



REGULATORY COMPLIANCE TEST REPORT

FCC CFR 47 Part 15 Subpart C (15.247 DTS)
ISED RSS-247 Issue 3

Report No.: CATA18 – U7 Rev A

Company: Catapult Sports Pty Ltd

Model Name: WD-S8-08-V1



REGULATORY COMPLIANCE TEST REPORT

Company Name: Catapult Sports Pty Ltd

Model Name: WD-S8-08-V1

To: FCC CFR 47 Part 15 Subpart C (15.247 DTS) & ISED RSS-247 Issue 3

Test Report Serial No.: CATA18 – U7 Rev A

This report supersedes: NONE

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

Issue Date: 31st March 2025

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
575 Boulder Court
Pleasanton California 94566
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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 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 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	17 th March 2025	Draft for client review
Rev A	31 st March 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

Type Of Equipment: Wearable athlete tracking device

Fax: +1 925 462 0306

S/N's: 000094, 000409

Test Date(s): 7th, 10th – 11th, 13th,
20th – 21st February 2025,
10th March 2025

Website: www.micomlabs.com

STANDARD(S)

**FCC CFR 47 Part 15 Subpart C 15.247
ISED RSS-247 Issue 3**

TEST RESULTS

EQUIPMENT COMPLIES

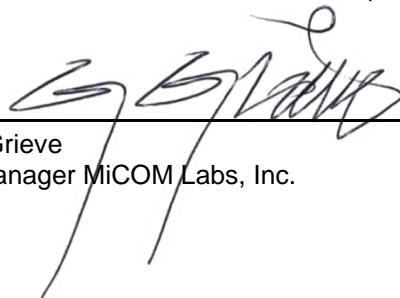
MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

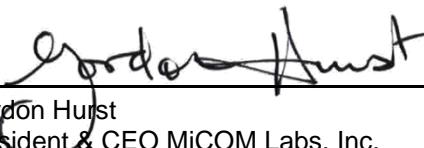
1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

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	KDB 662911 D01, D02, D03	D01 Oct 2013, D02 Oct 2011, D03 Oct 2020	Guidance for measurement of output emission of devices that employ single transmitter with multiple outputs or systems with multiple transmitters operating simultaneously in the same frequency band. 662911 D01 Multiple Transmitter Output v02r01, 662911 D02 MIMO with Cross Polarized Antenna v01, 662911 D03 MIMO Antenna Gain Measurement v01, OET 13TR1003 Directional Gain of 802.11 MIMO with CDD 04.05.2013
II	KDB 558074 D01 v05r02	Apr 2019	Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices operating under section 15.247 of the FCC Rules.
III	A2LA	16 th April 2024	R105 – Requirements When Making Reference to A2LA Accreditation Status
IV	ANSI C63.10	2020	American National Standard for Testing Unlicensed Wireless Devices
V	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 9kHz to 40GHz
VI	FCC 47 CFR Part 15.247	Apr 2020	Radio Frequency Devices; Subpart C – Intentional Radiators
VII	ICES-003	Issue 7; Oct 2020	Information Technology Equipment (Including Digital Apparatus)
VIII	RSS-247 Issue 3	Aug 2023	Digital Transmission Systems (DTSS), Frequency Hopping System (FHSs) and License-Exempt Local Area Network (LE-LEN) Devices
IX	RSS-Gen Issue 5	Amendment 1,2 (Feb 2021)	General Requirements for Compliance of Radio Apparatus. With Amendments 1: March 2019 and 2: Feb 2021
X	FCC 47 CFR Part 2.1033	Feb 2023	FCC requirements and rules regarding photographs and test setup diagrams
XI	KDB 789033 D02 V02r01	Dec 2017	Guidelines for Compliance Testing Of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E

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 to FCC CFR 47 Part 15 Subpart C 15.247 and ISED RSS-247 Issue 3
Applicant:	Catapult Sports Pty Ltd 10 Post Office Square, Floor 9 Boston, Massachusetts 02109
Manufacturer:	Catapult Sports Pty Ltd
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	CATA18-U7
Date EUT received:	30 th January 2025, 28 th February 2025
Standard(s) applied:	FCC CFR 47 Part 15 Subpart C 15.247
Dates of test (from - to):	7 th , 10 th – 11 th , 13 th , 20 th – 21 st February 2025, 10 th March 2025
No of Units Tested:	1
Product Family Name:	WD-S8-08-V1
Model(s):	WD-S8-08-V1
Location for use:	Indoor and Outdoor
Declared Frequency Range(s):	2400 - 2483.5 MHz;
Type of Modulation:	GFSK
EUT Modes of Operation:	BLE-1M/BLE-2M
Declared Nominal Output Power:	+4 dBm
Transmit/Receive Operation:	Transmitter
Rated Input Voltage and Current:	3.7V _{DC} 0.5A
Operating Temperature Range:	0°C to +50°C
ITU Emission Designator:	1M Variant; 517KF1D 2M Variant; 625KF1D
Equipment Dimensions:	81.8mm x 44.78mm x 16.3mm
Weight:	56.4g
Hardware Rev:	B1
Software Rev:	V0.3.2

5.2. Scope Of Test Program

Catapult Sports Pty Ltd, WD-S8-08-V1

The scope of the test program was to test the Catapult Sports Pty Ltd WD-S8-08-V1, WD-S8-08-V1 WD-S8-08-V1 configurations in the frequency ranges 2400 - 2483.5 MHz; for compliance against the following specification:

FCC 47 CFR Part 15.247

Radio Frequency Devices; Subpart C – Intentional Radiators

ISED RSS-247

Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices

5.3. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
Integral	Yageo	ANT2012LL13R2400A	Chip	2.72	-	-	-	2400 - 2483.5
BF Gain - Beamforming Gain								
Dir BW - Directional BeamWidth								
X-Pol - Cross Polarization								

5.4. Cabling and I/O Ports

1. NONE

5.5. 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
2400 - 2483.5 MHz				
GFSK	1	2,402.00	2,440.00	2,480.00
GFSK	2	2,402.00	2,440.00	2,480.00

5.6. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

5.7. 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

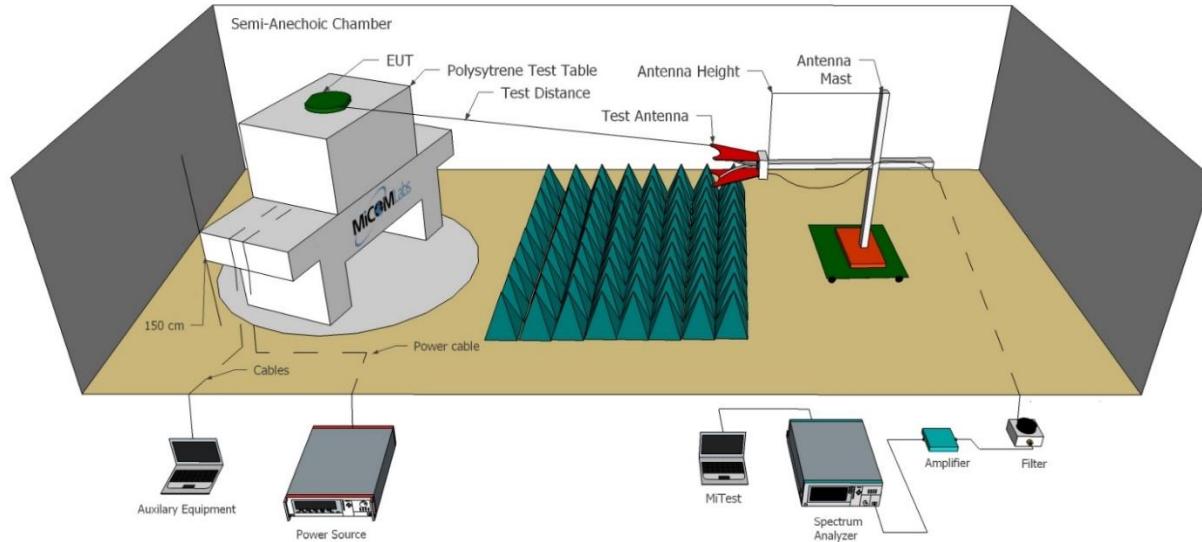
Test Header	Result	Data Link
6 dB & 99% Bandwidth	Complies	View Data
Conducted Output Power	Complies	View Data
Power Spectral Density	Complies	View Data
Emissions	Complies	-
(1) Conducted Emissions	Complies	-
(i) Conducted Spurious Emissions	Complies	View Data
(ii) Conducted Band-Edge Emissions	Complies	View Data
(2) Radiated Emissions	Complies	-
(i) TX Spurious & Restricted Band Emission	Complies	View Data
(ii) Restricted Edge & Band-Edge Emission	Complies	View Data
(iii) Digital Emissions	Complies	See MiCOM Labs test report CATA18-U3

7. TEST EQUIPMENT CONFIGURATION(S)

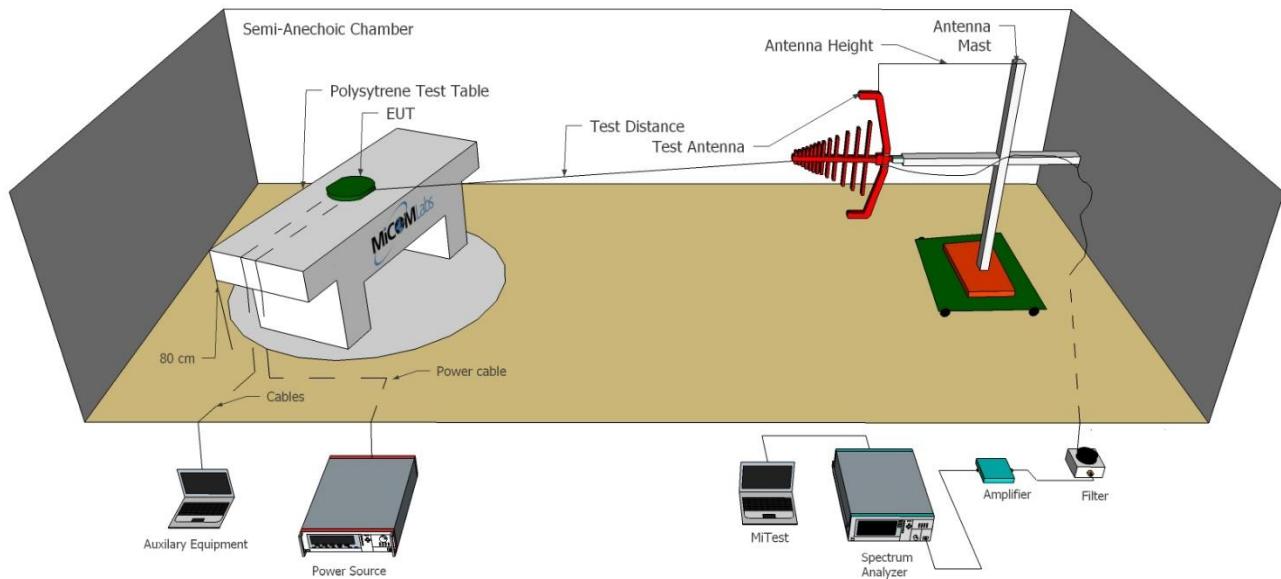
7.1. Radiated

Radiated emissions above and below 1GHz.

Radiated Emissions Above 1GHz Test Setup



Radiated Emissions Below 1GHz Test Setup





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
285	DC Power Supply	Keysight	E36155A	MY63000156	4 Dec 2025
298	3M Radiated Emissions Chamber Maintenance Check	MiCOM	3M Chamber	298	20 Jul 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
377	Band Rejection Filter 5150 to 5880MHz	Microtronics	BRM50716	034	13 Apr 2025
396	2.4 GHz Notch Filter	Microtronics	BRM50701	001	13 Apr 2025
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	27 May 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
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	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

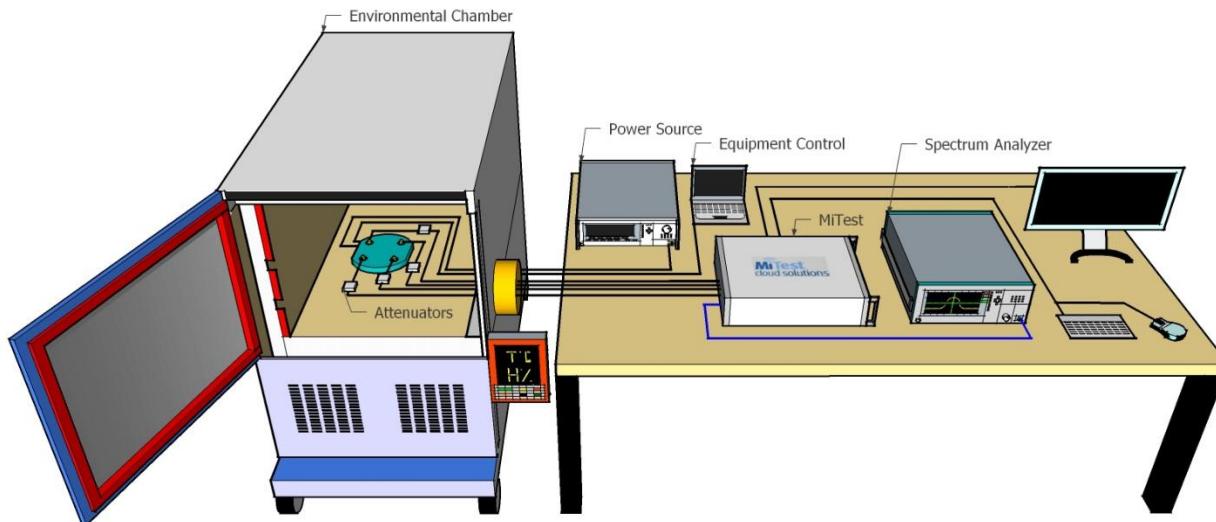


Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

510	Barometer/Termometer	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
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used
CC05	Confidence Check	MiCOM	CC05	None	20 Jul 2025

7.2. Conducted

MiTest Automated Test System



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
#3 SA	MiTest Box to SA	Fairview Microwave	SCA1814-0101-72	#3 SA	11 Jul 2025
#3P1	EUT to MiTest box port 1	Fairview Microwave	SCA1814-0101-72	#3P1	11 Jul 2025
#3P2	EUT to MiTest box port 2	Fairview Microwave	SCA1814-0101-72	#3P2	11 Jul 2025
#3P3	EUT to MiTest box port 3	Fairview Microwave	SCA1814-0101-72	#3P3	11 Jul 2025
#3P4	EUT to MiTest box port 4	Fairview Microwave	SCA1812-0101-72	#3P4	11 Jul 2025
580	Paperless Chart Recorder	Yokogawa Corporation	GP20-1E1D	S51411978	Not required
581	Analog Input Module	Yokogawa Corporation	GX90XA-10-U2N-3N Module	S51513026	28 May 2026
266	10 Hz to 50GHz MXA Signal Analyzer	Keysight	N9020B	MY60110791	25 Jul 2025
285	DC Power Supply	Keysight	E36155A	MY63000156	4 Dec 2025
382	Tunable Notch Filter	Wainwright Instruments GmbH	WRCT800/960-0.2/40-8EEK	64	Cal when used
398	MiTest RF Conducted Test	MiCOM	MiTest ATS	Version 4.2.3.0	Not Required



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To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

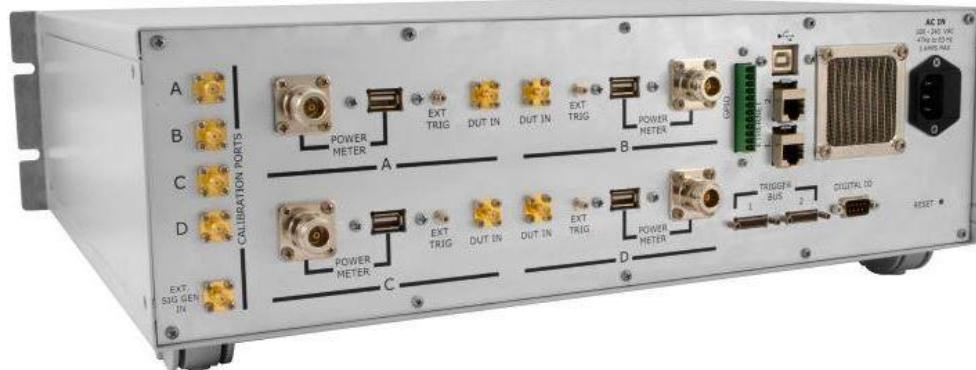
	Software				
405	DC Power Supply 0-60V	Agilent	6654A	MY4001826	Cal when used
408	USB to GPIB interface	National Instruments	GPIB-USB HS	14C0DE9	Not Required
441	USB Wideband Power Sensor	Boonton	55006	9179	4 Dec 2025
442	USB Wideband Power Sensor	Boonton	55006	9181	12 Dec 2025
445	PoE Injector	D-Link	DPE-101GL	QTAH1E2000625	Not Required
461	Spectrum Analyzer	Agilent	E4440A	MY46185537	27 Sep 2025
493	USB Wideband Power Sensor	Boonton	55006	9634	8 Oct 2025
494	USB Wideband Power Sensor	Boonton	55006	9726	12 Dec 2025
510	Barometer/Thermometer	Digi Sense	68000-49	170871375	4 Jan 2026
512	MiTest Cloud Solutions RF Test Box	MiCOM	2nd Gen	512	11 Jul 2025
516	USB Wideband Power Sensor	Boonton	RTP5006	10511	4 Dec 2025
555	Rhode & Schwarz Receiver (Firmware Version : 3.10 SP1)	Rhode & Schwarz	ESW 44	101893	28 Jun 2025
592	Harmonic Mixer, 140 GHz to 220 GHz	Radiometer Physics	RPG FS-Z220	101105	7 Jun 2026
593	Harmonic Mixer, 90 GHz to 140 GHz	Radiometer Physics	RPG FS-Z140	101197	2 Aug 2026
75	Environmental Chamber	Thermatron	SE-300-2-2	27946	20 Nov 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. 6 dB & 99% Bandwidth

Conducted Test Conditions for 6 dB and 99% Bandwidth			
Standard:	FCC CFR 47:15.247, ISED RSS-247	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	6 dB and 99 % Bandwidth	Rel. Humidity (%):	32 - 45
Standard Section(s):	15.247 (a)(2), RSS-247 5.2 (a)	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for 6 dB and 99% Bandwidth Measurement
The bandwidth at 6 dB and 99 % was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

Testing was performed under ambient conditions at nominal voltage. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported.

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

Limits for 6 dB and 99% Bandwidth

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(2) Systems using digital modulation techniques may operate in the 902-928 MHz and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for 6 dB & 99% Bandwidth

Variant:	1M	Duty Cycle (%):	99
Data Rate:	1.00 MBit/s	Antenna Gain (dBi):	Not Applicable
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2402MHz, GFSK, pwr 35		

Test Measurement Results

Test Frequency	Measured 6 dB Bandwidth (MHz)				6 dB Bandwidth (MHz)		Limit	Lowest Margin
	Port(s)							
MHz	a	b	c	d	Highest	Lowest	KHz	MHz
2402.0	0.505	--	--	--	0.505	0.505	≥500.0	-0.01
2440.0	0.505	--	--	--	0.505	0.505	≥500.0	-0.01
2480.0	0.517	--	--	--	0.517	0.517	≥500.0	-0.02

Test Frequency	Measured 99% Bandwidth (MHz)				Maximum 99% Bandwidth (MHz)
	Port(s)				
MHz	a	b	c	d	
2402.0	1.599	--	--	--	1.599
2440.0	1.539	--	--	--	1.539
2480.0	1.659	--	--	--	1.659

Traceability to Industry Recognized Test Methodologies

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

Note: click the links in the above matrix to view the graphical image (plot).



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for 6 dB & 99% Bandwidth

Variant:	2M	Duty Cycle (%):	99
Data Rate:	2.00 MBit/s	Antenna Gain (dBi):	Not Applicable
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2402MHz, GFSK, pwr 35		

Test Measurement Results

Test Frequency	Measured 6 dB Bandwidth (MHz)				6 dB Bandwidth (MHz)		Limit	Lowest Margin
	Port(s)							
MHz	a	b	c	d	Highest	Lowest	KHz	MHz
2402.0	0.541	--	--	--	0.541	0.541	≥500.0	-0.04
2440.0	0.613	--	--	--	0.613	0.613	≥500.0	-0.11
2480.0	0.625	--	--	--	0.625	0.625	≥500.0	-0.13

Test Frequency	Measured 99% Bandwidth (MHz)				Maximum 99% Bandwidth (MHz)	
	Port(s)					
MHz	a	b	c	d		
2402.0	2.164	--	--	--		2.164
2440.0	2.188	--	--	--		2.188
2480.0	2.212	--	--	--		2.212

Traceability to Industry Recognized Test Methodologies

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

Note: click the links in the above matrix to view the graphical image (plot).

9.2. Output Power

Conducted Test Conditions for Fundamental Emission Output Power			
Standard:	FCC CFR 47:15.247, ISED RSS-247	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	Output Power	Rel. Humidity (%):	32 - 45
Standard Section(s):	15.247 (b) & (c), RSS-247 5.4 (d)	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Fundamental Emission Output Power Measurement

In the case of average power measurements an average power sensor was utilized.

For peak power measurements the spectrum analyzer built-in power function was used to integrate peak power over the 20 dB bandwidth.

Testing was performed under ambient conditions at nominal voltage only. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured, summed (Σ) and reported.

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

Supporting Information

Calculated Power = $A + G + Y + 10 \log (1/x)$ dBm

A = Total Power [$10 \times \log_{10} (10^{a/10} + 10^{b/10} + 10^{c/10} + 10^{d/10})$]

G = Antenna Gain

Y = Beamforming Gain

x = Duty Cycle (average power measurements only)

Limits for Fundamental Emission Output Power

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following for non-frequency hopping systems:

(3) For systems using digital modulation in the 902-928 MHz and 2400-2483.5 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(iii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) and (c)(1)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(2) In addition to the provisions in paragraphs (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

- (i) Different information must be transmitted to each receiver.
- (ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:
 - (A) The directional gain shall be calculated as the sum of $10 \log$ (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.
 - (B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.
- (iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.
- (iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Peak Output Power

Variant:	1M	Duty Cycle (%):	99.0
Data Rate:	1.00 MBit/s	Antenna Gain (dBi):	2.72
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2402MHz, GFSK, pwr 35		

Test Measurement Results

Test Frequency	Measured Output Power (dBm)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
	Port(s)							
MHz	a	b	c	d	dBm	dBm	dB	
2402.0	4.63	--	--	--	4.63	30.00	-25.37	35.00
2440.0	4.05	--	--	--	4.05	30.00	-25.95	35.00
2480.0	3.97	--	--	--	3.97	30.00	-26.03	35.00

Traceability to Industry Recognized Test Methodologies

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

The above measurements are true pulse readings and therefore a Duty Cycling correction factor is not required.



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Peak Output Power

Variant:	2M	Duty Cycle (%):	99.0
Data Rate:	2.00 MBit/s	Antenna Gain (dBi):	2.72
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2402MHz, GFSK, pwr 35		

Test Measurement Results

Test Frequency	Measured Output Power (dBm)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
	Port(s)							
MHz	a	b	c	d	dBm	dBm	dB	
2402.0	2.32	--	--	--	2.32	30.00	-27.68	35.00
2440.0	1.83	--	--	--	1.83	30.00	-28.17	35.00
2480.0	1.79	--	--	--	1.79	30.00	-28.21	35.00

Traceability to Industry Recognized Test Methodologies

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

The above measurements are true pulse readings and therefore a Duty Cycling correction factor is not required.

9.3. Power Spectral Density

Conducted Test Conditions for Power Spectral Density			
Standard:	FCC CFR 47:15.247, ISED RSS-247	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	Power Spectral Density	Rel. Humidity (%):	32 - 45
Standard Section(s):	15.247 (e) RSS-247 5.2 (b)	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Power Spectral Density

The transmitter output was connected to a spectrum analyzer and the measured made in a 3 kHz resolution bandwidth using the analyzer auto-coupled sweep-time. A peak value was found over the full emission bandwidth and the spectrum downloaded for post processing purposes.

Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured separately. The Peak Power Spectral Density is the highest level found across the emission bandwidth. With multiple antenna port measurements the numerical analyzer data from each port is summed (a) and a link to this additional graphic is provided.

Testing was performed under ambient conditions at nominal voltage only.

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

Measure and sum the spectra across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The individual spectra are then summed mathematically in linear power units. Unlike in-band power measurements, in which the sum involves a single measured value (output power) from each output, measurements for compliance with PSD limits involve summing entire spectra across corresponding frequency bins on the various outputs. Consistency is maintained for any device with multiple transmitter outputs to be certain the individual outputs are all aligned with the same span and same number of points. In this instance, the linear power spectrum value within the first spectral bin of output 0 is summed with that in the first spectral bin of output 1, and the first spectral bin of output 2, and so on up to the Nth output to obtain the true value for the first frequency bin of the summed spectrum. The summed spectrum value for each frequency bin is computed in this fashion. These summed spectral values were post processed and the resulting numerical and graphical data presented.

NOTE:

It may be observed that the spectrum in some antenna port plots break the limit line however this in itself does NOT constitute a failure. In all cases a spectrum summation plot is provided in order to prove compliance. A failure occurs only after the summation of all spectrum plots have been summed and are found to be greater than the limit line.

Supporting Information

Calculated Power = $A + 10 \log (1/x)$ dBm

$A = \text{Total Power Spectral Density} [10 \log_{10} (10^{a/10} + 10^{b/10} + 10^{c/10} + 10^{d/10})]$

$x = \text{Duty Cycle}$

Limits Power Spectral Density

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Power Spectral Density - Peak

Variant:	1M	Duty Cycle (%):	99.0
Data Rate:	1.00 MBit/s	Antenna Gain (dBi):	2.72
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density				Amplitude Summation	Limit	Margin
	Port(s) (dBm/3KHz)						
MHz	a	b	c	d	dBm/3KHz	dBm/3KHz	dB
2402.0	-2.307	--	--	--	-2.307	8.0	-10.3
2440.0	-3.455	--	--	--	-3.455	8.0	-11.5
2480.0	-2.658	--	--	--	-2.658	8.0	-10.7

Traceability to Industry Recognized Test Methodologies

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

Note: click the links in the above matrix to view the graphical image (plot).



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Power Spectral Density - Peak

Variant:	2M	Duty Cycle (%):	99.0
Data Rate:	2.00 MBit/s	Antenna Gain (dBi):	2.72
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density				Amplitude Summation	Limit	Margin
	Port(s) (dBm/3KHz)						
MHz	a	b	c	d	dBm/3KHz	dBm/3KHz	dB
2402.0	-5.567	--	--	--	-5.567	8.0	-13.6
2440.0	-5.659	--	--	--	-5.659	8.0	-13.7
2480.0	-6.069	--	--	--	-6.069	8.0	-14.1

Traceability to Industry Recognized Test Methodologies

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

Note: click the links in the above matrix to view the graphical image (plot).

9.4. Emissions

9.4.1. Conducted Emissions

9.4.1.1. Conducted Spurious Emissions

Conducted Test Conditions for Transmitter Conducted Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47:15.247, ISED RSS-247	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	Max Unwanted Emission Levels	Rel. Humidity (%):	32 - 45
Standard Section(s):	FCC 15.247 (d), RSS-247 5.5	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Transmitter Conducted Spurious and Band-Edge Emissions Measurement

Transmitter Conducted Spurious and Band-Edge emissions were measured at a limit of 30 dBc (average detector) or 20 dBc (peak detector) below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Measurements were made while EUT was operating in transmit mode of operation at the appropriate centre frequency closest to the band-edge. Emissions were maximized during the measurement and limits derived from the peak spectral power and drawn on each plot.

Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured separately. Testing was performed under ambient conditions at nominal voltage only.

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

Limits Transmitter Conducted Spurious and Band-Edge Emissions

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Conducted Spurious Emissions - Peak

Variant:	1M	Duty Cycle (%):	99
Data Rate:	1.00 MBit/s	Antenna Gain (dBi):	Not Applicable
Modulation:	GFSK	Beam Forming Gain (Y):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2402MHz, GFSK, pwr 35		

Test Measurement Results

Test Frequency	Frequency Range	Conducted Spurious Emissions - Peak (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
2402.0	30.0 - 26000.0	-40.045	-21.87	--	--	--	--	--	--
2440.0	30.0 - 26000.0	-37.855	-22.17	--	--	--	--	--	--
2480.0	30.0 - 26000.0	-38.985	-25.20	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Conducted Spurious Emissions - Peak

Variant:	2M	Duty Cycle (%):	99
Data Rate:	2.00 MBit/s	Antenna Gain (dBi):	Not Applicable
Modulation:	GFSK	Beam Forming Gain (Y):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2402MHz, GFSK, pwr 35		

Test Measurement Results

Test Frequency	Frequency Range	Conducted Spurious Emissions - Peak (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
2402.0	30.0 - 26000.0	-40.258	-21.07	--	--	--	--	--	--
2440.0	30.0 - 26000.0	-38.895	-23.68	--	--	--	--	--	--
2480.0	30.0 - 26000.0	-38.891	-27.38	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).

9.4.1.2. Conducted Band-Edge Emissions

Conducted Test Conditions for Transmitter Conducted Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47:15.247, ISED RSS-247	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	Max Unwanted Emission Levels	Rel. Humidity (%):	32 - 45
Standard Section(s):	FCC 15.247 (d), RSS-247 5.5	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Transmitter Conducted Spurious and Band-Edge Emissions Measurement

Transmitter Conducted Spurious and Band-Edge emissions were measured at a limit of 30 dBc (average detector) or 20 dBc (peak detector) below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Measurements were made while EUT was operating in transmit mode of operation at the appropriate centre frequency closest to the band-edge. Emissions were maximized during the measurement and limits derived from the peak spectral power and drawn on each plot.

Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured separately. Testing was performed under ambient conditions at nominal voltage only.

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

Limits Transmitter Conducted Spurious and Band-Edge Emissions

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Conducted Low Band-Edge Emissions - Peak

Variant:	1M	Duty Cycle (%):	99.0
Data Rate:	1.00 MBit/s	Antenna Gain (dBi):	Not Applicable
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2402MHz, GFSK, pwr 35		

Test Measurement Results

Channel Frequency:	2402.0 MHz				
Band-Edge Frequency:	2400.0 MHz				
Test Frequency Range:	2350.0 - 2405.0 MHz				
Port(s)	Band-Edge Markers and Limit			Revised Limit	Margin
	M1 Amplitude (dBm)	Plot Limit (dBm)	M2 Frequency (MHz)	Amplitude (dBm)	M2A Frequency (MHz)
a	-45.35	-21.90	2401.30	--	--

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Conducted Low Band-Edge Emissions - Peak

Variant:	2M	Duty Cycle (%):	99.0
Data Rate:	2.00 MBit/s	Antenna Gain (dBi):	Not Applicable
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2402MHz, GFSK, pwr 35		

Test Measurement Results

Channel Frequency:	2402.0 MHz				
Band-Edge Frequency:	2400.0 MHz				
Test Frequency Range:	2350.0 - 2405.0 MHz				
Port(s)	Band-Edge Markers and Limit			Revised Limit	Margin
	M1 Amplitude (dBm)	Plot Limit (dBm)	M2 Frequency (MHz)	Amplitude (dBm)	M2A Frequency (MHz)
a	-31.34	-21.05	2400.90	--	--

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Conducted High Band-Edge Emissions - Peak

Variant:	1M	Duty Cycle (%):	99.0
Data Rate:	1.00 MBit/s	Antenna Gain (dBi):	Not Applicable
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2480MHz, GFSK, pwr 35		

Test Measurement Results

Channel Frequency:	2480.0 MHz				
Band-Edge Frequency:	2483.5 MHz				
Test Frequency Range:	2475.0 - 2524.0 MHz				
Port(s)	Band-Edge Markers and Limit			Revised Limit	Margin
	M3 Amplitude (dBm)	Plot Limit (dBm)	M2 Frequency (MHz)	Amplitude (dBm)	M2A Frequency (MHz)
a	-46.06	-30.66	2480.60		-2.900

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for Conducted High Band-Edge Emissions - Peak

Variant:	2M	Duty Cycle (%):	99.0
Data Rate:	2.00 MBit/s	Antenna Gain (dBi):	Not Applicable
Modulation:	GFSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	MN
Engineering Test Notes:	2480MHz, GFSK, pwr 35		

Test Measurement Results

Channel Frequency:	2480.0 MHz					
Band-Edge Frequency:	2483.5 MHz					
Test Frequency Range:	2475.0 - 2524.0 MHz					
Port(s)	Band-Edge Markers and Limit			Revised Limit		Margin
	M3 Amplitude (dBm)	Plot Limit (dBm)	M2 Frequency (MHz)	Amplitude (dBm)	M2A Frequency (MHz)	
a	-45.07	-21.64	2481.20	--	--	-2.300

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the links in the above matrix to view the graphical image (plot).

9.4.2. Radiated Emissions

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions (Restricted Bands)			
Standard:	FCC CFR 47 Part 15 Subpart C 15.247 ISED RSS-247	Ambient Temp. (°C):	20.0 - 24.5
Test Heading:	Radiated Spurious and Band-Edge Emissions	Rel. Humidity (%):	32 - 45
Standard Section(s):	15.205, 15.209 RSS-247:5.5	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Spurious and Band-Edge Emissions (Restricted Bands)

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 peak hold mode. Depending on the frequency band spanned a notch filter and waveguide 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.

Test configuration and setup for Radiated Spurious and Band-Edge Measurement were per the Radiated Test Set-up specified in this document.

Orientation testing of the EUT was performed and the EUT standing upright was determined to be the worst case for Spurious and Band Edge emissions with the integral antennas attached.

Limits for Restricted Bands

Peak emission: 74 dB μ V/m

Average emission: 54 dB μ V/m

Average Measurements were performed following ANSI C63.10 section 11.12.2.5.2 Trace averaging across on and off times of the EUT transmissions followed by a duty cycle correction.

RMS detector used, DCCF of 10log (1/D) where D is the Duty Cycle.

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 or Waveguide Loss

Example:

Given receiver input reading of 51.5 dBmV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength (FS) of the measured emission is:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3 \text{ dBmV/m}$$

Conversion between dBmV/m (or dBmV) and mV/m (or mV) are as follows:

Level (dBmV/m) = 20 * Log (level (mV/m))

40 dBmV/m = 100 mV/m

48 dBmV/m = 250 mV/m

Restricted Bands of Operation (15.205)

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Frequency Band			
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this section:

- (1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle.
- (2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.
- (3) Cable locating equipment operated pursuant to §15.213.
- (4) Any equipment operated under the provisions of §15.253, 15.255, and 15.256 in the frequency band 75-85 GHz, or §15.257 of this part.
- (5) Biomedical telemetry devices operating under the provisions of §15.242 of this part are not subject to the restricted band 608-614 MHz but are subject to compliance within the other restricted bands.
- (6) Transmitters operating under the provisions of subparts D or F of this part.
- (7) Devices operated pursuant to §15.225 are exempt from complying with this section for the 13.36-13.41 MHz band only.
- (8) Devices operated in the 24.075-24.175 GHz band under §15.245 are exempt from complying with the requirements of this section for the 48.15-48.35 GHz and 72.225-72.525 GHz bands only, and shall not exceed the limits specified in §15.245(b).
- (9) Devices operated in the 24.0-24.25 GHz band under §15.249 are exempt from complying with the requirements of this section for the 48.0-48.5 GHz and 72.0-72.75 GHz bands only, and shall not exceed the limits specified in §15.249(a).

(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).

9.4.2.1. TX Spurious & Restricted Band Emissions

Equipment Configuration for FCC SPURIOUS 1 - 18 GHZ

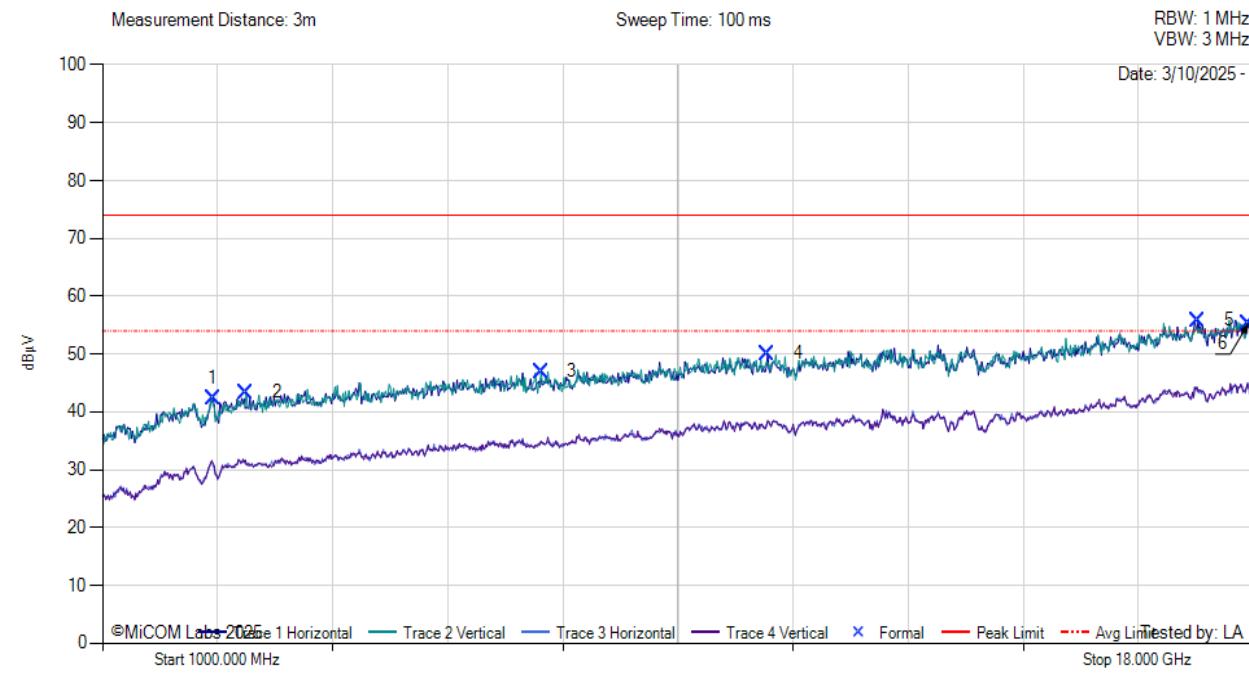
Antenna:	Integral	Variant:	BLE
Antenna Gain (dBi):	2.72	Modulation:	GFSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	-
Channel Frequency (MHz):	2402	Data Rate:	1Mb/s
Power Setting:	Max	Tested By:	LA

Test Measurement Results



FCC Spurious 1 GHz -18 GHz

Antenna: Integral



1000.00 - 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	2632.00	51.92	2.06	32.51	42.29	MaxP	Horizontal	199	210	74.0	-31.7	Pass	
2	3125.00	52.39	2.23	33.06	43.39	MaxP	Vertical	150	209	74.0	-30.6	Pass	
3	7477.00	51.18	3.84	35.85	47.01	MaxP	Vertical	199	59	74.0	-27.0	Pass	
4	10826.00	49.78	4.91	37.76	50.13	MaxP	Horizontal	199	120	74.0	-23.9	Pass	
5	17184.00	49.82	6.40	41.35	55.85	MaxP	Horizontal	199	0	74.0	-18.2	Pass	
6	17932.00	48.01	6.50	41.53	55.42	MaxP	Vertical	150	119	74.0	-18.6	Pass	

Test Notes: FCC Tx Spurious. Channel 0: 2402MHz. Low data rate. BW 1MHz. Max power.



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for FCC SPURIOUS 1 - 18 GHZ

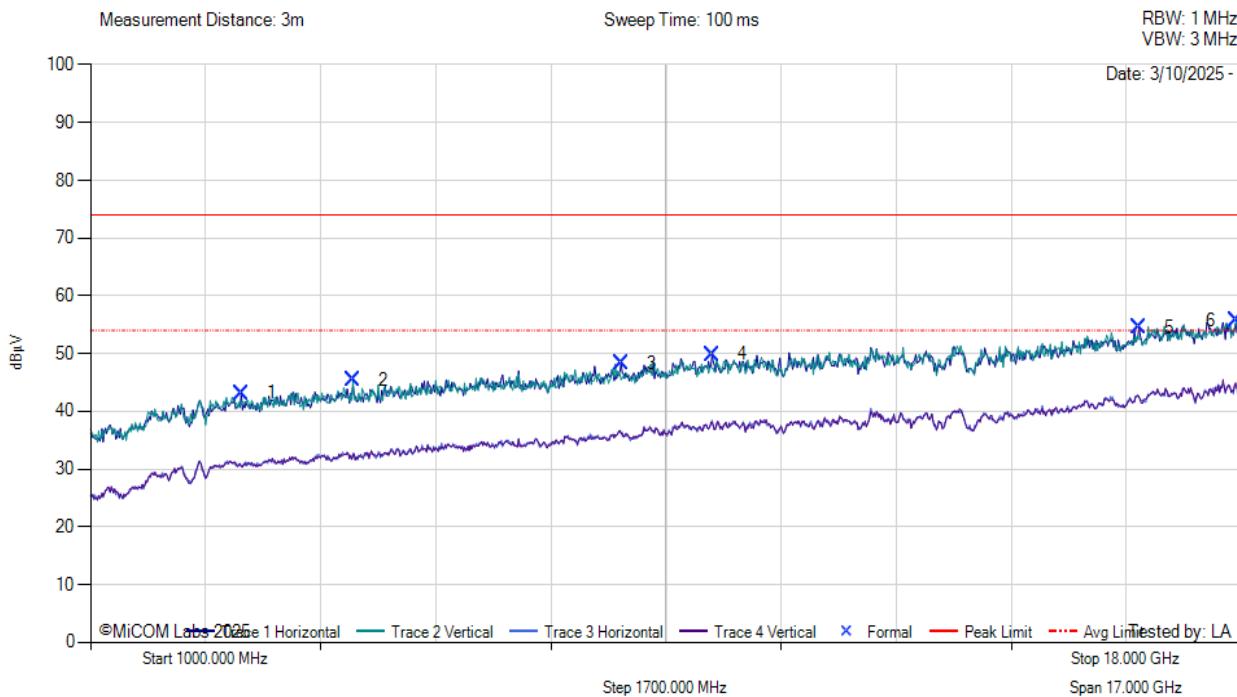
Antenna:	Integral	Variant:	BLE
Antenna Gain (dBi):	2.72	Modulation:	GFSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	-
Channel Frequency (MHz):	2440	Data Rate:	1Mb/s
Power Setting:	Max	Tested By:	LA

Test Measurement Results



FCC Spurious 1 GHz -18 GHz

Antenna: Integral



1000.00 - 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	3227.00	52.35	2.31	33.00	43.16	MaxP	Horizontal	150	150	74.0	-30.8	Pass		
2	4876.00	52.40	3.14	34.01	45.40	MaxP	Vertical	150	330	74.0	-28.6	Pass		
3	8837.00	52.10	4.10	36.01	48.31	MaxP	Horizontal	150	90	74.0	-25.7	Pass		
4	10180.00	50.55	4.42	37.45	49.89	MaxP	Horizontal	199	30	74.0	-24.1	Pass		
5	16487.00	49.04	6.19	41.07	54.53	MaxP	Horizontal	150	60	74.0	-19.5	Pass		
6	17932.00	48.34	6.50	41.53	55.75	MaxP	Vertical	150	89	74.0	-18.3	Pass		

Test Notes: FCC Tx Spurious. Channel 19: 2440MHz. Low data rate. BW 1MHz. Max power.



Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for FCC SPURIOUS 1 - 18 GHZ

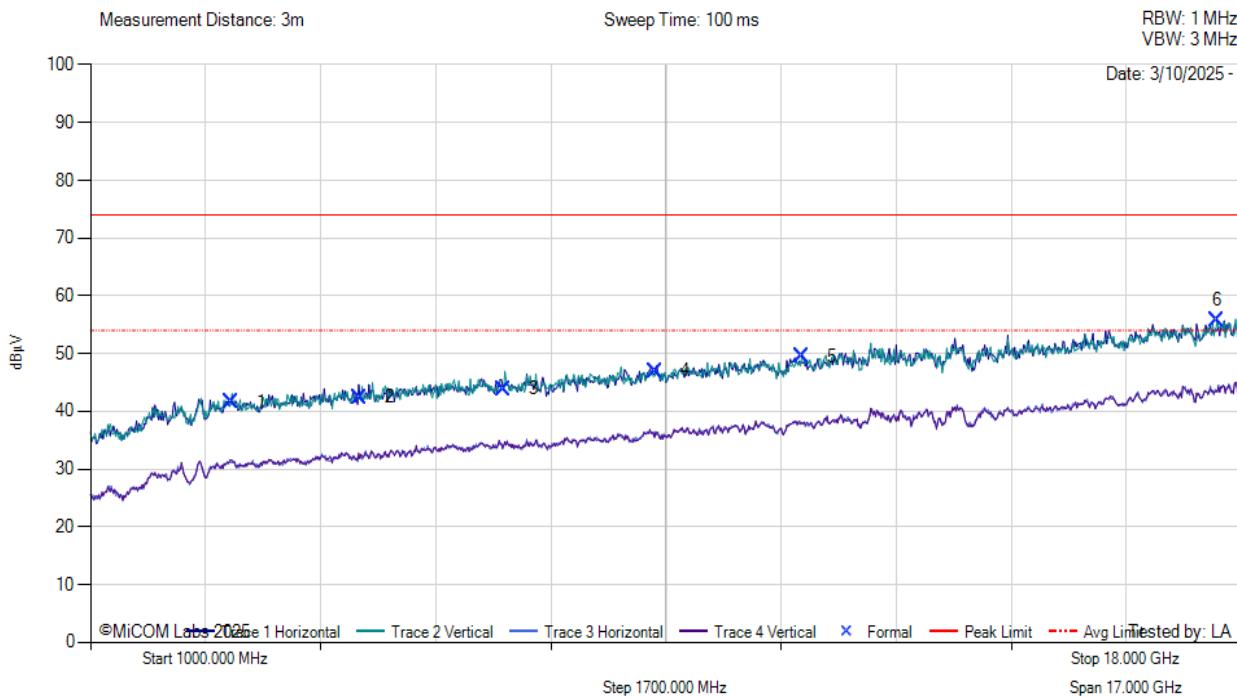
Antenna:	Integral	Variant:	BLE
Antenna Gain (dBi):	2.72	Modulation:	GFSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	-
Channel Frequency (MHz):	2480	Data Rate:	1Mb/s
Power Setting:	Max	Tested By:	LA

Test Measurement Results



FCC Spurious 1 GHz -18 GHz

Antenna: Integral



1000.00 - 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	3074.00	50.77	2.21	33.07	41.67	MaxP	Vertical	150	299	74.0	-32.3	Pass	
2	4978.00	51.63	2.94	34.02	42.48	MaxP	Horizontal	199	210	74.0	-31.5	Pass	
3	7103.00	48.52	3.52	35.95	43.91	MaxP	Vertical	150	299	74.0	-30.1	Pass	
4	9347.00	49.48	4.30	36.40	47.00	MaxP	Horizontal	150	300	74.0	-27.0	Pass	
5	11506.00	50.38	4.95	38.22	49.49	MaxP	Vertical	150	209	74.0	-24.5	Pass	
6	17643.00	49.77	6.27	41.66	55.73	MaxP	Vertical	150	179	74.0	-18.3	Pass	

Test Notes: FCC Tx Spurious. Channel 39: 2480MHz. Low data rate. BW 1MHz. Max power.



9.4.3. Restricted Edge & Band-Edge Emissions

9.4.3.1. Lower Band-Edge

WD-S8-08-V1		Band-Edge Freq	Limit 74.0dB μ V/m	Limit 54.0dB μ V/m	Power Setting
Operational Mode	Operating Frequency (MHz)	MHz	dB μ V/m	dB μ V/m	
BLE 1M	2402.00	2390.00	<u>60.01</u>	<u>48.62</u>	Max
BLE 2M	2402.00	2390.00	<u>60.18</u>	<u>48.65</u>	Max

9.4.3.2. Upper Band-Edge

WD-S8-08-V1		Band-Edge Freq	Limit 74.0dB μ V/m	Limit 54.0dB μ V/m	Power Setting
Operational Mode	Operating Frequency (MHz)	MHz	dB μ V/m	dB μ V/m	
BLE 1M	2480.00	2483.50	<u>62.21</u>	<u>49.16</u>	Max
BLE 2M	2480.00	2483.50	<u>62.73</u>	<u>49.19</u>	Max

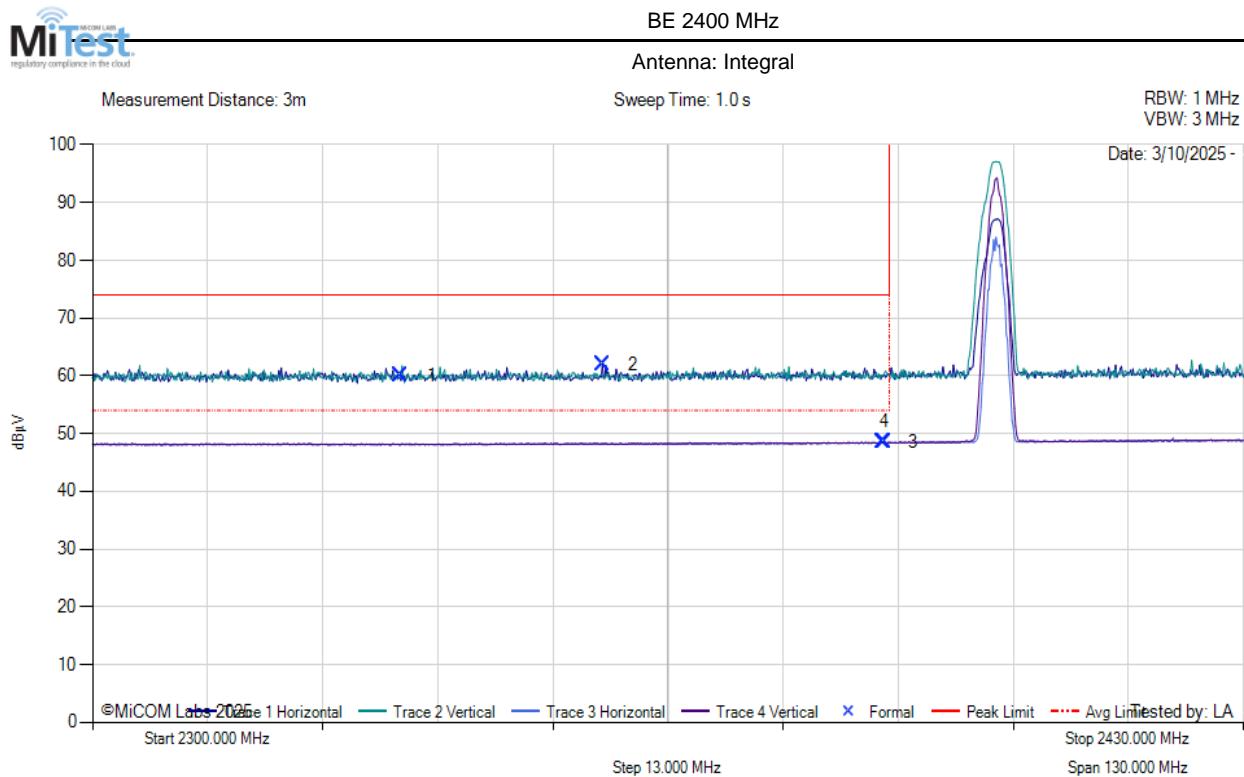


Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for BE 2400 MHZ

Antenna:	Integral	Variant:	BLE 1M
Antenna Gain (dBi):	2.72	Modulation:	GFSK
Channel Frequency (MHz):	2402	Data Rate:	1Mb/s
Power Setting:	Max	Tested By:	LA

Test Measurement Results



2300.00 - 2430.00 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	2334.84	26.66	1.93	31.92	60.01	MaxP	Vertical	101	0	74.0	-14.0	Pass	
2	2357.59	28.50	1.97	31.99	61.96	MaxP	Horizontal	100	210	74.0	-12.0	Pass	
3	2389.31	15.01	1.96	32.14	48.62	AVG	Horizontal	149	150	54.0	-5.4	Pass	
4	2389.44	14.95	1.96	32.14	48.55	AVG	Vertical	100	29	54.0	-5.4	Pass	

Test Notes: BE BLE BW: 1M. Channel 0: 2402MHz

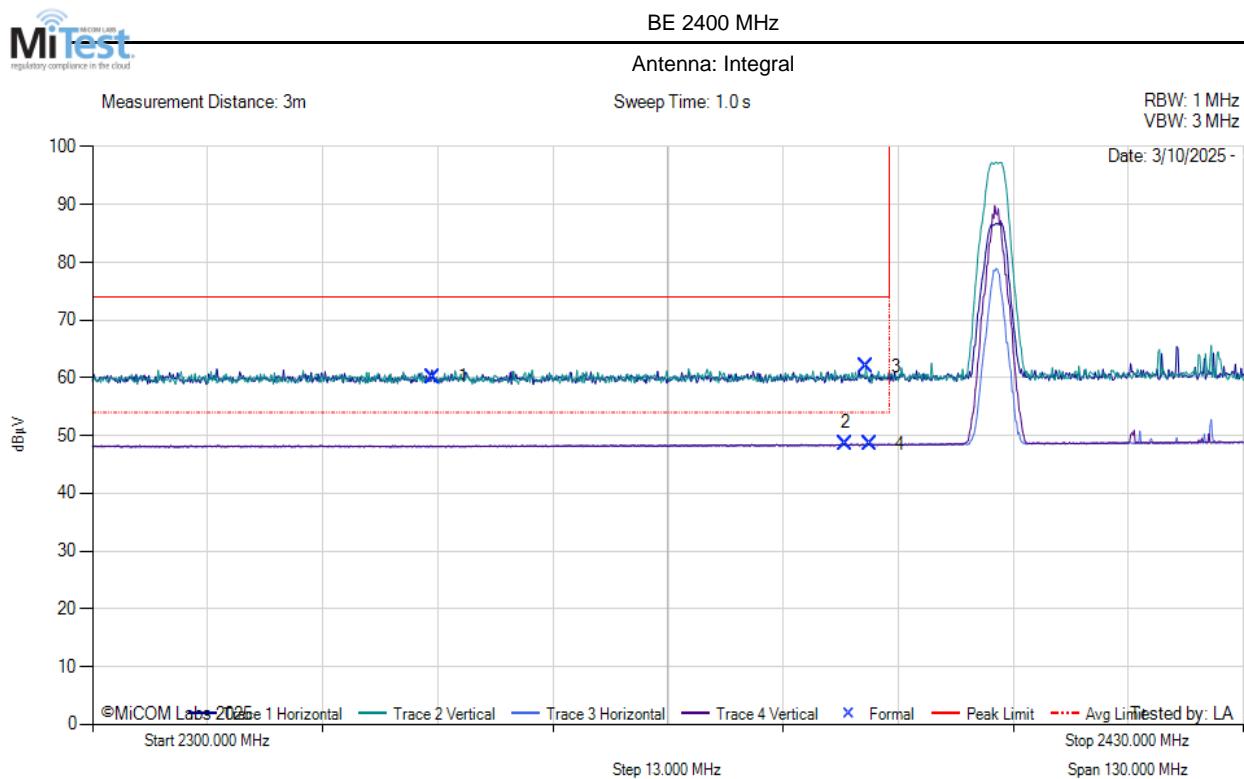


Title: Catapult Sports Pty Ltd, WD-S8-08-V1
To: FCC CFR 47 Part 15 Subpart C & ISED RSS-247 Issue 3
Serial #: CATA18-U7 Rev A

Equipment Configuration for BE 2400 MHZ

Antenna:	Integral	Variant:	BLE 2M
Antenna Gain (dBi):	2.72	Modulation:	GFSK
Channel Frequency (MHz):	2402	Data Rate:	2Mb/s
Power Setting:	Max	Tested By:	LA

Test Measurement Results



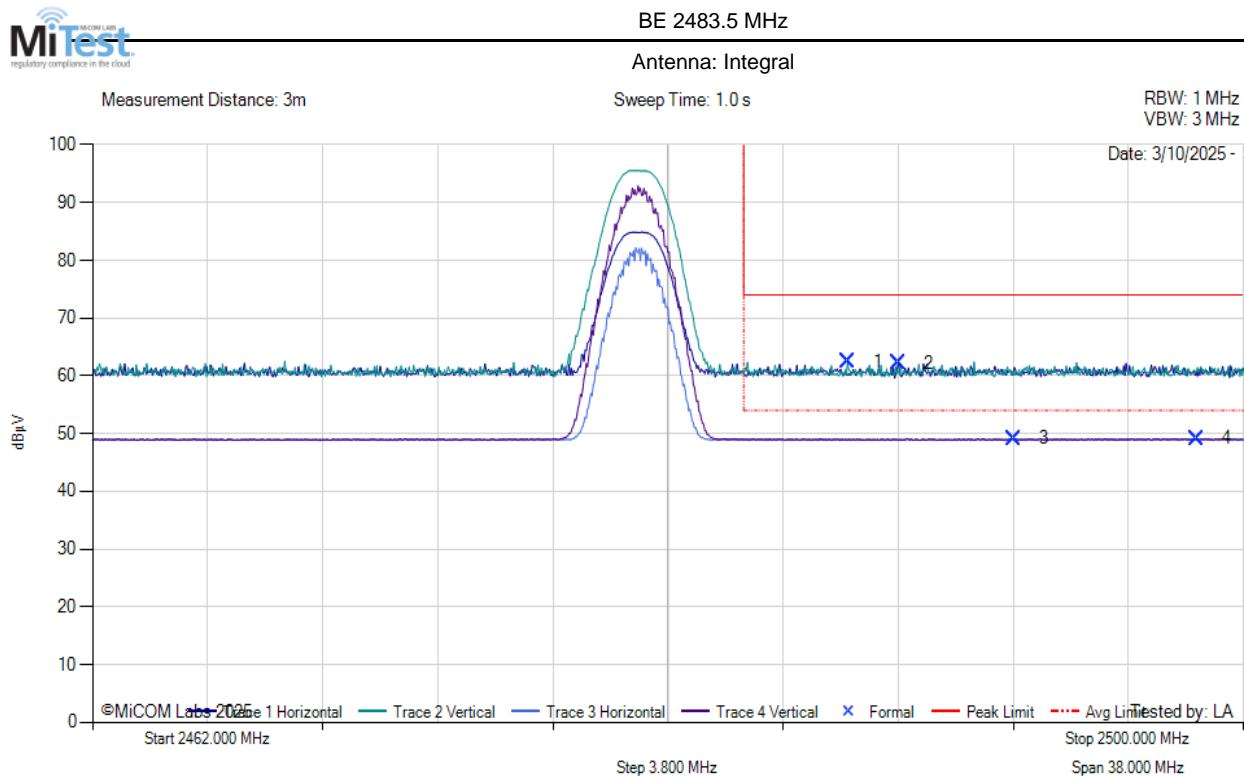
2300.00 - 2430.00 MHz													
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail	
1	2338.48	26.82	1.93	31.93	60.18	MaxP	Horizontal	99	300	74.0	-13.8	Pass	
2	2385.02	15.06	1.97	32.12	48.65	AVG	Horizontal	149	300	54.0	-5.4	Pass	
3	2387.36	28.32	1.97	32.13	61.91	MaxP	Vertical	149	90	74.0	-12.1	Pass	
4	2387.75	14.96	1.96	32.13	48.56	AVG	Vertical	99	59	54.0	-5.4	Pass	

Test Notes: BE BLE BW: 2M. Channel 0: 2402MHz

Equipment Configuration for BE 2483.5 MHZ

Antenna:	Integral	Variant:	BLE 1M
Antenna Gain (dBi):	2.72	Modulation:	GFSK
Channel Frequency (MHz):	2480	Data Rate:	1Mb/s
Power Setting:	Max	Tested By:	LA

Test Measurement Results



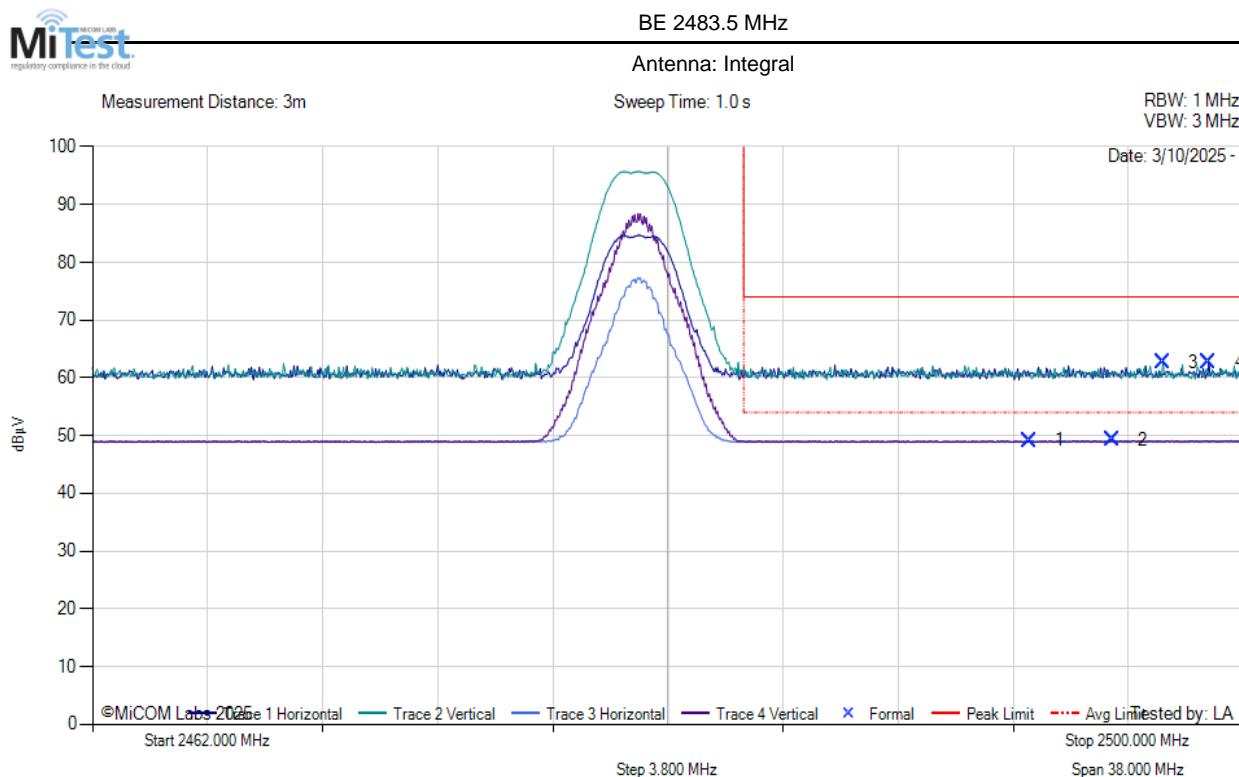
2462.00 - 2500.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	2486.93	28.60	1.98	32.42	62.50	MaxP	Vertical	149	239	74.0	-11.5	Pass	
2	2488.60	28.30	1.98	32.42	62.21	MaxP	Horizontal	149	150	74.0	-11.8	Pass	
3	2492.40	15.19	2.01	32.45	49.16	AVG	Vertical	100	330	54.0	-4.8	Pass	
4	2498.44	15.22	2.01	32.45	49.18	AVG	Horizontal	100	270	54.0	-4.8	Pass	

Test Notes: BE BLE BW: 1M. Channel 39: 2480MHz

Equipment Configuration for BE 2483.5 MHZ

Antenna:	Integral	Variant:	BLE 2M
Antenna Gain (dBi):	2.72	Modulation:	GFSK
Channel Frequency (MHz):	2480	Data Rate:	1Mb/s
Power Setting:	Max	Tested By:	LA

Test Measurement Results

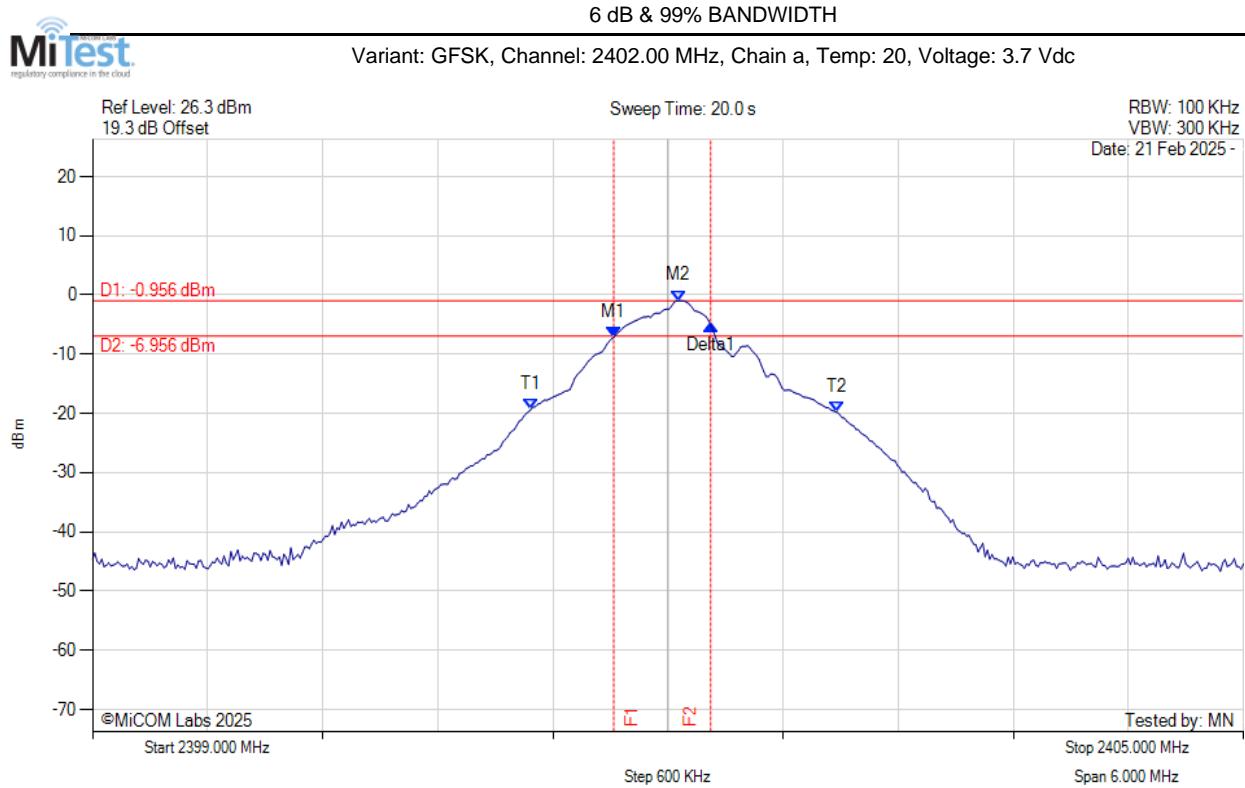


2462.00 - 2500.00 MHz												
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB/m	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail
1	2492.93	15.27	1.99	32.43	49.19	AVG	Horizontal	149	210	54.0	-4.8	Pass
2	2495.67	15.27	2.00	32.44	49.21	AVG	Vertical	99	209	54.0	-4.8	Pass
3	2497.34	28.78	2.00	32.44	62.73	MaxP	Vertical	99	119	74.0	-11.3	Pass
4	2498.86	28.78	2.01	32.45	62.74	MaxP	Horizontal	149	120	74.0	-11.3	Pass

Test Notes: BE BLE BW: 2M. Channel 39: 2480MHz

A. APPENDIX - GRAPHICAL IMAGES

A.1. 6 dB & 99% Bandwidth

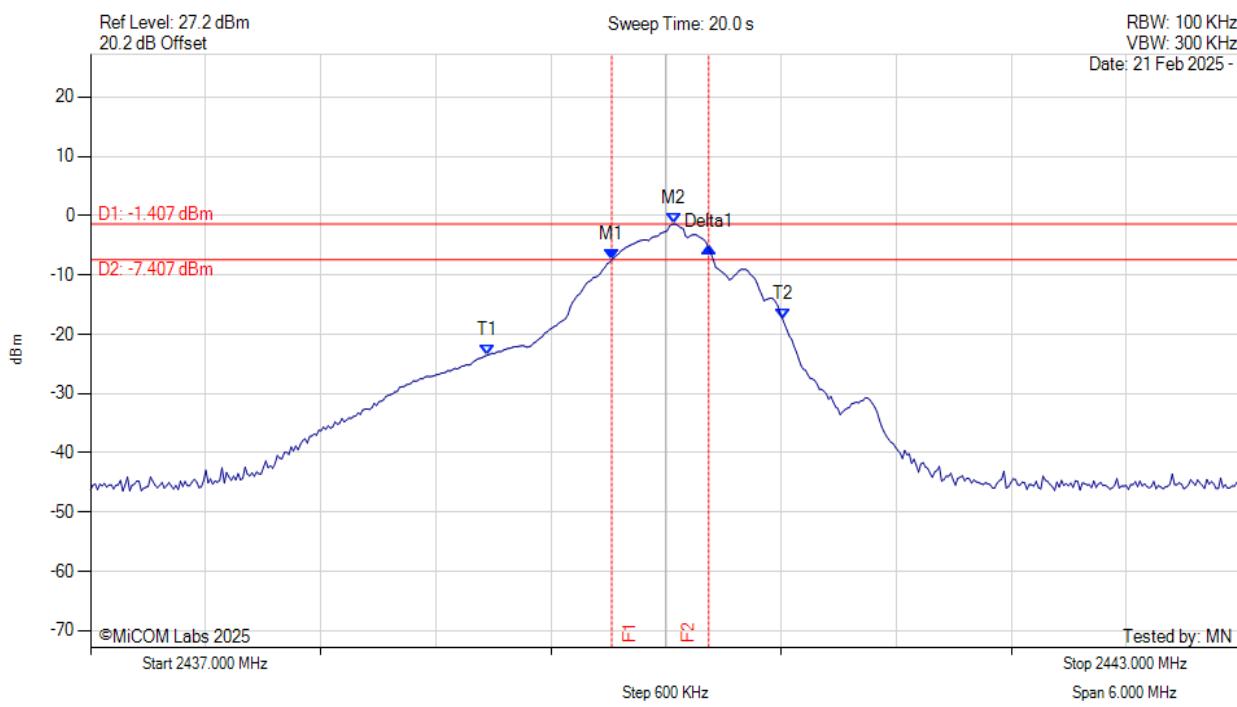


Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 2401.717 MHz : -7.123 dBm M2 : 2402.054 MHz : -0.956 dBm Delta1 : 505 KHz : 2.119 dB T1 : 2401.285 MHz : -19.374 dBm T2 : 2402.884 MHz : -19.840 dBm OBW : 1.599 MHz	Measured 6 dB Bandwidth: 0.505 MHz Limit: \geq 500.0 kHz Margin: -0.01 MHz

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6 dB & 99% BANDWIDTH

Variant: GFSK, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc

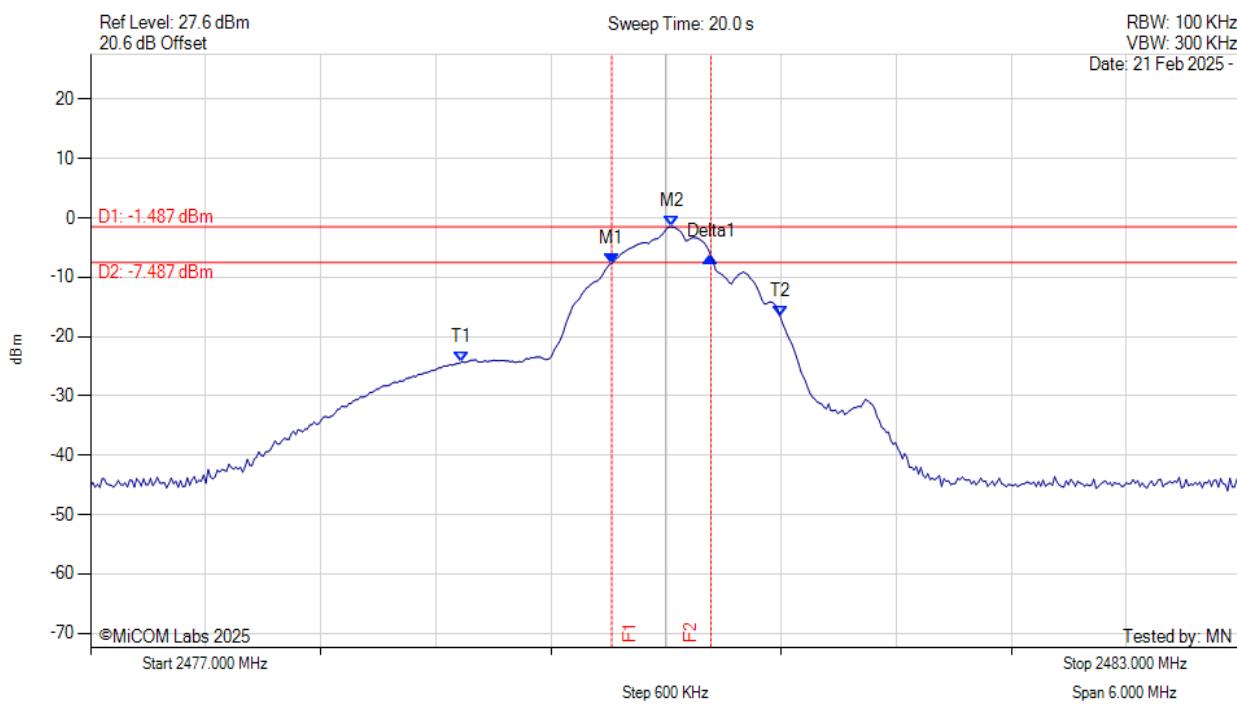


Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 2439.717 MHz : -7.457 dBm M2 : 2440.042 MHz : -1.407 dBm Delta1 : 505 KHz : 2.056 dB T1 : 2439.068 MHz : -23.526 dBm T2 : 2440.607 MHz : -17.380 dBm OBW : 1.539 MHz	Measured 6 dB Bandwidth: 0.505 MHz Limit: \geq 500.0 kHz Margin: -0.01 MHz

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6 dB & 99% BANDWIDTH

Variant: GFSK, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



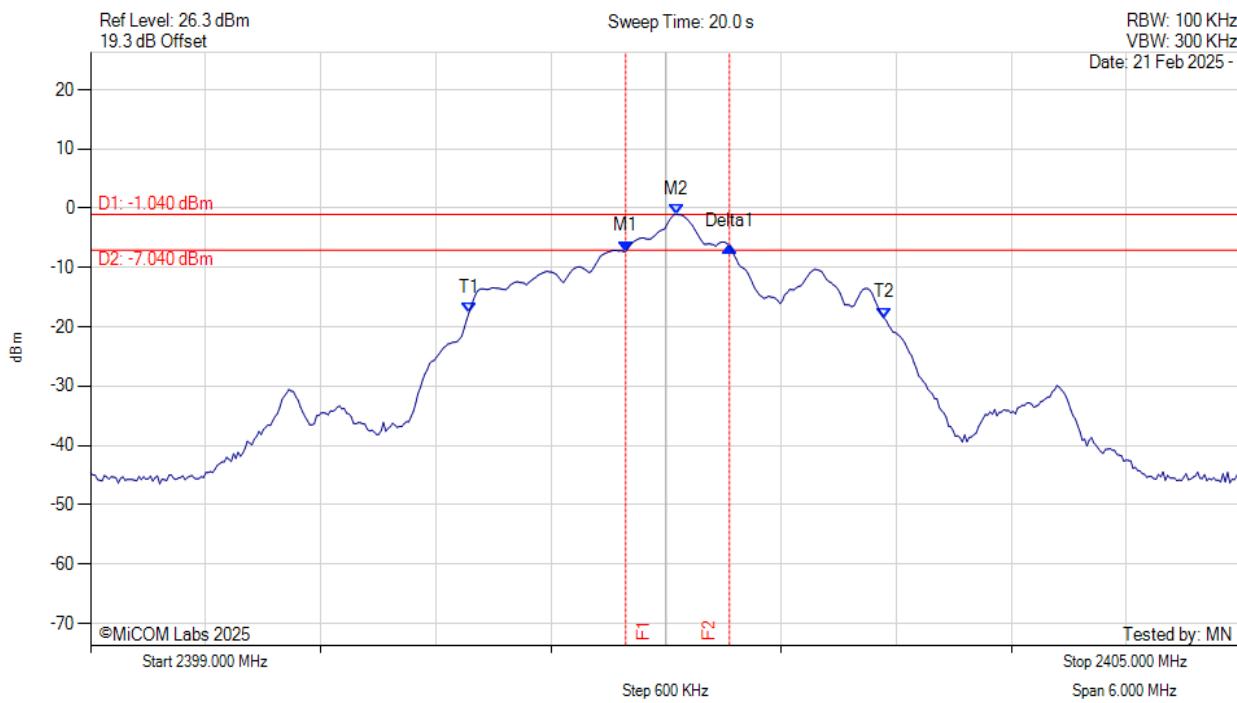
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 2479.717 MHz : -7.633 dBm M2 : 2480.030 MHz : -1.487 dBm Delta1 : 517 KHz : 1.180 dB T1 : 2478.936 MHz : -24.250 dBm T2 : 2480.595 MHz : -16.567 dBm OBW : 1.659 MHz	Measured 6 dB Bandwidth: 0.517 MHz Limit: \geq 500.0 kHz Margin: -0.02 MHz

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6 dB & 99% BANDWIDTH



Variant: GFSK-2M, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



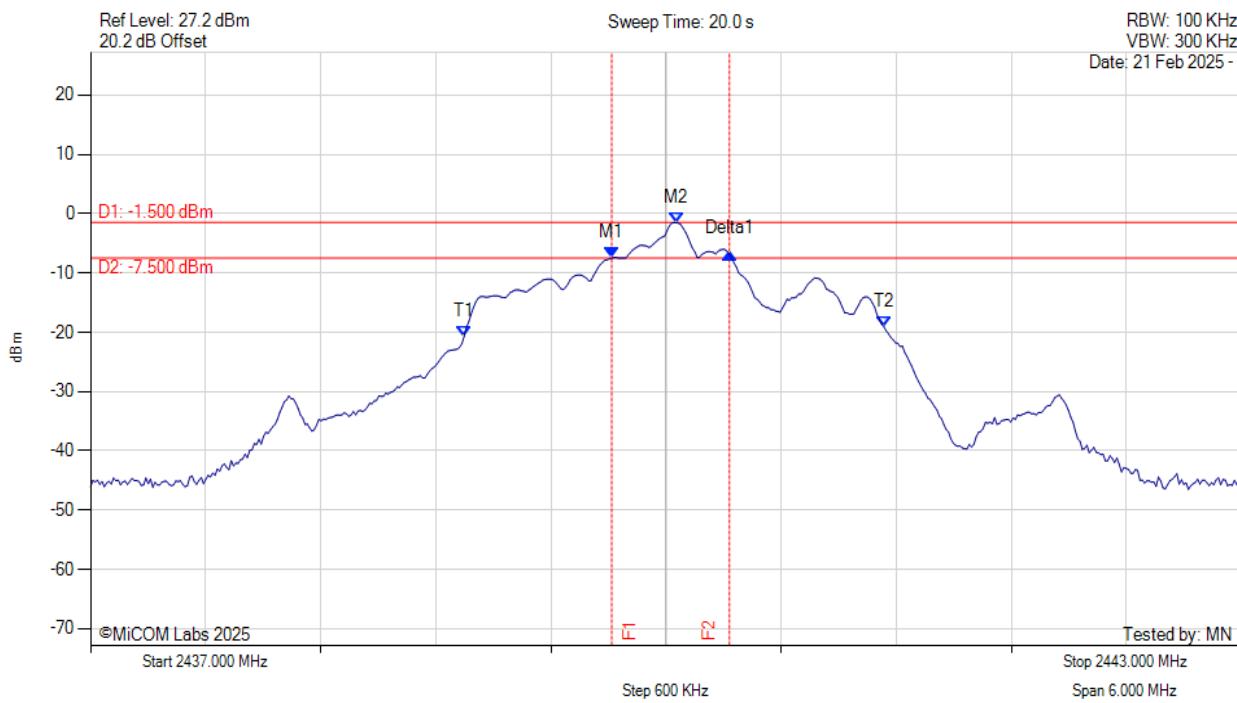
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 2401.790 MHz : -7.255 dBm M2 : 2402.054 MHz : -1.040 dBm Delta1 : 541 KHz : 0.899 dB T1 : 2400.972 MHz : -17.700 dBm T2 : 2403.136 MHz : -18.489 dBm OBW : 2.164 MHz	Measured 6 dB Bandwidth: 0.541 MHz Limit: \geq 500.0 kHz Margin: -0.04 MHz

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6 dB & 99% BANDWIDTH



Variant: GFSK-2M, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



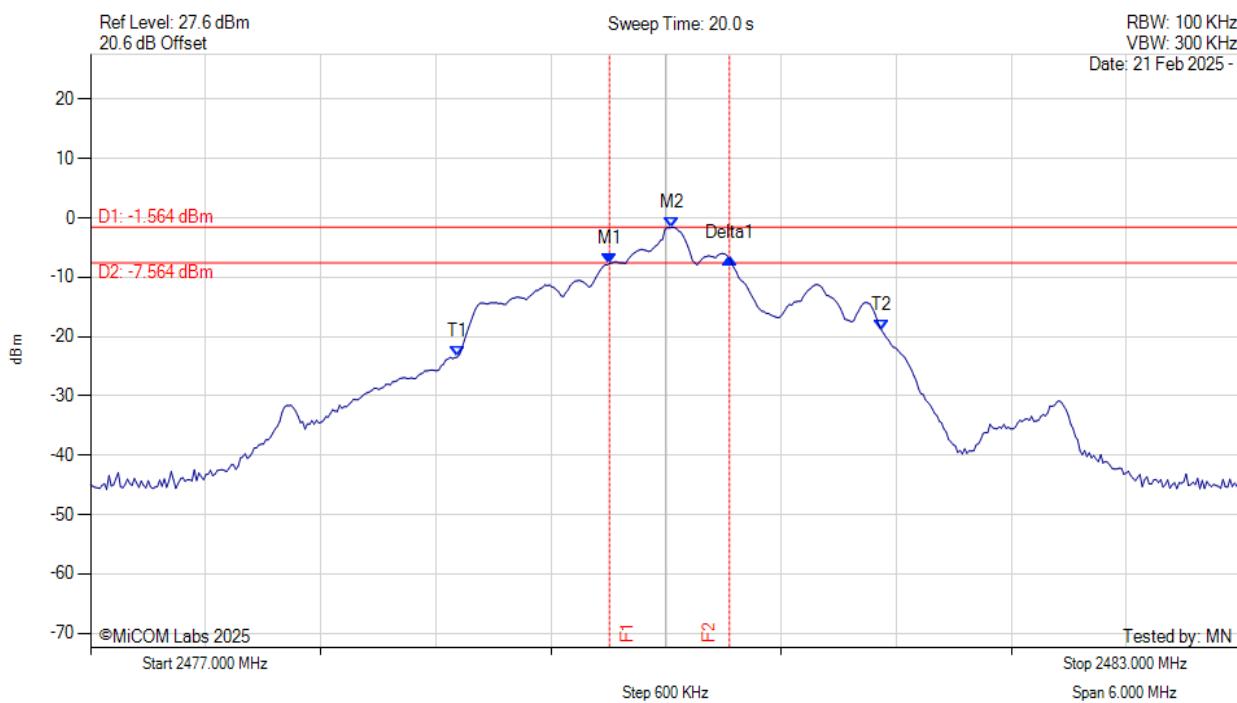
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 2439.717 MHz : -7.512 dBm M2 : 2440.054 MHz : -1.500 dBm Delta1 : 613 KHz : 0.702 dB T1 : 2438.948 MHz : -20.654 dBm T2 : 2441.136 MHz : -19.080 dBm OBW : 2.188 MHz	Measured 6 dB Bandwidth: 0.613 MHz Limit: \geq 500.0 kHz Margin: -0.11 MHz

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6 dB & 99% BANDWIDTH



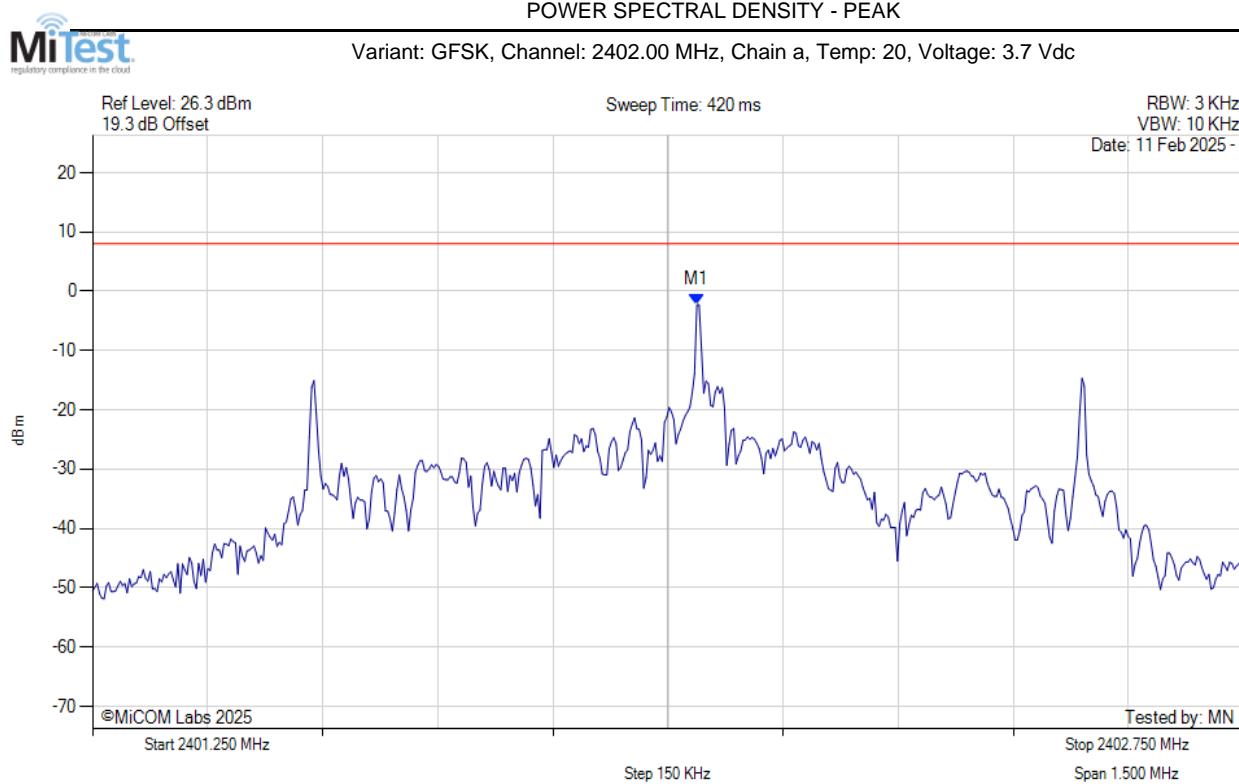
Variant: GFSK-2M, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = MAX HOLD	M1 : 2479.705 MHz : -7.704 dBm M2 : 2480.030 MHz : -1.564 dBm Delta1 : 625 KHz : 0.972 dB T1 : 2478.912 MHz : -23.441 dBm T2 : 2481.124 MHz : -18.944 dBm OBW : 2.212 MHz	Measured 6 dB Bandwidth: 0.625 MHz Limit: \geq 500.0 kHz Margin: -0.13 MHz

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A.2. Power Spectral Density

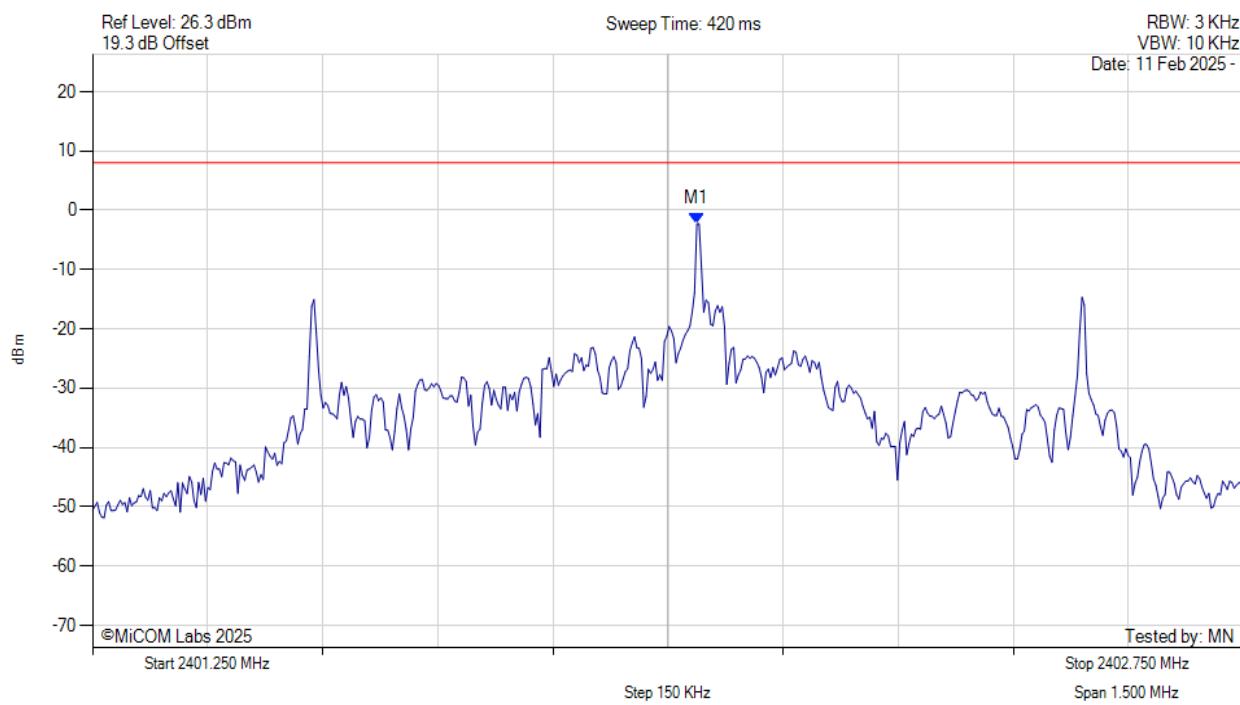


Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2402.038 MHz : -2.307 dBm	Limit: ≤ 8.000 dBm Margin: 10.31 dB

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POWER SPECTRAL DENSITY - PEAK

Variant: GFSK, Channel: 2402.00 MHz, SUM, Temp: 20, Voltage: 3.7 Vdc



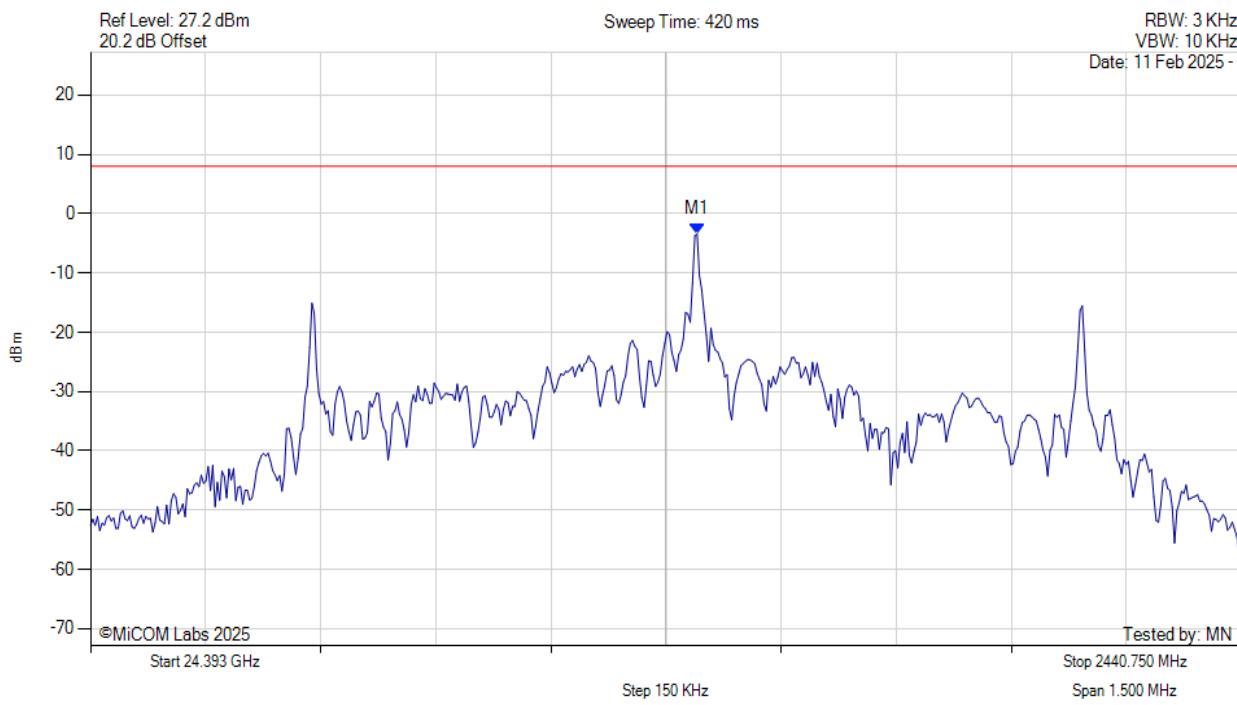
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2402.038 MHz : -2.307 dBm	Limit: ≤ 8.0 dBm Margin: -10.3 dB

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POWER SPECTRAL DENSITY - PEAK



Variant: GFSK, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



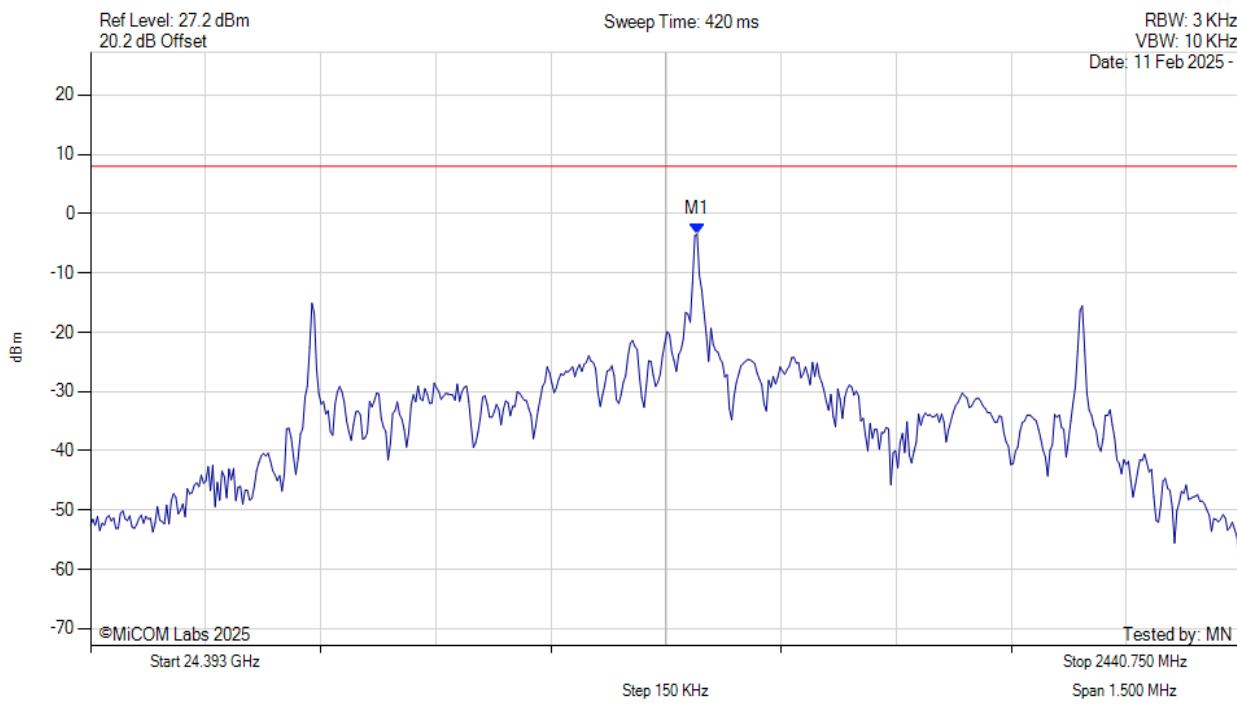
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2440.041 MHz : -3.455 dBm	Limit: ≤ 8.000 dBm Margin: 11.46 dB

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POWER SPECTRAL DENSITY - PEAK



Variant: GFSK, Channel: 2440.00 MHz, SUM, Temp: 20, Voltage: 3.7 Vdc



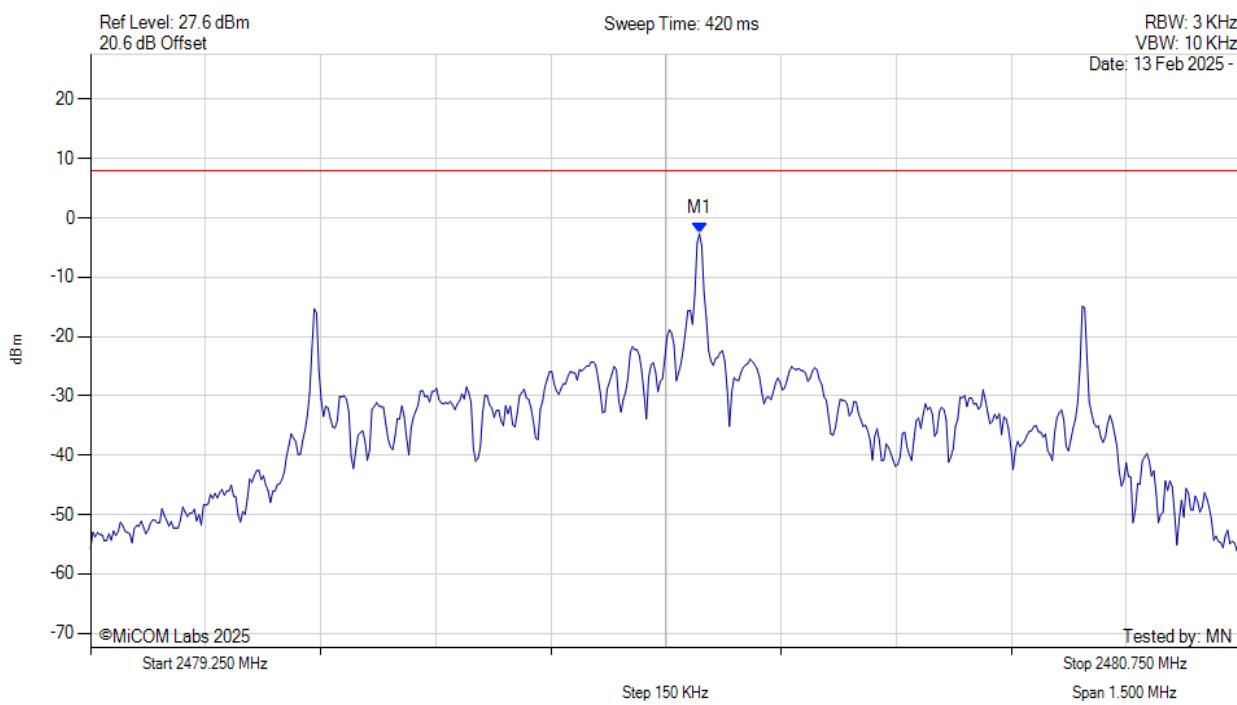
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2440.041 MHz : -3.455 dBm	Limit: ≤ 8.0 dBm Margin: -11.5 dB

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POWER SPECTRAL DENSITY - PEAK



Variant: GFSK, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc

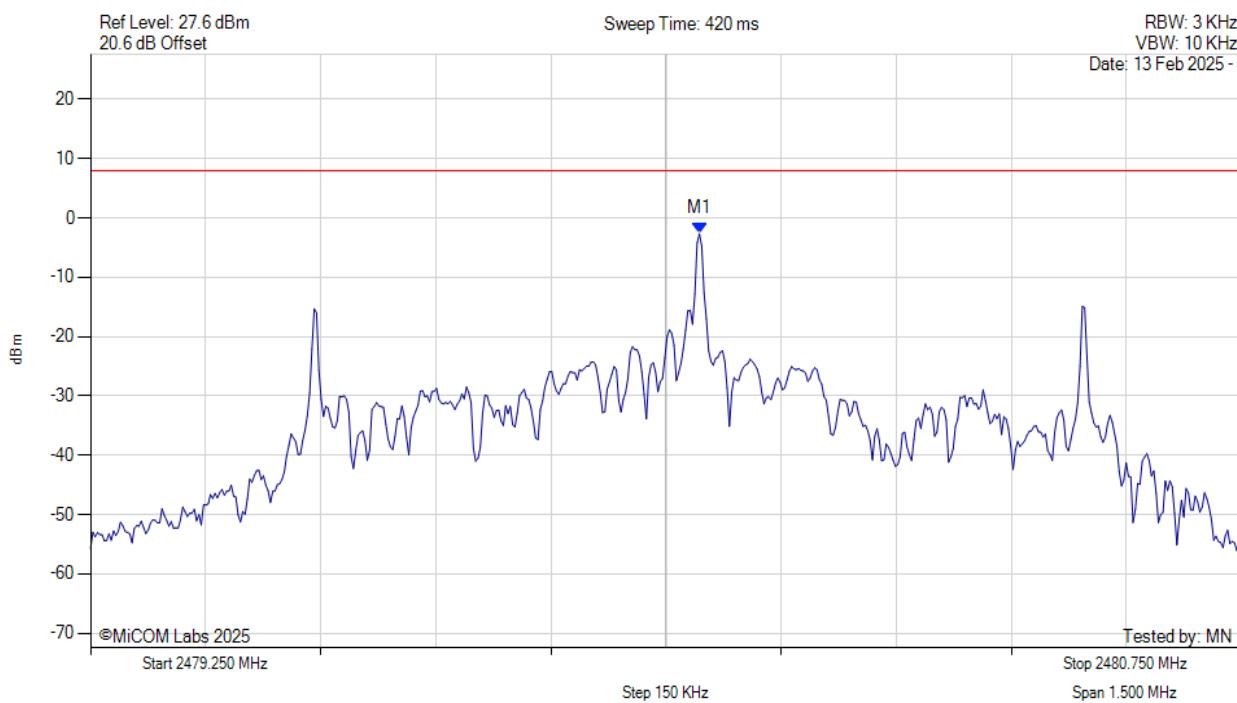


Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2480.044 MHz : -2.658 dBm	Limit: ≤ 8.000 dBm Margin: 10.66 dB

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POWER SPECTRAL DENSITY - PEAK

Variant: GFSK, Channel: 2480.00 MHz, SUM, Temp: 20, Voltage: 3.7 Vdc

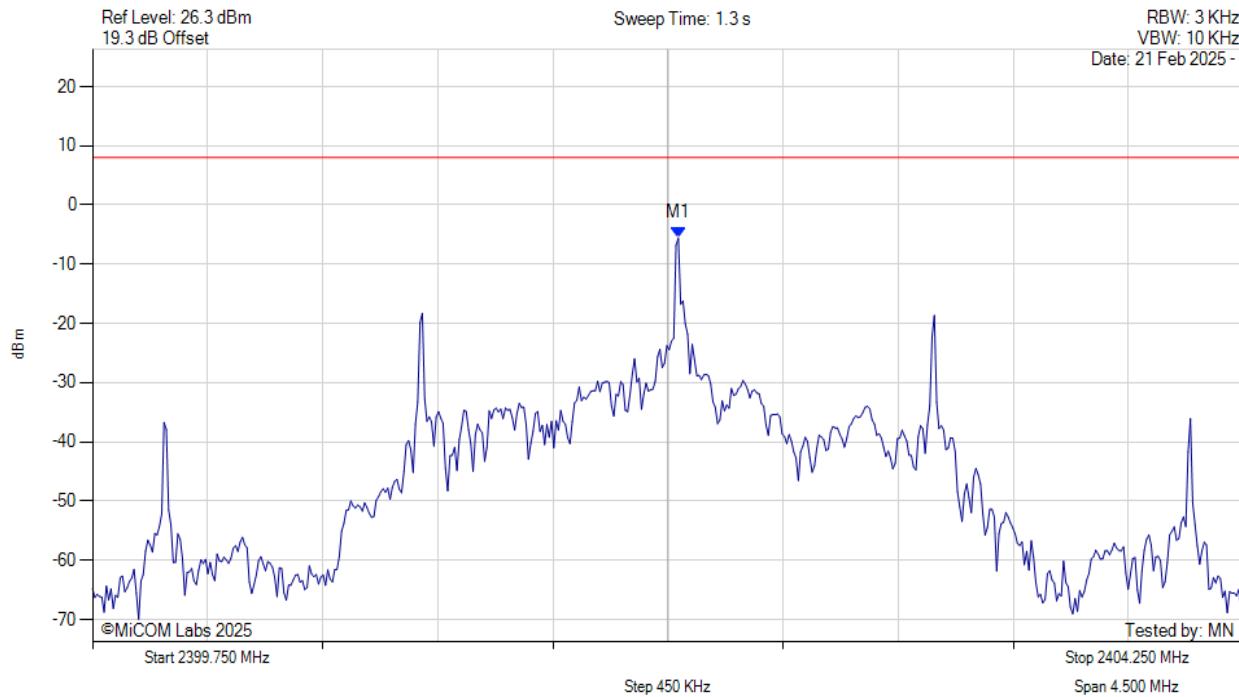


Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2480.044 MHz : -2.658 dBm	Limit: ≤ 8.0 dBm Margin: -10.7 dB

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POWER SPECTRAL DENSITY - PEAK

Variant: GFSK-2M, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



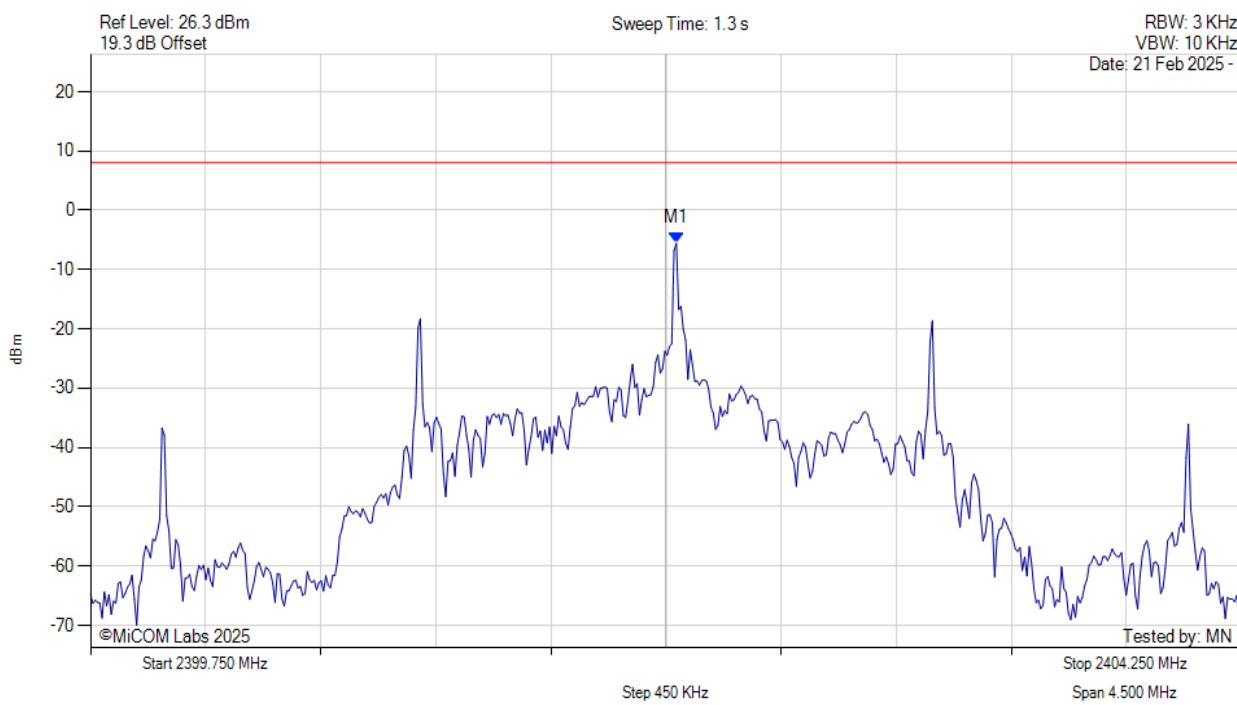
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2402.041 MHz : -5.567 dBm	Limit: ≤ 8.000 dBm Margin: 13.57 dB

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POWER SPECTRAL DENSITY - PEAK



Variant: GFSK-2M, Channel: 2402.00 MHz, SUM, Temp: 20, Voltage: 3.7 Vdc



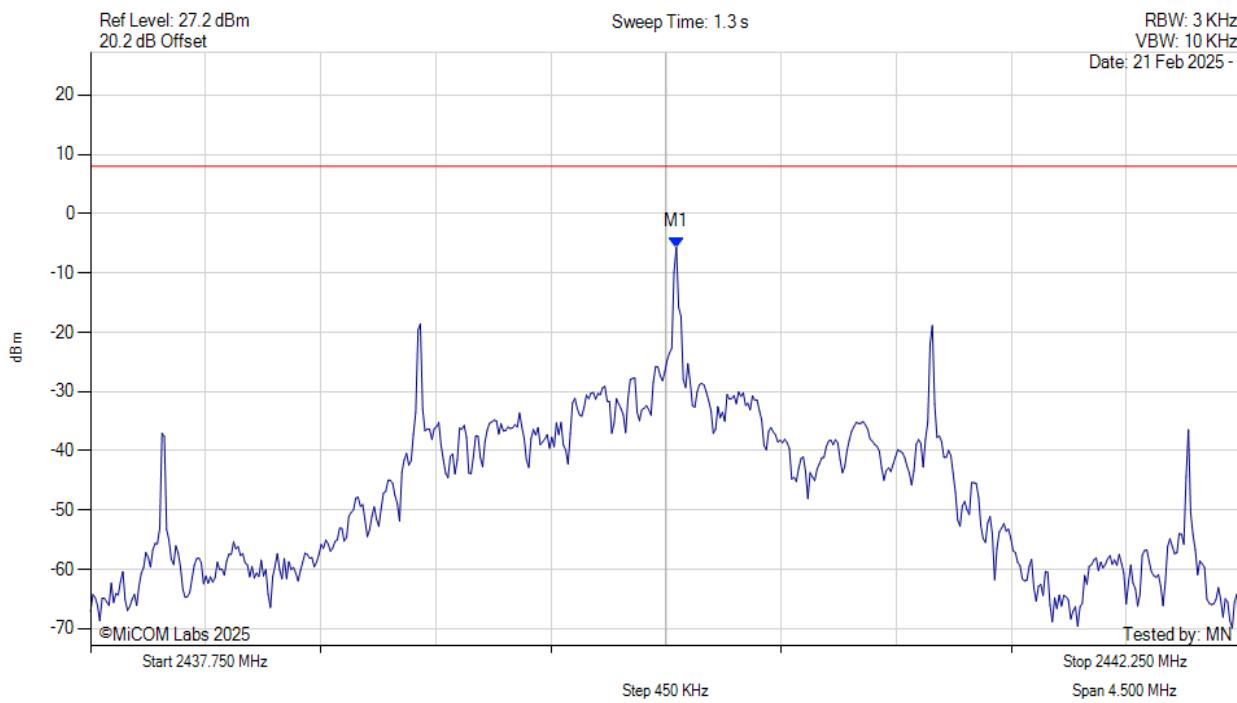
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2402.041 MHz : -5.567 dBm	Limit: ≤ 8.0 dBm Margin: -13.6 dB

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POWER SPECTRAL DENSITY - PEAK



Variant: GFSK-2M, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



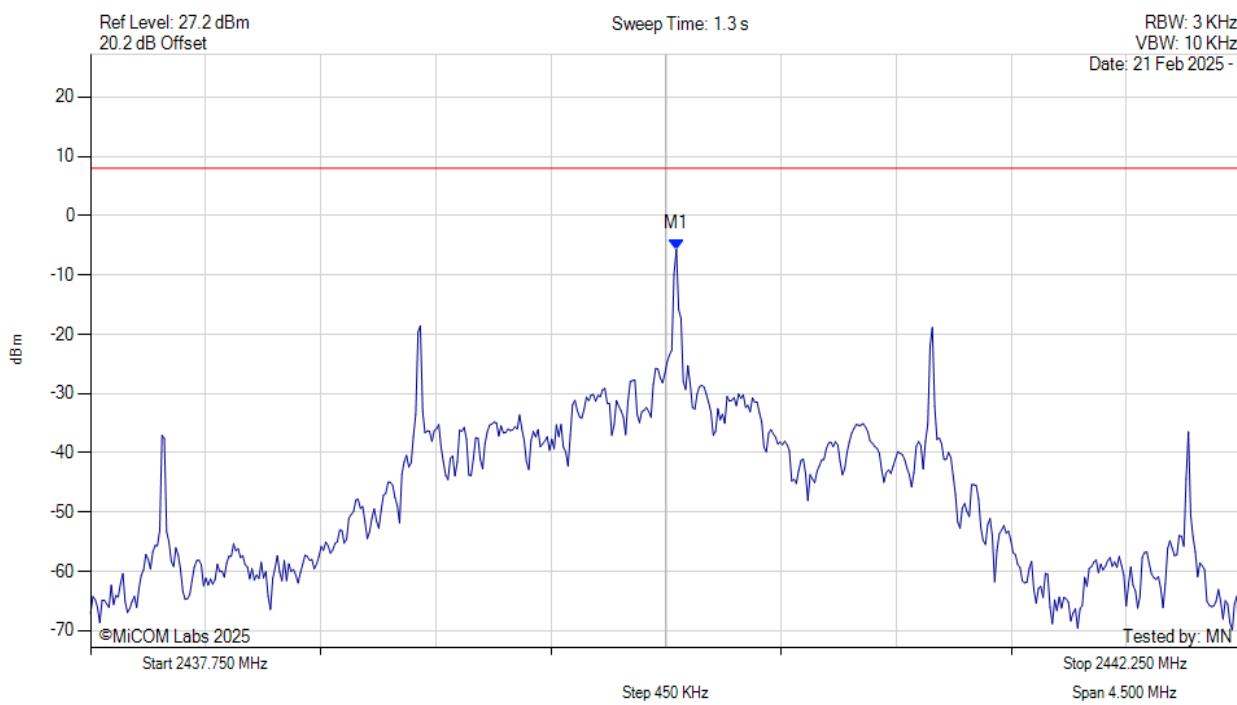
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2440.041 MHz : -5.659 dBm	Limit: ≤ 8.000 dBm Margin: 13.66 dB

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POWER SPECTRAL DENSITY - PEAK



Variant: GFSK-2M, Channel: 2440.00 MHz, SUM, Temp: 20, Voltage: 3.7 Vdc



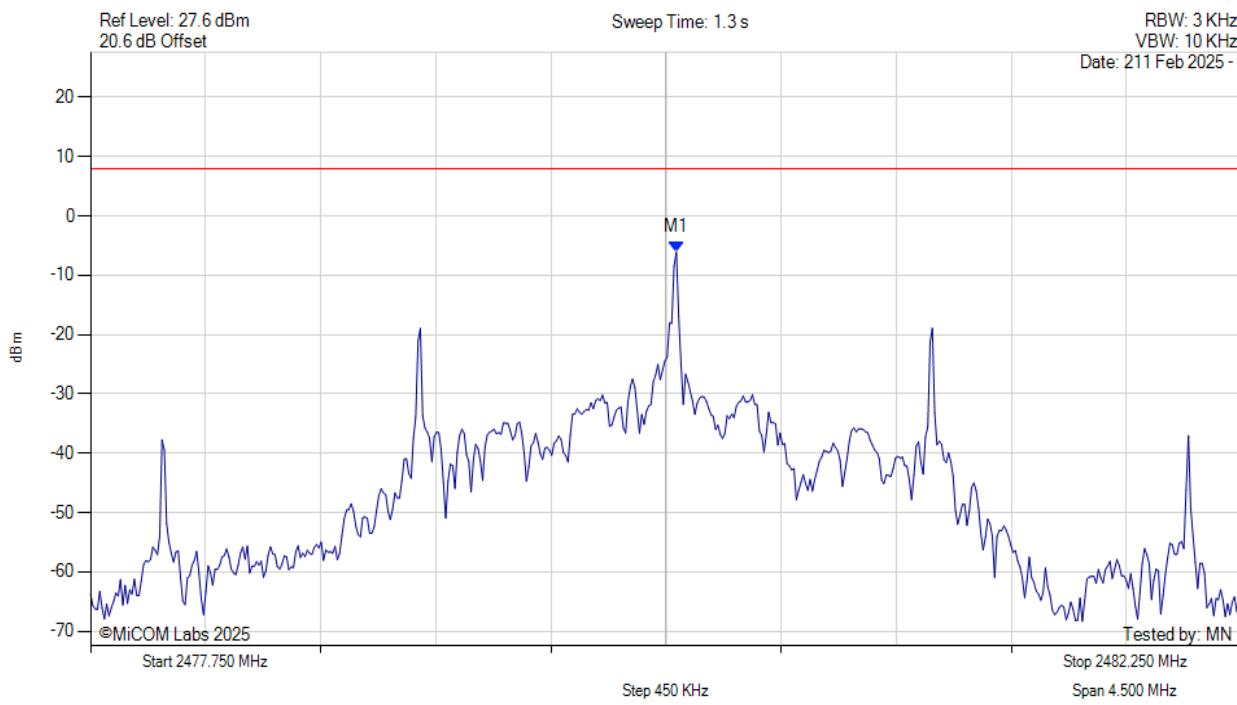
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2440.041 MHz : -5.659 dBm	Limit: ≤ 8.0 dBm Margin: -13.7 dB

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POWER SPECTRAL DENSITY - PEAK



Variant: GFSK-2M, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



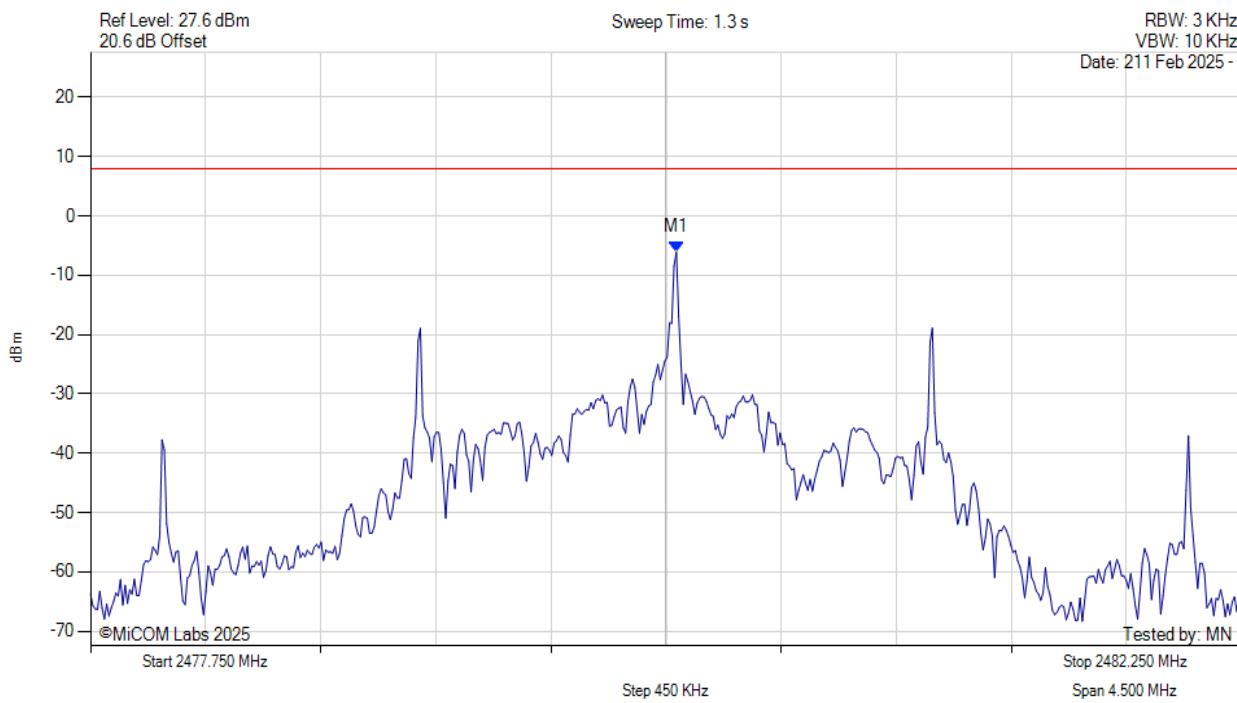
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2480.041 MHz : -6.069 dBm	Limit: ≤ 8.000 dBm Margin: 14.07 dB

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POWER SPECTRAL DENSITY - PEAK



Variant: GFSK-2M, Channel: 2480.00 MHz, SUM, Temp: 20, Voltage: 3.7 Vdc



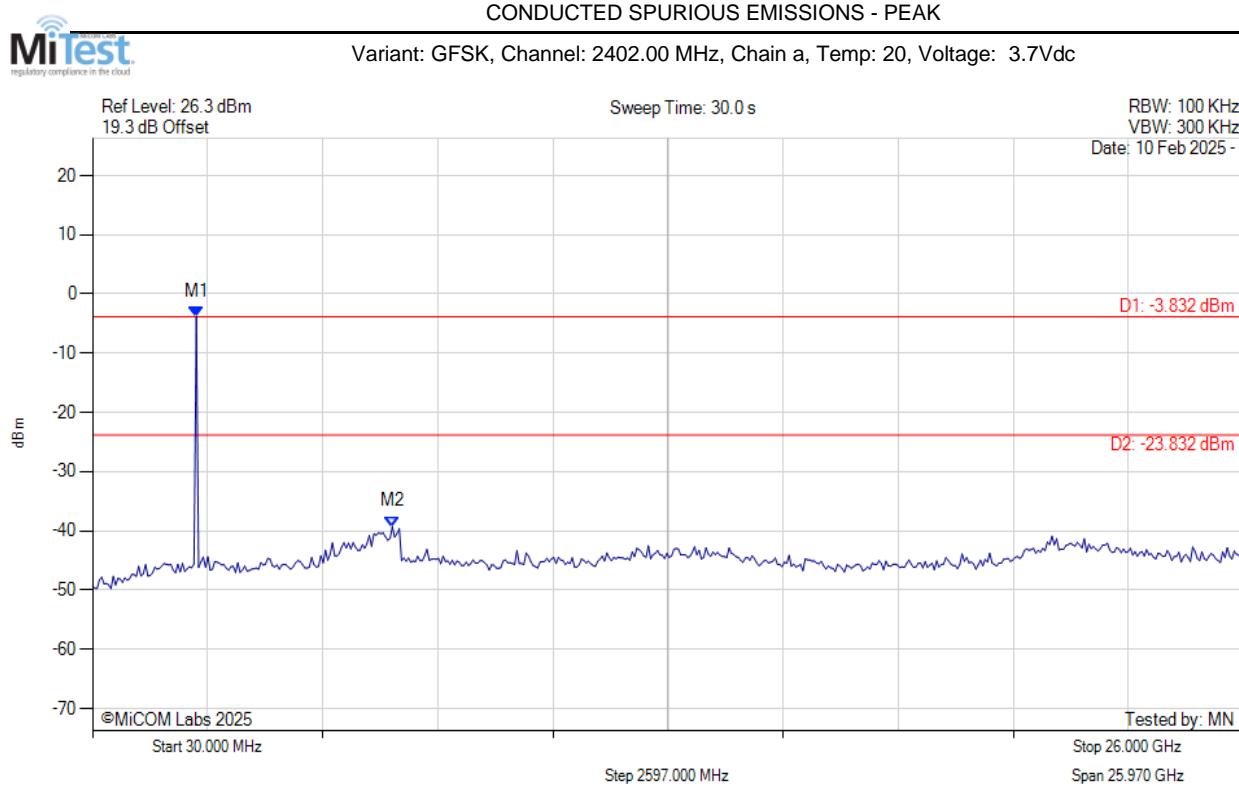
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2480.041 MHz : -6.069 dBm	Limit: ≤ 8.0 dBm Margin: -14.1 dB

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A.3. Emissions

A.3.1. Conducted Emissions

A.3.1.1. Conducted Spurious Emissions



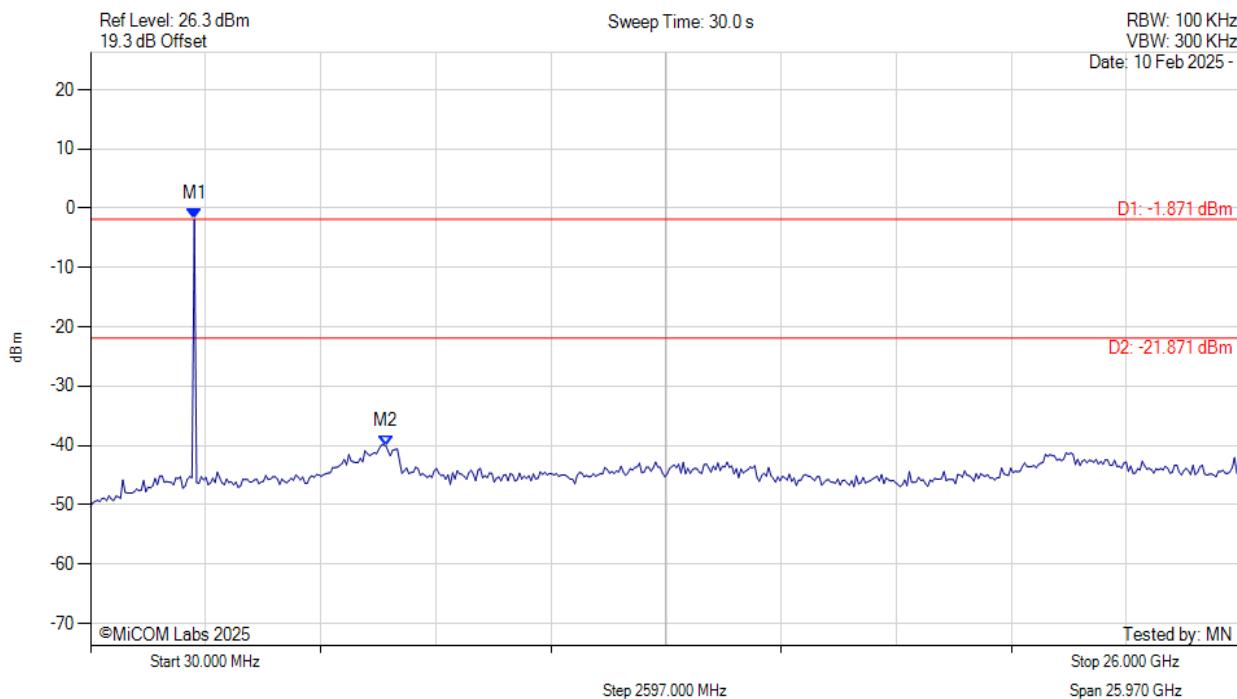
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2371.984 MHz : -3.832 dBm M2 : 6795.731 MHz : -39.288 dBm	Limit: -23.83 dBm Margin: -15.46 dB

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CONDUCTED SPURIOUS EMISSIONS - PEAK



Variant: GFSK, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



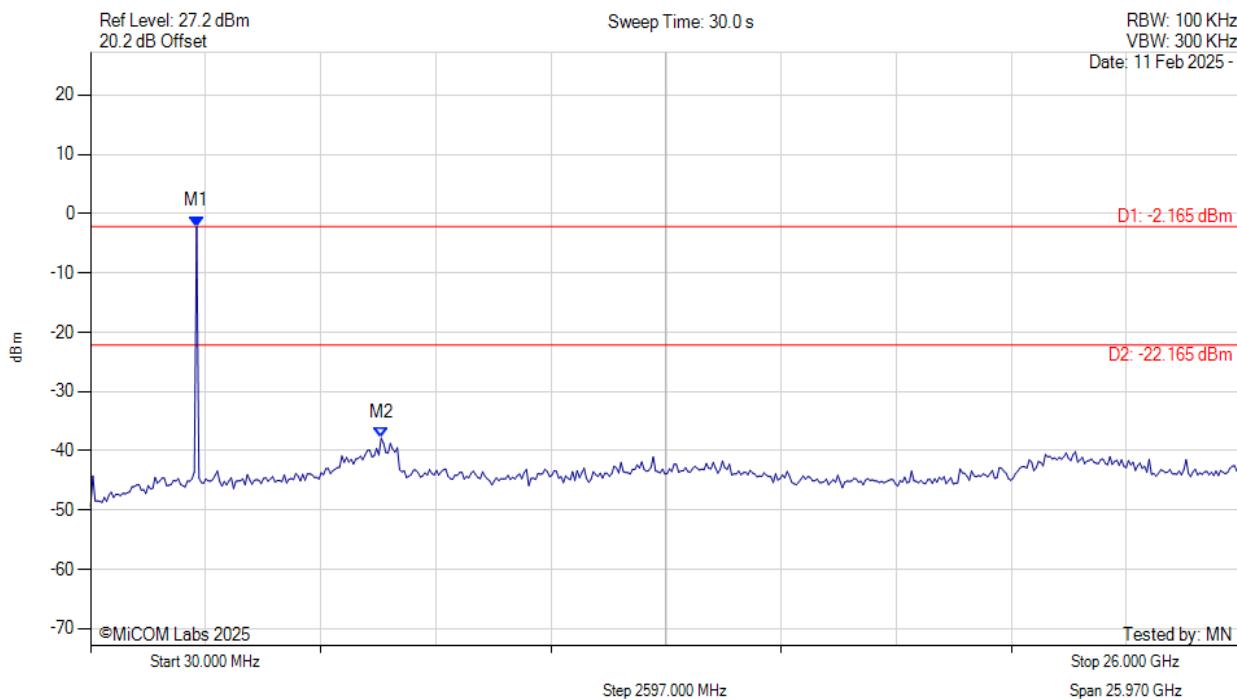
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2371.984 MHz : -1.871 dBm M2 : 6691.643 MHz : -40.045 dBm	Limit: -21.87 dBm Margin: -18.18 dB

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CONDUCTED SPURIOUS EMISSIONS - PEAK



Variant: GFSK, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



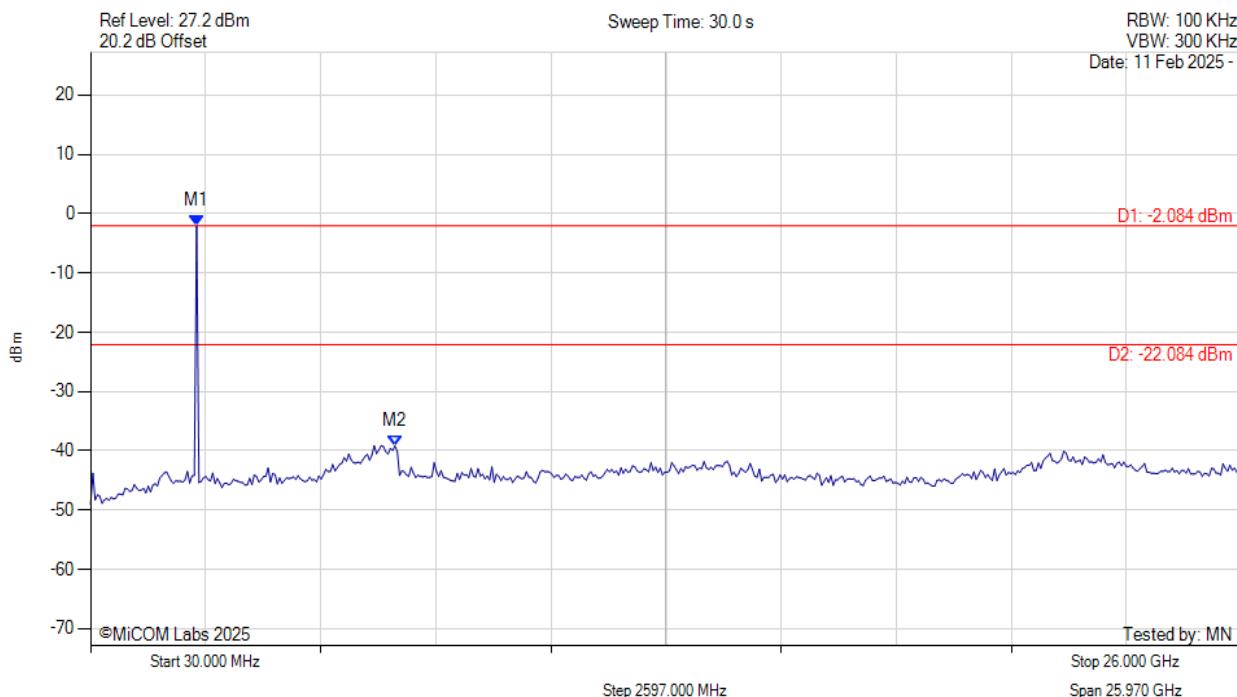
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2424.028 MHz : -2.165 dBm M2 : 6587.555 MHz : -37.855 dBm	Limit: -22.17 dBm Margin: -15.68 dB

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CONDUCTED SPURIOUS EMISSIONS - PEAK



Variant: GFSK, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



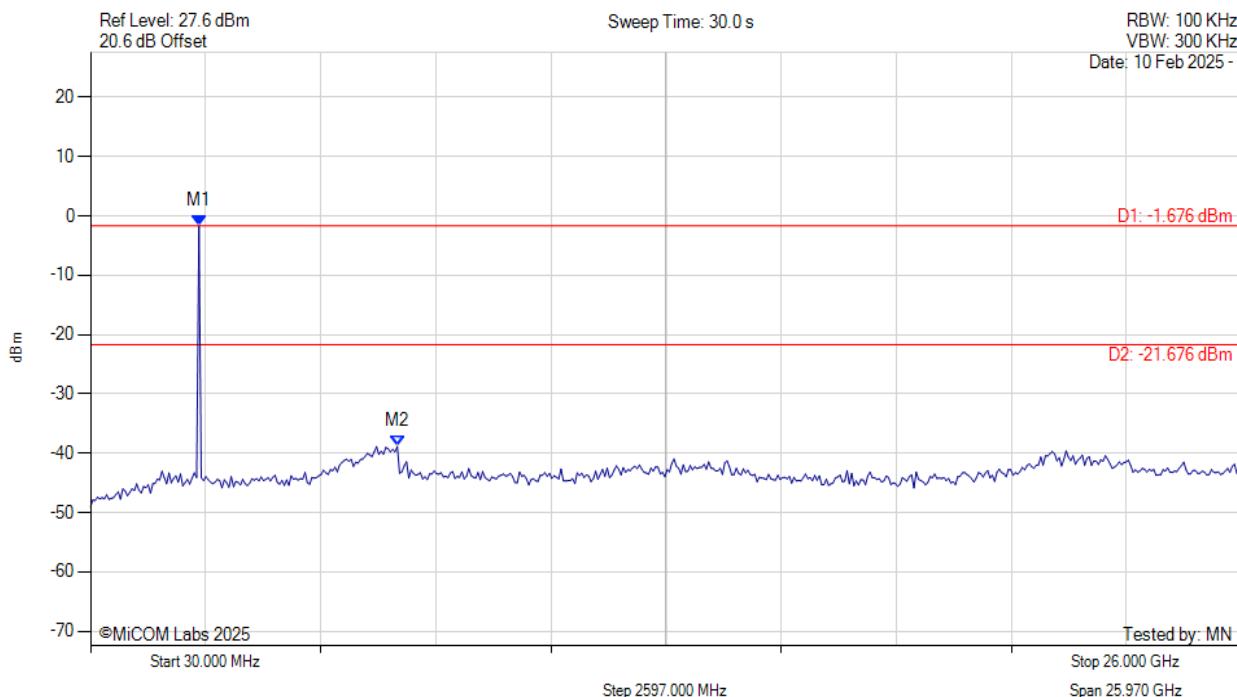
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2424.028 MHz : -2.084 dBm M2 : 6899.820 MHz : -39.190 dBm	Limit: -22.08 dBm Margin: -17.11 dB

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CONDUCTED SPURIOUS EMISSIONS - PEAK



Variant: GFSK, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.7Vdc



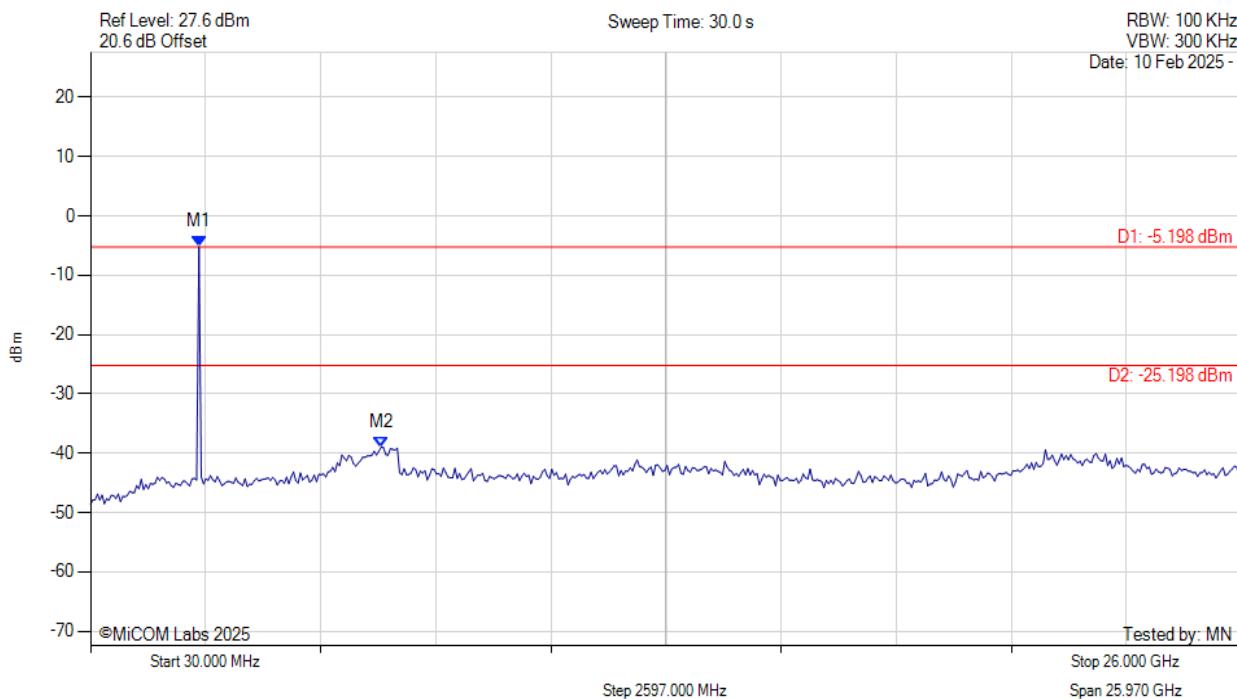
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2476.072 MHz : -1.676 dBm M2 : 6951.864 MHz : -38.859 dBm	Limit: -21.68 dBm Margin: -17.18 dB

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CONDUCTED SPURIOUS EMISSIONS - PEAK



Variant: GFSK, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



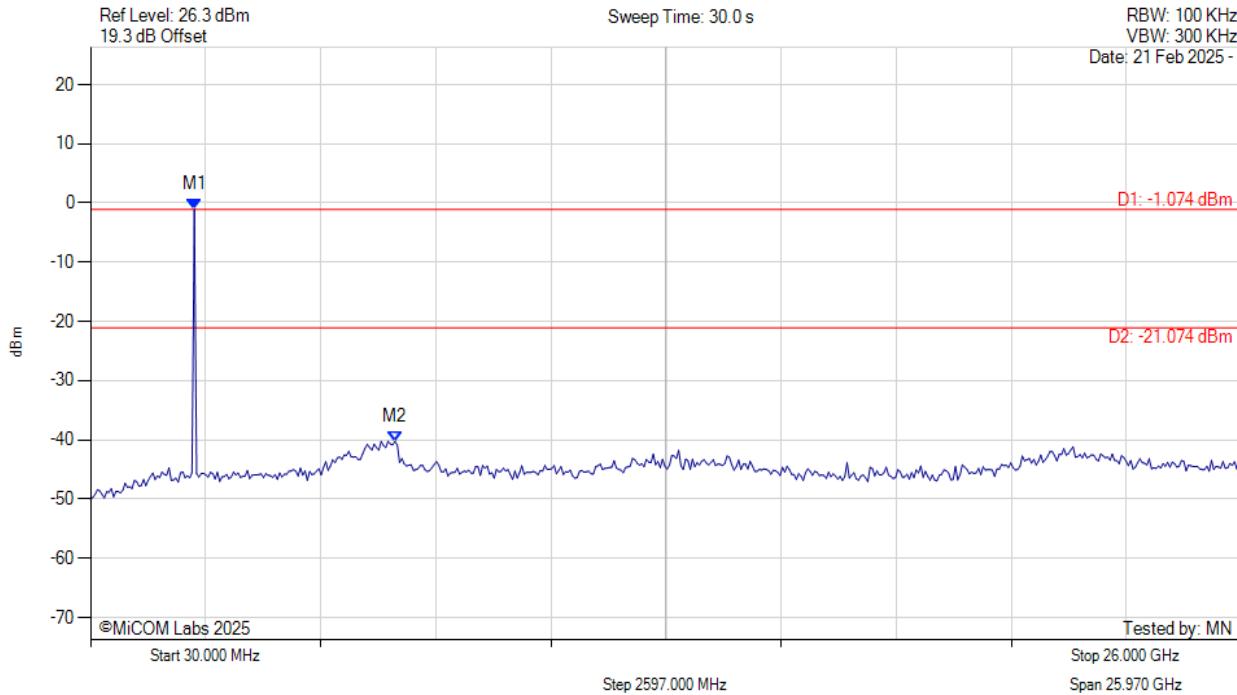
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2476.072 MHz : -5.198 dBm M2 : 6587.555 MHz : -38.985 dBm	Limit: -25.20 dBm Margin: -13.79 dB

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CONDUCTED SPURIOUS EMISSIONS - PEAK



Variant: GFSK-2M, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



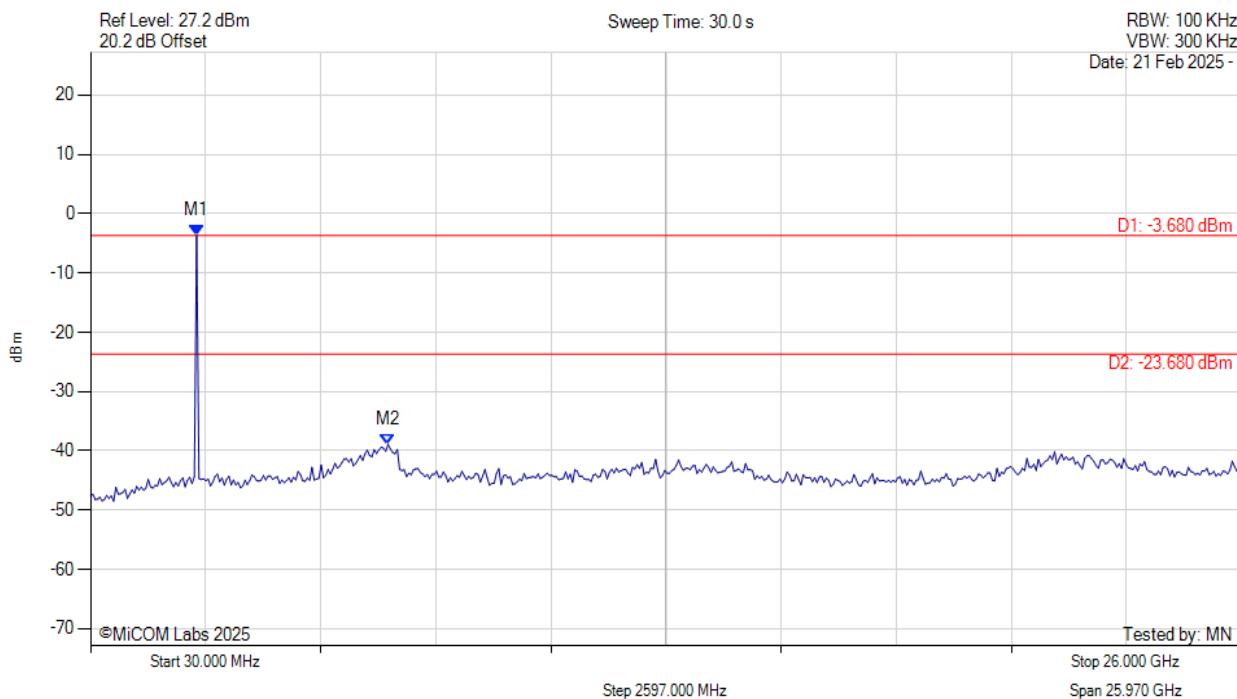
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2371.984 MHz : -1.074 dBm M2 : 6899.820 MHz : -40.258 dBm	Limit: -21.07 dBm Margin: -19.19 dB

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CONDUCTED SPURIOUS EMISSIONS - PEAK



Variant: GFSK-2M, Channel: 2440.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



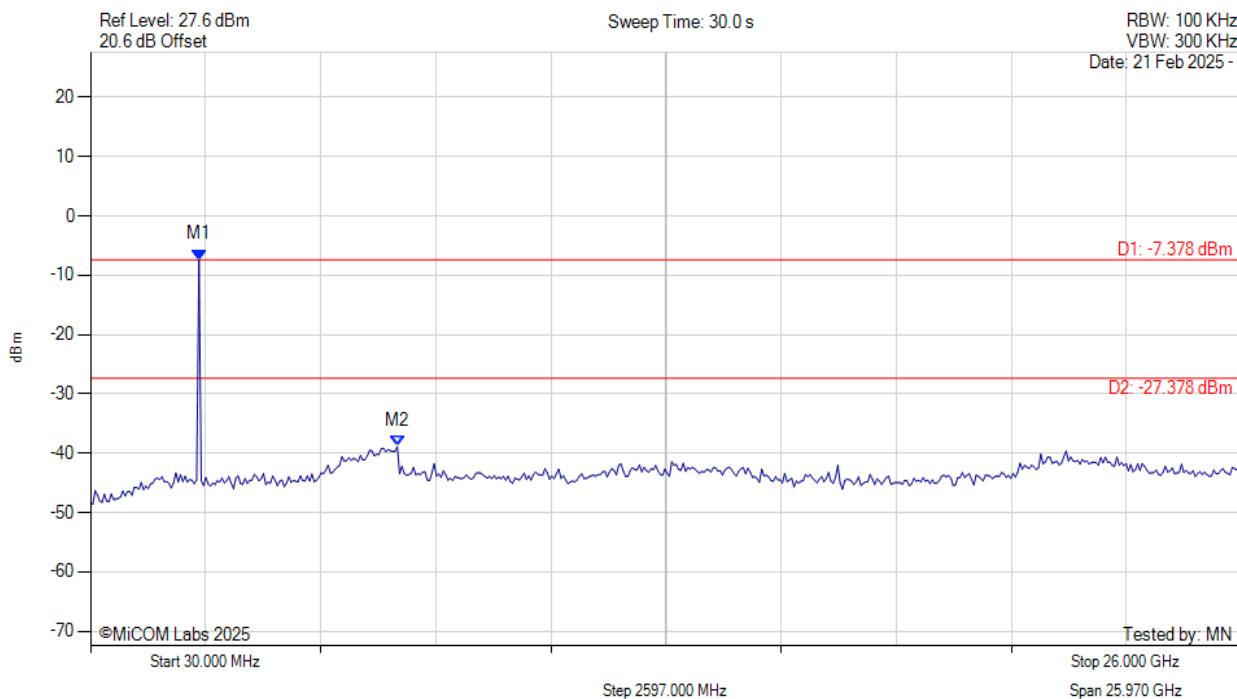
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2424.028 MHz : -3.680 dBm M2 : 6743.687 MHz : -38.895 dBm	Limit: -23.68 dBm Margin: -15.22 dB

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CONDUCTED SPURIOUS EMISSIONS - PEAK



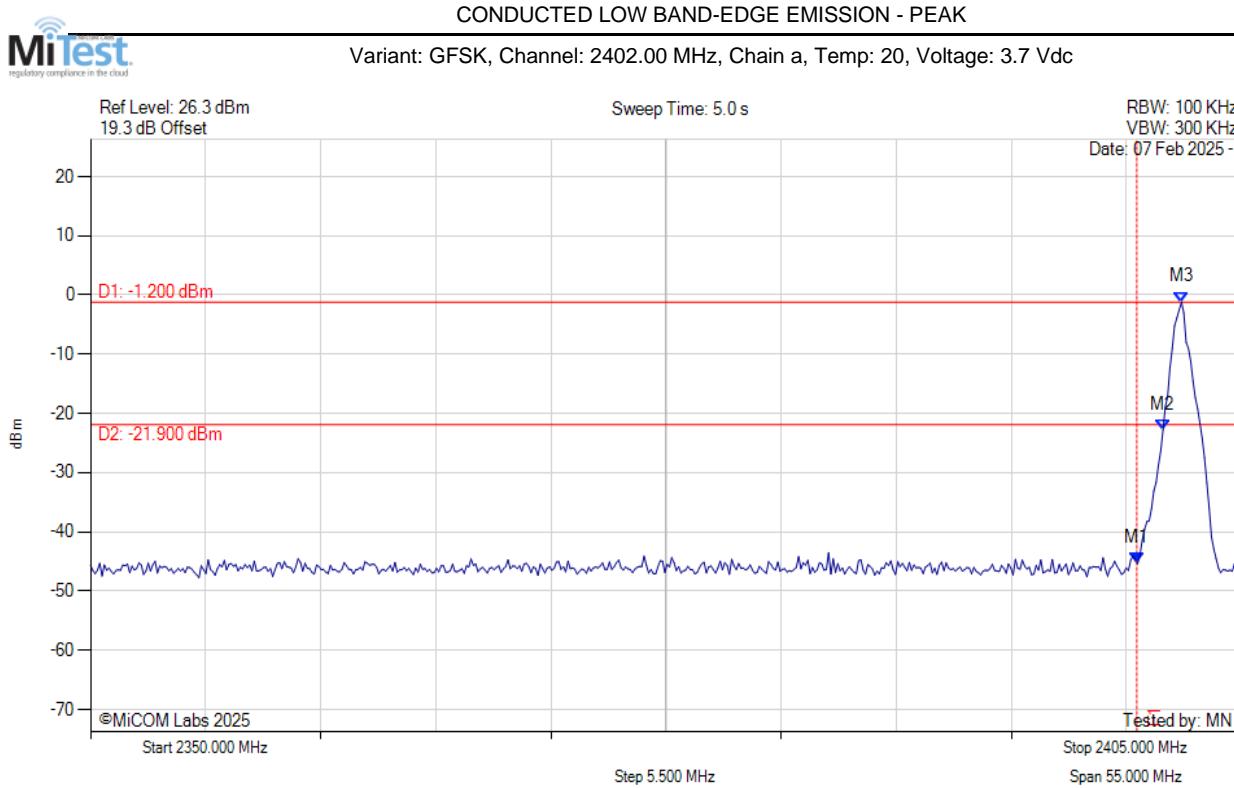
Variant: GFSK-2M, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2476.072 MHz : -7.378 dBm M2 : 6951.864 MHz : -38.891 dBm	Limit: -27.38 dBm Margin: -11.51 dB

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A.3.1.2. Conducted Band-Edge Emissions



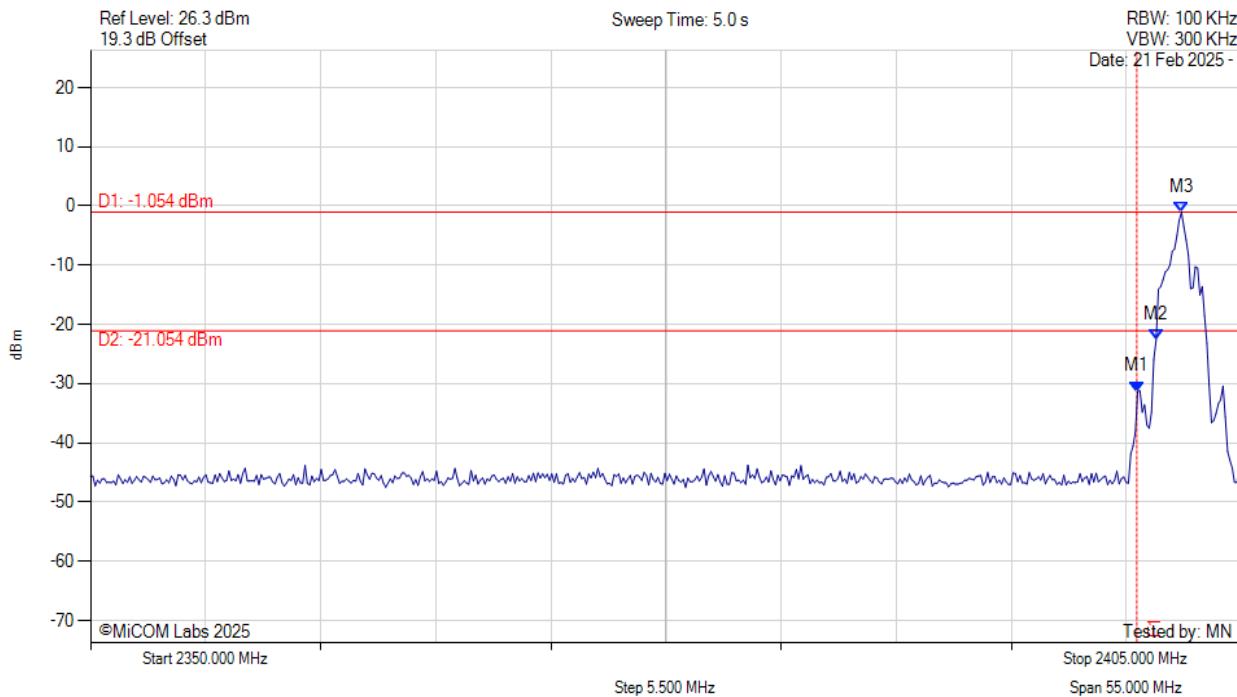
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2400.000 MHz : -45.345 dBm M2 : 2401.253 MHz : -22.760 dBm M3 : 2402.134 MHz : -1.200 dBm	Channel Frequency: 2402.00 MHz

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CONDUCTED LOW BAND-EDGE EMISSION - PEAK



Variant: GFSK-2M, Channel: 2402.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



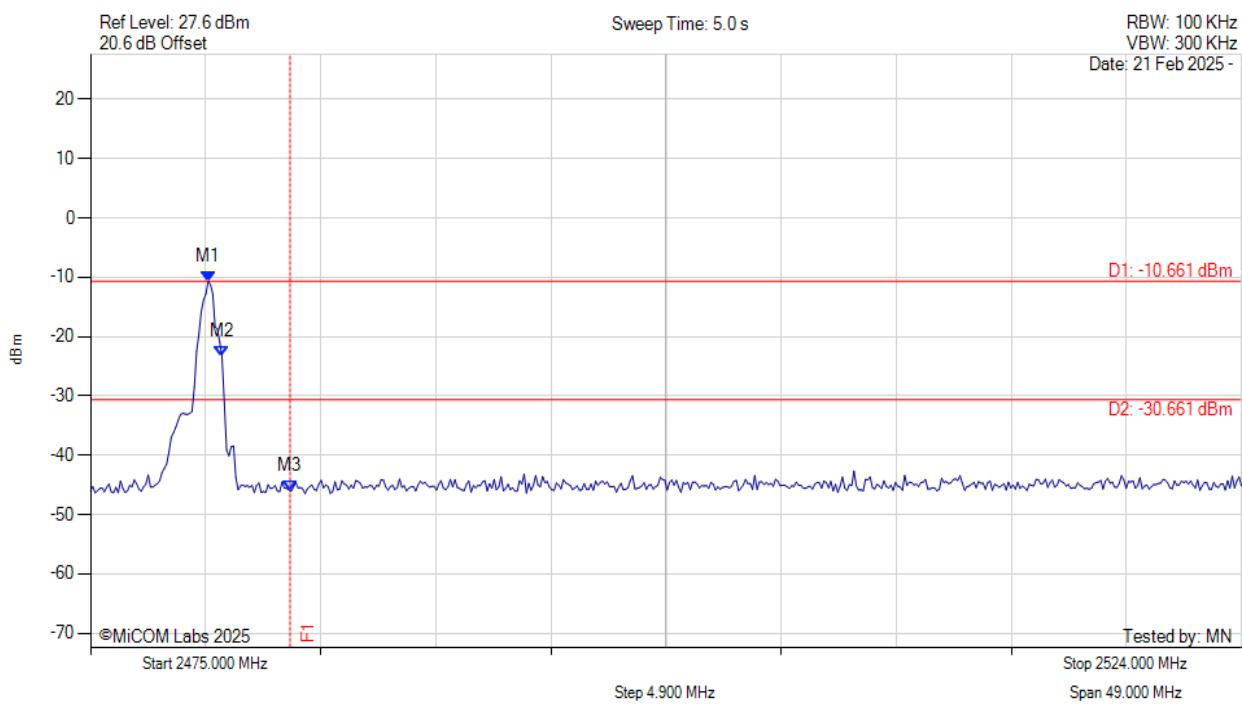
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2400.000 MHz : -31.336 dBm M2 : 2400.922 MHz : -22.581 dBm M3 : 2402.134 MHz : -1.054 dBm	Channel Frequency: 2402.00 MHz

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CONDUCTED HIGH BAND-EDGE EMISSION - PEAK



Variant: GFSK, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



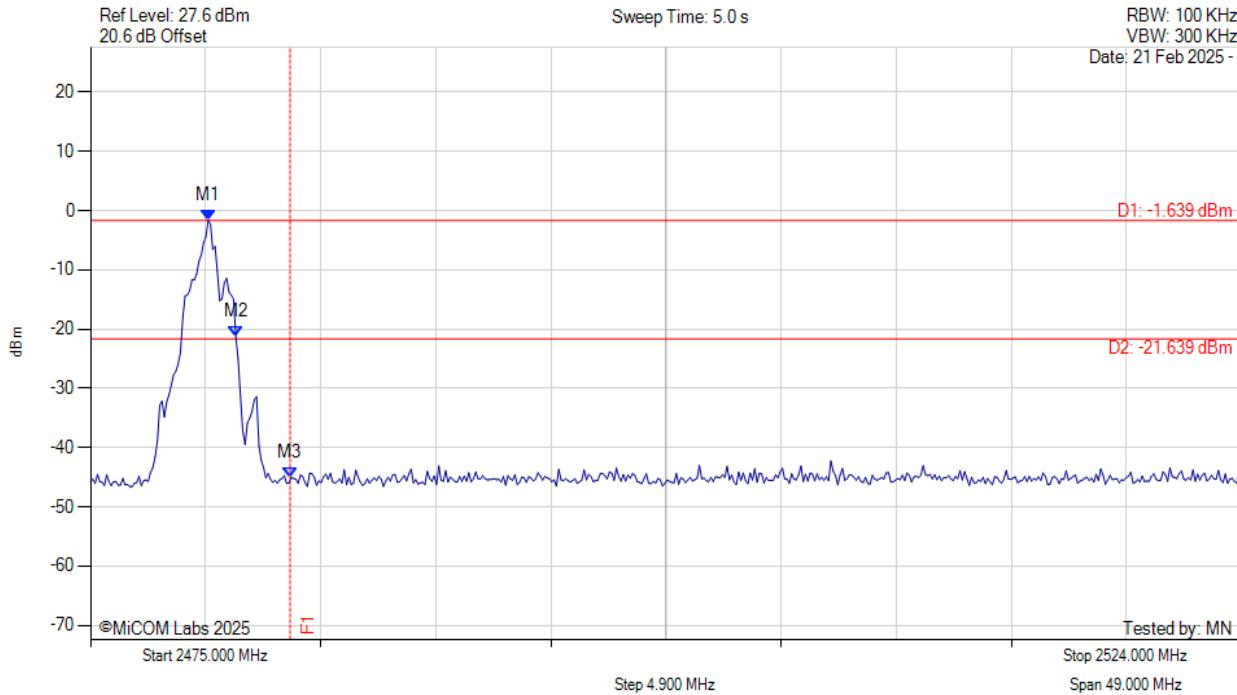
Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2480.008 MHz : -10.661 dBm M2 : 2480.597 MHz : -23.427 dBm M3 : 2483.500 MHz : -46.060 dBm	Channel Frequency: 2480.00 MHz

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CONDUCTED HIGH BAND-EDGE EMISSION - PEAK



Variant: GFSK-2M, Channel: 2480.00 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



Analyzer Setup	Marker: Frequency: Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 20 Trace Mode = VIEW	M1 : 2480.008 MHz : -1.639 dBm M2 : 2481.186 MHz : -21.312 dBm M3 : 2483.500 MHz : -45.074 dBm	Channel Frequency: 2480.00 MHz

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