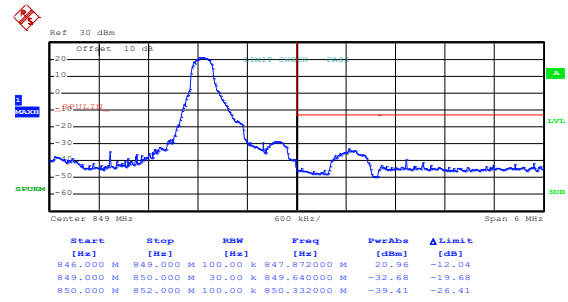
Highest channel

LTE Band 5, BW: 1.4MHz
QPSK & RB Size 1



Date: 1.DEC.2020 14:22:19

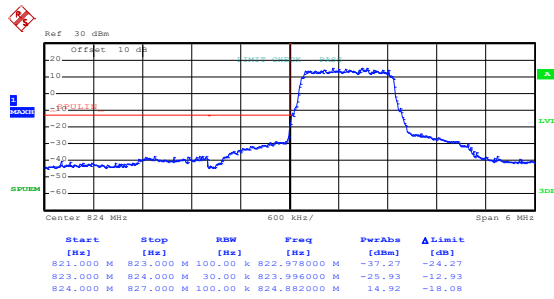
Lowest channel



Date: 1.DEC.2020 14:23:04

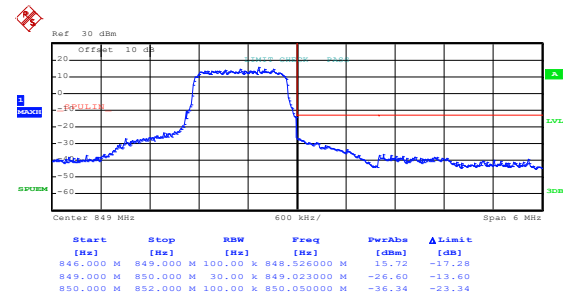
Highest channel

QPSK & RB Size 6



Date: 1.DEC.2020 14:22:37

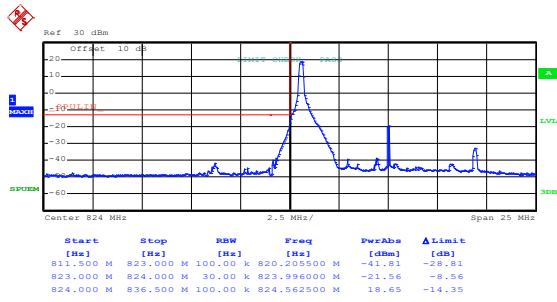
Lowest channel



Date: 1.DEC.2020 14:22:53

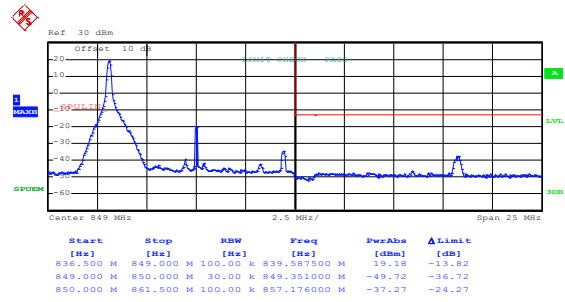
Highest channel

LTE Band 5, BW: 10MHz
16QAM & RB Size 1



Date: 1.DEC.2020 14:24:41

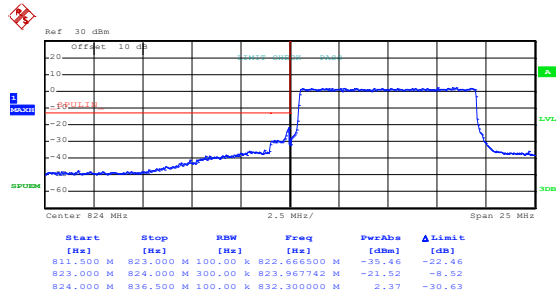
Lowest channel



Date: 1.DEC.2020 14:23:52

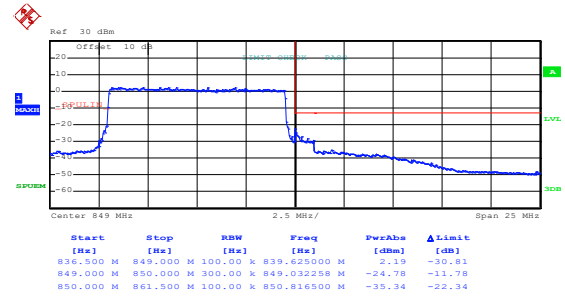
Highest channel

16QAM & RB Size 50



Date: 1.DEC.2020 14:25:01

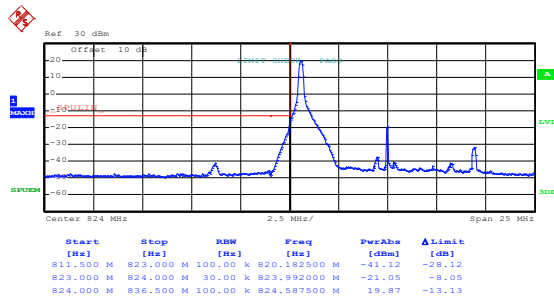
Lowest channel



Date: 1.DEC.2020 14:24:22

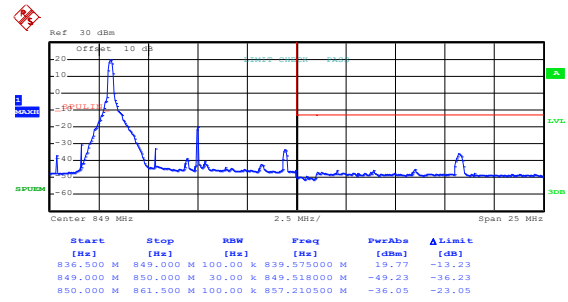
Highest channel

LTE Band 5, BW: 10MHz
QPSK & RB Size 1



Date: 1.DEC.2020 14:24:35

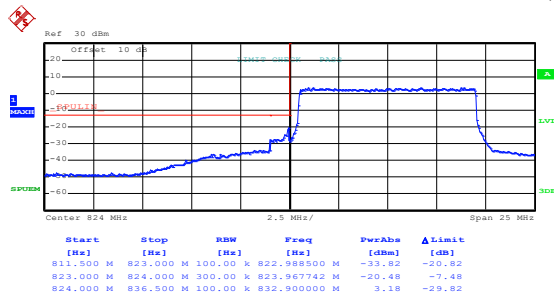
Lowest channel



Date: 1.DEC.2020 14:23:47

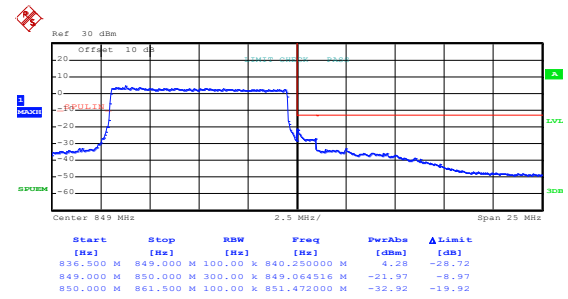
Highest channel

QPSK & RB Size 50



Date: 1.DEC.2020 14:24:56

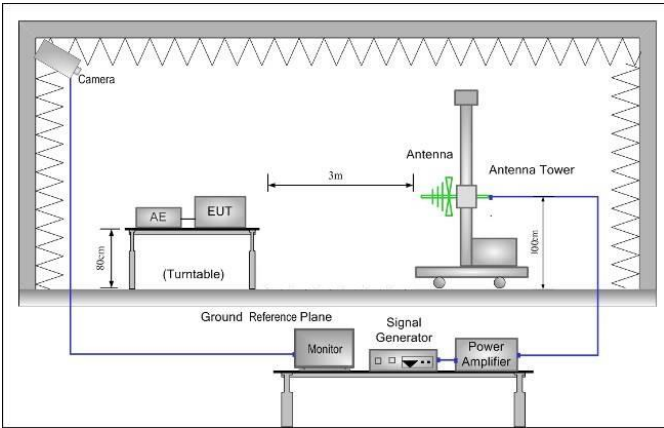
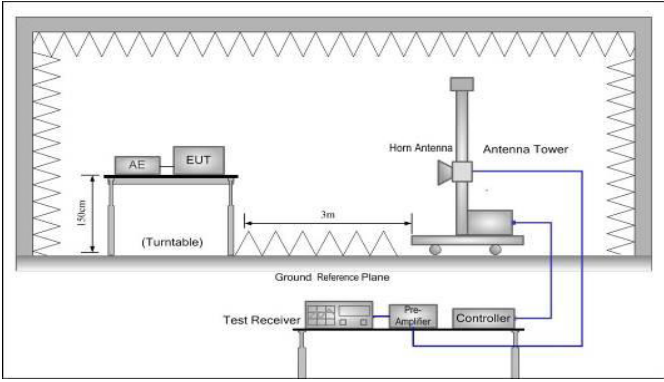
Lowest channel



Date: 1.DEC.2020 14:24:18

Highest channel

6.5 Field strength of spurious radiation measurement

Test Requirement:	Part 22.917(a), Part 24.238 (a), Part 27.53(g), Part 27.53(m), Part 27.53(h)
Limit:	LTE Band 2 & 4 & 5 & 12 & 17: The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB (-13 dBm). LTE Band 7: For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz.
Test setup:	Below 1GHz  Above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz)/1.5m(above 1GHz) above the ground at a 3 meter camber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer. 2. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations. 3. The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission

	was determined using the substitution method. 4. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency. ERP / EIRP = S.G. output (dBm) + Antenna Gain(dB/dBi) – Cable Loss (dB)
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details.
Test results:	Passed

Measurement Data:

Band 5 (1.4MHz)							
Lowest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
1649.40	-69.57	9.57	0.20	-60.20	-13.00	-47.20	Vertical
2474.10	-70.91	10.86	0.43	-60.48	-13.00	-47.48	Vertical
3298.80	-71.73	12.00	0.64	-60.37	-13.00	-47.37	Vertical
1649.40	-66.43	9.57	0.20	-57.06	-13.00	-44.06	Horizontal
2474.10	-69.44	10.86	0.43	-59.01	-13.00	-46.01	Horizontal
3298.80	-71.80	12.00	0.64	-60.44	-13.00	-47.44	Horizontal
Middle channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
1673.30	-69.75	9.66	0.22	-60.31	-13.00	-47.31	Vertical
2509.50	-70.44	10.91	0.46	-59.99	-13.00	-46.99	Vertical
3346.00	-71.96	12.09	0.66	-60.53	-13.00	-47.53	Vertical
1673.30	-66.58	9.66	0.22	-57.14	-13.00	-44.14	Horizontal
2509.50	-69.54	10.91	0.46	-59.09	-13.00	-46.09	Horizontal
3346.00	-71.44	12.09	0.66	-60.01	-13.00	-47.01	Horizontal
Highest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
1696.60	-69.90	9.74	0.23	-60.39	-13.00	-47.39	Vertical
2544.90	-70.62	10.94	0.49	-60.17	-13.00	-47.17	Vertical
3393.20	-72.00	12.19	0.68	-60.49	-13.00	-47.49	Vertical
1696.60	-66.93	9.74	0.23	-57.42	-13.00	-44.42	Horizontal
2544.90	-69.15	10.94	0.49	-58.70	-13.00	-45.70	Horizontal
3393.20	-71.71	12.19	0.68	-60.20	-13.00	-47.20	Horizontal
Remark: The emission levels of below 1 GHz are lower than the limit 20dB and not show in test report.							

Band 5 (10MHz)							
Lowest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
1658.00	-69.56	9.60	0.21	-60.17	-13.00	-47.17	Vertical
2487.00	-70.77	10.88	0.45	-60.34	-13.00	-47.34	Vertical
3316.00	-72.25	12.03	0.65	-60.87	-13.00	-47.87	Vertical
1658.00	-66.89	9.60	0.21	-57.50	-13.00	-44.50	Horizontal
2487.00	-68.89	10.88	0.45	-58.46	-13.00	-45.46	Horizontal
3316.00	-71.58	12.03	0.65	-60.20	-13.00	-47.20	Horizontal
Middle channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
1673.30	-69.74	9.66	0.21	-60.29	-13.00	-47.29	Vertical
2509.50	-71.15	10.91	0.46	-60.70	-13.00	-47.70	Vertical
3346.00	-71.98	12.09	0.66	-60.55	-13.00	-47.55	Vertical
1673.30	-67.41	9.66	0.21	-57.96	-13.00	-44.96	Horizontal
2509.50	-69.00	10.91	0.46	-58.55	-13.00	-45.55	Horizontal
3346.00	-71.15	12.09	0.66	-59.72	-13.00	-46.72	Horizontal
Highest channel							
Frequency (MHz)	Level at antenna terminals (dBm)	Substitute antenna gain (dBi)	Cable Loss (dBi)	Spurious Emission level (dBm)	Limit Line (dBm)	Over Limit (dBm)	Polarization
1688.00	-70.03	9.71	0.23	-60.55	-13.00	-47.55	Vertical
2532.00	-70.76	10.93	0.48	-60.31	-13.00	-47.31	Vertical
3376.00	-72.28	12.15	0.67	-60.80	-13.00	-47.80	Vertical
1688.00	-67.85	9.71	0.23	-58.37	-13.00	-45.37	Horizontal
2532.00	-69.26	10.93	0.48	-58.81	-13.00	-45.81	Horizontal
3376.00	-70.80	12.15	0.67	-59.32	-13.00	-46.32	Horizontal
Remark: The emission levels of below 1 GHz are lower than the limit 20dB and not show in test report.							

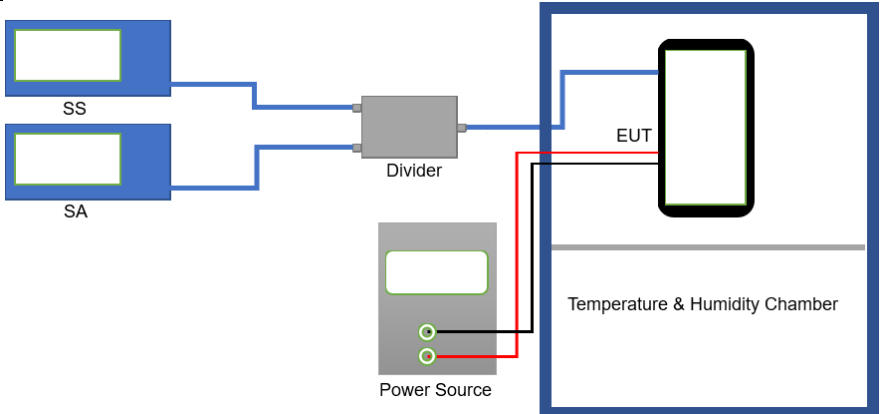
6.6 Frequency stability V.S. Temperature measurement

Test Requirement:	Part 22.355
Limit:	± 2.5 ppm for Band 5
Test setup:	
Test procedure:	1. The equipment under test was connected to an external DC power supply and input rated voltage. 2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. 3. The EUT was placed inside the temperature chamber. 4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. 5. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. 6. Repeat step measure with 10°C increased per stage until the highest temperature of $+50^{\circ}\text{C}$ reached
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data (worst case):
LTE Band 5 part:

Reference Frequency: LTE Band 5 (10MHz) Middle channel=20525 channel=836.50MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
7.4	-30	198	0.236701	±2.5	Pass
	-20	177	0.211596		
	-10	131	0.156605		
	0	165	0.197250		
	10	124	0.148237		
	20	101	0.120741		
	30	146	0.174537		
	40	117	0.139868		
	50	180	0.215182		
16QAM					
7.4	-30	199	0.237896	±2.5	Pass
	-20	132	0.157800		
	-10	165	0.197250		
	0	144	0.172146		
	10	102	0.121937		
	20	178	0.212791		
	30	180	0.215182		
	40	156	0.186491		
	50	111	0.132696		
Note: Only the worst case shown in the report.					

6.7 Frequency stability V.S. Voltage measurement

Test Requirement:	Part 22.355
Limit:	± 2.5 ppm for Band 5
Test setup:	
Test procedure:	1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage. 2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. 3. Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data (worst case):
LTE Band 5 part:

Reference Frequency: LTE Band 5(10MHz) Middle channel=20525 channel=836.50MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
QPSK					
25	8.51	98	0.117155	±2.5	Pass
	7.40	78	0.093246		
	6.29	80	0.095637		
16QAM					
25	8.51	99	0.118350	±2.5	Pass
	7.40	88	0.105200		
	6.29	77	0.092050		
Note: Only the worst case shown in the report.					

8 EUT Constructional Details

Reference to the test report No. JYTSZE201104901

-----End of report-----