



ANT31

QPSK



16QAM





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16QAM





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7. Radiated Spurious Emission

Test Requirements :

§ 2.1053 Measurements required : Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.
- (2) All equipment operating on frequencies higher than 25 MHz.
- (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4) Other types of equipment as required, when deemed necessary by the Commission.

§ 27.53 Emission limits

(l) 3.7 GHz Service. The following emission limits apply to stations transmitting in the 3700-3980 MHz band:

(1) For base station operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz . Compliance with this paragraph (l)(1) 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 dB below the transmitter power.

Notes :

1. Due to 64 x 64 MIMO operation, limit is **-31.06 dBm** ($-13 \text{ dBm} - 10 \cdot \log(64)$) per KDB Publication 662911 D01 Multiple Transmitter Output v02r01.

Test Procedures :

The EUT was placed on a non-conductive rotating platform 1 meters high in a fully anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna. The maximum emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable.

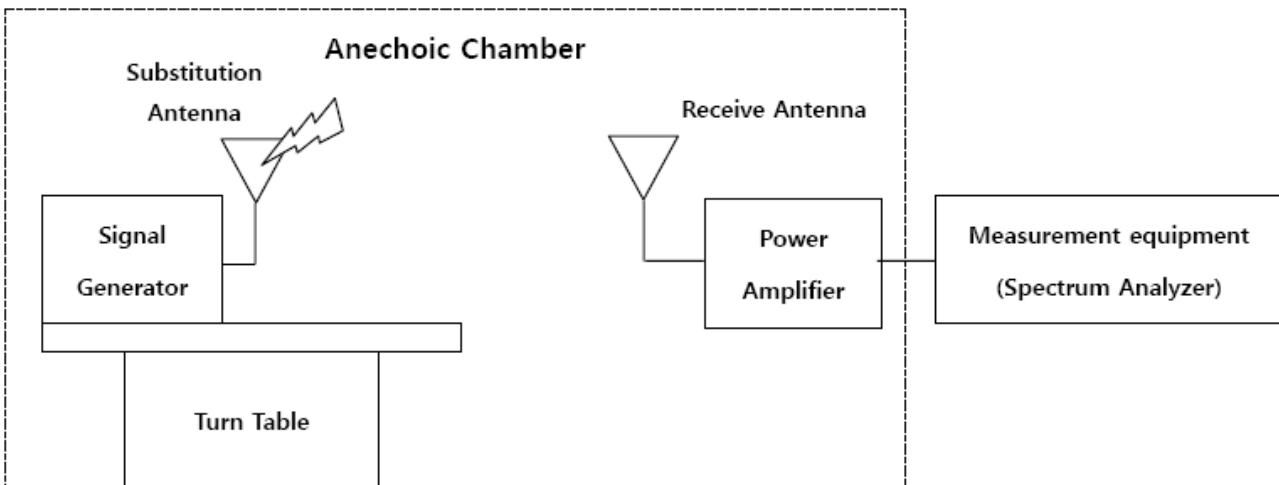
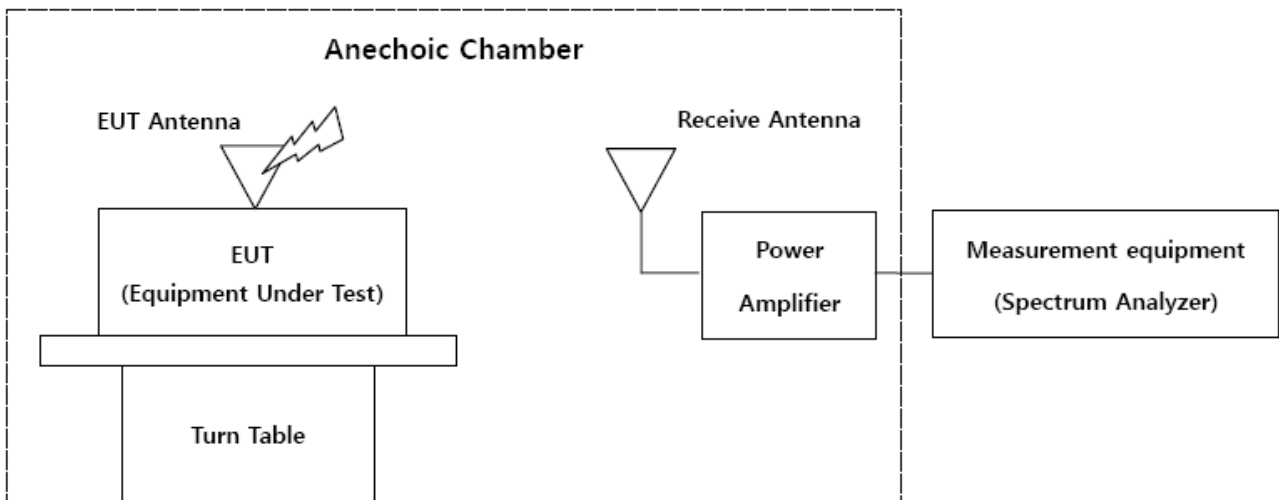
Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-C.

The EUT was replaced by substitution antenna at same location, and then a known power from S.G. was applied into the dipole antenna through a Tx cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna.

The space loss (in dB) = S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading.

The spectrum was searched from 30 MHz to 10th harmonic.

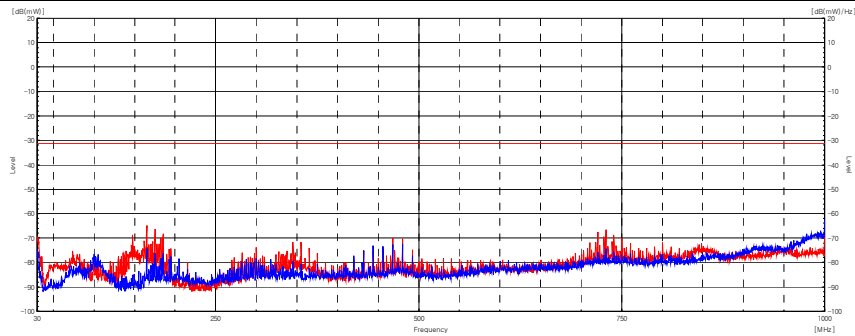
Test Setup :



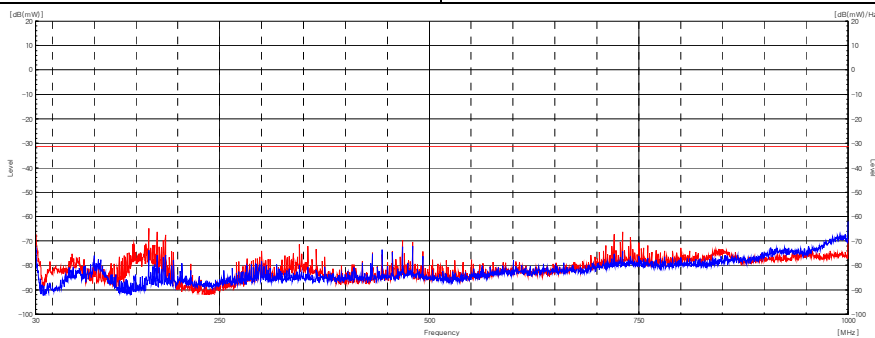
Test Results :

- * We have done all test case. Test data was only the worst case(16QAM).
- * In all test cases, the measurement results in the following measurement bands are similar.
(30 MHz - 1 GHz, 1 GHz - 40 GHz)

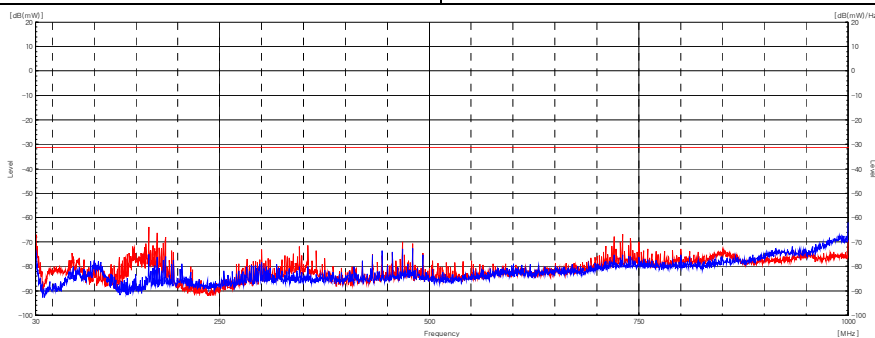
Frequency range	30 MHz - 1 GHz
Test mode	Single Carrier_Middle
Channel bandwidth	100 MHz



Frequency range	30 MHz - 1 GHz
Test mode	Multi Carrier(Contiguous)_Middle
Channel bandwidth	100 MHz + 100 MHz

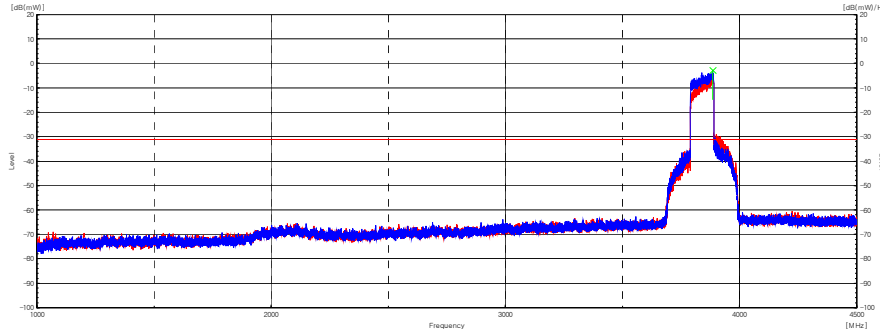


Frequency range	30 MHz - 1 GHz
Test mode	Multi Carrier(Non-contiguous)
Channel bandwidth	100 MHz / 100 MHz



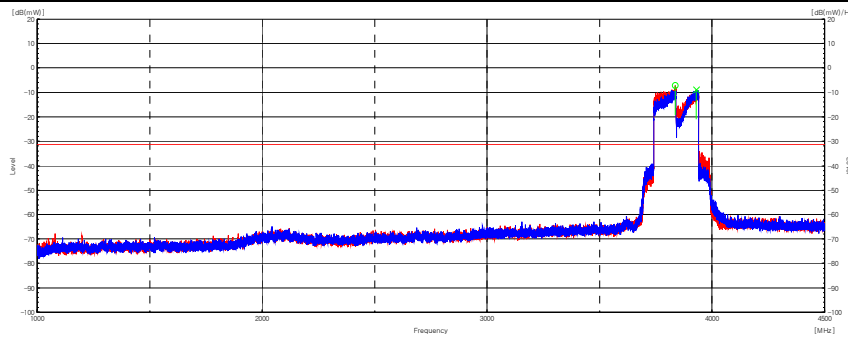


Frequency range	1 GHz - 4.5 GHz
Test mode	Single Carrier_Middle
Channel bandwidth	100 MHz



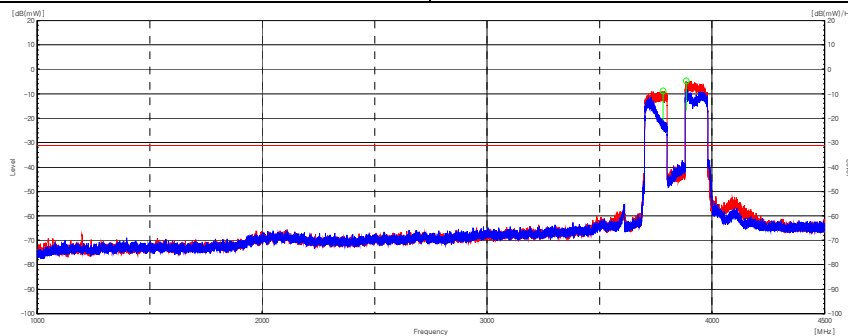
Frequency [MHz]	Pol	Reading [dB(mW)]	Space Loss [dB]	Level [dB(mW)]	Limit [dB(mW)]	Margin [dB]
3884.000	V	-5.5	2.6	-2.9	-31.1	-28.2

Frequency range	1 GHz - 4.5 GHz
Test mode	Multi Carrier(Contiguous)_Middle
Channel bandwidth	100 MHz + 100 MHz



Frequency [MHz]	Pol	Reading [dB(mW)]	Space Loss [dB]	Level [dB(mW)]	Limit [dB(mW)]	Margin [dB]
3837.275	H	-9.2	2.2	-7	-31.1	-24.1
3927.925	V	-11.5	2.7	-8.8	-31.1	-22.3

Frequency range	1 GHz - 4.5 GHz
Test mode	Multi Carrier(Non-contiguous)
Channel bandwidth	100 MHz / 100 MHz



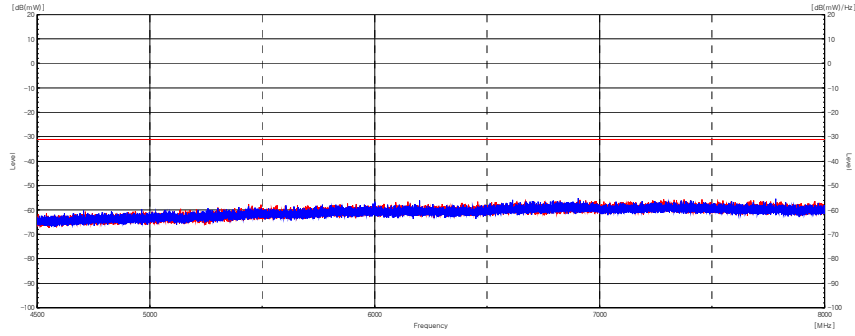
Frequency [MHz]	Pol	Reading [dB(mW)]	Space Loss [dB]	Level [dB(mW)]	Limit [dB(mW)]	Margin [dB]
3780.750	H	-10.9	2.1	-8.8	-31.1	-22.3
3885.925	H	-7.5	2.8	-4.7	-31.1	-26.4



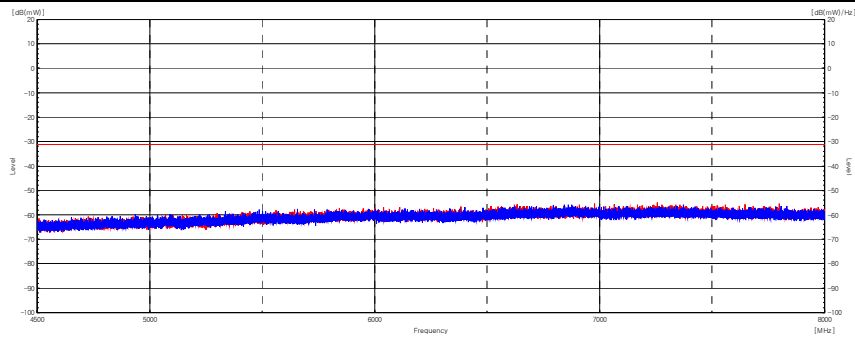
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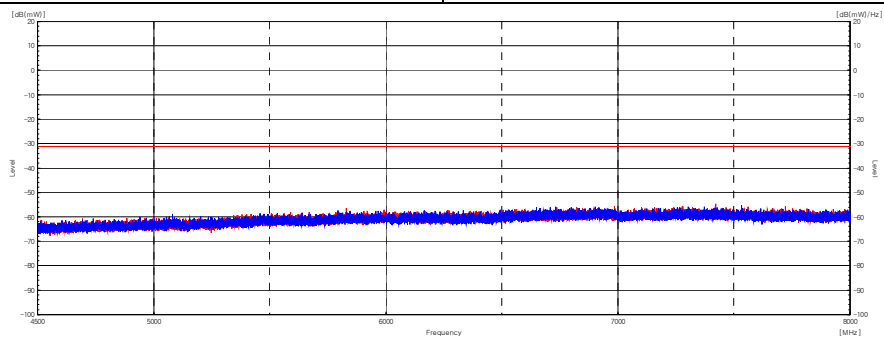
Frequency range	4.5 GHz - 8 GHz
Test mode	Single Carrier_Middle
Channel bandwidth	100 MHz



Frequency range	4.5 GHz - 8 GHz
Test mode	Multi Carrier(Contiguous)_Middle
Channel bandwidth	100 MHz + 100 MHz



Frequency range	4.5 GHz - 8 GHz
Test mode	Multi Carrier(Non-contiguous)
Channel bandwidth	100 MHz / 100 MHz

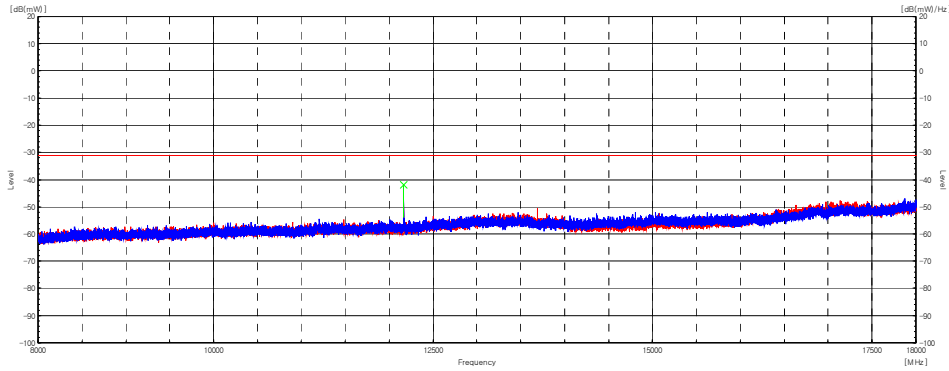




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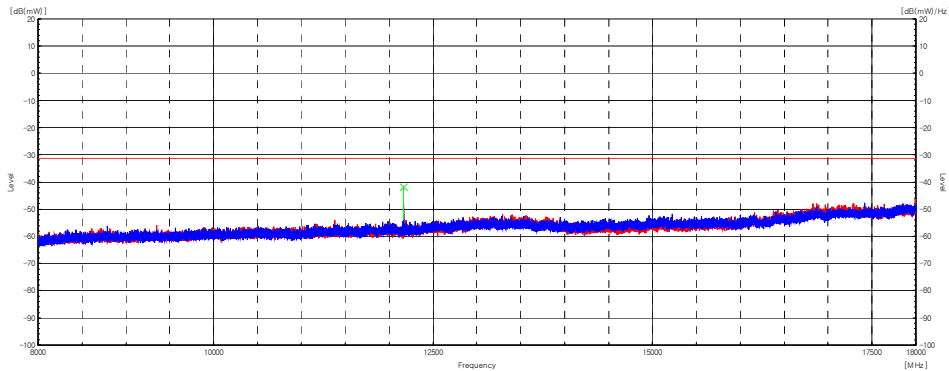
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Frequency range	8 GHz - 18 GHz
Test mode	Single Carrier_Middle
Channel bandwidth	100 MHz



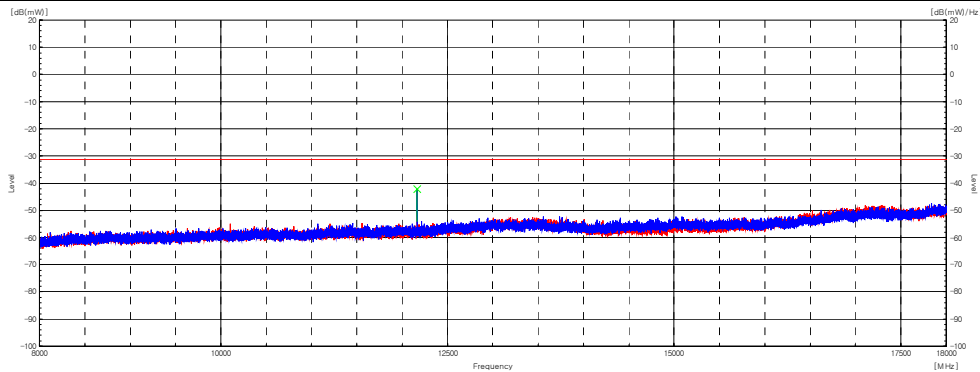
Frequency [MHz]	Pol	Reading [dB(mW)]	Space Loss [dB]	Level [dB(mW)]	Limit [dB(mW)]	Margin [dB]
12165.000	V	-52.5	10.6	-41.9	-31.1	10.8

Frequency range	8 GHz - 18 GHz
Test mode	Multi Carrier(Contiguous)_Middle
Channel bandwidth	100 MHz + 100 MHz



Frequency [MHz]	Pol	Reading [dB(mW)]	Space Loss [dB]	Level [dB(mW)]	Limit [dB(mW)]	Margin [dB]
12165.500	V	-52.4	10.6	-41.8	-31.1	10.7

Frequency range	8 GHz - 18 GHz
Test mode	Multi Carrier(Non-contiguous)
Channel bandwidth	100 MHz / 100 MHz



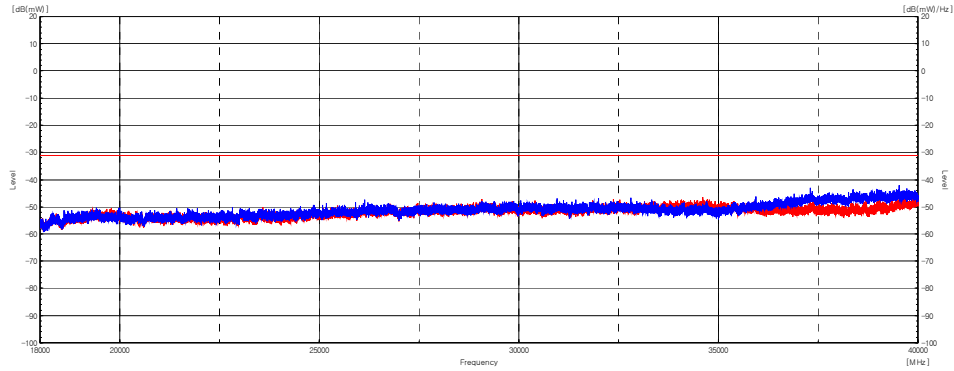
Frequency [MHz]	Pol	Reading [dB(mW)]	Space Loss [dB]	Level [dB(mW)]	Limit [dB(mW)]	Margin [dB]
12165.500	V	-52.7	10.6	-42.1	-31.1	11



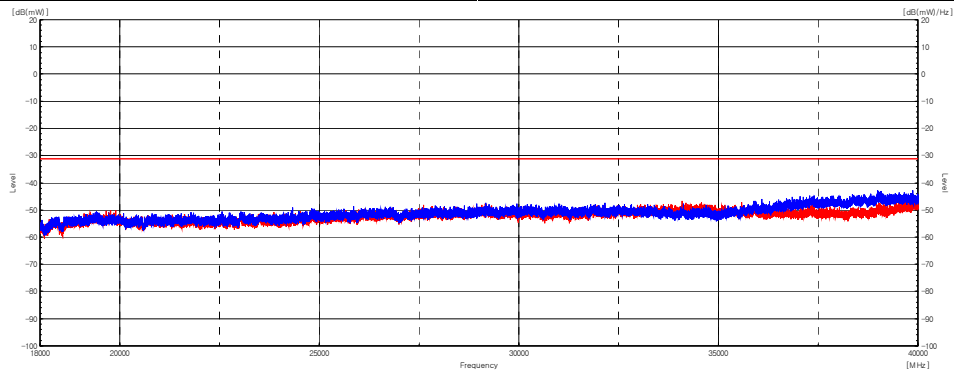
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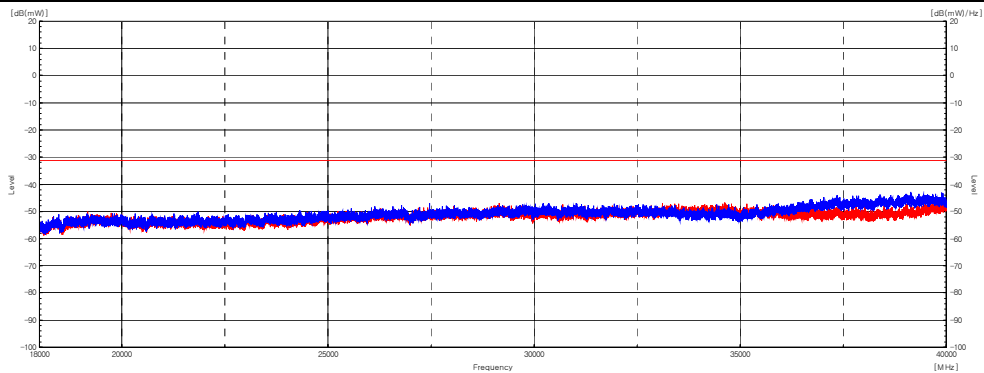
Frequency range	18 GHz - 40 GHz
Test mode	Single Carrier_Middle
Channel bandwidth	100 MHz




Frequency range	18 GHz - 40 GHz
Test mode	Multi Carrier(Contiguous)_Middle
Channel bandwidth	100 MHz + 100 MHz



Frequency range	18 GHz - 40 GHz
Test mode	Multi Carrier(Non-contiguous)
Channel bandwidth	100 MHz / 100 MHz



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8. Frequency Stability

Test Requirements :

§ 2.1055 Measurements required : Frequency stability.

- (a) The frequency stability shall be measured with variation of ambient temperature as follows:
- (1) From -30° to $+50^{\circ}$ centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.
 - (2) From -20° to $+50^{\circ}$ centigrade for equipment to be licensed for use in the Maritime Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radiobeacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to-Point Microwave Radio Service under part 21 of this chapter, equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter, and equipment authorized for use in the Family Radio Service under part 95 of this chapter.
 - (3) From 0° to $+50^{\circ}$ centigrade for equipment to be licensed for use in the Radio Broadcast Services under part 73 of this chapter.
- (b) The frequency stability shall be measured with variation of primary supply voltage as follows:
- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

§27.54 Frequency stability.

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

Test Procedures :

- (a) Device is placed at the Temp & Humidity Chamber. The Temp & Humidity Chamber could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- (b) The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- (c) The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.



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Test Results :

Test Data at output Antenna Port 0

Operating frequency	3840 MHz
Channel bandwidth	Single Carrier 100 MHz
Reference voltage / temperature	-48 Vdc / 20 °C
Modulation type	16QAM

Voltage (%)	Temperature (°C)	Frequency (Hz)	Frequency Error(Hz)	Deviation (Hz)	Frequency Error (ppm)
100	+20(Ref)	3840 005 291	5291.0	0.0	0.0000
	-30	3840 005 289	5289.0	-2.0	-0.0005
	-20	3840 005 290	5290.0	-1.0	-0.0003
	-10	3840 005 289	5289.0	-2.0	-0.0005
	0	3840 005 290	5290.0	-1.0	-0.0003
	+10	3840 005 294	5294.0	3.0	0.0008
	+30	3840 005 294	5294.0	3.0	0.0008
	+40	3840 005 293	5293.0	2.0	0.0005
115	+50	3840 005 289	5289.0	-2.0	-0.0005
	+20	3840 005 292	5292.0	1.0	0.0003
85	+20	3840 005 292	5292.0	1.0	0.0003

Note:

The results of the frequency stability test shown above the frequency deviation measured values are very small and similar trend for each port, so we are attached only the worst case data.



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APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
1	MXA Signal Analyzer	Agilent	N9020B	MY57431080	2021-04-17
2	EMI Test Receiver	R&S	ESCI7	100814	2021-10-20
3	EMI Test Receiver	R&S	ESU40	100336	2021-01-17
4	Bilog Antenna	Schaffner	CBL6111C	2551	2021-04-17
5	Biconical Antenna	SCHWARZBECK	VUBA 9117	9117-280	2022-11-11
6	6dB Attenuator	R&S	DNF	272.4110.50-1	2021-03-03
7	AMPLIFIER	SONOMA	310	291721	2021-01-22
8	Horn Antenna	ETS-Lindgren	3115	00078894	2020-12-10
9	Horn Antenna	ETS-Lindgren	3115	00078895	2021-04-13
10	Double Ridged Guide Antenna	ETS-Lindgren	3116	00062504	2020-12-17
11	Double Ridged Guide Antenna	ETS-Lindgren	3116	00062916	2021-04-20
12	Signal Generator	R&S	SMB100A	175528	2021-04-28
13	PREAMPLIFIER	Agilent	8449B	3008A02011	2021-11-30
14	Temp & Humidity Chamber	ESPEC	EBE-3HW2PAC-22	3013002866	2021-02-26
15	DC POWER SUPPLY	Agilent	6674A	MY41001477	2021-02-26
16	System Power Supply	HP	6032A	3440A-10521	2021-01-16
17	RF Switch system	INSJOY	RFX0132R	RFS02	2021-10-14
18	RF Switch system	INSJOY	RFX0132R	RFS01	2021-10-14
19	High Pass Filter	FILTRON	H16032FL	16060001S-4	2021-05-25