



REGULATORY COMPLIANCE TEST REPORT

FCC Part 15 Subpart F 15.519, 15.521 - UWB Device

Report No.: CATA08-U6 Rev A

Company: Catapult Sports Pty Ltd

Model Name: Smart Football

REGULATORY COMPLIANCE TEST REPORT

Company: Catapult Sports Pty Ltd

Model Name: Smart Football

To: FCC CFR 47 Part 15 Subpart F 15.519, 15.521

Test Report Serial No.: CATA08-U6 Rev A

This report supersedes: NONE

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

Issue Date: 28th June 2021

This Test Report is Issued Under the Authority of:

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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 24th day of February 2020.



Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2021

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

1.2. RECOGNITION

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

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

TCB- Telecommunications Certification Bodies (TCB)

FCB – Foreign Certification Body

CAB – Conformity Assessment Body

NB – Notified Body;

AB – Approved Body

MRA – Mutual Recognition Agreement

MRA Phases

Phase I - recognition for product testing

Phase II – recognition for both product testing and certification

1.3. PRODUCT CERTIFICATION

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



Accredited Product Certification Body

A2LA has accredited

MiCOM LABS

Pleasanton, CA

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

Presented this 24th day of February 2020



Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2021

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
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	25 th June 2021	Draft for comment
Rev A	28 th June 2021	Initial Release

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

3. TEST RESULT CERTIFICATE

Manufacturer: Catapult Sports Pty Ltd 75-83 High St Prahran Melbourne, Victoria 3181 Australia	Tested By: MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model: B001	Telephone: +1 925 462 0304
Equipment Type: UWB (Smart Football)	Fax: +1 925 462 0306
S/N's: None	
Test Date(s): 24 th – 28 th May 2021	Website: www.micomlabs.com

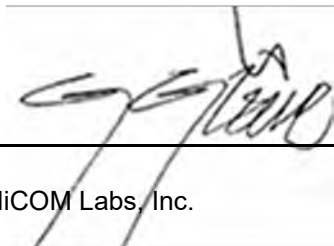
STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart F 15.519, 15.521	EQUIPMENT COMPLIES

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.

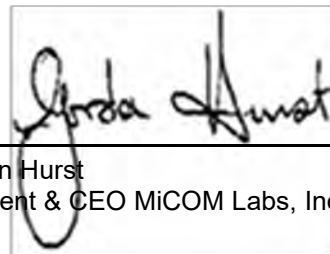
Notes:

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	FCC CFR 47 Part 15 F	2018	Radio Frequency Devices; Subpart F –Ultra Wide Band Devices
II	FCC CFR 47 Part 15.519	2002	Technical requirements for hand-held UWB systems.
III	FCC 47 CFR Part 15.521	2005	Technical requirements applicable to all UWB devices.
IV	A2LA	October 2019	R105 - Requirement's When Making Reference to A2LA Accreditation Status
V	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
VI	ANSI C63.4	2014	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
VII	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
VIII	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
IX	FCC 47 CFR Part 2.1033	2016	FCC requirements and rules regarding photographs and test setup diagrams.
X	KDB 393764 D01 UWB FAQ v02	January 29, 2018	Ultra-Wideband (UWB) Devices frequently asked questions

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 Smart Football to FCC CFR 47 Part 15 Subpart F 15.519, 15.521.
Applicant:	Catapult Sports Pty Ltd 75-83 High St Prahran Melbourne, Victoria 3181 Australia
Manufacturer:	As applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	CATA08-U6
Date EUT received:	12th May 2021
Standard(s) applied:	FCC Part 15 Subpart F 15.519, 15.521
Dates of test (from - to):	24 th – 28 th May 2021
No of Units Tested:	2
Product Family Name:	Smart Football
Model(s):	B001
Location for use:	Indoors and Outdoors
Declared Frequency Range(s):	3993.6 GHz; 4492.8 GHz
Type of Modulation:	BPM/BPSK
EUT Modes of Operation:	UWB
Declared Nominal Output Power (dBm):	-8 dBm
Rated Input Voltage and Current:	3.7Vdc (Li-ion Battery)
Operating Temperature Range:	-20 to 60°C
Equipment Dimensions:	175 x 130 x 59.5 mm
Weight:	520 g
Hardware Rev:	MP
Software Rev:	1.1.0
Product Application:	Mobile & Portable Client Devices

5.2. Scope Of Test Program

Catapult Sports Pty Ltd Company B001

The scope of the test program was to test the Catapult Sports Pty Ltd Company B001 Smart Football configurations operating within the frequency ranges 3100 - 10600 MHz for compliance against the following specification:

FCC CFR 47 Part 15 Subpart F – Ultra-Wideband Operation; 15.519, 15.521

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

15.519 Technical requirements for hand-held UWB systems.

15.521 Technical requirements applicable to all UWB devices.

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

Type (EUT/Support)	Equipment Description	Manufacturer	Model No.	Serial No.
EUT	Smart Football	Catapult Sports Pty Ltd	B001	N/A
Support	Charging Cradle	Energous	--	--

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
integral	Catapult Sports Pty Ltd	TaoGlas UWC.21	Bespoke	-0.15	--	--	--	3750-4500
BF Gain - Beamforming Gain Dir BW - Directional BeamWidth X-Pol - Cross Polarization								

5.5. Cabling and I/O Ports

The EUT has no I/O Ports, it connects to the charger wirelessly.

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
3100-10600 MHz				
UWB	--	3993.6	--	4492.8

5.7. Equipment Modifications

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

- NONE

5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

- NONE

6. TEST SUMMARY

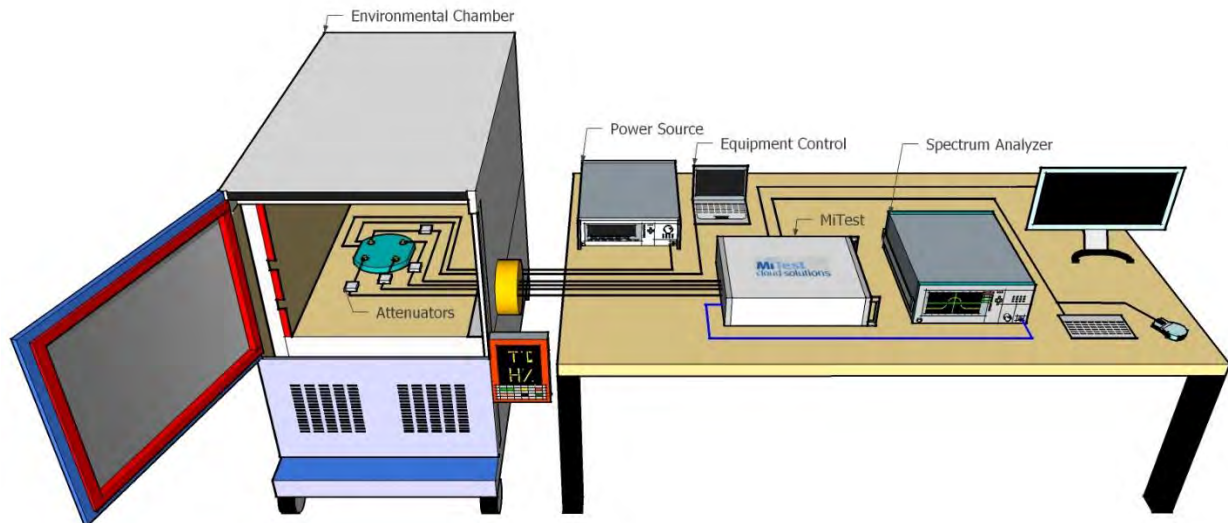
List of Measurements

Test Header	Result	Data Link
UWB Bandwidth	Complies	View Data
Peak Power	Complies	View Data
Peak Power Density	Complies	View Data
Transmitter Spurious Radiated Emissions	Complies	View Data
Shutoff Timing Requirements	Complies	View Data
Digital Emissions	Complies, see MiCOM Labs CATA08-U2 Emissions Report	
AC Wire Line Emissions	Complies, see MiCOM Labs CATA08-U2 Emissions Report	
Comments: None		

7. TEST EQUIPMENT CONFIGURATION(S)

7.1. Conducted Test Setup

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
249	Resistance Thermometer	Thermotronics	GR2105-02	9340 #2	30 Oct 2021
361	Desktop for RF#1, Labview Software installed	Dell	Vostro 220	WS RF#1	Not Required
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	12 Oct 2021
405	DC Power Supply 0-60V	Agilent	6654A	MY4001826	Cal when used
408	USB to GPIB interface	National Instruments	GPIB-USB HS	14C0DE9	Not Required
445	PoE Injector	D-Link	DPE-101GL	QTAH1E2000625	Not Required
510	Barometer/Thermometer	Control Company	68000-49	170871375	11 Dec 2021
75	Environmental Chamber	Thermatron	SE-300-2-2	27946	24 Feb 2022

Rented Equipment

ISO17025 Accredited Calibration

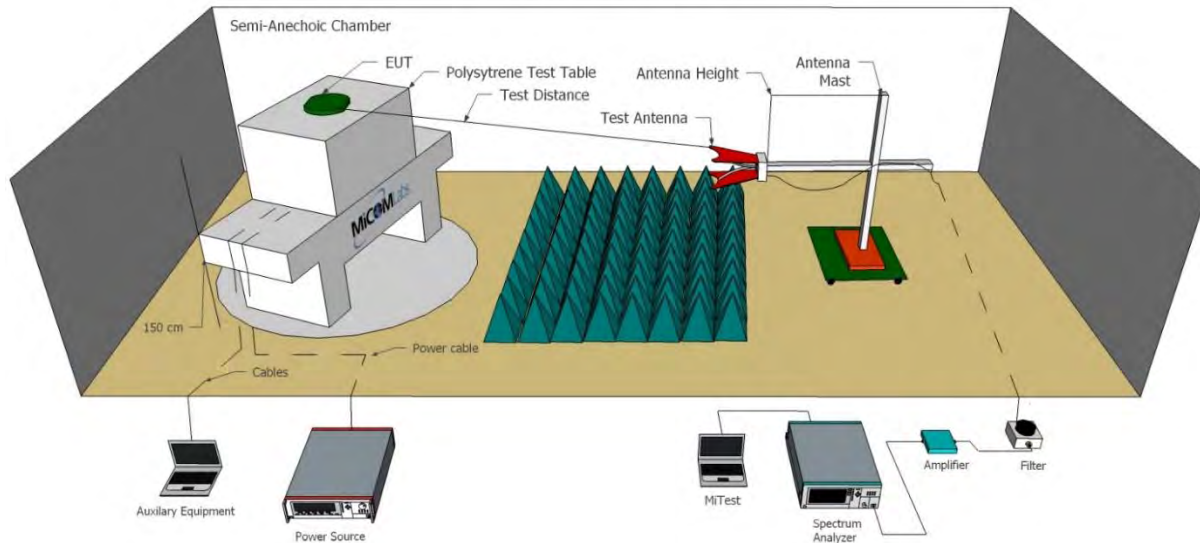
Calibrated By: Rohde & Schwarz

Description	Manufacturer	Model#	Serial#	Calibration Date
Signal Analyzer	Rohde & Schwarz	ESW44	101892	12 May 2021

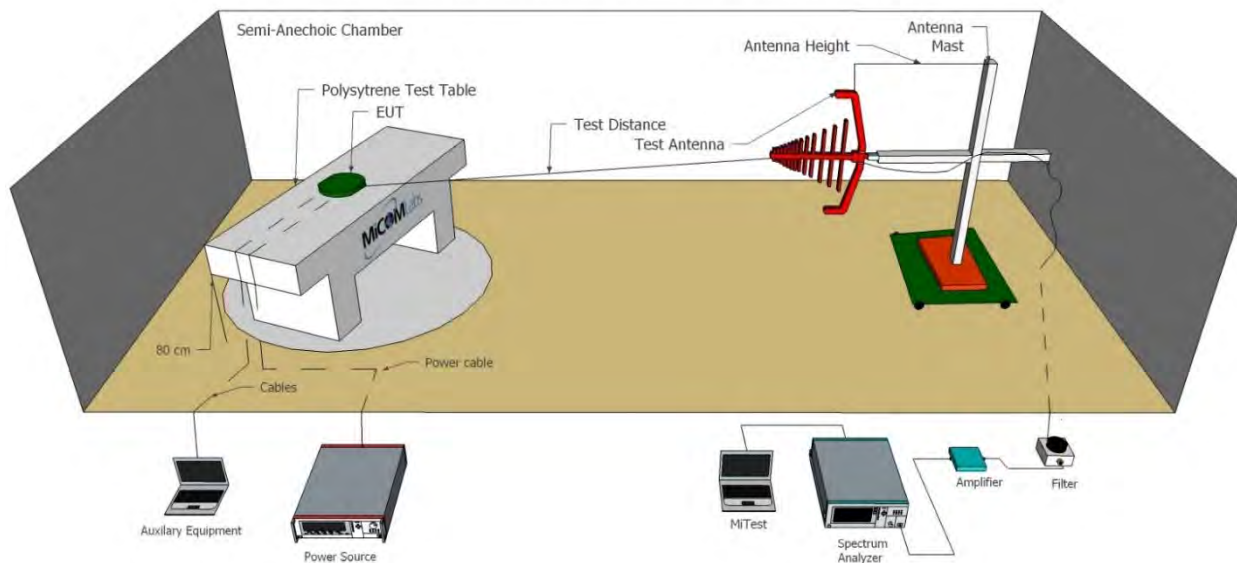
7.2. Radiated Emissions - 3m Chamber

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

Radiated Emissions Above 1GHz Test Setup



Radiated Emissions Below 1GHz Test Setup



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

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
107	26–40 GHz Horn Antenna	Millimeter Products	261A	None	15 Jan 2022
145	18–26 GHz Horn Antenna	Millimeter Products	261K	None	15 Jan 2022
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CU101	04R08507	Not Required
336	Active Loop Antenna	Emco	6502	00060498	29 Nov 2021
338	Sunol 30 - 3000 MHz Antenna	Sunol	JB3	A052907	4 Apr 2022
378	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100107/040	12 Oct 2021
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	12 Apr 2022
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	12 Oct 2021
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	12 Apr 2022
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
447	MiTest Rad Emissions Test Software	MiCOM	Test Software Version 1.0	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	9 Oct 2021
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	9 Oct 2021
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	9 Oct 2021
480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	24 Sep 2021
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	24 Sep 2021
510	Barometer/Thermometer	Control Company	68000-49	170871375	11 Dec 2021
518	Cable - Amp to Antenna	SRC Haverhill	157-3051574	518	24 Sep 2021

Rented Equipment

ISO17025 Accredited Calibration
 Calibrated By: Rohde & Schwarz

Description	Manufacturer	Model#	Serial#	Calibration Date
Signal Analyzer	Rohde & Schwarz	ESW44	101892	12 May 2021

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. UWB Bandwidth

Conducted Test Conditions for UWB Bandwidth			
Standard:	FCC CFR 47:15.519(b)	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	UWB Bandwidth	Rel. Humidity (%):	32 - 45
Standard Section(s):	ANSI C63.10 Section 10.1	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		
Test Procedure for Bandwidth Measurement			
15.519 (b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.			
The UWB Bandwidth is measured radiated, at a 3-meter distance, while EUT is operating in transmission mode at the appropriate center frequency. The Resolution Bandwidth was set to 1MHz RBW IAW ANSI C63.10. Testing was performed under ambient conditions at nominal voltage.			
Test configuration and setup used for the measurement was per the Radiated Test Set-up section specified in this document.			

Equipment Configuration for UWB Bandwidth
--

Variant:	UWB	Duty Cycle (%):	100
Data Rate:	-	Antenna Gain (dBi):	-0.15
Modulation:	--	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Frequency	Measurement Technique 10 dB Bandwidth (MHz)	10 dB Bandwidth (MHz)			
		Port A	Highest		
3993.6	813.627	813.627	813.627		
4492.8	725.451	725.451	725.451		

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 CFR 47:15.519 (c)	Ambient Temp. (°C):	24.0 - 27.5				
Test Heading:	Radiated Emissions UWB Transmission	Rel. Humidity (%):	32 - 45				
Standard Section(s):	ANSI C63.10 Section 10.3.5	Pressure (mBars):	999 - 1001				
Reference Document(s):	None						
<p>Test Procedure for UWB Transmission</p> <p>Testing was performed under ambient conditions nominal voltage.</p> <p>Test configuration and setup used for the measurement was per the Radiated Test Set-up section specified in this document. Supporting KDB's referenced below.</p> <p>15.519 (c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:</p> <p>Operating Frequency Band: 3100-10600 MHz</p> <p>Limits Maximum EIRP (dBm)</p> <table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>EIRP Limit (dBm)</th> </tr> </thead> <tbody> <tr> <td>3100 - 10600</td> <td>-41.3</td> </tr> </tbody> </table>				Frequency (MHz)	EIRP Limit (dBm)	3100 - 10600	-41.3
Frequency (MHz)	EIRP Limit (dBm)						
3100 - 10600	-41.3						

Equipment Configuration for RF Output Power

Variant:	UWB	Duty Cycle (%):	99
Data Rate:	-	Antenna Gain (dBi):	-0.15
Modulation:	-	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	JK
Engineering Test Notes:			

Test Measurement Results

Test Frequency MHz	Channel Power* (dBm)	Measured Radiated Output Power (dBm)	EIRP + Duty Cycle Correction Factor (99%)	Limit (dBm)	Margin (dB)	EUT Power Setting
3993.6	-14.80	<u>-42.05</u>	-42.05	-41.3	-0.75	16.0
4492.8	-17.39	<u>-42.64</u>	-42.64	-41.3	-1.34	16.0

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

*Channel power measured with Wideband Power Meter, used to calculate MPE minimum distance, see report CATA08-U7 FCC MPE.

9.3. Peak Power Density

Test Conditions for Maximum Peak Power Density									
Standard:	FCC CFR 47:15.519(e), 15.521	Ambient Temp. (°C):	24.0 - 27.5						
Test Heading:	Radiated Emissions UWB Transmission	Rel. Humidity (%):	32 - 45						
Standard Section(s):	ANSI C63.10 Section 10.3.6	Pressure (mBars):	999 - 1001						
Reference Document(s):	None								
<p>Test Procedure for UWB Transmission</p> <p>15.519 (e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.</p> <p>Testing was performed under ambient conditions at nominal voltage.</p> <p>Test configuration and setup used for the measurement was per the Radiated Test Set-up section specified in this document.</p> <p>Operating Frequency Band: 3100-10600 MHz</p> <p>Limits Maximum EIRP (dBm)</p> <table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>EIRP Limit (dBm/50MHz)</th> <th>EIRP Limit (dBm/1MHz)</th> </tr> </thead> <tbody> <tr> <td>3100 - 10600</td> <td>0</td> <td>-34</td> </tr> </tbody> </table>				Frequency (MHz)	EIRP Limit (dBm/50MHz)	EIRP Limit (dBm/1MHz)	3100 - 10600	0	-34
Frequency (MHz)	EIRP Limit (dBm/50MHz)	EIRP Limit (dBm/1MHz)							
3100 - 10600	0	-34							

Equipment Configuration for Peak Power Density

Variant:	UWB	Duty Cycle (%):	99
Data Rate:	-	Antenna Gain (dBi):	-0.15
Modulation:	--	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency MHz	Measured Peak Power Density (dBm)	EIRP + Duty Cycle Correction Factor (99%)	Limit (dBm)	Margin (dB)	EUT Power Setting
3993.6	<u>-0.55</u>	-0.55	0.0	-0.55	25.0
4492.8	<u>-0.03</u>	-0.03	0.0	-0.03	24.5

Traceability to Industry Recognized Test Methodologies

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

9.4. Transmitter Spurious Band Emissions

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47 15.519(c) (d) (e) , 15.521(d)	Ambient Temp. (°C):	20.0 - 24.5
Test Heading:	Radiated Spurious and Band-Edge Emissions	Rel. Humidity (%):	32 - 45
Standard Section(s):	ANSI C63.10 Section 10.2 + 10.3	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Spurious and Band-Edge Emissions

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

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

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

Radiated Spurious Emissions in the GPS Bands 15.519 (c), 15.521 (d)

15.519 (c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

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

Radiated Spurious Emissions in the GPS Bands 15.519(d), 15.521 (d)

15.519 (d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

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

50 MHz Peak Emissions 15.519, 15.521

15.519 (e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521

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

Equipment Configuration for Transmitter Spurious Emissions

Variant:	UWB	Duty Cycle (%):	99
Data Rate:	6.00 MBit/s	Antenna Gain (dBi):	-0.15
Modulation:	BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	JK
Engineering Test Notes:			

Test Measurement Results

HORIZONTAL					
Temperature	20.0 °C	Maximum Observed Spurious Emission		Limit	Margin
Voltage	12.00 Vdc	Amplitude	Emission Frequency		
Test Frequency	Frequency Range	dBuV/m	MHz	dBuV/m	dB
3993.6 MHz	960 - 1000 MHz	24.07	999.04	29.40	-5.33
	1000 - 1610 MHz	26.18	1309.28	29.40	-3.22
	1164 - 1240 MHz	6.66	1214.41	19.47	-12.81
	1559 - 1610 MHz	5.85	1599.98	19.47	-13.62
	1610 - 1990 MHz	27.64	1951.92	41.40	-13.76
	1990 - 3100 MHz	28.92	3082.20	43.40	-14.48
	3100 - 10600 MHz	59.05	3852.51	63.40	-4.35
	10600 - 18000 MHz	40.73	16413.00	43.40	-2.67
4492.8 MHz	960 - 1000 MHz	24.08	999.52	29.40	-5.32
	1000 - 1610 MHz	25.76	1309.28	29.40	-3.64
	1164 - 1240 MHz	6.59	1189.44	19.47	-12.89
	1559 - 1610 MHz	5.84	1562.88	19.47	-13.63
	1610 - 1990 MHz	27.39	1949.64	41.40	-14.01
	1990 - 3100 MHz	28.43	2688.48	43.40	-14.97
	3100 - 10600 MHz	58.37	4512.83	63.40	-5.03
	10600 - 18000 MHz	40.60	16458.00	43.40	-2.80

VERTICAL					
Temperature	20.0 °C	Maximum Observed Spurious Emission		Limit	Margin
Voltage	12.00 Vdc	Amplitude	Emission Frequency		
Test Frequency	Frequency Range	dBuV/m	MHz	dBuV/m	dB
3993.6 MHz	960 - 1000 MHz	24.06	997.80	29.40	-5.34
	1000 - 1610 MHz	25.99	1310.50	29.40	-3.41
	1164 - 1240 MHz	6.68	1240.00	19.47	-12.79
	1559 - 1610 MHz	5.50	1597.74	19.47	-13.97
	1610 - 1990 MHz	28.49	1881.86	41.40	-12.92
	1990 - 3100 MHz	29.10	3084.43	43.40	-14.31
	3100 - 10600 MHz	62.99	3936.67	63.40	-0.41
	10600 - 18000 MHz	40.66	16413.00	43.40	-2.74
4492.8 MHz	960 - 1000 MHz	24.05	998.40	29.40	-5.35
	1000 - 1610 MHz	25.68	1310.50	29.40	-3.72
	1164 - 1240 MHz	6.67	1239.09	19.47	-12.80
	1559 - 1610 MHz	5.48	1574.43	19.47	-13.99
	1610 - 1990 MHz	29.30	1881.86	41.40	-12.10
	1990 - 3100 MHz	28.62	2572.81	43.40	-14.78
	3100 - 10600 MHz	62.42	4437.68	63.40	-0.98
	10600 - 18000 MHz	40.60	16428.00	43.40	-2.80

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).

9.5. Shutoff Timing Requirements

Radiated Test Conditions for Shutoff Timing Requirements			
Standard:	FCC CFR 47:15.519 (a) (1)	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	Shutoff Timing Requirements	Rel. Humidity (%):	32 - 45
Standard Section(s):	ANSI C63.10 Section 10	Pressure (mBars):	999 - 1001
Reference Document(s):	None		
<p>Test Procedure for UWB Transmission</p> <p>15.519 (a) (1) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. 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. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting</p> <p>Testing was performed under ambient conditions at nominal voltage.</p> <p>Test configuration and setup used for the measurement was per the Radiated Test Set-up section specified in this document.</p> <p>Operating Frequency Band: 3100-10600 MHz</p> <p>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.</p>			

Operational Markers M1, M2, M3

The graphical representation on the next page contains 3 markers:

M1: device start sending information to associated receiver.

M2: device cease transmission due to not receive acknowledgement from associated receiver.

M3 indicates the end of the 10 second window

Equipment Configuration for Shutdown Timing Requirements

Variant:	UWB	Duty Cycle (%):	99
Data Rate:	-	Antenna Gain (dBi):	-0.15
Modulation:	-	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	JK
Engineering Test Notes:			

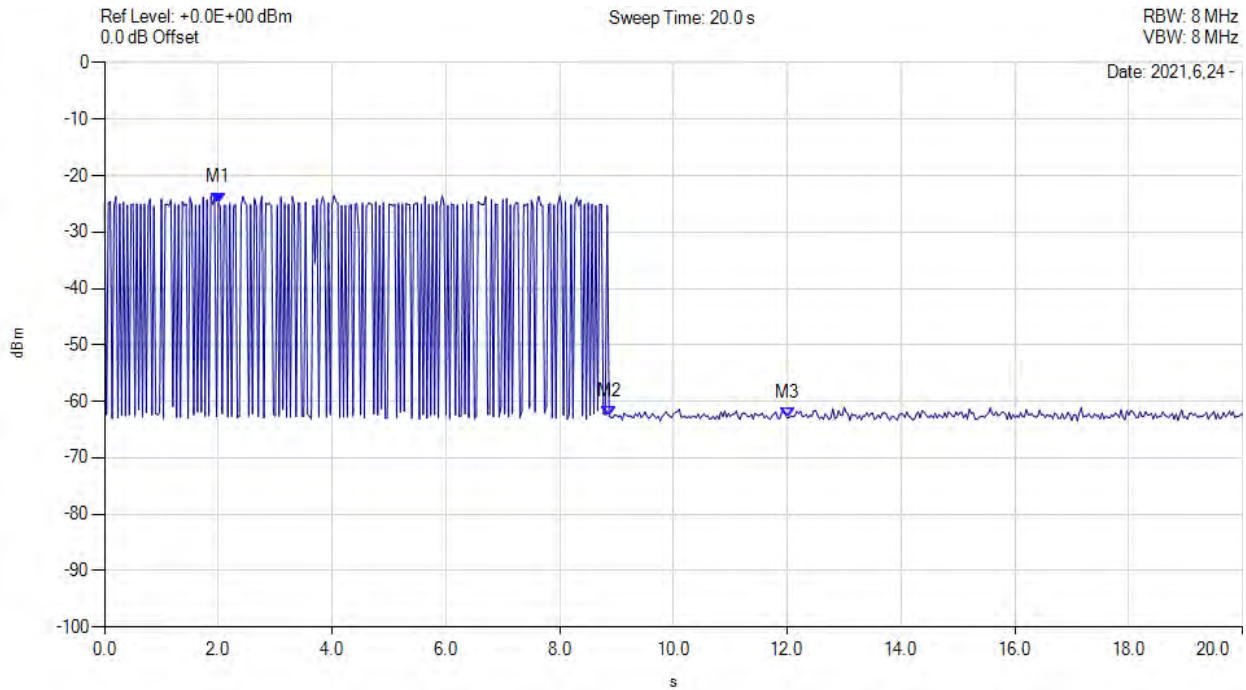
Test Measurement Results

Frequency (MHz)	Shutdown Time	Limit	Margin	EUT Power Setting
	(s)	(s)	(s)	Numeric
3993.60	6.867	10	-1.23	16

Shutdown Timing



Variant: UWB, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

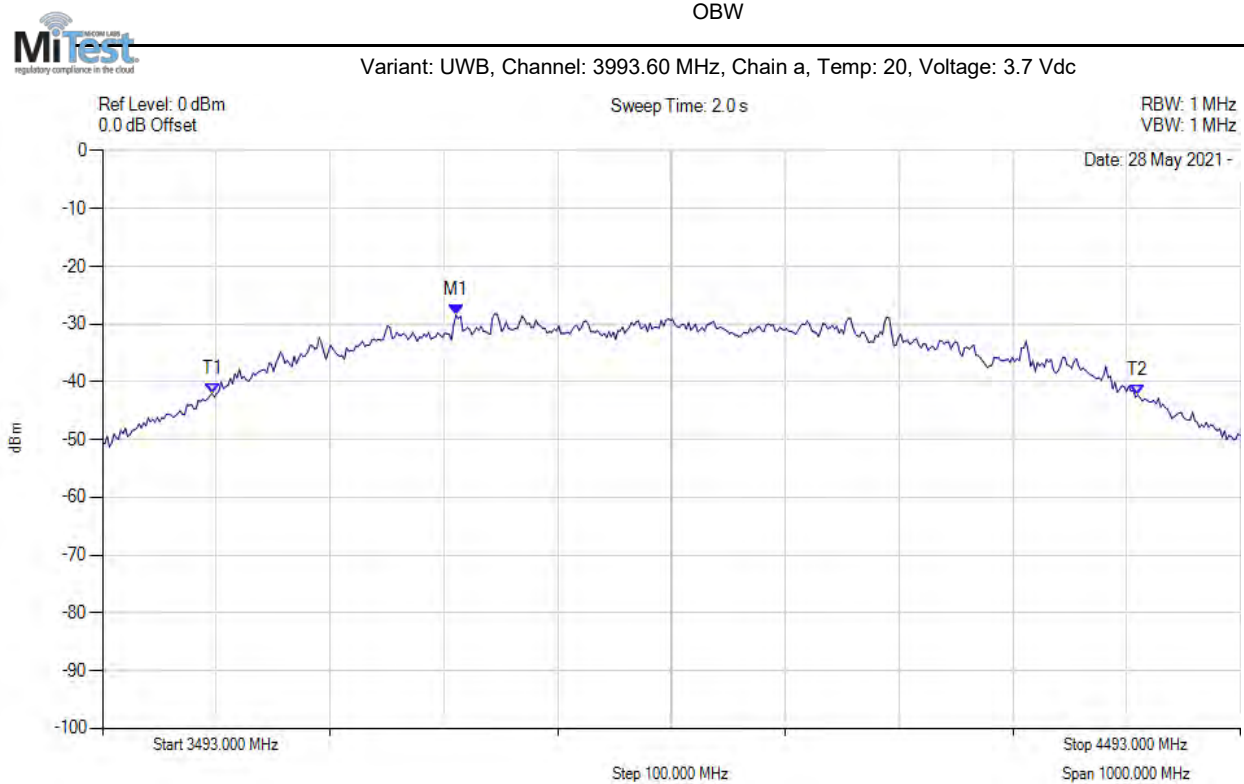


Analyzer Setup	Marker:Time:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 10 Trace Mode = WRIT	M1(3993.60 MHz) : 2.000 s : -24.814 dBm M2(3993.60 MHz) : 8.867 s : -62.621 dBm M3(3993.60 MHz) : 12.000 s : -62.947 dBm	Channel Frequency: 3993.60 MHz

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

A. Appendix A - Graphical Images

A.1. Occupied Bandwidth



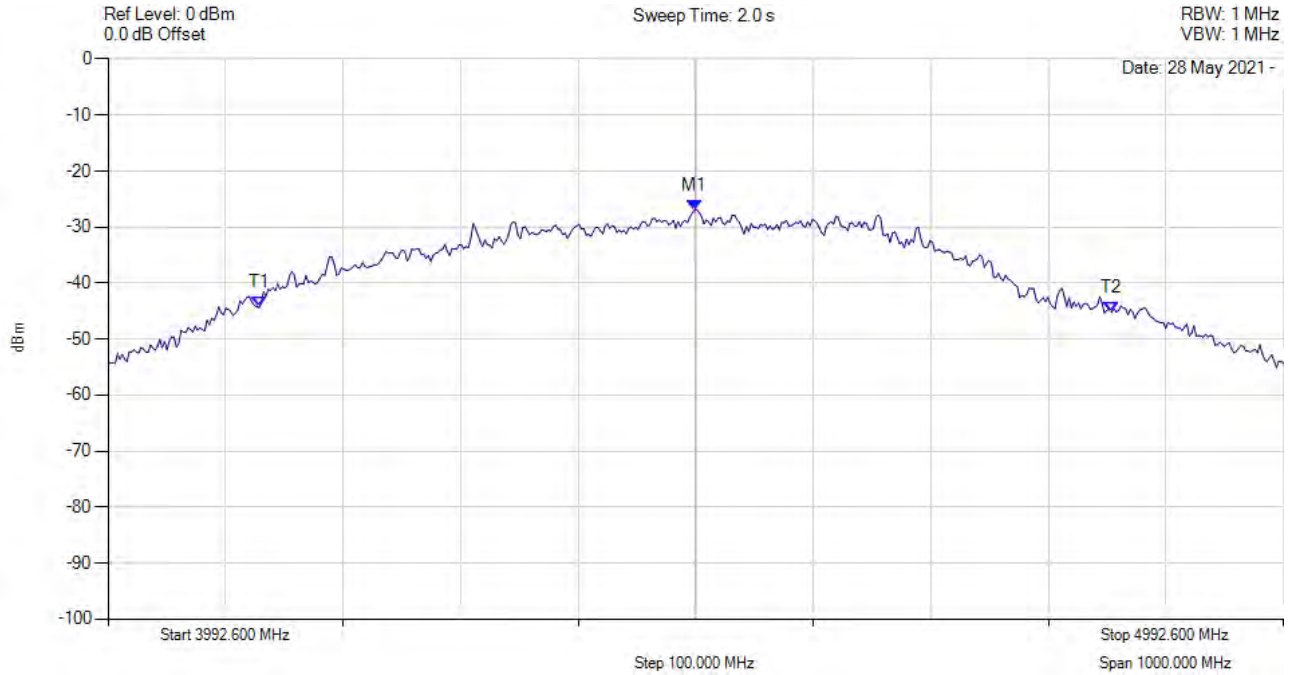
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 10 Trace Mode = CLR/WRITE	M1 : 3803.621 MHz : -28.420 dBm T1 : 3589.192 MHz : -41.995 dBm T2 : 4402.820 MHz : -42.304 dBm OBW : 813.627 MHz	Channel Frequency: 3993.60 MHz

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OBW



Variant: UWB, Channel: 4492.80 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) = 10 Trace Mode = CLR/WRITE	M1 : 4491.598 MHz : -26.904 dBm T1 : 4120.857 MHz : -44.340 dBm T2 : 4846.307 MHz : -45.208 dBm OBW : 725.451 MHz	Channel Frequency: 4492.80 MHz

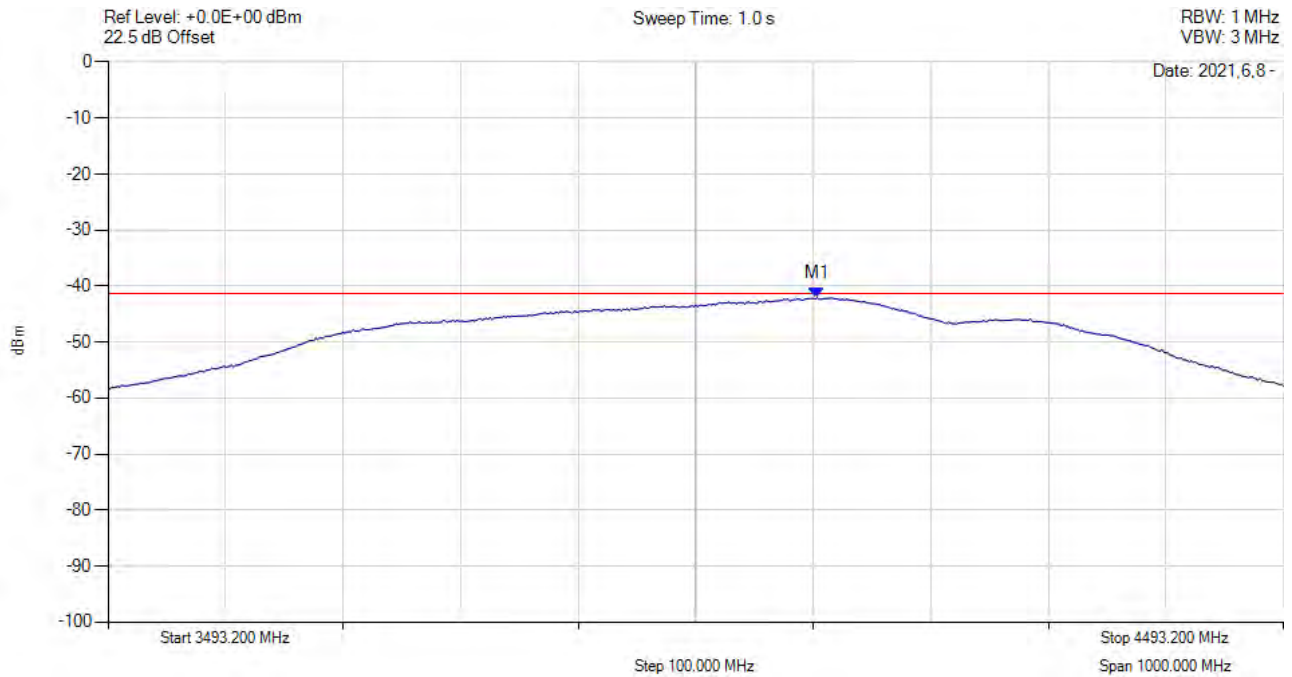
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A.2. Transmit Power

TRANSMIT POWER



Variant: UWB, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



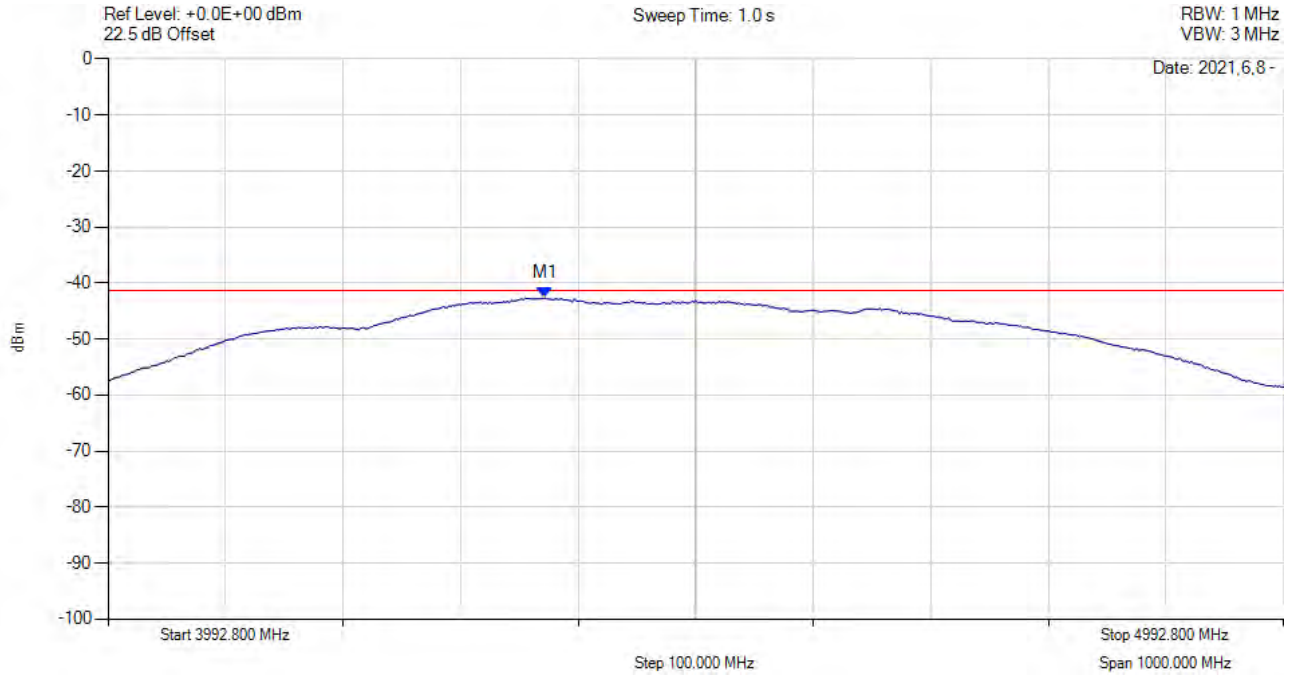
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVER Sweep Count = 1 RF Atten (dB) = 10 Trace Mode = CLR/WRITE	M1 : 4096.500 MHz : -42.053 dBm	Channel Frequency: 3993.60 MHz

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TRANSMIT POWER



Variant: UWB, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVER Sweep Count = 1 RF Atten (dB) = 10 Trace Mode = CLR/WRITE	M1 : 4364.500 MHz : -42.638 dBm	Channel Frequency: 4492.80 MHz

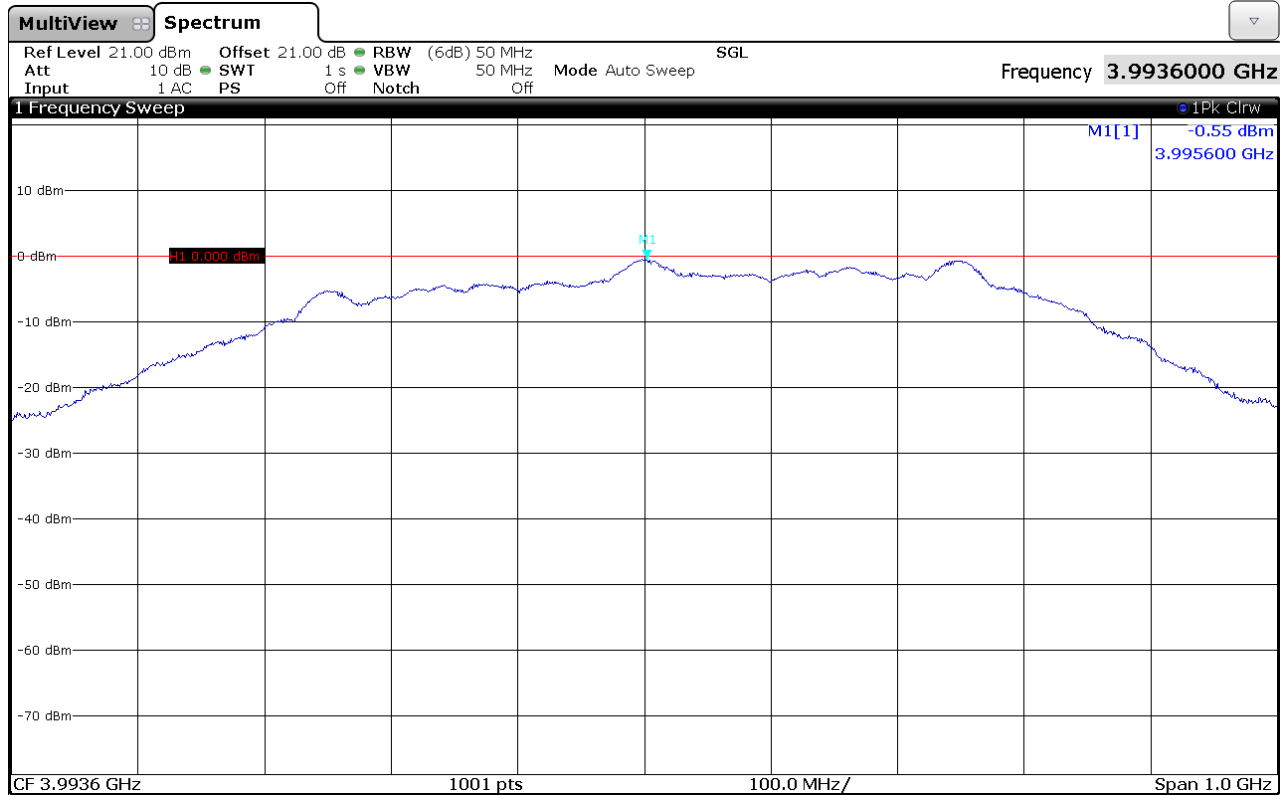
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A.3. Peak Power Density

PEAK POWER DENSITY



Variant: UWB, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



Date: 14.MAY.2021 17:24:59

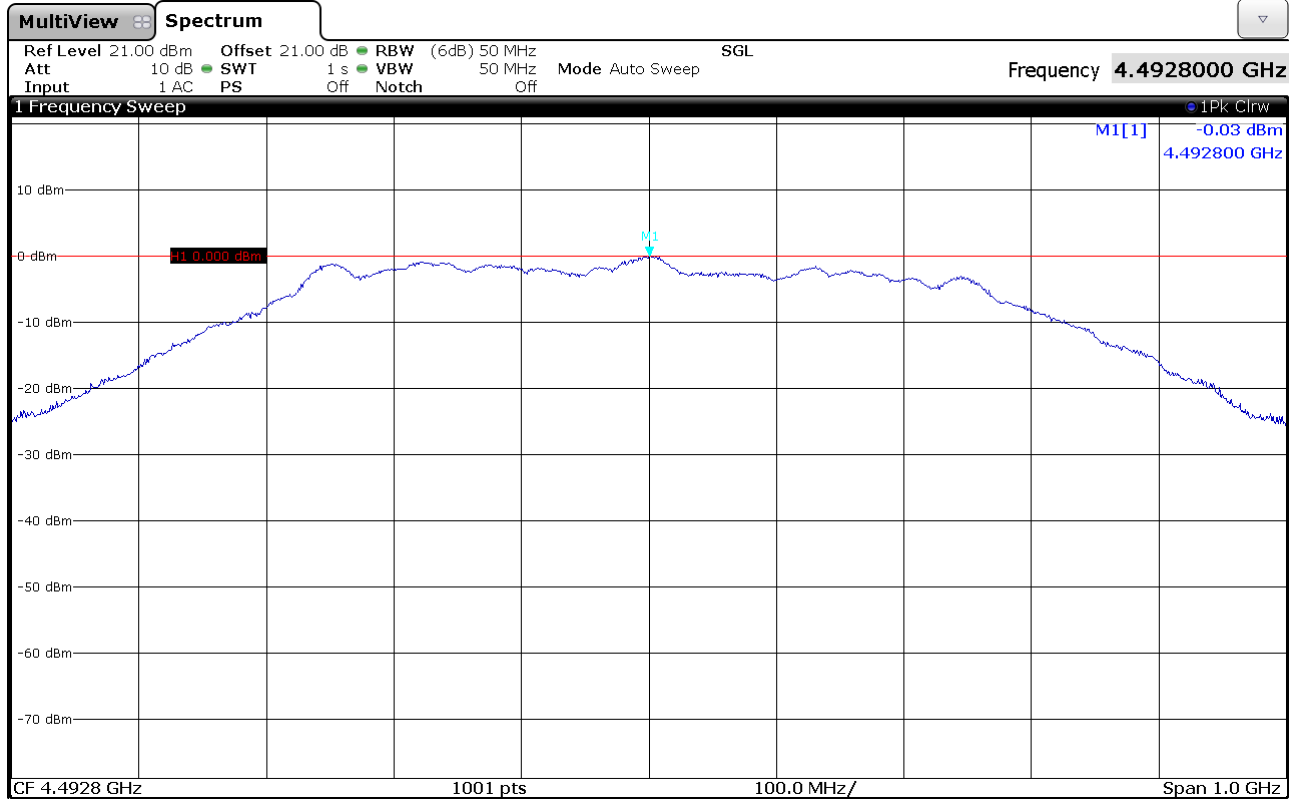
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = PEAK Sweep Count = 1 RF Atten (dB) = 10 Trace Mode = CLR/WRITE	M1 : 3995.6 MHz : -0.55 dBm	Channel Frequency: 3993.60 MHz

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PEAK POWER DENSITY



Variant: UWB, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



Date: 14.MAY.2021 17:23:40

Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = PEAK Sweep Count = 1 RF Atten (dB) = 10 Trace Mode = CLR/WRITE	M1 : 4492.800 MHz : -0.03 dBm	Channel Frequency: 4492.80 MHz

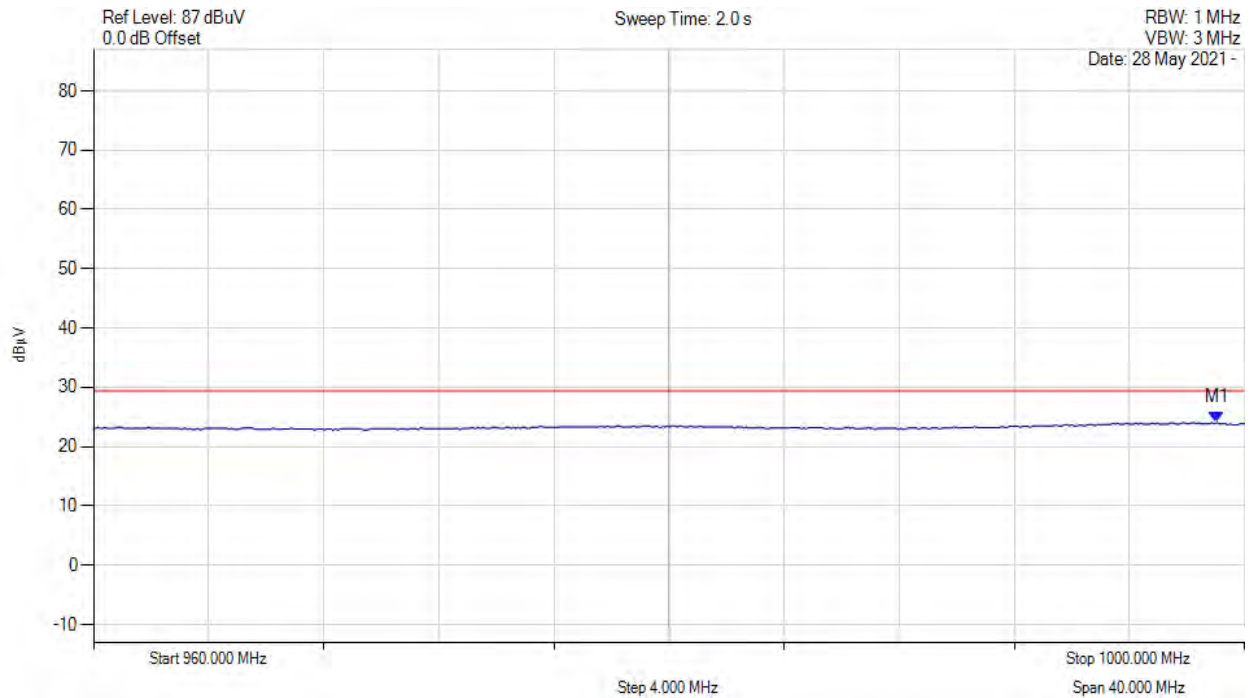
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A.4. Transmitter Spurious Emissions

TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



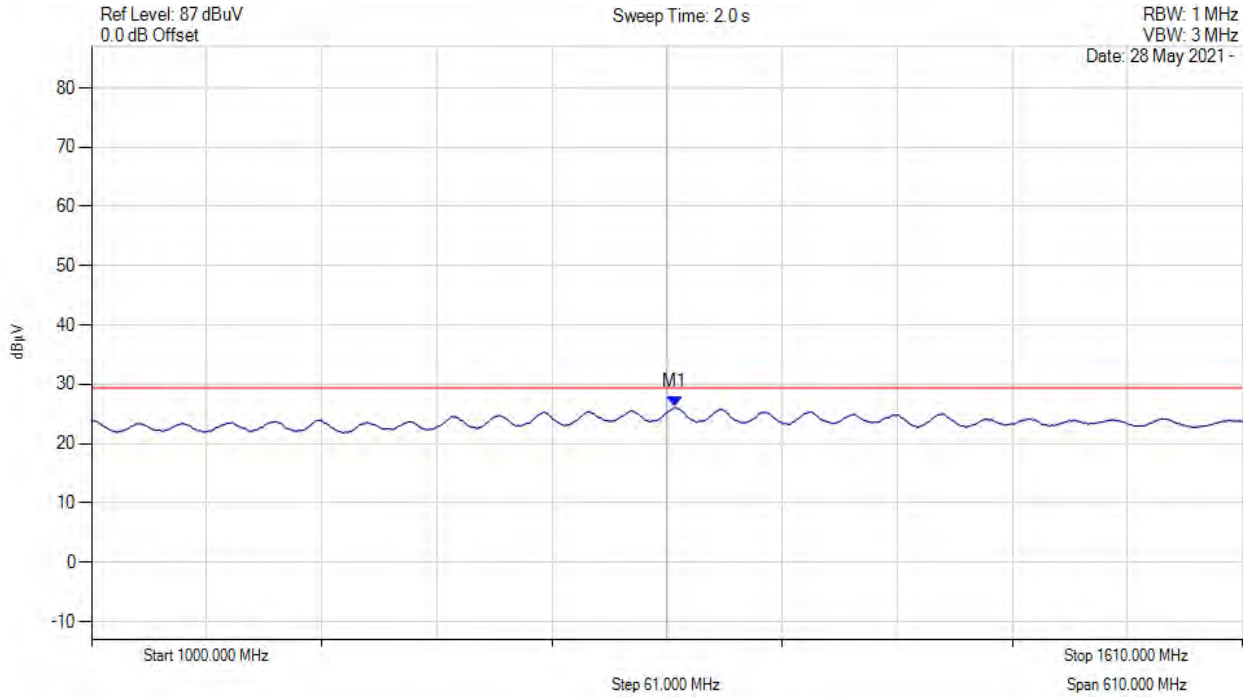
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 999.038 MHz : 24.067 dBμV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



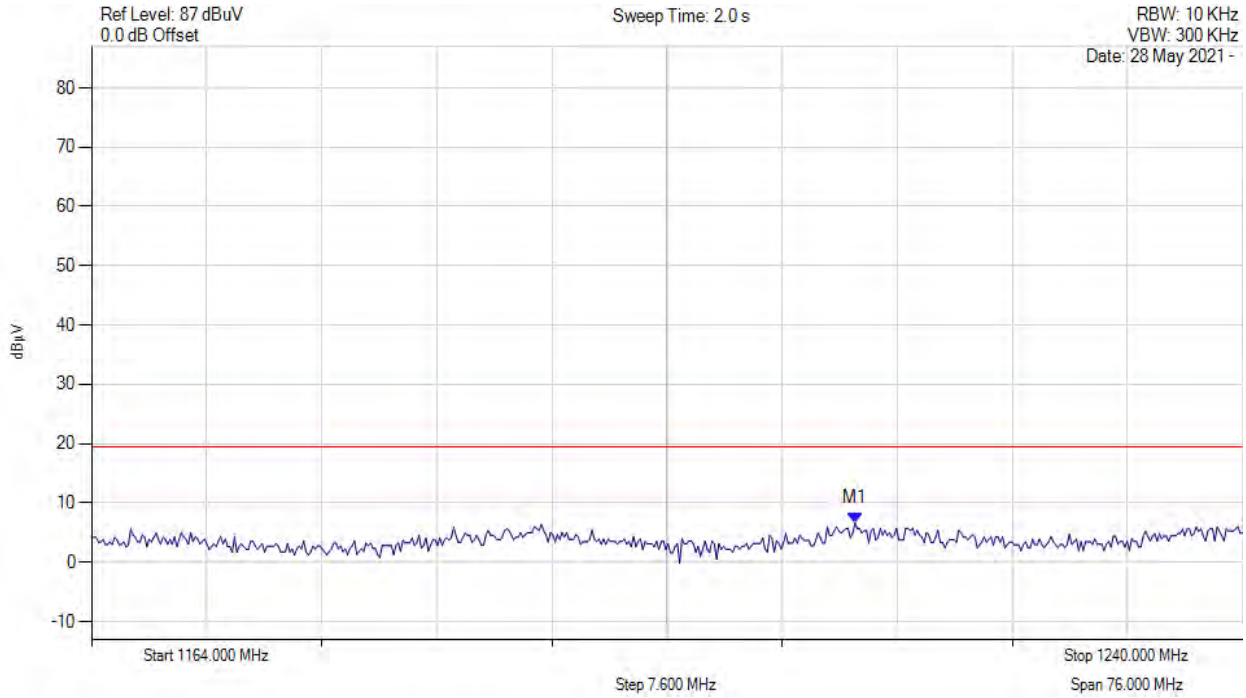
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1309.279 MHz : 26.179 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



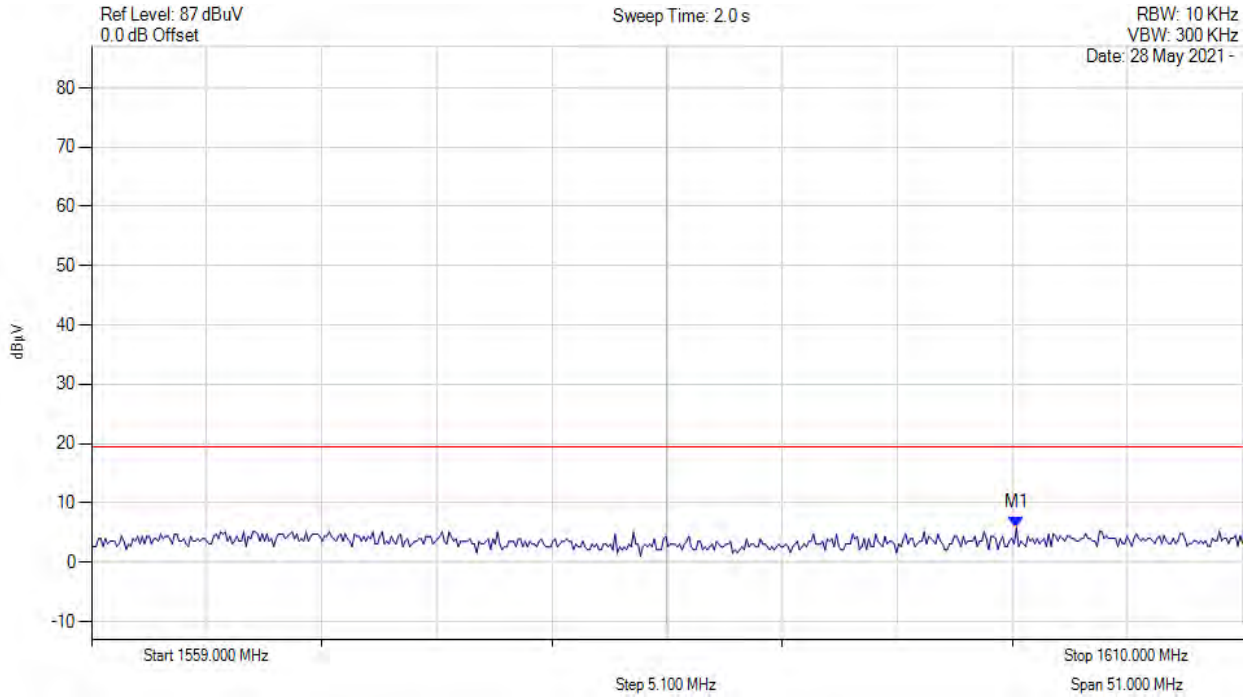
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1214.413 MHz : 6.656 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



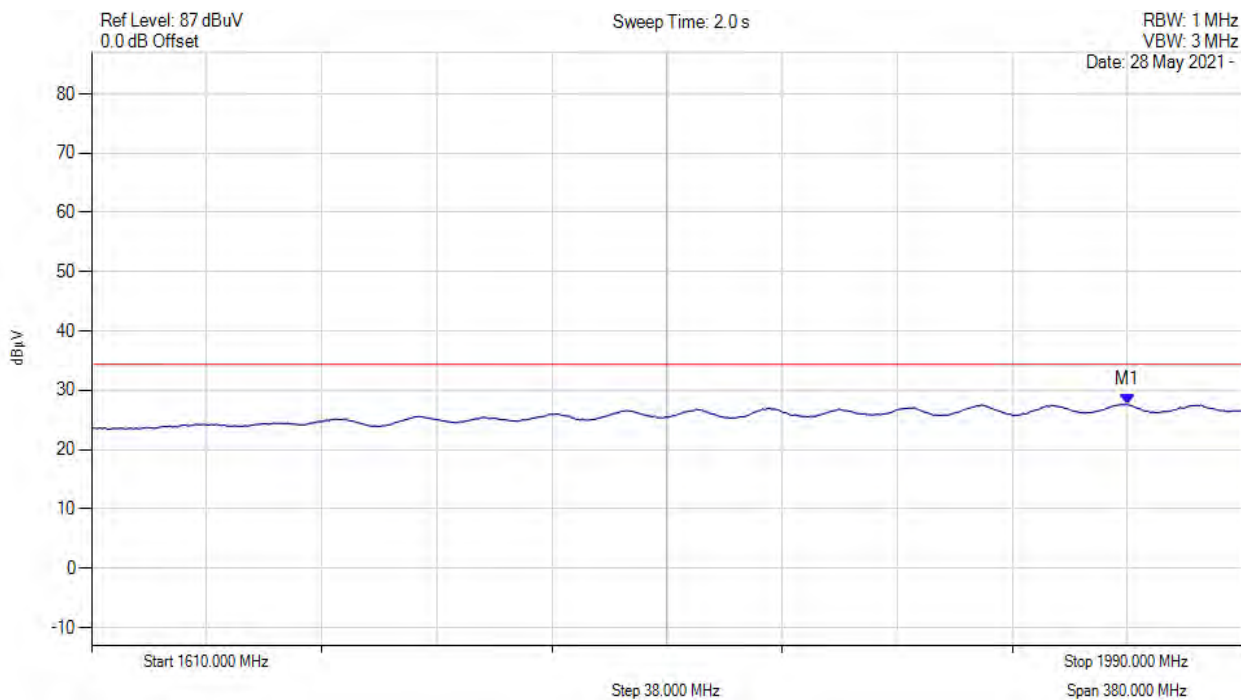
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1599.984 MHz : 5.854 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



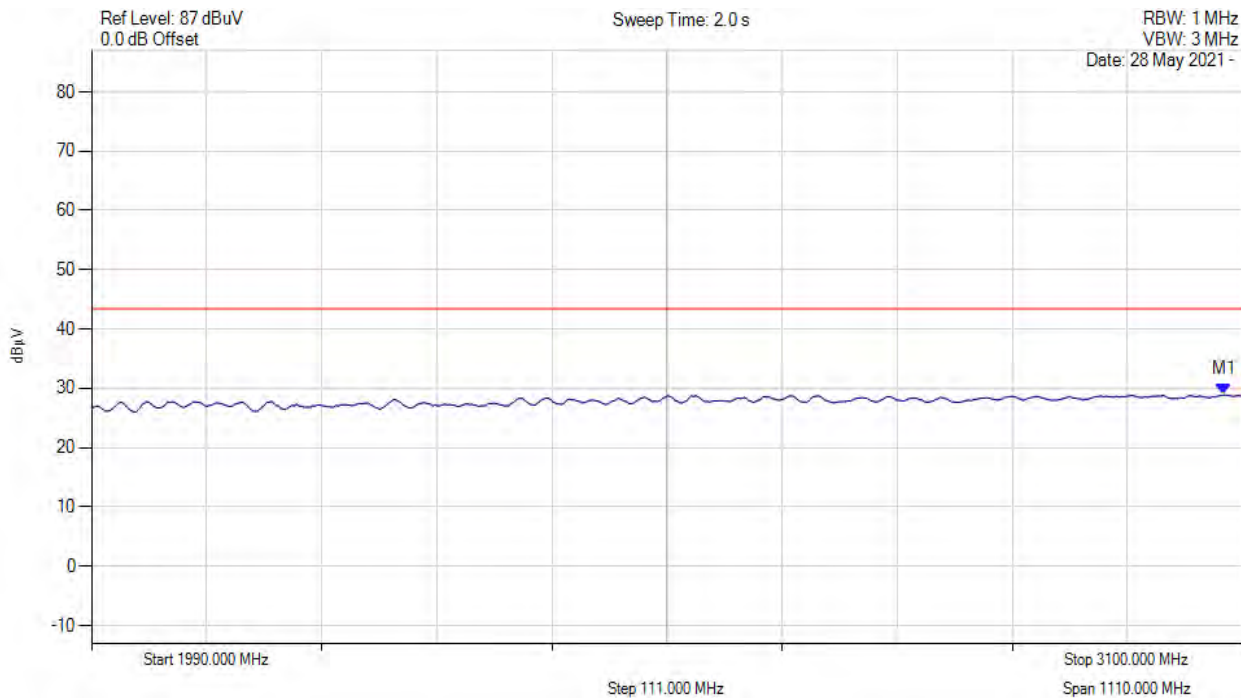
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1951.924 MHz : 27.642 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



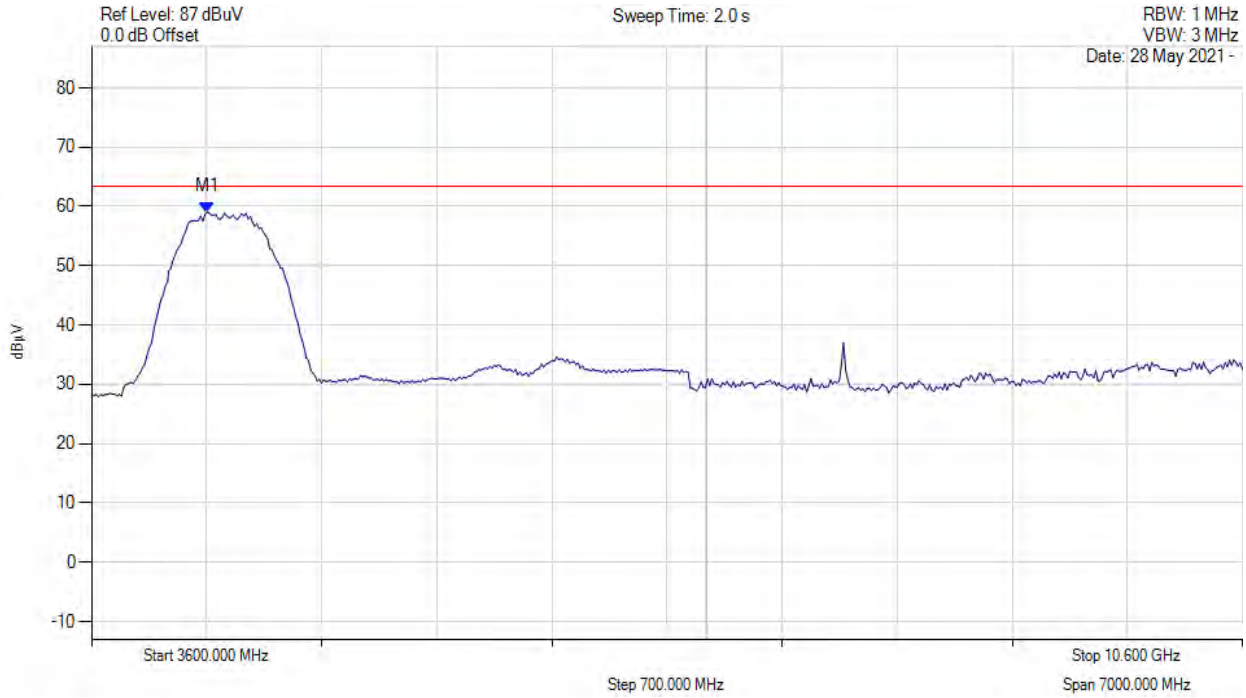
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 3082.204 MHz : 28.920 dBμV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



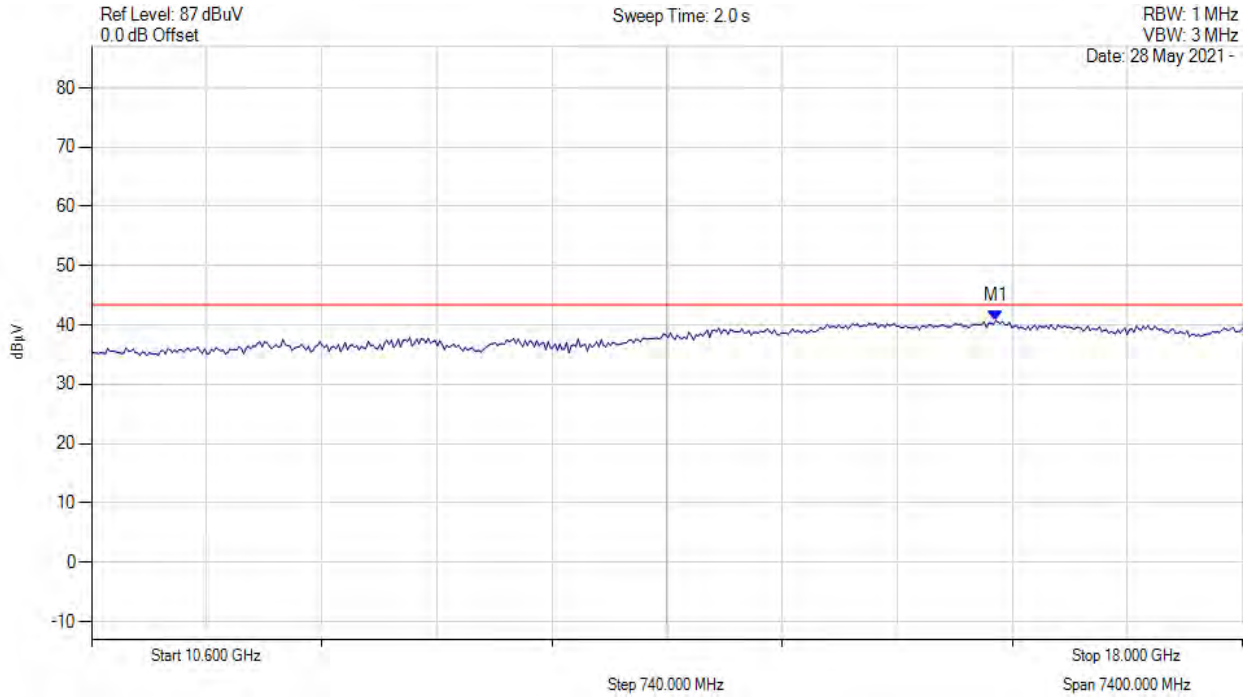
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 3852.505 MHz : 59.051 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



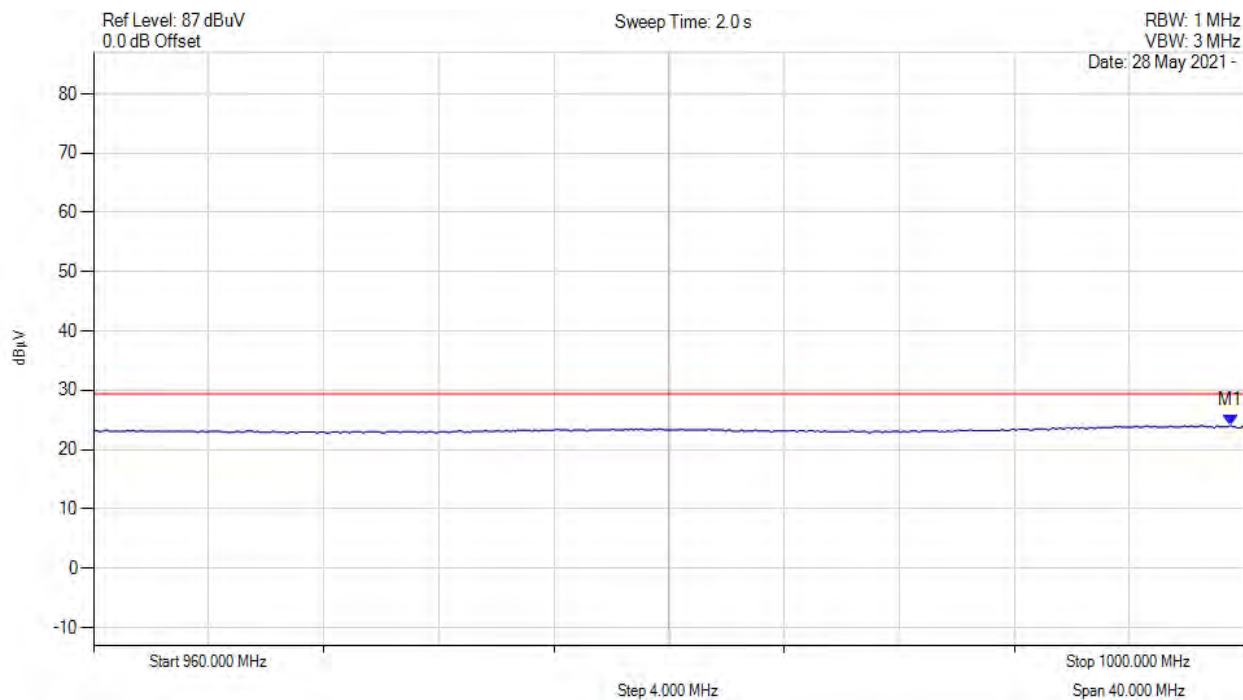
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 16.413 GHz : 40.734 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



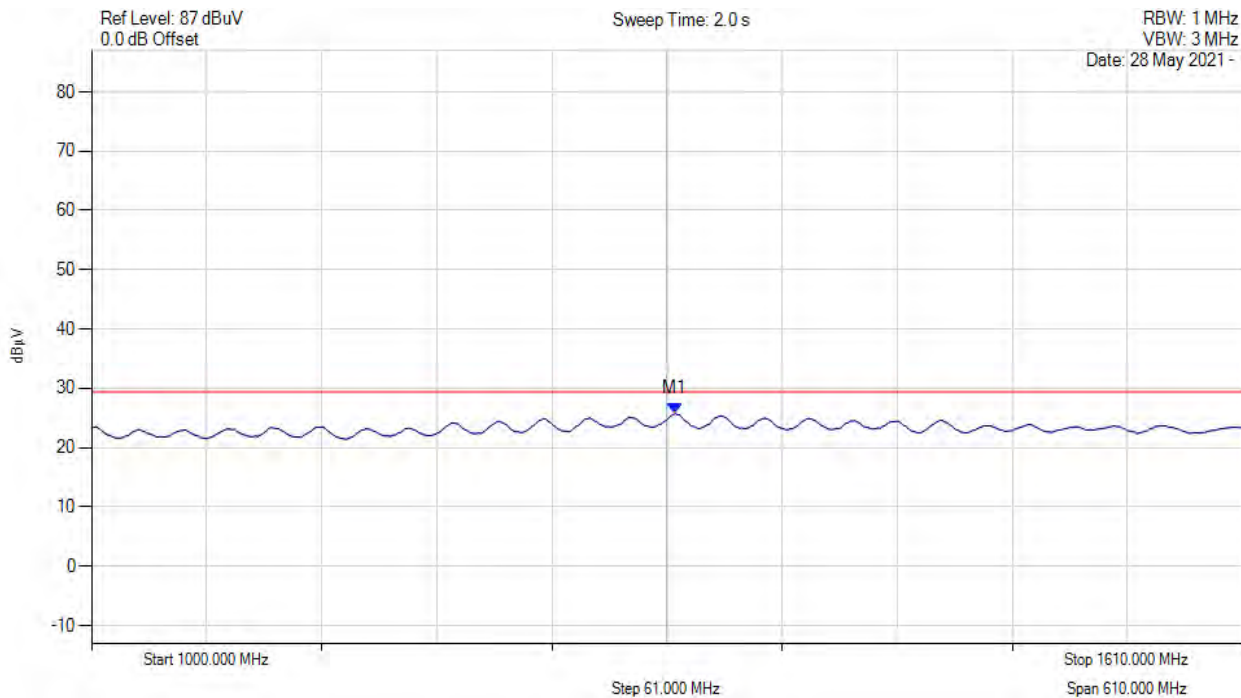
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 999.519 MHz : 24.079 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



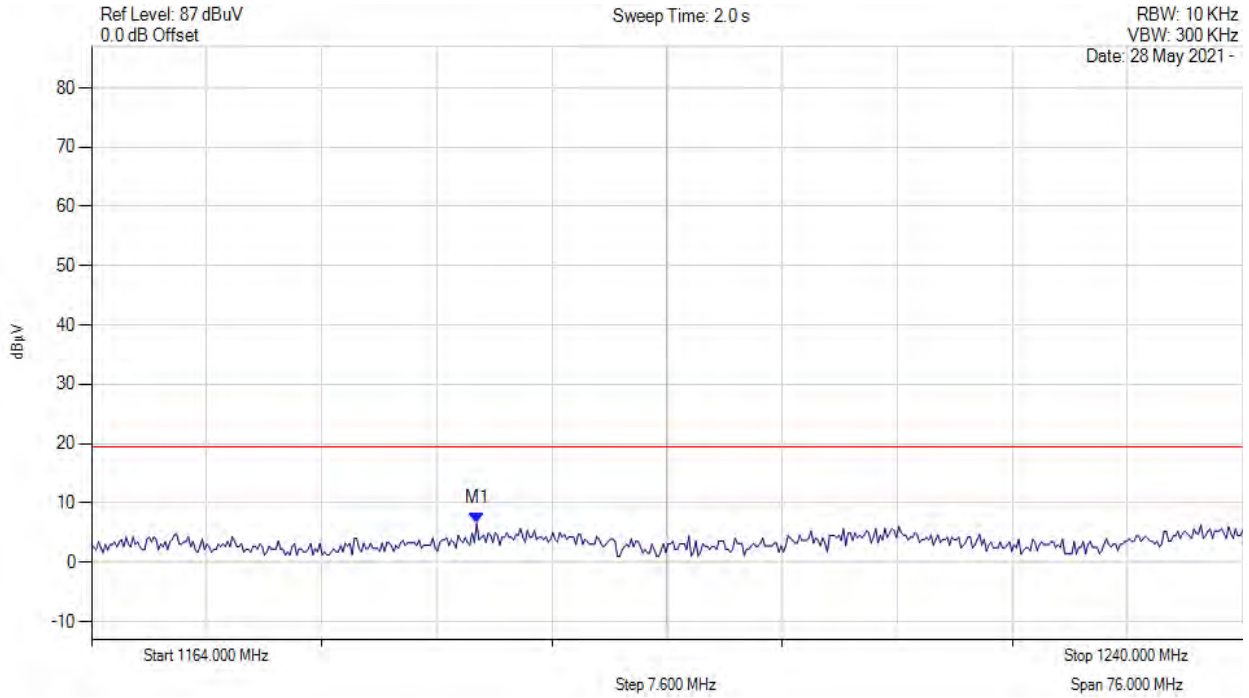
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1309.279 MHz : 25.761 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



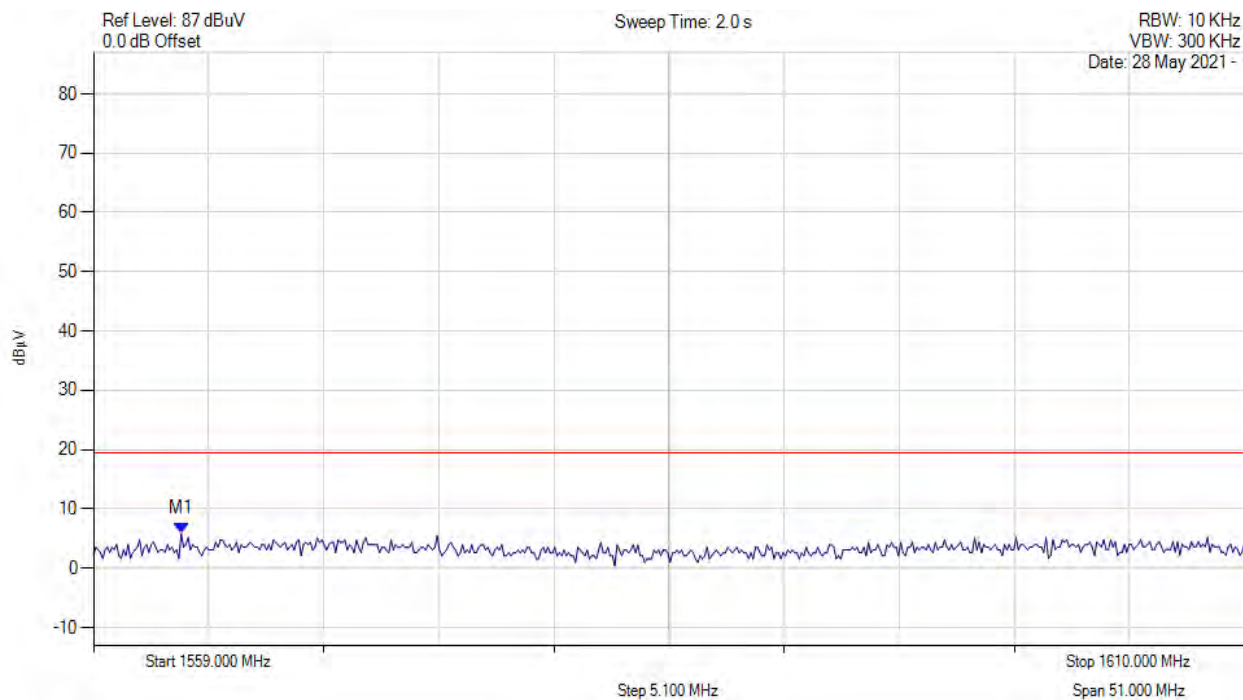
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1189.435 MHz : 6.585 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



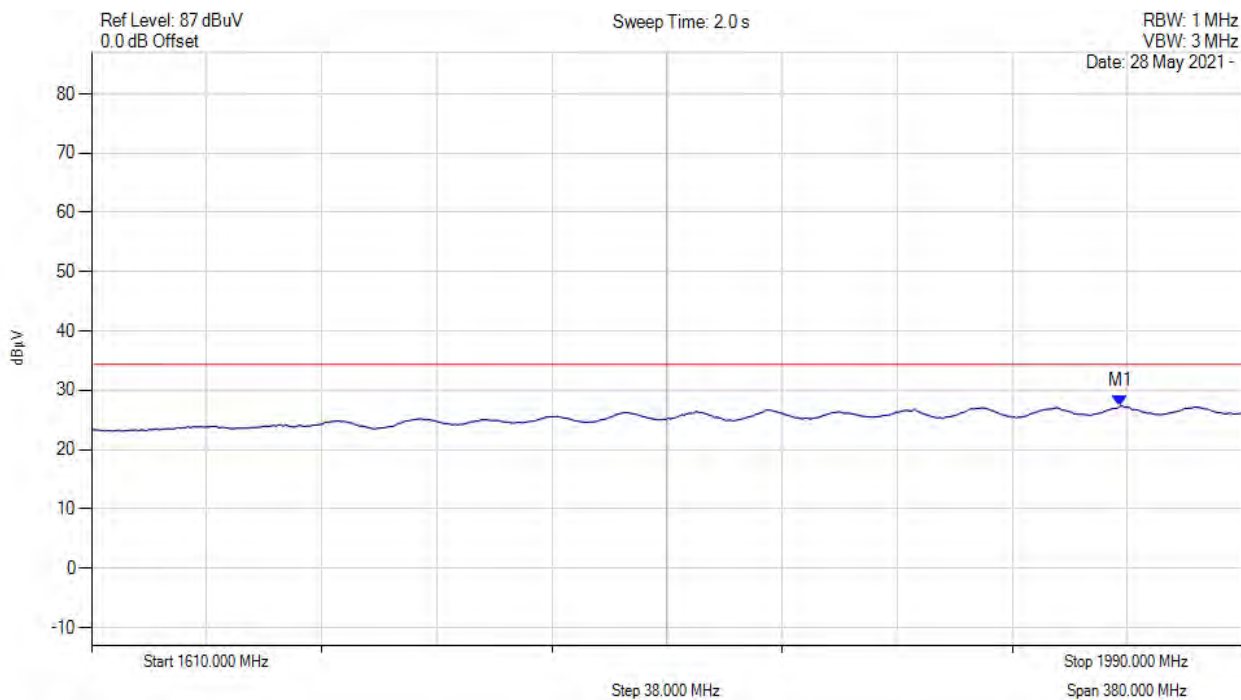
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1562.884 MHz : 5.842 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



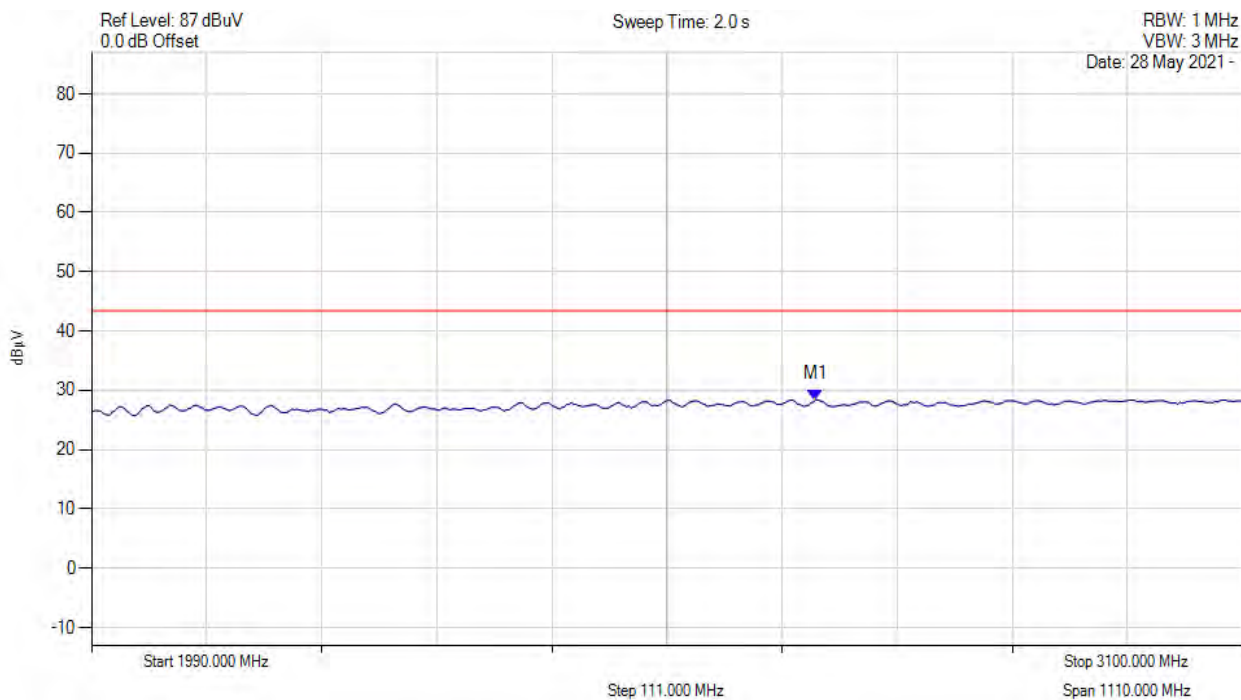
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1949.639 MHz : 27.387 dBμV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



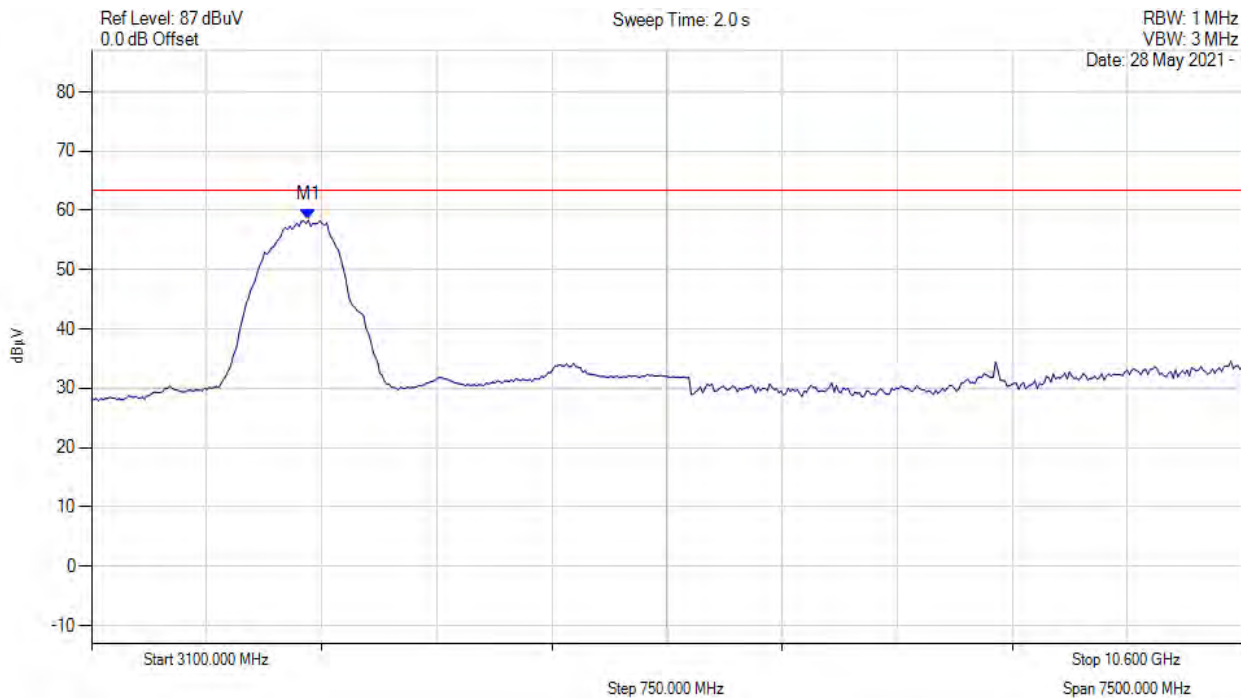
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 2688.477 MHz : 28.431 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



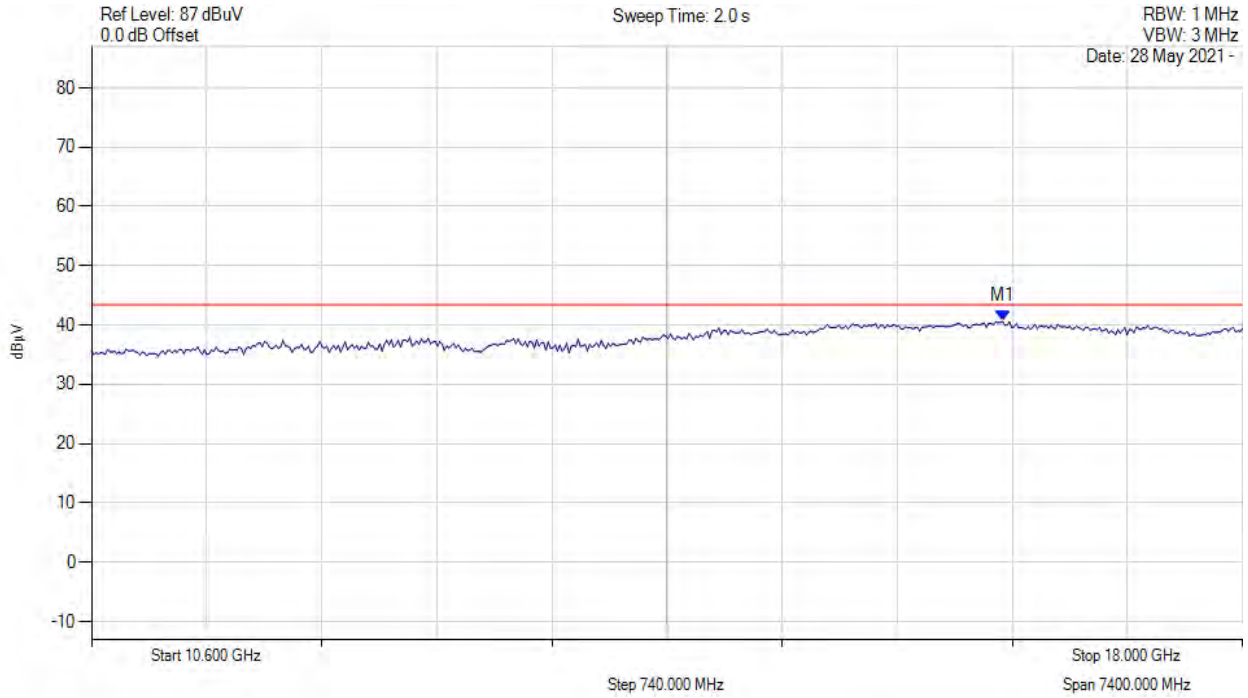
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 4512.826 MHz : 58.369 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Horizontal, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



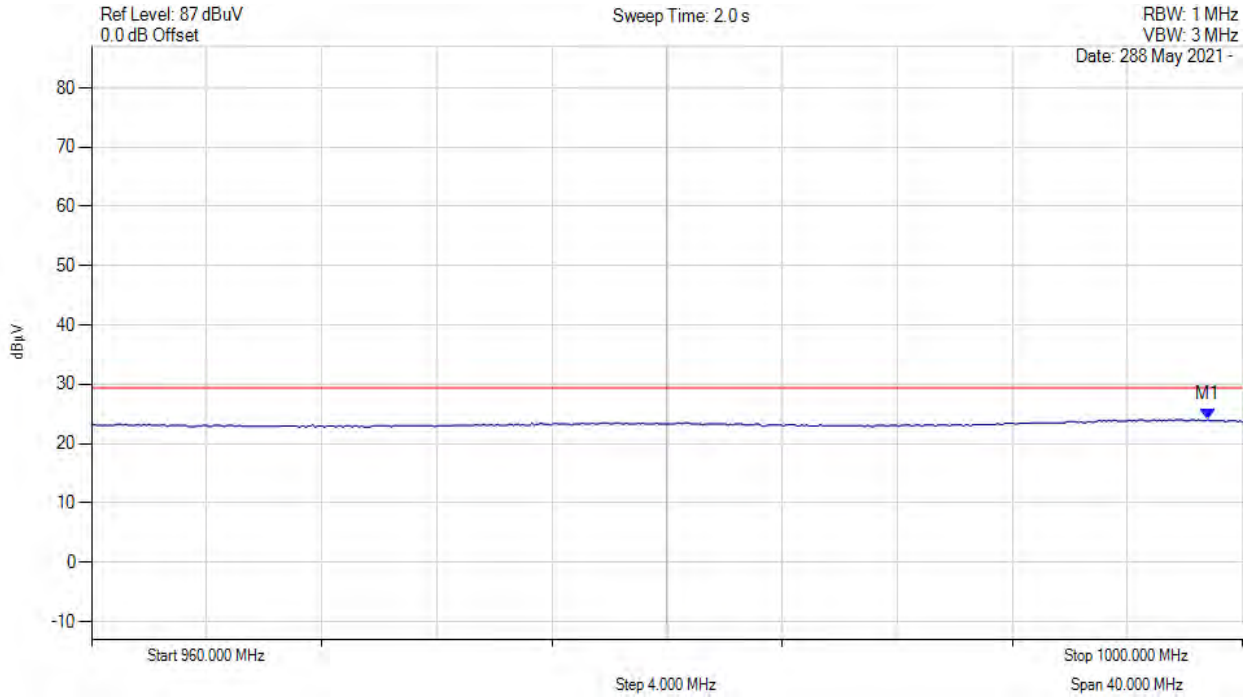
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 16.458 GHz : 40.598 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variation: Vertical, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



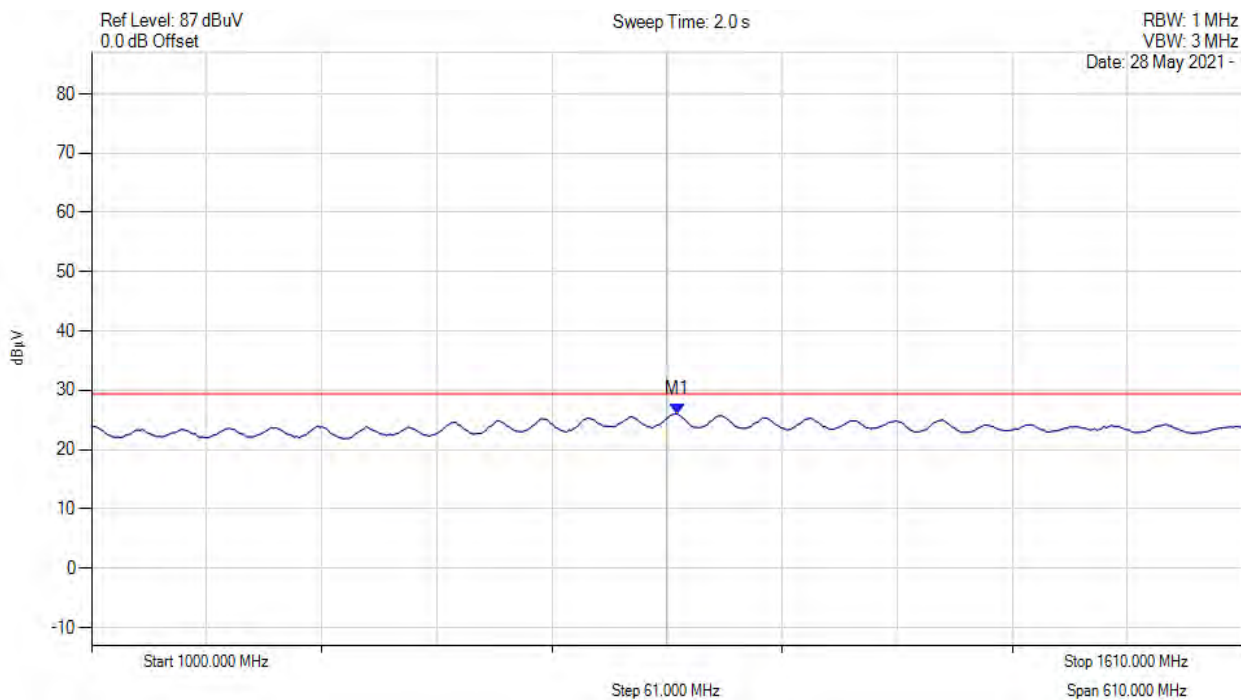
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 998.798 MHz : 24.062 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variation: Vertical, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



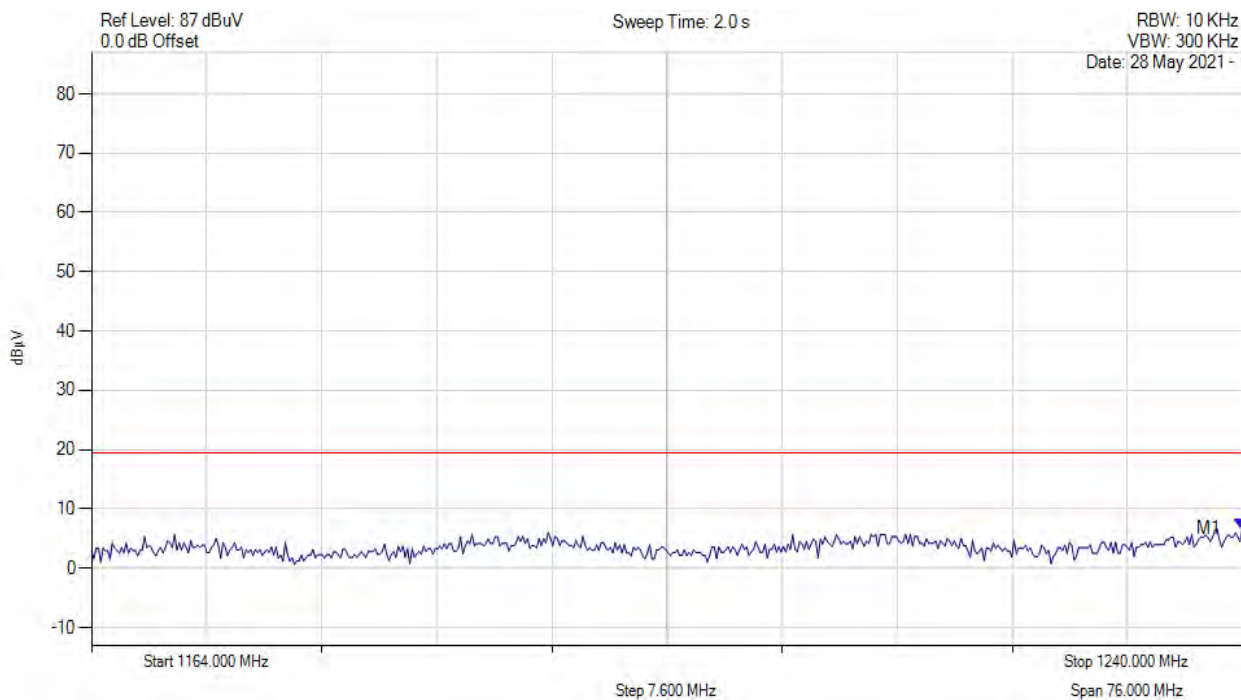
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1310.501 MHz : 25.992 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Vertical, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



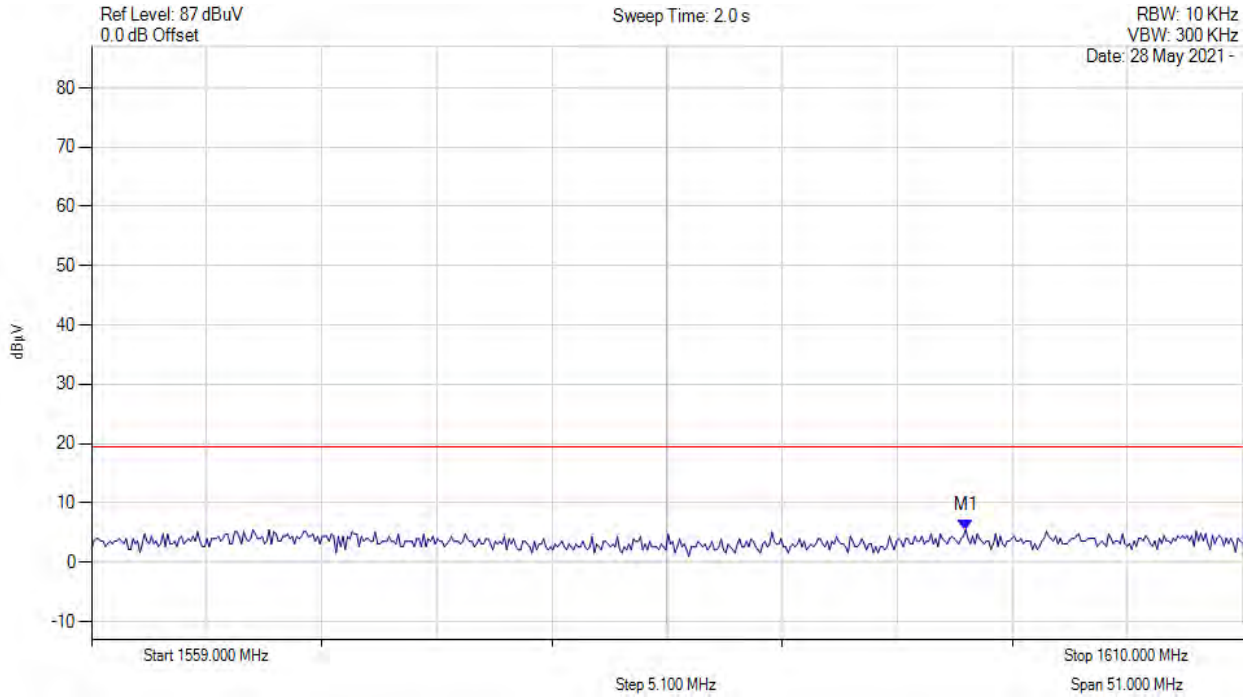
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1240.000 MHz : 6.681 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Vertical, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



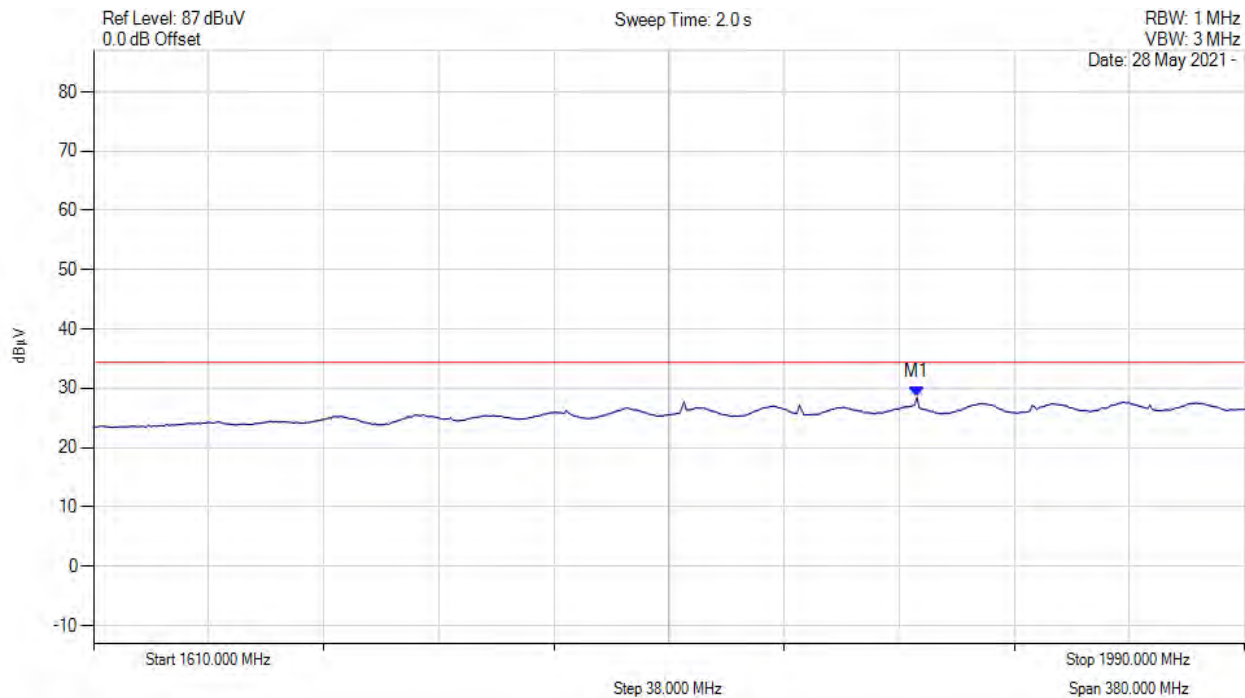
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1597.735 MHz : 5.499 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variation: Vertical, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



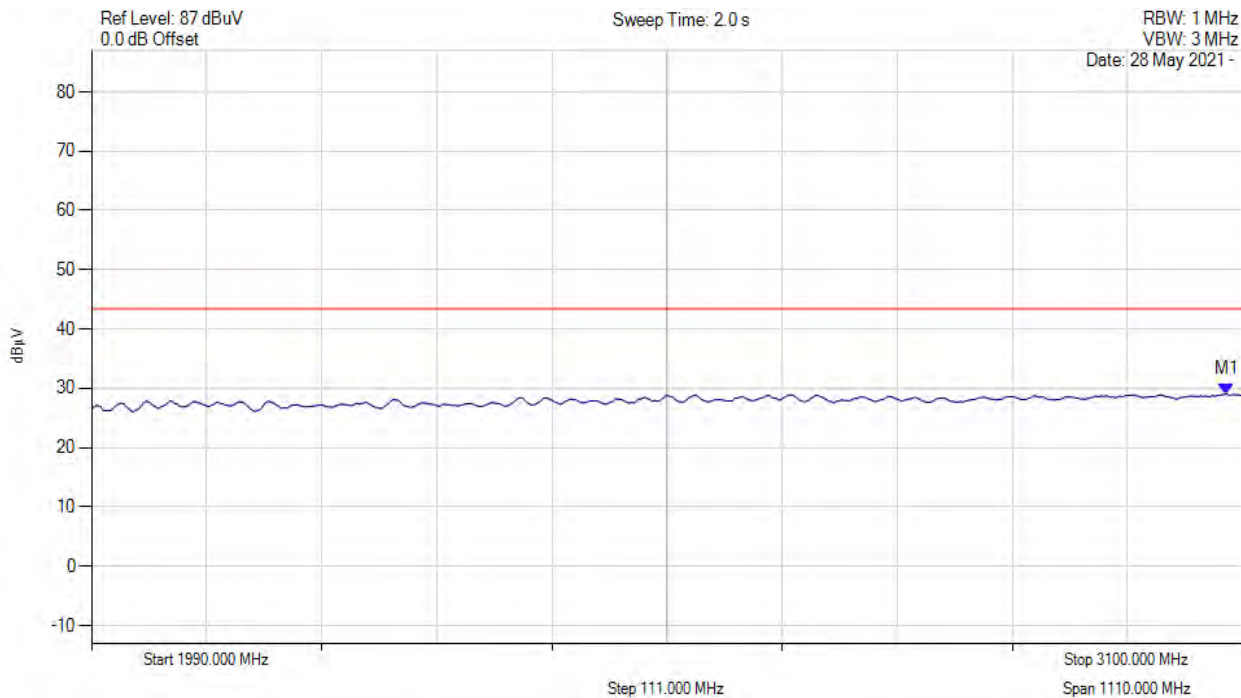
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1881.864 MHz : 28.485 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Vertical, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



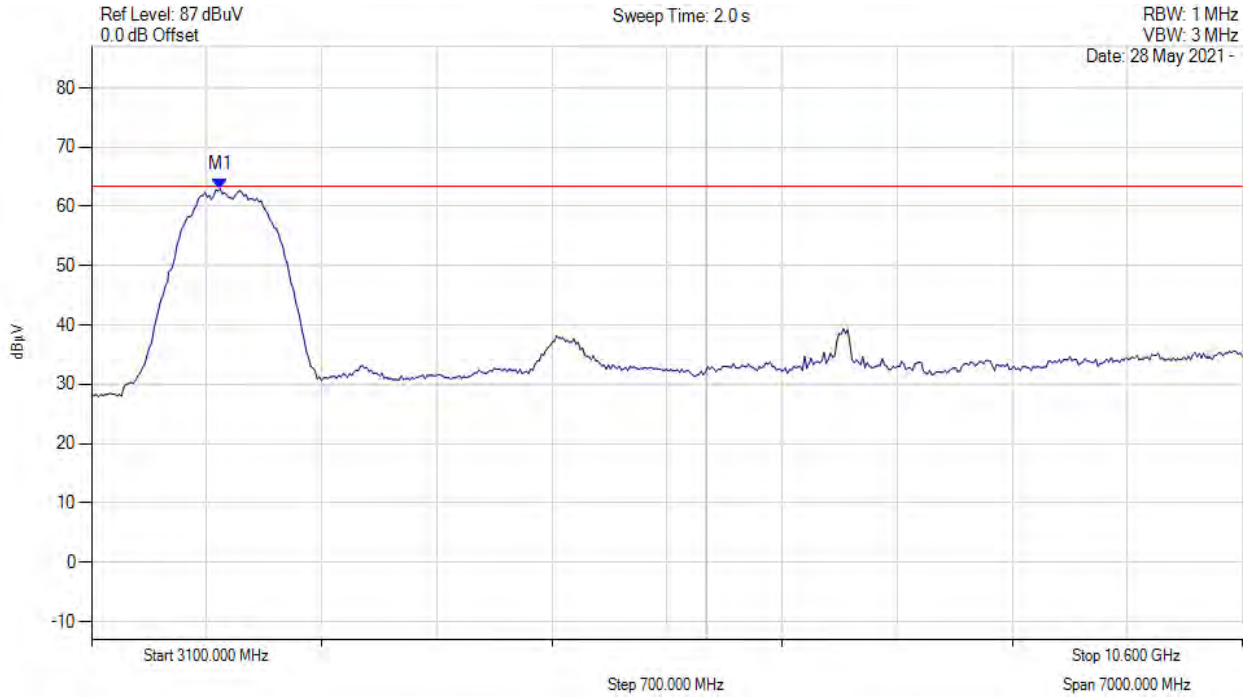
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 3084.429 MHz : 29.095 dBμV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Vertical, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



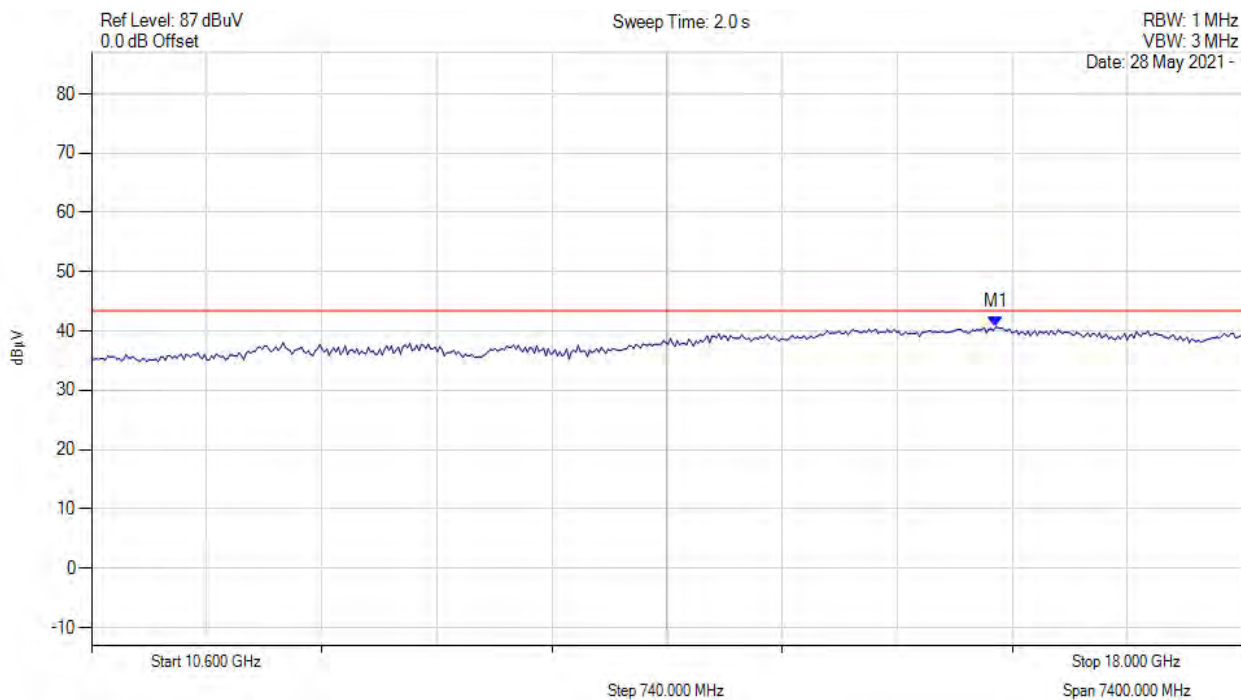
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 3936.673 MHz : 62.988 dBμV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variation: Vertical, Channel: 3993.60 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



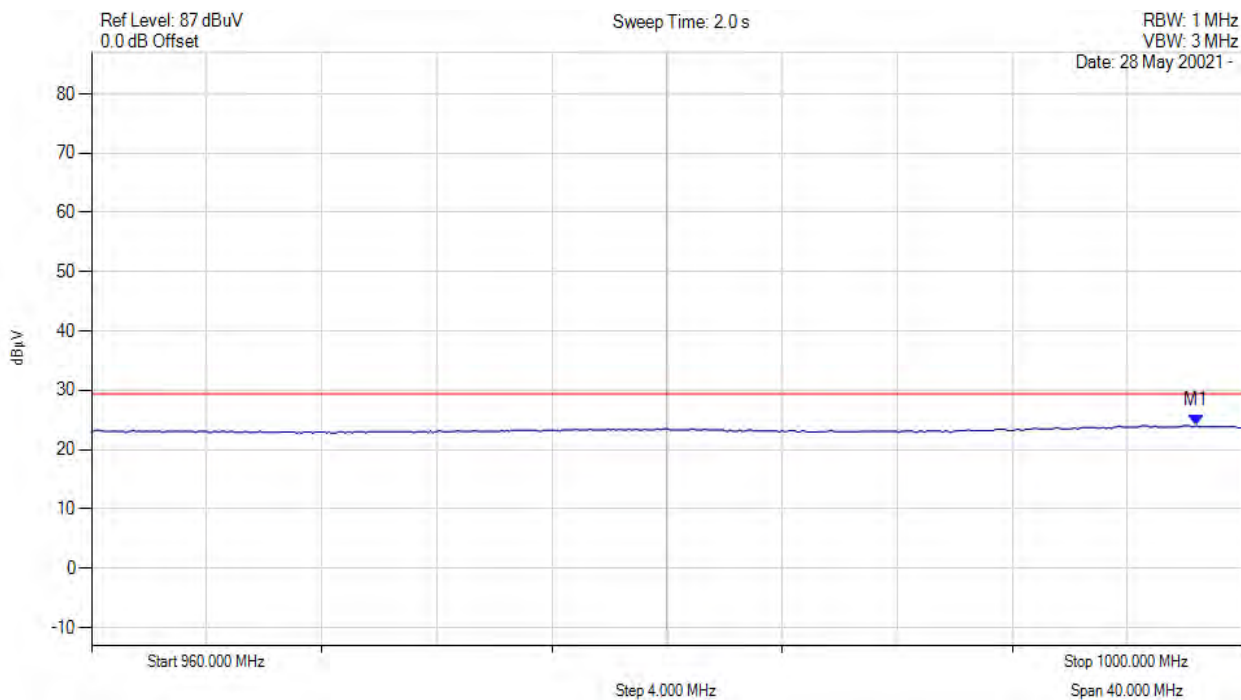
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 16.413 GHz : 40.662 dBµV	Channel Frequency: 3993.60 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variation: Vertical, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



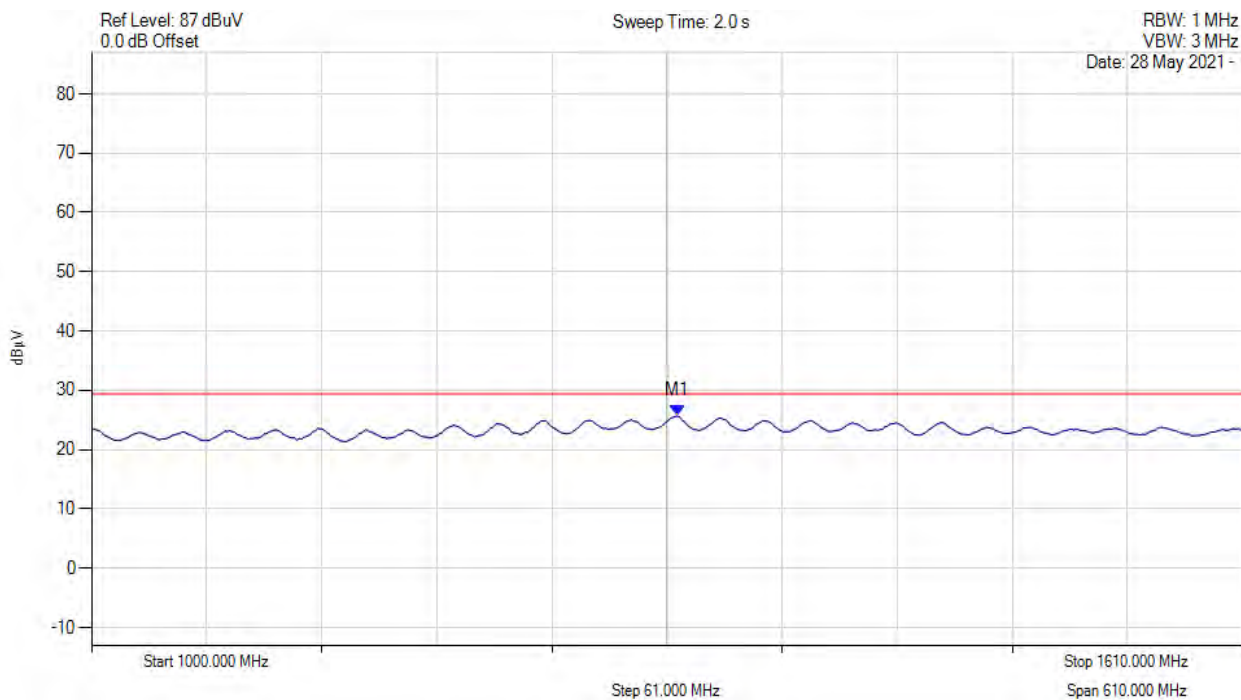
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 998.397 MHz : 24.052 dBμV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Vertical, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



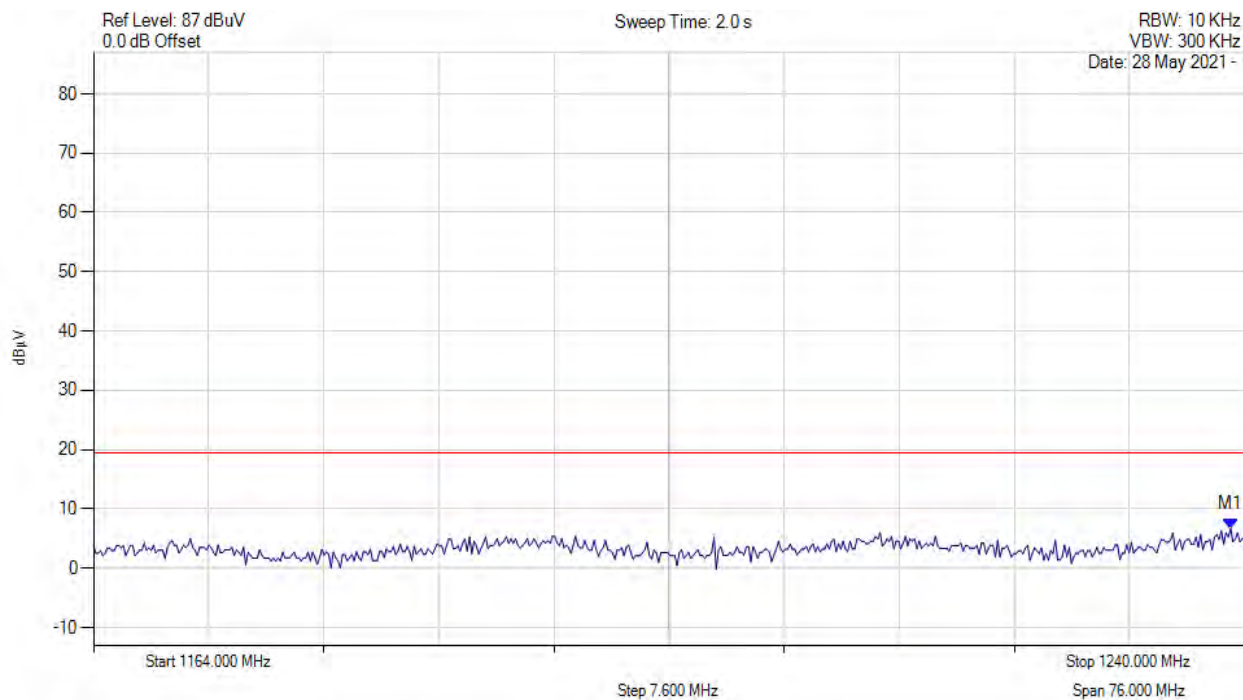
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1310.501 MHz : 25.683 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Vertical, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



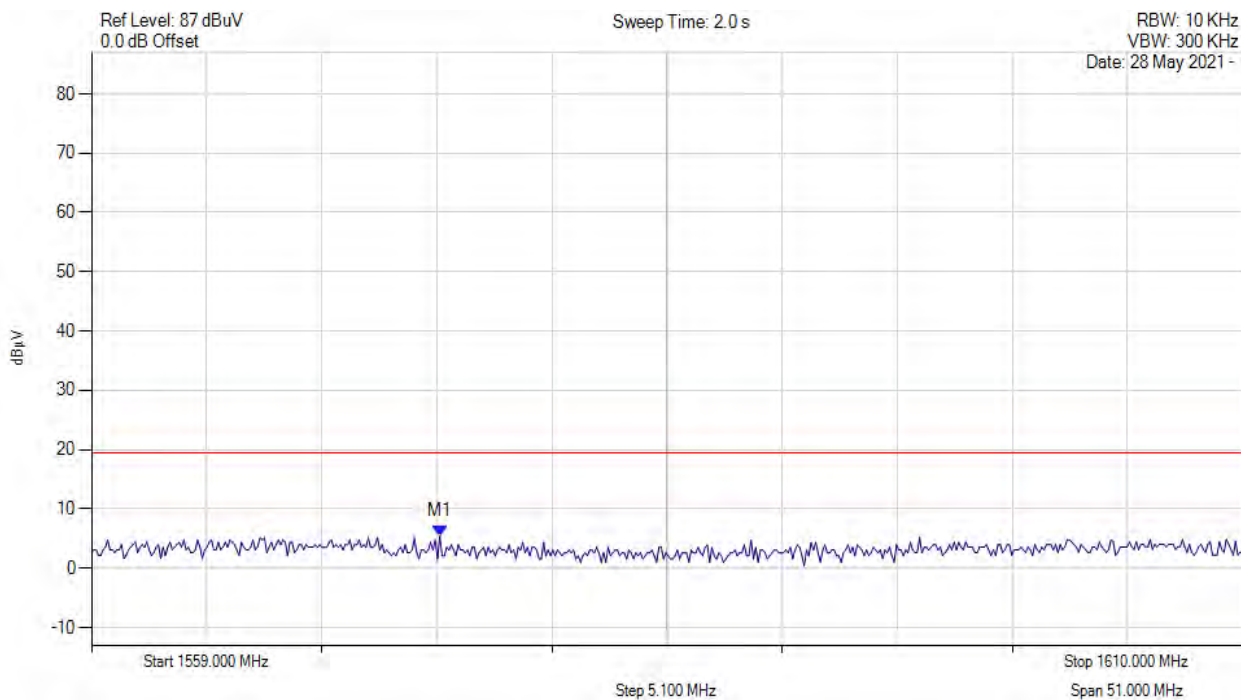
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1239.086 MHz : 6.669 dBμV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Vertical, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



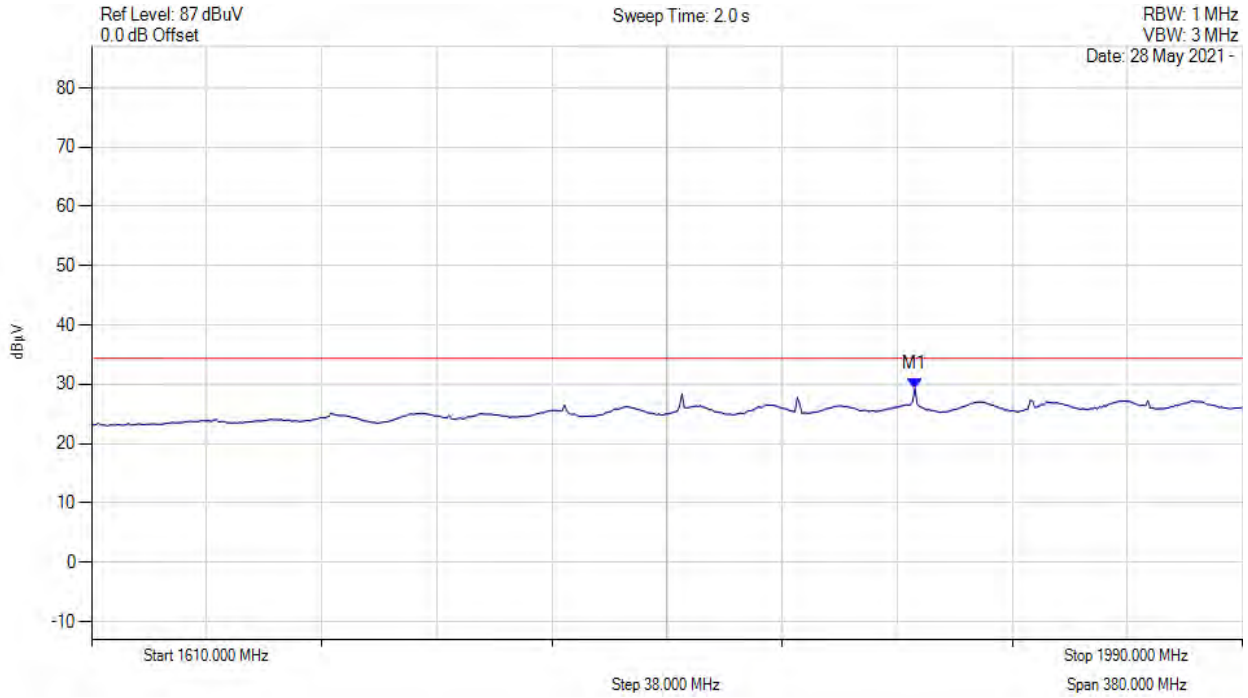
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1574.433 MHz : 5.479 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variation: Vertical, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



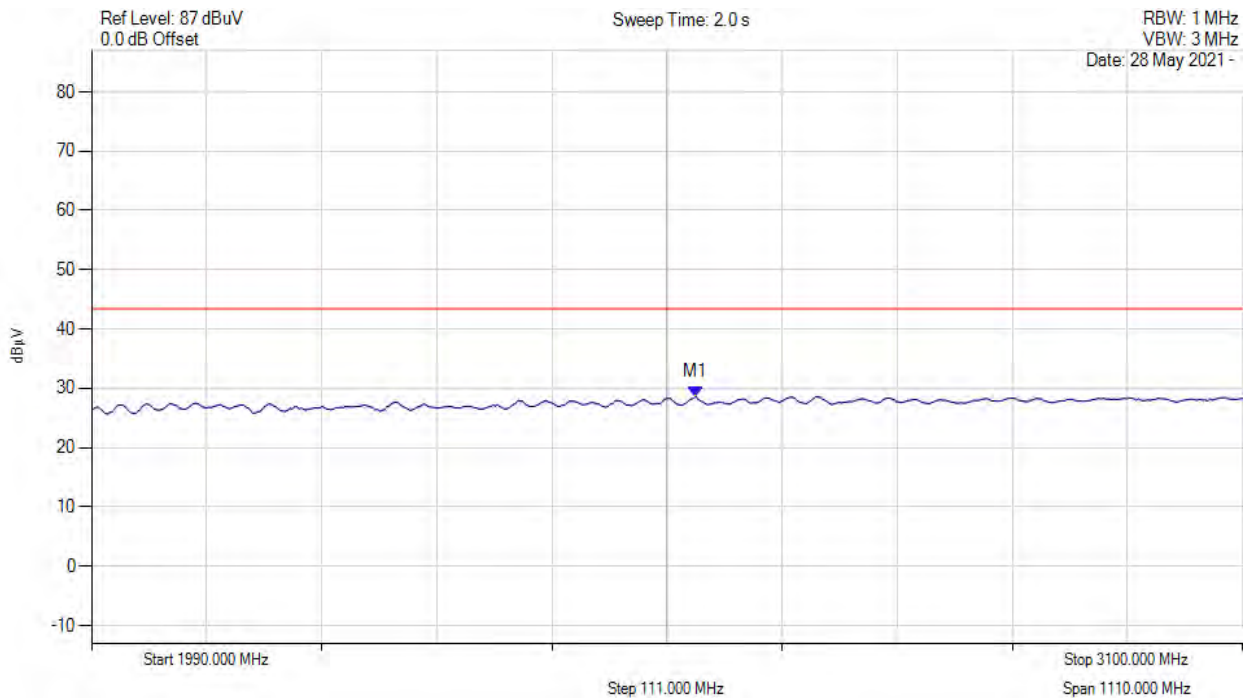
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 1881.864 MHz : 29.297 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variation: Vertical, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



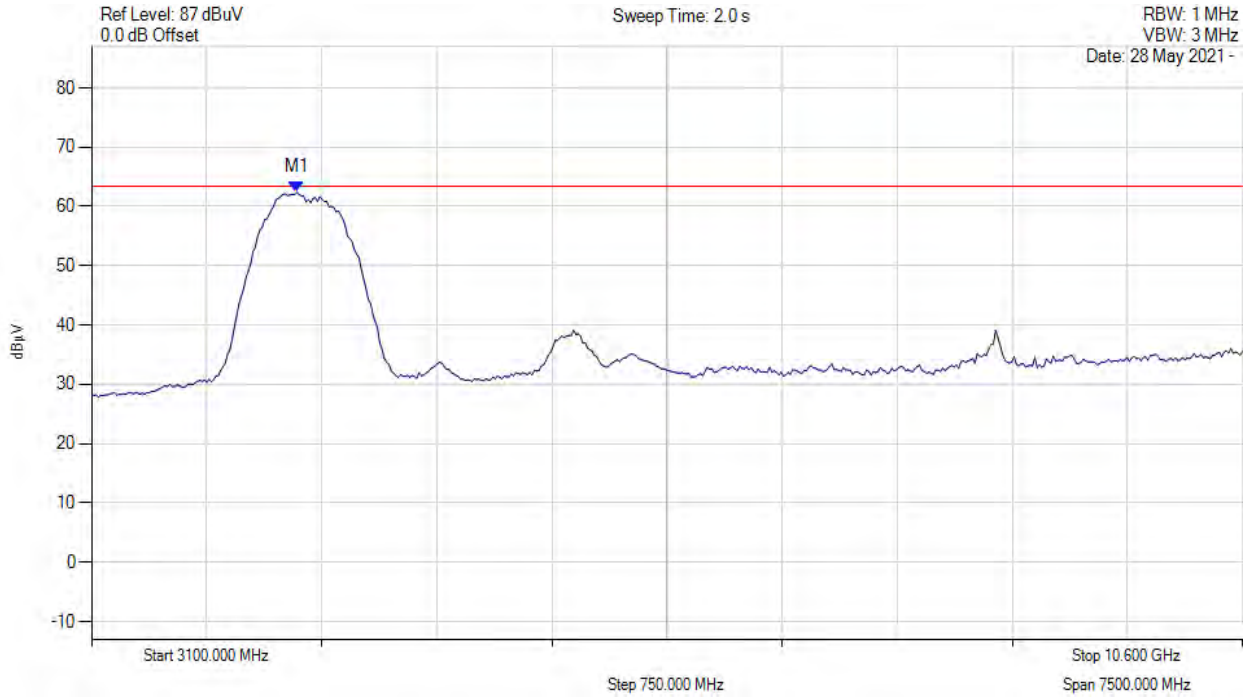
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 2572.806 MHz : 28.621 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variant: Vertical, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



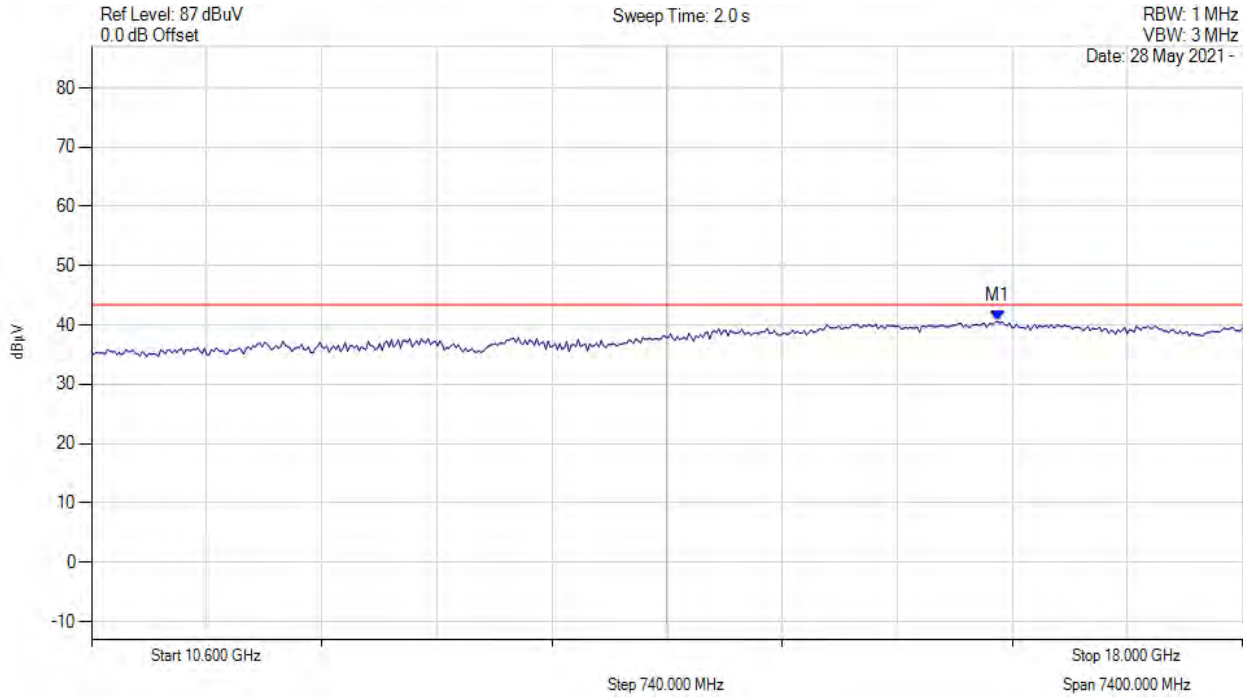
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 4437.675 MHz : 62.416 dBµV	Channel Frequency: 4492.80 MHz

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TRANSMITTER SPURIOUS EMISSIONS



Variation: Vertical, Channel: 4492.80 MHz, Chain a, Temp: 20, Voltage: 3.7 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = AVERAGE Sweep Count = 0 RF Atten (dB) = 0 Trace Mode = CLR/WRITE	M1 : 16.428 GHz : 40.600 dBµV	Channel Frequency: 4492.80 MHz

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