



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:

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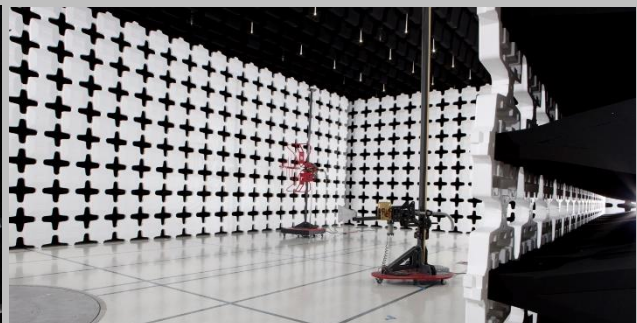
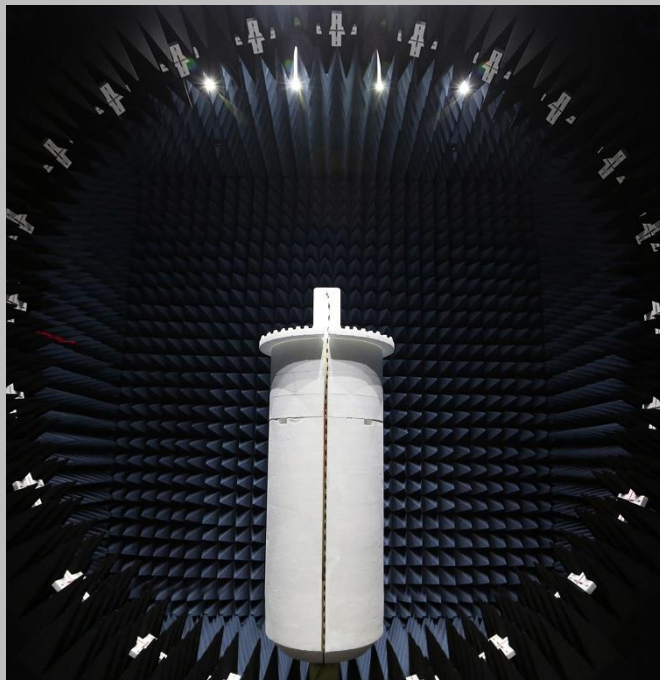
[Texas](#)

[Washington](#)

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

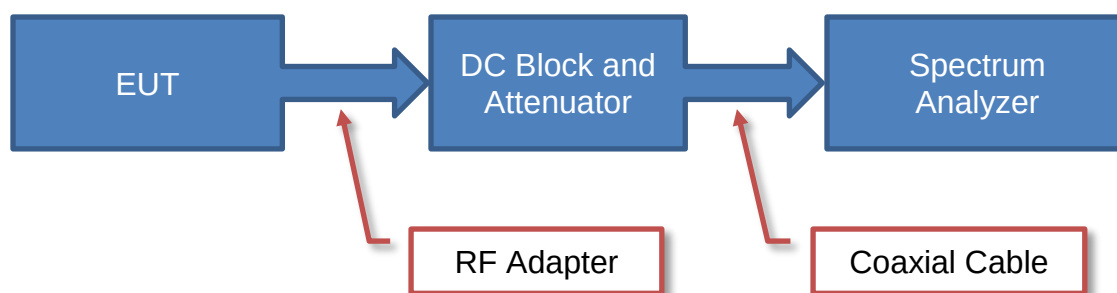
TEST SETUP BLOCK DIAGRAMS

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.

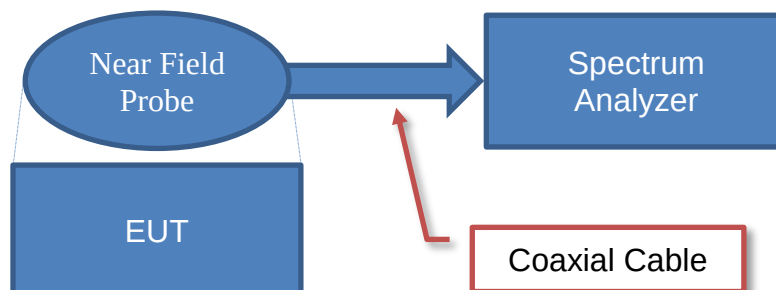
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

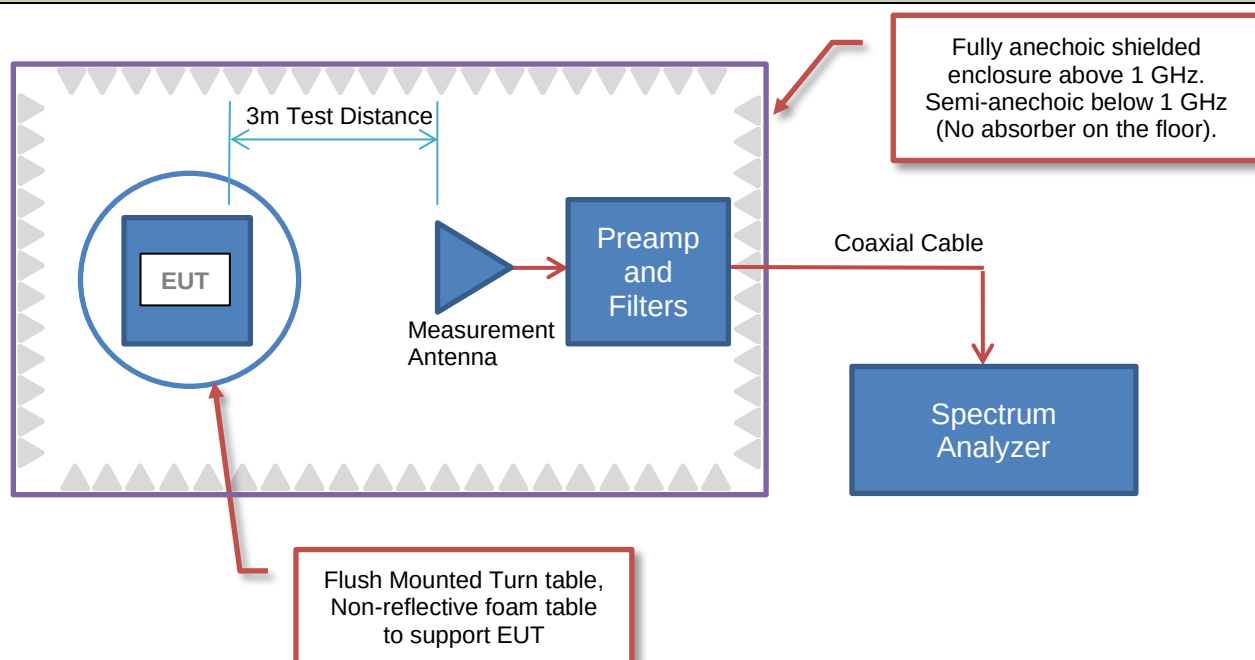


Sample Calculation (logarithmic units)

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

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

Measured Level (Amplitude)	Factor				Distance Adjustment Factor	External Attenuation		Field Strength
	Antenna Factor	Cable Factor	Amplifier Gain					
42.6	28.6	3.1	40.8	+	0.0	+	0.0	= 33.5

Conducted Emissions:

Measured Level (Amplitude)	Factor			External Attenuation		Adjusted Level
	Transducer Factor	Cable Factor				
26.7	0.3	0.1	+	20.0	=	47.1

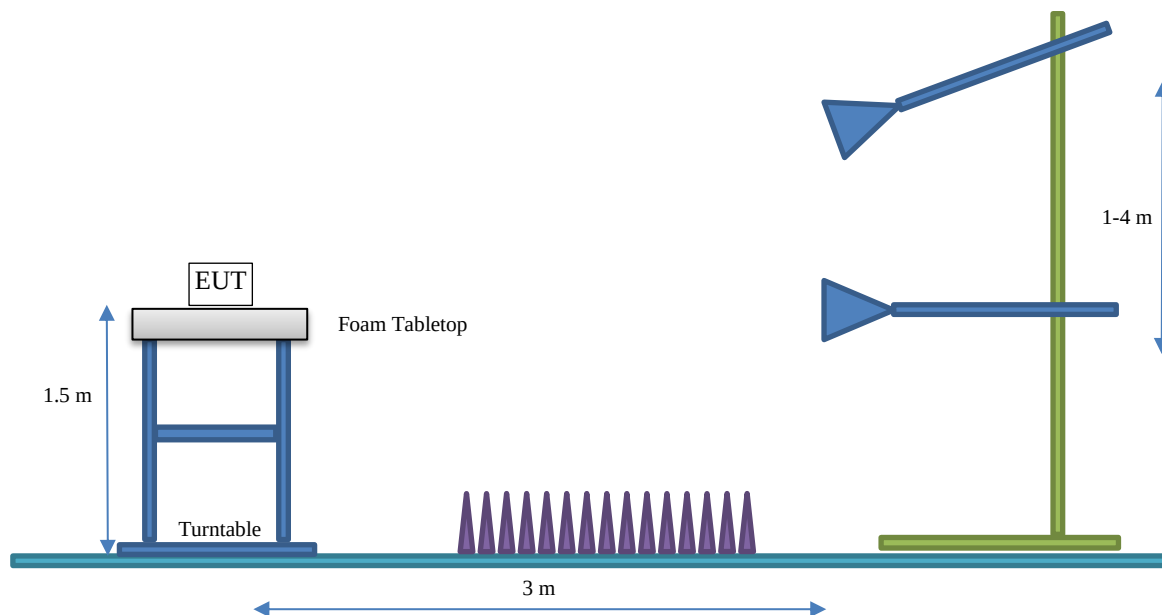
Radiated Power (ERP/EIRP) – Substitution Method:

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 settings Test software/firmware installed on EUT: Titan Gateway MFG Wi-FiATE V22.02.28B2
☐ Rated power settings

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Position	Power Setting
LoRa – See details below	Low Channel (2405 MHz)	-8
	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

CONFIGURATIONS



Configuration NGRF0028- 1

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

CONFIGURATIONS



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	Inspiron 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

Configuration NGRF0028- 17

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	Inspiron 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

CONFIGURATIONS



Configuration NGRF0028- 32

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					
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

CONFIGURATIONS



Configuration NGRF0028- 33

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	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					
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

CONFIGURATIONS



Configuration NGRF0028- 34

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					
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.

BAND EDGE COMPLIANCE



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

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

BAND EDGE COMPLIANCE



TSTx 2022.06.03.0 XMR 2022.02.07.0

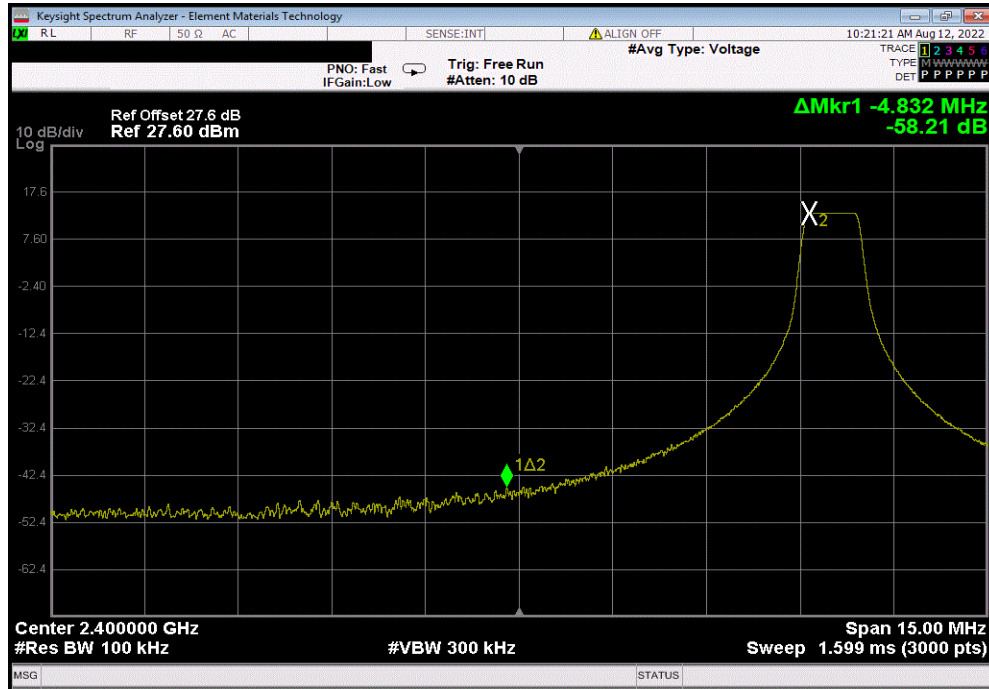
EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G01		Date: 12-Aug-22	
Customer: NextGen RF Design		Temperature: 20.9 °C	
Attendees: Tim Smith		Humidity: 49.2% RH	
Project: None		Barometric Pres.: 1023 mbar	
Tested by: Christopher Heintzelman	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
Reference Level Offset includes measurement cable, attenuator, and DC Block.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	17	Signature <i>Christopher Heintzelman</i>	
		Value (dBc)	Limit ≤ (dBc) Result
Low Channel, 2405 MHz		-58.21	-20 Pass

BAND EDGE COMPLIANCE



TbTx 2022.06.03.0 XMR 2022.02.07.0

Low Channel, 2405 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-58.21	-20	Pass



BAND EDGE COMPLIANCE



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.

BAND EDGE COMPLIANCE



TSTx 2022.06.03.0 XMR 2022.02.07.0

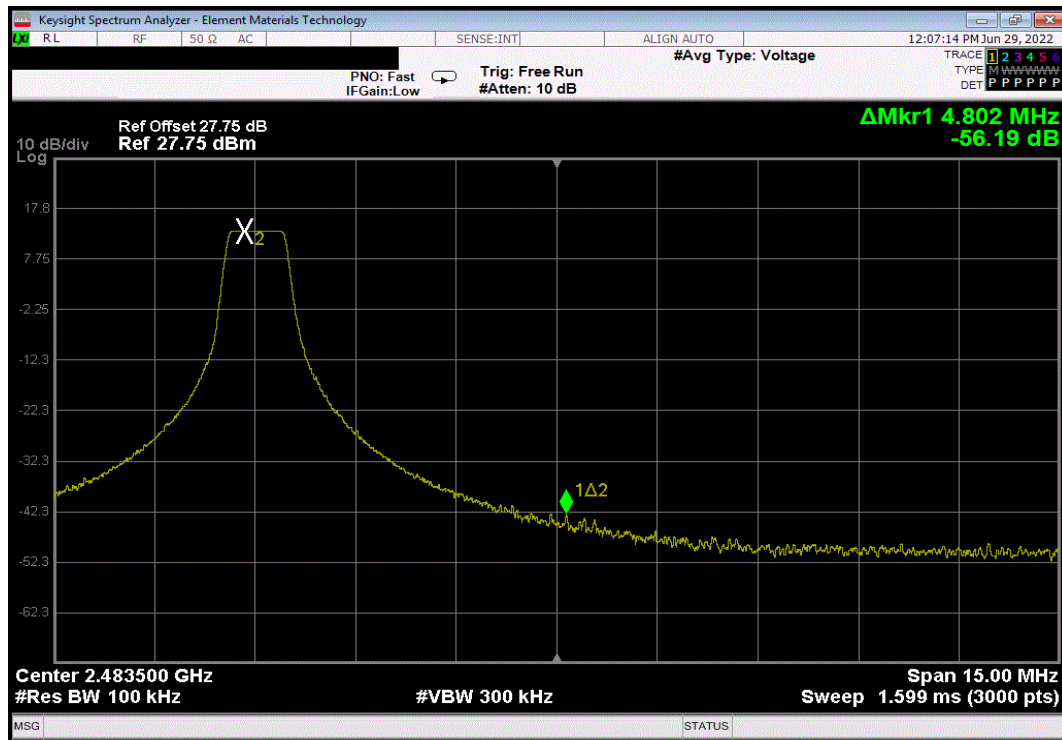
EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G02		Date: 29-Jun-22	
Customer: NextGen RF Design		Temperature: 25.1 °C	
Attendees: Tim Smith		Humidity: 42.4% RH	
Project: None		Barometric Pres.: 1021 mbar	
Tested by: Christopher Heintzelman	Power: 120VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	14	Signature <i>Christopher Heintzelman</i>	
		Value (dBc)	Limit ≤ (dBc) Result
High Channel, 2480 MHz, Modulated		-56.19	-20 Pass

BAND EDGE COMPLIANCE



TbTx 2022.06.03.0 XMt 2022.02.07.0

High Channel, 2480 MHz, Modulated						
				Value (dBc)	Limit ≤ (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.

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



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)

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TSTx 2022.06.03.0 XMR 2022.02.07.0

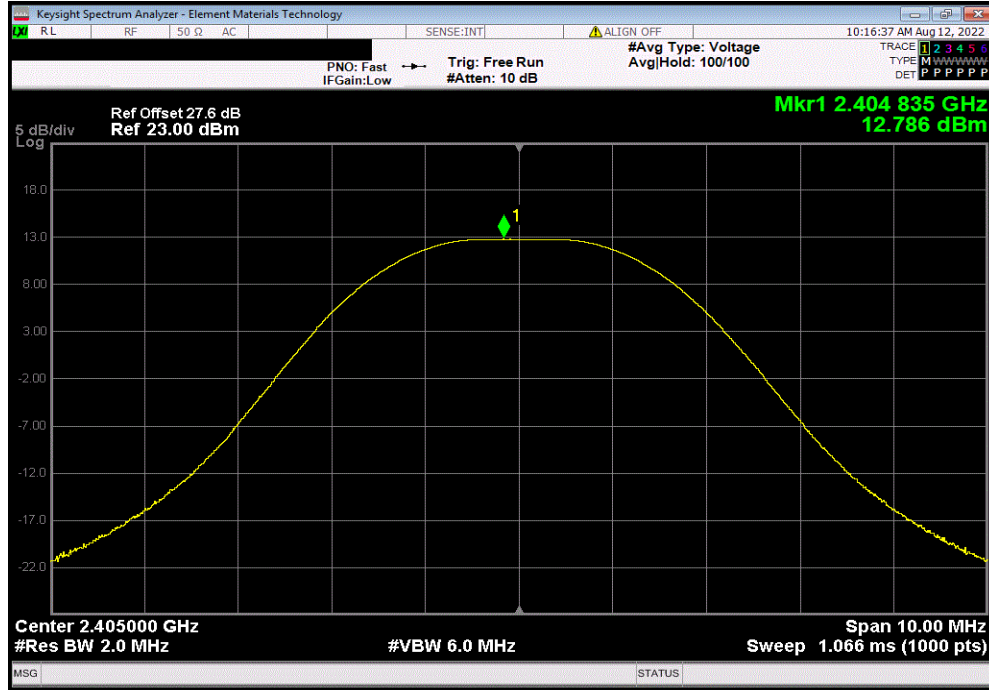
EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G01		Date: 12-Aug-22	
Customer: NextGen RF Design		Temperature: 20.8 °C	
Attendees: Tim Smith		Humidity: 50.8% RH	
Project: None		Barometric Pres.: 1021 mbar	
Tested by: Christopher Heintzelman	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
Reference Level Offset includes measurement cable, attenuator, and DC Block.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	17	Signature <i>Christopher Heintzelman</i>	
		Out Pwr (dBm)	Antenna Gain (dBi)
		EIRP (dBm)	EIRP Limit (dBm)
			Result
Low Channel, 2405 MHz		12.786	2.21
		14.996	36
			Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TbTx 2022.06.03.0 XMR 2022.02.07.0

Low Channel, 2405 MHz					
Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
12.786	2.21	14.996	36	Pass	



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



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
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)

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TSTx 2022.06.03.0 XMR 2022.02.07.0

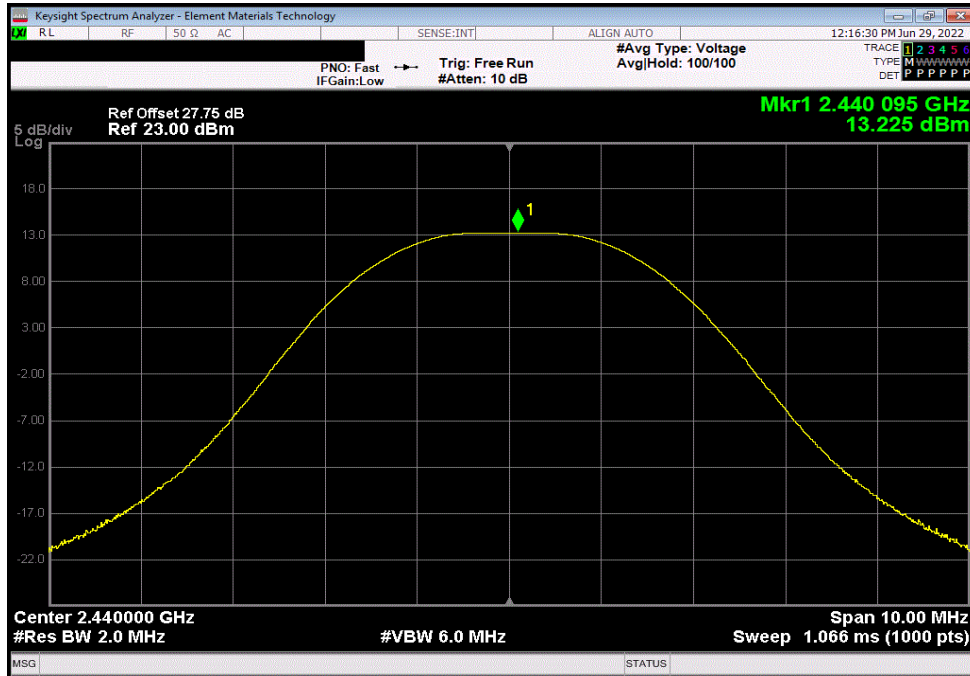
EUT: Titan Gateway		Work Order: NGRF0028				
Serial Number: PP-G02		Date: 29-Jun-22				
Customer: NextGen RF Design		Temperature: 25 °C				
Attendees: Tim Smith		Humidity: 42.4% RH				
Project: None		Barometric Pres.: 1021 mbar				
Tested by: Christopher Heintzelman	Power: 120VAC/60Hz	Job Site: MN08				
TEST SPECIFICATIONS						
FCC 15.247:2022		Test Method				
		ANSI C63.10:2013				
COMMENTS						
None						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	14	Signature <i>Christopher Heintzelman</i>				
		Out Pwr (dBm)	Antenna Gain (dBi)			
		EIRP (dBm)	EIRP Limit (dBm)			
			Result			
Mid Channel, 2440 MHz, Modulated		13.225	2.21	15.435	36	Pass
High Channel, 2479 MHz, Modulated		12.957	2.21	15.167	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

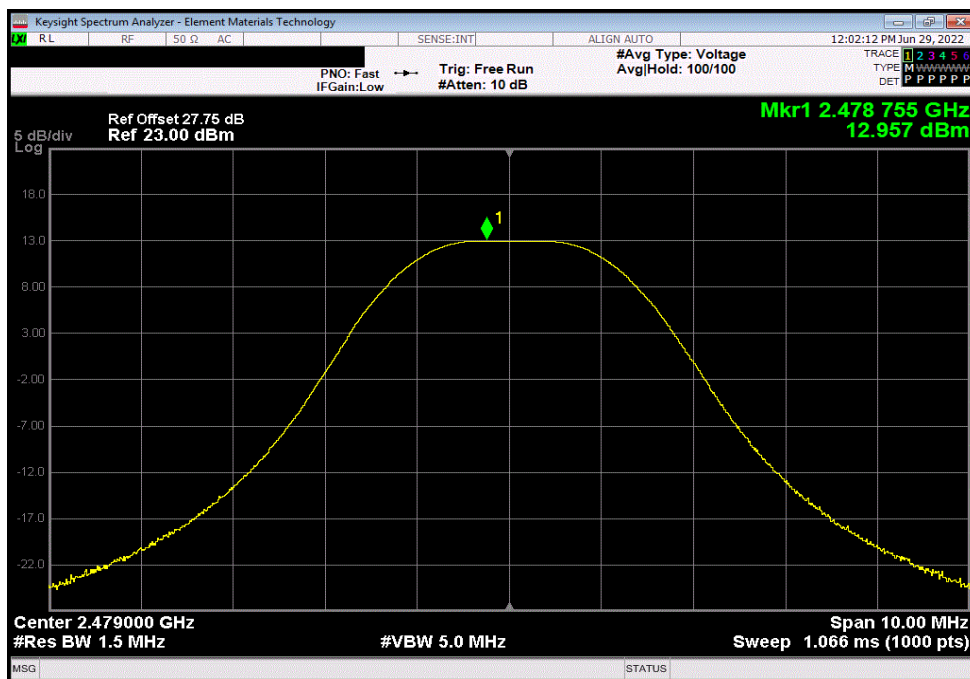


TbTxs 2022.06.03.0 XMI 2022.02.07.0

Mid Channel, 2440 MHz, Modulated						
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
	13.225	2.21	15.435	36	Pass	



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



EMISSIONS BANDWIDTH AND OCCUPIED BANDWIDTH



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 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.

EMISSIONS BANDWIDTH AND OCCUPIED BANDWIDTH



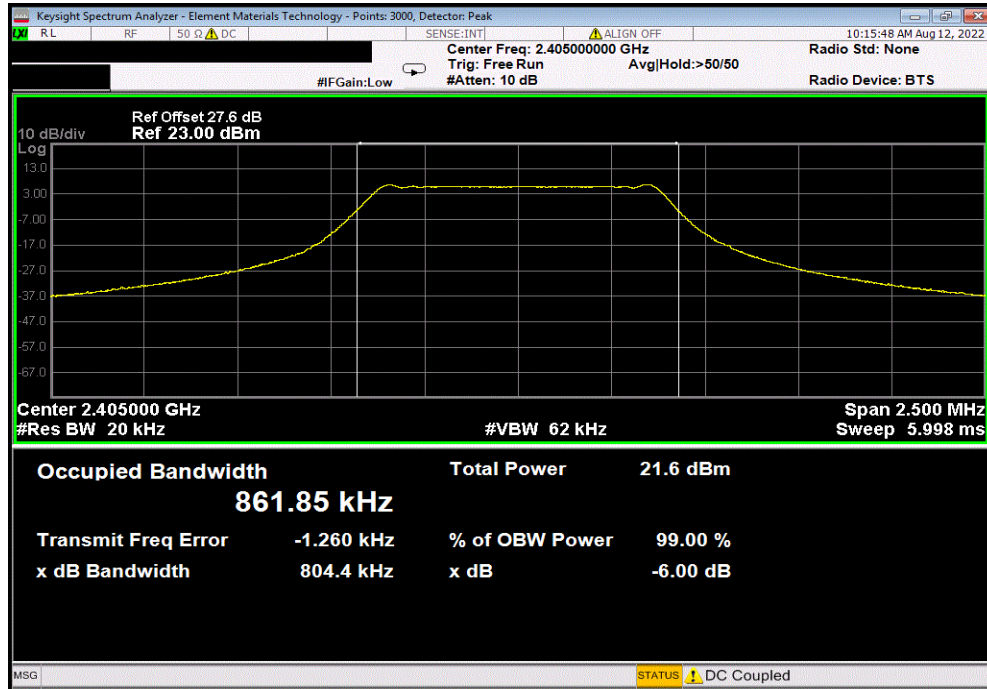
EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G01		Date: 12-Aug-22	
Customer: NextGen RF Design		Temperature: 20.9 °C	
Attendees: Tim Smith		Humidity: 50.9% RH	
Project: None		Barometric Pres.: 1021 mbar	
Tested by: Christopher Heintzelman	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2022		ANSI C63.10:2013	
COMMENTS			
Reference Level Offset includes measurement cable, attenuator, and DC Block.			
DEVIATIONS FROM TEST STANDARD			
The narrower RBW measurement (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).			
Configuration #	17	Signature <i>Christopher Heintzelman</i>	
		Emissions BW Value	Emissions BW Limit (kHz)
		OBW Value	OBW Limit
			Results
Low Channel, 2405 MHz		804.4 kHz	> 500 kHz
		861.863 kHz	N/A
			Pass

EMISSIONS BANDWIDTH AND OCCUPIED BANDWIDTH



TbTx 2022.06.03.0 XbTx 2022.02.07.0

Low Channel, 2405 MHz					
	Emissions BW Value	Emissions BW Limit (kHz)	OBW Value	OBW Limit	Results
	804.4 kHz	> 500 kHz	861.863 kHz	N/A	Pass



EMISSIONS BANDWIDTH AND OCCUPIED BANDWIDTH



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
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.

EMISSIONS BANDWIDTH AND OCCUPIED BANDWIDTH



TSTx 2022.06.03.0 XMR 2022.02.07.0

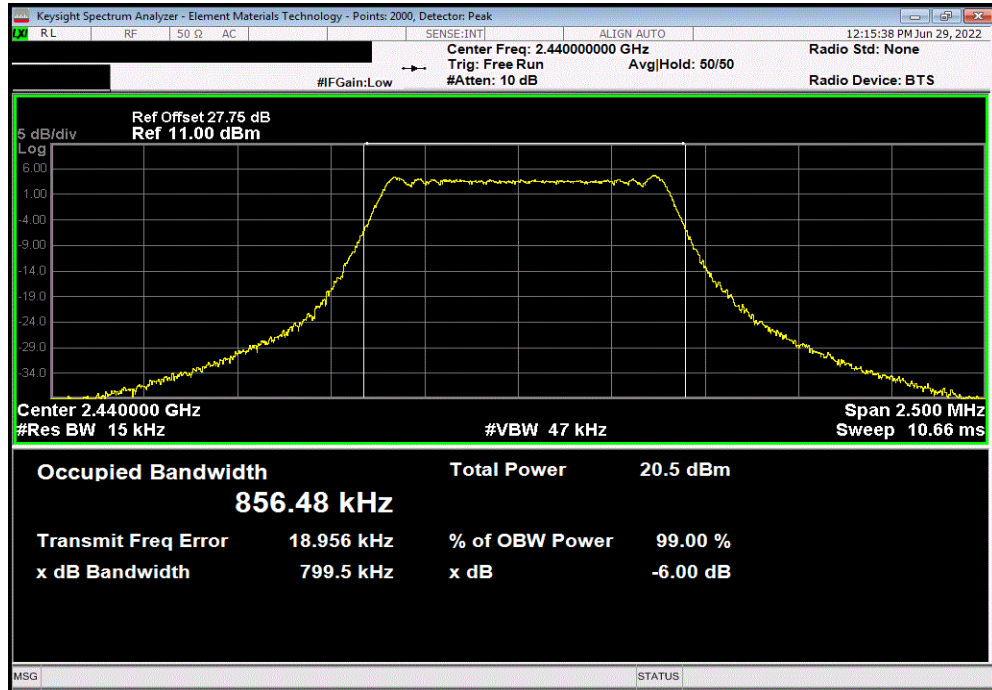
EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G02		Date: 29-Jun-22	
Customer: NextGen RF Design		Temperature: 25.2 °C	
Attendees: Tim Smith		Humidity: 42.2% RH	
Project: None		Barometric Pres.: 1020 mbar	
Tested by: Christopher Heintzelman	Power: 120VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
The narrower RBW measurement (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).			
Configuration #	14	Signature <i>Christopher Heintzelman</i>	
		Emissions BW Value	Emissions BW Limit (kHz)
Mid Channel, 2440 MHz, Modulated		799.5 kHz	> 500 kHz
High Channel, 2479 MHz, Modulated		798.3 kHz	> 500 kHz
		OBW Value	OBW Limit
		856.483 kHz	N/A
		856.832 kHz	N/A
			Results
			Pass
			Pass

EMISSIONS BANDWIDTH AND OCCUPIED BANDWIDTH

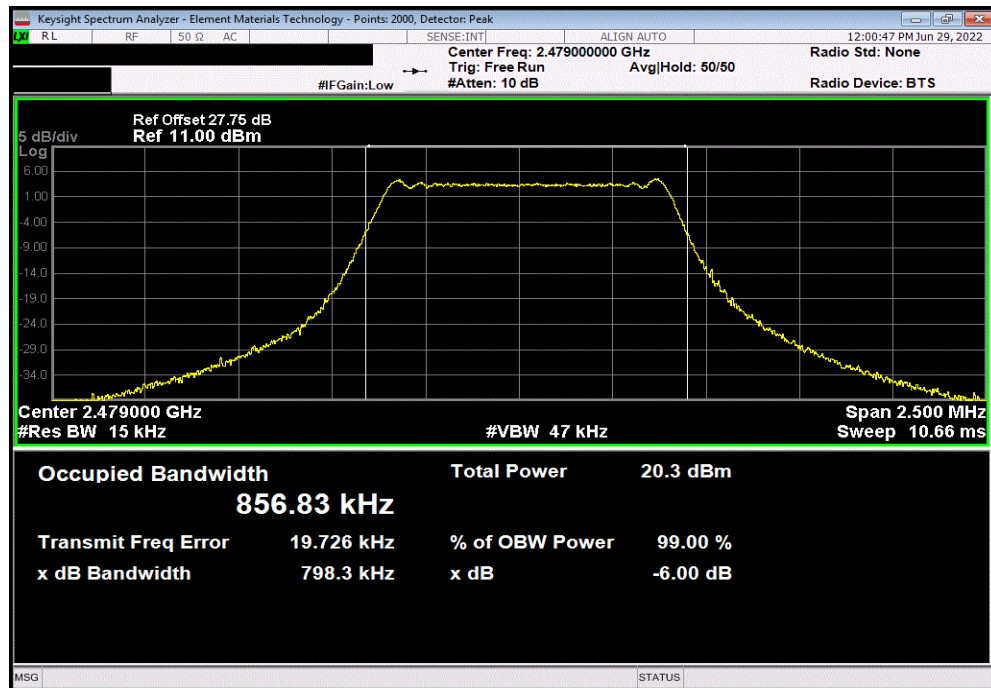


TbTx 2022.06.03.0 XMI 2022.02.07.0

Mid Channel, 2440 MHz, Modulated					
Emissions BW Value	Emissions BW Limit (kHz)	OBW Value	OBW Limit	Results	
799.5 kHz	> 500 kHz	856.483 kHz	N/A	Pass	



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



OUTPUT POWER



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.

OUTPUT POWER



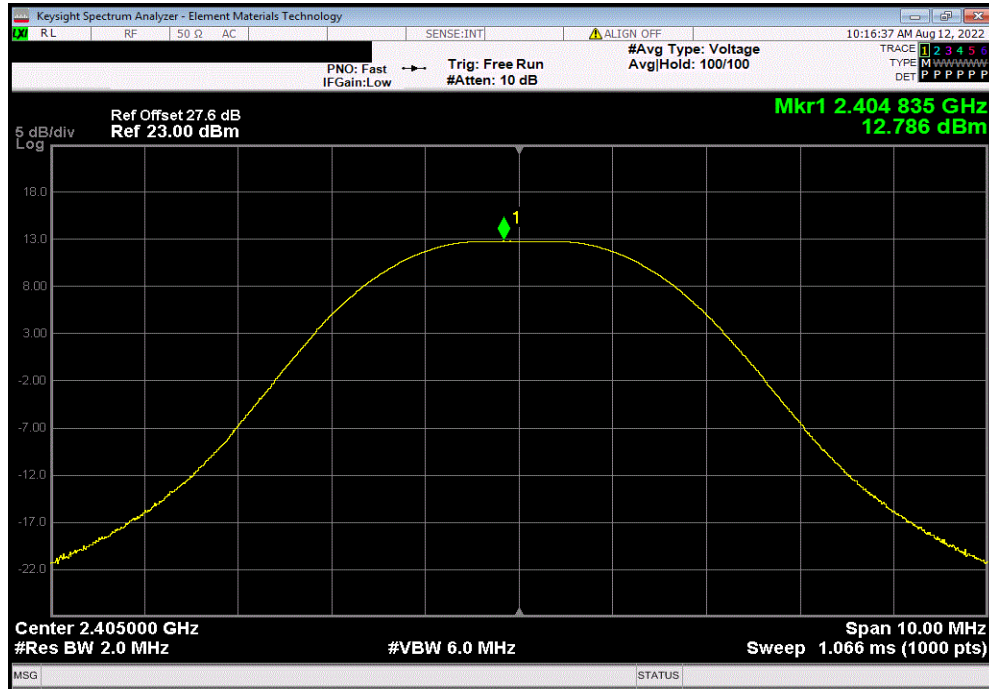
EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G01		Date: 12-Aug-22	
Customer: NextGen RF Design		Temperature: 20.9 °C	
Attendees: Tim Smith		Humidity: 51% RH	
Project: None		Barometric Pres.: 1021 mbar	
Tested by: Christopher Heintzelman	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
Reference Level Offset includes measurement cable, attenuator, and DC Block.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	17	Signature <i>Christopher Heintzelman</i>	
		Out Pwr (dBm)	Limit (dBm)
Low Channel, 2405 MHz		12.786	30
			Result
			Pass

OUTPUT POWER



TbTx 2022.06.03.0 XMt 2022.02.07.0

Low Channel, 2405 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				12.786	30	Pass



OUTPUT POWER



XMH 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
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.

OUTPUT POWER



TSTx 2022.06.03.0 XMR 2022.02.07.0

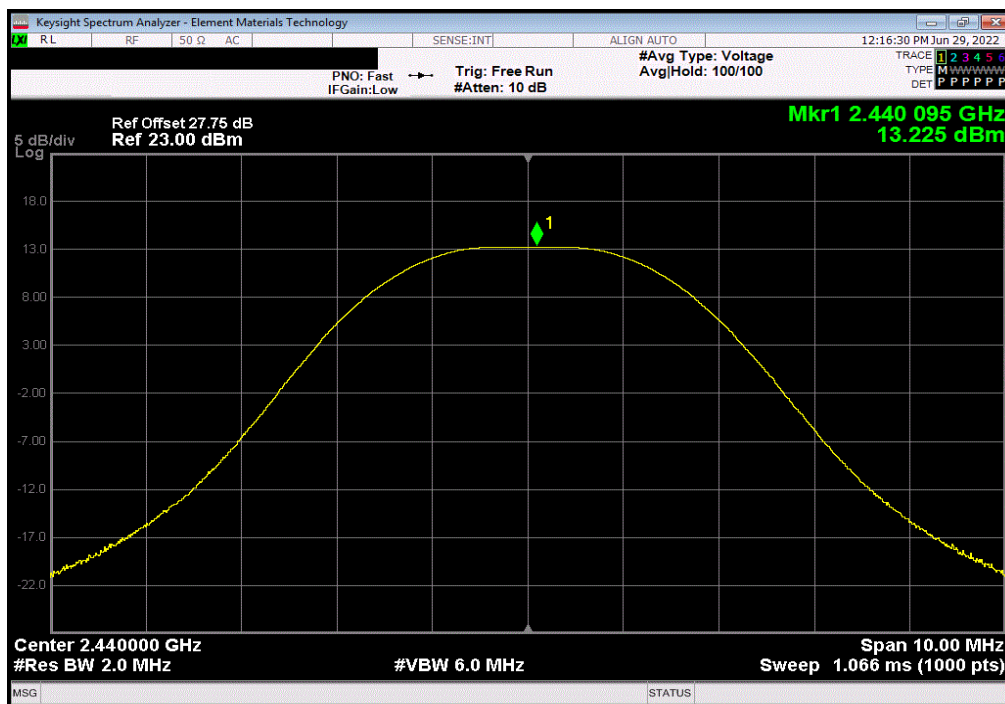
EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G02		Date: 29-Jun-22	
Customer: NextGen RF Design		Temperature: 25.1 °C	
Attendees: Tim Smith		Humidity: 42.4% RH	
Project: None		Barometric Pres.: 1020 mbar	
Tested by: Christopher Heintzelman	Power: 120VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
Reference Level Offset includes measurement cable, attenuator, and DC block.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	14	Signature <i>Christopher Heintzelman</i>	
		Out Pwr (dBm)	Limit (dBm)
Mid Channel, 2440 MHz, Modulated		13.225	30
High Channel, 2479 MHz, Modulated		12.957	30
			Result
			Pass
			Pass

OUTPUT POWER

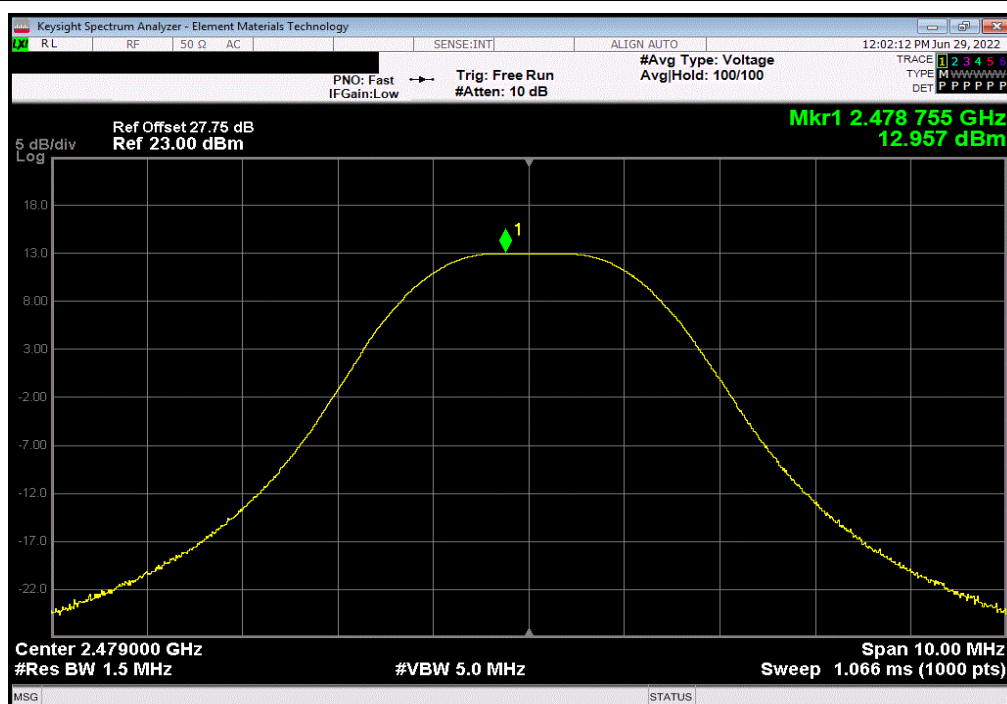


TotTx 2022.06.03.0 XMI 2022.02.07.0

Mid Channel, 2440 MHz, Modulated						
				Out Pwr (dBm)	Limit (dBm)	Result
				13.225	30	Pass



High Channel, 2479 MHz, Modulated						
				Out Pwr (dBm)	Limit (dBm)	Result
				12.957	30	Pass



POWER SPECTRAL DENSITY



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

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

POWER SPECTRAL DENSITY



TSTx 2022.06.03.0 XMR 2022.02.07.0

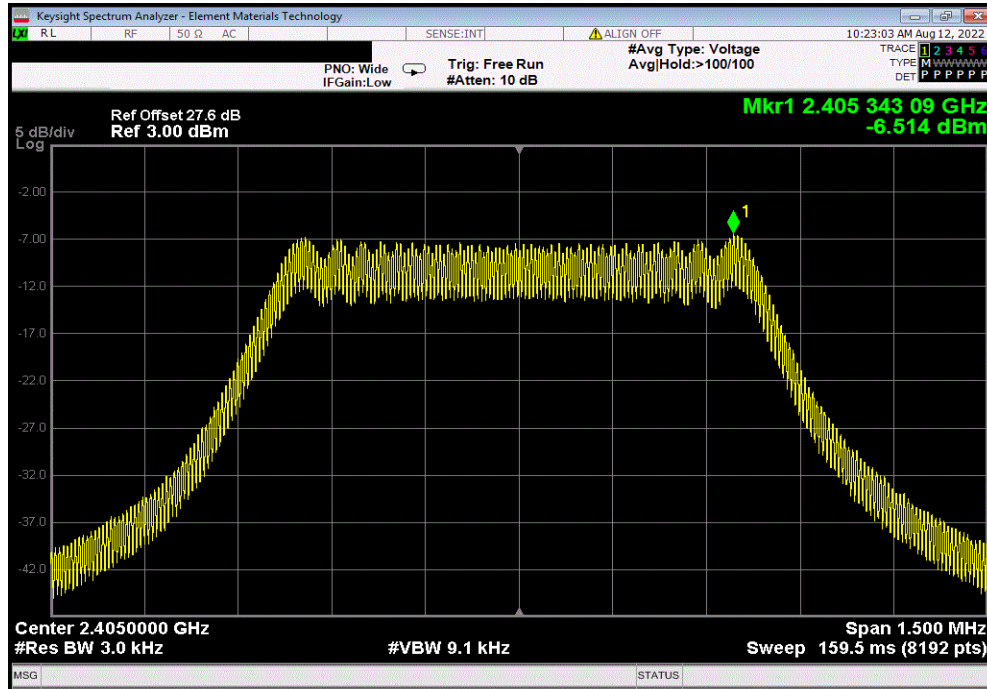
EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G01		Date: 12-Aug-22	
Customer: NextGen RF Design		Temperature: 20.8 °C	
Attendees: Tim Smith		Humidity: 50.5% RH	
Project: None		Barometric Pres.: 1021 mbar	
Tested by: Christopher Heintzelman	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
Reference Level Offset includes measurement cable, attenuator, and DC Block.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	17	Signature <i>Christopher Heintzelman</i>	
		Value dBm/3kHz	Limit < dBm/3kHz
Low Channel, 2405 MHz		-6.514	8
			Results Pass

POWER SPECTRAL DENSITY



TbTx 2022.06.03.0 XMR 2022.02.07.0

Low Channel, 2405 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-6.514	8	Pass



POWER SPECTRAL DENSITY

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

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

POWER SPECTRAL DENSITY



TSTx 2022.06.03.0 XMR 2022.02.07.0

EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G02		Date: 29-Jun-22	
Customer: NextGen RF Design		Temperature: 24.7 °C	
Attendees: Tim Smith		Humidity: 43.2% RH	
Project: None		Barometric Pres.: 1020 mbar	
Tested by: Christopher Heintzelman		Power: 120VAC/60Hz	
		Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
Reference Level Offset includes measurement cable, attenuator, and DC block.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	14	Signature <i>Christopher Heintzelman</i>	
		Value	Limit
		dBm/3kHz	< dBm/3kHz
Mid Channel, 2440 MHz, Modulated		-6.092	8
High Channel, 2480 MHz, Modulated		-6.108	8
			Results
			Pass
			Pass

TbrTx 2022.06.03.0 XMit 2022.02.07.0

Keysight Spectrum Analyzer - Element Materials Technology

R L RF 50 Ω AC SENSE:INT ALIGN AUTO 12:19:56 PM Jun 29, 2022

PNO: Wide IF Gain: Low Trig: Free Run #Atten: 10 dB #Avg Type: Voltage Avg|Hold:>100/100

TRACE 1 2 3 4 5 TYPE M W V A F DET P P P P P

Ref Offset 27.75 dB
Ref 4.00 dBm

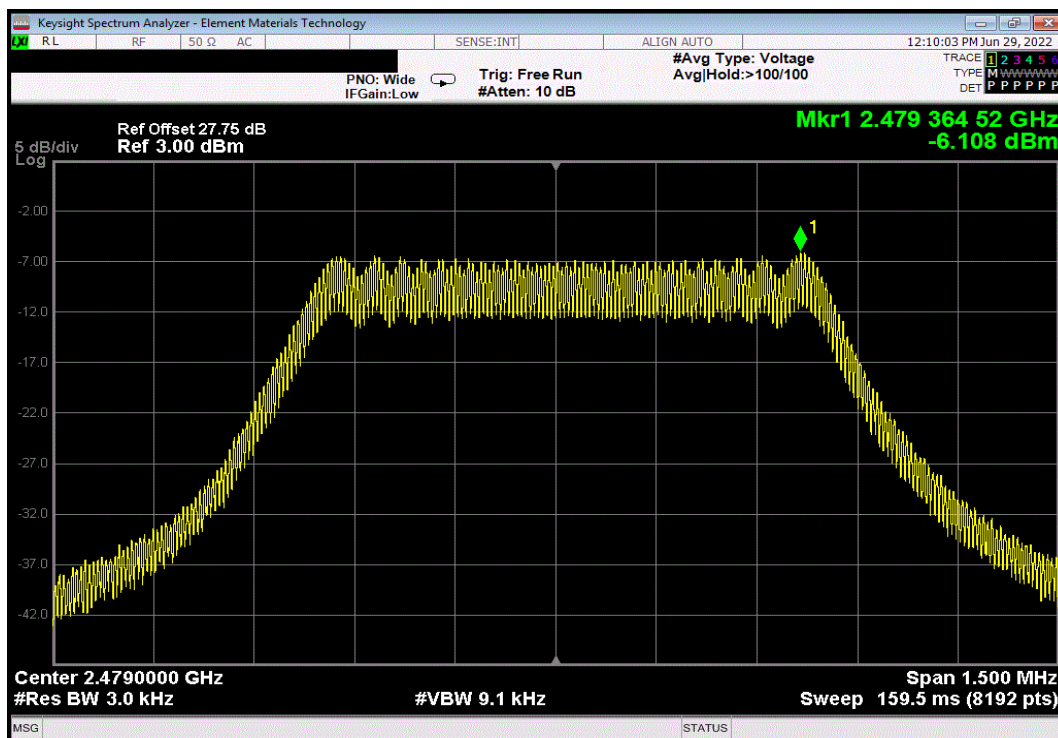
Mkr1 2.440 364 15 GHz
-6.092 dBm

5 dB/div Log

Center 2.440000 GHz
#Res BW 3.0 kHz #VBW 9.1 kHz Span 1.500 MHz Sweep 159.5 ms (8192 pts)

TbrTx 2022.06.03.0 XMit 2022.02.07.0

High Channel, 2480 MHz, Modulated						
				Value	Limit	
				dBm/3kHz	< dBm/3kHz	Results
				-6.108	8	Pass



POWERLINE CONDUCTED EMISSIONS

TEST DESCRIPTION

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Gauss Instruments	TDEMI 30M	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

POWERLINE CONDUCTED EMISSIONS

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 FCC 15.207:2022	Method: ANSI C63.10:2013
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TEST PARAMETERS

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

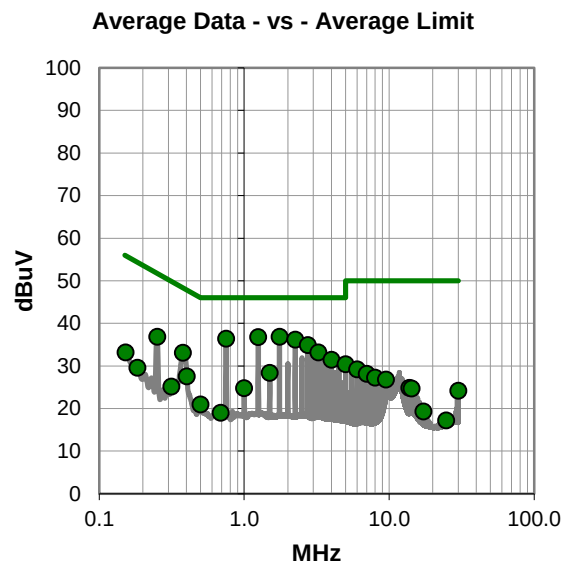
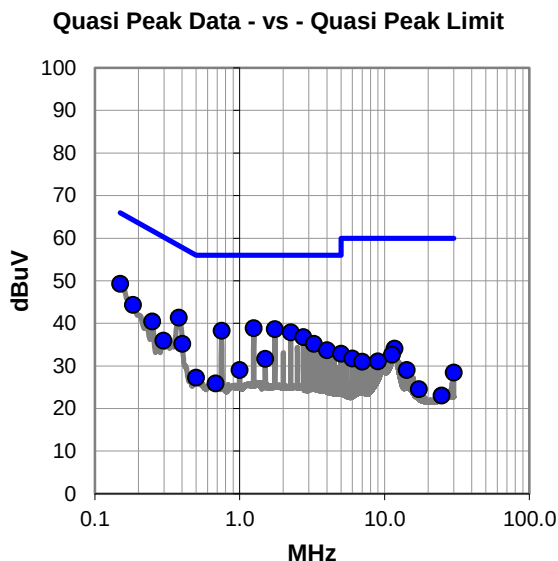
Paired with wireless sensor. Connected to WiFi router. Power supply ME20A1203B01.

EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #57

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
0.687	-1.3	20.3	19.0	46.0	-27.0

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

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
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COMMENTS

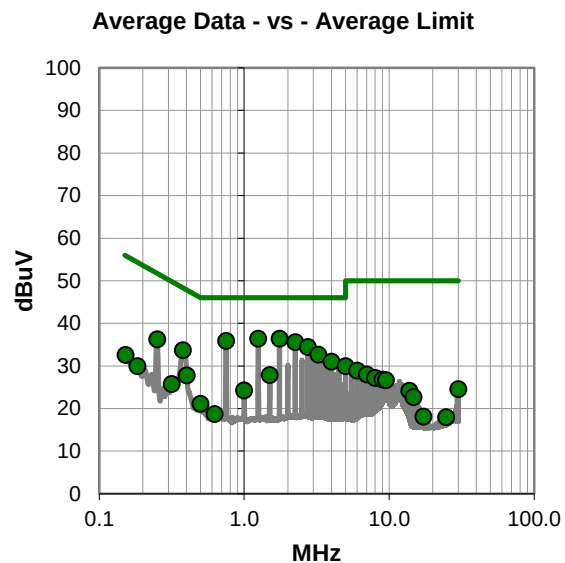
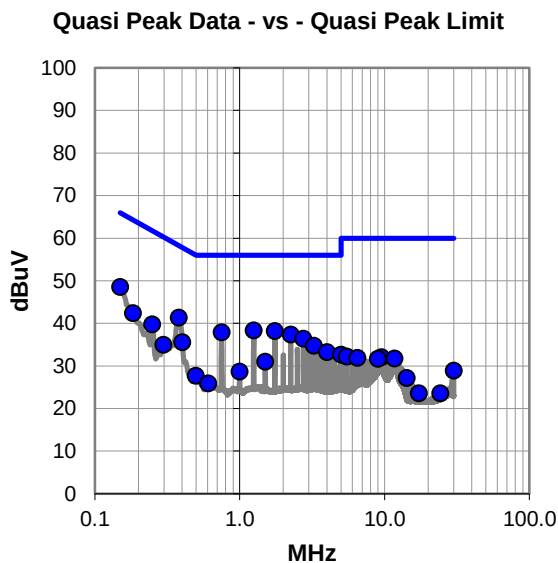
Paired with wireless sensor. Connected to WiFi router. Power supply ME20A1203B01.

EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #58

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

POWERLINE CONDUCTED EMISSIONS

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
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COMMENTS

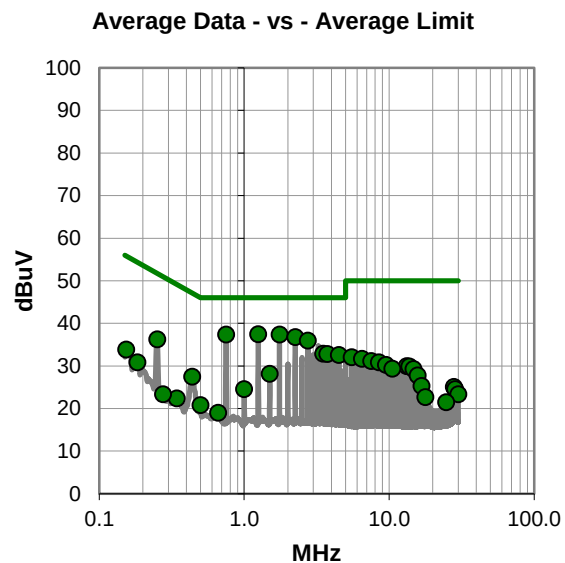
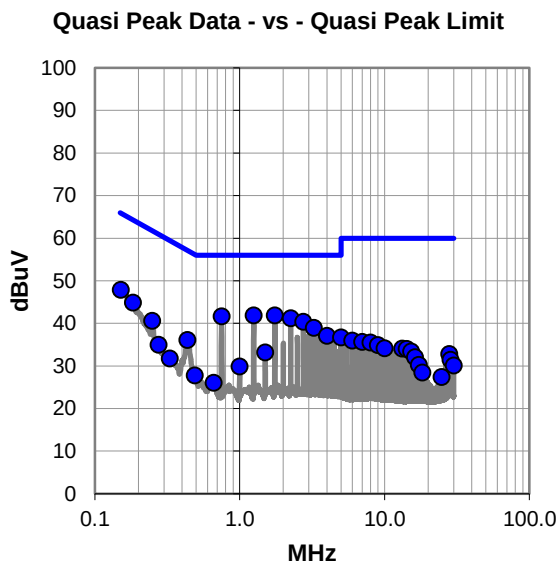
Paired with wireless sensor. Connected to WiFi router. Power supply GlobTek WR9HE1000LCPIMFR6B.

EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #59

Quasi Peak Data - vs - Quasi Peak Limit

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
16.752	3.7	21.6	25.3	50.0	-24.7

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

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
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COMMENTS

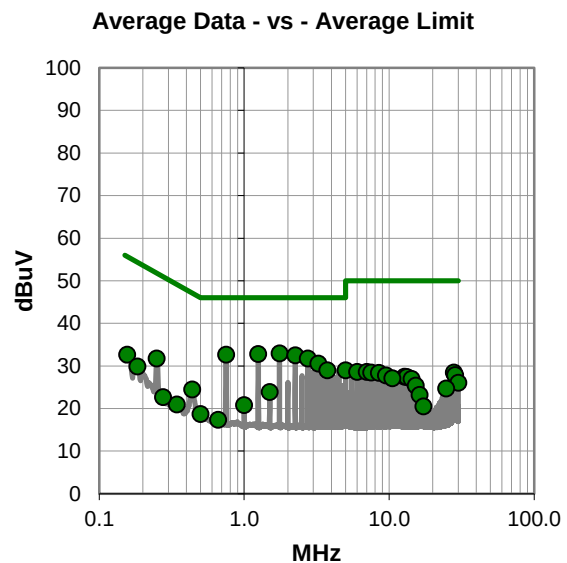
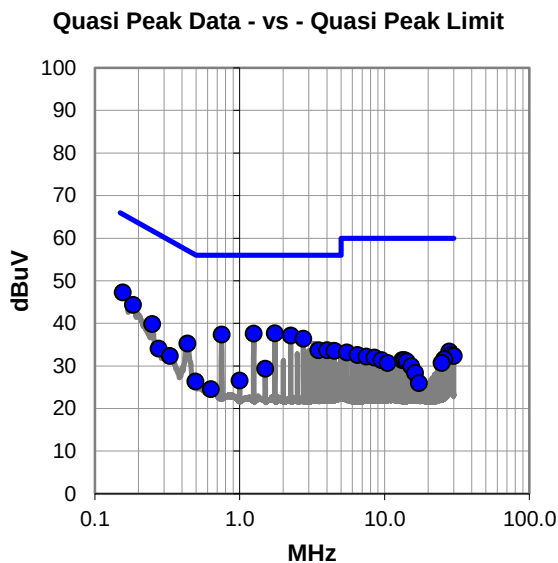
Paired with wireless sensor. Connected to WiFi router. Power supply GlobTek WR9HE1000LCPIMFR6B.

EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #60

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

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. 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
1.500	3.6	20.3	23.9	46.0	-22.1
9.500	6.8	21.0	27.8	50.0	-22.2
12.752	6.1	21.4	27.5	50.0	-22.5
13.251	6.0	21.4	27.4	50.0	-22.6
0.437	4.2	20.3	24.5	47.1	-22.6
10.501	5.9	21.2	27.1	50.0	-22.9
0.156	12.0	20.7	32.7	55.7	-23.0
14.251	5.6	21.4	27.0	50.0	-23.0
30.000	3.6	22.5	26.1	50.0	-23.9
0.184	9.4	20.5	29.9	54.3	-24.4

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

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 #:	61	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

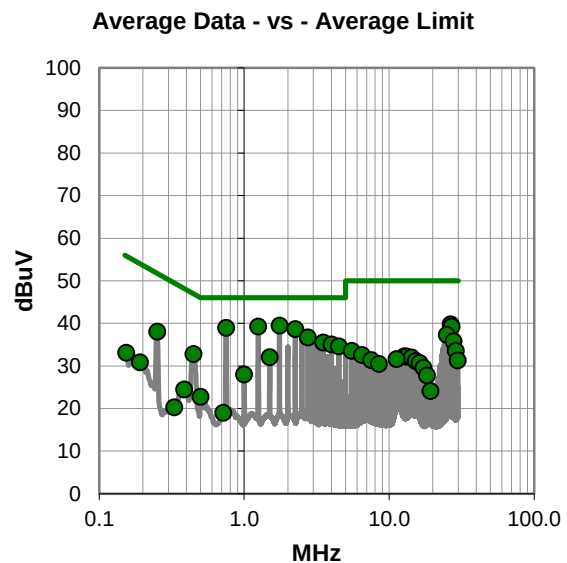
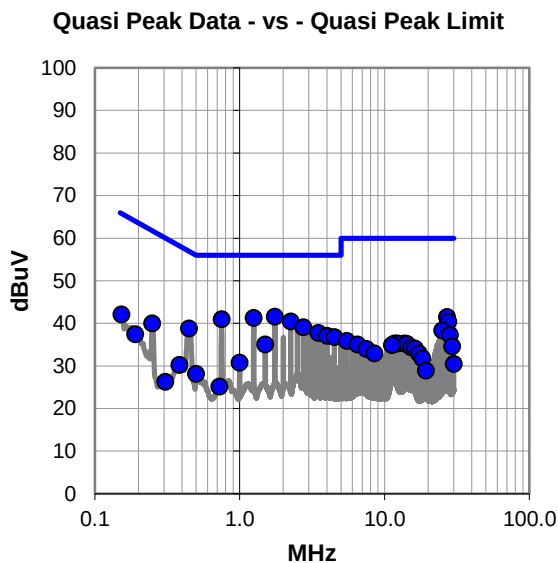
Paired with wireless sensor. Connected to WiFi router. Power supply MeanWell GSM18U12-P1J

EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #61

Quasi Peak Data - vs - Quasi Peak Limit

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
29.754	8.8	22.5	31.3	50.0	-18.7

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

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
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COMMENTS

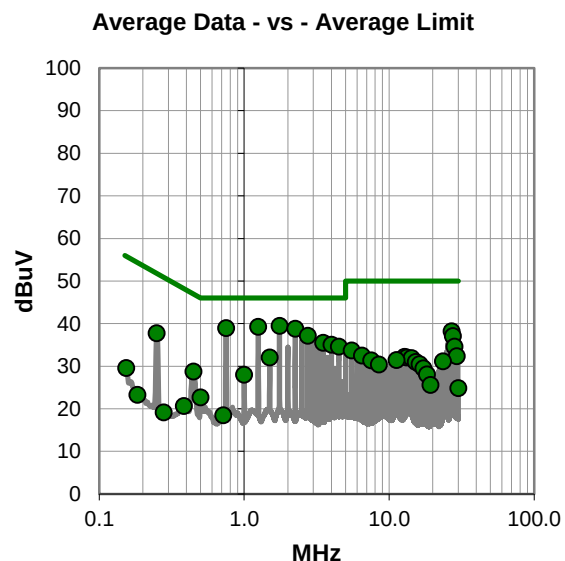
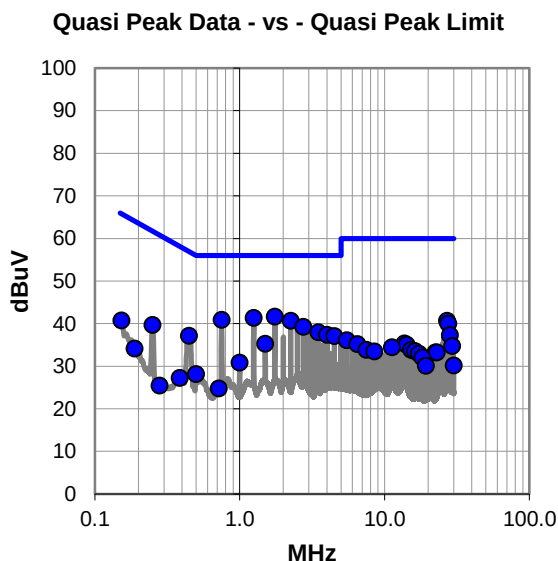
Paired with wireless sensor. Connected to WiFi router. Power supply MeanWell GSM18U12-P1J

EUT OPERATING MODES

Transmitting 2.4 GHz FHSS mode

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

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
23.502	9.2	22.0	31.2	50.0	-18.8
15.252	9.5	21.5	31.0	50.0	-19.0

CONCLUSION

Pass



Tested By

SPURIOUS CONDUCTED EMISSIONS



XMH 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

SPURIOUS CONDUCTED EMISSIONS



TSTx 2022.06.03.0 XMR 2022.02.07.0

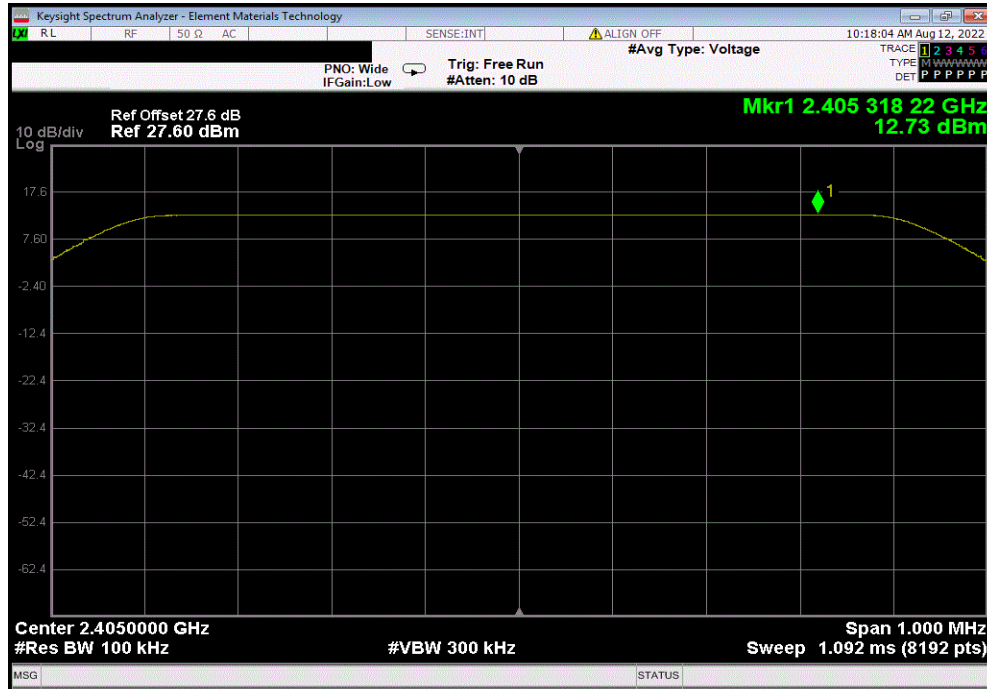
EUT: Titan Gateway		Work Order: NGRF0028	
Serial Number: PP-G01		Date: 12-Aug-22	
Customer: NextGen RF Design		Temperature: 20.7 °C	
Attendees: Tim Smith		Humidity: 50.5% RH	
Project: None		Barometric Pres.: 1021 mbar	
Tested by: Christopher Heintzelman	Power: 110VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method: ANSI C63.10:2013	
COMMENTS			
Reference Level Offset includes measurement cable, attenuator, and DC Block.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	17	Signature <i>Christopher Heintzelman</i>	
		Frequency Range	Measured Freq (MHz)
Low Channel, 2405 MHz		Fundamental	2405.32
Low Channel, 2405 MHz		30 MHz - 12.5 GHz	12419.31
Low Channel, 2405 MHz		12.5 GHz - 25 GHz	24803.14
		Max Value (dBc)	Limit ≤ (dBc)
		N/A	N/A
		-55.44	-20
		-43.48	-20
			Result
			N/A
			Pass
			Pass

SPURIOUS CONDUCTED EMISSIONS

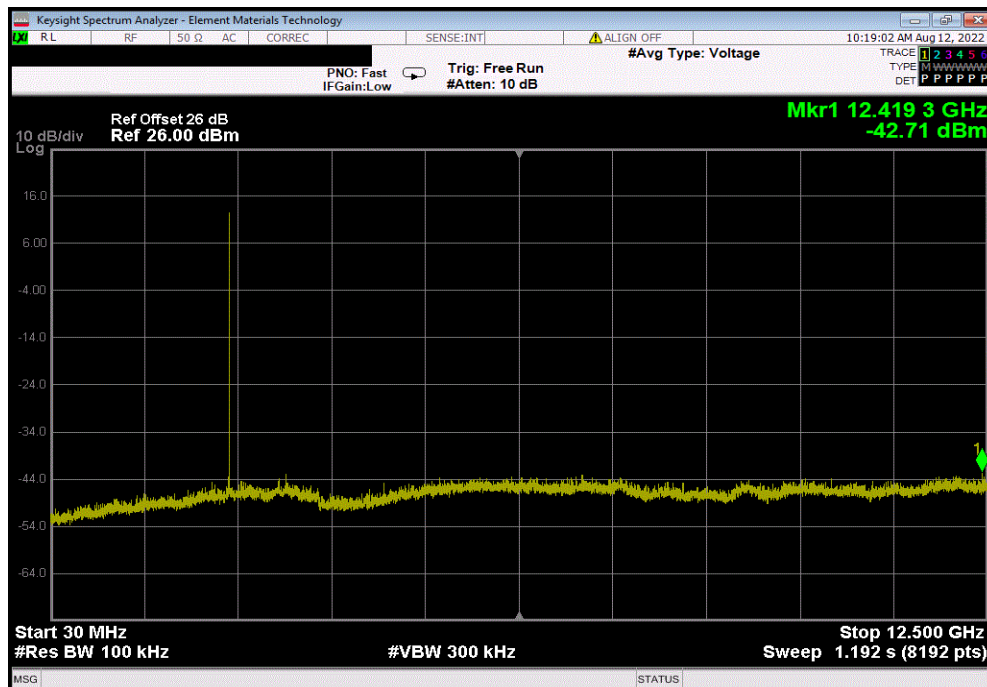


TbTx 2022.06.03.0 XMt 2022.02.07.0

Low Channel, 2405 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	2405.32	N/A	N/A	N/A	



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

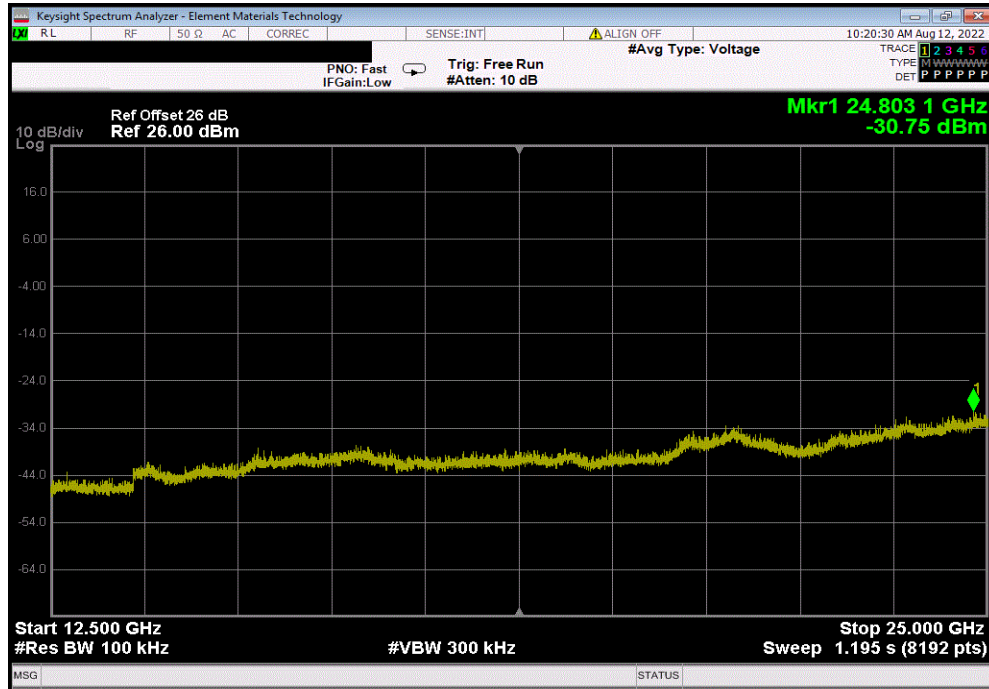


SPURIOUS CONDUCTED EMISSIONS



TbTtx 2022.06.03.0 XMR 2022.02.07.0

Low Channel, 2405 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	24803.14	-43.48	-20	Pass	



SPURIOUS CONDUCTED EMISSIONS



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
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

SPURIOUS CONDUCTED EMISSIONS



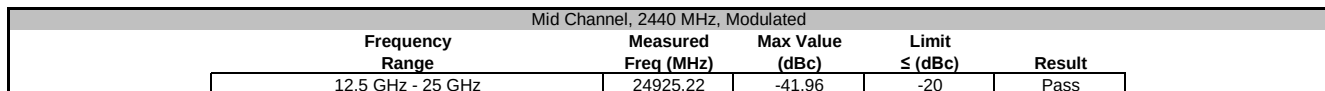
TSTx 2022.06.03.0 XMR 2022.02.07.0

EUT: Titan Gateway		Work Order: NGRF0028			
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 SPECIFICATIONS					
FCC 15.247:2022		Test Method			
		ANSI C63.10:2013			
COMMENTS					
None					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	14	Signature <i>Christopher Heintzelman</i>			
		Frequency Range	Measured Freq (MHz)		
			Max Value (dBc)		
			Limit ≤ (dBc)		
			Result		
Mid Channel, 2440 MHz, Modulated		Fundamental	2440.04	N/A	N/A
Mid Channel, 2440 MHz, Modulated		30 MHz - 12.5 GHz	1867.54	-49.1	-20
Mid Channel, 2440 MHz, Modulated		12.5 GHz - 25 GHz	24925.22	-41.96	-20
High Channel, 2479 MHz, Modulated		Fundamental	2479.25	N/A	N/A
High Channel, 2479 MHz, Modulated		30 MHz - 12.5 GHz	11930.62	-53.79	-20
High Channel, 2479 MHz, Modulated		12.5 GHz - 25 GHz	24865.71	-42.08	-20

Mid Channel, 2440 MHz, Modulated						
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
	Fundamental	2440.04	N/A	N/A	N/A	



Mid Channel, 2440 MHz, Modulated					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	1867.54	-49.1	-20	Pass	

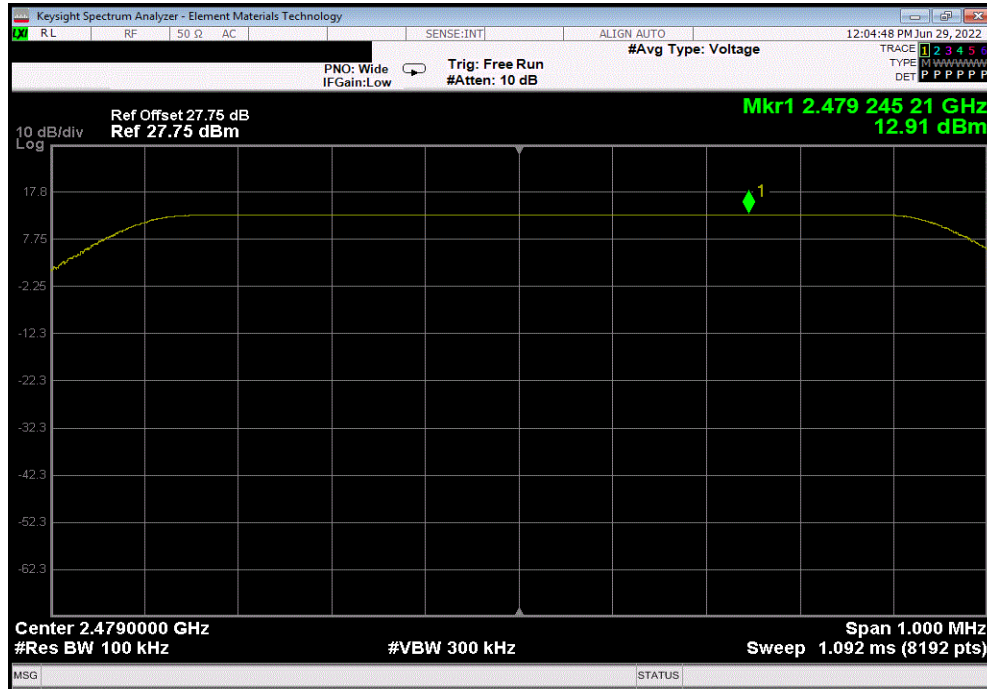


SPURIOUS CONDUCTED EMISSIONS

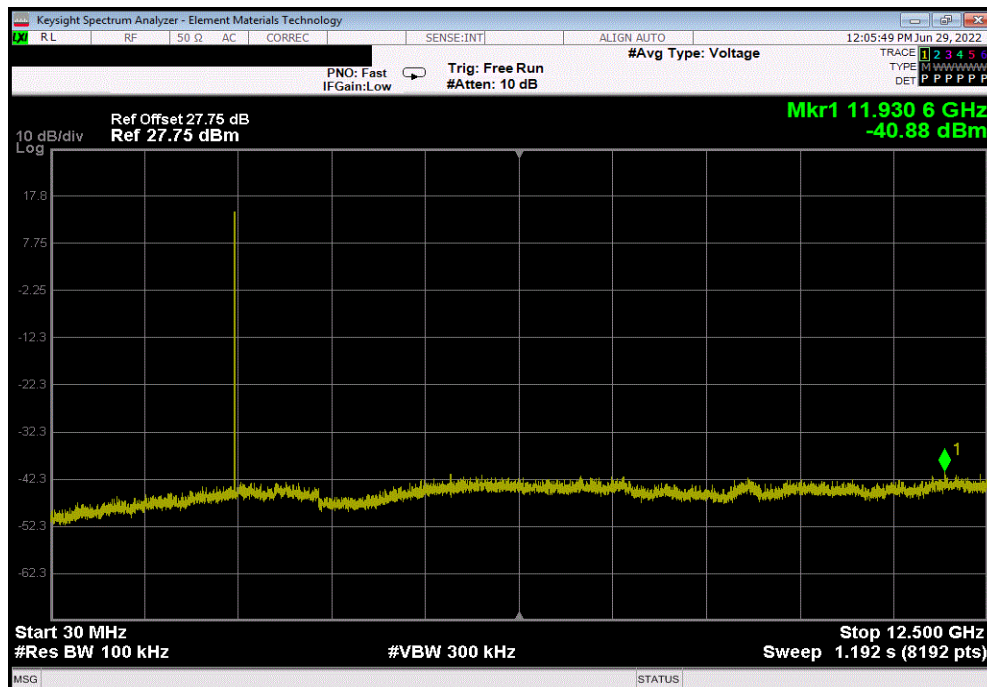


TbTx 2022.06.03.0 XMt 2022.02.07.0

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



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

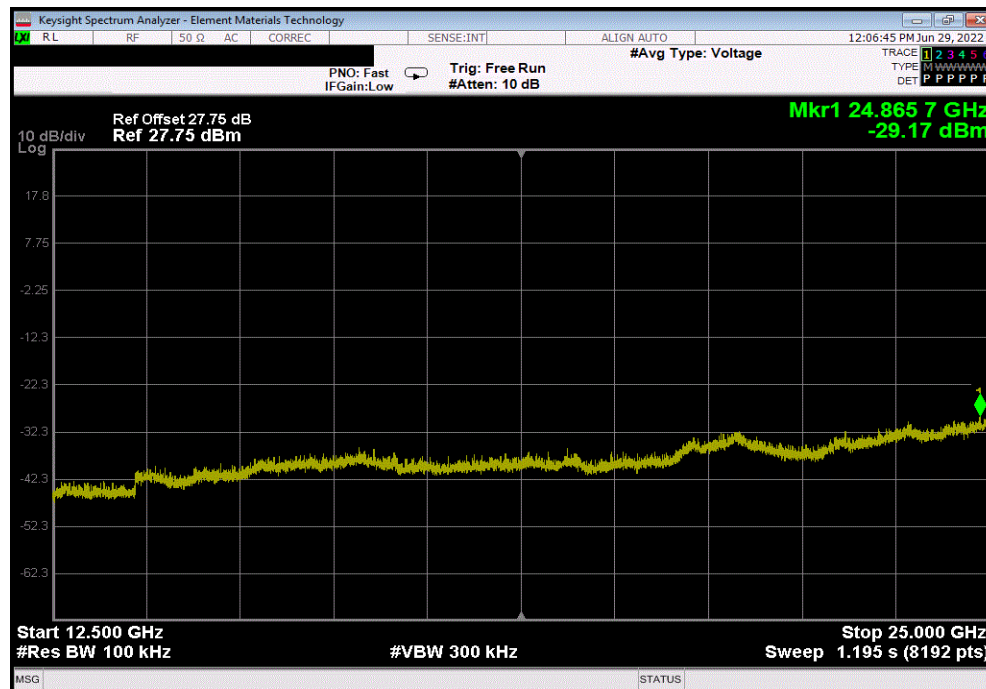


SPURIOUS CONDUCTED EMISSIONS



TbTx 2022.06.03.0 XbTx 2022.02.07.0

High Channel, 2479 MHz, Modulated					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	24865.71	-42.08	-20	Pass	



SPURIOUS RADIATED EMISSIONS

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

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

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

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

SPURIOUS RADIATED EMISSIONS

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

SPURIOUS RADIATED EMISSIONS

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)
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COMMENTS

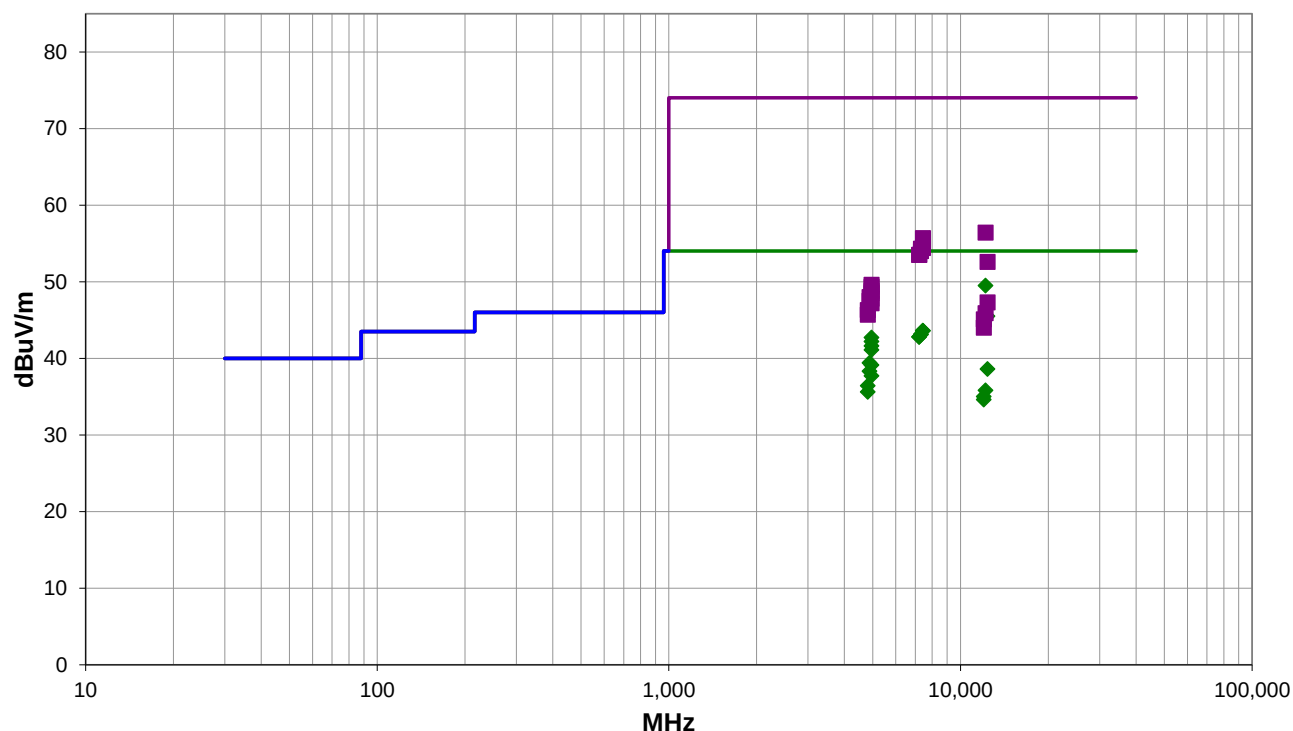
Shielded radio module, Power setting: -8 dbm

EUT OPERATING MODES

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

DEVIATIONS FROM TEST STANDARD

None



Run #: 68

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #68

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
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

SPURIOUS RADIATED EMISSIONS

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
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

SPURIOUS RADIATED EMISSIONS

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)
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COMMENTS

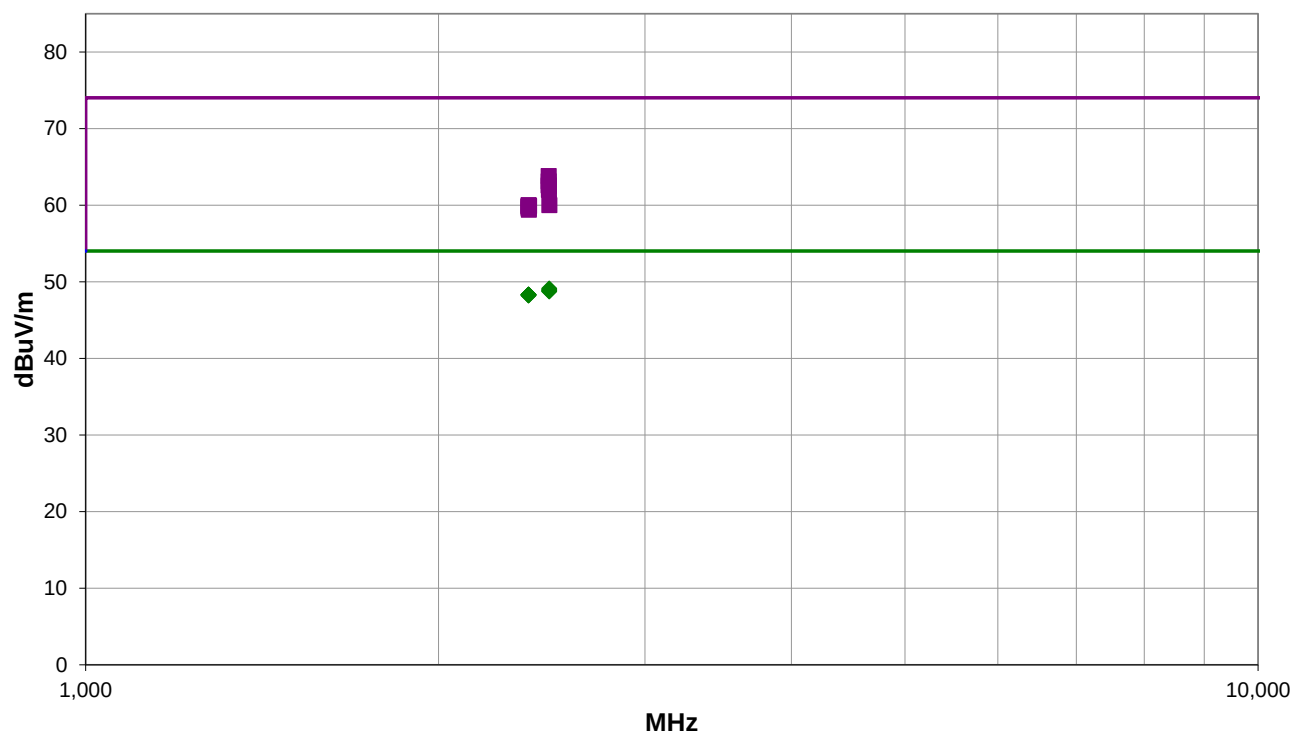
Shielded radio module, Power setting: -8 dbm

EUT OPERATING MODES

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

DEVIATIONS FROM TEST STANDARD

None



Run #: 70

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #70

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	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