TEST REPORT

No. 25T04Z100018-003

for

Japan Radio Co., Ltd.

Product Name: CBRS eNodeB

Model Name: JRL-119

FCC ID: CKEJRL-119

with

Hardware Version: D01

Software Version: JR_1.1.1

Issued Date: 2025-04-21

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
25T04Z100018-003	Rev.0	1st edition	2025-04-09
25T04Z100018-003	Rev.1	Modified the calculation of EIRP	2025-04-21

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

CONTENTS

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: 2025-01-11

Testing End Date: 2025-03-11

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

Company Name:	Japan Radio Co., Ltd.
Address:	3000 Scott Blvd, Suite 212, Santa Clara, California 95054, United States
Contact:	Yuji Kinoshita
Email:	kinoshita.yuji@jrc.co.jp
Tel.:	+81-49-257-6468
Fax:	+81-49-257-6214

2.2. Manufacturer Information

Company Name:	Japan Radio Co., Ltd.
Address:	3000 Scott Blvd, Suite 212, Santa Clara, California 95054, United States
Contact:	Yuji Kinoshita
Email:	kinoshita.yuji@jrc.co.jp
Tel.:	+81-49-257-6468
Fax:	+81-49-257-6214

3. Equipment Under Test (EUT)

3.1. About EUT(*)

Description	LTE Base Station
Model Name	JRL-119
CBSD Category	Category B
Antenna type	external
Antenna Gain	14/17dBi
Supported Channel bandwidth	LTE:10/20MHz
Output Power	EIRP maximum 37dBm/MHz
Number of Antenna ports	4
Frequency range	LTE TDD48 3550MHz-3700MHz
Type of modulation	QPSK, 16QAM, 64QAM
Extreme Temperature	-40/+55℃
Normal Voltage	-48V DC

(*): Declared by applicant.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN	HW Version	SW Version	Date of receipt
UT01a	12020004712217Y0038	D01	JR_1.1.1	2025-01-09

3.3. General Description

The Equipment Under Test (EUT) JRL-119 is a LTE Base Station which provides communication connections to 3550-3700 MHz network. The EUT operates from a -48V DC supply.

The EUT includes 4 TX/RX ports. It can operate in LTE single RAT mode. It can be configured to transmit in MIMO mode which was used for measurements as the worst configuration. The complete testing was performed with the EUT transmitting at rated maximum RF power unless otherwise stated.

A full technical description can be found in the Manufacturer's documentation.

3.4. Configuration Description

The following settings were used to represent all traffic scenarios. The output power was measured on the bottom, middle and top channel of both applicable antenna ports. By measuring the output power of QPSK, 16QAM and 64QAM for LTE on all of the antenna ports, it was determined that QPSK was the worst case modulation scheme and was used for all testing.

Complete testing was carried out on the worst case antenna port which was established as being the highest output power from the applicable measured ports on worst case modulation scheme. This antenna port was Port 1 for LTE single RAT mode.

The settings below were used for all measurements unless otherwise noted:

Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
	Bottom	Middle	Top
10MHz	3555	3625	3695
20MHz	3560	3625	3690

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 96	CITIZENS BROADBAND RADIO SERVICE	10-1-23 Edition
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	10-1-23 Edition
ANSI 63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS	v03r01
KDB 662911 D01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band	v02r01
KDB 940660 D01	CERTIFICATION AND TEST PROCEDURES FOR CITIZENS BROADBAND RADIO SERVICE DEVICES AUTHORIZED UNDER PART 96	v03

5. Laboratory Environment

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

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

Semi-anechoic chamber did not exceed following limits along the testing:

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

6. Summary Of Test Result

Items	Test Name	Clause in FCC rules	Verdict
1	Maximum Output Power and PAPR	96.41(b) (g), 2.1046	Pass
2	Occupied Bandwidth	96.41(e), 2.1049	Pass
3	Transmitter unwanted emissions at Band Edge	96.41(e), 2.1051	Pass
4	Transmitter unwanted emissions - Conducted Spurious Emission	96.41(e), 2.1051	Pass
5	Radiated Spurious Emission	96.41(e) 2.1051	Pass
6	Frequency Stability	2.1055	Pass

7. Test Equipment Utilized

NO.	Description	Type	Series Number	Manufacture	Cal. Due Date	Cal. Interval
1	AC Power Supply	PCR2000M	PJ000583	Kikusui	2025-05-13	1 year
2	20dB Attenuator	53AS120-K20	74842	Rosenberger	-	1 year
3	PXA Signal Analyzer	N9030B	MY57142378	Keysight	2025-02-22	1 year
4	PXA Signal Analyzer	N9030B	MY57142378	Keysight	2026-02-20	1 year
5	Climate Chamber	GPS-4	0010-003512	Espec	2025-03-18	1 year
6	Test Receiver	ESU26	100376	R&S	2025-06-06	1 year
7	Antenna	VULB9163	01177	Schwarzbeck	2025-11-19	1 year
8	Antenna	3117	00119021	ETS-Lindgren	2025-09-18	1 year
9	Test Receiver	FSV40	101047	R&S	2025-07-18	1 year
10	Antenna	LB-180400-25-C-KF	2110084000006	A-INFO	2025-05-15	1 year

Note: All equipment is in valid calibration period when used.

8. Measurement Uncertainty

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

Test Discipline	Measurement Uncertainty
Conducted Maximum Peak Output Power	0.68dB
Occupied Bandwidth	439.79kHz
Conducted Unwanted Emissions	4.5dB
Frequency Stability	11Hz
Radiated Spurious Emissions	30MHz-1GHz: 5.73dB, k=2 1GHz-18GHz: 5.58dB, k=2 18GHz-40GHz: 3.37dB, k=2

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.

Annex A: Measurement Results

A.1 Maximum Output Power and Peak to Average Power Ratio

A.1.1 Reference

FCC CFR 47 Part 96, Clause 96.41(b), 96.41(g)
FCC CFR 47 Part 2, Clause 2.1046

A.1.2 Method of Measurements

During the process of testing, the EUT was configured to transmit on maximum power and proper modulation. The transmitter power shall be measured in terms of a root-mean-square (RMS) average value. In case of the EUT was configured to MIMO mode, since the EUT transmits on all antennas simultaneously in the same frequency range, using the Measure-and-Sum approach, spectra are measured at each output of the EUT at the required resolution bandwidth. The individual spectra are then summed mathematically in linear power units according to FCC KDB 662911 D01.

A peak to average ratio measurement is performed at the conducted ports of the EUT for single carrier for single RAT mode. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) was used and 0.1% probability value recorded.

The antenna gain is declared as 14dBi, therefore the EIRP is calculated as the sum of the power over all ports plus the antenna gain.

A.1.3 Limit

Maximum EIRP: ≤47dBm/10MHz
Maximum PSD: ≤37dBm/MHz
PAPR: ≤13dB

A.1.4 Measurement result

Port	BW(MHz)	Channel position	Modulation	PAPR(dB)	Conducted Power (dBm)	Total Conducted Power (dBm)	Calculated EIRP (dBm)
0	10	Bottom	QPSK	7.45	26.52	29.77	46.77
1	10	Bottom	QPSK	7.41	26.98		
2	10	Bottom	QPSK	7.4	26.74	29.72	46.72
3	10	Bottom	QPSK	7.49	26.68		
0	10	Bottom	16QAM	7.45	26.55	29.73	46.73
1	10	Bottom	16QAM	7.43	26.89		
2	10	Bottom	16QAM	7.39	26.64	29.71	46.71
3	10	Bottom	16QAM	7.42	26.75		
0	10	Bottom	64QAM	7.46	26.61	29.79	46.79
1	10	Bottom	64QAM	7.49	26.94		
2	10	Bottom	64QAM	7.5	26.87	29.84	46.84
3	10	Bottom	64QAM	7.53	26.78		
0	10	Mid	QPSK	7.47	26.31	29.61	46.61
1	10	Mid	QPSK	7.45	26.88		
2	10	Mid	QPSK	7.41	26.78	29.73	46.73
3	10	Mid	QPSK	7.49	26.66		
0	10	Mid	16QAM	7.52	26.37	29.63	46.63
1	10	Mid	16QAM	7.52	26.86		
2	10	Mid	16QAM	7.53	26.77	29.66	46.66
3	10	Mid	16QAM	7.57	26.53		
0	10	Mid	64QAM	7.54	26.21	29.64	46.64
1	10	Mid	64QAM	7.53	27.02		
2	10	Mid	64QAM	7.57	26.91	29.86	46.86
3	10	Mid	64QAM	7.6	26.79		
0	10	Top	QPSK	7.47	26.49	29.79	46.79
1	10	Top	QPSK	7.52	27.06		
2	10	Top	QPSK	7.47	26.97	29.84	46.84
3	10	Top	QPSK	7.53	26.69		
0	10	Top	16QAM	7.5	26.58	29.73	46.73
1	10	Top	16QAM	7.52	26.85		
2	10	Top	16QAM	7.52	26.82	29.78	46.78
3	10	Top	16QAM	7.56	26.72		
0	10	Top	64QAM	7.55	26.51	29.74	46.74
1	10	Top	64QAM	7.59	26.93		
2	10	Top	64QAM	7.6	26.9	29.88	46.88
3	10	Top	64QAM	7.66	26.83		

0	20	Bottom	QPSK	7.25	26.56	29.77	46.77
1	20	Bottom	QPSK	7.24	26.95		
2	20	Bottom	QPSK	7.29	26.91	29.86	46.86
3	20	Bottom	QPSK	7.33	26.79		
0	20	Bottom	16QAM	7.44	26.61	29.73	46.73
1	20	Bottom	16QAM	7.49	26.83		
2	20	Bottom	16QAM	7.44	26.88	29.83	46.83
3	20	Bottom	16QAM	7.49	26.76		
0	20	Bottom	64QAM	7.51	26.56	29.69	46.69
1	20	Bottom	64QAM	7.57	26.79		
2	20	Bottom	64QAM	7.56	26.88	29.87	46.87
3	20	Bottom	64QAM	7.67	26.83		
0	20	Mid	QPSK	7.26	26.27	29.49	46.49
1	20	Mid	QPSK	7.35	26.68		
2	20	Mid	QPSK	7.22	26.63	29.53	46.53
3	20	Mid	QPSK	7.26	26.41		
0	20	Mid	16QAM	7.53	26.32	29.56	46.56
1	20	Mid	16QAM	7.54	26.77		
2	20	Mid	16QAM	7.54	26.74	29.57	46.57
3	20	Mid	16QAM	7.61	26.37		
0	20	Mid	64QAM	7.53	26.22	29.46	46.46
1	20	Mid	64QAM	7.59	26.67		
2	20	Mid	64QAM	7.53	26.76	29.52	46.52
3	20	Mid	64QAM	7.6	26.24		
0	20	Top	QPSK	7.25	26.69	29.86	46.86
1	20	Top	QPSK	7.22	27.01		
2	20	Top	QPSK	7.27	26.97	29.85	46.85
3	20	Top	QPSK	7.32	26.71		
0	20	Top	16QAM	7.4	26.77	29.85	46.85
1	20	Top	16QAM	7.45	26.9		
2	20	Top	16QAM	7.47	26.86	29.82	46.82
3	20	Top	16QAM	7.51	26.76		
0	20	Top	64QAM	7.57	26.62	29.69	46.69
1	20	Top	64QAM	7.57	26.73		
2	20	Top	64QAM	7.59	26.7	29.77	46.77
3	20	Top	64QAM	7.63	26.82		

Port	BW(MHz)	Channel position	Modulation	Conducted Power (dBm/10MHz)	Total Conducted Power (dBm/10MHz)	Total Calculated EIRP (dBm/10MHz)
0	10	Bottom	QPSK	25.20	28.55	45.55
1	10	Bottom	QPSK	25.86		
2	10	Bottom	QPSK	25.75	28.50	45.50
3	10	Bottom	QPSK	25.22		
0	10	Bottom	16QAM	25.39	28.54	45.54
1	10	Bottom	16QAM	25.67		
2	10	Bottom	16QAM	25.51	28.55	45.55
3	10	Bottom	16QAM	25.57		
0	10	Bottom	64QAM	25.23	28.56	45.56
1	10	Bottom	64QAM	25.85		
2	10	Bottom	64QAM	25.77	28.66	45.66
3	10	Bottom	64QAM	25.52		
0	10	Mid	QPSK	24.86	28.34	45.34
1	10	Mid	QPSK	25.75		
2	10	Mid	QPSK	25.67	28.45	45.45
3	10	Mid	QPSK	25.19		
0	10	Mid	16QAM	24.99	28.42	45.42
1	10	Mid	16QAM	25.79		
2	10	Mid	16QAM	25.60	28.33	45.33
3	10	Mid	16QAM	25.01		
0	10	Mid	64QAM	24.89	28.47	45.47
1	10	Mid	64QAM	25.96		
2	10	Mid	64QAM	25.92	28.56	45.56
3	10	Mid	64QAM	25.15		
0	10	Top	QPSK	25.32	28.73	45.73
1	10	Top	QPSK	26.09		
2	10	Top	QPSK	25.94	28.82	45.82
3	10	Top	QPSK	25.67		
0	10	Top	16QAM	25.41	28.67	45.67
1	10	Top	16QAM	25.89		
2	10	Top	16QAM	25.89	28.73	45.73
3	10	Top	16QAM	25.54		
0	10	Top	64QAM	25.46	28.67	45.67
1	10	Top	64QAM	25.86		
2	10	Top	64QAM	25.79	28.76	45.76
3	10	Top	64QAM	25.70		

0	20	Bottom	QPSK	23.53	26.71	43.71
1	20	Bottom	QPSK	23.86		
2	20	Bottom	QPSK	23.79	26.76	43.76
3	20	Bottom	QPSK	23.71		
0	20	Bottom	16QAM	23.60	26.72	43.72
1	20	Bottom	16QAM	23.81		
2	20	Bottom	16QAM	23.85	26.80	43.80
3	20	Bottom	16QAM	23.72		
0	20	Bottom	64QAM	23.49	26.66	43.66
1	20	Bottom	64QAM	23.80		
2	20	Bottom	64QAM	23.85	26.81	43.81
3	20	Bottom	64QAM	23.74		
0	20	Mid	QPSK	23.01	26.30	43.30
1	20	Mid	QPSK	23.55		
2	20	Mid	QPSK	23.46	26.29	43.29
3	20	Mid	QPSK	23.10		
0	20	Mid	16QAM	23.12	26.44	43.44
1	20	Mid	16QAM	23.72		
2	20	Mid	16QAM	23.40	26.20	43.20
3	20	Mid	16QAM	22.97		
0	20	Mid	64QAM	23.07	26.37	43.37
1	20	Mid	64QAM	23.64		
2	20	Mid	64QAM	23.58	26.29	43.29
3	20	Mid	64QAM	22.95		
0	20	Top	QPSK	23.77	26.88	43.88
1	20	Top	QPSK	23.96		
2	20	Top	QPSK	23.82	26.78	43.78
3	20	Top	QPSK	23.72		
0	20	Top	16QAM	23.73	26.85	43.85
1	20	Top	16QAM	23.94		
2	20	Top	16QAM	23.81	26.79	43.79
3	20	Top	16QAM	23.75		
0	20	Top	64QAM	23.39	26.52	43.52
1	20	Top	64QAM	23.62		
2	20	Top	64QAM	23.74	26.77	43.77
3	20	Top	64QAM	23.77		

Port	BW(MHz)	Channel position	Modulation	Conducted Power (dBm/MHz)	Total Conducted Power (dBm/MHz)	Total Calculated PSD (dBm/MHz)
0	10	Bottom	QPSK	16.68	19.87	36.87
1	10	Bottom	QPSK	17.04		
2	10	Bottom	QPSK	16.83	19.86	36.86
3	10	Bottom	QPSK	16.86		
0	10	Bottom	16QAM	16.74	19.89	36.89
1	10	Bottom	16QAM	17.01		
2	10	Bottom	16QAM	16.79	19.86	36.86
3	10	Bottom	16QAM	16.91		
0	10	Bottom	64QAM	16.75	19.87	36.87
1	10	Bottom	64QAM	16.96		
2	10	Bottom	64QAM	16.83	19.86	36.86
3	10	Bottom	64QAM	16.87		
0	10	Mid	QPSK	16.47	19.77	36.77
1	10	Mid	QPSK	17.03		
2	10	Mid	QPSK	17.01	19.96	36.96
3	10	Mid	QPSK	16.89		
0	10	Mid	16QAM	16.53	19.74	36.74
1	10	Mid	16QAM	16.92		
2	10	Mid	16QAM	16.83	19.80	36.80
3	10	Mid	16QAM	16.74		
0	10	Mid	64QAM	16.63	19.85	36.85
1	10	Mid	64QAM	17.04		
2	10	Mid	64QAM	17.01	19.92	36.92
3	10	Mid	64QAM	16.81		
0	10	Top	QPSK	16.58	19.87	36.87
1	10	Top	QPSK	17.13		
2	10	Top	QPSK	17.06	19.97	36.97
3	10	Top	QPSK	16.86		
0	10	Top	16QAM	16.62	19.79	36.79
1	10	Top	16QAM	16.94		
2	10	Top	16QAM	16.97	19.88	36.88
3	10	Top	16QAM	16.77		
0	10	Top	64QAM	16.62	19.77	36.77
1	10	Top	64QAM	16.89		
2	10	Top	64QAM	16.88	19.87	36.87
3	10	Top	64QAM	16.83		

0	20	Bottom	QPSK	14.35	17.50	34.50
1	20	Bottom	QPSK	14.62		
2	20	Bottom	QPSK	14.59	17.46	34.46
3	20	Bottom	QPSK	14.31		
0	20	Bottom	16QAM	14.42	17.49	34.49
1	20	Bottom	16QAM	14.53		
2	20	Bottom	16QAM	14.59	17.47	34.47
3	20	Bottom	16QAM	14.33		
0	20	Bottom	64QAM	14.45	17.55	34.55
1	20	Bottom	64QAM	14.62		
2	20	Bottom	64QAM	14.74	17.56	34.56
3	20	Bottom	64QAM	14.36		
0	20	Mid	QPSK	14.04	17.16	34.16
1	20	Mid	QPSK	14.26		
2	20	Mid	QPSK	14.24	17.16	34.16
3	20	Mid	QPSK	14.06		
0	20	Mid	16QAM	14.21	17.40	34.40
1	20	Mid	16QAM	14.57		
2	20	Mid	16QAM	14.62	17.34	34.34
3	20	Mid	16QAM	14.01		
0	20	Mid	64QAM	14.06	17.22	34.22
1	20	Mid	64QAM	14.36		
2	20	Mid	64QAM	14.65	17.36	34.36
3	20	Mid	64QAM	14.02		
0	20	Top	QPSK	14.5	17.69	34.69
1	20	Top	QPSK	14.85		
2	20	Top	QPSK	14.71	17.60	34.60
3	20	Top	QPSK	14.47		
0	20	Top	16QAM	14.57	17.64	34.64
1	20	Top	16QAM	14.69		
2	20	Top	16QAM	14.75	17.65	34.65
3	20	Top	16QAM	14.52		
0	20	Top	64QAM	14.45	17.49	34.49
1	20	Top	64QAM	14.51		
2	20	Top	64QAM	14.61	17.65	34.65
3	20	Top	64QAM	14.66		

Port	BW(MHz)	Channel position	Modulation	PAPR(dB)	Conducted Power (dBm/10MHz)	Total Conducted Power (dBm/10MHz)	Total Calculated EIRP (dBm/10MHz)
0	10	Bottom	QPSK	7.44	29.61	32.75	46.75
1	10	Bottom	QPSK	7.43	29.87		
2	10	Bottom	QPSK	7.42	29.65	32.68	46.68
3	10	Bottom	QPSK	7.45	29.69		
0	10	Mid	QPSK	7.45	29.76	32.83	46.83
1	10	Mid	QPSK	7.48	29.88		
2	10	Mid	QPSK	7.37	29.63	32.75	46.75
3	10	Mid	QPSK	7.46	29.84		
0	10	Top	QPSK	7.37	29.62	32.79	46.79
1	10	Top	QPSK	7.48	29.93		
2	10	Top	QPSK	7.58	29.88	32.80	46.80
3	10	Top	QPSK	7.57	29.69		

Port 0, 20MHz, Mid Channel, QPSK, Conducted Power(dBm/10MHz)

Port 0, 20MHz, Mid Channel, QPSK, Conducted PSD(dBm/MHz)

A.2 Occupied Bandwidth

A.2.1 Reference

FCC CFR 47 Part 96, Clause 96.41(e)
FCC CFR 47 Part 2, Clause 2.1049

A.2.2 Method of Measurements

The EUT was set to transmit at maximum power and testing was carried out on bottom, middle and top channels. Using the Occupied Bandwidth measurement function in the spectrum analyzer, the 26dB bandwidth was measured in accordance with ANSI 63.26.

The measurement method is from ANSI 63.26:
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 (i.e., two to five times the OBW).
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.
d) Set the detection mode to peak, and the trace mode to max hold.
e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

A.2.3 Measurement result

Port	Channel Position	BW(MHz)	Occupied Bandwidth (MHz)			Emission Bandwidth (MHz)		
			QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
1	Middle	10	8.930	8.929	8.990	9.402	9.387	9.591
		20	17.84	17.94	17.80	18.88	18.87	18.71

Port 1, 10MHz, Mid Channel, QPSK

Port 1, 10MHz, Mid Channel, 16QAM

Port 1, 10MHz, Mid Channel, 64QAM

Port 1, 20MHz, Mid Channel, QPSK

Port 1, 20MHz, Mid Channel, 16QAM

Port 1, 20MHz, Mid Channel, 64QAM

A.3 Transmitter unwanted emissions at Band Edge

A.3.1 Reference

FCC CFR 47 Part 96, Clause 96.41(e)
FCC CFR 47 Part 2, Clause 2.1051

A.3.2 Method of measurement

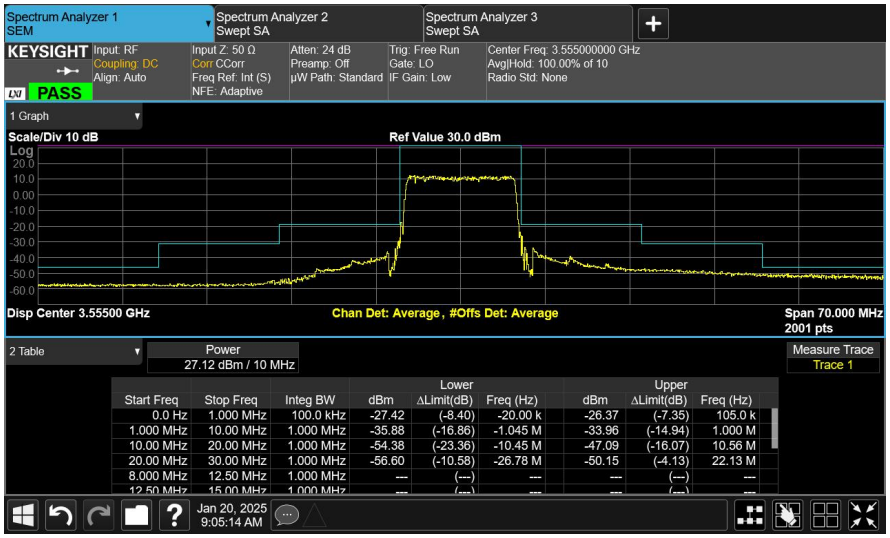
For channel and frequency assignments made by the SAS to CBSDs, the conducted power of any CBSD emission outside the fundamental emission bandwidth shall not exceed -13dBm/MHz within 0–10 megahertz above the upper SAS-assigned channel edge and within 0–10megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any CBSD emission shall not exceed -25 dBm/MHz. The conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed -25dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz.
In the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed.
For MIMO mode configurations, the limit was adjusted with a correction of -6.02dB [10Log(1/4)] by using the Measure and Add 10Log(N) dB technique according to FCC KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from antenna ports.

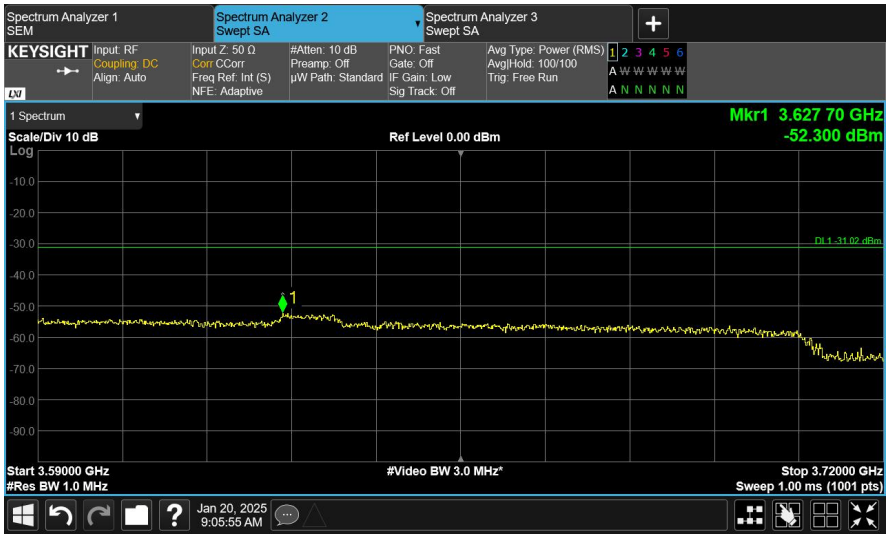
A.3.3 Measurement limit

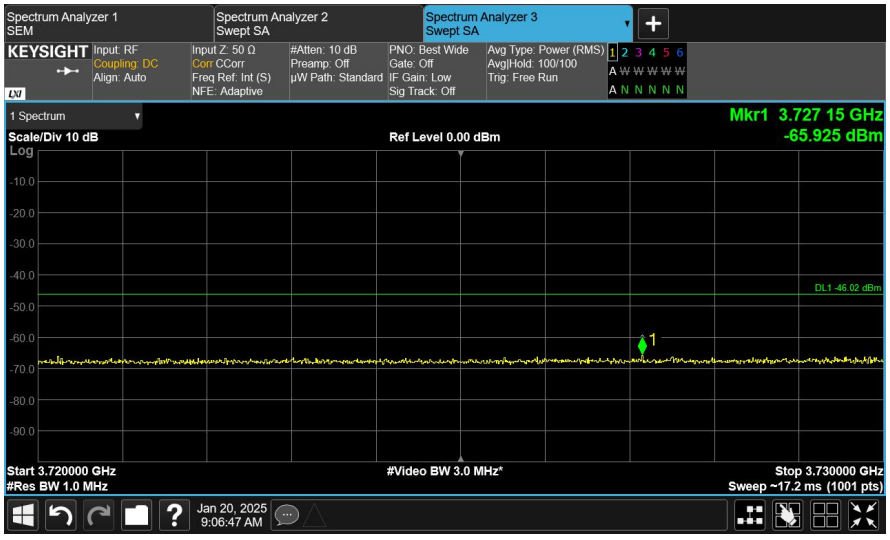
0-10MHz from channel edge: ≤-19.02dBm/MHz
>10MHz from channel edge: ≤-31.02dBm/MHz
3530MHz-3540MHz and 3710MHz-3720MHz: ≤-31.02dBm/MHz
below 3530 MHz and above 3720 MHz: ≤-46.02dBm/MHz

A.3.4 Measurement result

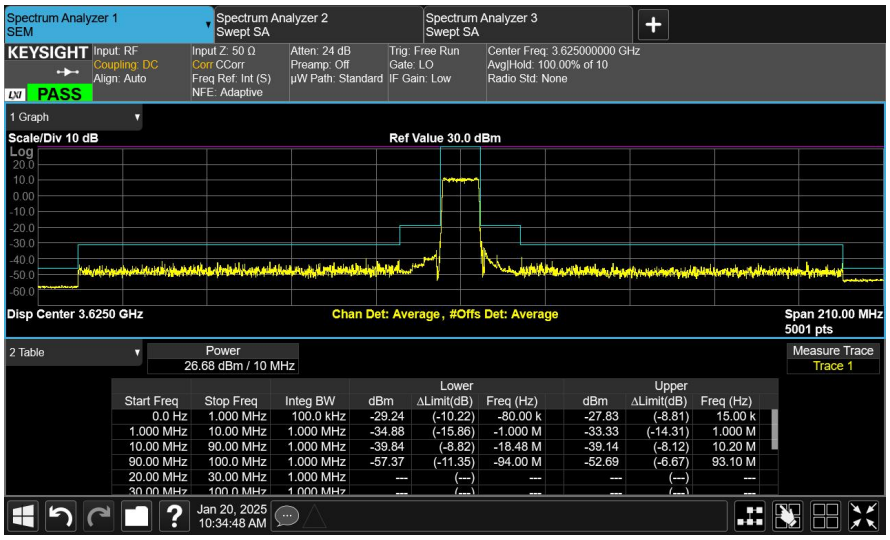
Port 1, 10MHz, Bottom Channel, QPSK





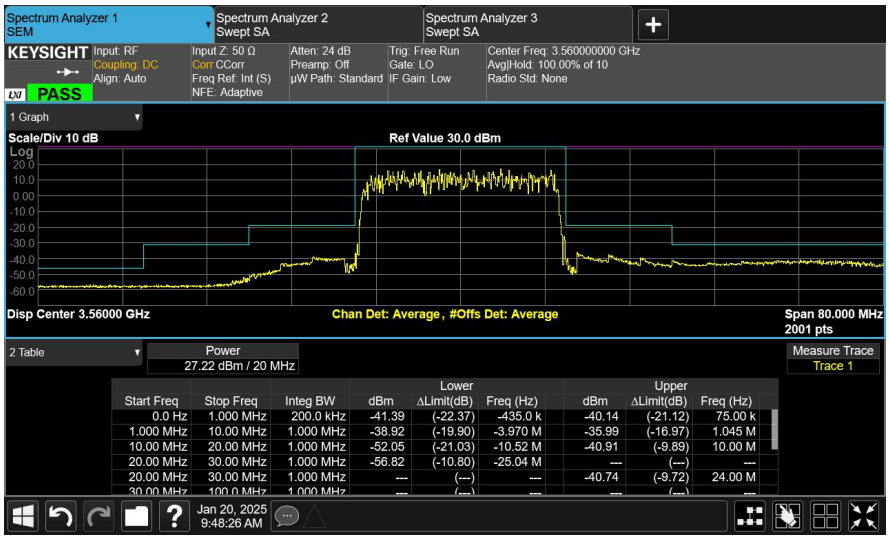


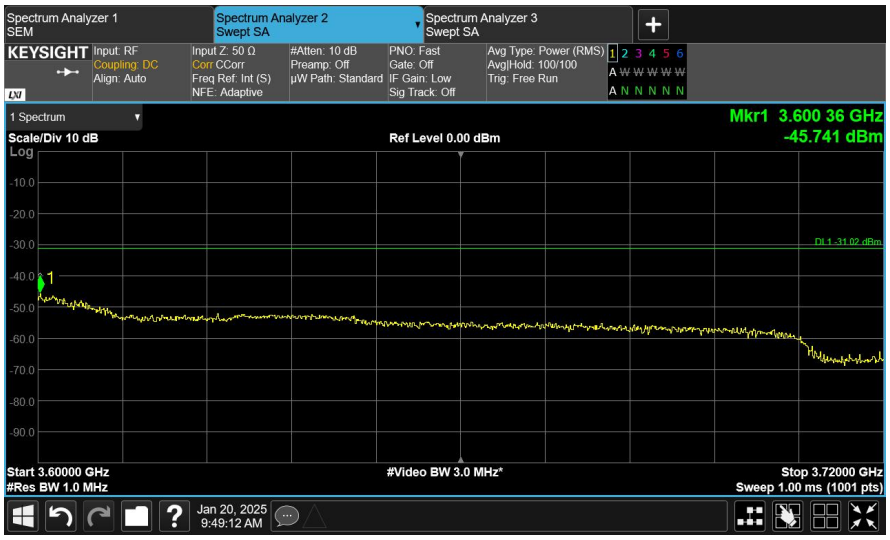
Port 1, 10MHz, Mid Channel, QPSK



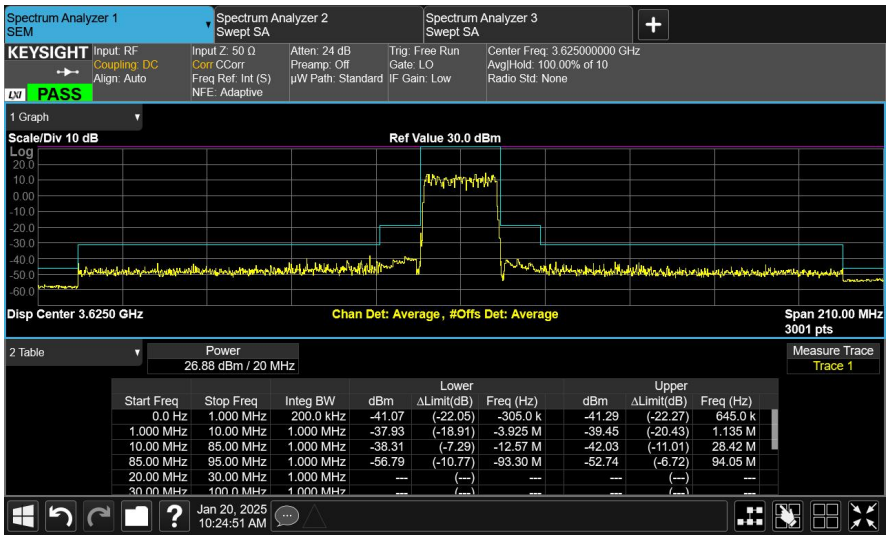
Port 1, 10MHz, Top Channel, QPSK

Port 1, 20MHz, Bottom Channel, QPSK

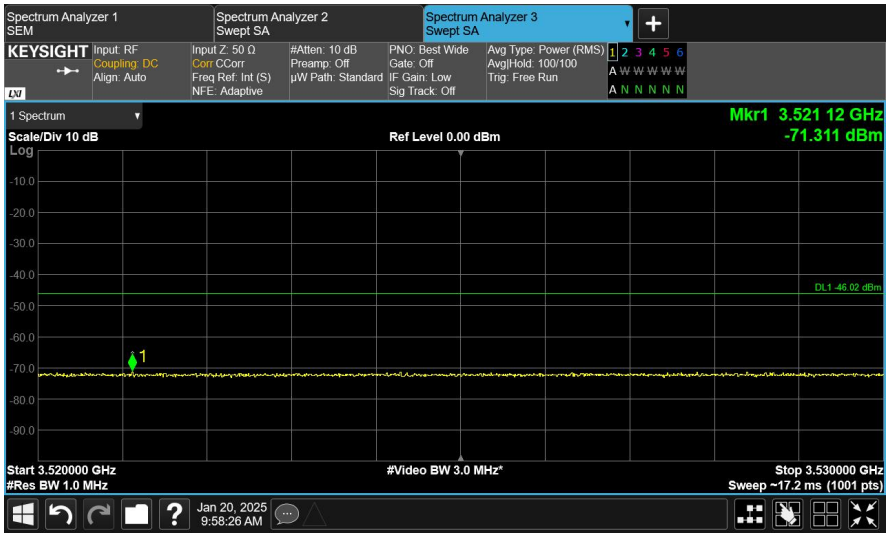




Port 1, 20MHz, Mid Channel, QPSK



Port 1, 20MHz, Top Channel, QPSK



A.4 Transmitter unwanted emissions - Conducted Spurious Emission

A.4.1 Reference

FCC Part 96, Clause 96.41(e)

A.4.2 Method of measurement

In accordance with FCC rules, the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz.

The spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 30MHz to 37GHz. The resolution bandwidth of 1MHz was employed for frequency band 30MHz to 37GHz. The spectrum analyzer detector was set to RMS.

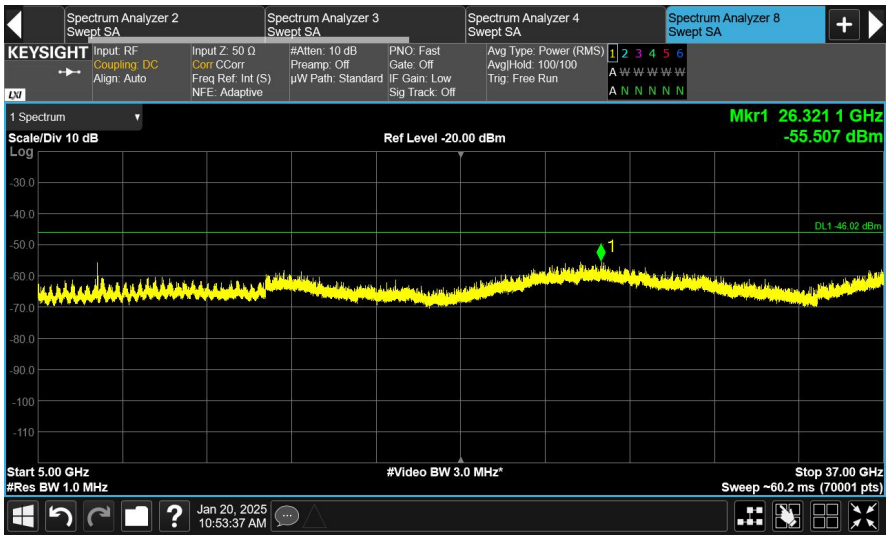
For MIMO mode configurations, the limit was adjusted with a correction of -6.02dB [10Log(1/4)] by using the Measure and Add 10Log(N) dB technique according to FCC KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from antenna ports. Then the limit was adjust to -46.02dBm.

A.4.3 Measurement limit

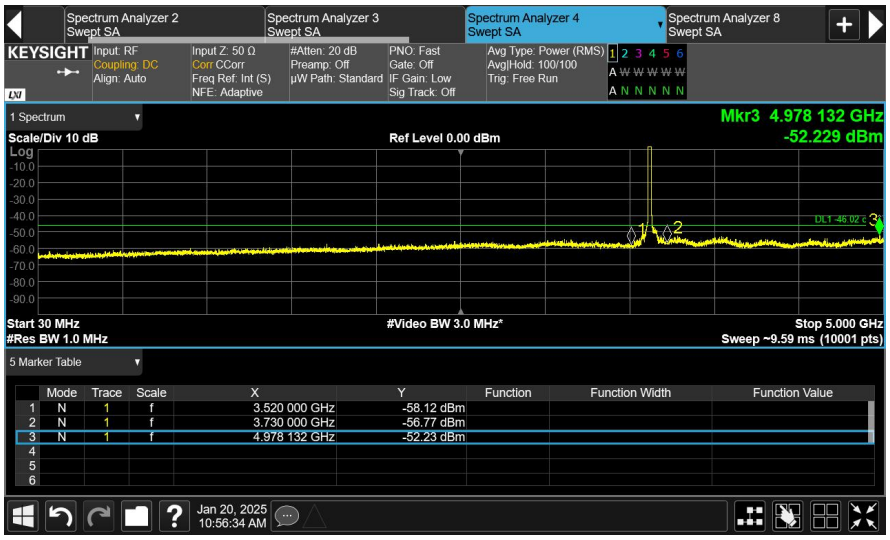
≤-46.02dBm/MHz

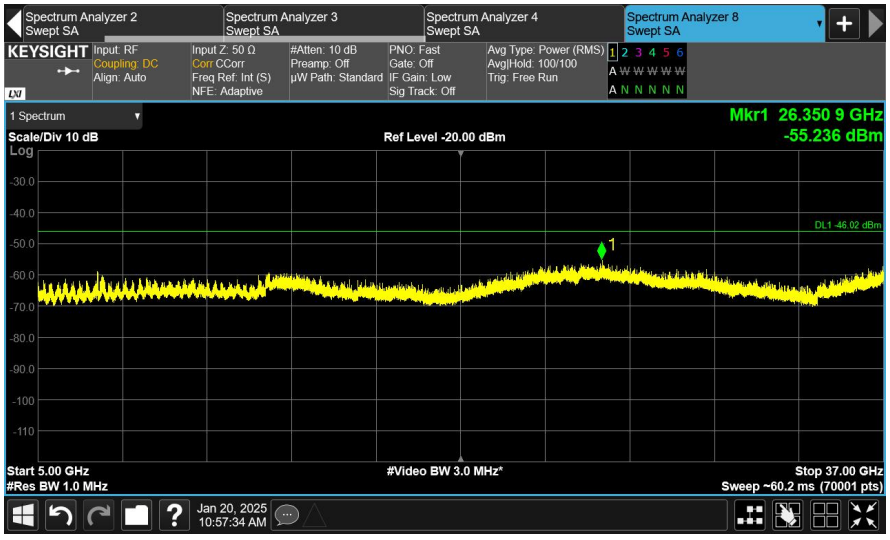
A.4.4 Measurement results

Port 1, 10MHz, Mid Channel, QPSK



Port 1, 20MHz, Mid Channel, QPSK





A.5 Radiated Spurious Emission

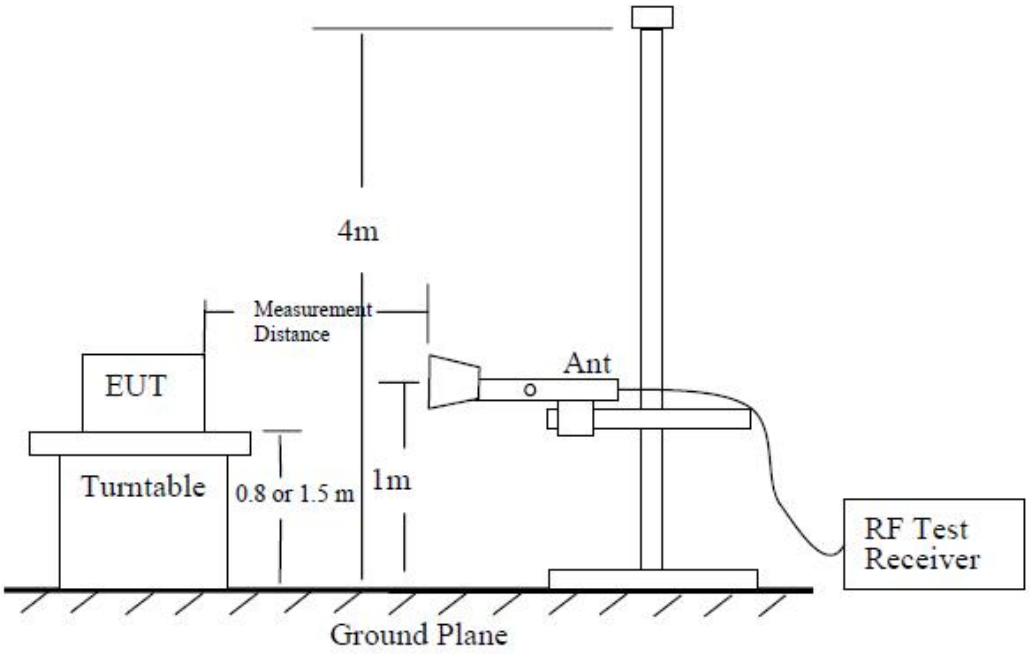
A.5.1 Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 96, Clause 96.41(e)

A.5.2 Method of measurement

The measurements procedures in C63.26 are used.
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment.

The procedure of radiated spurious emissions is as follows:
Using the test configuration as follow, measure the radiated emissions directly from the EUT and convert the measured field strength or received power to ERP or EIRP, as required, for comparison to the applicable limits.



The emission characteristics of the EUT can be identified from the pre-scan measurement information.

Exploratory radiated measurements (pre-scans) may be performed to determine the general EUT radiated emissions characteristics and, when necessary, the EUT-to-measurement antenna orientation that produces the maximum emission amplitude. Pre-scans shall only be used to determine the emission frequencies (i.e., not amplitude levels). The information garnered from a pre-scan can then be used to perform final compliance measurements using either the substitution or direct field strength method.

For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80 cm above the reference ground plane. Radiated measurements shall be made with the measurement

antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e., field strength or received power). When orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25 cm.

The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.

For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table or support at a nominal height of 1.5 m above the ground plane. When maximizing the emissions from the EUT for measurement, the EUT and its transmitting antenna(s) shall be rotated through 360°. For each mode of operation to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.
Final measurements shall be performed for the worst case combination(s) of variable technical parameters that result in the maximum measured emission amplitude, record the frequency and amplitude of the highest fundamental emission (if applicable), and the frequency and amplitude data for the six highest-amplitude spurious emissions.
The measurements in the frequency range 30 to 1000MHz was performed with a RBW of 100kHz.
The measurements in the frequency range 1 to 40GHz was performed with a RBW of 1MHz.
Emissions identified within the range 30MHz to 40GHz were then formally measured using a peak detector as the worst case.

A.5.3 Measurement limit

The limits for outside a licensee's frequency band(s) of operation the power of the spurious emissions have been calculated, as shown below using the following formula:

EIRP = Field Strength of Carrier + 20 log (d) -104.7

Where:

Field Strength is measured in dBμV/m

d is the measurement distance in meter.

As Clause 96.41(e)(1) : Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by the SAS to CBSDs, the conducted power of any CBSD emission outside the fundamental emission bandwidth as specified in paragraph (e)(3) of this section (whether the emission is inside or outside of the authorized band) shall not exceed −13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge.
For 3540MHz-3550MHz and 3700MHz-3710MHz

-13dBm = Field Strength of Carrier + 20 log (3) -104.7

Field Strength of Carrie = -13dBm – (20 log (3) -104.7) = -13dBm – (-95.2) = 82.2 dBμV/m

As Clause 96.41(e)(2) : Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

For 3530MHz- 3540 MHz and 3710MHz-3720MHz

-25dBm = Field Strength of Carrier + 20 log (3) -104.7

Field Strength of Carrie = -25dBm – (20 log (3) -104.7) = -25dBm – (-95.2) = 70.2 dBμV/m

For below 3530 MHz or above 3720 MHz

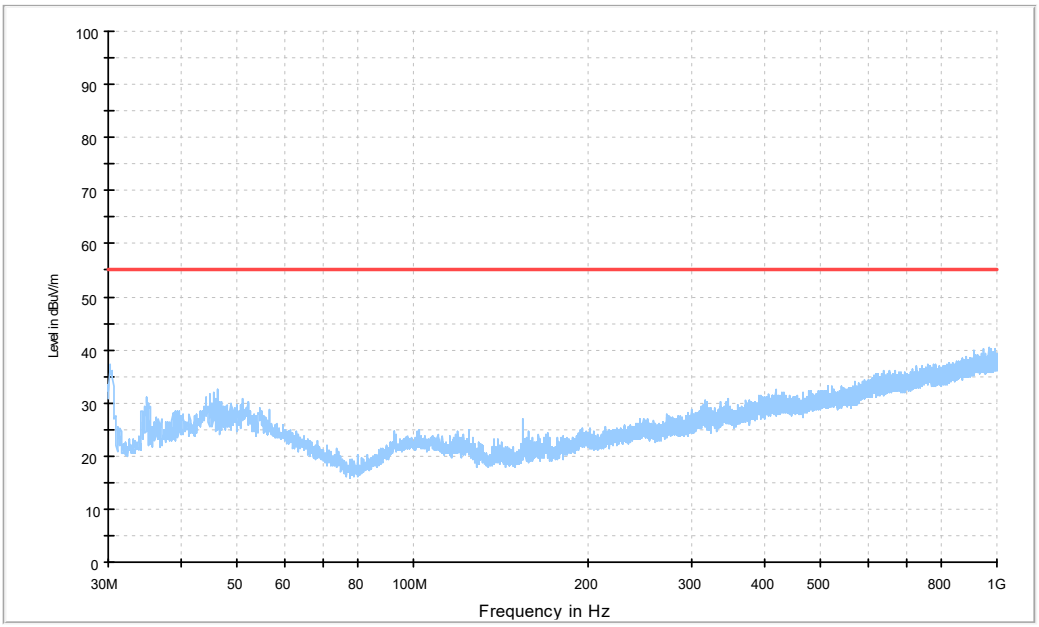
−40dBm = Field Strength of Carrier + 20 log (3) -104.7

Field Strength of Carrie = −40dBm – (20 log (3) -104.7) = −40dBm – (-95.2) = 55.2 dBμV/m

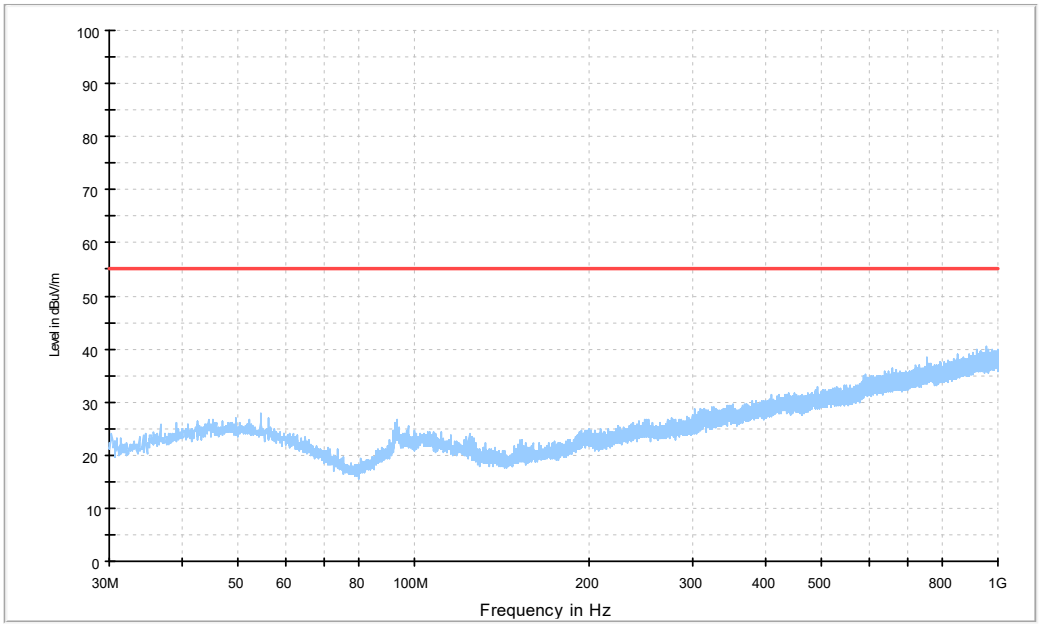
These limits have been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

Frenqucy range(MHz)	Limit(dBμV/m) Distance = 3m
30-3530	55.2
3530-3540	70.2
3540-3550	82.2
3700-3710	82.2
3710-3720	70.2
3720-40000	55.2

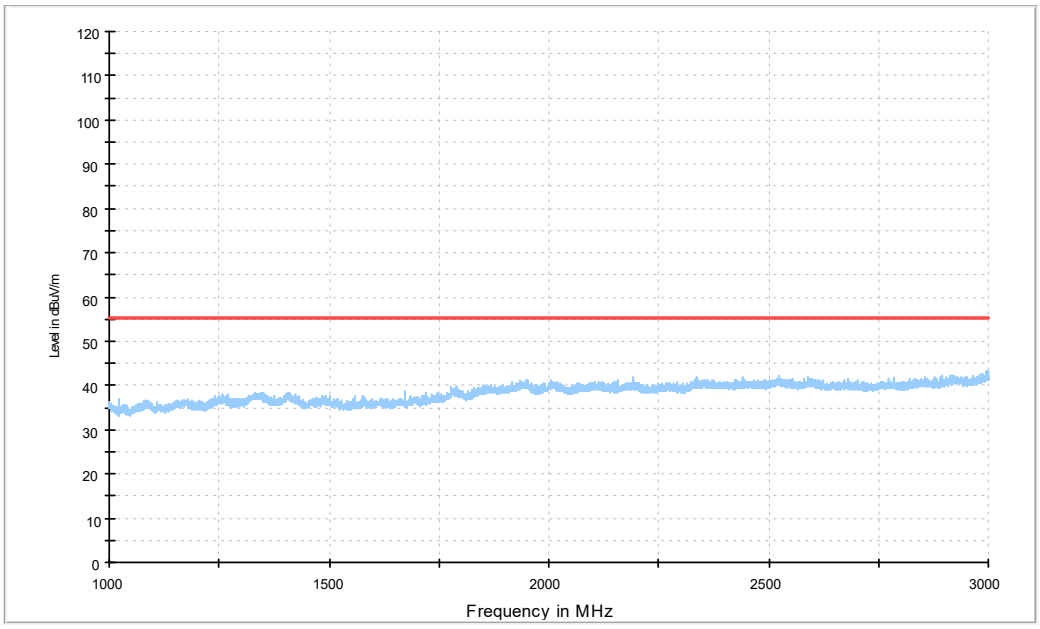
A.5.4 Measurement results



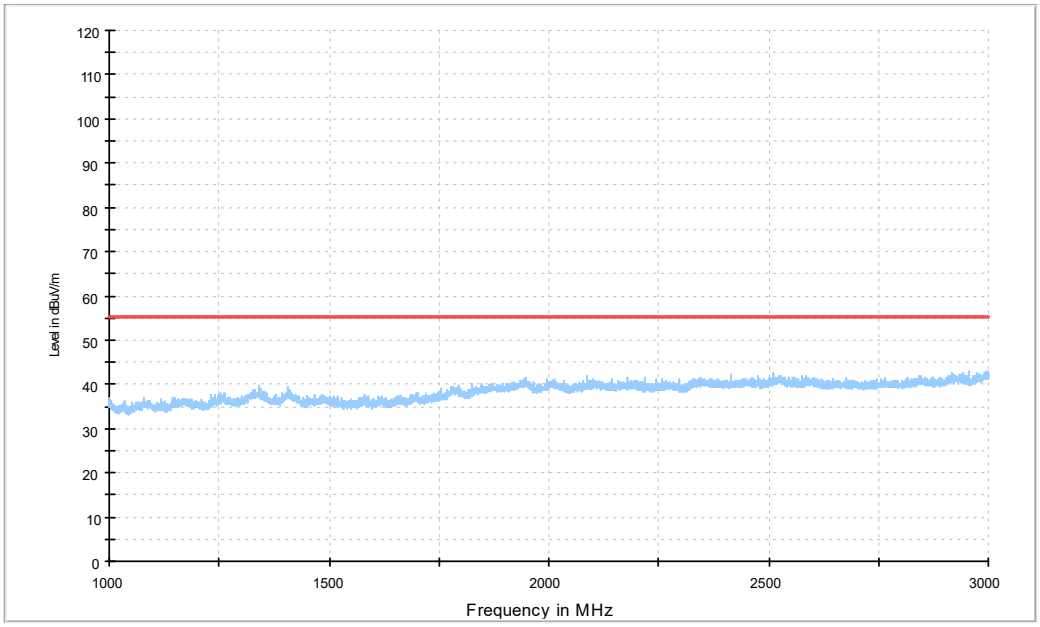
Configuration LTE TDD band 48; 10MHz, MIMO, Top, Vertical, 30MHz-1GHz



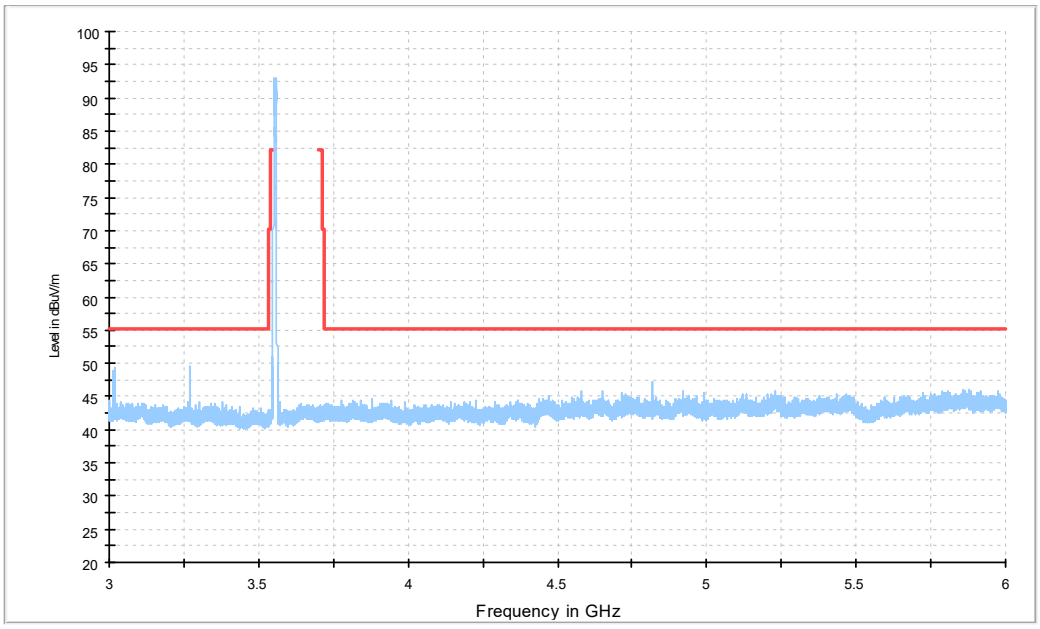
Configuration LTE TDD band 48; 10MHz, MIMO, Top, Horizontal, 30MHz-1GHz



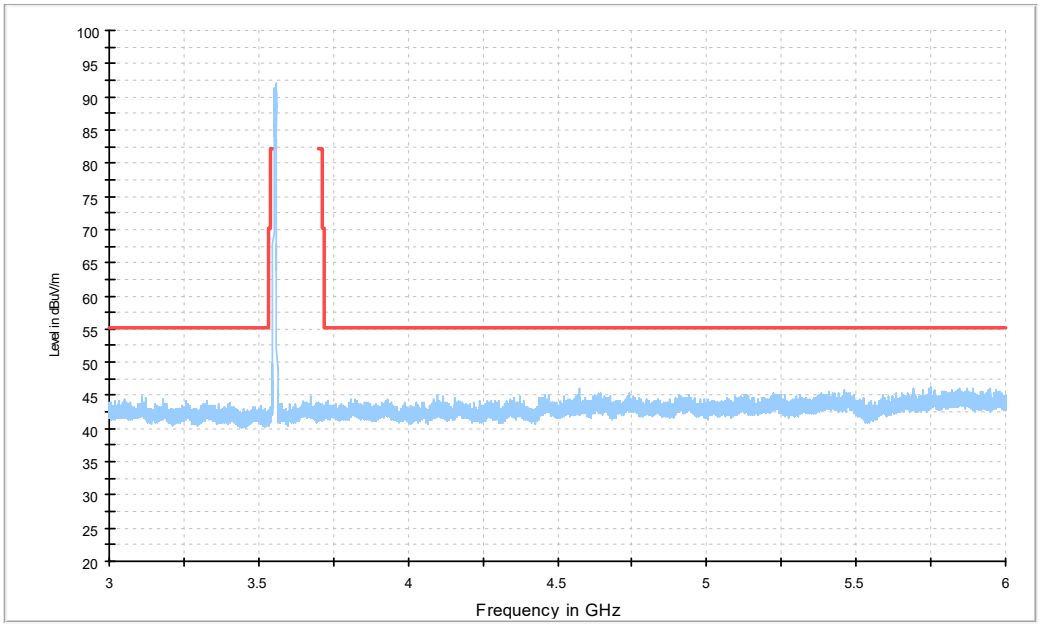
Configuration LTE TDD band 48; 10MHz, MIMO, Top, Vertical, 1GHz-3GHz



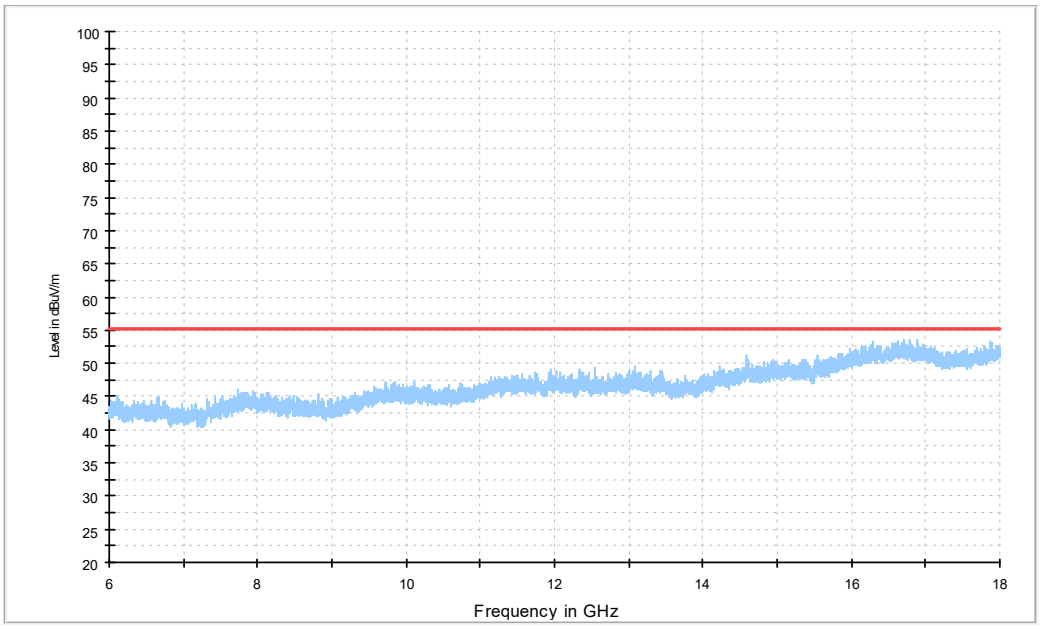
Configuration LTE TDD band 48; 10MHz, MIMO, Top, Horizontal, 1GHz-3GHz



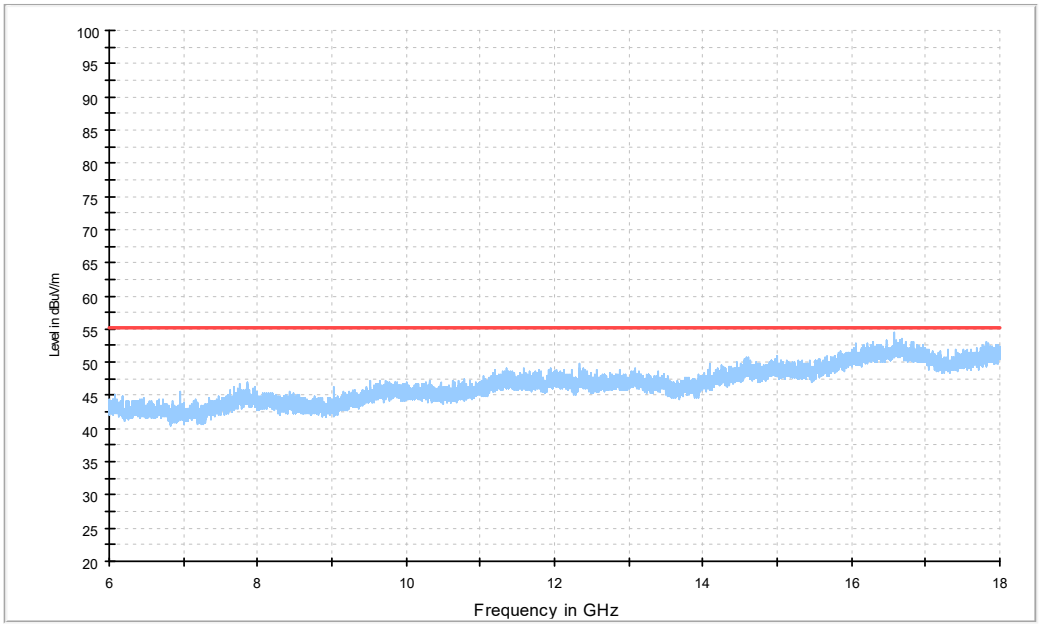
Configuration LTE TDD band 48; 10MHz, MIMO, Bottom, Vertical, 3GHz-6GHz



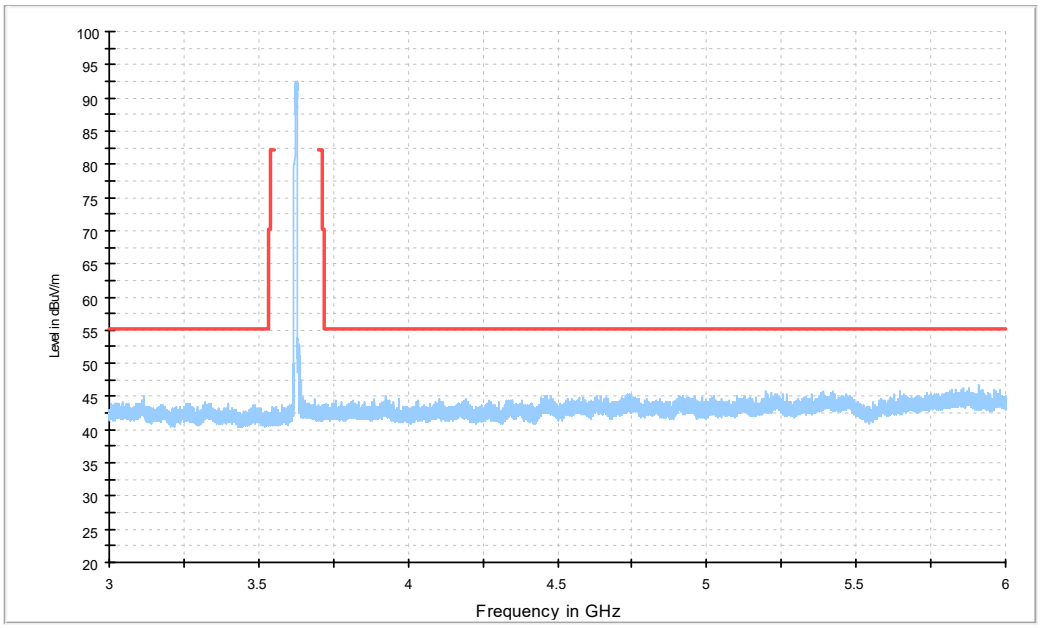
Configuration LTE TDD band 48; 10MHz, MIMO, Bottom, Horizontal, 3GHz-6GHz



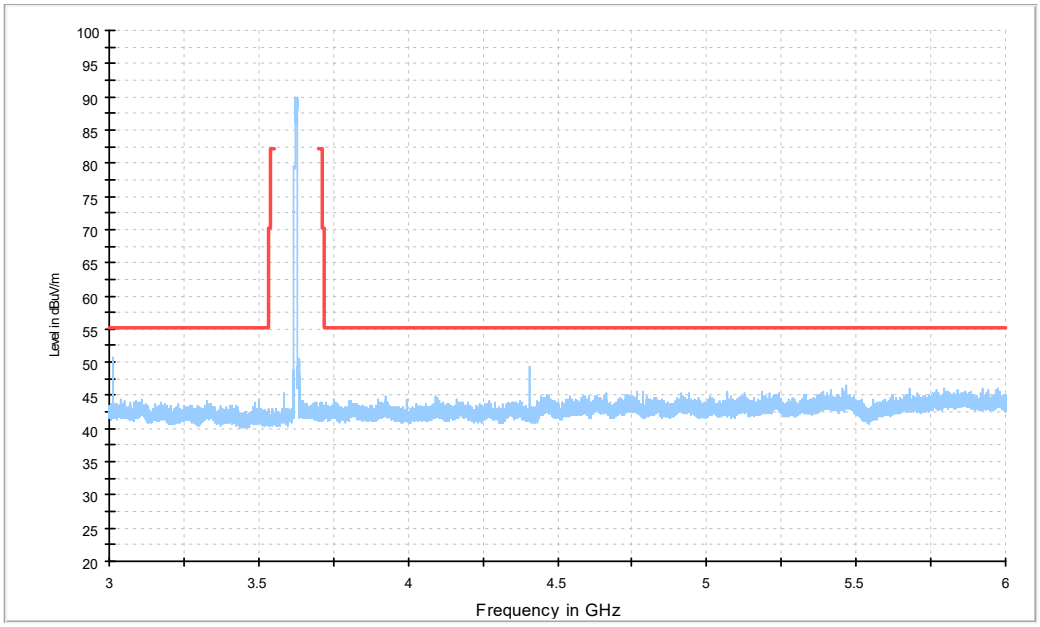
Configuration LTE TDD band 48; 10MHz, MIMO, Bottom, Vertical, 6GHz-18GHz



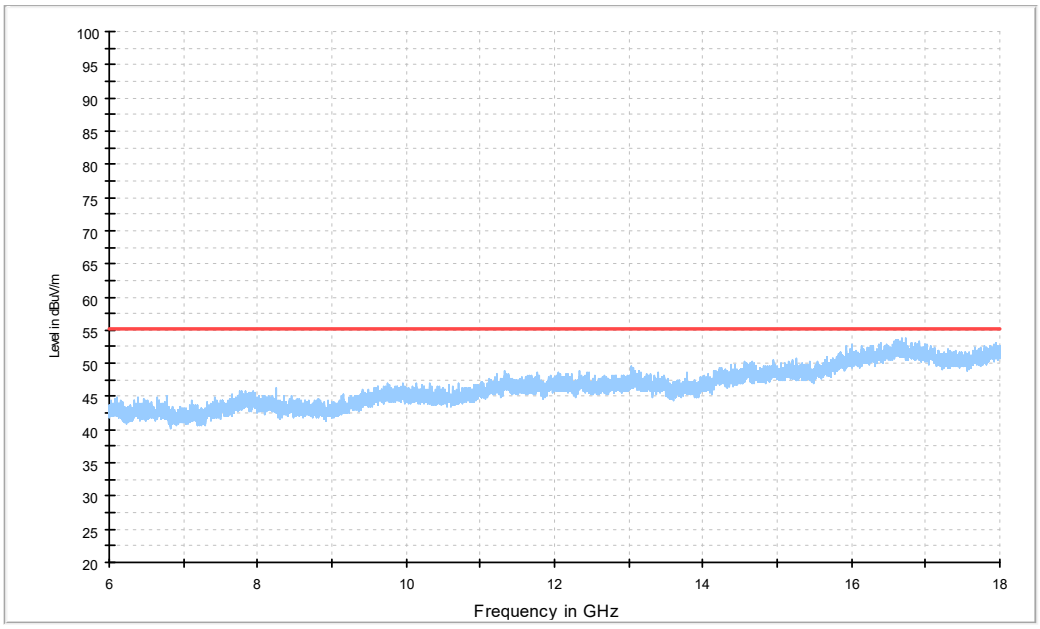
Configuration LTE TDD band 48; 10MHz, MIMO, Bottom, Horizontal, 6GHz-18GHz



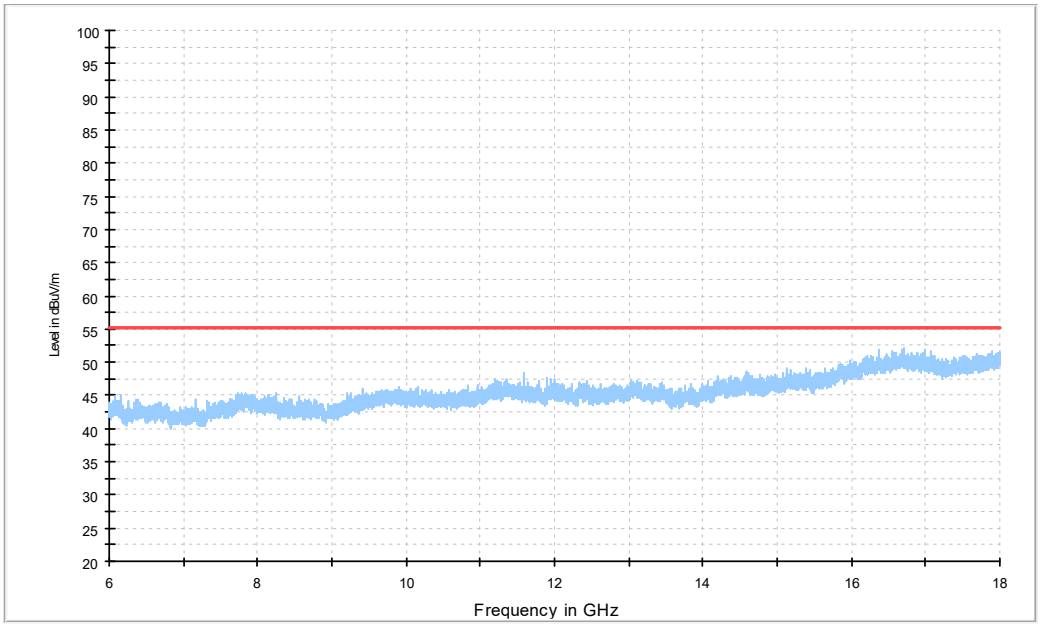
Configuration LTE TDD band 48; 10MHz, MIMO, Middle, Vertical, 3GHz-6GHz



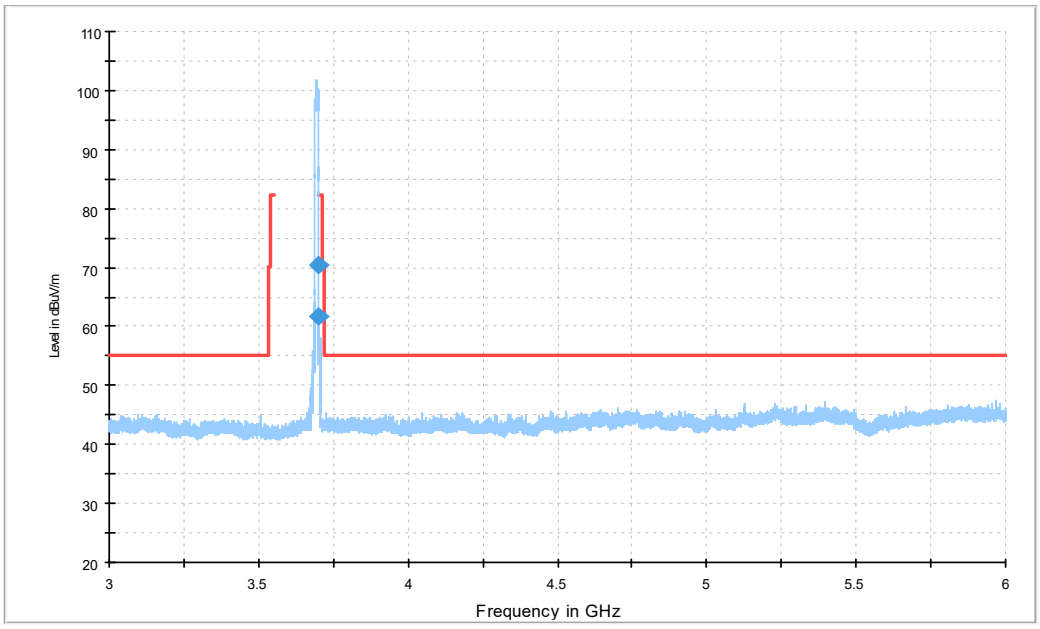
Configuration LTE TDD band 48; 10MHz, MIMO, Middle, Horizontal, 3GHz-6GHz



Configuration LTE TDD band 48; 10MHz, MIMO, Middle, Vertical, 6GHz-18GHz



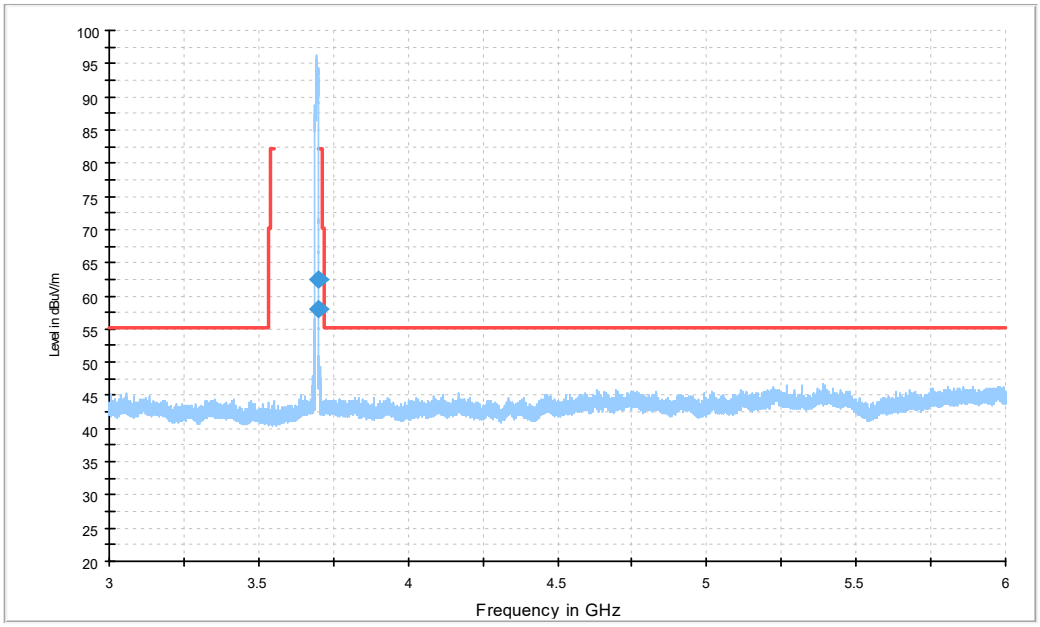
Configuration LTE TDD band 48; 10MHz, MIMO, Middle, Horizontal, 6GHz-18GHz



Configuration LTE TDD band 48; 10MHz, MIMO, Top, Vertical, 3GHz-6GHz

Final Result 1

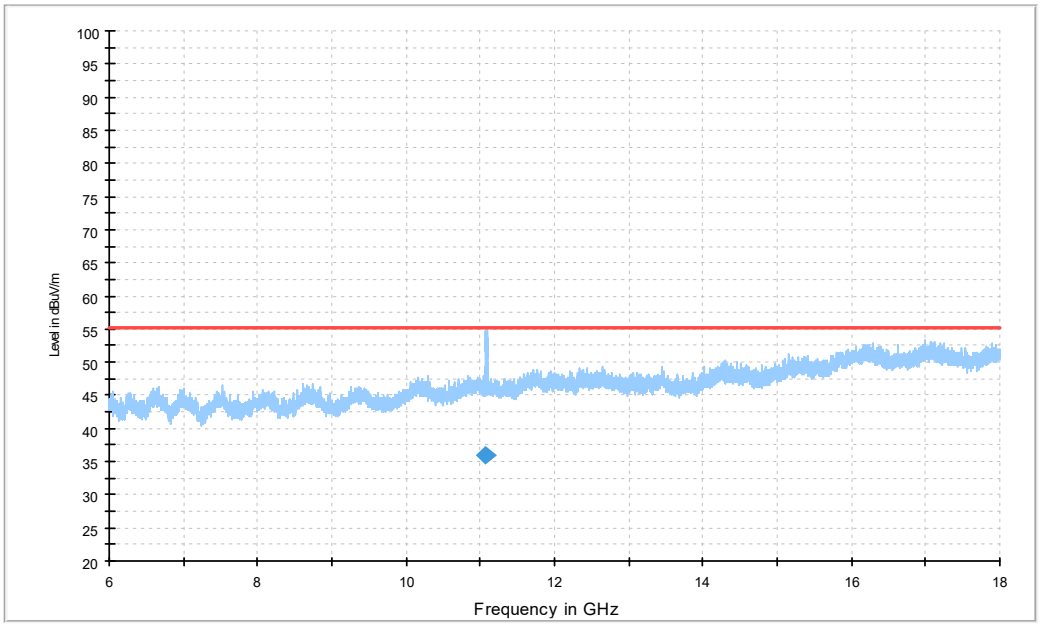
Frequency (MHz)	RMS (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
3700.000000	70.4	200.0	V	334.0	-1.0	11.8	82.2
3700.300000	61.8	250.0	V	262.0	-1.0	20.4	82.2



Configuration LTE TDD band 48; 10MHz, MIMO, Top, Horizontal, 3GHz-6GHz

Final Result 1

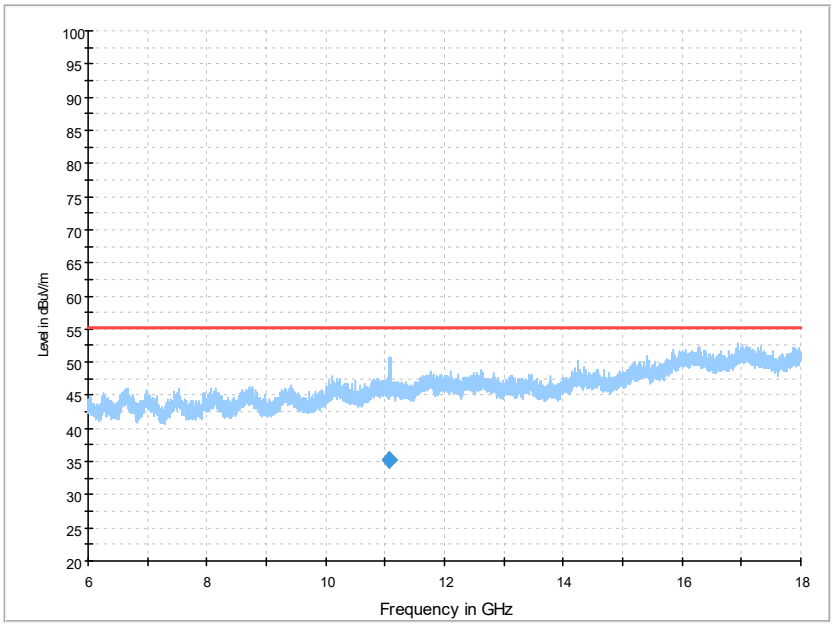
Frequency (MHz)	RMS (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
3700.000000	62.4	100.0	H	344.0	-1.0	19.8	82.2
3700.100000	58.1	100.0	H	346.0	-1.0	24.1	82.2



Configuration LTE TDD band 48; 10MHz, MIMO, Top, Vertical, 6GHz-18GHz

Final Result 1

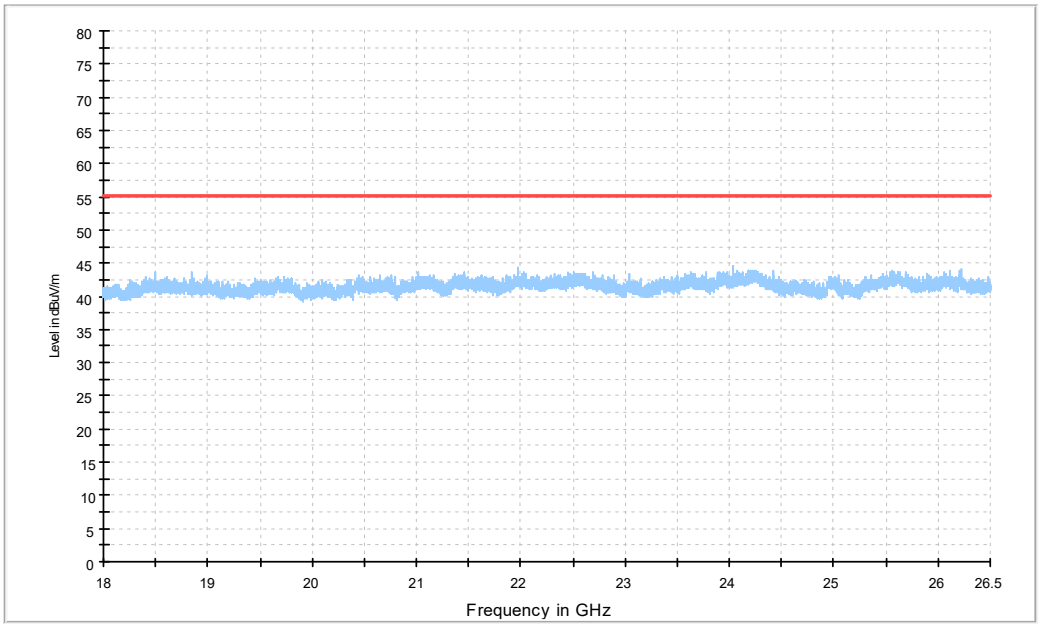
Frequency (MHz)	RMS (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
3700.000000	62.4	100.0	H	344.0	-1.0	19.8	82.2



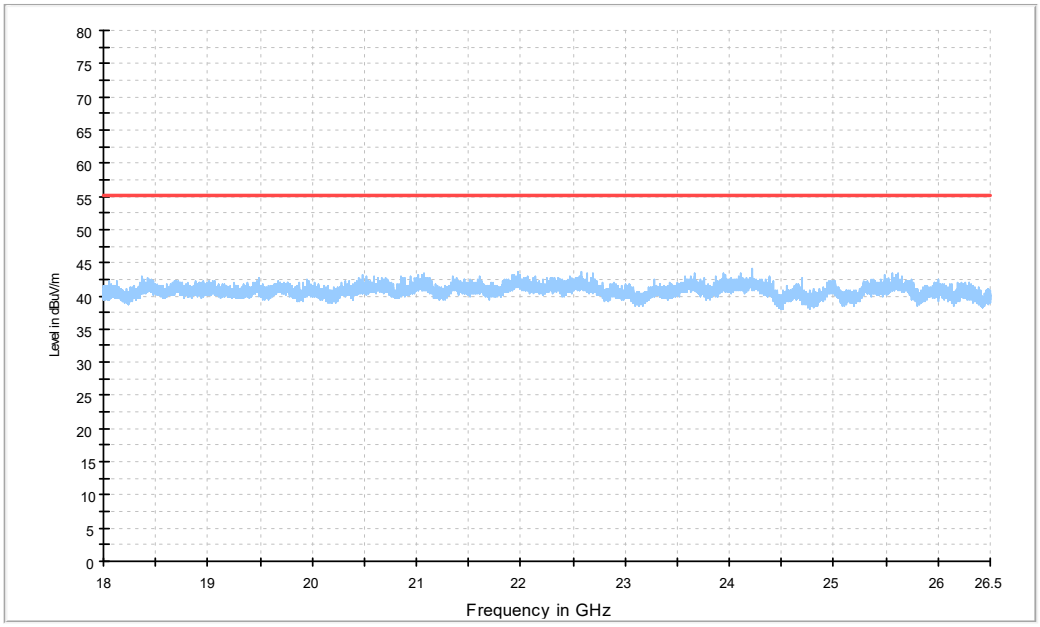
Configuration LTE TDD band 48; 10MHz, MIMO, Top, Horizontal, 6GHz-18GHz

Final Result 1

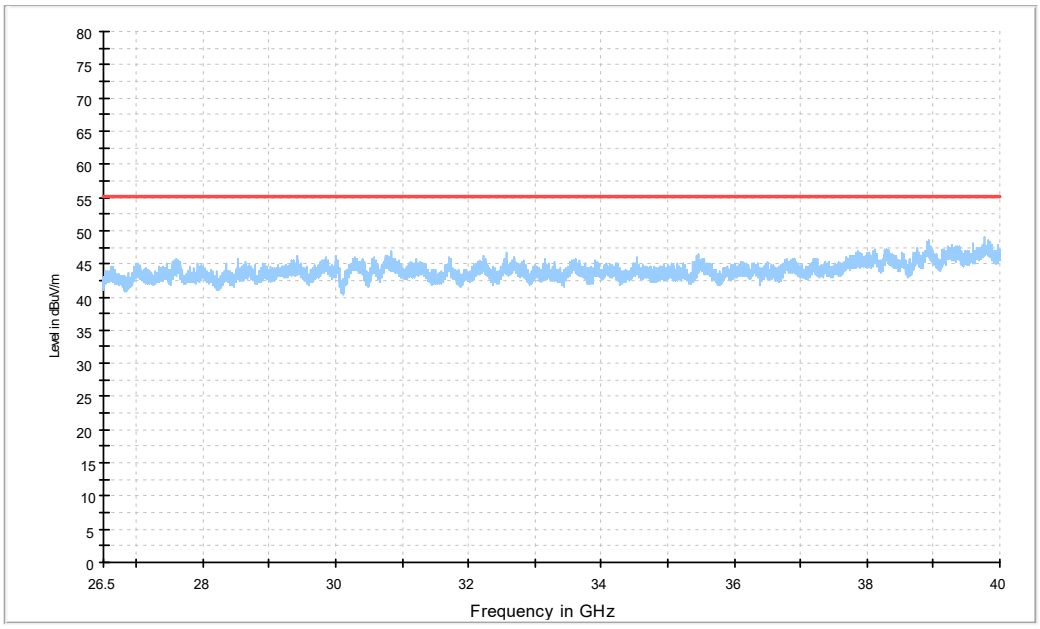
Frequency (MHz)	RMS (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBuV/m)
11081.20000	35.3	100.0	H	283.0	9.0	19.9	55.2



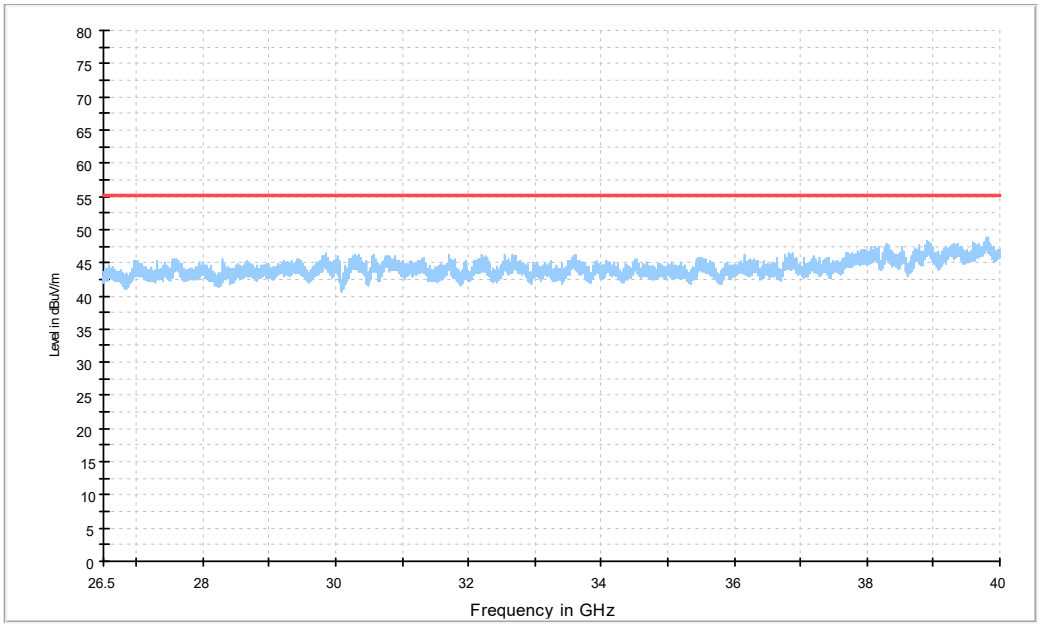
Configuration LTE TDD band 48; 10MHz, MIMO, Top, Vertical, 18GHz-26.5GHz



Configuration LTE TDD band 48; 10MHz, MIMO, Top, Horizontal, 18GHz-26.5GHz



Configuration LTE TDD band 48; 10MHz, MIMO, Top, Vertical, 26.5GHz-40GHz



Configuration LTE TDD band 48; 10MHz, MIMO, Top, Horizontal, 26.5GHz-40GHz

A.6 Frequency Stability

A.6.1 Reference

FCC Part 2, Clause 2.1055

A.6.2 Method of measurement

Temperature Variation

The EUT was tested over the temperature range -30°C to +50°C in 10°C steps with -48VDC Power Supply. At each temperature step, the Base Station was configured to transmit a [RAT]* at maximum power on the middle channel of the operating band. After achieving thermal balance, the averages of 200 transmission bursts were measured and the result recorded.

Voltage Variation

The EUT was tested at the supplied voltages varied from 85 to 115 percent of the nominal value of 48 VDC. At +20°C, the Base Station was configured to transmit a [RAT]* at maximum power on the middle channel of the operating band. The average of 200 transmission bursts was measured and the result recorded.

[RAT]*:

LTE – QPSK modulation

A.6.3 Measurement results

Frequency Error vs Voltage

Port	Modulation	BW	Temperature	Voltage	Offset(Hz)	Frequency error(ppm)
1	QPSK	10MHz	20℃	-40.8V	-145.66	0.0402
				-55.2V	-149.80	0.0413

Port	Modulation	BW	Temperature	Voltage	Offset(Hz)	Frequency error(ppm)
1	QPSK	20MHz	20℃	-40.8V	-176.23	0.0486
				-55.2V	-170.49	0.0470

Port	Temperature	Supply Voltage DC(V)	Frequency Stability(MHz)			
			10MHz, QPSK		20MHz, QPSK	
			F_L	F_H	F_L	F_H
1	20℃	40.8	3620.531	3629.456	3616.013	3633.906
		55.2	3620.543	3629.490	3615.985	3633.923

Frequency Error vs Temperature

Port	Modulation	BW	Voltage	Temperature	Offset(Hz)	Frequency error(ppm)
1	QPSK	10MHz	-48V	20℃	-145.55	0.0402
				-30℃	-142.69	0.0394
				-20℃	-143.71	0.0396
				-10℃	-149.39	0.0412
				0℃	-145.59	0.0402
				10℃	-145.81	0.0402
				30℃	-148.26	0.0409
				40℃	-145.96	0.0403
				50℃	-143.11	0.0395

Port	BW / Modulation	Voltage	Temperature	Offset(Hz)	Frequency error(ppm)
1	20MHz, QPSK	-48V	20℃	-165.23	0.0456
			-30℃	-169.34	0.0467
			-20℃	-168.20	0.0464
			-10℃	-166.81	0.0460
			0℃	-165.01	0.0455
			10℃	-165.17	0.0456
			30℃	-168.68	0.0465
			40℃	-173.88	0.0480
			50℃	-178.79	0.0493

Port	Supply Voltage DC(V)	Temperature	Frequency Stability(MHz)			
			10MHz, QPSK		20MHz, QPSK	
			F_L	F_H	F_L	F_H
1	48	20℃	3620.550	3629.425	3615.939	3633.893
		-30℃	3620.506	3629.441	3616.057	3633.957
		-20℃	3620.514	3629.466	3616.067	3633.938
		-10℃	3620.524	3629.464	3616.078	3633.861
		0℃	3620.509	3629.479	3616.018	3633.882
		10℃	3620.528	3629.487	3616.046	3633.873
		30℃	3620.503	3629.473	3616.011	3633.913
		40℃	3620.500	3629.501	3616.003	3633.924
		50℃	3620.541	3629.472	3616.040	3633.885

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 23rd day of July 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2026

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

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