

ATTACHMENT 3

FCC Form 312 – Notification of Minor Modification  
Description of Modification – Attachment to Question 43

Pursuant to Section 25.118(a)(4) of the Commission’s rules, Honeywell International Inc. (“Honeywell”) hereby provides notice to the FCC of a minor modification to its Title III authorization to provide certain Inmarsat services to customers in the United States.<sup>1</sup>

Honeywell is currently authorized to provide the Inmarsat D service over a total of 25,000 mobile earth terminals (“METs”), model numbers JUE-610 DT, DMR-200, SAT-101, SAT-201, SAT-200/202, SAT-232, SAT-242, SAT-401 and TAM-401. Honeywell is not seeking to increase the overall number of terminals that it is authorized for; rather, it will use the SAT-IDP terminal as part of the 25,000 terminals for which it is already authorized.

The SAT-IDP is manufactured by Honeywell Global Tracking, Ltd., and is a next-generation IDP compliant multi-purpose satellite terminal for tracking and monitoring high-value assets like vehicles, vessels, and cargo containers.

Pursuant to FCC Rule Section 25.118(a)(4), the new model SAT-IDP can be added to Honeywell’s authorization by filing a Notification of Minor Modification within 30 days of the modification. Specifically, 47 C.F.R. § 25.118(a)(4) provides:

Licensees may make other changes to their authorized earth stations without prior authority from the Commission, provided the modification does not involve:

- (i) An increase in EIRP or EIRP density (either main lobe or off-axis);
- (ii) Additional operating frequencies;
- (iii) A change in polarization;
- (iv) An increase in antenna height;
- (v) Antenna repointing beyond any coordinated range or

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<sup>1</sup> See Call Sign E020074; File No. SES-RWL-20180205-00094.

- (vi) A change from the originally authorized coordinates of more than 1 second in latitude or longitude for stations operating in frequency bands shared with terrestrial systems or more than 10 seconds of latitude or longitude for stations operating in frequency bands not shared with terrestrial systems.

As set forth in the accompanying materials and engineering certificate, the SAT-IDP meets the Section 25.118(a)(4) criteria.

FCC Rule Section 25.209 is not applicable to mobile satellite services. The particulars of operation of the terminal remain unchanged, and frequency coordination is not required for the use of the SAT-IDP. The maximum allowable EIRP under Call Sign E020074 is 9 dBw, and the input power at the antenna flange for SAT-IDP is 1 W (0 dBw), well within the parameters of 47 CFR § 25.118(a)(4)(i).

Honeywell's new SAT-IDP complies with all the terms and conditions of Honeywell's authorization, including the requirement of having an average shut-down time of 1.35 seconds and maximum shutdown time of 2.6 seconds (condition 3920) in order to protect the Global Maritime Distress and Safety Service ("GMDSS"). Because the SAT-IDP is not intended for Ship Security Alert Systems ("SSAS") services or long range identification and tracking ("LRIT") uses, it does not need to meet IMO SSAS and LRIT requirements.

Honeywell Global Tracking Ltd., formerly known as EMS Global Tracking Ltd., offers Inmarsat-D services, which include both the D+ and IsatM2M modes of operation.<sup>2</sup> Inmarsat D is a low data-rate, two-way store and forward short messaging and tracking system. Inmarsat D

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<sup>2</sup> The difference in the two modes of operation is that the IsatM2M mode is capable of longer messages and reduced messaging latency. As a result, there is a difference in the receive modulation for those Inmarsat-D terminals that are capable of operating in the IsatM2M mode. *See* Honeywell International Inc., Call Sign E020074, IBFS File No. SES-MOD-20071107-01542 (Mar. 3, 2008). As originally authorized, the license was limited to only the D+ mode of operation. However, after changes implemented by Inmarsat to its network of satellites and corresponding modulation changes requested to its authorization, Honeywell is now authorized to operate in either mode of the Inmarsat-D service.

provides low cost satellite communications for such applications as asset tracking and SCADA.

Honeywell Global Tracking provides essential services to government customers, such as the U.S. Coast Guard and the U.S. Navy in connection with their homeland security efforts (e.g., surveillance and warnings for terrorist hijackings of marine vessels), and to private sector customers to track their assets and to monitor sensitive energy facilities, including natural gas well heads, pipelines, shipping containers and service vehicles. The new model SAT-IDP adds to the choices and flexibility Honeywell Global Tracking is able to offer its customers.



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### Engineering Certificate

I hereby certify that I am Engineering Manager for Honeywell Global Tracking Ltd.,<sup>1</sup> and that the Honeywell Global Tracking mobile earth terminal ("MET") model number SAT-IDP complies with all applicable Part 25 rules and the terms and conditions of the E020074 blanket authorization to provide the Inmarsat-D (D+ and IsatM2M modes) service to customers in the United States. See Call Sign E020074.

MET model number SAT-IDP is electrically equivalent in terms of its underlying RF characteristics to the SAT-401 MET that is already included in the E020074 authorization. In addition, the SAT-IDP MET complies with all terms and conditions of the E020074 authorization, including the requirement of having an average shut-down time of 1.35 seconds and maximum shut-down time of 2.6 seconds (condition 3920) in order to protect the Global Maritime Distress and Safety Service ("GMDSS").

Attached to this certification is a report including a technical specification sheet for model number SAT-IDP and a test report demonstrating the compliance of the MET with the FCC's out-of-band emissions requirements, 47 C.F.R. §§25.202(f) and 25.216.

By: Khalid Amr Digitally signed by Khalid Amr  
Date: 2021.05.26 13:48:15  
-04'00'

Name: Khalid Amr

Title: Engineering Manager

Dated: May 26, 2021

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<sup>1</sup> Honeywell Global Tracking Ltd. is an affiliate of EMS Technologies Canada Ltd., both owned by Honeywell International, Inc. EMS Technologies Canada Ltd. is the Grantee of the Federal Communications Commission's equipment certification for SAT-IDP (FCC ID K6K-SATIDP).

**TCB**

**GRANT OF EQUIPMENT  
AUTHORIZATION**

**TCB**

**Certification  
Issued Under the Authority of the  
Federal Communications Commission  
By:**

**TUV Rheinland of North America, Inc.  
1279 Quarry Lane Suite A  
Pleasanton, CA 94566**

**Date of Grant: 03/22/2021  
Application Dated: 03/17/2021**

**EMS Technologies Canada, Ltd.  
400 Maple grove  
Ottawa, Ontario, K2V 1B8  
Canada**

**Attention: Dennis Teske , Director of Engineering - SATCOM**

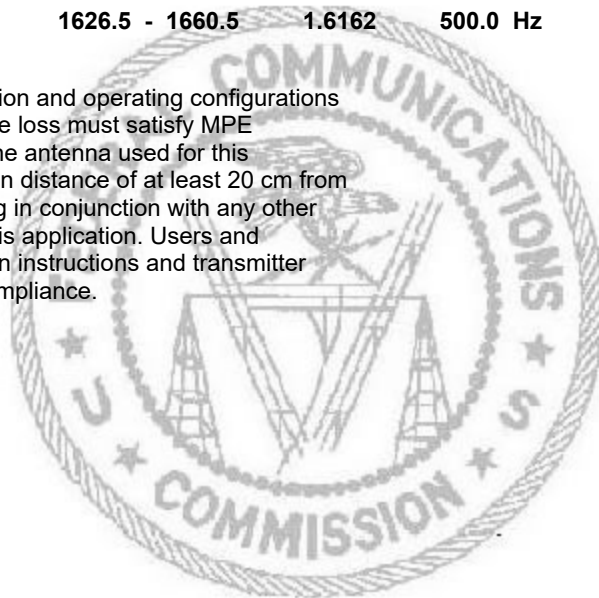
**NOT TRANSFERABLE**

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE,  
and is VALID ONLY for the equipment identified hereon for use under the  
Commission's Rules and Regulations listed below.

**FCC IDENTIFIER: K6K-SATIDP**  
**Name of Grantee: EMS Technologies Canada, Ltd.**  
**Equipment Class: Licensed Non-Broadcast Station Transmitter**  
**Notes: Global Tracking Terminal using satellite**

<u>Grant Notes</u>	<u>FCC Rule Parts</u>	<u>Frequency Range (MHZ)</u>	<u>Output Watts</u>	<u>Frequency Tolerance</u>	<u>Emission Designator</u>
	25	1626.5 - 1660.5	1.6162	500.0 Hz	1K55G1W

Output Power listed is EIRP. The Antenna installation and operating configurations of this transmitter, including antenna gain and cable loss must satisfy MPE Categorical Exclusion Requirements of §2.1091. The antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter except as documented in this application. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.



Next-Generation Satellite Terminal

**Honeywell**

# SAT-IDP

Model: SAT-IDP-SC  
SAT-IDP-BC

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## Datasheet

Document Number:

Issue No.

Dated: 18th December 2020

*Honeywell Global Tracking Ltd*

# Next-Generation Satellite Terminal

## Disclaimer

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Web Address: [www.gt.honeywell.com](http://www.gt.honeywell.com)

## Revision History

Date	Issue	Comments

# Next-Generation Satellite Terminal

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# Next-Generation Satellite Terminal

## Chapter 1 - Introduction

The SAT-IDP satellite terminal from Honeywell Global Tracking is a next-generation IDP compliant multi-purpose satellite terminal for tracking and monitoring high-value assets like vehicles, vessels, and cargo containers.

Once an asset has been equipped with a SAT-IDP terminal and deployed in the field, the device automatically selects the most appropriate satellite and transmits its location and any additional message data via secure systems.



The SAT-IDP terminal is powered by the asset and can be used in virtually all environments. It is favoured in remote regions where terrestrial communication cannot be relied upon. It is same in size as its predecessor SAT-401. It be programmed to send and receive customized data from internal and external sensors – including temperature, humidity, vibration and shock.

Like many of Honeywell Global Tracking's terminals, the SAT-IDP uses the Inmarsat constellation of satellites and the IDP standard. This connectivity method delivers an affordable and reliable direct-to-desktop information service with fast and easy-to-use message handling.

The SAT-IDP terminal has five fully configurable inputs/outputs for sensor monitoring, and one open drain output suitable for driving relays and other indicators. The data-logging function includes GNSS positions, transmissions and data more than 20,000 entries which are accessible locally via the serial port and Bluetooth (BLE). All transmissions are logged with a record of the time the message was created.

# Next-Generation Satellite Terminal

## Chapter 2 - Features

The customer scripts written in Lua script are stored as text files in the FileX of the SAT IDP processor at a specific location: EXFLASH/Lua folder. Lua script interpretation mainly depends on the embedded Lua Libraries and Build-in Customer Libraries. About the embedded Lua Libraries part, SAT IDP embeds Lua lib based on LUA-5.2.3, which supports most of original standard Lua libraries. This document would focus on the Build-in Customer Libraries part.

- **Global Coverage:** Offers secure satellite connectivity worldwide
- **Inmarsat and GNSS Connectivity:** Tracks, monitors and communicates with mobile and fixed assets anywhere in the world
- **Affordable and Reliable:** Field-proven and cost-effective tracking solution for a wide range of applications
- **Multiple I/O Ports:** Allows connected external sensors to report additional data, e.g., speed, tire pressure, and fuel consumption; ideal for fleet management applications
- **Optional Alert Button:** Convenient in-vehicle button allows drivers to immediately warn others of danger which can be configured easily using the onboard I/O

## Next-Generation Satellite Terminal

### Chapter 3 - SAT-IDP Technical Specifications

#### Physical:

Dimensions	112mm x 37mm (4.4" x 1.5")
Weight	240g (12.0 oz) (excluding cable)
Connector	12-way Bulgin

#### Environmental:

Operating Temperature	-40°C to +70°C (-40°F to +158°F)
Humidity	≤ 95% @ +40°C (+104°F)
Vibration & Shock	Meets Inmarsat-D requirements
IP Rating	IP66

#### Power (typical):

Sleep	10 mW
Receive	2.3W (incl. GNSS)
Transmit	9.6W
Power Supply Voltage	9.6V to 32V 'smoothed' DC

#### Interfaces:

Serial Interface	Asynchronous serial RS232 and Bluetooth (BLE)
Baud Rate	4800 or 9600 bps
Parity/Data Bits/Stop Bits	N, 8, 1
Configurable Inputs/Outputs	Five
Open Drain Output	250mA max. sink current

## Next-Generation Satellite Terminal

### Satellite connectivity:

Transmitter	EIRP: 0- 7 dBW, Maximum 7dBW TX Burst duration: 0.5 Sec and 1 Sec Message length: 6400 bytes
Receiver	Message length: 10000 bytes
Elevation angle	0° - 90°
Frequency range	Transmit: 1626.5 MHz to 1675 MHz Receive: 1518 MHz to 1559 MHz GNSS support with GPS, GLONASS & GALILEO and Beidou
Message Latencies	Transmit: 100 bytes: 20 sec 1000 bytes: 45 sec Receive: 100 bytes: 12 sec 1000 bytes: 70 sec
GNSS	Typical position accuracies (SA off): 2.5m (CEP 2D)

### Capabilities/Applications:

Custom Features	New Advanced scripting capabilities enable custom features and functionality
Geofencing (Via ViewPoint)	Alert areas, Safe Areas, Route corridors, Curfews, Waypoints, Checkpoints, Overdue and more.
Third-Party Connectivity	Can be integrated with existing ERP systems

### Bluetooth Low Energy (BLE)

BLE Version	4.2
Frequency band	2.4GHz
Output power	10 dBm
Antenna	Built-In

## Next-Generation Satellite Terminal




### ***Regulatory Approvals:***

- Inmarsat Type Approval
- FCC
- ICASA (In progress)
- CE
- ANATEL for Brazil (In progress)
- ARPCE for Algeria (In progress)
- SDPPI for Indonesia (In progress)
- CITC for Kingdom of Saudi Arabia (In progress)
- SIRIM for Malaysia (In progress)
- ICASA and NRCS LOA for South Africa (In progress)

### **For more information:**

EMS Technologies Canada Ltd.  
Honeywell Global Tracking CA  
400 Maple Grove Rd  
Ottawa ON K2V 188  
CANADA

Web: [www.gt.honeywell.com](http://www.gt.honeywell.com)

<b>Prüfbericht-Nr.:</b> <i>Test report no.:</i>	ULR- TC568821300000005F	<b>Auftrags-Nr.:</b> <i>Order no.:</i>	166501087 0010	Seite 1 von 36 Page 1 of 36
<b>Kunden-Referenz-Nr.:</b> <i>Client reference no.:</i>	NA	<b>Auftragsdatum:</b> <i>Order date:</i>	2020-11-23	
<b>Auftraggeber:</b> <i>Client:</i>	EMS TECHNOLOGIES CANADA, LTD. 400 Maple Grove Rd Ottawa ON K2V 188 CANADA			
<b>Prüfgegenstand:</b> <i>Test item:</i>	SAT-IDP-BC SAT-IDP-SC			
<b>Bezeichnung:</b> <i>Identification.:</i>	SAT-IDP	<b>Serien -Nr.:</b> <i>Serial no.:</i>	EMC-Rev4-002	
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	Testing and issue of FCC and IC grant certificate			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC Part 2, Part 25 RSS-170 Issue 3, RSS GEN Issue 5			
<b>Wareneingangsdatum:</b> <i>Date of sample receipt:</i>	2021-01-22			
<b>Prüfmuster-Nr.:</b> <i>Test sample no.:</i>	A002986226-001 A002986226-002			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	2021-01-23 - 2021-01-29			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	Wireless laboratory, Bangalore			
<b>Prüflaboratorium:</b> <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			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass			
<b>geprüft von:</b> <i>tested by:</i>	<b>genehmigt von:</b> <i>authorized by:</i>			
<b>Datum:</b> <i>Date:</i> 2021-01-29		<b>Ausstellatum:</b> <i>Issue date:</i> 2021-03-15		
<b>Stellung / Position:</b>	<b>Srinivasa B R</b> Engineer	<b>Stellung / Position:</b>	<b>Mahammadgouse Kaladagi</b> Assistant Manager	
<b>Sonstiges / Other:</b>	FCC ID : K6KSATIDP IC : 1275B-SATIDP HVIN:Rev 4 PMN:SAT-IDP-SC/SAT-IDP-BC			
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>	<b>Prüfmuster vollständig und unbeschädigt</b> <i>Test item complete and undamaged</i>			
* 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><b>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.</b>  <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.,<br/>27/B, 2nd Cross,<br/>ElectronicCityPhase1<br/>Bangalore – 560 100,<br/>India</p> | <p>2. TUV Rheinland (India) Pvt.Ltd.,<br/>108 , Beside ISBR Business School,<br/>Electronic city Phase I<br/>Bangalore - 560 100.<br/>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

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### 3.2 Ratings and System Details of Equipment under Test

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

<b>EUT name</b>	SAT-IDP	
<b>Protocol</b>	Inmarsat Data Pro (IDP)	BLE
<b>Operating Frequency Range</b>	<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
<b>No. of Channels</b>	Not applicable	40
<b>Channel Spacing</b>	5kHz	2MHz
<b>Maximum Measured Power</b>	32.085 dBm at 1626.501MHz	10.12 dBm (as Per BLE module grant)
<b>Modulation</b>	OQPSK	GFSK ( DSSS)
<b>Number of antennas</b>	1	1
<b>Antenna Gain</b>	6dBi	1 dBi
<b>Antenna Type</b>	Integrated Planar	PCB Chip Antenna
<b>Supply Voltage to Product</b>	9.6V to 32V DC Supply	
<b>Environmental conditions</b>	Temperature -40°C to +70°C Humidity ≤ 95% @ +40°C, non-condensing	
<b>EUT Dimension</b>	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	<b>BLE And MSS (Mobile-Satellite Service) / 1.5/1.6 GHz MSS bands</b>
-------------	-----------------------------------------------------------------------

**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)
<b>Transmit Frequency</b>	<b>Receive Frequency</b>	<b>Low</b>	<b>1626.501</b>
1626.5MHz-1660.5 MHz	1525MHz-1559 MHz	:	:
		<b>Mid</b>	<b>1643.501</b>
		:	:
		<b>High</b>	<b>1660.501</b>

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 10<sup>th</sup> 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

$\text{EUT}_{\text{Prec}}$  = 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

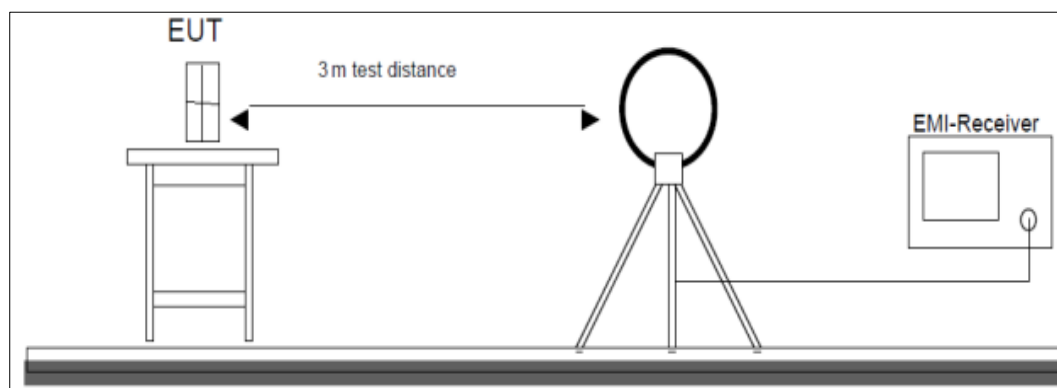
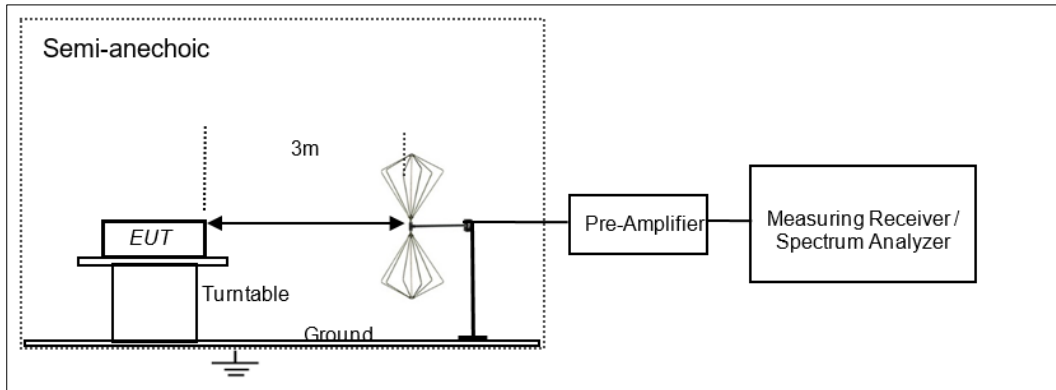
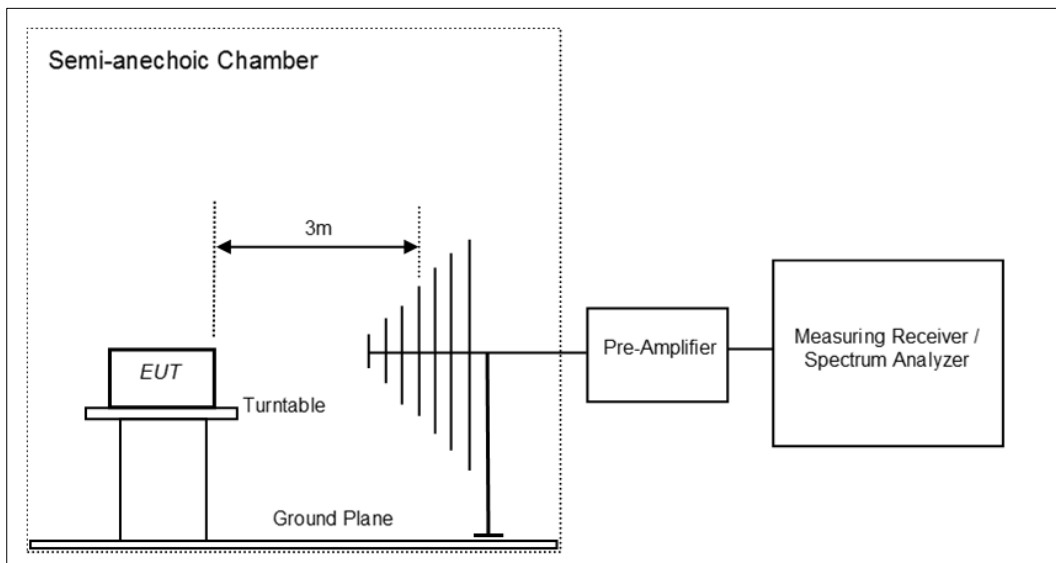


Figure 3: Frequency Range 9 kHz- 30 MHz

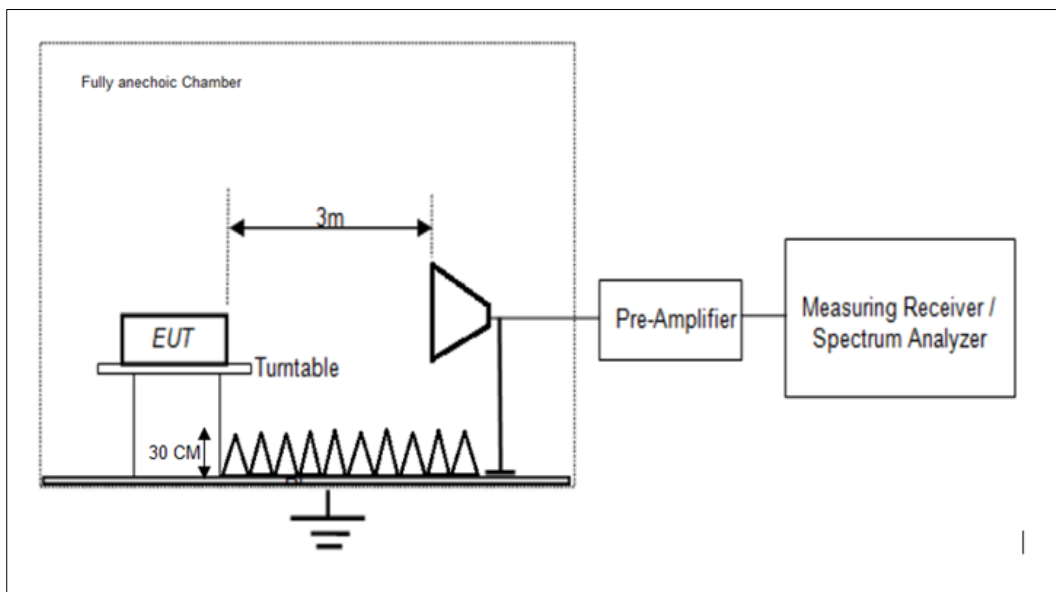




**Figure 4: Frequency Range 30 MHz – 200 MHz**



**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 $\theta$  dBW in any 4 kHz band for  $0^\circ < \theta \leq 5^\circ$

Where  $\theta$  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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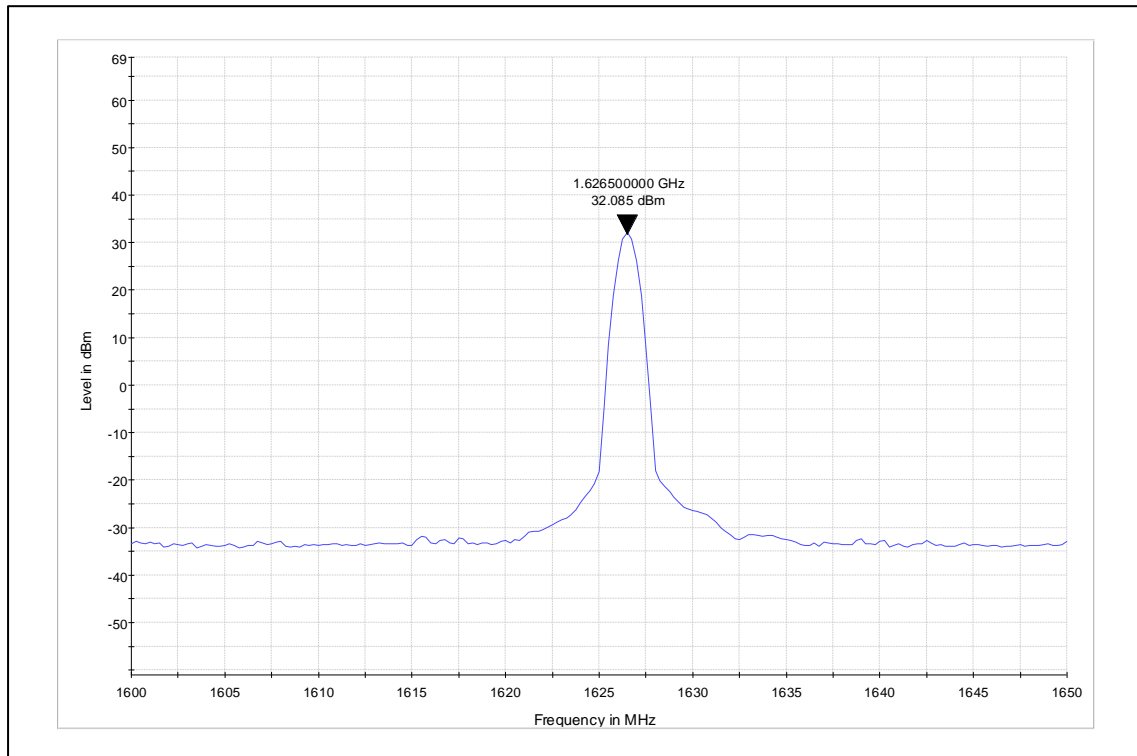
**Test results:**

**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:**



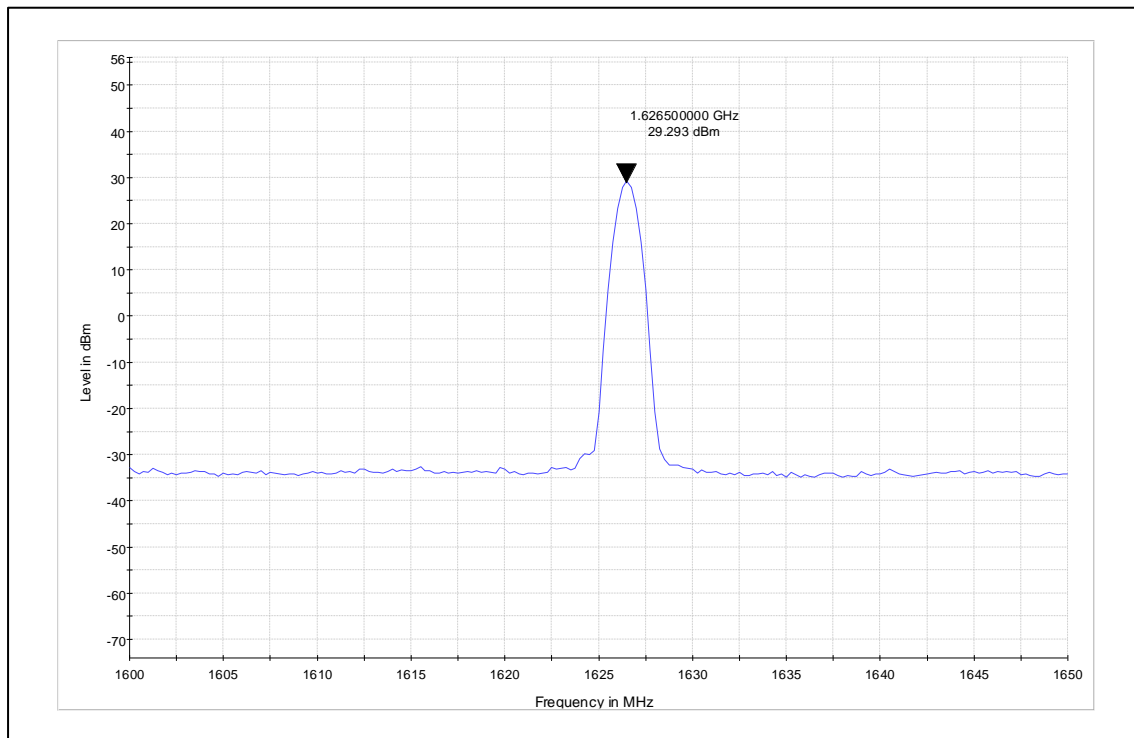
**Frequency: 1626.501MHz**

**Polarization: Vertical**

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**Frequency: 1626.501MHz**

**Polarization: Horizontal**

## 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:

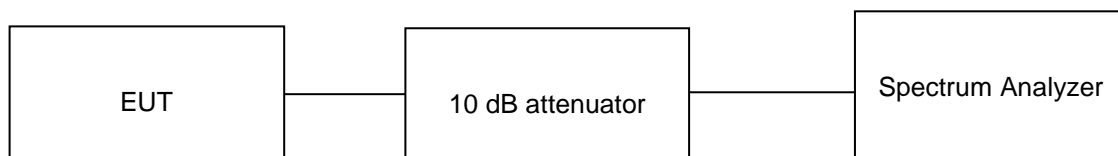
#### FCC Clause

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

**Prüfbericht - Nr.:**  
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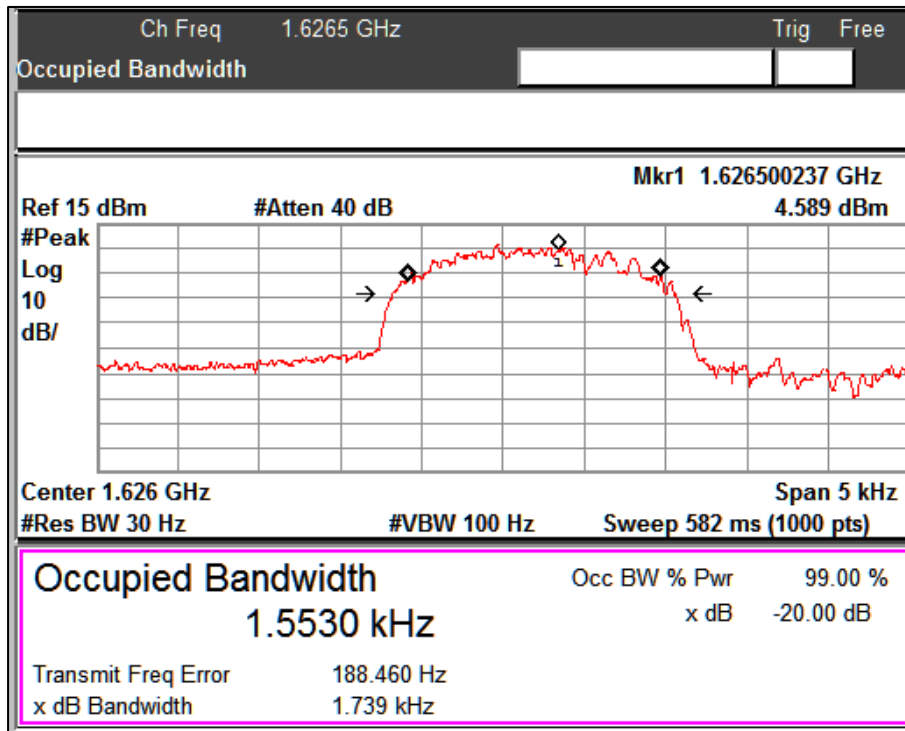
**Test results:**

**Note:**

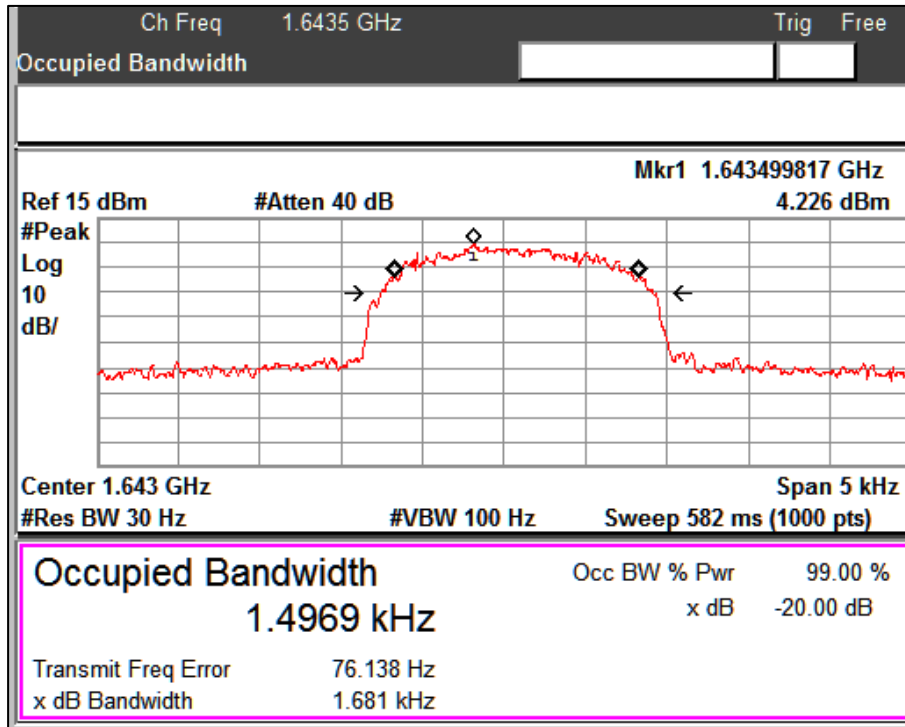
1. All the losses are included during measurement and final values are mentioned in the test report.
2. For the measurement of x dB and 99% BW the RBW is set to 1% of nominal CH BW (2.5 kHz)

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

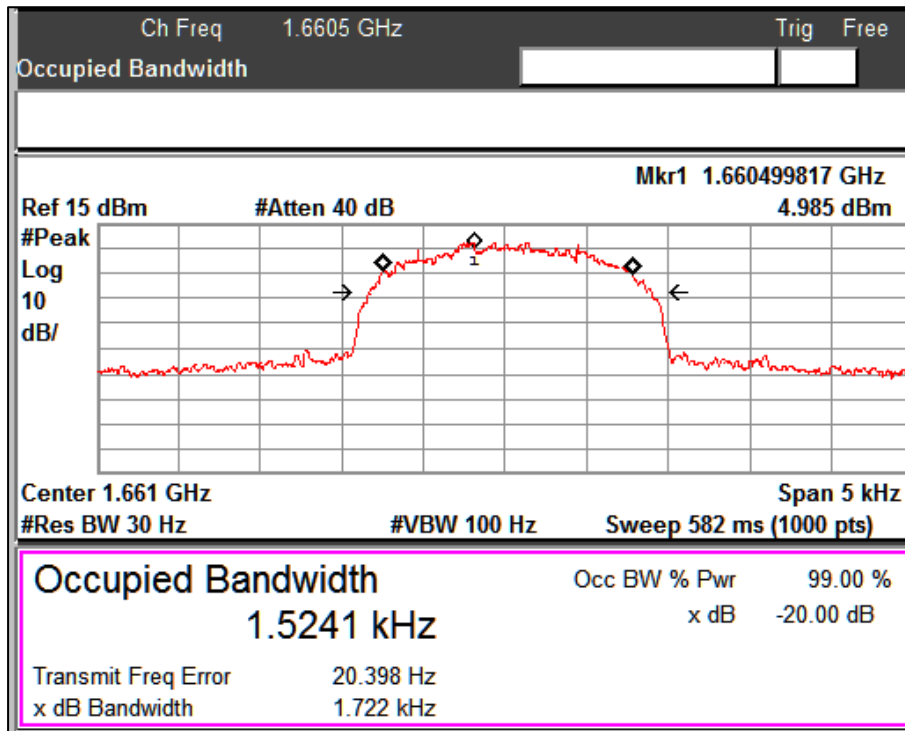
**Test Plots:**



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

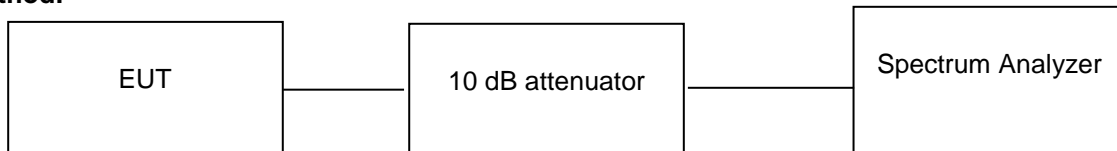
**Limit:**

**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) <math>43 + 10 \log p</math> (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>
-------------------------------------------	------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**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:**

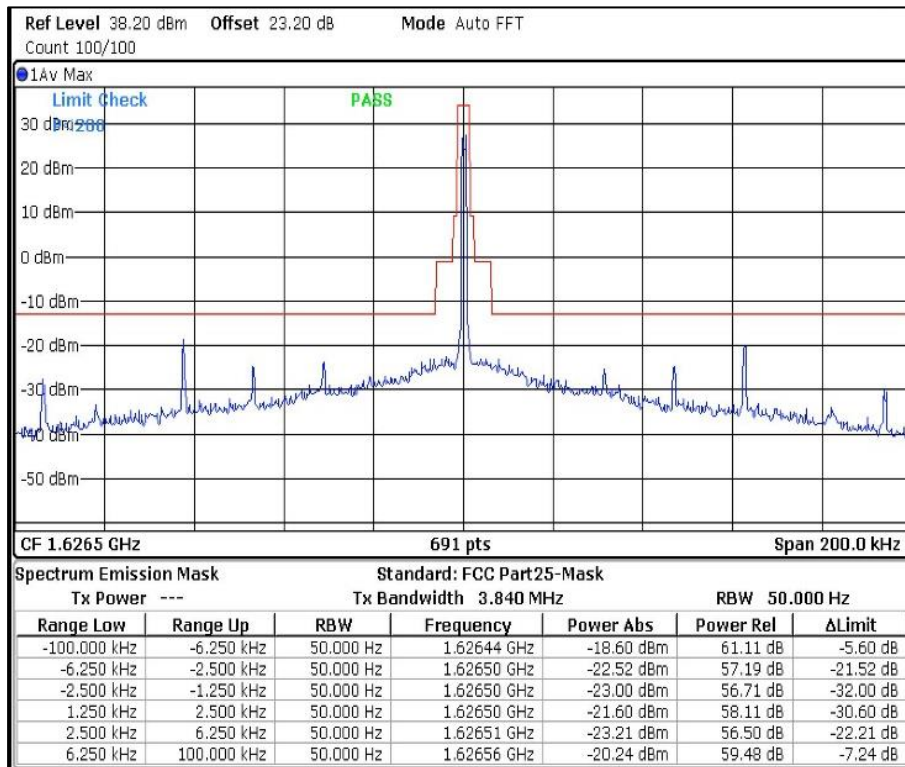
1. All the losses are included during measurement and final values are mentioned in the test report.
2. BW correction factors added to the measured results and final values reported in the graphs
3. Emission limitation test is specified for 4 kHz, which is greater than the channel spacing of the device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

Bandwidth correction factors :

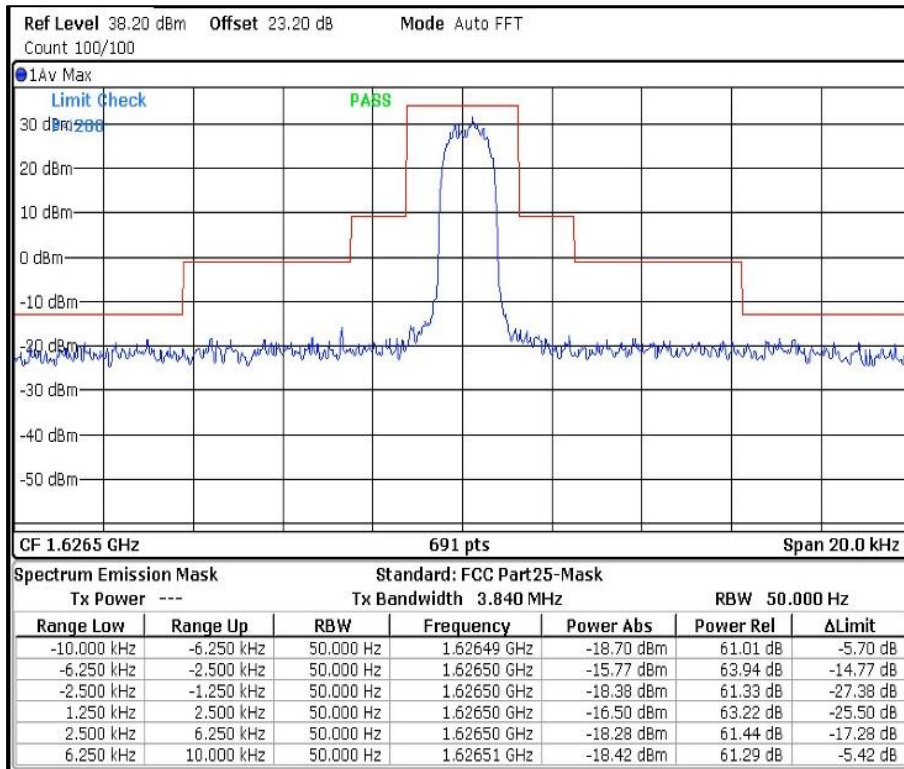
Reference bandwidth : 4 kHz  
 Measurement bandwidth : 1% of 4 kHz = 40 Hz, hence 50 Hz is used  
 Bandwidth correction factor:  $10 \log [(reference\ bandwidth) / (measurement\ bandwidth)] = 19.03\ dB$

**Test Plots:**

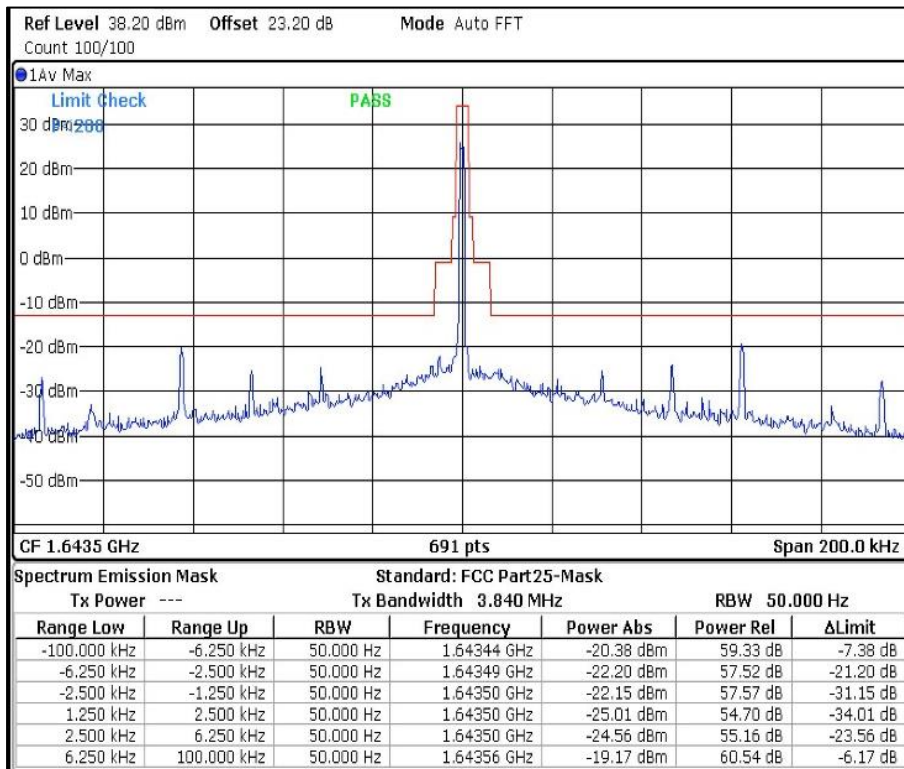
**Emission Mask**



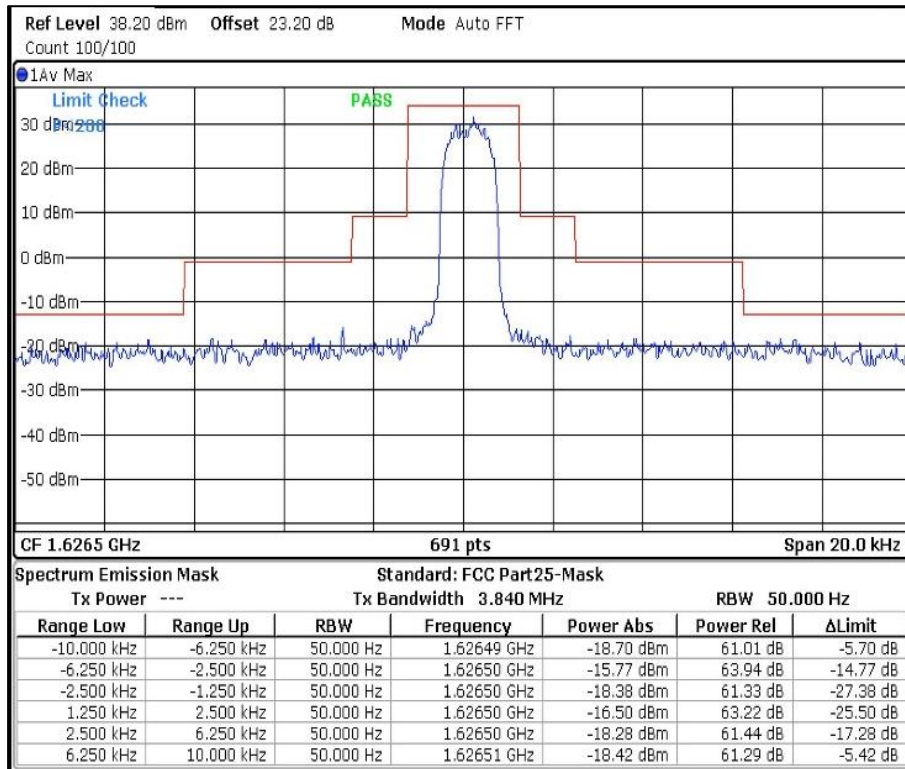
Frequency:1626.501MHz Full Scan



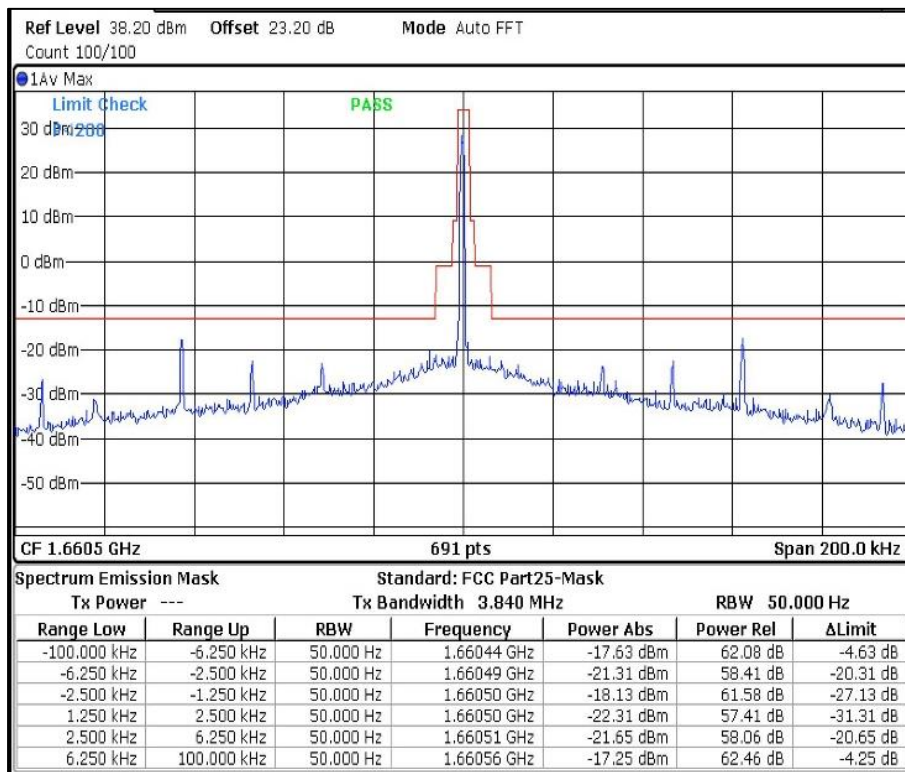
Frequency:1626.501MHz Zoom Scan



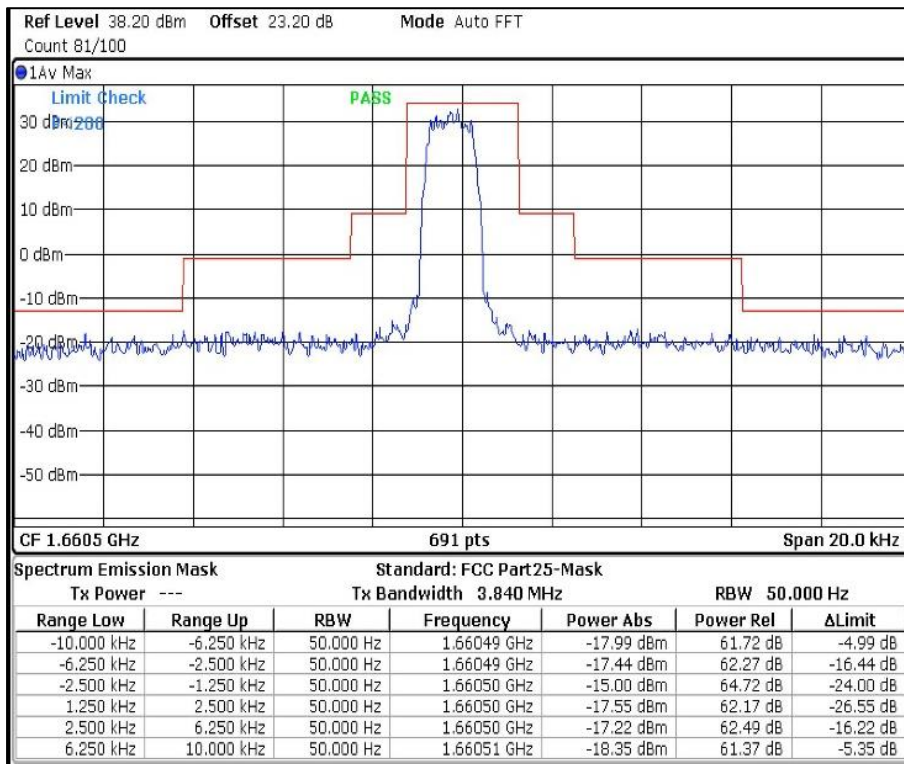
Frequency:1643.501MHz Full Scan



Frequency:1643.501MHz Zoom Scan



Frequency:1660.501MHz Full Scan

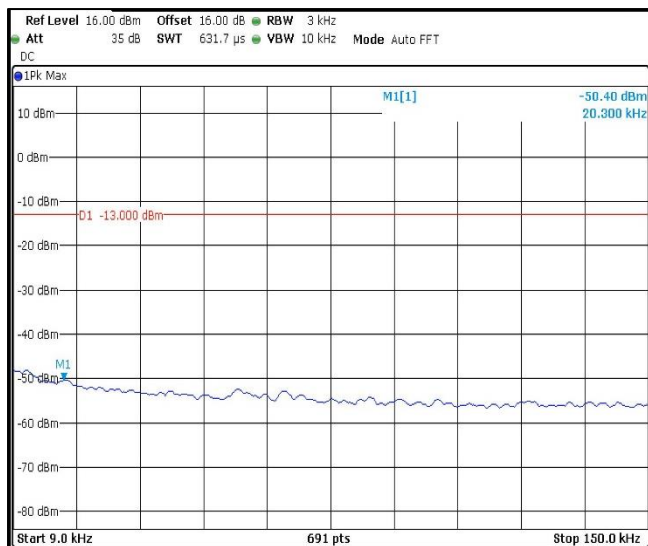


Frequency:1660.501MHz Zoom Scan

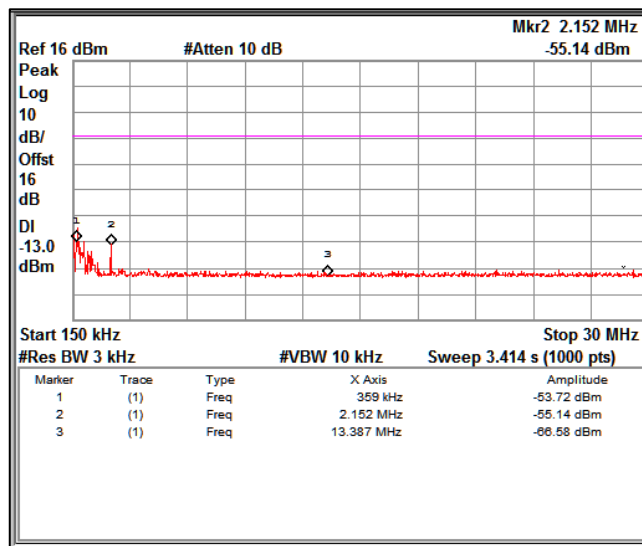
Spurious Emissions

Note : only worst case plots of low channel reported

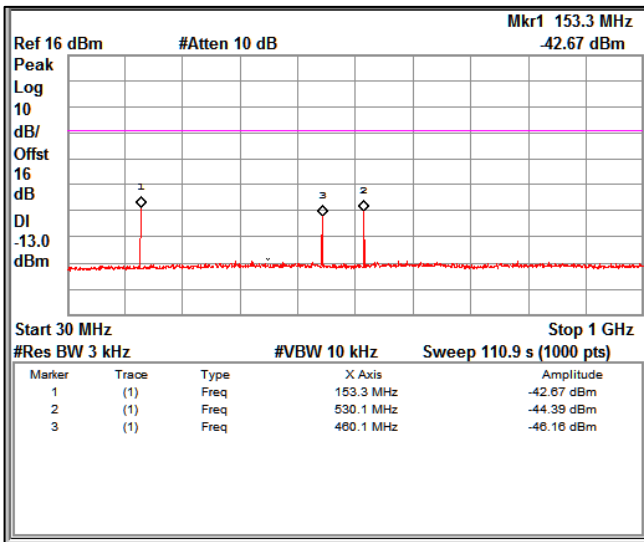
Frequency:1660.501MHz



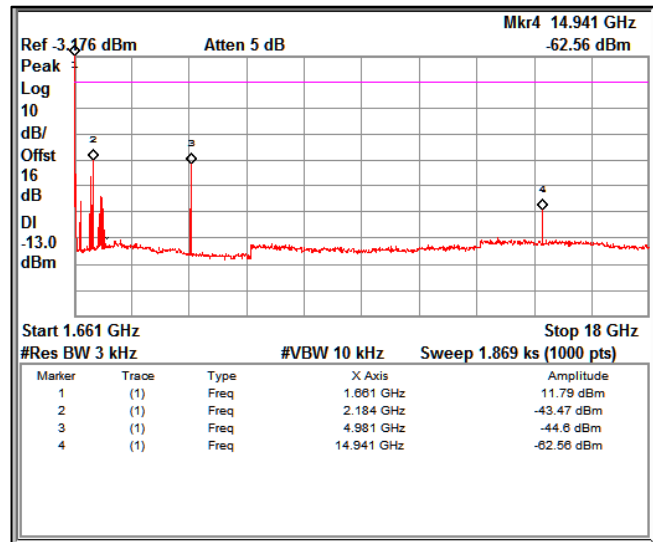
Frequency Range:9KHz-150KHz



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

<b>Result</b>	<b>Pass</b>
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.:

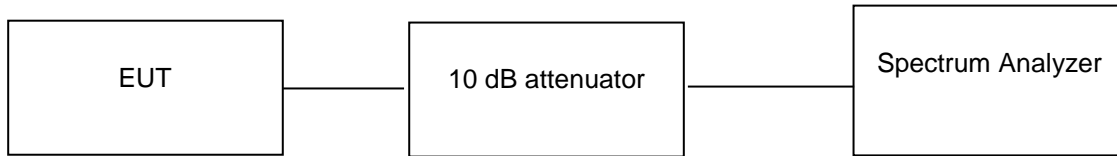
**ULR-TC56882130000005F**

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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**

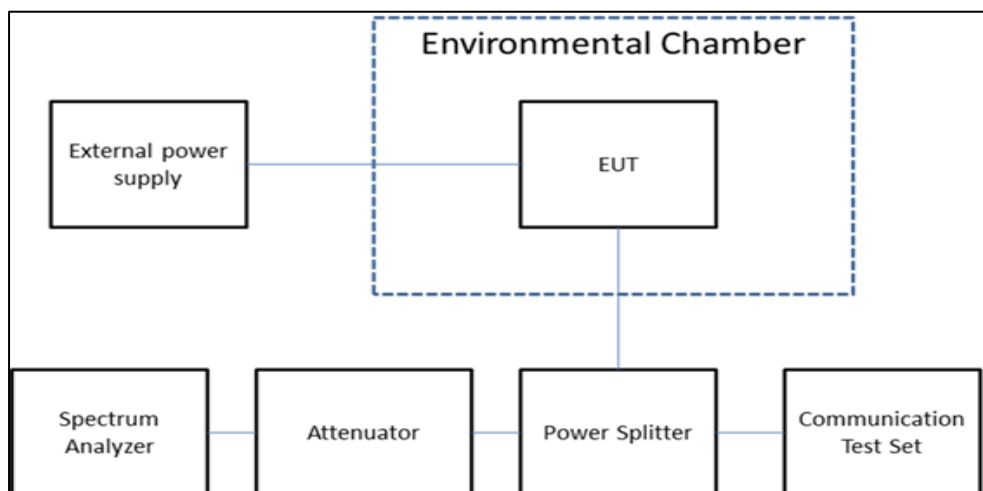
25.202(d)

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  $\pm 10\text{ ppm}$

**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%

**Prüfbericht - Nr.:**  
*Test Report No.:*

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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

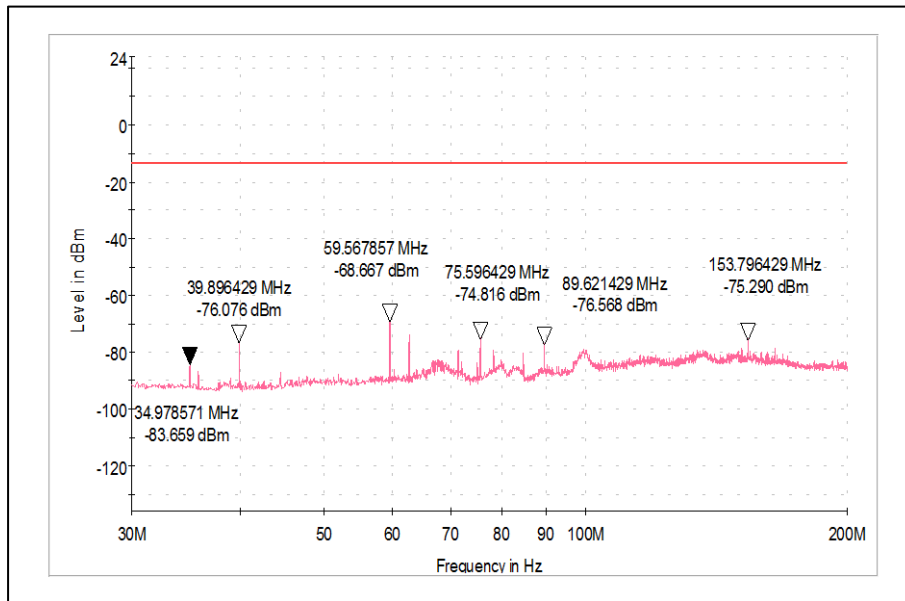
**Test results for frequency range 9kHz – 30MHz**

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**

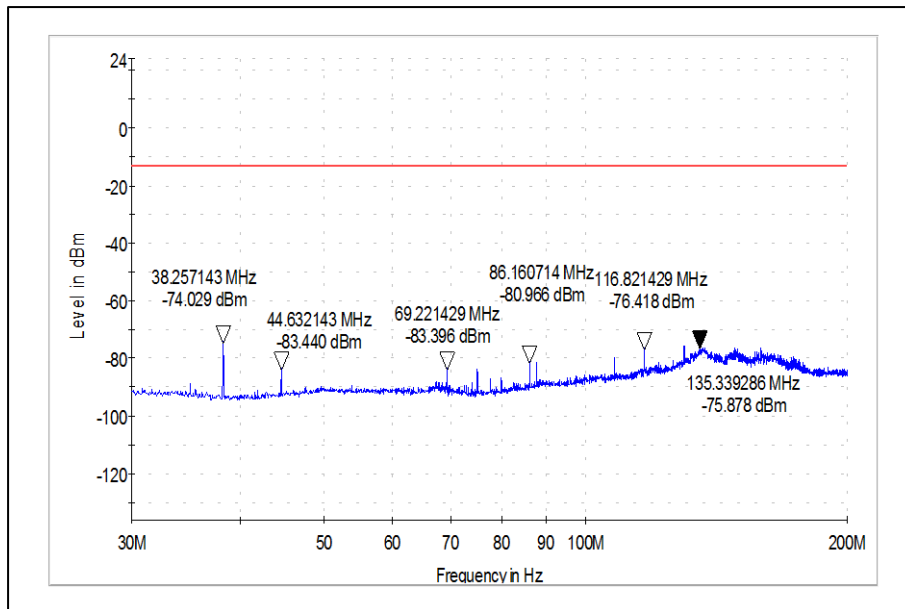
Polarization	Frequency (MHz)	Measured value (dBm)	Limit (dBm)	Margin (dB)
Vertical	39.896	-76.076	-13.000	-63.076
	59.567	-68.667	-13.000	-55.667
	153.796	-75.290	-13.000	-62.290
	216.619	-78.488	-13.000	-65.488
	490.423	-78.022	-13.000	-65.022
	960.476	-72.910	-13.000	-59.910
Horizontal	38.257	-74.029	-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:**



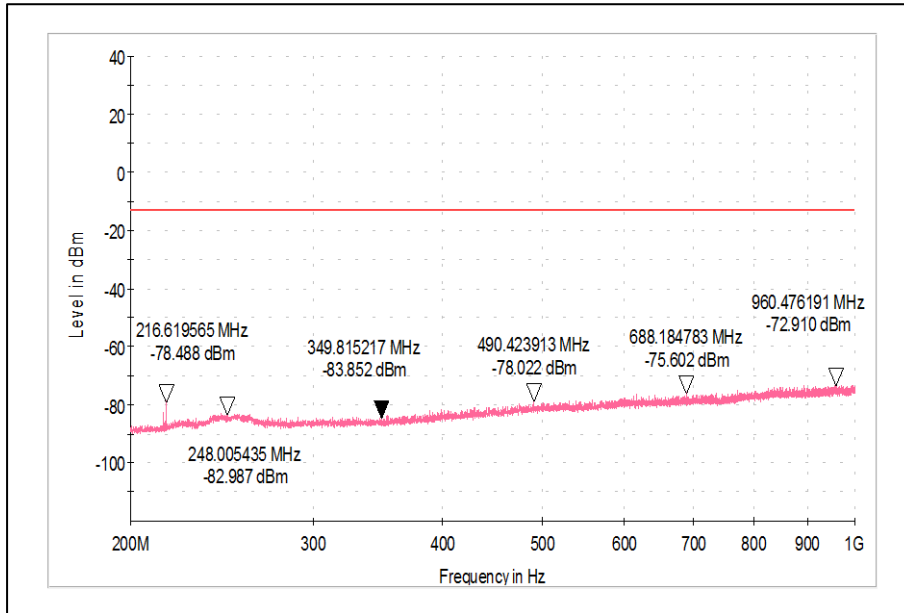
**Frequency: 30MHz – 200MHz**

**Polarization: Vertical**



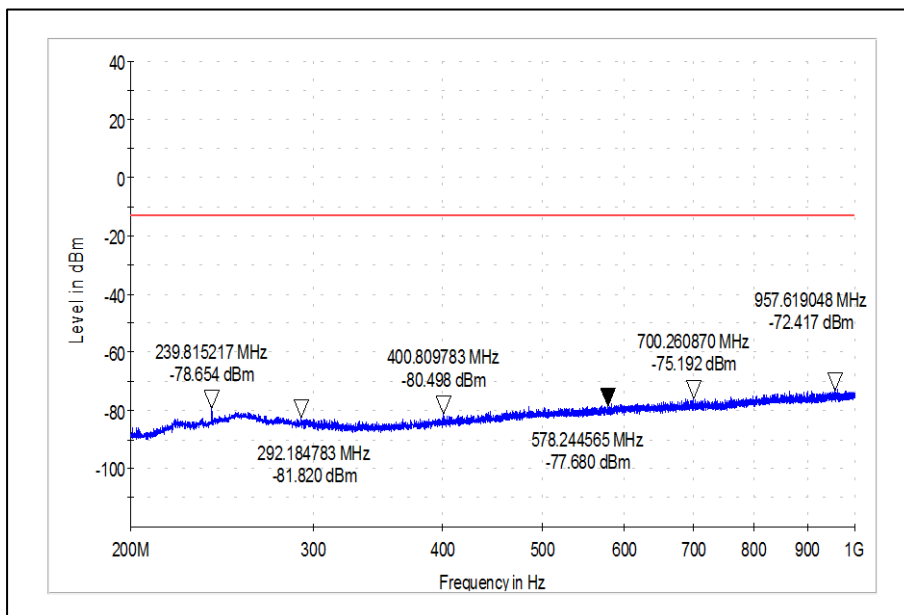
**Frequency: 30MHz – 200MHz**

**Polarization: Horizontal**



**Frequency: 200MHz – 1GHz**

**Polarization: Vertical**



**Frequency: 200MHz – 1GHz**

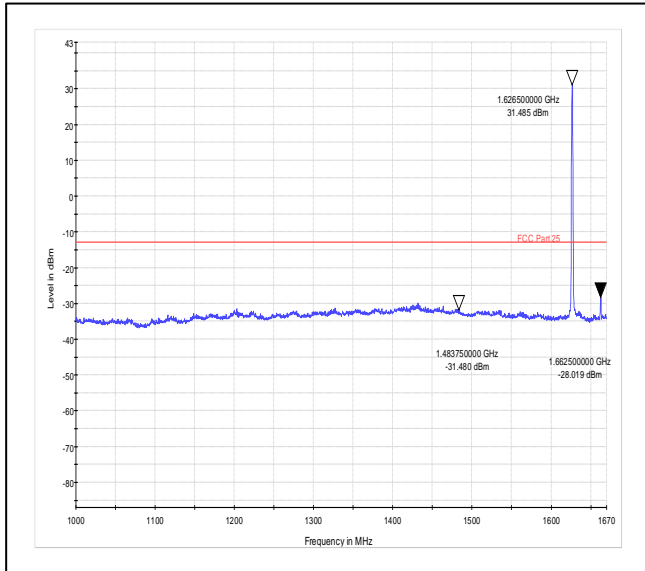
**Polarization: Horizontal**

**Table 11: Test results for the frequencies above 1GHz**

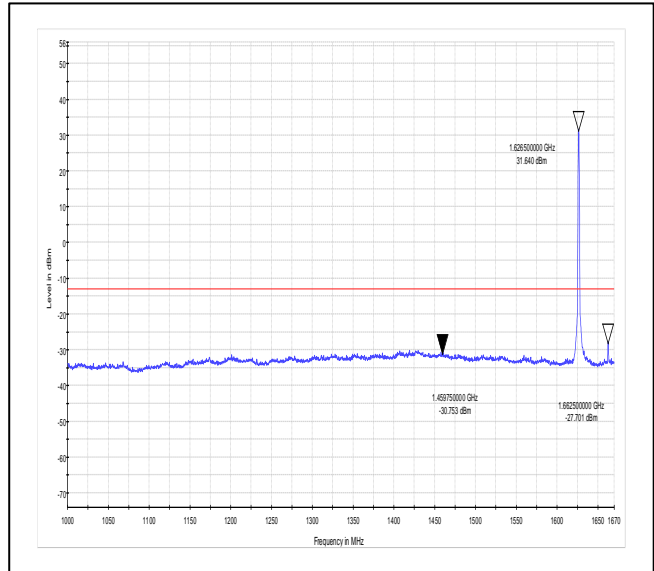
Fundamental Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Transmitter spurious emissions level (dBm)	Limit (dBm)	Margin (dB)
1626.501	3253.002	Vertical	-32.015	-13	-19.02
		Horizontal	-25.629	-13	-12.63
	4879.503	Vertical	-36.793	-13	-23.79
		Horizontal	-42.932	-13	-29.93
	6506.004	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:**

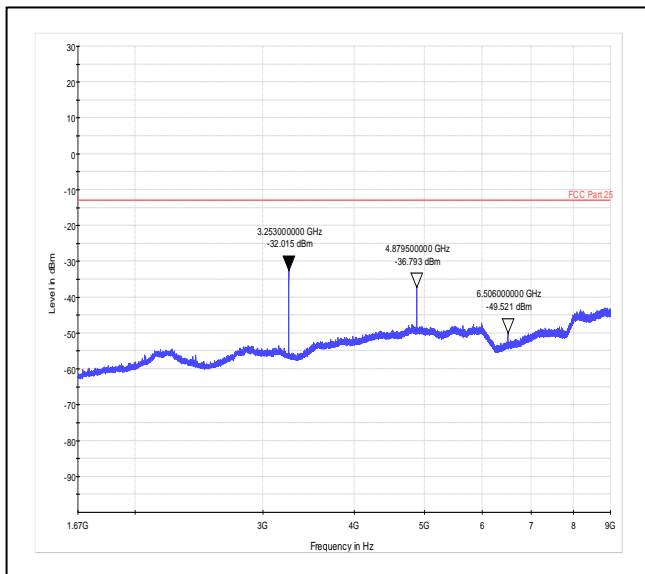
**Channel frequency:1626.501MHz**



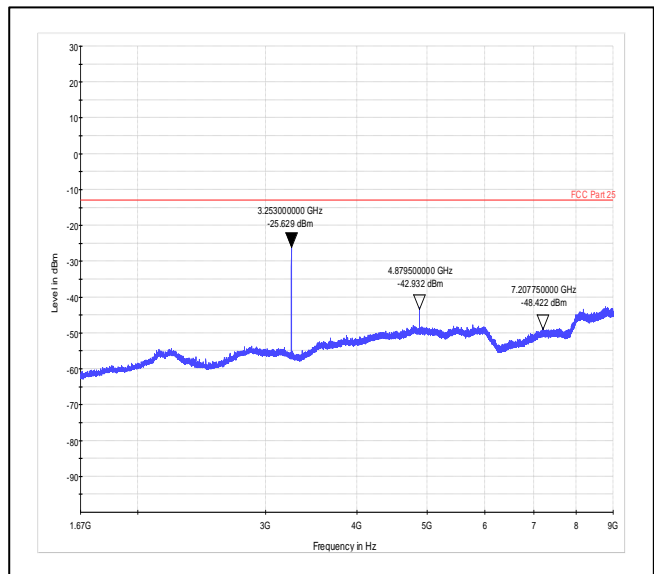
**Polarization:Vertical**



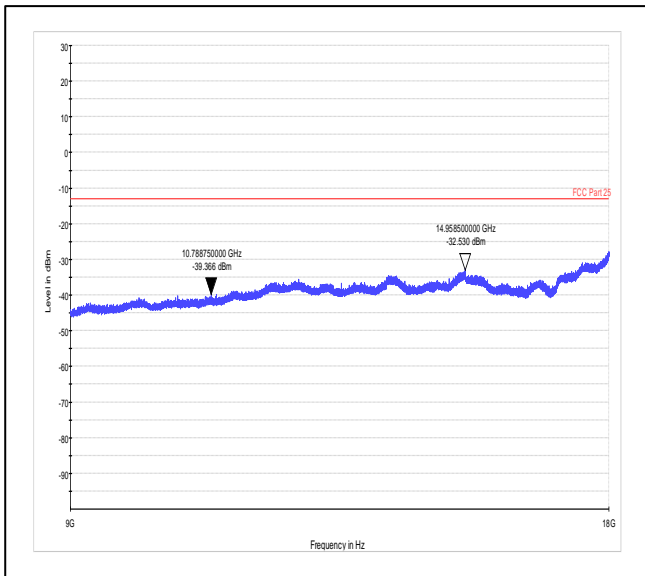
**Polarization:Horizontal**



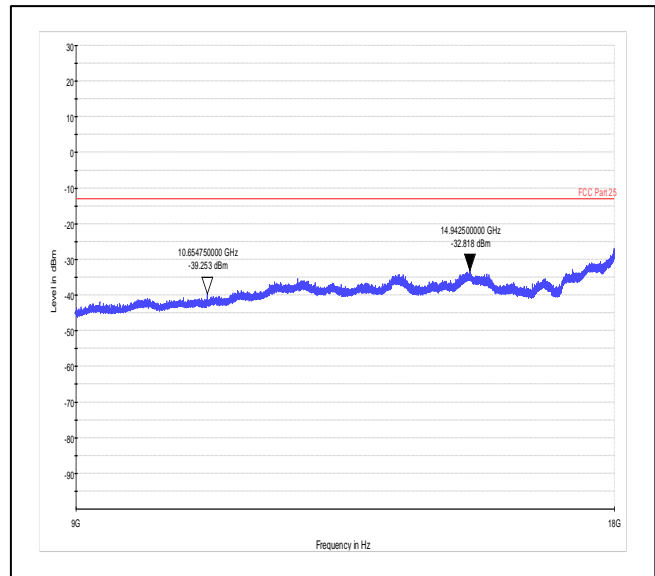
**Polarization:Vertical**



**Polarization:Horizontal**



**Polarization:Vertical**



**Polarization:Horizontal**

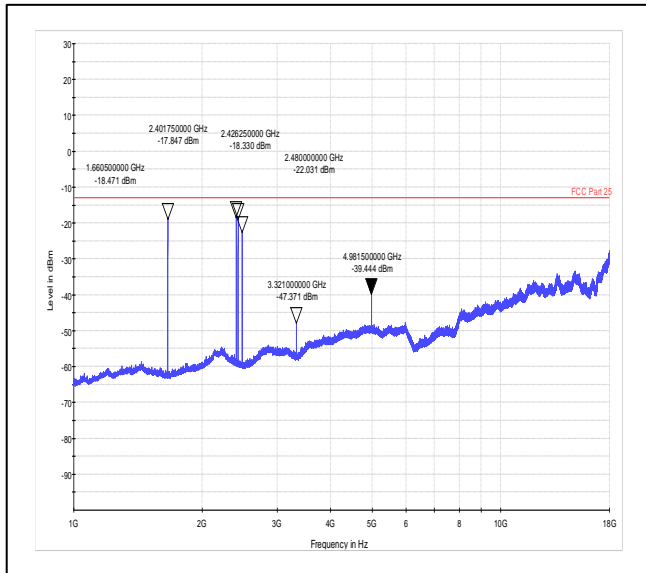
**Table 12: Test Results of Simultaneous operation**

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			

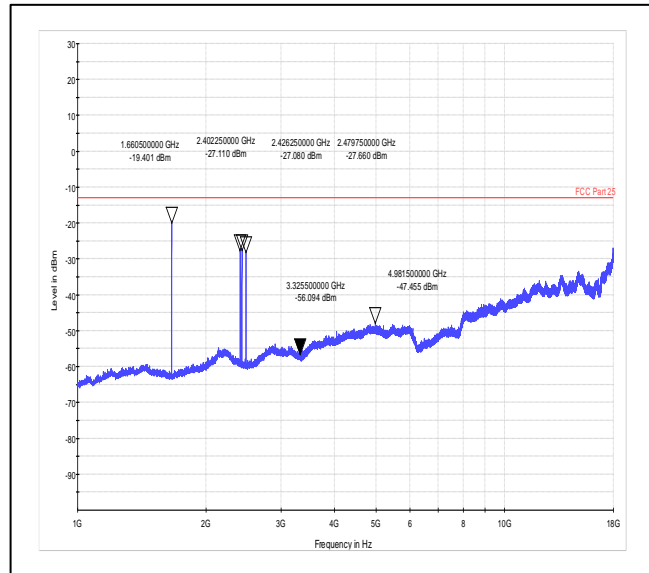


**Worst Case Plots:**

**Channel frequency:1660.501MHz And BLE Normal mode operation.**



**Polarization:Vertical**



**Polarization:Horizontal**

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\*\*\*End of test Report\*\*\*