



Traffic & Parking Control Co., Inc.

Radio 136377

FCC 15.207:2017

FCC 15.247:2017

902 - 928 MHz FHSS Transceiver

Report # MARJ0007



NVLAP Lab Code: 200881-0



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CERTIFICATE OF TEST

Last Date of Test: September 1, 2017
Traffic & Parking Control Co., Inc.
Model: Radio 136377

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2017	ANSI C63.10:2013
FCC 15.247:2017	

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	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	
7.8.6	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:

Matt Nuernberg, 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.

REVISION HISTORY



Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS



United States

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

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

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

Korea

MSIP / 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:

<http://portlandcustomer.element.com/ts/scope/scope.htm>

<http://gsi.nist.gov/global/docs/cabs/designations.html>

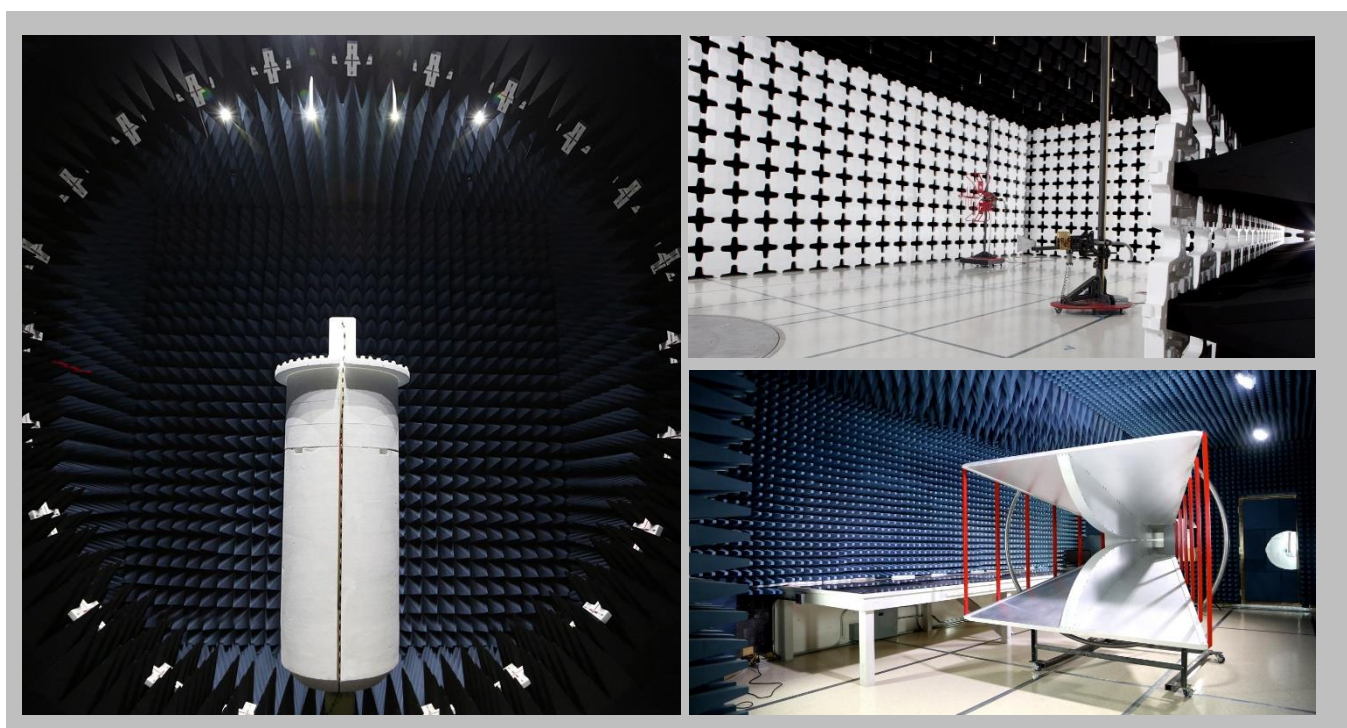
FACILITIES



2017.7.25



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



MEASUREMENT UNCERTAINTY



Measurement Uncertainty

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

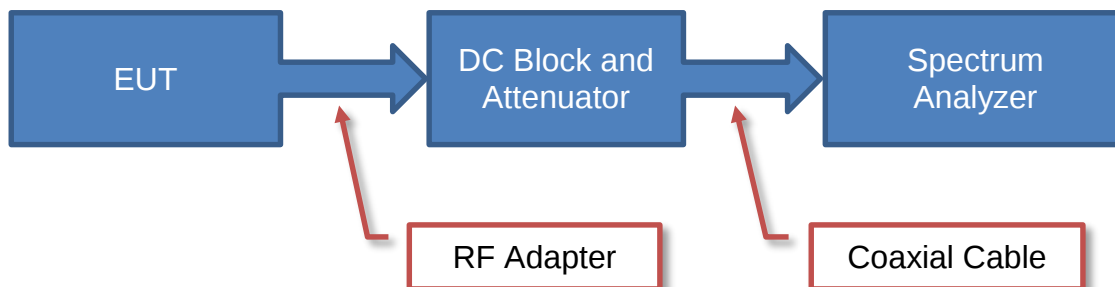
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. 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.

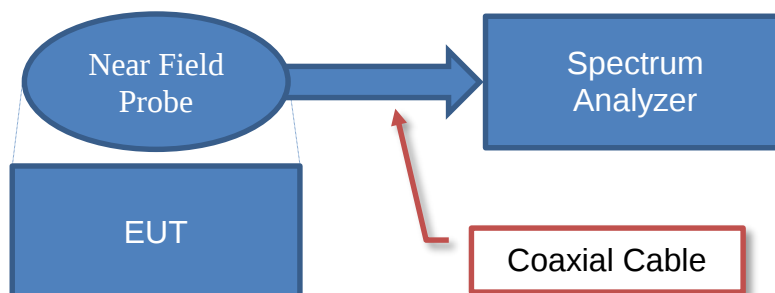
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

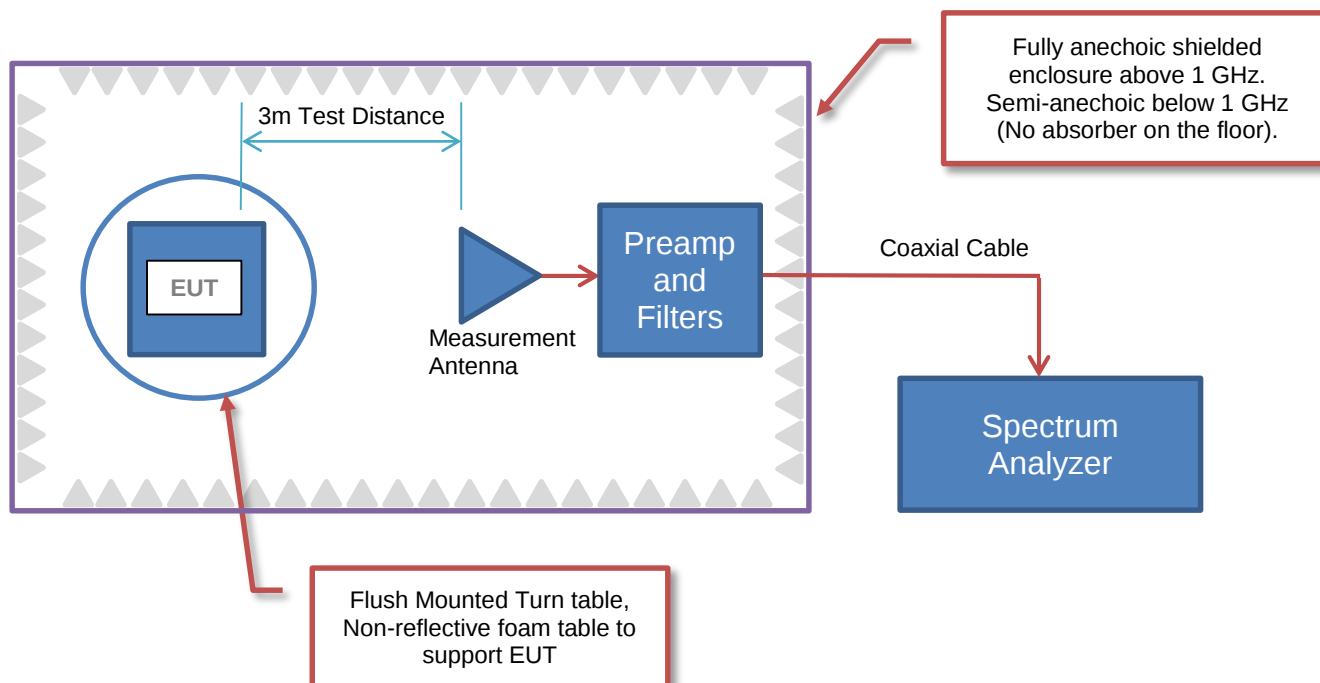
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions





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 of Marjamaa Engineering Inc.
Model:	Radio 136377
First Date of Test:	August 24, 2017
Last Date of Test:	September 1, 2017
Receipt Date of Samples:	August 24, 2017
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
900MHz ISM FHSS 1Watt radio module.
Testing Objective:
Seeking to demonstrate compliance under FCC 15.247:2017 for operation in the 902 - 928 MHz Band.

CONFIGURATIONS



Configuration MARJ0007- 1

Software/Firmware Running during test	
Description	Version
Firmware	6.0.2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Transmitter Module	Traffic & Parking Control Co., Inc.	Radio 136377	3

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Antenna (Rubber Duck)	Pulse Electronics Corporation	553-1474-ND	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
SMA to U.FL Cable (Rubber Duck)	No	0.2m	No	Transmitter Module	Rubber Duck Antenna
DC Cable	No	1.0m	No	TPZ	Transmitter Module

Configuration MARJ0007- 4

Software/Firmware Running during test	
Description	Version
Firmware	6.0.2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Transmitter Module	Traffic & Parking Control Co., Inc.	Radio 136377	3

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Antenna (Rubber Duck)	Pulse Electronics Corporation	553-1474-ND	None
Development Board	Tapco Inc.	129443R4	None
Power Supply	V-Infinity	ETSA050360UD	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
SMA to U.FL Cable (Rubber Duck)	No	0.2m	No	Transmitter Module	Rubber Duck Antenna
DC Cable	No	1.0m	No	Power Supply	Development Board
AC Cable	No	1.9m	No	Power Supply	AC Mains

CONFIGURATIONS



Configuration MARJ0007- 5

Software/Firmware Running during test	
Description	Version
Firmware	6.0.2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Transmitter Module	Traffic & Parking Control Co., Inc.	Radio 136377	3

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Development Board	Tapco Inc.	129443R4	None
Antenna (Omni)	Hana Wireless	HW-OD9-5-NF	None
Power Supply	V-Infinity	ETSA050360UD	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable	No	1.0m	No	Power Supply	Development Board
AC Cable	No	1.9m	No	Power Supply	AC Mains
SMA to U.FL Cable (Omni)	No	0.2m	No	Transmitter Module	Coaxial Cable (Omni Antenna)
Coaxial Cable (Omni Antenna)	Yes	0.5m	No	Omni Antenna	SMA to U.FL Cable (Omni)

CONFIGURATIONS



Configuration MARJ0007- 6

Software/Firmware Running during test	
Description	Version
Firmware	6.0.2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Transmitter Module	Traffic & Parking Control Co., Inc.	Radio 136377	3

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Development Board	Tapco Inc.	129443R4	None
Antenna (Puck)	Antenna Plus	AP90-S2-RP	None
Power Supply	V-Infinity	ETSA050360UD	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable	No	1.0m	No	Power Supply	Development Board
AC Cable	No	1.9m	No	Power Supply	AC Mains
Coaxial Cable (Puck Antenna)	Yes	0.5m	No	Puck Antenna	SMA to U.FL Cable (Puck)
SMA to U.FL Cable (Puck)	No	0.2m	No	Transmitter Module	Coaxial Cable (Puck Antenna)

CONFIGURATIONS



Configuration MARJ0007- 7

Software/Firmware Running during test	
Description	Version
Firmware	6.0.2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Transmitter Module	Traffic & Parking Control Co., Inc.	Radio 136377	3

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Development Board	Tapco Inc.	129443R4	None
Antenna (Yagi)	Laird Technologies	PC906N	00049
Power Supply	V-Infinity	ETSA050360UD	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable	No	1.0m	No	Power Supply	Development Board
AC Cable	No	1.9m	No	Power Supply	AC Mains
Coaxial Cable (Yagi Antenna)	Yes	0.9m	No	Yagi Antenna	SMA to U.FL Cable (Yagi)
SMA to U.FL Cable (Yagi)	No	0.2m	No	Transmitter Module	Coaxial Cable (Yagi Antenna)

CONFIGURATIONS



Configuration MARJ0007- 8

Software/Firmware Running during test	
Description	Version
Firmware	6.0.2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Transmitter Module	Traffic & Parking Control Co., Inc.	Radio 136377	3

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Development Board	Tapco Inc.	129443R4	None
Power Supply	V-Infinity	ETSA050360UD	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable	No	1.0m	No	Power Supply	Development Board
AC Cable	No	1.9m	No	Power Supply	AC Mains

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	8/24/2017	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.
2	8/30/2017	Spurious Radiated Emissions	Modified from delivered configuration.	Extra solder points were added to the shield (can) on the transmitter module. The customer has added the location of these solder points to his solder mask file for the board manufacturer. Modification authorized by Roman Marjamaa.	EUT remained at Element following the test.
3	9/1/2017	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.
4	9/1/2017	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.
5	9/1/2017	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.
6	9/1/2017	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.
7	9/1/2017	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.
8	9/1/2017	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.
9	9/1/2017	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.
10	9/1/2017	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT was taken home by the client before the next scheduled test.
11	9/1/2017	Number of Hopping Frequencies	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS



TEST DESCRIPTION

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESR7	ARI	6/4/2017	6/4/2018
Cable - Conducted Cable Assembly	Element	MNC, HGN, TYK	MNCA	1/27/2017	1/27/2018
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/20/2017	3/20/2018
Power Supply - DC	Agilent	U8002A	TPZ	NCR	NCR

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

MARJ0007-1

MODES INVESTIGATED

Tx modulated signal at 915MHz at 30.06dBm, power level 20.

POWERLINE CONDUCTED EMISSIONS



EUT:	Radio 136377	Work Order:	MARJ0007
Serial Number:	3	Date:	08/24/2017
Customer:	Traffic & Parking Control Co., Inc.	Temperature:	22.4°C
Attendees:	Roman Marjamaa	Relative Humidity:	48.7%
Customer Project:	None	Bar. Pressure:	1022 mb
Tested By:	Kyle McMullan	Job Site:	MN03
Power:	5VDC	Configuration:	MARJ0007-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	14	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

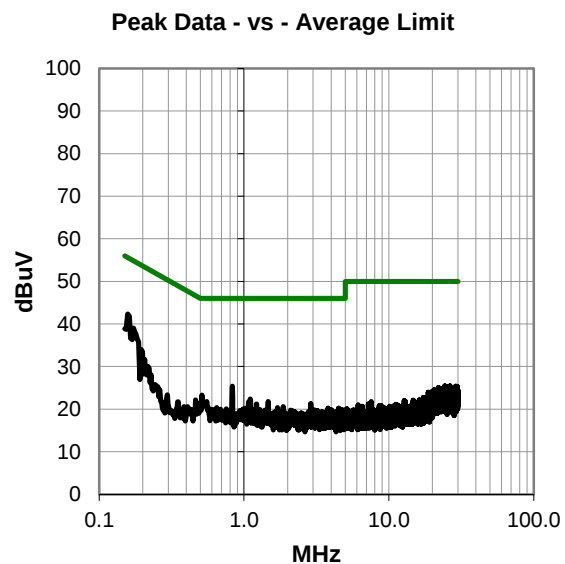
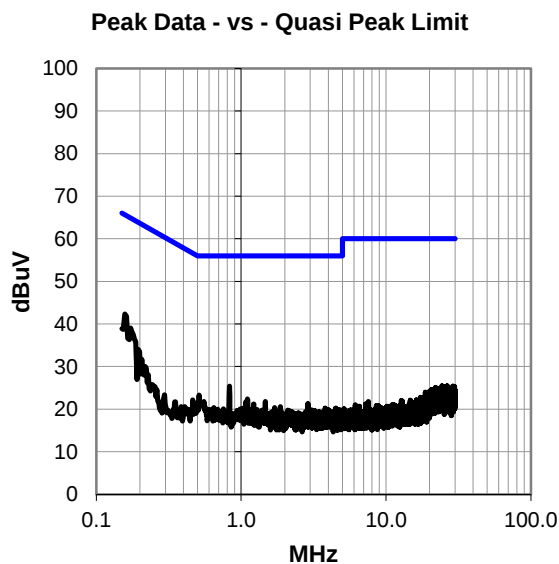
Using second power supply.

EUT OPERATING MODES

Tx modulated signal at 915MHz at 30.06dBm, power level 20.

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #14

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.157	21.8	20.5	42.3	65.6	-23.3
0.195	13.6	20.4	34.0	63.8	-29.8
0.829	5.1	20.3	25.4	56.0	-30.6
0.206	11.4	20.3	31.7	63.4	-31.7
0.512	3.0	20.3	23.3	56.0	-32.7
1.105	2.1	20.3	22.4	56.0	-33.6
1.471	1.5	20.3	21.8	56.0	-34.2
1.075	1.4	20.3	21.7	56.0	-34.3
0.463	1.9	20.3	22.2	56.6	-34.4
24.381	3.3	22.2	25.5	60.0	-34.5
26.389	3.1	22.4	25.5	60.0	-34.5
28.978	2.7	22.7	25.4	60.0	-34.6
2.892	0.9	20.4	21.3	56.0	-34.7
25.169	3.1	22.2	25.3	60.0	-34.7
29.705	2.4	22.9	25.3	60.0	-34.7
1.217	0.9	20.3	21.2	56.0	-34.8
21.975	3.3	21.8	25.1	60.0	-34.9
24.803	2.8	22.2	25.0	60.0	-35.0
29.314	2.3	22.7	25.0	60.0	-35.0
26.650	2.5	22.4	24.9	60.0	-35.1
22.833	2.8	22.0	24.8	60.0	-35.2
23.467	2.6	22.1	24.7	60.0	-35.3
1.862	0.3	20.3	20.6	56.0	-35.4
20.584	2.9	21.7	24.6	60.0	-35.4
24.840	2.4	22.2	24.6	60.0	-35.4
25.818	2.3	22.3	24.6	60.0	-35.4

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.157	21.8	20.5	42.3	55.6	-13.3
0.195	13.6	20.4	34.0	53.8	-19.8
0.829	5.1	20.3	25.4	46.0	-20.6
0.206	11.4	20.3	31.7	53.4	-21.7
0.512	3.0	20.3	23.3	46.0	-22.7
1.105	2.1	20.3	22.4	46.0	-23.6
1.471	1.5	20.3	21.8	46.0	-24.2
1.075	1.4	20.3	21.7	46.0	-24.3
0.463	1.9	20.3	22.2	46.6	-24.4
24.381	3.3	22.2	25.5	50.0	-24.5
26.389	3.1	22.4	25.5	50.0	-24.5
28.978	2.7	22.7	25.4	50.0	-24.6
2.892	0.9	20.4	21.3	46.0	-24.7
25.169	3.1	22.2	25.3	50.0	-24.7
29.705	2.4	22.9	25.3	50.0	-24.7
1.217	0.9	20.3	21.2	46.0	-24.8
21.975	3.3	21.8	25.1	50.0	-24.9
24.803	2.8	22.2	25.0	50.0	-25.0
29.314	2.3	22.7	25.0	50.0	-25.0
26.650	2.5	22.4	24.9	50.0	-25.1
22.833	2.8	22.0	24.8	50.0	-25.2
23.467	2.6	22.1	24.7	50.0	-25.3
1.862	0.3	20.3	20.6	46.0	-25.4
20.584	2.9	21.7	24.6	50.0	-25.4
24.840	2.4	22.2	24.6	50.0	-25.4
25.818	2.3	22.3	24.6	50.0	-25.4

CONCLUSION

Pass

Kyle McMillan

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	Radio 136377	Work Order:	MARJ0007
Serial Number:	3	Date:	08/24/2017
Customer:	Traffic & Parking Control Co., Inc.	Temperature:	22.4°C
Attendees:	Roman Marjamaa	Relative Humidity:	48.7%
Customer Project:	None	Bar. Pressure:	1022 mb
Tested By:	Kyle McMullan	Job Site:	MN03
Power:	5VDC	Configuration:	MARJ0007-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	15	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

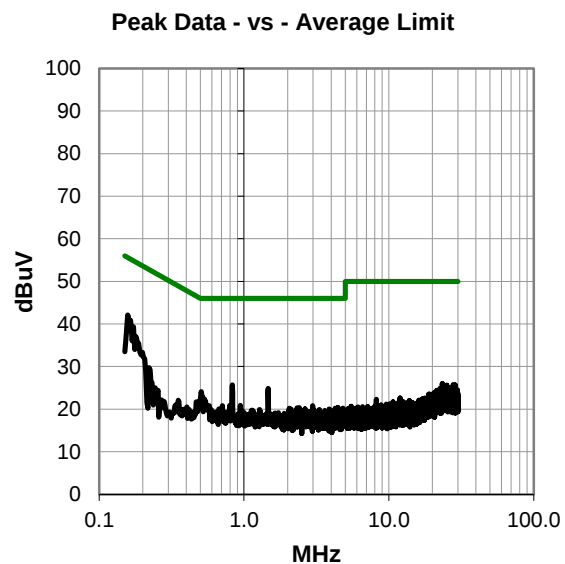
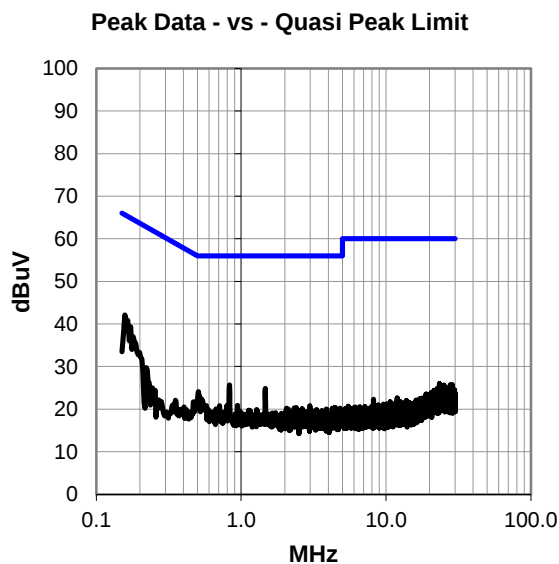
Ground tied to neutral on DC supply.

EUT OPERATING MODES

Tx modulated signal at 915MHz at 30.06dBm, power level 20.

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #15

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.157	21.6	20.5	42.1	65.6	-23.5
0.172	18.8	20.5	39.3	64.8	-25.5
0.829	5.4	20.3	25.7	56.0	-30.3
1.467	4.6	20.3	24.9	56.0	-31.1
0.508	3.8	20.3	24.1	56.0	-31.9
0.221	9.4	20.3	29.7	62.8	-33.1
23.370	3.9	22.1	26.0	60.0	-34.0
27.873	3.2	22.6	25.8	60.0	-34.2
28.623	3.0	22.7	25.7	60.0	-34.3
25.161	3.4	22.2	25.6	60.0	-34.4
28.709	2.7	22.7	25.4	60.0	-34.6
23.576	3.2	22.1	25.3	60.0	-34.7
23.654	3.0	22.1	25.1	60.0	-34.9
25.892	2.8	22.3	25.1	60.0	-34.9
28.056	2.5	22.6	25.1	60.0	-34.9
0.795	0.6	20.3	20.9	56.0	-35.1
0.941	0.6	20.3	20.9	56.0	-35.1
22.706	2.9	22.0	24.9	60.0	-35.1
0.710	0.5	20.3	20.8	56.0	-35.2
2.982	0.4	20.4	20.8	56.0	-35.2
24.777	2.6	22.2	24.8	60.0	-35.2
22.456	2.7	22.0	24.7	60.0	-35.3
29.179	2.0	22.7	24.7	60.0	-35.3
22.785	2.6	22.0	24.6	60.0	-35.4
22.945	2.5	22.0	24.5	60.0	-35.5
26.344	2.1	22.4	24.5	60.0	-35.5

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.157	21.6	20.5	42.1	55.6	-13.5
0.172	18.8	20.5	39.3	54.8	-15.5
0.829	5.4	20.3	25.7	46.0	-20.3
1.467	4.6	20.3	24.9	46.0	-21.1
0.508	3.8	20.3	24.1	46.0	-21.9
0.221	9.4	20.3	29.7	52.8	-23.1
23.370	3.9	22.1	26.0	50.0	-24.0
27.873	3.2	22.6	25.8	50.0	-24.2
28.623	3.0	22.7	25.7	50.0	-24.3
25.161	3.4	22.2	25.6	50.0	-24.4
28.709	2.7	22.7	25.4	50.0	-24.6
23.576	3.2	22.1	25.3	50.0	-24.7
23.654	3.0	22.1	25.1	50.0	-24.9
25.892	2.8	22.3	25.1	50.0	-24.9
28.056	2.5	22.6	25.1	50.0	-24.9
0.795	0.6	20.3	20.9	46.0	-25.1
0.941	0.6	20.3	20.9	46.0	-25.1
22.706	2.9	22.0	24.9	50.0	-25.1
0.710	0.5	20.3	20.8	46.0	-25.2
2.982	0.4	20.4	20.8	46.0	-25.2
24.777	2.6	22.2	24.8	50.0	-25.2
22.456	2.7	22.0	24.7	50.0	-25.3
29.179	2.0	22.7	24.7	50.0	-25.3
22.785	2.6	22.0	24.6	50.0	-25.4
22.945	2.5	22.0	24.5	50.0	-25.5
26.344	2.1	22.4	24.5	50.0	-25.5

CONCLUSION

Pass

Kyle McMillan

Tested By

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.06.01

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

MODES OF OPERATION

Transmitting low channel (902.2 MHz), mid channel (915 MHz), and high channel (926.8 MHz); modulated signal at 15k, 120k, 200k, 400k, and 610k data rates.

POWER SETTINGS INVESTIGATED

5VDC

CONFIGURATIONS INVESTIGATED

MARJ0007 - 7

MARJ0007 - 6

MARJ0007 - 5

MARJ0007 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12400 MHz
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SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HGS	8/7/2017	12 mo
Attenuator	Fairview Microwave	SA18E-10	TYA	9/23/2016	12 mo
Attenuator	Fairview Microwave	SA18E-20	TWZ	9/23/2016	12 mo
Filter - High Pass	Micro-Tronics	HPM50108	LFM	9/22/2016	12 mo
Filter - Low Pass	Micro-Tronics	LPM50003	LFJ	9/22/2016	12 mo
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/12/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2/14/2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2/14/2017	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/1/2016	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJA	6/23/2016	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	12/1/2016	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/1/2016	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	12/22/2016	12 mo

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

TEST DESCRIPTION

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 at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.



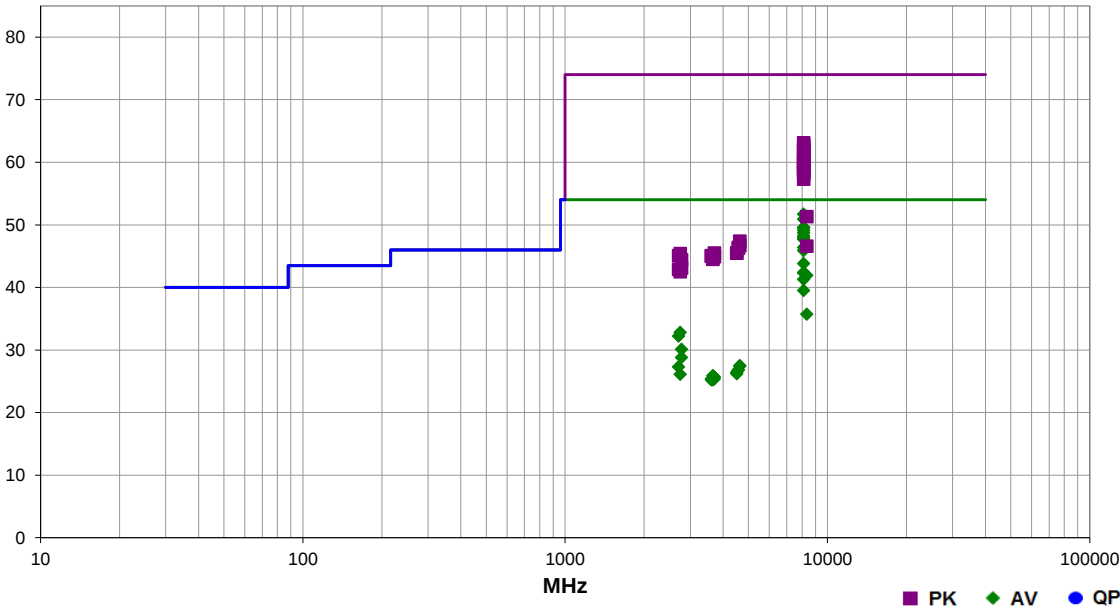
SPURIOUS RADIATED EMISSIONS

EmiRS 2017.07.11 PSA-ESCI 2017.06.01

Work Order:	MARJ0007	Date:	08/28/17	
Project:	None	Temperature:	22.6 °C	
Job Site:	MN05	Humidity:	61.4% RH	
Serial Number:	3	Barometric Pres.:	1021 mbar	
Tested by: Dustin Sparks				
EUT:	Radio 136377			
Configuration:	4			
Customer:	Traffic & Parking Control Co., Inc.			
Attendees:	Roman Marjamaa			
EUT Power:	5VDC			
Operating Mode:	Transmitting low channel (902.4 MHz), mid channel (915 MHz), and high channel (927.6 MHz); modulated signal at 15k, 120k, 200k, 400k, and 610k data rates.			
Deviations:	None			
Comments:	3dBi rubber duck antenna. -8 dB duty cycle correction factor based on a maximum duty cycle of 39.8% while in 50-channel hopping mode. 400k and 610k data rates were not operating at > 98% duty cycle so the correction factor does not apply. Extra solder points were added to the shield (can) on the transmitter module. The customer has added the location of these solder points to his solder mask file for the board manufacturer.			

Test Specifications	Test Method
FCC 15.247:2017	ANSI C63.10:2013

Run #	28	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
8119.283	43.8	15.9	2.1	160.1	-8.0	0.0	Horz	AV	0.0	51.7	54.0	-2.3	Low ch, EUT vert, 120k
8119.358	43.0	15.9	1.6	103.0	-8.0	0.0	Vert	AV	0.0	50.9	54.0	-3.1	Low ch, EUT horz, 120k
8119.733	41.7	15.9	1.0	135.0	-8.0	0.0	Vert	AV	0.0	49.6	54.0	-4.4	Low ch, EUT horz, 10k
8119.383	33.6	15.9	1.0	300.9	0.0	0.0	Horz	AV	0.0	49.5	54.0	-4.5	Low ch, EUT vert, 400k, pwr 9
8119.733	33.6	15.9	1.9	67.0	0.0	0.0	Horz	AV	0.0	49.5	54.0	-4.5	Low ch, EUT vert, 610k, pwr 9
8119.325	41.2	15.9	1.8	71.1	-8.0	0.0	Horz	AV	0.0	49.1	54.0	-4.9	Low ch, EUT on side, 120k
8119.858	32.8	15.9	1.0	112.1	0.0	0.0	Vert	AV	0.0	48.7	54.0	-5.3	Low ch, EUT horz, 610k, pwr 9
8119.317	40.3	15.9	1.3	106.1	-8.0	0.0	Vert	AV	0.0	48.2	54.0	-5.8	Low ch, EUT on side, 120k
8119.308	40.0	15.9	1.0	134.1	-8.0	0.0	Vert	AV	0.0	47.9	54.0	-6.1	Low ch, EUT vert, 200k
8119.342	39.8	15.9	1.0	135.0	-8.0	0.0	Vert	AV	0.0	47.7	54.0	-6.3	Low ch, EUT horz, 120k
8119.283	38.5	15.9	1.0	170.1	-8.0	0.0	Horz	AV	0.0	46.4	54.0	-7.6	Low ch, EUT on side, 120k
8119.283	38.0	15.9	1.0	84.1	-8.0	0.0	Vert	AV	0.0	45.9	54.0	-8.1	Low ch, EUT vert, 120k
8119.267	35.9	15.9	1.0	142.1	-8.0	0.0	Vert	AV	0.0	43.8	54.0	-10.2	Low ch, EUT on side, 120k
8119.142	47.2	15.9	2.1	160.1	0.0	0.0	Horz	PK	0.0	63.1	74.0	-10.9	Low ch, EUT vert, 120k
8119.842	46.8	15.9	1.6	103.0	0.0	0.0	Vert	PK	0.0	62.7	74.0	-11.3	Low ch, EUT horz, 120k
8119.308	34.5	15.9	1.2	99.0	-8.0	0.0	Vert	AV	0.0	42.4	54.0	-11.6	Low ch, EUT vert, 120k
8119.300	34.4	15.9	2.0	163.1	-8.0	0.0	Horz	AV	0.0	42.3	54.0	-11.7	Low ch, EUT on side, 120k
8119.942	46.2	15.9	1.0	135.0	0.0	0.0	Vert	PK	0.0	62.1	74.0	-11.9	Low ch, EUT horz, 10k
8120.508	46.1	15.9	1.0	134.1	0.0	0.0	Vert	PK	0.0	62.0	74.0	-12.0	Low ch, EUT horz, 200k

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
8340.683	55.4	-5.5	1.9	10.0	-8.0	0.0	Horz	AV	0.0	41.9	54.0	-12.1	High ch, EUT vert, 120k
8119.275	45.6	15.9	1.8	71.1	0.0	0.0	Horz	PK	0.0	61.5	74.0	-12.5	Low ch, EUT on side, 120k
8119.342	33.4	15.9	1.9	214.1	-8.0	0.0	Horz	AV	0.0	41.3	54.0	-12.7	Low ch, EUT horz, 120k
8119.275	45.3	15.9	1.3	106.1	0.0	0.0	Vert	PK	0.0	61.2	74.0	-12.8	Low ch, EUT on side, 120k
8119.467	44.7	15.9	1.0	135.0	0.0	0.0	Vert	PK	0.0	60.6	74.0	-13.4	Low ch, EUT horz, 120k
8119.792	44.2	15.9	1.0	112.1	0.0	0.0	Vert	PK	0.0	60.1	74.0	-13.9	Low ch, EUT horz, 610k, pwr 9
8120.292	44.1	15.9	1.0	84.1	0.0	0.0	Vert	PK	0.0	60.0	74.0	-14.0	Low ch, EUT vert, 120k
8120.650	44.1	15.9	1.9	67.0	0.0	0.0	Horz	PK	0.0	60.0	74.0	-14.0	Low ch, EUT vert, 610k, pwr 9
8119.208	43.7	15.9	1.0	170.1	0.0	0.0	Horz	PK	0.0	59.6	74.0	-14.4	Low ch, EUT vert, 120k
8119.308	31.6	15.9	1.0	133.0	-8.0	0.0	Horz	AV	0.0	39.5	54.0	-14.5	Low ch, EUT horz, 120k
8119.642	43.2	15.9	1.0	300.9	0.0	0.0	Horz	PK	0.0	59.1	74.0	-14.9	Low ch, EUT vert, 400k, pwr 9
8119.325	43.1	15.9	1.0	142.1	0.0	0.0	Vert	PK	0.0	59.0	74.0	-15.0	Low ch, EUT on side, 120k
8119.308	42.9	15.9	1.9	214.1	0.0	0.0	Horz	PK	0.0	58.8	74.0	-15.2	Low ch, EUT horz, 120k
8119.183	42.4	15.9	2.0	163.1	0.0	0.0	Horz	PK	0.0	58.3	74.0	-15.7	Low ch, EUT on side, 120k
8119.242	42.2	15.9	1.2	99.0	0.0	0.0	Vert	PK	0.0	58.1	74.0	-15.9	Low ch, EUT vert, 120k
8120.408	41.4	15.9	1.0	133.0	0.0	0.0	Horz	PK	0.0	57.3	74.0	-16.7	Low ch, EUT horz, 120k
8340.717	49.2	-5.5	1.0	145.1	-8.0	0.0	Vert	AV	0.0	35.7	54.0	-18.3	High ch, EUT vert, 120k
2744.875	42.5	-1.7	1.0	71.0	-8.0	0.0	Horz	AV	0.0	32.8	54.0	-21.2	Mid ch, EUT vert, 120k
2706.425	42.3	-2.1	1.0	65.1	-8.0	0.0	Horz	AV	0.0	32.2	54.0	-21.8	Low ch, EUT vert, 120k
8340.708	56.8	-5.5	1.9	10.0	0.0	0.0	Horz	PK	0.0	51.3	74.0	-22.7	High ch, EUT vert, 120k
2780.183	39.6	-1.5	1.0	308.9	-8.0	0.0	Vert	AV	0.0	30.1	54.0	-23.9	High ch, EUT horz, 120k
2780.292	38.3	-1.5	1.0	45.0	-8.0	0.0	Horz	AV	0.0	28.8	54.0	-25.2	High ch, EUT vert, 120k
4636.250	30.1	5.4	2.2	0.0	-8.0	0.0	Vert	AV	0.0	27.5	54.0	-26.5	High ch, EUT horz, 120k
4635.933	30.0	5.4	1.0	299.0	-8.0	0.0	Horz	AV	0.0	27.4	54.0	-26.6	High ch, EUT vert, 120k
4633.450	42.0	5.4	2.2	0.0	0.0	0.0	Vert	PK	0.0	47.4	74.0	-26.6	High ch, EUT horz, 120k
2706.408	37.4	-2.1	1.0	314.0	-8.0	0.0	Vert	AV	0.0	27.3	54.0	-26.7	Low ch, EUT horz, 120k
4572.858	29.6	5.2	3.1	218.0	-8.0	0.0	Horz	AV	0.0	26.8	54.0	-27.2	Mid ch, EUT vert, 120k
4574.833	29.6	5.2	1.0	172.0	-8.0	0.0	Vert	AV	0.0	26.8	54.0	-27.2	Mid ch, EUT horz, 120k
4632.975	41.3	5.4	1.0	299.0	0.0	0.0	Horz	PK	0.0	46.7	74.0	-27.3	High ch, EUT vert, 120k
8340.733	52.1	-5.5	1.0	145.1	0.0	0.0	Vert	PK	0.0	46.6	74.0	-27.4	High ch, EUT horz, 120k
4510.783	29.2	5.2	1.0	9.0	-8.0	0.0	Horz	AV	0.0	26.4	54.0	-27.6	Low ch, EUT vert, 120k
4573.558	41.2	5.2	3.1	218.0	0.0	0.0	Horz	PK	0.0	46.4	74.0	-27.6	Mid ch, EUT vert, 120k
4572.925	41.1	5.2	1.0	172.0	0.0	0.0	Vert	PK	0.0	46.3	74.0	-27.7	Mid ch, EUT horz, 120k
4512.883	29.0	5.2	2.6	289.9	-8.0	0.0	Vert	AV	0.0	26.2	54.0	-27.8	Low ch, EUT horz, 120k
2744.867	35.8	-1.7	1.0	31.0	-8.0	0.0	Vert	AV	0.0	26.1	54.0	-27.9	Mid ch, EUT horz, 120k
3659.725	31.6	2.3	1.0	347.9	-8.0	0.0	Horz	AV	0.0	25.9	54.0	-28.1	Mid ch, EUT vert, 120k
3706.892	31.0	2.7	4.0	231.0	-8.0	0.0	Horz	AV	0.0	25.7	54.0	-28.3	High ch, EUT vert, 120k
4509.758	40.3	5.2	2.6	289.9	0.0	0.0	Vert	PK	0.0	45.5	74.0	-28.5	Low ch, EUT horz, 120k
4513.467	40.3	5.2	1.0	9.0	0.0	0.0	Horz	PK	0.0	45.5	74.0	-28.5	Low ch, EUT vert, 120k
3706.600	42.8	2.7	4.0	231.0	0.0	0.0	Horz	PK	0.0	45.5	74.0	-28.5	High ch, EUT vert, 120k
3610.667	31.2	2.2	1.0	2.0	-8.0	0.0	Horz	AV	0.0	25.4	54.0	-28.6	Low ch, EUT vert, 120k
3707.400	30.7	2.7	1.0	348.9	-8.0	0.0	Vert	AV	0.0	25.4	54.0	-28.6	High ch, EUT horz, 120k
2744.783	47.1	-1.7	1.0	71.0	0.0	0.0	Horz	PK	0.0	45.4	74.0	-28.6	Mid ch, EUT vert, 120k
3610.642	31.0	2.2	1.0	292.0	-8.0	0.0	Vert	AV	0.0	25.2	54.0	-28.8	Low ch, EUT horz, 120k
3662.267	30.9	2.3	1.0	98.1	-8.0	0.0	Vert	AV	0.0	25.2	54.0	-28.8	Mid ch, EUT horz, 120k
3611.175	42.9	2.2	1.0	292.0	0.0	0.0	Vert	PK	0.0	45.1	74.0	-28.9	Low ch, EUT horz, 120k
2706.633	47.2	-2.1	1.0	65.1	0.0	0.0	Horz	PK	0.0	45.1	74.0	-28.9	Low ch, EUT vert, 120k
3606.925	42.9	2.1	1.0	2.0	0.0	0.0	Horz	PK	0.0	45.0	74.0	-29.0	Low ch, EUT vert, 120k
3708.375	42.2	2.7	1.0	348.9	0.0	0.0	Vert	PK	0.0	44.9	74.0	-29.1	High ch, EUT horz, 120k
3658.633	42.4	2.3	1.0	347.9	0.0	0.0	Horz	PK	0.0	44.7	74.0	-29.3	Mid ch, EUT vert, 120k
3660.442	42.2	2.3	1.0	98.1	0.0	0.0	Vert	PK	0.0	44.5	74.0	-29.5	Mid ch, EUT horz, 120k
2780.067	45.9	-1.5	1.0	308.9	0.0	0.0	Vert	PK	0.0	44.4	74.0	-29.6	High ch, EUT horz, 120k
2780.442	44.6	-1.5	1.0	45.0	0.0	0.0	Horz	PK	0.0	43.1	74.0	-30.9	High ch, EUT vert, 120k
2706.575	45.0	-2.1	1.0	314.0	0.0	0.0	Vert	PK	0.0	42.9	74.0	-31.1	Low ch, EUT horz, 120k
2745.217	44.2	-1.7	1.0	31.0	0.0	0.0	Vert	PK	0.0	42.5	74.0	-31.5	Mid ch, EUT horz, 120k

SPURIOUS RADIATED EMISSIONS



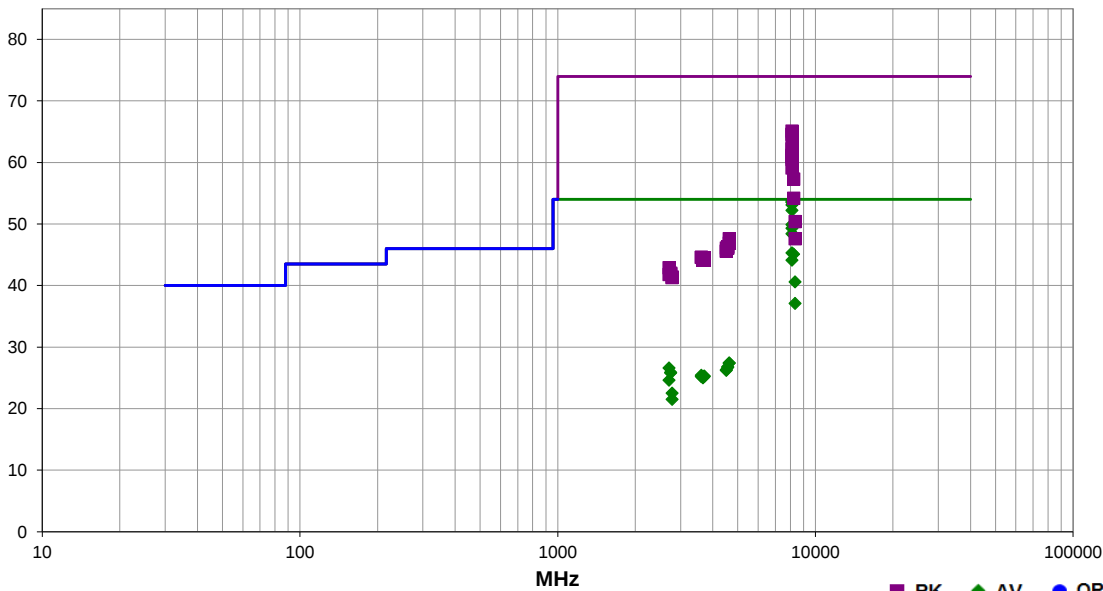
EmiRS 2017.07.11

PSA-ESCI 2017.06.01

Work Order:	MARJ0007	Date:	08/28/17	
Project:	None	Temperature:	22.6 °C	
Job Site:	MN05	Humidity:	61.4% RH	
Serial Number:	3	Barometric Pres.:	1021 mbar	Tested by: Dustin Sparks
EUT:	Radio 136377			
Configuration:	5			
Customer:	Traffic & Parking Control Co., Inc.			
Attendees:	Roman Marjamaa			
EUT Power:	5VDC			
Operating Mode:	Transmitting low channel (902.4 MHz), mid channel (915 MHz), and high channel (927.6 MHz); modulated signal at 15k, 120k, 200k, 400k, and 610k data rates.			
Deviations:	None			
Comments:	6dBi omnidirectional antenna. -8 dB duty cycle correction factor based on a maximum duty cycle of 39.8% while in 50-channel hopping mode. 400k and 610k data rates were not operating at > 98% duty cycle so the correction factor does not apply. Extra solder points were added to the shield (can) on the transmitter module. The customer has added the location of these solder points to his solder mask file for the board manufacturer.			

Test Specifications	Test Method
FCC 15.247:2017	ANSI C63.10:2013

Run #	40	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
8119.342	45.9	15.9	1.0	130.1	-8.0	0.0	Vert	AV	0.0	53.8	54.0	-0.2	Low ch, EUT horz, 120k
8119.775	45.7	15.9	1.0	105.1	-8.0	0.0	Vert	AV	0.0	53.6	54.0	-0.4	Low ch, EUT horz, 15k
8119.400	37.6	15.9	1.0	105.1	0.0	0.0	Vert	AV	0.0	53.5	54.0	-0.5	Low ch, EUT horz, 400k, power 9
8119.333	45.2	15.9	1.8	103.0	-8.0	0.0	Horz	AV	0.0	53.1	54.0	-0.9	Low ch, EUT vert, 120k
8119.800	36.3	15.9	1.0	106.1	0.0	0.0	Vert	AV	0.0	52.2	54.0	-1.8	Low ch, EUT horz, 610k, power 10
8119.308	42.0	15.9	1.8	360.0	-8.0	0.0	Vert	AV	0.0	49.9	54.0	-4.1	Low ch, EUT vert, 120k
8119.350	41.4	15.9	1.0	115.0	-8.0	0.0	Vert	AV	0.0	49.3	54.0	-4.7	Low ch, EUT horz, 200k
8119.283	40.5	15.9	1.0	271.9	-8.0	0.0	Vert	AV	0.0	48.4	54.0	-5.6	Low ch, EUT on side, 120k
8234.517	61.8	-5.6	1.7	101.1	-8.0	0.0	Horz	AV	0.0	48.2	54.0	-5.8	Mid ch, EUT vert, 120k
8119.342	37.4	15.9	1.5	194.0	-8.0	0.0	Horz	AV	0.0	45.3	54.0	-8.7	Low ch, EUT horz, 120k
8234.542	58.7	-5.6	1.0	131.1	-8.0	0.0	Vert	AV	0.0	45.1	54.0	-8.9	Mid ch, EUT horz, 120k
8119.800	49.2	15.9	1.0	105.1	0.0	0.0	Vert	PK	0.0	65.1	74.0	-8.9	Low ch, EUT horz, 15k
8119.292	48.7	15.9	1.0	130.1	0.0	0.0	Vert	PK	0.0	64.6	74.0	-9.4	Low ch, EUT horz, 120k
8119.300	48.6	15.9	1.8	103.0	0.0	0.0	Horz	PK	0.0	64.5	74.0	-9.5	Low ch, EUT vert, 120k
8119.275	36.2	15.9	1.0	222.0	-8.0	0.0	Horz	AV	0.0	44.1	54.0	-9.9	Low ch, EUT on side, 120k
8119.575	46.5	15.9	1.0	115.0	0.0	0.0	Vert	PK	0.0	62.4	74.0	-11.6	Low ch, EUT horz, 200k
8119.358	46.3	15.9	1.8	360.0	0.0	0.0	Vert	PK	0.0	62.2	74.0	-11.8	Low ch, EUT vert, 120k
8120.950	45.3	15.9	1.0	106.1	0.0	0.0	Vert	PK	0.0	61.2	74.0	-12.8	Low ch, EUT horz, 610k, power 10
8119.317	45.2	15.9	1.0	271.9	0.0	0.0	Vert	PK	0.0	61.1	74.0	-12.9	Low ch, EUT on side, 120k
8120.017	45.0	15.9	1.0	105.1	0.0	0.0	Vert	PK	0.0	60.9	74.0	-13.1	Low ch, EUT horz, 400k, power 9
8340.708	54.1	-5.5	1.5	5.1	-8.0	0.0	Horz	AV	0.0	40.6	54.0	-13.4	High ch, EUT vert, 120k

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
8119.250	44.6	15.9	1.5	194.0	0.0	0.0	Horz	PK	0.0	60.5	74.0	-13.5	Low ch, EUT horz, 120k
8119.983	43.2	15.9	1.0	222.0	0.0	0.0	Horz	PK	0.0	59.1	74.0	-14.9	Low ch, EUT on side, 120k
8234.975	62.9	-5.6	1.7	101.1	0.0	0.0	Horz	PK	0.0	57.3	74.0	-16.7	Mid ch, EUT vert, 120k
8340.750	50.6	-5.5	1.0	127.1	-8.0	0.0	Vert	AV	0.0	37.1	54.0	-16.9	High ch, EUT horz, 120k
8235.417	59.8	-5.6	1.0	131.1	0.0	0.0	Vert	PK	0.0	54.2	74.0	-19.8	Mid ch, EUT horz, 120k
8341.258	55.9	-5.5	1.5	5.1	0.0	0.0	Horz	PK	0.0	50.4	74.0	-23.6	High ch, EUT vert, 120k
4634.933	42.2	5.4	1.0	45.0	0.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	High ch, EUT horz, 120k
8341.067	53.1	-5.5	1.0	127.1	0.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	High ch, EUT horz, 120k
4636.150	30.0	5.4	1.0	0.0	-8.0	0.0	Horz	AV	0.0	27.4	54.0	-26.6	High ch, EUT vert, 120k
4635.617	30.0	5.4	1.0	45.0	-8.0	0.0	Vert	AV	0.0	27.4	54.0	-26.6	High ch, EUT horz, 120k
4631.425	41.5	5.4	1.0	0.0	0.0	0.0	Horz	PK	0.0	46.9	74.0	-27.1	High ch, EUT vert, 120k
4572.583	29.6	5.2	1.0	360.0	-8.0	0.0	Vert	AV	0.0	26.8	54.0	-27.2	Mid ch, EUT horz, 120k
4572.558	29.5	5.2	1.0	344.9	-8.0	0.0	Horz	AV	0.0	26.7	54.0	-27.3	Mid ch, EUT vert, 120k
2706.450	36.7	-2.1	1.1	130.1	-8.0	0.0	Horz	AV	0.0	26.6	54.0	-27.4	Low ch, EUT vert, 120k
4513.092	29.1	5.2	4.0	249.0	-8.0	0.0	Horz	AV	0.0	26.3	54.0	-27.7	Low ch, EUT vert, 120k
4574.042	41.1	5.2	1.0	344.9	0.0	0.0	Horz	PK	0.0	46.3	74.0	-27.7	Mid ch, EUT vert, 120k
4513.433	29.0	5.2	1.0	329.9	-8.0	0.0	Vert	AV	0.0	26.2	54.0	-27.8	Low ch, EUT horz, 120k
4513.142	40.9	5.2	4.0	249.0	0.0	0.0	Horz	PK	0.0	46.1	74.0	-27.9	Low ch, EUT vert, 120k
4575.683	40.8	5.3	1.0	360.0	0.0	0.0	Vert	PK	0.0	46.1	74.0	-27.9	Mid ch, EUT horz, 120k
2744.842	35.6	-1.7	1.0	135.0	-8.0	0.0	Horz	AV	0.0	25.9	54.0	-28.1	Mid ch, EUT vert, 120k
2744.842	35.5	-1.7	1.0	5.1	-8.0	0.0	Vert	AV	0.0	25.8	54.0	-28.2	Mid ch, EUT horz, 120k
4510.675	40.4	5.2	1.0	329.9	0.0	0.0	Vert	PK	0.0	45.6	74.0	-28.4	Low ch, EUT horz, 120k
3610.950	31.2	2.2	2.4	228.1	-8.0	0.0	Horz	AV	0.0	25.4	54.0	-28.6	Low ch, EUT vert, 120k
3708.717	30.6	2.7	1.0	182.0	-8.0	0.0	Horz	AV	0.0	25.3	54.0	-28.7	High ch, EUT vert, 120k
3708.892	30.5	2.7	2.9	170.1	-8.0	0.0	Vert	AV	0.0	25.2	54.0	-28.8	High ch, EUT horz, 120k
3611.000	31.0	2.2	1.0	329.9	-8.0	0.0	Vert	AV	0.0	25.2	54.0	-28.8	Low ch, EUT horz, 120k
3662.433	30.8	2.3	1.0	263.0	-8.0	0.0	Horz	AV	0.0	25.1	54.0	-28.9	Mid ch, EUT vert, 120k
3662.467	30.7	2.3	1.0	119.1	-8.0	0.0	Vert	AV	0.0	25.0	54.0	-29.0	Mid ch, EUT horz, 120k
2706.425	34.7	-2.1	1.0	17.0	-8.0	0.0	Vert	AV	0.0	24.6	54.0	-29.4	Low ch, EUT horz, 120k
3609.808	42.5	2.1	2.4	228.1	0.0	0.0	Horz	PK	0.0	44.6	74.0	-29.4	Low ch, EUT vert, 120k
3610.267	42.4	2.2	1.0	329.9	0.0	0.0	Vert	PK	0.0	44.6	74.0	-29.4	Low ch, EUT horz, 120k
3660.467	42.2	2.3	1.0	263.0	0.0	0.0	Horz	PK	0.0	44.5	74.0	-29.5	Mid ch, EUT vert, 120k
3708.692	41.8	2.7	1.0	182.0	0.0	0.0	Horz	PK	0.0	44.5	74.0	-29.5	High ch, EUT vert, 120k
3709.192	41.4	2.7	2.9	170.1	0.0	0.0	Vert	PK	0.0	44.1	74.0	-29.9	High ch, EUT horz, 120k
3660.650	41.8	2.3	1.0	119.1	0.0	0.0	Vert	PK	0.0	44.1	74.0	-29.9	Mid ch, EUT horz, 120k
2706.650	45.0	-2.1	1.1	130.1	0.0	0.0	Horz	PK	0.0	42.9	74.0	-31.1	Low ch, EUT vert, 120k
2780.283	32.0	-1.5	1.0	353.1	-8.0	0.0	Horz	AV	0.0	22.5	54.0	-31.5	High ch, EUT vert, 120k
2744.942	43.7	-1.7	1.0	5.1	0.0	0.0	Vert	PK	0.0	42.0	74.0	-32.0	Mid ch, EUT horz, 120k
2744.417	43.6	-1.7	1.0	135.0	0.0	0.0	Horz	PK	0.0	41.9	74.0	-32.1	Mid ch, EUT vert, 120k
2706.300	43.9	-2.1	1.0	17.0	0.0	0.0	Vert	PK	0.0	41.8	74.0	-32.2	Low ch, EUT horz, 120k
2780.308	31.0	-1.5	1.0	53.0	-8.0	0.0	Vert	AV	0.0	21.5	54.0	-32.5	High ch, EUT horz, 120k
2780.675	42.9	-1.5	1.0	53.0	0.0	0.0	Vert	PK	0.0	41.4	74.0	-32.6	High ch, EUT horz, 120k
2780.017	42.8	-1.5	1.0	353.1	0.0	0.0	Horz	PK	0.0	41.3	74.0	-32.7	High ch, EUT vert, 120k

SPURIOUS RADIATED EMISSIONS

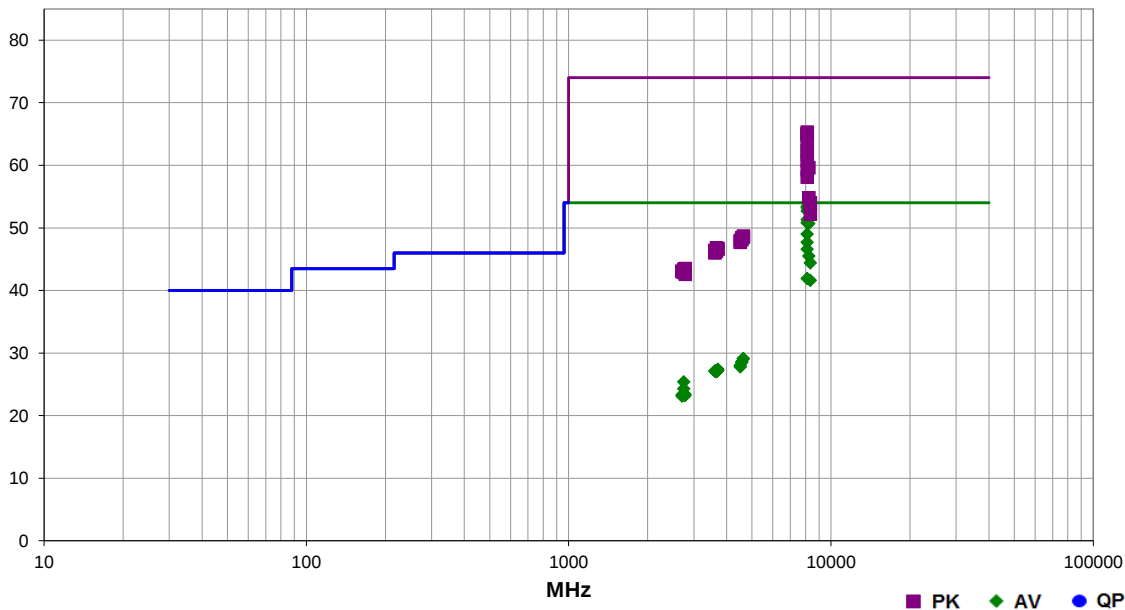


EmiRS 2017.07.11 PSA-ESCI 2017.06.01

Work Order:	MARJ0007	Date:	08/29/17	
Project:	None	Temperature:	22.5 °C	
Job Site:	MN05	Humidity:	56.4% RH	
Serial Number:	3	Barometric Pres.:	1023 mbar	Tested by: Dustin Sparks
EUT:	Radio 136377			
Configuration:	6			
Customer:	Traffic & Parking Control Co., Inc.			
Attendees:	Roman Marjamaa			
EUT Power:	5VDC			
Operating Mode:	Transmitting low channel (902.4 MHz), mid channel (915 MHz), and high channel (927.6 MHz); modulated signal at 15k, 120k, 200k, 400k, and 610k data rates.			
Deviations:	None			
Comments:	3dBi puck antenna. -8 dB duty cycle correction factor based on a maximum duty cycle of 39.8% while in 50-channel hopping mode. 400k and 610k data rates were not operating at > 98% duty cycle so the correction factor does not apply. Extra solder points were added to the shield (can) on the transmitter module. The customer has added the location of these solder points to his solder mask file for the board manufacturer.			

Test Specifications	FCC 15.247:2017	Test Method	ANSI C63.10:2013
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Run #	61	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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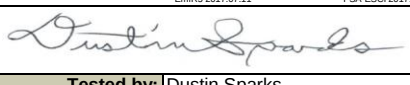
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
8119.333	46.1	15.9	2.0	92.0	-8.0	0.0	Vert	AV	0.0	54.0	54.0	0.0	Low ch, EUT horz, 120k
8119.350	45.5	15.9	1.9	193.0	-8.0	0.0	Horz	AV	0.0	53.4	54.0	-0.6	Low ch, EUT vert, 120k
8119.908	45.3	15.9	1.9	94.1	-8.0	0.0	Vert	AV	0.0	53.2	54.0	-0.8	Low ch, EUT horz, 15k
8119.400	44.8	15.9	2.0	94.1	-8.0	0.0	Vert	AV	0.0	52.7	54.0	-1.3	Low ch, EUT horz, 200k
8119.333	43.4	15.9	1.6	68.0	-8.0	0.0	Horz	AV	0.0	51.3	54.0	-2.7	Low ch, EUT on side, 120k
8120.083	34.9	15.9	1.9	112.1	0.0	0.0	Vert	AV	0.0	50.8	54.0	-3.2	Low ch, EUT horz, 610k, pwr 10
8234.558	64.3	-5.6	1.9	91.1	-8.0	0.0	Horz	AV	0.0	50.7	54.0	-3.3	Mid ch, EUT vert, 120k
8119.333	41.1	15.9	2.1	114.0	-8.0	0.0	Vert	AV	0.0	49.0	54.0	-5.0	Low ch, EUT vert, 120k
8119.292	39.8	15.9	1.0	96.0	-8.0	0.0	Vert	AV	0.0	47.7	54.0	-6.3	Low ch, EUT on side, 120k
8122.167	30.7	15.9	1.0	52.1	0.0	0.0	Vert	AV	0.0	46.6	54.0	-7.4	Low ch, EUT horz, 400k, pwr 8
8234.575	59.1	-5.6	1.0	292.0	-8.0	0.0	Vert	AV	0.0	45.5	54.0	-8.5	Mid ch, EUT horz, 120k
8119.425	49.4	15.9	2.0	92.0	0.0	0.0	Vert	PK	0.0	65.3	74.0	-8.7	Low ch, EUT horz, 120k
8119.842	49.2	15.9	1.9	94.1	0.0	0.0	Vert	PK	0.0	65.1	74.0	-8.9	Low ch, EUT horz, 15k
8119.275	49.1	15.9	1.9	193.0	0.0	0.0	Horz	PK	0.0	65.0	74.0	-9.0	Low ch, EUT vert, 120k
8119.383	48.9	15.9	2.0	94.1	0.0	0.0	Vert	PK	0.0	64.8	74.0	-9.2	Low ch, EUT horz, 200k
8340.775	57.9	-5.5	1.8	360.0	-8.0	0.0	Horz	AV	0.0	44.4	54.0	-9.6	High ch, EUT vert, 120k
8119.450	47.7	15.9	1.6	68.0	0.0	0.0	Horz	PK	0.0	63.6	74.0	-10.4	Low ch, EUT on side, 120k
8119.075	46.5	15.9	2.1	114.0	0.0	0.0	Vert	PK	0.0	62.4	74.0	-11.6	Low ch, EUT vert, 120k
8119.325	34.0	15.9	1.0	173.1	-8.0	0.0	Horz	AV	0.0	41.9	54.0	-12.1	Low ch, EUT horz, 120k

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
8118.983	45.8	15.9	1.0	96.0	0.0	0.0	Vert	PK	0.0	61.7	74.0	-12.3	Low ch, EUT on side, 120k
8340.775	55.1	-5.5	1.9	98.1	-8.0	0.0	Vert	AV	0.0	41.6	54.0	-12.4	High ch, EUT horz, 120k
8120.325	44.8	15.9	1.9	112.1	0.0	0.0	Vert	PK	0.0	60.7	74.0	-13.3	Low ch, EUT horz, 610k, pwr 10
8234.775	65.2	-5.6	1.9	91.1	0.0	0.0	Horz	PK	0.0	59.6	74.0	-14.4	Mid ch, EUT vert, 120k
8119.575	43.4	15.9	1.0	173.1	0.0	0.0	Horz	PK	0.0	59.3	74.0	-14.7	Low ch, EUT horz, 120k
8119.492	42.2	15.9	1.0	52.1	0.0	0.0	Vert	PK	0.0	58.1	74.0	-15.9	Low ch, EUT horz, 400k, pwr 8
8234.508	60.4	-5.6	1.0	292.0	0.0	0.0	Vert	PK	0.0	54.8	74.0	-19.2	Mid ch, EUT horz, 120k
8340.708	59.5	-5.5	1.8	360.0	0.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	High ch, EUT vert, 120k
8340.775	57.7	-5.5	1.9	98.1	0.0	0.0	Vert	PK	0.0	52.2	74.0	-21.8	High ch, EUT horz, 120k
4636.425	31.7	5.4	1.4	0.0	-8.0	0.0	Horz	AV	0.0	29.1	54.0	-24.9	High ch, EUT vert, 120k
4631.808	31.7	5.4	3.6	144.0	-8.0	0.0	Vert	AV	0.0	29.1	54.0	-24.9	High ch, EUT horz, 120k
4632.067	43.3	5.4	1.4	0.0	0.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	High ch, EUT vert, 120k
4576.883	31.3	5.3	3.2	271.9	-8.0	0.0	Horz	AV	0.0	28.6	54.0	-25.4	Mid ch, EUT vert, 120k
4575.300	31.2	5.3	3.2	318.9	-8.0	0.0	Vert	AV	0.0	28.5	54.0	-25.5	Mid ch, EUT horz, 120k
4635.792	43.1	5.4	3.6	144.0	0.0	0.0	Vert	PK	0.0	48.5	74.0	-25.5	High ch, EUT horz, 120k
4572.850	43.2	5.2	3.2	318.9	0.0	0.0	Vert	PK	0.0	48.4	74.0	-25.6	Mid ch, EUT horz, 120k
4574.825	42.9	5.2	3.2	271.9	0.0	0.0	Horz	PK	0.0	48.1	74.0	-25.9	Mid ch, EUT vert, 120k
4510.792	30.8	5.2	1.0	185.1	-8.0	0.0	Horz	AV	0.0	28.0	54.0	-26.0	Low ch, EUT vert, 120k
4510.517	42.8	5.2	1.0	185.1	0.0	0.0	Horz	PK	0.0	48.0	74.0	-26.0	Low ch, EUT vert, 120k
4513.408	30.6	5.2	1.6	15.1	-8.0	0.0	Vert	AV	0.0	27.8	54.0	-26.2	Low ch, EUT horz, 120k
4510.750	42.5	5.2	1.6	15.1	0.0	0.0	Vert	PK	0.0	47.7	74.0	-26.3	Low ch, EUT horz, 120k
3709.658	32.7	2.7	1.0	243.9	-8.0	0.0	Horz	AV	0.0	27.4	54.0	-26.6	High ch, EUT vert, 120k
3709.850	32.5	2.7	1.0	169.0	-8.0	0.0	Vert	AV	0.0	27.2	54.0	-26.8	High ch, EUT horz, 120k
3611.108	32.9	2.2	1.0	205.0	-8.0	0.0	Horz	AV	0.0	27.1	54.0	-26.9	Low ch, EUT vert, 120k
3611.242	32.9	2.2	1.0	48.1	-8.0	0.0	Vert	AV	0.0	27.1	54.0	-26.9	Low ch, EUT horz, 120k
3662.325	32.8	2.3	3.7	354.9	-8.0	0.0	Horz	AV	0.0	27.1	54.0	-26.9	Mid ch, EUT vert, 120k
3662.483	32.7	2.3	1.0	115.0	-8.0	0.0	Vert	AV	0.0	27.0	54.0	-27.0	Mid ch, EUT horz, 120k
3661.683	44.5	2.3	3.7	354.9	0.0	0.0	Horz	PK	0.0	46.8	74.0	-27.2	Mid ch, EUT vert, 120k
3708.867	44.0	2.7	1.0	243.9	0.0	0.0	Horz	PK	0.0	46.7	74.0	-27.3	High ch, EUT vert, 120k
3709.608	43.9	2.7	1.0	169.0	0.0	0.0	Vert	PK	0.0	46.6	74.0	-27.4	High ch, EUT horz, 120k
3610.558	44.2	2.2	1.0	48.1	0.0	0.0	Vert	PK	0.0	46.4	74.0	-27.6	Low ch, EUT horz, 120k
3659.033	44.0	2.3	1.0	115.0	0.0	0.0	Vert	PK	0.0	46.3	74.0	-27.7	Mid ch, EUT horz, 120k
3609.658	43.9	2.1	1.0	205.0	0.0	0.0	Horz	PK	0.0	46.0	74.0	-28.0	Low ch, EUT vert, 120k
2744.917	35.1	-1.7	1.0	226.0	-8.0	0.0	Horz	AV	0.0	25.4	54.0	-28.6	Mid ch, EUT vert, 120k
2744.892	34.0	-1.7	3.9	351.9	-8.0	0.0	Vert	AV	0.0	24.3	54.0	-29.7	Mid ch, EUT horz, 120k
2778.133	45.0	-1.5	1.2	48.1	0.0	0.0	Horz	PK	0.0	43.5	74.0	-30.5	High ch, EUT vert, 120k
2780.167	32.9	-1.5	1.2	48.1	-8.0	0.0	Horz	AV	0.0	23.4	54.0	-30.6	High ch, EUT vert, 120k
2745.492	45.1	-1.7	1.0	226.0	0.0	0.0	Horz	PK	0.0	43.4	74.0	-30.6	Mid ch, EUT vert, 120k
2706.383	33.4	-2.1	1.0	290.9	-8.0	0.0	Vert	AV	0.0	23.3	54.0	-30.7	Low ch, EUT horz, 120k
2780.408	32.7	-1.5	1.0	203.1	-8.0	0.0	Vert	AV	0.0	23.2	54.0	-30.8	High ch, EUT horz, 120k
2706.433	33.2	-2.1	2.8	43.0	-8.0	0.0	Horz	AV	0.0	23.1	54.0	-30.9	Low ch, EUT vert, 120k
2704.183	45.2	-2.1	2.8	43.0	0.0	0.0	Horz	PK	0.0	43.1	74.0	-30.9	Low ch, EUT vert, 120k
2708.625	45.1	-2.1	1.0	290.9	0.0	0.0	Vert	PK	0.0	43.0	74.0	-31.0	Low ch, EUT horz, 120k
2744.867	44.6	-1.7	3.9	351.9	0.0	0.0	Vert	PK	0.0	42.9	74.0	-31.1	Mid ch, EUT horz, 120k
2782.858	44.0	-1.4	1.0	203.1	0.0	0.0	Vert	PK	0.0	42.6	74.0	-31.4	High ch, EUT horz, 120k

SPURIOUS RADIATED EMISSIONS

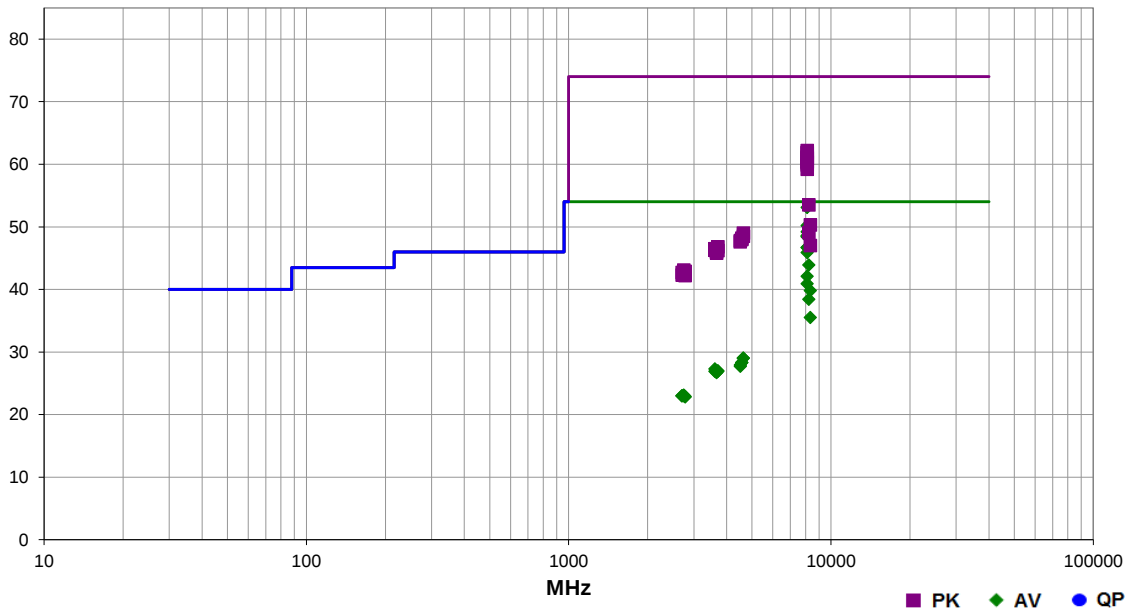


EmiRS 2017.07.11 PSA-ESCI 2017.06.01

Work Order:	MARJ0007	Date:	08/30/17	
Project:	None	Temperature:	22.2 °C	
Job Site:	MN05	Humidity:	57.4% RH	
Serial Number:	3	Barometric Pres.:	1021 mbar	Tested by: Dustin Sparks
EUT:	Radio 136377			
Configuration:	7			
Customer:	Traffic & Parking Control Co., Inc.			
Attendees:	Roman Marjamaa			
EUT Power:	5VDC			
Operating Mode:	Transmitting low channel (902.4 MHz), mid channel (915 MHz), and high channel (927.6 MHz); modulated signal at 15k, 120k, 200k, 400k, and 610k data rates.			
Deviations:	None			
Comments:	10.65dBi Yagi antenna. -8 dB duty cycle correction factor based on a maximum duty cycle of 39.8% while in 50-channel hopping mode. 400k and 610k data rates were not operating at > 98% duty cycle so the correction factor does not apply. Extra solder points were added to the shield (can) on the transmitter module. The customer has added the location of these solder points to his solder mask file for the board manufacturer.			

Test Specifications	Test Method
FCC 15.247:2017	ANSI C63.10:2013

Run #	89	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
8119.375	37.2	15.9	1.0	115.0	0.0	0.0	Vert	AV	0.0	53.1	54.0	-0.9	Low ch, EUT horz, 400k, pwr 10
8119.942	34.3	15.9	1.2	114.0	0.0	0.0	Vert	AV	0.0	50.2	54.0	-3.8	Low ch, EUT horz, 610k, pwr 10
8119.500	33.3	15.9	1.2	114.0	0.0	0.0	Vert	AV	0.0	49.2	54.0	-4.8	Low ch, EUT horz, 610k, pwr 9
8119.858	40.7	15.9	1.0	114.0	-8.0	0.0	Vert	AV	0.0	48.6	54.0	-5.4	Low ch, EUT horz, 15k
8119.292	40.6	15.9	1.0	119.1	-8.0	0.0	Vert	AV	0.0	48.5	54.0	-5.5	Low ch, EUT horz, 120k
8119.375	40.5	15.9	1.0	114.0	-8.0	0.0	Vert	AV	0.0	48.4	54.0	-5.6	Low ch, EUT horz, 200k
8119.242	38.8	15.9	1.0	115.0	-8.0	0.0	Vert	AV	0.0	46.7	54.0	-7.3	Low ch, EUT on side, 120k
8119.317	38.8	15.9	1.1	5.1	-8.0	0.0	Horz	AV	0.0	46.7	54.0	-7.3	Low ch, EUT vert, 120k
8119.350	38.0	15.9	1.0	153.0	-8.0	0.0	Horz	AV	0.0	45.9	54.0	-8.1	Low ch, EUT on side, 120k
8234.492	57.5	-5.6	1.6	360.0	-8.0	0.0	Horz	AV	0.0	43.9	54.0	-10.1	Mid ch, EUT vert, 120k
8119.233	46.3	15.9	1.0	114.0	0.0	0.0	Vert	PK	0.0	62.2	74.0	-11.8	Low ch, EUT horz, 200k
8119.225	34.2	15.9	1.0	340.0	-8.0	0.0	Vert	AV	0.0	42.1	54.0	-11.9	Low ch, EUT vert, 120k
8119.950	46.0	15.9	1.0	114.0	0.0	0.0	Vert	PK	0.0	61.9	74.0	-12.1	Low ch, EUT horz, 15k
8119.250	45.9	15.9	1.0	119.1	0.0	0.0	Vert	PK	0.0	61.8	74.0	-12.2	Low ch, EUT horz, 120k
8119.317	45.3	15.9	1.1	5.1	0.0	0.0	Horz	PK	0.0	61.2	74.0	-12.8	Low ch, EUT vert, 120k
8118.867	45.1	15.9	1.0	115.0	0.0	0.0	Vert	PK	0.0	61.0	74.0	-13.0	Low ch, EUT on side, 120k
8119.283	33.0	15.9	1.0	184.1	-8.0	0.0	Horz	AV	0.0	40.9	54.0	-13.1	Low ch, EUT horz, 120k
8119.358	45.0	15.9	1.0	153.0	0.0	0.0	Horz	PK	0.0	60.9	74.0	-13.1	Low ch, EUT on side, 120k
8119.433	44.5	15.9	1.0	340.0	0.0	0.0	Vert	PK	0.0	60.4	74.0	-13.6	Low ch, EUT vert, 120k

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	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
8119.583	44.5	15.9	1.0	115.0	0.0	0.0	Vert	PK	0.0	60.4	74.0	-13.6	Low ch, EUT horz, 400k, pwr 10
8119.942	44.3	15.9	1.2	114.0	0.0	0.0	Vert	PK	0.0	60.2	74.0	-13.8	Low ch, EUT horz, 610k, pwr 10
8119.142	44.0	15.9	1.2	114.0	0.0	0.0	Vert	PK	0.0	59.9	74.0	-14.1	Low ch, EUT horz, 610k, pwr 9
8340.675	53.3	-5.5	1.5	42.0	-8.0	0.0	Horz	AV	0.0	39.8	54.0	-14.2	High ch, EUT vert, 120k
8118.183	43.3	15.9	1.0	184.1	0.0	0.0	Horz	PK	0.0	59.2	74.0	-14.8	Low ch, EUT horz, 120k
8234.517	52.0	-5.6	1.0	111.0	-8.0	0.0	Vert	AV	0.0	38.4	54.0	-15.6	Mid ch, EUT horz, 120k
8340.683	49.0	-5.5	1.1	220.1	-8.0	0.0	Vert	AV	0.0	35.5	54.0	-18.5	High ch, EUT horz, 120k
8235.550	59.1	-5.6	1.6	360.0	0.0	0.0	Horz	PK	0.0	53.5	74.0	-20.5	Mid ch, EUT vert, 120k
8340.708	55.8	-5.5	1.5	42.0	0.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	High ch, EUT horz, 120k
8234.600	54.7	-5.6	1.0	111.0	0.0	0.0	Vert	PK	0.0	49.1	74.0	-24.9	Mid ch, EUT horz, 120k
4636.367	31.6	5.4	3.3	2.0	-8.0	0.0	Horz	AV	0.0	29.0	54.0	-25.0	High ch, EUT vert, 120k
4636.025	31.6	5.4	1.0	342.0	-8.0	0.0	Vert	AV	0.0	29.0	54.0	-25.0	High ch, EUT horz, 120k
4631.567	43.6	5.4	3.3	2.0	0.0	0.0	Horz	PK	0.0	49.0	74.0	-25.0	High ch, EUT vert, 120k
4631.925	43.1	5.4	1.0	342.0	0.0	0.0	Vert	PK	0.0	48.5	74.0	-25.5	High ch, EUT horz, 120k
4576.708	31.0	5.3	1.0	243.9	-8.0	0.0	Horz	AV	0.0	28.3	54.0	-25.7	Mid ch, EUT vert, 120k
4577.308	31.0	5.3	1.6	185.1	-8.0	0.0	Vert	AV	0.0	28.3	54.0	-25.7	Mid ch, EUT horz, 120k
4573.283	43.0	5.2	1.6	185.1	0.0	0.0	Vert	PK	0.0	48.2	74.0	-25.8	Mid ch, EUT horz, 120k
4577.175	42.7	5.3	1.0	243.9	0.0	0.0	Horz	PK	0.0	48.0	74.0	-26.0	Mid ch, EUT vert, 120k
4513.500	30.7	5.2	1.0	232.0	-8.0	0.0	Vert	AV	0.0	27.9	54.0	-26.1	Low ch, EUT horz, 120k
4512.867	42.6	5.2	1.0	19.1	0.0	0.0	Horz	PK	0.0	47.8	74.0	-26.2	Low ch, EUT vert, 120k
4513.267	30.5	5.2	1.0	19.1	-8.0	0.0	Horz	AV	0.0	27.7	54.0	-26.3	Low ch, EUT vert, 120k
4511.008	42.4	5.2	1.0	232.0	0.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	Low ch, EUT horz, 120k
3611.100	33.1	2.2	1.0	97.0	-8.0	0.0	Vert	AV	0.0	27.3	54.0	-26.7	Low ch, EUT horz, 120k
3709.133	32.3	2.7	1.0	14.0	-8.0	0.0	Vert	AV	0.0	27.0	54.0	-27.0	High ch, EUT horz, 120k
8340.733	52.5	-5.5	1.1	220.1	0.0	0.0	Vert	PK	0.0	47.0	74.0	-27.0	High ch, EUT horz, 120k
3611.050	32.7	2.2	2.2	43.0	-8.0	0.0	Horz	AV	0.0	26.9	54.0	-27.1	Low ch, EUT vert, 120k
3709.550	32.2	2.7	1.0	13.0	-8.0	0.0	Horz	AV	0.0	26.9	54.0	-27.1	High ch, EUT vert, 120k
3662.425	32.5	2.3	1.0	333.0	-8.0	0.0	Vert	AV	0.0	26.8	54.0	-27.2	Mid ch, EUT horz, 120k
3709.308	44.1	2.7	1.0	14.0	0.0	0.0	Vert	PK	0.0	46.8	74.0	-27.2	High ch, EUT horz, 120k
3662.433	32.4	2.3	1.0	161.0	-8.0	0.0	Horz	AV	0.0	26.7	54.0	-27.3	Mid ch, EUT vert, 120k
3609.900	44.4	2.1	2.2	43.0	0.0	0.0	Horz	PK	0.0	46.5	74.0	-27.5	Low ch, EUT vert, 120k
3607.525	44.2	2.1	1.0	97.0	0.0	0.0	Vert	PK	0.0	46.3	74.0	-27.7	Low ch, EUT horz, 120k
3707.733	43.5	2.7	1.0	13.0	0.0	0.0	Horz	PK	0.0	46.2	74.0	-27.8	High ch, EUT vert, 120k
3659.358	43.7	2.3	1.0	161.0	0.0	0.0	Horz	PK	0.0	46.0	74.0	-28.0	Mid ch, EUT vert, 120k
3662.300	43.5	2.3	1.0	333.0	0.0	0.0	Vert	PK	0.0	45.8	74.0	-28.2	Mid ch, EUT horz, 120k
2746.025	32.8	-1.7	1.0	0.0	-8.0	0.0	Horz	AV	0.0	23.1	54.0	-30.9	Mid ch, EUT vert, 120k
2746.767	44.8	-1.7	1.0	300.0	0.0	0.0	Vert	PK	0.0	43.1	74.0	-30.9	Mid ch, EUT horz, 120k
2704.550	33.1	-2.1	1.1	180.0	-8.0	0.0	Horz	AV	0.0	23.0	54.0	-31.0	Low ch, EUT vert, 120k
2745.633	32.7	-1.7	1.0	300.0	-8.0	0.0	Vert	AV	0.0	23.0	54.0	-31.0	Mid ch, EUT horz, 120k
2704.925	33.1	-2.1	3.4	89.0	-8.0	0.0	Vert	AV	0.0	23.0	54.0	-31.0	Low ch, EUT horz, 120k
2780.517	32.4	-1.5	1.0	2.0	-8.0	0.0	Horz	AV	0.0	22.9	54.0	-31.1	High ch, EUT vert, 120k
2779.342	44.4	-1.5	1.0	2.0	0.0	0.0	Horz	PK	0.0	42.9	74.0	-31.1	High ch, EUT vert, 120k
2780.850	32.3	-1.5	1.0	246.9	-8.0	0.0	Vert	AV	0.0	22.8	54.0	-31.2	High ch, EUT horz, 120k
2745.700	44.5	-1.7	1.0	0.0	0.0	0.0	Horz	PK	0.0	42.8	74.0	-31.2	Mid ch, EUT vert, 120k
2706.750	44.8	-2.1	3.4	89.0	0.0	0.0	Vert	PK	0.0	42.7	74.0	-31.3	Low ch, EUT horz, 120k
2708.792	44.4	-2.1	1.1	180.0	0.0	0.0	Horz	PK	0.0	42.3	74.0	-31.7	Low ch, EUT vert, 120k
2778.925	43.7	-1.5	1.0	246.9	0.0	0.0	Vert	PK	0.0	42.2	74.0	-31.8	High ch, EUT horz, 120k

DUTY CYCLE



XMI 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	3/17/2015	3/17/2018
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/16/2017	3/16/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

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

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

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

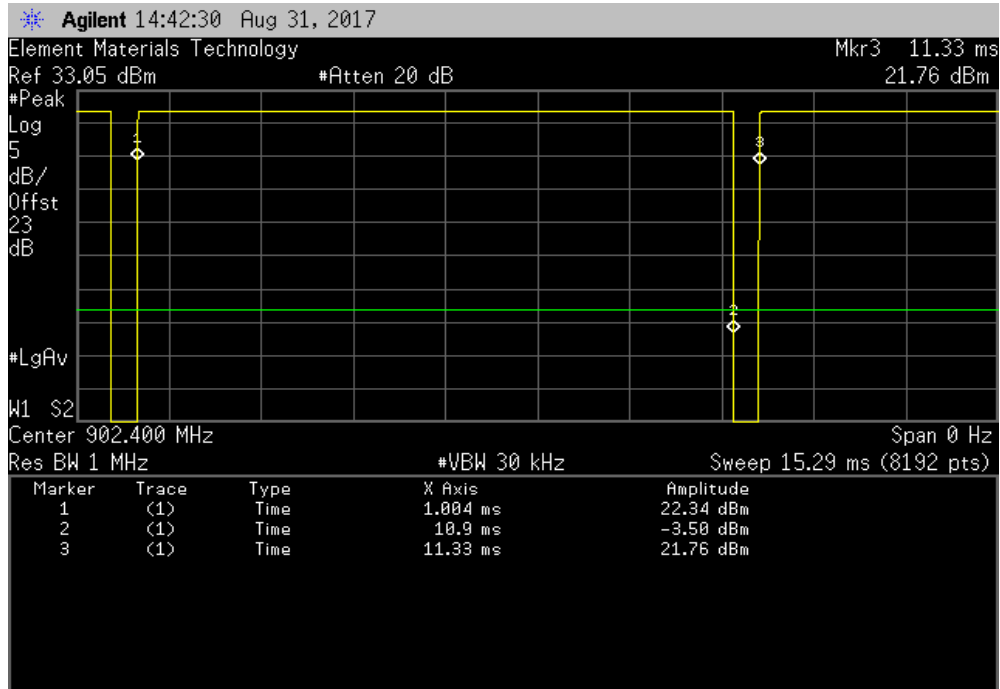
TbTx 2017.07.11 XMit 2017.02.08

DUTY CYCLE

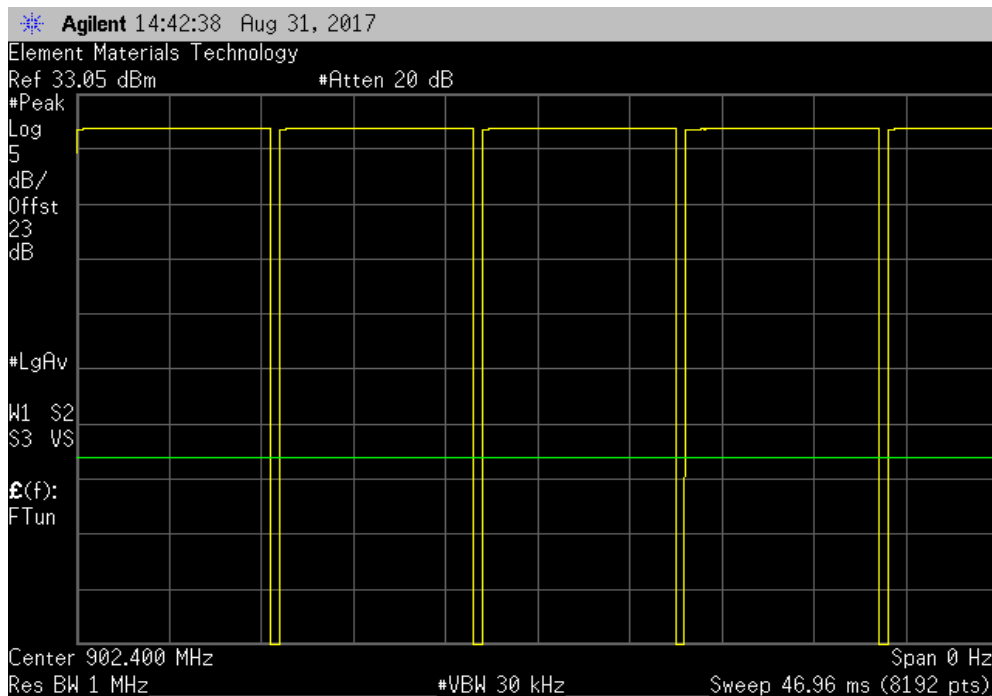


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 15k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	9.893 ms	10.321 ms	1	95.9	N/A	N/A



All Other Antennas, Low Channel, 902.4 MHz, 15k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

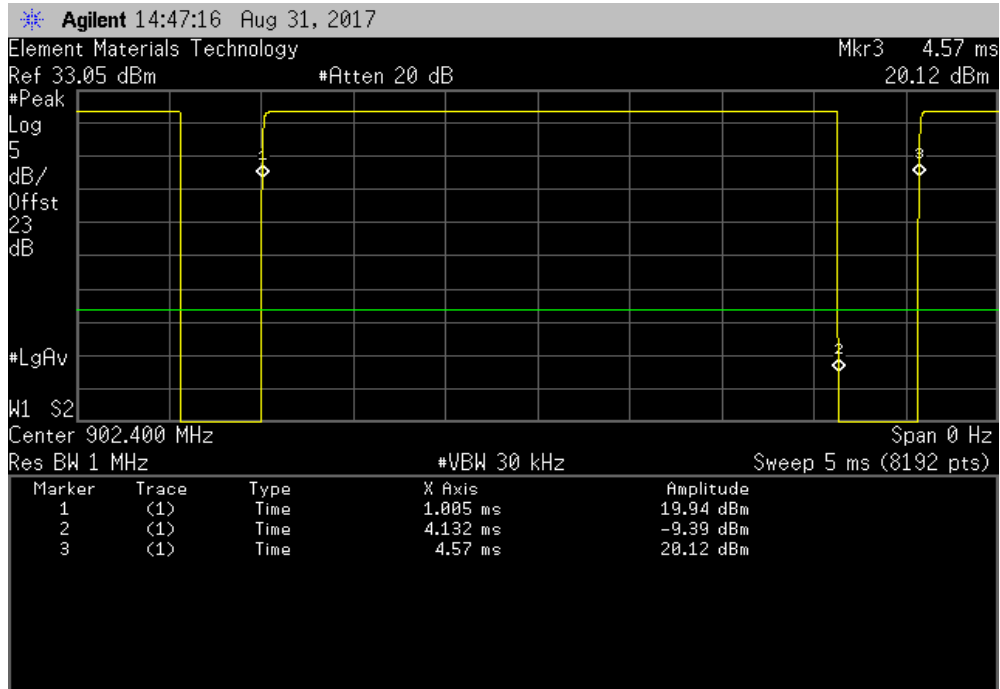


DUTY CYCLE

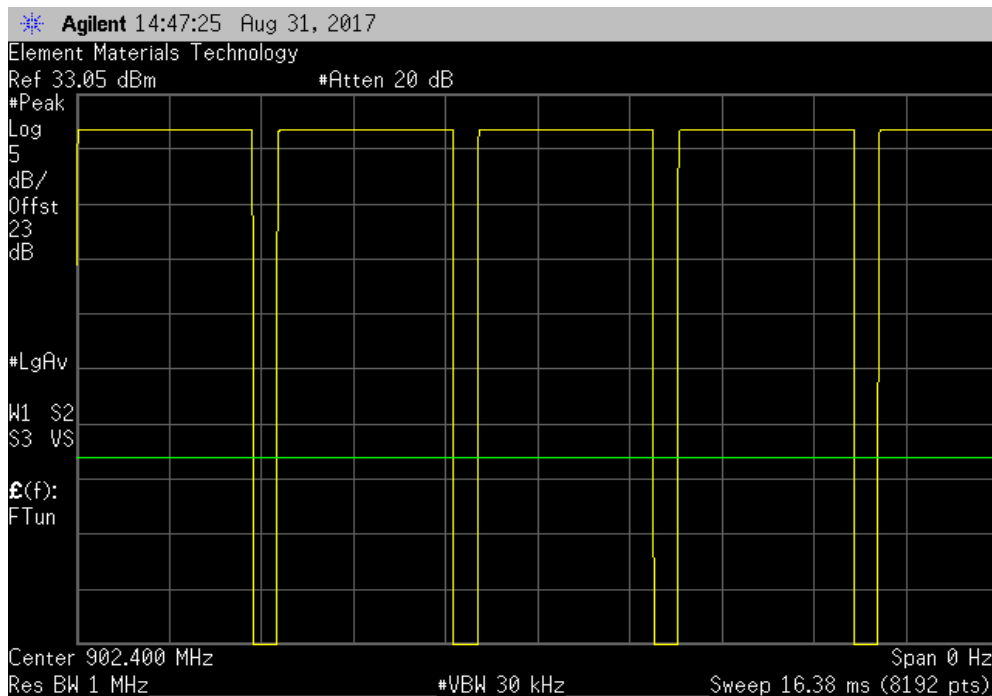


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 120k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	3.127 ms	3.565 ms	1	87.7	N/A	N/A



All Other Antennas, Low Channel, 902.4 MHz, 120k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

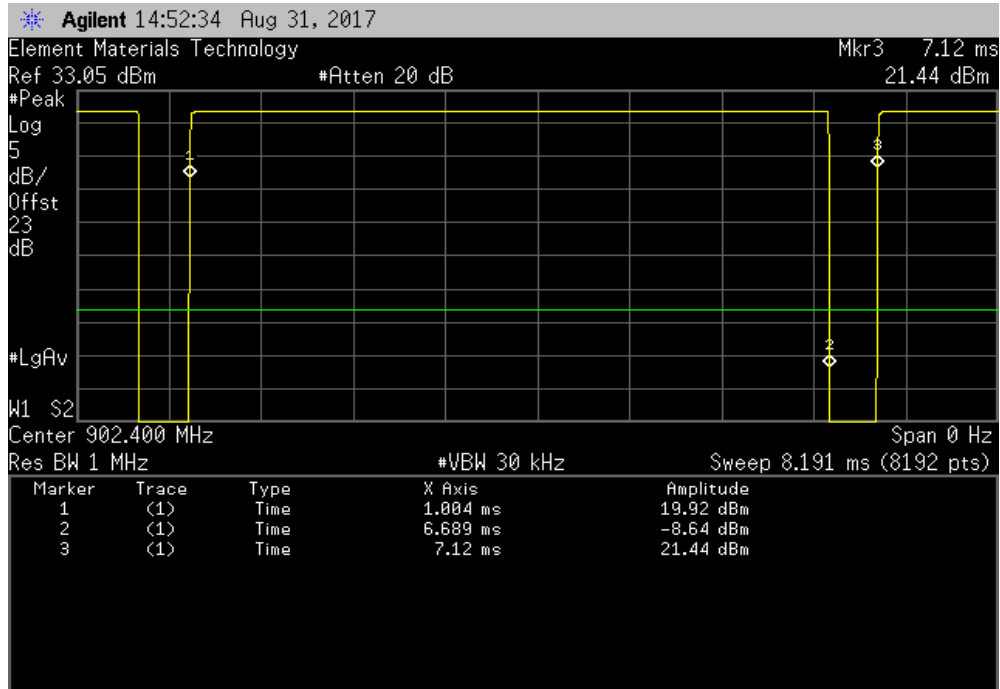


DUTY CYCLE

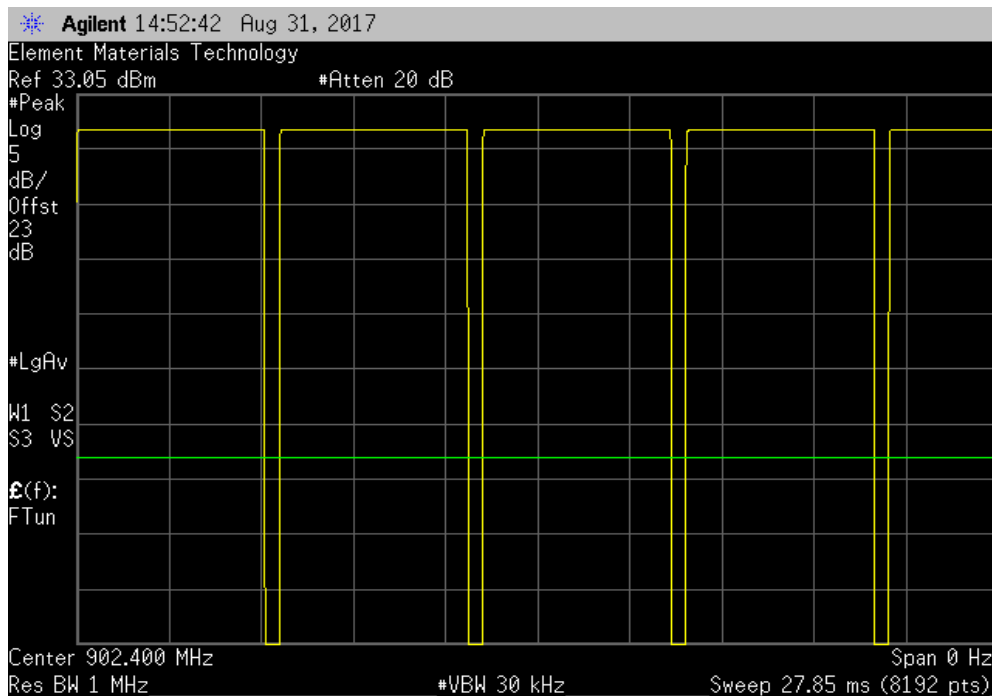


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 200k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	5.685 ms	6.116 ms	1	93	N/A	N/A



All Other Antennas, Low Channel, 902.4 MHz, 200k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

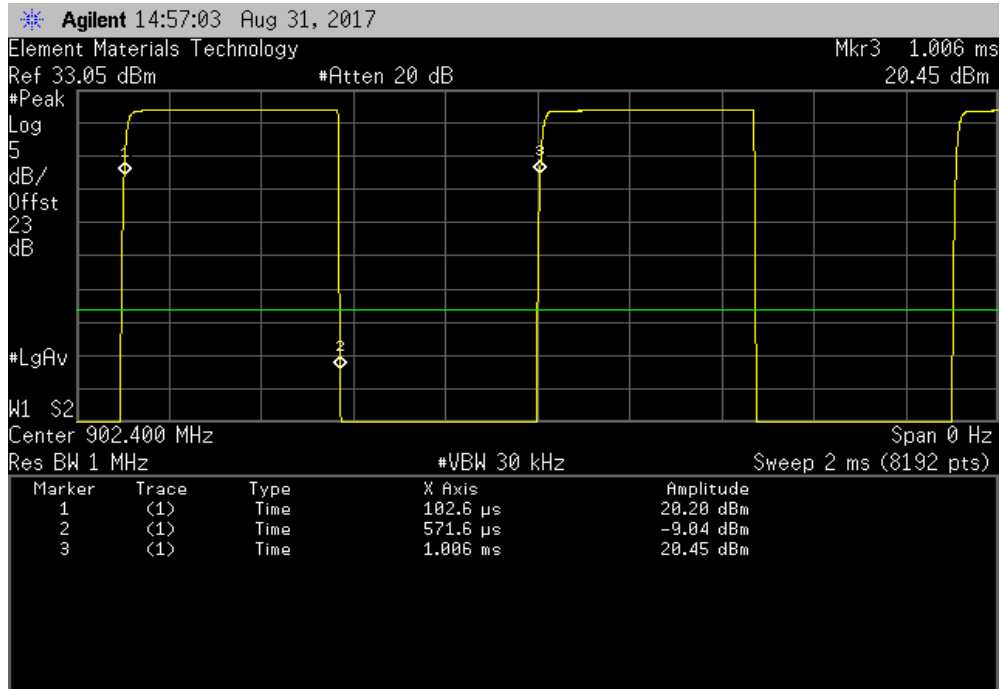


DUTY CYCLE

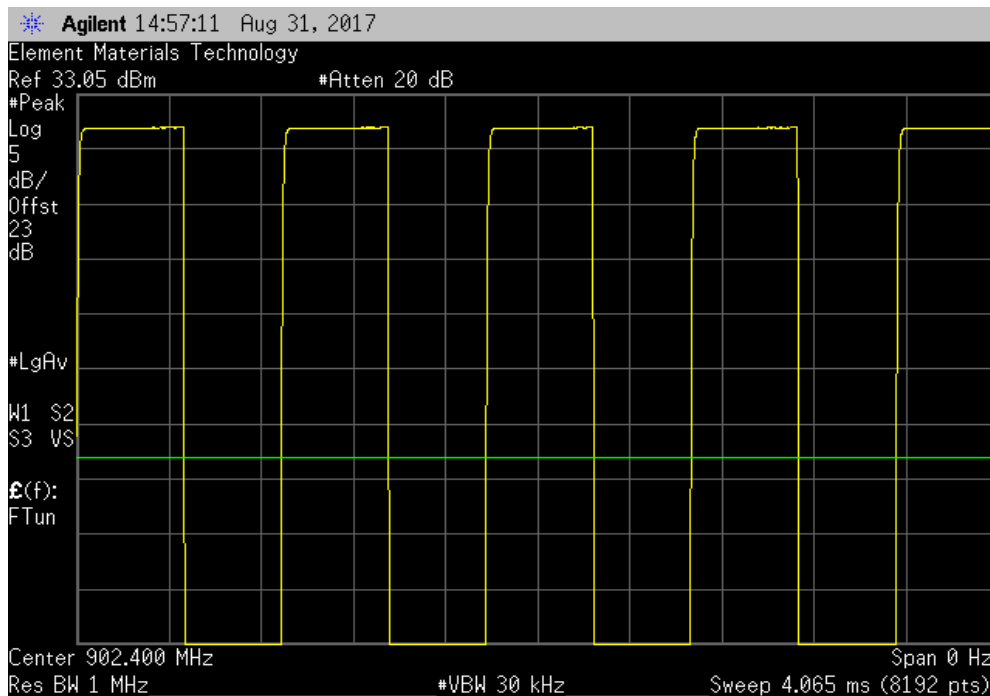


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 400k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	469 us	903.4 us	1	51.9	N/A	N/A



All Other Antennas, Low Channel, 902.4 MHz, 400k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

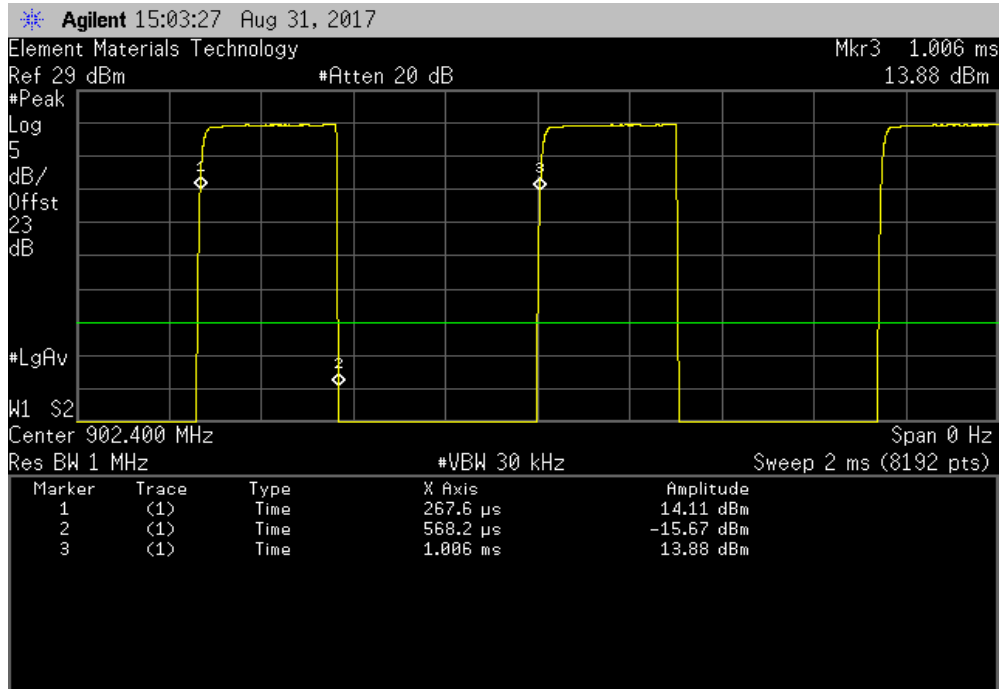


DUTY CYCLE

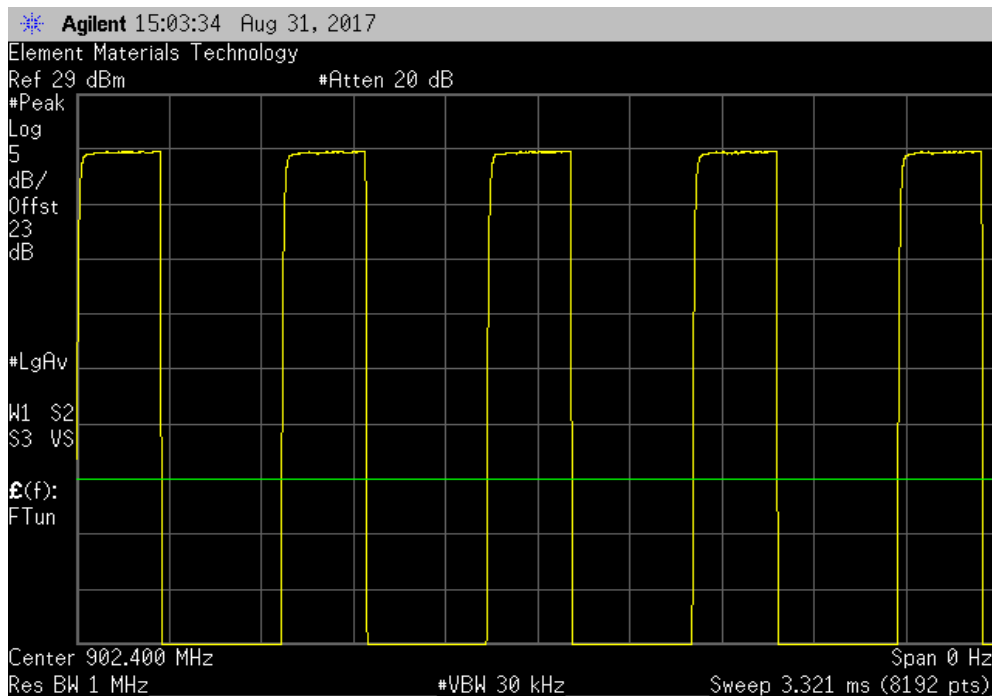


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 610k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	300.6 us	738.1 us	1	40.7	N/A	N/A



All Other Antennas, Low Channel, 902.4 MHz, 610k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

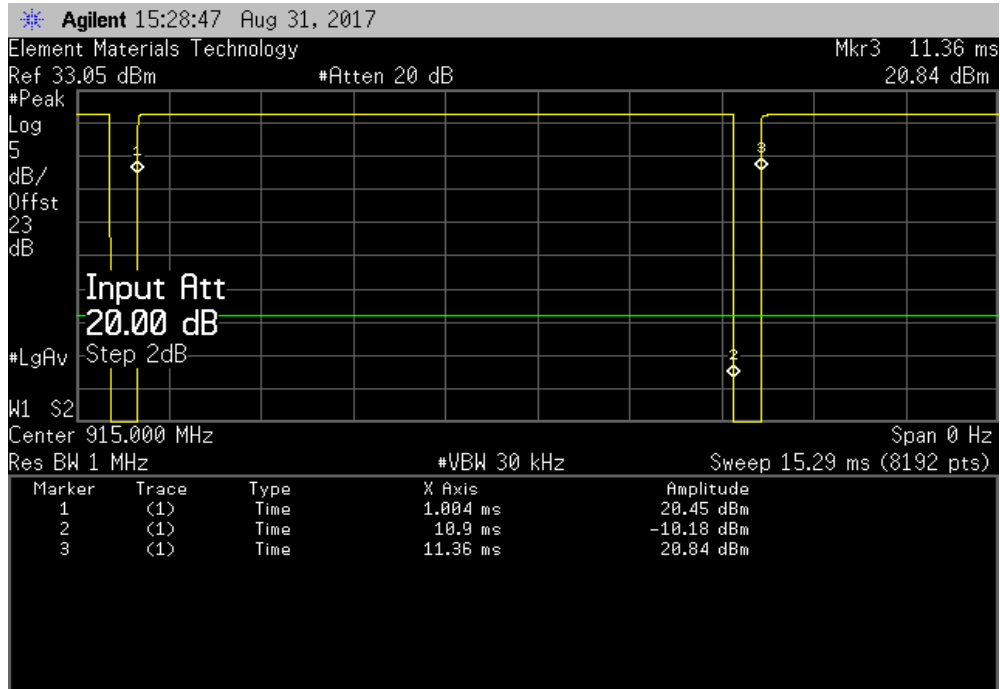


DUTY CYCLE

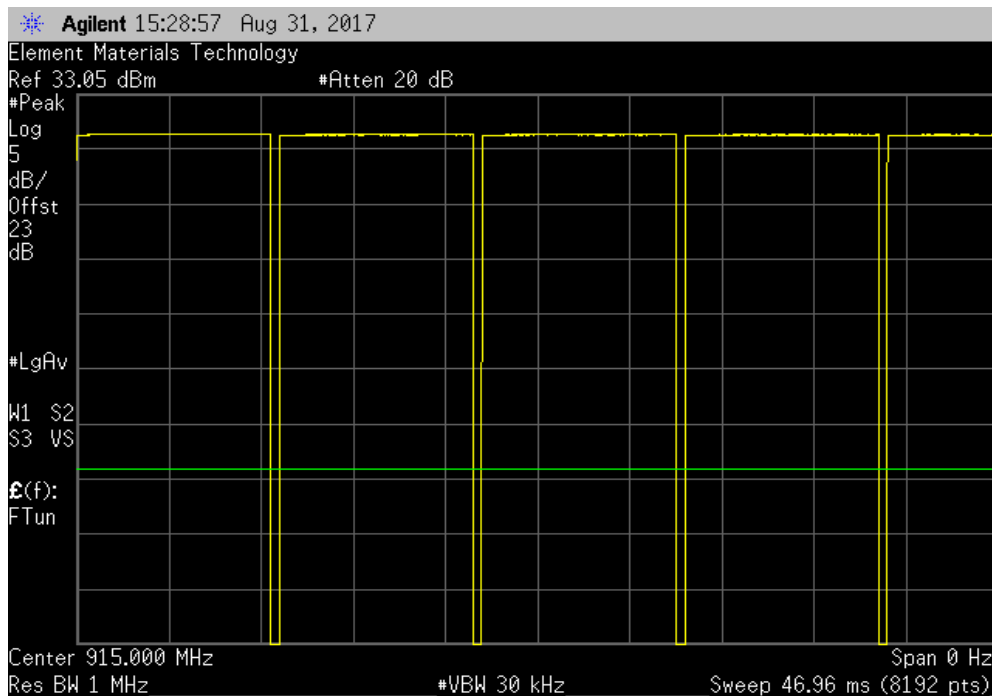


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 15k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	9.895 ms	10.353 ms	1	95.6	N/A	N/A



All Other Antennas, Mid Channel, 915 MHz, 15k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

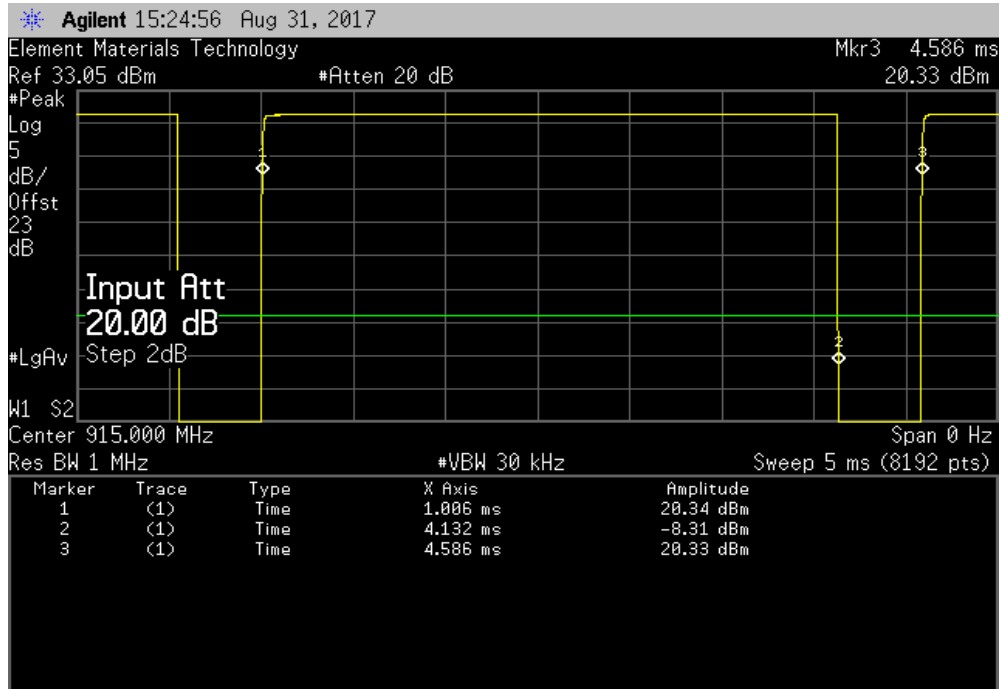


DUTY CYCLE

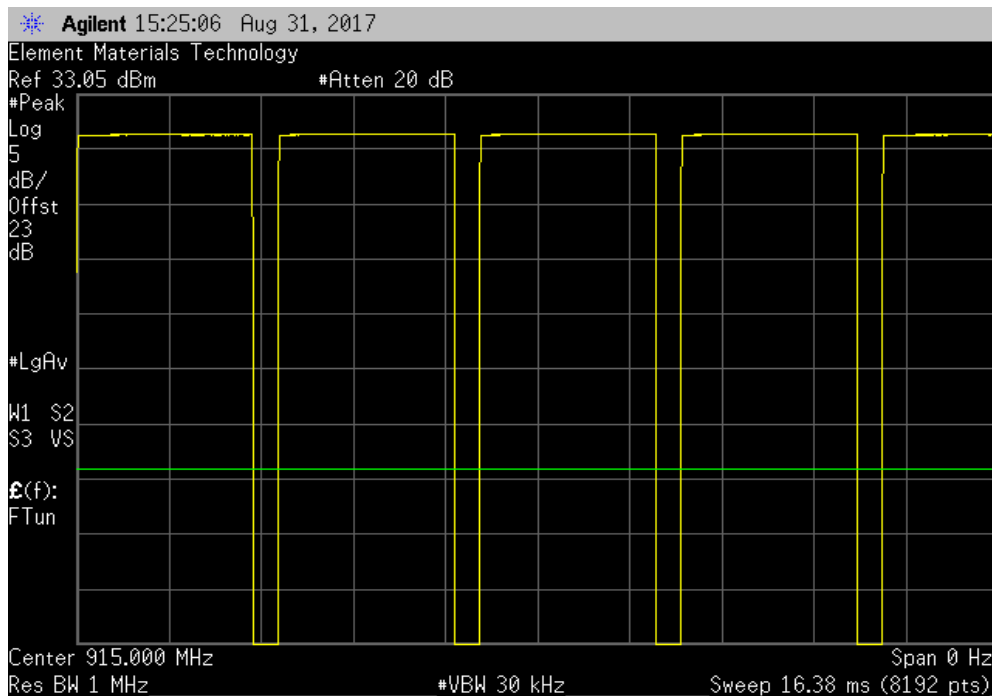


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 120k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	3.126 ms	3.58 ms	1	87.3	N/A	N/A



All Other Antennas, Mid Channel, 915 MHz, 120k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

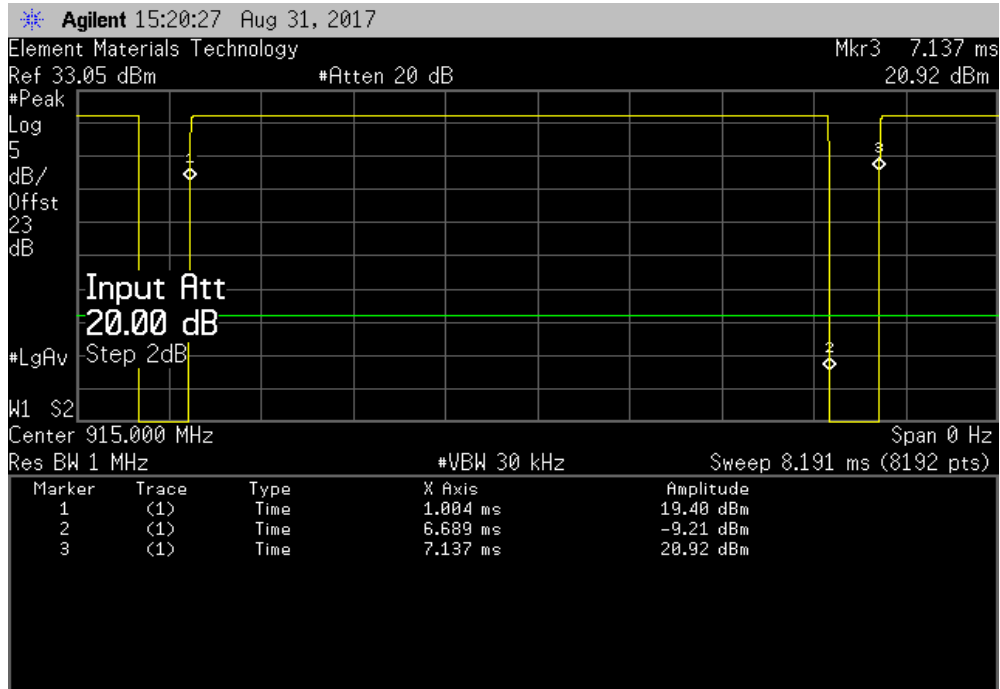


DUTY CYCLE

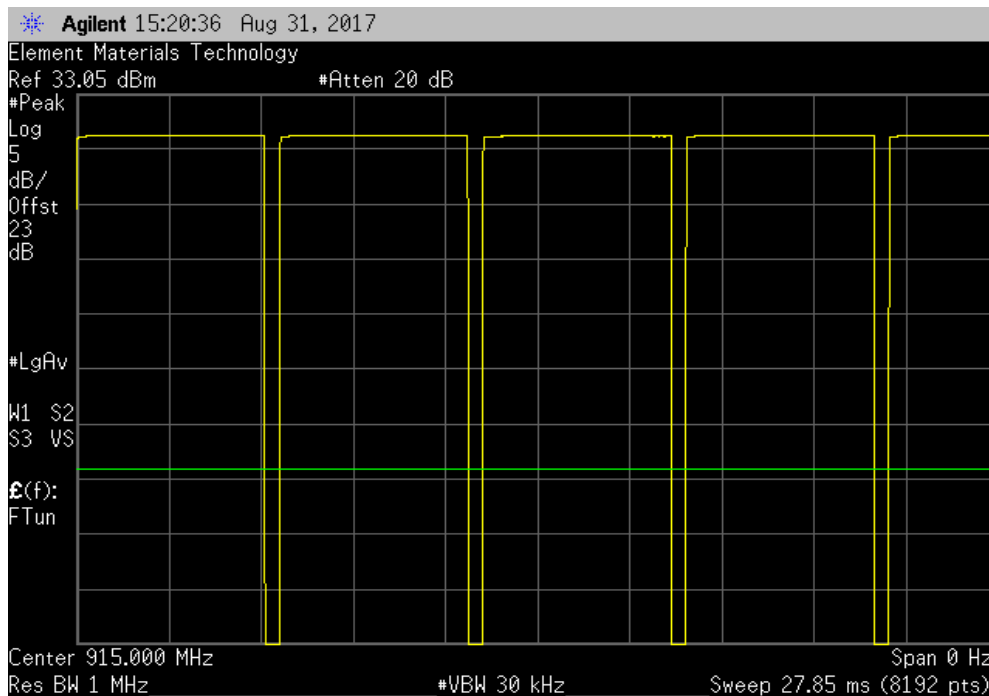


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 200k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	5.685 ms	6.133 ms	1	92.7	N/A	N/A



All Other Antennas, Mid Channel, 915 MHz, 200k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

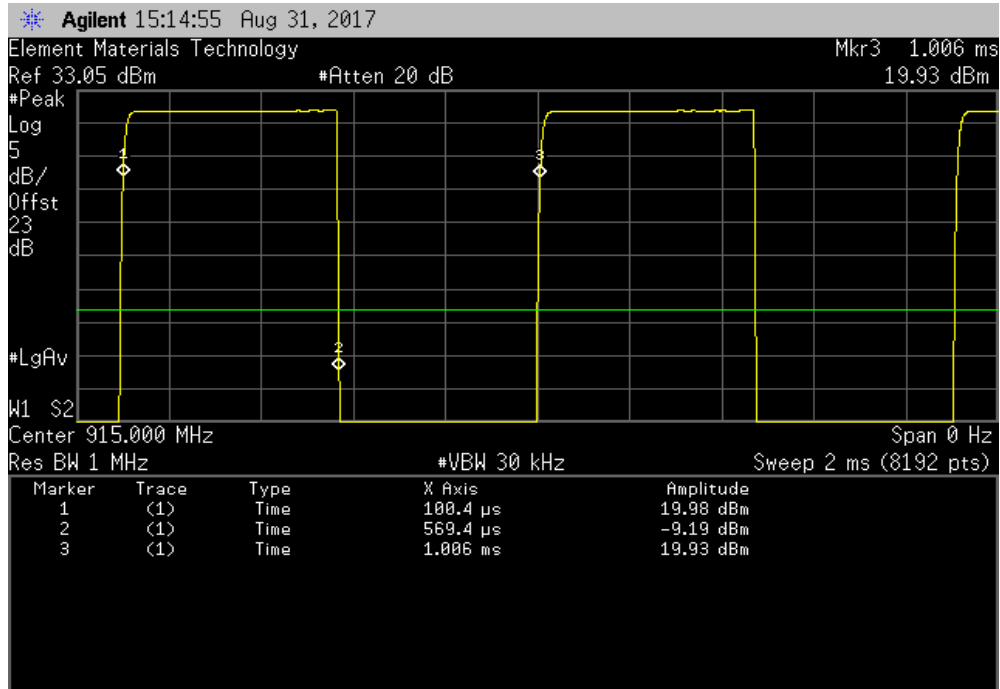


DUTY CYCLE

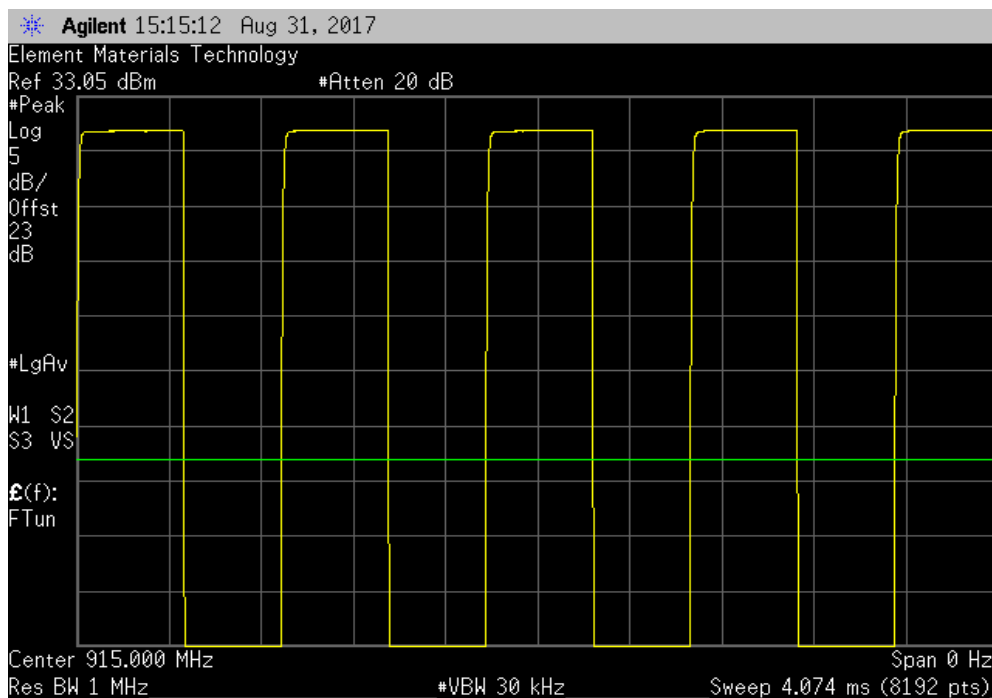


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 400k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	469 us	905.3 us	1	51.8	N/A	N/A



All Other Antennas, Mid Channel, 915 MHz, 400k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

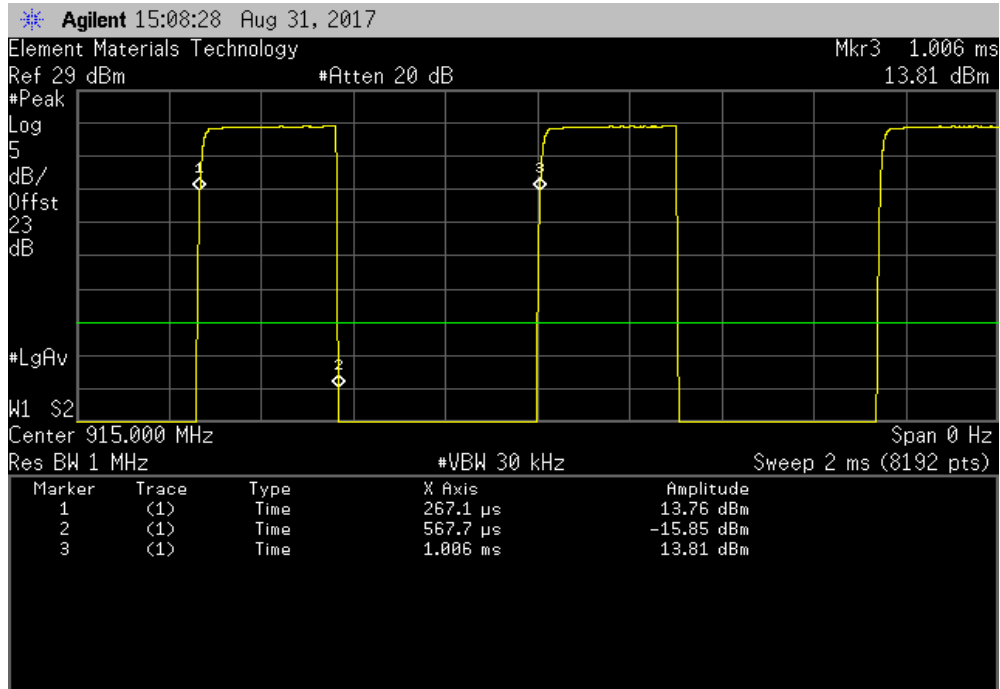


DUTY CYCLE

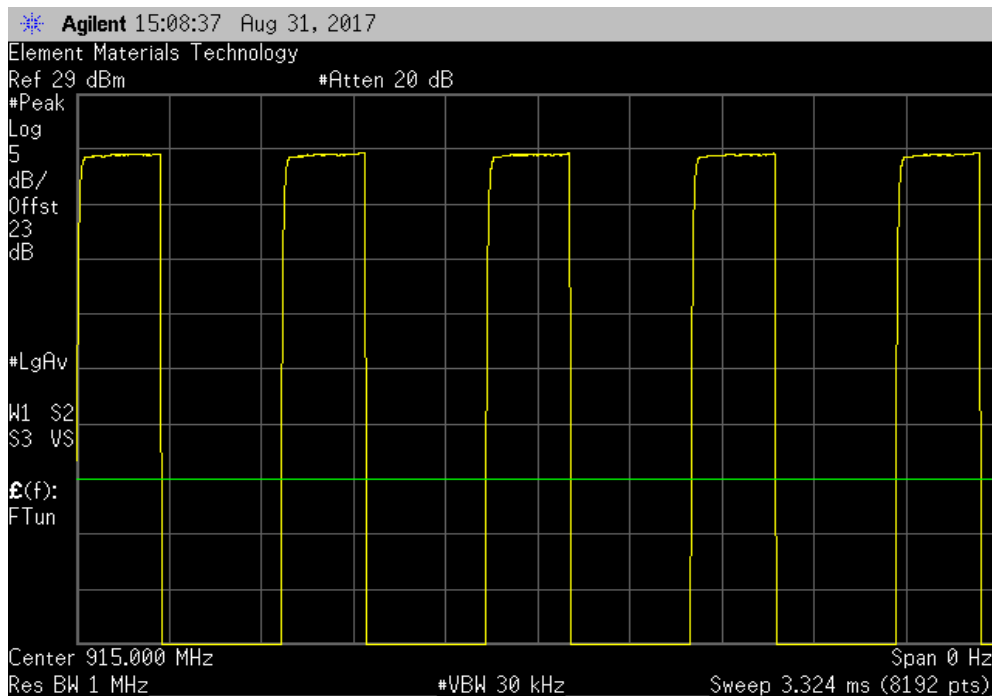


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 610k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	300.6 us	738.6 us	1	40.7	N/A	N/A



All Other Antennas, Mid Channel, 915 MHz, 610k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

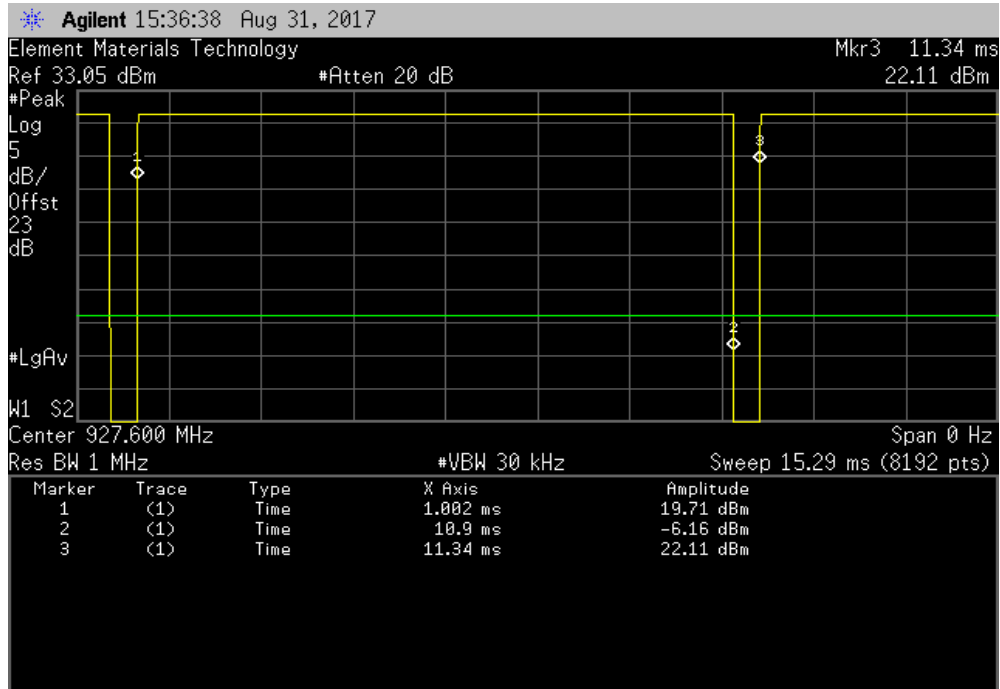


DUTY CYCLE

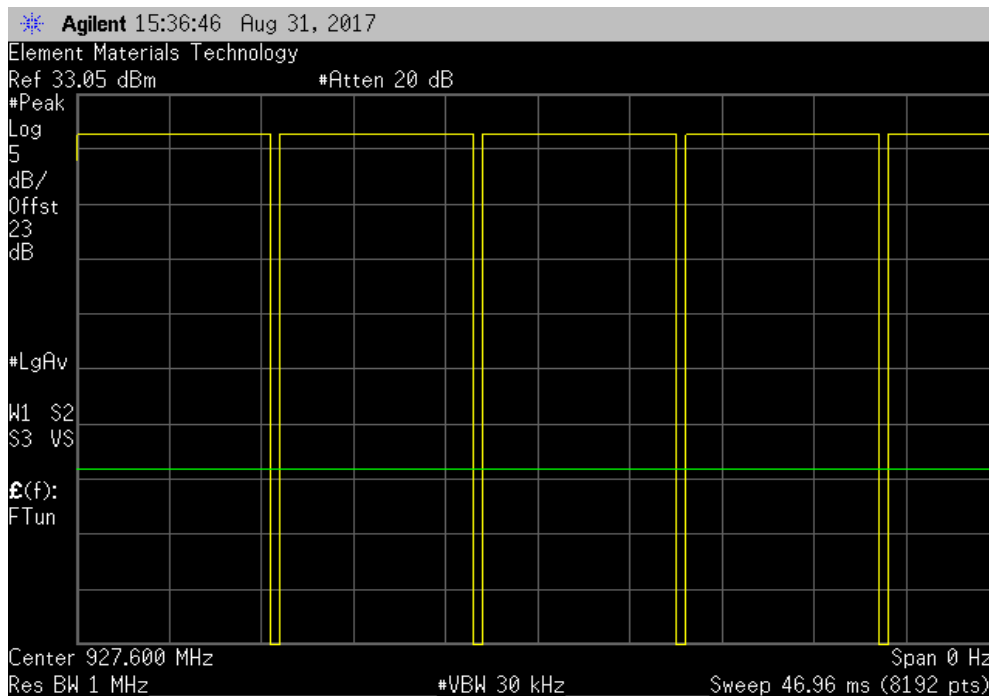


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 15k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	9.895 ms	10.336 ms	1	95.7	N/A	N/A



All Other Antennas, High Channel, 927.6 MHz, 15k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

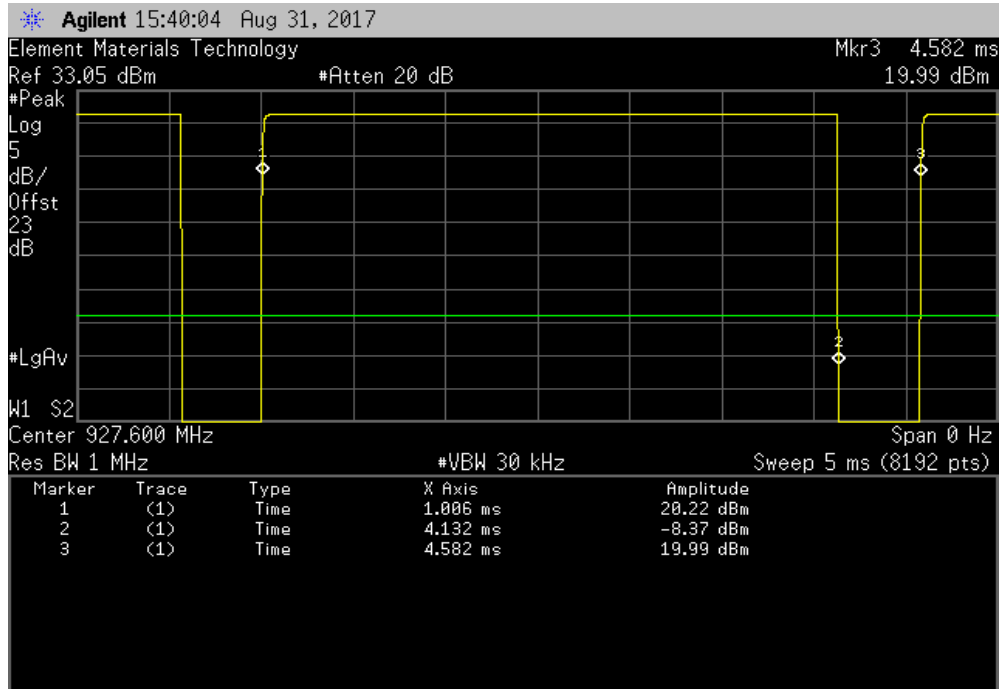


DUTY CYCLE

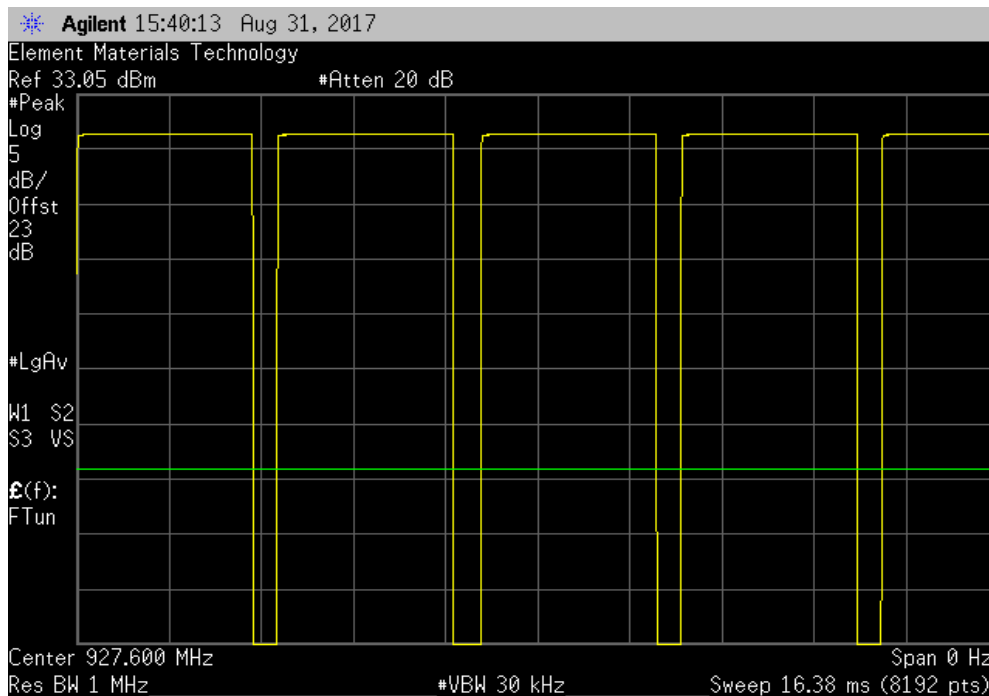


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 120k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	3.126 ms	3.577 ms	1	87.4	N/A	N/A



All Other Antennas, High Channel, 927.6 MHz, 120k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

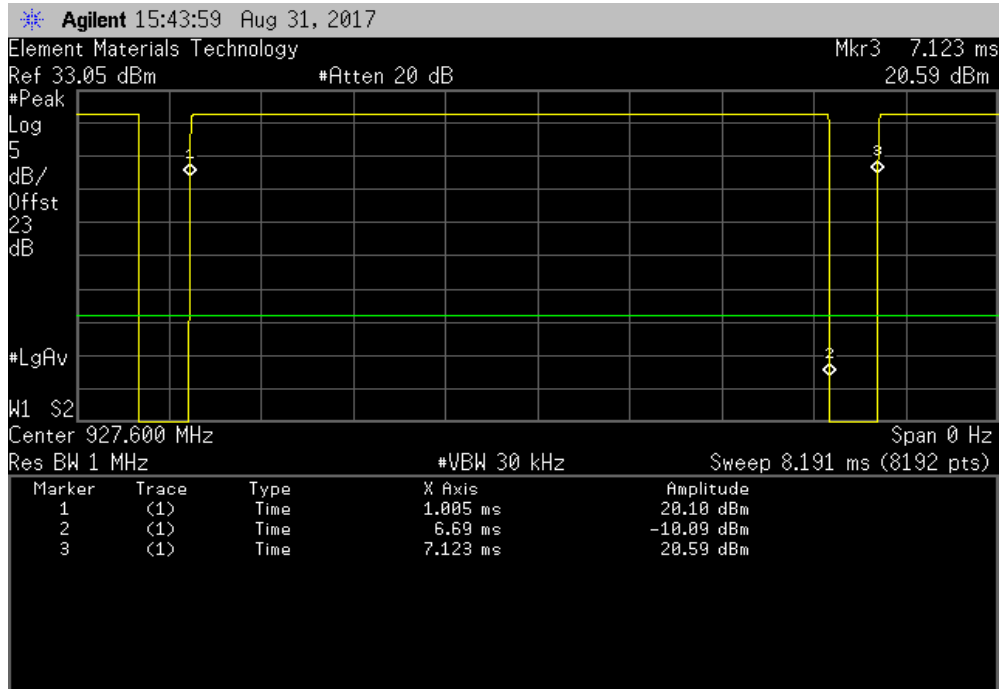


DUTY CYCLE

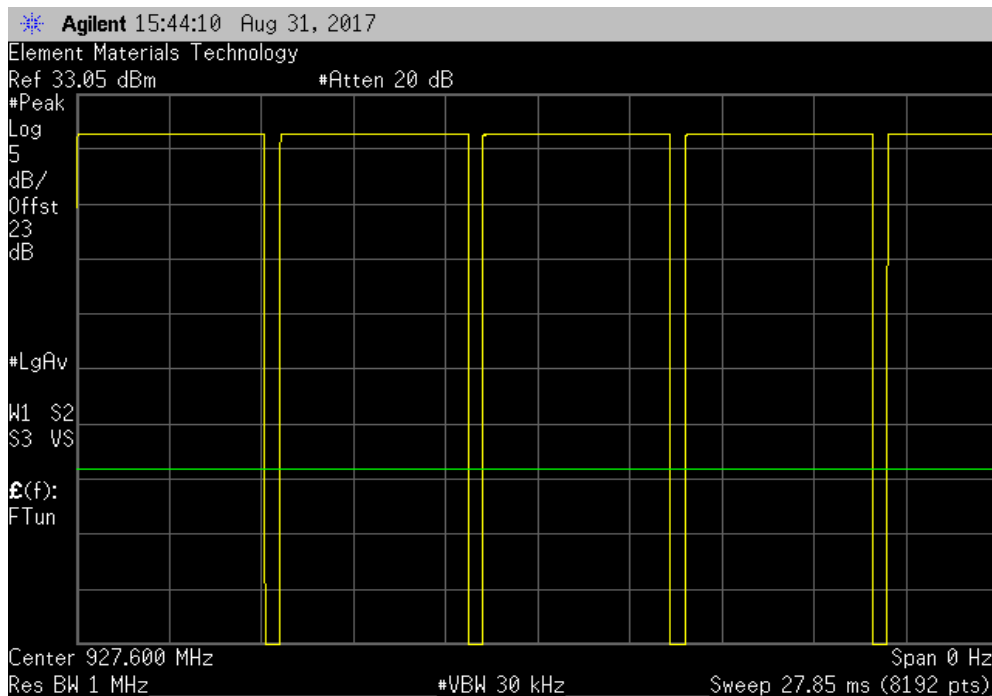


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 200k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	5.685 ms	6.118 ms	1	92.9	N/A	N/A



All Other Antennas, High Channel, 927.6 MHz, 200k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

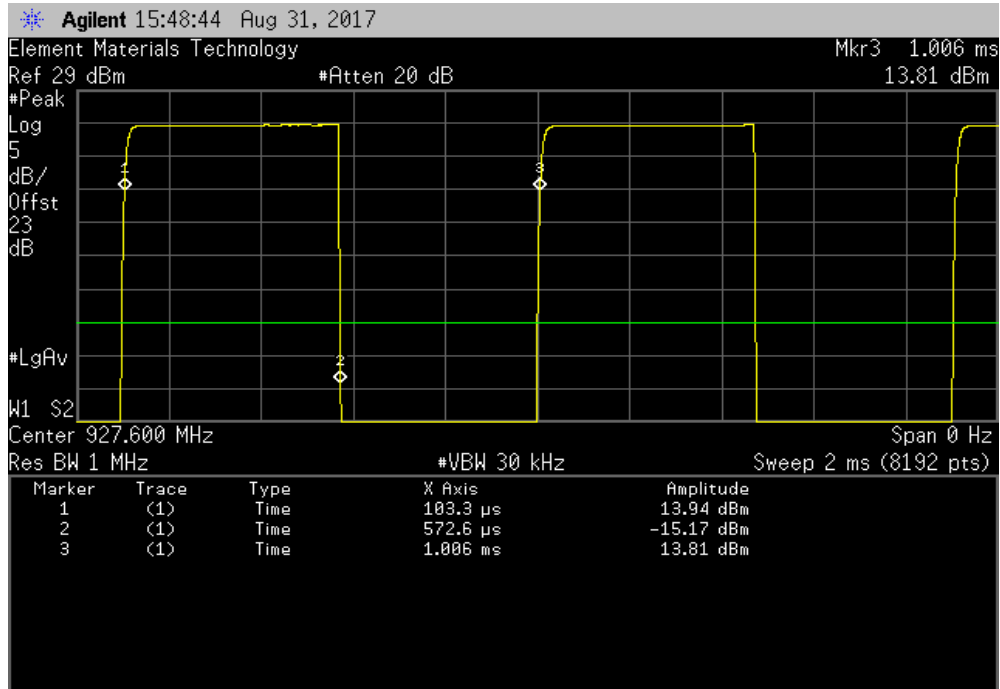


DUTY CYCLE

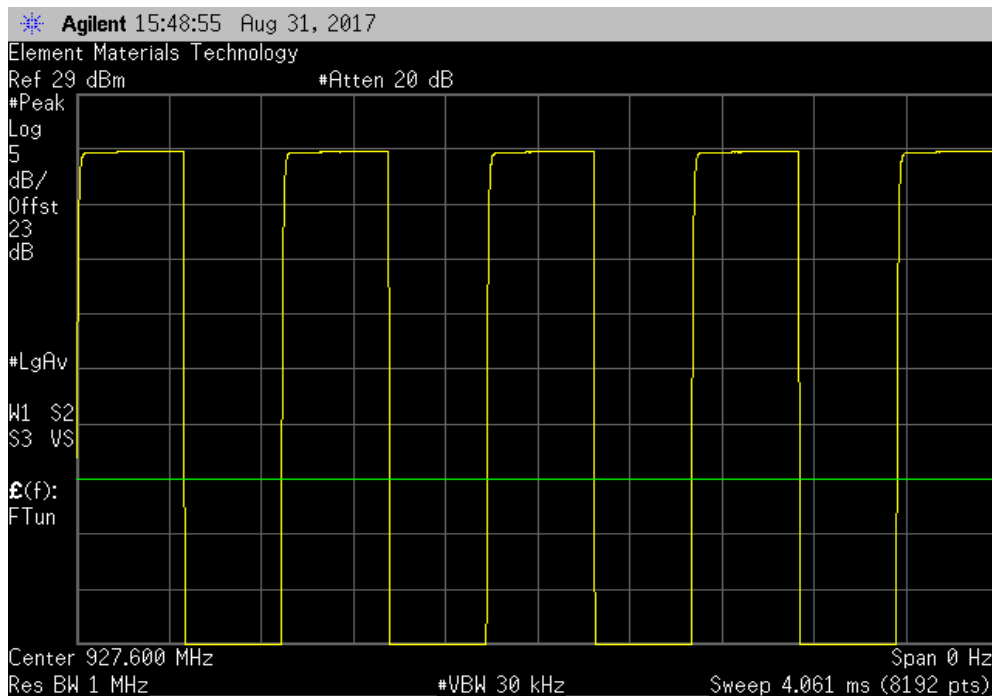


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 400k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	469.3 us	902.4 us	1	52	N/A	N/A



All Other Antennas, High Channel, 927.6 MHz, 400k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

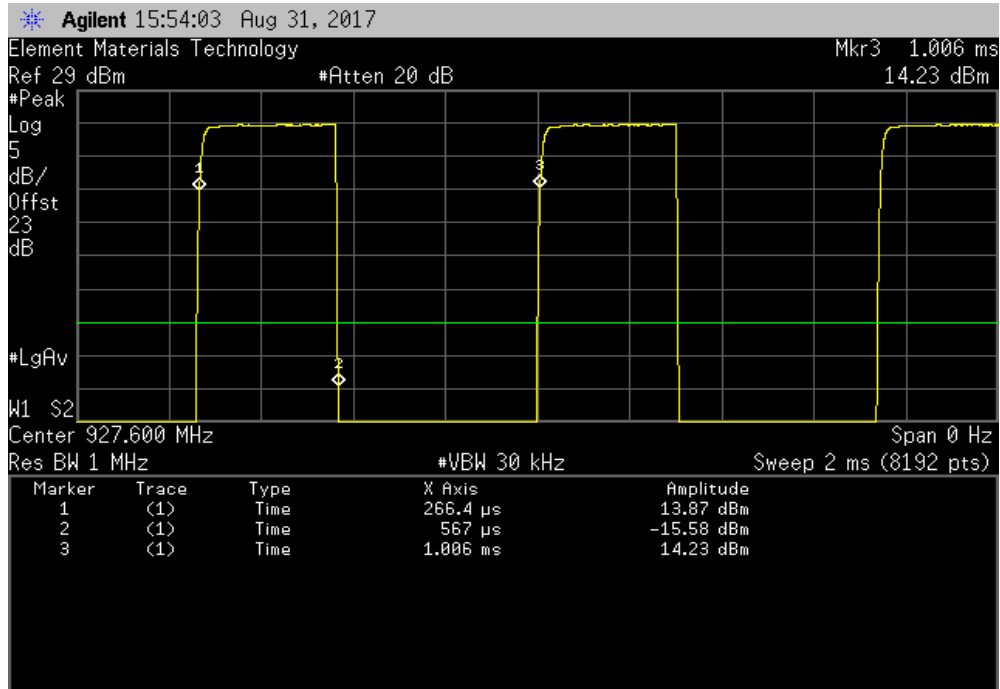


DUTY CYCLE

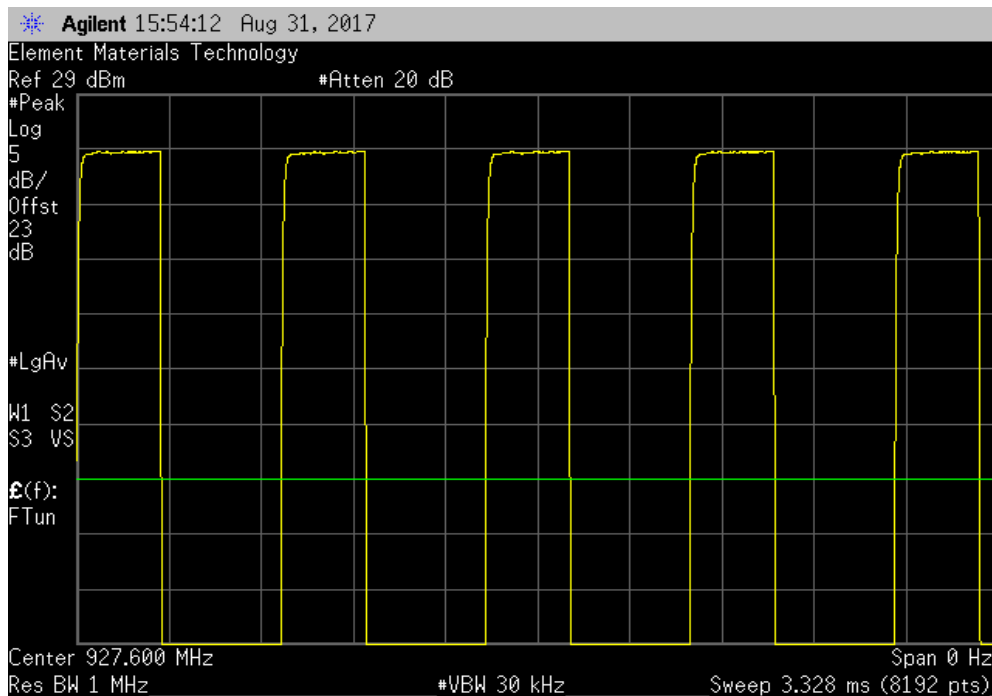


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 610k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	300.6 us	739.6 us	1	40.6	N/A	N/A



All Other Antennas, High Channel, 927.6 MHz, 610k						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



DUTY CYCLE



XMit 2017.02.08

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
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/1/2016	12/1/2017
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	1/6/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	12/22/2016	12/22/2017

TEST DESCRIPTION

The measurement was made using radiated emissions equipment.

The duty cycle of the hopping modes (defined as on time within 100ms) was determined in order to generate a correction factor for RMS average points taken during spurious radiated emissions. This correction factor was determined using the following formula: $20 * \log(\text{duty cycle})$.

DUTY CYCLE



XMM 2017.02.08

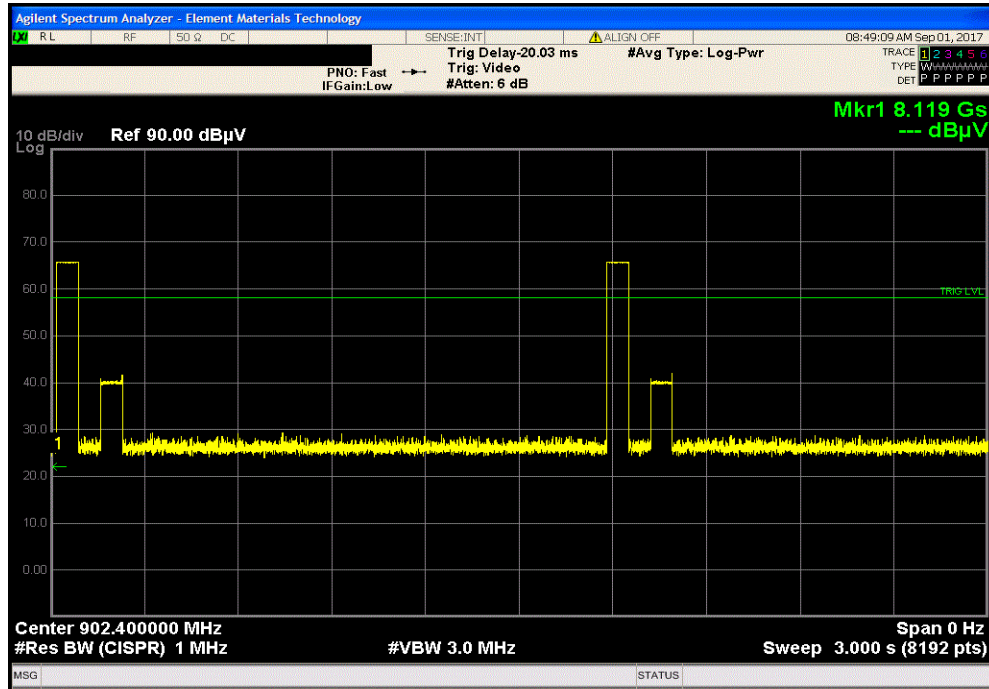
EUT: Radio 136377		Work Order: MARJ0007	
Serial Number: 3		Date: 09/01/17	
Customer: Traffic & Parking Control Co., Inc.		Temperature: 22 °C	
Attendees: Roman Marjamaa		Humidity: 49.4% RH	
Project: None		Barometric Pres.: 1022 mbar	
Tested by: Dustin Sparks	Power: 5VDC	Job Site: MN05	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
On time during 100 ms was used to determine a duty cycle correction factor for spurious radiated emissions. A correction factor of 8.0 dB was generated using the 39.73% duty cycle for the 50 channel hopping mode. 25 channel hopping mode has a lower output power (~250 mW) so a correction factor was not needed, but the value was included here for reference. The DCCF was only applied to RMS average points for the 15k, 120, and 200k data rates because the 400k and 610k data rates could not achieve >98% duty cycle during single channel transmit mode.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	5	Signature <i>Dustin Sparks</i>	
		Value (ms)	Duty Cycle (%)
25 Channel Hopping Mode			
	3 Second Sweep	N/A	N/A
	500 ms Sweep	N/A	N/A
	100 ms Sweep	43.37	43.37
50 Channel Hopping Mode			
	3 Second Sweep	N/A	N/A
	500 ms Sweep	N/A	N/A
	100 ms Sweep	39.73	39.73
			Result
			N/A
			N/A
			N/A

DUTY CYCLE

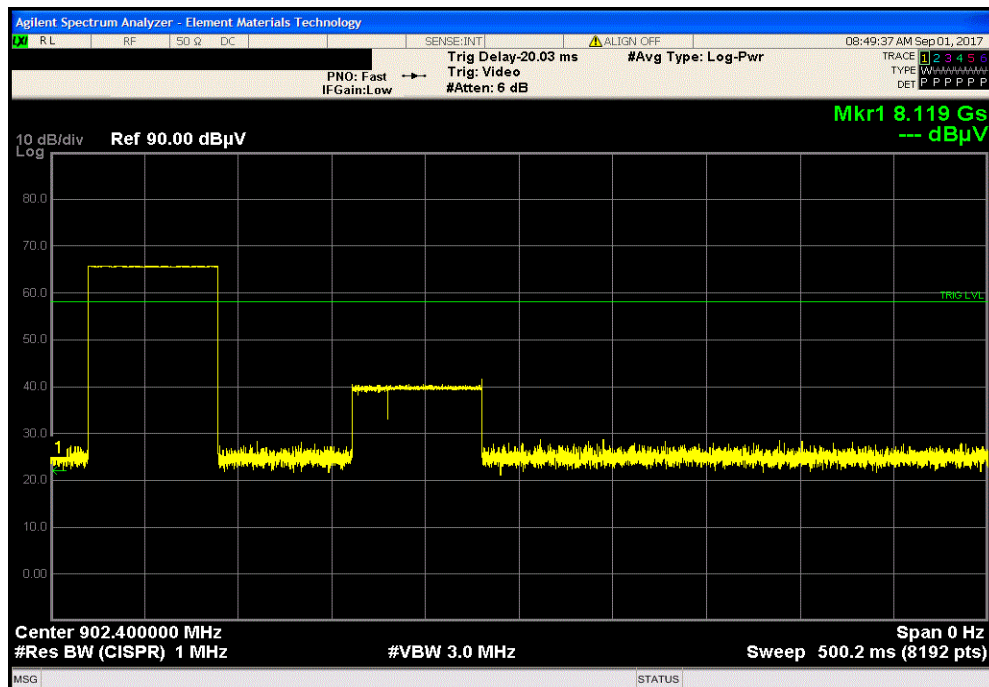


XMM 2017.02.08

25 Channel Hopping Mode, 3 Second Sweep						
				Value (ms)	Duty Cycle (%)	Result
				N/A	N/A	N/A



25 Channel Hopping Mode, 500 ms Sweep						
				Value (ms)	Duty Cycle (%)	Result
				N/A	N/A	N/A

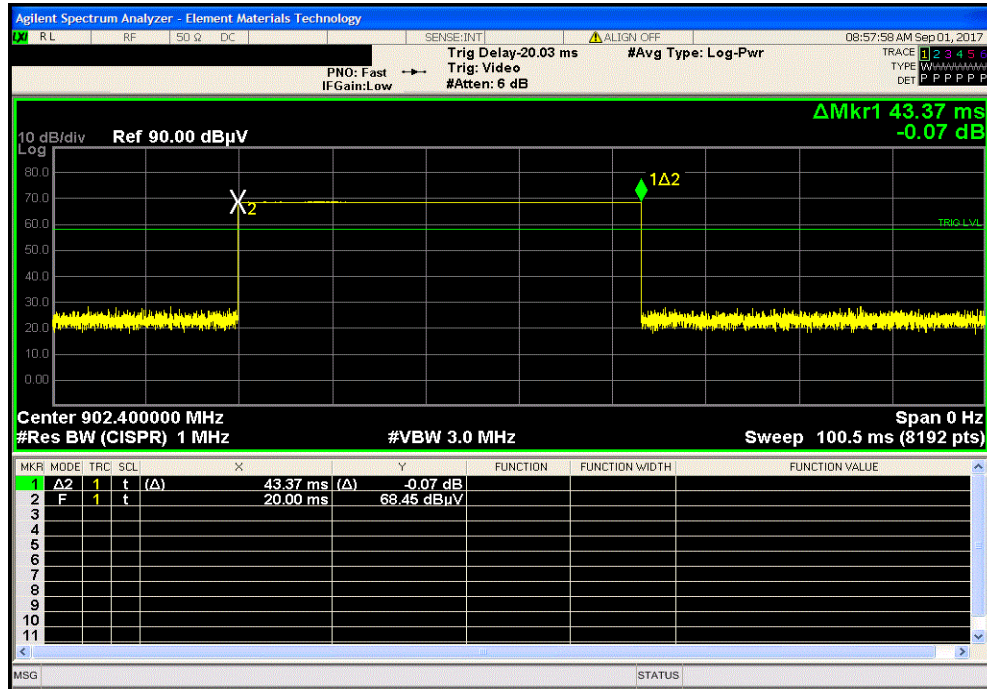


DUTY CYCLE

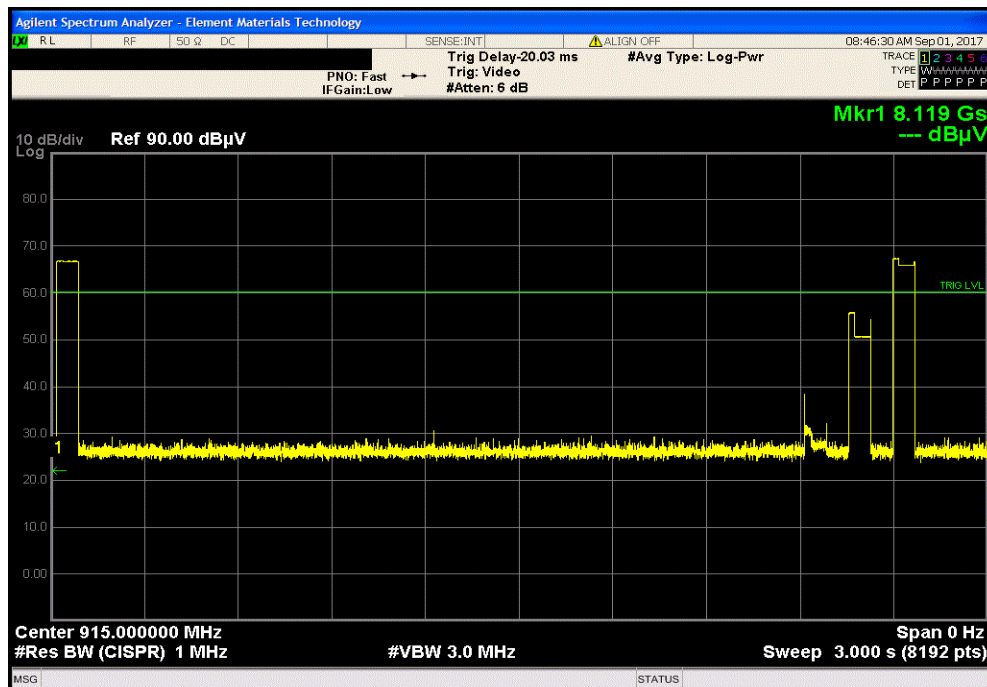


XMI 2017.02.08

25 Channel Hopping Mode, 100 ms Sweep						
				Value (ms)	Duty Cycle (%)	Result
				43.37	43.37	N/A



50 Channel Hopping Mode, 3 Second Sweep						
				Value (ms)	Duty Cycle (%)	Result
				N/A	N/A	N/A

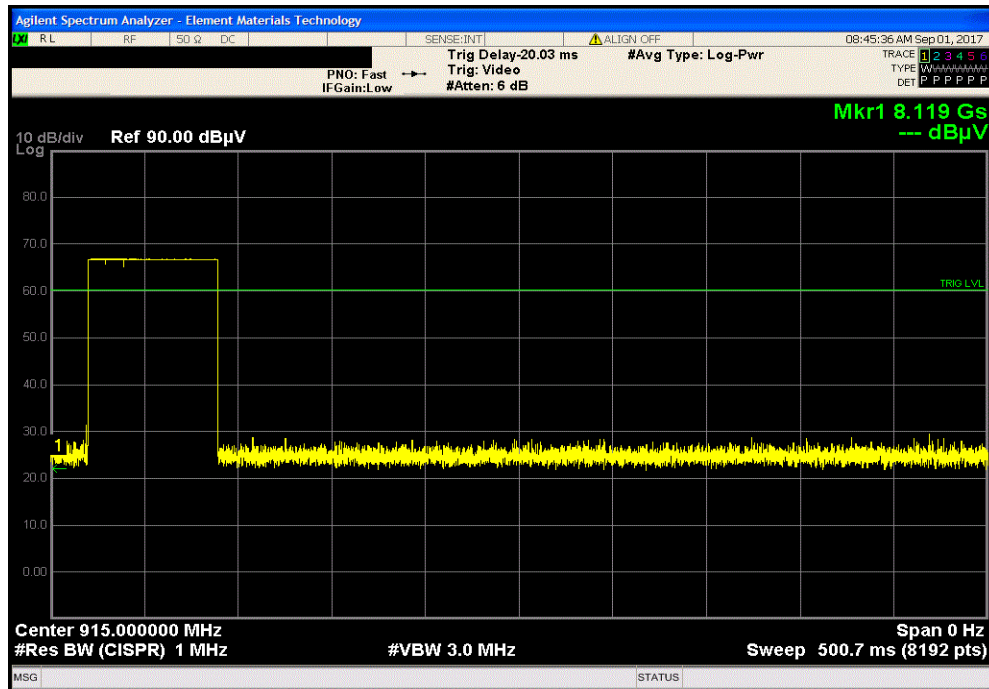


DUTY CYCLE

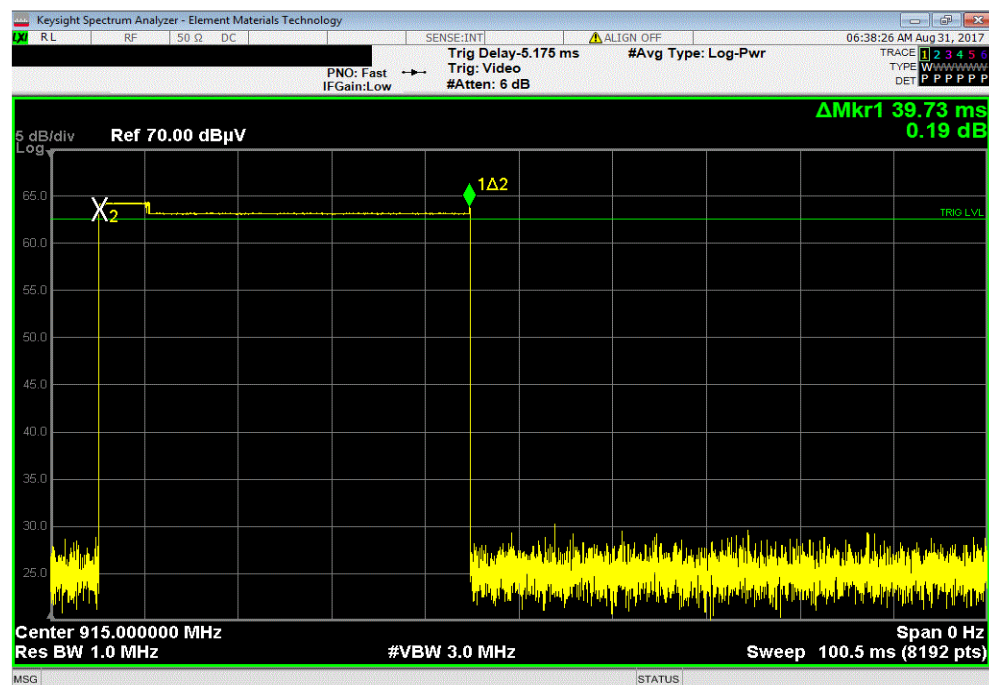


XMM 2017.02.08

50 Channel Hopping Mode, 500 ms Sweep						
				Value (ms)	Duty Cycle (%)	Result
				N/A	N/A	N/A



50 Channel Hopping Mode, 100 ms Sweep						
				Value (ms)	Duty Cycle (%)	Result
				39.73	39.73	N/A



CARRIER FREQUENCY SEPARATION



XMit 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	3/17/2015	3/17/2018
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/16/2017	3/16/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The channel carrier frequencies must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Or, if the output power is less than 125 mW, the channel separation can be 25 kHz or 2/3 of the 20dB bandwidth. 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



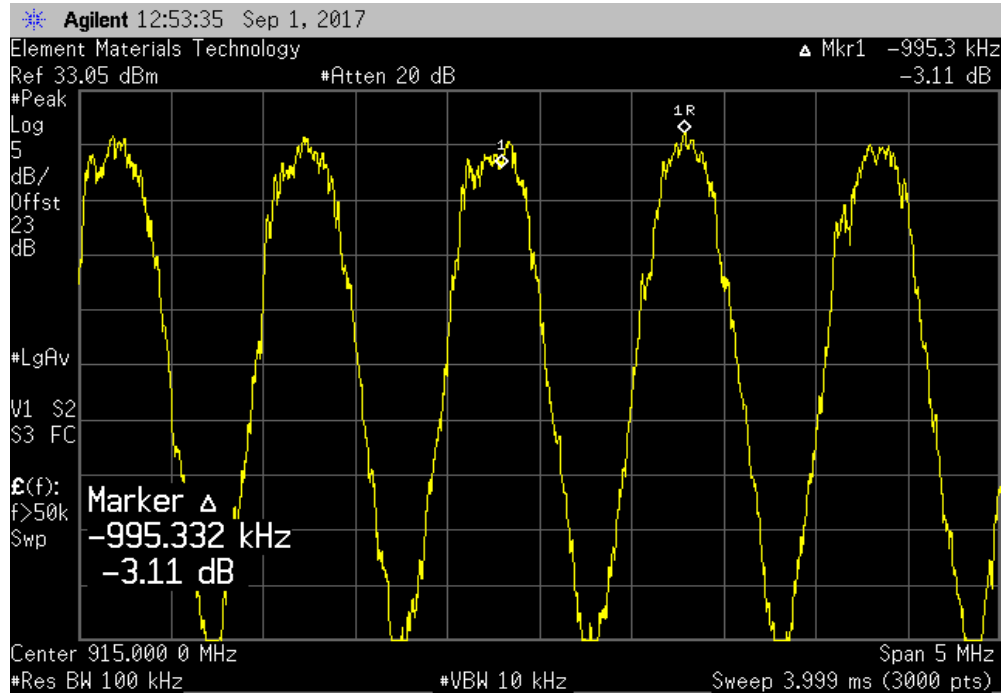
EUT: Radio 136377		Work Order: MARJ0007	
Serial Number: 3		Date: 09/01/17	
Customer: Traffic & Parking Control Co., Inc.		Temperature: 22 °C	
Attendees: Roman Marjamaa		Humidity: 49% RH	
Project: None		Barometric Pres.: 1023 mbar	
Tested by: Dustin Sparks		Job Site: MN08	
Power: 5VDC			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
Limits based on worst case occupied bandwidth results for both data rates.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	8	Signature <i>Dustin Sparks</i>	
		Value	Limit (±) Results
25-Channel Hopping Mode			
610k		1.0 MHz	485.026 kHz Pass
50-Channel Hopping Mode			
120k		0.6 MHz	243.19 kHz Pass

CARRIER FREQUENCY SEPARATION

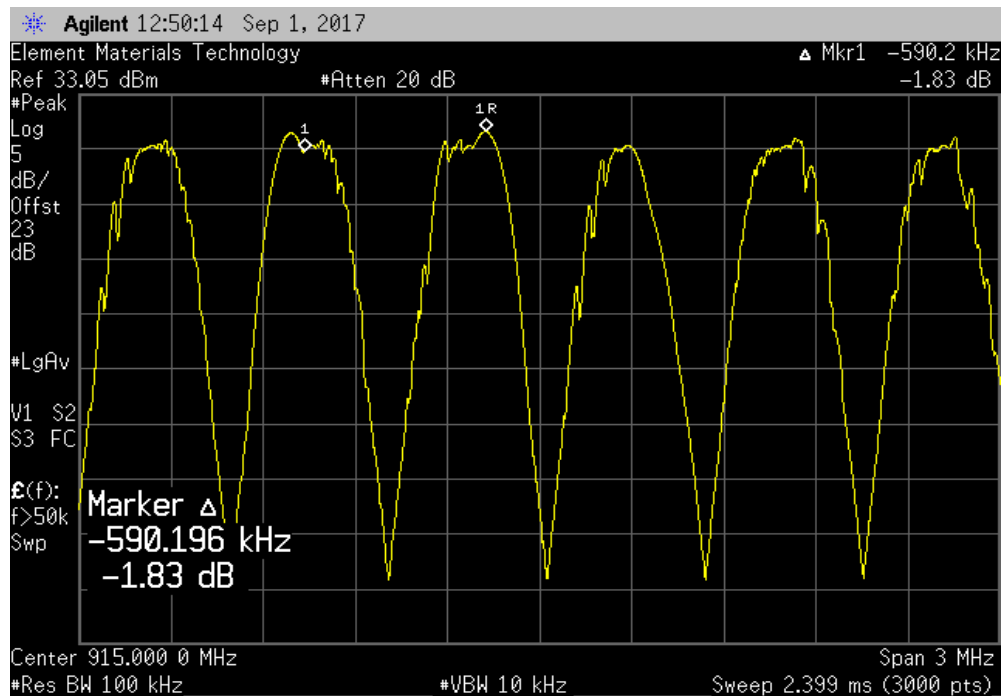


TMTx 2017.07.11 XMM 2017.02.08

25-Channel Hopping Mode, 610k						
				Value	Limit (≥)	Results
				1.0 MHz	485.026 kHz	Pass



50-Channel Hopping Mode, 120k						
				Value	Limit (≥)	Results
				0.6 MHz	243.19 kHz	Pass



NUMBER OF HOPPING FREQUENCIES



XMit 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	3/17/2015	3/17/2018
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/16/2017	3/16/2018

TEST DESCRIPTION

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



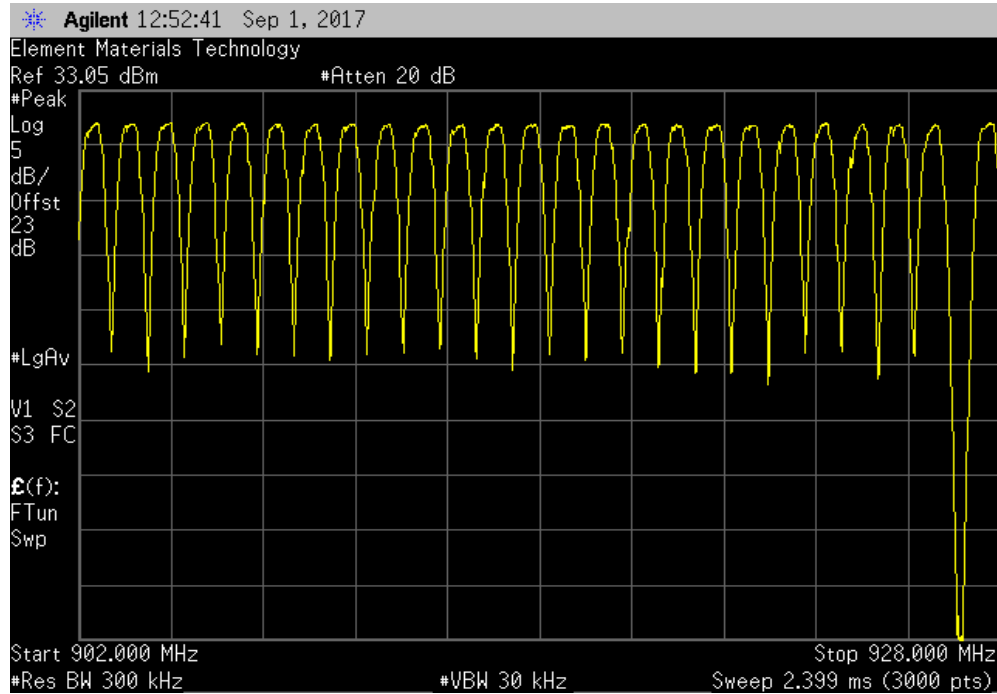
EUT: Radio 136377		Work Order: MARJ0007	
Serial Number: 3		Date: 09/01/17	
Customer: Traffic & Parking Control Co., Inc.		Temperature: 22 °C	
Attendees: Roman Marjamaa		Humidity: 49.1% RH	
Project: None		Barometric Pres.: 1022 mbar	
Tested by: Dustin Sparks		Job Site: MN08	
Power: 5VDC			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	8	Signature <i>Dustin Sparks</i>	
		Number of Channels	Limit (±) Results
25-Channel Hopping Mode			
610k		25	25 Pass
50-Channel Hopping Mode			
120k		50	50 Pass

NUMBER OF HOPPING FREQUENCIES

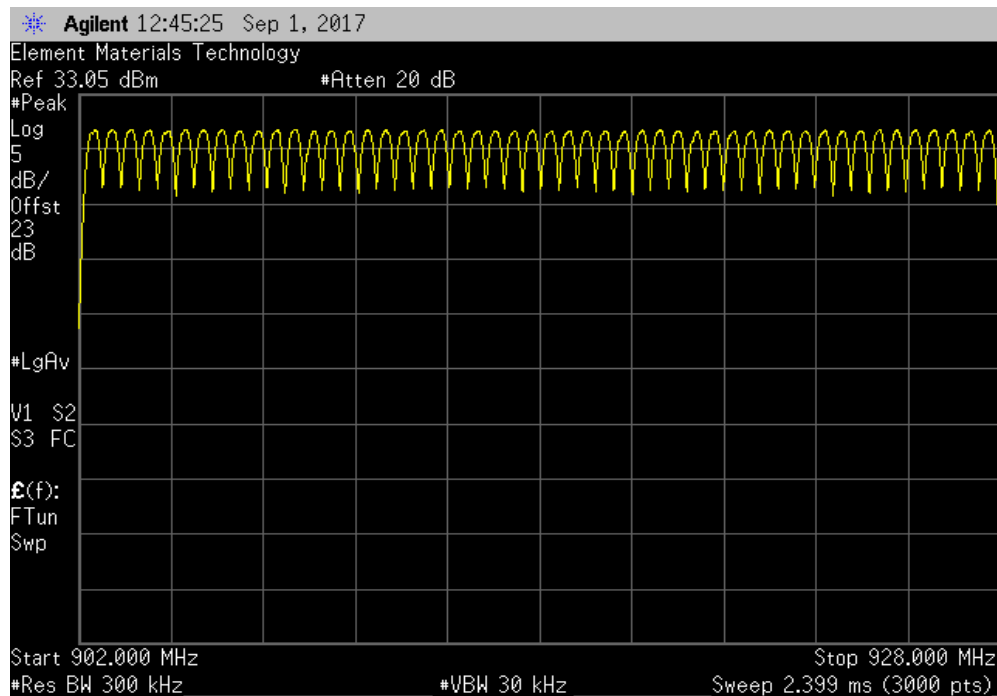


TMTx 2017.07.11 XMM 2017.02.08

25-Channel Hopping Mode, 610k						
				Number of Channels	Limit (≥)	Results
				25	25	Pass



50-Channel Hopping Mode, 120k						
				Number of Channels	Limit (≥)	Results
				50	50	Pass



DWELL TIME



XMIT 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	3/17/2015	3/17/2018
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/16/2017	3/16/2018

TEST DESCRIPTION

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

DWELL TIME



XMM 2017.02.08

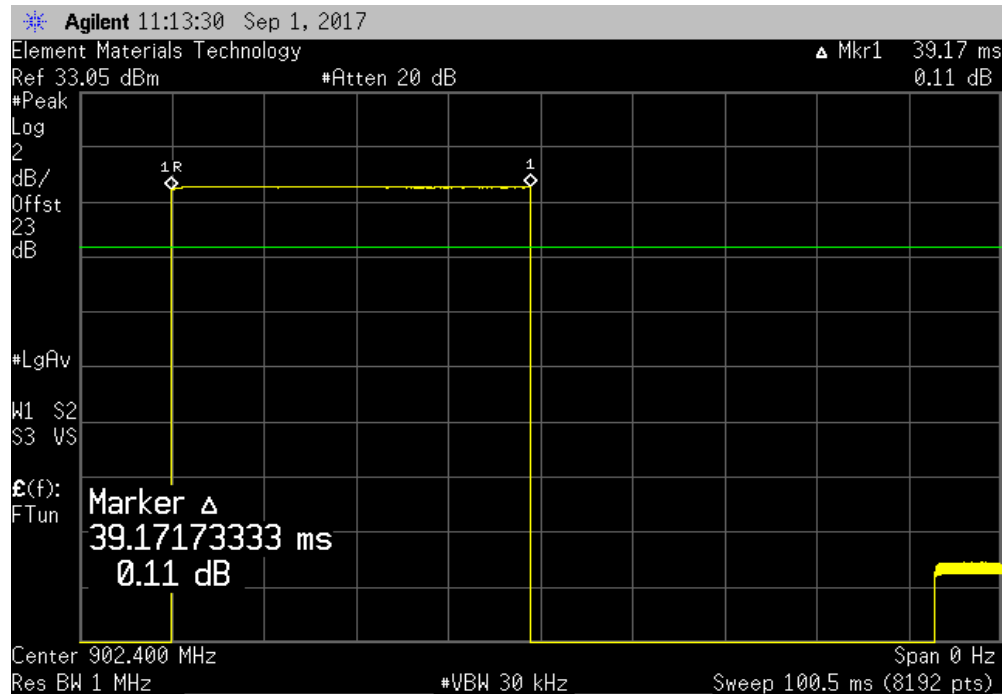
EUT: Radio 136377		Work Order: MARJ0007	
Serial Number: 3		Date: 09/01/17	
Customer: Traffic & Parking Control Co., Inc.		Temperature: 21.9 °C	
Attendees: Roman Marjamaa		Humidity: 49.2% RH	
Project: None		Barometric Pres.: 1022 mbar	
Tested by: Dustin Sparks		Power: 5VDC	
Job Site: MN08			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	8	Signature <i>Dustin Sparks</i>	
		Pulse Length (ms)	Number of Pulses
		Total On-Time (ms)	Limit (ms)
			Result
25 Channel Hopping Mode			
15k			
	Pulse Length	39.17	N/A
	Pulse Train	39.17	10
		N/A	N/A
		N/A	≤ 400
		N/A	Pass
120k			
	Pulse Length	37.36	N/A
	Pulse Train	37.36	10
		N/A	N/A
		N/A	≤ 400
		N/A	Pass
200k			
	Pulse Length	38.77	N/A
	Pulse Train	38.77	10
		N/A	N/A
		N/A	≤ 400
		N/A	Pass
400k			
	Pulse Length	19.4	N/A
	Pulse Train	19.4	20
		N/A	N/A
		N/A	≤ 400
		N/A	Pass
610k			
	Pulse Length	13.13	N/A
	Pulse Train	13.13	29
		N/A	N/A
		N/A	≤ 400
		N/A	Pass
50 Channel Hopping Mode			
15k			
	Pulse Length	39.13	N/A
	Pulse Train	39.13	10
		N/A	N/A
		N/A	≤ 400
		N/A	Pass
120k			
	Pulse Length	37.34	N/A
	Pulse Train	37.34	10
		N/A	N/A
		N/A	≤ 400
		N/A	Pass
200k			
	Pulse Length	38.74	N/A
	Pulse Train	38.74	10
		N/A	N/A
		N/A	≤ 400
		N/A	Pass
400k			
	Pulse Length	19.4	N/A
	Pulse Train	19.4	20
		N/A	N/A
		N/A	≤ 400
		N/A	Pass

DWELL TIME

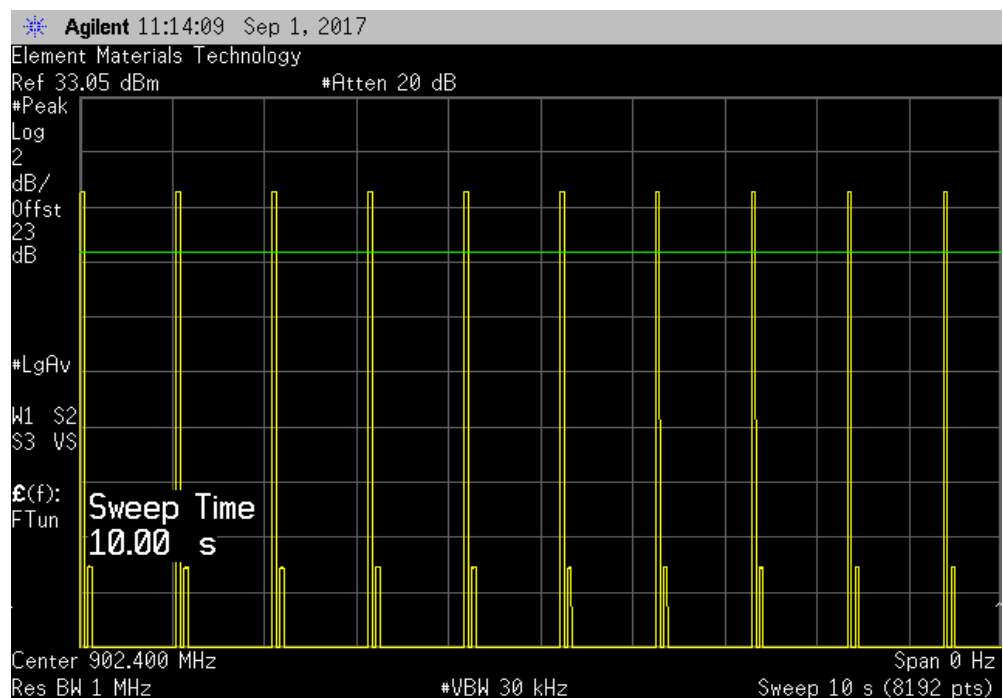


XMM 2017.02.08

25 Channel Hopping Mode, 15k, Pulse Length						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	39.17	N/A	N/A	N/A	N/A	



25 Channel Hopping Mode, 15k, Pulse Train						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	39.17	10	391.7	≤ 400	Pass	

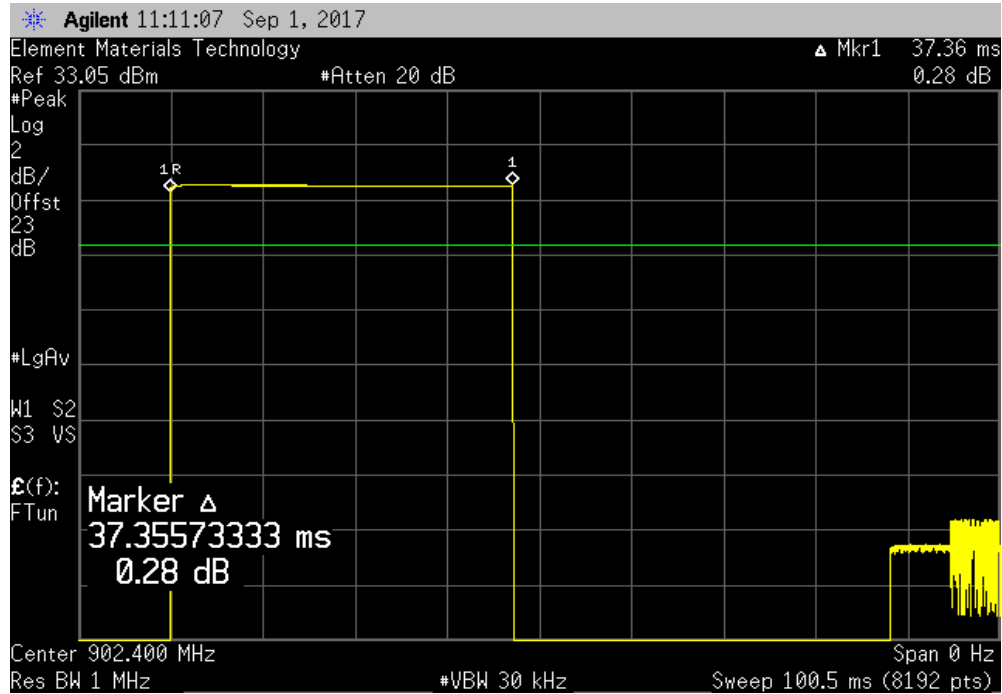


DWELL TIME

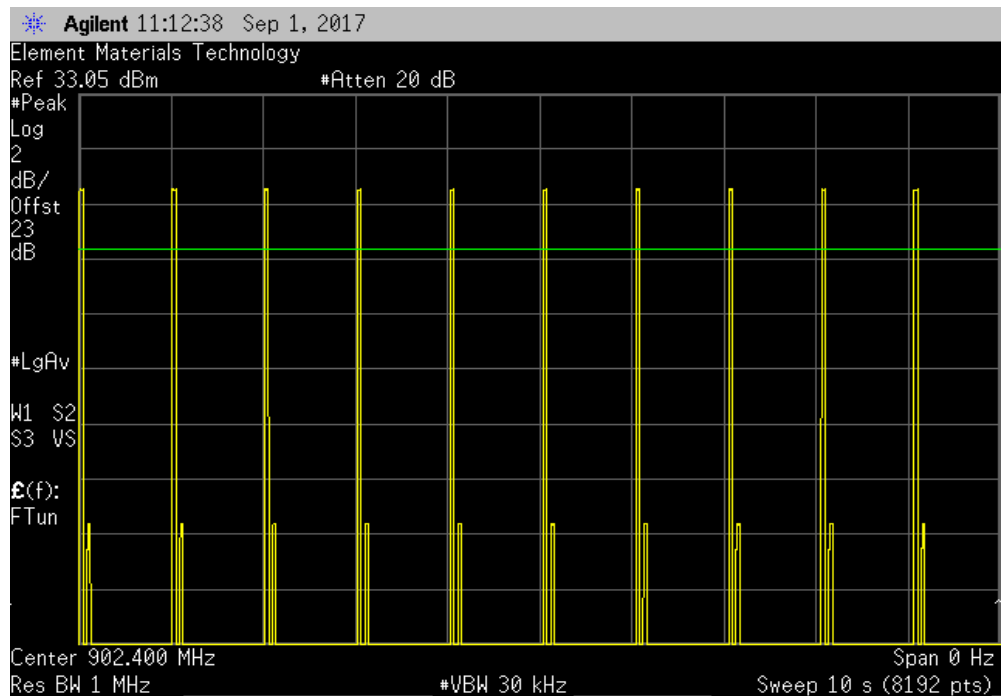


XMM 2017.02.08

25 Channel Hopping Mode, 120k, Pulse Length						
Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result		
37.36	N/A	N/A	N/A	N/A		



25 Channel Hopping Mode, 120k, Pulse Train						
Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result		
37.36	10	373.6	≤ 400	Pass		

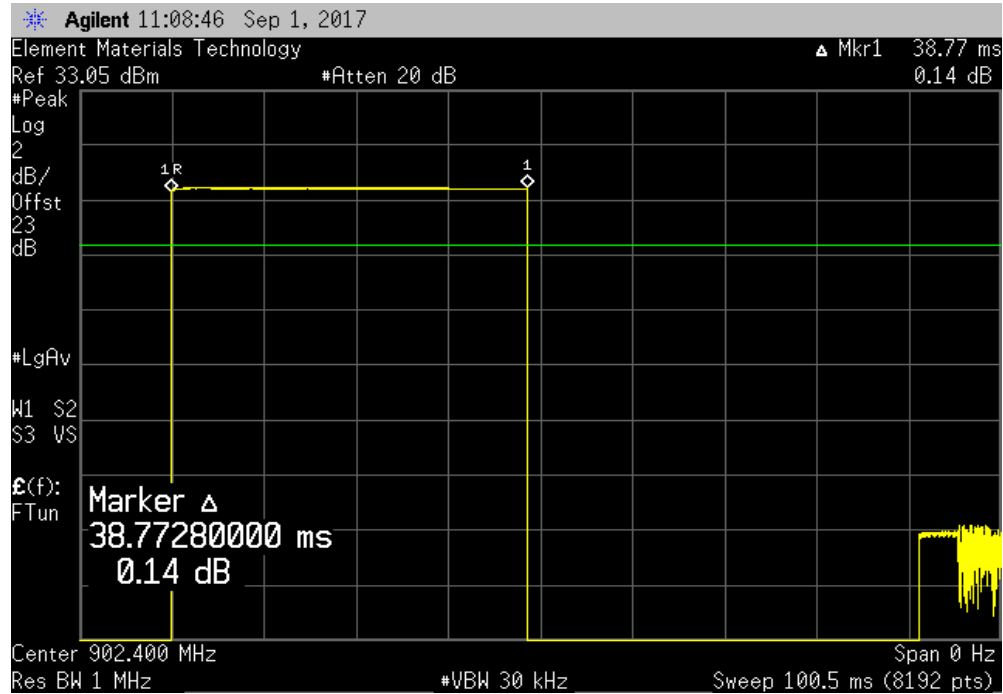


DWELL TIME

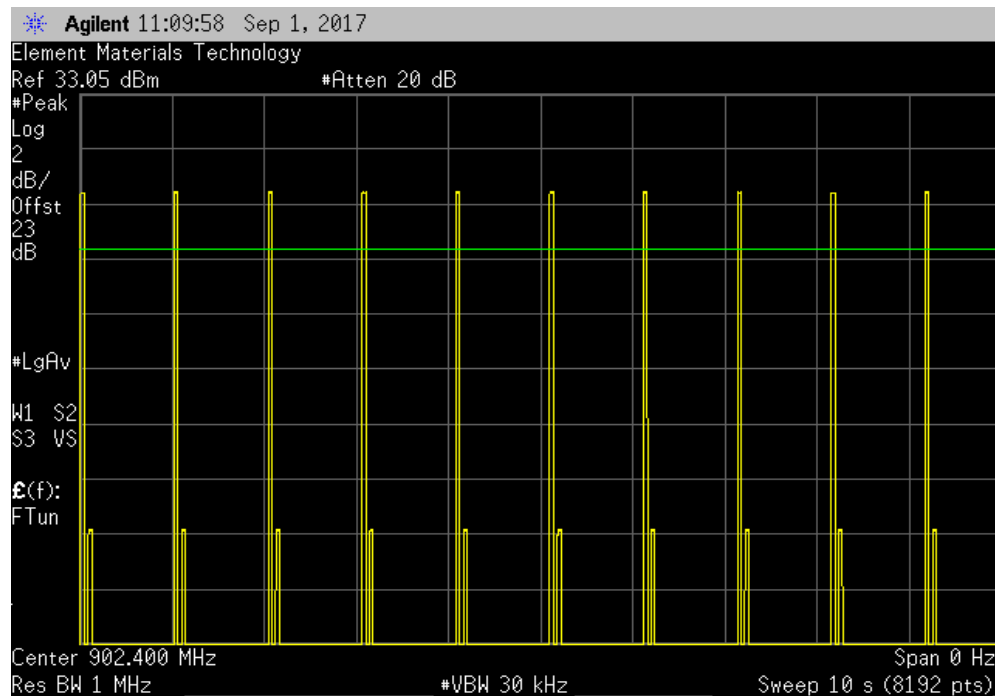


XMM 2017.02.08

25 Channel Hopping Mode, 200k, Pulse Length						
Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result		
38.77	N/A	N/A	N/A	N/A		



25 Channel Hopping Mode, 200k, Pulse Train						
Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result		
38.77	10	387.7	≤ 400	Pass		

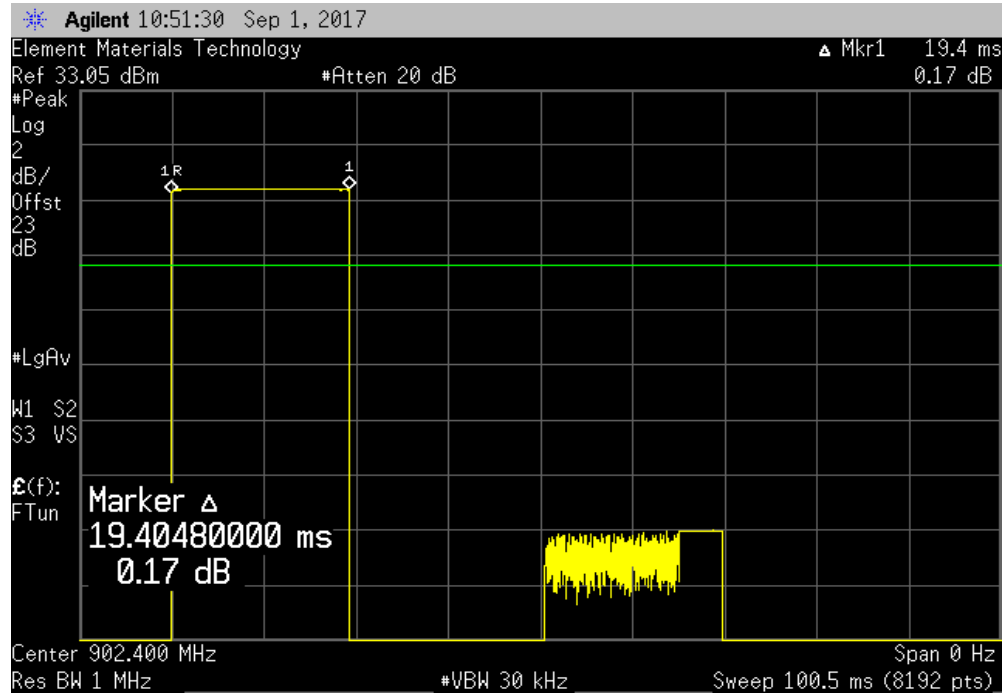


DWELL TIME

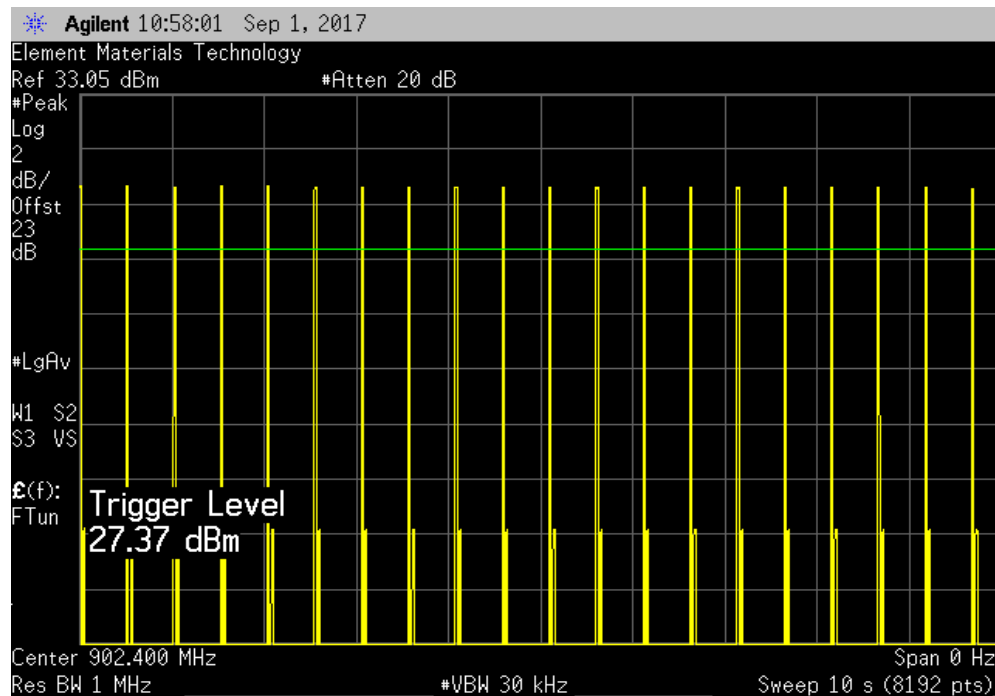


XMM 2017.02.08

25 Channel Hopping Mode, 400k, Pulse Length						
Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result		
19.4	N/A	N/A	N/A	N/A		



25 Channel Hopping Mode, 400k, Pulse Train						
Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result		
19.4	20	388	≤ 400	Pass		

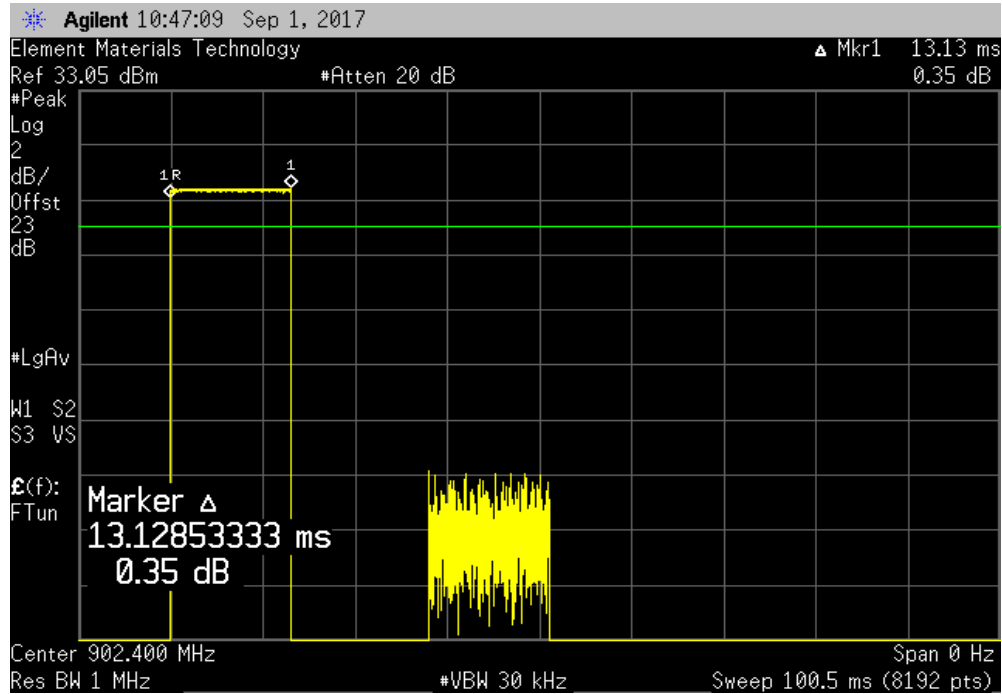


DWELL TIME



XMM 2017.02.08

25 Channel Hopping Mode, 610k, Pulse Length						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	13.13	N/A	N/A	N/A	N/A	



25 Channel Hopping Mode, 610k, Pulse Train						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	13.13	29	380.77	≤ 400	Pass	

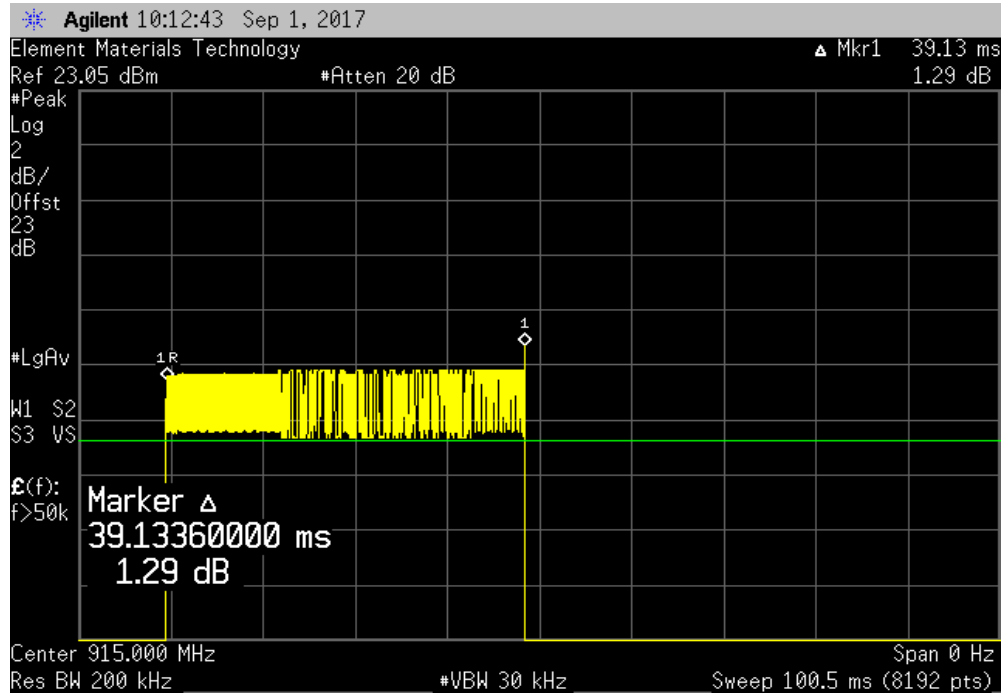


DWELL TIME

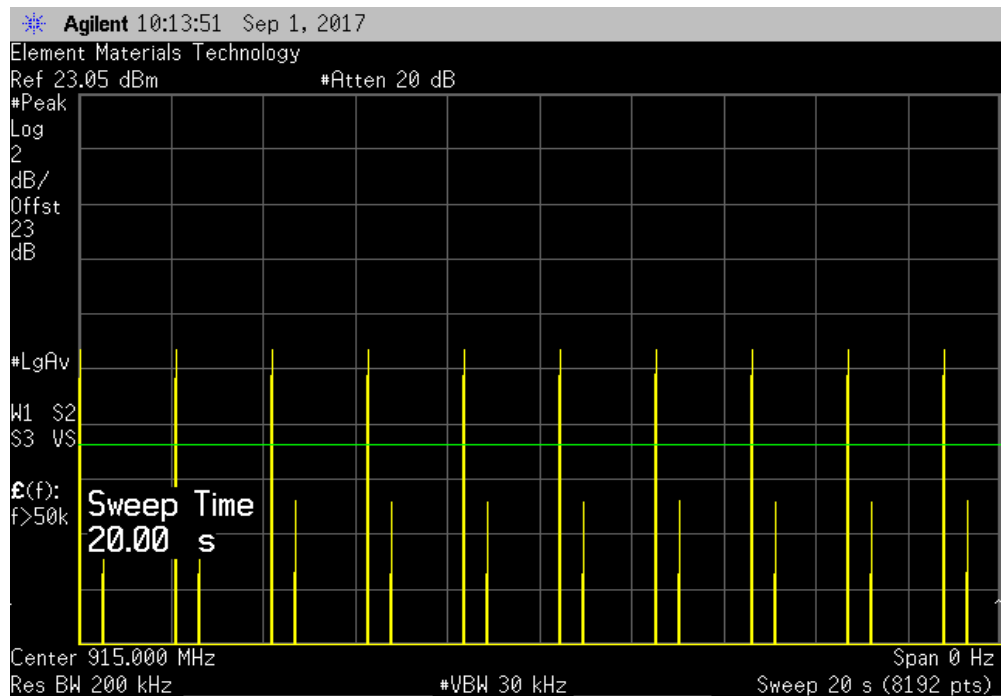


XMM 2017.02.08

50 Channel Hopping Mode, 15k, Pulse Length						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	39.13	N/A	N/A	N/A	N/A	



50 Channel Hopping Mode, 15k, Pulse Train						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	39.13	10	391.3	≤ 400	Pass	

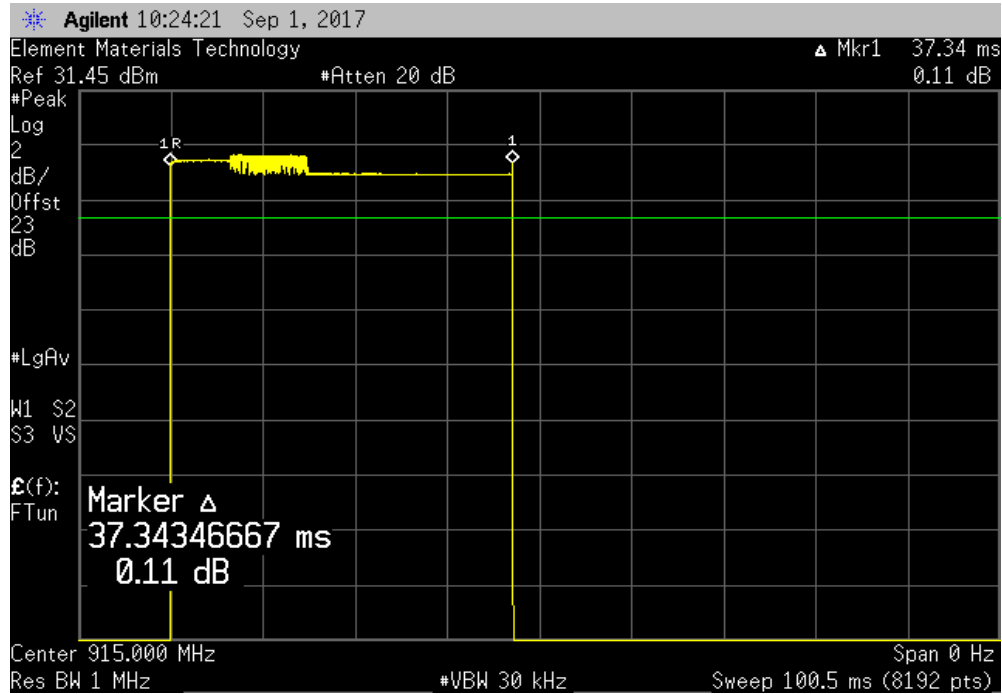


DWELL TIME

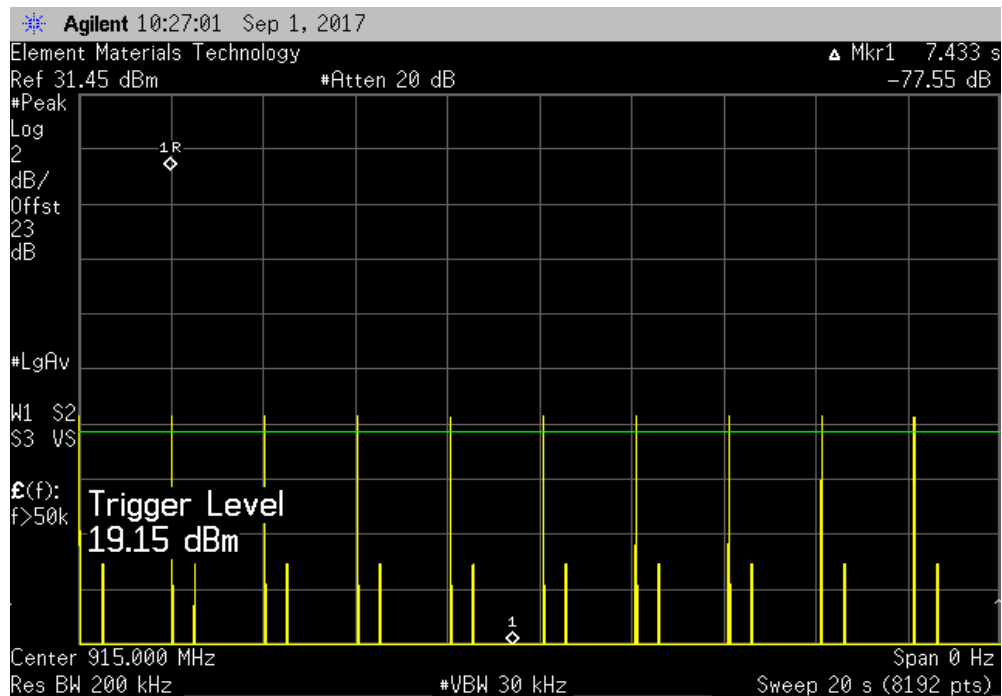


XMM 2017.02.08

50 Channel Hopping Mode, 120k, Pulse Length						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	37.34	N/A	N/A	N/A	N/A	



50 Channel Hopping Mode, 120k, Pulse Train						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	37.34	10	373.4	≤ 400	Pass	

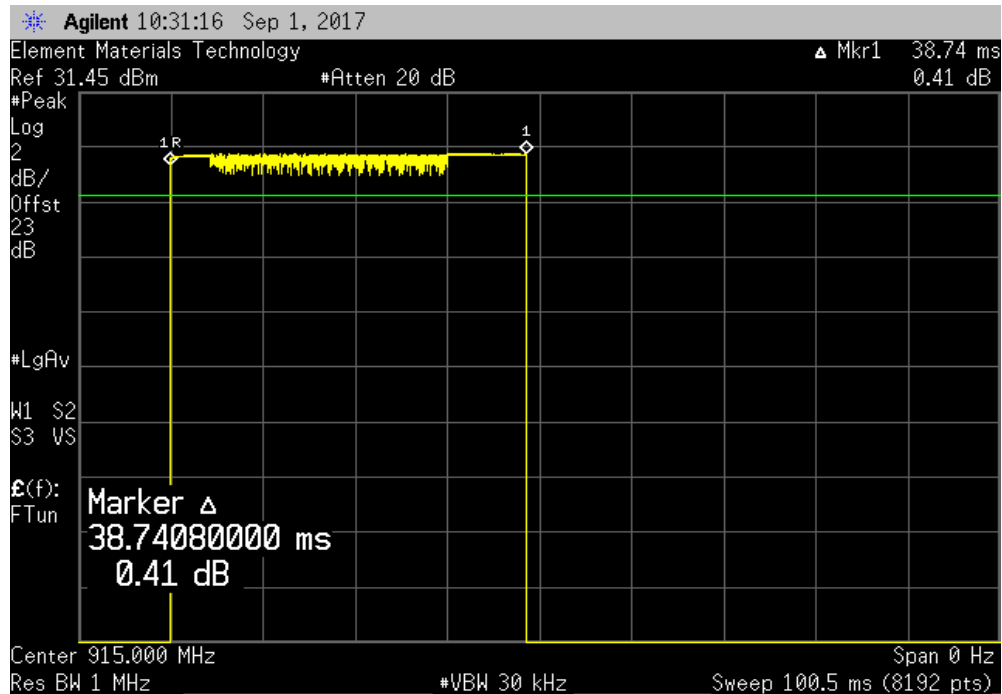


DWELL TIME

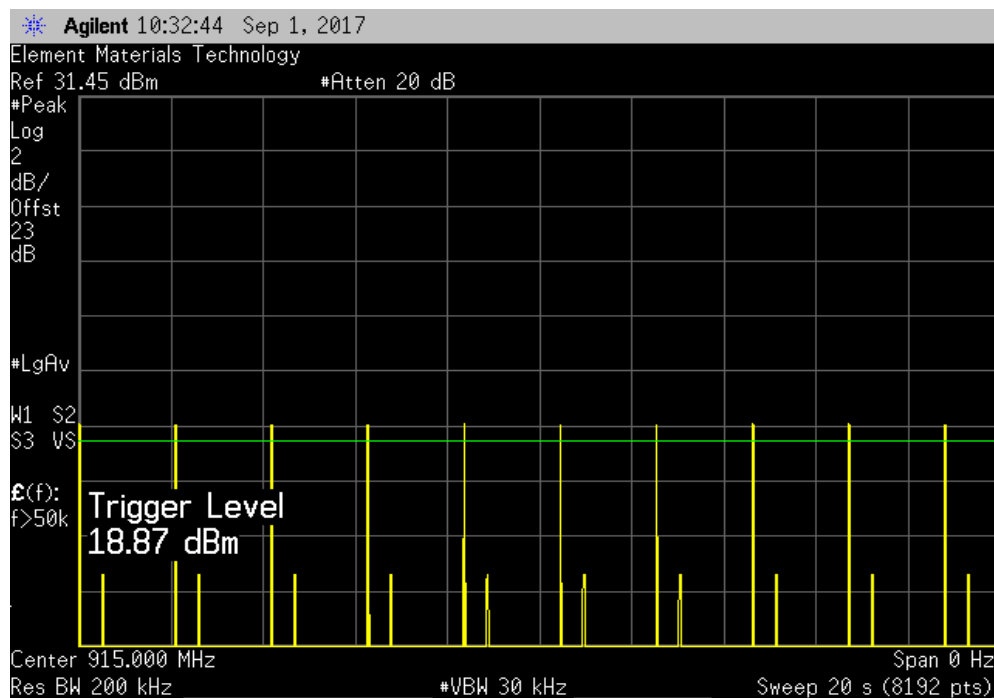


XMM 2017.02.08

50 Channel Hopping Mode, 200k, Pulse Length						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	38.74	N/A	N/A	N/A	N/A	



50 Channel Hopping Mode, 200k, Pulse Train						
	Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result	
	38.74	10	387.4	≤ 400	Pass	

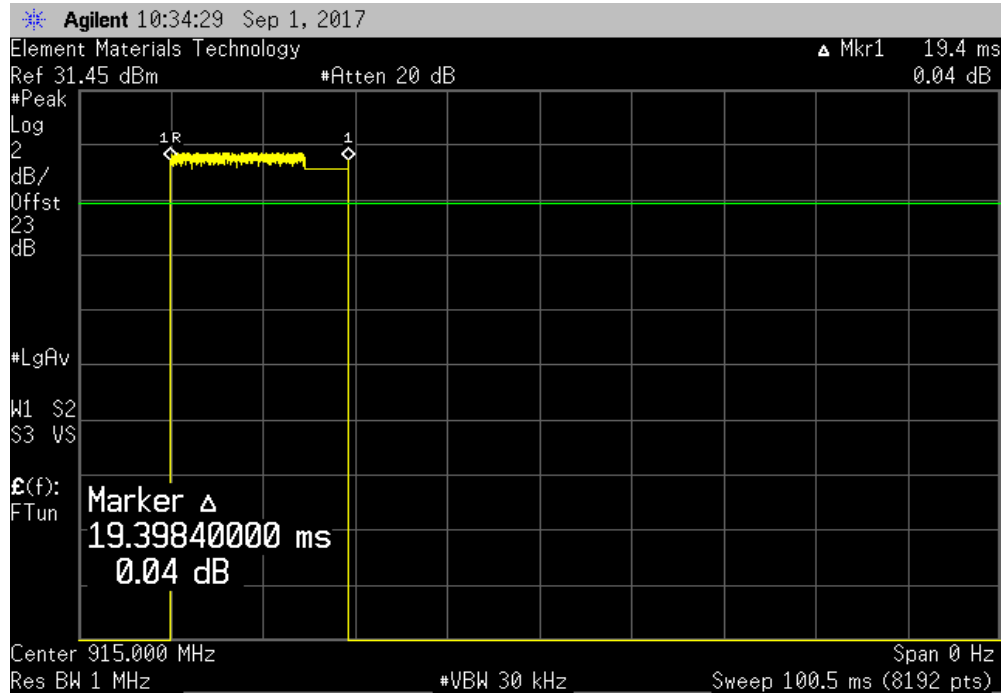


DWELL TIME

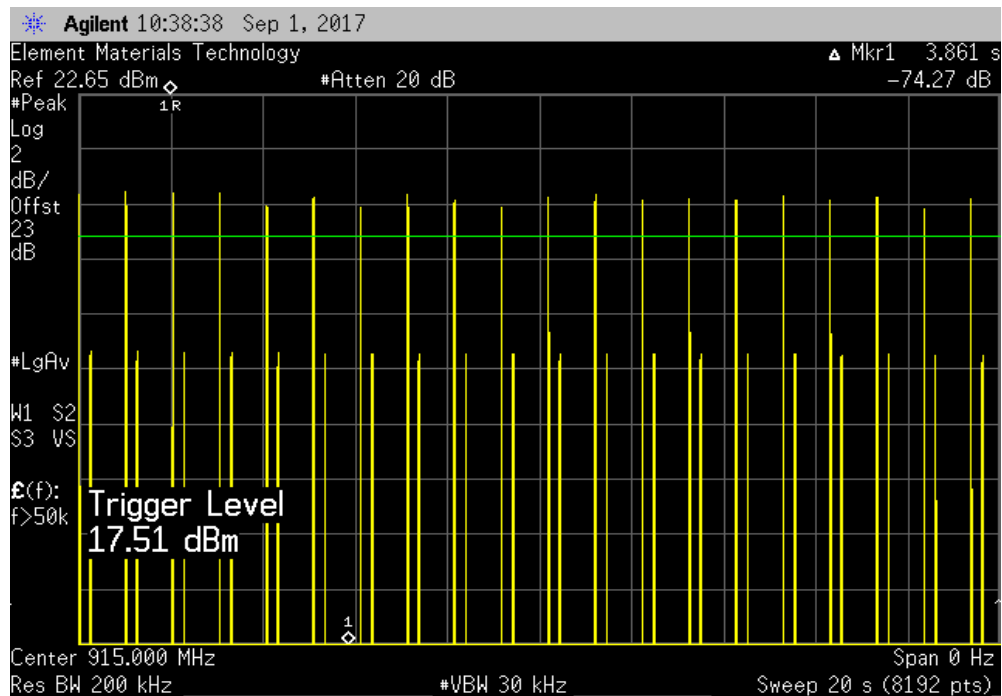


XMM 2017.02.08

50 Channel Hopping Mode, 400k, Pulse Length						
Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result		
19.4	N/A	N/A	N/A	N/A		



50 Channel Hopping Mode, 400k, Pulse Train						
Pulse Length (ms)	Number of Pulses	Total On-Time (ms)	Limit (ms)	Result		
19.4	20	388	≤ 400	Pass		



OUTPUT POWER



XMIT 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	3/17/2015	3/17/2018
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/16/2017	3/16/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

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

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

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER



THtTx 2017.07.11 XMtM 2017.02.08

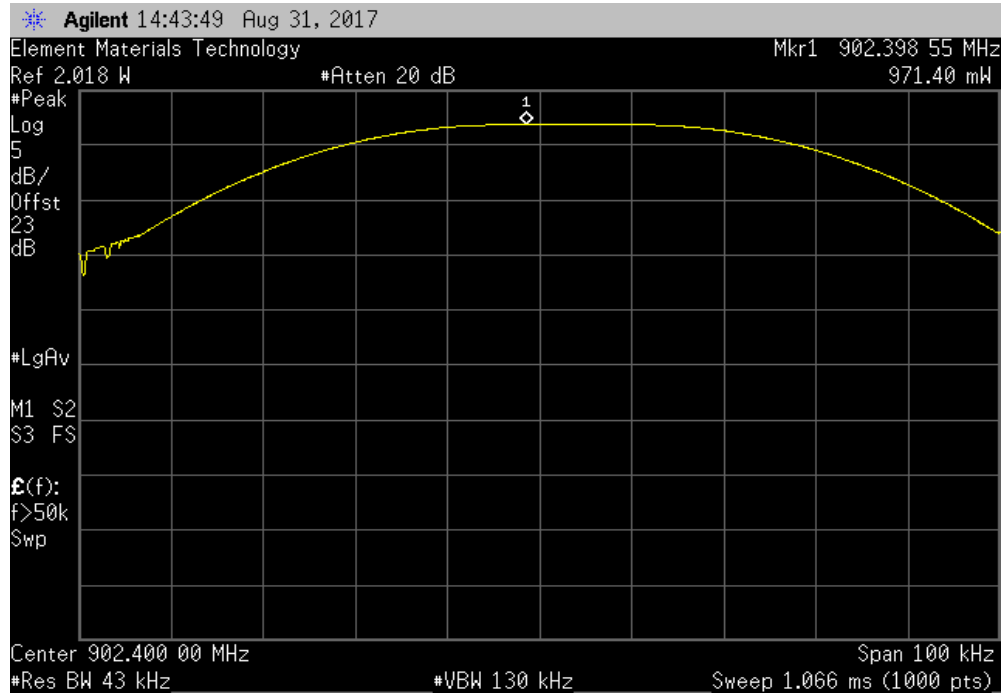
EUT: Radio 136377		Work Order: MARJ0007	
Serial Number: 3		Date: 09/01/17	
Customer: Traffic & Parking Control Co., Inc.		Temperature: 22.7 °C	
Attendees: Roman Marjamaa		Humidity: 48.2% RH	
Project: None		Barometric Pres.: 1023 mbar	
Tested by: Dustin Sparks		Power: 5VDC	
Job Site: MN08			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
610k data rate is only used for 25 channel hopping mode (output power limit of 250 mW.) Yagi antenna has a 10.65 dBi gain so conducted output power is lowered.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	8	Signature <i>Dustin Sparks</i>	
		Value	Limit (<)
All Other Antennas			
Low Channel, 902.4 MHz			
15k		971.404 mW	1 W
120k		969.17 mW	1 W
200k		960.506 mW	1 W
400k		254.156 mW	1 W
610k		244.906 mW	250 mW
Mid Channel, 915 MHz			
15k		860.795 mW	1 W
120k		874.178 mW	1 W
200k		844.112 mW	1 W
400k		241.88 mW	1 W
610k		232.702 mW	250 mW
High Channel, 927.6 MHz			
15k		874.984 mW	1 W
120k		883.894 mW	1 W
200k		878.82 mW	1 W
400k		244.343 mW	1 W
610k		244.343 mW	250 mW
Yagi Antenna			
Low Channel, 902.4 MHz			
120k		311.817 mW	1 W
610k		61.773 mW	250 mW
Mid Channel, 915 MHz			
120k		302.204 mW	1 W
610k		57.77 mW	250 mW
High Channel, 927.6 MHz			
120k		319.08 mW	1 W
610k		58.925 mW	250 mW

OUTPUT POWER

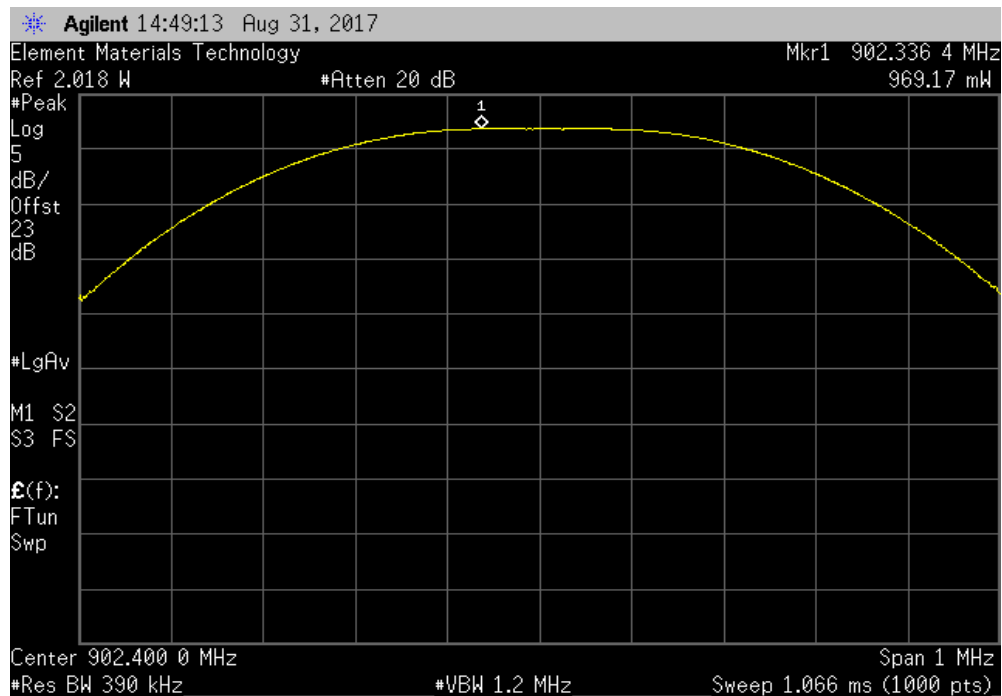


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 15k						
				Value	Limit (<)	Result
				971.404 mW	1 W	Pass



All Other Antennas, Low Channel, 902.4 MHz, 120k						
				Value	Limit (<)	Result
				969.17 mW	1 W	Pass

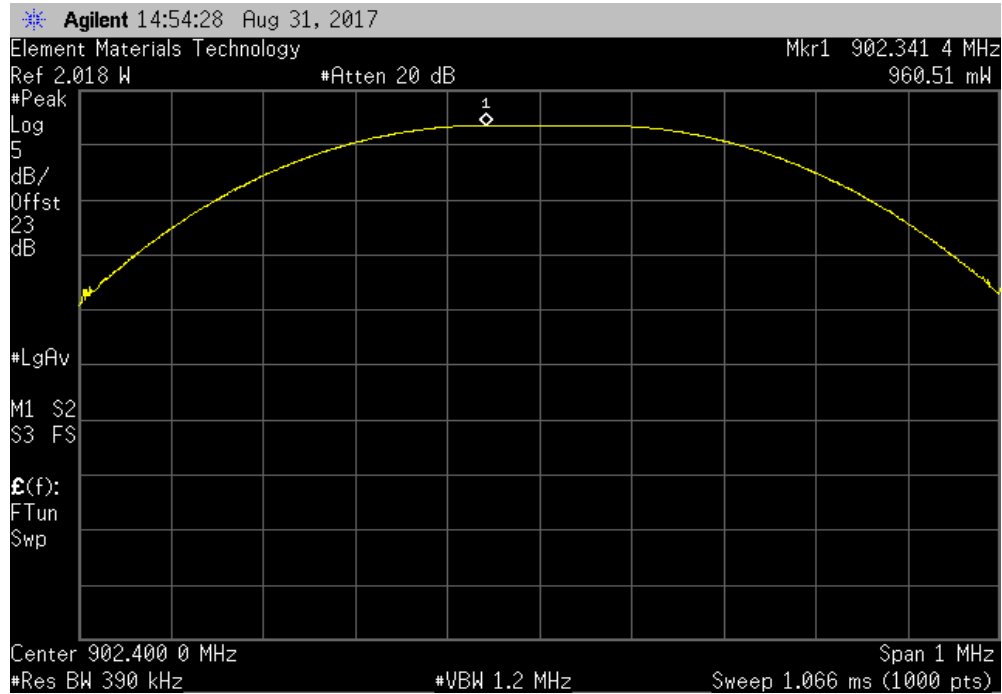


OUTPUT POWER

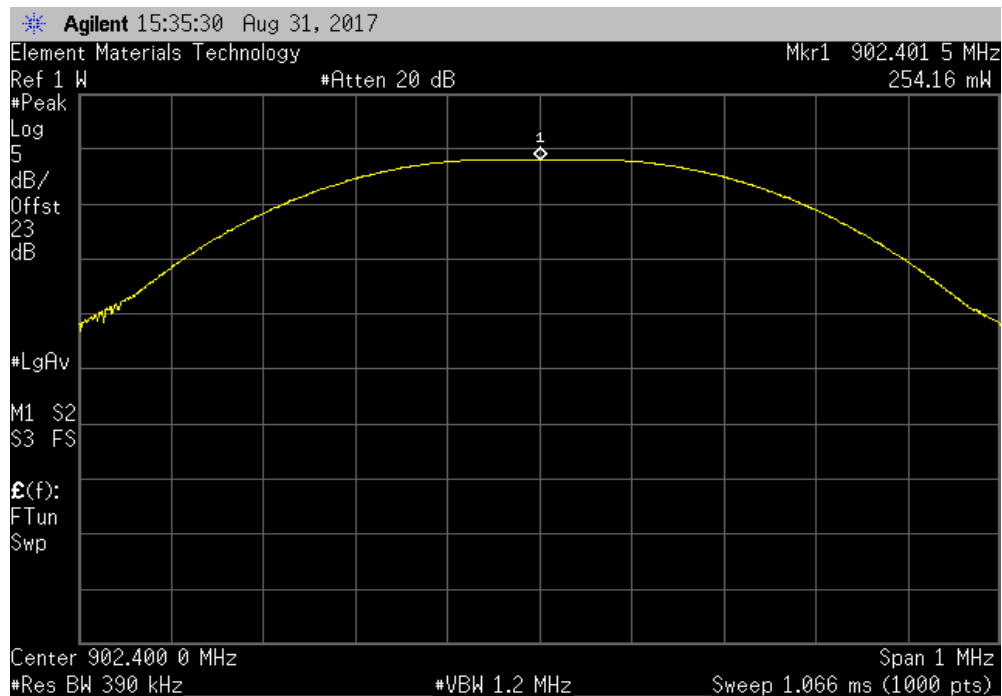


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 200k				Value	Limit (<)	Result
				960.506 mW	1 W	Pass



All Other Antennas, Low Channel, 902.4 MHz, 400k				Value	Limit (<)	Result
				254.156 mW	1 W	Pass

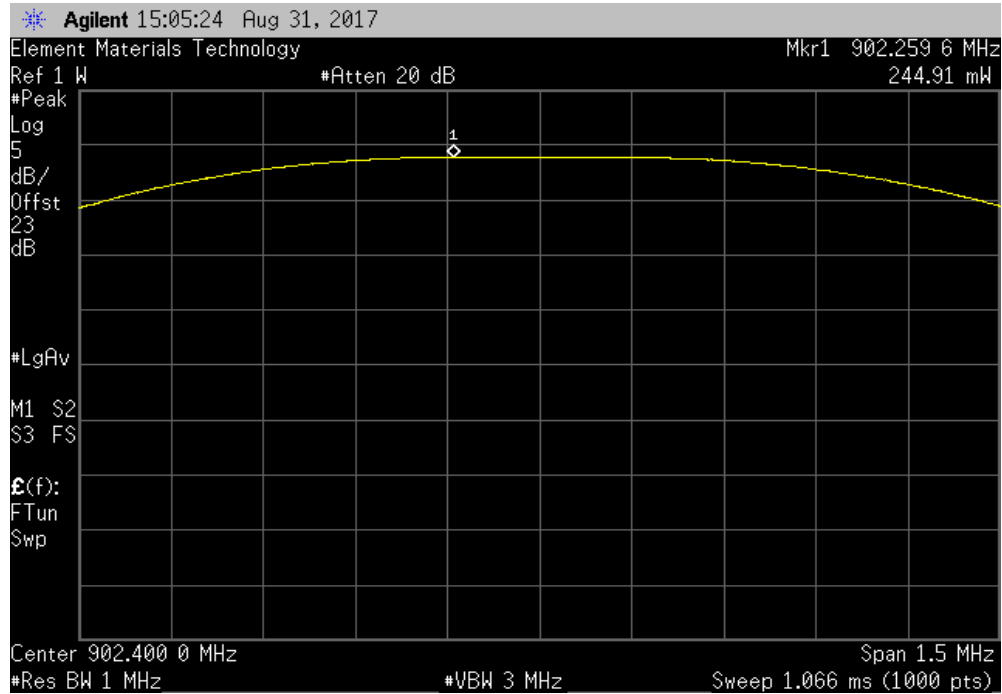


OUTPUT POWER

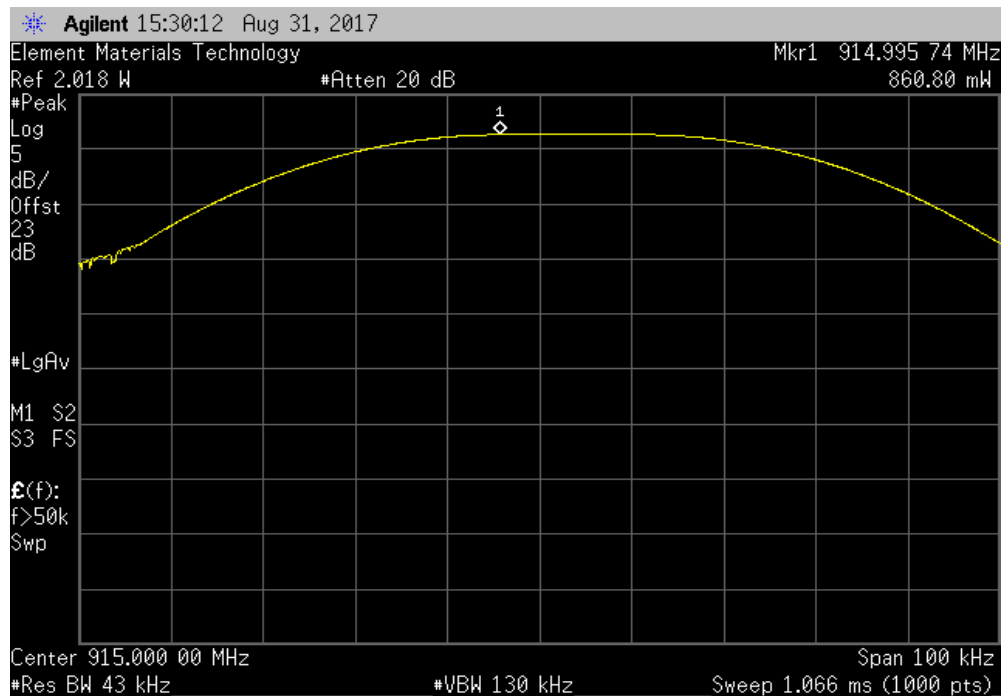


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 610k						
				Value	Limit (<)	Result
				244.906 mW	250 mW	Pass



All Other Antennas, Mid Channel, 915 MHz, 15k						
				Value	Limit (<)	Result
				860.795 mW	1 W	Pass

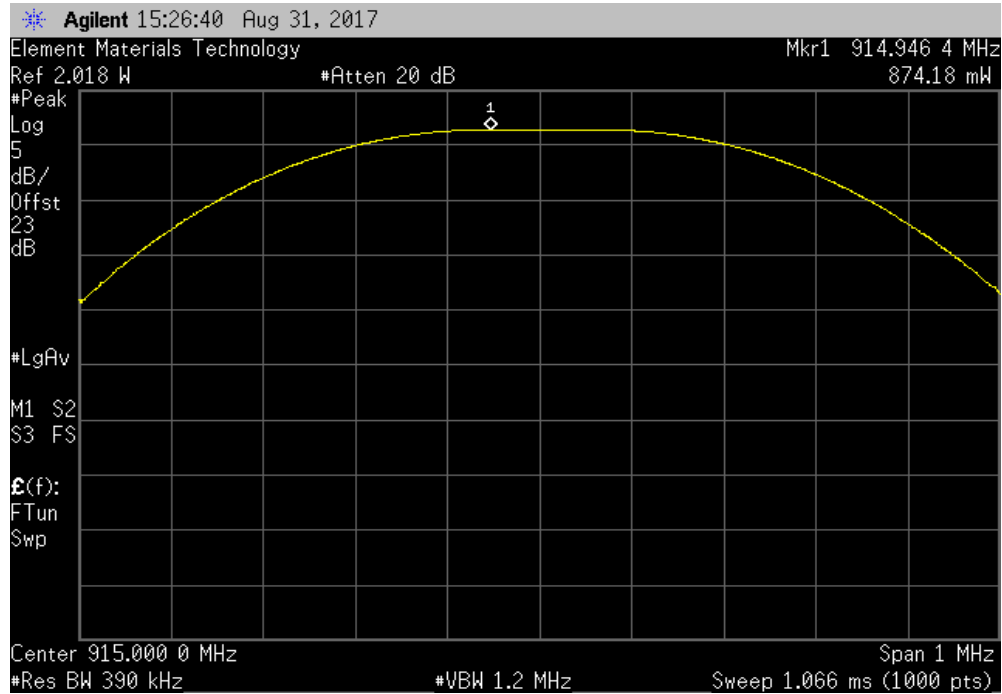


OUTPUT POWER

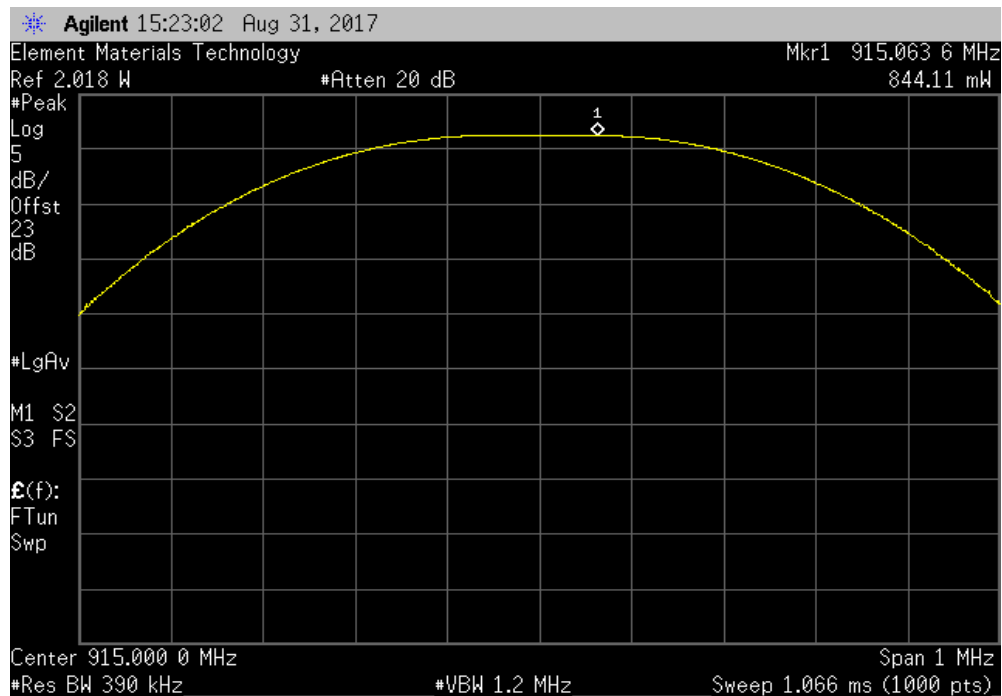


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 120k						
				Value	Limit (<)	Result
				874.178 mW	1 W	Pass



All Other Antennas, Mid Channel, 915 MHz, 200k						
				Value	Limit (<)	Result
				844.112 mW	1 W	Pass

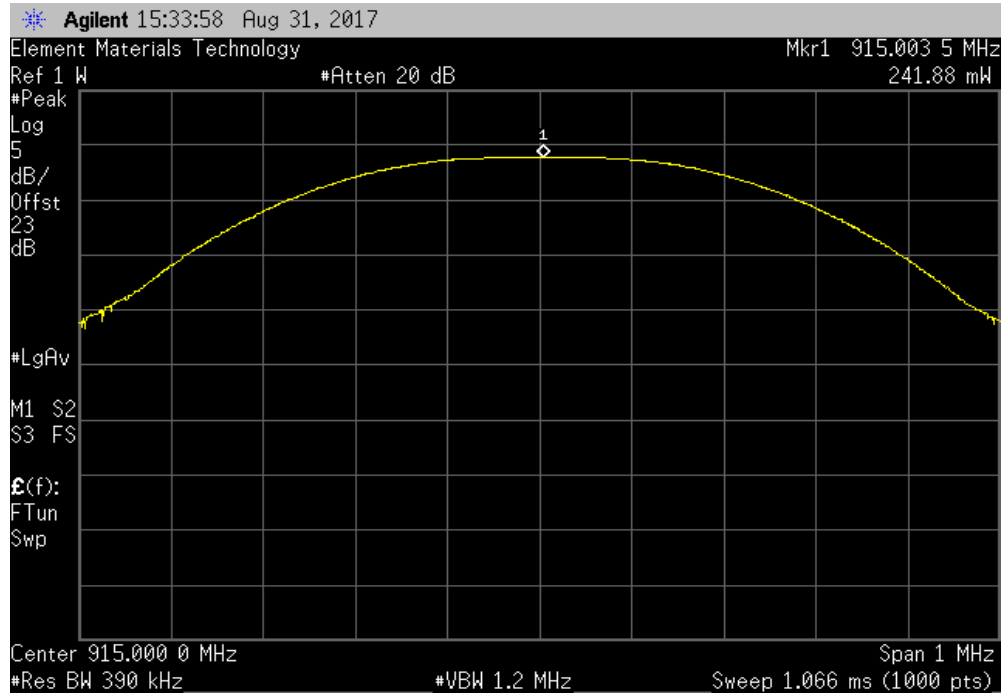


OUTPUT POWER

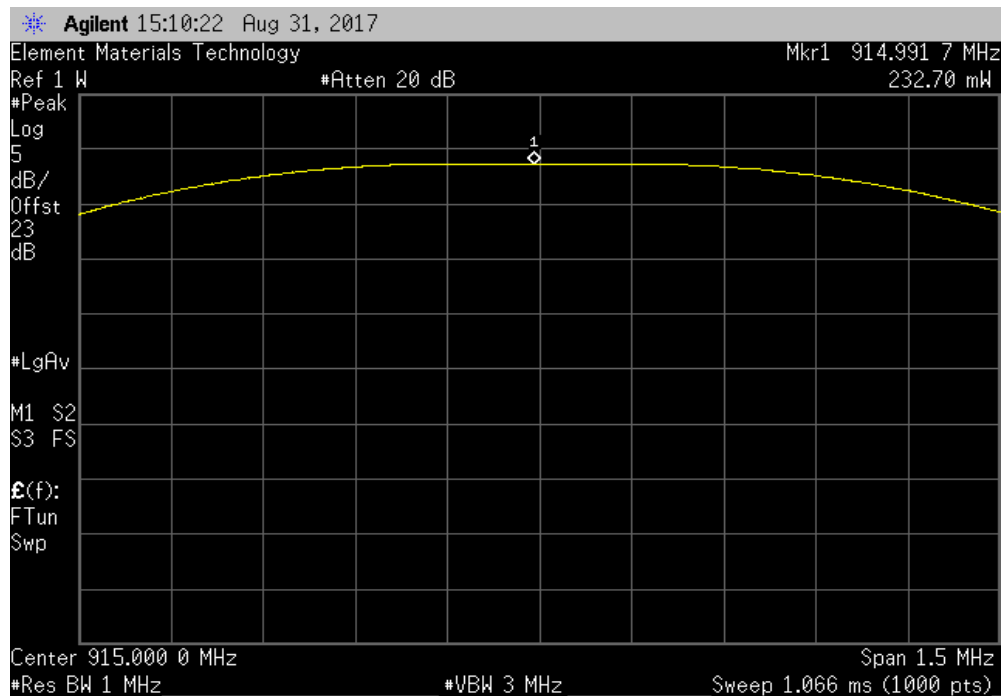


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 400k						
				Value	Limit (<)	Result
				241.88 mW	1 W	Pass



All Other Antennas, Mid Channel, 915 MHz, 610k						
				Value	Limit (<)	Result
				232.702 mW	250 mW	Pass

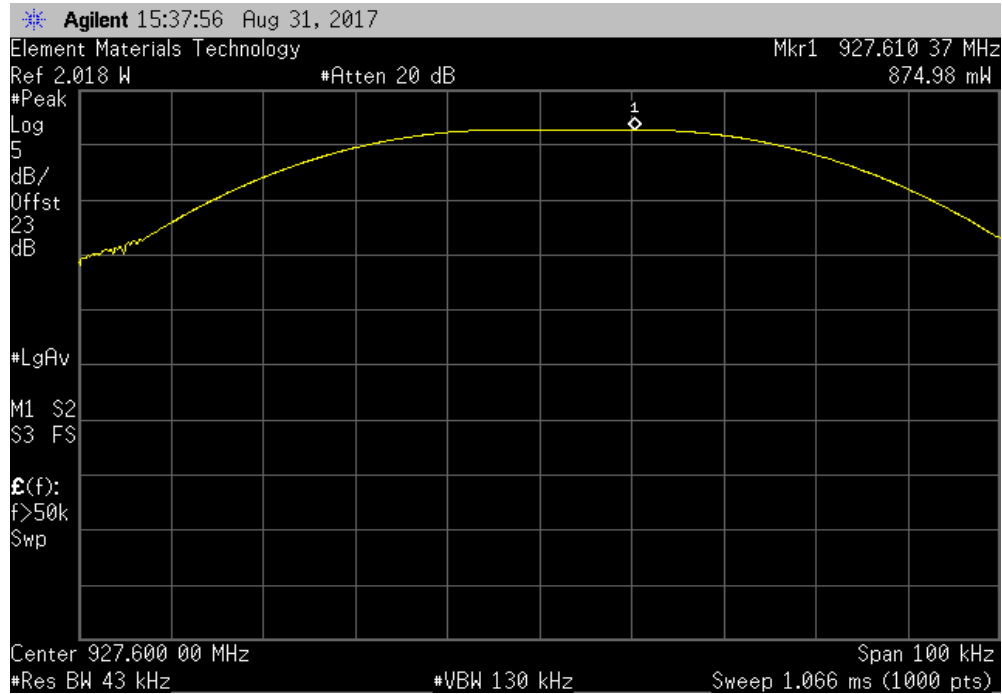


OUTPUT POWER

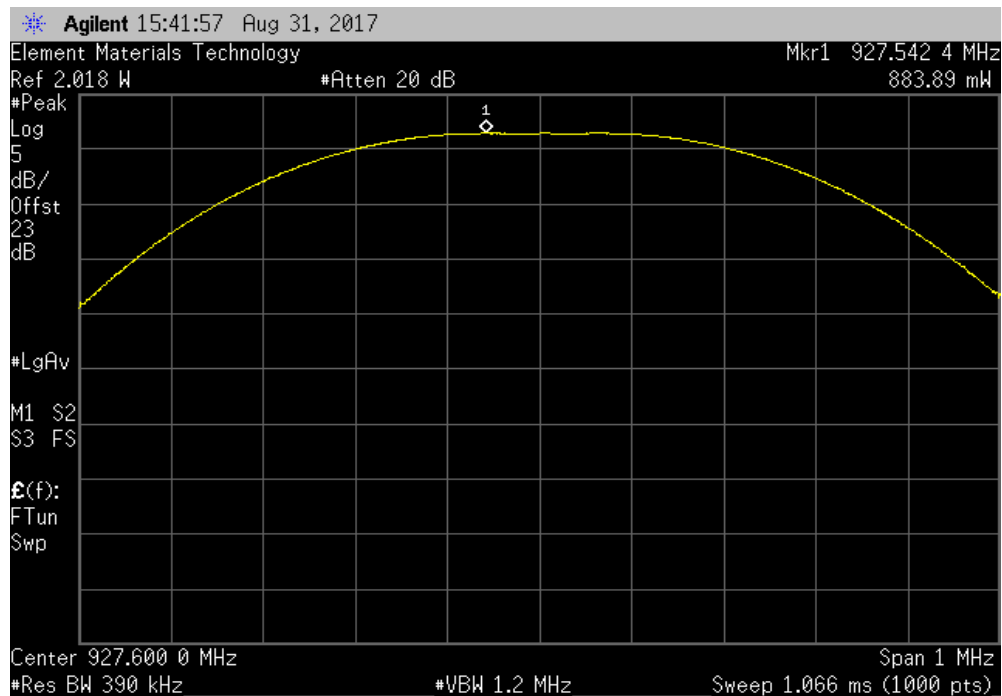


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 15k						
				Value	Limit (<)	Result
				874.984 mW	1 W	Pass



All Other Antennas, High Channel, 927.6 MHz, 120k						
				Value	Limit (<)	Result
				883.894 mW	1 W	Pass

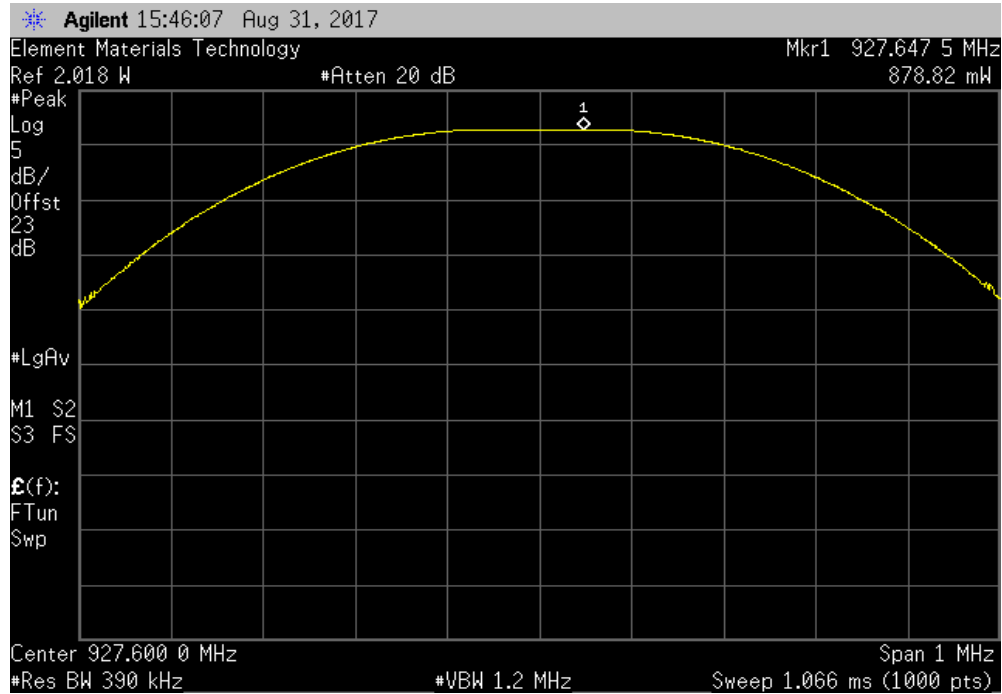


OUTPUT POWER

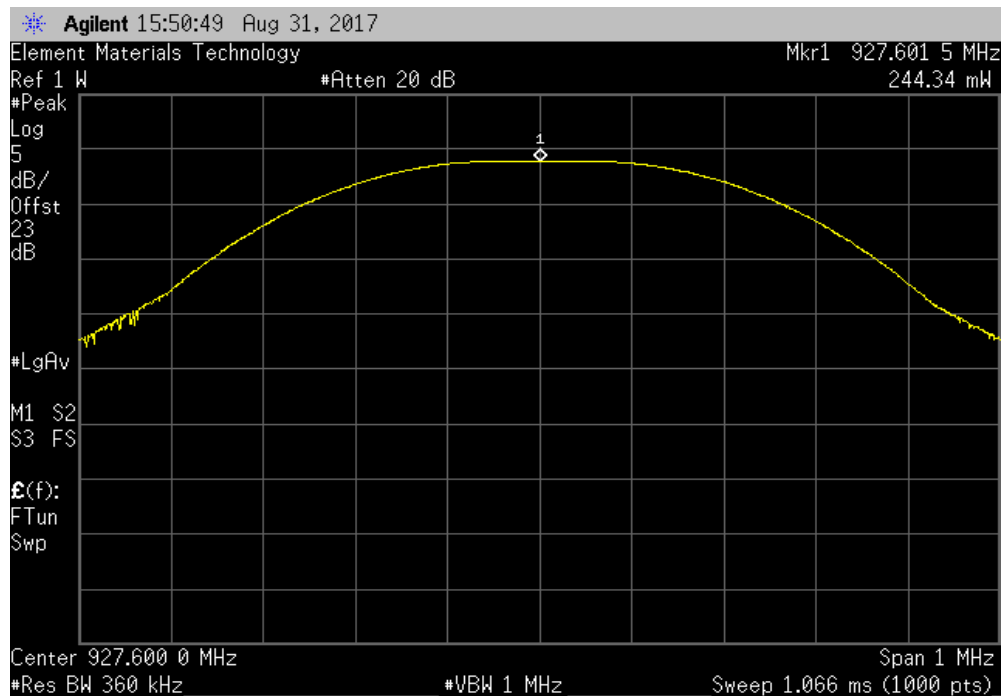


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 200k						
				Value	Limit (<)	Result
				878.82 mW	1 W	Pass



All Other Antennas, High Channel, 927.6 MHz, 400k						
				Value	Limit (<)	Result
				244.343 mW	1 W	Pass

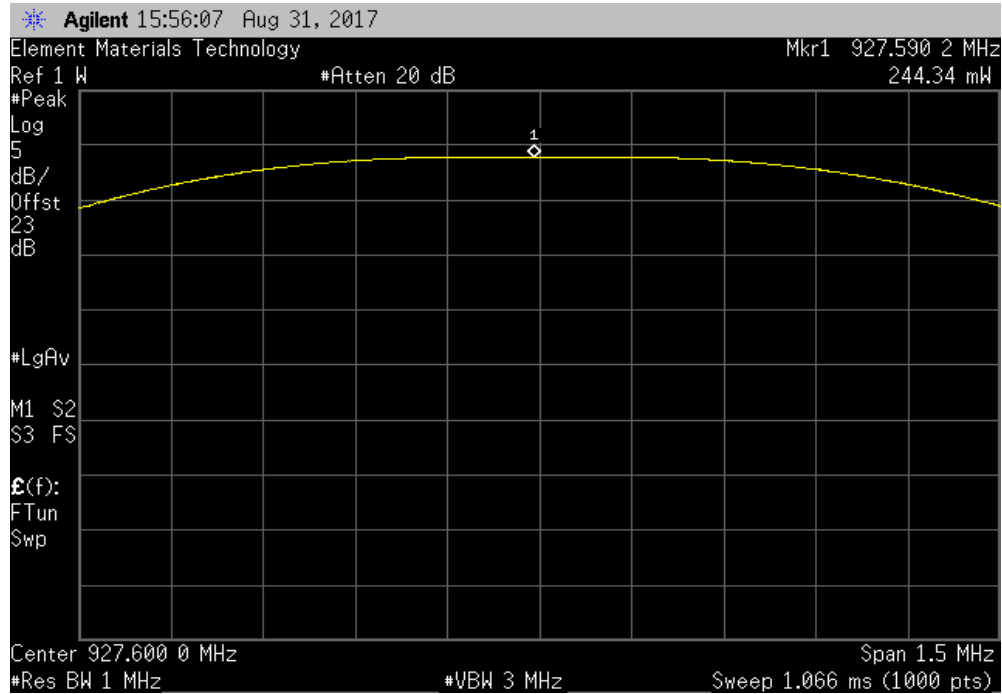


OUTPUT POWER

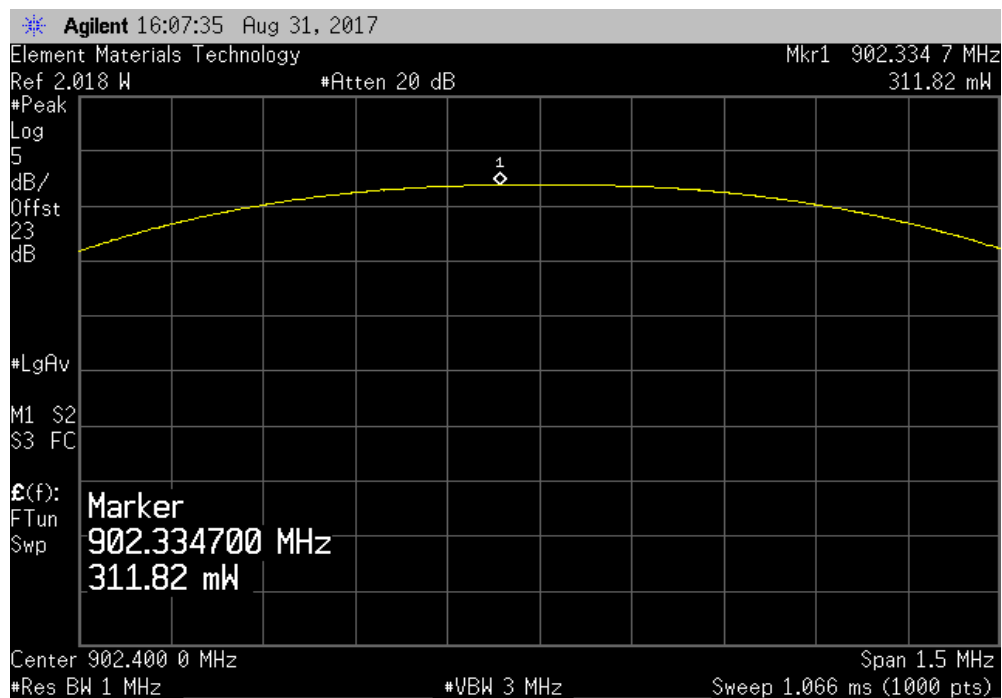


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 610k						
				Value	Limit (<)	Result
				244.343 mW	250 mW	Pass



Yagi Antenna, Low Channel, 902.4 MHz, 120k						
				Value	Limit (<)	Result
				311.817 mW	1 W	Pass

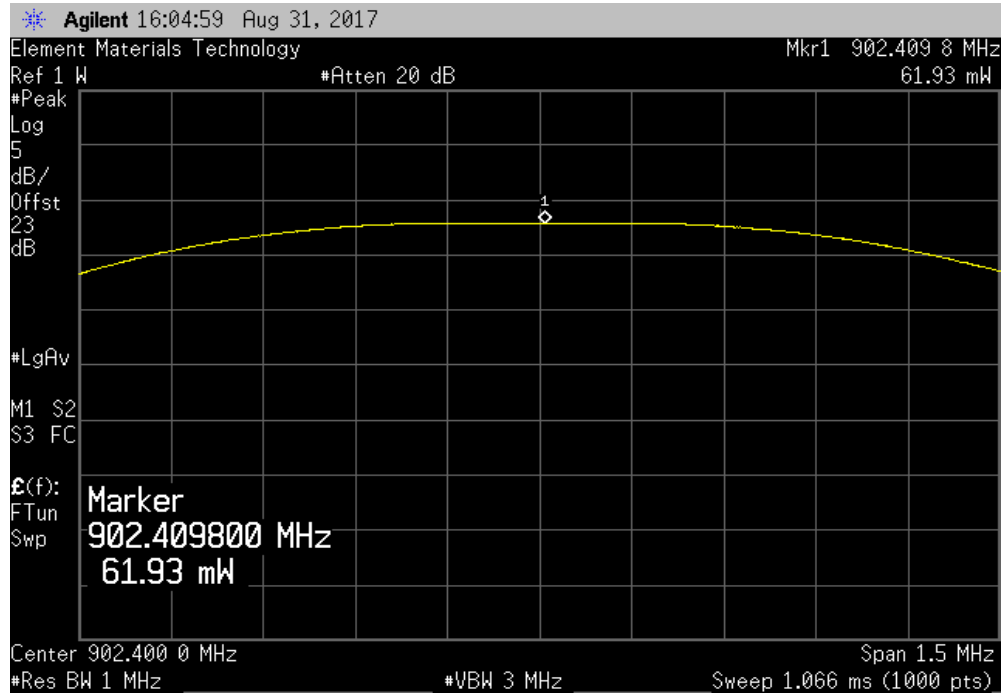


OUTPUT POWER

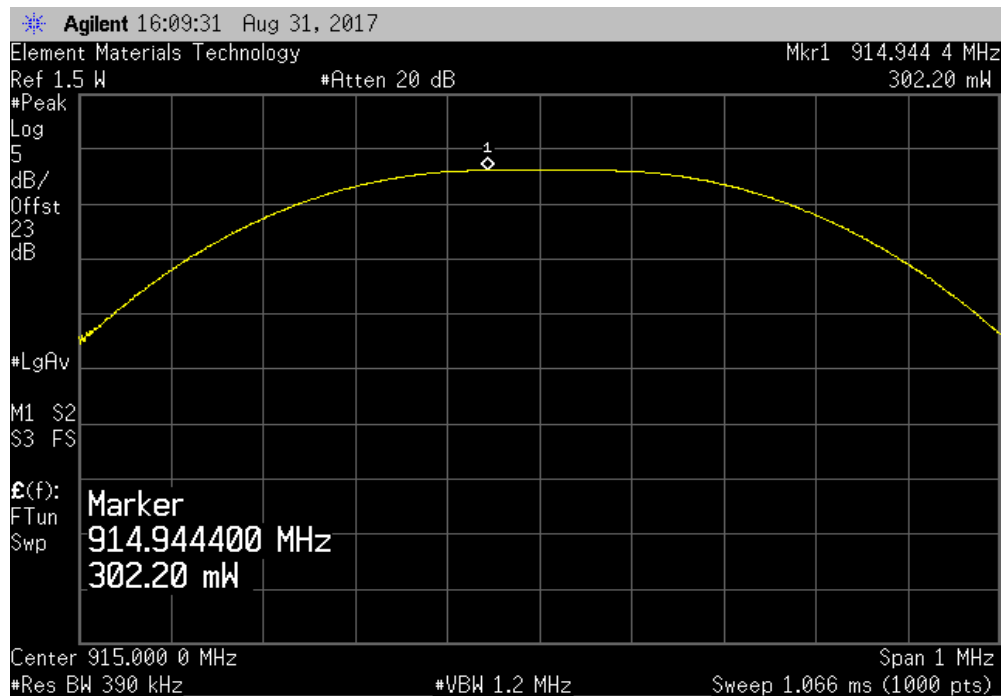


TMTx 2017.07.11 XMM 2017.02.08

Yagi Antenna, Low Channel, 902.4 MHz, 610k						
				Value	Limit (<)	Result
				61.773 mW	250 mW	Pass



Yagi Antenna, Mid Channel, 915 MHz, 120k						
				Value	Limit (<)	Result
				302.204 mW	1 W	Pass

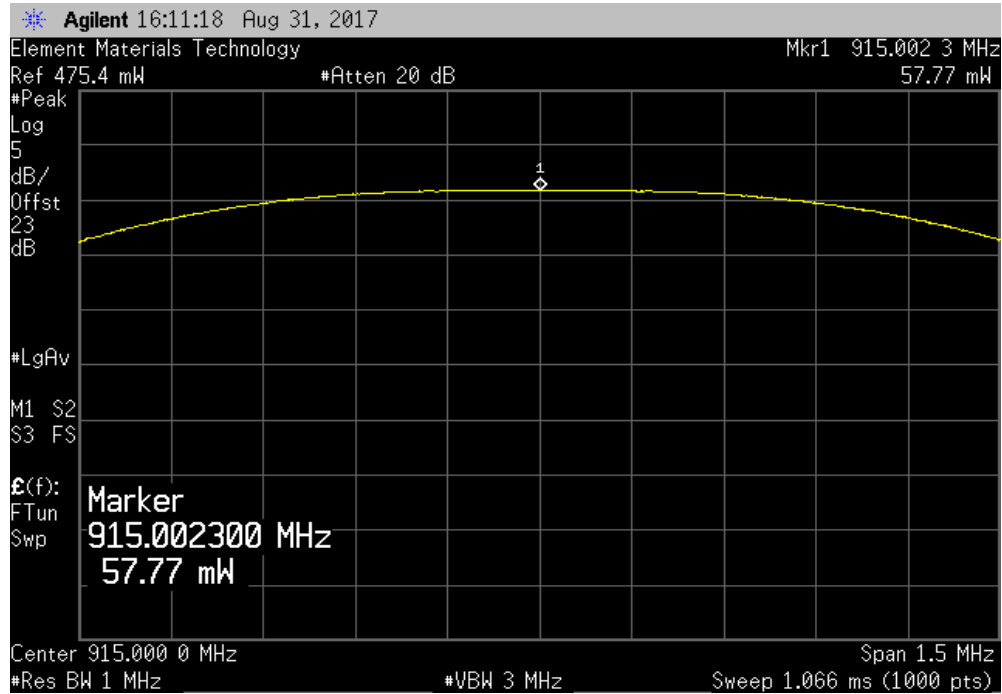


OUTPUT POWER

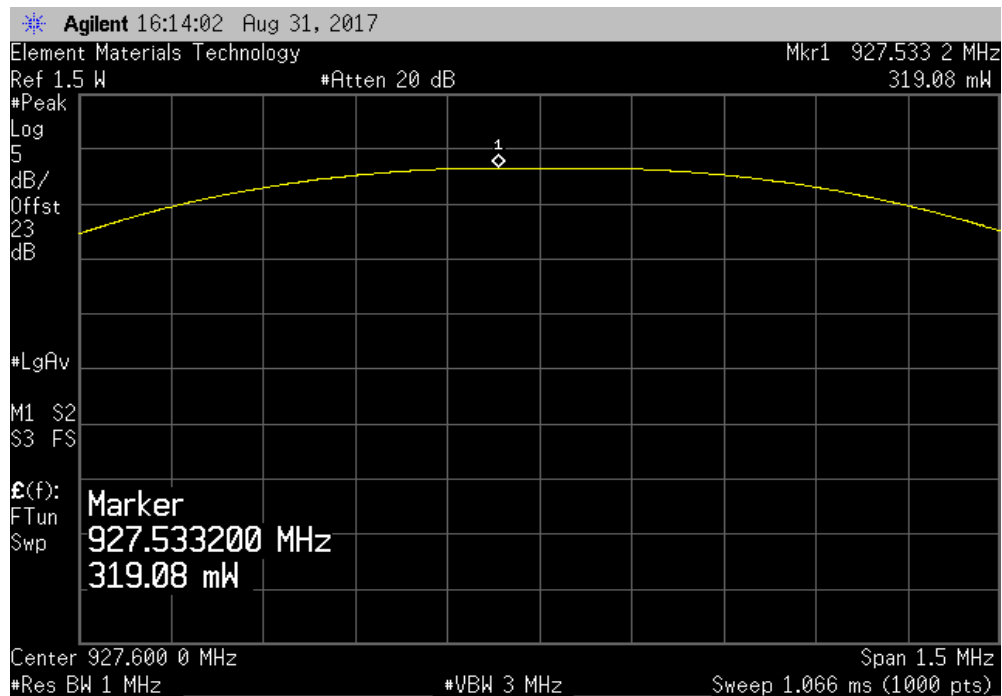


TMTx 2017.07.11 XMM 2017.02.08

Yagi Antenna, Mid Channel, 915 MHz, 610k						
				Value	Limit (<)	Result
				57.77 mW	250 mW	Pass



Yagi Antenna, High Channel, 927.6 MHz, 120k						
				Value	Limit (<)	Result
				319.08 mW	1 W	Pass

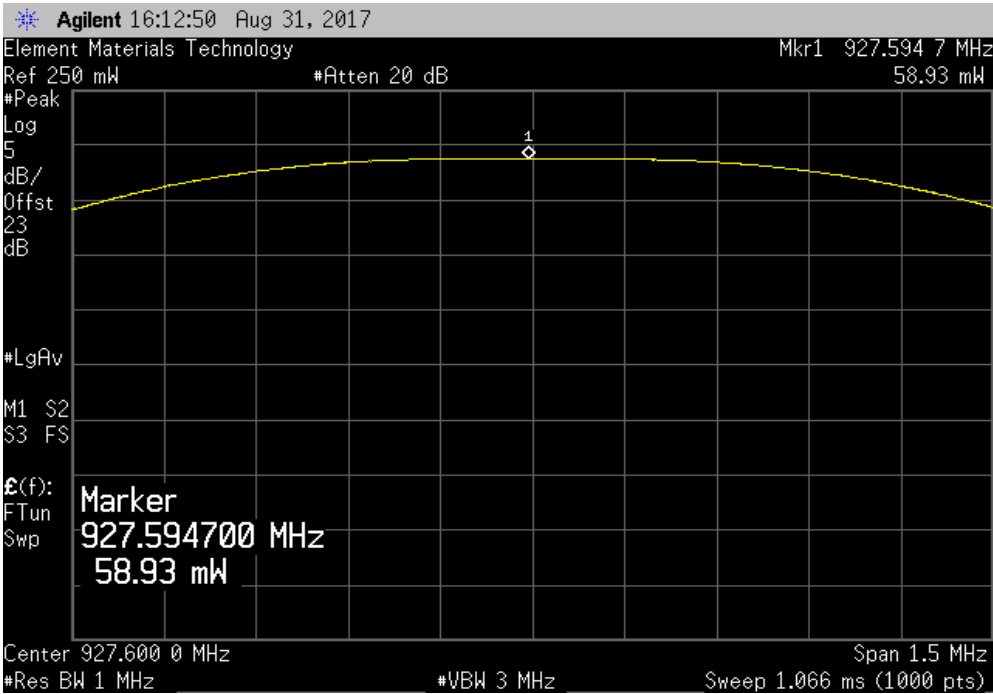


OUTPUT POWER



TMTx 2017.07.11 XMM 2017.02.08

Yagi Antenna, High Channel, 927.6 MHz, 610k						
				Value	Limit (<)	Result
				58.925 mW	250 mW	Pass



BAND EDGE COMPLIANCE



XMit 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	3/17/2015	3/17/2018
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/16/2017	3/16/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized 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



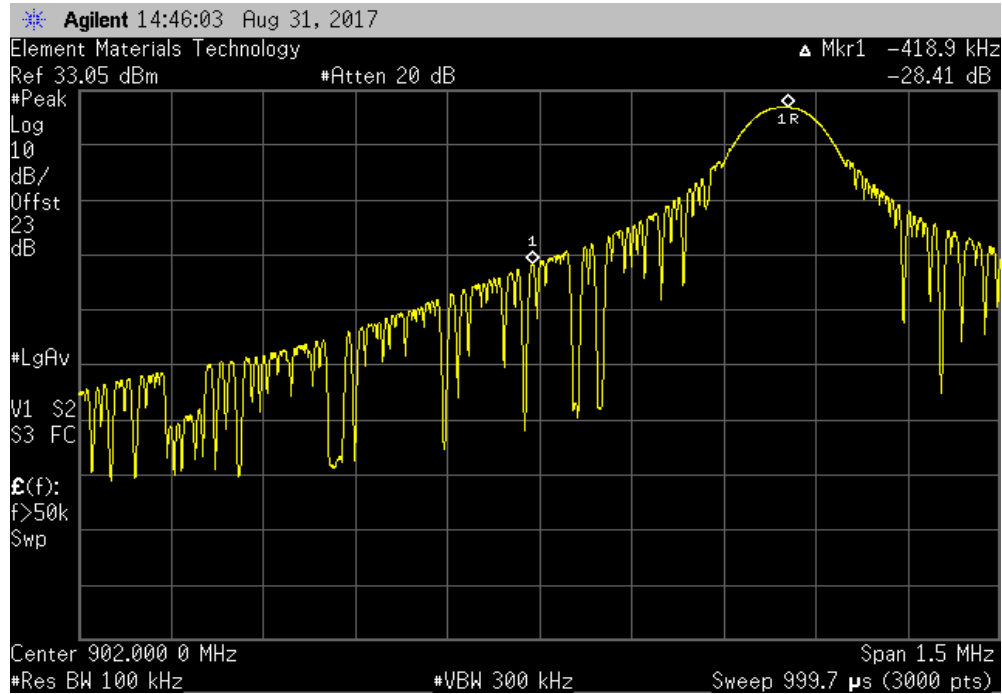
EUT: Radio 136377		Work Order: MARJ0007	
Serial Number: 3		Date: 09/01/17	
Customer: Traffic & Parking Control Co., Inc.		Temperature: 22 °C	
Attendees: Roman Marjamaa		Humidity: 48.5% RH	
Project: None		Barometric Pres.: 1022 mbar	
Tested by: Dustin Sparks		Job Site: MN08	
Power: 5VDC		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	8	Signature <i>Dustin Sparks</i>	
		Value (dBc)	Limit ≤ (dBc) Result
902-928 MHz FHSS			
Low Channel, 902.4 MHz			
	15k	-28.41	-20 Pass
	120k	-28.05	-20 Pass
	200k	-28.29	-20 Pass
	400k	-27.62	-20 Pass
	610k	-27.52	-20 Pass
High Channel, 927.6 MHz			
	15k	-28.42	-20 Pass
	120k	-28.19	-20 Pass
	200k	-28.13	-20 Pass
	400k	-27.52	-20 Pass
	610k	-27.57	-20 Pass

BAND EDGE COMPLIANCE

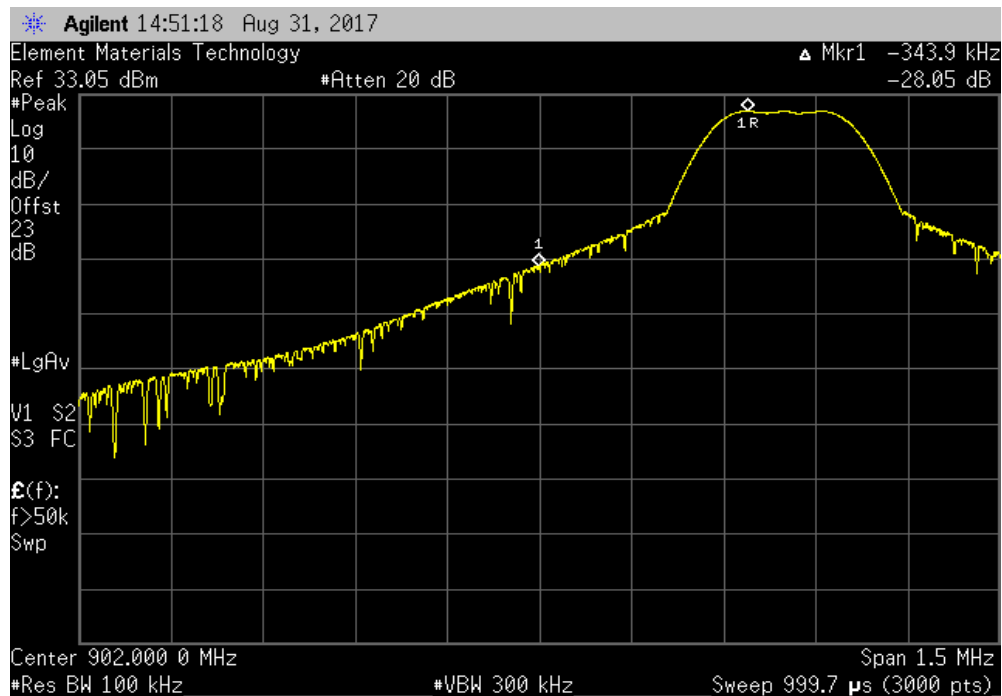


TMTx 2017.07.11 XMM 2017.02.08

902-928 MHz FHSS, Low Channel, 902.4 MHz, 15k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.41	-20	Pass



902-928 MHz FHSS, Low Channel, 902.4 MHz, 120k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.05	-20	Pass

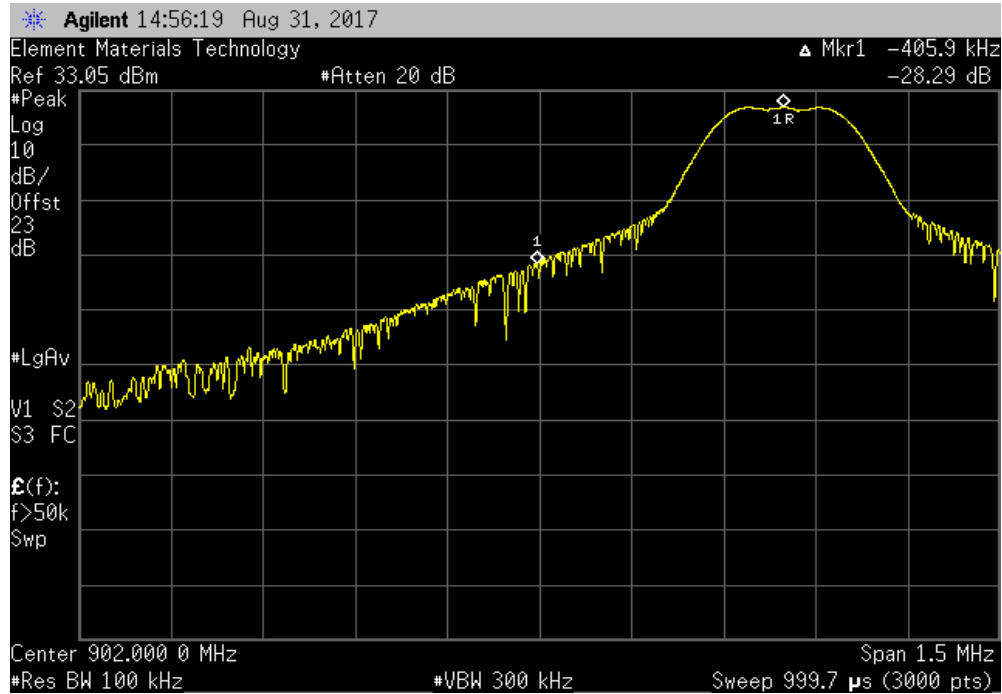


BAND EDGE COMPLIANCE

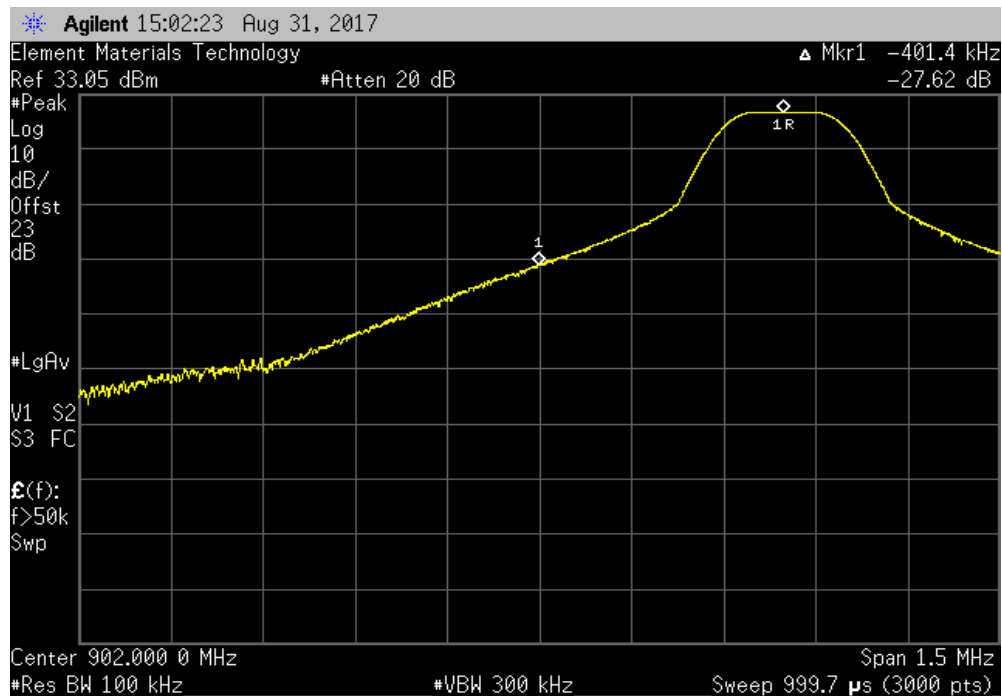


TMTX 2017.07.11 XMM 2017.02.08

902-928 MHz FHSS, Low Channel, 902.4 MHz, 200k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.29	-20	Pass



902-928 MHz FHSS, 902.4 MHz, 400k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-27.62	-20	Pass

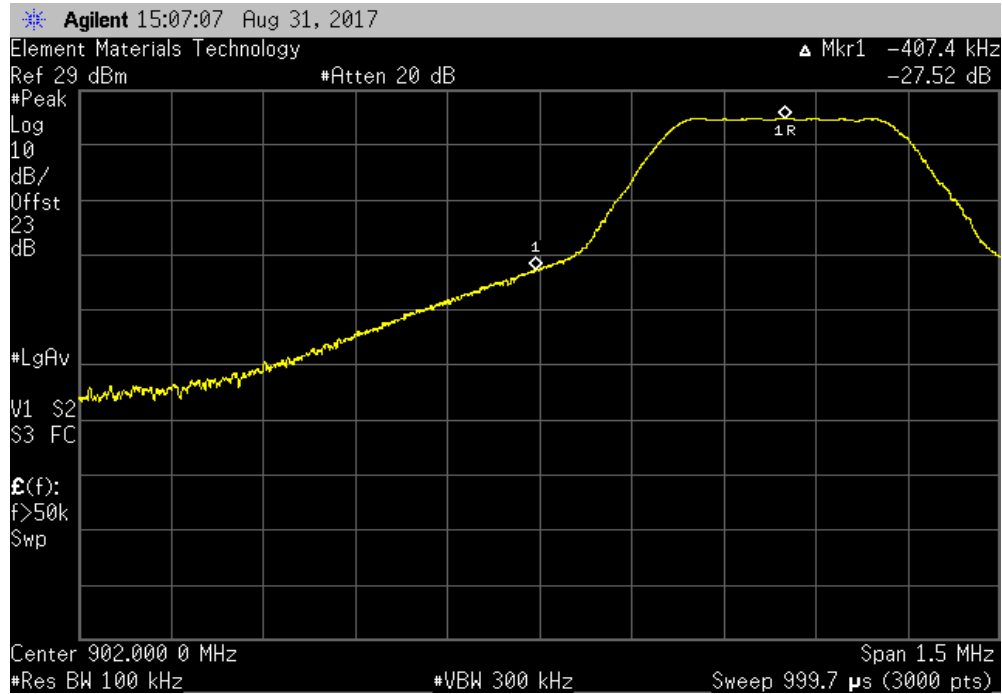


BAND EDGE COMPLIANCE

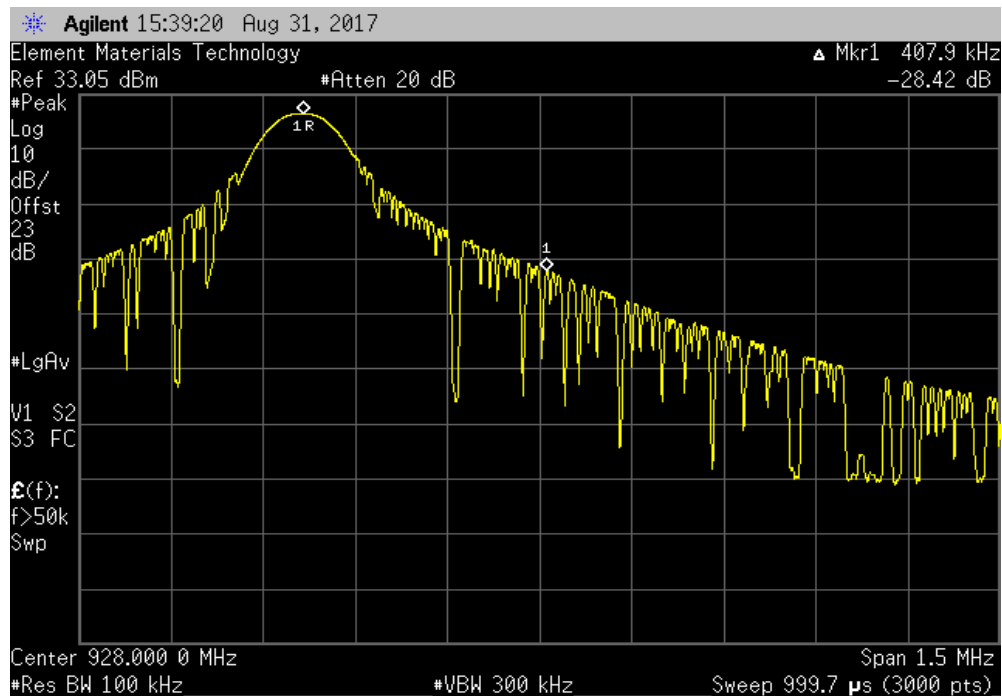


TMTX 2017.07.11 XMM 2017.02.08

902-928 MHz FHSS, Low Channel, 902.4 MHz, 610k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-27.52	-20	Pass



902-928 MHz FHSS, High Channel, 927.6 MHz, 15k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.42	-20	Pass

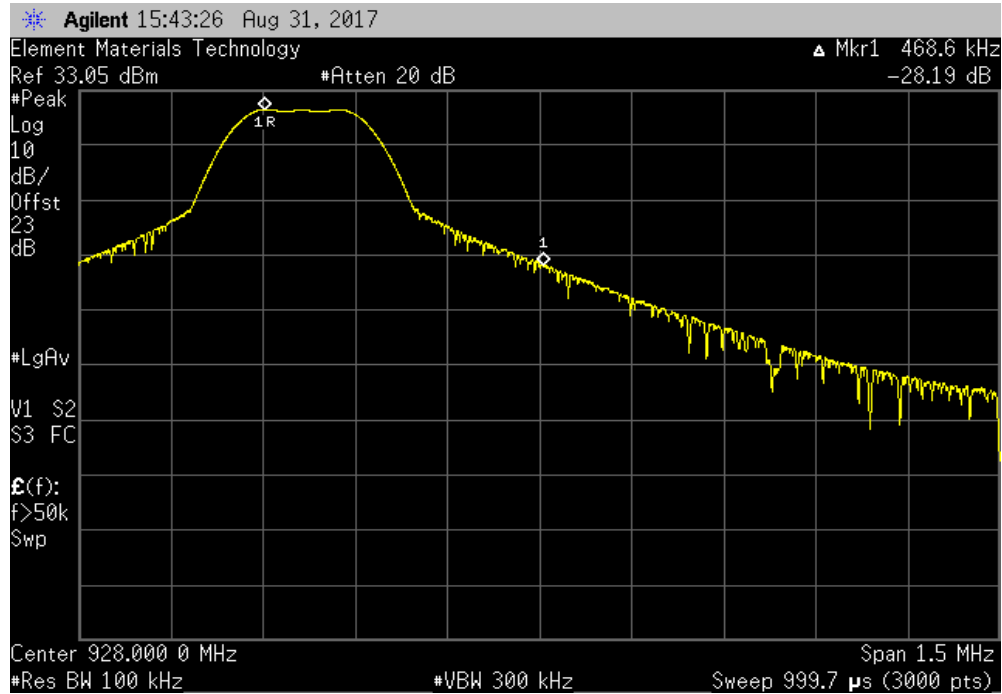


BAND EDGE COMPLIANCE

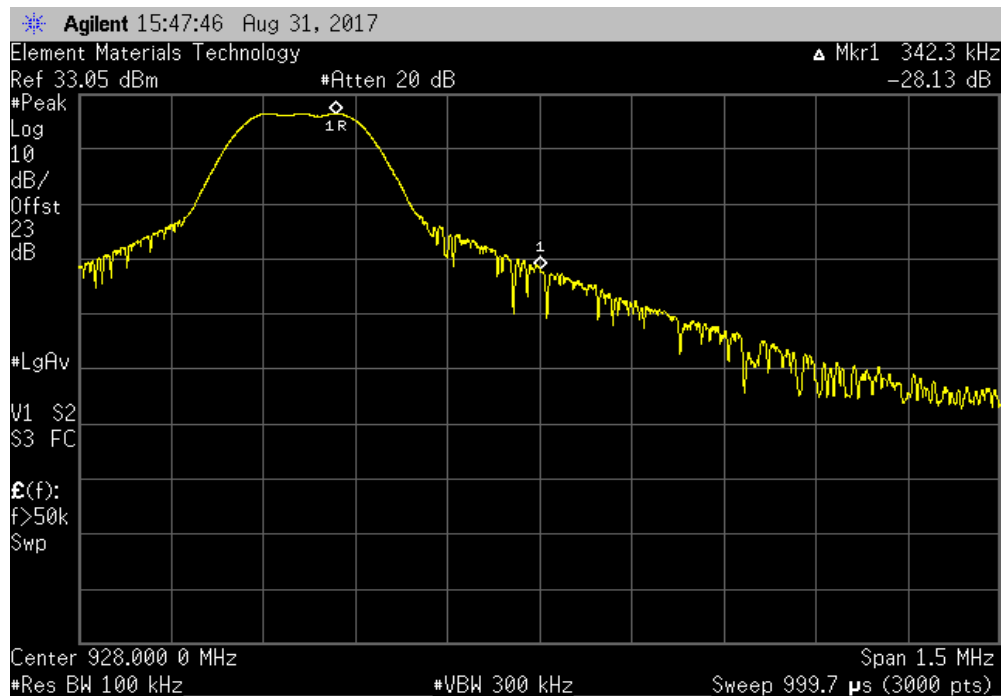


TMTX 2017.07.11 XMM 2017.02.08

902-928 MHz FHSS, High Channel, 927.6 MHz, 120k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.19	-20	Pass



902-928 MHz FHSS, High Channel, 927.6 MHz, 200k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.13	-20	Pass

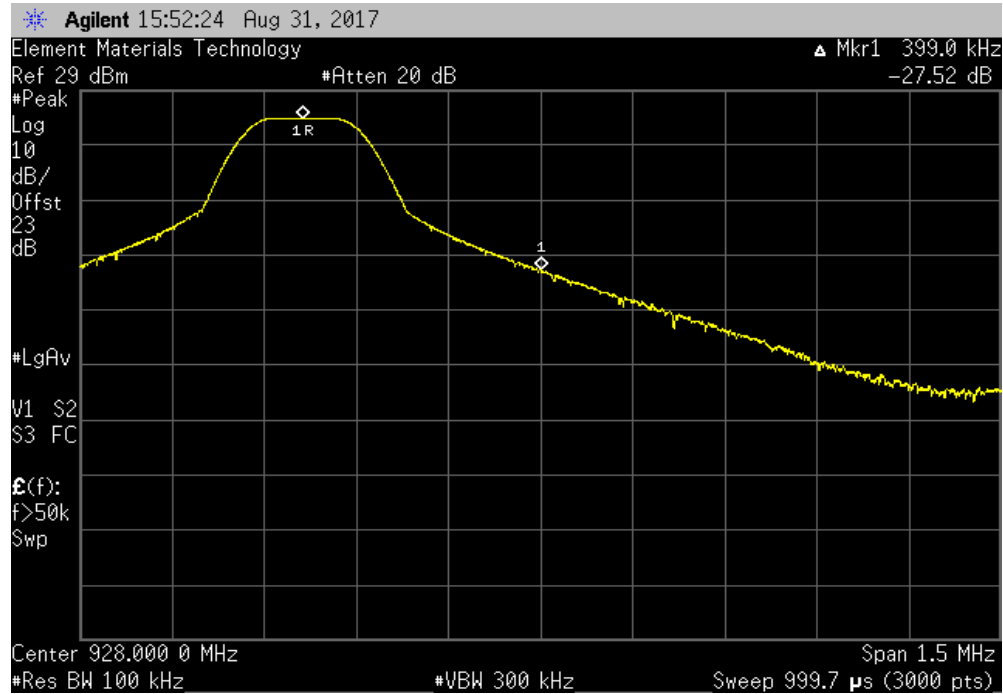


BAND EDGE COMPLIANCE

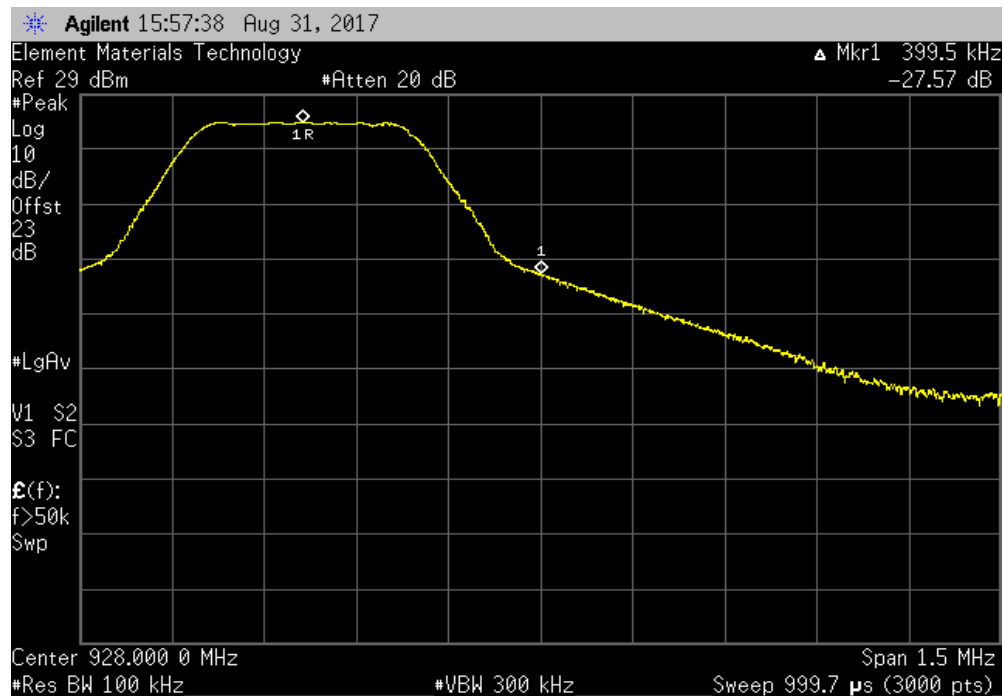


TMTX 2017.07.11 XMM 2017.02.08

902-928 MHz FHSS, High Channel, 927.6 MHz, 400k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-27.52	-20	Pass



902-928 MHz FHSS, High Channel, 927.6 MHz, 610k						
				Value (dBc)	Limit ≤ (dBc)	Result
				-27.57	-20	Pass



BAND EDGE COMPLIANCE -HOPPING MODE



XMM 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	3/17/2015	3/17/2018
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/16/2017	3/16/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized 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

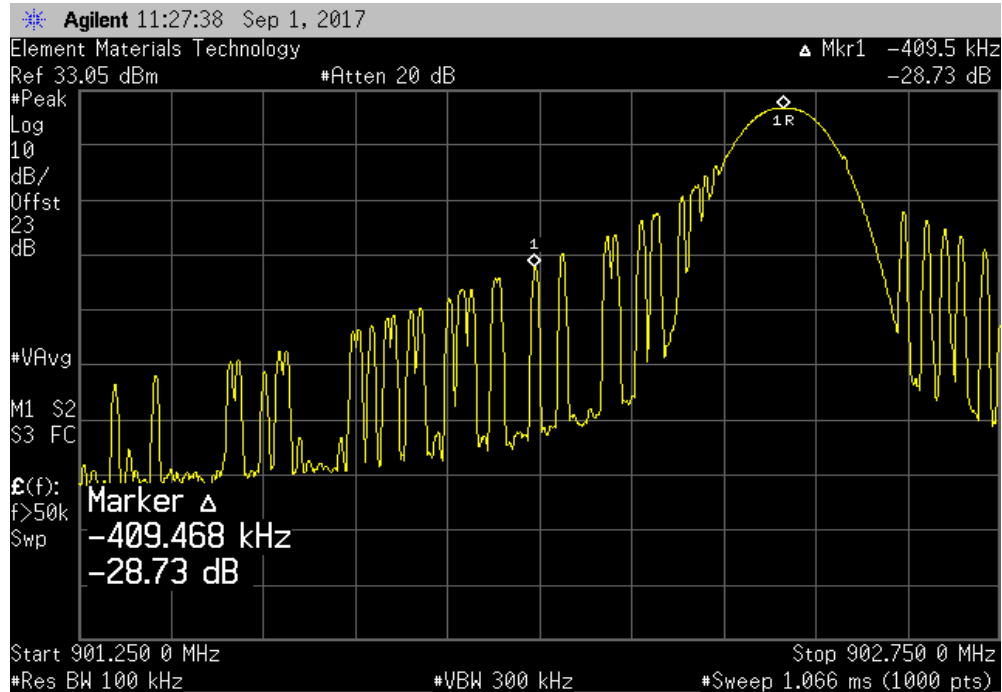
EUT: Radio 136377		Work Order: MARJ0007		
Serial Number: 3		Date: 09/01/17		
Customer: Traffic & Parking Control Co., Inc.		Temperature: 21.9 °C		
Attendees: Roman Marjamaa		Humidity: 49.2% RH		
Project: None		Barometric Pres.: 1022 mbar		
Tested by: Dustin Sparks		Power: 5VDC		
		Job Site: MN08		
TEST SPECIFICATIONS		Test Method		
FCC 15.247:2017		ANSI C63.10:2013		
COMMENTS				
None				
DEVIATIONS FROM TEST STANDARD				
None				
Configuration #	8	Signature <i>Dustin Sparks</i>		
		Value (dBc)	Limit ≤ (dBc)	Result
25-Channel Hopping Mode				
15k				
Low Channel (902.4 MHz)		-28.73	-20	Pass
High Channel (927.6 MHz)		-26.42	-20	Pass
120k				
Low Channel (902.4 MHz)		-28.67	-20	Pass
High Channel (927.6 MHz)		-27.59	-20	Pass
200k				
Low Channel (902.4 MHz)		-28.18	-20	Pass
High Channel (927.6 MHz)		-26.89	-20	Pass
400k				
Low Channel (902.4 MHz)		-28.17	-20	Pass
High Channel (927.6 MHz)		-26.7	-20	Pass
610k				
Low Channel (902.4 MHz)		-28.13	-20	Pass
High Channel (927.6 MHz)		-26.74	-20	Pass
50-Channel Hopping Mode				
15k				
Low Channel (902.4 MHz)		-28.25	-20	Pass
High Channel (927.6 MHz)		-26.94	-20	Pass
120k				
Low Channel (902.4 MHz)		-28.97	-20	Pass
High Channel (927.6 MHz)		-26.86	-20	Pass
200k				
Low Channel (902.4 MHz)		-28.99	-20	Pass
High Channel (927.6 MHz)		-26.77	-20	Pass
400k				
Low Channel (902.4 MHz)		-28.63	-20	Pass
High Channel (927.6 MHz)		-27.14	-20	Pass

BAND EDGE COMPLIANCE -HOPPING MODE

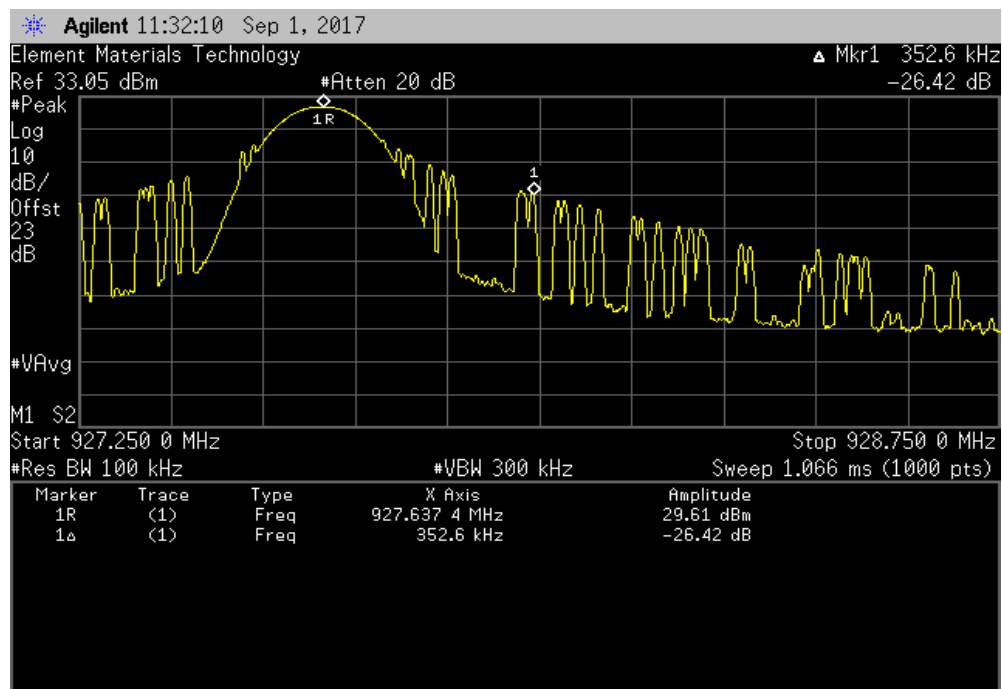


TMTx 2017.07.11 XMM 2017.02.08

25-Channel Hopping Mode, 15k, Low Channel (902.4 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.73	-20	Pass



25-Channel Hopping Mode, 15k, High Channel (927.6 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.42	-20	Pass

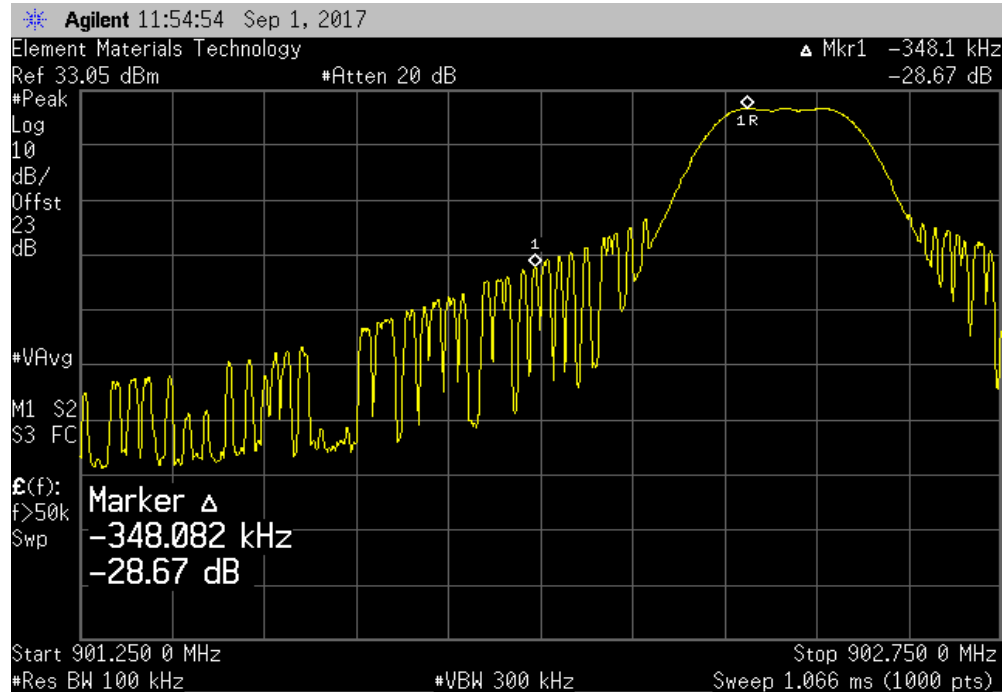


BAND EDGE COMPLIANCE -HOPPING MODE

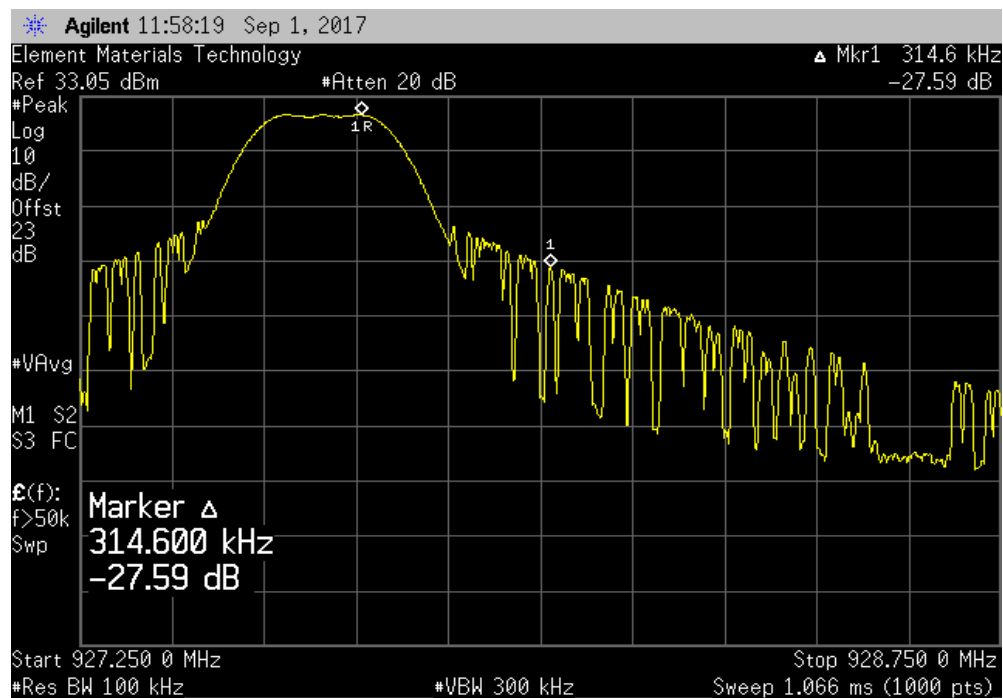


TMTx 2017.07.11 XMM 2017.02.08

25-Channel Hopping Mode, 120k, Low Channel (902.4 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.67	-20	Pass



25-Channel Hopping Mode, 120k, High Channel (927.6 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-27.59	-20	Pass

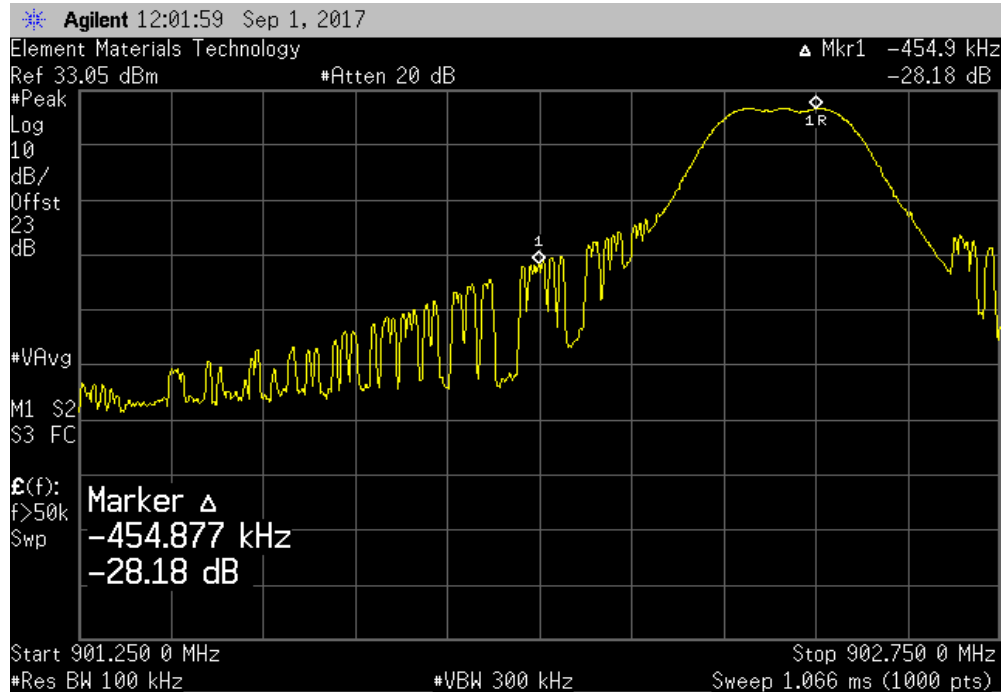


BAND EDGE COMPLIANCE -HOPPING MODE

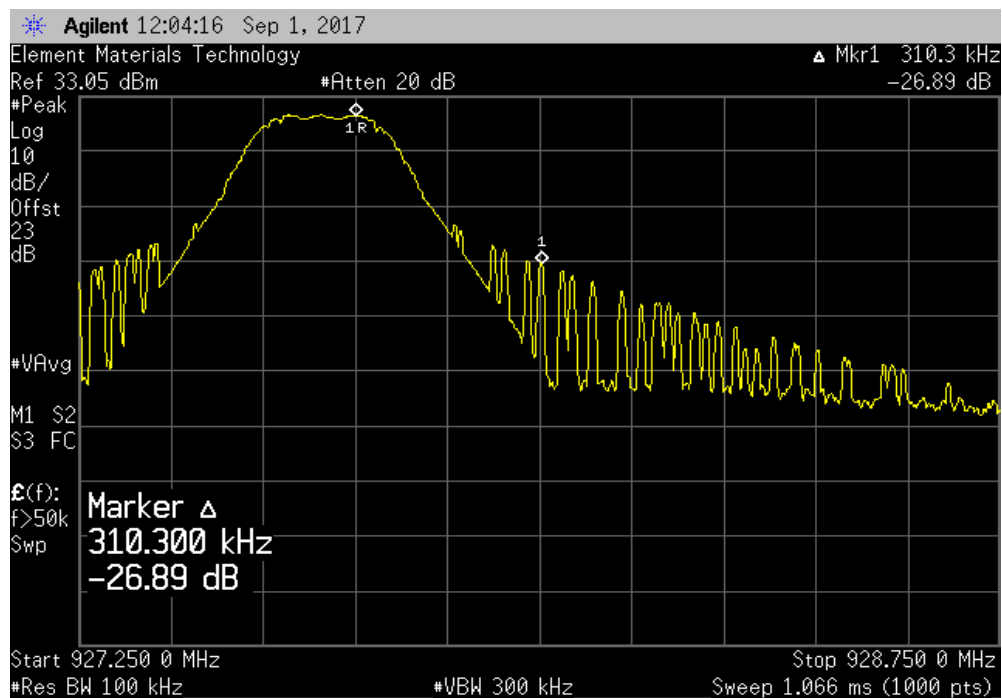


TMTX 2017.07.11 XMM 2017.02.08

25-Channel Hopping Mode, 200k, Low Channel (902.4 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.18	-20	Pass



25-Channel Hopping Mode, 200k, High Channel (927.6 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.89	-20	Pass

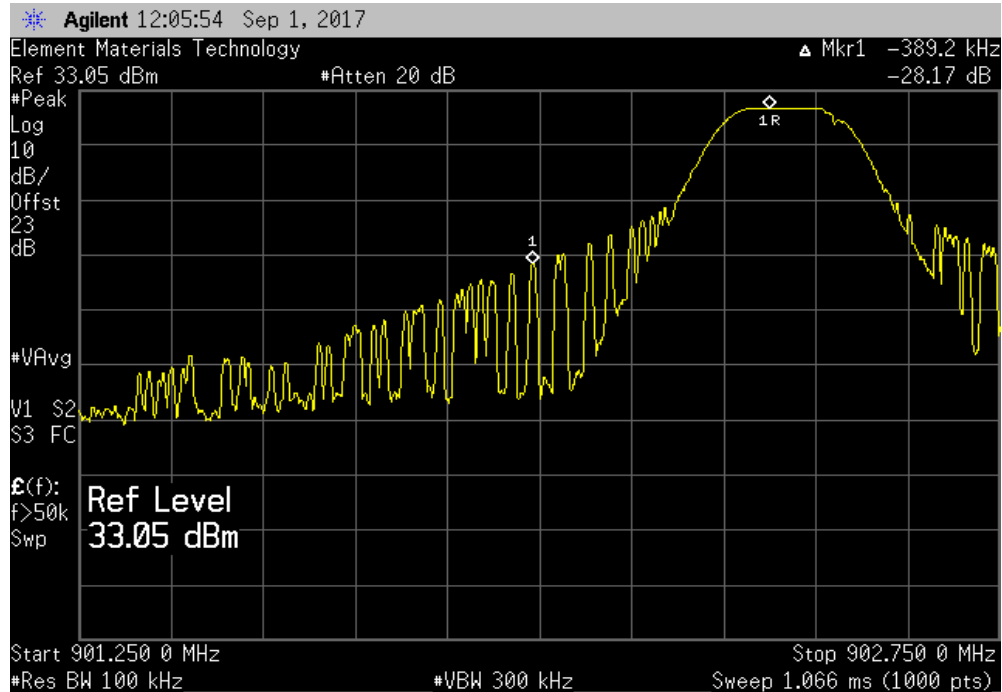


BAND EDGE COMPLIANCE -HOPPING MODE

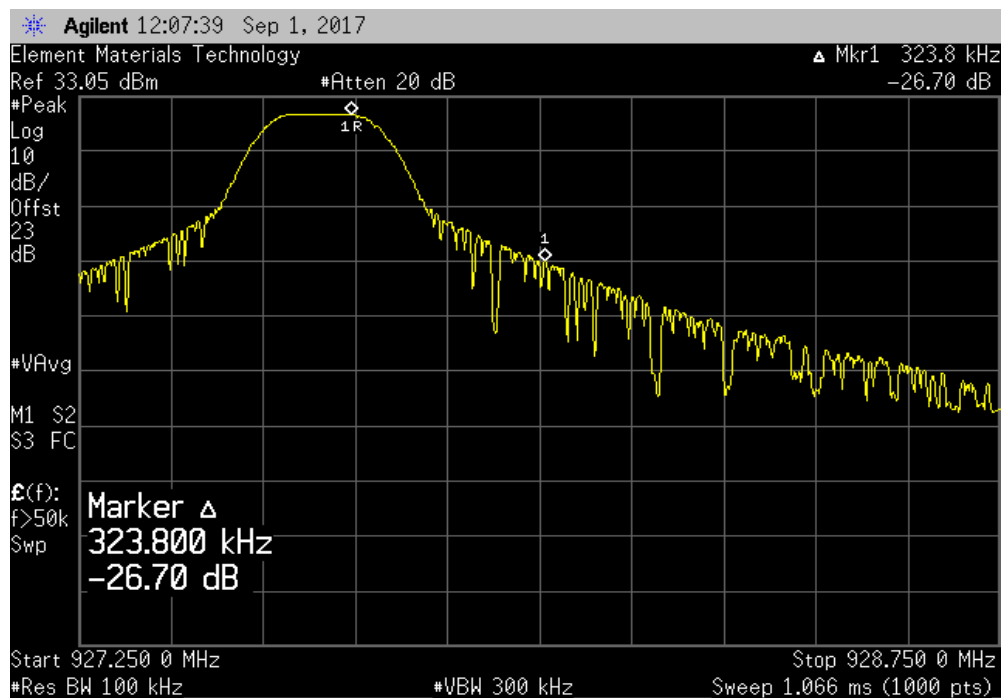


TMTX 2017.07.11 XMM 2017.02.08

25-Channel Hopping Mode, 400k, Low Channel (902.4 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.17	-20	Pass



25-Channel Hopping Mode, 400k, High Channel (927.6 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.7	-20	Pass

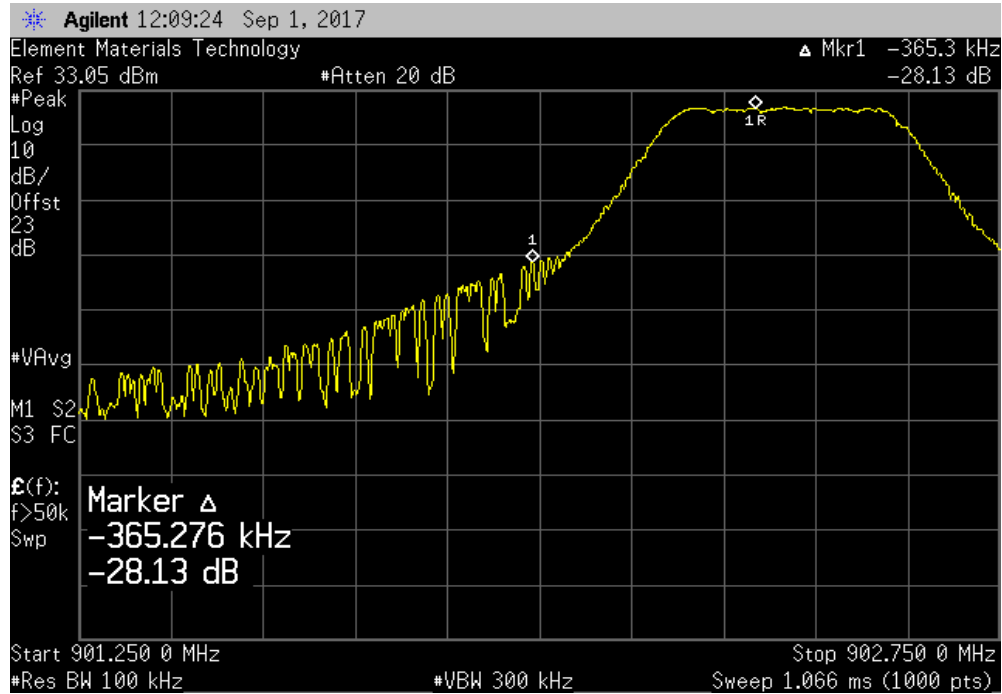


BAND EDGE COMPLIANCE -HOPPING MODE

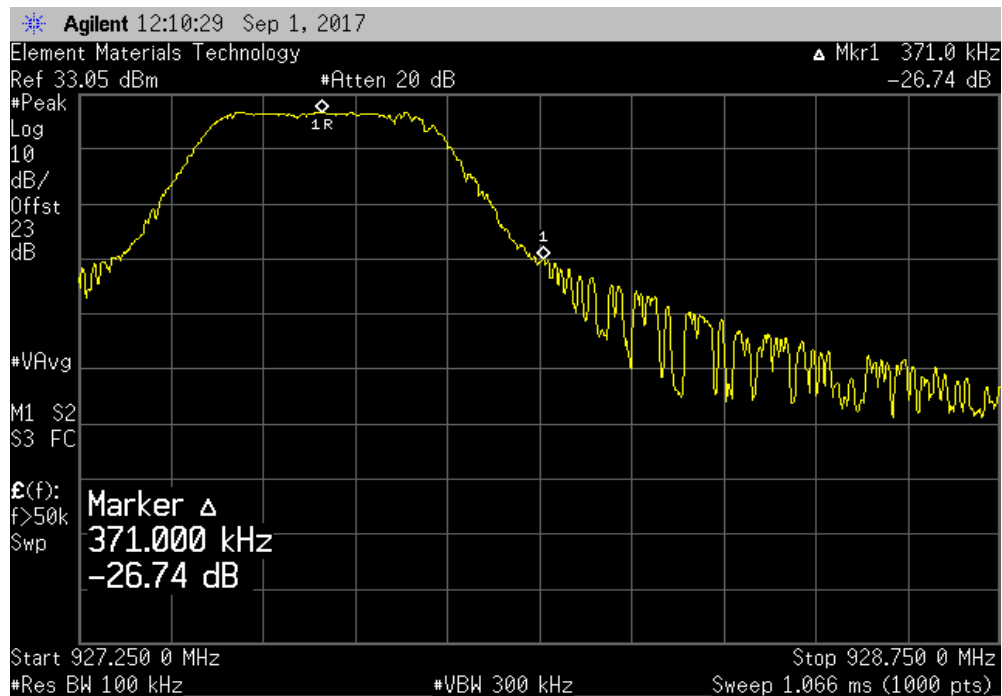


TMTx 2017.07.11 XMM 2017.02.08

25-Channel Hopping Mode, 610k, Low Channel (902.4 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.13	-20	Pass



25-Channel Hopping Mode, 610k, High Channel (927.6 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.74	-20	Pass

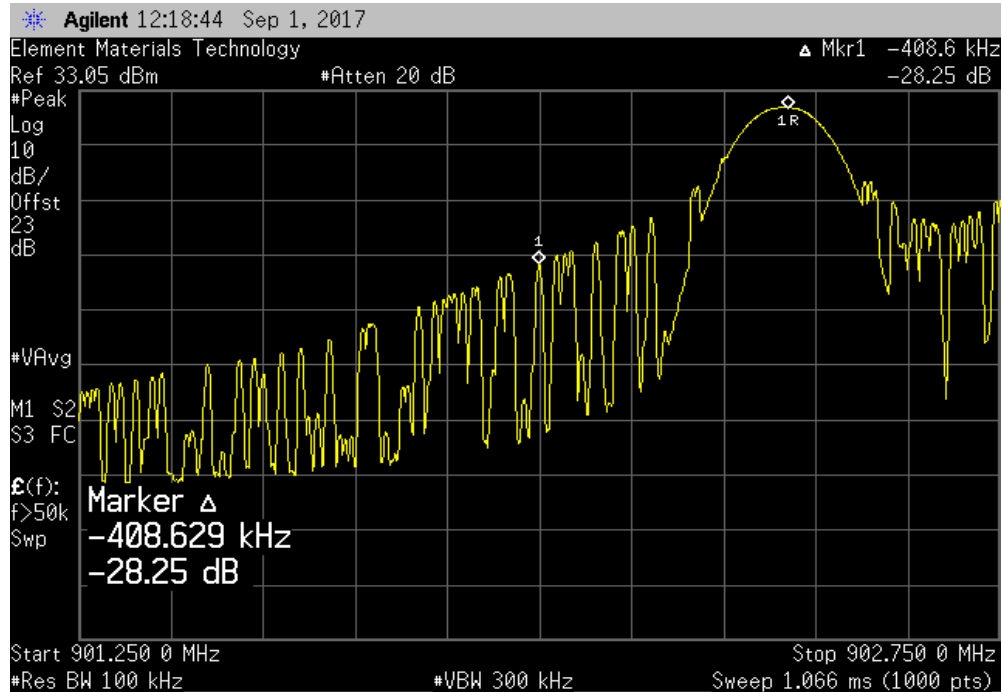


BAND EDGE COMPLIANCE -HOPPING MODE

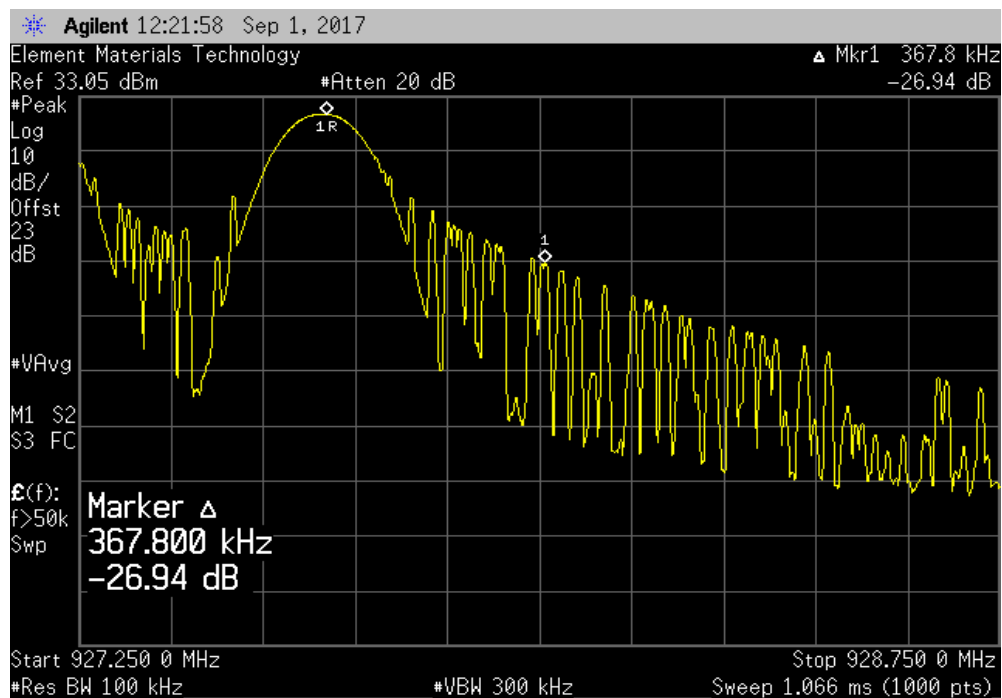


TMTx 2017.07.11 XMM 2017.02.08

50-Channel Hopping Mode, 15k, Low Channel (902.4 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.25	-20	Pass



50-Channel Hopping Mode, 15k, High Channel (927.6 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.94	-20	Pass

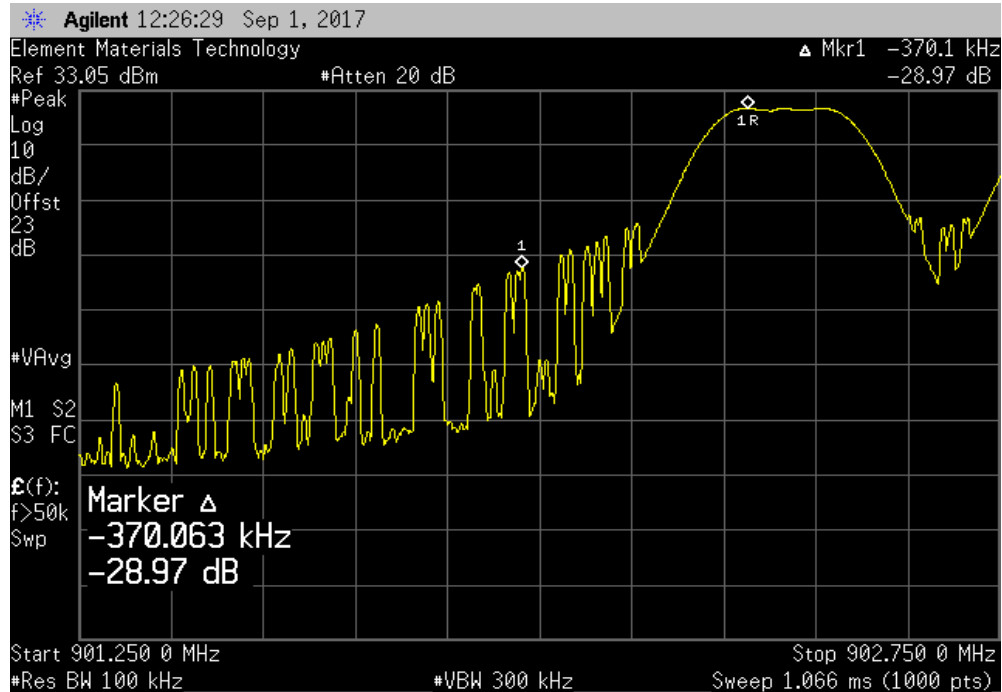


BAND EDGE COMPLIANCE -HOPPING MODE

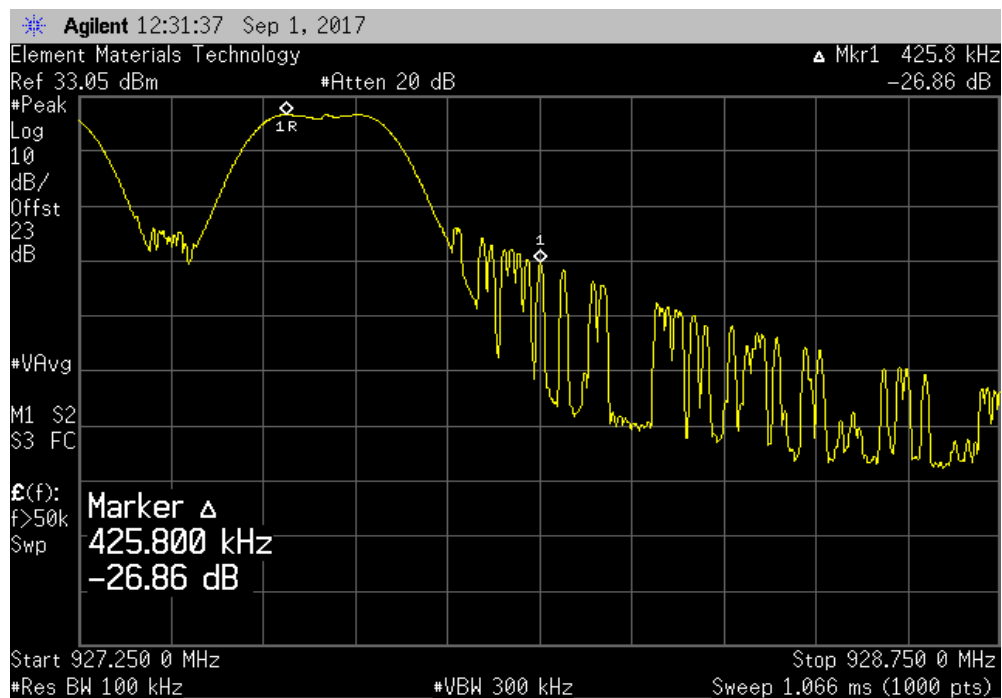


TMTx 2017.07.11 XMM 2017.02.08

50-Channel Hopping Mode, 120k, Low Channel (902.4 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.97	-20	Pass



50-Channel Hopping Mode, 120k, High Channel (927.6 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.86	-20	Pass

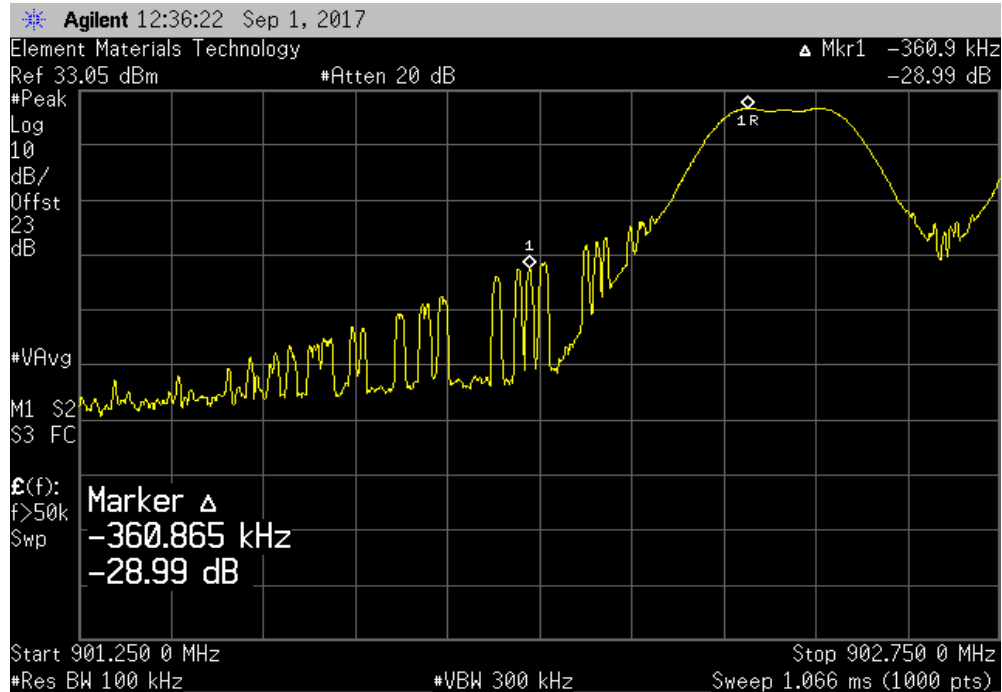


BAND EDGE COMPLIANCE -HOPPING MODE

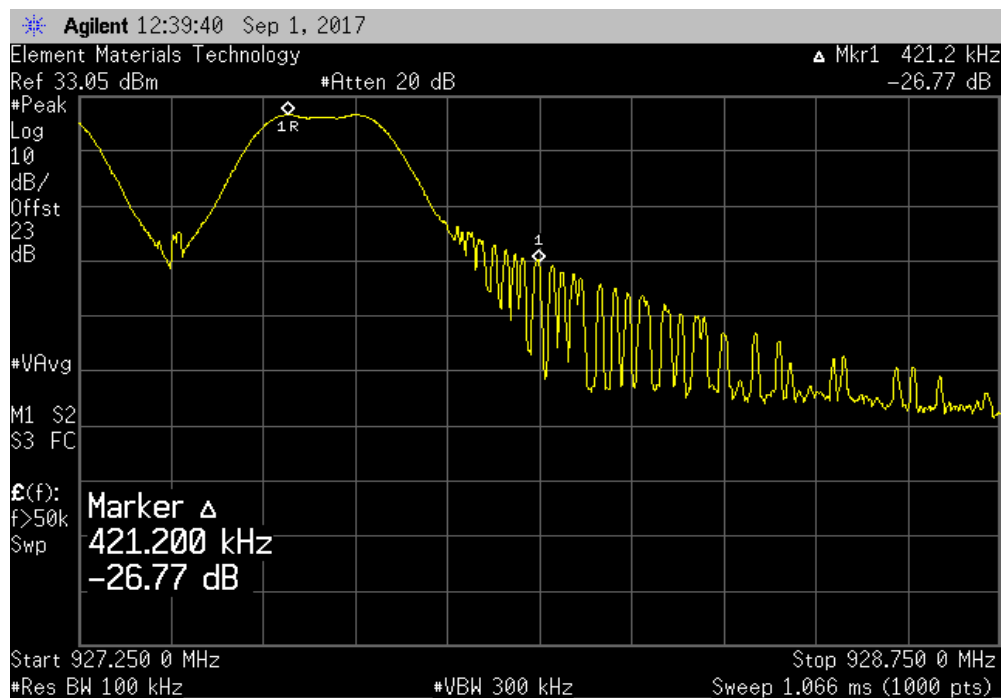


TMTx 2017.07.11 XMM 2017.02.08

50-Channel Hopping Mode, 200k, Low Channel (902.4 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.99	-20	Pass



50-Channel Hopping Mode, 200k, High Channel (927.6 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.77	-20	Pass

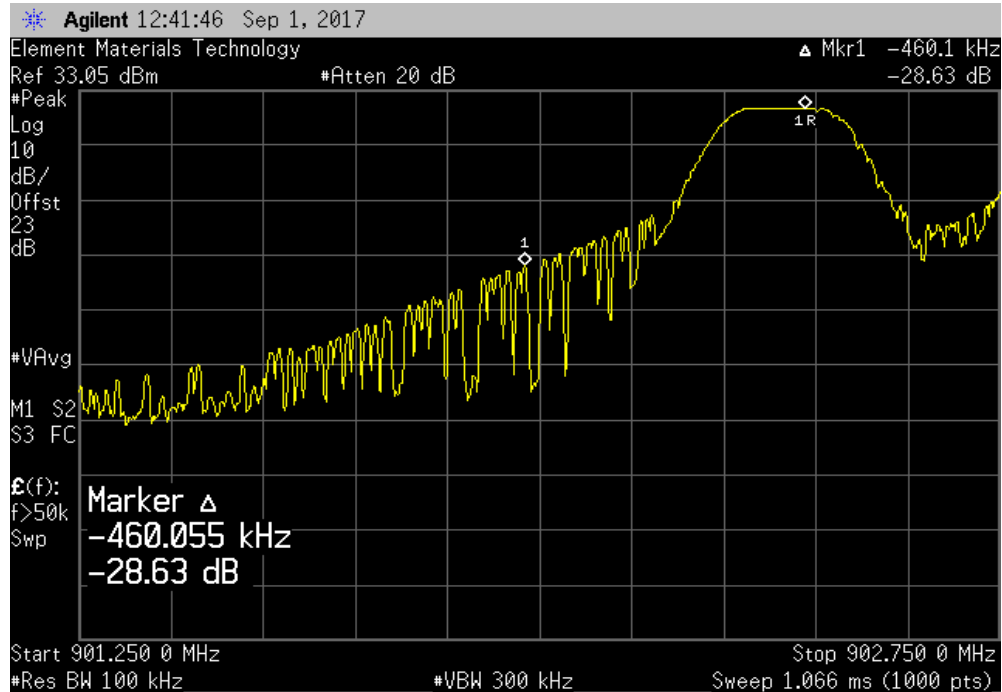


BAND EDGE COMPLIANCE -HOPPING MODE

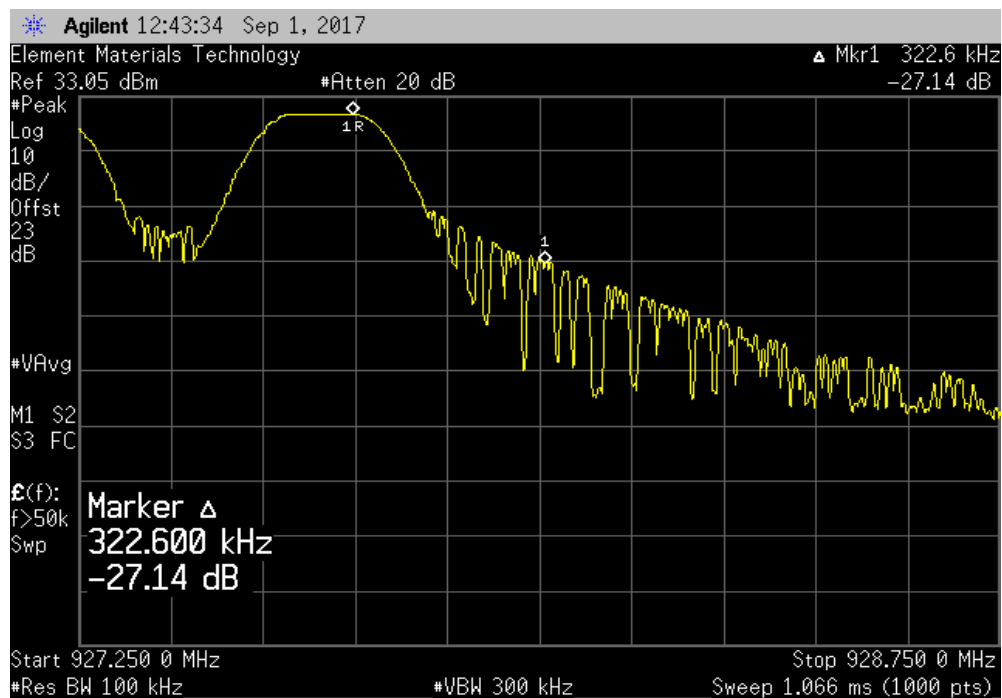


TMTx 2017.07.11 XMM 2017.02.08

50-Channel Hopping Mode, 400k, Low Channel (902.4 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-28.63	-20	Pass



50-Channel Hopping Mode, 400k, High Channel (927.6 MHz)						
				Value (dBc)	Limit ≤ (dBc)	Result
				-27.14	-20	Pass



OCCUPIED BANDWIDTH



XMIT 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	3/17/2015	3/17/2018
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/16/2017	3/16/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The 20 dB occupied 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.

OCCUPIED BANDWIDTH



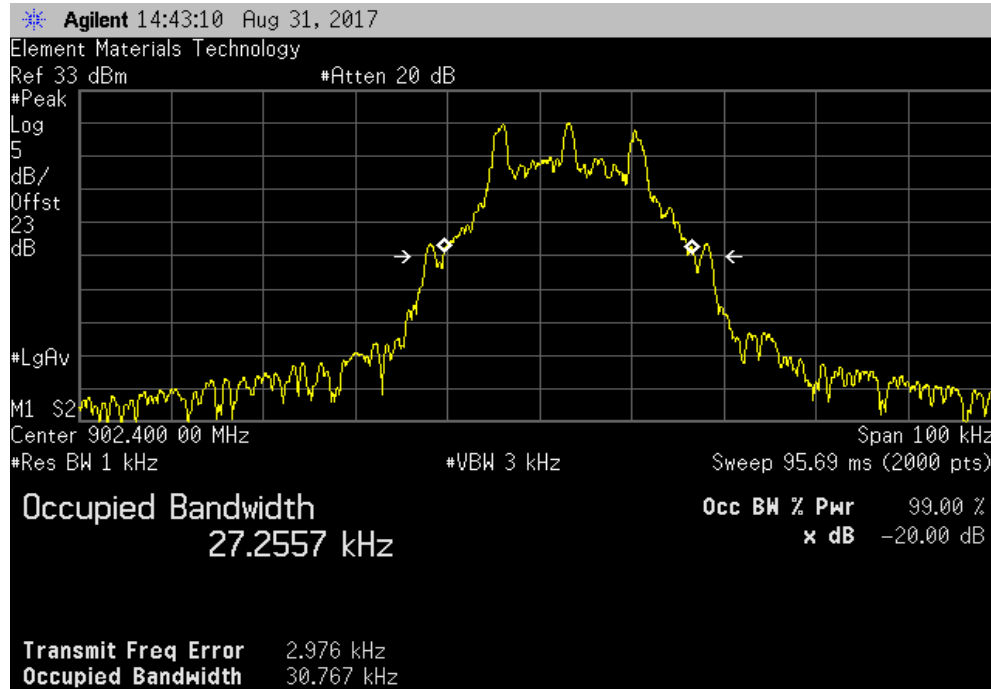
EUT: Radio 136377		Work Order: MARJ0007	
Serial Number: 3		Date: 09/01/17	
Customer: Traffic & Parking Control Co., Inc.		Temperature: 22.6 °C	
Attendees: Roman Marjamaa		Humidity: 48% RH	
Project: None		Barometric Pres.: 1024 mbar	
Tested by: Dustin Sparks		Power: 5VDC	
TEST SPECIFICATIONS		Job Site: MN08	
FCC 15.247:2017		Test Method	
		ANSI C63.10:2013	
COMMENTS			
610k data rate is only used in 25 channel hopping mode (OBW limit of ≤ 500 kHz.)			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	8	Signature <i>Dustin Sparks</i>	
		Value	Limit (s)
All Other Antennas			
Low Channel, 902.4 MHz			
15k		30.767 kHz	250 kHz Pass
120k		243.08 kHz	250 kHz Pass
200k		238.335 kHz	250 kHz Pass
400k		217.705 kHz	250 kHz Pass
610k		485.026 kHz	500 kHz Pass
Mid Channel, 915 MHz			
15k		30.392 kHz	250 kHz Pass
120k		243.19 kHz	250 kHz Pass
200k		237.99 kHz	250 kHz Pass
400k		217.401 kHz	250 kHz Pass
610k		449.606 kHz	500 kHz Pass
High Channel, 927.6 MHz			
15k		30.732 kHz	250 kHz Pass
120k		243.131 kHz	250 kHz Pass
200k		239.335 kHz	250 kHz Pass
400k		217.248 kHz	250 kHz Pass
610k		461.054 kHz	500 kHz Pass

OCCUPIED BANDWIDTH

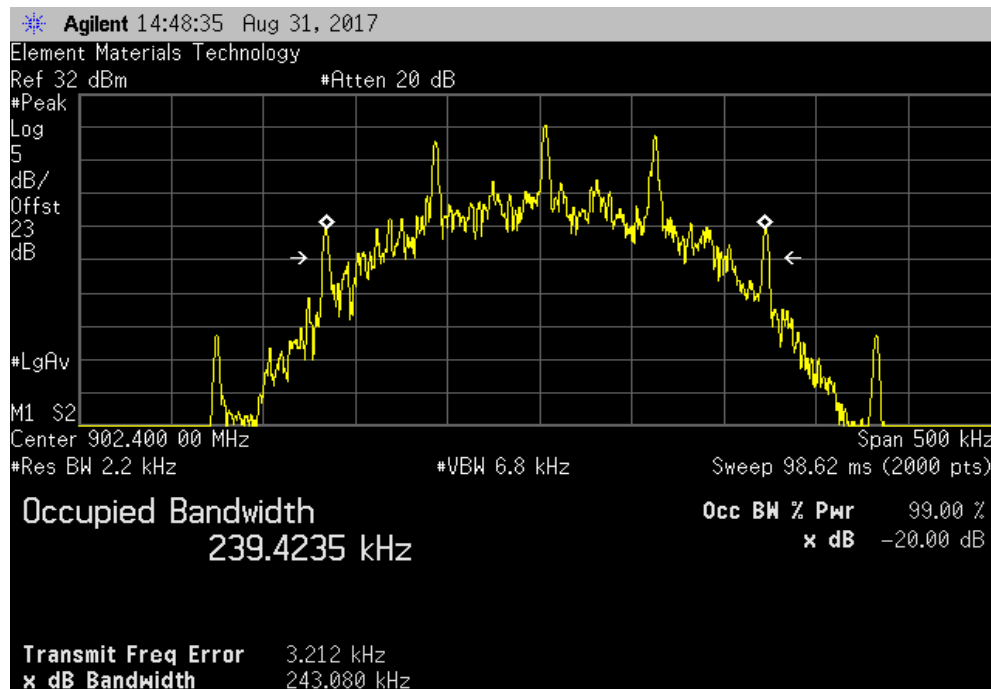


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 15k						
				Value	Limit (S)	Result
				30.767 kHz	250 kHz	Pass



All Other Antennas, Low Channel, 902.4 MHz, 120k						
				Value	Limit (S)	Result
				243.08 kHz	250 kHz	Pass

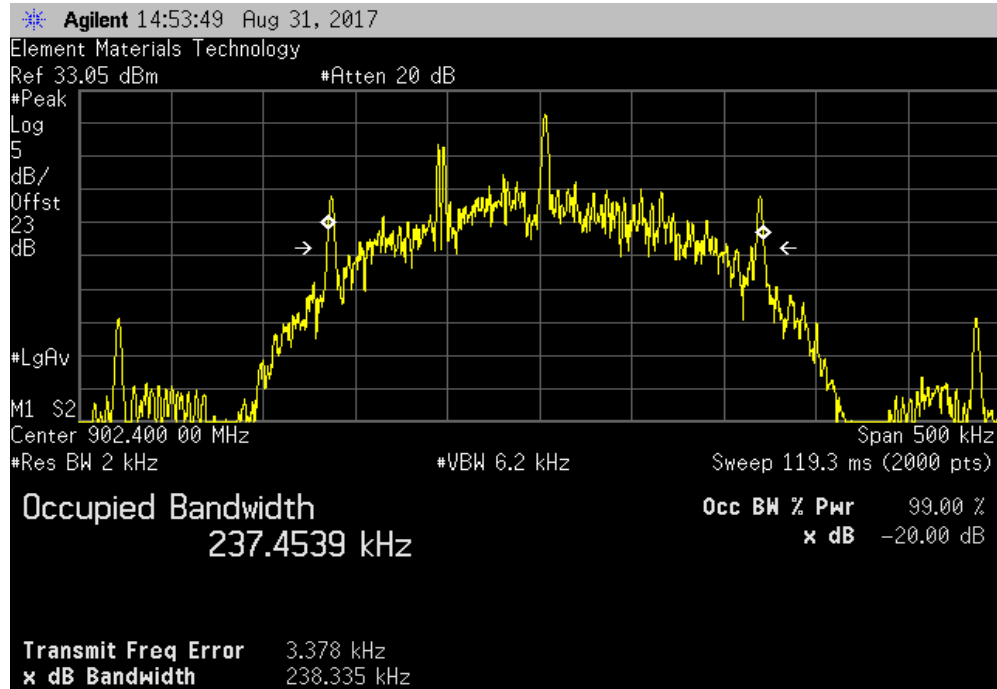


OCCUPIED BANDWIDTH

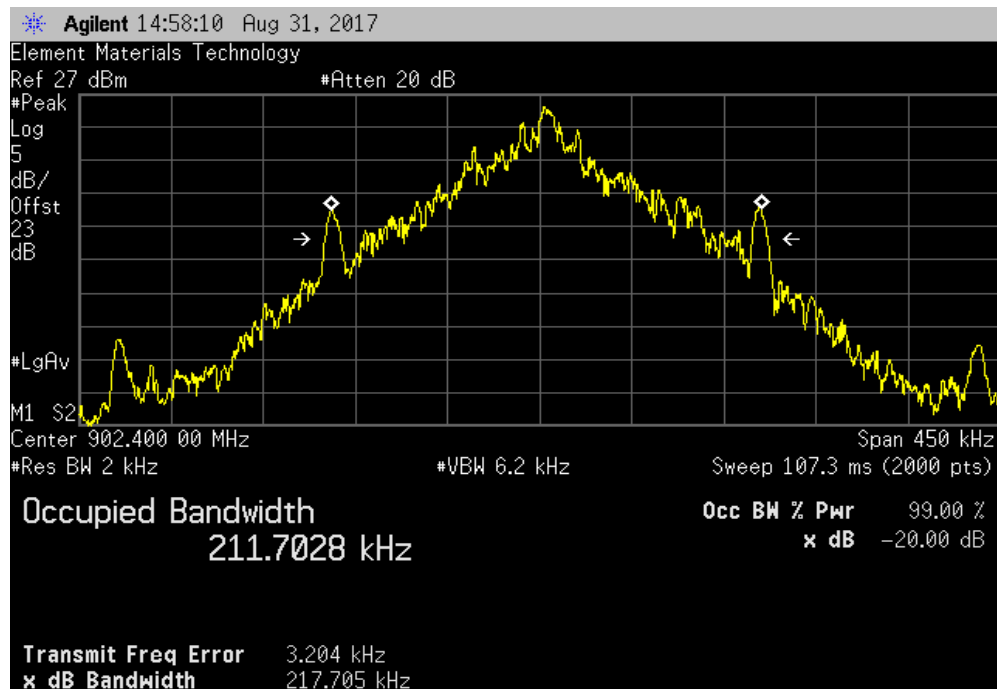


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 200k						
				Value	Limit (S)	Result
				238.335 kHz	250 kHz	Pass



All Other Antennas, Low Channel, 902.4 MHz, 400k						
				Value	Limit (S)	Result
				217.705 kHz	250 kHz	Pass

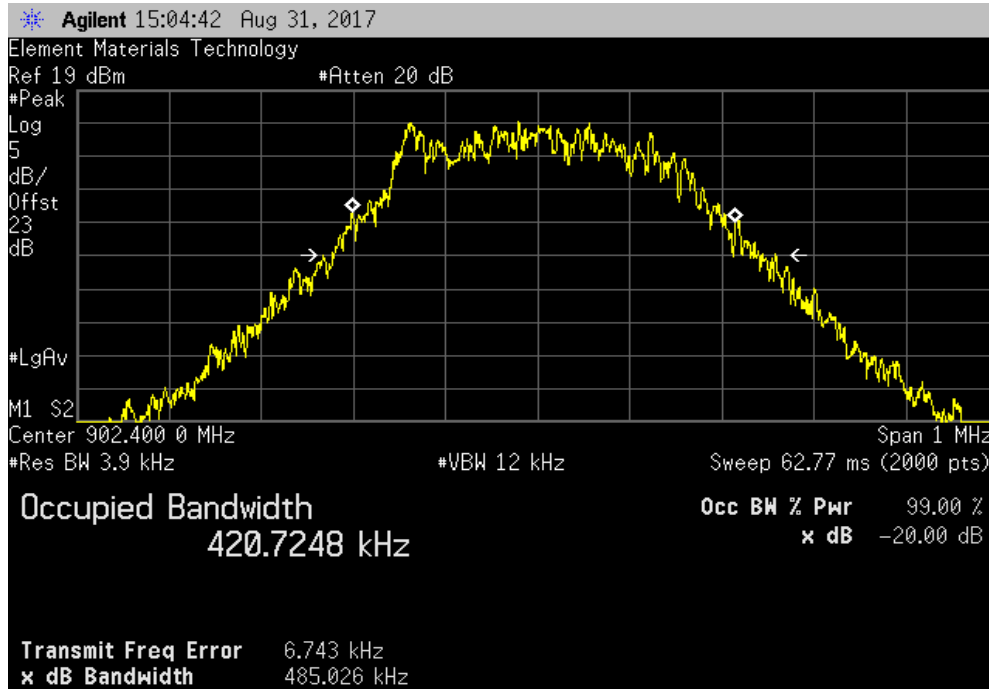


OCCUPIED BANDWIDTH

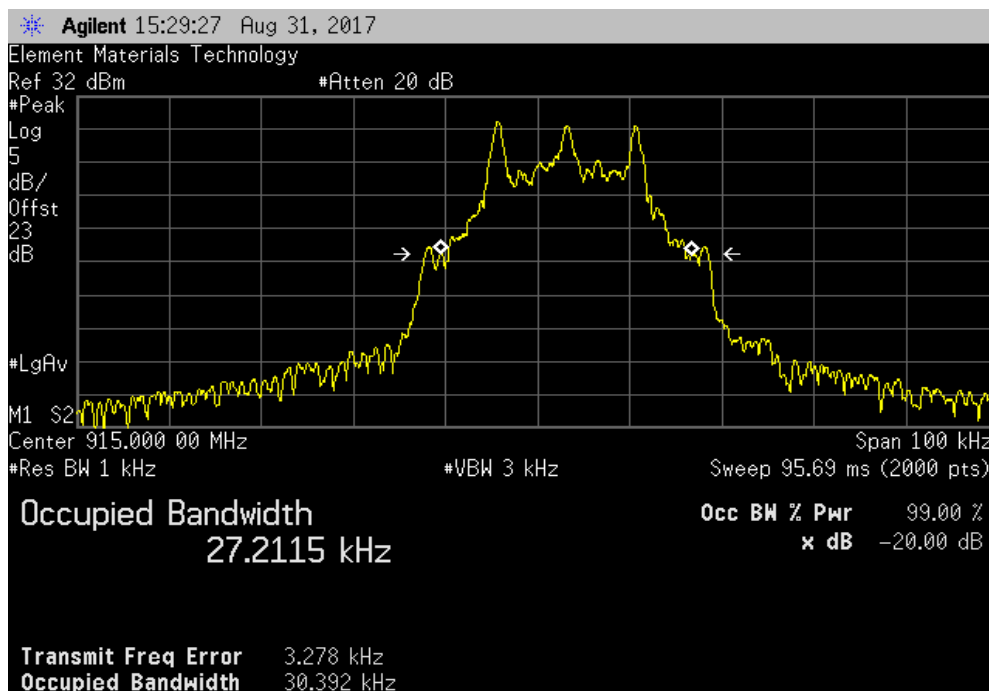


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 610k						
				Value	Limit (S)	Result
				485.026 kHz	500 kHz	Pass



All Other Antennas, Mid Channel, 915 MHz, 15k						
				Value	Limit (S)	Result
				30.392 kHz	250 kHz	Pass

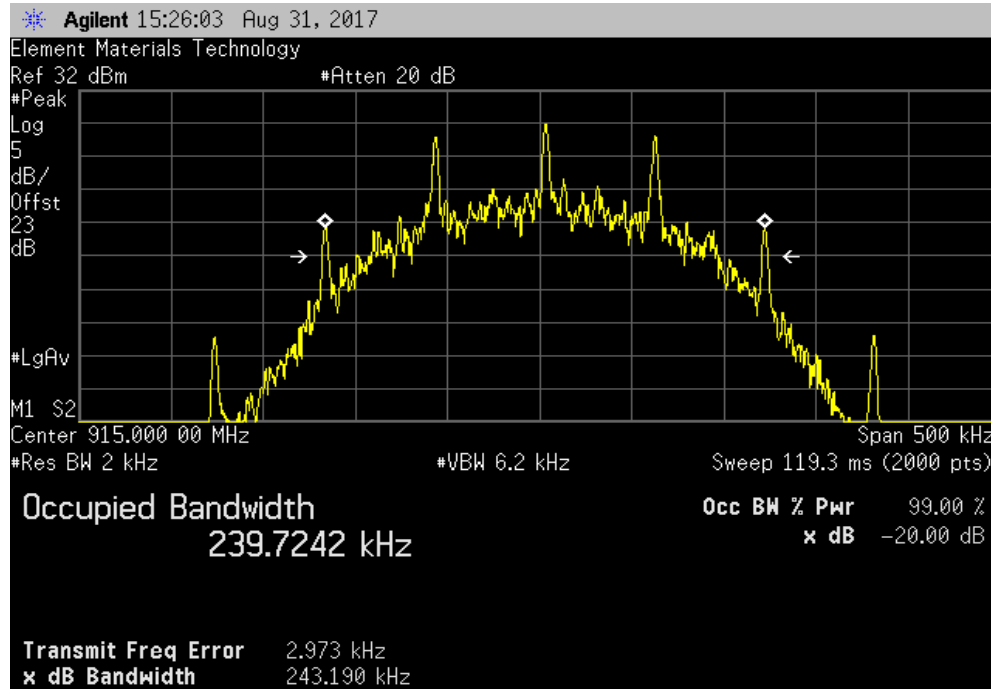


OCCUPIED BANDWIDTH

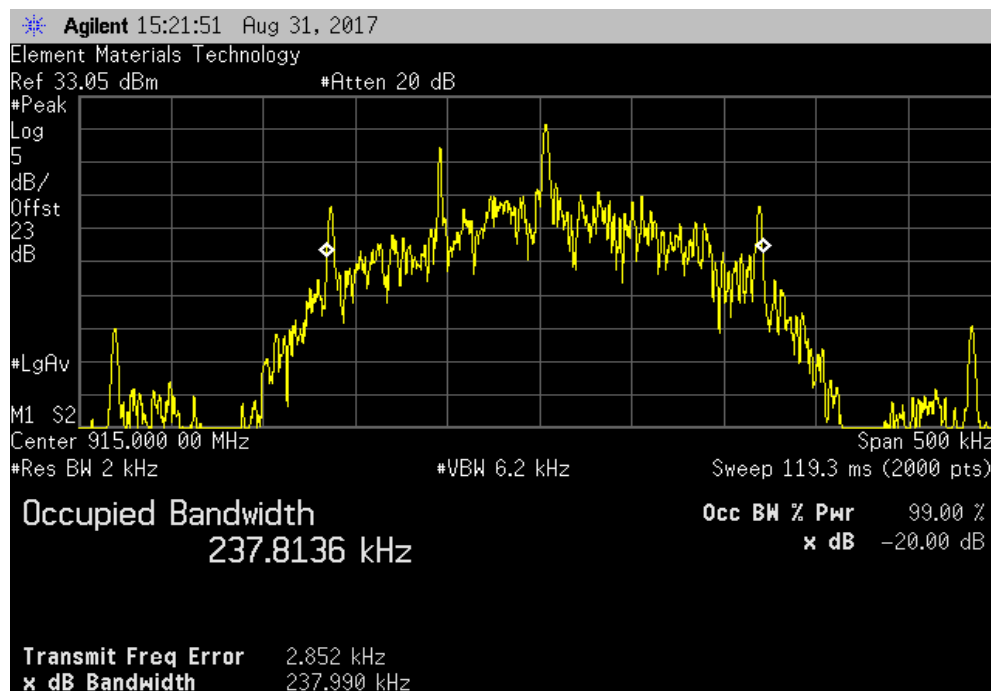


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 120k						
				Value	Limit (S)	Result
				243.19 kHz	250 kHz	Pass



All Other Antennas, Mid Channel, 915 MHz, 200k						
				Value	Limit (S)	Result
				237.99 kHz	250 kHz	Pass

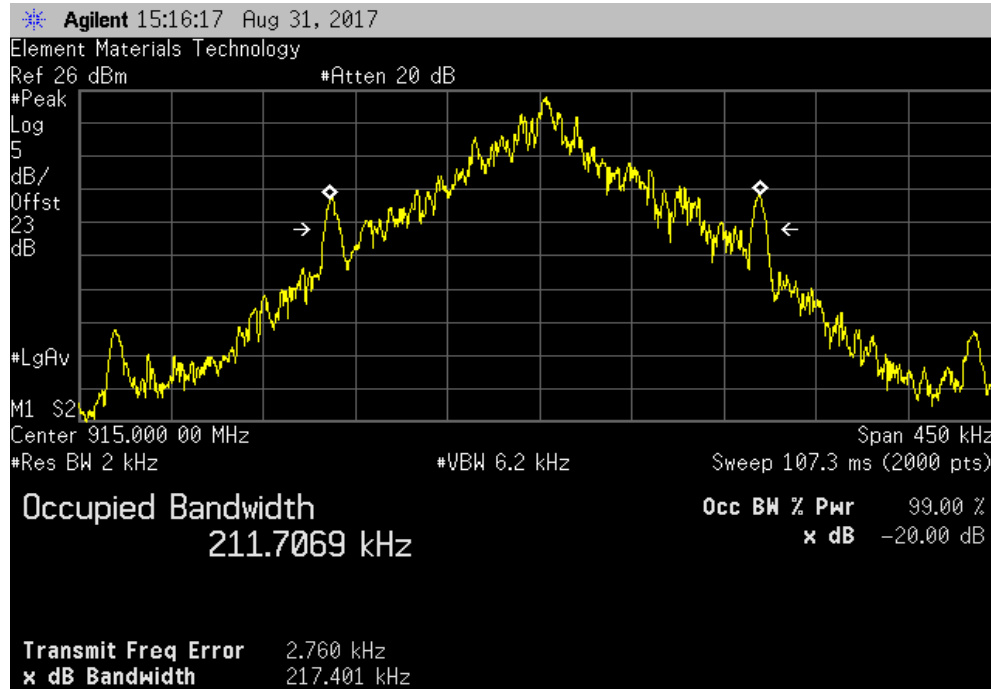


OCCUPIED BANDWIDTH

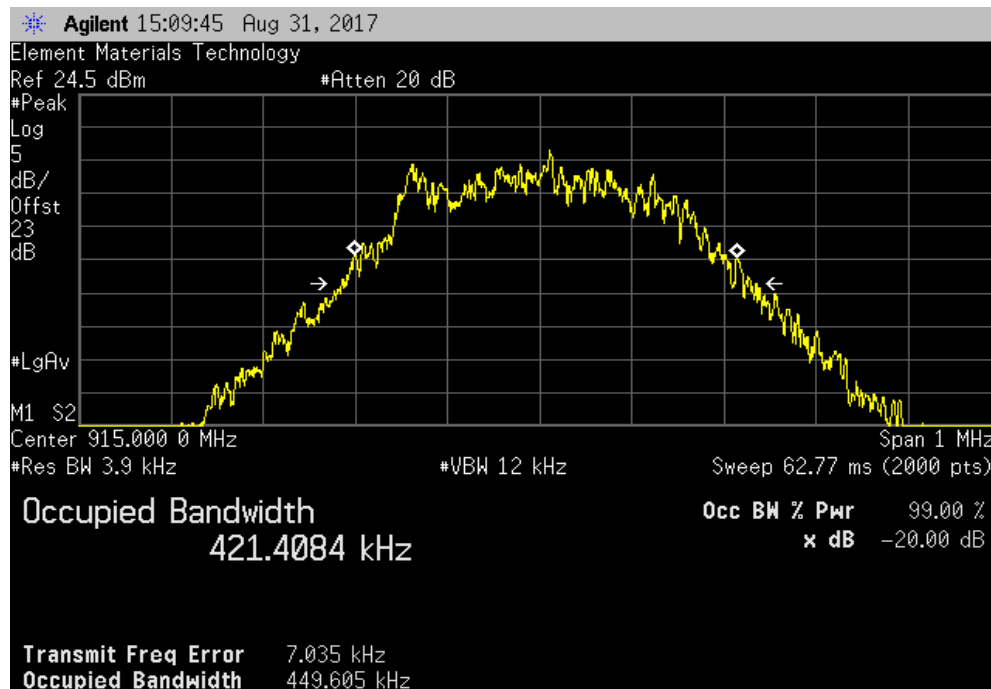


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 400k						
				Value	Limit (S)	Result
				217.401 kHz	250 kHz	Pass



All Other Antennas, Mid Channel, 915 MHz, 610k						
				Value	Limit (S)	Result
				449.606 kHz	500 kHz	Pass

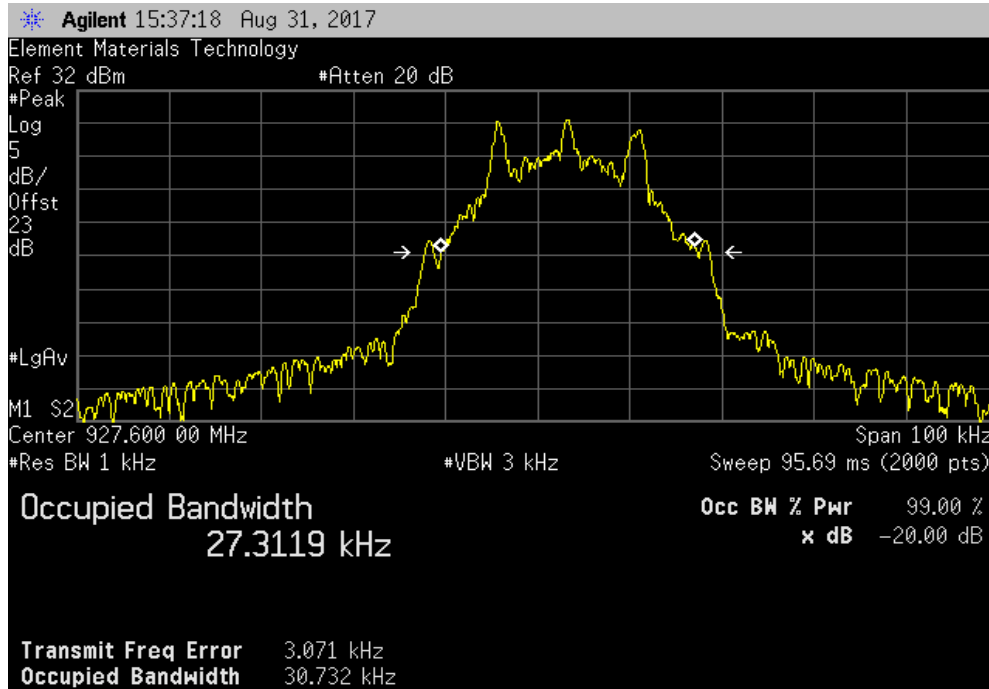


OCCUPIED BANDWIDTH

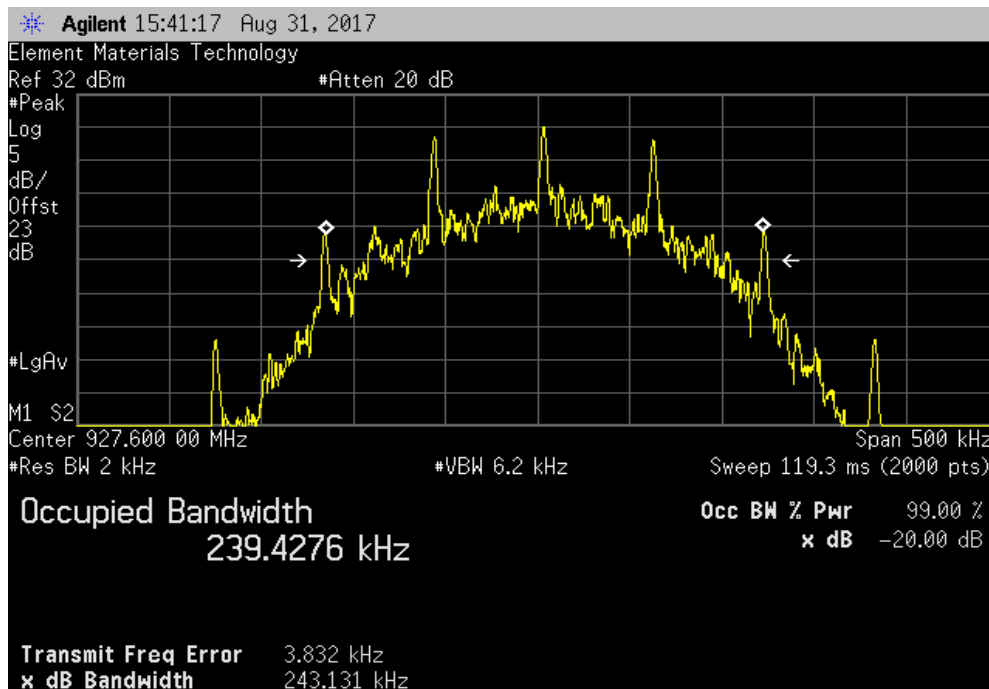


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 15k						
				Value	Limit (S)	Result
				30.732 kHz	250 kHz	Pass



All Other Antennas, High Channel, 927.6 MHz, 120k						
				Value	Limit (S)	Result
				243.131 kHz	250 kHz	Pass

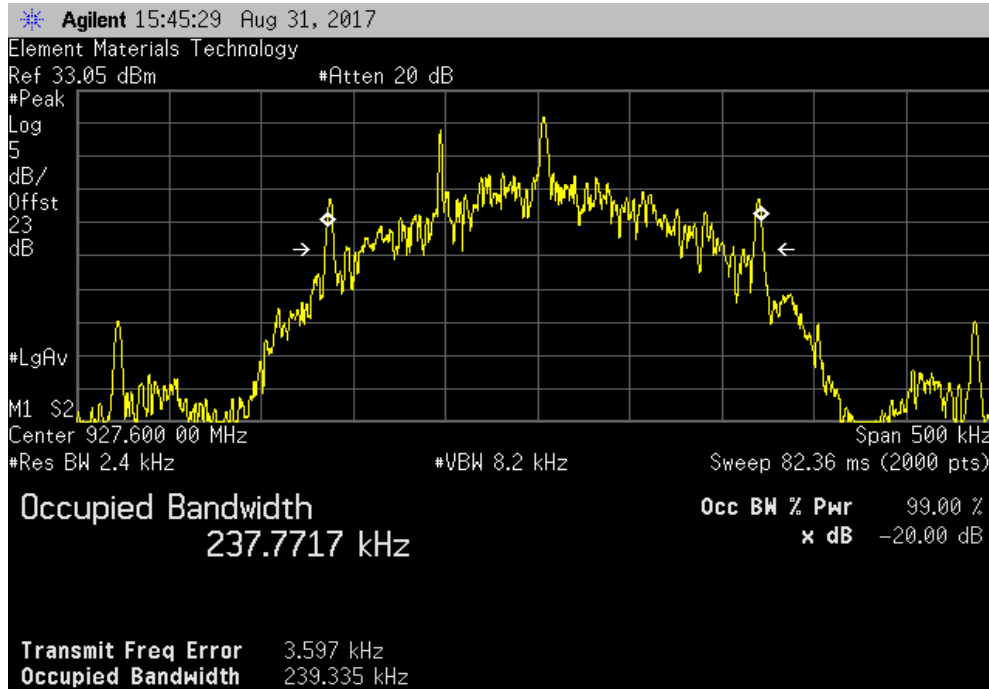


OCCUPIED BANDWIDTH

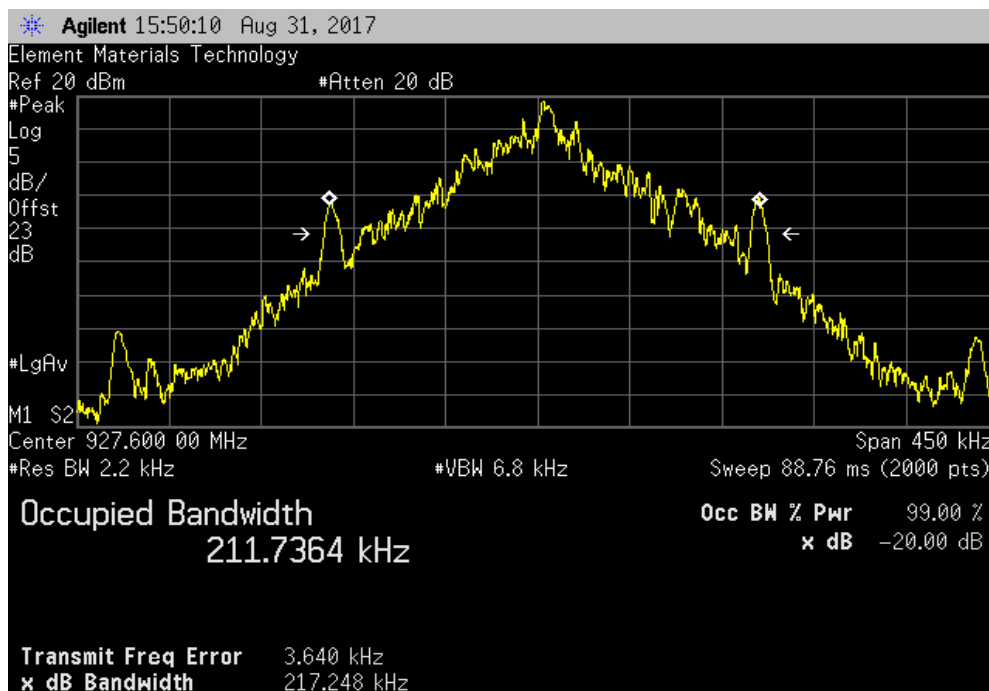


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 200k						
				Value	Limit (S)	Result
				239.335 kHz	250 kHz	Pass



All Other Antennas, High Channel, 927.6 MHz, 400k						
				Value	Limit (S)	Result
				217.248 kHz	250 kHz	Pass



OCCUPIED BANDWIDTH



TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 610k						
Value				Limit	Result	
461.054 kHz				500 kHz	Pass	



SPURIOUS CONDUCTED EMISSIONS



XMR 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	3/17/2015	3/17/2018
Cable	ESM Cable Corp	TTBJ141 KMKM-72	MNP	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	RFW	2/14/2017	2/14/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	3/16/2017	3/16/2018

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS



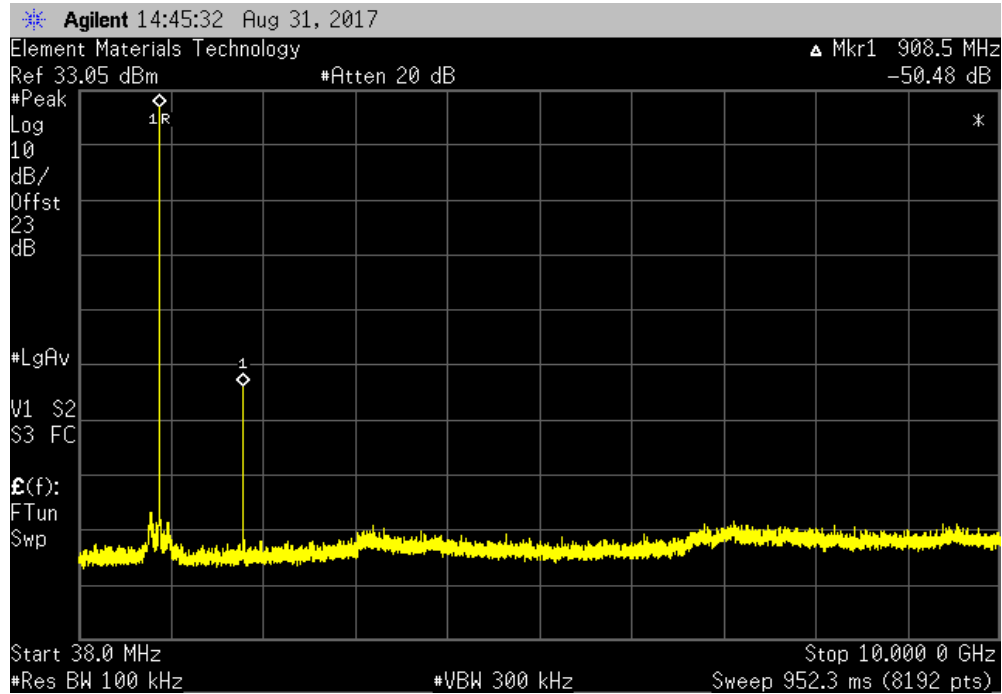
EUT: Radio 136377		Work Order: MARJ0007	
Serial Number: 3		Date: 09/01/17	
Customer: Traffic & Parking Control Co., Inc.		Temperature: 22.1 °C	
Attendees: Roman Marjamaa		Humidity: 48.3% RH	
Project: None		Barometric Pres.: 1022 mbar	
Tested by: Dustin Sparks		Job Site: MN08	
Power: 5VDC			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	8	Signature <i>Dustin Sparks</i>	
		Frequency Range	Max Value (dBc)
			Limit ≤ (dBc)
			Result
All Other Antennas			
Low Channel, 902.4 MHz			
	15k	30 MHz - 10 GHz	-50.48
	120k	30 MHz - 10 GHz	-50.66
	200k	30 MHz - 10 GHz	-50.76
	400k	30 MHz - 10 GHz	-50.27
	610k	30 MHz - 10 GHz	-47.95
Mid Channel, 915 MHz			
	15k	30 MHz - 10 GHz	-53.42
	120k	30 MHz - 10 GHz	-53.73
	200k	30 MHz - 10 GHz	-53.72
	400k	30 MHz - 10 GHz	-53.59
	610k	30 MHz - 10 GHz	-51.29
High Channel, 927.6 MHz			
	15k	30 MHz - 10 GHz	-56.98
	120k	30 MHz - 10 GHz	-57.28
	200k	30 MHz - 10 GHz	-57.32
	400k	30 MHz - 10 GHz	-55.07
	610k	30 MHz - 10 GHz	-54.85

SPURIOUS CONDUCTED EMISSIONS

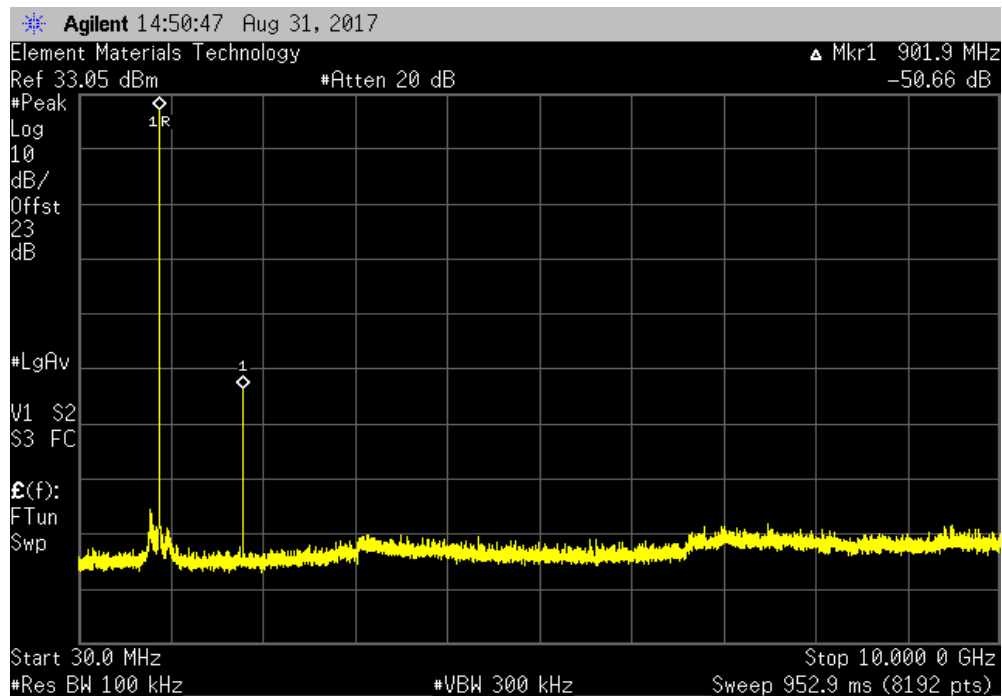


TMTx 2017.07.11 XMI 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 15k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-50.48	-20	Pass	



All Other Antennas, Low Channel, 902.4 MHz, 120k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-50.66	-20	Pass	

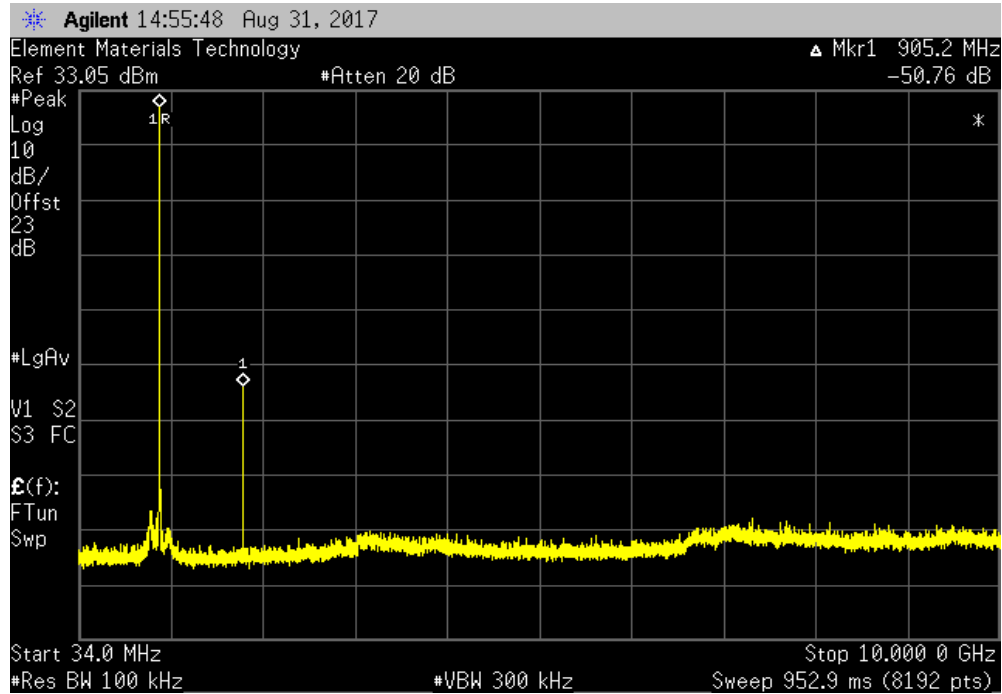


SPURIOUS CONDUCTED EMISSIONS

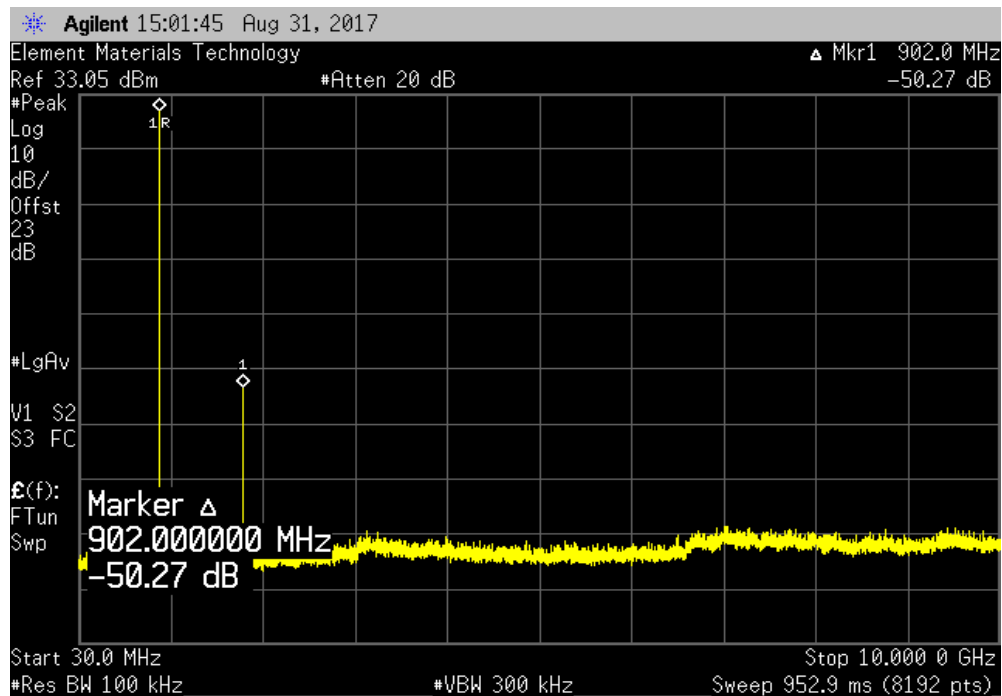


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 200k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-50.76	-20	Pass	



All Other Antennas, Low Channel, 902.4 MHz, 400k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-50.27	-20	Pass	

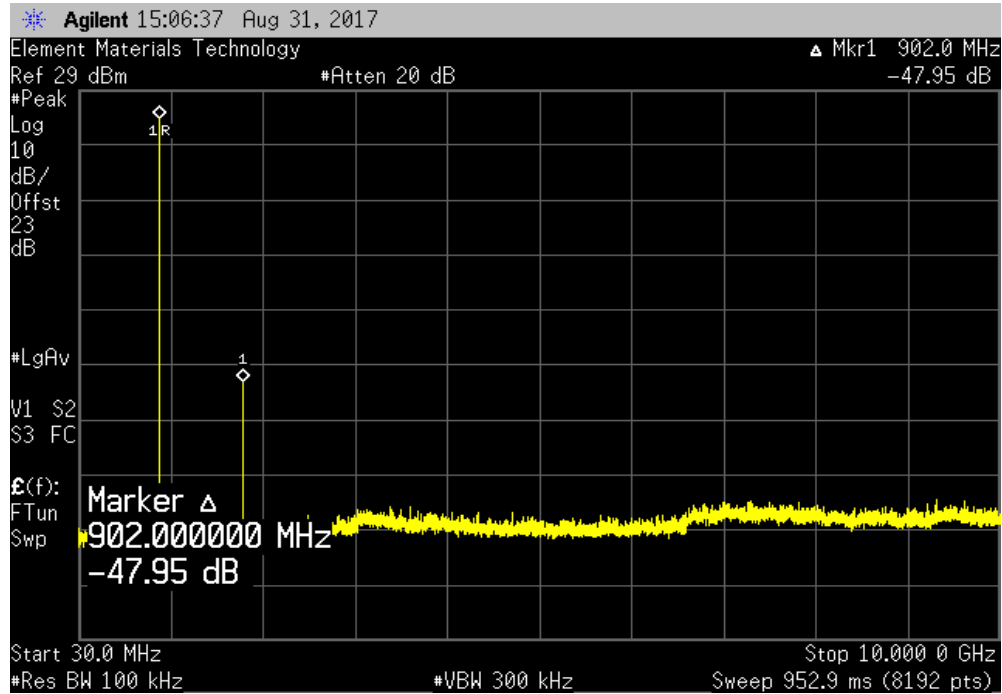


SPURIOUS CONDUCTED EMISSIONS

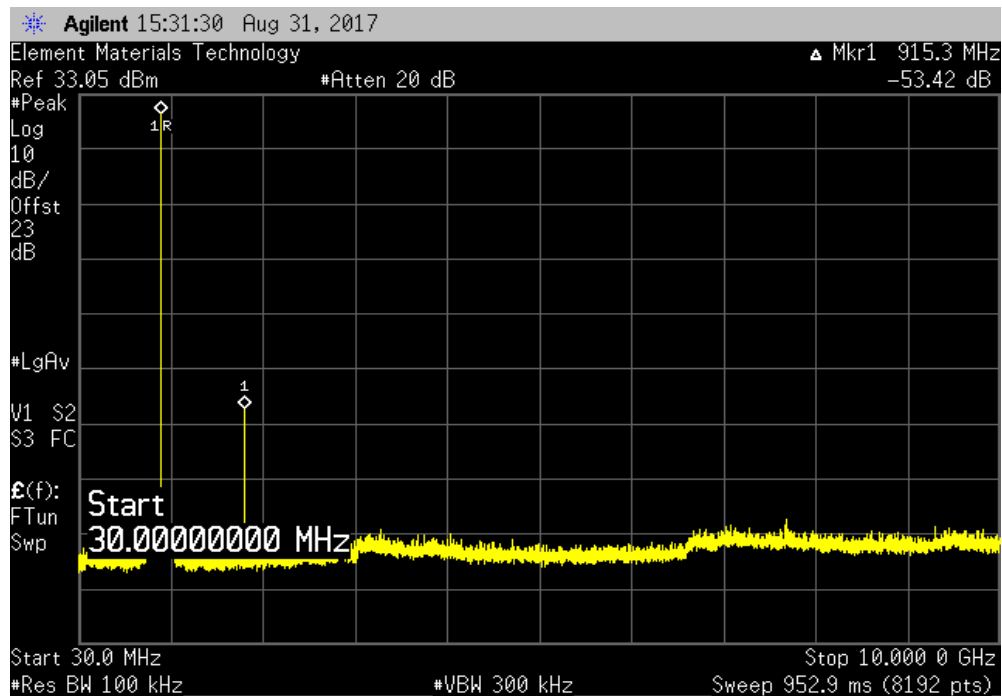


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Low Channel, 902.4 MHz, 610k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-47.95	-20	Pass	



All Other Antennas, Mid Channel, 915 MHz, 15k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-53.42	-20	Pass	

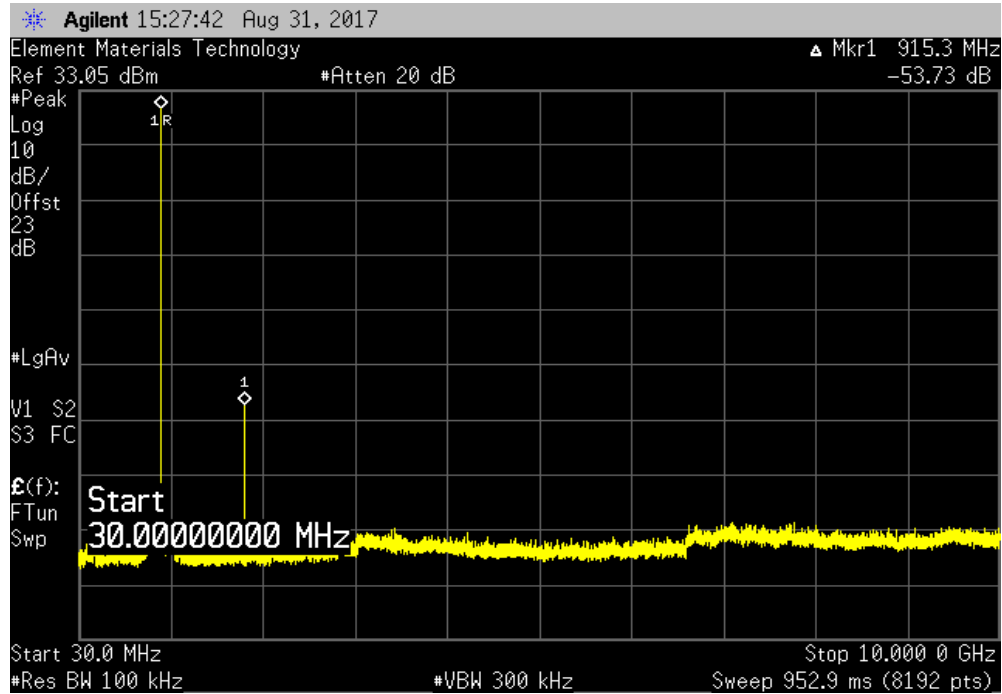


SPURIOUS CONDUCTED EMISSIONS

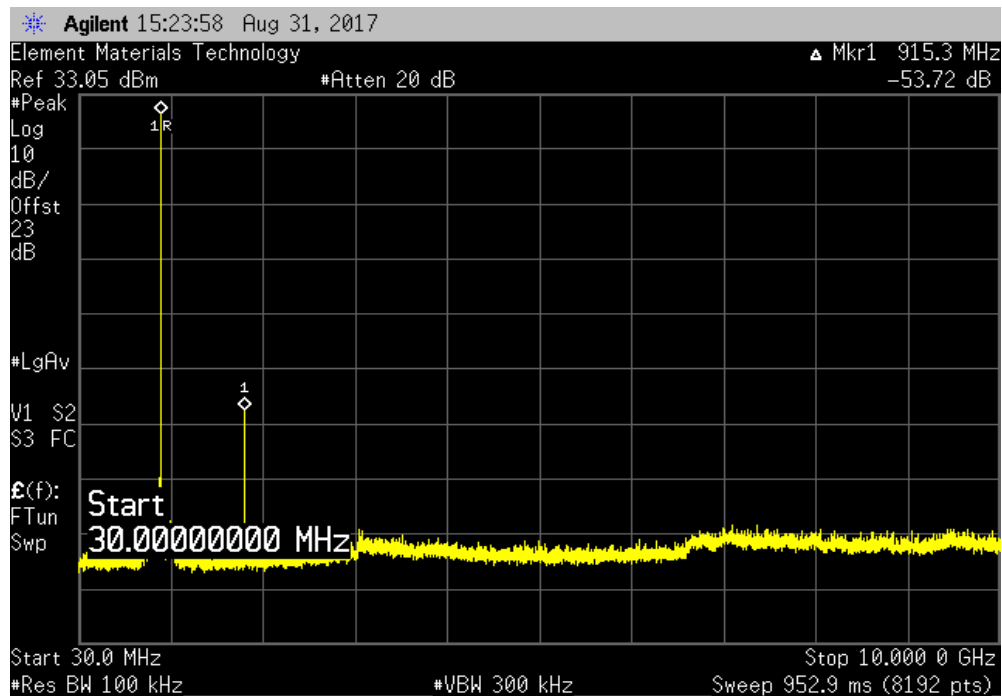


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 120k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-53.73	-20	Pass	



All Other Antennas, Mid Channel, 915 MHz, 200k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-53.72	-20	Pass	

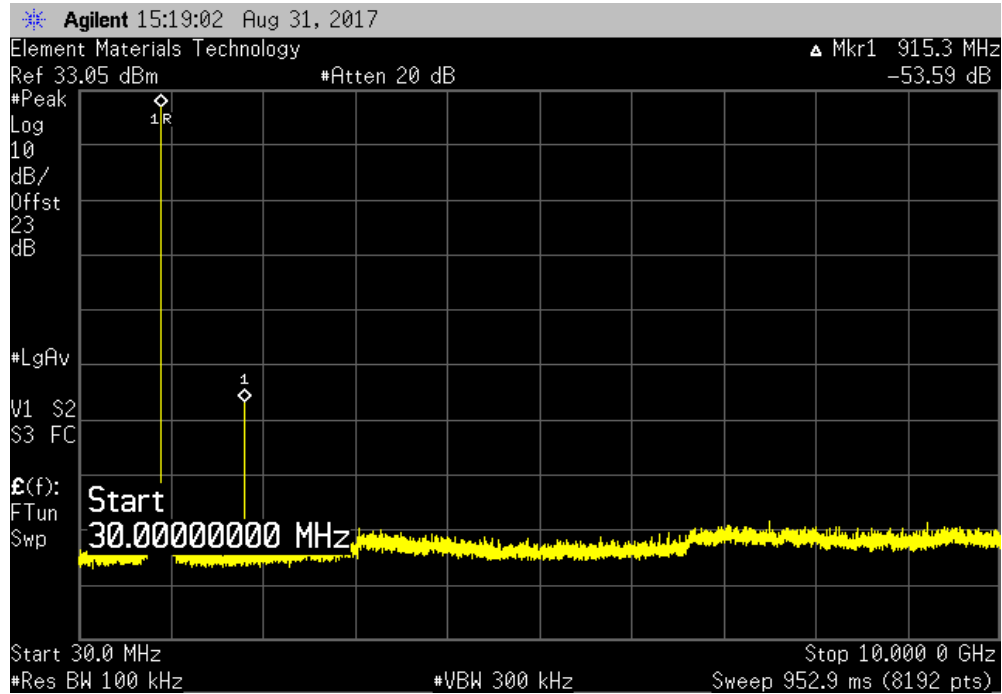


SPURIOUS CONDUCTED EMISSIONS

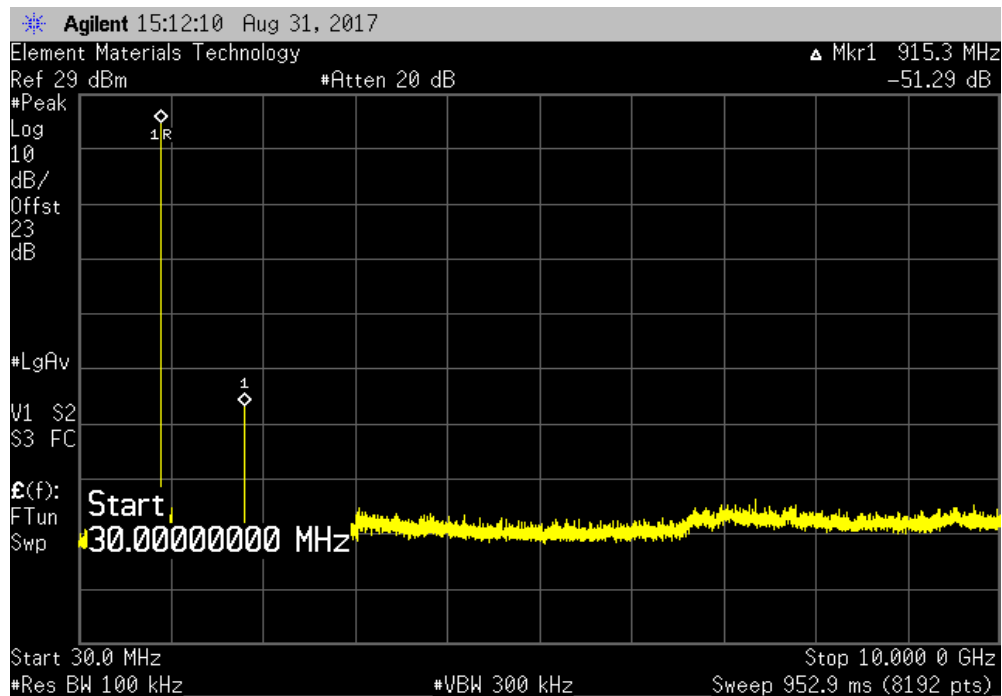


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, Mid Channel, 915 MHz, 400k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-53.59	-20	Pass	



All Other Antennas, Mid Channel, 915 MHz, 610k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-51.29	-20	Pass	

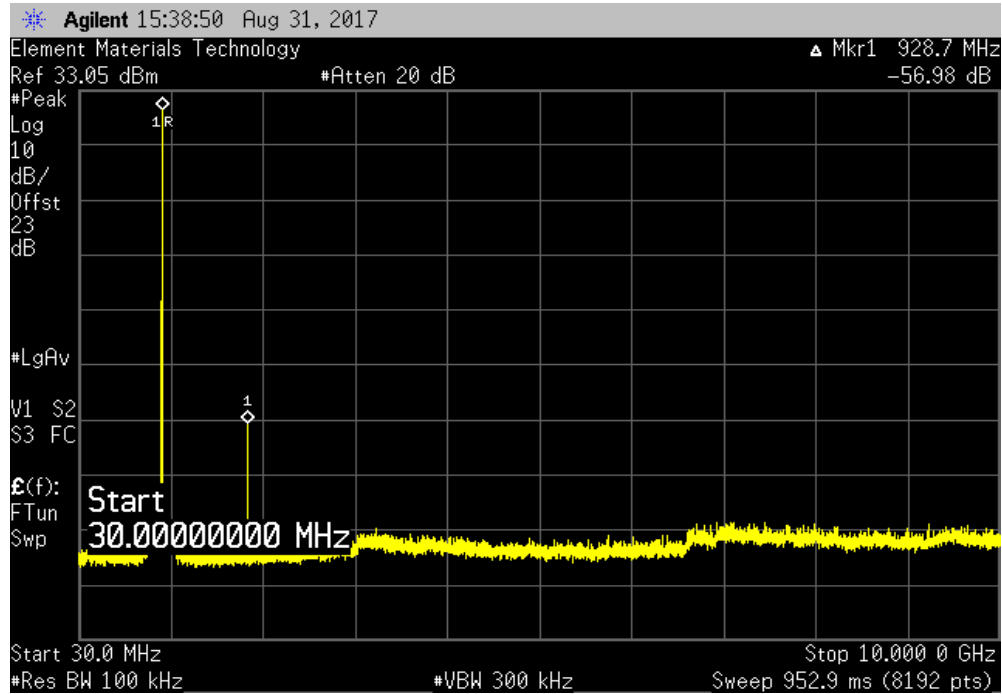


SPURIOUS CONDUCTED EMISSIONS

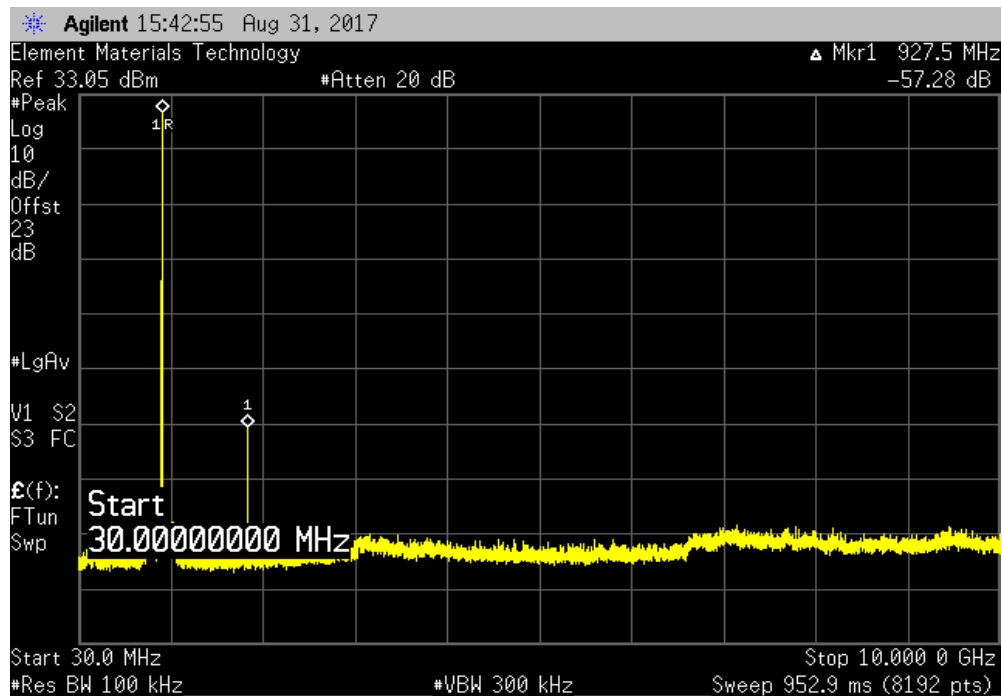


TMTx 2017.07.11 XMM 2017.02.08

All Other Antennas, High Channel, 927.6 MHz, 15k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-56.98	-20	Pass	



All Other Antennas, High Channel, 927.6 MHz, 120k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-57.28	-20	Pass	

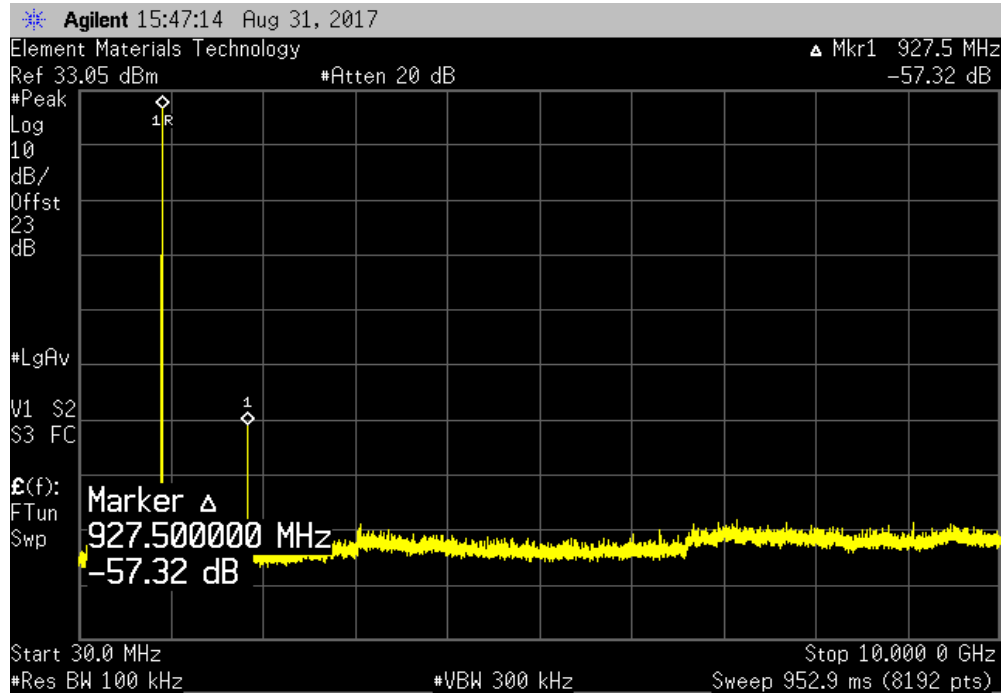


SPURIOUS CONDUCTED EMISSIONS

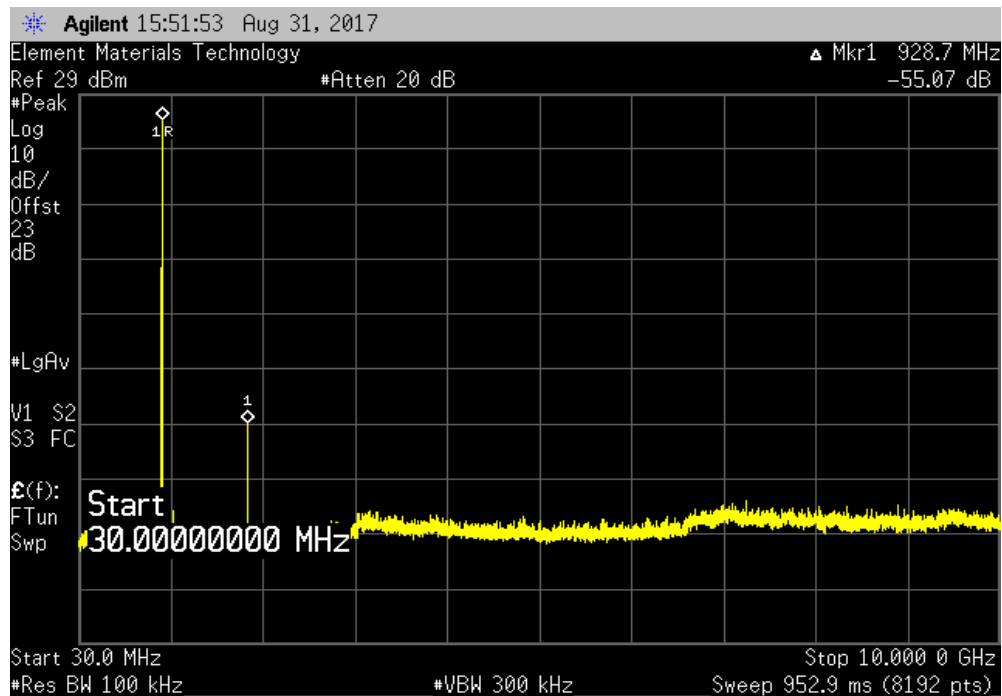


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All Other Antennas, High Channel, 927.6 MHz, 200k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-57.32	-20	Pass	



All Other Antennas, High Channel, 927.6 MHz, 400k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-55.07	-20	Pass	



SPURIOUS CONDUCTED EMISSIONS



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All Other Antennas, High Channel, 927.6 MHz, 610k				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 10 GHz	-54.85	-20	Pass	

