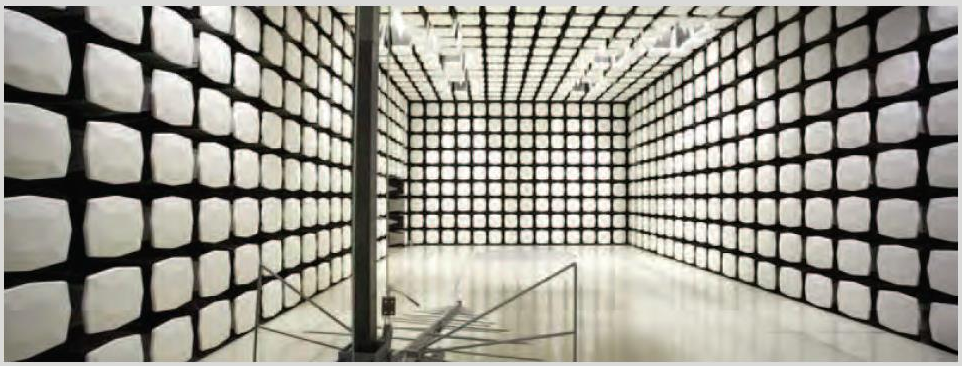
Multi-Tech Systems, Inc.

MTCAP-LSP3

FCC 15. 247:2018

902 – 928 Other Wideband DTS Transceiver

Report # MLTI0092.1



NVLAP LAB CODE: 200881-0

CERTIFICATE OF TEST

Last Date of Test: November 1, 2018
Multi-Tech Systems, Inc.
Model: MTCAP-LSP3

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2018	ANSI C63.10:2013
FCC 15.247:2018	

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6, 11.12.1, 11.13.2	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	N/A	Characterization of radio operation.
7.8.2	Carrier Frequency Separation	No	N/A	Not required for DTS devices.
7.8.3	Number of Hopping Frequencies	No	N/A	Not required for DTS devices.
7.8.4	Dwell Time	No	N/A	Not required for DTS devices.
11.9.1.1	Output Power	Yes	Pass	
11.9.1.1	Equivalent Isotropic Radiated Power	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
7.8.6	Band Edge Compliance - Hopping Mode	No	N/A	Not required for DTS devices.
11.8.2	Occupied Bandwidth	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Matt Nuernberg, Operations Manager

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.

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

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 - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

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

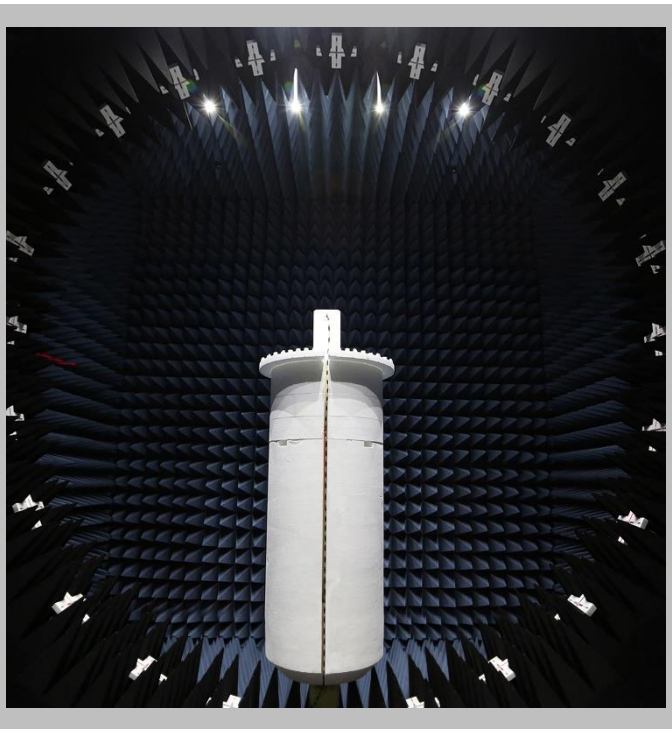
MIC – Recognized by MIC as a CAB for the acceptance of test data.

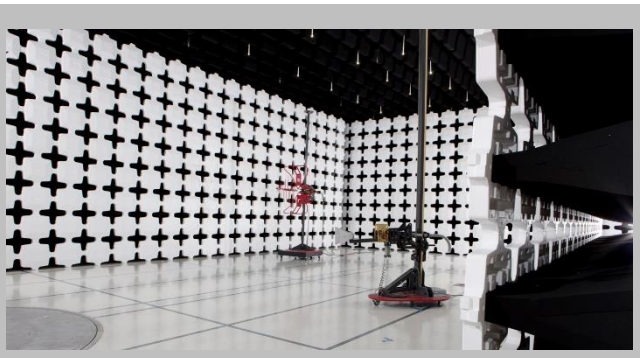
SCOPE

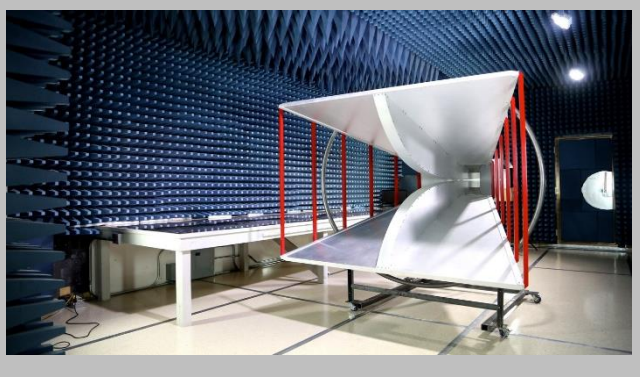
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	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
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	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.

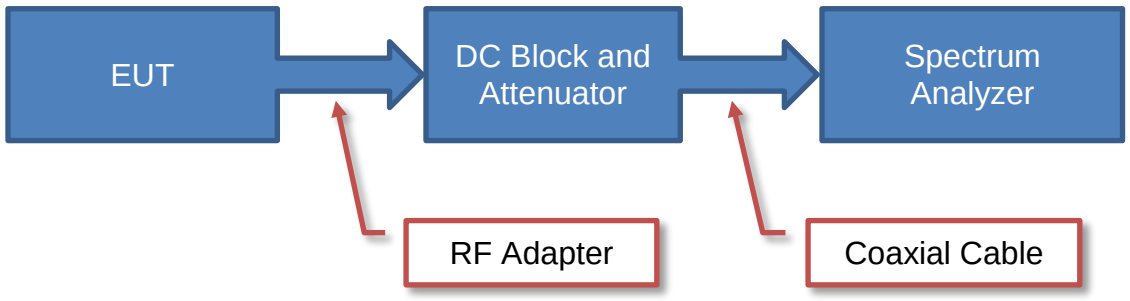
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. 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.

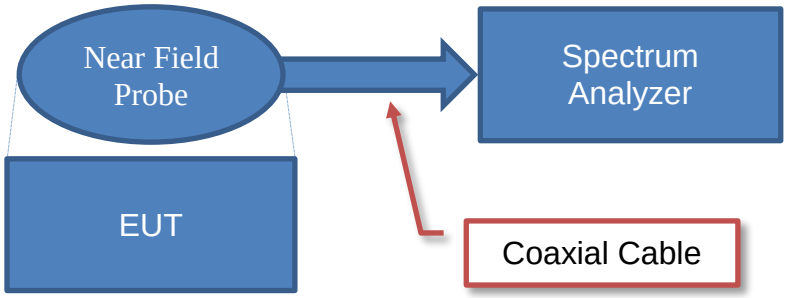
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

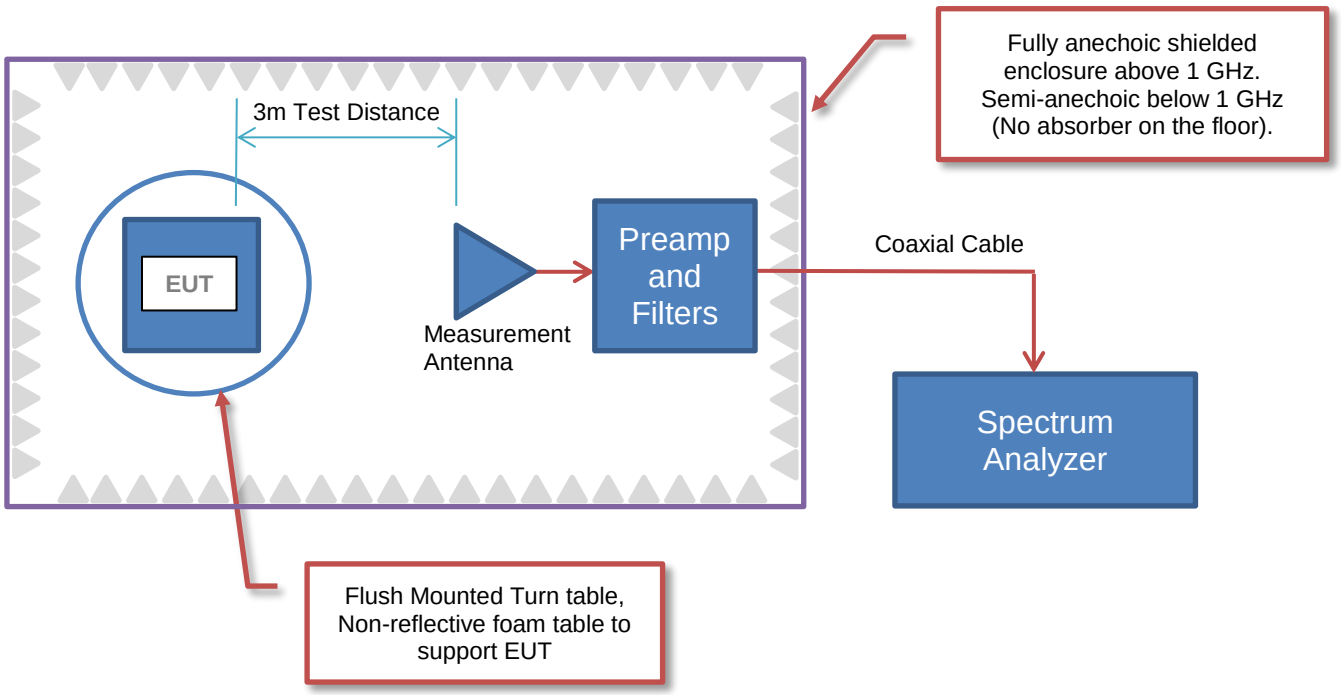
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Multi-Tech Systems, Inc.
Address:	2205 Woodale Drive
City, State, Zip:	Mounds View, MN 55112
Test Requested By:	Marcus Glass
Model:	MTCAP-LSP3
First Date of Test:	October 31, 2018
Last Date of Test:	November 1, 2018
Receipt Date of Samples:	October 31, 2018
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Device containing cellular and LoRa radios

Testing Objective:
Seeking to demonstrate compliance under FCC 15.247:2018 for operation in the 902 - 928 MHz Band.

POWER SETTINGS

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

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types / Data Rates	Type	Channel	Frequency (MHz)	Power Setting
LoRa	DTS	0	923.3	3.2.15 Util_Tx_Cont
		3	925.1	3.2.15 Util_Tx_Cont
		7	927.5	3.2.15 Util_Tx_Cont

CONFIGURATIONS

Configuration MLTI0092- 1

Software/Firmware Running during test	
Description	**Version**
M Linux	4.0.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
MTCAP-LSP3	Multi-Tech Systems, Inc.	MTCAP-LSP3	359868070098618

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC Adapter	Mega Electronics Inc.	FJ-SW1260502500DN	MJSW1260502500DN

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Dell	PP41L	38RNBH1
Mouse	Logitech	M-BJ58	LNA24020904
AC Adapter (Laptop)	Dell	LA65NS2-00	CN-ONXO61-71615-961-2184

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Ethernet Cable	No	>3.0 m	No	MTCAP-LSP3	Laptop
DC Power	No	1.4 m	No	MTCAP-LSP3	AC Adapter
USB Cable	Yes	1.7 m	No	Laptop	Mouse
AC Power (Laptop)	No	0.8 m	No	AC Mains	AC Adapter (Laptop)
DC Power (Laptop)	No	1.7 m	Yes	AC Adapter (Laptop)	Laptop

CONFIGURATIONS

element
2018-07-17

Configuration MLTI0092- 2

Software/Firmware Running during test	
Description	**Version**
M Linux	4.0.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
MTCAP-LSP3	Multi-Tech Systems, Inc.	MTCAP-LSP3	359868070098451

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC Adapter	Mega Electronics Inc.	FJ-SW1260502500DN	MJSW1260502500DN
Laptop	Dell	PP41L	38RNBH1
Mouse	Logitech	M-BJ58	LNA24020904
AC Adapter (Laptop)	Dell	LA65NS2-00	CN-ONXO61-71615-961-2184

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Ethernet Cable	No	2.1 m	No	MTCAP-LSP3	Laptop
DC Power	No	1.4 m	No	MTCAP-LSP3	AC Adapter
USB Cable	Yes	1.7 m	No	Laptop	Mouse
AC Power (Laptop)	No	0.8 m	No	AC Mains	AC Adapter (Laptop)
DC Power (Laptop)	No	1.7 m	Yes	AC Adapter (Laptop)	Laptop

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2018-10-31	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.
2	2018-10-31	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.
3	2018-10-31	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.
4	2018-10-31	Occupied Bandwidth	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	2018-10-31	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.
6	2018-10-31	Power Spectral Density	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	2018-10-31	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.
8	2018-11-01	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESR7	ARI	6/26/2018	6/26/2019
Cable - Conducted Cable Assembly	Northwest EMC	MNC, HGN, TYK	MNCA	3/14/2018	3/14/2019
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/15/2018	3/15/2019
LISN	Solar Electronics	9252-50-R-24-BNC	LIO	10/4/2018	10/4/2019

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

MLTI0092-1

MODES INVESTIGATED

Tx LoRa modulated Mid Ch at 925.1 MHz. 3.2.15 Util_Tx_Cont power setting used.

POWERLINE CONDUCTED EMISSIONS

EUT:	MTCAP-LSP3	Work Order:	MLTI0092
Serial Number:	359868070098451	Date:	11/01/2018
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.4°C
Attendees:	Marcus Glass	Relative Humidity:	31.4%
Customer Project:	None	Bar. Pressure:	1015 mb
Tested By:	Kyle McMullan	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0092-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2018	ANSI C63.10:2013

TEST PARAMETERS

Run #:	2	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

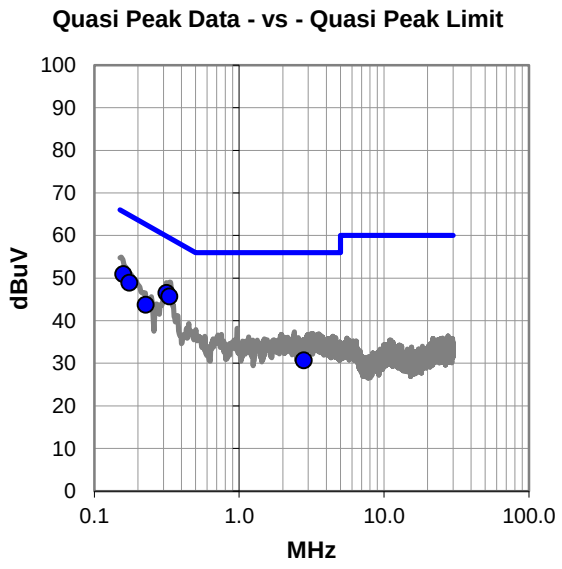
None

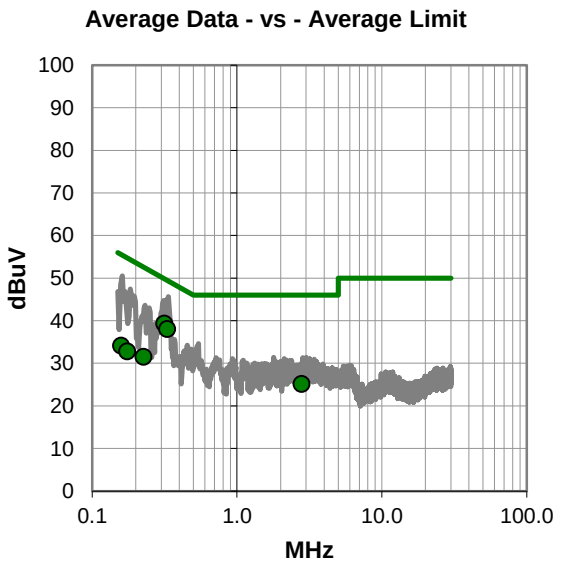
EUT OPERATING MODES

Tx LoRa modulated Mid Ch at 925.1 MHz. 3.2.15 Util_Tx_Cont power setting used.

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

RESULTS - Run #2

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.315	26.1	20.4	46.5	59.8	-13.3
0.330	25.3	20.4	45.7	59.5	-13.8
0.159	30.2	20.7	50.9	65.5	-14.6
0.175	28.2	20.7	48.9	64.7	-15.8
0.226	23.1	20.6	43.7	62.6	-18.9
2.794	10.2	20.5	30.7	56.0	-25.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.315	18.9	20.4	39.3	49.8	-10.5
0.330	17.6	20.4	38.0	49.5	-11.5
2.794	4.6	20.5	25.1	46.0	-20.9
0.226	10.9	20.6	31.5	52.6	-21.1
0.159	13.4	20.7	34.1	55.5	-21.4
0.175	12.1	20.7	32.8	54.7	-21.9

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

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WTD.2017.11.22.1

EUT:	MTCAP-LSP3	Work Order:	MLTI0092
Serial Number:	359868070098451	Date:	11/01/2018
Customer:	Multi-Tech Systems, Inc.	Temperature:	22.4°C
Attendees:	Marcus Glass	Relative Humidity:	31.4%
Customer Project:	None	Bar. Pressure:	1015 mb
Tested By:	Kyle McMullan	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0092-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2018	ANSI C63.10:2013

TEST PARAMETERS

Run #:	3	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

None

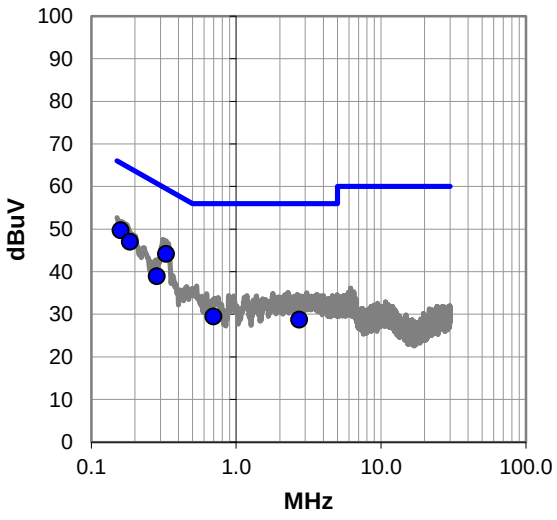
EUT OPERATING MODES

Tx LoRa modulated Mid Ch at 925.1 MHz. 3.2.15 Util_Tx_Cont power setting used.

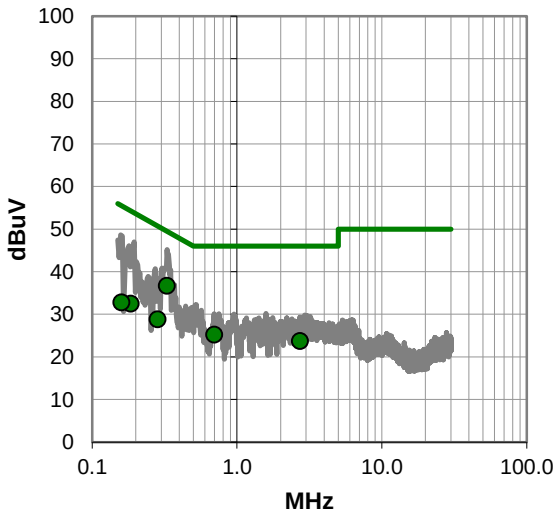
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

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WTD.2017.11.22.1

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.328	23.8	20.4	44.2	59.5	-15.3
0.159	29.0	20.7	49.7	65.5	-15.8
0.185	26.3	20.7	47.0	64.3	-17.3
0.282	18.5	20.4	38.9	60.7	-21.8
0.696	9.0	20.5	29.5	56.0	-26.5
2.719	8.2	20.5	28.7	56.0	-27.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.328	16.3	20.4	36.7	49.5	-12.8
0.696	4.7	20.5	25.2	46.0	-20.8
0.185	11.8	20.7	32.5	54.3	-21.8
0.282	8.4	20.4	28.8	50.7	-21.9
2.719	3.2	20.5	23.7	46.0	-22.3
0.159	12.1	20.7	32.8	55.5	-22.7

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2018.07.27

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

Tx LoRa modulated Low, Mid, or High Ch at 923.3, 925.1, or 927.5 MHz. 3.2.15 Util_Tx_Cont power setting used.

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MLTI0092 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	10 GHz

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.	Interval
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HGS	31-Jul-2018	12 mo
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	12-Jul-2018	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	24-Sep-2018	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	9-Nov-2017	12 mo
Filter - High Pass	Micro-Tronics	HPM50108	LFM	24-Sep-2018	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	25-Jan-2018	24 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	13-Feb-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	13-Feb-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	9-Nov-2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJA	27-Jun-2018	24 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	27-Apr-2018	12 mo

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 at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

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(dc).

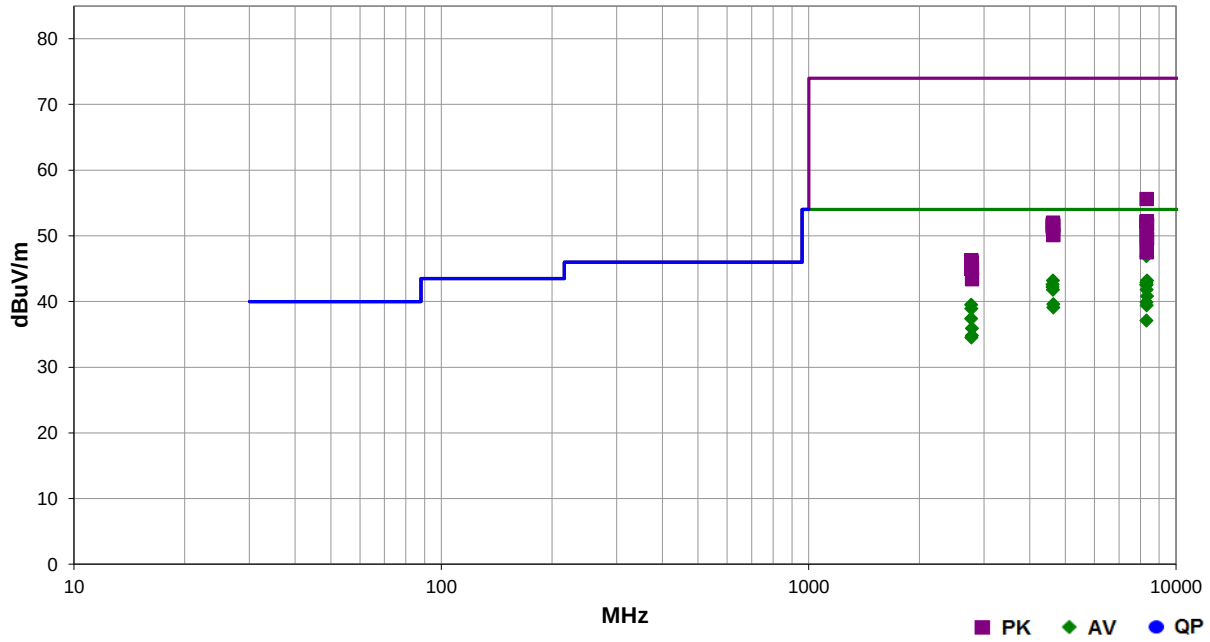
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.09.26 PSA-ESCI 2018.07.27

Work Order:	MLTI0092	**Date:**	31-Oct-2018		
Project:	None	**Temperature:**	21.7 °C		
Job Site:	MN05	**Humidity:**	34% RH		
Serial Number:	359868070098618	**Barometric Pres.:**	1017 mbar	**Tested by:**	Kyle McMullan
EUT:	MTCAP-LSP3				
Configuration:	1				
Customer:	Multi-Tech Systems, Inc.				
Attendees:	Marcus Glass				
EUT Power:	110VAC/60Hz				
Operating Mode:	Tx LoRa modulated Low, Mid, or High Ch at 923.3, 925.1, or 927.5 MHz. 3.2.15 Util_Tx_Cont power setting used.				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

Run #	19	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
8309.742	53.5	-6.6	1.0	322.0	0.0	0.0	Horz	AV	0.0	46.9	54.0	-7.1	Low Ch, EUT Vert
8324.408	48.4	-6.6	1.0	330.9	0.0	0.0	Horz	AV	0.0	41.8	54.0	-12.2	Mid Ch, EUT Vert
8309.550	49.2	-6.6	2.2	282.9	0.0	0.0	Vert	AV	0.0	42.6	54.0	-11.4	Low Ch, EUT On Side
8309.500	49.5	-6.6	2.2	286.9	0.0	0.0	Vert	AV	0.0	42.9	54.0	-11.1	Low Ch, EUT Horz
4625.650	39.6	3.6	3.2	275.0	0.0	0.0	Vert	AV	0.0	43.2	54.0	-10.8	Mid Ch, EUT On Side
8347.000	49.8	-6.6	1.5	329.0	0.0	0.0	Horz	AV	0.0	43.2	54.0	-10.8	High Ch, EUT Vert
8309.742	49.1	-6.6	1.6	275.9	0.0	0.0	Vert	AV	0.0	42.5	54.0	-11.5	Low Ch, EUT Vert
4625.475	38.2	3.6	1.7	315.9	0.0	0.0	Horz	AV	0.0	41.8	54.0	-12.2	Mid Ch, EUT Vert
4616.408	39.1	3.5	1.0	232.0	0.0	0.0	Horz	AV	0.0	42.6	54.0	-11.4	Low Ch, EUT Vert
4616.542	38.7	3.5	1.0	304.9	0.0	0.0	Vert	AV	0.0	42.2	54.0	-11.8	Low Ch, EUT On Side
8324.433	46.0	-6.6	2.3	285.0	0.0	0.0	Vert	AV	0.0	39.4	54.0	-14.6	Mid Ch, EUT On Side
8346.867	47.4	-6.6	2.2	265.9	0.0	0.0	Vert	AV	0.0	40.8	54.0	-13.2	High Ch, EUT On Side
8309.592	46.5	-6.6	1.0	285.0	0.0	0.0	Horz	AV	0.0	39.9	54.0	-14.1	Low Ch, EUT On Side
4637.717	35.8	3.8	1.0	292.0	0.0	0.0	Vert	AV	0.0	39.6	54.0	-14.4	High Ch, EUT On Side
8309.775	43.7	-6.6	1.0	61.0	0.0	0.0	Horz	AV	0.0	37.1	54.0	-16.9	Low Ch, EUT Horz
2769.842	42.7	-3.2	1.0	264.9	0.0	0.0	Vert	AV	0.0	39.5	54.0	-14.5	Low Ch, EUT On Side
4637.508	35.3	3.8	1.0	335.0	0.0	0.0	Horz	AV	0.0	39.1	54.0	-14.9	High Ch, EUT Vert

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
2775.275	42.0	-3.1	1.0	271.0	0.0	0.0	Vert	AV	0.0	38.9	54.0	-15.1	Mid Ch, EUT On Side
2769.833	40.6	-3.2	1.0	351.0	0.0	0.0	Horz	AV	0.0	37.4	54.0	-16.6	Low Ch, EUT Vert
2782.458	39.0	-3.1	1.0	275.9	0.0	0.0	Vert	AV	0.0	35.9	54.0	-18.1	High Ch, EUT On Side
2782.483	37.9	-3.1	1.0	224.1	0.0	0.0	Horz	AV	0.0	34.8	54.0	-19.2	High Ch, EUT Vert
2775.275	37.6	-3.1	1.0	216.0	0.0	0.0	Horz	AV	0.0	34.5	54.0	-19.5	Mid Ch, EUT Vert
8309.200	62.2	-6.6	1.0	322.0		0.0	Horz	PK	0.0	55.6	74.0	-18.4	Low Ch, EUT Vert
8309.342	58.8	-6.6	2.2	282.9		0.0	Vert	PK	0.0	52.2	74.0	-21.8	Low Ch, EUT On Side
8309.175	58.7	-6.6	2.2	286.9		0.0	Vert	PK	0.0	52.1	74.0	-21.9	Low Ch, EUT Horz
4625.892	48.4	3.6	3.2	275.0		0.0	Vert	PK	0.0	52.0	74.0	-22.0	Mid Ch, EUT On Side
8346.450	58.4	-6.6	1.5	329.0		0.0	Horz	PK	0.0	51.8	74.0	-22.2	High Ch, EUT Vert
8309.342	58.3	-6.6	1.6	275.9		0.0	Vert	PK	0.0	51.7	74.0	-22.3	Low Ch, EUT Vert
4616.725	48.2	3.5	1.0	232.0		0.0	Horz	PK	0.0	51.7	74.0	-22.3	Low Ch, EUT Vert
4637.408	47.8	3.8	1.0	292.0		0.0	Vert	PK	0.0	51.6	74.0	-22.4	High Ch, EUT On Side
8324.183	58.1	-6.6	1.0	330.9		0.0	Horz	PK	0.0	51.5	74.0	-22.5	Mid Ch, EUT Vert
4616.892	47.9	3.5	1.0	304.9		0.0	Vert	PK	0.0	51.4	74.0	-22.6	Low Ch, EUT On Side
4625.917	47.4	3.6	1.7	315.9		0.0	Horz	PK	0.0	51.0	74.0	-23.0	Mid Ch, EUT Vert
4637.233	46.3	3.8	1.0	335.0		0.0	Horz	PK	0.0	50.1	74.0	-23.9	High Ch, EUT Vert
8309.175	56.3	-6.6	1.0	285.0		0.0	Horz	PK	0.0	49.7	74.0	-24.3	Low Ch, EUT On Side
8346.550	56.2	-6.6	2.2	265.9		0.0	Vert	PK	0.0	49.6	74.0	-24.4	High Ch, EUT On Side
8324.208	56.0	-6.6	2.3	285.0		0.0	Vert	PK	0.0	49.4	74.0	-24.6	Mid Ch, EUT On Side
8309.133	54.1	-6.6	1.0	61.0		0.0	Horz	PK	0.0	47.5	74.0	-26.5	Low Ch, EUT Horz
2770.067	49.5	-3.2	1.0	264.9		0.0	Vert	PK	0.0	46.3	74.0	-27.7	Low Ch, EUT On Side
2775.108	49.3	-3.1	1.0	271.0		0.0	Vert	PK	0.0	46.2	74.0	-27.8	Mid Ch, EUT On Side
2776.050	48.9	-3.1	1.0	216.0		0.0	Horz	PK	0.0	45.8	74.0	-28.2	Mid Ch, EUT Vert
2782.908	48.1	-3.1	1.0	275.9		0.0	Vert	PK	0.0	45.0	74.0	-29.0	High Ch, EUT On Side
2770.083	48.2	-3.2	1.0	351.0		0.0	Horz	PK	0.0	45.0	74.0	-29.0	Low Ch, EUT Vert
2782.800	46.5	-3.1	1.0	224.1		0.0	Horz	PK	0.0	43.4	74.0	-30.6	High Ch, EUT Vert

DUTY CYCLE

TEST DESCRIPTION

The Duty Cycle (x) were measured for each of the EUT operating modes. 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. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

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

The EUT operates at 100% Duty Cycle.

OUTPUT POWER

XMit 2017.12.13

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
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Attenuator	Fairview Microwave	SA4014-20	AQI	7-Sep-18	7-Sep-19
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Generator - Signal	Keysight	N5182B-506	TEU	23-Apr-18	23-Apr-21
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

OUTPUT POWER

element

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	MTCAP-LSP3			**Work Order:**	MLTI0092
Serial Number:	359868070098451			**Date:**	1-Nov-18
Customer:	Multi-Tech Systems, Inc.			**Temperature:**	22.7 °C
Attendees:	Marcus Glass			**Humidity:**	31.9% RH
Project:	None			**Barometric Pres.:**	1016 mbar
Tested by:	Kyle McMullan	**Power:**	110VAC/60Hz	**Job Site:**	MN08

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

None

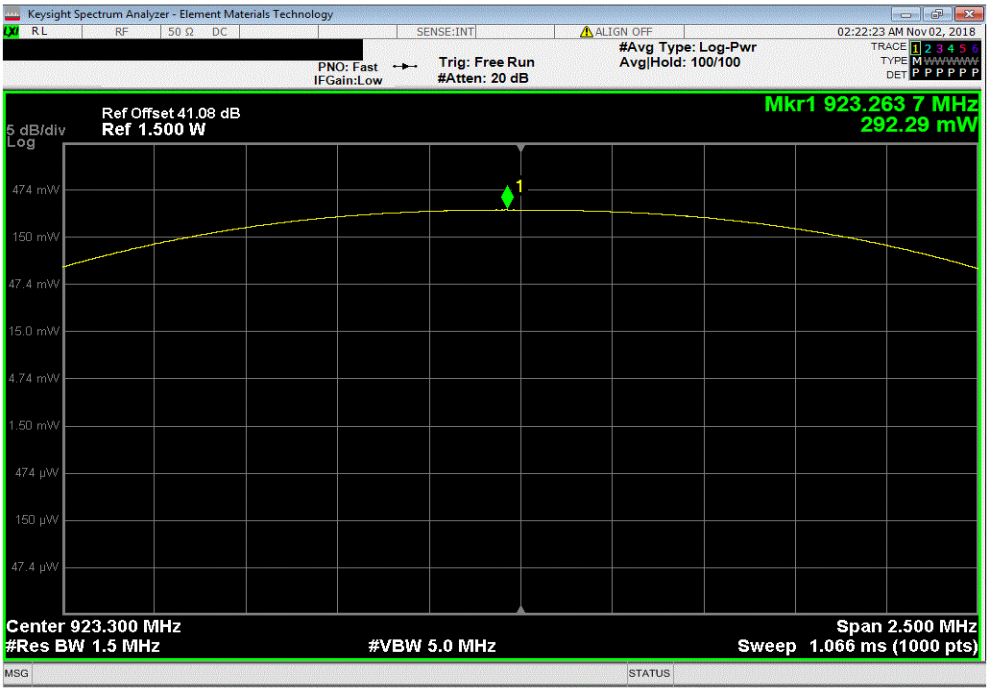
DEVIATIONS FROM TEST STANDARD

None

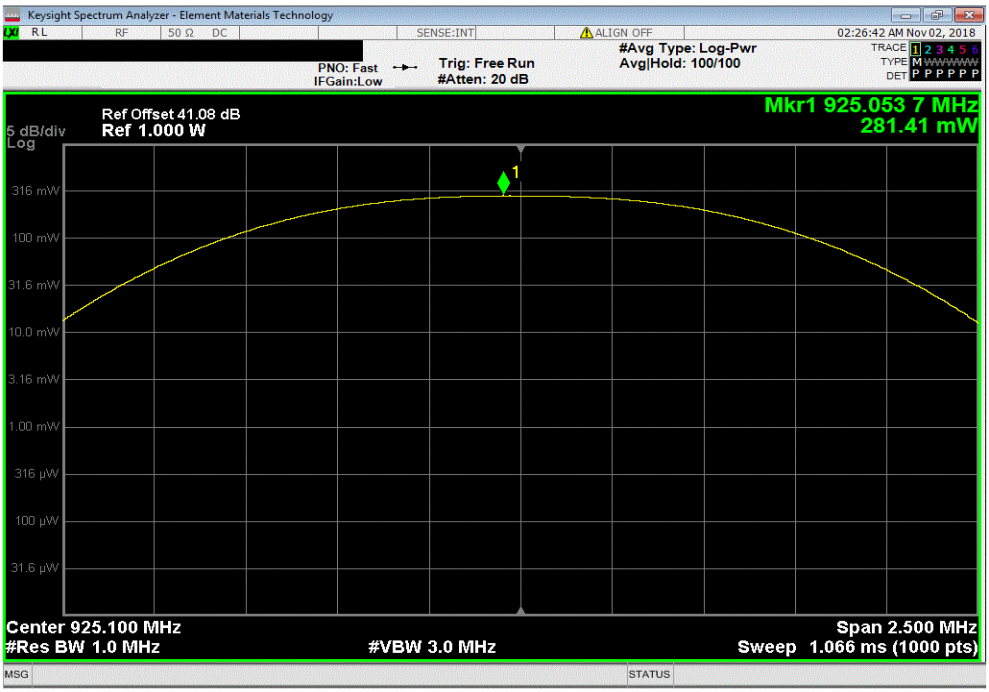
Configuration #	2	*Signature*

	Value	Limit (<)	Result
LoRa Low Channel, 923.3 MHz	292.29 mW	1 W	Pass
LoRa Mid Channel, 925.1 MHz	281.41 mW	1 W	Pass
LoRa High Channel, 927.5 MHz	265.72 mW	1 W	Pass

LoRa Low Channel, 923.3 MHz						
				Value	Limit (<)	Result
				292.29 mW	1 W	Pass

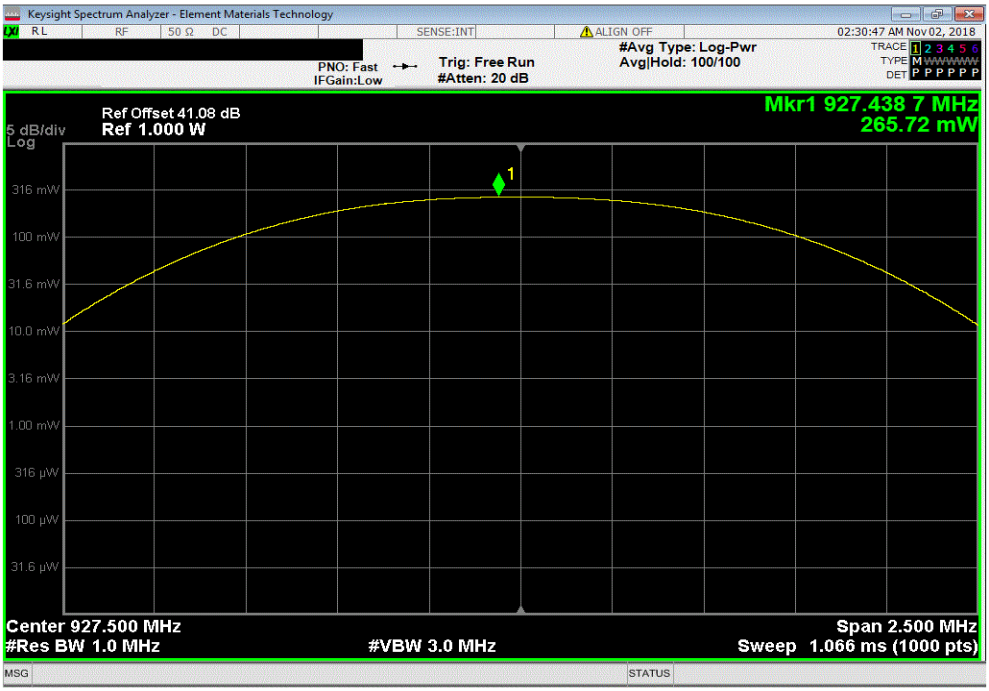


LoRa Mid Channel, 925.1 MHz						
				Value	Limit (<)	Result
				281.41 mW	1 W	Pass



OUTPUT POWER

LoRa High Channel, 927.5 MHz						
				Value	Limit (<)	Result
				265.72 mW	1 W	Pass



EQUIVELENT ISOTROPIC RADIATED POWER

XMit 2017.12.13

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
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Attenuator	Fairview Microwave	SA4014-20	AQI	7-Sep-18	7-Sep-19
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Generator - Signal	Keysight	N5182B-506	TEU	23-Apr-18	23-Apr-21
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

The declared antenna gain was added to the output power of the EUT. This was comparred to the 4 Watt=36 dBm limit to determine compliance.

EQUIVELENT ISOTROPIC RADIATED POWER

element

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**MTCAP-LSP3**			**Work Order:**	**MLTI0092**
Serial Number:	**359868070098451**			**Date:**	**1-Nov-18**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**22.7 °C**
Attendees:	**Marcus Glass**			**Humidity:**	**31.9% RH**
Project:	**None**			**Barometric Pres.:**	**1016 mbar**
Tested by:	**Kyle McMullan**	**Power:**	**110VAC/60Hz**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

Configuration #	**2**	*Signature*

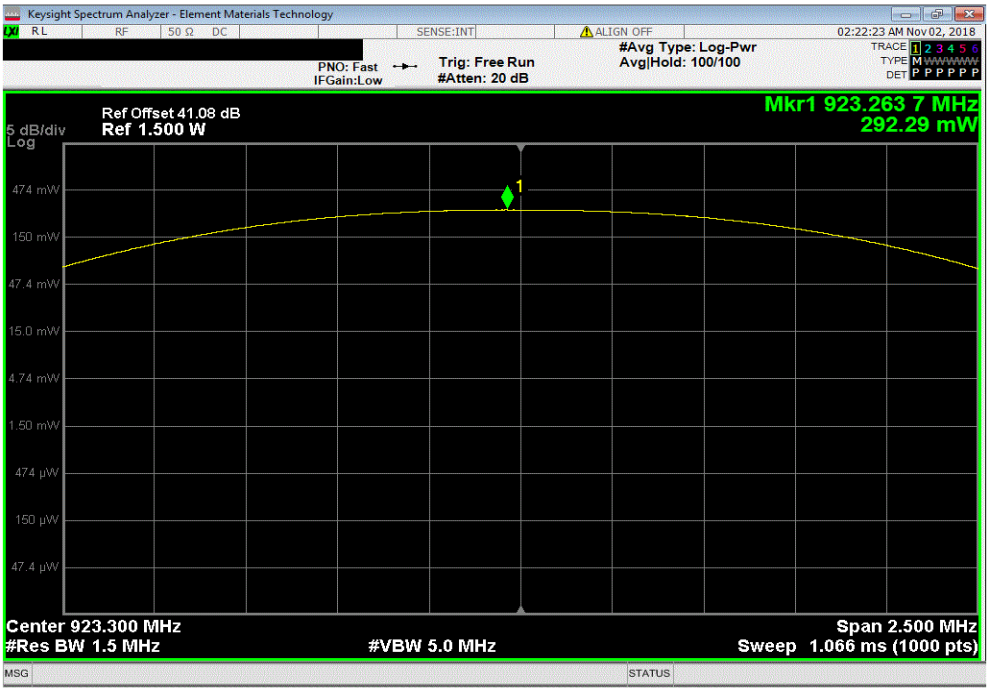
	Value (mW)	Gain (dBi)	EIRP (dBm)	Limit (dBm) (<)	Result
LoRa Low Channel, 923.3 MHz	292.29	1.0	25.66	36	Pass
LoRa Mid Channel, 925.1 MHz	281.41	1.0	25.49	36	Pass
LoRa High Channel, 927.5 MHz	265.72	1.0	25.24	36	Pass

EQUIVELENT ISOTROPIC RADIATED POWER

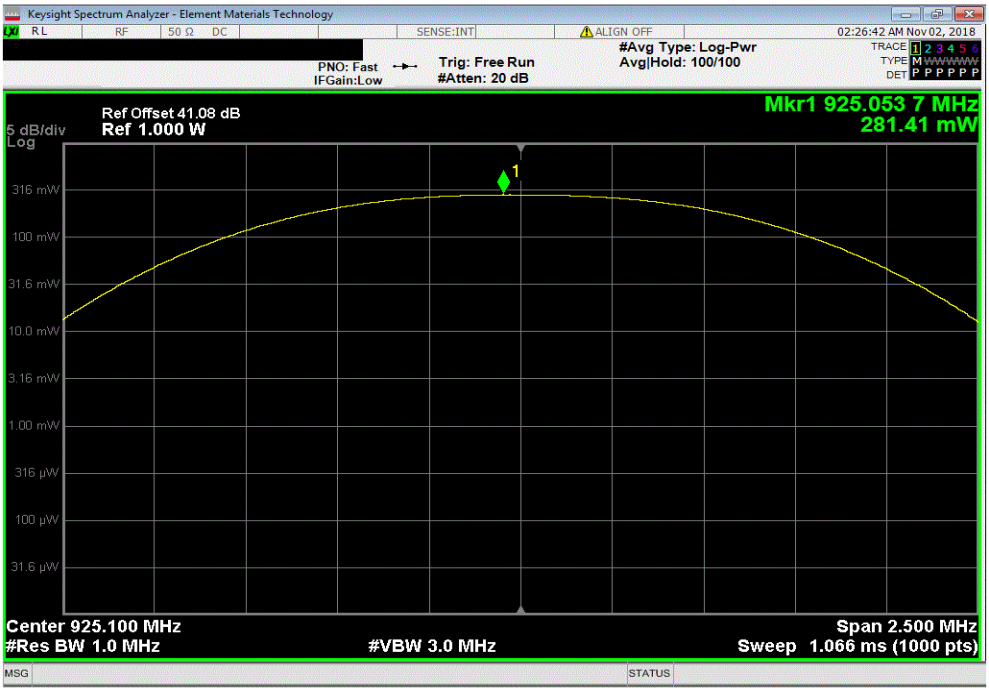
element

TbtTx 2018.09.13 XMit 2017.12.13

LoRa Low Channel, 923.3 MHz						
		Value (mW)	Gain (dBi)	EIRP (dBm)	Limit (dBm) (<)	Result
		292.29	1.0	25.66	36	Pass



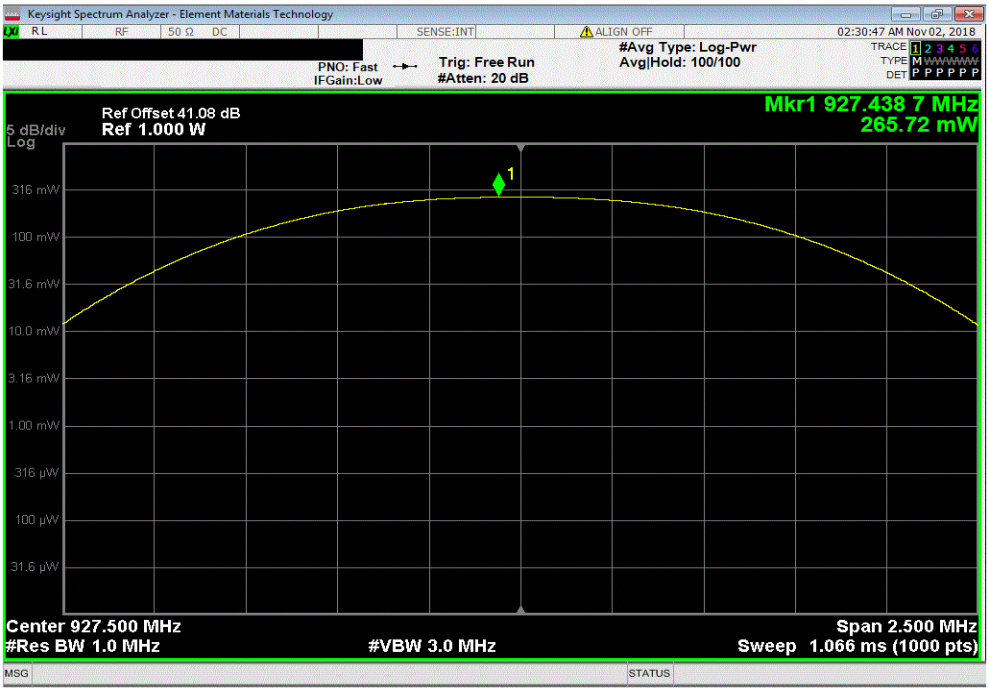
LoRa Mid Channel, 925.1 MHz						
		Value (mW)	Gain (dBi)	EIRP (dBm)	Limit (dBm) (<)	Result
		281.41	1.0	25.49	36	Pass



EQUIVELENT ISOTROPIC RADIATED POWER

TbtTx 2018.09.13 XMit 2017.12.13

LoRa High Channel, 927.5 MHz						
		Value (mW)	Gain (dBi)	EIRP (dBm)	Limit (dBm) (<)	Result
		265.72	1.0	25.24	36	Pass



BAND EDGE COMPLIANCE

XMit 2017.12.13

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
Attenuator	Fairview Microwave	SA4014-20	AQI	7-Sep-18	7-Sep-19
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Generator - Signal	Keysight	N5182B-506	TEU	23-Apr-18	23-Apr-21
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. 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

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**MTCAP-LSP3**			**Work Order:**	**MLTI0092**
Serial Number:	**359868070098451**			**Date:**	**1-Nov-18**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**22.6 °C**
Attendees:	**Marcus Glass**			**Humidity:**	**31.9% RH**
Project:	**None**			**Barometric Pres.:**	**1016 mbar**
Tested by:	**Kyle McMullan**	**Power:**	**110VAC/60Hz**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

None

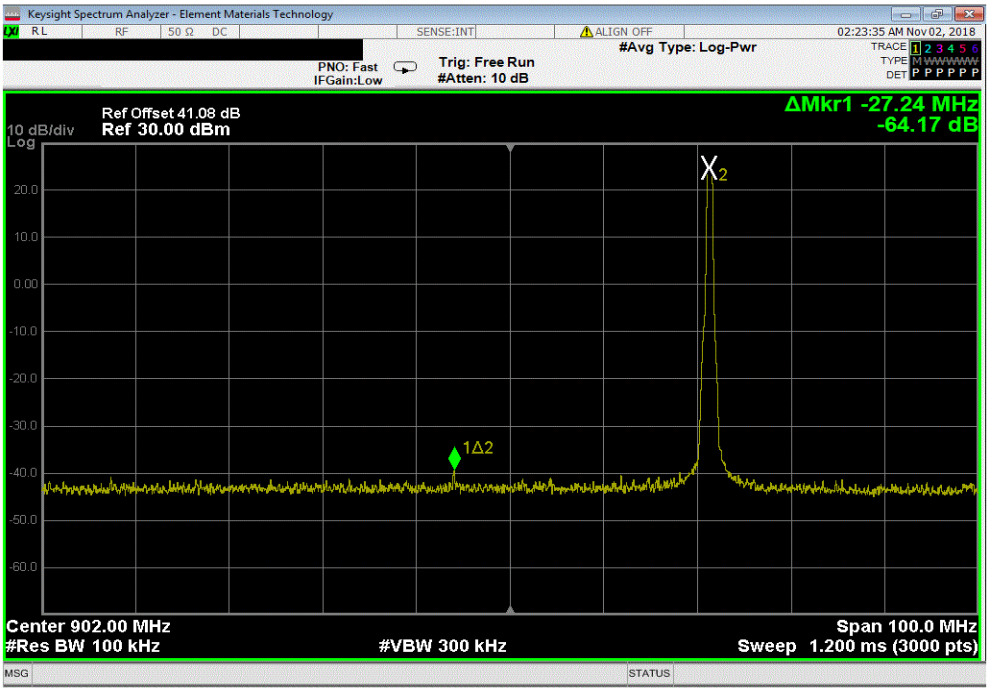
DEVIATIONS FROM TEST STANDARD

None

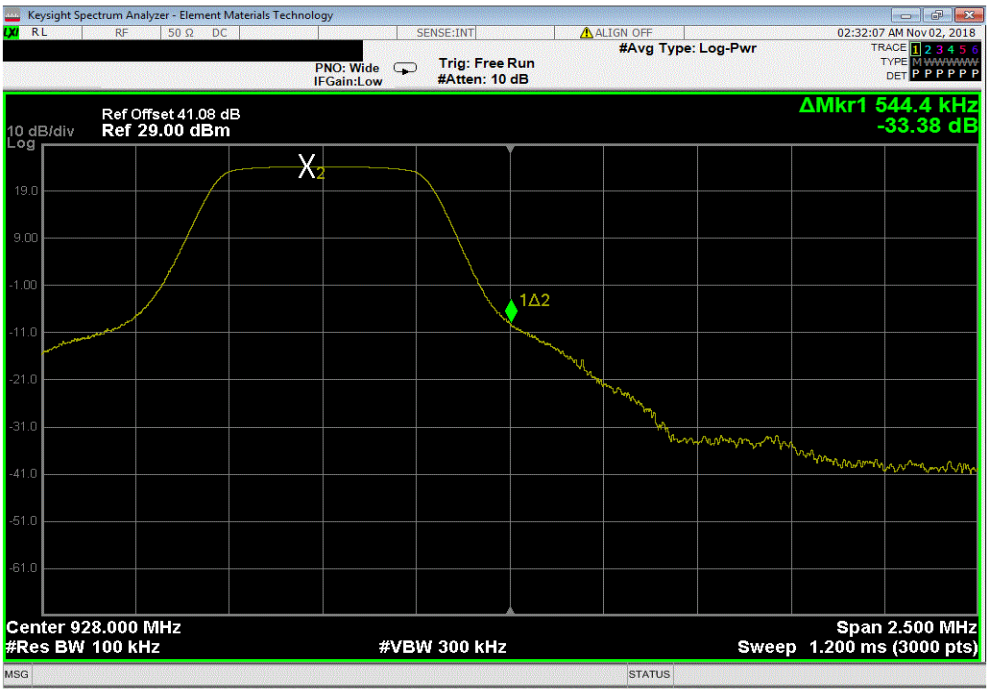
Configuration #	**2**	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
LoRa Low Channel, 923.3 MHz	-64.17	-20	Pass
LoRa High Channel, 927.5 MHz	-33.38	-20	Pass

LoRa Low Channel, 923.3 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-64.17	-20	Pass



LoRa High Channel, 927.5 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-33.38	-20	Pass



OCCUPIED BANDWIDTH

XMit 2017.12.13

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-506	TEU	23-Apr-18	23-Apr-21
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Attenuator	Fairview Microwave	SA4014-20	AQI	7-Sep-18	7-Sep-19
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was set to the channels and modes listed in the datasheet.

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.

OCCUPIED BANDWIDTH

element

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**MTCAP-LSP3**			**Work Order:**	**MLTI0092**
Serial Number:	**359868070098451**			**Date:**	**1-Nov-18**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**22.6 °C**
Attendees:	**Marcus Glass**			**Humidity:**	**31.8% RH**
Project:	**None**			**Barometric Pres.:**	**1016 mbar**
Tested by:	**Kyle McMullan**	**Power:**	**110VAC/60Hz**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

None

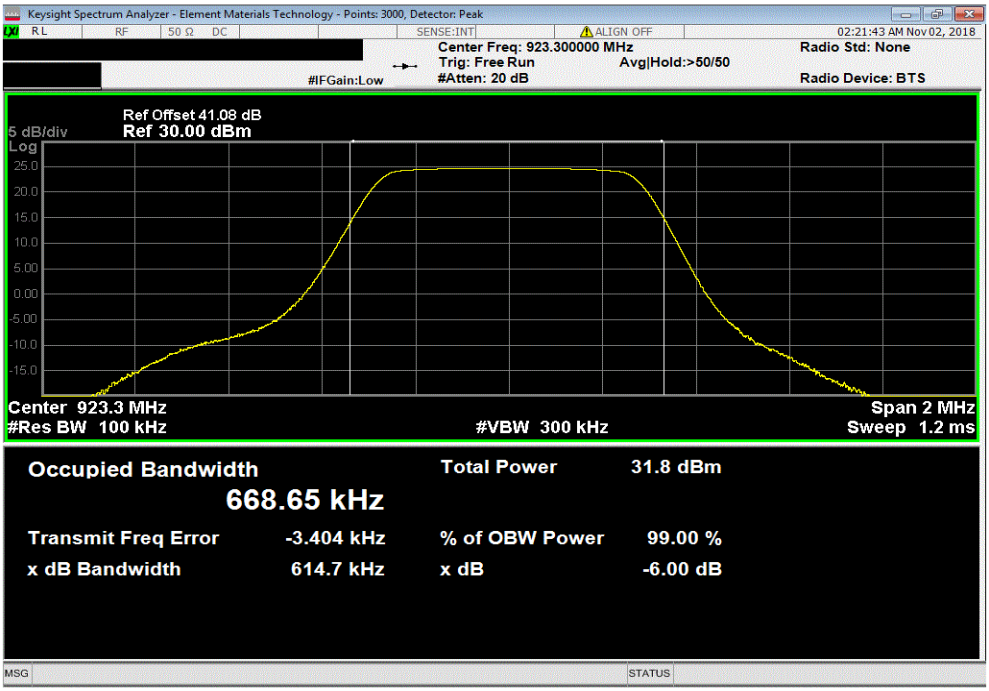
DEVIATIONS FROM TEST STANDARD

None

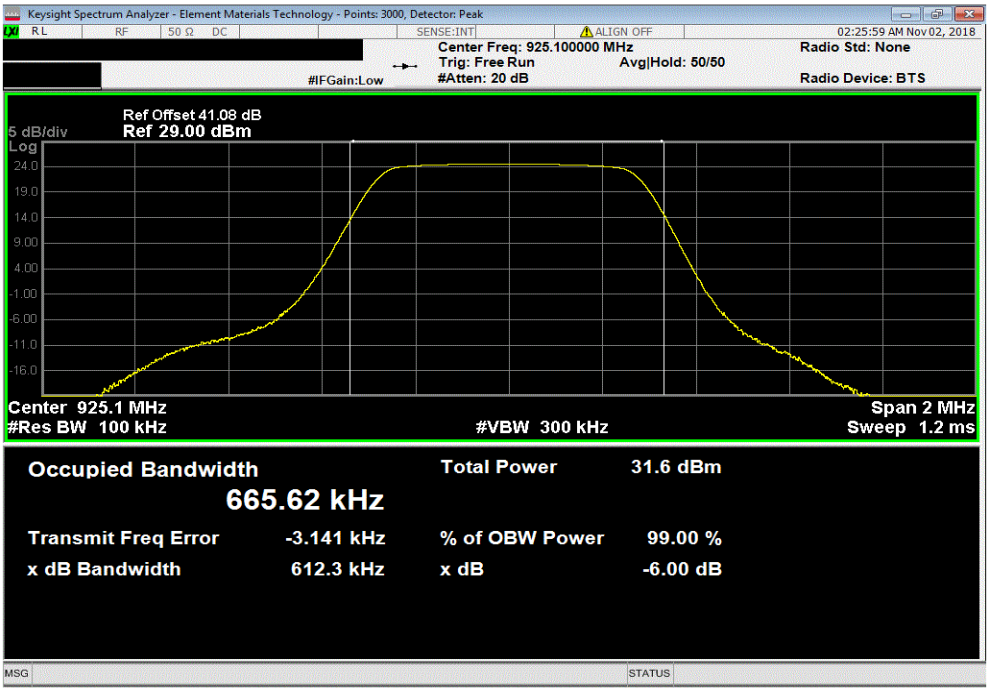
Configuration #	**2**	*Signature*

	Value	**Limit (>)**	**Result**
LoRa Low Channel, 923.3 MHz	614.742 kHz	500 kHz	Pass
LoRa Mid Channel, 925.1 MHz	612.254 kHz	500 kHz	Pass
LoRa High Channel, 927.5 MHz	609.645 kHz	500 kHz	Pass

LoRa Low Channel, 923.3 MHz						
				Value	Limit (>)	Result
				614.742 kHz	500 kHz	Pass

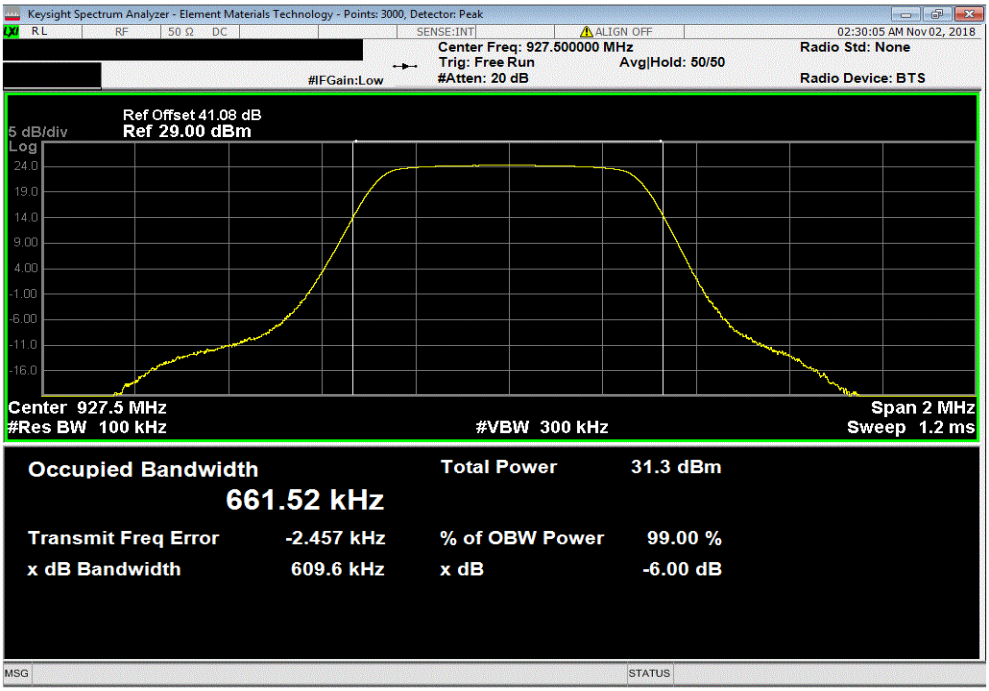


LoRa Mid Channel, 925.1 MHz						
				Value	Limit (>)	Result
				612.254 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

LoRa High Channel, 927.5 MHz						
				Value	Limit (>)	Result
				609.645 kHz	500 kHz	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2017.12.13

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
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Attenuator	Fairview Microwave	SA4014-20	AQI	7-Sep-18	7-Sep-19
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Generator - Signal	Keysight	N5182B-506	TEU	23-Apr-18	23-Apr-21
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. 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. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	MTCAP-LSP3			**Work Order:**	MLTI0092
Serial Number:	359868070098451			**Date:**	1-Nov-18
Customer:	Multi-Tech Systems, Inc.			**Temperature:**	22.7 °C
Attendees:	Marcus Glass			**Humidity:**	31.9% RH
Project:	None			**Barometric Pres.:**	1016 mbar
Tested by:	Kyle McMullan	**Power:**	110VAC/60Hz	**Job Site:**	MN08

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

None

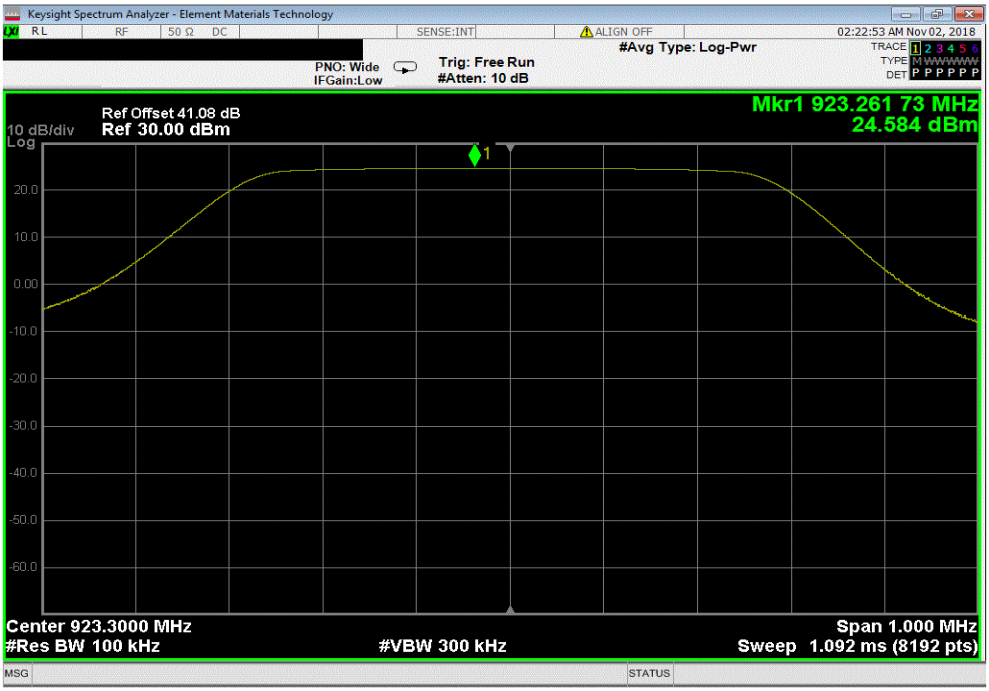
DEVIATIONS FROM TEST STANDARD

None

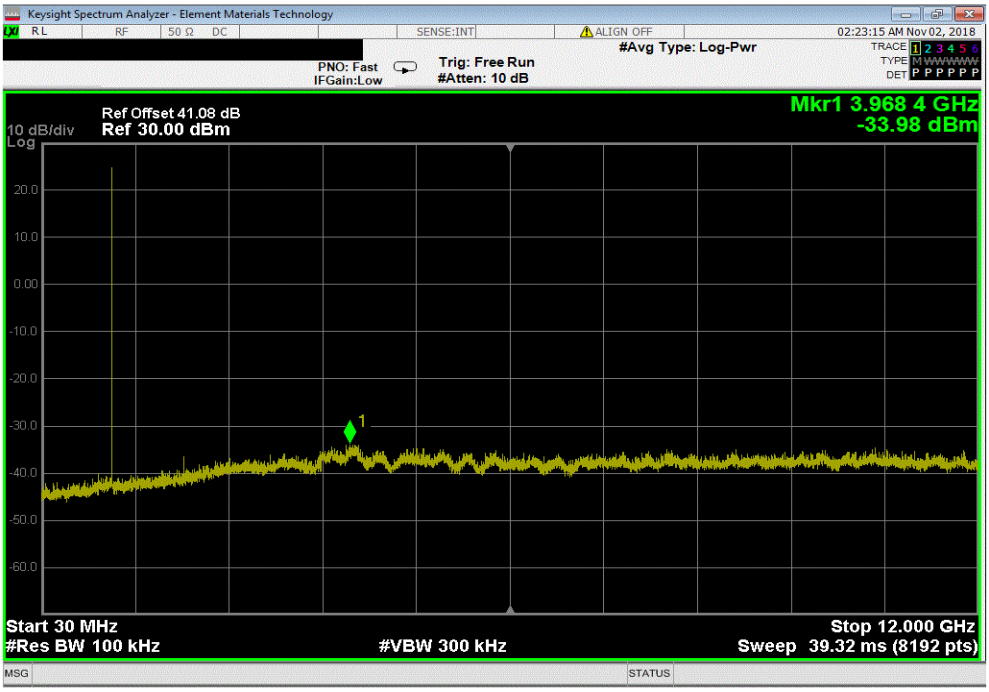
Configuration #	2	*Signature*

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
LoRa Low Channel, 923.3 MHz	Fundamental	923.26	N/A	N/A	N/A
LoRa Low Channel, 923.3 MHz	30 MHz - 12 GHz	3968.37	-58.56	-20	Pass
LoRa Mid Channel, 925.1 MHz	Fundamental	925.06	N/A	N/A	N/A
LoRa Mid Channel, 925.1 MHz	30 MHz - 12 GHz	5441.42	-58.02	-20	Pass
LoRa High Channel, 927.5 MHz	Fundamental	927.46	N/A	N/A	N/A
LoRa High Channel, 927.5 MHz	30 MHz - 12 GHz	928.74	-35.17	-20	Pass

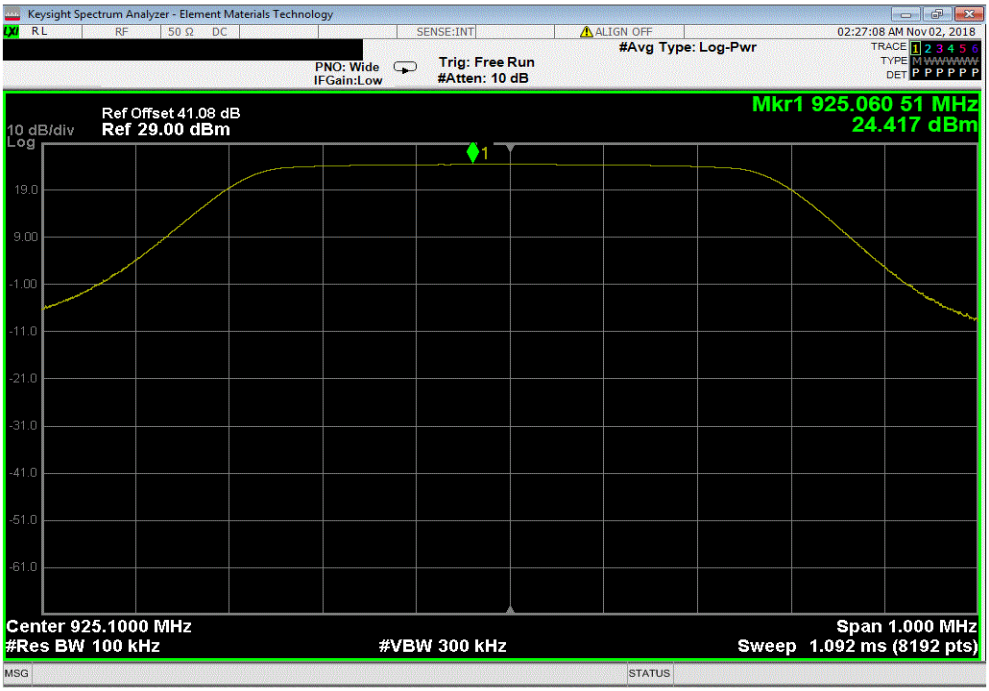
LoRa Low Channel, 923.3 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	923.26	N/A	N/A	N/A



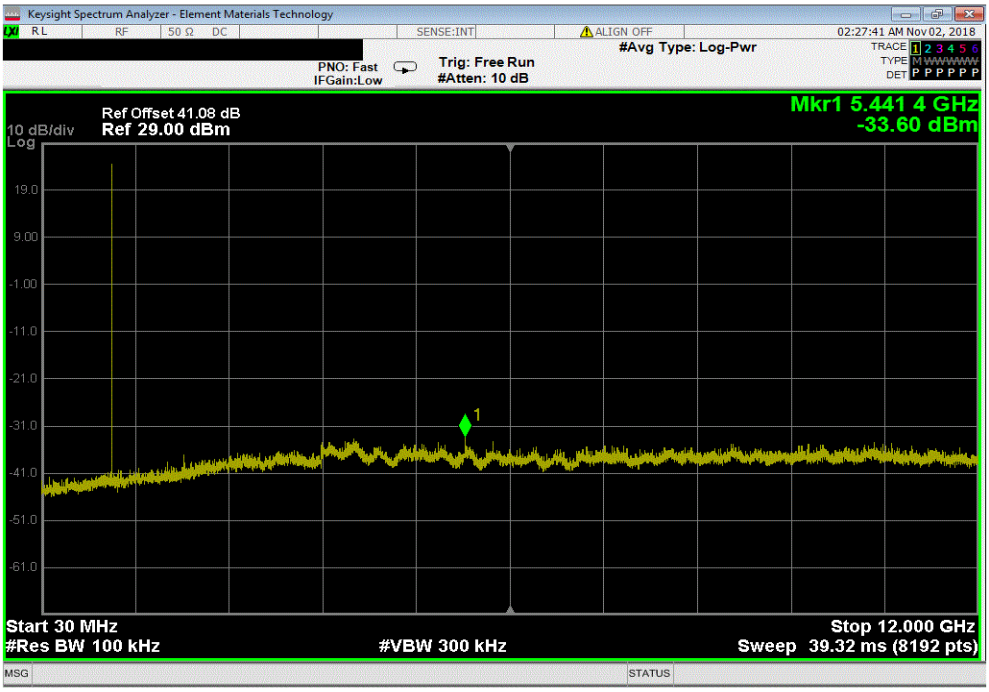
LoRa Low Channel, 923.3 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12 GHz	3968.37	-58.56	-20	Pass



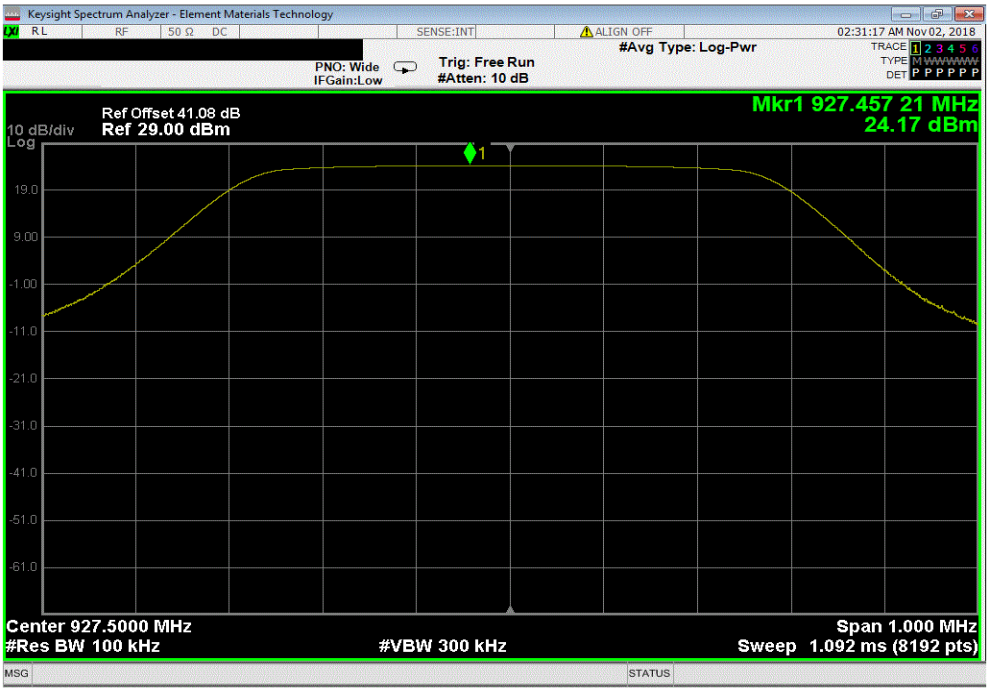
LoRa Mid Channel, 925.1 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	925.06	N/A	N/A	N/A



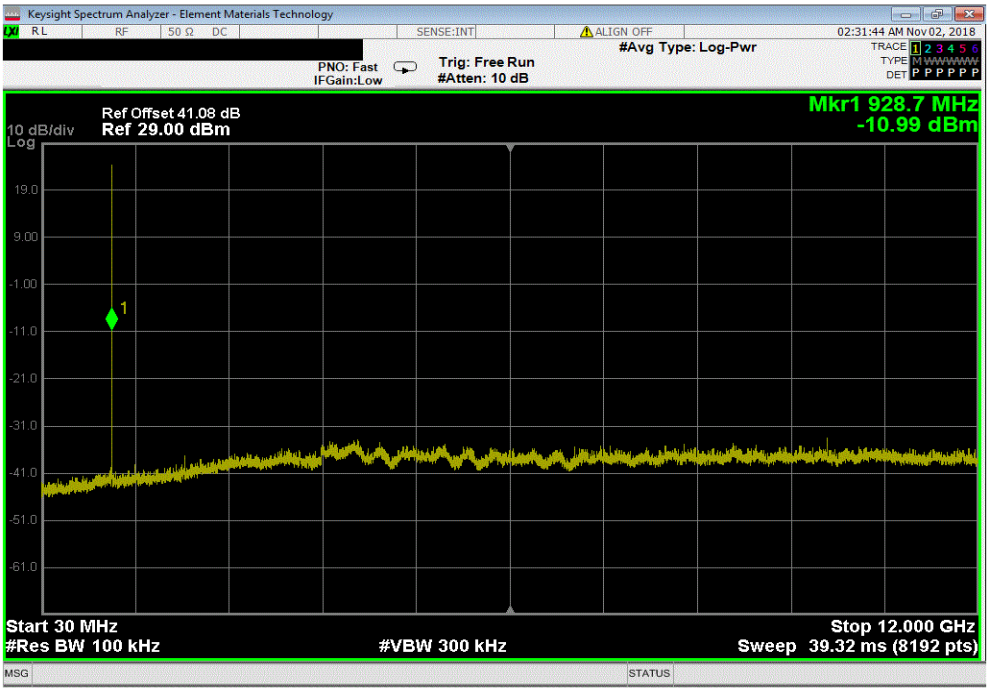
LoRa Mid Channel, 925.1 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12 GHz	5441.42	-58.02	-20	Pass



LoRa High Channel, 927.5 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	927.46	N/A	N/A	N/A



LoRa High Channel, 927.5 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12 GHz	928.74	-35.17	-20	Pass



POWER SPECTRAL DENSITY

XMit 2017.12.13

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TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
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Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
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Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.

POWER SPECTRAL DENSITY

TbtTx 2018.09.13 XMit 2017.12.13

EUT:	**MTCAP-LSP3**			**Work Order:**	**MLTI0092**
Serial Number:	**359868070098451**			**Date:**	**1-Nov-18**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**22.7 °C**
Attendees:	**Marcus Glass**			**Humidity:**	**31.9% RH**
Project:	**None**			**Barometric Pres.:**	**1016 mbar**
Tested by:	**Kyle McMullan**	**Power:**	**110VAC/60Hz**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

None

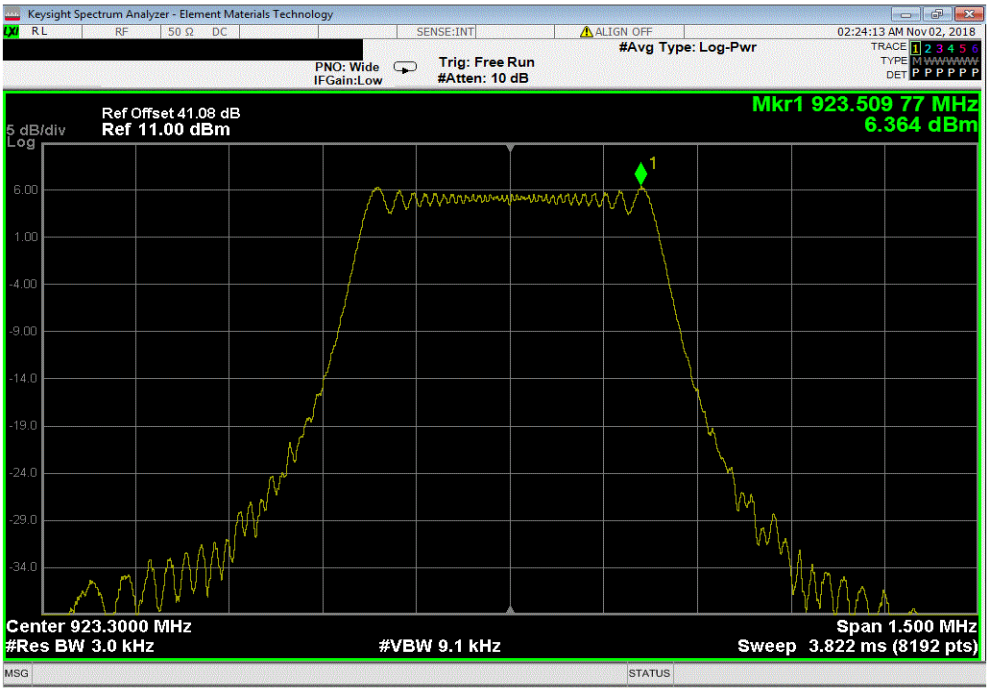
DEVIATIONS FROM TEST STANDARD

None

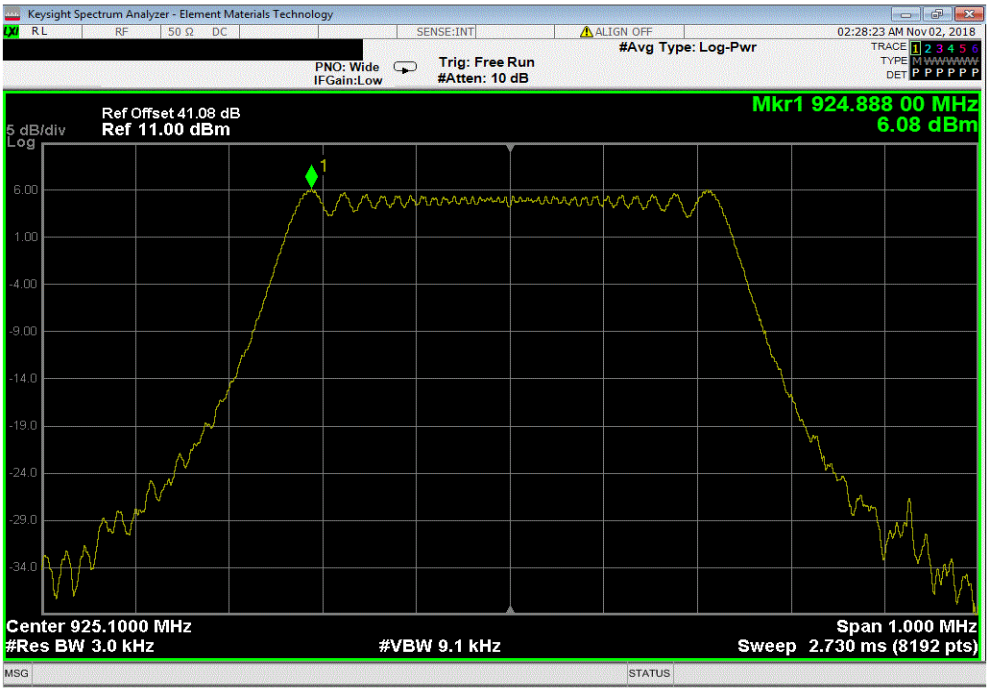
Configuration #	**2**	*Signature*

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
LoRa Low Channel, 923.3 MHz	6.364	8	Pass
LoRa Mid Channel, 925.1 MHz	6.077	8	Pass
LoRa High Channel, 927.5 MHz	5.767	8	Pass

LoRa Low Channel, 923.3 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				6.364	8	Pass



LoRa Mid Channel, 925.1 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				6.077	8	Pass



LoRa High Channel, 927.5 MHz							
					Value dBm/3kHz	Limit < dBm/3kHz	Results
					5.767	8	Pass