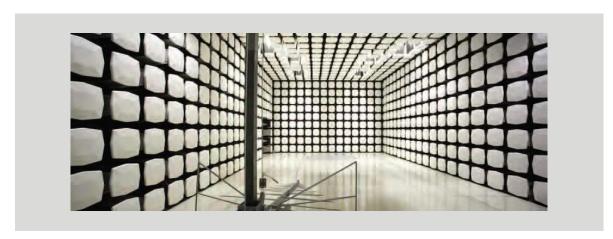


NextGen RF Design

Titan Gateway

FCC 15.247:2022 2.4 GHz DTS Radio

Report: NGRF0028.0, Issue Date: December 13, 2022







CERTIFICATE OF TEST



Last Date of Test: August 25, 2022 NextGen RF Design EUT:Titan Gateway

Radio Equipment Testing

Standards

| Specification | Method |
|-----------------|------------------------------|
| FCC 15.247:2022 | ANSI C63.10:2013, KDB 558074 |

Results

| Test Description | Result | Specification Section(s) | Method Section(s) | Comments |
|--|--------|---------------------------------------|----------------------------------|----------|
| Band Edge Compliance | Pass | 15.247(d), KDB 558074 -11 | 11.11 | |
| Duty Cycle | Pass | KDB 558074 -6.0 | 11.6 | |
| Equivalent Isotropic Radiated Power | Pass | 15.247(b)(3), KDB 558074 - 9.1.1 | 11.9.1.1 | |
| Emissions Bandwidth and Occupied Bandwidth | Pass | 15.247(a)(2), KDB 558074 -8.2 | 11.8.2 | |
| Output Power | Pass | 15.247(b)(3), KDB 558074 - 9.1.1 | 11.9.1.1 | |
| Power Spectral Density | Pass | 15.247(e), KDB 558074 -10.2 | 11.10.2 | |
| Powerline Conducted Emissions | Pass | 15.207 | 6.2 | |
| Spurious Conducted Emissions | Pass | 15.247(d), KDB 558074 -11 | 11.11 | |
| Spurious Radiated Emissions | Pass | 15.247(d), KDB 558074 - 12.1, 13.2 | 11.12.1, 11.13.2, 6.5, 6.6 | |

Deviations From Test Standards

The narrower RBW measurement for Emissions Bandwidth and Occupied Bandwidth (1-5% of the measured value) shows that the 6 dB Emissions Bandwidth will meet the limit with a larger RBW as specified in the standard (100 kHz).

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 |
|--------------------|--------------------------------|----------------------|-------------|
| 01 | Updated standard year | 2022-12-13 | Cover |
| 01 | Updated functional description | 2022-12-13 | 10 |
| 01 | Added information | 2022-12-13 | 11 |
| 01 | Added configurations | 2022-12-13 | 12-16 |
| 01 | Screen capture added | 2022-12-13 | 30 |
| 01 | Updated test name | 2022-12-13 | 31-36 |
| 01 | Updated configurations | 2022-12-13 | 50-62 |

ACCREDITATIONS AND AUTHORIZATIONS



United States

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

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

Canada

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

European Union

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

United Kingdom

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

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

<u>California</u> <u>Minnesota</u> <u>Oregon</u> <u>Texas</u> <u>Washington</u>

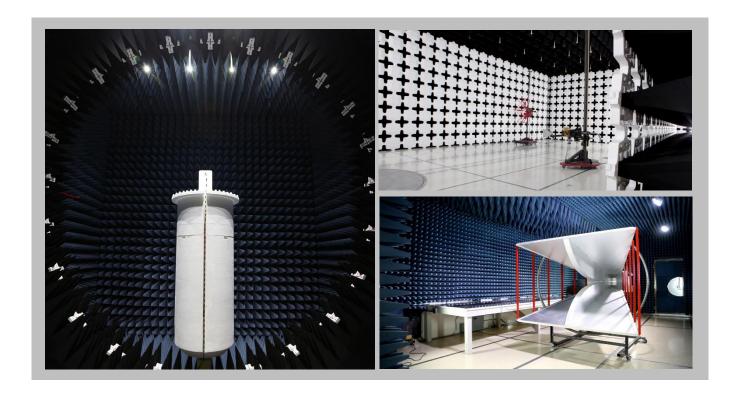
FACILITIES







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



MEASUREMENT UNCERTAINTY



Measurement Uncertainty

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

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

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

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

TEST SETUP BLOCK DIAGRAMS

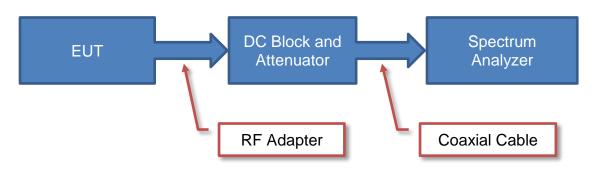


Measurement Bandwidths

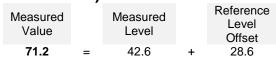
| Frequency Range (MHz) | Peak Data (kHz) | Quasi-Peak Data (kHz) | Average Data (kHz) |
|--------------------------|--------------------|--------------------------|-----------------------|
| 0.01 - 0.15 | 1.0 | 0.2 | 0.2 |
| 0.15 - 30.0 | 10.0 | 9.0 | 9.0 |
| 30.0 - 1000 | 100.0 | 120.0 | 120.0 |
|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

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

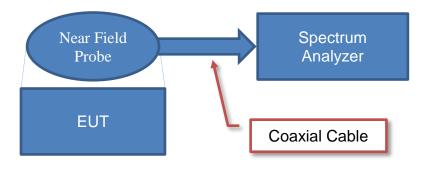
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)



Near Field Test Fixture Measurements

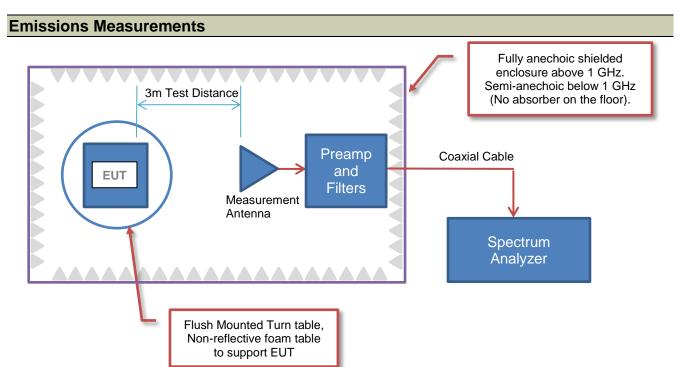


Sample Calculation (logarithmic units)

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

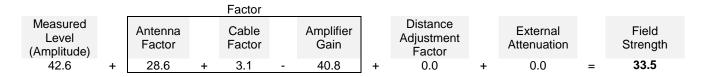
TEST SETUP BLOCK DIAGRAMS



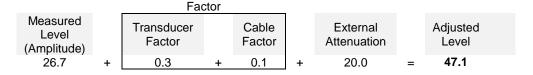


Sample Calculation (logarithmic units)

Radiated Emissions:



Conducted Emissions:



Radiated Power (ERP/EIRP) - Substitution Method:

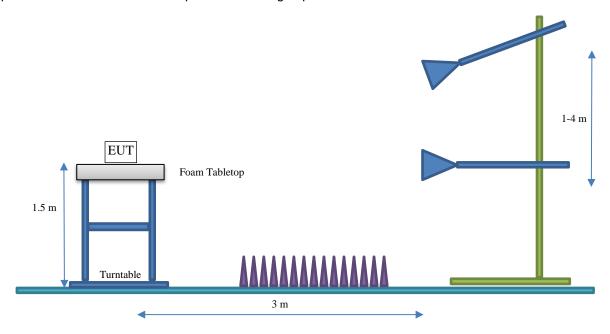
| Measured Level into Substitution Antenna (Amplitude dBm) | | Substitution Antenna Factor (dBi) | | EIRP to ERP (if applicable) | | Measured power (dBm ERP/EIRP) |
|--|---|---|---|-----------------------------|---|-------------------------------|
| 10.0 | + | 6.0 | - | 2.15 | = | 13.9/16.0 |

TEST SETUP BLOCK DIAGRAMS



Bore Sighting (>1GHz)

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



PRODUCT DESCRIPTION



Client and Equipment under Test (EUT) Information

| Company Name: | NextGen RF Design |
|--------------------------------|--|
| Address: | 2130 Howard Drive West |
| City, State, Zip: | North Mankato, MN 56003 |
| Test Requested By: | Ross Loven |
| EUT: | EAPRO-GTWY, EAPRO-WTS, EAPRO-WHS, EAPRO-WMFT, EAPRO-WMFT-R |
| First Date of Test: | June 29, 2022 |
| Last Date of Test: | August 12, 2022 |
| Receipt Date of Samples: | June 29, 2022 |
| Equipment Design Stage: | Preproduction |
| Equipment Condition: | No Damage |
| Purchase Authorization: | Verified |

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Gateway system containing a 2.4 GHz LoRa and a pre-approved 802.11bgn 20 MHz SISO radio module. Sensors containing a 2.4 GHz LoRa radio. EAPRO-GTWY, ENVIROALERT Professional Gateway, EAPRO-WTS, ENVIROALERT Professional Wireless Temperature Sensor, EAPRO-WHS, ENVIROALERT Professional Wireless Humidity Sensor, EAPRO-WMFT, ENVIROALERT Professional Wireless Multi-Function Transmitter, EAPRO-WMFT-R, ENVIROALERT Professional Wireless Multi-Function Transmitter with Relay

This report is specific to the Gateway. The sensor(s) will be tested separately.

Testing Objective:

To demonstrate compliance of the 2.4 GHz DTS radio to FCC 15.247 requirements.

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. The power settings below reflect the maximum power that the EUT is allowed to transmit at during normal operation.

ANTENNA GAIN (dBi)

| Type | Provided by: | Frequency Range (MHz) | Gain (dBi) |
|----------------------------|-------------------|-----------------------|------------|
| PCB Trace Monopole Antenna | NextGen RF Design | 2400-2500 | 2.21 |

Note 1. No datasheet exists for this antenna. Antenna measurements will be provided in a separate report.

The EUT was tested using the power settings provided by the manufacturer which were based upon:

Test software/firmware installed on EUT:Titan_Gateway_MFG_WiFiATE_V22.02.28B2_

☐ Rated power settings

SETTINGS FOR ALL TESTS IN THIS REPORT

| Modulation Types | Position | Power Setting |
|--------------------------|-------------------------|---------------|
| | Low Channel (2405 MHz) | -8 |
| LoRa – See details below | Mid Channel (2440 MHz) | -8 |
| | High Channel (2479 MHz) | -8 |

The power setting is much lower than the measured output power because there is a pre-amp in the signal path between the radio and antenna.

- Spreading Factor = 7
- Bandwidth = 812khz (double sided modulation BW = 2x 812kHz ~1.6MHz)
- Coding Rate = 4/5
- Preamble Length = 24 symbols
- Max Payload Length = 128bytes
- Effective Data Rate = 35.53kb/s
- Time on air = 35.665ms



| EUT | | | |
|-------------|--------------------------|-------------------|---------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Gateway | WINLAND Electronics, Inc | EAPRO-GTWY | PP-G01 |

| Peripherals in Test Setup Boundary | | | | | | |
|------------------------------------|--------------------------|-------------------|---------------|--|--|--|
| Description | Manufacturer | Model/Part Number | Serial Number | | | |
| Sensor 1 (Temperature) | WINLAND Electronics, Inc | TEMP-L-S | None | | | |
| Sensor 2 (Humidity) | WINLAND Electronics, Inc | HA-III+ | None | | | |
| Sensor 3 (Humidity) | Omega Engineering, Inc | HX71-V1 | 2112798 | | | |
| Sensor 4 (4-20 Pressure) | Omegadyne, Inc | PX209-060AI | None | | | |
| ITE Power Supply (Gateway) | GlobTek, Inc. | GT-46120-1212 | None | | | |

| Remote Equipment Outside of Test Setup Boundary | | | | | |
|--|--------------------------|---------------|----------------|--|--|
| Description Manufacturer Model/Part Number Serial Number | | | | | |
| Wireless Sensor Module | WINLAND Electronics, Inc | EAPRO-WMFT-R | PP-W01 | | |
| Sensor 5 (Temperature) | WINLAND Electronics, Inc | TEMP-L-S | None | | |
| ITE Power Supply (Wireless) | GlobTek, Inc. | GT-46120-1212 | None | | |
| Wireless Router | Belkin | F9K1103V1 | 121124GG117433 | | |

| Cables | | | | | |
|----------------------------------|---------|------------|---------|-------------------------------|---------------------------|
| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 |
| DC Power (Gateway) | No | 1.1m | No | ITE Power Supply (Gateway) | Gateway |
| DC Power (Sensor) | No | 1.1m | No | ITE Power Supply (Wireless) | Wireless Sensor Module |
| Sensor 1 Cable | Unknown | 3.0m | No | Sensor 1 (Humidity) | Gateway |
| Sensor 2 Cable | Unknown | 3.0m | No | Sensor 2 (Humidity) | Gateway |
| Sensor 3 Cable | Unknown | 3.0m | No | Sensor 3 (Temperature) | Gateway |
| Sensor 4 Cable | Unknown | 3.0m | No | Sensor 4 (4-20 Pressure) | Gateway |
| Sensor 5 Cable | Unknown | 3.0m | No | Sensor 5 (Temperature) | Wireless Sensor Module |
| Ethernet | No | 3.0m | No | Gateway | Unterminated |
| Gateway Signal Output x5 | No | 1.0m | No | Gateway | Unterminated |
| Wireless Module Signal Output | No | 1.0m | No | Wireless Sensor Module | Unterminated |



Configuration NGRF0028- 14

| EUT | | | |
|-------------|--------------------------|-------------------|---------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Gateway | WINLAND Electronics, Inc | EAPRO-GTWY | PP-G02 |

| Peripherals in Test Setup Boundary | | | | | |
|------------------------------------|---------------|-------------------|---------------|--|--|
| Description | Manufacturer | Model/Part Number | Serial Number | | |
| ITE Power Supply (Gateway) | GlobTek, Inc. | GT-46120-1212 | None | | |
| Laptop | Dell | Inspirion 5566 | 1VYYRQ2 | | |

| Cables | | | | | |
|---------------------|--------|------------|---------|----------------------------|--------------|
| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 |
| USB Cable (Gateway) | Yes | 1.5 m | No | Laptop | Gateway |
| DC Power (Gateway) | No | 1.1 m | Yes | ITE Power Supply (Gateway) | Gateway |

| EUT | | | |
|-------------|--------------------------|-------------------|---------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Gateway | WINLAND Electronics, Inc | EAPRO-GTWY | PP-G01 |

| Peripherals in Test Setup Boundary | | | | |
|------------------------------------|---------------|-------------------|---------------|--|
| Description | Manufacturer | Model/Part Number | Serial Number | |
| ITE Power Supply (Gateway) | GlobTek, Inc. | GT-46120-1212 | None | |

| Remote Equipment Outside of Test Setup Boundary | | | | | |
|--|--|--|--|--|--|
| Description Manufacturer Model/Part Number Serial Number | | | | | |
| Laptop Dell Inspirion 5566 1VYYRQ2 | | | | | |

| Cables | | | | | |
|---------------------|--------|------------|---------|----------------------------|--------------|
| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 |
| USB Cable (Gateway) | Yes | 1.5 m | No | Laptop | Gateway |
| DC Power (Gateway) | No | 1.1 m | Yes | ITE Power Supply (Gateway) | Gateway |



| EUT | | | |
|-------------|--------------------------|-------------------|---------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Gateway | WINLAND Electronics, Inc | EAPRO-GTWY | PP-G01 |

| Peripherals in Test Setup Boundary | | | | | |
|------------------------------------|--------------------------|-------------------|---------------|--|--|
| Description | Manufacturer | Model/Part Number | Serial Number | | |
| Sensor 1 (Temperature) | WINLAND Electronics, Inc | TEMP-L-S | None | | |
| Sensor 2 (Humidity) | WINLAND Electronics, Inc | HA-III+ | None | | |
| Sensor 3 (Humidity) | Omega Engineering, Inc | HX71-V1 | 2112798 | | |
| Sensor 4 (4-20 Pressure) | Omegadyne, Inc | PX209-060AI | None | | |
| ITE Power Supply (Gateway) | SL Power Electronics | ME20A1203B01 | None | | |

| Remote Equipment Outside of Test Setup Boundary | | | | | | | |
|--|--------------------------|---------------|----------------|--|--|--|--|
| Description Manufacturer Model/Part Number Serial Number | | | | | | | |
| Wireless Sensor Module | WINLAND Electronics, Inc | EAPRO-WMFT-R | PP-W01 | | | | |
| Sensor 5 (Temperature) | WINLAND Electronics, Inc | TEMP-L-S | None | | | | |
| ITE Power Supply (Wireless) | GlobTek, Inc. | GT-46120-1212 | None | | | | |
| Wireless Router | Belkin | F9K1103V1 | 121124GG117433 | | | | |

| Cables | Cables | | | | | |
|----------------------------------|---------|------------|---------|-------------------------------|---------------------------|--|
| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 | |
| DC Power (Gateway) | No | 1.1m | No | ITE Power Supply (Gateway) | Gateway | |
| DC Power (Sensor) | No | 1.1m | No | ITE Power Supply (Wireless) | Wireless Sensor Module | |
| Sensor 1 Cable | Unknown | 3.0m | No | Sensor 1 (Humidity) | Gateway | |
| Sensor 2 Cable | Unknown | 3.0m | No | Sensor 2 (Humidity) | Gateway | |
| Sensor 3 Cable | Unknown | 3.0m | No | Sensor 3 (Temperature) | Gateway | |
| Sensor 4 Cable | Unknown | 3.0m | No | Sensor 4 (4-20 Pressure) | Gateway | |
| Sensor 5 Cable | Unknown | 3.0m | No | Sensor 5 (Temperature) | Wireless Sensor Module | |
| Ethernet | No | 3.0m | No | Gateway | Unterminated | |
| Gateway Signal Output x5 | No | 1.0m | No | Gateway | Unterminated | |
| Wireless Module Signal Output | No | 1.0m | No | Wireless Sensor Module | Unterminated | |



| EUT | | | |
|-------------|--------------------------|-------------------|---------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Gateway | WINLAND Electronics, Inc | EAPRO-GTWY | PP-G01 |

| Peripherals in Test Setup Boundary | | | | | | |
|---|--------------------------|--------------------|---------|--|--|--|
| Description Manufacturer Model/Part Number Serial Num | | | | | | |
| Sensor 1 (Temperature) | WINLAND Electronics, Inc | TEMP-L-S | None | | | |
| Sensor 2 (Humidity) | WINLAND Electronics, Inc | HA-III+ | None | | | |
| Sensor 3 (Humidity) | Omega Engineering, Inc | HX71-V1 | 2112798 | | | |
| Sensor 4 (4-20 Pressure) | Omegadyne, Inc | PX209-060AI | None | | | |
| ITE Power Supply (Gateway) | GlobTek | WR9HE1000LCPIMFR6B | None | | | |

| Remote Equipment Outside of Test Setup Boundary | | | | | | | |
|--|--------------------------|---------------|----------------|--|--|--|--|
| Description Manufacturer Model/Part Number Serial Number | | | | | | | |
| Wireless Sensor Module | WINLAND Electronics, Inc | EAPRO-WMFT-R | PP-W01 | | | | |
| Sensor 5 (Temperature) | WINLAND Electronics, Inc | TEMP-L-S | None | | | | |
| ITE Power Supply (Wireless) | GlobTek, Inc. | GT-46120-1212 | None | | | | |
| Wireless Router | Belkin | F9K1103V1 | 121124GG117433 | | | | |

| Cables | Cables | | | | | |
|----------------------------------|---------|------------|---------|-------------------------------|---------------------------|--|
| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 | |
| DC Power (Gateway) | No | 1.1m | No | ITE Power Supply (Gateway) | Gateway | |
| DC Power (Sensor) | No | 1.1m | No | ITE Power Supply (Wireless) | Wireless Sensor Module | |
| Sensor 1 Cable | Unknown | 3.0m | No | Sensor 1 (Humidity) | Gateway | |
| Sensor 2 Cable | Unknown | 3.0m | No | Sensor 2 (Humidity) | Gateway | |
| Sensor 3 Cable | Unknown | 3.0m | No | Sensor 3 (Temperature) | Gateway | |
| Sensor 4 Cable | Unknown | 3.0m | No | Sensor 4 (4-20 Pressure) | Gateway | |
| Sensor 5 Cable | Unknown | 3.0m | No | Sensor 5 (Temperature) | Wireless Sensor Module | |
| Ethernet | No | 3.0m | No | Gateway | Unterminated | |
| Gateway Signal Output x5 | No | 1.0m | No | Gateway | Unterminated | |
| Wireless Module Signal Output | No | 1.0m | No | Wireless Sensor Module | Unterminated | |



| EUT | | | |
|-------------|--------------------------|-------------------|---------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| Gateway | WINLAND Electronics, Inc | EAPRO-GTWY | PP-G01 |

| Peripherals in Test Setup Boundary | | | | | | |
|--|--------------------------|--------------|---------|--|--|--|
| Description Manufacturer Model/Part Number Serial Number | | | | | | |
| Sensor 1 (Temperature) | WINLAND Electronics, Inc | TEMP-L-S | None | | | |
| Sensor 2 (Humidity) | WINLAND Electronics, Inc | HA-III+ | None | | | |
| Sensor 3 (Humidity) | Omega Engineering, Inc | HX71-V1 | 2112798 | | | |
| Sensor 4 (4-20 Pressure) | Omegadyne, Inc | PX209-060AI | None | | | |
| ITE Power Supply (Gateway) | MeanWell | GSM18U12-P1J | None | | | |

| Remote Equipment Outside of Test Setup Boundary | | | | | | |
|--|--------------------------|---------------|----------------|--|--|--|
| Description Manufacturer Model/Part Number Serial Number | | | | | | |
| Wireless Sensor Module | WINLAND Electronics, Inc | EAPRO-WMFT-R | PP-W01 | | | |
| Sensor 5 (Temperature) | WINLAND Electronics, Inc | TEMP-L-S | None | | | |
| ITE Power Supply (Wireless) | GlobTek, Inc. | GT-46120-1212 | None | | | |
| Wireless Router | Belkin | F9K1103V1 | 121124GG117433 | | | |

| Cables | Cables | | | | | |
|----------------------------------|---------|------------|---------|-------------------------------|---------------------------|--|
| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 | |
| DC Power (Gateway) | No | 1.1m | No | ITE Power Supply (Gateway) | Gateway | |
| DC Power (Sensor) | No | 1.1m | No | ITE Power Supply (Wireless) | Wireless Sensor Module | |
| Sensor 1 Cable | Unknown | 3.0m | No | Sensor 1 (Humidity) | Gateway | |
| Sensor 2 Cable | Unknown | 3.0m | No | Sensor 2 (Humidity) | Gateway | |
| Sensor 3 Cable | Unknown | 3.0m | No | Sensor 3 (Temperature) | Gateway | |
| Sensor 4 Cable | Unknown | 3.0m | No | Sensor 4 (4-20 Pressure) | Gateway | |
| Sensor 5 Cable | Unknown | 3.0m | No | Sensor 5 (Temperature) | Wireless Sensor Module | |
| Ethernet | No | 3.0m | No | Gateway | Unterminated | |
| Gateway Signal Output x5 | No | 1.0m | No | Gateway | Unterminated | |
| Wireless Module Signal Output | No | 1.0m | No | Wireless Sensor Module | Unterminated | |

MODIFICATIONS



Equipment Modifications

| Item | Date | Test | Modification | Note | Disposition of EUT |
|------|------------|---|--------------------------------------|---|---|
| 1 | 2022-07-01 | 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. |
| 2 | 2022-07-28 | Powerline Conducted Emissions | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 3 | 2022-08-12 | Occupied Bandwidth | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 4 | 2022-08-12 | 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. |
| 5 | 2022-08-12 | 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. |
| 6 | 2022-08-12 | 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 | 2022-08-12 | 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. |
| 8 | 2022-08-12 | Spurious Conducted Emissions | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | Scheduled testing was completed. |



XMit 2022.02.07.0

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TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|------------|------------|
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Generator - Signal | Agilent | N5183A | TIK | 2022-01-24 | 2025-01-24 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

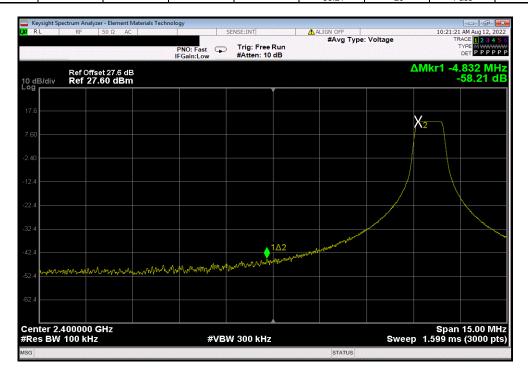
The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

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



| | | | | | | TbtTx 2022.06.03.0 | XMit 2022.02.07.0 |
|------------------------|-------------------------|-------------------------------------|--------|------------------|-------------|--------------------|-------------------|
| EUT: | Titan Gateway | | | | Work Order | NGRF0028 | |
| Serial Number: | PP-G01 | | | | | 12-Aug-22 | |
| Customer: | NextGen RF Design | | | | Temperature | 20.9 °C | |
| Attendees: | Attendees: Tim Smith | | | | | 49.2% RH | |
| | Project: None | | | | | 1023 mbar | |
| Tested by: | Christopher Heintzelman | | Power: | 110VAC/60Hz | Job Site | MN08 | |
| TEST SPECIFICATI | ONS | | | Test Method | | | |
| FCC 15.247:2022 | | | | ANSI C63.10:2013 | | | |
| | | | | | | | |
| COMMENTS | | | | | | | |
| Reference Level Of | fset includes measureme | nt cable, attenuator, and DC Block. | | | | | |
| DEVIATIONS FROM | I TEST STANDARD | | | | | | |
| None | | | | | | | |
| Configuration # | 17 | Signature | er Am | Harten | | | |
| | | - | | • | Value | Limit | |
| | | | | | (dBc) | ≤ (dBc) | Result |
| Low Channel, 2405 N | MHz | • | | - | -58.21 | -20 | Pass |







XMit 2022.02.07.0

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 |
|------------------------------|--------------------|-----------------------|-----|------------|------------|
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |
| Generator - Signal | Agilent | N5182A | TIF | 2020-08-29 | 2023-08-29 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

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

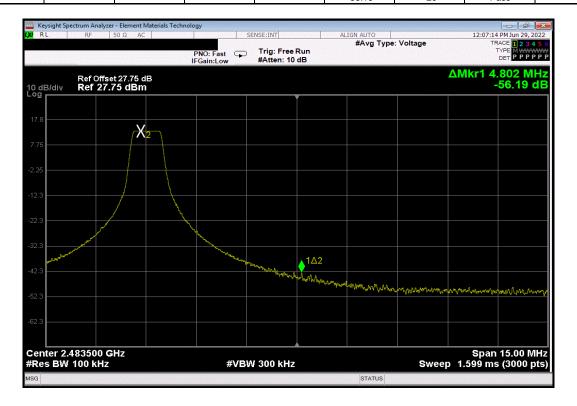


| | | | | | | TbtTx 2022.06.03.0 | XMit 2022.02.07.0 | | |
|-----------------------|------------------------|-----------|---------------------------------|------------------|----------------|--------------------|-------------------|--|--|
| EUT: Ti | itan Gateway | | | | Work Order: | | | | |
| Serial Number: Pf | P-G02 | | | | Date: | 29-Jun-22 | | | |
| Customer: No | extGen RF Design | | | | Temperature: | 25.1 °C | | | |
| Attendees: Ti | | | | 42.4% RH | | | | | |
| Project: No | one | | Barometric Pres.: | 1021 mbar | | | | | |
| | hristopher Heintzelman | | Power: | 120VAC/60Hz | Job Site: | MN08 | | | |
| TEST SPECIFICATION | NS | | | | | | | | |
| FCC 15.247:2022 | | | | ANSI C63.10:2013 | | | | | |
| | | | | | | | | | |
| COMMENTS | | | | | | | | | |
| None | | | | | | | | | |
| DEVIATIONS FROM T | TEST STANDARD | | | | | | | | |
| None | | | | | | | | | |
| Configuration # | 14 | Signature | CliAm t | Harten | | | | | |
| | | | | | Value (dBc) | Limit ≤ (dBc) | Result | | |
| High Channel, 2480 MF | Hz. Modulated | | th Channel, 2480 MHz. Modulated | | | | | | |



High Channel, 2480 MHz, Modulated

| Value | Limit |
| (dBc) | ≤ (dBc) | Result |
| -56.19 | -20 | Pass |



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.



XMit 2022.02.07.0

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 |
|------------------------------|--------------------|-----------------------|-----|------------|------------|
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Generator - Signal | Agilent | N5183A | TIK | 2022-01-24 | 2025-01-24 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

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

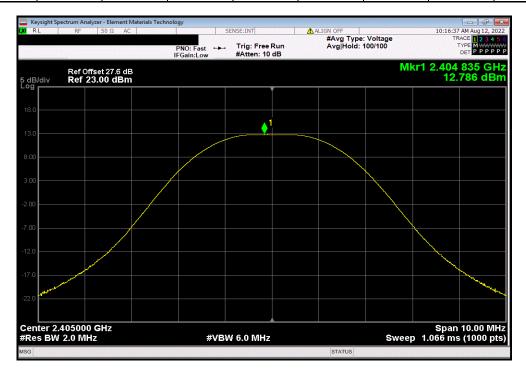
The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

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



| | | | | | | | | TbtTx 2022.06.03.0 | XMit 2022.02.07.0 | | |
|------------------------|-------------------------|-------------------------------------|--------|------------------|---------|----------------------|-------------------|--------------------|-------------------|--|--|
| EUT: | Titan Gateway | | | | | | Work Order: | NGRF0028 | | | |
| Serial Number: | PP-G01 | | | | | | Date: | 12-Aug-22 | | | |
| Customer: | NextGen RF Design | | | | | Temperature: 20.8 °C | | | | | |
| Attendees: | Tim Smith | | | | | | Humidity: | 50.8% RH | | | |
| Project: | | | | | | | Barometric Pres.: | 1021 mbar | | | |
| | Christopher Heintzelman | | Power: | 110VAC/60Hz | | Job Site: MN08 | | | | | |
| TEST SPECIFICATI | ONS | | | Test Method | | | | | | | |
| FCC 15.247:2022 | | | | ANSI C63.10:2013 | | | | | | | |
| | | | | | | | | | | | |
| COMMENTS | | | | | | | | | | | |
| Reference Level Of | fset includes measureme | nt cable, attenuator, and DC Block. | | | | | | | | | |
| DEVIATIONS FROM | I TEST STANDARD | | | | | | | | | | |
| None | | | | | | | | | | | |
| Configuration # | 17 | Signature | e Am | Harten | | | | | | | |
| | · | · | | · | Out Pwr | Antenna | EIRP | EIRP Limit | | | |
| | | | | | (dBm) | Gain (dBi) | (dBm) | (dBm) | Result | | |
| Low Channel, 2405 M | ИHz | | | | 12.786 | 2.21 | 14.996 | 36 | Pass | | |







XMit 2022.02.07

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|------------|------------|
| Generator - Signal | Agilent | N5182A | TIF | 2020-08-29 | 2023-08-29 |
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

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

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

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



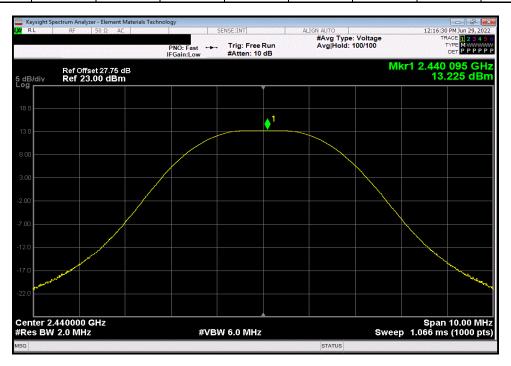
| | | | | | | | | TbtTx 2022.06.03.0 | XMit 2022.02.07.0 |
|---------------------|-----------------------------------|-----------|----------|------------------|---------|--------------|-------------------|--------------------|-------------------|
| EUT: | Titan Gateway | | | | | | Work Order: | NGRF0028 | |
| Serial Number: | PP-G02 | | | | | | Date: | 29-Jun-22 | |
| Customer: | NextGen RF Design | | | | | | Temperature: | 25 °C | |
| Attendees: | Tim Smith | | | | | | Humidity: | 42.4% RH | |
| Project: | | | | | | | Barometric Pres.: | 1021 mbar | |
| | Christopher Heintzelman | | Power: | 120VAC/60Hz | | | Job Site: | MN08 | |
| TEST SPECIFICATI | ONS | | | Test Method | | | | | |
| FCC 15.247:2022 | | | | ANSI C63.10:2013 | | | | | |
| | | | | | | | | | |
| COMMENTS | | | | | | | | | |
| None | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| DEVIATIONS FROM | I TEST STANDARD | | | | | | | | |
| None | | | | | | | | | |
| 0 | 44 | | COSAda. | Kuften | | | | | |
| Configuration # | 14 | 0: | CW/for t | Henten | | | | | |
| | | Signature | | V | | | | | |
| | | | | | Out Pwr | Antenna | EIRP | EIRP Limit | |
| | | | | | (dBm) | Gain (dBi) | (dBm) | (dBm) | Result |
| Mid Channel, 2440 N | | | | | 13.225 | 2.21 2.21 | 15.435 | 36 | Pass |
| High Channel 2479 | Channel 2479 MHz Modulated 12 957 | | | | | | 15 167 | 36 | Pass |



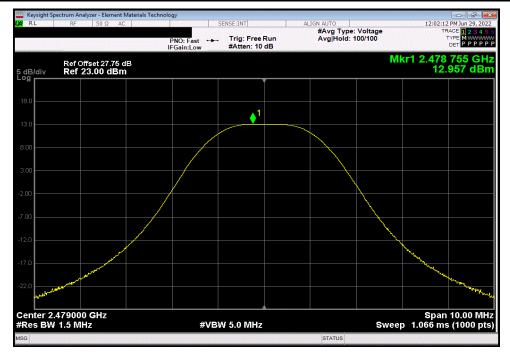
Mid Channel, 2440 MHz, Modulated

Out Pwr Antenna EIRP EIRP Limit
(dBm) Gain (dBi) (dBm) (dBm) Result

13.225 2.21 15.435 36 Pass



| High Channel, 2479 MHz, Modulated | | | | | | | | | | |
|-----------------------------------|--|--|-------|------------|-------|-------|--------|--|--|--|
| Out Pwr Antenna EIRP EIRP Limit | | | | | | | | | | |
| | | | (dBm) | Gain (dBi) | (dBm) | (dBm) | Result | | | |
| 12.957 2.21 15.167 36 Pass | | | | | | | | | | |





XMit 2022.02.07.0

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TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|------------|------------|
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Generator - Signal | Agilent | N5183A | TIK | 2022-01-24 | 2025-01-24 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The 99% occupied bandwidth was measured with the EUT configured for continuous modulated operation.

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

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

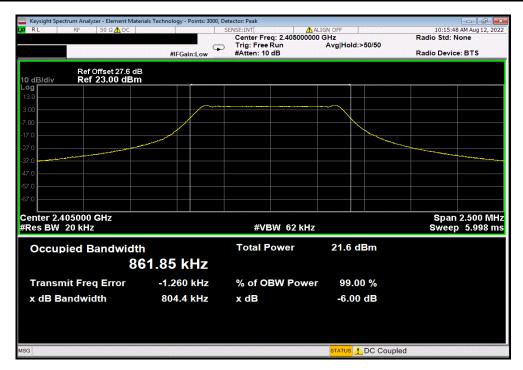
The resolution bandwidth (RBW) of the spectrum analyzer was set to the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) bandwidth was set to at least 3 times the resolution bandwidth. The analyzer sweep time was set to auto to prevent video filtering or averaging. A sample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

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



| | | | | | | | | TbtTx 2022.06.03.0 | XMit 2022.02.07.0 |
|---------------------|-------------------------|---------------------------------------|---------------------|-----------------------|-----------------------|-----------------------------|--------------------|--------------------|-------------------|
| EUT: | Titan Gateway | | | | | | Work Order: | NGRF0028 | |
| Serial Number: | PP-G01 | | | | | | Date: | 12-Aug-22 | |
| Customer: | NextGen RF Design | | | | | | Temperature: | 20.9 °C | |
| Attendees: | Tim Smith | | | | | | Humidity: | | |
| Project: | | | | | | | Barometric Pres.: | | |
| Tested by: | Christopher Heintzelman | | Power: 11 | 0VAC/60Hz | | | Job Site: | MN08 | |
| TEST SPECIFICATI | IONS | | Te | est Method | | | | | |
| FCC 15.247:2022 | | | ΑN | NSI C63.10:2013 | | | | | |
| | | | | | | | | | |
| COMMENTS | | | | | | | | | |
| Reference Level Of | fset includes measureme | nt cable, attenuator, and DC Block. | · | · | | · | | · | |
| DEVIATIONS FROM | // TEST STANDARD | | | | | | | | |
| The narrower RBW | measurement (1-5% of th | e measured value) shows that the 6 of | dB Emissions Bandwi | dth will meet the lim | it with a larger | RBW as specified in | n the standard (10 | 0 kHz). | |
| Configuration # | 17 | Signature | en Am H | cuften | | | | | |
| | | | | | Emissions BW Value | Emissions BW Limit (kHz) | OBW Value | OBW Limit | Results |
| Low Channel, 2405 I | MHz | | | | 804.4 kHz | > 500 kHz | 861.863 kHz | N/A | Pass |







XMit 2022.02.07.0

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TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|------------|------------|
| Generator - Signal | Agilent | N5182A | TIF | 2020-08-29 | 2023-08-29 |
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The 99% occupied bandwidth was measured with the EUT configured for continuous modulated operation.

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

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

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

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



| | | | | | | | | TbtTx 2022.06.03.0 | XMit 2022.02.07.0 |
|---------------------|-------------------------|---------------------------------------|-------------------|-------------------------|-------------------|--------------------|--------------------|--------------------|-------------------|
| EUT: | Titan Gateway | | | | | | Work Order: | NGRF0028 | |
| Serial Number: | PP-G02 | | | | | | Date: | 29-Jun-22 | |
| Customer: | NextGen RF Design | | | | | | Temperature: | 25.2 °C | |
| Attendees: | Tim Smith | | | | | | Humidity: | 42.2% RH | |
| Project: | None | | | | | | Barometric Pres.: | 1020 mbar | |
| Tested by: | Christopher Heintzelman | l | Power: | 120VAC/60Hz | | | Job Site: | MN08 | |
| TEST SPECIFICATI | IONS | | | Test Method | | | | | |
| FCC 15.247:2022 | | | | ANSI C63.10:2013 | | | | | |
| | | | | | | | | | |
| COMMENTS | | | | | | | | | |
| None | | | | | | | | | |
| DEVIATIONS FROM | M TEST STANDARD | | | | | | | | |
| The narrower RBW | measurement (1-5% of th | ne measured value) shows that the 6 c | dB Emissions Band | lwidth will meet the li | mit with a larger | RBW as specified i | n the standard (10 | 00 kHz). | |
| Configuration # | 14 | Signature | er Arm | Harten | | | | | |
| | | • | | • | Emissions | Emissions BW | OBW | OBW | |
| | | | | | BW Value | Limit (kHz) | Value | Limit | Results |
| Mid Channel, 2440 M | MHz, Modulated | _ | | | 799.5 kHz | > 500 kHz | 856.483 kHz | N/A | Pass |
| High Channel, 2479 | MHz, Modulated | | | | 798.3 kHz | > 500 kHz | 856.832 kHz | N/A | Pass |
| | | | | | | | | | |

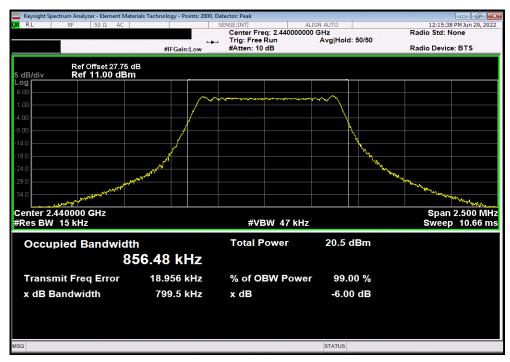


Mid Channel, 2440 MHz, Modulated

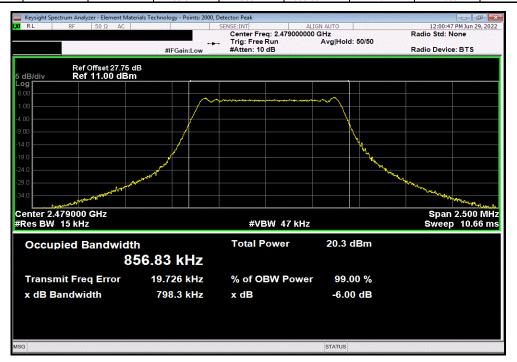
Emissions Emissions BW OBW

BW Value Limit (kHz) Value Limit Results

799.5 kHz > 500 kHz 856.483 kHz N/A Pass



| High Channel, 2479 MHz, Modulated | | | | | | | |
|-----------------------------------|--|--|------------------|---------------------|-------------|-------|---------|
| | | | Emissions | Emissions BW | OBW | OBW | |
| | | | BW Value | Limit (kHz) | Value | Limit | Results |
| 1 | | | 798.3 kHz | > 500 kHz | 856.832 kHz | N/A | Pass |





XMit 2022.02.07.0

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|------------------------------|--------------------|-----------------------|-----|------------|------------|
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| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Generator - Signal | Agilent | N5183A | TIK | 2022-01-24 | 2025-01-24 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

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

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



Work Order: NGRF0028
Date: 12-Aug-22
Temperature: 20,9 °C
Humidity: 51% RH
Barometric Pres: 1021 mbar EUT: Titan Gateway

Serial Number: PP-G01

Customer: NextGen RF Design

Attendees: Tim Smith

Project: None

Tested by: Christopher Heintzelman

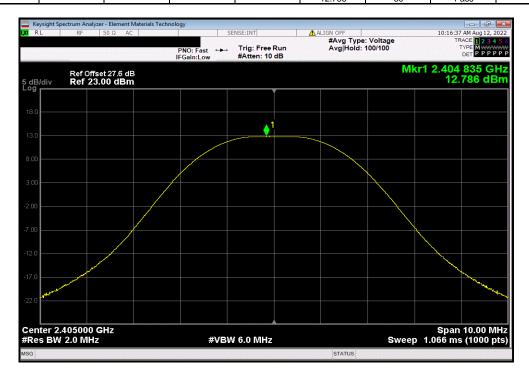
TEST SPECIFICATIONS Power: 110VAC/60Hz Test Method Job Site: MN08 FCC 15.247:2022 COMMENTS Reference Level Offset includes measurement cable, attenuator, and DC Block. DEVIATIONS FROM TEST STANDARD Clithu Hauften Configuration # 17 Signature Out Pwr (dBm) 12.786 Limit (dBm) Result Low Channel, 2405 MHz



Low Channel, 2405 MHz

Out Pwr Limit
(dBm) (dBm) Result

12.786 30 Pass





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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due | | | |
|------------------------------|--------------------|------------------|-----|------------|------------|--|--|--|
| Generator - Signal | Agilent | N5182A | TIF | 2020-08-29 | 2023-08-29 | | | |
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 | | | |
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 | | | |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 | | | |
| Cable | Micro-Coax | D150A-1-0720-200 | MNL | 2021-09-12 | 2022-09-12 | | | |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

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

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



EUT: Titan Gateway

Serial Number: PP-G02

Customer: NextGen RF Design

Attendees: Tim Smith

Project: None

Tested by: Christopher Heintzelman

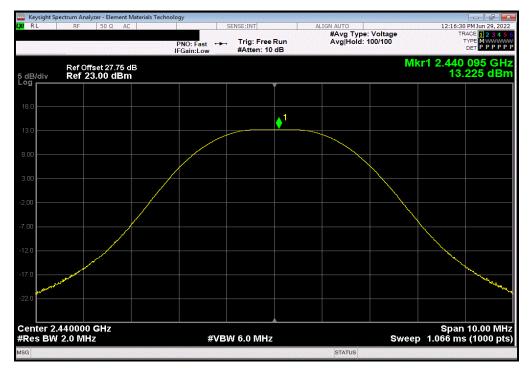
TEST SPECIFICATIONS Work Order: NGRF0028
Date: 29-Jun-22
Temperature: 25.1 °C
Humidity: 42.4% RH
Barometric Pres.: 1020 mbar Power: 120VAC/60Hz Test Method Job Site: MN08 FCC 15.247:2022 COMMENTS Reference Level Offset includes measurement cable, attenuator, and DC block. DEVIATIONS FROM TEST STANDARD Clither Hauften Configuration # 14 Signature Out Pwr (dBm) 13.225 Limit (dBm) Result Mid Channel, 2440 MHz, Modulated Pass Pass High Channel, 2479 MHz, Modulated 30 12.957

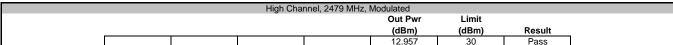


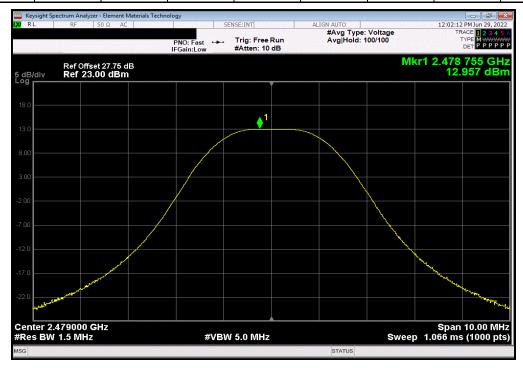
Mid Channel, 2440 MHz, Modulated

Out Pwr Limit
(dBm) (dBm) Result

13.225 30 Pass









XMit 2022.02.07

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|------------|------------|
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Generator - Signal | Agilent | N5183A | TIK | 2022-01-24 | 2025-01-24 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

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



| | | | | | | | TbtTx 2022.06.03.0 | XMit 2022.02.07.0 |
|--------------------|-------------------------|-------------------------------------|--------|------------------|---|-------------------|---------------------|-------------------|
| EUT: | Titan Gateway | | | | | Work Order: | NGRF0028 | |
| Serial Number: | PP-G01 | | | | | Date: | 12-Aug-22 | |
| Customer: | NextGen RF Design | | | | | Temperature: | 20.8 °C | |
| Attendees: | Tim Smith | | | | | Humidity: | 50.5% RH | |
| Project: | None | | | | | Barometric Pres.: | | |
| Tested by: | Christopher Heintzelman | l . | Power: | 110VAC/60Hz | | Job Site: | MN08 | |
| TEST SPECIFICATI | ONS | | | Test Method | | | | |
| FCC 15.247:2022 | | | | ANSI C63.10:2013 | | | | |
| | | | | | | | | |
| COMMENTS | | | | | | | | |
| Reference Level Of | fset includes measureme | nt cable, attenuator, and DC Block. | | | | | | |
| DEVIATIONS FROM | TEST STANDARD | | | | | | | |
| None | | | | | | | | |
| Configuration # | 17 | Signature | er Am | Henten | | | | |
| | | | | | • | Value dBm/3kHz | Limit < dBm/3kHz | Results |
| Low Channel, 2405 | MHz | • | | _ | | -6.514 | 8 | Pass |

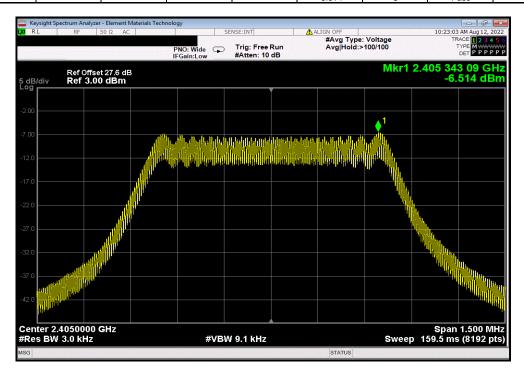


Low Channel, 2405 MHz

Value Limit

dBm/3kHz < dBm/3kHz Results

-6.514 8 Pass





XMit 2022.02.07.0

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 | scription Manufacturer | | ID | Last Cal. | Cal. Due |
|---------------------------------------|------------------------|-----------------------|-----|------------|------------|
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Analyzer - Spectrum Analyzer Keysight | | N9010A | AFM | 2022-04-25 | 2023-04-25 |
| Generator - Signal Agilent | | N5182A | TIF | 2020-08-29 | 2023-08-29 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

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



EUT: Titan Gateway
Serial Number: PP-G02
Customer: NextGen RF Design
Attendees: Tim Smith
Project: None
Tested by: Christopher Heintzelman
TEST SPECIFICATIONS Work Order: NGRF0028
Date: 29-Jun-22
Temperature: 24.7 °C Humidity: 43.2% RH
Barometric Pres.: 1020 mbar Power: 120VAC/60Hz Test Method Job Site: MN08 FCC 15.247:2022 COMMENTS Reference Level Offset includes measurement cable, attenuator, and DC block. DEVIATIONS FROM TEST STANDARD Clithe Houten Configuration # 14 Signature Value dBm/3kHz Limit < dBm/3kHz Results Pass Pass High Channel, 2480 MHz, Modulated -6.108

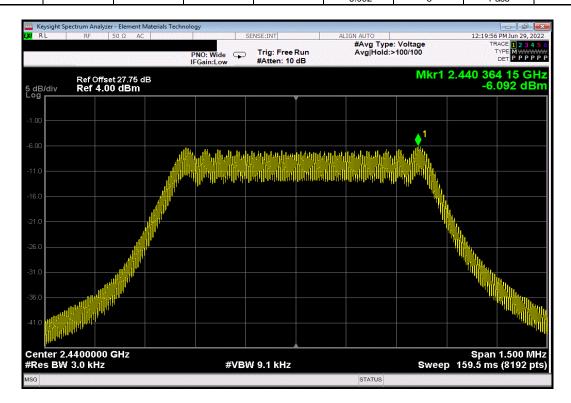


Mid Channel, 2440 MHz, Modulated

Value Limit

dBm/3kHz < dBm/3kHz Results

-6.092 8 Pass



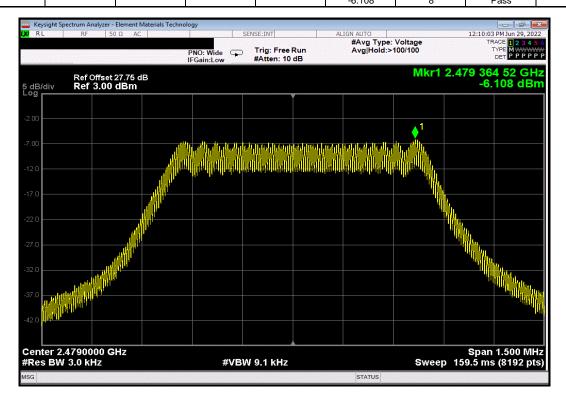


High Channel, 2480 MHz, Modulated

Value Limit

dBm/3kHz < dBm/3kHz Results

-6.108 8 Pass





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 | ARS | 2022-04-20 | 2023-04-20 |
| Cable - Conducted Cable Assembly | Northwest EMC | MNC, HGN, TYK | MNCA | 2022-03-07 | 2023-03-07 |
| LISN | Solar Electronics | 9252-50-R-24-BNC | LIY | 2022-04-04 | 2023-04-04 |

MEASUREMENT UNCERTAINTY

| Description | | |
|--------------|--------|---------|
| Expanded k=2 | 3.2 dB | -3.2 dB |

CONFIGURATIONS INVESTIGATED

NGRF0028-32 NGRF0028-33 NGRF0028-34

MODES INVESTIGATED

Transmitting 2.4 GHz FHSS mode



| EUT: | Titan Gateway | Work Order: | NGRF0028 |
|-------------------|-------------------------|-----------------------|-------------|
| Serial Number: | PP-G01 | Date: | 2022-07-28 |
| Customer: | NextGen RF Design | Temperature: | 20.7°C |
| Attendees: | Kevin Christoffer | Relative Humidity: | 51.7% |
| Customer Project: | None | Bar. Pressure (PMSL): | 1016 mb |
| Tested By: | Christopher Heintzelman | Job Site: | MN03 |
| Power: | 110VAC/60Hz | Configuration: | NGRF0028-32 |

TEST SPECIFICATIONS

| Specification: Equipment Class B | Method: |
|----------------------------------|------------------|
| FCC 15.207:2022 | ANSI C63.10:2013 |

TEST PARAMETERS

| Run #: | 57 | Line: | Neutral | Add. Ext. Attenuation (dB): | 0 |
|--------|----|-------|---------|-----------------------------|---|
| | | | | | |

COMMENTS

Paired with wireless sensor. Connected to WiFi router. Power supply ME20A1203B01.

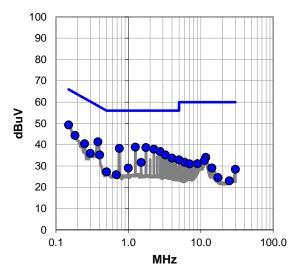
EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

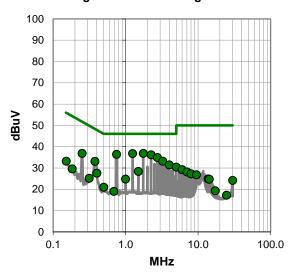
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



0.687

-1.3



-27.0

RESULTS - Run #57

Quasi Peak Data - vs - Quasi Peak Limit

| Quasi Peak Data - vs - Quasi Peak Limit | | | | | | | |
|---|----------------|----------------|-----------------|--------------------------|----------------|--|--|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) | | |
| 0.150 | 28.6 | 20.7 | 49.3 | 66.0 | -16.7 | | |
| 0.380 | 21.1 | 20.3 | 41.4 | 58.3 | -16.9 | | |
| 1.250 | 18.7 | 20.2 | 38.9 | 56.0 | -17.1 | | |
| 1.751 | 18.4 | 20.3 | 38.7 | 56.0 | -17.3 | | |
| 0.750 | 18.0 | 20.3 | 38.3 | 56.0 | -17.7 | | |
| 2.250 | 17.6 | 20.3 | 37.9 | 56.0 | -18.1 | | |
| 2.750 | 16.4 | 20.4 | 36.8 | 56.0 | -19.2 | | |
| 0.184 | 23.9 | 20.5 | 44.4 | 64.3 | -19.9 | | |
| 3.250 | 14.7 | 20.5 | 35.2 | 56.0 | -20.8 | | |
| 0.249 | 20.1 | 20.4 | 40.5 | 61.8 | -21.3 | | |
| 4.000 | 13.2 | 20.5 | 33.7 | 56.0 | -22.3 | | |
| 0.402 | 14.9 | 20.3 | 35.2 | 57.8 | -22.6 | | |
| 0.298 | 15.7 | 20.3 | 36.0 | 60.3 | -24.3 | | |
| 1.500 | 11.4 | 20.3 | 31.7 | 56.0 | -24.3 | | |
| 11.751 | 12.7 | 21.4 | 34.1 | 60.0 | -25.9 | | |
| 1.000 | 8.9 | 20.2 | 29.1 | 56.0 | -26.9 | | |
| 5.001 | 12.3 | 20.6 | 32.9 | 60.0 | -27.1 | | |
| 11.252 | 11.3 | 21.4 | 32.7 | 60.0 | -27.3 | | |
| 6.000 | 11.2 | 20.6 | 31.8 | 60.0 | -28.2 | | |
| 0.501 | 7.0 | 20.3 | 27.3 | 56.0 | -28.7 | | |
| 9.001 | 10.1 | 21.0 | 31.1 | 60.0 | -28.9 | | |
| 7.001 | 10.3 | 20.7 | 31.0 | 60.0 | -29.0 | | |
| 0.681 | 5.6 | 20.3 | 25.9 | 56.0 | -30.1 | | |
| 14.251 | 7.7 | 21.4 | 29.1 | 60.0 | -30.9 | | |
| 30.000 | 6.0 | 22.5 | 28.5 | 60.0 | -31.5 | | |

| Average Data - vs - Average Limit | | | | | | | |
|-----------------------------------|----------------|----------------|-----------------|--------------------------|----------------|--|--|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) | | |
| 1.751 | 16.6 | 20.3 | 36.9 | 46.0 | -9.1 | | |
| 1.250 | 16.6 | 20.2 | 36.8 | 46.0 | -9.2 | | |
| 0.750 | 16.1 | 20.3 | 36.4 | 46.0 | -9.6 | | |
| 2.250 | 15.9 | 20.3 | 36.2 | 46.0 | -9.8 | | |
| 2.750 | 14.5 | 20.4 | 34.9 | 46.0 | -11.1 | | |
| 3.250 | 12.7 | 20.5 | 33.2 | 46.0 | -12.8 | | |
| 4.000 | 11.0 | 20.5 | 31.5 | 46.0 | -14.5 | | |
| 0.251 | 16.5 | 20.4 | 36.9 | 51.7 | -14.8 | | |
| 0.377 | 12.8 | 20.3 | 33.1 | 48.3 | -15.2 | | |
| 1.500 | 8.1 | 20.3 | 28.4 | 46.0 | -17.6 | | |
| 5.001 | 9.8 | 20.6 | 30.4 | 50.0 | -19.6 | | |
| 0.402 | 7.3 | 20.3 | 27.6 | 47.8 | -20.2 | | |
| 6.000 | 8.6 | 20.6 | 29.2 | 50.0 | -20.8 | | |
| 1.000 | 4.6 | 20.2 | 24.8 | 46.0 | -21.2 | | |
| 7.001 | 7.5 | 20.7 | 28.2 | 50.0 | -21.8 | | |
| 0.152 | 12.5 | 20.7 | 33.2 | 55.9 | -22.7 | | |
| 8.000 | 6.4 | 20.9 | 27.3 | 50.0 | -22.7 | | |
| 9.500 | 5.8 | 21.0 | 26.8 | 50.0 | -23.2 | | |
| 0.315 | 4.9 | 20.3 | 25.2 | 49.8 | -24.6 | | |
| 0.184 | 9.1 | 20.5 | 29.6 | 54.3 | -24.7 | | |
| 0.499 | 0.7 | 20.3 | 21.0 | 46.0 | -25.0 | | |
| 13.751 | 3.5 | 21.4 | 24.9 | 50.0 | -25.1 | | |
| 14.251 | 3.3 | 21.4 | 24.7 | 50.0 | -25.3 | | |
| 30.000 | 1.7 | 22.5 | 24.2 | 50.0 | -25.8 | | |

20.3

CONCLUSION

Pass

Tested By



| EUT: | Titan Gateway | Work Order: | NGRF0028 |
|-------------------|-------------------------|-----------------------|-------------|
| Serial Number: | PP-G01 | Date: | 2022-07-28 |
| Customer: | NextGen RF Design | Temperature: | 20.7°C |
| Attendees: | Kevin Christoffer | Relative Humidity: | 51.7% |
| Customer Project: | None | Bar. Pressure (PMSL): | 1016 mb |
| Tested By: | Christopher Heintzelman | Job Site: | MN03 |
| Power: | 110VAC/60Hz | Configuration: | NGRF0028-32 |

TEST SPECIFICATIONS

| Specification: Equipment Class B | Method: |
|----------------------------------|------------------|
| FCC 15.207:2022 | ANSI C63.10:2013 |

TEST PARAMETERS

| Run #: | 58 | Line: | High Line | Add. Ext. Attenuation (dB): | 0 |
|--------|-----|-------|-----------|------------------------------------|---|
| | • • | | g =e | / taa: =/ti: / tito:/aa.io// (a=/) | |

COMMENTS

Paired with wireless sensor. Connected to WiFi router. Power supply ME20A1203B01.

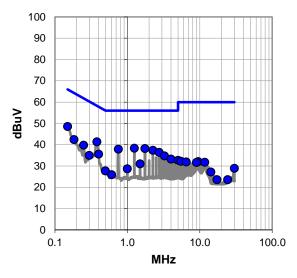
EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

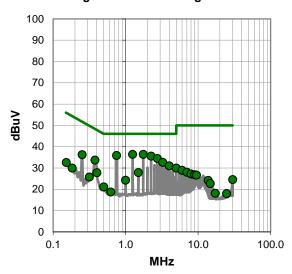
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit





RESULTS - Run #58

Quasi Peak Data - vs - Quasi Peak Limit

| Q | Quasi Peak Data - vs - Quasi Peak Limit | | | | | |
|---------------|---|----------------|-----------------|--------------------------|----------------|--|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) | |
| 0.380 | 21.1 | 20.3 | 41.4 | 58.3 | -16.9 | |
| 0.150 | 27.9 | 20.7 | 48.6 | 66.0 | -17.4 | |
| 1.250 | 18.2 | 20.2 | 38.4 | 56.0 | -17.6 | |
| 1.751 | 17.9 | 20.3 | 38.2 | 56.0 | -17.8 | |
| 0.750 | 17.6 | 20.3 | 37.9 | 56.0 | -18.1 | |
| 2.250 | 17.1 | 20.3 | 37.4 | 56.0 | -18.6 | |
| 2.750 | 16.0 | 20.4 | 36.4 | 56.0 | -19.6 | |
| 3.250 | 14.3 | 20.5 | 34.8 | 56.0 | -21.2 | |
| 0.184 | 21.9 | 20.5 | 42.4 | 64.3 | -21.9 | |
| 0.249 | 19.4 | 20.4 | 39.8 | 61.8 | -22.0 | |
| 0.402 | 15.3 | 20.3 | 35.6 | 57.8 | -22.2 | |
| 4.000 | 12.8 | 20.5 | 33.3 | 56.0 | -22.7 | |
| 1.500 | 10.7 | 20.3 | 31.0 | 56.0 | -25.0 | |
| 0.298 | 14.7 | 20.3 | 35.0 | 60.3 | -25.3 | |
| 5.001 | 12.1 | 20.6 | 32.7 | 60.0 | -27.3 | |
| 1.000 | 8.5 | 20.2 | 28.7 | 56.0 | -27.3 | |
| 5.501 | 11.6 | 20.6 | 32.2 | 60.0 | -27.8 | |
| 9.500 | 11.1 | 21.0 | 32.1 | 60.0 | -27.9 | |
| 6.500 | 11.2 | 20.7 | 31.9 | 60.0 | -28.1 | |
| 11.751 | 10.4 | 21.4 | 31.8 | 60.0 | -28.2 | |
| 0.498 | 7.4 | 20.3 | 27.7 | 56.0 | -28.3 | |
| 9.000 | 10.7 | 21.0 | 31.7 | 60.0 | -28.3 | |
| 0.606 | 5.6 | 20.3 | 25.9 | 56.0 | -30.1 | |
| 30.000 | 6.4 | 22.5 | 28.9 | 60.0 | -31.1 | |
| 14.251 | 5.8 | 21.4 | 27.2 | 60.0 | -32.8 | |

| Average Data - vs - Average Limit | | | | | |
|-----------------------------------|----------------|----------------|-----------------|--------------------------|----------------|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
| 1.250 | 16.2 | 20.2 | 36.4 | 46.0 | -9.6 |
| 1.751 | 16.1 | 20.3 | 36.4 | 46.0 | -9.6 |
| 0.750 | 15.6 | 20.3 | 35.9 | 46.0 | -10.1 |
| 2.250 | 15.3 | 20.3 | 35.6 | 46.0 | -10.4 |
| 2.750 | 14.1 | 20.4 | 34.5 | 46.0 | -11.5 |
| 3.250 | 12.2 | 20.5 | 32.7 | 46.0 | -13.3 |
| 0.377 | 13.4 | 20.3 | 33.7 | 48.3 | -14.6 |
| 4.000 | 10.5 | 20.5 | 31.0 | 46.0 | -15.0 |
| 0.251 | 15.9 | 20.4 | 36.3 | 51.7 | -15.4 |
| 1.500 | 7.6 | 20.3 | 27.9 | 46.0 | -18.1 |
| 0.402 | 7.5 | 20.3 | 27.8 | 47.8 | -20.0 |
| 5.001 | 9.4 | 20.6 | 30.0 | 50.0 | -20.0 |
| 6.000 | 8.3 | 20.6 | 28.9 | 50.0 | -21.1 |
| 1.000 | 4.1 | 20.2 | 24.3 | 46.0 | -21.7 |
| 7.001 | 7.3 | 20.7 | 28.0 | 50.0 | -22.0 |
| 8.000 | 6.3 | 20.9 | 27.2 | 50.0 | -22.8 |
| 9.001 | 5.8 | 21.0 | 26.8 | 50.0 | -23.2 |
| 0.152 | 11.9 | 20.7 | 32.6 | 55.9 | -23.3 |
| 9.500 | 5.7 | 21.0 | 26.7 | 50.0 | -23.3 |
| 0.316 | 5.5 | 20.3 | 25.8 | 49.8 | -24.0 |
| 0.184 | 9.5 | 20.5 | 30.0 | 54.3 | -24.3 |
| 0.499 | 0.8 | 20.3 | 21.1 | 46.0 | -24.9 |
| 30.000 | 2.1 | 22.5 | 24.6 | 50.0 | -25.4 |
| 13.751 | 2.8 | 21.4 | 24.2 | 50.0 | -25.8 |
| 14.750 | 1.2 | 21.5 | 22.7 | 50.0 | -27.3 |

CONCLUSION

Pass

Tested By



| EUT: | Titan Gateway | Work Order: | NGRF0028 |
|-------------------|-------------------------|-----------------------|-------------|
| Serial Number: | PP-G01 | Date: | 2022-07-28 |
| Customer: | NextGen RF Design | Temperature: | 20.7°C |
| Attendees: | Kevin Christoffer | Relative Humidity: | 51.7% |
| Customer Project: | None | Bar. Pressure (PMSL): | 1016 mb |
| Tested By: | Christopher Heintzelman | Job Site: | MN03 |
| Power: | 110VAC/60Hz | Configuration: | NGRF0028-33 |

TEST SPECIFICATIONS

| Specification: Equipment Class B | Method: |
|----------------------------------|------------------|
| FCC 15.207:2022 | ANSI C63.10:2013 |

TEST PARAMETERS

| Run #: | 59 | Line: | High Line | Add. Ext. Attenuation (dB): | 0 |
|---------|----|--------|--------------|------------------------------|---|
| π . | 55 | LITIC. | riigii Liile | Add. Lxt. Atteridation (db). | U |

COMMENTS

Paired with wireless sensor. Connected to WiFi router. Power supply GlobTek WR9HE1000LCPIMFR6B.

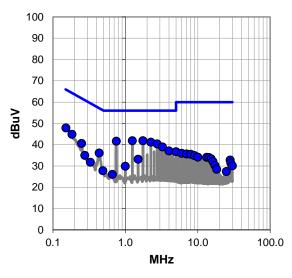
EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

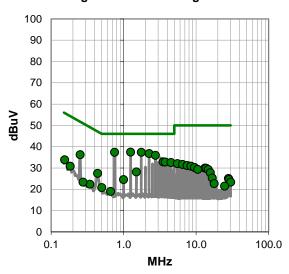
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit





-24.7

RESULTS - Run #59

Quasi Peak Data - vs - Quasi Peak Limit

| Q | uasi Peak | Data - vs | - Quasi F | <u>'eak Limit</u> | |
|---------------|----------------|----------------|--------------------|--------------------------|----------------|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
| 1.250 | 21.7 | 20.2 | 41.9 | 56.0 | -14.1 |
| 1.751 | 21.6 | 20.3 | 41.9 | 56.0 | -14.1 |
| 0.750 | 21.4 | 20.3 | 41.7 | 56.0 | -14.3 |
| 2.250 | 20.9 | 20.3 | 41.2 | 56.0 | -14.8 |
| 2.750 | 20.0 | 20.4 | 40.4 | 56.0 | -15.6 |
| 3.250 | 18.5 | 20.5 | 39.0 | 56.0 | -17.0 |
| 0.152 | 27.2 | 20.7 | 47.9 | 65.9 | -18.0 |
| 4.000 | 16.6 | 20.5 | 37.1 | 56.0 | -18.9 |
| 0.184 | 24.4 | 20.5 | 44.9 | 64.3 | -19.4 |
| 0.435 | 15.8 | 20.3 | 36.1 | 57.2 | -21.1 |
| 0.249 | 20.2 | 20.4 | 40.6 | 61.8 | -21.2 |
| 1.500 | 12.9 | 20.3 | 33.2 | 56.0 | -22.8 |
| 5.001 | 16.1 | 20.6 | 36.7 | 60.0 | -23.3 |
| 6.000 | 15.4 | 20.6 | 36.0 | 60.0 | -24.0 |
| 7.001 | 15.0 | 20.7 | 35.7 | 60.0 | -24.3 |
| 8.000 | 14.6 | 20.9 | 35.5 | 60.0 | -24.5 |
| 9.001 | 13.9 | 21.0 | 34.9 | 60.0 | -25.1 |
| 10.001 | 13.1 | 21.1 | 34.2 | 60.0 | -25.8 |
| 13.251 | 12.7 | 21.4 | 34.1 | 60.0 | -25.9 |
| 14.251 | 12.6 | 21.4 | 34.0 | 60.0 | -26.0 |
| 0.275 | 14.7 | 20.3 | 35.0 | 61.0 | -26.0 |
| 1.000 | 9.7 | 20.2 | 29.9 | 56.0 | -26.1 |
| 15.251 | 11.9 | 21.5 | 33.4 | 60.0 | -26.6 |
| 28.002 | 10.4 | 22.4 | 32.8 | 60.0 | -27.2 |
| 0.330 | 11.5 | 20.3 | 31.8 | 59.5 | -27.7 |

| | Average Data - vs - Average Limit | | | | | |
|---------------|-----------------------------------|----------------|-----------------|--------------------------|----------------|--|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) | |
| 1.250 | 17.3 | 20.2 | 37.5 | 46.0 | -8.5 | |
| 1.751 | 17.1 | 20.3 | 37.4 | 46.0 | -8.6 | |
| 0.750 | 17.1 | 20.3 | 37.4 | 46.0 | -8.6 | |
| 2.250 | 16.5 | 20.3 | 36.8 | 46.0 | -9.2 | |
| 2.750 | 15.6 | 20.4 | 36.0 | 46.0 | -10.0 | |
| 3.501 | 12.4 | 20.5 | 32.9 | 46.0 | -13.1 | |
| 3.751 | 12.3 | 20.5 | 32.8 | 46.0 | -13.2 | |
| 4.500 | 12.1 | 20.5 | 32.6 | 46.0 | -13.4 | |
| 0.251 | 15.9 | 20.4 | 36.3 | 51.7 | -15.4 | |
| 1.500 | 7.9 | 20.3 | 28.2 | 46.0 | -17.8 | |
| 5.501 | 11.5 | 20.6 | 32.1 | 50.0 | -17.9 | |
| 6.500 | 11.0 | 20.7 | 31.7 | 50.0 | -18.3 | |
| 7.501 | 10.4 | 20.8 | 31.2 | 50.0 | -18.8 | |
| 8.501 | 10.0 | 20.9 | 30.9 | 50.0 | -19.1 | |
| 0.438 | 7.2 | 20.3 | 27.5 | 47.1 | -19.6 | |
| 9.502 | 9.3 | 21.0 | 30.3 | 50.0 | -19.7 | |
| 13.251 | 8.6 | 21.4 | 30.0 | 50.0 | -20.0 | |
| 13.751 | 8.5 | 21.4 | 29.9 | 50.0 | -20.1 | |
| 10.501 | 8.2 | 21.2 | 29.4 | 50.0 | -20.6 | |
| 14.752 | 7.8 | 21.5 | 29.3 | 50.0 | -20.7 | |
| 1.000 | 4.4 | 20.2 | 24.6 | 46.0 | -21.4 | |
| 0.153 | 13.2 | 20.7 | 33.9 | 55.8 | -21.9 | |
| 15.751 | 6.3 | 21.5 | 27.8 | 50.0 | -22.2 | |
| 0.184 | 10.4 | 20.5 | 30.9 | 54.3 | -23.4 | |

21.6

16.752

CONCLUSION

Pass

Tested By



| EUT: | Titan Gateway | Work Order: | NGRF0028 |
|-------------------|-------------------------|-----------------------|-------------|
| Serial Number: | PP-G01 | Date: | 2022-07-28 |
| Customer: | NextGen RF Design | Temperature: | 20.7°C |
| Attendees: | Kevin Christoffer | Relative Humidity: | 51.7% |
| Customer Project: | None | Bar. Pressure (PMSL): | 1016 mb |
| Tested By: | Christopher Heintzelman | Job Site: | MN03 |
| Power: | 110VAC/60Hz | Configuration: | NGRF0028-33 |

TEST SPECIFICATIONS

| Specification: Equipment Class B | Method: |
|----------------------------------|------------------|
| FCC 15.207:2022 | ANSI C63.10:2013 |

TEST PARAMETERS

| Run #: | 60 | Line: | Neutral | Add. Ext. Attenuation (dB): | 0 |
|--------|----|-------|---------|-----------------------------|---|
| | | _ | | (1) | |

COMMENTS

Paired with wireless sensor. Connected to WiFi router. Power supply GlobTek WR9HE1000LCPIMFR6B.

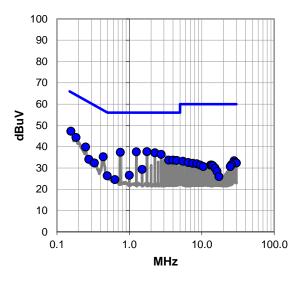
EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

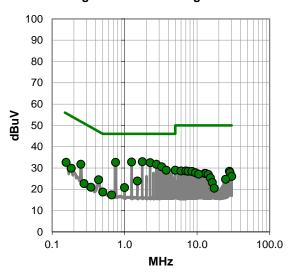
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit





-22.1

-22.2

-22.5

-22.6

-22.6

-22.9

-23.0

-23.0

-23.9

-24.4

RESULTS - Run #60

| Qı | Quasi Peak Data - vs - Quasi Peak Limit | | | | | | |
|---------------|---|----------------|-----------------|--------------------------|----------------|--|--|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) | | |
| 1.751 | 17.4 | 20.3 | 37.7 | 56.0 | -18.3 | | |
| 1.250 | 17.4 | 20.2 | 37.6 | 56.0 | -18.4 | | |
| 0.156 | 26.6 | 20.7 | 47.3 | 65.7 | -18.4 | | |
| 0.750 | 17.1 | 20.3 | 37.4 | 56.0 | -18.6 | | |
| 2.250 | 16.9 | 20.3 | 37.2 | 56.0 | -18.8 | | |
| 2.750 | 16.0 | 20.4 | 36.4 | 56.0 | -19.6 | | |
| 0.184 | 23.9 | 20.5 | 44.4 | 64.3 | -19.9 | | |
| 0.437 | 15.0 | 20.3 | 35.3 | 57.1 | -21.8 | | |
| 0.249 | 19.5 | 20.4 | 39.9 | 61.8 | -21.9 | | |
| 3.501 | 13.2 | 20.5 | 33.7 | 56.0 | -22.3 | | |
| 4.001 | 13.2 | 20.5 | 33.7 | 56.0 | -22.3 | | |
| 4.500 | 13.1 | 20.5 | 33.6 | 56.0 | -22.4 | | |
| 28.002 | 11.0 | 22.4 | 33.4 | 60.0 | -26.6 | | |
| 1.500 | 9.1 | 20.3 | 29.4 | 56.0 | -26.6 | | |
| 5.501 | 12.6 | 20.6 | 33.2 | 60.0 | -26.8 | | |
| 0.275 | 13.8 | 20.3 | 34.1 | 61.0 | -26.9 | | |
| 0.330 | 12.1 | 20.3 | 32.4 | 59.5 | -27.1 | | |
| 6.500 | 11.9 | 20.7 | 32.6 | 60.0 | -27.4 | | |
| 28.503 | 10.2 | 22.4 | 32.6 | 60.0 | -27.4 | | |
| 30.000 | 9.9 | 22.5 | 32.4 | 60.0 | -27.6 | | |
| 7.501 | 11.4 | 20.8 | 32.2 | 60.0 | -27.8 | | |
| 8.501 | 11.1 | 20.9 | 32.0 | 60.0 | -28.0 | | |
| 25.753 | 9.5 | 22.1 | 31.6 | 60.0 | -28.4 | | |
| 9.500 | 10.4 | 21.0 | 31.4 | 60.0 | -28.6 | | |
| 13.251 | 10.0 | 21.4 | 31.4 | 60.0 | -28.6 | | |

| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Limit (dBuV) | Margin (dB) |
|---------------|----------------|----------------|-----------------|-----------------|----------------|
| 1.751 | 12.7 | 20.3 | 33.0 | 46.0 | -13.0 |
| 1.250 | 12.6 | 20.2 | 32.8 | 46.0 | -13.2 |
| 0.750 | 12.4 | 20.3 | 32.7 | 46.0 | -13.3 |
| 2.250 | 12.2 | 20.3 | 32.5 | 46.0 | -13.5 |
| 2.750 | 11.4 | 20.4 | 31.8 | 46.0 | -14.2 |
| 3.250 | 10.1 | 20.5 | 30.6 | 46.0 | -15.4 |
| 3.751 | 8.5 | 20.5 | 29.0 | 46.0 | -17.0 |
| 0.249 | 11.4 | 20.4 | 31.8 | 51.8 | -20.0 |
| 5.001 | 8.4 | 20.6 | 29.0 | 50.0 | -21.0 |
| 6.000 | 8.0 | 20.6 | 28.6 | 50.0 | -21.4 |
| 7.001 | 7.9 | 20.7 | 28.6 | 50.0 | -21.4 |
| 7.501 | 7.7 | 20.8 | 28.5 | 50.0 | -21.5 |
| 28.002 | 6.1 | 22.4 | 28.5 | 50.0 | -21.5 |
| 8.501 | 7.5 | 20.9 | 28.4 | 50.0 | -21.6 |
| 28.503 | 5.5 | 22.4 | 27.9 | 50.0 | -22.1 |

20.3

21.0

21.4

21.4

20.3

21.2

20.7

21.4

22.5

23.9

27.8

27.5

27.4

24.5

27.1

32.7

27.0

26.1

50.0

50.0

50.0

47.1

50.0

55.7

50.0

50.0

54.3

3.6

6.8

6.1

6.0

4.2

12.0

5.6

3.6

9.500

12.752

13.251

0.437

10.501

0.156

14.251

30.000

0.184

Average Data - vs - Average Limit

CONCLUSION

Pass

Tested By



| EUT: | Titan Gateway | Work Order: | NGRF0028 |
|-------------------|-------------------------|-----------------------|-------------|
| Serial Number: | PP-G01 | Date: | 2022-07-28 |
| Customer: | NextGen RF Design | Temperature: | 20.7°C |
| Attendees: | Kevin Christoffer | Relative Humidity: | 51.7% |
| Customer Project: | None | Bar. Pressure (PMSL): | 1016 mb |
| Tested By: | Christopher Heintzelman | Job Site: | MN03 |
| Power: | 110VAC/60Hz | Configuration: | NGRF0028-34 |

TEST SPECIFICATIONS

| Specification: Equipment Class B | Method: |
|----------------------------------|------------------|
| FCC 15.207:2022 | ANSI C63.10:2013 |

TEST PARAMETERS

| rtdir#. 01 Line. Nedital Add. Ext. Attendation (db). 0 | Run #: | 61 | Line: | Neutral | Add. Ext. Attenuation (dB): | 0 |
|--|--------|----|-------|---------|-----------------------------|---|
|--|--------|----|-------|---------|-----------------------------|---|

COMMENTS

Paired with wireless sensor. Connected to WiFi router. Power supply MeanWell GSM18U12-P1J

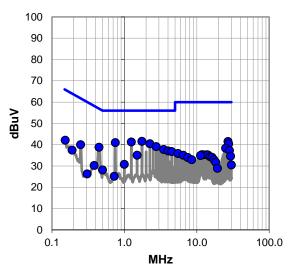
EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

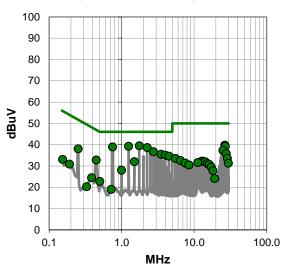
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit





RESULTS - Run #61

Quasi Peak Data - vs - Quasi Peak Limit

| Qı | <u>uasi Peak</u> | Data - vs | - Quasi F | | |
|---------------|------------------|----------------|-----------------|--------------------------|----------------|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
| 1.751 | 21.3 | 20.3 | 41.6 | 56.0 | -14.4 |
| 1.250 | 21.1 | 20.2 | 41.3 | 56.0 | -14.7 |
| 0.750 | 20.7 | 20.3 | 41.0 | 56.0 | -15.0 |
| 2.250 | 20.2 | 20.3 | 40.5 | 56.0 | -15.5 |
| 2.750 | 18.7 | 20.4 | 39.1 | 56.0 | -16.9 |
| 0.448 | 18.5 | 20.3 | 38.8 | 56.9 | -18.1 |
| 3.501 | 17.3 | 20.5 | 37.8 | 56.0 | -18.2 |
| 27.003 | 19.3 | 22.2 | 41.5 | 60.0 | -18.5 |
| 4.000 | 16.6 | 20.5 | 37.1 | 56.0 | -18.9 |
| 4.500 | 16.3 | 20.5 | 36.8 | 56.0 | -19.2 |
| 27.503 | 18.0 | 22.4 | 40.4 | 60.0 | -19.6 |
| 1.500 | 14.8 | 20.3 | 35.1 | 56.0 | -20.9 |
| 25.002 | 16.4 | 22.0 | 38.4 | 60.0 | -21.6 |
| 0.249 | 19.6 | 20.4 | 40.0 | 61.8 | -21.8 |
| 28.252 | 14.9 | 22.4 | 37.3 | 60.0 | -22.7 |
| 0.153 | 21.4 | 20.7 | 42.1 | 65.8 | -23.7 |
| 5.501 | 15.3 | 20.6 | 35.9 | 60.0 | -24.1 |
| 13.751 | 13.9 | 21.4 | 35.3 | 60.0 | -24.7 |
| 11.751 | 13.9 | 21.4 | 35.3 | 60.0 | -24.7 |
| 12.251 | 13.9 | 21.4 | 35.3 | 60.0 | -24.7 |
| 14.251 | 13.8 | 21.4 | 35.2 | 60.0 | -24.8 |
| 6.500 | 14.4 | 20.7 | 35.1 | 60.0 | -24.9 |
| 11.252 | 13.5 | 21.4 | 34.9 | 60.0 | -25.1 |
| 1.000 | 10.6 | 20.2 | 30.8 | 56.0 | -25.2 |
| 29.253 | 12.1 | 22.5 | 34.6 | 60.0 | -25.4 |

| Average Data - vs - Average Limit | | | | | | |
|-----------------------------------|----------------|----------------|-----------------|--------------------------|----------------|--|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) | |
| 1.751 | 19.2 | 20.3 | 39.5 | 46.0 | -6.5 | |
| 1.250 | 19.1 | 20.2 | 39.3 | 46.0 | -6.7 | |
| 0.750 | 18.7 | 20.3 | 39.0 | 46.0 | -7.0 | |
| 2.250 | 18.4 | 20.3 | 38.7 | 46.0 | -7.3 | |
| 2.750 | 16.3 | 20.4 | 36.7 | 46.0 | -9.3 | |
| 26.504 | 17.6 | 22.2 | 39.8 | 50.0 | -10.2 | |
| 3.501 | 15.0 | 20.5 | 35.5 | 46.0 | -10.5 | |
| 27.003 | 17.1 | 22.2 | 39.3 | 50.0 | -10.7 | |
| 4.001 | 14.6 | 20.5 | 35.1 | 46.0 | -10.9 | |
| 4.500 | 14.1 | 20.5 | 34.6 | 46.0 | -11.4 | |
| 25.002 | 15.3 | 22.0 | 37.3 | 50.0 | -12.7 | |
| 0.251 | 17.7 | 20.4 | 38.1 | 51.7 | -13.6 | |
| 1.500 | 11.8 | 20.3 | 32.1 | 46.0 | -13.9 | |
| 0.448 | 12.5 | 20.3 | 32.8 | 46.9 | -14.1 | |
| 27.753 | 13.4 | 22.4 | 35.8 | 50.0 | -14.2 | |
| 5.501 | 13.0 | 20.6 | 33.6 | 50.0 | -16.4 | |
| 28.753 | 11.2 | 22.4 | 33.6 | 50.0 | -16.4 | |
| 6.500 | 11.9 | 20.7 | 32.6 | 50.0 | -17.4 | |
| 12.752 | 10.9 | 21.4 | 32.3 | 50.0 | -17.7 | |
| 13.252 | 10.8 | 21.4 | 32.2 | 50.0 | -17.8 | |
| 14.251 | 10.6 | 21.4 | 32.0 | 50.0 | -18.0 | |
| 1.000 | 7.8 | 20.2 | 28.0 | 46.0 | -18.0 | |
| 11.252 | 10.2 | 21.4 | 31.6 | 50.0 | -18.4 | |
| 7.501 | 10.6 | 20.8 | 31.4 | 50.0 | -18.6 | |
| | | | | | | |

CONCLUSION

Pass

Tested By



| EUT: | Titan Gateway | Work Order: | NGRF0028 |
|-------------------|-------------------------|-----------------------|-------------|
| Serial Number: | PP-G01 | Date: | 2022-07-28 |
| Customer: | NextGen RF Design | Temperature: | 20.7°C |
| Attendees: | Kevin Christoffer | Relative Humidity: | 51.7% |
| Customer Project: | None | Bar. Pressure (PMSL): | 1016 mb |
| Tested By: | Christopher Heintzelman | Job Site: | MN03 |
| Power: | 110VAC/60Hz | Configuration: | NGRF0028-34 |

TEST SPECIFICATIONS

| Specification: Equipment Class B | Method: |
|----------------------------------|------------------|
| FCC 15.207:2022 | ANSI C63.10:2013 |

TEST PARAMETERS

| Run #: | 62 | Line: | High Line | Add. Ext. Attenuation (dB): | 0 |
|--------|----|-------|-----------|-----------------------------|---|

COMMENTS

Paired with wireless sensor. Connected to WiFi router. Power supply MeanWell GSM18U12-P1J

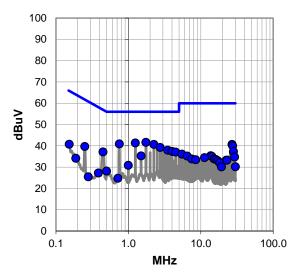
EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

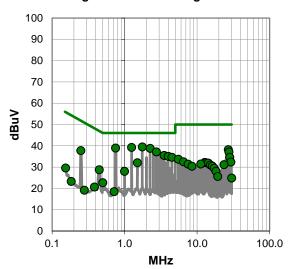
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit





RESULTS - Run #62

| Quasi Peak Data - vs - Quasi Peak Limit | | | | | |
|---|----------------|----------------|--------------------|--------------------------|----------------|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
| 1.751 | 21.4 | 20.3 | 41.7 | 56.0 | -14.3 |
| 1.250 | 21.2 | 20.2 | 41.4 | 56.0 | -14.6 |
| 0.750 | 20.6 | 20.3 | 40.9 | 56.0 | -15.1 |
| 2.250 | 20.4 | 20.3 | 40.7 | 56.0 | -15.3 |
| 2.750 | 18.9 | 20.4 | 39.3 | 56.0 | -16.7 |
| 3.501 | 17.5 | 20.5 | 38.0 | 56.0 | -18.0 |
| 4.000 | 16.9 | 20.5 | 37.4 | 56.0 | -18.6 |
| 4.500 | 16.6 | 20.5 | 37.1 | 56.0 | -18.9 |
| 27.003 | 18.5 | 22.2 | 40.7 | 60.0 | -19.3 |
| 0.448 | 16.9 | 20.3 | 37.2 | 56.9 | -19.7 |
| 27.503 | 17.6 | 22.4 | 40.0 | 60.0 | -20.0 |
| 1.500 | 15.0 | 20.3 | 35.3 | 56.0 | -20.7 |
| 0.251 | 19.3 | 20.4 | 39.7 | 61.7 | -22.0 |
| 28.252 | 14.9 | 22.4 | 37.3 | 60.0 | -22.7 |
| 5.501 | 15.5 | 20.6 | 36.1 | 60.0 | -23.9 |
| 13.751 | 14.0 | 21.4 | 35.4 | 60.0 | -24.6 |
| 6.500 | 14.5 | 20.7 | 35.2 | 60.0 | -24.8 |
| 14.251 | 13.7 | 21.4 | 35.1 | 60.0 | -24.9 |
| 0.153 | 20.1 | 20.7 | 40.8 | 65.8 | -25.0 |
| 1.000 | 10.7 | 20.2 | 30.9 | 56.0 | -25.1 |
| 29.253 | 12.3 | 22.5 | 34.8 | 60.0 | -25.2 |
| 11.252 | 13.1 | 21.4 | 34.5 | 60.0 | -25.5 |
| 7.500 | 13.1 | 20.8 | 33.9 | 60.0 | -26.1 |
| 15.251 | 12.4 | 21.5 | 33.9 | 60.0 | -26.1 |
| 16.252 | 12.0 | 21.6 | 33.6 | 60.0 | -26.4 |

| Average Data - vs - Average Limit | | | | | |
|-----------------------------------|----------------|----------------|-----------------|--------------------------|----------------|
| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
| 1.751 | 19.2 | 20.3 | 39.5 | 46.0 | -6.5 |
| 1.250 | 19.1 | 20.2 | 39.3 | 46.0 | -6.7 |
| 0.750 | 18.7 | 20.3 | 39.0 | 46.0 | -7.0 |
| 2.250 | 18.5 | 20.3 | 38.8 | 46.0 | -7.2 |
| 2.750 | 16.8 | 20.4 | 37.2 | 46.0 | -8.8 |
| 3.501 | 15.0 | 20.5 | 35.5 | 46.0 | -10.5 |
| 4.001 | 14.6 | 20.5 | 35.1 | 46.0 | -10.9 |
| 4.500 | 14.1 | 20.5 | 34.6 | 46.0 | -11.4 |
| 27.003 | 16.0 | 22.2 | 38.2 | 50.0 | -11.8 |
| 27.503 | 14.7 | 22.4 | 37.1 | 50.0 | -12.9 |
| 1.500 | 11.8 | 20.3 | 32.1 | 46.0 | -13.9 |
| 0.249 | 17.4 | 20.4 | 37.8 | 51.8 | -14.0 |
| 28.252 | 12.2 | 22.4 | 34.6 | 50.0 | -15.4 |
| 5.501 | 13.1 | 20.6 | 33.7 | 50.0 | -16.3 |
| 6.500 | 11.8 | 20.7 | 32.5 | 50.0 | -17.5 |
| 29.253 | 9.9 | 22.5 | 32.4 | 50.0 | -17.6 |
| 12.752 | 10.8 | 21.4 | 32.2 | 50.0 | -17.8 |
| 13.251 | 10.7 | 21.4 | 32.1 | 50.0 | -17.9 |
| 1.000 | 7.8 | 20.2 | 28.0 | 46.0 | -18.0 |
| 0.448 | 8.5 | 20.3 | 28.8 | 46.9 | -18.1 |
| 14.251 | 10.5 | 21.4 | 31.9 | 50.0 | -18.1 |
| 11.252 | 10.1 | 21.4 | 31.5 | 50.0 | -18.5 |
| 7.501 | 10.6 | 20.8 | 31.4 | 50.0 | -18.6 |

22.0

23.502

15.252

CONCLUSION

Pass

Tested By

31.2

50.0

-18.8

-19.0



XMit 2022.02.07.0

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 |
|------------------------------|--------------------|-----------------------|-----|------------|------------|
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Generator - Signal | Agilent | N5183A | TIK | 2022-01-24 | 2025-01-24 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the fundamental was measured with a 100 kHz resolution bandwidth and the highest value was recorded. The rest of the spectrum was then measured with a 100 kHz resolution bandwidth and the highest value was found. The difference between the value found on the fundamental and the rest of the spectrum was compared against the limit to determine compliance.

The reference level offset for the fundamental screen capture was based on a measured value of the loss between the spectrum analyzer and the EUT which was verified at the time of test. The remaining screen capture(s) use an internal transducer factor on the analyzer to correct the displayed trace based on the cable loss over frequency. The reference level offset for the additional screen capture(s) is then based on the expected attenuator value and any other losses.

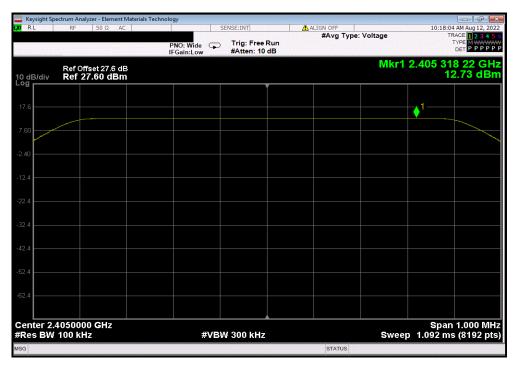
Fundamental Offset = Ref Lvl Offset showing measured composite factor of all losses

Remaining Screen capture(s) Offset = "Internal" cable loss factor not shown on screen capture + Ref Lvl Offset showing expected attenuator value and any other losses

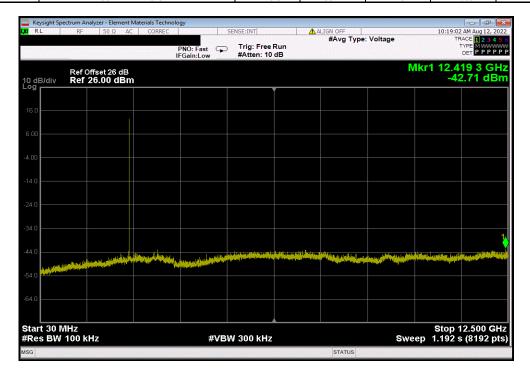


| | | | | | | TbtTx 2022.06.03.0 | XMit 2022.02.07.0 |
|-------------------------|--|------------------------------|--------------------|------------|-------------------|--------------------|-------------------|
| EUT: Tita | an Gateway | | | | Work Order: | NGRF0028 | |
| Serial Number: PP- | -G01 | | | | Date: | 12-Aug-22 | |
| Customer: Nex | ktGen RF Design | | | | Temperature: | 20.7 °C | |
| Attendees: Tim | n Smith | | | | Humidity: | 50.5% RH | |
| Project: Nor | ne | | | | Barometric Pres.: | 1021 mbar | |
| Tested by: Chr | ristopher Heintzelman | | Power: 110VAC/60Hz | | Job Site: | MN08 | |
| TEST SPECIFICATIONS | | | Test Method | | | | |
| FCC 15.247:2022 | | | ANSI C63.10:2013 | | | | |
| | | | | | | | |
| COMMENTS | | | | | | | |
| D-f | In all orders are a second and a selection | | | | | | |
| Reference Level Offset | includes measurement cabl | e, attenuator, and DC Block. | • | | | | |
| | | | | | | | |
| DEL // 1 TION OF DOM TO | 07.07.110.100 | | | | | | |
| DEVIATIONS FROM TE | SISIANDARD | | | | | | |
| None | | | | | | | |
| | | | Clither Hauften | | | | |
| Configuration # | 17 | (| In the Houtten | | | | |
| | | Signature | | | | | |
| • | • | <u> </u> | Frequency | Measured | Max Value | Limit | |
| | | | Range | Freq (MHz) | (dBc) | ≤ (dBc) | Result |
| Low Channel, 2405 MHz | | | Fundamental | 2405.32 | N/A | N/A | N/A |
| Low Channel, 2405 MHz | | | 30 MHz - 12.5 GHz | 12419.31 | -55.44 | -20 | Pass |
| Low Channel, 2405 MHz | | | 12.5 GHz - 25 GHz | 24803.14 | -43.48 | -20 | Pass |
| LUW CHAIRIEI, 2405 MITZ | | | 12.3 GHZ - 25 GHZ | 24003.14 | -43.40 | -20 | rass |





| Low Channel, 2405 MHz | | | | | |
|-----------------------|-------------------|------------|-----------|---------|--------|
| | Frequency | Measured | Max Value | Limit | |
| | Range | Freq (MHz) | (dBc) | ≤ (dBc) | Result |
| ı İ | 30 MHz - 12.5 GHz | 12419.31 | -55.44 | -20 | Pass |





 Low Channel, 2405 MHz

 Frequency
 Measured
 Max Value
 Limit

 Range
 Freq (MHz)
 (dBc)
 ≤ (dBc)
 Result

 12.5 GHz - 25 GHz
 24803.14
 -43.48
 -20
 Pass





XMit 2022.02.07.

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|-----------------------|-----|------------|------------|
| Attenuator | Fairview Microwave | 18B5W-26 | RFY | 2022-05-30 | 2023-05-30 |
| Block - DC | Fairview Microwave | SD3379 | AMI | 2021-08-13 | 2022-08-13 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | MNL | 2021-09-12 | 2022-09-12 |
| Generator - Signal | Agilent | N5182A | TIF | 2020-08-29 | 2023-08-29 |
| Analyzer - Spectrum Analyzer | Keysight | N9010A | AFM | 2022-04-25 | 2023-04-25 |

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the fundamental was measured with a 100 kHz resolution bandwidth and the highest value was recorded. The rest of the spectrum was then measured with a 100 kHz resolution bandwidth and the highest value was found. The difference between the value found on the fundamental and the rest of the spectrum was compared against the limit to determine compliance.

The reference level offset for the fundamental screen capture was based on a measured value of the loss between the spectrum analyzer and the EUT which was verified at the time of test. The remaining screen capture(s) use an internal transducer factor on the analyzer to correct the displayed trace based on the cable loss over frequency. The reference level offset for the additional screen capture(s) is then based on the expected attenuator value and any other losses.

Fundamental Offset = Ref Lvl Offset showing measured composite factor of all losses

Remaining Screen capture(s) Offset = "Internal" cable loss factor not shown on screen capture + Ref Lvl Offset showing expected attenuator value and any other losses



| | | | | | | TbtTx 2022.06.03.0 | XMit 2022.02.07.0 |
|----------------------|-------------------------|-----------|--------------------|------------|-------------------|--------------------|-------------------|
| | Titan Gateway | | | | Work Order: | | |
| Serial Number: | PP-G02 | | | | Date: | 29-Jun-22 | |
| Customer: | NextGen RF Design | | | | Temperature: | 25.5 °C | |
| Attendees: | Tim Smith | | | | Humidity: | 41.7% RH | |
| Project: | None | | | | Barometric Pres.: | 1020 mbar | |
| Tested by: | Christopher Heintzelman | | Power: 120VAC/60Hz | | Job Site: | MN08 | |
| TEST SPECIFICATION | ONS | | Test Method | | | | |
| FCC 15.247:2022 | | | ANSI C63.10:2013 | | | | |
| | | | | | | | |
| COMMENTS | | | | | | | |
| None | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| DEVIATIONS FROM | TEST STANDARD | | | | | | |
| None | | | | | | | |
| | | | Clitter Hauften | | | | |
| Configuration # | 14 | (| (lithe Houten | | | | |
| _ | | Signature | - To the open | | | | |
| | • | | Frequency | Measured | Max Value | Limit | |
| | | | Range | Freq (MHz) | (dBc) | ≤ (dBc) | Result |
| Mid Channel, 2440 M | IHz. Modulated | | Fundamental | 2440.04 | N/A | N/A | N/A |
| Mid Channel, 2440 M | | | 30 MHz - 12.5 GHz | 1867.54 | -49.1 | -20 | Pass |
| Mid Channel, 2440 M | | | 12.5 GHz - 25 GHz | 24925.22 | -41.96 | -20 | Pass |
| High Channel, 2479 I | | | Fundamental | 2479.25 | N/A | N/A | N/A |
| High Channel, 2479 I | | | 30 MHz - 12.5 GHz | 11930.62 | -53.79 | -20 | Pass |
| | MHz, Modulated | | 12.5 GHz - 25 GHz | 24865.71 | -42.08 | -20 | |

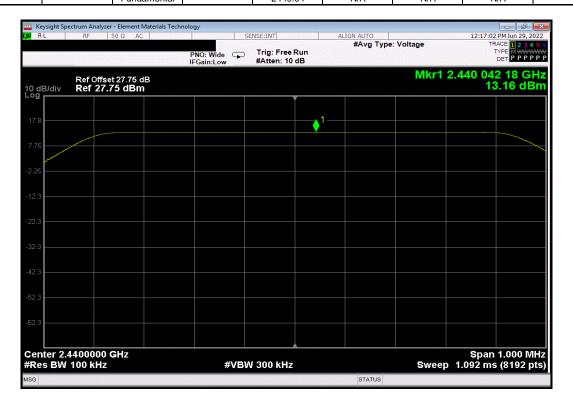


 Mid Channel, 2440 MHz, Modulated

 Frequency
 Measured
 Max Value
 Limit

 Range
 Freq (MHz)
 (dBc)
 ≤ (dBc)
 Result

 Fundamental
 2440.04
 N/A
 N/A
 N/A



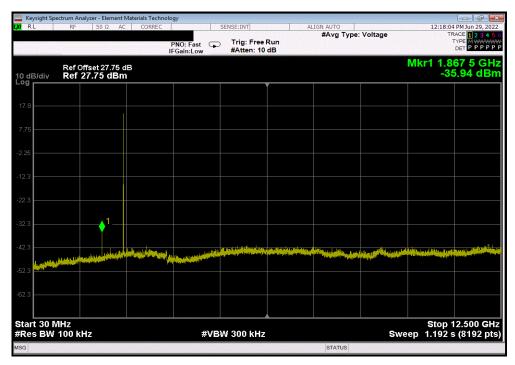


Mid Channel, 2440 MHz, Modulated

Frequency Measured Max Value Limit

Range Freq (MHz) (dBc) ≤ (dBc) Result

30 MHz - 12.5 GHz 1867.54 -49.1 -20 Pass

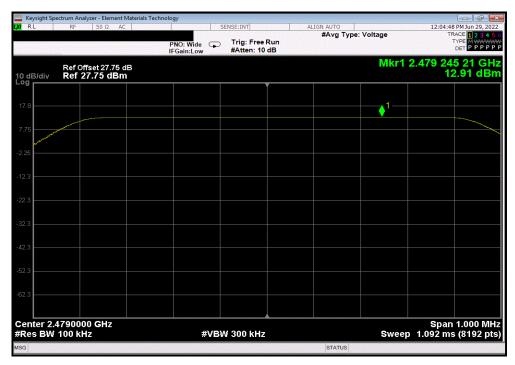


| Mid Channel, 2440 MHz, Modulated | | | | | |
|----------------------------------|-------------------|------------|-----------|---------|--------|
| | Frequency | Measured | Max Value | Limit | |
| | Range | Freq (MHz) | (dBc) | ≤ (dBc) | Result |
| | 12.5 GHz - 25 GHz | 24925.22 | -41.96 | -20 | Pass |

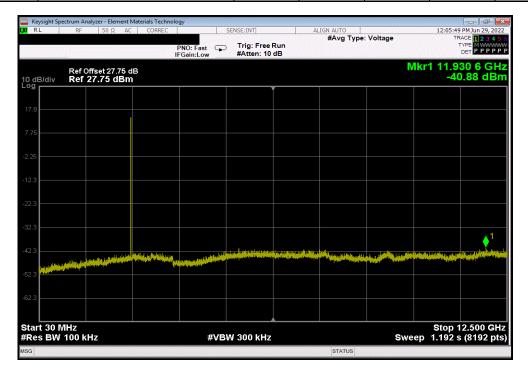




| High Channel, 2479 MHz, Modulated | | Frequency | Measured | Max Value | Limit | | Range | Freq (MHz) | (dBc) | ≤ (dBc) | Result | | Fundamental | 2479.25 | N/A | N/A | N/A | N/A | N/A | | N/A |



| High Channel, 2479 MHz, Modulated | | | | | |
|-----------------------------------|-------------------|------------|-----------|---------|--------|
| | Frequency | Measured | Max Value | Limit | |
| | Range | Freq (MHz) | (dBc) | ≤ (dBc) | Result |
| 1 | 30 MHz - 12.5 GHz | 11930.62 | -53.79 | -20 | Pass |



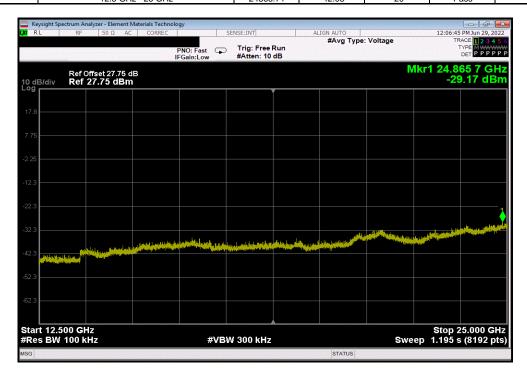


 High Channel, 2479 MHz, Modulated

 Frequency
 Measured
 Max Value
 Limit

 Range
 Freq (MHz)
 (dBc)
 ≤ (dBc)
 Result

 12.5 GHz - 25 GHz
 24865.71
 -42.08
 -20
 Pass





TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

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

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

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

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

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|---------------------|--------------------------------|-----|------------|------------|
| Amplifier - Pre-Amplifier | Miteq | AMF-6F-08001200-30-10P | AVC | 2022-01-24 | 2023-01-24 |
| Cable | Element | Standard Gain Cable | MNW | 2022-01-24 | 2023-01-24 |
| Antenna - Standard Gain | ETS-Lindgren | 3160-07 | AJJ | NCR | NCR |
| Amplifier - Pre-Amplifier | Miteq | AM-1064-9079 and SA18E-10 | AOO | 2022-01-24 | 2023-01-24 |
| Cable | Element | Biconilog Cable | MNX | 2022-01-24 | 2023-01-24 |
| Antenna - Biconilog | Ametek | CBL 6141B | AYS | 2021-03-09 | 2023-03-09 |
| Amplifier - Pre-Amplifier | Miteq | AMF-3D-00100800-32-13P | AVX | 2022-01-24 | 2023-01-24 |
| Cable | Element | Double Ridge Guide Horn Cables | MNV | 2022-01-24 | 2023-01-24 |
| Antenna - Double Ridge | ETS Lindgren | 3115 | AIB | 2020-09-03 | 2022-09-03 |
| Amplifier - Pre-Amplifier | L-3 Narda- Miteq | AMF-6F-12001800-30-10P | PAP | 2022-01-24 | 2023-01-24 |
| Antenna - Standard Gain | ETS-Lindgren | 3160-08 | AJP | NCR | NCR |
| Analyzer - Spectrum Analyzer | Agilent | E4440A | AFG | 2022-05-18 | 2023-05-18 |
| Attenuator | Coaxicom | 3910-20 | AXY | 2021-09-10 | 2022-09-10 |
| Filter - High Pass | Micro-Tronics | HPM50111 | HFM | 2021-09-10 | 2022-09-10 |
| Filter - Low Pass | Micro-Tronics | LPM50004 | HGG | 2021-09-10 | 2022-09-10 |

MEASUREMENT UNCERTAINTY

| Description | | |
|--------------|--------|---------|
| Expanded k=2 | 5.2 dB | -5.2 dB |

FREQUENCY RANGE INVESTIGATED

30 MHz TO 18000 MHz



POWER INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

NGRF0028-14

MODES INVESTIGATED

Transmitting Lora High Channel 2479 MHz, Low Channel 2405 MHz; modulated Transmitting Lora High Channel 2479 MHz, Mid Channel 2440 MHz, Low Channel 2405 MHz; modulated



| EUT: | Titan Gateway | Work Order: | NGRF0028 |
|-------------------|-------------------|-----------------------|-------------|
| Serial Number: | PP-G02 | Date: | 2022-07-01 |
| Customer: | NextGen RF Design | Temperature: | 25°C |
| Attendees: | Tim Smith | Relative Humidity: | 49.1% |
| Customer Project: | None | Bar. Pressure (PMSL): | 1014 mb |
| Tested By: | Chris Patterson | Job Site: | MN09 |
| Power: | 120VAC/60Hz | Configuration: | NGRF0028-14 |

TEST SPECIFICATIONS

| Specification: | Method: |
|-----------------|------------------|
| FCC 15.247:2022 | ANSI C63.10:2013 |

TEST PARAMETERS

| Run #: | 68 | Test Distance (m): | 3 | Ant. Height(s) (m): | 1 to 4(m) |
|--------|----|--------------------|---|---------------------|-----------|

COMMENTS

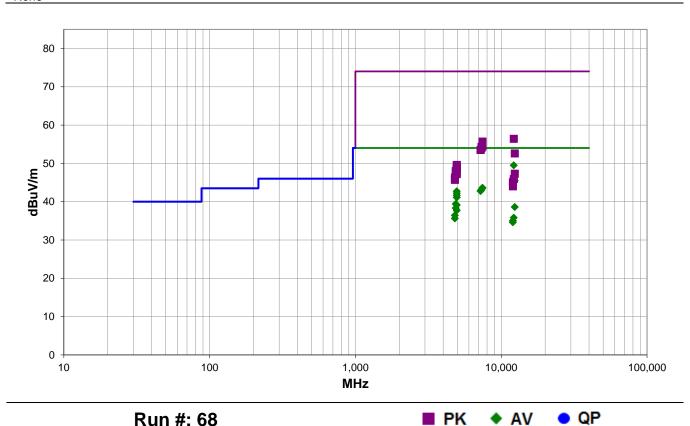
Shielded radio module, Power setting: -8 dbm

EUT OPERATING MODES

Transmitting Lora High Channel 2479 MHz, Mid Channel 2440 MHz, Low Channel 2405 MHz; modulated

DEVIATIONS FROM TEST STANDARD

None





RESULTS - Run #68

| RESULTS - Run #68 | | | | | | | | | | | | | |
|-------------------|---------------------|------------------|----------------------------|----------------------|------------------------------|---------------------------------|---------------------------------|----------|--------------------------------|----------------------|-------------------------|------------------------------|----------------------|
| Freq (MHz) | Amplitude (dBuV) | Factor (dB/m) | Antenna Height (meters) | Azimuth (degrees) | Duty Cycle Correction Factor | External Attenuation (dB) | Polarity/ Transducer Tvne | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments |
| 12200.000 | 49.7 | -0.2 | 1.5 | 35.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 49.5 | 54.0 | -4.5 | EUT On Side, Mid Ch |
| 12395.000 | 45.6 | -0.1 | 3.2 | 35.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 45.5 | 54.0 | -8.5 | EUT Vert, High Ch |
| 7437.000 | 28.2 | 15.4 | 1.5 | 159.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 43.6 | 54.0 | -10.4 | EUT On Side, High Ch |
| 7437.000 | 28.2 | 15.4 | 1.5 | 86.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 43.6 | 54.0 | -10.4 | EUT Vert, High Ch |
| 7320.000 | 28.5 | 14.6 | 1.5 | 96.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 43.1 | 54.0 | -10.9 | EUT Vert, Mid Ch |
| 7320.000 | 28.5 | 14.6 | 1.5 | 115.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 43.1 | 54.0 | -10.9 | EUT On Side, Mid Ch |
| 7215.000 | 28.9 | 13.9 | 1.5 | 266.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 42.8 | 54.0 | -11.2 | EUT On Side, Low Ch |
| 7215.000 | 28.9 | 13.9 | 1.5 | 187.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 42.8 | 54.0 | -11.2 | EUT Vert, Low Ch |
| 4958.000 | 37.1 | 5.6 | 1.2 | 57.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 42.7 | 54.0 | -11.3 | EUT On Side, High Ch |
| 4958.000 | 36.6 | 5.6 | 1.7 | 48.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 42.2 | 54.0 | -11.8 | EUT Vert, High Ch |
| 4958.000 | 36.0 | 5.6 | 2.3 | 325.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 41.6 | 54.0 | -12.4 | EUT Horz, High Ch |
| 4958.000 | 35.5 | 5.6 | 1.7 | 33.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 41.1 | 54.0 | -12.9 | EUT Horz, High Ch |
| 4880.000 | 33.7 | 5.7 | 1.2 | 23.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 39.4 | 54.0 | -14.6 | EUT On Side, Mid Ch |
| 4958.000 | 33.5 | 5.6 | 1.1 | 312.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 39.1 | 54.0 | -14.9 | EUT On Side, High Ch |
| 12395.000 | 38.7 | -0.1 | 1.7 | 241.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 38.6 | 54.0 | -15.4 | EUT On Side, High Ch |
| 4880.000 | 32.6 | 5.7 | 1.5 | 37.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 38.3 | 54.0 | -15.7 | EUT Vert, Mid Ch |
| 4958.000 | 32.1 | 5.6 | 1.5 | 173.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 37.7 | 54.0 | -16.3 | EUT Vert, High Ch |
| 4810.000 | 30.7 | 5.7 | 1.5 | 24.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 36.4 | 54.0 | -17.6 | EUT On Side, Low Ch |
| 12201.640 | 56.5 | -0.1 | 1.5 | 35.0 | | 0.0 | Horz | PK | 0.0 | 56.4 | 74.0 | -17.6 | EUT On Side, Mid Ch |
| 12200.000 | 36.0 | -0.2 | 4.0 | 37.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 35.8 | 54.0 | -18.2 | EUT Vert, Mid Ch |
| 7438.242 | 40.3 | 15.4 | 1.5 | 86.0 | | 0.0 | Vert | PK | 0.0 | 55.7 | 74.0 | -18.3 | EUT Vert, High Ch |
| 4810.000 | 29.9 | 5.7 | 1.0 | 42.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 35.6 | 54.0 | -18.4 | EUT Vert, Low Ch |
| 12025.000 | 36.2 | -1.2 | 1.7 | 44.0 | 0.0 | 0.0 | Horz | AV | 0.0 | 35.0 | 54.0 | -19.0 | EUT On Side, Low Ch |
| 12025.000 | 35.8 | -1.2 | 3.4 | 80.0 | 0.0 | 0.0 | Vert | AV | 0.0 | 34.6 | 54.0 | -19.4 | EUT Vert, Low Ch |
| 7436.733 | 39.0 | 15.4 | 1.5 | 159.0 | | 0.0 | Horz | PK | 0.0 | 54.4 | 74.0 | -19.6 | EUT On Side, High Ch |
| 7322.417 | 39.7 | 14.6 | 1.5 | 115.0 | | 0.0 | Horz | PK | 0.0 | 54.3 | 74.0 | -19.7 | EUT On Side, Mid Ch |
| 7321.508 | 39.4 | 14.6 | 1.5 | 96.0 | | 0.0 | Vert | PK | 0.0 | 54.0 | 74.0 | -20.0 | EUT Vert, Mid Ch |
| 7214.983 | 39.6 | 13.9 | 1.5 | 266.0 | | 0.0 | Horz | PK | 0.0 | 53.5 | 74.0 | -20.5 | EUT On Side, Low Ch |
| 7214.592 | 39.6 | 13.9 | 1.5 | 187.0 | | 0.0 | Vert | PK | 0.0 | 53.5 | 74.0 | -20.5 | EUT Vert, Low Ch |
| 12396.410 | 52.7 | -0.1 | 3.2 | 35.0 | | 0.0 | Vert | PK | 0.0 | 52.6 | 74.0 | -21.4 | EUT Vert, High Ch |
| 4958.658 | 44.0 | 5.6 | 1.2 | 57.0 | | 0.0 | Horz | PK | 0.0 | 49.6 | 74.0 | -24.4 | EUT On Side, High Ch |
| 4957.250 | 43.7 | 5.6 | 1.7 | 48.0 | | 0.0 | Vert | PK | 0.0 | 49.3 | 74.0 | -24.7 | EUT Vert, High Ch |
| 4958.650 | 43.2 | 5.6 | 2.3 | 325.0 | | 0.0 | Vert | PK | 0.0 | 48.8 | 74.0 | -25.2 | EUT Horz, High Ch |
| 4957.350 | 42.9 | 5.6 | 1.7 | 33.0 | | 0.0 | Horz | PK | 0.0 | 48.5 | 74.0 | -25.5 | EUT Horz, High Ch |
| 4879.583 | 42.3 | 5.7 | 1.2 | 23.0 | | 0.0 | Horz | PK | 0.0 | 48.0 | 74.0 | -26.0 | EUT On Side, Mid Ch |
| 4958.483 | 42.2 | 5.6 | 1.1 | 312.0 | | 0.0 | Vert | PK | 0.0 | 47.8 | 74.0 | -26.2 | EUT On Side, High Ch |
| 4880.717 | 41.8 | 5.7 | 1.5 | 37.0 | | 0.0 | Vert | PK | 0.0 | 47.5 | 74.0 | -26.5 | EUT Vert, Mid Ch |
| 12394.630 | 47.4 | -0.1 | 1.7 | 241.0 | | 0.0 | Horz | PK | 0.0 | 47.3 | 74.0 | -26.7 | EUT On Side, High Ch |
| 4958.625 | 41.6 | 5.6 | 1.5 | 173.0 | | 0.0 | Horz | PK | 0.0 | 47.2 | 74.0 | -26.8 | EUT Vert, High Ch |
| 4810.917 | 40.6 | 5.7 | 1.5 | 24.0 | | 0.0 | Horz | PK | 0.0 | 46.3 | 74.0 | -27.7 | EUT On Side, Low Ch |
| 12197.820 | 46.1 | -0.2 | 4.0 | 37.0 | | 0.0 | Vert | PK | 0.0 | 45.9 | 74.0 | -28.1 | EUT Vert, Mid Ch |
| 4809.933 | 40.0 | 5.7 | 1.0 | 42.0 | | 0.0 | Vert | PK | 0.0 | 45.7 | 74.0 | -28.3 | EUT Vert, Low Ch |
| 12026.690 | 46.3 | -1.2 | 1.7 | 44.0 | | 0.0 | Horz | PK | 0.0 | 45.1 | 74.0 | -28.9 | EUT On Side, Low Ch |



| Freq (MHz) | Amplitude (dBuV) | Factor (dB/m) | Antenna Height (meters) | Azimuth | Duty Cycle Correction Factor | External Attenuation (dB) | Polarity/ Transducer Tvne | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments |
|---------------|---------------------|------------------|----------------------------|---------|------------------------------------|---------------------------------|---------------------------------|----------|--------------------------------|----------------------|-------------------------|------------------------------|------------------|
| 12025.450 | 45.2 | -1.2 | 3.4 | 80.0 | | 0.0 | Vert | PK | 0.0 | 44.0 | 74.0 | -30.0 | EUT Vert, Low Ch |

CONCLUSION

Pass

Tested By



| EUT: | Titan Gateway | Work Order: | NGRF0028 |
|-------------------|-------------------|-----------------------|-------------|
| Serial Number: | PP-G02 | Date: | 2022-07-01 |
| Customer: | NextGen RF Design | Temperature: | 25°C |
| Attendees: | Tim Smith | Relative Humidity: | 49.1% |
| Customer Project: | None | Bar. Pressure (PMSL): | 1014 mb |
| Tested By: | Chris Patterson | Job Site: | MN09 |
| Power: | 120VAC/60Hz | Configuration: | NGRF0028-14 |

TEST SPECIFICATIONS

| Specification: | Method: |
|-----------------|------------------|
| FCC 15.247:2022 | ANSI C63.10:2013 |

TEST PARAMETERS

| Run #: | 70 | Test Distance (m): | 3 | Ant. Height(s) (m): | 1 to 4(m) |
|--------|----|--------------------|---|---------------------|-----------|

COMMENTS

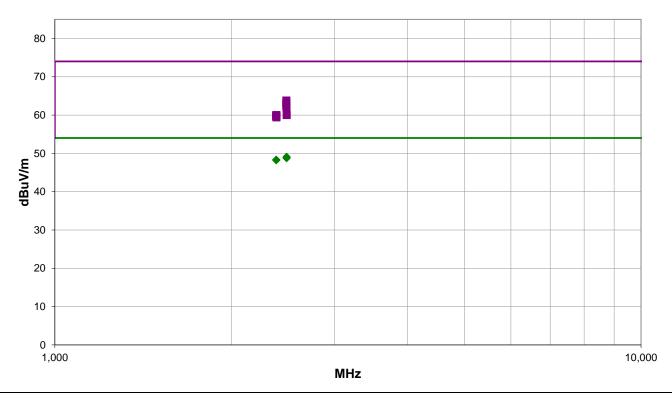
Shielded radio module, Power setting: -8 dbm

EUT OPERATING MODES

Transmitting Lora High Channel 2479 MHz, Low Channel 2405 MHz; modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 70 ■ PK ◆ AV • QP



RESULTS - Run #70

| KLSUL | RESULTS - Run #70 | | | | | | | | | | | | |
|---------------|---------------------|------------------|----------------------------|----------------------|------------------------------|---------------------------------|---------------------------------|----------|--------------------------------|----------------------|-------------------------|------------------------------|----------------------|
| Freq (MHz) | Amplitude (dBuV) | Factor (dB/m) | Antenna Height (meters) | Azimuth (degrees) | Duty Cycle Correction Factor | External Attenuation (dB) | Polarity/ Transducer Tvne | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments |
| 2486.000 | 31.5 | -2.4 | 1.5 | 353.0 | 0.0 | 20.0 | Horz | AV | 0.0 | 49.1 | 54.0 | -4.9 | EUT Horz, High Ch |
| 2486.000 | 31.4 | -2.4 | 1.01 | 241.0 | 0.0 | 20.0 | Vert | AV | 0.0 | 49.0 | 54.0 | -5.0 | EUT Horz, High Ch |
| 2486.000 | 31.3 | -2.4 | 1.5 | 323.0 | 0.0 | 20.0 | Vert | AV | 0.0 | 48.9 | 54.0 | -5.1 | EUT Vert, High Ch |
| 2486.000 | 31.2 | -2.4 | 1.5 | 350.0 | 0.0 | 20.0 | Horz | AV | 0.0 | 48.8 | 54.0 | -5.2 | EUT On Side, High Ch |
| 2486.000 | 31.2 | -2.4 | 1.5 | 1.0 | 0.0 | 20.0 | Horz | AV | 0.0 | 48.8 | 54.0 | -5.2 | EUT Vert, High Ch |
| 2486.000 | 31.1 | -2.4 | 1.5 | 107.0 | 0.0 | 20.0 | Vert | AV | 0.0 | 48.7 | 54.0 | -5.3 | EUT On Side, High Ch |
| 2387.500 | 30.7 | -2.4 | 1.5 | 279.0 | 0.0 | 20.0 | Horz | AV | 0.0 | 48.3 | 54.0 | -5.7 | EUT On Side, Low Ch |
| 2387.500 | 30.7 | -2.4 | 1.5 | 128.0 | 0.0 | 20.0 | Vert | AV | 0.0 | 48.3 | 54.0 | -5.7 | EUT On Side, Low Ch |
| 2387.500 | 30.7 | -2.4 | 1.5 | 242.0 | 0.0 | 20.0 | Horz | AV | 0.0 | 48.3 | 54.0 | -5.7 | EUT Horz, Low Ch |
| 2387.500 | 30.7 | -2.4 | 1.5 | 122.0 | 0.0 | 20.0 | Vert | AV | 0.0 | 48.3 | 54.0 | -5.7 | EUT Horz, Low Ch |
| 2387.500 | 30.6 | -2.4 | 1.5 | 175.0 | 0.0 | 20.0 | Horz | AV | 0.0 | 48.2 | 54.0 | -5.8 | EUT Vert, Low Ch |
| 2387.500 | 30.6 | -2.4 | 1.5 | 29.0 | 0.0 | 20.0 | Vert | AV | 0.0 | 48.2 | 54.0 | -5.8 | EUT Vert, Low Ch |
| 2483.583 | 46.2 | -2.4 | 1.5 | 353.0 | | 20.0 | Horz | PK | 0.0 | 63.8 | 74.0 | -10.2 | EUT Horz, High Ch |
| 2483.508 | 45.5 | -2.4 | 1.01 | 241.0 | | 20.0 | Vert | PK | 0.0 | 63.1 | 74.0 | -10.9 | EUT Horz, High Ch |
| 2483.592 | 45.0 | -2.4 | 1.5 | 1.0 | | 20.0 | Horz | PK | 0.0 | 62.6 | 74.0 | -11.4 | EUT Vert, High Ch |
| 2483.617 | 44.9 | -2.4 | 1.5 | 323.0 | | 20.0 | Vert | PK | 0.0 | 62.5 | 74.0 | -11.5 | EUT Vert, High Ch |
| 2483.717 | 44.4 | -2.4 | 1.5 | 350.0 | | 20.0 | Horz | PK | 0.0 | 62.0 | 74.0 | -12.0 | EUT On Side, High Ch |
| 2387.150 | 42.4 | -2.4 | 1.5 | 175.0 | | 20.0 | Horz | PK | 0.0 | 60.0 | 74.0 | -14.0 | EUT Vert, Low Ch |
| 2485.975 | 42.4 | -2.4 | 1.5 | 107.0 | | 20.0 | Vert | PK | 0.0 | 60.0 | 74.0 | -14.0 | EUT On Side, High Ch |
| 2386.792 | 42.3 | -2.4 | 1.5 | 242.0 | | 20.0 | Horz | PK | 0.0 | 59.9 | 74.0 | -14.1 | EUT Horz, Low Ch |
| 2389.025 | 42.3 | -2.4 | 1.5 | 122.0 | | 20.0 | Vert | PK | 0.0 | 59.9 | 74.0 | -14.1 | EUT Horz, Low Ch |
| 2386.550 | 42.2 | -2.4 | 1.5 | 128.0 | | 20.0 | Vert | PK | 0.0 | 59.8 | 74.0 | -14.2 | EUT On Side, Low Ch |
| 2387.158 | 42.0 | -2.4 | 1.5 | 279.0 | | 20.0 | Horz | PK | 0.0 | 59.6 | 74.0 | -14.4 | EUT On Side, Low Ch |
| 2388.333 | 41.8 | -2.4 | 1.5 | 29.0 | | 20.0 | Vert | PK | 0.0 | 59.4 | 74.0 | -14.6 | EUT Vert, Low Ch |

CONCLUSION

Pass

Tested By



End of Test Report