



NextGen RF Design

Titan Sensor

FCC 15.247:2022
2.4 GHz DTS Radio

Report: NGRF0028.1 Rev. 2, Issue Date: January 11, 2023



CERTIFICATE OF TEST

Last Date of Test: December 29, 2022

NextGen RF Design

EUT: Titan Sensor

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	N/A	KDB 558074 -6.0	11.6	Operates at 100%.
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

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 functional description	2022-12-13	10
	Added information	2022-12-13	11
	Added configurations	2022-12-13	12-13
	Updated dates of test	2022-12-13	14
	Updated antenna information	2022-12-13	26-29
	Added test equipment	2022-12-13	48
	Updated configurations	2022-12-13	56-77
02	Added configurations NGRF0028-29, 30, 31, 32, 33, 34, 35	2022-12-30	13-16
	Added Emissions Bandwidth data	2022-12-30	30-33
	Added EIRP data	2022-12-30	22-25
	Added Output Power data	2022-12-30	35-37
	Updated photos only report to reflect new data	2022-12-30	N/A
	Updated test dates	2022-12-30	2, 10, 17

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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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

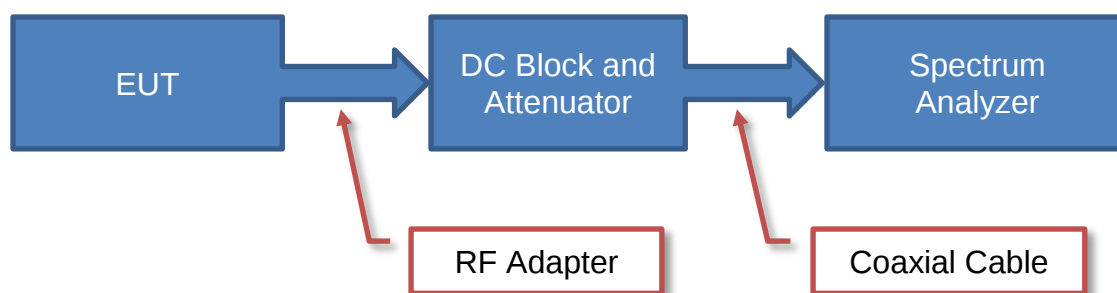
TEST SETUP BLOCK DIAGRAMS

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.

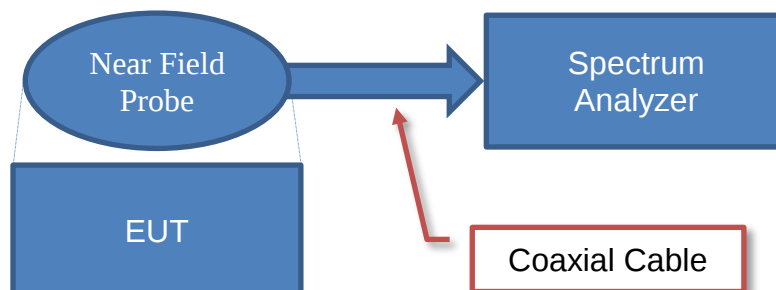
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

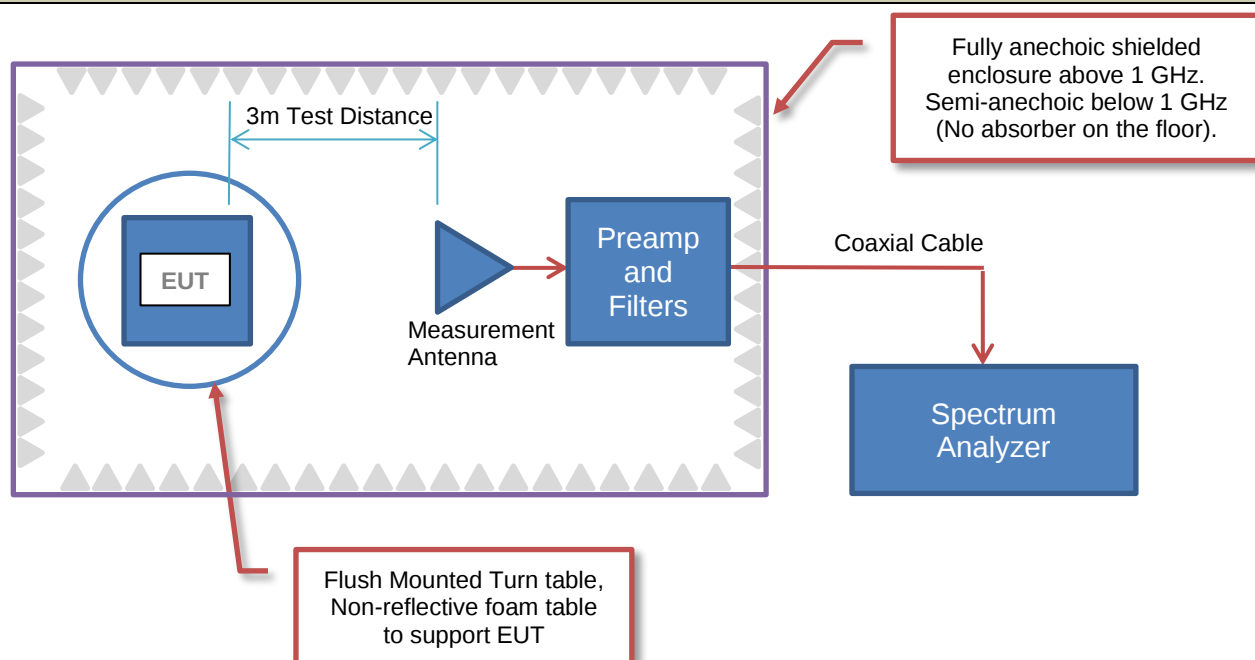


Sample Calculation (logarithmic units)

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

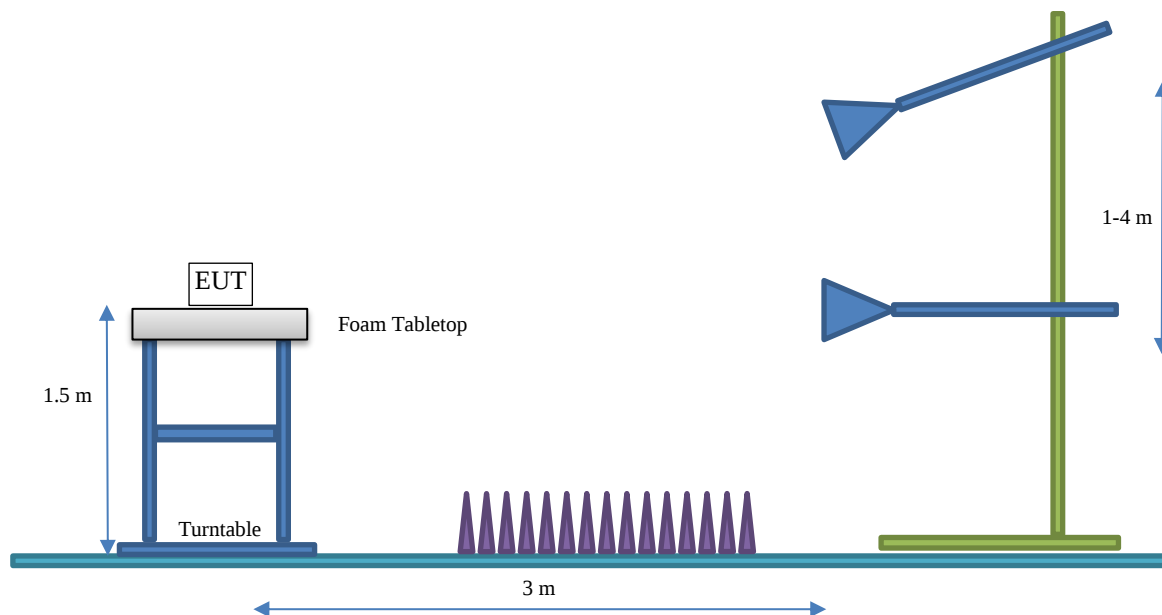
Radiated Power (ERP/EIRP) – Substitution Method:

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:	Titan Sensor
First Date of Test:	June 29, 2022
Last Date of Test:	December 29, 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 test report is specific to the Sensor only. The Gateway will be tested separately

Testing Objective:

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

Client Provided Justification

The wireless sensor has four variations, Wireless Humidity Sensor (WHS), Wireless Temp Sensor (WTS), Wireless Multi-Function Transmitter (WMFT), and WMFT with relay (WMFT-R). The PCB layout, MCU, and radio design is exactly the same between all four variants. The only difference is related to the on-board sensing capabilities and control, which is managed thru the BOM at production. The WHS & WTS are self-explanatory, as they use on-board humidity & temperature sensing elements. The WMFT has an analog sensing circuit that interfaces with various external sensor types, including resistive based, 0-5V, and 4-20mA sensors. The WMFT-R simply adds a relay that can be used for monitoring and/or control for future applications.

Element Materials Technology makes no claims of compliance on these additional variants.

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	3.16

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 Sensor V22.06.28
☒ 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- 15

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor Module	WINLAND Electronics, Inc	EAPRO-WMFT-R	PP-W02

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

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power (Sensor)	No	1.1m	No	ITE Power Supply (Wireless)	Wireless Sensor Module
USB Cable (Sensor)	Yes	0.9 m	No	Laptop	Sensor

Configuration NGRF0028- 26

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor Module	WINLAND Electronics, Inc	EAPRO-WMFT-R	PP-W01

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Sensor 1 (Temperature)	WINLAND Electronics, Inc	TEMP-L-S	None
Medical Power Supply	SL Power Electronics	ME20A1203B01	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power (Sensor)	No	1.1m	No	ITE Power Supply (Wireless)	Wireless Sensor Module

CONFIGURATIONS



Configuration NGRF0028- 29

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor Module	WINLAND Electronics, Inc	EAPRO-WMFT-R	000-0503A

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
ITE Power Supply (Wireless)	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
DC Power (Sensor)	No	1.1m	No	ITE Power Supply (Wireless)	Wireless Sensor Module
USB Cable (Sensor)	Yes	0.9 m	No	Laptop	Sensor

Configuration NGRF0028- 30

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor Module	WINLAND Electronics, Inc	EAPRO-WMFT	05038

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Medical Power Supply	SL Power Electronics	ME20A1203B01	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power (Sensor)	No	1.1m	No	Medical Power Supply	Wireless Sensor Module

CONFIGURATIONS



Configuration NGRF0028- 31

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor Module	WINLAND Electronics, Inc	EAPRO-WTS	05066

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Medical Power Supply	SL Power Electronics	ME20A1203B01	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power (Sensor)	No	1.1m	No	Medical Power Supply	Wireless Sensor Module

Configuration NGRF0028- 32

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor Module	WINLAND Electronics, Inc	EAPRO-WHS	0503A

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Medical Power Supply	SL Power Electronics	ME20A1203B01	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power (Sensor)	No	1.1m	No	Medical Power Supply	Wireless Sensor Module

CONFIGURATIONS



Configuration NGRF0028- 33

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor Module	WINLAND Electronics, Inc	EAPRO-WMFT-R	PP-W01

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Sensor 1 (Temperature)	WINLAND Electronics, Inc	TEMP-L-S	None
ITE Power Supply (Wireless)	GlobTek, Inc.	GT-46120-1212	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power (Sensor)	No	1.1m	No	ITE Power Supply (Wireless)	Wireless Sensor Module

Configuration NGRF0028- 34

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor Module	WINLAND Electronics, Inc	EAPRO-WMFT-R	PP-W01

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Sensor 1 (Temperature)	WINLAND Electronics, Inc	TEMP-L-S	None
ITE Power Supply (Wireless)	Meanwell	GSM18U12-P1J	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power (Sensor)	No	1.1m	No	ITE Power Supply (Wireless)	Wireless Sensor Module

CONFIGURATIONS



Configuration NGRF0028- 35

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Sensor Module	WINLAND Electronics, Inc	EAPRO-WMFT-R	PP-W01

Peripherals in Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Sensor 1 (Temperature)	WINLAND Electronics, Inc	TEMP-L-S	None
ITE Power Supply (Wireless)	GlobTek, Inc.	WR9HE1000LCPIMFR6B	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power (Sensor)	No	1.1m	No	ITE Power Supply (Wireless)	Wireless Sensor Module

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2022-06-29	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.
2	2022-06-29	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.
3	2022-06-29	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2022-06-29	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2022-08-12	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.
6	2022-12-19	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.
7	2022-12-19	Emissions 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.
8	2022-12-19	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.
9	2022-12-29	Spurious Radiated 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

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 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

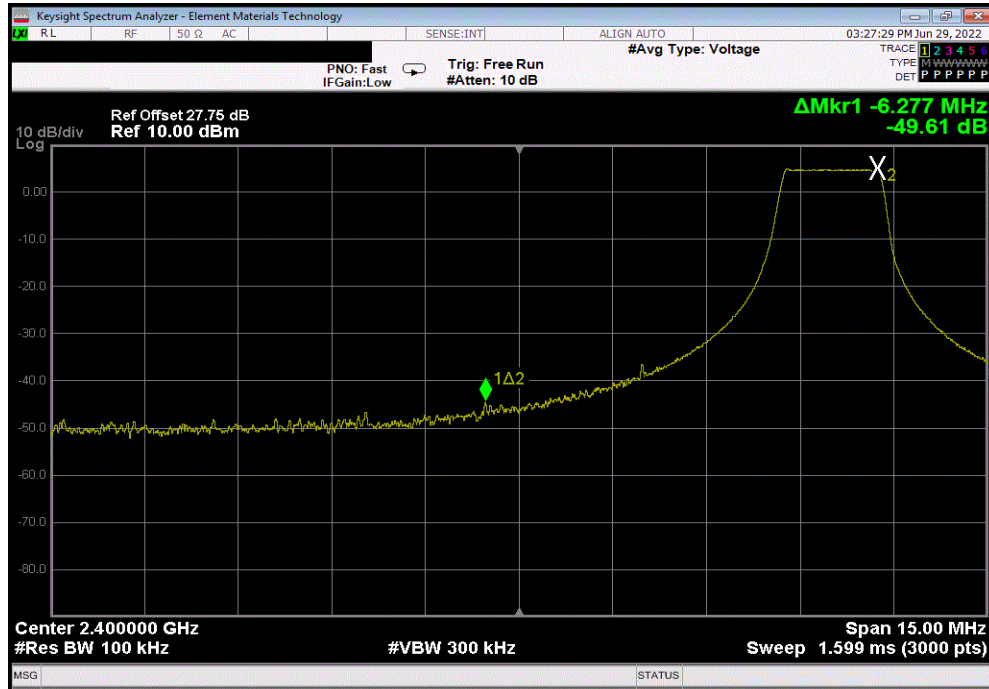
EUT: Titan Sensor		Work Order: NGRF0028	
Serial Number: PP-W02		Date: 29-Jun-22	
Customer: NextGen RF Design		Temperature: 24.2 °C	
Attendees: Tim Smith		Humidity: 44.3% RH	
Project: None		Barometric Pres.: 1016 mbar	
Tested by: Christopher Heintzelman	Power: 120VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	15	Signature <i>Christopher Heintzelman</i>	
		Value (dBc)	Limit ≤ (dBc) Result
Low Channel, 2405 MHz, Modulated		-49.61	-20 Pass
High Channel, 2479 MHz, Modulated		-49.58	-20 Pass

BAND EDGE COMPLIANCE

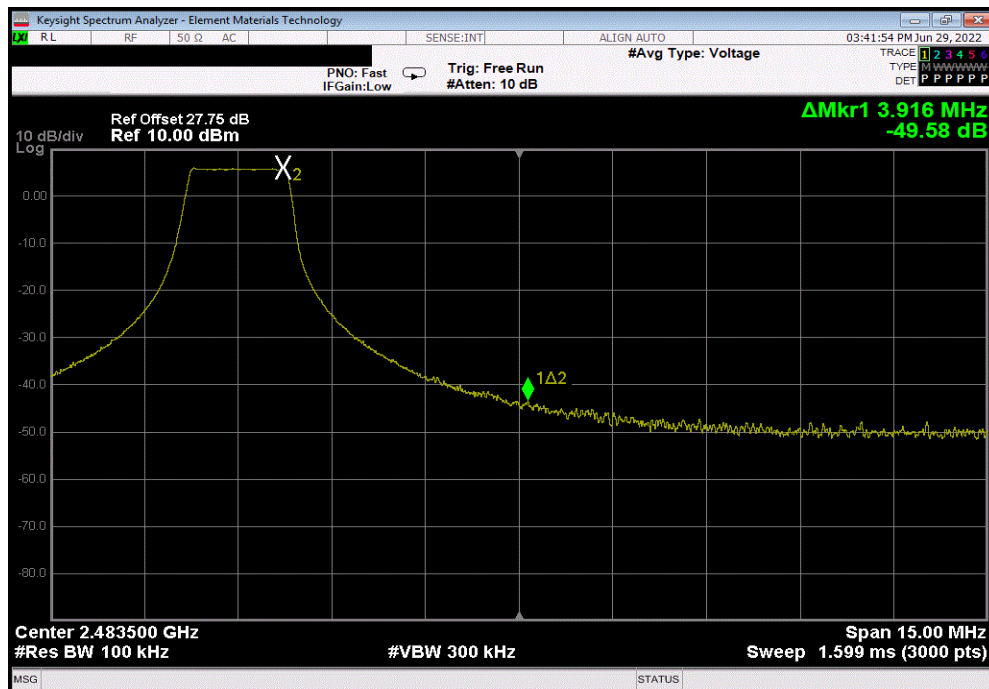


TbTtx 2022.06.03.0 XMt 2022.02.07.0

Low Channel, 2405 MHz, Modulated						
				Value (dBc)	Limit ≤ (dBc)	Result
				-49.61	-20	Pass



High Channel, 2479 MHz, Modulated						
				Value (dBc)	Limit ≤ (dBc)	Result
				-49.58	-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
Attenuator	S.M. Electronics	SA26B-20	RFW	2022-02-08	2023-02-08
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2022-04-25	2023-04-25
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24

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

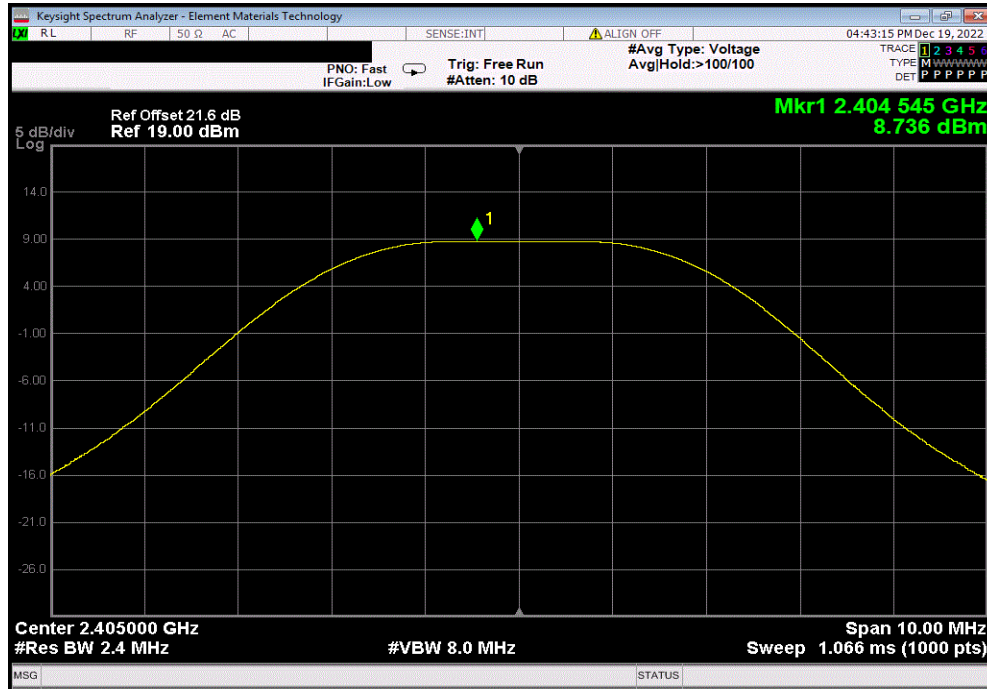
EUT: Titan Sensor		Work Order: NGRF0028	
Serial Number: 000-0503A		Date: 19-Dec-22	
Customer: NextGen RF Design		Temperature: 21.5 °C	
Attendees: Tim Smith		Humidity: 20.2% RH	
Project: None		Barometric Pres.: 1028 mbar	
Tested by: Christopher Heintzelman	Power: 110VAC/60Hz	Job Site: MN11	
TEST SPECIFICATIONS			
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 #	29	Signature <i>Christopher Heintzelman</i>	
		Out Pwr (dBm)	Antenna Gain (dBi)
Low Channel, 2405 MHz, Modulated		8.736	3.16
Mid Channel, 2440 MHz, Modulated		8.595	3.16
High Channel, 2479 MHz, Modulated		8.493	3.16
		EIRP (dBm)	EIRP Limit (dBm)
		11.896	36
		11.755	36
		11.653	36
			Result
			Pass
			Pass
			Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

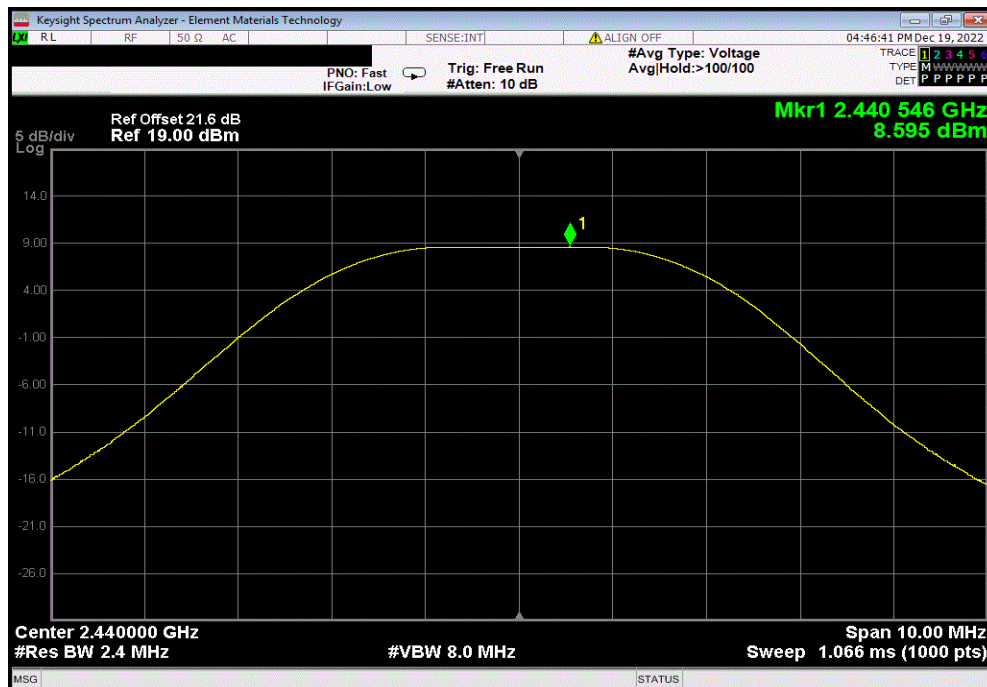


TbTx 2022.06.03.0 XbTx 2022.02.07.0

Low Channel, 2405 MHz, Modulated						
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
	8.736	3.16	11.896	36	Pass	



Mid Channel, 2440 MHz, Modulated						
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
	8.595	3.16	11.755	36	Pass	

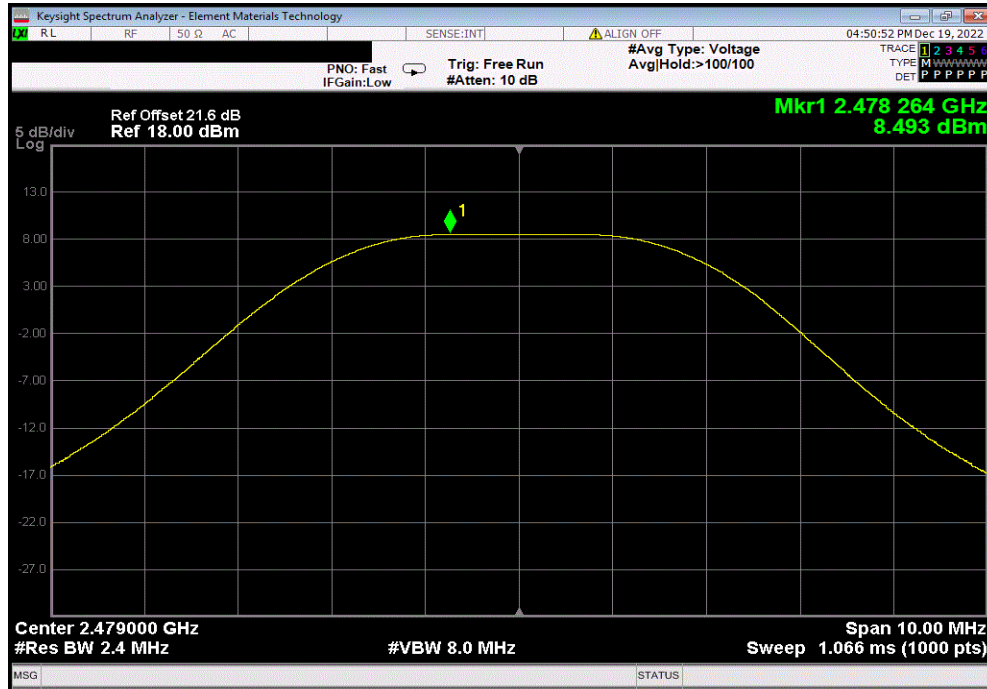


EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TbTx 2022.06.03.0 XMR 2022.02.07.0

High Channel, 2479 MHz, Modulated					
Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
8.493	3.16	11.653	36	Pass	



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	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 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.

The 6 dB emissions bandwidth was also measured at the same time.

OCCUPIED BANDWIDTH



TSTx 2022.06.03.0 XMR 2022.02.07.0

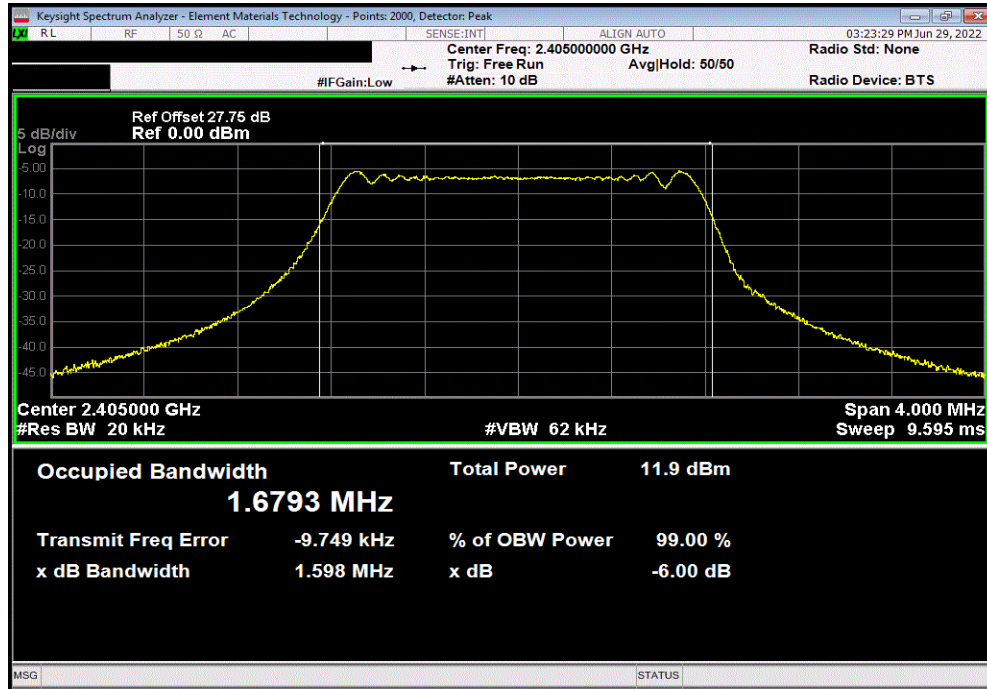
EUT: Titan Sensor		Work Order: NGRF0028	
Serial Number: PP-W02		Date: 29-Jun-22	
Customer: NextGen RF Design		Temperature: 24.1 °C	
Attendees: Tim Smith		Humidity: 44.4% RH	
Project: None		Barometric Pres.: 1016 mbar	
Tested by: Christopher Heintzelman	Power: 120VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	15	Signature <i>Christopher Heintzelman</i>	
		Emissions BW Value	Emissions BW Limit (kHz)
Low Channel, 2405 MHz, Modulated		1.598 MHz	> 500 kHz
Mid Channel, 2440 MHz, Modulated		1.596 MHz	> 500 kHz
High Channel, 2479 MHz, Modulated		1.600 MHz	> 500 kHz
		OBW Value	OBW Limit
		1.679 MHz	N/A
		1.683 MHz	N/A
		1.684 MHz	N/A
			Results
			Pass
			Pass
			Pass

OCCUPIED BANDWIDTH

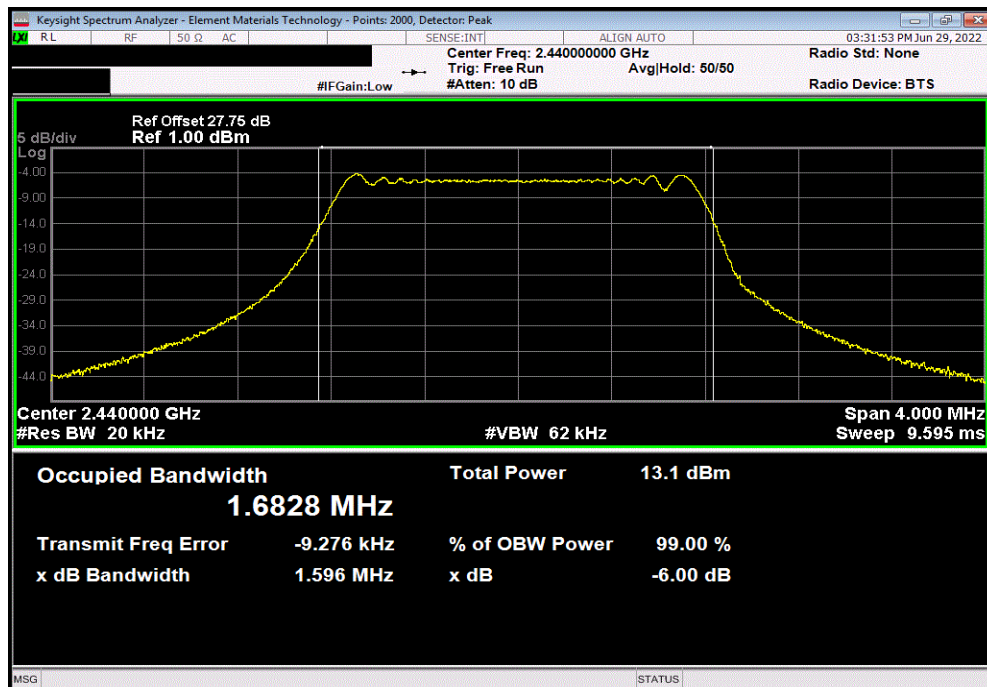


TbTx 2022.06.03.0 XMt 2022.02.07.0

Low Channel, 2405 MHz, Modulated						
	Emissions BW Value	Emissions BW Limit (kHz)	OBW Value	OBW Limit	Results	
	1.598 MHz	> 500 kHz	1.679 MHz	N/A	Pass	



Mid Channel, 2440 MHz, Modulated						
	Emissions BW Value	Emissions BW Limit (kHz)	OBW Value	OBW Limit	Results	
	1.596 MHz	> 500 kHz	1.683 MHz	N/A	Pass	

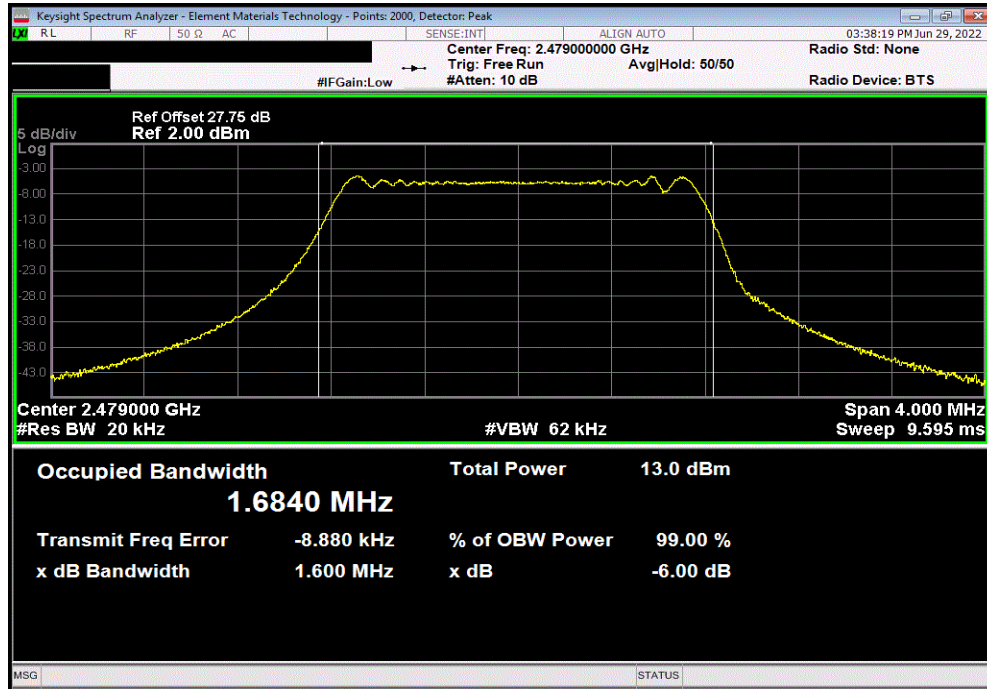


OCCUPIED BANDWIDTH



TbTx 2022.06.03.0 XbTx 2022.02.07.0

High Channel, 2479 MHz, Modulated					
	Emissions BW Value	Emissions BW Limit (kHz)	OBW Value	OBW Limit	Results
	1.600 MHz	> 500 kHz	1.684 MHz	N/A	Pass



EMISSIONS 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
Attenuator	S.M. Electronics	SA26B-20	RFW	2022-02-08	2023-02-08
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
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 EUT was set to the channels and modes listed in the datasheet.

The 6dB DTS bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

EMISSIONS BANDWIDTH



TSTx 2022.06.03.0 XMR 2022.02.07.0

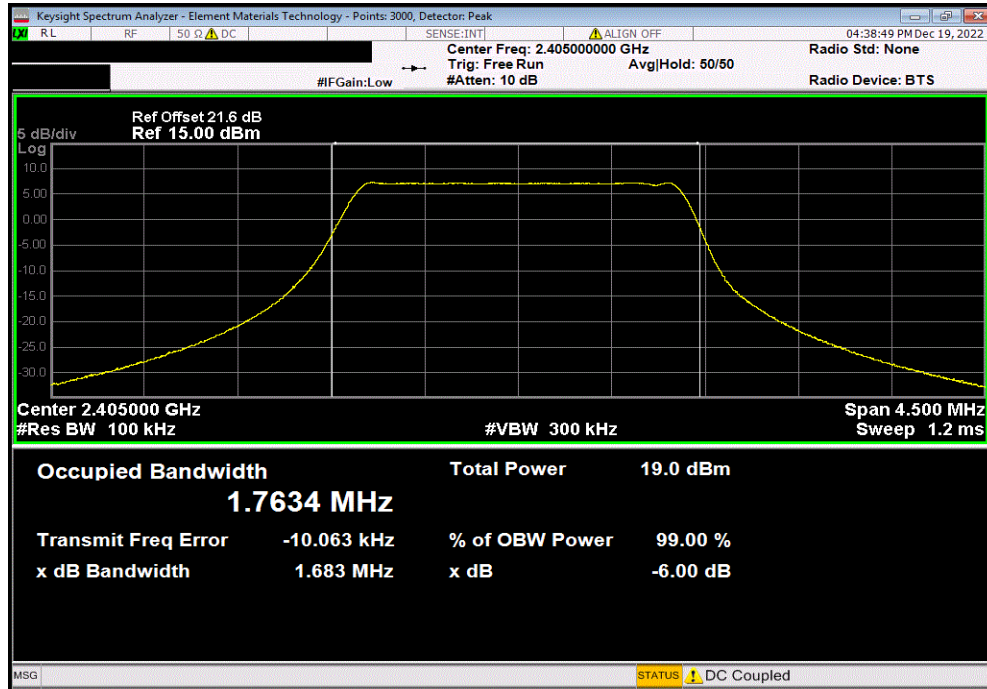
EUT: Titan Sensor		Work Order: NGRF0028	
Serial Number: 000-0503A		Date: 19-Dec-22	
Customer: NextGen RF Design		Temperature: 21.5 °C	
Attendees: Tim Smith		Humidity: 20% RH	
Project: None		Barometric Pres.: 1028 mbar	
Tested by: Christopher Heintzelman	Power: 110VAC/60Hz	Job Site: MN11	
TEST SPECIFICATIONS			
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 #	29	Signature <i>Christopher Heintzelman</i>	
		Value	Limit (>)
Low Channel, 2405 MHz, Modulated		1.683 MHz	500 kHz
Mid Channel, 2440 MHz, Modulated		1.684 MHz	500 kHz
High Channel, 2479 MHz, Modulated		1.685 MHz	500 kHz
			Result
			Pass
			Pass
			Pass

EMISSIONS BANDWIDTH

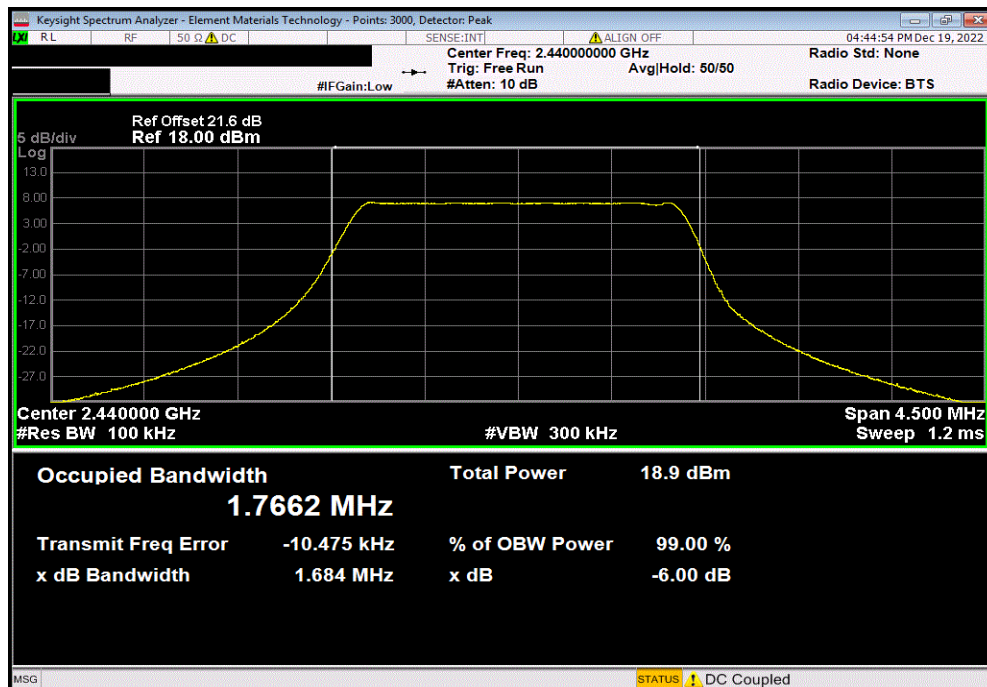


TbTx 2022.06.03.0 XbTx 2022.02.07.0

Low Channel, 2405 MHz, Modulated						
				Value	Limit (>)	Result
				1.683 MHz	500 kHz	Pass



Mid Channel, 2440 MHz, Modulated						
				Value	Limit (>)	Result
				1.684 MHz	500 kHz	Pass

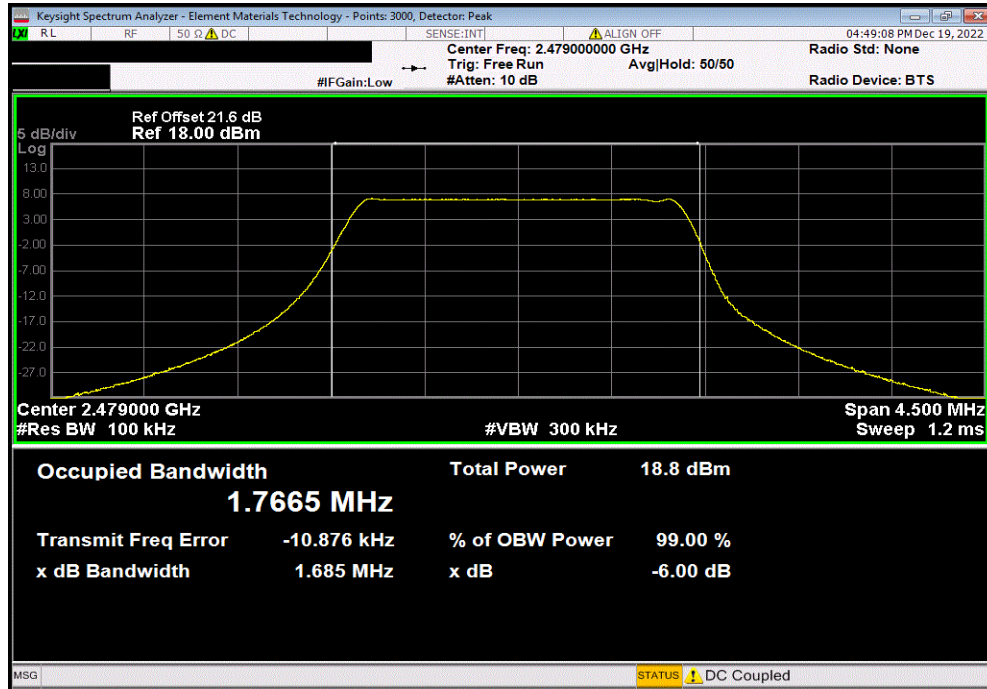


EMISSIONS BANDWIDTH



TbTx 2022.06.03.0 XMI 2022.02.07.0

High Channel, 2479 MHz, Modulated						
Value				Limit	Result	
1.685 MHz				(>) 500 kHz	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
Attenuator	S.M. Electronics	SA26B-20	RFW	2022-02-08	2023-02-08
Block - DC	Fairview Microwave	SD3379	AMZ	2022-11-06	2023-11-06
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2022-09-10	2023-09-10
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



TSTx 2022.06.03.0 XMR 2022.02.07.0

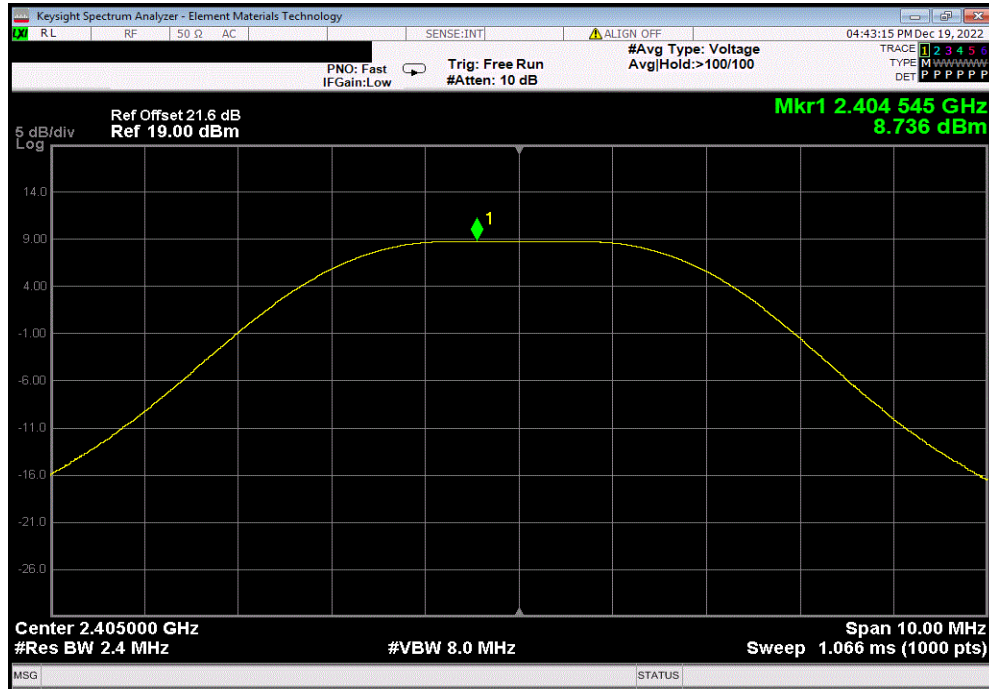
EUT: Titan Sensor		Work Order: NGRF0028	
Serial Number: 000-0503A		Date: 19-Dec-22	
Customer: NextGen RF Design		Temperature: 21.5 °C	
Attendees: Tim Smith		Humidity: 20% RH	
Project: None		Barometric Pres.: 1028 mbar	
Tested by: Christopher Heintzelman		Power: 110VAC/60Hz	
		Job Site: MN11	
TEST SPECIFICATIONS			
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 #	29	Signature <i>Christopher Heintzelman</i>	
		Out Pwr (dBm)	Limit (dBm)
Low Channel, 2405 MHz, Modulated		8.736	30
Mid Channel, 2440 MHz, Modulated		8.595	30
High Channel, 2479 MHz, Modulated		8.493	30
			Result
			Pass
			Pass
			Pass

OUTPUT POWER

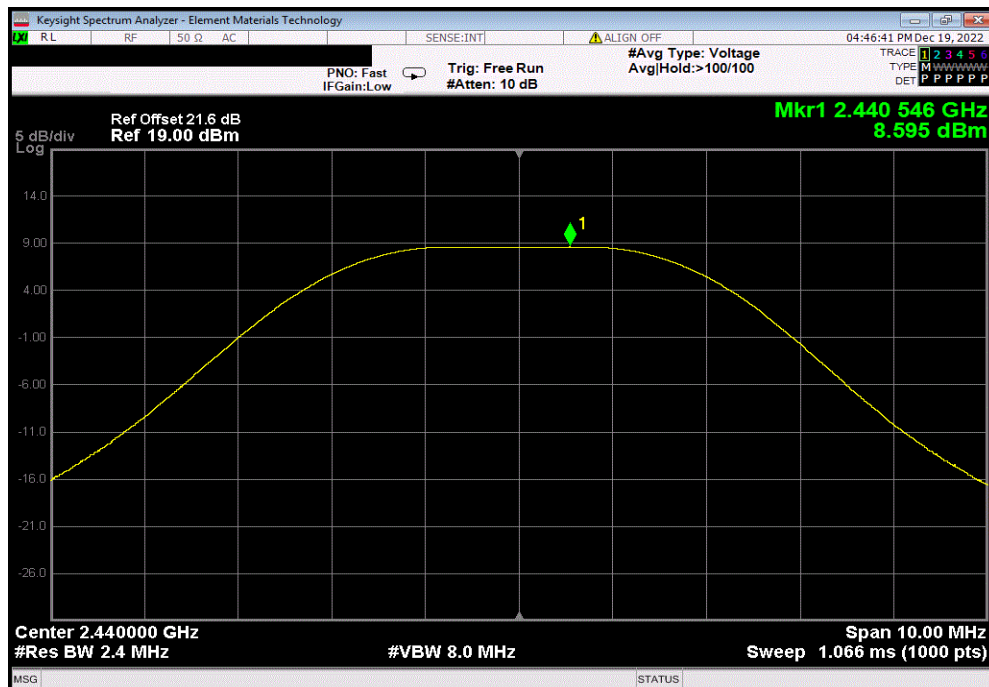


TbTx 2022.06.03.0 XMt 2022.02.07.0

Low Channel, 2405 MHz, Modulated						
				Out Pwr (dBm)	Limit (dBm)	Result
				8.736	30	Pass



Mid Channel, 2440 MHz, Modulated						
				Out Pwr (dBm)	Limit (dBm)	Result
				8.595	30	Pass

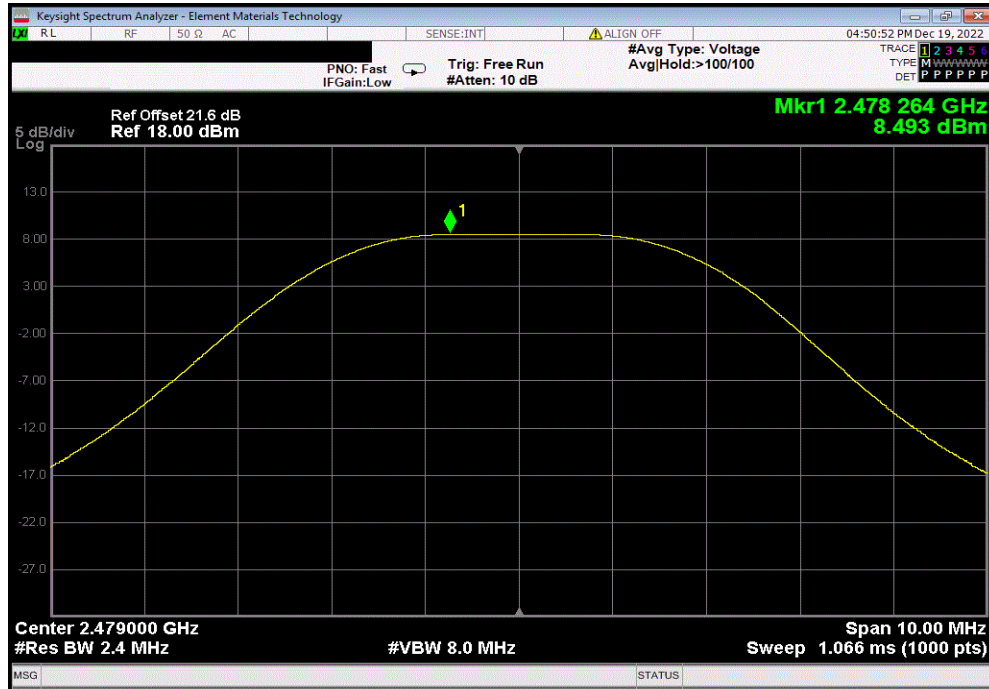


OUTPUT POWER



TbTx 2022.06.03.0 XMR 2022.02.07.0

High Channel, 2479 MHz, Modulated						
				Out Pwr (dBm)	Limit (dBm)	Result
				8.493	30	Pass



POWER SPECTRAL DENSITY



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
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12
Attenuator	Fairview Microwave	18B5W-26	RFY	2022-05-30	2023-05-30
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

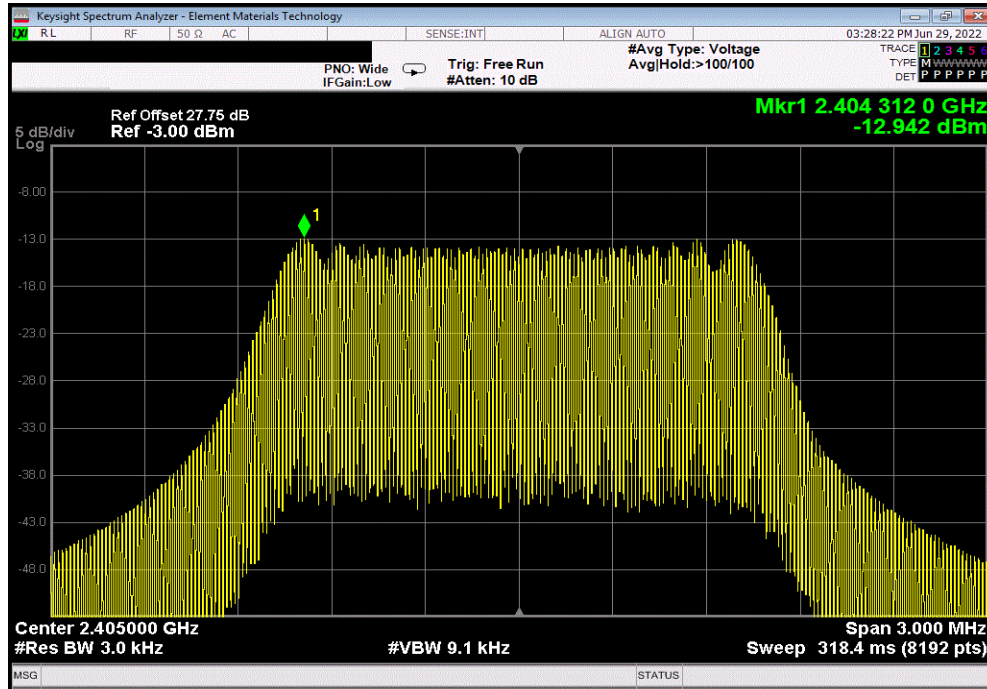
EUT: Titan Sensor		Work Order: NGRF0028	
Serial Number: PP-W02		Date: 29-Jun-22	
Customer: NextGen RF Design		Temperature: 24 °C	
Attendees: Tim Smith		Humidity: 45% RH	
Project: None		Barometric Pres.: 1016 mbar	
Tested by: Christopher Heintzelman	Power: 120VAC/60Hz	Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2022		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	15	Signature <i>Christopher Heintzelman</i>	
		Value dBm/3kHz	Limit < dBm/3kHz
Low Channel, 2405 MHz, Modulated		-12.942	8
Mid Channel, 2440 MHz, Modulated		-11.751	8
High Channel, 2479 MHz, Modulated		-11.86	8
			Results
			Pass
			Pass
			Pass

POWER SPECTRAL DENSITY

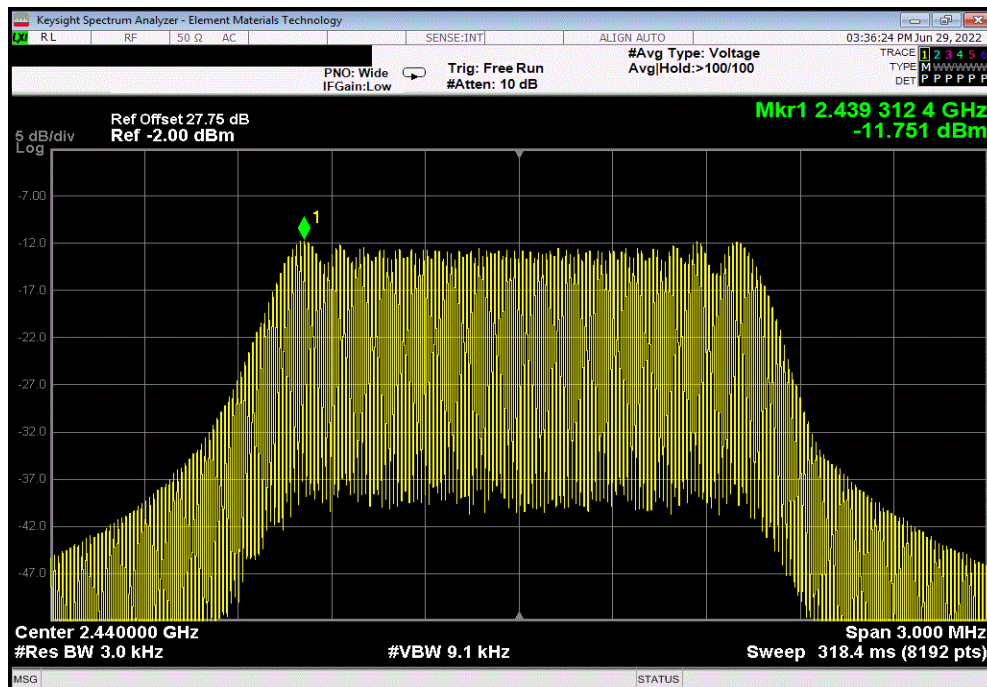


TbTtX 2022.06.03.0 XMt 2022.02.07.0

Low Channel, 2405 MHz, Modulated						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-12.942	8	Pass



Mid Channel, 2440 MHz, Modulated						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-11.751	8	Pass

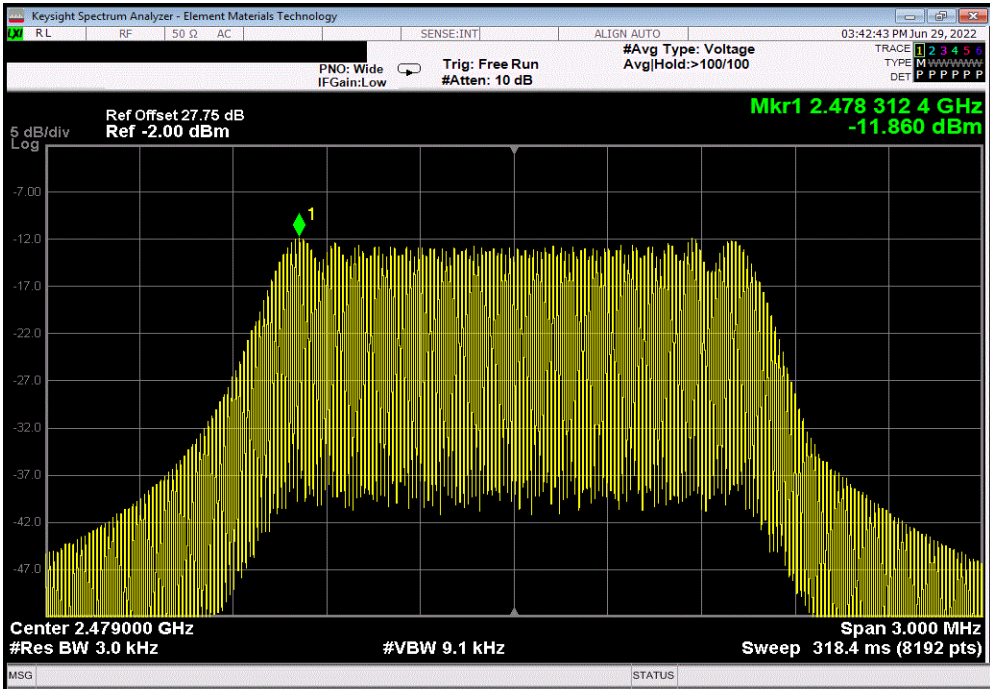


POWER SPECTRAL DENSITY



TbTtx 2022.06.03.0 XMR 2022.02.07.0

High Channel, 2479 MHz, Modulated						
				Value	Limit	Results
				dBm/3kHz	< dBm/3kHz	
				-11.86	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

NGRF0028-26
NGRF0028-33
NGRF0028-34
NGRF0028-35

MODES INVESTIGATED

Transmitting LoRa modulated Mid Ch (2440 MHz)

POWERLINE CONDUCTED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W01	Date:	2022-08-12
Customer:	NextGen RF Design	Temperature:	20.8°C
Attendees:	Tim Smith	Relative Humidity:	51.5%
Customer Project:	None	Bar. Pressure (PMSL):	1021 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	NGRF0028-26

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	65	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

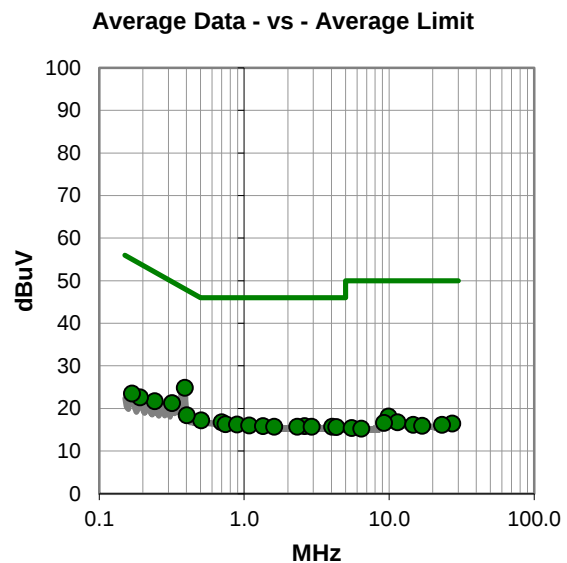
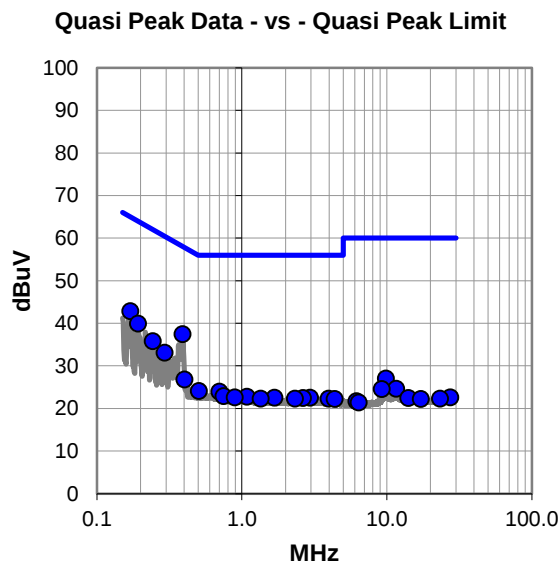
Medical power supply ME20A1203B01 (SL Electronics).

EUT OPERATING MODES

Transmitting LoRa modulated Mid Ch (2440 MHz)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #65

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.390	17.1	20.3	37.4	58.1	-20.7
0.170	22.3	20.5	42.8	65.0	-22.2
0.193	19.4	20.5	39.9	63.9	-24.0
0.243	15.4	20.4	35.8	62.0	-26.2
0.293	12.8	20.3	33.1	60.4	-27.3
0.402	6.5	20.3	26.8	57.8	-31.0
0.506	3.8	20.3	24.1	56.0	-31.9
0.699	3.6	20.3	23.9	56.0	-32.1
9.850	5.9	21.1	27.0	60.0	-33.0
0.747	2.6	20.3	22.9	56.0	-33.1
1.082	2.5	20.2	22.7	56.0	-33.3
0.893	2.4	20.2	22.6	56.0	-33.4
1.682	2.2	20.3	22.5	56.0	-33.5
2.954	2.1	20.4	22.5	56.0	-33.5
2.642	2.0	20.4	22.4	56.0	-33.6
1.348	2.1	20.2	22.3	56.0	-33.7
2.329	1.9	20.4	22.3	56.0	-33.7
3.963	1.8	20.5	22.3	56.0	-33.7
4.373	1.7	20.5	22.2	56.0	-33.8
11.607	3.2	21.4	24.6	60.0	-35.4
9.248	3.5	21.0	24.5	60.0	-35.5
27.518	0.2	22.4	22.6	60.0	-37.4
14.105	1.0	21.4	22.4	60.0	-37.6
23.382	0.3	22.0	22.3	60.0	-37.7
17.231	0.6	21.6	22.2	60.0	-37.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.390	4.5	20.3	24.8	48.1	-23.3
0.318	0.9	20.3	21.2	49.8	-28.6
0.506	-3.1	20.3	17.2	46.0	-28.8
0.699	-3.6	20.3	16.7	46.0	-29.3
0.402	-1.9	20.3	18.4	47.8	-29.4
0.745	-4.0	20.3	16.3	46.0	-29.7
0.896	-4.0	20.2	16.2	46.0	-29.8
1.084	-4.2	20.2	16.0	46.0	-30.0
1.349	-4.4	20.2	15.8	46.0	-30.2
2.619	-4.6	20.4	15.8	46.0	-30.2
0.242	1.3	20.4	21.7	52.0	-30.3
1.612	-4.6	20.3	15.7	46.0	-30.3
2.330	-4.7	20.4	15.7	46.0	-30.3
2.930	-4.7	20.4	15.7	46.0	-30.3
4.061	-4.8	20.5	15.7	46.0	-30.3
4.325	-4.9	20.5	15.6	46.0	-30.4
0.191	2.1	20.5	22.6	54.0	-31.4
0.168	3.0	20.5	23.5	55.0	-31.5
9.900	-3.0	21.1	18.1	50.0	-31.9
11.439	-4.7	21.4	16.7	50.0	-33.3
9.248	-4.4	21.0	16.6	50.0	-33.4
27.355	-6.0	22.4	16.4	50.0	-33.6
14.654	-5.4	21.5	16.1	50.0	-33.9
23.248	-5.9	22.0	16.1	50.0	-33.9
16.964	-5.7	21.6	15.9	50.0	-34.1

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W01	Date:	2022-08-12
Customer:	NextGen RF Design	Temperature:	20.8°C
Attendees:	Tim Smith	Relative Humidity:	51.5%
Customer Project:	None	Bar. Pressure (PMSL):	1021 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	NGRF0028-26

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	66	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

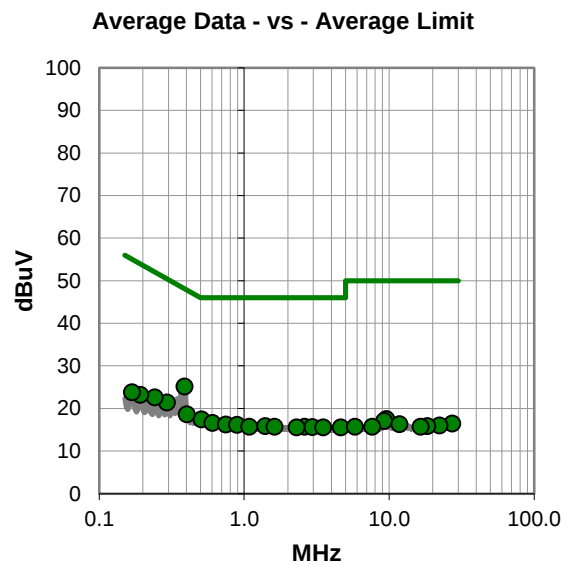
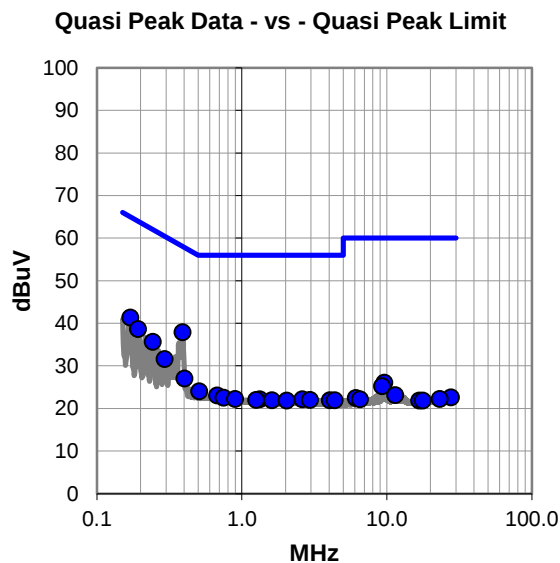
Medical power supply ME20A1203B01 (SL Electronics).

EUT OPERATING MODES

Transmitting LoRa modulated Mid Ch (2440 MHz)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #66

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.390	17.6	20.3	37.9	58.1	-20.2
0.170	20.8	20.5	41.3	65.0	-23.7
0.193	18.1	20.5	38.6	63.9	-25.3
0.243	15.2	20.4	35.6	62.0	-26.4
0.293	11.3	20.3	31.6	60.4	-28.8
0.402	6.7	20.3	27.0	57.8	-30.8
0.507	3.7	20.3	24.0	56.0	-32.0
0.675	2.7	20.3	23.0	56.0	-33.0
0.748	2.2	20.3	22.5	56.0	-33.5
0.898	2.0	20.2	22.2	56.0	-33.8
1.328	1.9	20.2	22.1	56.0	-33.9
2.619	1.7	20.4	22.1	56.0	-33.9
1.256	1.8	20.2	22.0	56.0	-34.0
2.956	1.6	20.4	22.0	56.0	-34.0
9.634	4.9	21.1	26.0	60.0	-34.0
1.616	1.6	20.3	21.9	56.0	-34.1
4.059	1.4	20.5	21.9	56.0	-34.1
4.373	1.4	20.5	21.9	56.0	-34.1
2.044	1.5	20.3	21.8	56.0	-34.2
9.273	4.2	21.0	25.2	60.0	-34.8
11.461	1.7	21.4	23.1	60.0	-36.9
27.691	0.2	22.4	22.6	60.0	-37.4
6.127	1.7	20.7	22.4	60.0	-37.6
23.223	0.2	22.0	22.2	60.0	-37.8
6.535	1.4	20.7	22.1	60.0	-37.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.388	4.8	20.3	25.1	48.1	-23.0
0.507	-2.9	20.3	17.4	46.0	-28.6
0.293	1.1	20.3	21.4	50.4	-29.0
0.402	-1.7	20.3	18.6	47.8	-29.2
0.242	2.2	20.4	22.6	52.0	-29.4
0.605	-3.7	20.3	16.6	46.0	-29.4
0.747	-4.1	20.3	16.2	46.0	-29.8
0.896	-4.1	20.2	16.1	46.0	-29.9
1.401	-4.5	20.3	15.8	46.0	-30.2
1.084	-4.5	20.2	15.7	46.0	-30.3
1.618	-4.6	20.3	15.7	46.0	-30.3
2.619	-4.7	20.4	15.7	46.0	-30.3
2.954	-4.8	20.4	15.6	46.0	-30.4
2.304	-4.9	20.4	15.5	46.0	-30.5
3.508	-5.0	20.5	15.5	46.0	-30.5
4.639	-5.0	20.5	15.5	46.0	-30.5
0.193	2.7	20.5	23.2	53.9	-30.7
0.168	3.3	20.5	23.8	55.0	-31.2
9.564	-3.5	21.0	17.5	50.0	-32.5
9.229	-4.0	21.0	17.0	50.0	-33.0
27.360	-6.0	22.4	16.4	50.0	-33.6
11.774	-5.1	21.4	16.3	50.0	-33.7
22.271	-5.9	21.9	16.0	50.0	-34.0
18.336	-5.9	21.7	15.8	50.0	-34.2
5.815	-4.9	20.6	15.7	50.0	-34.3

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W01	Date:	2022-08-12
Customer:	NextGen RF Design	Temperature:	20.8°C
Attendees:	Tim Smith	Relative Humidity:	51.5%
Customer Project:	None	Bar. Pressure (PMSL):	1021 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	NGRF0028-33

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	68	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

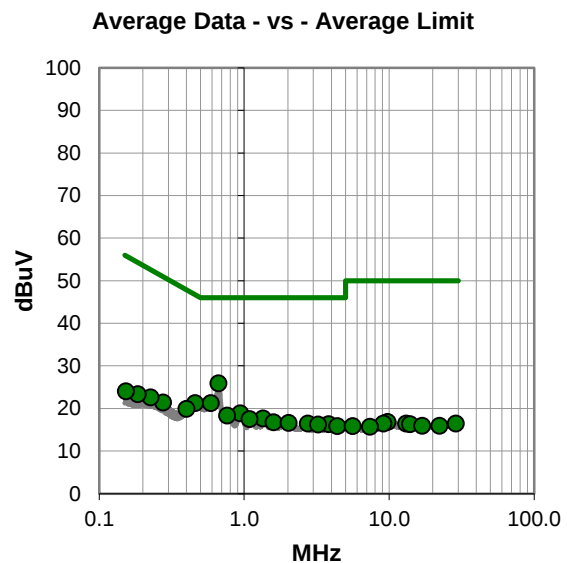
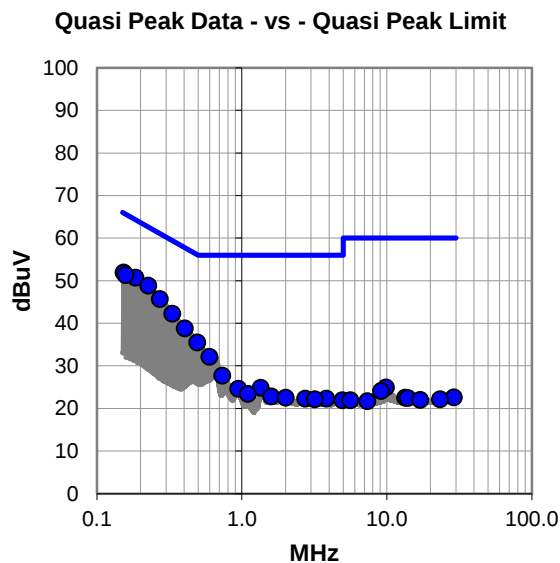
Original power supply.

EUT OPERATING MODES

Transmitting LoRa modulated Mid Ch (2440 MHz)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #68

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.185	30.2	20.5	50.7	64.3	-13.6
0.226	28.4	20.4	48.8	62.6	-13.8
0.153	31.2	20.7	51.9	65.8	-13.9
0.158	30.6	20.7	51.3	65.6	-14.3
0.272	25.4	20.3	45.7	61.1	-15.4
0.332	21.9	20.3	42.2	59.4	-17.2
0.405	18.5	20.3	38.8	57.8	-19.0
0.492	15.2	20.3	35.5	56.1	-20.6
0.597	11.8	20.3	32.1	56.0	-23.9
0.734	7.4	20.3	27.7	56.0	-28.3
1.352	4.6	20.2	24.8	56.0	-31.2
0.946	4.4	20.2	24.6	56.0	-31.4
1.102	3.2	20.2	23.4	56.0	-32.6
1.600	2.5	20.3	22.8	56.0	-33.2
2.008	2.2	20.3	22.5	56.0	-33.5
2.741	1.9	20.4	22.3	56.0	-33.7
3.826	1.8	20.5	22.3	56.0	-33.7
3.186	1.6	20.5	22.1	56.0	-33.9
4.947	1.3	20.6	21.9	56.0	-34.1
9.872	3.8	21.1	24.9	60.0	-35.1
9.168	3.1	21.0	24.1	60.0	-35.9
29.029	0.1	22.5	22.6	60.0	-37.4
13.408	1.1	21.4	22.5	60.0	-37.5
13.952	1.0	21.4	22.4	60.0	-37.6
23.356	0.1	22.0	22.1	60.0	-37.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.666	5.6	20.3	25.9	46.0	-20.1
0.588	0.9	20.3	21.2	46.0	-24.8
0.460	0.9	20.3	21.2	46.7	-25.5
0.939	-1.4	20.2	18.8	46.0	-27.2
0.762	-2.0	20.3	18.3	46.0	-27.7
0.400	-0.4	20.3	19.9	47.8	-27.9
1.351	-2.6	20.2	17.6	46.0	-28.4
1.093	-2.7	20.2	17.5	46.0	-28.5
1.596	-3.6	20.3	16.7	46.0	-29.3
2.025	-3.7	20.3	16.6	46.0	-29.4
0.277	1.1	20.3	21.4	50.9	-29.5
2.747	-4.0	20.4	16.4	46.0	-29.6
3.824	-4.2	20.5	16.3	46.0	-29.7
3.247	-4.3	20.5	16.2	46.0	-29.8
0.226	2.2	20.4	22.6	52.6	-30.0
4.399	-4.7	20.5	15.8	46.0	-30.2
0.185	2.8	20.5	23.3	54.3	-31.0
0.153	3.3	20.7	24.0	55.8	-31.8
9.760	-4.3	21.1	16.8	50.0	-33.2
9.164	-4.6	21.0	16.4	50.0	-33.6
13.093	-5.0	21.4	16.4	50.0	-33.6
28.951	-6.1	22.5	16.4	50.0	-33.6
13.930	-5.1	21.4	16.3	50.0	-33.7
16.963	-5.7	21.6	15.9	50.0	-34.1
22.257	-6.0	21.9	15.9	50.0	-34.1

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W01	Date:	2022-08-12
Customer:	NextGen RF Design	Temperature:	20.8°C
Attendees:	Tim Smith	Relative Humidity:	51.5%
Customer Project:	None	Bar. Pressure (PMSL):	1021 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	NGRF0028-33

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	70	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

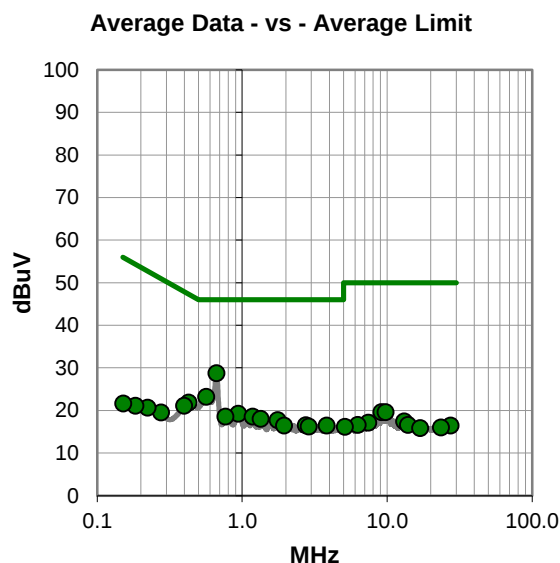
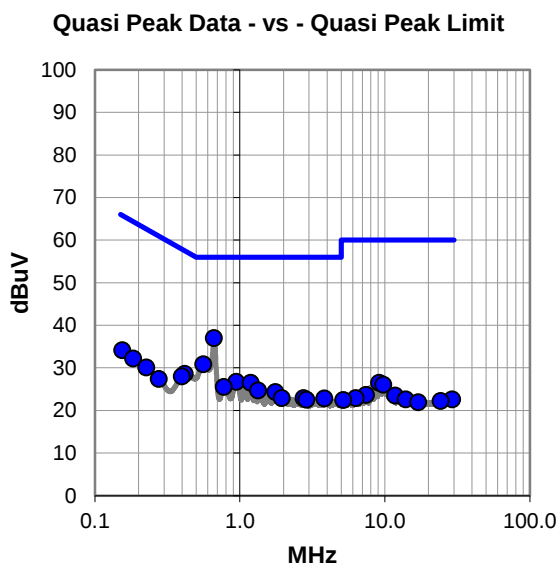
Original power supply.

EUT OPERATING MODES

Transmitting LoRa modulated Mid Ch (2440 MHz)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #70

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.663	16.7	20.3	37.0	56.0	-19.0
0.559	10.5	20.3	30.8	56.0	-25.2
0.417	8.3	20.3	28.6	57.5	-28.9
0.943	6.5	20.2	26.7	56.0	-29.3
1.191	6.3	20.2	26.5	56.0	-29.5
0.399	7.7	20.3	28.0	57.9	-29.9
0.777	5.3	20.2	25.5	56.0	-30.5
1.339	4.5	20.2	24.7	56.0	-31.3
0.155	13.4	20.7	34.1	65.8	-31.7
1.763	4.0	20.3	24.3	56.0	-31.7
0.184	11.7	20.5	32.2	64.3	-32.1
0.226	9.7	20.4	30.1	62.6	-32.5
1.943	2.6	20.3	22.9	56.0	-33.1
2.747	2.5	20.4	22.9	56.0	-33.1
3.838	2.3	20.5	22.8	56.0	-33.2
0.277	7.1	20.3	27.4	60.9	-33.5
2.886	2.1	20.4	22.5	56.0	-33.5
9.169	5.5	21.0	26.5	60.0	-33.5
9.784	4.9	21.1	26.0	60.0	-34.0
7.439	2.8	20.8	23.6	60.0	-36.4
11.786	2.1	21.4	23.5	60.0	-36.5
6.296	2.2	20.7	22.9	60.0	-37.1
13.934	1.2	21.4	22.6	60.0	-37.4
29.215	0.1	22.5	22.6	60.0	-37.4
5.176	1.8	20.6	22.4	60.0	-37.6

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.664	8.4	20.3	28.7	46.0	-17.3
0.565	2.9	20.3	23.2	46.0	-22.8
0.428	1.5	20.3	21.8	47.3	-25.5
0.397	0.8	20.3	21.1	47.9	-26.8
0.939	-1.0	20.2	19.2	46.0	-26.8
0.768	-1.8	20.3	18.5	46.0	-27.5
1.183	-1.7	20.2	18.5	46.0	-27.5
1.345	-2.2	20.2	18.0	46.0	-28.0
1.758	-2.6	20.3	17.7	46.0	-28.3
2.753	-3.9	20.4	16.5	46.0	-29.5
1.943	-3.9	20.3	16.4	46.0	-29.6
3.833	-4.1	20.5	16.4	46.0	-29.6
2.881	-4.2	20.4	16.2	46.0	-29.8
9.166	-1.4	21.0	19.6	50.0	-30.4
9.773	-1.5	21.1	19.6	50.0	-30.4
0.277	-0.8	20.3	19.5	50.9	-31.4
0.223	0.2	20.4	20.6	52.7	-32.1
13.095	-4.0	21.4	17.4	50.0	-32.6
7.407	-3.7	20.8	17.1	50.0	-32.9
0.184	0.6	20.5	21.1	54.3	-33.2
6.282	-4.1	20.7	16.6	50.0	-33.4
13.934	-4.8	21.4	16.6	50.0	-33.4
27.503	-6.0	22.4	16.4	50.0	-33.6
5.132	-4.5	20.6	16.1	50.0	-33.9
23.571	-6.0	22.0	16.0	50.0	-34.0

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W01	Date:	2022-08-12
Customer:	NextGen RF Design	Temperature:	20.8°C
Attendees:	Tim Smith	Relative Humidity:	51.5%
Customer Project:	None	Bar. Pressure (PMSL):	1021 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	NGRF0028-34

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	71	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

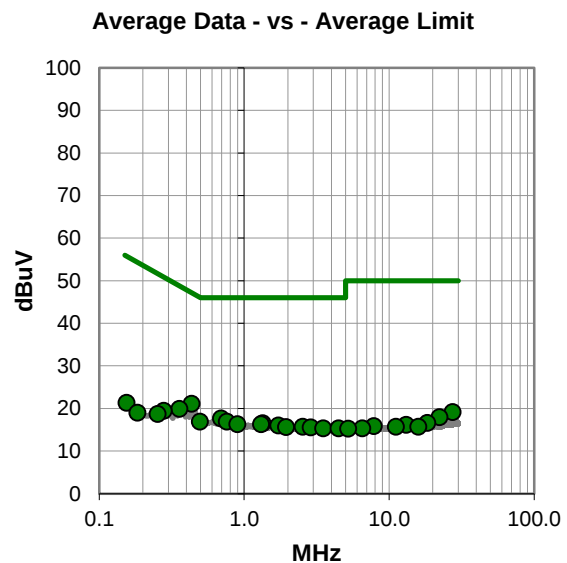
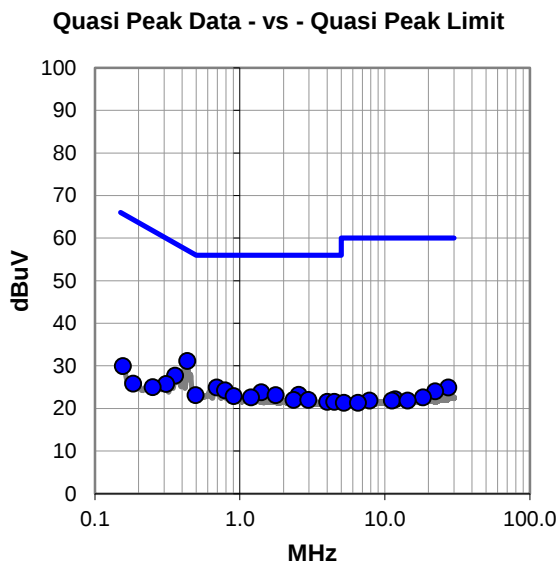
Power supply: MeanWell GSM18U12-P1J

EUT OPERATING MODES

Transmitting LoRa modulated Mid Ch (2440 MHz)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #71

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.434	10.8	20.3	31.1	57.2	-26.1
0.358	7.4	20.3	27.7	58.8	-31.1
0.693	4.6	20.3	24.9	56.0	-31.1
0.791	4.0	20.2	24.2	56.0	-31.8
1.406	3.5	20.3	23.8	56.0	-32.2
2.546	2.8	20.4	23.2	56.0	-32.8
1.766	2.8	20.3	23.1	56.0	-32.9
0.496	2.8	20.3	23.1	56.1	-33.0
0.910	2.7	20.2	22.9	56.0	-33.1
1.197	2.4	20.2	22.6	56.0	-33.4
2.346	1.6	20.4	22.0	56.0	-34.0
2.970	1.6	20.4	22.0	56.0	-34.0
0.310	5.4	20.3	25.7	60.0	-34.3
4.018	1.0	20.5	21.5	56.0	-34.5
4.489	1.0	20.5	21.5	56.0	-34.5
27.502	2.5	22.4	24.9	60.0	-35.1
0.156	9.2	20.7	29.9	65.7	-35.8
22.260	2.1	21.9	24.0	60.0	-36.0
0.251	4.6	20.4	25.0	61.7	-36.7
18.333	0.9	21.7	22.6	60.0	-37.4
11.787	0.7	21.4	22.1	60.0	-37.9
7.860	0.9	20.9	21.8	60.0	-38.2
11.185	0.4	21.4	21.8	60.0	-38.2
14.404	0.3	21.5	21.8	60.0	-38.2
0.184	5.3	20.5	25.8	64.3	-38.5

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.434	0.8	20.3	21.1	47.2	-26.1
0.692	-2.7	20.3	17.6	46.0	-28.4
0.358	-0.4	20.3	19.9	48.8	-28.9
0.759	-3.4	20.3	16.9	46.0	-29.1
0.495	-3.4	20.3	16.9	46.1	-29.2
1.340	-3.7	20.2	16.5	46.0	-29.5
0.898	-3.9	20.2	16.3	46.0	-29.7
1.310	-3.9	20.2	16.3	46.0	-29.7
1.722	-4.3	20.3	16.0	46.0	-30.0
2.542	-4.7	20.4	15.7	46.0	-30.3
1.950	-4.7	20.3	15.6	46.0	-30.4
2.881	-4.9	20.4	15.5	46.0	-30.5
3.514	-5.2	20.5	15.3	46.0	-30.7
4.489	-5.2	20.5	15.3	46.0	-30.7
27.506	-3.3	22.4	19.1	50.0	-30.9
0.278	-0.9	20.3	19.4	50.9	-31.5
22.260	-4.0	21.9	17.9	50.0	-32.1
0.254	-1.7	20.4	18.7	51.6	-32.9
18.333	-5.1	21.7	16.6	50.0	-33.4
13.096	-5.3	21.4	16.1	50.0	-33.9
7.855	-5.1	20.9	15.8	50.0	-34.2
11.171	-5.7	21.4	15.7	50.0	-34.3
15.899	-5.9	21.6	15.7	50.0	-34.3
0.155	0.6	20.7	21.3	55.8	-34.5
6.546	-5.4	20.7	15.3	50.0	-34.7

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W01	Date:	2022-08-12
Customer:	NextGen RF Design	Temperature:	20.8°C
Attendees:	Tim Smith	Relative Humidity:	51.5%
Customer Project:	None	Bar. Pressure (PMSL):	1021 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	NGRF0028-34

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	72	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

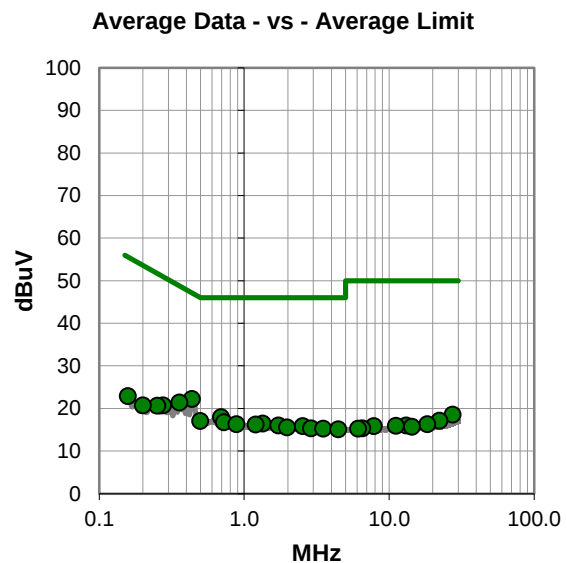
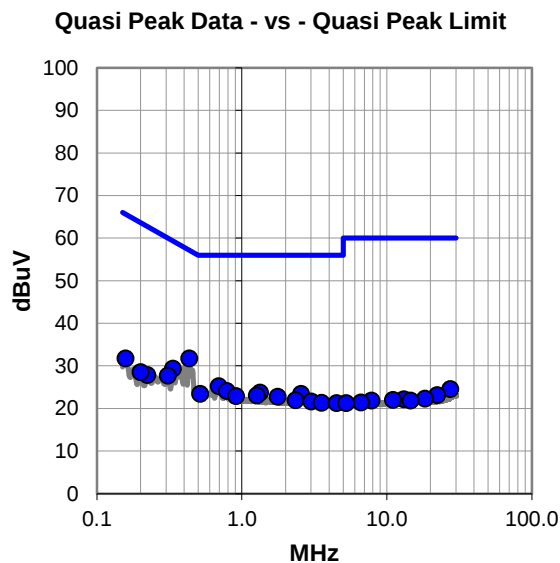
Power supply: MeanWell GSM18U12-P1J

EUT OPERATING MODES

Transmitting LoRa modulated Mid Ch (2440 MHz)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #72

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.434	11.4	20.3	31.7	57.2	-25.5
0.335	9.0	20.3	29.3	59.3	-30.0
0.693	4.9	20.3	25.2	56.0	-30.8
0.789	3.9	20.2	24.1	56.0	-31.9
0.309	7.4	20.3	27.7	60.0	-32.3
1.339	3.5	20.2	23.7	56.0	-32.3
0.516	3.1	20.3	23.4	56.0	-32.6
2.568	3.0	20.4	23.4	56.0	-32.6
1.271	2.8	20.2	23.0	56.0	-33.0
0.911	2.7	20.2	22.9	56.0	-33.1
1.766	2.4	20.3	22.7	56.0	-33.3
0.158	11.0	20.7	31.7	65.6	-33.9
2.347	1.5	20.4	21.9	56.0	-34.1
3.015	1.2	20.4	21.6	56.0	-34.4
3.554	0.8	20.5	21.3	56.0	-34.7
4.517	0.7	20.5	21.2	56.0	-34.8
0.223	7.4	20.4	27.8	62.7	-34.9
0.200	8.0	20.5	28.5	63.6	-35.1
27.502	2.1	22.4	24.5	60.0	-35.5
22.260	1.2	21.9	23.1	60.0	-36.9
18.333	0.6	21.7	22.3	60.0	-37.7
13.093	0.7	21.4	22.1	60.0	-37.9
11.049	0.7	21.3	22.0	60.0	-38.0
7.855	0.9	20.9	21.8	60.0	-38.2
14.578	0.3	21.5	21.8	60.0	-38.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.435	1.9	20.3	22.2	47.2	-25.0
0.358	1.1	20.3	21.4	48.8	-27.4
0.692	-2.4	20.3	17.9	46.0	-28.1
0.498	-3.3	20.3	17.0	46.0	-29.0
0.727	-3.6	20.3	16.7	46.0	-29.3
1.340	-3.8	20.2	16.4	46.0	-29.6
0.885	-3.9	20.2	16.3	46.0	-29.7
1.198	-4.0	20.2	16.2	46.0	-29.8
1.722	-4.3	20.3	16.0	46.0	-30.0
0.277	0.4	20.3	20.7	50.9	-30.2
2.542	-4.6	20.4	15.8	46.0	-30.2
1.981	-4.8	20.3	15.5	46.0	-30.5
2.900	-5.1	20.4	15.3	46.0	-30.7
3.508	-5.3	20.5	15.2	46.0	-30.8
4.470	-5.4	20.5	15.1	46.0	-30.9
0.252	0.2	20.4	20.6	51.7	-31.1
27.506	-3.9	22.4	18.5	50.0	-31.5
0.158	2.2	20.7	22.9	55.6	-32.7
22.262	-4.8	21.9	17.1	50.0	-32.9
0.200	0.2	20.5	20.7	53.6	-32.9
18.336	-5.4	21.7	16.3	50.0	-33.7
13.093	-5.4	21.4	16.0	50.0	-34.0
11.157	-5.5	21.4	15.9	50.0	-34.1
7.857	-5.1	20.9	15.8	50.0	-34.2
14.403	-5.8	21.5	15.7	50.0	-34.3

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W01	Date:	2022-08-12
Customer:	NextGen RF Design	Temperature:	20.8°C
Attendees:	Tim Smith	Relative Humidity:	51.5%
Customer Project:	None	Bar. Pressure (PMSL):	1021 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	NGRF0028-35

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	73	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

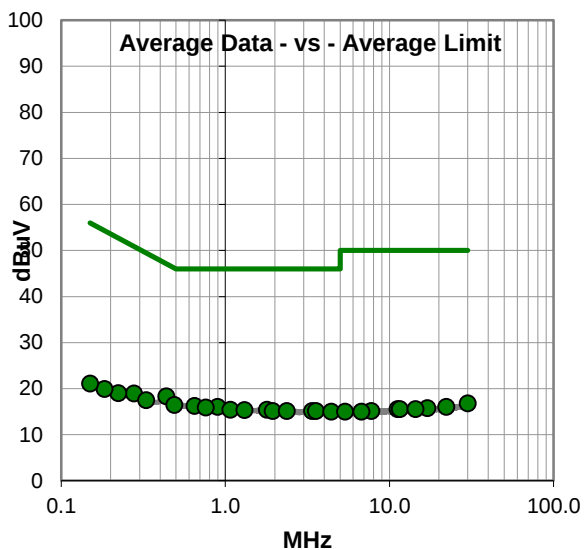
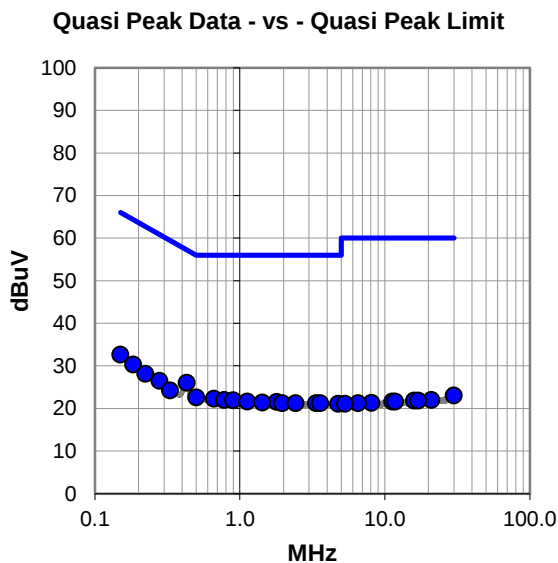
Power supply: GlobTek WR9HE1000LCPIMFR6B
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EUT OPERATING MODES

Transmitting LoRa modulated Mid Ch (2440 MHz)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #73

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.429	5.7	20.3	26.0	57.3	-31.3
0.150	11.9	20.7	32.6	66.0	-33.4
0.499	2.3	20.3	22.6	56.0	-33.4
0.663	2.0	20.3	22.3	56.0	-33.7
0.184	9.8	20.5	30.3	64.3	-34.0
0.779	1.8	20.2	22.0	56.0	-34.0
0.898	1.7	20.2	21.9	56.0	-34.1
0.278	6.2	20.3	26.5	60.9	-34.4
1.125	1.4	20.2	21.6	56.0	-34.4
1.795	1.2	20.3	21.5	56.0	-34.5
0.223	7.7	20.4	28.1	62.7	-34.6
1.427	1.1	20.3	21.4	56.0	-34.6
1.954	0.9	20.3	21.2	56.0	-34.8
2.422	0.8	20.4	21.2	56.0	-34.8
3.357	0.7	20.5	21.2	56.0	-34.8
3.585	0.7	20.5	21.2	56.0	-34.8
4.766	0.5	20.6	21.1	56.0	-34.9
0.330	3.9	20.3	24.2	59.5	-35.3
29.966	0.5	22.5	23.0	60.0	-37.0
20.968	0.2	21.8	22.0	60.0	-38.0
15.896	0.2	21.6	21.8	60.0	-38.2
17.028	0.2	21.6	21.8	60.0	-38.2
11.249	0.2	21.4	21.6	60.0	-38.4
11.783	0.2	21.4	21.6	60.0	-38.4
8.104	0.4	20.9	21.3	60.0	-38.7

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.437	-2.0	20.3	18.3	47.1	-28.8
0.649	-4.1	20.3	16.2	46.0	-29.8
0.490	-3.9	20.3	16.4	46.2	-29.8
0.898	-4.2	20.2	16.0	46.0	-30.0
0.762	-4.4	20.3	15.9	46.0	-30.1
1.076	-4.8	20.2	15.4	46.0	-30.6
1.795	-4.9	20.3	15.4	46.0	-30.6
1.311	-4.9	20.2	15.3	46.0	-30.7
1.944	-5.2	20.3	15.1	46.0	-30.9
2.365	-5.3	20.4	15.1	46.0	-30.9
3.382	-5.4	20.5	15.1	46.0	-30.9
3.562	-5.4	20.5	15.1	46.0	-30.9
4.425	-5.5	20.5	15.0	46.0	-31.0
0.278	-1.4	20.3	18.9	50.9	-32.0
0.330	-2.8	20.3	17.5	49.5	-32.0
29.984	-5.7	22.5	16.8	50.0	-33.2
0.223	-1.4	20.4	19.0	52.7	-33.7
22.260	-5.9	21.9	16.0	50.0	-34.0
17.028	-5.9	21.6	15.7	50.0	-34.3
0.184	-0.6	20.5	19.9	54.3	-34.4
11.237	-5.9	21.4	15.5	50.0	-34.5
11.575	-5.9	21.4	15.5	50.0	-34.5
14.419	-6.0	21.5	15.5	50.0	-34.5
0.150	0.4	20.7	21.1	56.0	-34.9
7.771	-5.8	20.9	15.1	50.0	-34.9

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W01	Date:	2022-08-12
Customer:	NextGen RF Design	Temperature:	20.8°C
Attendees:	Tim Smith	Relative Humidity:	51.5%
Customer Project:	None	Bar. Pressure (PMSL):	1021 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	NGRF0028-35

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2022	ANSI C63.10:2013

TEST PARAMETERS

Run #:	74	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

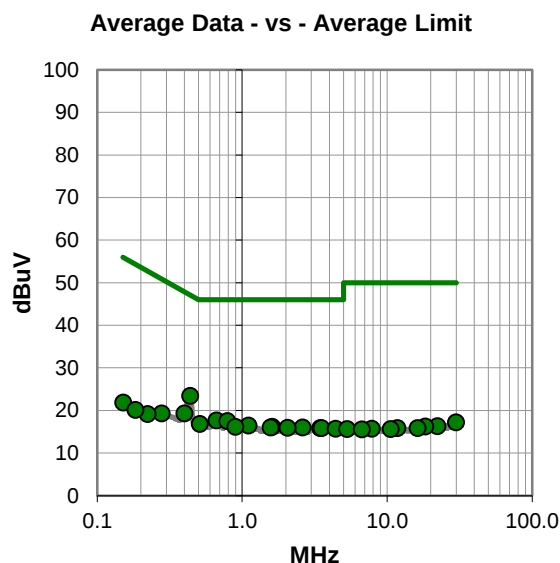
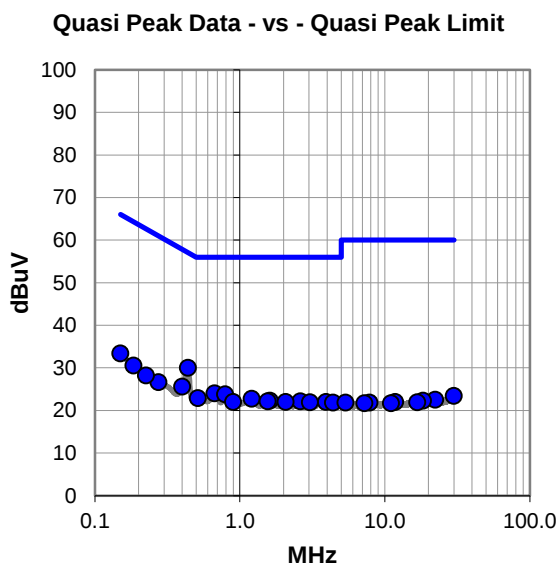
Power supply: GlobTek WR9HE1000LCPIMFR6B
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EUT OPERATING MODES

Transmitting LoRa modulated Mid Ch (2440 MHz)

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #74

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.438	9.7	20.3	30.0	57.1	-27.1
0.670	3.7	20.3	24.0	56.0	-32.0
0.400	5.3	20.3	25.6	57.8	-32.2
0.791	3.6	20.2	23.8	56.0	-32.2
0.150	12.7	20.7	33.4	66.0	-32.6
0.515	2.6	20.3	22.9	56.0	-33.1
1.207	2.5	20.2	22.7	56.0	-33.3
1.610	2.0	20.3	22.3	56.0	-33.7
0.185	10.0	20.5	30.5	64.3	-33.8
1.557	1.8	20.3	22.1	56.0	-33.9
2.617	1.7	20.4	22.1	56.0	-33.9
0.898	1.8	20.2	22.0	56.0	-34.0
2.068	1.7	20.3	22.0	56.0	-34.0
3.932	1.5	20.5	22.0	56.0	-34.0
3.041	1.5	20.4	21.9	56.0	-34.1
4.395	1.3	20.5	21.8	56.0	-34.2
0.275	6.3	20.3	26.6	61.0	-34.4
0.225	7.8	20.4	28.2	62.6	-34.4
29.922	0.9	22.5	23.4	60.0	-36.6
22.264	0.6	21.9	22.5	60.0	-37.5
18.335	0.6	21.7	22.3	60.0	-37.7
11.789	0.6	21.4	22.0	60.0	-38.0
16.757	0.3	21.6	21.9	60.0	-38.1
5.353	1.2	20.6	21.8	60.0	-38.2
7.864	0.9	20.9	21.8	60.0	-38.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.438	3.1	20.3	23.4	47.1	-23.7
0.664	-2.7	20.3	17.6	46.0	-28.4
0.400	-1.0	20.3	19.3	47.8	-28.5
0.791	-2.7	20.2	17.5	46.0	-28.5
0.510	-3.5	20.3	16.8	46.0	-29.2
1.107	-3.8	20.2	16.4	46.0	-29.6
0.898	-4.1	20.2	16.1	46.0	-29.9
1.610	-4.2	20.3	16.1	46.0	-29.9
1.574	-4.3	20.3	16.0	46.0	-30.0
2.620	-4.4	20.4	16.0	46.0	-30.0
2.059	-4.4	20.3	15.9	46.0	-30.1
3.464	-4.7	20.5	15.8	46.0	-30.2
3.524	-4.7	20.5	15.8	46.0	-30.2
4.419	-4.8	20.5	15.7	46.0	-30.3
0.278	-1.0	20.3	19.3	50.9	-31.6
29.908	-5.3	22.5	17.2	50.0	-32.8
0.223	-1.3	20.4	19.1	52.7	-33.6
22.268	-5.6	21.9	16.3	50.0	-33.7
18.336	-5.5	21.7	16.2	50.0	-33.8
0.152	1.1	20.7	21.8	55.9	-34.1
0.184	-0.4	20.5	20.1	54.3	-34.2
11.786	-5.6	21.4	15.8	50.0	-34.2
16.220	-5.8	21.6	15.8	50.0	-34.2
7.857	-5.2	20.9	15.7	50.0	-34.3
5.301	-5.0	20.6	15.6	50.0	-34.4

CONCLUSION

Pass



Tested By

SPURIOUS CONDUCTED EMISSIONS

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

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	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. An additional 6 dB factor was added to the results for an attenuator that was not accounted for in the reference level offset of the spurious emissions.

SPURIOUS CONDUCTED EMISSIONS



TSTx 2022.06.03.0 XMR 2022.02.07.0

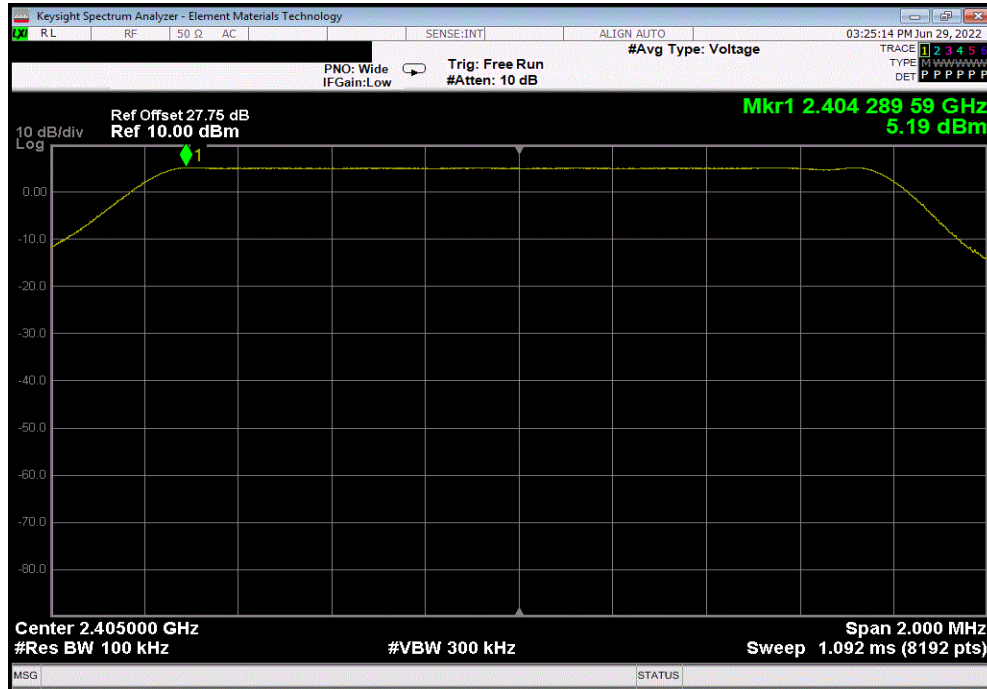
EUT: Titan Sensor		Work Order: NGRF0028				
Serial Number: PP-W02		Date: 29-Jun-22				
Customer: NextGen RF Design		Temperature: 24.2 °C				
Attendees: Tim Smith		Humidity: 44.6% RH				
Project: None		Barometric Pres.: 1016 mbar				
Tested by: Christopher Heintzelman		Power: 120VAC/60Hz				
		Job Site: MN08				
TEST SPECIFICATIONS						
FCC 15.247:2022		Test Method				
		ANSI C63.10:2013				
COMMENTS						
None						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	15	Signature <i>Christopher Heintzelman</i>				
		Frequency Range	Measured Freq (MHz)			
			Max Value (dBc)			
			Limit ≤ (dBc)			
			Result			
Low Channel, 2405 MHz, Modulated		Fundamental	2404.29	N/A	N/A	
Low Channel, 2405 MHz, Modulated		30 MHz - 12.5 GHz	6638.75	-48.02	-20	Pass
Low Channel, 2405 MHz, Modulated		12.5 GHz - 25 GHz	24818.4	-35.95	-20	Pass
Mid Channel, 2440 MHz, Modulated		Fundamental	2439.29	N/A	N/A	N/A
Mid Channel, 2440 MHz, Modulated		30 MHz - 12.5 GHz	1879.72	-31.93	-20	Pass
Mid Channel, 2440 MHz, Modulated		12.5 GHz - 25 GHz	24833.66	-37.58	-20	Pass
High Channel, 2479 MHz, Modulated		Fundamental	2478.29	N/A	N/A	N/A
High Channel, 2479 MHz, Modulated		30 MHz - 12.5 GHz	1864.5	-40.92	-20	Pass
High Channel, 2479 MHz, Modulated		12.5 GHz - 25 GHz	24855.02	-37.02	-20	Pass

SPURIOUS CONDUCTED EMISSIONS

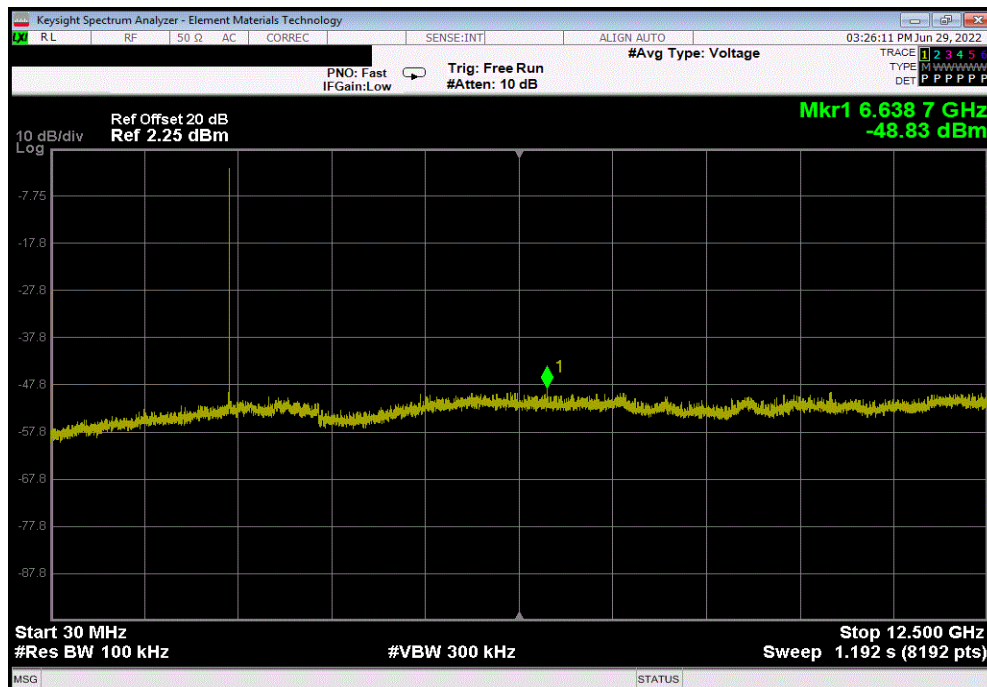


TbTtX 2022.06.03.0 XMt 2022.02.07.0

Low Channel, 2405 MHz, Modulated						
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental	2404.29	N/A	N/A	N/A		



Low Channel, 2405 MHz, Modulated						
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz	6638.75	-48.02	-20	Pass		

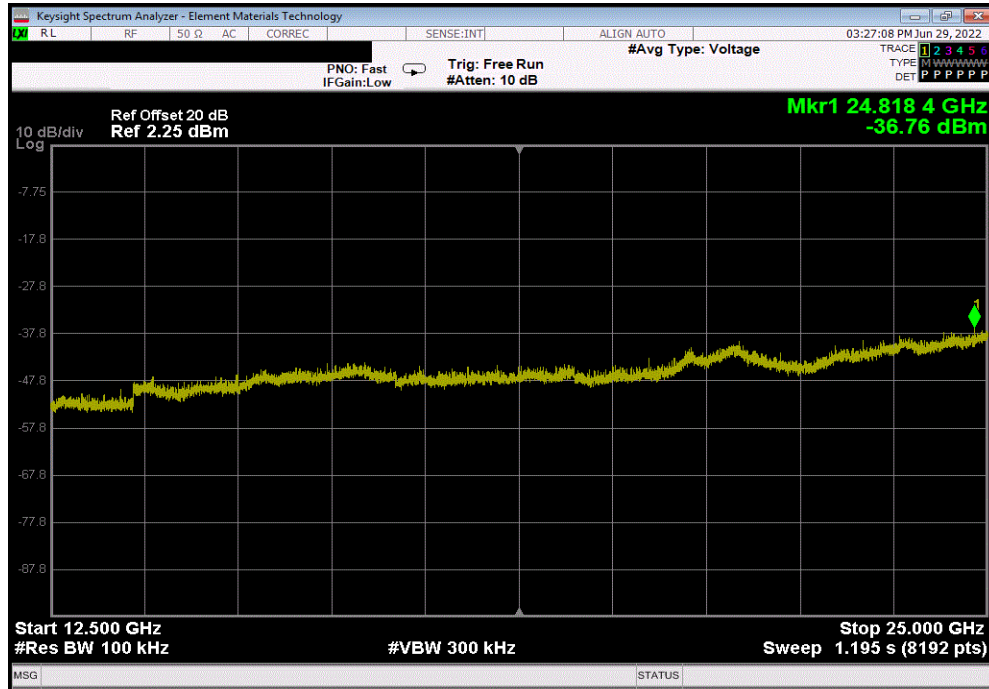


SPURIOUS CONDUCTED EMISSIONS

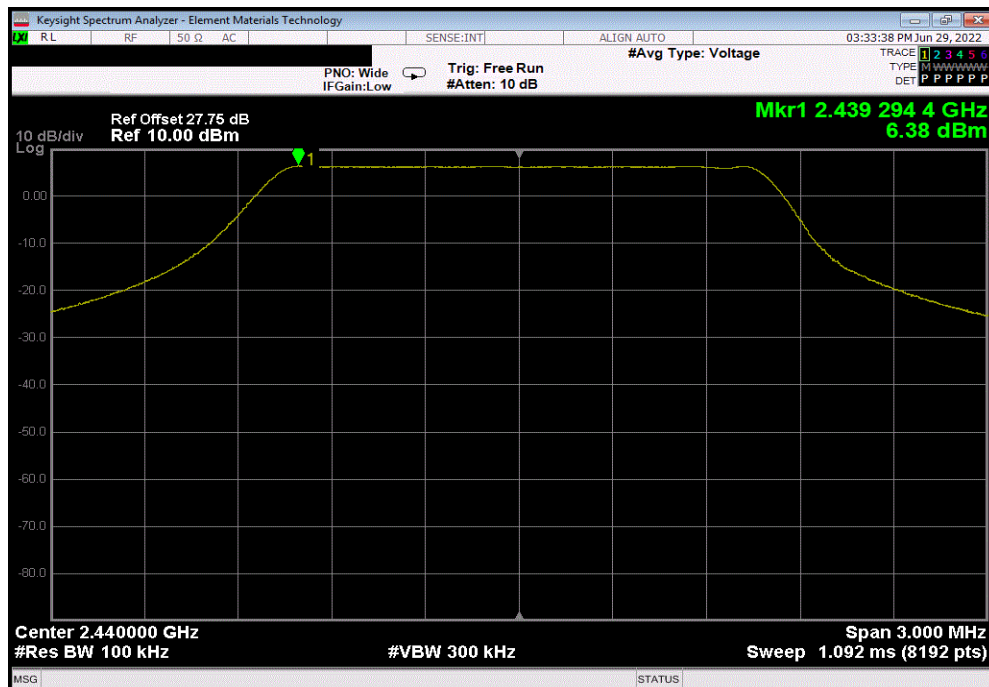


TbTtX 2022.06.03.0 XMt 2022.02.07.0

Low Channel, 2405 MHz, Modulated					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	24818.4	-35.95	-20	Pass	



Mid Channel, 2440 MHz, Modulated					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	2439.29	N/A	N/A	N/A	

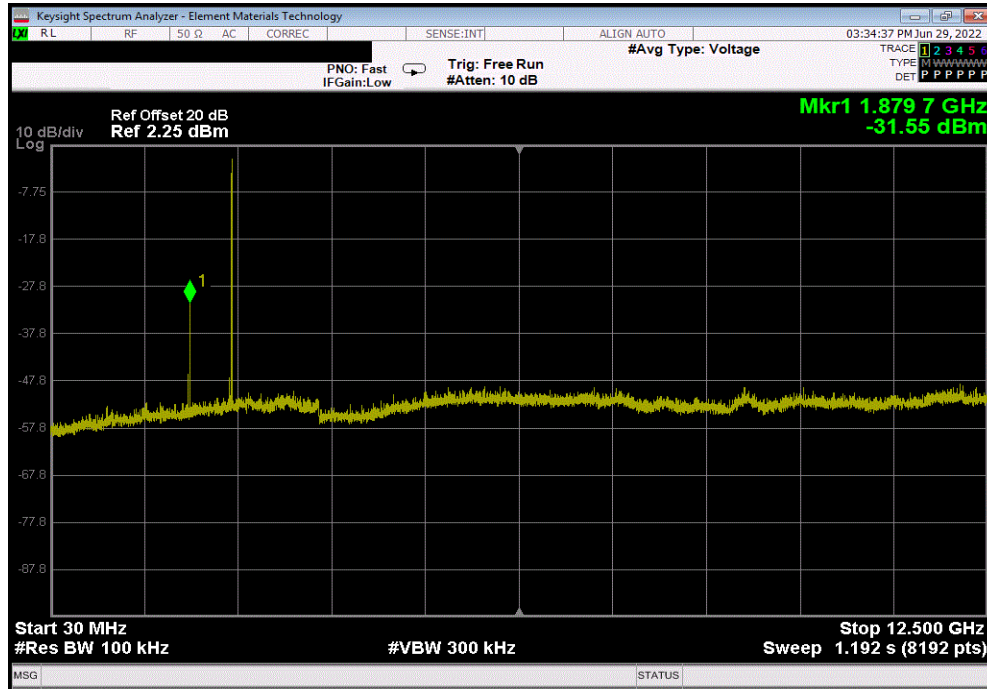


SPURIOUS CONDUCTED EMISSIONS

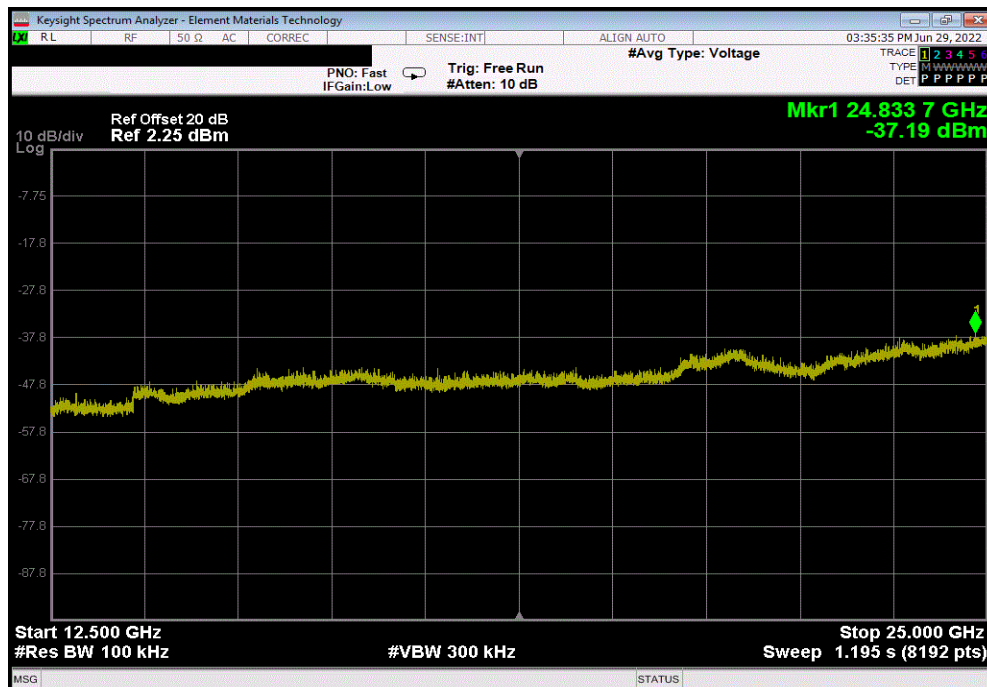


TbTtx 2022.06.03.0 XMt 2022.02.07.0

Mid Channel, 2440 MHz, Modulated					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	1879.72	-31.93	-20	Pass	



Mid Channel, 2440 MHz, Modulated					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	24833.66	-37.58	-20	Pass	

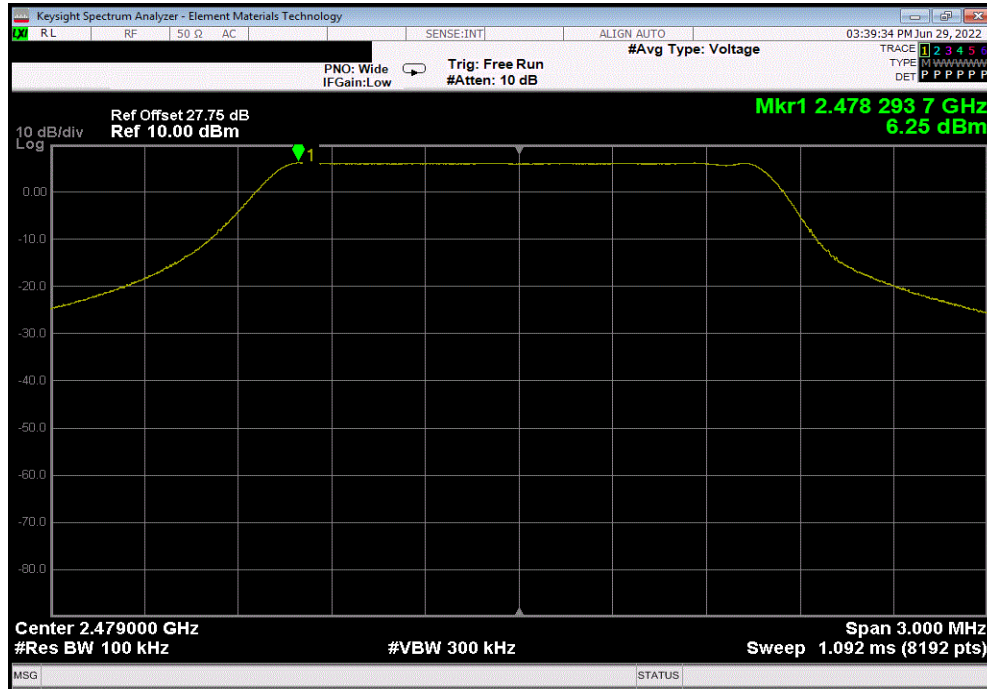


SPURIOUS CONDUCTED EMISSIONS

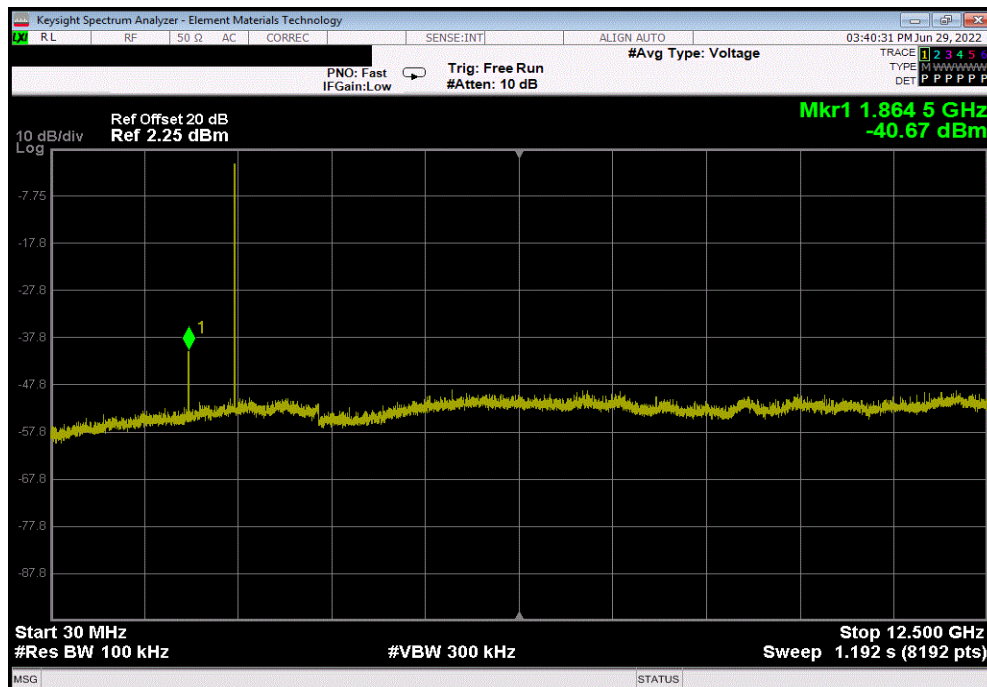


TbTx 2022.06.03.0 XMt 2022.02.07.0

High Channel, 2479 MHz, Modulated						
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental	2478.29	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	1864.5	-40.92	-20	Pass		

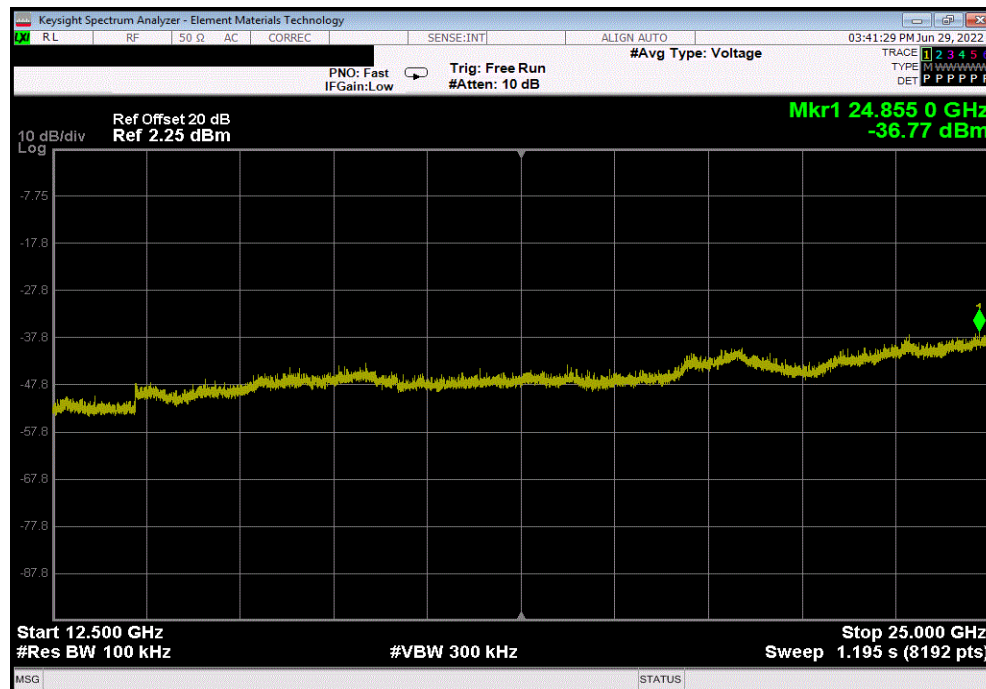


SPURIOUS CONDUCTED EMISSIONS



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	24855.02	-37.02	-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

POWER INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

NGRF0028-15

SPURIOUS RADIATED EMISSIONS

MODES INVESTIGATED

Transmitting Lora High Channel at 2479 MHz, modulated

SPURIOUS RADIATED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W02	Date:	2022-07-01
Customer:	NextGen RF Design	Temperature:	24.8°C
Attendees:	Tim Smith	Relative Humidity:	42.2%
Customer Project:	None	Bar. Pressure (PMSL):	1018 mb
Tested By:	Chris Patterson	Job Site:	MN09
Power:	120VAC/60Hz	Configuration:	NGRF0028-15

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	62	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

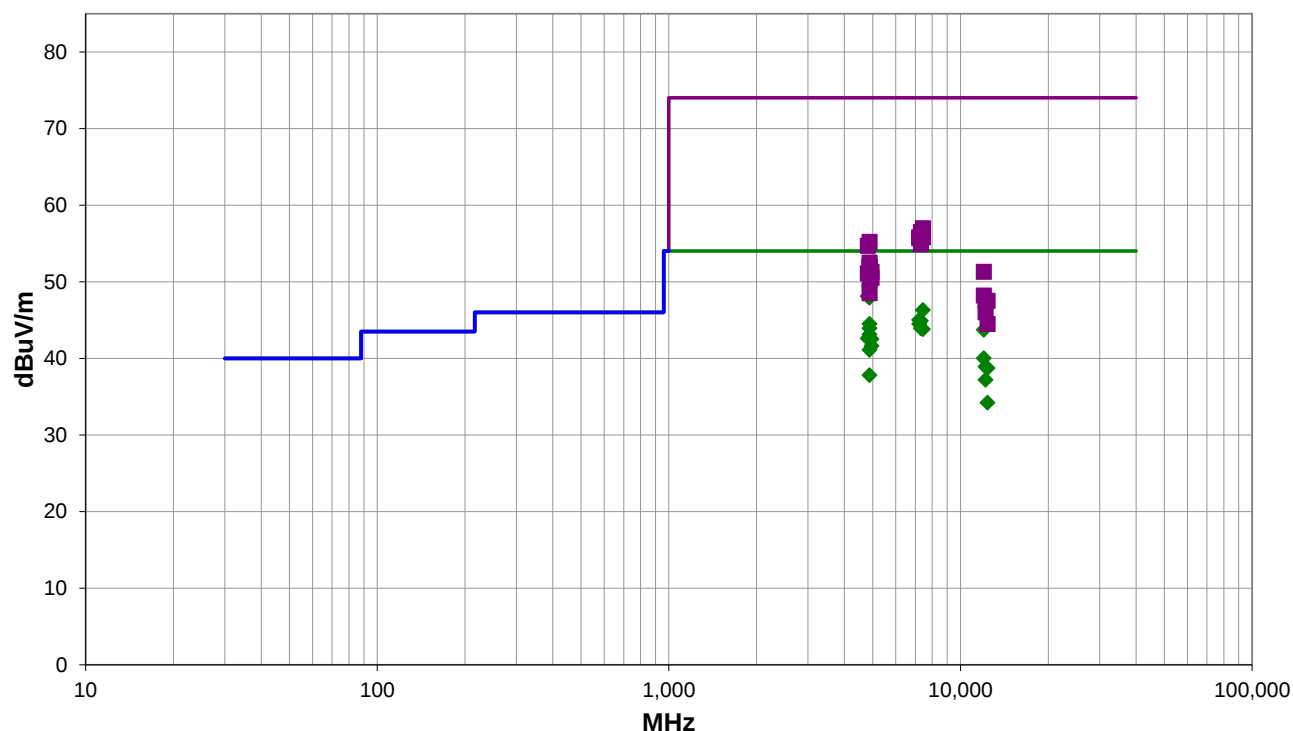
None

EUT OPERATING MODES

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

DEVIATIONS FROM TEST STANDARD

None



Run #: 62

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #62

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
4810.000	42.4	5.7	2.4	169.0	0.0	0.0	Horz	AV	0.0	48.1	54.0	-5.9	EUT Vert, Low Ch
4880.000	42.2	5.7	2.6	294.0	0.0	0.0	Horz	AV	0.0	47.9	54.0	-6.1	EUT Vert, Mid Ch
7437.000	30.9	15.4	1.0	67.0	0.0	0.0	Horz	AV	0.0	46.3	54.0	-7.7	EUT Vert, High Ch
7215.000	31.1	13.9	1.5	345.0	0.0	0.0	Vert	AV	0.0	45.0	54.0	-9.0	EUT On Side, Low Ch
7320.000	30.3	14.6	1.5	316.0	0.0	0.0	Vert	AV	0.0	44.9	54.0	-9.1	EUT On Side, Mid Ch
4880.000	38.8	5.7	1.3	33.0	0.0	0.0	Vert	AV	0.0	44.5	54.0	-9.5	EUT On Side, Mid Ch
7215.000	30.6	13.9	2.2	197.0	0.0	0.0	Horz	AV	0.0	44.5	54.0	-9.5	EUT Vert, Low Ch
4880.000	38.2	5.7	2.5	104.0	0.0	0.0	Horz	AV	0.0	43.9	54.0	-10.1	EUT On Side, Mid Ch
7320.000	29.3	14.6	1.5	191.0	0.0	0.0	Horz	AV	0.0	43.9	54.0	-10.1	EUT Vert, Mid Ch
7437.000	28.4	15.4	1.5	331.0	0.0	0.0	Vert	AV	0.0	43.8	54.0	-10.2	EUT On Side, High Ch
12025.000	44.9	-1.2	1.2	340.0	0.0	0.0	Vert	AV	0.0	43.7	54.0	-10.3	EUT On Side, Low Ch
4880.000	37.4	5.7	2.6	161.0	0.0	0.0	Horz	AV	0.0	43.1	54.0	-10.9	EUT Horz, Mid Ch
4810.000	36.9	5.7	1.5	46.0	0.0	0.0	Vert	AV	0.0	42.6	54.0	-11.4	EUT On Side, Low Ch
4958.000	36.9	5.6	1.5	58.0	0.0	0.0	Vert	AV	0.0	42.5	54.0	-11.5	EUT On Side, High Ch
4958.000	36.0	5.6	2.6	109.0	0.0	0.0	Horz	AV	0.0	41.6	54.0	-12.4	EUT Vert, High Ch
4880.000	35.4	5.7	1.4	30.0	0.0	0.0	Vert	AV	0.0	41.1	54.0	-12.9	EUT Horz, Mid Ch
12025.000	41.2	-1.2	2.0	195.0	0.0	0.0	Horz	AV	0.0	40.0	54.0	-14.0	EUT Vert, Low Ch
12200.000	39.1	-0.2	2.0	196.0	0.0	0.0	Horz	AV	0.0	38.9	54.0	-15.1	EUT Vert, Mid Ch
12395.000	38.8	-0.1	2.6	325.0	0.0	0.0	Horz	AV	0.0	38.7	54.0	-15.3	EUT Vert, High Ch
4880.000	32.1	5.7	2.9	84.0	0.0	0.0	Vert	AV	0.0	37.8	54.0	-16.2	EUT Vert, Mid Ch
12200.000	37.4	-0.2	1.0	309.0	0.0	0.0	Vert	AV	0.0	37.2	54.0	-16.8	EUT On Side, Mid Ch
7436.233	41.6	15.4	1.0	67.0		0.0	Horz	PK	0.0	57.0	74.0	-17.0	EUT Vert, High Ch
7319.692	41.9	14.6	1.5	316.0		0.0	Vert	PK	0.0	56.5	74.0	-17.5	EUT On Side, Mid Ch
7436.267	40.4	15.4	1.5	331.0		0.0	Vert	PK	0.0	55.8	74.0	-18.2	EUT On Side, High Ch
7213.458	41.9	13.9	1.5	345.0		0.0	Vert	PK	0.0	55.8	74.0	-18.2	EUT On Side, Low Ch
7217.375	41.7	14.0	2.2	197.0		0.0	Horz	PK	0.0	55.7	74.0	-18.3	EUT Vert, Low Ch
4879.633	49.5	5.7	2.6	294.0		0.0	Horz	PK	0.0	55.2	74.0	-18.8	EUT Vert, Mid Ch
7321.908	40.3	14.6	1.5	191.0		0.0	Horz	PK	0.0	54.9	74.0	-19.1	EUT Vert, Mid Ch
4811.192	49.0	5.7	2.4	169.0		0.0	Horz	PK	0.0	54.7	74.0	-19.3	EUT Vert, Low Ch
12395.000	34.3	-0.1	3.1	322.0	0.0	0.0	Vert	AV	0.0	34.2	54.0	-19.8	EUT On Side, High Ch
4881.058	46.8	5.7	1.3	33.0		0.0	Vert	PK	0.0	52.5	74.0	-21.5	EUT On Side, Mid Ch
4880.042	46.3	5.7	2.6	161.0		0.0	Horz	PK	0.0	52.0	74.0	-22.0	EUT Horz, Mid Ch
4881.067	46.2	5.7	2.5	104.0		0.0	Horz	PK	0.0	51.9	74.0	-22.1	EUT On Side, Mid Ch
4956.408	45.7	5.6	1.5	58.0		0.0	Vert	PK	0.0	51.3	74.0	-22.7	EUT On Side, High Ch
12026.180	52.5	-1.2	1.2	340.0		0.0	Vert	PK	0.0	51.3	74.0	-22.7	EUT On Side, Low Ch
4811.100	45.4	5.7	1.5	46.0		0.0	Vert	PK	0.0	51.1	74.0	-22.9	EUT On Side, Low Ch
4958.358	44.9	5.6	2.6	109.0		0.0	Horz	PK	0.0	50.5	74.0	-23.5	EUT Vert, High Ch
4879.600	44.6	5.7	1.4	30.0		0.0	Vert	PK	0.0	50.3	74.0	-23.7	EUT Horz, Mid Ch
4878.725	42.8	5.7	2.9	84.0		0.0	Vert	PK	0.0	48.5	74.0	-25.5	EUT Vert, Mid Ch
12024.350	49.4	-1.2	2.0	195.0		0.0	Horz	PK	0.0	48.2	74.0	-25.8	EUT Vert, Low Ch
12201.900	47.6	-0.1	2.0	196.0		0.0	Horz	PK	0.0	47.5	74.0	-26.5	EUT Vert, Mid Ch
12393.370	47.6	-0.1	2.6	325.0		0.0	Horz	PK	0.0	47.5	74.0	-26.5	EUT Vert, High 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
12198.390	46.2	-0.2	1.0	309.0		0.0	Vert	PK	0.0	46.0	74.0	-28.0	EUT On Side, Mid Ch
12395.330	44.6	-0.1	3.1	322.0		0.0	Vert	PK	0.0	44.5	74.0	-29.5	EUT On Side, High Ch

CONCLUSION

Pass



Tested By

SPURIOUS RADIATED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	PP-W02	Date:	2022-07-01
Customer:	NextGen RF Design	Temperature:	24.8°C
Attendees:	Tim Smith	Relative Humidity:	42.2%
Customer Project:	None	Bar. Pressure (PMSL):	1018 mb
Tested By:	Chris Patterson	Job Site:	MN09
Power:	120VAC/60Hz	Configuration:	NGRF0028-15

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	64	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

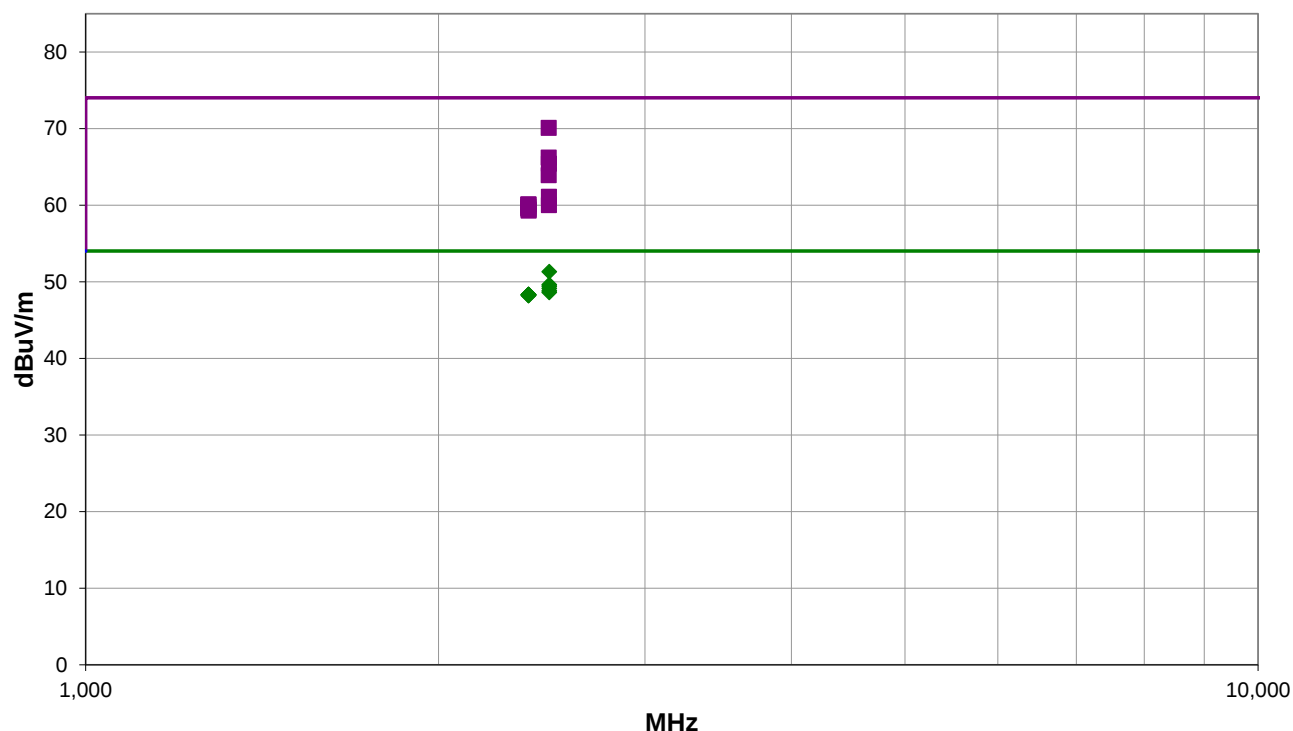
None

EUT OPERATING MODES

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

DEVIATIONS FROM TEST STANDARD

None



Run #: 64

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #64

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	33.7	-2.4	1.01	276.0	0.0	20.0	Horz	AV	0.0	51.3	54.0	-2.7	EUT Horz, High Ch
2483.517	52.5	-2.4	1.01	276.0		20.0	Horz	PK	0.0	70.1	74.0	-3.9	EUT Horz, High Ch
2486.000	32.0	-2.4	1.01	75.0	0.0	20.0	Horz	AV	0.0	49.6	54.0	-4.4	EUT Vert, High Ch
2486.000	31.8	-2.4	1.0	293.0	0.0	20.0	Vert	AV	0.0	49.4	54.0	-4.6	EUT Vert, High Ch
2486.000	31.5	-2.4	1.5	31.0	0.0	20.0	Horz	AV	0.0	49.1	54.0	-4.9	EUT On Side, High Ch
2486.000	31.2	-2.4	1.5	157.0	0.0	20.0	Vert	AV	0.0	48.8	54.0	-5.2	EUT On Side, High Ch
2486.000	31.0	-2.4	1.5	210.0	0.0	20.0	Vert	AV	0.0	48.6	54.0	-5.4	EUT Horz, High Ch
2387.500	30.7	-2.4	1.5	105.0	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	90.0	0.0	20.0	Vert	AV	0.0	48.3	54.0	-5.7	EUT Horz, Low Ch
2387.500	30.7	-2.4	1.5	146.0	0.0	20.0	Horz	AV	0.0	48.3	54.0	-5.7	EUT Vert, Low Ch
2387.500	30.7	-2.4	1.76	60.0	0.0	20.0	Vert	AV	0.0	48.3	54.0	-5.7	EUT On Side, Low Ch
2387.500	30.6	-2.4	1.5	173.0	0.0	20.0	Vert	AV	0.0	48.2	54.0	-5.8	EUT Vert, Low Ch
2387.500	30.6	-2.4	1.5	62.0	0.0	20.0	Horz	AV	0.0	48.2	54.0	-5.8	EUT On Side, Low Ch
2483.542	48.6	-2.4	1.01	75.0		20.0	Horz	PK	0.0	66.2	74.0	-7.8	EUT Vert, High Ch
2483.633	47.8	-2.4	1.0	293.0		20.0	Vert	PK	0.0	65.4	74.0	-8.6	EUT Vert, High Ch
2483.533	46.3	-2.4	1.5	31.0		20.0	Horz	PK	0.0	63.9	74.0	-10.1	EUT On Side, High Ch
2483.783	43.5	-2.4	1.5	157.0		20.0	Vert	PK	0.0	61.1	74.0	-12.9	EUT On Side, High Ch
2385.292	42.5	-2.4	1.5	62.0		20.0	Horz	PK	0.0	60.1	74.0	-13.9	EUT On Side, Low Ch
2386.950	42.5	-2.4	1.76	60.0		20.0	Vert	PK	0.0	60.1	74.0	-13.9	EUT On Side, Low Ch
2484.508	42.4	-2.4	1.5	210.0		20.0	Vert	PK	0.0	60.0	74.0	-14.0	EUT Horz, High Ch
2385.808	42.2	-2.4	1.5	105.0		20.0	Horz	PK	0.0	59.8	74.0	-14.2	EUT Horz, Low Ch
2385.192	42.0	-2.4	1.5	90.0		20.0	Vert	PK	0.0	59.6	74.0	-14.4	EUT Horz, Low Ch
2387.275	41.8	-2.4	1.5	173.0		20.0	Vert	PK	0.0	59.4	74.0	-14.6	EUT Vert, Low Ch
2387.567	41.7	-2.4	1.5	146.0		20.0	Horz	PK	0.0	59.3	74.0	-14.7	EUT Vert, Low Ch

CONCLUSION

Pass



Tested By

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
Antenna - Double Ridge	ETS Lindgren	3115	AIB	2022-09-01	2024-09-01
Cable	Element	Double Ridge Guide Horn Cables	MNV	2022-01-24	2023-01-24
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	2022-01-24	2023-01-24
Attenuator	Coaxicom	3910-20	AXY	2022-09-10	2023-09-10
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	2022-06-10	2023-06-10
Filter - High Pass	Micro-Tronics	HPM50111	HFM	2022-09-10	2023-09-10
Antenna - Standard Gain	ETS-Lindgren	3160-07	AJJ	NCR	NCR
Cable	Element	Standard Gain Cable	MN W	2022-01-24	2023-01-24
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2022-01-24	2023-01-24
Antenna - Standard Gain	ETS-Lindgren	3160-08	AJP	NCR	NCR
Amplifier - Pre-Amplifier	L-3 Narda-Miteq	AMF-6F-12001800-30-10P	PAP	2022-01-24	2023-01-24
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	NCR
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNP	2022-09-10	2023-09-10
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	2022-09-10	2023-09-10

SPURIOUS RADIATED EMISSIONS

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

FREQUENCY RANGE INVESTIGATED

1000 MHz TO 26500 MHz

POWER INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

NGRF0028-30
NGRF0028-31
NGRF0028-32

MODES INVESTIGATED

Transmitting LoRa High Channel 2479 MHz, modulated
Transmitting LoRa Low Channel 2405 MHz, modulated
Transmitting LoRa Mid Channel 2440 MHz, modulated

SPURIOUS RADIATED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	05038	Date:	2022-12-29
Customer:	NextGen RF Design	Temperature:	21.3°C
Attendees:	Tim Smith	Relative Humidity:	25.9%
Customer Project:	None	Bar. Pressure (PMSL):	1004 mb
Tested By:	Marcelo Aguayo, Chris Heintzelman	Job Site:	MN09
Power:	110VAC/60Hz	Configuration:	NGRF0028-30

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	135	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

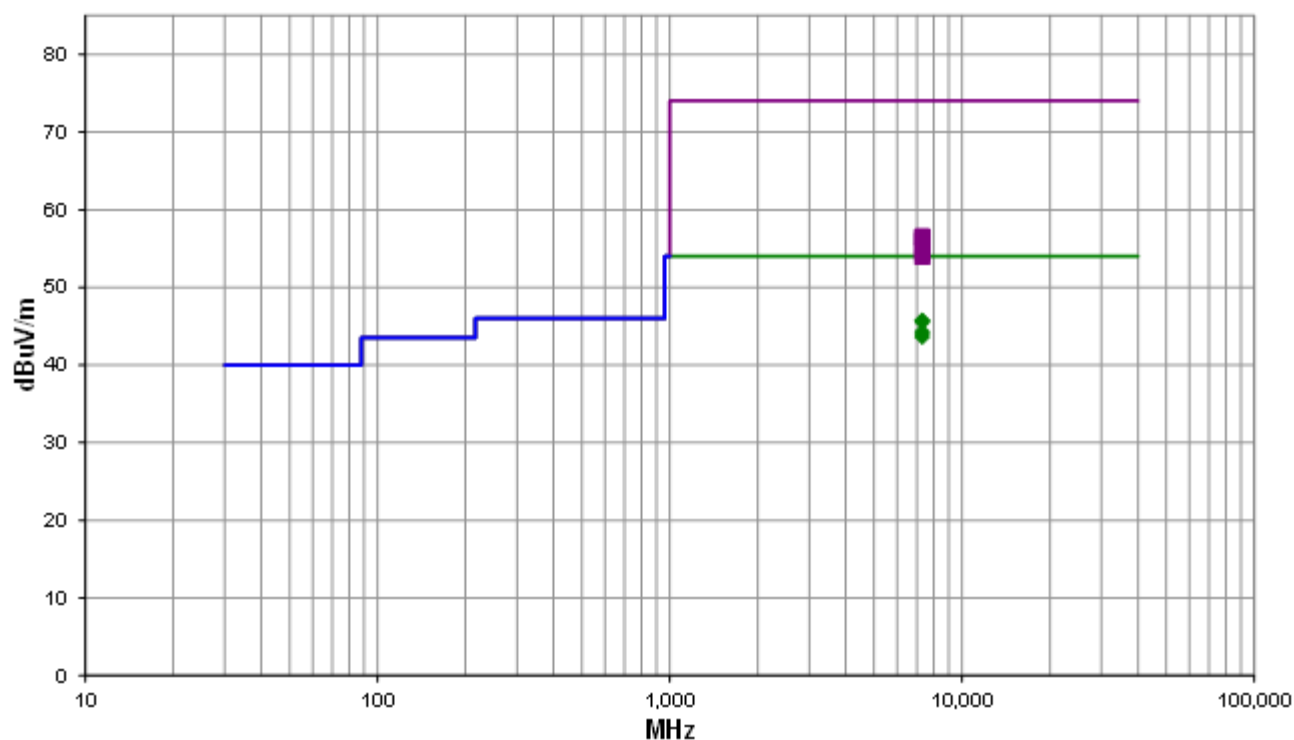
Multifunction sensor

EUT OPERATING MODES

Transmitting LoRa Mid Channel 2440 MHz, modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 135

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #135

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7319.817	31.2	14.5	3.91	103.0	3.0	0.0	Vert	AV	0.0	45.7	54.0	-8.3	EUT Vert, Mid Ch
7318.725	31.2	14.5	1.38	112.0	3.0	0.0	Horz	AV	0.0	45.7	54.0	-8.3	EUT On Side, Mid Ch
7318.950	31.0	14.5	1.5	18.0	3.0	0.0	Horz	AV	0.0	45.5	54.0	-8.5	EUT Horz, Mid Ch
7319.058	29.8	14.5	3.96	347.0	3.0	0.0	Vert	AV	0.0	44.3	54.0	-9.7	EUT On Side, Mid Ch
7318.925	29.4	14.5	3.85	24.0	3.0	0.0	Horz	AV	0.0	43.9	54.0	-10.1	EUT Vert, Mid Ch
7318.325	29.1	14.5	2.33	64.0	3.0	0.0	Vert	AV	0.0	43.6	54.0	-10.4	EUT Horz, Mid Ch
7320.108	42.0	14.5	3.91	103.0	3.0	0.0	Vert	PK	0.0	56.5	74.0	-17.5	EUT Vert, Mid Ch
7319.883	42.0	14.5	1.38	112.0	3.0	0.0	Horz	PK	0.0	56.5	74.0	-17.5	EUT On Side, Mid Ch
7320.217	41.5	14.5	1.5	18.0	3.0	0.0	Horz	PK	0.0	56.0	74.0	-18.0	EUT Horz, Mid Ch
7317.650	40.3	14.5	3.96	347.0	3.0	0.0	Vert	PK	0.0	54.8	74.0	-19.2	EUT On Side, Mid Ch
7321.608	39.9	14.5	2.33	64.0	3.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	EUT Horz, Mid Ch
7318.500	39.4	14.5	3.85	24.0	3.0	0.0	Horz	PK	0.0	53.9	74.0	-20.1	EUT Vert, Mid Ch

CONCLUSION

Pass



Tested By

SPURIOUS RADIATED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	05038	Date:	2022-12-29
Customer:	NextGen RF Design	Temperature:	21.3°C
Attendees:	Tim Smith	Relative Humidity:	25.9%
Customer Project:	None	Bar. Pressure (PMSL):	1004 mb
Tested By:	Marcelo Aguayo, Chris Heintzelman	Job Site:	MN09
Power:	110VAC/60Hz	Configuration:	NGRF0028-30

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	136	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

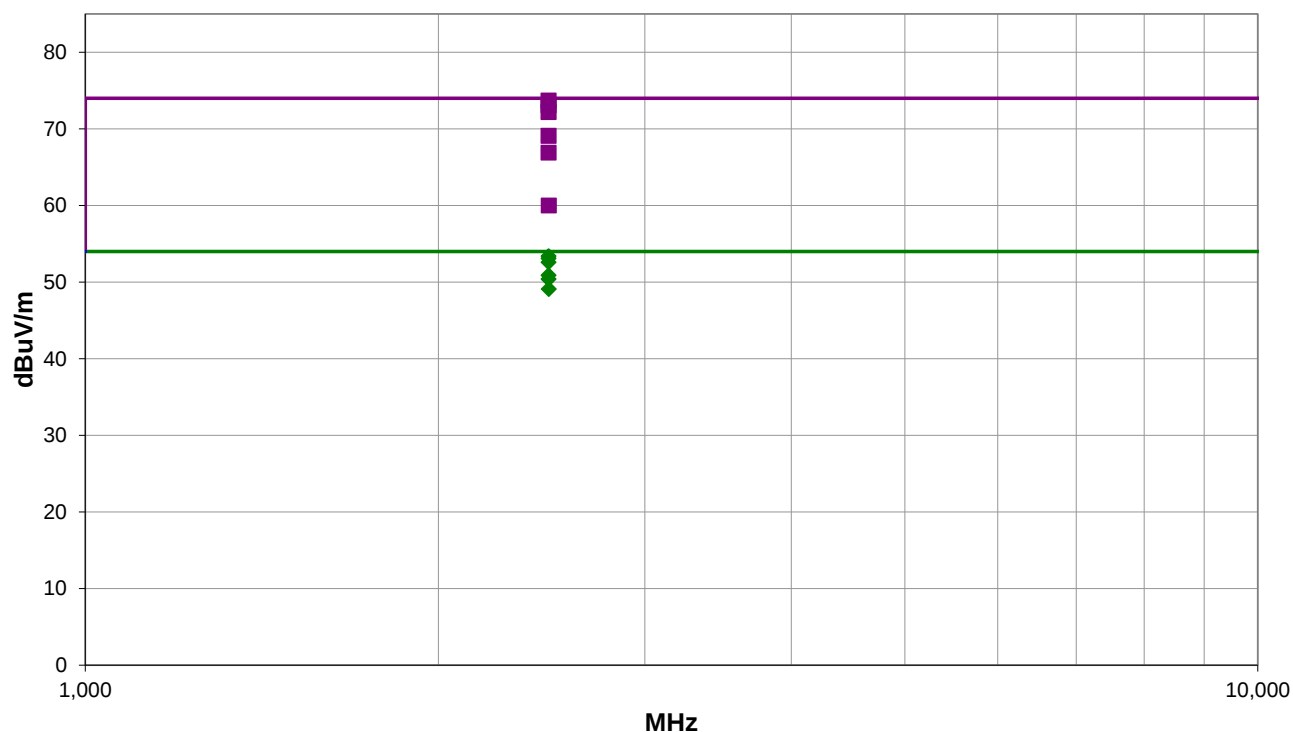
Multifunction sensor

EUT OPERATING MODES

Transmitting LoRa High Channel 2479 MHz, modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 136

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #136

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.508	55.9	-2.2	4.0	40.0	3.0	20.0	Horz	PK	0.0	73.7	74.0	-0.3	EUT Horz, High Ch
2483.508	35.6	-2.2	4.0	40.0	3.0	20.0	Horz	AV	0.0	53.4	54.0	-0.6	EUT Horz, High Ch
2483.517	35.3	-2.2	4.0	343.0	3.0	20.0	Vert	AV	0.0	53.1	54.0	-0.9	EUT On Side, High Ch
2483.525	55.3	-2.2	4.0	343.0	3.0	20.0	Vert	PK	0.0	73.1	74.0	-0.9	EUT On Side, High Ch
2483.517	34.8	-2.2	3.83	30.0	3.0	20.0	Vert	AV	0.0	52.6	54.0	-1.4	EUT Vert, High Ch
2483.508	54.4	-2.2	3.83	30.0	3.0	20.0	Vert	PK	0.0	72.2	74.0	-1.8	EUT Vert, High Ch
2483.508	33.1	-2.2	1.01	112.0	3.0	20.0	Horz	AV	0.0	50.9	54.0	-3.1	EUT Vert, High Ch
2483.600	32.6	-2.2	3.53	66.0	3.0	20.0	Horz	AV	0.0	50.4	54.0	-3.6	EUT On Side, High Ch
2484.567	31.3	-2.2	1.5	282.0	3.0	20.0	Vert	AV	0.0	49.1	54.0	-4.9	EUT Horz, High Ch
2483.500	51.3	-2.2	1.01	112.0	3.0	20.0	Horz	PK	0.0	69.1	74.0	-4.9	EUT Vert, High Ch
2483.500	49.1	-2.2	3.53	66.0	3.0	20.0	Horz	PK	0.0	66.9	74.0	-7.1	EUT On Side, High Ch
2484.800	42.2	-2.2	1.5	282.0	3.0	20.0	Vert	PK	0.0	60.0	74.0	-14.0	EUT Horz, High Ch

CONCLUSION

Pass



Tested By

SPURIOUS RADIATED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	05066	Date:	2022-12-29
Customer:	NextGen RF Design	Temperature:	21.3°C
Attendees:	Tim Smith	Relative Humidity:	25.9%
Customer Project:	None	Bar. Pressure (PMSL):	1004 mb
Tested By:	Marcelo Aguayo, Chris Heintzeman	Job Site:	MN09
Power:	110VAC/60Hz	Configuration:	NGRF0028-31

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	148	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

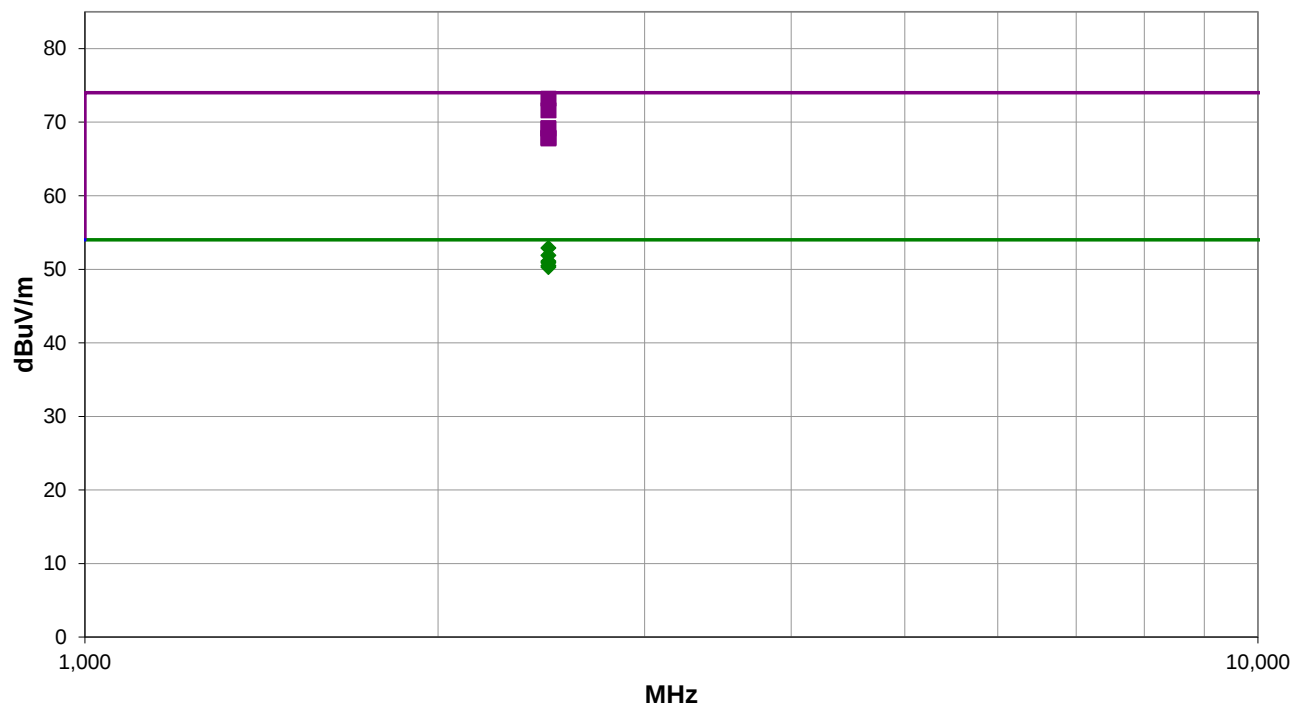
Temperature sensor

EUT OPERATING MODES

Transmitting LoRa High Channel 2479 MHz, modulated
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DEVIATIONS FROM TEST STANDARD

None



Run #: 148

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #148

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.583	55.4	-2.2	4.0	48.0	3.0	20.0	Horz	PK	0.0	73.2	74.0	-0.8	EUT Horz, High Ch
2483.508	35.1	-2.2	4.0	48.0	3.0	20.0	Horz	AV	0.0	52.9	54.0	-1.1	EUT Horz, High Ch
2483.500	34.1	-2.2	4.0	359.0	3.0	20.0	Vert	AV	0.0	51.9	54.0	-2.1	EUT On Side, High Ch
2483.617	53.8	-2.2	4.0	359.0	3.0	20.0	Vert	PK	0.0	71.6	74.0	-2.4	EUT On Side, High Ch
2483.500	33.3	-2.2	4.0	212.0	3.0	20.0	Horz	AV	0.0	51.1	54.0	-2.9	EUT Vert, High Ch
2483.500	33.1	-2.2	4.0	215.0	3.0	20.0	Horz	AV	0.0	50.9	54.0	-3.1	EUT On Side, High Ch
2483.533	32.7	-2.2	3.7	194.0	3.0	20.0	Vert	AV	0.0	50.5	54.0	-3.5	EUT Horz, High Ch
2483.533	32.5	-2.2	1.0	76.0	3.0	20.0	Vert	AV	0.0	50.3	54.0	-3.7	EUT Vert, High Ch
2483.533	51.4	-2.2	4.0	212.0	3.0	20.0	Horz	PK	0.0	69.2	74.0	-4.8	EUT Vert, High Ch
2483.542	51.3	-2.2	4.0	215.0	3.0	20.0	Horz	PK	0.0	69.1	74.0	-4.9	EUT On Side, High Ch
2483.608	50.1	-2.2	1.0	76.0	3.0	20.0	Vert	PK	0.0	67.9	74.0	-6.1	EUT Vert, High Ch
2483.575	50.0	-2.2	3.7	194.0	3.0	20.0	Vert	PK	0.0	67.8	74.0	-6.2	EUT Horz, High Ch

CONCLUSION

Pass



Tested By

SPURIOUS RADIATED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	05066	Date:	2022-12-29
Customer:	NextGen RF Design	Temperature:	21.3°C
Attendees:	Tim Smith	Relative Humidity:	25.9%
Customer Project:	None	Bar. Pressure (PMSL):	1004 mb
Tested By:	Marcelo Aguayo, Chris Heintzelman	Job Site:	MN09
Power:	110VAC/60Hz	Configuration:	NGRF0028-31

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	150	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

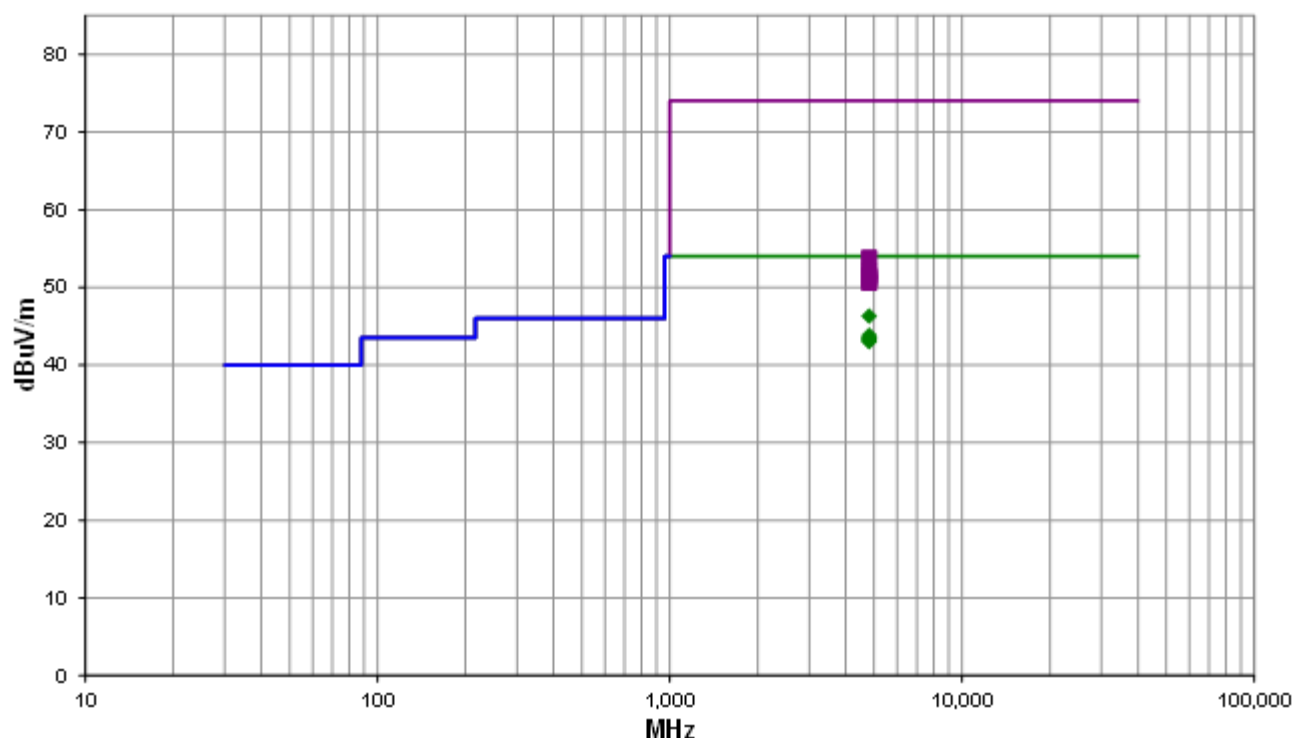
Temperature sensor

EUT OPERATING MODES

Transmitting LoRa Low Channel 2405 MHz, modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 150

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #150

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4809.825	40.6	5.7	1.2	162.0	3.0	0.0	Vert	AV	0.0	46.3	54.0	-7.7	EUT Horz, Low Ch
4809.475	38.1	5.7	3.74	251.0	3.0	0.0	Vert	AV	0.0	43.8	54.0	-10.2	EUT Vert, Low Ch
4810.375	37.7	5.7	3.51	324.0	3.0	0.0	Horz	AV	0.0	43.4	54.0	-10.6	EUT Horz, Low Ch
4809.467	37.7	5.7	1.5	237.0	3.0	0.0	Horz	AV	0.0	43.4	54.0	-10.6	EUT Vert, Low Ch
4810.292	37.5	5.7	1.5	249.0	3.0	0.0	Horz	AV	0.0	43.2	54.0	-10.8	EUT On Side, Low Ch
4809.750	37.3	5.7	3.75	230.0	3.0	0.0	Vert	AV	0.0	43.0	54.0	-11.0	EUT On Side, Low Ch
4810.483	48.1	5.7	1.2	162.0	3.0	0.0	Vert	PK	0.0	53.8	74.0	-20.2	EUT Horz, Low Ch
4808.550	46.3	5.7	1.5	237.0	3.0	0.0	Horz	PK	0.0	52.0	74.0	-22.0	EUT Vert, Low Ch
4809.183	45.9	5.7	3.74	251.0	3.0	0.0	Vert	PK	0.0	51.6	74.0	-22.4	EUT Vert, Low Ch
4809.358	45.6	5.7	1.5	249.0	3.0	0.0	Horz	PK	0.0	51.3	74.0	-22.7	EUT On Side, Low Ch
4810.425	45.3	5.7	3.51	324.0	3.0	0.0	Horz	PK	0.0	51.0	74.0	-23.0	EUT Horz, Low Ch
4808.558	44.9	5.7	3.75	230.0	3.0	0.0	Vert	PK	0.0	50.6	74.0	-23.4	EUT On Side, Low Ch

CONCLUSION

Pass



Tested By

SPURIOUS RADIATED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	0503A	Date:	2022-12-29
Customer:	NextGen RF Design	Temperature:	21.3°C
Attendees:	Tim Smith	Relative Humidity:	25.9%
Customer Project:	None	Bar. Pressure (PMSL):	1004 mb
Tested By:	Marcelo Aguayo, Chris Heintzelman	Job Site:	MN09
Power:	110VAC/60Hz	Configuration:	NGRF0028-32

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	162	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

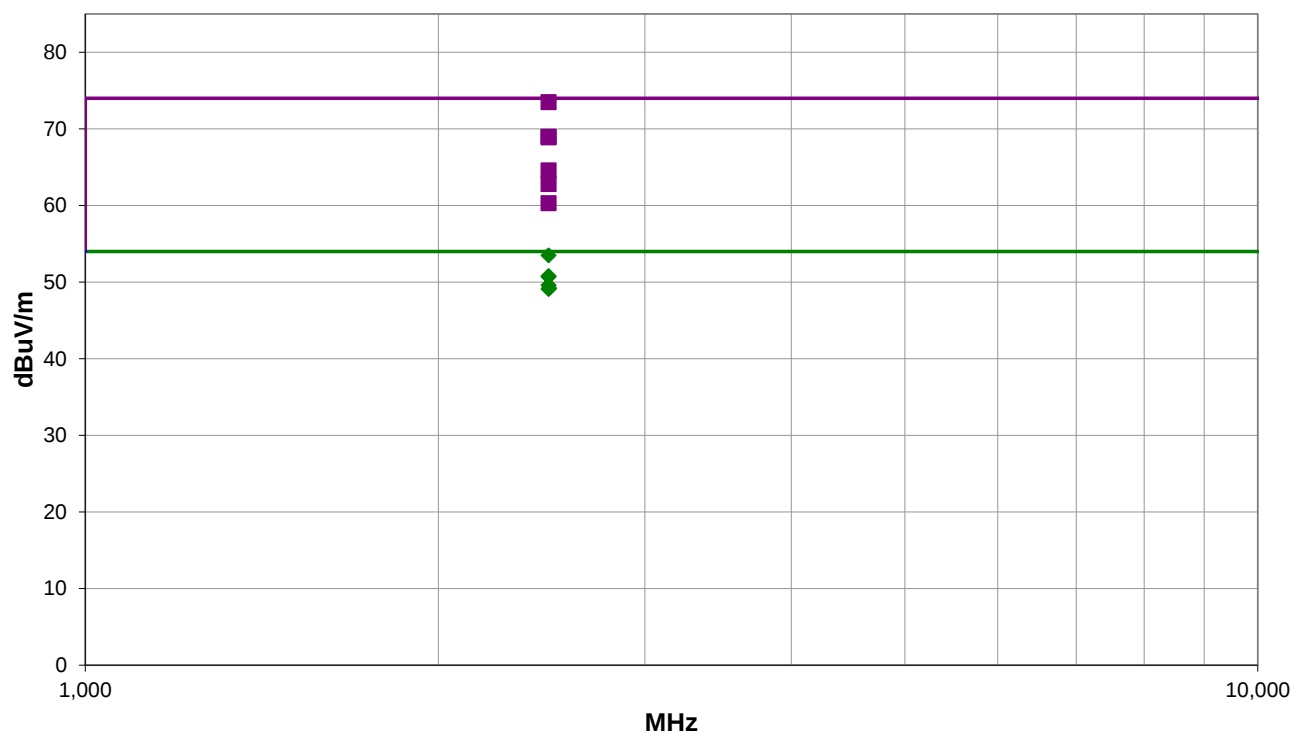
Humidity sensor

EUT OPERATING MODES

Transmitting LoRa Mid Channel 2440 MHz, modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 162

■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #162

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.558	55.7	-2.2	1.0	215.0	3.0	20.0	Horz	PK	0.0	73.5	74.0	-0.5	EUT Horz, High Ch
2483.508	35.7	-2.2	1.0	215.0	3.0	20.0	Horz	AV	0.0	53.5	54.0	-0.5	EUT Horz, High Ch
2483.508	33.0	-2.2	3.81	62.0	3.0	20.0	Horz	AV	0.0	50.8	54.0	-3.2	EUT Vert, High Ch
2483.517	32.9	-2.2	3.89	71.0	3.0	20.0	Horz	AV	0.0	50.7	54.0	-3.3	EUT On Side, High Ch
2483.650	31.8	-2.2	1.01	161.0	3.0	20.0	Vert	AV	0.0	49.6	54.0	-4.4	EUT On Side, High Ch
2486.517	31.4	-2.2	2.88	97.0	3.0	20.0	Vert	AV	0.0	49.2	54.0	-4.8	EUT Horz, High Ch
2483.583	31.3	-2.2	1.5	137.0	3.0	20.0	Vert	AV	0.0	49.1	54.0	-4.9	EUT Vert, High Ch
2483.667	51.2	-2.2	3.81	62.0	3.0	20.0	Horz	PK	0.0	69.0	74.0	-5.0	EUT Vert, High Ch
2483.533	51.1	-2.2	3.89	71.0	3.0	20.0	Horz	PK	0.0	68.9	74.0	-5.1	EUT On Side, High Ch
2483.942	46.8	-2.2	1.01	161.0	3.0	20.0	Vert	PK	0.0	64.6	74.0	-9.4	EUT On Side, High Ch
2483.750	45.0	-2.2	1.5	137.0	3.0	20.0	Vert	PK	0.0	62.8	74.0	-11.2	EUT Vert, High Ch
2483.533	42.5	-2.2	2.88	97.0	3.0	20.0	Vert	PK	0.0	60.3	74.0	-13.7	EUT Horz, High Ch

CONCLUSION

Pass



Tested By

SPURIOUS RADIATED EMISSIONS

EUT:	Titan Sensor	Work Order:	NGRF0028
Serial Number:	0503A	Date:	2022-12-29
Customer:	NextGen RF Design	Temperature:	21.3°C
Attendees:	Tim Smith	Relative Humidity:	25.9%
Customer Project:	None	Bar. Pressure (PMSL):	1004 mb
Tested By:	Marcelo Aguayo, Chris Heintzelman	Job Site:	MN09
Power:	110VAC/60Hz	Configuration:	NGRF0028-32

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	163	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

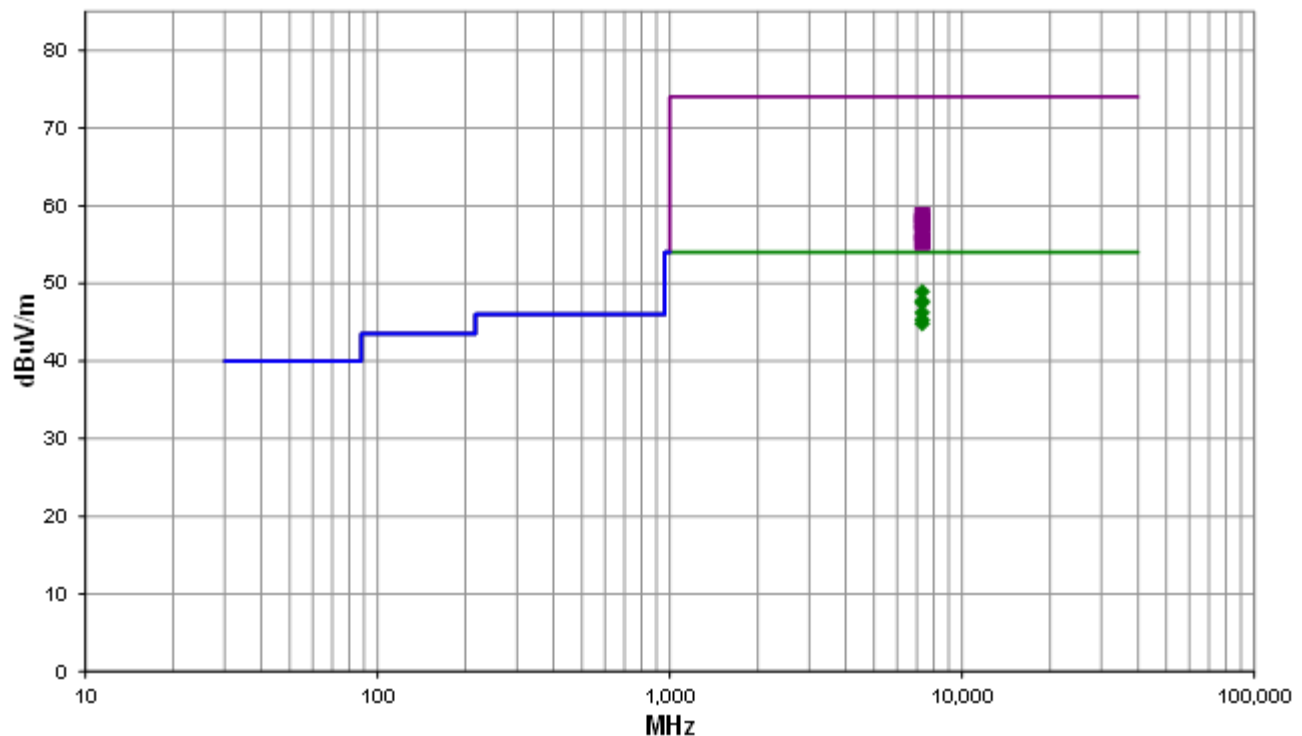
Humidity sensor

EUT OPERATING MODES

Transmitting LoRa Mid Channel 2440 MHz, modulated

DEVIATIONS FROM TEST STANDARD

None



SPURIOUS RADIATED EMISSIONS

RESULTS - Run #163

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7319.575	34.4	14.5	2.08	240.0	3.0	0.0	Horz	AV	0.0	48.9	54.0	-5.1	EUT On Side, Mid Ch
7319.050	33.2	14.5	1.14	301.0	3.0	0.0	Vert	AV	0.0	47.7	54.0	-6.3	EUT Vert, Mid Ch
7318.808	33.0	14.5	1.05	44.0	3.0	0.0	Vert	AV	0.0	47.5	54.0	-6.5	EUT Horz, Mid Ch
7320.033	31.7	14.5	2.8	174.0	3.0	0.0	Horz	AV	0.0	46.2	54.0	-7.8	EUT Horz, Mid Ch
7319.208	30.8	14.5	2.37	178.0	3.0	0.0	Vert	AV	0.0	45.3	54.0	-8.7	EUT On Side, Mid Ch
7319.000	30.3	14.5	3.48	0.0	3.0	0.0	Horz	AV	0.0	44.8	54.0	-9.2	EUT Vert, Mid Ch
7319.300	44.3	14.5	2.08	240.0	3.0	0.0	Horz	PK	0.0	58.8	74.0	-15.2	EUT On Side, Mid Ch
7317.708	43.6	14.5	1.14	301.0	3.0	0.0	Vert	PK	0.0	58.1	74.0	-15.9	EUT Vert, Mid Ch
7318.767	43.3	14.5	1.05	44.0	3.0	0.0	Vert	PK	0.0	57.8	74.0	-16.2	EUT Horz, Mid Ch
7319.200	42.0	14.5	2.8	174.0	3.0	0.0	Horz	PK	0.0	56.5	74.0	-17.5	EUT Horz, Mid Ch
7321.142	41.0	14.5	2.37	178.0	3.0	0.0	Vert	PK	0.0	55.5	74.0	-18.5	EUT On Side, Mid Ch
7319.175	40.8	14.5	3.48	0.0	3.0	0.0	Horz	PK	0.0	55.3	74.0	-18.7	EUT Vert, Mid Ch

CONCLUSION

Pass



Tested By

End of Test Report