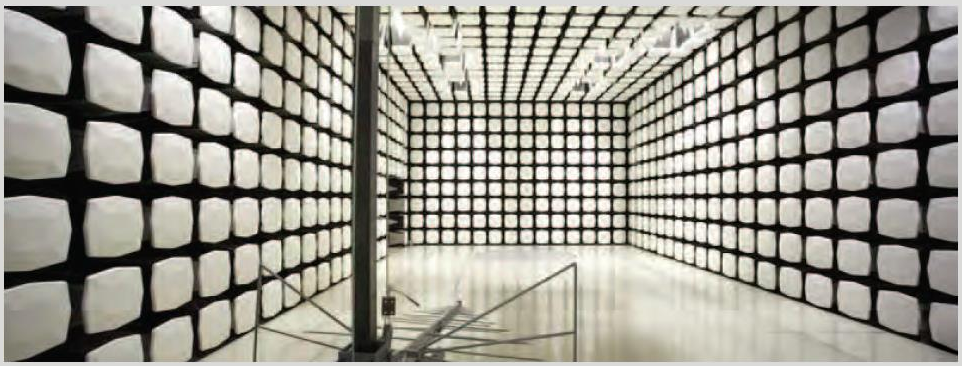
Traffic & Parking Control Co., Inc

RM148221

902-928 MHz FHSS Transceiver
FCC 15.247:2022

Report: TRPA0008 Rev. 4, Issue Date: June 6, 2022



CERT #3310.05

CERTIFICATE OF TEST

Last Date of Test: March 23, 2022
Traffic & Parking Control Co., Inc
EUT: RM148221

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2021	ANSI C63.10:2013
FCC 15.247:2022	ANSI C63.10:2013, KDB 558074 v05r02

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions (Transmitter)	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	
7.8.2	Carrier Frequency Separation	Yes	Pass	
7.8.3	Number of Hopping Frequencies	Yes	Pass	
7.8.4	Dwell Time	Yes	Pass	
7.8.5	Output Power	Yes	Pass	
7.8.5	Equivalent Isotropic Radiated Power	Yes	Pass	
7.8.6	Band Edge Compliance	Yes	Pass	
7.8.6	Band Edge Compliance - Hopping Mode	Yes	Pass	
7.8.7	Occupied Bandwidth	Yes	Pass	
7.8.8	Spurious Conducted Emissions	Yes	Pass	
11.10.2	Power Spectral Density	No	N/A	Not required for FHSS devices.

Deviations From Test Standards

None

Approved By:

James E Morris

James Morris, Operations 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	Replaced occupied bandwidth data with retest	2022-01-22	81-84
	Updated last dates of test	2022-01-22	2, 10 and 15
02	Updated block diagram	2022-04-02	7
	Added detail about test method in test description	2022-04-02	47
	Updated the standard year on the cover and CoT to 2022 (15.247:2022). Last date of test was in 2022.	2022-04-02	1, 2
	Updated to say the 15th for first date of test.	2022-04-02	10
	Updated test description	2022-04-02	85, 88, 91, 94, 103
	Changed the calculation based on the gain.	2022-04-02	68, 72
	Added data	2022-04-02	36-45, 51-53, 71-73, 82-84, 91-93, 100-102, 115-117
03	Added the type of modulation of the transmitter	2022-05-16	11
	Updated antenna gain table	2022-05-16	11
	Added configuration(s) for the new testing	2022-05-16	14
	Changed configurations investigated TRPA0008-4 to TRPA0008-5.	2022-05-16	18
	Added a note on the power settings and antennas page that if the power settings deviate from this it will be listed.	2022-05-16	11
	Re-worded the comments because the whip antenna is using a different low channel power setting than the puck and omni.	2022-05-16	66, 77, 97, 110
	Added units to the limit values and added the equation used to calculate the new limit in the comments.	2022-05-16	70
	Re-calculated the EIRP with the new higher gain of 5.15 dBi for the Omni antenna.	2022-05-16	77-79
	Added the power settings to the comments to account for the Whip low channel having a different power setting.	2022-05-16	88
04	Added SRE data for two antennas is missing in the report (testing done outside of the plastic enclosure).	2022-06-06	27

ACCREDITATIONS AND AUTHORIZATIONS

element
2021.09.01

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

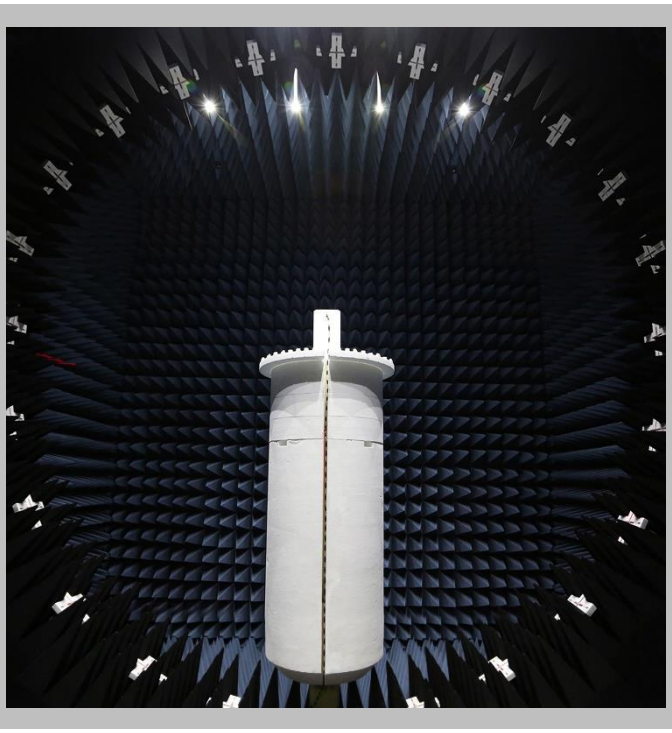
For details on the Scopes of our Accreditations, please visit:

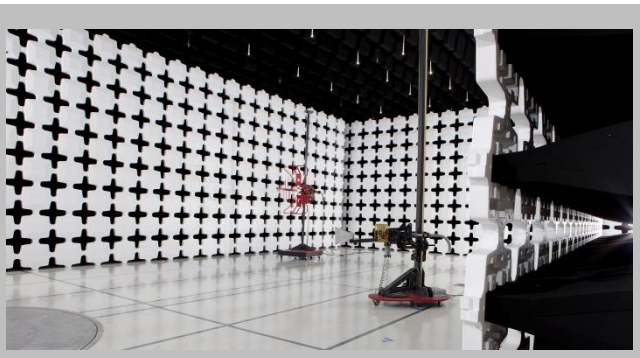
California Minnesota Oregon Texas Washington

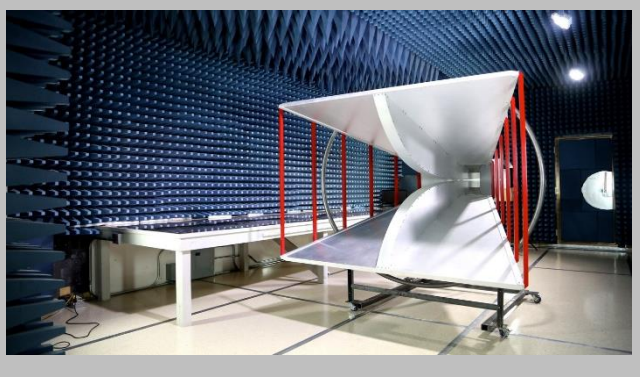
FACILITIES

element
2020.12.15

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th 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

element
TMU.2015.07.10

Measurement Uncertainty

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

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

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

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

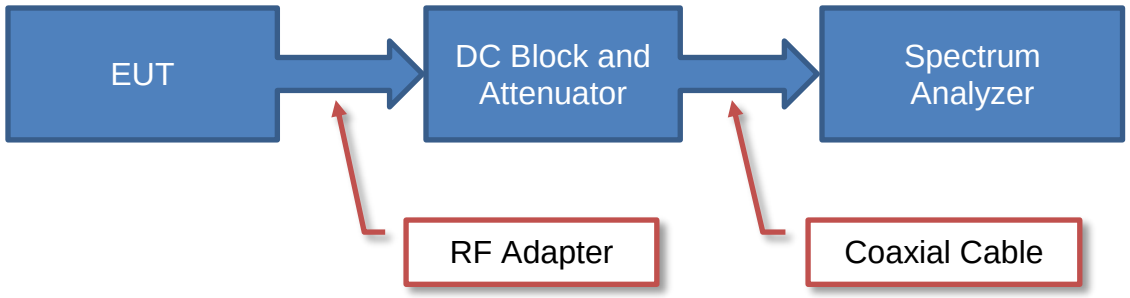
TEST SETUP BLOCK DIAGRAMS

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.

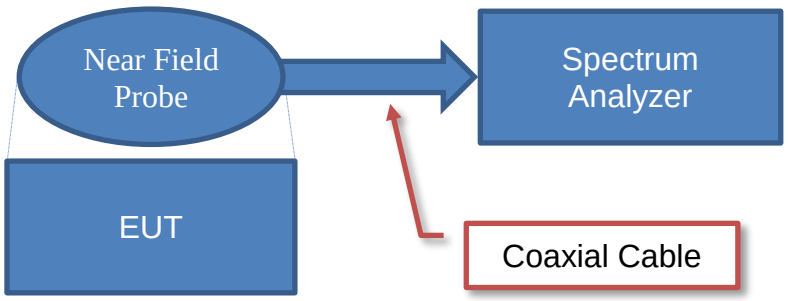
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

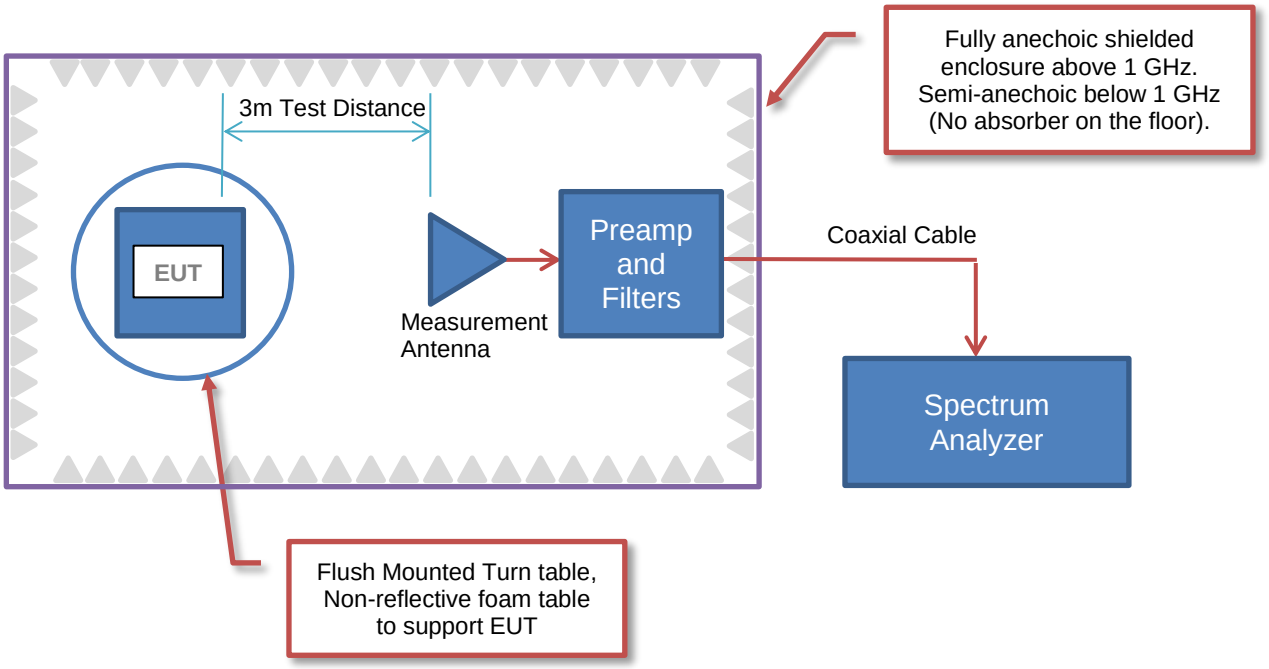


Sample Calculation (logarithmic units)

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:

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

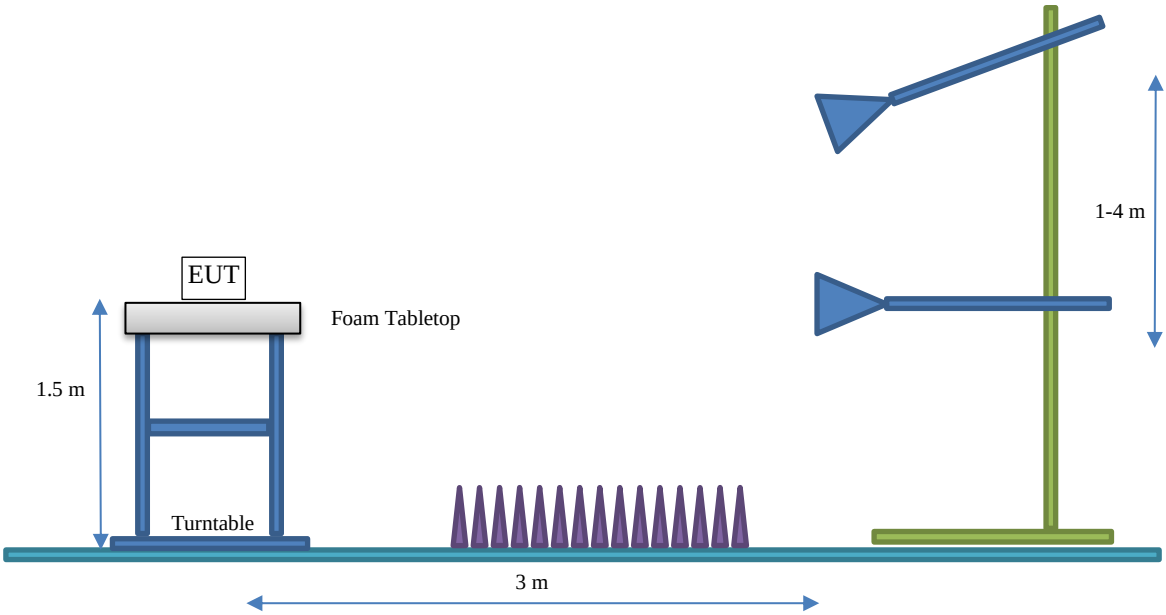
Conducted Emissions:

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

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:	Traffic & Parking Control Co., Inc
Address:	5100 W Brown Deer Road
City, State, Zip:	Brown Deer, WI 53223
Test Requested By:	Roman Marjamaa
EUT:	RM148221
First Date of Test:	November 15, 2021
Last Date of Test:	March 23, 2022
Receipt Date of Samples:	November 15, 2021
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Device containing a 900 MHz radio.

Testing Objective:
Seeking to demonstrate compliance under FCC 15.247:2021 for operation in the 902 - 928 MHz Band.

POWER SETTINGS AND ANTENNAS

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

ANTENNA GAIN (dBi)

Type	Provided by:	Frequency Range (MHz)	Gain (dBi)
Yagi, (model PC906)	Laird Connectivity	896-940	10.65
Whip (model W1063)	Pulse	868-928	3.0
Puck (model WPANT30026-S5A)	World Products Inc	902-928	4.0
Omni (model MFB9153)	PCTEL	902-928	5.15

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

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Antenna Types	Channel	Power Setting (software value)
2GFSK 123k Baud	Yagi Antenna	Low - 902.4 MHz	Mid, 48
		Mid - 915 MHz	Mid, 48
		High - 927.6 MHz	Mid, 47
	Puck and Omni Antennas	Low - 902.4 MHz	High, 83
		Mid - 915 MHz	High, 83
		High - 927.6 MHz	High, 81
	Whip	Low - 902.4 MHz	High, 76
		Mid - 915 MHz	High, 83
		High - 927.6 MHz	High, 81

It will be clearly stated in the data sheet if power settings deviate from those listed above.

CONFIGURATIONS

Configuration TRPA0008- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radio Module	Traffic & Parking Control Co., Inc	RM148221	RM148221-2

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LCD Module	Traffic & Parking Control Co., Inc	129443	129443-2

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	U8002A	TZP

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Leads 1	No	0.3 m	No	LCD Module	DC Cable
DC Cable	No	0.2 m	No	DC Leads 1	DC Leads 2
DC Leads 2	No	0.9 m	No	DC Cable	DC Power Supply

Configuration TRPA0008- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radio Module	Traffic & Parking Control Co., Inc	RM148221	RM148221-2

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LCD Module	Traffic & Parking Control Co., Inc	129443	129443-2
Omni Antenna	Hana Wireless	HW-OD9-5-NF	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	U8002A	TZP

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Leads 1	No	0.3 m	No	LCD Module	DC Cable
DC Cable	No	0.2 m	No	DC Leads 1	DC Leads 2
DC Leads 2	No	0.9 m	No	DC Cable	DC Power Supply
Antenna Coax Cable (Omni)	Yes	0.9 m	No	Radio Module	Omni Antenna

CONFIGURATIONS

Configuration TRPA0008- 3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radio Module	Traffic & Parking Control Co., Inc	RM148221	RM148221-2

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LCD Module	Traffic & Parking Control Co., Inc	129443	129443-2
Puck Antenna	World Products Inc	WPANT30026-S5A	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	U8002A	TZP

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Leads 1	No	0.3 m	No	LCD Module	DC Cable
DC Cable	No	0.2 m	No	DC Leads 1	DC Leads 2
DC Leads 2	No	0.9 m	No	DC Cable	DC Power Supply
Antenna Cable	Yes	0.9 m	No	Puck Antenna	Radio Module

Configuration TRPA0008- 4

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radio Module	Traffic & Parking Control Co., Inc	RM148221	RM148221-2

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LCD Module	Traffic & Parking Control Co., Inc	129443	129443-2
Whip Antenna	Pulse	W1063	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	U8002A	TZP

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Leads 1	No	0.3 m	No	LCD Module	DC Cable
DC Cable	No	0.2 m	No	DC Leads 1	DC Leads 2
DC Leads 2	No	0.9 m	No	DC Cable	DC Power Supply

CONFIGURATIONS

Configuration TRPA0008- 5

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radio Module	Traffic & Parking Control Co., Inc	RM148221	RM148221-2

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LCD Module	Traffic & Parking Control Co., Inc	129443	129443-2
YAGI Antenna	Laird	PC906	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	U8002A	TZP

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Leads 1	No	0.3 m	No	LCD Module	DC Cable
DC Cable	No	0.2 m	No	DC Leads 1	DC Leads 2
DC Leads 2	No	0.9 m	No	DC Cable	DC Power Supply
Antenna Coax Cable (Yagi)	Yes	0.9 m	No	Radio Module	Yagi Antenna

Configuration TRPA0008- 6

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radio Module	Traffic & Parking Control Co., Inc	RM148221	RM148221-2

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LCD Module	Traffic & Parking Control Co., Inc	129443	129443-2

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	U8002A	TZP

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Leads 1	No	0.3 m	No	LCD Module	DC Cable
DC Cable	No	0.2 m	No	DC Leads 1	DC Power Supply
AC Cable	No	1.8 m	No	AC Mains	DC Power Supply
u.fl to sma adapter	Yes	0.1 m	No	Radio Module	Antenna Cable

CONFIGURATIONS

Configuration TRPA0008- 8

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radio Module	Traffic & Parking Control Co., Inc	RM148221	RM148221-2

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Whip Antenna	Pulse	W1063	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	U8002A	TZP

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.8 m	No	AC Mains	DC Power Supply
DC Cable x2	No	1.0 m	No	DC Power Supply	Radio Module
u.fl to SMA adapter	No	0.1 m	No	Radio Module	Whip Antenna

Configuration TRPA0008- 11

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radio Module	Traffic & Parking Control Co., Inc	RM148221	RM148221-2

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Omni Antenna	PCTEL	MFB9153	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	U8002A	TZP

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.8 m	No	AC Mains	DC Power Supply
DC Cable x2	No	1.0 m	No	DC Power Supply	Radio Module
u.fl to SMA adapter	No	0.1 m	No	Radio Module	Whip Antenna

CONFIGURATIONS

Configuration TRPA0008- 12

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Radio Module	Traffic & Parking Control Co., Inc	RM148221	RM148221-2

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	Agilent	U8002A	TZP

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.8 m	No	AC Mains	DC Power Supply
DC Cable x2	No	1.0 m	No	DC Power Supply	Radio Module
u.fl to SMA adapter	No	0.1 m	No	Radio Module	Whip Antenna

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-11-15	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.
2	2021-11-15	Carrier Frequency Separation	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2021-11-15	Number of Hopping Frequencies	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2021-11-15	Dwell Time	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2021-11-22	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	2022-01-20	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.
7	2022-03-11	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2022-03-23	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.
9	2022-03-23	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.
10	2022-03-23	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.
11	2022-03-23	Band Edge Compliance – Hopping Mode	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
12	2022-03-23	Spurious Conducted Emissions	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.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

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
Receiver	Gauss Instruments	TDEMI 30M	ARK	2021-11-02	2022-11-02
Cable - Conducted Cable Assembly	Northwest EMC	MNC, HGN, TYK	MNCA	2021-03-10	2022-03-10
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	2021-03-15	2022-03-15
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Filter - High Pass	TTE	H97-100K-50-720B	HGN	NCR	NCR

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.2 dB	-3.2 dB

CONFIGURATIONS INVESTIGATED

TRPA0008-2
TRPA0008-5

MODES INVESTIGATED

Transmitting Mid Ch 915 MHz, 123k data rate. High Power, Omni antenna.
Transmitting Mid Ch 915 MHz, 123k data rate. Mid Power, Yagi antenna.

POWERLINE CONDUCTED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

EUT:	RM148221	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2021-11-22
Customer:	Traffic & Parking Control Co., Inc	Temperature:	23.5°C
Attendees:	Roman Marjamaa	Relative Humidity:	20.9%
Customer Project:	None	Bar. Pressure (PMSL):	1024 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	4.8 VDC via 110VAC/60Hz	Configuration:	TRPA0008-5

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	3	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

Yagi Antenna.

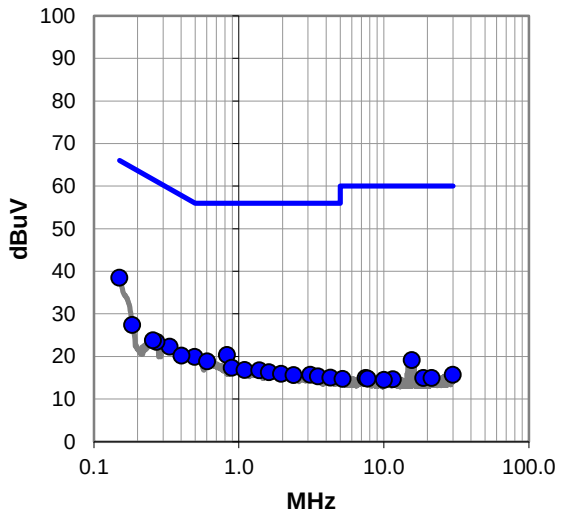
EUT OPERATING MODES

Transmitting Mid Ch 915 MHz, 123k data rate. Mid Power, Yagi antenna.

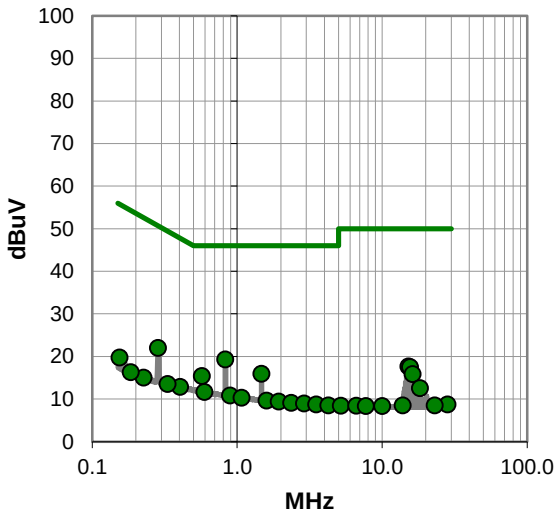
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	17.5	21.0	38.5	66.0	-27.5
0.830	-0.2	20.5	20.3	56.0	-35.7
0.495	-0.6	20.5	19.9	56.1	-36.2
0.183	6.6	20.8	27.4	64.3	-36.9
0.334	1.8	20.5	22.3	59.4	-37.1
0.605	-1.6	20.4	18.8	56.0	-37.2
0.402	-0.3	20.5	20.2	57.8	-37.6
0.271	2.9	20.5	23.4	61.1	-37.7
0.256	3.2	20.6	23.8	61.6	-37.8
0.893	-3.2	20.5	17.3	56.0	-38.7
1.094	-3.7	20.5	16.8	56.0	-39.2
1.385	-3.8	20.5	16.7	56.0	-39.3
1.612	-4.2	20.5	16.3	56.0	-39.7
1.955	-4.6	20.5	15.9	56.0	-40.1
3.102	-4.9	20.6	15.7	56.0	-40.3
2.392	-5.0	20.6	15.6	56.0	-40.4
3.514	-5.3	20.6	15.3	56.0	-40.7
15.618	-2.0	21.1	19.1	60.0	-40.9
4.277	-5.6	20.6	15.0	56.0	-41.0
30.000	-5.9	21.6	15.7	60.0	-44.3
7.499	-5.9	20.8	14.9	60.0	-45.1
18.765	-6.2	21.1	14.9	60.0	-45.1
21.446	-6.4	21.3	14.9	60.0	-45.1
7.721	-6.0	20.8	14.8	60.0	-45.2
5.208	-5.9	20.6	14.7	60.0	-45.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.830	-1.2	20.5	19.3	46.0	-26.7
0.285	1.5	20.5	22.0	50.7	-28.7
1.470	-4.6	20.5	15.9	46.0	-30.1
0.570	-5.0	20.4	15.4	46.0	-30.6
15.251	-3.5	21.1	17.6	50.0	-32.4
15.618	-3.6	21.1	17.5	50.0	-32.5
16.228	-5.3	21.1	15.8	50.0	-34.2
0.596	-8.8	20.4	11.6	46.0	-34.4
0.404	-7.7	20.5	12.8	47.8	-35.0
0.894	-9.7	20.5	10.8	46.0	-35.2
1.076	-10.2	20.5	10.3	46.0	-35.7
0.331	-7.0	20.5	13.5	49.4	-35.9
0.154	-1.2	20.9	19.7	55.8	-36.1
1.598	-10.9	20.5	9.6	46.0	-36.4
1.943	-11.1	20.5	9.4	46.0	-36.6
2.367	-11.5	20.6	9.1	46.0	-36.9
2.892	-11.7	20.6	8.9	46.0	-37.1
3.513	-11.9	20.6	8.7	46.0	-37.3
4.272	-12.1	20.6	8.5	46.0	-37.5
18.245	-8.6	21.1	12.5	50.0	-37.5
0.226	-5.6	20.6	15.0	52.6	-37.6
0.185	-4.5	20.8	16.3	54.3	-38.0
28.314	-12.8	21.5	8.7	50.0	-41.3
13.902	-12.5	21.0	8.5	50.0	-41.5
23.127	-12.8	21.3	8.5	50.0	-41.5

CONCLUSION

Pass

Christine Hamilton

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

EUT:	RM148221	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2021-11-22
Customer:	Traffic & Parking Control Co., Inc	Temperature:	23.5°C
Attendees:	Roman Marjamaa	Relative Humidity:	20.9%
Customer Project:	None	Bar. Pressure (PMSL):	1024 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	4.8 VDC via 110VAC/60Hz	Configuration:	TRPA0008-5

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	4	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

Yagi Antenna.

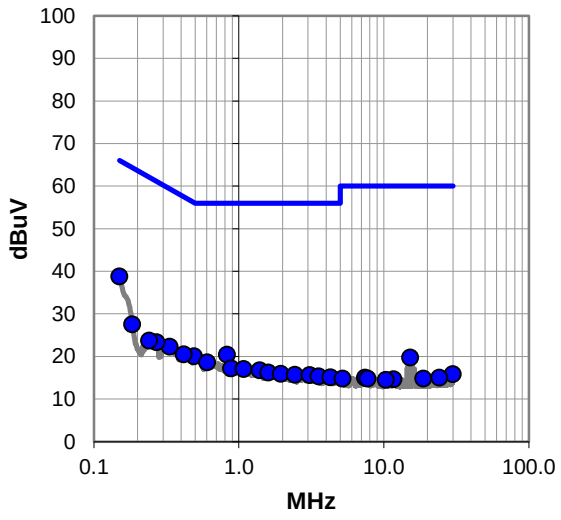
EUT OPERATING MODES

Transmitting Mid Ch 915 MHz, 123k data rate. Mid Power, Yagi antenna.

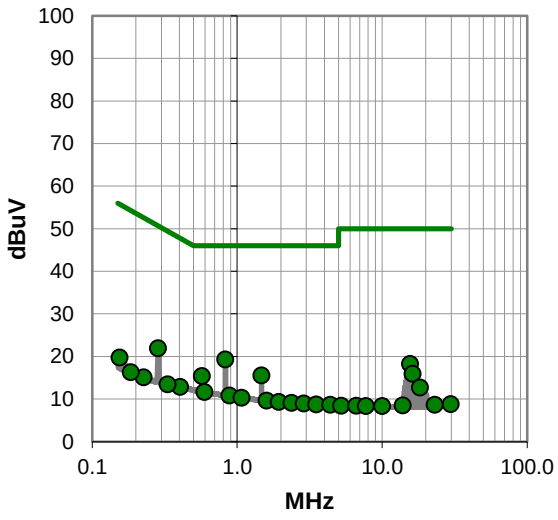
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

RESULTS - Run #4

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	17.8	21.0	38.8	66.0	-27.2
0.830	-0.1	20.5	20.4	56.0	-35.6
0.491	-0.5	20.5	20.0	56.2	-36.2
0.183	6.7	20.8	27.5	64.3	-36.8
0.417	0.0	20.5	20.5	57.5	-37.0
0.334	1.8	20.5	22.3	59.4	-37.1
0.605	-1.8	20.4	18.6	56.0	-37.4
0.271	2.8	20.5	23.3	61.1	-37.8
0.240	3.1	20.6	23.7	62.1	-38.4
0.887	-3.3	20.5	17.2	56.0	-38.8
1.079	-3.5	20.5	17.0	56.0	-39.0
1.392	-3.8	20.5	16.7	56.0	-39.3
1.596	-4.3	20.5	16.2	56.0	-39.8
1.947	-4.6	20.5	15.9	56.0	-40.1
15.251	-1.4	21.1	19.7	60.0	-40.3
2.442	-4.9	20.6	15.7	56.0	-40.3
3.084	-5.0	20.6	15.6	56.0	-40.4
3.554	-5.3	20.6	15.3	56.0	-40.7
4.291	-5.5	20.6	15.1	56.0	-40.9
30.000	-5.8	21.6	15.8	60.0	-44.2
7.417	-5.8	20.8	15.0	60.0	-45.0
24.183	-6.3	21.3	15.0	60.0	-45.0
5.209	-5.8	20.6	14.8	60.0	-45.2
7.718	-6.0	20.8	14.8	60.0	-45.2
18.707	-6.3	21.1	14.8	60.0	-45.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.830	-1.2	20.5	19.3	46.0	-26.7
0.285	1.4	20.5	21.9	50.7	-28.8
1.470	-5.0	20.5	15.5	46.0	-30.5
0.570	-5.0	20.4	15.4	46.0	-30.6
15.618	-2.9	21.1	18.2	50.0	-31.8
16.228	-5.2	21.1	15.9	50.0	-34.1
0.596	-8.8	20.4	11.6	46.0	-34.4
0.404	-7.7	20.5	12.8	47.8	-35.0
0.884	-9.7	20.5	10.8	46.0	-35.2
1.076	-10.2	20.5	10.3	46.0	-35.7
0.331	-7.1	20.5	13.4	49.4	-36.0
0.154	-1.2	20.9	19.7	55.8	-36.1
1.596	-10.9	20.5	9.6	46.0	-36.4
1.943	-11.2	20.5	9.3	46.0	-36.7
2.369	-11.5	20.6	9.1	46.0	-36.9
2.885	-11.7	20.6	8.9	46.0	-37.1
3.510	-11.9	20.6	8.7	46.0	-37.3
18.243	-8.4	21.1	12.7	50.0	-37.3
4.386	-12.0	20.6	8.6	46.0	-37.4
0.226	-5.5	20.6	15.1	52.6	-37.5
0.185	-4.5	20.8	16.3	54.3	-38.0
29.751	-12.8	21.6	8.8	50.0	-41.2
23.129	-12.7	21.3	8.6	50.0	-41.4
13.902	-12.5	21.0	8.5	50.0	-41.5
5.215	-12.2	20.6	8.4	50.0	-41.6

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

EUT:	RM148221	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2021-11-22
Customer:	Traffic & Parking Control Co., Inc	Temperature:	23.5°C
Attendees:	Roman Marjamaa	Relative Humidity:	20.9%
Customer Project:	None	Bar. Pressure (PMSL):	1024 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	4.8 VDC via 110VAC/60Hz	Configuration:	TRPA0008-2

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	5	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

Omni Antenna.

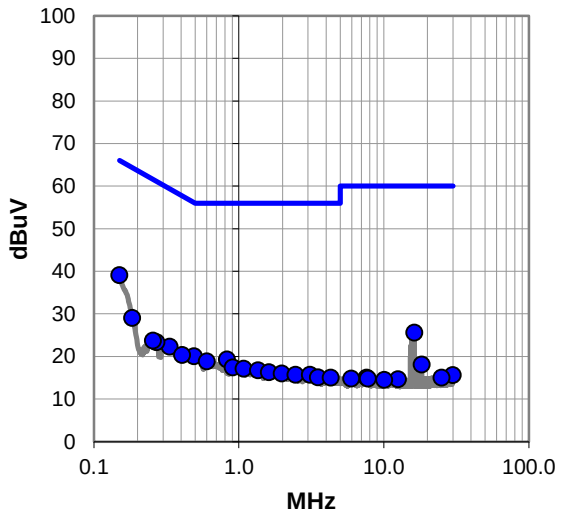
EUT OPERATING MODES

Transmitting Mid Ch 915 MHz, 123k data rate. High Power, Omni antenna.

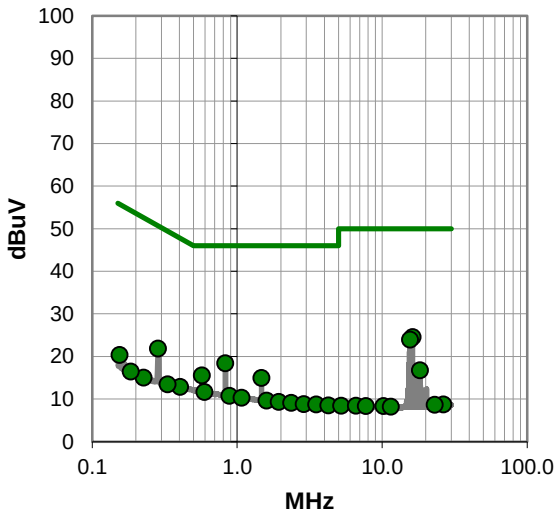
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

RESULTS - Run #5

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	18.1	21.0	39.1	66.0	-26.9
16.228	4.5	21.1	25.6	60.0	-34.4
0.183	8.2	20.8	29.0	64.3	-35.3
0.491	-0.5	20.5	20.0	56.2	-36.2
0.830	-1.2	20.5	19.3	56.0	-36.7
0.334	1.8	20.5	22.3	59.4	-37.1
0.601	-1.6	20.4	18.8	56.0	-37.2
0.407	-0.2	20.5	20.3	57.7	-37.4
0.271	2.8	20.5	23.3	61.1	-37.8
0.256	3.1	20.6	23.7	61.6	-37.9
0.907	-3.1	20.5	17.4	56.0	-38.6
1.079	-3.4	20.5	17.1	56.0	-38.9
1.356	-3.8	20.5	16.7	56.0	-39.3
1.612	-4.2	20.5	16.3	56.0	-39.7
1.975	-4.5	20.5	16.0	56.0	-40.0
2.457	-4.9	20.6	15.7	56.0	-40.3
3.095	-4.9	20.6	15.7	56.0	-40.3
3.513	-5.5	20.6	15.1	56.0	-40.9
4.297	-5.6	20.6	15.0	56.0	-41.0
18.243	-3.0	21.1	18.1	60.0	-41.9
29.996	-6.0	21.6	15.6	60.0	-44.4
7.622	-5.8	20.8	15.0	60.0	-45.0
24.991	-6.3	21.3	15.0	60.0	-45.0
5.970	-5.8	20.6	14.8	60.0	-45.2
7.786	-6.0	20.8	14.8	60.0	-45.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
16.228	3.4	21.1	24.5	50.0	-25.5
15.618	2.8	21.1	23.9	50.0	-26.1
0.830	-2.1	20.5	18.4	46.0	-27.6
0.285	1.3	20.5	21.8	50.7	-28.9
0.570	-4.9	20.4	15.5	46.0	-30.5
1.470	-5.6	20.5	14.9	46.0	-31.1
18.243	-4.4	21.1	16.7	50.0	-33.3
0.596	-8.8	20.4	11.6	46.0	-34.4
0.404	-7.7	20.5	12.8	47.8	-35.0
0.884	-9.8	20.5	10.7	46.0	-35.3
0.154	-0.6	20.9	20.3	55.8	-35.5
1.076	-10.2	20.5	10.3	46.0	-35.7
0.331	-7.1	20.5	13.4	49.4	-36.0
1.598	-10.9	20.5	9.6	46.0	-36.4
1.943	-11.2	20.5	9.3	46.0	-36.7
2.367	-11.5	20.6	9.1	46.0	-36.9
2.881	-11.8	20.6	8.8	46.0	-37.2
3.508	-11.9	20.6	8.7	46.0	-37.3
4.272	-12.1	20.6	8.5	46.0	-37.5
0.226	-5.6	20.6	15.0	52.6	-37.6
0.185	-4.4	20.8	16.4	54.3	-37.9
26.487	-12.7	21.4	8.7	50.0	-41.3
23.129	-12.7	21.3	8.6	50.0	-41.4
5.237	-12.2	20.6	8.4	50.0	-41.6
6.611	-12.4	20.8	8.4	50.0	-41.6

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

EUT:	RM148221	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2021-11-22
Customer:	Traffic & Parking Control Co., Inc	Temperature:	23.5°C
Attendees:	Roman Marjamaa	Relative Humidity:	20.9%
Customer Project:	None	Bar. Pressure (PMSL):	1024 mb
Tested By:	Christopher Heintzelman	Job Site:	MN03
Power:	4.8 VDC via 110VAC/60Hz	Configuration:	TRPA0008-2

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	6	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

Omni Antenna.

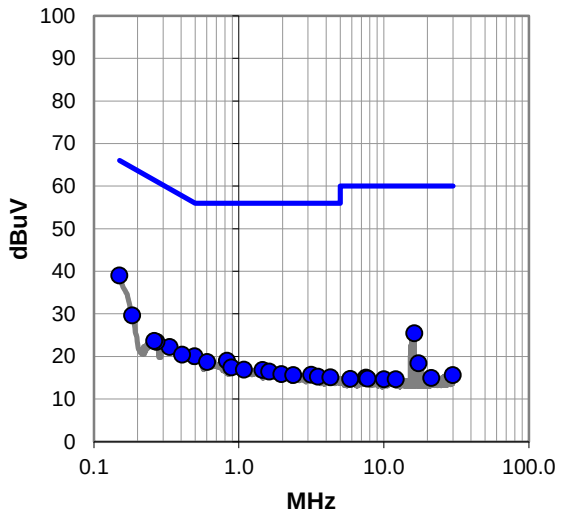
EUT OPERATING MODES

Transmitting Mid Ch 915 MHz, 123k data rate. High Power, Omni antenna.

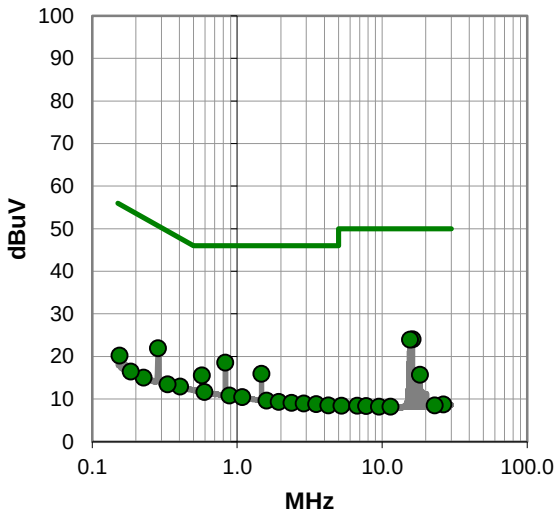
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

RESULTS - Run #6

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.150	18.0	21.0	39.0	66.0	-27.0
16.228	4.3	21.1	25.4	60.0	-34.6
0.183	8.8	20.8	29.6	64.3	-34.7
0.495	-0.5	20.5	20.0	56.1	-36.1
0.830	-1.5	20.5	19.0	56.0	-37.0
0.334	1.7	20.5	22.2	59.4	-37.2
0.605	-1.7	20.4	18.7	56.0	-37.3
0.407	-0.1	20.5	20.4	57.7	-37.3
0.271	2.9	20.5	23.4	61.1	-37.7
0.261	3.0	20.6	23.6	61.4	-37.8
0.891	-3.1	20.5	17.4	56.0	-38.6
1.085	-3.6	20.5	16.9	56.0	-39.1
1.454	-3.7	20.5	16.8	56.0	-39.2
1.623	-4.1	20.5	16.4	56.0	-39.6
1.970	-4.7	20.5	15.8	56.0	-40.2
3.157	-4.9	20.6	15.7	56.0	-40.3
2.375	-5.0	20.6	15.6	56.0	-40.4
3.518	-5.4	20.6	15.2	56.0	-40.8
4.290	-5.5	20.6	15.1	56.0	-40.9
17.387	-2.7	21.1	18.4	60.0	-41.6
29.996	-6.0	21.6	15.6	60.0	-44.4
7.529	-5.8	20.8	15.0	60.0	-45.0
21.249	-6.4	21.3	14.9	60.0	-45.1
7.732	-6.0	20.8	14.8	60.0	-45.2
5.871	-5.9	20.6	14.7	60.0	-45.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
16.228	2.9	21.1	24.0	50.0	-26.0
15.618	2.8	21.1	23.9	50.0	-26.1
0.830	-2.0	20.5	18.5	46.0	-27.5
0.285	1.4	20.5	21.9	50.7	-28.8
1.470	-4.6	20.5	15.9	46.0	-30.1
0.570	-4.9	20.4	15.5	46.0	-30.5
18.243	-5.4	21.1	15.7	50.0	-34.3
0.596	-8.8	20.4	11.6	46.0	-34.4
0.404	-7.6	20.5	12.9	47.8	-34.9
0.884	-9.7	20.5	10.8	46.0	-35.2
0.154	-0.7	20.9	20.2	55.8	-35.6
1.086	-10.1	20.5	10.4	46.0	-35.6
0.331	-7.1	20.5	13.4	49.4	-36.0
1.596	-10.9	20.5	9.6	46.0	-36.4
1.943	-11.2	20.5	9.3	46.0	-36.7
2.371	-11.5	20.6	9.1	46.0	-36.9
2.888	-11.7	20.6	8.9	46.0	-37.1
3.510	-11.8	20.6	8.8	46.0	-37.2
4.272	-12.1	20.6	8.5	46.0	-37.5
0.226	-5.6	20.6	15.0	52.6	-37.6
0.185	-4.4	20.8	16.4	54.3	-37.9
26.488	-12.7	21.4	8.7	50.0	-41.3
23.127	-12.8	21.3	8.5	50.0	-41.5
5.259	-12.2	20.6	8.4	50.0	-41.6
6.732	-12.4	20.8	8.4	50.0	-41.6

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

TEST DESCRIPTION

The measurement was performed in a radiated configuration in a semi-anechoic chamber. The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies (in no-hop, single channel mode) 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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2020-12-27	2021-12-27
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2022-1-17	2023-1-17
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HGS	2021-06-28	2022-06-28
Antenna - Double Ridge	ETS Lindgren	3115	AIB	2020-09-03	2022-09-03
Antenna - Standard Gain	ETS-Lindgren	3160-07	AJJ	NCR	NCR
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	2021-02-01	2022-02-01
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2021-02-01	2022-02-01
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	2021-02-01	2022-02-01
Antenna - Biconilog	Teseq	CBL 6141B	AYD	2020-02-05	2022-02-05
Cable	Element	Double Ridge Guide Horn Cables	MNV	2021-02-01	2022-02-01
Cable	Element	Standard Gain Cable	MNW	2021-02-01	2022-02-01
Cable	Element	Biconilog Cable	MNX	2021-02-01	2022-02-01
Attenuator	Coaxicom	3910-10	AWZ	2021-09-10	2022-09-10
Attenuator	Coaxicom	3910-20	AXY	2021-09-10	2022-09-10
Filter - High Pass	Micro-Tronics	HPM50108	HFW	2021-09-10	2022-09-10
Filter - Low Pass	Micro-Tronics	LPM50003	HGL	2021-09-10	2022-09-10
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2021-09-14	2023-09-14
Cable	ESM Cable Corp.	Bilog Cables	MNH	2021-10-13	2022-10-13
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2021-10-13	2022-10-13
Antenna - Double Ridge	ETS Lindgren	3115	AJQ	2021-01-25	2023-01-25
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2022-01-18	2023-01-18

SPURIOUS RADIATED EMISSIONS

element
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Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2022-01-18	2023-01-18
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	NCR
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	2022-01-18	2023-01-18
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2022-01-18	2023-01-18

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 12400 MHz

POWER INVESTIGATED

4.8 VDC

CONFIGURATIONS INVESTIGATED

TRPA0008-3
TRPA0008-4
TRPA0008-5

MODES INVESTIGATED

Continuous Transmit, high power on Mid, and High Chs (915, and 927.6 MHz), 123k data rate, duty cycle >99%. See comments for transmit channel and antenna orientation.
Continuous Transmit, high power on Low, Mid, and High Chs (902.4, 915, and 927.6 MHz), 123k data rate, duty cycle >99%. See comments for transmit channel and antenna orientation.
Continuous Transmit, mid power on Low, Mid, and High Chs (902.4, 915, and 927.6 MHz), 123k data rate, duty cycle >99%. See comments for transmit channel and antenna orientation.

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

EUT:	RM148221	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2021-11-17
Customer:	Traffic & Parking Control Co., Inc	Temperature:	23.8°C
Attendees:	Roman Marjamaa	Relative Humidity:	26.2%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mb
Tested By:	Dan Haas, Christopher Heintzelman	Job Site:	MN09
Power:	4.8 VDC	Configuration:	TRPA0008-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	22	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

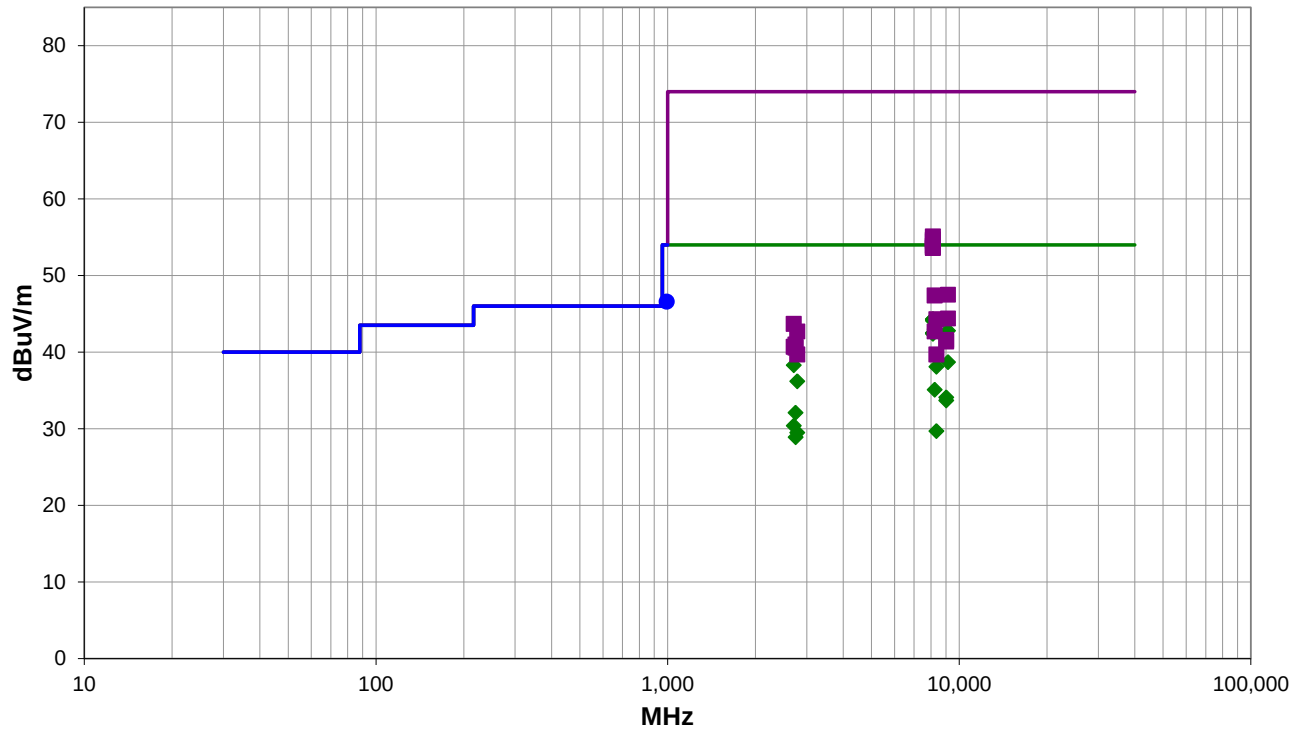
Puck Antenna. Radio module plastic case cover used to stabilize SMA connector.

EUT OPERATING MODES

Continuous Transmit, high power on Low, Mid, and High Chs (902.4, 915, and 927.6 MHz), 123k data rate, duty cycle >99%. See comments for transmit channel and antenna orientation.

DEVIATIONS FROM TEST STANDARD

None



Run #: 22 PK AV QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

RESULTS - Run #22

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
992.458	24.4	12.2	1.0	288.0	3.0	10.0	Vert	QP	0.0	46.6	54.0	-7.4	Low Ch, EUT Vert
8121.217	30.4	13.9	1.3	118.0	3.0	0.0	Vert	AV	0.0	44.3	54.0	-9.7	Low ch., Vert antenna
8121.792	30.4	13.9	1.1	119.0	3.0	0.0	Vert	AV	0.0	44.3	54.0	-9.7	Low ch., antenna on side (Y)
8121.925	30.2	13.9	1.3	114.0	3.0	0.0	Vert	AV	0.0	44.1	54.0	-9.9	Low ch., antenna on side (Z)
8234.483	53.0	-10.0	1.1	118.0	3.0	0.0	Vert	AV	0.0	43.0	54.0	-11.0	Mid ch, vert antenna
9149.408	53.1	-10.3	1.3	260.0	3.0	0.0	Vert	AV	0.0	42.8	54.0	-11.2	Mid ch, vert antenna
8122.200	28.6	13.9	1.4	335.0	3.0	0.0	Horz	AV	0.0	42.5	54.0	-11.5	Low ch., Vert antenna
8121.792	28.6	13.9	1.3	308.0	3.0	0.0	Horz	AV	0.0	42.5	54.0	-11.5	Low ch., antenna on side (Y)
8121.975	28.5	13.9	1.3	132.0	3.0	0.0	Horz	AV	0.0	42.4	54.0	-11.6	Low ch., antenna on side (Z)
9149.383	49.0	-10.3	1.1	257.0	3.0	0.0	Horz	AV	0.0	38.7	54.0	-15.3	Mid ch, vert antenna
2707.150	41.1	-2.8	3.9	75.0	3.0	0.0	Vert	AV	0.0	38.3	54.0	-15.7	Low ch., Vert antenna
8348.692	48.2	-10.1	1.3	120.0	3.0	0.0	Vert	AV	0.0	38.1	54.0	-15.9	High ch., Vert antenna
2782.775	38.9	-2.7	4.0	69.0	3.0	0.0	Vert	AV	0.0	36.2	54.0	-17.8	High ch., Vert antenna
8121.008	41.2	13.9	1.3	118.0	3.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9	Low ch., Vert antenna
8235.342	45.1	-10.0	1.0	248.0	3.0	0.0	Horz	AV	0.0	35.1	54.0	-18.9	Mid ch, vert antenna
8121.167	40.8	13.9	1.1	119.0	3.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	Low ch., antenna on side (Y)
8121.008	40.6	13.9	1.3	114.0	3.0	0.0	Vert	PK	0.0	54.5	74.0	-19.5	Low ch., antenna on side (Z)
9023.375	44.3	-10.2	1.0	258.0	3.0	0.0	Vert	AV	0.0	34.1	54.0	-19.9	Low ch, vert antenna
8120.542	40.0	13.9	1.4	335.0	3.0	0.0	Horz	PK	0.0	53.9	74.0	-20.1	Low ch., Vert antenna
8123.125	39.8	13.9	1.3	308.0	3.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	Low ch., antenna on side (Y)
9023.400	43.9	-10.2	1.1	203.0	3.0	0.0	Horz	AV	0.0	33.7	54.0	-20.3	Low ch, vert antenna
8119.200	39.7	13.9	1.3	132.0	3.0	0.0	Horz	PK	0.0	53.6	74.0	-20.4	Low ch., antenna on side (Z)
2744.900	34.8	-2.7	3.5	217.0	3.0	0.0	Vert	AV	0.0	32.1	54.0	-21.9	Mid ch., Vert antenna
2707.325	33.2	-2.8	3.9	360.0	3.0	0.0	Horz	AV	0.0	30.4	54.0	-23.6	Low ch., Vert antenna
8347.850	39.8	-10.1	1.2	343.0	3.0	0.0	Horz	AV	0.0	29.7	54.0	-24.3	High ch., Vert antenna
2782.725	32.2	-2.7	1.8	264.0	3.0	0.0	Horz	AV	0.0	29.5	54.0	-24.5	High ch., Vert antenna
2747.375	31.6	-2.7	2.0	319.0	3.0	0.0	Horz	AV	0.0	28.9	54.0	-25.1	Mid ch., Vert antenna
9149.342	57.8	-10.3	1.3	260.0	3.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	Mid ch, vert antenna
8234.275	57.4	-10.0	1.1	118.0	3.0	0.0	Vert	PK	0.0	47.4	74.0	-26.6	Mid ch, vert antenna
9149.450	54.7	-10.3	1.1	257.0	3.0	0.0	Horz	PK	0.0	44.4	74.0	-29.6	Mid ch, vert antenna
8348.883	54.4	-10.1	1.3	120.0	3.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	High ch., Vert antenna
2707.075	46.5	-2.8	3.9	75.0	3.0	0.0	Vert	PK	0.0	43.7	74.0	-30.3	Low ch., Vert antenna
2782.692	45.4	-2.7	4.0	69.0	3.0	0.0	Vert	PK	0.0	42.7	74.0	-31.3	High ch., Vert antenna
8235.283	52.7	-10.0	1.0	248.0	3.0	0.0	Horz	PK	0.0	42.7	74.0	-31.3	Mid ch, vert antenna
9023.567	51.8	-10.2	1.0	258.0	3.0	0.0	Vert	PK	0.0	41.6	74.0	-32.4	Low ch, vert antenna
9023.367	51.6	-10.2	1.1	203.0	3.0	0.0	Horz	PK	0.0	41.4	74.0	-32.6	Low ch, vert antenna
2745.100	43.7	-2.7	3.5	217.0	3.0	0.0	Vert	PK	0.0	41.0	74.0	-33.0	Mid ch., Vert antenna
2706.775	43.5	-2.8	3.9	360.0	3.0	0.0	Horz	PK	0.0	40.7	74.0	-33.3	Low ch., Vert antenna
2745.408	43.3	-2.7	2.0	319.0	3.0	0.0	Horz	PK	0.0	40.6	74.0	-33.4	Mid ch., Vert antenna
2783.083	42.4	-2.7	1.8	264.0	3.0	0.0	Horz	PK	0.0	39.7	74.0	-34.3	High ch., Vert antenna

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

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
8348.950	49.8	-10.1	1.2	343.0	3.0	0.0	Horz	PK	0.0	39.7	74.0	-34.3	High ch., Vert antenna

CONCLUSION
Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

EUT:	RM148221	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2021-11-17
Customer:	Traffic & Parking Control Co., Inc	Temperature:	24°C
Attendees:	Roman Marjamaa	Relative Humidity:	25.7%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mb
Tested By:	Dan Haas, Christopher Heintzelman	Job Site:	MN09
Power:	4.8 VDC	Configuration:	TRPA0008-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	31	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

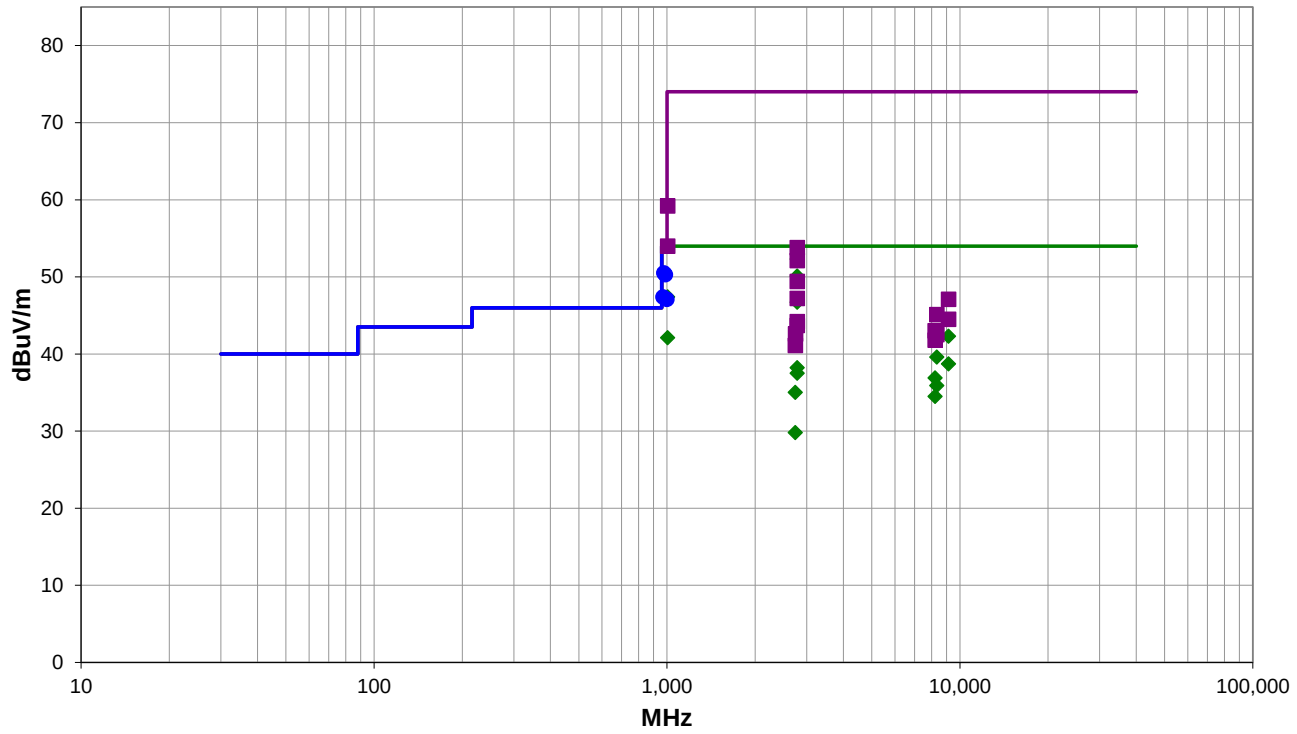
Whip Antenna. Radio module plastic case cover used to stabilize SMA connector.

EUT OPERATING MODES

Continuous Transmit, high power on Mid, and High Chs (915, and 927.6 MHz), 123k data rate, duty cycle >99%. See comments for transmit channel and antenna orientation.

DEVIATIONS FROM TEST STANDARD

None



Run #: 31 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

RESULTS - Run #31

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
2782.800	55.0	-2.7	4.0	220.0	3.0	0.0	Horz	AV	0.0	52.3	54.0	-1.7	High ch., EUT on side
975.054	28.0	12.5	1.0	17.0	3.0	10.0	Vert	QP	0.0	50.5	54.0	-3.5	Mid Ch, EUT Vert
987.655	28.0	12.3	1.0	330.0	3.0	10.0	Vert	QP	0.0	50.3	54.0	-3.7	High ch, EUT Vert
2782.758	52.8	-2.7	3.9	205.0	3.0	0.0	Vert	AV	0.0	50.1	54.0	-3.9	High ch., EUT on side
1005.000	37.2	-9.8	1.1	232.0	3.0	20.0	Horz	AV	0.0	47.4	54.0	-6.6	EUT Horz, Mid ch, 123k datarate
969.080	24.7	12.7	1.0	317.0	3.0	10.0	Vert	QP	0.0	47.4	54.0	-6.6	High ch, EUT Vert
998.049	25.1	12.0	1.0	208.0	3.0	10.0	Vert	QP	0.0	47.1	54.0	-6.9	Mid Ch, EUT Vert
2782.808	49.4	-2.7	1.0	118.0	3.0	0.0	Horz	AV	0.0	46.7	54.0	-7.3	High ch., EUT Horiz
2782.767	45.9	-2.7	1.0	217.0	3.0	0.0	Vert	AV	0.0	43.2	54.0	-10.8	High ch., EUT Vert
9149.433	52.6	-10.3	1.9	284.0	3.0	0.0	Horz	AV	0.0	42.3	54.0	-11.7	Mid ch., EUT on side
1005.025	31.9	-9.8	1.2	323.0	3.0	20.0	Vert	AV	0.0	42.1	54.0	-11.9	EUT Horz, Mid ch, 123k datarate
8347.958	49.7	-10.1	3.1	264.0	3.0	0.0	Vert	AV	0.0	39.6	54.0	-14.4	High ch., EUT on side
1005.050	49.0	-9.8	1.1	232.0	3.0	20.0	Horz	PK	0.0	59.2	74.0	-14.8	EUT Horz, Mid ch, 123k datarate
9149.475	49.0	-10.3	4.0	293.0	3.0	0.0	Vert	AV	0.0	38.7	54.0	-15.3	Mid ch., EUT on side
2782.758	40.9	-2.7	1.3	208.0	3.0	0.0	Horz	AV	0.0	38.2	54.0	-15.8	High ch., EUT Vert
2782.725	40.2	-2.7	1.3	35.0	3.0	0.0	Vert	AV	0.0	37.5	54.0	-16.5	High ch., EUT Horiz
8234.517	46.9	-10.0	3.3	268.0	3.0	0.0	Vert	AV	0.0	36.9	54.0	-17.1	Mid ch., EUT on side
8348.050	46.0	-10.1	2.1	311.0	3.0	0.0	Horz	AV	0.0	35.9	54.0	-18.1	High ch., EUT on side
2744.950	37.7	-2.7	1.3	50.0	3.0	0.0	Horz	AV	0.0	35.0	54.0	-19.0	Mid ch., EUT on side
8234.567	44.5	-10.0	2.0	308.0	3.0	0.0	Horz	AV	0.0	34.5	54.0	-19.5	Mid ch., EUT on side
1006.025	43.8	-9.8	1.2	323.0	3.0	20.0	Vert	PK	0.0	54.0	74.0	-20.0	EUT Horz, Mid ch, 123k datarate
2782.642	56.5	-2.7	4.0	220.0	3.0	0.0	Horz	PK	0.0	53.8	74.0	-20.2	High ch., EUT on side
2782.592	54.8	-2.7	3.9	205.0	3.0	0.0	Vert	PK	0.0	52.1	74.0	-21.9	High ch., EUT on side
2744.875	32.5	-2.7	1.3	310.0	3.0	0.0	Vert	AV	0.0	29.8	54.0	-24.2	Mid ch., EUT on side
2782.500	52.1	-2.7	1.0	118.0	3.0	0.0	Horz	PK	0.0	49.4	74.0	-24.6	High ch., EUT Horiz
2782.450	49.9	-2.7	1.0	217.0	3.0	0.0	Vert	PK	0.0	47.2	74.0	-26.8	High ch., EUT Vert
9149.267	57.4	-10.3	1.9	284.0	3.0	0.0	Horz	PK	0.0	47.1	74.0	-26.9	Mid ch., EUT on side
8348.675	55.2	-10.1	3.1	264.0	3.0	0.0	Vert	PK	0.0	45.1	74.0	-28.9	High ch., EUT on side
9150.258	54.8	-10.3	4.0	293.0	3.0	0.0	Vert	PK	0.0	44.5	74.0	-29.5	Mid ch., EUT on side
2783.025	46.9	-2.7	1.3	208.0	3.0	0.0	Horz	PK	0.0	44.2	74.0	-29.8	High ch., EUT Vert
2783.083	46.4	-2.7	1.3	35.0	3.0	0.0	Vert	PK	0.0	43.7	74.0	-30.3	High ch., EUT Horiz
8234.300	53.0	-10.0	3.3	268.0	3.0	0.0	Vert	PK	0.0	43.0	74.0	-31.0	Mid ch., EUT on side
2745.275	45.3	-2.7	1.3	50.0	3.0	0.0	Horz	PK	0.0	42.6	74.0	-31.4	Mid ch., EUT on side
8348.792	52.6	-10.1	2.1	311.0	3.0	0.0	Horz	PK	0.0	42.5	74.0	-31.5	High ch., EUT on side
8235.592	51.8	-10.0	2.0	308.0	3.0	0.0	Horz	PK	0.0	41.8	74.0	-32.2	Mid ch., EUT on side
2742.600	43.8	-2.7	1.3	310.0	3.0	0.0	Vert	PK	0.0	41.1	74.0	-32.9	Mid ch., EUT on side

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

CONCLUSION
Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

EUT:	RM148221	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2021-11-18
Customer:	Traffic & Parking Control Co., Inc	Temperature:	24.2°C
Attendees:	None	Relative Humidity:	24.1%
Customer Project:	None	Bar. Pressure (PMSL):	1022 mb
Tested By:	Christopher Heintzelman	Job Site:	MN09
Power:	4.8 VDC	Configuration:	TRPA0008-5

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	39	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

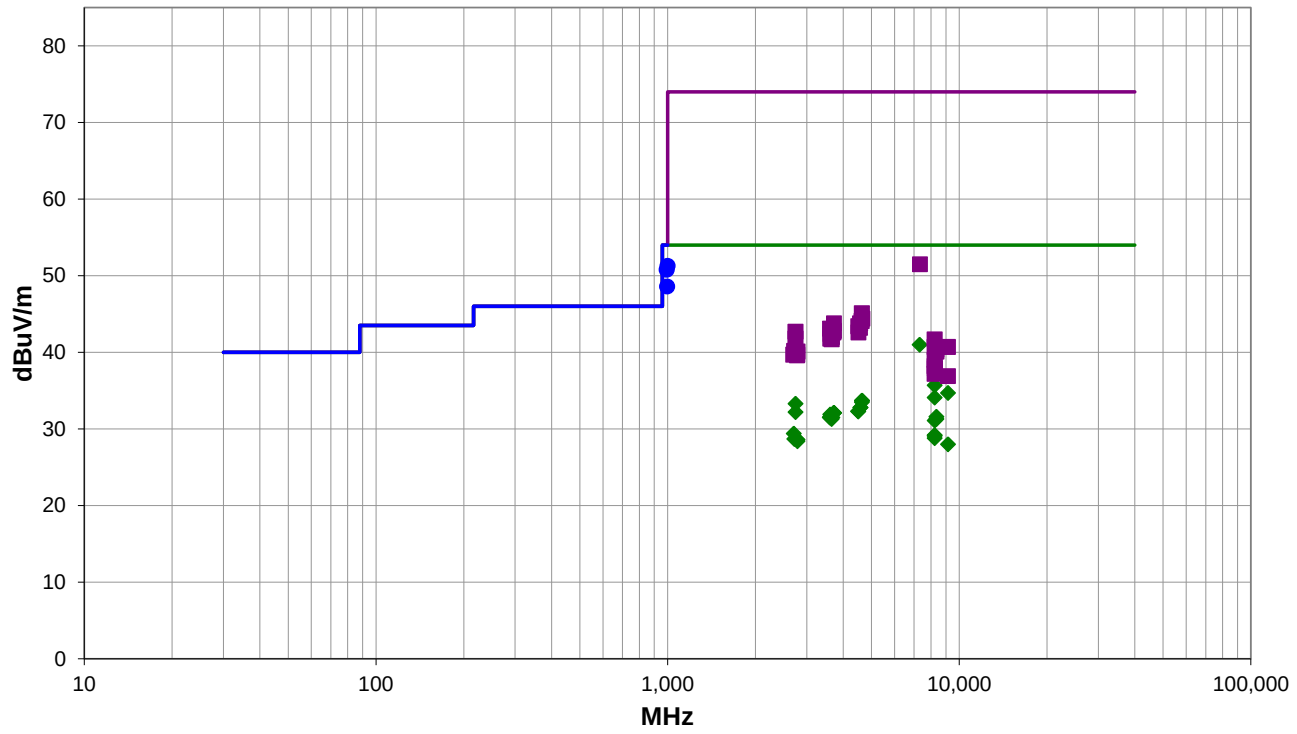
Yagi Antenna. Radio module plastic case cover used to stabilize SMA connector.

EUT OPERATING MODES

Continuous Transmit, mid power on Low, Mid, and High Chs (902.4, 915, and 927.6 MHz), 123k data rate, duty cycle >99%. See comments for transmit channel and antenna orientation.

DEVIATIONS FROM TEST STANDARD

None



Run #: 39 PK AV QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

RESULTS - Run #39

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
999.318	29.3	12.0	1.2	317.0	3.0	10.0	Horz	QP	0.0	51.3	54.0	-2.7	Low Ch, EUT Horz
992.460	28.6	12.2	1.3	309.0	3.0	10.0	Horz	QP	0.0	50.8	54.0	-3.2	Low Ch, EUT Horz
996.377	26.6	12.0	1.2	315.0	3.0	10.0	Horz	QP	0.0	48.6	54.0	-5.4	Low Ch, EUT Horz
7311.917	28.0	13.0	1.9	105.0	3.0	0.0	Vert	AV	0.0	41.0	54.0	-13.0	Mid Ch, EUT Horz, noise floor, 123k data rate
8234.500	45.7	-10.0	1.1	108.0	3.0	0.0	Vert	AV	0.0	35.7	54.0	-18.3	Mid Ch, EUT Horz, 123k data rate
9149.458	45.0	-10.3	3.0	9.0	3.0	0.0	Vert	AV	0.0	34.7	54.0	-19.3	Mid Ch, EUT Horz, 123k data rate
8234.667	44.1	-10.0	1.1	102.0	3.0	0.0	Vert	AV	0.0	34.1	54.0	-19.9	Mid Ch, EUT Vert, 123k data rate
4641.375	29.4	4.3	1.5	88.0	3.0	0.0	Horz	AV	0.0	33.7	54.0	-20.3	High Ch, EUT Horz, 123k data rate
4637.708	29.5	4.2	3.7	199.0	3.0	0.0	Vert	AV	0.0	33.7	54.0	-20.3	High Ch, EUT Horz, 123k data rate
4635.458	29.3	4.2	1.5	178.0	3.0	0.0	Horz	AV	0.0	33.5	54.0	-20.5	High Ch, EUT On Side, 123k data rate
2744.958	36.0	-2.7	1.5	41.0	3.0	0.0	Horz	AV	0.0	33.3	54.0	-20.7	Mid Ch, EUT On Side, 123k data rate
4582.208	28.8	4.0	1.5	144.0	3.0	0.0	Vert	AV	0.0	32.8	54.0	-21.2	Mid Ch, EUT Horz, 123k data rate
4584.208	28.8	4.0	2.4	125.0	3.0	0.0	Horz	AV	0.0	32.8	54.0	-21.2	Mid Ch, EUT On Side, 123k data rate
4502.167	28.7	3.6	1.5	86.0	3.0	0.0	Horz	AV	0.0	32.3	54.0	-21.7	Low Ch, EUT On Side, 123k data rate
4502.917	28.7	3.6	1.5	52.0	3.0	0.0	Vert	AV	0.0	32.3	54.0	-21.7	Low Ch, EUT Horz, 123k data rate
2745.000	34.9	-2.7	1.5	274.0	3.0	0.0	Vert	AV	0.0	32.2	54.0	-21.8	Mid Ch, EUT Horz, 123k data rate
3718.358	30.7	1.4	3.8	112.0	3.0	0.0	Horz	AV	0.0	32.1	54.0	-21.9	High Ch, EUT On Side, 123k data rate
3710.442	30.7	1.4	1.5	112.0	3.0	0.0	Vert	AV	0.0	32.1	54.0	-21.9	High Ch, EUT Horz, 123k data rate
3720.567	30.7	1.4	1.5	74.0	3.0	0.0	Vert	AV	0.0	32.1	54.0	-21.9	High Ch, EUT Horz, 123k data rate
3611.992	31.4	0.5	1.5	75.0	3.0	0.0	Horz	AV	0.0	31.9	54.0	-22.1	Low Ch, EUT On Side, 123k data rate
3609.683	31.1	0.5	1.5	275.0	3.0	0.0	Vert	AV	0.0	31.6	54.0	-22.4	Low Ch, EUT Horz, 123k data rate
8347.900	41.7	-10.1	3.8	236.0	3.0	0.0	Vert	AV	0.0	31.6	54.0	-22.4	High Ch, EUT Horz, 123k data rate
7331.042	38.4	13.1	1.9	105.0	3.0	0.0	Vert	PK	0.0	51.5	74.0	-22.5	Mid Ch, EUT Horz, noise floor, 123k data rate
3671.542	30.3	1.2	1.5	135.0	3.0	0.0	Horz	AV	0.0	31.5	54.0	-22.5	Mid Ch, EUT On Side, 123k data rate
3597.267	31.1	0.4	1.5	83.0	3.0	0.0	Horz	AV	0.0	31.5	54.0	-22.5	Low Ch, EUT On Side, 123k data rate
3650.458	30.3	1.0	1.6	332.0	3.0	0.0	Vert	AV	0.0	31.3	54.0	-22.7	Mid Ch, EUT Horz, 123k data rate
8348.733	41.4	-10.1	2.1	314.0	3.0	0.0	Horz	AV	0.0	31.3	54.0	-22.7	High Ch, EUT On Side, 123k data rate
8235.292	41.1	-10.0	2.3	313.0	3.0	0.0	Horz	AV	0.0	31.1	54.0	-22.9	Mid Ch, EUT On Side, 123k data rate
2707.158	32.2	-2.8	2.1	162.0	3.0	0.0	Horz	AV	0.0	29.4	54.0	-24.6	Low Ch, EUT On Side, 123k data rate
8234.708	39.2	-10.0	1.1	172.0	3.0	0.0	Horz	AV	0.0	29.2	54.0	-24.8	Mid Ch, EUT Vert, 123k data rate
8234.583	39.1	-10.0	1.5	222.0	3.0	0.0	Vert	AV	0.0	29.1	54.0	-24.9	Mid Ch, EUT On Side, 123k data rate
8234.750	38.8	-10.0	1.4	169.0	3.0	0.0	Horz	AV	0.0	28.8	54.0	-25.2	Mid Ch, EUT Horz, 123k data rate
2718.533	31.4	-2.7	2.9	179.0	3.0	0.0	Vert	AV	0.0	28.7	54.0	-25.3	Low Ch, EUT Horz, 123k data rate
2782.883	31.3	-2.7	1.5	78.0	3.0	0.0	Horz	AV	0.0	28.6	54.0	-25.4	High Ch, EUT On Side, 123k data rate
2787.050	31.3	-2.7	3.9	194.0	3.0	0.0	Vert	AV	0.0	28.6	54.0	-25.4	High Ch, EUT Horz, 123k data rate
2786.758	31.1	-2.7	1.5	224.0	3.0	0.0	Vert	AV	0.0	28.4	54.0	-25.6	High Ch, EUT Horz, 123k data rate
9149.375	38.3	-10.3	1.5	194.0	3.0	0.0	Horz	AV	0.0	28.0	54.0	-26.0	Mid Ch, EUT On Side, 123k data rate
4633.292	40.9	4.2	1.5	88.0	3.0	0.0	Horz	PK	0.0	45.1	74.0	-28.9	High Ch, EUT Horz, 123k data rate
4650.500	40.1	4.3	1.5	178.0	3.0	0.0	Horz	PK	0.0	44.4	74.0	-29.6	High Ch, EUT On Side, 123k data rate
4628.250	39.9	4.2	3.7	199.0	3.0	0.0	Vert	PK	0.0	44.1	74.0	-29.9	High Ch, EUT Horz, 123k data rate

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

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
4569.667	40.0	3.8	1.5	144.0	3.0	0.0	Vert	PK	0.0	43.8	74.0	-30.2	Mid Ch, EUT Horz, 123k data rate
3718.358	42.4	1.4	3.8	112.0	3.0	0.0	Horz	PK	0.0	43.8	74.0	-30.2	High Ch, EUT On Side, 123k data rate
4506.125	39.8	3.6	1.5	52.0	3.0	0.0	Vert	PK	0.0	43.4	74.0	-30.6	Low Ch, EUT Horz, 123k data rate
4566.917	39.4	3.8	2.4	125.0	3.0	0.0	Horz	PK	0.0	43.2	74.0	-30.8	Mid Ch, EUT On Side, 123k data rate
3608.342	42.6	0.5	1.5	75.0	3.0	0.0	Horz	PK	0.0	43.1	74.0	-30.9	Low Ch, EUT On Side, 123k data rate
3717.650	41.4	1.4	1.5	74.0	3.0	0.0	Vert	PK	0.0	42.8	74.0	-31.2	High Ch, EUT Horz, 123k data rate
2745.042	45.4	-2.7	1.5	41.0	3.0	0.0	Horz	PK	0.0	42.7	74.0	-31.3	Mid Ch, EUT On Side, 123k data rate
4510.208	39.0	3.6	1.5	86.0	3.0	0.0	Horz	PK	0.0	42.6	74.0	-31.4	Low Ch, EUT On Side, 123k data rate
3702.567	41.2	1.4	1.5	112.0	3.0	0.0	Vert	PK	0.0	42.6	74.0	-31.4	High Ch, EUT Horz, 123k data rate
3616.058	41.9	0.5	1.5	83.0	3.0	0.0	Horz	PK	0.0	42.4	74.0	-31.6	Low Ch, EUT On Side, 123k data rate
3658.167	40.9	1.1	1.5	135.0	3.0	0.0	Horz	PK	0.0	42.0	74.0	-32.0	Mid Ch, EUT On Side, 123k data rate
2744.750	44.5	-2.7	1.5	274.0	3.0	0.0	Vert	PK	0.0	41.8	74.0	-32.2	Mid Ch, EUT Horz, 123k data rate
3609.933	41.3	0.5	1.5	275.0	3.0	0.0	Vert	PK	0.0	41.8	74.0	-32.2	Low Ch, EUT Horz, 123k data rate
8234.583	51.7	-10.0	1.1	108.0	3.0	0.0	Vert	PK	0.0	41.7	74.0	-32.3	Mid Ch, EUT Horz, 123k data rate
3649.917	40.7	1.0	1.6	332.0	3.0	0.0	Vert	PK	0.0	41.7	74.0	-32.3	Mid Ch, EUT Horz, 123k data rate
8234.333	50.7	-10.0	1.1	102.0	3.0	0.0	Vert	PK	0.0	40.7	74.0	-33.3	Mid Ch, EUT Vert, 123k data rate
9150.500	51.0	-10.3	3.0	9.0	3.0	0.0	Vert	PK	0.0	40.7	74.0	-33.3	Mid Ch, EUT Horz, 123k data rate
8347.775	50.5	-10.1	2.1	314.0	3.0	0.0	Horz	PK	0.0	40.4	74.0	-33.6	High Ch, EUT On Side, 123k data rate
2713.783	42.9	-2.7	2.9	179.0	3.0	0.0	Vert	PK	0.0	40.2	74.0	-33.8	Low Ch, EUT Horz, 123k data rate
2786.425	42.8	-2.7	1.5	78.0	3.0	0.0	Horz	PK	0.0	40.1	74.0	-33.9	High Ch, EUT On Side, 123k data rate
8347.900	50.2	-10.1	3.8	236.0	3.0	0.0	Vert	PK	0.0	40.1	74.0	-33.9	High Ch, EUT Horz, 123k data rate
2695.200	42.5	-2.8	2.1	162.0	3.0	0.0	Horz	PK	0.0	39.7	74.0	-34.3	Low Ch, EUT On Side, 123k data rate
2782.425	42.4	-2.7	3.9	194.0	3.0	0.0	Vert	PK	0.0	39.7	74.0	-34.3	High Ch, EUT Horz, 123k data rate
2778.092	42.3	-2.7	1.5	224.0	3.0	0.0	Vert	PK	0.0	39.6	74.0	-34.4	High Ch, EUT Horz, 123k data rate
8234.542	49.0	-10.0	2.3	313.0	3.0	0.0	Horz	PK	0.0	39.0	74.0	-35.0	Mid Ch, EUT On Side, 123k data rate
8234.417	48.2	-10.0	1.4	169.0	3.0	0.0	Horz	PK	0.0	38.2	74.0	-35.8	Mid Ch, EUT Horz, 123k data rate
8245.708	48.1	-10.2	1.1	172.0	3.0	0.0	Horz	PK	0.0	37.9	74.0	-36.1	Mid Ch, EUT Vert, 123k data rate
8234.333	47.2	-10.0	1.5	222.0	3.0	0.0	Vert	PK	0.0	37.2	74.0	-36.8	Mid Ch, EUT On Side, 123k data rate
9150.042	47.2	-10.3	1.5	194.0	3.0	0.0	Horz	PK	0.0	36.9	74.0	-37.1	Mid Ch, EUT On Side, 123k data rate

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

EUT:	Zulu	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2022-02-14
Customer:	Traffic & Parking Control Co., Inc	Temperature:	21.7°C
Attendees:	Roman Marjamaa	Relative Humidity:	15.8%
Customer Project:	None	Bar. Pressure (PMSL):	1029 mb
Tested By:	Christopher Heintzelman	Job Site:	MN05
Power:	4.8 VDC	Configuration:	TRPA0008-9

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	12	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

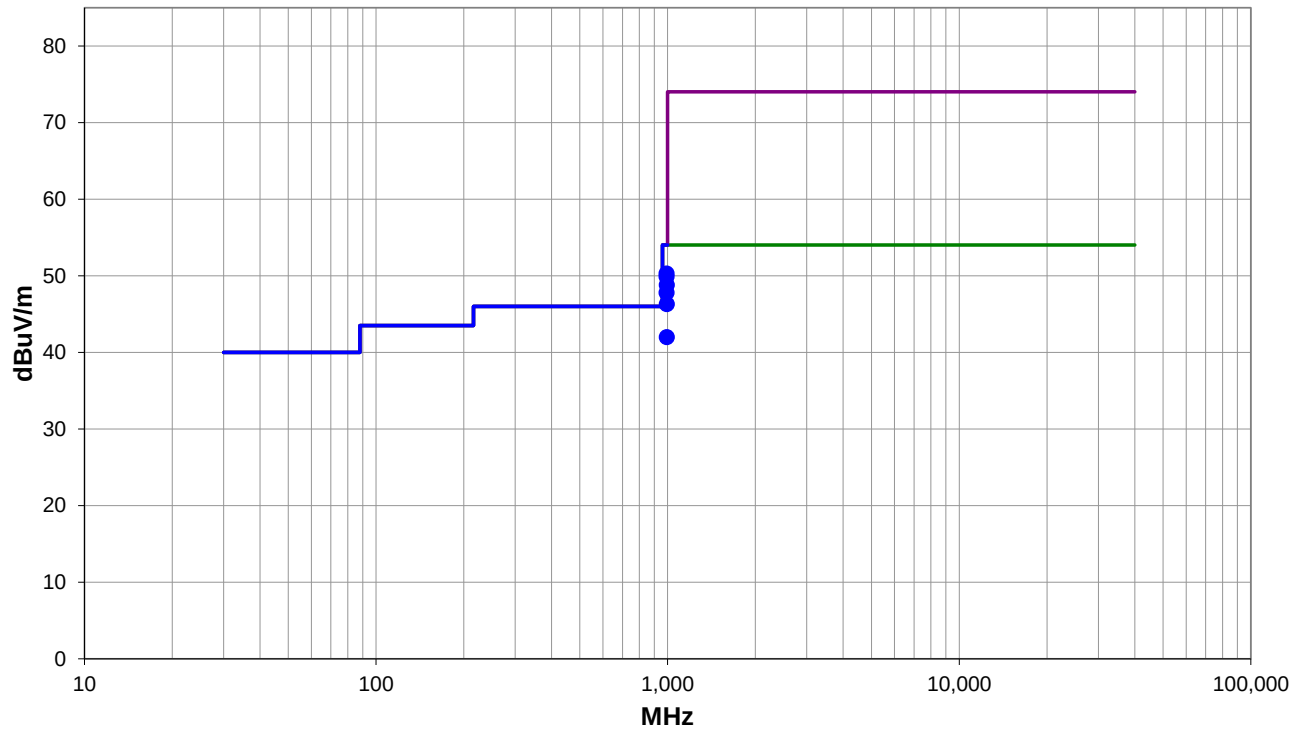
Puck Antenna. New u.fl adapter.

EUT OPERATING MODES

Continuous Transmit, high power on Low, Mid, and High Chs (902.4, 915, and 927.6 MHz), 123k data rate, duty cycle >99%. See comments for transmit channel and antenna orientation.

DEVIATIONS FROM TEST STANDARD

None



Run #: 12 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

RESULTS - Run #12

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
992.345	25.4	14.9	1.0	170.0	3.0	10.0	Vert	QP	0.0	50.3	54.0	-3.7	EUT Horz, High pwr, low ch
992.345	25.0	14.9	2.15	289.9	3.0	10.0	Horz	QP	0.0	49.9	54.0	-4.1	EUT Vert, High power, low Ch
992.450	23.9	14.9	1.0	110.9	3.0	10.0	Horz	QP	0.0	48.8	54.0	-5.2	EUT On Side, High power, low ch
992.345	22.9	14.9	3.18	246.0	3.0	10.0	Vert	QP	0.0	47.8	54.0	-6.2	EUT Vert, High power, low Ch
992.440	21.4	14.9	1.69	42.9	3.0	10.0	Vert	QP	0.0	46.3	54.0	-7.7	EUT On Side, High power, low ch
992.477	17.1	14.9	1.0	232.0	3.0	10.0	Horz	QP	0.0	42.0	54.0	-12.0	EUT Horz, High pwr, low ch

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

EUT:	Zulu	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2022-02-14
Customer:	Traffic & Parking Control Co., Inc	Temperature:	21.7°C
Attendees:	Roman Marjamaa	Relative Humidity:	15.8%
Customer Project:	None	Bar. Pressure (PMSL):	1029 mb
Tested By:	Christopher Heintzelman	Job Site:	MN05
Power:	4.8 VDC	Configuration:	TRPA0008-10

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	13	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

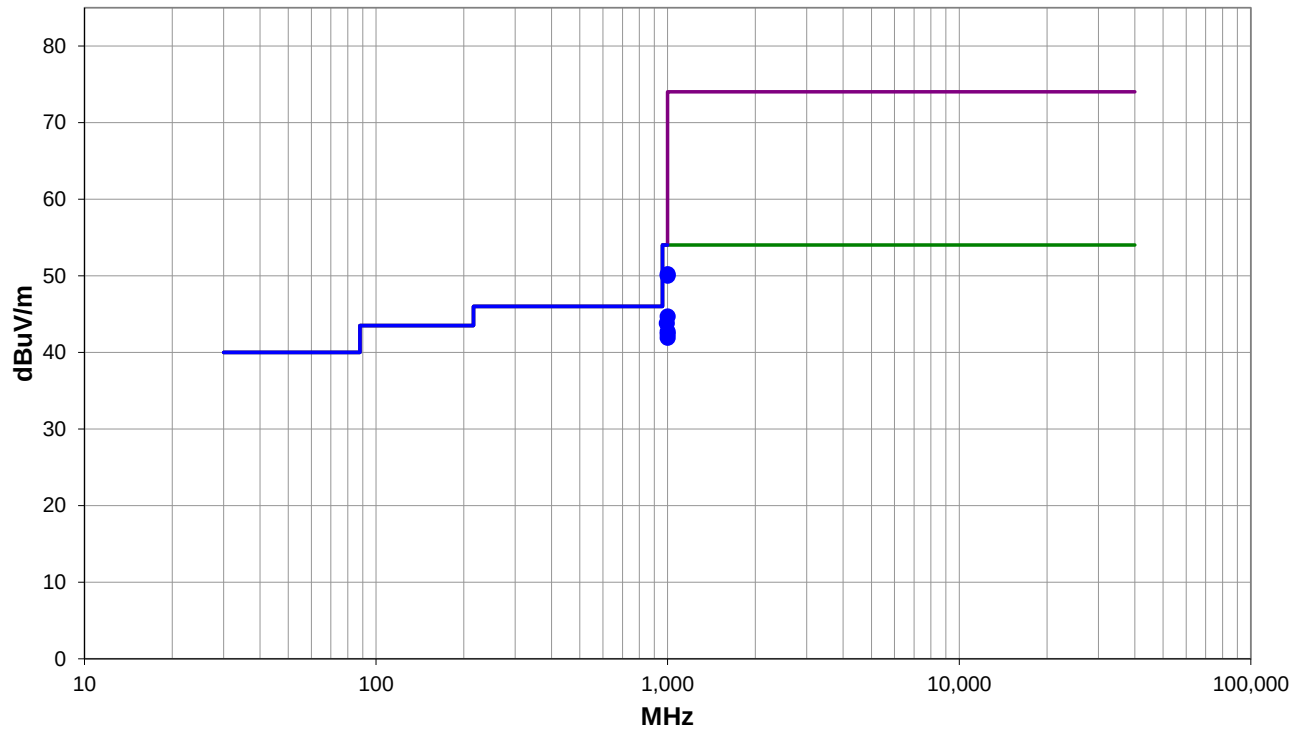
Yagi Antenna. New u.fl adapter.

EUT OPERATING MODES

Continuous Transmit, mid power on Low, Mid, and High Chs (902.4, 915, and 927.6 MHz), 123k data rate, duty cycle >99%. See comments for transmit channel and antenna orientation.

DEVIATIONS FROM TEST STANDARD

None



Run #: 13 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.09.09.0
PSA-ESCI 2021.03.17.0

RESULTS - Run #13

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
1000.000	25.4	14.8	1.07	66.9	3.0	10.0	Horz	QP	0.0	50.2	54.0	-3.8	EUT Horz, Mid Power, Low Ch
999.462	25.2	14.8	1.0	159.1	3.0	10.0	Vert	QP	0.0	50.0	54.0	-4.0	EUT Vert, Mid Power, Low Ch
1000.000	19.9	14.8	2.39	276.9	3.0	10.0	Horz	QP	0.0	44.7	54.0	-9.3	EUT On Side, Mid Power, Low Ch
992.442	18.9	14.9	1.0	332.0	3.0	10.0	Horz	QP	0.0	43.8	54.0	-10.2	EUT Horz, Mid Power, Low Ch
999.479	17.9	14.8	3.73	214.0	3.0	10.0	Vert	QP	0.0	42.7	54.0	-11.3	EUT On Side, Mid Power, Low Ch
999.952	17.6	14.8	1.0	160.0	3.0	10.0	Horz	QP	0.0	42.4	54.0	-11.6	EUT Vert, Mid Power, Low Ch
999.942	17.1	14.8	1.0	333.9	3.0	10.0	Vert	QP	0.0	41.9	54.0	-12.1	EUT Horz, Mid Power, Low Ch

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

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 (in no-hop, single channel mode) and the modes as showed in the data sheets.

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

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

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

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

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

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

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

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

RMS measurements taken for a FHSS radio also may have a duty cycle correction subtracted using the formula 10*log(DC), where DC is the worst-case dwell time of the radio while in a hopping mode in a 100 ms period.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	2021-05-21	2022-05-21
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HGS	2021-06-28	2022-06-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2021-09-14	2023-09-14
Cable	ESM Cable Corp.	Bilog Cables	MNH	2021-10-13	2022-10-13
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2021-10-13	2022-10-13
Antenna - Double Ridge	ETS Lindgren	3115	AJQ	2021-01-25	2023-01-25
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2022-01-18	2023-01-18
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2022-01-18	2023-01-18
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	NCR
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	2022-01-18	2023-01-18
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2022-01-18	2023-01-18

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

FREQUENCY RANGE INVESTIGATED

30 MHz TO 10000 MHz

POWER INVESTIGATED

4.8 VDC

CONFIGURATIONS INVESTIGATED

TRPA0008-11

MODES INVESTIGATED

Transmitting Low channel (902.4 MHz), Mid channel (915 MHz), and High channel (927.6 MHz), 123k data rate. High Power (power setting 83); >98% duty cycle

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

EUT:	Zulu	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2022-03-11
Customer:	Traffic & Parking Control Co., Inc	Temperature:	22.6°C
Attendees:	Roman Marjamaa	Relative Humidity:	16.3%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mb
Tested By:	Andrew Rogstad	Job Site:	MN05
Power:	4.8 VDC	Configuration:	TRPA0008-11

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	36	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

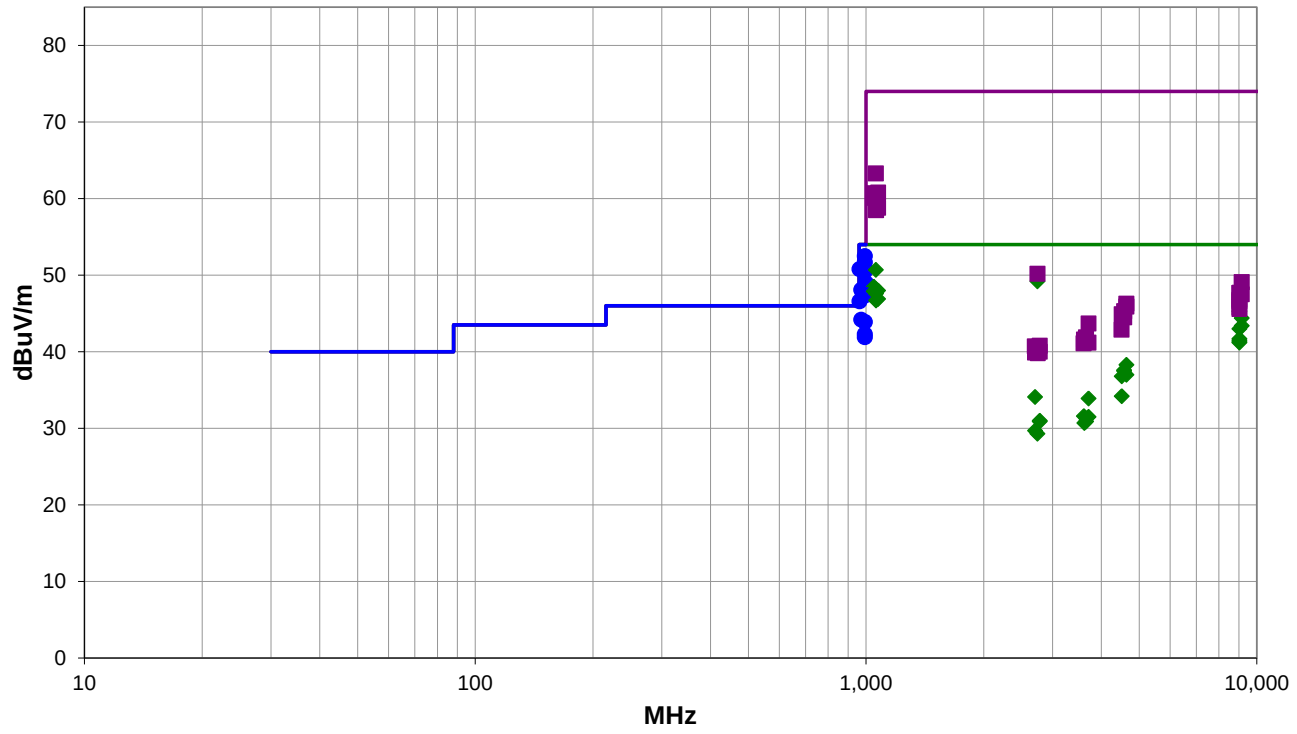
PCTEL 5.15 dBi Omni Antenna. New u.fl adapter. Test mode operates at 100% duty cycle.

EUT OPERATING MODES

Transmitting Low channel (902.4 MHz), Mid channel (915 MHz), and High channel (927.6 MHz), 123k data rate. High Power (power setting 83); >98% duty cycle

DEVIATIONS FROM TEST STANDARD

None



Run #: 36 PK AV QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

RESULTS - Run #36

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
992.454	27.6	14.9	1.3	348.9	0.0	10.0	Horz	QP	0.0	52.5	54.0	-1.5	Low ch, EUT on side, Power 83, >98% DC
992.442	26.8	14.9	2.1	196.0	0.0	10.0	Horz	QP	0.0	51.7	54.0	-2.3	Low ch, EUT horz, Power 83, >98% DC
992.347	25.9	14.9	1.7	207.9	0.0	10.0	Vert	QP	0.0	50.8	54.0	-3.2	Low ch, EUT vert, Power 83, >98% DC
962.453	36.8	14.0	1.5	311.9	0.0	0.0	Horz	QP	0.0	50.8	54.0	-3.2	Low ch, EUT on side
992.456	25.6	14.9	3.2	181.9	0.0	10.0	Horz	QP	0.0	50.5	54.0	-3.5	Low ch, EUT on side
1059.410	40.3	-9.6	2.8	153.9	0.0	20.0	Horz	AV	0.0	50.7	54.0	-3.3	High ch, EUT vert
999.320	34.2	14.8	2.1	153.0	0.0	0.0	Horz	QP	0.0	49.0	54.0	-5.0	Low ch, EUT on side
2744.960	52.9	-3.7	3.7	137.0	0.0	0.0	Horz	AV	0.0	49.2	54.0	-4.8	Mid ch, EUT on side
971.698	33.5	14.6	2.2	142.9	0.0	0.0	Horz	QP	0.0	48.1	54.0	-5.9	Low ch, EUT on side
1046.845	38.2	-9.7	2.2	297.9	0.0	20.0	Vert	AV	0.0	48.5	54.0	-5.5	Mid ch, EUT vert
1059.460	37.8	-9.6	2.2	261.0	0.0	20.0	Vert	AV	0.0	48.2	54.0	-5.8	High ch, EUT vert
999.384	32.6	14.8	1.7	141.0	0.0	0.0	Vert	QP	0.0	47.4	54.0	-6.6	Low ch, EUT vert
1073.260	37.5	-9.5	2.8	339.0	0.0	20.0	Vert	AV	0.0	48.0	54.0	-6.0	High ch, EUT vert
1046.645	37.6	-9.7	2.7	150.9	0.0	20.0	Horz	AV	0.0	47.9	54.0	-6.1	Mid ch, EUT on side
1060.633	37.2	-9.6	2.7	155.0	0.0	20.0	Horz	AV	0.0	47.6	54.0	-6.4	Mid ch, EUT on side
962.456	32.6	14.0	1.0	232.0	0.0	0.0	Vert	QP	0.0	46.6	54.0	-7.4	Low ch, EUT vert
1073.368	36.4	-9.5	1.9	149.0	0.0	20.0	Horz	AV	0.0	46.9	54.0	-7.1	High ch, EUT vert
1060.475	36.3	-9.6	2.3	292.0	0.0	20.0	Vert	AV	0.0	46.7	54.0	-7.3	Mid ch, EUT vert
9023.583	50.2	-4.9	2.0	333.0	0.0	0.0	Vert	AV	0.0	45.3	54.0	-8.7	Low ch, EUT vert
971.632	29.6	14.6	1.0	288.0	0.0	0.0	Vert	QP	0.0	44.2	54.0	-9.8	Low ch, EUT vert
992.447	19.0	14.9	1.4	209.0	0.0	10.0	Vert	QP	0.0	43.9	54.0	-10.1	Low ch, EUT horz, Power 83, >98% DC
9150.500	48.6	-4.2	1.9	324.0	0.0	0.0	Vert	AV	0.0	44.4	54.0	-9.6	Mid ch, EUT vert
1059.768	52.9	-9.6	2.8	153.9	0.0	20.0	Horz	PK	0.0	63.3	74.0	-10.7	High ch, EUT vert
9150.380	47.6	-4.2	1.5	289.9	0.0	0.0	Horz	AV	0.0	43.4	54.0	-10.6	Mid ch, EUT on side
992.402	17.4	14.9	1.0	102.9	0.0	10.0	Vert	QP	0.0	42.3	54.0	-11.7	Low ch, EUT on side, Power 83, >98% DC
9023.425	47.9	-4.9	1.5	303.0	0.0	0.0	Vert	AV	0.0	43.0	54.0	-11.0	Low ch, EUT horz
992.382	17.0	14.9	2.8	1.0	0.0	10.0	Horz	QP	0.0	41.9	54.0	-12.1	Low ch, EUT vert, Power 83, >98% DC
9024.458	46.6	-4.9	1.9	37.9	0.0	0.0	Vert	AV	0.0	41.7	54.0	-12.3	Low ch, EUT on side
1073.710	50.3	-9.5	2.8	339.0	0.0	20.0	Vert	PK	0.0	60.8	74.0	-13.2	High ch, EUT vert
9024.358	46.4	-4.9	1.5	297.0	0.0	0.0	Horz	AV	0.0	41.5	54.0	-12.5	Low ch, EUT on side
1046.945	50.4	-9.7	2.2	297.9	0.0	20.0	Vert	PK	0.0	60.7	74.0	-13.3	Mid ch, EUT vert
9024.408	46.2	-4.9	1.5	240.9	0.0	0.0	Horz	AV	0.0	41.3	54.0	-12.7	Low ch, EUT vert
9024.342	46.1	-4.9	1.5	90.0	0.0	0.0	Horz	AV	0.0	41.2	54.0	-12.8	Low ch, EUT horz
1059.460	50.0	-9.6	2.2	261.0	0.0	20.0	Vert	PK	0.0	60.4	74.0	-13.6	High ch, EUT vert
1046.870	49.8	-9.7	2.7	150.9	0.0	20.0	Horz	PK	0.0	60.1	74.0	-13.9	Mid ch, EUT on side
1060.625	49.2	-9.6	2.7	155.0	0.0	20.0	Horz	PK	0.0	59.6	74.0	-14.4	Mid ch, EUT on side
1073.527	48.3	-9.5	1.9	149.0	0.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	High ch, EUT vert
1060.467	48.1	-9.6	2.3	292.0	0.0	20.0	Vert	PK	0.0	58.5	74.0	-15.5	Mid ch, EUT vert
4637.920	35.7	2.6	2.4	142.9	0.0	0.0	Horz	AV	0.0	38.3	54.0	-15.7	High ch, EUT on side
4574.960	35.2	2.4	3.0	221.0	0.0	0.0	Vert	AV	0.0	37.6	54.0	-16.4	Mid ch, EUT vert

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

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
4575.000	35.1	2.4	1.7	156.0	0.0	0.0	Horz	AV	0.0	37.5	54.0	-16.5	Mid ch, EUT on side
4637.880	34.4	2.6	1.6	282.9	0.0	0.0	Vert	AV	0.0	37.0	54.0	-17.0	High ch, EUT vert
4511.892	34.6	2.2	1.0	207.9	0.0	0.0	Vert	AV	0.0	36.8	54.0	-17.2	Low ch, EUT vert
4511.880	32.0	2.2	1.2	192.9	0.0	0.0	Horz	AV	0.0	34.2	54.0	-19.8	Low ch, EUT on side
2707.150	37.9	-3.8	1.5	202.0	0.0	0.0	Vert	AV	0.0	34.1	54.0	-19.9	Low ch, EUT vert
3710.320	34.2	-0.3	1.5	340.0	0.0	0.0	Vert	AV	0.0	33.9	54.0	-20.1	High ch, EUT vert
3609.433	32.5	-0.9	1.5	360.0	0.0	0.0	Vert	AV	0.0	31.6	54.0	-22.4	Low ch, EUT vert
3710.480	31.8	-0.3	1.5	225.0	0.0	0.0	Horz	AV	0.0	31.5	54.0	-22.5	High ch, EUT on side
3659.960	31.9	-0.6	1.5	297.0	0.0	0.0	Horz	AV	0.0	31.3	54.0	-22.7	Mid ch, EUT on side
2782.800	34.7	-3.7	1.9	134.0	0.0	0.0	Horz	AV	0.0	31.0	54.0	-23.0	High ch, EUT on side
3657.170	31.5	-0.6	1.5	96.9	0.0	0.0	Vert	AV	0.0	30.9	54.0	-23.1	Mid ch, EUT vert
2782.720	34.6	-3.7	1.5	336.9	0.0	0.0	Vert	AV	0.0	30.9	54.0	-23.1	High ch, EUT vert
2745.290	53.9	-3.7	3.7	137.0	0.0	0.0	Horz	PK	0.0	50.2	74.0	-23.8	Mid ch, EUT on side
3619.310	31.5	-0.8	1.5	264.9	0.0	0.0	Horz	AV	0.0	30.7	54.0	-23.3	Low ch, EUT on side
9150.620	53.3	-4.2	1.9	324.0	0.0	0.0	Vert	PK	0.0	49.1	74.0	-24.9	Mid ch, EUT vert
2707.160	33.5	-3.8	1.4	203.9	0.0	0.0	Horz	AV	0.0	29.7	54.0	-24.3	Low ch, EUT on side
2745.040	33.0	-3.7	1.5	31.9	0.0	0.0	Vert	AV	0.0	29.3	54.0	-24.7	Mid ch, EUT vert
9023.258	52.6	-4.9	1.5	303.0	0.0	0.0	Vert	PK	0.0	47.7	74.0	-26.3	Low ch, EUT horz
9024.567	52.6	-4.9	2.0	333.0	0.0	0.0	Vert	PK	0.0	47.7	74.0	-26.3	Low ch, EUT vert
9150.460	51.7	-4.2	1.5	289.9	0.0	0.0	Horz	PK	0.0	47.5	74.0	-26.5	Mid ch, EUT on side
9024.533	51.7	-4.9	1.5	90.0	0.0	0.0	Horz	PK	0.0	46.8	74.0	-27.2	Low ch, EUT horz
9023.858	51.5	-4.9	1.9	37.9	0.0	0.0	Vert	PK	0.0	46.6	74.0	-27.4	Low ch, EUT on side
4637.580	43.7	2.6	2.4	142.9	0.0	0.0	Horz	PK	0.0	46.3	74.0	-27.7	High ch, EUT on side
4637.880	43.3	2.6	1.6	282.9	0.0	0.0	Vert	PK	0.0	45.9	74.0	-28.1	High ch, EUT vert
9024.608	50.7	-4.9	1.5	240.9	0.0	0.0	Horz	PK	0.0	45.8	74.0	-28.2	Low ch, EUT vert
9024.567	50.5	-4.9	1.5	297.0	0.0	0.0	Horz	PK	0.0	45.6	74.0	-28.4	Low ch, EUT on side
4575.210	42.9	2.4	1.7	156.0	0.0	0.0	Horz	PK	0.0	45.3	74.0	-28.7	Mid ch, EUT on side
4511.617	42.7	2.2	1.0	207.9	0.0	0.0	Vert	PK	0.0	44.9	74.0	-29.1	Low ch, EUT vert
4574.670	42.1	2.4	3.0	221.0	0.0	0.0	Vert	PK	0.0	44.5	74.0	-29.5	Mid ch, EUT vert
3710.320	44.0	-0.3	1.5	340.0	0.0	0.0	Vert	PK	0.0	43.7	74.0	-30.3	High ch, EUT vert
4506.580	40.7	2.2	1.2	192.9	0.0	0.0	Horz	PK	0.0	42.9	74.0	-31.1	Low ch, EUT on side
3653.580	42.5	-0.6	1.5	96.9	0.0	0.0	Vert	PK	0.0	41.9	74.0	-32.1	Mid ch, EUT vert
3610.700	42.5	-0.9	1.5	360.0	0.0	0.0	Vert	PK	0.0	41.6	74.0	-32.4	Low ch, EUT vert
3649.170	42.2	-0.6	1.5	297.0	0.0	0.0	Horz	PK	0.0	41.6	74.0	-32.4	Mid ch, EUT on side
3707.690	41.5	-0.3	1.5	225.0	0.0	0.0	Horz	PK	0.0	41.2	74.0	-32.8	High ch, EUT on side
3603.480	42.0	-0.9	1.5	264.9	0.0	0.0	Horz	PK	0.0	41.1	74.0	-32.9	Low ch, EUT on side
2782.380	44.5	-3.7	1.9	134.0	0.0	0.0	Horz	PK	0.0	40.8	74.0	-33.2	High ch, EUT on side
2703.910	44.5	-3.8	1.4	203.9	0.0	0.0	Horz	PK	0.0	40.7	74.0	-33.3	Low ch, EUT on side
2783.050	43.7	-3.7	1.5	336.9	0.0	0.0	Vert	PK	0.0	40.0	74.0	-34.0	High ch, EUT vert
2705.575	43.7	-3.8	1.5	202.0	0.0	0.0	Vert	PK	0.0	39.9	74.0	-34.1	Low ch, EUT vert
2750.960	43.5	-3.7	1.5	31.9	0.0	0.0	Vert	PK	0.0	39.8	74.0	-34.2	Mid ch, EUT vert

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

CONCLUSION
Pass

Tested By

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

TEST DESCRIPTION

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

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

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

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

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

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

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

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

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	2021-05-21	2022-05-21
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HGS	2021-06-28	2022-06-28
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2021-09-14	2023-09-14
Cable	ESM Cable Corp.	Bilog Cables	MNH	2021-10-13	2022-10-13
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2021-10-13	2022-10-13
Antenna - Double Ridge	ETS Lindgren	3115	AJQ	2021-01-25	2023-01-25
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2022-01-18	2023-01-18
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2022-01-18	2023-01-18
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	NCR
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	2022-01-18	2023-01-18
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2022-01-18	2023-01-18

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

FREQUENCY RANGE INVESTIGATED

30 MHz TO 10000 MHz

POWER INVESTIGATED

4.8 VDC

CONFIGURATIONS INVESTIGATED

TRPA0008-8

MODES INVESTIGATED

Transmitting Low Ch 902.4 MHz, 123k data rate. High Power (power setting 76); 50.4% duty cycle

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

EUT:	Zulu	Work Order:	TRPA0008
Serial Number:	RM148221-2	Date:	2022-03-09
Customer:	Traffic & Parking Control Co., Inc	Temperature:	22.4°C
Attendees:	Roman Marjamaa	Relative Humidity:	20.2%
Customer Project:	None	Bar. Pressure (PMSL):	1022 mb
Tested By:	Andrew Rogstad	Job Site:	MN05
Power:	4.8 VDC	Configuration:	TRPA0008-8

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	28	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

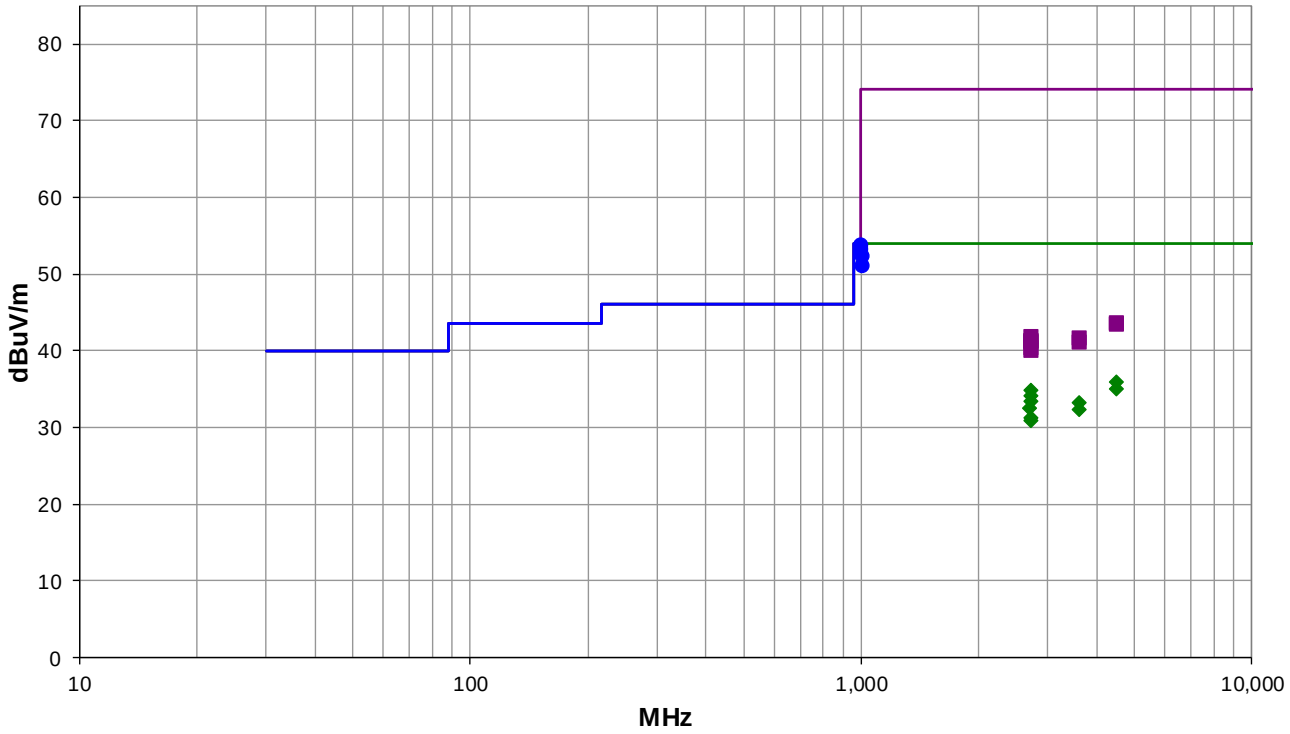
Whip Antenna. New u.fl adapter. Test mode operates at 50.4% duty cycle, upward DCCF correction applied based on 10*log(1/Duty cycle) = 3.0 dB. When operating in FHSS mode, the worst-case transmission time over any 100 ms period is 85.59 ms. Downward DCCF correction applied based on 10*log(On Time/100 ms) = -0.7 dB. Total correction applied = 2.3 dB.

EUT OPERATING MODES

Transmitting Low Ch 902.4 MHz, 123k data rate. High Power (power setting 76); 50.4% duty cycle

DEVIATIONS FROM TEST STANDARD

None



Run #: 28 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2021.09.21.0
EmiR5 2021.12.28.2
PSA-ESCI 2022.1.12.0

RESULTS - Run #28

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
992.459	28.9	14.9	1.0	289.9	0.0	10.0	Vert	QP	0.0	53.8	54.0	-0.2	Low ch, EUT vert
992.447	28.5	14.9	1.8	325.9	0.0	10.0	Horz	QP	0.0	53.4	54.0	-0.6	Low ch, EUT on side
999.985	27.6	14.8	1.0	242.0	0.0	10.0	Vert	QP	0.0	52.4	54.0	-1.6	Low ch, EUT vert
999.979	26.3	14.8	1.1	317.0	0.0	10.0	Horz	QP	0.0	51.1	54.0	-2.9	Low ch, EUT on side
4512.000	31.4	2.2	1.2	224.0	2.3	0.0	Vert	AV	0.0	35.9	54.0	-18.1	Low ch, EUT horz
4512.000	30.6	2.2	1.5	325.9	2.3	0.0	Horz	AV	0.0	35.1	54.0	-18.9	Low ch, EUT on side
2707.200	36.3	-3.8	1.5	41.0	2.3	0.0	Horz	AV	0.0	34.8	54.0	-19.2	Low ch, EUT on side
2707.400	35.6	-3.8	1.7	307.9	2.3	0.0	Vert	AV	0.0	34.1	54.0	-19.9	Low ch, EUT vert
2707.183	34.9	-3.8	2.1	36.0	2.3	0.0	Horz	AV	0.0	33.4	54.0	-20.6	Low ch, EUT horz
3609.600	31.8	-0.9	1.5	2.9	2.3	0.0	Horz	AV	0.0	33.2	54.0	-20.8	Low ch, EUT on side
2706.867	34.0	-3.8	1.6	257.9	2.3	0.0	Horz	AV	0.0	32.5	54.0	-21.5	Low ch, EUT vert
3609.600	30.9	-0.9	1.9	96.9	2.3	0.0	Vert	AV	0.0	32.3	54.0	-21.7	Low ch, EUT horz
2707.200	32.7	-3.8	1.5	0.0	2.3	0.0	Vert	AV	0.0	31.2	54.0	-22.8	Low ch, EUT on side
2709.692	32.4	-3.8	1.5	88.0	2.3	0.0	Vert	AV	0.0	30.9	54.0	-23.1	Low ch, EUT horz
4511.817	41.4	2.2	1.2	224.0	0.0	0.0	Vert	PK	0.0	43.6	74.0	-30.4	Low ch, EUT horz
4511.692	41.2	2.2	1.5	325.9	0.0	0.0	Horz	PK	0.0	43.4	74.0	-30.6	Low ch, EUT on side
2707.350	45.7	-3.8	1.5	41.0	0.0	0.0	Horz	PK	0.0	41.9	74.0	-32.1	Low ch, EUT on side
3609.817	42.5	-0.9	1.5	2.9	0.0	0.0	Horz	PK	0.0	41.6	74.0	-32.4	Low ch, EUT on side
2707.625	45.1	-3.8	2.1	36.0	0.0	0.0	Horz	PK	0.0	41.3	74.0	-32.7	Low ch, EUT horz
2707.167	45.1	-3.8	1.6	257.9	0.0	0.0	Horz	PK	0.0	41.3	74.0	-32.7	Low ch, EUT vert
2707.325	45.0	-3.8	1.7	307.9	0.0	0.0	Vert	PK	0.0	41.2	74.0	-32.8	Low ch, EUT vert
3607.842	42.0	-0.9	1.9	96.9	0.0	0.0	Vert	PK	0.0	41.1	74.0	-32.9	Low ch, EUT horz
2708.833	44.2	-3.8	1.5	0.0	0.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	Low ch, EUT on side
2708.108	43.9	-3.8	1.5	88.0	0.0	0.0	Vert	PK	0.0	40.1	74.0	-33.9	Low ch, EUT horz

CONCLUSION

Pass

Tested By

DUTY CYCLE

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the 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.

DUTY CYCLE

element

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	24.3 °C
Attendees:	Roman Marjamaa			**Humidity:**	24.9% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block.

DEVIATIONS FROM TEST STANDARD

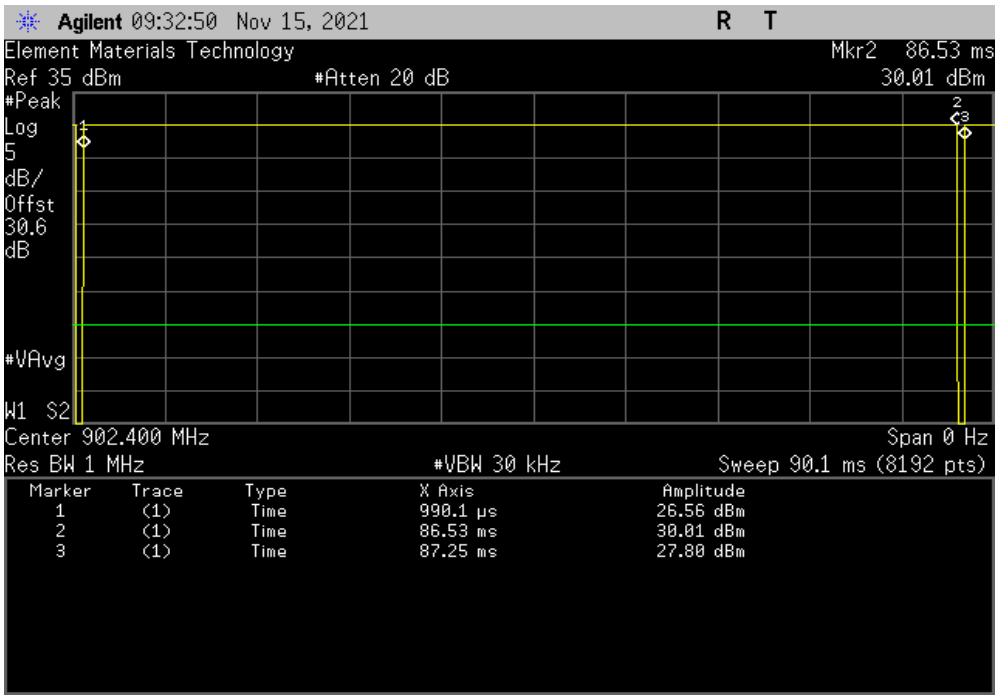
None

Configuration #	1	Signature

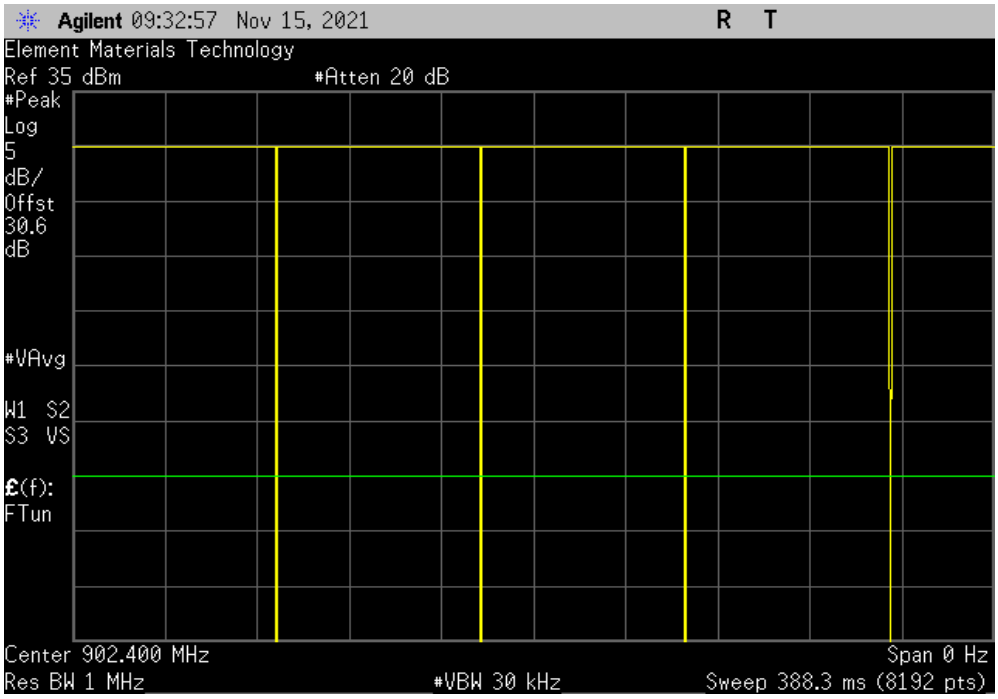
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
123k Data Rate						
Low channel, 902.4 MHz	85.536 ms	86.262 ms	1	99.2	N/A	N/A
Low channel, 902.4 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid channel, 915 MHz	85.536 ms	86.306 ms	1	99.1	N/A	N/A
Mid channel, 915 MHz	N/A	N/A	5	N/A	N/A	N/A
High channel, 927.6 MHz	85.536 ms	86.306 ms	1	99.1	N/A	N/A
High channel, 927.6 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

123k Data Rate, Low channel, 902.4 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	85.536 ms	86.262 ms	1	99.2	N/A	N/A

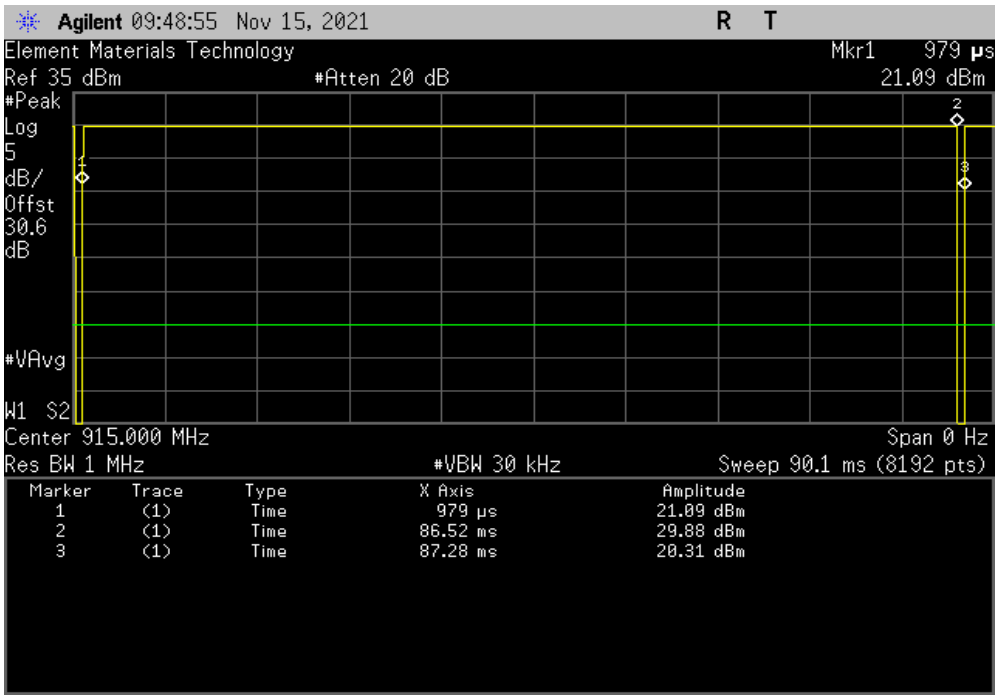


123k Data Rate, Low channel, 902.4 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

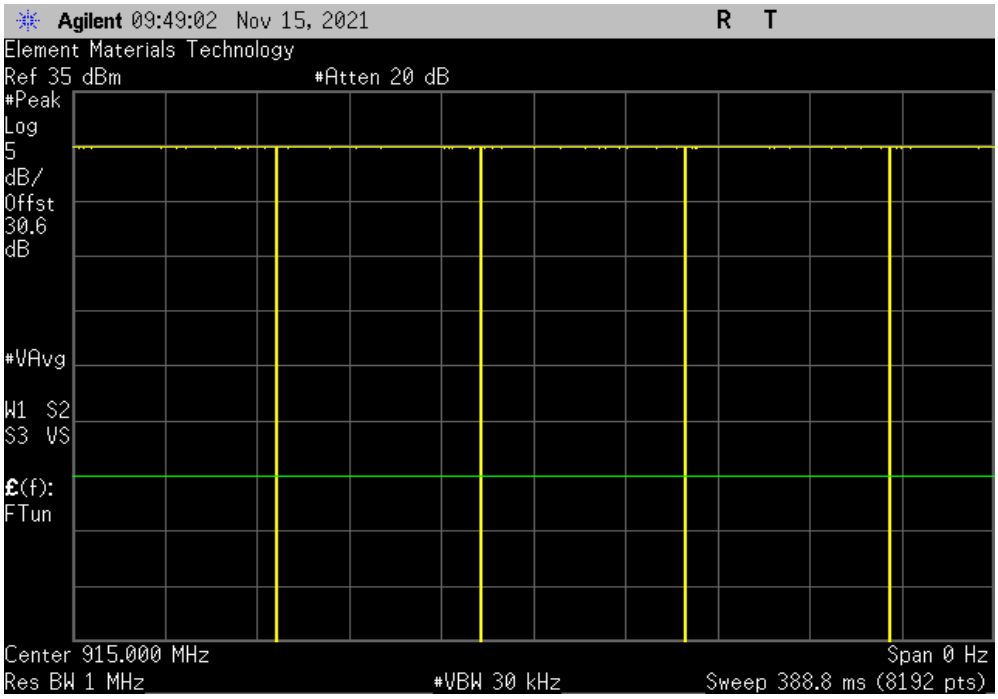


DUTY CYCLE

123k Data Rate, Mid channel, 915 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	85.536 ms	86.306 ms	1	99.1	N/A	N/A

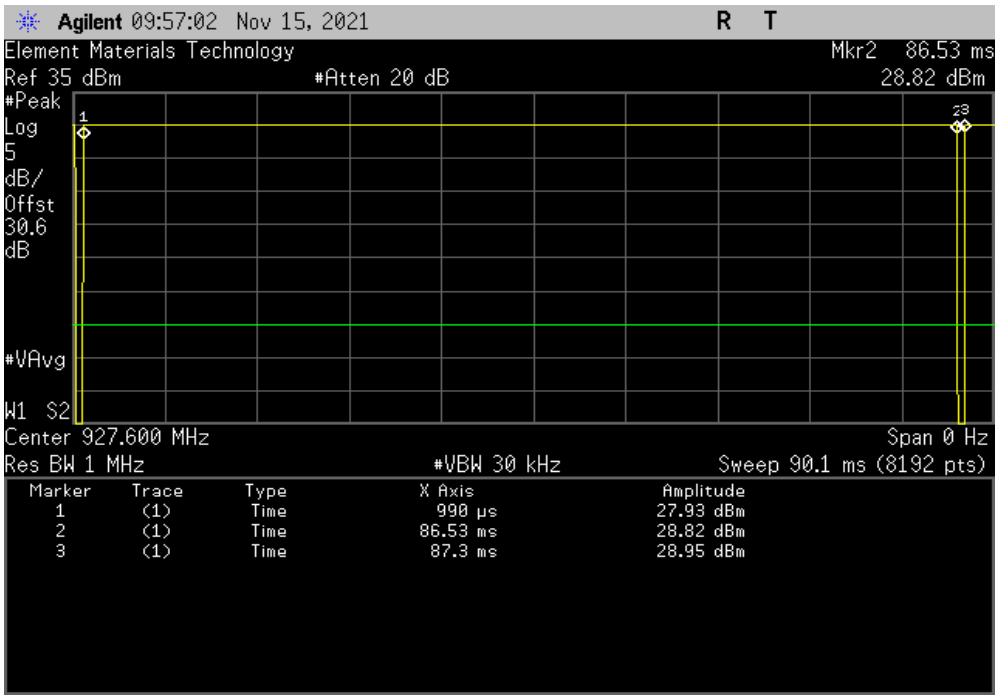


123k Data Rate, Mid channel, 915 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

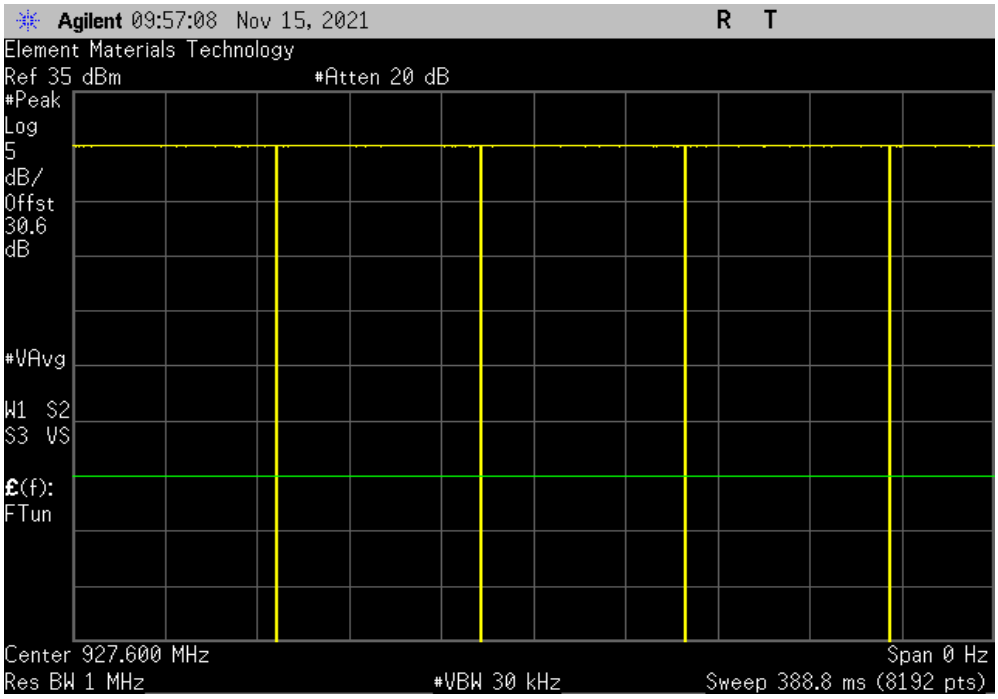


DUTY CYCLE

123k Data Rate, High channel, 927.6 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	85.536 ms	86.306 ms	1	99.1	N/A	N/A



123k Data Rate, High channel, 927.6 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



DUTY CYCLE

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12
Block - DC	Fairview Microwave	SD3379	AMI	2021-08-13	2022-08-13
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the 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.

DUTY CYCLE

element

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	23-Mar-22
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	23.1 °C
Attendees:	None			**Humidity:**	30% RH
Project:	None			**Barometric Pres.:**	1008 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Used for testing low channel for the Whip antenna.

DEVIATIONS FROM TEST STANDARD

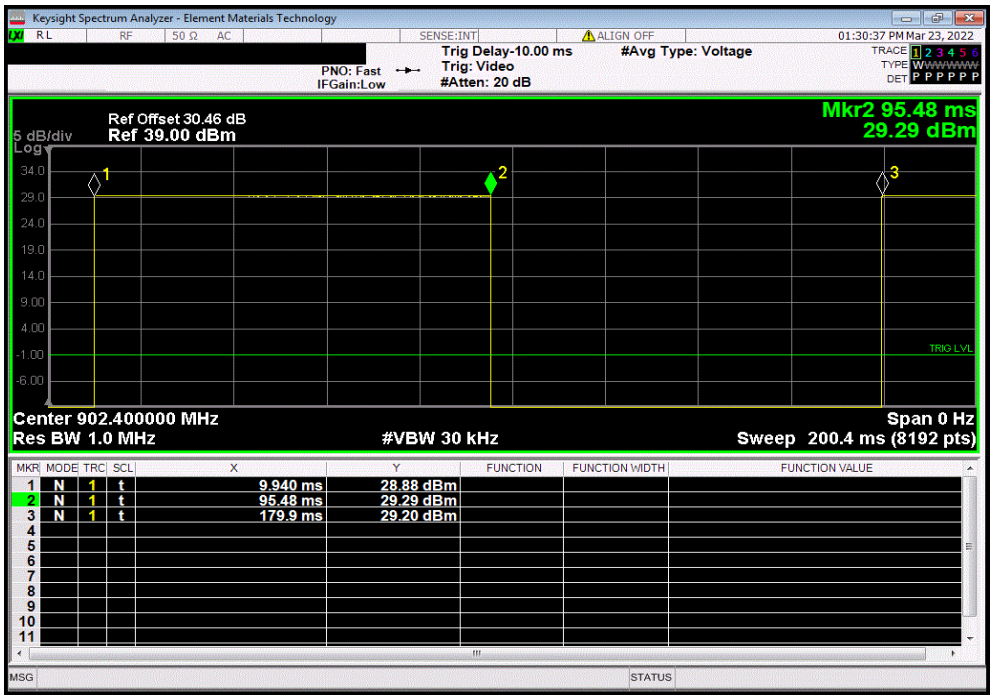
None

Configuration #	12	Signature

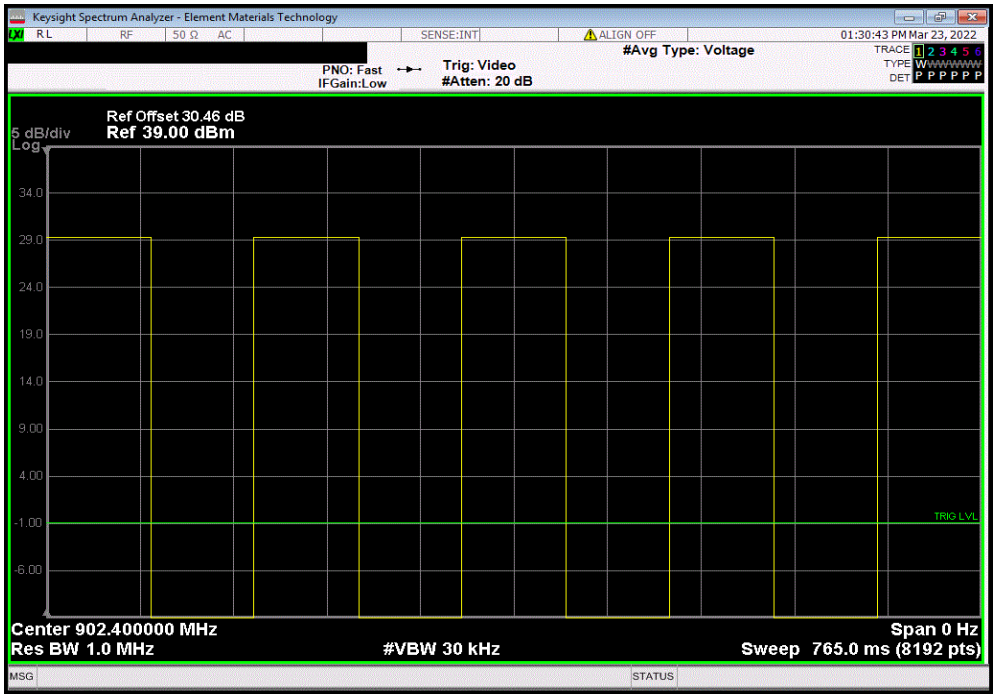
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
123k Data Rate						
Low channel, 902.4 MHz	85.541 ms	169.963 ms	1	50.3	N/A	N/A
Low channel, 902.4 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

123k Data Rate, Low channel, 902.4 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	85.541 ms	169.963 ms	1	50.3	N/A	N/A



123k Data Rate, Low channel, 902.4 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



CARRIER FREQUENCY SEPARATION

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The channel carrier frequencies in the 902-928 MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

CARRIER FREQUENCY SEPARATION

element

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			Work Order:	TRPA0008
Serial Number:	RM148221-2			Date:	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			Temperature:	24.3 °C
Attendees:	Roman Marjamaa			Humidity:	24.9% RH
Project:	None			Barometric Pres.:	1012 mbar
Tested by:	Andrew Rogstad	Power:	4.8 VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block.

DEVIATIONS FROM TEST STANDARD

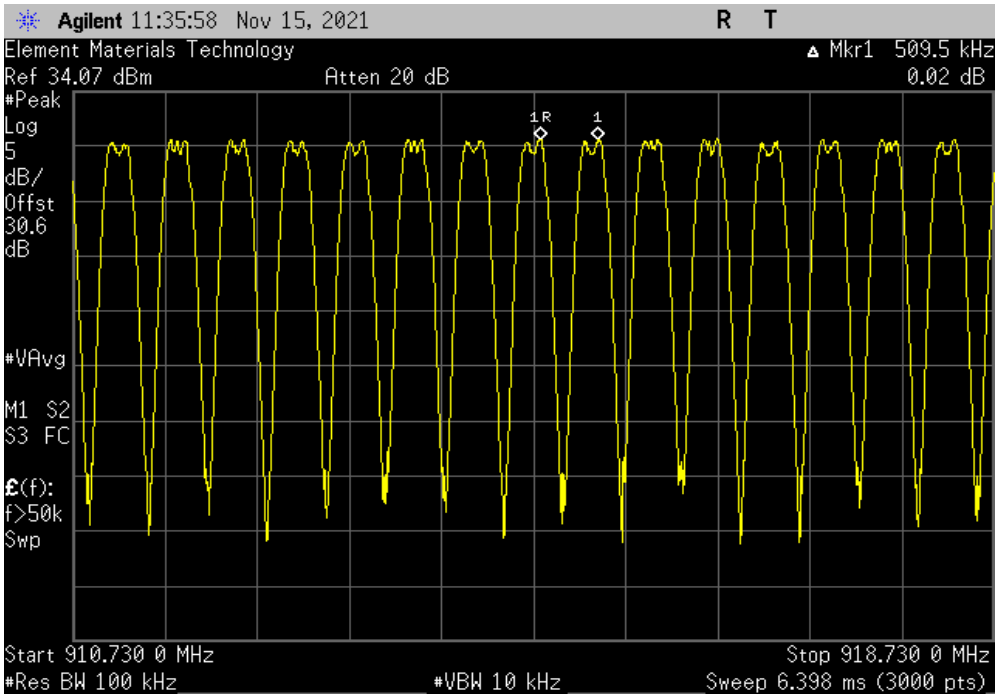
None

Configuration #	1	Signature Andrew Rogstad

	Value	Limit (≥)	Results
123k Data Rate			
Hopping Mode, 902-928 MHz	0.5 MHz	234.5 kHz	Pass

CARRIER FREQUENCY SEPARATION

123k Data Rate, Hopping Mode, 902-928 MHz						
				Value	Limit (≥)	Results
				0.5 MHz	234.5 kHz	Pass



NUMBER OF HOPPING FREQUENCIES

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The number of hopping frequencies was measured across the authorized band. The hopping function of the EUT was enabled.

NUMBER OF HOPPING FREQUENCIES

XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	24.4 °C
Attendees:	Roman Marjamaa			**Humidity:**	24.8% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block.

DEVIATIONS FROM TEST STANDARD

None

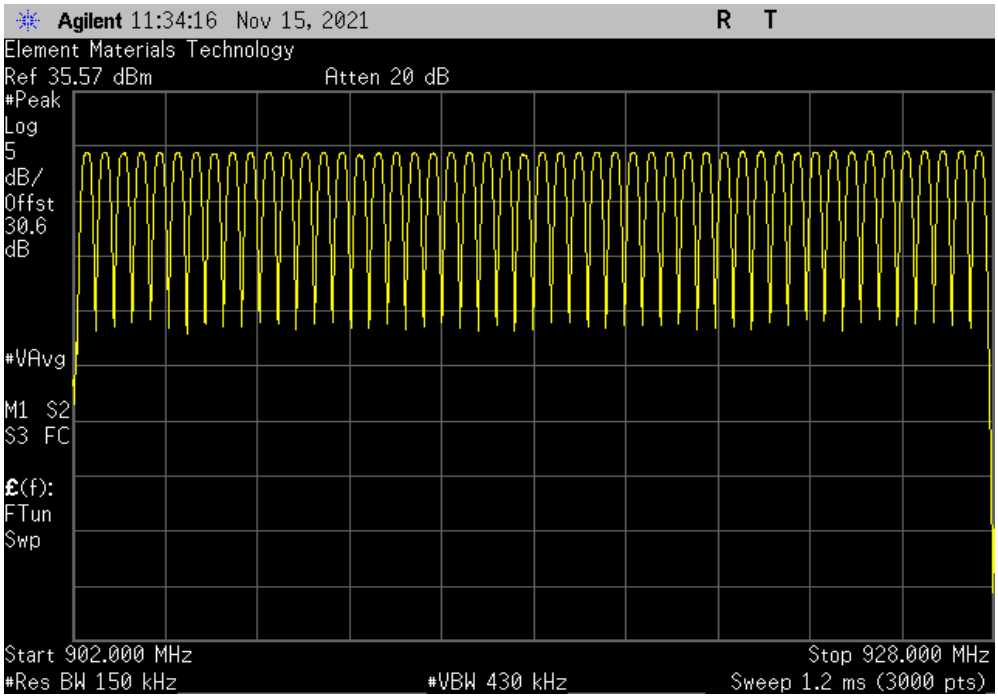
Configuration #	1	Signature

	Number of Channels	Limit (≥)	Result
Hopping Mode, 902-928 MHz			
123k Data Rate	50	50	Pass

NUMBER OF HOPPING FREQUENCIES

XMit 2020.12.30.0

Hopping Mode, 902-928 MHz, 123k Data Rate						
				Number of Channels	Limit (≥)	Result
				50	50	Pass



DWELL TIME

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band. The hopping function of the EUT was enabled.

The dwell time limit is based on the Number of Hopping Channels * 400 mS. For this 902-928 MHz radio this would be 50 Channels * 400mS = 20 seconds.

On Time During 20 Sec = Pulse Width * Average Number of Pulses

DWELL TIME

XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	24.4 °C
Attendees:	Roman Marjamaa			**Humidity:**	24.8% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	1	Signature

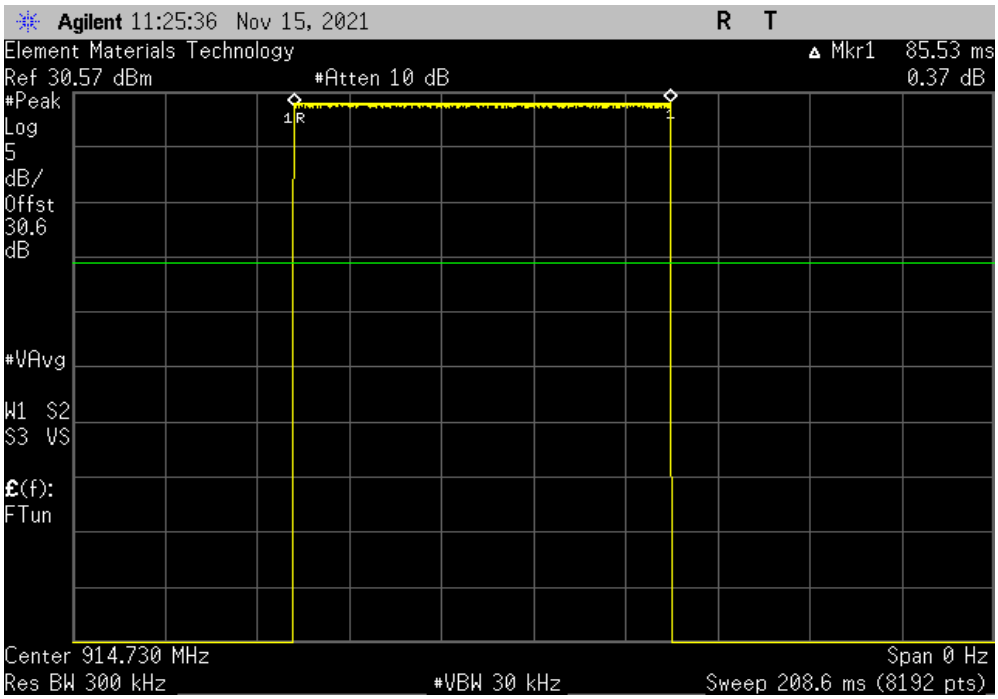
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result
Hopping Mode, 902-928 MHz					
123k Data Rate					
Pulse Length	85.53	N/A	N/A	N/A	N/A
Pulse Count Over 20 Seconds	85.53	4	342.12	400	Pass

DWELL TIME

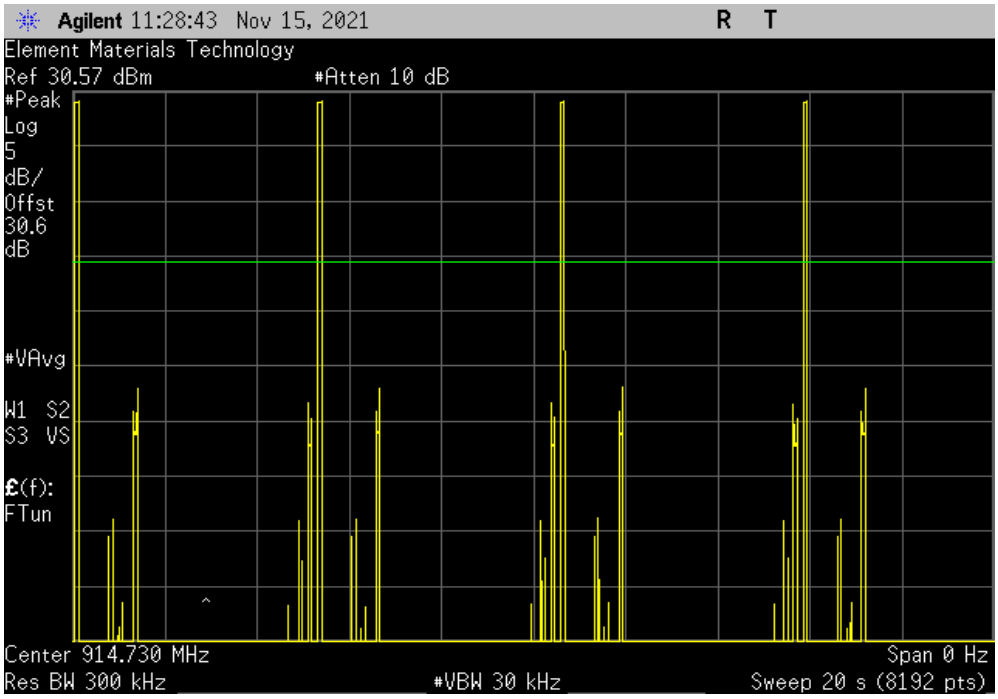
element

XMit 2020.12.30.0

Hopping Mode, 902-928 MHz, 123k Data Rate, Pulse Length						
		Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result
		85.53	N/A	N/A	N/A	N/A



Hopping Mode, 902-928 MHz, 123k Data Rate, Pulse Count Over 20 Seconds						
		Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result
		85.53	4	342.12	400	Pass



OUTPUT POWER

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

OUTPUT POWER

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	24.3 °C
Attendees:	Roman Marjamaa			**Humidity:**	25% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at the following power settings: Low channel (High,83), Mid channel (High,83), and High channel (High,81). These power settings are used with the Puck and Omnidirectional antennas. The Mid channel (High,83) and High channel (High,81) are used for the Whip antenna.

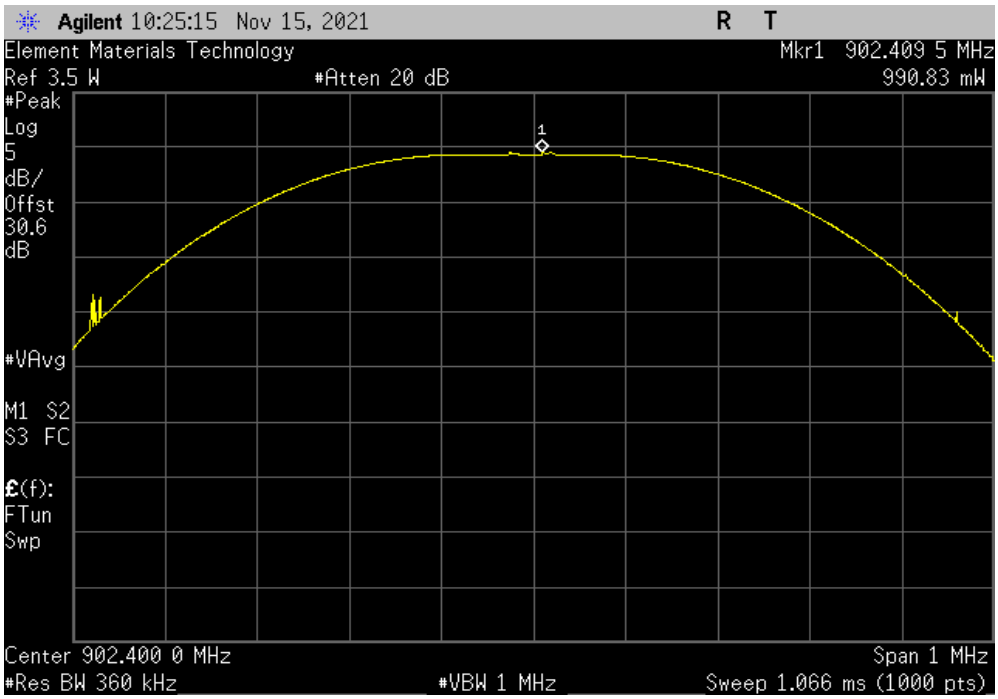
DEVIATIONS FROM TEST STANDARD

None

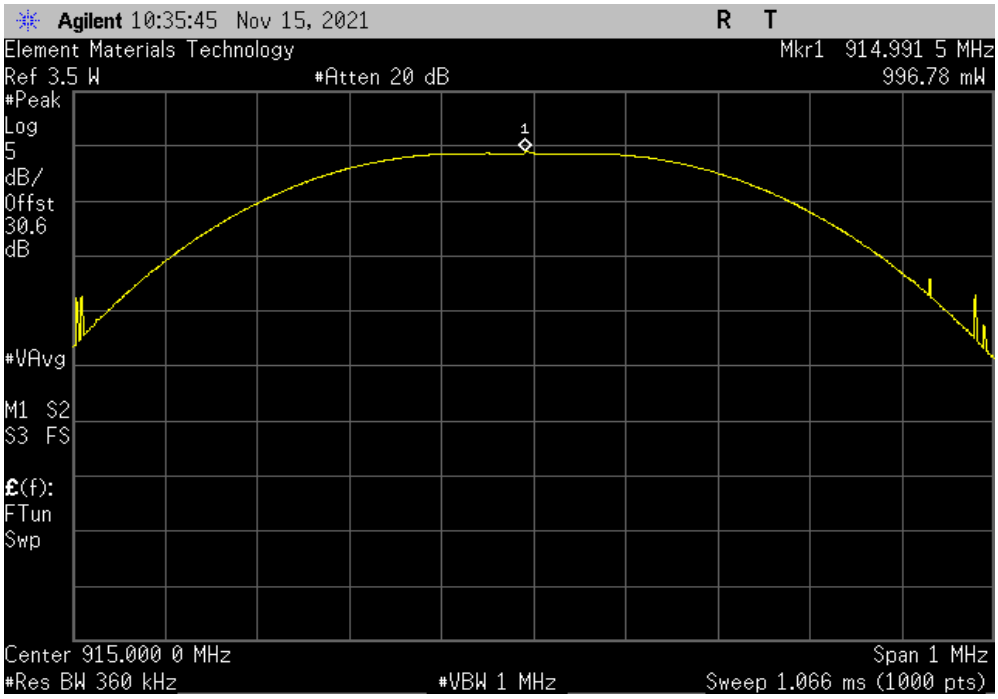
Configuration #	1	Signature

		Value	Limit (<)	Result
123k Data Rate				
	Low channel, 902.4 MHz	990.832 mW	1 W	Pass
	Mid channel, 915 MHz	996.782 mW	1 W	Pass
	High channel, 927.6 MHz	990.148 mW	1 W	Pass

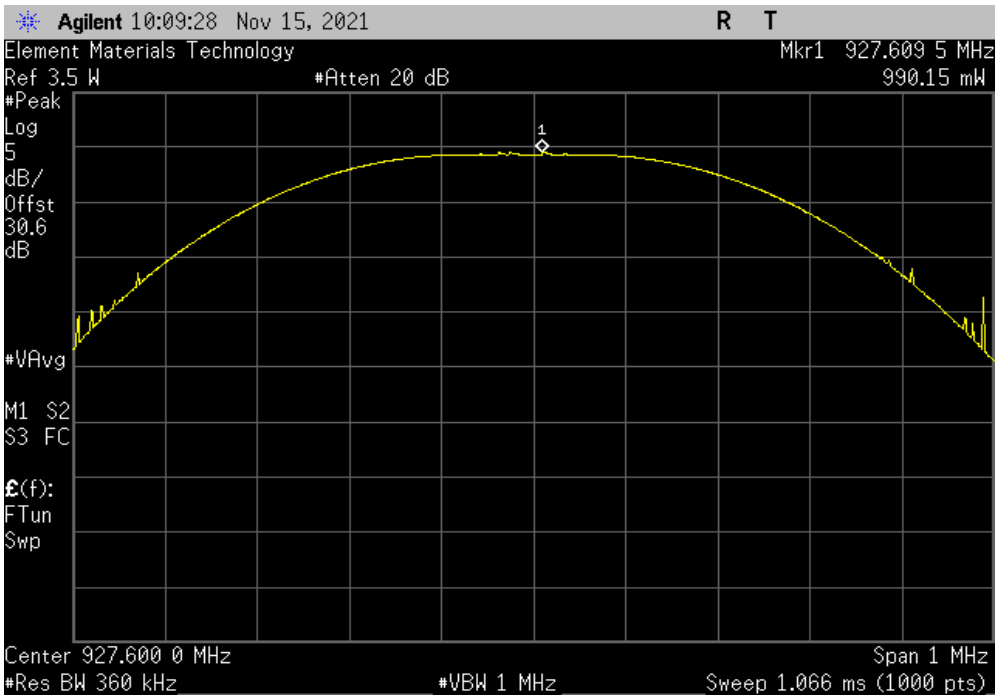
123k Data Rate, Low channel, 902.4 MHz						
				Value	Limit (<)	Result
				990.832 mW	1 W	Pass



123k Data Rate, Mid channel, 915 MHz						
				Value	Limit (<)	Result
				996.782 mW	1 W	Pass



123k Data Rate, High channel, 927.6 MHz						
				Value	Limit (<)	Result
				990.148 mW	1 W	Pass



OUTPUT POWER

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

Only when an antenna is used with a gain greater than 6 dBi, the output power limit in terms of dB needs to be reduced by excess amount. Mathematically, this is represented by:
Output Power Limit = 30 dBm - (Gain (dBi) - 6)

OUTPUT POWER

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	24.3 °C
Attendees:	Roman Marjamaa			**Humidity:**	24.8% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at the following power settings: Low channel (Mid,48), Mid channel (Mid,48), and High channel (Mid,47). These power settings are used with Yagi antenna, which as a gain of 10.65 dBi. The limit of 1 W (30 dBm) was lowered by 4.65 dB to account for the 10.65 dBi antenna gain.

DEVIATIONS FROM TEST STANDARD

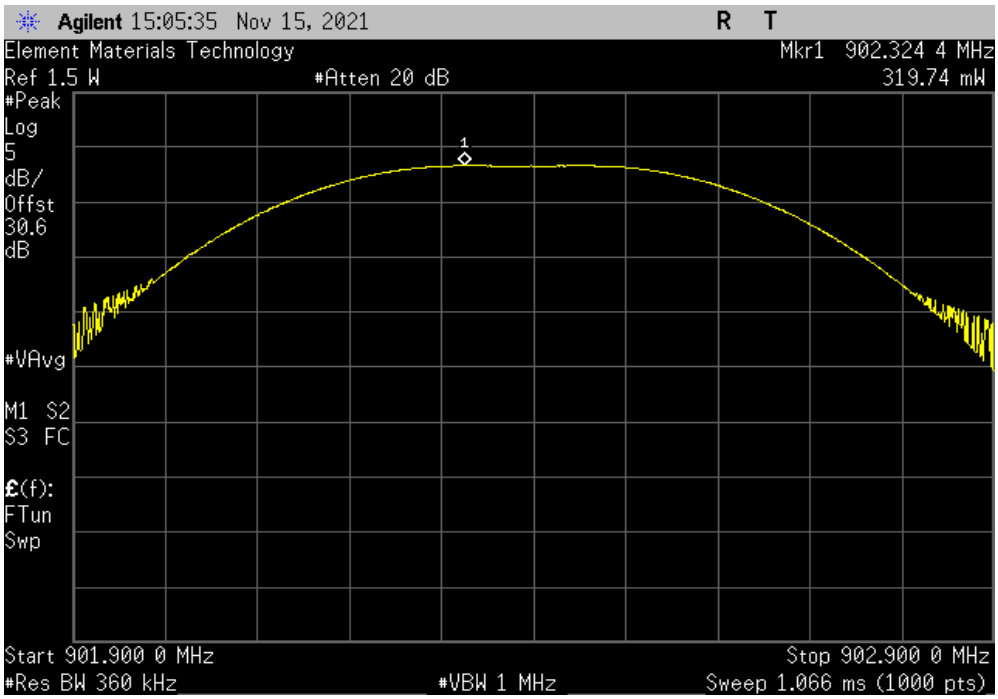
None

Configuration #	1	*Signature* Andrew Rogstad

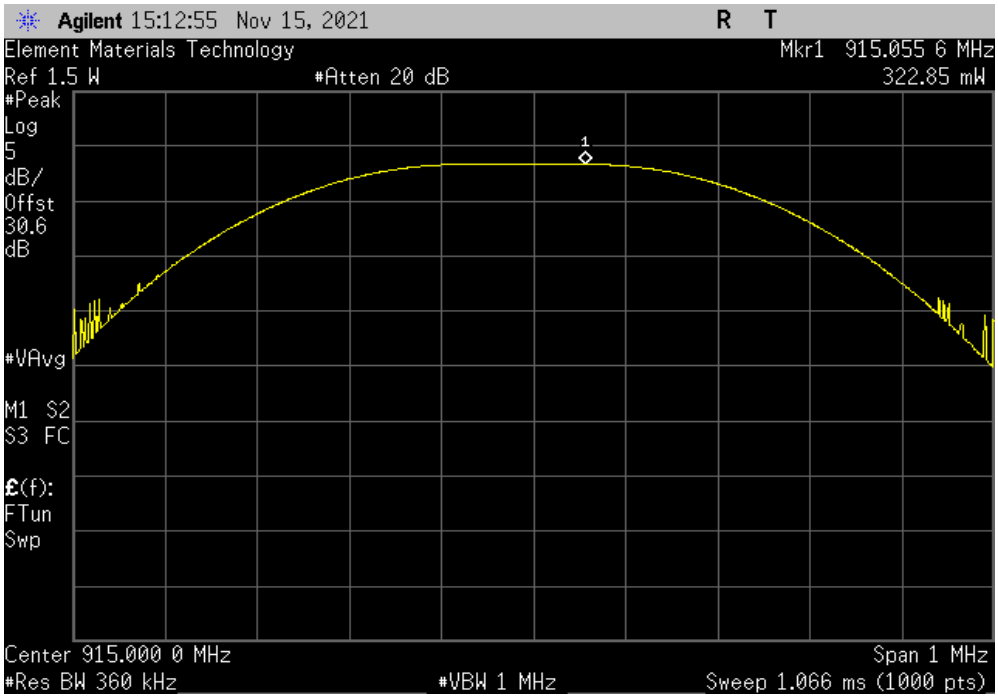
	Value	Limit (<)	Result
123k Data Rate			
Low channel, 902.4 MHz	319.742 mW	342.768 mW	Pass
Mid channel, 915 MHz	322.849 mW	342.768 mW	Pass
High channel, 927.6 MHz	321.884 mW	342.768 mW	Pass

OUTPUT POWER

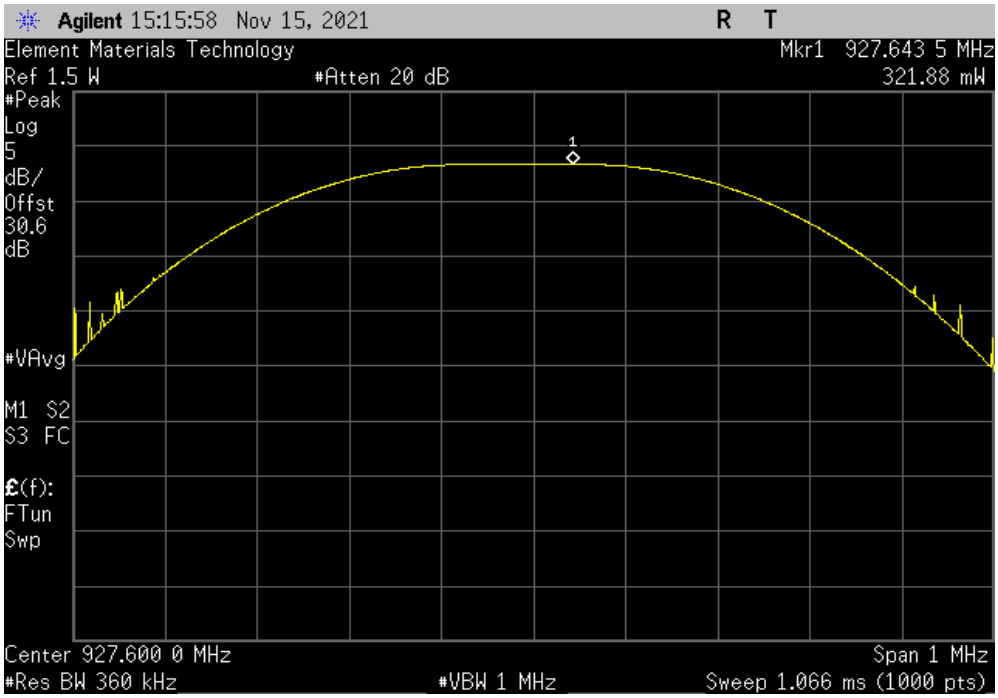
123k Data Rate, Low channel, 902.4 MHz						
				Value	Limit (<)	Result
				319.742 mW	342.768 mW	Pass



123k Data Rate, Mid channel, 915 MHz						
				Value	Limit (<)	Result
				322.849 mW	342.768 mW	Pass



123k Data Rate, High channel, 927.6 MHz						
				Value	Limit (<)	Result
				321.884 mW	342.768 mW	Pass



OUTPUT POWER

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12
Block - DC	Fairview Microwave	SD3379	AMI	2021-08-13	2022-08-13
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

OUTPUT POWER

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			Work Order:	TRPA0008
Serial Number:	RM148221-2			Date:	23-Mar-22
Customer:	Traffic & Parking Control Co., Inc			Temperature:	23.1 °C
Attendees:	None			Humidity:	30% RH
Project:	None			Barometric Pres.:	1008 mbar
Tested by:	Andrew Rogstad	Power:	4.8 VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at power setting 76. This power setting is used for low channel with the Whip antenna.

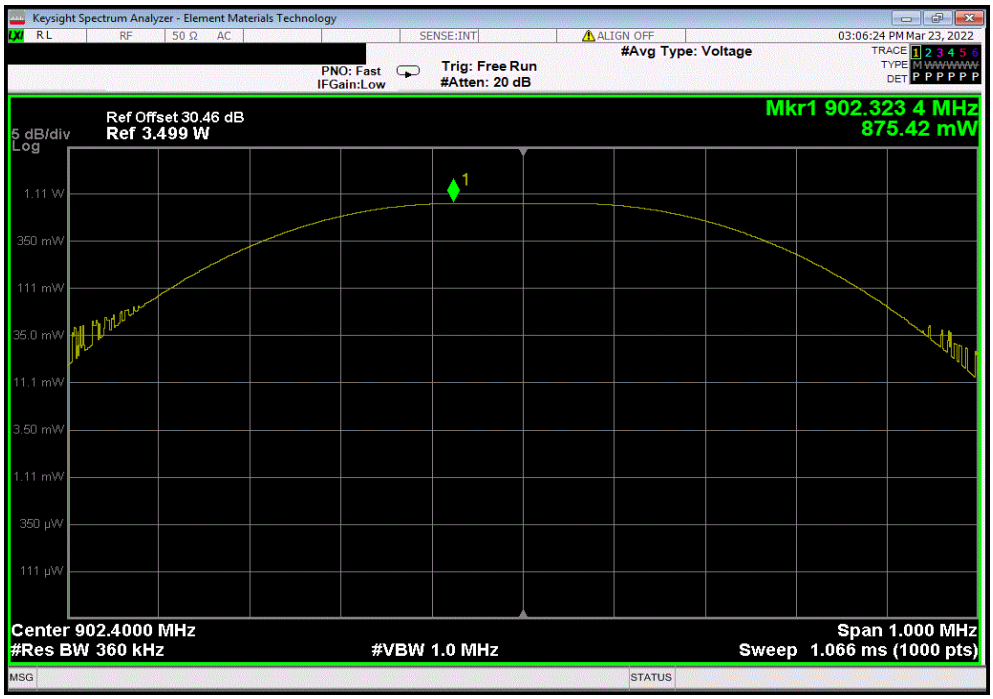
DEVIATIONS FROM TEST STANDARD

None

Configuration #	12	Signature

	Value	Limit (<)	Result
123k Data Rate			
Low channel, 902.4 MHz	875.420 mW	1 W	Pass

123k Data Rate, Low channel, 902.4 MHz						
				Value	Limit (<)	Result
				875.420 mW	1 W	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

Equivalent Isotropic Radiated Power (EIRP) = Max Measured Power + Antenna gain (dBi)
for a FHSS radio.

EQUIVALENT ISOTROPIC RADIATED POWER

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	24.3 °C
Attendees:	Roman Marjamaa			**Humidity:**	25% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at the following power settings: Low channel (High,83), Mid channel (High,83), and High channel (High,81). These power settings are used with the Puck and Omnidirectional antennas. The Mid channel (High,83) and High channel (High,81) are used for the Whip antenna. The highest antenna gain out of the three listed antennas (Omnidirectional) was used to show compliance.

DEVIATIONS FROM TEST STANDARD

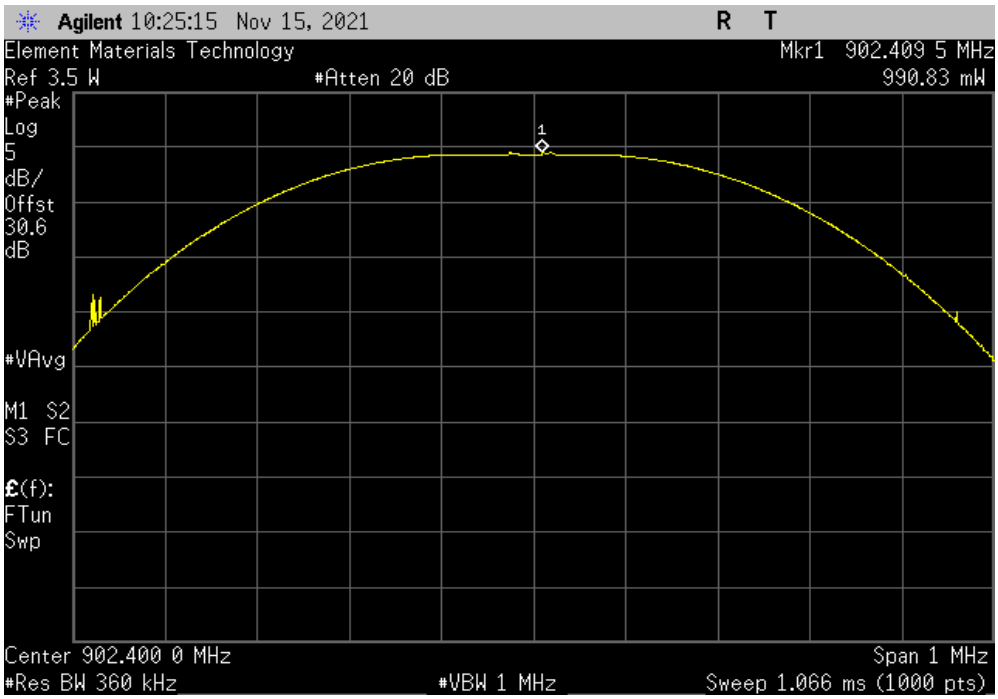
None

Configuration #	1	Signature

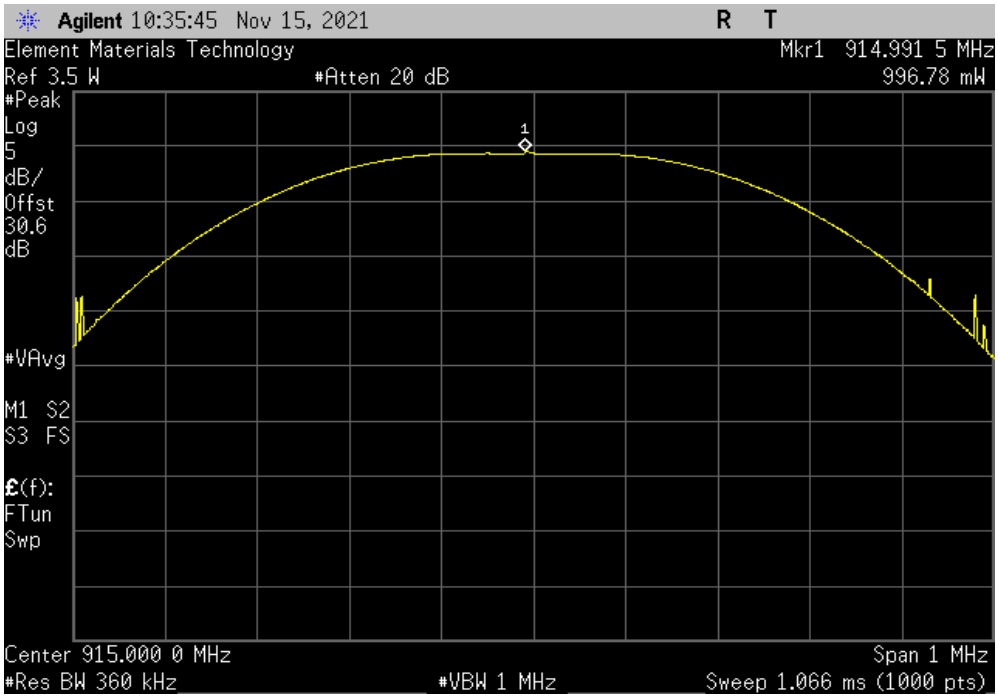
	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
123k Data Rate						
Low channel, 902.4 MHz	990.832	29.96	5.15	35.11	36	Pass
Mid channel, 915 MHz	996.782	29.99	5.15	35.14	36	Pass
High channel, 927.6 MHz	990.148	29.96	5.15	35.11	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER

123k Data Rate, Low channel, 902.4 MHz						
	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
	990.832	29.96	5.15	35.11	36	Pass



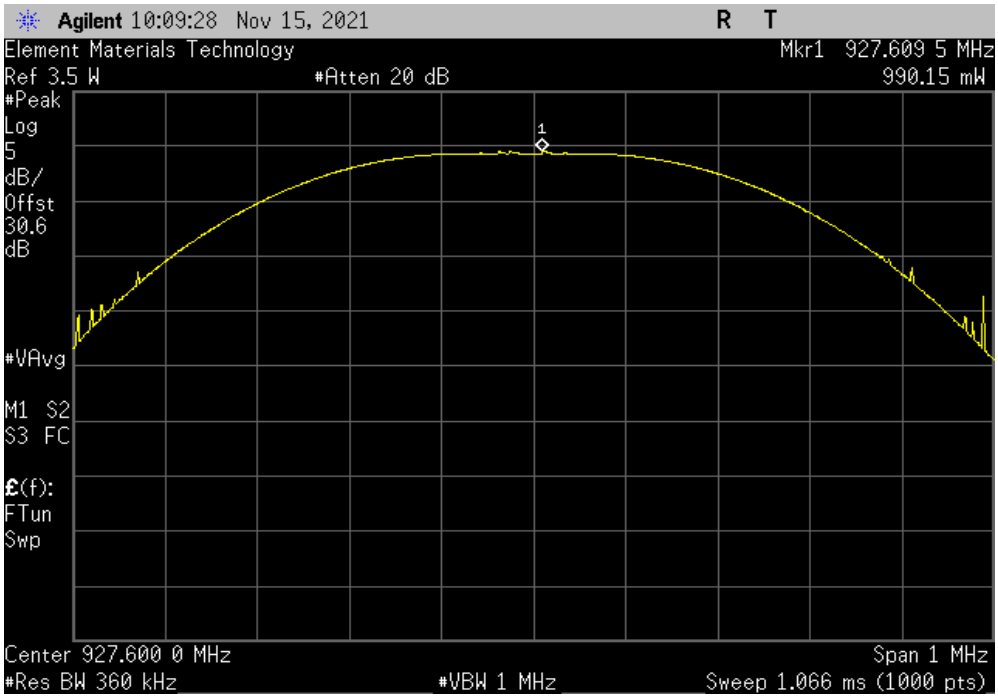
123k Data Rate, Mid channel, 915 MHz						
	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
	996.782	29.99	5.15	35.14	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

TbtTx 2021.03.19.1 XMit 2020.12.30.0

123k Data Rate, High channel, 927.6 MHz						
	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
	990.148	29.96	5.15	35.11	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

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

EQUIVALENT ISOTROPIC RADIATED POWER

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	24.3 °C
Attendees:	Roman Marjamaa			**Humidity:**	24.8% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at the following power settings: Low channel (Mid,48), Mid channel (Mid,48), and High channel (Mid,47). These power settings are used with Yagi antenna.

DEVIATIONS FROM TEST STANDARD

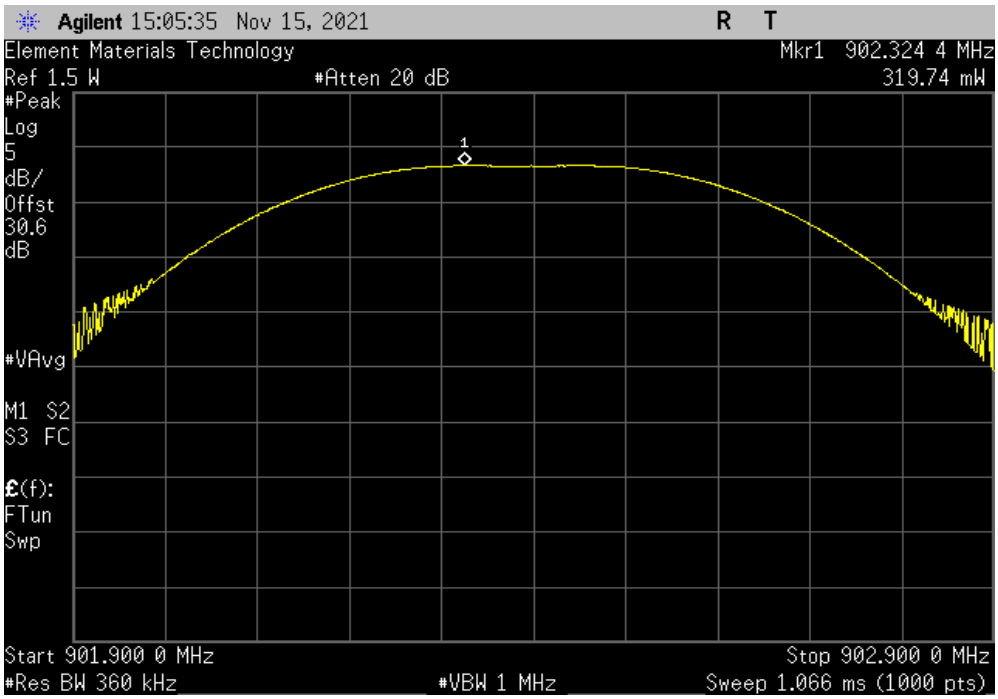
None

Configuration #	1	Signature

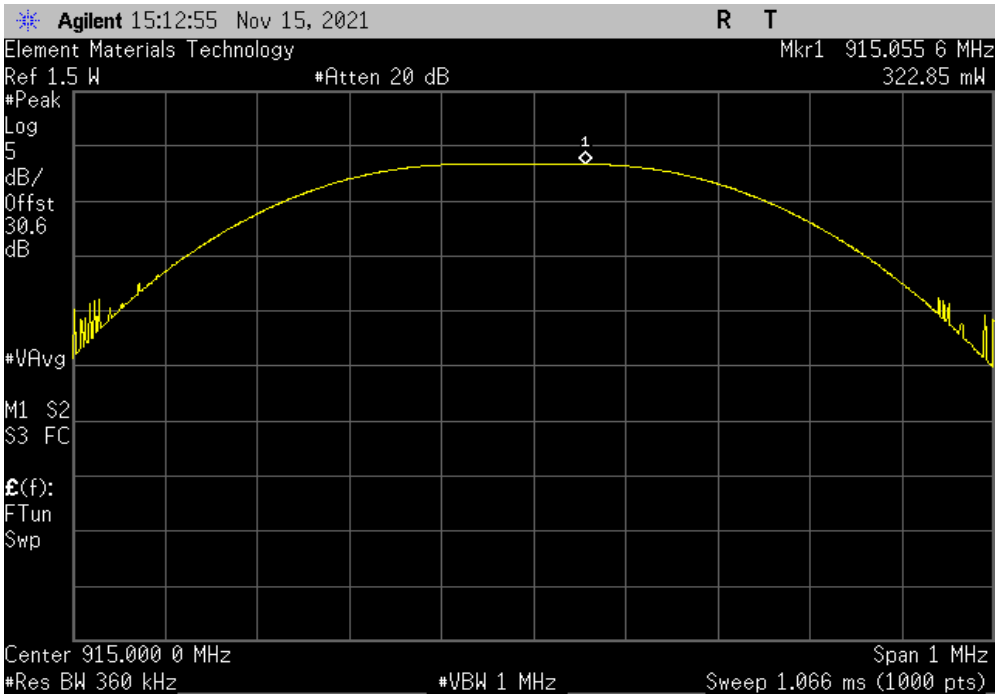
	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
123k Data Rate						
Low channel, 902.4 MHz	319.742	25.05	10.65	35.70	36	Pass
Mid channel, 915 MHz	322.849	25.09	10.65	35.74	36	Pass
High channel, 927.6 MHz	321.884	25.08	10.65	35.73	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER

123k Data Rate, Low channel, 902.4 MHz						
	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
	319.742	25.05	10.65	35.70	36	Pass

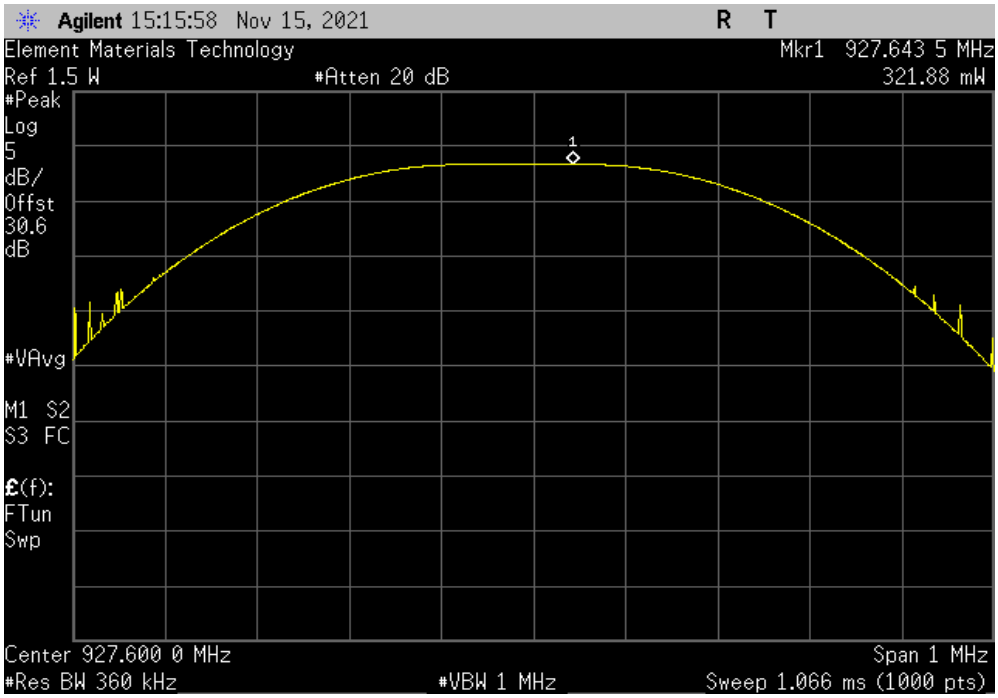


123k Data Rate, Mid channel, 915 MHz						
	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
	322.849	25.09	10.65	35.74	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

123k Data Rate, High channel, 927.6 MHz						
	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
	321.884	25.08	10.65	35.73	36	Pass



EQUIVALENT ISOTROPIC RADIATED POWER

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12
Block - DC	Fairview Microwave	SD3379	AMI	2021-08-13	2022-08-13
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

Equivalent Isotropic Radiated Power (EIRP) = Max Measured Power + Antenna gain (dBi)
for a FHSS radio.

EQUIVALENT ISOTROPIC RADIATED POWER

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	23-Mar-22
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	23.1 °C
Attendees:	None			**Humidity:**	30% RH
Project:	None			**Barometric Pres.:**	1008 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at power setting 76. This power setting is used for low channel with the Whip antenna. The gain for the Whip antenna was used to show compliance as this power setting will only be used with the Whip antenna.

DEVIATIONS FROM TEST STANDARD

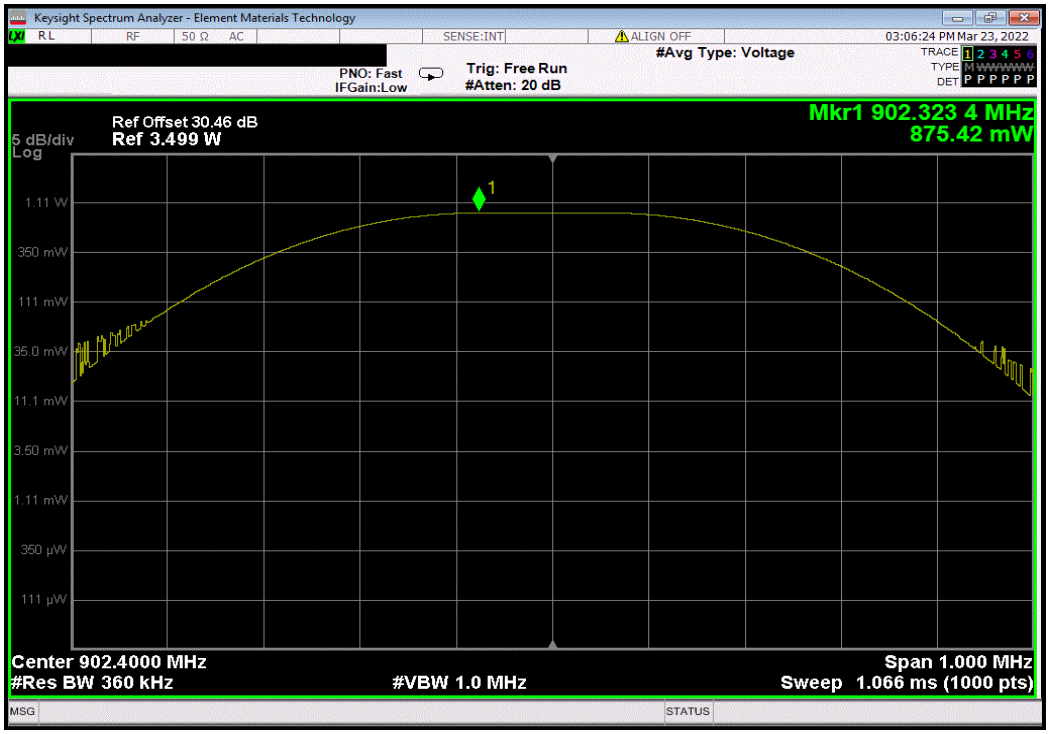
None

Configuration #	12	Signature

	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
123k Data Rate						
Low channel, 902.4 MHz	875.42	29.42	3	32.42	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER

123k Data Rate, Low channel, 902.4 MHz						
	Measured Pwr (mW)	Measured Pwr (dBm)	Antenna Gain (dBi)	Value (dBm)	Limit (< dBm)	Result
	875.42	29.42	3	32.42	36	Pass



BAND EDGE COMPLIANCE

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

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

BAND EDGE COMPLIANCE

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			Work Order:	TRPA0008
Serial Number:	RM148221-2			Date:	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			Temperature:	24 °C
Attendees:	Roman Marjamaa			Humidity:	24.8% RH
Project:	None			Barometric Pres.:	1012 mbar
Tested by:	Andrew Rogstad	Power:	4.8 VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at the following power settings: Low channel (High,83), Mid channel (High,83), and High channel (High,81). These power settings are used with the Puck and Omnidirectional antennas. The Mid channel (High,83) and High channel (High,81) are used for the Whip antenna.

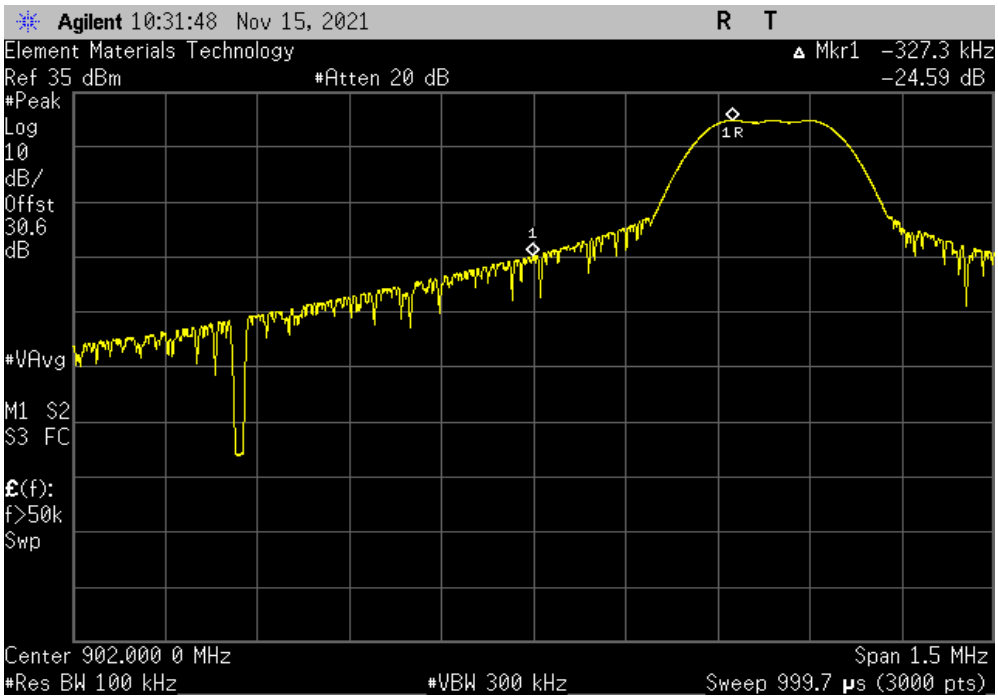
DEVIATIONS FROM TEST STANDARD

None

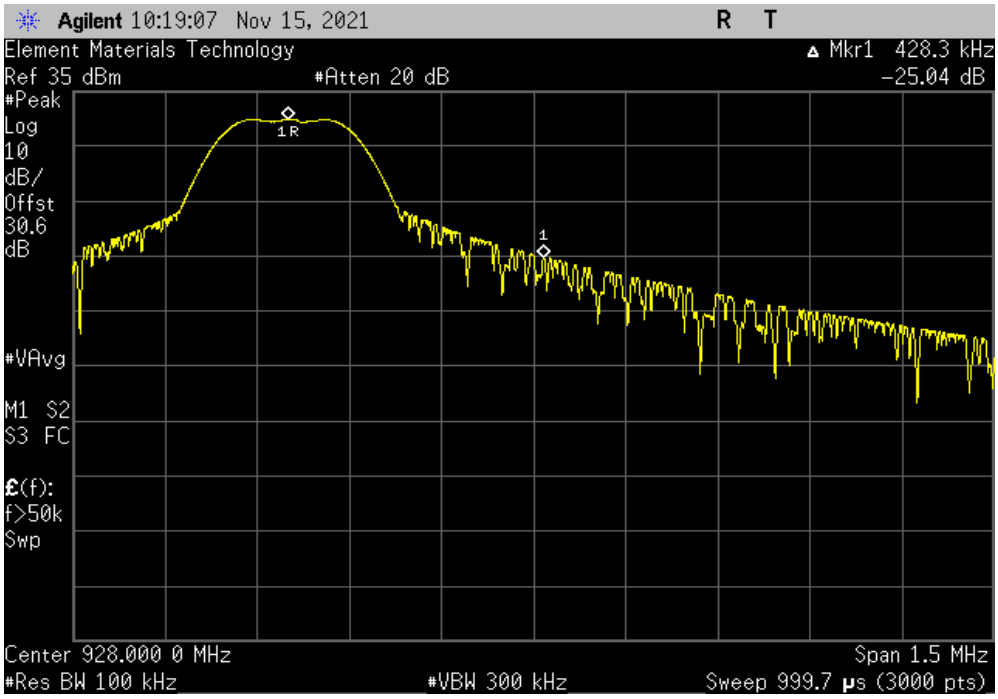
Configuration #	1	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
123k Data Rate			
Low channel, 902.4 MHz	-24.59	-20	Pass
High channel, 927.6 MHz	-25.04	-20	Pass

123k Data Rate, Low channel, 902.4 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-24.59	-20	Pass



123k Data Rate, High channel, 927.6 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-25.04	-20	Pass



BAND EDGE COMPLIANCE

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

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

BAND EDGE COMPLIANCE

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	24.4 °C
Attendees:	Roman Marjamaa			**Humidity:**	24.8% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at the following power settings: Low channel (Mid,48), Mid channel (Mid,48), and High channel (Mid,47). These power settings are used with Yagi antenna.

DEVIATIONS FROM TEST STANDARD

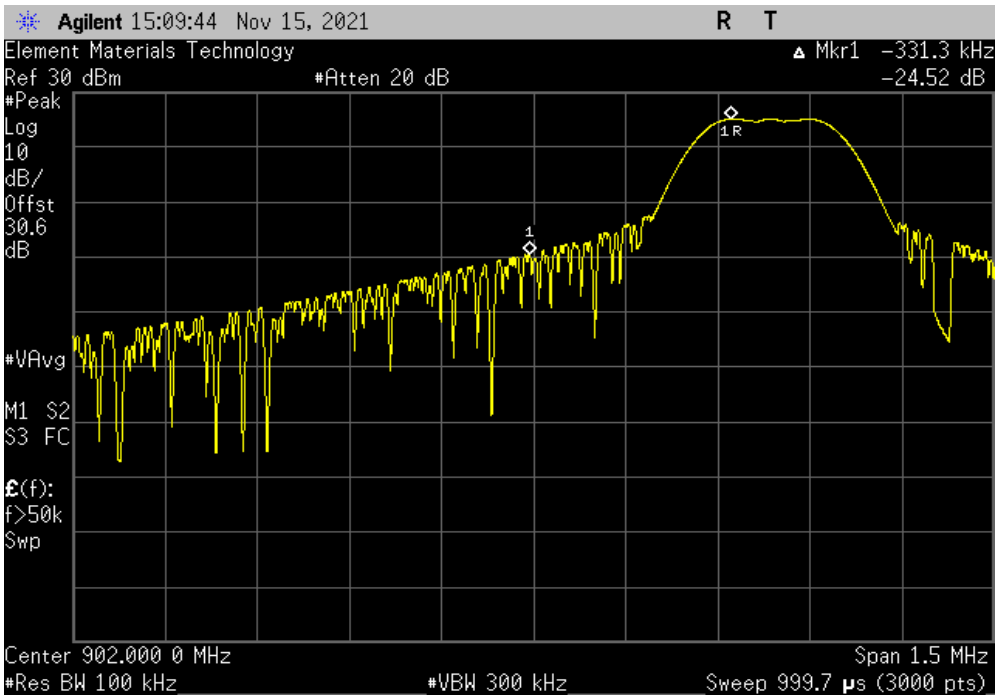
None

Configuration #	1	Signature

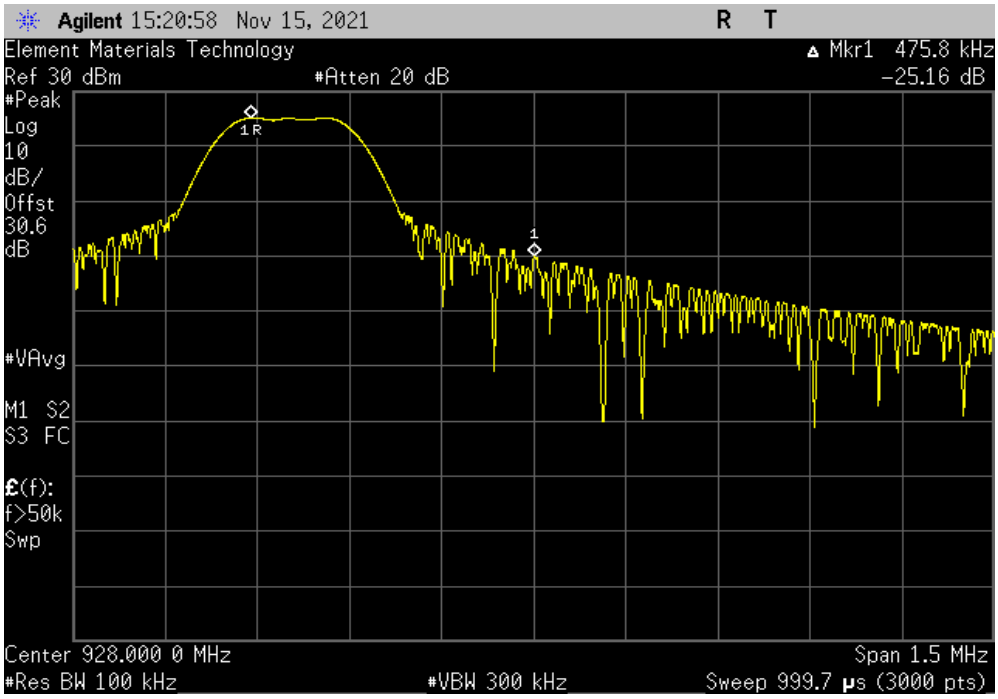
	Value (dBc)	Limit ≤ (dBc)	Result
123k Data Rate			
Low channel, 902.4 MHz	-24.52	-20	Pass
High channel, 927.6 MHz	-25.17	-20	Pass

BAND EDGE COMPLIANCE

123k Data Rate, Low channel, 902.4 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-24.52	-20	Pass



123k Data Rate, High channel, 927.6 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-25.17	-20	Pass



BAND EDGE COMPLIANCE

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12
Block - DC	Fairview Microwave	SD3379	AMI	2021-08-13	2022-08-13
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

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

BAND EDGE COMPLIANCE

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			Work Order:	TRPA0008
Serial Number:	RM148221-2			Date:	23-Mar-22
Customer:	Traffic & Parking Control Co., Inc			Temperature:	23.1 °C
Attendees:	None			Humidity:	30% RH
Project:	None			Barometric Pres.:	1008 mbar
Tested by:	Andrew Rogstad	Power:	4.8 VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at power setting 76, which will be used on low channel with the Whip antenna.

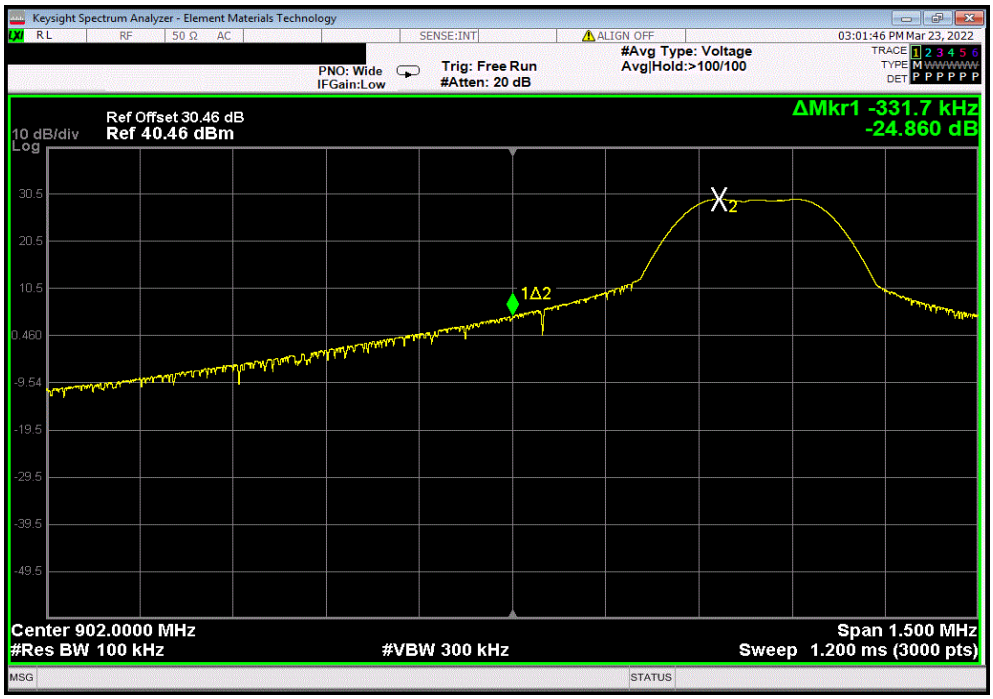
DEVIATIONS FROM TEST STANDARD

None

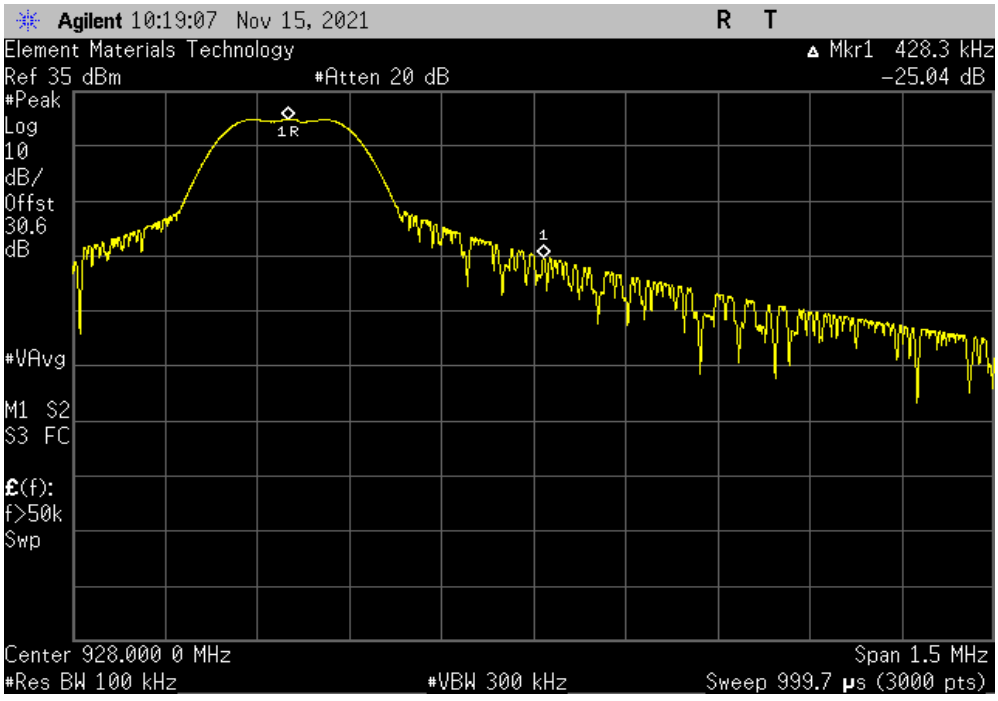
Configuration #	12	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
123k Data Rate			
Low channel, 902.4 MHz	-24.86	-20	Pass

123k Data Rate, Low channel, 902.4 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-24.86	-20	Pass



#REF!						
				Value (dBc)	Limit ≤ (dBc)	Result
				-25.04	-20	Pass



BAND EDGE COMPLIANCE -HOPPING MODE

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to its normal pseudo-random hopping sequence. 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 -HOPPING MODE

element

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	**RM148221**			**Work Order:**	**TRPA0008**
Serial Number:	**RM148221-2**			**Date:**	**15-Nov-21**
Customer:	**Traffic & Parking Control Co., Inc**			**Temperature:**	**24.3 °C**
Attendees:	**Roman Marjamaa**			**Humidity:**	**24.8% RH**
Project:	**None**			**Barometric Pres.:**	**1012 mbar**
Tested by:	**Andrew Rogstad**	**Power:**	**4.8 VDC**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2021	**ANSI C63.10:2013**

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at the following power settings: Low channel (High,83), Mid channel (High,83), and High channel (High,81). These power settings are used with the Puck and Omnidirectional antennas.

DEVIATIONS FROM TEST STANDARD

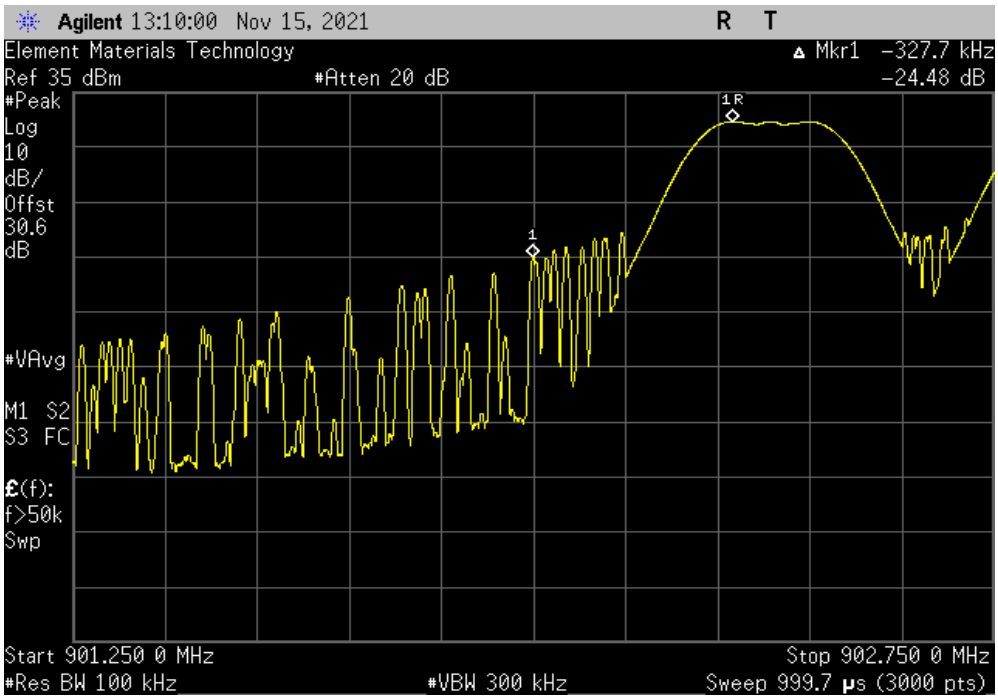
None

Configuration #	**1**	*Signature* Andrew Rogstad

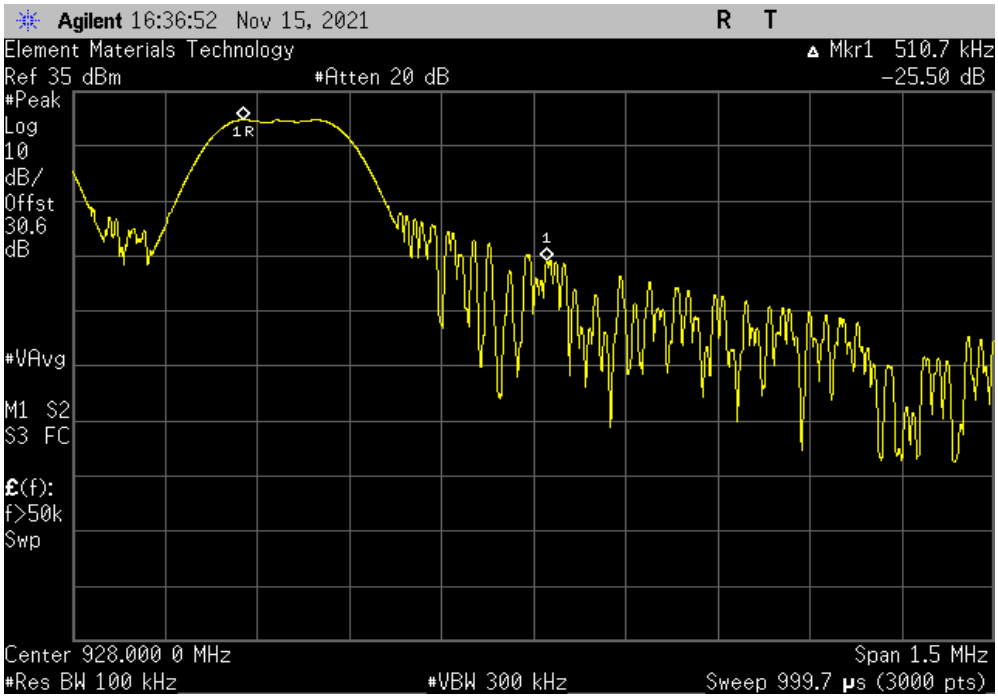
		Value (dBc)	**Limit ≤ (dBc)**	**Result**
123k Data Rate				
	Hopping Mode, 902.928 MHz			
	Low channel, 902.4 MHz	-24.48	-20	Pass
	High channel, 927.6 MHz	-25.51	-20	Pass

BAND EDGE COMPLIANCE -HOPPING MODE

123k Data Rate, Hopping Mode, 902.928 MHz, Low channel, 902.4 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-24.48	-20	Pass



123k Data Rate, Hopping Mode, 902.928 MHz, High channel, 927.6 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-25.51	-20	Pass



BAND EDGE COMPLIANCE

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to its normal pseudo-random hopping sequence. 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

element

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	**RM148221**			**Work Order:**	**TRPA0008**
Serial Number:	**RM148221-2**			**Date:**	**16-Nov-21**
Customer:	**Traffic & Parking Control Co., Inc**			**Temperature:**	**24.8 °C**
Attendees:	**Roman Marjamaa**			**Humidity:**	**25.3% RH**
Project:	**None**			**Barometric Pres.:**	**1002 mbar**
Tested by:	**Andrew Rogstad**	**Power:**	**4.8 VDC**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2021	**ANSI C63.10:2013**

COMMENTS

Reference level offset includes measurement cable, attenuators, and DC block. Tested at the following power settings: Low channel (Mid,48), Mid channel (Mid,48), and High channel (Mid,47). These power settings are used with Yagi antenna, which as a gain of 10.65 dBi.

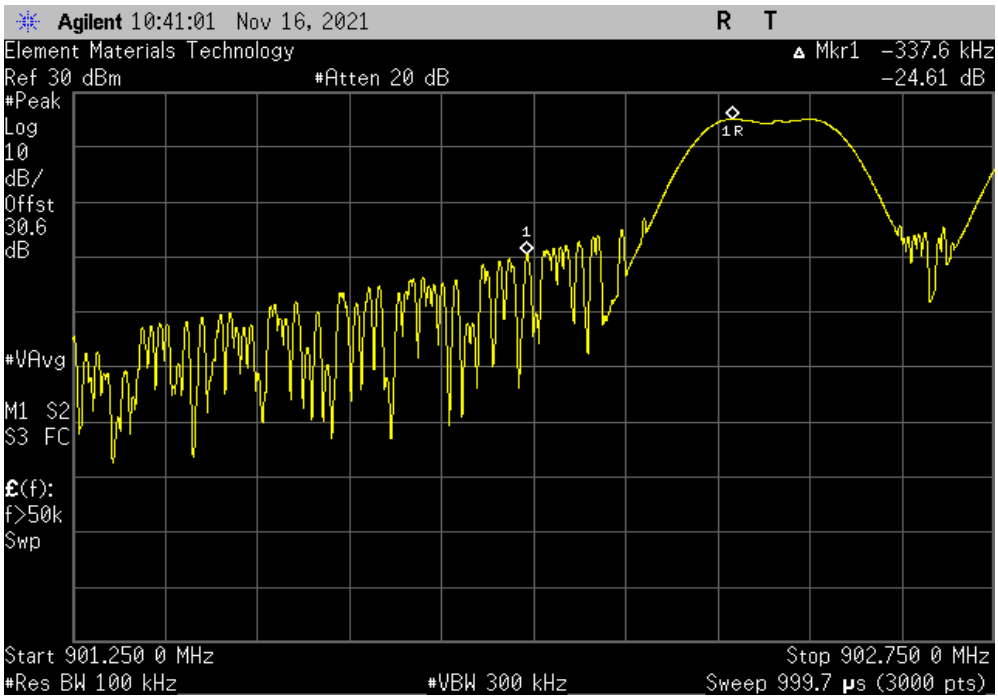
DEVIATIONS FROM TEST STANDARD

None

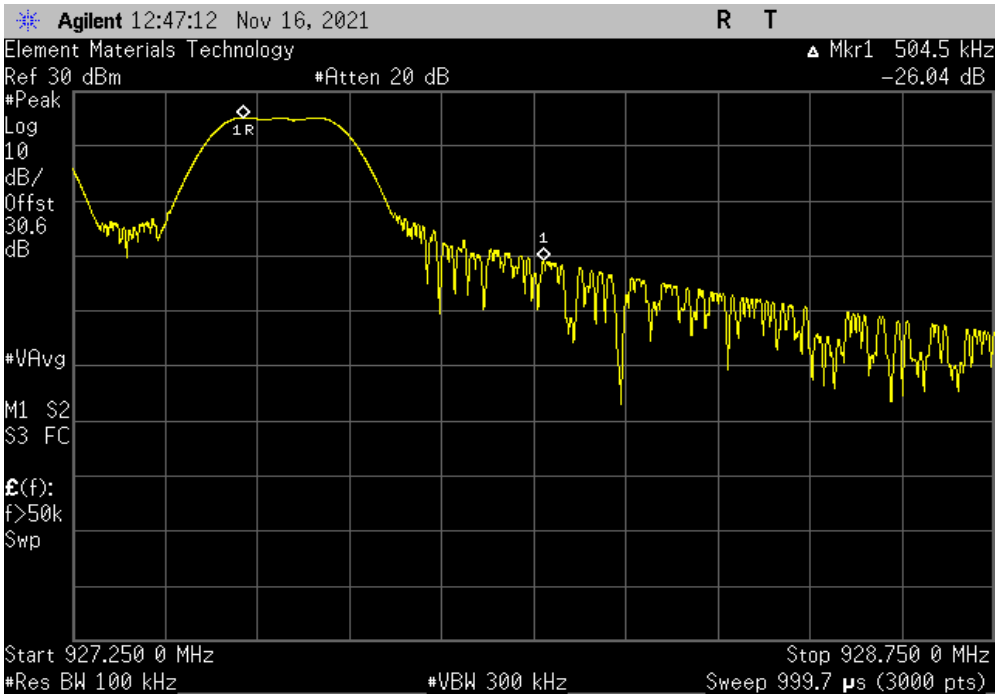
Configuration #	**1**	*Signature*

		Value (dBc)	**Limit ≤ (dBc)**	**Result**
123k Data Rate				
	Hopping Mode, 902-928 MHz			
	Low channel, 902.4 MHz	-24.61	-20	Pass
	High channel, 927.6 MHz	-26.04	-20	Pass

123k Data Rate, Hopping Mode, 902-928 MHz, Low channel, 902.4 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-24.61	-20	Pass



123k Data Rate, Hopping Mode, 902-928 MHz, High channel, 927.6 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.04	-20	Pass



BAND EDGE COMPLIANCE -HOPPING MODE

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12
Block - DC	Fairview Microwave	SD3379	AMI	2021-08-13	2022-08-13
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to its normal pseudo-random hopping sequence. 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 -HOPPING MODE

element

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	23-Mar-22
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	23.1 °C
Attendees:	None			**Humidity:**	30% RH
Project:	None			**Barometric Pres.:**	1008 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at power setting 76. This power setting is used for low channel with the Whip antenna.

DEVIATIONS FROM TEST STANDARD

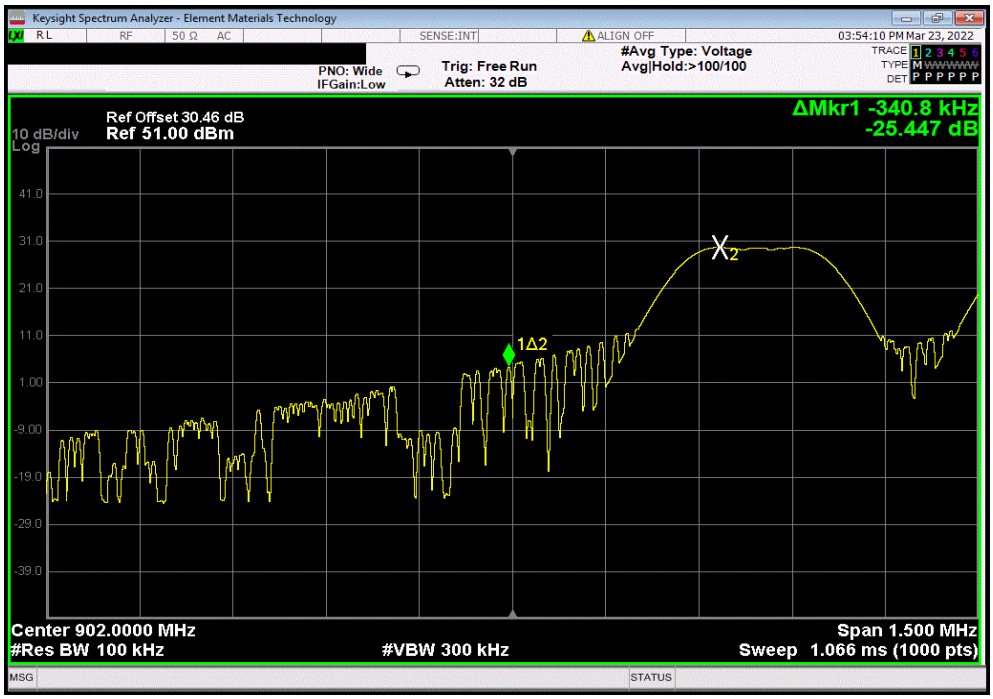
None

Configuration #	**12**	*Signature* Andrew Rogstad

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
123k Data Rate			
Hopping Mode, 902.928 MHz			
Low channel, 902.4 MHz	-25.45	-20	Pass

BAND EDGE COMPLIANCE -HOPPING MODE

123k Data Rate, Hopping Mode, 902.928 MHz, Low channel, 902.4 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-25.45	-20	Pass



OCCUPIED BANDWIDTH

XMit 2020.12.30.0

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
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2021-04-16	2022-04-16
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the spectrum analyzer. The 20 dB emissions bandwidth was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

OCCUPIED BANDWIDTH

XMit 2020.12.30.0

EUT:	**RM148221**			**Work Order:**	**TRPA0008**
Serial Number:	**RM148221-2**			**Date:**	**20-Jan-22**
Customer:	**Traffic & Parking Control Co., Inc**			**Temperature:**	**21.6 °C**
Attendees:	**None**			**Humidity:**	**17.5% RH**
Project:	**None**			**Barometric Pres.:**	**1038 mbar**
Tested by:	**Andrew Rogstad**	**Power:**	**4.8 VDC**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2022	ANSI C63.10:2013

COMMENTS

Tested with the EUT tranmitting modulated in high power mode.

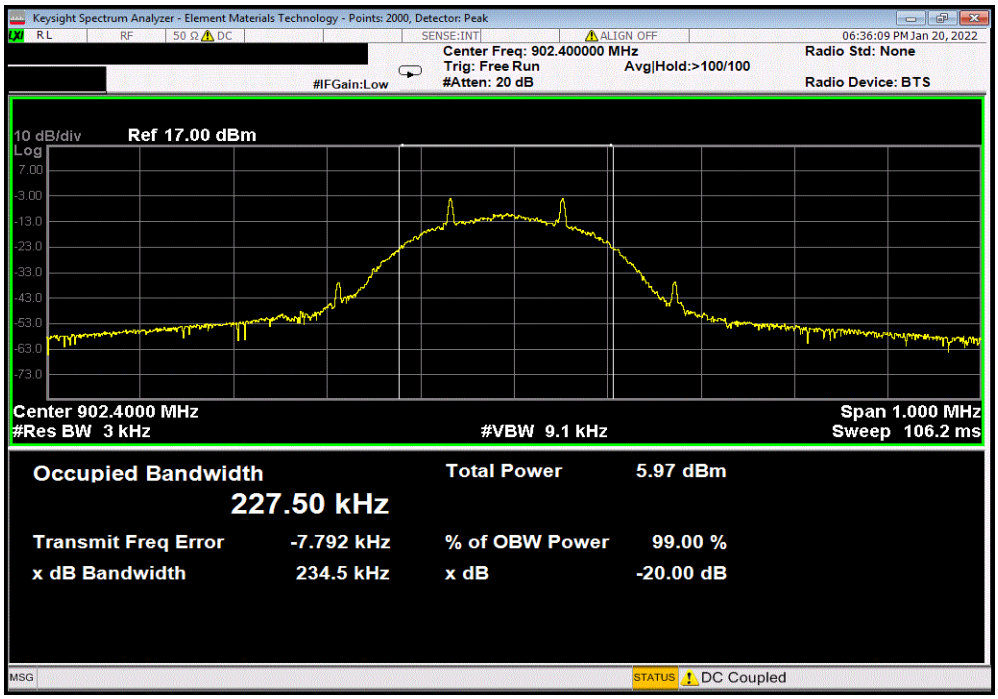
DEVIATIONS FROM TEST STANDARD

None

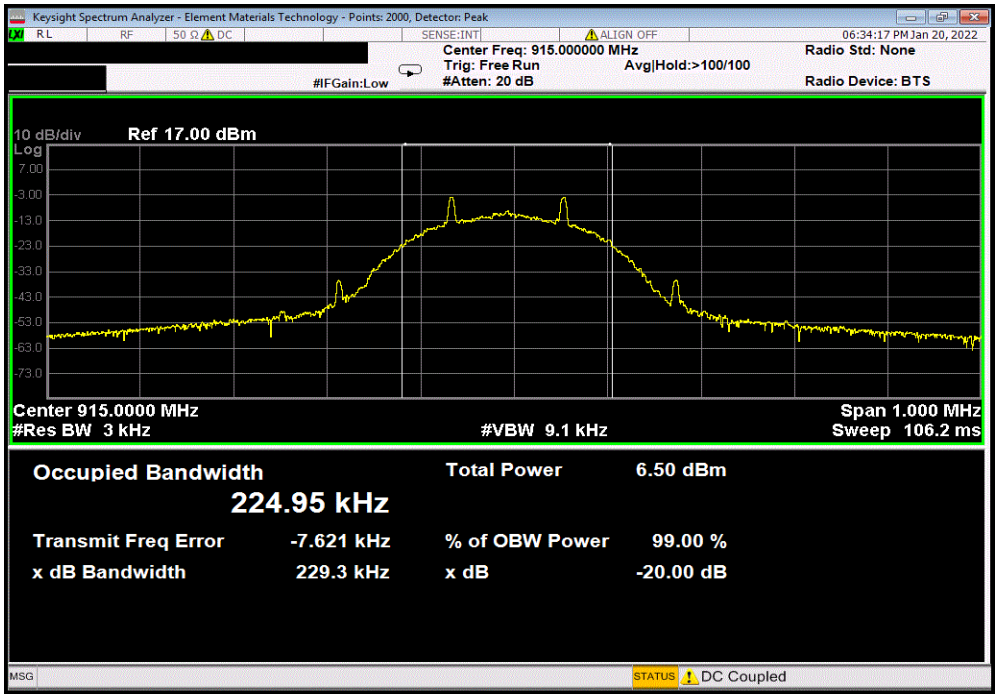
Configuration #	**6**	*Signature* Andrew Rogstad

	Value (kHz)	**Limit (kHz)**	**Result**
123k Data Rate			
Low channel, 902.4 MHz	234.5	250	Pass
Mid channel, 915 MHz	229.3	250	Pass
High channel, 927.6 MHz	229.1	250	Pass

123k Data Rate, Low channel, 902.4 MHz						
				Value (kHz)	Limit (kHz)	Result
				234.5	250	Pass



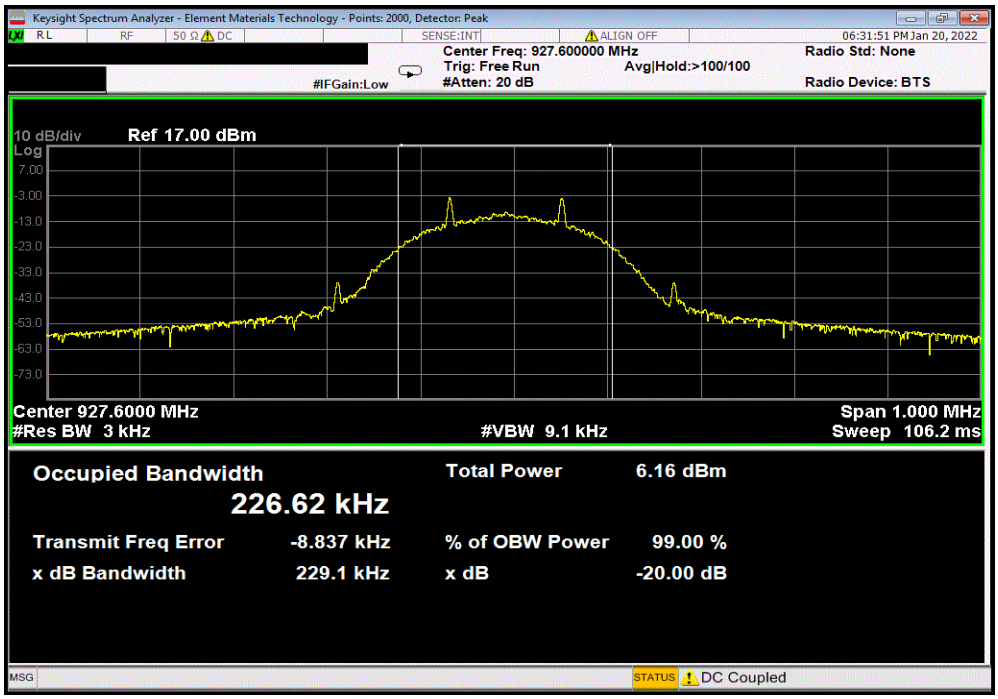
123k Data Rate, Mid channel, 915 MHz						
				Value (kHz)	Limit (kHz)	Result
				229.3	250	Pass



OCCUPIED BANDWIDTH

XMit 2020.12.30.0

123k Data Rate, High channel, 927.6 MHz							
					Value (kHz)	Limit (kHz)	Result
					229.1	250	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the 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 in a no-hop mode. 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.

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			**Work Order:**	TRPA0008
Serial Number:	RM148221-2			**Date:**	15-Nov-21
Customer:	Traffic & Parking Control Co., Inc			**Temperature:**	24.3 °C
Attendees:	Roman Marjamaa			**Humidity:**	24.9% RH
Project:	None			**Barometric Pres.:**	1012 mbar
Tested by:	Andrew Rogstad	**Power:**	4.8 VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at the following power settings: Low channel (High,83), Mid channel (High,83), and High channel (High,81). These power settings are used with the Puck and Omnidirectional antennas. The Mid channel (High,83) and High channel (High,81) are used for the Whip antenna.

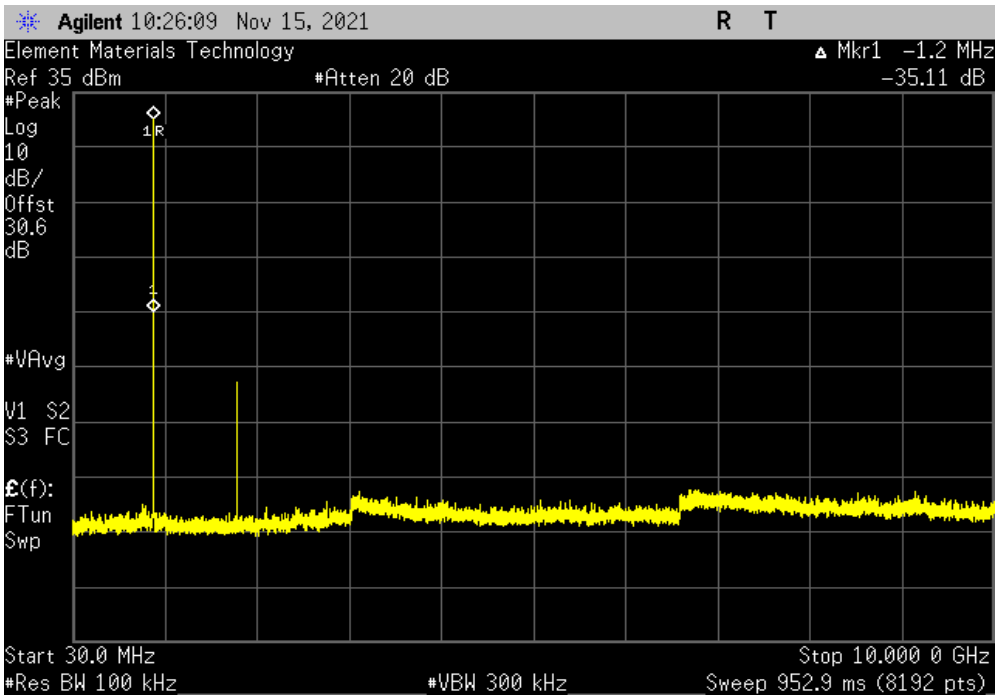
DEVIATIONS FROM TEST STANDARD

None

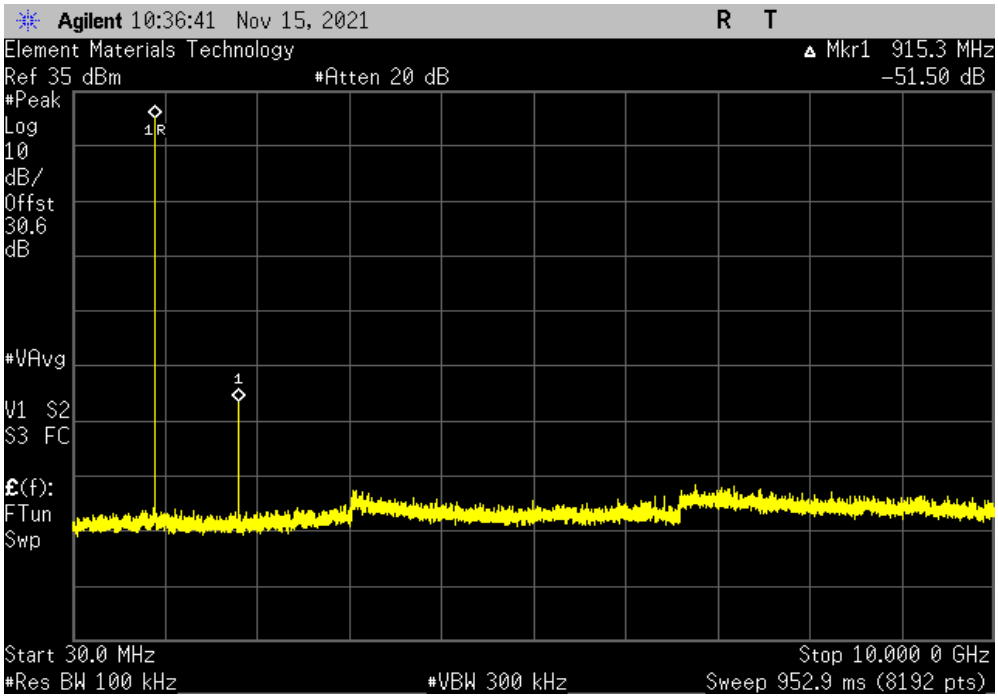
Configuration #	1	Signature

	Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
123k Data Rate				
Low channel, 902.4 MHz	30 MHz - 10 GHz	-35.11	-20	Pass
Mid channel, 915 MHz	30 MHz - 10 GHz	-51.5	-20	Pass
High channel, 927.6 MHz	30 MHz - 10 GHz	-54.82	-20	Pass

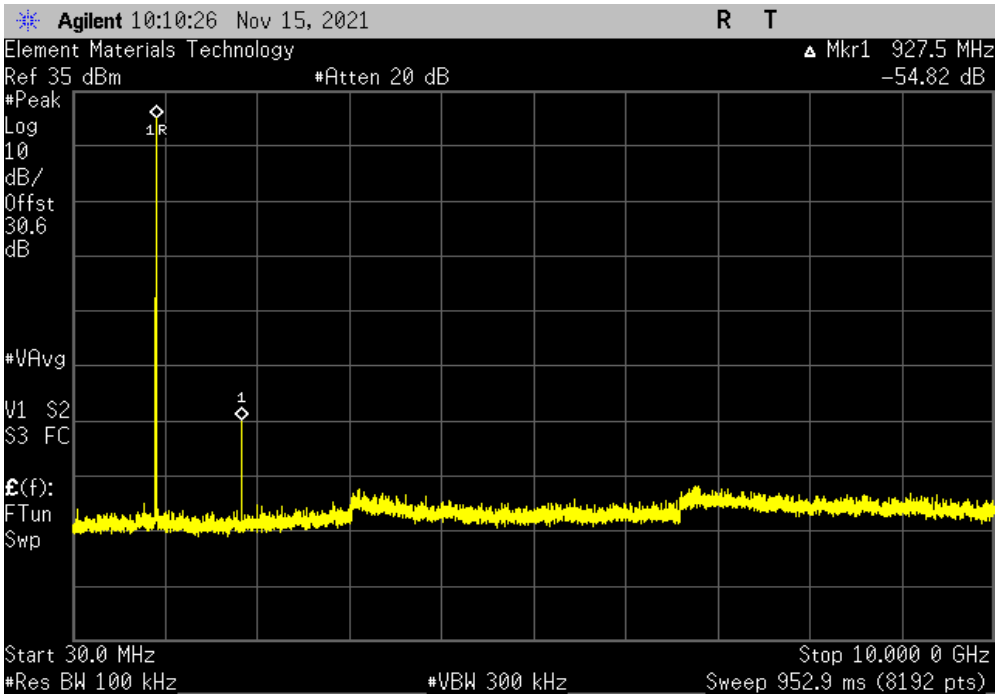
123k Data Rate, Low channel, 902.4 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 10 GHz		-35.11	-20	Pass



123k Data Rate, Mid channel, 915 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 10 GHz		-51.5	-20	Pass



123k Data Rate, High channel, 927.6 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 10 GHz		-54.82	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Block - DC	Fairview Microwave	SD3379	AMZ	2021-11-05	2022-11-05
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the 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 in a no-hop mode. 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.

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	**RM148221**			**Work Order:**	**TRPA0008**
Serial Number:	**RM148221-2**			**Date:**	**15-Nov-21**
Customer:	**Traffic & Parking Control Co., Inc**			**Temperature:**	**24.3 °C**
Attendees:	**Roman Marjamaa**			**Humidity:**	**24.8% RH**
Project:	**None**			**Barometric Pres.:**	**1012 mbar**
Tested by:	**Andrew Rogstad**	**Power:**	**4.8 VDC**	**Job Site:**	**MN08**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2021	**ANSI C63.10:2013**

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at the following power settings: Low channel (Mid,48), Mid channel (Mid,48), and High channel (Mid,47). These power settings are used with Yagi antenna.

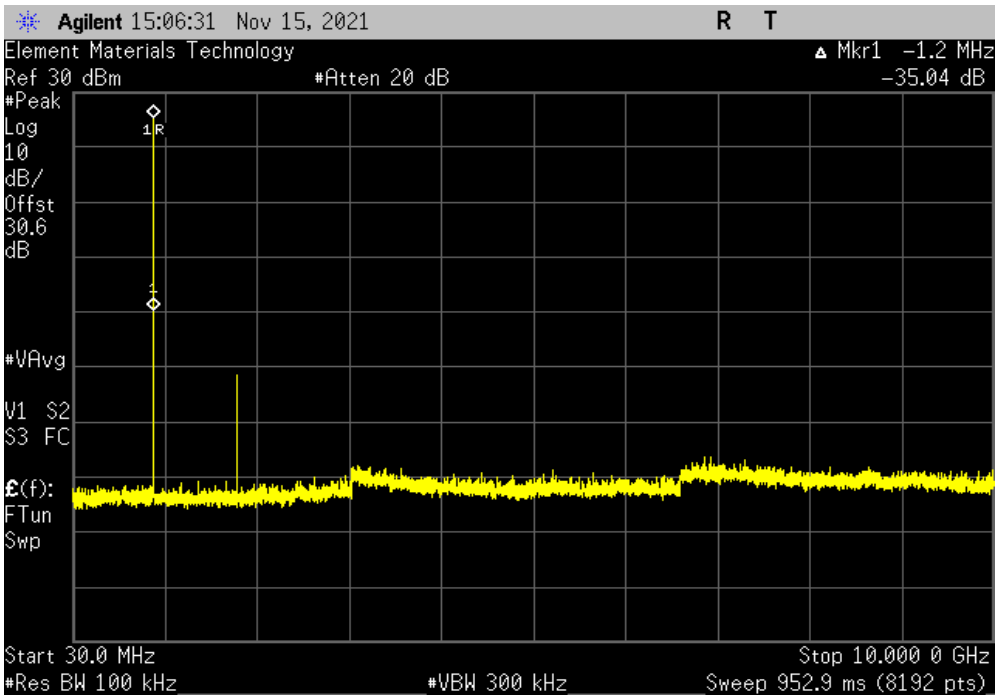
DEVIATIONS FROM TEST STANDARD

None

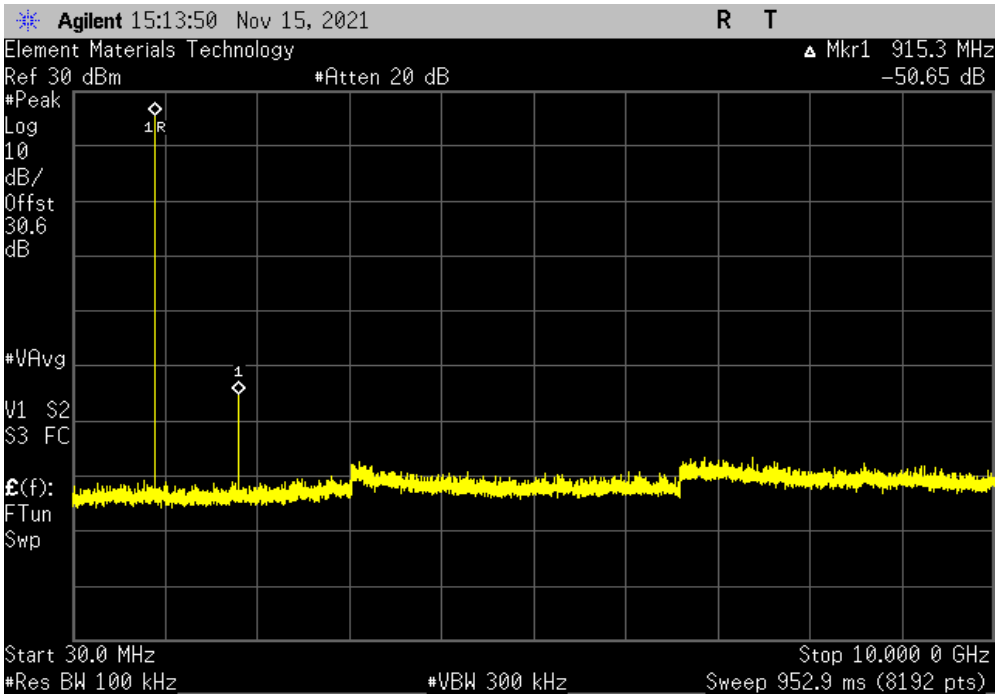
Configuration #	**1**	*Signature* Andrew Rogstad

	Frequency Range	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
123k Data Rate				
Low channel, 902.4 MHz	30 MHz - 10 GHz	-35.04	-20	Pass
Mid channel, 915 MHz	30 MHz - 10 GHz	-50.65	-20	Pass
High channel, 927.6 MHz	30 MHz - 10 GHz	-54.22	-20	Pass

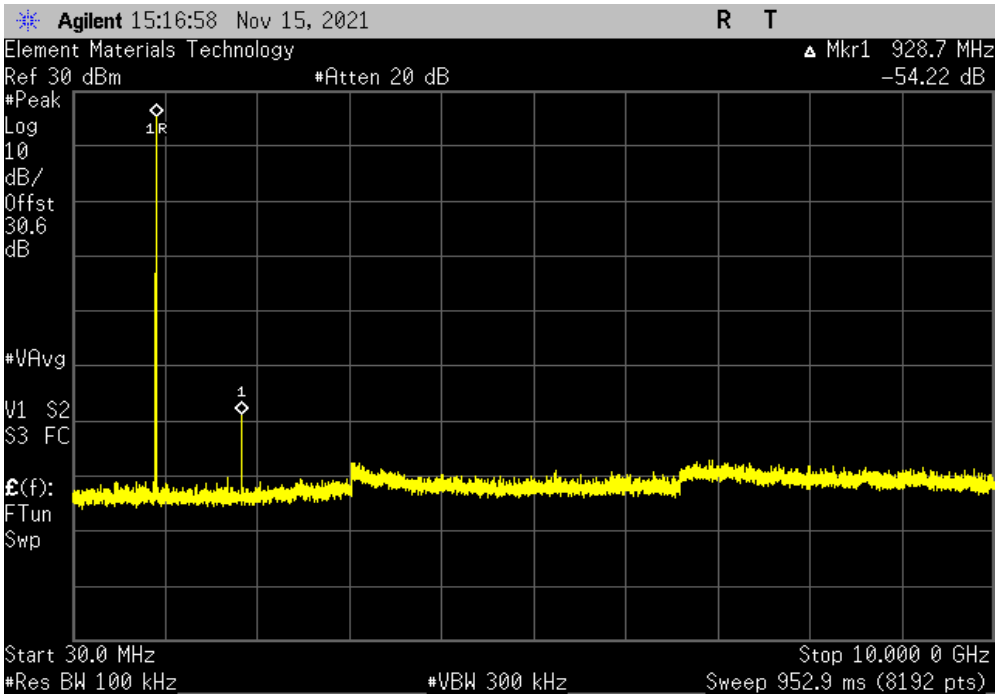
123k Data Rate, Low channel, 902.4 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 10 GHz		-35.04	-20	Pass



123k Data Rate, Mid channel, 915 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 10 GHz		-50.65	-20	Pass



123k Data Rate, High channel, 927.6 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 10 GHz		-54.22	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B (EXG)	TEY	2019-12-31	2022-12-31
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2021-05-18	2022-05-18
Attenuator	INMET	64671 6A-10dB	AUI	2021-08-04	2022-08-04
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2021-09-12	2022-09-12
Block - DC	Fairview Microwave	SD3379	AMI	2021-08-13	2022-08-13
Attenuator	Fairview Microwave	SA18S5W-20	RFX	2021-06-02	2022-06-02

TEST DESCRIPTION

The measurement was performed via a direct connection between the EUT and the 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 in a no-hop mode. 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.

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2021.03.19.1 XMit 2020.12.30.0

EUT:	RM148221			Work Order:	TRPA0008
Serial Number:	RM148221-2			Date:	23-Mar-22
Customer:	Traffic & Parking Control Co., Inc			Temperature:	23.1 °C
Attendees:	None			Humidity:	30% RH
Project:	None			Barometric Pres.:	1008 mbar
Tested by:	Andrew Rogstad	Power:	4.8 VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2021	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuation, and DC block. Tested at power setting 76. This power setting is used for low channel with the Whip antenna.

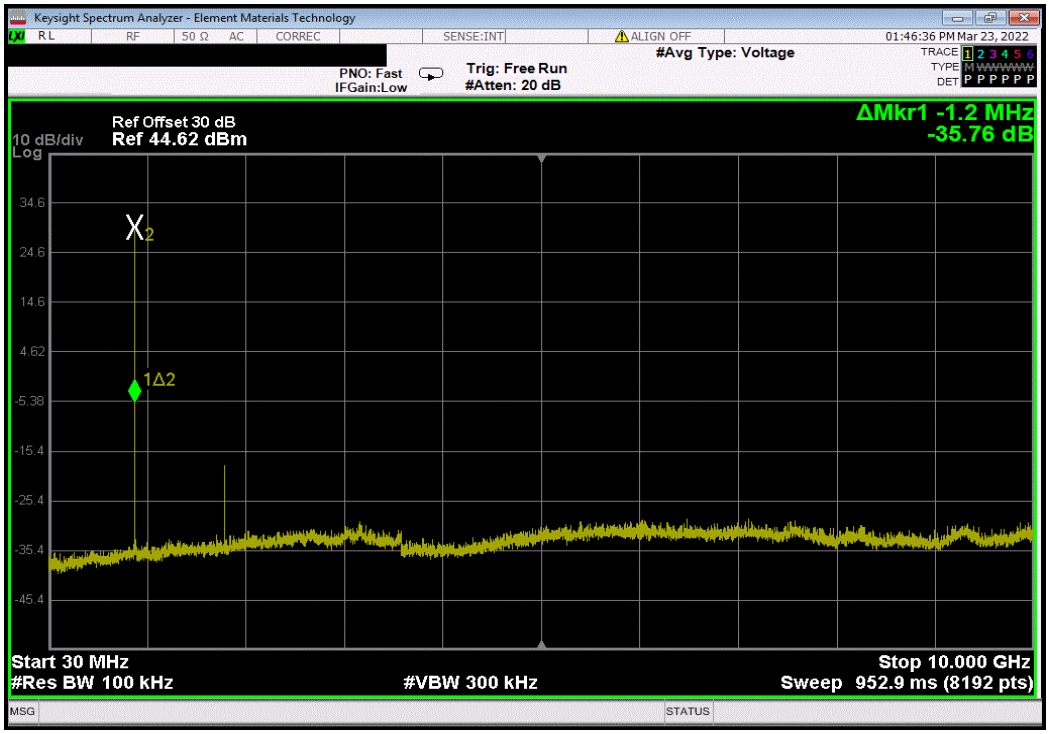
DEVIATIONS FROM TEST STANDARD

None

Configuration #	12	Signature

		Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
123k Data Rate					
	Low channel, 902.4 MHz	30 MHz - 10 GHz	-35.76	-20	Pass

123k Data Rate, Low channel, 902.4 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
30 MHz - 10 GHz		-35.76	-20	Pass



End of Test Report