



# TEST REPORT

## No. I20Z60989-WMD03

for

**HMD Global Oy**

**Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN**

**Model Name: TA-1274**

**FCC ID: 2AJOTTA-1274**

with

**Hardware Version: 99651\_1\_10**

**Software Version: 00WW\_0\_070**

**Issued Date: 2020-07-13**

**Note:**

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The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

**Test Laboratory:**

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I20Z60989-WMD03	Rev.0	1 <sup>st</sup> edition	2020-07-13

Note: the latest revision of the test report supersedes all previous version.

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## **1. Test Laboratory**

### **1.1. Introduction & Accreditation**

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0 and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

### **1.2. Testing Location**

Location 1: CTTL (huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing,  
P. R. China 100191

Location 2: CTTL (Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road,  
Haidian District, Beijing, P. R. China 100191

Location 3: CTTL (BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology  
Development Area, Beijing, P. R. China 100176

### 1.3. Testing Environment

Normal Temperature: 15-35°C  
Relative Humidity: 20-75%

### 1.4. Project Data

Testing Start Date: 2020-06-02  
Testing End Date: 2020-07-13

### 1.5. Signature



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Dong Yuan  
(Prepared this test report)



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Zhou Yu  
(Reviewed this test report)



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Zhao Hui Lin  
Deputy Director of the laboratory  
(Approved this test report)



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: HMD Global Oy  
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### **2.2. Manufacturer Information**

Company Name: HMD Global Oy  
Address /Post: Bertel Jungin aukio 9,02600 Espoo, Finland  
Contact: Rosario Casillo  
Email: Rosario.Casillo@hmdglobal.com  
Telephone: NA  
Fax: NA

### **3. Equipment Under Test (EUT) and Ancillary Equipment (AE)**

#### **3.1. About EUT**

Description	Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN
Model Name	TA-1274
FCC ID	2AJOTTA-1274
Antenna	Embedded
Output power	22.68dBm maximum EIRP measured for LTE Band 7
Extreme vol. Limits	3.6VDC to 4.4VDC (nominal:3.85VDC)
Extreme temp. Tolerance	-10°C to +45°C

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL.

#### **3.2. Internal Identification of EUT used during the test**

EUT ID*	IMEI	HW Version	SW Version	Date of receipt
UT02a	353180110009373/	99651_1_10	00WW_0_070	2020-06-17
	353180110009381			

\*EUT ID: is used to identify the test sample in the lab internally.

#### **3.3. Internal Identification of AE used during the test**

AE ID*	Description
AE1	Battery
AE1	
Model	WT242
Manufacturer	Jiade Energy Technology (Zhuhai) Co., Ltd
Capacitance	4380mAh

\*AE ID: is used to identify the test sample in the lab internally.



#### **4. Reference Documents**

The following documents listed in this section are referred for testing.

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-19 Edition
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-19 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-19 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS	v03r01



## 5. Laboratory Environment

**Control room / conducted chamber** did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 0.5 Ω

**Fully-anechoic chamber 2** (8.6 meters×6.1 meters×3.85 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 1 Ω
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

**Semi-anechoic chamber 2 / Fully-anechoic chamber 3** (10 meters×6.7 meters×6.15 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	<±3.5 dB, 3 m distance
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

## 6. Summary Of Test Result

### LTE Band 2

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	24.232	BR
2	Emission Limit	2.1051/24.238	BR
3	Frequency Stability	2.1055	BR
4	Occupied Bandwidth	2.1049	BR
5	Emission Bandwidth	24.238	BR
6	Band Edge Compliance	24.238	BR
7	Conducted Spurious Emission	24.238	BR
8	Peak-to-Average Power Ratio	24.232	BR

### LTE Band 5

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	22.913	BR
2	Emission Limit	2.1051/22.917	BR
3	Frequency Stability	2.1055	BR
4	Occupied Bandwidth	2.1049	BR
5	Emission Bandwidth	22.917	BR
6	Band Edge Compliance	22.917	BR
7	Conducted Spurious Emission	22.917	BR

### LTE Band 7

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50	P
2	Emission Limit	2.1051/27.53	P
3	Frequency Stability	2.1055	BR
4	Occupied Bandwidth	2.1049	BR
5	Emission Bandwidth	27.53	BR
6	Band Edge Compliance	27.53	BR
7	Conducted Spurious Emission	27.53	BR
8	Peak-to-Average Power Ratio	27.50	BR

**LTE Band 12**

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50	BR
2	Emission Limit	2.1051/27.53	BR
3	Frequency Stability	2.1055	BR
4	Occupied Bandwidth	2.1049	BR
5	Emission Bandwidth	27.53	BR
6	Band Edge Compliance	27.53	BR
7	Conducted Spurious Emission	27.53	BR
8	Peak-to-Average Power Ratio	27.50	BR

**LTE Band 66**

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50	BR
2	Emission Limit	2.1051/27.53	BR
3	Frequency Stability	2.1055	BR
4	Occupied Bandwidth	2.1049	BR
5	Emission Bandwidth	27.53	BR
6	Band Edge Compliance	27.53	BR
7	Conducted Spurious Emission	27.53	BR
8	Peak-to-Average Power Ratio	27.50	BR

## Terms used in Verdict column

P	Pass. The EUT complies with the essential requirements in the standard.
NP	Not Performed. The test was not performed by CTTL.
NA	Not Applicable. The test was not applicable.
BR	Re-use test data from basic model report.
F	Fail. The EUT does not comply with the essential requirements in the standard.

## Explanation of worst-case configuration

The worst-case scenario for all measurements is based on the conducted output power measurement investigation results. Output power was measured on QPSK, 16QAM and 64QAM modulations. It was found that QPSK was the worst case. All testing was performed using QPSK modulations to represent the worst case unless otherwise stated. The test results shown in the following sections represent the worst case emission.

The Equipment Under Test (EUT) model TA-1274 (FCC ID: 2AJOTTA-1274) is a variant product of TA-1277 (FCC ID: 2AJOTTA-1277), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements were performed on this device. Other test results are derived from test report No. I20Z60930-WMD03. Please refer Annex A for detail spot check verification data and reference data. The spot check test results are consistent with basic model.

For detail differences between two models please refer the Declaration of Changes document.

## 7. Test Equipment Utilized

NO.	Description	Type	Series Number	Manufacture	Cal Due Date	Calibration Interval
1	Wideband Radio Communication Tester	CMW500	159082	R&S	2020-12-24	1 year
2	Spectrum Analyzer	FSU	200030	R&S	2021-06-01	1 year
3	Radio Communication Analyzer	MT8821C	6201763159	Anritsu	2020-07-23	1 year
4	Climate Chamber	SH-242	93008556	ESPEC	2020-12-21	3 years
5	EMI Antenna	9117	177	Schwarzbeck	2021-10-12	3 years
6	EMI Antenna	3117	00058889	ETS-Lindgren	2020-11-18	1 year
7	EMI Antenna	3117	00119021	ETS-Lindgren	2021-01-14	1 year
8	Signal Generator	SMF100A	101295	R&S	2020-11-06	1 year
9	Test Receiver	E4440A	MY48250642	Agilent	2021-03-12	1 year
10	Universal Radio Communication Tester	CMW500	143008	R&S	2020-11-26	1 year
11	EMI Antenna	VULB9163	9163-235	Schwarzbeck	2020-11-24	1 year
12	Power Amplifier	5S1G4	0341863	AR	/	

## Annex A: Measurement Results

### A.1 Output Power

#### A.1.1 Summary

During the process of testing, the EUT was controlled via communication tester to ensure max power transmission and proper modulation.

In all cases, output power is within the specified limits.

#### A.1.2 Conducted

##### A.1.2.1 Method of Measurements

The EUT was set up for the max output power with pseudo random data modulation.

These measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) for each bandwidth.

##### A.1.2.2 Measurement Result

#### LTE band 2

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1 RB high	1909.3	23.80	22.77	22.12
		1880.0	23.78	22.86	22.21
		1850.7	23.84	23.15	22.50
	1 RB low	1909.3	23.80	22.76	22.11
		1880.0	23.79	22.84	22.19
		1850.7	23.84	23.13	22.48
	50% RB mid	1909.3	23.86	22.98	22.33
		1880.0	23.86	22.91	22.26
		1850.7	23.89	23.06	22.41
	100% RB	1909.3	23.00	21.98	21.33
		1880.0	22.89	21.97	21.32
		1850.7	22.97	21.83	21.18
3MHz	1 RB high	1908.5	23.86	22.82	22.17
		1880.0	23.87	22.75	22.10
		1851.5	23.93	23.23	22.58
	1 RB low	1908.5	23.93	22.84	22.19
		1880.0	23.82	22.80	22.15
		1851.5	23.99	23.21	22.56
	50% RB mid	1908.5	23.02	22.00	21.35
		1880.0	22.98	22.04	21.39
		1851.5	23.00	22.04	21.39
	100% RB	1908.5	22.91	21.87	21.22

		1880.0	22.91	21.96	21.31
		1851.5	22.94	21.92	21.27
5MHz	1 RB high	1907.5	23.84	22.80	22.15
		1880.0	23.85	22.92	22.27
		1852.5	23.78	23.30	22.65
	1 RB low	1907.5	23.81	22.86	22.21
		1880.0	23.86	22.95	22.30
		1852.5	23.80	23.25	22.60
	50% RB mid	1907.5	23.04	22.00	21.35
		1880.0	22.99	22.02	21.37
		1852.5	23.02	22.08	21.43
	100% RB	1907.5	22.94	21.83	21.18
		1880.0	22.93	21.95	21.30
		1852.5	22.95	21.99	21.34
10MHz	1 RB high	1905.0	23.89	22.77	22.12
		1880.0	23.82	22.73	22.08
		1855.0	23.87	23.23	22.58
	1 RB low	1905.0	23.83	22.85	22.20
		1880.0	23.79	22.75	22.10
		1855.0	23.90	23.18	22.53
	50% RB mid	1905.0	22.96	22.04	21.39
		1880.0	22.95	21.98	21.33
		1855.0	22.98	21.99	21.34
	100% RB	1905.0	22.85	21.91	21.26
		1880.0	22.91	21.93	21.28
		1855.0	22.96	21.99	21.34
15MHz	1 RB high	1902.5	23.90	23.00	22.35
		1880.0	23.72	22.71	22.06
		1857.5	23.77	23.13	22.48
	1 RB low	1902.5	23.82	23.21	22.56
		1880.0	23.79	22.68	22.03
		1857.5	23.85	23.15	22.50
	50% RB mid	1902.5	23.06	21.98	21.33
		1880.0	23.03	21.93	21.28
		1857.5	23.00	22.04	21.39
	100% RB	1902.5	22.98	21.89	21.24
		1880.0	23.04	21.98	21.33
		1857.5	23.02	22.00	21.35
20MHz	1 RB high	1900.0	23.01	22.33	21.44
		1880.0	23.02	22.45	21.60
		1860.0	23.00	22.52	21.49
	1 RB low	1900.0	23.04	22.52	21.53
		1880.0	23.08	22.36	21.58



		1860.0	23.01	22.49	21.49
	50% RB mid	1900.0	22.35	21.43	20.71
		1880.0	22.30	21.32	20.65
		1860.0	22.34	21.39	20.65
	100% RB	1900.0	22.30	21.33	20.68
		1880.0	22.31	21.33	20.60
		1860.0	22.29	21.36	20.65

**LTE band 5**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1 RB high	848.3	23.75	22.76	21.85
		836.5	23.76	22.79	21.88
		824.7	23.80	23.11	22.20
	1 RB low	848.3	23.68	22.71	21.80
		836.5	23.79	22.73	21.82
		824.7	23.82	23.08	22.17
	50% RB mid	848.3	23.90	23.00	22.09
		836.5	23.85	22.87	21.96
		824.7	23.91	23.03	22.12
	100% RB	848.3	22.87	22.07	21.16
		836.5	22.82	21.94	21.03
		824.7	22.86	21.78	20.87
3MHz	1 RB high	847.5	23.76	22.73	21.82
		836.5	23.78	22.64	21.73
		825.5	23.89	23.15	22.24
	1 RB low	847.5	23.78	22.79	21.88
		836.5	23.72	22.67	21.76
		825.5	23.83	23.10	22.19
	50% RB mid	847.5	22.85	21.93	21.02
		836.5	22.85	21.97	21.06
		825.5	22.86	21.97	21.06
	100% RB	847.5	22.82	21.80	20.89
		836.5	22.81	21.86	20.95
		825.5	22.79	21.86	20.95
5MHz	1 RB high	846.5	23.78	22.78	21.87
		836.5	23.81	22.85	21.94
		826.5	23.77	23.25	22.34
	1 RB low	846.5	23.72	22.78	21.87
		836.5	23.79	22.86	21.95
		826.5	23.70	23.18	22.27
	50% RB mid	846.5	22.82	21.92	21.01
		836.5	22.83	21.95	21.04
		826.5	22.85	22.00	21.09
	100% RB	846.5	22.78	21.78	20.87
		836.5	22.78	21.85	20.94
		826.5	22.78	21.93	21.02
10MHz	1 RB high	844.0	23.44	22.73	21.83
		836.5	23.39	22.39	21.74
		829.0	23.40	22.31	21.74
	1 RB low	844.0	23.30	22.70	21.85





		836.5	23.23	22.38	21.76
		829.0	23.38	22.30	21.78
	50% RB mid	844.0	22.39	21.47	20.71
		836.5	22.40	21.51	20.68
		829.0	22.43	21.43	20.70
	100% RB	844.0	22.37	21.38	20.73
		836.5	22.40	21.45	20.69
		829.0	22.40	21.38	20.67

**LTE band 7**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
5MHz	1 RB high	2567.5	23.57	22.61	20.73
		2535.0	23.56	22.60	20.72
		2502.5	23.38	22.78	20.90
	1 RB low	2567.5	23.54	22.56	20.68
		2535.0	23.52	22.59	20.71
		2502.5	23.38	22.78	20.90
	50% RB mid	2567.5	22.64	21.75	19.87
		2535.0	22.59	21.61	19.73
		2502.5	22.49	21.56	19.68
	100% RB	2567.5	22.57	21.62	19.74
		2535.0	22.54	21.55	19.67
		2502.5	22.43	21.47	19.59
10MHz	1 RB high	2565.0	23.58	22.58	20.70
		2535.0	23.53	22.45	20.57
		2505.0	23.48	22.75	20.87
	1 RB low	2565.0	23.54	22.52	20.64
		2535.0	23.50	22.41	20.53
		2505.0	23.48	22.72	20.84
	50% RB mid	2565.0	22.58	21.79	19.91
		2535.0	22.57	21.61	19.73
		2505.0	22.42	21.47	19.59
	100% RB	2565.0	22.58	21.69	19.81
		2535.0	22.56	21.55	19.67
		2505.0	22.45	21.45	19.57
15MHz	1 RB high	2562.5	23.46	22.36	20.57
		2535.0	23.47	22.74	20.86
		2507.5	23.39	22.67	20.79
	1 RB low	2562.5	23.41	22.36	20.58
		2535.0	23.40	22.75	20.87
		2507.5	23.41	22.63	20.75
	50% RB mid	2562.5	22.61	21.63	19.75
		2535.0	22.61	21.59	19.71
		2507.5	22.55	21.43	19.55
	100% RB	2562.5	22.56	21.65	19.77
		2535.0	22.62	21.57	19.69
		2507.5	22.52	21.44	19.56
20MHz	1 RB high	2560.0	23.35	22.72	20.84
		2535.0	23.34	22.67	20.70
		2510.0	23.24	22.69	20.65
	1 RB low	2560.0	23.34	22.71	20.83



		2535.0	23.26	22.63	20.71
		2510.0	23.14	22.60	20.69
	50% RB mid	2560.0	22.55	21.67	20.00
		2535.0	22.53	21.52	19.94
		2510.0	22.46	21.46	19.91
	100% RB	2560.0	22.62	21.68	19.98
		2535.0	22.55	21.54	19.89
		2510.0	22.45	21.42	19.85

**LTE band 12**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1 RB high	715.3	23.75	22.71	21.76
		707.5	23.82	22.87	21.92
		699.7	23.81	23.13	22.18
	1 RB low	715.3	23.73	22.73	21.78
		707.5	23.81	22.80	21.85
		699.7	23.80	23.09	22.14
	50% RB mid	715.3	23.81	23.01	22.06
		707.5	23.87	22.89	21.94
		699.7	23.93	22.99	22.04
	100% RB	715.3	22.84	21.96	21.01
		707.5	22.85	21.98	21.03
		699.7	22.78	21.67	20.72
3MHz	1 RB high	714.5	23.82	22.69	21.74
		707.5	23.85	22.67	21.72
		700.5	23.89	23.18	22.23
	1 RB low	714.5	23.84	22.88	21.93
		707.5	23.77	22.67	21.72
		700.5	23.85	23.09	22.14
	50% RB mid	714.5	22.89	21.92	20.97
		707.5	22.88	21.99	21.04
		700.5	22.88	21.94	20.99
	100% RB	714.5	22.80	21.76	20.81
		707.5	22.86	21.87	20.92
		700.5	22.82	21.84	20.89
5MHz	1 RB high	713.5	23.76	22.74	21.79
		707.5	23.81	22.85	21.90
		701.5	23.74	23.27	22.32
	1 RB low	713.5	23.77	22.83	21.88
		707.5	23.82	22.87	21.92
		701.5	23.72	23.18	22.23
	50% RB mid	713.5	22.91	21.94	20.99
		707.5	22.87	21.92	20.97
		701.5	22.87	21.98	21.03
	100% RB	713.5	22.85	21.82	20.87
		707.5	22.83	21.85	20.90
		701.5	22.83	21.94	20.99
10MHz	1 RB high	711.0	23.21	22.12	21.79
		707.5	23.30	22.58	21.90
		704.0	23.21	22.24	21.92
	1 RB low	711.0	23.16	22.12	21.95



		707.5	23.24	22.57	22.01
		704.0	23.19	22.19	21.92
	50% RB mid	711.0	22.31	21.34	20.95
		707.5	22.28	21.33	20.92
		704.0	22.28	21.42	20.95
	100% RB	711.0	22.25	21.27	20.93
		707.5	22.28	21.30	20.91
		704.0	22.32	21.34	20.93

**LTE band 66**

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1 RB high	1779.3	23.12	22.06	21.15
		1745.0	23.06	22.38	21.47
		1710.7	22.94	22.03	21.12
	1 RB low	1779.3	23.11	22.03	21.12
		1745.0	23.06	22.36	21.45
		1710.7	22.91	22.02	21.11
	50% RB mid	1779.3	23.06	22.04	21.13
		1745.0	23.09	22.27	21.36
		1710.7	23.05	22.29	21.38
	100% RB	1779.3	22.20	21.26	20.35
		1745.0	22.18	21.01	20.10
		1710.7	22.11	21.28	20.37
3MHz	1 RB high	1778.5	23.15	21.86	20.95
		1745.0	23.12	22.39	21.48
		1711.5	23.00	22.05	21.14
	1 RB low	1778.5	23.11	21.97	21.06
		1745.0	23.11	22.39	21.48
		1711.5	23.04	22.08	21.17
	50% RB mid	1778.5	22.21	21.19	20.28
		1745.0	22.17	21.17	20.26
		1711.5	22.13	21.14	20.23
	100% RB	1778.5	22.12	21.09	20.18
		1745.0	22.10	21.13	20.22
		1711.5	22.05	21.03	20.12
5MHz	1 RB high	1777.5	23.09	22.10	21.19
		1745.0	22.99	22.47	21.56
		1712.5	23.00	22.11	21.20
	1 RB low	1777.5	23.08	22.10	21.19
		1745.0	22.99	22.45	21.54
		1712.5	22.95	22.09	21.18
	50% RB mid	1777.5	22.19	21.17	20.26
		1745.0	22.15	21.23	20.32
		1712.5	22.15	21.15	20.24
	100% RB	1777.5	22.08	21.03	20.12
		1745.0	22.10	21.15	20.24
		1712.5	22.08	21.04	20.13
10MHz	1 RB high	1775.0	23.10	21.91	21.00
		1745.0	23.10	22.38	21.47
		1715.0	23.01	22.08	21.17
	1 RB low	1775.0	23.07	21.99	21.08

		1745.0	23.06	22.37	21.46
		1715.0	22.96	22.02	21.11
	50% RB mid	1775.0	22.15	21.16	20.25
		1745.0	22.14	21.15	20.24
		1715.0	22.15	21.24	20.33
	100% RB	1775.0	22.13	21.09	20.18
		1745.0	22.12	21.13	20.22
1715.0		22.15	21.17	20.26	
15MHz	1 RB high	1772.5	23.01	22.26	21.35
		1745.0	23.03	22.29	21.38
		1717.5	22.97	21.94	21.03
	1 RB low	1772.5	23.01	22.35	21.44
		1745.0	23.03	22.32	21.41
		1717.5	22.96	21.91	21.00
	50% RB mid	1772.5	22.28	21.22	20.31
		1745.0	22.27	21.15	20.24
		1717.5	22.23	21.13	20.22
	100% RB	1772.5	22.27	21.19	20.28
		1745.0	22.25	21.18	20.27
		1717.5	22.24	21.17	20.26
20MHz	1 RB high	1770.0	23.11	22.44	21.51
		1745.0	23.12	22.48	21.59
		1720.0	23.15	22.67	21.55
	1 RB low	1770.0	23.04	22.47	21.53
		1745.0	23.11	22.45	21.58
		1720.0	23.05	22.47	21.57
	50% RB mid	1770.0	22.33	21.38	20.75
		1745.0	22.35	21.31	20.72
		1720.0	22.38	21.43	20.69
	100% RB	1770.0	22.29	21.33	20.66
		1745.0	22.33	21.31	20.66
		1720.0	22.41	21.44	20.70

### **A.1.3 Radiated**

#### **A.1.3.1 Description**

This is the test for the maximum radiated power from the EUT.

FDD Band 5: Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts".

FDD Band 2: Part 24.232(c) specifies "Mobile and portable stations are limited to 2 watts EIRP".

FDD Band 66: Part 27.50(d) specifies "Fixed, mobile, and portable (handheld) stations operating in the 1710–1755 MHz band and mobile and portable stations operating in the 1695–1710 MHz and 1755–1780 MHz bands are limited to 1 watt EIRP".

FDD Band 7: Part 27.50(h) specifies "Mobile stations are limited to 2.0 watts EIRP".

FDD Band 12: Part 27.50(c) specifies "Portable stations (hand-held devices) in the 600 MHz uplink band and the 698–746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP".

#### **A.1.3.2 Method of Measurement**

According to KDB 412172 D01 and ANSI C63.26 the relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

$ERP \text{ or } EIRP = P_T + G_T - L_C$ ,  $ERP = EIRP - 2.15$ , where

ERP or EIRP                      effective radiated power or equivalent isotropically radiated power,  
respectively

(expressed in the same units as  $P_{Mea}$ , e.g., dBm or dBW)

$P_T$  = transmitter output power in dBm;

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

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



### A.1.3.3 Measurement result

#### Spot Check Measurement Results:

#### LTE Band 7-EIRP

Limits: ≤33 dBm (2W)

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)			EIRP(dBm) ( $G_T - L_C = -0.9$ )		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5MHz	1 RB high	2567.5	23.26	21.81	21.30	22.36	20.91	20.40
		2535	22.97	22.07	21.34	22.07	21.17	20.44
		2502.5	22.63	22.23	21.57	21.73	21.33	20.67
	1 RB low	2567.5	22.88	21.80	21.26	21.98	20.90	20.36
		2535	22.70	21.78	21.27	21.80	20.88	20.37
		2502.5	22.65	22.04	21.54	21.75	21.14	20.64
	50% RB mid	2567.5	22.04	20.94	20.42	21.14	20.04	19.52
		2535	22.20	21.34	20.37	21.30	20.44	19.47
		2502.5	21.74	20.94	20.39	20.84	20.04	19.49
	100% RB	2567.5	21.79	20.79	20.26	20.89	19.89	19.36
		2535	22.01	21.19	20.26	21.11	20.29	19.36
		2502.5	21.67	20.97	20.24	20.77	20.07	19.34
10MHz	1 RB high	2565	23.29	21.78	21.30	22.39	20.88	20.40
		2535	23.24	22.12	21.15	22.34	21.22	20.25
		2505	23.23	22.41	21.46	22.33	21.51	20.56
	1 RB low	2565	23.22	21.85	21.23	22.32	20.95	20.33
		2535	22.84	21.97	21.13	21.94	21.07	20.23
		2505	22.72	22.01	21.47	21.82	21.11	20.57
	50% RB mid	2565	22.35	21.37	20.44	21.45	20.47	19.54
		2535	22.30	21.29	20.36	21.40	20.39	19.46
		2505	22.18	21.24	20.32	21.28	20.34	19.42
	100% RB	2565	22.31	21.29	20.32	21.41	20.39	19.42
		2535	22.23	21.23	20.26	21.33	20.33	19.36
		2505	22.14	21.20	20.26	21.24	20.30	19.36
15MHz	1 RB high	2562.5	23.24	22.51	21.52	22.34	21.61	20.62
		2535	23.11	22.03	21.61	22.21	21.13	20.71
		2507.5	22.69	22.33	20.98	21.79	21.43	20.08
	1 RB low	2562.5	23.25	22.53	21.57	22.35	21.63	20.67
		2535	23.08	21.95	21.64	22.18	21.05	20.74
		2507.5	23.12	22.37	20.99	22.22	21.47	20.09
	50% RB mid	2562.5	22.40	21.29	20.39	21.50	20.39	19.49
		2535	22.34	21.28	20.25	21.44	20.38	19.35
		2507.5	22.36	21.30	20.28	21.46	20.40	19.38

	100% RB	2562.5	22.40	21.33	20.35	21.50	20.43	19.45
		2535	22.32	21.22	20.31	21.42	20.32	19.41
		2507.5	22.28	21.21	20.23	21.38	20.31	19.33
20MHz	1 RB high	2560	23.03	22.41	21.94	22.13	21.51	21.04
		2535	23.00	22.35	21.72	22.10	21.45	20.82
		2510	22.91	22.36	21.72	22.01	21.46	20.82
	1 RB low	2560	22.99	22.36	21.82	22.09	21.46	20.92
		2535	22.87	22.27	21.77	21.97	21.37	20.87
		2510	22.89	22.31	21.71	21.99	21.41	20.81
	50% RB mid	2560	22.29	21.29	21.08	21.39	20.39	20.18
		2535	22.26	21.22	21.48	21.36	20.32	20.58
		2510	22.17	21.19	21.48	21.27	20.29	20.58
	100% RB	2560	22.23	21.23	21.00	21.33	20.33	20.10
		2535	22.29	21.25	20.96	21.39	20.35	20.06
		2510	22.15	21.16	21.03	21.25	20.26	20.13

**Reference Measurement Results from basic model:**
**LTE Band 2-EIRP**
**Limits:** ≤33dBm (2W)

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)			EIRP(dBm) ( $G_T - L_C = -1.7$ )		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
1.4MHz	1 RB high	1909.3	23.80	22.77	22.12	22.10	21.07	20.42
		1880.0	23.78	22.86	22.21	22.08	21.16	20.51
		1850.7	23.84	23.15	22.50	22.14	21.45	20.8
	1 RB low	1909.3	23.80	22.76	22.11	22.10	21.06	20.41
		1880.0	23.79	22.84	22.19	22.09	21.14	20.49
		1850.7	23.84	23.13	22.48	22.14	21.43	20.78
	50% RB mid	1909.3	23.86	22.98	22.33	22.16	21.28	20.63
		1880.0	23.86	22.91	22.26	22.16	21.21	20.56
		1850.7	23.89	23.06	22.41	22.19	21.36	20.71
	100% RB	1909.3	23.00	21.98	21.33	21.30	20.28	19.63
		1880.0	22.89	21.97	21.32	21.19	20.27	19.62
		1850.7	22.97	21.83	21.18	21.27	20.13	19.48
3MHz	1 RB high	1908.5	23.86	22.82	22.17	22.16	21.12	20.47
		1880.0	23.87	22.75	22.10	22.17	21.05	20.4
		1851.5	23.93	23.23	22.58	22.23	21.53	20.88
	1 RB low	1908.5	23.93	22.84	22.19	22.23	21.14	20.49
		1880.0	23.82	22.80	22.15	22.12	21.10	20.45
		1851.5	23.99	23.21	22.56	22.29	21.51	20.86
	50% RB mid	1908.5	23.02	22.00	21.35	21.32	20.30	19.65
		1880.0	22.98	22.04	21.39	21.28	20.34	19.69
		1851.5	23.00	22.04	21.39	21.30	20.34	19.69
	100% RB	1908.5	22.91	21.87	21.22	21.21	20.17	19.52
		1880.0	22.91	21.96	21.31	21.21	20.26	19.61
		1851.5	22.94	21.92	21.27	21.24	20.22	19.57
5MHz	1 RB high	1907.5	23.84	22.80	22.15	22.14	21.1	20.45
		1880.0	23.85	22.92	22.27	22.15	21.22	20.57
		1852.5	23.78	23.30	22.65	22.08	21.60	20.95
	1 RB low	1907.5	23.81	22.86	22.21	22.11	21.16	20.51
		1880.0	23.86	22.95	22.30	22.16	21.25	20.6
		1852.5	23.80	23.25	22.60	22.10	21.55	20.9
	50% RB mid	1907.5	23.04	22.00	21.35	21.34	20.30	19.65
		1880.0	22.99	22.02	21.37	21.29	20.32	19.67
		1852.5	23.02	22.08	21.43	21.32	20.38	19.73
	100% RB	1907.5	22.94	21.83	21.18	21.24	20.13	19.48
		1880.0	22.93	21.95	21.30	21.23	20.25	19.6
		1852.5	22.95	21.99	21.34	21.25	20.29	19.64
10MHz	1 RB high	1905.0	23.89	22.77	22.12	22.19	21.07	20.42

		1880.0	23.82	22.73	22.08	22.12	21.03	20.38	
		1855.0	23.87	23.23	22.58	22.17	21.53	20.88	
	1 RB low	1905.0	23.83	22.85	22.20	22.13	21.15	20.5	
		1880.0	23.79	22.75	22.10	22.09	21.05	20.4	
		1855.0	23.90	23.18	22.53	22.20	21.48	20.83	
	50% RB mid	1905.0	22.96	22.04	21.39	21.26	20.34	19.69	
		1880.0	22.95	21.98	21.33	21.25	20.28	19.63	
		1855.0	22.98	21.99	21.34	21.28	20.29	19.64	
	100% RB	1905.0	22.85	21.91	21.26	21.15	20.21	19.56	
		1880.0	22.91	21.93	21.28	21.21	20.23	19.58	
		1855.0	22.96	21.99	21.34	21.26	20.29	19.64	
	15MHz	1 RB high	1902.5	23.90	23.00	22.35	22.20	21.30	20.65
1880.0			23.72	22.71	22.06	22.02	21.01	20.36	
1857.5			23.77	23.13	22.48	22.07	21.43	20.78	
1 RB low		1902.5	23.82	23.21	22.56	22.12	21.51	20.86	
		1880.0	23.79	22.68	22.03	22.09	20.98	20.33	
		1857.5	23.85	23.15	22.50	22.15	21.45	20.8	
50% RB mid		1902.5	23.06	21.98	21.33	21.36	20.28	19.63	
		1880.0	23.03	21.93	21.28	21.33	20.23	19.58	
		1857.5	23.00	22.04	21.39	21.30	20.34	19.69	
100% RB		1902.5	22.98	21.89	21.24	21.28	20.19	19.54	
		1880.0	23.04	21.98	21.33	21.34	20.28	19.63	
		1857.5	23.02	22.00	21.35	21.32	20.30	19.65	
20MHz		1 RB high	1900.0	23.01	22.33	21.44	21.31	20.63	19.74
			1880.0	23.02	22.45	21.60	21.32	20.75	19.9
			1860.0	23.00	22.52	21.49	21.30	20.82	19.79
		1 RB low	1900.0	23.04	22.52	21.53	21.34	20.82	19.83
			1880.0	23.08	22.36	21.58	21.38	20.66	19.88
			1860.0	23.01	22.49	21.49	21.31	20.79	19.79
	50% RB mid	1900.0	22.35	21.43	20.71	20.65	19.73	19.01	
		1880.0	22.30	21.32	20.65	20.60	19.62	18.95	
		1860.0	22.34	21.39	20.65	20.64	19.69	18.95	
	100% RB	1900.0	22.30	21.33	20.68	20.60	19.63	18.98	
		1880.0	22.31	21.33	20.60	20.61	19.63	18.9	
		1860.0	22.29	21.36	20.65	20.59	19.66	18.95	

**LTE Band 5-ERP**
**Limits:** ≤38.45dBm (7W)

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)			ERP(dBm) (G <sub>T</sub> – L <sub>C</sub> = -2.6)		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
1.4MHz	1 RB high	848.3	23.75	22.76	21.85	19.00	18.01	17.10
		836.5	23.76	22.79	21.88	19.01	18.04	17.13
		824.7	23.80	23.11	22.20	19.05	18.36	17.45
	1 RB low	848.3	23.68	22.71	21.80	18.93	17.96	17.05
		836.5	23.79	22.73	21.82	19.04	17.98	17.07
		824.7	23.82	23.08	22.17	19.07	18.33	17.42
	50% RB mid	848.3	23.90	23.00	22.09	19.15	18.25	17.34
		836.5	23.85	22.87	21.96	19.10	18.12	17.21
		824.7	23.91	23.03	22.12	19.16	18.28	17.37
	100% RB	848.3	22.87	22.07	21.16	18.12	17.32	16.41
		836.5	22.82	21.94	21.03	18.07	17.19	16.28
		824.7	22.86	21.78	20.87	18.11	17.03	16.12
3MHz	1 RB high	847.5	23.76	22.73	21.82	19.01	17.98	17.07
		836.5	23.78	22.64	21.73	19.03	17.89	16.98
		825.5	23.89	23.15	22.24	19.14	18.40	17.49
	1 RB low	847.5	23.78	22.79	21.88	19.03	18.04	17.13
		836.5	23.72	22.67	21.76	18.97	17.92	17.01
		825.5	23.83	23.10	22.19	19.08	18.35	17.44
	50% RB mid	847.5	22.85	21.93	21.02	18.10	17.18	16.27
		836.5	22.85	21.97	21.06	18.10	17.22	16.31
		825.5	22.86	21.97	21.06	18.11	17.22	16.31
	100% RB	847.5	22.82	21.80	20.89	18.07	17.05	16.14
		836.5	22.81	21.86	20.95	18.06	17.11	16.20
		825.5	22.79	21.86	20.95	18.04	17.11	16.20
5MHz	1 RB high	846.5	23.78	22.78	21.87	19.03	18.03	17.12
		836.5	23.81	22.85	21.94	19.06	18.10	17.19
		826.5	23.77	23.25	22.34	19.02	18.50	17.59
	1 RB low	846.5	23.72	22.78	21.87	18.97	18.03	17.12
		836.5	23.79	22.86	21.95	19.04	18.11	17.20
		826.5	23.70	23.18	22.27	18.95	18.43	17.52
	50% RB mid	846.5	22.82	21.92	21.01	18.07	17.17	16.26
		836.5	22.83	21.95	21.04	18.08	17.20	16.29
		826.5	22.85	22.00	21.09	18.10	17.25	16.34
	100% RB	846.5	22.78	21.78	20.87	18.03	17.03	16.12
		836.5	22.78	21.85	20.94	18.03	17.10	16.19
		826.5	22.78	21.93	21.02	18.03	17.18	16.27
10MHz	1 RB high	844.0	23.44	22.73	21.83	18.69	17.98	17.08
		836.5	23.39	22.39	21.74	18.64	17.64	16.99

		829.0	23.40	22.31	21.74	18.65	17.56	16.99
	1 RB low	844.0	23.30	22.70	21.85	18.55	17.95	17.1
		836.5	23.23	22.38	21.76	18.48	17.63	17.01
		829.0	23.38	22.30	21.78	18.63	17.55	17.03
	50% RB mid	844.0	22.39	21.47	20.71	17.64	16.72	15.96
		836.5	22.40	21.51	20.68	17.65	16.76	15.93
		829.0	22.43	21.43	20.70	17.68	16.68	15.95
	100% RB	844.0	22.37	21.38	20.73	17.62	16.63	15.98
		836.5	22.40	21.45	20.69	17.65	16.70	15.94
		829.0	22.40	21.38	20.67	17.65	16.63	15.92

**LTE Band 7-EIRP**
**Limits:** ≤33 dBm (2W)

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)			EIRP(dBm) ( $G_T - L_C = -0.9$ )		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
5MHz	1 RB high	2567.5	23.57	22.61	20.73	22.67	21.71	19.83
		2535	23.56	22.60	20.72	22.66	21.70	19.82
		2502.5	23.38	22.78	20.90	22.48	21.88	20.00
	1 RB low	2567.5	23.54	22.56	20.68	22.64	21.66	19.78
		2535	23.52	22.59	20.71	22.62	21.69	19.81
		2502.5	23.38	22.78	20.90	22.48	21.88	20.00
	50% RB mid	2567.5	22.64	21.75	19.87	21.74	20.85	18.97
		2535	22.59	21.61	19.73	21.69	20.71	18.83
		2502.5	22.49	21.56	19.68	21.59	20.66	18.78
	100% RB	2567.5	22.57	21.62	19.74	21.67	20.72	18.84
		2535	22.54	21.55	19.67	21.64	20.65	18.77
		2502.5	22.43	21.47	19.59	21.53	20.57	18.69
10MHz	1 RB high	2565	23.58	22.58	20.70	22.68	21.68	19.8
		2535	23.53	22.45	20.57	22.63	21.55	19.67
		2505	23.48	22.75	20.87	22.58	21.85	19.97
	1 RB low	2565	23.54	22.52	20.64	22.64	21.62	19.74
		2535	23.50	22.41	20.53	22.60	21.51	19.63
		2505	23.48	22.72	20.84	22.58	21.82	19.94
	50% RB mid	2565	22.58	21.79	19.91	21.68	20.89	19.01
		2535	22.57	21.61	19.73	21.67	20.71	18.83
		2505	22.42	21.47	19.59	21.52	20.57	18.69
	100% RB	2565	22.58	21.69	19.81	21.68	20.79	18.91
		2535	22.56	21.55	19.67	21.66	20.65	18.77
		2505	22.45	21.45	19.57	21.55	20.55	18.67
15MHz	1 RB high	2562.5	23.46	22.36	20.57	22.56	21.46	19.67
		2535	23.47	22.74	20.86	22.57	21.84	19.96
		2507.5	23.39	22.67	20.79	22.49	21.77	19.89
	1 RB low	2562.5	23.41	22.36	20.58	22.51	21.46	19.68
		2535	23.40	22.75	20.87	22.50	21.85	19.97
		2507.5	23.41	22.63	20.75	22.51	21.73	19.85
	50% RB mid	2562.5	22.61	21.63	19.75	21.71	20.73	18.85
		2535	22.61	21.59	19.71	21.71	20.69	18.81
		2507.5	22.55	21.43	19.55	21.65	20.53	18.65
	100% RB	2562.5	22.56	21.65	19.77	21.66	20.75	18.87
		2535	22.62	21.57	19.69	21.72	20.67	18.79
		2507.5	22.52	21.44	19.56	21.62	20.54	18.66

20MHz	1 RB high	2560	23.35	22.72	20.84	22.45	21.82	19.94
		2535	23.34	22.67	20.70	22.44	21.77	19.8
		2510	23.24	22.69	20.65	22.34	21.79	19.75
	1 RB low	2560	23.34	22.71	20.83	22.44	21.81	19.93
		2535	23.26	22.63	20.71	22.36	21.73	19.81
		2510	23.14	22.60	20.69	22.24	21.70	19.79
	50% RB mid	2560	22.55	21.67	20.00	21.65	20.77	19.1
		2535	22.53	21.52	19.94	21.63	20.62	19.04
		2510	22.46	21.46	19.91	21.56	20.56	19.01
	100% RB	2560	22.62	21.68	19.98	21.72	20.78	19.08
		2535	22.55	21.54	19.89	21.65	20.64	18.99
		2510	22.45	21.42	19.85	21.55	20.52	18.95



**LTE Band 12 -ERP**
**Limits:** ≤34.77dBm (3W)

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)			ERP(dBm) ( $G_T - L_C = -2.9$ )		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
1.4MHz	1 RB high	715.3	23.75	22.71	21.76	18.70	17.66	16.71
		707.5	23.82	22.87	21.92	18.77	17.82	16.87
		699.7	23.81	23.13	22.18	18.76	18.08	17.13
	1 RB low	715.3	23.73	22.73	21.78	18.68	17.68	16.73
		707.5	23.81	22.80	21.85	18.76	17.75	16.8
		699.7	23.80	23.09	22.14	18.75	18.04	17.09
	50% RB mid	715.3	23.81	23.01	22.06	18.76	17.96	17.01
		707.5	23.87	22.89	21.94	18.82	17.84	16.89
		699.7	23.93	22.99	22.04	18.88	17.94	16.99
	100% RB	715.3	22.84	21.96	21.01	17.79	16.91	15.96
		707.5	22.85	21.98	21.03	17.80	16.93	15.98
		699.7	22.78	21.67	20.72	17.73	16.62	15.67
3MHz	1 RB high	714.5	23.82	22.69	21.74	18.77	17.64	16.69
		707.5	23.85	22.67	21.72	18.80	17.62	16.67
		700.5	23.89	23.18	22.23	18.84	18.13	17.18
	1 RB low	714.5	23.84	22.88	21.93	18.79	17.83	16.88
		707.5	23.77	22.67	21.72	18.72	17.62	16.67
		700.5	23.85	23.09	22.14	18.80	18.04	17.09
	50% RB mid	714.5	22.89	21.92	20.97	17.84	16.87	15.92
		707.5	22.88	21.99	21.04	17.83	16.94	15.99
		700.5	22.88	21.94	20.99	17.83	16.89	15.94
	100% RB	714.5	22.80	21.76	20.81	17.75	16.71	15.76
		707.5	22.86	21.87	20.92	17.81	16.82	15.87
		700.5	22.82	21.84	20.89	17.77	16.79	15.84
5MHz	1 RB high	713.5	23.76	22.74	21.79	18.71	17.69	16.74
		707.5	23.81	22.85	21.90	18.76	17.80	16.85
		701.5	23.74	23.27	22.32	18.69	18.22	17.27
	1 RB low	713.5	23.77	22.83	21.88	18.72	17.78	16.83
		707.5	23.82	22.87	21.92	18.77	17.82	16.87
		701.5	23.72	23.18	22.23	18.67	18.13	17.18
	50% RB mid	713.5	22.91	21.94	20.99	17.86	16.89	15.94
		707.5	22.87	21.92	20.97	17.82	16.87	15.92
		701.5	22.87	21.98	21.03	17.82	16.93	15.98
	100% RB	713.5	22.85	21.82	20.87	17.80	16.77	15.82
		707.5	22.83	21.85	20.90	17.78	16.8	15.85
		701.5	22.83	21.94	20.99	17.78	16.89	15.94

10MHz	1 RB high	711	23.21	22.12	21.79	18.16	17.07	16.74
		707.5	23.30	22.58	21.90	18.25	17.53	16.85
		704	23.21	22.24	21.92	18.16	17.19	16.87
	1 RB low	711	23.16	22.12	21.95	18.11	17.07	16.9
		707.5	23.24	22.57	22.01	18.19	17.52	16.96
		704	23.75	22.71	21.76	18.70	17.66	16.71
	50% RB mid	711	23.82	22.87	21.92	18.77	17.82	16.87
		707.5	23.81	23.13	22.18	18.76	18.08	17.13
		704	23.73	22.73	21.78	18.68	17.68	16.73
	100% RB	711	23.81	22.80	21.85	18.76	17.75	16.8
		707.5	23.80	23.09	22.14	18.75	18.04	17.09
		704	23.81	23.01	22.06	18.76	17.96	17.01

**LTE Band 66-EIRP**
**Limits:** ≤30dBm (1W)

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)			EIRP(dBm) (G <sub>T</sub> - L <sub>C</sub> = -1.3)		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
1.4MHz	1 RB high	1779.3	23.12	22.06	21.15	21.82	20.76	19.85
		1745	23.06	22.38	21.47	21.76	21.08	20.17
		1710.7	22.94	22.03	21.12	21.64	20.73	19.82
	1 RB low	1779.3	23.11	22.03	21.12	21.81	20.73	19.82
		1745	23.06	22.36	21.45	21.76	21.06	20.15
		1710.7	22.91	22.02	21.11	21.61	20.72	19.81
	50% RB mid	1779.3	23.06	22.04	21.13	21.76	20.74	19.83
		1745	23.09	22.27	21.36	21.79	20.97	20.06
		1710.7	23.05	22.29	21.38	21.75	20.99	20.08
	100% RB	1779.3	22.20	21.26	20.35	20.90	19.96	19.05
		1745	22.18	21.01	20.10	20.88	19.71	18.80
		1710.7	22.11	21.28	20.37	20.81	19.98	19.07
3MHz	1 RB high	1778.5	23.15	21.86	20.95	21.85	20.56	19.65
		1745	23.12	22.39	21.48	21.82	21.09	20.18
		1711.5	23.00	22.05	21.14	21.70	20.75	19.84
	1 RB low	1778.5	23.11	21.97	21.06	21.81	20.67	19.76
		1745	23.11	22.39	21.48	21.81	21.09	20.18
		1711.5	23.04	22.08	21.17	21.74	20.78	19.87
	50% RB mid	1778.5	22.21	21.19	20.28	20.91	19.89	18.98
		1745	22.17	21.17	20.26	20.87	19.87	18.96
		1711.5	22.13	21.14	20.23	20.83	19.84	18.93
	100% RB	1778.5	22.12	21.09	20.18	20.82	19.79	18.88
		1745	22.10	21.13	20.22	20.80	19.83	18.92
		1711.5	22.05	21.03	20.12	20.75	19.73	18.82
5MHz	1 RB high	1777.5	23.09	22.10	21.19	21.79	20.80	19.89
		1745	22.99	22.47	21.56	21.69	21.17	20.26
		1712.5	23.00	22.11	21.20	21.70	20.81	19.90
	1 RB low	1777.5	23.08	22.10	21.19	21.78	20.80	19.89
		1745	22.99	22.45	21.54	21.69	21.15	20.24
		1712.5	22.95	22.09	21.18	21.65	20.79	19.88
	50% RB mid	1777.5	22.19	21.17	20.26	20.89	19.87	18.96
		1745	22.15	21.23	20.32	20.85	19.93	19.02
		1712.5	22.15	21.15	20.24	20.85	19.85	18.94
	100% RB	1777.5	22.08	21.03	20.12	20.78	19.73	18.82
		1745	22.10	21.15	20.24	20.80	19.85	18.94
		1712.5	22.08	21.04	20.13	20.78	19.74	18.83

10MHz	1 RB high	1775	23.10	21.91	21.00	21.80	20.61	19.70
		1745	23.10	22.38	21.47	21.80	21.08	20.17
		1715	23.01	22.08	21.17	21.71	20.78	19.87
	1 RB low	1775	23.07	21.99	21.08	21.77	20.69	19.78
		1745	23.06	22.37	21.46	21.76	21.07	20.16
		1715	22.96	22.02	21.11	21.66	20.72	19.81
	50% RB mid	1775	22.15	21.16	20.25	20.85	19.86	18.95
		1745	22.14	21.15	20.24	20.84	19.85	18.94
		1715	22.15	21.24	20.33	20.85	19.94	19.03
	100% RB	1775	22.13	21.09	20.18	20.83	19.79	18.88
		1745	22.12	21.13	20.22	20.82	19.83	18.92
		1715	22.15	21.17	20.26	20.85	19.87	18.96
15MHz	1 RB high	1772.5	23.01	22.26	21.35	21.71	20.96	20.05
		1745	23.03	22.29	21.38	21.73	20.99	20.08
		1717.5	22.97	21.94	21.03	21.67	20.64	19.73
	1 RB low	1772.5	23.01	22.35	21.44	21.71	21.05	20.14
		1745	23.03	22.32	21.41	21.73	21.02	20.11
		1717.5	22.96	21.91	21.00	21.66	20.61	19.70
	50% RB mid	1772.5	22.28	21.22	20.31	20.98	19.92	19.01
		1745	22.27	21.15	20.24	20.97	19.85	18.94
		1717.5	22.23	21.13	20.22	20.93	19.83	18.92
	100% RB	1772.5	22.27	21.19	20.28	20.97	19.89	18.98
		1745	22.25	21.18	20.27	20.95	19.88	18.97
		1717.5	22.24	21.17	20.26	20.94	19.87	18.96
20MHz	1 RB high	1770	23.11	22.44	21.51	21.81	21.14	20.21
		1745	23.12	22.48	21.59	21.82	21.18	20.29
		1720	23.15	22.67	21.55	21.85	21.37	20.25
	1 RB low	1770	23.04	22.47	21.53	21.74	21.17	20.23
		1745	23.11	22.45	21.58	21.81	21.15	20.28
		1720	23.05	22.47	21.57	21.75	21.17	20.27
	50% RB mid	1770	22.33	21.38	20.75	21.03	20.08	19.45
		1745	22.35	21.31	20.72	21.05	20.01	19.42
		1720	22.38	21.43	20.69	21.08	20.13	19.39
	100% RB	1770	22.29	21.33	20.66	20.99	20.03	19.36
		1745	22.33	21.31	20.66	21.03	20.01	19.36
		1720	22.41	21.44	20.70	21.11	20.14	19.40

## A.2 Emission Limit

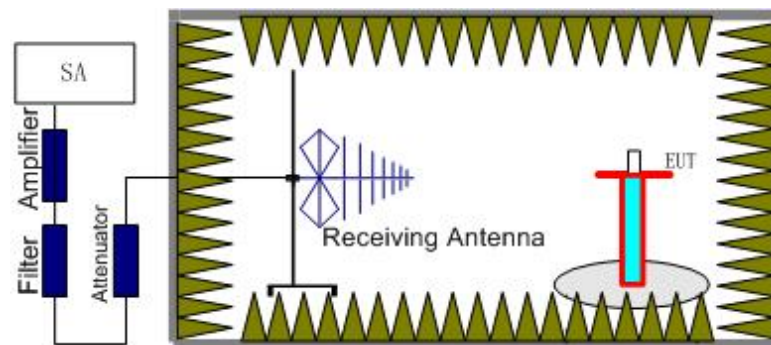
### A.2.1 Measurement Method

The measurements procedures in TIA-603E-2016 are used. This measurement is carried out in fully anechoic chamber FAC-3.

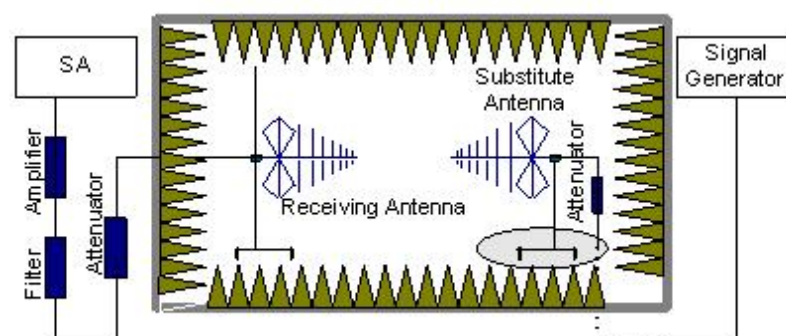
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of each LTE Band.

**The procedure of radiated spurious emissions is as follows:**

1. EUT was placed on a 1.5-meter-high non-conductive stand at a 3-meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360 and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as ( $P_r$ ).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the

receiver reaches the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss ( $P_{pl}$ ) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain ( $G_a$ ) should be recorded after test.

An amplifier should be connected in for the test.

The Path loss ( $P_{pl}$ ) is the summation of the cable loss and the gain of the amplifier.

The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{Mea} - P_{pl} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dB}$ .

### **A.2.2 Measurement Limit**

Part 22.917, Part 24.238 and Part 27.53(h) specify that 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.

Part 27.53(m) specifies 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 than  $43 + 10 \log(P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log(P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Part 27.53(g) states 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.

### **A.2.3 Measurement Results**

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of each LTE Band. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of each LTE Band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this. The range of evaluated frequency is from 30MHz to 26GHz.

**Spot Check Measurement Results:**
**LTE Band 7, 5 MHz, QPSK, Channel 20775**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5009.02	-55.72	6.59	9.91	-52.40	-25.00	27.40	H
7488.01	-54.23	8.36	12.19	-50.40	-25.00	25.40	V
10018.01	-52.48	9.23	12.91	-48.80	-25.00	23.80	H
12502.01	-48.12	10.18	13.20	-45.10	-25.00	20.10	V
15029.00	-45.32	11.25	13.98	-42.59	-25.00	17.59	V
17533.00	-43.85	12.85	14.95	-41.75	-25.00	16.75	H

**LTE Band 7, 5 MHz, QPSK, Channel 21100**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5075.02	-52.48	6.70	10.01	-49.17	-25.00	24.17	H
7595.01	-54.32	7.99	12.28	-50.03	-25.00	25.03	V
10129.01	-51.77	9.42	12.95	-48.24	-25.00	23.24	V
12663.01	-48.52	10.36	13.30	-45.58	-25.00	20.58	V
15225.00	-45.24	11.37	13.86	-42.75	-25.00	17.75	V
17763.00	-44.40	12.53	15.27	-41.66	-25.00	16.66	H

**LTE Band 7, 5 MHz, QPSK, Channel 21425**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5140.02	-52.75	6.87	10.10	-49.52	-25.00	24.52	H
7689.01	-54.45	8.38	12.35	-50.48	-25.00	25.48	V
10256.01	-51.65	9.49	13.00	-48.14	-25.00	23.14	H
12836.01	-48.63	10.67	13.40	-45.90	-25.00	20.90	V
15405.00	-44.89	11.40	13.76	-42.53	-25.00	17.53	H
17988.00	-43.99	12.90	15.58	-41.31	-25.00	16.31	H

**Reference Measurement Results from basic model:**

**LTE Band 2, 1.4MHz, QPSK, Channel 18607**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3702.02	-52.02	6.42	8.48	-49.96	-13.00	36.96	V
5553.02	-53.55	7.18	10.59	-50.14	-13.00	37.14	V
7369.01	-53.49	8.11	12.04	-49.56	-13.00	36.56	H
9213.01	-54.01	8.96	13.23	-49.74	-13.00	36.74	V
11076.01	-50.92	9.88	13.18	-47.62	-13.00	34.62	H
12950.01	-48.22	10.49	13.47	-45.24	-13.00	32.24	H

**LTE Band 2, 1.4MHz, QPSK, Channel 18900**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.02	-49.32	6.26	8.56	-47.02	-13.00	34.02	H
5644.02	-46.08	7.27	10.57	-42.78	-13.00	29.78	V
7523.01	-53.04	8.30	12.22	-49.12	-13.00	36.12	H
9396.01	-53.71	9.04	13.34	-49.41	-13.00	36.41	H
11272.01	-50.48	9.83	13.15	-47.16	-13.00	34.16	V
13144.01	-47.68	10.74	13.70	-44.72	-13.00	31.72	H

**LTE Band 2, 1.4MHz, QPSK, Channel 19193**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3819.02	-53.08	6.08	8.65	-50.51	-13.00	37.51	V
5733.02	-49.95	7.29	10.55	-46.69	-13.00	33.69	H
7614.01	-54.02	8.04	12.29	-49.77	-13.00	36.77	V
9566.01	-52.16	9.30	13.33	-48.13	-13.00	35.13	H
11483.01	-50.04	9.85	13.10	-46.79	-13.00	33.79	V
13349.01	-48.03	10.57	13.99	-44.61	-13.00	31.61	V



**LTE Band 5, 1.4MHz, QPSK, Channel 20407**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1650.01	-55.03	3.57	5.23	2.15	-55.52	-13.00	42.52	H
2474.00	-53.68	4.60	6.02	2.15	-54.41	-13.00	41.41	V
3296.02	-54.78	5.29	7.71	2.15	-54.51	-13.00	41.51	H
4134.02	-55.06	6.06	9.03	2.15	-54.24	-13.00	41.24	V
4944.01	-54.60	6.70	9.84	2.15	-53.61	-13.00	40.61	V
5760.01	-53.76	7.25	10.55	2.15	-52.61	-13.00	39.61	H

**LTE Band 5, 1.4MHz, QPSK, Channel 20525**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.01	-54.02	3.58	5.19	2.15	-54.56	-13.00	41.56	H
2519.00	-53.48	4.64	6.13	2.15	-54.14	-13.00	41.14	H
3346.02	-54.59	5.31	7.83	2.15	-54.22	-13.00	41.22	V
4179.02	-54.90	6.16	9.08	2.15	-54.13	-13.00	41.13	V
5023.01	-54.54	6.56	9.93	2.15	-53.32	-13.00	40.32	V
5846.01	-53.78	7.22	10.53	2.15	-52.62	-13.00	39.62	V

**LTE Band 5, 1.4MHz, QPSK, Channel 20643**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1697.01	-56.22	3.60	5.15	2.15	-56.82	-13.00	43.82	H
2545.00	-52.07	4.66	6.18	2.15	-52.70	-13.00	39.70	H
3390.02	-52.50	5.35	7.94	2.15	-52.06	-13.00	39.06	H
4239.02	-54.93	6.25	9.14	2.15	-54.19	-13.00	41.19	V
5089.01	-54.20	6.74	10.02	2.15	-53.07	-13.00	40.07	V
5930.01	-53.09	7.47	10.51	2.15	-52.20	-13.00	39.20	H

**LTE Band 7, 5 MHz, QPSK, Channel 20775**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5007.02	-55.80	6.59	9.91	-52.48	-25.00	27.48	H
7509.01	-54.02	8.36	12.21	-50.17	-25.00	25.17	V
10018.01	-52.70	9.23	12.91	-49.02	-25.00	24.02	V
12518.01	-49.09	10.23	13.21	-46.11	-25.00	21.11	V
15019.00	-46.48	11.24	13.99	-43.73	-25.00	18.73	V
17500.00	-44.50	12.72	14.90	-42.32	-25.00	17.32	H

**LTE Band 7, 5 MHz, QPSK, Channel 21100**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5073.02	-52.44	6.70	10.00	-49.14	-25.00	24.14	H
7608.01	-54.97	8.01	12.29	-50.69	-25.00	25.69	H
10144.01	-51.76	9.39	12.96	-48.19	-25.00	23.19	H
12670.01	-48.29	10.35	13.30	-45.34	-25.00	20.34	H
15208.00	-46.22	11.39	13.88	-43.73	-25.00	18.73	V
17756.00	-44.49	12.49	15.26	-41.72	-25.00	16.72	H

**LTE Band 7, 5 MHz, QPSK, Channel 21425**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5135.02	-49.98	6.86	10.09	-46.75	-25.00	21.75	H
7705.01	-53.15	8.42	12.36	-49.21	-25.00	24.21	V
10274.01	-51.37	9.55	13.01	-47.91	-25.00	22.91	V
12848.01	-47.90	10.64	13.41	-45.13	-25.00	20.13	V
15400.00	-44.77	11.39	13.76	-42.40	-25.00	17.40	H
17989.00	-44.88	12.90	15.58	-42.20	-25.00	17.20	V

**LTE Band 12, 1.4MHz, QPSK, Channel 23017**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1400.01	-58.49	3.24	4.98	2.15	-58.90	-13.00	45.90	H
2101.00	-56.30	4.19	4.90	2.15	-57.74	-13.00	44.74	H
2798.00	-52.48	4.91	6.64	2.15	-52.90	-13.00	39.90	V
3489.02	-54.39	5.50	8.17	2.15	-53.87	-13.00	40.87	H
4211.02	-52.63	6.23	9.11	2.15	-51.90	-13.00	38.90	V
4884.01	-54.59	6.72	9.78	2.15	-53.68	-13.00	40.68	V

**LTE Band 12, 1.4MHz, QPSK, Channel 23095**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1413.01	-52.68	3.25	5.05	2.15	-53.03	-13.00	40.03	V
2116.00	-56.20	4.21	4.95	2.15	-57.61	-13.00	44.61	H
2837.00	-52.33	4.95	6.71	2.15	-52.72	-13.00	39.72	H
3536.02	-54.11	5.68	8.25	2.15	-53.69	-13.00	40.69	H
4246.02	-54.26	6.24	9.15	2.15	-53.50	-13.00	40.50	H
4964.01	-54.89	6.67	9.86	2.15	-53.85	-13.00	40.85	H

**LTE Band 12, 1.4MHz, QPSK, Channel 23173**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1429.01	-57.96	3.27	5.13	2.15	-58.25	-13.00	45.25	V
2147.00	-55.95	4.24	5.04	2.15	-57.30	-13.00	44.30	V
2868.00	-48.75	4.97	6.76	2.15	-49.11	-13.00	36.11	H
3583.02	-53.71	6.16	8.32	2.15	-53.70	-13.00	40.70	V
4286.02	-54.78	6.21	9.19	2.15	-53.95	-13.00	40.95	H
5002.01	-54.40	6.60	9.90	2.15	-53.25	-13.00	40.25	H

**LTE Band 66, 1.4MHz QPSK, Channel 131979**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3422.02	-65.14	5.38	8.01	-62.51	-13.00	49.51	V
5135.02	-63.38	6.86	10.09	-60.15	-13.00	47.15	V
6868.01	-64.91	7.80	11.44	-61.27	-13.00	48.27	V
8504.01	-64.59	8.66	13.00	-60.25	-13.00	47.25	V
10278.01	-62.16	9.57	13.01	-58.72	-13.00	45.72	V
12027.01	-60.19	10.13	13.01	-57.31	-13.00	44.31	V

**LTE Band 66, 1.4MHz, QPSK, Channel 132322**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3490.02	-65.67	5.50	8.18	-62.99	-13.00	49.99	H
5237.02	-64.24	7.00	10.23	-61.01	-13.00	48.01	V
6973.01	-64.66	8.09	11.57	-61.18	-13.00	48.18	V
8764.01	-64.54	8.55	13.05	-60.04	-13.00	47.04	V
10495.01	-61.85	9.66	13.10	-58.41	-13.00	45.41	V
12192.01	-59.75	10.08	13.08	-56.75	-13.00	43.75	V

**LTE Band 66, 1.4MHz, QPSK, Channel 132665**

Frequency (MHz)	P <sub>Mea</sub> (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3559.02	-62.99	5.92	8.28	-60.63	-13.00	47.63	V
5342.02	-61.99	6.95	10.38	-58.56	-13.00	45.56	V
7148.01	-64.83	8.17	11.78	-61.22	-13.00	48.22	V
8944.01	-64.11	9.00	13.09	-60.02	-13.00	47.02	V
10683.01	-61.69	9.30	13.14	-57.85	-13.00	44.85	V
12495.01	-59.63	10.19	13.20	-56.62	-13.00	43.62	V

Note: The maximum value of expanded measurement uncertainty for this test item is  $U = 5.16$  dB,  $k = 2$ .

## **A.3 Frequency Stability**

### **A.3.1 Method of Measurement**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of CMW500.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMW500, and in a simulated call on middle channel for each LTE band, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the center channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 °C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of the lower, higher and nominal voltage. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress.

### A.3.2 Measurement results

#### LTE Band 2, 20MHz bandwidth QPSK (worst case of all bandwidths)

##### Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	1850.833	1909.199		
50				-1.26	0.0007
40				-1.19	0.0006
30				-7.97	0.0042
10				-2.23	0.0012
0				-6.39	0.0034
-10				-4.96	0.0026
-20				38.21	0.0203
-30				-4.43	0.0024

##### Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	1850.833	1909.199	-7.47	0.0040
4.4				-2.02	0.0011

#### LTE Band 5, 10MHz bandwidth QPSK (worst case of all bandwidths)

##### Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	824.417	848.583		
50				-1.23	0.0015
40				1.70	0.0020
30				0.77	0.0009
10				-2.82	0.0034
0				2.12	0.0025
-10				1.92	0.0023
-20				2.09	0.0025
-30				1.86	0.0022

##### Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	824.417	848.583	0.46	0.0005
4.4				0.80	0.0010

**LTE Band 7, 20MHz bandwidth QPSK (worst case of all bandwidths)**
**Frequency Error vs Temperature**

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	2500.929	2569.135		
50				-3.79	0.0015
40				-0.80	0.0003
30				-1.52	0.0006
10				-2.83	0.0011
0				-6.12	0.0024
-10				-0.26	0.0001
-20				-4.53	0.0018
-30				-4.01	0.0016

**Frequency Error vs Voltage**

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	2500.929	2569.135	-6.95	0.0027
4.4				1.29	0.0005

**LTE Band 12, 10MHz bandwidth QPSK (worst case of all bandwidths)**
**Frequency Error vs Temperature**

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	699.465	715.519		
50				1.76	0.0025
40				2.83	0.0040
30				0.50	0.0007
10				2.09	0.0030
0				5.04	0.0071
-10				-3.03	0.0043
-20				5.26	0.0074
-30				-0.53	0.0007

**Frequency Error vs Voltage**

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	699.465	715.519	4.12	0.0058
4.4				5.44	0.0077

**LTE Band 66, 20MHz bandwidth QPSK (worst case of all bandwidths)**

**Frequency Error vs Temperature**

Temperature(°C)	Voltage(V)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	1710.833	1779.199		
50				-2.69	0.0015
40				-2.98	0.0017
30				-1.46	0.0008
10				-2.78	0.0016
0				-3.99	0.0023
-10				0.69	0.0004
-20				0.00	0.0000
-30				-4.32	0.0025

**Frequency Error vs Voltage**

Voltage(V)	Temperature(°C)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	1710.833	1779.199	-0.80	0.0005
4.4				-1.23	0.0007



#### **A.4 Occupied Bandwidth**

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the mid frequencies frequency. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

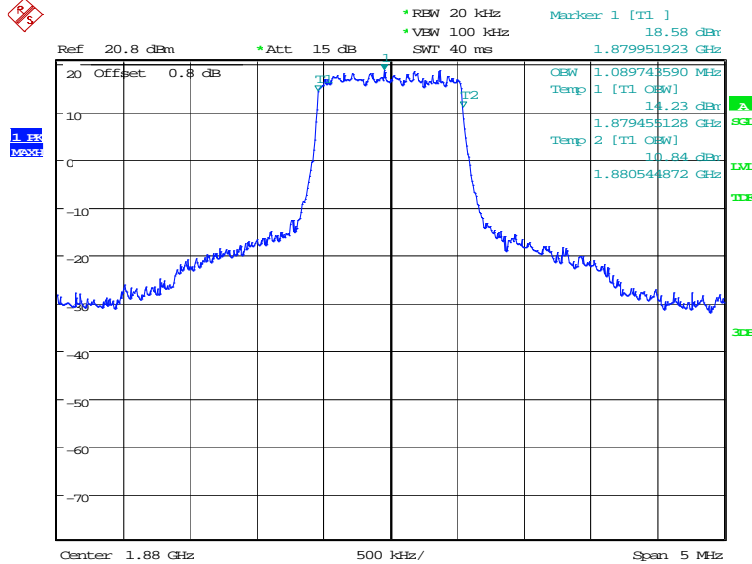
The measurement method is from ANSI C63.26:

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts.
- b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times$  RBW.
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
- d) Set the detection mode to peak, and the trace mode to max-hold.

**LTE band 2, 1.4MHz (99%)**

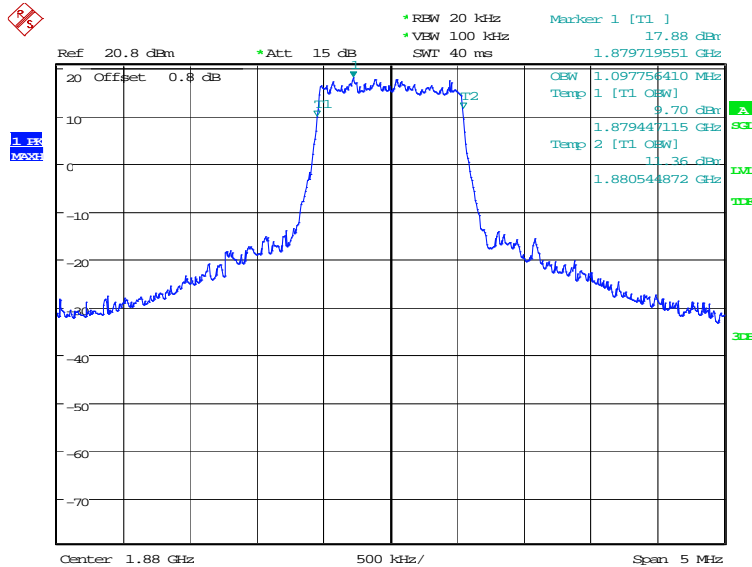
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1880.0	QPSK	16QAM
	1089.74	1097.76

**LTE band 2, 1.4MHz Bandwidth, QPSK (99% BW)**



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**LTE band 2, 1.4MHz Bandwidth, 16QAM (99% BW)**

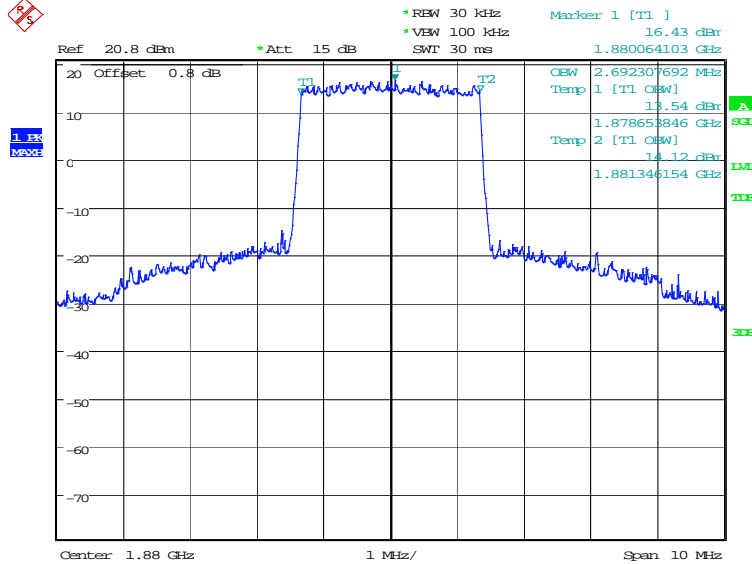


Date: 4.JUN.2020 13:46:05

### LTE band 2, 3MHz (99%)

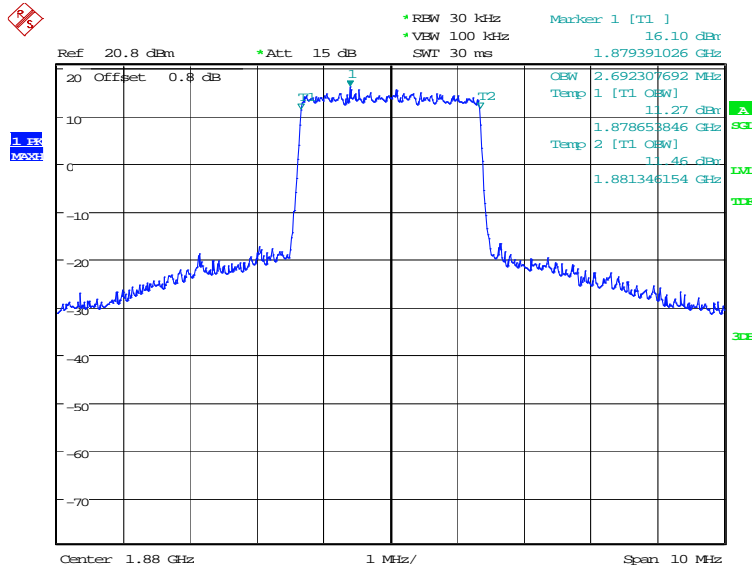
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1880.0	QPSK	16QAM
	2692.31	2692.31

### LTE band 2, 3MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 13:47:32

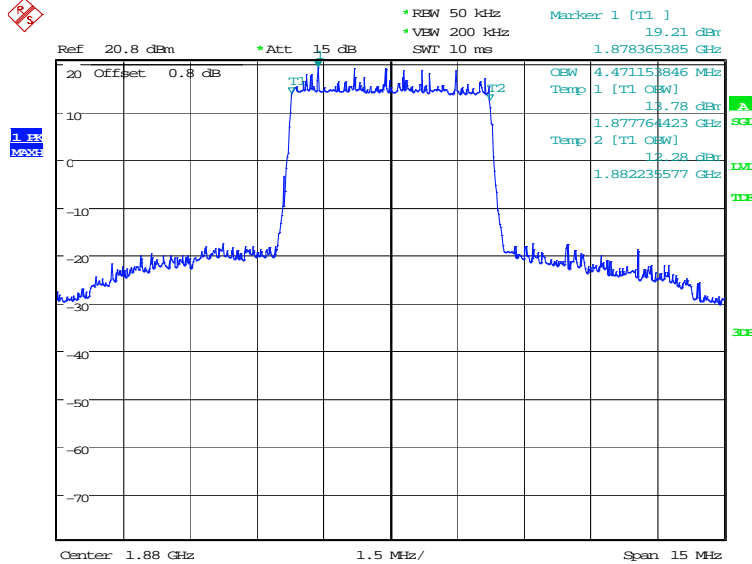
### LTE band 2, 3MHz Bandwidth, 16QAM (99% BW)



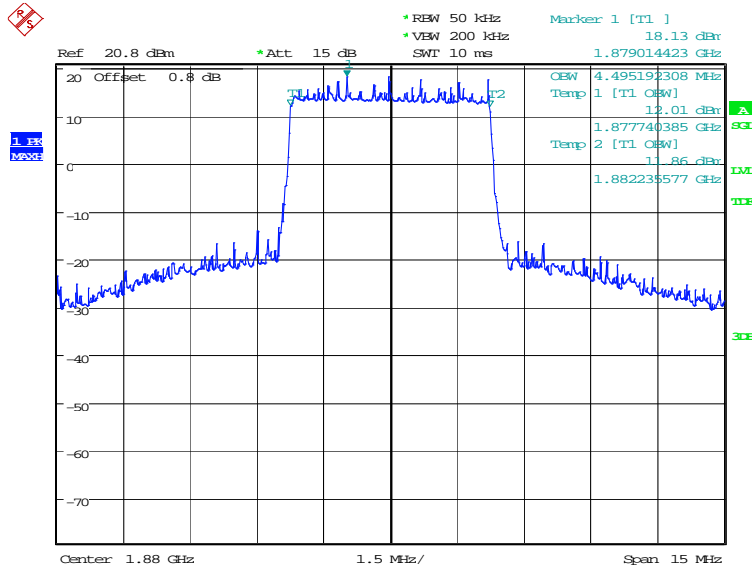
Date: 4.JUN.2020 13:48:10

**LTE band 2, 5MHz (99%)**

Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1880.0	QPSK	16QAM
	4471.15	4495.19

**LTE band 2, 5MHz Bandwidth, QPSK (99% BW)**


Date: 4.JUN.2020 13:49:53

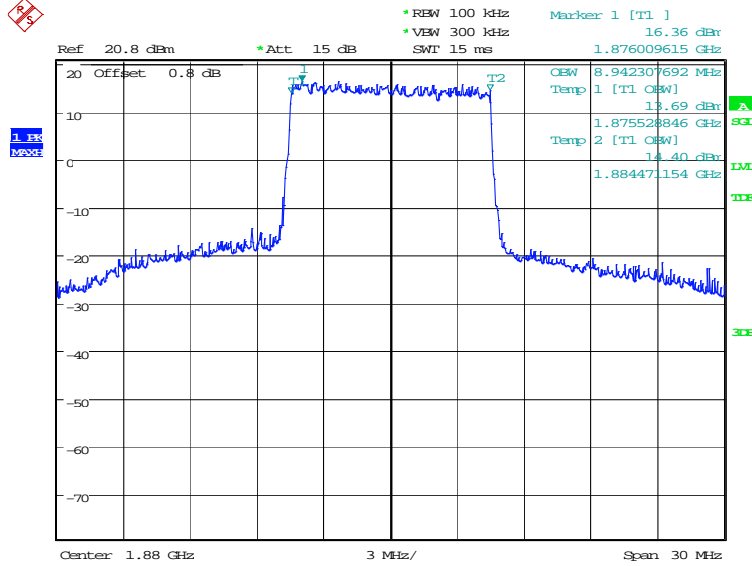
**LTE band 2, 5MHz Bandwidth, 16QAM (99% BW)**


Date: 4.JUN.2020 13:50:32

**LTE band 2, 10MHz (99%)**

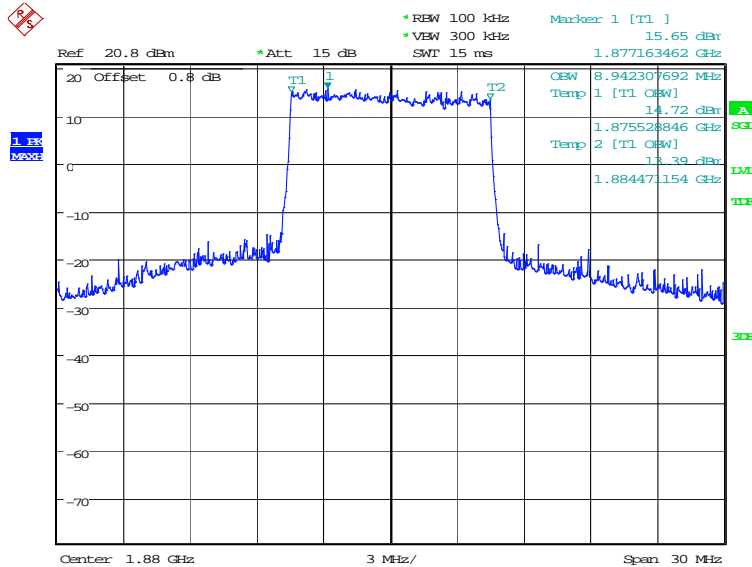
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1880.0	QPSK	16QAM
	8942.31	8942.31

**LTE band 2, 10MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 13:51:59

**LTE band 2, 10MHz Bandwidth, 16QAM (99% BW)**

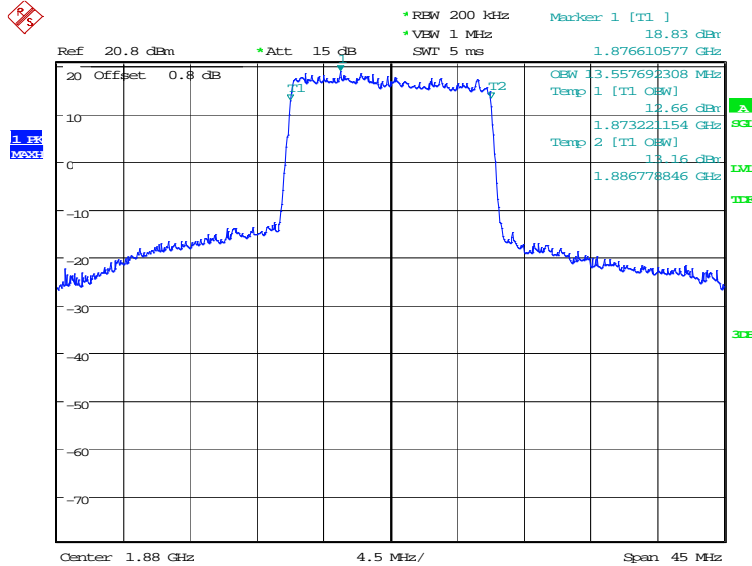


Date: 4.JUN.2020 13:52:38

### LTE band 2, 15MHz (99%)

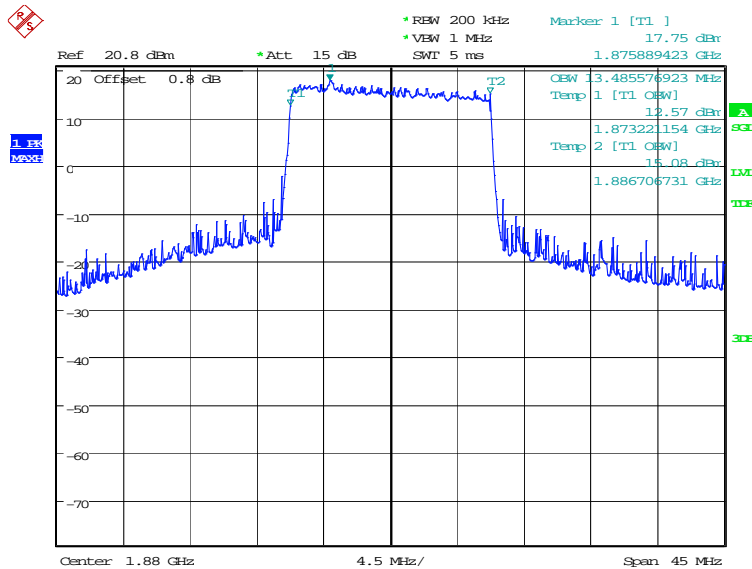
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1880.0	QPSK	16QAM
	1357.69	13485.58

### LTE band 2, 15MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 13:54:06

### LTE band 2, 15MHz Bandwidth, 16QAM (99% BW)

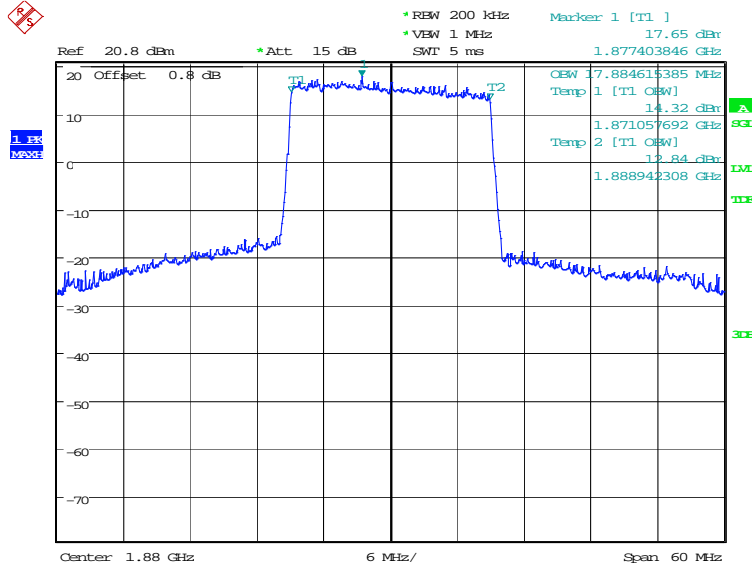


Date: 4.JUN.2020 13:54:44

### LTE band 2, 20MHz (99%)

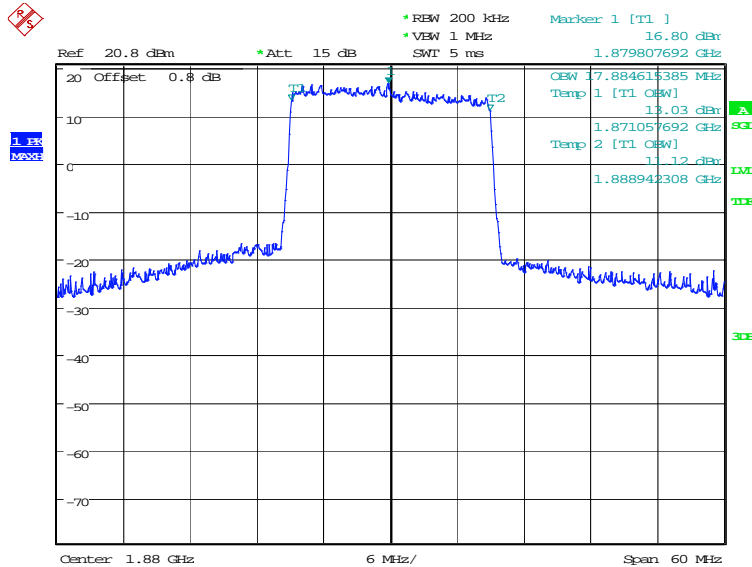
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1880.0	QPSK	16QAM
	17884.62	17884.62

### LTE band 2, 20MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 13:56:34

### LTE band 2, 20MHz Bandwidth, 16QAM (99% BW)

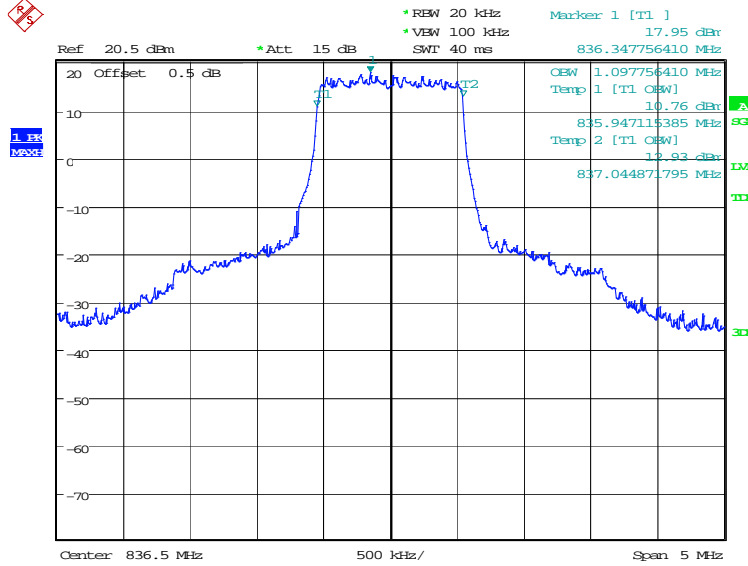


Date: 4.JUN.2020 13:57:12

**LTE band 5, 1.4MHz (99%)**

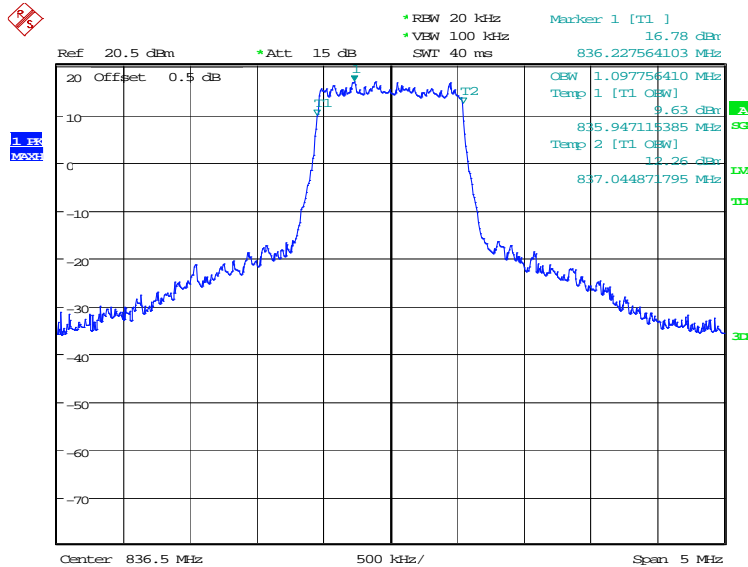
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
836.5	QPSK	16QAM
	1097.76	1097.76

**LTE band 5, 1.4MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 13:58:43

**LTE band 5, 1.4MHz Bandwidth, 16QAM (99% BW)**



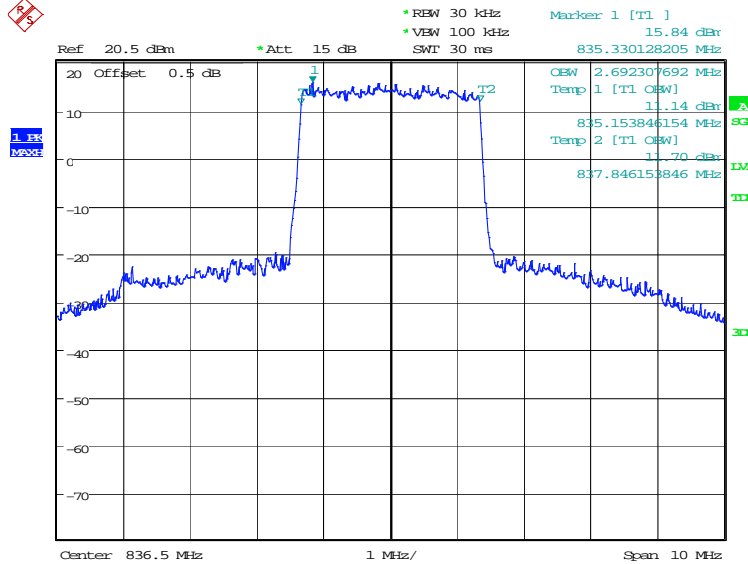
Date: 4.JUN.2020 13:59:22



**LTE band 5, 3MHz (99%)**

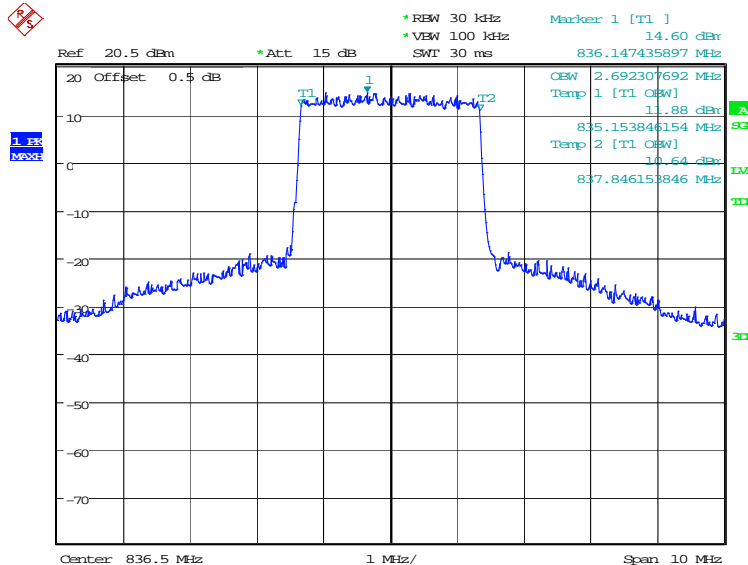
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
836.5	QPSK	16QAM
	2692.31	2692.31

**LTE band 5, 3MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 14:01:07

**LTE band 5, 3MHz Bandwidth, 16QAM (99% BW)**

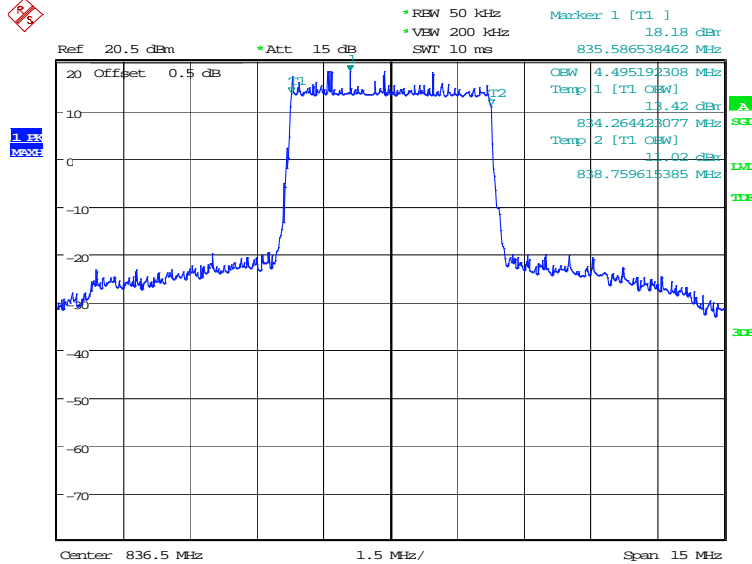


Date: 4.JUN.2020 14:01:45

**LTE band 5, 5MHz (99%)**

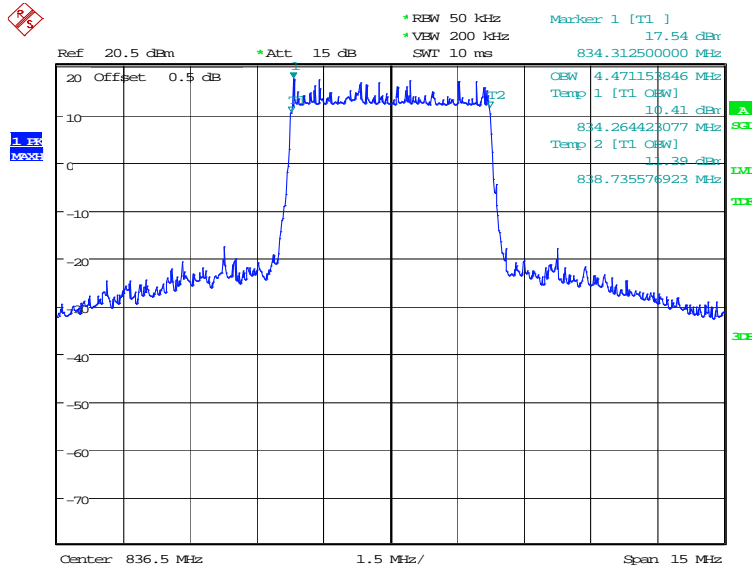
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
836.5	QPSK	16QAM
	4495.19	4471.15

**LTE band 5, 5MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 14:03:13

**LTE band 5, 5MHz Bandwidth, 16QAM (99% BW)**

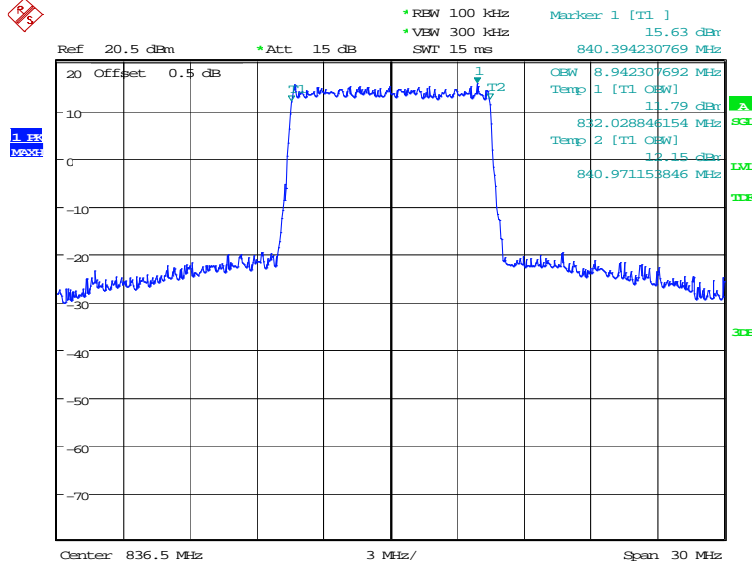


Date: 4.JUN.2020 14:03:51

**LTE band 5, 10MHz (99%)**

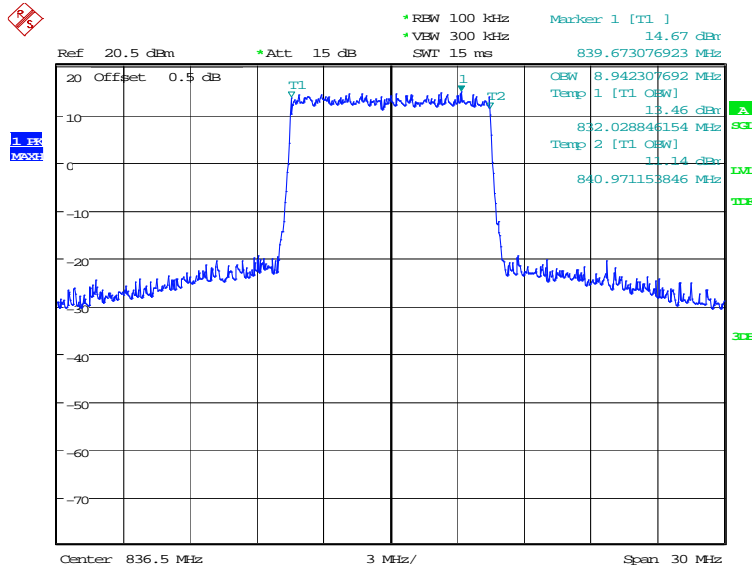
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
836.5	QPSK	16QAM
	8942.31	8942.31

**LTE band 5, 10MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 14:05:18

**LTE band 5, 10MHz Bandwidth, 16QAM (99% BW)**

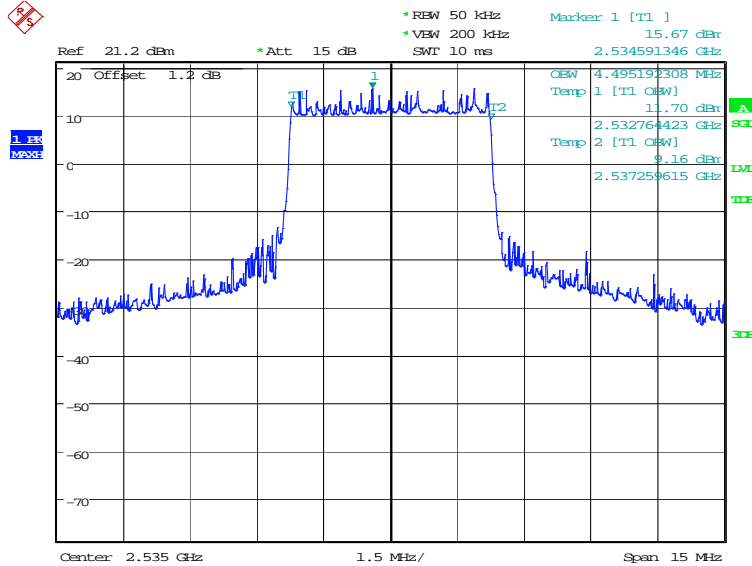


Date: 4.JUN.2020 14:05:57

### LTE band 7, 5MHz (99%)

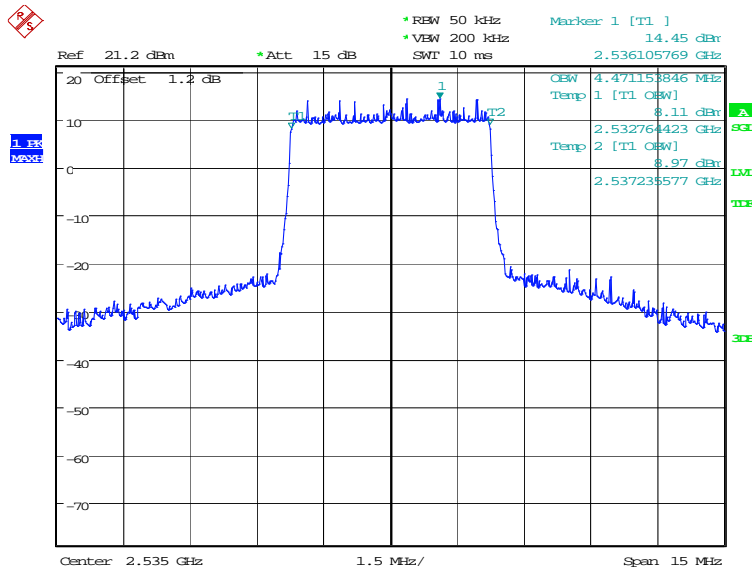
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
2535.0	QPSK	16QAM
	4495.19	4471.15

### LTE band 7, 5MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 14:07:37

### LTE band 7, 5MHz Bandwidth, 16QAM (99% BW)

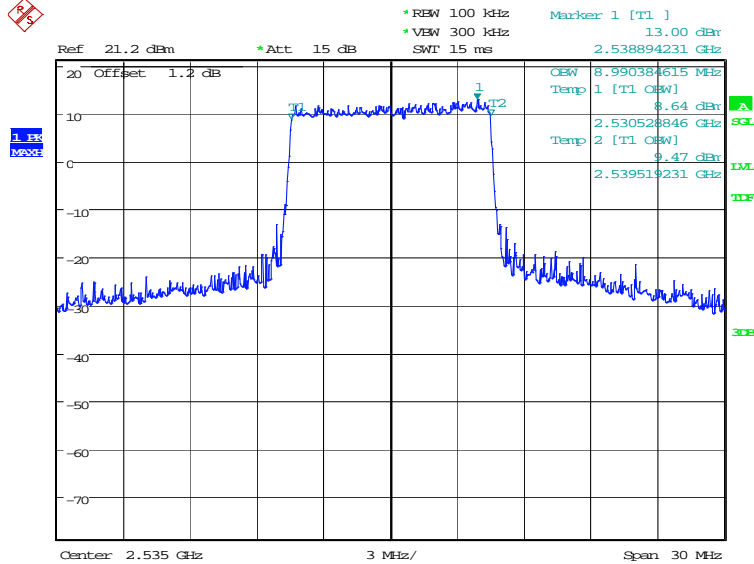


Date: 4.JUN.2020 14:08:15

**LTE band 7, 10MHz (99%)**

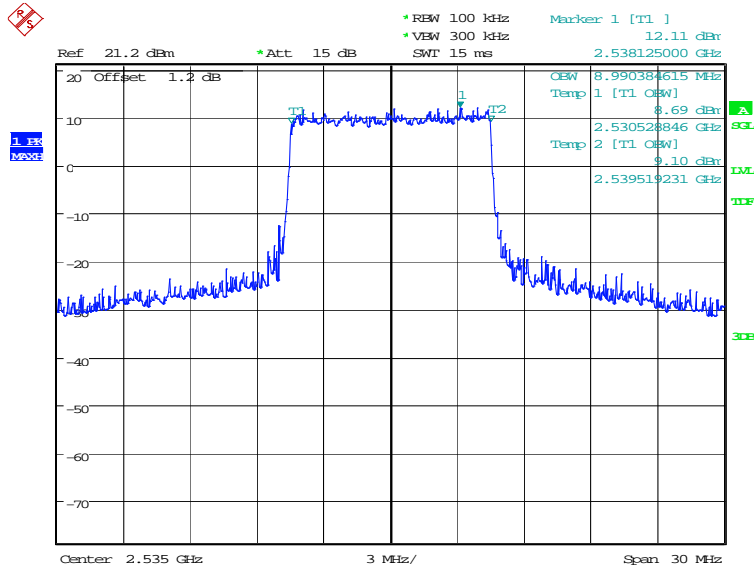
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
2535.0	QPSK	16QAM
	8990.38	8990.38

**LTE band 7, 10MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 14:09:43

**LTE band 7, 10MHz Bandwidth, 16QAM (99% BW)**

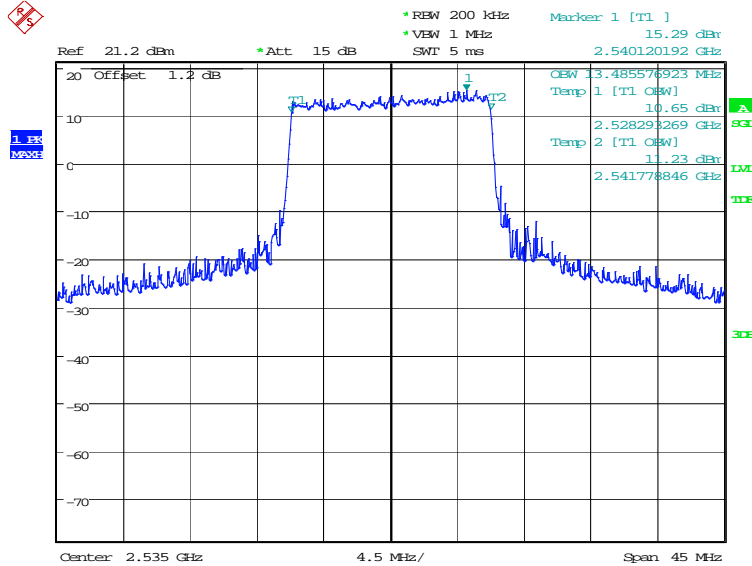


Date: 4.JUN.2020 14:10:21

### LTE band 7, 15MHz (99%)

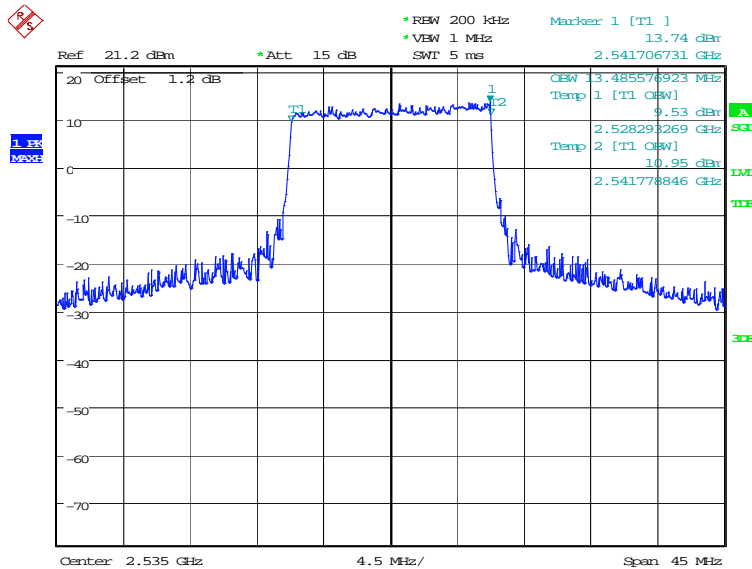
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
2535.0	QPSK	16QAM
	13485.58	13485.58

### LTE band 7, 15MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 14:11:49

### LTE band 7, 15MHz Bandwidth, 16QAM (99% BW)

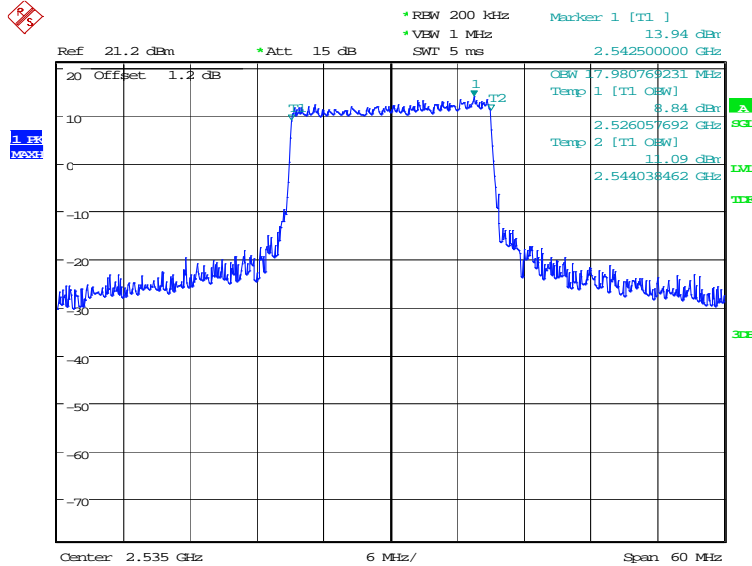


Date: 4.JUN.2020 14:12:28

**LTE band 7, 20MHz (99%)**

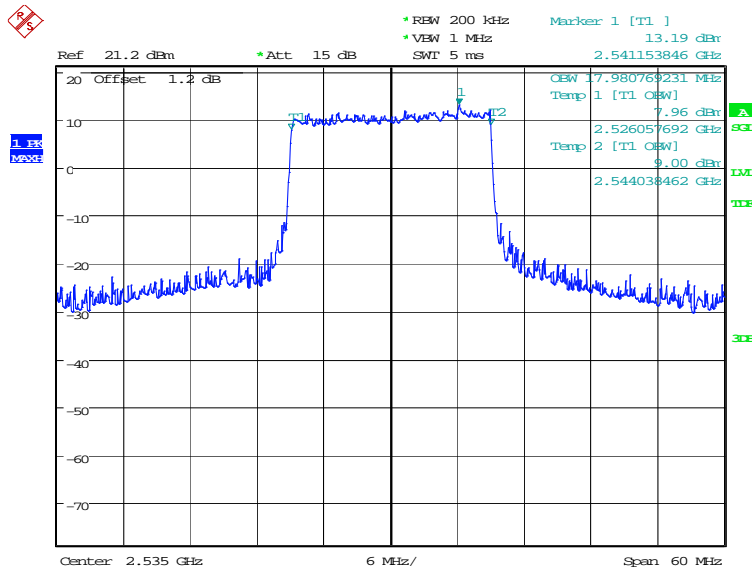
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
2535.0	QPSK	16QAM
	17980.77	17980.77

**LTE band 7, 20MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 14:13:55

**LTE band 7, 20MHz Bandwidth, 16QAM (99% BW)**

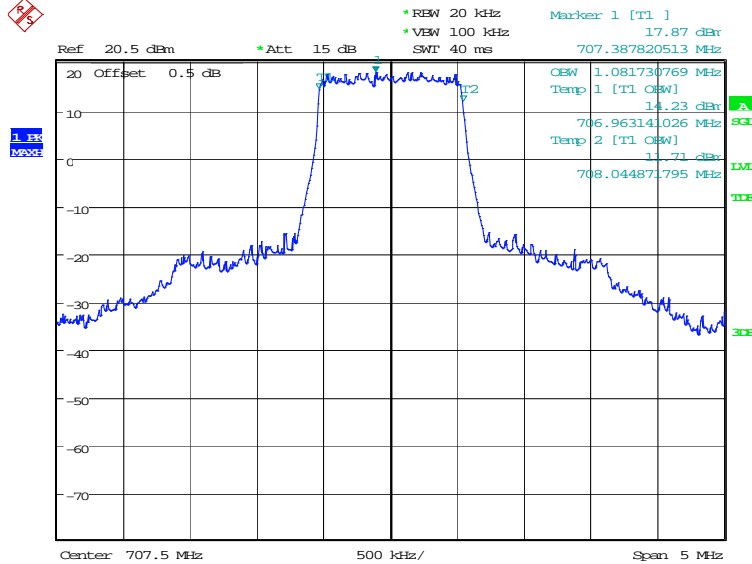


Date: 4.JUN.2020 14:14:34

### LTE band 12, 1.4MHz (99%)

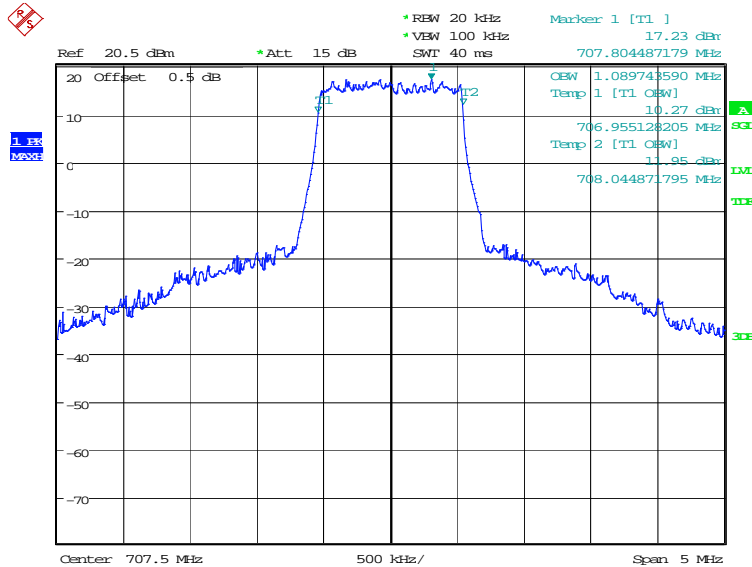
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
707.5	QPSK	16QAM
	1081.73	1089.74

### LTE band 12, 1.4MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 14:16:02

### LTE band 12, 1.4MHz Bandwidth, 16QAM (99% BW)



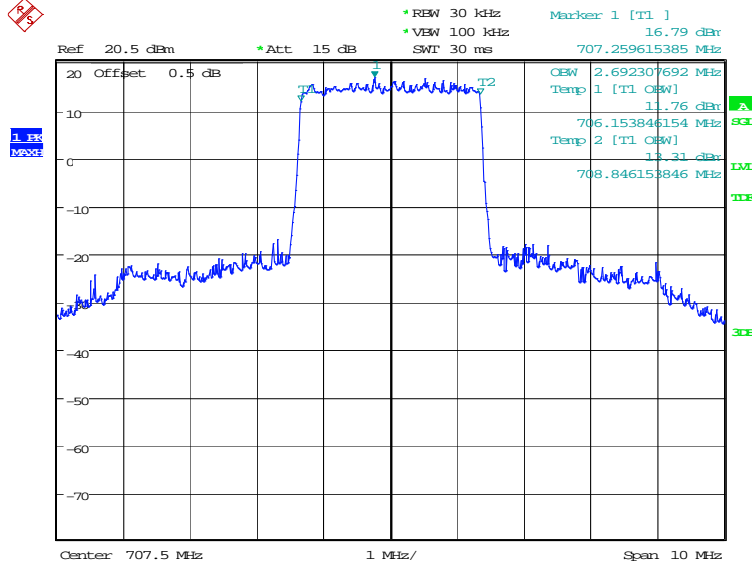
Date: 4.JUN.2020 14:16:40



### LTE band 12, 3MHz (99%)

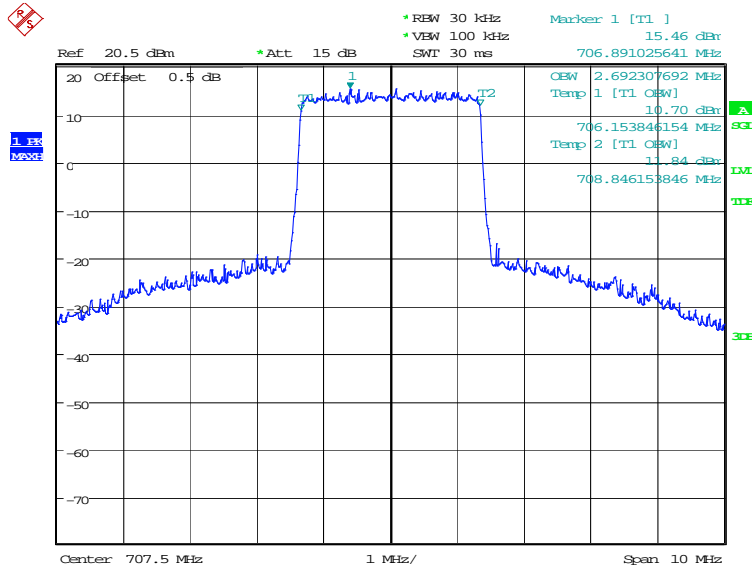
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
707.5	QPSK	16QAM
	2692.31	2692.31

### LTE band 12, 3MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 14:18:19

### LTE band 12, 3MHz Bandwidth, 16QAM (99% BW)

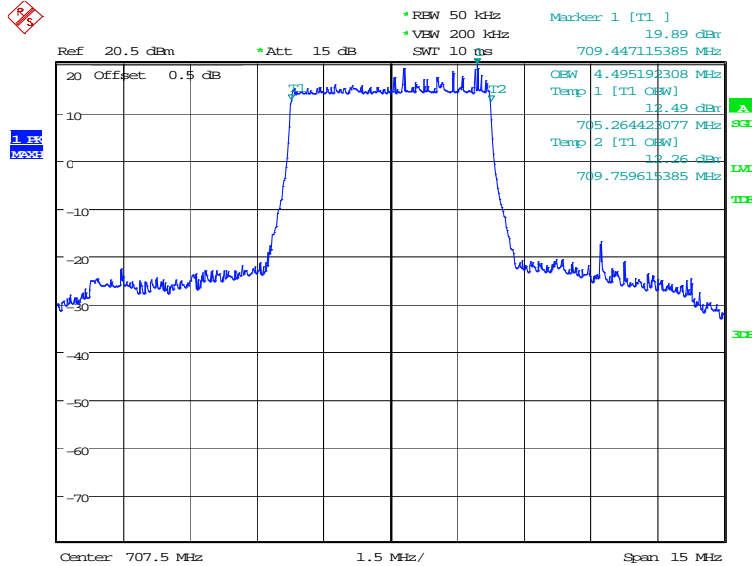


Date: 4.JUN.2020 14:18:57

### LTE band 12, 5MHz (99%)

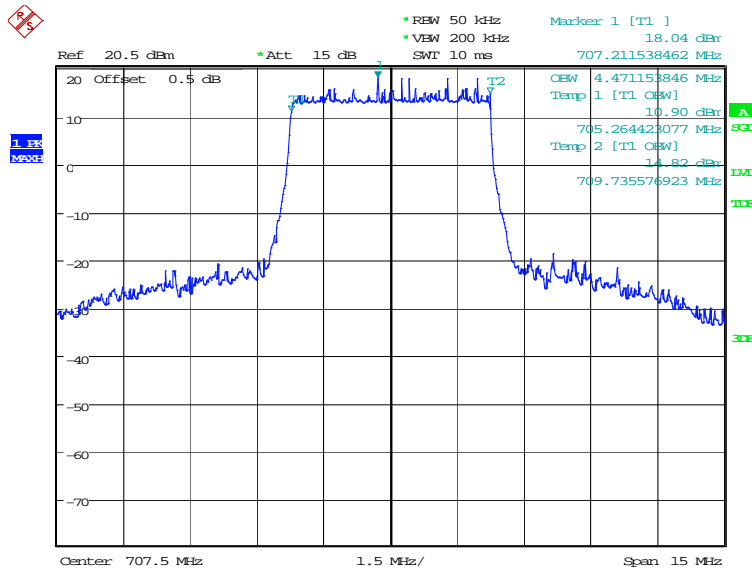
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
707.5	QPSK	16QAM
	4495.19	4471.15

### LTE band 12, 5MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 14:20:38

### LTE band 12, 5MHz Bandwidth, 16QAM (99% BW)

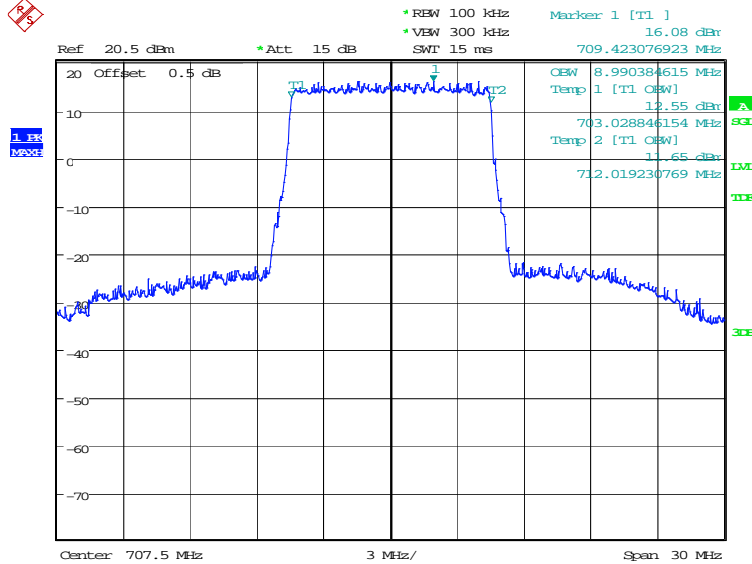


Date: 4.JUN.2020 14:21:17

**LTE band 12, 10MHz (99%)**

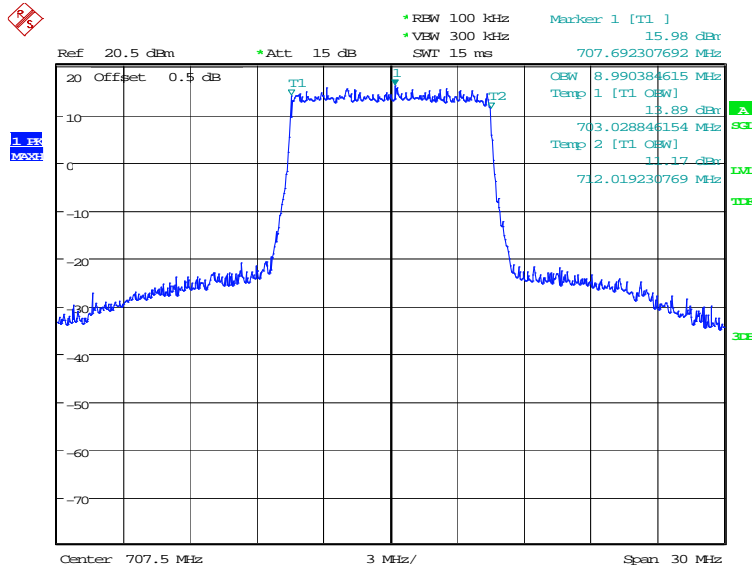
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
707.5	QPSK	16QAM
	8990.38	8990.38

**LTE band 12, 10MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 14:22:44

**LTE band 12, 10MHz Bandwidth, 16QAM (99% BW)**

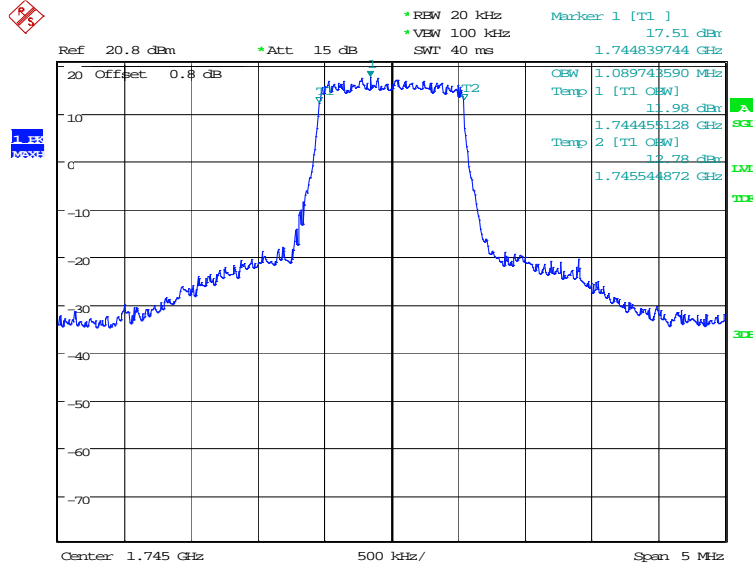


Date: 4.JUN.2020 14:23:23

### LTE band 66, 1.4MHz (99%)

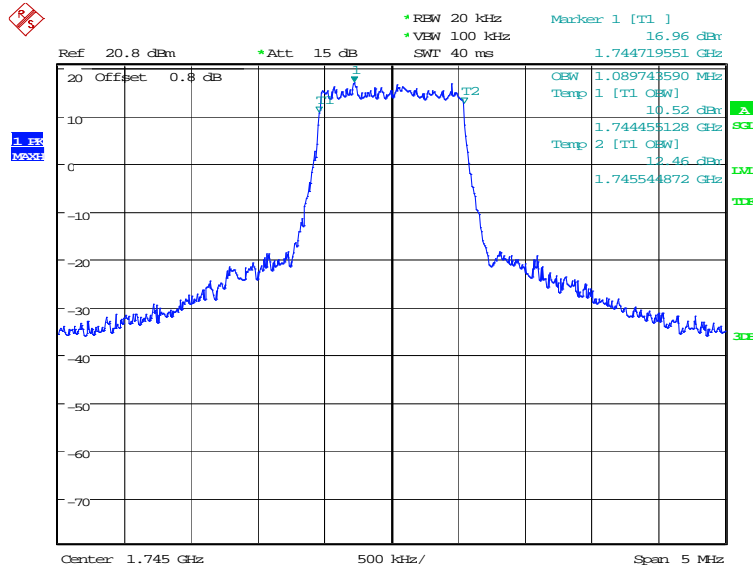
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
	1745.0	QPSK
	1089.74	1089.74

### LTE band 66, 1.4MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 14:24:52

### LTE band 66, 1.4MHz Bandwidth, 16QAM (99% BW)

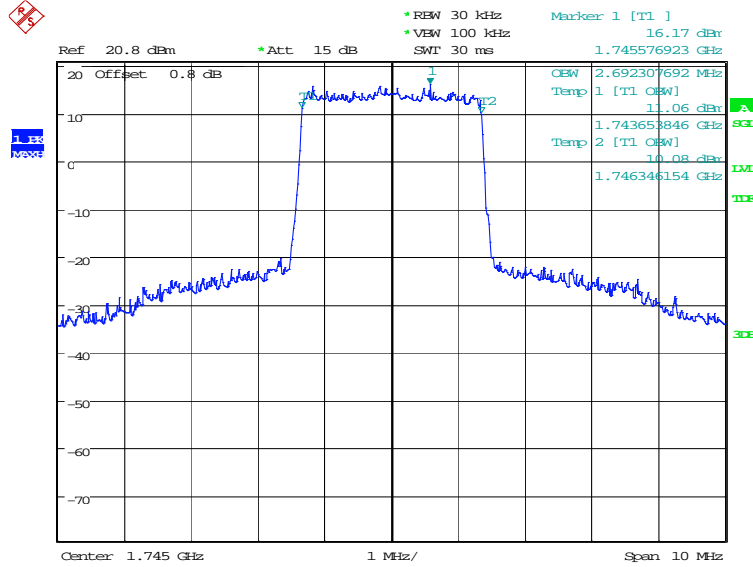


Date: 4.JUN.2020 14:25:30

### LTE band 66, 3MHz (99%)

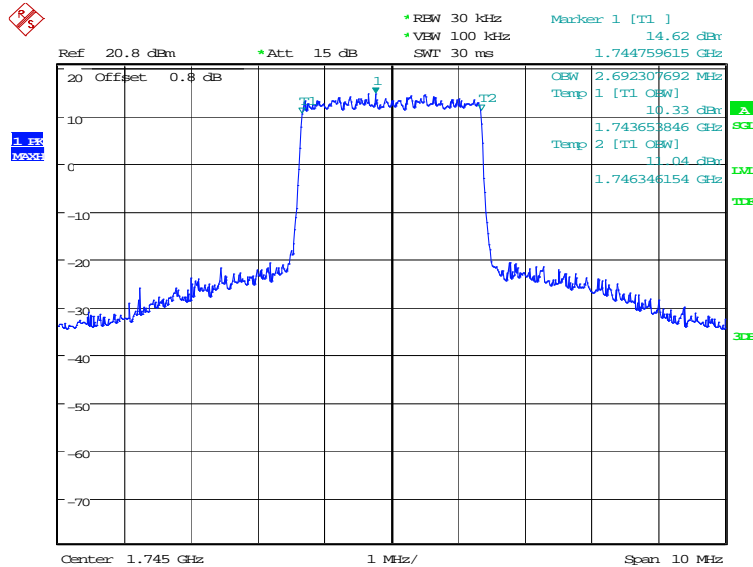
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
	1745.0	QPSK
2692.31		2692.31

### LTE band 66, 3MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 14:26:58

### LTE band 66, 3MHz Bandwidth, 16QAM (99% BW)

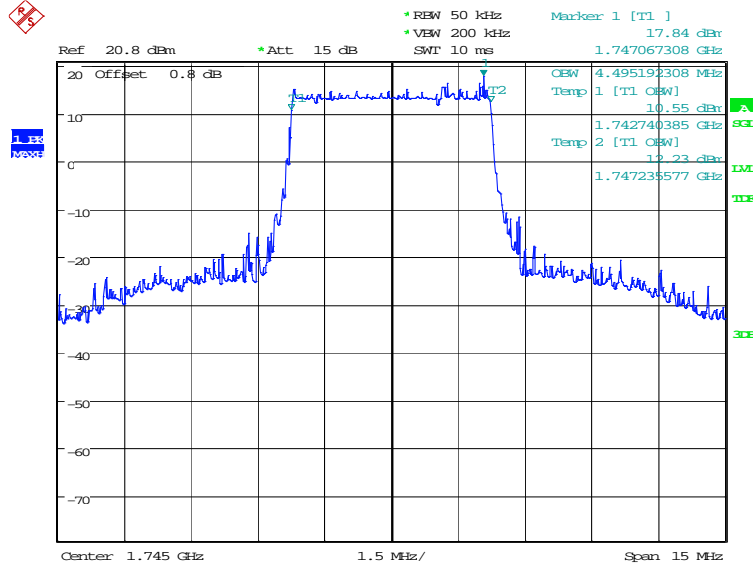


Date: 4.JUN.2020 14:27:36

**LTE band 66, 5MHz (99%)**

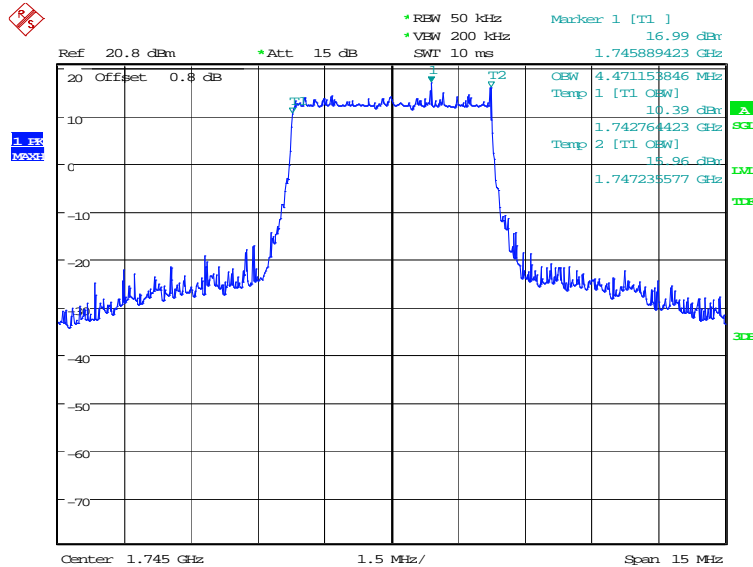
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1745.0	QPSK	16QAM
	4495.19	4471.15

**LTE band 66, 5MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 14:29:04

**LTE band 66, 5MHz Bandwidth, 16QAM (99% BW)**

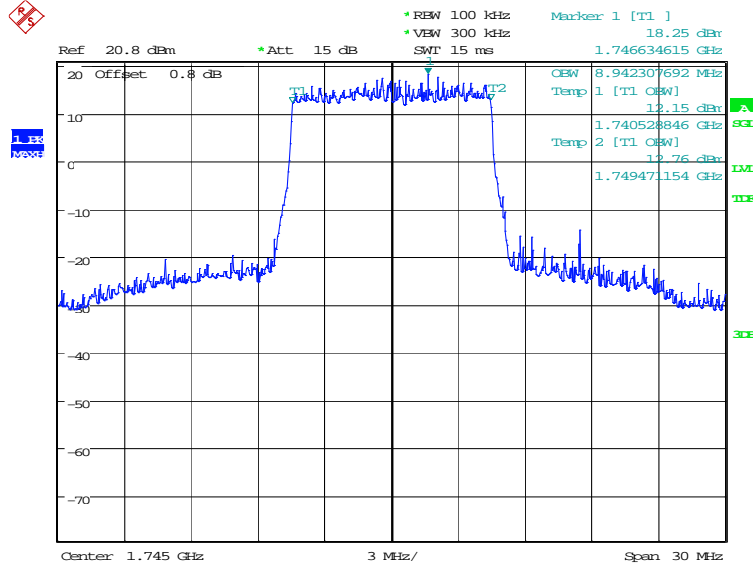


Date: 4.JUN.2020 14:29:43

### LTE band 66, 10MHz (99%)

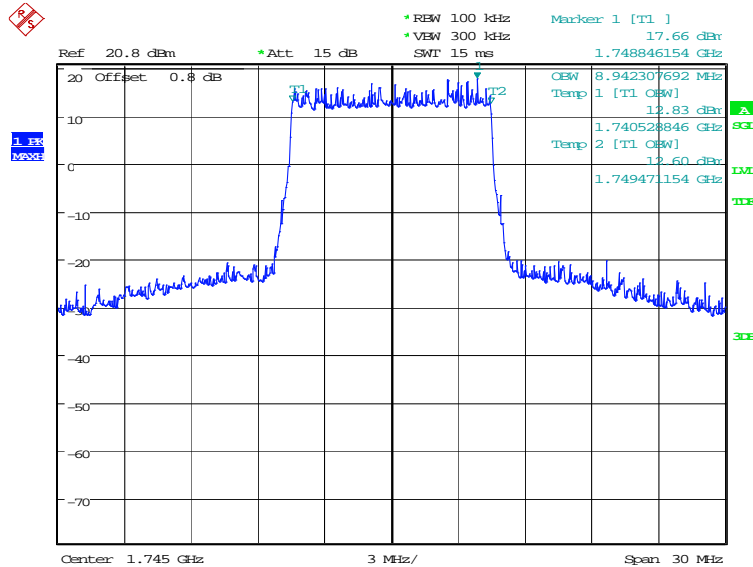
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1745.0	QPSK	16QAM
	8942.31	8942.31

### LTE band 66, 10MHz Bandwidth, QPSK (99% BW)



Date: 4.JUN.2020 14:31:10

### LTE band 66, 10MHz Bandwidth, 16QAM (99% BW)

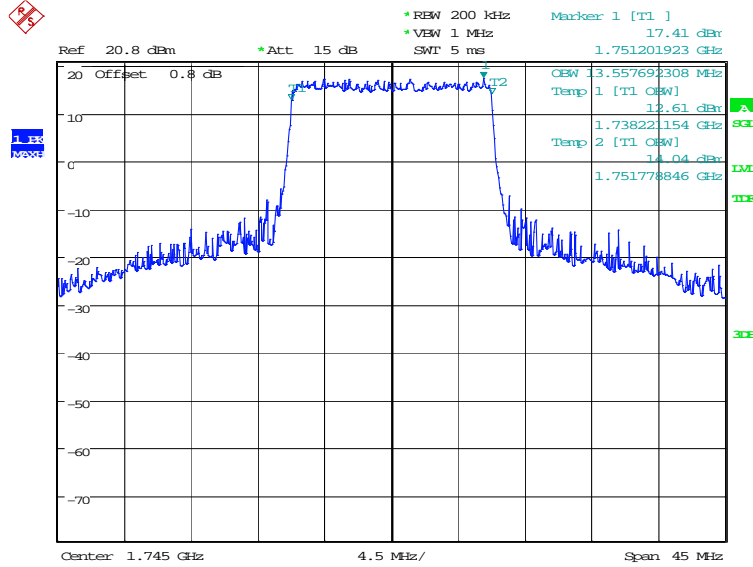


Date: 4.JUN.2020 14:31:48

**LTE band 66, 15MHz (99%)**

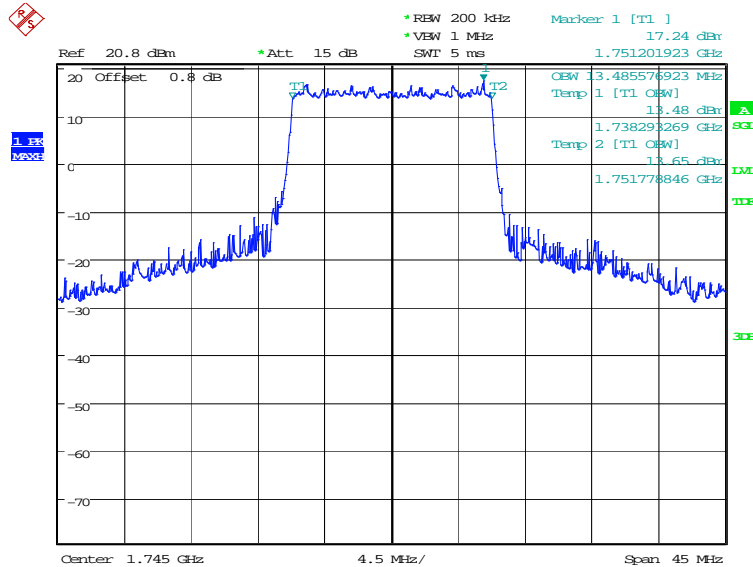
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1745.0	QPSK	16QAM
	13557.69	13485.58

**LTE band 66, 15MHz Bandwidth, QPSK (99% BW)**



Date: 4.JUN.2020 14:33:16

**LTE band 66, 15MHz Bandwidth, 16QAM (99% BW)**



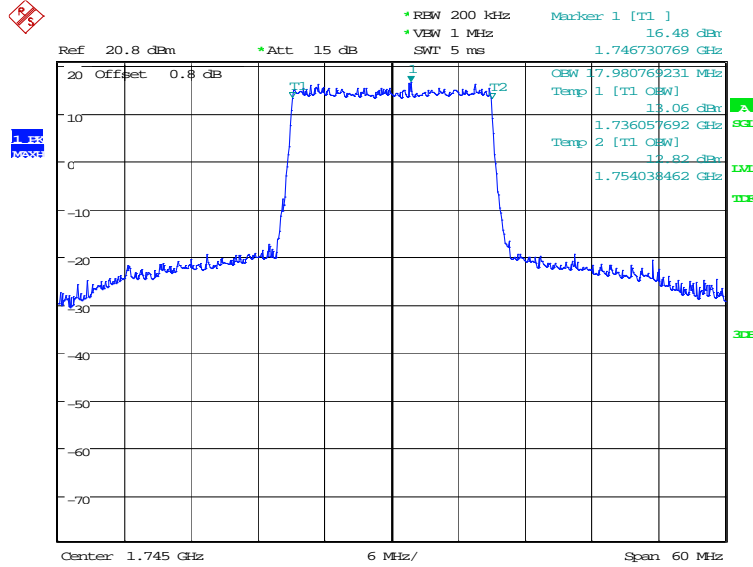
Date: 4.JUN.2020 14:33:54



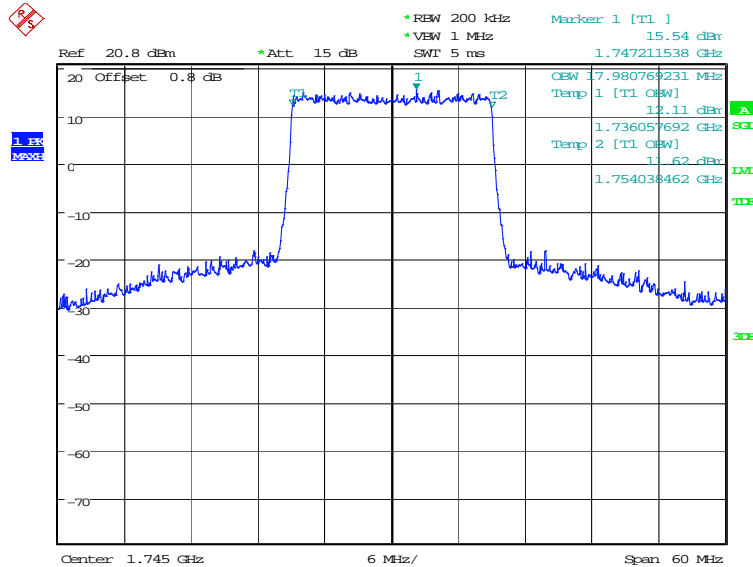
### LTE band 66, 20MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
1745.0	QPSK	16QAM
	17980.77	17980.77

### LTE band 66, 20MHz Bandwidth, QPSK (99% BW)



### LTE band 66, 20MHz Bandwidth, 16QAM (99% BW)



## **A.5 Emission Bandwidth**

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

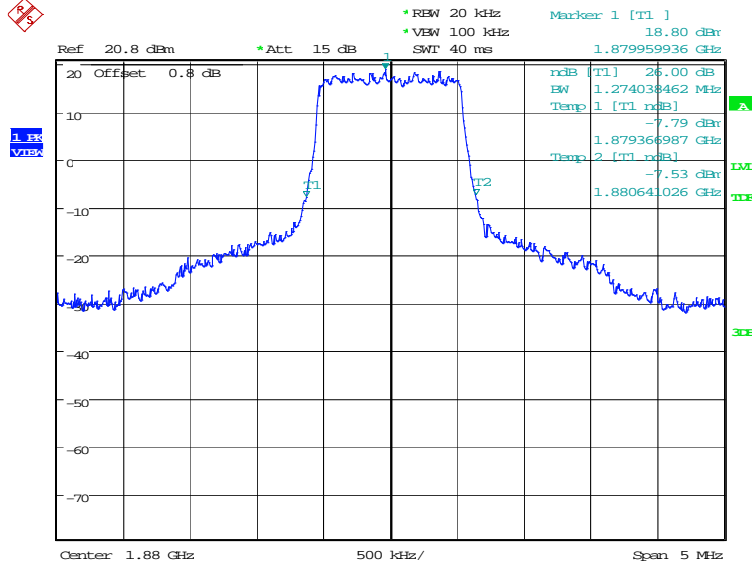
The measurement method is from ANSI C63.26:

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
- b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times$  RBW.
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
- d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “-X dB” requirement, i.e., if the requirement calls for measuring the -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
- e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

**LTE band 2, 1.4MHz (-26dBc)**

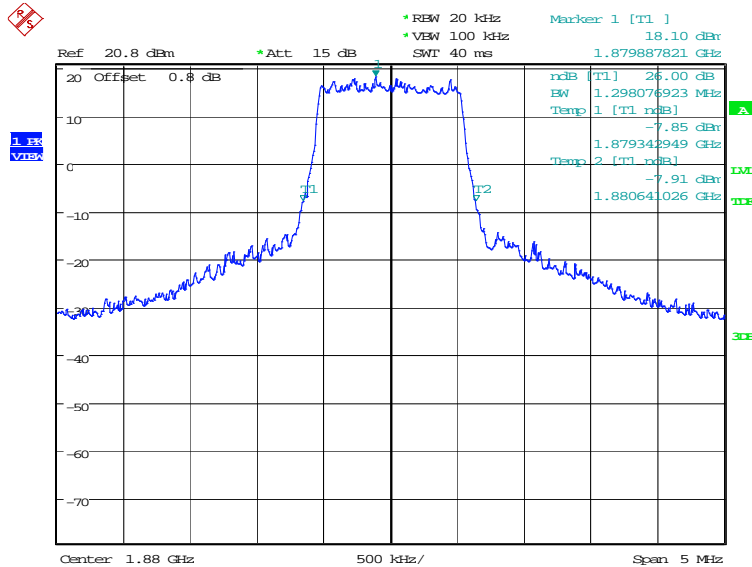
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1880.0	QPSK
1274.04		1298.08

**LTE band 2, 1.4MHz Bandwidth, QPSK (-26dBc BW)**



Date: 4.JUN.2020 15:10:47

**LTE band 2, 1.4MHz Bandwidth, 16QAM (-26dBc BW)**

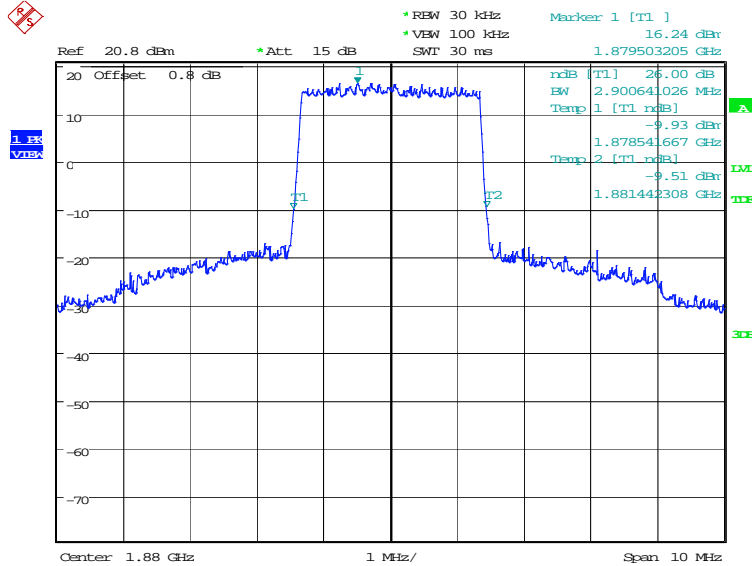


Date: 4.JUN.2020 15:11:26

### LTE band 2, 3MHz (-26dBc)

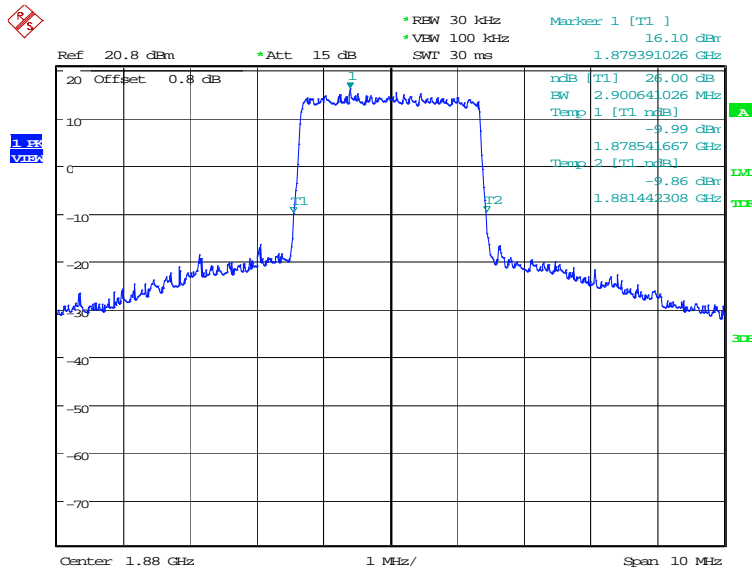
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
1880.0	QPSK	16QAM
	2900.64	2900.64

### LTE band 2, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:13:06

### LTE band 2, 3MHz Bandwidth, 16QAM (-26dBc BW)

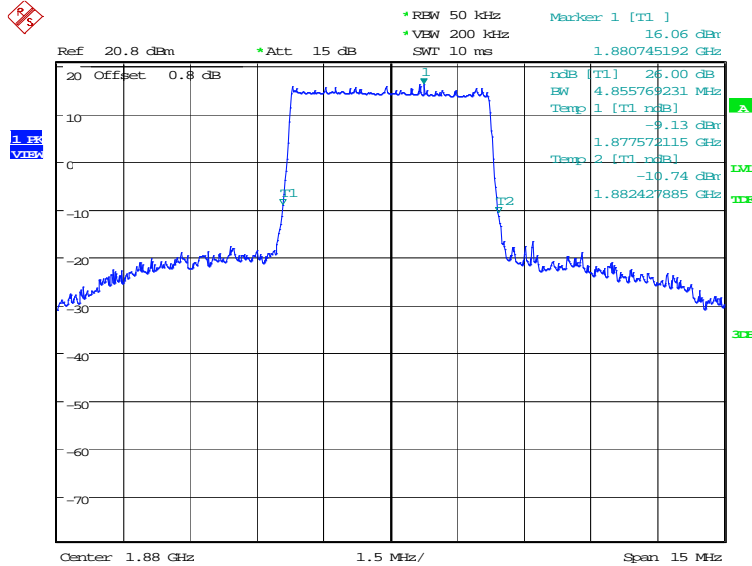


Date: 4.JUN.2020 15:13:45

### LTE band 2, 5MHz (-26dBc)

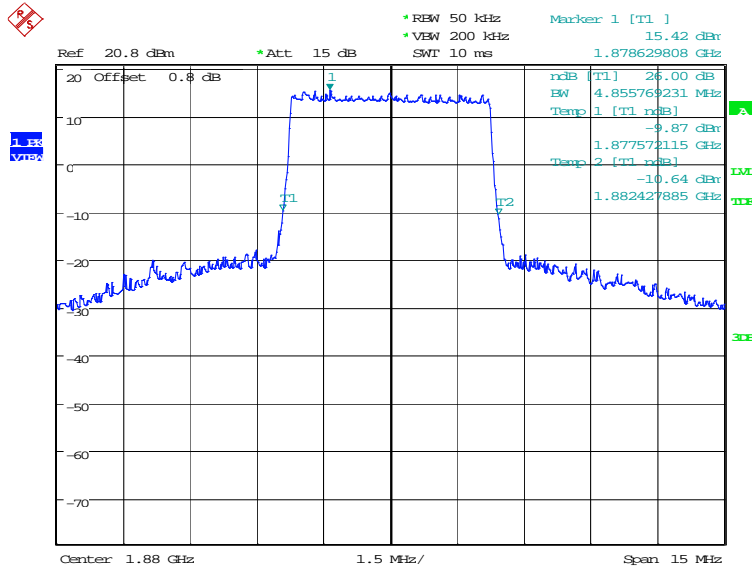
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1880.0	QPSK
4855.77		4855.77

### LTE band 2, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:15:16

### LTE band 2, 5MHz Bandwidth, 16QAM (-26dBc BW)

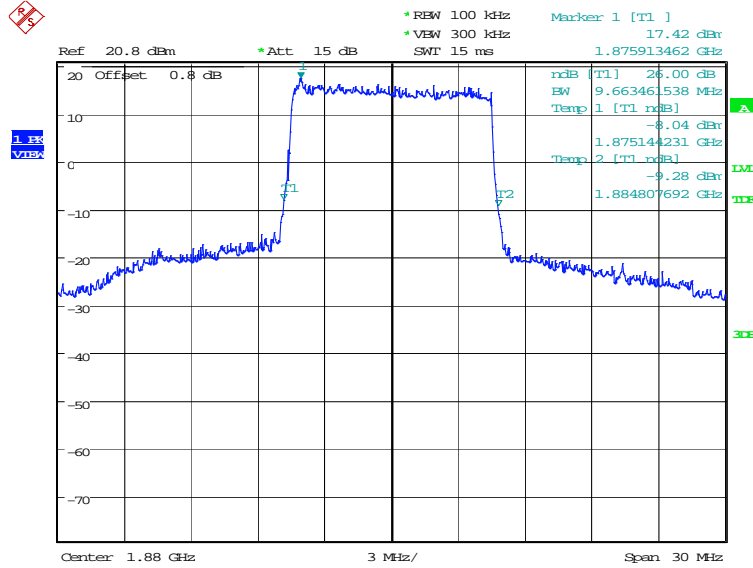


Date: 4.JUN.2020 15:15:55

### LTE band 2, 10MHz (-26dBc)

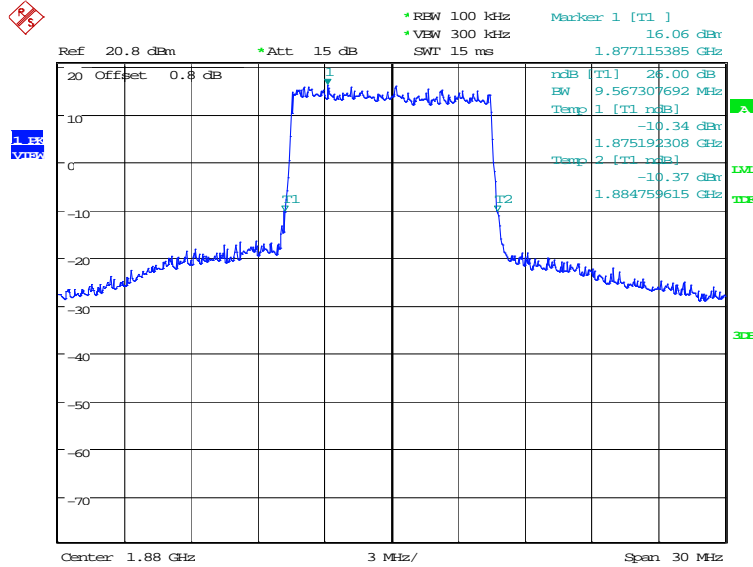
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1880.0	QPSK
9663.46		9567.31

### LTE band 2, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:17:06

### LTE band 2, 10MHz Bandwidth, 16QAM (-26dBc BW)

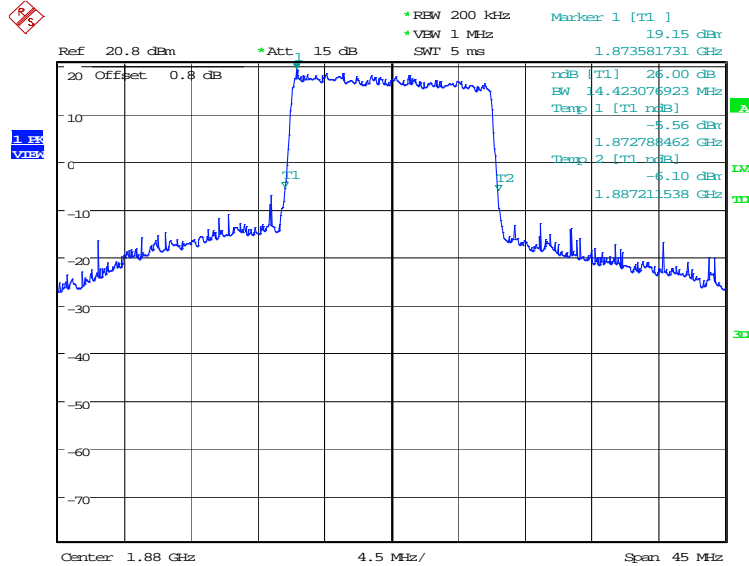


Date: 4.JUN.2020 15:17:45

### LTE band 2, 15MHz (-26dBc)

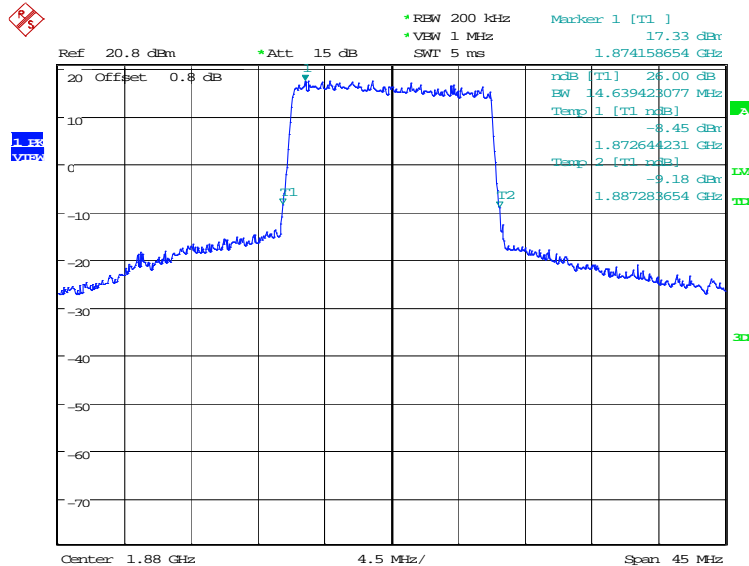
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1880.0	QPSK
	14423.08	14639.42

### LTE band 2, 15MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:18:48

### LTE band 2, 15MHz Bandwidth, 16QAM (-26dBc BW)

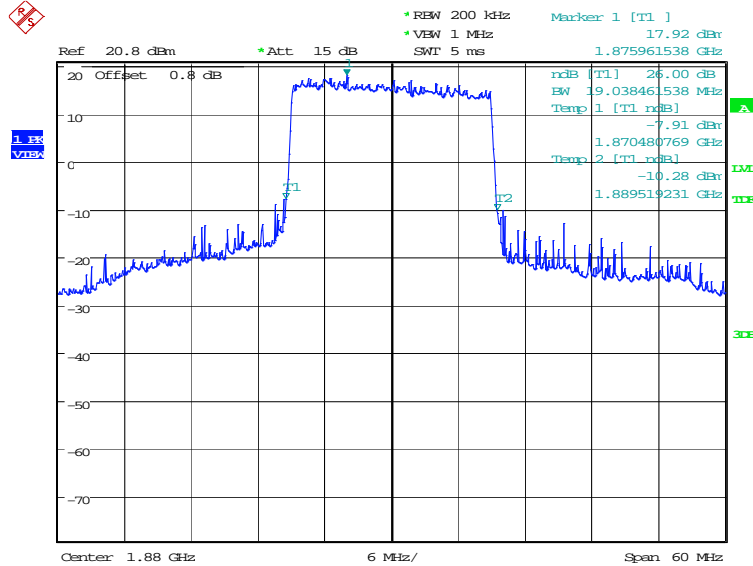


Date: 4.JUN.2020 15:19:27

### LTE band 2, 20MHz (-26dBc)

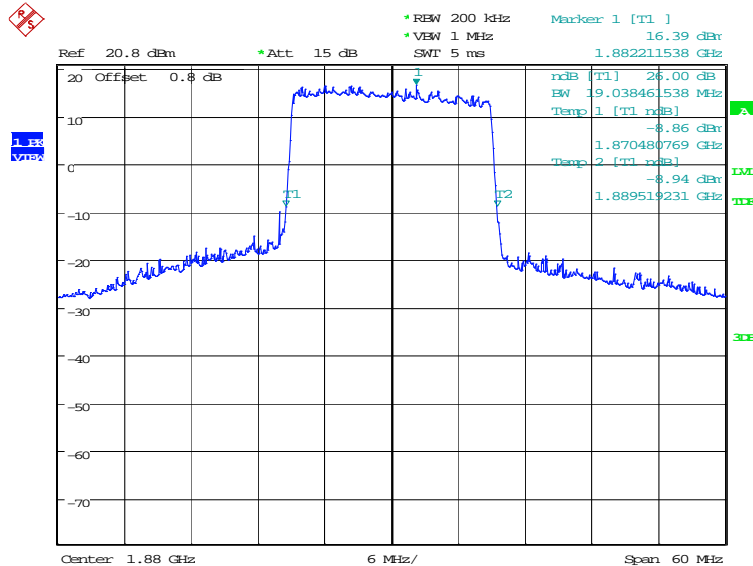
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1880.0	QPSK
19038.46		19038.46

### LTE band 2, 20MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:20:42

### LTE band 2, 20MHz Bandwidth, 16QAM (-26dBc BW)



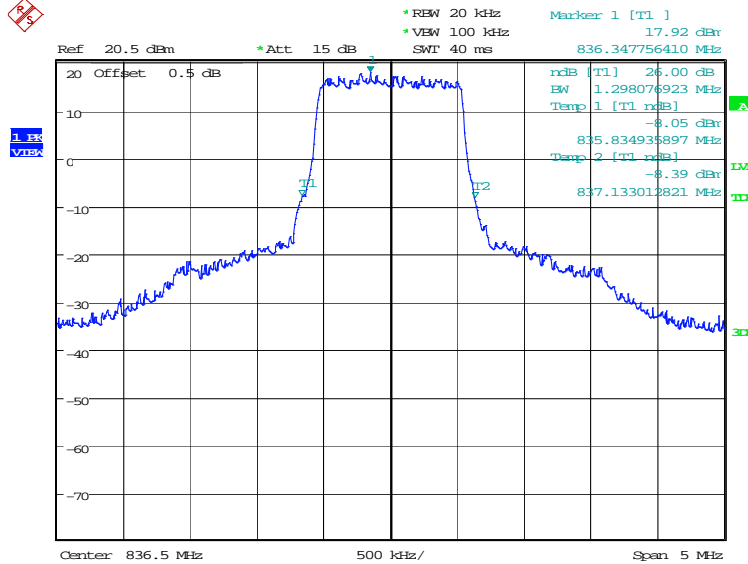
Date: 4.JUN.2020 15:21:21



**LTE band 5, 1.4MHz (-26dBc)**

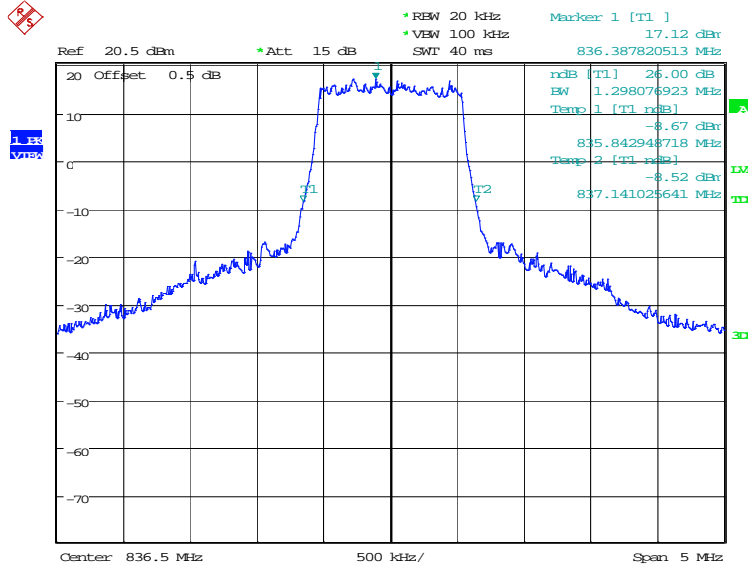
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	836.5	QPSK
1298.08		1298.08

**LTE band 5, 1.4MHz Bandwidth, QPSK (-26dBc BW)**



Date: 4.JUN.2020 15:22:33

**LTE band 5, 1.4MHz Bandwidth, 16QAM (-26dBc BW)**

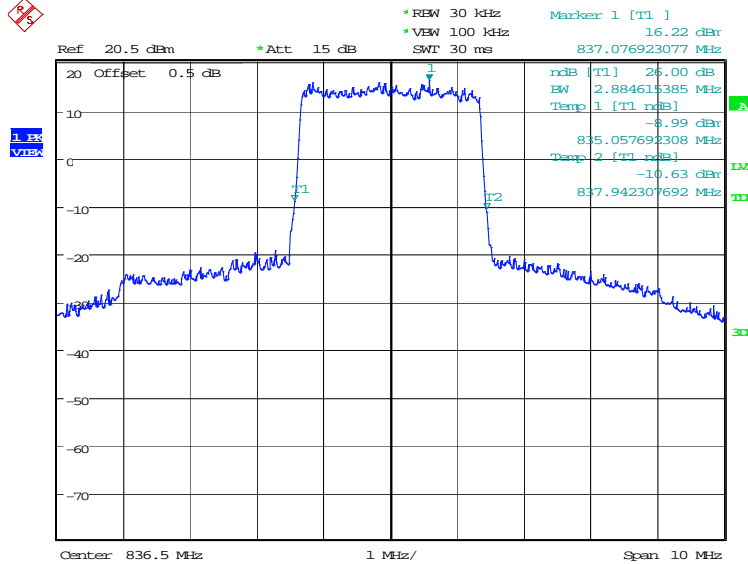


Date: 4.JUN.2020 15:23:12

### LTE band 5, 3MHz (-26dBc)

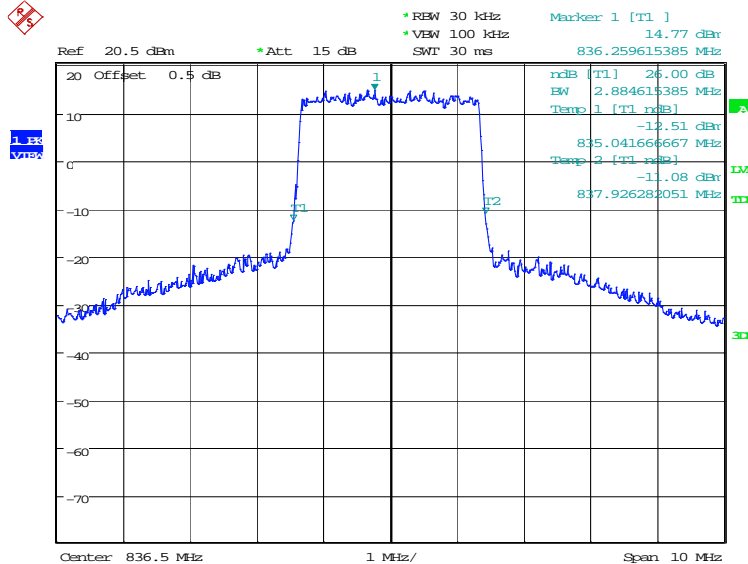
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	836.5	QPSK
2884.62		2884.62

### LTE band 5, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:24:38

### LTE band 5, 3MHz Bandwidth, 16QAM (-26dBc BW)

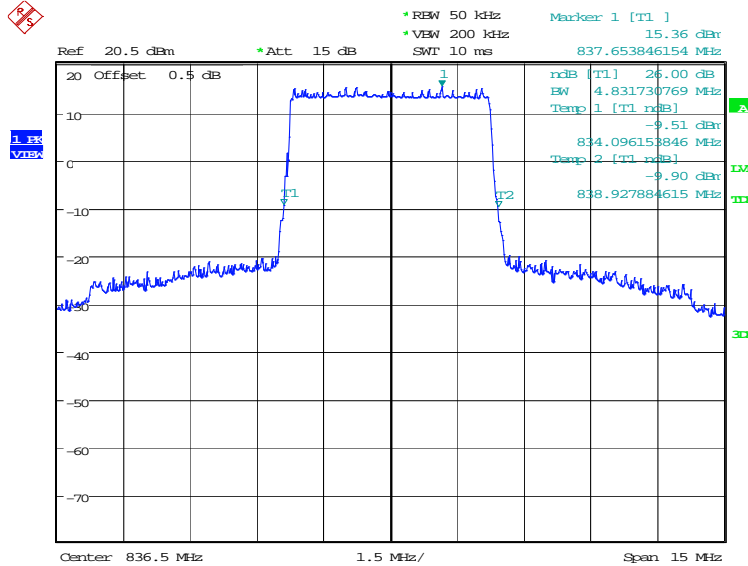


Date: 4.JUN.2020 15:25:17

### LTE band 5, 5MHz (-26dBc)

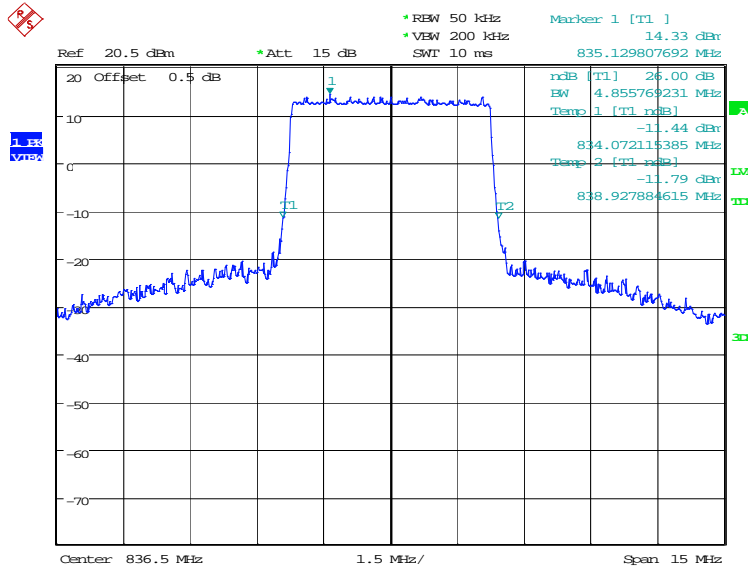
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
836.5	QPSK	16QAM
	4831.73	4855.77

### LTE band 5, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:26:34

### LTE band 5, 5MHz Bandwidth, 16QAM (-26dBc BW)

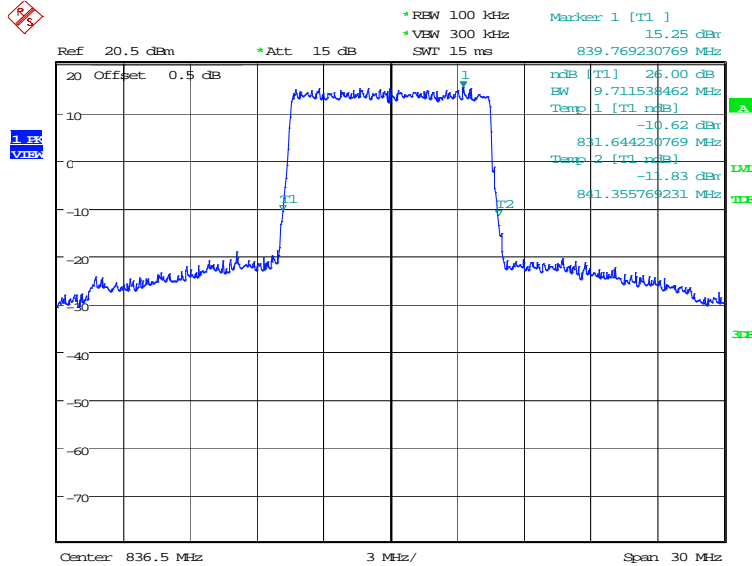


Date: 4.JUN.2020 15:27:13

**LTE band 5, 10MHz (-26dBc)**

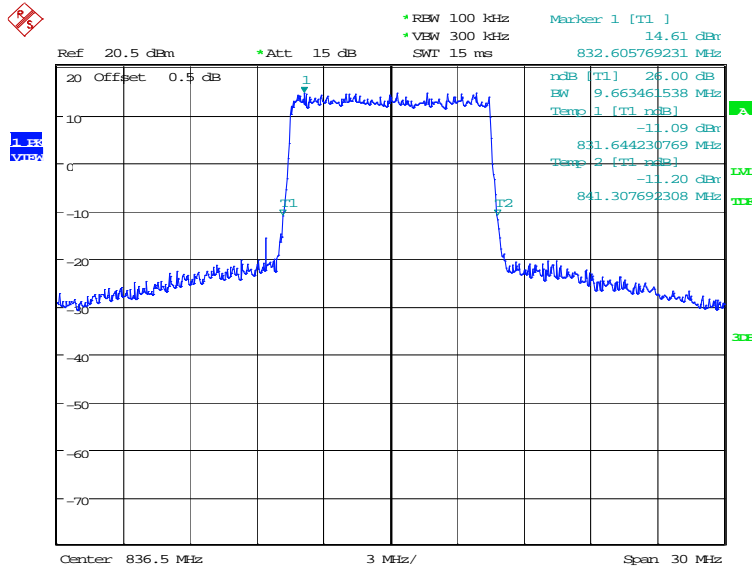
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
836.5	QPSK	16QAM
	9711.54	9663.46

**LTE band 5, 10MHz Bandwidth, QPSK (-26dBc BW)**



Date: 4.JUN.2020 15:28:29

**LTE band 5, 10MHz Bandwidth, 16QAM (-26dBc BW)**

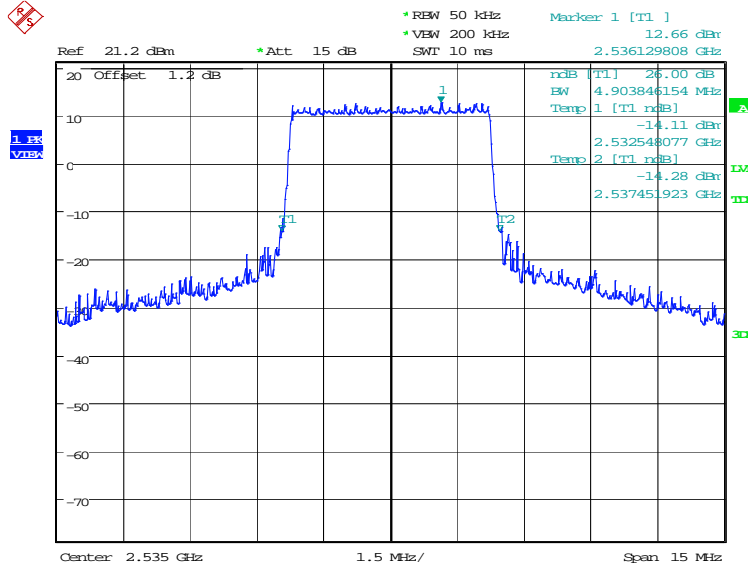


Date: 4.JUN.2020 15:29:08

### LTE band 7, 5MHz (-26dBc)

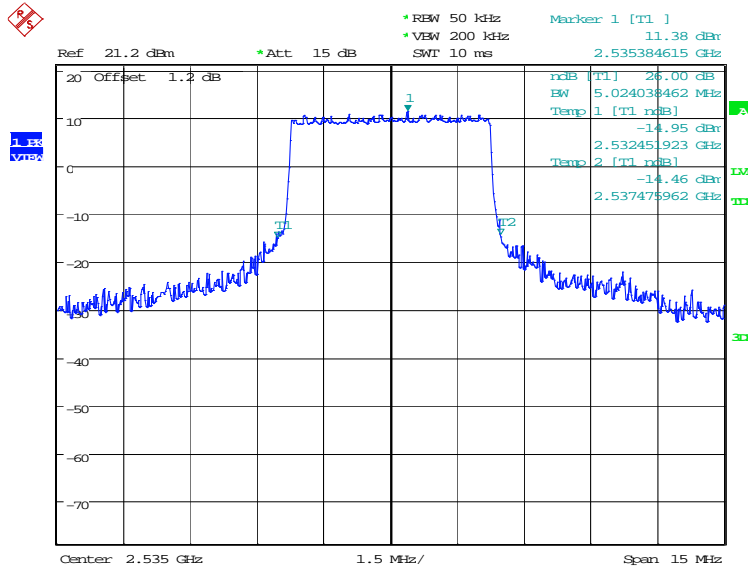
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
2535.0	QPSK	16QAM
	4903.85	5024.04

### LTE band 7, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:30:23

### LTE band 7, 5MHz Bandwidth, 16QAM (-26dBc BW)

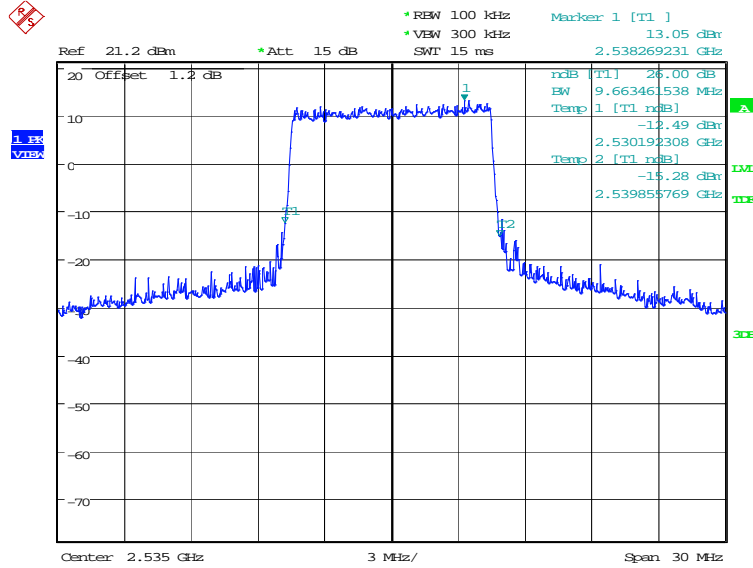


Date: 4.JUN.2020 15:31:02

**LTE band 7, 10MHz (-26dBc)**

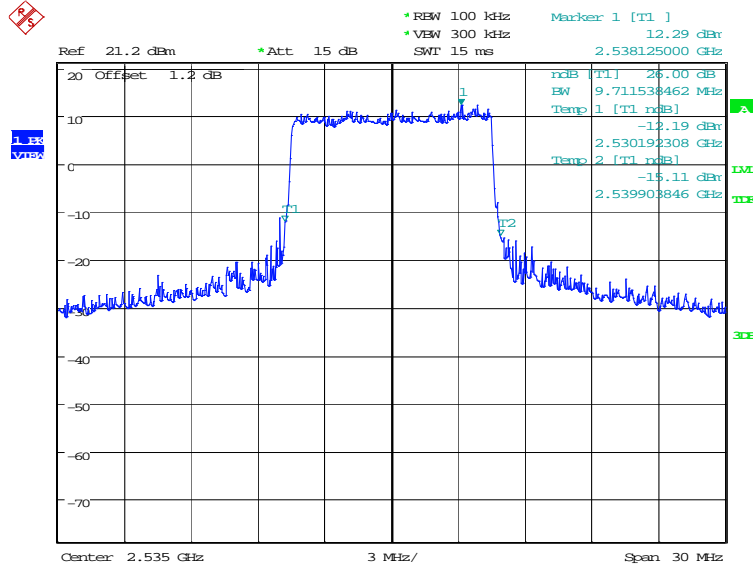
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
2535.0	QPSK	16QAM
	9663.46	9711.54

**LTE band 7, 10MHz Bandwidth, QPSK (-26dBc BW)**



Date: 4.JUN.2020 15:32:13

**LTE band 7, 10MHz Bandwidth, 16QAM (-26dBc BW)**

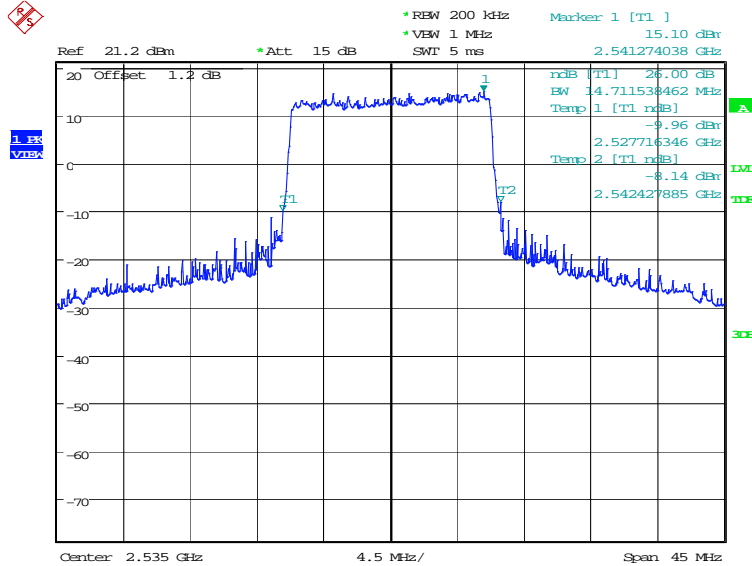


Date: 4.JUN.2020 15:32:52

**LTE band 7, 15MHz (-26dBc)**

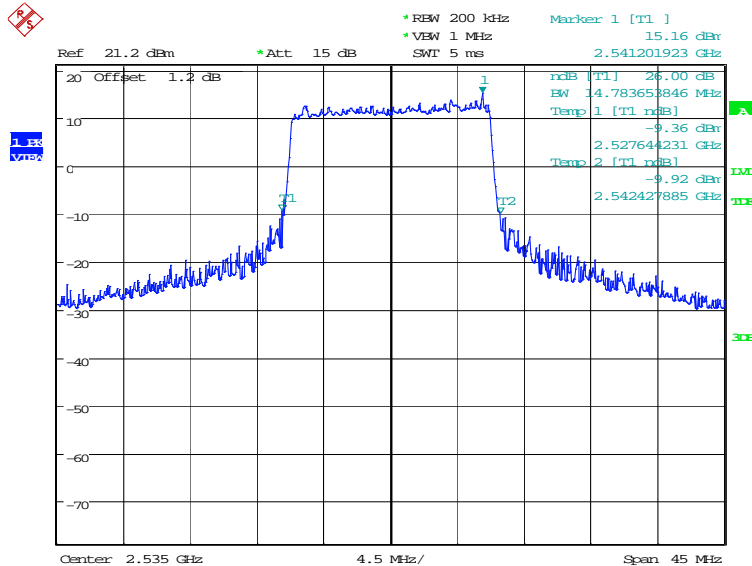
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
2535.0	QPSK	16QAM
	14711.54	14783.65

**LTE band 7, 15MHz Bandwidth, QPSK (-26dBc BW)**



Date: 4.JUN.2020 15:34:40

**LTE band 7, 15MHz Bandwidth, 16QAM (-26dBc BW)**

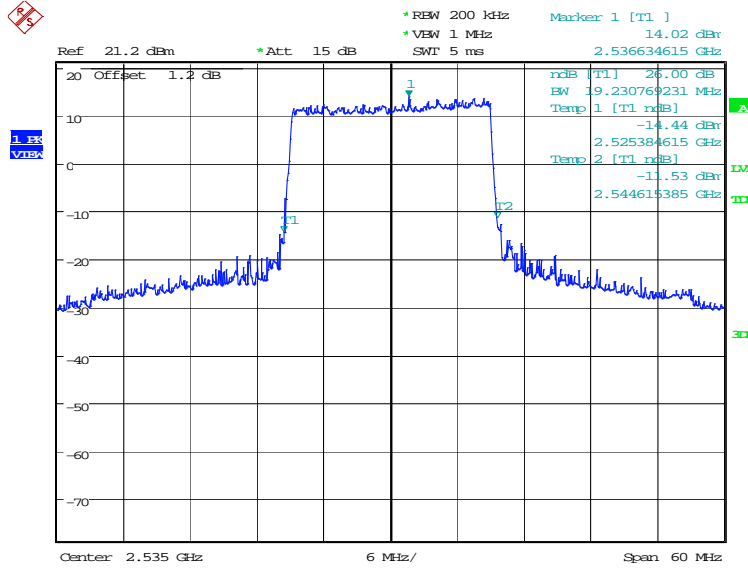


Date: 4.JUN.2020 15:35:19

**LTE band 7, 20MHz (-26dBc)**

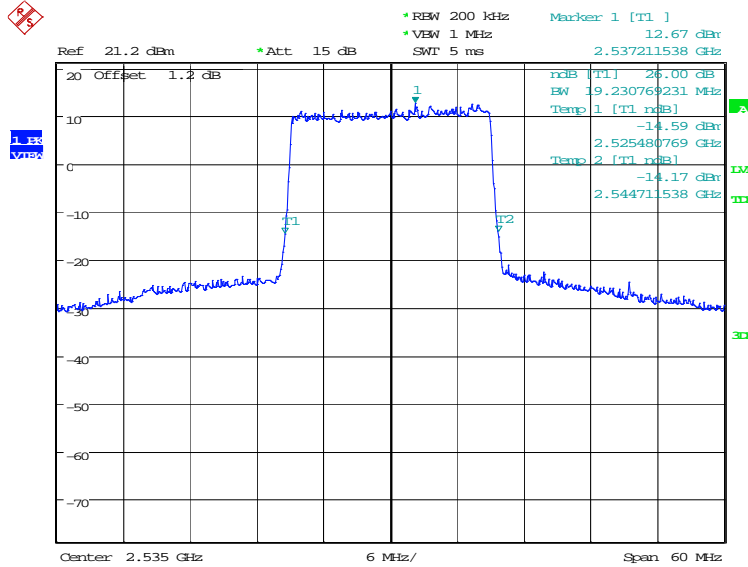
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
2535.0	QPSK	16QAM
	19230.77	19230.77

**LTE band 7, 20MHz Bandwidth, QPSK (-26dBc BW)**



Date: 4.JUN.2020 15:36:30

**LTE band 7, 20MHz Bandwidth, 16QAM (-26dBc BW)**



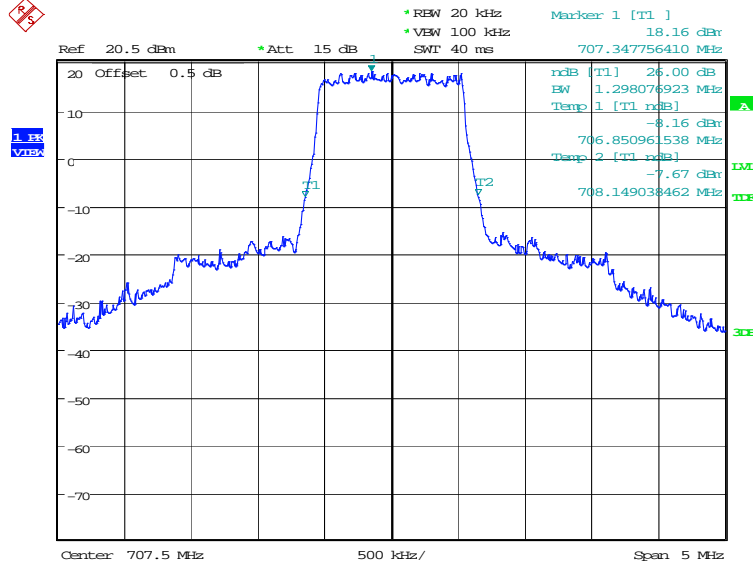
Date: 4.JUN.2020 15:37:09



### LTE band 12, 1.4MHz (-26dBc)

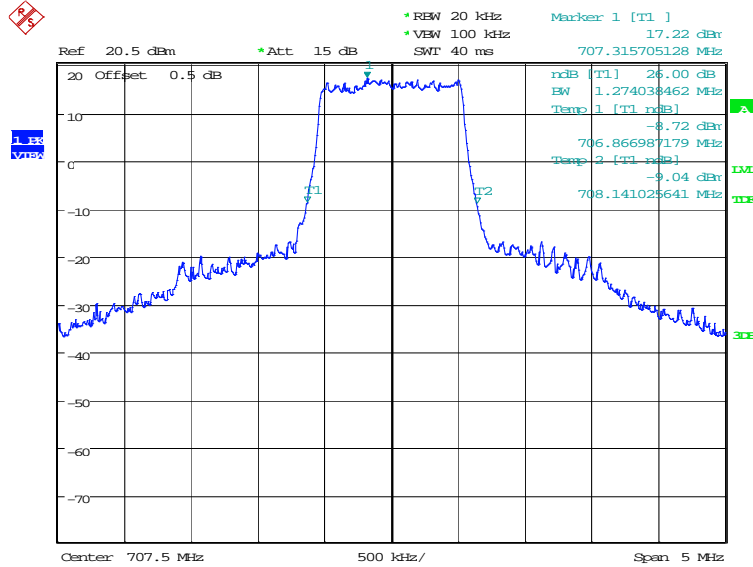
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
707.5	QPSK	16QAM
	1298.08	1274.04

### LTE band 12, 1.4MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:38:17

### LTE band 12, 1.4MHz Bandwidth, 16QAM (-26dBc BW)

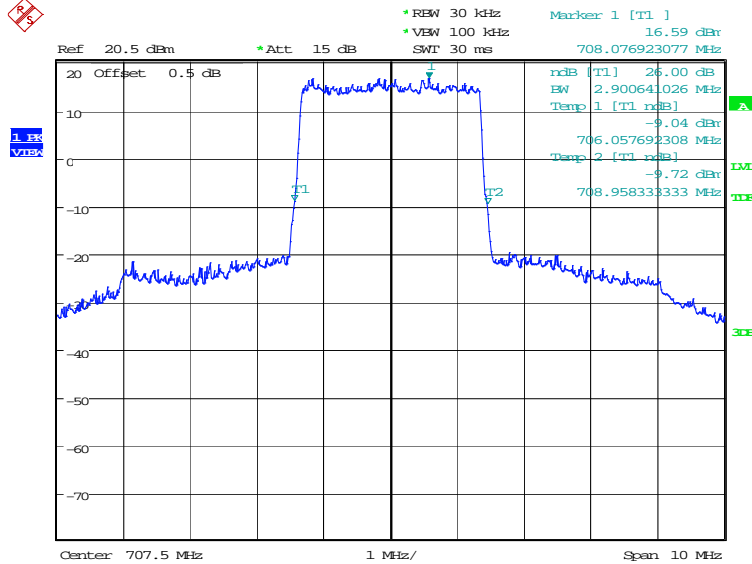


Date: 4.JUN.2020 15:38:56

**LTE band 12, 3MHz (-26dBc)**

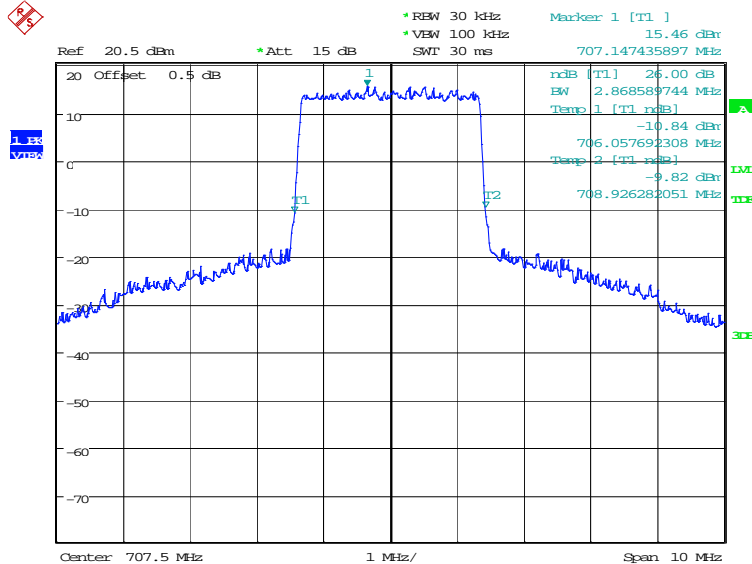
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
707.5	QPSK	16QAM
	2900.64	2868.59

**LTE band 12, 3MHz Bandwidth, QPSK (-26dBc BW)**



Date: 4.JUN.2020 15:40:09

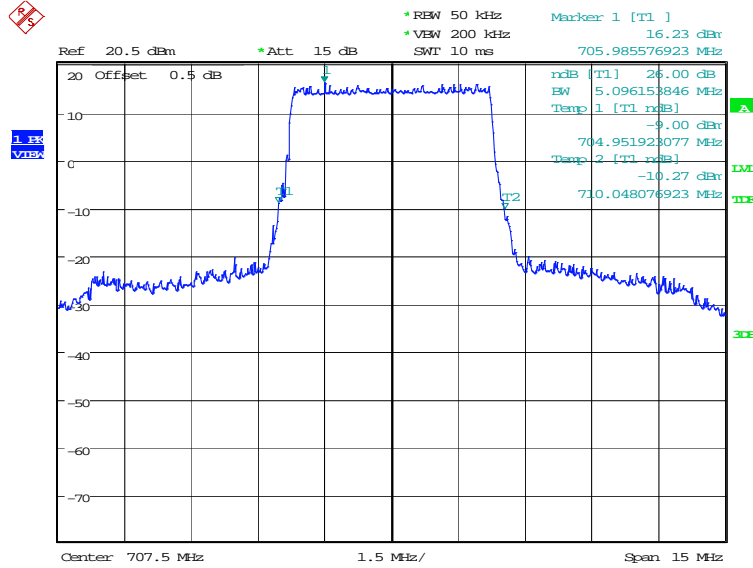
**LTE band 12, 3MHz Bandwidth, 16QAM (-26dBc BW)**



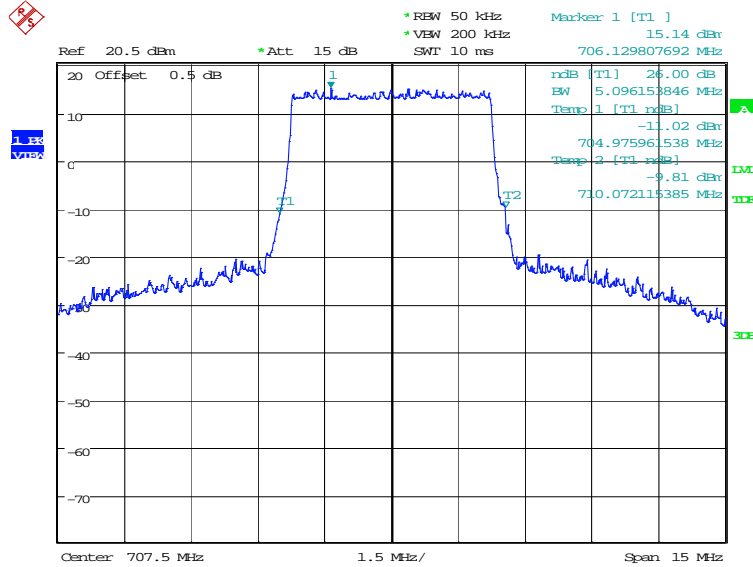
Date: 4.JUN.2020 15:40:48

**LTE band 12, 5MHz (-26dBc)**

Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
707.5	QPSK	16QAM
	5096.15	5096.15

**LTE band 12, 5MHz Bandwidth, QPSK (-26dBc BW)**


Date: 4.JUN.2020 15:42:13

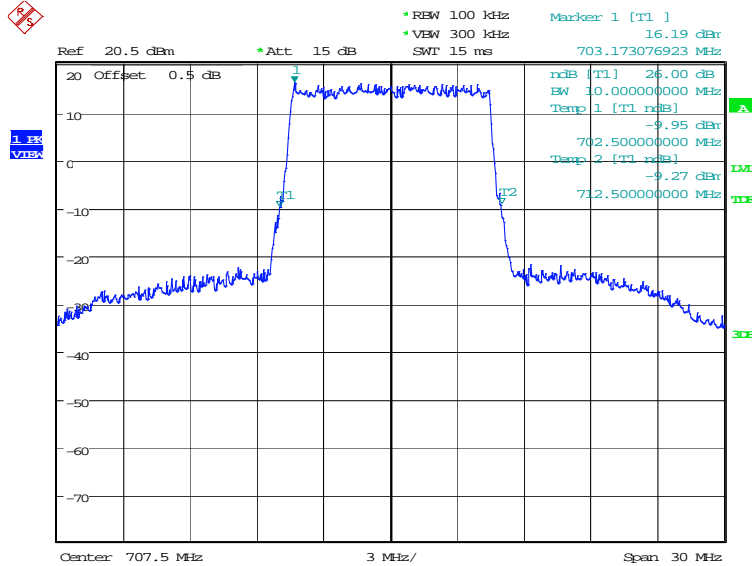
**LTE band 12, 5MHz Bandwidth, 16QAM (-26dBc BW)**


Date: 4.JUN.2020 15:42:52

**LTE band 12, 10MHz (-26dBc)**

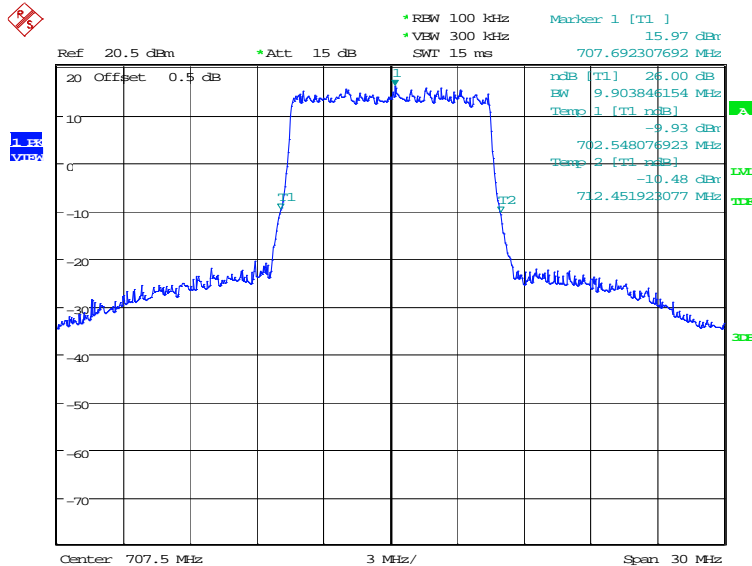
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
707.5	QPSK	16QAM
	10000.00	9903.85

**LTE band 12, 10MHz Bandwidth, QPSK (-26dBc BW)**



Date: 4.JUN.2020 15:44:18

**LTE band 12, 10MHz Bandwidth, 16QAM (-26dBc BW)**

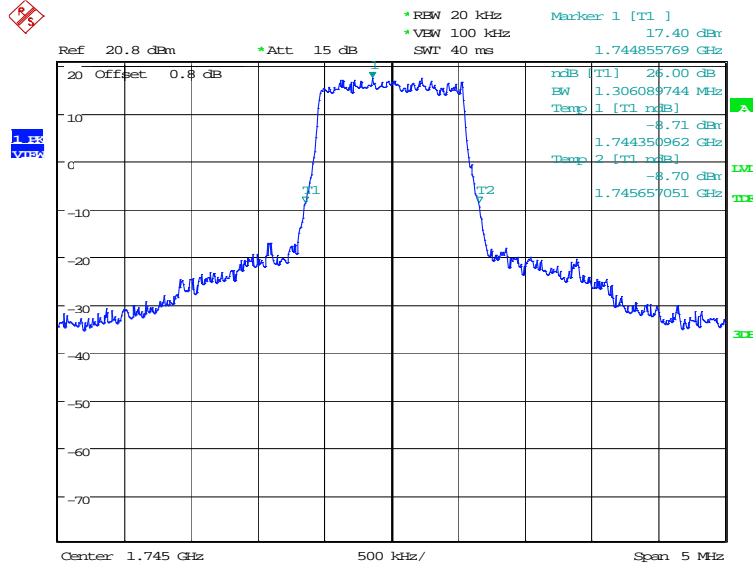


Date: 4.JUN.2020 15:44:58

### LTE band 66, 1.4MHz (-26dBc)

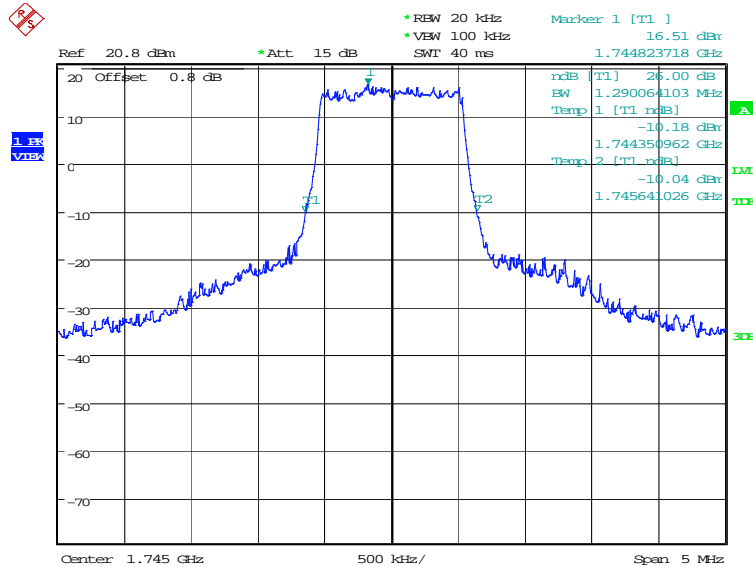
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1745.0	QPSK
1306.09		1290.06

### LTE band 66, 1.4MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:46:50

### LTE band 66, 1.4MHz Bandwidth, 16QAM (-26dBc BW)

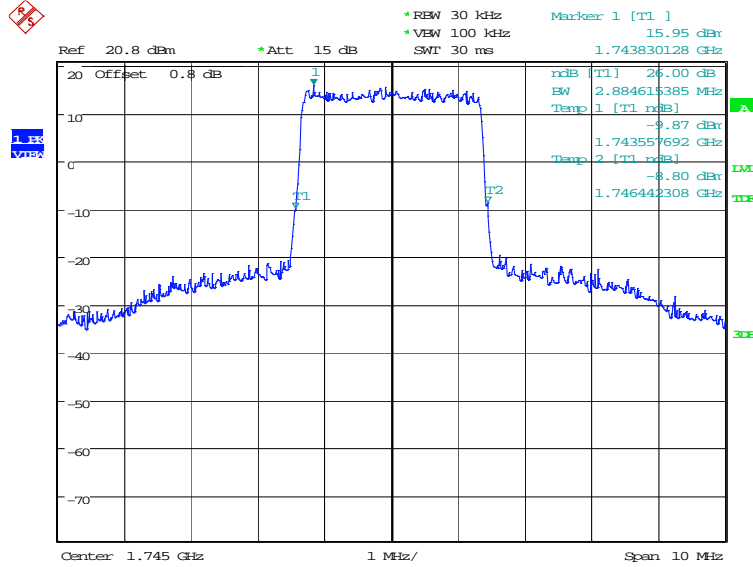


Date: 4.JUN.2020 15:47:29

### LTE band 66, 3MHz (-26dBc)

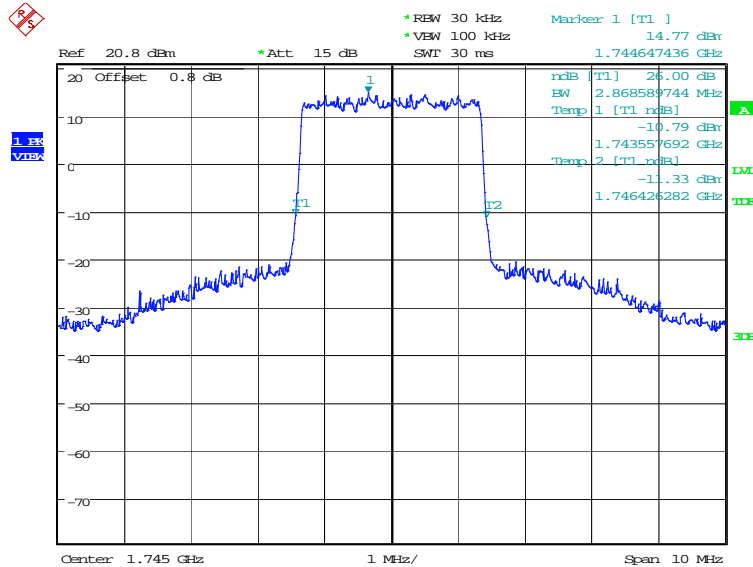
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1745.0	QPSK
2884.62		2868.59

### LTE band 66, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:48:57

### LTE band 66, 3MHz Bandwidth, 16QAM (-26dBc BW)

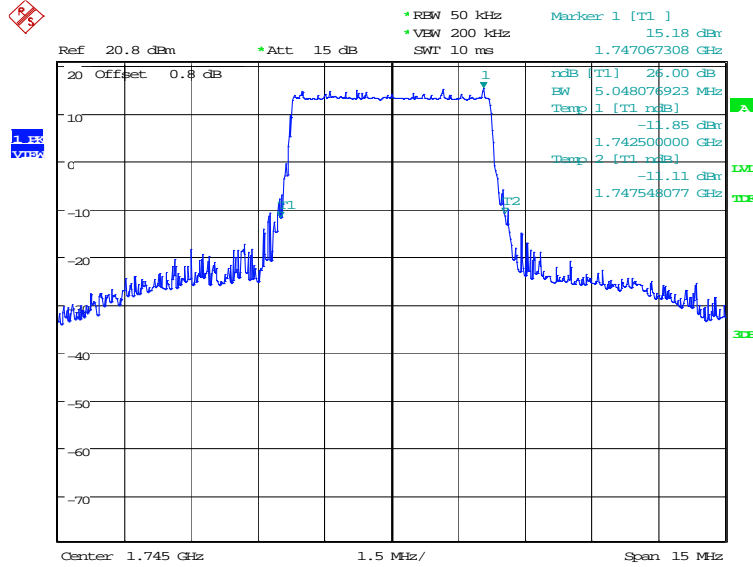


Date: 4.JUN.2020 15:49:36

**LTE band 66, 5MHz (-26dBc)**

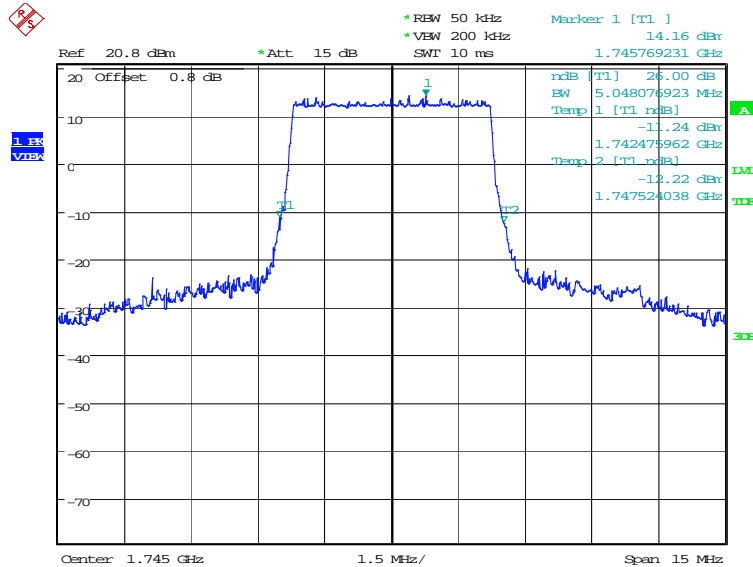
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1745.0	QPSK
5048.08		5048.08

**LTE band 66, 5MHz Bandwidth, QPSK (-26dBc BW)**



Date: 4.JUN.2020 15:50:47

**LTE band 66, 5MHz Bandwidth, 16QAM (-26dBc BW)**

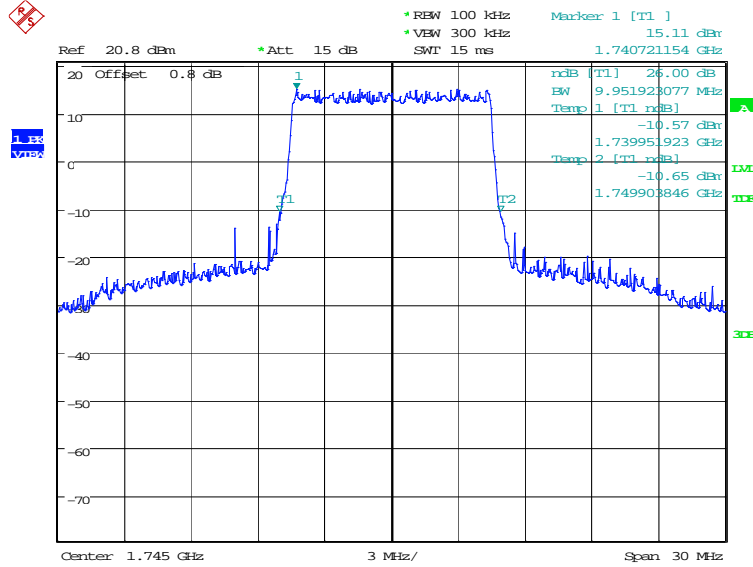


Date: 4.JUN.2020 15:51:26

### LTE band 66, 10MHz (-26dBc)

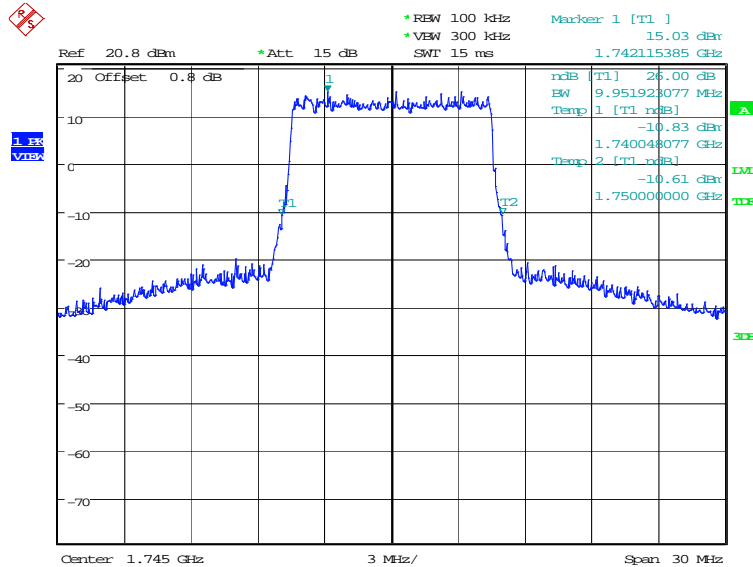
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1745.0	QPSK
9951.92		9951.92

### LTE band 66, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:52:52

### LTE band 66, 10MHz Bandwidth, 16QAM (-26dBc BW)



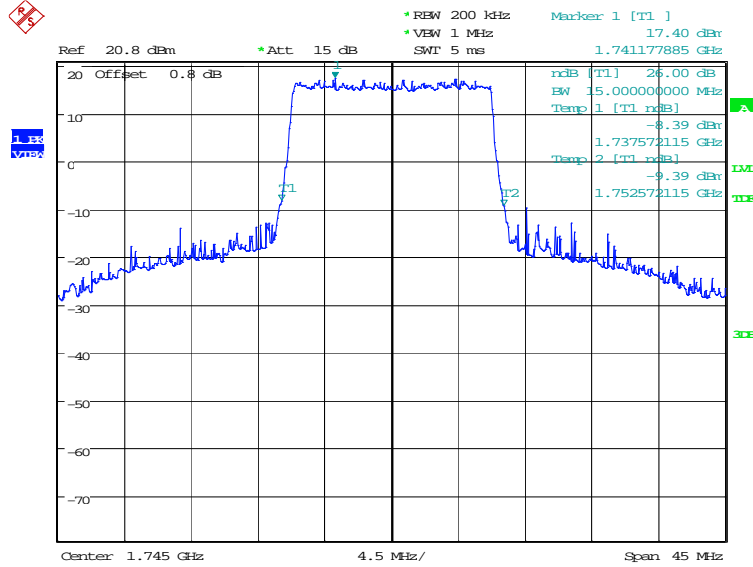
Date: 4.JUN.2020 15:53:31



### LTE band 66, 15MHz (-26dBc)

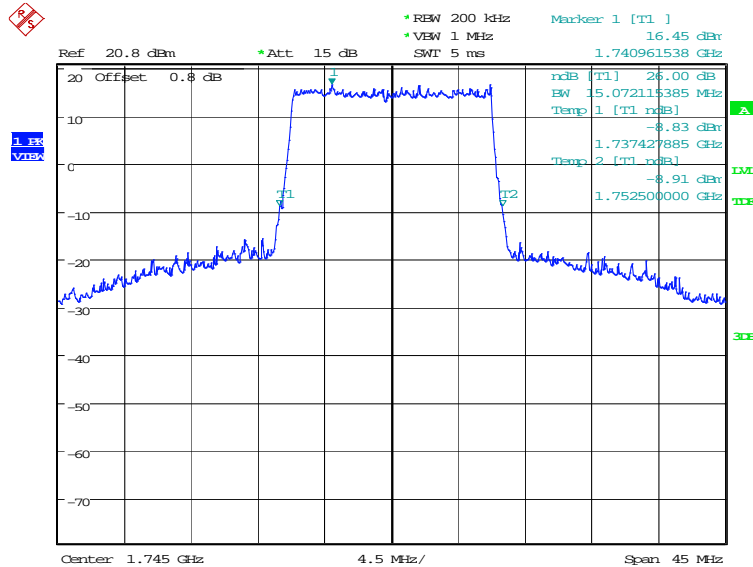
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1745.0	QPSK
15000.00		15072.12

### LTE band 66, 15MHz Bandwidth, QPSK (-26dBc BW)



Date: 4.JUN.2020 15:54:43

### LTE band 66, 15MHz Bandwidth, 16QAM (-26dBc BW)

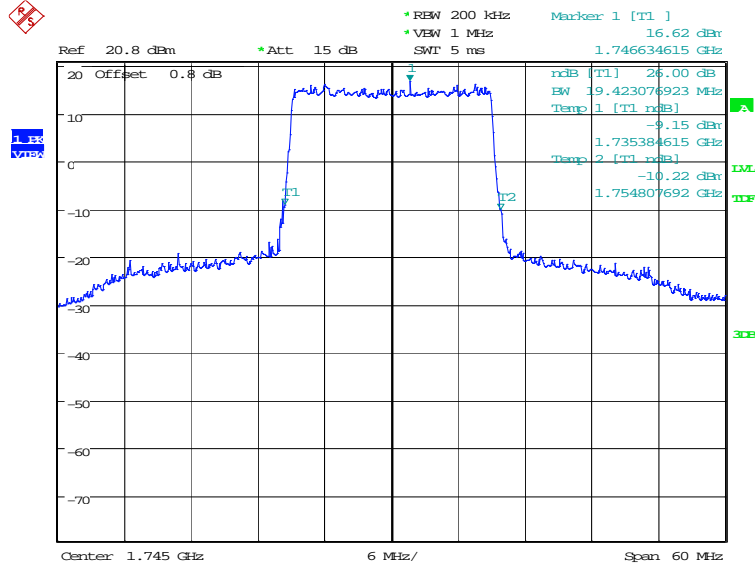


Date: 4.JUN.2020 15:55:22

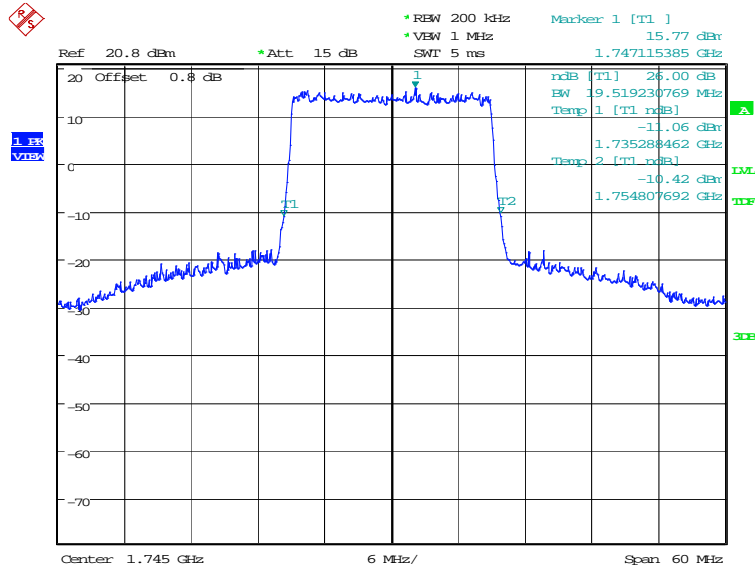
### LTE band 66, 20MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
	1745.0	QPSK
	19423.08	19519.23

### LTE band 66, 20MHz Bandwidth, QPSK (-26dBc BW)



### LTE band 66, 20MHz Bandwidth, 16QAM (-26dBc BW)



## **A.6 Band Edge Compliance**

### **A.6.1 Measurement limit**

Part 22.917, Part 24.238 and Part 27.53(h) specify that 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.

Part 27.53(m) specifies 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 than  $43 + 10 \log(P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log(P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

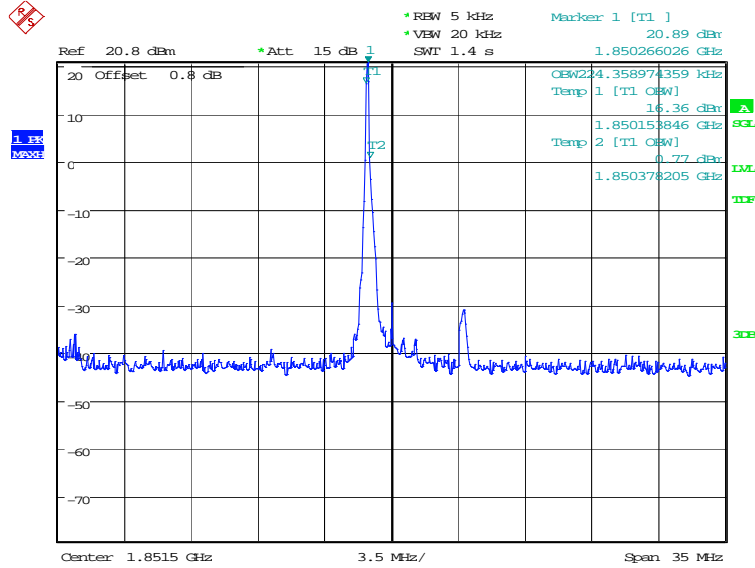
Part 27.53(g) states for operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log(P)$  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.

### A.6.2 Measurement result

Only the worst case result is given below

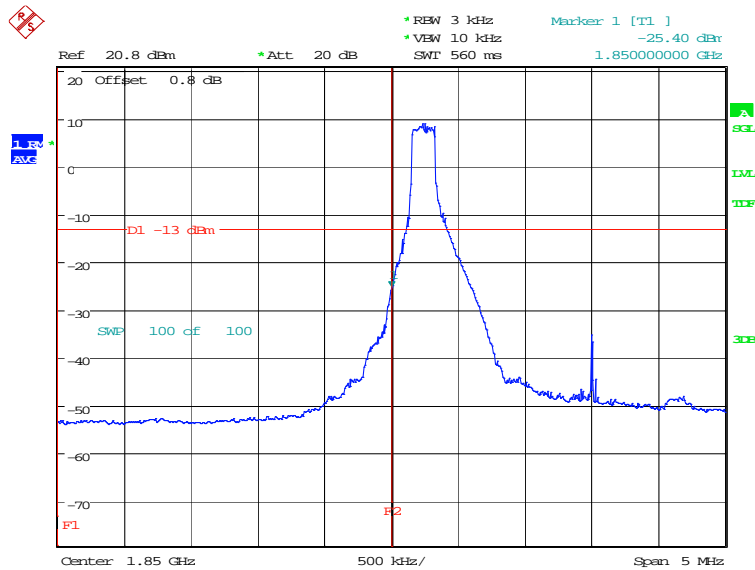
LTE band 2

OBW: 1RB-low\_offset



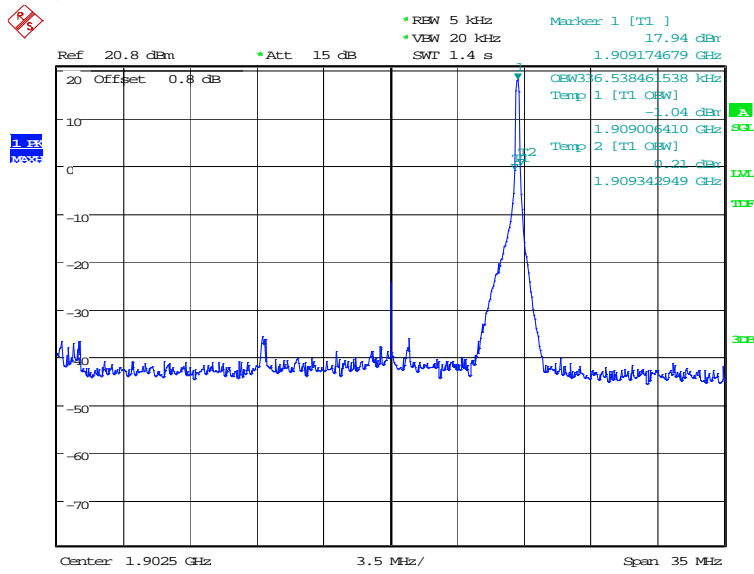
Date: 30.JUN.2020 16:07:30

### LOW BAND EDGE BLOCK-1RB-low\_offset



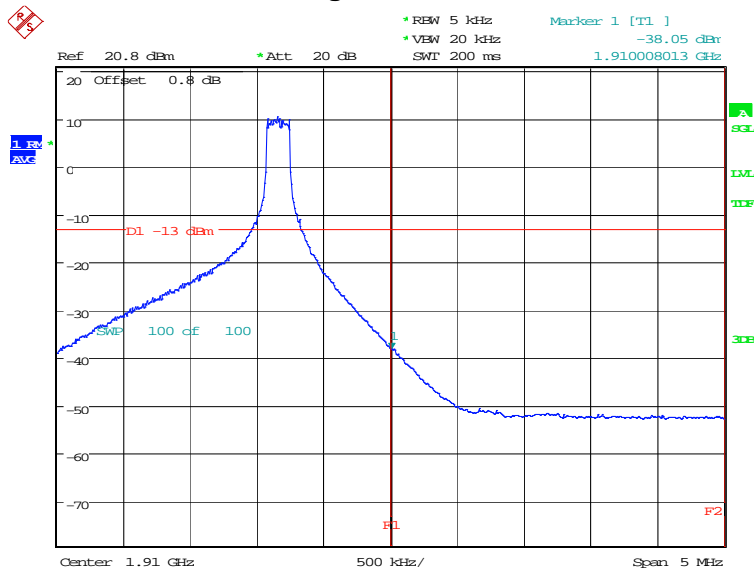
Date: 30.JUN.2020 16:08:43

### OBW: 1RB-high\_offset



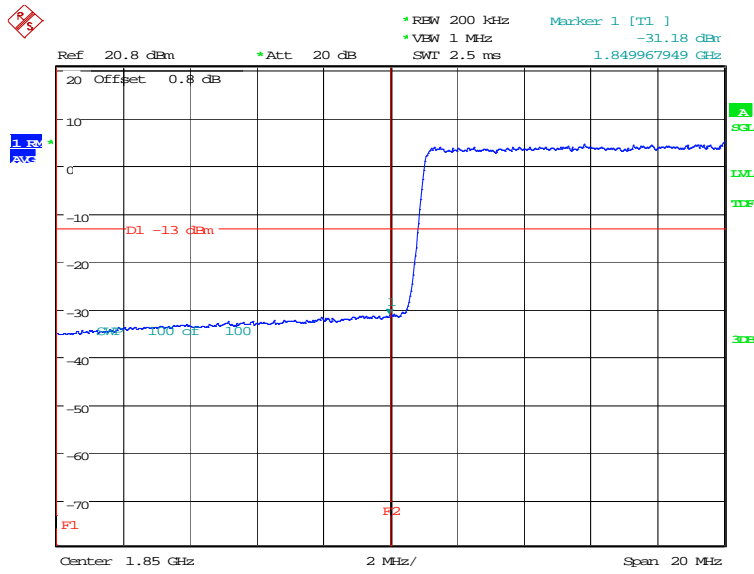
Date: 30.JUN.2020 16:09:24

### HIGH BAND EDGE BLOCK-1RB-high\_offset



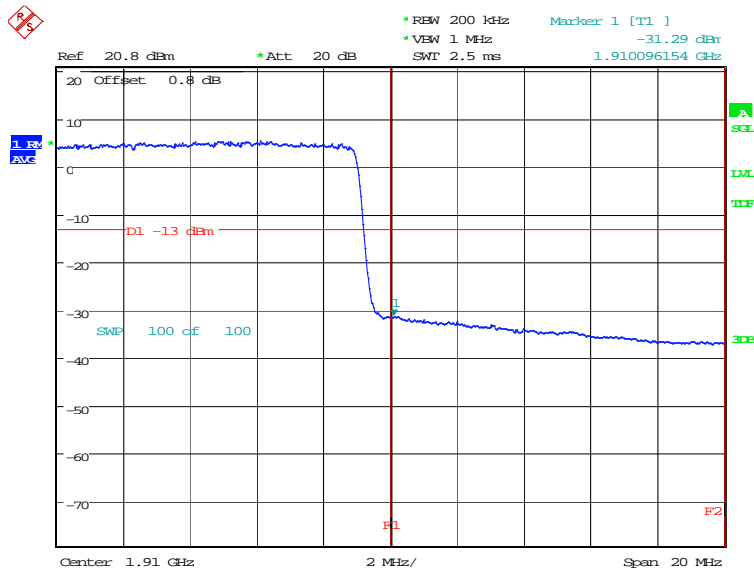
Date: 30.JUN.2020 16:10:36

### LOW BAND EDGE BLOCK-20MHz-100%RB



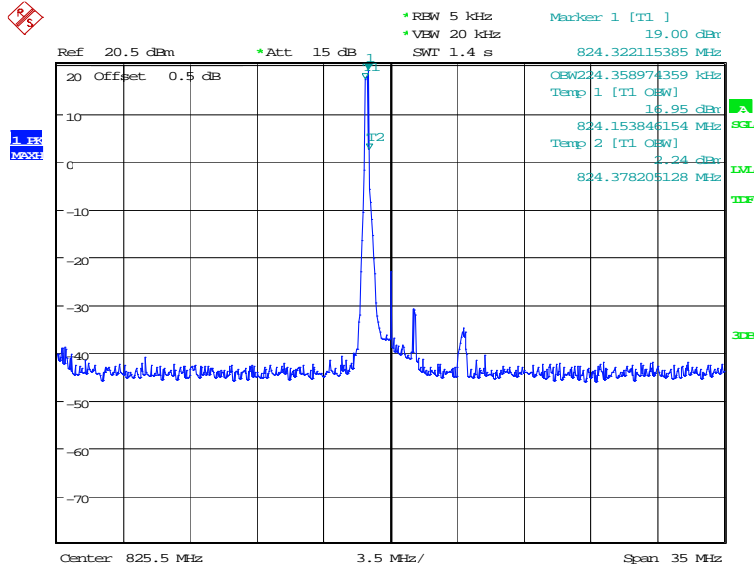
Date: 4.JUN.2020 15:58:20

### HIGH BAND EDGE BLOCK-20MHz-100%RB



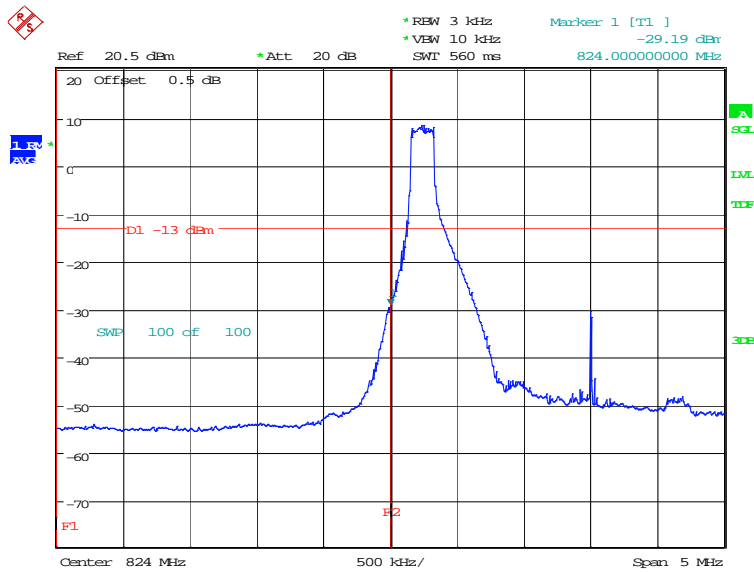
Date: 4.JUN.2020 15:59:40

**LTE band 5**  
**OBW: 1RB-low\_offset**



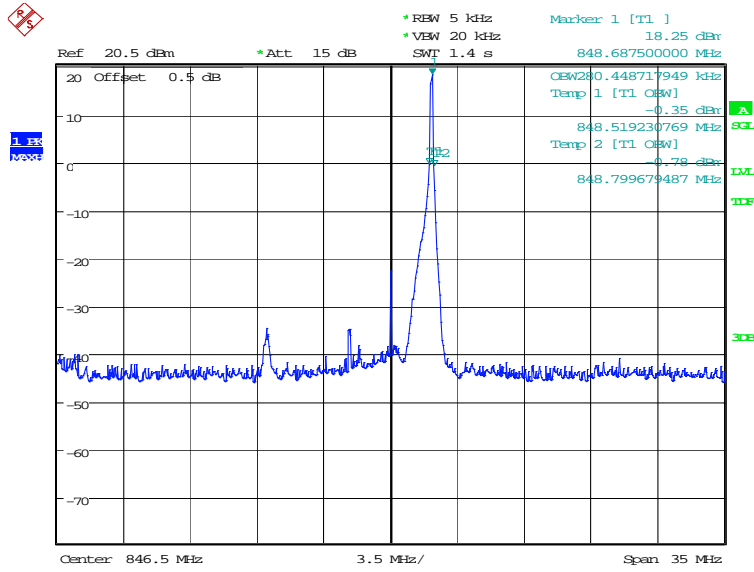
Date: 30.JUN.2020 16:11:51

**LOW BAND EDGE BLOCK-1RB-low\_offset**



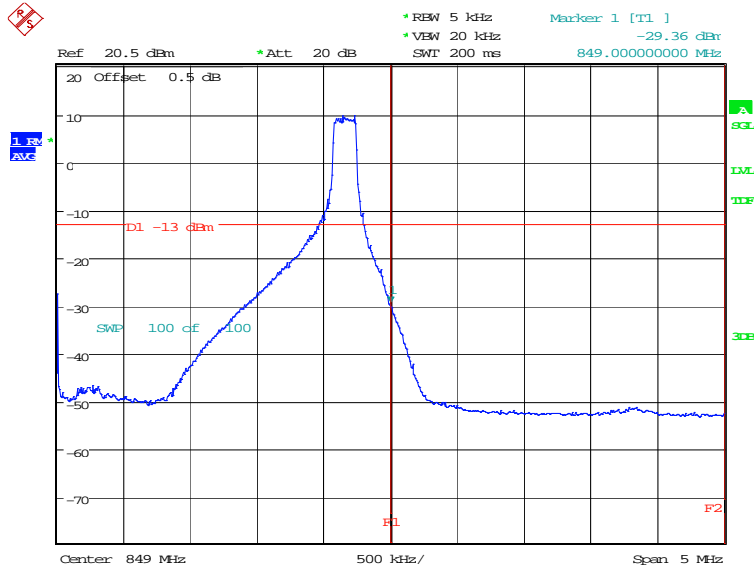
Date: 30.JUN.2020 16:13:04

### OBW: 1RB-high\_offset



Date: 30.JUN.2020 16:13:44

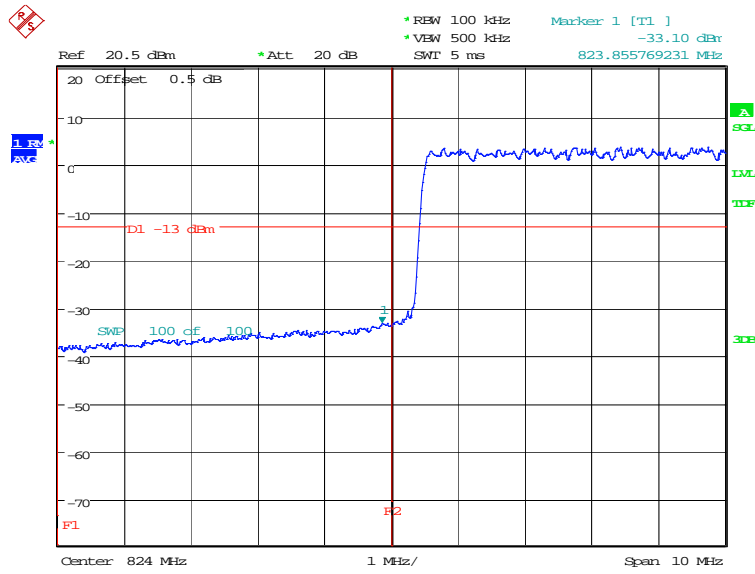
### HIGH BAND EDGE BLOCK-1RB-high\_offset



Date: 30.JUN.2020 16:14:57

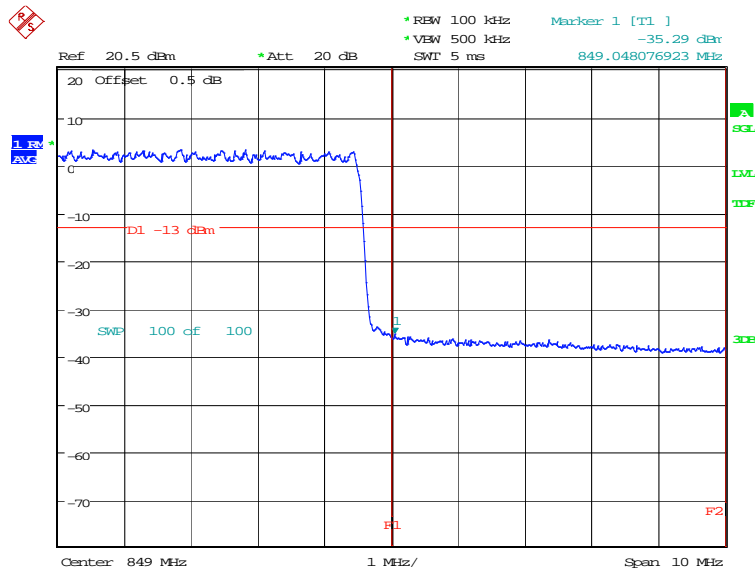


### LOW BAND EDGE BLOCK-10MHz-100%RB



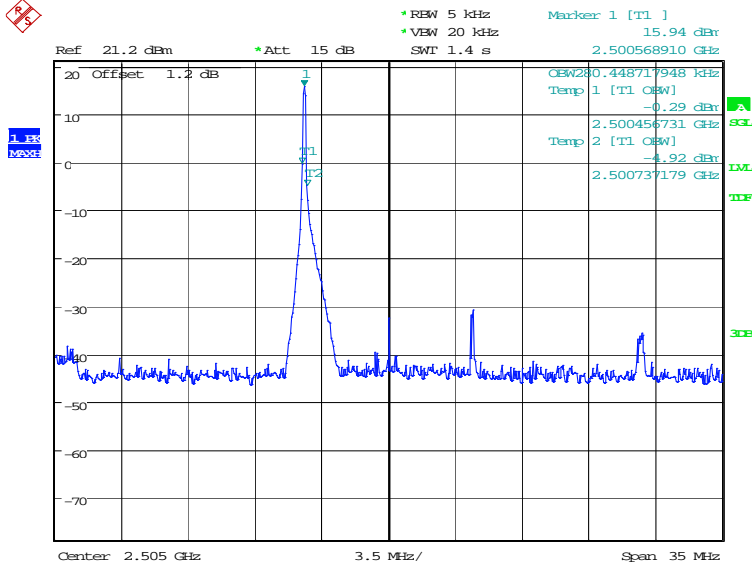
Date: 4.JUN.2020 16:01:25

### HIGH BAND EDGE BLOCK-10MHz-100%RB



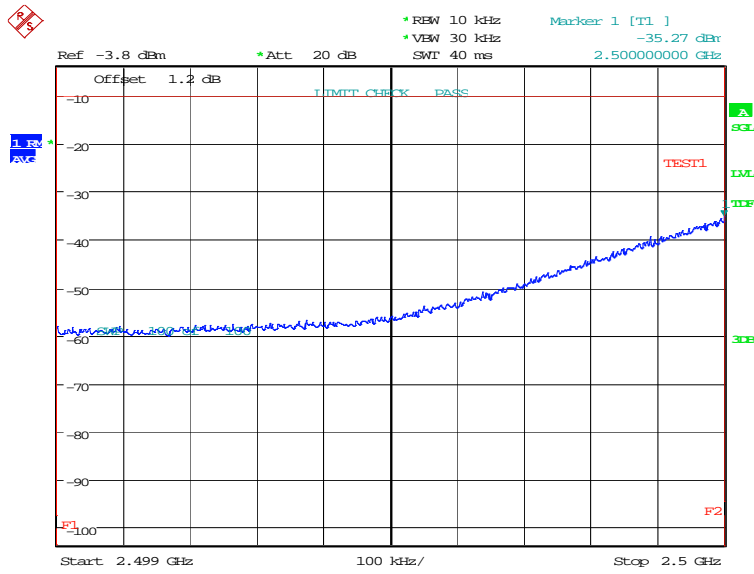
Date: 4.JUN.2020 16:02:45

**LTE band 7**  
**OBW: 1RB-low\_offset**

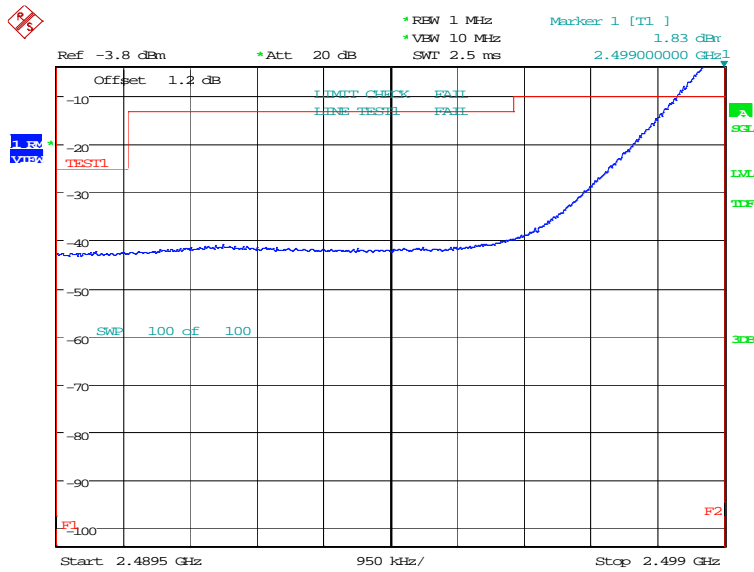


Date: 30.JUN.2020 16:15:40

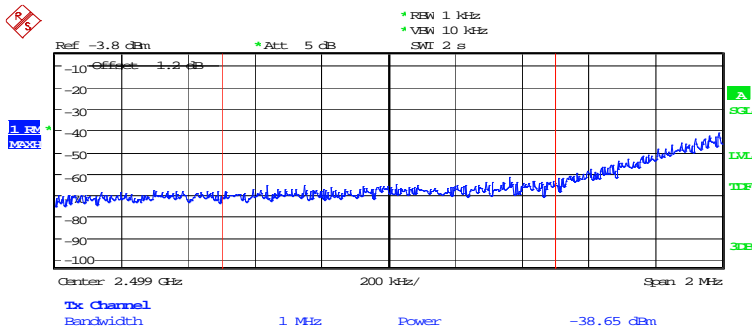
### LOW BAND EDGE BLOCK-1RB-low\_offset



Date: 30.JUN.2020 16:16:59

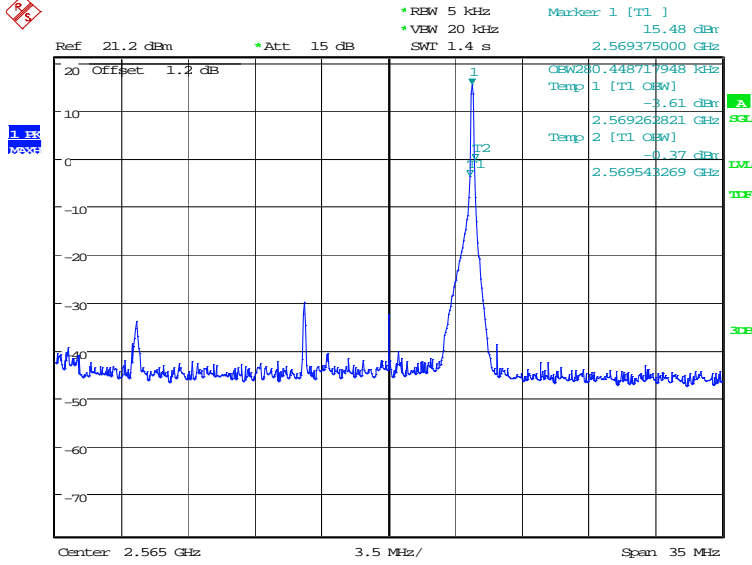


Date: 30.JUN.2020 16:17:16



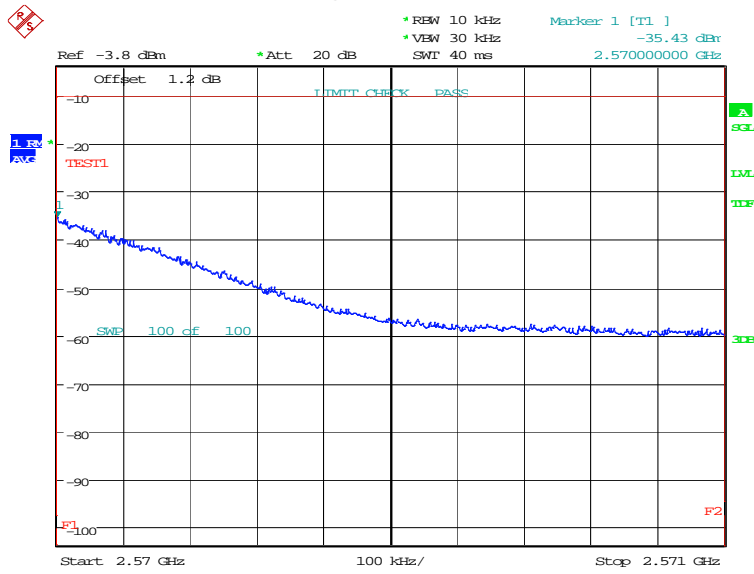
Date: 30.JUN.2020 16:17:27

OBW: 1RB-high\_offset

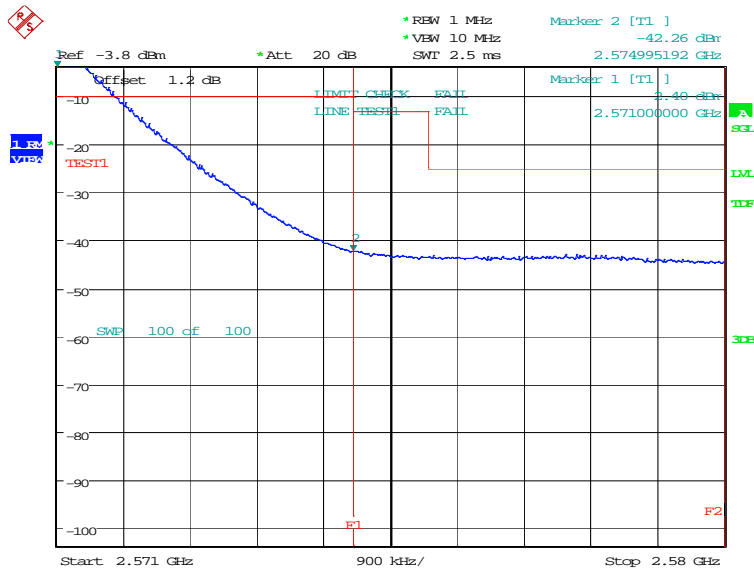


Date: 30.JUN.2020 16:18:00

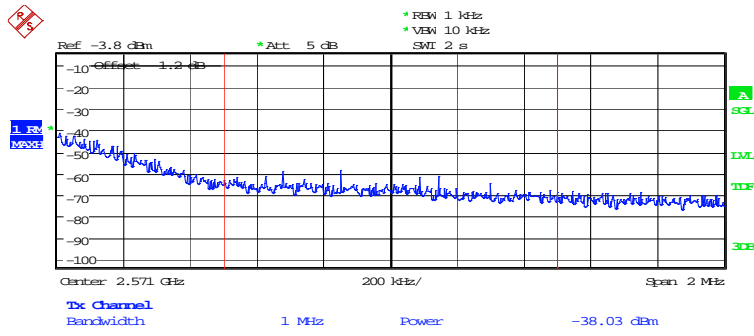
### HIGH BAND EDGE BLOCK-1RB-high\_offset



Date: 30.JUN.2020 16:19:20

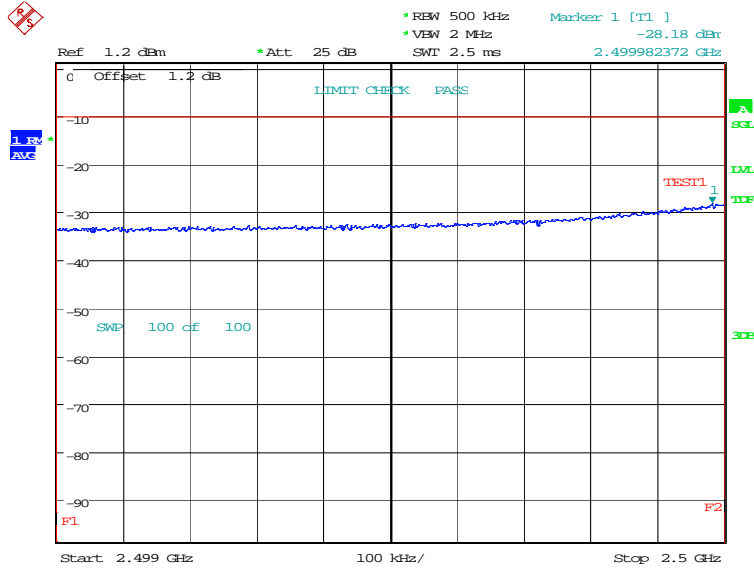


Date: 30.JUN.2020 16:19:39

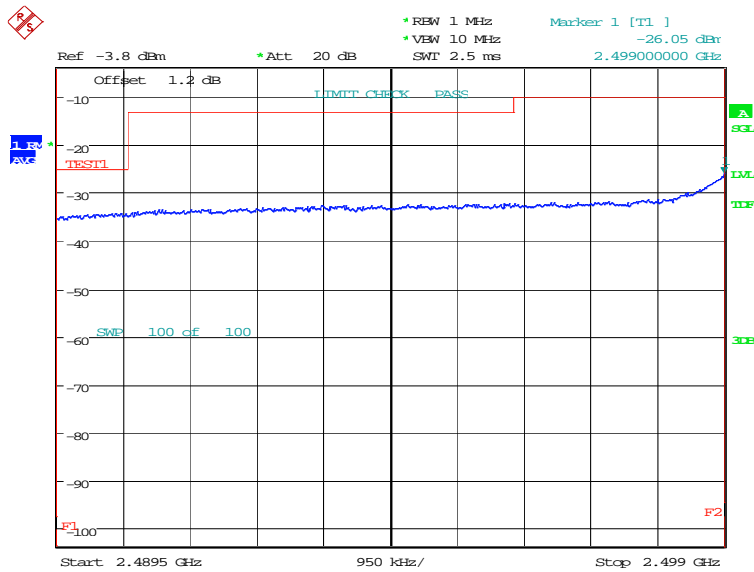


Date: 30.JUN.2020 16:19:50

### LOW BAND EDGE BLOCK-20MHz-100%RB



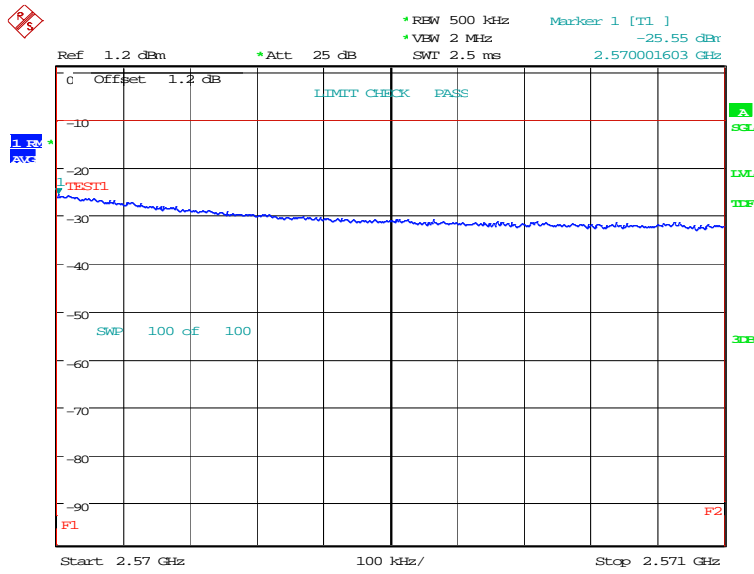
Date: 4.JUN.2020 16:04:16



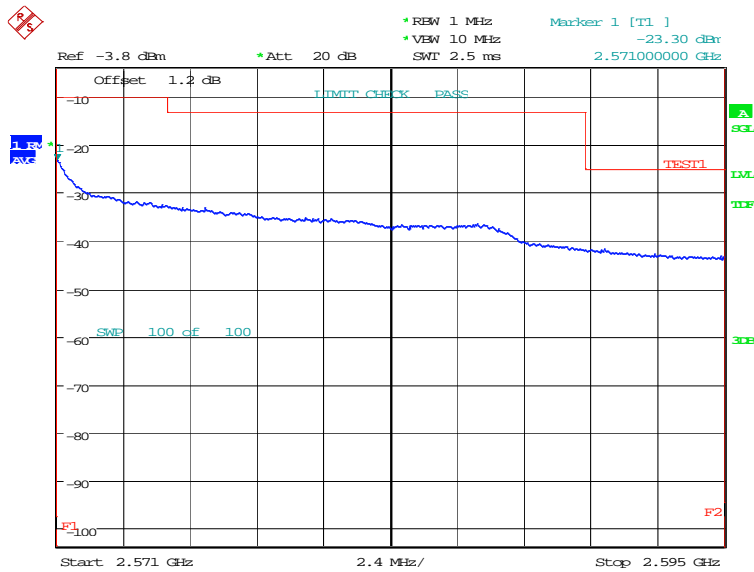
Date: 4.JUN.2020 16:04:30



### HIGH BAND EDGE BLOCK-20MHz-100%RB

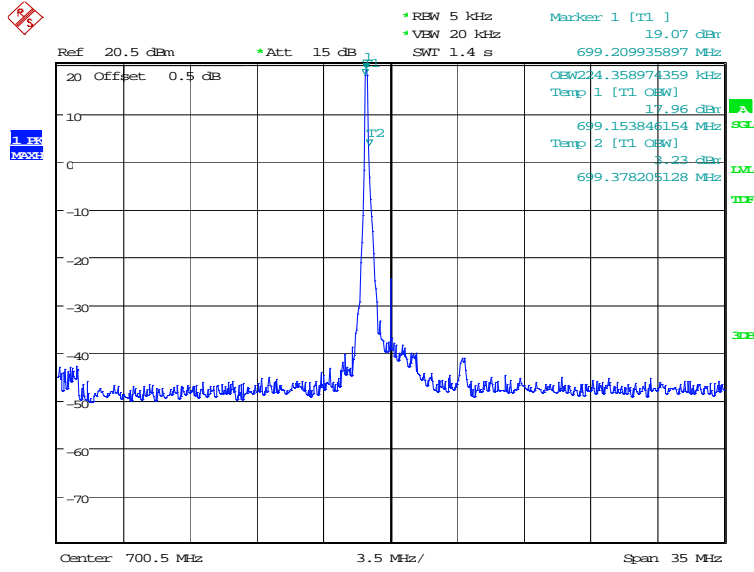


Date: 4.JUN.2020 16:05:56



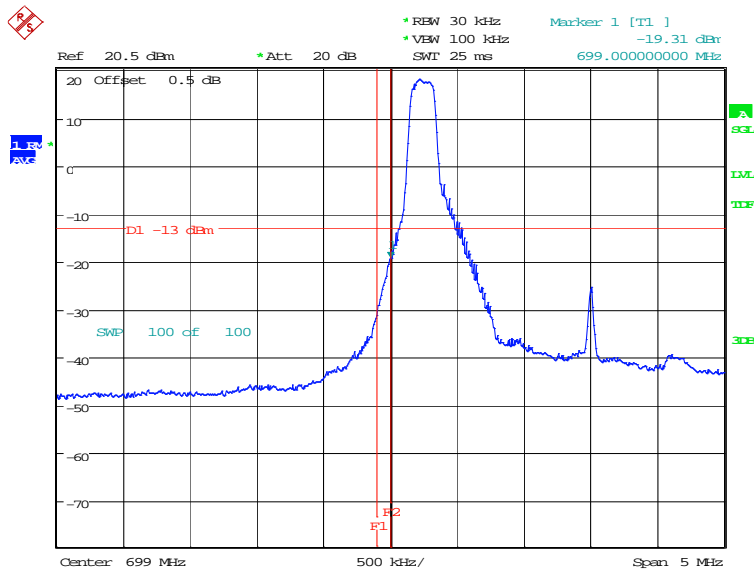
Date: 4.JUN.2020 16:06:10

**LTE band 12**  
**OBW: 1RB-low\_offset**



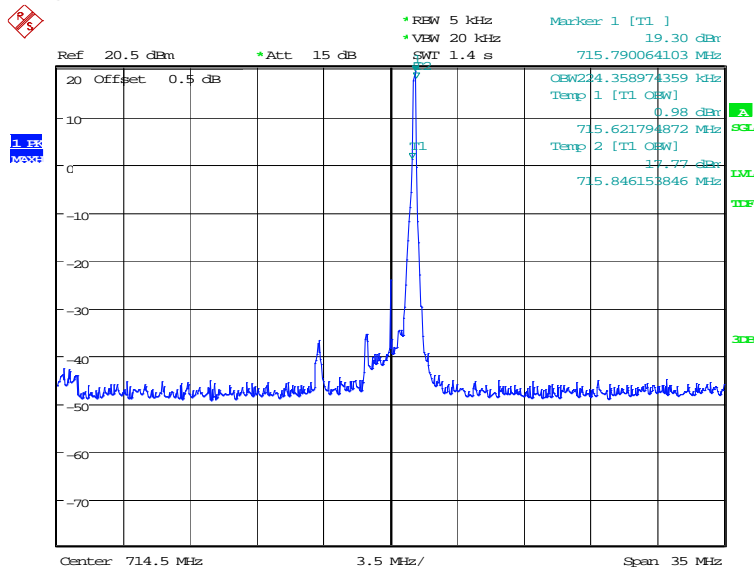
Date: 30.JUN.2020 16:21:04

**LOW BAND EDGE BLOCK-1RB-low\_offset**



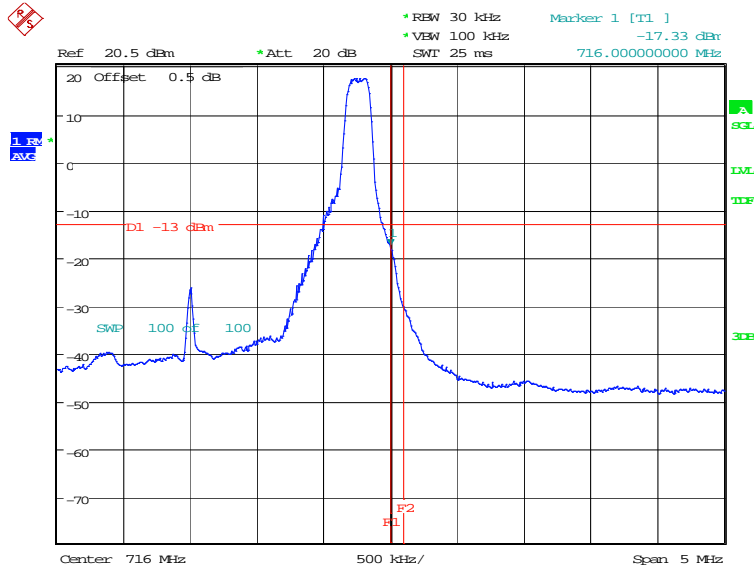
Date: 30.JUN.2020 16:21:17

### OBW: 1RB-high\_offset



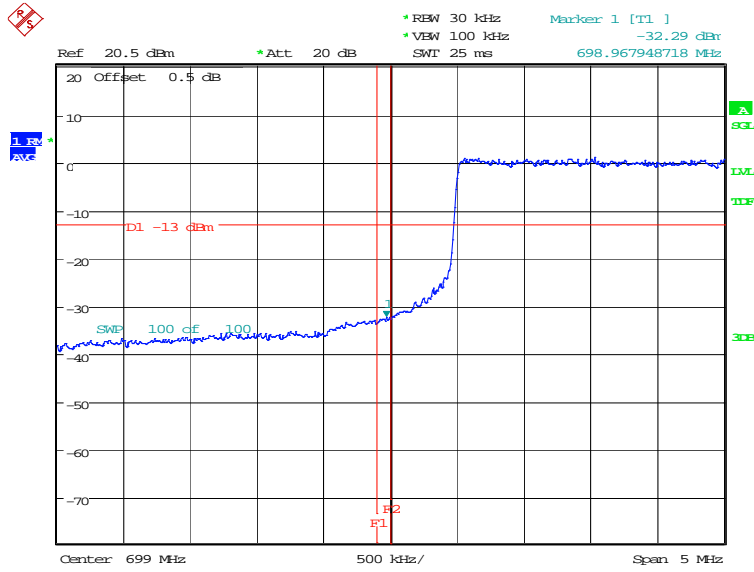
Date: 30.JUN.2020 16:21:52

### HIGH BAND EDGE BLOCK-1RB-high\_offset



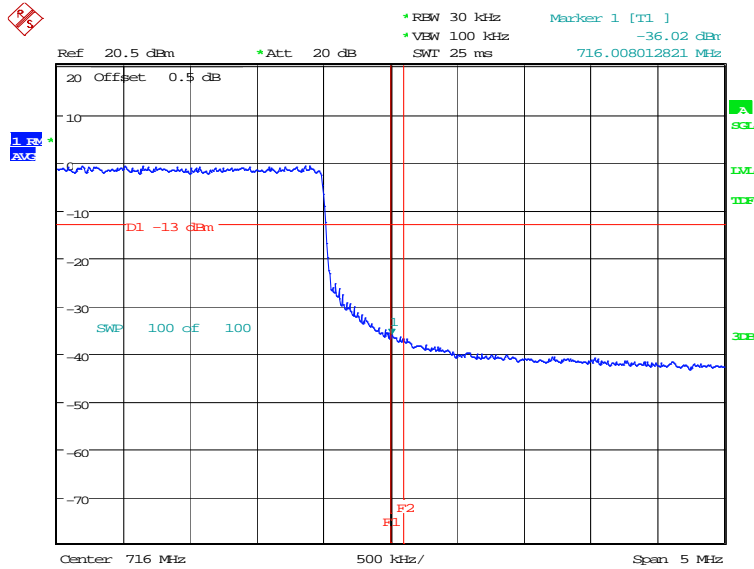
Date: 30.JUN.2020 16:22:04

### LOW BAND EDGE BLOCK-10MHz-100%RB



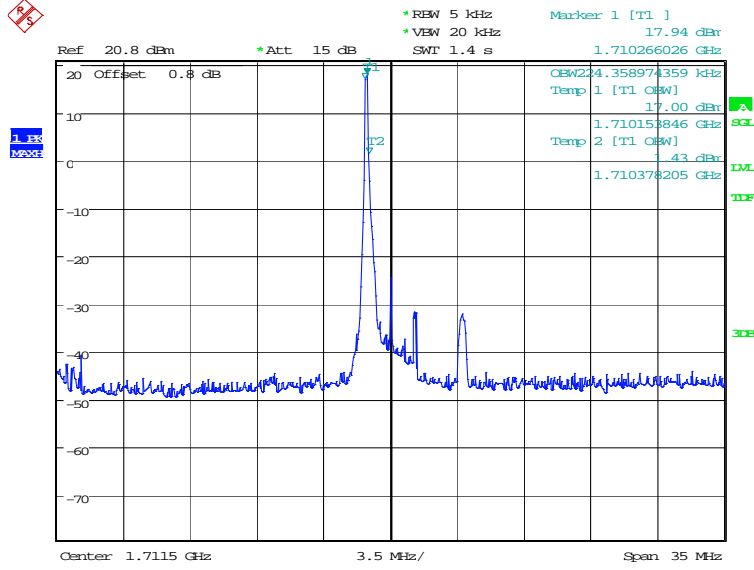
Date: 4.JUN.2020 16:08:01

### HIGH BAND EDGE BLOCK-10MHz-100%RB



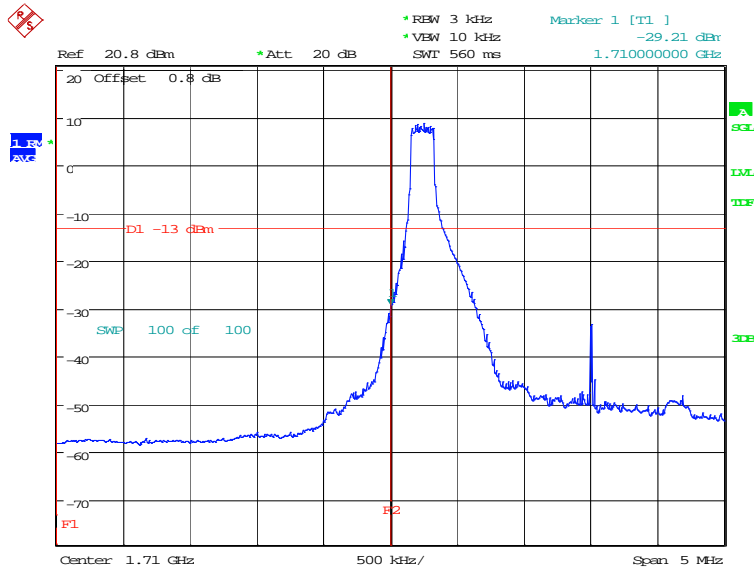
Date: 4.JUN.2020 16:09:21

**LTE band 66**  
**OBW: 1RB-low\_offset**



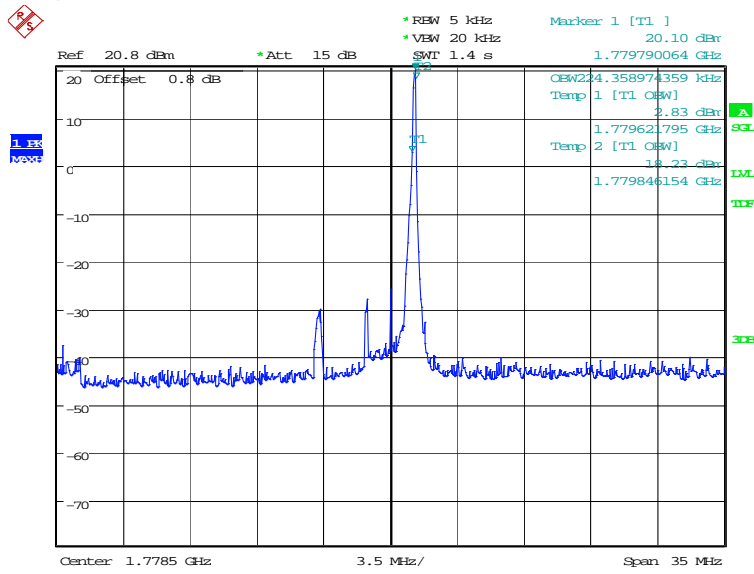
Date: 30.JUN.2020 16:22:40

**LOW BAND EDGE BLOCK-1RB-low\_offset**



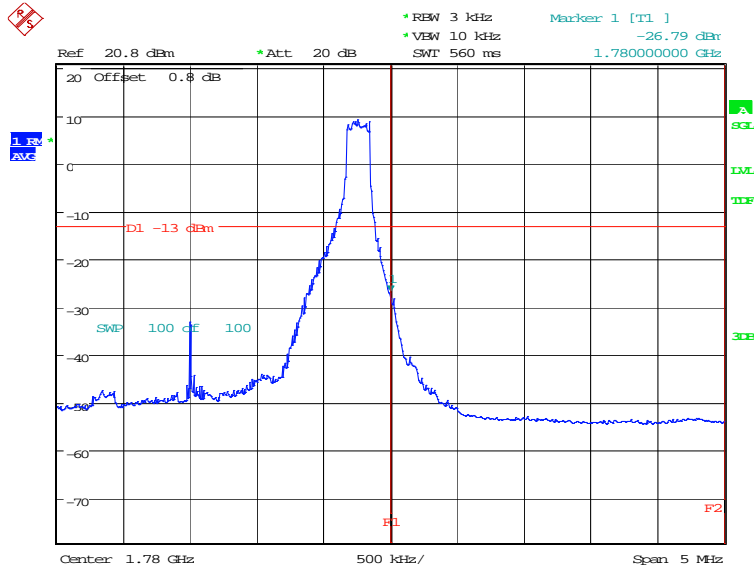
Date: 30.JUN.2020 16:23:53

### OBW: 1RB-high\_offset



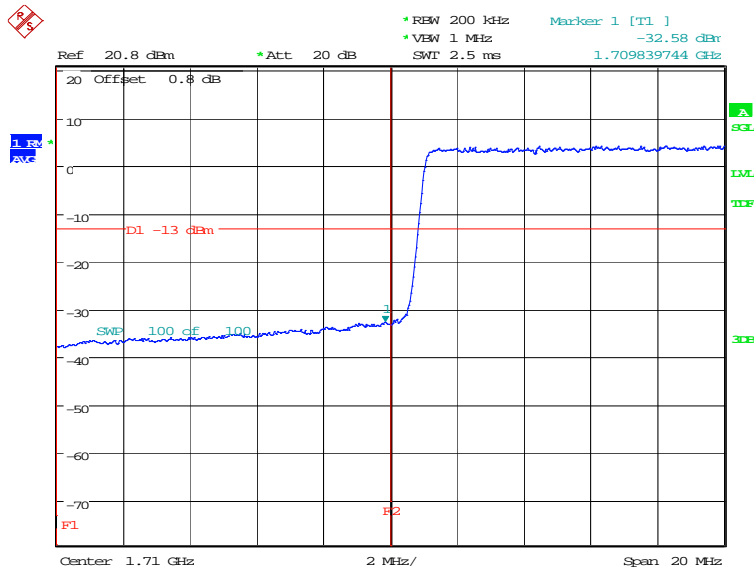
Date: 30.JUN.2020 16:24:27

### HIGH BAND EDGE BLOCK-1RB-high\_offset



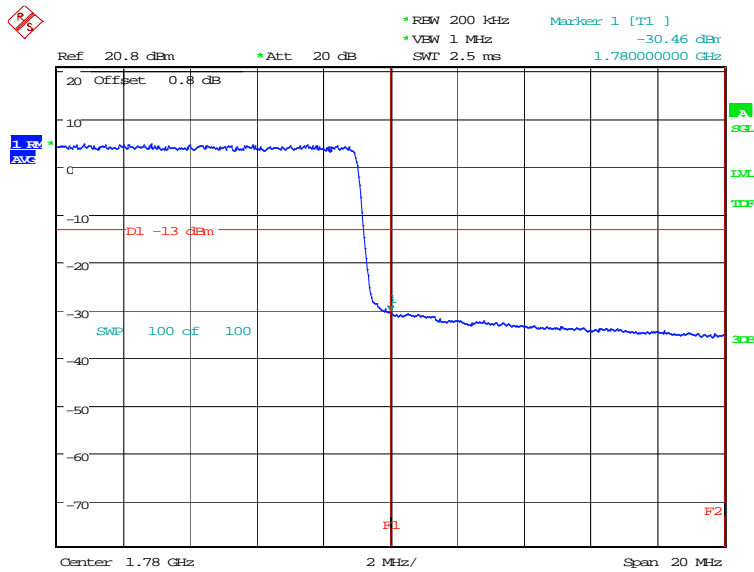
Date: 30.JUN.2020 16:25:40

### LOW BAND EDGE BLOCK-20MHz-100%RB



Date: 4.JUN.2020 16:10:50

### HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 4.JUN.2020 16:12:10

## **A.7 Conducted Spurious Emission**

### **A.7.1 Measurement Method**

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency given below:
  - (a) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
  - (b) If the equipment operates at or above 10 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.
3. The number of sweep points of spectrum analyzer is set to 30001 which is greater than span/RBW.

### **A. 7.2 Measurement Limit**

Part 22.917, Part 24.238 and Part 27.53(h) specify that 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.

Part 27.53(m) specifies 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 than  $43 + 10 \log(P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log(P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Part 27.53(g) states 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.

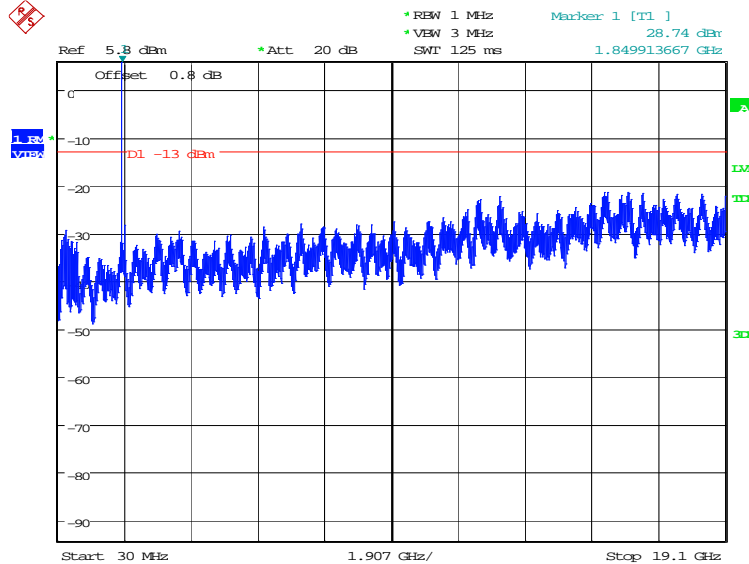


### A. 7.3 Measurement result

Only the worst case result is given below

#### LTE band 2: 30MHz – 19.1GHz

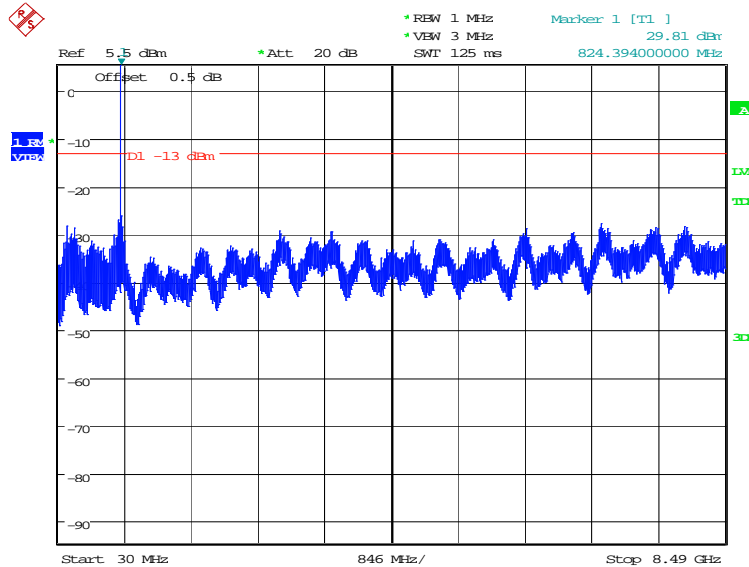
NOTE: peak above the limit line is the carrier frequency.



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#### LTE band 5: 30MHz – 8.49GHz

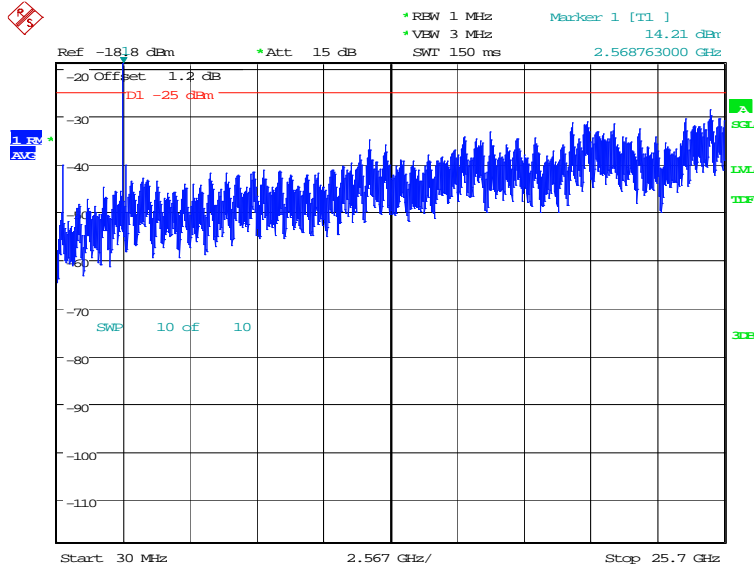
NOTE: peak above the limit line is the carrier frequency.



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**LTE band 7: 30MHz – 25.7GHz**

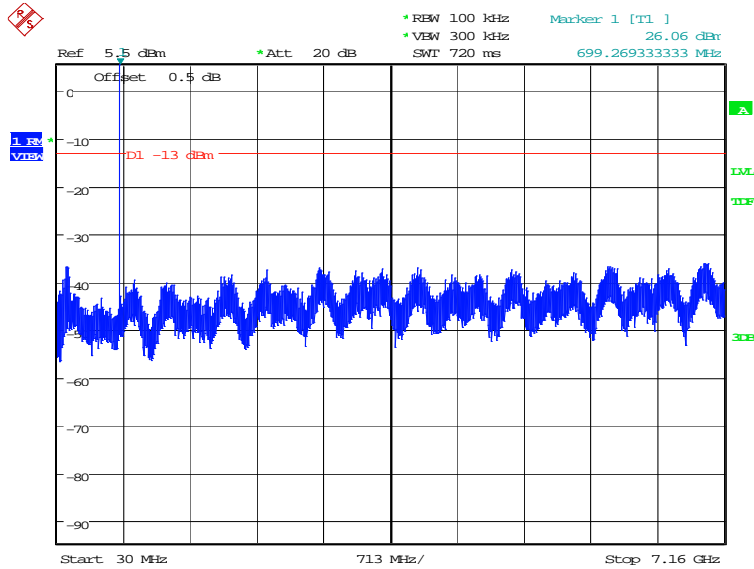
**NOTE: peak above the limit line is the carrier frequency.**



Date: 30.JUN.2020 16:29:29

**LTE band 12: 30MHz – 7.16GHz**

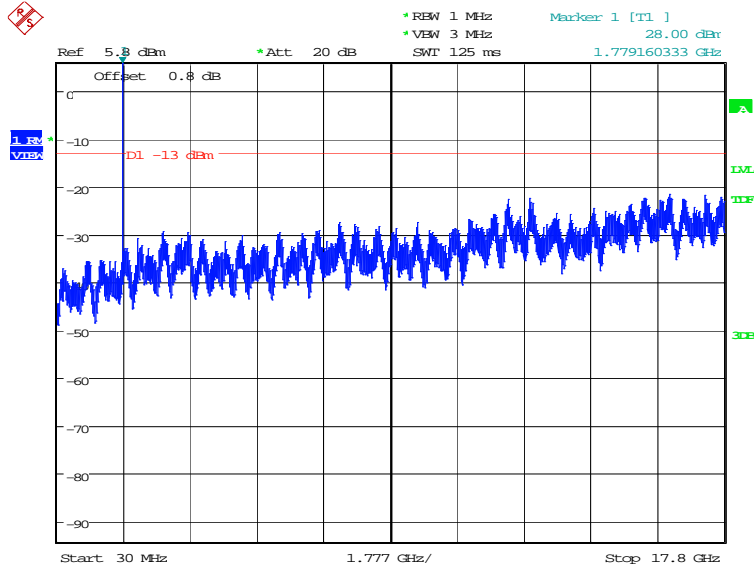
**NOTE: peak above the limit line is the carrier frequency.**



Date: 30.JUN.2020 16:30:49

### LTE band 66: 30MHz – 17.8GHz

NOTE: peak above the limit line is the carrier frequency.



Date: 30.JUN.2020 16:32:18

## **A.8 Peak-to-Average Power Ratio**

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

- a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
- b) Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
- c) Set the number of counts to a value that stabilizes the measured CCDF curve;
- d) Record the maximum PAPR level associated with a probability of 0.1%.

### **Measurement results**

#### **LTE band 2, 20MHz**

Frequency (MHz)	PAPR (dB)		
1880.0	QPSK	16QAM	64QAM
	6.73	7.37	7.53

#### **LTE band 7, 20MHz**

Frequency (MHz)	PAPR (dB)		
2535.0	QPSK	16QAM	64QAM
	7.02	7.60	7.88

#### **LTE band 12, 10MHz**

Frequency (MHz)	PAPR (dB)		
707.5	QPSK	16QAM	64QAM
	5.61	6.44	6.79

#### **LTE band 66, 20MHz**

Frequency (MHz)	PAPR (dB)		
1745.0	QPSK	16QAM	64QAM
	6.57	7.31	7.66

## Annex B: Accreditation Certificate

<p>United States Department of Commerce National Institute of Standards and Technology</p> 	
<hr/> <b>Certificate of Accreditation to ISO/IEC 17025:2005</b> <hr/>	
NVLAP LAB CODE: 600118-0	
<b>Telecommunication Technology Labs, CAICT</b> Beijing China	
<i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i>	
<b>Electromagnetic Compatibility &amp; Telecommunications</b>	
<i>This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).</i>	
<hr/> 2019-09-26 through 2020-09-30 <i>Effective Dates</i>	 For the National Voluntary Laboratory Accreditation Program

\*\*\*END OF REPORT\*\*\*