REGULATORY COMPLIANCE TEST REPORT

FCC CFR 47 Part 15 Subpart C 15.247 (900 MHz FHSS)
ISED: RSS-247 Issue 3

Report No.: BLYK08-U4 Rev A

Company: Novanta Corporation

Model Name: M7E-TERA

REGULATORY COMPLIANCE TEST REPORT

Company Name: Novanta Corporation

Model Name: M7E-TERA

To: FCC 15.247 & ISED RSS-247

Test Report Serial No.: BLYK08-U4 Rev A

This report supersedes: NONE

Applicant: Novanta Corporation
125 Middlesex Turnpike
Bedford, MA 01730-1409
USA

Issue Date: 18th December 2023

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
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A2LA ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

Table of Contents

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

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Pleasanton, CA

for technical competence in the field of

Electrical Testing

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

Presented this 14th day of January 2022.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.01
Valid to February 29, 2024
Revised October 26, 2023

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

1.2. RECOGNITION

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

1.3. PRODUCT CERTIFICATION

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

Accredited Product Certification Body

A2LA has accredited

MiCOM LABS

Pleasanton, CA

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

Presented this 14th day of January 2022

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.02
Valid to February 29, 2024
Revised October 26, 2023

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

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

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	27th November 2023	Draft report for client review.
Draft #2	16th December 2023	Client comment update
Rev A	18th December 2023	Initial Release

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

3. TEST RESULT CERTIFICATE

Manufacturer:	Novanta Corporation 125 Middlesex Turnpike Bedford MA 01730-1409 USA	**Tested By:**	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model:	M7E-TERA	**Telephone:**	+1 925 462 0304
Type Of Equipment:	RFID Interrogator	**Fax:**	+1 925 462 0306
S/N's:	01010		
Test Date(s):	6th – 7th November 2023	**Website:**	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart C 15.247 (FHSS) & ISED RSS-247 (FHSS)	**EQUIPMENT COMPLIES**

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

Notes:

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

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

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

A2LA ACCREDITED
TESTING CERT #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	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.
II	A2LA	22nd June 2022	R105 - Requirement's When Making Reference to A2LA Accreditation Status
III	ANSI C63.10	2020	American National Standard for Testing Unlicensed Wireless Devices
IV	ANSI C63.4	2014	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
V	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
VI	FCC 47 CFR Part 15, Subpart B	Nov 2017	Title 47: Telecommunication PART 15—RADIO FREQUENCY DEVICES, SubPart B; Unintentional Radiators
VII	FCC 47 CFR Part 15.247	Apr 2020	Radio Frequency Devices; Subpart C – Intentional Radiators
VIII	FCC Public Notice DA 00-705	Mar 2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
IX	ICES-003	Issue 7; Oct 2020	Information Technology Equipment (Including Digital Apparatus)
X	UKAS M3003	Edition 5 Sept 2022	The Expression of Uncertainty and Confidence in Measurements
XI	RSS-247 Issue 3	Aug 2023	Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices
XII	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.
XIII	FCC 47 CFR Part 2.1033	Feb 2023	FCC requirements and rules regarding photographs and test setup diagrams.
XIV	UKAS LAB 12	Edition 4 April 2022	The Expression of Uncertainty in Testing

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 Novanta Corporation M7E-TERA to FCC CFR 47 Part 15 Subpart C 15.247 (FHSS) & ISED RSS-247 Radio Frequency Devices; Subpart C – Intentional Radiators
Applicant:	Novanta Corporation 125 Middlesex Turnpike, Bedford MA 01730-1409 USA
Manufacturer:	Novanta Corporation
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court, Pleasanton California 94566 USA
Test report reference number:	BLYK08-U4
Date EUT received:	23rd October 2023
Standard(s) applied:	FCC CFR 47 Part 15 Subpart C 15.247 (FHSS) & ISED RSS-247
Dates of test (from - to):	6th – 7th November 2023
No of Units Tested:	1
Product Family Name:	M7E UHF RAIN RFID Module
Model(s):	M7E-TERA
Location for use:	Indoors or Protected Enclosure
Declared Frequency Range(s):	902 - 928 MHz;
Type of Modulation:	PR-ASK/FHSS
EUT Modes of Operation:	902 - 928 MHz:
Declared Nominal Output Power (dBm):	+30.0 dBm
Transmit/Receive Operation:	Transceiver
Rated Input Voltage and Current:	3.3 – 5Vdc ±5%, 1.5A
Operating Temperature Range:	-40°C - +60°C
ITU Emission Designator:	67K4K1D
Equipment Dimensions:	26 X 46 X 4 mm
Weight:	8 grams
Hardware Rev:	C
Software Rev:	2.01.02.1C

5.2. Scope Of Test Program

Novanta Corporation M7E-TERA

The scope of the test program was to test the Novanta Corporation M7E-TERA in the frequency ranges 902 - 928 MHz; for compliance against the following specifications;-

FCC CFR 47 Part 15 Subpart C 15.247 (FHSS)
Radio Frequency Devices; Subpart C – Intentional Radiators

Industry Canada RSS-247
Digital Transmission Systems (DTSs), Frequency Hopping System (FHSS) and License-Exempt Local Area Network (LE-LEN) Devices

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

Type (EUT/ Support)	Equipment Description	Manufacturer	Model No.	Serial No.
EUT	RFID Interrogator	Novanta	M7E-TERA	01010
Support	Laptop	Lenovo	-	-

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
external	Laird	S8964B	Dipole	6.0	-	360	-	902 - 928
external	MTI Wireless	MT-242043	Patch	6.0*	-	360	-	902 - 928
BF Gain - Beamforming Gain Dir BW - Directional BeamWidth X-Pol - Cross Polarization								

*Note: Antenna is circularly polarized with a gain of 9 dBiC which converts to the stated linear gain in dBi. (dBiC – 3.0 = dBi)

5.5. Cabling and I/O Ports

** No interfaces entered **

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s)	Data Rate with Highest Power kBit/s	Channel Frequency (MHz)		
		Low	Mid	High
902 - 928 MHz				
ASK	100	902.75	914.75	927.25

5.7. Equipment Modifications

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

1. NONE

5.8. Deviations from the Test Standard

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

1. The Manufacturer declares the product will be professionally installed in a host device and make use of cabling with a loss totaling at least 1.5 dB. The transmitter power limit used during the test program was adjusted to take account of these losses.

2. Of the 4 antenna ports, only one port will be active at a time. Therefore, power was measured on all ports and the highest value used. All remaining tests were performed on one antenna port only.

6. TEST SUMMARY

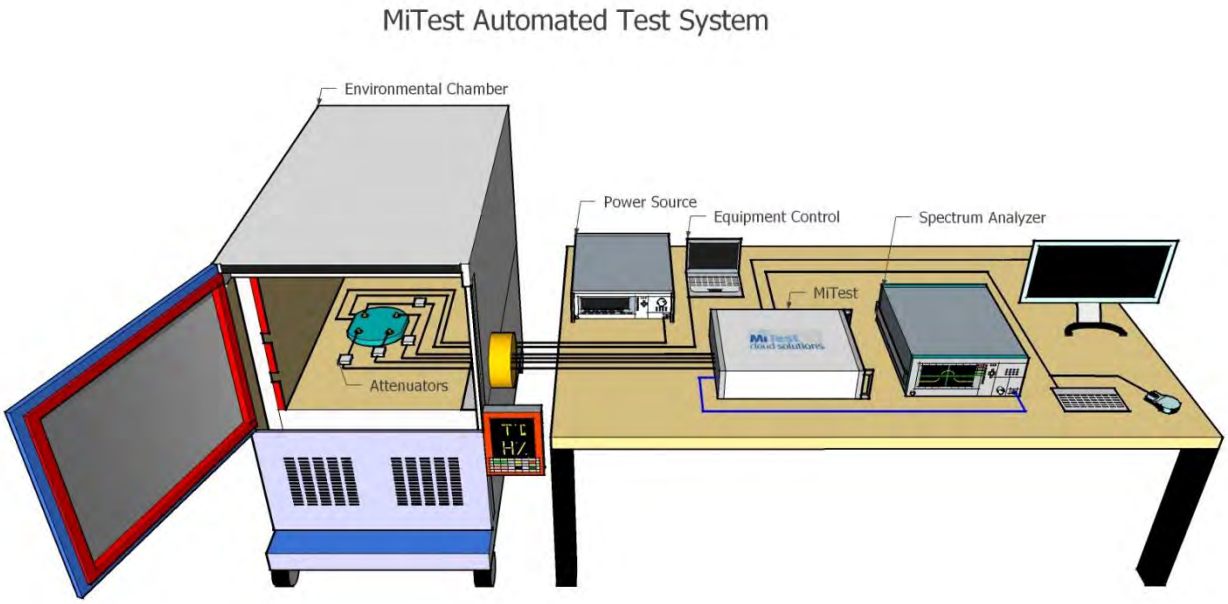
List of Measurements

Test Header	Result	Data Link
20 dB & 99% Bandwidth	Complies	View Data
Frequency Hopping Tests	Complies	-
Number of Hopping Channels	Complies	View Data
Channel Separation	Complies	View Data
Dwell Time	Complies	View Data
Channel Occupancy	Complies	View Data
Output Power	Complies	View Data
Emissions	Complies	-
(1) Conducted Emissions	Complies	-
(i) Conducted Unwanted Spurious Emissions	Complies	View Data
(ii) Conducted Band-Edge Emissions	Complies	View Data
(2) Radiated Emissions	Complies	-
(i) TX Spurious & Restricted Band Emissions	Complies	View Data
(3) Digital Emissions (0.03 - 1 GHz)	Complies	View Data
(4) AC Wireline Emissions	Not Required	-

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

7. TEST EQUIPMENT CONFIGURATION(S)

7.1. Conducted RF



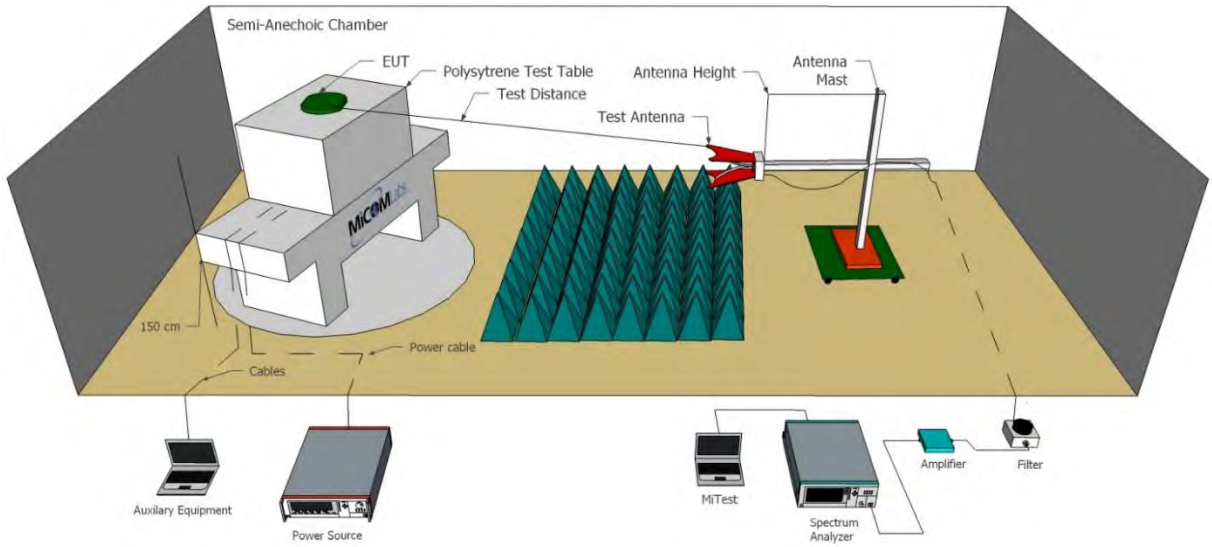
A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
127	Power Supply	HP	6674A	US36370530	Cal when used
248	Resistance Thermometer	Thermotronics	GR2105-02	9340 #1	30 Oct 2024
461	Spectrum Analyzer	Keysight	E4440A	MY46185537	27 Sep 2024
398	MiTest RF Conducted Test Software	MiCOM	MiTest ATS	Version 4.2.3.0	Not Required
420	USB to GPIB Interface	National Instruments	GPIB-USB HS	1346738	Not Required
510	Barometer/Thermometer	Digi Sense	68000-49	170871375	4 Jan 2024
515	MiTest Cloud Solutions RF Test Box	MiCOM	2nd Gen with DFS	515	24 Jan 2024
516	USB Wideband Power Sensor	Boonton	RTP5006	10511	12 Dec 2023
RF#2 GPIB#1	GPIB cable to Power Supply	HP	GPIB	None	Not Required
RF#2 SMA#1	EUT to Mitest box port 1	Flexco	SMA Cable port1	None	26 Jan 2024
RF#2 SMA#SA	Mitest box to SA	Flexco	SMA Cable SA	None	26 Jan 2024

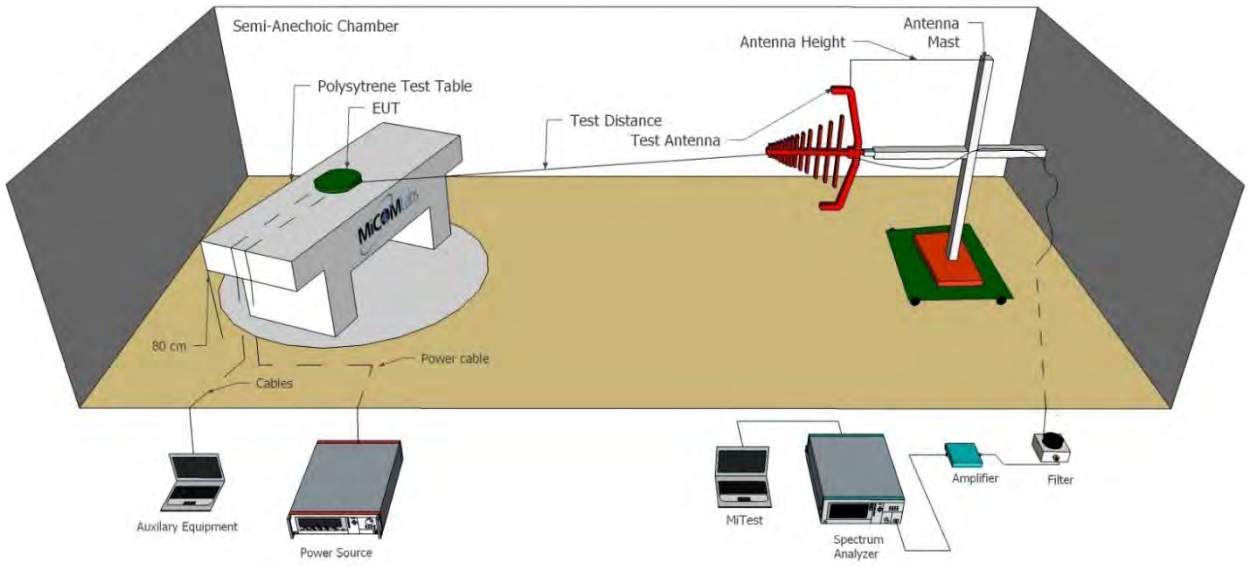
7.2. Radiated Emissions - 3m Chamber

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



Test Equipment Utilized

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
170	Video System Controller	Panasonic	WV-CU101	04R08507	Not Required
555	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESW44	101893	28 Jun 2024
298	3M Radiated Emissions Chamber Maintenance Check	MiCOM	3M Chamber	298	11 Jan 2024
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	29 Dec 2023
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	2Jan 2024
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	30 Dec 2023
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	2 Nov 2022
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
447	MiTest Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	18 Sep 2024
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	18 Sep 2024
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	16 Sep 2024
480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	18 Sep 2024
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	18 Sep 2024
510	Barometer/Thermometer	Digi Sense	68000-49	170871375	4 Jan 2024
554	Precision SMA Cable	Fairview Microwave	SCE18060101-400CM	554	18 Sep 2024

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. 20 dB & 99% Bandwidth

Conducted Test Conditions for 20 dB and 99% Bandwidth			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	20 dB and 99 % Bandwidth	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(1)(i)/(ii)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for 20 dB and 99% Bandwidth Measurement

The bandwidth at 20 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 20 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:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(ii) Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

Equipment Configuration for 20 dB 99% Bandwidth			
Variant:	M7E-TERA	**Duty Cycle (%):**	80
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.0
Modulation:	ASK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JK
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 20 dB Bandwidth (kHz) Port(s)				20 dB Bandwidth (kHz)		Limit	Lowest Margin
MHz	a	b	C	d	Highest	Lowest	kHz	kHz
902.75	16.66	--	--	--	16.66	16.66	250	-233.34
914.75	16.66	--	--	--	16.66	16.66	250	-233.34
927.25	11.33	--	--	--	11.33	11.33	250	-238.67

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				Maximum 99% Bandwidth (kHz)		
MHz	A	b	c	d			
902.75	67.396	--	--	--	67.396		
914.75	67.361	--	--	--	67.361		
927.25	67.164	--	--	--	67.164		

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. Frequency Hopping Tests

Conducted Test Conditions for Frequency Hopping Measurements			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Frequency Hopping Tests	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(1)(i)/(ii)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References, FCC Public Notice DA 00-705		

Test Procedure for Frequency Hopping Measurements

These tests cover the following measurements:

i) channel separation
ii) channel occupancy
iii) dwell time
iv) number of hopping frequencies

Frequency hopping testing was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency or hopping mode.

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 Frequency Hopping Measurements

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

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(ii) Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

9.2.1. Number of Hopping Channels

Equipment Configuration for Number of Hopping Channels

Variant:	M7E-TERA	**Antenna:**	MT-242043
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.0
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
Duty Cycle (%):	80.0	**Tested By:**	JK
Engineering Test Notes:			

Test Measurement Results

Frequency Range (MHz)	Number of Hopping Channels	Limit	Pass / Fail
902.0-910.0	15	--	--
910.0-920.0	20	--	--
920.0-928.0	15	--	--
Total number of Hops	**50**	**50**	**Pass**

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).

9.2.2. Channel Separation

Equipment Configuration for Channel Separation

Variant:	M7E-TERA	**Antenna:**	MT-242043
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.0
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
Duty Cycle (%):	80.0	**Tested By:**	JK
Engineering Test Notes:			

Test Measurement Results

Center Frequency (MHz)	Chan Separation (kHz)	Limit (kHz)	Pass / Fail
914.75	501	>25	Pass

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).

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

9.2.3. Dwell Time and Channel Occupancy

Equipment Configuration for Channel Occupancy

Variant:	M7E-TERA	**Antenna:**	MT-242043
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.0
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
Duty Cycle (%):	80.0	**Tested By:**	JK
Engineering Test Notes:			

Test Measurement Results

Channel Frequency(MHz)	Dwell Time (Single Burst) (S)	Channel Occupancy (mS)	Observation Period (S)	Channel Occupancy Limit (mS)	Pass / Fail
914.75	0.031	366.000	20.00	400.000	Pass

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).

9.3. Output Power

Conducted Test Conditions for Fundamental Emission Output Power			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Output Power	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (a)(1), (b)(1)/(2)/(3)	**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, nominal voltage. 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*Log10 ($10^{a/10}$ + $10^{b/10}$ + $10^{c/10}$ + $10^{d/10}$)]
G = Antenna Gain
Y = Beamforming Gain
x = Duty Cycle (average power measurements only)

Limits for Fundamental Emission Output Power

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

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

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

(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 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.

Equipment Configuration for Output Power Peak

Variant:	M7E-TERA	**Duty Cycle (%):**	100.0
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.00
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JK
Engineering Test Notes:	CW Transmit mode		

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Highest Measured Power	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dB	
902.75	31.30 / 29.80	31.45 / 29.95	31.46 / 29.96	31.41 / 29.91	29.96	30.00	-0.04	31.50
914.75	31.00 / 29.50	31.33 / 29.83	31.23 / 29.73	31.39 / 29.89	29.89	30.00	-0.11	31.50
927.25	31.50 / 30.00	31.46 / 29.96	31.50 / 30.00	31.50 / 30.00	30.00	30.00	-0.00	31.50

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

NOTE
The Manufacturer declares the product will be professionally installed in a host device and make use of cabling with a loss totaling at least 1.5 dB. The transmitter power limit used during the test program was adjusted to take account of these losses.

In the above matrix the first value is the output power from the UHF RFID device. The second value is the power delivered to the antenna after the 1.5 dB minimum cable loss.

9.4. Emissions

9.4.1. Conducted Emissions

Conducted Test Conditions for Transmitter Conducted Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Transmitter Conducted Spurious and Band-Edge Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (d)	**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)).

9.4.1.1. Conducted Unwanted Spurious Emissions

Equipment Configuration for Unwanted Emissions Peak			
Variant:	M7E-TERA	**Duty Cycle (%):**	80
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.0
Modulation:	FHSS	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JK
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Frequency Range	Unwanted Emissions Peak (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
902.75	30.0 - 10000.0	-41.591	10.94	--	--	--	--	--	--
914.75	30.0 - 10000.0	-42.535	11.71	--	--	--	--	--	--
927.25	30.0 - 10000.0	-40.885	11.98	--	--	--	--	--	--

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

Equipment Configuration for Conducted Low Band-Edge Emissions (Hopping) Peak

Variant:	M7E-TERA	**Duty Cycle (%):**	80.0
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.0
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JK
Engineering Test Notes:			

Test Measurement Results

Channel Frequency:	902.75 MHz					
Band-Edge Frequency:	902.0 MHz					
Test Frequency Range:	875.0 - 905.0 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)**	**(MHz)**
a	-44.02	11.58	902.60	--	--	-0.600

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).

Equipment Configuration for Conducted Low Band-Edge Emissions (Static) Peak			
Variant:	M7E-TERA	**Duty Cycle (%):**	80.0
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.0
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JK
Engineering Test Notes:			

Test Measurement Results

Channel Frequency:	902.75 MHz					
Band-Edge Frequency:	902.0 MHz					
Test Frequency Range:	875.0 - 905.0 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)**	**(MHz)**
a	-38.86	11.58	902.60	--	--	-0.600

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).

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Equipment Configuration for Conducted Upper Band-Edge Emissions (Hopping) Peak

Variant:	M7E-TERA	**Duty Cycle (%):**	80.0
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.0
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JK
Engineering Test Notes:			

Test Measurement Results

Channel Frequency:	927.25 MHz
Band-Edge Frequency:	928.0 MHz
Test Frequency Range:	925.0 - 950.0 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)	(MHz)
a	-35.75	12.13	927.50	--	--	-0.500

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).

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Equipment Configuration for Conducted Upper Band-Edge Emissions (Static) Peak			
Variant:	M7E-TERA	**Duty Cycle (%):**	80.0
Data Rate:	50 kbit/s	**Antenna Gain (dBi):**	6.0
Modulation:	FHSS	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JK
Engineering Test Notes:			

Test Measurement Results

Channel Frequency:	927.25 MHz					
Band-Edge Frequency:	928.0 MHz					
Test Frequency Range:	925.0 - 950.0 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)**	**(MHz)**
A	-41.01	12.06	927.50			-0.500

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).

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9.4.2. Radiated Emissions

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions (Restricted Bands)			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Radiated Spurious and Band-Edge Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.205, 15.209	**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.

Limits for Restricted Bands
Peak emission: 74 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 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 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).

9.4.2.3. TX Spurious & Restricted Band Emissions

S8964B Antenna

Equipment Configuration for 30 MHZ TO 1 GHZ

Antenna:	S8964B	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	902.75	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	39.70	47.38	3.63	-10.25	40.75	MaxP	Vertical	100	89	49.5	-8.7	Pass
#2	68.80	52.76	3.88	-17.26	39.39	MaxP	Vertical	100	59	49.5	-10.1	Pass
#3	70.74	56.34	3.90	-17.24	43.00	MaxP	Vertical	100	59	49.5	-6.5	Pass
#4	101.78	52.67	4.10	-14.90	41.87	MaxP	Vertical	199	209	54.0	-12.1	Pass
#5	103.72	53.58	4.11	-14.42	43.26	MaxP	Vertical	199	209	54.0	-10.7	Pass
#6	105.66	53.82	4.12	-13.94	44.01	MaxP	Vertical	199	209	54.0	-10.0	Pass
#7	236.61	51.32	4.73	-14.11	41.95	MaxP	Horizontal	199	210	57.0	-15.1	Pass
#8	246.31	50.77	4.78	-14.03	41.52	MaxP	Vertical	100	179	57.0	-15.5	Pass
#9	257.95	50.56	4.82	-13.75	41.64	MaxP	Horizontal	100	60	57.0	-15.4	Pass
#10	260.86	48.99	4.84	-13.42	40.40	MaxP	Vertical	100	210	57.0	-16.6	Pass
#11	389.87	43.02	5.31	-9.52	38.81	MaxP	Vertical	101	0	57.0	-18.2	Pass
#12	903.00	58.27	6.93	27.93	62.58	Fundamental	Vertical	199	59	--	--	--
Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.												

Equipment Configuration for 30 MHZ TO 1 GHZ

Antenna:	S8964B	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	914.75	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	38.73	48.31	3.61	-9.59	42.34	MaxP	Vertical	100	119	49.5	-7.2	Pass
#2	76.56	54.94	3.94	-17.34	41.55	MaxP	Vertical	100	0	49.5	-8.0	Pass
#3	88.20	59.01	4.01	-17.47	45.55	MaxP	Vertical	100	0	54.0	-8.4	Pass
#4	92.08	60.16	4.05	-17.08	47.13	MaxP	Horizontal	199	330	54.0	-6.9	Pass
#5	98.58	49.03	4.08	-15.65	37.46	MaxQP	Horizontal	174	355	54.0	-16.5	Pass
#6	208.48	44.48	4.62	-14.57	34.54	MaxP	Horizontal	100	300	54.0	-19.5	Pass
#7	241.46	49.53	4.76	-14.01	40.29	MaxP	Vertical	100	179	57.0	-16.7	Pass
#8	915.61	53.64	6.98	-2.66	57.96	Fundamental	Vertical	199	59	--	--	--
Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.												

Equipment Configuration for 30 MHZ TO 1 GHZ

Antenna:	S8964B	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	927.25	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	37.76	33.91	3.61	-9.59	37.52	MaxP	Vertical	100	119	49.5	-12.0	Pass
#2	38.73	45.18	3.61	-9.59	39.21	MaxP	Vertical	101	59	49.5	-10.3	Pass
#3	97.90	51.51	4.08	-15.83	39.77	MaxP	Vertical	199	269	54.0	-14.2	Pass
#4	116.33	51.33	4.18	-12.13	43.37	MaxP	Horizontal	199	180	54.0	-10.6	Pass
#5	237.58	52.54	4.74	-14.09	43.20	MaxP	Horizontal	199	240	57.0	-13.8	Pass
#6	243.40	50.42	4.77	-14.00	41.19	MaxP	Vertical	101	209	57.0	-15.8	Pass
#7	365.62	39.40	5.24	-9.66	34.98	MaxP	Vertical	199	299	57.0	-22.0	Pass
#8	927.25	61.37	7.00	-2.87	65.51	Fundamental	Vertical	199	59	--	--	--
Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.												

Equipment Configuration for FCC SPURIOUS 1 GHZ -18 GHZ

Antenna:	S8964B	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	902.75	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

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	1799.00	56.84	1.73	30.72	44.33	MaxP	Vertical	199	59	74.0	-29.7	Pass
#2	2708.35	55.89	2.06	-11.79	46.16	MaxP	Vertical	199	134	74.0	-27.8	Pass
#3	2708.35	44.34	2.06	-11.79	34.62	AVG	Vertical	199	134	54.0	-19.4	Pass
#4	4978.00	37.51	2.94	-11.86	46.43	MaxP	Vertical	118	145	74.0	-27.6	Pass
#5	6321.00	56.57	3.35	35.63	50.88	MaxP	Vertical	199	209	74.0	-23.1	Pass
#6	9027.56	62.23	4.09	-8.00	58.32	MaxP	Vertical	182	17	74.0	-15.7	Pass
#7	9027.56	55.31	4.09	-8.00	51.39	AVG	Vertical	182	17	54.0	-2.6	Pass
#8	10833.15	48.62	4.64	-4.61	48.64	MaxP	Vertical	194	177	74.0	-25.4	Pass
#9	10833.15	27.24	4.64	-4.61	27.26	AVG	Vertical	194	177	54.0	-26.7	Pass
Test Notes: 5VDC Max Power												

Equipment Configuration for FCC SPURIOUS 1 GHZ -18 GHZ

Antenna:	S8964B	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	914.75	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

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	2744.20	62.92	2.11	-11.79	53.24	MaxP	Vertical	198	311	74.0	-20.8	Pass
#2	2744.20	56.06	2.11	-11.79	46.38	AVG	Vertical	198	311	54.0	-7.6	Pass
#3	4978.00	37.90	2.94	-11.86	46.82	MaxP	Vertical	118	145	74.0	-27.2	Pass
#4	6406.00	54.89	3.36	35.71	49.42	MaxP	Vertical	199	299	74.0	-24.6	Pass
#5	9147.59	60.71	4.25	-7.81	57.15	MaxP	Vertical	173	18	74.0	-16.8	Pass
#6	9147.59	47.09	4.25	-7.81	43.53	AVG	Vertical	173	18	54.0	-10.5	Pass
Test Notes: 5VDC Max Power												

Equipment Configuration for FCC SPURIOUS 1 GHZ -18 GHZ

Antenna:	S8964B	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	927.25	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

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	1680.00	58.33	1.65	29.18	44.11	MaxP	Horizontal	199	120	74.0	-29.9	Pass
#2	2781.67	59.04	2.12	-11.86	49.30	MaxP	Vertical	181	323	74.0	-24.7	Pass
#3	2781.67	47.03	2.12	-11.86	37.29	AVG	Vertical	181	323	54.0	-16.7	Pass
#4	2781.72	63.19	2.12	-11.86	53.45	MaxP	Horizontal	178	325	74.0	-20.6	Pass
#5	2781.72	56.89	2.12	-11.86	47.15	AVG	Horizontal	178	325	54.0	-6.9	Pass
#6	6491.00	55.24	3.41	35.76	49.85	MaxP	Vertical	199	29	74.0	-24.2	Pass
#7	9272.52	58.76	4.23	-7.17	55.82	MaxP	Vertical	195	195	74.0	-18.2	Pass
#8	9272.52	56.28	4.23	-7.17	53.34	AVG	Vertical	195	195	54.0	-0.7	Pass
Test Notes: 5VDC Max Power												

MT-242043 Antenna

Equipment Configuration for 30 MHZ TO 1 GHZ

Antenna:	MT-242043	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	902.75	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	80.44	52.02	3.97	-17.54	38.46	MaxP	Horizontal	199	60	49.5	-11.0	Pass
#2	82.38	52.14	3.98	-17.61	38.51	MaxP	Horizontal	199	60	49.5	-11.0	Pass
#3	84.32	52.16	3.99	-17.63	38.53	MaxP	Horizontal	199	60	49.5	-11.0	Pass
#4	85.29	51.57	4.00	-17.60	37.97	MaxP	Vertical	101	0	49.5	-11.5	Pass
#5	100.81	56.90	4.09	-15.13	45.87	MaxP	Horizontal	199	330	54.0	-8.1	Pass
#6	249.22	48.31	4.79	-14.07	39.03	MaxP	Vertical	98	239	57.0	-18.0	Pass
#7	257.95	49.40	4.82	-13.75	40.48	MaxP	Horizontal	199	210	57.0	-16.5	Pass
#8	903.00	59.79	6.93	27.93	64.10	Fundamental	Horizontal	199	0	-	-	-
Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.												

Equipment Configuration for 30 MHZ TO 1 GHZ			
Antenna:	MT-242043	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	914.75	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	93.07	55.95	4.05	-16.93	43.07	MaxQP	Vertical	102	235	54.0	-10.9	Pass
#2	94.77	58.20	4.06	-16.58	45.68	MaxQP	Vertical	110	240	54.0	-8.3	Pass
#3	99.13	56.46	4.09	-15.52	45.03	MaxQP	Vertical	147	55	54.0	-9.0	Pass
#4	100.89	38.96	4.09	-15.11	27.94	MaxQP	Vertical	114	35	54.0	-26.1	Pass
#5	915.61	54.13	6.93	27.93	58.45	Fundamental	Vertical	199	57	--	--	--
Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.												

Equipment Configuration for 30 MHZ TO 1 GHZ

Antenna:	MT-242043	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	927.25	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	30.00	37.84	3.52	28.66	38.23	MaxP	Vertical	101	0	49.5	-11.3	Pass
#2	55.22	51.11	3.76	-17.09	37.78	MaxP	Vertical	99	59	49.5	-11.7	Pass
#3	100.81	49.69	4.09	-15.13	38.65	MaxP	Vertical	99	149	54.0	-15.3	Pass
#4	112.45	51.75	4.16	-12.60	43.31	MaxP	Vertical	99	149	54.0	-10.7	Pass
#5	116.33	51.23	4.18	-12.13	43.27	MaxP	Vertical	99	149	54.0	-10.7	Pass
#6	188.11	49.97	4.54	-14.37	40.14	MaxP	Vertical	99	119	54.0	-13.9	Pass
#7	246.31	50.88	4.78	-14.03	41.63	MaxP	Vertical	99	179	57.0	-15.4	Pass
#8	382.11	41.37	5.30	-9.60	37.06	MaxP	Horizontal	199	300	57.0	-19.9	Pass
#9	927.25	64.84	7.00	-2.87	68.98	Fundamental	Vertical	199	59	--	--	--
Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.												

Equipment Configuration for FCC SPURIOUS 1 GHZ - 18 GHZ

Antenna:	MT-242043	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	902.75	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

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	1799.00	58.70	1.73	30.72	46.20	MaxP	Horizontal	100	30	74.0	-27.8	Pass
#2	2700.00	63.54	2.06	32.41	53.83	MaxP	Vertical	149	209	74.0	-20.2	Pass
#3	3611.11	54.72	2.43	-11.81	45.34	MaxP	Vertical	199	118	74.0	-28.7	Pass
#4	3611.14	42.12	2.43	-11.81	32.74	MaxP	Vertical	192	132	74.0	-41.3	Pass
#5	3611.14	28.69	2.43	-11.81	19.30	AVG	Vertical	192	132	54.0	-34.7	Pass
#6	4978.63	47.39	2.94	-11.86	38.47	MaxP	Vertical	118	145	74.0	-35.5	Pass
#7	4978.63	32.80	2.94	-11.86	23.89	AVG	Vertical	118	145	54.0	-30.1	Pass
#8	4979.40	56.20	2.94	-11.85	47.30	MaxP	Vertical	99	150	74.0	-26.7	Pass
#9	6321.00	60.50	3.35	35.63	54.81	MaxP	Vertical	199	179	74.0	-19.2	Pass
#10	9027.36	62.50	4.09	-8.00	58.59	MaxP	Vertical	199	30	74.0	-15.4	Pass
#11	9027.57	60.73	4.09	-8.00	56.82	MaxP	Vertical	185	43	74.0	-17.2	Pass
#12	9027.57	52.76	4.09	-8.00	48.85	AVG	Vertical	185	43	54.0	-5.2	Pass
Test Notes: 5VDC Max Power												

Equipment Configuration for FCC SPURIOUS 1 GHZ -18 GHZ

Antenna:	MT-242043	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	914.75	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

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	2744.25	62.88	2.11	-11.79	53.20	MaxP	Horizontal	188	0	74.0	-20.8	Pass
#2	2744.25	58.87	2.11	-11.79	49.19	AVG	Horizontal	188	0	54.0	-4.8	Pass
#3	2744.36	53.83	2.11	-11.79	44.15	MaxP	Vertical	158	29	74.0	-29.9	Pass
#4	2744.36	38.84	2.11	-11.79	29.16	AVG	Vertical	158	29	54.0	-24.8	Pass
#5	6406.00	60.94	3.36	35.71	55.47	MaxP	Vertical	199	179	74.0	-18.5	Pass
#6	6406.00	57.78	3.36	35.71	52.31	MaxP	Horizontal	149	180	74.0	-21.7	Pass
#7	9147.48	56.48	4.25	-7.82	52.92	MaxP	Horizontal	150	242	74.0	-21.1	Pass
#8	9147.48	52.65	4.25	-7.82	49.09	AVG	Horizontal	150	242	54.0	-4.9	Pass
#9	9147.58	60.53	4.25	-7.81	56.97	MaxP	Vertical	184	30	74.0	-17.0	Pass
#10	9147.58	49.76	4.25	-7.81	46.19	AVG	Vertical	184	30	54.0	-7.8	Pass
Test Notes: 5VDC Max Power												

Equipment Configuration for FCC SPURIOUS 1 GHZ -18 GHZ

Antenna:	MT-242043	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	927.25	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

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	2781.72	62.82	2.12	-11.86	53.08	MaxP	Horizontal	153	66	74.0	-20.9	Pass
#2	2781.72	59.42	2.12	-11.86	49.68	AVG	Horizontal	153	66	54.0	-4.3	Pass
#3	2781.73	64.42	2.12	-11.86	54.68	MaxP	Vertical	180	214	74.0	-19.3	Pass
#4	2781.73	61.85	2.12	-11.86	52.11	AVG	Vertical	180	214	54.0	-1.9	Pass
#5	6491.00	54.41	3.41	35.76	49.01	MaxP	Vertical	150	149	74.0	-25.0	Pass
#6	6491.00	53.35	3.41	35.76	47.96	MaxP	Horizontal	150	180	74.0	-26.0	Pass
#7	9272.26	38.92	4.23	-7.17	35.98	MaxP	Horizontal	166	232	74.0	-38.0	Pass
#8	9272.26	26.86	4.23	-7.17	23.93	AVG	Horizontal	166	232	54.0	-30.1	Pass
#9	9272.79	38.93	4.24	-7.17	36.00	MaxP	Vertical	192	196	74.0	-38.0	Pass
#10	9272.79	26.83	4.24	-7.17	23.90	AVG	Vertical	192	196	54.0	-30.1	Pass
Test Notes: 5VDC Max Power												

9.4.3. Digital Emissions (0.03 - 1 GHz)

Radiated Test Conditions for Radiated Digital Emissions (0.03 – 1 GHz)			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Digital Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.205, 15.209	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Digital Emissions (0.03 – 1 GHz)

Testing 30M-1 GHz was performed in a 3-meter anechoic chamber using a CISPR compliant receiver. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. To further maximize emissions the receive antenna was varied between 1 and 4 meters. The emissions are recorded with receiver in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

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

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

FS = R + AF + CORR

where:
FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

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

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3dBmV/m

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

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

40 dBmV/m = 100mV/m
48 dBmV/m = 250mV/m

Limits for Radiated Digital Emissions (0.03 – 1 GHz)
Radiated emission limits; general requirements (15.209)

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength		Measurement Distance (m)
	µV/m (microvolts/meter)	dBµV/m (dB microvolts/meter)	
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F(kHz)	--	30
1.705-30.0	30	29.5	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46.0	3
Above 960	500	54.0	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.

(g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

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).

Equipment Configuration for 30 MHZ TO 1 GHZ CLASS A

Antenna:	MT-242043	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	Hopping	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	30.97	39.45	3.52	-3.90	39.06	MaxP	Vertical	101	0	49.5	-10.4	Pass
#2	56.25	56.68	3.77	-17.24	43.21	MaxP	Vertical	100	120	49.5	-6.3	Pass
#3	56.30	56.79	3.77	-17.25	43.31	MaxQP	Vertical	100	92	49.5	-6.2	Pass
#4	90.14	53.61	4.03	-17.33	40.31	MaxP	Vertical	99	89	54.0	-13.7	Pass
#5	94.02	53.20	4.06	-16.74	40.52	MaxP	Vertical	99	89	54.0	-13.5	Pass
#6	256.01	49.74	4.82	-13.91	40.66	MaxP	Vertical	99	179	57.0	-16.3	Pass
#7	331.67	45.06	5.14	-11.15	39.04	MaxP	Vertical	99	119	57.0	-18.0	Pass
#8	586.78	37.10	5.98	-6.59	36.49	MaxP	Vertical	99	149	57.0	-20.5	Pass
Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.												

Equipment Configuration for 1 GHZ TO 18 GHZ CLASS A

Antenna:	MT-242043	**Variant:**	M7E-TERA
Antenna Gain (dBi):	6.0	**Modulation:**	ASK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	80.0
Channel Frequency (MHz):	Hopping	**Data Rate:**	Not Applicable
Power Setting:	31.5	**Tested By:**	SB

Test Measurement Results

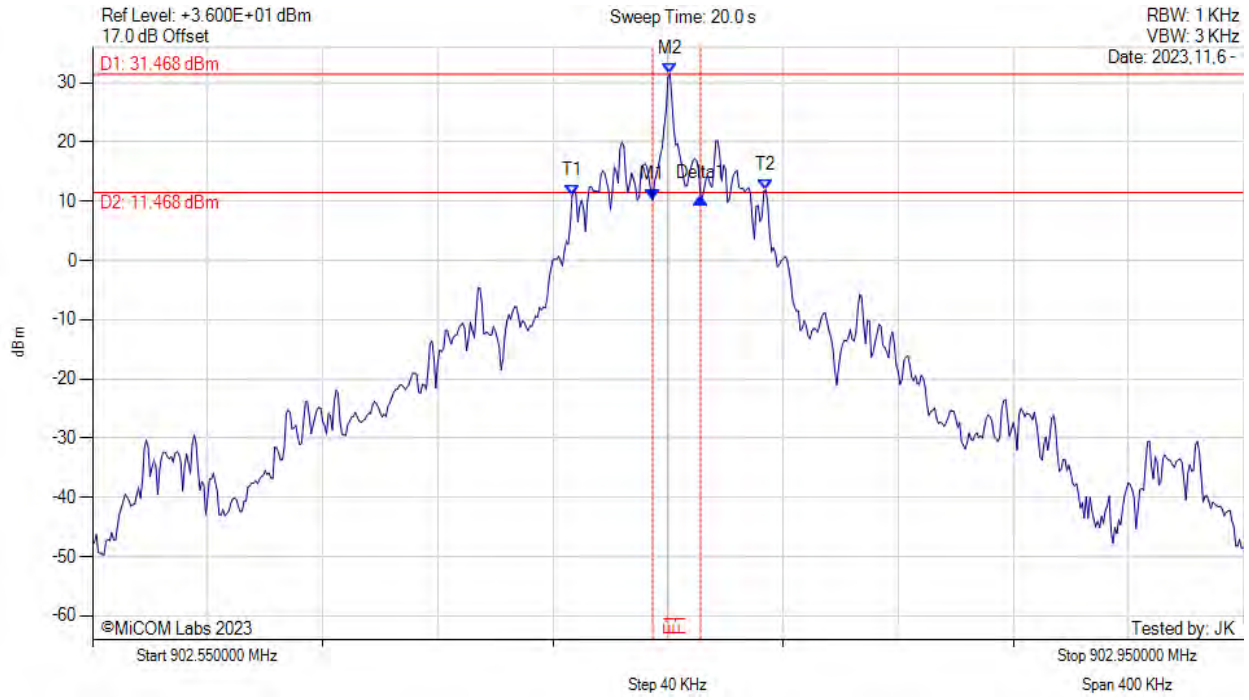
1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
#1	1510.00	54.87	1.56	28.21	39.70	MaxP	Vertical	99	209	80.0	-40.3	Pass
#2	4978.00	53.35	2.94	34.24	44.43	MaxP	Horizontal	149	300	80.0	-35.6	Pass
#3	4995.00	55.13	3.03	34.22	46.17	MaxP	Vertical	149	299	80.0	-33.8	Pass
#4	8378.00	48.59	3.90	35.72	44.23	MaxP	Vertical	99	239	80.0	-35.8	Pass
#5	9364.00	50.78	4.31	36.27	48.11	MaxP	Horizontal	149	210	80.0	-31.9	Pass
#6	17371.00	49.64	6.48	40.89	55.22	MaxP	Vertical	99	209	80.0	-24.8	Pass
Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.												

A. APPENDIX - GRAPHICAL IMAGES

A.1. 20 dB & 99% Bandwidth

20 dB 99% BANDWIDTH

Variant: M7E-TERA, Channel: 902.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

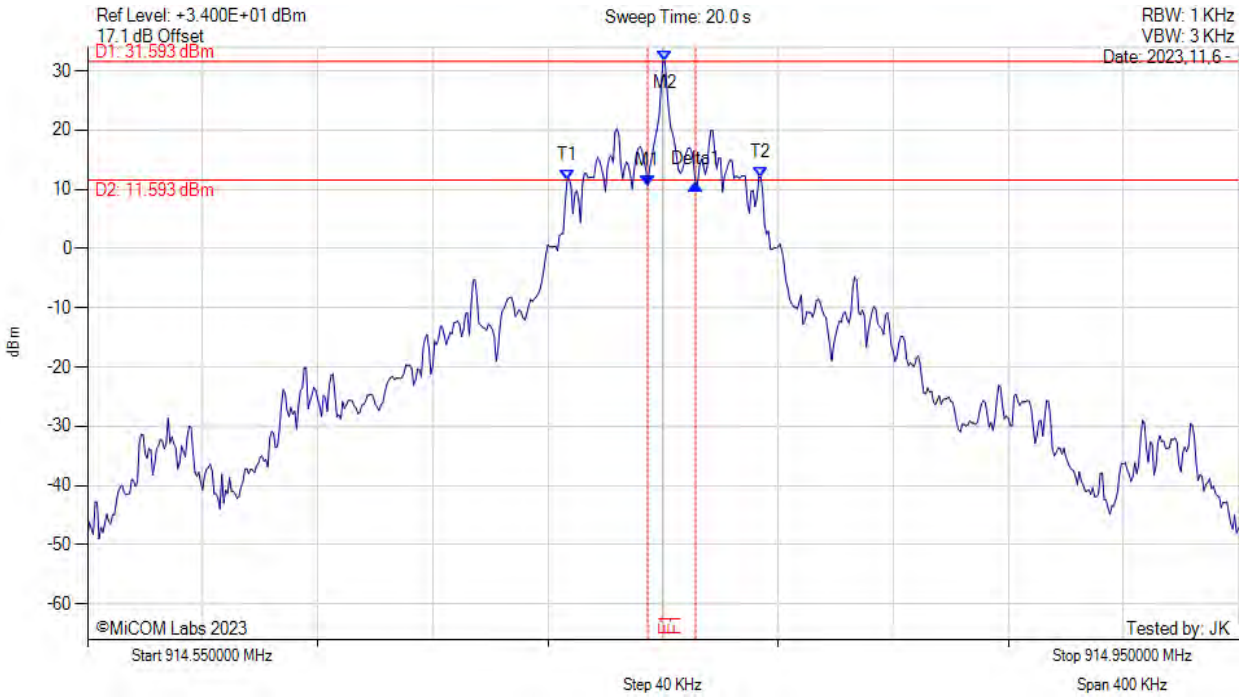


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAXH	M1 : 902.745 MHz : 10.230 dBm M2 : 902.751 MHz : 31.468 dBm Delta1 : 17 KHz : 0.228 dB T1 : 902.717 MHz : 10.927 dBm T2 : 902.784 MHz : 11.872 dBm OBW : 67 KHz	Measured 20 dB Bandwidth: 17 kHz Limit: 250 kHz Margin: 233 kHz

back to matrix

20 dB 99% BANDWIDTH

Variant: M7E-TERA, Channel: 914.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

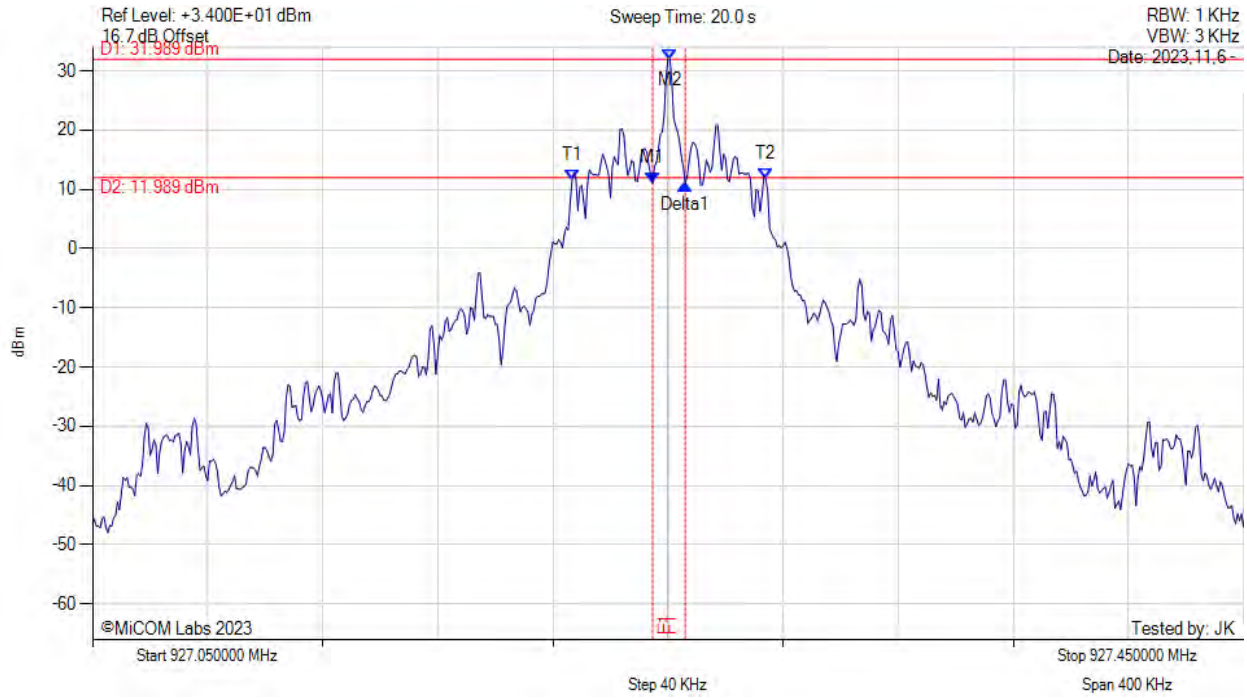


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAXH	M1 : 914.745 MHz : 10.700 dBm M2 : 914.751 MHz : 31.593 dBm Delta1 : 17 KHz : 0.180 dB T1 : 914.717 MHz : 11.512 dBm T2 : 914.784 MHz : 12.069 dBm OBW : 67 KHz	Measured 20 dB Bandwidth: 17 kHz Limit: 250 kHz Margin: 233 kHz

back to matrix

20 dB 99% BANDWIDTH

Variant: M7E-TERA, Channel: 927.25 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAXH	M1 : 927.245 MHz : 11.050 dBm M2 : 927.251 MHz : 31.989 dBm Delta1 : 11 KHz : -0.143 dB T1 : 927.217 MHz : 11.618 dBm T2 : 927.284 MHz : 11.732 dBm OBW : 67 KHz	Measured 20 dB Bandwidth: 11 kHz Limit: 25 kHz Margin: 239 kHz

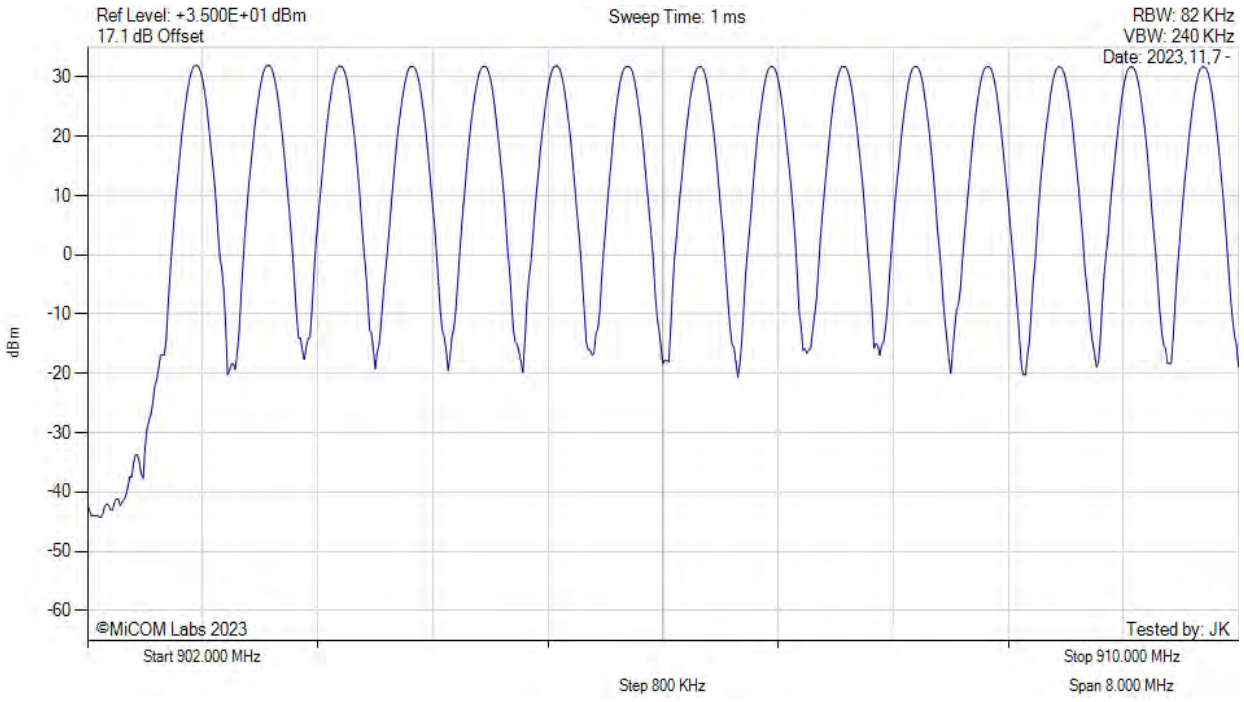
back to matrix

A.2. Frequency Hopping Tests

A.2.1. Number of Hopping Channels

NUMBER OF HOPPING CHANNELS

Variant: M7E-TERA, Channel: 914.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

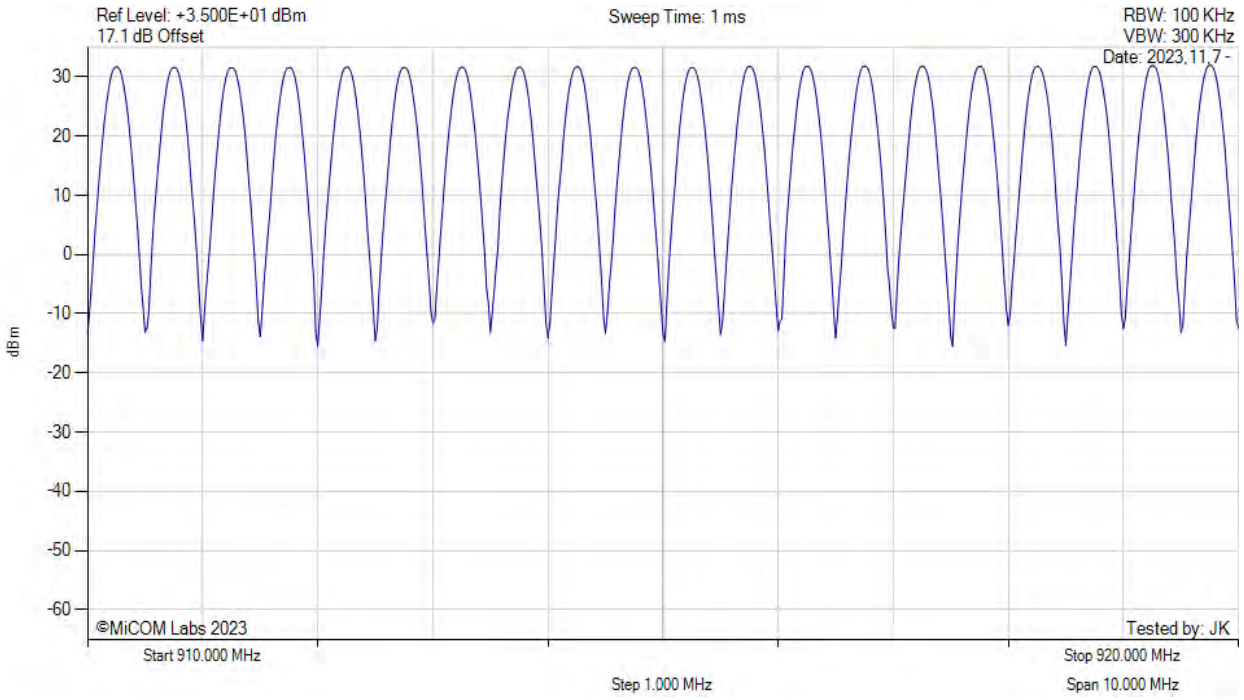


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW		Channel Frequency: 914.75 MHz

back to matrix

NUMBER OF HOPPING CHANNELS

Variant: M7E-TERA, Channel: 914.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

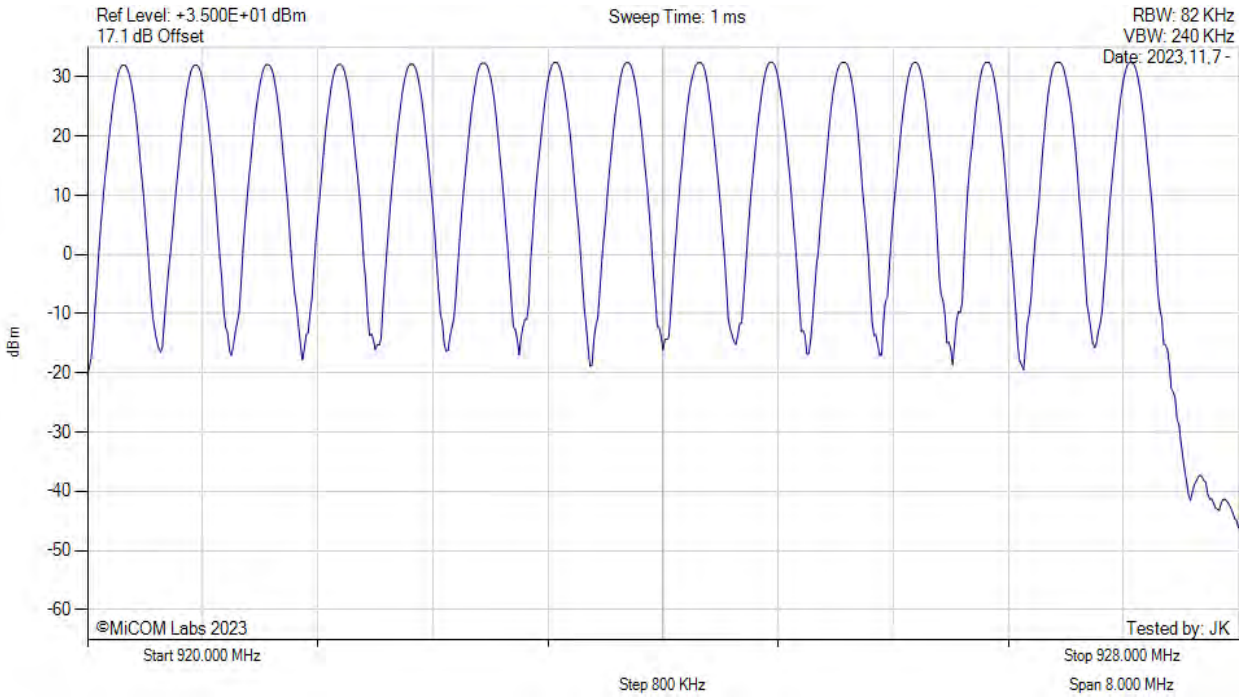


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW		Channel Frequency: 914.75 MHz

back to matrix

NUMBER OF HOPPING CHANNELS

Variant: M7E-TERA, Channel: 914.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



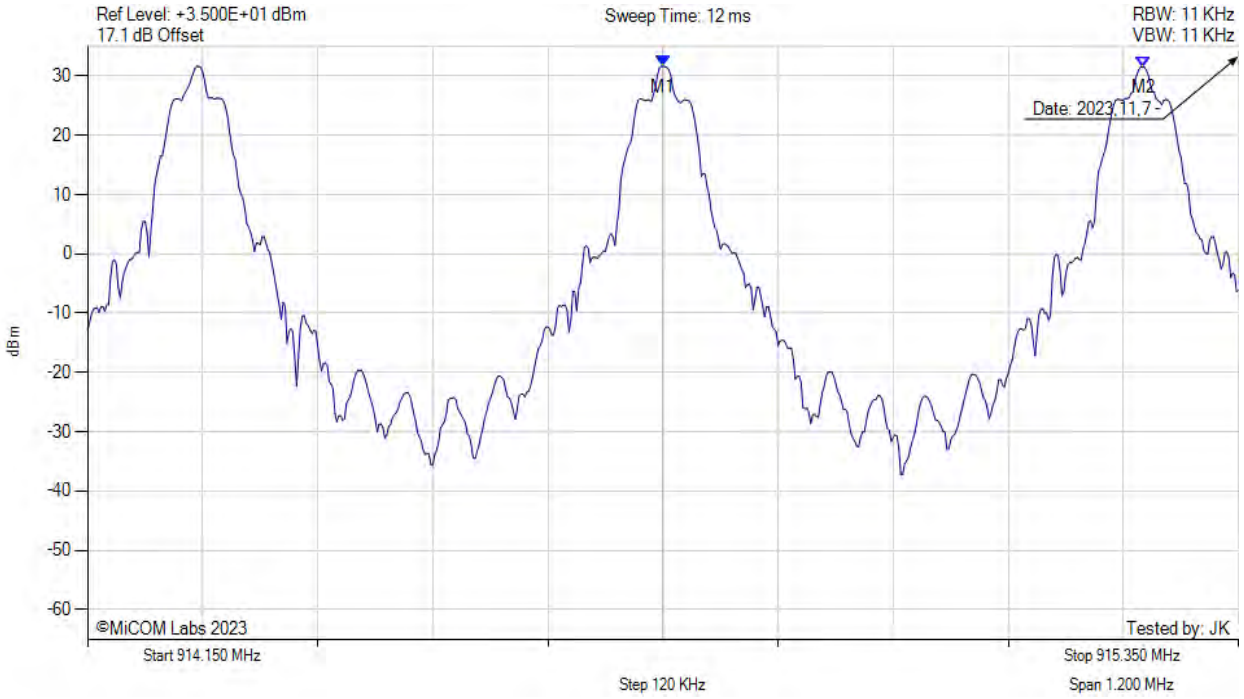
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW		Channel Frequency: 914.75 MHz

back to matrix

A.2.2. Channel Separation

CHANNEL SEPARATION

Variant: M7E-TERA, Channel: 914.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



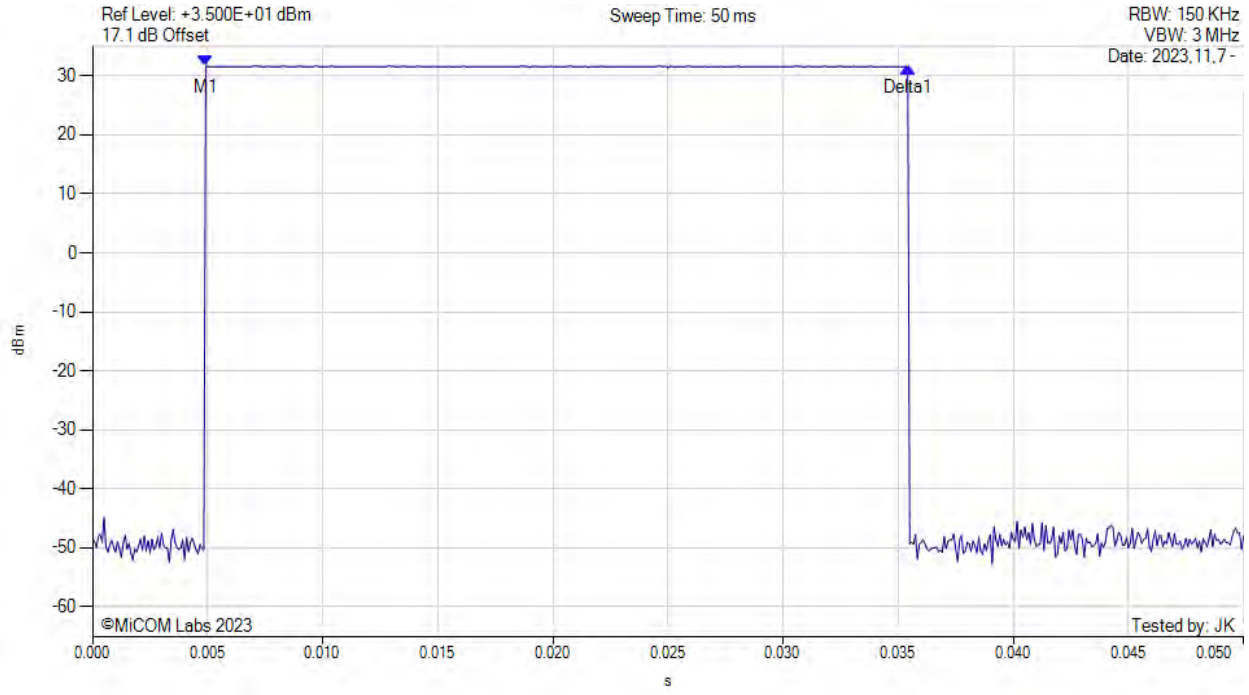
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 914.750 MHz : 31.643 dBm M2 : 915.251 MHz : 31.574 dBm	Channel Frequency: 914.75 MHz

back to matrix

A.2.3. Dwell Time

DWELL TIME

Variant: M7E-TERA, Channel: 914.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



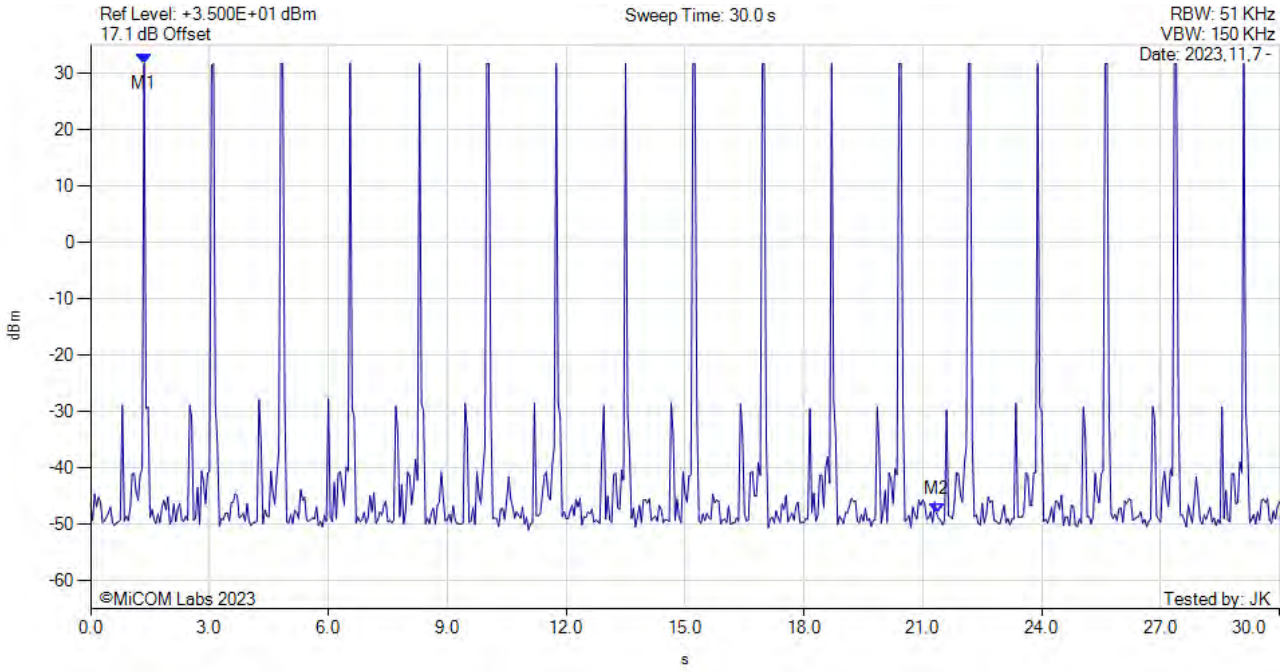
Analyzer Setup	Marker:Time:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1(914.75 MHz) : 0.005 s : 31.605 dBm Delta1(914.75 MHz) : 0.031 s : -0.074 dB	Channel Frequency: 914.75 MHz

back to matrix

A.2.4. Channel Occupancy

CHANNEL OCCUPANCY

Variant: M7E-TERA, Channel: 914.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



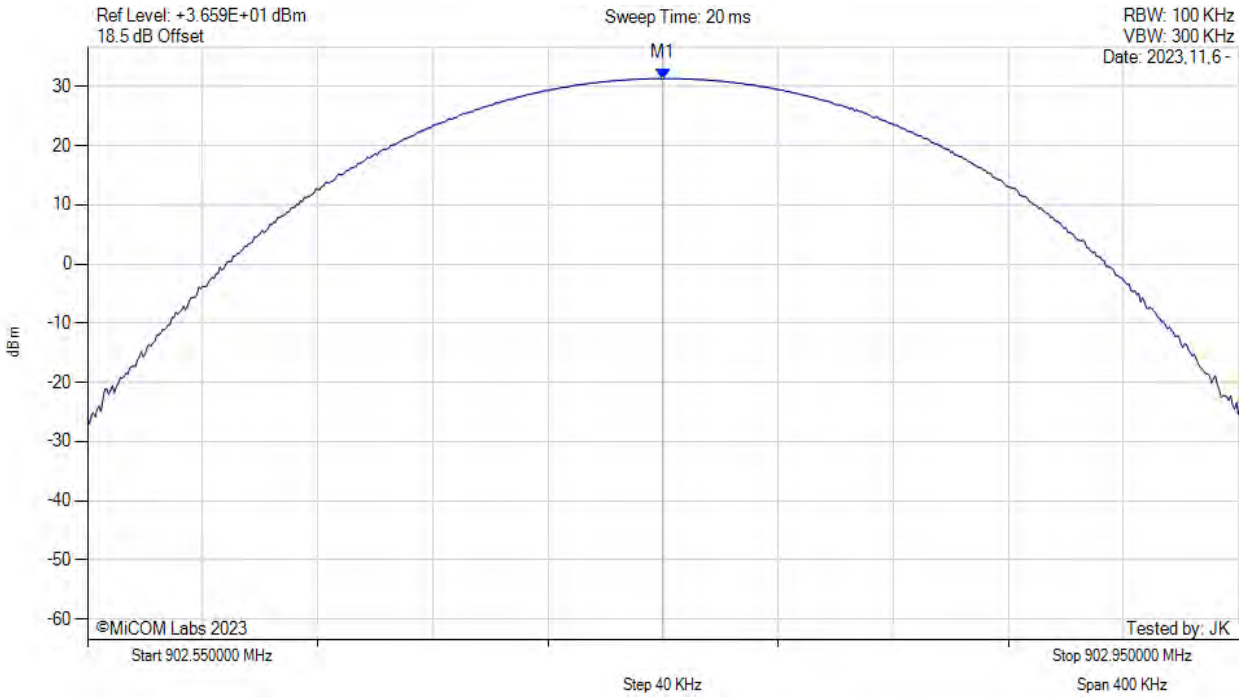
Analyzer Setup	Marker:Time:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1(914.75 MHz) : 1.350 s : 31.695 dBm M2(914.75 MHz) : 21.350 s : -47.989 dBm	Channel Frequency: 914.75 MHz

back to matrix

A.3. Output Power

Peak Output Power

Variant: M7E-TERA, Channel: 902.75 MHz, Chain a, Temp: 20, Voltage: 5 Vdc

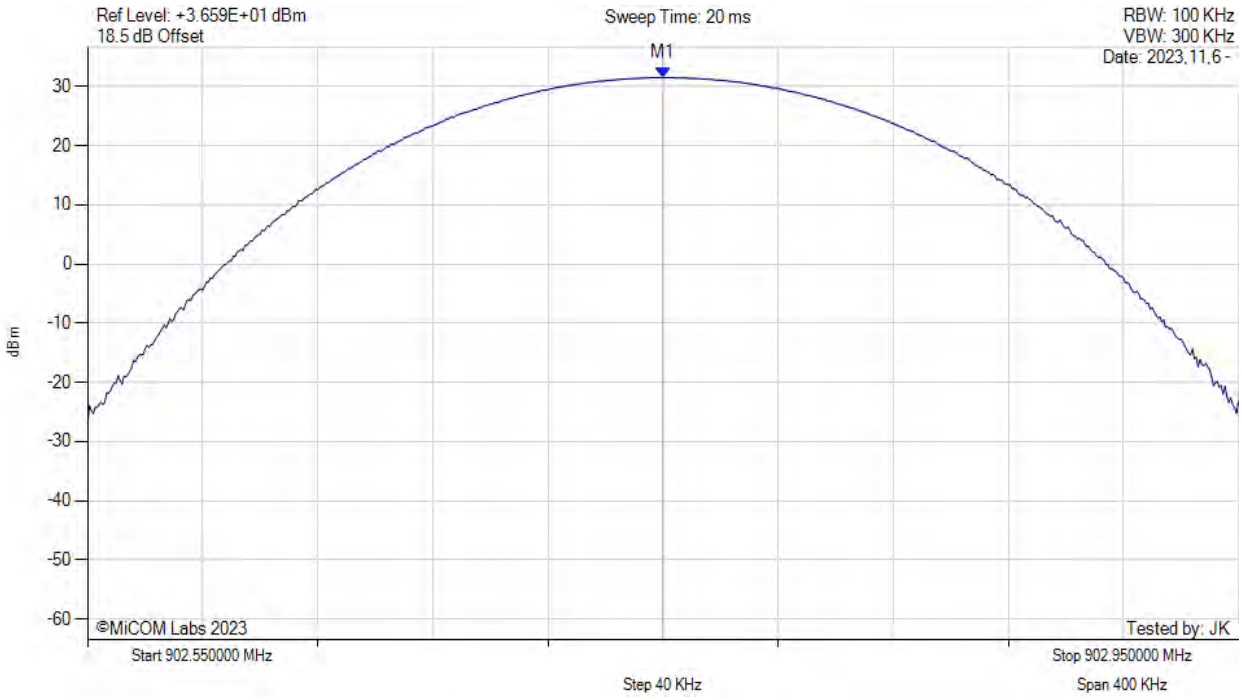


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 902.750 MHz : 31.304 dBm	Channel Frequency: 902.75 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 902.75 MHz, Chain b, Temp: 20, Voltage: 5 Vdc

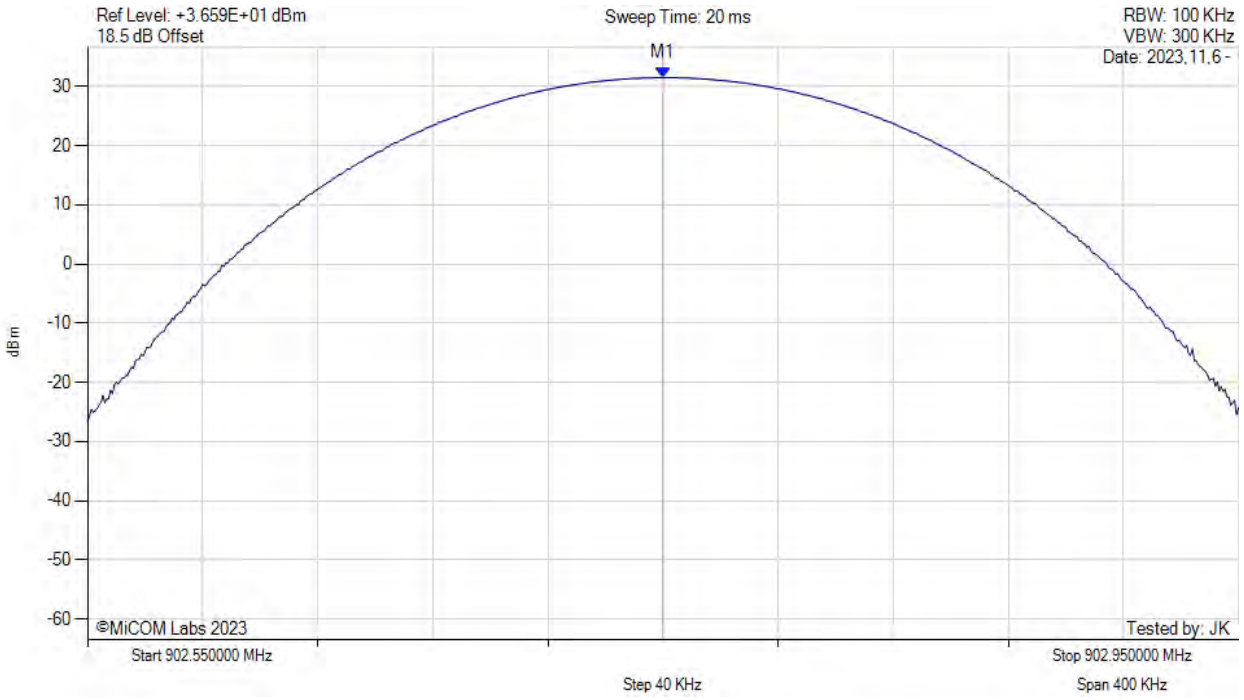


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 902.750 MHz : 31.452 dBm	Channel Frequency: 902.75 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 902.75 MHz, Chain c, Temp: 20, Voltage: 5 Vdc

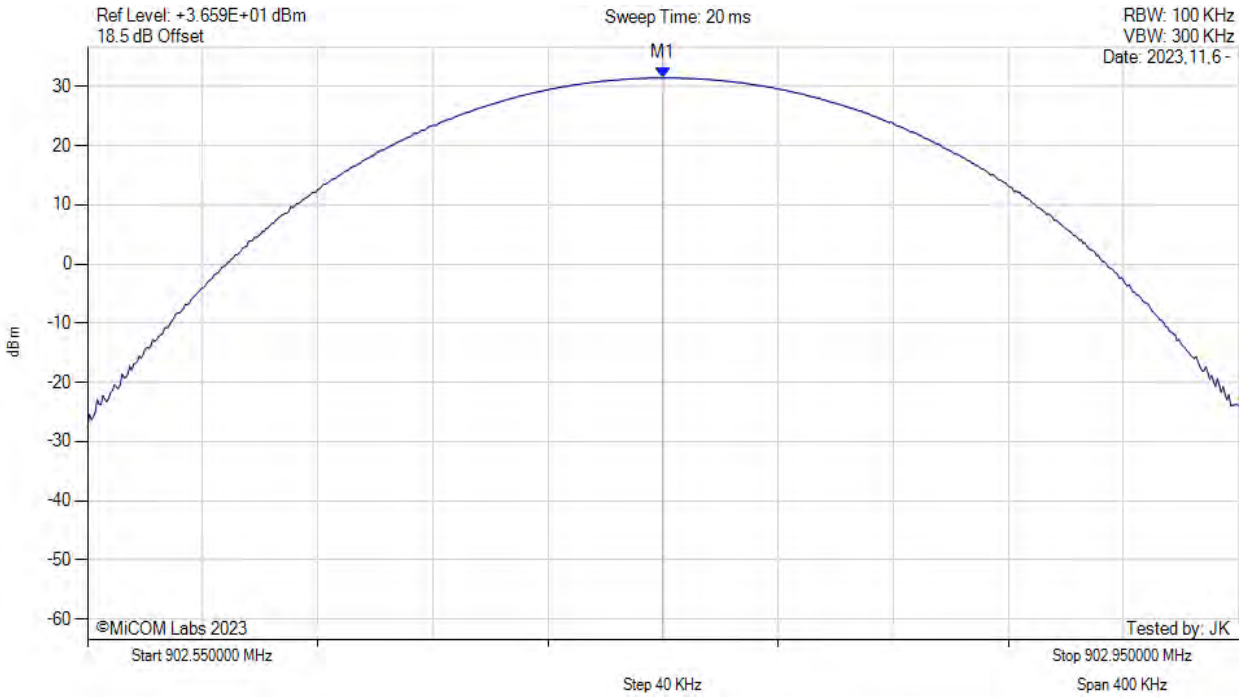


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 902.750 MHz : 31.456 dBm	Channel Frequency: 902.75 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 902.75 MHz, Chain d, Temp: 20, Voltage: 5 Vdc

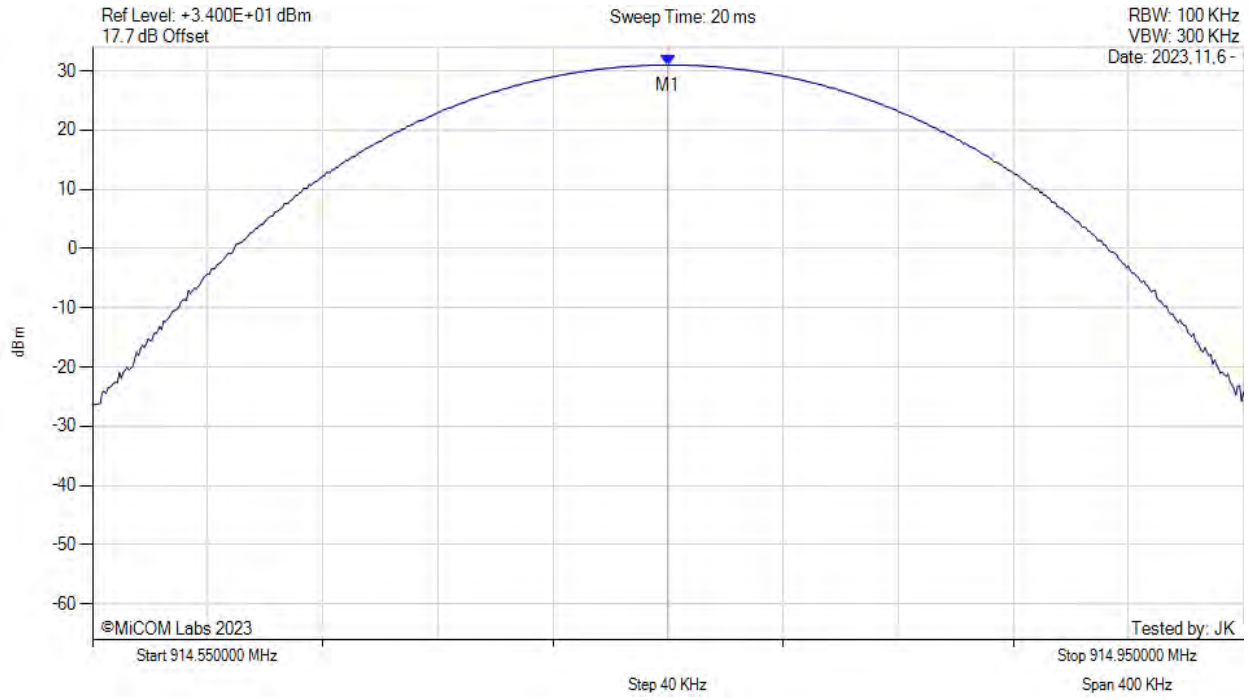


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 902.750 MHz : 31.413 dBm	Channel Frequency: 902.75 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 914.75 MHz, Chain a, Temp: 20, Voltage: 5 Vdc

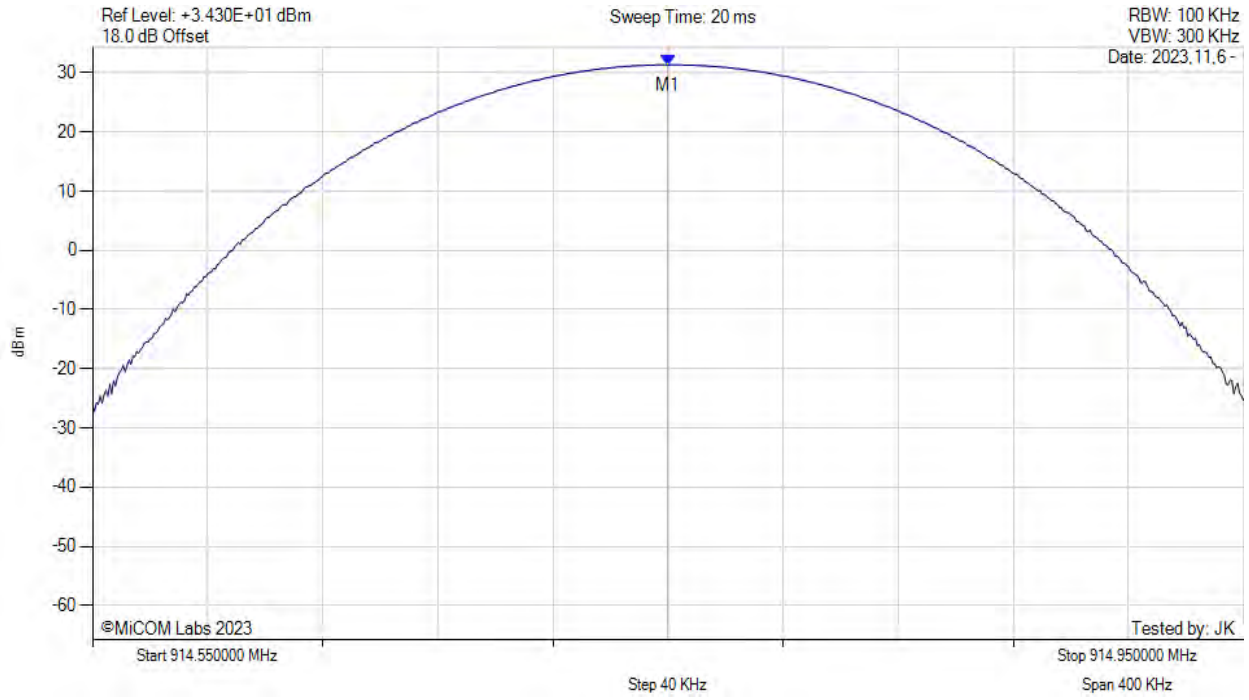


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 914.750 MHz : 31.000 dBm	Channel Frequency: 914.75 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 914.75 MHz, Chain b, Temp: 20, Voltage: 5 Vdc

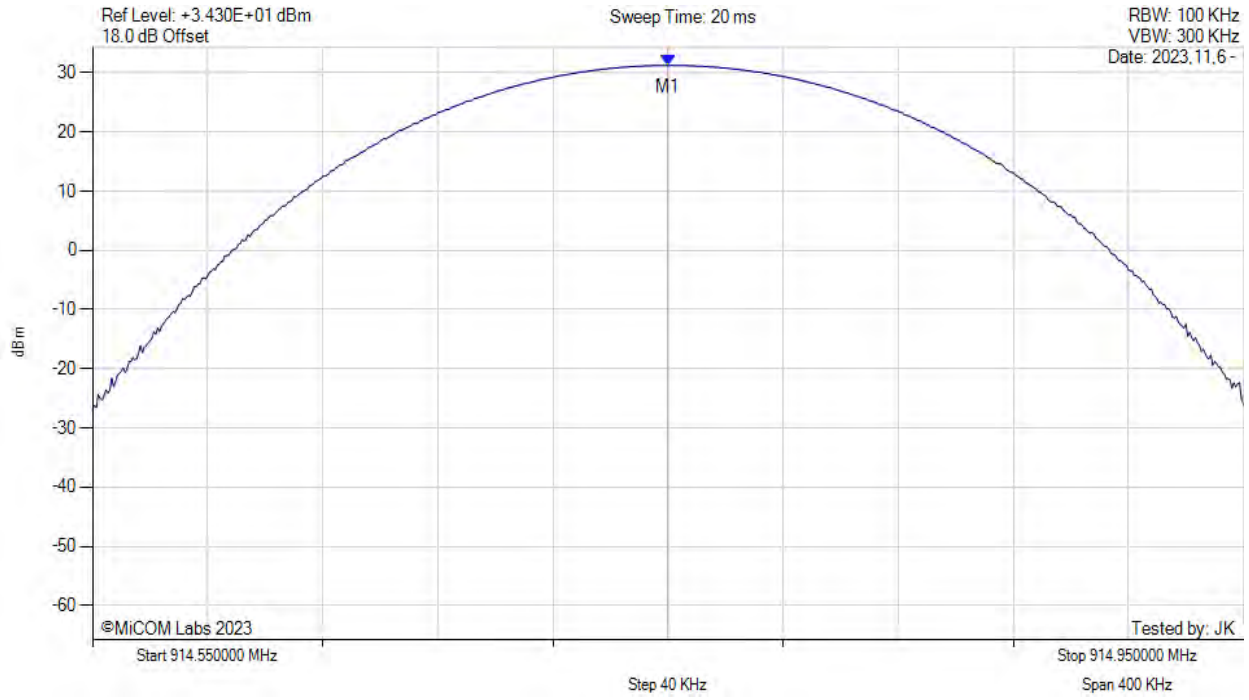


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 914.750 MHz : 31.335 dBm	Channel Frequency: 914.75 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 914.75 MHz, Chain c, Temp: 20, Voltage: 5 Vdc

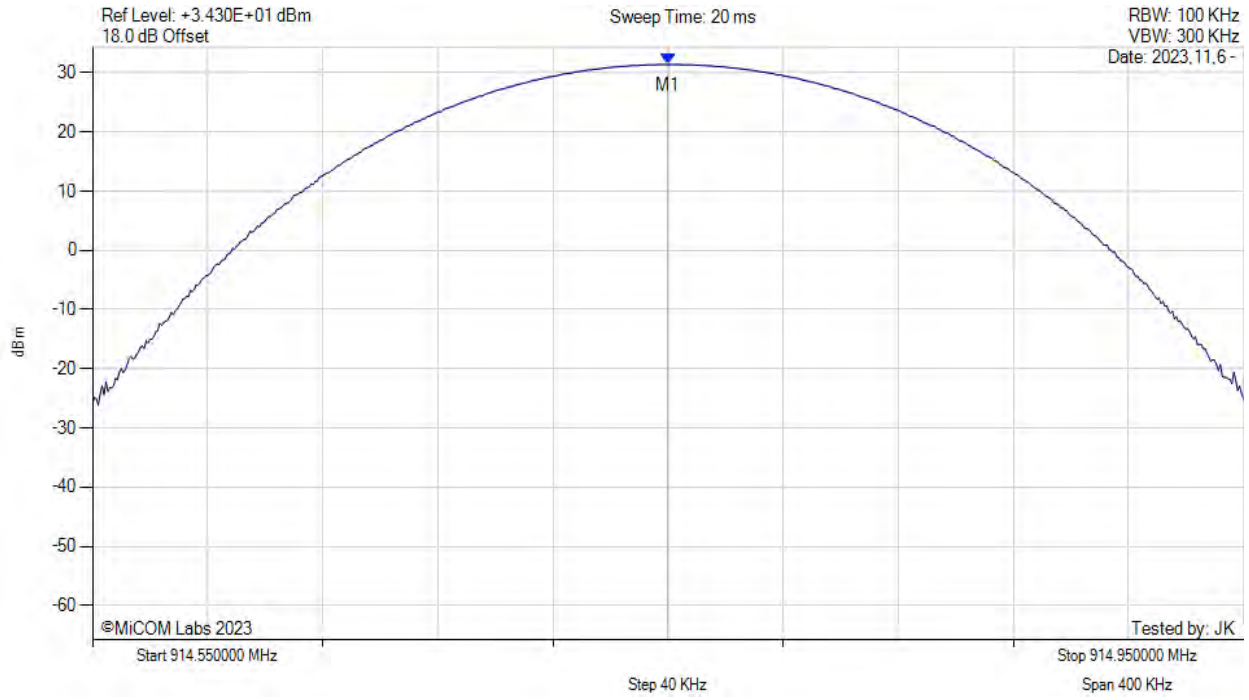


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 914.750 MHz : 31.234 dBm	Channel Frequency: 914.75 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 914.75 MHz, Chain d, Temp: 20, Voltage: 5 Vdc

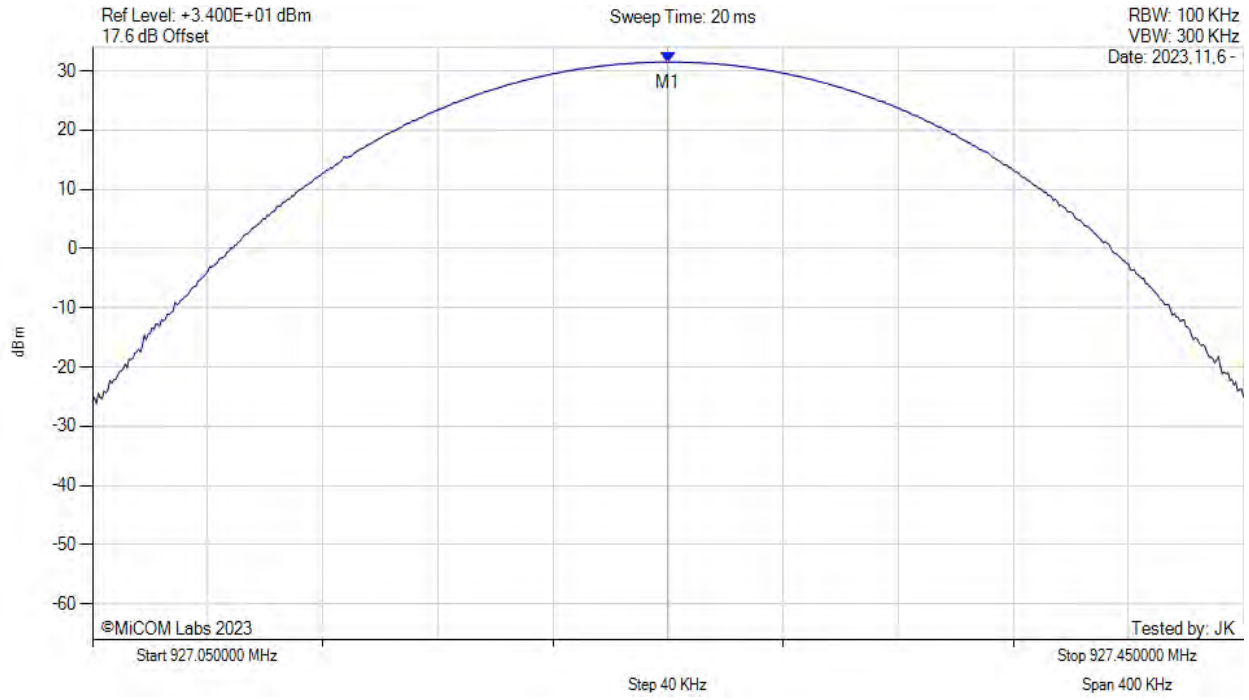


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 914.750 MHz : 31.388 dBm	Channel Frequency: 914.75 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 927.25 MHz, Chain a, Temp: 20, Voltage: 5 Vdc

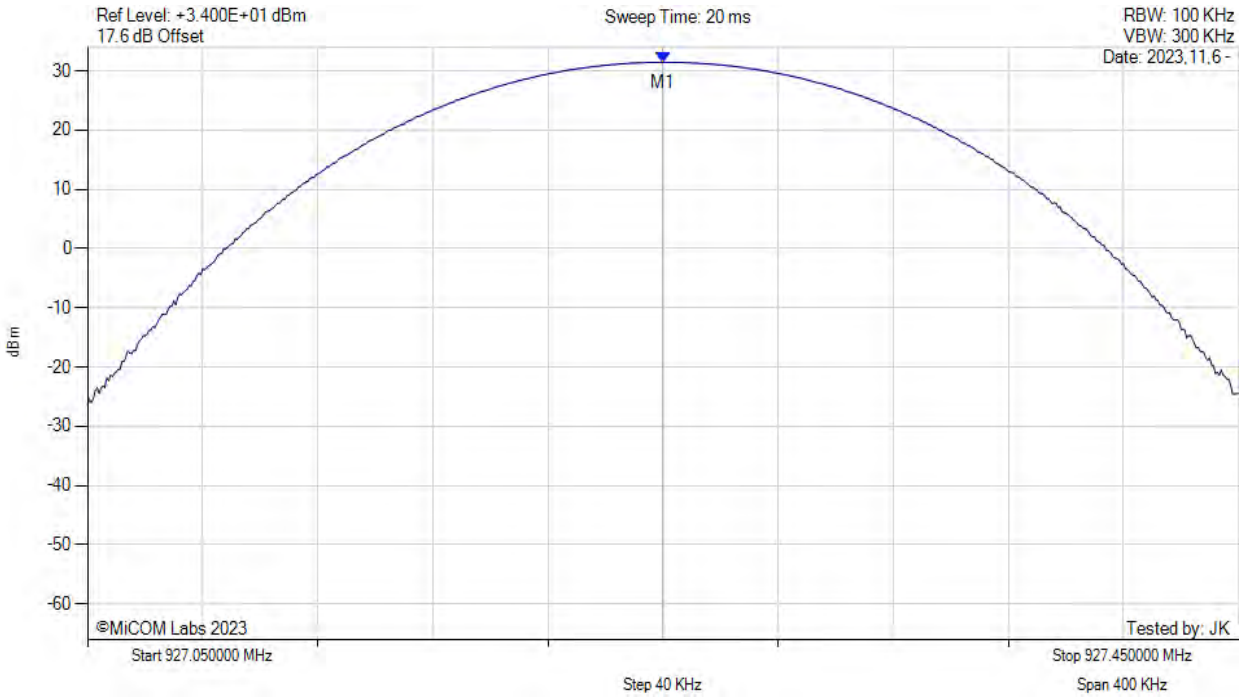


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 927.250 MHz : 31.496 dBm	Channel Frequency: 927.25 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 927.25 MHz, Chain b, Temp: 20, Voltage: 5 Vdc

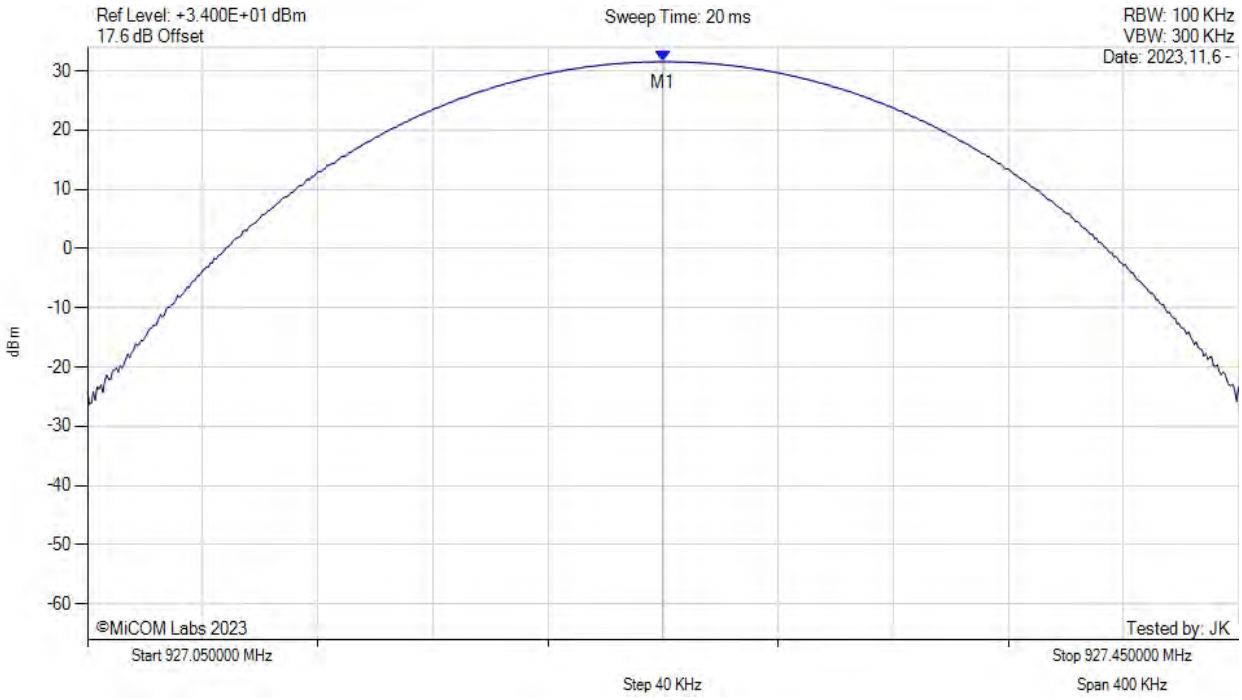


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 927.250 MHz : 31.464 dBm	Channel Frequency: 927.25 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 927.25 MHz, Chain c, Temp: 20, Voltage: 5 Vdc

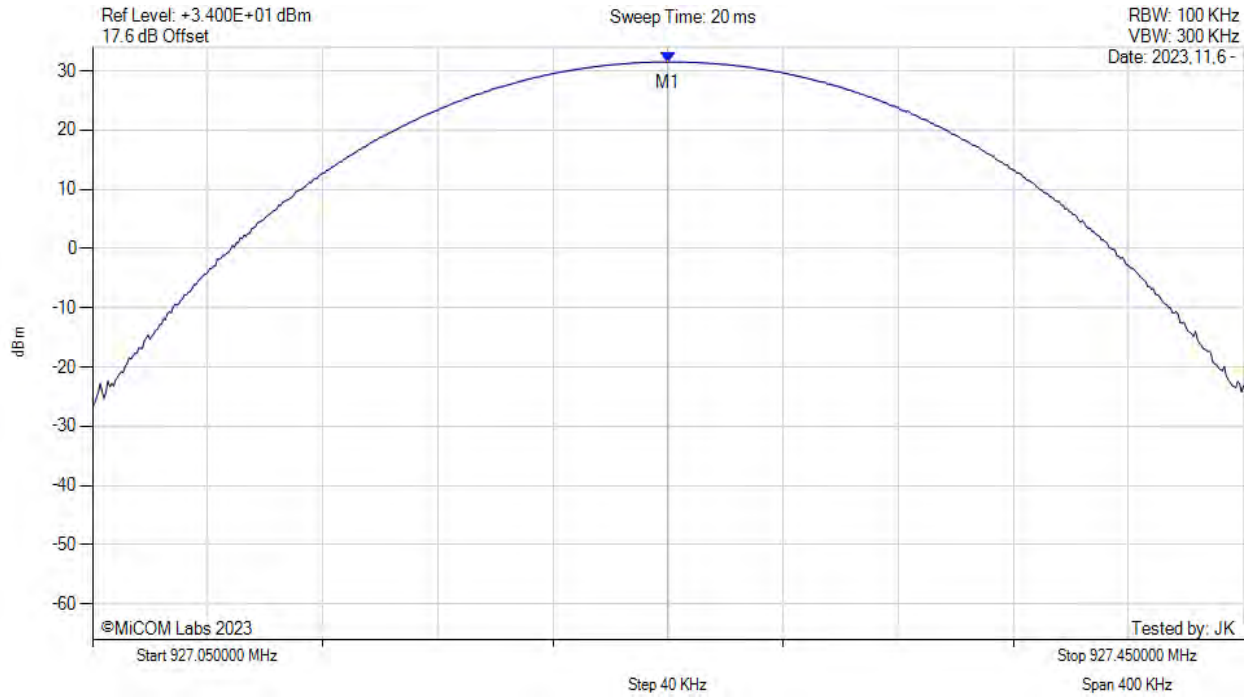


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 927.250 MHz : 31.501 dBm	Channel Frequency: 927.25 MHz

back to matrix

Peak Output Power

Variant: M7E-TERA, Channel: 927.25 MHz, Chain d, Temp: 20, Voltage: 5 Vdc



Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 927.250 MHz : 31.502 dBm	Channel Frequency: 927.25 MHz

back to matrix

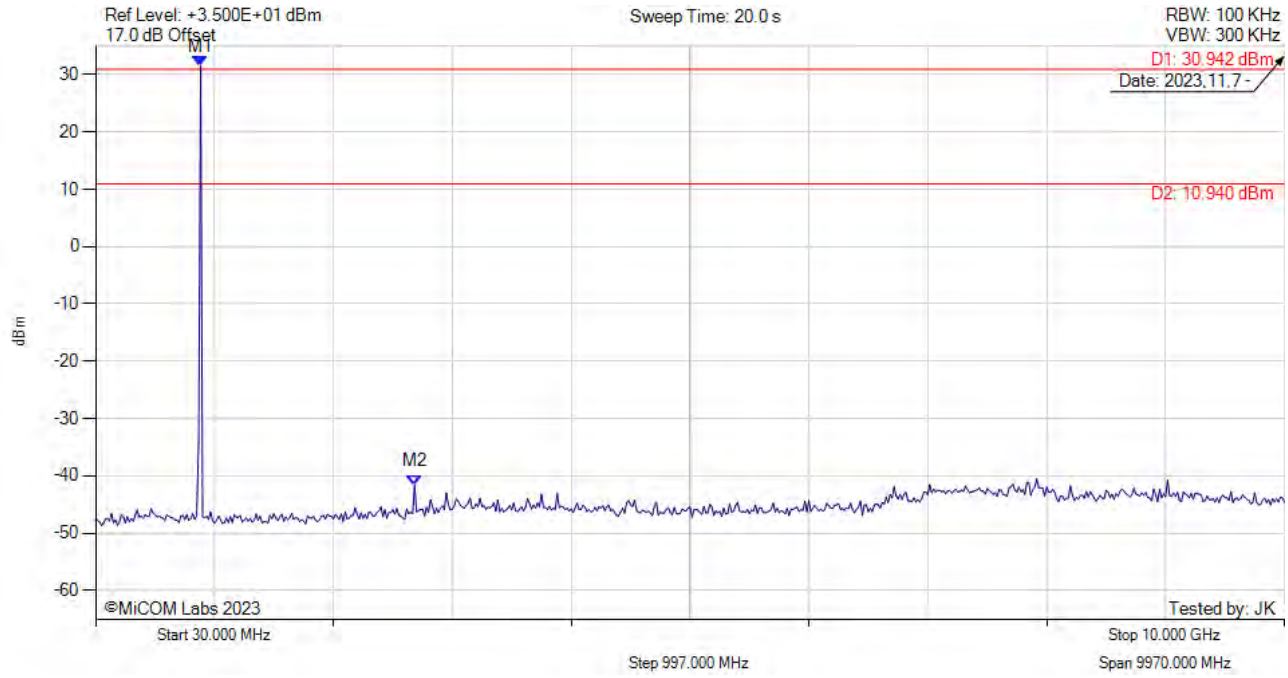
A.4. Emissions

A.4.1. Conducted Emissions

A.4.1.1. Conducted Unwanted Spurious Emissions

UNWANTED EMISSIONS PEAK

Variant: M7E-TERA, Channel: 902.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

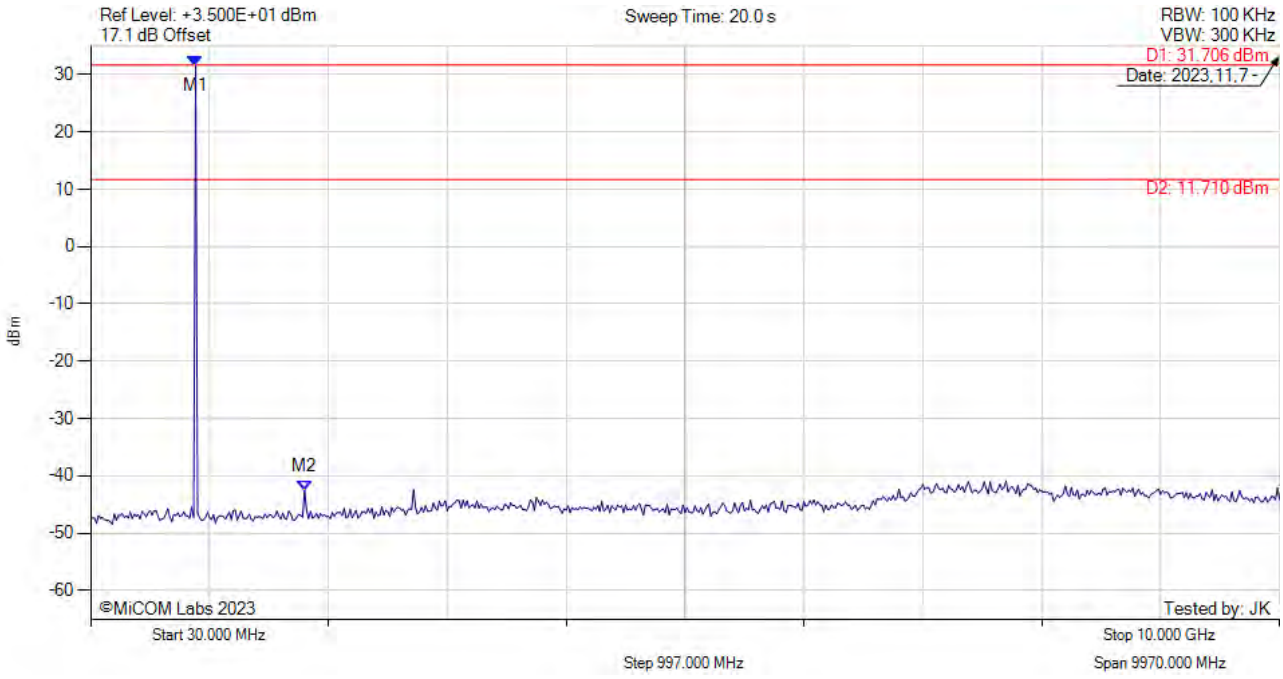


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAXH	M1 : 911.000 MHz : 31.457 dBm M2 : 2705.000 MHz : -41.591 dBm	Limit: 10.94 dBm Margin: -52.53 dB

back to matrix

UNWANTED EMISSIONS PEAK

Variant: M7E-TERA, Channel: 914.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

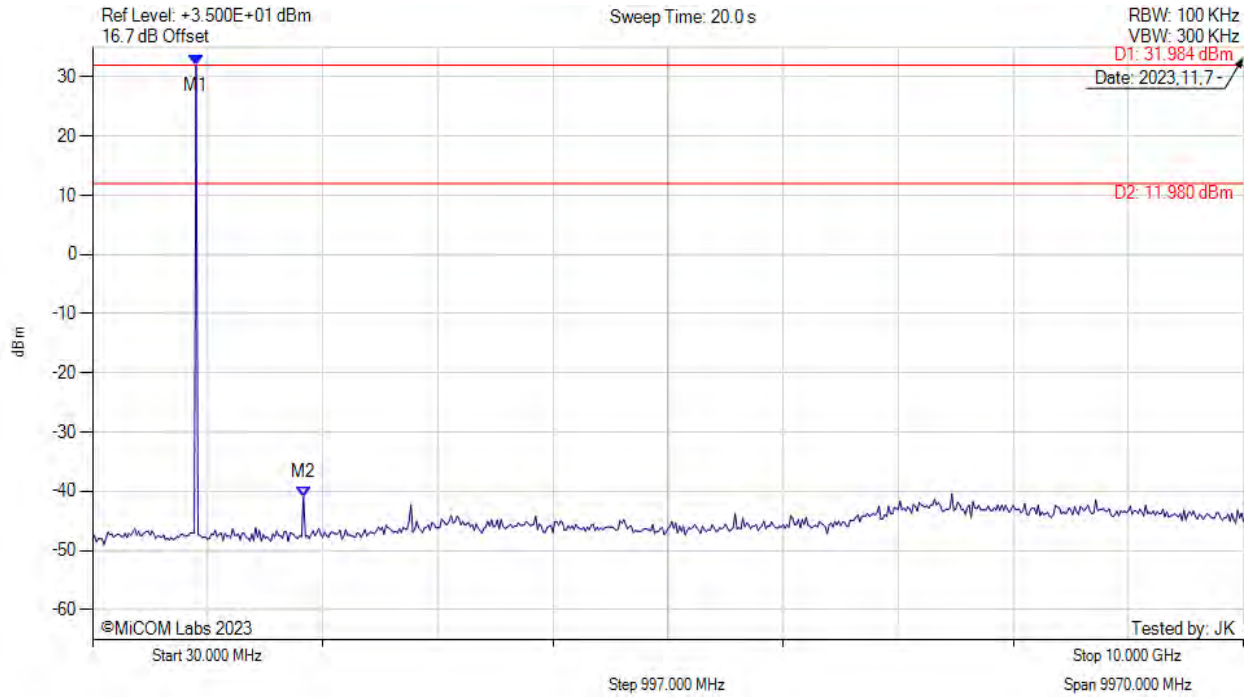


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAXH	M1 : 911.000 MHz : 31.578 dBm M2 : 1825.000 MHz : -42.535 dBm	Limit: 11.71 dBm Margin: -54.24 dB

back to matrix

UNWANTED EMISSIONS PEAK

Variant: M7E-TERA, Channel: 927.25 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc



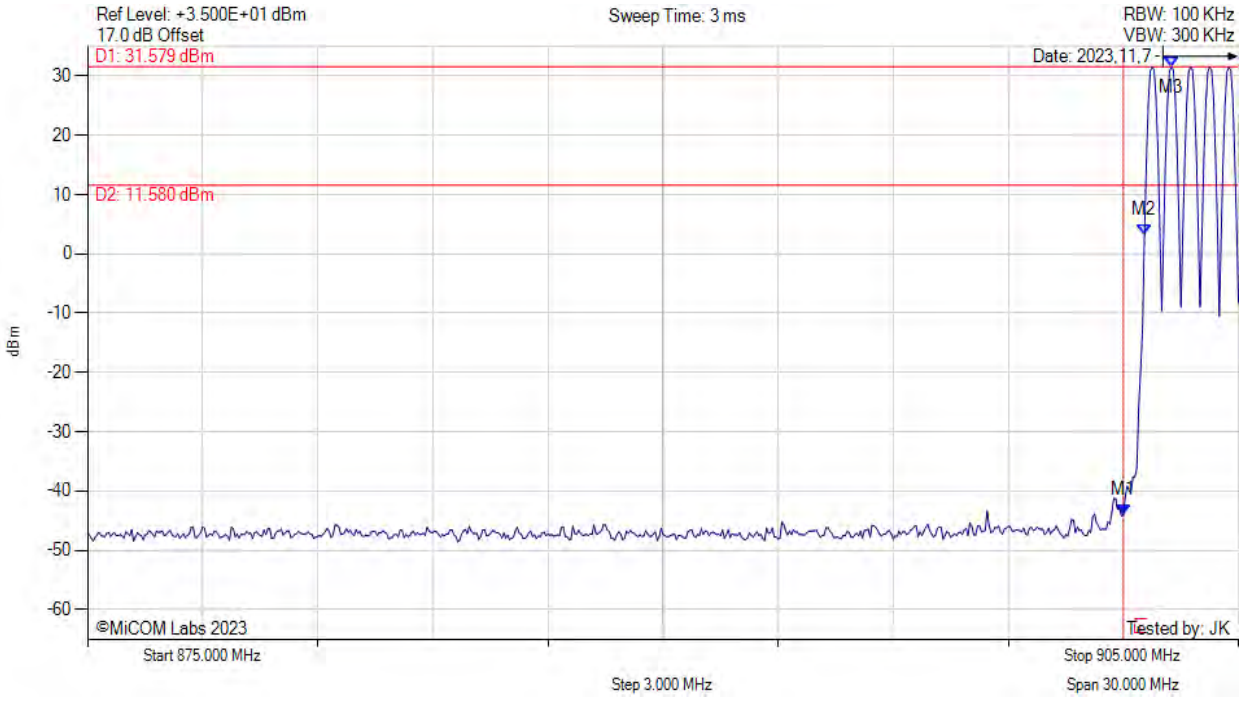
Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = MAXH	M1 : 927.000 MHz : 31.982 dBm M2 : 1858.000 MHz : -40.885 dBm	Limit: 11.98 dBm Margin: -52.86 dB

back to matrix

A.4.1.2. Conducted Band-Edge Emissions

CONDUCTED LOW BAND-EDGE EMISSIONS (HOPPING) PEAK

Variant: M7E-TERA, Channel: 902.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

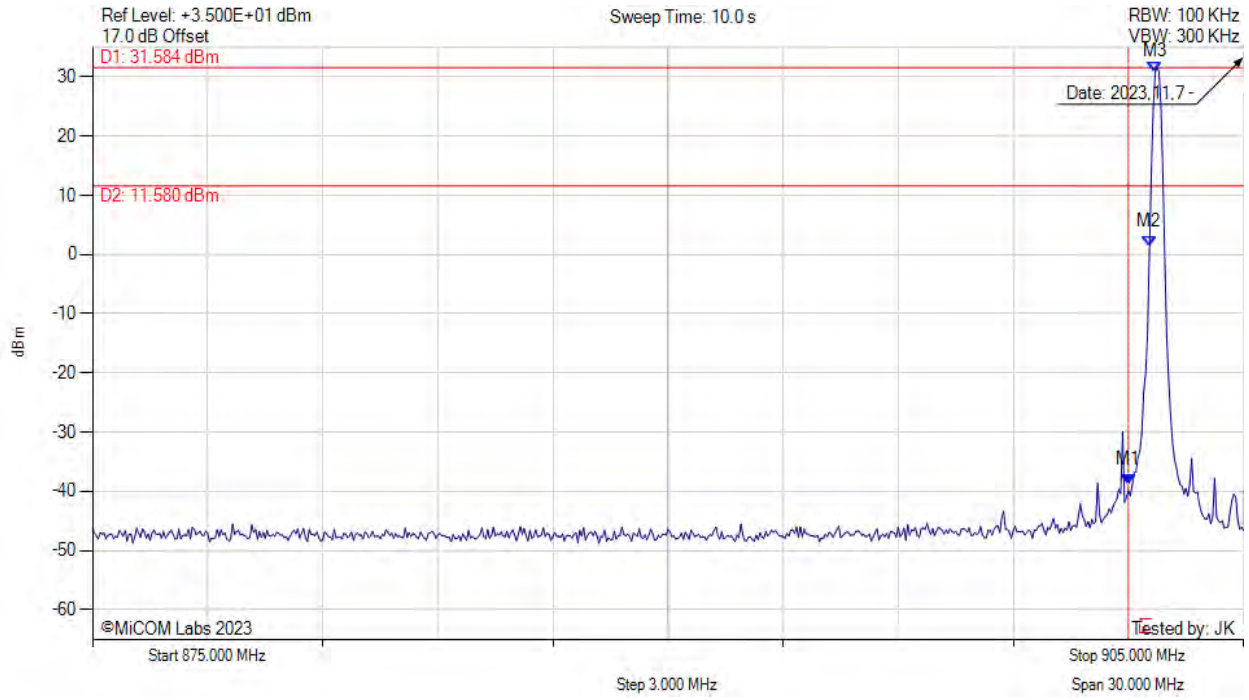


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : -44.018 dBm M2 : 902.550 MHz : 3.280 dBm M3 : 903.250 MHz : 31.579 dBm	Channel Frequency: 902.75 MHz

back to matrix

CONDUCTED LOW BAND-EDGE EMISSIONS (STATIC) PEAK

Variant: M7E-TERA, Channel: 902.75 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

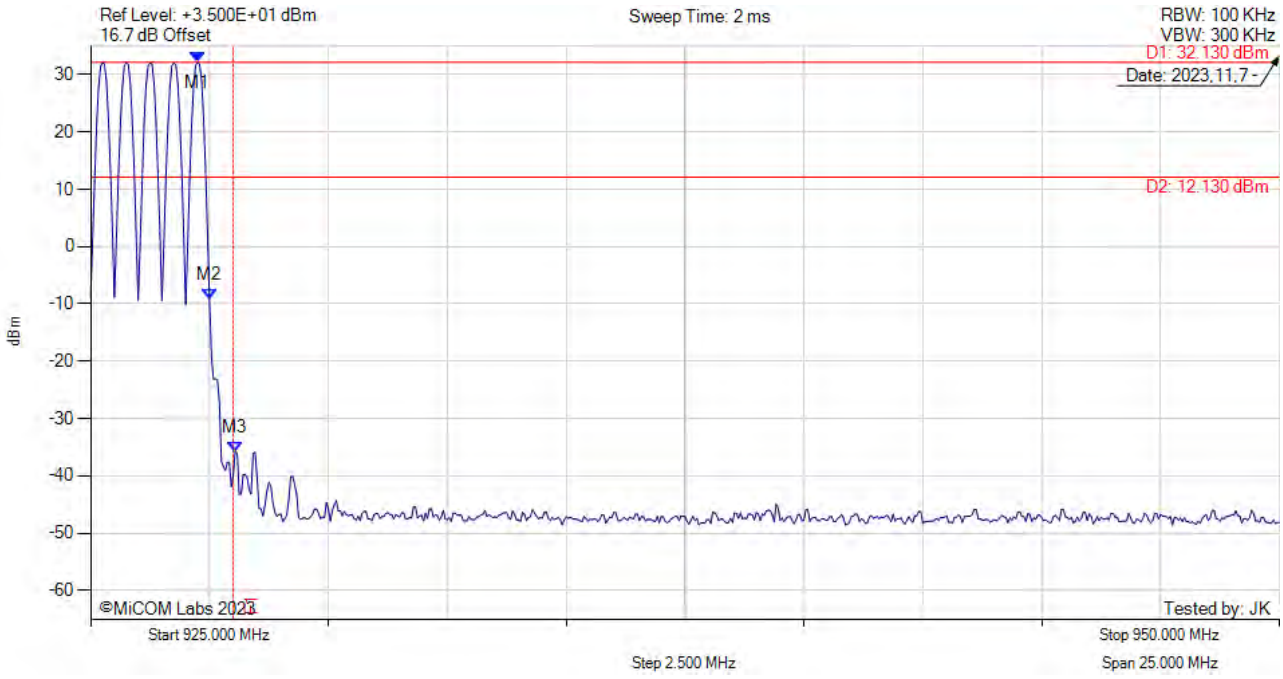


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : -38.864 dBm M2 : 902.550 MHz : 1.237 dBm M3 : 902.700 MHz : 30.837 dBm	Channel Frequency: 902.75 MHz

back to matrix

CONDUCTED UPPER BAND-EDGE EMISSIONS (HOPPING) PEAK

Variant: M7E-TERA, Channel: 927.25 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

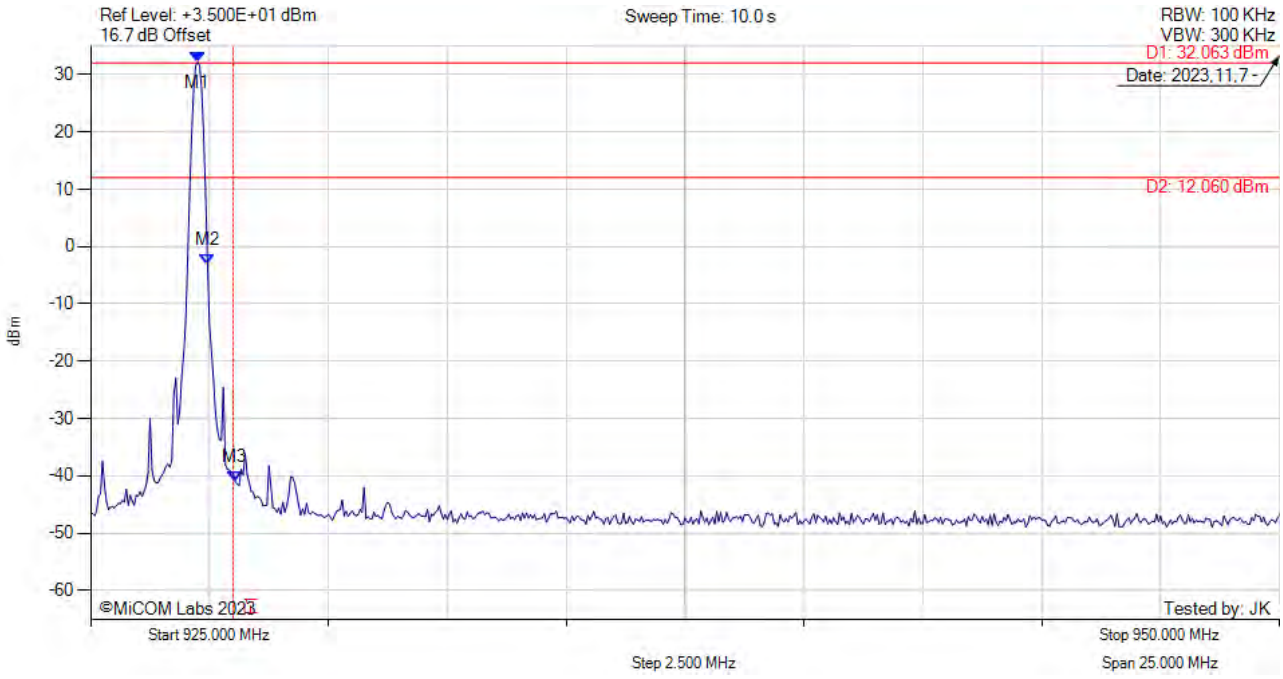


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.250 MHz : 32.130 dBm M2 : 927.500 MHz : -9.198 dBm M3 : 928.042 MHz : -35.751 dBm	Channel Frequency: 927.25 MHz

back to matrix

CONDUCTED UPPER BAND-EDGE EMISSIONS (STATIC) PEAK

Variant: M7E-TERA, Channel: 927.25 MHz, Chain a, Temp: 20, Voltage: 3.3 Vdc

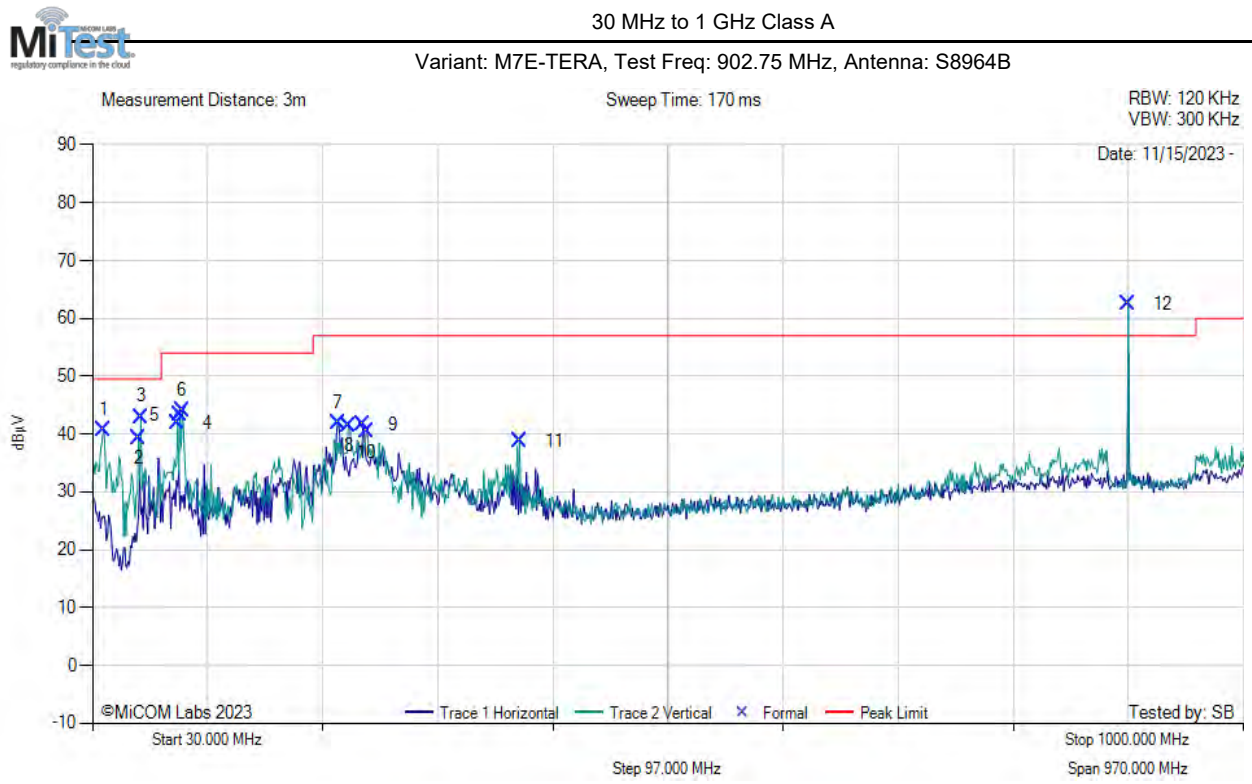


Analyzer Setup	Marker:Frequency:Amplitude	Test Results
Detector = POS Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = WRIT	M1 : 927.250 MHz : 32.149 dBm M2 : 927.458 MHz : -3.037 dBm M3 : 928.042 MHz : -41.008 dBm	Channel Frequency: 927.25 MHz

back to matrix

A.4.2. Radiated Emissions

A.4.2.3. TX Spurious & Restricted Band Emissions



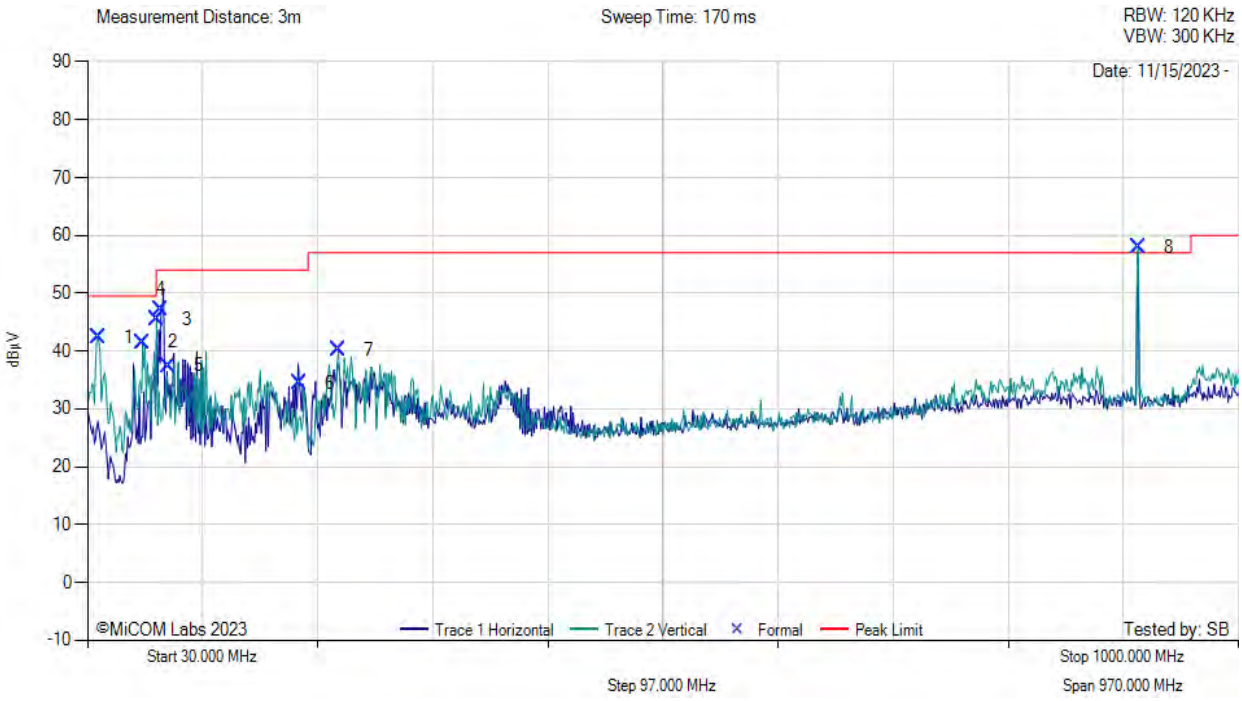
30.00 - 1000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	39.70	47.38	3.63	-10.25	40.75	MaxP	Vertical	100	89	49.5	-8.7	Pass
2	68.80	52.76	3.88	-17.26	39.39	MaxP	Vertical	100	59	49.5	-10.1	Pass
3	70.74	56.34	3.90	-17.24	43.00	MaxP	Vertical	100	59	49.5	-6.5	Pass
4	101.78	52.67	4.10	-14.90	41.87	MaxP	Vertical	199	209	54.0	-12.1	Pass
5	103.72	53.58	4.11	-14.42	43.26	MaxP	Vertical	199	209	54.0	-10.7	Pass
6	105.66	53.82	4.12	-13.94	44.01	MaxP	Vertical	199	209	54.0	-10.0	Pass
7	236.61	51.32	4.73	-14.11	41.95	MaxP	Horizontal	199	210	57.0	-15.1	Pass
8	246.31	50.77	4.78	-14.03	41.52	MaxP	Vertical	100	179	57.0	-15.5	Pass
9	257.95	50.56	4.82	-13.75	41.64	MaxP	Horizontal	100	60	57.0	-15.4	Pass
10	260.86	48.99	4.84	-13.42	40.40	MaxP	Vertical	100	210	57.0	-16.6	Pass
11	389.87	43.02	5.31	-9.52	38.81	MaxP	Vertical	101	0	57.0	-18.2	Pass
12	903.00	58.27	6.93	27.93	62.58	Fundamental	Vertical	199	59	--	--	--

Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.

back to matrix

30 MHz to 1 GHz Class A

Variant: M7E-TERA, Test Freq: 914.25 MHz, Antenna: S8964B



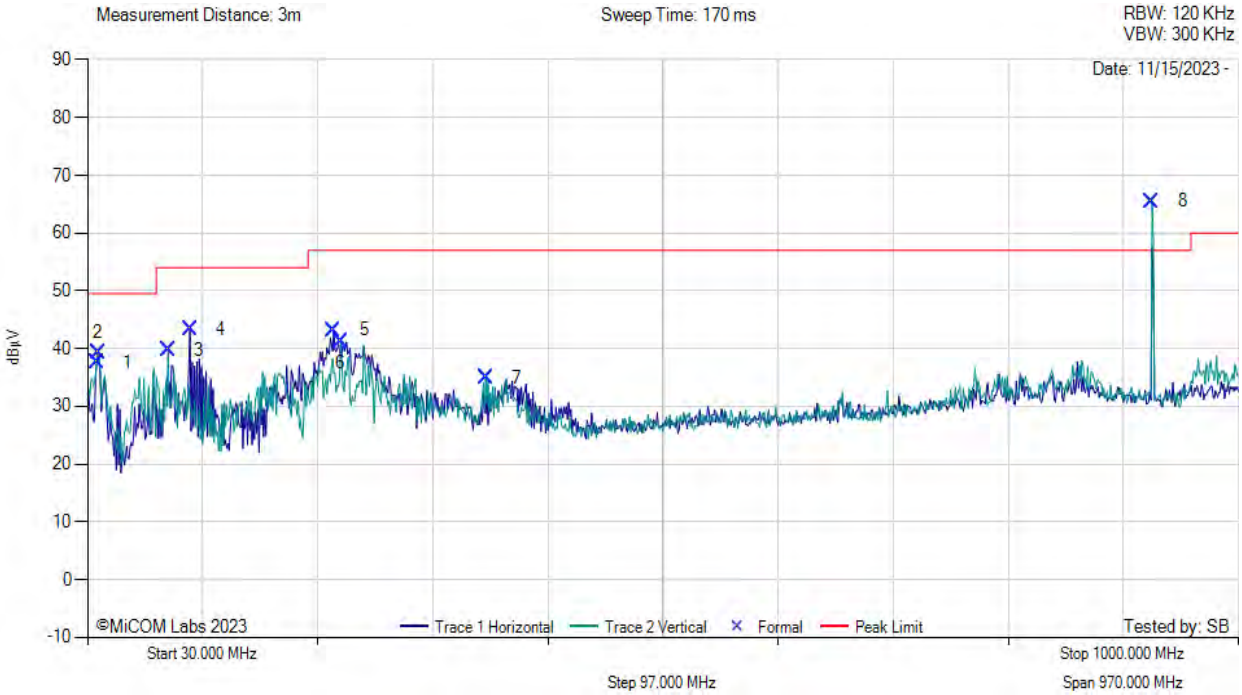
30.00 - 1000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	38.73	48.31	3.61	-9.59	42.34	MaxP	Vertical	100	119	49.5	-7.2	Pass
2	76.56	54.94	3.94	-17.34	41.55	MaxP	Vertical	100	0	49.5	-8.0	Pass
3	88.20	59.01	4.01	-17.47	45.55	MaxP	Vertical	100	0	54.0	-8.4	Pass
4	92.08	60.16	4.05	-17.08	47.13	MaxP	Horizontal	199	330	54.0	-6.9	Pass
5	98.58	49.03	4.08	-15.65	37.46	MaxQP	Horizontal	174	355	54.0	-16.5	Pass
6	208.48	44.48	4.62	-14.57	34.54	MaxP	Horizontal	100	300	54.0	-19.5	Pass
7	241.46	49.53	4.76	-14.01	40.29	MaxP	Vertical	100	179	57.0	-16.7	Pass
8	915.61	53.64	6.98	-2.66	57.96	Fundamental	Vertical	199	59	--	--	--

Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.

back to matrix

30 MHz to 1 GHz Class A

Variant: M7E-TERA, Test Freq: 927.25 MHz, Antenna: S8964B



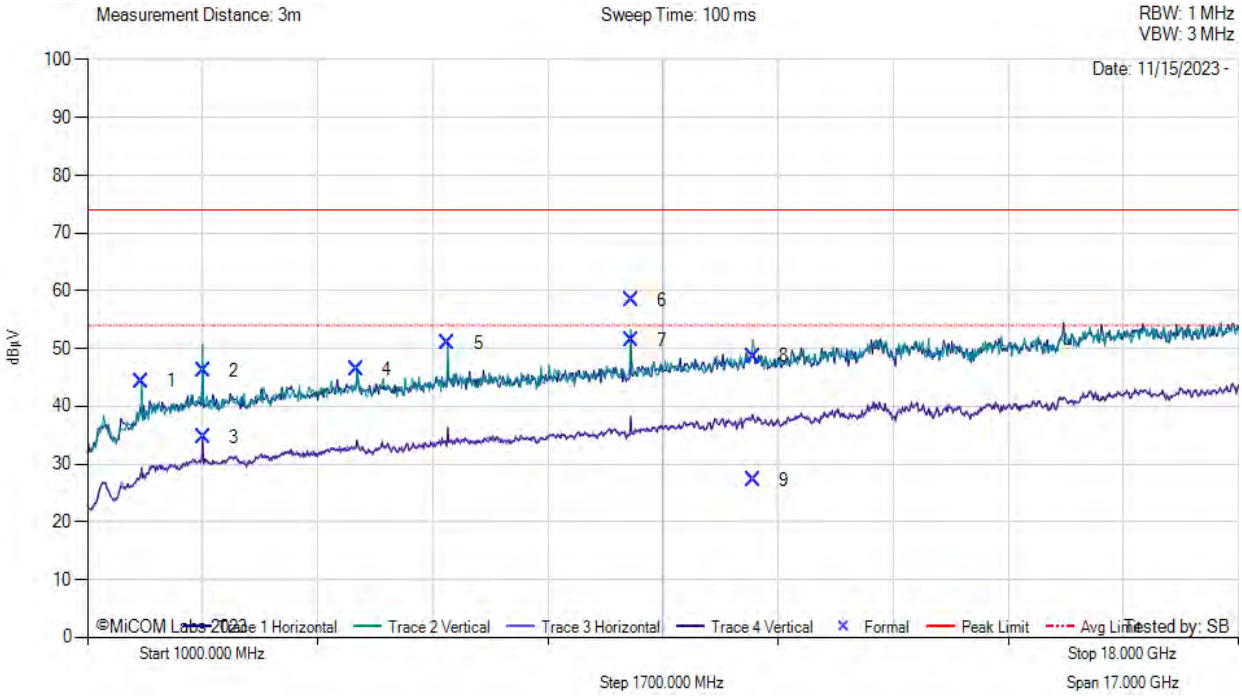
30.00 - 1000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	37.76	43.31	3.61	-9.59	37.52	MaxP	Vertical	100	119	49.5	-12.0	Pass
2	38.73	45.18	3.61	-9.59	39.21	MaxP	Vertical	101	59	49.5	-10.3	Pass
3	97.90	51.51	4.08	-15.83	39.77	MaxP	Vertical	199	269	54.0	-14.2	Pass
4	116.33	51.33	4.18	-12.13	43.37	MaxP	Horizontal	199	180	54.0	-10.6	Pass
5	237.58	52.54	4.74	-14.09	43.20	MaxP	Horizontal	199	240	57.0	-13.8	Pass
6	243.40	50.42	4.77	-14.00	41.19	MaxP	Vertical	101	209	57.0	-15.8	Pass
7	365.62	39.40	5.24	-9.66	34.98	MaxP	Vertical	199	299	57.0	-22.0	Pass
8	927.25	61.37	7.00	-2.87	65.51	Fundamental	Vertical	199	59	--	--	--

Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.

back to matrix

FCC Spurious 1 GHz -18 GHz

Variant: M7E-TERA, Test Freq: 902.75 MHz, Antenna: S8964B



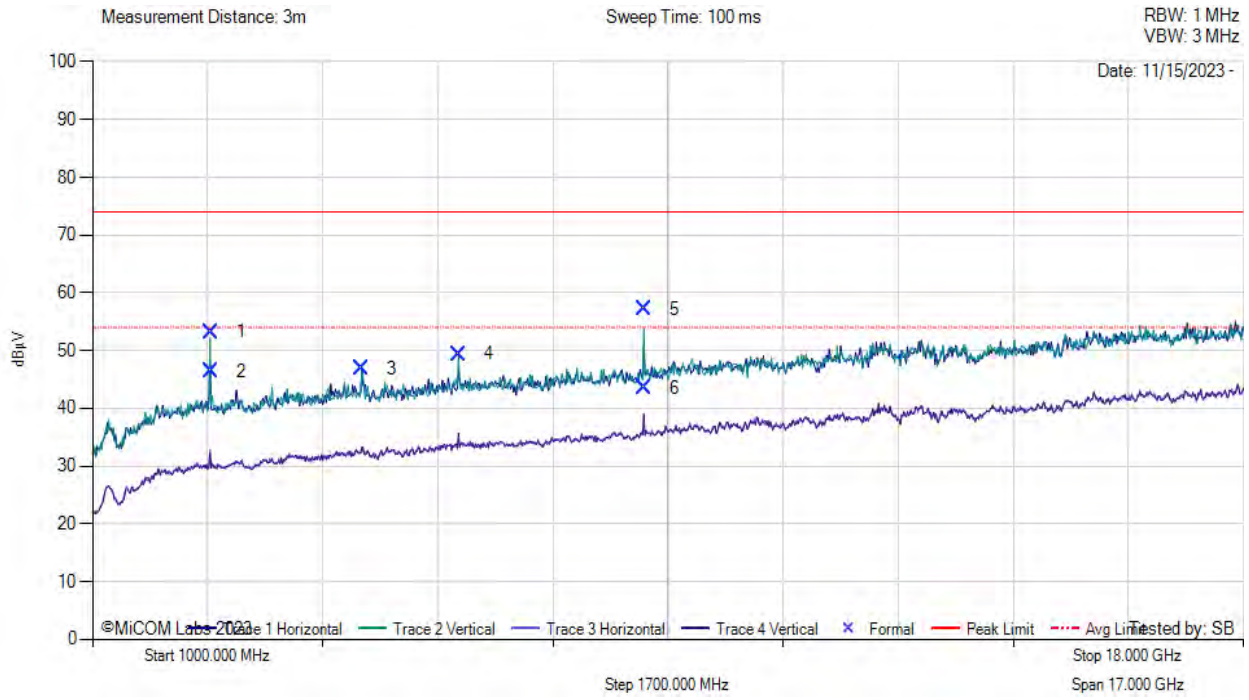
1000.00 - 18000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	1799.00	56.84	1.73	30.72	44.33	MaxP	Vertical	199	59	74.0	-29.7	Pass
2	2708.35	55.89	2.06	-11.79	46.16	MaxP	Vertical	199	134	74.0	-27.8	Pass
3	2708.35	44.34	2.06	-11.79	34.62	AVG	Vertical	199	134	54.0	-19.4	Pass
4	4978.00	37.51	2.94	-11.86	46.43	MaxP	Vertical	118	145	74.0	-27.6	Pass
5	6321.00	56.57	3.35	35.63	50.88	MaxP	Vertical	199	209	74.0	-23.1	Pass
6	9027.56	62.23	4.09	-8.00	58.32	MaxP	Vertical	182	17	74.0	-15.7	Pass
7	9027.56	55.31	4.09	-8.00	51.39	AVG	Vertical	182	17	54.0	-2.6	Pass
8	10833.15	48.62	4.64	-4.61	48.64	MaxP	Vertical	194	177	74.0	-25.4	Pass
9	10833.15	27.24	4.64	-4.61	27.26	AVG	Vertical	194	177	54.0	-26.7	Pass

Test Notes: 5VDC Max Power

back to matrix

FCC Spurious 1 GHz -18 GHz

Variant: M7E-TERA, Test Freq: 914.75 MHz, Antenna: S8964B



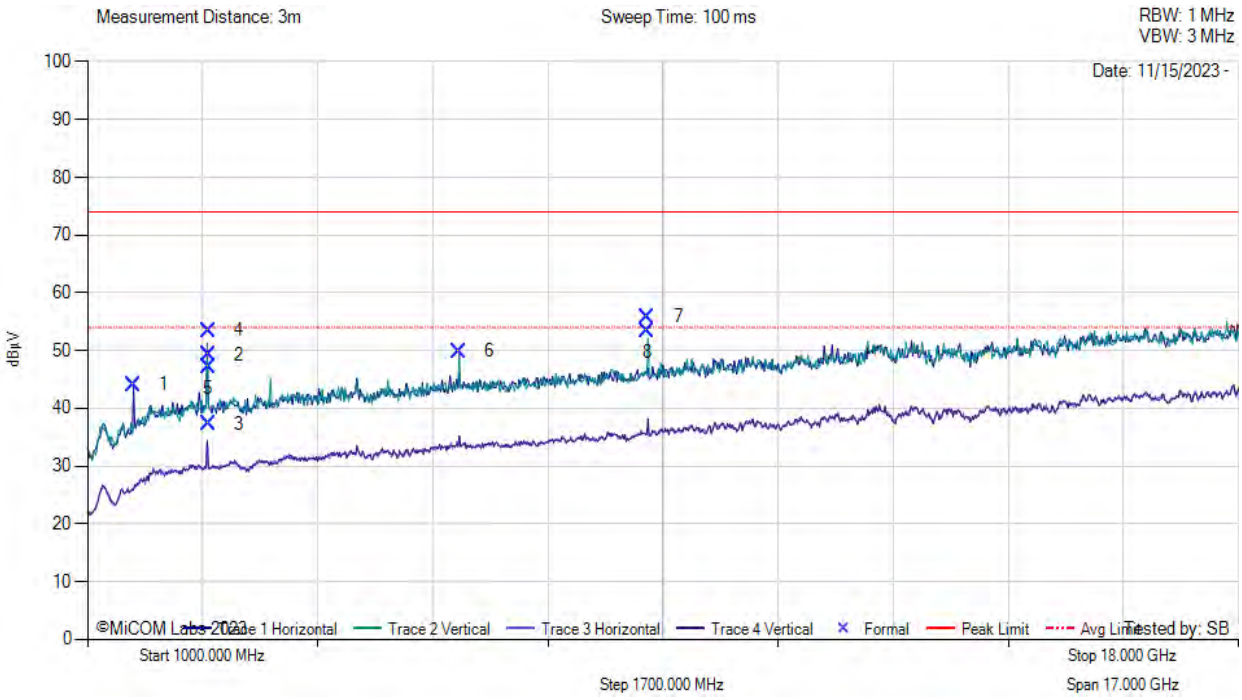
1000.00 - 18000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2744.20	62.92	2.11	-11.79	53.24	MaxP	Vertical	198	311	74.0	-20.8	Pass
2	2744.20	56.06	2.11	-11.79	46.38	AVG	Vertical	198	311	54.0	-7.6	Pass
3	4978.00	37.90	2.94	-11.86	46.82	MaxP	Vertical	118	145	74.0	-27.2	Pass
4	6406.00	54.89	3.36	35.71	49.42	MaxP	Vertical	199	299	74.0	-24.6	Pass
5	9147.59	60.71	4.25	-7.81	57.15	MaxP	Vertical	173	18	74.0	-16.8	Pass
6	9147.59	47.09	4.25	-7.81	43.53	AVG	Vertical	173	18	54.0	-10.5	Pass

Test Notes: 5VDC Max Power

back to matrix

FCC Spurious 1 GHz -18 GHz

Variant: M7E-TERA, Test Freq: 927.25 MHz, Antenna: S8964B



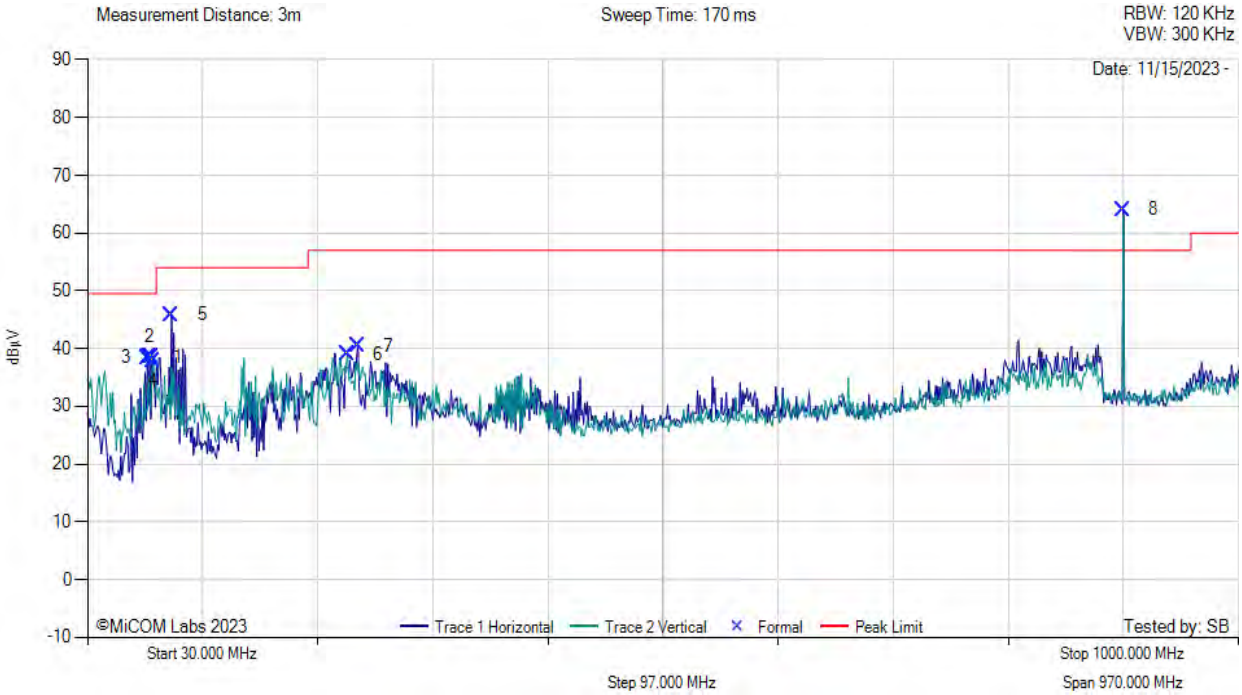
1000.00 - 18000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	1680.00	58.33	1.65	29.18	44.11	MaxP	Horizontal	199	120	74.0	-29.9	Pass
2	2781.67	59.04	2.12	-11.86	49.30	MaxP	Vertical	181	323	74.0	-24.7	Pass
3	2781.67	47.03	2.12	-11.86	37.29	AVG	Vertical	181	323	54.0	-16.7	Pass
4	2781.72	63.19	2.12	-11.86	53.45	MaxP	Horizontal	178	325	74.0	-20.6	Pass
5	2781.72	56.89	2.12	-11.86	47.15	AVG	Horizontal	178	325	54.0	-6.9	Pass
6	6491.00	55.24	3.41	35.76	49.85	MaxP	Vertical	199	29	74.0	-24.2	Pass
7	9272.52	58.76	4.23	-7.17	55.82	MaxP	Vertical	195	195	74.0	-18.2	Pass
8	9272.52	56.28	4.23	-7.17	53.34	AVG	Vertical	195	195	54.0	-0.7	Pass

Test Notes: 5VDC Max Power

back to matrix

30 MHz to 1 GHz Class A

Variant: M7E-TERA, Test Freq: 902.75 MHz, Antenna: MT-242043



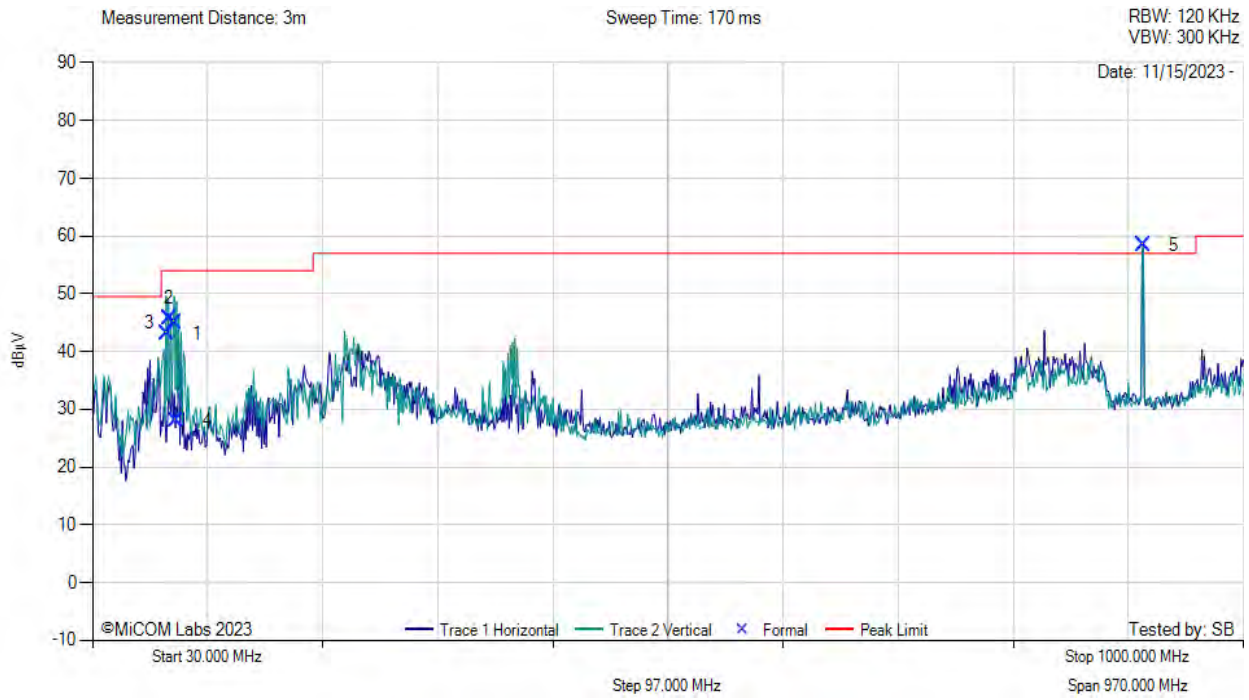
30.00 - 1000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	80.44	52.02	3.97	-17.54	38.46	MaxP	Horizontal	199	60	49.5	-11.0	Pass
2	82.38	52.14	3.98	-17.61	38.51	MaxP	Horizontal	199	60	49.5	-11.0	Pass
3	84.32	52.16	3.99	-17.63	38.53	MaxP	Horizontal	199	60	49.5	-11.0	Pass
4	85.29	51.57	4.00	-17.60	37.97	MaxP	Vertical	101	0	49.5	-11.5	Pass
5	100.81	56.90	4.09	-15.13	45.87	MaxP	Horizontal	199	330	54.0	-8.1	Pass
6	249.22	48.31	4.79	-14.07	39.03	MaxP	Vertical	98	239	57.0	-18.0	Pass
7	257.95	49.40	4.82	-13.75	40.48	MaxP	Horizontal	199	210	57.0	-16.5	Pass
8	903.00	59.79	6.93	27.93	64.10	Fundamental	Horizontal	199	0	-	-	-

Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.

back to matrix

30 MHz to 1 GHz Class A

Variant: M7E-TERA, Test Freq: 914.75 MHz, Antenna: MT-242043



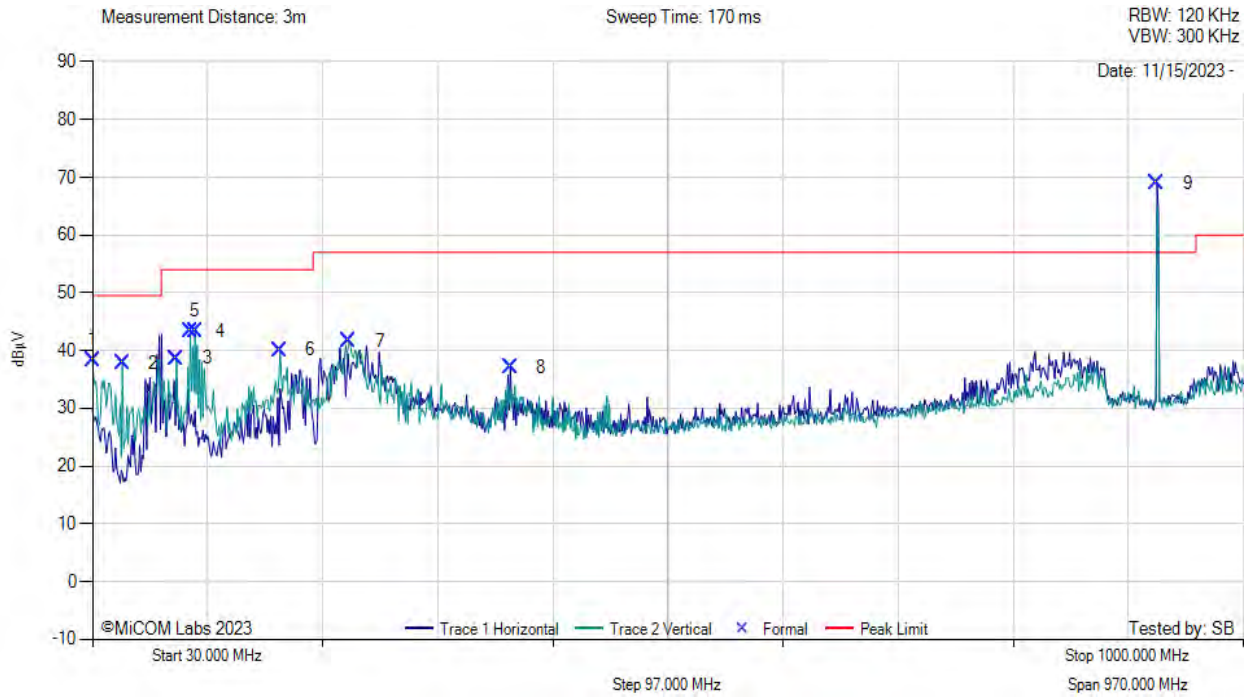
30.00 - 1000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	93.07	55.95	4.05	-16.93	43.07	MaxQP	Vertical	102	235	54.0	-10.9	Pass
2	94.77	58.20	4.06	-16.58	45.68	MaxQP	Vertical	110	240	54.0	-8.3	Pass
3	99.13	56.46	4.09	-15.52	45.03	MaxQP	Vertical	147	55	54.0	-9.0	Pass
4	100.89	38.96	4.09	-15.11	27.94	MaxQP	Vertical	114	35	54.0	-26.1	Pass
5	915.61	53.64	6.98	-2.66	58.45	Fundamental	--	--	--	--	--	--

Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.

back to matrix

30 MHz to 1 GHz Class A 2m

Variant: M7E-TERA, Test Freq: 927.25 MHz, Antenna: MT-242043



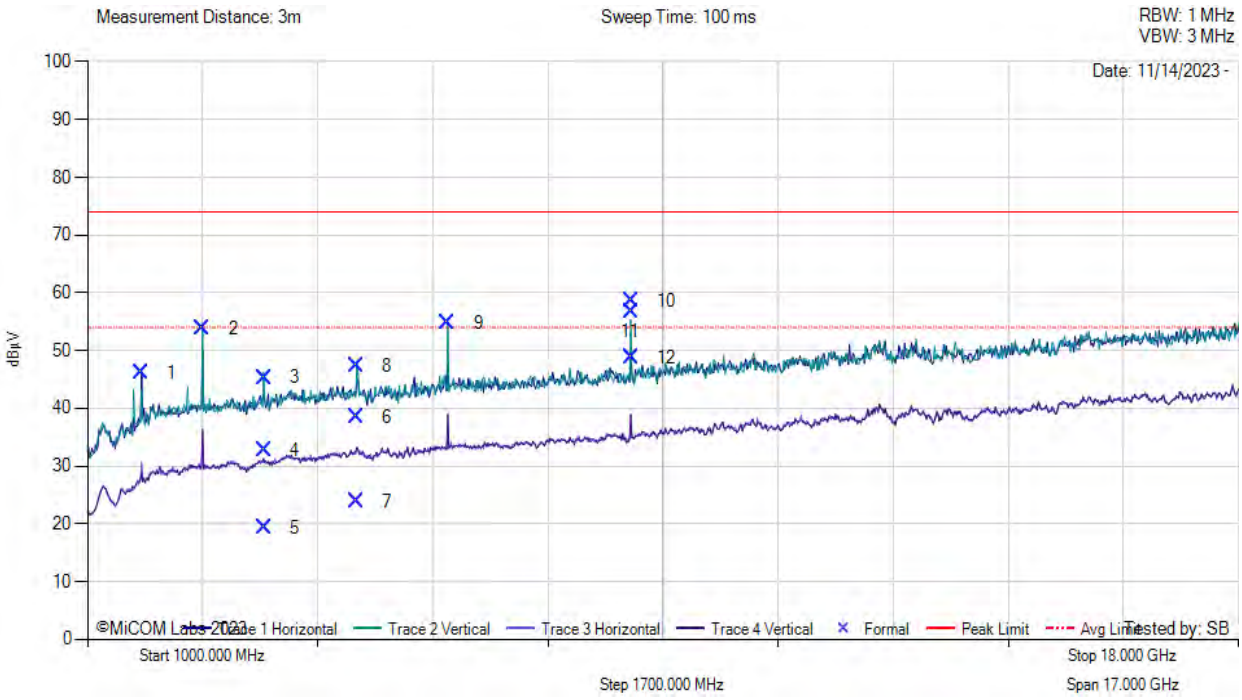
30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	30.00	37.84	3.52	28.66	38.23	MaxP	Vertical	101	0	49.5	-11.3	Pass
2	55.22	51.11	3.76	-17.09	37.78	MaxP	Vertical	99	59	49.5	-11.7	Pass
3	100.81	49.69	4.09	-15.13	38.65	MaxP	Vertical	99	149	54.0	-15.3	Pass
4	112.45	51.75	4.16	-12.60	43.31	MaxP	Vertical	99	149	54.0	-10.7	Pass
5	116.33	51.23	4.18	-12.13	43.27	MaxP	Vertical	99	149	54.0	-10.7	Pass
6	188.11	49.97	4.54	-14.37	40.14	MaxP	Vertical	99	119	54.0	-13.9	Pass
7	246.31	50.88	4.78	-14.03	41.63	MaxP	Vertical	99	179	57.0	-15.4	Pass
8	382.11	41.37	5.30	-9.60	37.06	MaxP	Horizontal	199	300	57.0	-19.9	Pass
9	927.25	--	--	--	68.98	Fundamental	--	--	--	--	--	--

Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.

back to matrix

FCC Spurious 1 GHz -18 GHz

Variant: M7E-TERA, Test Freq: 902.75 MHz, Antenna: MT-242043



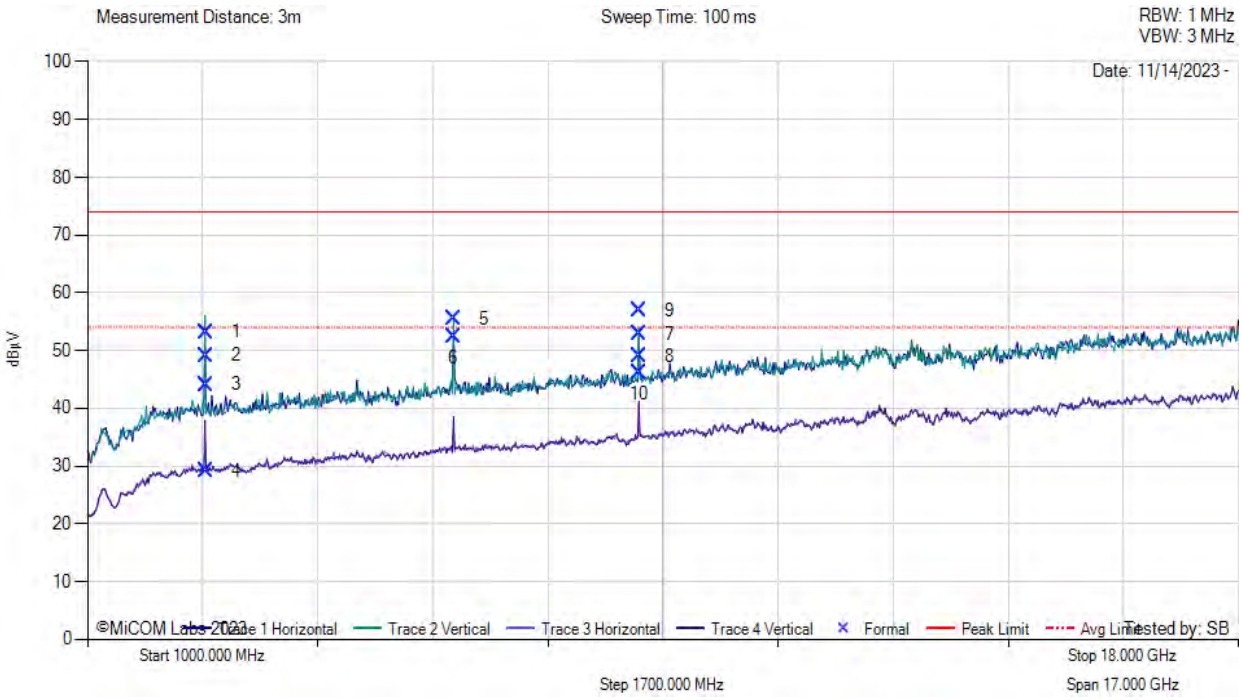
1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1799.00	58.70	1.73	30.72	46.20	MaxP	Horizontal	100	30	74.0	-27.8	Pass
2	2700.00	63.54	2.06	32.41	53.83	MaxP	Vertical	149	209	74.0	-20.2	Pass
3	3611.11	54.72	2.43	-11.81	45.34	MaxP	Vertical	199	118	74.0	-28.7	Pass
4	3611.14	42.12	2.43	-11.81	32.74	MaxP	Vertical	192	132	74.0	-41.3	Pass
5	3611.14	28.69	2.43	-11.81	19.30	AVG	Vertical	192	132	54.0	-34.7	Pass
6	4978.63	47.39	2.94	-11.86	38.47	MaxP	Vertical	118	145	74.0	-35.5	Pass
7	4978.63	32.80	2.94	-11.86	23.89	AVG	Vertical	118	145	54.0	-30.1	Pass
8	4979.40	56.20	2.94	-11.85	47.30	MaxP	Vertical	99	150	74.0	-26.7	Pass
9	6321.00	60.50	3.35	35.63	54.81	MaxP	Vertical	199	179	74.0	-19.2	Pass
10	9027.36	62.50	4.09	-8.00	58.59	MaxP	Vertical	199	30	74.0	-15.4	Pass
11	9027.57	60.73	4.09	-8.00	56.82	MaxP	Vertical	185	43	74.0	-17.2	Pass
12	9027.57	52.76	4.09	-8.00	48.85	AVG	Vertical	185	43	54.0	-5.2	Pass

Test Notes: 5VDC Max Power

back to matrix

FCC Spurious 1 GHz -18 GHz

Variant: M7E-TERA, Test Freq: 914.75 MHz, Antenna: MT-242043



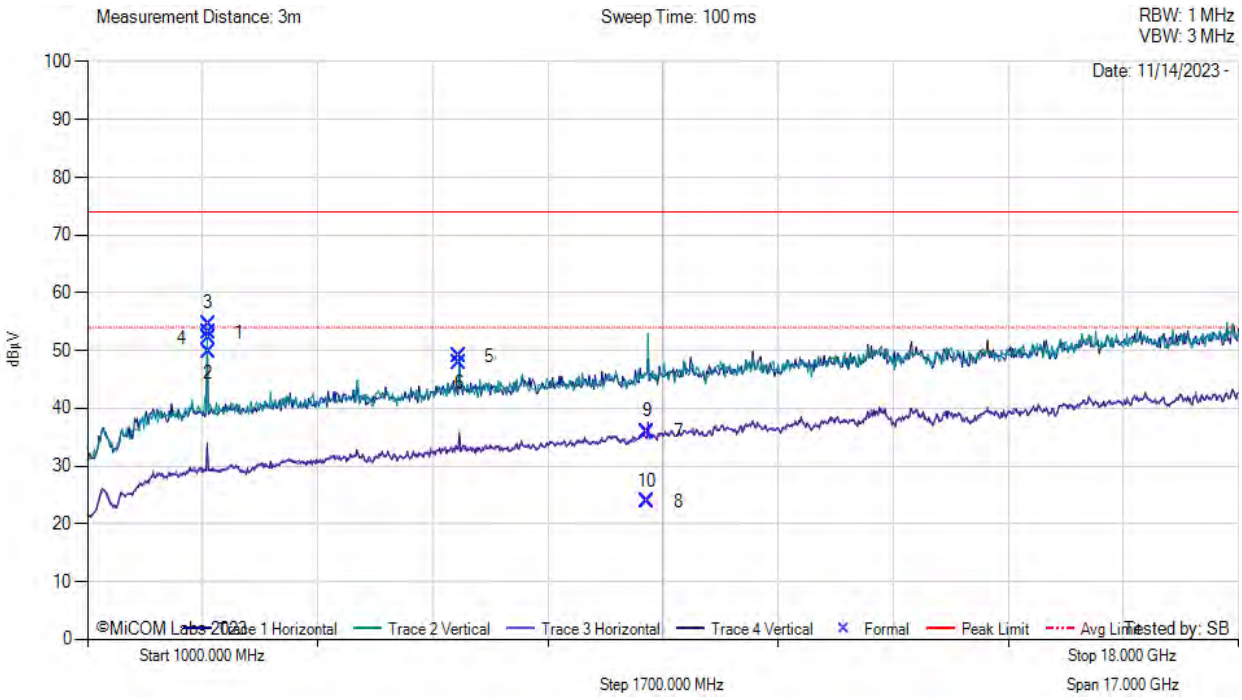
1000.00 - 18000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	2744.25	62.88	2.11	-11.79	53.20	MaxP	Horizontal	188	0	74.0	-20.8	Pass
2	2744.25	58.87	2.11	-11.79	49.19	AVG	Horizontal	188	0	54.0	-4.8	Pass
3	2744.36	53.83	2.11	-11.79	44.15	MaxP	Vertical	158	29	74.0	-29.9	Pass
4	2744.36	38.84	2.11	-11.79	29.16	AVG	Vertical	158	29	54.0	-24.8	Pass
5	6406.00	60.94	3.36	35.71	55.47	MaxP	Vertical	199	179	74.0	-18.5	Pass
6	6406.00	57.78	3.36	35.71	52.31	MaxP	Horizontal	149	180	74.0	-21.7	Pass
7	9147.48	56.48	4.25	-7.82	52.92	MaxP	Horizontal	150	242	74.0	-21.1	Pass
8	9147.48	52.65	4.25	-7.82	49.09	AVG	Horizontal	150	242	54.0	-4.9	Pass
9	9147.58	60.53	4.25	-7.81	56.97	MaxP	Vertical	184	30	74.0	-17.0	Pass
10	9147.58	49.76	4.25	-7.81	46.19	AVG	Vertical	184	30	54.0	-7.8	Pass

Test Notes: 5VDC Max Power

back to matrix

FCC Spurious 1 GHz -18 GHz

Variant: M7E-TERA, Test Freq: 927.25 MHz, Antenna: MT-242043



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	2781.72	62.82	2.12	-11.86	53.08	MaxP	Horizontal	153	66	74.0	-20.9	Pass
2	2781.72	59.42	2.12	-11.86	49.68	AVG	Horizontal	153	66	54.0	-4.3	Pass
3	2781.73	64.42	2.12	-11.86	54.68	MaxP	Vertical	180	214	74.0	-19.3	Pass
4	2781.73	61.85	2.12	-11.86	52.11	AVG	Vertical	180	214	54.0	-1.9	Pass
5	6491.00	54.41	3.41	35.76	49.01	MaxP	Vertical	150	149	74.0	-25.0	Pass
6	6491.00	53.35	3.41	35.76	47.96	MaxP	Horizontal	150	180	74.0	-26.0	Pass
7	9272.26	38.92	4.23	-7.17	35.98	MaxP	Horizontal	166	232	74.0	-38.0	Pass
8	9272.26	26.86	4.23	-7.17	23.93	AVG	Horizontal	166	232	54.0	-30.1	Pass
9	9272.79	38.93	4.24	-7.17	36.00	MaxP	Vertical	192	196	74.0	-38.0	Pass
10	9272.79	26.83	4.24	-7.17	23.90	AVG	Vertical	192	196	54.0	-30.1	Pass

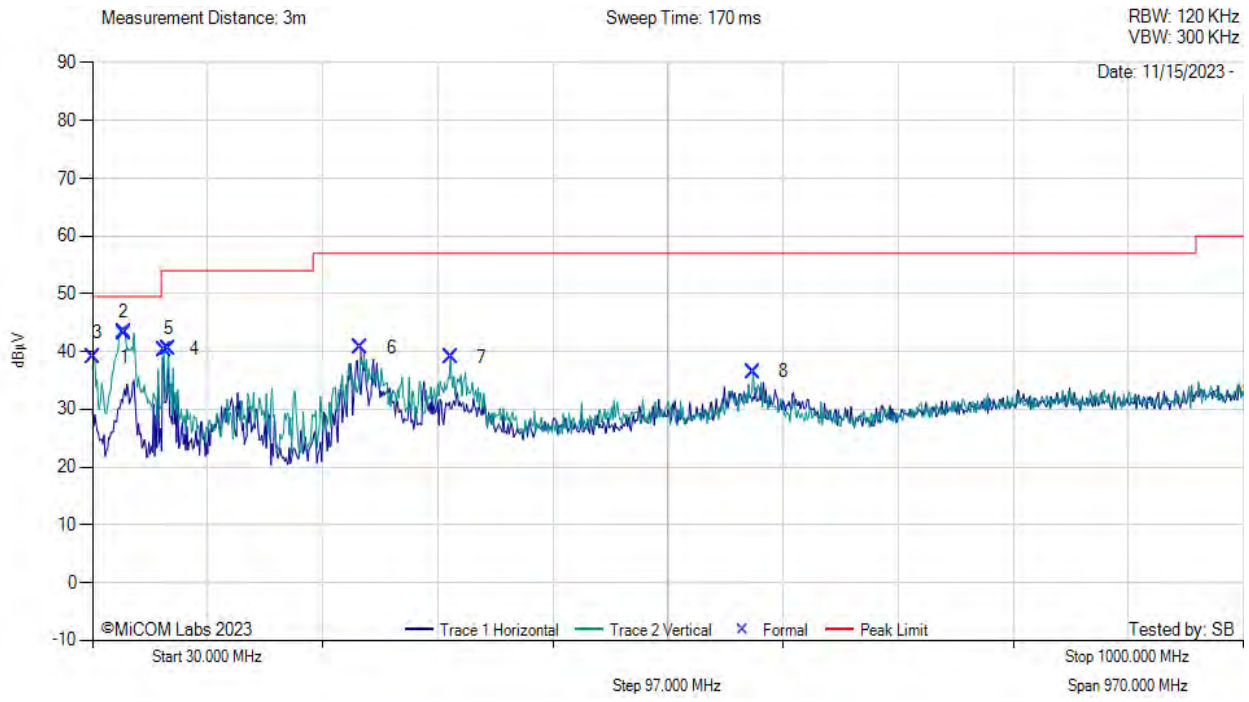
Test Notes: 5VDC Max Power

back to matrix

A.4.3. Digital Emissions (0.03 - 1 GHz)

30 MHz to 1 GHz Class A 2m

Variant: M7E-TERA, Test Freq: 0.00 MHz, Antenna: MT-242043



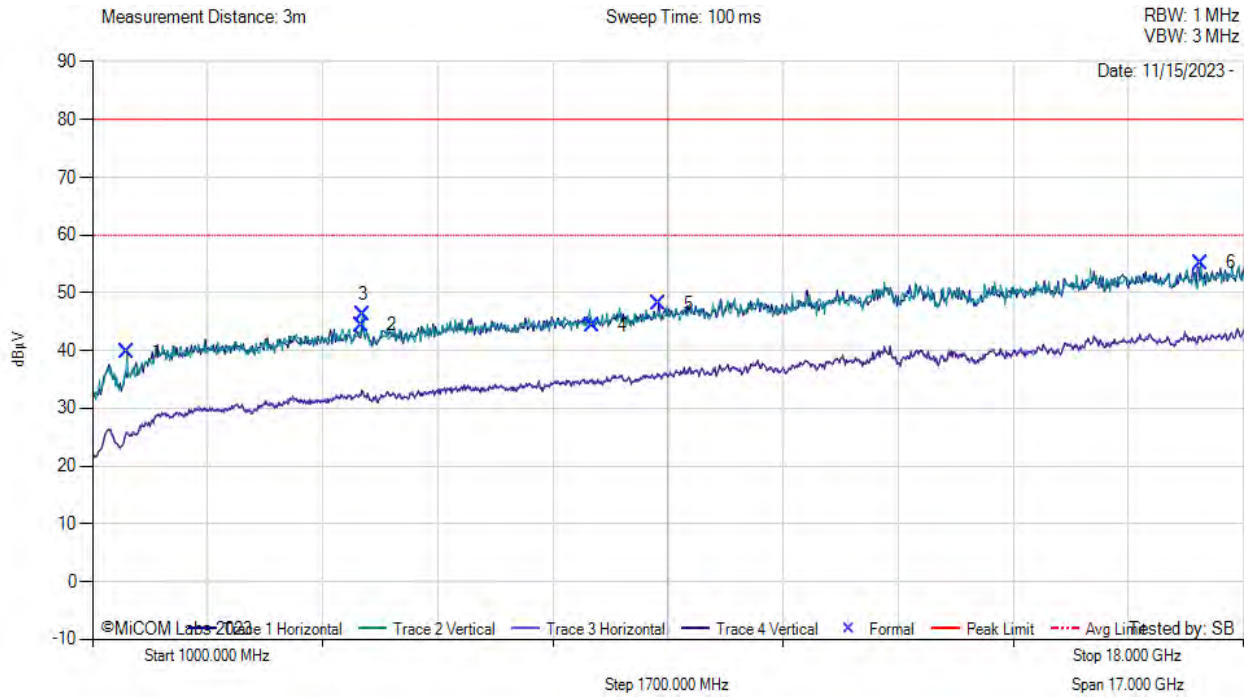
30.00 - 1000.00 MHz												
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.97	39.45	3.52	-3.90	39.06	MaxP	Vertical	101	0	49.5	-10.4	Pass
2	56.25	56.68	3.77	-17.24	43.21	MaxP	Vertical	100	120	49.5	-6.3	Pass
3	56.30	56.79	3.77	-17.25	43.31	MaxQP	Vertical	100	92	49.5	-6.2	Pass
4	90.14	53.61	4.03	-17.33	40.31	MaxP	Vertical	99	89	54.0	-13.7	Pass
5	94.02	53.20	4.06	-16.74	40.52	MaxP	Vertical	99	89	54.0	-13.5	Pass
6	256.01	49.74	4.82	-13.91	40.66	MaxP	Vertical	99	179	57.0	-16.3	Pass
7	331.67	45.06	5.14	-11.15	39.04	MaxP	Vertical	99	119	57.0	-18.0	Pass
8	586.78	37.10	5.98	-6.59	36.49	MaxP	Vertical	99	149	57.0	-20.5	Pass

Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.

back to matrix

1 GHz to 18 GHz Class A

Variant: M7E-TERA, Test Freq: 0.00 MHz, Antenna: MT-242043



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	1510.00	54.87	1.56	28.21	39.70	MaxP	Vertical	99	209	80.0	-40.3	Pass
2	4978.00	53.35	2.94	34.24	44.43	MaxP	Horizontal	149	300	80.0	-35.6	Pass
3	4995.00	55.13	3.03	34.22	46.17	MaxP	Vertical	149	299	80.0	-33.8	Pass
4	8378.00	48.59	3.90	35.72	44.23	MaxP	Vertical	99	239	80.0	-35.8	Pass
5	9364.00	50.78	4.31	36.27	48.11	MaxP	Horizontal	149	210	80.0	-31.9	Pass
6	17371.00	49.64	6.48	40.89	55.22	MaxP	Vertical	99	209	80.0	-24.8	Pass

Test Notes: 5VDC, Max Power, Ferrite on support Laptops PSU and USB port.

back to matrix

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