Multi-Tech Systems, Inc.

RBS301

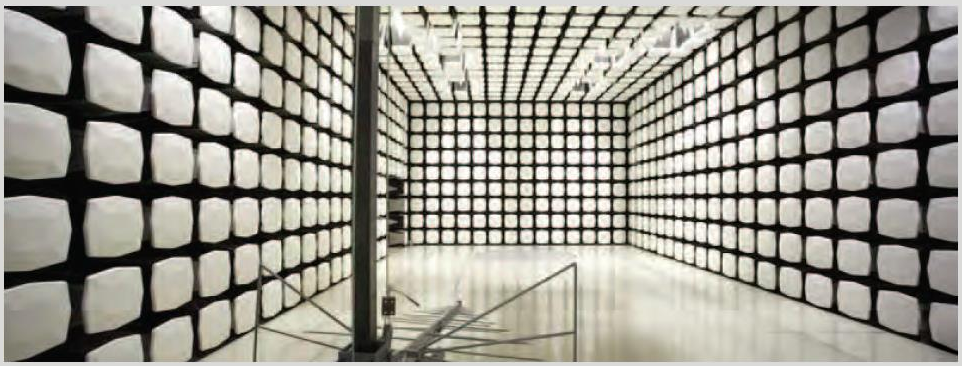
FCC 15.247:2023

RSS-247 Issue 3:2023

RSS-Gen Issue 5:2018+A1:2019+A2:2021

902 - 928 MHz Hybrid Radio

Report: MLTI0234.1 Rev. 2, Issue Date: March 1, 2024



CERT #3310.05

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CERTIFICATE OF TEST

Last Date of Test: March 1, 2023
Re-issue Date: February 7, 2024
Multi-Tech Systems, Inc.
EUT: RBS301 V2.2, RBS301 V3.0

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2023	ANSI C63.10:2013, KDB 558074 v05r02:2019
RSS-247 Issue 3:2023	
RSS-Gen Issue 5:2018+A1:2019+A2:2021	

Note: RSS-247 Issue 3 has been updated superseding prior editions and amendments noted within the body of this report. The changes between the specifications do not affect the results of the prior testing. The manufacturer attests that no changes have been made to the product. See gap analysis in the appendix along with the manufacturer's attestation.

Results

Test Description	Result	FCC Sections(s)	RSS-Sections(s)	ANSI C63.10 Sections(s)	Comments
Powerline Conducted Emissions	N/A	15.207	RSS-Gen 8.8	6.2	Not required for a battery powered EUT.
Carrier Frequency Separation	Pass	15.247(a)(1)	RSS-247 5.1(b)	7.8.2	
Number of Hopping Frequencies	Pass	15.247(a)(1)	RSS-247 5.1(d)	7.8.3	
Dwell Time	Pass	15.247(a)(1)	RSS-247 5.1(d)	7.8.4	
Band Edge Compliance - Hopping Mode	Pass	15.247(d)	RSS-247 5.5	7.8.6	
Band Edge Compliance	Pass	15.247(d)	RSS-247 5.5	11.11	
Power Spectral Density	Pass	15.247(e)	RSS-247 5.2(b)	11.10.2	An FCC inquiry was leveraged to utilize an average detector for a hybrid radio.
Duty Cycle	Pass	15.247	RSS-247 3.1	11.6	
Occupied Bandwidth (99%)	N/A	15.247(a)	RSS-247 5.2(a)	6.9.3	
Emissions Bandwidth (20 dB)	Pass	15.247(a)	RSS-247 5.2(a)	6.9.2	
Spurious Conducted Emissions	Pass	15.247(d)	RSS-247 5.5	11.11	
Output Power	Pass	15.247(b)	RSS-247 5.4(d)	11.9.1.1	An FCC inquiry was leveraged to utilize an average detector for a hybrid radio.
Equivalent Isotropic Radiated Power	Pass	15.247(b)	RSS-247 5.4(d)	11.9.1.1	

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

CERTIFICATE OF TEST

Spurious Radiated Emissions	Pass	15.247(d)	RSS-247 5.5	6.5, 6.6, 11.12.1, 11.13.2	The testing on the RBS301 V3 was limited to the frequency ranges most likely to cause the highest emissions.
Radiated Emissions for Receiver	N/A	15.101, 15.109	RSS-Gen 7.3	ANSI C63.4 - 12.2.5	Not included per FCC 15.101 as this will be covered under SDoC rules for the FCC. RSS-Gen section 7 stated receiver requirements only apply to standalone receivers operating in the 30-960 MHz band and this is not a standalone receiver.

Deviations From Test Standards

None

Approved By:

Eric Brandon, Department Manager

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REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		
01	Minor changes and clarifications throughout. Also combined FCC and ISED requirements into a single report	2022-11-15	All
	Added SRE data from MLTI0299	2023-03-04	85
	Updated test dates	2023-03-04	2, 11, 14
	Added configuration MLTI0299-1	2023-03-04	13
	Report revised to reflect RSS-247 Issue 3	2024-02-07	1, 2
	Added Appendix to include Manufacturer Attestation and Gap Analysis.	2024-02-07	90

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

European Commission – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

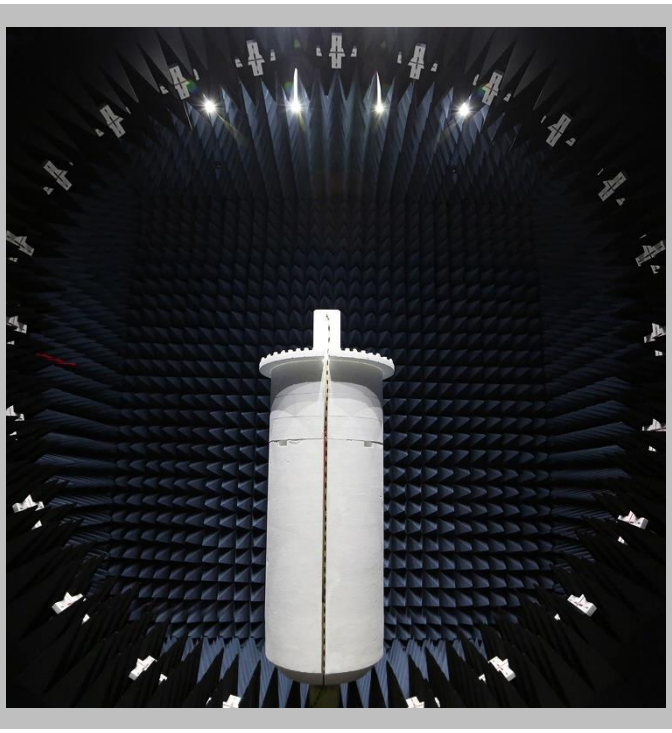
SCOPE

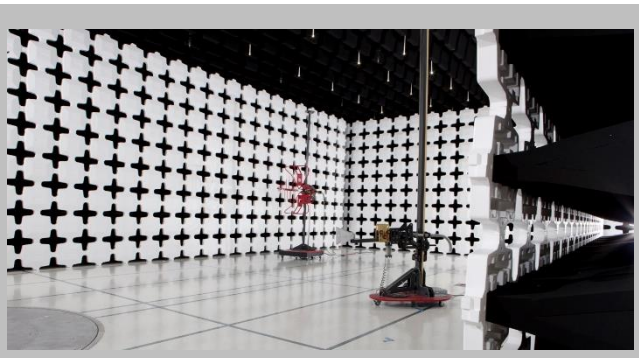
For details on the Scopes of our Accreditations, please visit:

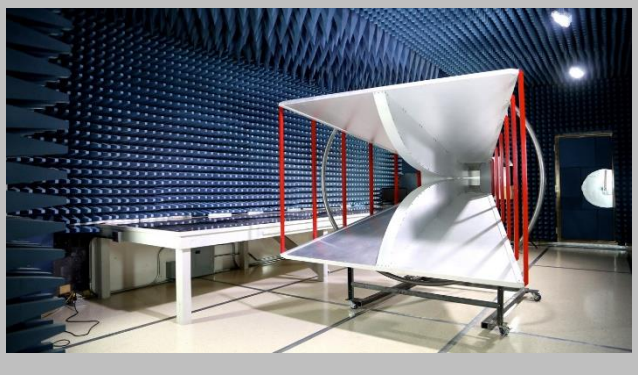
California Minnesota Oregon Texas Washington

FACILITIES

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
Innovation, Science and Economic Development Canada				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found in the table below. A lab specific value may also be found in the applicable test description section. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	3.2 dB	-3.2 dB

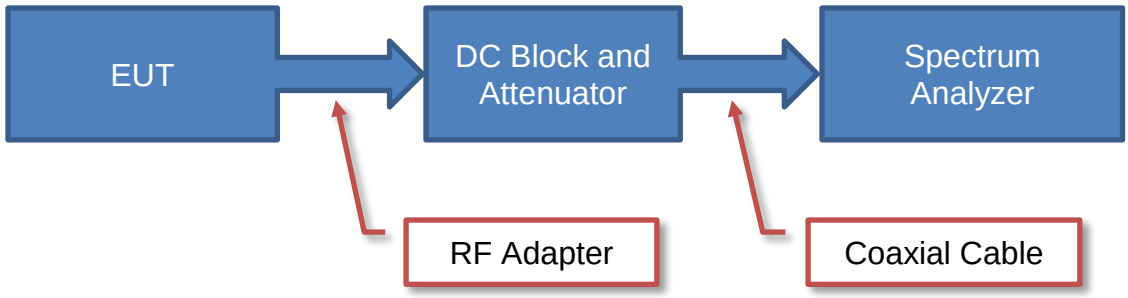
TEST SETUP BLOCK DIAGRAMS

Measurement Bandwidths

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.

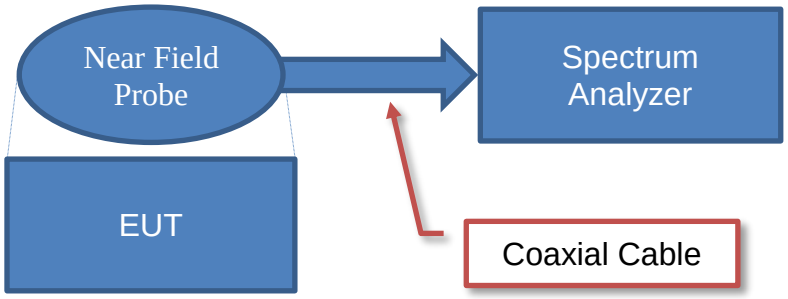
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

Near Field Test Fixture Measurements

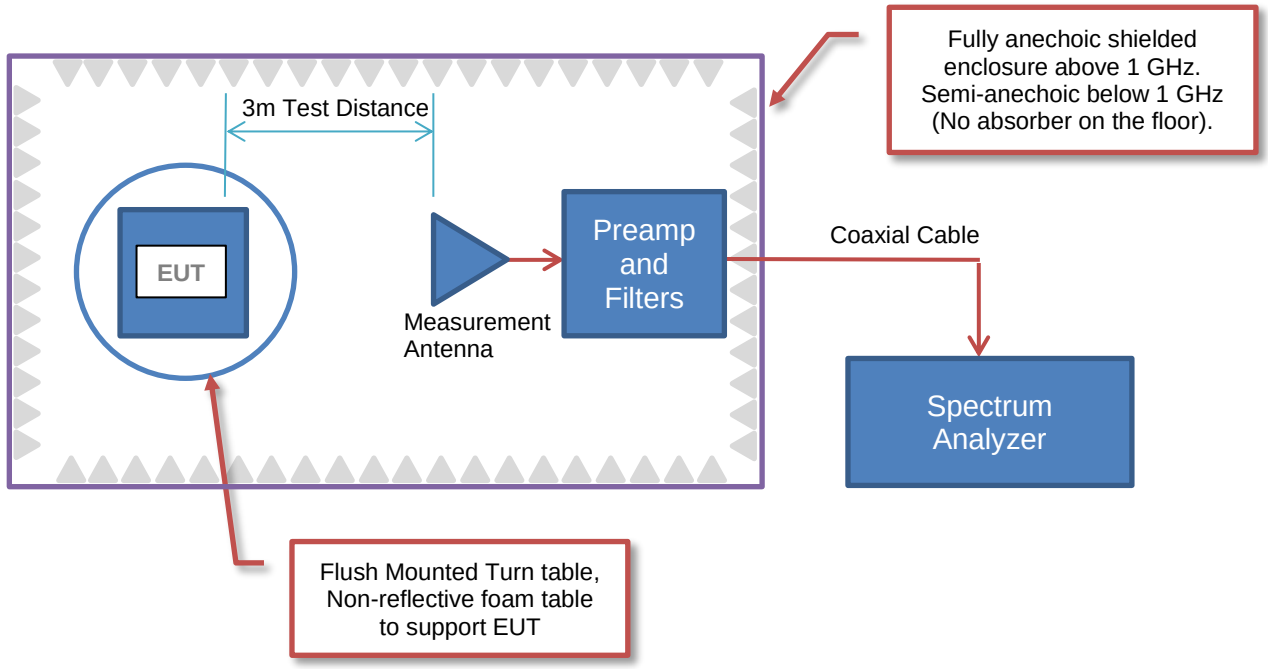


Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

Measured Level (Amplitude)		Factor: Antenna Factor		Factor: Cable Factor		Factor: Amplifier Gain		Distance Adjustment Factor		External Attenuation		Field Strength
42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0	=	**33.5**

Conducted Emissions:

Measured Level (Amplitude)		Factor: Transducer Factor		Factor: Cable Factor		External Attenuation		Adjusted Level
26.7	+	0.3	+	0.1	+	20.0	=	**47.1**

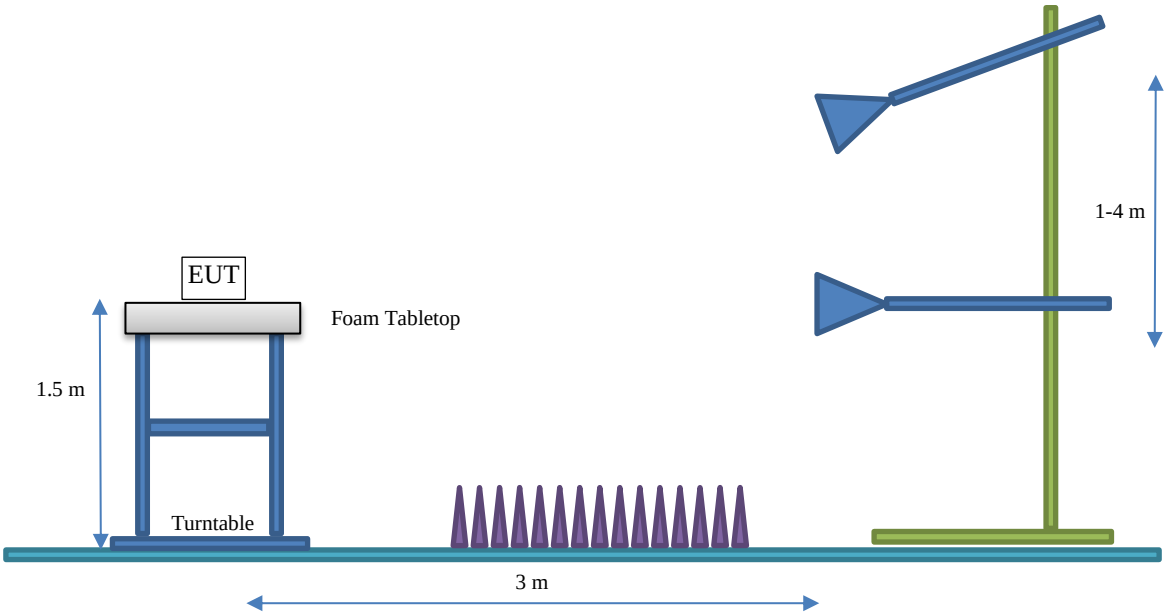
Radiated Power (ERP/EIRP) – Substitution Method:

Measured Level into Substitution Antenna (Amplitude dBm)		Substitution Antenna Factor (dBi)		EIRP to ERP (if applicable)		Measured power (dBm ERP/EIRP)
10.0	+	6.0	-	2.15	=	**13.9/16.0**

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Multi-Tech Systems, Inc.
Address:	2205 Woodale Dr
City, State, Zip:	Mounds View, MN 55112
Test Requested By:	Tim Gunn
EUT:	RBS301 V2.2, RBS301 V3.0
First Date of Test:	December 30, 2021
Last Date of Test:	March 1, 2023
Receipt Date of Samples:	December 30, 2021
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

The wireless acceleration-based movement sensor uses an internal accelerometer to detect movement of an asset. When motion is detected that exceeds a certain threshold, an alert is sent over the wireless network. Versions of the sensor support the major LPWAN standards such as Sigfox, LoRa/LoRaWAN, and SubGig.

Two worst case scenarios were tested one as the base model and the second with the 10m Water Rope.
HW Version: 2.2
FW Version: 2.5.1

A model variant was tested for Spurious Radiated Emissions and included in the test report
HW Version: 3.0

Testing Objective:

Seeking to demonstrate compliance under FCC 15.247 and RSS-247 for operation in the 902 - 928 MHz Band as a Hybrid radio.

CONFIGURATIONS

Configuration MLTI0234- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RBS301 V2.2	Multi-Tech Systems, Inc.	RBS301-Jolt-004-US	P1

Configuration MLTI0234- 3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RBS301 V2.2	Multi-Tech Systems, Inc.	RBS301-Jolt-004-US	T4

Configuration MLTI0283- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RBS301 V3.0	Multi-Tech Systems, Inc.	RBS301-Jolt-004-US	D1

CONFIGURATIONS

Configuration MLTI0299- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RBS301 V3.0	Multi-Tech Systems, Inc.	RBS301-Jolt-004-US	E7

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-12-30	Carrier Frequency Separation	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2021-12-30	Number of Hopping Frequencies	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2022-01-03	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2022-01-04	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2022-01-04	Dwell Time	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2022-01-04	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2022-01-04	Equivalent Isotropic Radiated Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2022-01-04	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
9	2022-01-04	Band Edge Compliance - Hopping Mode	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
10	2022-01-04	Occupied Bandwidth (99%)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
11	2022-01-04	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
12	2022-01-04	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT was removed from the Element facility following the test.
13	2023-03-01	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWER SETTINGS AND ANTENNAS

The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information.

ANTENNA GAIN (dBi)

Type	Provided by:	Frequency Range (MHz)	Gain (dBi)
Ceramic Chip Antenna	Unictron Technologies Corp.	902-928	0.3

The EUT was tested using the power settings provided by the manufacturer:

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Position (if multiple channels)	Power Setting
125 kHz Channel (Data Rates 3)*	Low Channel, 902.3 MHz	20 dBm
	Mid Channel, 908.7 MHz	20 dBm
	High Channel, 914.9 MHz	20 dBm
500 kHz Channel (Data Rate 4)	Low Channel, 903 MHz	20 dBm
	Mid Channel, 909.4 MHz	20 dBm
	High Channel, 914.2 MHz	20 dBm

*Data rate 3 was determined to be the worst case data rate for 125 kHz bandwidth

CARRIER FREQUENCY SEPARATION

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The channel carrier frequencies in the 902-928 MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

CARRIER FREQUENCY SEPARATION

TbtTx 2021.12.14.0 XMit 2020.12.30.0

EUT:	RBS301			Work Order:	MLTI0234
Serial Number:	T4			Date:	30-Dec-21
Customer:	Multi-Tech Systems, Inc.			Temperature:	22.7 °C
Attendees:	Mike Fette			Humidity:	22.5% RH
Project:	None			Barometric Pres.:	1000 mbar
Tested by:	Andrew Rogstad	Power:	Battery	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

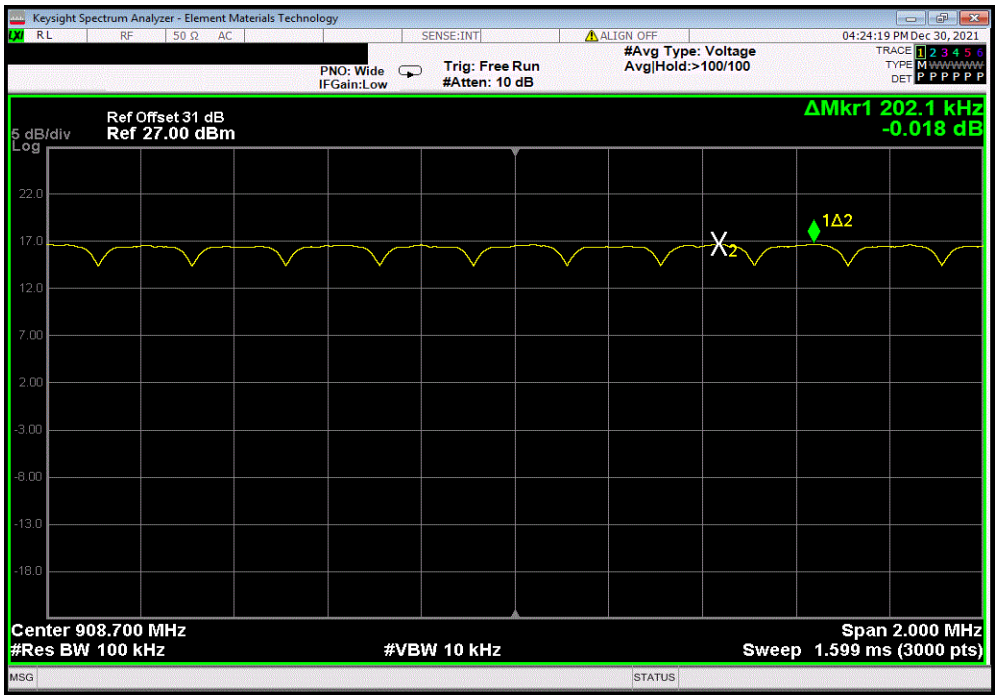
DEVIATIONS FROM TEST STANDARD

None

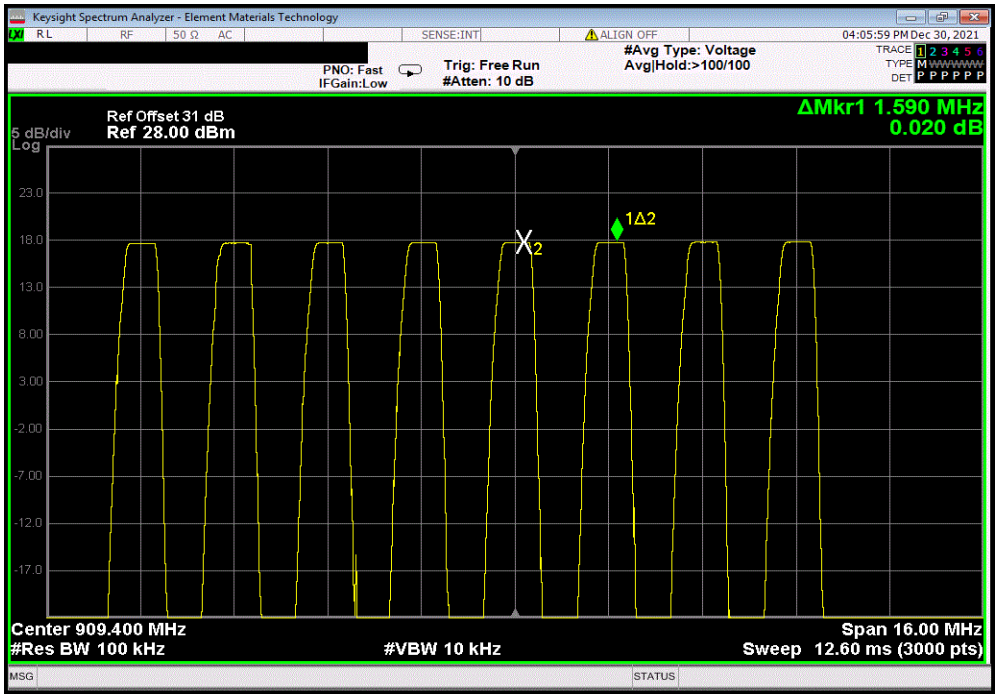
Configuration #	3	Signature

	Value (MHz)	Limit (≥) (MHz)	Results
Channel Bandwidth (125 kHz)			
Data Rate 3	0.2	0.14	Pass
Channel Bandwidth (500 kHz)			
Data Rate 4	1.59	0.72	Pass

Channel Bandwidth (125 kHz), Data Rate 3						
				Value (MHz)	Limit (≥) (MHz)	Results
				0.2	0.14	Pass



Channel Bandwidth (500 kHz), Data Rate 4						
				Value (MHz)	Limit (≥) (MHz)	Results
				1.59	0.72	Pass



NUMBER OF HOPPING FREQUENCIES

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The number of hopping frequencies was measured across the authorized band. The hopping function of the EUT was enabled.

NUMBER OF HOPPING FREQUENCIES

TbtTx 2021.12.14.0 XMit 2020.12.30.0

EUT:	**RBS301**			**Work Order:**	**MLTI0234**
Serial Number:	**T4**			**Date:**	**30-Dec-21**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**22.7 °C**
Attendees:	**Mike Fette**			**Humidity:**	**22.5% RH**
Project:	**None**			**Barometric Pres.:**	**1000 mbar**
Tested by:	**Andrew Rogstad**	**Power:**	**Battery**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2021	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

DEVIATIONS FROM TEST STANDARD

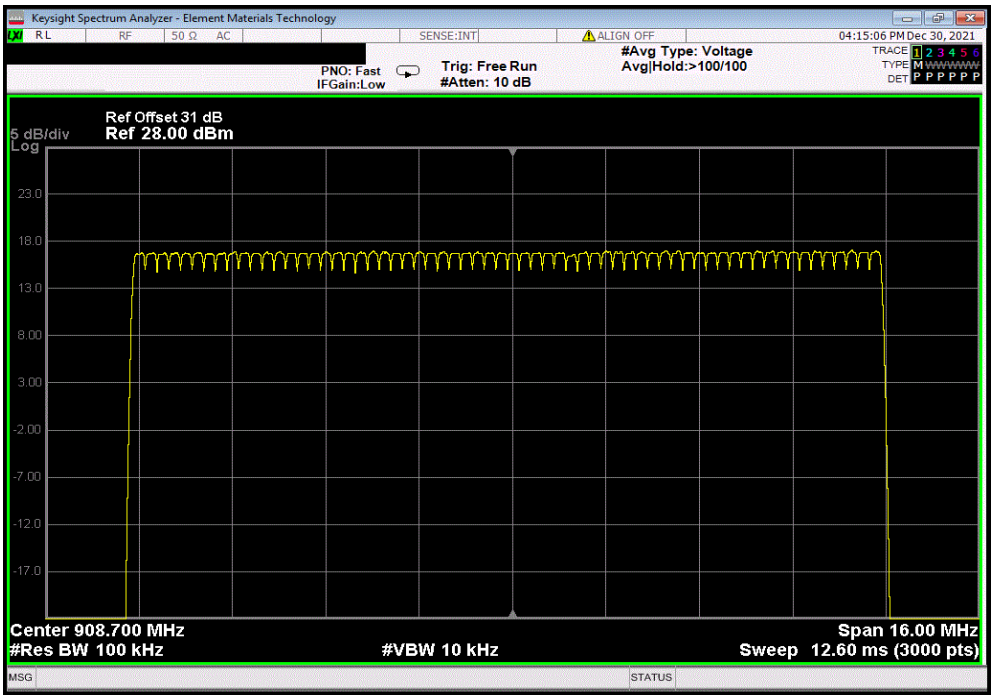
None

Configuration #	**3**	*Signature*

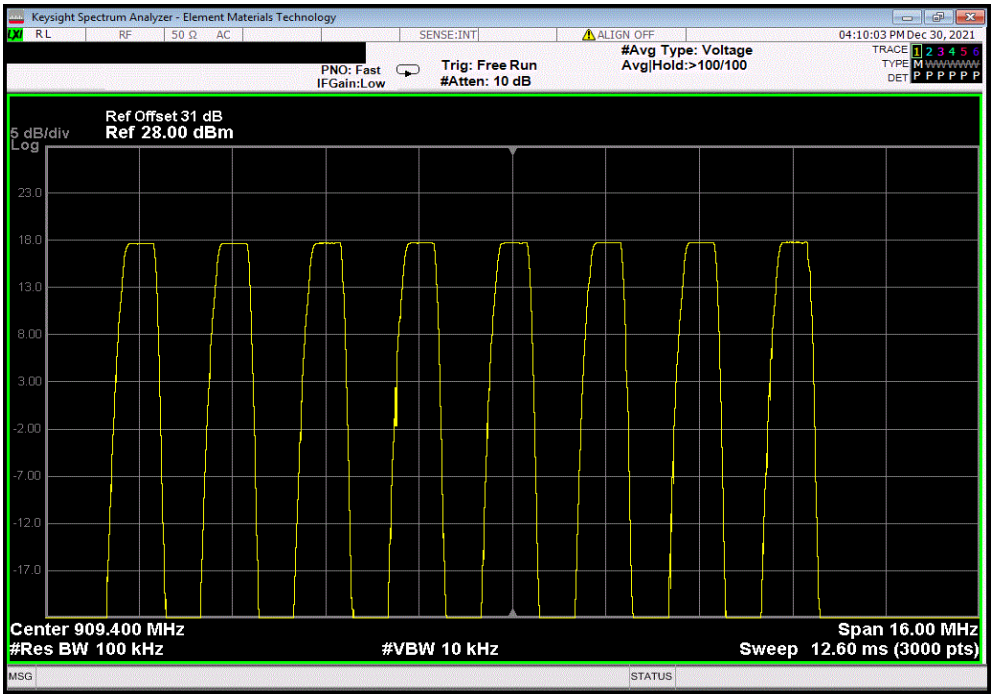
	Number of Channels	Limit (≥)	Results
Channel Bandwidth (125 kHz)			
Data Rate 3	64	N/A	N/A
Channel Bandwidth (500 kHz)			
Data Rate 4	8	N/A	N/A

NUMBER OF HOPPING FREQUENCIES

Channel Bandwidth (125 kHz), Data Rate 3						
				Number of Channels	Limit (≥)	Results
				64	N/A	N/A



Channel Bandwidth (500 kHz), Data Rate 4						
				Number of Channels	Limit (≥)	Results
				8	N/A	N/A



DWELL TIME

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band.
The hopping function of the EUT was enabled.

The dwell time limit is based on the Number of Hopping Channels * 400 mS. For LoRa this would be 64 Channels * 400mS = 25.6S, and 8 Channels * 400mS = 3.2S

DWELL TIME

element

TbtTx 2021.10.29.2 XMit 2020.12.30.0

EUT:	RBS301			Work Order:	MLTI0234
Serial Number:	T4			Date:	4-Jan-22
Customer:	Multi-Tech Systems, Inc.			Temperature:	22.6 °C
Attendees:	Mike Fette			Humidity:	22.6% RH
Project:	None			Barometric Pres.:	1000 mbar
Tested by:	Andrew Rogstad	Power:	Battery	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable. For data rates with 125 kHz bandwidth there are 64 channels. This means that the measurement period is 0.4 seconds * 64 channels which equals 25.6 seconds. For the 500 kHz bandwidth there are 8 channels. This means that the measurement period is 0.4 seconds * 8 channels which equals 3.2 seconds.

DEVIATIONS FROM TEST STANDARD

None

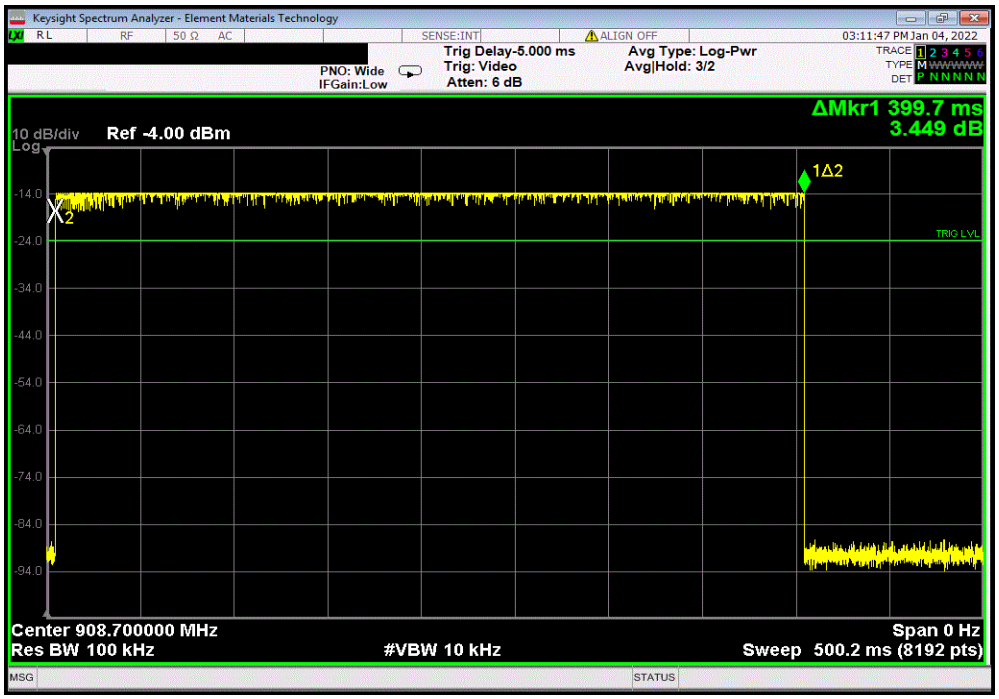
Configuration #	3	Signature

	Pulse Width (ms)	Number of Pulses	Value (ms)	Limit (ms)	Results
Channel Bandwidth (125 kHz)					
Data Rate 3					
Mid Channel, 908.7 MHz					
Pulse Length	399.7	N/A	N/A	N/A	N/A
Number of Pulses	399.7	1	399.7	400	Pass
Channel Bandwidth (500 kHz)					
Data Rate 4					
Mid Channel, 909.4 MHz					
Pulse Length	177	N/A	N/A	N/A	N/A
Number of Pulses	177	1	177	400	Pass

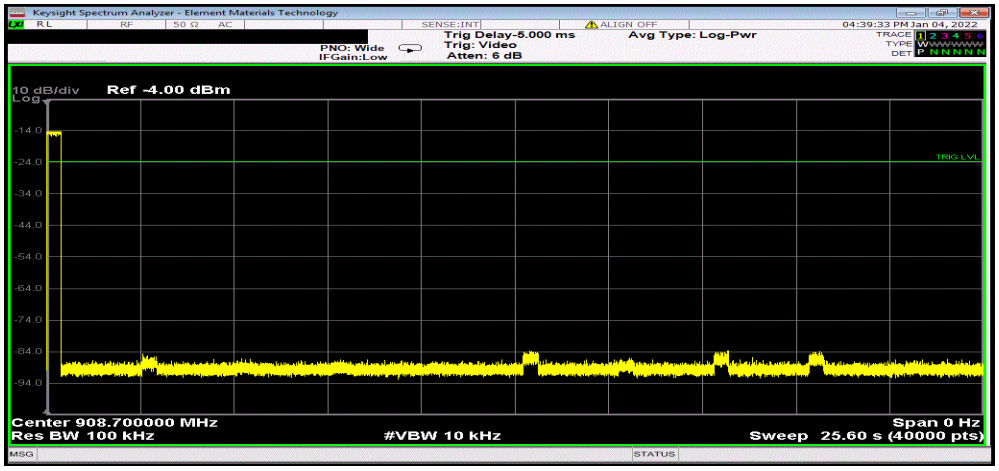
DWELL TIME

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz, Pulse Length						
		Pulse Width (ms)	Number of Pulses	Value (ms)	Limit (ms)	Results
		399.7	N/A	N/A	N/A	N/A



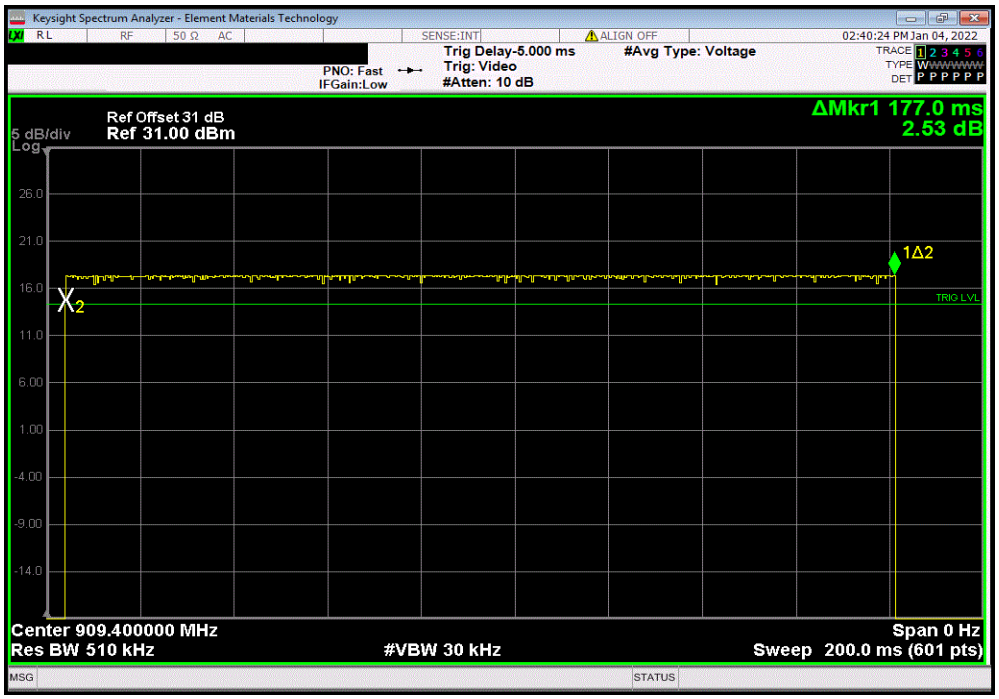
Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz, Number of Pulses						
		Pulse Width (ms)	Number of Pulses	Value (ms)	Limit (ms)	Results
		399.7	1	399.7	400	Pass



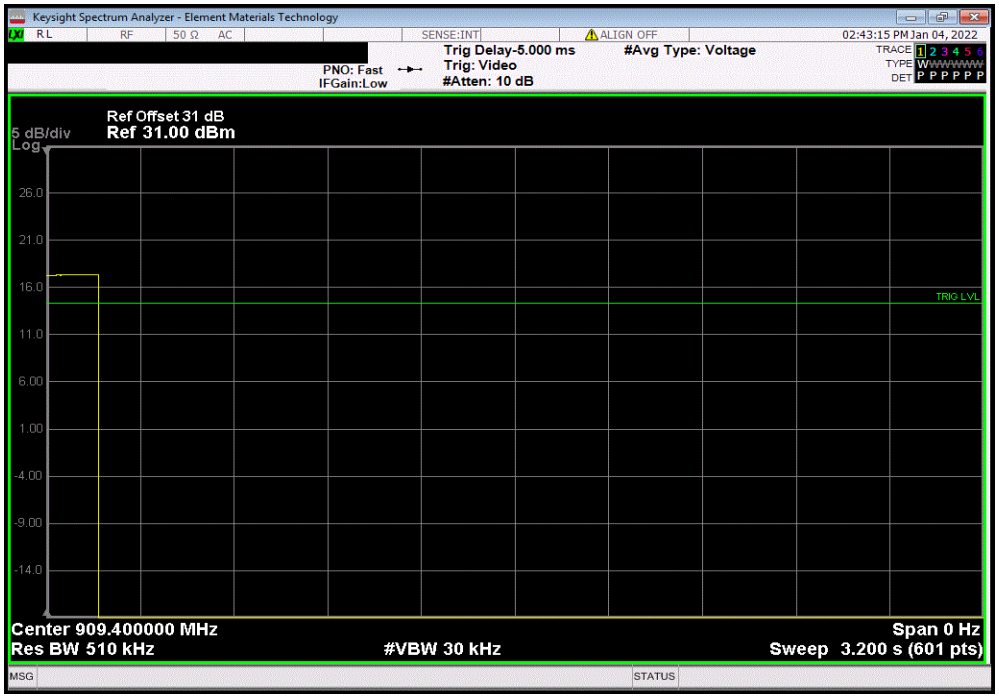
DWELL TIME

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz, Pulse Length						
		Pulse Width (ms)	Number of Pulses	Value (ms)	Limit (ms)	Results
		177	N/A	N/A	N/A	N/A



Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz, Pulse Length						
		Pulse Width (ms)	Number of Pulses	Value (ms)	Limit (ms)	Results
		177	1	177	400	Pass



BAND EDGE COMPLIANCE

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

TbtTx 2021.10.29.2 XMit 2020.12.30.0

EUT:	**RBS301**	**Work Order:**	**MLTI0234**
Serial Number:	**T4**	**Date:**	**4-Jan-22**
Customer:	**Multi-Tech Systems, Inc.**	**Temperature:**	**22.6 °C**
Attendees:	**Mike Fette**	**Humidity:**	**22.4% RH**
Project:	**None**	**Barometric Pres.:**	**1000 mbar**
Tested by:	**Andrew Rogstad**	**Power:** **Battery**	**Job Site:** **MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

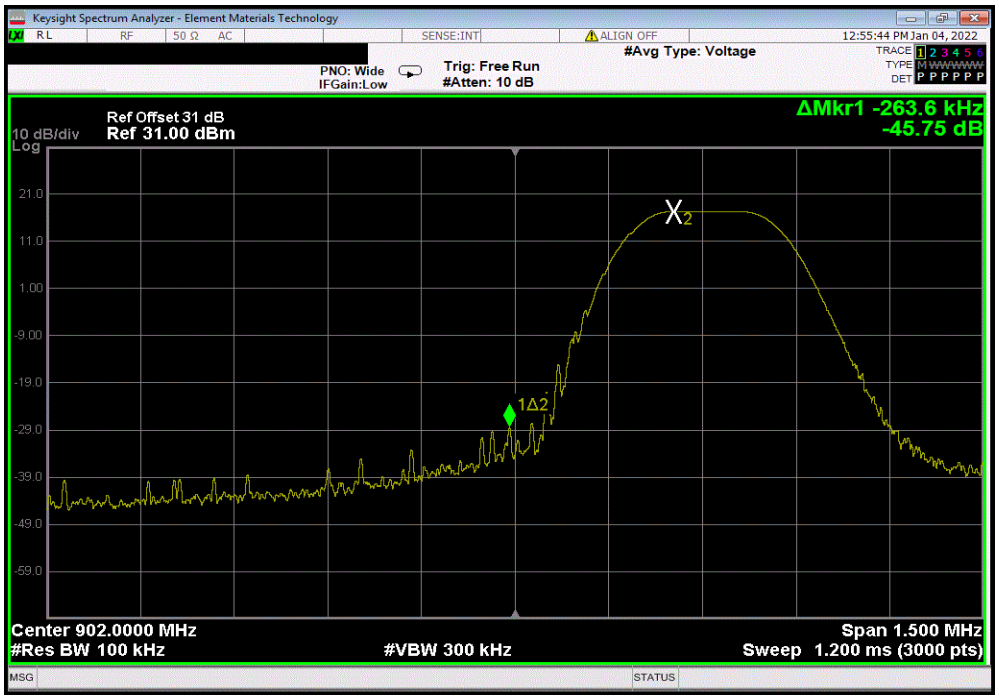
DEVIATIONS FROM TEST STANDARD

None

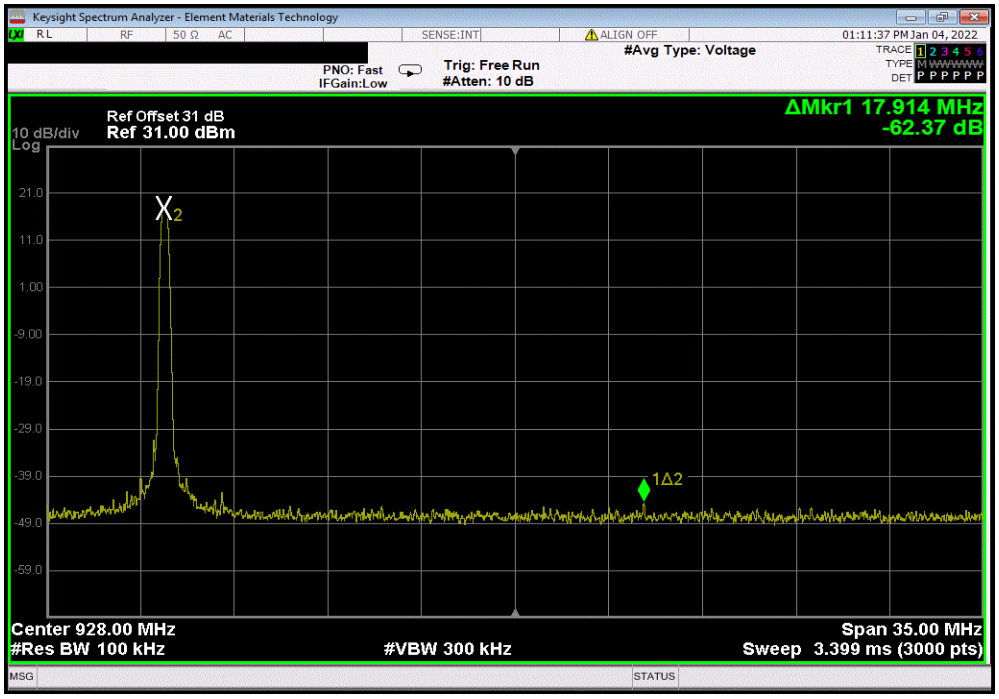
Configuration #	**3**	*Signature*

		Value (dBc)	**Limit ≤ (dBc)**	**Result**
Channel Bandwidth (125 kHz)				
Data Rate 3				
Low Channel, 902.3 MHz		-45.75	-30	Pass
High Channel, 914.9 MHz		-62.37	-30	Pass
Channel Bandwidth (500 kHz)				
Data Rate 4				
Low Channel, 903 MHz		-57.01	-30	Pass
High Channel, 914.2 MHz		-62.62	-30	Pass

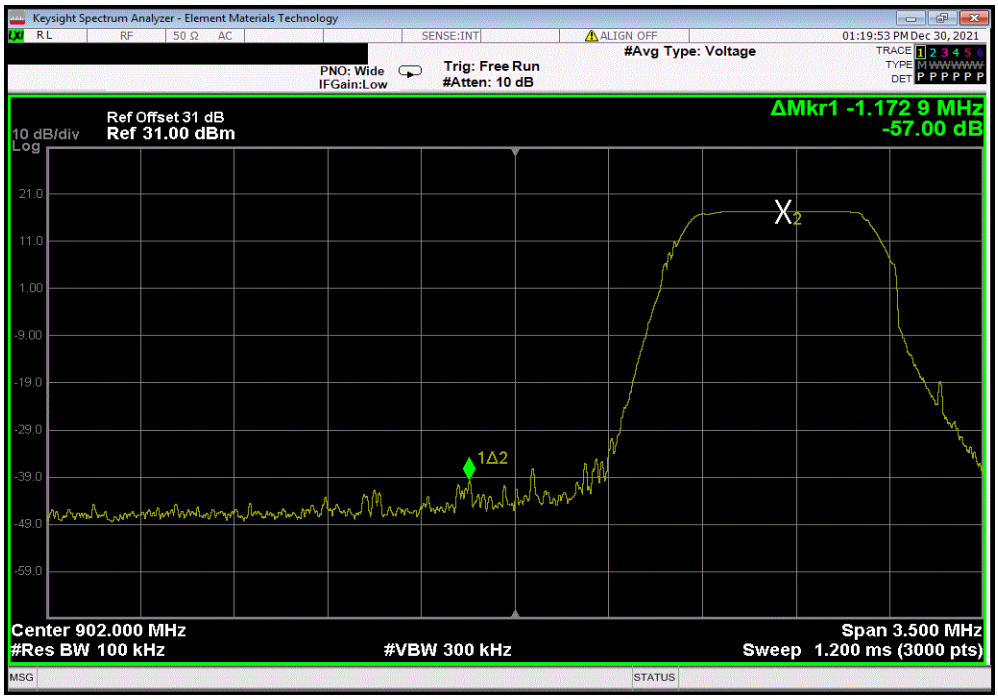
Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-45.75	-30	Pass



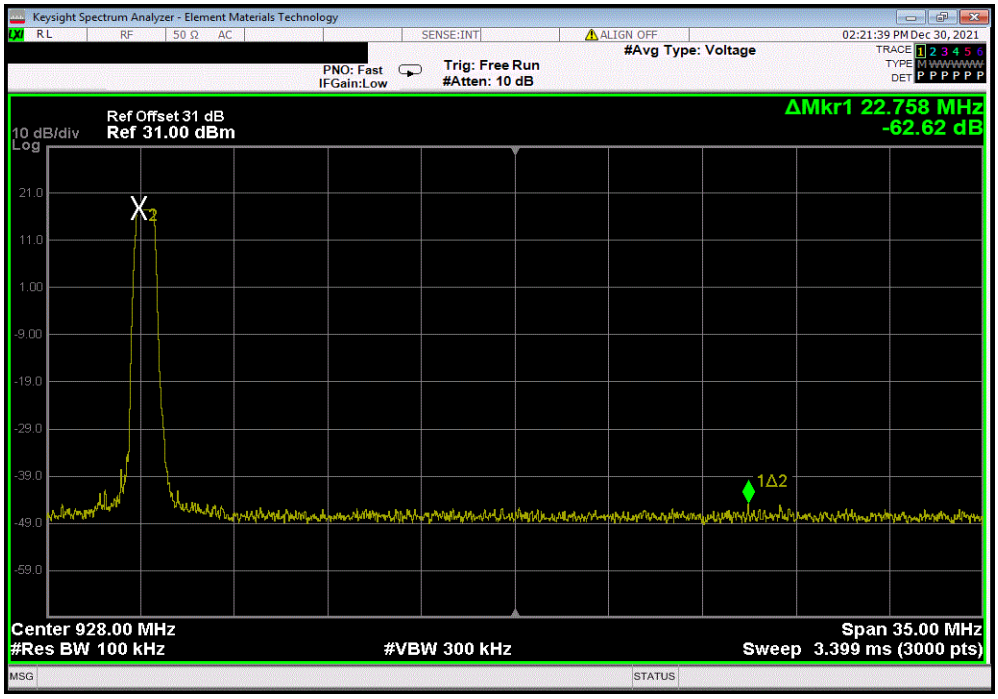
Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-62.37	-30	Pass



Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-57.01	-30	Pass



Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-62.62	-30	Pass



BAND EDGE COMPLIANCE - HOPPING MODE

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to its normal pseudo-random hopping sequence. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE - HOPPING MODE

TbtTx 2021.12.14.0 XMit 2020.12.30.0

EUT:	**RBS301**	**Work Order:**	**MLTI0234**
Serial Number:	**T4**	**Date:**	**4-Jan-22**
Customer:	**Multi-Tech Systems, Inc.**	**Temperature:**	**22.7 °C**
Attendees:	**Mike Fette**	**Humidity:**	**22.5% RH**
Project:	**None**	**Barometric Pres.:**	**1000 mbar**
Tested by:	**Andrew Rogstad**	**Power:** **Battery**	**Job Site:** **MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

DEVIATIONS FROM TEST STANDARD

None

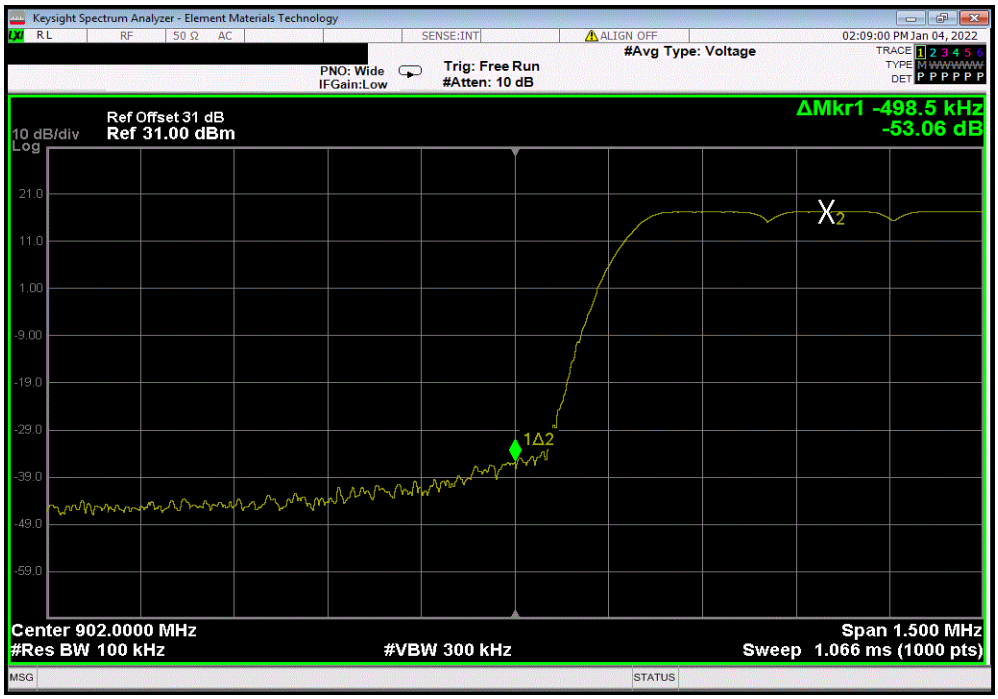
Configuration #	**3**	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
Hopping Mode (All Channels)			
Channel Bandwidth (125 kHz)			
Data Rate 3			
Low Channel, 902.3 MHz	-53.06	-30	Pass
High Channel, 914.9 MHz	-62.4	-30	Pass
Channel Bandwidth (500 kHz)			
Data Rate 4			
Low Channel, 903 MHz	-59.94	-30	Pass
High Channel, 914.2 MHz	-62.58	-30	Pass

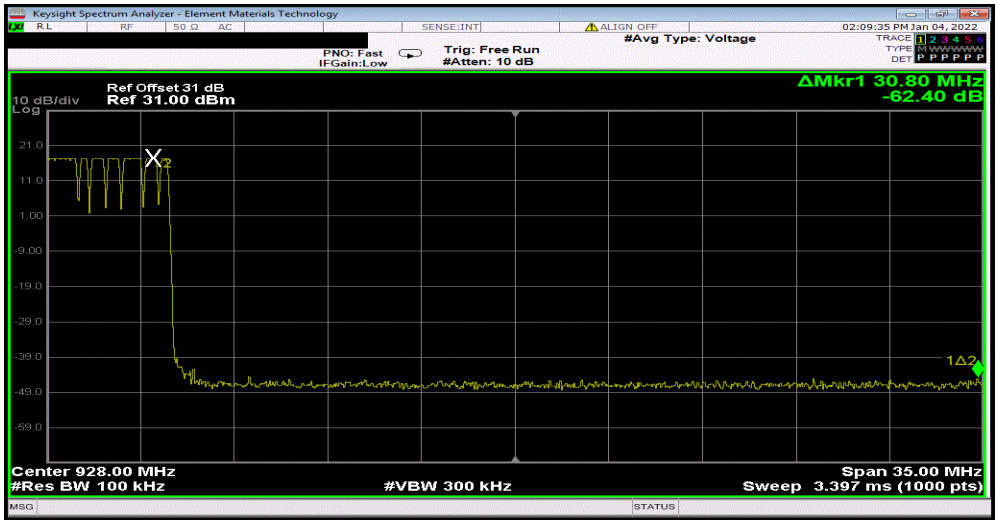
BAND EDGE COMPLIANCE - HOPPING MODE

TbtTx 2021.12.14.0 XMit 2020.12.30.0

Hopping Mode (All Channels), Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-53.06	-30	Pass



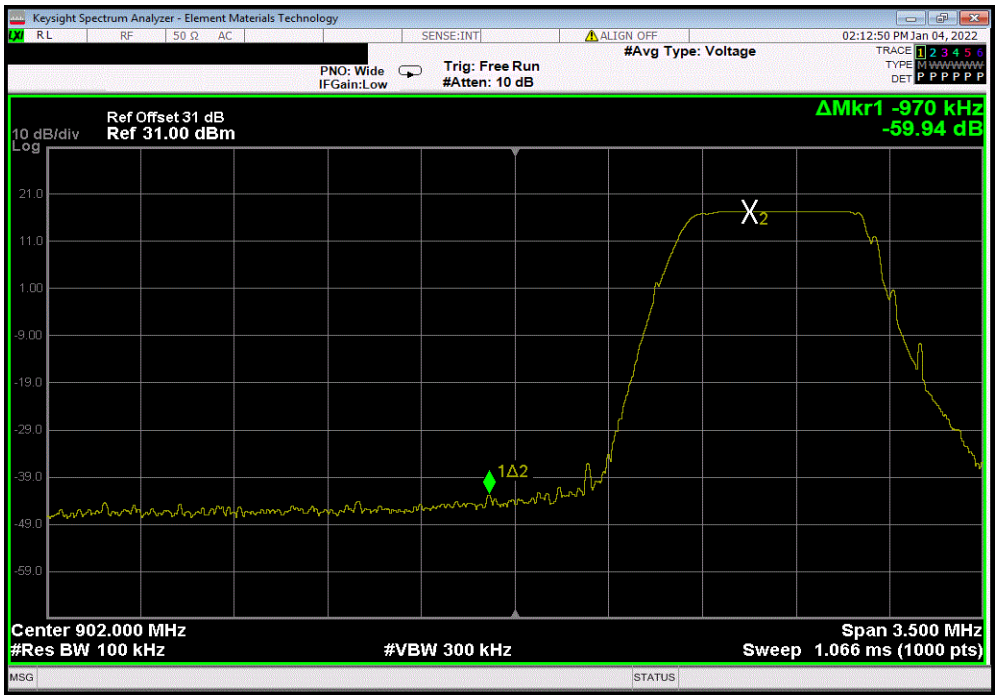
Hopping Mode (All Channels), Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-62.4	-30	Pass



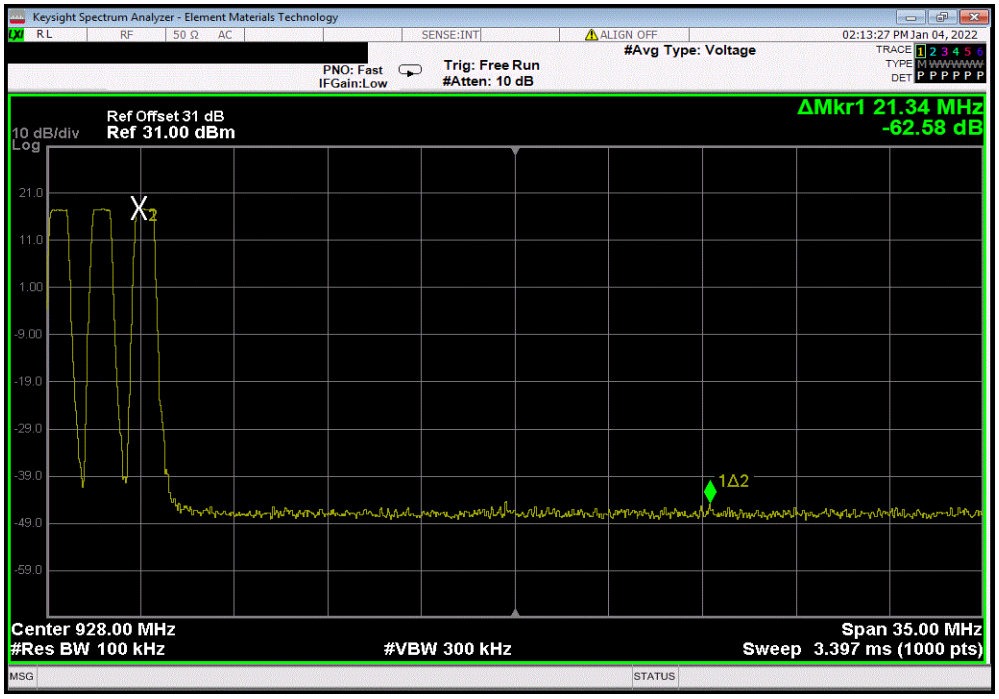
BAND EDGE COMPLIANCE - HOPPING MODE

TbtTx 2021.12.14.0 XMit 2020.12.30.0

Hopping Mode (All Channels), Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-59.94	-30	Pass



Hopping Mode (All Channels), Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-62.58	-30	Pass



POWER SPECTRAL DENSITY

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The power spectral density was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method AVGPSD-2 in section 11.10.5 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging and RMS detection across ON and OFF times of the EUT transmissions. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times. This method is allowed as the same method has been used to determine the conducted output power.

POWER SPECTRAL DENSITY

TbtTx 2021.10.29.2 XMit 2020.12.30.0

EUT:	RBS301	Work Order:	MLTI0234
Serial Number:	T4	Date:	4-Jan-22
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.7 °C
Attendees:	Mike Fette	Humidity:	22.6% RH
Project:	None	Barometric Pres.:	1000 mbar
Tested by:	Andrew Rogstad	Power: Battery	Job Site: MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable. Per an FCC inquiry an average detector was used to make the power measurement on the Hybrid device per ANSI C63.10:2013 section 11.1.

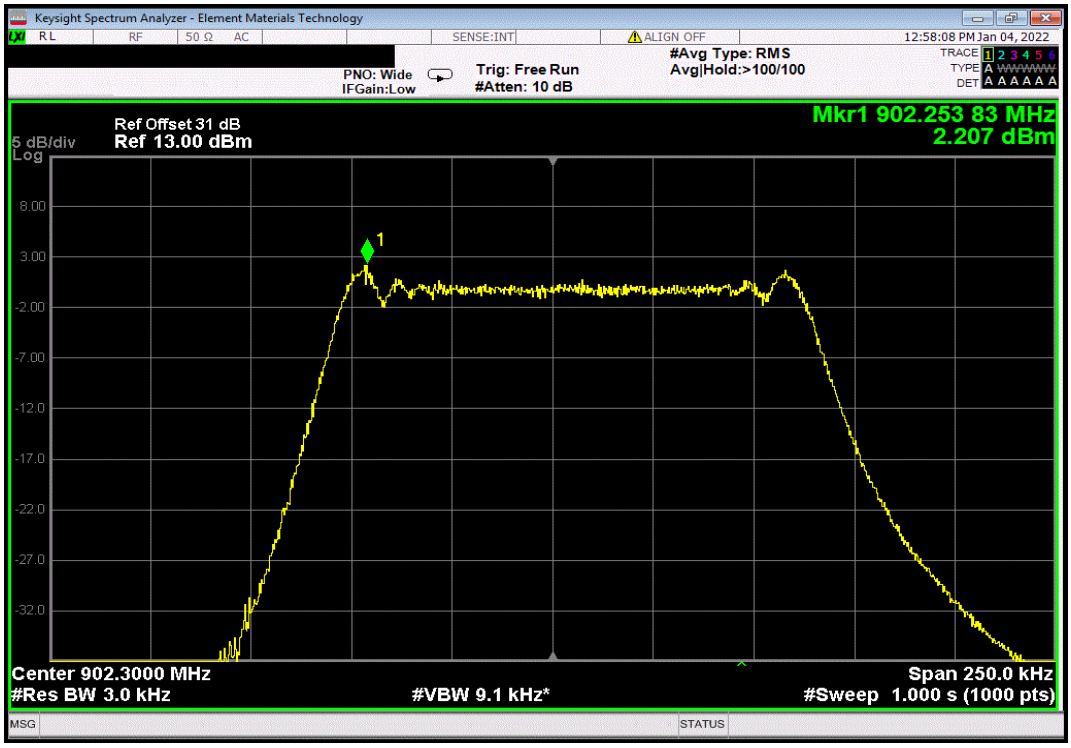
DEVIATIONS FROM TEST STANDARD

None

Configuration #	3	Signature

	Measures PSD dBm/3kHz	Duty Cycle Correction (dB)	Value dBm/3kHz	Limit dBm/3kHz	Results
Channel Bandwidth (125 kHz)					
Data Rate 3					
Low Channel, 902.3 MHz	2.207	1.4	3.607	8	Pass
Mid Channel, 908.7 MHz	2.06	1.4	3.46	8	Pass
High Channel, 914.9 MHz	1.989	1.4	3.389	8	Pass
Channel Bandwidth (500 kHz)					
Data Rate 4					
Low Channel, 903 MHz	-5.559	2.6	-2.959	8	Pass
Mid Channel, 909.4 MHz	-5.449	2.6	-2.849	8	Pass
High Channel, 914.2 MHz	-5.362	2.6	-2.762	8	Pass

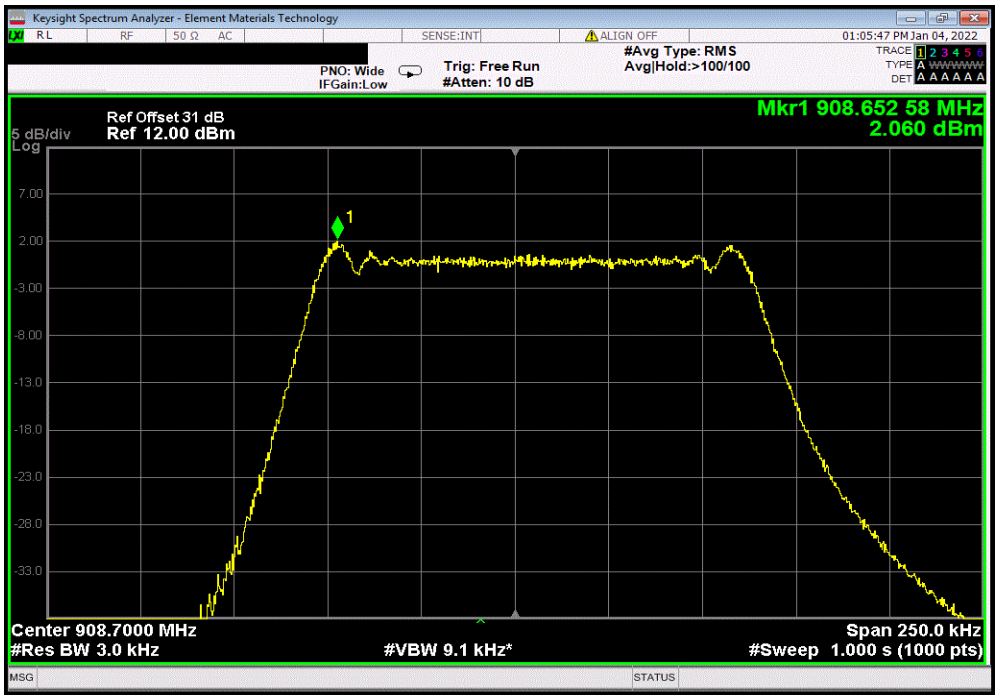
Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
		Measures PSD dBm/3kHz	Duty Cycle Correction (dB)	Value dBm/3kHz	Limit dBm/3kHz	Results
		2.207	1.4	3.607	8	Pass



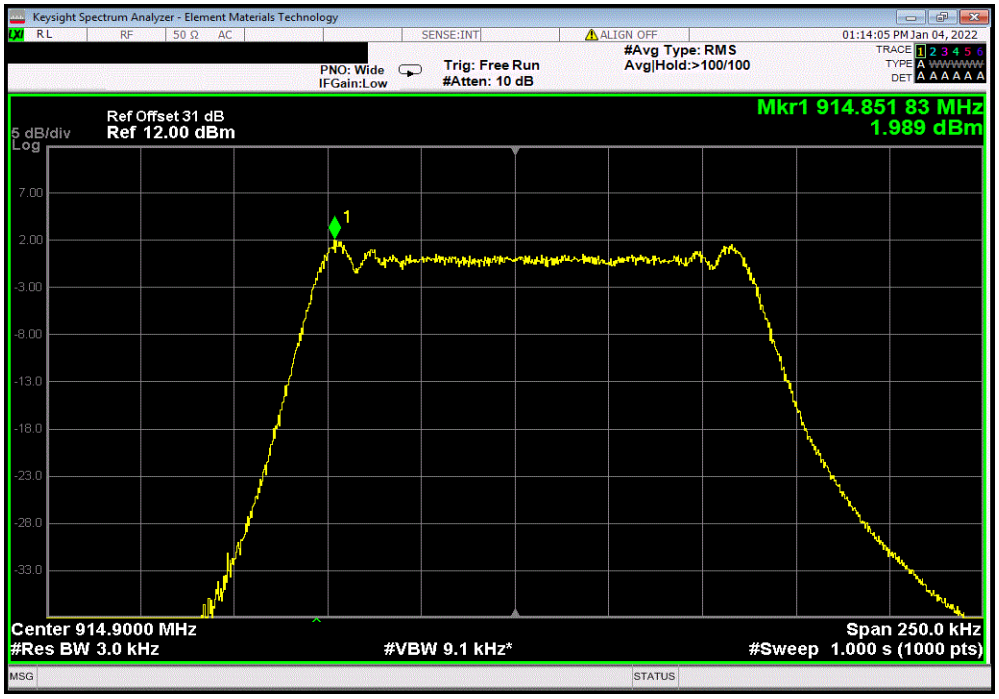
POWER SPECTRAL DENSITY

TbtTx 2021.10.29.2 XMit 2020.12.30.0

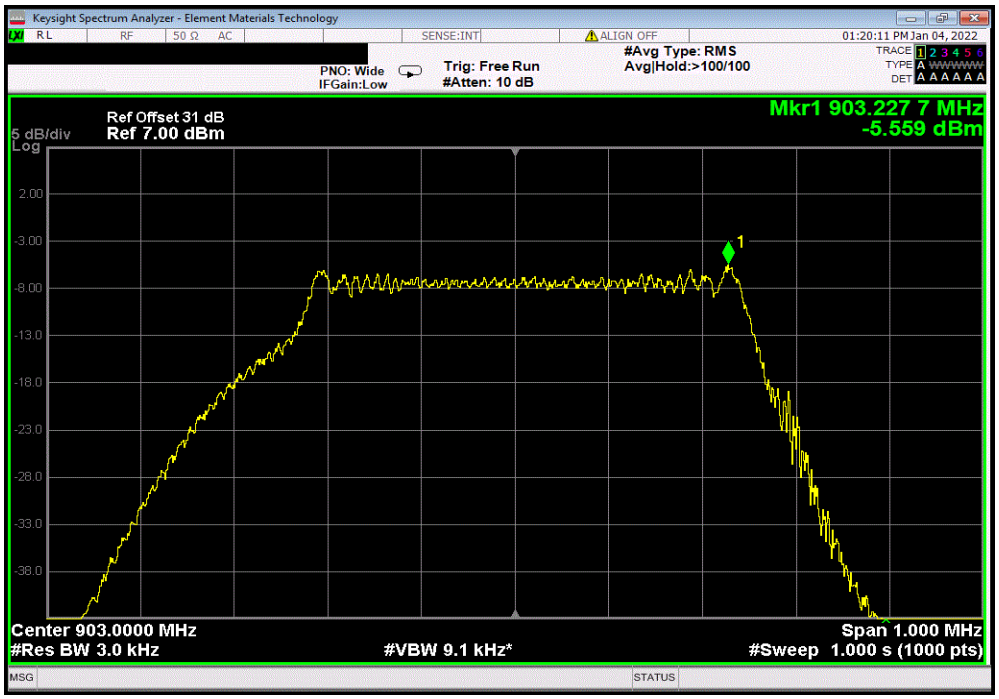
Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz						
		Measures PSD dBm/3kHz	Duty Cycle Correction (dB)	Value dBm/3kHz	Limit dBm/3kHz	Results
		2.06	1.4	3.46	8	Pass



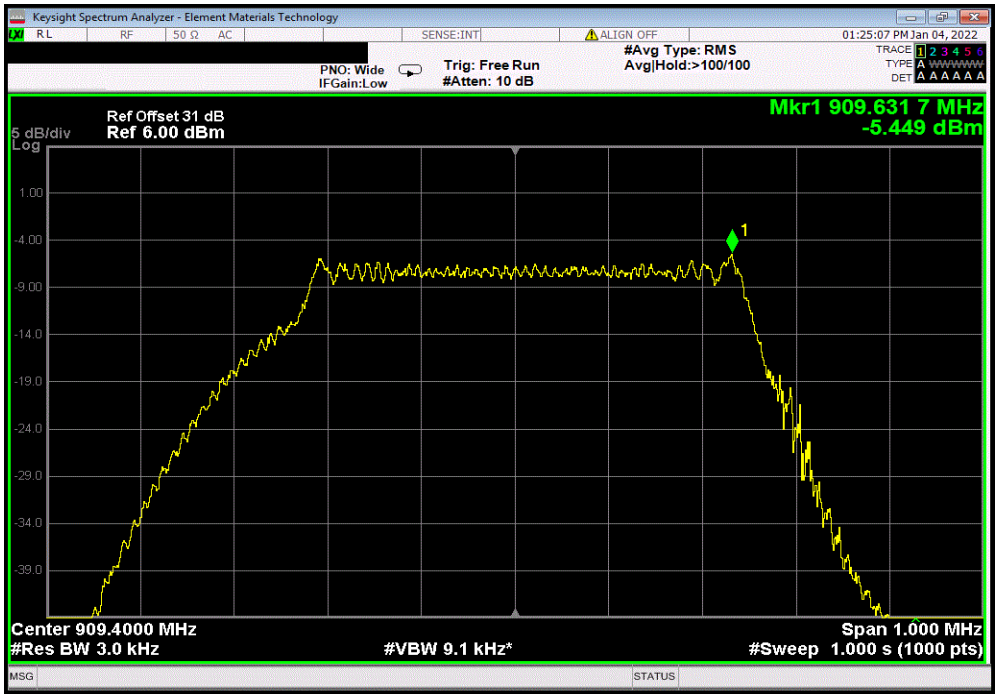
Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
		Measures PSD dBm/3kHz	Duty Cycle Correction (dB)	Value dBm/3kHz	Limit dBm/3kHz	Results
		1.989	1.4	3.389	8	Pass



Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
		Measures PSD dBm/3kHz	Duty Cycle Correction (dB)	Value dBm/3kHz	Limit dBm/3kHz	Results
		-5.559	2.6	-2.959	8	Pass



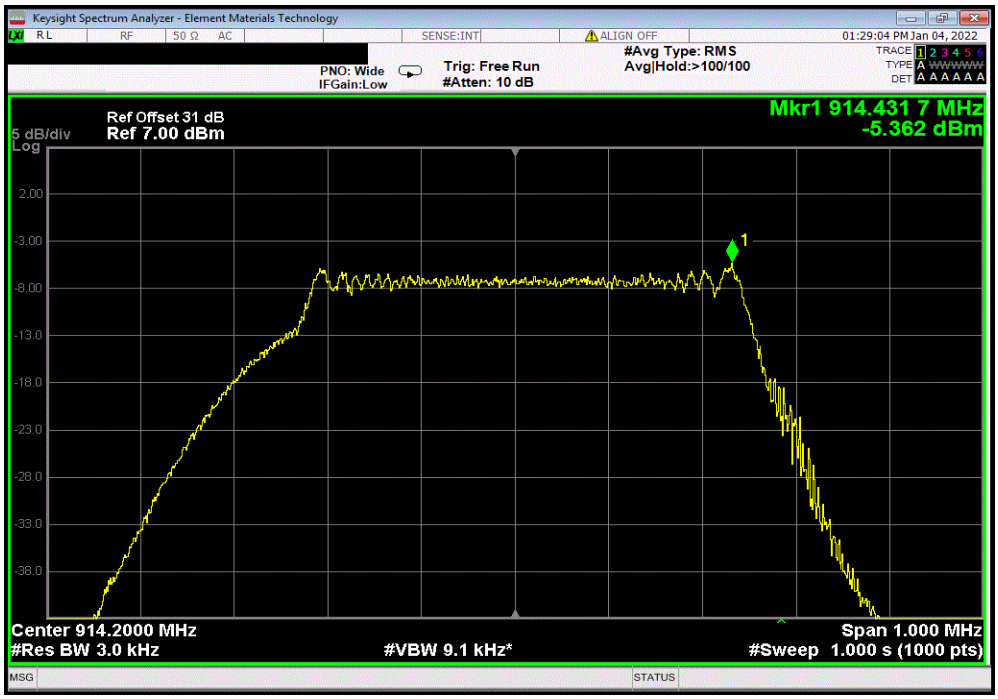
Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz						
		Measures PSD dBm/3kHz	Duty Cycle Correction (dB)	Value dBm/3kHz	Limit dBm/3kHz	Results
		-5.449	2.6	-2.849	8	Pass



POWER SPECTRAL DENSITY

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
		Measures PSD dBm/3kHz	Duty Cycle Correction (dB)	Value dBm/3kHz	Limit dBm/3kHz	Results
		-5.362	2.6	-2.762	8	Pass



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DUTY CYCLE

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.

DUTY CYCLE

TbtTx 2021.10.29.2 XMit 2020.12.30.0

EUT:	RBS301	Work Order:	MLTI0234
Serial Number:	T4	Date:	4-Jan-22
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.6 °C
Attendees:	Mike Fette	Humidity:	22.6% RH
Project:	None	Barometric Pres.:	1000 mbar
Tested by:	Andrew Rogstad	Power: Battery	Job Site: MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

DEVIATIONS FROM TEST STANDARD

None

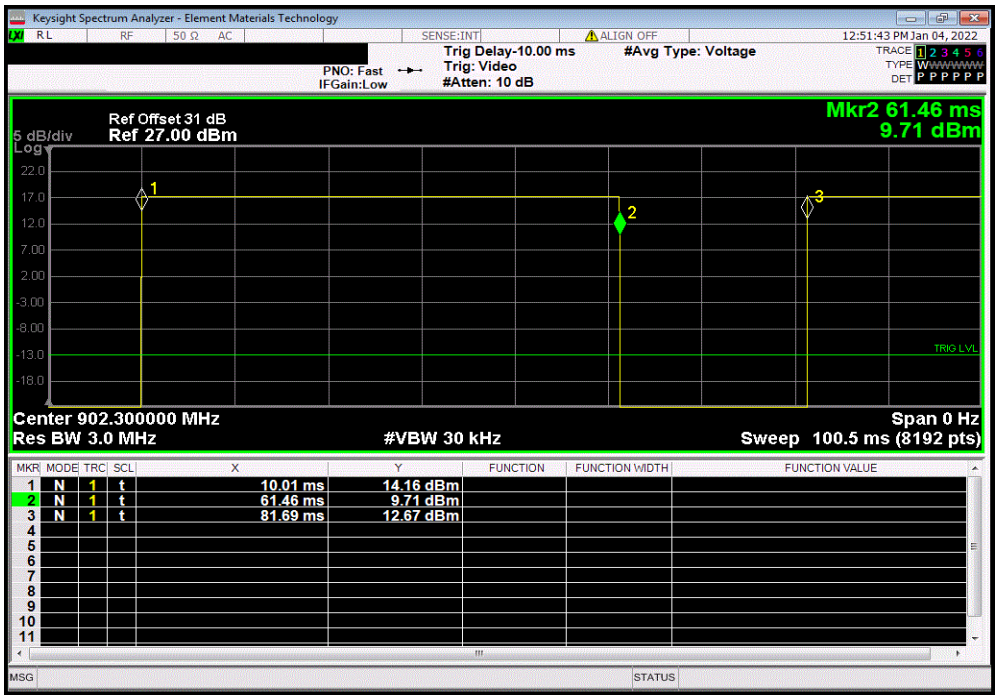
Configuration #	3	Signature

	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
Channel Bandwidth (125 kHz)						
Data Rate 3						
Low Channel, 902.3 MHz	51.449 ms	71.678 ms	1	71.8	N/A	N/A
Low Channel, 902.3 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 908.7 MHz	51.46 ms	71.677 ms	1	71.8	N/A	N/A
Mid Channel, 908.7 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel, 914.9 MHz	51.46 ms	71.665 ms	1	71.8	N/A	N/A
High Channel, 914.9 MHz	N/A	N/A	5	N/A	N/A	N/A
Channel Bandwidth (500 kHz)						
Data Rate 4						
Low Channel, 903 MHz	23.187 ms	41.819 ms	1	55.4	N/A	N/A
Low Channel, 903 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 909.4 MHz	23.179 ms	41.799 ms	1	55.5	N/A	N/A
Mid Channel, 909.4 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel, 914.2 MHz	23.186 ms	41.819 ms	1	55.4	N/A	N/A
High Channel, 914.2 MHz	N/A	N/A	5	N/A	N/A	N/A

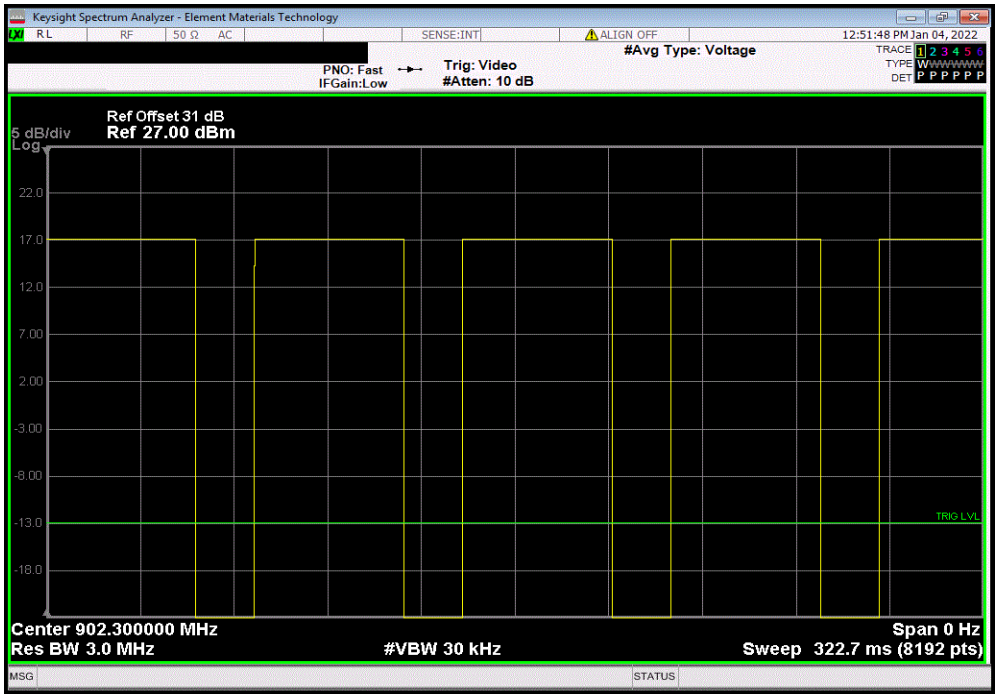
DUTY CYCLE

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	51.449 ms	71.678 ms	1	71.8	N/A	N/A



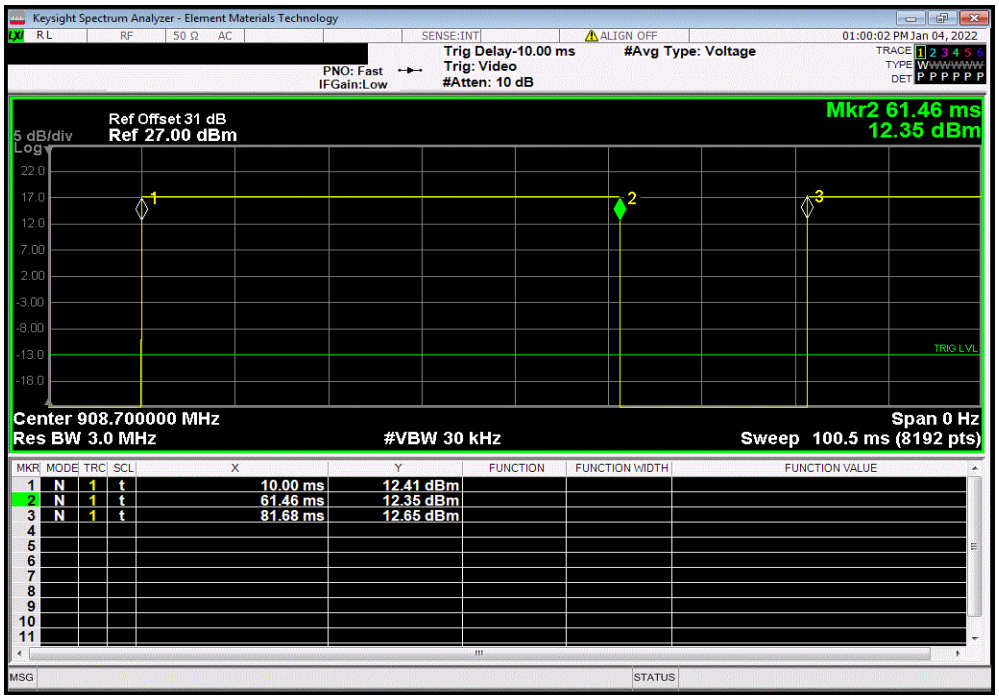
Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



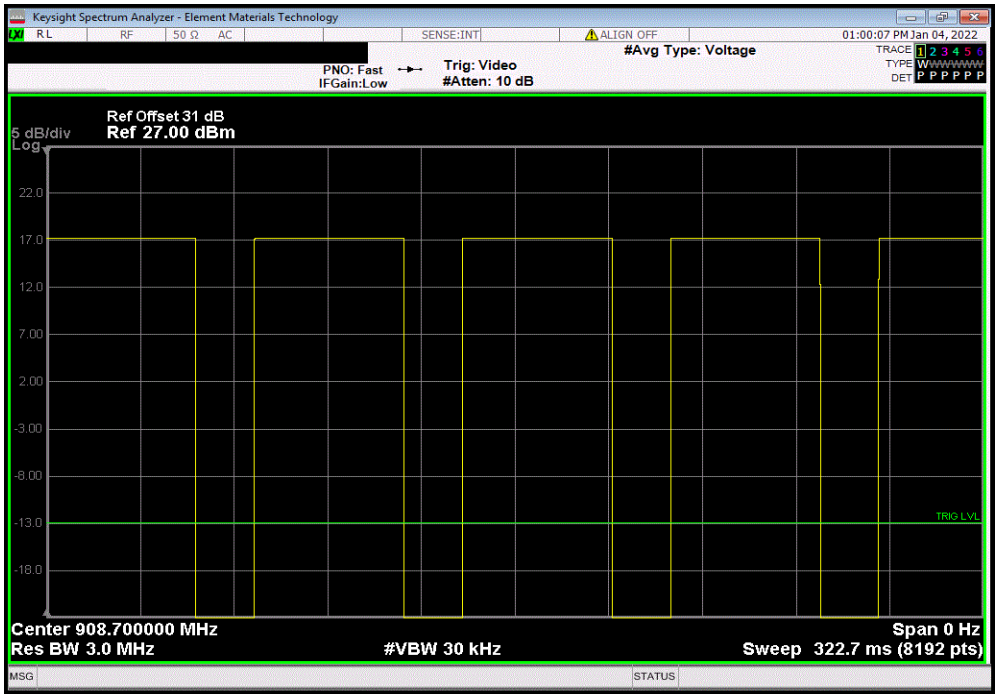
DUTY CYCLE

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	51.46 ms	71.677 ms	1	71.8	N/A	N/A



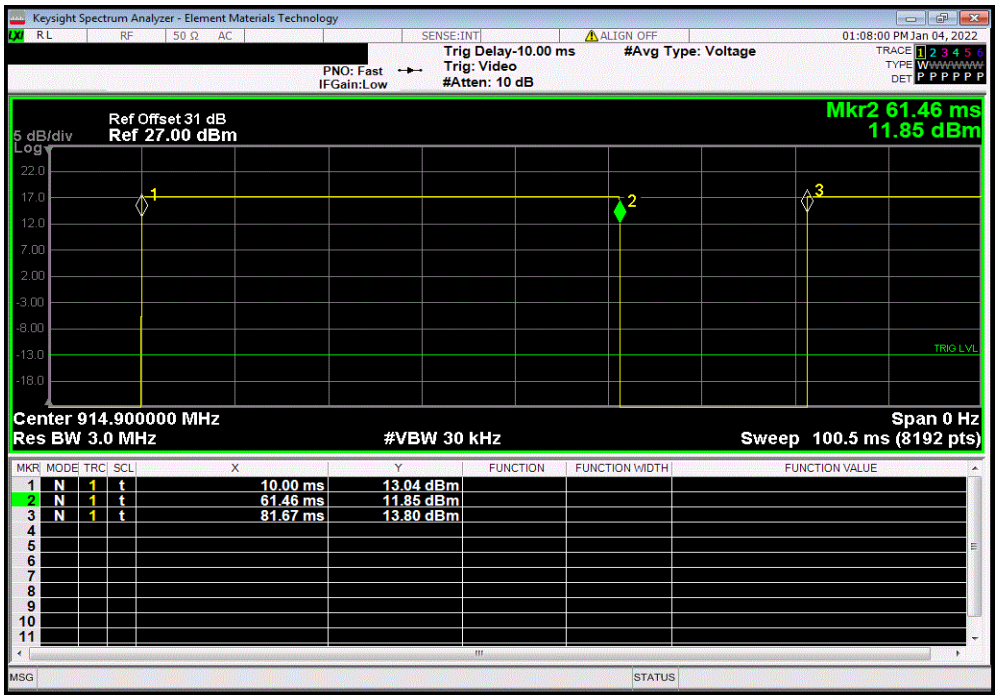
Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



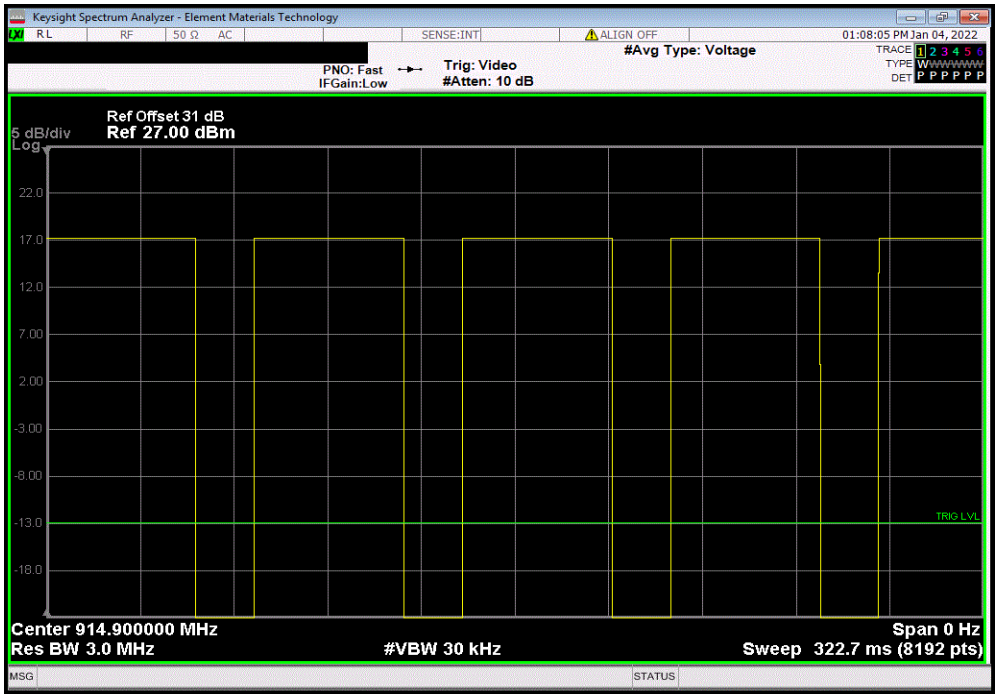
DUTY CYCLE

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	51.46 ms	71.665 ms	1	71.8	N/A	N/A



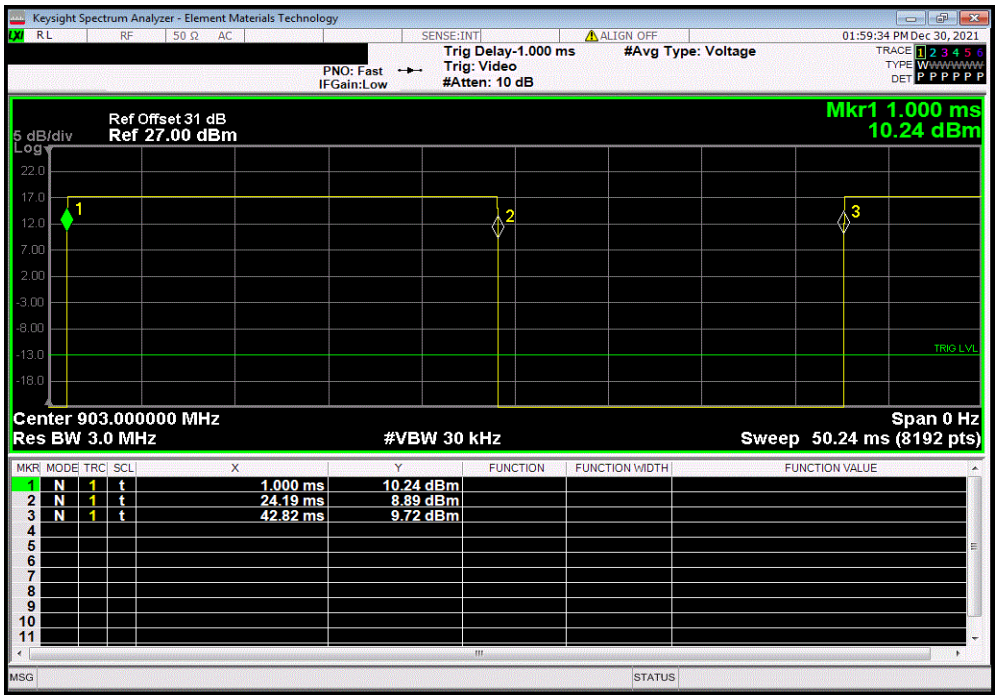
Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



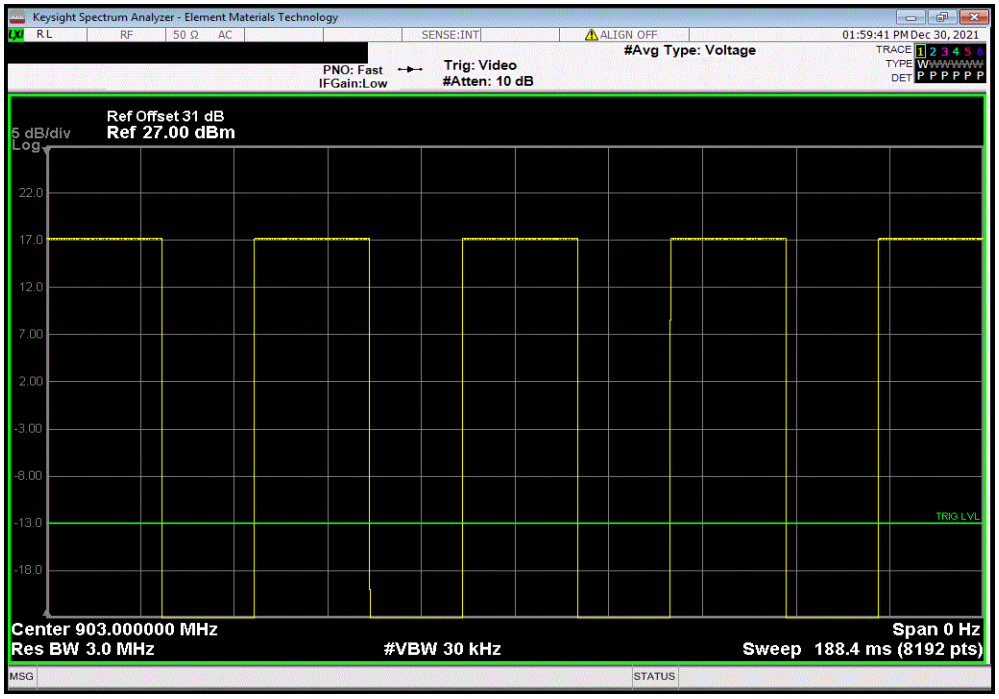
DUTY CYCLE

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	23.187 ms	41.819 ms	1	55.4	N/A	N/A



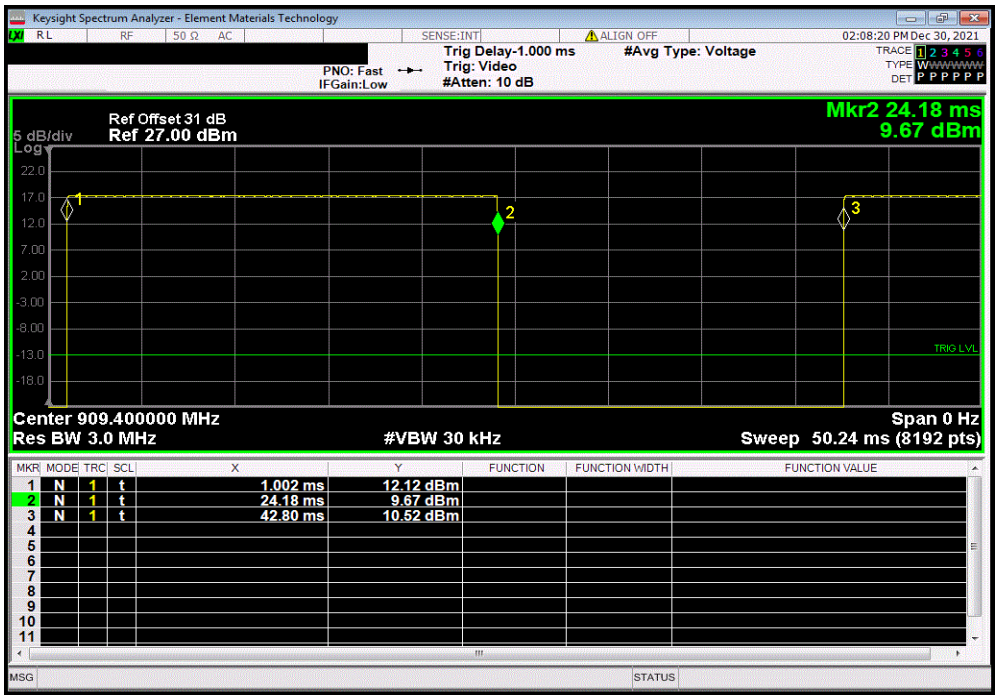
Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



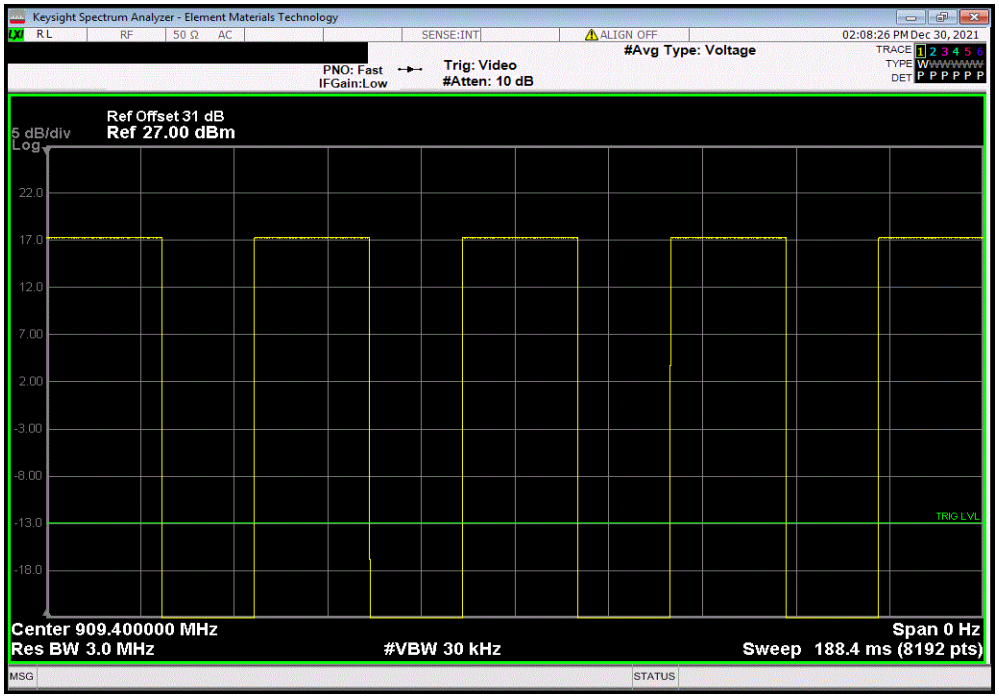
DUTY CYCLE

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	23.179 ms	41.799 ms	1	55.5	N/A	N/A



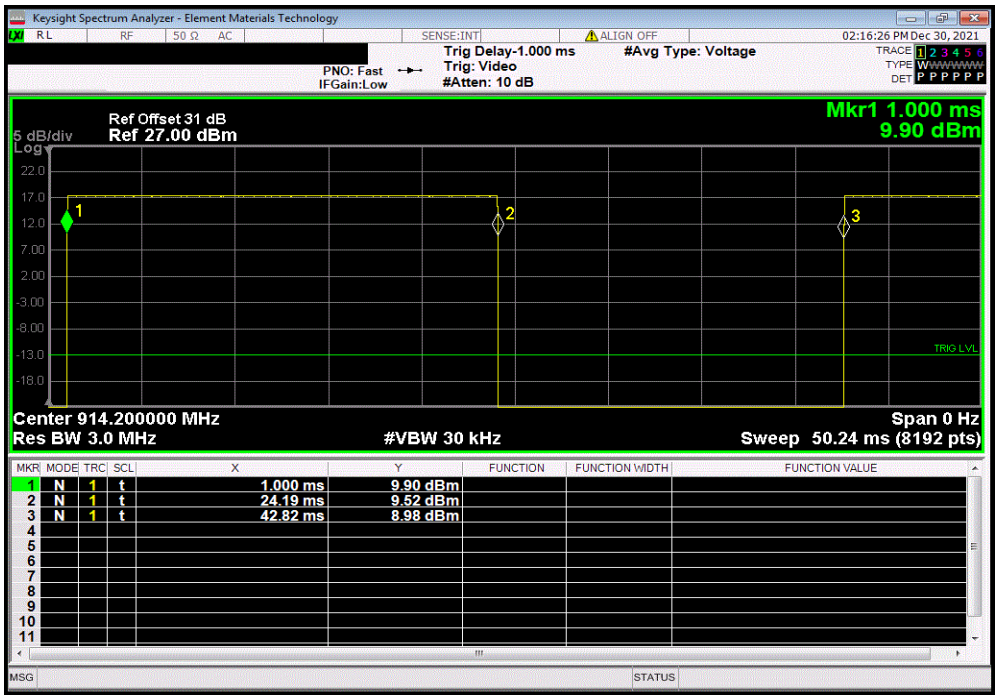
Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



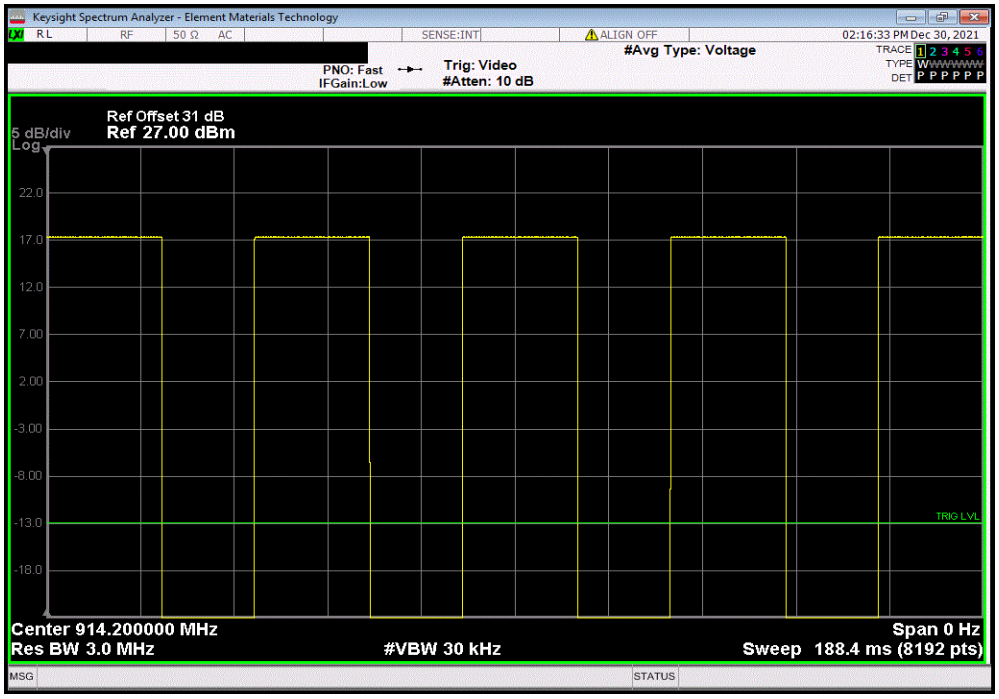
DUTY CYCLE

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	23.186 ms	41.819 ms	1	55.4	N/A	N/A



Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



EMISSIONS BANDWIDTH (20 dB)

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The 20 dB emissions bandwidth was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

EMISSIONS BANDWIDTH (20 dB)

TbtTx 2021.10.29.2 XMit 2020.12.30.0

EUT:	**RBS301**	**Work Order:**	**MLTI0234**
Serial Number:	**T4**	**Date:**	**4-Jan-22**
Customer:	**Multi-Tech Systems, Inc.**	**Temperature:**	**22.6 °C**
Attendees:	**Mike Fette**	**Humidity:**	**22.6% RH**
Project:	**None**	**Barometric Pres.:**	**1000 mbar**
Tested by:	**Andrew Rogstad**	**Power:** **Battery**	**Job Site:** **MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

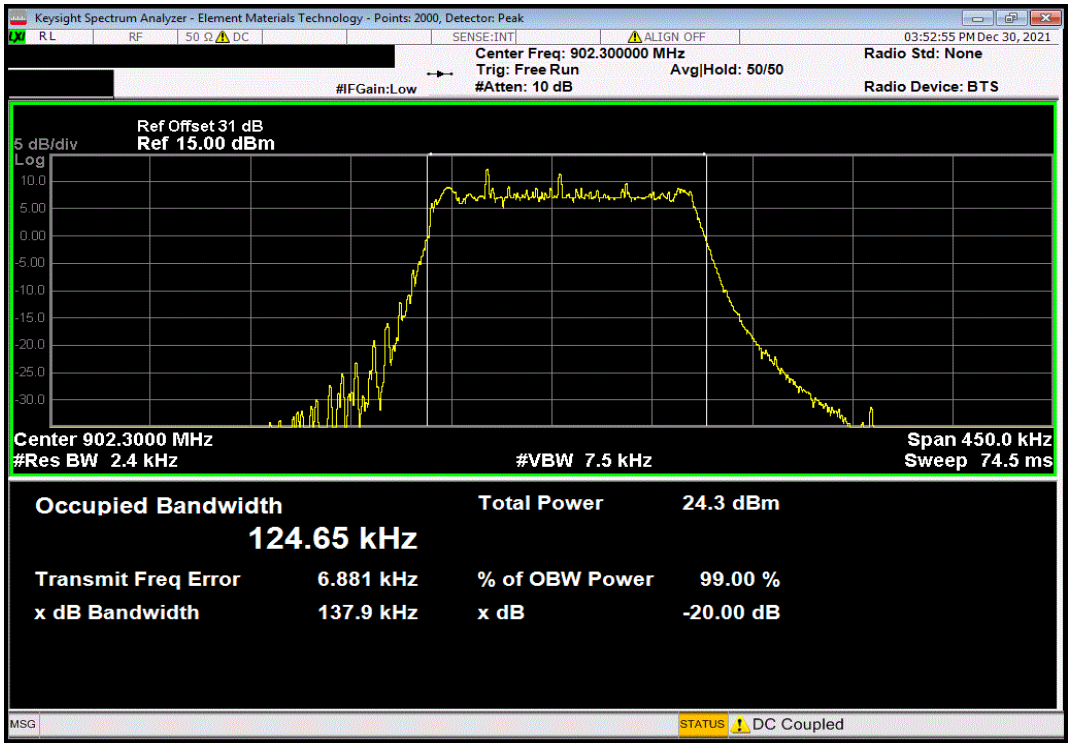
DEVIATIONS FROM TEST STANDARD

None

Configuration #	**3**	*Signature*

		Value	**Limit (<)**	**Result**
Channel Bandwidth (125 kHz)				
	Data Rate 3			
	Low Channel, 902.3 MHz	137.901 kHz	N/A	N/A
	Mid Channel, 908.7 MHz	141.198 kHz	N/A	N/A
	High Channel, 914.9 MHz	139.485 kHz	N/A	N/A
Channel Bandwidth (500 kHz)				
	Data Rate 4			
	Low Channel, 903 MHz	720.054 kHz	N/A	N/A
	Mid Channel, 909.4 MHz	707.6 kHz	N/A	N/A
	High Channel, 914.2 MHz	698.276 kHz	N/A	N/A

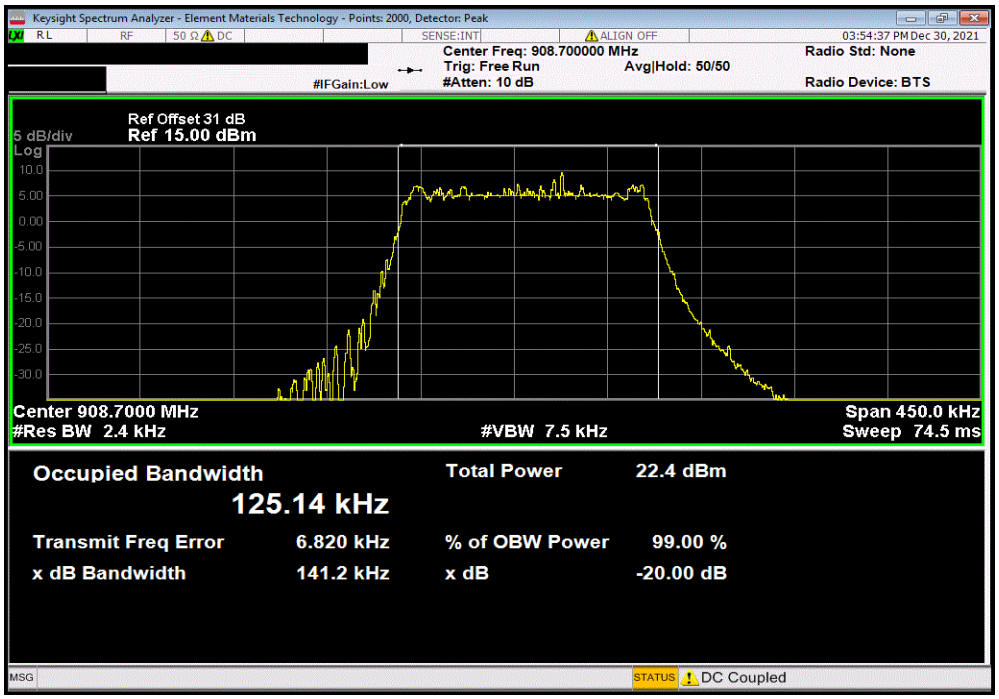
Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
				Value	Limit (<)	Result
				137.901 kHz	N/A	N/A



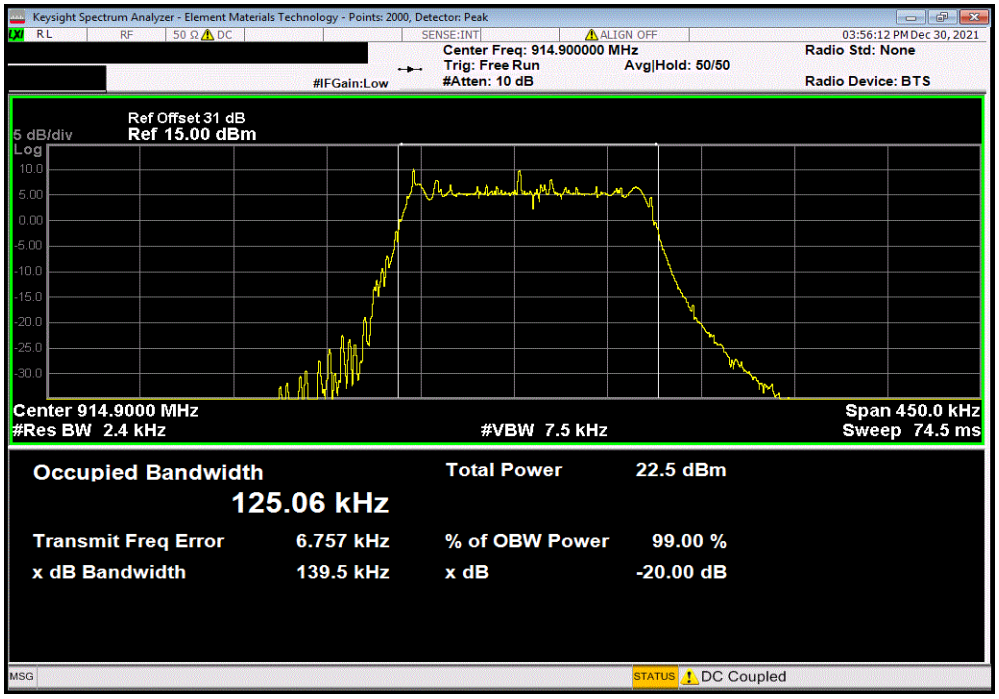
EMISSIONS BANDWIDTH (20 dB)

TbtTx 2021.10.29.2 XMit 2020.12.30.0

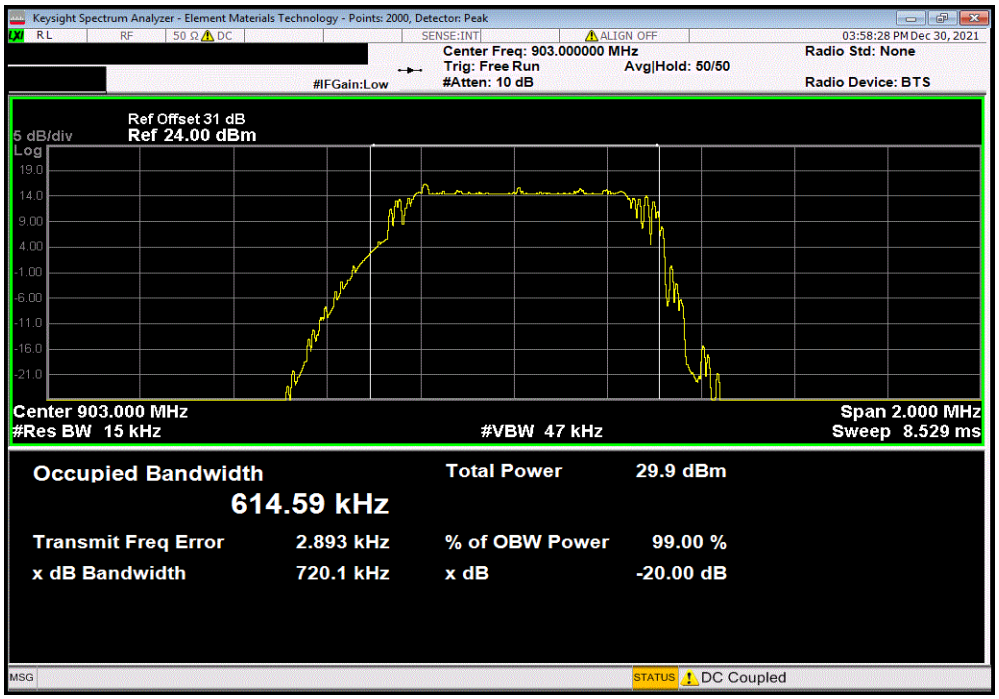
Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz						
				Value	Limit (<)	Result
				141.198 kHz	N/A	N/A



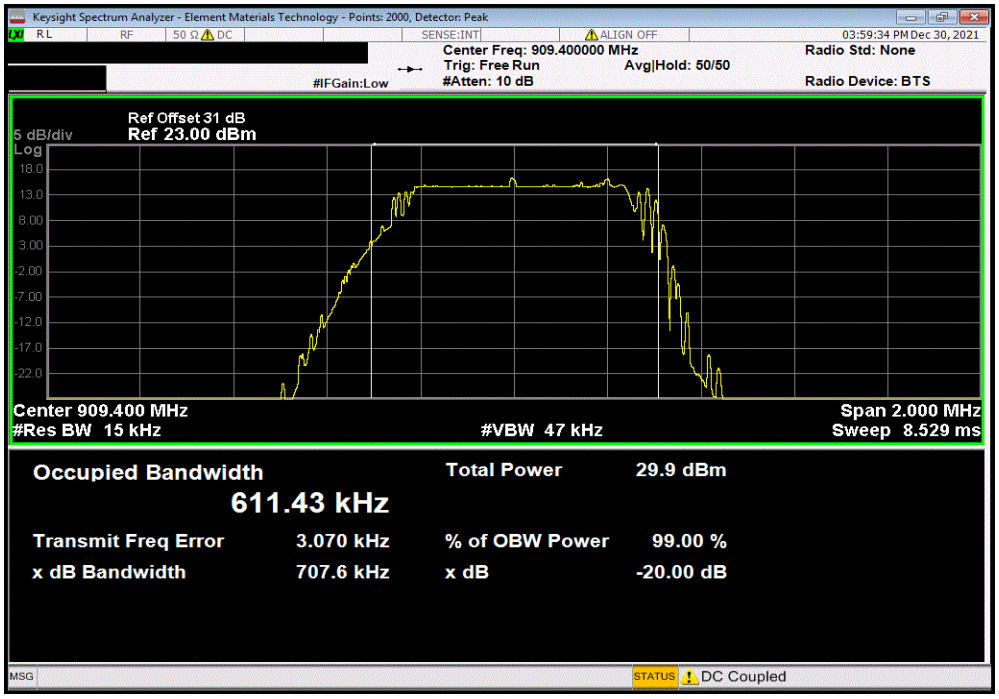
Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
				Value	Limit (<)	Result
				139.485 kHz	N/A	N/A



Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
				Value	Limit (<)	Result
				720.054 kHz	N/A	N/A



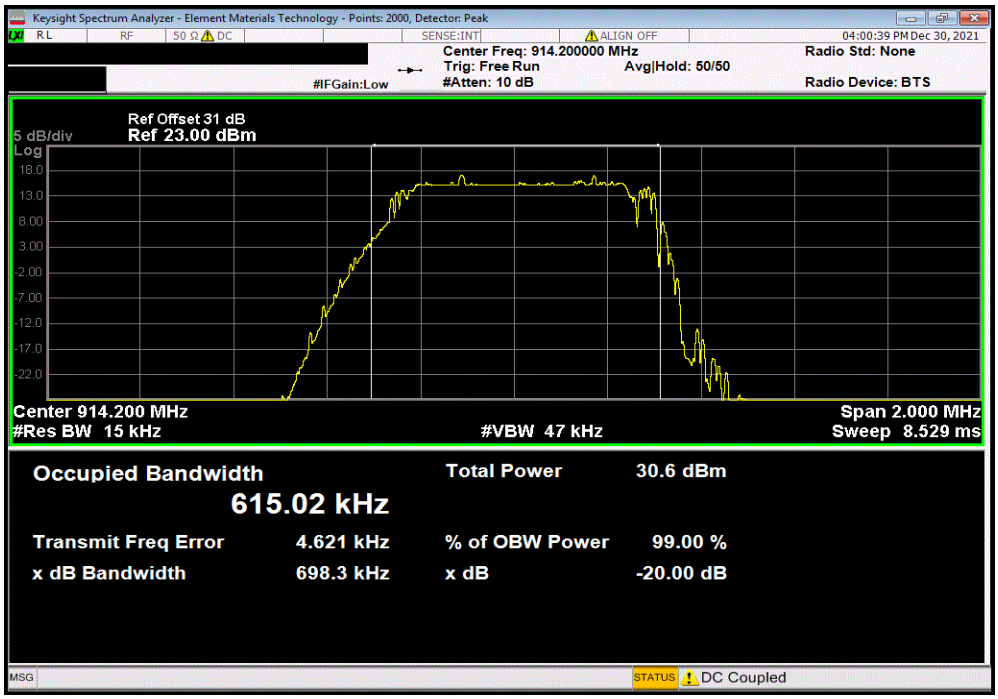
Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz						
				Value	Limit (<)	Result
				707.6 kHz	N/A	N/A



EMISSIONS BANDWIDTH (20 dB)

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
				Value	Limit (<)	Result
				698.276 kHz	N/A	N/A



OCCUPIED BANDWIDTH (99%)

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	D150A-1-0720-200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was made with a direction connection between the spectrum analyzer and the antenna port of the EUT. The 99% occupied bandwidth was measured with the EUT configured for continuous modulated operation.

Per ANSI C63.10:2013, 6.9.3, the spectrum analyzer was configured as follows:

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) of the spectrum analyzer was set to the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) bandwidth was set to at least 3 times the resolution bandwidth. The analyzer sweep time was set to auto to prevent video filtering or averaging. A sample detector was used unless the device was not able to be operated in a continuous transmit mode, in which case a peak detector was used.

The spectrum analyzer occupied bandwidth measurement function was used to sum the power of the transmission in linear terms to obtain the 99% bandwidth.

OCCUPIED BANDWIDTH (99%)

TbtTx 2021.10.29.2 XMit 2020.12.30.0

EUT:	**RBS301**	**Work Order:**	**MLTI0234**
Serial Number:	**T4**	**Date:**	**4-Jan-22**
Customer:	**Multi-Tech Systems, Inc.**	**Temperature:**	**22.6 °C**
Attendees:	**Mike Fette**	**Humidity:**	**22.6% RH**
Project:	**None**	**Barometric Pres.:**	**1000 mbar**
Tested by:	**Andrew Rogstad**	**Power:** **Battery**	**Job Site:** **MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

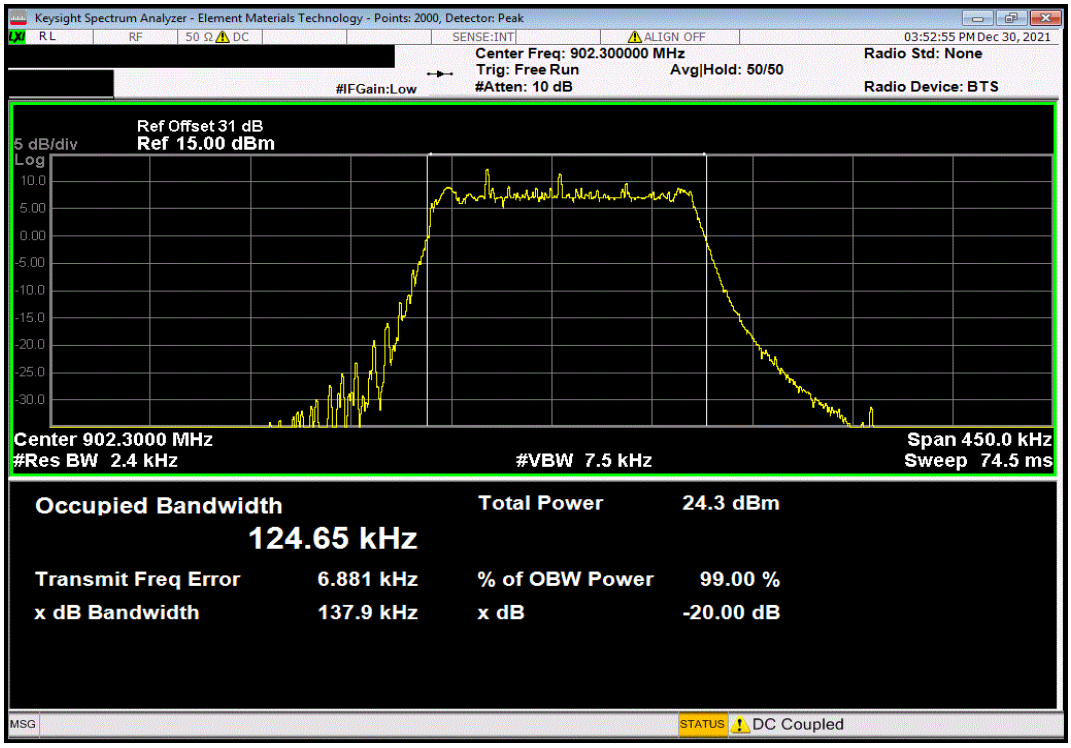
DEVIATIONS FROM TEST STANDARD

None

Configuration #	**3**	*Signature*

		Value (kHz)	**Limit (<)**	**Result**
Channel Bandwidth (125 kHz)				
Data Rate 3				
	Low Channel, 902.3 MHz	124.65	N/A	N/A
	Mid Channel, 908.7 MHz	125.14	N/A	N/A
	High Channel, 914.9 MHz	125.06	N/A	N/A
Channel Bandwidth (500 kHz)				
Data Rate 4				
	Low Channel, 903 MHz	614.59	N/A	N/A
	Mid Channel, 909.4 MHz	611.43	N/A	N/A
	High Channel, 914.2 MHz	615.02	N/A	N/A

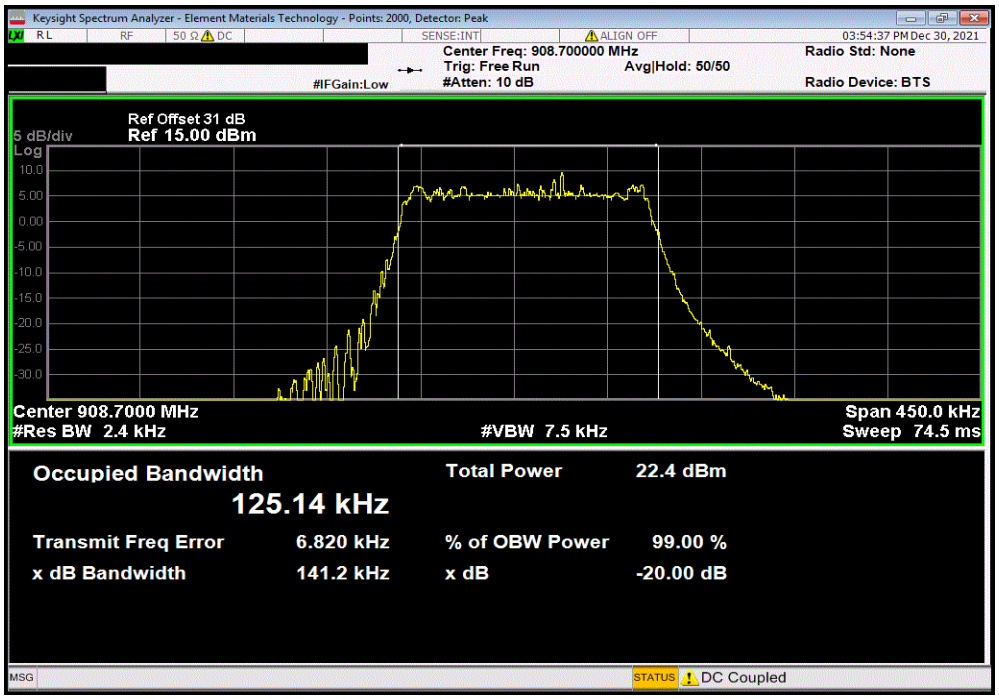
Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
				Value (kHz)	Limit (<)	Result
				124.65	N/A	N/A



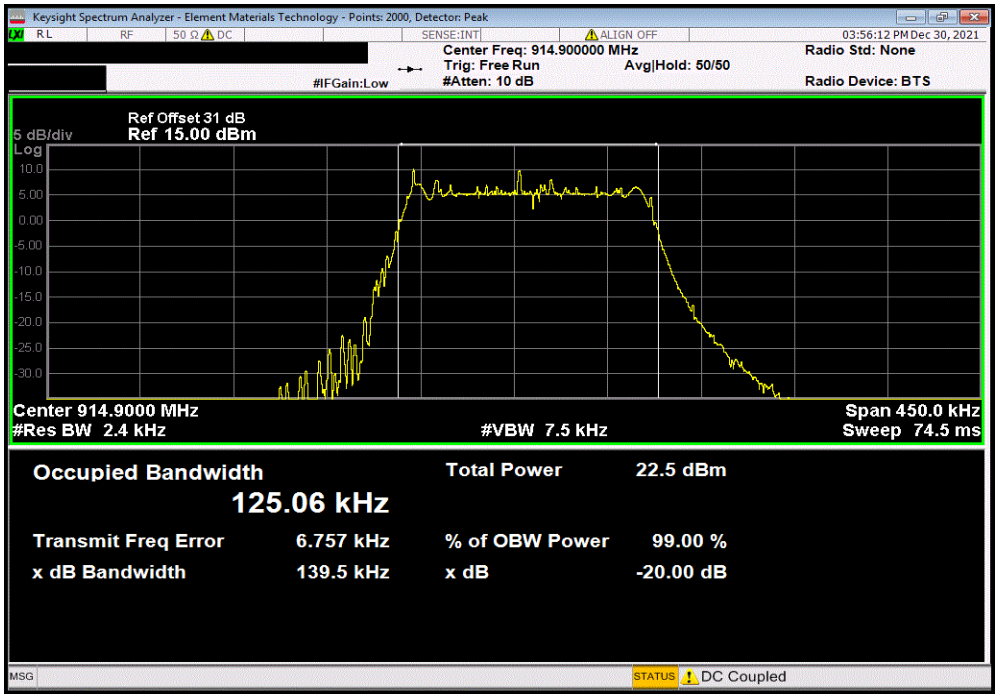
OCCUPIED BANDWIDTH (99%)

TbtTx 2021.10.29.2 XMit 2020.12.30.0

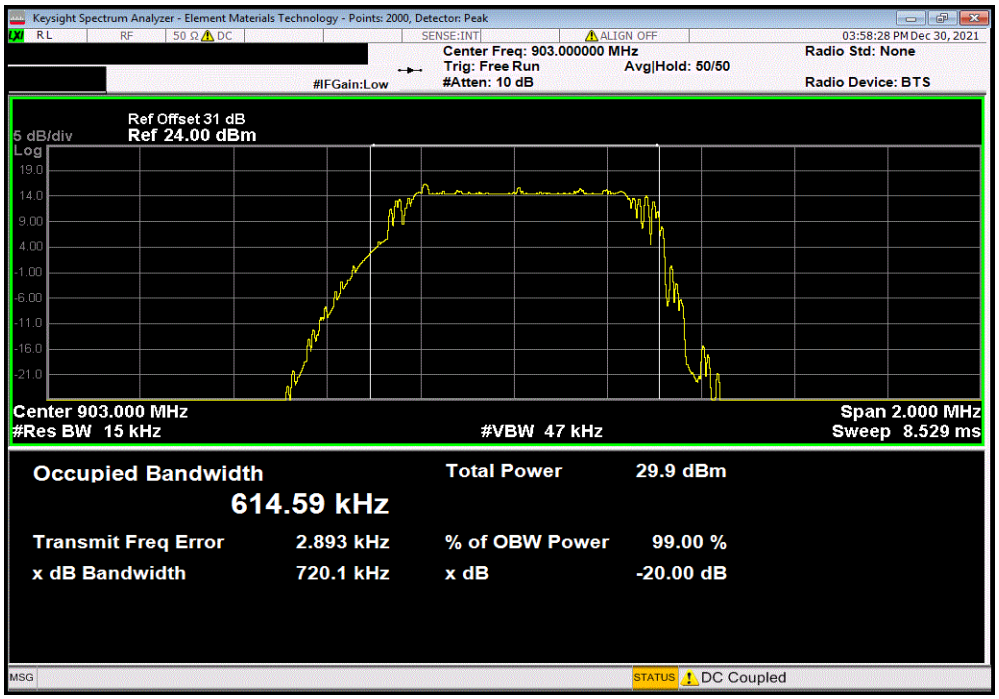
Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz						
				Value (kHz)	Limit (<)	Result
				125.14	N/A	N/A



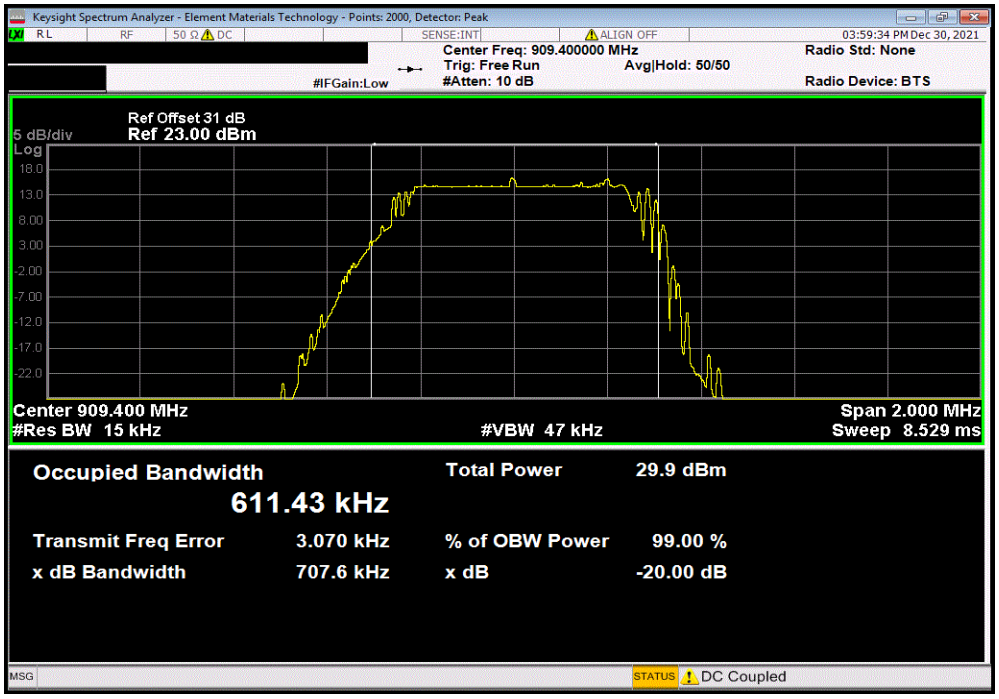
Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
				Value (kHz)	Limit (<)	Result
				125.06	N/A	N/A



Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
				Value (kHz)	Limit (<)	Result
				614.59	N/A	N/A



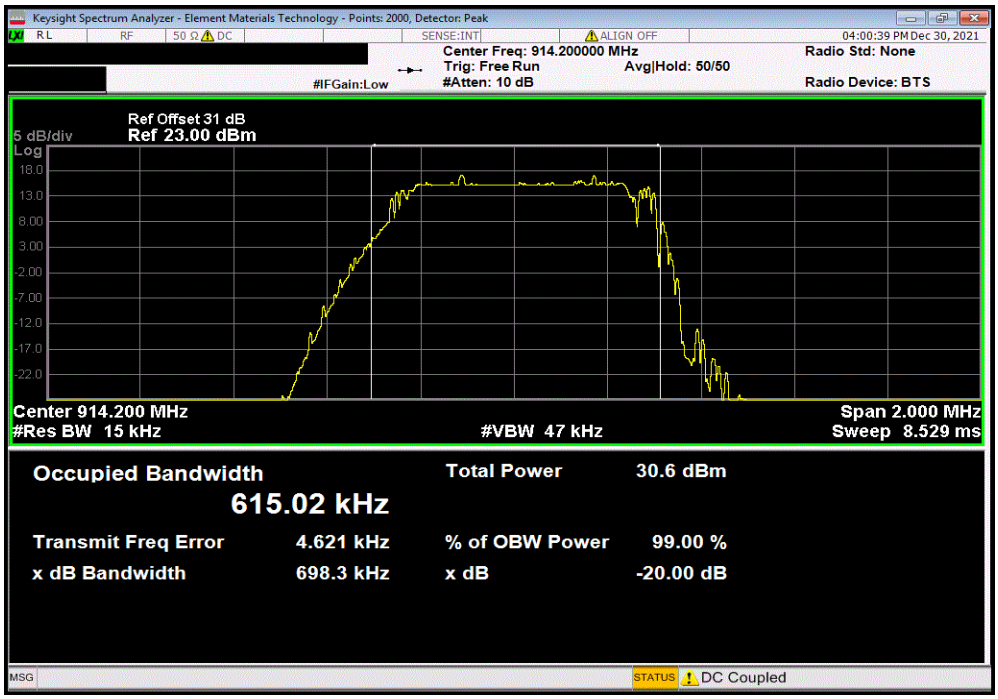
Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz						
				Value (kHz)	Limit (<)	Result
				611.43	N/A	N/A



OCCUPIED BANDWIDTH (99%)

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
				Value (kHz)	Limit (<)	Result
				615.02	N/A	N/A



SPURIOUS CONDUCTED EMISSIONS

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. For each transmit frequency, the fundamental was measured with a 100 kHz resolution bandwidth and the highest value was recorded. The rest of the spectrum was then measured with a 100 kHz resolution bandwidth and the highest value was found. The difference between the value found on the fundamental and the rest of the spectrum was compared against the limit to determine compliance.

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2021.10.29.2 XMit 2020.12.30.0

EUT:	RBS301	Work Order:	MLTI0234
Serial Number:	T4	Date:	4-Jan-22
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.6 °C
Attendees:	Mike Fette	Humidity:	22.7% RH
Project:	None	Barometric Pres.:	1000 mbar
Tested by:	Andrew Rogstad	Power: Battery	Job Site: MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

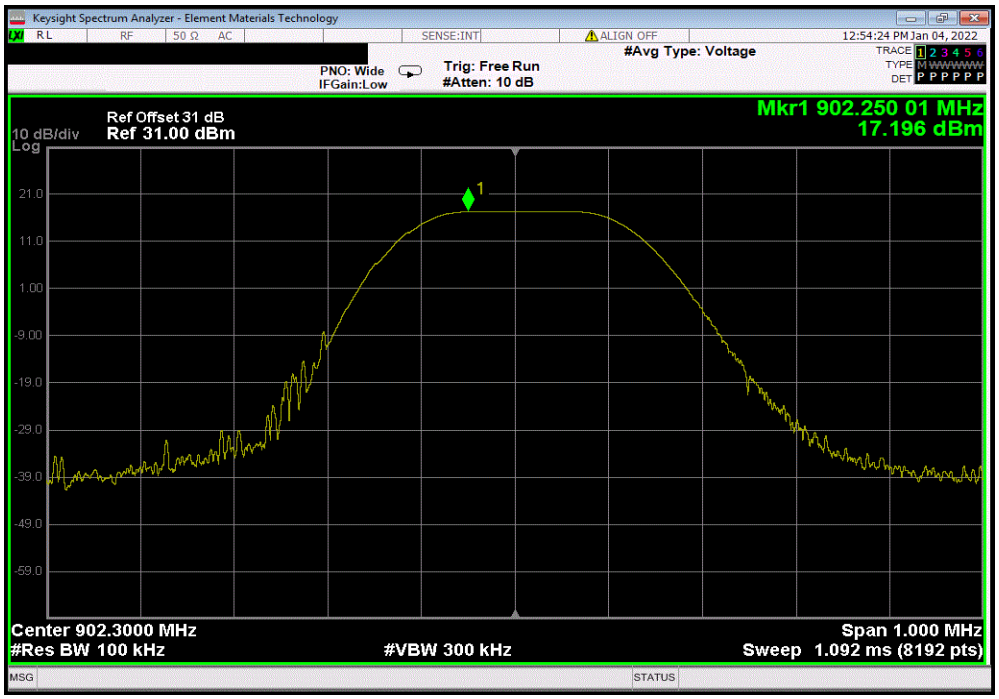
DEVIATIONS FROM TEST STANDARD

None

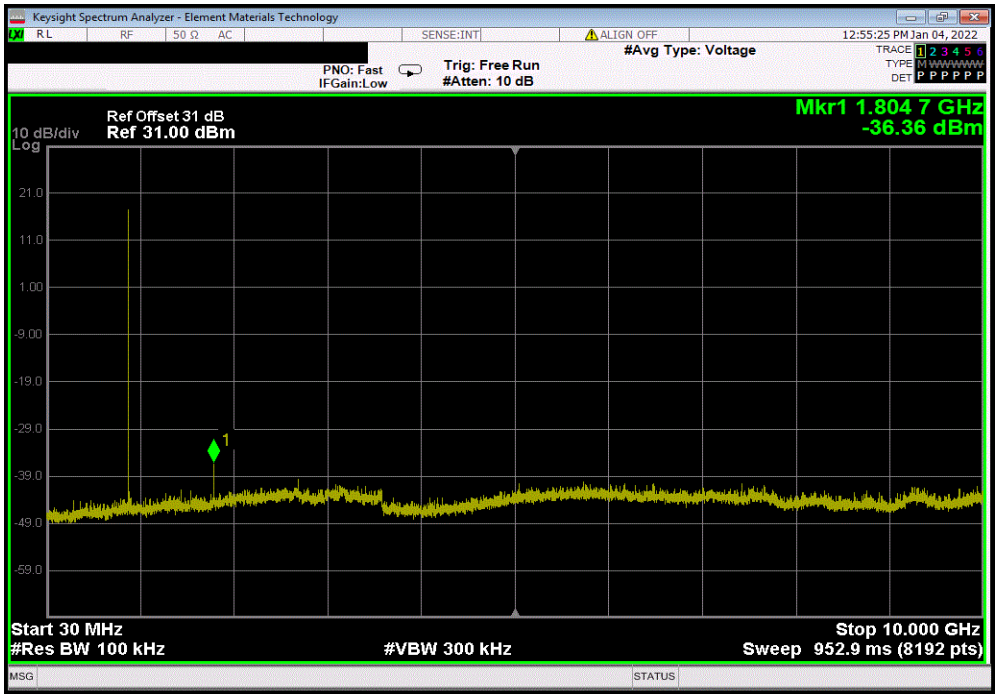
Configuration #	3	Signature

		Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Channel Bandwidth (125 kHz)						
Data Rate 3						
Low Channel, 902.3 MHz		Fundamental	902.25	N/A	N/A	N/A
Low Channel, 902.3 MHz		30 MHz - 10 GHz	1804.66	-53.56	-30	Pass
Mid Channel, 908.7 MHz		Fundamental	908.73	N/A	N/A	N/A
Mid Channel, 908.7 MHz		30 MHz - 10 GHz	1816.83	-54.74	-30	Pass
High Channel, 914.9 MHz		Fundamental	914.9	N/A	N/A	N/A
High Channel, 914.9 MHz		30 MHz - 10 GHz	1830.22	-54.16	-30	Pass
Channel Bandwidth (500 kHz)						
Data Rate 4						
Low Channel, 903 MHz		Fundamental	902.92	N/A	N/A	N/A
Low Channel, 903 MHz		30 MHz - 10 GHz	1805.88	-54.27	-30	Pass
Mid Channel, 909.4 MHz		Fundamental	909.57	N/A	N/A	N/A
Mid Channel, 909.4 MHz		30 MHz - 10 GHz	1819.27	-55.47	-30	Pass
High Channel, 914.2 MHz		Fundamental	914.45	N/A	N/A	N/A
High Channel, 914.2 MHz		30 MHz - 10 GHz	1829.01	-56.15	-30	Pass

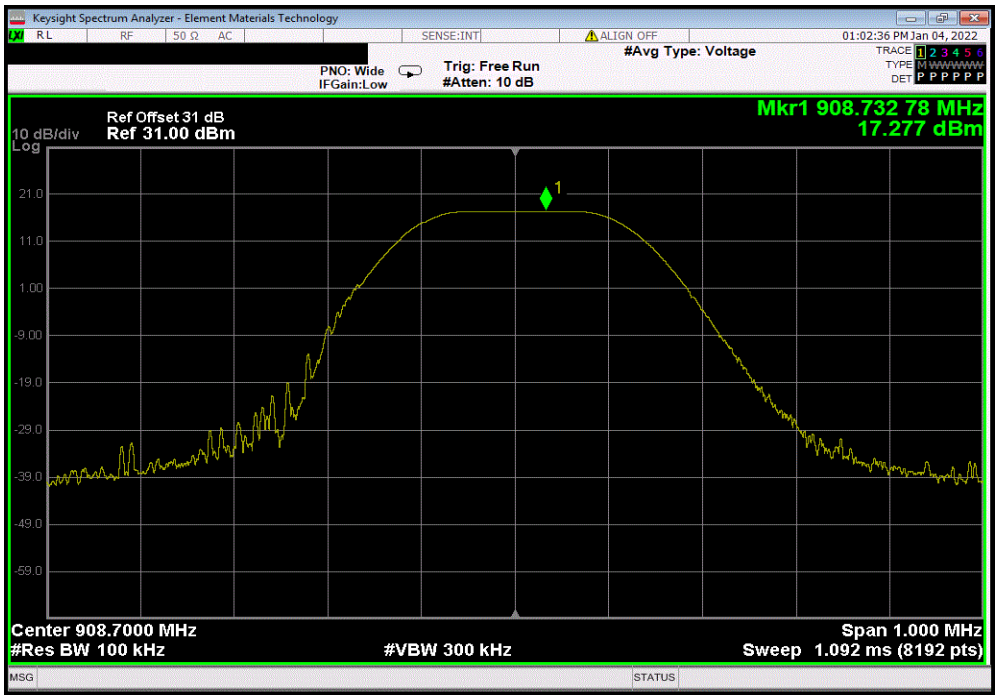
Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		902.25	N/A	N/A	N/A



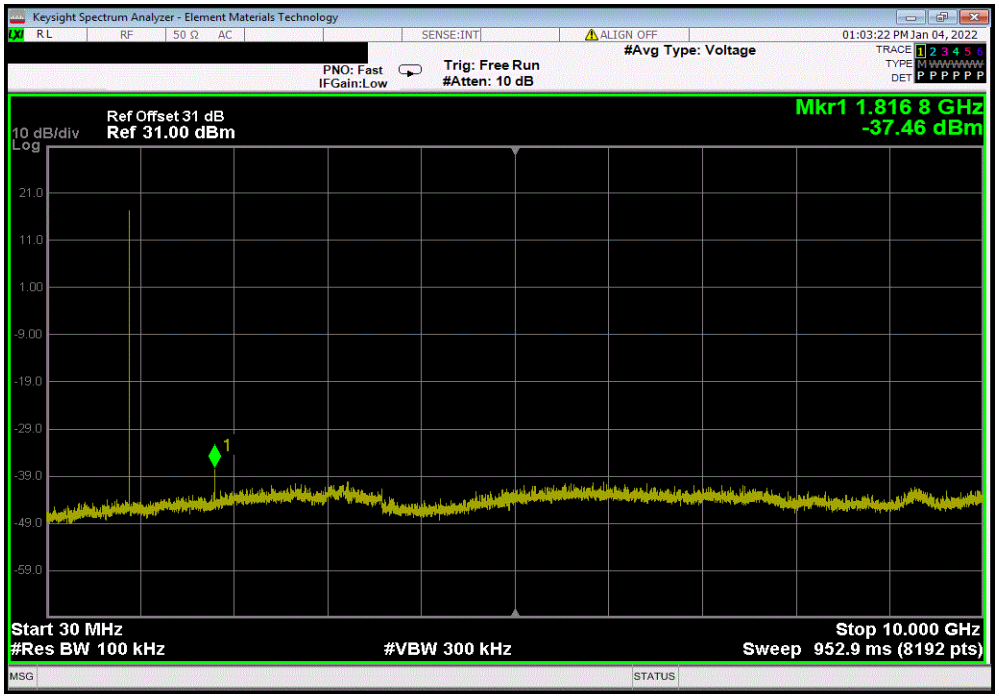
Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 10 GHz	1804.66	-53.56	-30	Pass



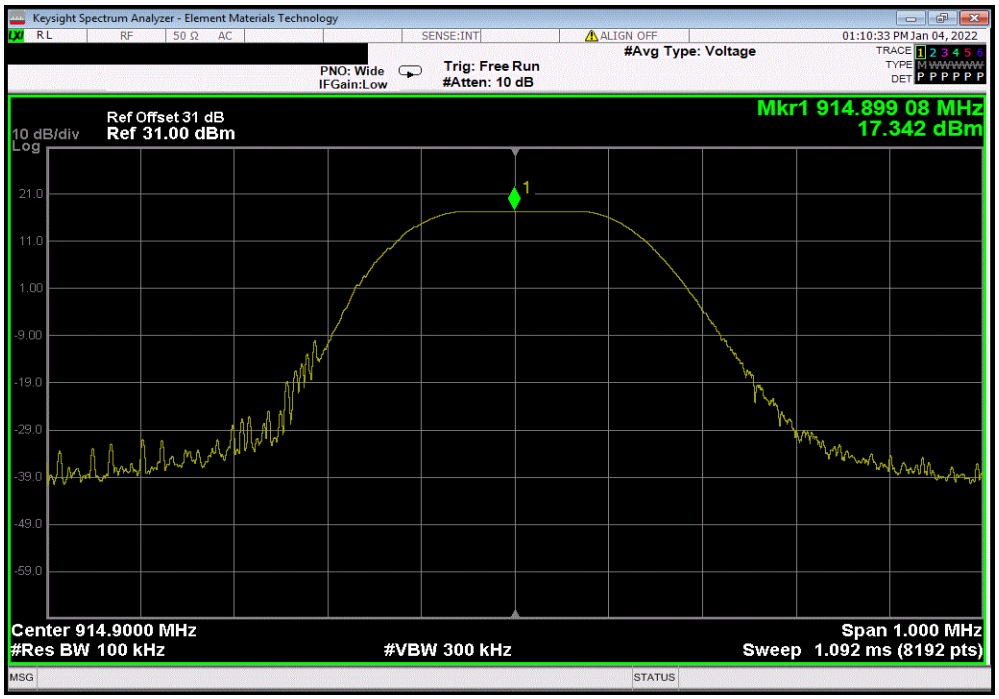
Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		908.73	N/A	N/A	N/A



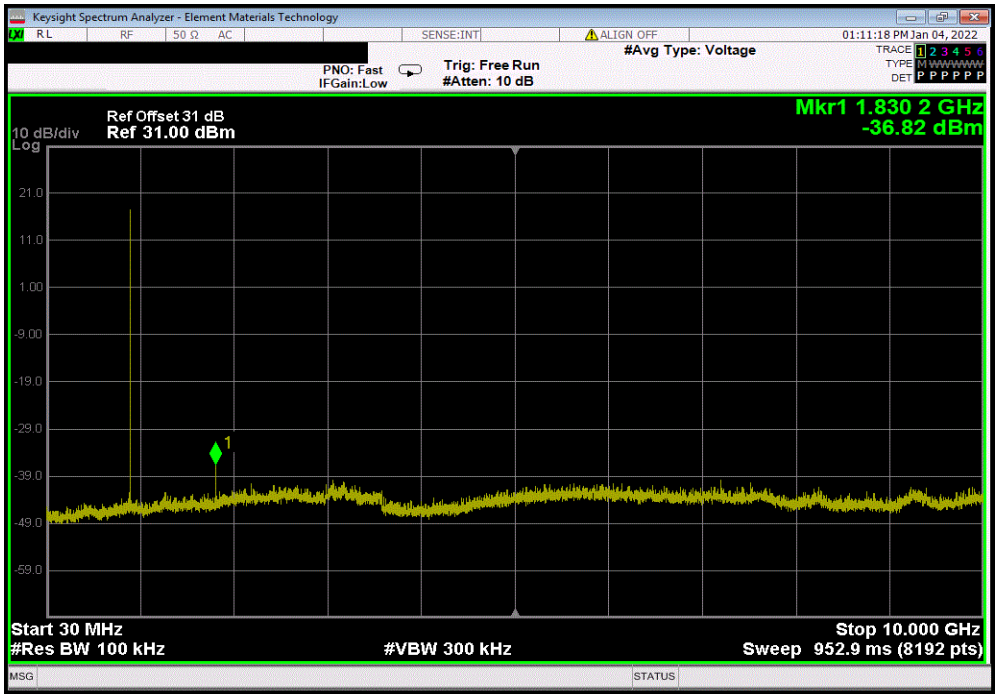
Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 10 GHz	1816.83	-54.74	-30	Pass



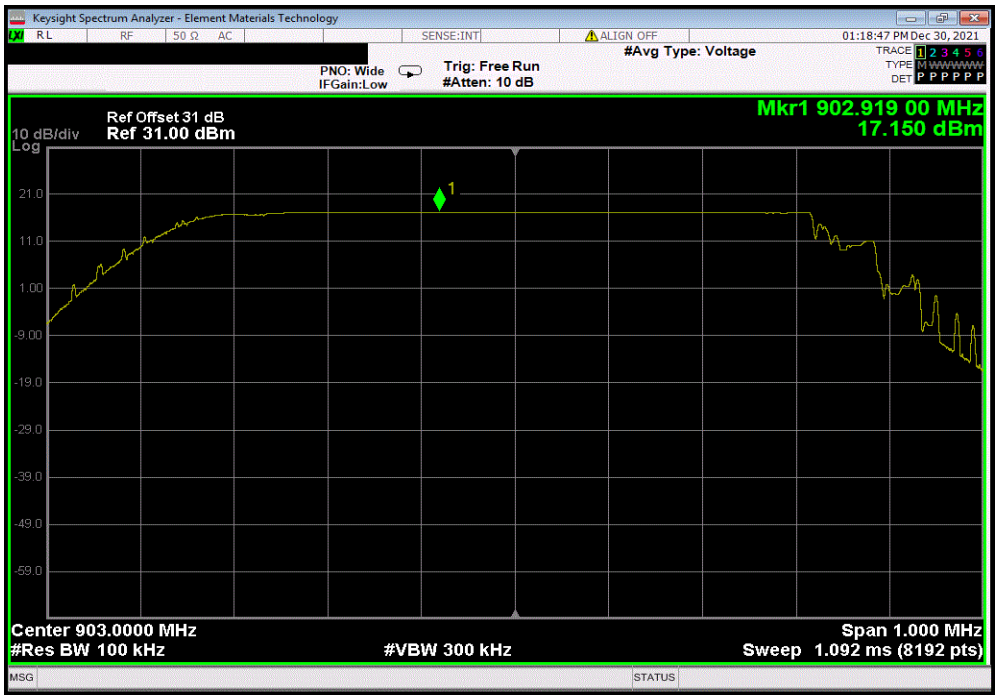
Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		914.9	N/A	N/A	N/A



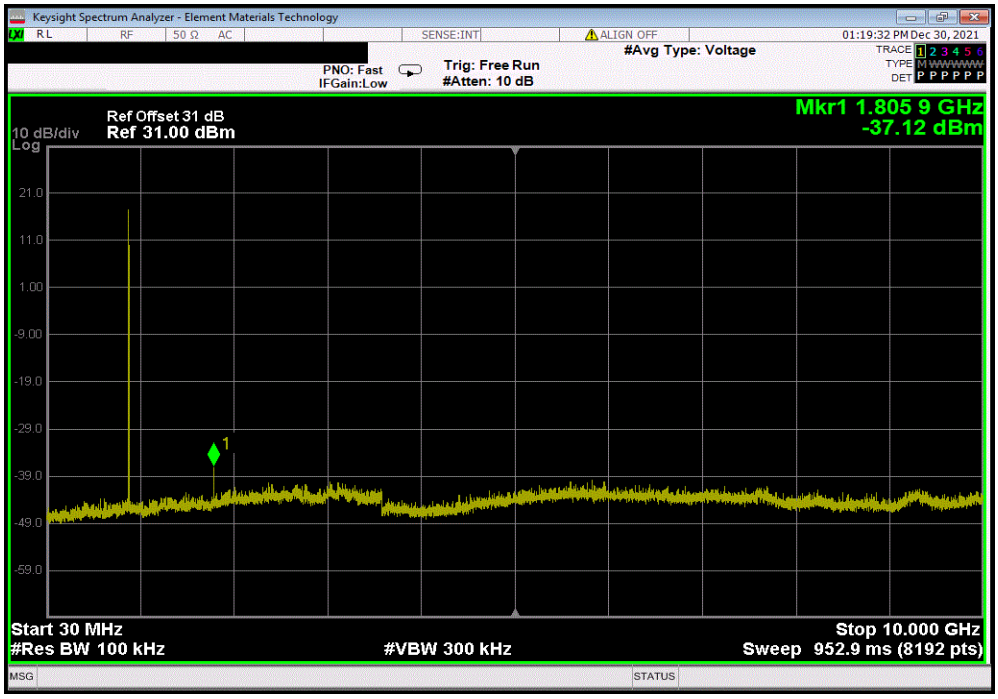
Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 10 GHz	1830.22	-54.16	-30	Pass



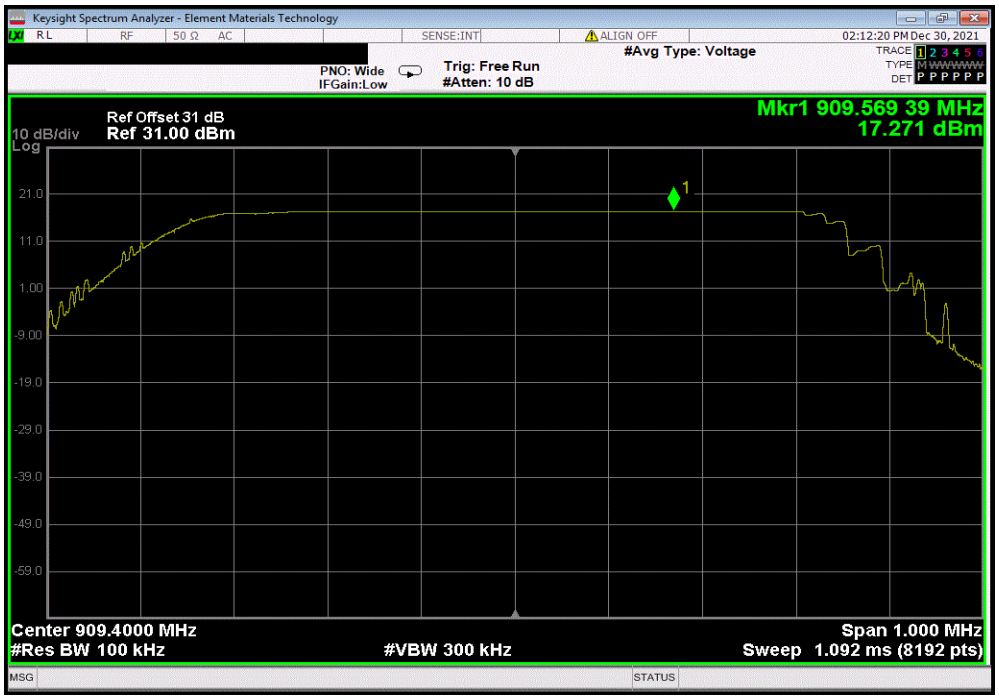
Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		902.92	N/A	N/A	N/A



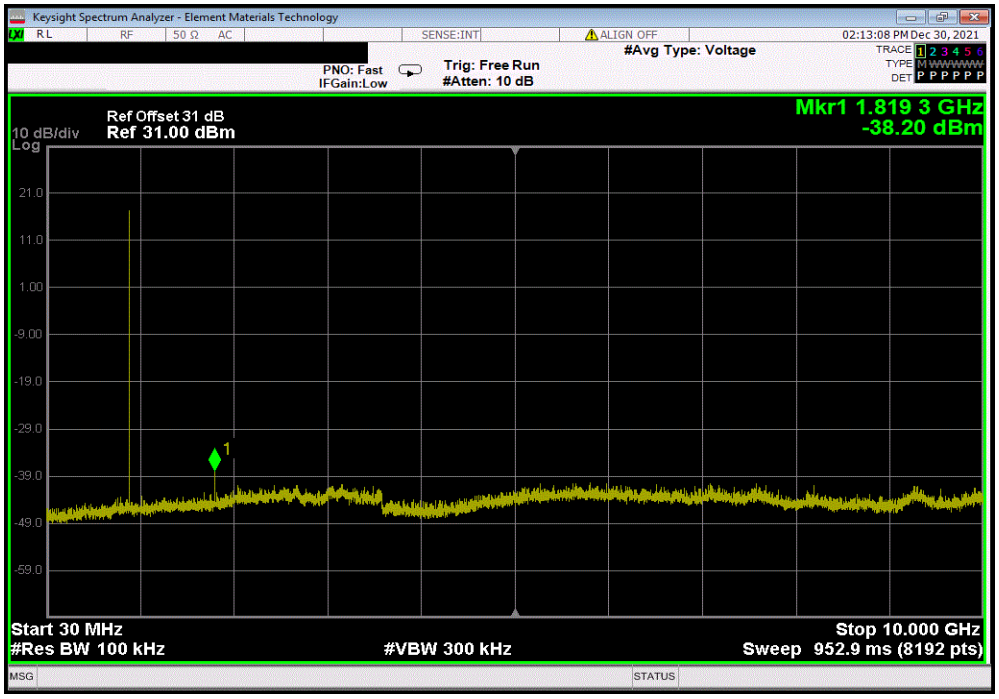
Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 10 GHz	1805.88	-54.27	-30	Pass



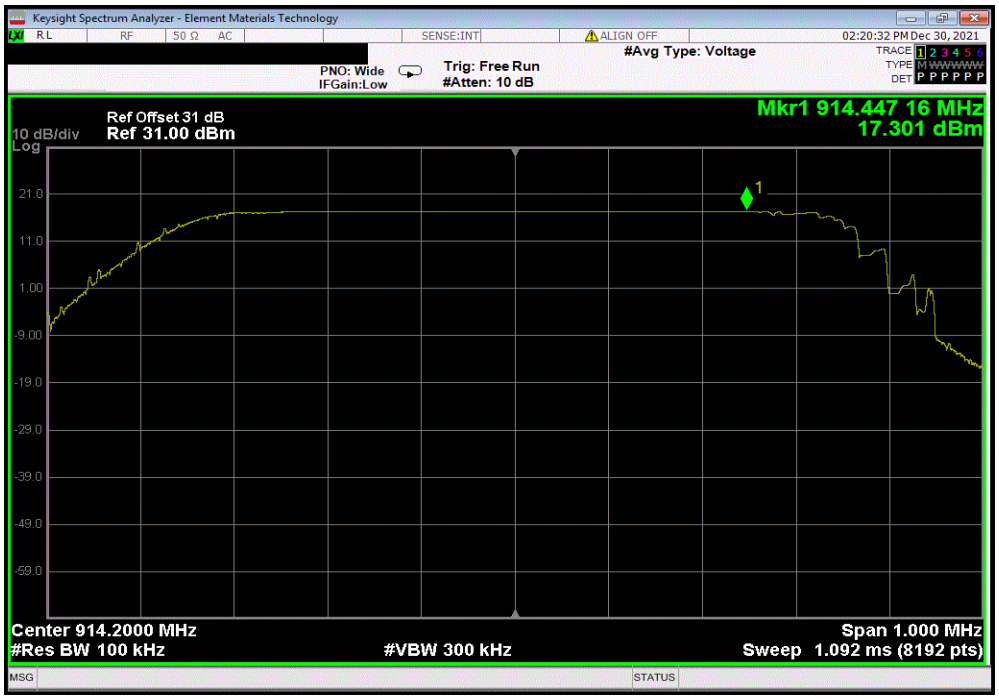
Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		909.57	N/A	N/A	N/A



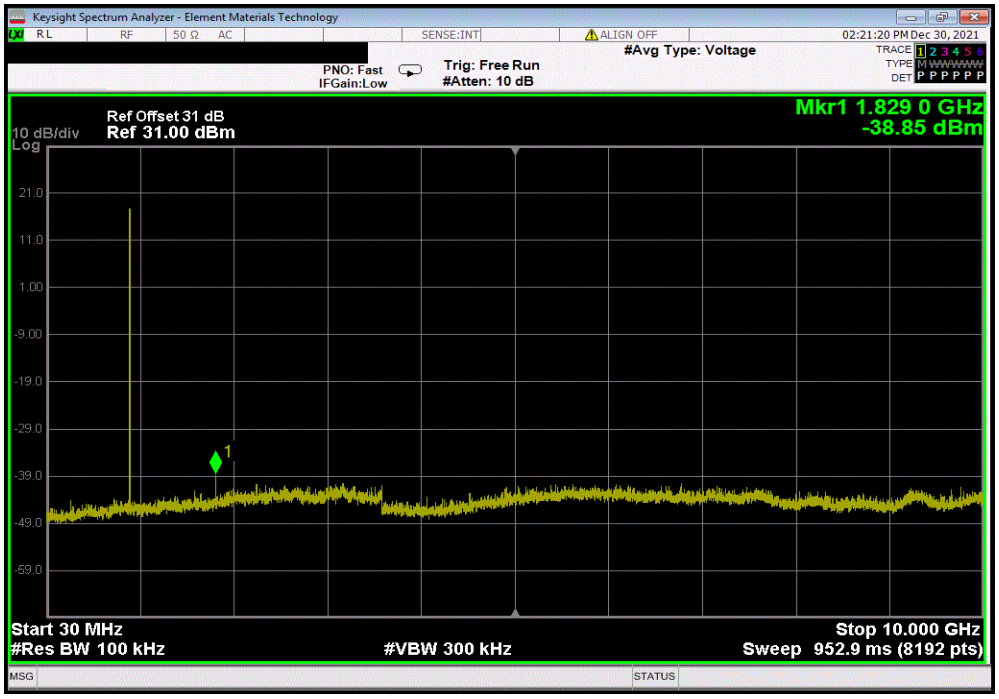
Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 10 GHz	1819.27	-55.47	-30	Pass



Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
	Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental		914.45	N/A	N/A	N/A



Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 10 GHz	1829.01	-56.15	-30	Pass



OUTPUT POWER

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFX	2020-04-28	2023-04-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

Prior to measuring output power; the emission bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The method AVGSA-2 in section 11.9.2.2.4 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

The AVGSA-2 method was modified as the available resolution bandwidth (RBw) on the spectrum analyzer could be set wider than the measured emissions bandwidth (B). RBw was set wider than B. This follows the guidance of section 11.9.1.1 and is equivalent to a measurement with a power meter AVGPM per section 11.9.2.3.

OUTPUT POWER

TbtTx 2021.10.29.2 XMit 2020.12.30.0

EUT:	**RBS301**			**Work Order:**	**MLTI0234**
Serial Number:	**T4**			**Date:**	**4-Jan-22**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**22.6 °C**
Attendees:	**Mike Fette**			**Humidity:**	**22.6% RH**
Project:	**None**			**Barometric Pres.:**	**1000 mbar**
Tested by:	**Andrew Rogstad**	**Power:**	**Battery**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

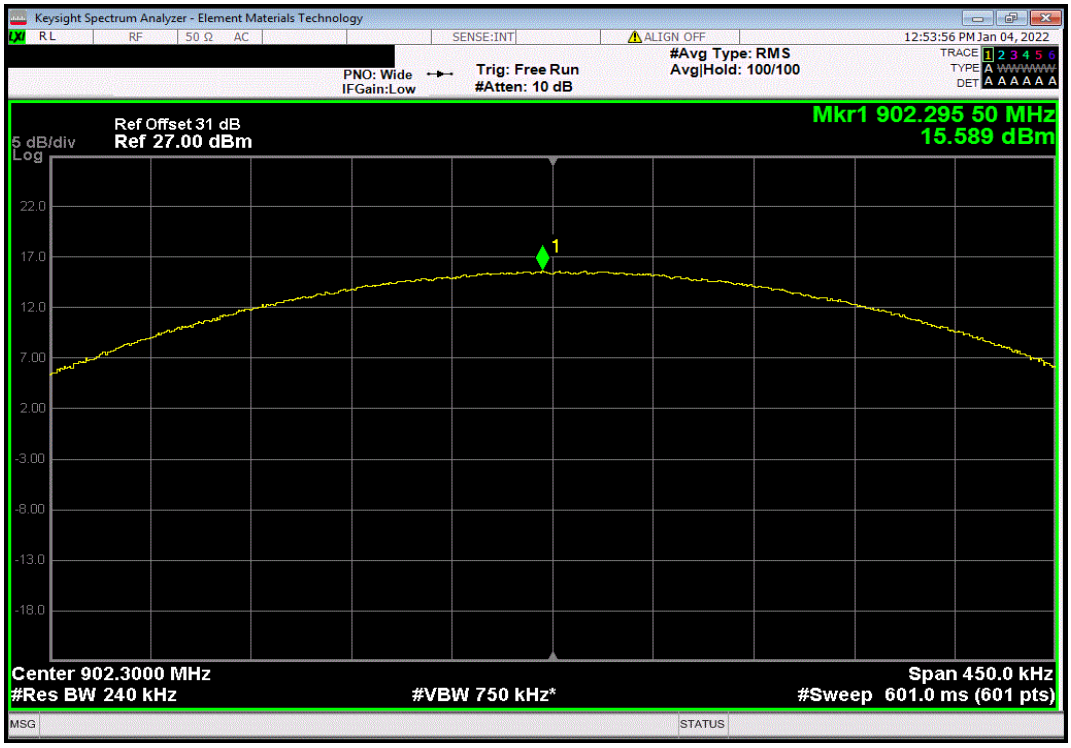
DEVIATIONS FROM TEST STANDARD

None

Configuration #	**3**	*Signature*

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
Channel Bandwidth (125 kHz)					
Data Rate 3					
Low Channel, 902.3 MHz	15.589	1.4	17	30	Pass
Mid Channel, 908.7 MHz	15.714	1.4	17.1	30	Pass
High Channel, 914.9 MHz	15.797	1.4	17.2	30	Pass
Channel Bandwidth (500 kHz)					
Data Rate 4					
Low Channel, 903 MHz	14.578	2.6	17.2	30	Pass
Mid Channel, 909.4 MHz	14.762	2.6	17.4	30	Pass
High Channel, 914.2 MHz	14.754	2.6	17.4	30	Pass

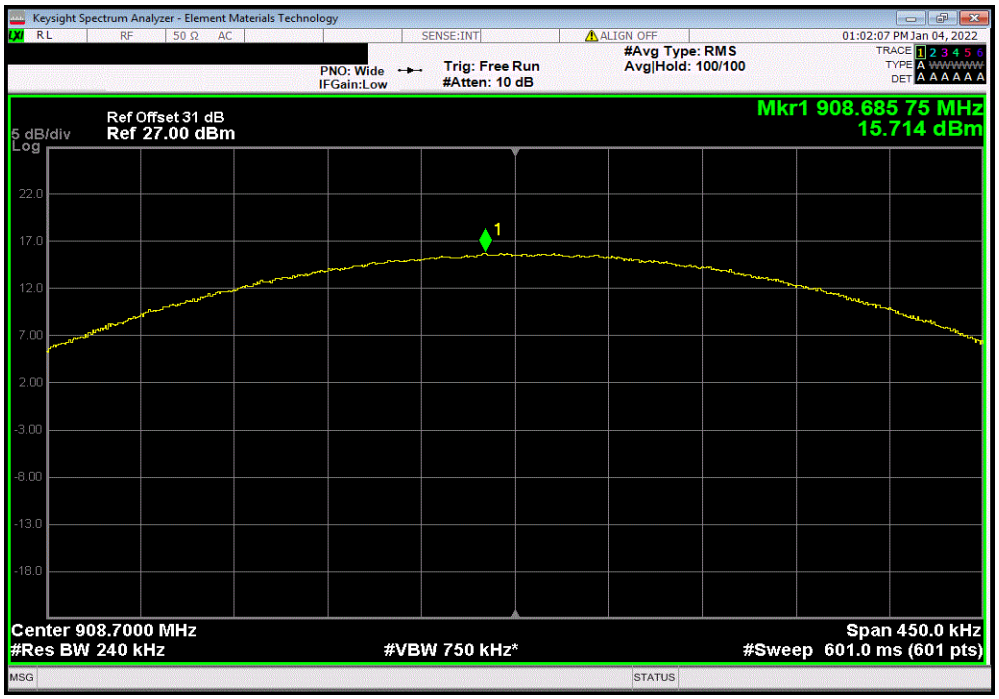
Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
		Avg Cond Pwr (dBm)	**Duty Cycle Factor (dB)**	**Out Pwr (dBm)**	**Limit (dBm)**	**Result**
		15.589	1.4	17	30	Pass



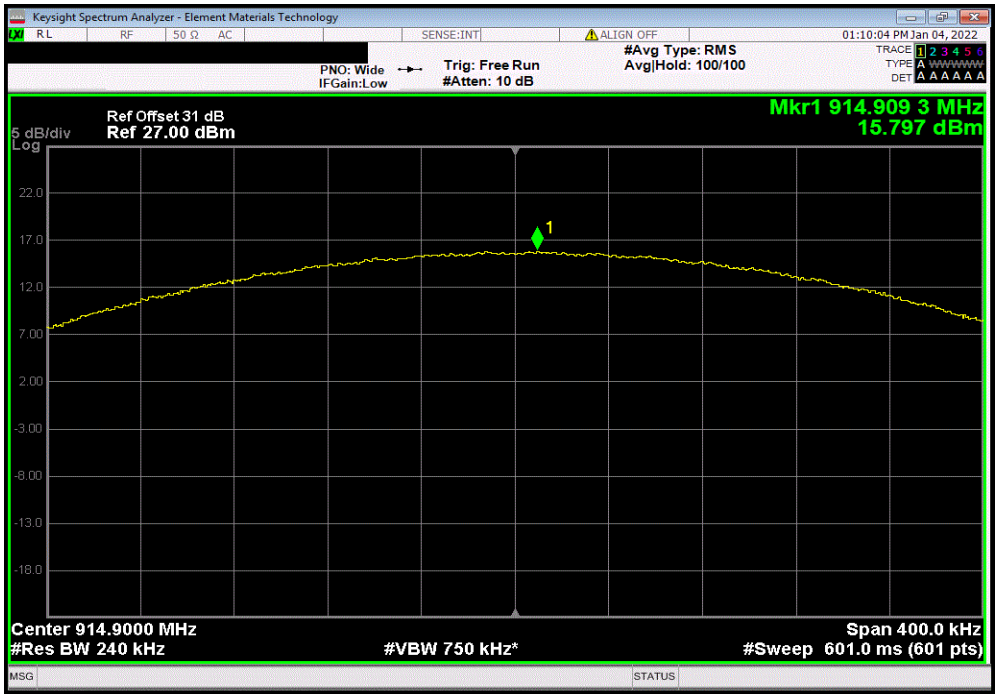
OUTPUT POWER

TbtTx 2021.10.29.2 XMit 2020.12.30.0

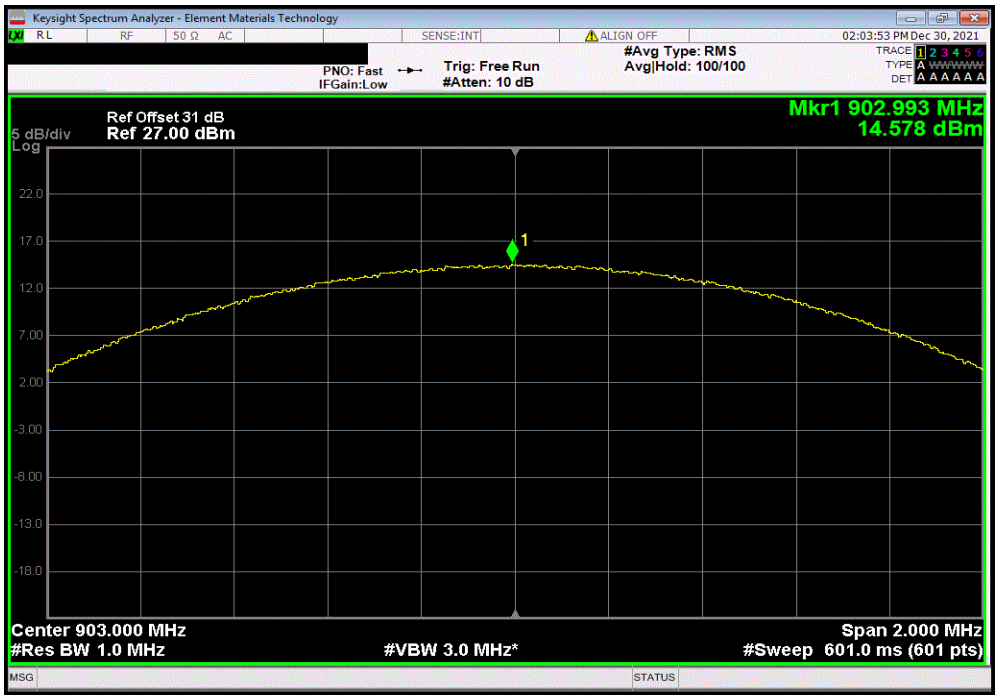
Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz						
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
		15.714	1.4	17.1	30	Pass



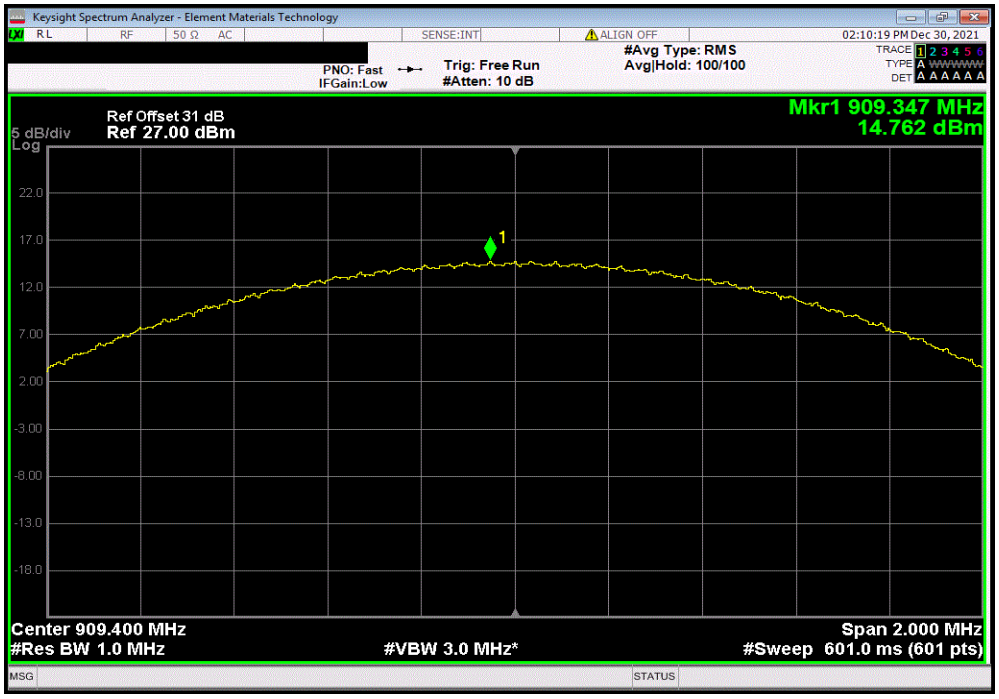
Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
		15.797	1.4	17.2	30	Pass



Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
		14.578	2.6	17.2	30	Pass



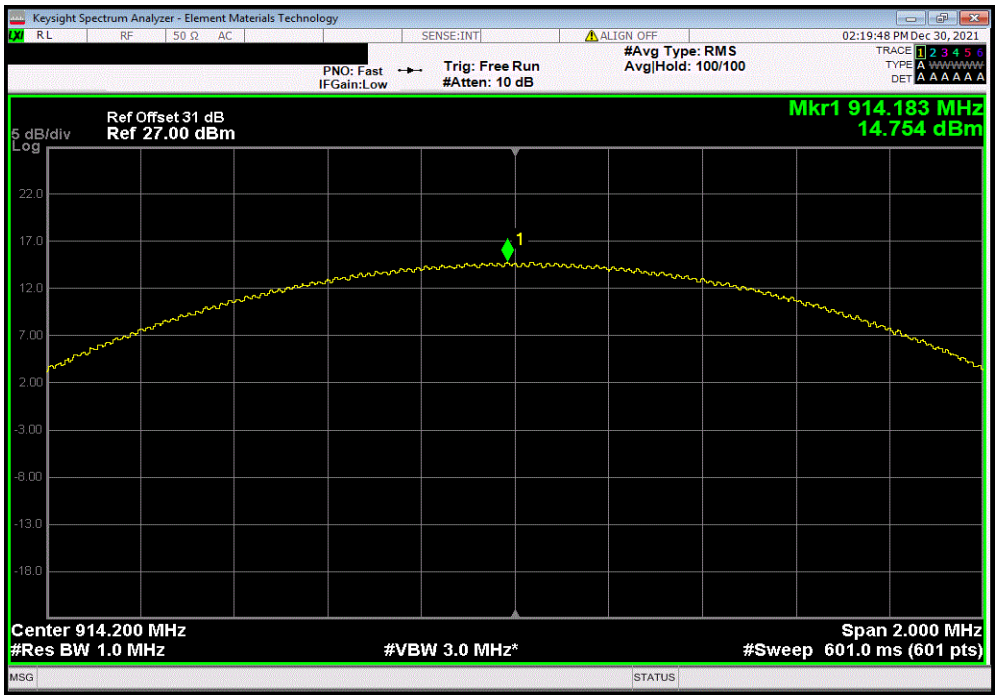
Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz						
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
		14.762	2.6	17.4	30	Pass



OUTPUT POWER

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
		14.754	2.6	17.4	30	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

XMit 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
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Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

Prior to measuring output power; the emission bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The method AVGSA-2 in section 11.9.2.2.4 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

The AVGSA-2 method was modified as the available resolution bandwidth (RBw) on the spectrum analyzer could be set wider than the measured emissions bandwidth (B). RBw was set wider than B. This follows the guidance of section 11.9.1.1 and is equivalent to a measurement with a power meter AVGPM per section 11.9.2.3.

Equivalent Isotropic Radiated Power (EIRP) = Max Measured Power + Antenna gain (dBi)

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element

TbtTx 2021.10.29.2 XMit 2020.12.30.0

EUT:	**RBS301**	**Work Order:**	**MLTI0234**
Serial Number:	**T4**	**Date:**	**4-Jan-22**
Customer:	**Multi-Tech Systems, Inc.**	**Temperature:**	**22.6 °C**
Attendees:	**Mike Fette**	**Humidity:**	**22.5% RH**
Project:	**None**	**Barometric Pres.:**	**1000 mbar**
Tested by:	**Andrew Rogstad**	**Power:** **Battery**	**Job Site:** **MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuators, DC block, and customer patch cable.

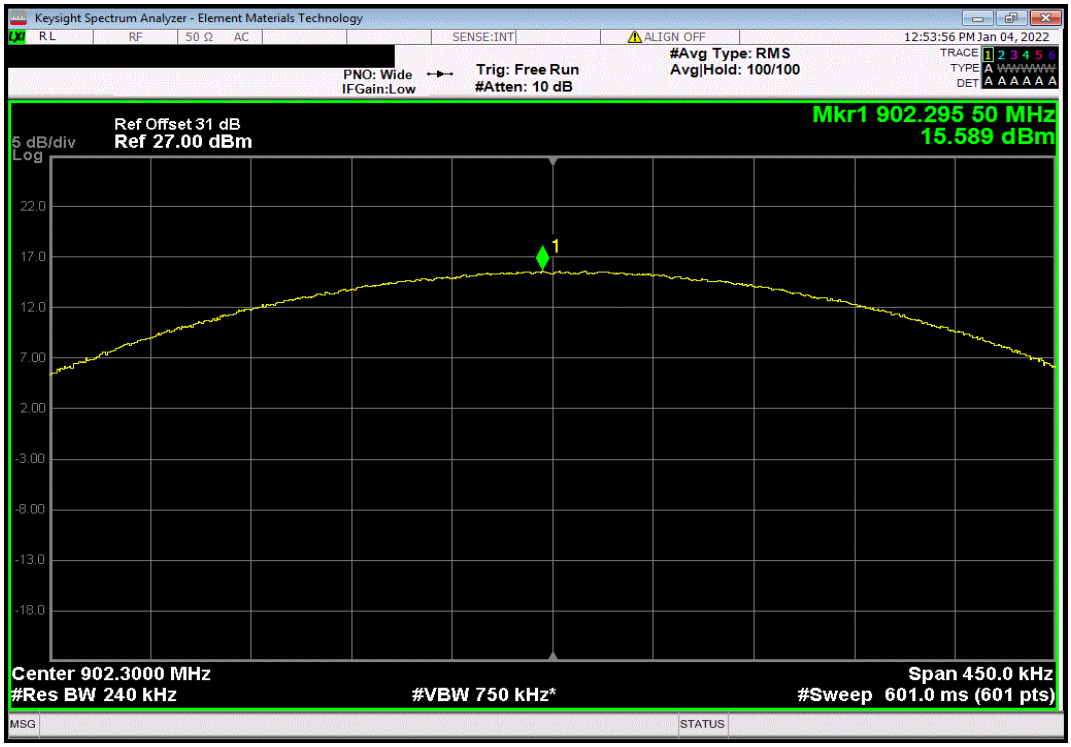
DEVIATIONS FROM TEST STANDARD

None

Configuration #	**3**	*Signature*

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
Channel Bandwidth (125 kHz)							
Data Rate 3							
Low Channel, 902.3 MHz	15.589	1.4	17	0.3	17.3	36	Pass
Mid Channel, 908.7 MHz	15.714	1.4	17.1	0.3	17.4	36	Pass
High Channel, 914.9 MHz	15.797	1.4	17.2	0.3	17.5	36	Pass
Channel Bandwidth (500 kHz)							
Data Rate 4							
Low Channel, 903 MHz	14.578	2.6	17.2	0.3	17.5	36	Pass
Mid Channel, 909.4 MHz	14.762	2.6	17.4	0.3	17.7	36	Pass
High Channel, 914.2 MHz	14.754	2.6	17.4	0.3	17.7	36	Pass

Channel Bandwidth (125 kHz), Data Rate 3, Low Channel, 902.3 MHz						
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
15.589	1.4	17	0.3	17.3	36	Pass

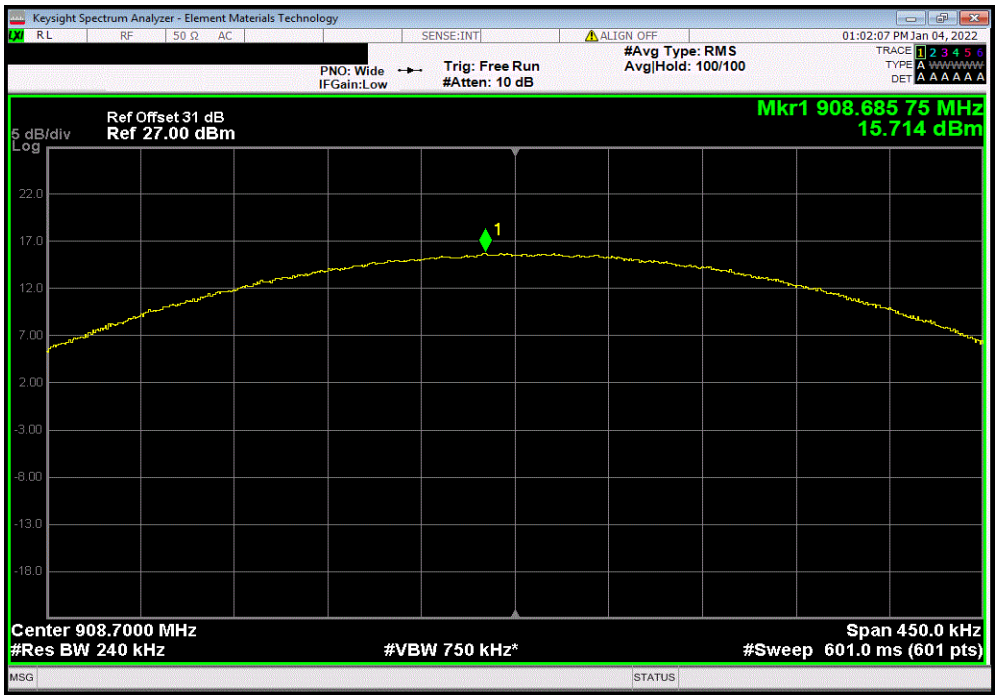


EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

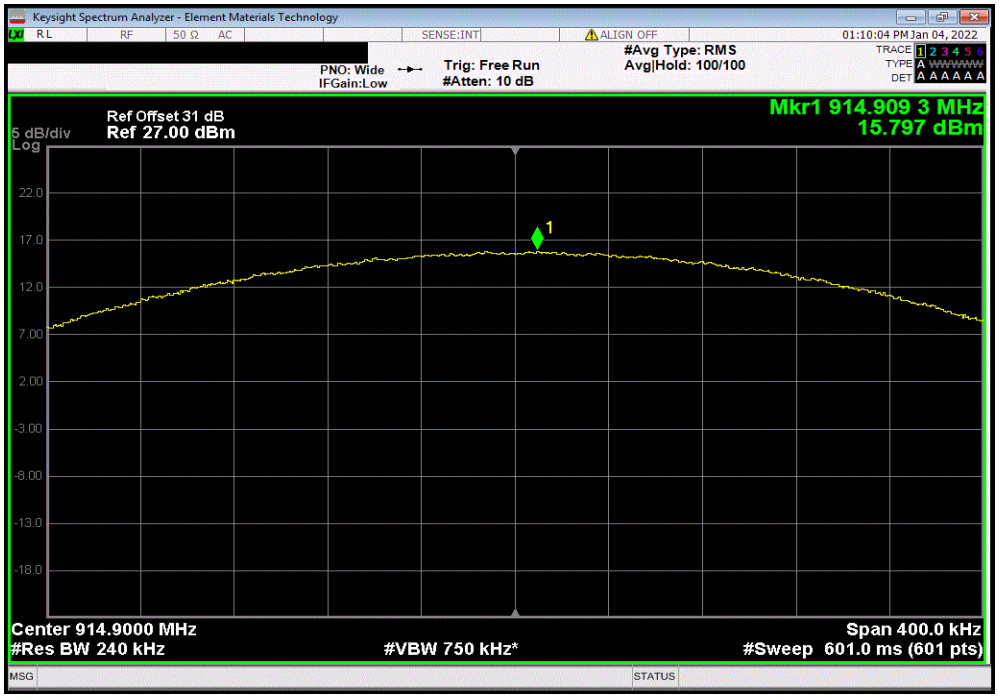
element

TbtTx 2021.10.29.2 XMit 2020.12.30.0

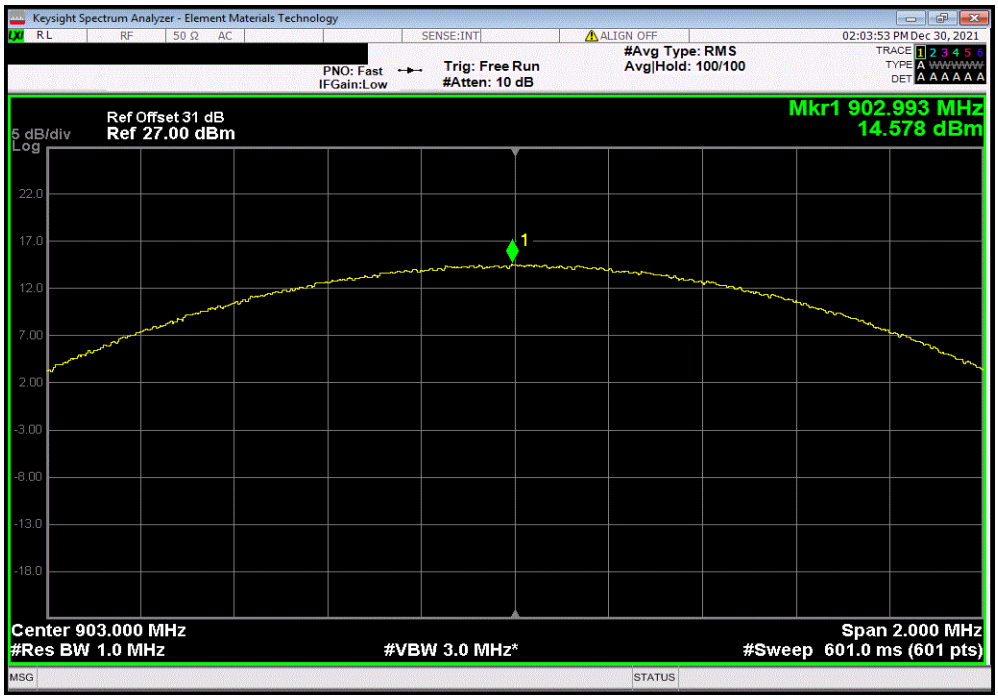
Channel Bandwidth (125 kHz), Data Rate 3, Mid Channel, 908.7 MHz						
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
15.714	1.4	17.1	0.3	17.4	36	Pass



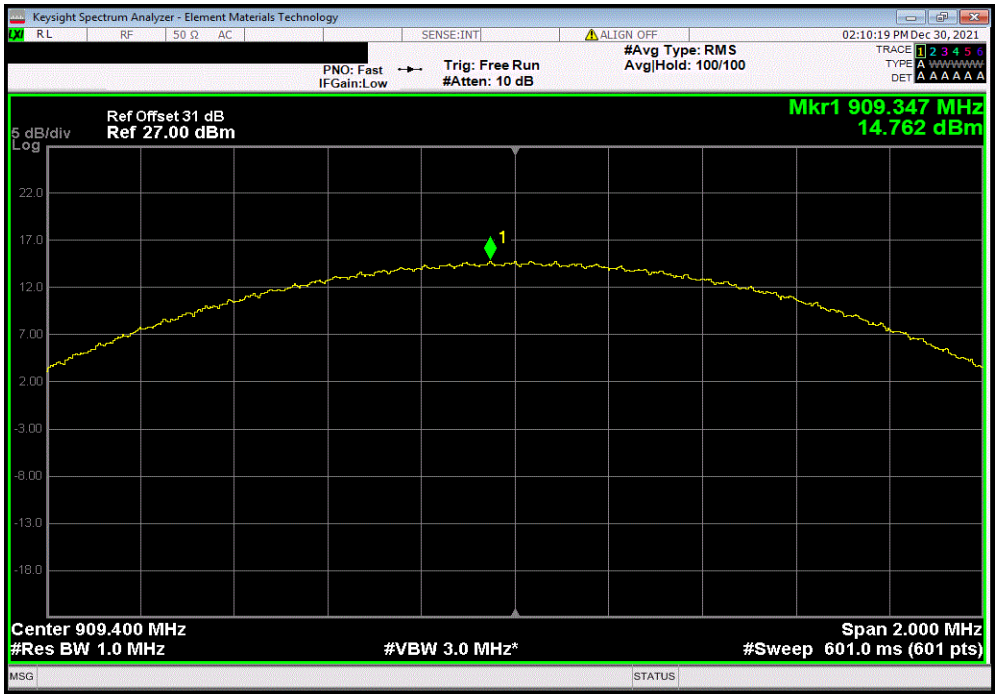
Channel Bandwidth (125 kHz), Data Rate 3, High Channel, 914.9 MHz						
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
15.797	1.4	17.2	0.3	17.5	36	Pass



Channel Bandwidth (500 kHz), Data Rate 4, Low Channel, 903 MHz						
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
14.578	2.6	17.2	0.3	17.5	36	Pass



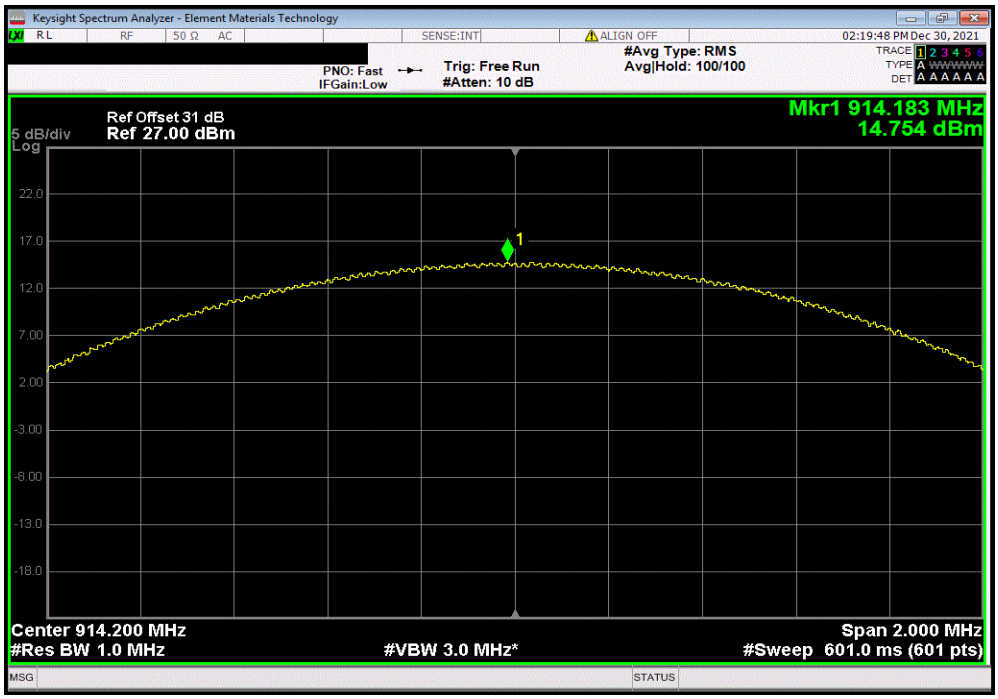
Channel Bandwidth (500 kHz), Data Rate 4, Mid Channel, 909.4 MHz						
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
14.762	2.6	17.4	0.3	17.7	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

TbtTx 2021.10.29.2 XMit 2020.12.30.0

Channel Bandwidth (500 kHz), Data Rate 4, High Channel, 914.2 MHz						
Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
14.754	2.6	17.4	0.3	17.7	36	Pass



SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2021.12.10.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

SRD Transmitting Low Channel 902.3 MHz, Mid Channel 908.7 MHz, High Channel 914.9 MHz, modulated 125 kHz BW (data rate 3) and 500 kHz BW (data rate 4)

SRD Transmitting Low Channel 902.3 MHz, Mid Channel 908.7 MHz, High Channel 914.9 MHz, modulated

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

MLTI0234 - 1

MLTI0283 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12400 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2021-10-13	2022-10-13
Cable	ESM Cable Corp.	Bilog Cables	MNH	2021-10-13	2022-10-13
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2021-03-09	2023-03-09
Filter - Low Pass	Micro-Tronics	LPM50003	HGL	2021-09-10	2022-09-10
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HGS	2021-06-28	2022-06-28
Filter - High Pass	Micro-Tronics	HPM50108	LFM	2021-09-09	2022-09-09
Attenuator	Fairview Microwave	SA18E-20	TWZ	2021-09-09	2022-09-09
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	2021-05-21	2022-05-21
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2021-01-15	2022-01-15
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	2021-03-07	2022-03-07
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	NCR
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2021-01-15	2022-01-15
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2021-01-15	2022-01-15
Antenna - Double Ridge	ETS Lindgren	3115	AJQ	2021-01-25	2023-01-25
Antenna - Double Ridge	ETS Lindgren	3115	AIB	2022-09-01	2024-09-01
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	2022-01-24	2023-01-24
Cable	Element	Double Ridge Guide Horn Cables	MNV	2022-01-24	2023-01-24
Filter - High Pass	Micro-Tronics	HPM50108	HFW	2022-09-10	2023-09-10

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3.

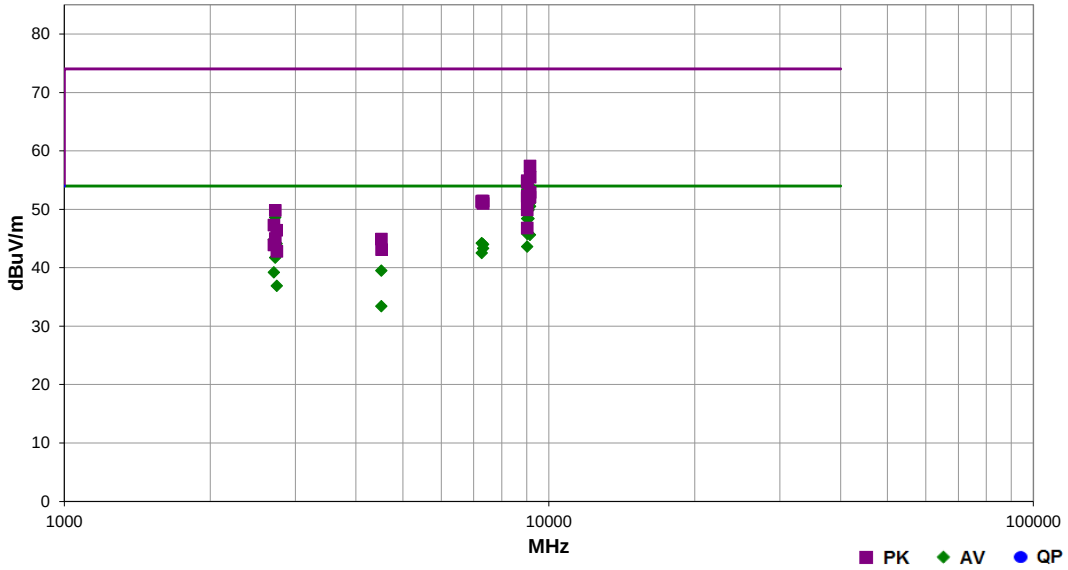
SPURIOUS RADIATED EMISSIONS

EmiR5 2021.09.09.0 PSA-ESCI 2021.12.10.0

Work Order:	MLTI0234	**Date:**	2022-11-11		
Project:	None	**Temperature:**	23.5 °C		
Job Site:	MN05, MN09	**Humidity:**	15.5% RH		
Serial Number:	P1	**Barometric Pres.:**	1022 mbar	**Tested by:**	Chris Patterson
EUT:	RBS301				
Configuration:	1				
Customer:	Multi-Tech Systems, Inc.				
Attendees:	Mike Fette				
EUT Power:	Battery				
Operating Mode:	SRD Transmitting Low Channel 902.3 MHz, Mid Channel 908.7 MHz, High Channel 914.9 MHz, modulated 125 kHz BW (data rate 3) and 500 kHz BW (data rate 4)				
Deviations:	None				
Comments:	Shielded, max power setting, DCCF based on measured 71.8% duty cycle while operating in Data rate 3 and 55.5% duty cycle in data rate 4. DCCF = 10(log(1/0.718)) = 1.4 or 10(log(1/0.555)) = 2.6				

Test Specifications	Test Method
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

Run #	22	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
9148.750	55.7	-3.2	1.7	157.9	1.4	0.0	Horz	AV	0.0	53.9	54.0	-0.1	EUT Vert, High Ch, Modulated, Data rate 3
9023.250	56.2	-3.8	1.0	196.9	1.4	0.0	Horz	AV	0.0	53.8	54.0	-0.2	EUT Horz, Low Ch, Modulated, Data rate 3
9022.960	55.7	-3.8	1.0	16.9	1.4	0.0	Horz	AV	0.0	53.3	54.0	-0.7	EUT Vert, Low Ch, Modulated, Data rate 3
9023.210	53.9	-3.8	1.0	196.9	1.4	0.0	Horz	AV	0.0	51.5	54.0	-2.5	EUT Horz, Low Ch, Modulated, Data rate 3
9143.000	59.1	-10.6	2.4	337.0	2.6	0.0	Horz	AV	0.0	51.1	54.0	-2.9	EUT Vert, High Ch, Modulated, Data rate 4
9148.790	52.3	-3.2	1.9	119.0	1.4	0.0	Vert	AV	0.0	50.5	54.0	-3.5	EUT Vert, High Ch, Modulated, Data rate 3
9023.250	52.6	-3.8	1.0	16.9	1.4	0.0	Vert	AV	0.0	50.2	54.0	-3.8	EUT Vert, Low Ch, Modulated, Data rate 3
9086.960	51.9	-3.4	1.0	344.9	1.4	0.0	Horz	AV	0.0	49.9	54.0	-4.1	EUT Vert, Mid Ch, Modulated, Data rate 3
9023.250	52.2	-3.8	1.0	152.0	1.4	0.0	Horz	AV	0.0	49.8	54.0	-4.2	EUT On Side, Low Ch, Modulated, Data rate 3
2726.220	51.9	-4.7	1.0	270.0	1.4	0.0	Vert	AV	0.0	48.6	54.0	-5.4	EUT Vert, Mid Ch, Modulated, Data rate 3
9086.790	50.4	-3.4	1.0	314.0	1.4	0.0	Vert	AV	0.0	48.4	54.0	-5.6	EUT Vert, Mid Ch, Modulated, Data rate 3
9023.080	50.8	-3.8	2.0	157.9	1.4	0.0	Vert	AV	0.0	48.4	54.0	-5.6	EUT On Side, Low Ch, Modulated, Data rate 3
9023.170	48.2	-3.8	1.5	160.0	1.4	0.0	Vert	AV	0.0	45.8	54.0	-8.2	EUT Horz, Low Ch, Modulated, Data rate 3
9143.000	53.6	-10.6	1.4	335.0	2.6	0.0	Vert	AV	0.0	45.6	54.0	-8.4	EUT Vert, High Ch, Modulated, Data rate 4
2706.980	48.0	-4.6	1.1	84.9	1.4	0.0	Vert	AV	0.0	44.8	54.0	-9.2	EUT Vert, Low Ch, Modulated, Data rate 3
7269.770	33.6	9.2	1.6	19.0	1.4	0.0	Horz	AV	0.0	44.2	54.0	-9.8	EUT Vert, Mid Ch, Modulated, Data rate 3
2744.820	47.3	-4.6	1.5	278.0	1.4	0.0	Vert	AV	0.0	44.1	54.0	-9.9	EUT Vert, High Ch, Modulated, Data rate 3
7319.200	33.4	9.2	3.7	6.9	1.4	0.0	Vert	AV	0.0	44.0	54.0	-10.0	EUT Vert, High Ch, Modulated, Data rate 3
9022.790	46.0	-3.8	1.5	160.0	1.4	0.0	Vert	AV	0.0	43.6	54.0	-10.4	EUT Horz, Low Ch, Modulated, Data rate 3
7319.240	32.7	9.2	1.8	167.9	1.4	0.0	Horz	AV	0.0	43.3	54.0	-10.7	EUT Vert, High Ch, Modulated, Data rate 3
7269.520	31.9	9.2	2.2	62.0	1.4	0.0	Vert	AV	0.0	42.5	54.0	-11.5	EUT Vert, Mid Ch, Modulated, Data rate 3
2726.060	45.0	-4.7	1.0	121.9	1.4	0.0	Horz	AV	0.0	41.7	54.0	-12.3	EUT Vert, Mid Ch, Modulated, Data rate 3
4511.620	36.4	1.7	1.5	145.9	1.4	0.0	Vert	AV	0.0	39.5	54.0	-14.5	EUT Vert, Low Ch, Modulated, Data rate 3
2706.900	42.4	-4.6	1.5	199.0	1.4	0.0	Horz	AV	0.0	39.2	54.0	-14.8	EUT Vert, Low Ch, Modulated, Data rate 3
9143.000	68.0	-10.6	2.4	337.0		0.0	Horz	PK	0.0	57.4	74.0	-16.6	EUT Vert, High Ch, Modulated, Data rate 4
2744.990	40.1	-4.6	1.9	325.9	1.4	0.0	Horz	AV	0.0	36.9	54.0	-17.1	EUT Vert, High Ch, Modulated, Data rate 3
9149.120	58.7	-3.2	1.7	157.9		0.0	Horz	PK	0.0	55.5	74.0	-18.5	EUT Vert, High Ch, Modulated, Data rate 3
9022.540	58.7	-3.8	1.0	16.9		0.0	Horz	PK	0.0	54.9	74.0	-19.1	EUT Vert, Low Ch, Modulated, Data rate 3
9022.460	58.4	-3.8	1.0	196.9		0.0	Horz	PK	0.0	54.6	74.0	-19.4	EUT Horz, Low Ch, Modulated, Data rate 3

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4511.710	30.6	1.7	1.5	34.0	1.4	0.0	Horz	AV	0.0	33.4	54.0	-20.6	EUT Vert, Low Ch, Modulated, Data rate 3
9149.580	56.1	-3.2	1.9	119.0		0.0	Vert	PK	0.0	52.9	74.0	-21.1	EUT Vert, High Ch, Modulated, Data rate 3
9086.250	55.7	-3.4	1.0	314.0		0.0	Vert	PK	0.0	52.3	74.0	-21.7	EUT Vert, Mid Ch, Modulated, Data rate 3
9023.250	56.0	-3.8	1.0	16.9		0.0	Vert	PK	0.0	52.2	74.0	-21.8	EUT Vert, Low Ch, Modulated, Data rate 3
9143.000	62.7	-10.6	1.4	335.0		0.0	Vert	PK	0.0	52.1	74.0	-21.9	EUT Vert, High Ch, Modulated, Data rate 4
9023.670	55.7	-3.8	1.0	152.0		0.0	Horz	PK	0.0	51.9	74.0	-22.1	EUT On Side, Low Ch, Modulated, Data rate 3
9087.040	55.3	-3.4	1.0	344.9		0.0	Horz	PK	0.0	51.9	74.0	-22.1	EUT Vert, Mid Ch, Modulated, Data rate 3
7319.030	42.2	9.2	3.7	6.9		0.0	Vert	PK	0.0	51.4	74.0	-22.6	EUT Vert, High Ch, Modulated, Data rate 3
7269.220	42.2	9.2	2.2	62.0		0.0	Vert	PK	0.0	51.4	74.0	-22.6	EUT Vert, Mid Ch, Modulated, Data rate 3
7269.220	42.0	9.2	1.6	19.0		0.0	Horz	PK	0.0	51.2	74.0	-22.8	EUT Vert, Mid Ch, Modulated, Data rate 3
7319.780	41.8	9.2	1.8	167.9		0.0	Horz	PK	0.0	51.0	74.0	-23.0	EUT Vert, High Ch, Modulated, Data rate 3
9022.710	53.7	-3.8	2.0	157.9		0.0	Vert	PK	0.0	49.9	74.0	-24.1	EUT On Side, Low Ch, Modulated, Data rate 3
2725.980	54.5	-4.7	1.0	270.0		0.0	Vert	PK	0.0	49.8	74.0	-24.2	EUT Vert, Mid Ch, Modulated, Data rate 3
2707.150	51.9	-4.6	1.1	84.9		0.0	Vert	PK	0.0	47.3	74.0	-26.7	EUT Vert, Low Ch, Modulated, Data rate 3
9023.380	50.6	-3.8	1.5	160.0		0.0	Vert	PK	0.0	46.8	74.0	-27.2	EUT Horz, Low Ch, Modulated, Data rate 3
2744.620	51.0	-4.6	1.5	278.0		0.0	Vert	PK	0.0	46.4	74.0	-27.6	EUT Vert, High Ch, Modulated, Data rate 3
2726.390	49.7	-4.7	1.0	121.9		0.0	Horz	PK	0.0	45.0	74.0	-29.0	EUT Vert, Mid Ch, Modulated, Data rate 3
4511.790	43.2	1.7	1.5	145.9		0.0	Vert	PK	0.0	44.9	74.0	-29.1	EUT Vert, Low Ch, Modulated, Data rate 3

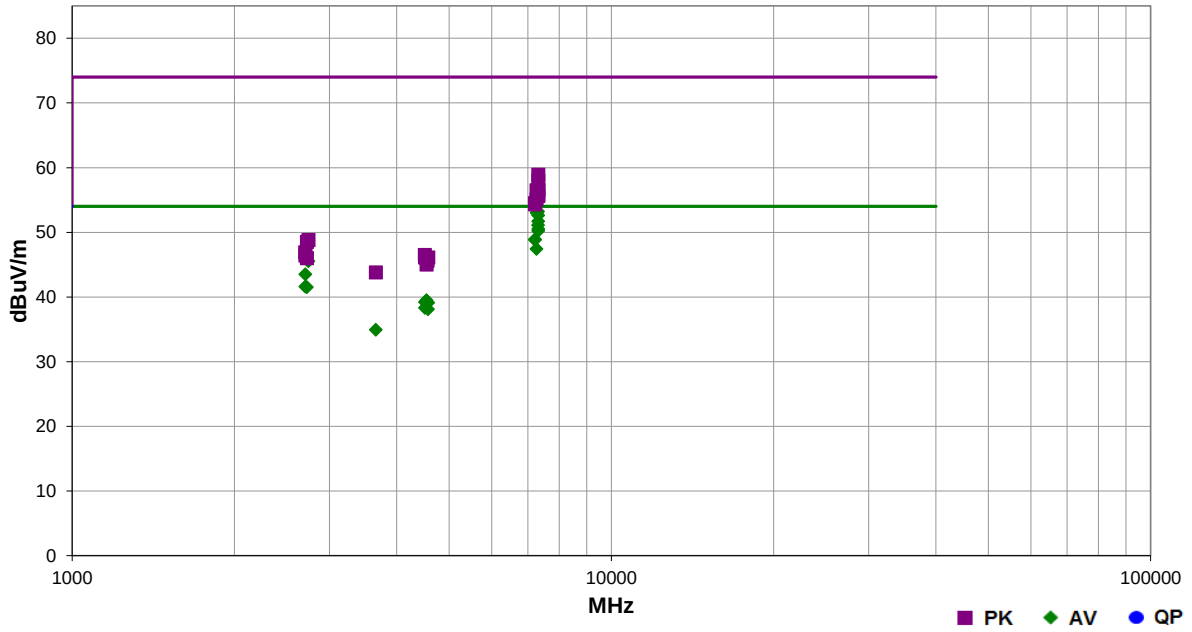
SPURIOUS RADIATED EMISSIONS

EmiR5 2022.07.06.0 PSA-ESCI 2022.08.23.0

Work Order:	MLTI0283	**Date:**	2022-11-11	Trevor Buls	
Project:	None	**Temperature:**	20.7 °C		
Job Site:	MN09	**Humidity:**	31.6% RH		
Serial Number:	D1	**Barometric Pres.:**	1016 mbar	**Tested by:**	Chris Patterson, Trevor Buls
EUT:	RBS301				
Configuration:	1				
Customer:	Multi-Tech Systems, Inc.				
Attendees:	Mike Dauk, Aaron Kramer				
EUT Power:	12VDC				
Operating Mode:	SRD Transmitting Low Channel 902.3 MHz, Mid Channel 908.7 MHz, High Channel 914.9 MHz, modulated 125 kHz BW				
Deviations:	None				
Comments:	DCCF was measured at the time of test. DCCF = 10(log(1/~0.93) = 0.3. The testing is limited to the frequency ranges most likely to cause the highest emissions.				

Test Specifications	Test Method
FCC 15.247:2022	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013

Run #	7	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
7312.000	38.5	14.4	1.5	203.0	0.3	0.0	Vert	AV	0.0	53.2	54.0	-0.8
7269.975	38.5	14.2	1.3	23.0	0.3	0.0	Vert	AV	0.0	53.0	54.0	-1.0
7318.917	37.8	14.5	1.14	125.0	0.3	0.0	Horz	AV	0.0	52.6	54.0	-1.4
7319.042	36.9	14.5	1.53	29.0	0.3	0.0	Vert	AV	0.0	51.7	54.0	-2.3
7312.000	36.4	14.4	1.56	174.0	0.3	0.0	Horz	AV	0.0	51.1	54.0	-2.9
7318.792	35.7	14.5	1.5	311.0	0.3	0.0	Horz	AV	0.0	50.5	54.0	-3.5
7319.125	35.4	14.5	2.51	218.0	0.3	0.0	Vert	AV	0.0	50.2	54.0	-3.8
7218.233	34.7	13.9	2.64	351.0	0.3	0.0	Horz	AV	0.0	48.9	54.0	-5.1
7218.150	34.6	13.9	1.46	15.0	0.3	0.0	Vert	AV	0.0	48.8	54.0	-5.2
7269.600	32.9	14.2	2.08	43.0	0.3	0.0	Vert	AV	0.0	47.4	54.0	-6.6
2726.100	47.3	-1.8	3.95	276.0	0.3	0.0	Vert	AV	0.0	45.8	54.0	-8.2
2744.833	47.1	-1.9	4.0	119.0	0.3	0.0	Vert	AV	0.0	45.5	54.0	-8.5
2707.025	45.1	-1.9	4.0	285.0	0.3	0.0	Vert	AV	0.0	43.5	54.0	-10.5
2707.025	43.2	-1.9	1.0	192.0	0.3	0.0	Horz	AV	0.0	41.6	54.0	-12.4
2725.975	43.0	-1.8	1.0	175.0	0.3	0.0	Horz	AV	0.0	41.5	54.0	-12.5
4543.583	34.2	5.0	1.7	5.0	0.3	0.0	Vert	AV	0.0	39.5	54.0	-14.5
4543.292	33.9	5.0	1.5	25.0	0.3	0.0	Horz	AV	0.0	39.2	54.0	-14.8
4511.500	34.0	4.9	1.46	30.0	0.3	0.0	Horz	AV	0.0	39.2	54.0	-14.8

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3. This procedure uses the channel power feature of the spectrum analyzer to integrate the power of the emission within a 1 MHz bandwidth.

Where the radio test software does not provide for a duty cycle at continuous transmit conditions (> 98%) and the RMS (power average) measurements were made across the on and off times of the EUT transmissions, a duty cycle correction is added to the measurements using the formula of 10*log(1/dc).

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2021-09-14	2023-09-14
Cable	ESM Cable Corp.	Bilog Cables	MNH	2022-10-08	2023-10-08
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2022-10-08	2023-10-08
Filter - Low Pass	Micro-Tronics	LPM50003	LFJ	2022-08-27	2023-08-27
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2022-03-22	2023-03-22
Attenuator	Fairview Microwave	SA18E-10	TYA	2022-08-27	2023-08-27
Antenna - Double Ridge	ETS Lindgren	3115	AIP	2022-07-20	2024-07-20
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2023-01-14	2024-01-14
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2023-01-14	2024-01-14
Attenuator	Fairview Microwave	SA18E-20	TWZ	2022-08-27	2023-08-27
Filter - High Pass	Micro-Tronics	HPM50108	LFM	2022-08-27	2023-08-27
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	NCR
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	2023-01-14	2024-01-14
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2023-01-14	2024-01-14
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HGS	2022-06-22	2023-06-22

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 10000 MHz

POWER INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

MLTI0299-MLTI0299-1

MODES INVESTIGATED

Transmitting Lora Low Ch 908.7 MHz, modulated, 125 kHz CBW

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

EUT:	RB301 v3.0	Work Order:	MLTI0299
Serial Number:	E7	Date:	2023-03-01
Customer:	Multi-Tech Systems, Inc.	Temperature:	23°C
Attendees:	Mike Dauk, Ethan Houle	Relative Humidity:	26.7%
Customer Project:	None	Bar. Pressure (PMSL):	1003 mb
Tested By:	Chris Patterson	Job Site:	MN05
Power:	Battery	Configuration:	MLTI0299-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013

TEST PARAMETERS

Run #:	19	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

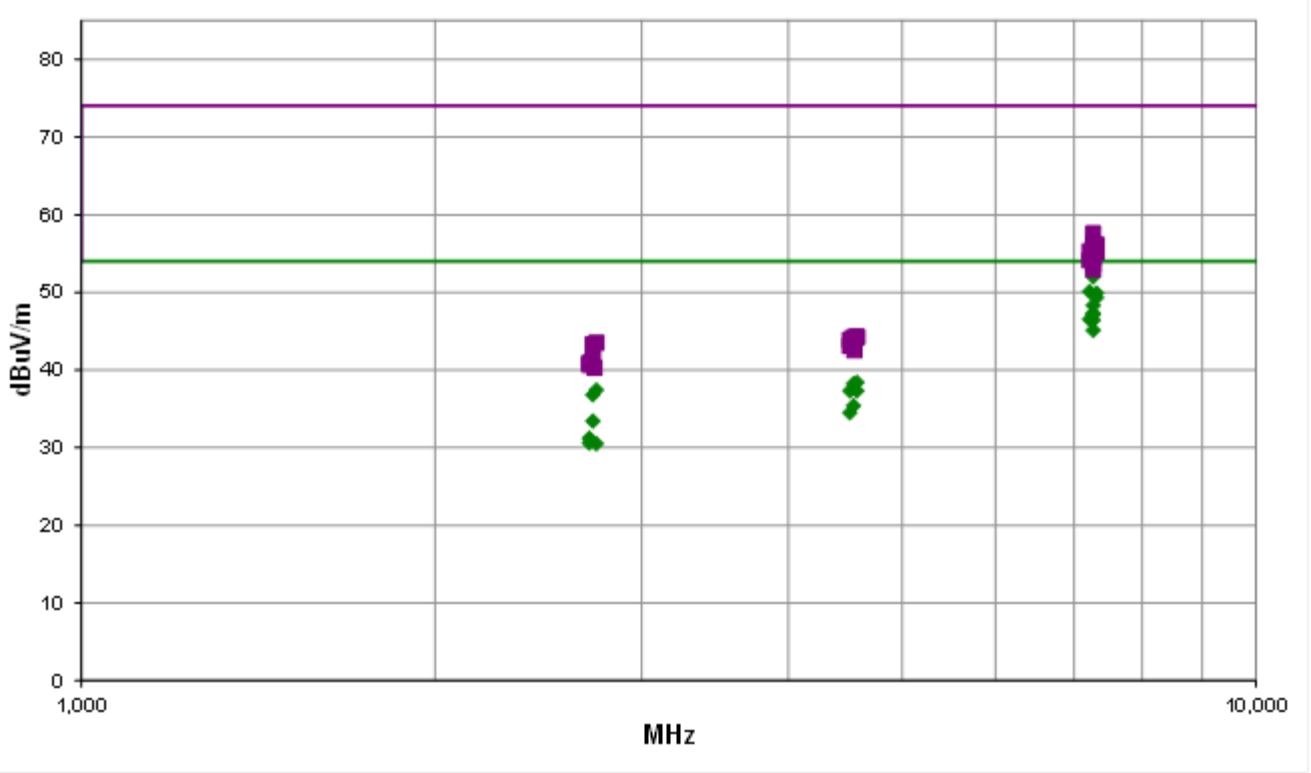
.26 DCCF derived from Duty Cycle data gathered under job MLTI0280. See comments for any changes in Data rate, or CBW. All settings tested per client's specification at time of test.

EUT OPERATING MODES

Transmitting Lora Low Ch 902.3 MHz, Mid Ch 908.7 MHz, High Ch 914.9 MHz , Data rate 0, 125 kHz CBW

DEVIATIONS FROM TEST STANDARD

None



Run #: 19 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

RESULTS - Run #19

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7269.600	41.6	11.6	2.7	49.9	0.3	0.0	Horz	AV	0.0	53.5	54.0	-0.5	EUT Horz, Mid Ch, Data rate 0
7269.600	40.1	11.6	2.2	209.0	0.3	0.0	Horz	AV	0.0	52.0	54.0	-2.0	EUT Vert, Mid Ch, Data rate 0
7218.400	38.2	11.6	2.81	222.9	0.3	0.0	Horz	AV	0.0	50.1	54.0	-3.9	EUT Horz, Low Ch, Data rate 0
7319.200	37.9	11.7	1.31	214.0	0.3	0.0	Horz	AV	0.0	49.9	54.0	-4.1	EUT Horz, High Ch, Data rate 0
7319.200	37.3	11.7	2.77	210.0	0.3	0.0	Vert	AV	0.0	49.3	54.0	-4.7	EUT On Side, High Ch, Data rate 0
7269.600	36.4	11.6	1.5	153.0	0.3	0.0	Vert	AV	0.0	48.3	54.0	-5.7	EUT On Side, Mid Ch, Data rate 0
7269.600	35.4	11.6	3.96	77.0	0.3	0.0	Vert	AV	0.0	47.3	54.0	-6.7	EUT Vert, Mid Ch, Data rate 0
7269.600	35.2	11.6	2.05	240.9	0.3	0.0	Horz	AV	0.0	47.1	54.0	-6.9	EUT On Side, Mid Ch, Data rate 0
7218.400	34.6	11.6	1.37	214.9	0.3	0.0	Vert	AV	0.0	46.5	54.0	-7.5	EUT On Side, Low Ch, Data rate 0
7269.600	34.5	11.6	2.55	238.0	0.3	0.0	Horz	AV	0.0	46.4	54.0	-7.6	EUT Horz, Mid Ch, Data rate 4, 500 kHz CBW
7269.600	33.2	11.6	1.51	254.9	0.3	0.0	Vert	AV	0.0	45.1	54.0	-8.9	EUT Horz, Mid Ch, Data rate 0
4574.500	36.3	1.8	4.0	329.0	0.3	0.0	Horz	AV	0.0	38.4	54.0	-15.6	EUT Horz, High Ch, Data rate 0
4543.500	36.1	1.8	1.75	59.0	0.3	0.0	Horz	AV	0.0	38.2	54.0	-15.8	EUT Horz, Mid Ch, Data rate 0
7269.350	46.0	11.6	2.7	49.9		0.0	Horz	PK	0.0	57.6	74.0	-16.4	EUT Horz, Mid Ch, Data rate 0
2744.700	40.8	-3.7	1.11	347.0	0.3	0.0	Horz	AV	0.0	37.4	54.0	-16.6	EUT Horz, High Ch, Data rate 0
4511.500	35.5	1.5	3.46	166.0	0.3	0.0	Vert	AV	0.0	37.3	54.0	-16.7	EUT On Side, Low Ch, Data rate 0
4574.500	35.2	1.8	1.5	8.0	0.3	0.0	Vert	AV	0.0	37.3	54.0	-16.7	EUT On Side, High Ch, Data rate 0
2726.100	40.2	-3.7	1.08	181.9	0.3	0.0	Horz	AV	0.0	36.8	54.0	-17.2	EUT Horz, Mid Ch, Data rate 0
7270.017	44.7	11.6	2.2	209.0		0.0	Horz	PK	0.0	56.3	74.0	-17.7	EUT Vert, Mid Ch, Data rate 0
7319.408	44.4	11.7	1.31	214.0		0.0	Horz	PK	0.0	56.1	74.0	-17.9	EUT Horz, High Ch, Data rate 0
7268.642	44.1	11.6	2.55	238.0		0.0	Horz	PK	0.0	55.7	74.0	-18.3	EUT Horz, Mid Ch, Data rate 4, 500 kHz CBW
4543.500	33.3	1.8	1.5	13.9	0.3	0.0	Vert	AV	0.0	35.4	54.0	-18.6	EUT On Side, Mid Ch, Data rate 0
7218.900	43.7	11.6	2.81	222.9		0.0	Horz	PK	0.0	55.3	74.0	-18.7	EUT Horz, Low Ch, Data rate 0
7319.533	43.5	11.7	2.77	210.0		0.0	Vert	PK	0.0	55.2	74.0	-18.8	EUT On Side, High Ch, Data rate 0
7269.517	42.9	11.6	1.5	153.0		0.0	Vert	PK	0.0	54.5	74.0	-19.5	EUT On Side, Mid Ch, Data rate 0
7269.808	42.9	11.6	3.96	77.0		0.0	Vert	PK	0.0	54.5	74.0	-19.5	EUT Vert, Mid Ch, Data rate 0
4511.500	32.7	1.5	1.5	128.9	0.3	0.0	Horz	AV	0.0	34.5	54.0	-19.5	EUT On Side, Low Ch, Data rate 0
7218.358	42.5	11.6	1.37	214.9		0.0	Vert	PK	0.0	54.1	74.0	-19.9	EUT On Side, Low Ch, Data rate 0
7269.600	42.0	11.6	2.05	240.9		0.0	Horz	PK	0.0	53.6	74.0	-20.4	EUT On Side, Mid Ch, Data rate 0
2726.100	36.8	-3.7	3.09	34.0	0.3	0.0	Vert	AV	0.0	33.4	54.0	-20.6	EUT On Side, Mid Ch, Data rate 0
7269.017	41.4	11.6	1.51	254.9		0.0	Vert	PK	0.0	53.0	74.0	-21.0	EUT Horz, Mid Ch, Data rate 0
2706.900	34.6	-3.7	1.5	159.0	0.3	0.0	Vert	AV	0.0	31.2	54.0	-22.8	EUT On Side, Low Ch, Data rate 0
2706.900	34.0	-3.7	1.5	181.0	0.3	0.0	Horz	AV	0.0	30.6	54.0	-23.4	EUT Horz, Low Ch, Data rate 0
2744.700	33.9	-3.7	2.27	315.9	0.3	0.0	Vert	AV	0.0	30.5	54.0	-23.5	EUT On Side, High Ch, Data rate 0
4574.375	42.5	1.8	4.0	329.0		0.0	Horz	PK	0.0	44.3	74.0	-29.7	EUT Horz, High Ch, Data rate 0
4543.208	42.4	1.8	1.75	59.0		0.0	Horz	PK	0.0	44.2	74.0	-29.8	EUT Horz, Mid Ch, Data rate 0
4574.417	42.4	1.8	1.5	8.0		0.0	Vert	PK	0.0	44.2	74.0	-29.8	EUT On Side, High Ch, Data rate 0
4511.625	42.4	1.5	3.46	166.0		0.0	Vert	PK	0.0	43.9	74.0	-30.1	EUT On Side, Low Ch, Data rate 0
2744.492	47.2	-3.7	1.11	347.0		0.0	Horz	PK	0.0	43.5	74.0	-30.5	EUT Horz, High Ch, Data rate 0
2725.850	47.0	-3.7	1.08	181.9		0.0	Horz	PK	0.0	43.3	74.0	-30.7	EUT Horz, Mid Ch, Data rate 0

SPURIOUS RADIATED EMISSIONS

element
WTD.2022.12.01.0
EmiR5 2022.07.06.0
PSA-ESCI 2022.12.29.0

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4511.125	41.6	1.5	1.5	128.9		0.0	Horz	PK	0.0	43.1	74.0	-30.9	EUT Horz, Low Ch, Data rate 0
4551.958	40.8	1.7	1.5	13.9		0.0	Vert	PK	0.0	42.5	74.0	-31.5	EUT On Side, Mid Ch, Data rate 0
2726.558	45.1	-3.7	3.09	34.0		0.0	Vert	PK	0.0	41.4	74.0	-32.6	EUT On Side, Mid Ch, Data rate 0
2707.067	44.6	-3.7	1.5	159.0		0.0	Vert	PK	0.0	40.9	74.0	-33.1	EUT On Side, Low Ch, Data rate 0
2706.483	44.4	-3.7	1.5	181.0		0.0	Horz	PK	0.0	40.7	74.0	-33.3	EUT Horz, Low Ch, Data rate 0
2734.950	44.0	-3.7	2.27	315.9		0.0	Vert	PK	0.0	40.3	74.0	-33.7	EUT On Side, High Ch, Data rate 0

CONCLUSION

Pass

Tested By

APPENDIX

GAP ANALYSIS

Gap analysis comparing RSS-247 Issue 2:2017 to RSS-247 Issue 3:2023

RSS-247 Issue 2 has been superseded by RSS-247 Issue 3.

The standard has had technical changes requiring evaluation of the compliance information of relevant products. The following changes have been made to this report

- The manufacturer's attestation to the status of the product is included in this report.
- A Gap Analysis (GA) has been performed of the current issue of the standard and was compared to the standard and method used during testing of the device documented in this report. The GA is located in the appendix of this report.

The data was verified that it continues to comply with the requirements of RSS-247 Issue 3:2023.

Conclusion:
No retesting of the device described in this report is required due to the changes made to the standard.

<u>The following changes were made in RSS-247 Issue 3:2023</u>

1. Modified section 6.2 to clarify that different measurement methods can apply depending on the operating frequency range of the device.
2. Added section 6.2.5 to introduce the requirements for devices operating from 5850 5895 MHz and channels that span across 5850 MHz.
3. Added section 6.2.5.1 to provide general information and definitions.
4. Added section 6.2.5.2 to identify the power limits associated with devices operating in the 5850-5895 MHz band.
5. Added section 6.2.5.3 to identify the unwanted emission limits associated with devices operating in the 5850-5895 MHz band.
6. Made editorial changes and clarifications, as appropriate.

DATE: February 29, 2024

RBS301 No Changes Attestation

The equipment documented in test report MLTI2034.1 rev 2 continues to be representative of the current device. The equipment design and manufacturing process have not changed since the testing/evaluation was performed and documented in the report.

Sincerely,

_____

Name : Tim Gunn
Position: Directory of Certifications
Company: Multi-Tech Systems, Inc

End of Test Report