



TEST REPORT

No.I23Z61098-WMD03

for

TCL Communication Ltd.

LTE/WCDMA/GSM mobile phone

Model Name: T312A, T312E

FCC ID: 2ACCJB211

with

Hardware Version: T300_MB_V1.01

Software Version: T312A_1SIM_V1.0_20230826_UNLOCK/

T312E_2SIM_V1.0_20230906_UNLOCK

Issued Date: 2023-09-19

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

Test Laboratory:

CTTL-Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I23Z61098-WMD03	Rev.0	1 st edition	2023-09-19

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 17025:2017 accredited test laboratory under American Association for Laboratory Accreditation (A2LA) with lab code 7049.01, and is also an FCC accredited test laboratory (CN1349), and ISED accredited test laboratory (CAB identifier:CN0066). The detail accreditation scope can be found on A2LA 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 (BDA)

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

1.3. Testing Environment

Normal Temperature: 15-35℃
Relative Humidity: 20-75%

1.4. Project Data

Testing Start Date: 2023-08-31
Testing End Date: 2023-09-15

1.5. Signature



Dong Yuan
(Prepared this test report)



Zhou Yu
(Reviewed this test report)



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



2. Client Information

2.1. Applicant Information

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2.2. Manufacturer Information

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

3.1. About EUT

Description	LTE/WCDMA/GSM mobile phone
Model Name	T312A, T312E
FCC ID	2ACCJB211
Antenna	Embedded
Output power	25.45dBm maximum EIRP measured for LTE B7
Extreme Voltage	3.6VDC to 4.35VDC (nominal: 3.8VDC)
Extreme Temperature	0°C to +55°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
UT09a	353032630001713	T300_MB_V1.01	T312A_1SIM_V1.0_ 20230826_UNLOCK/ T312E_2SIM_V1.0_ 20230906_UNLOCK	2023-08-31
UT08a	353032630001754	T300_MB_V1.01	T312A_1SIM_V1.0_ 20230826_UNLOCK/ T312E_2SIM_V1.0_ 20230906_UNLOCK	2023-08-30

*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
AE2	Battery
AE1	
Model	TLi015MA
Manufacturer	ZhongShan Tianmao Battery CO.,Ltd.
Capacitance	1530mAh
AE2	
Model	TLi015MB
Manufacturer	ShenzhenAerospaceElectronic Co.,Ltd
Capacitance	1530mAh

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



4. Reference Documents

4.1. Documents supplied by applicant

EUT parameters are supplied by the customer, which are the bases of testing. CAICT is not responsible for the accuracy of customer supplied technical information that may affect the test results (for example, antenna gain and loss of customer supplied cable).

4.2. Reference Documents for testing

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

Reference	Title	Version
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-22 Edition
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-22 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-22 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. Summary of Test Result

LTE Band 2

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

LTE Band 4

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

LTE Band 5

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

LTE Band 7

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

LTE Band 13

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

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.

All the test results are based on normal power.

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 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.

6. Test Equipment Utilized

Description	Type	Series Number	Manufacture	Cal Due Date	Calibration Interval
Wideband Radio Communication Tester	CMW500	159082	R&S	2024-01-09	1 year
Spectrum Analyzer	FSU	200030	R&S	2024-05-25	1 year
Climate Chamber	SH-242	93008556	ESPEC	2023-12-23	3 years
Test Receiver	FSV40	101047	R&S	2024-07-25	1 Year
EMI Antenna	VULB9163	9163-482	Schwarzbeck	2023-11-28	1 Year
EMI Antenna	LB-7180-NF	J203001300005	A-INFO	2024-05-25	1 Year
EMI Antenna	3115	00167252	ETS-Lindgren	2024-01-28	1 Year
Signal Generator	SMF100A	101295	R&S	2024-02-08	1 Year
Universal Radio Communication Tester	CMW500	143008	R&S	2024-02-03	1 Year

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.

The results below include a correction factor for cable loss that is provided by the customer.

A.1.2.2 Measurement Result

LTE band 2

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1909.3	23.25	22.24
		1880.0	23.24	21.63
		1850.7	23.26	22.80
	1 RB low	1909.3	23.26	22.34
		1880.0	23.19	21.73
		1850.7	23.20	22.73
	50% RB mid	1909.3	23.26	22.47
		1880.0	23.39	22.19
		1850.7	23.38	22.64
	100% RB	1909.3	22.32	21.23
		1880.0	22.25	21.07
		1850.7	22.28	21.08
3MHz	1 RB high	1908.5	23.25	22.34
		1880.0	23.29	22.25
		1851.5	23.30	22.81
	1 RB low	1908.5	23.12	22.26
		1880.0	23.26	22.23
		1851.5	23.33	22.85
	50% RB mid	1908.5	22.42	21.46
		1880.0	22.35	21.47
		1851.5	22.33	21.45

	100% RB	1908.5	22.33	21.41
		1880.0	22.30	21.23
		1851.5	22.38	21.42
5MHz	1 RB high	1907.5	23.16	22.74
		1880.0	23.13	22.74
		1852.5	23.22	22.74
	1 RB low	1907.5	23.11	22.74
		1880.0	23.12	22.85
		1852.5	23.20	22.72
	50% RB mid	1907.5	22.22	21.28
		1880.0	22.27	21.27
		1852.5	22.25	21.45
	100% RB	1907.5	22.28	21.33
		1880.0	22.26	21.17
		1852.5	22.18	21.33
10MHz	1 RB high	1905.0	23.23	22.32
		1880.0	23.20	22.89
		1855.0	23.21	22.93
	1 RB low	1905.0	23.17	22.11
		1880.0	23.13	22.77
		1855.0	23.28	22.81
	50% RB mid	1905.0	22.32	21.56
		1880.0	22.25	21.27
		1855.0	22.31	21.25
	100% RB	1905.0	22.30	21.27
		1880.0	22.38	21.29
		1855.0	22.31	21.36
15MHz	1 RB high	1902.5	23.24	22.76
		1880.0	23.12	22.22
		1857.5	23.19	22.47
	1 RB low	1902.5	23.10	22.67
		1880.0	23.11	22.51
		1857.5	23.15	22.34
	50% RB mid	1902.5	22.30	21.27
		1880.0	22.19	21.30
		1857.5	22.31	21.56
	100% RB	1902.5	22.33	21.31
		1880.0	22.17	21.30
		1857.5	22.39	21.45

20MHz	1 RB high	1900.0	23.20	22.29
		1880.0	23.14	21.67
		1860.0	23.22	22.15
	1 RB low	1900.0	23.26	22.10
		1880.0	23.25	21.93
		1860.0	23.30	22.18
	50% RB mid	1900.0	22.26	21.43
		1880.0	22.54	21.24
		1860.0	22.28	21.50
	100% RB	1900.0	22.12	21.49
		1880.0	22.17	21.31
		1860.0	22.26	21.46

LTE band 4

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	1754.3	23.11	22.84
		1732.5	23.23	22.15
		1710.7	23.16	22.11
	1 RB low	1754.3	23.08	22.71
		1732.5	23.18	22.05
		1710.7	23.20	22.26
	50% RB mid	1754.3	23.34	22.44
		1732.5	23.25	22.37
		1710.7	23.24	22.46
	100% RB	1754.3	22.18	20.91
		1732.5	22.26	21.18
		1710.7	22.18	21.15
3MHz	1 RB high	1753.5	23.13	22.43
		1732.5	23.12	22.63
		1711.5	23.19	22.59
	1 RB low	1753.5	23.11	22.27
		1732.5	23.09	22.70
		1711.5	23.22	22.67
	50% RB mid	1753.5	22.27	21.73
		1732.5	22.21	21.45
		1711.5	22.26	21.28
	100% RB	1753.5	22.23	21.72
		1732.5	22.30	21.37
		1711.5	22.22	21.27
5MHz	1 RB high	1752.5	23.06	22.89
		1732.5	23.16	22.05
		1712.5	23.25	22.13
	1 RB low	1752.5	23.05	22.93
		1732.5	23.17	22.23
		1712.5	23.28	22.23
	50% RB mid	1752.5	22.24	21.55
		1732.5	22.23	21.41
		1712.5	22.18	21.28
	100% RB	1752.5	22.19	21.59
		1732.5	22.12	21.48
		1712.5	22.18	21.51
10MHz	1 RB high	1750.0	23.14	22.12
		1732.5	22.97	22.77
		1715.0	23.01	22.86
	1 RB low	1750.0	23.16	22.07

	50% RB mid	1732.5	23.03	22.77
		1715.0	23.09	22.90
		1750.0	22.29	21.33
		1732.5	22.27	21.20
	100% RB	1715.0	22.23	21.29
		1750.0	22.31	21.08
		1732.5	22.15	21.22
		1715.0	22.08	21.26
15MHz	1 RB high	1747.5	23.11	22.65
		1732.5	23.03	22.16
		1717.5	23.01	22.16
	1 RB low	1747.5	23.14	22.82
		1732.5	23.03	22.44
		1717.5	23.05	22.31
	50% RB mid	1747.5	22.00	21.09
		1732.5	22.22	21.39
		1717.5	22.14	21.28
	100% RB	1747.5	22.22	21.32
		1732.5	22.27	21.33
		1717.5	22.24	21.21
20MHz	1 RB high	1745.0	23.19	22.31
		1732.5	23.16	22.28
		1720.0	23.18	22.12
	1 RB low	1745.0	23.09	22.30
		1732.5	23.19	22.27
		1720.0	23.27	22.28
	50% RB mid	1745.0	22.09	21.33
		1732.5	22.32	21.28
		1720.0	22.23	21.54
	100% RB	1745.0	22.22	21.37
		1732.5	22.20	21.37
		1720.0	22.26	21.56

LTE band 5

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	848.3	22.83	22.22
		836.5	22.78	21.87
		824.7	22.77	21.87
	1 RB low	848.3	22.83	22.41
		836.5	22.90	22.20
		824.7	22.77	21.69
	50% RB mid	848.3	23.06	22.49
		836.5	22.92	22.19
		824.7	22.85	22.22
	100% RB	848.3	22.41	21.12
		836.5	21.99	21.20
		824.7	21.93	20.77
3MHz	1 RB high	847.5	22.94	22.73
		836.5	22.88	22.34
		825.5	22.79	22.39
	1 RB low	847.5	22.94	22.98
		836.5	22.83	22.79
		825.5	22.78	22.29
	50% RB mid	847.5	22.39	21.47
		836.5	21.84	21.46
		825.5	21.85	21.08
	100% RB	847.5	22.37	21.52
		836.5	22.04	21.41
		825.5	21.83	21.11
5MHz	1 RB high	846.5	22.91	22.34
		836.5	22.93	21.98
		826.5	22.93	21.92
	1 RB low	846.5	22.91	22.32
		836.5	22.97	22.22
		826.5	22.97	21.80
	50% RB mid	846.5	22.35	21.35
		836.5	21.89	21.40
		826.5	21.98	21.36
	100% RB	846.5	22.28	21.60
		836.5	21.83	21.60
		826.5	21.99	21.57
10MHz	1 RB high	844.0	22.74	22.31
		836.5	22.77	22.48



		829.0	22.83	22.49
	1 RB low	844.0	22.78	21.96
		836.5	22.82	22.80
		829.0	22.80	22.50
	50% RB mid	844.0	21.85	21.12
		836.5	21.95	21.30
		829.0	22.15	20.92
	100% RB	844.0	21.82	20.91
		836.5	22.06	21.42
		829.0	22.03	21.01

LTE band 7

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)	
			QPSK	16QAM
5MHz	1 RB high	2567.5	23.39	23.38
		2535.0	23.66	23.88
		2502.5	23.73	23.97
	1 RB low	2567.5	23.41	23.54
		2535.0	23.62	23.90
		2502.5	23.72	23.86
	50% RB mid	2567.5	22.52	21.80
		2535.0	22.75	21.87
		2502.5	22.73	21.91
	100% RB	2567.5	22.48	21.82
		2535.0	22.64	21.79
		2502.5	22.82	21.88
10MHz	1 RB high	2565.0	23.43	23.77
		2535.0	23.63	23.67
		2505.0	23.68	23.73
	1 RB low	2565.0	23.53	23.89
		2535.0	23.66	23.74
		2505.0	23.76	23.77
	50% RB mid	2565.0	22.51	21.62
		2535.0	22.70	21.83
		2505.0	22.84	21.72
	100% RB	2565.0	22.46	21.73
		2535.0	22.75	21.86
		2505.0	22.81	21.98
15MHz	1 RB high	2562.5	23.29	23.26
		2535.0	23.50	23.96
		2507.5	23.61	24.08
	1 RB low	2562.5	23.49	23.57
		2535.0	23.57	24.15
		2507.5	23.55	24.14
	50% RB mid	2562.5	22.63	21.85
		2535.0	22.77	21.82
		2507.5	22.83	21.93
	100% RB	2562.5	22.61	21.67
		2535.0	22.70	21.92
		2507.5	22.85	21.98
20MHz	1 RB high	2560.0	23.52	23.45
		2535.0	23.52	23.48
		2510.0	23.62	23.52
	1 RB low	2560.0	23.64	23.51



		2535.0	23.65	23.47
		2510.0	23.61	23.49
		2560.0	22.74	21.77
	50% RB mid	2535.0	22.74	21.89
		2510.0	22.70	21.91
		2560.0	22.69	21.74
	100% RB	2535.0	22.71	21.92
		2510.0	22.70	21.92

LTE band 13

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)	
			QPSK	16QAM
5MHz	1 RB high	784.5	22.98	21.91
		782.0	22.88	21.86
		779.5	22.77	22.22
	1 RB low	784.5	22.99	22.37
		782.0	22.84	22.36
		779.5	22.94	22.07
	50% RB mid	784.5	22.02	21.28
		782.0	22.19	21.14
		779.5	22.16	21.31
	100% RB	784.5	21.94	21.43
		782.0	22.37	21.39
		779.5	22.33	21.42
10MHz	1 RB high	782.0	22.95	21.98
	1 RB low	782.0	23.02	22.10
	50% RB mid	782.0	22.39	21.39
	100% RB	782.0	22.23	21.29

A.1.3 Radiated

A.1.3.1 Description

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

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

FDD Band 4: Part 27.50(d)(4) 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 5: Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts".

FDD Band 7: Part 27.50(h)(2) specifies "Mobile stations are limited to 2.0 watts EIRP".

FDD Band 13: Part 27.50(b) specifies "Portable stations(hand-held devices) transmitting in the 746–757 MHz, 776–788 MHz, and 805–806 MHz bands 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:

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

where;

- **ERP or EIRP** = effective radiated power or equivalent isotropically radiated power(expressed in the same units as P_T).
- **P_T** = transmitter output power, in this report the unit express as 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.

Alternatively, the EIRP can be determined from Equation above and then converted to ERP based on the maximum antenna gain relationship by applying the following equation:

$$\text{ERP} = \text{EIRP} - 2.15\text{dB}$$

Note: The antenna gain information was provided by the client. The laboratory is not responsible for identifying its authenticity during the test.

A.1.3.3 Limits and Measurement Results

LTE Band 2-EIRP

Limits: $\leq 33\text{dBm}(2\text{W})$

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)		EIRP(dBm)(Gt-Lc =0.55)	
			QPSK	16QAM	QPSK	16QAM
1.4MHz	1 RB high	1909.3	23.25	22.24	23.80	22.79
		1880.0	23.24	21.63	23.79	22.18
		1850.7	23.26	22.80	23.81	23.35
	1 RB low	1909.3	23.26	22.34	23.81	22.89
		1880.0	23.19	21.73	23.74	22.28
		1850.7	23.20	22.73	23.75	23.28
	50% RB mid	1909.3	23.26	22.47	23.81	23.02
		1880.0	23.39	22.19	23.94	22.74
		1850.7	23.38	22.64	23.93	23.19
	100% RB	1909.3	22.32	21.23	22.87	21.78
		1880.0	22.25	21.07	22.80	21.62
		1850.7	22.28	21.08	22.83	21.63
3MHz	1 RB high	1908.5	23.25	22.34	23.80	22.89
		1880.0	23.29	22.25	23.84	22.80
		1851.5	23.30	22.81	23.85	23.36
	1 RB low	1908.5	23.12	22.26	23.67	22.81
		1880.0	23.26	22.23	23.81	22.78
		1851.5	23.33	22.85	23.88	23.40
	50% RB mid	1908.5	22.42	21.46	22.97	22.01
		1880.0	22.35	21.47	22.90	22.02
		1851.5	22.33	21.45	22.88	22.00
	100% RB	1908.5	22.33	21.41	22.88	21.96
		1880.0	22.30	21.23	22.85	21.78
		1851.5	22.38	21.42	22.93	21.97
5MHz	1 RB high	1907.5	23.16	22.74	23.71	23.29
		1880.0	23.13	22.74	23.68	23.29
		1852.5	23.22	22.74	23.77	23.29
	1 RB low	1907.5	23.11	22.74	23.66	23.29
		1880.0	23.12	22.85	23.67	23.40
		1852.5	23.20	22.72	23.75	23.27
	50% RB mid	1907.5	22.22	21.28	22.77	21.83
		1880.0	22.27	21.27	22.82	21.82
		1852.5	22.25	21.45	22.80	22.00
	100% RB	1907.5	22.28	21.33	22.83	21.88
		1880.0	22.26	21.17	22.81	21.72
		1852.5	22.18	21.33	22.73	21.88
10MHz	1 RB high	1905.0	23.23	22.32	23.78	22.87

	1 RB low	1880.0	23.20	22.89	23.75	23.44	
		1855.0	23.21	22.93	23.76	23.48	
		1905.0	23.17	22.11	23.72	22.66	
		1880.0	23.13	22.77	23.68	23.32	
		1855.0	23.28	22.81	23.83	23.36	
		1905.0	22.32	21.56	22.87	22.11	
	50% RB mid	1880.0	22.25	21.27	22.80	21.82	
		1855.0	22.31	21.25	22.86	21.80	
		1905.0	22.30	21.27	22.85	21.82	
	100% RB	1880.0	22.38	21.29	22.93	21.84	
		1855.0	22.31	21.36	22.86	21.91	
		1902.5	23.24	22.76	23.79	23.31	
15MHz	1 RB high	1880.0	23.12	22.22	23.67	22.77	
		1857.5	23.19	22.47	23.74	23.02	
		1902.5	23.10	22.67	23.65	23.22	
	1 RB low	1880.0	23.11	22.51	23.66	23.06	
		1857.5	23.15	22.34	23.70	22.89	
		1902.5	22.30	21.27	22.85	21.82	
	50% RB mid	1880.0	22.19	21.30	22.74	21.85	
		1857.5	22.31	21.56	22.86	22.11	
		1902.5	22.33	21.31	22.88	21.86	
	100% RB	1880.0	22.17	21.30	22.72	21.85	
		1857.5	22.39	21.45	22.94	22.00	
		1900.0	23.20	22.29	23.75	22.84	
	20MHz	1 RB high	1880.0	23.14	21.67	23.69	22.22
			1860.0	23.22	22.15	23.77	22.70
			1900.0	23.26	22.10	23.81	22.65
		1 RB low	1880.0	23.25	21.93	23.80	22.48
			1860.0	23.30	22.18	23.85	22.73
			1900.0	22.26	21.43	22.81	21.98
50% RB mid		1880.0	22.54	21.24	23.09	21.79	
		1860.0	22.28	21.50	22.83	22.05	
		1900.0	22.12	21.49	22.67	22.04	
100% RB		1880.0	22.17	21.31	22.72	21.86	
		1860.0	22.26	21.46	22.81	22.01	

LTE Band 4-EIRP
Limits: $\leq 30\text{dBm}(1\text{W})$

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)		EIRP(dBm)(Gt-Lc =0.55)	
			QPSK	16QAM	QPSK	16QAM
1.4MHz	1 RB high	1754.3	23.11	22.84	23.66	23.39
		1732.5	23.23	22.15	23.78	22.70
		1710.7	23.16	22.11	23.71	22.66
	1 RB low	1754.3	23.08	22.71	23.63	23.26
		1732.5	23.18	22.05	23.73	22.60
		1710.7	23.20	22.26	23.75	22.81
	50% RB mid	1754.3	23.34	22.44	23.89	22.99
		1732.5	23.25	22.37	23.80	22.92
		1710.7	23.24	22.46	23.79	23.01
	100% RB	1754.3	22.18	20.91	22.73	21.46
		1732.5	22.26	21.18	22.81	21.73
		1710.7	22.18	21.15	22.73	21.70
3MHz	1 RB high	1753.5	23.13	22.43	23.68	22.98
		1732.5	23.12	22.63	23.67	23.18
		1711.5	23.19	22.59	23.74	23.14
	1 RB low	1753.5	23.11	22.27	23.66	22.82
		1732.5	23.09	22.70	23.64	23.25
		1711.5	23.22	22.67	23.77	23.22
	50% RB mid	1753.5	22.27	21.73	22.82	22.28
		1732.5	22.21	21.45	22.76	22.00
		1711.5	22.26	21.28	22.81	21.83
	100% RB	1753.5	22.23	21.72	22.78	22.27
		1732.5	22.30	21.37	22.85	21.92
		1711.5	22.22	21.27	22.77	21.82
5MHz	1 RB high	1752.5	23.06	22.89	23.61	23.44
		1732.5	23.16	22.05	23.71	22.60
		1712.5	23.25	22.13	23.80	22.68
	1 RB low	1752.5	23.05	22.93	23.60	23.48
		1732.5	23.17	22.23	23.72	22.78
		1712.5	23.28	22.23	23.83	22.78
	50% RB mid	1752.5	22.24	21.55	22.79	22.10
		1732.5	22.23	21.41	22.78	21.96
		1712.5	22.18	21.28	22.73	21.83
	100% RB	1752.5	22.19	21.59	22.74	22.14
		1732.5	22.12	21.48	22.67	22.03
		1712.5	22.18	21.51	22.73	22.06
10MHz	1 RB high	1750.0	23.14	22.12	23.69	22.67
		1732.5	22.97	22.77	23.52	23.32
		1715.0	23.01	22.86	23.56	23.41

	1 RB low	1750.0	23.16	22.07	23.71	22.62
		1732.5	23.03	22.77	23.58	23.32
		1715.0	23.09	22.90	23.64	23.45
	50% RB mid	1750.0	22.29	21.33	22.84	21.88
		1732.5	22.27	21.20	22.82	21.75
		1715.0	22.23	21.29	22.78	21.84
	100% RB	1750.0	22.31	21.08	22.86	21.63
		1732.5	22.15	21.22	22.70	21.77
		1715.0	22.08	21.26	22.63	21.81
15MHz	1 RB high	1747.5	23.11	22.65	23.66	23.20
		1732.5	23.03	22.16	23.58	22.71
		1717.5	23.01	22.16	23.56	22.71
	1 RB low	1747.5	23.14	22.82	23.69	23.37
		1732.5	23.03	22.44	23.58	22.99
		1717.5	23.05	22.31	23.60	22.86
	50% RB mid	1747.5	22.00	21.09	22.55	21.64
		1732.5	22.22	21.39	22.77	21.94
		1717.5	22.14	21.28	22.69	21.83
	100% RB	1747.5	22.22	21.32	22.77	21.87
		1732.5	22.27	21.33	22.82	21.88
		1717.5	22.24	21.21	22.79	21.76
20MHz	1 RB high	1745.0	23.19	22.31	23.74	22.86
		1732.5	23.16	22.28	23.71	22.83
		1720.0	23.18	22.12	23.73	22.67
	1 RB low	1745.0	23.09	22.30	23.64	22.85
		1732.5	23.19	22.27	23.74	22.82
		1720.0	23.27	22.28	23.82	22.83
	50% RB mid	1745.0	22.09	21.33	22.64	21.88
		1732.5	22.32	21.28	22.87	21.83
		1720.0	22.23	21.54	22.78	22.09
	100% RB	1745.0	22.22	21.37	22.77	21.92
		1732.5	22.20	21.37	22.75	21.92
		1720.0	22.26	21.56	22.81	22.11

LTE Band 5-ERP
Limits: $\leq 38.45\text{dBm}(7\text{W})$

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)		ERP(dBm)(Gt-Lc =0.3)	
			QPSK	16QAM	QPSK	16QAM
1.4MHz	1 RB high	848.3	22.83	22.22	20.98	20.37
		836.5	22.78	21.87	20.93	20.02
		824.7	22.77	21.87	20.92	20.02
	1 RB low	848.3	22.83	22.41	20.98	20.56
		836.5	22.90	22.20	21.05	20.35
		824.7	22.77	21.69	20.92	19.84
	50% RB mid	848.3	23.06	22.49	21.21	20.64
		836.5	22.92	22.19	21.07	20.34
		824.7	22.85	22.22	21.00	20.37
	100% RB	848.3	22.41	21.12	20.56	19.27
		836.5	21.99	21.20	20.14	19.35
		824.7	21.93	20.77	20.08	18.92
3MHz	1 RB high	847.5	22.94	22.73	21.09	20.88
		836.5	22.88	22.34	21.03	20.49
		825.5	22.79	22.39	20.94	20.54
	1 RB low	847.5	22.94	22.98	21.09	21.13
		836.5	22.83	22.79	20.98	20.94
		825.5	22.78	22.29	20.93	20.44
	50% RB mid	847.5	22.39	21.47	20.54	19.62
		836.5	21.84	21.46	19.99	19.61
		825.5	21.85	21.08	20.00	19.23
	100% RB	847.5	22.37	21.52	20.52	19.67
		836.5	22.04	21.41	20.19	19.56
		825.5	21.83	21.11	19.98	19.26
5MHz	1 RB high	846.5	22.91	22.34	21.06	20.49
		836.5	22.93	21.98	21.08	20.13
		826.5	22.93	21.92	21.08	20.07
	1 RB low	846.5	22.91	22.32	21.06	20.47
		836.5	22.97	22.22	21.12	20.37
		826.5	22.97	21.80	21.12	19.95
	50% RB mid	846.5	22.35	21.35	20.50	19.50
		836.5	21.89	21.40	20.04	19.55
		826.5	21.98	21.36	20.13	19.51
	100% RB	846.5	22.28	21.60	20.43	19.75
		836.5	21.83	21.60	19.98	19.75
		826.5	21.99	21.57	20.14	19.72
10MHz	1 RB high	844.0	22.74	22.31	20.89	20.46
		836.5	22.77	22.48	20.92	20.63
		829.0	22.83	22.49	20.98	20.64



	1 RB low	844.0	22.78	21.96	20.93	20.11
		836.5	22.82	22.80	20.97	20.95
		829.0	22.80	22.50	20.95	20.65
	50% RB mid	844.0	21.85	21.12	20.00	19.27
		836.5	21.95	21.30	20.10	19.45
		829.0	22.15	20.92	20.30	19.07
	100% RB	844.0	21.82	20.91	19.97	19.06
		836.5	22.06	21.42	20.21	19.57
		829.0	22.03	21.01	20.18	19.16

LTE Band 7-EIRP
Limits: $\leq 33\text{dBm}(2\text{W})$

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)		EIRP(dBm)(Gt-Lc =1.3)	
			QPSK	16QAM	QPSK	16QAM
5MHz	1 RB high	2567.5	23.39	23.38	24.69	24.68
		2535.0	23.66	23.88	24.96	25.18
		2502.5	23.73	23.97	25.03	25.27
	1 RB low	2567.5	23.41	23.54	24.71	24.84
		2535.0	23.62	23.90	24.92	25.20
		2502.5	23.72	23.86	25.02	25.16
	50% RB mid	2567.5	22.52	21.80	23.82	23.10
		2535.0	22.75	21.87	24.05	23.17
		2502.5	22.73	21.91	24.03	23.21
	100% RB	2567.5	22.48	21.82	23.78	23.12
		2535.0	22.64	21.79	23.94	23.09
		2502.5	22.82	21.88	24.12	23.18
10MHz	1 RB high	2565.0	23.43	23.77	24.73	25.07
		2535.0	23.63	23.67	24.93	24.97
		2505.0	23.68	23.73	24.98	25.03
	1 RB low	2565.0	23.53	23.89	24.83	25.19
		2535.0	23.66	23.74	24.96	25.04
		2505.0	23.76	23.77	25.06	25.07
	50% RB mid	2565.0	22.51	21.62	23.81	22.92
		2535.0	22.70	21.83	24.00	23.13
		2505.0	22.84	21.72	24.14	23.02
	100% RB	2565.0	22.46	21.73	23.76	23.03
		2535.0	22.75	21.86	24.05	23.16
		2505.0	22.81	21.98	24.11	23.28
15MHz	1 RB high	2562.5	23.29	23.26	24.59	24.56
		2535.0	23.50	23.96	24.80	25.26
		2507.5	23.61	24.08	24.91	25.38
	1 RB low	2562.5	23.49	23.57	24.79	24.87
		2535.0	23.57	24.15	24.87	25.45
		2507.5	23.55	24.14	24.85	25.44
	50% RB mid	2562.5	22.63	21.85	23.93	23.15
		2535.0	22.77	21.82	24.07	23.12
		2507.5	22.83	21.93	24.13	23.23
	100% RB	2562.5	22.61	21.67	23.91	22.97
		2535.0	22.70	21.92	24.00	23.22
		2507.5	22.85	21.98	24.15	23.28
20MHz	1 RB high	2560.0	23.52	23.45	24.82	24.75
		2535.0	23.52	23.48	24.82	24.78
		2510.0	23.62	23.52	24.92	24.82

	1 RB low	2560.0	23.64	23.51	24.94	24.81
		2535.0	23.65	23.47	24.95	24.77
		2510.0	23.61	23.49	24.91	24.79
	50% RB mid	2560.0	22.74	21.77	24.04	23.07
		2535.0	22.74	21.89	24.04	23.19
		2510.0	22.70	21.91	24.00	23.21
	100% RB	2560.0	22.69	21.74	23.99	23.04
		2535.0	22.71	21.92	24.01	23.22
		2510.0	22.70	21.92	24.00	23.22

LTE Band 13-ERP
Limits: $\leq 34.77\text{dBm}(3\text{W})$

Bandwidth	RB size/offset	Frequency (MHz)	Conducted Power(dBm)		ERP(dBm)(Gt-Lc =0.2)	
			QPSK	16QAM	QPSK	16QAM
5MHz	1 RB high	784.5	22.98	21.91	21.03	19.96
		782.0	22.88	21.86	20.93	19.91
		779.5	22.77	22.22	20.82	20.27
	1 RB low	784.5	22.99	22.37	21.04	20.42
		782.0	22.84	22.36	20.89	20.41
		779.5	22.94	22.07	20.99	20.12
	50% RB mid	784.5	22.02	21.28	20.07	19.33
		782.0	22.19	21.14	20.24	19.19
		779.5	22.16	21.31	20.21	19.36
	100% RB	784.5	21.94	21.43	19.99	19.48
		782.0	22.37	21.39	20.42	19.44
		779.5	22.33	21.42	20.38	19.47
10MHz	1 RB high	782.0	22.95	21.98	21.00	20.03
	1 RB low	782.0	23.02	22.10	21.07	20.15
	50% RB mid	782.0	22.39	21.39	20.44	19.44
	100% RB	782.0	22.23	21.29	20.28	19.34

 Note: Expanded measurement uncertainty is $U = 0.578 \text{ dB}$, $k = 2$.

A.2 Emission Limit

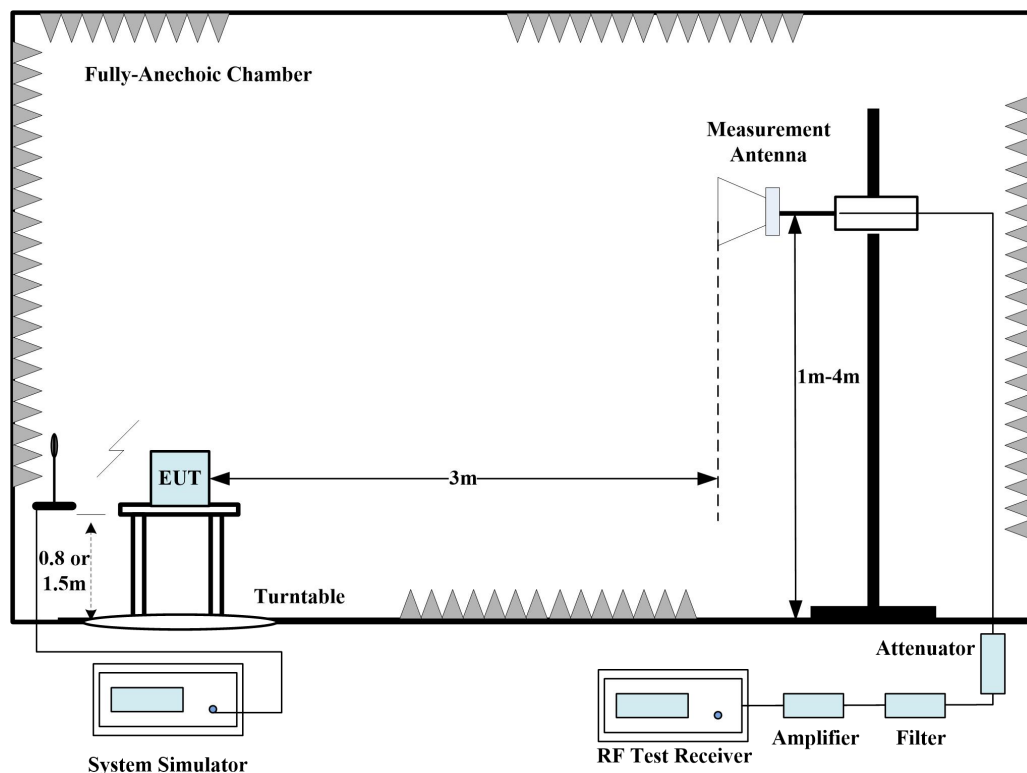
A.2.1 Measurement Method

The measurement procedures in TIA-603E-2016 are used.

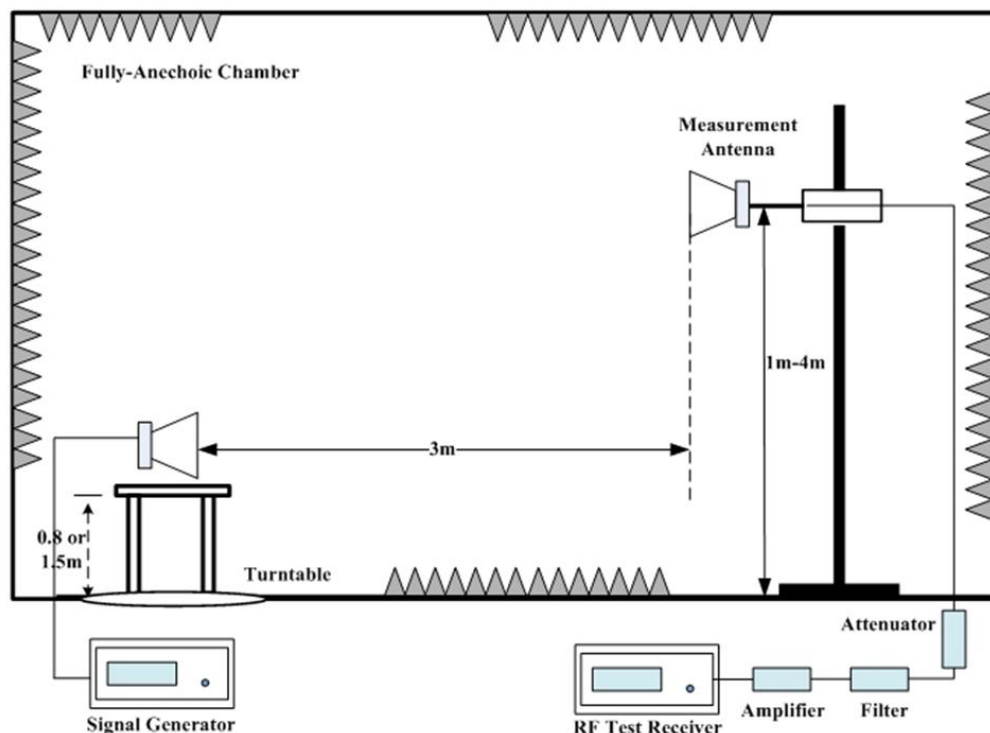
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and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

The procedure of radiated spurious emissions is as follows:

For measurements performed at frequencies less than or equal to 1 GHz, the EUT was placed on a 80cm-high non-conductive support; For measurements performed at frequencies above 1GHz,EUT was placed on a 1.5-meter-high non-conductive support. A measurement antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. In the initial test, the height of the measurement antenna was varied from 1 m to 4 m for the relative positioning that produces the maximum radiated signal level. 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.



1. 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).
2. 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. The height of measurement antenna varied between 1 m to 4 m to maximize the received signal amplitude for each emission that was detected and measured in the initial test. A power (P_{Mea}) is applied to the input of the substitution antenna and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test was performed with the measurement antenna in both vertical and horizontal polarization.

3. The Path loss (P_{pl}) between the Signal Source and the Substitution Antenna and the Substitution Antenna Gain (G_a) were recorded after test. A amplifier was connected in for the test. The Path loss (P_{pl}) is the summation of the cable loss and the gain of the amplifier.
4. The measurement results are obtained as described below:

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

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

A.2.2 Measurement Limit

FDD Band 2: Part 24.238 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.

FDD Band 13: 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.

FDD Band 5: Part 22.917 specifies 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.

FDD Band 7: 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.

FDD Band 4: Part 27.53(h) specifies 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.

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.

Note 1: Both of Vertical and Horizontal polarizations are evaluated, but only the worst case is recorded in this report.

A.2.4 Measurement Results Table

Frequency	Channel	Frequency Range	Result
LTE Bands	Low	9kHz-26GHz	Pass
	Middle	9kHz-26GHz	Pass
	High	9kHz-26GHz	Pass

A.2.5 Sweep Table

Subrange	RBW	VBW
9~150 kHz	0.2kHz	0.6kHz
150kHz~30MHz	9kHz	27kHz
30MHz~1 GHz	100KHz	300KHz
1~20 GHz	1 MHz	3 MHz

A.2.6 Measurement Result

LTE Band 2, 1.4MHz, QPSK, Channel 18607

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3701.50	-46.02	6.42	8.48	-43.96	-13.00	30.96	V
5506.00	-58.87	7.08	10.60	-55.35	-13.00	42.35	V
7403.00	-51.81	8.13	12.08	-47.86	-13.00	34.86	V
9276.00	-55.24	9.10	13.27	-51.07	-13.00	38.07	H
11077.00	-53.88	9.88	13.18	-50.58	-13.00	37.58	H
13001.00	-55.74	10.47	13.50	-52.71	-13.00	39.71	V

LTE Band 2, 1.4MHz, QPSK, Channel 18900

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.00	-50.24	6.26	10.30	-46.20	-13.00	33.20	H
5639.50	-58.35	7.27	11.20	-54.42	-13.00	41.42	V
7520.00	-50.26	8.31	10.30	-48.27	-13.00	35.27	H
9433.00	-53.77	9.20	11.67	-51.30	-13.00	38.30	H
11318.00	-52.90	10.01	12.78	-50.13	-13.00	37.13	H
13181.00	-51.45	10.58	12.62	-49.41	-13.00	36.41	V

LTE Band 2, 1.4MHz, QPSK, Channel 19193

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3818.50	-47.84	6.08	8.65	-45.27	-13.00	32.27	V
5728.00	-57.85	7.30	10.55	-54.60	-13.00	41.60	V
7637.50	-54.54	8.14	12.31	-50.37	-13.00	37.37	H
9528.50	-54.98	9.44	13.37	-51.05	-13.00	38.05	V
11501.00	-53.25	9.81	13.10	-49.96	-13.00	36.96	H
13332.50	-53.70	10.58	13.97	-50.31	-13.00	37.31	H

LTE Band 4, 1.4MHz, QPSK, Channel 19957

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3421.50	-54.30	5.38	8.01	-51.67	-13.00	38.67	V
5132.00	-67.09	6.85	10.08	-63.86	-13.00	50.86	H
6843.00	-56.13	7.83	11.41	-52.55	-13.00	39.55	H
8553.50	-64.05	8.58	13.01	-59.62	-13.00	46.62	H
10285.50	-62.32	9.59	13.01	-58.90	-13.00	45.90	V
11975.50	-54.08	10.17	13.00	-51.25	-13.00	38.25	H

LTE Band 4, 1.4MHz, QPSK, Channel 20175

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.00	-62.20	5.46	8.12	-59.54	-13.00	46.54	V
5197.50	-65.19	6.96	10.18	-61.97	-13.00	48.97	V
6930.00	-61.32	7.76	11.52	-57.56	-13.00	44.56	V
8684.00	-64.99	8.38	13.04	-60.33	-13.00	47.33	V
10363.50	-61.65	9.74	13.05	-58.34	-13.00	45.34	H
12154.50	-63.45	10.19	13.06	-60.58	-13.00	47.58	V

LTE Band 4, 1.4MHz, QPSK, Channel 20393

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3508.50	-53.17	5.54	8.21	-50.50	-13.00	37.50	V
5263.00	-64.70	6.99	10.27	-61.42	-13.00	48.42	H
7017.50	-54.83	8.27	11.62	-51.48	-13.00	38.48	H
8771.50	-63.81	8.57	13.05	-59.33	-13.00	46.33	V
10484.50	-62.04	9.68	13.09	-58.63	-13.00	45.63	H
12280.50	-57.57	10.01	13.11	-54.47	-13.00	41.47	V

LTE Band 5, 1.4MHz, QPSK, Channel 20407

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1649.50	-55.58	3.56	5.23	2.15	-56.06	-13.00	43.06	H
2473.50	-54.97	4.60	6.02	2.15	-55.70	-13.00	42.70	V
3298.50	-63.59	5.29	7.72	2.15	-63.31	-13.00	50.31	H
4124.00	-56.48	6.04	9.02	2.15	-55.65	-13.00	42.65	H
4958.50	-62.18	6.68	9.86	2.15	-61.15	-13.00	48.15	H
5762.50	-61.65	7.25	10.55	2.15	-60.50	-13.00	47.50	H

LTE Band 5, 1.4MHz, QPSK, Channel 20525

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.00	-58.17	3.58	5.19	2.15	-58.71	-13.00	45.71	V
2499.00	-54.90	4.62	6.10	2.15	-55.57	-13.00	42.57	V
3345.50	-64.71	5.31	7.83	2.15	-64.34	-13.00	51.34	V
4183.00	-60.52	6.17	9.08	2.15	-59.76	-13.00	46.76	V
5022.50	-61.90	6.56	9.93	2.15	-60.68	-13.00	47.68	H
5842.00	-61.94	7.21	10.53	2.15	-60.77	-13.00	47.77	V

LTE Band 5, 1.4MHz, QPSK, Channel 20643

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1696.50	-55.39	3.60	5.15	2.15	-55.99	-13.00	42.99	H
2541.50	-54.72	4.66	6.17	2.15	-55.36	-13.00	42.36	H
3393.00	-59.17	5.36	7.94	2.15	-58.74	-13.00	45.74	V
4241.50	-57.52	6.25	9.14	2.15	-56.78	-13.00	43.78	V
5087.00	-62.74	6.74	10.02	2.15	-61.61	-13.00	48.61	V
5929.50	-61.37	7.47	10.51	2.15	-60.48	-13.00	47.48	V

LTE Band 7, 5 MHz, QPSK, Channel 20775

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5005.50	-50.78	6.59	9.91	-47.46	-25.00	22.46	V
7508.00	-52.16	8.36	12.21	-48.31	-25.00	23.31	H
10010.50	-48.67	9.21	12.90	-44.98	-25.00	19.98	H
12513.50	-43.41	10.21	13.21	-40.41	-25.00	15.41	H
15008.00	-51.21	11.23	14.00	-48.44	-25.00	23.44	H
17516.50	-44.78	12.79	14.92	-42.65	-25.00	17.65	V

LTE Band 7, 5 MHz, QPSK, Channel 21100

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5070.00	-53.65	6.69	10.00	-50.34	-25.00	25.34	V
7605.50	-54.38	8.00	12.28	-50.10	-25.00	25.10	V
10140.00	-52.50	9.40	12.96	-48.94	-25.00	23.94	V
12676.00	-46.97	10.34	13.31	-44.00	-25.00	19.00	V
15209.50	-50.91	11.39	13.87	-48.43	-25.00	23.43	H
17744.50	-47.29	12.43	15.24	-44.48	-25.00	19.48	V

LTE Band 7, 5 MHz, QPSK, Channel 21425

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
5135.50	-60.56	6.86	10.09	-57.33	-25.00	32.33	H
7703.00	-51.16	8.42	12.36	-47.22	-25.00	22.22	V
10270.50	-56.91	9.54	13.01	-53.44	-25.00	28.44	V
12838.50	-51.35	10.67	13.40	-48.62	-25.00	23.62	V
15424.00	-55.63	11.43	13.75	-53.31	-25.00	28.31	H
17990.00	-51.78	12.90	15.59	-49.09	-25.00	24.09	V

LTE Band 13, 5MHz, QPSK, Channel 23205

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1559.00	-55.32	3.47	5.39	0.00	-55.55	-40.00	15.55	H
2339.25	-54.11	4.44	5.62	2.15	-55.08	-13.00	42.08	V
3117.50	-63.83	5.38	7.28	2.15	-64.08	-13.00	51.08	H
3897.50	-63.85	6.11	8.76	2.15	-63.35	-13.00	50.35	H
4677.50	-63.72	6.49	9.58	2.15	-62.78	-13.00	49.78	H
5455.00	-62.45	6.89	10.54	2.15	-60.95	-13.00	47.95	V

LTE Band 13, 5MHz, QPSK, Channel 23230

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3127.50	-64.10	5.40	7.31	2.15	-64.34	-13.00	51.34	V
3907.50	-64.05	6.11	8.77	2.15	-63.54	-13.00	50.54	V
4695.00	-62.80	6.50	9.60	2.15	-61.85	-13.00	48.85	V
5475.00	-62.13	6.97	10.57	2.15	-60.68	-13.00	47.68	H
6252.50	-60.73	7.45	10.75	2.15	-59.58	-13.00	46.58	H
7037.50	-58.76	8.24	11.65	2.15	-57.50	-13.00	44.50	V

LTE Band 13, 5MHz, QPSK, Channel 23255

Frequency (MHz)	SG (dBm)	CableLoss (dB)	AntennaGain (dBi)	Correction	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3127.50	-64.26	5.40	7.31	2.15	-64.50	-13.00	51.50	V
3927.50	-64.04	6.12	8.80	2.15	-63.51	-13.00	50.51	H
4697.50	-62.39	6.50	9.60	2.15	-61.44	-13.00	48.44	H
5480.00	-62.06	6.98	10.57	2.15	-60.62	-13.00	47.62	H
6265.00	-60.61	7.47	10.77	2.15	-59.46	-13.00	46.46	V
7052.50	-58.83	8.22	11.66	2.15	-57.54	-13.00	44.54	V

Note: Peak EIRP (dBm) = P_{Mea}(dBm) - Path Loss(dB) + Antenna Gain(dBi)

Note: Expanded measurement uncertainty is U = 5.64 dB, k = 2.

A.3 Frequency Stability

A.3.1 Method of Measurement

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage. Two reference points are established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as F_L and F_H respectively.

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 decrements from +50°C to -30°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 _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.8	1850.801	1909.199		
50				12.52	0.0067
40				4.85	0.0026
30				9.38	0.0050
10				8.63	0.0046
0				12.50	0.0066
-10				16.65	0.0089
-20				9.14	0.0049
-30				3.58	0.0019

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	1850.801	1909.199	8.17	0.0043
4.35				6.67	0.0035

LTE Band 4, 20MHz bandwidth QPSK (worst case of all bandwidths)

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.8	1710.801	1754.167		
50				-5.08	0.0029
40				-4.16	0.0024
30				-11.29	0.0065
10				-14.13	0.0082
0				-16.01	0.0092
-10				-16.55	0.0096
-20				-2.62	0.0015
-30				-8.05	0.0046

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	1710.801	1754.167	1.93	0.0011
4.35				-4.55	0.0026

LTE Band 5, 10MHz bandwidth QPSK (worst case of all bandwidths)
Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.8	824.433	848.583		
50				-29.45	0.0352
40				9.16	0.0110
30				0.20	0.0002
10				-7.48	0.0089
0				-21.34	0.0255
-10				-27.82	0.0333
-20				12.85	0.0154
-30				3.05	0.0036

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	824.433	848.583	-10.21	0.0122
4.35				-19.84	0.0237

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

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.8	2500.545	2569.423		
50				-7.55	0.0030
40				-6.51	0.0026
30				1.76	0.0007
10				16.24	0.0064
0				-13.16	0.0052
-10				-6.19	0.0024
-20				25.05	0.0099
-30				-6.49	0.0026

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	2500.545	2569.423	8.10	0.0032
4.35				25.59	0.0101

LTE Band 13, 10MHz bandwidth QPSK (worst case of all bandwidths)
Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
20	3.8	777.465	786.535		
50				-21.13	0.0270
40				-28.04	0.0359
30				-34.20	0.0437
10				-40.63	0.0520
0				-47.28	0.0605
-10				-54.69	0.0699
-20				-59.51	0.0761
-30				-15.48	0.0198

Frequency Error vs Voltage

Voltage(V)	Temperature(°C)	F _L (MHz)	F _H (MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	777.465	786.535	-3.25	0.0042
4.35				-15.28	0.0195

Note: Expanded measurement uncertainty is U = 0.01 PPM, k = 2.

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.

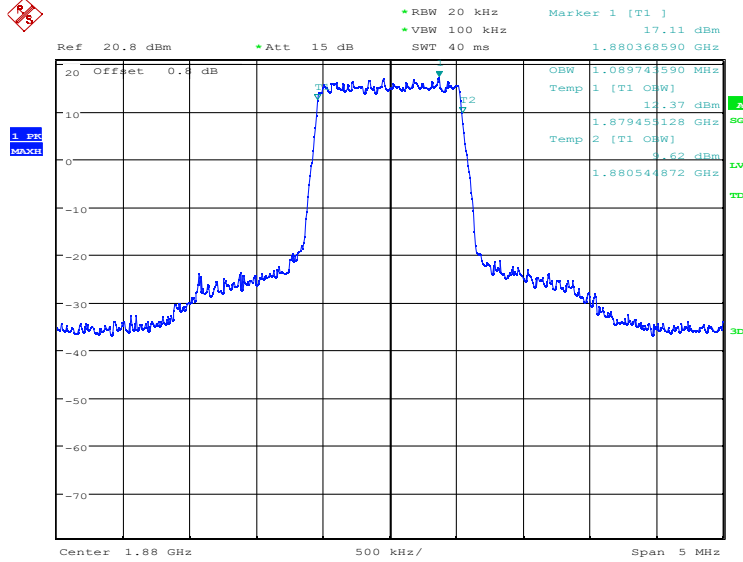
The measurement method is from ANSI C63.26:

- 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%)

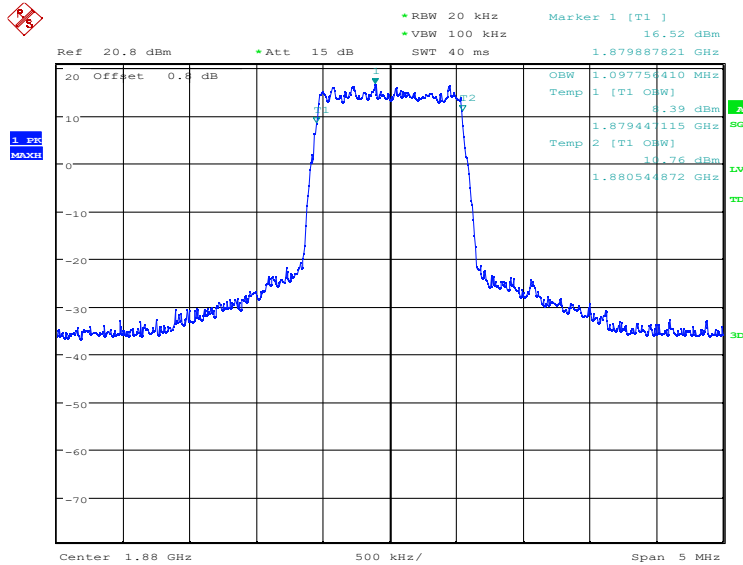
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	1089.74	1097.76

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



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

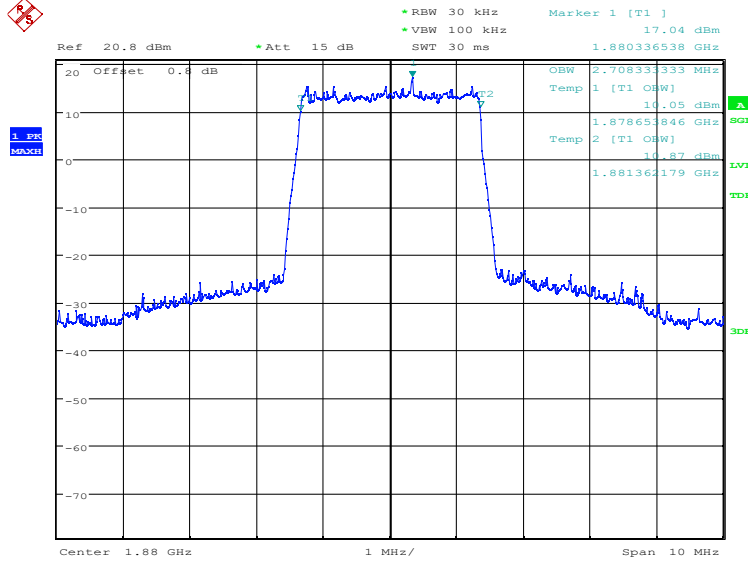


Date: 6.SEP.2023 12:07:19

LTE band 2, 3MHz (99%)

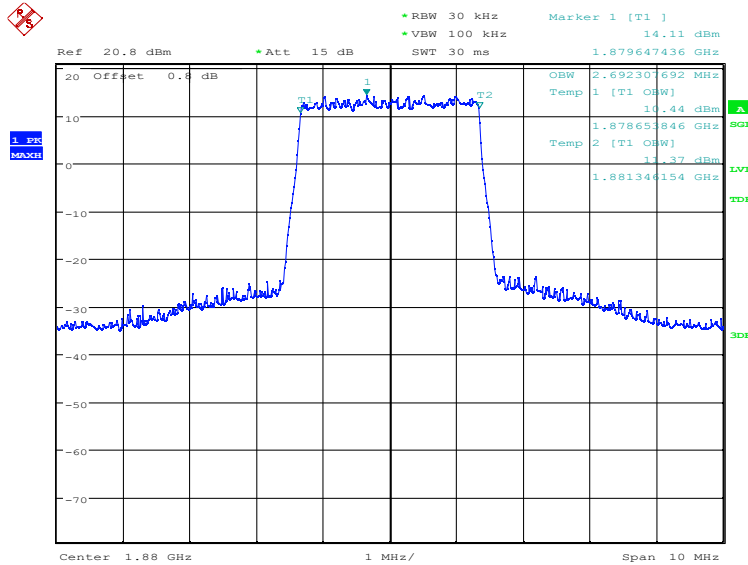
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	2708.33	2692.31

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



Date: 6.SEP.2023 12:08:01

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

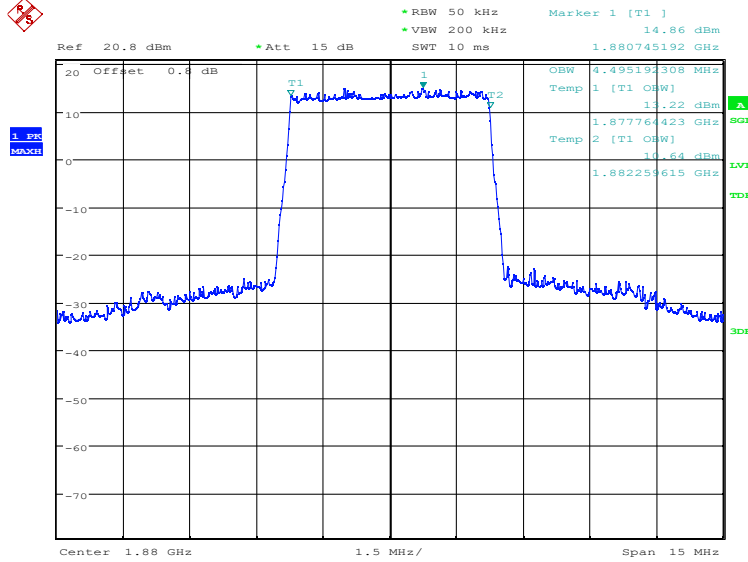


Date: 6.SEP.2023 12:08:41

LTE band 2, 5MHz (99%)

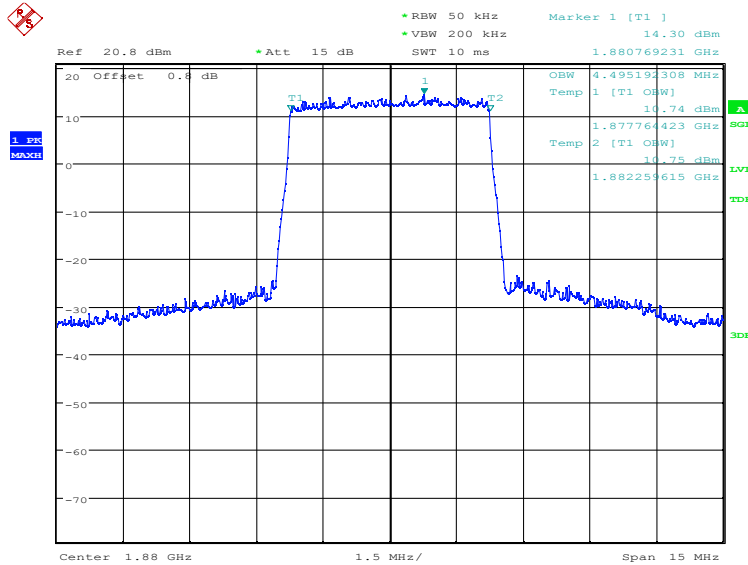
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	4495.19	4495.19

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



Date: 6.SEP.2023 12:09:23

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

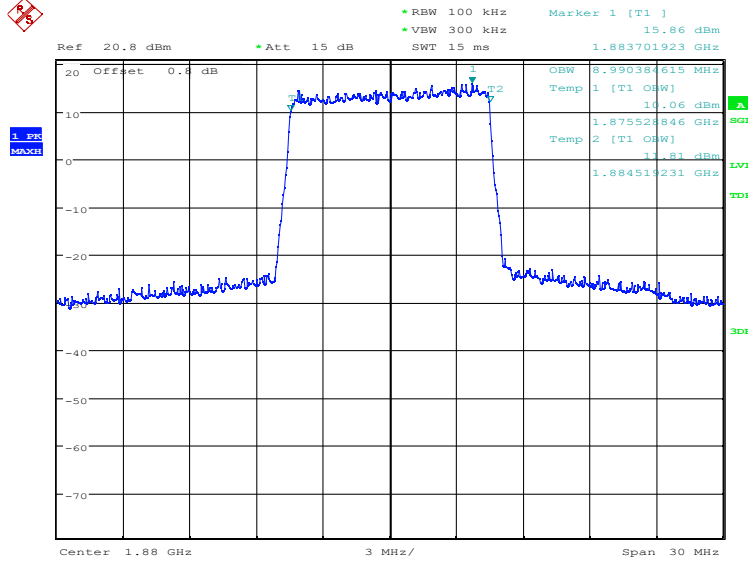


Date: 6.SEP.2023 12:10:03

LTE band 2, 10MHz (99%)

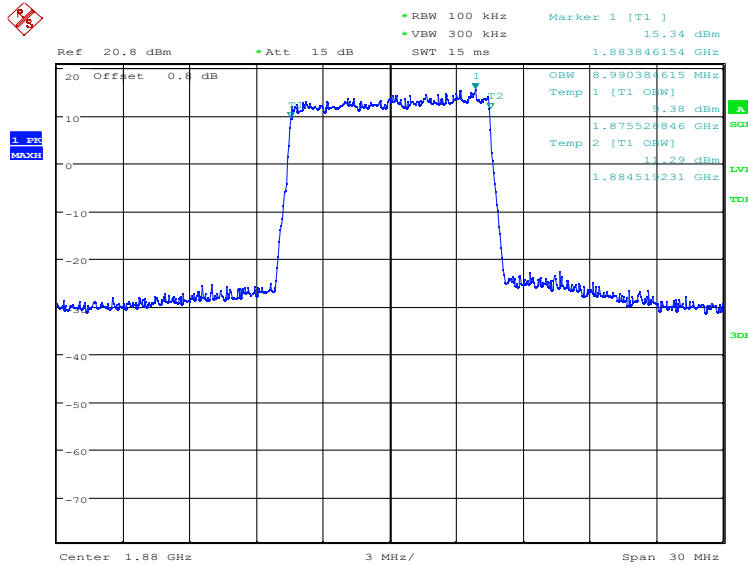
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	8990.38	8990.38

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



Date: 6.SEP.2023 12:10:45

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

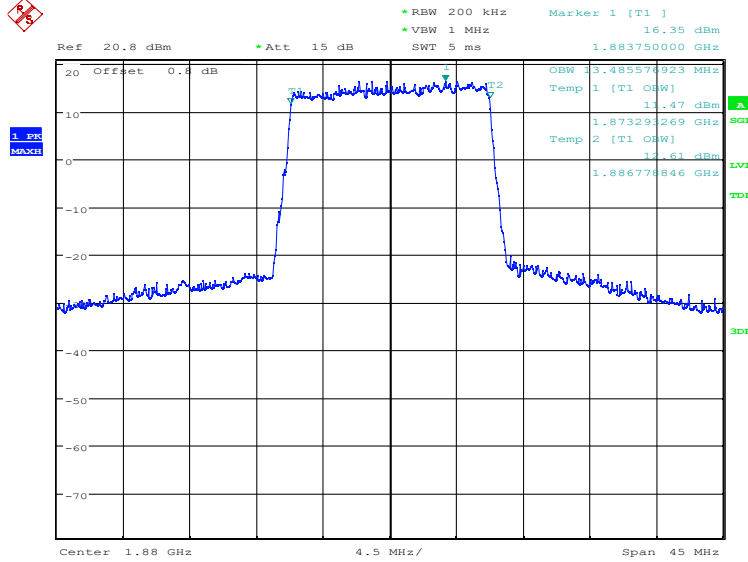


Date: 6.SEP.2023 12:11:26

LTE band 2, 15MHz (99%)

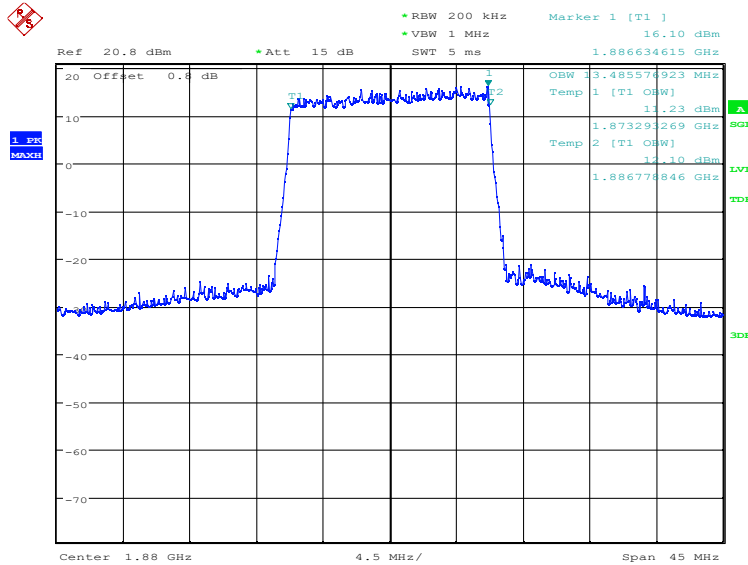
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	13485.58	13485.58

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



Date: 6.SEP.2023 12:12:07

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

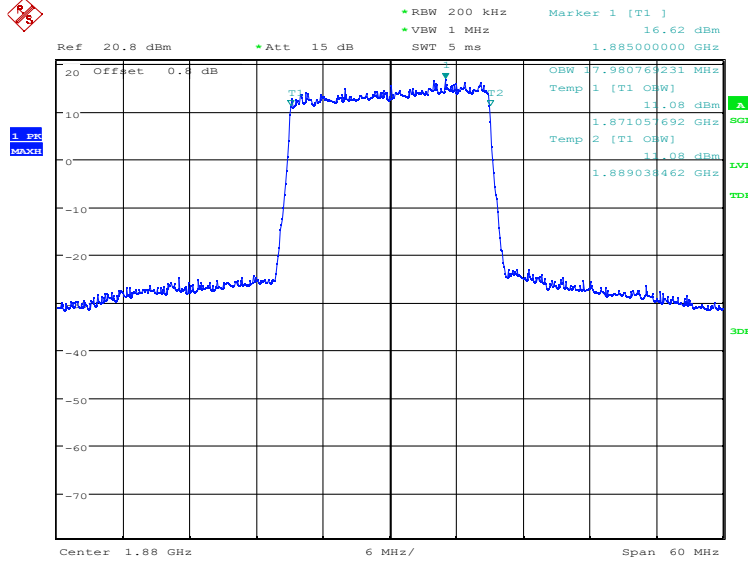


Date: 6.SEP.2023 12:12:48

LTE band 2, 20MHz (99%)

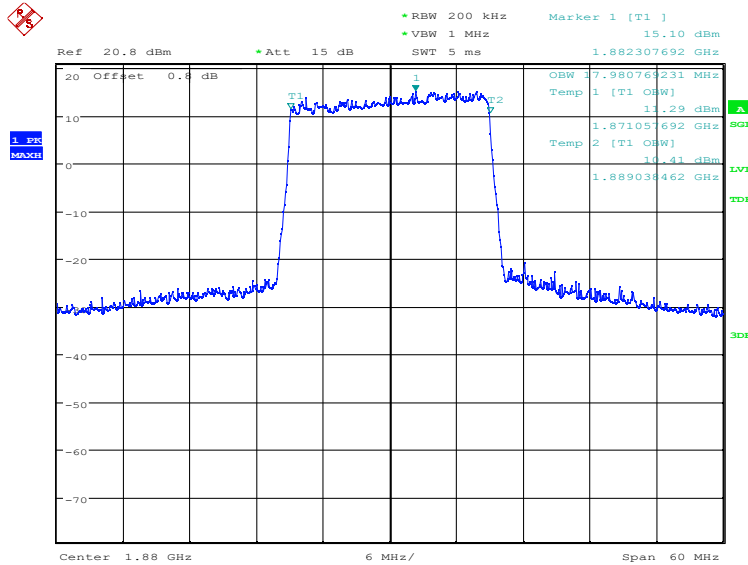
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1880.0	QPSK	16QAM
	17980.77	17980.77

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



Date: 6.SEP.2023 12:14:25

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

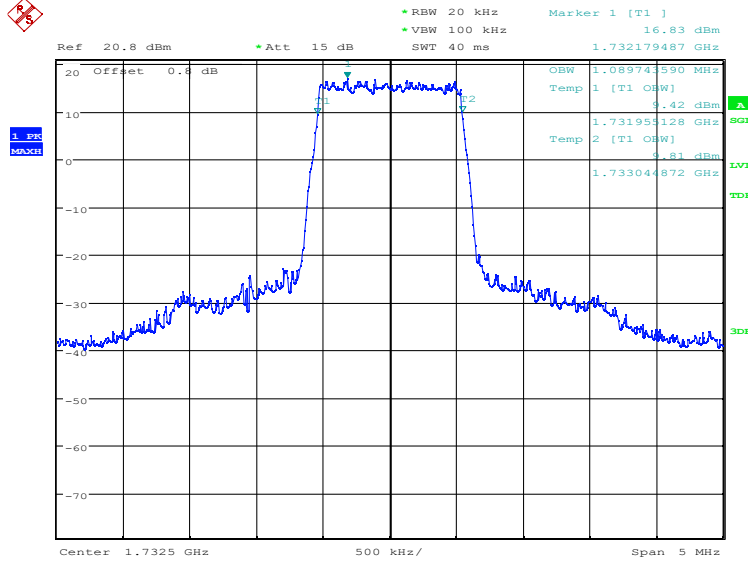


Date: 6.SEP.2023 12:15:06

LTE band 4, 1.4MHz (99%)

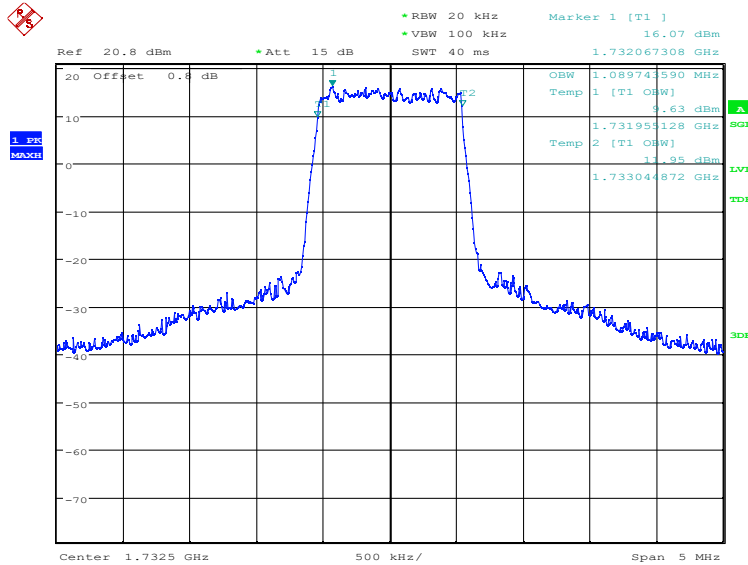
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	1089.74	1089.74

LTE band 4, 1.4MHz Bandwidth, QPSK (99% BW)



Date: 6.SEP.2023 12:16:44

LTE band 4, 1.4MHz Bandwidth, 16QAM (99% BW)

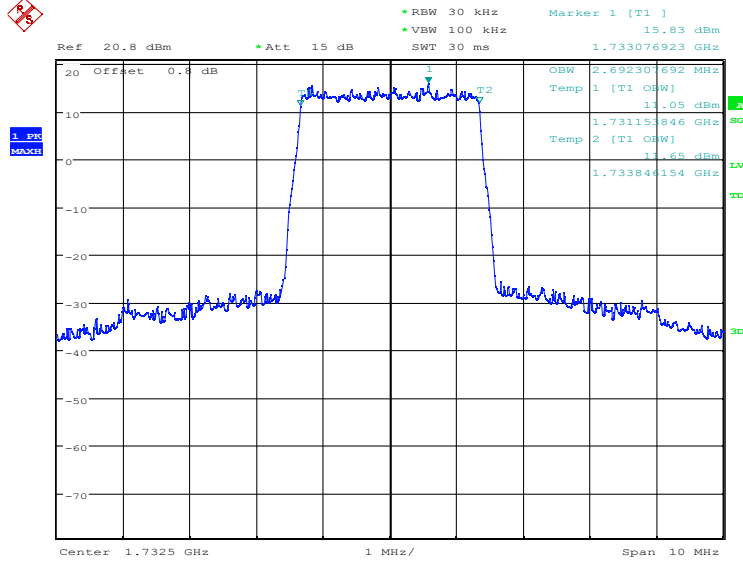


Date: 6.SEP.2023 12:17:25

LTE band 4, 3MHz (99%)

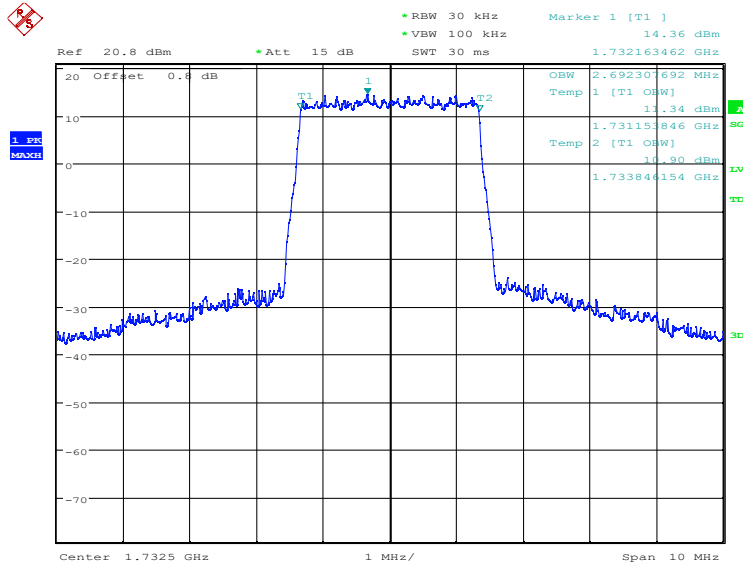
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	2692.31	2692.31

LTE band 4, 3MHz Bandwidth, QPSK (99% BW)



Date: 6.SEP.2023 12:18:07

LTE band 4, 3MHz Bandwidth, 16QAM (99% BW)

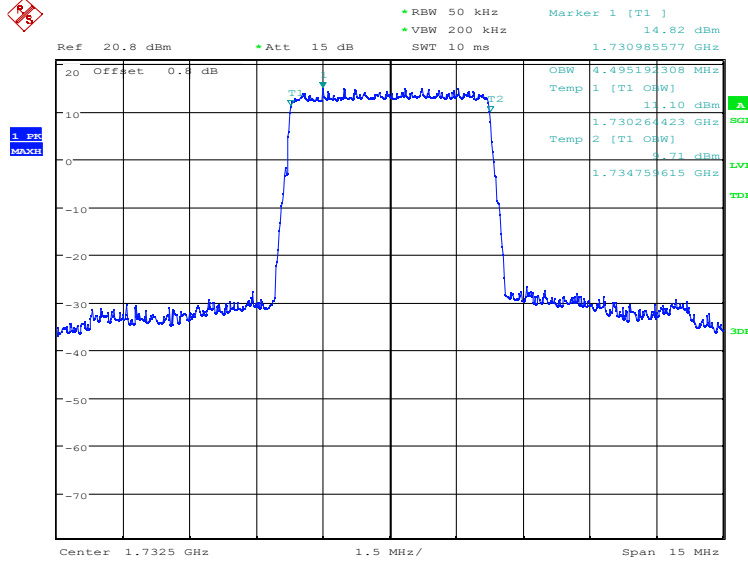


Date: 6.SEP.2023 12:18:47

LTE band 4, 5MHz (99%)

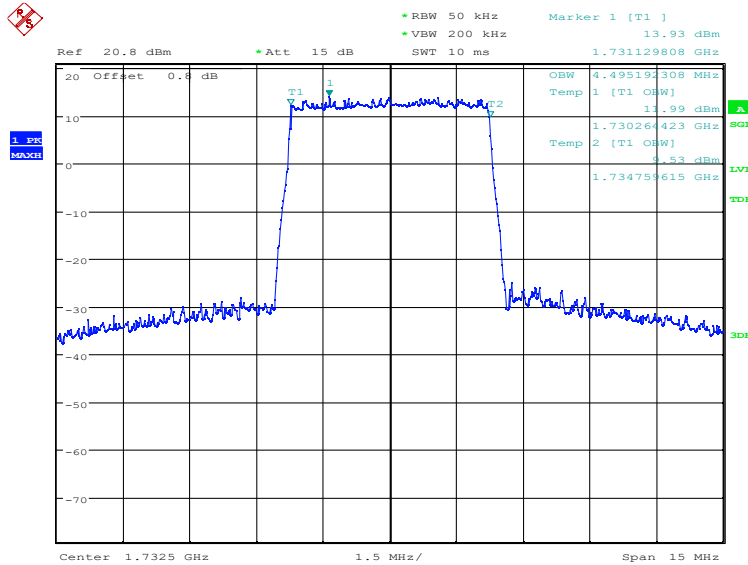
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	4495.19	4495.19

LTE band 4, 5MHz Bandwidth, QPSK (99% BW)



Date: 6.SEP.2023 12:19:29

LTE band 4, 5MHz Bandwidth, 16QAM (99% BW)

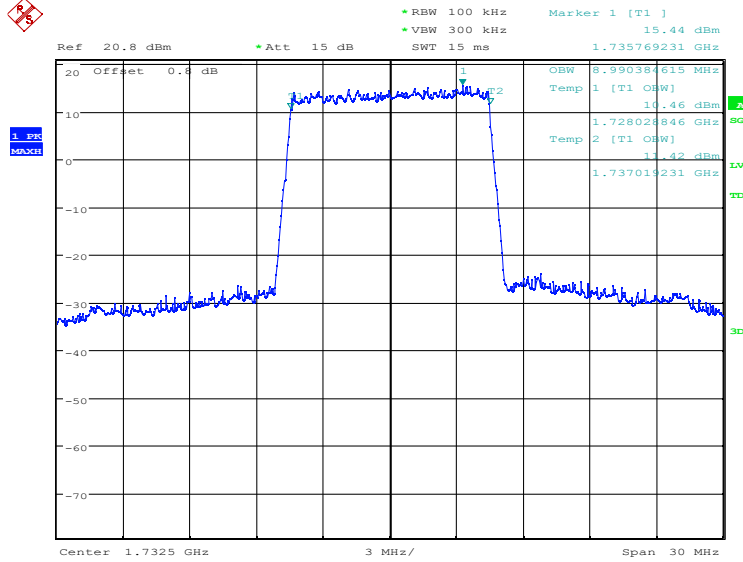


Date: 6.SEP.2023 12:20:09

LTE band 4, 10MHz (99%)

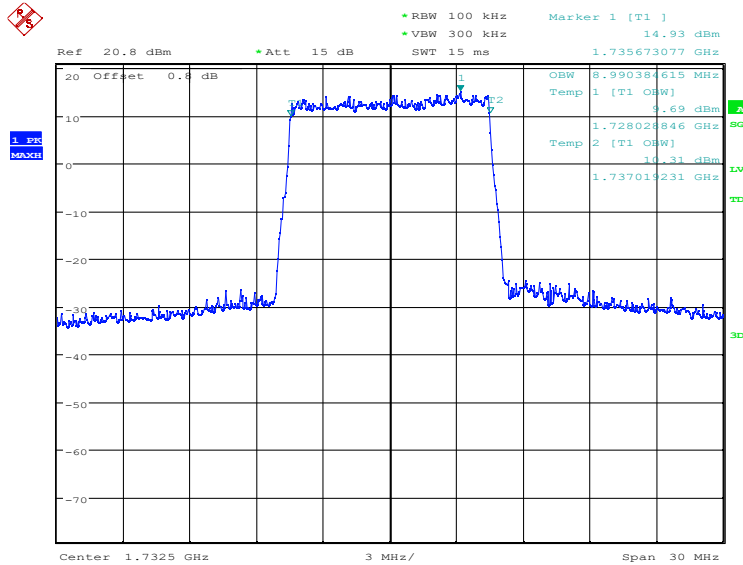
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	8990.38	8990.38

LTE band 4, 10MHz Bandwidth, QPSK (99% BW)



Date: 6.SEP.2023 12:20:51

LTE band 4, 10MHz Bandwidth, 16QAM (99% BW)

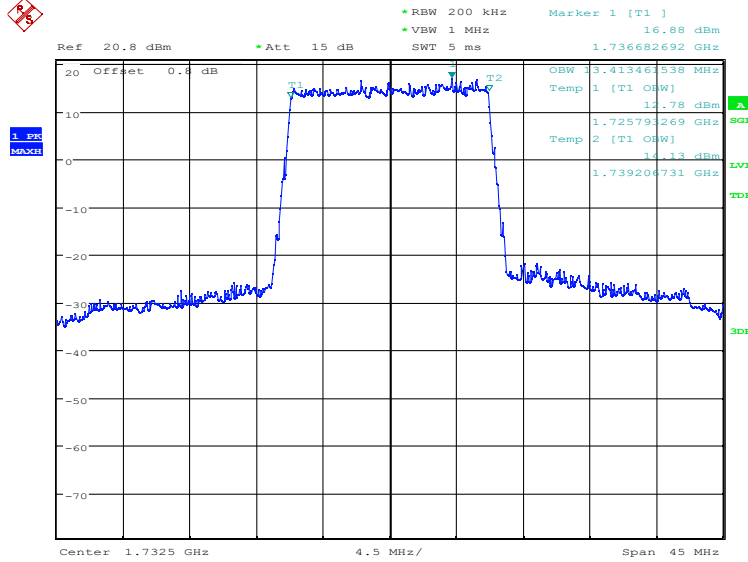


Date: 6.SEP.2023 12:21:31

LTE band 4, 15MHz (99%)

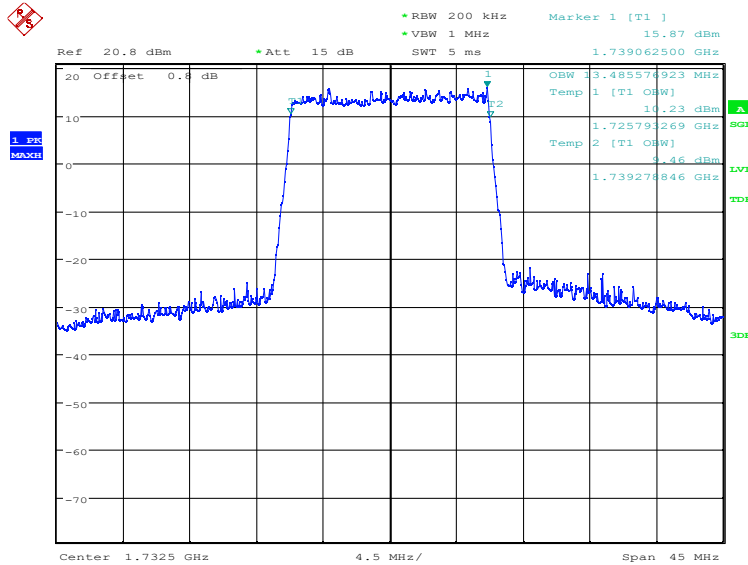
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	13413.46	13485.58

LTE band 4, 15MHz Bandwidth, QPSK (99% BW)



Date: 6.SEP.2023 12:23:11

LTE band 4, 15MHz Bandwidth, 16QAM (99% BW)

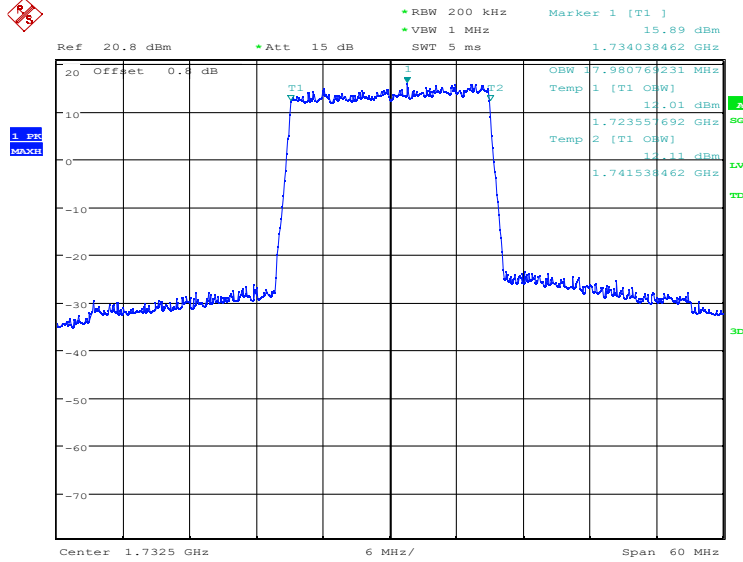


Date: 6.SEP.2023 12:23:52

LTE band 4, 20MHz (99%)

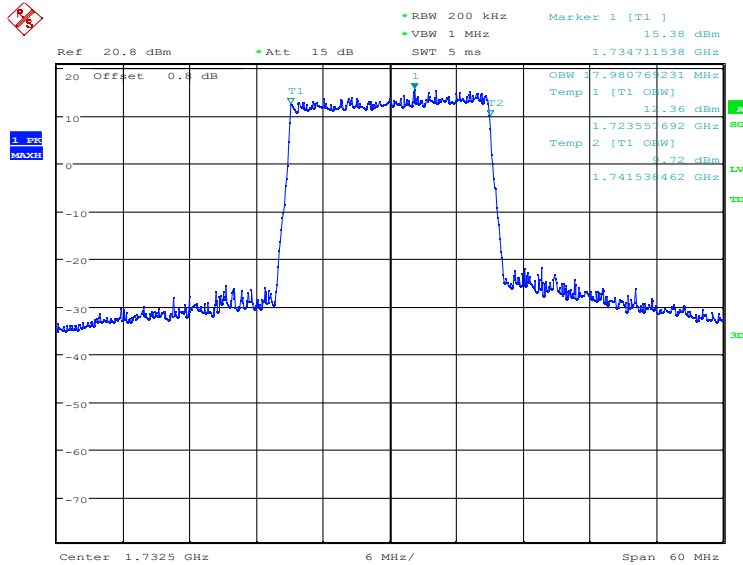
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
1732.5	QPSK	16QAM
	17980.77	17980.77

LTE band 4, 20MHz Bandwidth, QPSK (99% BW)



Date: 6.SEP.2023 12:25:34

LTE band 4, 20MHz Bandwidth, 16QAM (99% BW)

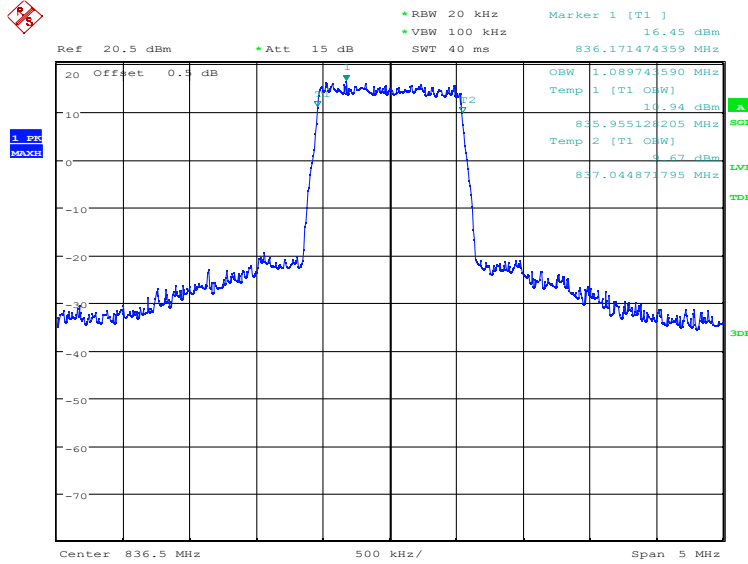


Date: 6.SEP.2023 12:26:14

LTE band 5, 1.4MHz (99%)

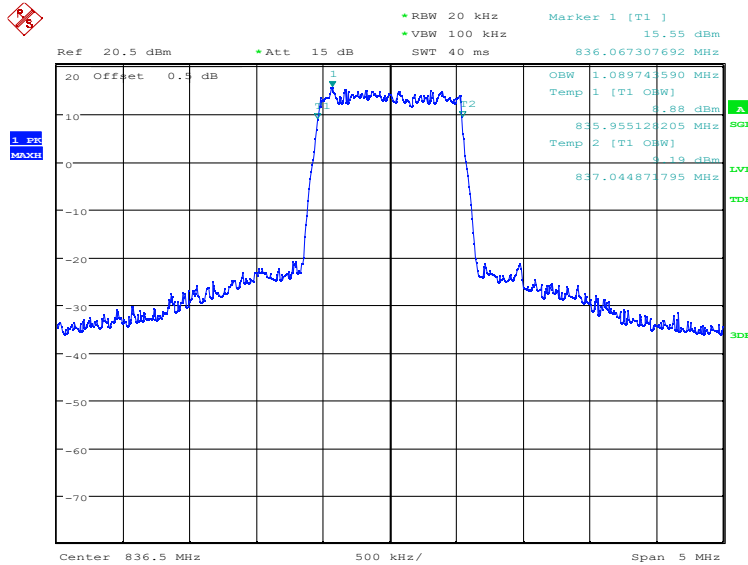
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	1089.74	1089.74

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



Date: 6.SEP.2023 12:27:53

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

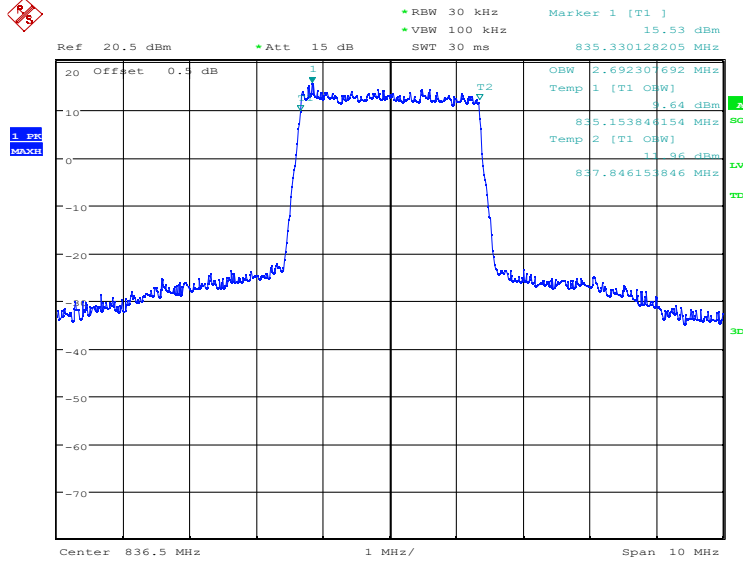


Date: 6.SEP.2023 12:28:33

LTE band 5, 3MHz (99%)

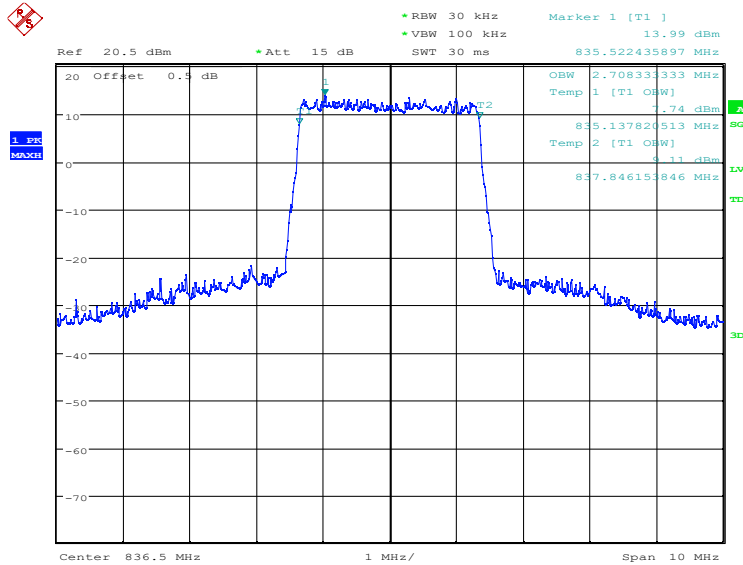
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	2692.31	2708.33

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



Date: 6.SEP.2023 12:29:15

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

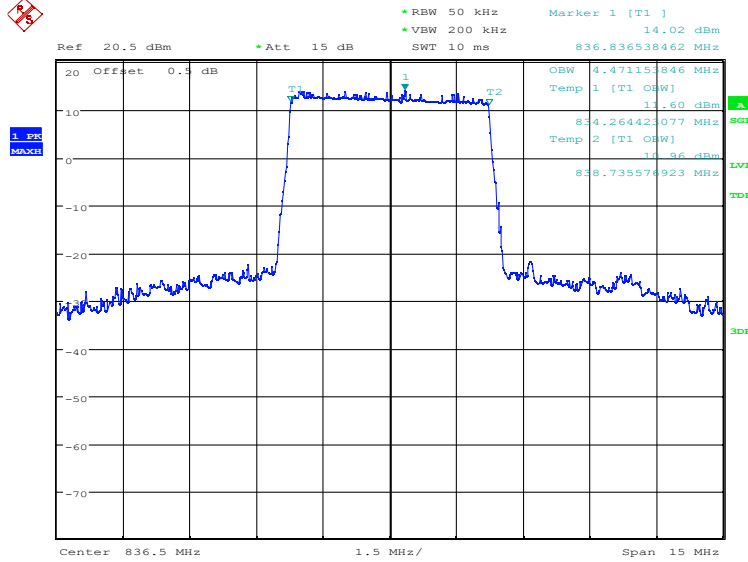


Date: 6.SEP.2023 12:29:56

LTE band 5, 5MHz (99%)

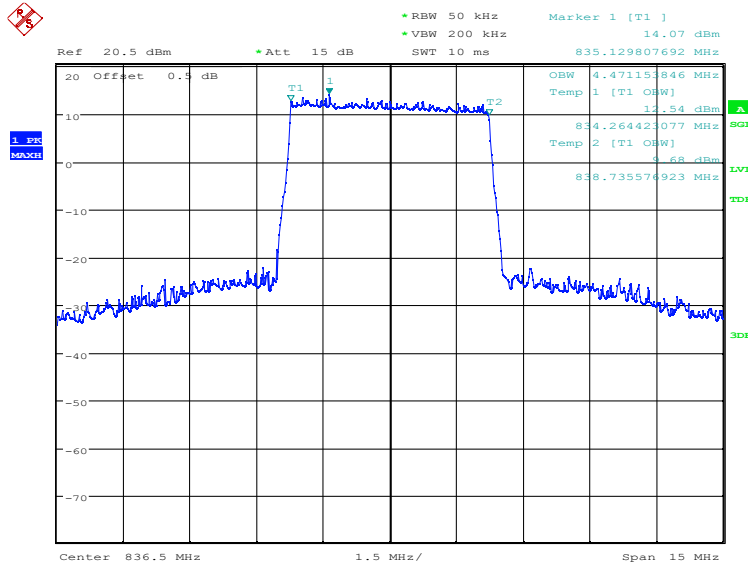
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	4471.15	4471.15

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



Date: 6.SEP.2023 12:30:37

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

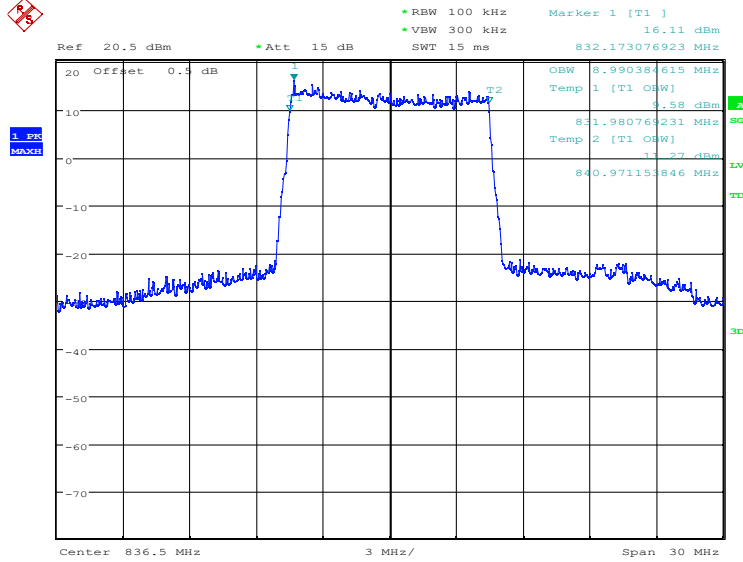


Date: 6.SEP.2023 12:31:18

LTE band 5, 10MHz (99%)

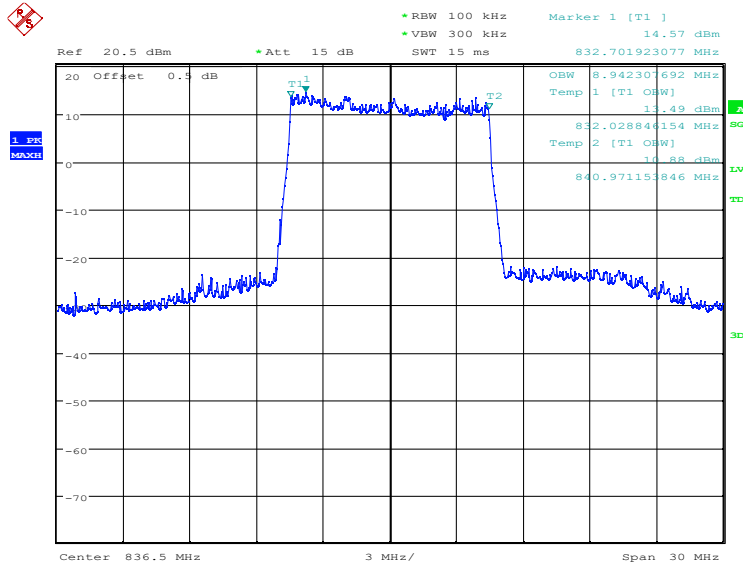
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
836.5	QPSK	16QAM
	8990.38	8942.31

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



Date: 6.SEP.2023 12:32:00

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

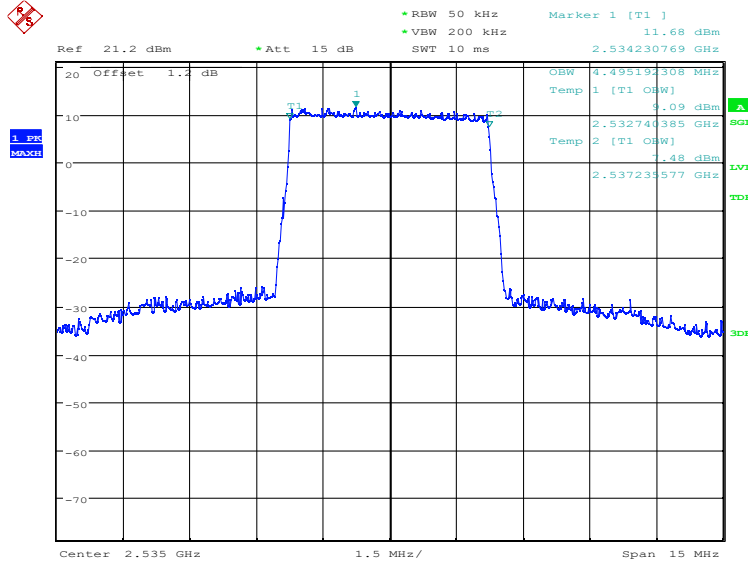


Date: 6.SEP.2023 12:32:40

LTE band 7, 5MHz (99%)

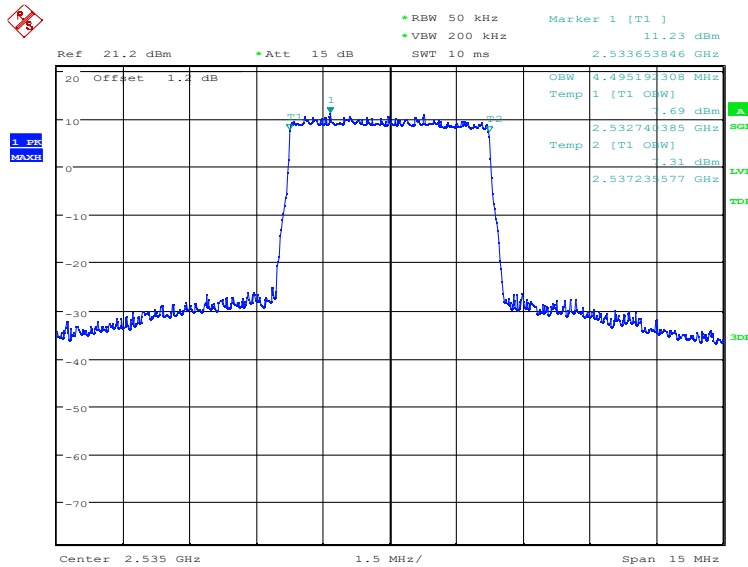
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2535.0	QPSK	16QAM
	4495.19	4495.19

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



Date: 6.SEP.2023 12:33:23

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

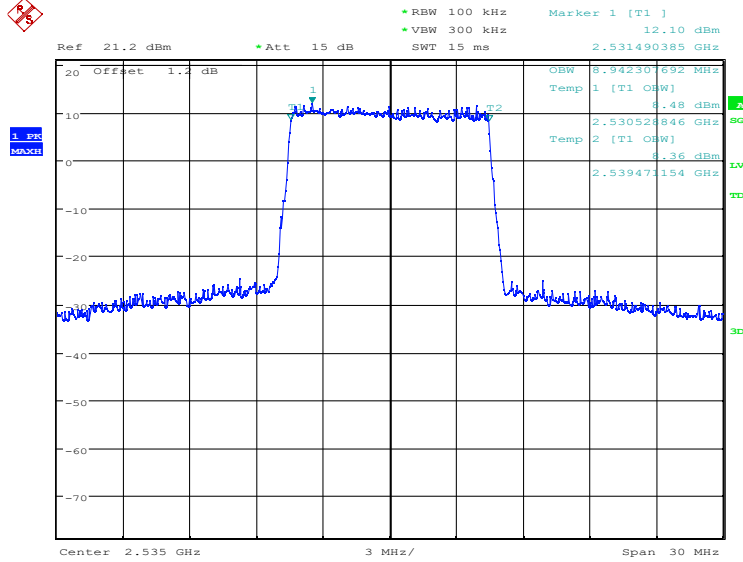


Date: 6.SEP.2023 12:34:04

LTE band 7, 10MHz (99%)

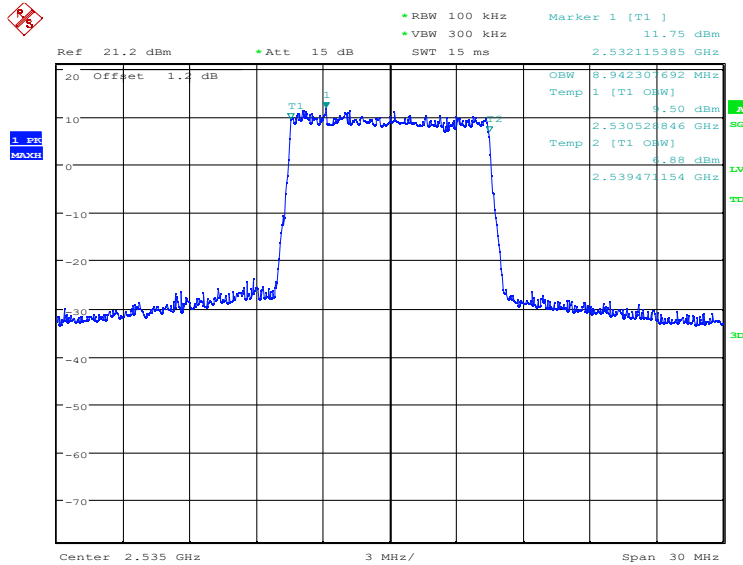
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2535.0	QPSK	16QAM
	8942.31	8942.31

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



Date: 6.SEP.2023 12:34:45

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

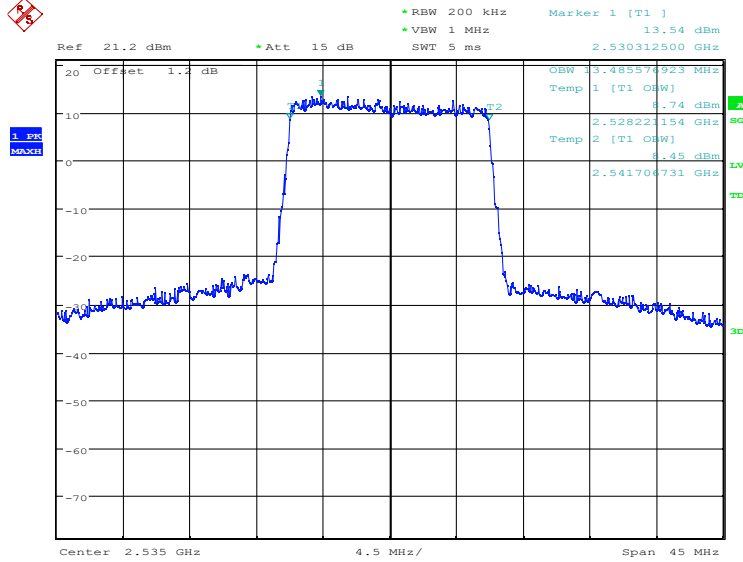


Date: 6.SEP.2023 12:35:26

LTE band 7, 15MHz (99%)

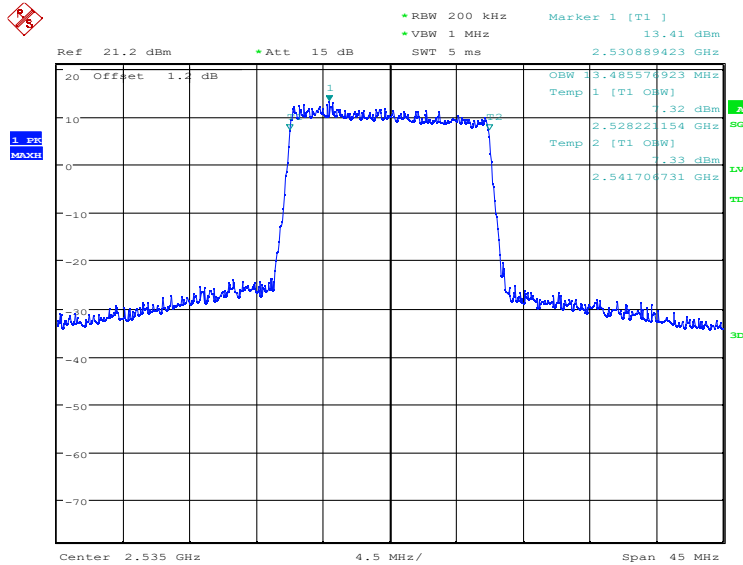
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2535.0	QPSK	16QAM
	13485.58	13485.58

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



Date: 6.SEP.2023 12:37:06

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

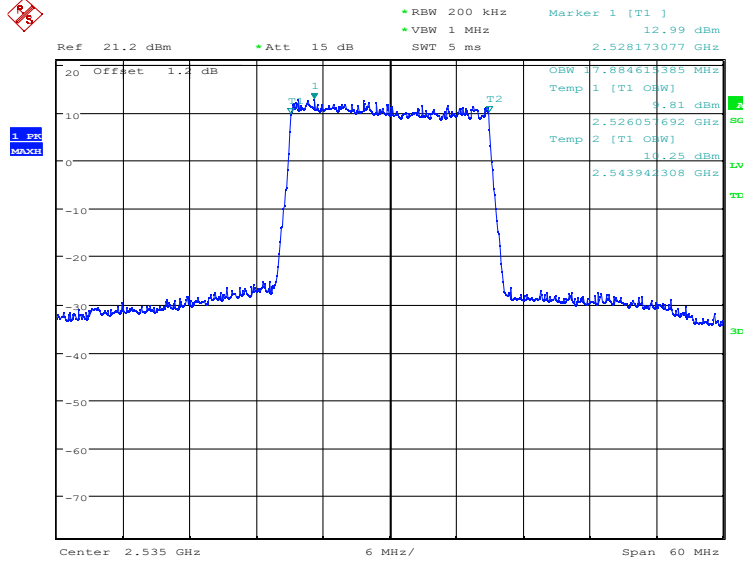


Date: 6.SEP.2023 12:37:46

LTE band 7, 20MHz (99%)

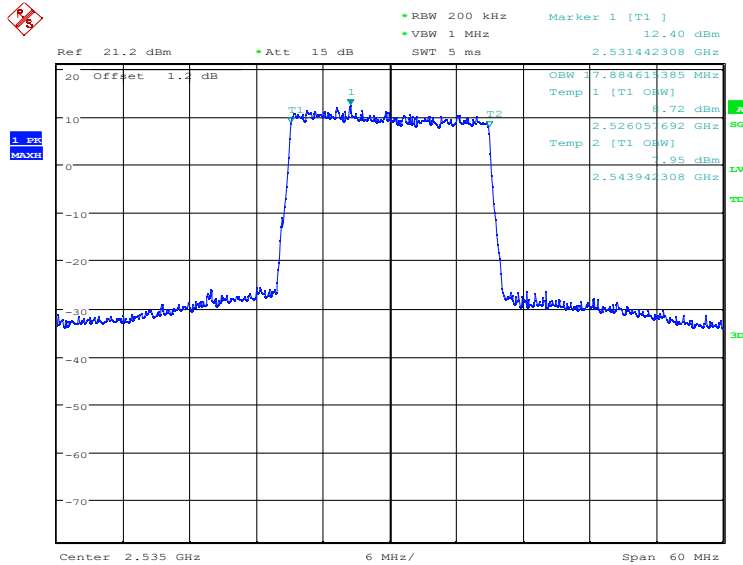
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
2535.0	QPSK	16QAM
	17884.62	17884.62

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



Date: 6.SEP.2023 12:39:29

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

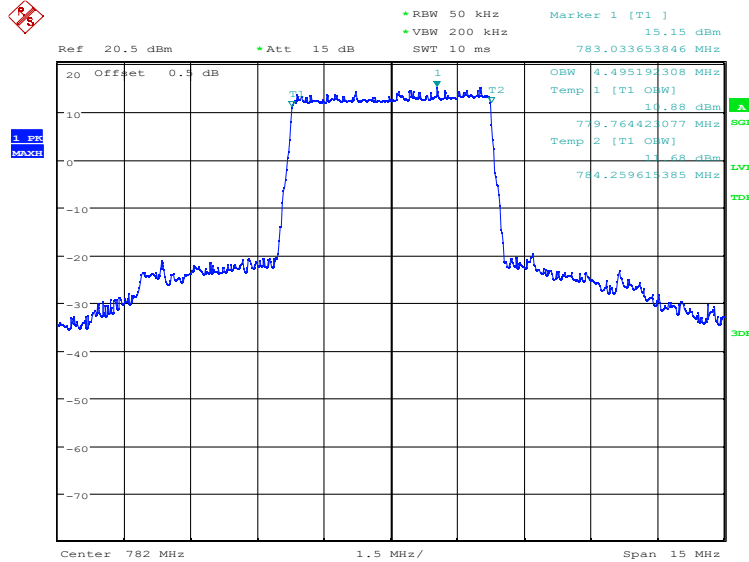


Date: 6.SEP.2023 12:40:09

LTE band 13, 5MHz (99%)

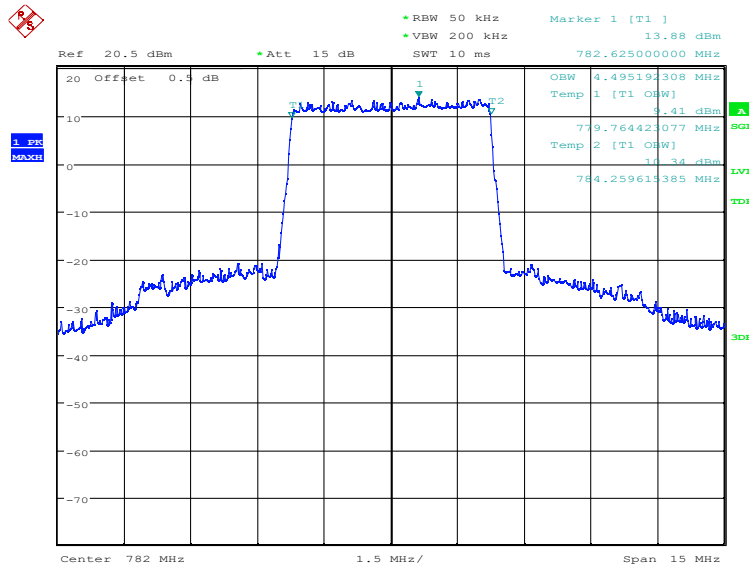
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
782.0	QPSK	16QAM
	4495.19	4495.19

LTE band 13, 5MHz Bandwidth, QPSK (99% BW)



Date: 6.SEP.2023 12:41:48

LTE band 13, 5MHz Bandwidth, 16QAM (99% BW)

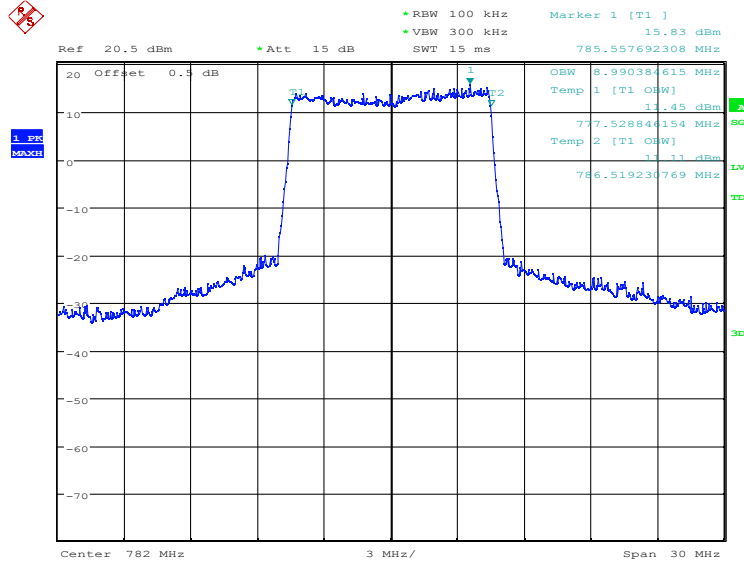


Date: 6.SEP.2023 12:42:28

LTE band 13, 10MHz (99%)

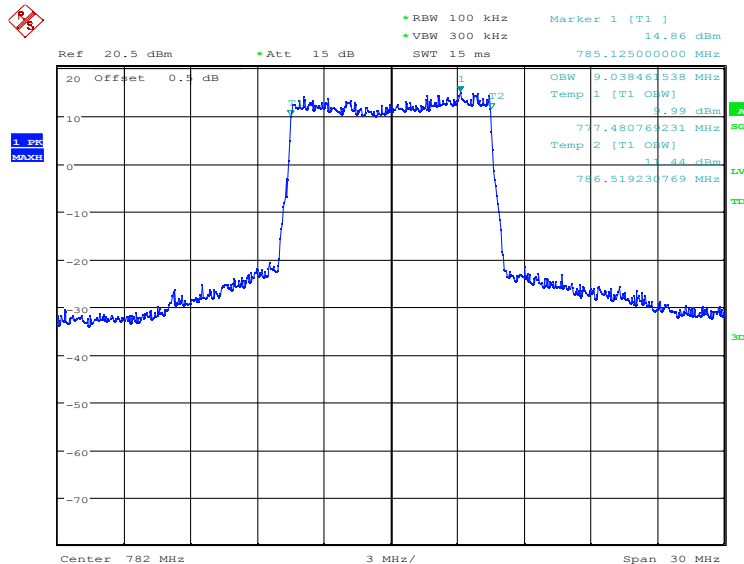
Frequency(MHz)	Occupied Bandwidth (99%)(kHz)	
782.0	QPSK	16QAM
	8990.38	9038.46

LTE band 13, 10MHz Bandwidth, QPSK (99% BW)



Date: 6.SEP.2023 12:43:10

LTE band 13, 10MHz Bandwidth,16QAM (99% BW)



Date: 6.SEP.2023 12:43:50

Note: Expanded measurement uncertainty is $U = 3428 \text{ Hz}$, $k = 2$.

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.

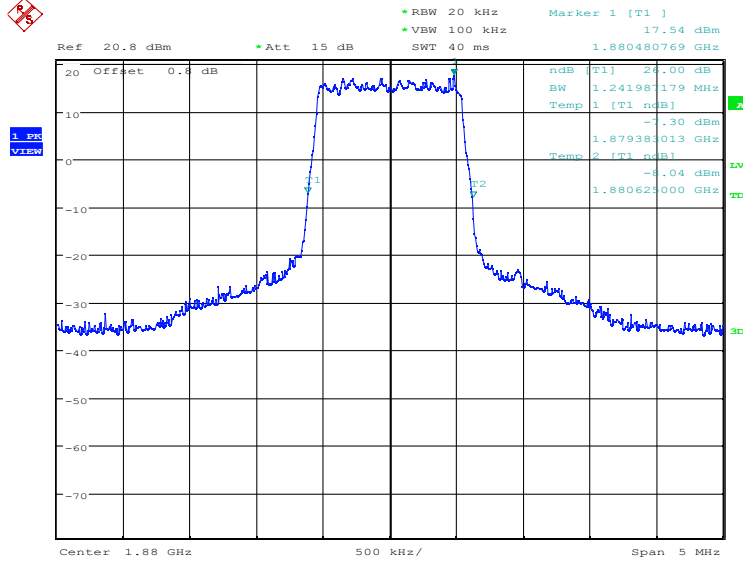
The measurement method is from ANSI C63.26:

- 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 $\geq 3 \times \text{RBW}$.
- 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)

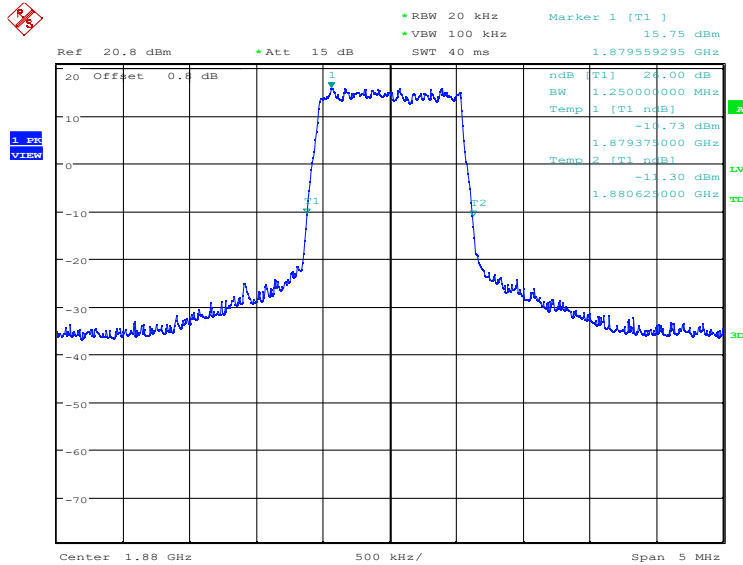
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1880.0	QPSK
	1241.99	1250.00

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



Date: 6.SEP.2023 13:16:33

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

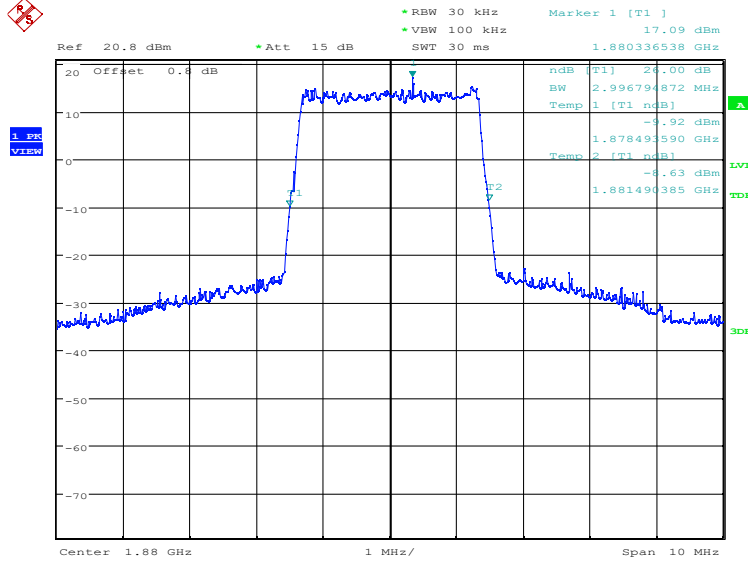


Date: 6.SEP.2023 13:17:14

LTE band 2, 3MHz (-26dBc)

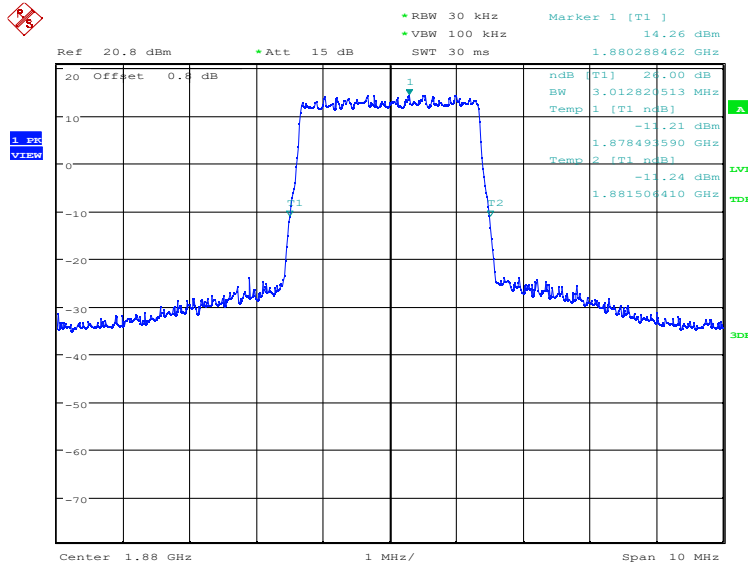
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1880.0	QPSK
	2996.79	3012.82

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



Date: 6.SEP.2023 13:17:56

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

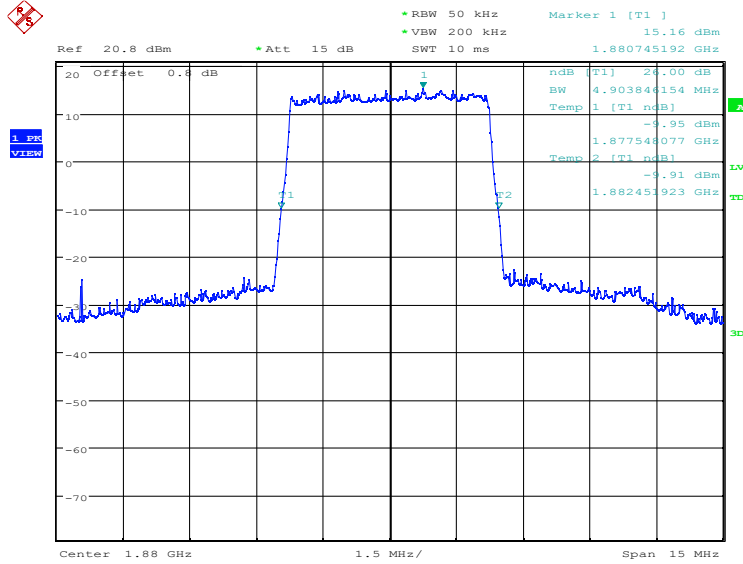


Date: 6.SEP.2023 13:18:38

LTE band 2, 5MHz (-26dBc)

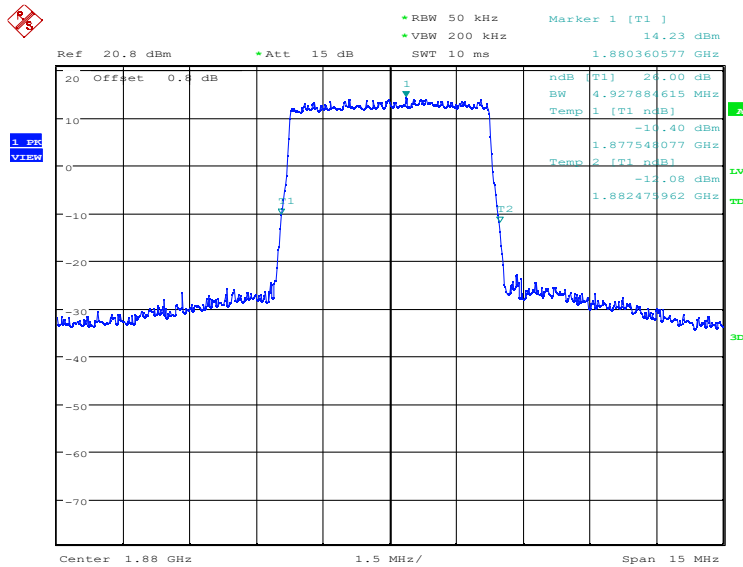
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1880.0	QPSK	16QAM
	4903.85	4927.88

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



Date: 6.SEP.2023 13:19:20

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

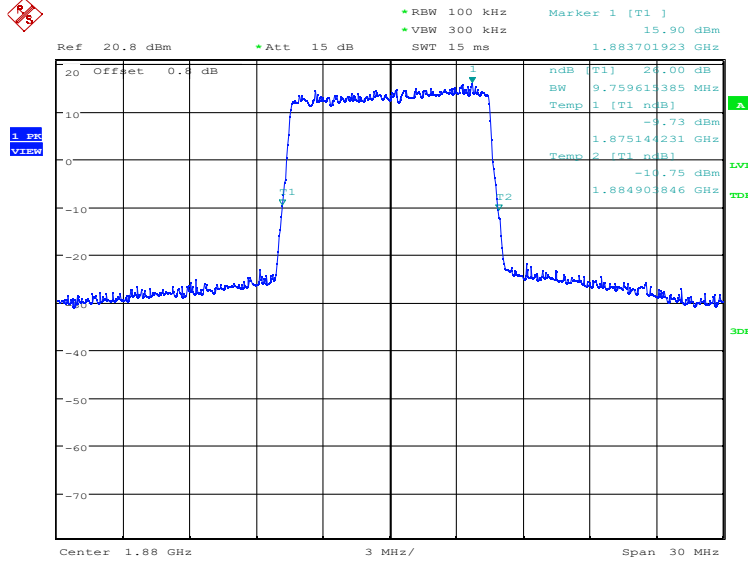


Date: 6.SEP.2023 13:20:01

LTE band 2, 10MHz (-26dBc)

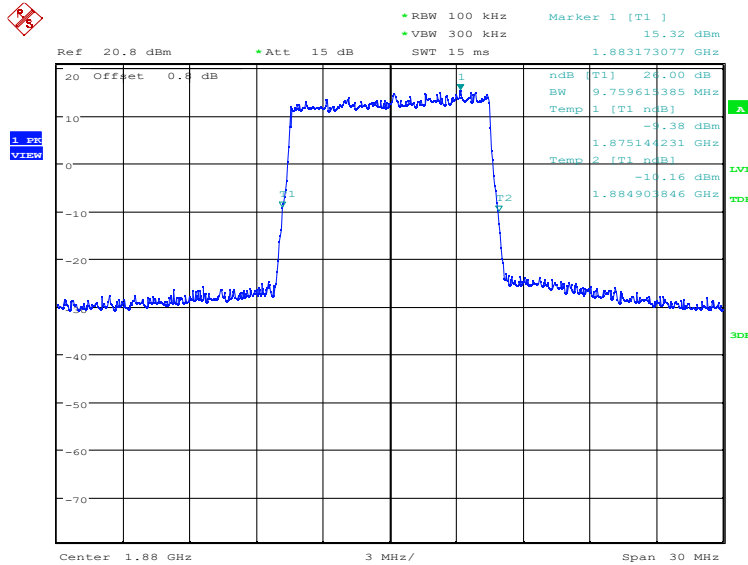
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1880.0	QPSK
	9759.62	9759.62

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



Date: 6.SEP.2023 13:20:43

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

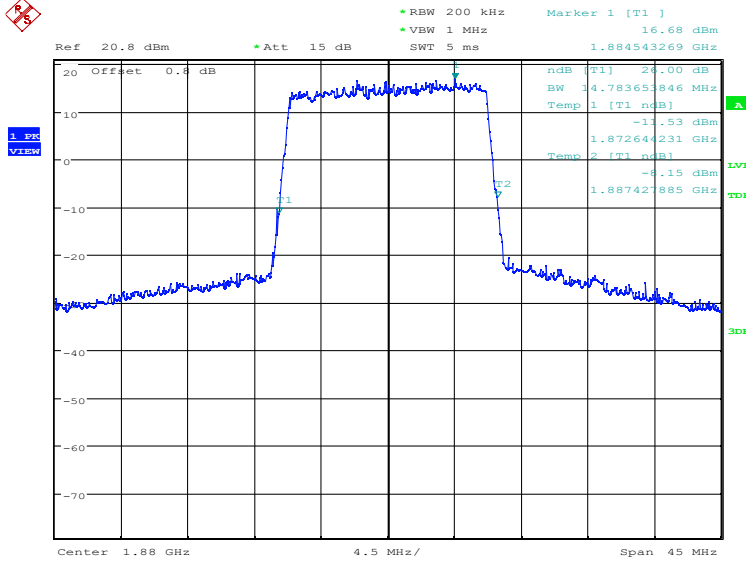


Date: 6.SEP.2023 13:21:24

LTE band 2, 15MHz (-26dBc)

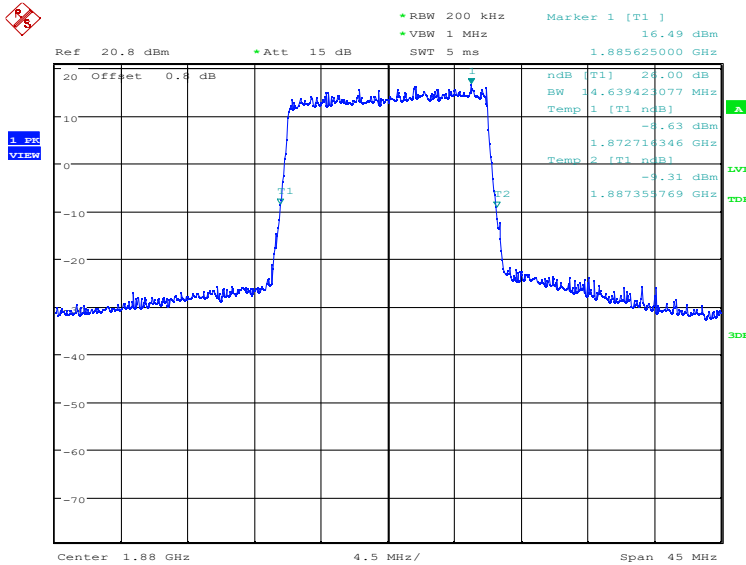
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1880.0	QPSK
	14783.65	14639.42

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



Date: 6.SEP.2023 13:22:06

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

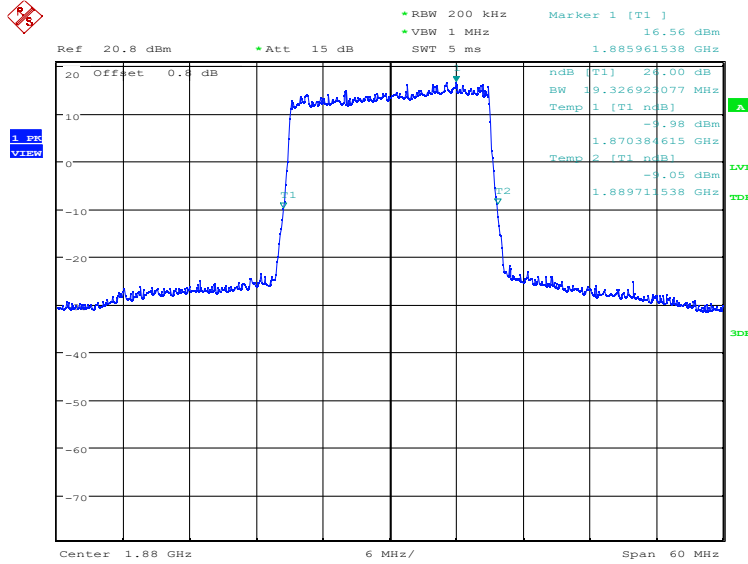


Date: 6.SEP.2023 13:22:47

LTE band 2, 20MHz (-26dBc)

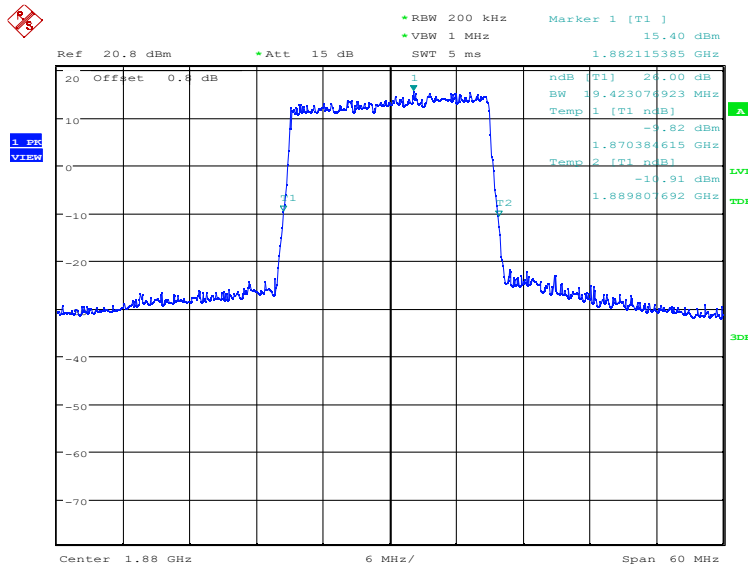
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1880.0	QPSK
	19326.92	19423.08

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



Date: 6.SEP.2023 13:24:25

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

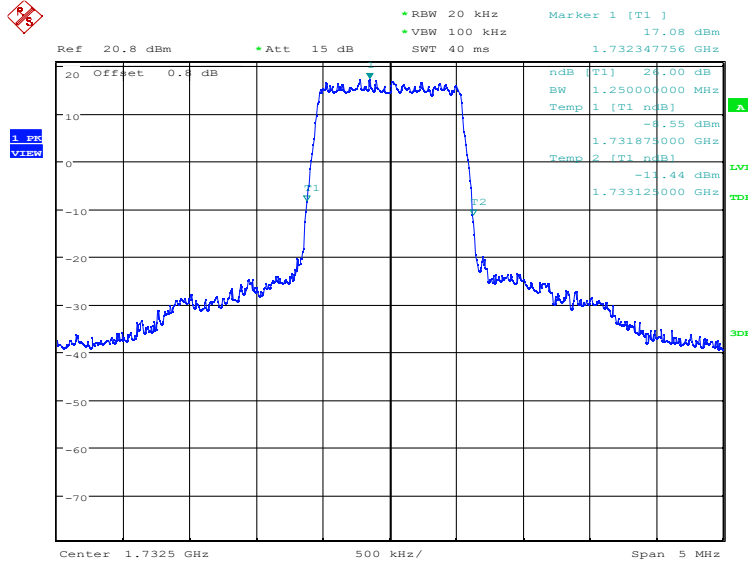


Date: 6.SEP.2023 13:25:05

LTE band 4, 1.4MHz (-26dBc)

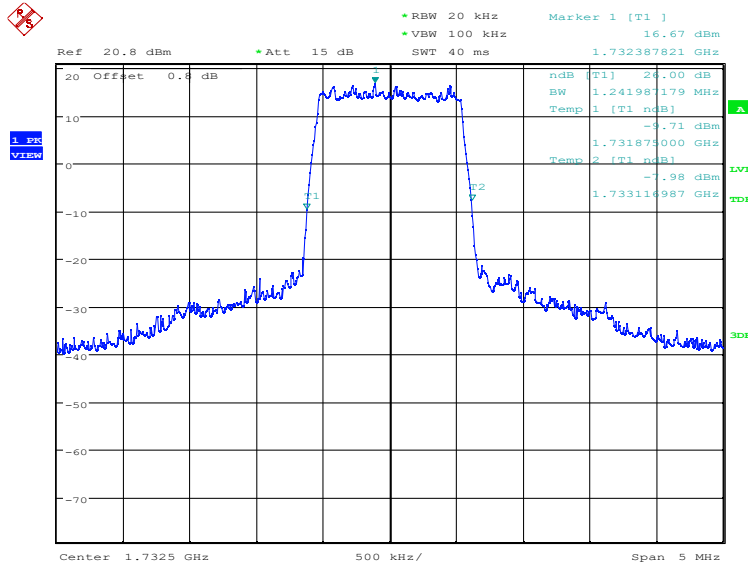
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1732.5	QPSK
	1250.00	1241.99

LTE band 4, 1.4MHz Bandwidth, QPSK (-26dBc BW)



Date: 6.SEP.2023 13:26:44

LTE band 4, 1.4MHz Bandwidth, 16QAM (-26dBc BW)

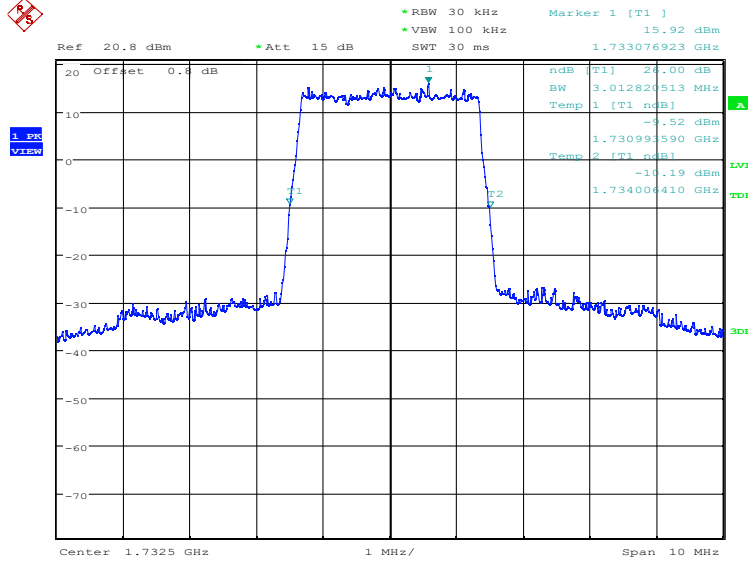


Date: 6.SEP.2023 13:27:25

LTE band 4, 3MHz (-26dBc)

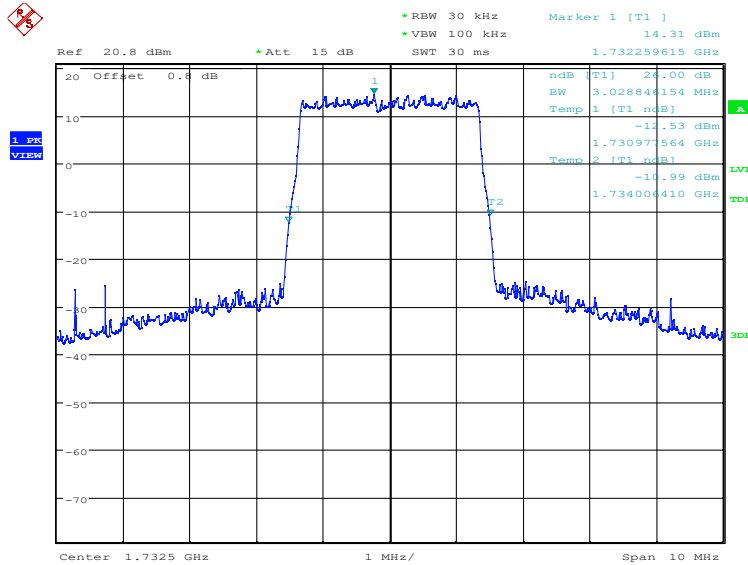
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1732.5	QPSK
	3012.82	3028.85

LTE band 4, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 6.SEP.2023 13:28:07

LTE band 4, 3MHz Bandwidth, 16QAM (-26dBc BW)

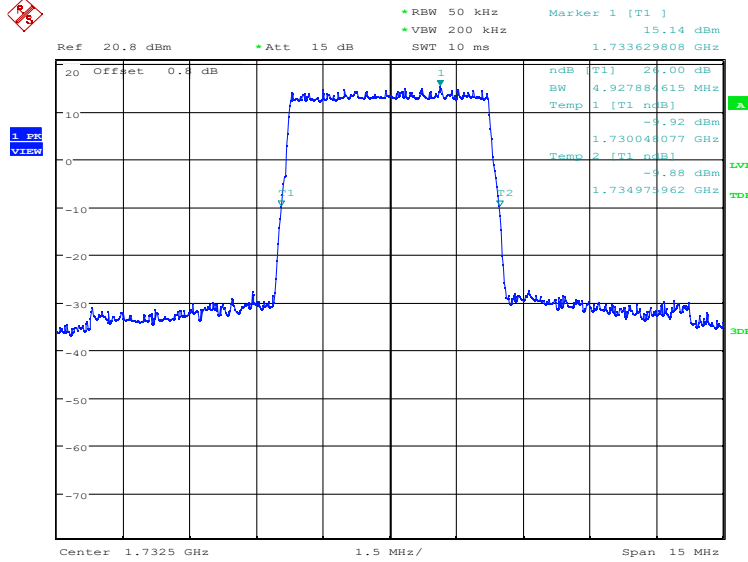


Date: 6.SEP.2023 13:28:48

LTE band 4, 5MHz (-26dBc)

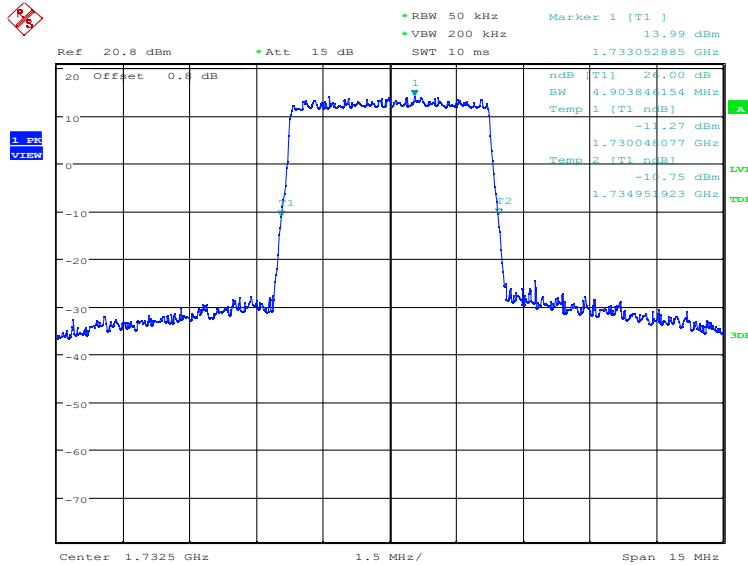
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	4927.88	4903.85

LTE band 4, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 6.SEP.2023 13:29:30

LTE band 4, 5MHz Bandwidth, 16QAM (-26dBc BW)

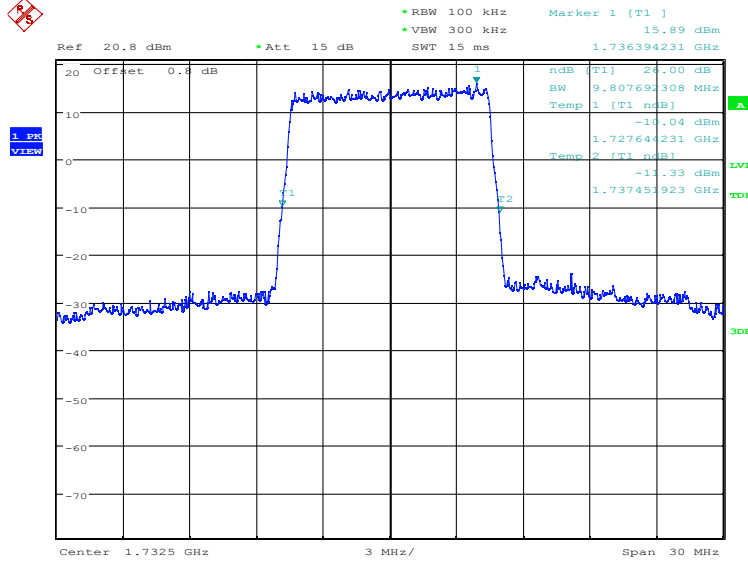


Date: 6.SEP.2023 13:30:11

LTE band 4, 10MHz (-26dBc)

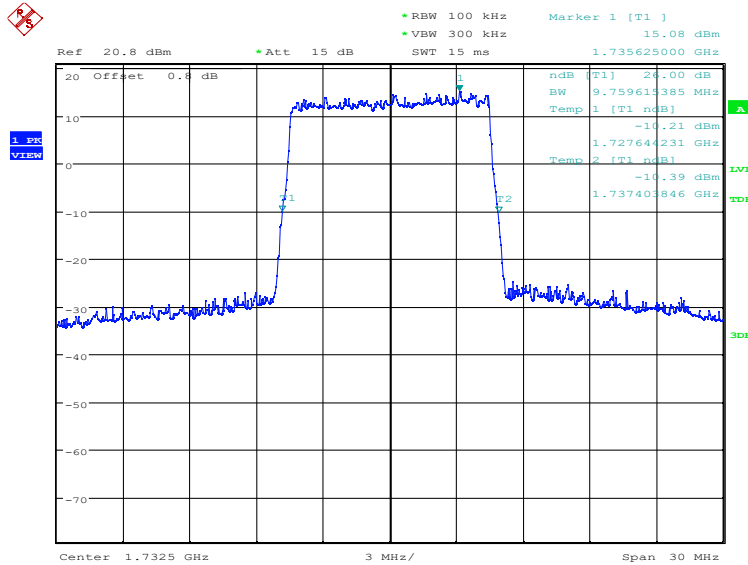
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	9807.69	9759.62

LTE band 4, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 6.SEP.2023 13:30:53

LTE band 4, 10MHz Bandwidth, 16QAM (-26dBc BW)

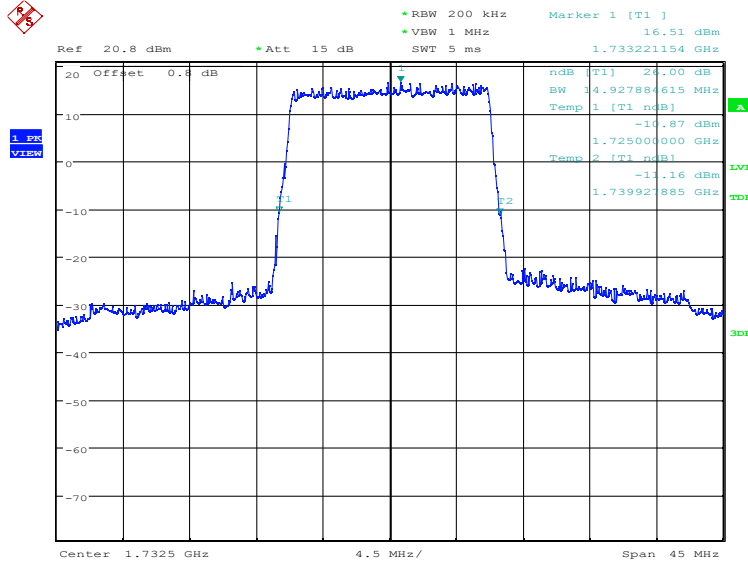


Date: 6.SEP.2023 13:31:34

LTE band 4, 15MHz (-26dBc)

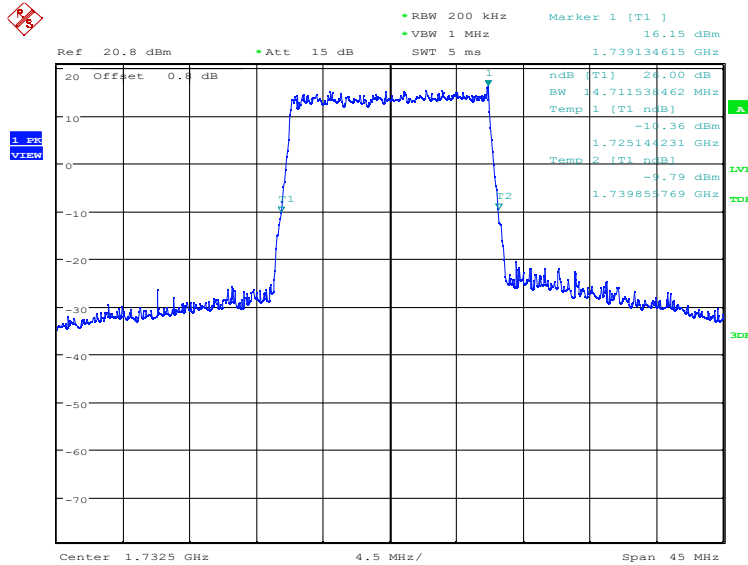
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	1732.5	QPSK
	14927.88	14711.54

LTE band 4, 15MHz Bandwidth, QPSK (-26dBc BW)



Date: 6.SEP.2023 13:33:14

LTE band 4, 15MHz Bandwidth, 16QAM (-26dBc BW)

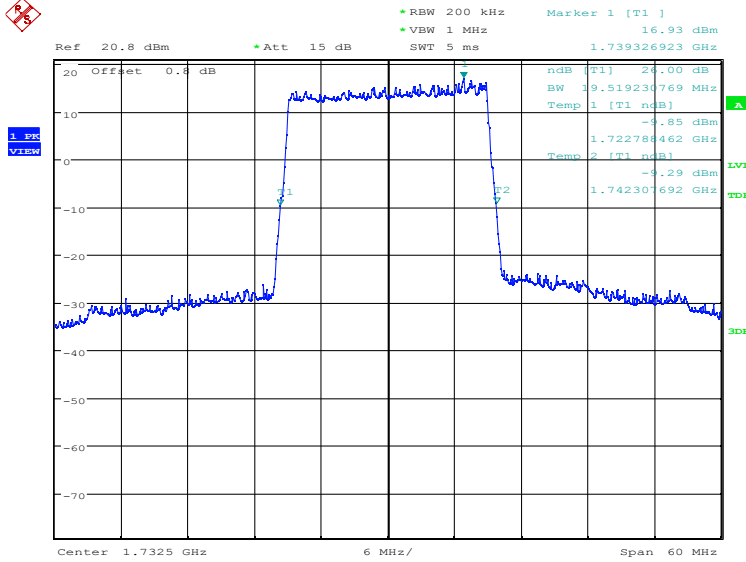


Date: 6.SEP.2023 13:33:55

LTE band 4, 20MHz (-26dBc)

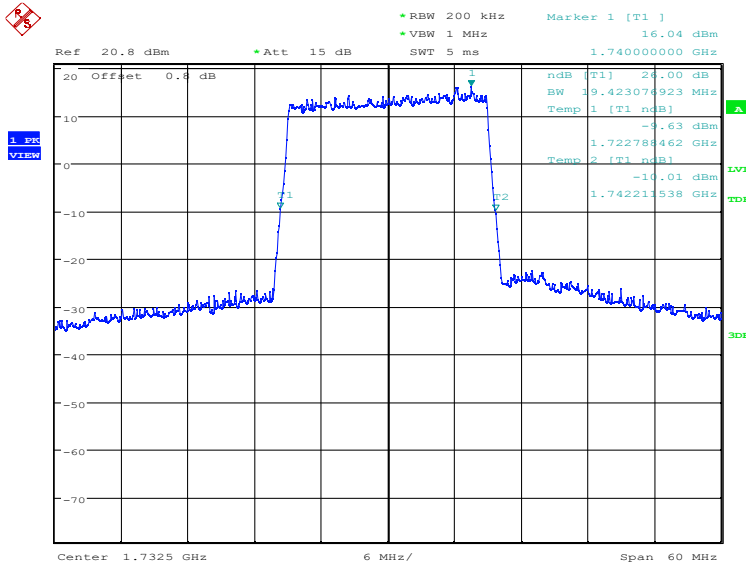
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
1732.5	QPSK	16QAM
	19519.23	19423.08

LTE band 4, 20MHz Bandwidth, QPSK (-26dBc BW)



Date: 6.SEP.2023 13:35:38

LTE band 4, 20MHz Bandwidth, 16QAM (-26dBc BW)

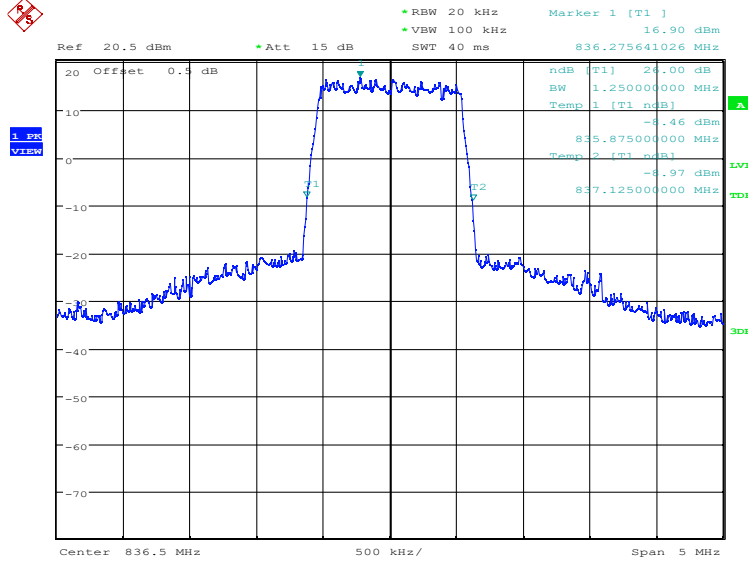


Date: 6.SEP.2023 13:36:18

LTE band 5, 1.4MHz (-26dBc)

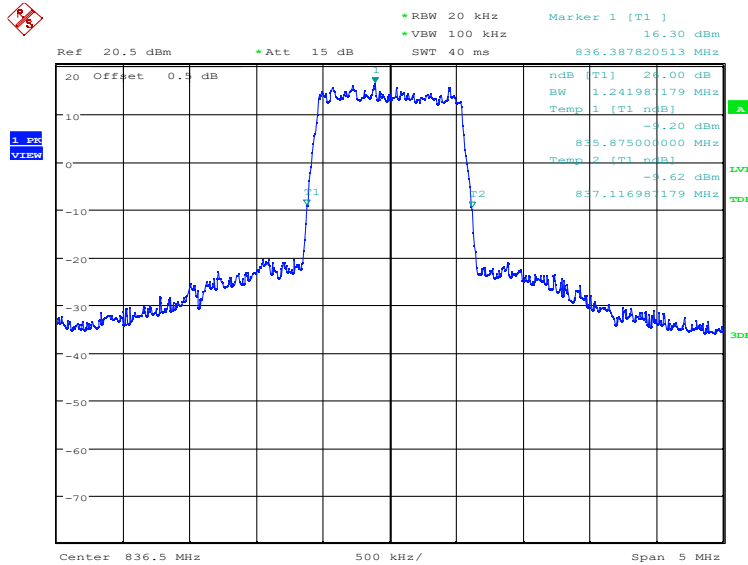
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	836.5	QPSK
	1250.00	1241.99

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



Date: 6.SEP.2023 13:37:57

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

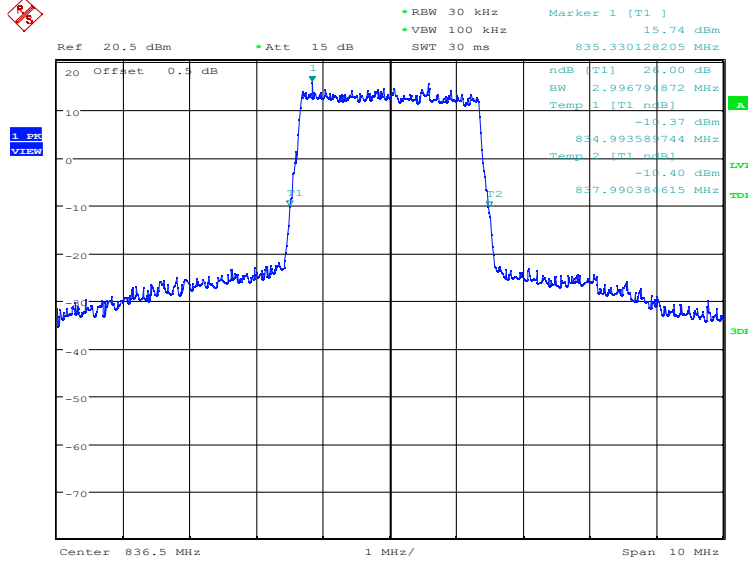


Date: 6.SEP.2023 13:38:38

LTE band 5, 3MHz (-26dBc)

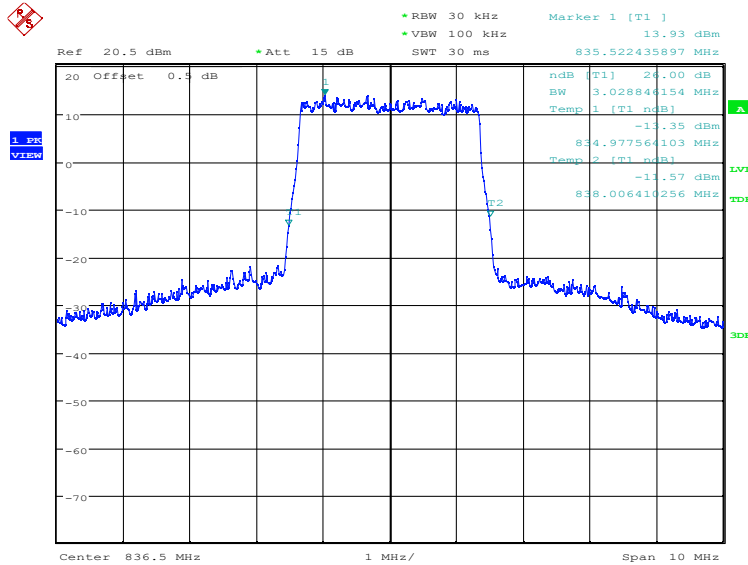
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	836.5	QPSK
	2996.79	3028.85

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



Date: 6.SEP.2023 13:39:20

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

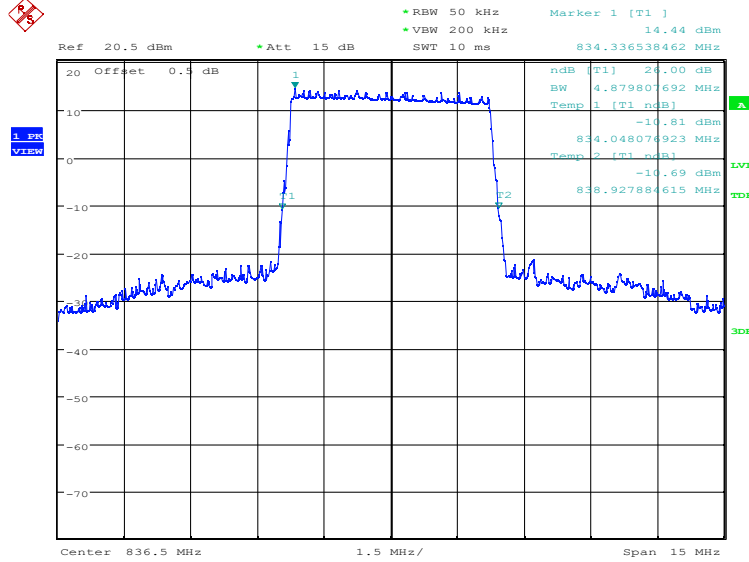


Date: 6.SEP.2023 13:40:01

LTE band 5, 5MHz (-26dBc)

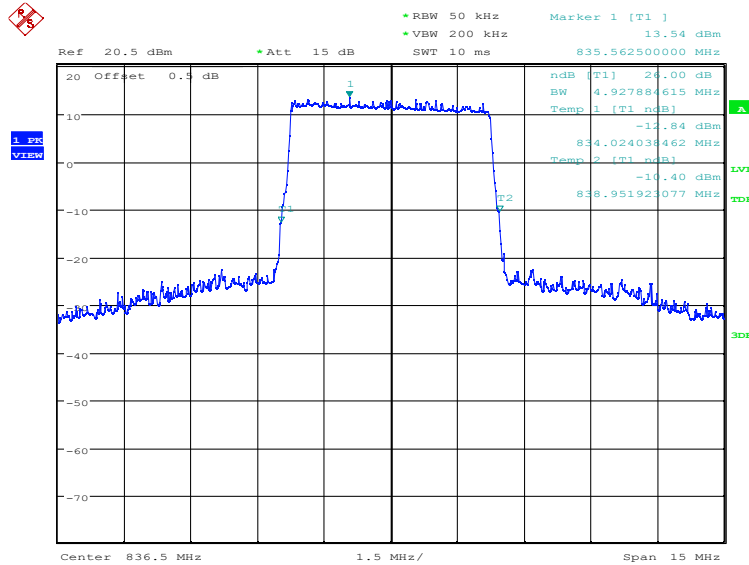
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	836.5	QPSK
4879.81		4927.88

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



Date: 6.SEP.2023 13:40:44

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

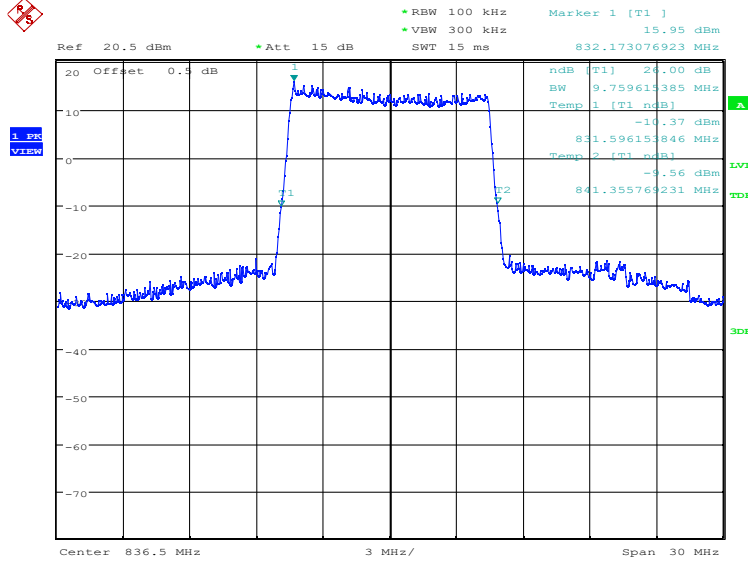


Date: 6.SEP.2023 13:41:25

LTE band 5, 10MHz (-26dBc)

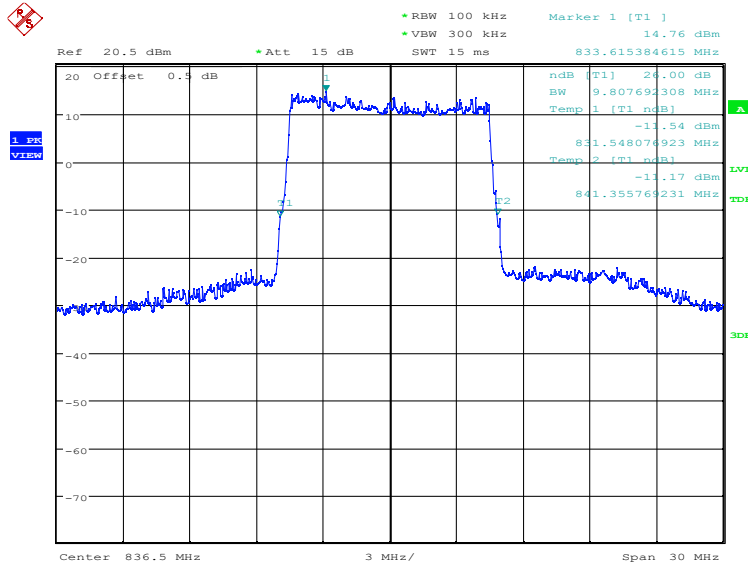
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
836.5	QPSK	16QAM
	9759.62	9807.69

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



Date: 6.SEP.2023 13:42:07

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

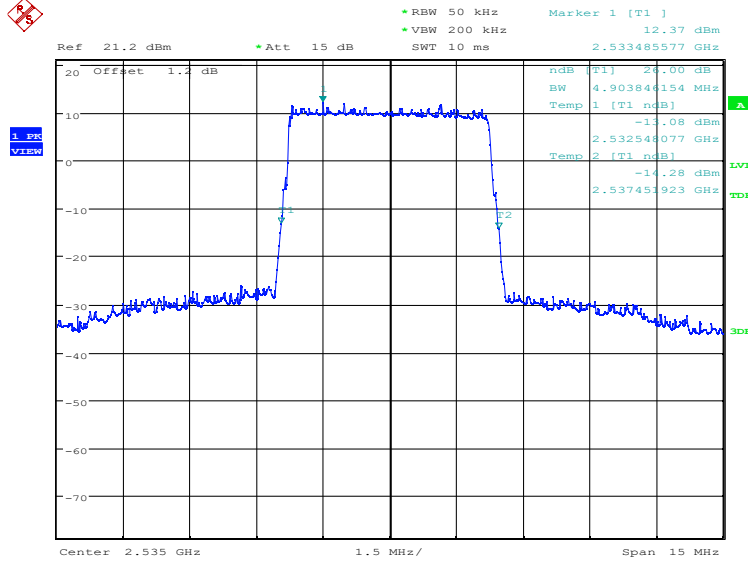


Date: 6.SEP.2023 13:42:48

LTE band 7, 5MHz (-26dBc)

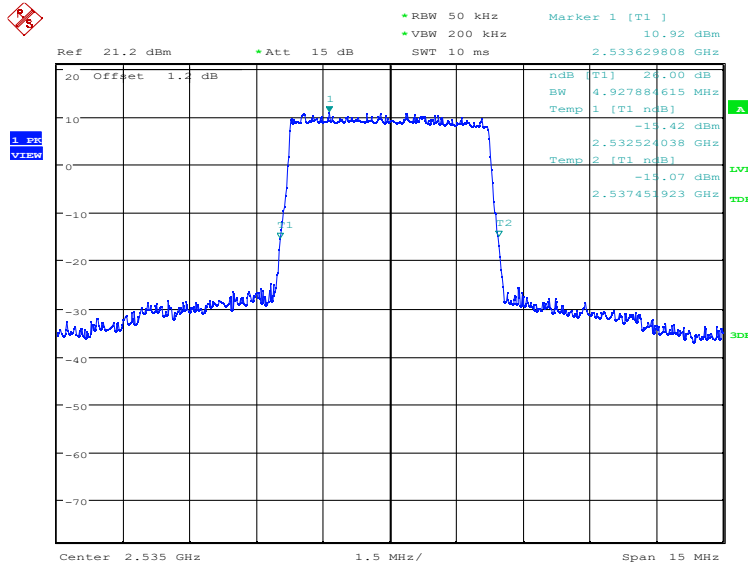
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
2535.0	QPSK	16QAM
	4903.85	4927.88

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



Date: 6.SEP.2023 13:43:32

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

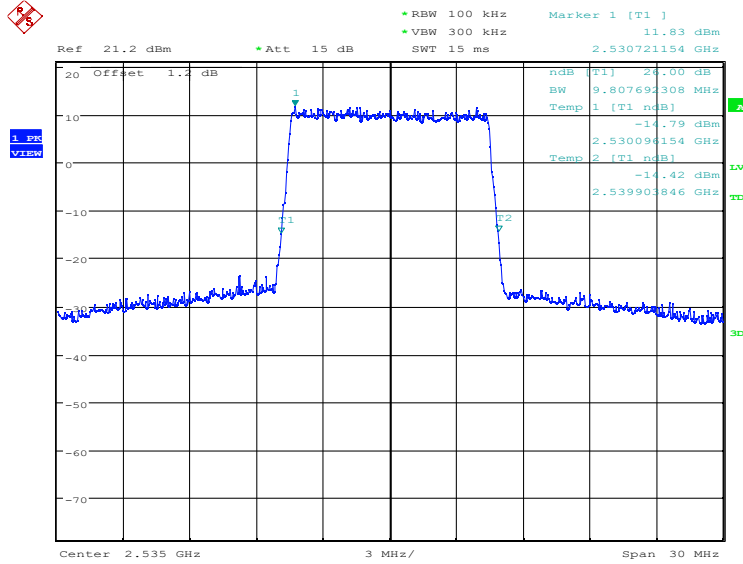


Date: 6.SEP.2023 13:44:12

LTE band 7, 10MHz (-26dBc)

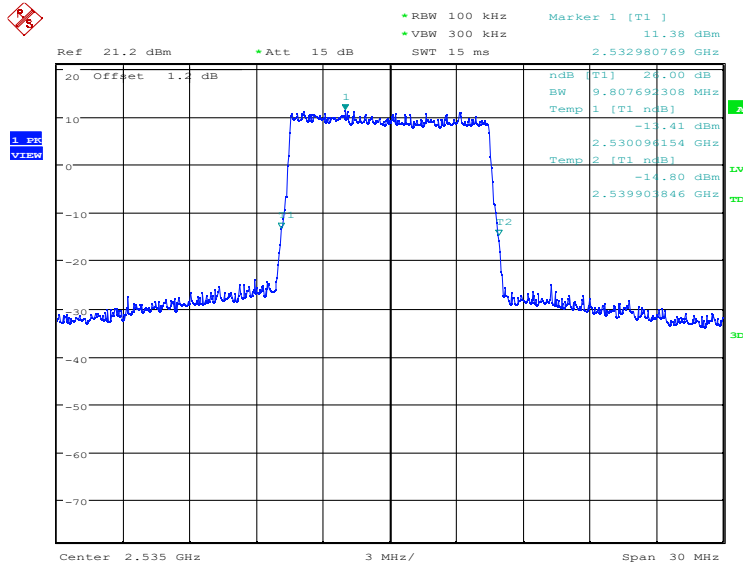
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	2535.0	QPSK
	9807.69	9807.69

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



Date: 6.SEP.2023 13:44:55

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

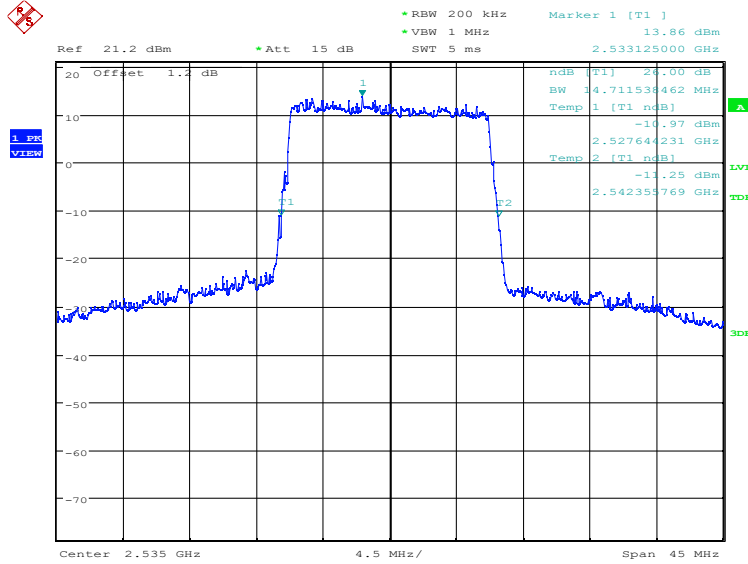


Date: 6.SEP.2023 13:45:36

LTE band 7, 15MHz (-26dBc)

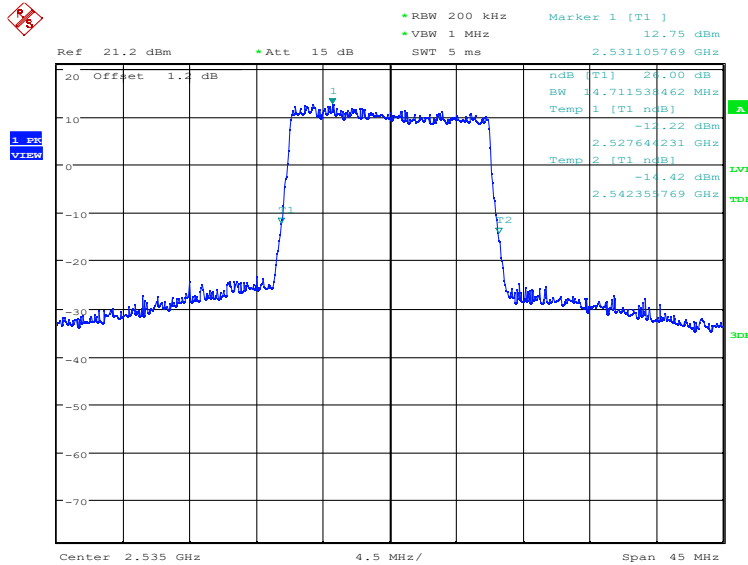
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	2535.0	QPSK
	14711.54	14711.54

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



Date: 6.SEP.2023 13:47:16

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

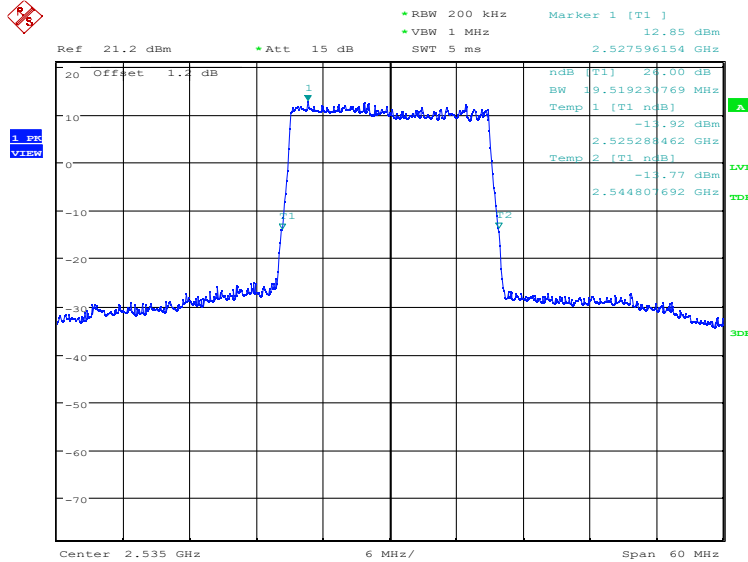


Date: 6.SEP.2023 13:47:57

LTE band 7, 20MHz (-26dBc)

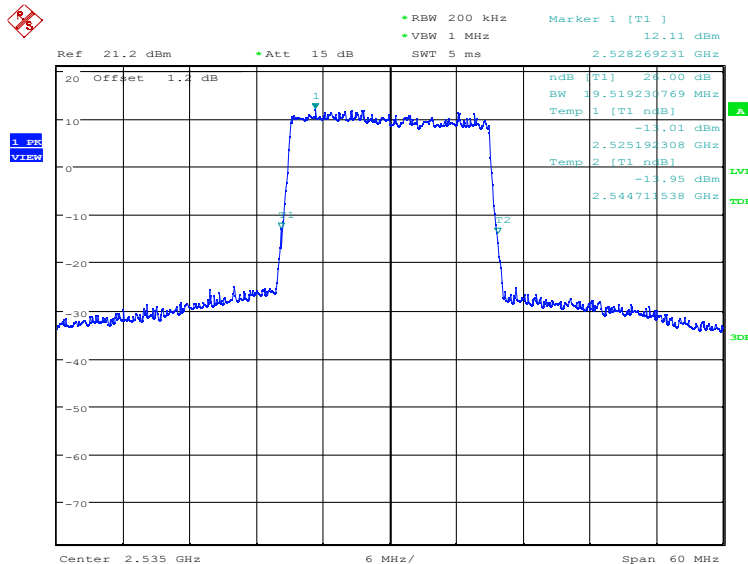
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
2535.0	QPSK	16QAM
	19519.23	19519.23

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



Date: 6.SEP.2023 13:49:39

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

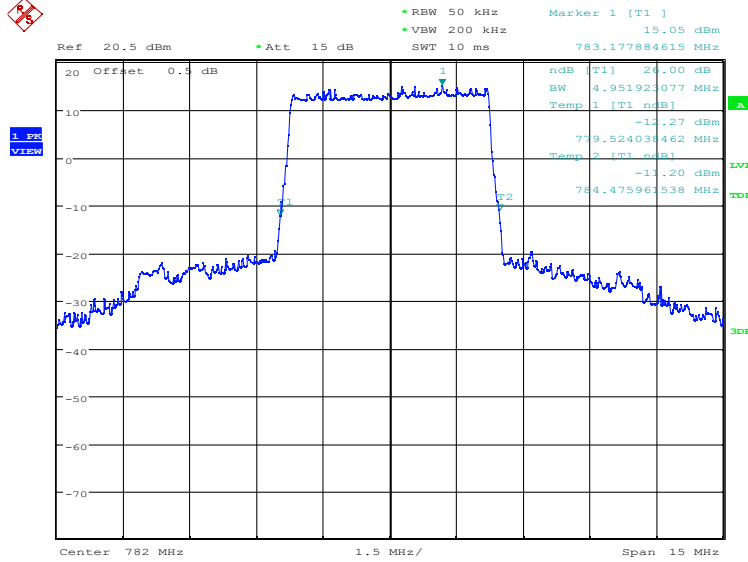


Date: 6.SEP.2023 13:50:20

LTE band 13, 5MHz (-26dBc)

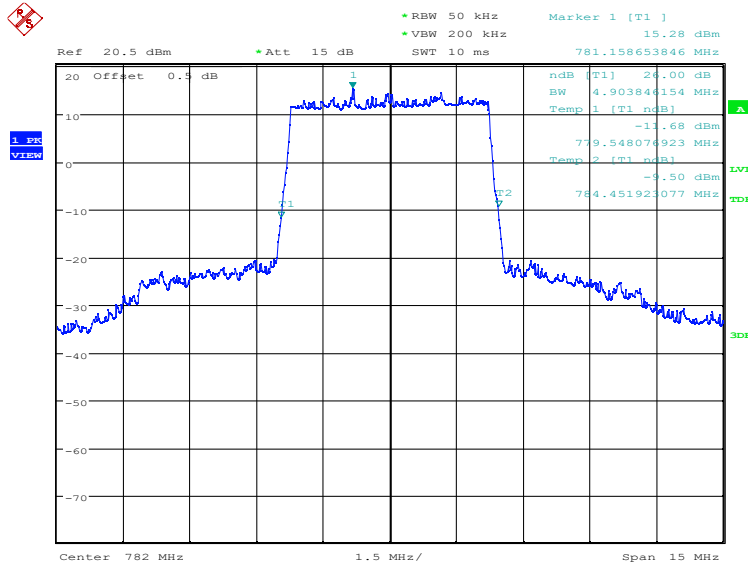
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
782.0	QPSK	16QAM
	4951.92	4903.85

LTE band 13, 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 6.SEP.2023 13:51:59

LTE band 13, 5MHz Bandwidth, 16QAM (-26dBc BW)

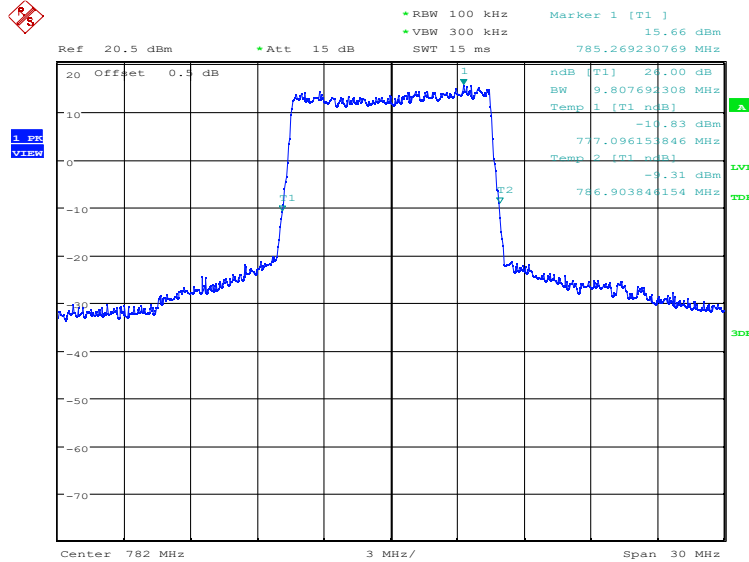


Date: 6.SEP.2023 13:52:40

LTE band 13, 10MHz (-26dBc)

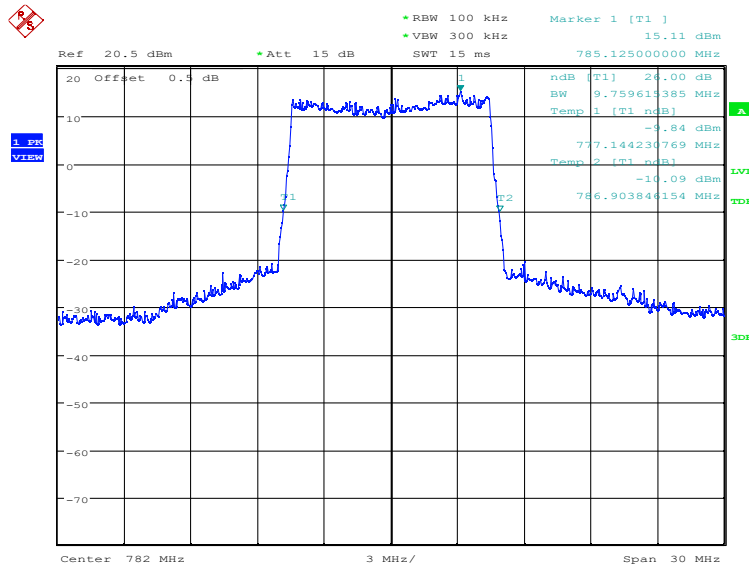
Frequency(MHz)	Emission Bandwidth (-26dBc)(kHz)	
	782.0	QPSK
	9807.69	9759.62

LTE band 13, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 6.SEP.2023 13:53:23

LTE band 13, 10MHz Bandwidth,16QAM (-26dBc BW)



Date: 6.SEP.2023 13:54:03

Note: Expanded measurement uncertainty is $U = 3428 \text{ Hz}$, $k = 2$.

A.6 Band Edge Compliance

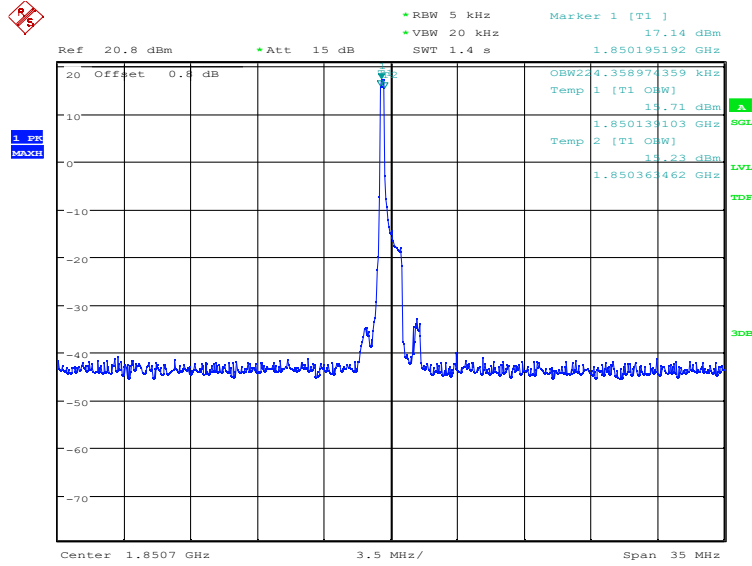
A.6.1 Measurement limit

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.

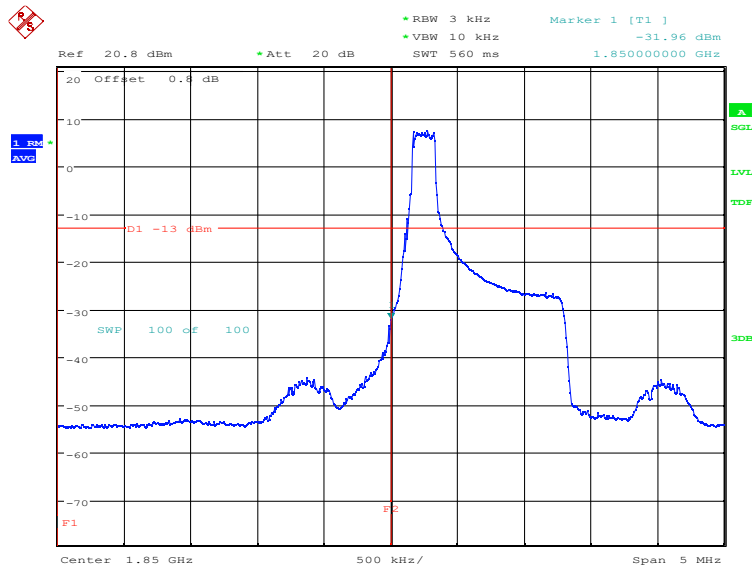
Part 27.53(c) states for operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB; (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB; (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.

A.6.2 Measurement result
Only the worst case result is given below
LTE band 2
OBW: 1RB-low_offset



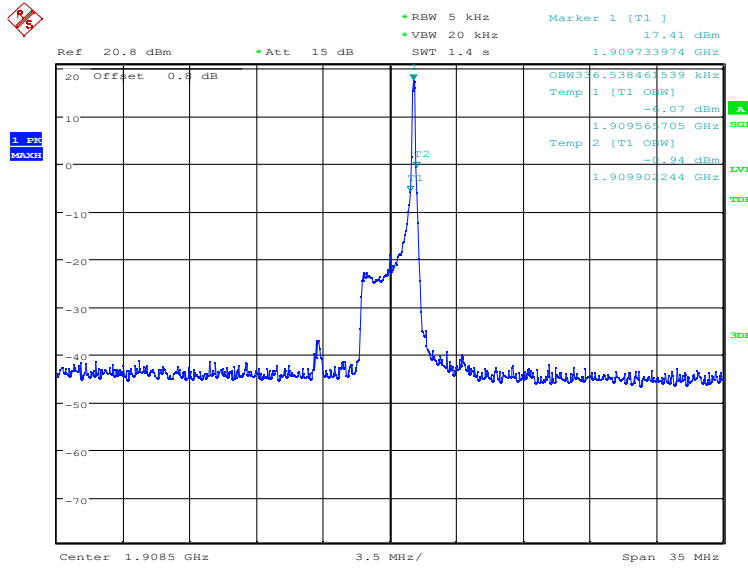
Date: 7.SEP.2023 08:57:49

LOW BAND EDGE BLOCK-1RB-low_offset



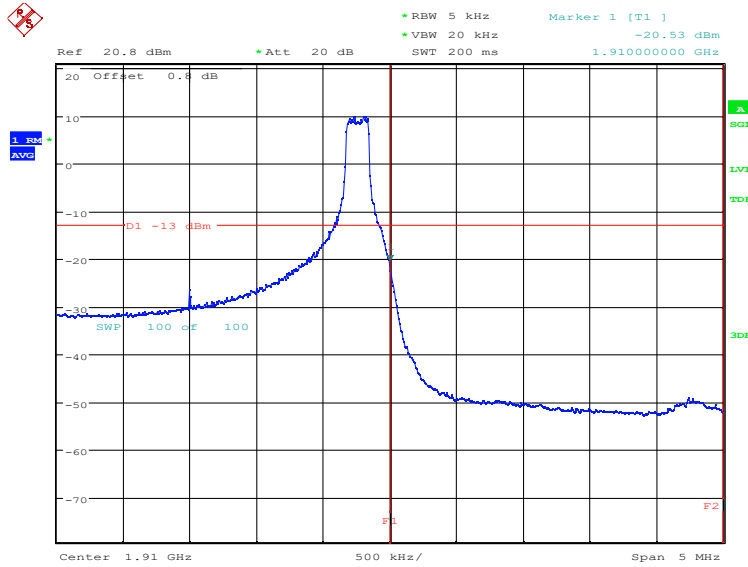
Date: 7.SEP.2023 08:59:04

OBW: 1RB-high_offset



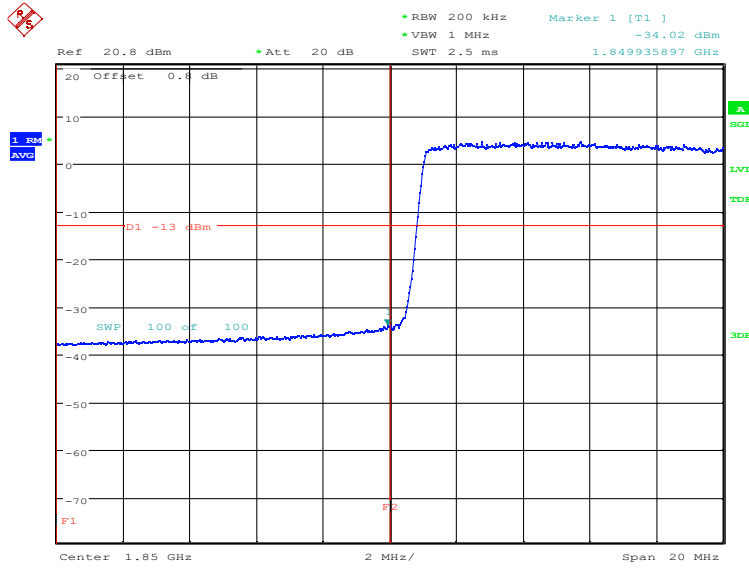
Date: 7.SEP.2023 09:03:46

HIGH BAND EDGE BLOCK-1RB-high_offset



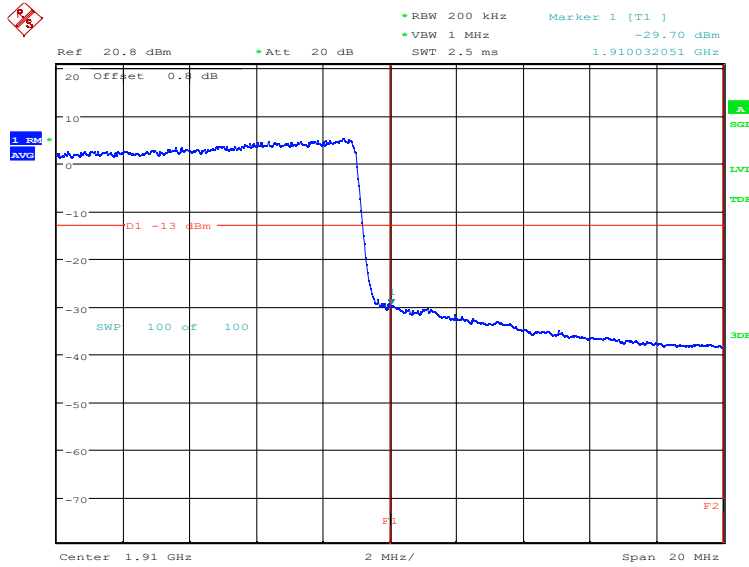
Date: 7.SEP.2023 09:05:01

LOW BAND EDGE BLOCK-20MHz-100%RB



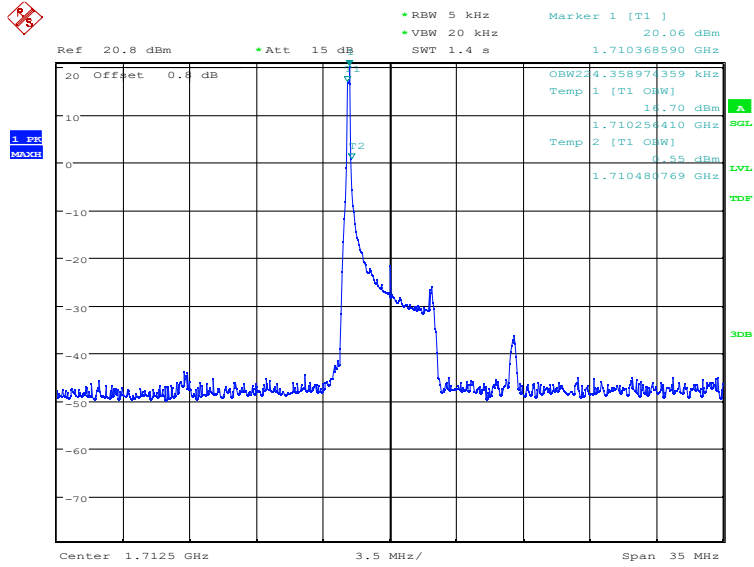
Date: 6.SEP.2023 14:03:04

HIGH BAND EDGE BLOCK-20MHz-100%RB



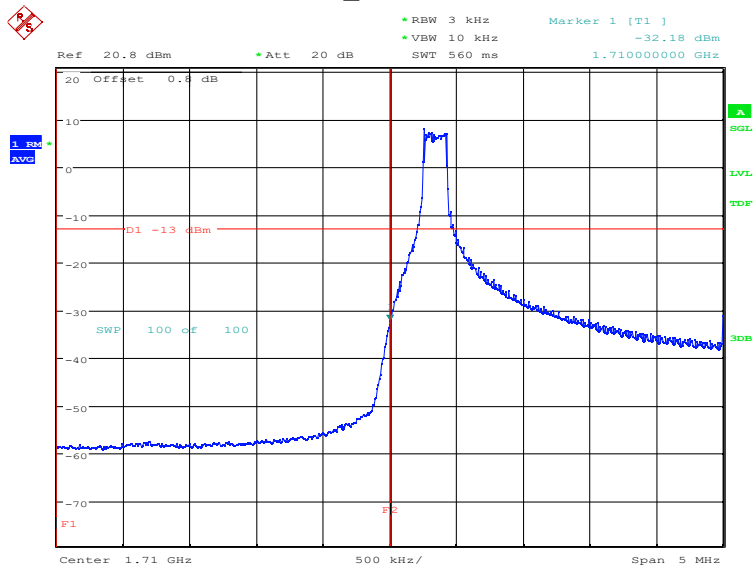
Date: 6.SEP.2023 14:04:37

LTE band 4
OBW: 1RB-low_offset



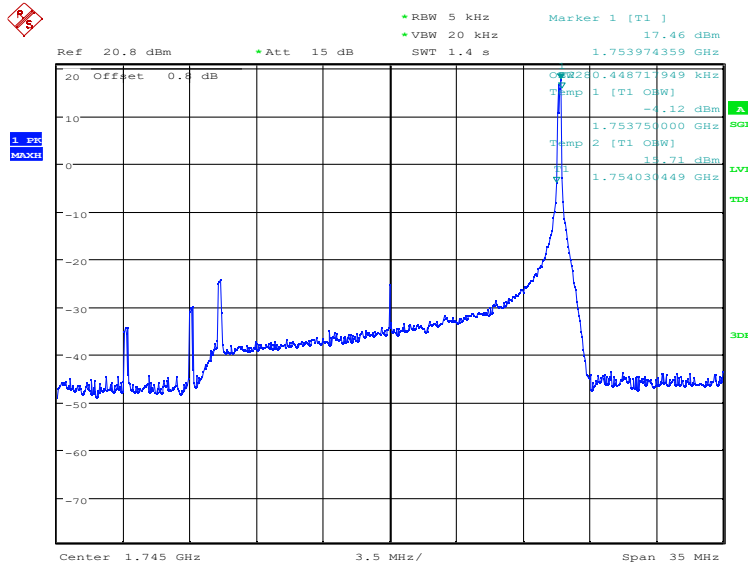
Date: 7.SEP.2023 09:05:39

LOW BAND EDGE BLOCK-1RB-low_offset



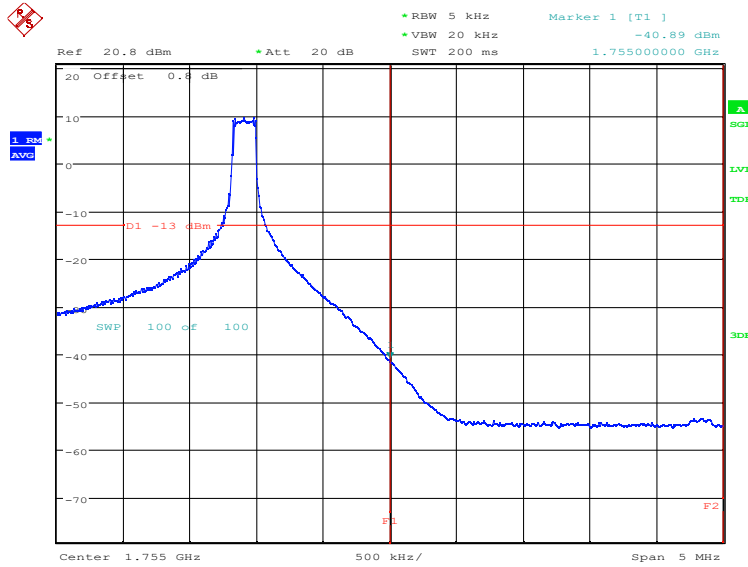
Date: 7.SEP.2023 09:06:54

OBW: 1RB-high_offset



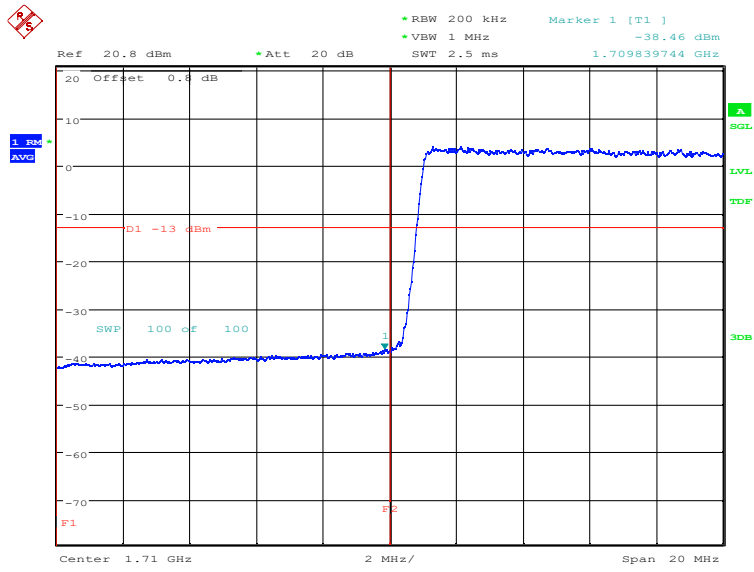
Date: 7.SEP.2023 09:07:32

HIGH BAND EDGE BLOCK-1RB-high_offset



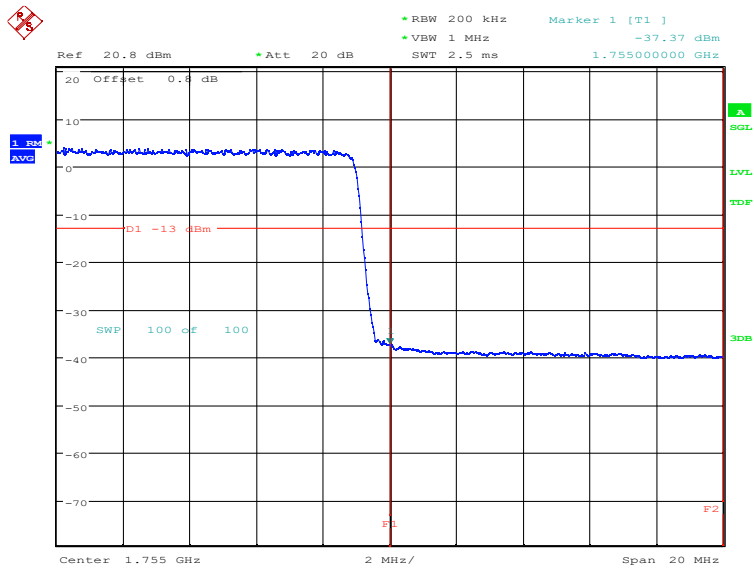
Date: 7.SEP.2023 09:08:46

LOW BAND EDGE BLOCK-20MHz-100%RB



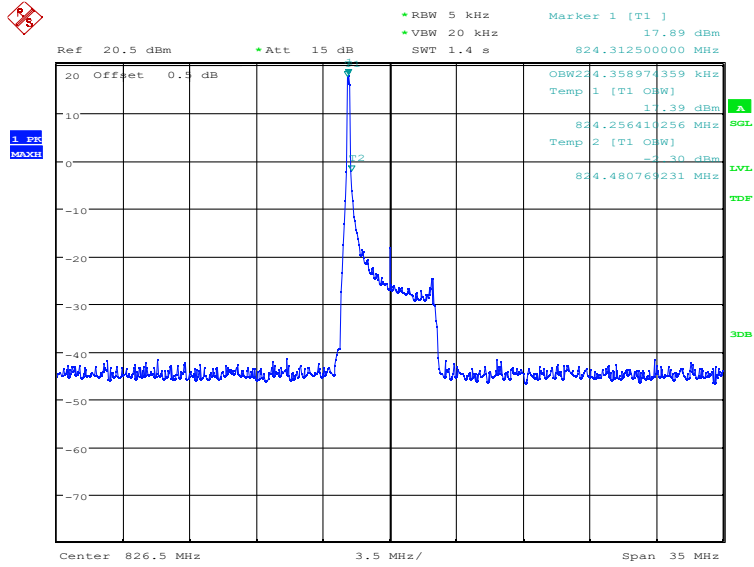
Date: 6.SEP.2023 14:06:12

HIGH BAND EDGE BLOCK-20MHz-100%RB



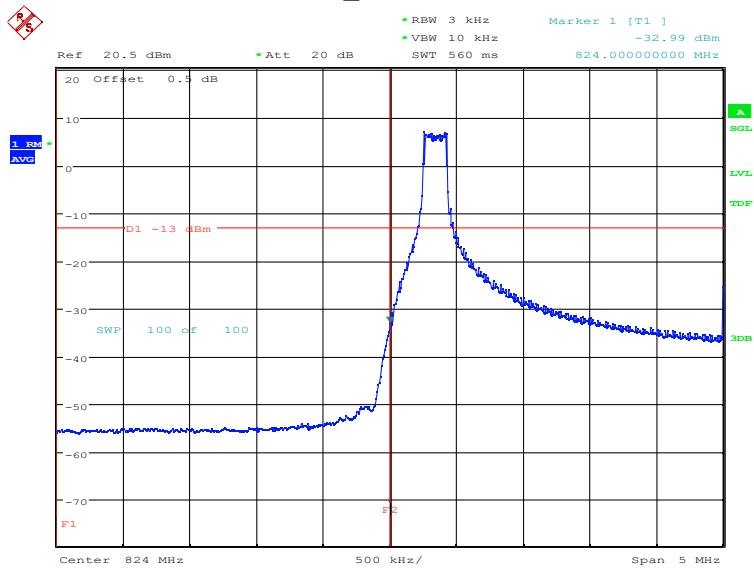
Date: 6.SEP.2023 14:07:45

LTE band 5
OBW: 1RB-low_offset



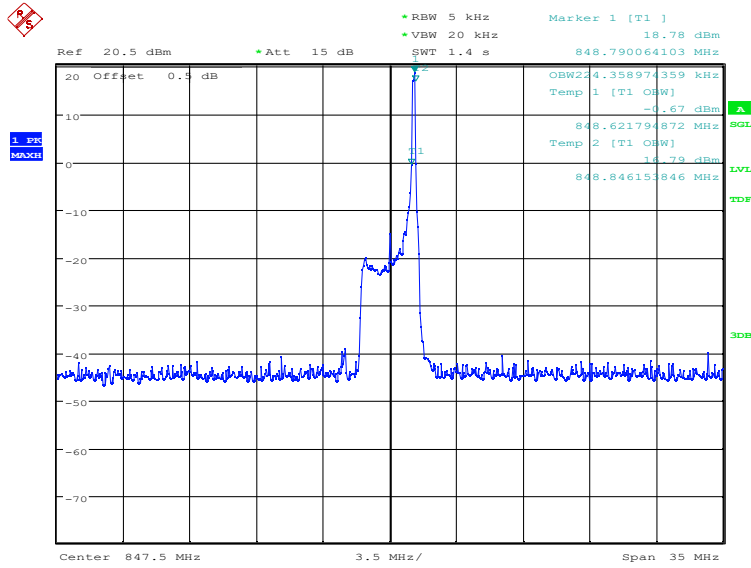
Date: 7.SEP.2023 09:10:56

LOW BAND EDGE BLOCK-1RB-low_offset



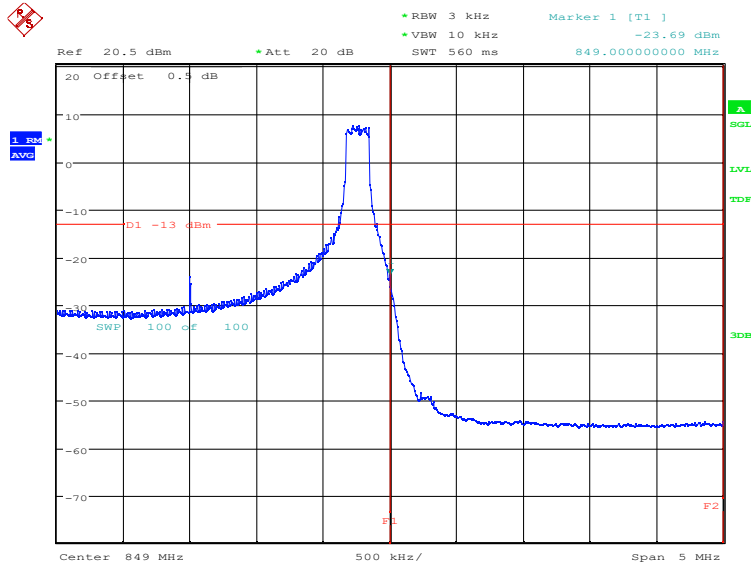
Date: 7.SEP.2023 09:12:10

OBW: 1RB-high_offset



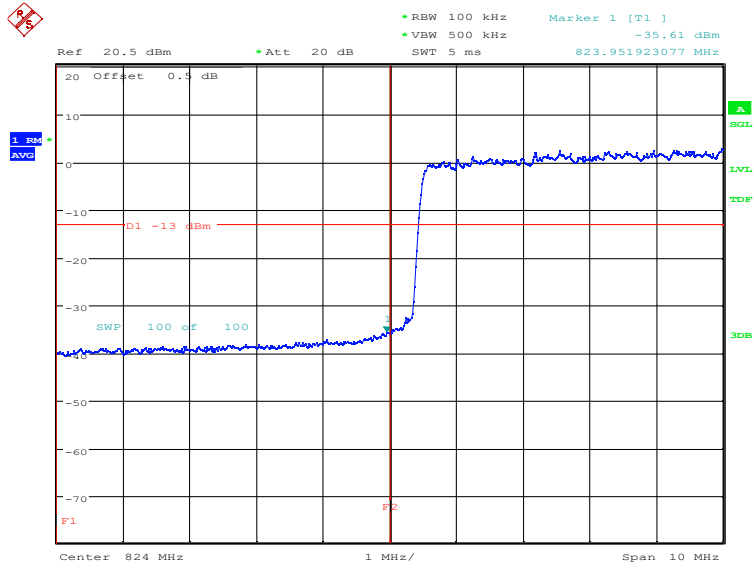
Date: 7.SEP.2023 09:12:48

HIGH BAND EDGE BLOCK-1RB-high_offset



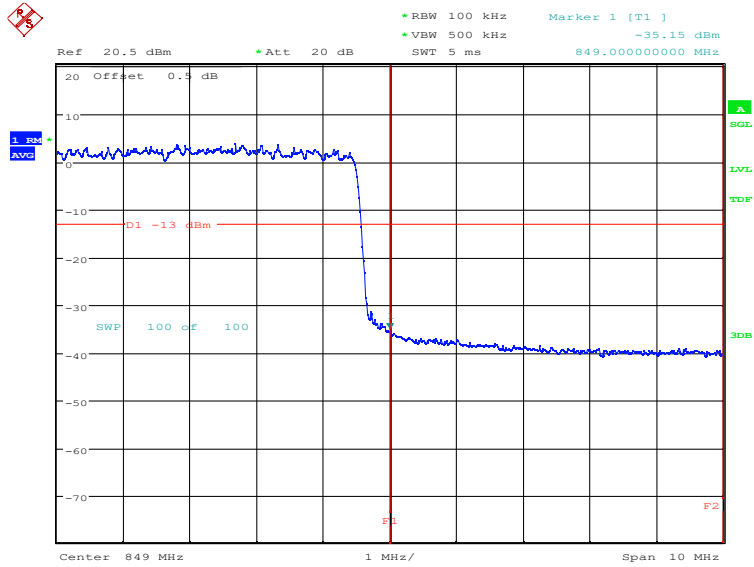
Date: 7.SEP.2023 09:14:02

LOW BAND EDGE BLOCK-10MHz-100%RB



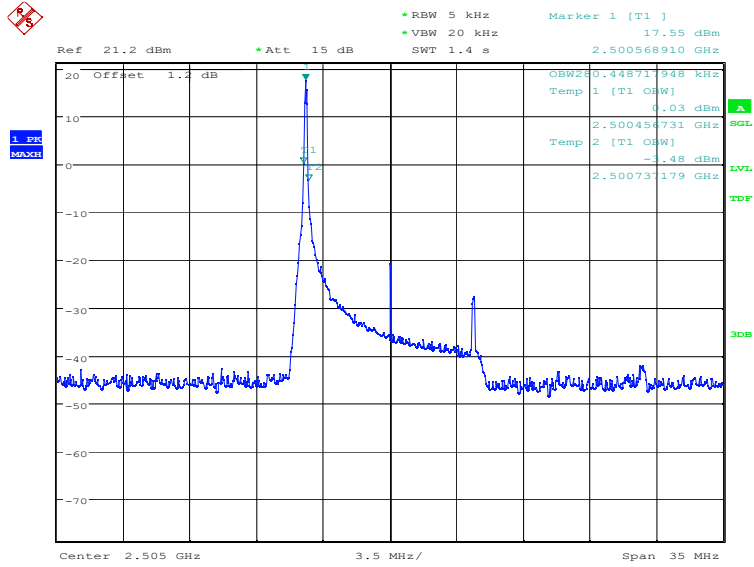
Date: 6.SEP.2023 14:09:20

HIGH BAND EDGE BLOCK-10MHz-100%RB



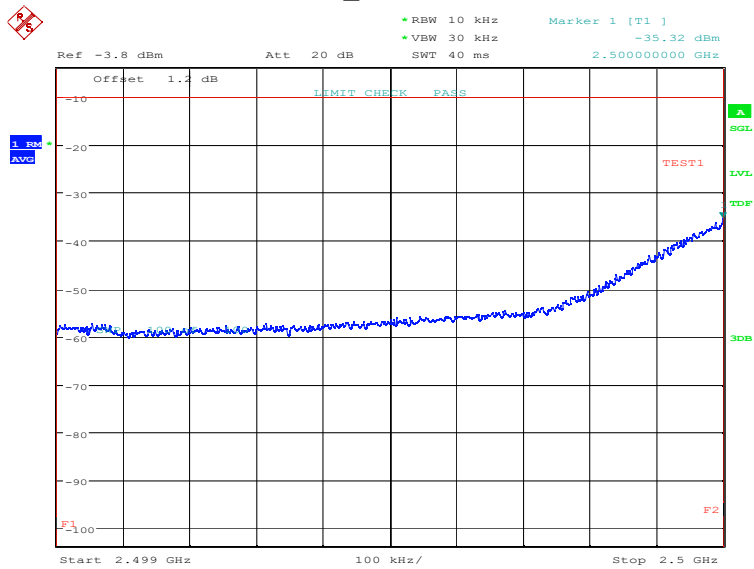
Date: 6.SEP.2023 14:10:53

LTE band 7
OBW: 1RB-low_offset

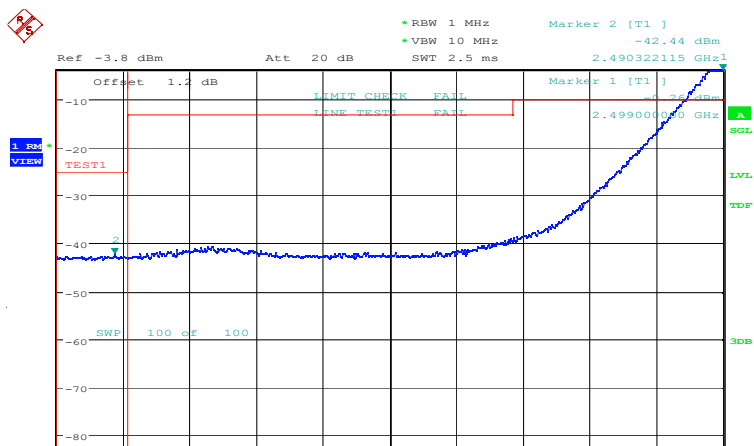


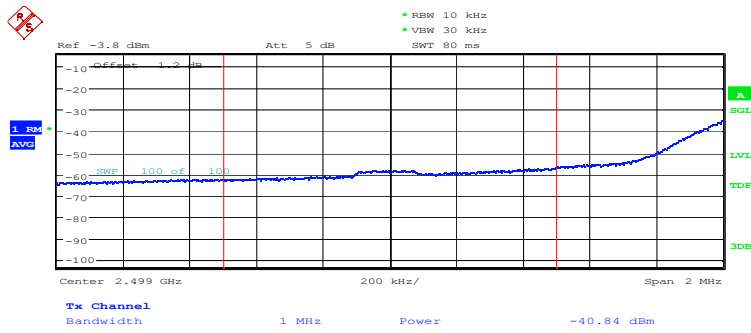
Date: 15.SEP.2023 08:56:03

LOW BAND EDGE BLOCK-1RB-low_offset



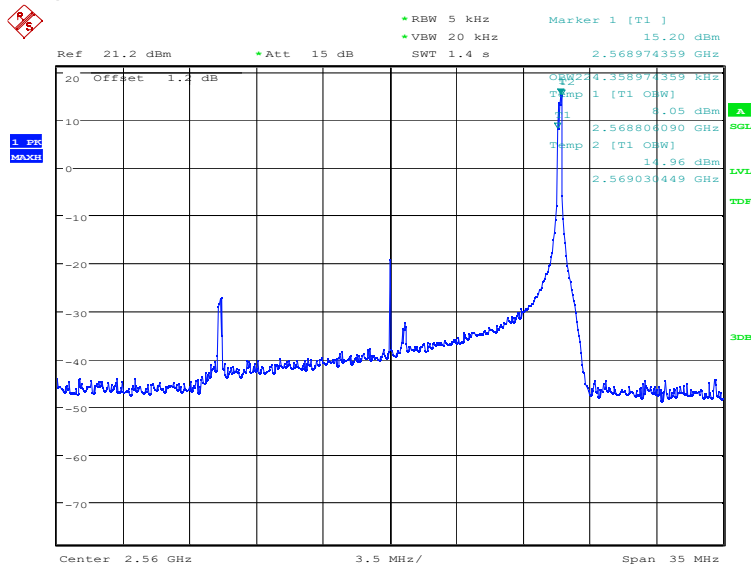
Date: 15.SEP.2023 08:57:24





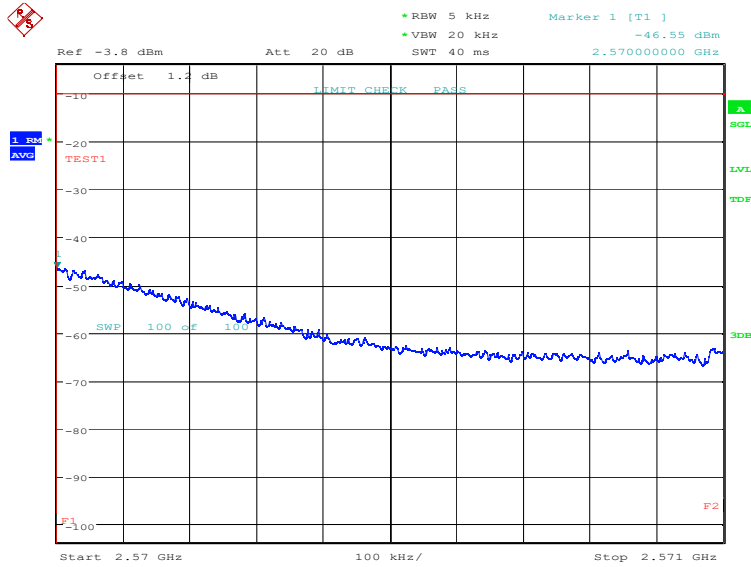
Date: 15.SEP.2023 08:59:42

OBW: 1RB-high_offset

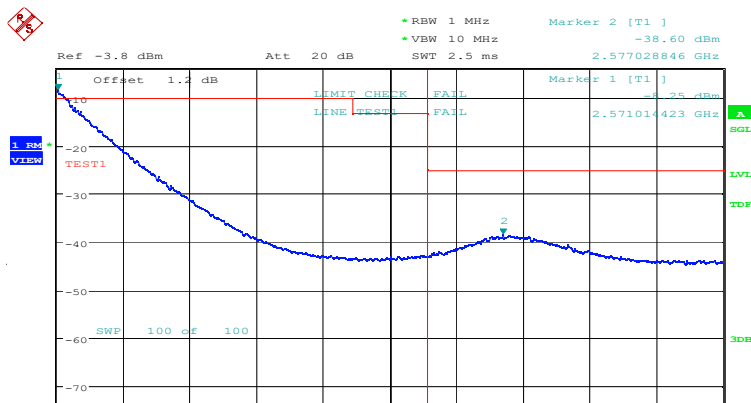


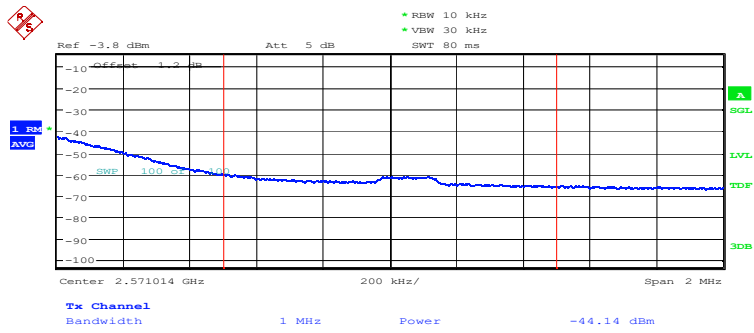
Date: 15.SEP.2023 09:00:19

HIGH BAND EDGE BLOCK-1RB-high_offset



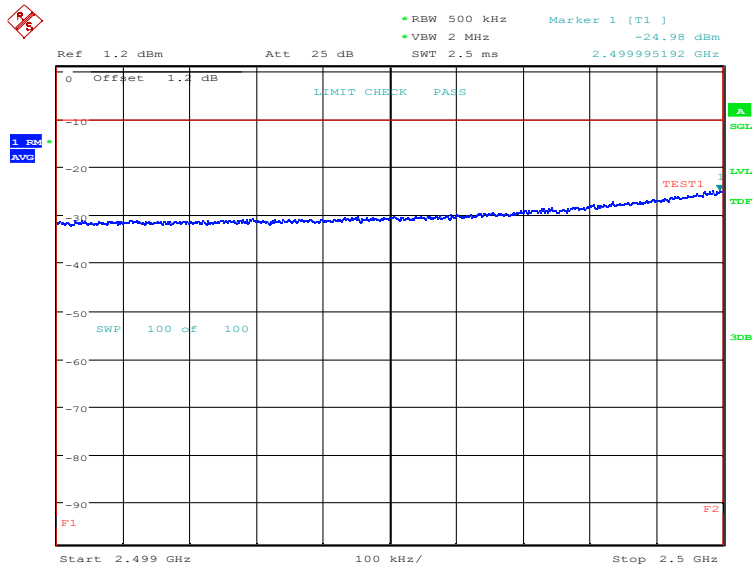
Date: 15.SEP.2023 09:01:41



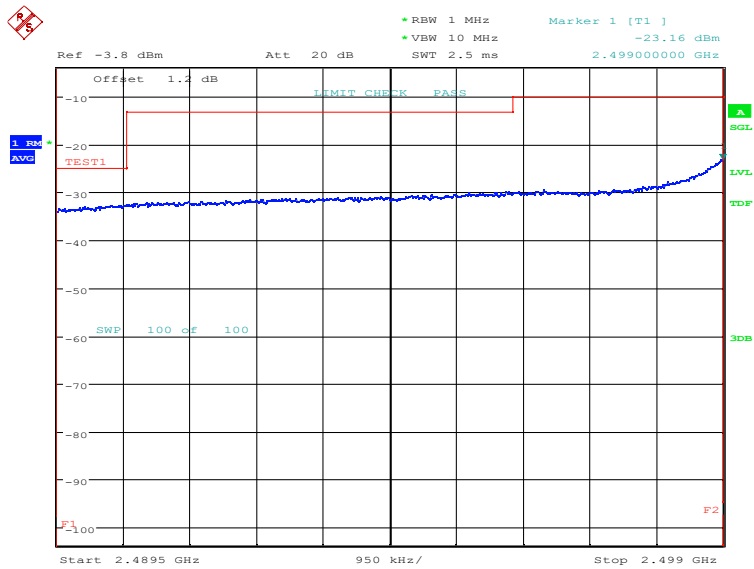


Date: 15.SEP.2023 09:03:59

LOW BAND EDGE BLOCK-20MHz-100%RB

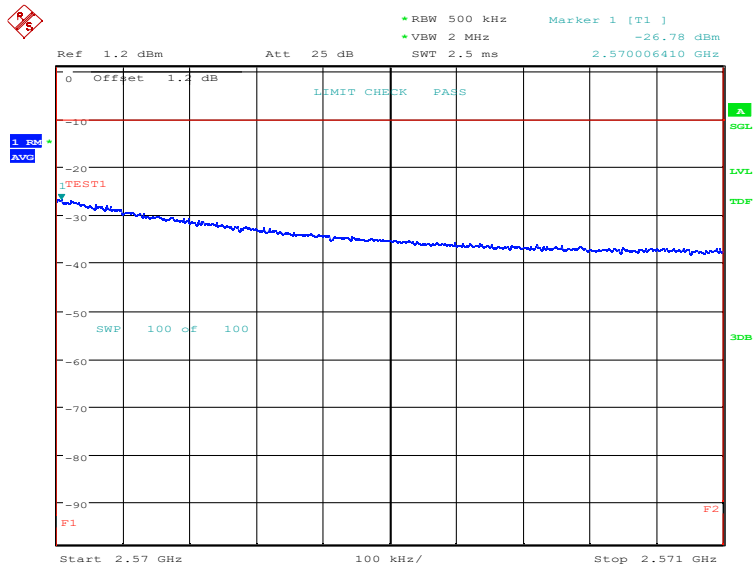


Date: 6.SEP.2023 14:13:53

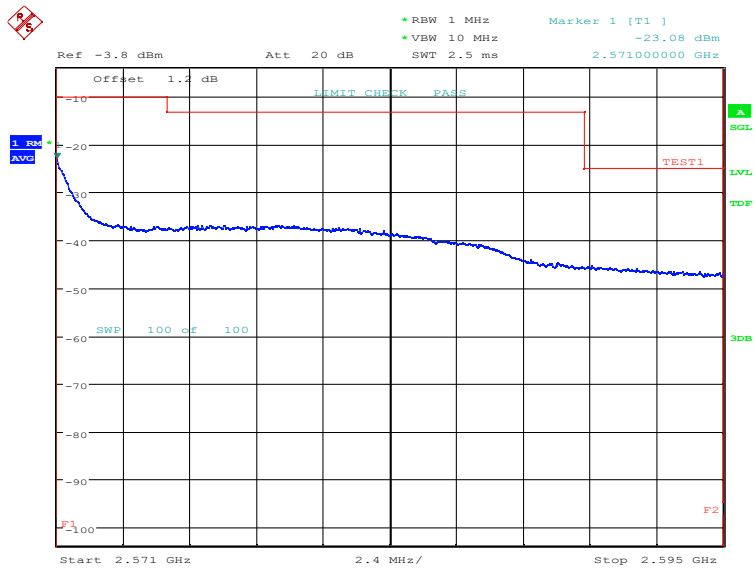


Date: 6.SEP.2023 14:15:34

HIGH BAND EDGE BLOCK-20MHz-100%RB

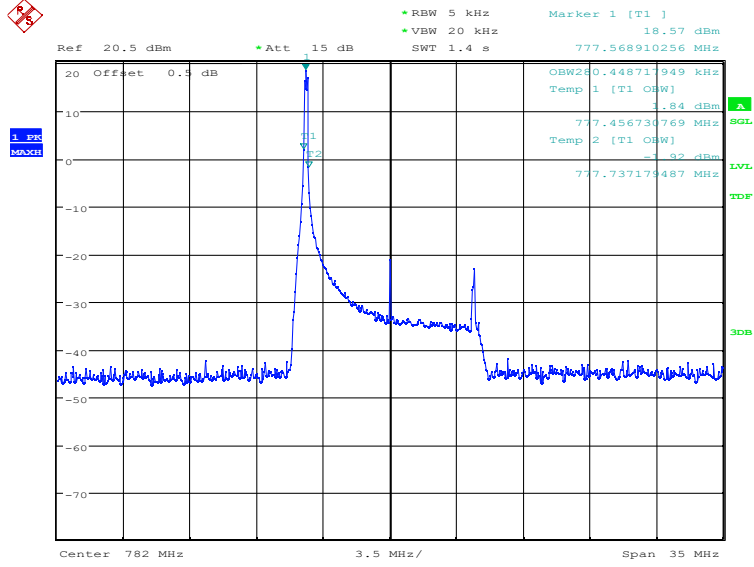


Date: 6.SEP.2023 14:18:34



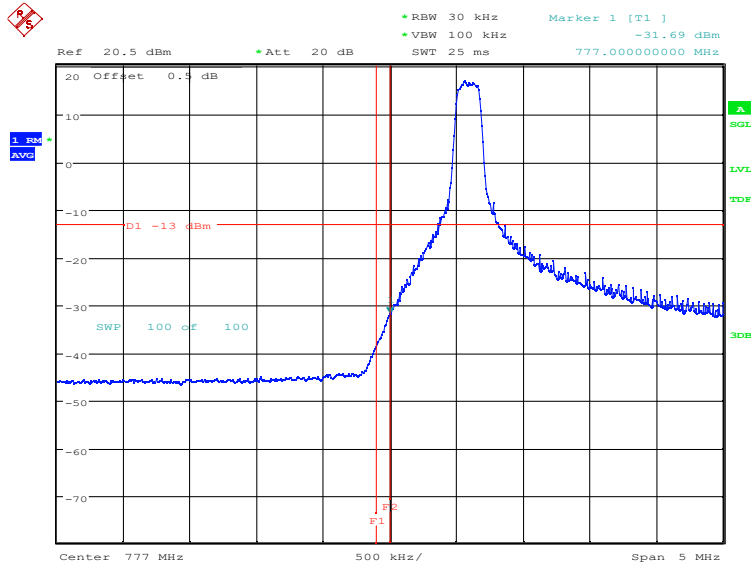
Date: 6.SEP.2023 14:20:15

LTE band 13
OBW: 1RB-low_offset

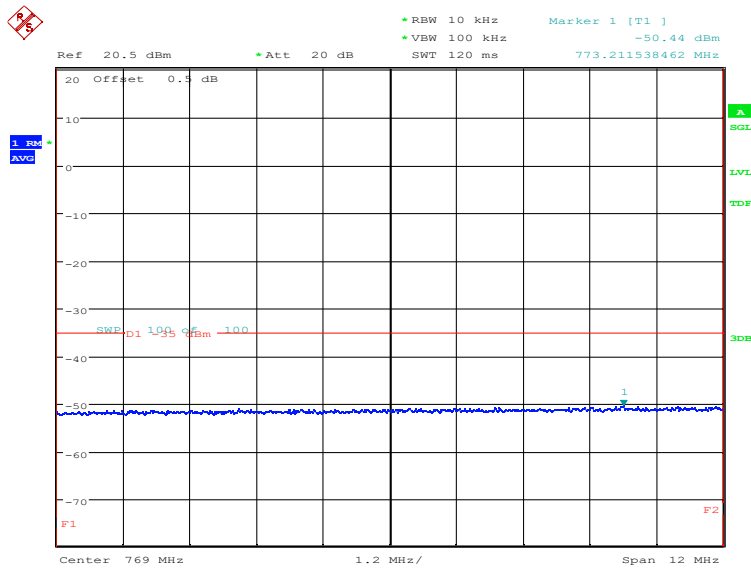


Date: 7.SEP.2023 09:14:41

LOW BAND EDGE BLOCK-1RB-low_offset

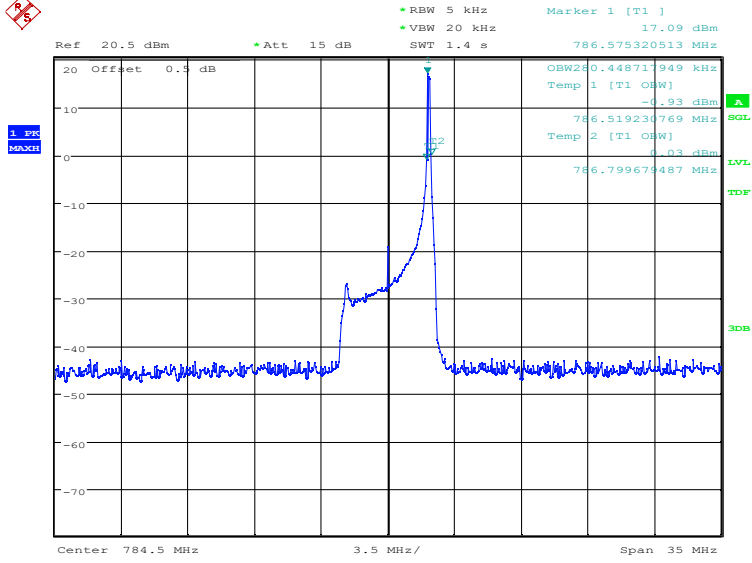


Date: 7.SEP.2023 09:15:00



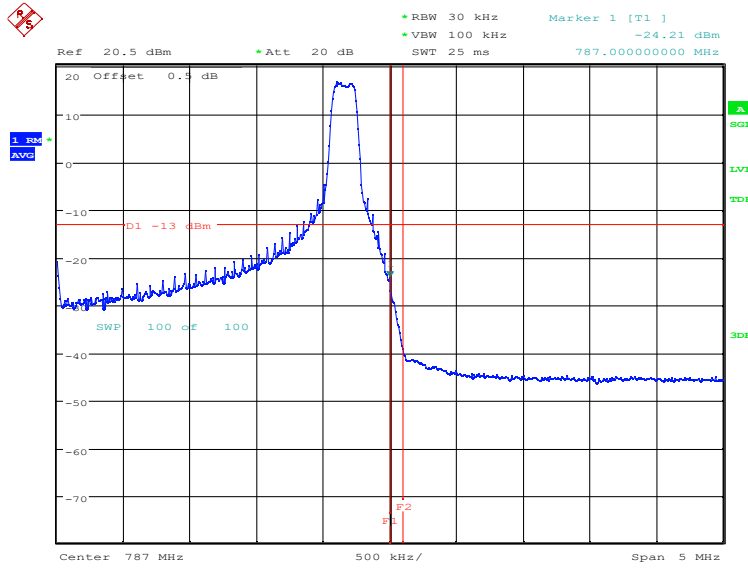
Date: 7.SEP.2023 09:15:39

OBW: 1RB-high_offset

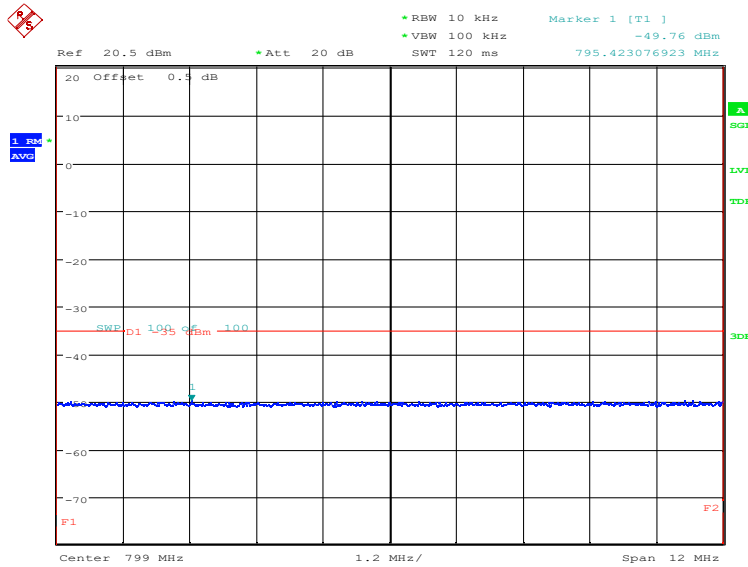


Date: 7.SEP.2023 09:16:16

HIGH BAND EDGE BLOCK-1RB-high_offset

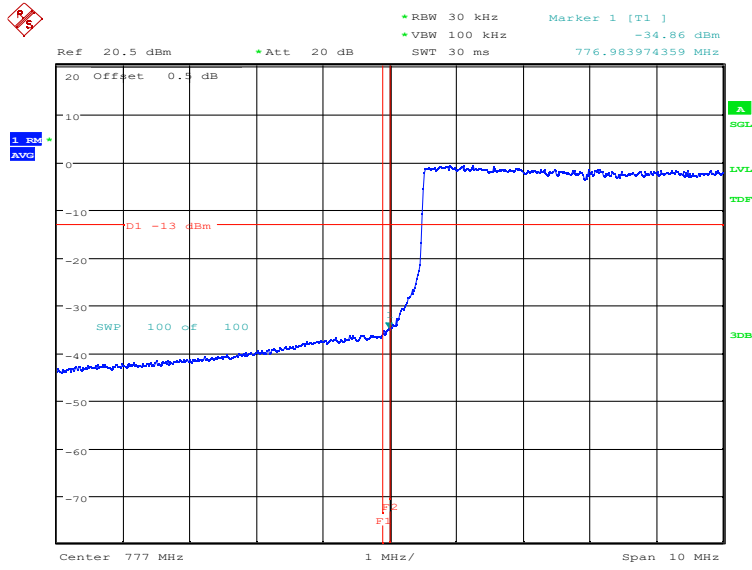


Date: 7.SEP.2023 09:16:36

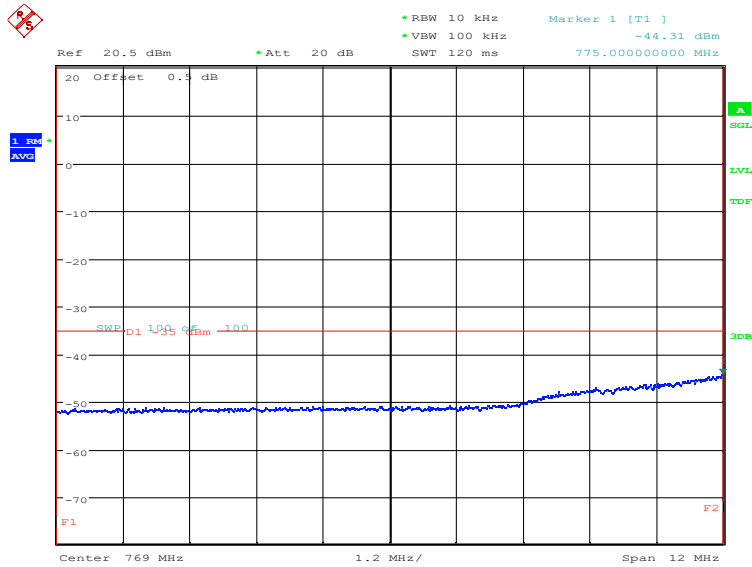


Date: 7.SEP.2023 09:17:15

LOW BAND EDGE BLOCK-10MHz-100%RB

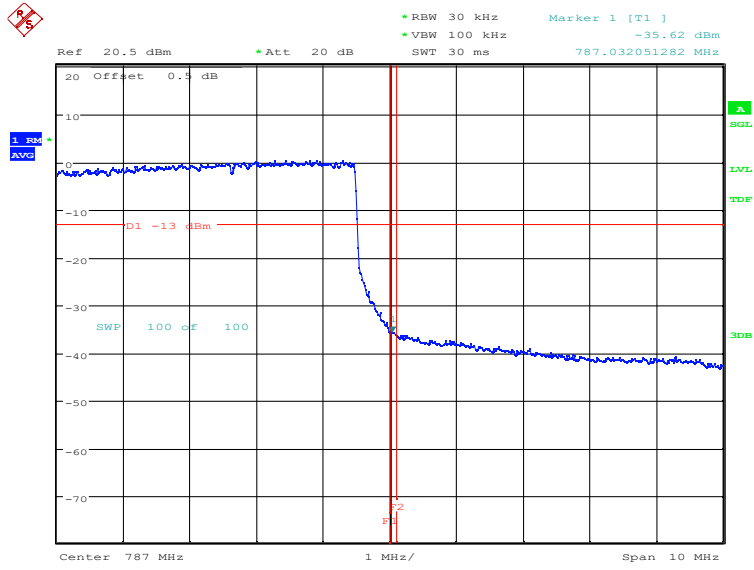


Date: 6.SEP.2023 14:21:53

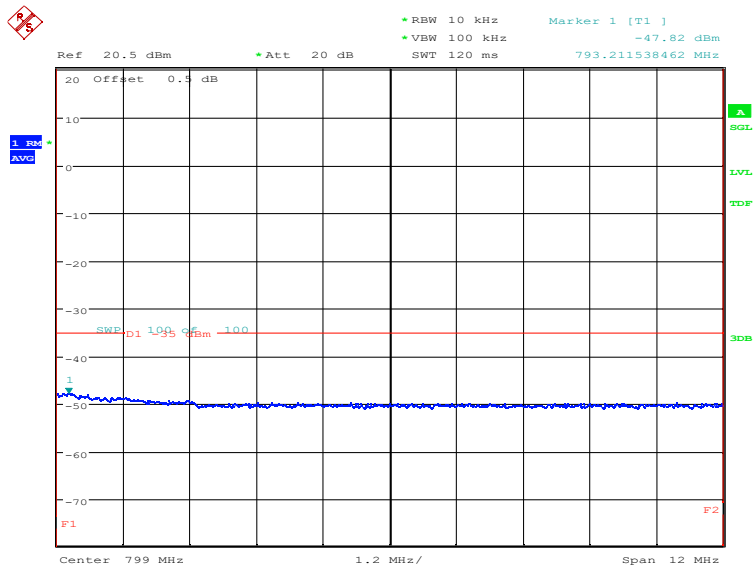


Date: 6.SEP.2023 14:22:32

HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 6.SEP.2023 14:24:10



Date: 6.SEP.2023 14:24:49

Note: Expanded measurement uncertainty is $U = 0.622$ dB, $k = 2$.

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 greater than $2 \times \text{span}/\text{RBW}$.

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(c) states for operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the 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, in accordance with the following:(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.

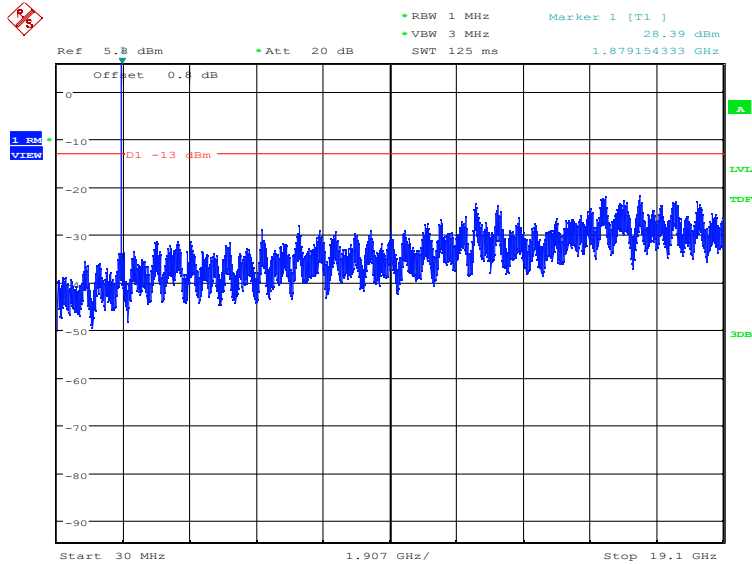
Part 27.53(f) states for operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals.

A. 7.3 Measurement result

Only the worst case result is given below

LTE band 2: 30MHz – 19.1GHz

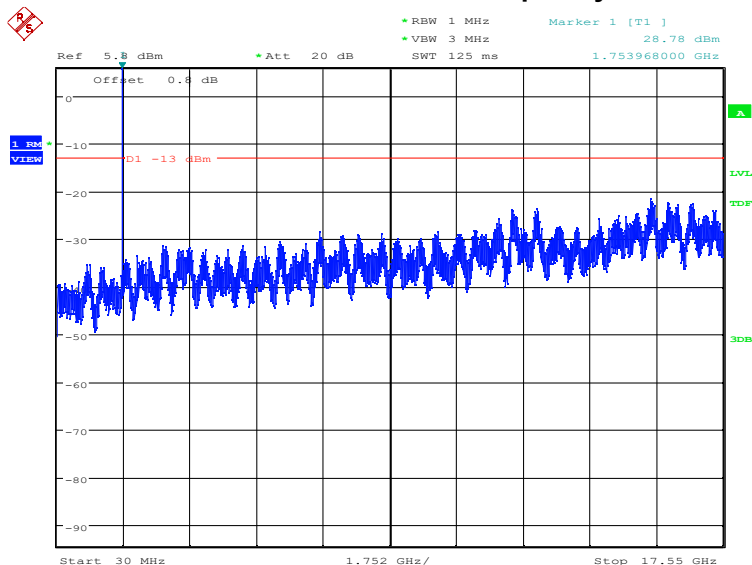
NOTE: peak above the limit line is the carrier frequency.



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LTE band 4: 30MHz – 17.55GHz

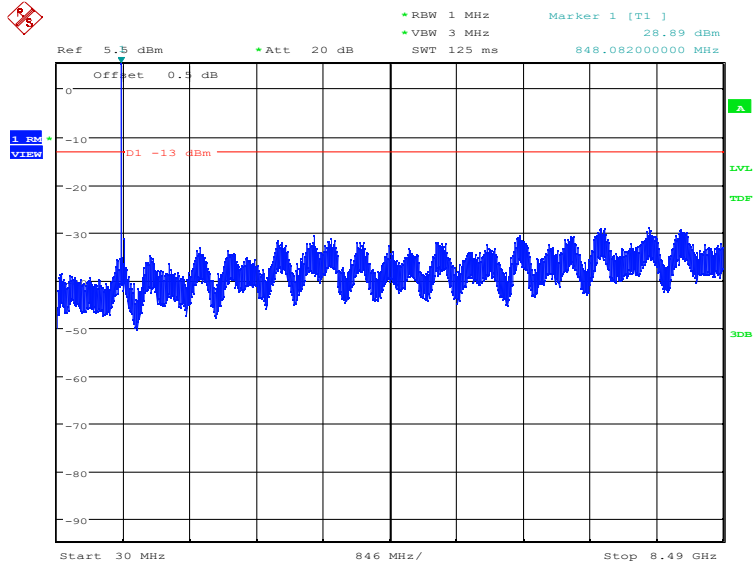
NOTE: peak above the limit line is the carrier frequency.



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LTE band 5: 30MHz – 8.49GHz

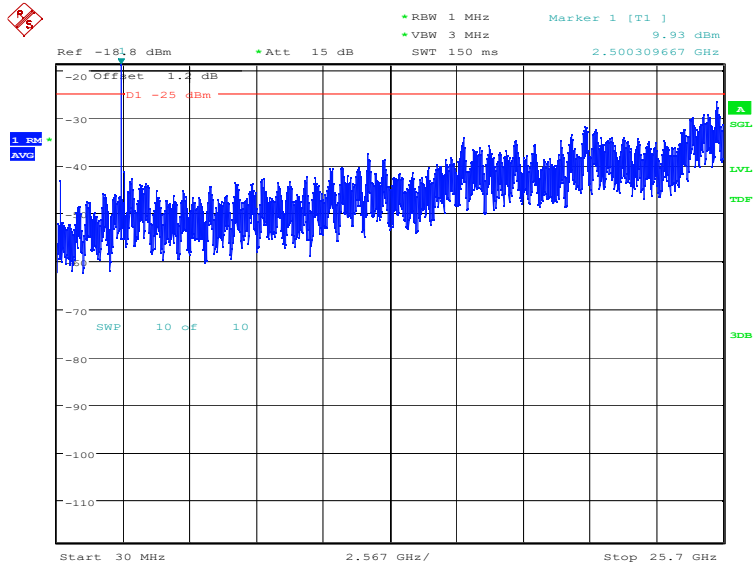
NOTE: peak above the limit line is the carrier frequency.



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LTE band 7: 30MHz – 25.7GHz

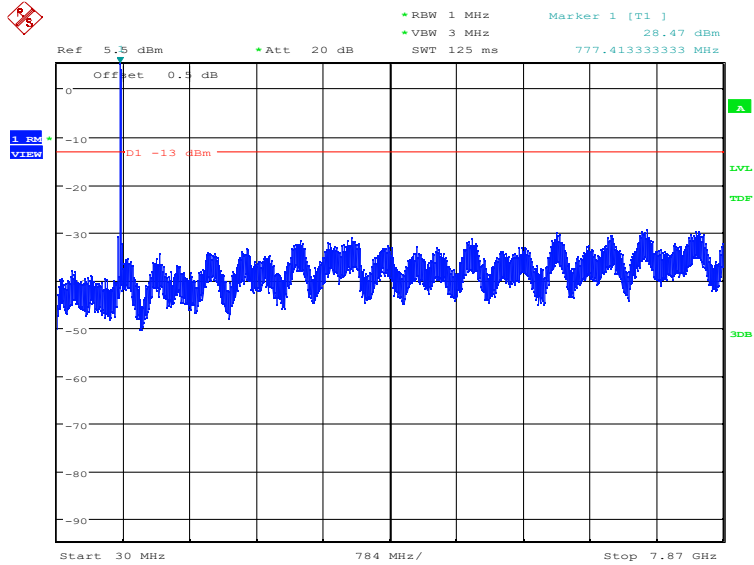
NOTE: peak above the limit line is the carrier frequency.



Date: 15.SEP.2023 09:12:31

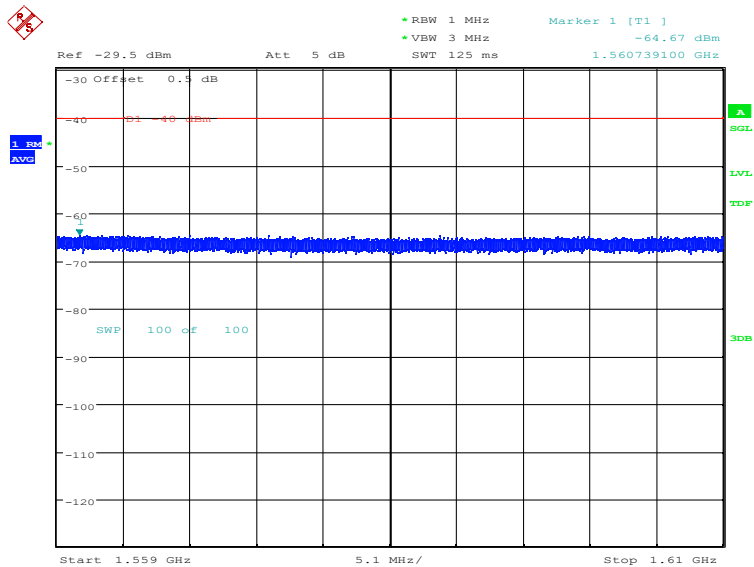
LTE band 13: 30MHz – 7.87GHz

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



Date: 7.SEP.2023 09:21:23

LTE band 13: 1559MHz – 1610MHz



Date: 7.SEP.2023 09:21:58

Note: Expanded measurement uncertainty is $U = 0.622 \text{ dB}$, $k = 2$.

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%.

LTE band 2, 20MHz

Frequency(MHz)	PAPR(dB)	
	1880.0	QPSK
6.83		7.31

LTE band 4, 20MHz

Frequency(MHz)	PAPR(dB)	
	1732.5	QPSK
6.57		7.34

LTE band 7, 20MHz

Frequency(MHz)	PAPR(dB)	
	2535.0	QPSK
6.83		7.34

LTE band 13,10MHz

Frequency(MHz)	PAPR(dB)	
	782.0	QPSK
6.09		6.89

Note: Expanded measurement uncertainty is $U = 0.578$ dB, $k = 2$.

Annex B: Accreditation Certificate



Accredited Laboratory

A2LA has accredited

TELECOMMUNICATION TECHNOLOGY LABS, CAICT

Beijing, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 26th day of June 2023.



Mr. Trace McInturf, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2024

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

END OF REPORT