Digi International Inc

Digi XBee LR RF Module for LoRaWAN

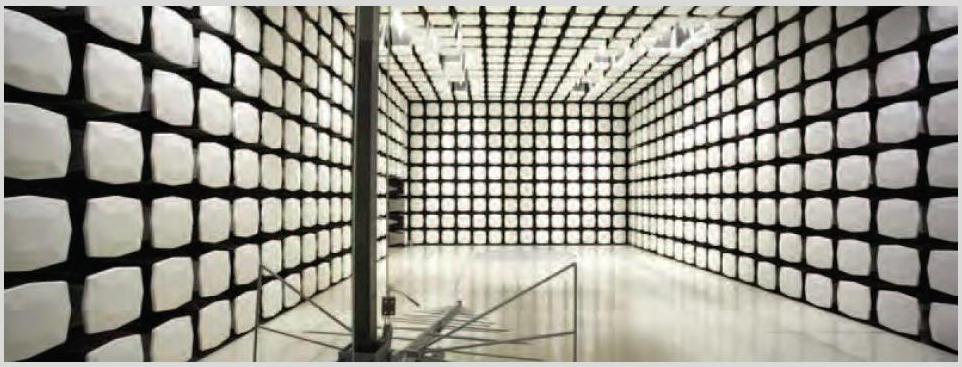
FCC 15.247:2025

RSS-Gen Issue 5:2018+A1:2019+A2:2021

RSS-247 Issue 3:2023

LoRa DTS Transceiver

Report: DGII0507.1 Rev. 01, Issue Date: August 11, 2025



ACCREDITED
CERT #3310.05

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element
2023.04.17

Section	Page Number

CERTIFICATE OF TEST

Last Date of Test: February 20, 2025
Digi International Inc
EUT: Digi XBee LR RF Module for LoRaWAN

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2025	ANSI C63.10:2020 + Corr.1:2023
RSS-Gen Issue 5:2018+A1:2019+A2:2021	
RSS-247 Issue 3:2023	

Note: FCC 15.247:2024 has been updated to FCC 15.247:2025 superseding prior issues. A gap analysis was performed, and the changes between the specifications do not affect the results of the prior testing. The manufacturer attests that no changes have been made to the product.

Guidance

FCC KDB 558074 v05r02:2019

Results

Test Description	Result	FCC Section(s)	RSS Section(s)	ANSI C63.10 Section(s)	Comments
Powerline Conducted Emissions (Transmitter)	Pass	15.207	RSS-Gen 8.8	6.2	
Spurious Radiated Emissions	Pass	15.247(d), KDB 558074 -8.6, 8.7	RSS-247 5.5	6.5, 6.6, 11.12.1	
Occupied Bandwidth (99%)	Pass	KDB 558074 -2.1	RSS-Gen 6.7	6.9.3	
Duty Cycle	Pass	15.247, KDB 558074 -6.0	RSS-Gen 3.2	11.6	
Emissions Bandwidth (dB)	Pass	15.247(a), KDB 558074 -8.2	RSS-247 5.2(a)	11.8.2	
Output Power	Pass	15.247(b), KDB 558074 -8.3	RSS-247 5.4(d)	11.9.2.2.4	
Equivalent Isotropic Radiated Power (EIRP)	Pass	15.247(b), KDB 558074 -8.3	RSS-247 5.4(d)	11.9.2.2.4	
Band Edge Compliance	Pass	15.247(d), KDB 558074 -8.5	RSS-247 5.5	11.11	
Power Spectral Density	Pass	15.247(e), KDB 558074 -8.4	RSS-247 5.2(b)	11.10.2	
Spurious Conducted Emissions	Pass	15.247(d), KDB 558074 -8.5	RSS-247 5.5	11.11	

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.

CERTIFICATE OF TEST

Powerline Conducted Emissions (Receiver)	N/A	15.101, 15.107	RSS-Gen 5.2	ANSI C63.4 - 12.2.4	Not included per FCC 15.101 as this will be covered under SDoC rules for the FCC. RSS-Gen section 7 stated receiver requirements only apply to standalone receivers operating in the 30-960 MHz band and this is not a standalone receiver.
Radiated Emissions for Receiver	N/A	15.101, 15.109	RSS-Gen 5.2	ANSI C63.4 - 12.2.5	Not included per FCC 15.101 as this will be covered under SDoC rules for the FCC. RSS-Gen section 7 stated receiver requirements only apply to standalone receivers operating in the 30-960 MHz band and this is not a standalone receiver.

Deviations From Test Standards

*Power Spectral Density: ANSI C63.10:2020 section 11.10.5 states the number of points as ≥ 2*span/RBW. This would be 667 points based on 1 MHz span and 3 kHz RBW. The testing was performed using 601 points with used an increased sweep time to improve accuracy of the measurement. Due to the high margin involved and only slightly decreased number of points, the measurements collected were considered to be valid.*

Approved By:

Jeff Alcoke, Senior EMC Test Engineer
Signed for and on behalf of Element

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		
01	Updated test method to ANSI C63.10:2020	2025-08-06	3, 20, 22, 49
	Clarified language in footnote for change in FCC specification year.		3
	Removed accreditation page from report		6
	Removed CAB Identifier from report		7
	Added MU for MN05 and MN03		8
	Corrected modulation type to CSS		13
	Updated test description for Output Power and EIRP		38, 41
	Corrected test description for Power Spectral Density		56
	Added a deviation for Sower Spectral Density.		3, 57

FACILITIES

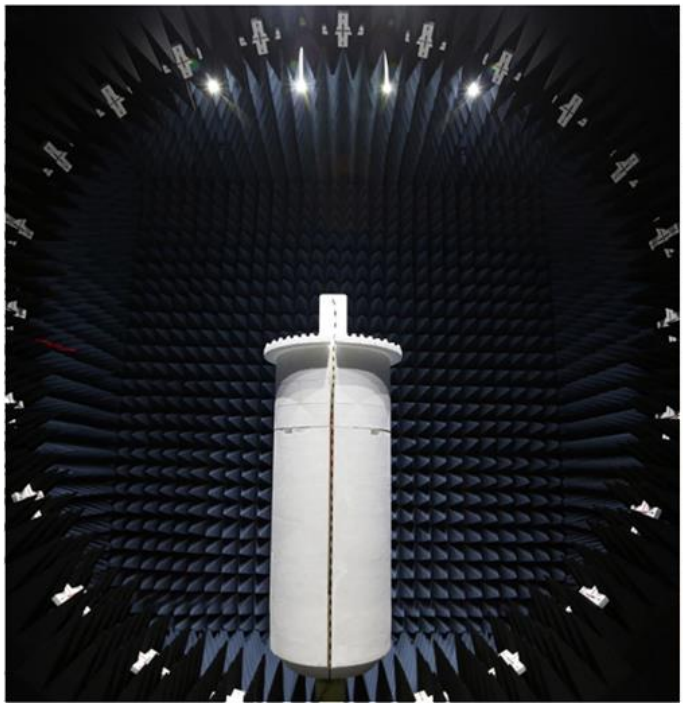
element
2024.09.23

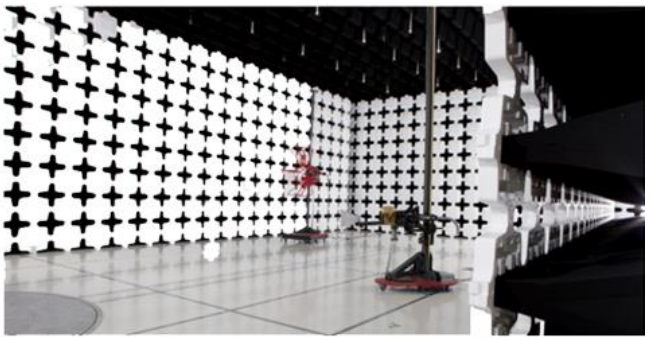
Testing was performed at the following location(s)

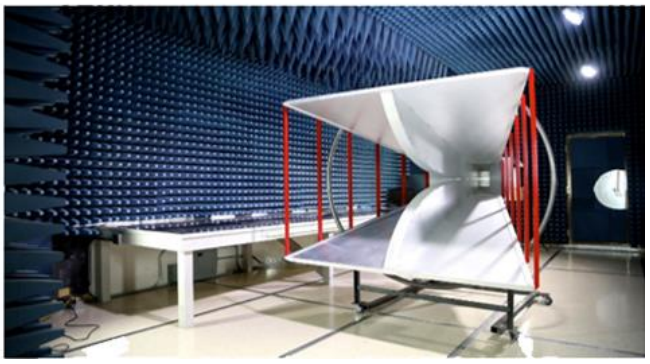
	Location	Labs (1)	Address	A2LA (2)	ISED (3)	BSMI (4)	VCCI (5)	FDA (6)
☐	California	OC01-17	41 Tesla Irvine, CA 92618 (949) 861-8918	3310.04	2834B	SL2-IN-E-1154R	A-0029	TL-55
☒	Minnesota	MN01-11	9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	3310.05	2834E	SL2-IN-E-1152R	A-0109	TL-57
☐	Oregon	EV01-12	6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	3310.02	2834D	SL2-IN-E-1017	A-0108	TL-56
☐	Plano Texas	PT01-15	1701 E Plano Pkwy, Ste 150 Plano, TX 75074 (972) 509-2566	214.19	32637	SL2-IN-E-057R	A-0426	N/A
☐	Washington	NC01-05	19201 120th Ave NE Bothell, WA 98011 (425) 984-6600	3310.06	2834F	SL2-IN-E-1153R	A-0110	TL-67
☐	Offsite	N/A	See Product Description	N/A	N/A	N/A	N/A	N/A

See data sheets for specific labs

(1) The lab designations denote individual rooms within each location. (OC01, OC02, OC03, etc.)
(2) A2LA Certificate No.
(3) ISED Company No.
(4) BSMI No.
(5) VCCI Site Filing No.
(6) FDA ASCA No.







MEASUREMENT UNCERTAINTY

element
MU 2023-09-21

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.

Various Measurements

Test	All Labs (+/-)
Frequency Accuracy (%)	0.0007
Amplitude Accuracy (dB)	1.2
Conducted Power (dB)	1.2
Radiated Power via Substitution (dB)	0.7
Temperature (degrees C)	0.7
Humidity (% RH)	2.5
Voltage (AC) (%)	1
Voltage (DC) (%)	0.7

Field Strength Measurements (dB)

Range	MN05 (+/-)
10kHz-30MHz	1.8
30MHz-1GHz 3m	4.6
1GHz-6GHz	5.1
6GHz-40GHz	5.2

AC Powerline Conducted Emissions Measurements (dB)

Range	MN03 (+/-)
9kHz-150kHz LISN	3.6
150kHz-30MHz LISN	3.2
150kHz-30MHz CVP	3
150kHz-30MHz Telecom-ISN	4.4

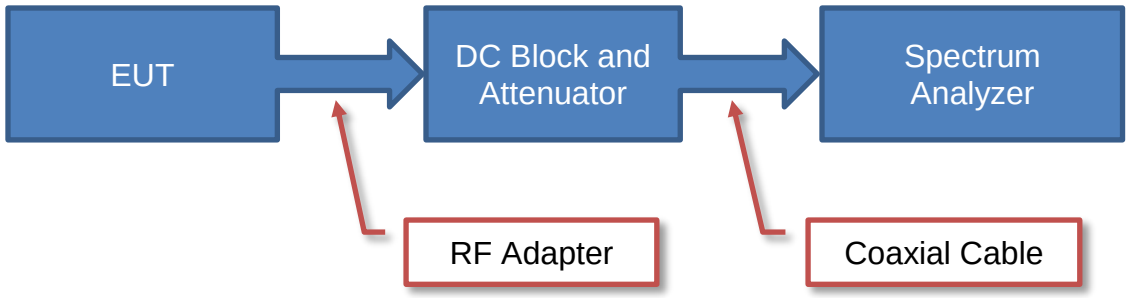
TEST SETUP BLOCK DIAGRAMS

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.

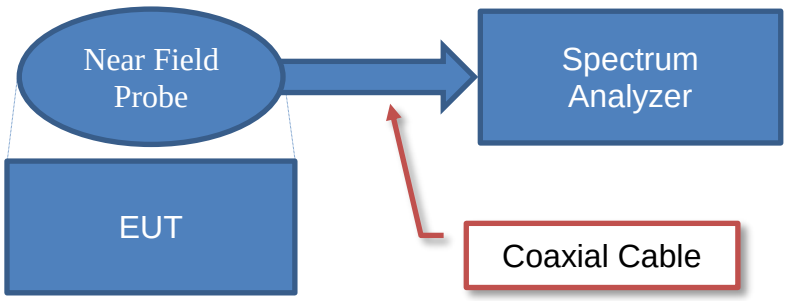
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

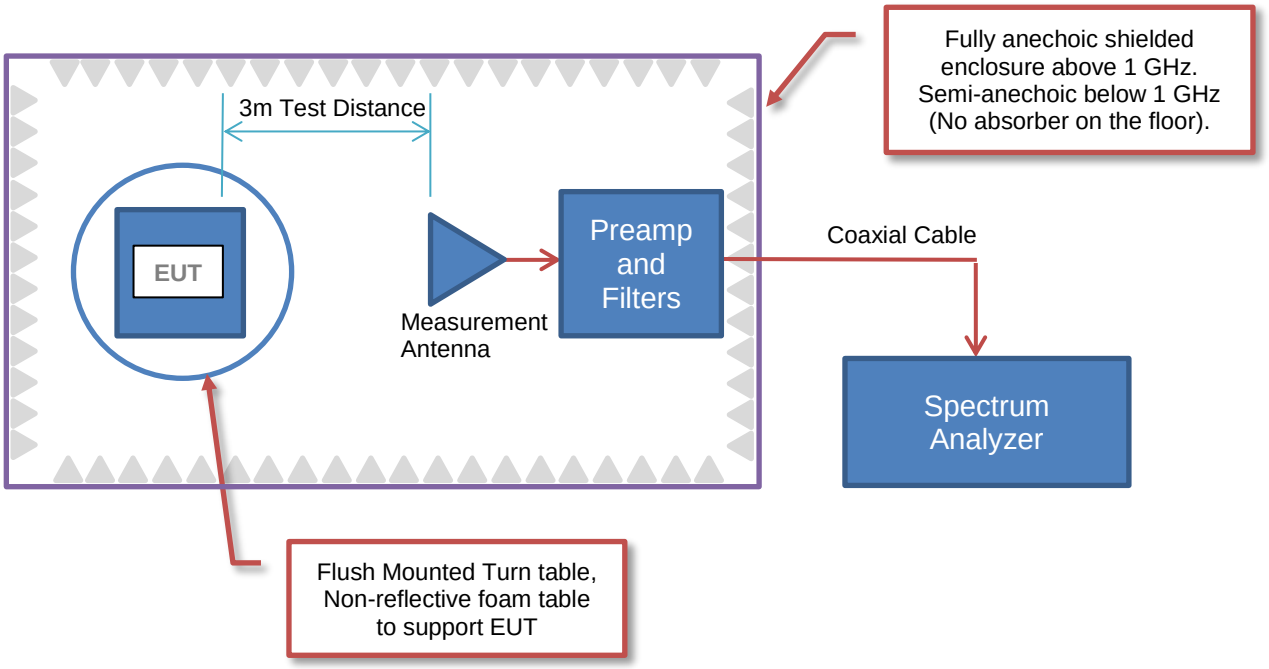


Sample Calculation (logarithmic units)

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: Antenna Factor		Factor: Cable Factor		Factor: Amplifier Gain		Distance Adjustment Factor		External Attenuation		Field Strength
42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0	=	**33.5**

Conducted Emissions:

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

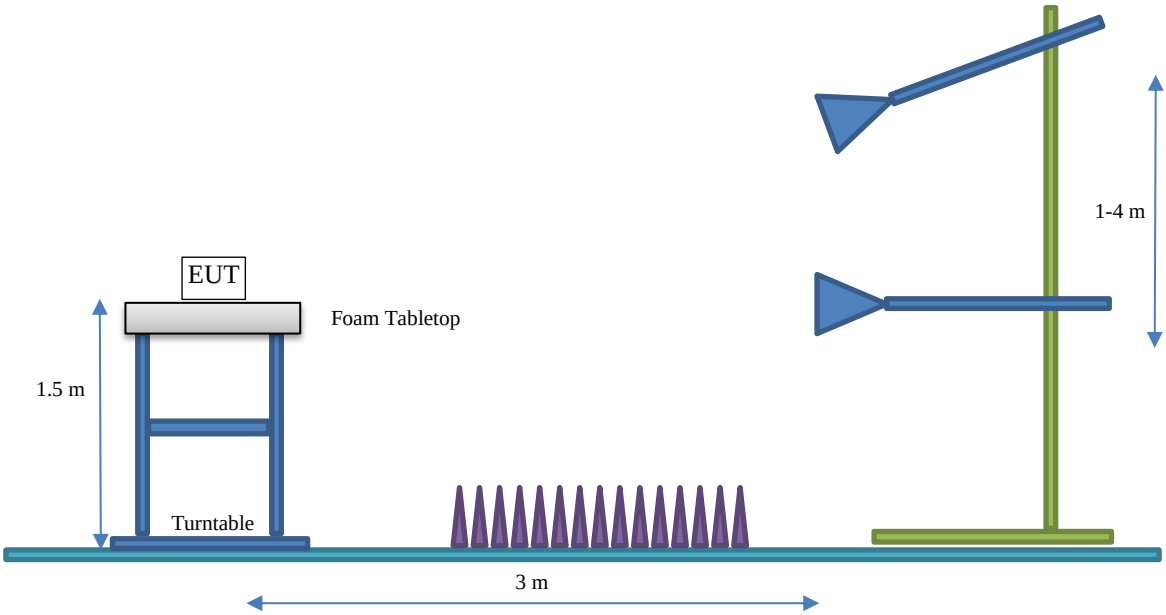
Radiated Power (ERP/EIRP) – Substitution Method:

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:	Digi International Inc
Address:	9350 Excelsior Blvd.
City, State, Zip:	Hopkins, MN 55343
Test Requested By:	Matt Schellin
EUT:	Digi XBee LR RF Module for LoRaWAN
First Date of Test:	September 3, 2024
Last Date of Test:	February 20, 2025
Receipt Date of Samples:	September 3, 2024
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
A wireless communications module that OEMs incorporate into end-node sensor products. Radio is a LoRaWan device.

Testing Objective:
Seeking to demonstrate compliance of the LoRa radio with operation under FCC 15.247:2024 and RSS-Gen Issue 5:2018+A1:2019+A2:2021, RSS-247 Issue 3:2023 specifications under technology category Other.

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)
Flex PCB, Taoglas FXP895.07.0200C	Taoglas	902-928	2.83
Dipole, TE (Linx) ANT-916-CW-HWR-SMA	Linx	902-928	1.2

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

☒ Test software settings
☐ Rated power settings

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Position (if multiple channels)	Power Setting (hex / dBm)
LoRa CSS Modulation (500 kHz BW)	Low Channel (903.0 MHz)	0x1B / 18
	Mid Channel (909.4 MHz)	0x1B / 18
	High Channel (914.2 MHz)	0x1B / 18

Firmware Version: 82004787, revision 05

CONFIGURATIONS

Configuration DGII0507-1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LoRa Module	Digi International, Inc	DEV 001149	EUT #2
Flex Antenna	Taoglas	FXP895	None

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Dev Board 1	Digi International, Inc	Xbee Micro Development Board	None
Variable DC Supply	Agilent	E3631A	MY40035429
HP Laptop	HP	Elitebook 850 G4	5CG74260WL
Laptop Power Supply	HP	L25298-001	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Leads (SRE)	No	1.6 m	No	DC Supply	Dev Board 1
USB Cable (SRE)	Yes	2.9 m	No	Laptop	Dev Board 1
AC Cable (Laptop Power Supply)	No	0.9 m	No	AC Mains	Laptop Power Supply
DC Cable (Laptop Power Supply)	No	1.8 m	No	Laptop Power Supply	Laptop
AC Cable (Agilent Supply)	No	1.7 m	No	AC Mains	Agilent Power Supply

CONFIGURATIONS

Configuration DGII0507-2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LoRa Module	Digi International, Inc	DEV 001149	EUT #2
Whip Antenna	Linx	ANT-916-CW-HWR	None

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Dev Board 1	Digi International, Inc	Xbee Micro Development Board	None
Variable DC Supply	Agilent	E3631A	MY40035429
HP Laptop	HP	Elitebook 850 G4	5CG74260WL
Laptop Power Supply	HP	L25298-001	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Leads (SRE)	No	1.6 m	No	DC Supply	Dev Board 1
USB Cable (SRE)	Yes	2.9 m	No	Laptop	Dev Board 1
AC Cable (Laptop Power Supply)	No	0.9 m	No	AC Mains	Laptop Power Supply
DC Cable (Laptop Power Supply)	No	1.8 m	No	Laptop Power Supply	Laptop
AC Cable (Agilent Supply)	No	1.7 m	No	AC Mains	Agilent Power Supply

CONFIGURATIONS

Configuration DGII0507-4

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Flex Antenna	Taoglas	FXP895	None
DIgi XBee LR RF Module for LoRaWAN	Digi International, Inc	001149	EUT #1

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	E3634A	MY51270001
Dev Board 1	Digi International, Inc	Xbee Micro Development Board	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP Laptop	HP	Elitebook 850 G7	5CG0387DYW
Laptop Power Supply	HP	854055-002	WFTKV0ENJC31W8
HP Laptop	HP	Elitebook 8570p	N/A
Laptop Power Supply	HP	75613-001	WECJN0A1R27MSL
Mouse	Kensington	K72356	B1350A003513
Dev Board 2	Digi International, Inc	Xbee Micro Development Board	None
DIgi XBee LR RF Module for LoRaWAN	Digi International, Inc	DEV 001149	EUT #3
Flex Antenna 2	Taoglas	FXP895	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB Cable	Yes	4.6 m	No	DIgi XBee LR RF Module for LoRaWAN	HP Laptop
DC Cable (Laptop Power Supply)	No	1.7 m	No	HP Laptop	Laptop Power Supply
AC Cable (Laptop Power Supply)	No	0.9 m	No	Laptop Power Supply	AC Mains
DC Leads Immunity	No	0.9 m	No	DC Supply	Dev Board 1
AC Cable (Agilent Supply)	No	1.8 m	No	DC Power Supply	AC Mains
USB Cable Mouse	Yes	1.8 m	No	Mouse	HP Laptop
USB Cable	Yes	1 m	No	HP Laptop	Dev Board 2
DC Cable (Laptop Power Supply)	No	1.8 m	No	HP Laptop	Laptop Power Supply
AC Cable (Laptop Power Supply)	No	0.9 m	No	Laptop Power Supply	AC Mains

CONFIGURATIONS

Configuration DGII0507-16

Software/Firmware Running During Test	
Description	**Version**
FW	5037

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DIgi XBee LR RF Module for LoRaWAN	Digi International, Inc	DEV 001149	EUT #7

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
HP Laptop	HP	Elitebook 850 G4	5CG74260WL

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB Cable	Yes	4.6 m	No	DIgi XBee LR RF Module for LoRaWAN	HP Laptop

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2024-09-03	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.
2	2024-09-03	Duty Cycle	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	2024-09-03	Emissions Bandwidth (dB)	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	2024-09-03	Occupied Bandwidth (99%)	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	2024-09-04	Powerline Conducted Emissions (Transmitter)	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	2025-01-24	Spurious Radiated Emissions	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2025-02-20	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.
8	2025-02-20	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.
9	2025-02-20	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.
10	2025-02-20	Equivalent Isotropic Radiated Power (EIRP)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

element
WTD.2024.01.16.0
EmiR5 2023.08.29.0
PSA-ESCI 2023.12.23.0

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
LISN	Solar Electronics	9252-50-R-24-BNC	LIQ	2024-03-27	2025-03-27
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	2024-03-27	2025-03-27
Receiver	Gauss Instruments	TDEMI 30M	ARS	2024-05-07	2025-05-07
Cable - Conducted Cable Assembly	Northwest EMC	MNC, HGN, TYK, VAE	MNCA	2024-03-11	2025-03-11

CONFIGURATIONS INVESTIGATED

DGII0507-4

MODES INVESTIGATED

LoRa, CSS Modulated. Continuous packet transmit, Taoglass FXP895 antenna, transmitting on Mid Channel at 908.5 MHz, Bandwidth 500 kHz, DTS

POWERLINE CONDUCTED EMISSIONS

element
WTD.2024.01.16.0
EmiR5 2023.08.29.0
PSA-ESCI 2023.12.23.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	EUT#1	Date:	2024-09-04
Customer:	Digi International Inc	Temperature:	21.9°C
Attendees:	David Lentz	Relative Humidity:	52.9%
Customer Project:	None	Bar. Pressure (PMSL):	1019 mb
Tested By:	William Hoffa	Job Site:	MN03
Power:	3.3 VDC	Configuration:	DGII0507-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2024	ANSI C63.10:2020

TEST PARAMETERS

Run #:	10	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

Measuring off of the AC side of the linear power supply providing the DC power.

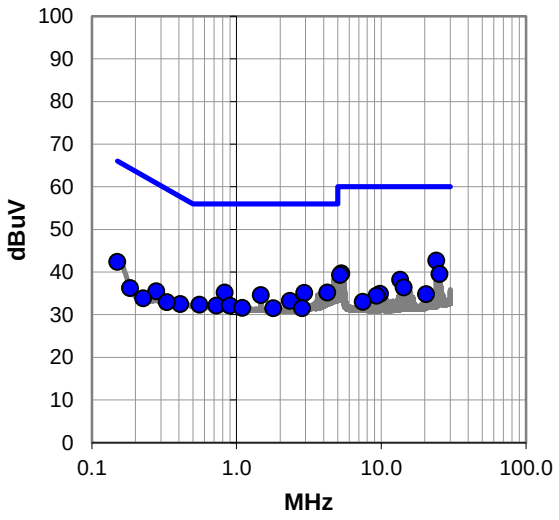
EUT OPERATING MODES

LoRa, CSS Modulated. Continuous packet transmit, Taoglass FXP895 antenna, transmitting on Mid Channel at 908.5 MHz, Bandwidth 500 kHz, DTS

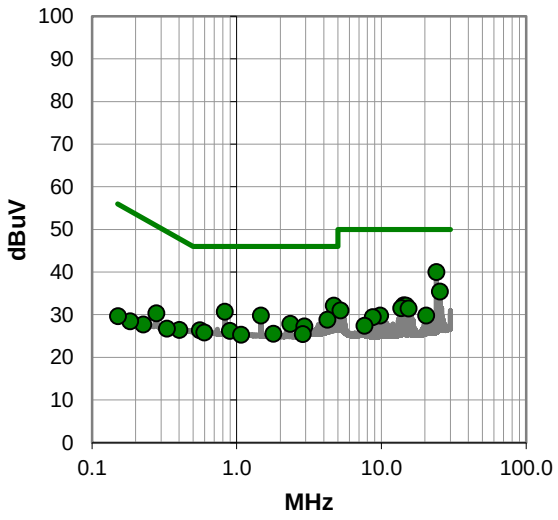
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2024.01.16.0
EmiR5 2023.08.29.0
PSA-ESCI 2023.12.23.0

RESULTS - Run #10

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
24.000	20.5	22.2	42.7	60.0	-17.3
5.316	19.1	20.6	39.7	60.0	-20.3
25.320	17.1	22.4	39.5	60.0	-20.5
5.193	18.7	20.6	39.3	60.0	-20.7
0.829	15.1	20.1	35.2	56.0	-20.8
4.241	14.8	20.4	35.2	56.0	-20.8
2.941	14.7	20.4	35.1	56.0	-20.9
1.471	14.4	20.2	34.6	56.0	-21.4
13.560	17.0	21.2	38.2	60.0	-21.8
2.344	12.9	20.3	33.2	56.0	-22.8
0.150	21.8	20.6	42.4	66.0	-23.6
14.319	15.1	21.3	36.4	60.0	-23.6
0.554	12.2	20.1	32.3	56.0	-23.7
0.725	12.0	20.1	32.1	56.0	-23.9
0.898	12.0	20.1	32.1	56.0	-23.9
1.094	11.4	20.2	31.6	56.0	-24.4
1.796	11.3	20.2	31.5	56.0	-24.5
2.840	11.1	20.4	31.5	56.0	-24.5
9.801	13.9	21.0	34.9	60.0	-25.1
0.408	12.4	20.1	32.5	57.7	-25.2
20.440	13.0	21.8	34.8	60.0	-25.2
0.278	15.3	20.2	35.5	60.9	-25.4
9.279	13.6	20.8	34.4	60.0	-25.6
0.330	12.8	20.1	32.9	59.5	-26.6
7.480	12.2	20.8	33.0	60.0	-27.0

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
24.000	17.8	22.2	40.0	50.0	-10.0
4.689	11.7	20.4	32.1	46.0	-13.9
25.399	13.0	22.4	35.4	50.0	-14.6
0.829	10.6	20.1	30.7	46.0	-15.3
1.470	9.6	20.2	29.8	46.0	-16.2
4.241	8.4	20.4	28.8	46.0	-17.2
14.319	10.9	21.3	32.2	50.0	-17.8
14.799	10.8	21.3	32.1	50.0	-17.9
2.346	7.5	20.3	27.8	46.0	-18.2
13.719	10.3	21.2	31.5	50.0	-18.5
15.440	10.0	21.4	31.4	50.0	-18.6
2.941	6.8	20.4	27.2	46.0	-18.8
5.239	10.4	20.6	31.0	50.0	-19.0
0.556	6.2	20.1	26.3	46.0	-19.7
0.898	6.1	20.1	26.2	46.0	-19.8
0.597	5.7	20.1	25.8	46.0	-20.2
9.801	8.8	21.0	29.8	50.0	-20.2
20.440	8.0	21.8	29.8	50.0	-20.2
1.795	5.3	20.2	25.5	46.0	-20.5
0.278	10.1	20.2	30.3	50.9	-20.6
2.872	5.0	20.4	25.4	46.0	-20.6
8.720	8.6	20.8	29.4	50.0	-20.6
1.076	5.1	20.2	25.3	46.0	-20.7
0.402	6.3	20.1	26.4	47.8	-21.4
7.640	6.6	20.8	27.4	50.0	-22.6

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2024.01.16.0
EmiR5 2023.08.29.0
PSA-ESCI 2023.12.23.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	EUT#1	Date:	2024-09-04
Customer:	Digi International Inc	Temperature:	21.9°C
Attendees:	David Lentz	Relative Humidity:	52.9%
Customer Project:	None	Bar. Pressure (PMSL):	1019 mb
Tested By:	William Hoffa	Job Site:	MN03
Power:	3.3 VDC	Configuration:	DGII0507-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2024	ANSI C63.10:2020

TEST PARAMETERS

Run #:	11	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

Measuring off of the AC side of the linear power supply providing the DC power.

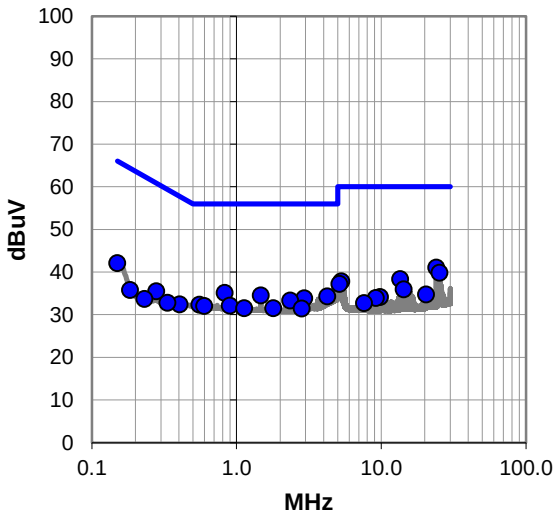
EUT OPERATING MODES

LoRa, CSS Modulated Continuous packet transmit, Taoglass FXP895 antenna, transmitting on Mid Channel at 908.5 MHz, Bandwidth 500 kHz, DTS

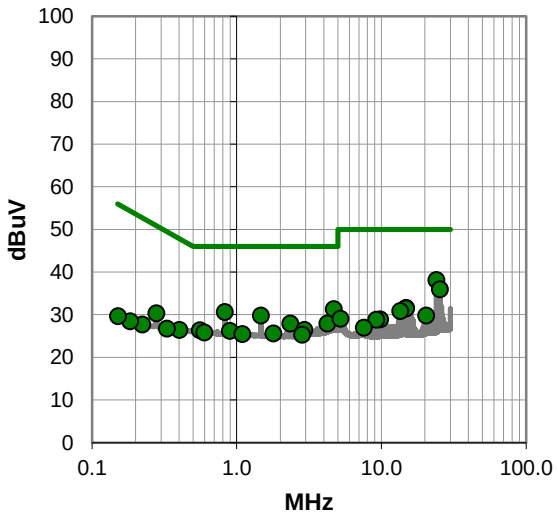
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2024.01.16.0
EmiR5 2023.08.29.0
PSA-ESCI 2023.12.23.0

RESULTS - Run #11

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
24.000	18.8	22.2	41.0	60.0	-19.0
25.320	17.4	22.4	39.8	60.0	-20.2
0.829	15.0	20.1	35.1	56.0	-20.9
1.470	14.3	20.2	34.5	56.0	-21.5
13.560	17.1	21.2	38.3	60.0	-21.7
4.241	13.9	20.4	34.3	56.0	-21.7
5.298	17.2	20.6	37.8	60.0	-22.2
2.936	13.4	20.4	33.8	56.0	-22.2
2.346	13.0	20.3	33.3	56.0	-22.7
5.152	16.6	20.6	37.2	60.0	-22.8
0.554	12.2	20.1	32.3	56.0	-23.7
0.150	21.5	20.6	42.1	66.0	-23.9
0.898	12.0	20.1	32.1	56.0	-23.9
0.599	11.9	20.1	32.0	56.0	-24.0
14.280	14.6	21.3	35.9	60.0	-24.1
1.131	11.3	20.2	31.5	56.0	-24.5
1.795	11.3	20.2	31.5	56.0	-24.5
2.828	11.0	20.4	31.4	56.0	-24.6
20.400	12.9	21.8	34.7	60.0	-25.3
0.278	15.3	20.2	35.5	60.9	-25.4
0.403	12.3	20.1	32.4	57.8	-25.4
9.799	13.1	21.0	34.1	60.0	-25.9
9.200	13.1	20.8	33.9	60.0	-26.1
0.333	12.7	20.1	32.8	59.4	-26.6
7.601	11.9	20.8	32.7	60.0	-27.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
24.000	15.9	22.2	38.1	50.0	-11.9
25.399	13.5	22.4	35.9	50.0	-14.1
4.694	10.9	20.4	31.3	46.0	-14.7
0.829	10.5	20.1	30.6	46.0	-15.4
1.470	9.6	20.2	29.8	46.0	-16.2
2.346	7.6	20.3	27.9	46.0	-18.1
4.241	7.5	20.4	27.9	46.0	-18.1
14.799	10.3	21.3	31.6	50.0	-18.4
14.839	10.1	21.3	31.4	50.0	-18.6
13.560	9.6	21.2	30.8	50.0	-19.2
2.936	6.0	20.4	26.4	46.0	-19.6
0.556	6.2	20.1	26.3	46.0	-19.7
0.898	6.1	20.1	26.2	46.0	-19.8
0.597	5.7	20.1	25.8	46.0	-20.2
20.440	8.0	21.8	29.8	50.0	-20.2
1.796	5.4	20.2	25.6	46.0	-20.4
0.278	10.1	20.2	30.3	50.9	-20.6
1.096	5.2	20.2	25.4	46.0	-20.6
2.840	4.9	20.4	25.3	46.0	-20.7
5.239	8.4	20.6	29.0	50.0	-21.0
9.840	7.9	21.0	28.9	50.0	-21.1
9.239	8.0	20.8	28.8	50.0	-21.2
0.402	6.3	20.1	26.4	47.8	-21.4
0.330	6.6	20.1	26.7	49.5	-22.8
7.559	6.1	20.8	26.9	50.0	-23.1

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

TEST DESCRIPTION

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

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. A reference preview scan (pre-scan) is included in the report. Final measurements on individual emissions were then made and included in this test report.

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

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

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

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

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

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

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Double Ridge	ETS Lindgren	3115	AIP	2024-08-02	2026-08-02
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2024-11-26	2025-11-26
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2024-01-08	2025-01-08
Attenuator	Fairview Microwave	SA18H-20	VAF	2024-08-25	2025-08-25
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	2024-03-13	2025-03-13
Filter - High Pass	Micro-Tronics	HPM50111	LFN	2024-08-25	2025-08-25
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	NCR
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	2024-11-26	2025-11-26
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2024-01-08	2025-01-08
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2023-10-02	2025-10-02
Cable	ESM Cable Corp.	Bilog Cables	MNH	2024-11-26	2025-11-26
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2024-10-09	2025-10-09
Filter - Low Pass	Micro-Tronics	LPM50003	LFJ	2024-08-25	2025-08-25
Attenuator	Fairview Microwave	SA18E-10	TYA	2024-08-25	2025-08-25
Antenna - Loop	ETS Lindgren	6502	AOB	2023-06-12	2025-06-12

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

FREQUENCY RANGE INVESTIGATED

9 kHz TO 10 GHz

POWER INVESTIGATED

3.3VDC

CONFIGURATIONS INVESTIGATED

DGII0507-1
DGII0507-2

MODES INVESTIGATED

Transmitting LoRa CSS Modulated on Low, Mid and High Chs (903.0, 909.4, 914.2 MHz) 500kHz BW, Power=18

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	DEV 001149	Date:	2024-12-26
Customer:	Digi International Inc	Temperature:	22.5°C
Attendees:	David Lentz	Relative Humidity:	27.3%
Customer Project:	None	Bar. Pressure (PMSL):	1017 mb
Tested By:	Marcelo Aguayo	Job Site:	MN05
Power:	3.3VDC	Configuration:	DGII0507-2

TEST PARAMETERS

Run #:	231	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

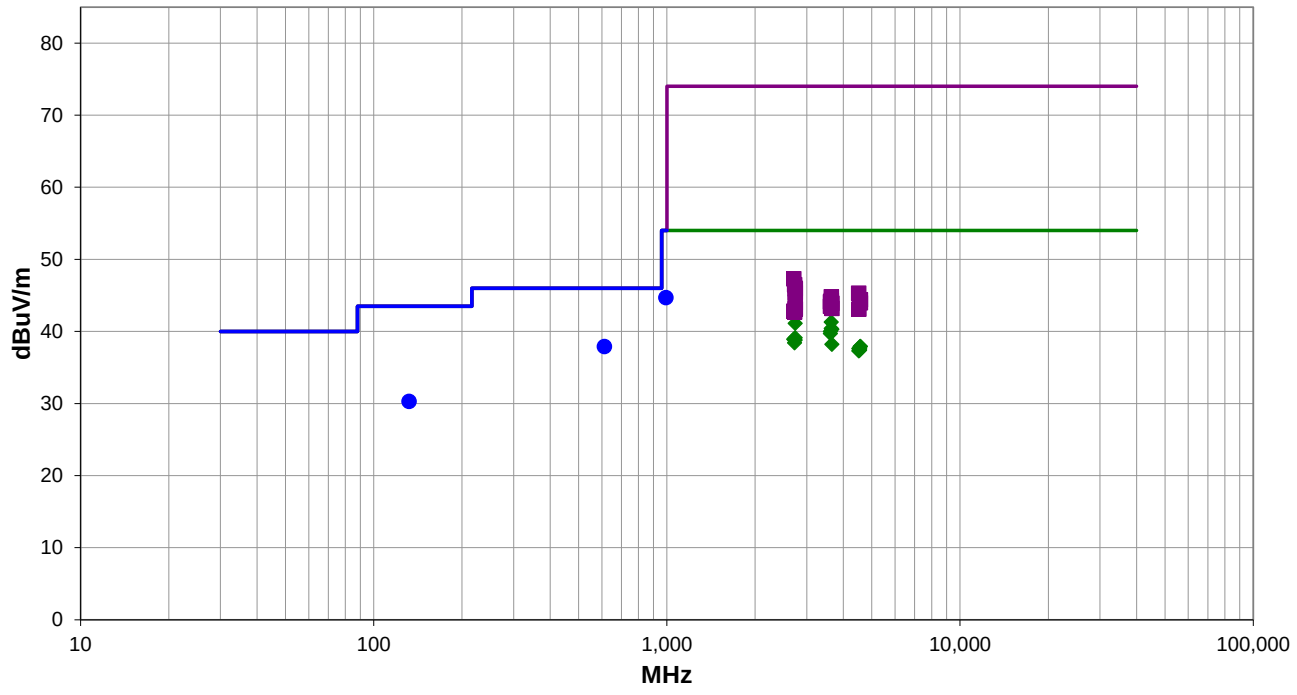
Whip Antenna. Test mode operates at 39.5% duty cycle, upward DCCF correction applied based on 10*log(1/Duty cycle) = 4 dB.

EUT OPERATING MODES

Transmitting LoRa, CSS Modulated, on Low, Mid and High Chs (903.0, 909.4, 914.2 MHz) 500kHz BW, Power=18

DEVIATIONS FROM TEST STANDARD

None



Run #: 231 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

RESULTS - Run #231

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
2708.725	45.1	-2.1	3.4	109.0	4.0	0.0	Horz	AV	0.0	47.0	54.0	-7.0	EUT Horz, Low Ch
2728.550	44.1	-1.9	2.5	103.9	4.0	0.0	Horz	AV	0.0	46.2	54.0	-7.8	EUT Horz, Mid Ch
612.213	17.1	10.8	1.5	106.9	0.0	10.0	Vert	QP	0.0	37.9	46.0	-8.1	EUT Horz, Mid Ch
2741.992	43.7	-1.9	1.2	63.9	4.0	0.0	Vert	AV	0.0	45.8	54.0	-8.2	EUT On Side, High Ch
2742.517	43.3	-1.9	1.5	337.9	4.0	0.0	Horz	AV	0.0	45.4	54.0	-8.6	EUT Horz, High Ch
991.926	16.9	17.8	1.9	135.9	0.0	10.0	Vert	QP	0.0	44.7	54.0	-9.3	EUT Horz, Mid Ch
2743.233	42.2	-1.9	1.5	59.9	4.0	0.0	Horz	AV	0.0	44.3	54.0	-9.7	EUT Vert, High Ch
3636.825	36.5	0.8	3.0	168.9	4.0	0.0	Horz	AV	0.0	41.3	54.0	-12.7	EUT Horz, Mid Ch
2741.942	39.0	-1.9	1.5	304.0	4.0	0.0	Horz	AV	0.0	41.1	54.0	-12.9	EUT On Side, High Ch
132.002	38.7	-8.4	1.7	203.0	0.0	0.0	Horz	QP	0.0	30.3	43.5	-13.2	EUT Horz, Mid Ch
3636.917	35.6	0.8	3.9	58.0	4.0	0.0	Vert	AV	0.0	40.4	54.0	-13.6	EUT On Side, Mid Ch
3656.550	35.6	0.7	1.5	84.0	4.0	0.0	Horz	AV	0.0	40.3	54.0	-13.7	EUT Horz, High Ch
3611.792	35.1	0.9	3.8	138.0	4.0	0.0	Horz	AV	0.0	40.0	54.0	-14.0	EUT Horz, Low Ch
3612.633	34.8	0.9	3.2	34.9	4.0	0.0	Vert	AV	0.0	39.7	54.0	-14.3	EUT On Side, Low Ch
2742.050	37.0	-1.9	1.5	360.0	4.0	0.0	Vert	AV	0.0	39.1	54.0	-14.9	EUT Horz, High Ch
2708.617	37.0	-2.1	1.5	247.9	4.0	0.0	Vert	AV	0.0	38.9	54.0	-15.1	EUT On Side, Low Ch
2741.983	36.7	-1.9	1.5	102.0	4.0	0.0	Vert	AV	0.0	38.8	54.0	-15.2	EUT Vert, High Ch
2728.117	36.3	-1.9	3.3	315.9	4.0	0.0	Vert	AV	0.0	38.4	54.0	-15.6	EUT On Side, Mid Ch
3656.050	33.5	0.7	1.4	44.0	4.0	0.0	Vert	AV	0.0	38.2	54.0	-15.8	EUT On Side, High Ch
4573.325	30.2	3.7	1.5	149.9	4.0	0.0	Horz	AV	0.0	37.9	54.0	-16.1	EUT Horz, High Ch
4571.592	30.2	3.7	1.5	192.9	4.0	0.0	Vert	AV	0.0	37.9	54.0	-16.1	EUT On Side, High Ch
4547.350	30.0	3.6	4.0	207.0	4.0	0.0	Horz	AV	0.0	37.6	54.0	-16.4	EUT Horz, Mid Ch
4515.392	30.0	3.6	1.5	74.9	4.0	0.0	Horz	AV	0.0	37.6	54.0	-16.4	EUT Horz, Low Ch
4549.325	29.8	3.6	1.5	34.0	4.0	0.0	Vert	AV	0.0	37.4	54.0	-16.6	EUT On Side, Mid Ch
4514.742	29.8	3.5	1.5	162.0	4.0	0.0	Vert	AV	0.0	37.3	54.0	-16.7	EUT On Side, Low Ch
2708.725	49.4	-2.1	3.4	109.0	0.0	0.0	Horz	PK	0.0	47.3	74.0	-26.7	EUT Horz, Low Ch
2728.892	48.4	-1.9	2.5	103.9	0.0	0.0	Horz	PK	0.0	46.5	74.0	-27.5	EUT Horz, Mid Ch
2741.775	47.9	-1.9	1.2	63.9	0.0	0.0	Vert	PK	0.0	46.0	74.0	-28.0	EUT On Side, High Ch
2741.875	47.8	-1.9	1.5	337.9	0.0	0.0	Horz	PK	0.0	45.9	74.0	-28.1	EUT Horz, High Ch
2742.400	47.3	-1.9	1.5	59.9	0.0	0.0	Horz	PK	0.0	45.4	74.0	-28.6	EUT Vert, High Ch
4512.800	41.8	3.5	1.5	162.0	0.0	0.0	Vert	PK	0.0	45.3	74.0	-28.7	EUT On Side, Low Ch
3637.483	44.0	0.8	3.0	168.9	0.0	0.0	Horz	PK	0.0	44.8	74.0	-29.2	EUT Horz, Mid Ch
4573.333	40.7	3.7	1.5	192.9	0.0	0.0	Vert	PK	0.0	44.4	74.0	-29.6	EUT On Side, High Ch
3638.342	43.5	0.8	3.9	58.0	0.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	EUT On Side, Mid Ch
4548.500	40.7	3.6	1.5	34.0	0.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	EUT On Side, Mid Ch
3612.467	43.2	0.9	3.2	34.9	0.0	0.0	Vert	PK	0.0	44.1	74.0	-29.9	EUT On Side, Low Ch
2742.592	45.9	-1.9	1.5	304.0	0.0	0.0	Horz	PK	0.0	44.0	74.0	-30.0	EUT On Side, High Ch
4570.133	40.3	3.7	1.5	149.9	0.0	0.0	Horz	PK	0.0	44.0	74.0	-30.0	EUT Horz, High Ch
4548.933	40.4	3.6	4.0	207.0	0.0	0.0	Horz	PK	0.0	44.0	74.0	-30.0	EUT Horz, Mid Ch
3656.175	43.2	0.7	1.5	84.0	0.0	0.0	Horz	PK	0.0	43.9	74.0	-30.1	EUT Horz, High Ch

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

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
3611.292	42.6	0.9	3.8	138.0	0.0	0.0	Horz	PK	0.0	43.5	74.0	-30.5	EUT Horz, Low Ch
2742.700	45.1	-1.9	1.5	102.0	0.0	0.0	Vert	PK	0.0	43.2	74.0	-30.8	EUT Vert, High Ch
3657.633	42.4	0.8	1.4	44.0	0.0	0.0	Vert	PK	0.0	43.2	74.0	-30.8	EUT On Side, High Ch
2742.408	45.0	-1.9	1.5	360.0	0.0	0.0	Vert	PK	0.0	43.1	74.0	-30.9	EUT Horz, High Ch
4514.692	39.6	3.5	1.5	74.9	0.0	0.0	Horz	PK	0.0	43.1	74.0	-30.9	EUT Horz, Low Ch
2709.067	44.9	-2.1	1.5	247.9	0.0	0.0	Vert	PK	0.0	42.8	74.0	-31.2	EUT On Side, Low Ch
2727.342	44.7	-2.0	3.3	315.9	0.0	0.0	Vert	PK	0.0	42.7	74.0	-31.3	EUT On Side, Mid Ch

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	DEV 001149	Date:	2024-12-26
Customer:	Digi International Inc	Temperature:	22.5°C
Attendees:	David Lentz	Relative Humidity:	27.3%
Customer Project:	None	Bar. Pressure (PMSL):	1017 mb
Tested By:	Marcelo Aguayo	Job Site:	MN05
Power:	3.3VDC	Configuration:	DGII0507-1

TEST PARAMETERS

Run #:	220	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

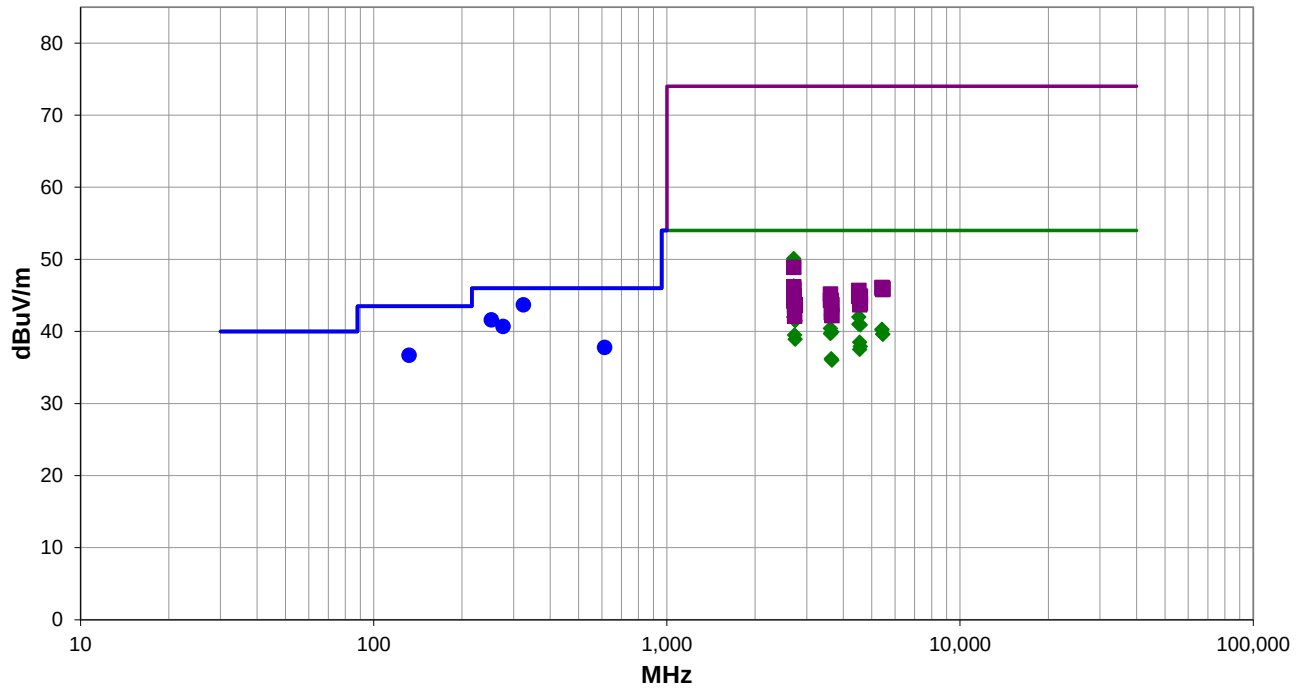
Taoglass FXP895 antenna. Test mode operates at 39.5% duty cycle, upward DCCF correction applied based on 10*log(1/Duty cycle) = 4 dB.

EUT OPERATING MODES

Transmitting LoRa, CSS Modulated on Low, Mid and High Chs (903.0, 909.4, 914.2 MHz) 500kHz BW, Power=18

DEVIATIONS FROM TEST STANDARD

None



Run #: 220 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

RESULTS - Run #220

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
323.997	43.0	0.7	1.0	264.9	0.0	0.0	Vert	QP	0.0	43.7	46.0	-2.3	EUT Horz, Mid Ch
2708.442	48.2	-2.1	1.1	181.9	4.0	0.0	Horz	AV	0.0	50.1	54.0	-3.9	EUT Horz, Low Ch
251.998	42.0	-0.4	1.0	142.9	0.0	0.0	Horz	QP	0.0	41.6	46.0	-4.4	EUT Horz, Mid Ch
275.998	41.9	-1.2	1.0	250.9	0.0	0.0	Vert	QP	0.0	40.7	46.0	-5.3	EUT Horz, Mid Ch
131.996	45.1	-8.4	1.8	166.0	0.0	0.0	Horz	QP	0.0	36.7	43.5	-6.8	EUT Horz, Mid Ch
2708.633	44.4	-2.1	1.2	160.9	4.0	0.0	Vert	AV	0.0	46.3	54.0	-7.7	EUT Horz, Low Ch
613.400	17.0	10.8	1.0	121.9	0.0	10.0	Horz	QP	0.0	37.8	46.0	-8.2	EUT Horz, Mid Ch
2708.367	43.4	-2.1	1.1	326.9	4.0	0.0	Horz	AV	0.0	45.3	54.0	-8.7	EUT Vert, Low Ch
2709.458	42.2	-2.1	4.0	301.9	4.0	0.0	Vert	AV	0.0	44.1	54.0	-9.9	EUT Vert, Low Ch
2709.258	41.3	-2.1	1.0	156.9	4.0	0.0	Horz	AV	0.0	43.2	54.0	-10.8	EUT On Side, Low Ch
3638.392	37.5	0.8	3.3	15.0	4.0	0.0	Horz	AV	0.0	42.3	54.0	-11.7	EUT Horz, Mid Ch
2708.950	40.1	-2.1	1.6	202.0	4.0	0.0	Vert	AV	0.0	42.0	54.0	-12.0	EUT On Side, Low Ch
4514.100	34.5	3.5	3.8	0.0	4.0	0.0	Horz	AV	0.0	42.0	54.0	-12.0	EUT Horz, Low Ch
2728.667	39.5	-1.9	1.4	26.0	4.0	0.0	Horz	AV	0.0	41.6	54.0	-12.4	EUT Horz, Mid Ch
2742.000	39.4	-1.9	2.1	23.9	4.0	0.0	Horz	AV	0.0	41.5	54.0	-12.5	EUT Horz, High Ch
4514.408	33.5	3.5	4.0	16.9	4.0	0.0	Vert	AV	0.0	41.0	54.0	-13.0	EUT Horz, Low Ch
4571.192	33.2	3.7	3.6	336.9	4.0	0.0	Horz	AV	0.0	40.9	54.0	-13.1	EUT Horz, High Ch
3612.717	35.5	0.9	1.5	113.9	4.0	0.0	Horz	AV	0.0	40.4	54.0	-13.6	EUT Horz, Low Ch
5418.025	30.1	6.2	3.9	250.0	4.0	0.0	Horz	AV	0.0	40.3	54.0	-13.7	EUT Horz, Low Ch
5418.308	30.0	6.2	2.8	311.9	4.0	0.0	Vert	AV	0.0	40.2	54.0	-13.8	EUT Horz, Low Ch
3656.817	35.2	0.7	2.9	113.9	4.0	0.0	Horz	AV	0.0	39.9	54.0	-14.1	EUT Horz, High Ch
3611.750	34.8	0.9	1.0	337.9	4.0	0.0	Vert	AV	0.0	39.7	54.0	-14.3	EUT Horz, Low Ch
5455.017	29.2	6.4	1.5	307.9	4.0	0.0	Horz	AV	0.0	39.6	54.0	-14.4	EUT Horz, Mid Ch
5457.558	29.2	6.4	3.5	44.0	4.0	0.0	Vert	AV	0.0	39.6	54.0	-14.4	EUT Horz, Mid Ch
2728.717	37.4	-1.9	1.5	96.9	4.0	0.0	Vert	AV	0.0	39.5	54.0	-14.5	EUT Horz, Mid Ch
2742.217	36.8	-1.9	1.5	106.0	4.0	0.0	Vert	AV	0.0	38.9	54.0	-15.1	EUT Horz, High Ch
4547.217	30.9	3.6	1.5	19.9	4.0	0.0	Horz	AV	0.0	38.5	54.0	-15.5	EUT Horz, Mid Ch
4573.300	30.2	3.7	1.5	257.0	4.0	0.0	Vert	AV	0.0	37.9	54.0	-16.1	EUT Horz, High Ch
4548.208	29.9	3.6	1.5	81.0	4.0	0.0	Vert	AV	0.0	37.5	54.0	-16.5	EUT Horz, Mid Ch
3637.625	31.4	0.8	1.5	24.9	4.0	0.0	Vert	AV	0.0	36.2	54.0	-17.8	EUT Horz, Mid Ch
3657.242	31.2	0.8	1.5	94.0	4.0	0.0	Vert	AV	0.0	36.0	54.0	-18.0	EUT Horz, High Ch
2708.425	51.0	-2.1	1.1	181.9	0.0	0.0	Horz	PK	0.0	48.9	74.0	-25.1	EUT Horz, Low Ch
2708.708	48.3	-2.1	1.2	160.9	0.0	0.0	Vert	PK	0.0	46.2	74.0	-27.8	EUT Vert, Low Ch
5420.108	39.9	6.2	2.8	311.9	0.0	0.0	Vert	PK	0.0	46.1	74.0	-27.9	EUT Horz, Low Ch
5415.700	39.8	6.2	3.9	250.0	0.0	0.0	Horz	PK	0.0	46.0	74.0	-28.0	EUT Horz, Low Ch
5453.950	39.6	6.4	1.5	307.9	0.0	0.0	Horz	PK	0.0	46.0	74.0	-28.0	EUT Horz, Mid Ch
2708.267	47.9	-2.1	1.1	326.9	0.0	0.0	Horz	PK	0.0	45.8	74.0	-28.2	EUT Vert, Low Ch
5454.242	39.4	6.4	3.5	44.0	0.0	0.0	Vert	PK	0.0	45.8	74.0	-28.2	EUT Horz, Mid Ch
4515.700	42.1	3.6	3.8	0.0	0.0	0.0	Horz	PK	0.0	45.7	74.0	-28.3	EUT Horz, Low Ch
3611.708	44.3	0.9	1.5	113.9	0.0	0.0	Horz	PK	0.0	45.2	74.0	-28.8	EUT Horz, Low Ch

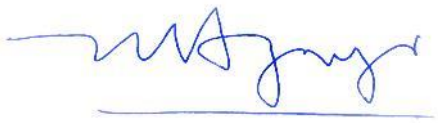
SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

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
2708.392	47.1	-2.1	4.0	301.9	0.0	0.0	Vert	PK	0.0	45.0	74.0	-29.0	EUT Horz, Low Ch
2709.675	47.1	-2.1	1.0	156.9	0.0	0.0	Horz	PK	0.0	45.0	74.0	-29.0	EUT On Side, Low Ch
4515.983	41.3	3.6	4.0	16.9	0.0	0.0	Vert	PK	0.0	44.9	74.0	-29.1	EUT Horz, Low Ch
4571.317	41.2	3.7	3.6	336.9	0.0	0.0	Horz	PK	0.0	44.9	74.0	-29.1	EUT Horz, High Ch
2709.075	46.4	-2.1	1.6	202.0	0.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	EUT On Side, Low Ch
3611.917	43.4	0.9	1.0	337.9	0.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	EUT Horz, Low Ch
3637.508	43.5	0.8	3.3	15.0	0.0	0.0	Horz	PK	0.0	44.3	74.0	-29.7	EUT Horz, Mid Ch
4548.350	40.7	3.6	1.5	19.9	0.0	0.0	Horz	PK	0.0	44.3	74.0	-29.7	EUT Horz, Mid Ch
4572.725	40.2	3.7	1.5	257.0	0.0	0.0	Vert	PK	0.0	43.9	74.0	-30.1	EUT Horz, High Ch
4547.467	40.1	3.6	1.5	81.0	0.0	0.0	Vert	PK	0.0	43.7	74.0	-30.3	EUT Horz, Mid Ch
2742.750	45.6	-1.9	1.5	106.0	0.0	0.0	Vert	PK	0.0	43.7	74.0	-30.3	EUT Horz, High Ch
3655.575	43.0	0.7	2.9	113.9	0.0	0.0	Horz	PK	0.0	43.7	74.0	-30.3	EUT Horz, High Ch
2728.900	45.5	-1.9	1.4	26.0	0.0	0.0	Horz	PK	0.0	43.6	74.0	-30.4	EUT Horz, Mid Ch
2742.717	45.5	-1.9	2.1	23.9	0.0	0.0	Horz	PK	0.0	43.6	74.0	-30.4	EUT Horz, High Ch
3635.733	41.8	0.8	1.5	24.9	0.0	0.0	Vert	PK	0.0	42.6	74.0	-31.4	EUT Horz, Mid Ch
3657.925	41.4	0.8	1.5	94.0	0.0	0.0	Vert	PK	0.0	42.2	74.0	-31.8	EUT Horz, High Ch
2728.067	44.0	-1.9	1.5	96.9	0.0	0.0	Vert	PK	0.0	42.1	74.0	-31.9	EUT Horz, Mid Ch

CONCLUSION

Pass



Tested By

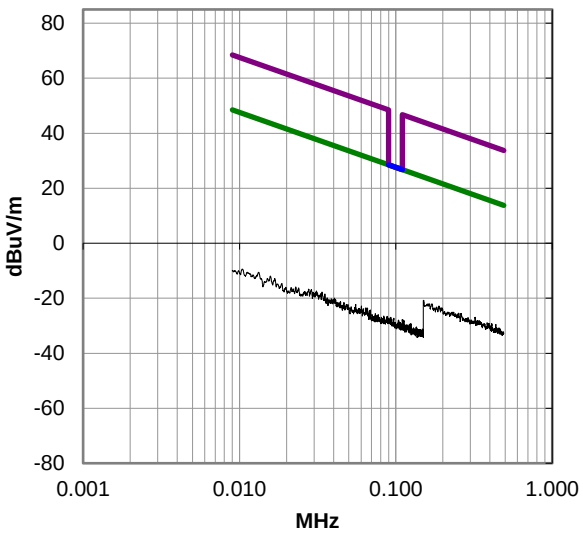
SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

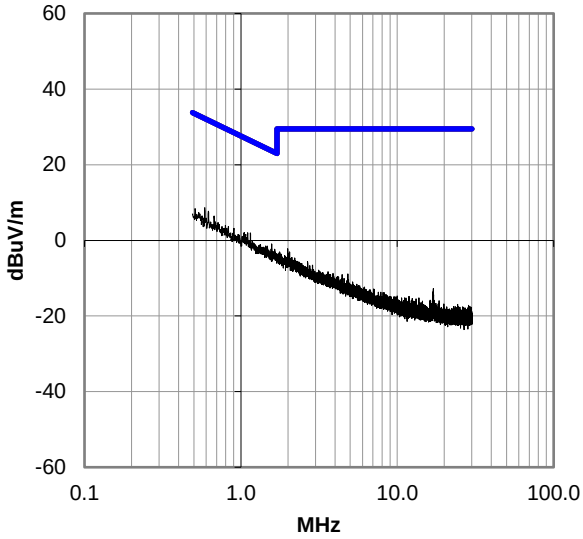
PRESCAN DATA

Radiated spurious emissions from the EUT are initially reviewed with Pre-scans (Preview scans). Pre-scans are performed, with the EUT transmitting on the lowest applicable data rate, for both vertical and horizontal polarizations. The Pre-scan plots below are shown with a peak detector and RBW for the following frequency ranges: 9 kHz RBW (< 30 MHz); 120 kHz RBW (30 - 1000 MHz); 1 MHz RBW (> 1 GHz). In the case where unintentional emissions are observed, an ambient or idle pre-scan with the radio off, will be shown for comparison.

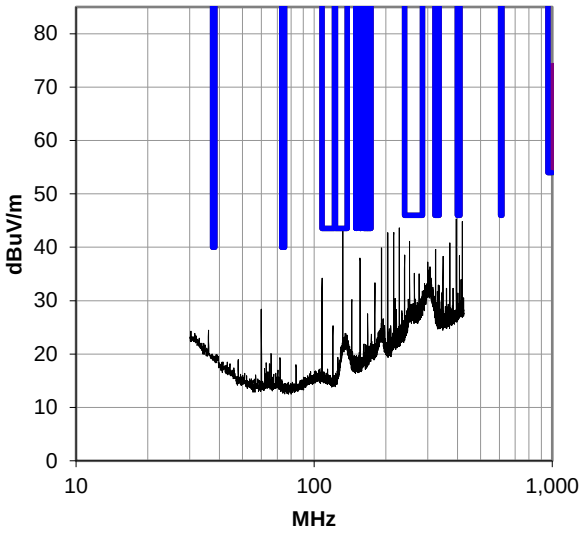
0.009-0.49 MHz, Run 239



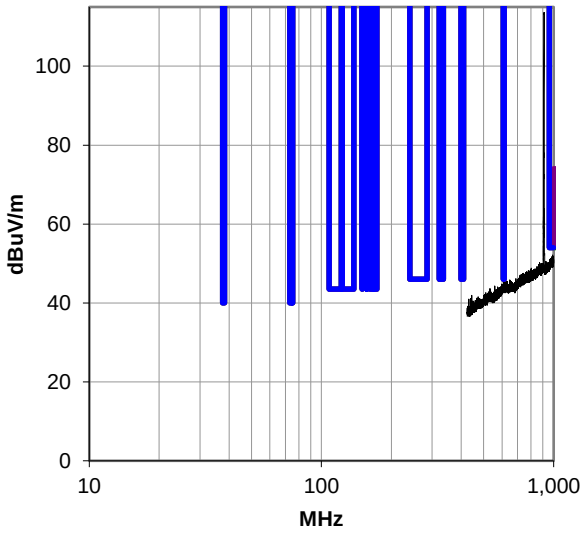
0.49-30 MHz, Run 240



30-425 MHz, Run 236



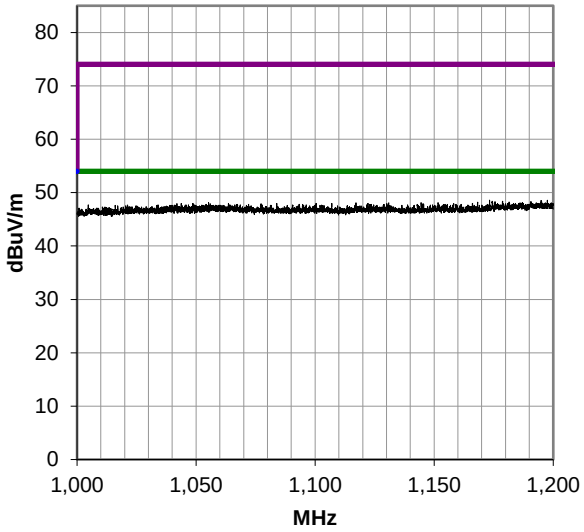
425-1000 MHz, Run 235



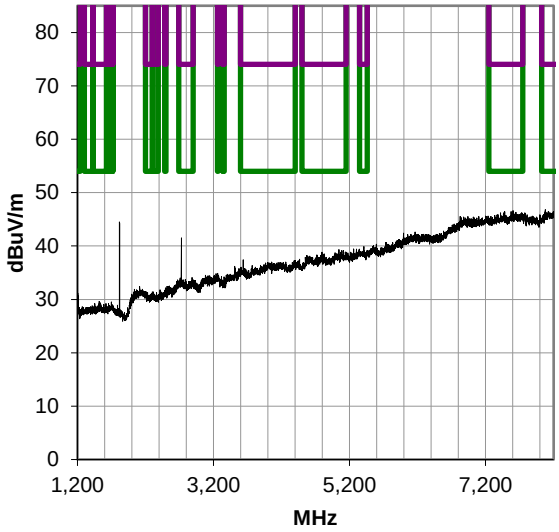
SPURIOUS RADIATED EMISSIONS

element
WTD.2024.10.30.0
EmiR5 2023.08.29.0
PSA-ESCI 2024.10.24.0

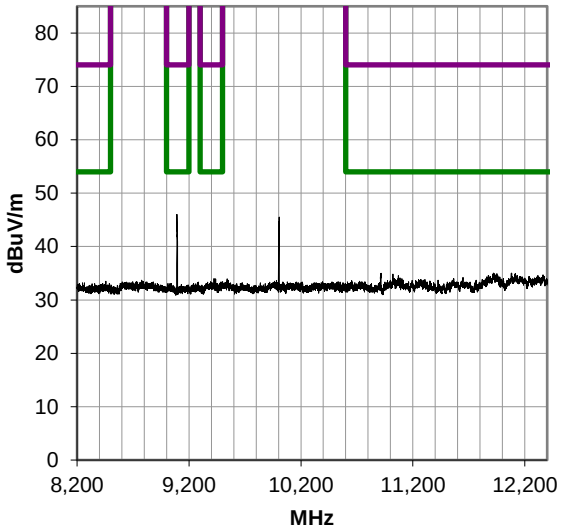
1000-1200 MHz, Run 210



1200-8200 MHz, Run 211



8200-12400 MHz, Run 212



DUTY CYCLE

element
TbtTx 2024.05.24.1
WTD.2024.10.30.0

TEST DESCRIPTION

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

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

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

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.

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2024-05-22	2025-05-22
Generator - Signal	Agilent	N5182A	TIF	2023-07-27	2026-07-27
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2024-08-28	2025-08-28
Attenuator	S.M. Electronics	SA26B-20	RFW	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANH	2024-08-28	2025-08-28

DUTY CYCLE

element
TbtTx 2024.05.24.1
WTD.2024.10.30.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	Sample #7	Date:	2024-12-20
Customer:	Digi International Inc	Temperature:	22.3°C
Attendees:	David Lentz	Relative Humidity:	22.6%
Customer Project:	None	Bar. Pressure (PMSL):	1033 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3.3VDC	Configuration:	DGII0507-16

COMMENTS

Reference level offset includes measurement cable, attenuator, DC Block, and 0.35dB loss for the ufl to SMA patch cable, which was provided by the client.
LoRa, CSS, 500 kHz Bandwidth, Spreading Factor 12.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass

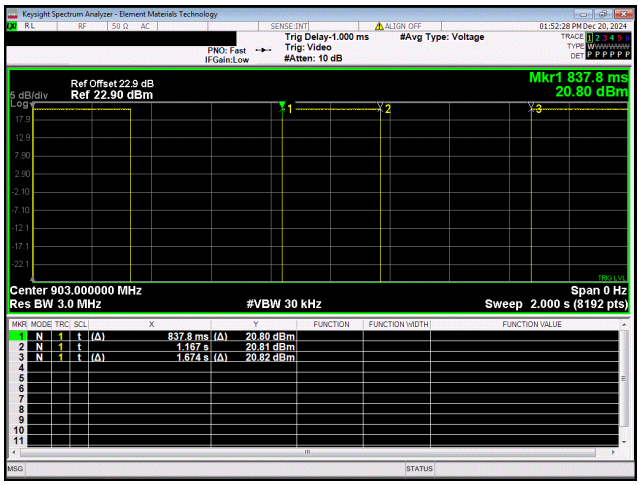
Tested By

TEST RESULTS

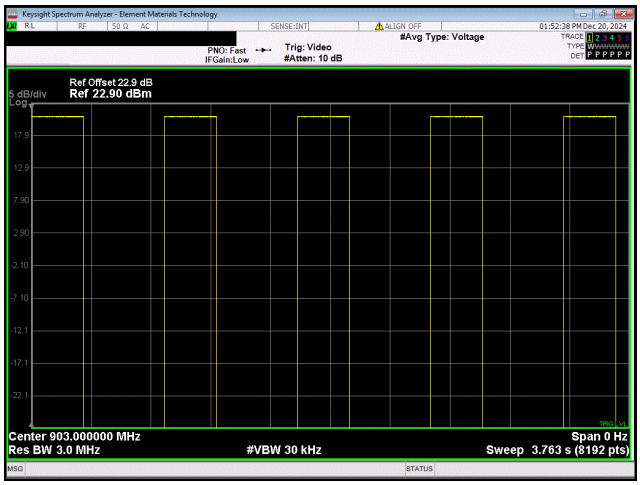
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
LoRa CSS						
Low Channel, 903.0 MHz	329.075 ms	836.135 ms	1	39.4	N/A	N/A
	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 909.4 MHz	330.027 ms	836.807 ms	1	39.4	N/A	N/A
	N/A	N/A	5	N/A	N/A	N/A
High Channel, 914.2 MHz	329.806 ms	836.57 ms	1	39.4	N/A	N/A
	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

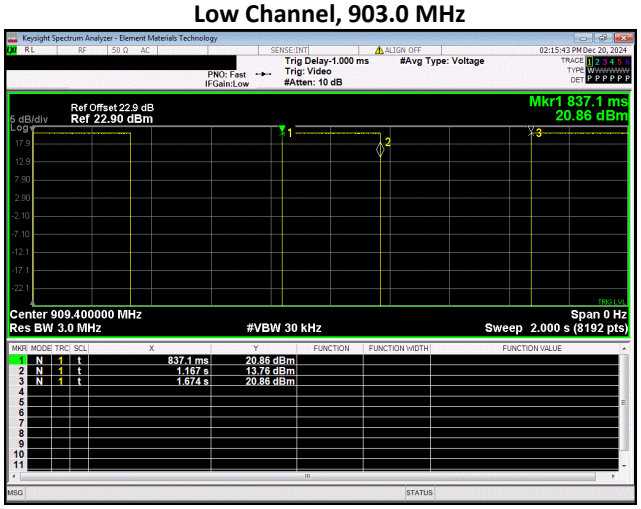
element
TbtTx 2024.05.24.1
WTD.2024.10.30.0



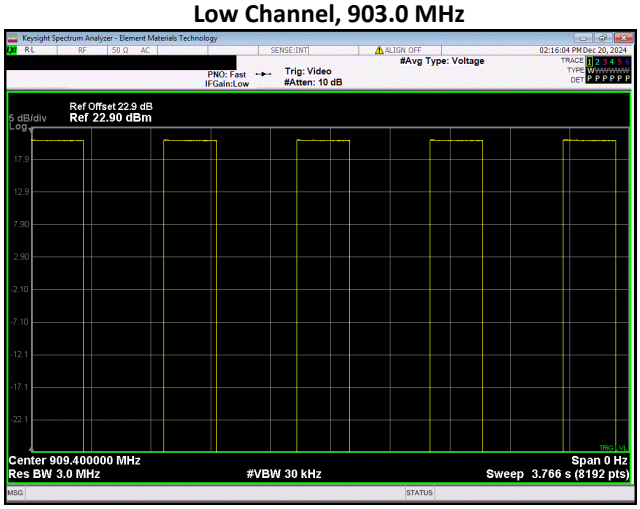
LoRa CSS
Low Channel, 903.0 MHz



LoRa CSS
Low Channel, 903.0 MHz



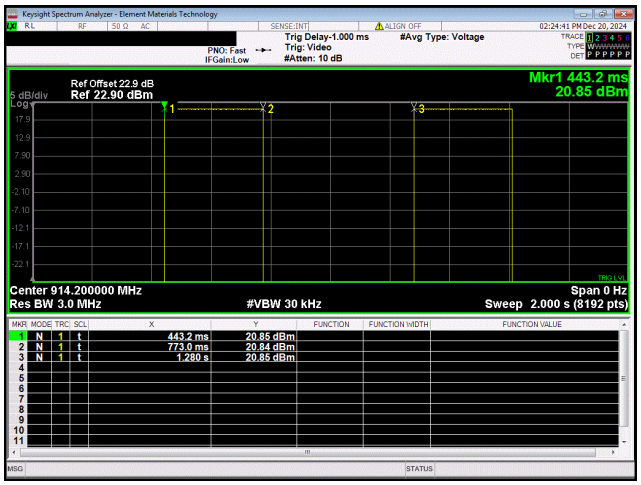
LoRa CSS
Mid Channel, 909.4 MHz



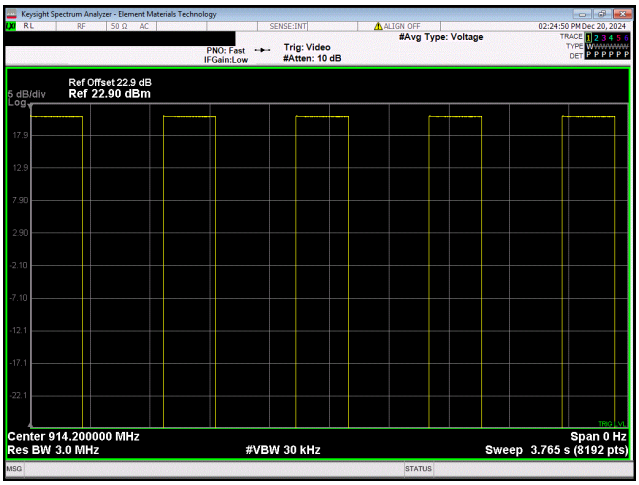
LoRa CSS
Mid Channel, 909.4 MHz

DUTY CYCLE

element
TbtTx 2024.05.24.1
WTD.2024.10.30.0



LoRa CSS
High Channel, 914.2 MHz



LoRa CSS
High Channel, 914.2 MHz

OUTPUT POWER

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

TEST DESCRIPTION

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

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

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

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

The method AVGSA-2 in section 11.9.2.2.4 of ANSI C63.10:2020 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

The AVGSA-2 method was modified as the available resolution bandwidth (RBw) on the spectrum analyzer could be set wider than the measured emissions bandwidth (B). RBw was set wider than B. This follows the guidance of section 11.9.1.1 and is equivalent to a measurement with a power meter AVGPM per section 11.9.2.3.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2024-05-22	2025-05-22
Generator - Signal	Agilent	N5182A	TIF	2023-07-27	2026-07-27
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2024-08-28	2025-08-28
Block - DC	Fairview Microwave	SD3379	ANH	2024-08-28	2025-08-28
Attenuator	S.M. Electronics	SA26B-20	RFW	2025-02-03	2026-02-03

OUTPUT POWER

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	Sample #7	Date:	2025-02-20
Customer:	Digi International Inc	Temperature:	21.9°C
Attendees:	Ben Beaudoin	Relative Humidity:	17.5%
Customer Project:	None	Bar. Pressure (PMSL):	1034 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3.3VDC	Configuration:	DGII0507-16

COMMENTS

Reference level offset includes measurement cable, attenuator, DC Block, and 0.35dB loss for the ufl to SMA patch cable, which was provided by the client.
500 kHz Bandwidth, Power Level 1B, Spreading Factor 12.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

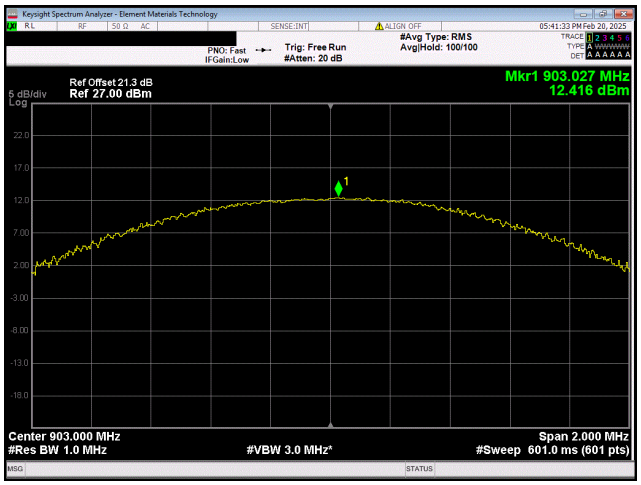
Pass

Tested By

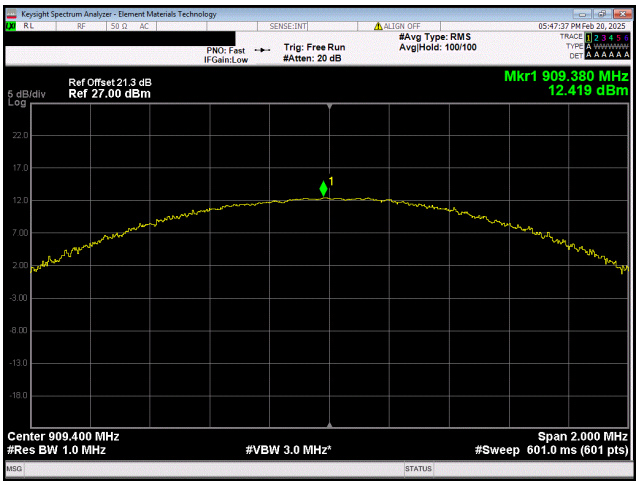
TEST RESULTS

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Limit (dBm)	Result
LoRa CSS					
Low Channel, 903.0 MHz	12.416	4	16.4	30	Pass
Mid Channel, 909.4 MHz	12.419	4	16.4	30	Pass
High Channel, 914.2 MHz	12.24	4	16.2	30	Pass

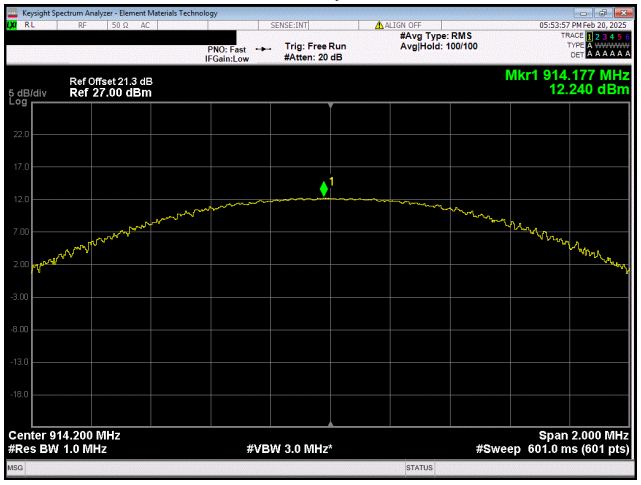
OUTPUT POWER



LoRa CSS
Low Channel, 903.0 MHz



LoRa CSS
Mid Channel, 909.4 MHz



LoRa CSS
High Channel, 914.2 MHz

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

TEST DESCRIPTION

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

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

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

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

The method AVGSA-2 in section 11.9.2.2.4 of ANSI C63.10:2020 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

The AVGSA-2 method was modified as the available resolution bandwidth (RBw) on the spectrum analyzer could be set wider than the measured emissions bandwidth (B). RBw was set wider than B. This follows the guidance of section 11.9.1.1 and is equivalent to a measurement with a power meter AVGPM per section 11.9.2.3.

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2024-05-22	2025-05-22
Generator - Signal	Agilent	N5182A	TIF	2023-07-27	2026-07-27
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2024-08-28	2025-08-28
Block - DC	Fairview Microwave	SD3379	ANH	2024-08-28	2025-08-28
Attenuator	S.M. Electronics	SA26B-20	RFW	2025-02-03	2026-02-03

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	Sample #7	Date:	2025-02-20
Customer:	Digi International Inc	Temperature:	21.8°C
Attendees:	Ben Beaudoin	Relative Humidity:	17.5%
Customer Project:	None	Bar. Pressure (PMSL):	1034 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3.3VDC	Configuration:	DGII0507-16

COMMENTS

Reference level offset includes measurement cable, attenuator, DC Block, and 0.35dB loss for the ufl to SMA patch cable, which was provided by the client.
Antenna gain value is for the Taoglas Flex PCB Antenna, which is the higher gain of the antennas in this report.
500 kHz Bandwidth, Power Level 1B, Spreading Factor 12.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass

Tested By

TEST RESULTS

	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
LoRa CSS							
Low Channel, 903.0 MHz	12.416	4	16.4	2.83	19.2	36	Pass
Mid Channel, 909.4 MHz	12.419	4	16.4	2.83	19.2	36	Pass
High Channel, 914.2 MHz	12.24	4	16.2	2.83	19.1	36	Pass

BAND EDGE COMPLIANCE

element
TbtTx 2024.05.24.1
WTD.2024.10.30.0

TEST DESCRIPTION

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

The 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. The analyzer screen captures for this test show an example of the emission mask for the test mode also used during the radiated spurious emissions at the restricted band edges test.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2024-05-22	2025-05-22
Generator - Signal	Agilent	N5182A	TIF	2023-07-27	2026-07-27
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2024-08-28	2025-08-28
Attenuator	S.M. Electronics	SA26B-20	RFW	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANH	2024-08-28	2025-08-28

BAND EDGE COMPLIANCE

element
TbtTx 2024.05.24.1
WTD.2024.10.30.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	Sample #7	Date:	2024-12-20
Customer:	Digi International Inc	Temperature:	22.3°C
Attendees:	David Lentz	Relative Humidity:	23%
Customer Project:	None	Bar. Pressure (PMSL):	1033 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3.3VDC	Configuration:	DGII0507-16

COMMENTS

Reference level offset includes measurement cable, attenuator, DC Block, and 0.35dB loss for the ufl to SMA patch cable, which was provided by the client.
LoRa, CSS, 500 kHz Bandwidth, Spreading Factor 12.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass

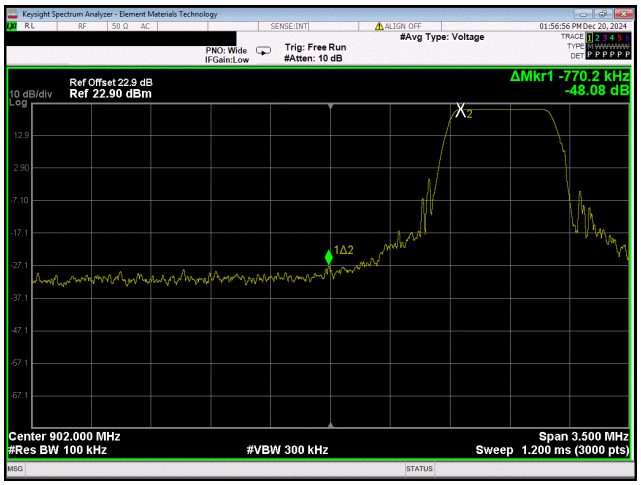
Tested By

TEST RESULTS

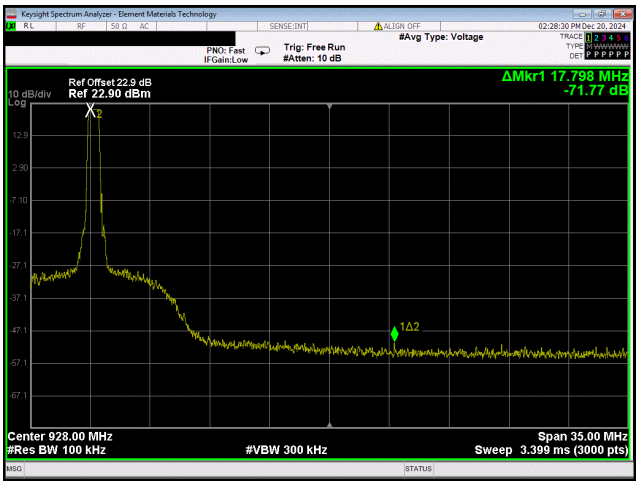
	Value (dBc)	Limit ≤ (dBc)	Result
LoRa CSS			
Low Channel, 903.0 MHz	-48.09	-30	Pass
High Channel, 914.2 MHz	-71.77	-30	Pass

BAND EDGE COMPLIANCE

element
TbtTx 2024.05.24.1
WTD.2024.10.30.0



LoRa CSS
Low Channel, 903.0 MHz



LoRa CSS
High Channel, 914.2 MHz

DTS BANDWIDTH

element
TbtTx 2024.05.24.1
TbtTx 2024.05.24.1
WTD.2024.10.30.0

TEST DESCRIPTION

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

The 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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2024-05-22	2025-05-22
Generator - Signal	Agilent	N5182A	TIF	2023-07-27	2026-07-27
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2024-08-28	2025-08-28
Attenuator	S.M. Electronics	SA26B-20	RFW	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANH	2024-08-28	2025-08-28

DTS BANDWIDTH

element
TbtTx 2024.05.24.1
TbtTx 2024.05.24.1
WTD.2024.10.30.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	Sample #7	Date:	2024-12-20
Customer:	Digi International Inc	Temperature:	22.3°C
Attendees:	David Lentz	Relative Humidity:	22.8%
Customer Project:	None	Bar. Pressure (PMSL):	1033 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3.3VDC	Configuration:	DGII0507-16

COMMENTS

Reference level offset includes measurement cable, attenuator, DC Block, and 0.35dB loss for the ufl to SMA patch cable, which was provided by the client.
LoRa, CSS, 500 kHz Bandwidth, Spreading Factor 12.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass

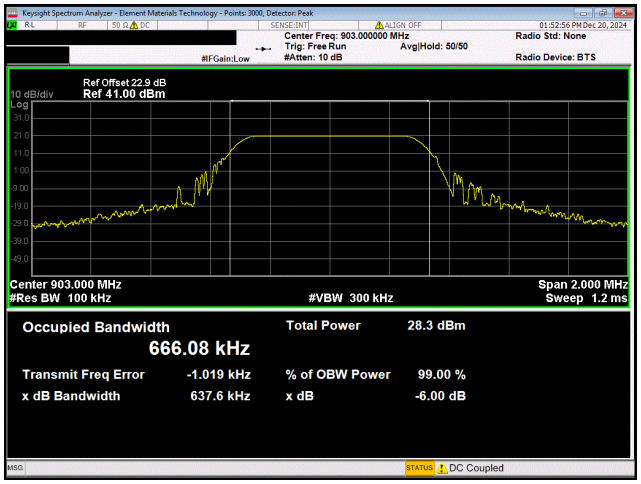
Tested By

TEST RESULTS

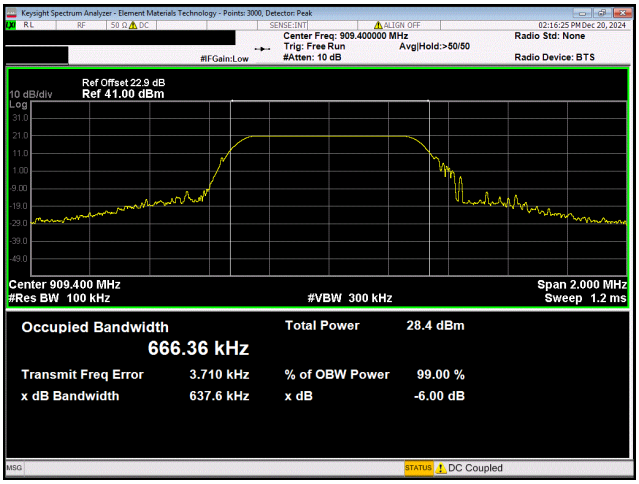
	Value	Limit (>)	Result
LoRa CSS			
Low Channel, 903.0 MHz	637.579 kHz	500 kHz	Pass
Mid Channel, 909.4 MHz	637.622 kHz	500 kHz	Pass
High Channel, 914.2 MHz	640.739 kHz	500 kHz	Pass

DTS BANDWIDTH

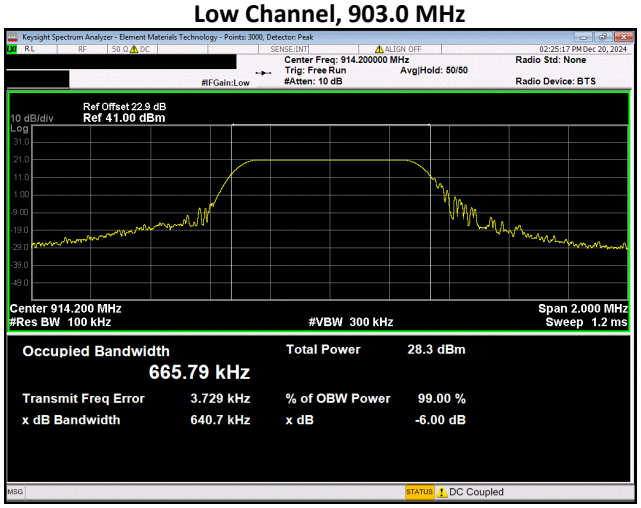
element
TbtTx 2024.05.24.1
TbtTx 2024.05.24.1
WTD.2024.10.30.0



LoRa CSS
Low Channel, 903.0 MHz



LoRa CSS
Mid Channel, 909.4 MHz



LoRa CSS
High Channel, 914.2 MHz

OCCUPIED BANDWIDTH

element
TbtTx 2024.05.24.1
WTD.2024.10.30.0

TEST DESCRIPTION

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

The 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 C63.10:2020, 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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2024-05-22	2025-05-22
Generator - Signal	Agilent	N5182A	TIF	2023-07-27	2026-07-27
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2024-08-28	2025-08-28
Attenuator	S.M. Electronics	SA26B-20	RFW	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANH	2024-08-28	2025-08-28

OCCUPIED BANDWIDTH

element
TbtTx 2024.05.24.1
WTD.2024.10.30.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	Sample #7	Date:	2024-12-20
Customer:	Digi International Inc	Temperature:	22.3°C
Attendees:	David Lentz	Relative Humidity:	22.8%
Customer Project:	None	Bar. Pressure (PMSL):	1033 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3.3VDC	Configuration:	DGII0507-16

COMMENTS

Reference level offset includes measurement cable, attenuator, DC Block, and 0.35dB loss for the ufl to SMA patch cable, which was provided by the client.
LoRa, CSS, 500 kHz Bandwidth, Spreading Factor 12.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

N/A

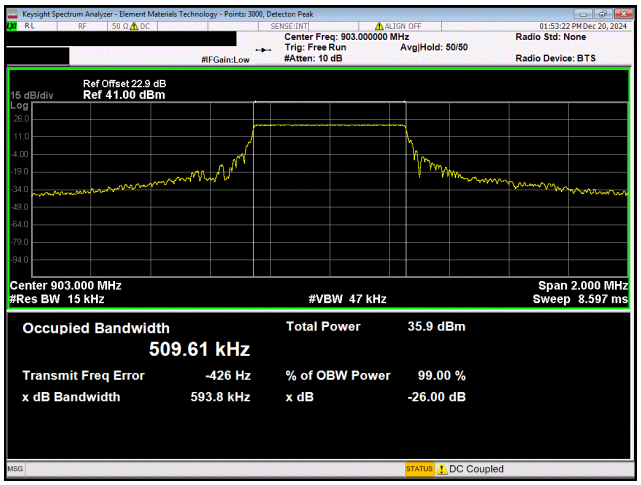
Tested By

TEST RESULTS

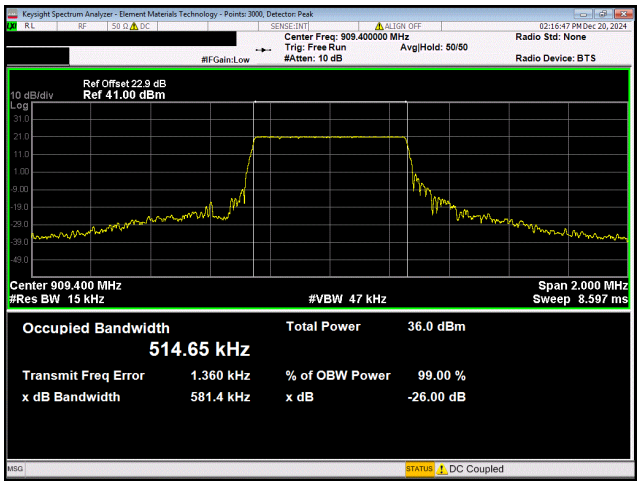
	Value	Limit	Result
LoRa CSS			
Low Channel, 903.0 MHz	509.606 kHz	N/A	N/A
Mid Channel, 909.4 MHz	514.654 kHz	N/A	N/A
High Channel, 914.2 MHz	511.654 kHz	N/A	N/A

OCCUPIED BANDWIDTH

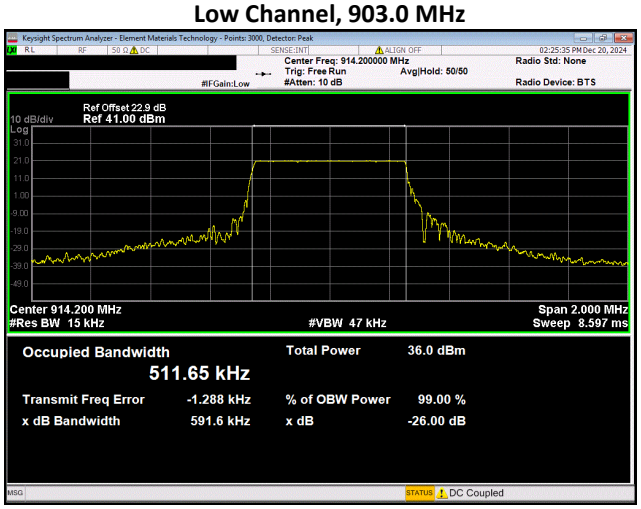
element
TbtTx 2024.05.24.1
WTD.2024.10.30.0



LoRa CSS
Low Channel, 903.0 MHz



LoRa CSS
Mid Channel, 909.4 MHz



LoRa CSS
High Channel, 914.2 MHz

SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

TEST DESCRIPTION

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

The 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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2024-05-22	2025-05-22
Generator - Signal	Agilent	N5182A	TIF	2023-07-27	2026-07-27
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2024-08-28	2025-08-28
Block - DC	Fairview Microwave	SD3379	ANH	2024-08-28	2025-08-28
Attenuator	S.M. Electronics	SA26B-20	RFW	2025-02-03	2026-02-03

SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	Sample #7	Date:	2025-02-20
Customer:	Digi International Inc	Temperature:	21.8°C
Attendees:	Ben Beaudoin	Relative Humidity:	17.6%
Customer Project:	None	Bar. Pressure (PMSL):	1034 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3.3VDC	Configuration:	DGII0507-16

COMMENTS

Reference level offset includes measurement cable, attenuator, DC Block, and 0.35dB loss for the ufl to SMA patch cable, which was provided by the client.
500 kHz Bandwidth, Power Level 1B, Spreading Factor 12.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass

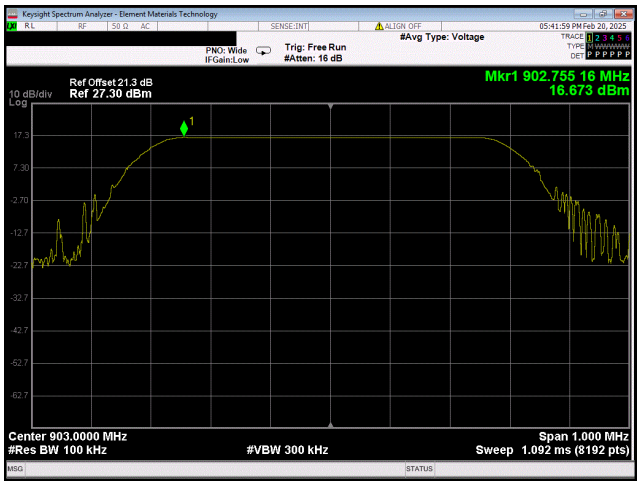
Tested By

TEST RESULTS

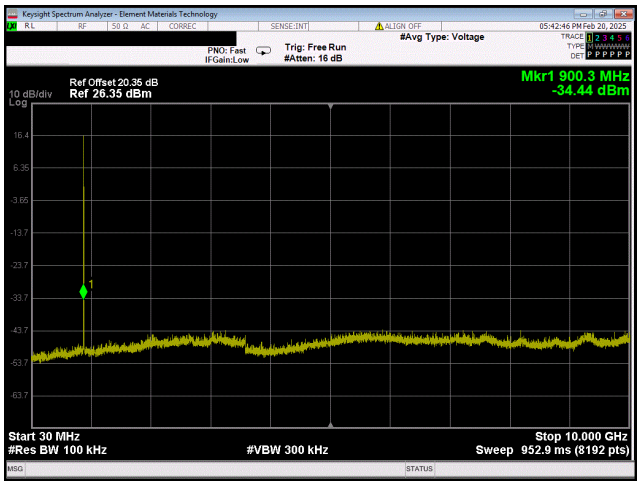
	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
LoRa CSS					
Low Channel, 903.0 MHz	Fundamental	902.76	N/A	N/A	N/A
	30 MHz - 10 GHz	900.29	-51.11	-30	Pass
Mid Channel, 909.4 MHz	Fundamental	909.18	N/A	N/A	N/A
	30 MHz - 10 GHz	7587.53	-59.84	-30	Pass
High Channel, 914.2 MHz	Fundamental	913.97	N/A	N/A	N/A
	30 MHz - 10 GHz	5727.66	-59.67	-30	Pass

SPURIOUS CONDUCTED EMISSIONS

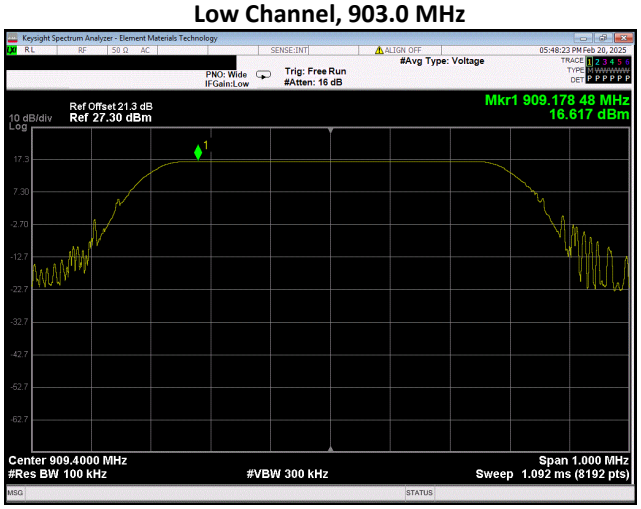
element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



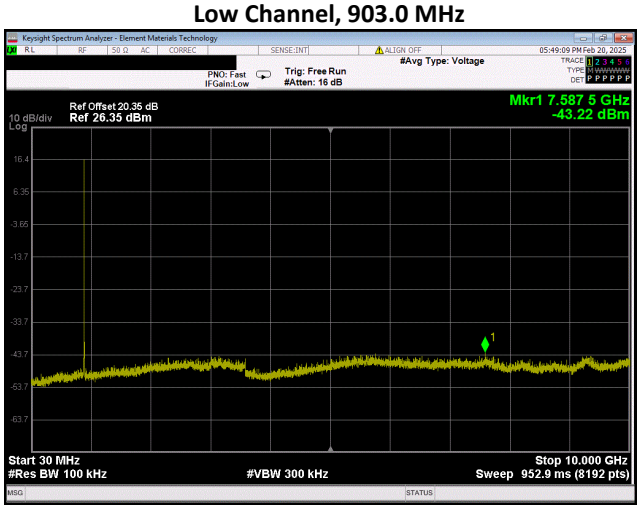
LoRa CSS
Low Channel, 903.0 MHz



LoRa CSS
Low Channel, 903.0 MHz



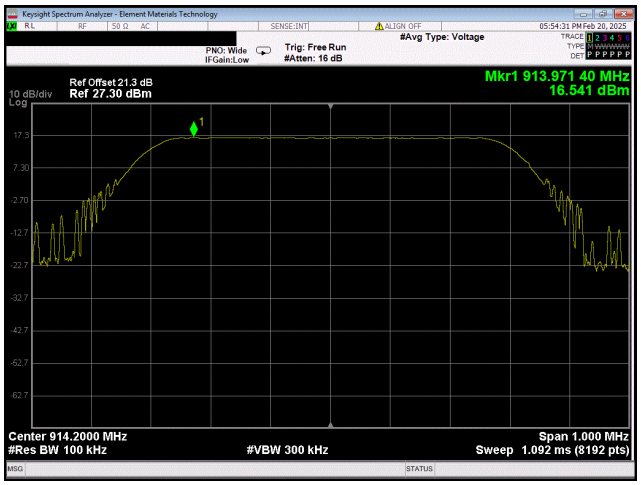
LoRa CSS
Mid Channel, 909.4 MHz



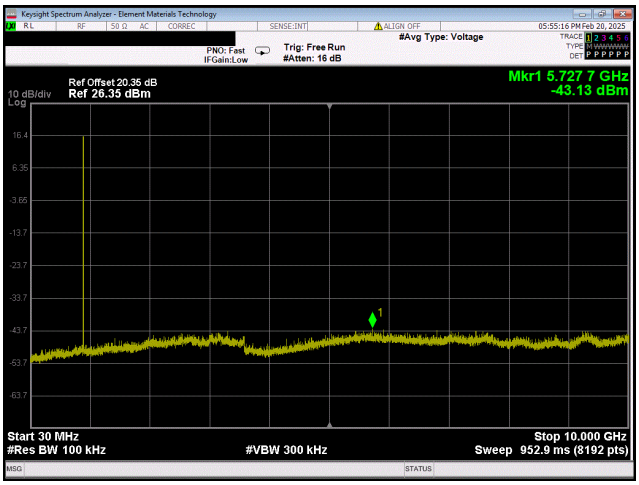
LoRa CSS
Mid Channel, 909.4 MHz

SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



LoRa CSS
High Channel, 914.2 MHz



LoRa CSS
High Channel, 914.2 MHz

POWER SPECTRAL DENSITY

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

TEST DESCRIPTION

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

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

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

The method AVGPSD-2 in clause 11.10.5 of ANSI C63.10:2020 was used to make the measurement. This method uses trace averaging and RMS detection across the ON and OFF times of the transmission. The analyzer was configured to the following settings:

Span = at least 1.5 * OBW
RBW = 3 kHz
VBW ≥ 3 x RBW
Detector = RMS
Sweep = 601 mS
Points = 601

The peak marker function was used to determine the maximum amplitude level. An additional [10*log(1 / D)], where D is the duty cycle was added to the peak marker to compute the average PSD during the actual transmission time.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2024-05-22	2025-05-22
Generator - Signal	Agilent	N5182A	TIF	2023-07-27	2026-07-27
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2024-08-28	2025-08-28
Block - DC	Fairview Microwave	SD3379	ANH	2024-08-28	2025-08-28
Attenuator	S.M. Electronics	SA26B-20	RFW	2025-02-03	2026-02-03

POWER SPECTRAL DENSITY

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	Digi XBee LR RF Module for LoRaWAN	Work Order:	DGII0507
Serial Number:	Sample #7	Date:	2025-02-20
Customer:	Digi International Inc	Temperature:	21.8°C
Attendees:	Ben Beaudoin	Relative Humidity:	17.6%
Customer Project:	None	Bar. Pressure (PMSL):	1034 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	3.3VDC	Configuration:	DGII0507-16

COMMENTS

Reference level offset includes measurement cable, attenuator, DC Block, and 0.35dB loss for the ufl to SMA patch cable, which was provided by the client.
500 kHz Bandwidth, Power Level 1B, Spreading Factor 12.

DEVIATIONS FROM TEST STANDARD

ANSI C63.10:2020 section 11.10.5 states the number of points as ≥ 2*span/RBW. This would be 667 points based on 1 MHz span and 3 kHz RBW. The testing was performed using 601 points with an increased sweep time to improve accuracy of the measurement. Due to the high margin involved and only slightly decreased number of points, the measurements collected were considered to be valid.

CONCLUSION

Pass

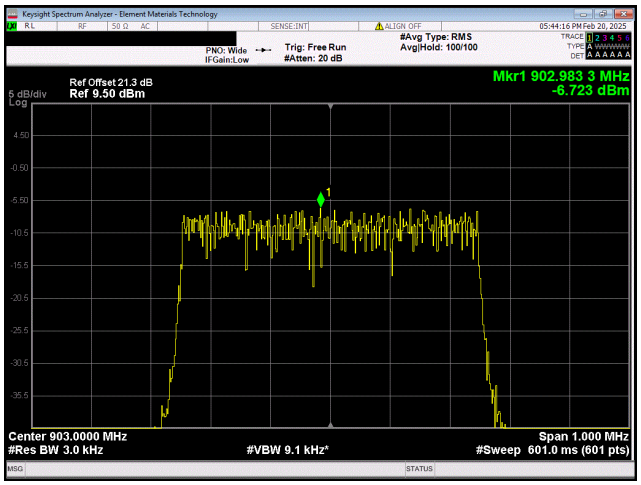
Tested By

TEST RESULTS

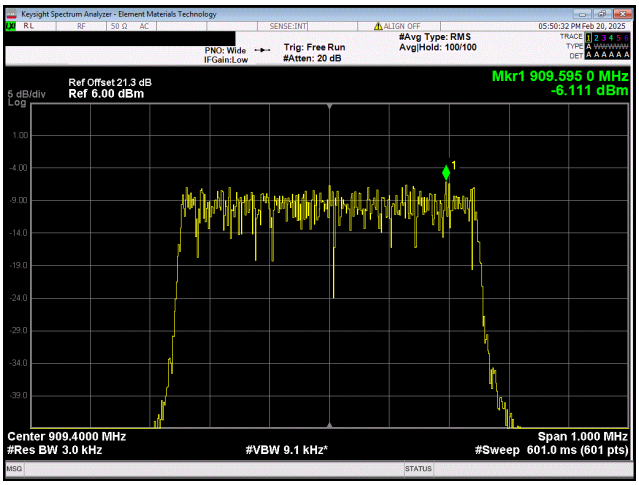
	Value dBm/3kHz	Duty Cycle Factor (dB)	Value dBm/3kHz	Limit ≤ (dBm / 3 kHz)	Results
LoRa CSS					
Low Channel, 903.0 MHz	-6.723	4	-2.7	8	Pass
Mid Channel, 909.4 MHz	-6.111	4	-2.1	8	Pass
High Channel, 914.2 MHz	-5.634	4	-1.6	8	Pass

POWER SPECTRAL DENSITY

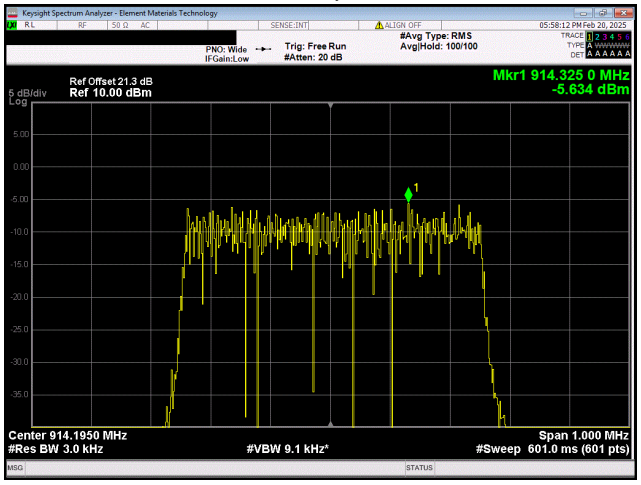
element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



LoRa CSS
Low Channel, 903.0 MHz



LoRa CSS
Mid Channel, 909.4 MHz



LoRa CSS
High Channel, 914.2 MHz

End of Test Report