



REGULATORY COMPLIANCE TEST REPORT

FCC Part 15 Subpart F 15.519
ISED RSS-220 UWB Device

Report No.: CATA18-U5 Rev A (UWB)

Company: Catapult Sports Pty Ltd

Model Name: WD-S8-08-V1



REGULATORY COMPLIANCE TEST REPORT

Company: Catapult Sports Pty Ltd

Model Name: WD-S8-08-V1

To: FCC Part 15 Subpart F 15.519 & ISED RSS-220 UWB

Test Report Serial No.: CATA18-U5 Rev A (UWB)

This report supersedes: NONE

Applicant: Catapult Sports Pty Ltd Company
10 Post Office Square, Floor 9
Boston, Massachusetts 02109
USA

Issue Date: 19th May 2025

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
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MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. TESTING ACCREDITATION

MiCOM 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 28th day of February 2024.



Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2025



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 Labs 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 Firm Designation#: US1084
Canada	Industry Canada (ISED)	FCB	APEC MRA 2	US0159 ISED#: 4143A
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	Japan MRA 2	RCB 210
	Japan Approvals Institute for Telecommunication Equipment (JATE)			
	VCCI			
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 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](http://www.a2la.org/testlaboratorynumber/2381.02) 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 28th day of February 2024.



Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2025



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	14 th February 2025	Draft report for client review.
Rev A	19 th May 2025	Initial Release

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

3. TEST RESULT CERTIFICATE

Manufacturer: Catapult Sports Pty Ltd
10 Post Office Square, Floor 9
Boston, Massachusetts 02109
USA

Tested By: MiCOM Labs, Inc.
575 Boulder Court
Pleasanton California 94566
USA

Model: WD-S8-08-V1

Telephone: +1 925 462 0304

Equipment Type: Handheld Device

Fax: +1 925 462 0306

S/N's: 000381

Test Date(s): 10th - 12th February 2025

Website: www.micomlabs.com

STANDARD(S)

**FCC CFR 47 Part 15 Subpart F 15.519
&
ISED RSS-220**

TEST RESULTS

EQUIPMENT COMPLIES

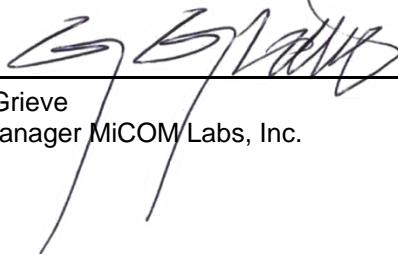
MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

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.

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	A2LA	16 th April 2024	R105 - Requirement's When Making Reference to A2LA Accreditation Status
II	ANSI C63.10	2020	American National Standard for Testing Unlicensed Wireless Devices
III	ANSI C63.4	2014 + 2017 Amendment	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
IV	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
V	M 3003	Edition 4 Oct.2019	Expression of Uncertainty and Confidence in Measurements
VI	FCC 47 CFR Part F	2018	Radio Frequency Devices; Subpart F – Ultra Wide Band Devices
VII	ISED RSS-220 (Issue 1, Amd. 1)	2018	Radio Frequency Devices; Ultra-Wide Band Devices
VIII	KDB 393764 D01 UWB FAQ v02	January 29, 2018	Ultra-Wideband (UWB) Devices frequently asked questions
IX	KDB 789033	20 th July 2021	Unlicensed Service Rules and Procedures

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 WD-S8-08-V1 FCC Part 15 Subpart F 15.519 & ISED RSS-220.
Applicant:	Catapult Sports Pty Ltd 10 Post Office Square, Floor 9 Boston, Massachusetts 02109 USA
Manufacturer:	As applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	CATA18-U5
Date EUT received:	30 th January 2025
Standard(s) applied:	FCC Part 15 Subpart F 15.519 & ISED RSS-220 UWB Device
Dates of test (from - to):	10th - 12th February 2025
No of Units Tested:	1
Product Family Name:	WD-S8-08-V1
Model(s):	WD-S8-08-V1
Location for use:	Indoor and Outdoors
Declared Frequency Range(s):	6489.60 MHz, 7987.2 MHz;
Type of Modulation:	BPM/BPSK
EUT Modes of Operation:	WB
Declared Nominal Output Power (dBm):	-41.3 dBm
Rated Input Voltage and Current:	3.7 VDC 0.5 A
Operating Temperature Range:	0C to + 50C
Equipment Dimensions:	81.88mm x 44.78mm x 16.3mm
Weight:	56.4g
Hardware Rev:	B1
Software Rev:	V0.3.2
Product Application:	Handheld

5.2. Scope Of Test Program

Catapult Sports Pty Ltd Company

The scope of the test program was to test the Catapult Sports Pty Ltd Company WD-S8-08-V1 for compliance against the following specifications:

FCC CFR 47 Part 15 Subpart F – 15.519, 15.521

Compliance Measurement Procedures for Unlicensed National Information Infrastructure devices operating in the 3100 - 10600 MHz bands.

ISED RSS-220

Compliance Measurement Procedures for Unlicensed National Information Infrastructure devices operating in the 4750 - 10600 MHz bands.

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

Type (EUT/ Support)	Equipment Description	Manufacturer	Model No.	Serial No.
EUT	Mobile & Portable Client Device	Catapult Sports Pty Ltd	WD-S8-08-V1	000381

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
Integral	AntennaWare	AW-BW-6580D11	SMD mounted antenna	2.8	0	Omnidirectional	-1dB	6250 – 6750
Integral	AntennaWare	AW-BW-6580D11	SMD mounted antenna	2.3	0	Omnidirectional	-1dB	7750-8250

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

5.5. Cabling and I/O Ports

1. NONE

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
WB	--	6489.6	--	7987.2

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

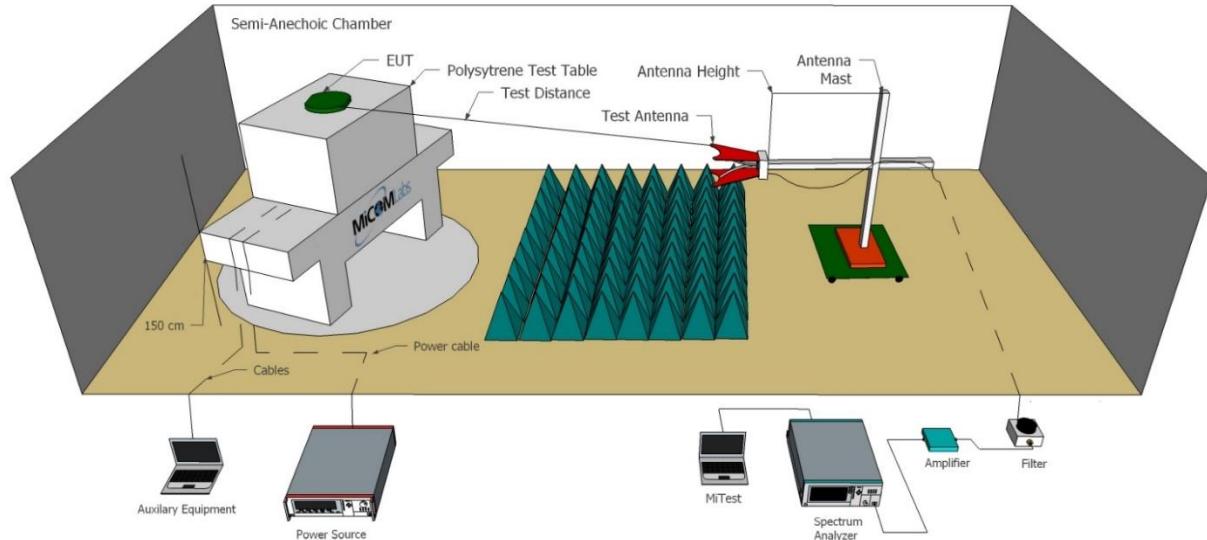
Test Header	Result	Data Link
WB Bandwidth	Complies	View Data
Average Output Power	Complies	View Data
Peak Power Density	Complies	View Data
Spurious Radiated Emissions	Complies	View Data
Spurious Radiated Emissions in GPS Bands	Complies	View Data
Shutdown Timing Requirements	Complies	View Data
Comments: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

7. TEST EQUIPMENT CONFIGURATION(S)

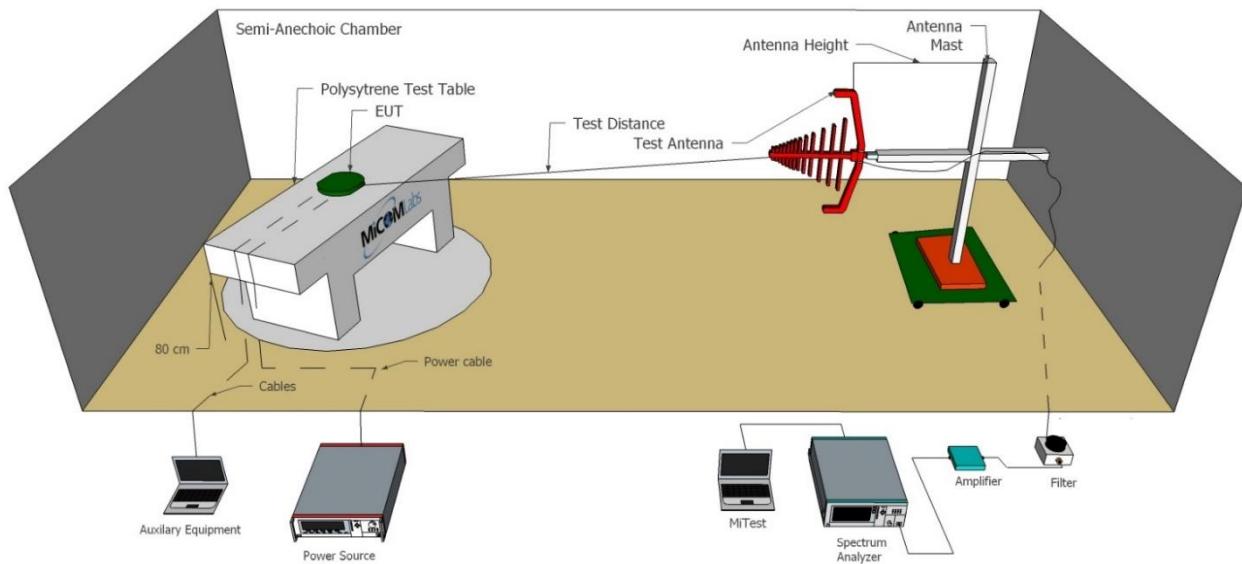
7.1. Radiated Emissions - 3m Chamber

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
266	10 Hz to 50GHz MXA Signal Analyzer	Keysight	N9020B	MY60110791	25 Jul 2025
298	3M Radiated Emissions Chamber Maintenance Check	MiCOM	3M Chamber	298	11 Mar 2025
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	7 Dec 2025
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	5 Dec 2025
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	29 Sep 2025
382	Tunable Notch Filter	Wainwright Instruments GmbH	WRCT800/960-0.2/40-8EEK	64	Cal when used
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	27 Feb 2025
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	7 Dec 2025
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	2 Apr 2025
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
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	18 Apr 2025
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	18 Apr 2025
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	16 Apr 2025
465	Low Pass Filter DC-1000 MHz	Mini-Circuits	NLP-1200+	VUU01901402	14 Apr 2025

480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	18 Apr 2025
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	18 Apr 2025
510	Barometer/Thermometer	Digi Sense	68000-49	170871375	4 Jan 2026
554	Precision SMA Cable	Fairview Microwave	SCE18060101-400CM	554	18 Apr 2025
555	Rhode & Schwarz Receiver (Firmware Version : 3.10 SP1)	Rhode & Schwarz	ESW 44	101893	28 Jun 2025
701	DC Power Supply	Keysight	E36155A	MY63000671	6 Nov 2025
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used
CC05	Confidence Check	MiCOM	CC05	None	5 Mar 2025

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

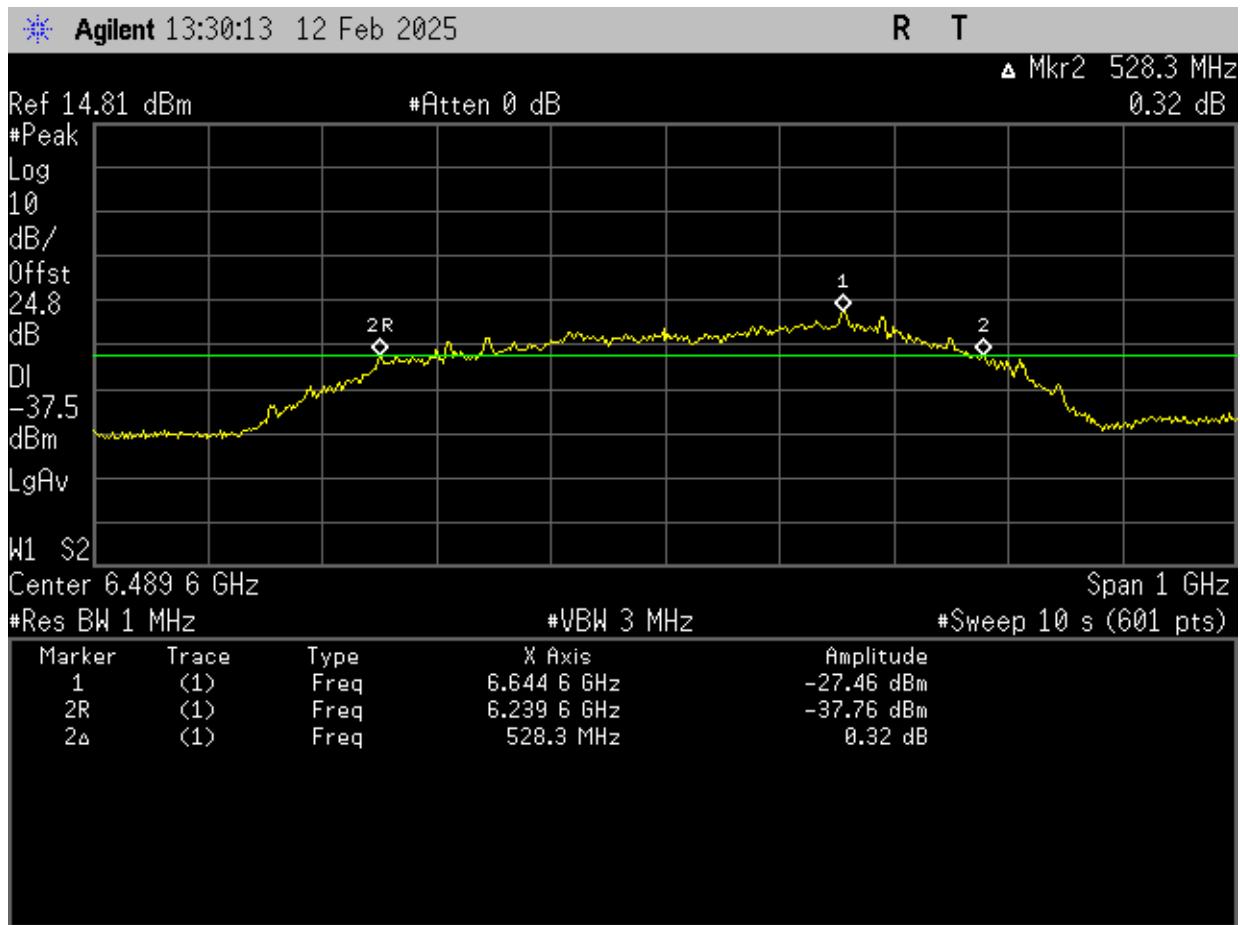
9.1. WB Bandwidth

Conducted Test Conditions for WB Bandwidth						
Standard:	FCC Part 15 Subpart F 15.519 & ISED RSS-220 UWB Device	Ambient Temp. (°C):	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)	Pressure (mBars):	999 - 1001			
Reference Document(s):	See Normative References					
Test Procedure for WB Bandwidth Measurement The WB Bandwidth is measured radiated, at a 1-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 (%):	99
Data Rate:	--	Antenna Gain (dBi):	4.28
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 Frequencies (MHz)	
		Lowest	Highest
6489.60	528.3	6225.45	6753.75



Traceability to Industry Recognized Test Methodologies

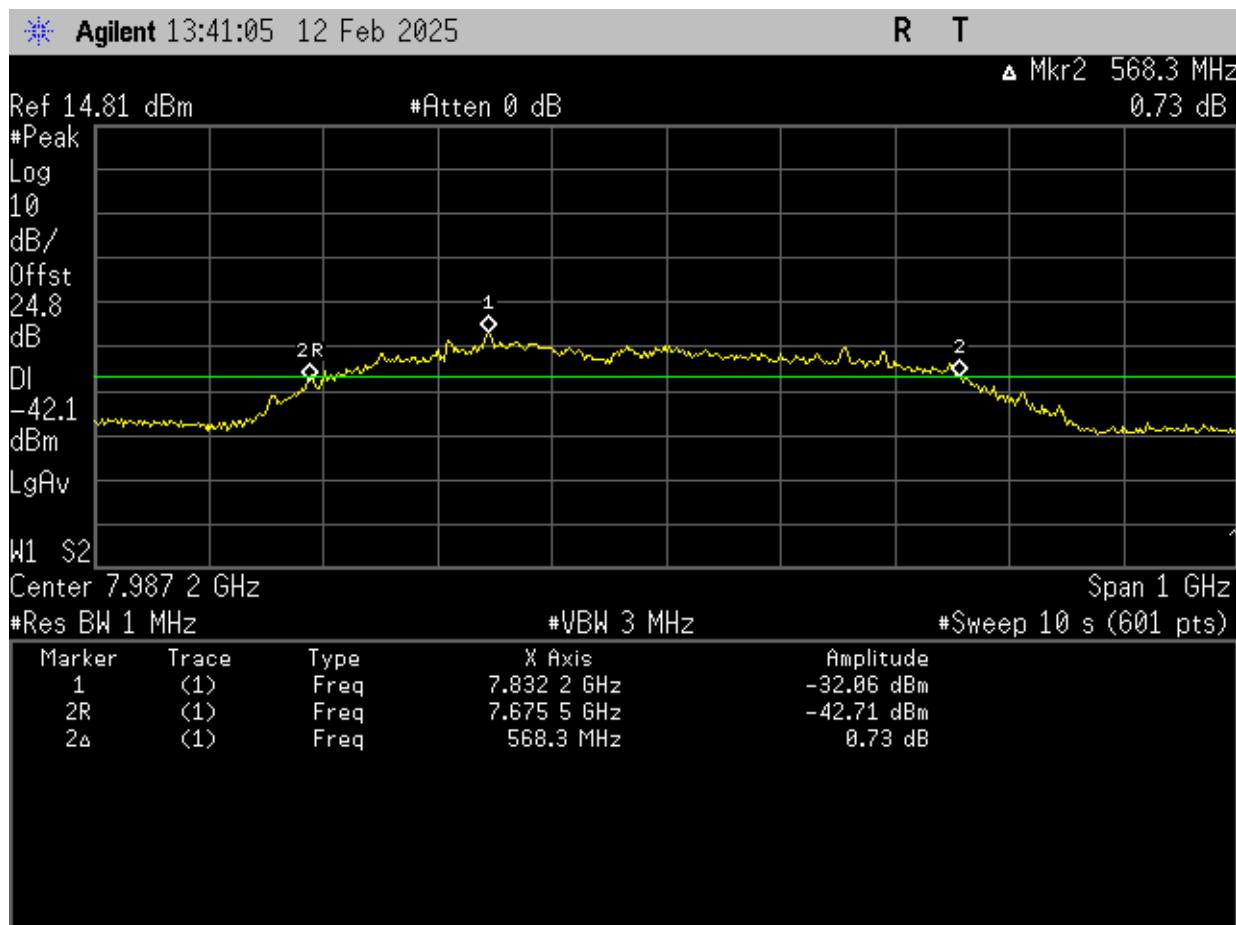
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

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

Equipment Configuration for WB Bandwidth

Variant:	WB	Duty Cycle (%):	99
Data Rate:	--	Antenna Gain (dBi):	7.65
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 Frequencies (MHz)	
		Lowest	Highest
MHz	Port A		
7987.2	568.30	7703.05	8271.35



Traceability to Industry Recognized Test Methodologies

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 Part 15 Subpart F 15.519 & ISED RSS-220 UWB Device	Ambient Temp. (°C):	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	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.

Operating Frequency Band:
4750-10600 MHz

Limits Maximum EIRP (dBm)

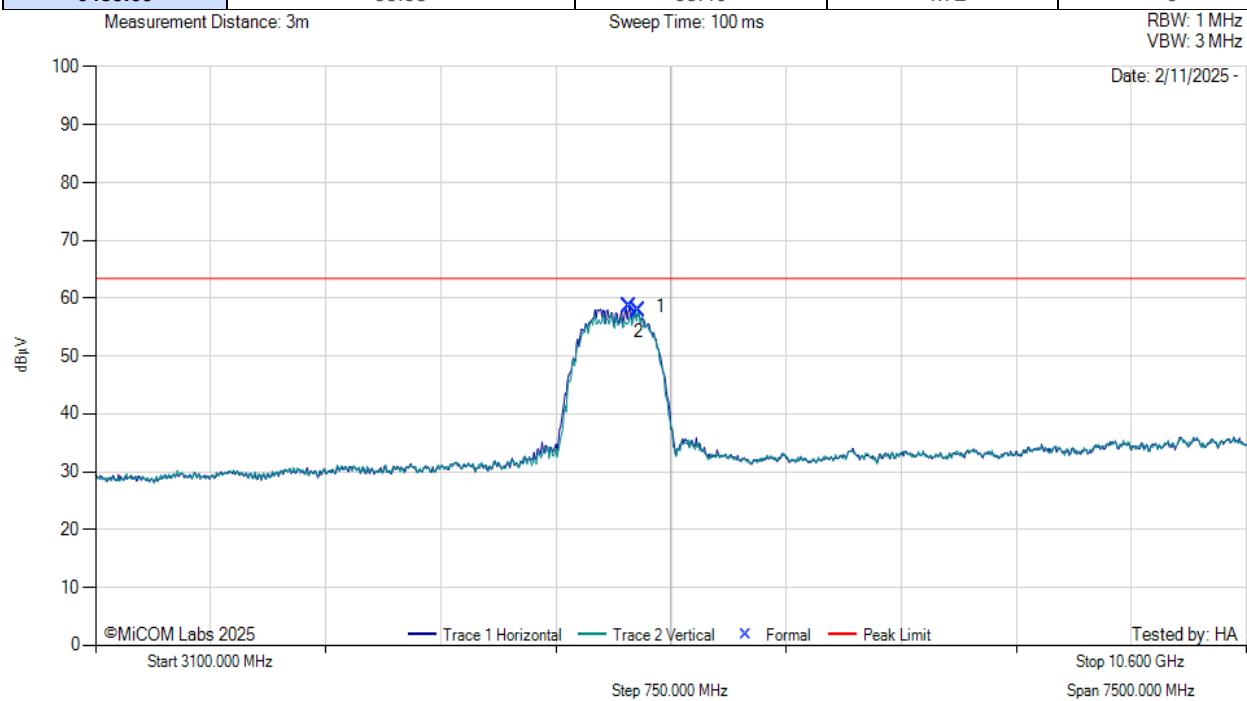
Frequency (MHz)	EIRP Limit (dBm)	EIRP at 3 Meters (dBuv/m)	EIRP at 1 Meter (dBuv/m)
4750 - 10600	-41.3	53.9	63.4

Equipment Configuration for RF Output Power

Variant:	WB	Duty Cycle (%):	99
Data Rate:	--	Antenna Gain (dBi):	4.28
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 (dB μ V/m)	Limit (dB μ V/n)	Margin (dB)	EUT Power Setting
6489.60	58.68	63.40	-4.72	9



3100.00 - 10600.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	6580.00	65.86	3.41	35.68	58.68	AVG	Horizontal	149	60	63.4	-4.7	Pass	
2	6640.00	65.00	3.41	35.68	57.82	AVG	Vertical	149	330	63.4	-5.6	Pass	

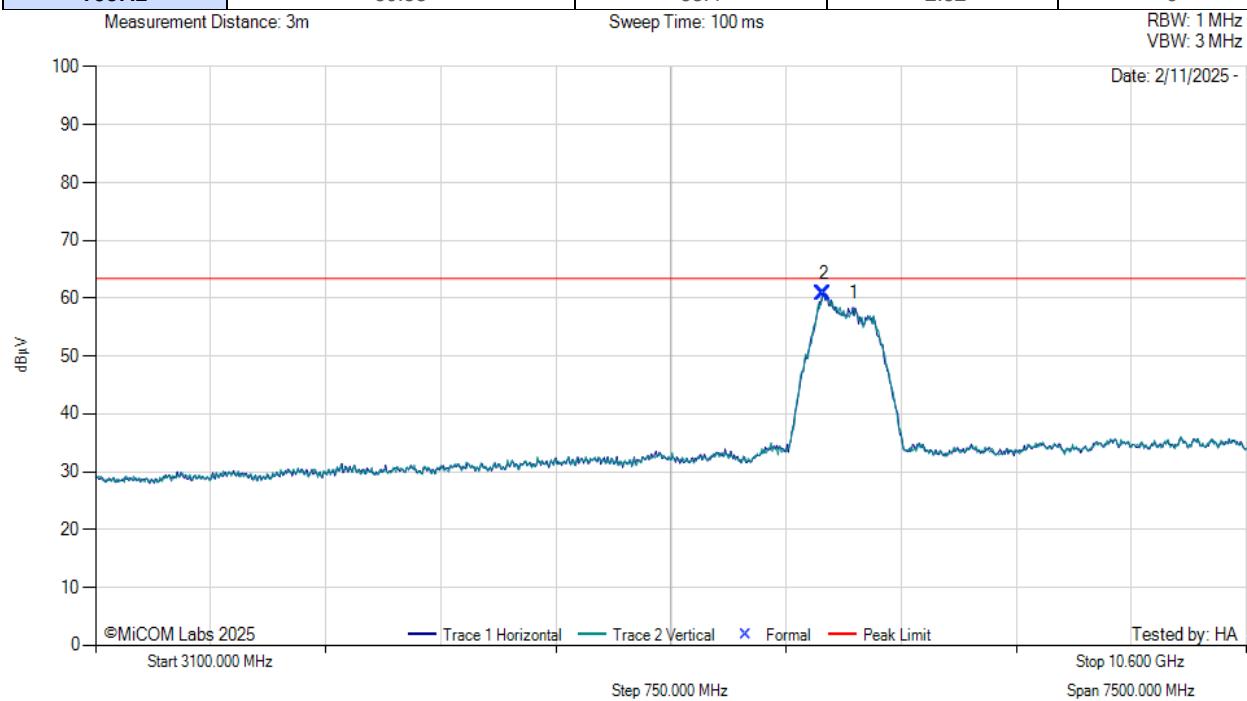
Test Notes: Channel 5 6489.6, power setting 9 (58 8 bit integer) 1 Meter distance

Equipment Configuration for RF Output Power

Variant:	WB	Duty Cycle (%):	99
Data Rate:	--	Antenna Gain (dBi):	7.65
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 (dB μ V/m)	Limit (dB μ V/n)	Margin (dB)	EUT Power Setting
7987.2	60.88	63.4	-2.52	9



3100.00 - 10600.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	7840.00	66.80	3.84	35.88	60.88	AVG	Horizontal	149	330	63.4	-2.5	Pass	
2	7847.50	66.73	3.84	35.88	60.82	AVG	Vertical	149	330	63.4	-2.6	Pass	

Test Notes: Channel 9 7987.2, power setting 9 (58 8 bit integer) 1 Meter distance

9.3. Peak Power Density

Test Conditions for Maximum Peak Power Density			
Standard:	FCC Part 15 Subpart F 15.519 & ISED RSS-220 UWB Device	Ambient Temp. (°C):	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	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.

If measurements were gathered with a RBW less than 50MHz then formula below was used to convert to the correct limit. (example shown is 1MHz):

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

dBuv/m to EIRP

$$\text{EIRP} = E + 20 \cdot \log(d/m) - 104.77 \text{ (see FCC KDB 789033)}$$

Where:

E = Field Strength

D = Distance in Meters

Operating Frequency Band:

4750-10600 MHz

Limits Maximum EIRP (dBm)

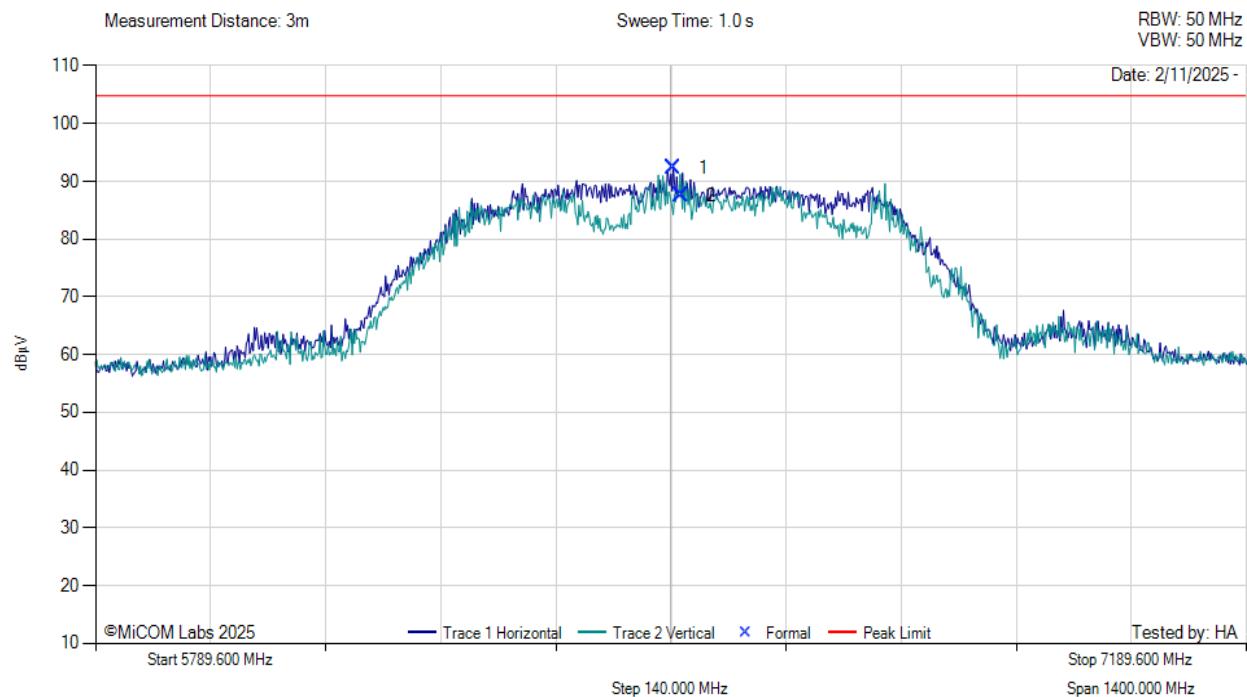
Frequency (MHz)	EIRP Limit (dBm/50MHz)	EIRP at 1 Meters (dBuv/m) (50MHz RBW)	EIRP at 1 Meters (dBuv/m) (30MHz RBW)
4750 - 10600	0	104.77	100.77

Equipment Configuration for Peak Power Density

Variant:	WB	Duty Cycle (%):	99
Data Rate:	--	Antenna Gain (dBi):	4.28
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 (dB μ V/m)	Limit (dB μ V/n)	Margin (dB)	EUT Power Setting
6489.60	92.28	104.8	-12.52	9



5789.600 - 7189.600 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	6492.40	99.58	3.41	-8.92	92.28	MaxP	Horizontal	149	59	104.8	-12.5	Pass	
2	6502.20	94.83	3.41	-8.92	87.53	MaxP	Vertical	149	330	104.8	-17.2	Pass	

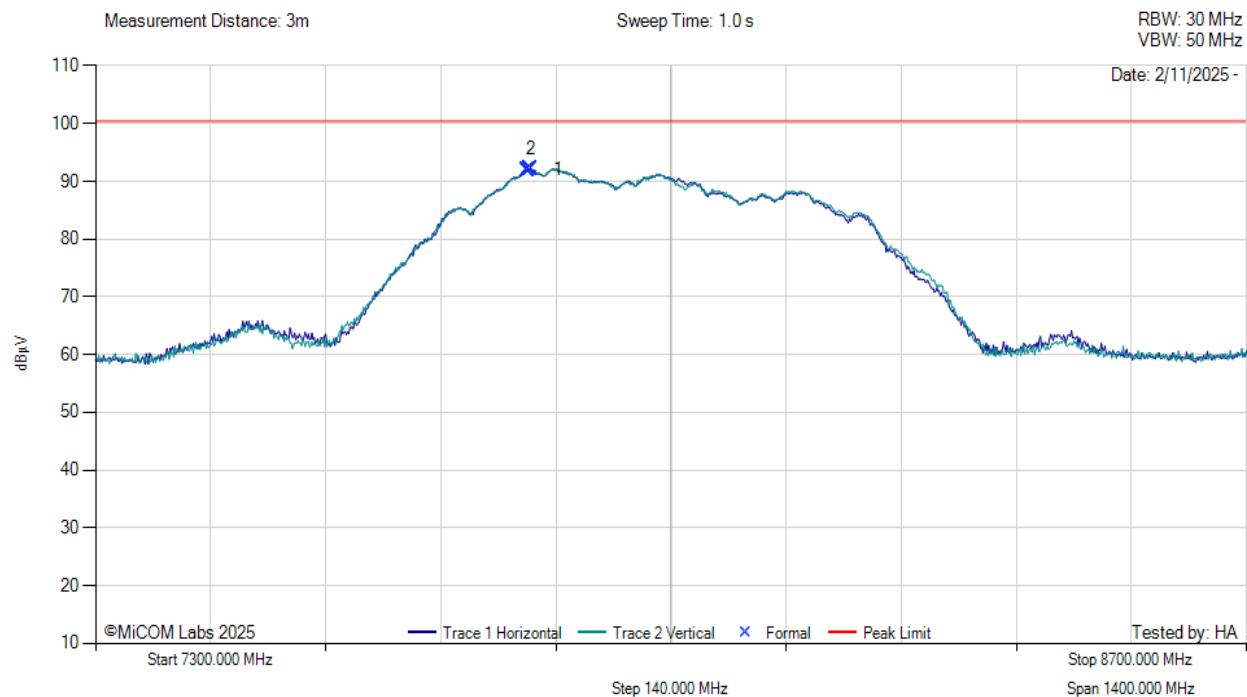
Test Notes: Channel 5 6489.6, power setting 9 (58 8 bit integer) 1 Meter distance

Equipment Configuration for RF Output Power

Variant:	WB	Duty Cycle (%):	99
Data Rate:	--	Antenna Gain (dBi):	7.65
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 (dB μ V/m)	Limit (dB μ V/n)	Margin (dB)	EUT Power Setting
7987.2	92.05	100.77	-8.72	9



7300.00 - 8700.00 MHz												
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail
1	7826.40	97.12	3.82	-8.05	91.98	MaxP	Vertical	149	330	100.4	-8.4	Pass
2	7829.20	98.08	3.82	-8.05	92.05	MaxP	Horizontal	149	330	100.4	-8.4	Pass

Test Notes: Channel 9 7987.2, power setting 9 (58 8 bit integer) 1 Meter distance

9.4. Transmitter Spurious Band Emissions

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions			
Standard:	FCC Part 15 Subpart F 15.519, 15.521 & ISED RSS-220 UWB Device	Ambient Temp. (°C):	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	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 1-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.

Limits for Restricted Bands (15.205, 15.209)

Peak emission: 68.23 dBuV/m

Average emission: 54 dBuV/m

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

FCC 15.519(c) 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	-75.3	29.4
1610	1990	-63.3	41.4
1990	3100	-61.3	43.4
3100	10600	-41.3	63.4
10600	18000	-61.3	43.4

IC RSS-220 5.3.1 (d) 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	-75.3	29.4
1610	4750	-70.0	34.7
4750	10600	-41.3	63.4
10600	18000	-61.3	43.4

Radiated Spurious Emissions in the GPS Bands FCC 15.519 (d) & IC RSS-220 5.3.1 (e)

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 FCC 15.519 (e) & IC RSS-220 (g)

Within 50 MHz bandwidth centered on highest radiated emissions f_M , Limit is 0.0 dBm EIRP. At 1-meter distance the equivalent level is 104.77 dBuV/m

No Emissions in the ranges of 18GHz – 40GHz were observed.

9.4.1. Transmitter Spurious Emissions

9.4.1.1. 30MHz to 1GHz

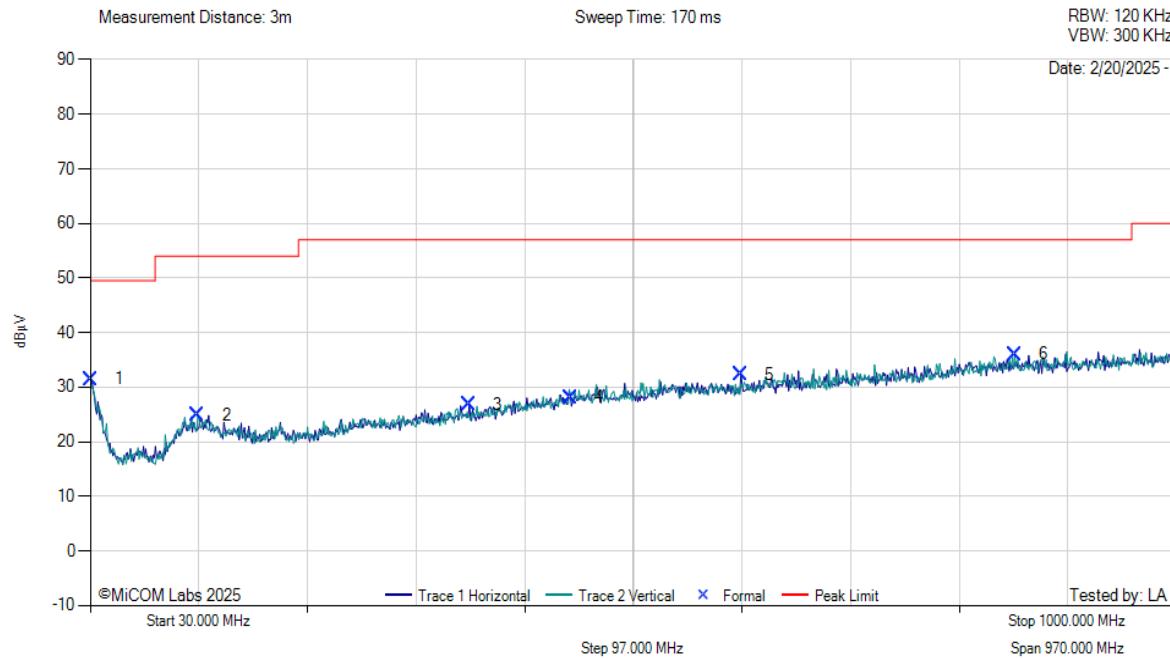
Equipment Configuration for 30 MHZ TO 1 GHZ CLASS A

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	6489.6	Data Rate:	--
Power Setting:	28.0	Tested By:	LA

Test Measurement Results



30 MHz to 1 GHz Class A



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	30.00	31.31	3.52	28.41	31.45	MaxP	Horizontal	100	210	49.5	-18.1	Pass	
2	126.03	31.97	4.22	-11.30	24.90	MaxP	Vertical	149	210	54.0	-29.1	Pass	
3	368.53	31.23	5.25	-9.65	26.83	MaxP	Horizontal	149	240	57.0	-30.2	Pass	
4	458.74	30.02	5.56	-7.46	28.12	MaxP	Vertical	100	59	57.0	-28.9	Pass	
5	611.03	31.79	6.05	-5.50	32.34	MaxP	Horizontal	199	240	57.0	-24.7	Pass	
6	855.47	31.59	6.78	-2.36	36.02	MaxP	Vertical	100	119	57.0	-21.0	Pass	

Test Notes: Battery Powered

9.4.1.2. FCC 15.519

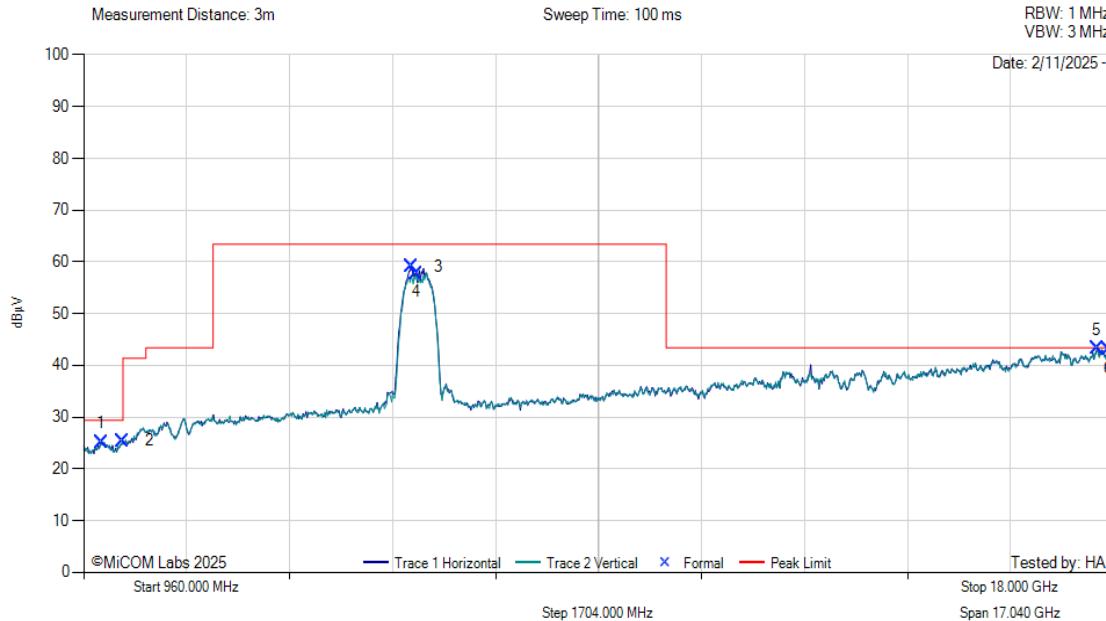
Equipment Configuration for FCC SPURIOUS 960 MHZ - 18 GHZ 1M

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	6489.6	Data Rate:	--
Power Setting:	9	Tested By:	HA

Test Measurement Results



FCC Spurious 960 MHz - 18 GHz 1M



960.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	1249.68	41.63	1.44	-16.10	25.17	AVG	Horizontal	149	180	29.4	-4.2	Pass	
2	1607.52	41.82	1.61	-16.25	25.39	AVG	Vertical	149	269	29.4	-4.0	Pass	
3	6378.72	66.30	3.35	-8.78	59.07	AVG	Horizontal	149	58	63.4	-4.3	Pass	
4	6463.92	64.96	3.35	-8.78	57.73	AVG	Vertical	149	328	63.4	-5.7	Pass	
5	17727.36	38.25	6.35	0.40	43.21	AVG	Horizontal	149	300	43.4	-0.2	Pass	
6	17914.80	36.81	6.68	1.28	42.97	AVG	Vertical	149	269	43.4	-0.4	Pass	

Test Notes: Channel 5 6489.6, power setting 9 (58 8 bit integer) 1 Meter distance

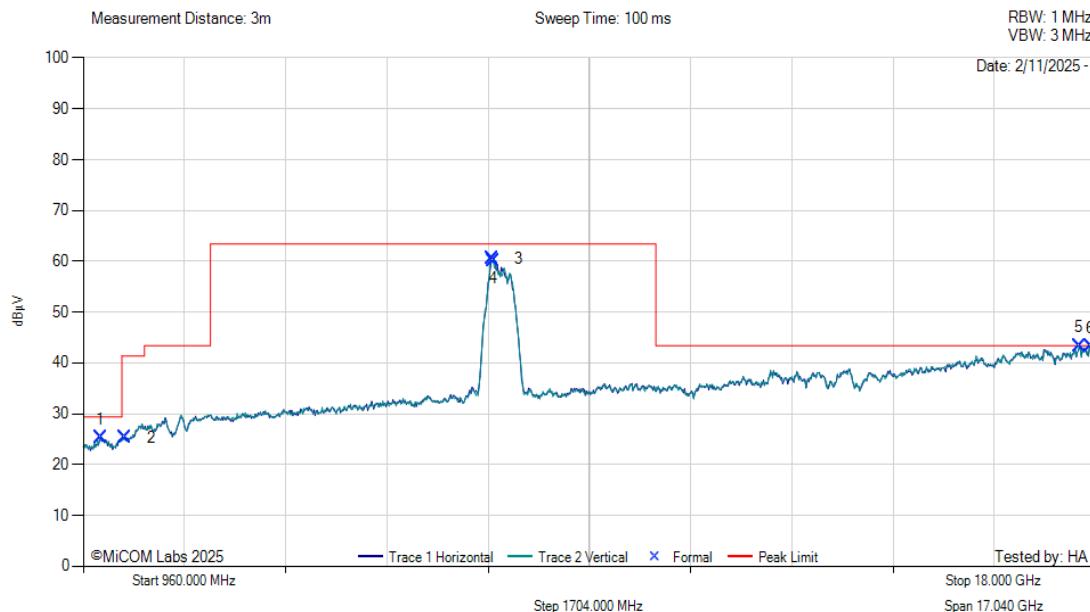
Equipment Configuration for FCC SPURIOUS 960 MHZ - 18 GHZ 1M

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	7987.2	Data Rate:	--
Power Setting:	9	Tested By:	HA

Test Measurement Results



FCC Spurious 960 MHz - 18 GHz 1M



960.00 - 18000.00 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	1249.68	41.79	1.44	-16.10	25.33	AVG	Horizontal	149	270	29.4	-4.1	Pass	
2	1658.64	41.39	1.65	-15.90	25.34	AVG	Vertical	149	59	41.4	-16.1	Pass	
3	7844.16	66.29	3.85	-7.78	60.57	AVG	Vertical	149	330	63.4	-2.8	Pass	
4	7861.20	65.91	3.85	-7.78	60.19	AVG	Horizontal	149	330	63.4	-3.2	Pass	
5	17727.36	39.45	6.68	1.28	43.40	AVG	Vertical	149	330	43.4	0.0	Pass	
6	17914.80	37.05	6.68	1.28	43.21	AVG	Horizontal	149	210	43.4	-0.2	Pass	

Test Notes: Channel 9 7987.2, power setting 9 (58 8 bit integer) 1 Meter distance

9.4.1.3. ISED RSS-220

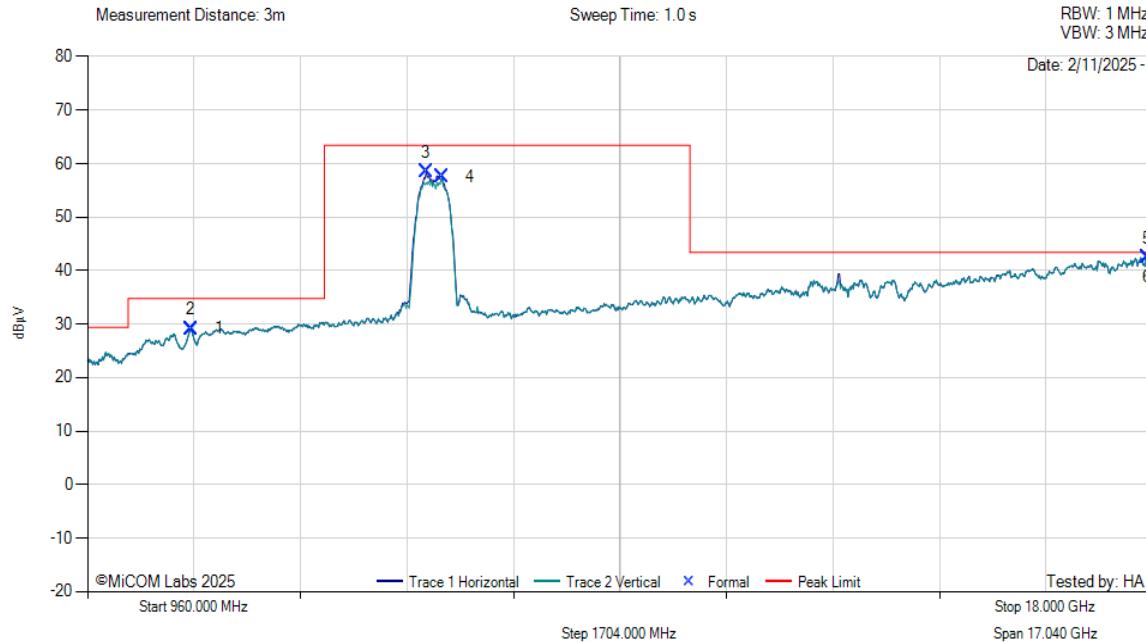
Equipment Configuration for TX SPURIOUS 960 MHZ - 18 GHZ 1M

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	6489.6	Data Rate:	--
Power Setting:	9	Tested By:	HA

Test Measurement Results



TX Spurious 960 MHz - 18 GHz 1M



960.00 - 18000.00 MHz

Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail
1	2612.88	40.56	2.09	-11.69	29.16	AVG	Vertical	149	119	34.8	-5.6	Pass
2	2612.88	40.57	2.09	-11.69	29.18	AVG	Horizontal	149	300	34.8	-5.6	Pass
3	6378.72	65.67	3.35	-8.78	58.44	AVG	Horizontal	149	60	63.4	-5.0	Pass
4	6634.32	64.73	3.35	-8.78	57.50	AVG	Vertical	149	330	63.4	-5.9	Pass
5	17914.80	36.34	6.68	1.28	42.50	AVG	Horizontal	149	300	43.4	-0.9	Pass
6	17914.80	36.28	6.68	1.28	42.43	AVG	Vertical	149	0	43.4	-1.0	Pass

Test Notes: Channel 5 6489.6, power setting 9 (58 8 bit integer) 1 Meter distance

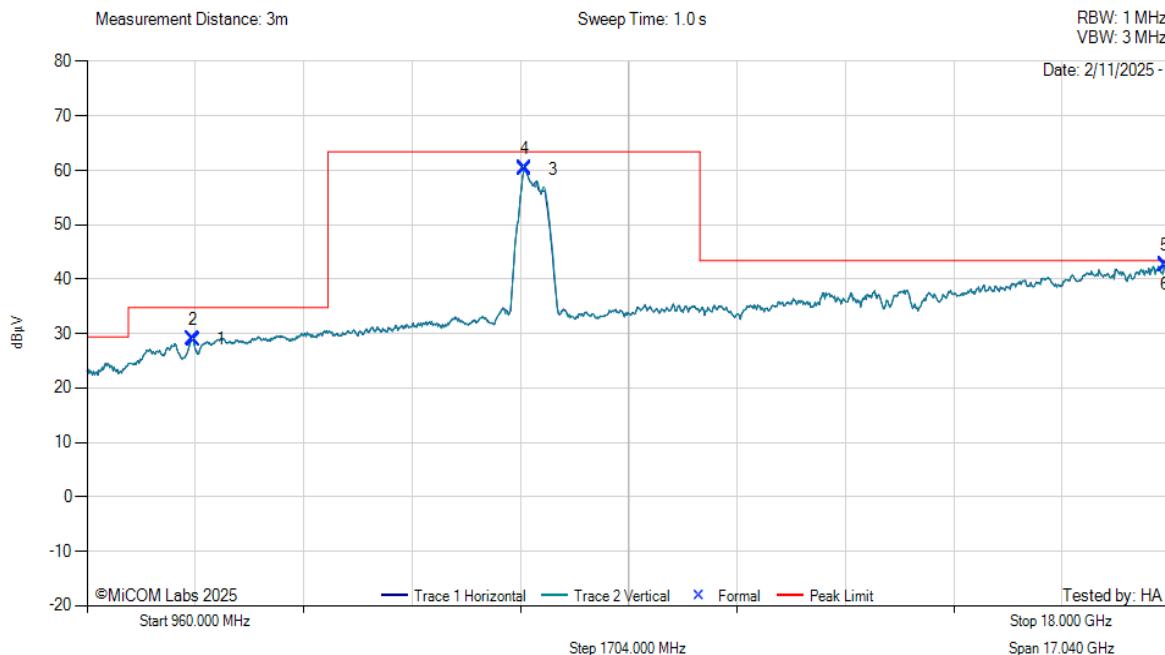
Equipment Configuration for HANDHELD TX SPURIOUS 960 MHZ - 18 GHZ 1M

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	7987.2	Data Rate:	--
Power Setting:	9	Tested By:	HA

Test Measurement Results



Handheld TX Spurious 960 MHz - 18 GHz 1M



960.00 - 18000.00 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	2612.88	40.41	2.09	-11.69	29.02	AVG	Vertical	149	29	34.8	-5.8	Pass
2	2629.92	40.33	2.05	-11.68	28.89	AVG	Horizontal	149	30	34.8	-5.9	Pass
3	7844.16	66.10	3.85	-7.92	60.24	AVG	Horizontal	149	330	63.4	-3.2	Pass
4	7844.16	66.33	3.85	-7.92	60.47	AVG	Vertical	149	330	63.4	-3.0	Pass
5	17914.80	36.55	6.68	1.28	42.71	AVG	Horizontal	149	180	43.4	-0.7	Pass
6	17914.80	36.43	6.68	1.28	42.59	AVG	Vertical	149	90	43.4	-0.8	Pass

Test Notes: Channel 9 7987.2, power setting 9 (58 8 bit integer) 1 Meter distance

9.4.2. GPS Band Emissions

9.4.2.4. 1164 MHz - 1240 MHz

Equipment Configuration for FCC GPS SPURIOUS 1164 MHZ - 1240 MHZ 1M

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	6489.6	Data Rate:	--
Power Setting:	9	Tested By:	HA

Test Measurement Results



FCC GPS Spurious 1164 MHz - 1240 MHz 1M



1164.00 - 1240.00 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	1214.77	27.10	1.40	-16.53	10.17	AVG	Horizontal	149	180	19.5	-9.3	Pass	
2	1235.06	27.10	1.43	-16.29	10.44	AVG	Vertical	149	239	19.5	-9.1	Pass	

Test Notes: Channel 5 6489.6, power setting 9 (58 8 bit integer) 1 Meter distance

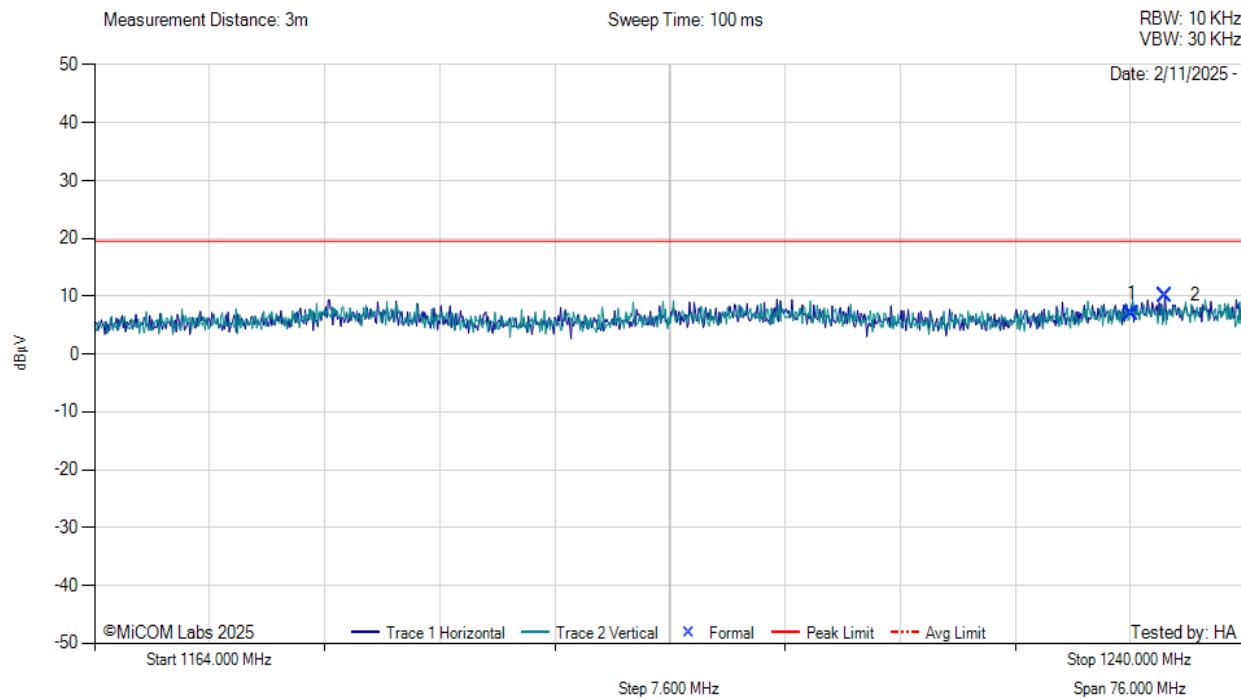
Equipment Configuration for FCC GPS SPURIOUS 1164 MHZ - 1240 MHZ 1M

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	7987.2	Data Rate:	--
Power Setting:	9	Tested By:	HA

Test Measurement Results



FCC GPS Spurious 1164 MHz - 1240 MHz 1M



1164.00 - 1240.00 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	1232.48	23.60	1.43	-16.33	6.89	AVG	Vertical	149	0	19.5	-12.6	Pass	
2	1234.68	26.84	1.43	-16.30	10.17	AVG	Horizontal	149	330	19.5	-9.3	Pass	

Test Notes: Channel 9 7987.2, power setting 9 (58 8 bit integer) 1 Meter distance

9.4.2.5. 1559 MHz - 1610 MHz

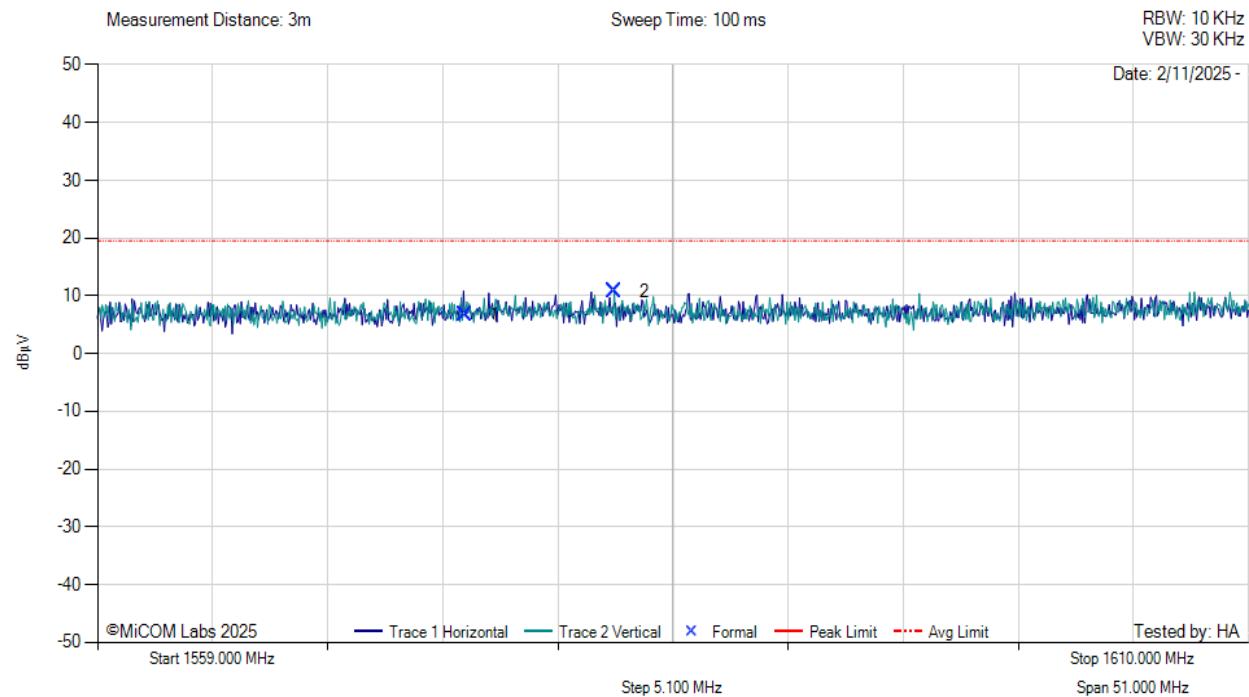
Equipment Configuration for FCC GPS SPURIOUS 1559 MHZ - 1610 MHZ 1M

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	6489.6	Data Rate:	--
Power Setting:	9	Tested By:	HA

Test Measurement Results



FCC GPS Spurious 1559 MHz - 1610 MHz 1M



1559.00 - 1610.00 MHz												
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail
1	1575.27	23.45	1.62	-16.54	6.72	AVG	Horizontal	149	210	19.5	-12.8	Pass
2	1581.90	27.55	1.59	-16.51	10.83	AVG	Vertical	149	179	19.5	-8.7	Pass

Test Notes: Channel 5 6489.6, power setting 9 (58 8 bit integer) 1 Meter distance

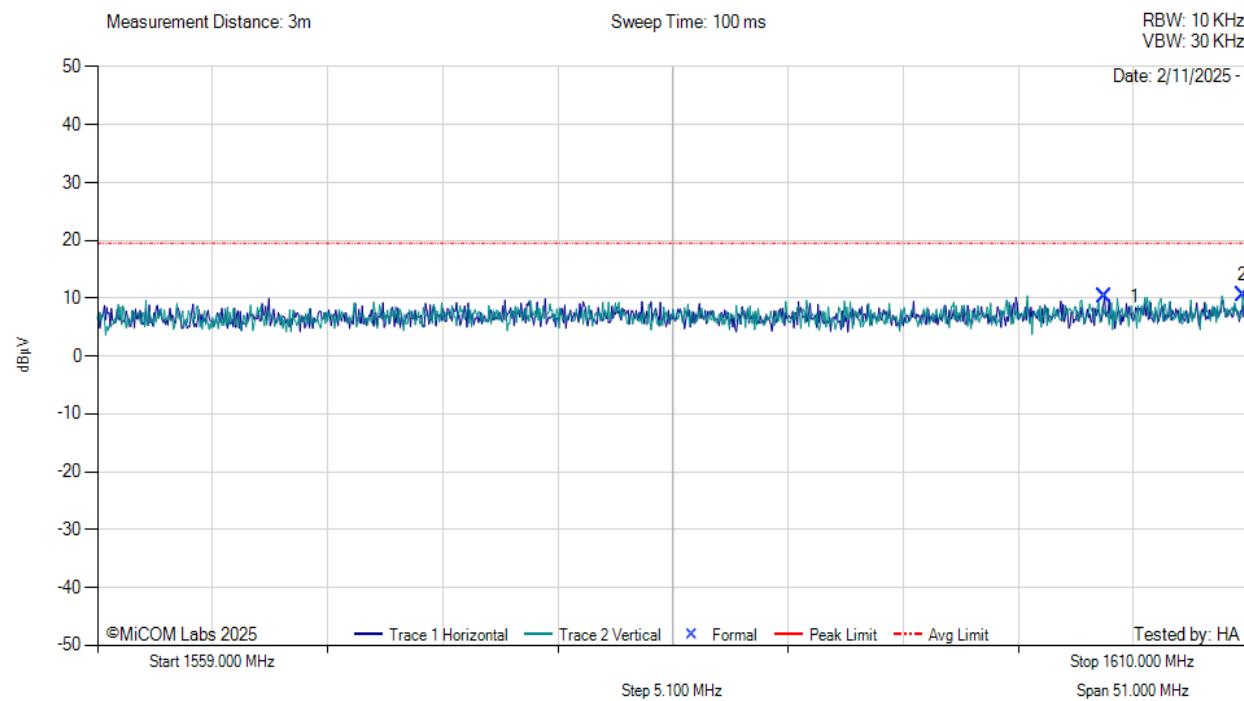
Equipment Configuration for FCC GPS SPURIOUS 1559 MHZ - 1610 MHZ 1M

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99
Channel Frequency (MHz):	7987.2	Data Rate:	--
Power Setting:	9	Tested By:	HA

Test Measurement Results



FCC GPS Spurious 1559 MHz - 1610 MHz 1M



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	1603.63	26.79	1.62	-16.29	10.32	AVG	Horizontal	149	270	19.5	-9.2	Pass
2	1609.75	27.00	1.61	-16.23	10.58	AVG	Vertical	149	59	19.5	-8.9	Pass

Test Notes: Channel 9 7987.2, power setting 9 (58 8 bit integer) 1 Meter distance

9.4. Shutoff Timing Requirements

Radiated Test Conditions for Shutoff Timing Requirements			
Standard:	FCC CFR 47:15.519 (a)(1) ISED RSS-220 5.3.1(b)	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	Shutoff Timing Requirements	Rel. Humidity (%):	32 - 45
Standard Section(s):	ANSI C63.10 Section 10.3.6	Pressure (mBars):	999 - 1001
Reference Document(s):	None		

Test Procedure for UWB 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.

Limits
The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received.

Equipment Configuration for Shutdown Timing Requirements

Antenna:	Integral	Variant:	UWB
Antenna Gain (dBi):	4.28	Modulation:	--
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	<5%
Channel Frequency (MHz):	7987.2	Data Rate:	--
Engineering Test Notes:			

Test Measurement Results

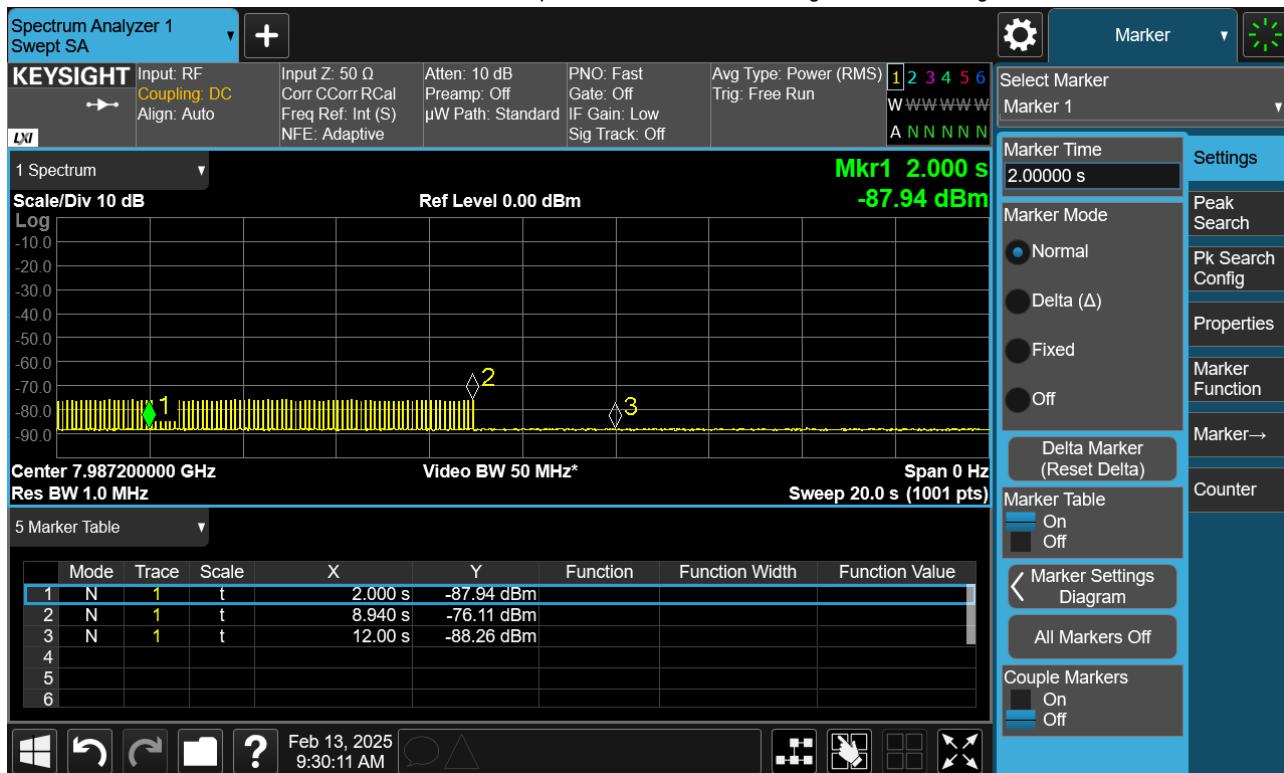
Frequency (MHz)	Shutdown Time	Limit	Margin	EUT Power Setting
	(s)	(s)	(s)	Numeric
7987.2	6.94	10	-3.06	9

Traceability to Industry Recognized Test Methodologies

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

Shutdown Timing Requirement

Test Freq: 7987.2 MHz, Antenna: integral, Power Setting: 9





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