



element

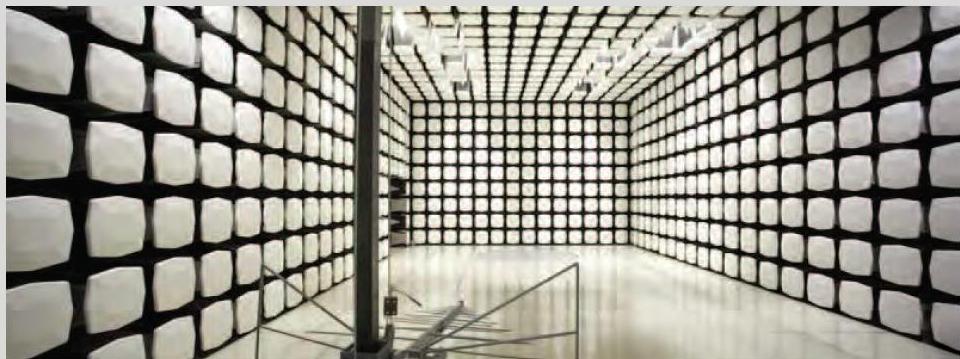
Multi-Tech Systems, Inc.

MTCDTIP2-LNA3-B11UKP-L1L
MTCDTIP2-EN-B11UKP-L1L

FCC 15.247:2021

902 - 928 MHz Other Wideband (DTS) Transceiver

Report: MLTI0180.6, Issue Date: July 26, 2021



NVLAP LAB CODE: 200881-0



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CERTIFICATE OF TEST



Last Date of Test: February 11, 2021
Multi-Tech Systems, Inc.
EUT: MTCDTIP2-LNA3-B11UKP-L1L

Radio Equipment Testing

Standards

| Specification | Method |
|-----------------|------------------------------|
| FCC 15.207:2021 | |
| FCC 15.247:2021 | ANSI C63.10:2013, KDB 558074 |

Results

| Method Clause | Test Description | Applied | Results | Comments |
|-------------------------------|---|---------|---------|--------------------------------------|
| 6.2 | Powerline Conducted Emissions (Transmitter) | Yes | Pass | |
| 6.5, 6.6, 11.12.1, 11.13.2 | Spurious Radiated Emissions | Yes | Pass | |
| 11.6 | Duty Cycle | Yes | NA | 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:

Eric Brandon, Department 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) and as a CAB for the acceptance of test data.

European Union

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

United Kingdom

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

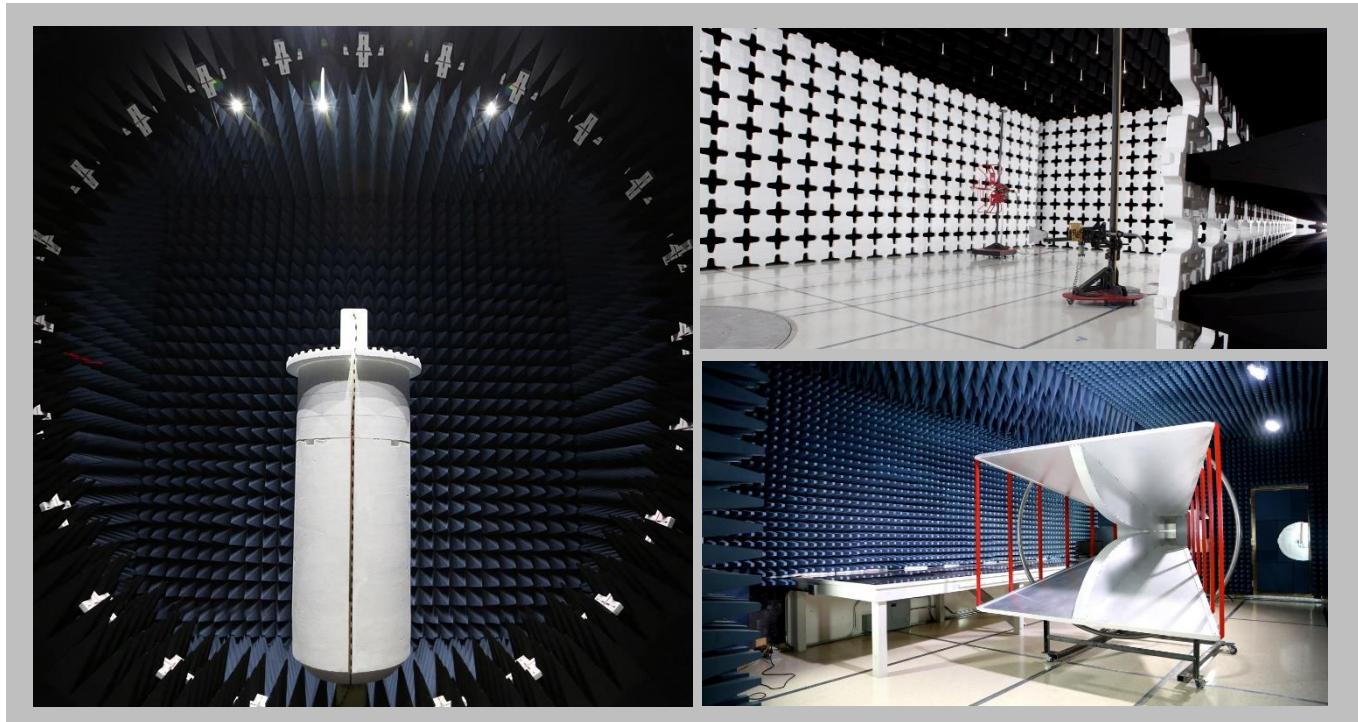
For details on the Scopes of our Accreditations, please visit:

<https://www.nwemc.com/emc-testing-accreditations>

FACILITIES



| California | Minnesota | Oregon | Texas | Washington |
|---|---|--|--|---|
| Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918 | Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136 | Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066 | Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255 | Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425) 984-6600 |
| NVLAP | | | | |
| NVLAP Lab Code: 200676-0 | NVLAP Lab Code: 200881-0 | 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 | 2834D-1 | 2834G-1 | 2834F-1 |
| BSMI | | | | |
| SL2-IN-E-1154R | SL2-IN-E-1152R | SL2-IN-E-1017 | SL2-IN-E-1158R | SL2-IN-E-1153R |
| VCCI | | | | |
| A-0029 | A-0109 | A-0108 | A-0201 | A-0110 |
| Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA | | | | |
| US0158 | US0175 | US0017 | US0191 | US0157 |



MEASUREMENT UNCERTAINTY



Measurement Uncertainty

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

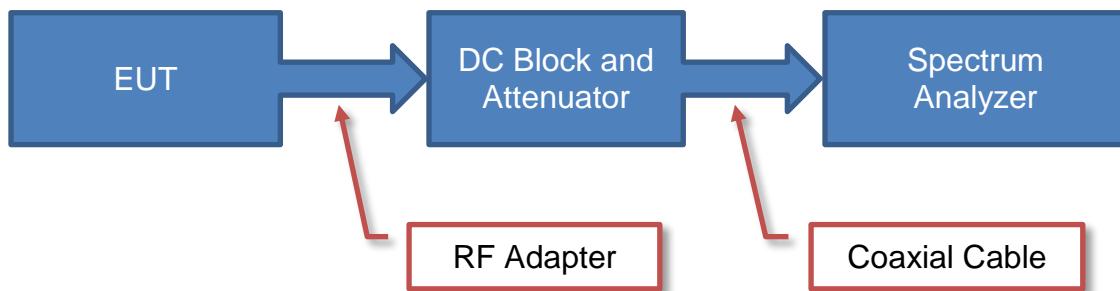
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found in the table below. A lab specific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

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

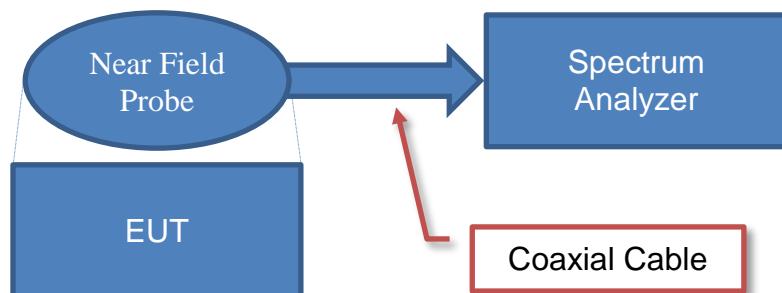
| Test | + MU | - MU |
|---------------------------------------|---------|----------|
| Frequency Accuracy | 0.0007% | -0.0007% |
| Amplitude Accuracy (dB) | 1.2 dB | -1.2 dB |
| Conducted Power (dB) | 1.2 dB | -1.2 dB |
| Radiated Power via Substitution (dB) | 0.7 dB | -0.7 dB |
| Temperature (degrees C) | 0.7°C | -0.7°C |
| Humidity (% RH) | 2.5% RH | -2.5% RH |
| Voltage (AC) | 1.0% | -1.0% |
| Voltage (DC) | 0.7% | -0.7% |
| Field Strength (dB) | 5.2 dB | -5.2 dB |
| AC Powerline Conducted Emissions (dB) | 2.6 dB | -2.6 dB |

Test Setup Block Diagrams

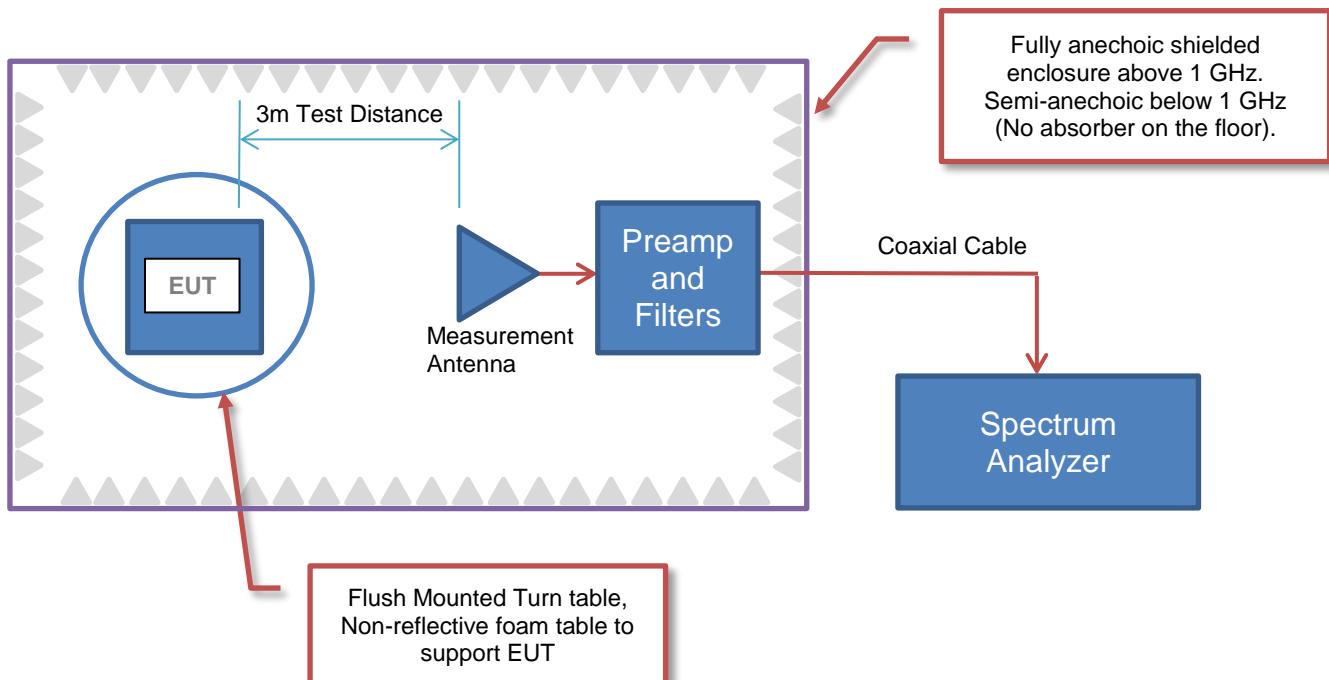
Antenna Port Conducted Measurements



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: | Saint Paul, MN 55112 |
| Test Requested By: | Jim Asp |
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L MTCDTIP2-EN-B11UKP-L1L |
| First Date of Test: | January 4, 2021 |
| Last Date of Test: | February 11, 2021 |
| Receipt Date of Samples: | December 11, 2020 |
| Equipment Design Stage: | Preproduction |
| Equipment Condition: | No Damage |
| Purchase Authorization: | Verified |

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

The Conduit® IP67 Base Station is a ruggedized IoT gateway solution, specifically designed for outdoor LoRa® public or private network deployments. The highly scalable and certified Conduit IP67 gateway is capable of resisting the harshest environmental factors including moisture, dust, wind, rain, snow and extreme heat. The device supports LoRaWAN® applications in virtually any environment. Leveraging the Conduit, this device can support thousands of LoRaWAN-certified end nodes, including the mDot™*. This flexible solution provides durable, low-power, low-power, wide area network connectivity in support of M2M and IoT applications for both LoRa service providers and individual enterprises wanting to expand their LoRa network coverage.

Bundled for easy deployment, the solution includes a Conduit with a LoRa mCard™, IP67 enclosure and LoRa antenna to improve outdoor range. It also provides a choice of cellular 3G, 4G-LTE or Ethernet backhaul options. The LoRa transceiver can be deployed as part of an existing telecommunications tower, individual stand or wall mount.

Model Equivalency Statement:

| | |
|--------------------------|---|
| MTCDTIP2-LNA3-B11UKP-L1L | 915 external Lora Antenna, LNA3 Cell,mlinux |
| MTCDTIP2-EN-B11UKP-L1L | 915 External Lora Antenna, no cell,mlinux |

Testing Objective:

Seeking to demonstrate compliance under FCC 15.247:2020 for operation in the 902 - 928 MHz Band.

CONFIGURATIONS



Configuration MLTI0180- 11

| EUT | | | |
|---|--------------------------|-------------------|-----------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| MTCDTIP2-LNA3-B11UKP-L1L (external 915 Lora Antenna) | Multi-Tech Systems, Inc. | 70006807L | 0205123980-0008 |

| Peripherals in test setup boundary | | | |
|------------------------------------|--------------|-------------------|------------------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Laptop | Lenovo | ThinkPad T430 | PB7Z4FB |
| AC/DC Adapter (Laptop) | Lenovo | ADLX90NLT2A | 11S45N0307Z1ZLZ437C86U |

| Cables | | | | | |
|---------------------|--------|------------|---------|------------------------|------------------------|
| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 |
| AC Cable | No | 1.8m | No | Gigabit PoE+ Injector | AC Mains |
| Ethernet Cable (TE) | No | 1.8m | No | Gigabit PoE+ Injector | Laptop |
| Ethernet | No | 1.8m | No | EUT Family | Gigabit PoE+ Injector |
| AC Cable (Laptop) | No | 1.8m | No | AC Mains | AC/DC Adapter (Laptop) |
| DC Cable (Laptop) | No | 1.8m | Yes | AC/DC Adapter (Laptop) | Laptop |

CONFIGURATIONS



Configuration MLTI0180- 14

| EUT | | | |
|---|--------------------------|--------------------------|----------------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| MTCDTIP2-LNA3-B11UKP-L1L (external 915 Lora Antenna) | Multi-Tech Systems, Inc. | 70006807L | 0205123980-0008 |
| L-Com External Antenna | L-Com | HGV-906U | None |

| Peripherals in test setup boundary | | | |
|---|---------------------|--------------------------|----------------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Gigabit PoE+ Injector | Trendnet | TPE-115Gi/A | IT0E5I2208642 |

| Remote Equipment Outside of Test Setup Boundary | | | |
|--|---------------------|--------------------------|------------------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Laptop | Lenovo | ThinkPad T430 | PB7Z4FB |
| AC/DC Adapter (Laptop) | Lenovo | ADLX90NLT2A | 11S45N0307Z1ZLZ437C86U |

| Cables | | | | | |
|-------------------|---------------|-------------------|----------------|------------------------|------------------------|
| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 |
| AC Cable | No | 1.8m | No | Gigabit PoE+ Injector | AC Mains |
| Ethernet | No | 1.8m | No | EUT Family | Gigabit PoE+ Injector |
| Ethernet | No | >3m | No | Gigabit PoE+ Injector | Laptop |
| AC Cable (Laptop) | No | 1.8m | No | AC Mains | AC/DC Adapter (Laptop) |
| DC Cable (Laptop) | No | 1.8m | Yes | AC/DC Adapter (Laptop) | Laptop |

CONFIGURATIONS



Configuration MLTI0180- 17

| EUT | | | |
|---|--------------------------|--------------------------|----------------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| MTCDTIP2-LNA3-B11UKP-L1L (external 915 Lora Antenna) | Multi-Tech Systems, Inc. | 70006807L | 0205123980-0008 |
| L-Com External Antenna | L-Com | HGV-906U | None |

| Peripherals in test setup boundary | | | |
|---|---------------------|--------------------------|----------------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Gigabit PoE+ Injector | Intellinet | 560566/Rev.1 | 1019692032000059 |

| Remote Equipment Outside of Test Setup Boundary | | | |
|--|---------------------|--------------------------|------------------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Laptop | Lenovo | ThinkPad T430 | PB7Z4FB |
| AC/DC Adapter (Laptop) | Lenovo | ADLX90NLT2A | 11S45N0307Z1ZLZ437C86U |

| Cables | | | | | |
|-------------------|---------------|-------------------|----------------|------------------------|------------------------|
| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 |
| AC Cable | No | 1.8m | No | Gigabit PoE+ Injector | AC Mains |
| Ethernet | No | 1.8m | No | EUT Family | Gigabit PoE+ Injector |
| Ethernet | No | >3m | No | Gigabit PoE+ Injector | Laptop |
| AC Cable (Laptop) | No | 1.8m | No | AC Mains | AC/DC Adapter (Laptop) |
| DC Cable (Laptop) | No | 1.8m | Yes | AC/DC Adapter (Laptop) | Laptop |

MODIFICATIONS



Equipment Modifications

| Item | Date | Test | Modification | Note | Disposition of EUT |
|------|------------|---|--|---|---|
| 1 | 2021-01-04 | Output Power | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 2 | 2021-01-04 | Equivalent Isotropic Radiated Power | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 3 | 2021-01-04 | Band Edge Compliance | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 4 | 2021-01-04 | 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 | 2021-01-04 | Spurious Conducted Emissions | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 6 | 2021-01-04 | 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 | 2021-01-08 | 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 | 2021-02-11 | Powerline Conducted Emissions (Transmitter) | Modified from delivered configuration. | Clients added a ground strap from the circuit board ground to the sim card board ground. Approved by Jim Asp. | Scheduled testing was completed. |

POWER SETTINGS AND ANTENNAS



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

ANTENNA GAIN (dBi)

| Type | Provided by: | Frequency Range (MHz) | Gain (dBi) |
|----------|--------------|-----------------------|------------|
| HGV-906U | L-Com | 824-960 | 6 |

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

SETTINGS FOR ALL TESTS IN THIS REPORT

| Modulation Types | Position (if multiple channels) | Power Setting |
|-------------------------------|------------------------------------|---------------------|
| Single Data Rate / Modulation | Low Channel (923.3 MHz) | Mix 13, PA 3, Dig 0 |
| | Mid Channel (925.1 MHz) | Mix 13, PA 3, Dig 0 |
| | High Channel (927.5 MHz) | Mix 13, PA 3, Dig 0 |

POWERLINE CONDUCTED EMISSIONS



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 | Gauss Instruments | TDEMI 30M | ARK | 2020-10-27 | 2021-10-27 |
| Cable - Conducted Cable Assembly | Northwest EMC | MNC, HGN, TYK | MNCA | 2020-03-11 | 2021-03-11 |
| LISN | Solar Electronics | 9252-50-R-24-BNC | LIY | 2020-03-15 | 2021-03-15 |
| LISN | Solar Electronics | 9252-50-R-24-BNC | LIO | 2020-09-28 | 2021-09-28 |

MEASUREMENT UNCERTAINTY

| Description | | | |
|--------------|--------|--|---------|
| Expanded k=2 | 2.6 dB | | -2.6 dB |

CONFIGURATIONS INVESTIGATED

MLTI0180-17

MODES INVESTIGATED

LoRa Transmitting: Mid Channel 925.1 MHz

POWERLINE CONDUCTED EMISSIONS



| | | | |
|-------------------|--------------------------|--------------------|-------------|
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L | Work Order: | MLTI0180 |
| Serial Number: | 0205123980-0008 | Date: | 2021-02-11 |
| Customer: | Multi-Tech Systems, Inc. | Temperature: | 22°C |
| Attendees: | Jim Asp | Relative Humidity: | 12.8% |
| Customer Project: | None | Bar. Pressure: | 1039.2 mb |
| Tested By: | Andrew Rogstad | Job Site: | MN03 |
| Power: | 54VDC via PoE | Configuration: | MLTI0180-17 |

TEST SPECIFICATIONS

| | |
|-----------------|------------------|
| Specification: | Method: |
| FCC 15.207:2021 | ANSI C63.10:2013 |

TEST PARAMETERS

| | | | | | |
|--------|----|-------|---------|-----------------------------|---|
| Run #: | 27 | Line: | Neutral | Add. Ext. Attenuation (dB): | 0 |
|--------|----|-------|---------|-----------------------------|---|

COMMENTS

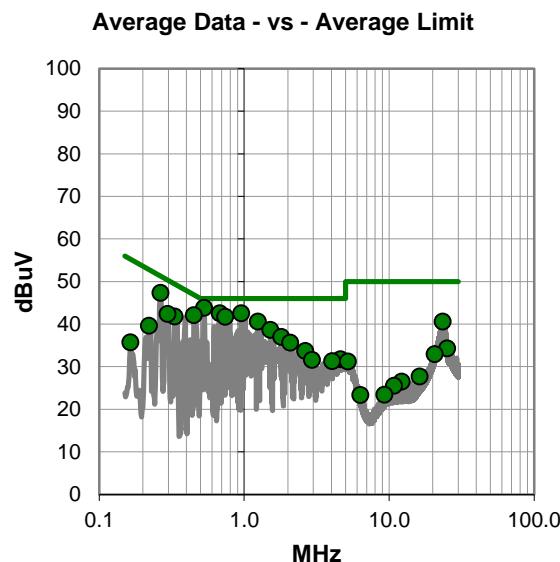
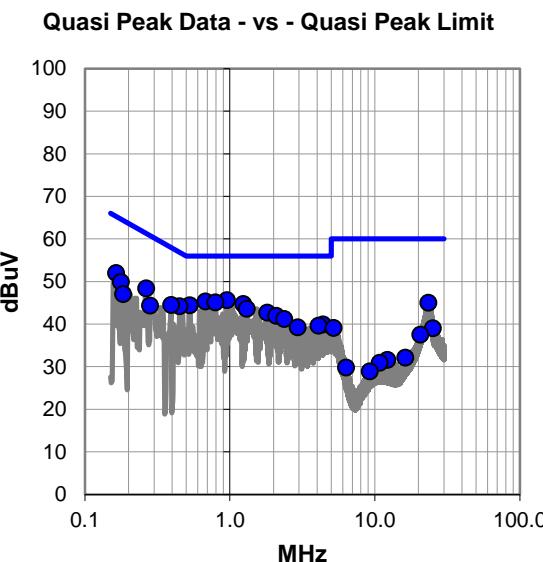
54VDC provided by power over Ethernet adapter supplied with 120VAC/60Hz.

EUT OPERATING MODES

LoRa Transmitting: Mid Channel 925.1 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #27

Quasi Peak Data - vs - Quasi Peak Limit

| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
|------------|-------------|-------------|-----------------|--------------------|-------------|
| 0.957 | 25.1 | 20.5 | 45.6 | 56.0 | -10.4 |
| 0.678 | 24.8 | 20.5 | 45.3 | 56.0 | -10.7 |
| 0.795 | 24.6 | 20.5 | 45.1 | 56.0 | -10.9 |
| 1.241 | 24.2 | 20.5 | 44.7 | 56.0 | -11.3 |
| 0.530 | 23.9 | 20.5 | 44.4 | 56.0 | -11.6 |
| 1.312 | 23.1 | 20.5 | 43.6 | 56.0 | -12.4 |
| 0.450 | 23.7 | 20.5 | 44.2 | 56.9 | -12.7 |
| 0.265 | 27.7 | 20.7 | 48.4 | 61.3 | -12.9 |
| 0.165 | 31.1 | 20.9 | 52.0 | 65.2 | -13.2 |
| 1.812 | 22.1 | 20.6 | 42.7 | 56.0 | -13.3 |
| 0.394 | 24.0 | 20.5 | 44.5 | 58.0 | -13.5 |
| 2.096 | 21.3 | 20.6 | 41.9 | 56.0 | -14.1 |
| 0.177 | 29.1 | 20.8 | 49.9 | 64.6 | -14.7 |
| 2.374 | 20.6 | 20.6 | 41.2 | 56.0 | -14.8 |
| 23.481 | 23.7 | 21.3 | 45.0 | 60.0 | -15.0 |
| 4.391 | 19.2 | 20.7 | 39.9 | 56.0 | -16.1 |
| 4.084 | 18.9 | 20.7 | 39.6 | 56.0 | -16.4 |
| 0.281 | 23.8 | 20.5 | 44.3 | 60.8 | -16.5 |
| 2.935 | 18.6 | 20.6 | 39.2 | 56.0 | -16.8 |
| 0.183 | 26.3 | 20.7 | 47.0 | 64.3 | -17.3 |
| 5.204 | 18.4 | 20.7 | 39.1 | 60.0 | -20.9 |
| 25.154 | 17.7 | 21.3 | 39.0 | 60.0 | -21.0 |
| 20.598 | 16.3 | 21.2 | 37.5 | 60.0 | -22.5 |
| 16.226 | 11.0 | 21.1 | 32.1 | 60.0 | -27.9 |
| 12.196 | 10.6 | 21.0 | 31.6 | 60.0 | -28.4 |

Average Data - vs - Average Limit

| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
|------------|-------------|-------------|-----------------|--------------------|-------------|
| 0.530 | 23.3 | 20.5 | 43.8 | 46.0 | -2.2 |
| 0.678 | 22.0 | 20.5 | 42.5 | 46.0 | -3.5 |
| 0.957 | 22.0 | 20.5 | 42.5 | 46.0 | -3.5 |
| 0.265 | 26.6 | 20.7 | 47.3 | 51.3 | -4.0 |
| 0.740 | 21.2 | 20.5 | 41.7 | 46.0 | -4.3 |
| 0.450 | 21.6 | 20.5 | 42.1 | 46.9 | -4.8 |
| 1.243 | 20.1 | 20.5 | 40.6 | 46.0 | -5.4 |
| 1.520 | 18.1 | 20.5 | 38.6 | 46.0 | -7.4 |
| 0.331 | 21.3 | 20.5 | 41.8 | 49.4 | -7.6 |
| 0.296 | 21.9 | 20.5 | 42.4 | 50.4 | -8.0 |
| 1.808 | 16.4 | 20.6 | 37.0 | 46.0 | -9.0 |
| 23.481 | 19.3 | 21.3 | 40.6 | 50.0 | -9.4 |
| 2.084 | 15.0 | 20.6 | 35.6 | 46.0 | -10.4 |
| 2.647 | 13.1 | 20.6 | 33.7 | 46.0 | -12.3 |
| 0.221 | 18.9 | 20.7 | 39.6 | 52.8 | -13.2 |
| 4.620 | 11.0 | 20.7 | 31.7 | 46.0 | -14.3 |
| 2.937 | 11.0 | 20.6 | 31.6 | 46.0 | -14.4 |
| 4.057 | 10.6 | 20.7 | 31.3 | 46.0 | -14.7 |
| 25.154 | 13.0 | 21.3 | 34.3 | 50.0 | -15.7 |
| 20.644 | 11.7 | 21.2 | 32.9 | 50.0 | -17.1 |
| 5.204 | 10.5 | 20.7 | 31.2 | 50.0 | -18.8 |
| 0.165 | 14.8 | 20.9 | 35.7 | 55.2 | -19.5 |
| 16.226 | 6.6 | 21.1 | 27.7 | 50.0 | -22.3 |
| 12.198 | 5.5 | 21.0 | 26.5 | 50.0 | -23.5 |
| 10.795 | 4.6 | 20.9 | 25.5 | 50.0 | -24.5 |

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



| | | | |
|-------------------|--------------------------|--------------------|-------------|
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L | Work Order: | MLTI0180 |
| Serial Number: | 0205123980-0008 | Date: | 2021-02-11 |
| Customer: | Multi-Tech Systems, Inc. | Temperature: | 22°C |
| Attendees: | Jim Asp | Relative Humidity: | 12.8% |
| Customer Project: | None | Bar. Pressure: | 1039.2 mb |
| Tested By: | Andrew Rogstad | Job Site: | MN03 |
| Power: | 54VDC via PoE | Configuration: | MLTI0180-17 |

TEST SPECIFICATIONS

| | |
|-----------------|------------------|
| Specification: | Method: |
| FCC 15.207:2021 | ANSI C63.10:2013 |

TEST PARAMETERS

| | | | | | |
|--------|----|-------|-----------|-----------------------------|---|
| Run #: | 28 | Line: | High Line | Add. Ext. Attenuation (dB): | 0 |
|--------|----|-------|-----------|-----------------------------|---|

COMMENTS

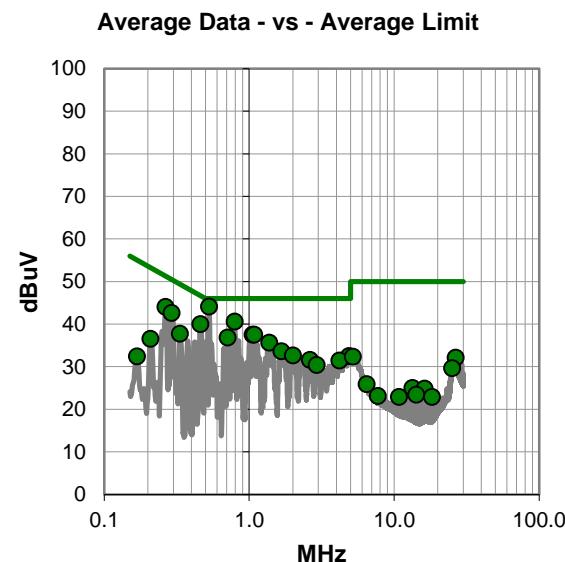
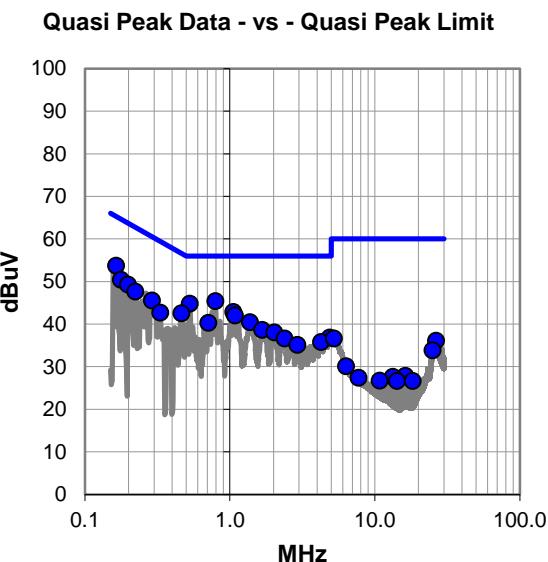
54VDC provided by power over Ethernet adapter supplied with 120VAC/60Hz.

EUT OPERATING MODES

LoRa Transmitting: Mid Channel 925.1 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #28

Quasi Peak Data - vs - Quasi Peak Limit

| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
|------------|-------------|-------------|-----------------|--------------------|-------------|
| 0.795 | 24.9 | 20.5 | 45.4 | 56.0 | -10.6 |
| 0.530 | 24.3 | 20.5 | 44.8 | 56.0 | -11.2 |
| 0.165 | 32.8 | 20.9 | 53.7 | 65.2 | -11.5 |
| 1.059 | 22.3 | 20.5 | 42.8 | 56.0 | -13.2 |
| 1.087 | 21.5 | 20.5 | 42.0 | 56.0 | -14.0 |
| 0.465 | 22.0 | 20.5 | 42.5 | 56.6 | -14.1 |
| 0.177 | 29.6 | 20.8 | 50.4 | 64.6 | -14.2 |
| 0.198 | 28.6 | 20.7 | 49.3 | 63.7 | -14.4 |
| 0.290 | 25.0 | 20.5 | 45.5 | 60.5 | -15.0 |
| 0.223 | 26.9 | 20.7 | 47.6 | 62.7 | -15.1 |
| 1.381 | 19.9 | 20.5 | 40.4 | 56.0 | -15.6 |
| 0.711 | 19.8 | 20.5 | 40.3 | 56.0 | -15.7 |
| 0.331 | 22.2 | 20.5 | 42.7 | 59.4 | -16.7 |
| 1.671 | 18.1 | 20.5 | 38.6 | 56.0 | -17.4 |
| 2.032 | 17.4 | 20.6 | 38.0 | 56.0 | -18.0 |
| 4.893 | 16.1 | 20.7 | 36.8 | 56.0 | -19.2 |
| 2.384 | 16.0 | 20.6 | 36.6 | 56.0 | -19.4 |
| 4.266 | 15.1 | 20.7 | 35.8 | 56.0 | -20.2 |
| 2.922 | 14.5 | 20.6 | 35.1 | 56.0 | -20.9 |
| 5.231 | 15.9 | 20.7 | 36.6 | 60.0 | -23.4 |
| 26.487 | 14.8 | 21.3 | 36.1 | 60.0 | -23.9 |
| 25.112 | 12.5 | 21.3 | 33.8 | 60.0 | -26.2 |
| 6.335 | 9.4 | 20.7 | 30.1 | 60.0 | -29.9 |
| 16.228 | 6.7 | 21.1 | 27.8 | 60.0 | -32.2 |
| 13.358 | 6.6 | 21.0 | 27.6 | 60.0 | -32.4 |

Average Data - vs - Average Limit

| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
|------------|-------------|-------------|-----------------|--------------------|-------------|
| 0.530 | 23.6 | 20.5 | 44.1 | 46.0 | -1.9 |
| 0.795 | 20.1 | 20.5 | 40.6 | 46.0 | -5.4 |
| 0.461 | 19.5 | 20.5 | 40.0 | 46.7 | -6.7 |
| 0.265 | 23.3 | 20.7 | 44.0 | 51.3 | -7.3 |
| 0.292 | 22.1 | 20.5 | 42.6 | 50.5 | -7.9 |
| 1.057 | 17.0 | 20.5 | 37.5 | 46.0 | -8.5 |
| 1.087 | 17.0 | 20.5 | 37.5 | 46.0 | -8.5 |
| 0.711 | 16.3 | 20.5 | 36.8 | 46.0 | -9.2 |
| 1.379 | 15.1 | 20.5 | 35.6 | 46.0 | -10.4 |
| 0.334 | 17.2 | 20.5 | 37.7 | 49.4 | -11.7 |
| 1.671 | 13.1 | 20.5 | 33.6 | 46.0 | -12.4 |
| 2.004 | 12.0 | 20.6 | 32.6 | 46.0 | -13.4 |
| 4.896 | 11.8 | 20.7 | 32.5 | 46.0 | -13.5 |
| 2.632 | 11.0 | 20.6 | 31.6 | 46.0 | -14.4 |
| 4.190 | 10.7 | 20.7 | 31.4 | 46.0 | -14.6 |
| 2.926 | 9.8 | 20.6 | 30.4 | 46.0 | -15.6 |
| 0.208 | 15.8 | 20.7 | 36.5 | 53.3 | -16.8 |
| 5.202 | 11.6 | 20.7 | 32.3 | 50.0 | -17.7 |
| 26.608 | 10.8 | 21.3 | 32.1 | 50.0 | -17.9 |
| 25.144 | 8.3 | 21.3 | 29.6 | 50.0 | -20.4 |
| 0.169 | 11.6 | 20.8 | 32.4 | 55.0 | -22.6 |
| 6.456 | 5.2 | 20.7 | 25.9 | 50.0 | -24.1 |
| 13.419 | 4.0 | 21.0 | 25.0 | 50.0 | -25.0 |
| 16.228 | 3.7 | 21.1 | 24.8 | 50.0 | -25.2 |
| 14.274 | 2.4 | 21.0 | 23.4 | 50.0 | -26.6 |

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2020.06.24.2

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

Lora Radio: Transmitting High Ch 927.5 MHz, Mid Ch 925.1 MHz, Low Ch 923.3 MHz

POWER SETTINGS INVESTIGATED

54VDC via PoE

CONFIGURATIONS INVESTIGATED

MLTI0180 - 14

FREQUENCY RANGE INVESTIGATED

| | | | |
|-----------------|--------|----------------|-----------|
| Start Frequency | 30 MHz | Stop Frequency | 12400 MHz |
|-----------------|--------|----------------|-----------|

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Interval |
|------------------------------|--------------------|--------------------------------|-----|------------|----------|
| Analyzer - Spectrum Analyzer | Keysight | N9010A (EXA) | AFQ | 2020-12-27 | 12 mo |
| Filter - Low Pass | Micro-Tronics | LPM50004 | LFK | 2020-09-24 | 12 mo |
| Filter - Low Pass | Micro-Tronics | LPM50003 | LFJ | 2020-09-24 | 12 mo |
| Filter - Band Pass/Notch | K&L Microwave | 3TNF-500/1000-N/N | HGS | 2020-06-30 | 12 mo |
| Attenuator | Fairview Microwave | SA18E-10 | TYA | 2020-09-14 | 12 mo |
| Attenuator | Fairview Microwave | SA18E-20 | TWZ | 2020-09-14 | 12 mo |
| Amplifier - Pre-Amplifier | Miteq | AMF-6F-08001200-30-10P | AVV | 2020-01-17 | 12 mo |
| Cable | ESM Cable Corp. | Standard Gain Horn Cables | MNJ | 2020-03-10 | 12 mo |
| Antenna - Standard Gain | ETS Lindgren | 3160-07 | AXP | NCR | 0 mo |
| Amplifier - Pre-Amplifier | Miteq | AMF-3D-00100800-32-13P | AVT | 2020-01-17 | 12 mo |
| Cable | ESM Cable Corp. | Double Ridge Guide Horn Cables | MNI | 2020-09-14 | 12 mo |
| Antenna - Double Ridge | ETS-Lindgren | 3115 | AJQ | 2019-01-16 | 24 mo |
| Amplifier - Pre-Amplifier | Miteq | AM-1616-1000 | AVO | 2020-10-06 | 12 mo |
| Cable | ESM Cable Corp. | Bilog Cables | MNH | 2020-10-06 | 12 mo |
| Antenna - Biconilog | ETS Lindgren | 3142D | AXO | 2019-09-03 | 24 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 within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3. This procedure uses the channel power feature of the spectrum analyzer to integrate the power of the emission within a 1 MHz bandwidth.

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

SPURIOUS RADIATED EMISSIONS



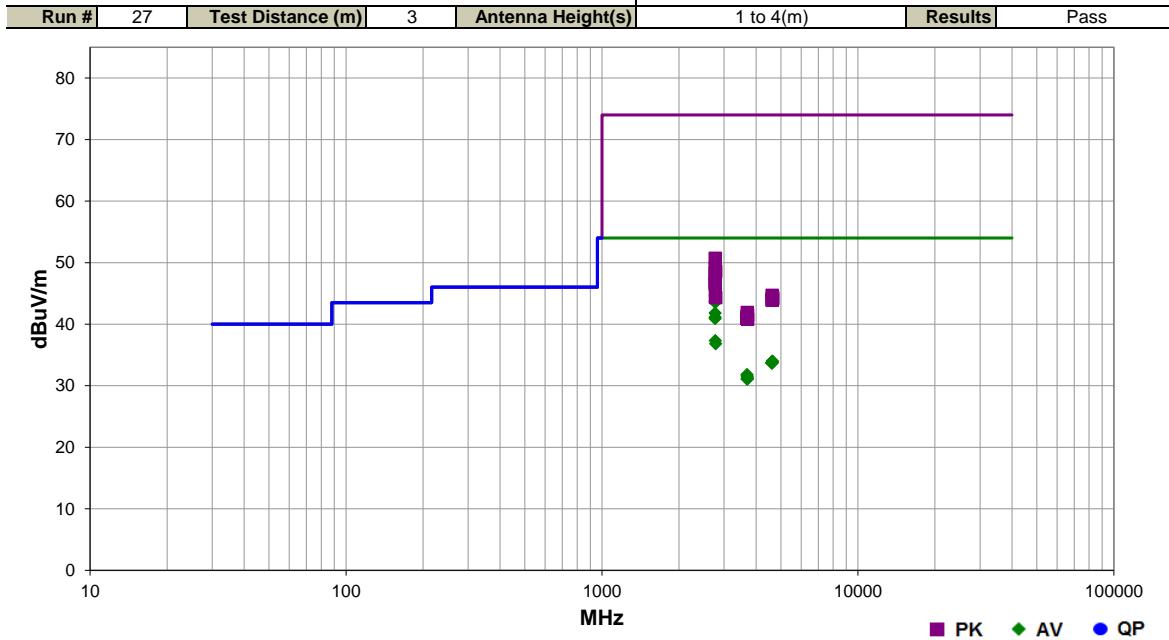
| | | | | | | |
|-----------------|--|-------------------|------------|-----------|-------------------|-----------------------|
| Work Order: | MLTI0180 | Date: | 2021-01-08 | Signature | EmR5 2020.12.09.0 | PSA-ESCI 2020.06.24.2 |
| Project: | None | Temperature: | 22.4 °C | | Chris Patterson | |
| Job Site: | MN05 | Humidity: | 23.3% RH | | | |
| Serial Number: | 0205123980-0008 | Barometric Pres.: | 1031 mbar | | | |
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L | | | | | |
| Configuration: | 14 | | | | | |
| Customer: | Multi-Tech Systems, Inc. | | | | | |
| Attendees: | Jim Asp | | | | | |
| EUT Power: | 54VDC via PoE | | | | | |
| Operating Mode: | Lora Radio: Transmitting High Ch 927.5 MHz, Mid Ch 925.1 MHz, Low Ch 923.3 MHz | | | | | |
| Deviations: | None | | | | | |
| Comments: | EUT position listed in comments. Bandwidth was set to 500 kHz. | | | | | |

Test Specifications

FCC 15.247:2021

Test Method

ANSI C63.10:2013



| Freq (MHz) | Amplitude (dBuV) | Factor | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limi (dBuV/m) | Compared to Spec. (dB) | Comments |
|------------|------------------|--------|-------------------------|-------------------|------------------------|---------------------------|--------------------------|----------|--------------------------|-------------------|---------------------|------------------------|---------------------|
| 2769.942 | 51.5 | -4.3 | 3.6 | 227.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 47.2 | 54.0 | -6.8 | EUT Horz, Low Ch |
| 2769.817 | 49.0 | -4.3 | 1.1 | 353.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 44.7 | 54.0 | -9.3 | EUT Vert, Low Ch |
| 2769.900 | 48.0 | -4.3 | 1.5 | 253.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 43.7 | 54.0 | -10.3 | EUT On Side, Low Ch |
| 2782.500 | 47.9 | -4.2 | 2.6 | 351.9 | 3.0 | 0.0 | Horz | AV | 0.0 | 43.7 | 54.0 | -10.3 | EUT Vert, High Ch |
| 2775.383 | 47.7 | -4.2 | 1.1 | 358.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 43.5 | 54.0 | -10.5 | EUT Vert, Mid Ch |
| 2769.858 | 46.1 | -4.3 | 1.6 | 55.9 | 3.0 | 0.0 | Vert | AV | 0.0 | 41.8 | 54.0 | -12.2 | EUT Vert, Low Ch |
| 2769.817 | 45.4 | -4.3 | 1.5 | 296.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 41.1 | 54.0 | -12.9 | EUT On Side, Low Ch |
| 2770.025 | 45.2 | -4.3 | 1.5 | 171.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 40.9 | 54.0 | -13.1 | EUT Horz, Low Ch |
| 2775.342 | 41.5 | -4.2 | 1.5 | 254.9 | 3.0 | 0.0 | Vert | AV | 0.0 | 37.3 | 54.0 | -16.7 | EUT Horz, Mid Ch |
| 2782.417 | 41.0 | -4.2 | 1.4 | 58.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 36.8 | 54.0 | -17.2 | EUT Horz, High Ch |
| 4637.292 | 30.9 | 3.1 | 2.5 | 185.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 34.0 | 54.0 | -20.0 | EUT Vert, High Ch |
| 4638.792 | 30.8 | 3.1 | 1.5 | 168.9 | 3.0 | 0.0 | Vert | AV | 0.0 | 33.9 | 54.0 | -20.1 | EUT Horz, High Ch |
| 4611.917 | 30.8 | 2.9 | 1.5 | 181.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 33.7 | 54.0 | -20.3 | EUT Horz, Low Ch |
| 4614.042 | 30.8 | 2.9 | 1.5 | 222.9 | 3.0 | 0.0 | Horz | AV | 0.0 | 33.7 | 54.0 | -20.3 | EUT Vert, Low Ch |
| 4613.458 | 30.8 | 2.9 | 1.5 | 318.9 | 3.0 | 0.0 | Horz | AV | 0.0 | 33.7 | 54.0 | -20.3 | EUT Vert, Mid Ch |
| 4625.542 | 30.7 | 3.0 | 1.5 | 185.9 | 3.0 | 0.0 | Vert | AV | 0.0 | 33.7 | 54.0 | -20.3 | EUT Horz, Mid Ch |
| 3693.158 | 32.2 | -0.4 | 1.9 | 228.9 | 3.0 | 0.0 | Horz | AV | 0.0 | 31.8 | 54.0 | -22.2 | EUT Vert, Low Ch |
| 3693.200 | 32.0 | -0.4 | 1.5 | 196.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 31.6 | 54.0 | -22.4 | EUT Horz, Low Ch |
| 3700.108 | 31.8 | -0.4 | 1.5 | 227.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 31.4 | 54.0 | -22.6 | EUT Vert, Mid Ch |
| 3695.983 | 31.5 | -0.4 | 1.5 | 62.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 31.1 | 54.0 | -22.9 | EUT Horz, Mid Ch |
| 3698.167 | 31.5 | -0.4 | 3.1 | 42.9 | 3.0 | 0.0 | Vert | AV | 0.0 | 31.1 | 54.0 | -22.9 | EUT Horz, High Ch |
| 3697.583 | 31.5 | -0.4 | 1.5 | 181.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 31.1 | 54.0 | -22.9 | EUT Vert, High Ch |
| 2769.942 | 55.0 | -4.3 | 3.6 | 227.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 50.7 | 74.0 | -23.3 | EUT Horz, Low Ch |

| 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 |
|------------|------------------|-------------|-------------------------|-------------------|------------------------|---------------------------|---------------------------|----------|--------------------------|-------------------|----------------------|------------------------|---------------------|
| 2769.608 | 53.4 | -4.3 | 1.1 | 353.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 49.1 | 74.0 | -24.9 | EUT Vert, Low Ch |
| 2782.167 | 52.8 | -4.2 | 2.6 | 351.9 | 3.0 | 0.0 | Horz | PK | 0.0 | 48.6 | 74.0 | -25.4 | EUT Vert, High Ch |
| 2770.192 | 52.7 | -4.3 | 1.5 | 253.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 48.4 | 74.0 | -25.6 | EUT On Side, Low Ch |
| 2774.925 | 52.4 | -4.2 | 1.1 | 358.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 48.2 | 74.0 | -25.8 | EUT Vert, Mid Ch |
| 2769.692 | 51.3 | -4.3 | 1.6 | 55.9 | 3.0 | 0.0 | Vert | PK | 0.0 | 47.0 | 74.0 | -27.0 | EUT Vert, Low Ch |
| 2769.983 | 50.8 | -4.3 | 1.5 | 296.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 46.5 | 74.0 | -27.5 | EUT On Side, Low Ch |
| 2769.692 | 50.8 | -4.3 | 1.5 | 171.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 46.5 | 74.0 | -27.5 | EUT Horz, Low Ch |
| 4622.708 | 41.7 | 3.0 | 1.5 | 318.9 | 3.0 | 0.0 | Horz | PK | 0.0 | 44.7 | 74.0 | -29.3 | EUT Vert, Mid Ch |
| 2775.175 | 48.6 | -4.2 | 1.5 | 254.9 | 3.0 | 0.0 | Vert | PK | 0.0 | 44.4 | 74.0 | -29.6 | EUT Horz, Mid Ch |
| 4639.917 | 41.3 | 3.1 | 1.5 | 168.9 | 3.0 | 0.0 | Vert | PK | 0.0 | 44.4 | 74.0 | -29.6 | EUT Horz, High Ch |
| 2782.208 | 48.5 | -4.2 | 1.4 | 58.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 44.3 | 74.0 | -29.7 | EUT Horz, High Ch |
| 4627.167 | 41.2 | 3.0 | 1.5 | 181.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 44.2 | 74.0 | -29.8 | EUT Horz, Low Ch |
| 4649.417 | 41.0 | 3.1 | 2.5 | 185.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 44.1 | 74.0 | -29.9 | EUT Vert, High Ch |
| 4617.250 | 41.1 | 2.9 | 1.5 | 185.9 | 3.0 | 0.0 | Vert | PK | 0.0 | 44.0 | 74.0 | -30.0 | EUT Horz, Mid Ch |
| 4623.000 | 40.9 | 3.0 | 1.5 | 222.9 | 3.0 | 0.0 | Horz | PK | 0.0 | 43.9 | 74.0 | -30.1 | EUT Vert, Low Ch |
| 3695.358 | 42.3 | -0.4 | 1.5 | 227.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 41.9 | 74.0 | -32.1 | EUT Vert, Mid Ch |
| 3709.292 | 41.9 | -0.4 | 1.5 | 181.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 41.5 | 74.0 | -32.5 | EUT Vert, High Ch |
| 3693.742 | 41.7 | -0.4 | 1.9 | 228.9 | 3.0 | 0.0 | Horz | PK | 0.0 | 41.3 | 74.0 | -32.7 | EUT Vert, Low Ch |
| 3688.483 | 41.8 | -0.5 | 1.5 | 62.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 41.3 | 74.0 | -32.7 | EUT Horz, Mid Ch |
| 3684.242 | 41.6 | -0.6 | 1.5 | 196.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 41.0 | 74.0 | -33.0 | EUT Horz, Low Ch |
| 3706.167 | 41.2 | -0.4 | 3.1 | 42.9 | 3.0 | 0.0 | Vert | PK | 0.0 | 40.8 | 74.0 | -33.2 | EUT Horz, High Ch |



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.

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 2020.03.25.0

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Generator - Signal | Keysight | N5182B | TFX | 28-Apr-20 | 28-Apr-23 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 14-Sep-20 | 14-Sep-21 |
| Attenuator | Fairview Microwave | SA18S5W-20 | RFX | 3-Jun-20 | 3-Jun-21 |
| Attenuator | INMET | 64671 6A-10dB | AUI | 5-Aug-20 | 5-Aug-21 |
| Block - DC | Fairview Microwave | SD3379 | AMZ | 4-Nov-20 | 4-Nov-21 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 14-Apr-20 | 14-Apr-21 |

TEST DESCRIPTION

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

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

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

OUTPUT POWER



TbTx 2019.08.30.0 XMII 2020.03.25.0

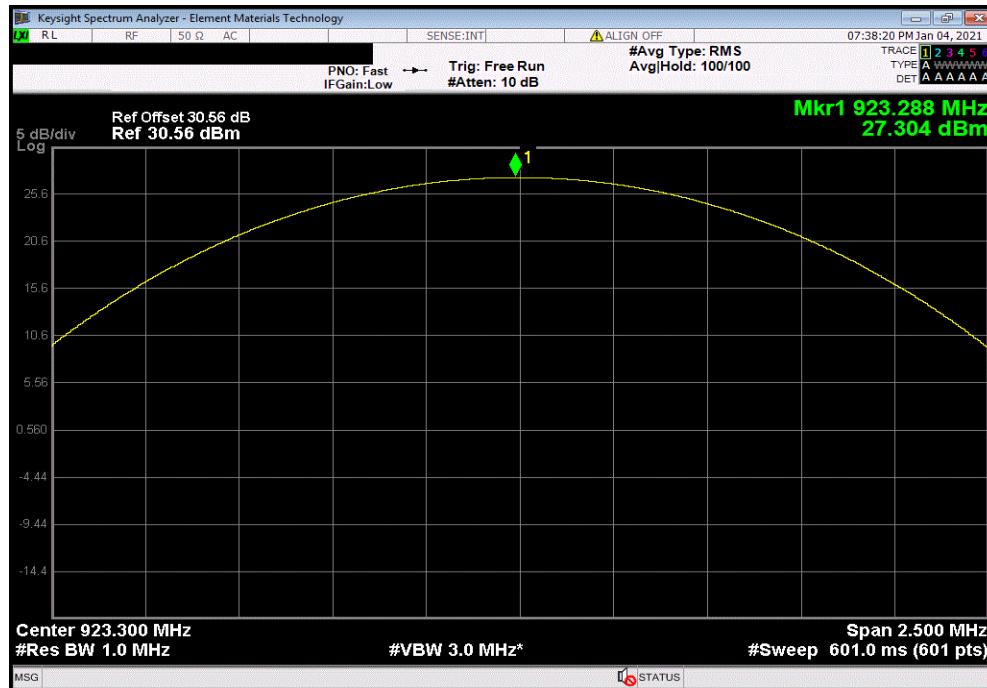
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L | | Work Order: | MLTI0180 | |
|--|--------------------------|------------------|--------------------|------------------------|---------------|
| Serial Number: | 0205123980-0008 | | Date: | 4-Jan-21 | |
| Customer: | Multi-Tech Systems, Inc. | | Temperature: | 22.3 °C | |
| Attendees: | Jim Asp, Brent Nielsen | | Humidity: | 26.9% RH | |
| Project: | None | | Barometric Pres.: | 1013 mbar | |
| Tested by: | Dustin Sparks | Power: | 54VDC via PoE | Job Site: | MN08 |
| TEST SPECIFICATIONS | | Test Method | | | |
| FCC 15.247:2021 | | ANSI C63.10:2013 | | | |
| COMMENTS | | | | | |
| Power over Ethernet (PoE) adapter powered with 120VAC/60Hz. Reference level offset includes measurement cable, attenuator, and DC block. | | | | | |
| DEVIATIONS FROM TEST STANDARD | | | | | |
| None | | | | | |
| Configuration # | 11 | Signature | | | |
| | | | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Out Pwr (dBm) |
| 915 MHz LoRa | | | 27.304 | 0 | 27.3 |
| | | | 27.039 | 0 | 27 |
| | | | 26.353 | 0 | 26.4 |
| | | | | | 30 |
| | | | | | Pass |
| | | | | | 30 |
| | | | | | Pass |
| | | | | | 30 |
| | | | | | Pass |

OUTPUT POWER

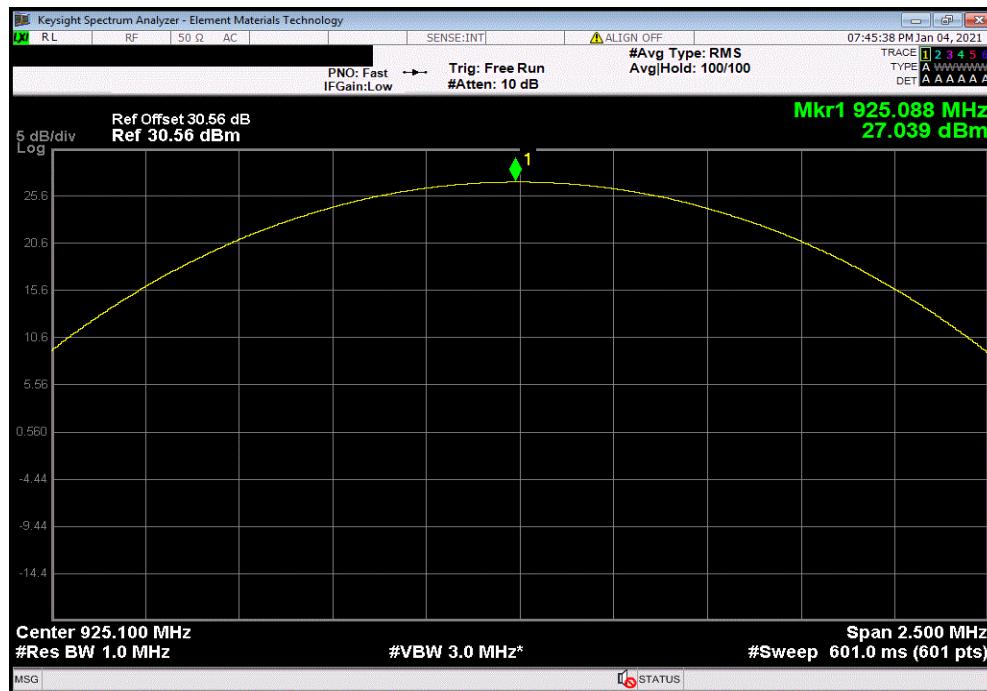


TbtTx 2019.08.30.0 XMit 2020.03.25.0

| 915 MHz LoRa, Low Channel (923.3 MHz) | | | | | |
|---------------------------------------|------------------------|---------------|-------------|--------|--|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Out Pwr (dBm) | Limit (dBm) | Result | |
| 27.304 | 0 | 27.3 | 30 | Pass | |



| 915 MHz LoRa, Mid Channel (925.1 MHz) | | | | | |
|---------------------------------------|------------------------|---------------|-------------|--------|--|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Out Pwr (dBm) | Limit (dBm) | Result | |
| 27.039 | 0 | 27 | 30 | Pass | |

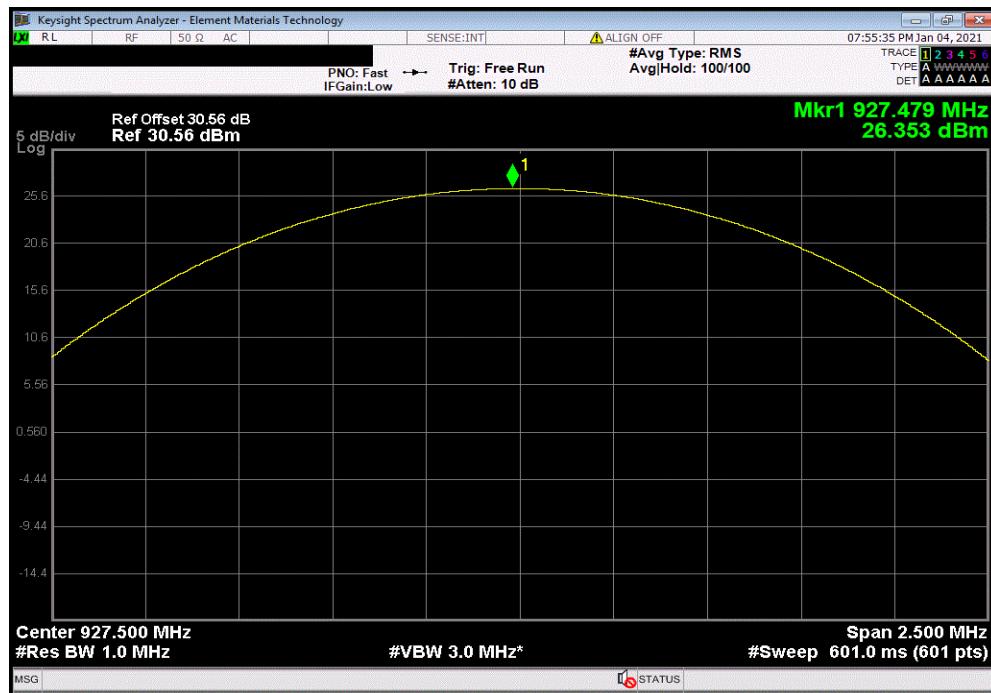


OUTPUT POWER



TbtTx 2019.08.30.0 XMit 2020.03.25.0

| 915 MHz LoRa, High Channel (927.5 MHz) | | | | | |
|--|------------------------|---------------|-------------|--------|--|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Out Pwr (dBm) | Limit (dBm) | Result | |
| 26.353 | 0 | 26.4 | 30 | Pass | |



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



XMit 2020.03.25.0

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Generator - Signal | Keysight | N5182B | TFX | 28-Apr-20 | 28-Apr-23 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 14-Sep-20 | 14-Sep-21 |
| Attenuator | Fairview Microwave | SA18S5W-20 | RFX | 3-Jun-20 | 3-Jun-21 |
| Attenuator | INMET | 64671 6A-10dB | AUI | 5-Aug-20 | 5-Aug-21 |
| Block - DC | Fairview Microwave | SD3379 | AMZ | 4-Nov-20 | 4-Nov-21 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 14-Apr-20 | 14-Apr-21 |

TEST DESCRIPTION

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

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

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

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

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TbTx 2019.08.30.0 XMII 2020.03.25.0

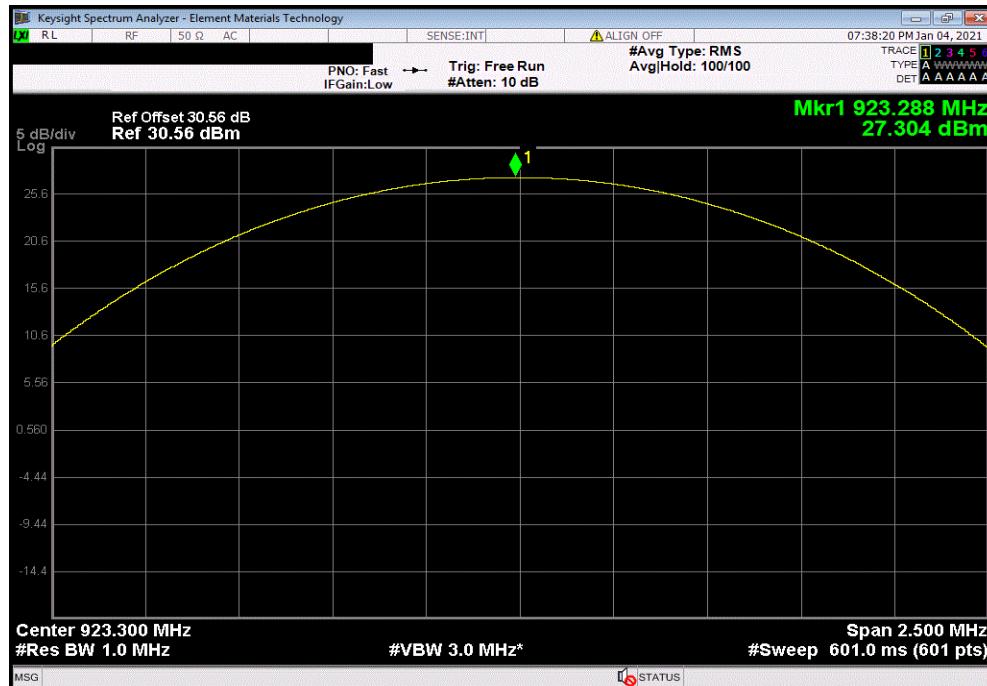
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L | | Work Order: | MLTI0180 | | | | |
|--|--------------------------|----------------------|--------------------|------------------------|---------------|--------------------|------------|--------|
| Serial Number: | 0205123980-0008 | | Date: | 4-Jan-21 | | | | |
| Customer: | Multi-Tech Systems, Inc. | | Temperature: | 22.3 °C | | | | |
| Attendees: | Jim Asp, Brent Nielsen | | Humidity: | 26.8% RH | | | | |
| Project: | None | | Barometric Pres.: | 1013 mbar | | | | |
| Tested by: | Dustin Sparks | Power: | 54VDC via PoE | | | | | |
| TEST SPECIFICATIONS | | Test Method | | | | | | |
| FCC 15.247:2021 | | ANSI C63.10:2013 | | | | | | |
| COMMENTS | | | | | | | | |
| Power over Ethernet (PoE) adapter powered with 120VAC/60Hz. Reference level offset includes measurement cable, attenuator, and DC block. | | | | | | | | |
| DEVIATIONS FROM TEST STANDARD | | | | | | | | |
| None | | | | | | | | |
| Configuration # | 11 | Signature | | | | EIRP | EIRP Limit | Result |
| 915 MHz LoRa | | <i>Dustin Sparks</i> | Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Out Pwr (dBm) | Antenna Gain (dBi) | (dBm) | (dBm) |
| Low Channel (923.3 MHz) | | 27.304 | 0 | 27.3 | 6 | 33.3 | 36 | Pass |
| Mid Channel (925.1 MHz) | | 27.039 | 0 | 27 | 6 | 33 | 36 | Pass |
| High Channel (927.5 MHz) | | 26.353 | 0 | 26.4 | 6 | 32.4 | 36 | Pass |

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TbtTx 2019.08.30.0 XMit 2020.03.25.0

| 915 MHz LoRa, Low Channel (923.3 MHz) | | | | | | |
|---------------------------------------|------------------------|---------------|--------------------|------------|------------------|--------|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Out Pwr (dBm) | Antenna Gain (dBi) | EIRP (dBm) | EIRP Limit (dBm) | Result |
| 27.304 | 0 | 27.3 | 6 | 33.3 | 36 | Pass |

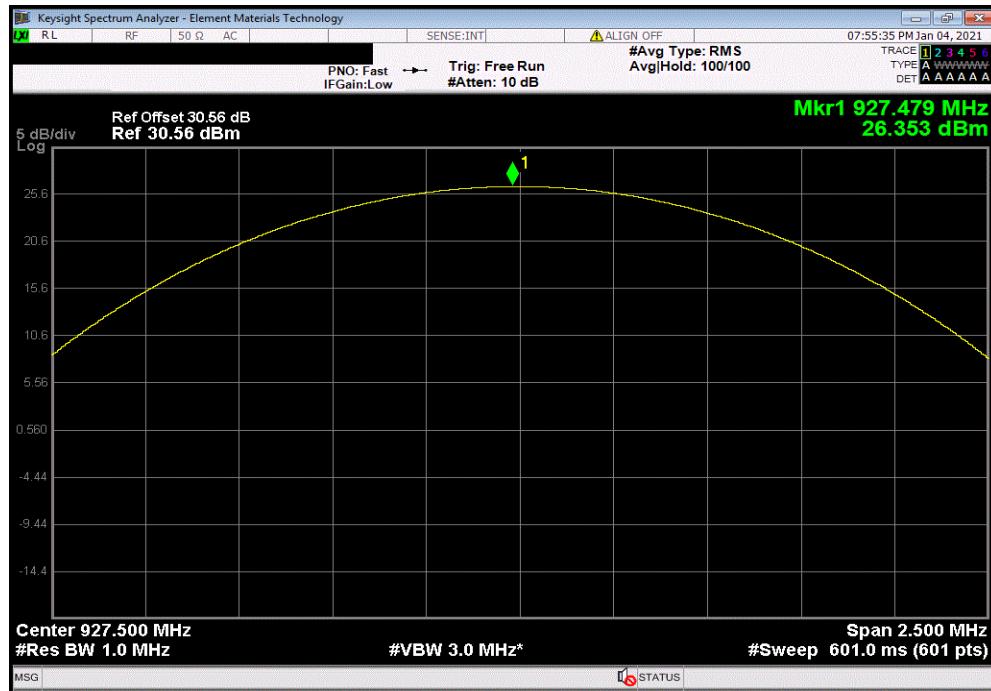


EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TbtTx 2019.08.30.0 XMit 2020.03.25.0

| 915 MHz LoRa, High Channel (927.5 MHz) | | | | | | |
|--|------------------------|---------------|--------------------|------------|------------------|--------|
| Avg Cond Pwr (dBm) | Duty Cycle Factor (dB) | Out Pwr (dBm) | Antenna Gain (dBi) | EIRP (dBm) | EIRP Limit (dBm) | Result |
| 26.353 | 0 | 26.4 | 6 | 32.4 | 36 | Pass |



BAND EDGE COMPLIANCE



XMit 2020.03.25.0

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Generator - Signal | Keysight | N5182B | TFX | 28-Apr-20 | 28-Apr-23 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 14-Sep-20 | 14-Sep-21 |
| Attenuator | Fairview Microwave | SA18S5W-20 | RFX | 3-Jun-20 | 3-Jun-21 |
| Attenuator | INMET | 64671 6A-10dB | AUI | 5-Aug-20 | 5-Aug-21 |
| Block - DC | Fairview Microwave | SD3379 | AMZ | 4-Nov-20 | 4-Nov-21 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 14-Apr-20 | 14-Apr-21 |

TEST DESCRIPTION

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.

An RMS detector was used to match the method called out for Output Power. Because the reference level was taken with an RMS detector, the attenuation requirement is -30 dBc.

BAND EDGE COMPLIANCE



TbTx 2019.08.30.0 XMII 2020.03.25.0

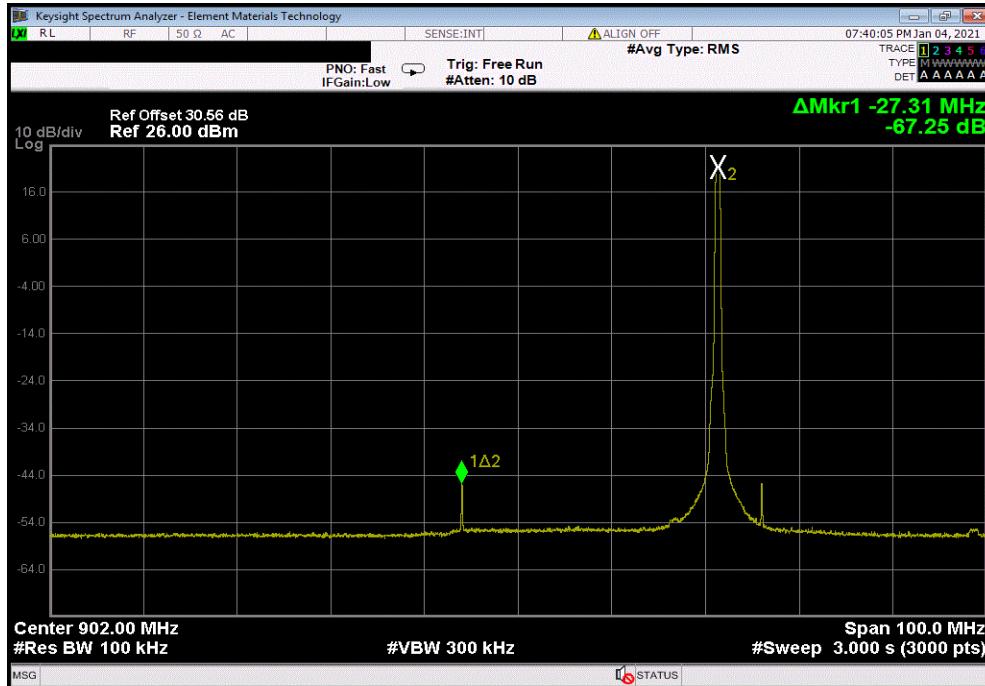
| | | | | | |
|--|--------------------------|------------------|-------------------|---------------|--------|
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L | | Work Order: | MLTI0180 | |
| Serial Number: | 0205123980-0008 | | Date: | 4-Jan-21 | |
| Customer: | Multi-Tech Systems, Inc. | | Temperature: | 22.3 °C | |
| Attendees: | Jim Asp, Brent Nielsen | | Humidity: | 26.7% RH | |
| Project: | None | | Barometric Pres.: | 1013 mbar | |
| Tested by: | Dustin Sparks | Power: | 54VDC via PoE | Job Site: | MN08 |
| TEST SPECIFICATIONS | | Test Method | | | |
| FCC 15.247:2021 | | ANSI C63.10:2013 | | | |
| COMMENTS | | | | | |
| Power over Ethernet (PoE) adapter powered with 120VAC/60Hz. Reference level offset includes measurement cable, attenuator, and DC block. | | | | | |
| DEVIATIONS FROM TEST STANDARD | | | | | |
| None | | | | | |
| Configuration # | 11 | Signature | | | |
| | | | Value (dBc) | Limit ≤ (dBc) | Result |
| 915 MHz LoRa | | | -67.26 | -30 | Pass |
| Low Channel (923.3 MHz) | | | -46.93 | -30 | Pass |
| High Channel (927.5 MHz) | | | | | |

BAND EDGE COMPLIANCE

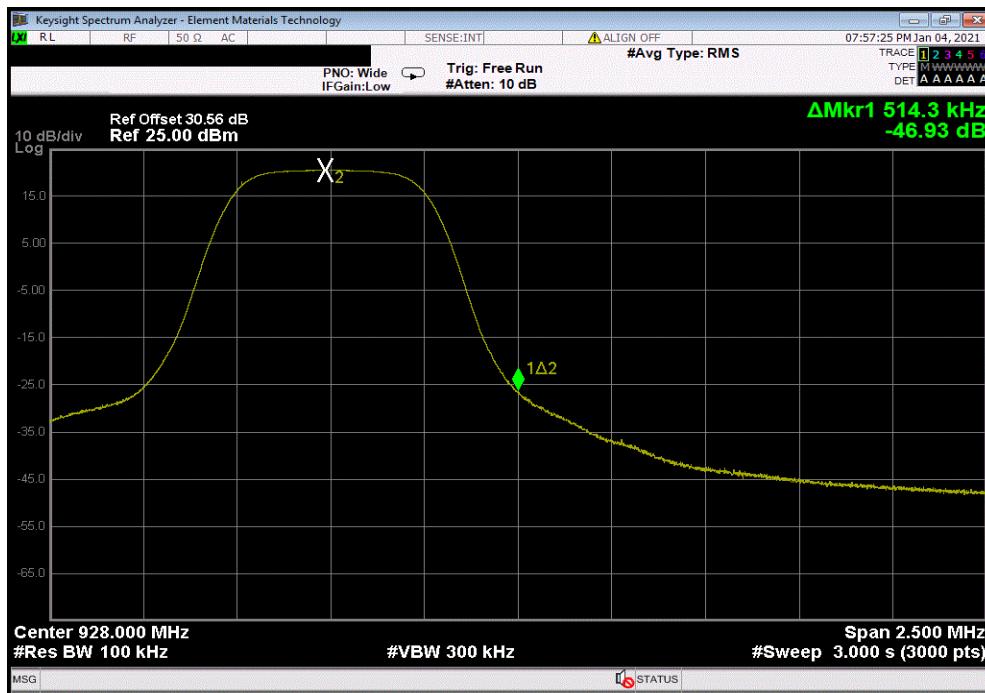


TbtTx 2019.08.30.0 XMit 2020.03.25.0

| 915 MHz LoRa, Low Channel (923.3 MHz) | | | |
|---------------------------------------|----------------|------------------|--------|
| | Value (dBc) | Limit ≤ (dBc) | Result |
| | -67.26 | -30 | Pass |



| 915 MHz LoRa, High Channel (927.5 MHz) | | | |
|--|----------------|------------------|--------|
| | Value (dBc) | Limit ≤ (dBc) | Result |
| | -46.93 | -30 | Pass |



OCCUPIED BANDWIDTH



XMit 2020.03.25.0

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Generator - Signal | Keysight | N5182B | TFX | 28-Apr-20 | 28-Apr-23 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 14-Sep-20 | 14-Sep-21 |
| Attenuator | Fairview Microwave | SA18S5W-20 | RFX | 3-Jun-20 | 3-Jun-21 |
| Attenuator | INMET | 64671 6A-10dB | AUI | 5-Aug-20 | 5-Aug-21 |
| Block - DC | Fairview Microwave | SD3379 | AMZ | 4-Nov-20 | 4-Nov-21 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 14-Apr-20 | 14-Apr-21 |

TEST DESCRIPTION

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



TbTx 2019.08.30.0 XMII 2020.03.25.0

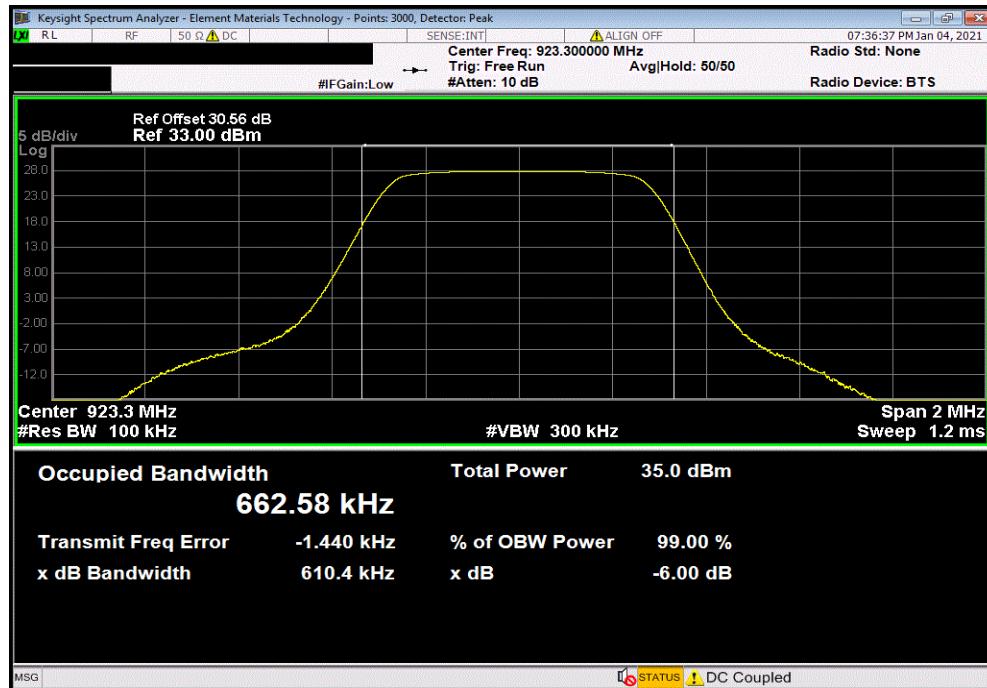
| | | | | | |
|--|--------------------------|------------------|-------------------|-----------|--------|
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L | | Work Order: | MLTI0180 | |
| Serial Number: | 0205123980-0008 | | Date: | 4-Jan-21 | |
| Customer: | Multi-Tech Systems, Inc. | | Temperature: | 22.3 °C | |
| Attendees: | Jim Asp, Brent Nielsen | | Humidity: | 26.8% RH | |
| Project: | None | | Barometric Pres.: | 1013 mbar | |
| Tested by: | Dustin Sparks | Power: | 54VDC via PoE | Job Site: | MN08 |
| TEST SPECIFICATIONS | | Test Method | | | |
| FCC 15.247:2021 | | ANSI C63.10:2013 | | | |
| COMMENTS | | | | | |
| Power over Ethernet (PoE) adapter powered with 120VAC/60Hz. Reference level offset includes measurement cable, attenuator, and DC block. | | | | | |
| DEVIATIONS FROM TEST STANDARD | | | | | |
| None | | | | | |
| Configuration # | 11 | Signature | | | |
| | | | Value | Limit (>) | Result |
| 915 MHz LoRa | | | 610.41 kHz | 500 kHz | Pass |
| | | | 604.624 kHz | 500 kHz | Pass |
| | | | 596.164 kHz | 500 kHz | Pass |

OCCUPIED BANDWIDTH

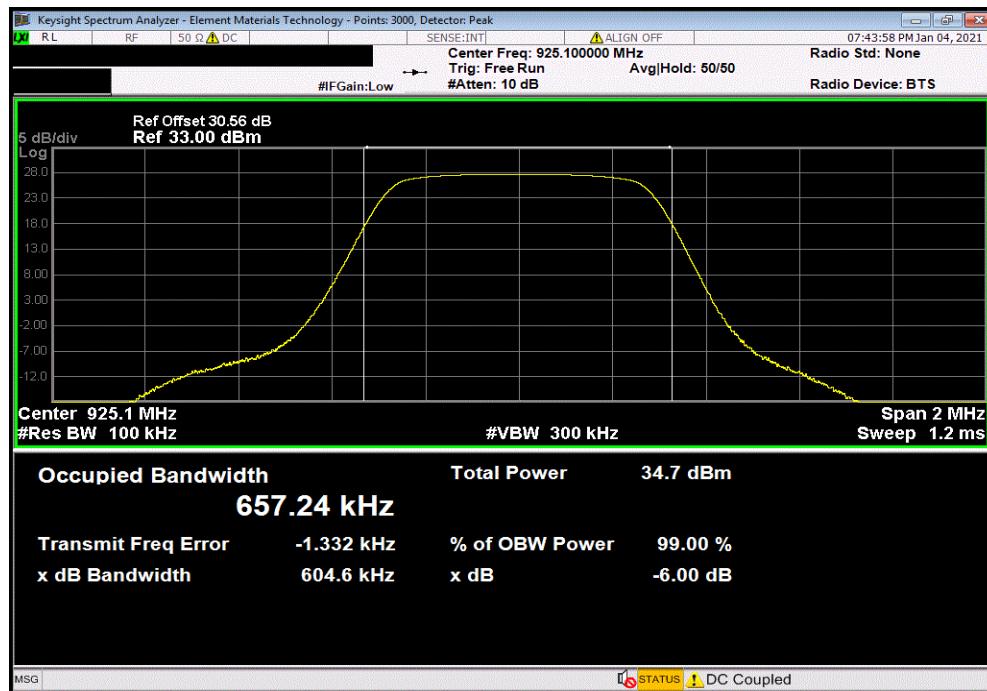


TbtTx 2019.08.30.0 XMit 2020.03.25.0

| 915 MHz LoRa, Low Channel (923.3 MHz) | | | Value | Limit (>) | Result |
|---------------------------------------|--|--|------------|-----------|--------|
| | | | 610.41 kHz | 500 kHz | Pass |



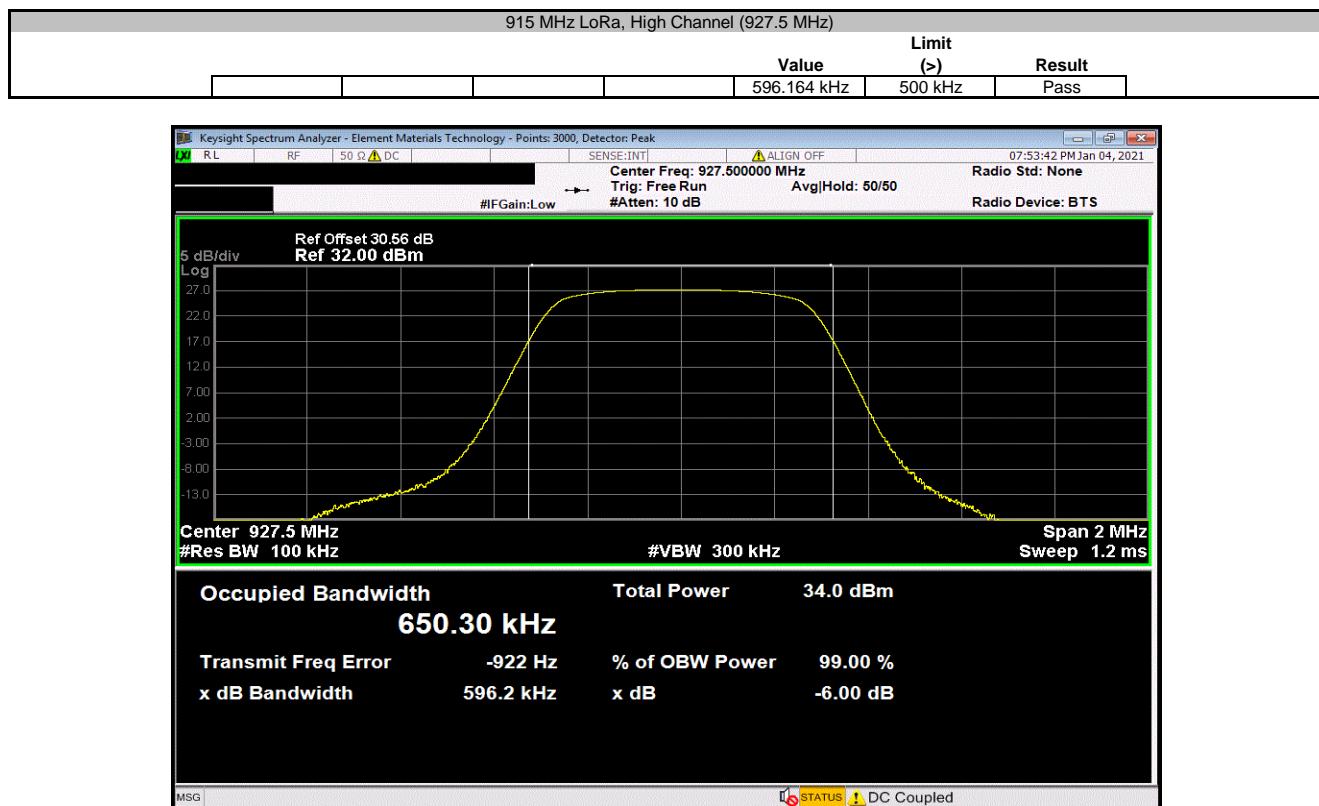
| 915 MHz LoRa, Mid Channel (925.1 MHz) | | | Value | Limit (>) | Result |
|---------------------------------------|--|--|-------------|-----------|--------|
| | | | 604.624 kHz | 500 kHz | Pass |



OCCUPIED BANDWIDTH



TbtTx 2019.08.30.0 XMit 2020.03.25.0



SPURIOUS CONDUCTED EMISSIONS



XMit 2020.03.25.0

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Generator - Signal | Keysight | N5182B | TFX | 28-Apr-20 | 28-Apr-23 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 14-Sep-20 | 14-Sep-21 |
| Attenuator | Fairview Microwave | SA18S5W-20 | RFX | 3-Jun-20 | 3-Jun-21 |
| Attenuator | INMET | 64671 6A-10dB | AUI | 5-Aug-20 | 5-Aug-21 |
| Block - DC | Fairview Microwave | SD3379 | AMZ | 4-Nov-20 | 4-Nov-21 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 14-Apr-20 | 14-Apr-21 |

TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

Because an RMS detector was used to measure Output Power, the attenuation requirement is -30 dBc.

SPURIOUS CONDUCTED EMISSIONS



TbTx 2019.08.30.0 XMII 2020.03.25.0

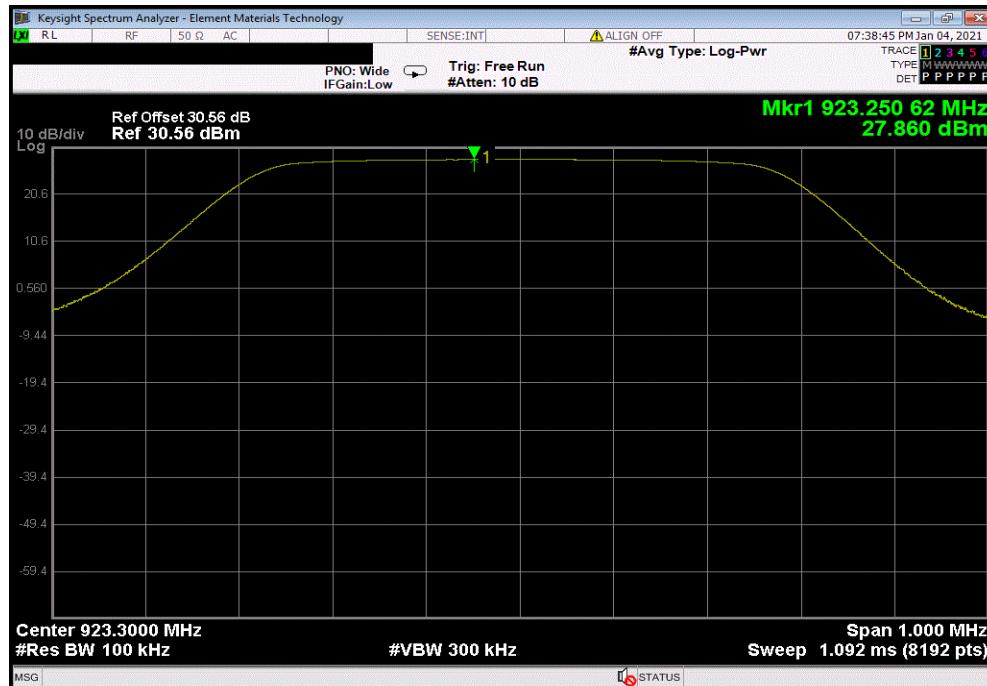
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L | | Work Order: | MLTI0180 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------------|------------------|-------------------|---------------------|--------------------------------------|-------------------------|-------------|--------|-----|-----|-----|-------------------------|-----------------|---------|--------|-----|------|-------------------------|-------------|--------|-----|-----|-----|-------------------------|-----------------|---------|--------|-----|------|--------------------------|-------------|--------|-----|-----|-----|--------------------------|-----------------|-------|--------|-----|------|
| Serial Number: | 0205123980-0008 | | Date: | 4-Jan-21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Customer: | Multi-Tech Systems, Inc. | | Temperature: | 22.4 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Attendees: | Jim Asp, Brent Nielsen | | Humidity: | 26.7% RH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Project: | None | | Barometric Pres.: | 1013 mbar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tested by: | Dustin Sparks | Power: | 54VDC via PoE | Job Site: | MN08 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TEST SPECIFICATIONS | | Test Method | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FCC 15.247:2021 | | ANSI C63.10:2013 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power over Ethernet (PoE) adapter powered with 120VAC/60Hz. Reference level offset includes measurement cable, attenuator, and DC block. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DEVIATIONS FROM TEST STANDARD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Configuration # | 11 | Signature | Frequency Range | Measured Freq (MHz) | Max Value (dBc) Limit ≤ (dBc) Result | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 915 MHz LoRa | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="0"> <tr> <td>Low Channel (923.3 MHz)</td> <td>Fundamental</td> <td>923.25</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>Low Channel (923.3 MHz)</td> <td>30 MHz - 10 GHz</td> <td>5818.95</td> <td>-68.73</td> <td>-30</td> <td>Pass</td> </tr> <tr> <td>Mid Channel (925.1 MHz)</td> <td>Fundamental</td> <td>925.05</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>Mid Channel (925.1 MHz)</td> <td>30 MHz - 10 GHz</td> <td>5874.94</td> <td>-67.88</td> <td>-30</td> <td>Pass</td> </tr> <tr> <td>High Channel (927.5 MHz)</td> <td>Fundamental</td> <td>927.45</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>High Channel (927.5 MHz)</td> <td>30 MHz - 10 GHz</td> <td>929.5</td> <td>-65.95</td> <td>-30</td> <td>Pass</td> </tr> </table> | | | | | | Low Channel (923.3 MHz) | Fundamental | 923.25 | N/A | N/A | N/A | Low Channel (923.3 MHz) | 30 MHz - 10 GHz | 5818.95 | -68.73 | -30 | Pass | Mid Channel (925.1 MHz) | Fundamental | 925.05 | N/A | N/A | N/A | Mid Channel (925.1 MHz) | 30 MHz - 10 GHz | 5874.94 | -67.88 | -30 | Pass | High Channel (927.5 MHz) | Fundamental | 927.45 | N/A | N/A | N/A | High Channel (927.5 MHz) | 30 MHz - 10 GHz | 929.5 | -65.95 | -30 | Pass |
| Low Channel (923.3 MHz) | Fundamental | 923.25 | N/A | N/A | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Low Channel (923.3 MHz) | 30 MHz - 10 GHz | 5818.95 | -68.73 | -30 | Pass | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mid Channel (925.1 MHz) | Fundamental | 925.05 | N/A | N/A | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mid Channel (925.1 MHz) | 30 MHz - 10 GHz | 5874.94 | -67.88 | -30 | Pass | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| High Channel (927.5 MHz) | Fundamental | 927.45 | N/A | N/A | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| High Channel (927.5 MHz) | 30 MHz - 10 GHz | 929.5 | -65.95 | -30 | Pass | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

SPURIOUS CONDUCTED EMISSIONS

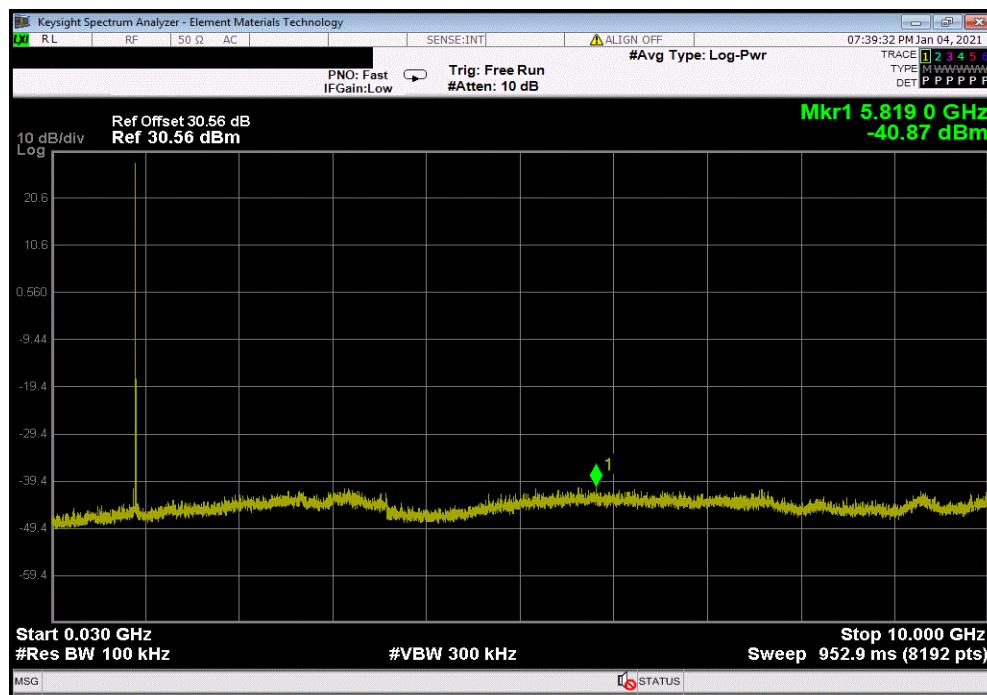


TbtTx 2019.08.30.0 XMit 2020.03.25.0

| 915 MHz LoRa, Low Channel (923.3 MHz) | | | | | |
|---------------------------------------|---------------------|-----------------|---------------|--------|--|
| Frequency Range | Measured Freq (MHz) | Max Value (dBc) | Limit ≤ (dBc) | Result | |
| Fundamental | 923.25 | N/A | N/A | N/A | |



| 915 MHz LoRa, Low Channel (923.3 MHz) | | | | | |
|---------------------------------------|---------------------|-----------------|---------------|--------|--|
| Frequency Range | Measured Freq (MHz) | Max Value (dBc) | Limit ≤ (dBc) | Result | |
| 30 MHz - 10 GHz | 5818.95 | -68.73 | -30 | Pass | |

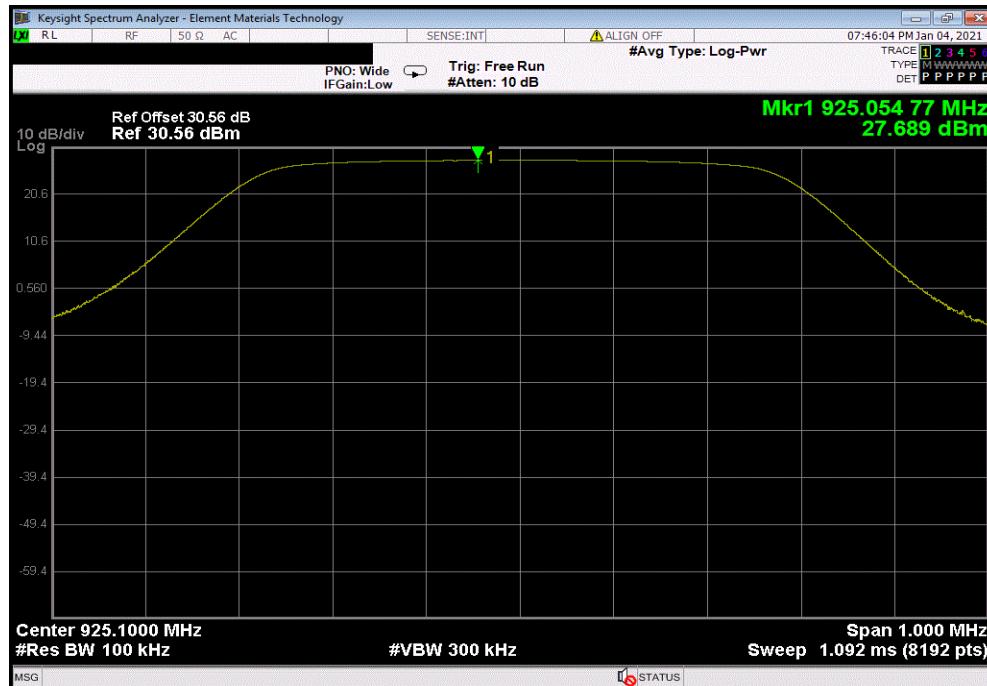


SPURIOUS CONDUCTED EMISSIONS

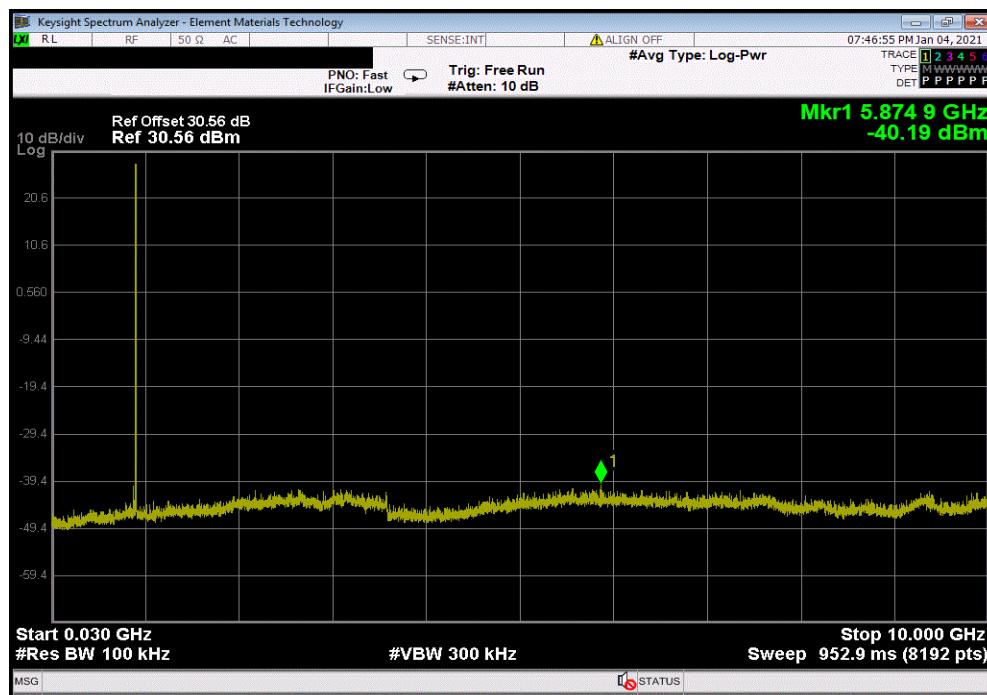


TbTx 2019.08.30.0 XMit 2020.03.25.0

| 915 MHz LoRa, Mid Channel (925.1 MHz) | | | | | |
|---------------------------------------|---------------------|-----------------|---------------|--------|--|
| Frequency Range | Measured Freq (MHz) | Max Value (dBc) | Limit ≤ (dBc) | Result | |
| Fundamental | 925.05 | N/A | N/A | N/A | |



| 915 MHz LoRa, Mid Channel (925.1 MHz) | | | | | |
|---------------------------------------|---------------------|-----------------|---------------|--------|--|
| Frequency Range | Measured Freq (MHz) | Max Value (dBc) | Limit ≤ (dBc) | Result | |
| 30 MHz - 10 GHz | 5874.94 | -67.88 | -30 | Pass | |

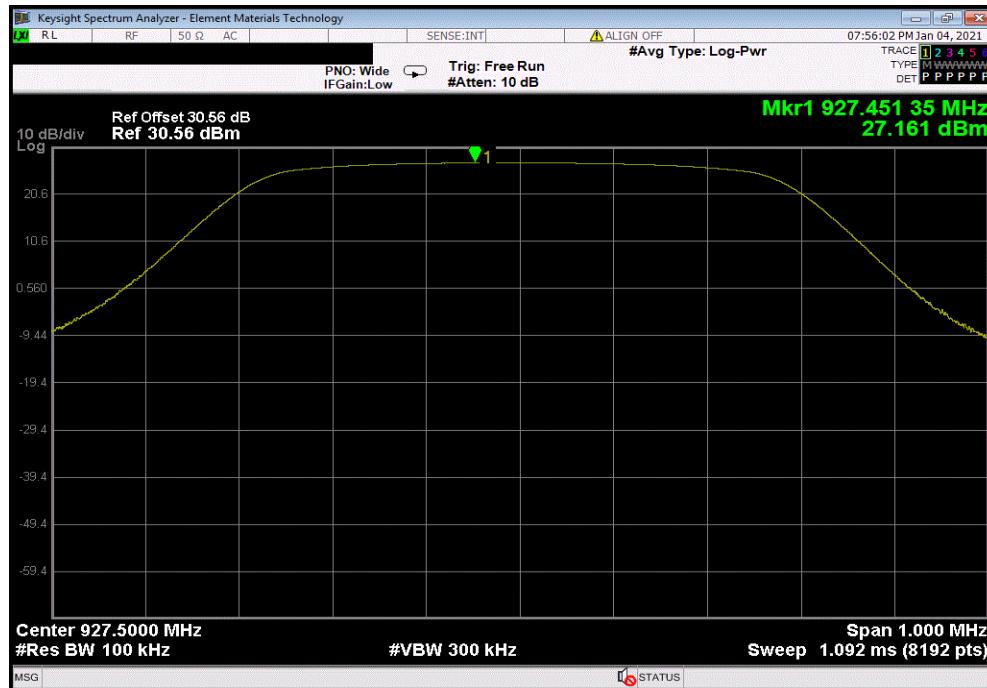


SPURIOUS CONDUCTED EMISSIONS

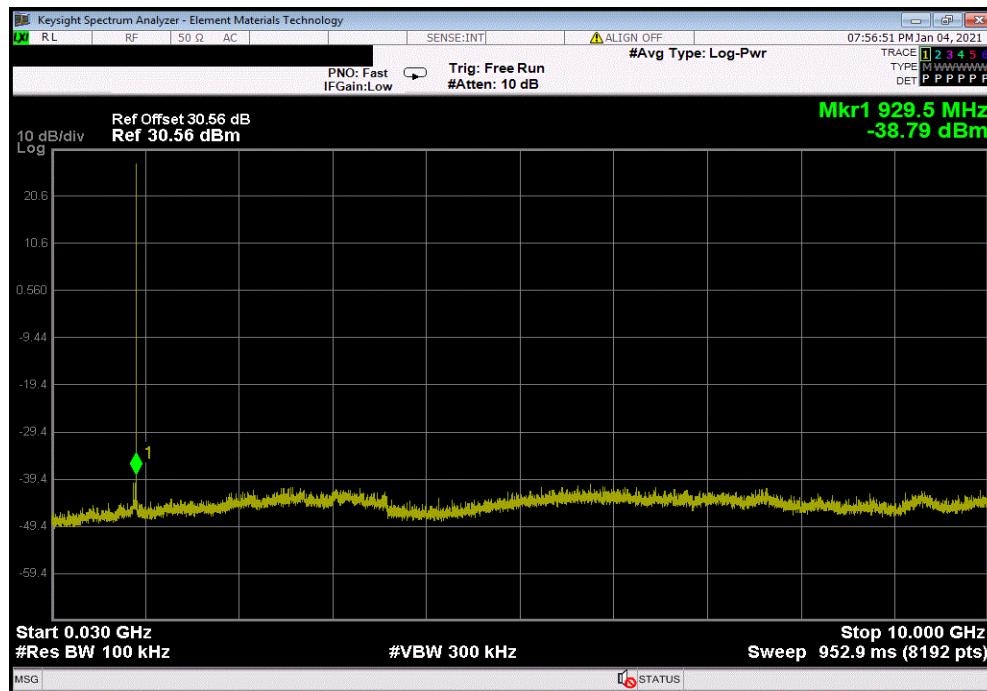


TbtTx 2019.08.30.0 XMit 2020.03.25.0

| 915 MHz LoRa, High Channel (927.5 MHz) | | | | | |
|--|---------------------|-----------------|---------------|--------|--|
| Frequency Range | Measured Freq (MHz) | Max Value (dBc) | Limit ≤ (dBc) | Result | |
| Fundamental | 927.45 | N/A | N/A | N/A | |



| 915 MHz LoRa, High Channel (927.5 MHz) | | | | | |
|--|---------------------|-----------------|---------------|--------|--|
| Frequency Range | Measured Freq (MHz) | Max Value (dBc) | Limit ≤ (dBc) | Result | |
| 30 MHz - 10 GHz | 929.5 | -65.95 | -30 | Pass | |



POWER SPECTRAL DENSITY



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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 | 28-Apr-20 | 28-Apr-23 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 14-Sep-20 | 14-Sep-21 |
| Attenuator | Fairview Microwave | SA18S5W-20 | RFX | 3-Jun-20 | 3-Jun-21 |
| Attenuator | INMET | 64671 6A-10dB | AUI | 5-Aug-20 | 5-Aug-21 |
| Block - DC | Fairview Microwave | SD3379 | AMZ | 4-Nov-20 | 4-Nov-21 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 14-Apr-20 | 14-Apr-21 |

TEST DESCRIPTION

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

The method AVGPSD-1 in section 11.10.3 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging and RMS detection across the full power of the burst. This method is allowed as the same method has been used to determine the conducted output power.

POWER SPECTRAL DENSITY



TbTx 2019.08.30.0 XMII 2020.03.25.0

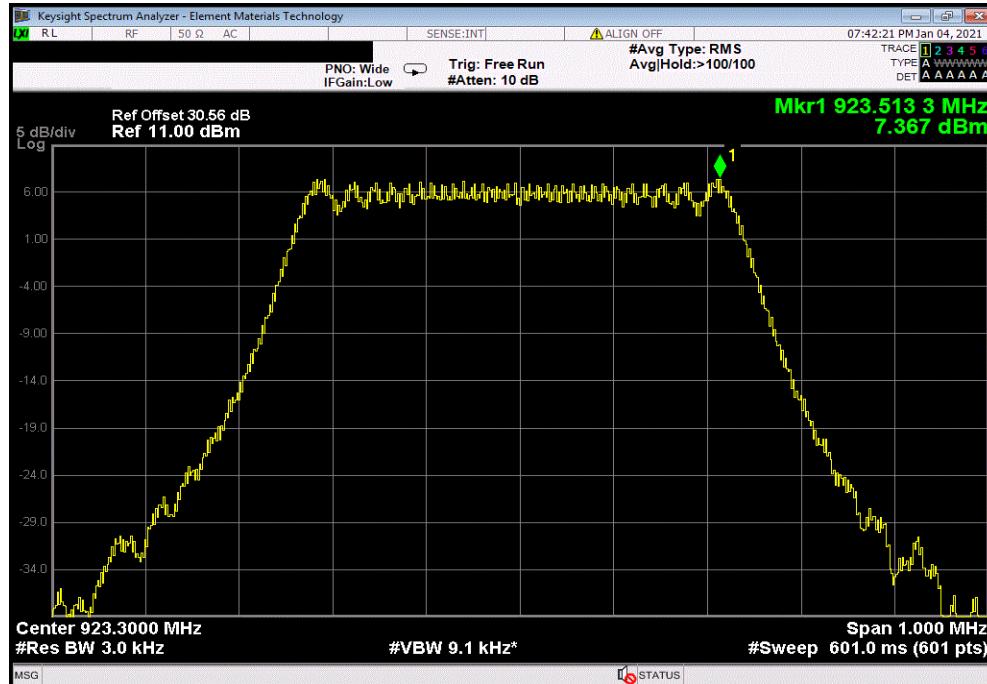
| EUT: | MTCDTIP2-LNA3-B11UKP-L1L | | Work Order: | MLTI0180 | |
|--|--------------------------|------------------|-------------------|-----------|---------|
| Serial Number: | 0205123980-0008 | | Date: | 4-Jan-21 | |
| Customer: | Multi-Tech Systems, Inc. | | Temperature: | 22.3 °C | |
| Attendees: | Jim Asp, Brent Nielsen | | Humidity: | 26.7% RH | |
| Project: | None | | Barometric Pres.: | 1013 mbar | |
| Tested by: | Dustin Sparks | Power: | 54VDC via PoE | Job Site: | MN08 |
| TEST SPECIFICATIONS | | Test Method | | | |
| FCC 15.247:2021 | | ANSI C63.10:2013 | | | |
| COMMENTS | | | | | |
| Power over Ethernet (PoE) adapter powered with 120VAC/60Hz. Reference level offset includes measurement cable, attenuator, and DC block. | | | | | |
| DEVIATIONS FROM TEST STANDARD | | | | | |
| None | | | | | |
| Configuration # | 11 | Signature | | | |
| | | | Value | Limit | Results |
| 915 MHz LoRa | | | dBm/3kHz | dBm/3kHz | |
| Low Channel (923.3 MHz) | | | 7.368 | 8 | Pass |
| Mid Channel (925.1 MHz) | | | 7.023 | 8 | Pass |
| High Channel (927.5 MHz) | | | 6.417 | 8 | Pass |

POWER SPECTRAL DENSITY

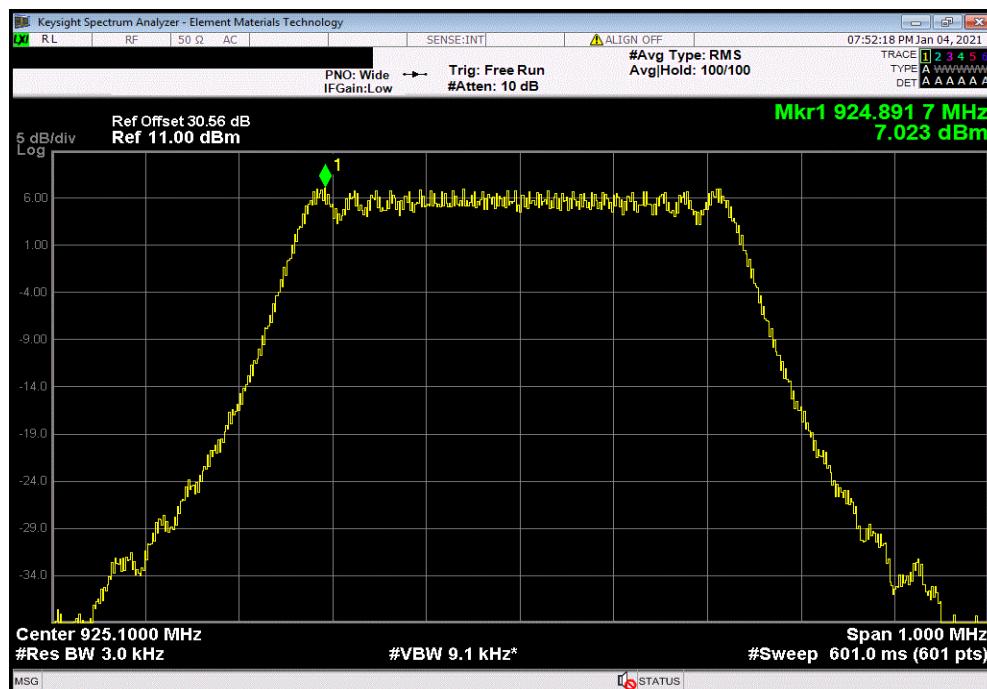


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| 915 MHz LoRa, Low Channel (923.3 MHz) | | | Value dBm/3kHz | Limit dBm/3kHz | Results |
|---------------------------------------|--|--|-------------------|-------------------|---------|
| | | | 7.368 | 8 | Pass |



| 915 MHz LoRa, Mid Channel (925.1 MHz) | | | Value dBm/3kHz | Limit dBm/3kHz | Results |
|---------------------------------------|--|--|-------------------|-------------------|---------|
| | | | 7.023 | 8 | Pass |



POWER SPECTRAL DENSITY



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| 915 MHz LoRa, High Channel (927.5 MHz) | | | | | | |
|--|--|----------|----------|---------|--|--|
| | | Value | Limit | Results | | |
| | | dBm/3kHz | dBm/3kHz | | | |
| | | 6.417 | 8 | Pass | | |

