

Test report

REP0023530-2R1TRFWL

Date of issue: March 3, 2023

Applicant:

Fujitsu Network Communications, Inc.

Product:

FujiCell

Model:

SC-B48-4X4-5W

Model variant:

None

FCC ID:

CFD1663

Specifications:

◆ **FCC 47 CFR Part 96**

Citizens Broadband Radio Service

Lab and test locations

Company name	Nemko USA Inc.
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Tested by	James Cunningham, EMC/MIL/WL Supervisor
Reviewed by	Juan M Gonzalez, CoE Director
Review date	March 3, 2023
Reviewer signature	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko USA's ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Fujitsu Networks Communications, Inc.
Address	2801 Telecom Parkway
City	Richardson
Province/State	TX
Postal/Zip code	75082
Country	United States of America

1.2 Test specifications

FCC 47 CFR Part 96	Citizens Broadband Radio Service
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1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.4 Exclusions

None

1.5 Test report revision history

Revision #	Details of changes made to test report
REP0023530-2TRFWL	Original report issued
REP0023530-2TRFWL	Minor corrections to Sections 8.5, 8.6

Section 2. Summary of test results

2.1 FCC Part 96 test results

Part	Test description	Verdict
§2.1033(c)(4)	Modulation type	Pass
§2.1049(h)	99% Occupied bandwidth	Pass
§2.1049(h)	26 dB Occupied bandwidth	Pass
§2.1055	Frequency stability	Pass
§96.41(b)	Power limits (EIRP)	Pass
§96.41(b)	Power limits (power spectral density)	Pass
§96.41(e)	Conducted spurious emissions	Pass
§96.41(e)	Radiated spurious emissions	Pass
§96.41(g)	Peak to average power ratio	Pass

Note: None.

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	January 10, 2023
Nemko sample ID number	NEx: 480859

3.2 EUT information

Product name	FujiCell
Model	SC-B48-4X4-5W
Part Number	N/A
Serial number	4022210002
FCC ID:	CFD1663

3.3 Technical information

Frequency band	3550 – 3700 MHz (Band TDD48)
RF power Max (W), Conducted	Band TDD48: 5 W (per port) (20 Watts - Total power across all ports)
Supported bandwidths:	10, 20 MHz
Type of modulation	QPSK; 16QAM; 64QAM
Power requirements	-36 to -58 V DC (-48 V DC nominal)
Antenna information	The EUT is professionally installed.
Number of antenna ports	4 (uncorrelated – per customer declaration)
Maximum antenna gain	6dBi

3.4 Product description and theory of operation

This is a self-contained, virtualized environment cloud in a box system, having integration with GNSS, EUT is a CBSD class B with Multi Step registration and an integrated unit for quick and easy installation, 4x4 MIMO 37m (4 x 5W), LTE TDD band 48 radio unit, supporting up to 64 users per sector and 128 users in two sectors.

3.5 EUT exercise details

A laptop computer was used to send test commands to EUT to force it to transmit the appropriate signal. Unit transmit the selected signal at full power. The unit was tested using a conducted port. The antenna installation shall be done by professionals, and they are not within the scope of the tests evaluated on this document.

3.6 EUT setup diagram

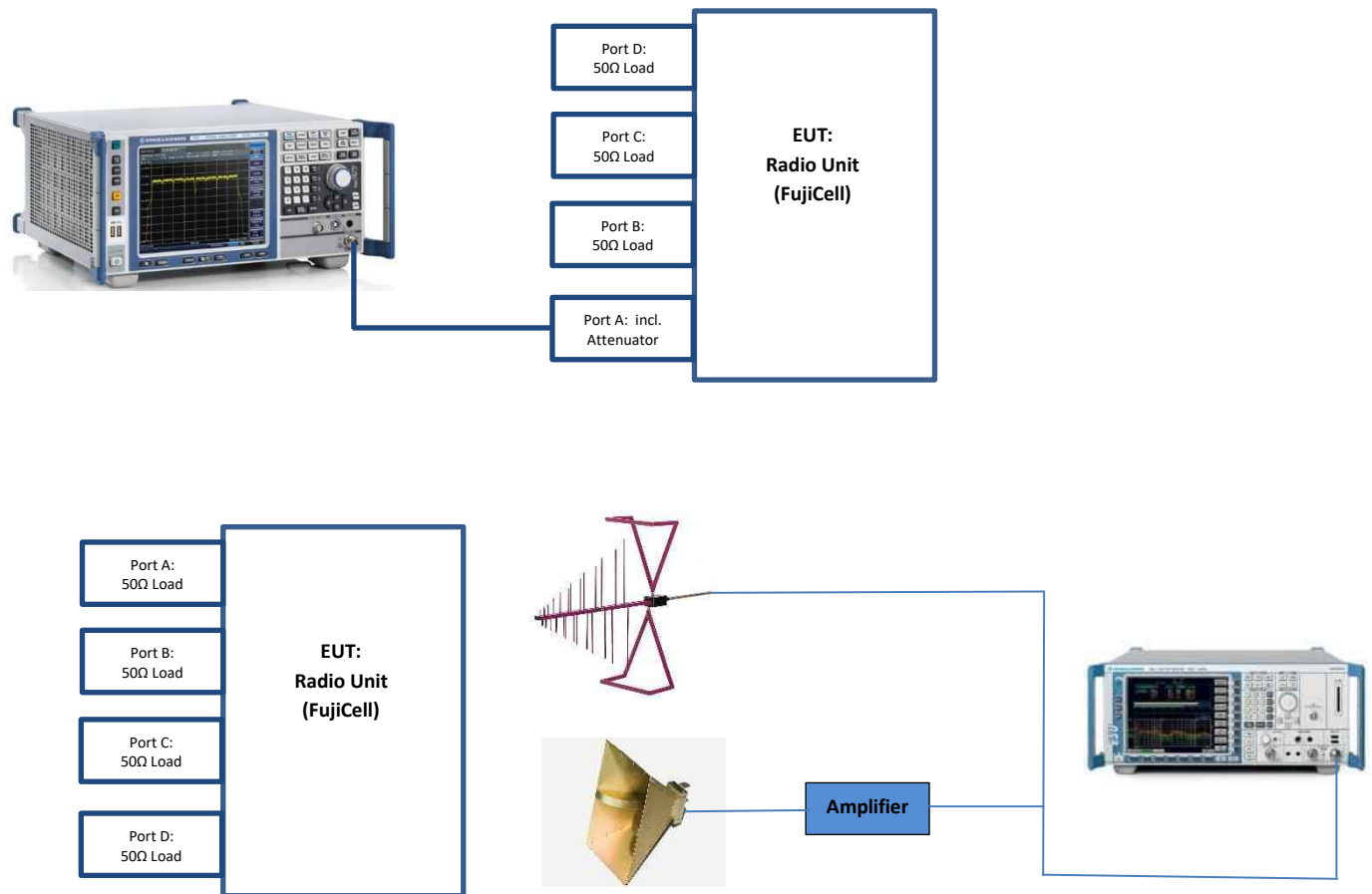


Figure 3.6-1: Setup diagram

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of $K = 2$ with 95% certainty.

Table 6.1-1: Measurement uncertainty.

Test name	Measurement uncertainty,
All antenna port measurements/ including OBW	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	1.38
Supply Voltages	0.05%
Time	2.09%

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMC Test Receiver	Rohde & Schwarz	ESU 40	E1121	1 year	31-May-2023
System Controller	Sunol Sciences	SC104V	E1191	NCR	NCR
Antenna, Bilog	Schaffner-Chase	CBL 6111D	1763	2 years	01-Apr-2024
Antenna, DRG Horn	ETS-Lindgren	3117-PA	E1139	2 years	19-Apr-2023
Signal & Spectrum Analyzer	Rohde & Schwarz	FSW43	E1302	1 year	20-Oct-2023
Band Reject Filter	Micro-Tronics	BRM50711	EW102	NCR	NCR
Environmental Chamber	TESTEQUITY	115A	E1162	1 year	29-Aug-2023
EMI Test Receiver 20Hz-40GHz	Rohde & Schwarz	ESU40	E1131	1 year	2-Mar-2023
System Controller	Sunol Sciences	SC104V	E1129	NCR	NCR
Standard Gain Horn Antenna	Eravant	SAZ-2410-42-S1	E107	VOU	VOU

Notes: N/A – not applicable
NCR – no calibration required
VOU – verify on use

Section 8. Testing data

8.1 FCC §2.1033(c)(4) Modulation type

8.1.1 Definitions and limits

(c) Applications for equipment other than that operating under parts 15, 11 and 18 of this chapter shall be accompanied by a technical report containing the following information:

(4) Type or types of emission

8.1.2 Test summary

Test date	January 10, 2023	Temperature	21 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1004 mbar
Verdict	Pass	Relative humidity	48 %

8.1.3 Observations, settings, and special notes

None

8.1.4 Test data

Band TDD48:

Bandwidth (MHz)	Emission type
10	QPSK; 16QAM; 64QAM
20	QPSK; 16QAM; 64QAM

Table 8.1-1: Types of emission

8.2 FCC §2.1049(h) 99% Occupied Bandwidth and frequency ranges

8.2.1 Definitions and limits

§2.1049 (h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the use.

8.2.2 Test summary

Test date	January 11, 2023	Temperature	18 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1001 mbar
Verdict	Pass	Relative humidity	62%

8.2.3 Observations, settings, and special notes

Selection of Port 1 was according to section 8.2.4 of this document.

Test method: ANSI C63.26 Section 5.4.4

Spectrum analyzer settings:

Resolution bandwidth	1% - 5% OBW
Video bandwidth	3*RBW
Frequency span	2*OBW
Detector mode	Peak
Trace mode	Max Hold

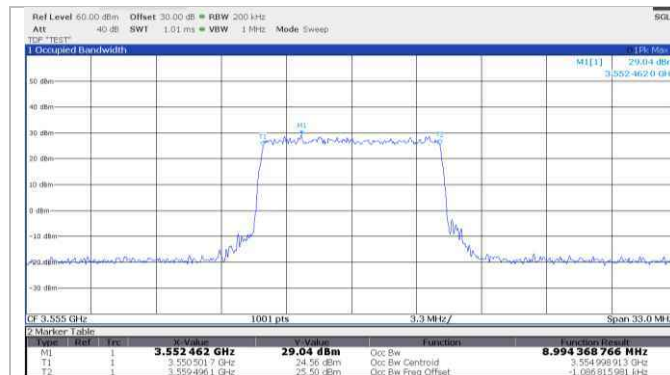
8.2.4 Test data

Band TDD48:

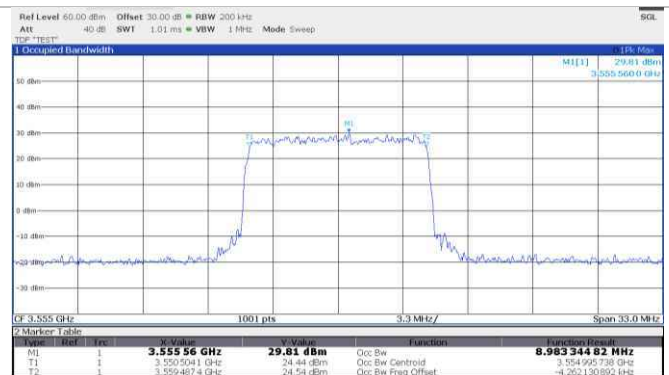
Band	Port	Channel Bandwidth (Declared)	Modulation	Center Frequency (MHz)	99% OBW (MHz)
TDD48	1	10 MHz	QPSK	3555	8.994
TDD48	1	10 MHz	16QAM	3555	8.983
TDD48	1	10 MHz	64QAM	3555	8.995
TDD48	1	10 MHz	QPSK	3625	9.001
TDD48	1	10 MHz	16QAM	3625	9.012
TDD48	1	10 MHz	64QAM	3625	8.976
TDD48	1	10 MHz	QPSK	3695	9.025
TDD48	1	10 MHz	16QAM	3695	9.029
TDD48	1	10 MHz	64QAM	3695	8.982
TDD48	1	20 MHz	QPSK	3560	17.941
TDD48	1	20 MHz	16QAM	3560	17.972
TDD48	1	20 MHz	64QAM	3560	17.906
TDD48	1	20 MHz	QPSK	3625	17.936
TDD48	1	20 MHz	16QAM	3625	18.010
TDD48	1	20 MHz	64QAM	3625	17.938
TDD48	1	20 MHz	QPSK	3690	17.924
TDD48	1	20 MHz	16QAM	3690	17.964
TDD48	1	20 MHz	64QAM	3690	17.936

Table 8.2-1: 99% Occupied bandwidth

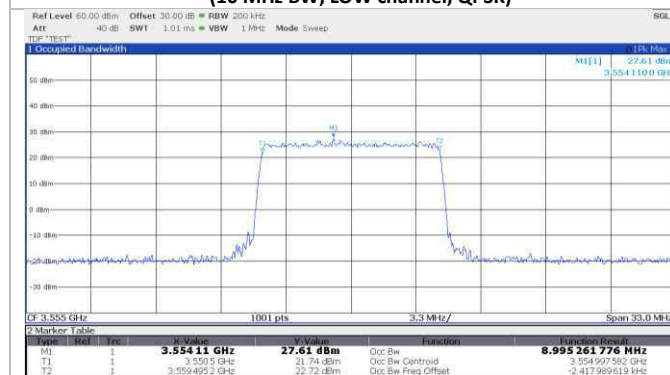
Band TDD48



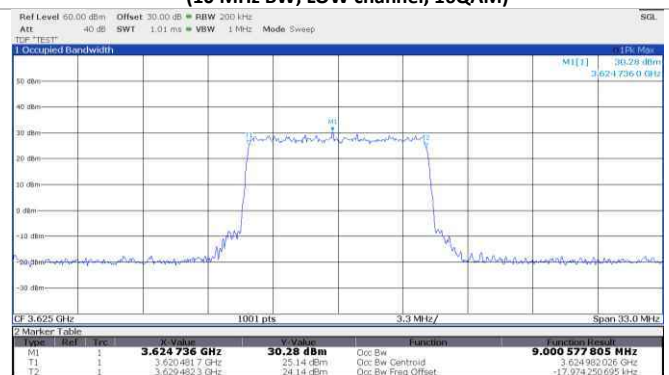
(10 MHz BW, LOW channel, QPSK)



(10 MHz BW, LOW channel, 16QAM)

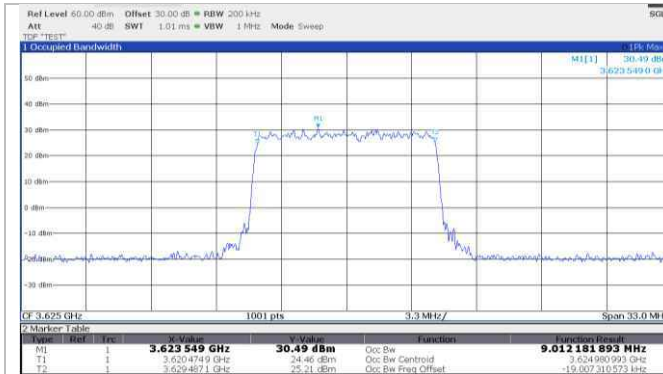


(10 MHz BW, LOW channel, 64QAM)

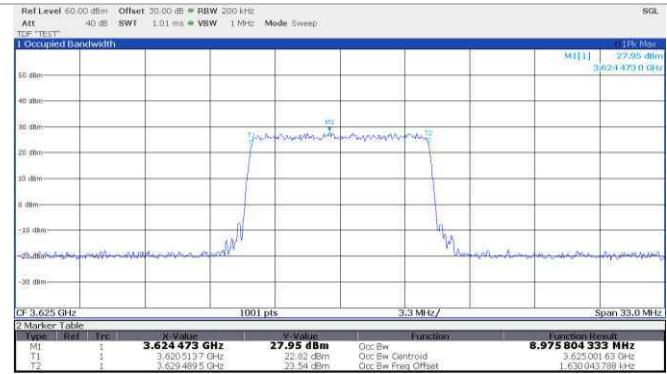


(10 MHz BW, MID channel, QPSK)

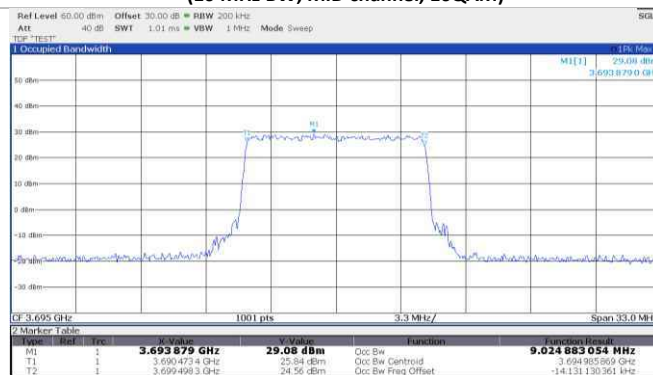
Testing data
FCC §2.1049(h) 99% Occupied Bandwidth
FCC Part 96



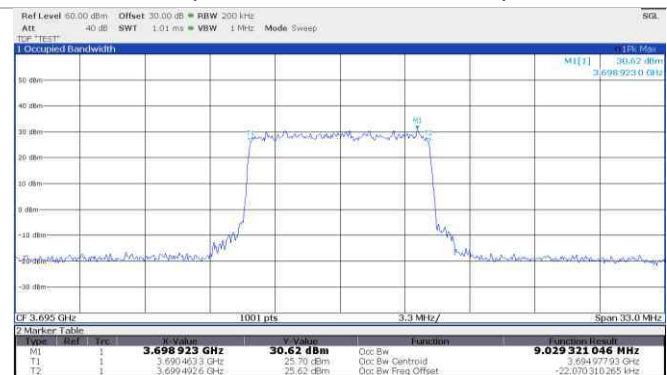
(10 MHz BW, MID channel, 16QAM)



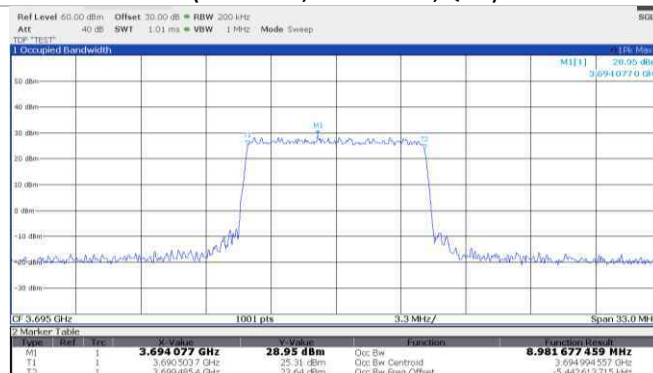
(10 MHz BW, MID channel, 64QAM)



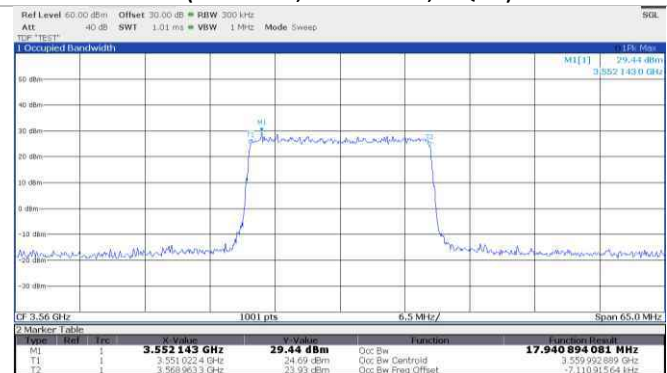
(10 MHz BW, HIGH channel, QPSK)



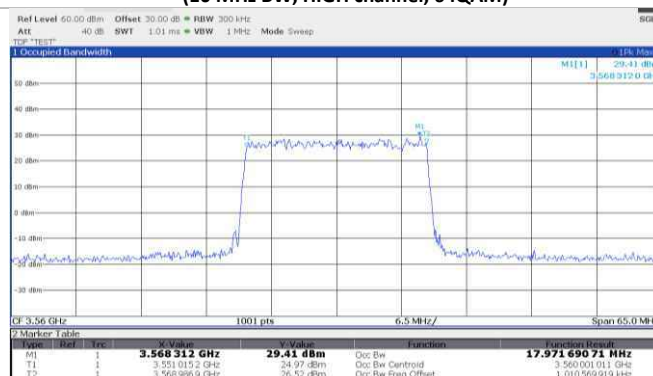
(10 MHz BW, HIGH channel, 16QAM)



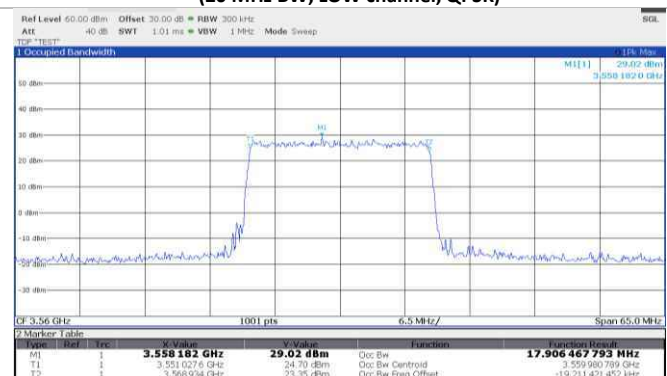
(10 MHz BW, HIGH channel, 64QAM)



(20 MHz BW, LOW channel, QPSK)



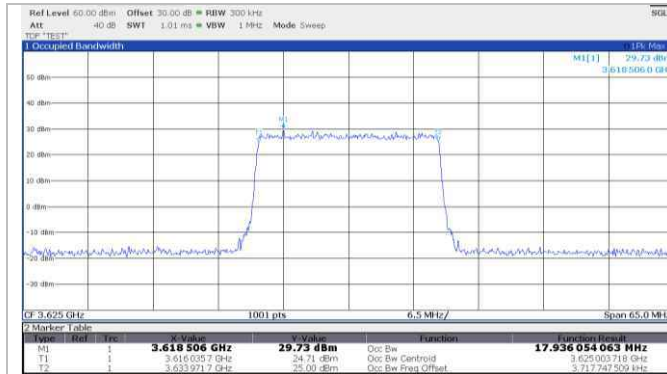
(20 MHz BW, LOW channel, 16QAM)



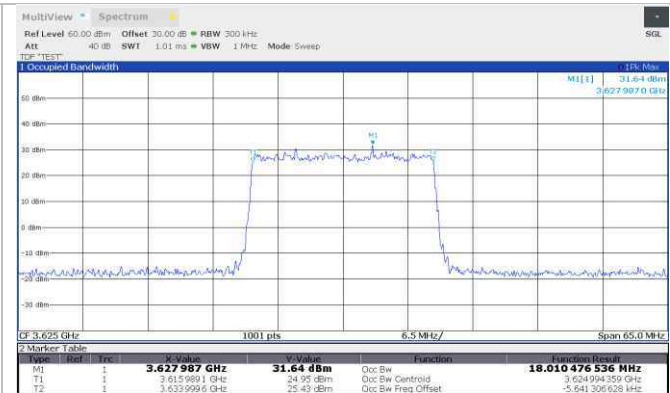
(20 MHz BW, LOW channel, 64QAM)

Section 8
Test name
Specification

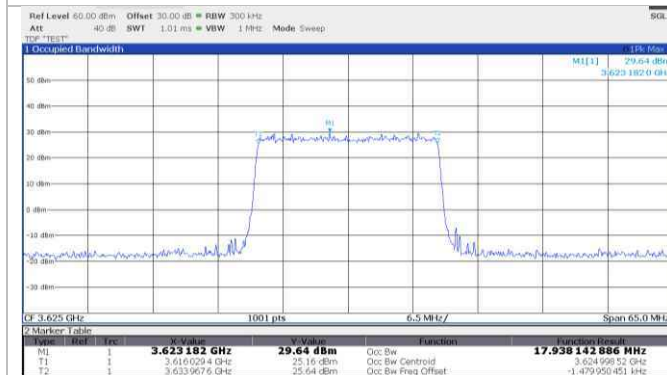
Testing data
FCC §2.1049(h) 99% Occupied Bandwidth
FCC Part 96



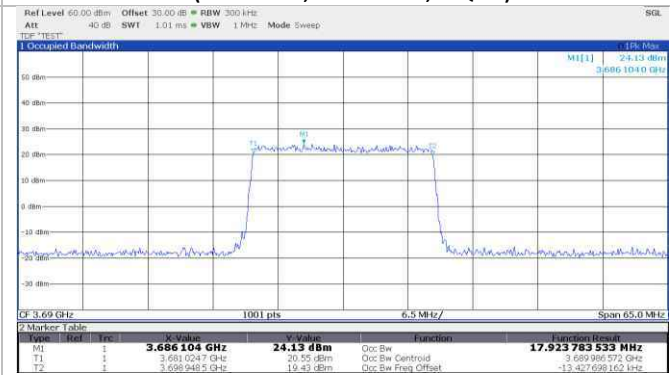
(20 MHz BW, MID channel, QPSK)



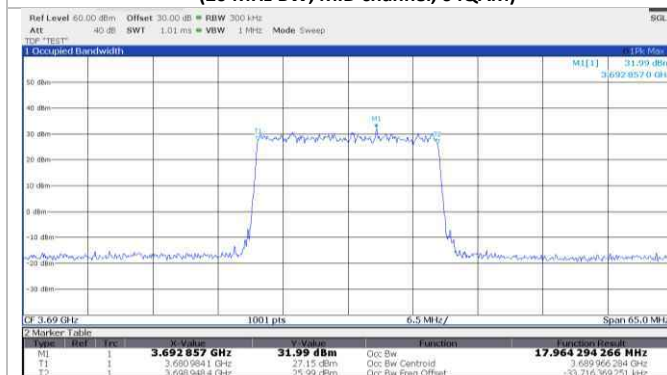
(20 MHz BW, MID channel, 16QAM)



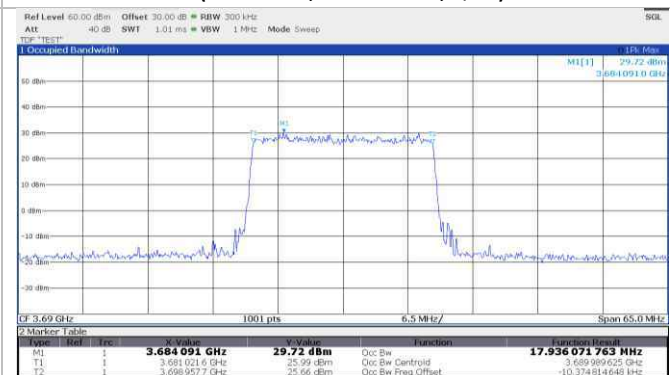
(20 MHz BW, MID channel, 64QAM)



(20 MHz BW, HIGH channel, QPSK)



(20 MHz BW, HIGH channel, 16QAM)



(20 MHz BW, HIGH channel, 64QAM)

8.3 FCC §96.41(b) 26 Occupied Bandwidth

8.3.1 Definitions and limits

(3) Measurement procedure. (i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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 below the transmitter power.

8.3.2 Test summary

Test date	January 11, 2023	Temperature	18 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1001 mbar
Verdict	Pass	Relative humidity	62%

8.3.3 Observations, settings and special notes

Selection of Port 1 was according to section 8.2.4 of this document.

Test method: ANSI C63.26 Section 5.4.4

Spectrum analyzer settings:

Resolution bandwidth	1% - 5% OBW
Video bandwidth	3*RBW
Frequency span	2*OBW
Detector mode	Peak
Trace mode	Max Hold

8.3.4 Test data

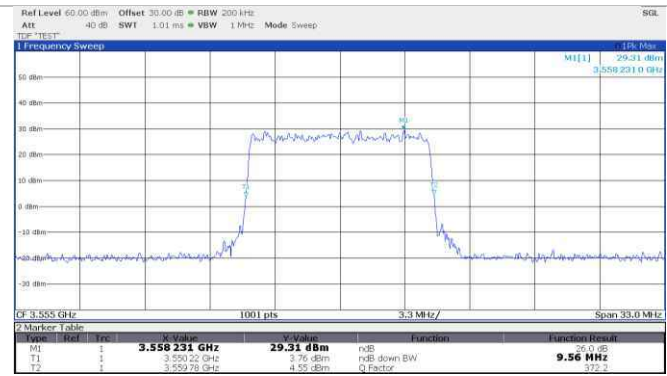
Band TDD48:

Band	Port	Channel Bandwidth (Declared)	Modulation	Center Frequency (MHz)	26 BW (MHz)
TDD48	1	10 MHz	QPSK	3555	9.593
TDD48	1	10 MHz	16QAM	3555	9.560
TDD48	1	10 MHz	64QAM	3555	9.659
TDD48	1	10 MHz	QPSK	3625	9.626
TDD48	1	10 MHz	16QAM	3625	9.659
TDD48	1	10 MHz	64QAM	3625	9.626
TDD48	1	10 MHz	QPSK	3695	9.626
TDD48	1	10 MHz	16QAM	3695	9.626
TDD48	1	10 MHz	64QAM	3695	9.659
TDD48	1	20 MHz	QPSK	3560	19.091
TDD48	1	20 MHz	16QAM	3560	19.026
TDD48	1	20 MHz	64QAM	3560	19.091
TDD48	1	20 MHz	QPSK	3625	19.026
TDD48	1	20 MHz	16QAM	3625	18.896
TDD48	1	20 MHz	64QAM	3625	19.026
TDD48	1	20 MHz	QPSK	3690	19.091
TDD48	1	20 MHz	16QAM	3690	19.091
TDD48	1	20 MHz	64QAM	3690	19.091

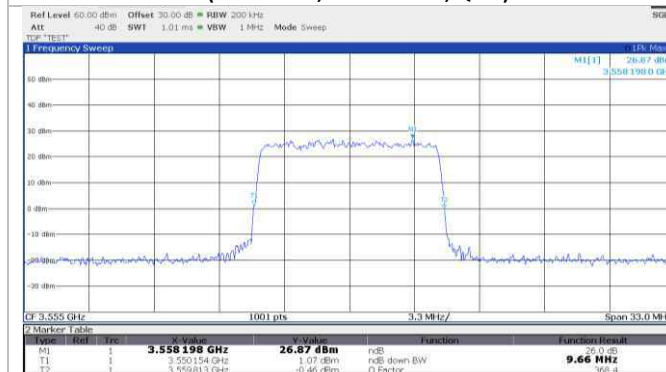
Table 8.3-1: 26 dB Occupied bandwidth



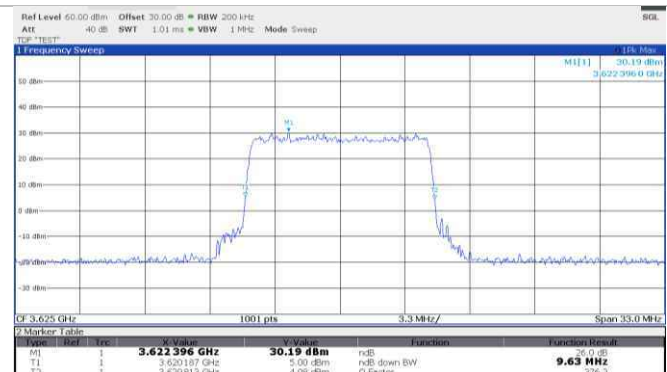
(10 MHz BW, LOW channel, QPSK)



(10 MHz BW, LOW channel, 16QAM)



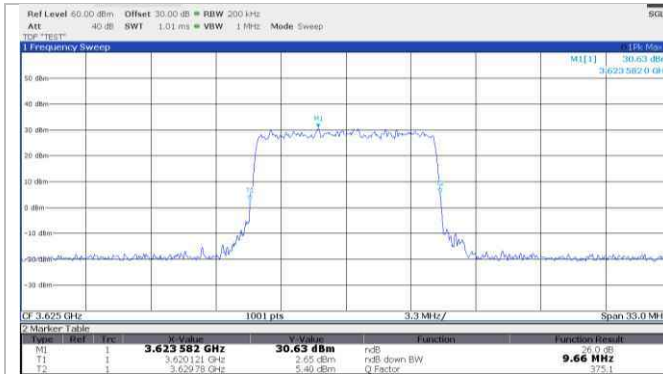
(10 MHz BW, LOW channel, 64QAM)



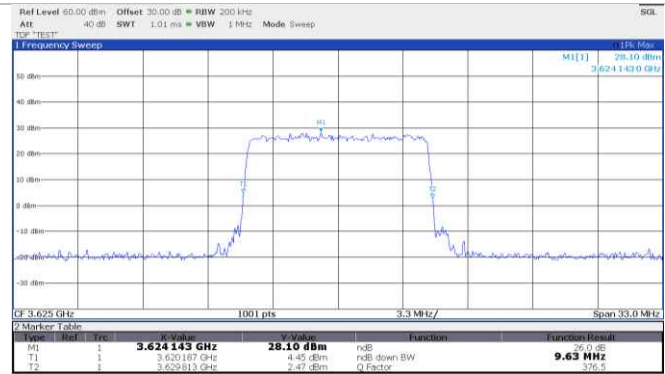
(10 MHz BW, MID channel, QPSK)

Section 8
Test name
Specification

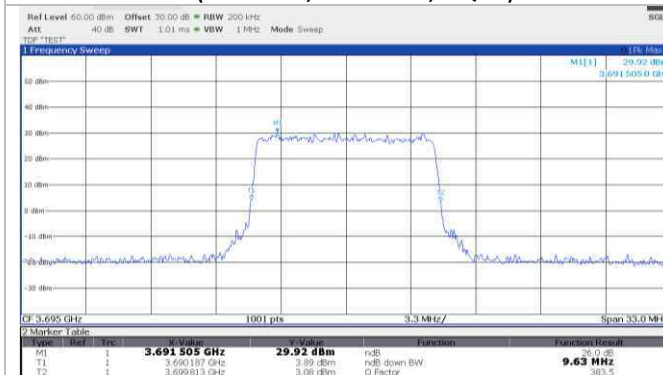
Testing data
FCC §96.41(b) 26 Occupied Bandwidth
FCC Part 96



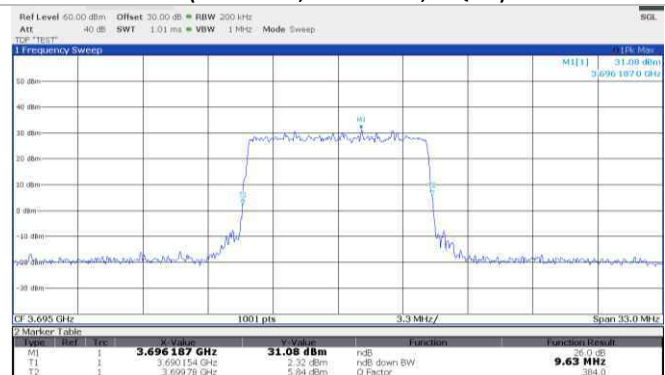
(10 MHz BW, MID channel, 16QAM)



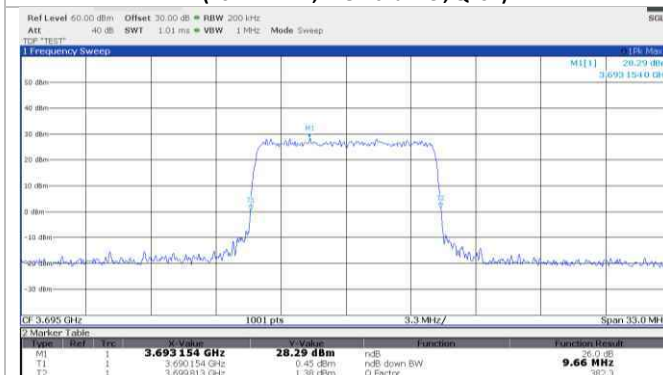
(10 MHz BW, MID channel, 64QAM)



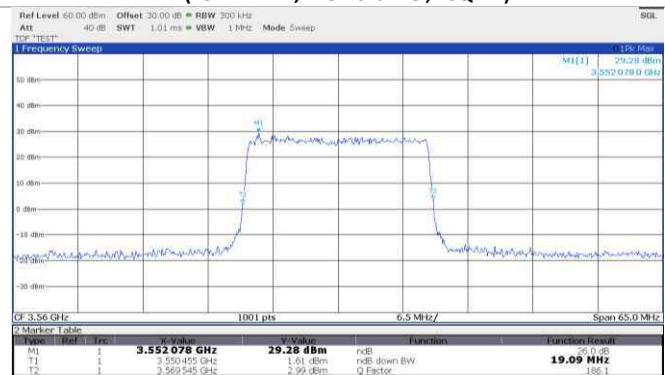
(10 MHz BW, HIGH channel, QPSK)



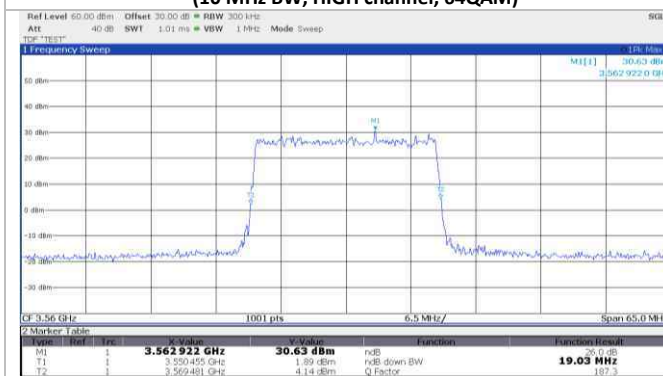
(10 MHz BW, HIGH channel, 16QAM)



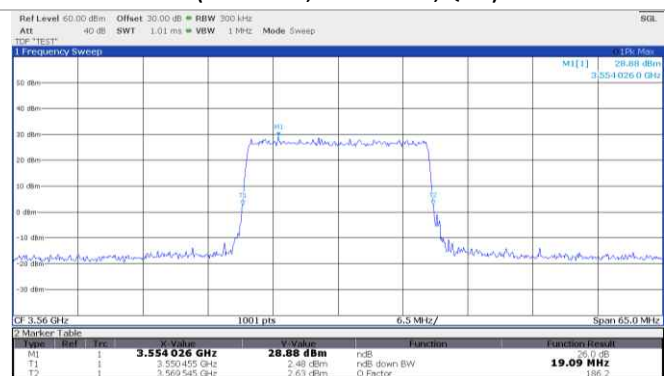
(10 MHz BW, HIGH channel, 64QAM)



(20 MHz BW, LOW channel, QPSK)



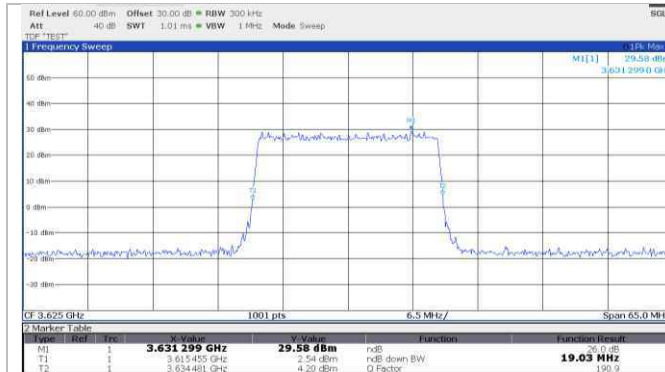
(20 MHz BW, LOW channel, 16QAM)



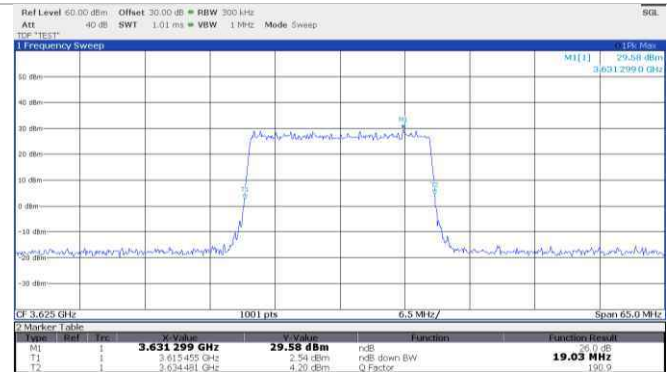
(20 MHz BW, LOW channel, 64QAM)

Section 8
Test name
Specification

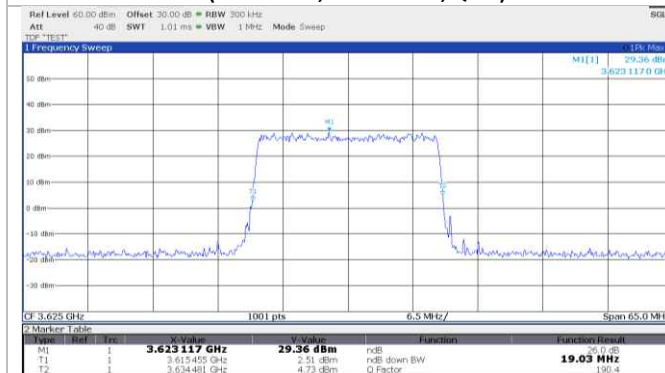
Testing data
FCC §96.41(b) 26 Occupied Bandwidth
FCC Part 96



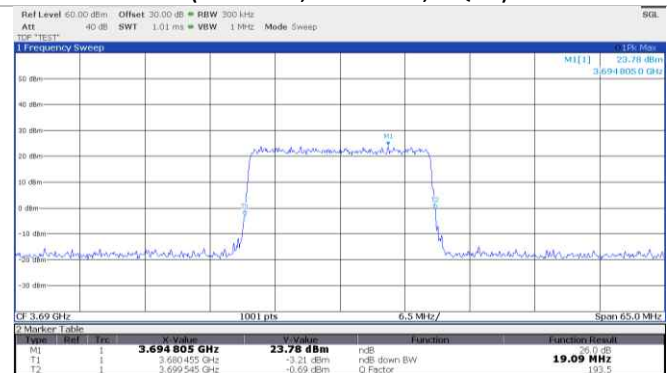
(20 MHz BW, MID channel, QPSK)



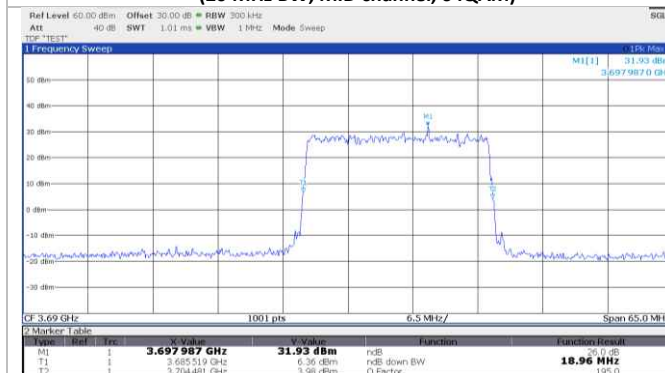
(20 MHz BW, MID channel, 16QAM)



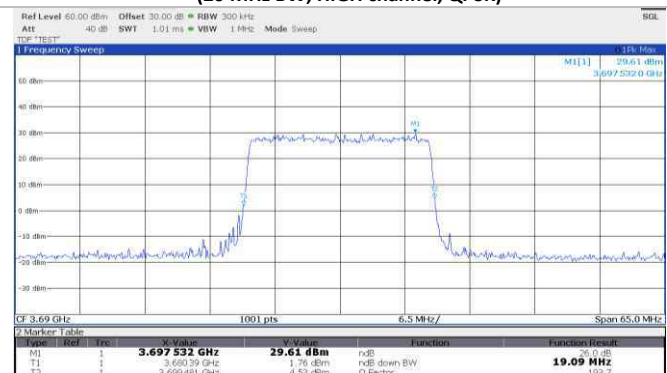
(20 MHz BW, MID channel, 64QAM)



(20 MHz BW, HIGH channel, QPSK)



(20 MHz BW, HIGH channel, 16QAM)



(20 MHz BW, HIGH channel, 64QAM)

8.4 FCC §2.1055(h) Frequency Stability

8.4.1 Definitions and limits

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

8.4.2 Test summary

Test date	January 25, 2023	Temperature	20 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1008 mbar
Verdict	Pass	Relative humidity	58%

8.4.3 Observations, settings and special notes

The EUT was configured to continuously transmit an un-modulated continuous wave signal. The frequency measurement was performed using the marker->signal count functionality of the spectrum analyzer. The requirement is that the carrier stays within the allocated band.

8.4.4 Test data

Band TDD48:

Table 8.4-1: Frequency stability results, band TDD48

Test conditions	Frequency, MHz
+50 °C, Nominal	3624.999967240 MHz
+40 °C, Nominal	3624.999970667 MHz
+30 °C, Nominal	3624.999913998 MHz
+20 °C, 58 VDC	3624.999967906 MHz
+20 °C, Nominal	3624.999953511 MHz
+20 °C, 36 VDC	3624.999938835 MHz
+10 °C, Nominal	3624.999935545 MHz
0 °C, Nominal	3624.999938787 MHz
-10 °C, Nominal	3624.999916713 MHz
-20 °C, Nominal	3624.999953341 MHz

Note - All measurements within the authorized band of operation (3550 – 3700 MHz)

8.5 FCC §96.41(b) Power limits (EIRP)

8.5.1 Definitions and limits

(b) Power limits. Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table in this paragraph (b):

Device	Maximum EIRP (dBm/10 MHz)	Maximum PSD (dBm/MHz)
End User Device	23	N/A
Category A CBSD	30	20
Category B CBSD	47	37

8.5.2 Test summary

Test date	February 14, 2023	Temperature	22 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1001 mbar
Verdict	Pass	Relative humidity	62%

8.5.3 Observations, settings and special notes

Test method: ANSI C63.26 Section 5.2.4.4.

Spectrum analyzer settings:

Resolution bandwidth	10 MHz
Video bandwidth	40 MHz
Frequency span	2 – 3- times OBW
Detector mode	RMS
Trace mode	Average (power averaging)
Number of sweeps	100

This test was made across the conducted port. A reference level offset was added to the measurement to compensate the loss of the used external attenuator. Interconnecting cable losses were included as a transducer factor in the spectrum analyzer.

The EUT has four ports which can transmit simultaneously in a non-correlated way.

To select the measurement port, a quick conducted channel power test was done. The four ports are nominally identical, however, the port with maximum power was chosen to make all the remaining tests.

Band	Modulation	OBW	Channel	Power Port 1	Power Port 2	Power Port 3	Power Port 4
TDD48	QPSK	10 MHz	3625 MHz	37.62 dBm	37.52 dBm	37.04 dBm	37.40 dBm
TDD48	QPSK	20 MHz	3625 MHz	38.08 dBm	37.87 dBm	37.56 dBm	37.79 dBm

Note: Port 1 was selected in the band, and it will be used to evaluate all the tests of this document.

Declared maximum antenna gain: 6 dBi.

Total channel power results are included below for informational purposes as they are required for RF exposure evaluation.

8.5.4 Test data

Band TDD48:

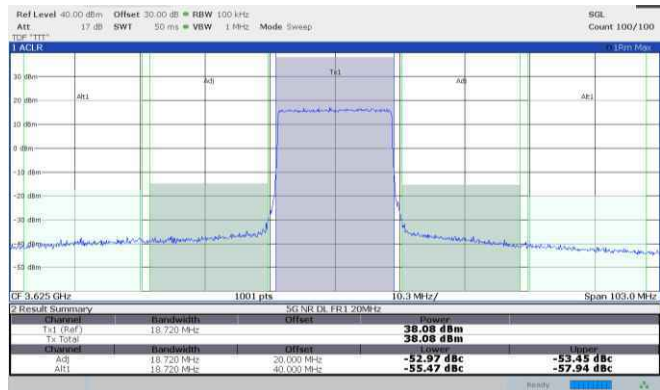
Table 8.5-1: Power limits (EIRP) results, band TDD48

Band	Modulation	OBW (MHz)	Port	Frequency (MHz)	Additional external attenuation (dB)	Conducted power (dBm/10 MHz)	Antenna gain (dBi)	EIRP (dBm/10 MHz)	Total channel power (conducted) (dBm)
TDD48	QPSK	10	1	3555	20.00	35.44	6.00	41.44	37.28
TDD48	16QAM	10	1	3555	20.00	33.98	6.00	39.98	36.30
TDD48	64QAM	10	1	3555	20.00	34.34	6.00	40.34	36.81
TDD48	QPSK	10	1	3625	20.00	35.87	6.00	41.87	37.62
TDD48	16QAM	10	1	3625	20.00	35.29	6.00	41.29	38.72
TDD48	64QAM	10	1	3625	20.00	36.08	6.00	42.08	38.08
TDD48	QPSK	10	1	3695	20.00	35.33	6.00	41.33	37.44
TDD48	16QAM	10	1	3695	20.00	35.49	6.00	41.49	39.31
TDD48	64QAM	10	1	3695	20.00	34.51	6.00	40.51	36.97
TDD48	QPSK	20	1	3560	20.00	33.89	6.00	49.89	38.39
TDD48	16QAM	20	1	3560	20.00	33.12	6.00	39.12	38.78
TDD48	64QAM	20	1	3560	20.00	34.14	6.00	40.14	38.57
TDD48	QPSK	20	1	3625	20.00	34.29	6.00	40.29	38.08
TDD48	16QAM	20	1	3625	20.00	33.70	6.00	40.70	39.16
TDD48	64QAM	20	1	3625	20.00	34.66	6.00	40.66	38.99
TDD48	QPSK	20	1	3690	20.00	34.01	6.00	40.01	37.98
TDD48	16QAM	20	1	3690	20.00	34.04	6.00	40.04	39.74
TDD48	64QAM	20	1	3690	20.00	34.39	6.00	40.39	38.79

Representative Total Channel Power Results:



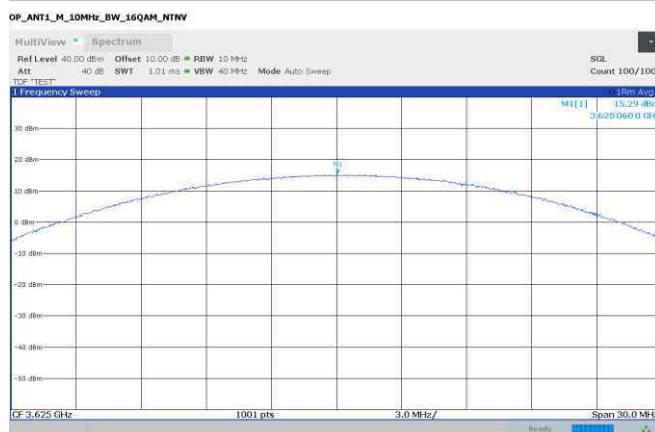
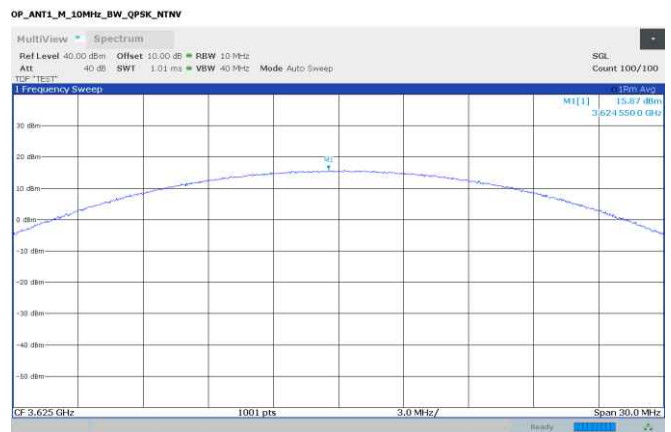
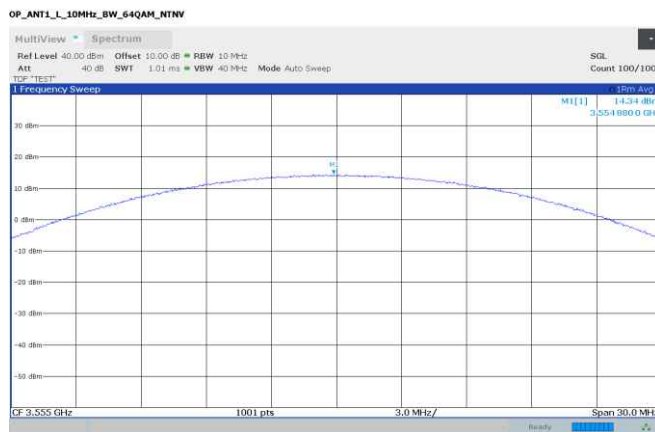
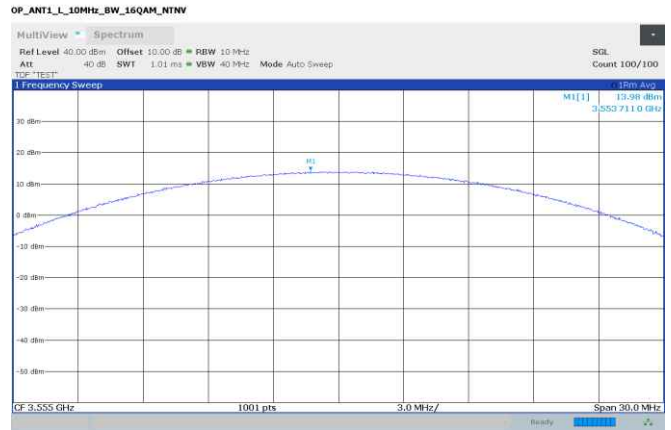
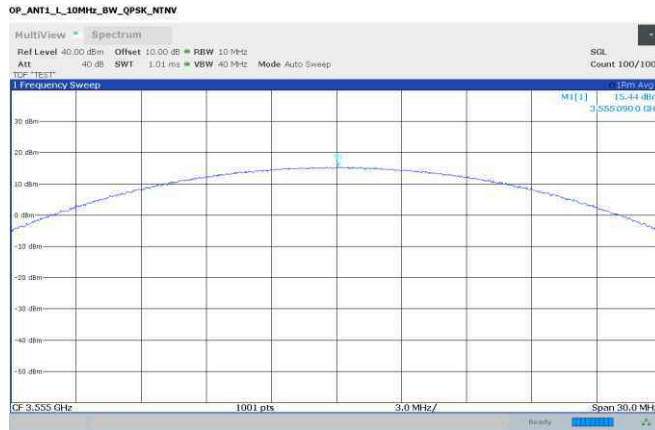
(10 MHz BW, MID channel, QPSK)

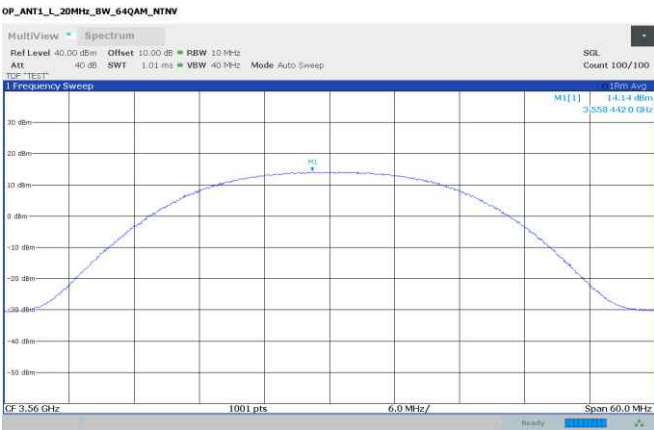
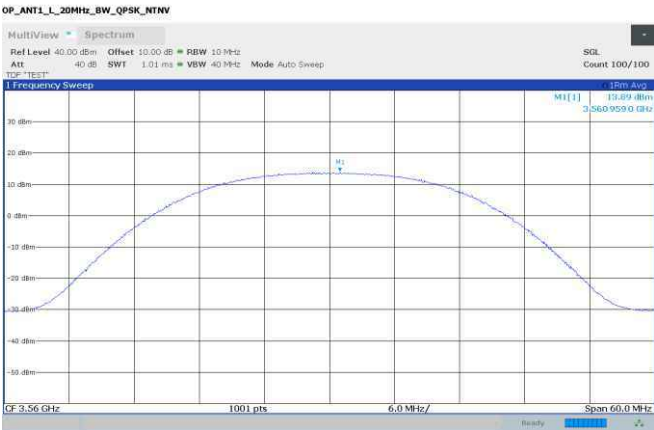
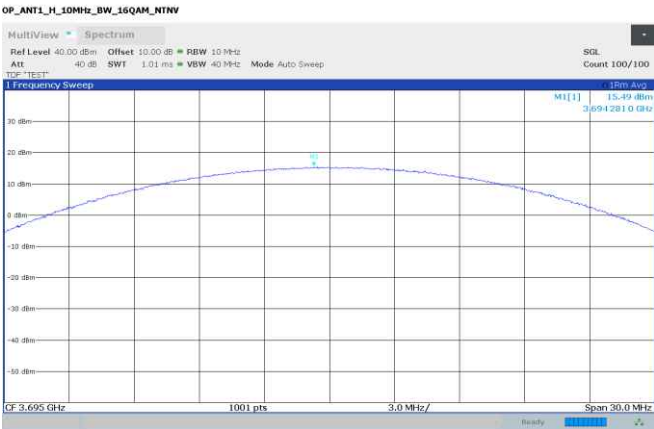
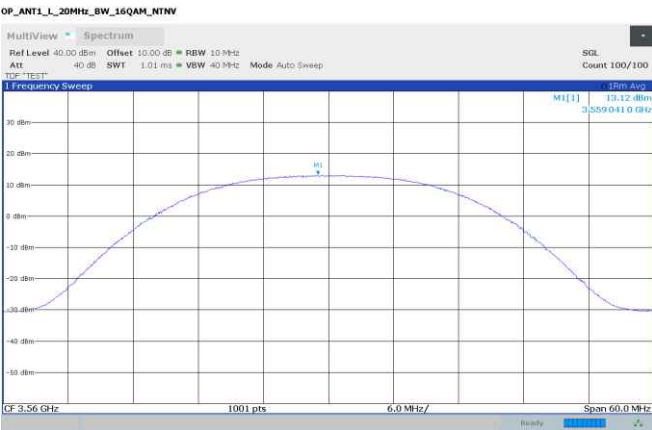
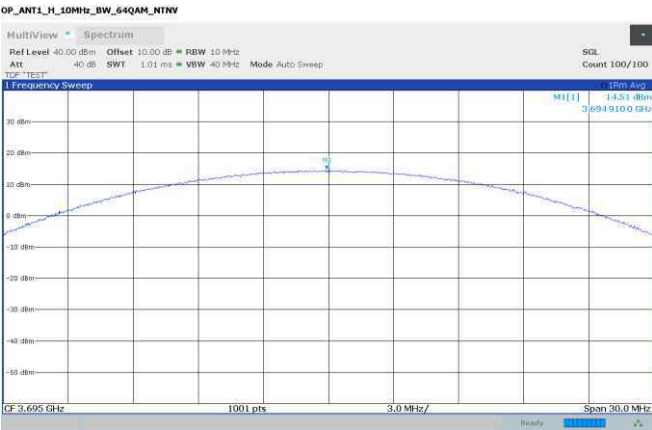
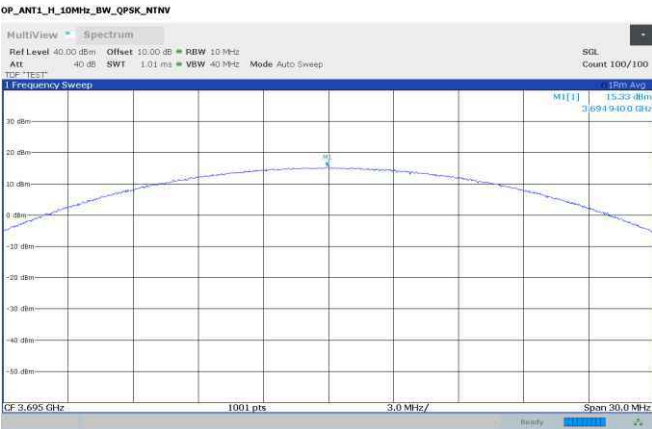


(20 MHz BW, MID channel, QPSK)

EIRP (dBm/10 MHz) Results:

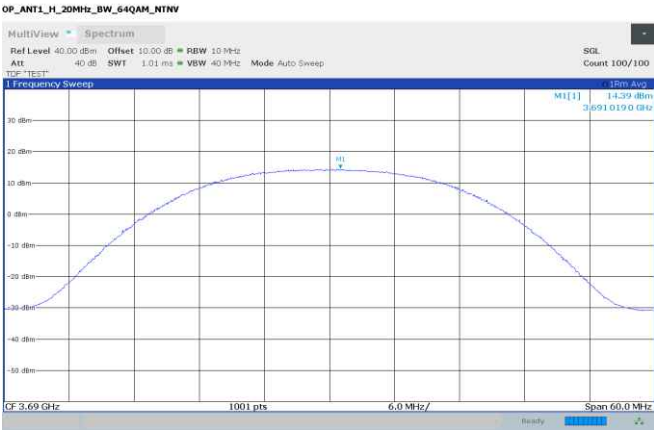
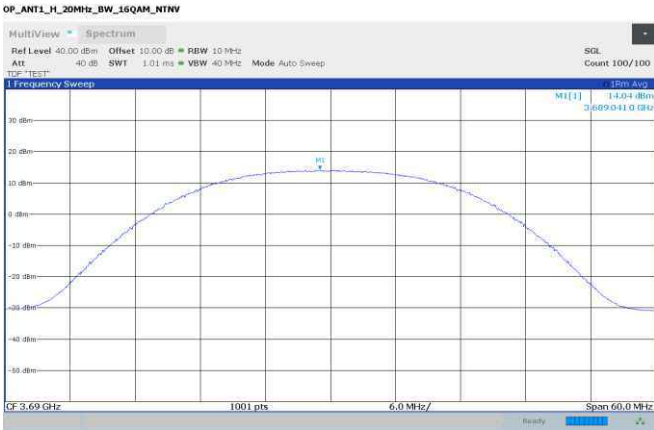
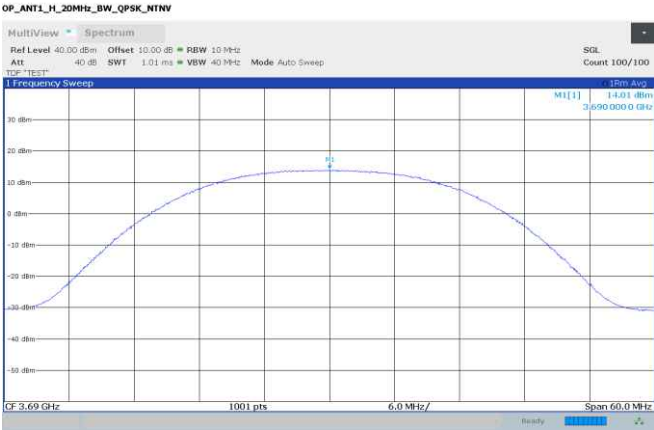
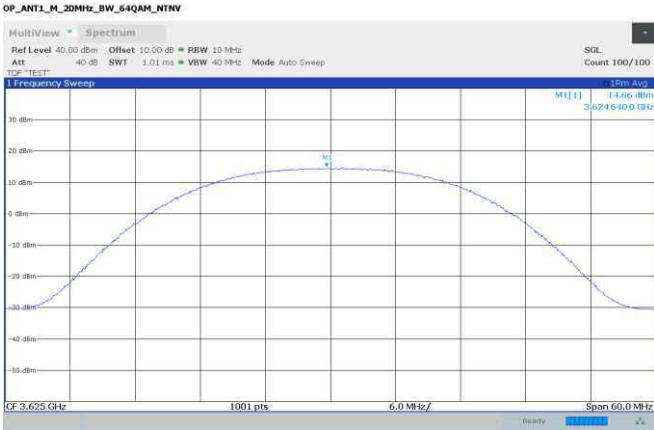
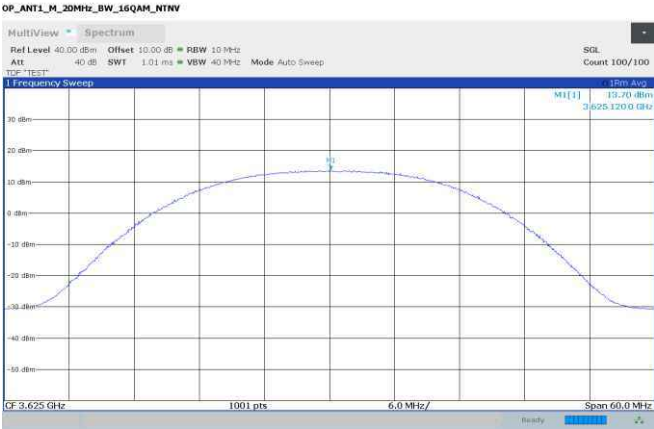
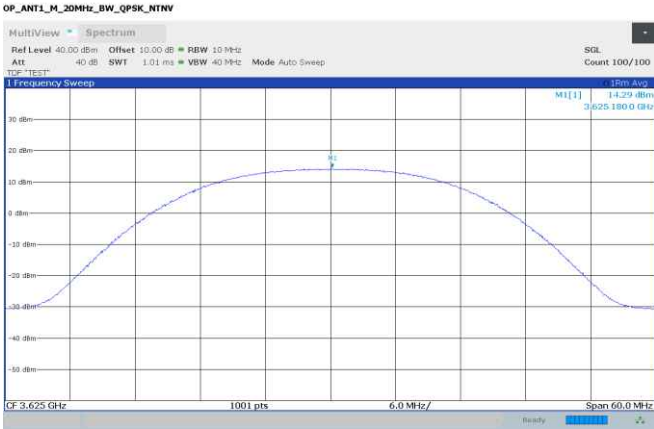
Note: Screenshots below are corrected for cable loss and 10 dB attenuator. An additional 20 dB of external attenuation was included but not corrected for. This 20 dB is accounted for in the result table, Table 8.5-1 above.





Section 8
Test name
Specification

Testing
FCC §96.41(b) Power limits (EIRP)
FCC Part 96



8.6 FCC §96.41(b) Power density limits

8.6.1 Definitions and limits

(b) Power limits. Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table in this paragraph (b):

Device	Maximum EIRP (dBm/10 MHz)	Maximum PSD (dBm/MHz)
End User Device	23	N/A
Category A CBSD	30	20
Category B CBSD	47	37

8.6.2 Test summary

Test date	February 14, 2023	Temperature	22 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1001 mbar
Verdict	Pass	Relative humidity	62%

8.6.3 Observations, settings and special notes

Test method: ANSI C63.26 Section 5.2.4.4.

Spectrum analyzer settings:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Frequency span	2 – 3- times OBW
Detector mode	RMS
Trace mode	Average (power averaging)
Number of sweeps	100

This test was made across the conducted port. A reference level offset was added to the measurement to compensate the loss of the used external attenuator. Interconnecting cable losses were included as a transducer factor in the spectrum analyzer.

The EUT has four ports which can transmit simultaneously in a non-correlated way.

Measurements were performed on antenna port 1, identified as the worst case with respect to output power in Section 8.5.

Declared maximum antenna gain: 6i.

8.6.4 Test data

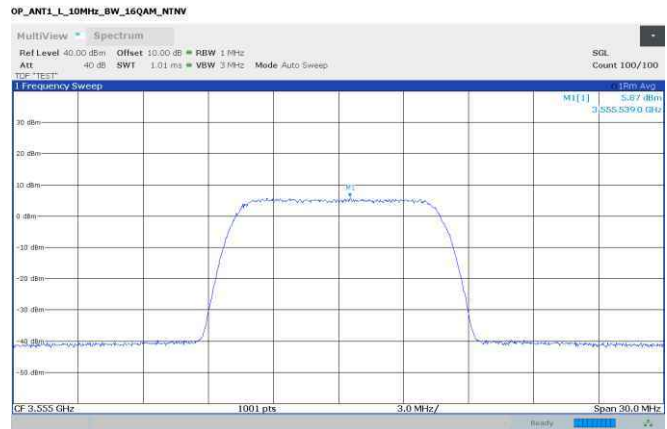
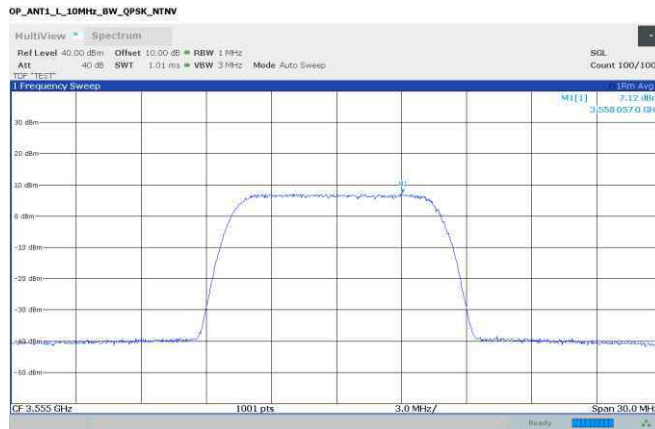
Band TDD48:

Table 8.6-1: Power density limits (EIRP) results, band TDD48

Band	Modulation	OBW (MHz)	Port	Frequency (MHz)	Additional external attenuation (dB)	Conducted power density (dBm/MHz)	Antenna gain (dBi)	Radiated power density (dBm/MHz)
TDD48	QPSK	10	1	3555	20.00	27.12	6.00	33.12
TDD48	16QAM	10	1	3555	20.00	25.87	6.00	31.87
TDD48	64QAM	10	1	3555	20.00	26.38	6.00	32.38
TDD48	QPSK	10	1	3625	20.00	27.53	6.00	33.53
TDD48	16QAM	10	1	3625	20.00	27.49	6.00	33.49
TDD48	64QAM	10	1	3625	20.00	28.40	6.00	34.40
TDD48	QPSK	10	1	3695	20.00	27.47	6.00	33.47
TDD48	16QAM	10	1	3695	20.00	27.75	6.00	33.75
TDD48	64QAM	10	1	3695	20.00	26.52	6.00	32.52
TDD48	QPSK	20	1	3560	20.00	24.29	6.00	30.29
TDD48	16QAM	20	1	3560	20.00	24.34	6.00	30.34
TDD48	64QAM	20	1	3560	20.00	24.95	6.00	30.95
TDD48	QPSK	20	1	3625	20.00	25.03	6.00	31.03
TDD48	16QAM	20	1	3625	20.00	24.58	6.00	30.58
TDD48	64QAM	20	1	3625	20.00	25.28	6.00	31.28
TDD48	QPSK	20	1	3690	20.00	24.89	6.00	30.89
TDD48	16QAM	20	1	3690	20.00	25.49	6.00	31.49
TDD48	64QAM	20	1	3690	20.00	25.17	6.00	31.17

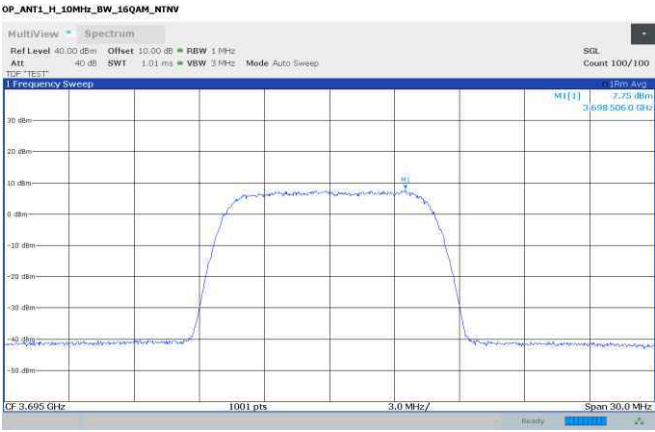
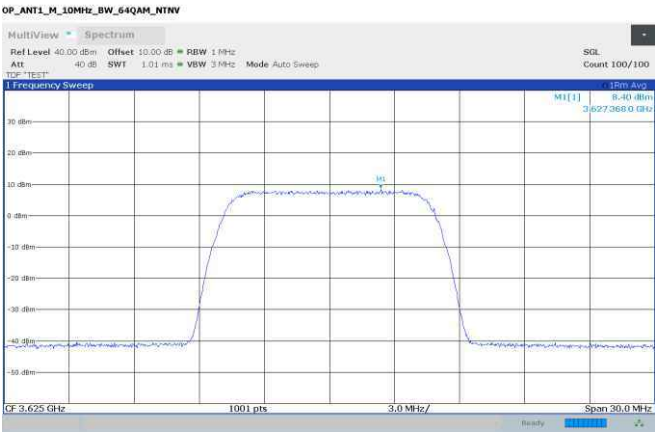
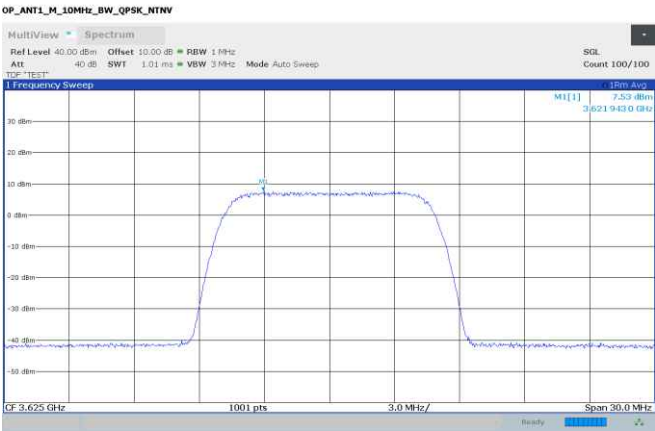
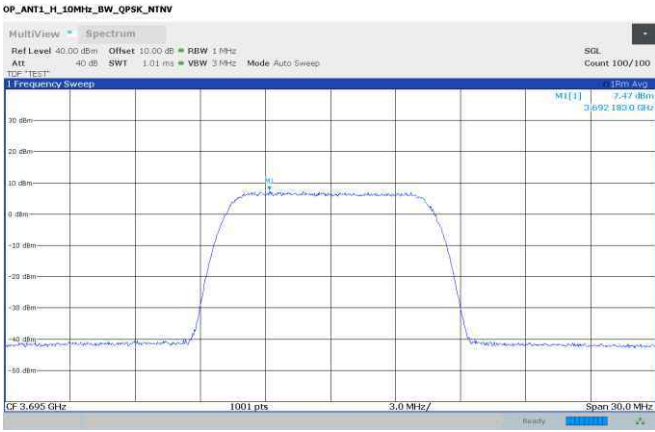
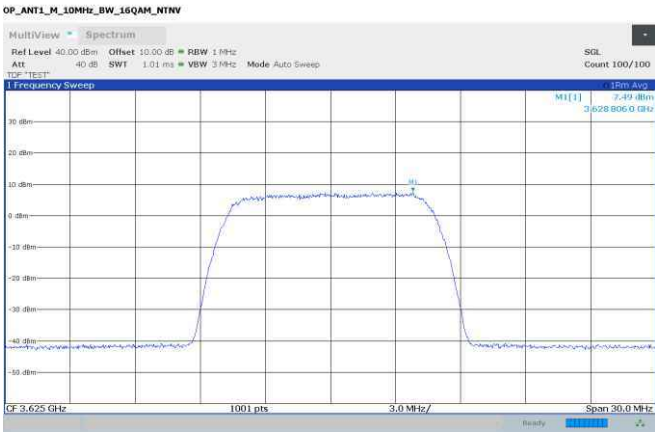
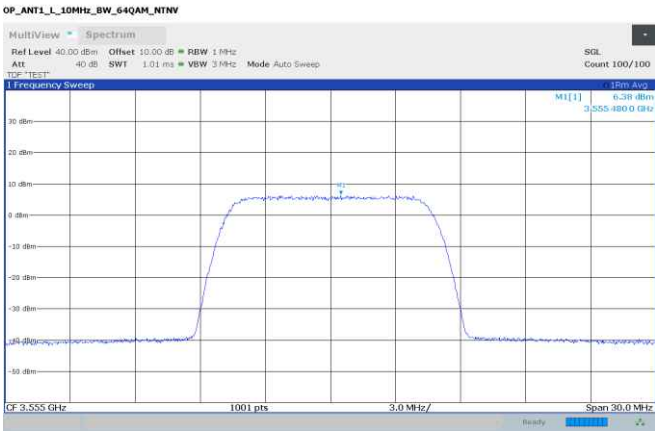
Power density (dBm/MHz) Results:

Note: Screenshots below are corrected for cable loss and 10 dB attenuator. An additional 20 dB of external attenuation was included but not corrected for. This 20 dB is accounted for in the result table, Table 8.6-1 above.



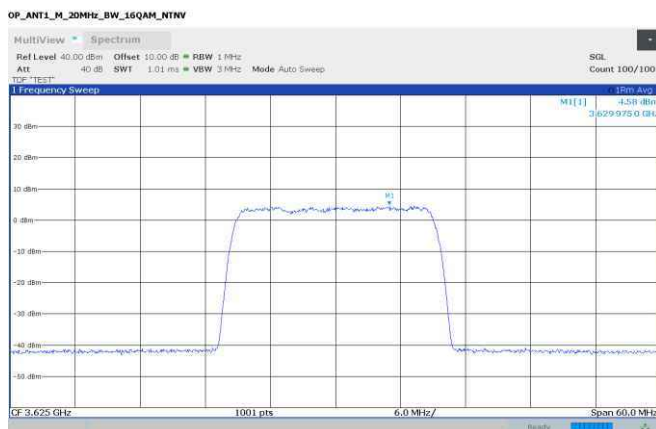
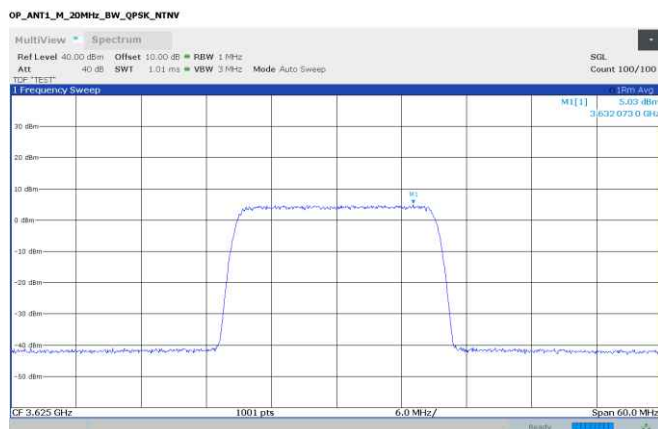
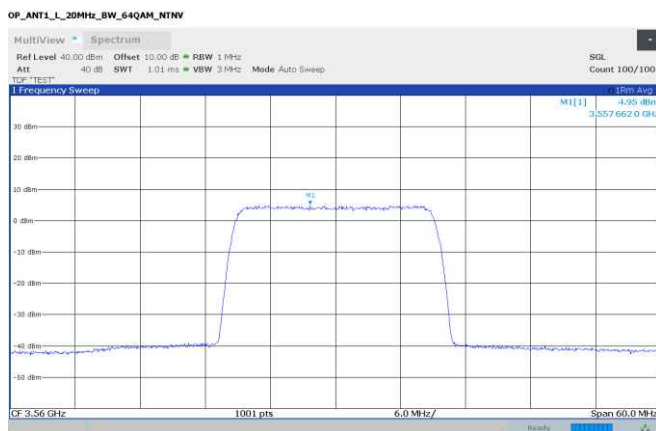
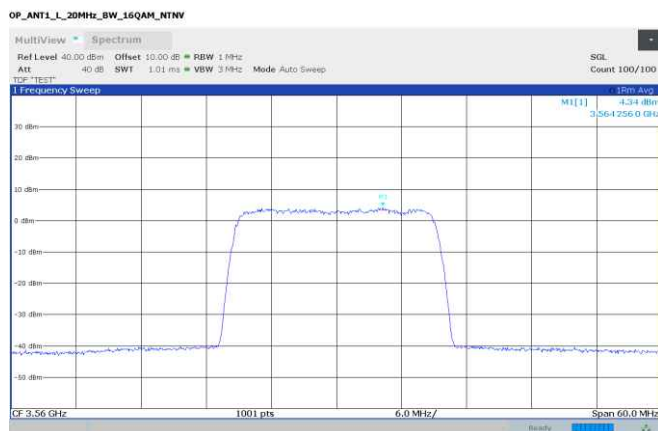
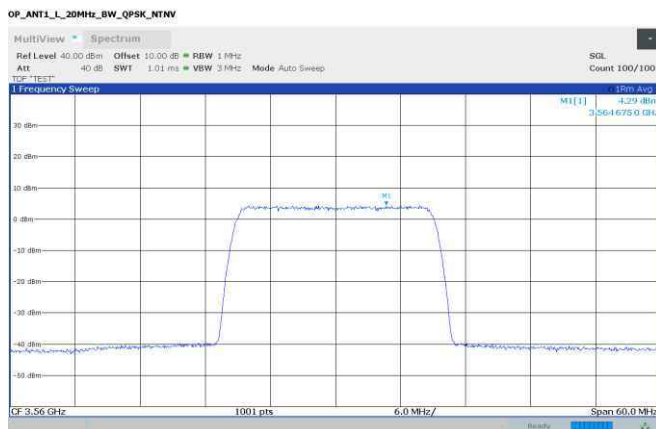
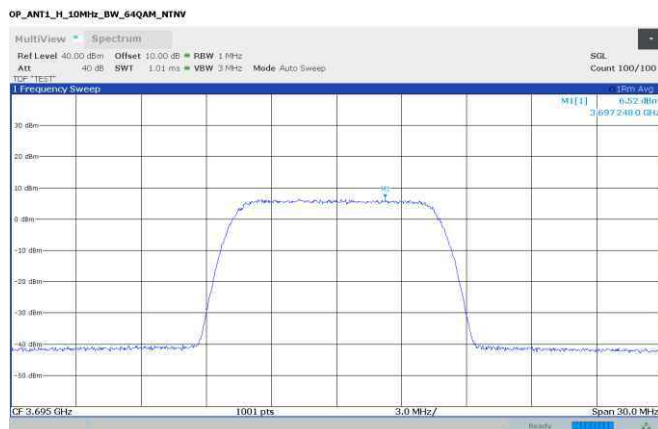
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Test name
Specification

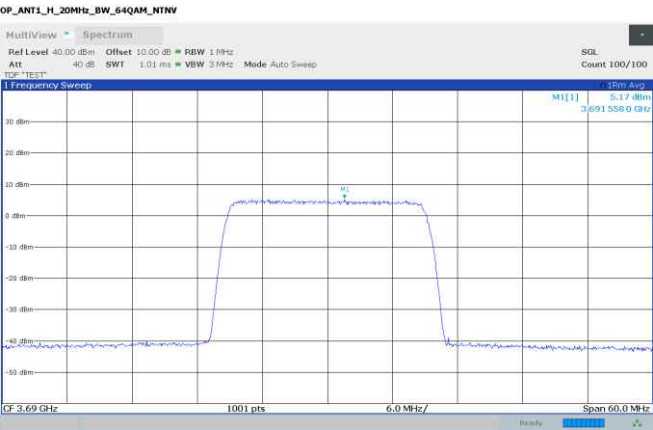
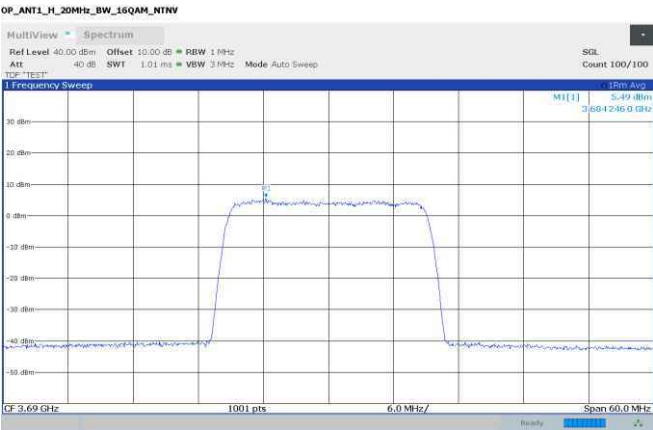
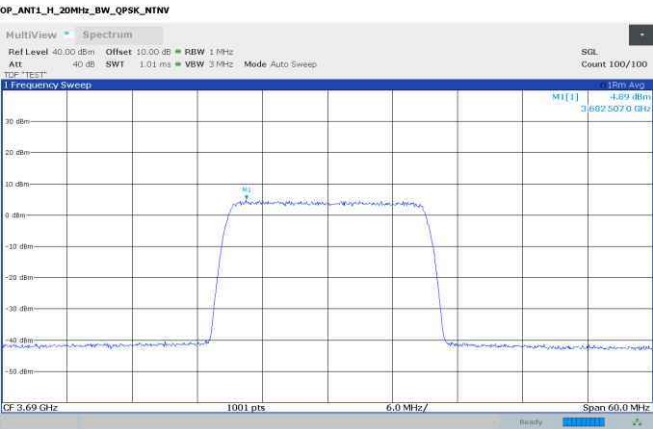
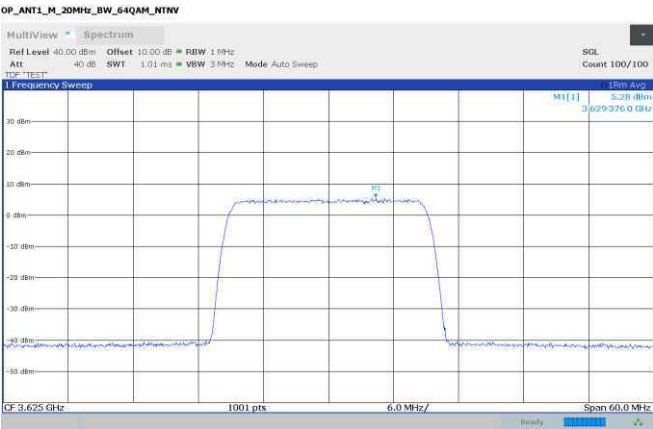
Testing
FCC §96.41(b) Power density limits
FCC Part 96



Section 8
Test name
Specification

Testing
FCC §96.41(b) Power density limits
FCC Part 96





8.7 FCC §96.41(g) Peak to Average Power Ratio

8.7.1 Definitions and limits

The peak-to-average power ratio (PAPR) of any CBSD transmitter output power must not exceed 13. PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities or another Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

8.7.2 Test summary

Test date	January 11, 2023	Temperature	22 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1001 mbar
Verdict	Pass	Relative humidity	62%

8.7.3 Observations, settings and special notes

The EUT has four ports which can transmit simultaneously in a non-correlated way.

Measurements were performed on antenna port 1, identified as the worst case with respect to output power in Section 8.5.

Test method: ANSI C63.26 Section 5.2.6.

Spectrum analyzer settings:

Resolution bandwidth	≥ OBW
Number of counts	The necessary number up to stabilizes the measured
Trace mode	Clear/Write

8.7.4 Test data

Band TDD48:

Band	Modulation	OBW (MHz)	Port	Channel (MHz)	0.1% (dB) PAPR
TDD48	QPSK	10	1	3555	7.86
TDD48	16QAM	10	1	3555	8.18
TDD48	64QAM	10	1	3555	8.36
TDD48	QPSK	10	1	3625	7.86
TDD48	16QAM	10	1	3625	8.1
TDD48	64QAM	10	1	3625	8.30
TDD48	QPSK	10	1	3695	7.82
TDD48	16QAM	10	1	3695	8.12
TDD48	64QAM	10	1	3695	8.30
TDD48	QPSK	20	1	3560	7.82
TDD48	16QAM	20	1	3560	8.10
TDD48	64QAM	20	1	3560	7.74
TDD48	QPSK	20	1	3625	7.84
TDD48	16QAM	20	1	3625	8.12
TDD48	64QAM	20	1	3625	7.76
TDD48	QPSK	20	1	3690	7.84
TDD48	16QAM	20	1	3690	8.14
TDD48	64QAM	20	1	3690	7.72

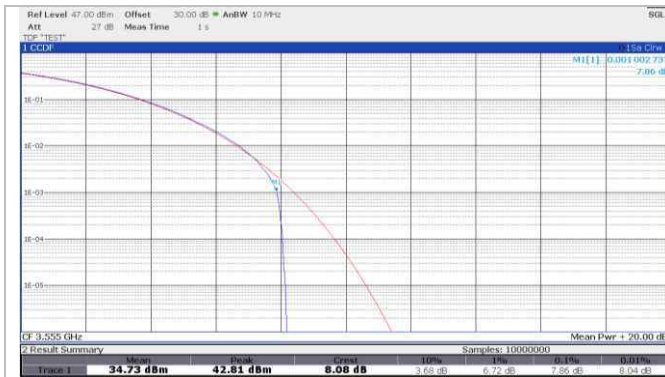
Table 8.7-1: Peak to average power ratio

Section 8
Test name
Specification

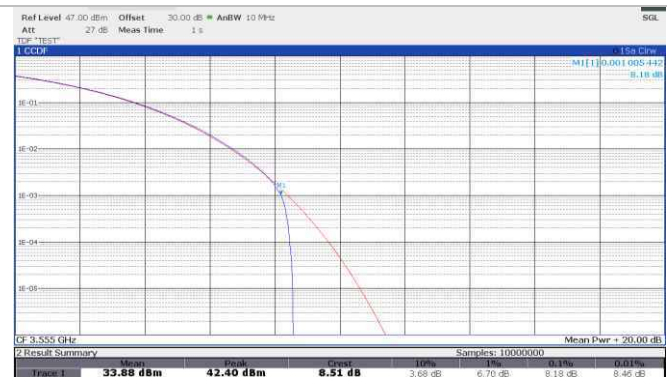
Testing
 FCC §96.41(g) Peak to Average Power Ratio
 FCC Part 96



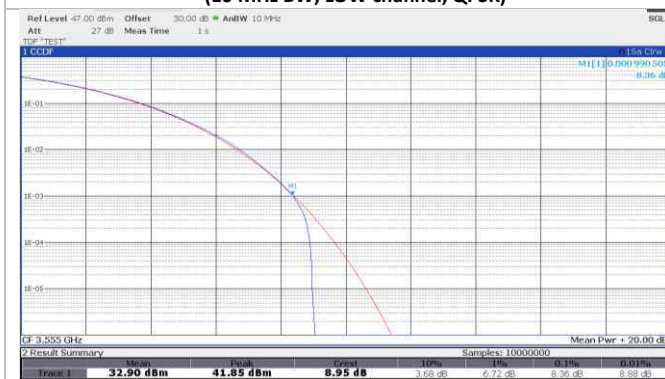
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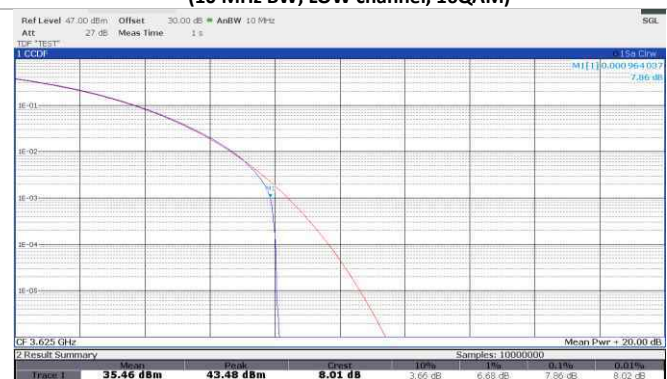
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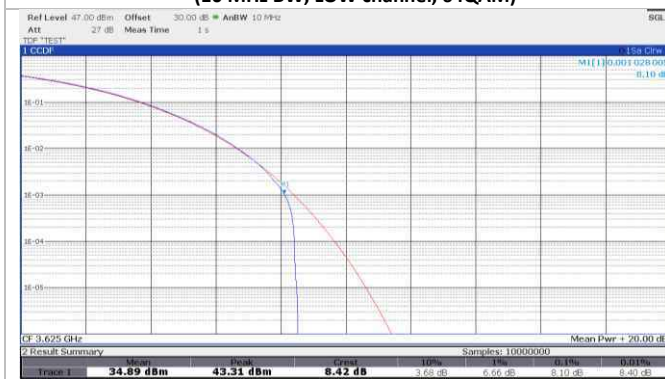
(10 MHz BW, LOW channel, 16QAM)



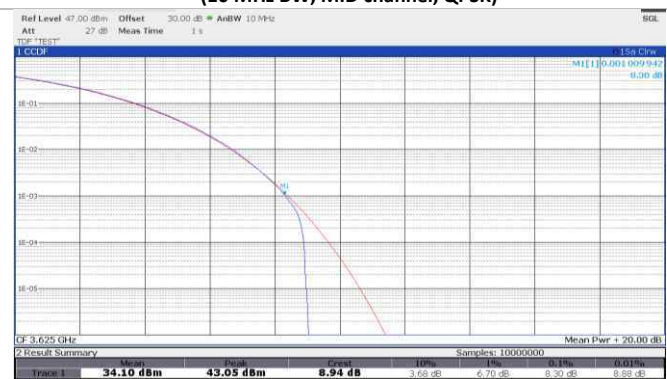
(10 MHz BW, LOW channel, 64QAM)



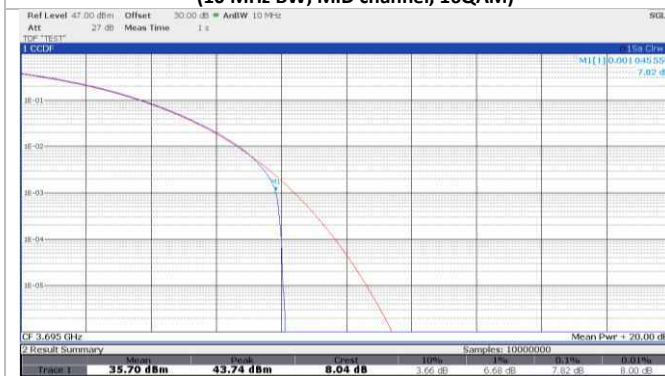
(10 MHz BW, MID channel, QPSK)



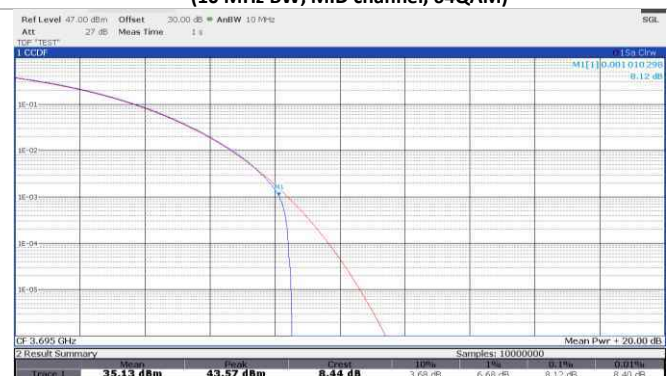
(10 MHz BW, MID channel, 16QAM)



(10 MHz BW, MID channel, 64QAM)



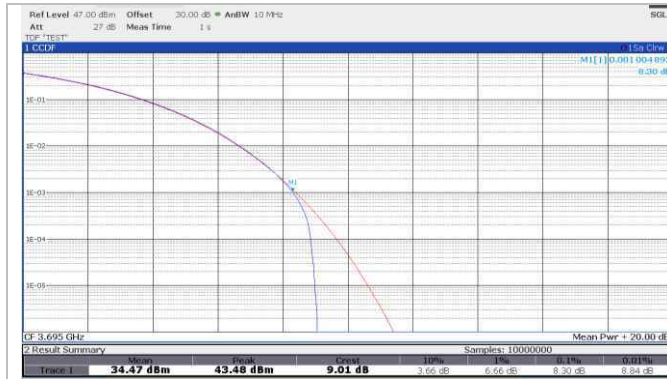
(10 MHz BW, HIGH channel, QPSK)



(10 MHz BW, HIGH channel, 16QAM)

Section 8
Test name
Specification

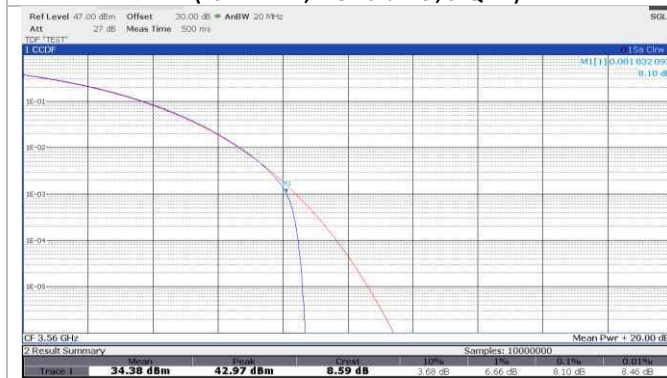
Testing
FCC §96.41(g) Peak to Average Power Ratio
FCC Part 96



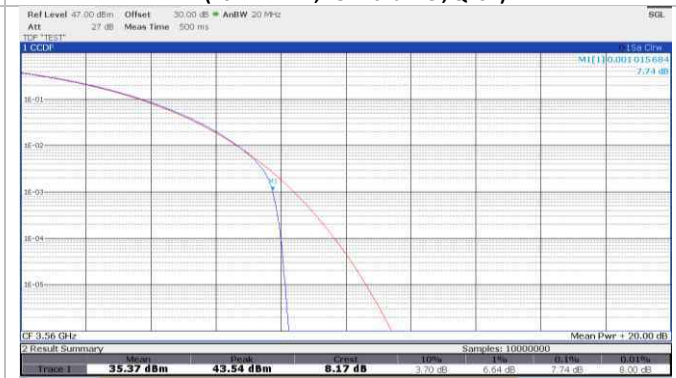
(10 MHz BW, HIGH channel, 64QAM)



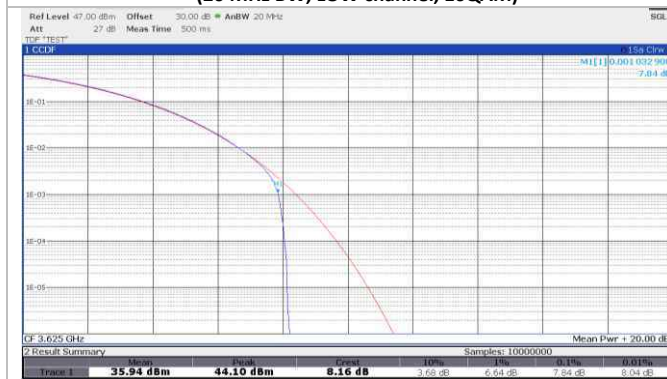
(20 MHz BW, LOW channel, QPSK)



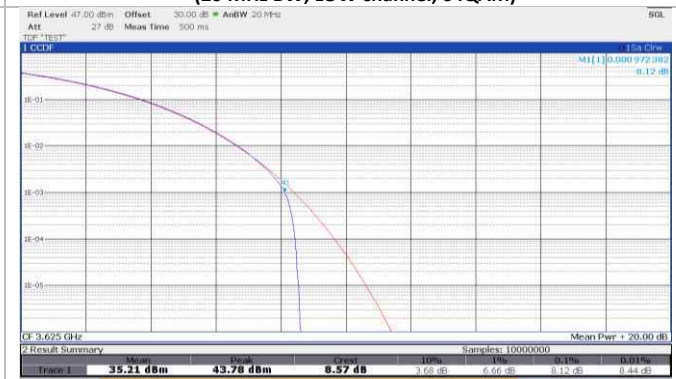
(20 MHz BW, LOW channel, 16QAM)



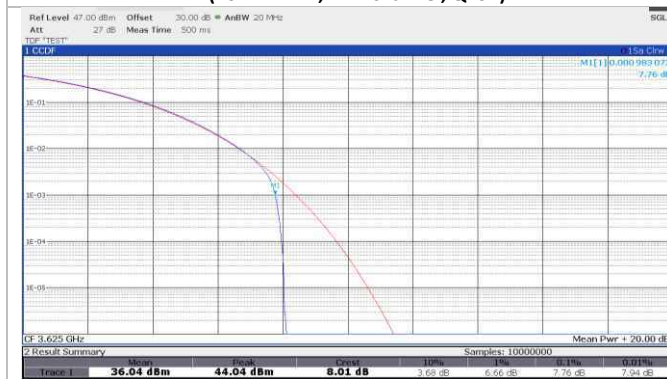
(20 MHz BW, LOW channel, 64QAM)



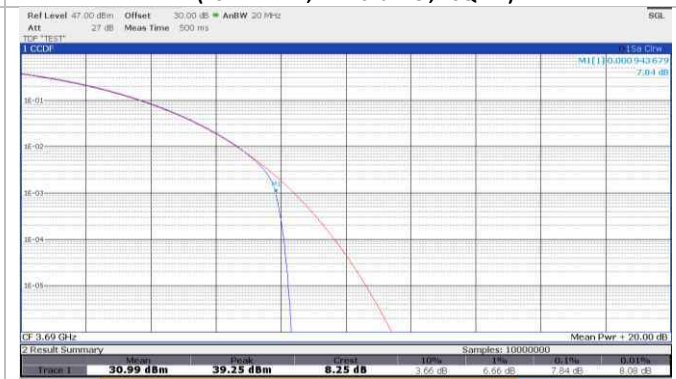
(20 MHz BW, MID channel, QPSK)



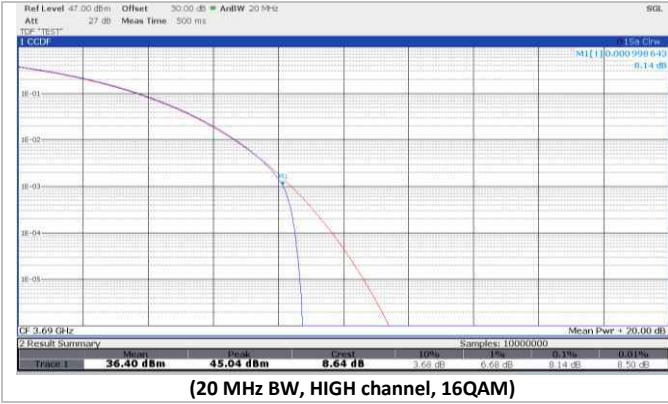
(20 MHz BW, MID channel, 16QAM)



(20 MHz BW, MID channel, 64QAM)



(20 MHz BW, HIGH channel, QPSK)



8.8 FCC §96.41(e)(1) Emissions intensity

8.8.1 Definitions and limits

- (1) General protection levels.
- (i) 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. 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 upper and lower SAS assigned channel edges are the upper and lower limits of any channel assigned to a CBSD by an SAS, or in the case of multiple contiguous channels, the upper and lower limits of the combined contiguous channels.
 - (ii) Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed -25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.
- (2) Additional protection levels. 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.

8.8.2 Test summary

Test date	January 30, 2023 January 31, 2023	Temperature	19 °C 20 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1008 mbar 1006 mbar
Verdict	Pass	Relative humidity	55 % 59 %

8.8.3 Observations, settings and special notes

Spectrum analyzer settings (conducted test):

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Frequency span	Sufficient for making an accurate measurement
Detector mode	RMS
Trace mode	Max Hold

Receiver settings (radiated test):

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Frequency span	Sufficient for making an accurate measurement
Detector mode	Pre-scan: Peak detector Final measurements: RMS detector
Measurement time	5 seconds

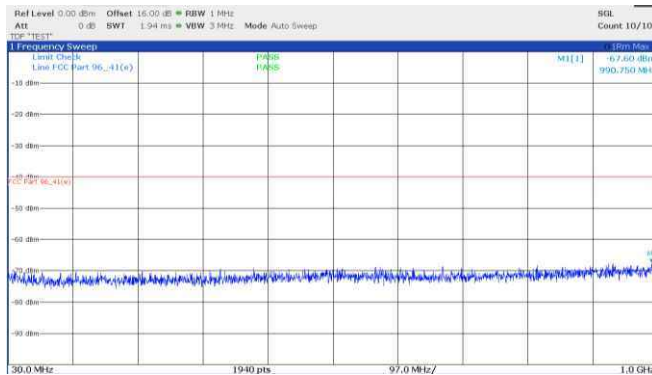
The EUT has four ports which can transmit simultaneously in a non-correlated way.

Measurements were performed on antenna port 1, identified as the worst case with respect to output power in Section 8.5.

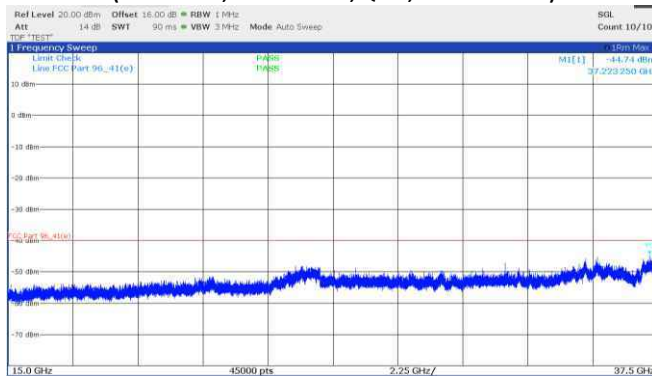
The evaluation was made on the three channels (lowest, middle and highest), all modulations (QPSK, 16QAM, and 64QAM) and operating bandwidths (10 MHz, and 20 MHz). Appropriate attenuation and filtering was applied to avoid overloading the measurement equipment and to achieve the required noise floor.

8.8.4 Test data

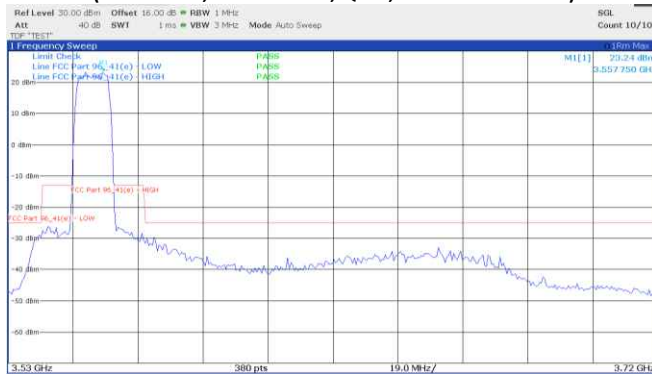
Band TDD48:



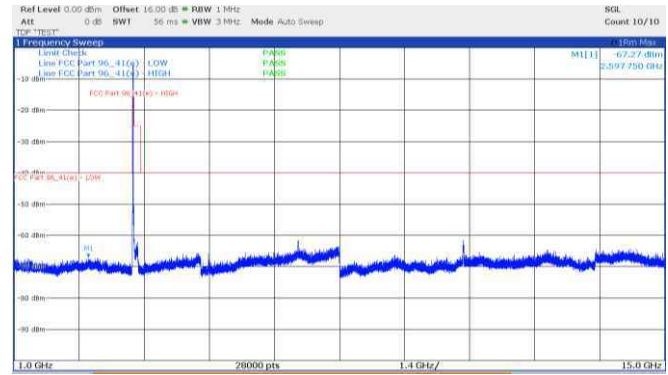
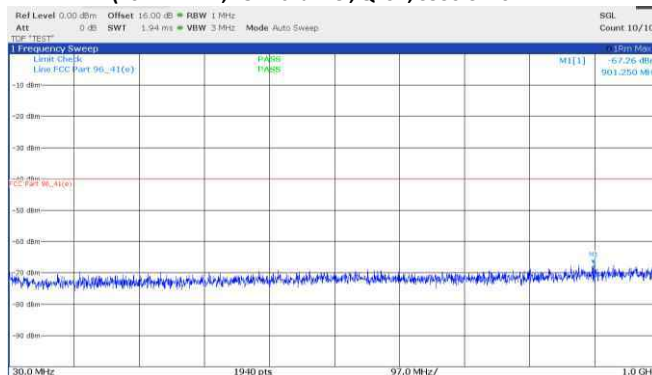
(10 MHz BW, LOW channel, QPSK, 30 – 1000 MHz)



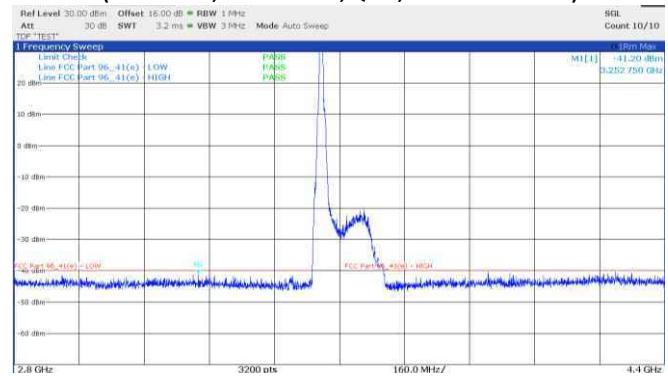
(10 MHz BW, LOW channel, QPSK, 15000 – 37500 MHz)



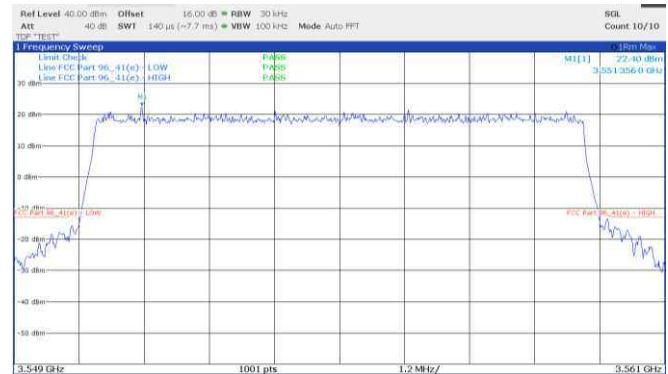
(10 MHz BW, LOW channel, QPSK, 3530 – 3720 MHz)



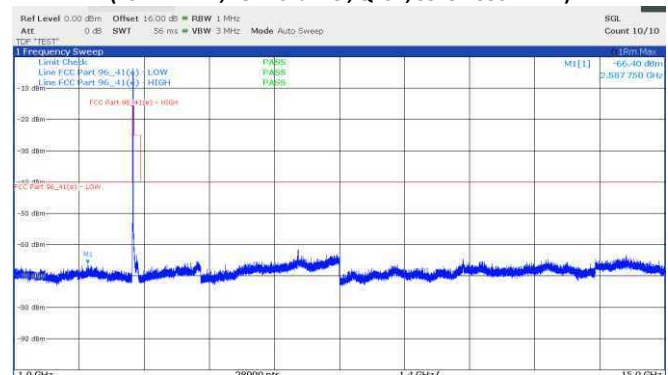
(10 MHz BW, LOW channel, QPSK, 1000 – 15000 MHz)



(10 MHz BW, LOW channel, QPSK, 2800 – 4400 MHz)



(10 MHz BW, LOW channel, QPSK, 3549 – 3561 MHz)

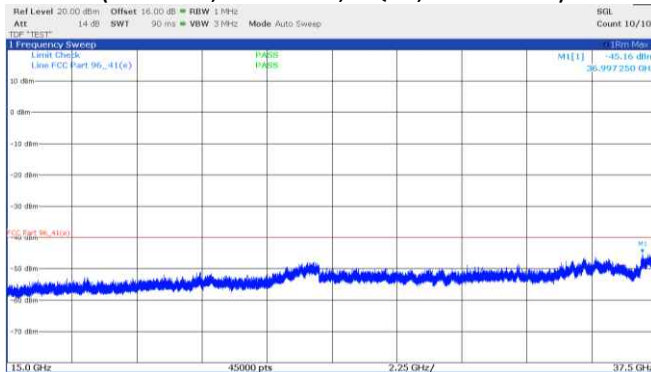


Section 8
Test name
Specification

Testing data
 FCC §96.41(e)(1) Emissions intensity
 FCC Part 96



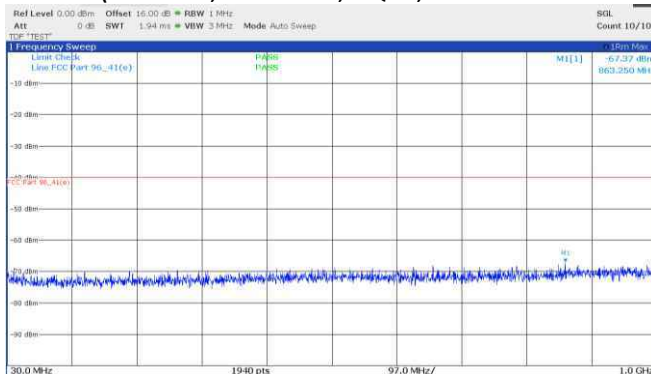
(10 MHz BW, LOW channel, 16QAM, 30 – 1000 MHz)



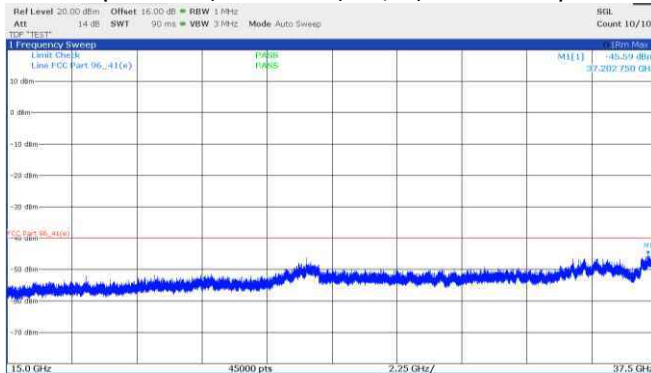
(10 MHz BW, LOW channel, 16QAM, 15000 - 37500 MHz)



(10 MHz BW, LOW channel, 16QAM, 3530-3720 MHz)

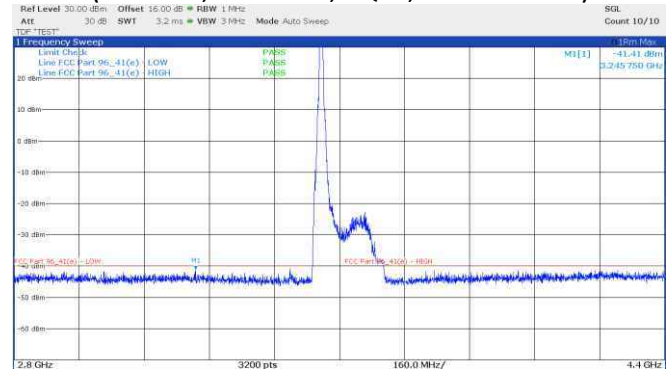


(10 MHz BW, LOW channel, 64QAM, 30 – 1000 MHz)

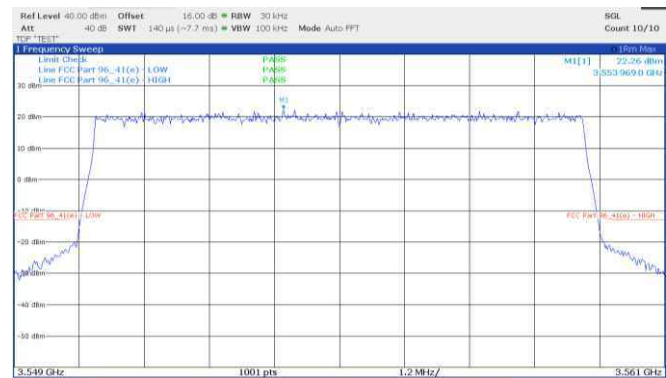


(10 MHz BW, LOW channel, 64QAM, 15000 - 37500 MHz)

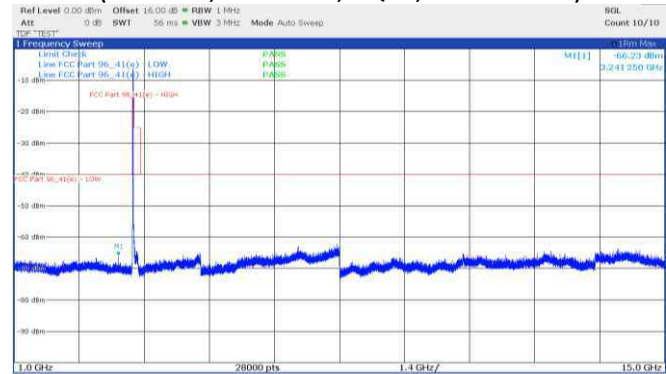
(10 MHz BW, LOW channel, 16QAM, 1000 – 15000 MHz)



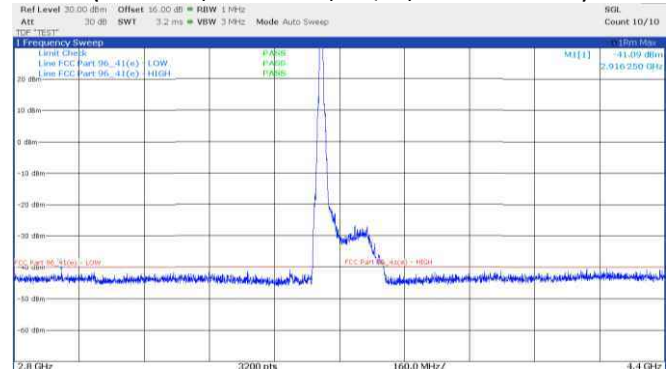
(10 MHz BW, LOW channel, 16QAM, 2800 – 4400 MHz)



(10 MHz BW, LOW channel, 16QAM, 3549 - 3561 MHz)



(10 MHz BW, LOW channel, 64QAM, 1000 – 15000 MHz)



(10 MHz BW, LOW channel, 64QAM, 2800 - 4400 MHz)

