REGULATORY COMPLIANCE TEST REPORT

FCC CFR 47 Part 15 Subpart C 15.250

Report No.: CATA07-U9 Rev A

Company: Catapult Sports Pty Ltd

Model Name: VR7601

REGULATORY COMPLIANCE TEST REPORT

Company: Catapult Sports Pty Ltd

Model Name: VR7601

To: FCC CFR 47 Part 15 Subpart C 15.250

Test Report Serial No.: CATA07-U9 Rev A

This report supersedes: NONE

Applicant: Catapult Sports Pty Ltd Company
75-83 High St Prahran
Melbourne, Victoria 3181
Australia

Issue Date: 1st April 2022

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
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Pleasanton California 94566
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ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2017. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 14th day of January 2022.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2023

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

1.2. RECOGNITION

MiCOM Labs, Inc is widely recognized for its wireless testing and certification capabilities. In addition to being recognized for Testing and Certification under Phase 2 Mutual Recognition Agreements (MRA) with Canada, Europe, United Kingdom and Japan, our international recognition includes Conformity Assessment Body (CAB) designation status under agreements with Asia Pacific (APEC) MRA Phase 1 countries giving acceptance of MiCOM test reports. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	MRA Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Test Site Designation #: US1084
Canada	Industry Canada (ISED)	FCB	APEC MRA 2	US0159 Test Company #: 4143A
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	Japan MRA 2	RCB 210
	Japan Approvals Institute for Telecommunication Equipment (JATE)			
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA 2	NB 2280
United Kingdom	Department for Business, Energy & Industrial Strategy (BEIS)	AB	UK MRA 2	AB 2280
Mexico	Instituto Federal de Telecomunicaciones (IFT)	CAB	Mexico MRA 1	US0159
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)			
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)			
Singapore	Infocomm Development Authority (IDA)			
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)			
Vietnam	Ministry of Communication (MIC)			

TCB- Telecommunications Certification Bodies (TCB)
FCB – Foreign Certification Body
CAB – Conformity Assessment Body
NB – Notified Body;
AB – Approved Body
MRA – Mutual Recognition Agreement

MRA Phases
Phase I - recognition for product testing
Phase II – recognition for both product testing and certification

1.3. PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

Accredited Product Certification Body

A2LA has accredited

MiCOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This product certification body also meets the *A2LA R322 – Specific Requirements – Notified Body Accreditation Requirements* and *A2LA R308 - Specific Requirements - ISO-IEC 17065 - Telecommunication Certification Body Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 14th day of January 2022

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2023

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body (TCB)
Industry Canada – Certification Body, CAB Identifier – US0159
Europe – Notified Body (NB), NB Identifier - 2280
UK – Approved Body (AB), AB Identifier - 2280
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	31st March 2022	Draft report for client review.
Rev A	1st April 2022	Initial release.

In the above table the latest report revision will replace all earlier versions.

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

3. TEST RESULT CERTIFICATE

Manufacturer:	Catapult Sports Pty Ltd 75-83 High St Prahran Melbourne, Victoria 3181 AUS	**Tested By:**	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model:	VR7601	**Telephone:**	+1 925 462 0304
Equipment Type:	Mobile & Portable Client Device	**Fax:**	+1 925 462 0306
S/N's:	Conducted: S7BX219511583 Radiated: S7BX219511593		
Test Date(s):	2nd – 11th January 2020, 23rd March 2022	**Website:**	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart C 15.250	**EQUIPMENT COMPLIES**

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.

2. Details of test methods used have been recorded and kept on file by the laboratory.

3. Test results apply only to the item(s) tested.

A2LA ACCREDITED TESTING CERT #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	15.250	Feb 2005	Operation of wideband systems within the band 5925-7250 MHz.
II	A2LA	5th Oct 2020	R105 - Requirement's When Making Reference to A2LA Accreditation Status
III	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
IV	ANSI C63.4	2014	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
V	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
VI	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
VII	FCC 47 CFR Part 2.1033	2016	FCC requirements and rules regarding photographs and test setup diagrams.

4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Catapult Sports Pty Ltd VR7601 to FCC Part 15 Subpart 15.250.
Applicant:	Catapult Sports Pty Ltd 75-83 High St Prahran Melbourne, Victoria 3181 Australia
Manufacturer:	As applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	CATA07-U9 Rev A
Date EUT received:	2nd January 2020
Standard(s) applied:	FCC Part 15 Subpart C 15.250
Dates of test (from - to):	2nd – 11th January 2020, 23rd March 2022
No of Units Tested:	2
Product Family Name:	Anchor
Model(s):	VR7601
Location for use:	Indoors and Outdoors
Declared Frequency Range(s):	6489.6 GHz;
Type of Modulation:	BPM/BPSK
EUT Modes of Operation:	WB
Declared Nominal Output Power (dBm):	-12 dBm
Rated Input Voltage and Current:	3.7Vdc (Li-ion Battery)
Operating Temperature Range:	0 - 70ºC
Equipment Dimensions:	99 x 56 x 193 mm
Weight:	0.488kg
Hardware Rev:	VR7601 MP
Software Rev:	6.10
Product Application:	Mobile & Portable Client Devices

5.2. Scope Of Test Program

Catapult Sports Pty Ltd Company VR7601

The scope of the test program was to test the Catapult Sports Pty Ltd Company VR7601 in the frequency range 5925 - 7250 MHz for compliance against the following specification:

FCC CFR 47 Part 15 Subpart C 15.250
Operation of wideband systems within the band 5925 -7250 MHz

The following report consists of data from the Catapult Sports Pty Ltd Company Vector Tag S7601 which uses the same WB radio as the Vector Tag Receiver VR7601. Please refer to CATA07-U10 Catapult Sports S7601 15.250 related data.

5.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description	Manufacturer	Model No.	Serial No.
EUT Conducted	Mobile & Portable Client Device	Catapult Sports Pty Ltd	VR7601	S7BX219511583
EUT Radiated	Mobile & Portable Client Device	Catapult Sports Pty Ltd	VR7601	S7BX219511593
Support	Switching Power Supply	PHIHONG	PSAF10R-050QA-R	P185100837A2

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
integral	Catapult Sports Pty Ltd	S-Parameter	Omni	5.39	--	--	--	6000 - 7000

BF Gain - Beamforming Gain
Dir BW - Directional BeamWidth
X-Pol - Cross Polarization

5.5. Cabling and I/O Ports

Port Type	Max Cable Length	# of Ports	Screened	Connector Type	Data Type	Data Rate(s)
USB	5m	1	Yes	USB	Digital	Unknown

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s)	Data Rate with Highest Power MBit/s	Channel Frequency (MHz)		
		Low	Mid	High
		5925 - 7250 MHz		
WB	--	--	6489.6	--

5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:
1. NONE

5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:
1. NONE

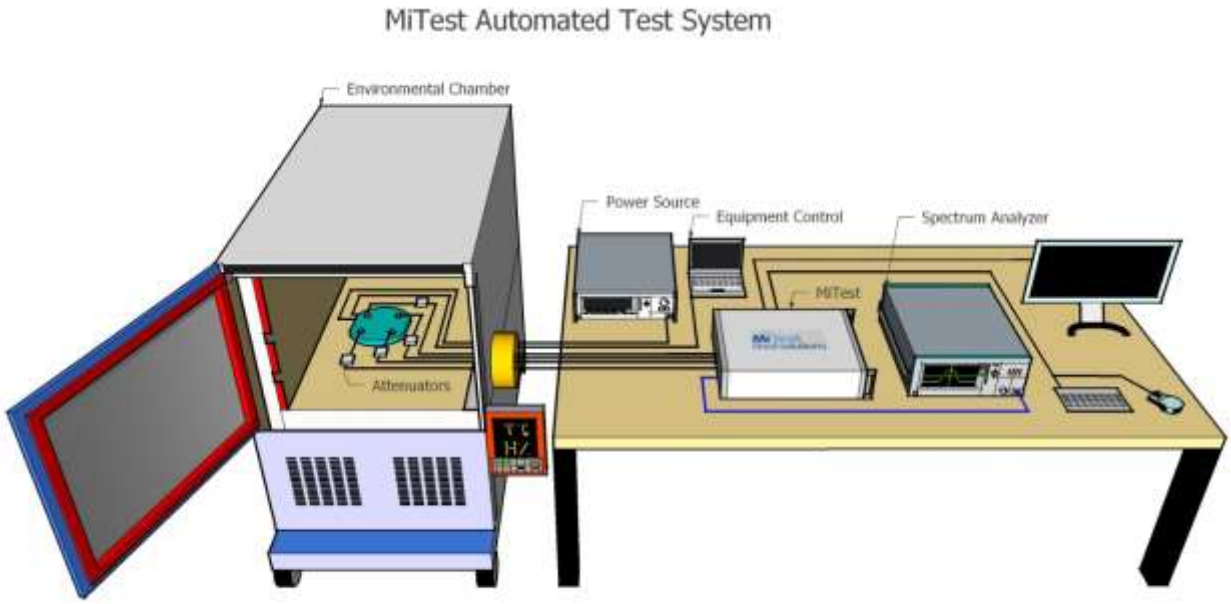
6. TEST SUMMARY

List of Measurements

Test Header	Result	Data Link
WB Bandwidth	Complies	View Data
Peak Power	Complies	View Data
Peak Power Density	Complies	View Data
Spurious Radiated Emissions	Complies	View Data
Spurious Radiated Emissions in GPS Bands	Complies	View Data
Shutdown Timing Requirements	Complies	View Data
AC Wire line Emissions	Complies	View Data
Comments: None		

7. TEST EQUIPMENT CONFIGURATION(S)

7.1. Conducted Test Setup



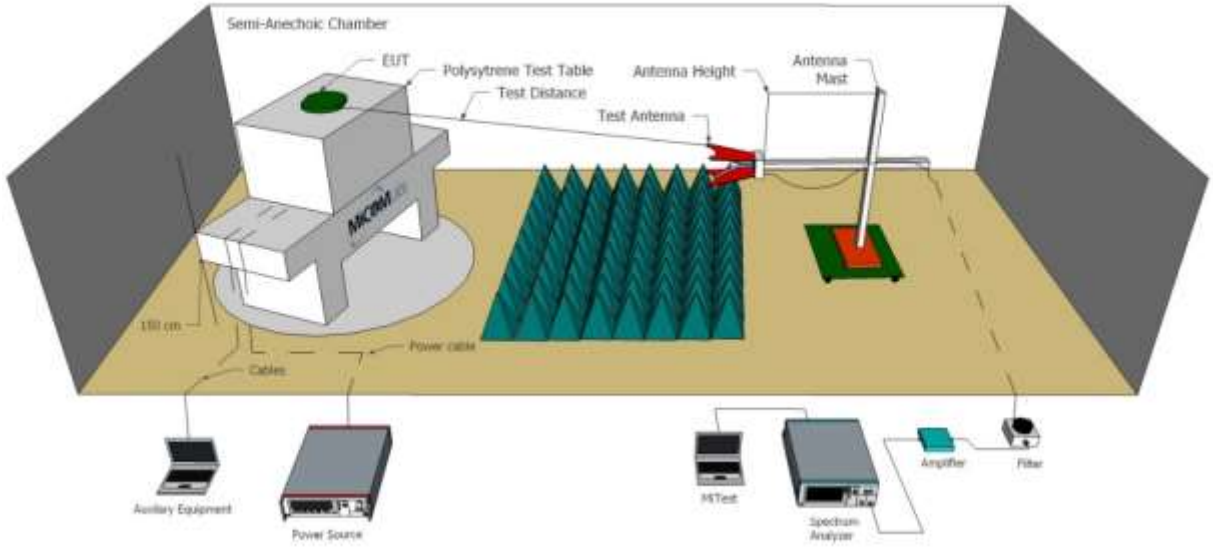
A full system calibration was performed on the test station and any resulting system losses (or gains) were considered in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
249	Thermocouple; Resistance Thermometer	Thermotronics	GR2105-02	9340 #2	30 Oct 2022
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2022
398	MiTest RF Conducted Test Software	MiCOM	MiTest ATS	Version 4.2.3.0	Not Required
405	DC Power Supply 0-60V	Agilent	6654A	MY4001826	Cal when used
408	USB to GPIB interface	National Instruments	GPIB-USB HS	14C0DE9	Not Required
445	PoE Injector	D-Link	DPE-101GL	QTAH1E2000625	Not Required
510	Barometer/Thermometer	Digi Sense	68000-49	170871375	4 Jan 2023
75	Environmental Chamber	Thermatron	SE-300-2-2	27946	20 Feb 2023

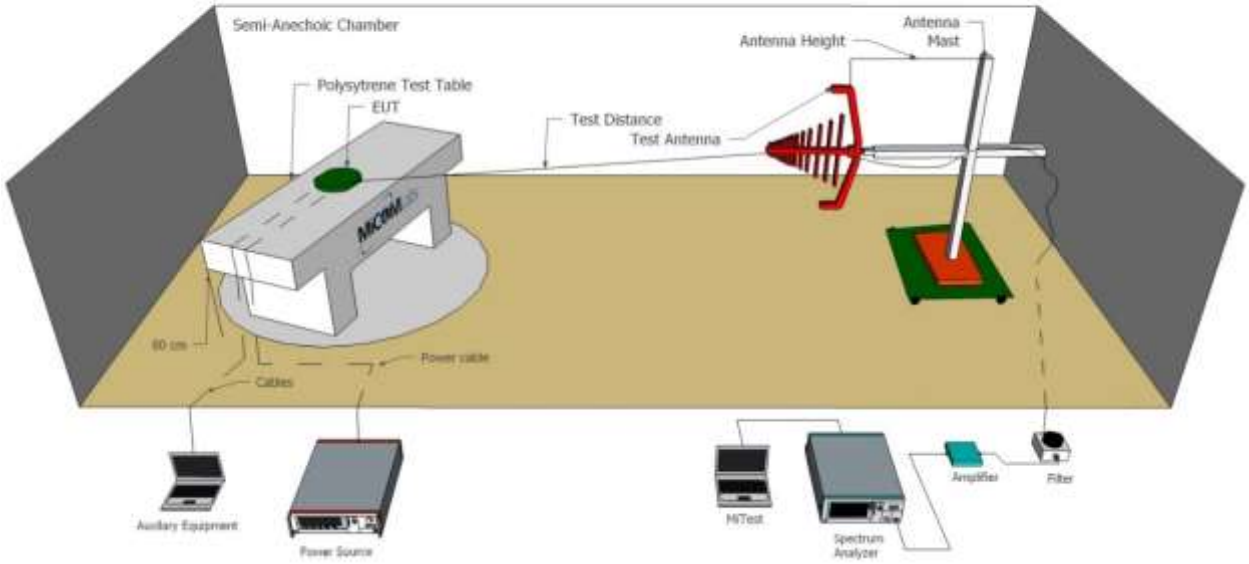
7.2. Radiated Emissions - 3m Chamber

The following tests were performed using the radiated test set-up shown in the diagram below. Radiated emissions above and below 1GHz.

Radiated Emissions Above 1GHz Test Setup



Radiated Emissions Below 1GHz Test Setup



A full system calibration was performed on the test station and any resulting system losses (or gains) were considered in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CU101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2022
298	3M Radiated Emissions Chamber Maintenance Check	MiCOM	3M Chamber	298	24 Jul 2022
330	Variac 0-280 Vac	Staco Energy Co	3PN1020B	0546	Cal when used
336	Active loop Ant 10kHz to 30 MHz	EMCO	EMCO 6502	00060498	29 Nov 2022
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	29 Sep 2023
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	29 Sep 2022
377	Band Rejection Filter 5150 to 5880MHz	Microtronics	BRM50716	034	6 Oct 2022
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	27 Oct 2022
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	30 Sep 2023
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	2 Nov 2022
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
447	MiTest Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	27 Oct 2022
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	27 Oct 2022
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	27 Oct 2022
466	Low Pass Filter DC-1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	6 Oct 2022
476	Low Pass dc-2200MHz	Mini Circuits	15542 NLP-	VUU13801345	6 Oct 2022

	filter		2400+		
480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	23 Jun 2022
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	23 Jun 2022
510	Barometer/Thermometer	Digi Sense	68000-49	170871375	4 Jan 2023
554	Precision SMA Cable	Fairview Microwave	SCE18060101-400CM	554	23 Jun 2022
555	Rhode & Schwarz Receiver (Firmware Version : 2.00 SP1)	Rhode & Schwarz	ESW 44	101893	28 Jun 2023
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used

8. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by MiTest. MiTest is an automated test system developed by MiCOM Labs. MiTest is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.

The MiCOM Labs "MiTest" Automated Test System" (Patent Pending)

9. TEST RESULTS

9.1. WB Bandwidth

Conducted Test Conditions for WB Bandwidth			
Standard:	FCC CFR 47 Part 15 Subpart C 15.250	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	WB Bandwidth	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	ANSI C63.10 Section 10.1; 5.1(a)(b) 15.250(a)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for WB Bandwidth Measurement
The WB Bandwidth is measured radiated, at a 3-meter distance, while EUT is operating in transmission mode at the appropriate center frequency. The Resolution Bandwidth was set to 1MHz RBW IAW ANSI C63.10.
Testing was performed under ambient conditions at nominal voltage.

Test configuration and setup used for the measurement was per the Radiated Test Set-up section specified in this document.

Equipment Configuration for WB Bandwidth

Variant:	WB	**Duty Cycle (%):**	100
Data Rate:	-	**Antenna Gain (dBi):**	5.39
Modulation:	--	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Frequency	Measured 10 dB Bandwidth (MHz)	10 dB Bandwidth (MHz)			
MHz	**Port A**	**Highest**	**Lowest**		
6489.6	752.1	752.1	752.1		

Traceability to Industry Recognized Test Methodologies

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Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

The above values are representative of the worst-case value between polarities and based on the power measurements.

9.2. Transmit Power

Conducted Test Conditions for Maximum Radiated Output Power			
Standard:	FCC CFR 47 Part 15 Subpart C 15.250	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Radiated Emissions WB Transmission	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	ANSI C63.10 Section 10.3.5; 5.3.1; Section 4 Annex 15.250 (d)(1)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	None		

Test Procedure for WB Transmission

Testing was performed under ambient conditions at nominal voltage.

Test configuration and setup used for the measurement was per the Radiated Test Set-up section specified in this document. Supporting KDB's referenced below.

Operating Frequency Band:
5925-7250 MHz

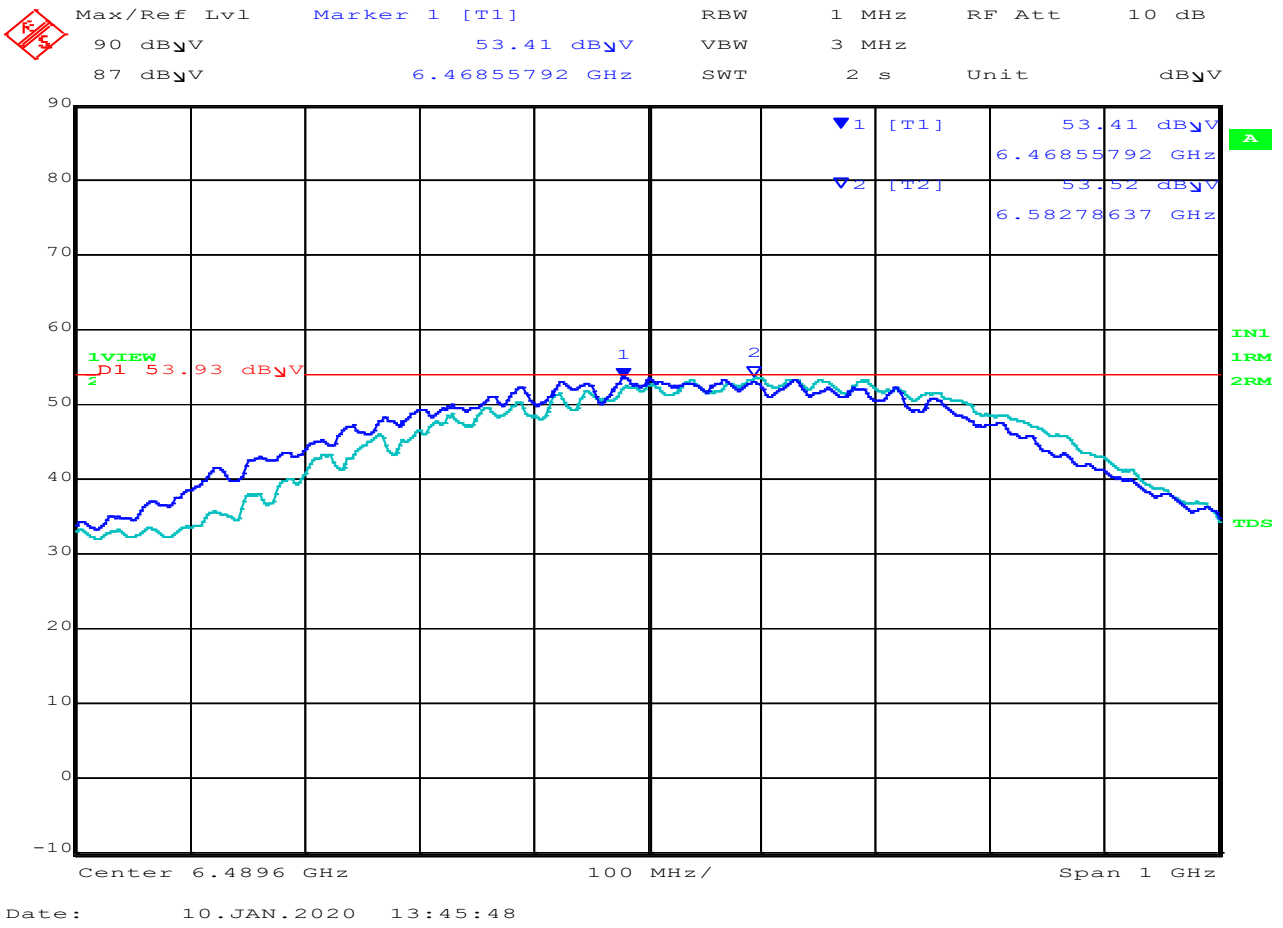
Limits Maximum EIRP (dBm)

Frequency (MHz)	EIRP Limit (dBm)	EIRP at 3 Meters (dBuv/m)
5925-7250	-41.3	53.9

Equipment Configuration for RF Output Power			
Variant:	WB	**Duty Cycle (%):**	99
Data Rate:	-	**Antenna Gain (dBi):**	5.39
Modulation:	-	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency MHz	Measured Radiated Output Power (dBm)	Limit (dBm)	Margin (dB)	EUT Power Setting
6489.6	-41.82	-41.3	-0.52	14.0



Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Uncertainty:	±1.33 dB

9.3. Peak Power Density

Test Conditions for Maximum Peak Power Density			
Standard:	FCC CFR 47 Part 15 Subpart C 15.250	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Radiated Emissions WB Transmission	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	ANSI C63.10 Section 10.3.6; 5.3.1; Section 4 Annex 15.250 (d)(3)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	None		

Test Procedure for WB Transmission

Testing was performed under ambient conditions at nominal voltage.

Test configuration and setup used for the measurement was per the Radiated Test Set-up section specified in this document.

Measurements were gathered with a RBW of 1MHz and converted to 50MHz using the following formula:

$EIRP_{1\ MHz} = EIRP_{50\ MHz} + 20\log(1MHz/50MHz) = 0dBm + (-34dBm) = -34dBm$

Operating Frequency Band:
5925-7250 MHz

Limits Maximum EIRP (dBm)

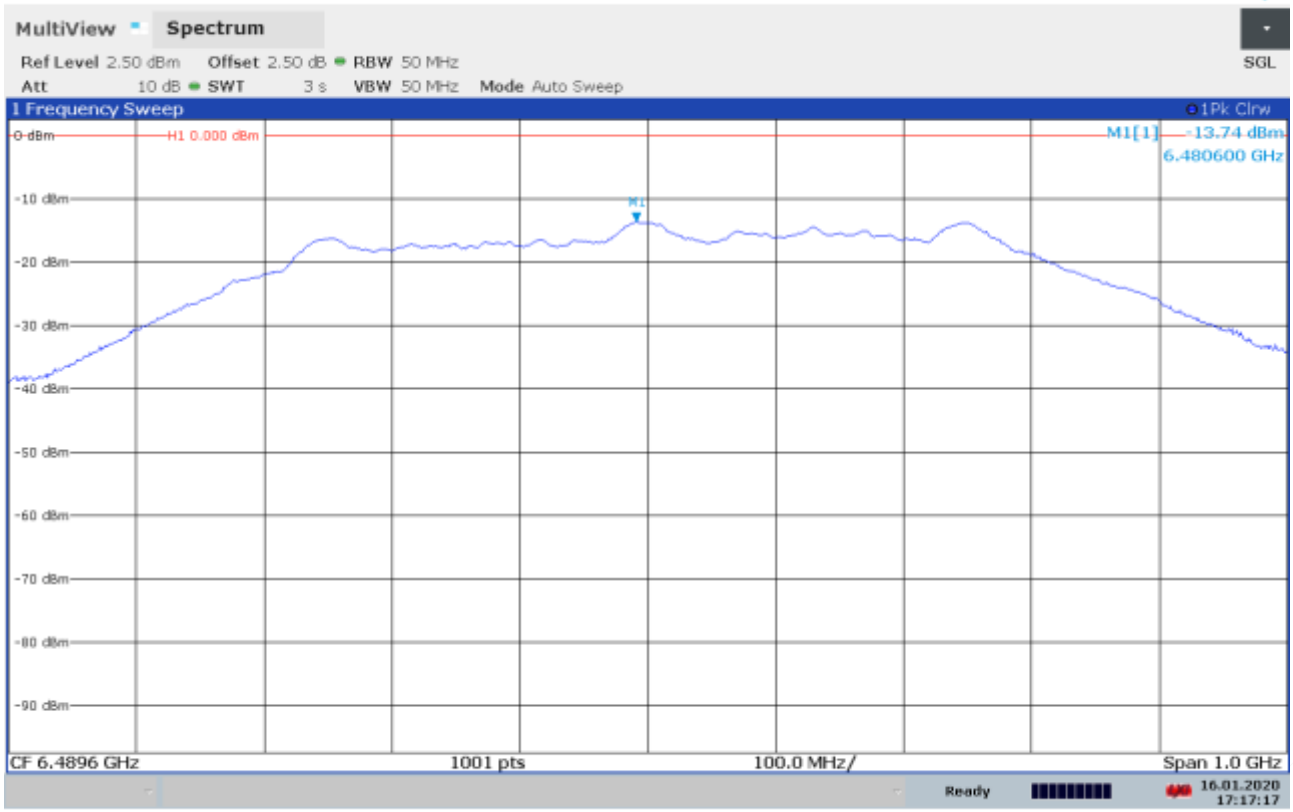
Frequency (MHz)	EIRP Limit (dBm/50MHz)	EIRP Limit (dBm/1MHz)
5925-7250	0	-34

Equipment Configuration for Peak Power Density			
Variant:	WB	**Duty Cycle (%):**	99
Data Rate:	-	**Antenna Gain (dBi):**	5.39
Modulation:	--	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency MHz	Measured Peak Power Density (dBm)	Limit (dBm)	Margin (dB)	EUT Power Setting
6489.6	-13.74	0.0	-13.74	14.0

Traceability to Industry Recognized Test Methodologies



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Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Uncertainty:	±1.33 dB

9.4. Transmitter Spurious Band Emissions

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47 Part 15 Subpart C 15.250	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Radiated Spurious Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	ANSI C63.10 Section 10.2 + 10.3; 5.3.1 15.250 (d)(1)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Spurious and Band-Edge Emissions
Radiated emissions for restricted bands above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in max hold mode. Depending on the frequency band spanned a notch filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.
Measurements on any restricted band frequency or frequencies above 1 GHz are based on the use of measurement instrumentation employing peak and average detectors. All measurements were performed using a resolution bandwidth of 1 MHz.

Field Strength Calculation
The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.
FS = R + AF + CORR - FO

where:
FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss

Measurements made at 1 meter to meet noise floor to limit requirements

Frequency Range		Average Limit	
MHz	**MHz**	**EIRP (dBm)**	**EIRP at 1 Meters (dBuV/m)**
960	1610	-75.30	29.40
1610	1990	-63.40	41.40
1990	3100	-61.30	43.40
3100	5925	-51.30	53.40
5925	7250	-41.30	63.40
7250	10600	-51.30	53.40
10600	18000	-61.30	43.40
18000	40000	-61.3	43.40

Radiated Spurious Emissions in the GPS Bands FCC 15.250 (d)(2)

Frequency Range		Average Limit	
MHz	**MHz**	**EIRP (dBm)**	**EIRP at 1 Meters (dBuV/m)**
1164	1240	-85.3	19.47
1559	1610	-85.3	19.47

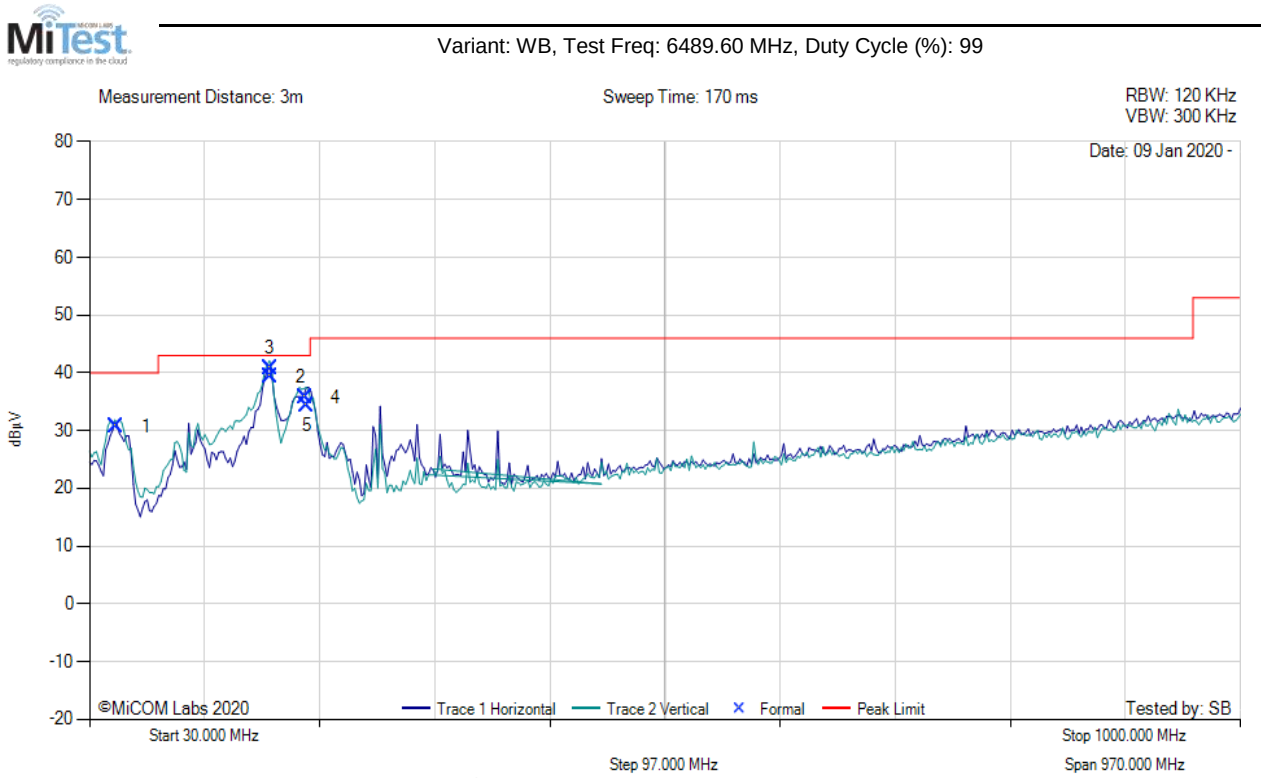
50 MHz Peak Emissions 15.250 (d)(3)
There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs and this 50 MHz bandwidth must be contained within the 5925-7250 MHz band. The peak EIRP limit is 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed by the measurement instrument. RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than RBW. If RBW is greater than 3 MHz, the application for certification filed with the Commission shall contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing

9.4.1. Transmitter Spurious Emissions

Equipment Configuration for Radiated Digital Emissions

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results



30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	52.46	47.92	3.75	-21.02	30.65	MaxQP	Vertical	100	300	40.0	-9.4	Pass
2	182.01	51.96	4.46	-17.11	39.31	MaxQP	Horizontal	123	10	43.0	-3.7	Pass
3	182.12	53.44	4.46	-17.11	40.79	MaxQP	Vertical	100	235	43.0	-2.2	Pass
4	211.68	48.43	4.57	-17.31	35.69	MaxQP	Horizontal	131	255	43.0	-7.3	Pass
5	213.00	47.05	4.59	-17.20	34.44	MaxQP	Vertical	101	295	43.0	-8.6	Pass

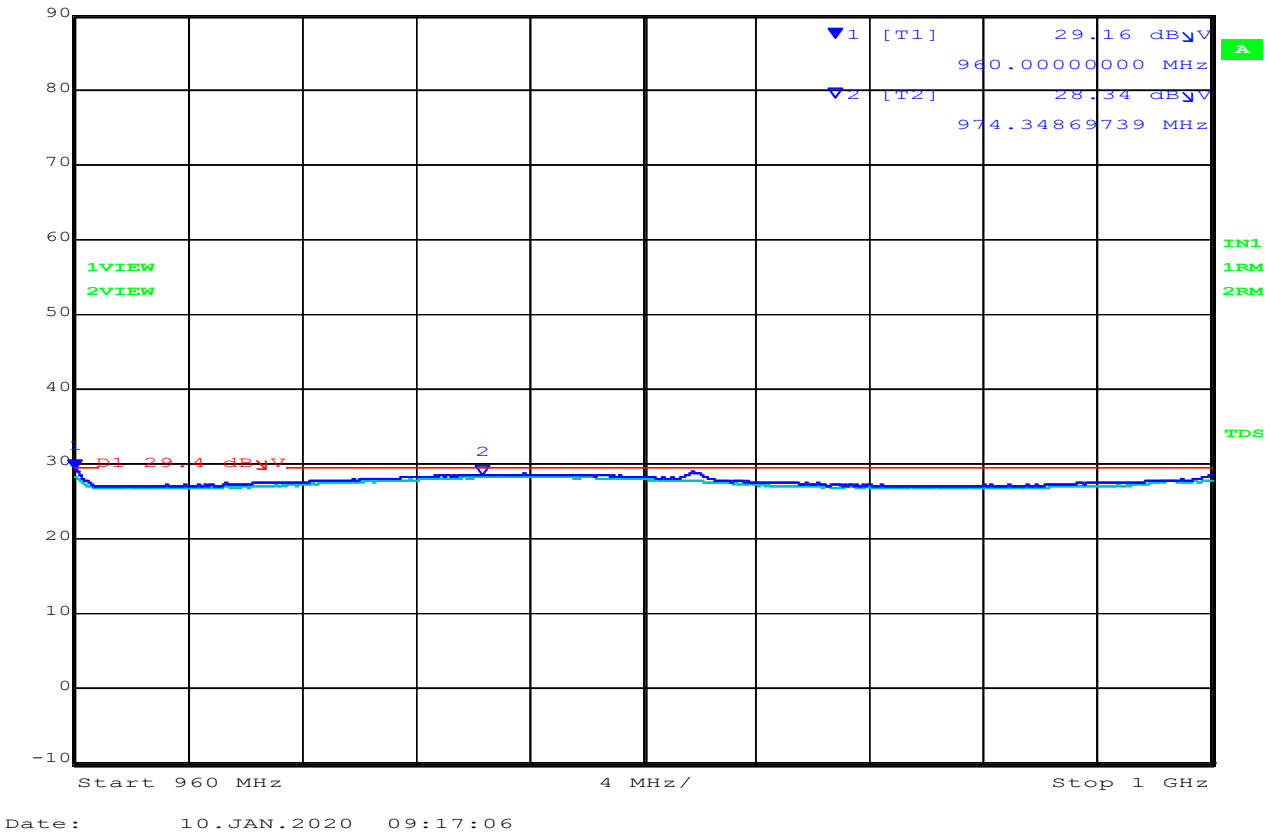
Test Notes: EUT transmitting and charging via acdc adapter.

Equipment Configuration for Spurious Emissions			
Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 960MHz-1.00GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



960.00– 1000.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	999.03	29.16	Average	Vertical	150	0	29.4	-0.24	Pass
2	999.51	28.34	Average	Horizontal	150	0	29.4	-1.06	Pass

Test Notes: None

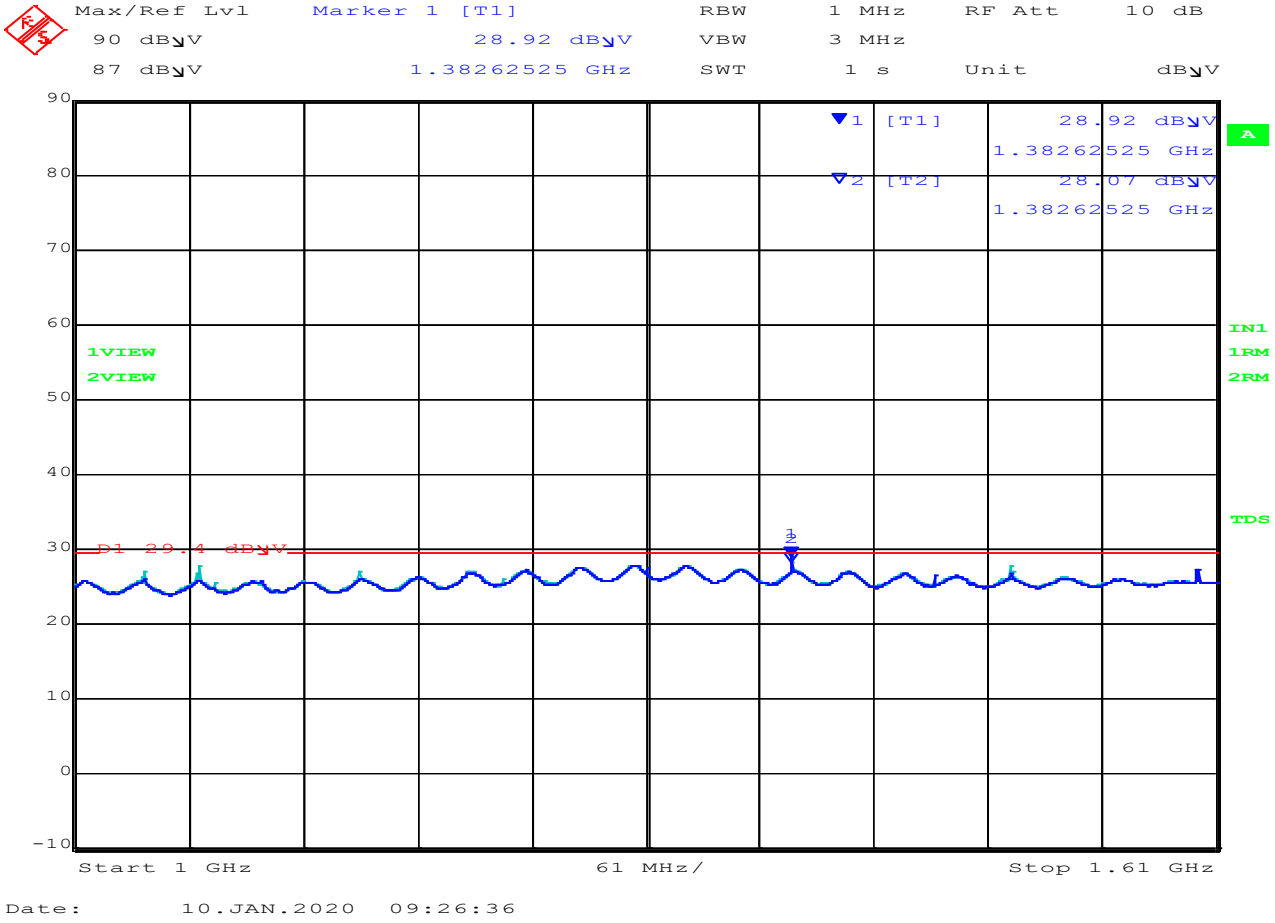
Equipment Configuration for Spurious Emissions

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 1.0-1.61GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



1000.00– 1610.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1299.4	28.92	Average	Vertical	150	0	29.4	-0.48	Pass
2	1298.2	28.07	Average	Horizontal	150	0	29.4	-1.33	Pass

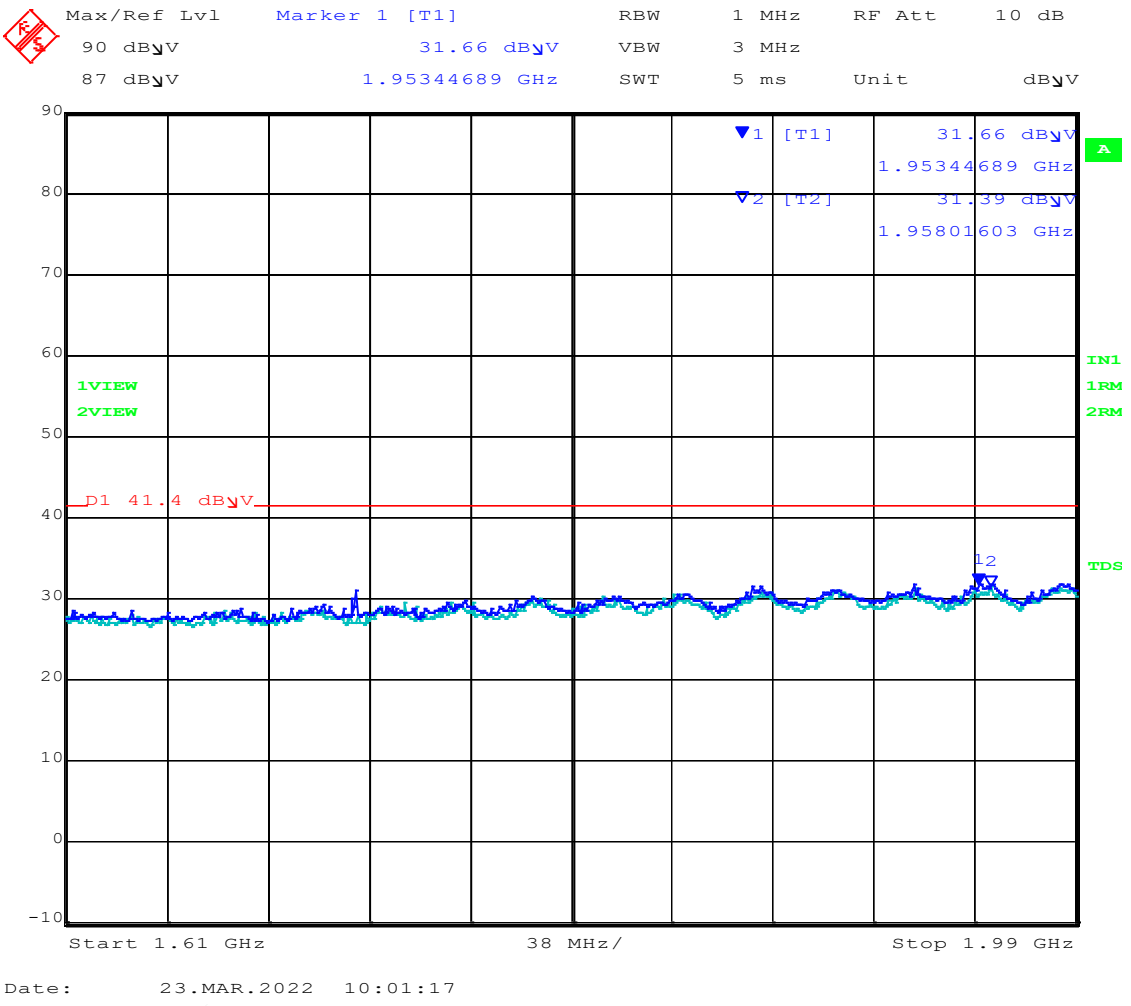
Test Notes: None

Equipment Configuration for Spurious Emissions			
Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 1.61-1.99GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



1610.00 – 1990.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1958.01	31.39	Average	Vertical	150	0	41.40	-10.01	Pass
2	1953.44	31.66	Average	Horizontal	150	0	41.40	-9.74	Pass
Test Notes: None									

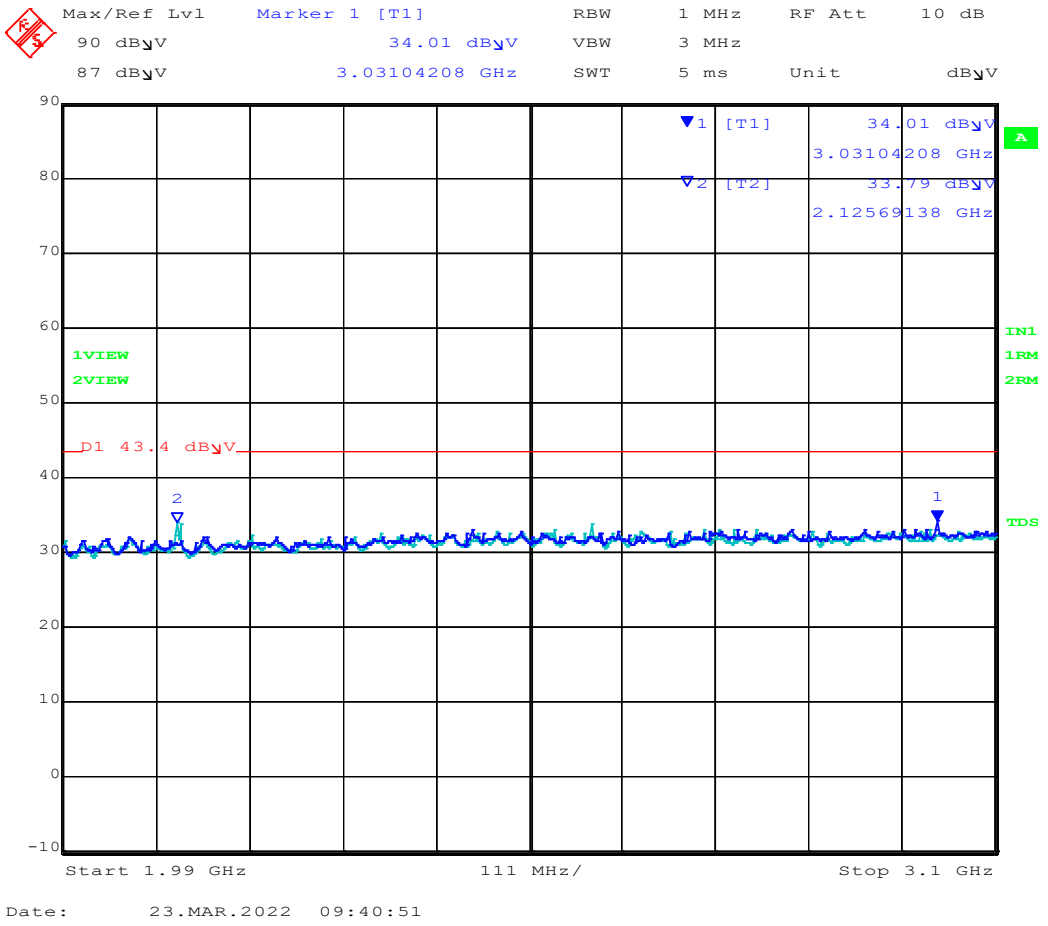
Equipment Configuration for Spurious Emissions

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 1.99-3.10GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



1990.00 – 3100.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	3031.04	34.01	Average	Horizontal	150	0	43.40	-9.39	Pass
2	2125.69	33.79	Average	Vertical	150	0	43.40	-9.61	Pass

Test Notes: None

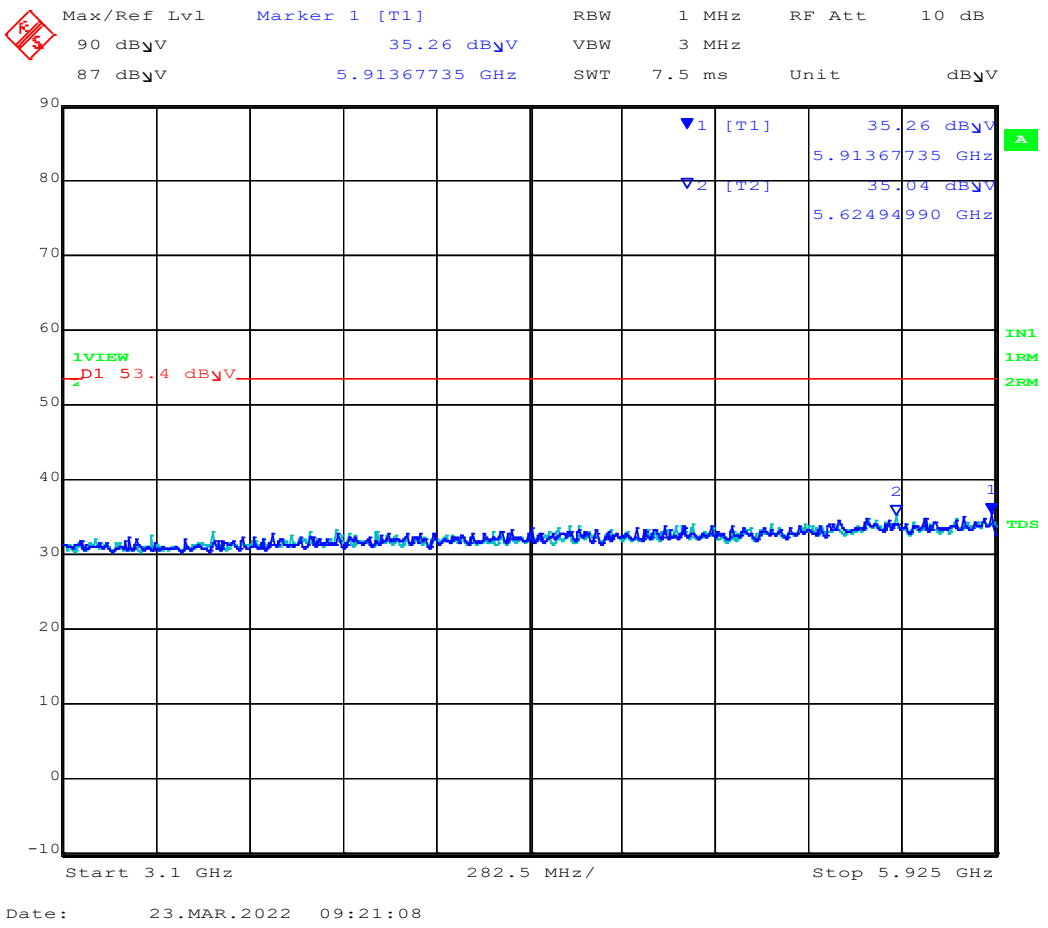
Equipment Configuration for Spurious Emissions

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 3.10-5.925GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



3100.00 – 5925.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	5913.67	35.26	Average	Vertical	150	0	53.4	-18.14	Pass
2	5624.94	35.04	Average	Horizontal	150	0	53.4	-18.36	Pass

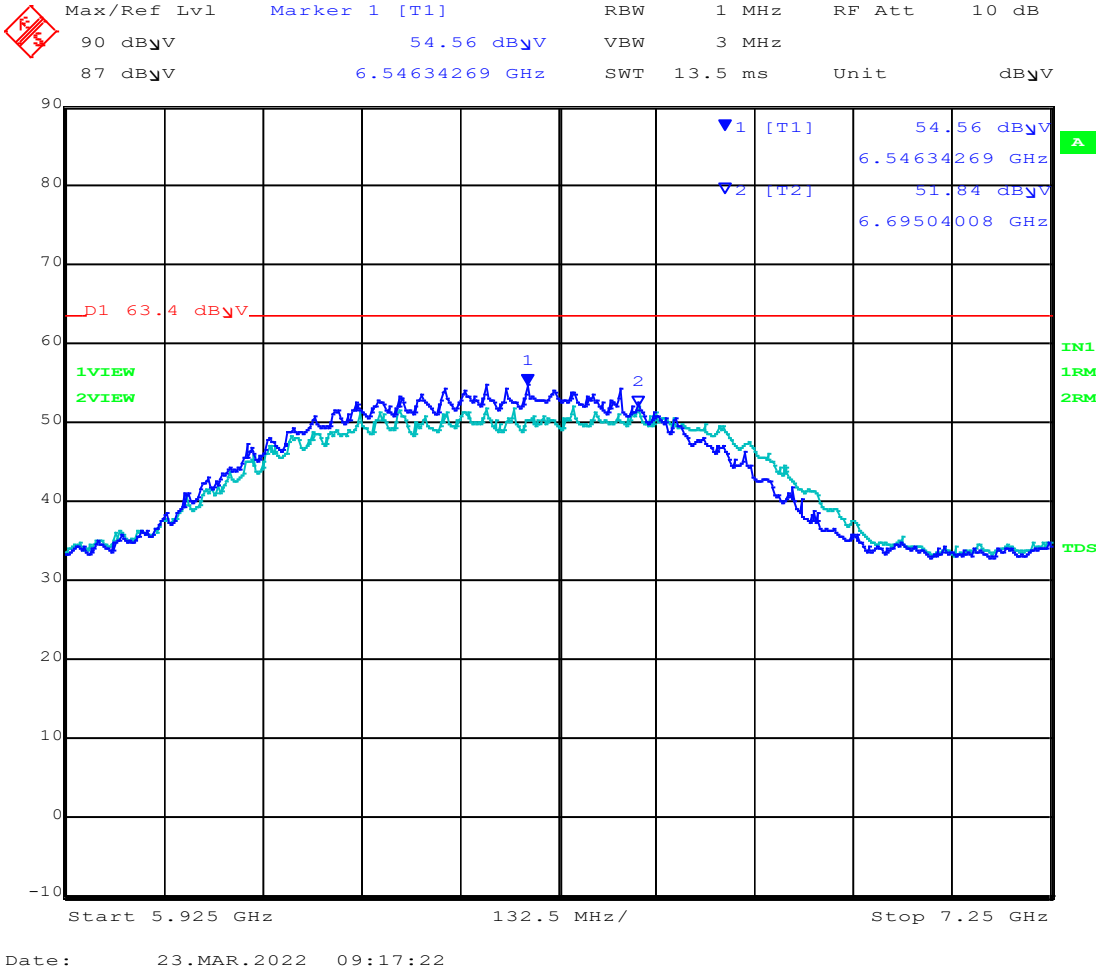
Test Notes: None

Equipment Configuration for Spurious Emissions			
Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 5.925-7.250GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



5925.00 – 7250.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	6546.34	54.56	Average	Horizontal	150	0	63.40	-8.84	-8.84
2	6695.04	51.84	Average	Vertical	150	0	63.40	-11.56	-11.56

Test Notes: None

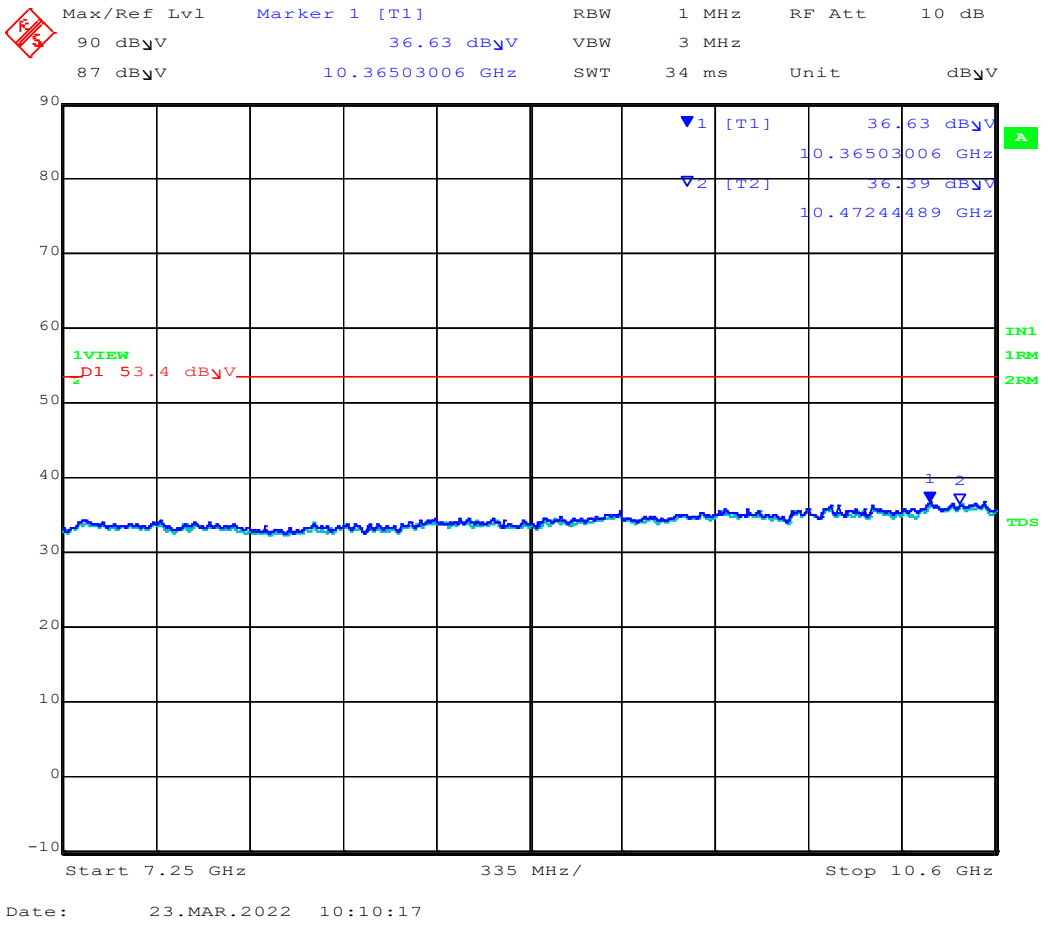
Equipment Configuration for Spurious Emissions

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 7.250 -10.600GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



7250.00 – 10600.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	10365.03	36.63	Average	Horizontal	150	0	53.40	-16.77	Pass
2	10472.44	36.39	Average	Vertical	150	0	53.40	-17.01	Pass

Test Notes: None

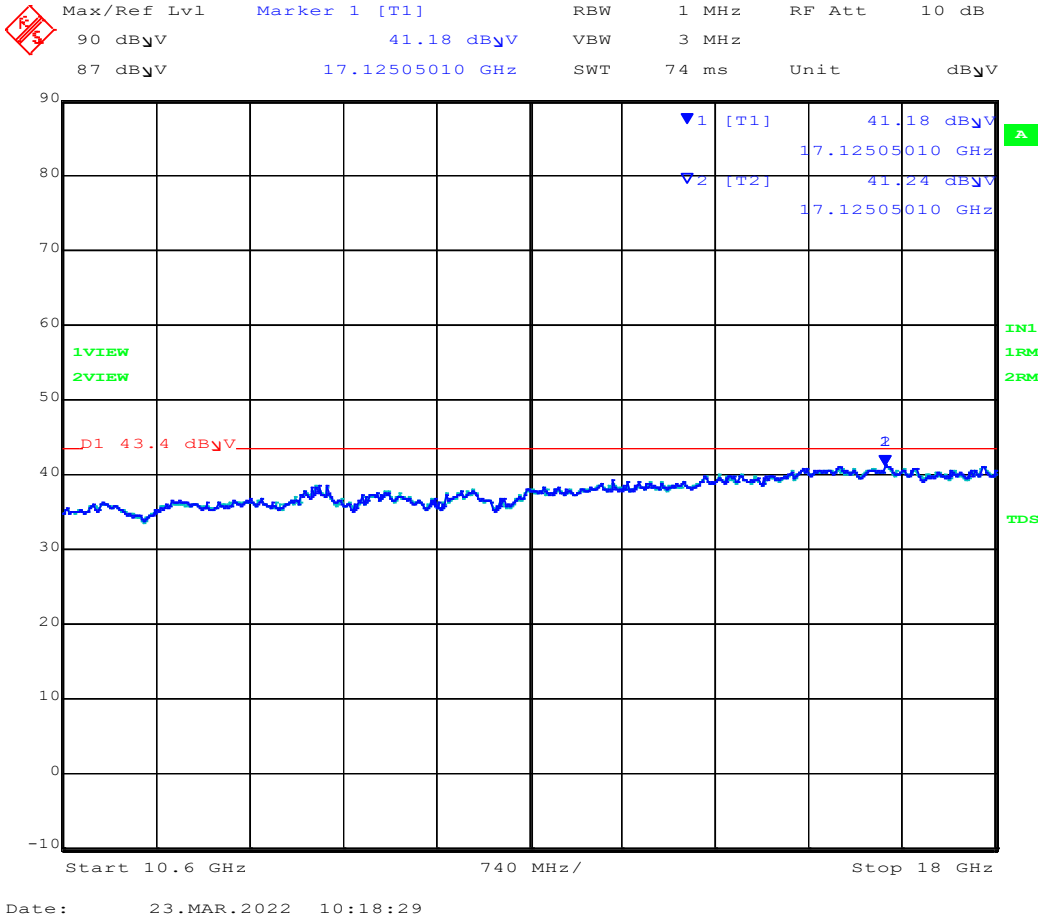
Equipment Configuration for Spurious Emissions

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 10.600-18.000GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



10600.00 – 18000.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	17125.05	41.18	Average	Horizontal	150	0	43.40	-2.22	Pass
2	17125.05	41.24	Average	Vertical	150	0	43.40	-2.16	Pass

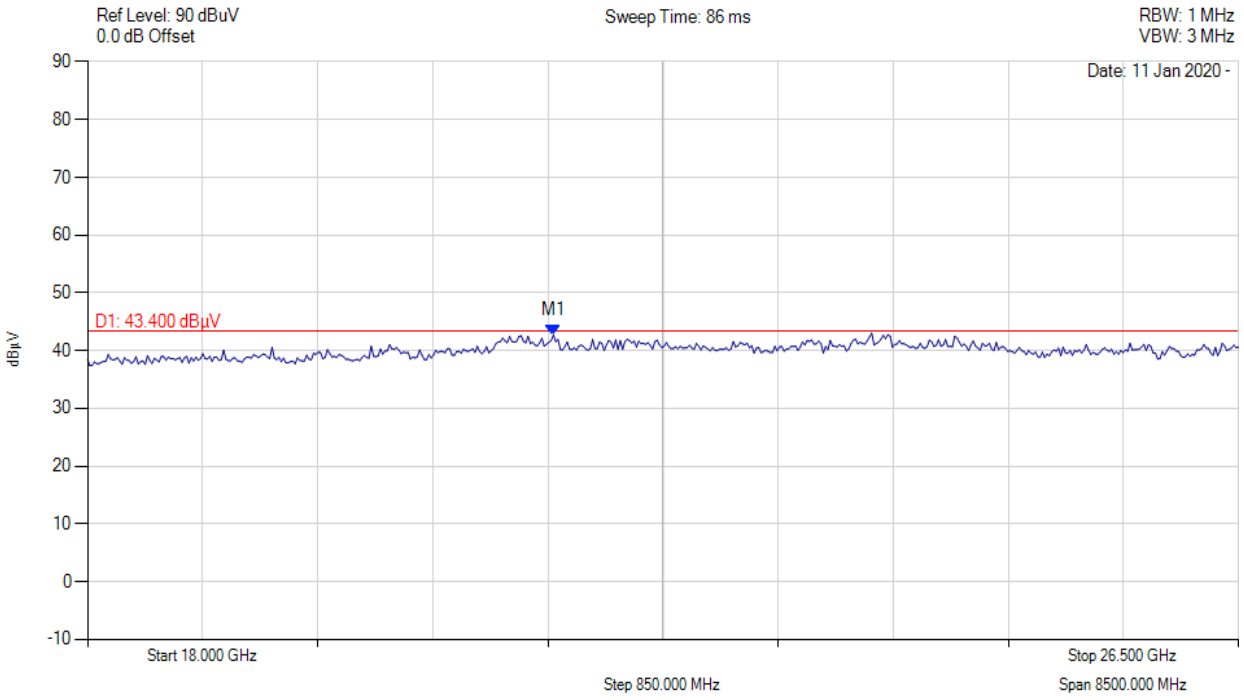
Test Notes: None

Equipment Configuration for Spurious Emissions Vertical			
Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 18-26GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 10 Trace Mode = MAX HOLD	M1 : 21.441 GHz : 42.709 dBµV	Pass

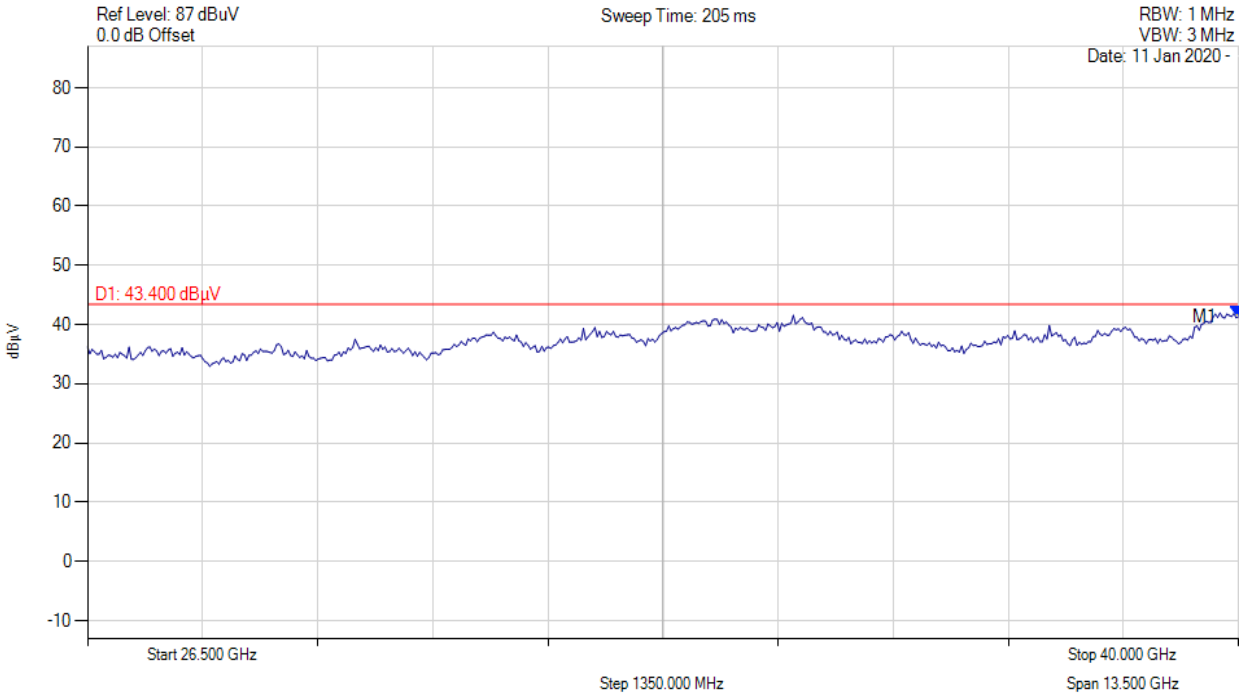
Equipment Configuration for Spurious Emissions Vertical

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 26 – 40 GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 10 Trace Mode = VIEW	M1 : 40.000 GHz : 41.347 dBµV	Pass

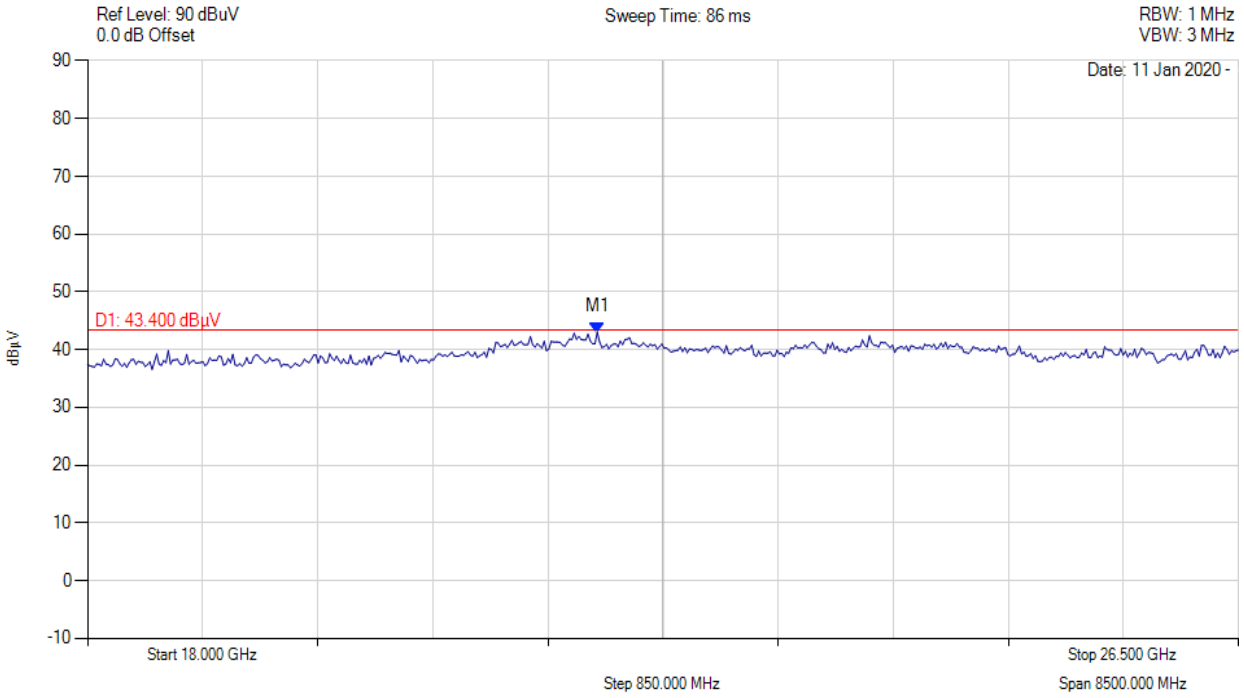
Equipment Configuration for Spurious Emissions Horizontal

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 18-26GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 10 Trace Mode = VIEW	M1 : 21.765 GHz : 43.012 dBµV	Pass

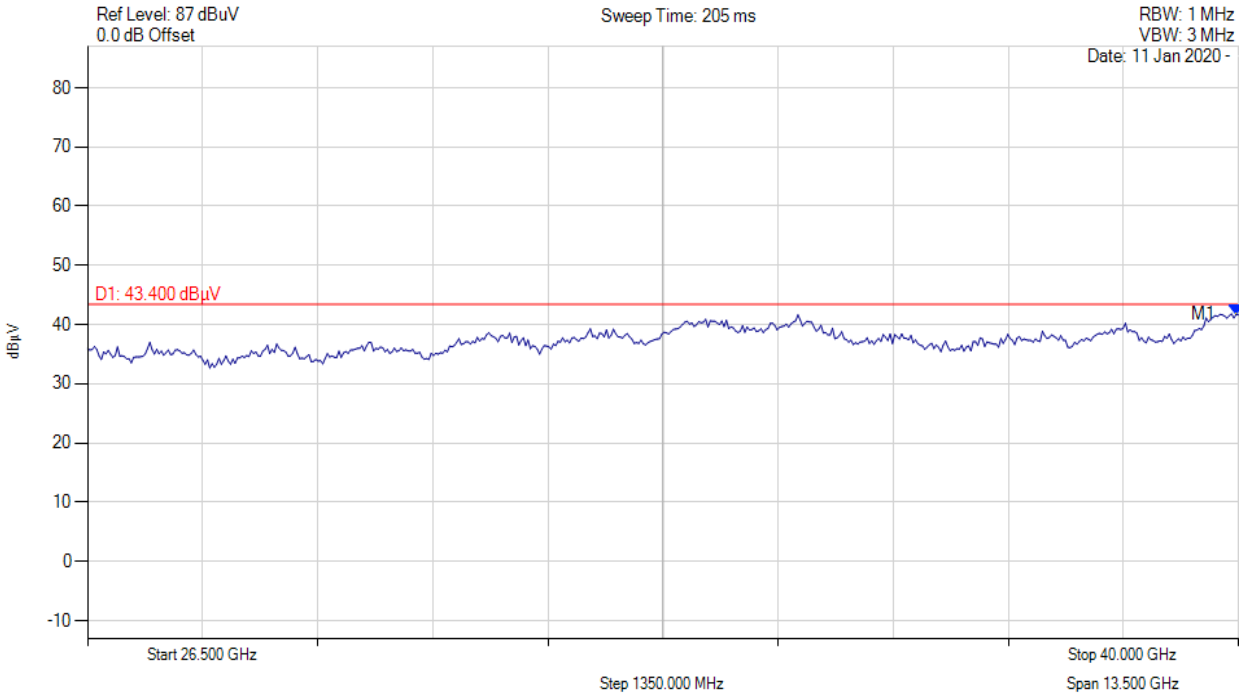
Equipment Configuration for Spurious Emissions Horizontal

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS 26 – 40 GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 10 Trace Mode = VIEW	M1 : 39.973 GHz : 41.706 dBµV	Pass

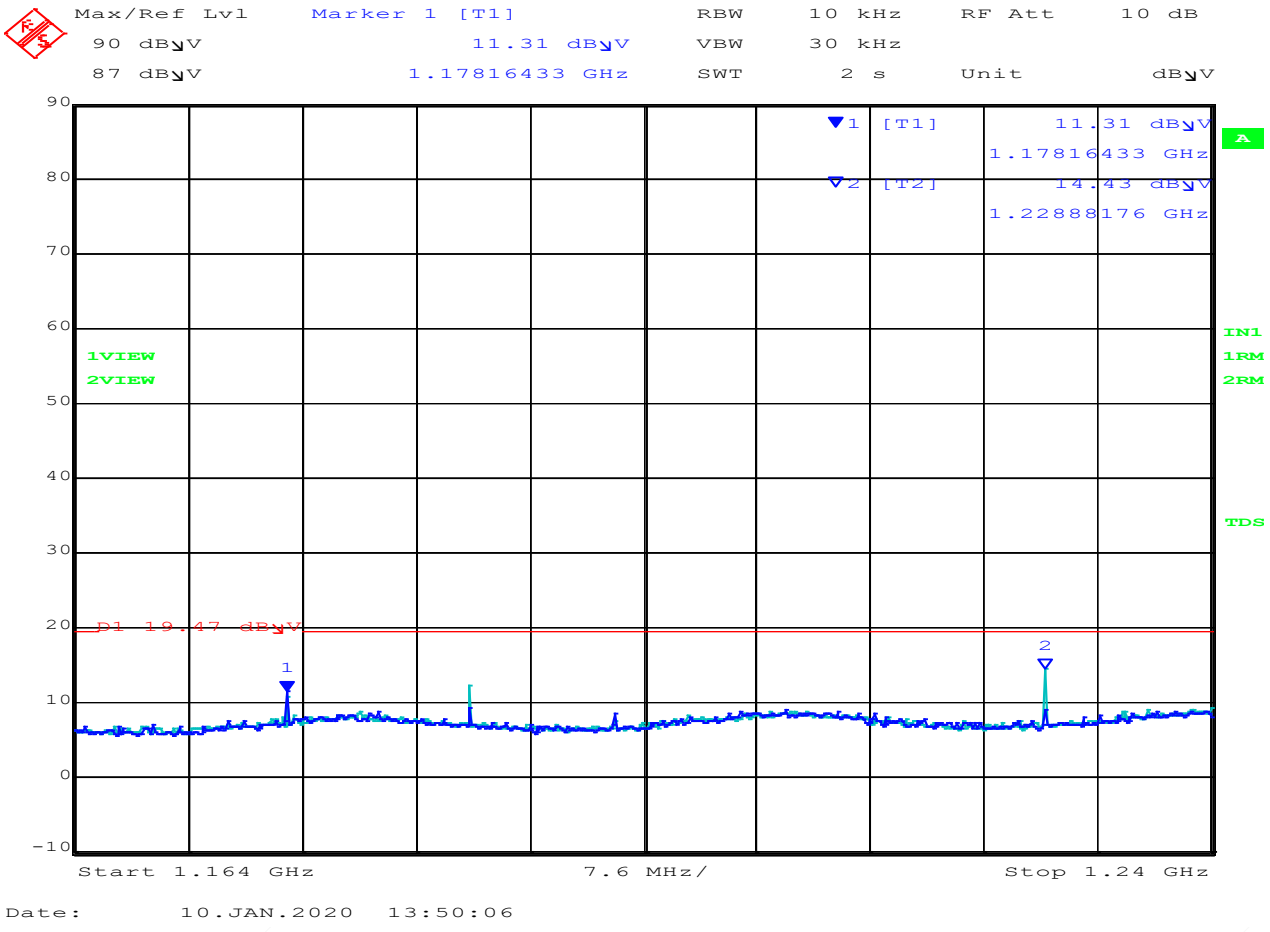
9.4.2. GPS Band Emissions

Equipment Configuration for Spurious Emissions			
Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS GPS 1.164-1.240GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



Date: 10.JAN.2020 13:50:06

1164.00-1240.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
No Signals Found within 6 dB of Limit									

Test Notes: None

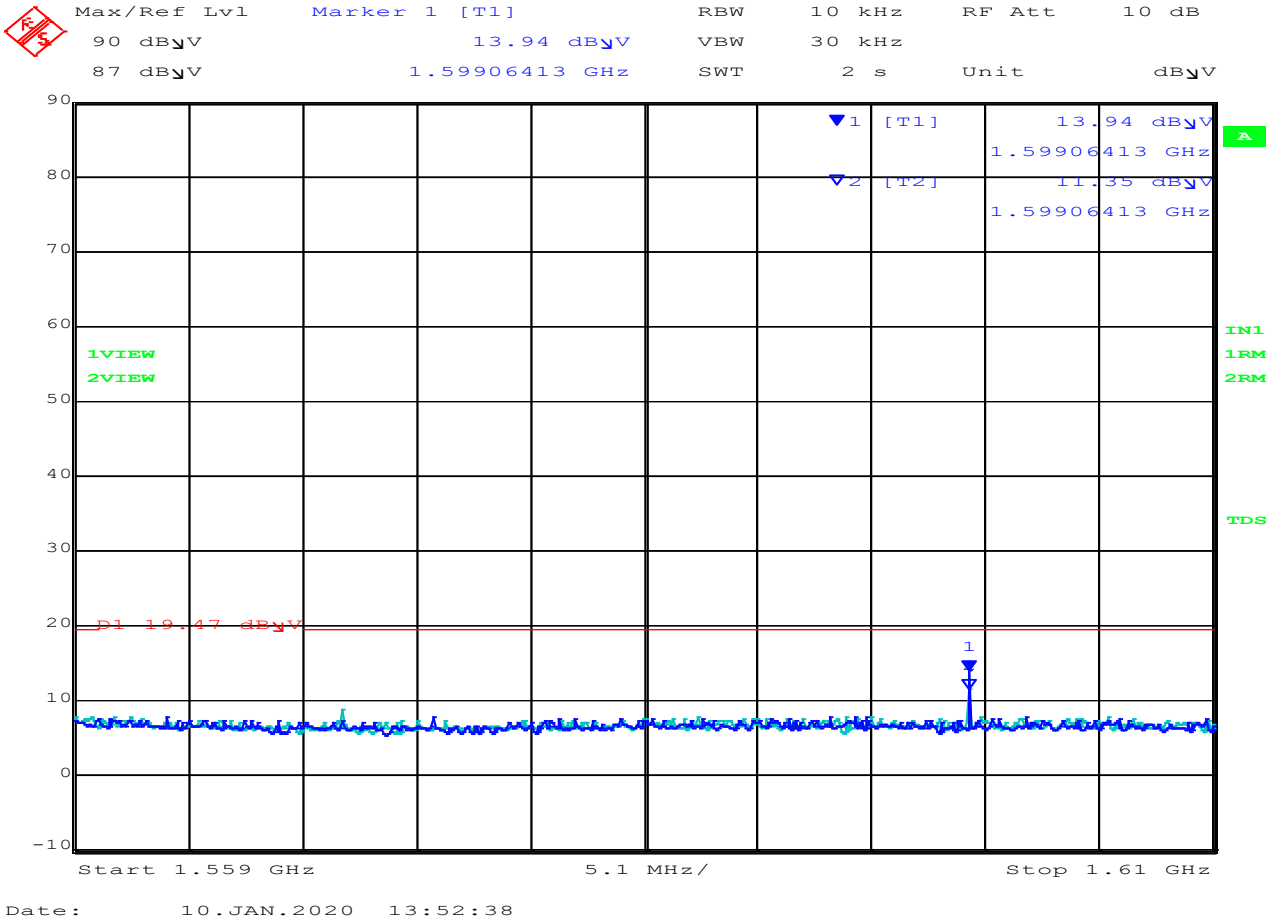
Equipment Configuration for Spurious Emissions

Antenna:	S-Parameter	**Variant:**	WB
Antenna Gain (dBi):	5.39	**Modulation:**	--
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99%
Channel Frequency (MHz):	6489.6	**Data Rate:**	
Power Setting:	Max	**Tested By:**	SB

Test Measurement Results

RADIATED SPURIOUS EMISSIONS GPS 1.559-1.61GHz

Test Freq: 6489.6 MHz, Antenna: integral, Power Setting: 14, Duty Cycle (%): 99



Date: 10.JAN.2020 13:52:38

1164.00-1240.00 MHz									
Num	**Frequency MHz**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
No Signals Found within 6 dB of Limit									

Test Notes: None

9.4. AC Mains Power Input / Output Ports

Scope

This test assesses the ability of the EUT to limit its internal noise from being present on the AC mains power input/output ports.

Test Procedure

The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

Limits

The equipment shall meet the class B limits given in FCC 15.207 & ICES-003. Alternatively, for equipment intended to be used in telecommunication centres only, the class A limits given in FCC 15B, ICES-003 may be used.

Limits for conducted disturbance at the mains ports of class B ITE

Frequency of emission (MHz)	Quasi-peak dBuV	Average dBuV
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50
Note 1	* Decreases with the logarithm of the frequency	
Note 2	* The lower limit applies at the boundary between frequency ranges	

Limits for conducted disturbance at the mains ports of class A ITE

Frequency of emission (MHz)	Quasi-peak dBuV	Average dBuV
0.15–0.5	79	66
0.5–30	73	60
Note 1	* The lower limit shall apply at the transition frequency.	

Traceability

All conducted emission measurements are traceable to national standards. The uncertainty of measurement at a confidence level of not less than 95 %, with a coverage factor of k=2, in the range 9 kHz – 30 MHz (Average & Quasi-peak) is ±2.64 dB.

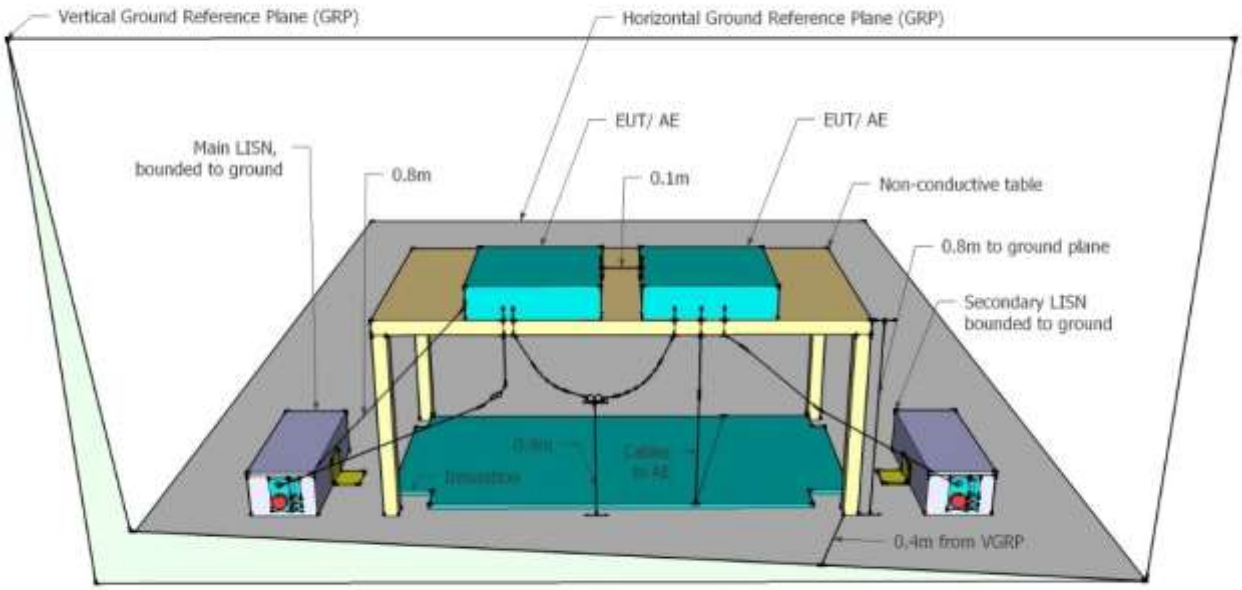
Laboratory Measurement Uncertainty	
Measurement uncertainty	±2.64 dB

Method
Measurements were made per work instruction WI-EMC-01 ‘Measurement of Conducted Emissions’

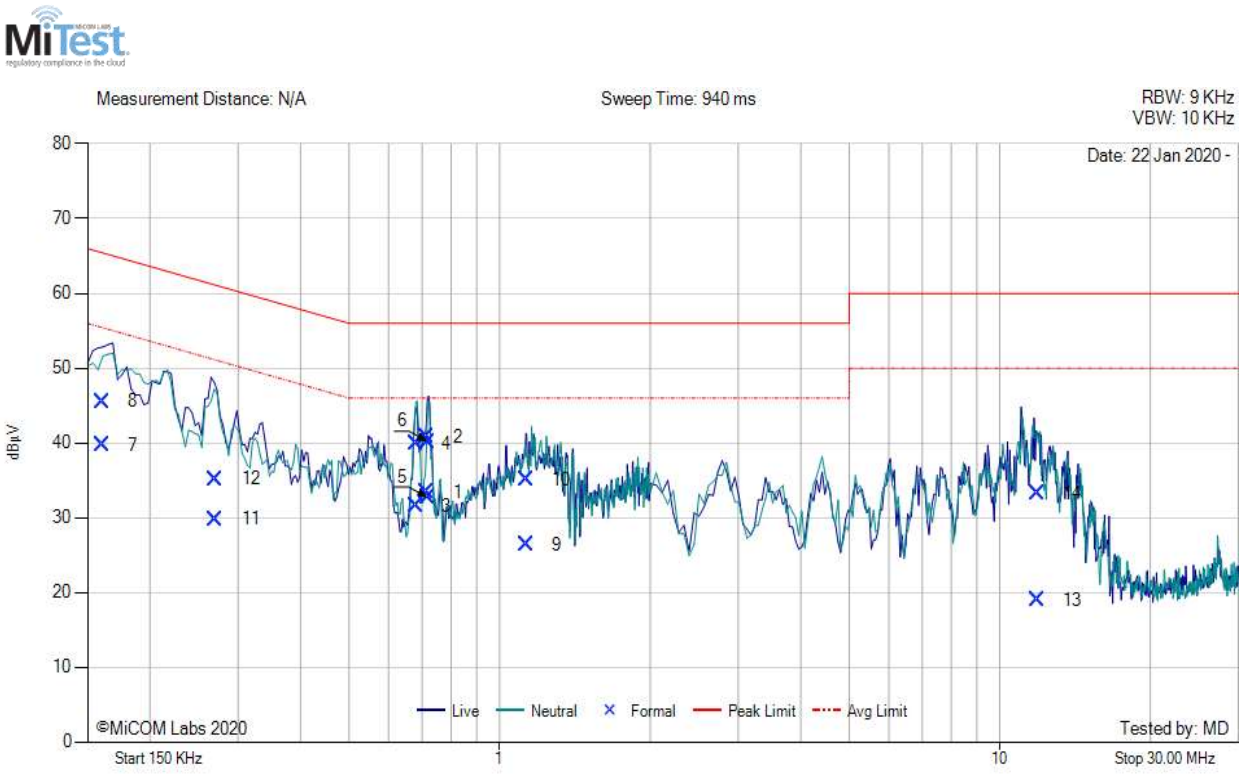
Test Equipment Utilized

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
184	Pulse Limiter	Rhode & Schwarz	ESH3Z2	357.8810.52	22 Oct 2022
190	LISN (two-line V-network)	Rhode & Schwarz	ESH3Z5	836679/006	11 Oct 2022
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2022
295	Conducted Emissions Chamber Maintenance Check	MiCOM	Conducted Emissions Chamber	295	24 Jul 2022
307	BNC-CABLE	Megaphase	1689 1GVT4	15F50B002	22 Oct 2022
316	Dell desktop computer workstation	Dell	Desktop	WS04	Not Required
372	AC Variable PS	California Instruments	1251P	L06951	Cal when used
389	LISN (3 Phase) 9kHz - 30 MHz for support equipment	Rohde & Schwarz	ESH2-Z5	881493/013	Not Required
496	MiTest Conducted Emissions test software.	MiCOM	Conducted Emissions Test Software Version 1.0	496	Not Required
510	Barometer/Thermometer	Digi Sense	68000-49	170871375	4 Jan 2023
555	Rhode & Schwarz Receiver (Firmware Version : 2.00 SP1)	Rhode & Schwarz	ESW 44	101893	28 Jun 2023
CCEMC01	Confidence Check.	MiCOM	CCEMC01	None	24 Jul 2022

Test Setup – Power Input / Output Port



Model:	VR7601	Configuration tested:	AC/DC PS
Input power:	$120V_{AC}/60_{Hz}$	Standard:	FCC 15B



Num	Frequency MHz	Raw dBµV	Cable Loss dB	Factor dB	Total Correction dBµV	Corrected Value dBµV	Measurement Type	Line	Limit dBµV/m	Margin dB	Pass /Fail
1	0.716	23.41	0.12	9.93	10.05	33.46	Max Avg	Live	46.0	-12.5	Pass
2	0.716	30.71	0.12	9.93	10.05	40.76	Max Qp	Live	56.0	-15.2	Pass
3	0.680	21.52	0.11	9.93	10.04	31.56	Max Avg	Neutral	46.0	-14.4	Pass
4	0.680	29.91	0.11	9.93	10.04	39.95	Max Qp	Neutral	56.0	-16.1	Pass
5	0.718	22.68	0.12	9.93	10.05	32.73	Max Avg	Neutral	46.0	-13.3	Pass
6	0.718	30.15	0.12	9.93	10.05	40.20	Max Qp	Neutral	56.0	-15.8	Pass
7	0.161	29.74	0.05	9.92	9.97	39.71	Max Avg	Live	55.7	-16.0	Pass
8	0.161	35.55	0.05	9.92	9.97	45.52	Max Qp	Live	65.7	-20.2	Pass
9	1.133	16.38	0.09	9.94	10.03	26.41	Max Avg	Neutral	46.0	-19.6	Pass
10	1.133	25.09	0.09	9.94	10.03	35.12	Max Qp	Neutral	56.0	-20.9	Pass
11	0.271	19.82	0.06	9.92	9.98	29.80	Max Avg	Live	52.5	-22.7	Pass
12	0.271	25.17	0.06	9.92	9.98	35.15	Max Qp	Live	62.5	-27.4	Pass
13	11.907	8.25	0.45	10.34	10.79	19.04	Max Avg	Neutral	50.0	-31.0	Pass
14	11.907	22.39	0.45	10.34	10.79	33.18	Max Qp	Neutral	60.0	-26.8	Pass

Test Notes: AC Main on PS and Vector Receiver 230v

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