


Prüfbericht-Nr.: <i>Test report no.:</i>	ULR- TC568821300000005F	Auftrags-Nr.: <i>Order no.:</i>	166501087 0010	Seite 1 von 36 Page 1 of 36
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	NA	Auftragsdatum: <i>Order date:</i>	2020-11-23	
Auftraggeber: <i>Client:</i>	EMS TECHNOLOGIES CANADA, LTD. 400 Maple Grove Rd Ottawa ON K2V 188 CANADA			
Prüfgegenstand: <i>Test item:</i>	SAT-IDP-BC SAT-IDP-SC			
Bezeichnung: <i>Identification.:</i>	SAT-IDP	Serien -Nr.: <i>Serial no.:</i>	EMC-Rev4-002	
Auftrags-Inhalt: <i>Order content:</i>	Testing and issue of FCC and IC grant certificate			
Prüfgrundlage: <i>Test specification:</i>	FCC Part 2, Part 25 RSS-170 Issue 3, RSS GEN Issue 5			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2021-01-22			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A002986226-001 A002986226-002			
Prüfzeitraum: <i>Testing period:</i>	2021-01-23 - 2021-01-29			
Ort der Prüfung: <i>Place of testing:</i>	Wireless laboratory, Bangalore			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 27/B,2nd cross road, Electronic city Phase1, Bangalore-560100, India FCC Test Site Registration No.: 496599 ISED Test site registration No.: 3466E-1			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>		genehmigt von: <i>authorized by:</i>		
Datum: <i>Date:</i>	2021-01-29	Ausstellatum: <i>Issue date:</i>	2021-03-15	
Stellung / Position:	Srinivasa B R Engineer	Stellung / Position:	Mahammadgouse Kaladagi Assistant Manager	
Sonstiges / Other:	FCC ID : K6KSATIDP IC : 1275B-SATIDP HVIN:Rev 4 PMN:SAT-IDP-SC/SAT-IDP-BC			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend 5 = mangelhaft N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient 5 = poor N/T = not tested
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>				

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TEST SUMMARY

Test Item	FCC Test clause	IC Test clause	Result
RF Output Power (e.i.r.p)	Part 25.204	RSS-170 5.3.2	Pass
Occupied bandwidth and 20dB Bandwidth	Part 2.1049	RSS GEN 6.7	Pass
Emission limitations	Part 25.202(f)	RSS-170 5.4.3.1	Pass
Protection of the Radio Navigation Satellite Service	Part 25.216 (h)(i)	RSS-170 5.4.3.2.2	Pass
Frequency Stability	Part 25.202(d)	RSS-170 5.2	Pass
Radiated Spurious Emissions	Part 25.202(f)	RSS-170 5.4.3.1	Pass

Note:

This device is classified as „mobile device“ as defined in §2.1091 (b) and meet the 20 centimeter separation requirement, hence certification is optional for this device as per KDB guidelines “273109 D01 Equip Authorization Guide Part 25 Tx Receiver v02r02 “, however testing is performed in accordance with 47 CFR Sections 2.1091, 25.129(c), 25.129(d), 25 subpart c, and related sections.

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

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REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568821300000005F	01	Initial issue of report	2021-02-26
ULR-TC568821300000005F	02	Updated as per the reviewer comments	2021-03-15

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1 GENERAL REMARKS

1.1 Attachments

All attachments are part of this test report and are issued in separate document

1. TEST SETUP PHOTOS
- 2: EUT EXTERNAL PHOTOS
- 3: EUT INTERNAL PHOTOS
- 4: FCC & IC LABEL AND LABEL LOCATION
- 5: BLOCK DIAGRAM
- 6: SPECIFICATION OF EUT
- 7: SCHEMATIC DIAGRAM
- 8: BILL OF MATERIAL
- 9: USER MANUAL
- 10: MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

2 TEST SITES

2.1 Testing Facilities

- | | |
|--|---|
| <p>1. TÜV Rheinland (India) Pvt.Ltd.,
27/B, 2nd Cross,
ElectronicCityPhase1
Bangalore – 560 100,
India</p> | <p>2. TUV Rheinland (India) Pvt.Ltd.,
108 , Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100.
India</p> |
|--|---|

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
Active loop antenna	Schwarzbeck	FMZB 1519 B	1519B-00111	-	31.06.2021	Yearly	Radiated Spurious Emission
Biconical Antenna	Schwarzbeck	VHBB91 24+BBA 9106	9124-1208+910 6-0525	-	16.06.2021	Yearly	
Baloon and Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	01028	-	16.06.2021	Yearly	
Log - Periodical Antenna	Schwarzbeck	VUSLP 9118 A	VULP911 8A-0733	-	17.06.2021	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-0904	-	29.06.2021	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	30.06.2021	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
EMI Receiver	Rohde & Schwarz	ESU 40	100288	-	09.06.2021	Yearly	
Spectrum Analyser	Agilent Technologies	E4407B	US41192 772	A.14.06	10.08.2021	Yearly	Antenna-Port Conducted test
Thermal Chamber	Votsch	VT4002	58566101 750010	-	16.10.2021	Yearly	
Signal Analyzer	Rohde & Schwarz	FSV7	101644	-	15.01.2022	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in SAC	EMC 32	10.60.00
2	Radiated spurious emission measurement in FAC	EMC 32	10.60.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

The SAT-IDP is a compact, single unit, low data rate satellite terminal, designed to operate over the INMARSAT satellites using the INMARSAT Data Pro (IDP) protocols. With an integral GPS receiver, the SAT-IDP provides low cost satellite communications for applications such as asset tracking, telematics and SCADA exception reporting. Mounting is via 3x M4 (No. 8) bolts or central M25 thread on base.

Model Types:

The SAT-IDP Model Types consist of the standard model (SAT-IDP-BC) (as shown in **Figure 1**) and the variant (SAT-IDP-SC) as shown in **Figure 2**. All units are functionally identical and only differ in that they offer various cable exit and termination options, which may then be used with optional extension cables.



Figure 1: SAT-IDP-BC



Figure 2: SAT-IDP-SC

3.2 Ratings and System Details of Equipment under Test

Table 3: Ratings and System Details as declared by Client*

EUT name	SAT-IDP	
Protocol	Inmarsat Data Pro (IDP)	BLE
Operating Frequency Range	<u>Radio Receiver Band:</u> 1518 MHz to 1610MHz; <u>Inmarsat:</u> 1525-1559 MHz <u>Extended receive band:</u> (Outside USA region): 1518-1525 MHz <u>GPS band:</u> 1559 MHz to 1610MHz <u>Radio Transmit Band:</u> 1626.5-1660.5 MHz, <u>Extended Inmarsat Transmit Band:</u> (outside USA region) 1668-1675 MHz	2402MHz to 2480MHz
No. of Channels	Not applicable	40
Channel Spacing	5kHz	2MHz
Maximum Measured Power	32.085 dBm at 1626.501MHz	10.12 dBm (as Per BLE module grant)
Modulation	OQPSK	GFSK (DSSS)
Number of antennas	1	1
Antenna Gain	6dBi	1 dBi
Antenna Type	Integrated Planar	PCB Chip Antenna
Supply Voltage to Product	9.6V to 32V DC Supply	
Environmental conditions	Temperature -40°C to +70°C	
	Humidity ≤ 95% @ +40°C, non-condensing	
EUT Dimension	118 mm x 108 mm x 37 mm (LxWxH)	

***Disclaimer:** The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

3.3 Simultaneous operation

Combination	BLE And MSS (Mobile-Satellite Service) / 1.5/1.6 GHz MSS bands
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Note: Simultaneous Operation was performed with the above mentioned combination and worst case test results are mentionrd in this report.

3.4 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 4: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±3 °C
Supply Voltages	±3 %
Time	±5 %

Note: The Listed Measurement Uncertainties are the worst-case uncertainty, for the respective test cases. Above Table is for reporting purpose only and not used in determining Final Pass/Fail verdict.

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle transmission on low, mid and high channel.

4.2 Test Operation and Test Software

Hardware Version(HVIN): Rev 4

Software Version(FVIN): 01.02.003.2021

4.3 Special Accessories and Auxiliary Equipment

SL No	Accessory Name	Make	Model
1	IDP Terminal Test Equipment (Test Equipment)	SPCI	PLTM-02
2	Load Board	Honeywell (Customer Make)	Not Applicable
3	Multi Channel GPS Simulator	Spirent	4500
4	Antenna's	Laird	OD24M-5
5	DC power source	TENMA	72-6610

Table 5: List of Accessories Used

4.4 Countermeasures to achieve EMC Compliance

None

4.5 List of MSS (Mobile-Satellite Service) frequencies

Frequency Band (GHz)		Channel No.	Frequency (MHz)
Transmit Frequency	Receive Frequency	Low	1626.501
1626.5MHz-1660.5 MHz	1525MHz-1559 MHz	:	:
		Mid	1643.501
		:	:
		High	1660.501

Table 6: List of Center frequencies

Note:

TUV Sample Identification number : A002986226-001 – Radiated test Sample
: A002986226-002 – Conducted test Sample

5 TEST METHODOLOGY

5.1 Radiated Emission Test

Frequency Range 30MHz to 10th harmonics of the highest fundamental frequency

Test performed as per ANSI C63.26-2015

ERP/EIRP Radiated Power & Radiated spurious emission test are performed as below.

All the radiated emission measurements are performed in accordance with common requirement specified in 5.5.2 and Pre-test site path loss correction factors are used to adjust the EUT emission data in place of two step substitution method (as defined in Annex B of ANSI C63.26-2015).

The equipment under test is placed on non-conductive table at 3m away from the receive antenna in accordance with above mentioned standard. Turn table is rotated through 360 degree, and receiver antenna height is varied in order to determine the level of maximum emission. The maximum emission level and position of the maximized emission is recorded with use of spectrum analyzer.

Using pre-test site path loss to determine EUT emission power:

- 1) EUT emission powers are calculated using the following equation:

$$\text{Emission Power} = \text{EUT}_{\text{Prec}} [\text{dBm EIRP}] + \text{PL} [\text{dB}]$$

where

EUT_{Prec} = power of the emission measured at the test receiver during EUT measurements.

PL = path loss determined on the frequency of the EUT emission or calculated using linear interpolation between site characterization frequencies.

- 2) This is the level to be compared against the regulatory limit as it is the emission power referenced back to the EUT on the test site.

5.1.1 Test Setup Configuration

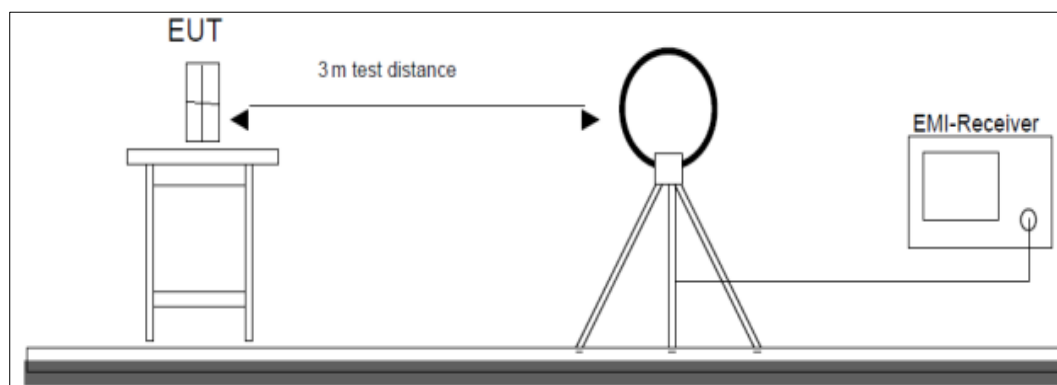


Figure 3: Frequency Range 9 kHz- 30 MHz

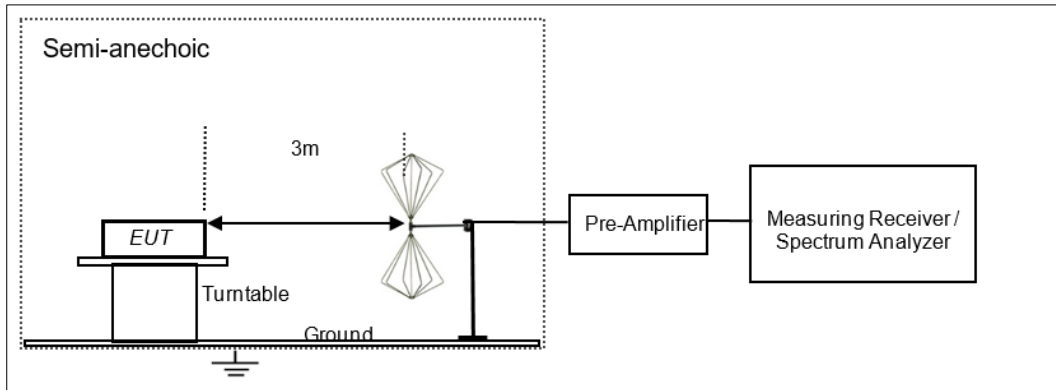


Figure 4: Frequency Range 30 MHz – 200 MHz

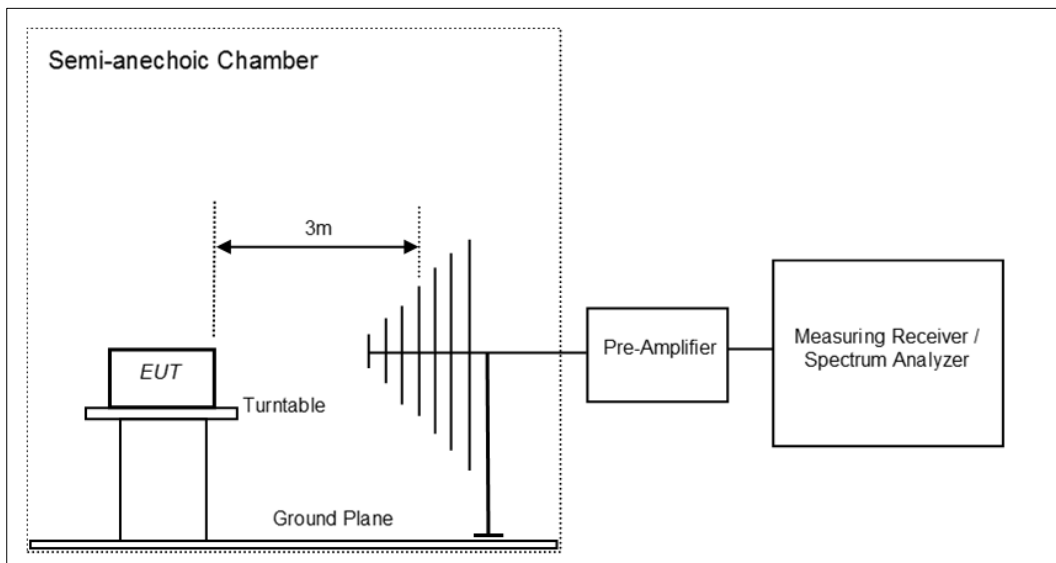


Figure 5: Frequency Range 200 MHz - 1GHz

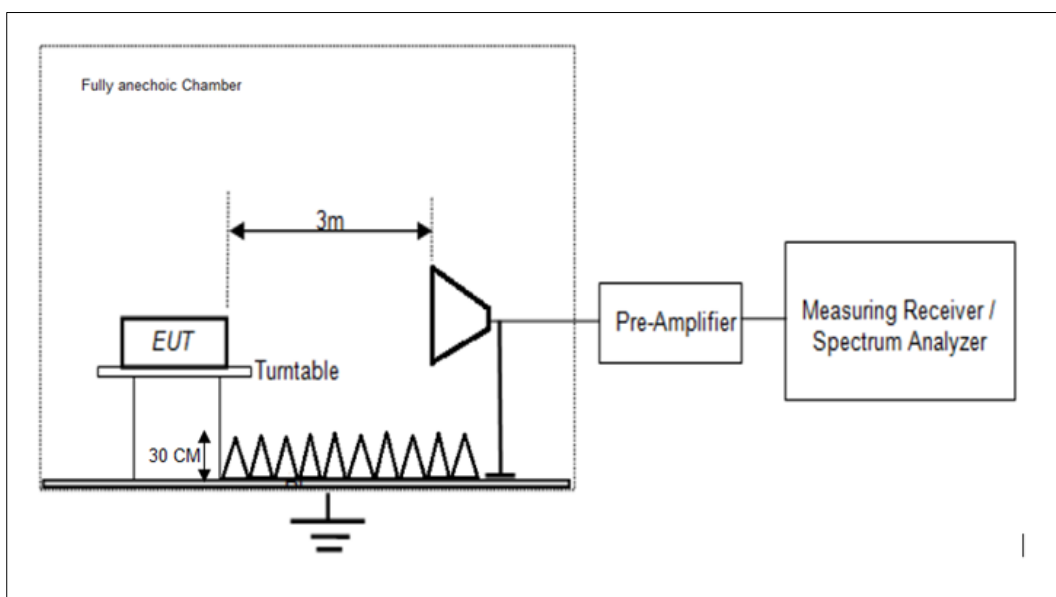


Figure 6: Frequency Range above 1 GHz

6 TEST RESULTS

6.1 Maximum Radiated Output Power (e.i.r.p)

Result

Pass

Test Specification	Part 25.204 RSS-170 5.3.2
Test Method	ANSI C63.26-2015
Measurement Bandwidth	100 kHz for frequency range < 1GHz 1 MHz for Frequency range >1GHz
Detector	Peak
Measuring Distance	3 m
Test setup	Refer TEST METHODOLOGY
Requirement	As per the limits mentioned in the below table

Limit:

FCC Clause

Requirements

FCC Part 25.204

frequency bands between 1 and 15 GHz, shall not exceed the following limits

- + 40 dBW in any 4 kHz band for $\theta \leq 0^\circ$
- + 40 + 3 θ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$

Where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

This product is not designed to use increased power levels, and has fixed power. Hence the increased power levels for elevation stated in the limit is not required to be tested; the EUT is tested for worst case scenarios with e.i.r.p limit + 40 dBW

Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.0 °C Voltage = 12V DC Supply Relative humidity: 64%

KDB Guidelines applied:

All the radiated emission measurements are performed in accordance with common requirement specified in 5.5.2 of ANSI C63.26-2015 and Pre-test site path loss correction factors are used to adjust the EUT emission data in place of two step substitution method (as defined in Annex B of ANSI C63.26-2015)

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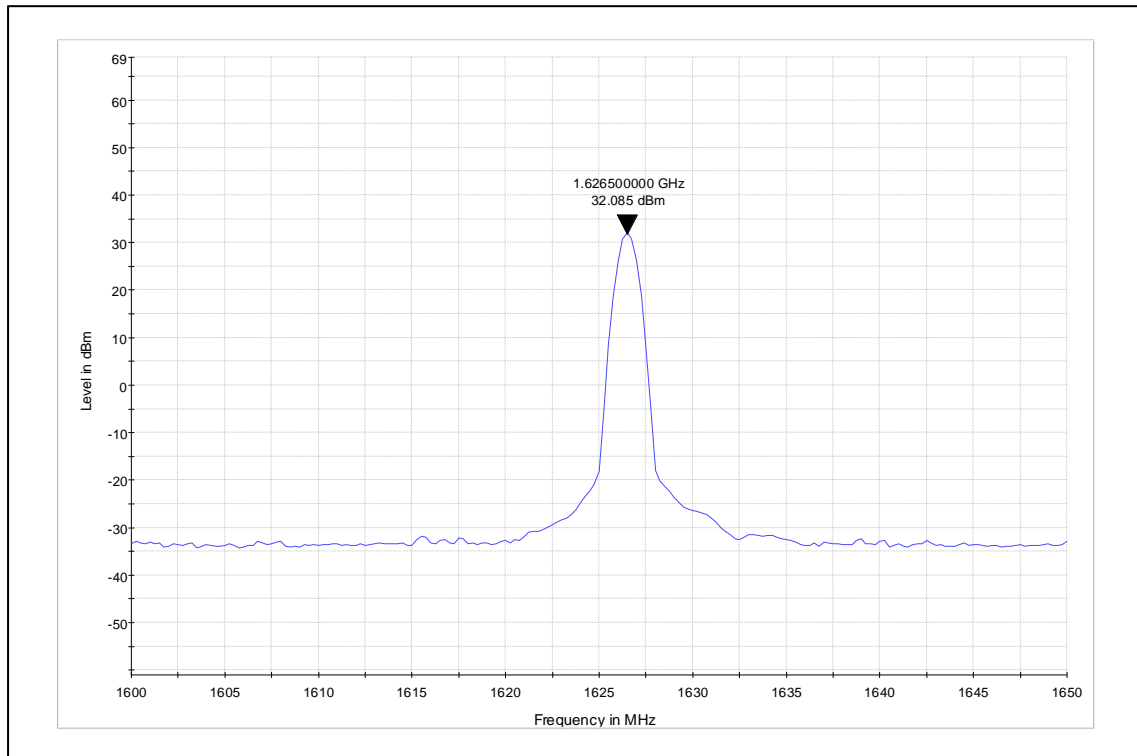
Test results:

Note:

1. Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

Frequency (MHz)	Polarization	Measured value e.i.r.p (dBm)	Measured value e.i.r.p (dBW)
1626.501	Vertical	32.085	2.085
	Horizontal	29.293	-0.707
1643.501	Vertical	27.996	-2.004
	Horizontal	26.800	-3.200
1660.501	Vertical	30.432	0.432
	Horizontal	29.174	-0.826

Worst case Plots:



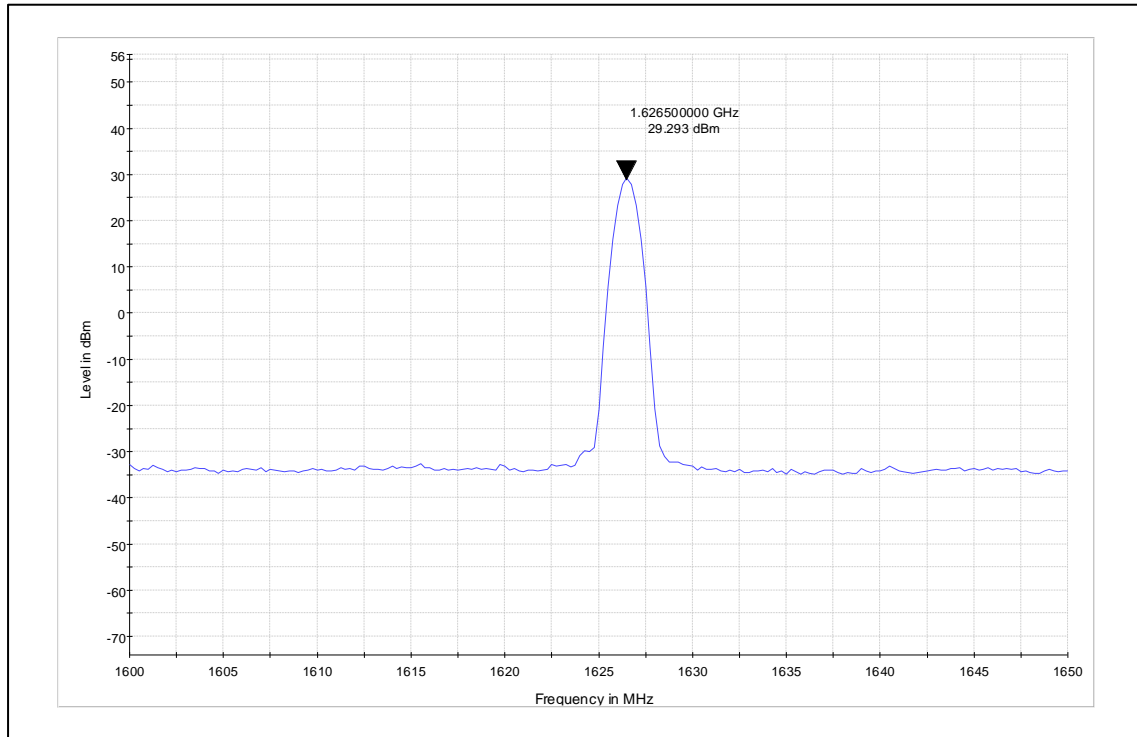
Frequency: 1626.501MHz

Polarization: Vertical

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Frequency: 1626.501MHz

Polarization: Horizontal

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6.2 Occupied bandwidth

Result

Pass

Test Specification	Part 2.1049 RSS GEN 6.7
Test Method	Subclause 5.4.3 and 5.4.4 of ANSI C63.26
Measurement Bandwidth	30 Hz
Detector	Peak
Port of testing	Antenna port
Requirement	As per the limits mentioned in the below table

Limit:

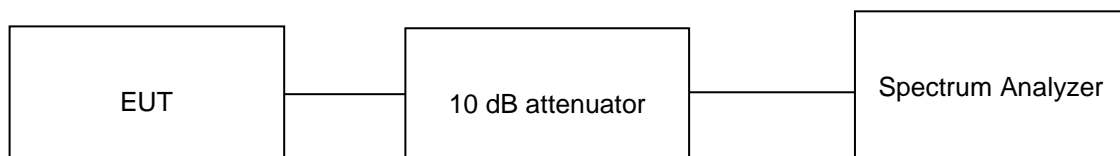
FCC Clause

FCC Part 2.1049

Requirements

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.0 °C

Voltage = 12V DC Supply

Relative humidity: 64%

KDB Guidelines applied:

Measurements were made as per sub clause 5.4.3 & 5.4.4 of ANSI C63.26-2015

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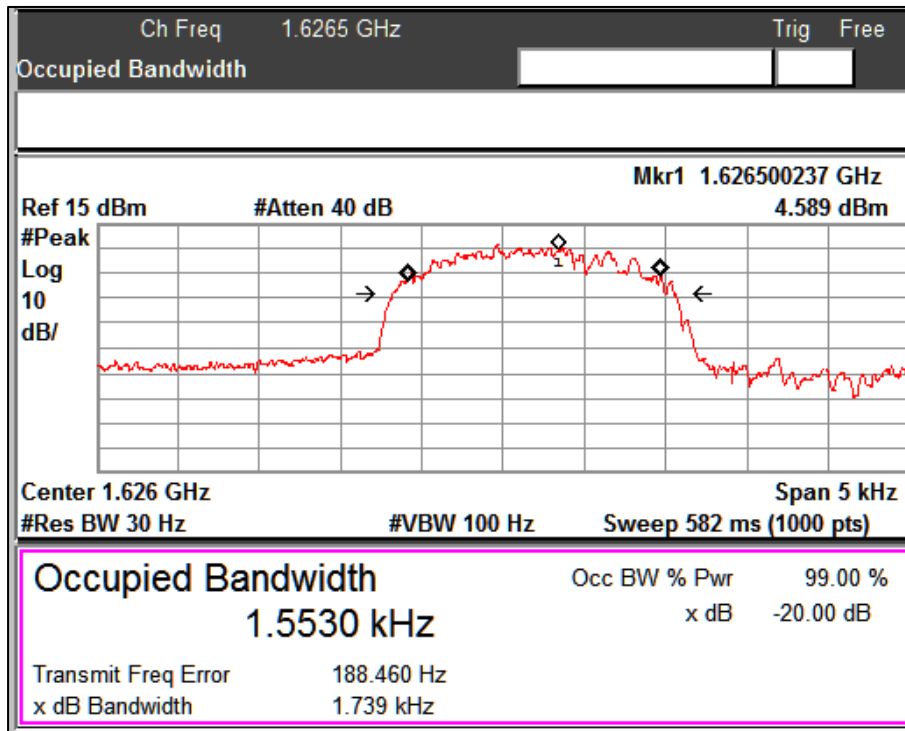
Test results:

Note:

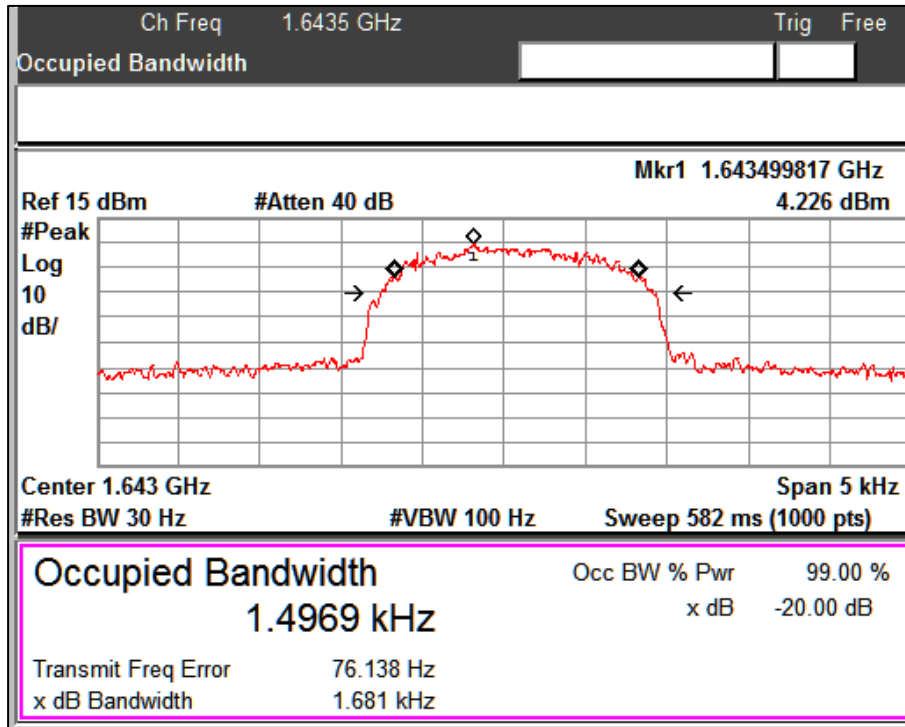
1. All the losses are included during measurement and final values are mentioned in the test report.
2. For the measurement of x dB and 99% BW the RBW is set to 1% of nominal CH BW (2.5 kHz)

Measured Frequency (MHz)	99% Occupied Bandwidth (kHz)	-20 dB emission bandwidth (kHz)
1626.5	1.553	1.739
1643.5	1.497	1.681
1660.5	1.524	1.722

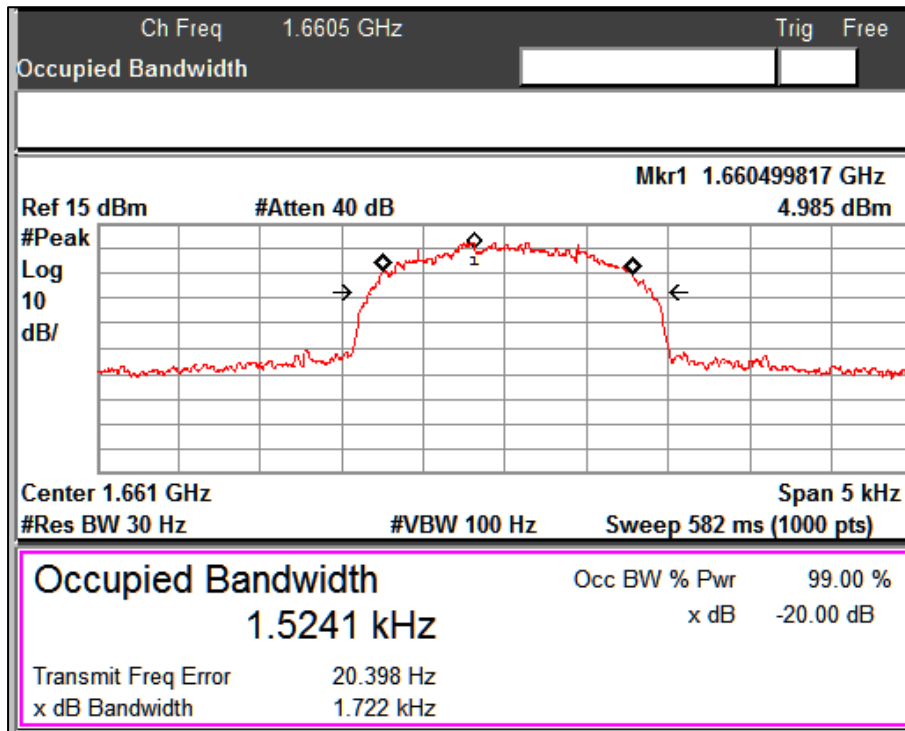
Test Plots:



Channel Frequency: 1626.501MHz



Channel Frequency: 1643.501MHz



Channel Frequency: 1660.501MHz

6.3 Emission limitations

Result

Pass

Test Specification	Part 25.202 (f) RSS-170 5.4.3.1
Test Method	Subclause 5.7 of ANSI C63.26
Measurement Bandwidth	100 kHz
Detector	Peak/Average
Port of testing	Antenna port
Requirement	The average power of unwanted emissions shall be attenuated below the average output power, P (dBW), of the transmitter, as specified below

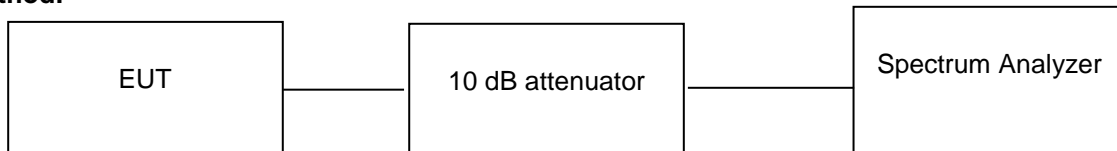
Limit:

FCC Clause

Requirements

<p>FCC 25.202 (f) RSS-170 5.4.3.1</p>	<p>Emission Mask</p> <p>Spurious Emissions</p>	<p>(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;</p> <p>(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;</p> <p>(3) $43 + 10 \log p$ (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the occupied bandwidth or necessary bandwidth, whichever is greater;</p>
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Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.0 °C Voltage = 12V DC Supply Relative humidity: 64%

KDB Guidelines applied:

Basic guidelines for conducted measurement as per clause 5.7.2 of ANSI C63.26-2015 are followed

Test results:

Note:

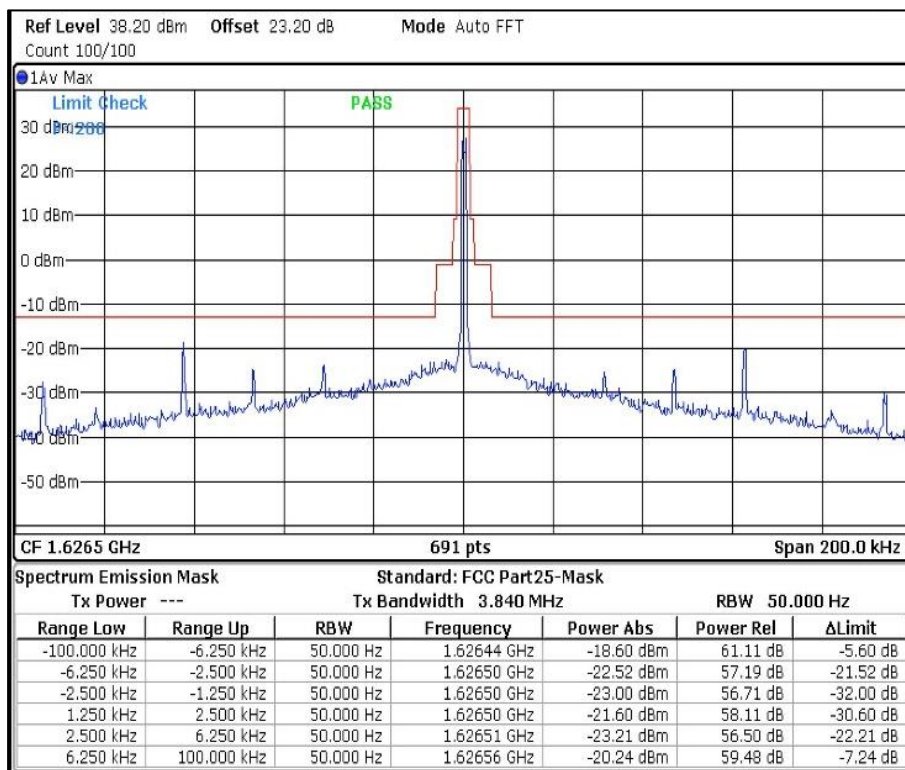
1. All the losses are included during measurement and final values are mentioned in the test report.
2. BW correction factors added to the measured results and final values reported in the graphs
3. Emission limitation test is specified for 4 kHz, which is greater than the channel spacing of the device hence the measurement bandwidth used was approximately 1 % of the specified reference BW.

Bandwidth correction factors :

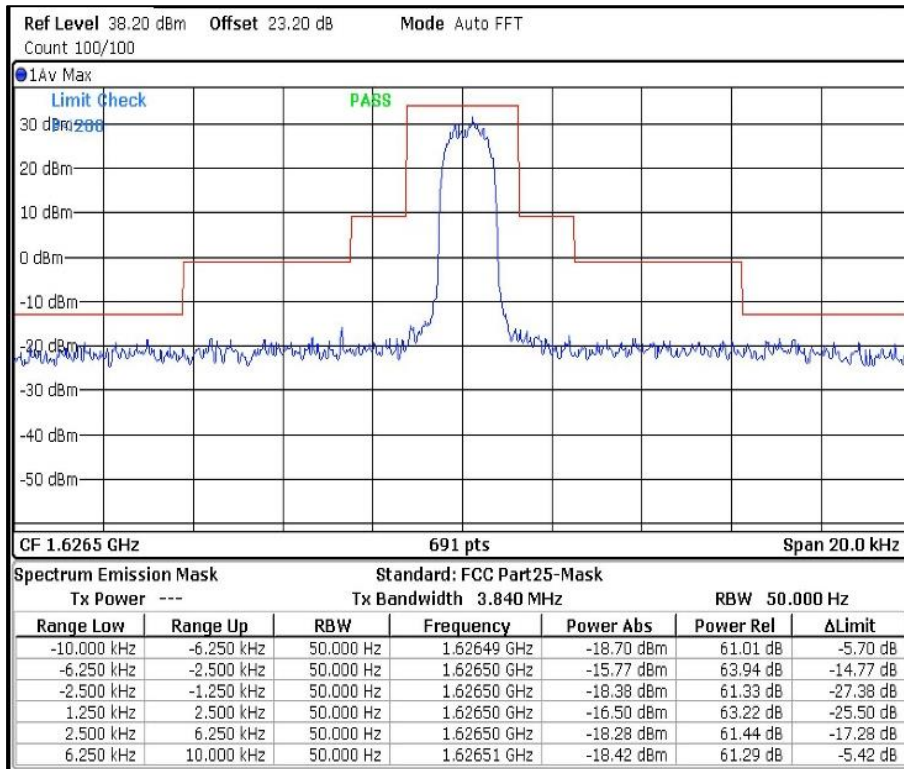
Reference bandwidth : 4 kHz
 Measurement bandwidth : 1% of 4 kHz = 40 Hz, hence 50 Hz is used
 Bandwidth correction factor: $10 \log [(reference\ bandwidth) / (measurement\ bandwidth)] = 19.03\ dB$

Test Plots:

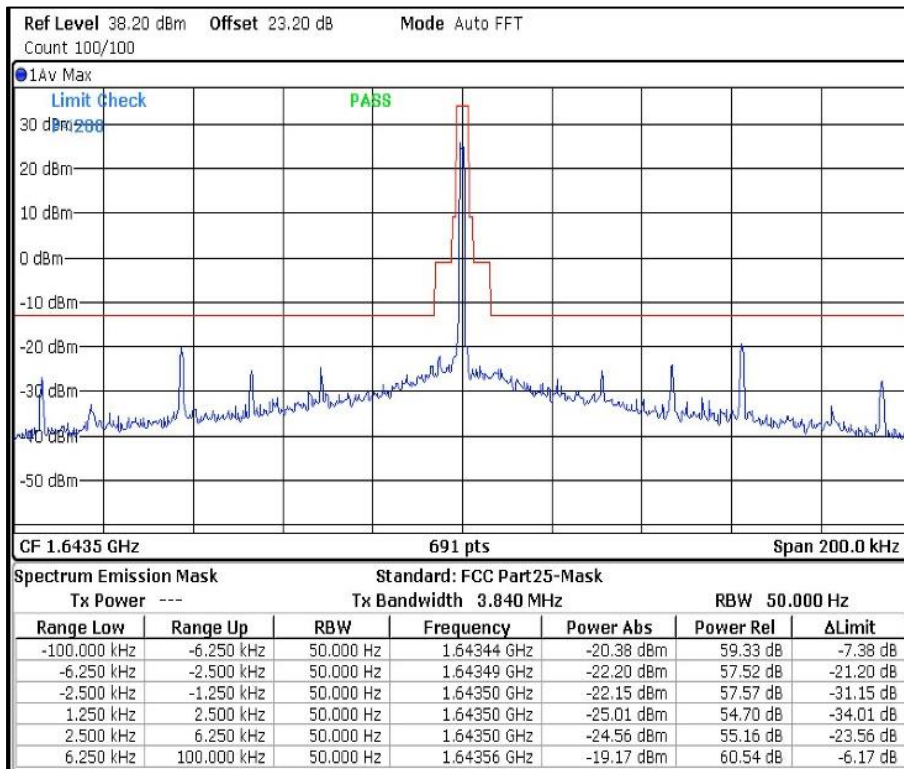
Emission Mask



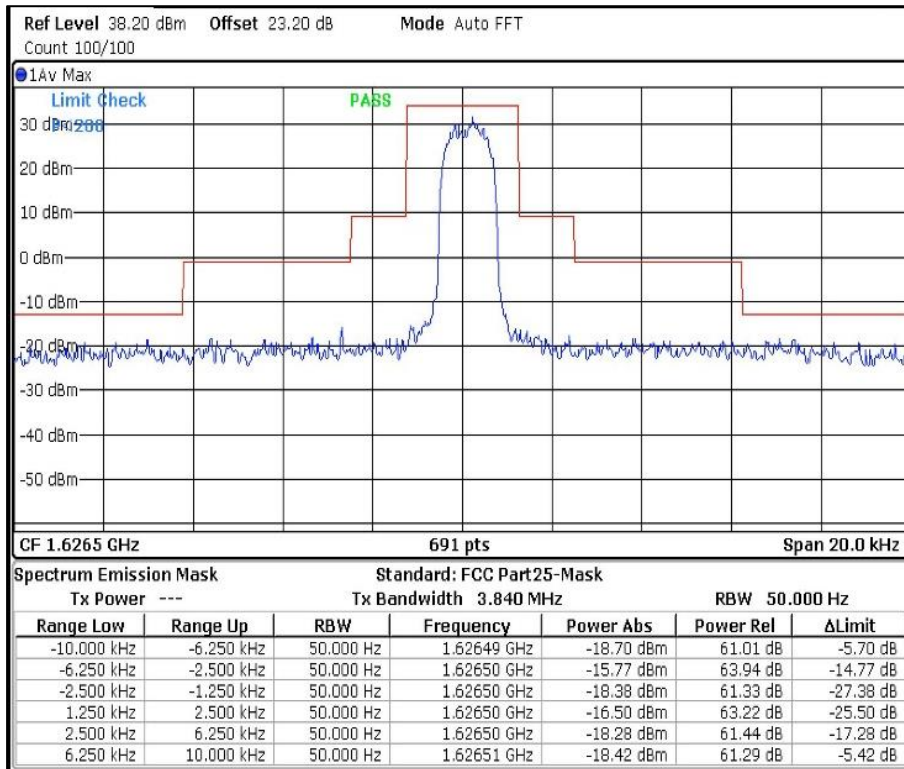
Frequency:1626.501MHz Full Scan



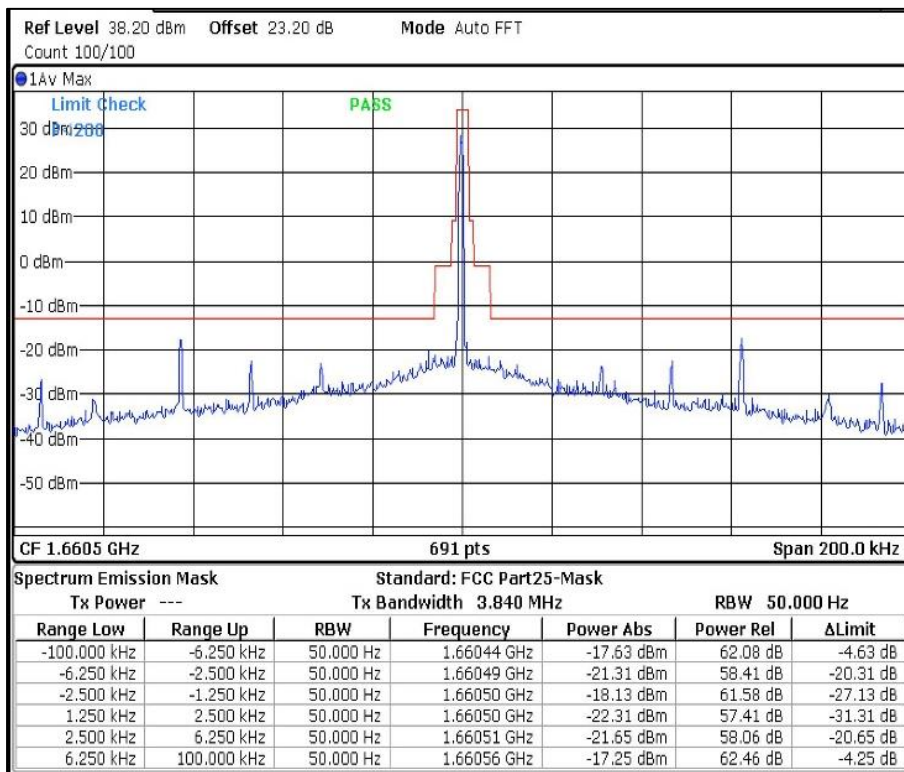
Frequency:1626.501MHz Zoom Scan



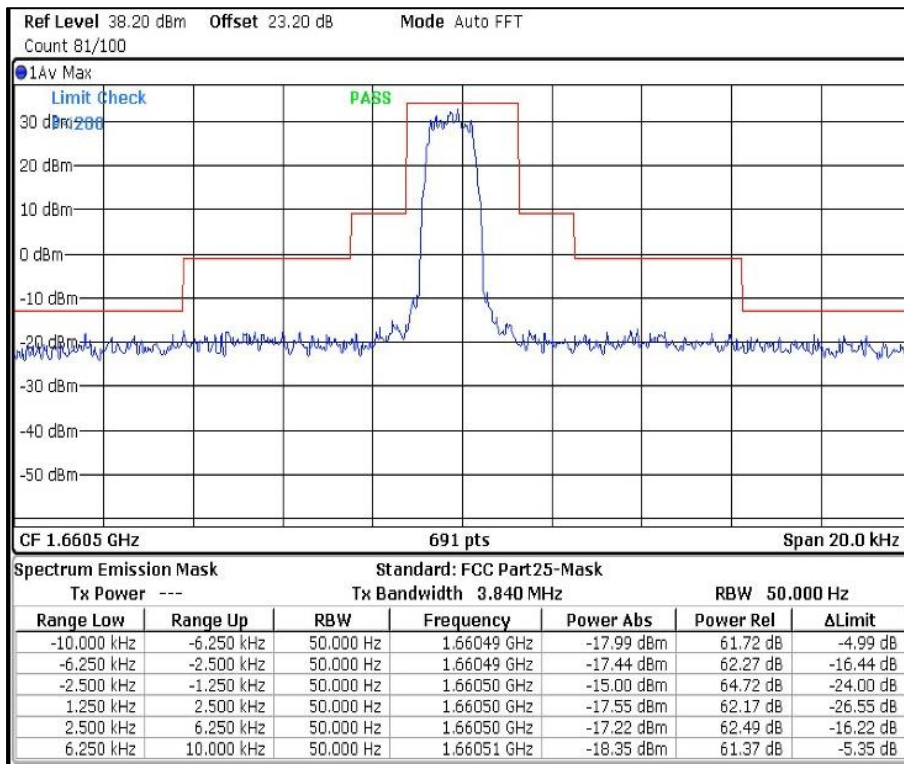
Frequency:1643.501MHz Full Scan



Frequency:1643.501MHz Zoom Scan



Frequency:1660.501MHz Full Scan

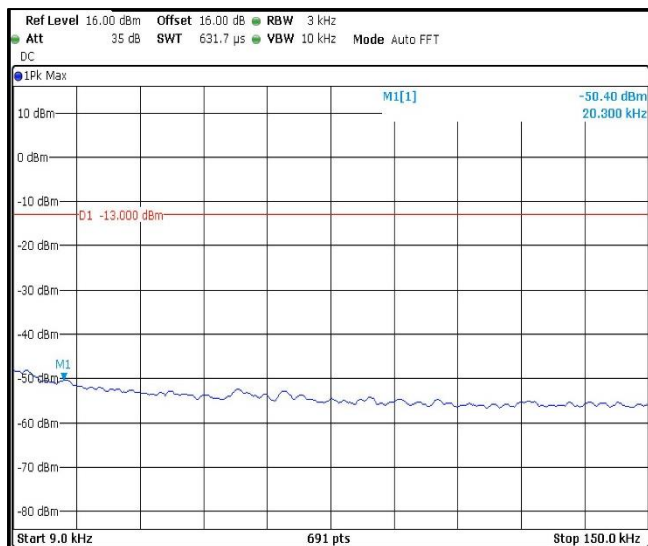


Frequency:1660.501MHz Zoom Scan

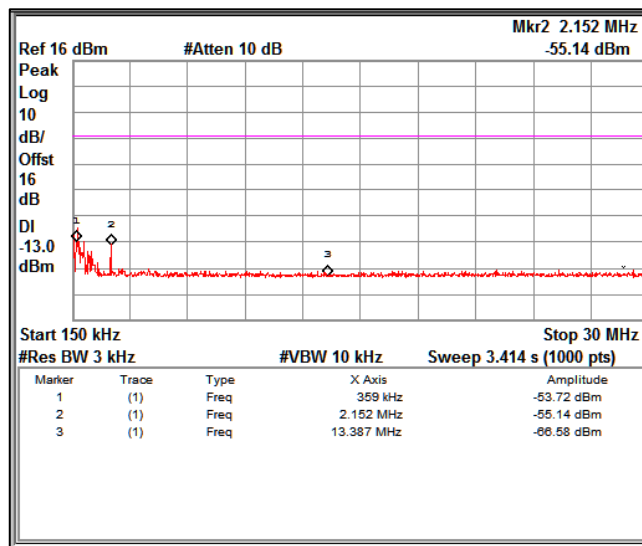
Spurious Emissions

Note : only worst case plots of low channel reported

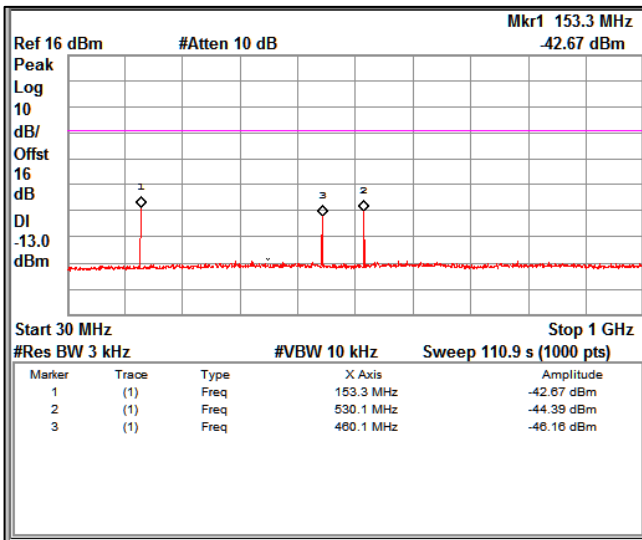
Frequency:1660.501MHz



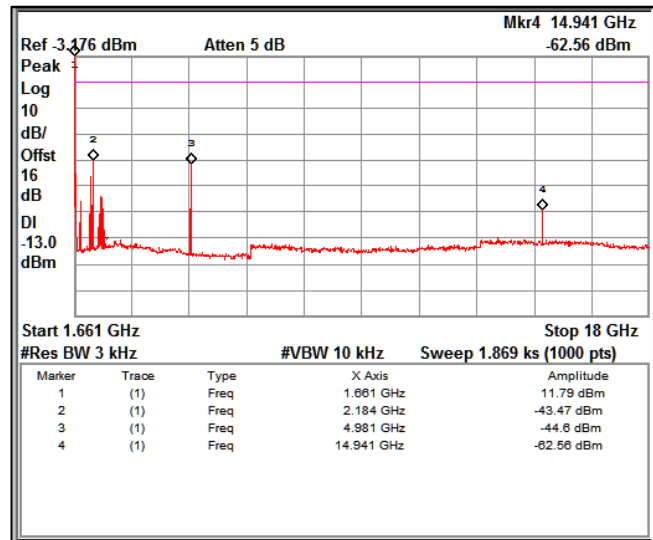
Frequency Range:9KHz-150KHz



Frequency Range:150KHz-30MHz



Frequency Range:30MHz-1GHz



Frequency Range:1GHz-18GHz

Note :

1. Marker frequency 1.661 GHz is fundamental emission
2. No emission found in frequency range 1GHz to 1.559 GHz
3. Spectrum ranging from 1.559GHz to 1.6265GHz are part of radio navigation test

6.4 Protection of the Radio Navigation Satellite service

Result	Pass
Test Specification	Part 25.216 (h)(i) RSS-170 5.4.3.2.2
Test Method	Subclause 5.7 of ANSI C63.26
Measurement Bandwidth	3 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	As per the limits mentioned in the below table

FCC:

(h) Mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03-283 with assigned uplink frequencies in the 1626.5-1660.5 MHz band shall suppress the power density of emissions in the 1605-1610 MHz band-segment to an extent determined by linear interpolation from -70 dBW/MHz at 1605 MHz to -46 dBW/MHz at 1610 MHz, averaged over any 2 millisecond active transmission interval. The e.i.r.p of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level determined by linear interpolation from -80 dBW at 1605 MHz to -56 dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

(i) The e.i.r.p density of carrier-off state emissions from mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03-283 with assigned uplink frequencies between 1 and 3 GHz shall not exceed -80 dBW/MHz in the 1559-1610 MHz band averaged over any two millisecond interval.

IC:

5.4.3.2.2. Band 1626.5-1660.5 MHz

Mobile earth stations with transmitting frequencies between 1626.5 MHz and 1660.5 MHz shall have the e.i.r.p. density of unwanted emissions in the band 1605-1610 MHz, averaged over any 2-ms active transmission interval, not exceed the following limits:

- (1) -70 dBW/MHz at 1605 MHz, linearly interpolated to -46 dBW/MHz at 1610 MHz, for broadband emissions; and
- (2) -80 dBW/kHz at 1605 MHz, linearly interpolated to -56 dBW/kHz at 1610 MHz, for discrete emissions.

5.4.4. Carrier-off State Emissions

Mobile equipment with transmitting frequencies between 1 GHz and 3 GHz shall have the e.i.r.p. density of carrier-off state emissions in the band 1559-1610 MHz not exceed -80 dBW/MHz.

Prüfbericht - Nr.:
Test Report No.:

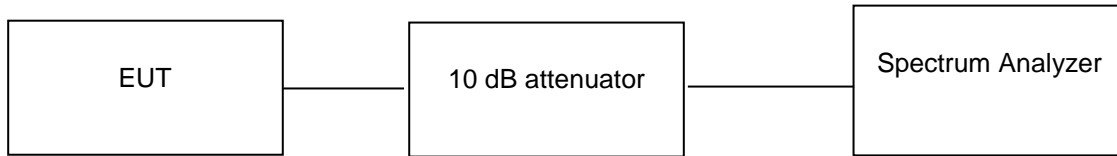
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KDB Guidelines applied:

Basic guidelines for conducted measurement as per clause 5.7.2 of ANSI C63.26-2015 are followed

Test Method:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.0 °C Voltage = 12V DC Supply Relative humidity: 64%

Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 6 dBi.
3. BW correction factors are taken into consideration and final values are reported in this report
4. No discrete emission found during the test. Hence only broadband emissions are reported.

Results for broadband emissions:

Mask	Frequency Range of measurement (MHz)		Measured Frequency (MHz)	Limit (linearly interpolated -40 dBm to -16 dBm)	Measured Level e.i.r.p (dBm/MHz)	Margin (dB)
	Channel	Start				
Low	1605	1610	1608.01	-25.55 dBm	-52.71	-27.16
Mid	1605	1610	1607.46	-28.19 dBm	-53.17	-24.98
High	1605	1610	1607.22	-29.34 dBm	-71.54	-42.20

Results for Carrier-off State Emissions

Mask	Frequency Range of measurement (MHz)		Measured Frequency (MHz)	Limit (dBm/MHz)	Measured Level (dBm/MHz)	Margin (dB)
	Channel	Start				
Low	1559	1610	1597.04	-50.0	-52.71	-2.71
Mid	1559	1610	1607.46	-50.0	-53.17	-3.17
High	1559	1610	1607.20	-50.0	-71.54	-21.54

6.5 Frequency Stability

Result

Pass

Test Specification	Part 25.202(d) RSS-170 5.2
Test Method	Clause 5.6.4 of ANSI C63.26
Measurement Bandwidth	3 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	As per the limits mentioned in the below table

Limit:

FCC Clause

Requirements

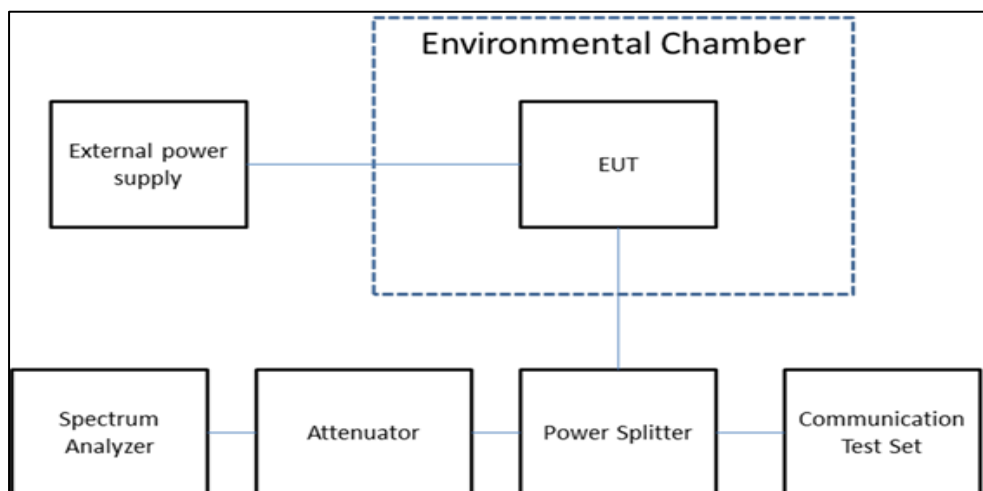
25.202(d)

The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.
 $\pm 0.001\% = \pm 10\text{ppm}$

RSS-170 5.2

For mobile earth station equipment, the carrier frequency shall not depart from the reference frequency by more than ± 10 ppm

Test Method:



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Test Condition

Normal Test Condition:

Temperature (Norm) = + 23.0 °C Voltage = 12V DC Supply Relative humidity: 64%

KDB Guidelines applied:

Basic guidelines for conducted measurement as per clause A.2.9.7 of ANSI C63.26-2015 are followed

Test results:

Table 7: Frequency Stability extrem Temperature

Temperature	Voltage(V)	Nominal frequency(Hz)	Measured frequency(Hz)	Deviation(Hz)	Measured Deviation (ppm)	Deviation Limit (ppm)
Nominal	12 VDC (V nominal)	1643500000	1643499750	250	0.15211439	10
-30 degrees		1643500000	1643500250	-250	-0.15211439	10
-20 degrees		1643500000	1643500250	-250	-0.15211439	10
-10 degrees		1643500000	1643500250	-250	-0.15211439	10
0 degrees		1643500000	1643500250	-250	-0.15211439	10
10 degrees		1643500000	1643500250	-250	-0.15211439	10
20 degrees		1643500000	1643499750	250	0.15211439	10
30 degrees		1643500000	1643499500	500	0.30422878	10
40 degrees		1643500000	1643499500	500	0.30422878	10
50 degrees		1643500000	1643499750	250	0.15211439	10

Table 8: Frequency Stability extrem Voltage

Temperature	Voltage(V)	Nominal frequency(Hz)	Measured frequency(Hz)	Deviation(Hz)	Measured Deviation (ppm)	Deviation Limit (PPM)
Nominal	9.6 VDC	1643500000	1643500250	-250	-0.15211439	10
	12 VDC	1643500000	1643499750	250	0.15211439	10
	32 VDC	1643500000	1643500250	-250	-0.15211439	10

6.6 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

Test Specification	Part 25.202(f) RSS-170 5.4.3.1
Test Method	ANSI C63.26
Measurement Location	Semi Anechoic Chamber 30MHz - 1 GHz Fully Anechoic Chamber 1 GHz - 40GHz
Measurement Bandwidth	100 kHz for frequency range < 1GHz 1 MHz for Frequency range >1GHz
Detector	Peak
Measuring Distance	3 m
Requirement	As per the limits mentioned in the below table
Test setup	Refer TEST METHODOLOGY

Table 9: Transmitter limits for Radiated spurious emission

Frequency (MHz)	Limit in dBm	Distance of Measurement (m)
30 - 1000	-13	3
1000-18000*	-13	3

*Note: Excluding OOB emissions

Test Conditions:

Temperature (Norm) = + 23.5 °C Voltage = 12V DC Supply Relative humidity: 63%

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Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY

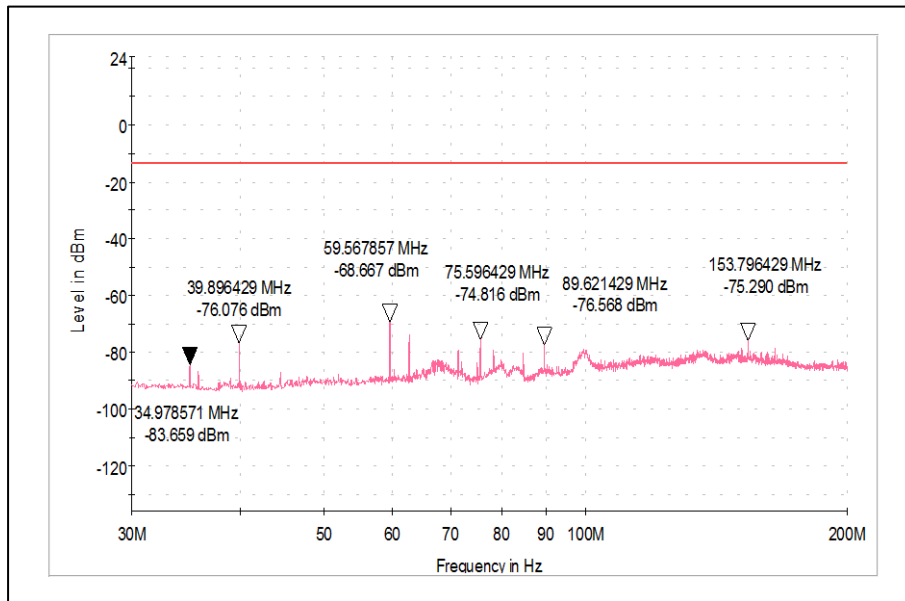
Test results for frequency range 9kHz – 30MHz

No emissions found in frequency range 9 kHz to 30 MHz, and measured levels are below 20dB from the limit line, hence not reported

Table 10: Test results for frequency range 30MHz – 1GHz

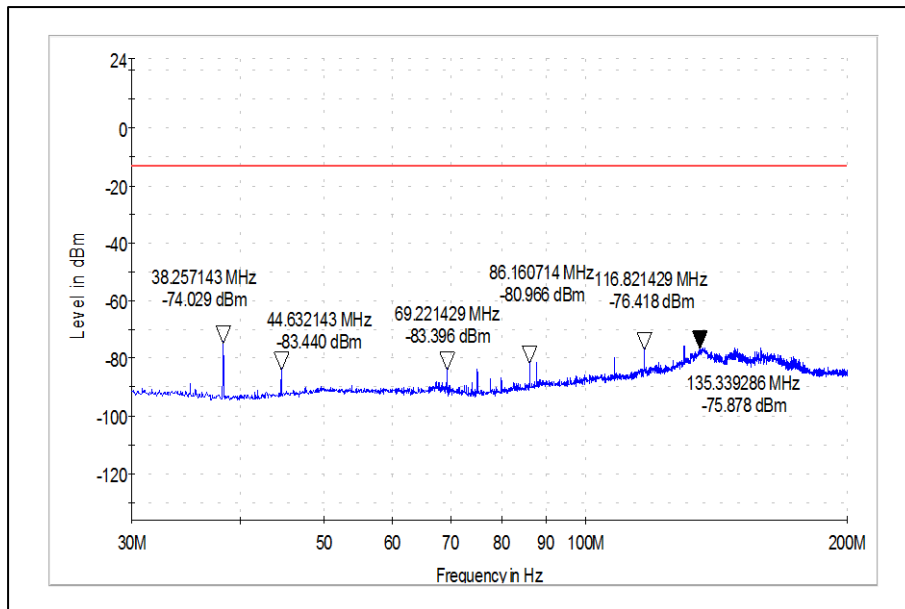
Polarization	Frequency (MHz)	Measured value (dBm)	Limit (dBm)	Margin (dB)
Vertical	39.896	-76.076	-13.000	-63.076
	59.567	-68.667	-13.000	-55.667
	153.796	-75.290	-13.000	-62.290
	216.619	-78.488	-13.000	-65.488
	490.423	-78.022	-13.000	-65.022
	960.476	-72.910	-13.000	-59.910
Horizontal	38.257	-74.029	-13.000	-61.029
	69.221	-83.396	-13.000	-70.396
	116.821	-76.418	-13.000	-63.418
	239.815	-78.654	-13.000	-65.654
	400.809	-80.498	-13.000	-67.498
	957.619	-72.417	-13.000	-59.417

Test Plots:



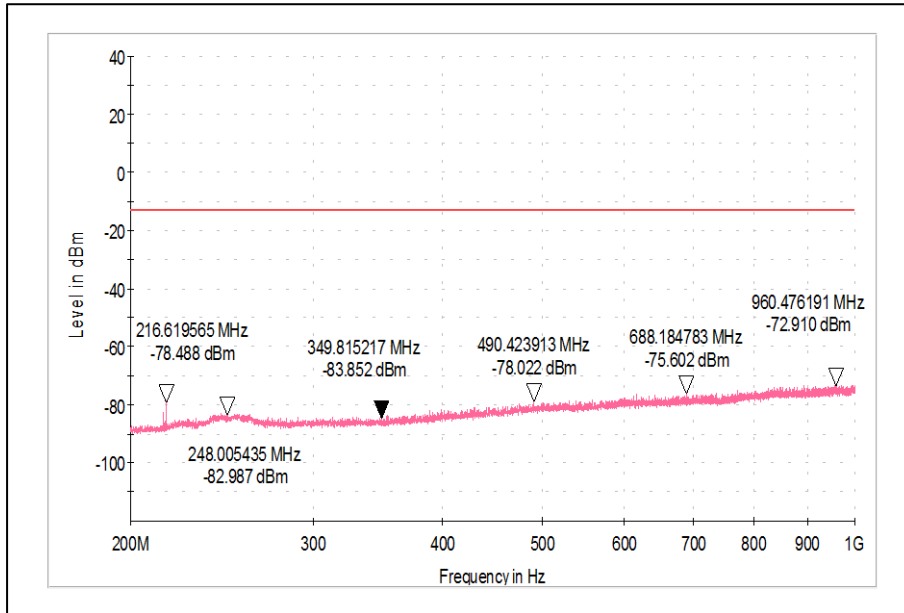
Frequency: 30MHz – 200MHz

Polarization: Vertical



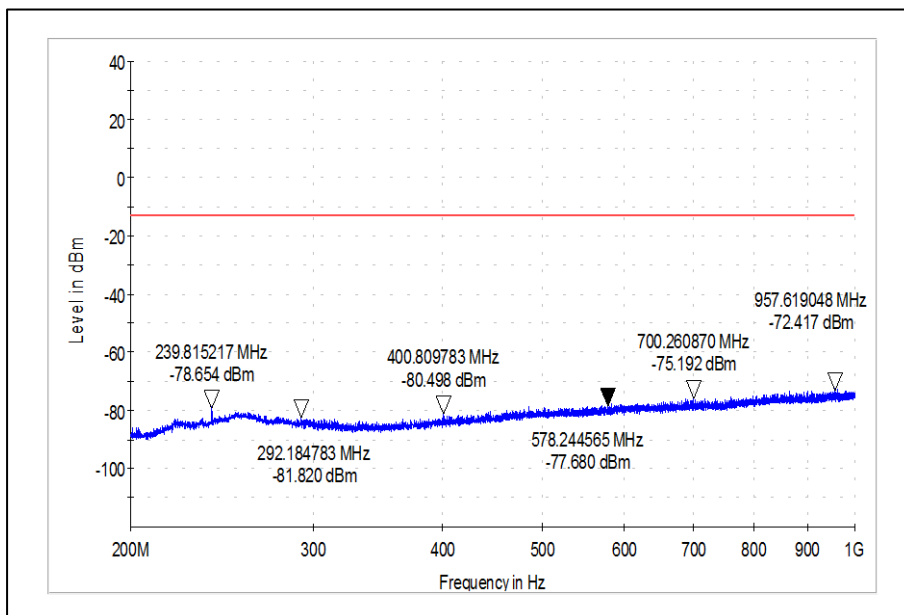
Frequency: 30MHz – 200MHz

Polarization: Horizontal



Frequency: 200MHz – 1GHz

Polarization: Vertical



Frequency: 200MHz – 1GHz

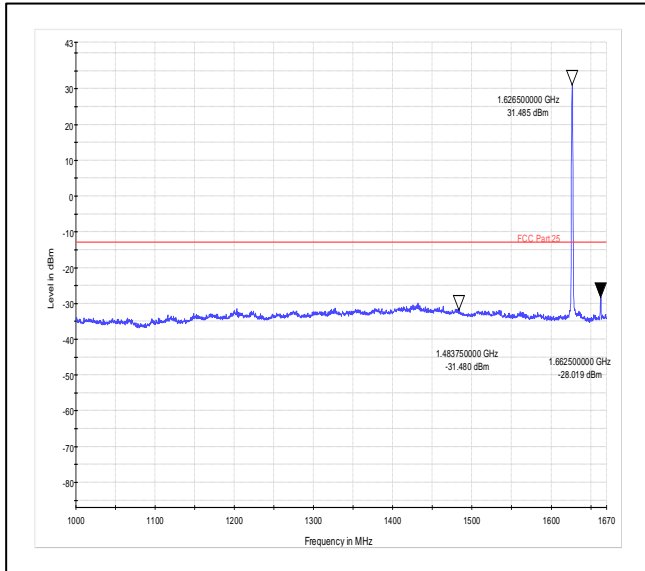
Polarization: Horizontal

Table 11: Test results for the frequencies above 1GHz

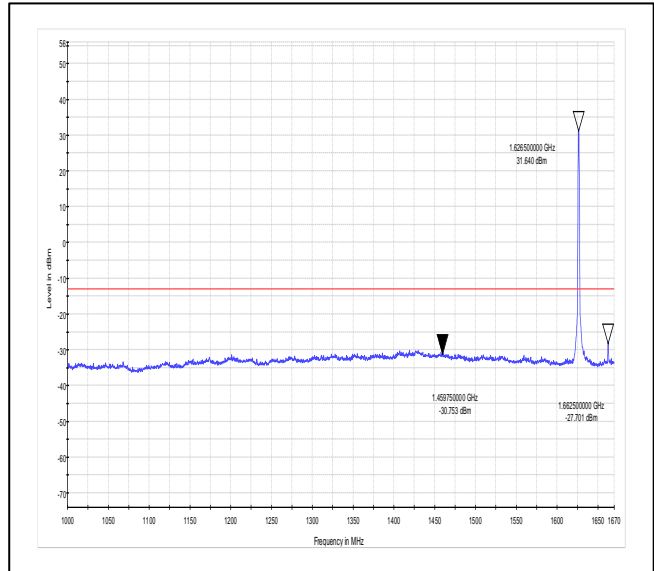
Fundamental Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Transmitter spurious emissions level (dBm)	Limit (dBm)	Margin (dB)
1626.501	3253.002	Vertical	-32.015	-13	-19.02
		Horizontal	-25.629	-13	-12.63
	4879.503	Vertical	-36.793	-13	-23.79
		Horizontal	-42.932	-13	-29.93
	6506.004	Vertical	-49.521	-13	-36.52
		Horizontal	No Harmonic found		
1643.501	3287.002	Vertical	-35.533	-13	-22.53
		Horizontal	-31.685	-13	-18.69
	4930.503	Vertical	-38.225	-13	-25.23
		Horizontal	-44.938	-13	-31.94
	6574.004	Vertical	No Harmonic found		
		Horizontal			
1660.499	3320.998	Vertical	-48.096	-13	-35.1
		Horizontal	-39.289	-13	-26.29
	4981.497	Vertical	-34.495	-13	-21.5
		Horizontal	-46.005	-13	-33.01
	6641.996	Vertical	No Harmonic found		
		Horizontal			

Worst Case Plots:

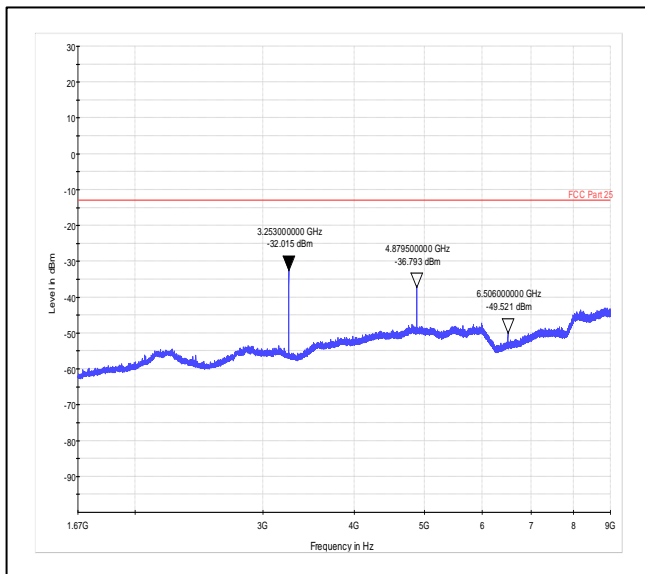
Channel frequency:1626.501MHz



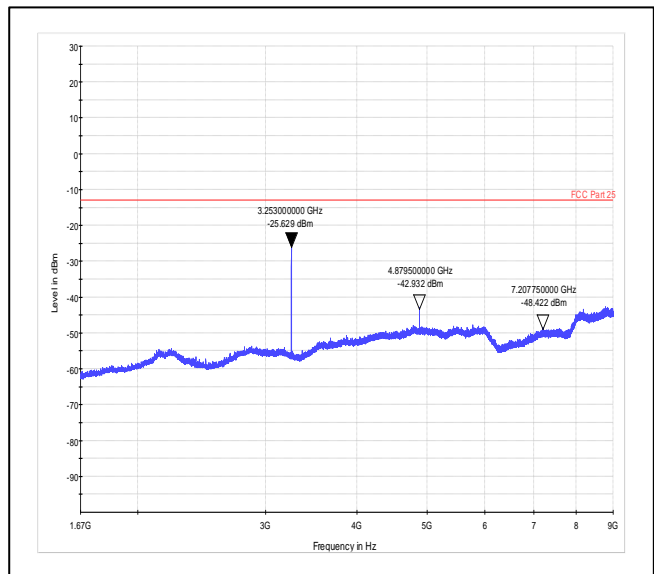
Polarization:Vertical



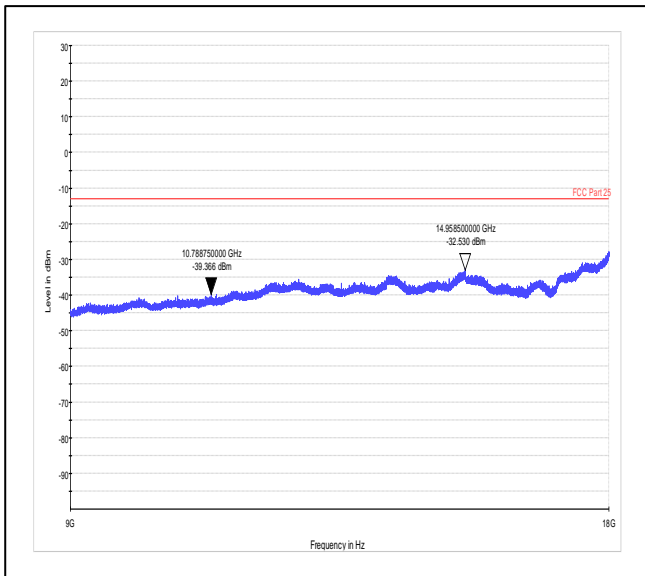
Polarization:Horizontal



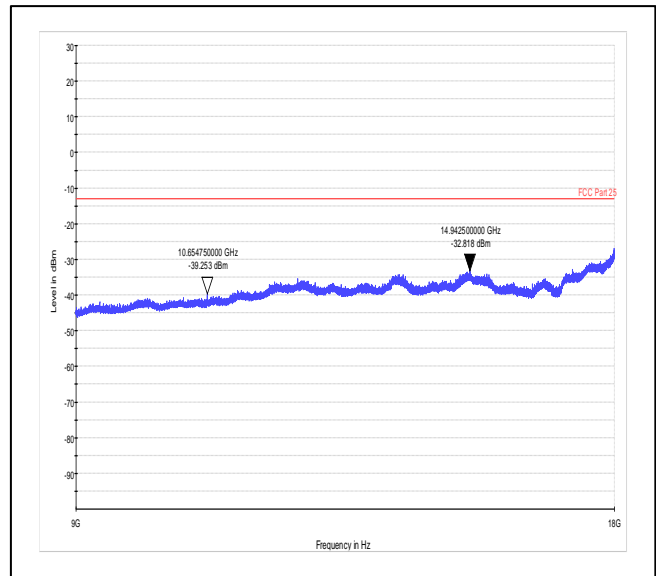
Polarization:Vertical



Polarization:Horizontal



Polarization:Vertical



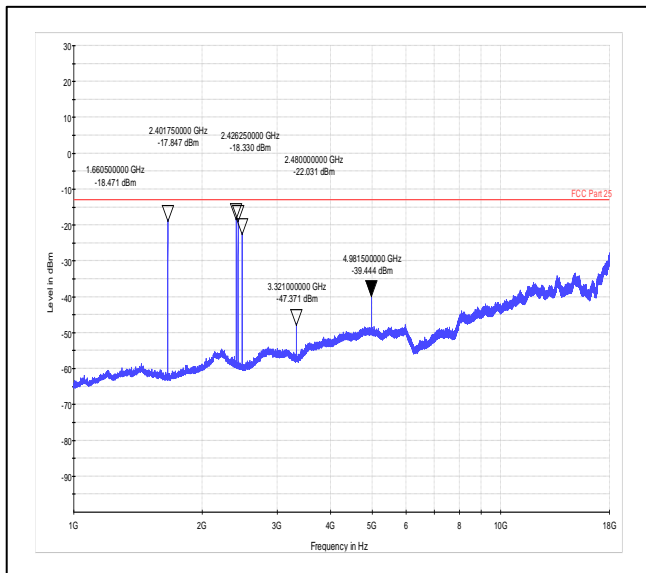
Polarization:Horizontal

Table 12: Test Results of Simultaneous operation

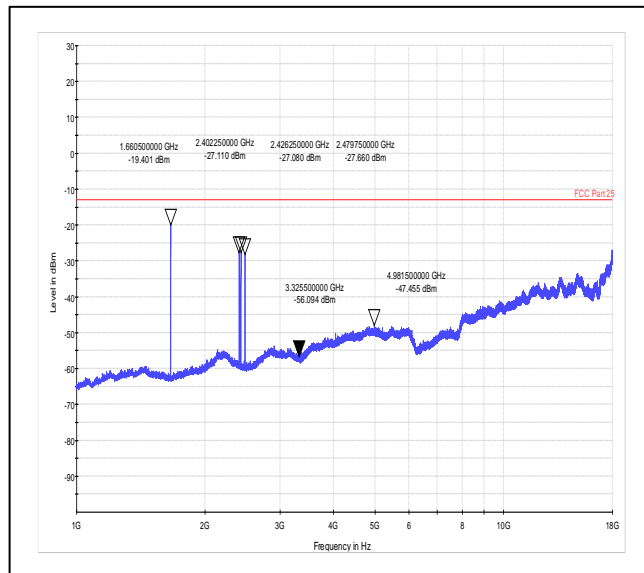
Measured Frequency (MHz)	Antenna Polarization	Measured Transmitter spurious emissions level (dBm)	Limit (dBm)	Margin (dB)
3321.002	Vertical	-47.371	-13	-34.371
	Horizontal	-56.094	-13	-43.094
4981.503	Vertical	-39.444	-13	-26.444
	Horizontal	-47.455	-13	-34.455
6642.004	Vertical	No Harmonic found		
	Horizontal			

Worst Case Plots:

Channel frequency:1660.501MHz And BLE Normal mode operation.



Polarization:Vertical



Polarization:Horizontal

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End of test Report