Multi-Tech Systems, Inc.

MTCDTIP-LAT1-275L-915

MTCDTIP-LVW2-275L-915

FCC 15.247:2018

902 - 928 MHz DTS Transceiver

Report # MLTI0080.9

NVLAP LAB CODE: 200881-0

CERTIFICATE OF TEST

Last Date of Test: August 9, 2018
Multi-Tech Systems, Inc.
Model: MTCDTIP-LAT1-275L-915, MTCDTIP-LVW2-275L-915

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2018	ANSI C63.10:2013, KDB 558074

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	Pass	
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	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.

REVISION HISTORY

Revision Number	Description	Date	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

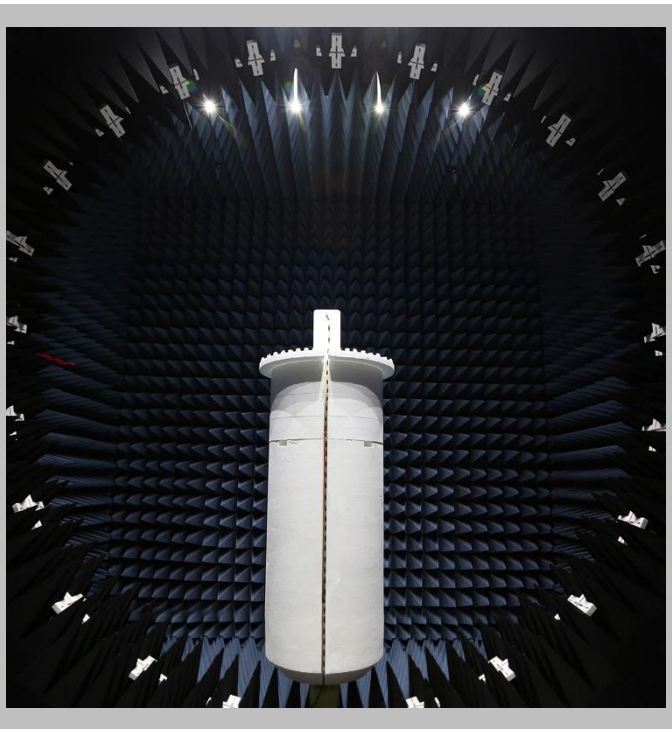
MIC – Recognized by MIC as a CAB for the acceptance of test data.

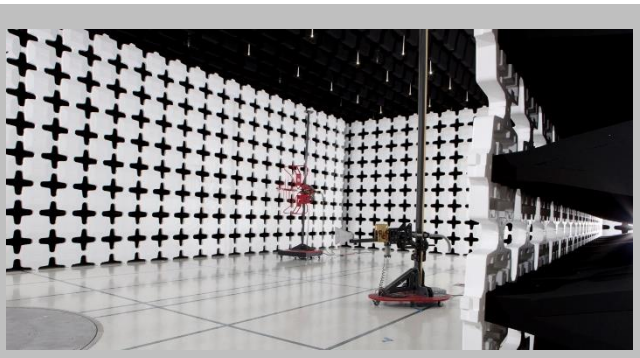
SCOPE

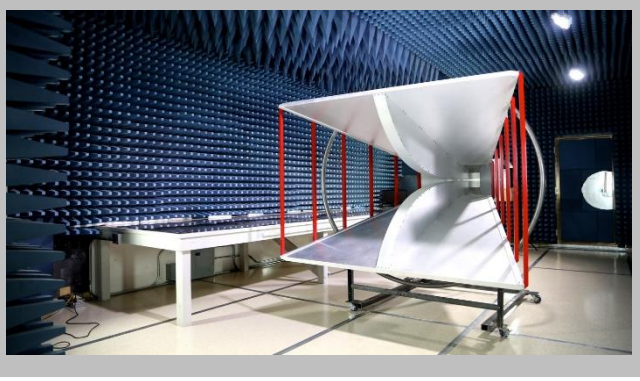
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

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

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.

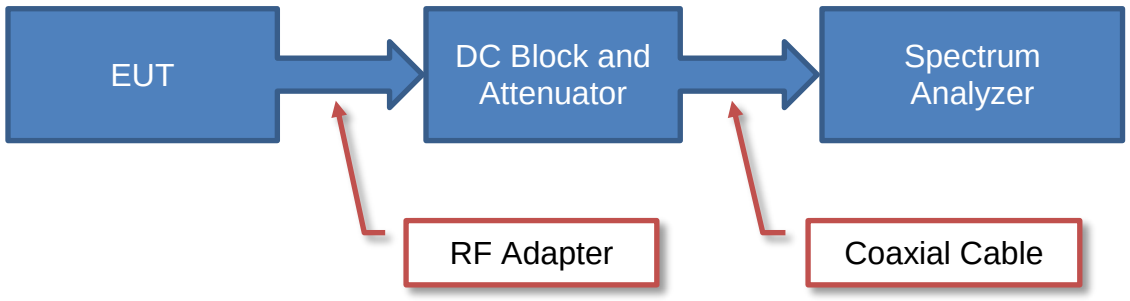
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

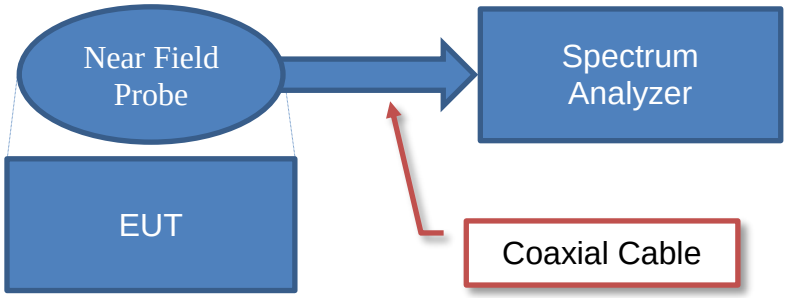
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

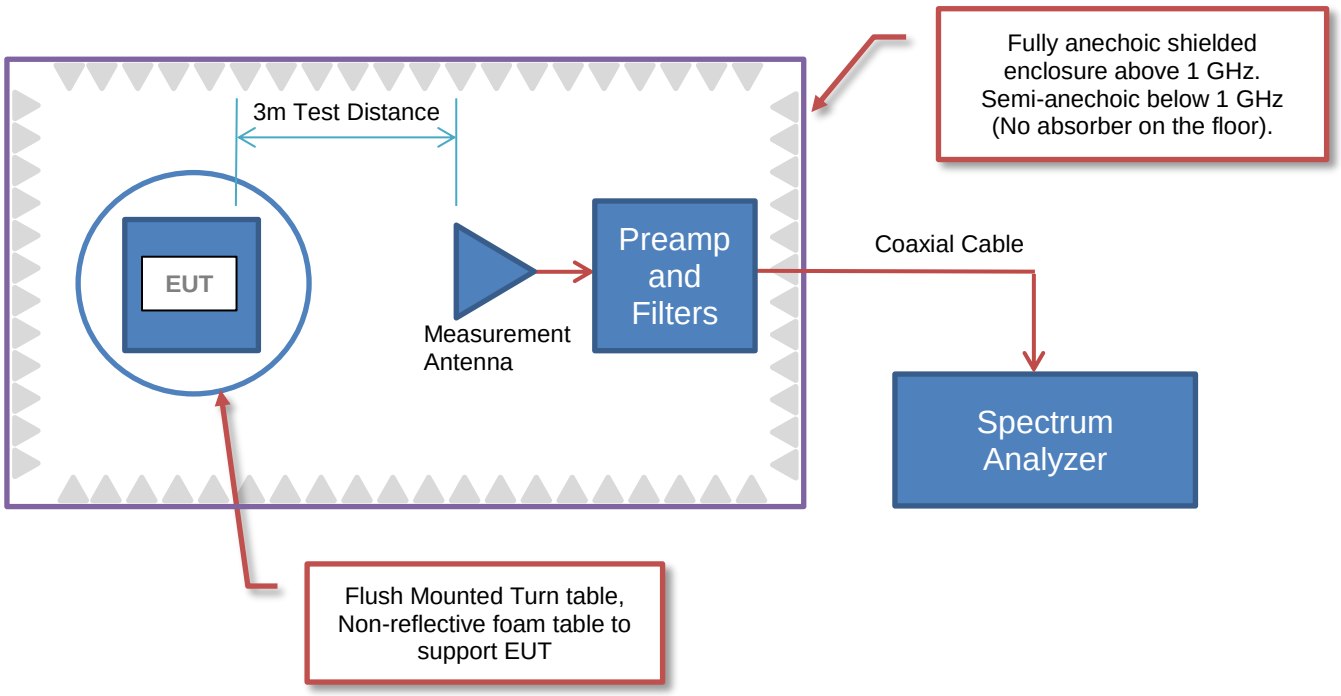
Antenna Port Conducted Measurements



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:	Jim Asp
Model:	MTCDTIP-LAT1-275L-915 MTCDTIP-LVW2-275L-915
First Date of Test:	May 16, 2018
Last Date of Test:	August 9, 2018
Receipt Date of Samples:	May 1, 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:

Wireless hub containing LTE, 802.11/BT, LoRa and GPS radios.

Depending on the operating system installed on the device, the character after “275” could either be designated as an “L” (for mLinux) or “A” (for AEP – a graphical interface). For example:
MTCDTIP-LVW2-275L-915
MTCDTIP-LVW2-275A-915

Testing Objective:

Seeking to demonstrate compliance of the DTS radio under FCC 15.247:2018 for operation in the 902 - 928 MHz Band.

CONFIGURATIONS

Configuration MLTI0080- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
MTCDTIP-LAT1-275L-915	Multi-Tech Systems, Inc.	MTCDTIP-LAT1-275L-915	19617486

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
POE power supply	Phihong	POE29W-1AT	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Monitor	Compaq	S1922a	CNC106PF44
Mouse	Microsoft	1094	X819485-003
Keyboard	Compaq	505130-371	LE10203115
PC	Dell	Optiplex 755	21433H1

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Ethernet Cable 1 FCC	No	1.9m	No	MTCDTIP-LAT1-275L-915	POE power supply
Ethernet Cable 2	No	2m	No	POE power supply	PC
AC Cable POE	No	1.9m	No	POE power supply	AC Mains
Mouse Cable	No	1.8m	No	Mouse	PC
Keyboard Cable	No	1.5m	No	Keyboard	PC
VGA Cable	No	1.8m	Yes	Monitor	PC
AC Cable PC	No	1.3m	No	PC	AC Mains
AC Cable Monitor	No	1.7m	No	Monitor	AC Mains

CONFIGURATIONS

Configuration MLTI0080- 3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
MTCDTIP-LVW2-275L-915	Multi-Tech Systems, Inc.	MTCDTIP-LVW2-275L-915	19617495

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
POE power supply	Phihong	POE29W-1AT	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Monitor	Compaq	S1922a	CNC106PF44
Mouse	Microsoft	1094	X819485-003
Keyboard	Compaq	505130-371	LE10203115
PC	Dell	Optiplex 755	21433H1

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Ethernet Cable 2	No	2m	No	POE power supply	PC
AC Cable POE	No	1.9m	No	POE power supply	AC Mains
Mouse Cable	No	1.8m	No	Mouse	PC
Keyboard Cable	No	1.5m	No	Keyboard	PC
VGA Cable	No	1.8m	Yes	Monitor	PC
AC Cable PC	No	1.3m	No	PC	AC Mains
AC Cable Monitor	No	1.7m	No	Monitor	AC Mains
Ethernet Cable 1 FCC 2	No	1.9m	No	MTCDTIP-LVW2-275L-915	POE power supply

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	5/16/2018	Powerline 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.
2	5/25/2018	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.
3	5/31/2018	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.
4	5/31/2018	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.
5	6/27/2018	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.
6	6/27/2018	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	8/9/2018	Band Edge Compliance	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
Cable - Conducted Cable Assembly	Northwest EMC	MNC	MNCC	1/24/2018	1/24/2019
Receiver	Rohde & Schwarz	ESR7	ARI	6/4/2017	6/4/2018
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/15/2018	3/15/2019
LISN	Solar Electronics	9252-50-R-24-BNC	LIQ	10/11/2017	10/11/2018

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

MLTI0080-1
MLTI0080-3

MODES INVESTIGATED

Cell connected max power, everything running, pinging from a PC, 925 MHz radio transmitting

POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

EUT:	MTCDTIP-LAT1-275L-915	Work Order:	MLTI0080
Serial Number:	19617486	Date:	05/16/2018
Customer:	Multi-Tech Systems, Inc.	Temperature:	23.4°C
Attendees:	Jim Asp	Relative Humidity:	37.8%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	William Hoffa	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0080-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	53	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

POE injector changed to Power supply: PHIHONG Model: POE29W-1AT.

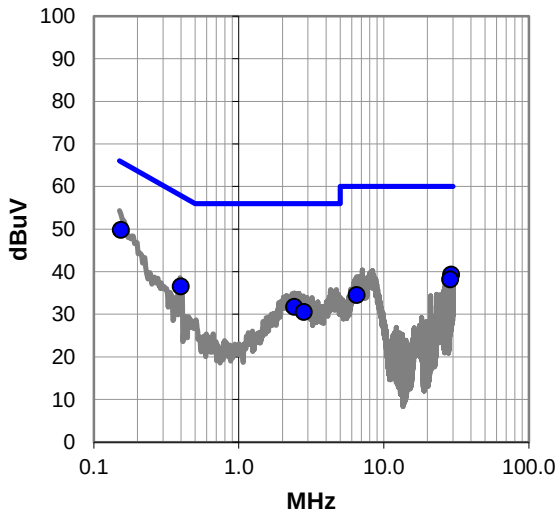
EUT OPERATING MODES

Cell connected max power, everything running, pinging from a PC, 925 MHz radio transmitting

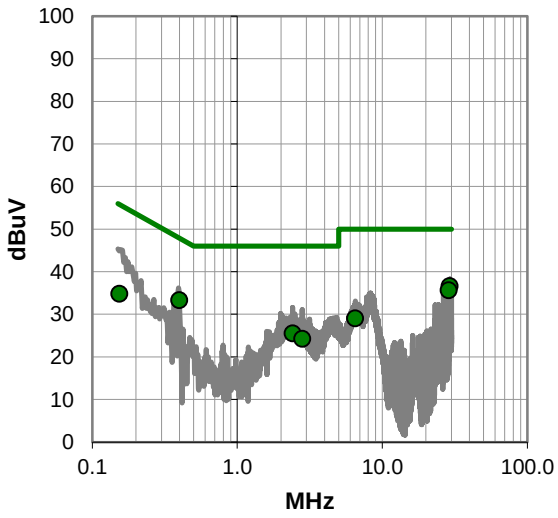
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

RESULTS - Run #53

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.154	49.5	0.3	49.8	65.8	-16.0
29.235	35.9	3.4	39.3	60.0	-20.7
0.397	36.3	0.2	36.5	57.9	-21.4
28.685	34.8	3.4	38.2	60.0	-21.8
2.410	31.4	0.3	31.7	56.0	-24.3
2.810	30.2	0.3	30.5	56.0	-25.5
6.507	33.9	0.6	34.5	60.0	-25.5

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
29.235	33.2	3.4	36.6	50.0	-13.4
28.685	32.2	3.4	35.6	50.0	-14.4
0.397	33.1	0.2	33.3	47.9	-14.6
2.410	25.2	0.3	25.5	46.0	-20.5
0.154	34.5	0.3	34.8	55.8	-21.0
6.507	28.4	0.6	29.0	50.0	-21.0
2.810	23.9	0.3	24.2	46.0	-21.8

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

EUT:	MTCDTIP-LAT1-275L-915	Work Order:	MLTI0080
Serial Number:	19617486	Date:	05/16/2018
Customer:	Multi-Tech Systems, Inc.	Temperature:	23.4°C
Attendees:	Jim Asp	Relative Humidity:	37.8%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	William Hoffa	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0080-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	54	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

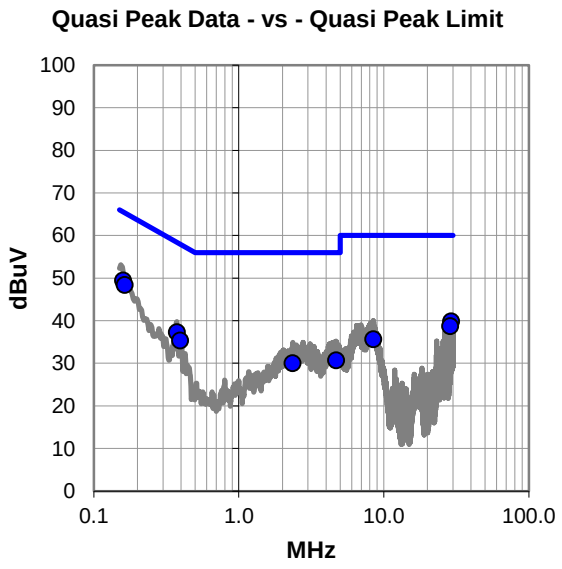
POE injector changed to Power supply: PHIHONG Model: POE29W-1AT.

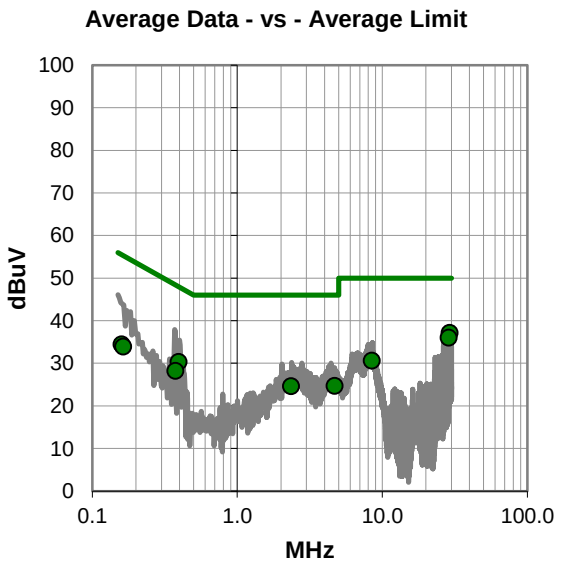
EUT OPERATING MODES

Cell connected max power, everything running, pinging from a PC, 925 MHz radio transmitting

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

RESULTS - Run #54

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.159	49.1	0.3	49.4	65.5	-16.1
0.163	48.1	0.3	48.4	65.3	-16.9
29.235	36.4	3.4	39.8	60.0	-20.2
0.375	37.1	0.2	37.3	58.4	-21.1
28.685	35.3	3.4	38.7	60.0	-21.3
0.395	35.1	0.2	35.3	58.0	-22.7
8.462	34.8	0.8	35.6	60.0	-24.4
4.696	30.3	0.4	30.7	56.0	-25.3
2.351	29.7	0.3	30.0	56.0	-26.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
29.235	33.7	3.4	37.1	50.0	-12.9
28.685	32.6	3.4	36.0	50.0	-14.0
0.395	30.1	0.2	30.3	48.0	-17.7
8.462	29.8	0.8	30.6	50.0	-19.4
0.375	28.0	0.2	28.2	48.4	-20.2
0.159	34.1	0.3	34.4	55.5	-21.1
4.696	24.3	0.4	24.7	46.0	-21.3
0.163	33.6	0.3	33.9	55.3	-21.4
2.351	24.3	0.3	24.6	46.0	-21.4

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

EUT:	MTCDTIP-LVW2-275L-915	Work Order:	MLTI0080
Serial Number:	19617495	Date:	05/16/2018
Customer:	Multi-Tech Systems, Inc.	Temperature:	23.4°C
Attendees:	Jim Asp	Relative Humidity:	37.8%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	William Hoffa	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0080-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	56	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

POE injector changed to Power supply: PHIHONG Model: POE29W-1AT.

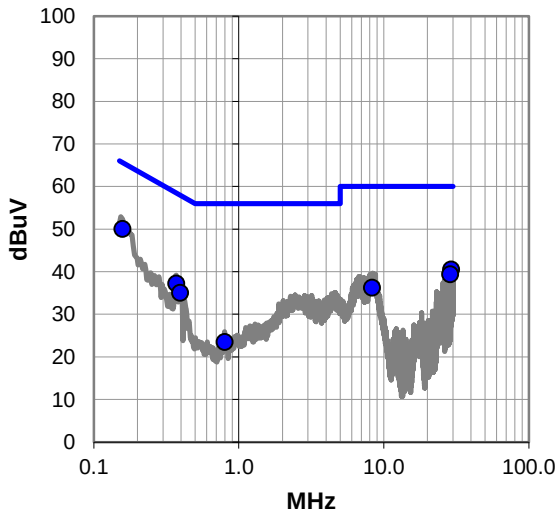
EUT OPERATING MODES

Cell connected max power, everything running, pinging from a PC, 915.2 MHz radio transmitting

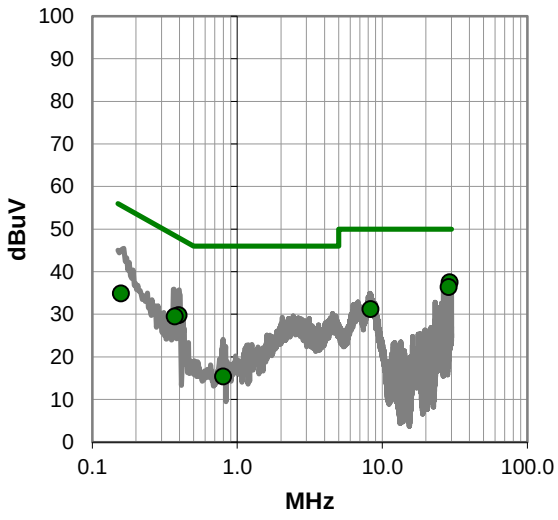
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

RESULTS - Run #56

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.158	49.7	0.3	50.0	65.6	-15.6
29.236	37.1	3.4	40.5	60.0	-19.5
28.685	36.0	3.4	39.4	60.0	-20.6
0.371	37.0	0.2	37.2	58.5	-21.3
0.393	34.8	0.2	35.0	58.0	-23.0
8.294	35.4	0.8	36.2	60.0	-23.8
0.799	23.3	0.2	23.5	56.0	-32.5

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
29.236	34.1	3.4	37.5	50.0	-12.5
28.685	33.0	3.4	36.4	50.0	-13.6
0.393	29.6	0.2	29.8	48.0	-18.2
8.294	30.4	0.8	31.2	50.0	-18.8
0.371	29.3	0.2	29.5	48.5	-19.0
0.158	34.6	0.3	34.9	55.6	-20.7
0.799	15.2	0.2	15.4	46.0	-30.6

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	MTCDTIP-LVW2-275L-915	Work Order:	MLTI0080
Serial Number:	19617495	Date:	05/16/2018
Customer:	Multi-Tech Systems, Inc.	Temperature:	23.4°C
Attendees:	Jim Asp	Relative Humidity:	37.8%
Customer Project:	None	Bar. Pressure:	1018 mb
Tested By:	William Hoffa	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	MLTI0080-3

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	57	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

POE injector changed to Power supply: PHIHONG Model: POE29W-1AT.

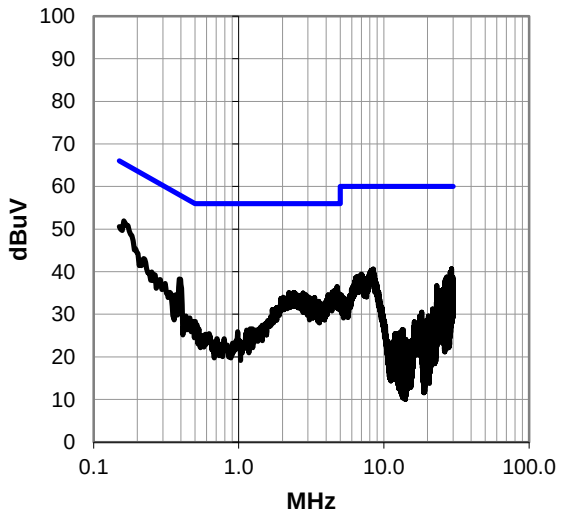
EUT OPERATING MODES

Cell connected max power, everything running, pinging from a PC, 915.2 MHz radio transmitting

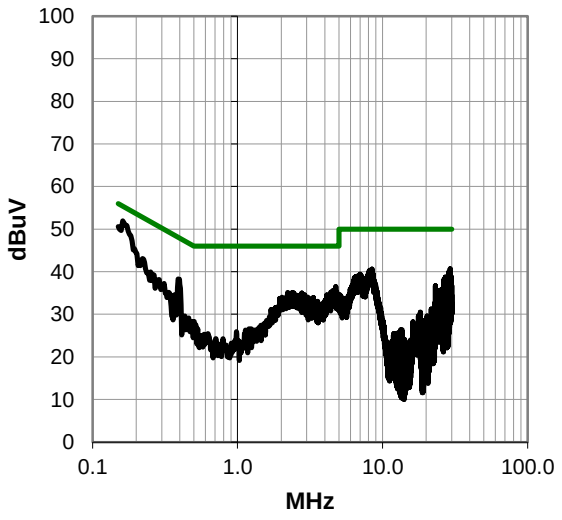
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

RESULTS - Run #57

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.161	51.6	0.3	51.9	65.4	-13.5
29.231	37.3	3.4	40.7	60.0	-19.3
8.451	39.8	0.8	40.6	60.0	-19.4
4.761	36.1	0.4	36.5	56.0	-19.5
8.141	39.5	0.8	40.3	60.0	-19.7
0.389	38.1	0.2	38.3	58.1	-19.8
28.683	36.5	3.4	39.9	60.0	-20.1
4.716	35.4	0.4	35.8	56.0	-20.2
29.112	36.1	3.4	39.5	60.0	-20.5
7.015	38.7	0.7	39.4	60.0	-20.6
4.821	34.9	0.4	35.3	56.0	-20.7
2.213	34.8	0.3	35.1	56.0	-20.9
2.392	34.8	0.3	35.1	56.0	-20.9
7.115	38.4	0.7	39.1	60.0	-20.9
2.444	34.7	0.3	35.0	56.0	-21.0
2.773	34.7	0.3	35.0	56.0	-21.0
6.772	38.4	0.6	39.0	60.0	-21.0
6.559	38.3	0.6	38.9	60.0	-21.1
6.690	38.3	0.6	38.9	60.0	-21.1
27.157	35.6	3.1	38.7	60.0	-21.3
29.903	35.2	3.5	38.7	60.0	-21.3
4.966	34.1	0.5	34.6	56.0	-21.4
6.392	38.0	0.6	38.6	60.0	-21.4
2.732	34.2	0.3	34.5	56.0	-21.5
2.907	34.2	0.3	34.5	56.0	-21.5
4.127	34.1	0.4	34.5	56.0	-21.5

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.161	51.6	0.3	51.9	55.4	-3.5
29.231	37.3	3.4	40.7	50.0	-9.3
8.451	39.8	0.8	40.6	50.0	-9.4
4.761	36.1	0.4	36.5	46.0	-9.5
8.141	39.5	0.8	40.3	50.0	-9.7
0.389	38.1	0.2	38.3	48.1	-9.8
28.683	36.5	3.4	39.9	50.0	-10.1
4.716	35.4	0.4	35.8	46.0	-10.2
29.112	36.1	3.4	39.5	50.0	-10.5
7.015	38.7	0.7	39.4	50.0	-10.6
4.821	34.9	0.4	35.3	46.0	-10.7
2.213	34.8	0.3	35.1	46.0	-10.9
2.392	34.8	0.3	35.1	46.0	-10.9
7.115	38.4	0.7	39.1	50.0	-10.9
2.444	34.7	0.3	35.0	46.0	-11.0
2.773	34.7	0.3	35.0	46.0	-11.0
6.772	38.4	0.6	39.0	50.0	-11.0
6.559	38.3	0.6	38.9	50.0	-11.1
6.690	38.3	0.6	38.9	50.0	-11.1
27.157	35.6	3.1	38.7	50.0	-11.3
29.903	35.2	3.5	38.7	50.0	-11.3
4.966	34.1	0.5	34.6	46.0	-11.4
6.392	38.0	0.6	38.6	50.0	-11.4
2.732	34.2	0.3	34.5	46.0	-11.5
2.907	34.2	0.3	34.5	46.0	-11.5
4.127	34.1	0.4	34.5	46.0	-11.5

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2018.05.04

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 on Low (923.3 MHz), Mid (925.1) or High channel (927.5 MHz).

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MLTI0080 - 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
Attenuator	Fairview Microwave	SA18E-20	TWZ	20-Sep-2017	12 mo
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	12-Jul-2017	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	21-Nov-2017	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	9-Nov-2017	12 mo
Filter - High Pass	Micro-Tronics	HPM50108	LFM	20-Sep-2017	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	20-Sep-2017	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	23-Jun-2016	24 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AIQ	NCR	0 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-2017	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).

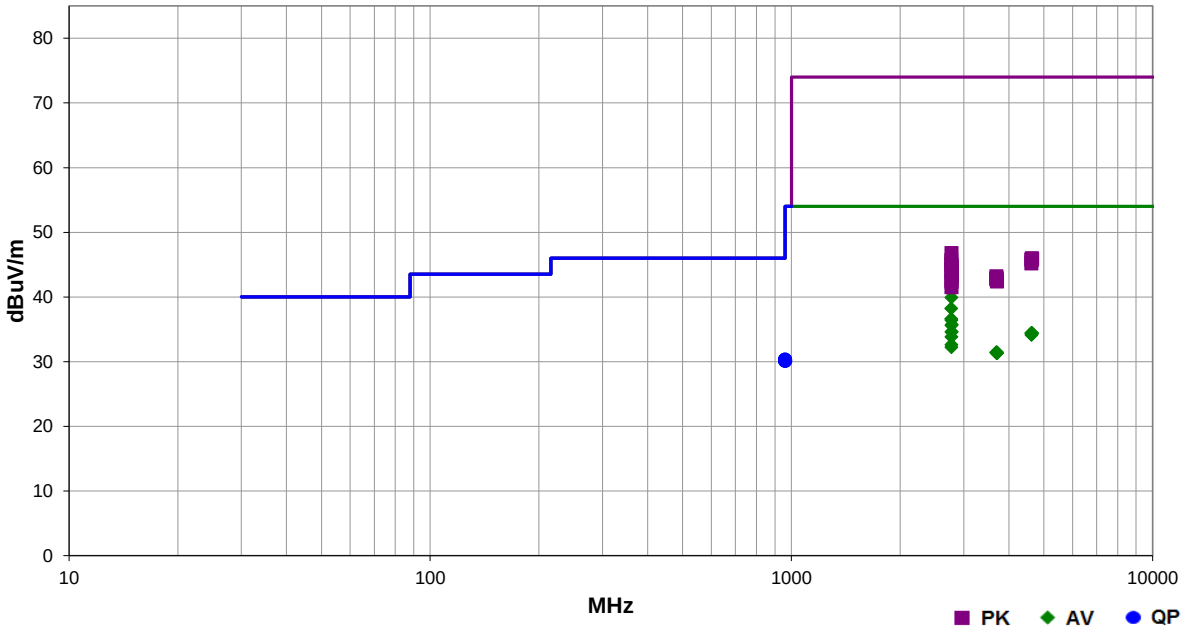
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.05.07 PSA-ESCI 2018.05.04

Work Order:	MLTI0080	**Date:**	25-May-2018		
Project:	None	**Temperature:**	23.3 °C		
Job Site:	MN05	**Humidity:**	57% RH		
Serial Number:	19617486	**Barometric Pres.:**	1010 mbar	**Tested by:**	Kyle McMullan
EUT:	MTCDTIP-LAT1-275L-915				
Configuration:	1				
Customer:	Multi-Tech Systems, Inc.				
Attendees:	Jim Asp				
EUT Power:	110VAC/60Hz				
Operating Mode:	Tx LoRa on Low (923.3 MHz), Mid (925.1) or High channel (927.5 MHz).				
Deviations:	None				
Comments:	POE injector used is Power supply: PHIHONG Model: POE29W-1AT.				

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

Run #	111	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2775.333	42.8	-2.9	1.0	90.0	3.0	0.0	Horz	AV	0.0	39.9	54.0	-14.1	Mid Ch, EUT On Side
960.000	16.2	14.1	1.0	62.1	3.0	0.0	Vert	QP	0.0	30.3	46.0	-15.7	High Ch, EUT Horz
2769.925	41.2	-3.0	1.0	94.1	3.0	0.0	Horz	AV	0.0	38.2	54.0	-15.8	Low Ch, EUT On Side
2769.875	39.6	-3.0	1.0	58.1	3.0	0.0	Vert	AV	0.0	36.6	54.0	-17.4	Low Ch, EUT Vert
2775.333	39.3	-2.9	1.0	145.1	3.0	0.0	Horz	AV	0.0	36.4	54.0	-17.6	Mid Ch, EUT Horz
2782.517	38.5	-2.8	1.0	87.1	3.0	0.0	Horz	AV	0.0	35.7	54.0	-18.3	High Ch, EUT On Side
2775.300	38.5	-2.9	1.6	147.0	3.0	0.0	Vert	AV	0.0	35.6	54.0	-18.4	Mid Ch, EUT Vert
2782.467	37.4	-2.8	1.0	131.1	3.0	0.0	Vert	AV	0.0	34.6	54.0	-19.4	High Ch, EUT Vert
2775.275	37.5	-2.9	1.0	75.0	3.0	0.0	Vert	AV	0.0	34.6	54.0	-19.4	Mid Ch, EUT Vert
4627.917	30.1	4.3	1.0	93.0	3.0	0.0	Horz	AV	0.0	34.4	54.0	-19.6	Mid Ch, EUT On Side
4618.092	30.2	4.2	1.0	351.0	3.0	0.0	Horz	AV	0.0	34.4	54.0	-19.6	Low Ch, EUT On Side
4639.358	30.0	4.4	1.9	254.9	3.0	0.0	Horz	AV	0.0	34.4	54.0	-19.6	High Ch, EUT On Side
4635.358	29.9	4.4	1.0	190.0	3.0	0.0	Vert	AV	0.0	34.3	54.0	-19.7	High Ch, EUT Vert
4627.592	30.0	4.3	2.7	126.0	3.0	0.0	Vert	AV	0.0	34.3	54.0	-19.7	Mid Ch, EUT Vert
4618.908	29.9	4.2	1.0	261.9	3.0	0.0	Vert	AV	0.0	34.1	54.0	-19.9	Low Ch, EUT Vert
2775.342	36.7	-2.9	1.0	83.1	3.0	0.0	Vert	AV	0.0	33.8	54.0	-20.2	Mid Ch, EUT On Side
2775.258	35.5	-2.9	1.0	133.0	3.0	0.0	Vert	AV	0.0	32.6	54.0	-21.4	Mid Ch, EUT Horz
2775.342	35.1	-2.9	1.2	152.1	3.0	0.0	Horz	AV	0.0	32.2	54.0	-21.8	Mid Ch, EUT Vert

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
3702.300	30.9	0.5	1.0	87.1	3.0	0.0	Horz	AV	0.0	31.4	54.0	-22.6	Mid Ch, EUT On Side
3695.442	31.0	0.4	1.0	318.0	3.0	0.0	Horz	AV	0.0	31.4	54.0	-22.6	Low Ch, EUT On Side
3712.475	30.9	0.5	1.0	264.0	3.0	0.0	Horz	AV	0.0	31.4	54.0	-22.6	High Ch, EUT On Side
3695.442	31.0	0.4	3.8	96.0	3.0	0.0	Vert	AV	0.0	31.4	54.0	-22.6	Low Ch, EUT Vert
3712.350	30.8	0.5	1.8	132.0	3.0	0.0	Vert	AV	0.0	31.3	54.0	-22.7	High Ch, EUT Vert
3702.833	30.8	0.5	1.4	110.0	3.0	0.0	Vert	AV	0.0	31.3	54.0	-22.7	Mid Ch, EUT Vert
960.008	16.2	14.1	1.0	125.0	3.0	0.0	Vert	QP	0.0	30.3	54.0	-23.7	High Ch, EUT On Side
960.023	16.1	14.1	2.8	107.0	3.0	0.0	Horz	QP	0.0	30.2	54.0	-23.8	High Ch, EUT Horz
960.003	16.1	14.1	1.1	227.1	3.0	0.0	Horz	QP	0.0	30.2	54.0	-23.8	High Ch, EUT Vert
960.390	16.1	14.1	2.0	63.0	3.0	0.0	Vert	QP	0.0	30.2	54.0	-23.8	High Ch, EUT Vert
960.730	16.0	14.1	1.4	215.0	3.0	0.0	Horz	QP	0.0	30.1	54.0	-23.9	High Ch, EUT On Side
2775.367	49.7	-2.9	1.0	90.0	3.0	0.0	Horz	PK	0.0	46.8	74.0	-27.2	Mid Ch, EUT On Side
4635.508	41.6	4.4	1.0	190.0	3.0	0.0	Vert	PK	0.0	46.0	74.0	-28.0	High Ch, EUT Vert
4638.675	41.5	4.4	1.9	254.9	3.0	0.0	Horz	PK	0.0	45.9	74.0	-28.1	High Ch, EUT On Side
4614.467	41.7	4.1	1.0	351.0	3.0	0.0	Horz	PK	0.0	45.8	74.0	-28.2	Low Ch, EUT On Side
4626.642	41.5	4.3	2.7	126.0	3.0	0.0	Vert	PK	0.0	45.8	74.0	-28.2	Mid Ch, EUT Vert
4627.842	41.4	4.3	1.0	93.0	3.0	0.0	Horz	PK	0.0	45.7	74.0	-28.3	Mid Ch, EUT On Side
2769.942	48.7	-3.0	1.0	94.1	3.0	0.0	Horz	PK	0.0	45.7	74.0	-28.3	Low Ch, EUT On Side
4614.883	41.1	4.1	1.0	261.9	3.0	0.0	Vert	PK	0.0	45.2	74.0	-28.8	Low Ch, EUT Vert
2769.925	48.1	-3.0	1.0	58.1	3.0	0.0	Vert	PK	0.0	45.1	74.0	-28.9	Low Ch, EUT Vert
2782.292	47.6	-2.8	1.0	87.1	3.0	0.0	Horz	PK	0.0	44.8	74.0	-29.2	High Ch, EUT On Side
2775.175	47.2	-2.9	1.0	145.1	3.0	0.0	Horz	PK	0.0	44.3	74.0	-29.7	Mid Ch, EUT Horz
2775.400	47.0	-2.9	1.6	147.0	3.0	0.0	Vert	PK	0.0	44.1	74.0	-29.9	Mid Ch, EUT Vert
2775.242	46.6	-2.9	1.0	75.0	3.0	0.0	Vert	PK	0.0	43.7	74.0	-30.3	Mid Ch, EUT Vert
3693.458	42.8	0.4	1.0	318.0	3.0	0.0	Horz	PK	0.0	43.2	74.0	-30.8	Low Ch, EUT On Side
2782.483	46.0	-2.8	1.0	131.1	3.0	0.0	Vert	PK	0.0	43.2	74.0	-30.8	High Ch, EUT Vert
3698.842	42.5	0.4	1.0	87.1	3.0	0.0	Horz	PK	0.0	42.9	74.0	-31.1	Mid Ch, EUT On Side
3691.825	42.4	0.4	3.8	96.0	3.0	0.0	Vert	PK	0.0	42.8	74.0	-31.2	Low Ch, EUT Vert
3698.783	42.3	0.4	1.4	110.0	3.0	0.0	Vert	PK	0.0	42.7	74.0	-31.3	Mid Ch, EUT Vert
2775.225	45.4	-2.9	1.0	83.1	3.0	0.0	Vert	PK	0.0	42.5	74.0	-31.5	Mid Ch, EUT On Side
3707.992	42.0	0.5	1.8	132.0	3.0	0.0	Vert	PK	0.0	42.5	74.0	-31.5	High Ch, EUT Vert
3708.892	41.9	0.5	1.0	264.0	3.0	0.0	Horz	PK	0.0	42.4	74.0	-31.6	High Ch, EUT On Side
2775.608	45.2	-2.9	1.0	133.0	3.0	0.0	Vert	PK	0.0	42.3	74.0	-31.7	Mid Ch, EUT Horz
2775.558	44.4	-2.9	1.2	152.1	3.0	0.0	Horz	PK	0.0	41.5	74.0	-32.5	Mid 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
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Attenuator	Fairview Microwave	SA18S5W-20	RFX	12-Jun-18	12-Jun-19
Block - DC	Fairview Microwave	SD3379	AMI	12-Sep-17	12-Sep-18
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	27-Apr-18	27-Apr-19

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.

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**MTCDTIP-LAT1-275L-915**			**Work Order:**	**MLTI0080**
Serial Number:	**19617486**			**Date:**	**27-Jun-18**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**24.3 °C**
Attendees:	**Mike Kwilinski**			**Humidity:**	**54% RH**
Project:	**None**			**Barometric Pres.:**	**1013 mbar**
Tested by:	**Dustin Sparks**	**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

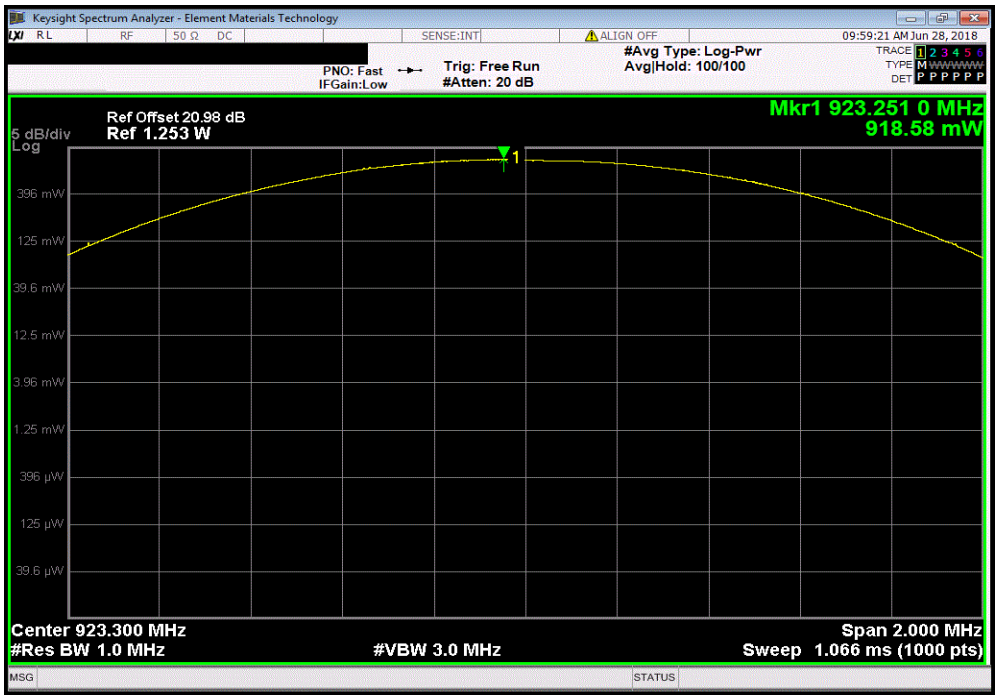
Configuration #	**1**	*Signature* Dustin Sparks

	Value	**Limit (<)**	**Result**
Mode: 500 kHz			
Low Channel, 923.3 MHz	918.58 mW	1 W	Pass
Mid Channel, 925.1 MHz	861.98 mW	1 W	Pass
High Channel, 927.5 MHz	799.89 mW	1 W	Pass

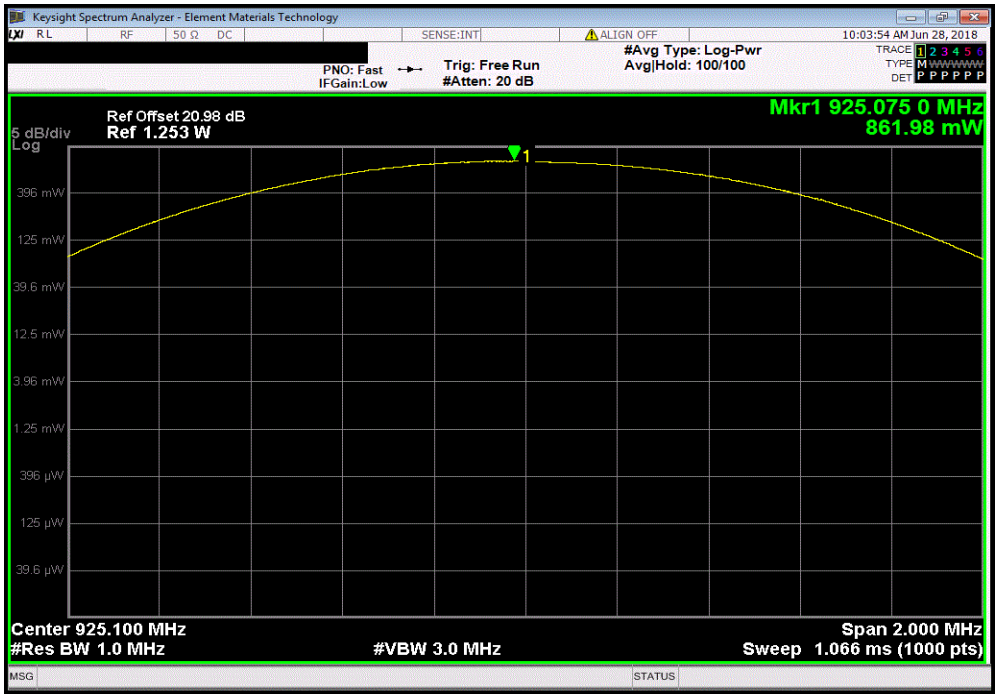
OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

Mode: 500 kHz, Low Channel, 923.3 MHz						
				Value	Limit (<)	Result
				918.58 mW	1 W	Pass



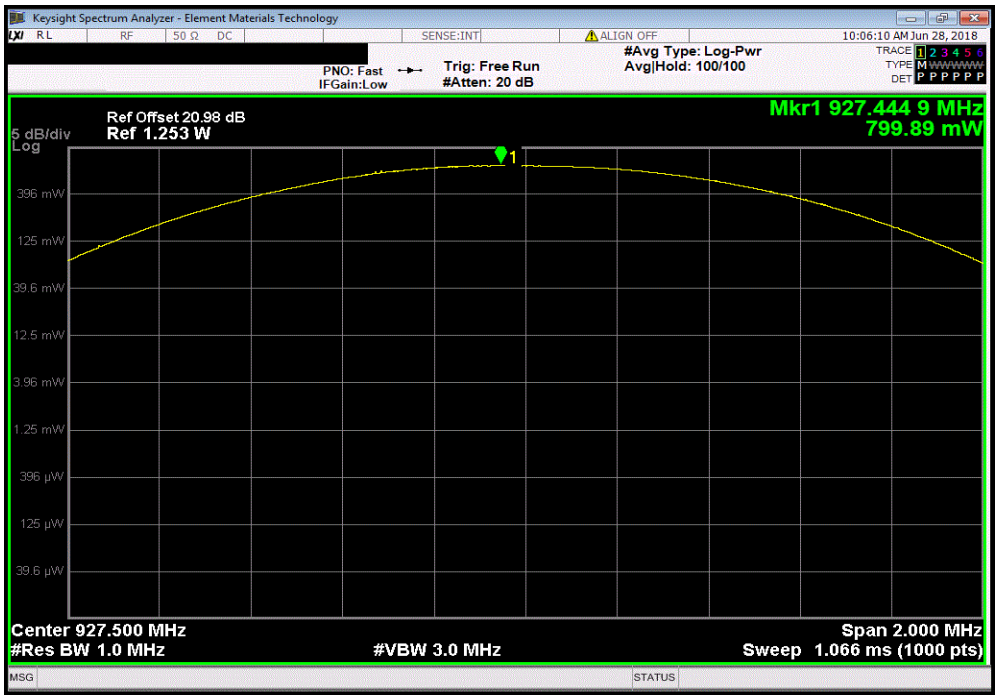
Mode: 500 kHz, Mid Channel, 925.1 MHz						
				Value	Limit (<)	Result
				861.98 mW	1 W	Pass



OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

Mode: 500 kHz, High Channel, 927.5 MHz						
				Value	Limit (<)	Result
				799.89 mW	1 W	Pass



POWER SPECTRAL DENSITY

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	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	12-Sep-17	12-Sep-18
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	27-Apr-18	27-Apr-19

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 2017.12.14 XMit 2017.12.13

EUT:	**MTCDTIP-LAT1-275L-915**			**Work Order:**	**MLTI0080**
Serial Number:	**19617486**			**Date:**	**27-Jun-18**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**24.4 °C**
Attendees:	**Mike Kwilinski**			**Humidity:**	**53.8% RH**
Project:	**None**			**Barometric Pres.:**	**1013 mbar**
Tested by:	**Dustin Sparks**	**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

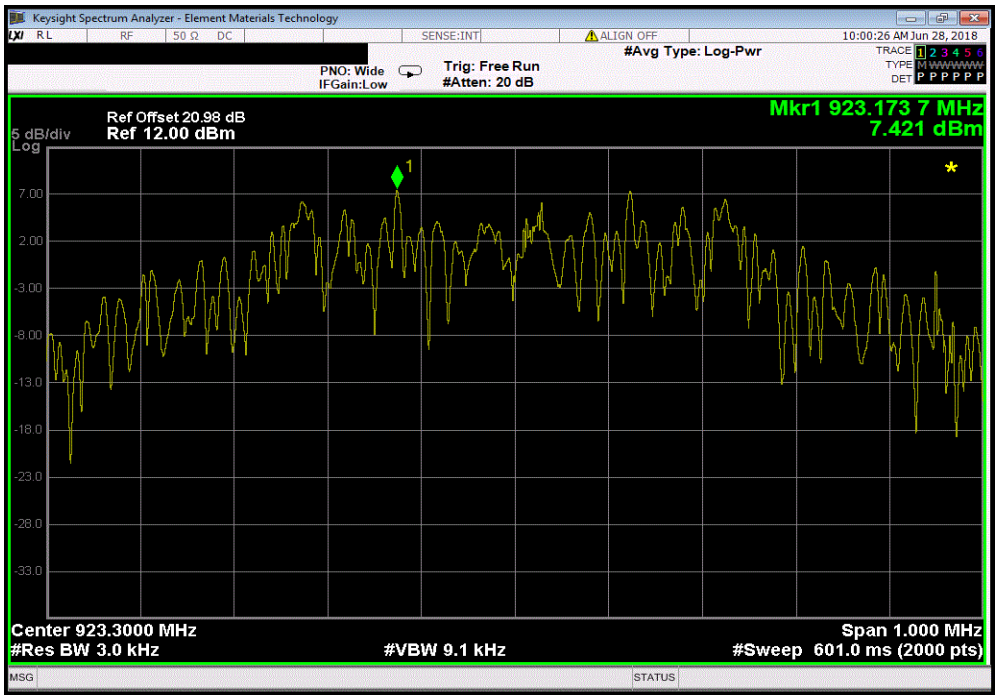
Configuration #	**1**	*Signature* Dustin Sparks

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
Mode: 500 kHz			
Low Channel, 923.3 MHz	7.421	8	Pass
Mid Channel, 925.1 MHz	7.054	8	Pass
High Channel, 927.5 MHz	6.589	8	Pass

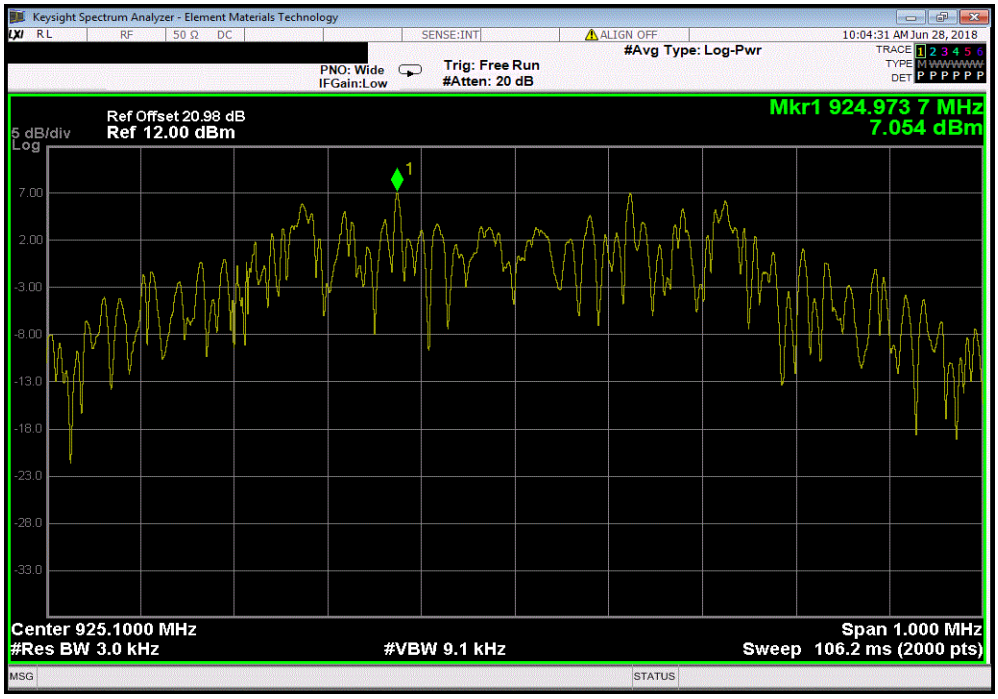
POWER SPECTRAL DENSITY

TbtTx 2017.12.14 XMit 2017.12.13

Mode: 500 kHz, Low Channel, 923.3 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				7.421	8	Pass



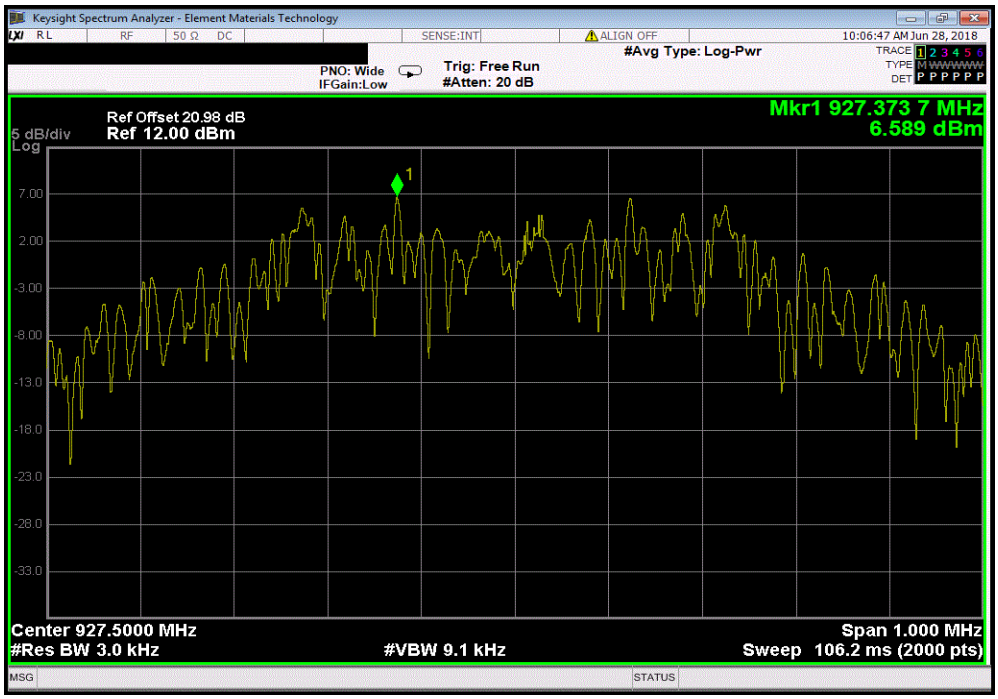
Mode: 500 kHz, Mid Channel, 925.1 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				7.054	8	Pass



POWER SPECTRAL DENSITY

TbtTx 2017.12.14 XMit 2017.12.13

Mode: 500 kHz, High Channel, 927.5 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				6.589	8	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
Generator - Signal	Keysight	N5182B	TFX	10-Apr-18	10-Apr-21
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	12-Sep-17	12-Sep-18
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

element

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**MTCDTIP-LAT1-275L-915**			**Work Order:**	**MLTI0080**
Serial Number:	**19617486**			**Date:**	**9-Aug-18**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**23.4 °C**
Attendees:	**Jim Asp**			**Humidity:**	**54.8% RH**
Project:	**None**			**Barometric Pres.:**	**1016 mbar**
Tested by:	**Dustin Sparks**	**Power:**	**110VAC/60Hz**	**Job Site:**	**MN08**

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

COMMENTS

None

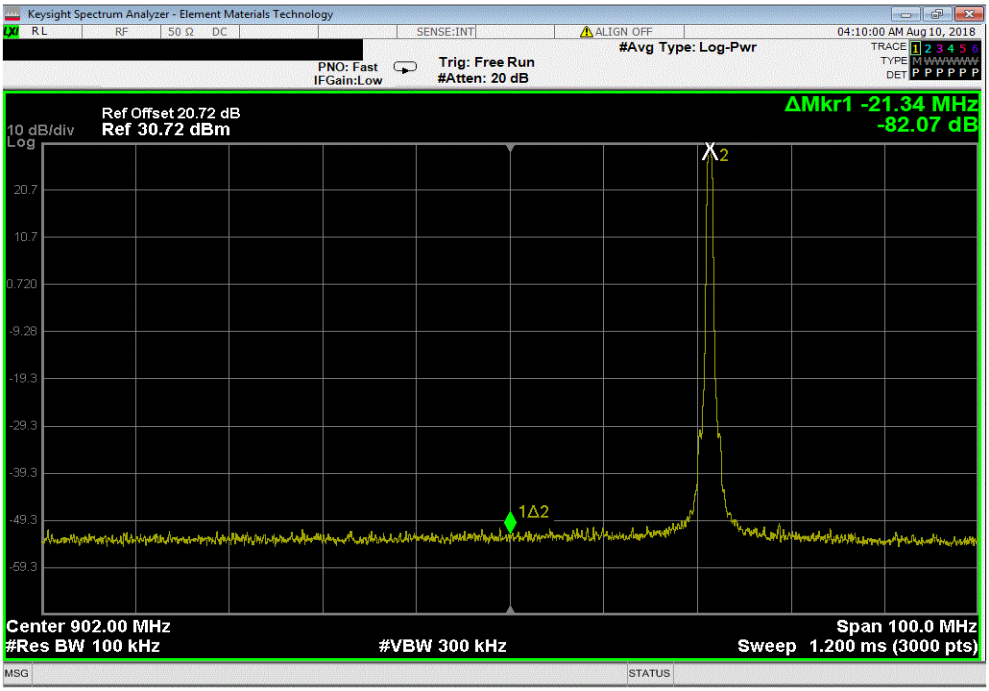
DEVIATIONS FROM TEST STANDARD

None

Configuration #	**1**	*Signature* Dustin Sparks

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
Mode: 500 kHz			
Low Channel, 923.3 MHz	-82.07	-20	Pass
High Channel, 927.5 MHz	-42.25	-20	Pass

Mode: 500 kHz, Low Channel, 923.3 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-82.07	-20	Pass



Mode: 500 kHz, High Channel, 927.5 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-42.25	-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
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Attenuator	Fairview Microwave	SA18S5W-20	RFX	12-Jun-17	12-Jun-18
Attenuator	INMET	64671 6A-10dB	AUI	14-Sep-17	14-Sep-18
Block - DC	Fairview Microwave	SD3379	AMI	12-Sep-17	12-Sep-18
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21

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

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**MTCDTIP-LAT1-275L-915**			**Work Order:**	**MLTI0080**
Serial Number:	**19617486**			**Date:**	**31-May-18**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**23.4 °C**
Attendees:	**Jim Asp**			**Humidity:**	**54.8% RH**
Project:	**None**			**Barometric Pres.:**	**1008 mbar**
Tested by:	**Trevor Buls; Andrew Rogstad**	**Power:**	**POE**	**Job Site:**	**MN08**

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

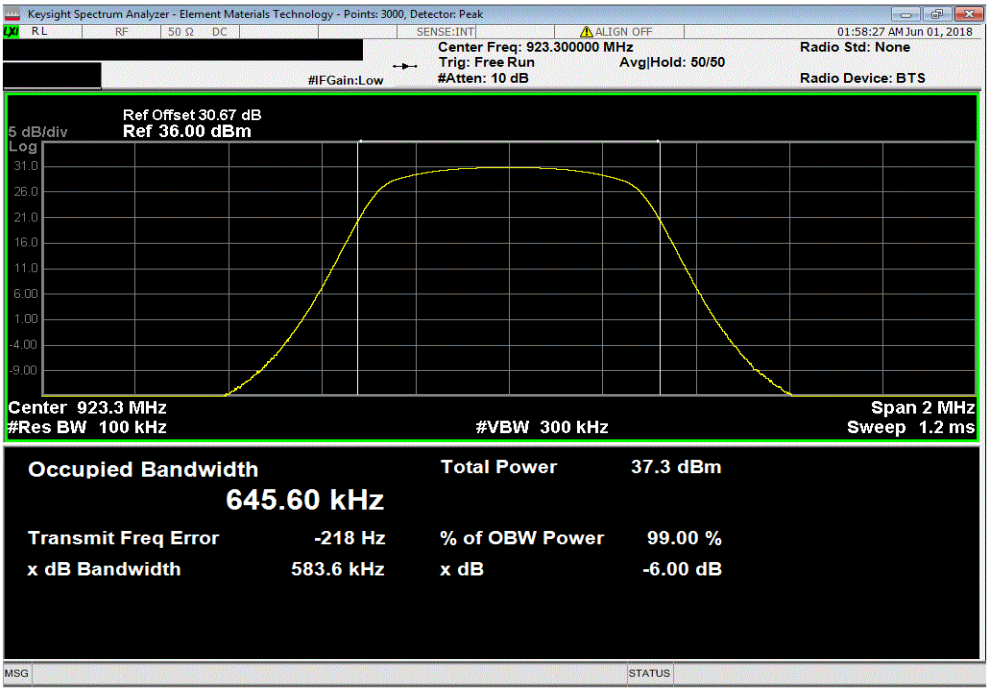
Configuration #	**1**	*Signature* Trevor Buls

	Value	**Limit (>)**	**Result**
Mode: 500 kHz			
Low Channel, 923.3 MHz	583.622 kHz	500 kHz	Pass
Mid Channel, 925.1 MHz	581.754 kHz	500 kHz	Pass
High Channel, 927.5 MHz	579.279 kHz	500 kHz	Pass

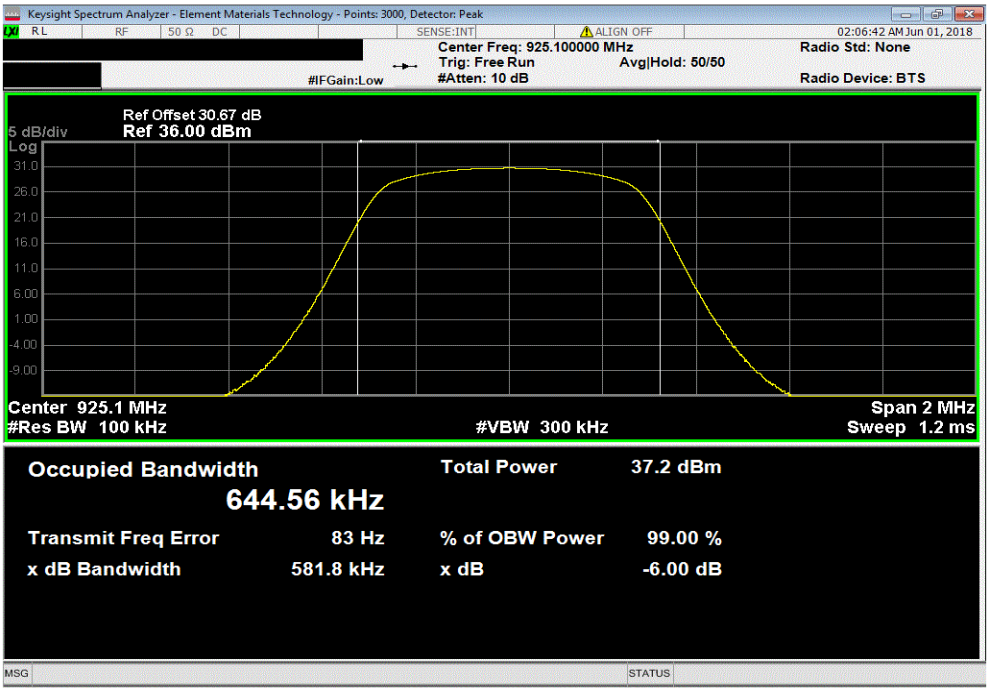
OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

Mode: 500 kHz, Low Channel, 923.3 MHz							
					Value	Limit (>)	Result
					583.622 kHz	500 kHz	Pass



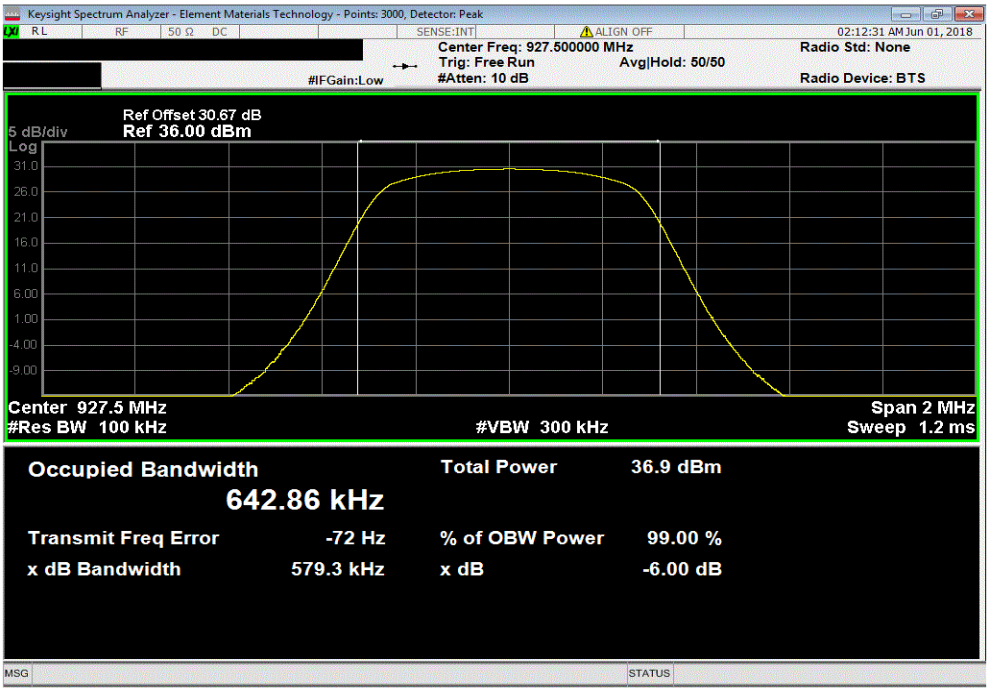
Mode: 500 kHz, Mid Channel, 925.1 MHz							
					Value	Limit (>)	Result
					581.754 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

Mode: 500 kHz, High Channel, 927.5 MHz						
				Value	Limit (>)	Result
				579.279 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
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Attenuator	Fairview Microwave	SA18S5W-20	RFX	12-Jun-17	12-Jun-18
Attenuator	INMET	64671 6A-10dB	AUI	14-Sep-17	14-Sep-18
Block - DC	Fairview Microwave	SD3379	AMI	12-Sep-17	12-Sep-18
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21

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 2017.12.14 XMit 2017.12.13

EUT:	**MTCDTIP-LAT1-275L-915**			**Work Order:**	**MLTI0080**
Serial Number:	**19617486**			**Date:**	**31-May-18**
Customer:	**Multi-Tech Systems, Inc.**			**Temperature:**	**23.4 °C**
Attendees:	**Jim Asp**			**Humidity:**	**55% RH**
Project:	**None**			**Barometric Pres.:**	**1008 mbar**
Tested by:	**Trevor Buls; Andrew Rogstad**	**Power:**	**POE**	**Job Site:**	**MN08**

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

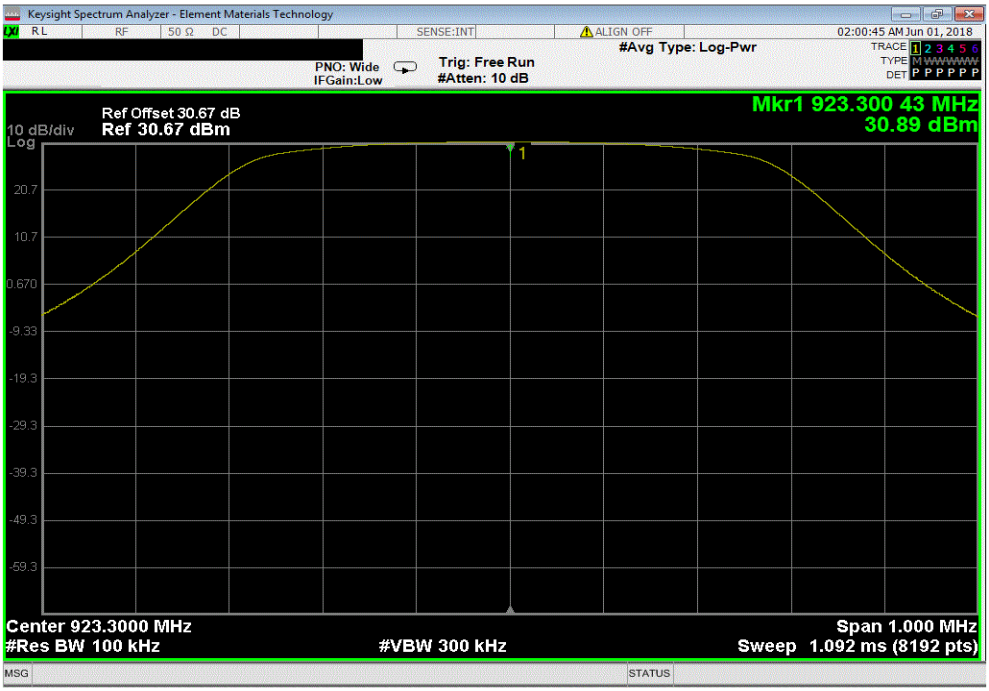
None

Configuration #	**1**	*Signature* Trevor Buls

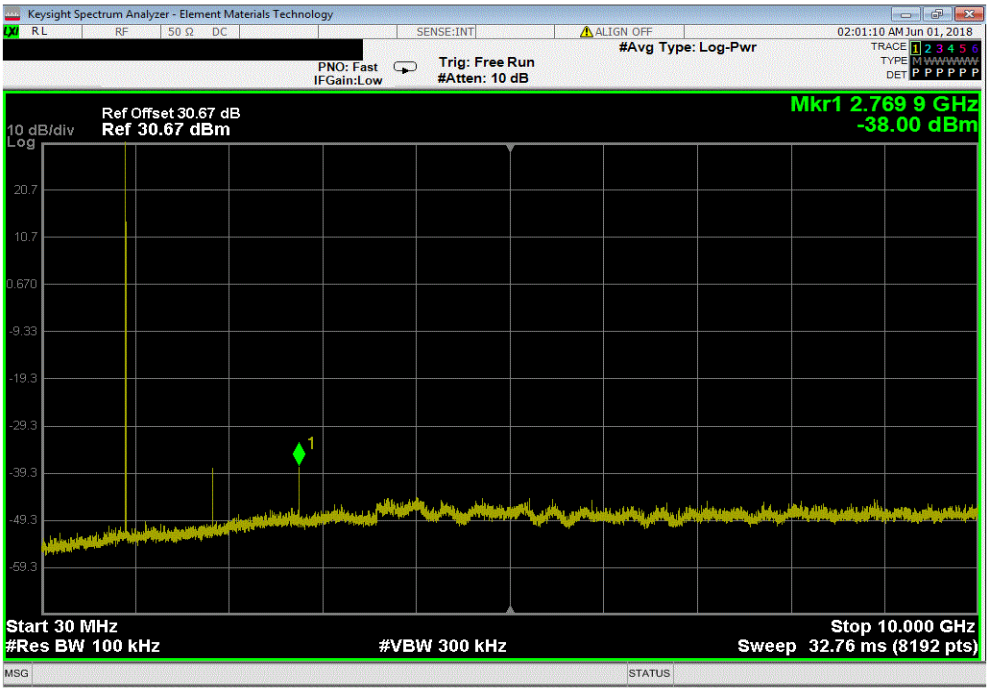
		Frequency Range	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
Mode: 500 kHz					
	Low Channel, 923.3 MHz	Fundamental	N/A	N/A	N/A
	Low Channel, 923.3 MHz	30 MHz - 10 GHz	-68.89	-20	Pass
	Mid Channel, 925.1 MHz	Fundamental	N/A	N/A	N/A
	Mid Channel, 925.1 MHz	30 MHz - 10 GHz	-69	-20	Pass
	High Channel, 927.5 MHz	Fundamental	N/A	N/A	N/A
	High Channel, 927.5 MHz	30 MHz - 10 GHz	-70.32	-20	Pass

TbtTx 2017.12.14 XMit 2017.12.13

Mode: 500 kHz, Low Channel, 923.3 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



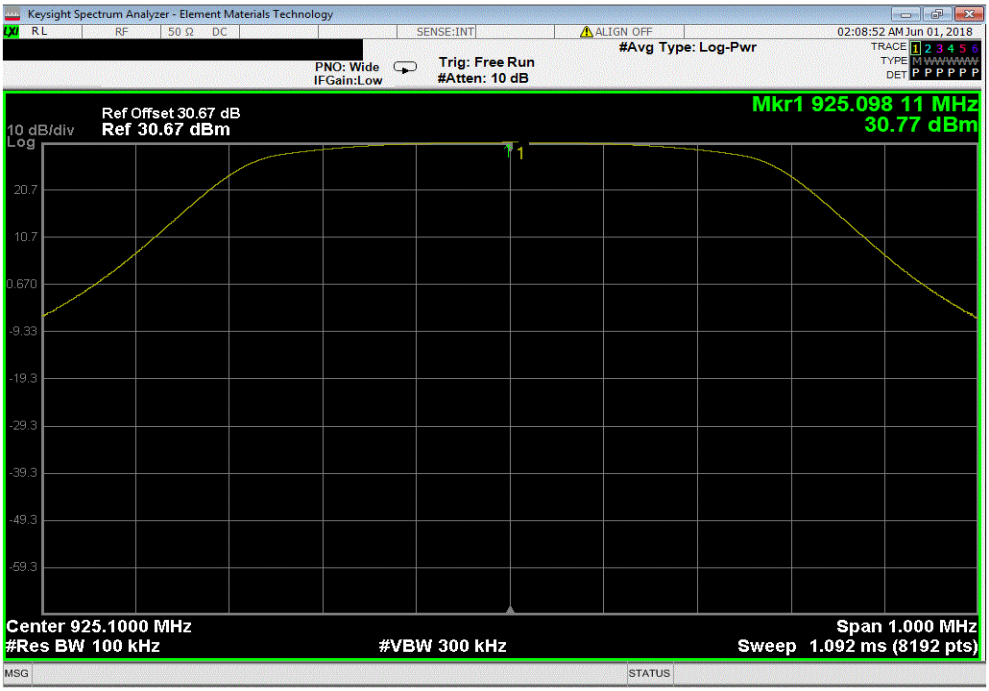
Mode: 500 kHz, Low Channel, 923.3 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 10 GHz			-68.89	-20	Pass



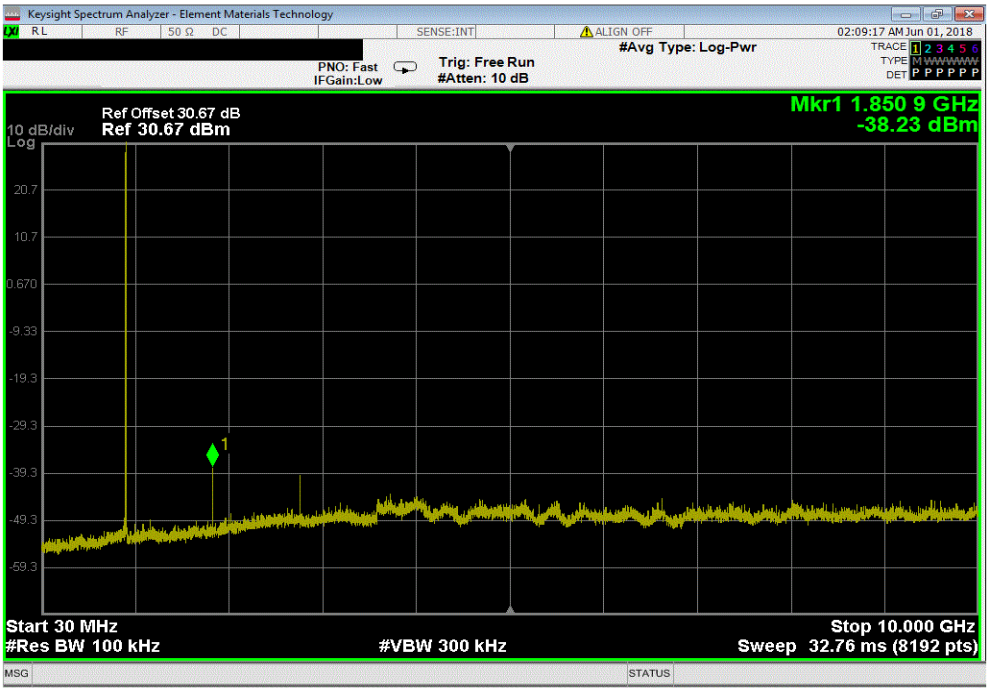
SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.12.14 XMit 2017.12.13

Mode: 500 kHz, Mid Channel, 925.1 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



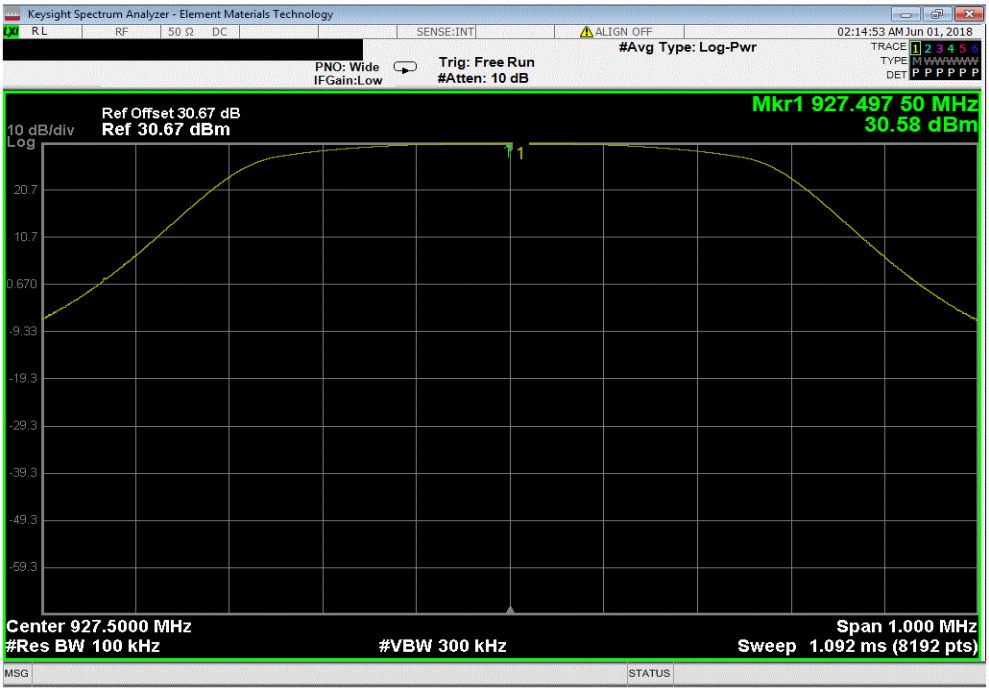
Mode: 500 kHz, Mid Channel, 925.1 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 10 GHz			-69	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.12.14 XMit 2017.12.13

Mode: 500 kHz, High Channel, 927.5 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



Mode: 500 kHz, High Channel, 927.5 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 10 GHz			-70.32	-20	Pass