NORTHWEST EMC

Multi-Tech Systems

MTAC-Lora-915

FCC 15.247:2015

Report # MLTI0043

NVLAP Lab Code: 201049-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: May 18, 2015
Multi-Tech Systems
Model: MTAC-Lora-915

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2015	ANSI C63.10:2009

Results

Method Clause	Test Description	Applied	Results	Comments
7.5	Duty Cycle	No	N/A	Not required for class 2 permissive change
6.9.1	Occupied Bandwidth	No	N/A	Not required for class 2 permissive change
6.10.2	Output Power	Yes	Pass	
6.11.2	Power Spectral Density	Yes	Pass	
6.7	Band Edge Compliance	Yes	Pass	
6.7	Spurious Conducted Emissions	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.2	Powerline Conducted Emissions	No	N/A	Not required for class 2 permissive change

Deviations From Test Standards

None

Approved By:

Jeremiah Darden, 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.

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

REV 2015.2.19

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 Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

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

Korea

MSIP / 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://www.nwemc.com/accreditations/
http://gsi.nist.gov/global/docs/cabs/designations.html

MEASUREMENT UNCERTAINTY

TMU.2014.12.03

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 WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. 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.

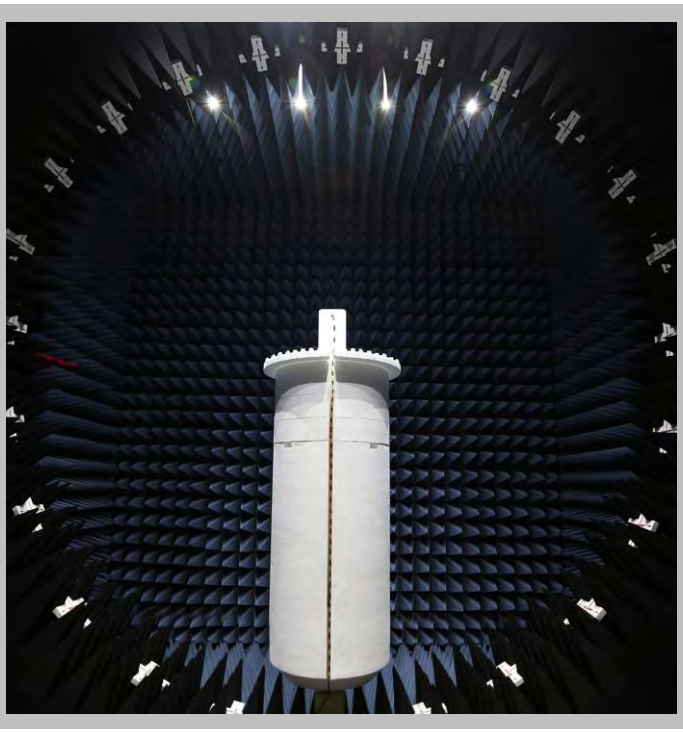
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

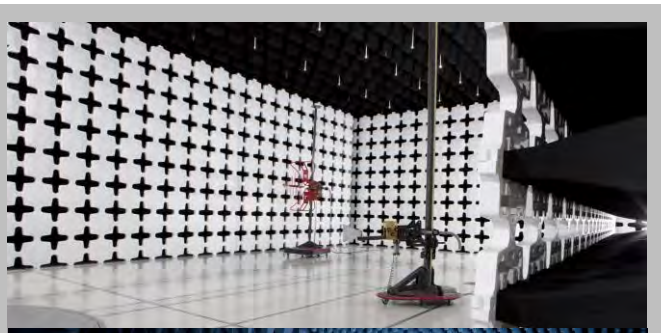
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	4.7 dB	-4.7 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

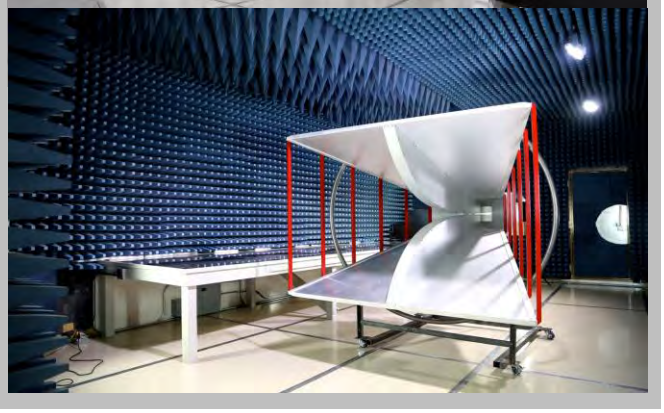
FACILITIES

NORTHWEST EMC
REV 2015.2.19

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 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 22975 NW Evergreen Pkwy 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 9801 (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
Industry Canada					
2834B-1, 2834B-3	2834E-1	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







PRODUCT DESCRIPTION

NORTHWEST EMC
2014-12-10

Client and Equipment Under Test (EUT) Information

Company Name:	Multi-Tech Systems
Address:	2205 Woodale Drive
City, State, Zip:	Mounds View, MN 55112
Test Requested By:	Bud Sundeen
Model:	MTAC-Lora-915
First Date of Test:	May 18, 2015
Last Date of Test:	May 18, 2015
Receipt Date of Samples:	May 18, 2015
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Lora Gateway Accessory Card

Testing Objective:
To demonstrate compliance of the change of the high channel and show compliance to FCC 15.247 requirements for a Class II Permissive change on FCC ID: AU792U13A16856.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration MLTI0043- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
MTAC-Lora	Multi-Tech Systems	MTAC-LORA-915	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop Computer	Hewlett Packard	Bres2-29-02XT	CNU72602XT
AC Power Adapter (for laptop)	Hewlett Packard	PPP014S	3892A300
AC Power Adapter (for controller)	GobTek	01006610L	None
Controller	Multi-Tech Systems	MTCDT-H5	18062244

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	Unknown	0.8 m	No	AC Power Adapter (for laptop)	AC Mains
DC Power	Unknown	1.1 m	Yes	AC Power Adapter (for laptop)	Laptop Computer
USB Cable	Unknown	1.8 m	Yes	Controller	MTAC-Lora
Ethernet Cable	Unknown	1.95 m	No	Controller	Laptop Computer
DC Power	Unknown	3 m	Yes	MTAC-Lora FCC	AC Power Adapter (for controller)

Configuration MLTI0043- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
MTAC-Lora	Multi-Tech Systems	MTAC-LORA-915	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop Computer	Hewlett Packard	Bres2-29-02XT	CNU72602XT
AC Power Adapter (for laptop)	Hewlett Packard	PPP014S	3892A300
AC Power Adapter (for controller)	GobTek	01006610L	None
Controller	Multi-Tech Systems	MTCDT-H5	18062244
Wireless External Antenna	Pulse	W1063	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	Unknown	0.8 m	No	AC Power Adapter (for laptop)	AC Mains
DC Power	Unknown	1.1 m	Yes	AC Power Adapter (for laptop)	Laptop Computer
USB Cable	Unknown	1.8 m	Yes	Controller	MTAC-Lora
Ethernet Cable	Unknown	1.95 m	No	Controller	Laptop Computer
DC Power	Unknown	3 m	Yes	MTAC-Lora FCC	AC Power Adapter (for controller)

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	5/18/2015	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	5/18/2015	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	5/18/2015	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	5/18/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	5/18/2015	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

SPURIOUS RADIATED EMISSIONS

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

Transmitting Lora at High Channel @ 927.5 MHz.

POWER SETTINGS INVESTIGATED

USB via 110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MLTI0043-2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	10000 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
High Pass Filter, 2.8-18 GHz	Micro-Tronics	HPM50111	HHX	8/18/2014	12 mo
Low Pass Filter, 0-1000 MHz	Micro-Tronics	LPM50004	HHV	8/18/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	PAK	10/27/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	PAL	10/27/2014	12 mo
TX02 Cable	Northwest EMC	8-18GHz	TXD	10/27/2014	12 mo
Pre-Amplifier	Miteq	JSDQK42-18004000-60-5P	PAM	11/21/2014	12 mo
Cable	Northwest EMC	18-40GHz	TXE	11/21/2014	12 mo
Antenna, Double Ridge Guide Horn	A.H. Systems, Inc.	SAS-574	AXW	4/23/2014	24 mo
Antenna, Horn	ETS Lindgren	3160-08	AJG	NCR	0 mo
Antenna, Horn	ETS Lindgren	3160-07	AJF	NCR	0 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	9/22/2014	12 mo
TX02 Cable	Northwest EMC	1-8.2 GHz	TXC	9/22/2014	12 mo
Antenna, Horn	ETS Lindgren	3115	AJL	9/15/2014	24 mo
Pre-Amplifier	Miteq	AM-1551	PAH	9/13/2014	12 mo
TX02 Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	9/22/2014	12 mo
Attenuator	Fairview Microwave	SA4018-20	TQY	2/27/2015	12 mo
Antenna, Biconilog	ETS Lindgren	3143B	AYF	4/7/2014	24 mo
Spectrum Analyzer	Agilent	N9010A	AFL	6/20/2014	12 mo

TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for the high transmit frequency. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance.

While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

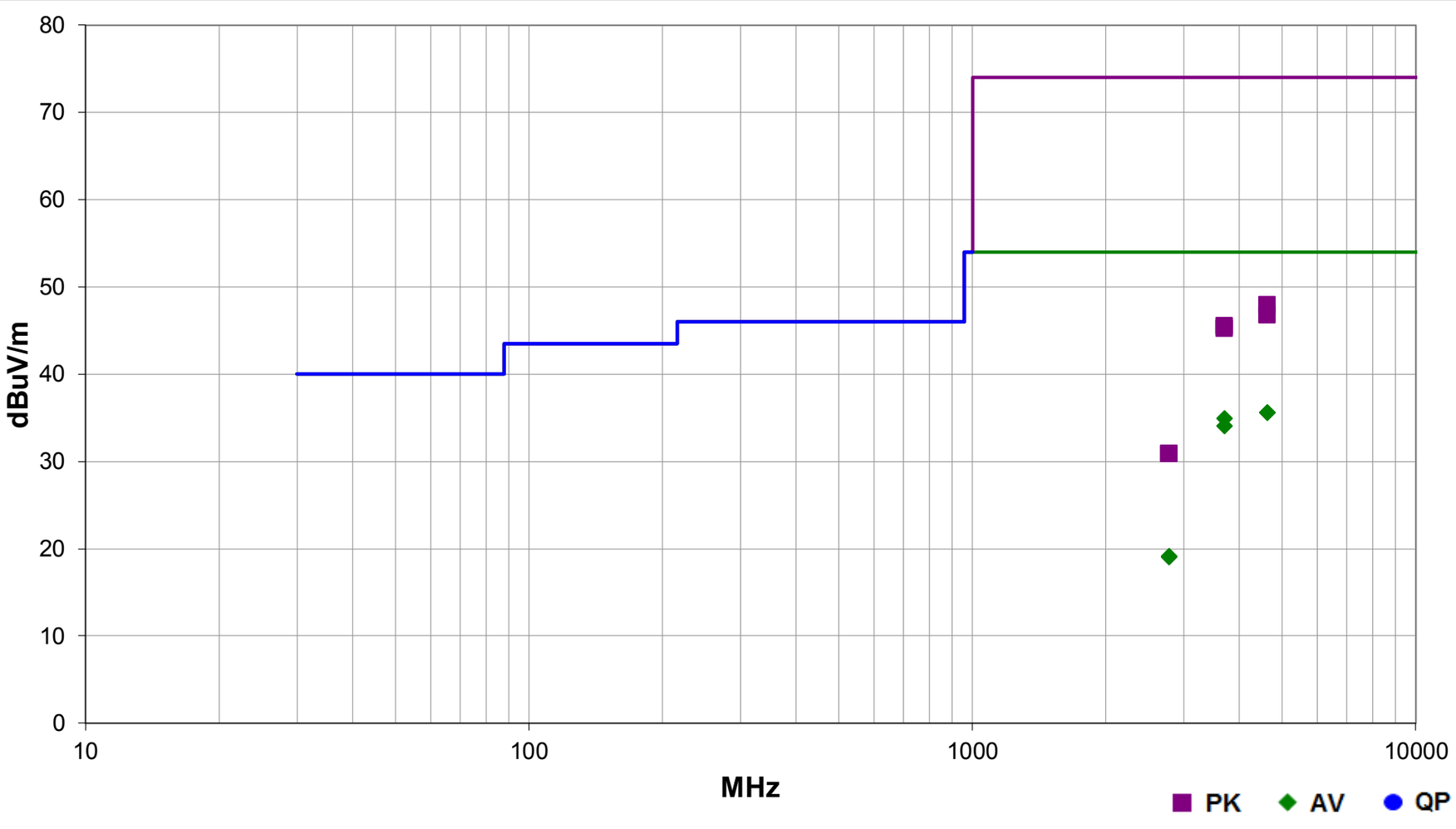
PSA-ESCI 2015.03.03
EmiR5 2015.03.19.1

SPURIOUS RADIATED EMISSIONS

Work Order:	MLTI0043	**Date:**	05/18/15		
Project:	None	**Temperature:**	24.6 °C		
Job Site:	TX02	**Humidity:**	50.6% RH		
Serial Number:	None	**Barometric Pres.:**	1021 mbar	**Tested by:**	Jonathan Kiefer
EUT:	MTAC-Lora				
Configuration:	2				
Customer:	Multi-Tech Systems				
Attendees:	None				
EUT Power:	USB via 110VAC/60Hz				
Operating Mode:	Transmitting Lora at High Channel @ 927.5 MHz.				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.247:2015	ANSI C63.10:2009

Run #	10	**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
4640.467	28.3	7.3	1.4	220.9	3.0	0.0	Vert	AV	0.0	35.6	54.0	-18.4	High Ch, EUT Horizontal
4640.342	28.3	7.3	1.0	211.0	3.0	0.0	Horz	AV	0.0	35.6	54.0	-18.4	High Ch, EUT Vertical
3709.967	30.7	4.2	2.1	220.9	3.0	0.0	Vert	AV	0.0	34.9	54.0	-19.1	High Ch, EUT Horizontal
3709.958	29.8	4.2	1.0	338.0	3.0	0.0	Horz	AV	0.0	34.0	54.0	-20.0	High Ch, EUT Vertical
4635.600	40.6	7.3	1.0	211.0	3.0	0.0	Horz	PK	0.0	47.9	74.0	-26.1	High Ch, EUT Vertical
4639.567	39.4	7.3	1.4	220.9	3.0	0.0	Vert	PK	0.0	46.7	74.0	-27.3	High Ch, EUT Horizontal
3709.717	41.3	4.2	1.0	338.0	3.0	0.0	Horz	PK	0.0	45.5	74.0	-28.5	High Ch, EUT Vertical
3710.633	41.0	4.2	2.1	220.9	3.0	0.0	Vert	PK	0.0	45.2	74.0	-28.8	High Ch, EUT Horizontal
2782.442	22.1	-3.0	1.0	165.0	3.0	0.0	Vert	AV	0.0	19.1	54.0	-34.9	High Ch, EUT Horizontal
2782.242	22.0	-3.0	1.0	118.9	3.0	0.0	Horz	AV	0.0	19.0	54.0	-35.0	High Ch, EUT Vertical
2781.533	33.9	-3.0	1.0	118.9	3.0	0.0	Horz	PK	0.0	30.9	74.0	-43.1	High Ch, EUT Vertical
2784.842	33.8	-3.0	1.0	165.0	3.0	0.0	Vert	PK	0.0	30.8	74.0	-43.2	High Ch, EUT Horizontal

SPURIOUS CONDUCTED EMISSIONS

XMit 2015.01.14

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.	Interval (mo)
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
Signal Analyzer	Agilent	N9010A	AFL	6/20/2014	12

TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set the high transmit frequency. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. 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

NORTHWEST EMC

XMit 2015.01.14

EUT:	**MTAC-Lora**			**Work Order:**	**MLTI0043**
Serial Number:	**None**			**Date:**	**05/18/15**
Customer:	**Multi-Tech Systems**			**Temperature:**	**24.0°C**
Attendees:	**None**			**Humidity:**	**51%**
Project:	**None**			**Barometric Pres.:**	**1019 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**USB via 110VAC/60Hz**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting Lora at High Channel @ 927.5 MHz.

DEVIATIONS FROM TEST STANDARD

None

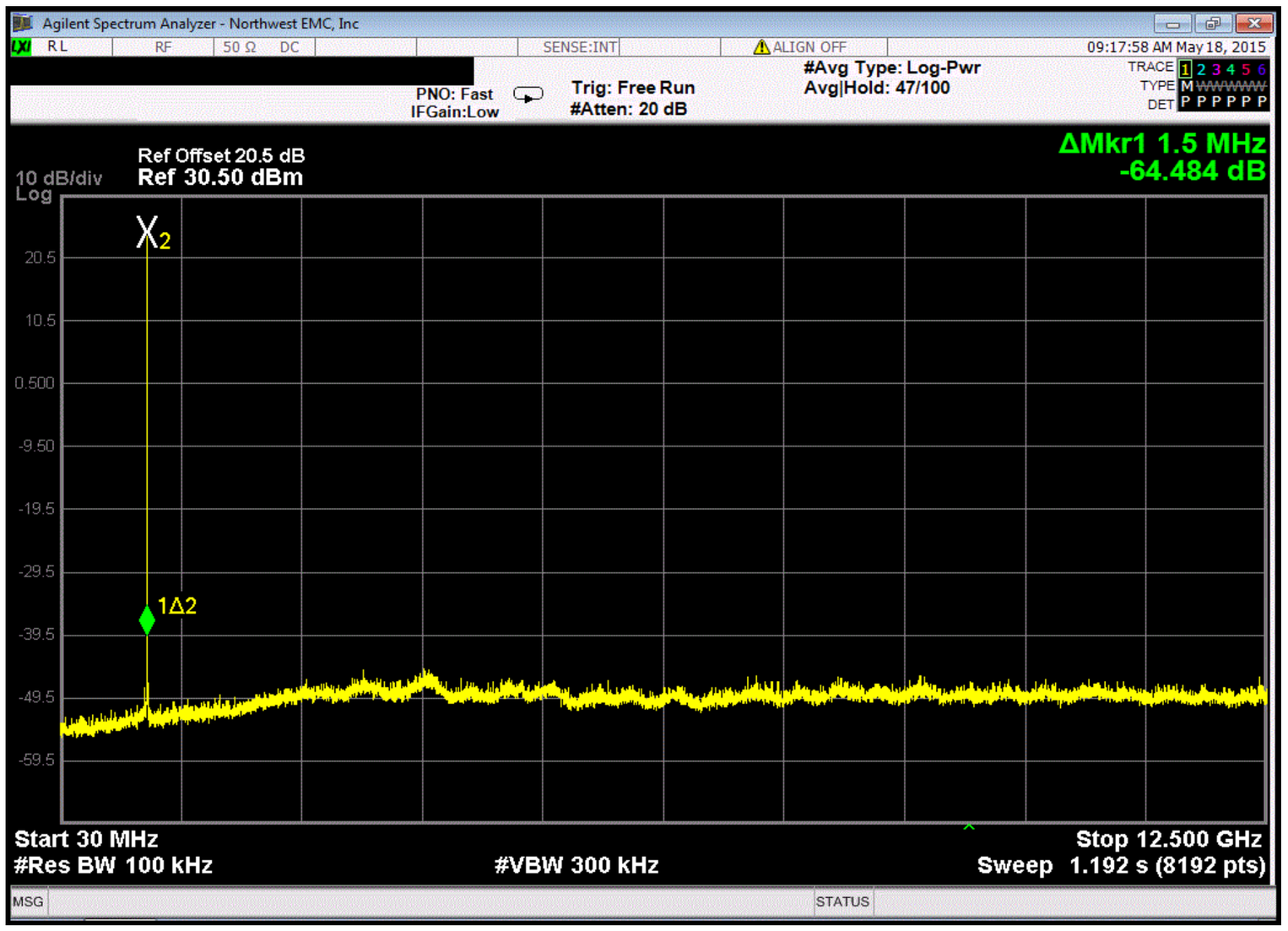
Configuration #	**1**	*Signature*

	Frequency Range	**Value (dBc)**	**Limit ≤ (dBc)**	**Result**
Lora				
High Channel, 927.5 MHz	30 MHz - 12.5 GHz	-66.48	-20	Pass
High Channel, 927.5 MHz	12.5 GHz - 25 GHz	-67.57	-20	Pass

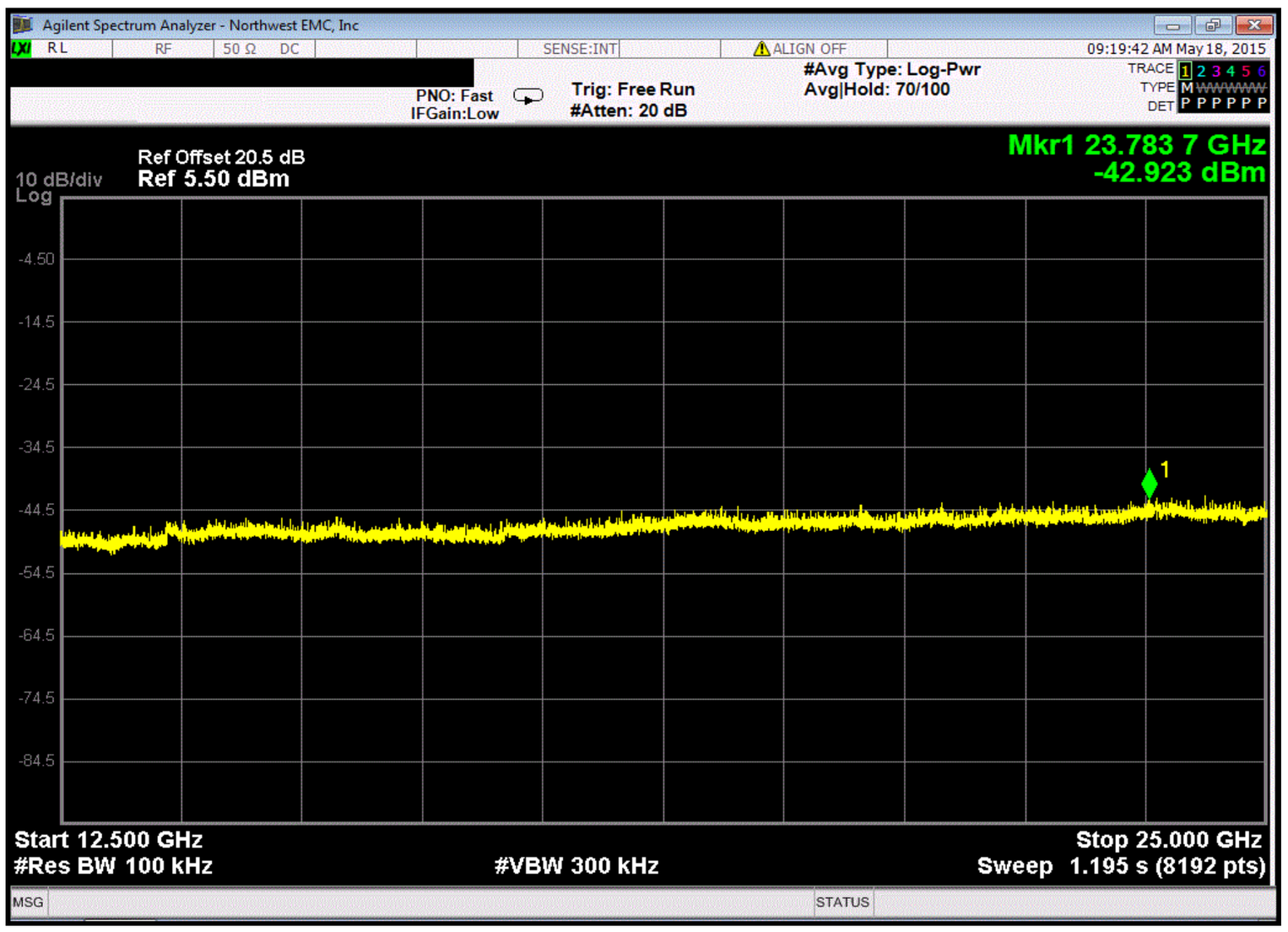
SPURIOUS CONDUCTED EMISSIONS

XMit 2015.01.14

Lora, High Channel, 927.5 MHz				
Frequency Range		**Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 12.5 GHz		-66.48	-20	Pass



Lora, High Channel, 927.5 MHz				
Frequency Range		**Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-67.57	-20	Pass



BAND EDGE COMPLIANCE

XMit 2015.01.14

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TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
Signal Analyzer	Agilent	N9010A	AFL	6/20/2014	12

TEST DESCRIPTION

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

NORTHWEST EMC

XMit 2015.01.14

EUT:	**MTAC-Lora**			**Work Order:**	**MLTI0043**
Serial Number:	**None**			**Date:**	**05/18/15**
Customer:	**Multi-Tech Systems**			**Temperature:**	**24.0°C**
Attendees:	**None**			**Humidity:**	**51%**
Project:	**None**			**Barometric Pres.:**	**1019 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**USB via 110VAC/60Hz**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting Lora at High Channel @ 927.5 MHz.

DEVIATIONS FROM TEST STANDARD

None

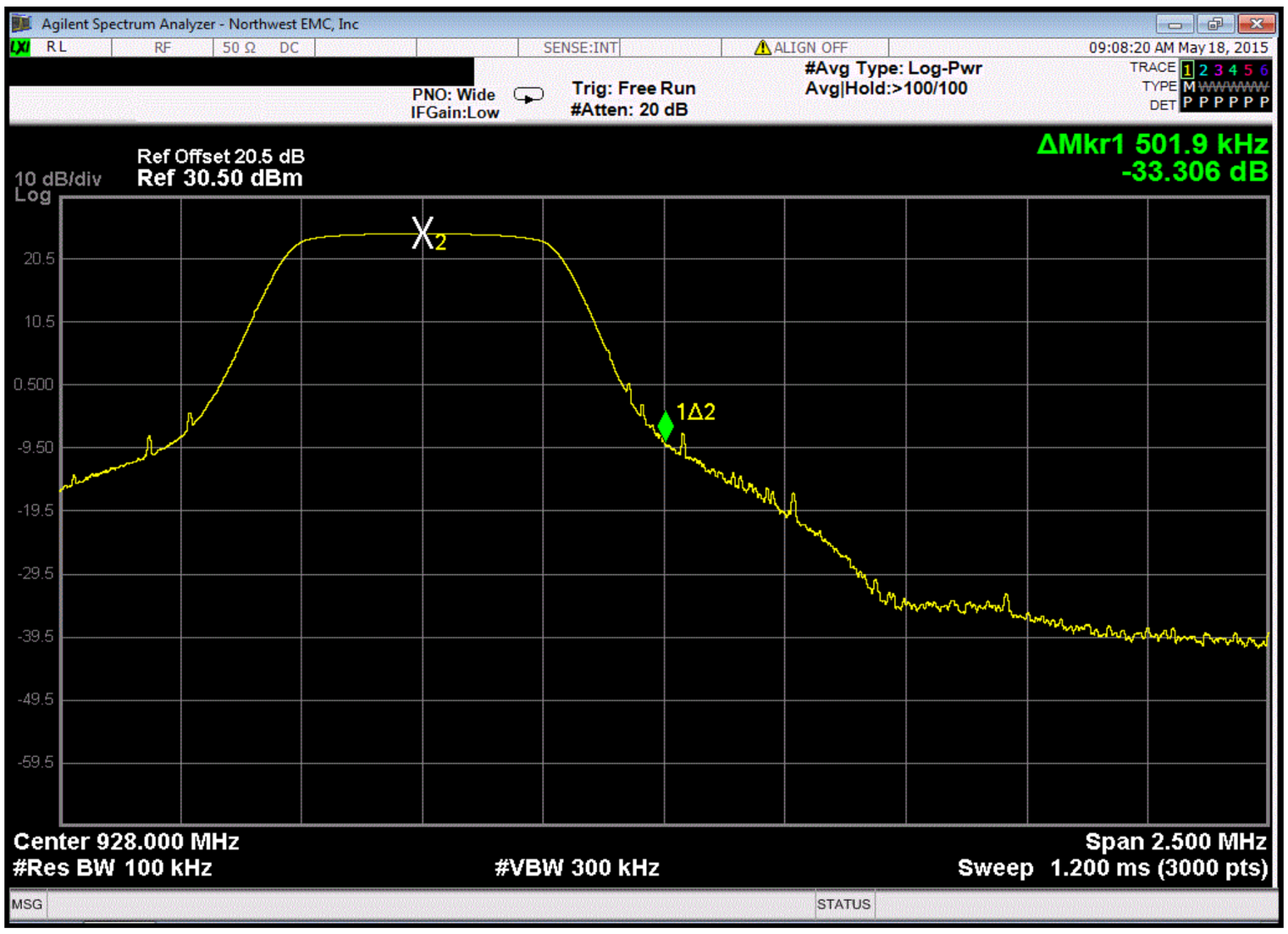
Configuration #	**1**	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
Lora			
High Channel, 927.5 MHz	-33.31	-20	Pass

BAND EDGE COMPLIANCE

XMit 2015.01.14

Lora, High Channel, 927.5 MHz							
					Value (dBc)	Limit ≤ (dBc)	Result
					-33.31	-20	Pass



OUTPUT POWER

NORTHWEST EMC

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.	Interval (mo)
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
Signal Analyzer	Agilent	N9010A	AFL	6/20/2014	12

TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. 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 reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

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

The method found in KDB 558074 DTS D01 Measurement Section 9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

XMit 2015.01.14

EUT:	MTAC-Lora			**Work Order:**	MLTI0043
Serial Number:	None			**Date:**	05/18/15
Customer:	Multi-Tech Systems			**Temperature:**	24.0°C
Attendees:	None			**Humidity:**	51%
Project:	None			**Barometric Pres.:**	1019 mbar
Tested by:	Jonathan Kiefer	**Power:**	USB via 110VAC/60Hz	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting Lora at High Channel @ 927.5 MHz.

DEVIATIONS FROM TEST STANDARD

None

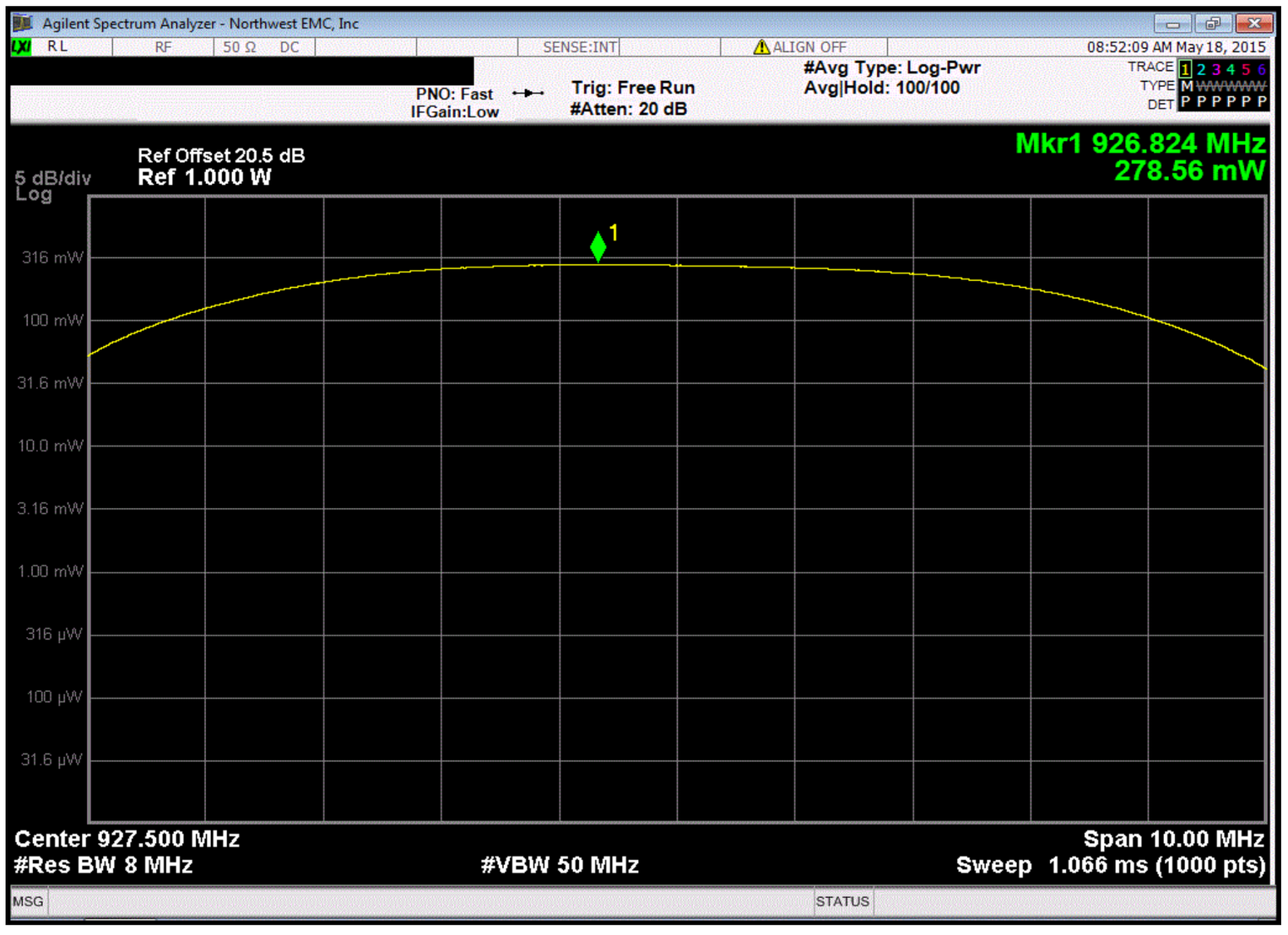
Configuration #	1	*Signature*

	Value	Limit (<)	Result
Lora			
High Channel, 927.5 MHz	278.56 mW	1 W	Pass

OUTPUT POWER

XMit 2015.01.14

Lora, High Channel, 927.5 MHz							
					Value	Limit (<)	Result
					278.56 mW	1 W	Pass



POWER SPECTRAL DENSITY

XMit 2015.01.14

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.	Interval (mo)
Signal Analyzer	Agilent	N9010A	AFL	6/20/2014	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
DC Block, 40 GHz	Fairview Microwave	SD4018-20	AMM	2/27/2015	12
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36

TEST DESCRIPTION

The maximum power spectral density measurements were measured with the EUT set to the high frequency. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available. A duty cycle of >98% was used.

Per the procedure outlined in section 10.3 in the KDB 558074 D01 v03r02 document, a power spectral density measurment using the AVGPSD-1 method was used on each channel.

b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set VBW ≥3 x RBW.
e) Detector = power averaging (RMS)
f) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.

POWER SPECTRAL DENSITY

NORTHWEST EMC

XMit 2015.01.14

EUT:	**MTAC-Lora**			**Work Order:**	**MLTI0043**
Serial Number:	**None**			**Date:**	**05/18/15**
Customer:	**Multi-Tech Systems**			**Temperature:**	**24.0°C**
Attendees:	**None**			**Humidity:**	**51%**
Project:	**None**			**Barometric Pres.:**	**1019 mbar**
Tested by:	**Jonathan Kiefer**	**Power:**	**USB via 110VAC/60Hz**	**Job Site:**	**TX09**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2015	ANSI C63.10:2009

COMMENTS

Transmitting Lora at High Channel @ 927.5 MHz.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	**1**	*Signature*

		Value dBm/3kHz	**Limit dBm/3kHz**	**Results**
Lora				
	High Channel, 927.5 MHz	2.879	8	Pass

POWER SPECTRAL DENSITY

XMit 2015.01.14

Lora, High Channel, 927.5 MHz						
		Value dBm/3kHz			Limit dBm/3kHz	Results
		2.879			8	Pass