



Banner Engineering Corp.

Q240RA Sensor

LP0002:2016

24075-24175 MHz Transceiver

Report # BANN0162.2



NVLAP Lab Code: 200881-0



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CERTIFICATE OF TEST

Last Date of Test: August 22, 2017
Banner Engineering Corp.
Model: Q240RA Sensor

Radio Equipment Testing

Standards

Specification	Method
LP0002:2016	ANSI C63.10:2013

Results

Test Description	Applied	Results	Comments
Powerline Conducted Emissions	Yes	Pass	
Field Strength of Harmonics and Spurious Radiated Emissions (Below 40 GHz)	Yes	Pass	
Field Strength of Harmonics and Spurious Radiated Emissions (Above 40 GHz)	Yes	Pass	
Field Strength of Fundamental	Yes	Pass	

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:

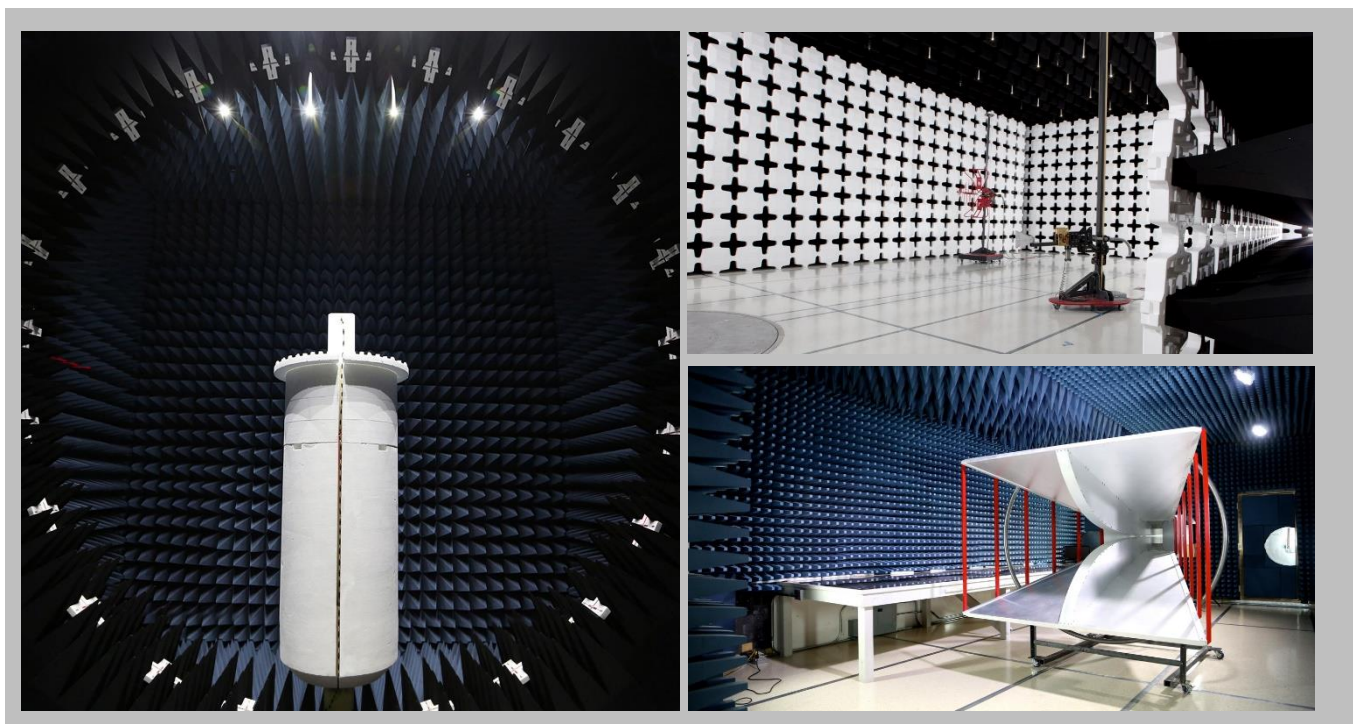
<http://portlandcustomer.element.com/ts/scope/scope.htm>

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

FACILITIES



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/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



MEASUREMENT UNCERTAINTY



WTD.2016.12.19

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.

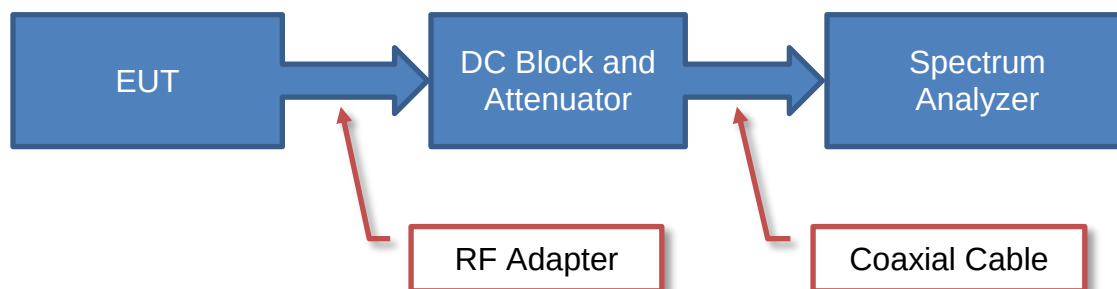
A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement 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.

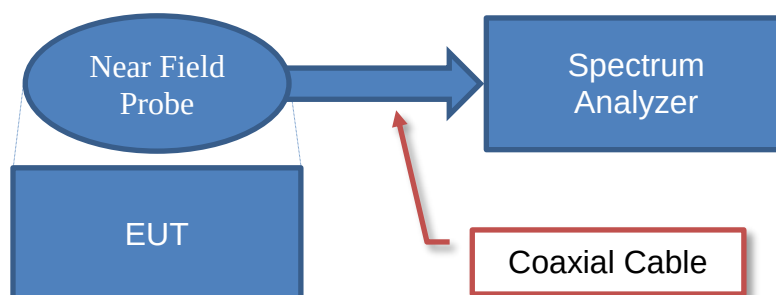
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

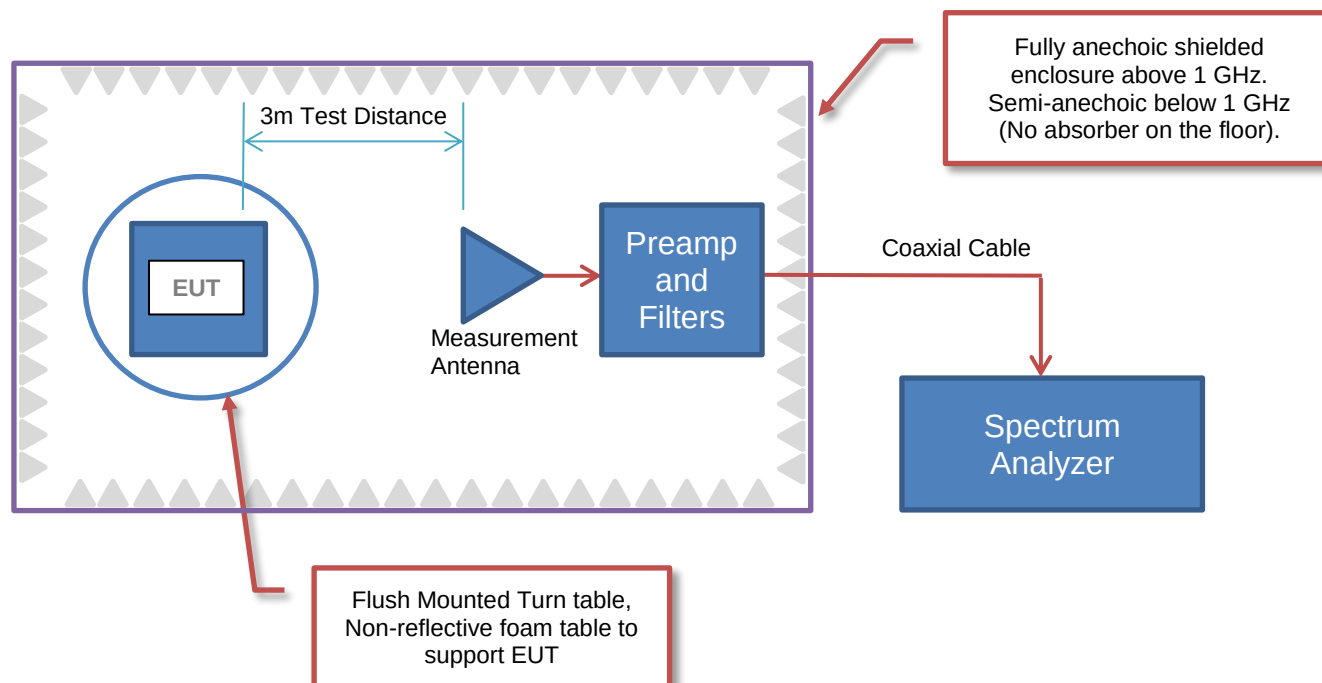
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions





PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Banner Engineering Corp.
Address:	9714 Tenth Avenue North
City, State, Zip:	Minneapolis, MN 55441
Test Requested By:	Joel Jankord
Brand:	Banner Engineering
Model:	Q240RA Sensor
First Date of Test:	August 21, 2017
Last Date of Test:	August 22, 2017
Receipt Date of Samples:	August 17, 2017
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Radar-Based Dual-Zone Narrow-Beam Sensors for Detection of Moving and Stationary Targets. Primarily used in industrial applications such as rail yards, ports, gantry systems and the like.

Client Provided Information:

All R-gage models are included by testing the Q240RA since the Transceiver module is the worst case focus, and the highest antenna gain of all of the following models:

Models Q240RA; followed by EU or UK, followed by AF2 or any other 4 alphanumeric characters not impacting hardware, emissions profile, or product safety approval; may be followed by Q; may be followed by up to 7 alphanumeric characters.

Models Q120RAXXXXXX; All models above may include a suffix that includes up to 6 alphanumeric characters not impacting hardware or emissions profile, or product safety approval.

Models QT50RAXXXXXXXX; All models above may include a suffix that includes up to 8 alphanumeric characters not impacting hardware or emissions profile, or product safety approval.

Testing Objective:

Seeking to demonstrate compliance under LP0002:2016 for operation in the 24075-24175 MHz band.

CONFIGURATIONS



Configuration BANN0162- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Q240RA Sensor	Banner Engineering Corp.	Q240RA	RD1708049

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Battery (x2, 24VDC)	Duracell	ProCell	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable	No	2m	No	Q240RA Sensor	24VDC Supply

Configuration BANN0162- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Q240RA Sensor	Banner Engineering Corp.	Q240RA	RD1708049

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
DC-AC Converter	Banner	PSD-24-4	N/A

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	2m	No	DC-AC Converter	AC Mains
DC Cable	No	2m	No	Q240R Sensor	DC-AC Converter

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	8/21/2017	Field Strength of Fundamental	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	8/22/2017	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.
3	8/22/2017	Field Strength of Harmonics and Spurious Radiated Emissions Below 40GHz	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	8/22/2017	Field Strength of Harmonics and Spurious Radiated Emissions Above 40GHz	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	Northwest EMC	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
Attenuator	Fairview Microwave	SA01B-20	TYK	NCR	NCR

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

BANN0162-2

MODES INVESTIGATED

Transmitting 24.125 GHz

POWERLINE CONDUCTED EMISSIONS



EUT:	Q240RA Sensor	Work Order:	BANN0162
Serial Number:	RD1708049	Date:	08/22/2017
Customer:	Banner Engineering Corp.	Temperature:	22.5°C
Attendees:	Joel Jankord	Relative Humidity:	51.9%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Trevor Buls, Chris Patterson	Job Site:	MN03
Power:	24VDC	Configuration:	BANN0162-2

TEST SPECIFICATIONS

Specification:	Method:
LP0002:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	1	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

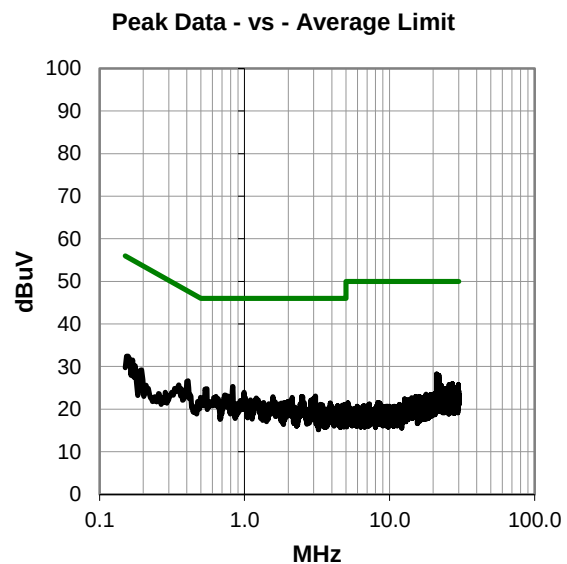
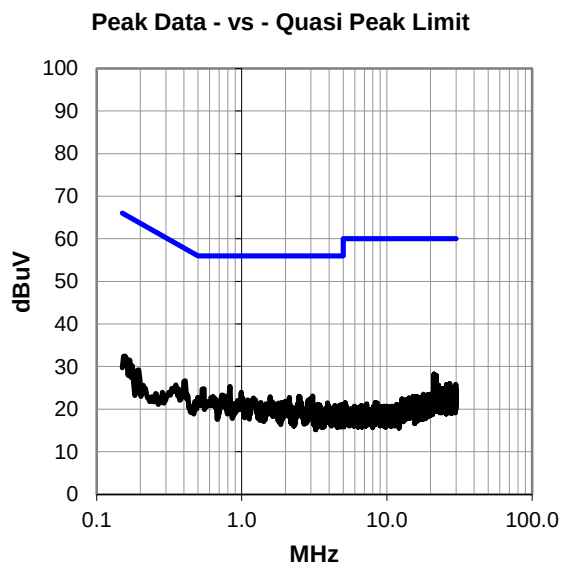
None

EUT OPERATING MODES

Transmitting 24.125 GHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #1

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.825	5.0	20.3	25.3	56.0	-30.7
0.407	6.5	20.2	26.7	57.7	-31.0
0.549	4.5	20.3	24.8	56.0	-31.2
21.128	6.4	21.8	28.2	60.0	-31.8
0.993	3.7	20.3	24.0	56.0	-32.0
21.863	6.1	21.8	27.9	60.0	-32.1
0.728	3.0	20.3	23.3	56.0	-32.7
21.766	5.5	21.8	27.3	60.0	-32.7
3.079	2.7	20.4	23.1	56.0	-32.9
0.635	2.7	20.3	23.0	56.0	-33.0
2.482	2.6	20.4	23.0	56.0	-33.0
1.568	2.6	20.3	22.9	56.0	-33.1
2.515	2.5	20.4	22.9	56.0	-33.1
21.621	5.1	21.8	26.9	60.0	-33.1
0.351	5.5	20.2	25.7	58.9	-33.2
2.127	2.5	20.3	22.8	56.0	-33.2
0.154	11.9	20.5	32.4	65.8	-33.4
1.202	2.3	20.3	22.6	56.0	-33.4
0.169	11.0	20.5	31.5	65.0	-33.5
21.755	4.7	21.8	26.5	60.0	-33.5
2.967	2.0	20.4	22.4	56.0	-33.6
21.479	4.5	21.8	26.3	60.0	-33.7
21.818	4.5	21.8	26.3	60.0	-33.7
1.098	1.9	20.3	22.2	56.0	-33.8
2.922	1.8	20.4	22.2	56.0	-33.8
21.516	4.4	21.8	26.2	60.0	-33.8

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.825	5.0	20.3	25.3	46.0	-20.7
0.407	6.5	20.2	26.7	47.7	-21.0
0.549	4.5	20.3	24.8	46.0	-21.2
21.128	6.4	21.8	28.2	50.0	-21.8
0.993	3.7	20.3	24.0	46.0	-22.0
21.863	6.1	21.8	27.9	50.0	-22.1
0.728	3.0	20.3	23.3	46.0	-22.7
21.766	5.5	21.8	27.3	50.0	-22.7
3.079	2.7	20.4	23.1	46.0	-22.9
0.635	2.7	20.3	23.0	46.0	-23.0
2.482	2.6	20.4	23.0	46.0	-23.0
1.568	2.6	20.3	22.9	46.0	-23.1
2.515	2.5	20.4	22.9	46.0	-23.1
21.621	5.1	21.8	26.9	50.0	-23.1
0.351	5.5	20.2	25.7	48.9	-23.2
2.127	2.5	20.3	22.8	46.0	-23.2
0.154	11.9	20.5	32.4	55.8	-23.4
1.202	2.3	20.3	22.6	46.0	-23.4
0.169	11.0	20.5	31.5	55.0	-23.5
21.755	4.7	21.8	26.5	50.0	-23.5
2.967	2.0	20.4	22.4	46.0	-23.6
21.479	4.5	21.8	26.3	50.0	-23.7
21.818	4.5	21.8	26.3	50.0	-23.7
1.098	1.9	20.3	22.2	46.0	-23.8
2.922	1.8	20.4	22.2	46.0	-23.8
21.516	4.4	21.8	26.2	50.0	-23.8

CONCLUSION

Pass

Trevor Buls
Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	Q240RA Sensor	Work Order:	BANN0162
Serial Number:	RD1708049	Date:	08/22/2017
Customer:	Banner Engineering Corp.	Temperature:	22.5°C
Attendees:	Joel Jankord	Relative Humidity:	51.9%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Trevor Buls, Chris Patterson	Job Site:	MN03
Power:	24VDC	Configuration:	BANN0162-2

TEST SPECIFICATIONS

Specification:	Method:
LP0002:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	2	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

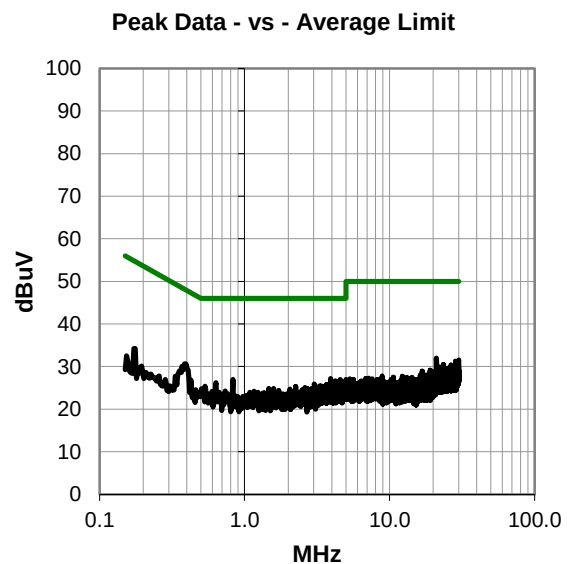
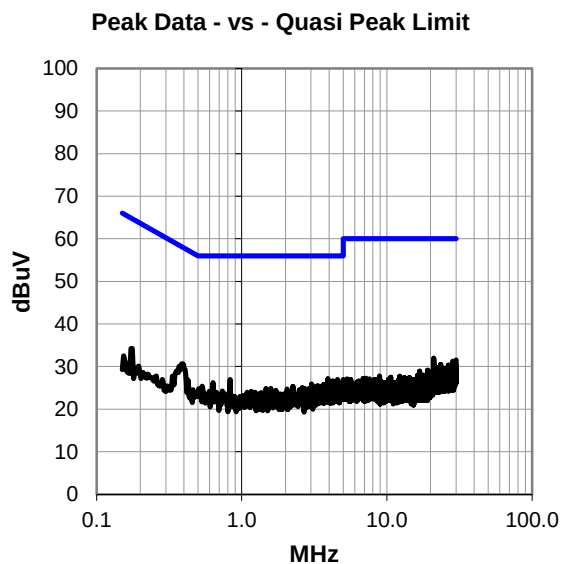
None

EUT OPERATING MODES

Transmitting 24.125 GHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #2

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.385	10.4	20.2	30.6	58.2	-27.6
21.069	10.3	21.7	32.0	60.0	-28.0
29.996	8.6	22.9	31.5	60.0	-28.5
3.929	6.8	20.4	27.2	56.0	-28.8
28.504	8.5	22.7	31.2	60.0	-28.8
29.213	8.4	22.7	31.1	60.0	-28.9
0.829	6.7	20.3	27.0	56.0	-29.0
4.575	6.6	20.4	27.0	56.0	-29.0
4.993	6.5	20.5	27.0	56.0	-29.0
4.231	6.2	20.4	26.6	56.0	-29.4
23.479	8.4	22.1	30.5	60.0	-29.5
29.127	7.8	22.7	30.5	60.0	-29.5
29.545	7.7	22.8	30.5	60.0	-29.5
29.403	7.7	22.7	30.4	60.0	-29.6
29.929	7.5	22.9	30.4	60.0	-29.6
3.903	5.9	20.4	26.3	56.0	-29.7
4.332	5.9	20.4	26.3	56.0	-29.7
26.556	7.9	22.4	30.3	60.0	-29.7
0.635	5.9	20.3	26.2	56.0	-29.8
29.332	7.5	22.7	30.2	60.0	-29.8
28.649	7.4	22.7	30.1	60.0	-29.9
4.504	5.6	20.4	26.0	56.0	-30.0
4.832	5.5	20.5	26.0	56.0	-30.0
28.832	7.3	22.7	30.0	60.0	-30.0
3.030	5.5	20.4	25.9	56.0	-30.1
4.675	5.5	20.4	25.9	56.0	-30.1

Peak Data - vs - Average Limit

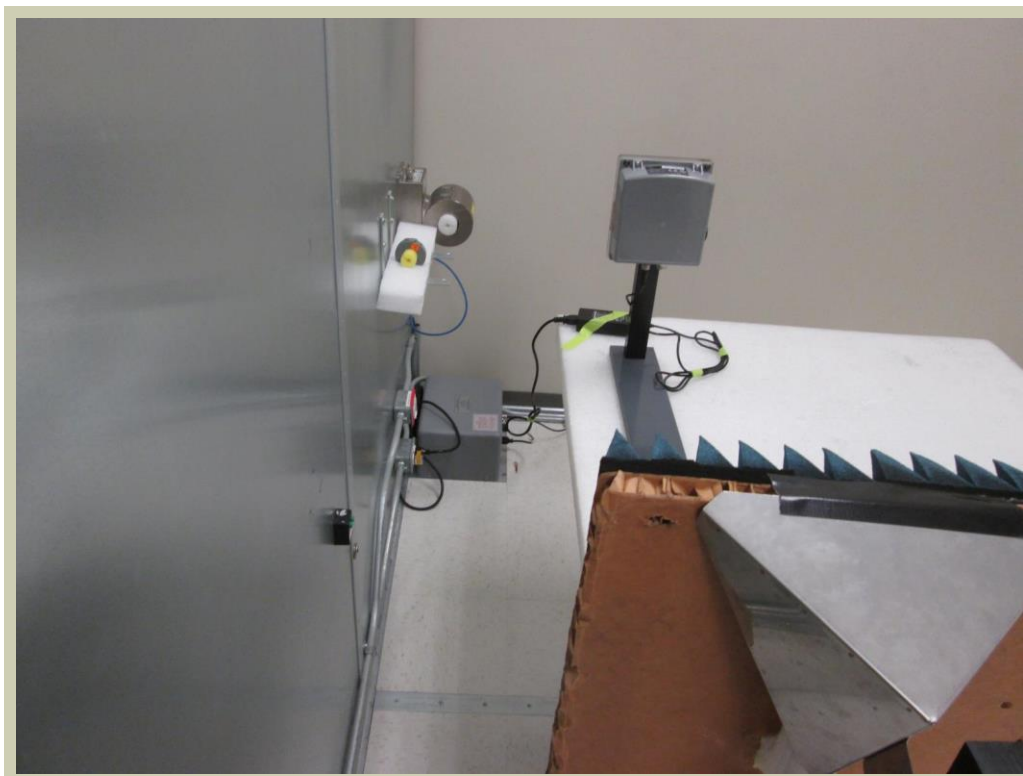
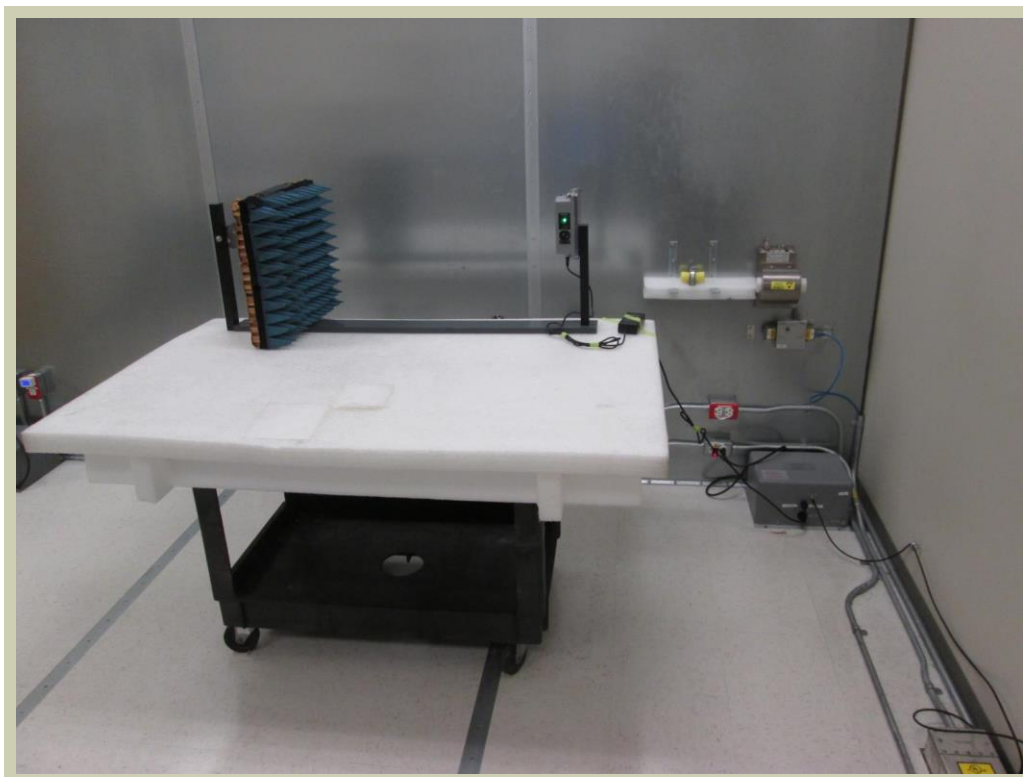
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.385	10.4	20.2	30.6	48.2	-17.6
21.069	10.3	21.7	32.0	50.0	-18.0
29.996	8.6	22.9	31.5	50.0	-18.5
3.929	6.8	20.4	27.2	46.0	-18.8
28.504	8.5	22.7	31.2	50.0	-18.8
29.213	8.4	22.7	31.1	50.0	-18.9
0.829	6.7	20.3	27.0	46.0	-19.0
4.575	6.6	20.4	27.0	46.0	-19.0
4.993	6.5	20.5	27.0	46.0	-19.0
4.231	6.2	20.4	26.6	46.0	-19.4
23.479	8.4	22.1	30.5	50.0	-19.5
29.127	7.8	22.7	30.5	50.0	-19.5
29.545	7.7	22.8	30.5	50.0	-19.5
29.403	7.7	22.7	30.4	50.0	-19.6
29.929	7.5	22.9	30.4	50.0	-19.6
3.903	5.9	20.4	26.3	46.0	-19.7
4.332	5.9	20.4	26.3	46.0	-19.7
26.556	7.9	22.4	30.3	50.0	-19.7
0.635	5.9	20.3	26.2	46.0	-19.8
29.332	7.5	22.7	30.2	50.0	-19.8
28.649	7.4	22.7	30.1	50.0	-19.9
4.504	5.6	20.4	26.0	46.0	-20.0
4.832	5.5	20.5	26.0	46.0	-20.0
28.832	7.3	22.7	30.0	50.0	-20.0
3.030	5.5	20.4	25.9	46.0	-20.1
4.675	5.5	20.4	25.9	46.0	-20.1

CONCLUSION

Pass

Trevor Buls
Tested By

POWERLINE CONDUCTED EMISSIONS



FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS BELOW 40GHz



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 24.125 GHz

POWER SETTINGS INVESTIGATED

24VDC

CONFIGURATIONS INVESTIGATED

BANN0162 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz Stop Frequency 1000 MHz

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
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	12 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

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

FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS BELOW 40GHz



PSA-ESCI 2017.06.01

TEST DESCRIPTION

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

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

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, 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.

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.

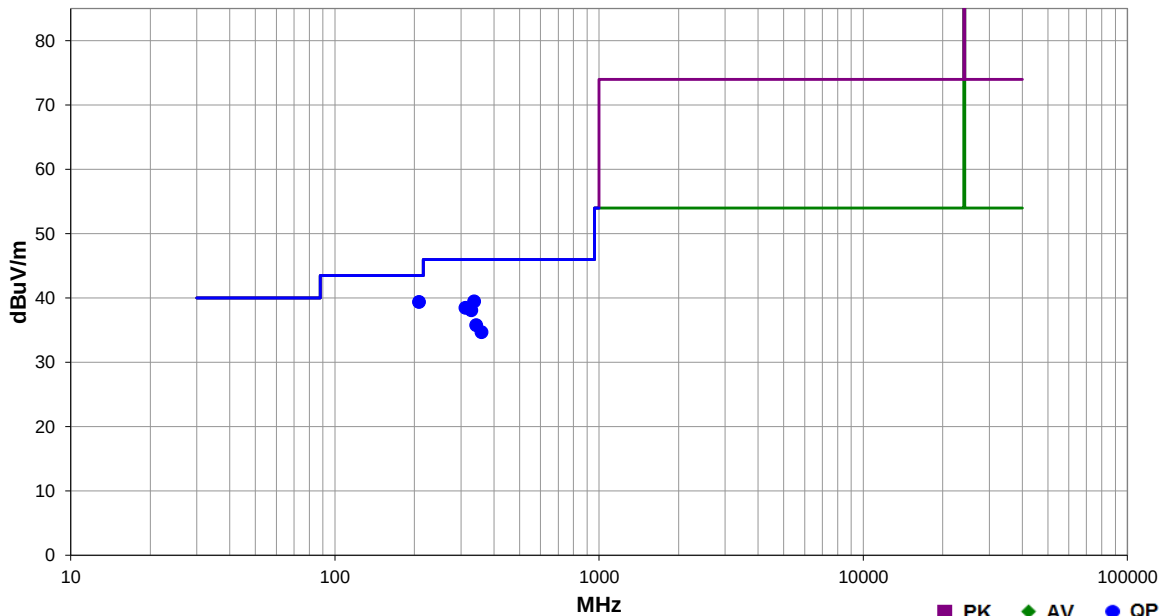
FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS BELOW 40GHz



Work Order:	BANN0162	Date:	08/22/17	EmiR5 2017.07.11 PSA-ESCI 2017.06.01 Trevor Buls
Project:	None	Temperature:	22.4 °C	
Job Site:	MN05	Humidity:	55.2% RH	
Serial Number:	RD1708049	Barometric Pres.:	1019 mbar	
EUT:	Q240RA Sensor			Tested by: Trevor Buls, Chris Patterson
Configuration:	1			
Customer:	Banner Engineering Corp.			
Attendees:	Joel Jankord			
EUT Power:	24VDC			
Operating Mode:	Transmitting 24.125 GHz			
Deviations:	None			
Comments:	None			

Test Specifications	LP0002:2016	Test Method	ANSI C63.10:2013
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Run #	15	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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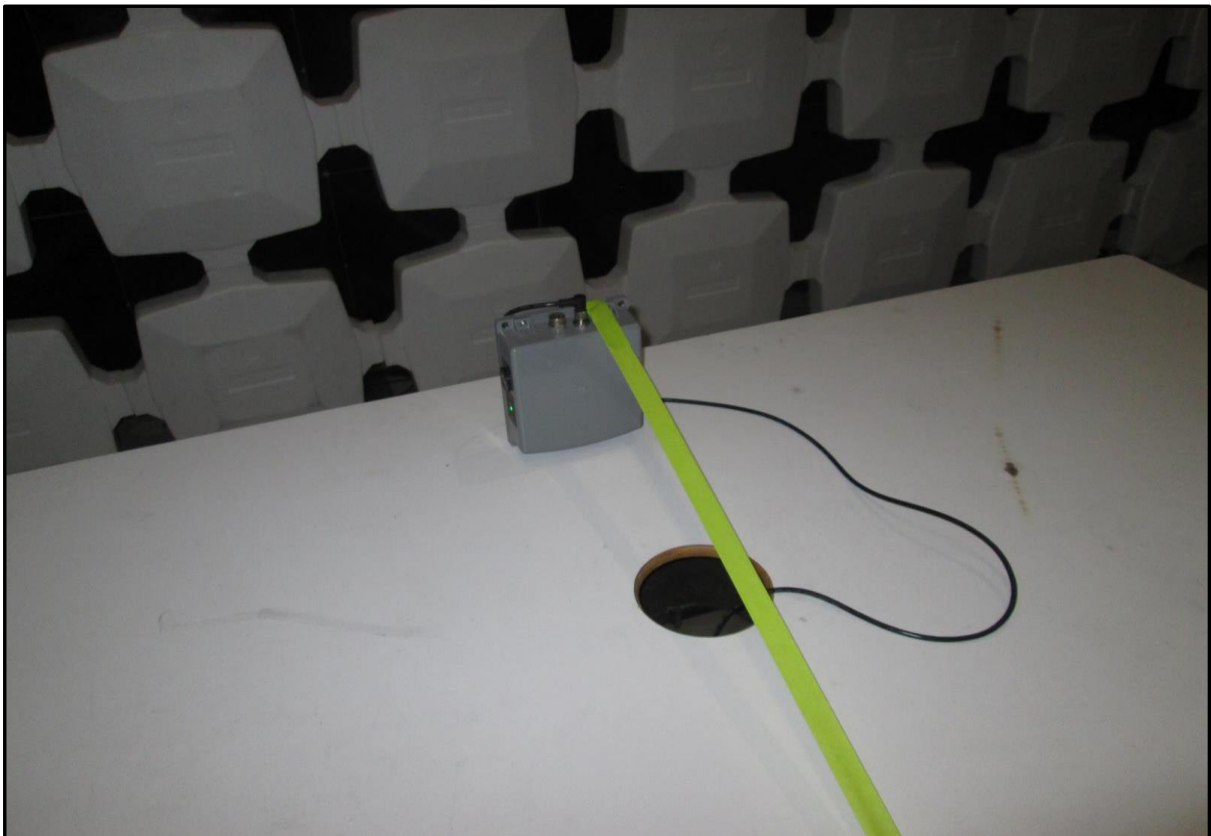
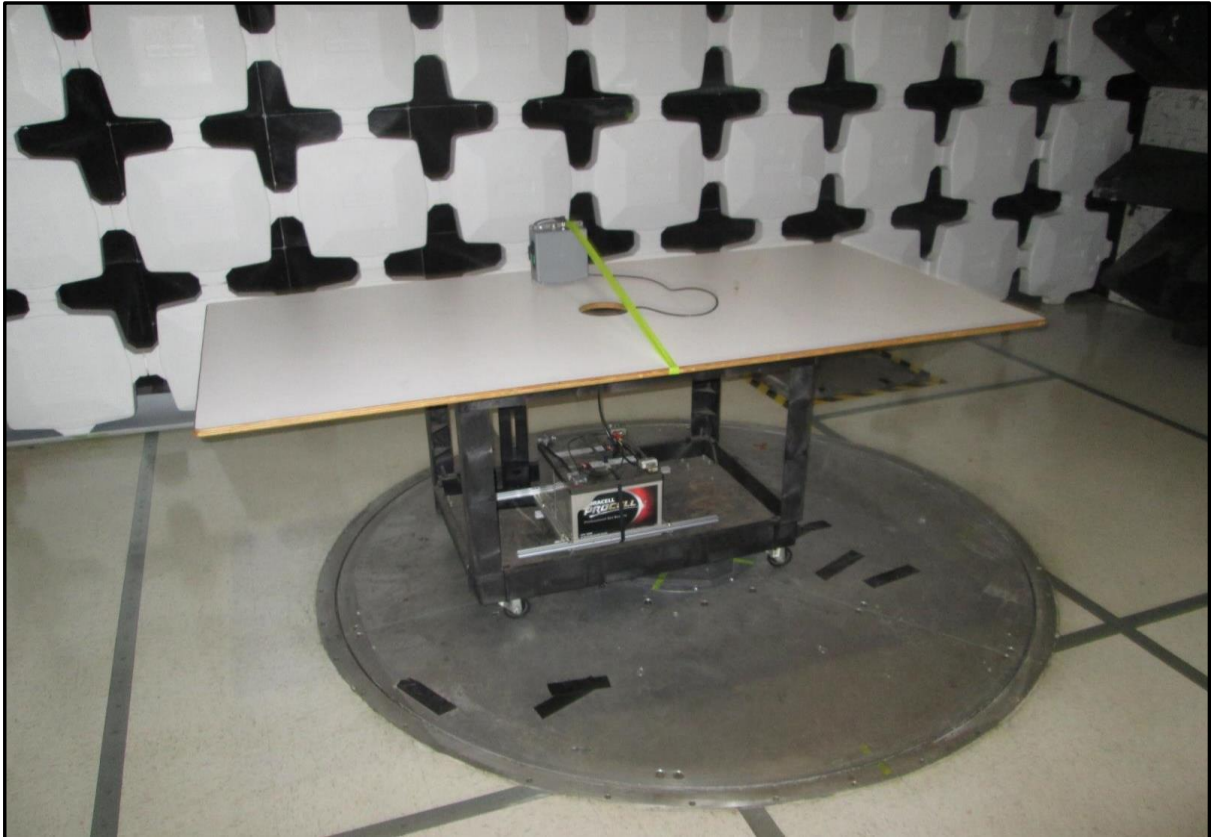


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
208.008	44.2	-4.8	1.7	116.1	3.0	0.0	Horz	QP	0.0	39.4	43.5	-4.1
336.136	40.7	-1.2	1.0	303.0	3.0	0.0	Horz	QP	0.0	39.5	46.0	-6.5
311.945	39.9	-1.4	1.0	300.9	3.0	0.0	Horz	QP	0.0	38.5	46.0	-7.5
328.070	39.6	-1.5	1.0	299.0	3.0	0.0	Horz	QP	0.0	38.1	46.0	-7.9
342.269	36.9	-1.1	1.0	315.9	3.0	0.0	Horz	QP	0.0	35.8	46.0	-10.2
358.536	35.2	-0.5	1.0	214.1	3.0	0.0	Horz	QP	0.0	34.7	46.0	-11.3

FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS BELOW 40GHz



PSA-ESCI 2017.06.01



FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS BELOW 40GHz



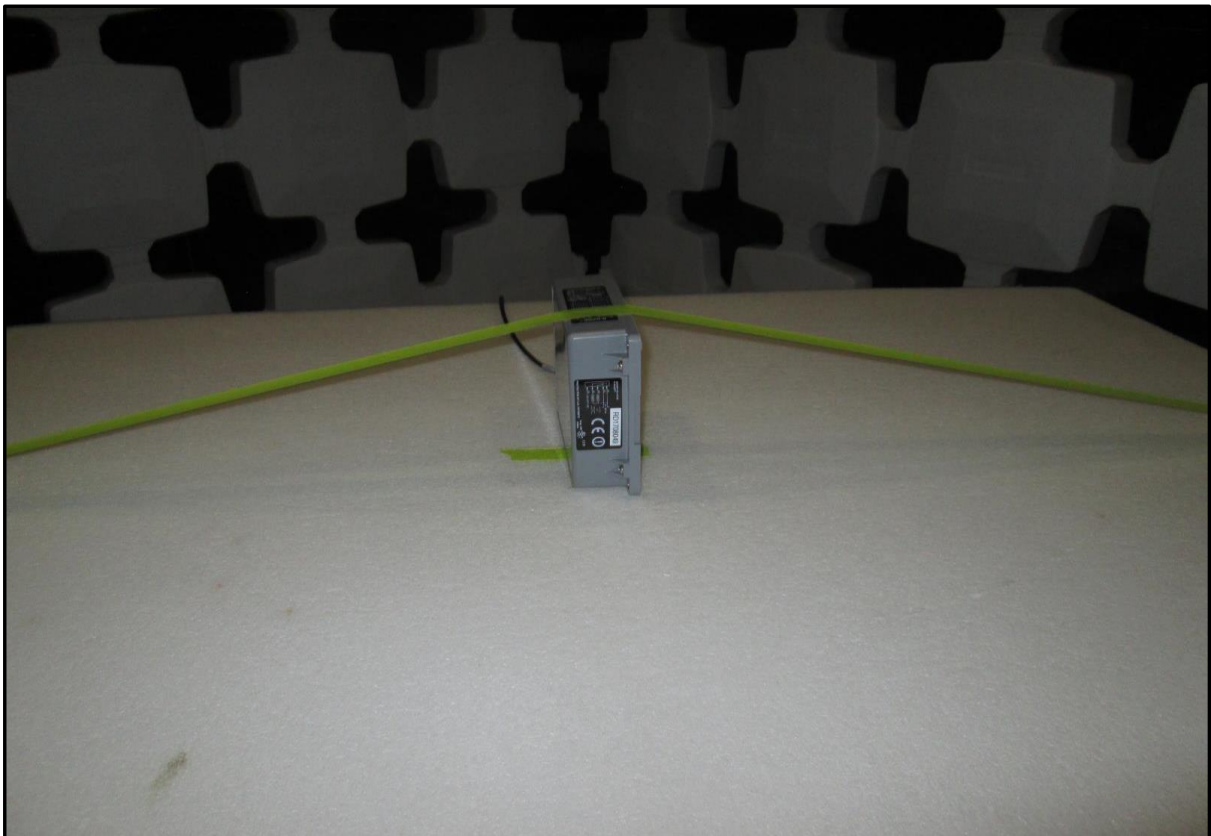
PSA-ESCI 2017.06.01



FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS BELOW 40GHz



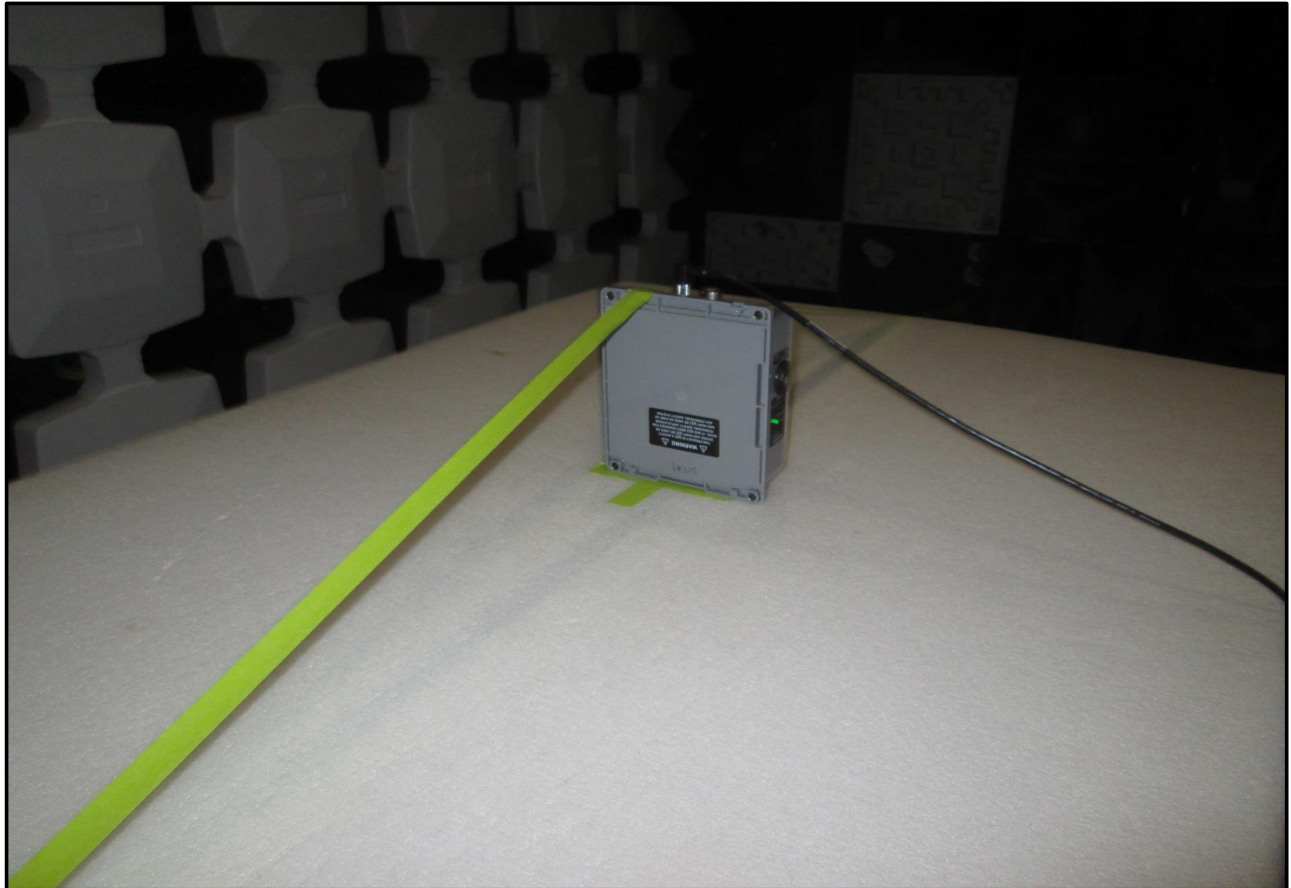
PSA-ESCI 2017.06.01



FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS BELOW 40GHz



PSA-ESCI 2017.06.01



FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS ABOVE 40GHz



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
Cable	Semplex, Inc.	S119BFSS100390443	SUN	NCR	NCR
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	1/6/2018
Antenna	OML, Inc.	M19HWAX	AIJ	8/25/2016	8/25/2019
Antenna	OML, Inc.	M12HWAX	AIK	8/25/2016	8/25/2019
Antenna	OML, Inc.	M08HWAX	AIL	8/25/2016	8/25/2019

TEST DESCRIPTION

The EUT was transmitting with an unmodulated carrier. The testing was done at distances closer than 3m as called out in the data sheets. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna orientation and polarization, and manipulating the EUT and EUT antenna in 3 orthogonal planes (per ANSI C63.10:2009). The specification limit was adjusted for the closer test distances at 20 dB per decade as called out in the following table:

Section 3.11.1.2	Spec limit 3m	Spec limit 20 cm	Spec limit 10 cm	Spec limit 5 cm	Spec limit 2 cm
Average	88	91.5	117.5	123.6	131.5
Peak	108	131.5	137.5	143.6	151.5

Section 2.8	Spec limit 3m	Spec limit 20 cm	Spec limit 10 cm	Spec limit 5 cm	Spec limit 2 cm
Average	54	77.5	83.5	89.6	97.5
Peak	74	97.5	103.5	109.6	117.5

The analyzer display was offset with the antenna factor per the following table. The Mixer/Duplexor/Cable calibration factor was loaded into the analyzer specific to each band.

Freq (MHz)	Antenna Gain (dBi)	Antenna Factor (dB/m)	Analyzer Offset (dB)
48320	24	39.89	39.89
72480	24	43.41	43.41
96640	24	45.91	45.91

FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS ABOVE 40GHz



XMM 2017.02.08

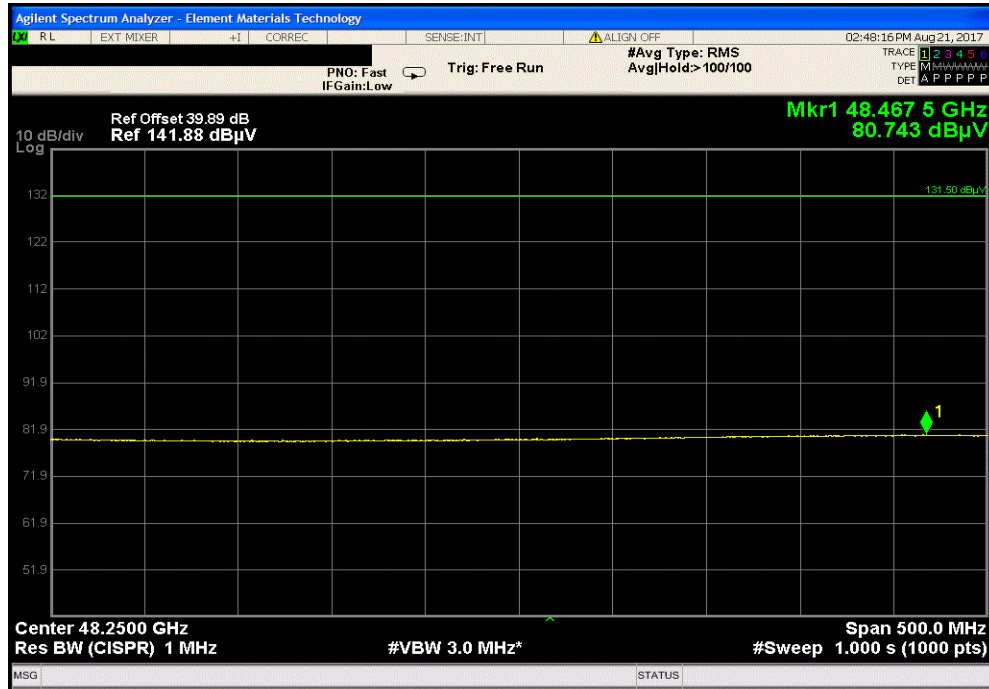
EUT: Q240RA Sensor		Work Order: BANN0162	
Serial Number: RD1708049		Date: 08/22/17	
Customer: Banner Engineering Corp.		Temperature: 22.4 °C	
Attendees: Joel Jankord		Humidity: 53% RH	
Project: None		Barometric Pres.: 1019 mbar	
Tested by: Trevor Buls, Chris Patterson		Power: 24VDC	
Job Site: MN05			
TEST SPECIFICATIONS			
LP0002:2016		Test Method	
		ANSI C63.10:2013	
COMMENTS			
Transmitting at 24.125 GHz			
All measurements taken at 2cm			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Trevor Buls</i>	
		PEAK Value (dBuV/m)	AVG Value (dBuV/m)
2nd Harmonic AVG		N/A	80.7
2nd Harmonic PEAK		95.7	N/A
3rd Harmonic AVG		N/A	80.7
3rd Harmonic PEAK		105.5	N/A
4th Harmonic AVG		N/A	91.2
4th Harmonic PEAK		103.3	N/A
		PEAK Limit (dBuV/m)	AVG Limit (dBuV/m)
		N/A	131.5
		151.5	N/A
		N/A	131.5
		151.5	N/A
		N/A	97.5
		117.5	N/A
			Results
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass

FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS ABOVE 40GHz

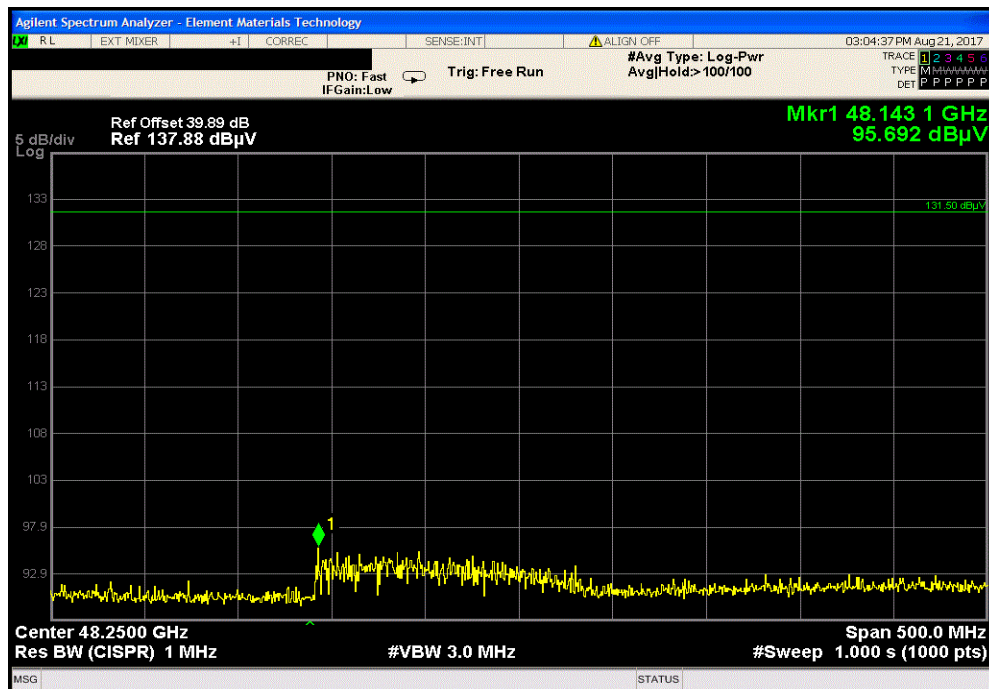


XMM 2017.02.08

2nd Harmonic AVG						
	PEAK Value (dBuV/m)	AVG Value (dBuV/m)	PEAK Limit (dBuV/m)	AVG Limit (dBuV/m)	Results	
	N/A	80.7	N/A	131.5	Pass	



2nd Harmonic PEAK						
	PEAK Value (dBuV/m)	AVG Value (dBuV/m)	PEAK Limit (dBuV/m)	AVG Limit (dBuV/m)	Results	
	95.7	N/A	151.5	N/A	Pass	

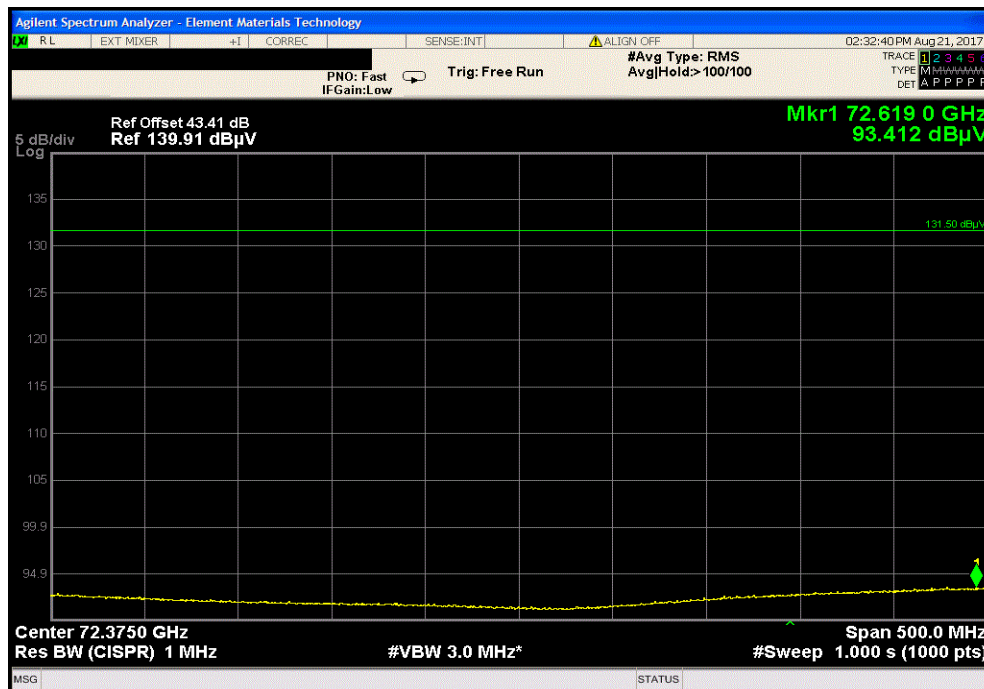


FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS ABOVE 40GHz

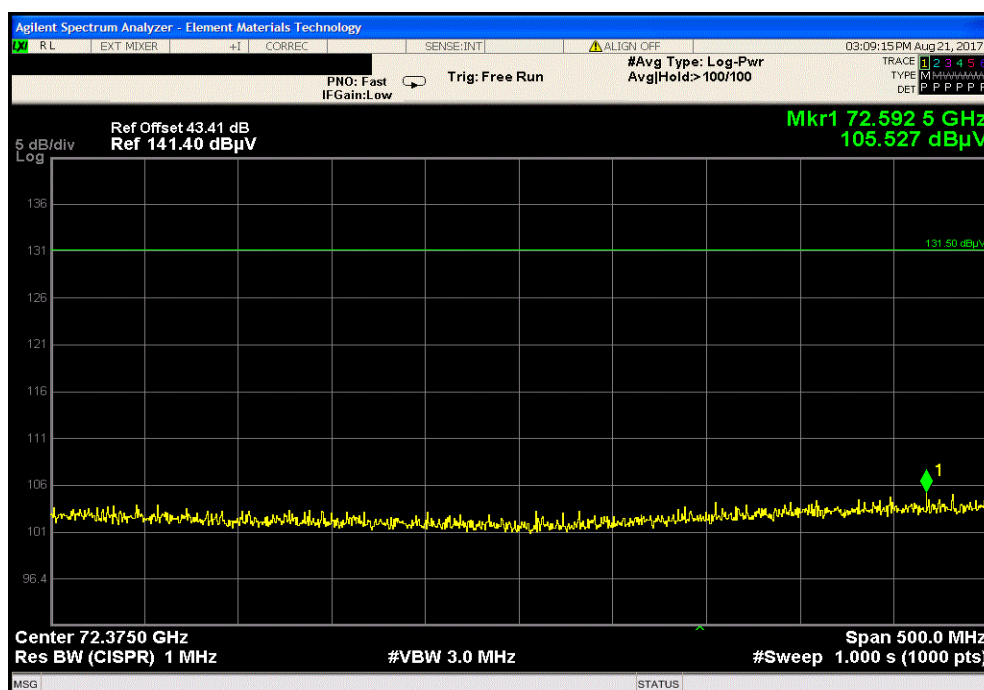


XMI 2017.02.08

3rd Harmonic AVG						
	PEAK Value (dBuV/m)	AVG Value (dBuV/m)	PEAK Limit (dBuV/m)	AVG Limit (dBuV/m)	Results	
	N/A	80.7	N/A	131.5	Pass	



3rd Harmonic PEAK						
	PEAK Value (dBuV/m)	AVG Value (dBuV/m)	PEAK Limit (dBuV/m)	AVG Limit (dBuV/m)	Results	
	105.5	N/A	151.5	N/A	Pass	

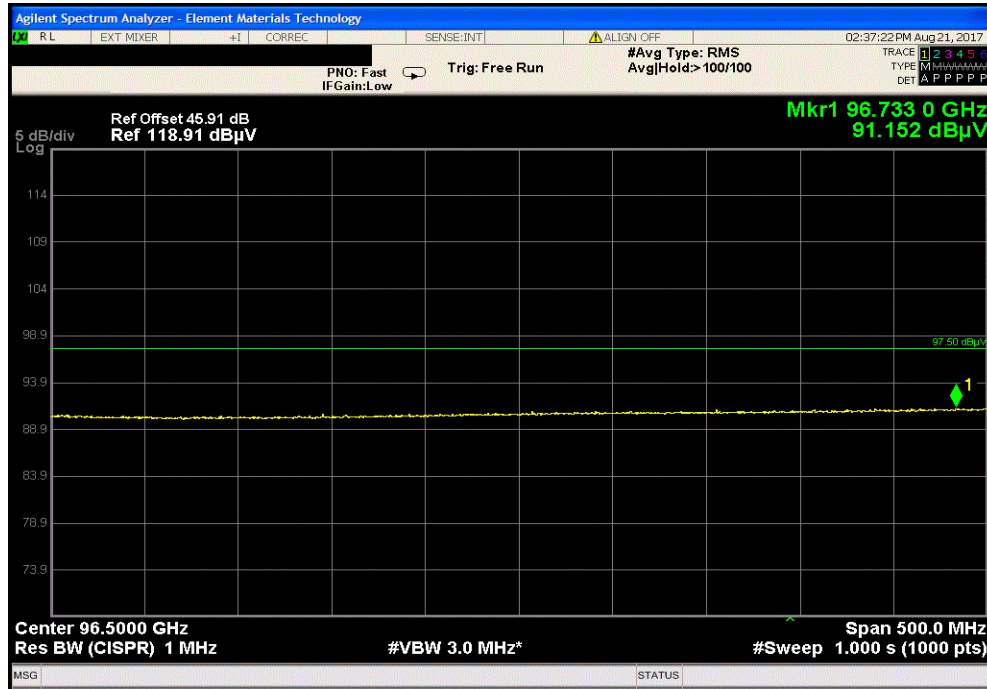


FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS ABOVE 40GHz

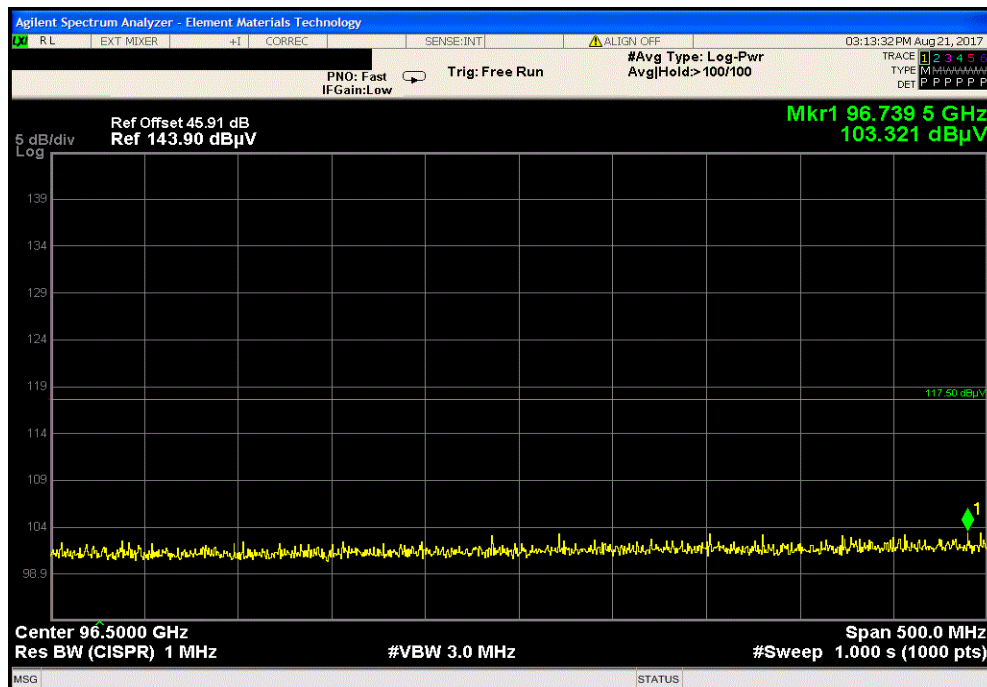


XMI 2017.02.08

4th Harmonic AVG						
	PEAK Value (dBuV/m)	AVG Value (dBuV/m)	PEAK Limit (dBuV/m)	AVG Limit (dBuV/m)	Results	
	N/A	91.2	N/A	97.5	Pass	



4th Harmonic PEAK						
	PEAK Value (dBuV/m)	AVG Value (dBuV/m)	PEAK Limit (dBuV/m)	AVG Limit (dBuV/m)	Results	
	103.3	N/A	117.5	N/A	Pass	



FIELD STRENGTH OF FUNDAMENTAL



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 24.125GHz

POWER SETTINGS INVESTIGATED

24VDC

CONFIGURATIONS INVESTIGATED

BANN0162 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency 24075 MHz

Stop Frequency 24175 MHz

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
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	9/15/2016	12 mo
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/15/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	0 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 antennas to be used with the EUT were tested. The EUT was transmitting and while set at the lowest channel, a middle channel, and the highest channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT and EUT antenna in 3 orthogonal planes.

FIELD STRENGTH OF FUNDAMENTAL



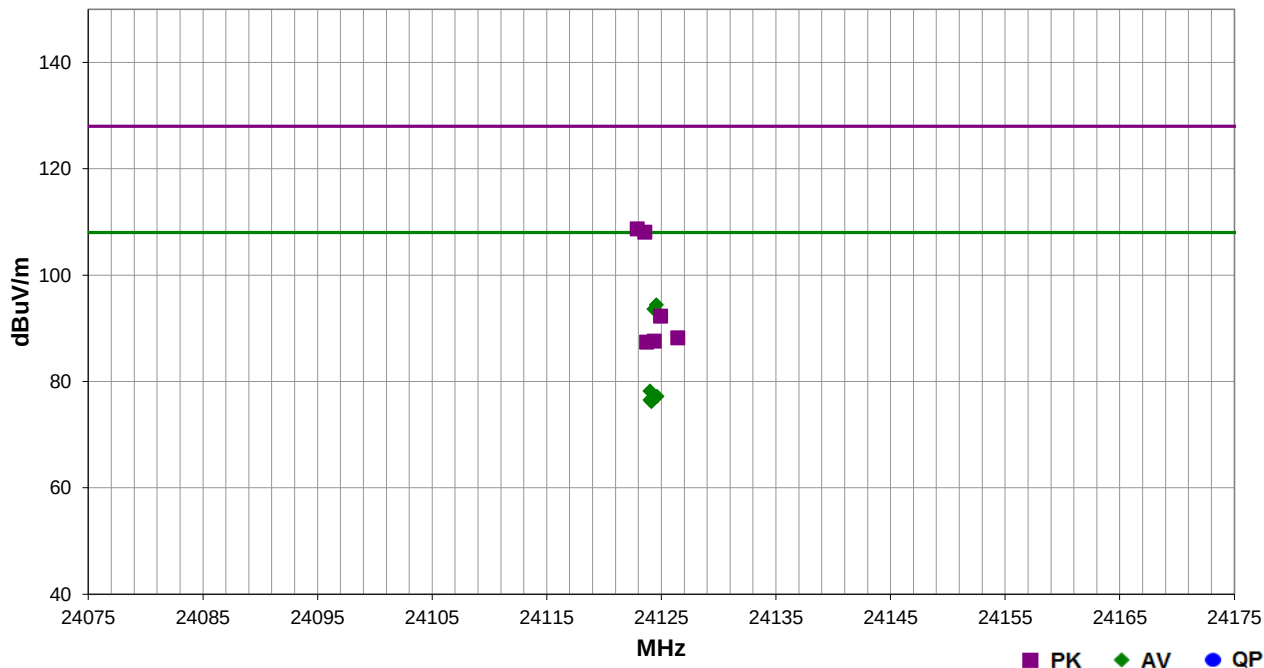
EmiRS 2017.07.11

PSA-ESCI 2017.06.01

Work Order:	BANN0162	Date:	08/21/17	<i>Trevor Buls</i>
Project:	None	Temperature:	22.5 °C	
Job Site:	MN05	Humidity:	59.5% RH	
Serial Number:	RD1708049	Barometric Pres.:	1020 mbar	Tested by: Trevor Buls, Chris Patterson
EUT:	Q240RA Sensor			
Configuration:	1			
Customer:	Banner Engineering Corp.			
Attendees:	Joel Jankord			
EUT Power:	24VDC			
Operating Mode:	Transmitting 24.125 GHz			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
LP0002:2016	ANSI C63.10:2013

Run #	5	Test Distance (m)	3	Antenna Height(s)	1 to 1.25(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
24124.580	45.4	49.0	1.8	264.0	3.0	0.0	Vert	AV	0.0	94.4	108.0	-13.6	EUT Vert
24124.350	44.6	49.0	1.5	358.9	3.0	0.0	Horz	AV	0.0	93.6	108.0	-14.4	EUT On Side
24122.890	59.7	49.0	1.5	71.0	3.0	0.0	Horz	PK	0.0	108.7	128.0	-19.3	EUT Vert
24123.550	59.1	49.0	1.8	333.9	3.0	0.0	Horz	PK	0.0	108.1	128.0	-19.9	EUT On Side
24124.020	29.2	49.0	1.8	358.9	3.0	0.0	Vert	AV	0.0	78.2	108.0	-29.8	EUT On Side
24124.620	28.2	49.0	1.8	268.0	3.0	0.0	Horz	AV	0.0	77.2	108.0	-30.8	EUT Vert
24124.020	27.5	49.0	1.8	137.1	3.0	0.0	Vert	AV	0.0	76.5	108.0	-31.5	EUT Horz
24124.140	27.2	49.0	1.8	276.9	3.0	0.0	Horz	AV	0.0	76.2	108.0	-31.8	EUT Horz
24124.930	43.3	49.0	2.0	333.9	3.0	0.0	Vert	PK	0.0	92.3	128.0	-35.7	EUT On Side
24126.440	39.2	49.0	1.8	232.1	3.0	0.0	Vert	PK	0.0	88.2	128.0	-39.8	EUT Vert
24124.370	38.6	49.0	1.8	101.1	3.0	0.0	Vert	PK	0.0	87.6	128.0	-40.4	EUT Horz
24123.720	38.4	49.0	1.8	274.0	3.0	0.0	Horz	PK	0.0	87.4	128.0	-40.6	EUT Horz

FIELD STRENGTH OF FUNDAMENTAL



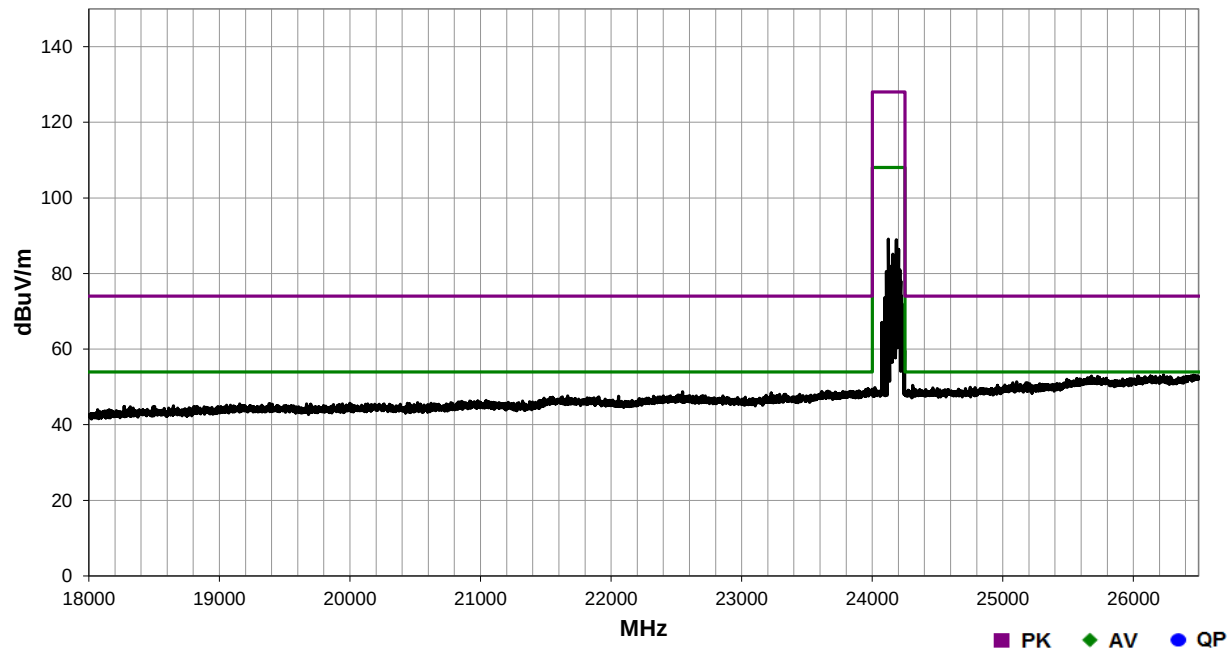
EmiRS 2017.07.11

PSA-ESCI 2017.06.01

Work Order:	BANN0162	Date:	08/21/17	FOR REFERENCE ONLY	
Project:	None	Temperature:	22.5 °C		
Job Site:	MN05	Humidity:	59.5% RH		
Serial Number:	RD1708049	Barometric Pres.:	1020 mbar		
EUT:	Q240R Sensor				
Configuration:	1				
Customer:	Banner Engineering Corp.				
Attendees:	Joel Jankord				
EUT Power:	24VDC				
Operating Mode:	Transmitting 24.125 GHz				
Deviations:	None				
Comments:	None				

Test Specifications	Test Method
LP0002:2016	ANSI C63.10:2013

Run #	8	Test Distance (m)	0.1	Antenna Height(s)	1.25 (m)	Results	Evaluation
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Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Antenna Height (meters)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
26230.220	31.1	0.0	1.2	40.5	11.1	0.0	Horz	PK	-29.5	53.2	54.0	-0.8
26473.020	30.6	0.0	1.2	40.5	11.4	0.0	Vert	PK	-29.5	53.0	54.0	-1.0
24310.670	30.8	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	50.4	54.0	-3.6
23966.190	30.2	0.0	1.2	40.4	8.5	0.0	Horz	PK	-29.5	49.6	54.0	-4.4
23968.260	30.0	0.0	1.2	40.4	8.5	0.0	Vert	PK	-29.5	49.4	54.0	-4.6
22546.750	30.4	0.0	1.2	40.4	7.4	0.0	Horz	PK	-29.5	48.7	54.0	-5.3
22512.510	29.6	0.0	1.2	40.4	7.4	0.0	Vert	PK	-29.5	47.9	54.0	-6.1
21666.870	29.8	0.0	1.2	40.3	7.0	0.0	Vert	PK	-29.5	47.6	54.0	-6.4
21906.560	29.6	0.0	1.2	40.3	7.0	0.0	Horz	PK	-29.5	47.4	54.0	-6.6
18503.230	28.0	0.0	1.2	40.2	6.1	0.0	Vert	PK	-29.5	44.8	54.0	-9.2
24123.900	69.6	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	89.1	108.0	-18.9
24184.080	69.4	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	88.9	108.0	-19.1
24201.720	66.8	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	86.4	108.0	-21.6
24157.100	65.6	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	85.1	108.0	-22.9
24141.540	62.4	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	81.9	108.0	-26.1
24164.370	61.6	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	81.1	108.0	-26.9

Freq (MHz)	Amplitude (dBuV)	Preamplifier (dB)	Antenna Height (meters)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
24211.060	61.4	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	81.0	108.0	-27.0
24187.190	61.1	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	80.6	108.0	-27.4
24109.380	61.0	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	80.5	108.0	-27.5
24203.800	59.2	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	78.8	108.0	-29.2
24174.740	59.0	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	78.5	108.0	-29.5
24218.320	58.4	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	78.0	108.0	-30.0
24125.980	58.4	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	77.9	108.0	-30.1
24214.170	57.9	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	77.5	108.0	-30.5
24148.800	57.6	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	77.1	108.0	-30.9
24144.650	56.7	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	76.2	108.0	-31.8
24214.170	56.2	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	75.8	108.0	-32.2
24207.950	55.7	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	75.3	108.0	-32.7
24203.800	54.9	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	74.5	108.0	-33.5
24162.290	54.9	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	74.4	108.0	-33.6
24208.980	54.7	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	74.3	108.0	-33.7
24220.400	54.5	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	74.1	108.0	-33.9
24205.870	54.5	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	74.1	108.0	-33.9
24119.750	54.3	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	73.8	108.0	-34.2
24137.390	54.3	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	73.8	108.0	-34.2
24168.520	54.3	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	73.8	108.0	-34.2
24180.970	54.2	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	73.7	108.0	-34.3
24095.890	54.1	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	73.6	108.0	-34.4
24165.410	53.5	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	73.0	108.0	-35.0
24195.500	52.9	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	72.5	108.0	-35.5
24150.880	52.9	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	72.4	108.0	-35.6
24168.520	52.8	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	72.3	108.0	-35.7
24103.150	52.7	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	72.2	108.0	-35.8
24227.660	52.4	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	72.0	108.0	-36.0
24114.560	51.7	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	71.2	108.0	-36.8
24195.500	51.6	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	71.2	108.0	-36.8
24128.050	51.5	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	71.0	108.0	-37.0
24189.270	51.3	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	70.9	108.0	-37.1
24197.570	51.0	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	70.6	108.0	-37.4
24161.250	50.6	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	70.1	108.0	-37.9
24176.820	50.5	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	70.0	108.0	-38.0
24231.810	50.3	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	69.9	108.0	-38.1
24159.180	50.3	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	69.8	108.0	-38.2
24130.130	49.9	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	69.4	108.0	-38.6
24105.220	49.8	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	69.3	108.0	-38.7
24101.070	49.7	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	69.2	108.0	-38.8
24142.580	48.7	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	68.2	108.0	-39.8
24238.040	48.6	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	68.2	108.0	-39.8
24095.890	48.5	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	68.0	108.0	-40.0
24143.620	47.7	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	67.2	108.0	-40.8
24185.120	47.7	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	67.2	108.0	-40.8
24074.100	47.6	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	67.1	108.0	-40.9
24220.400	47.3	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	66.9	108.0	-41.1
24201.720	46.8	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	66.4	108.0	-41.6
24125.980	46.7	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	66.2	108.0	-41.8
24091.740	46.4	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	65.9	108.0	-42.1
24149.840	46.0	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	65.5	108.0	-42.5
24232.850	45.7	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	65.3	108.0	-42.7
24105.220	45.7	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	65.2	108.0	-42.8
24245.300	45.2	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	64.8	108.0	-43.2
24153.990	44.9	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	64.4	108.0	-43.6
24173.710	44.8	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	64.3	108.0	-43.7
24233.890	44.6	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	64.2	108.0	-43.8
24130.130	44.2	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	63.7	108.0	-44.3
24147.770	44.2	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	63.7	108.0	-44.3
24156.070	44.0	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	63.5	108.0	-44.5
24118.710	43.7	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	63.2	108.0	-44.8
24138.430	43.7	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	63.2	108.0	-44.8
24086.550	43.6	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	63.1	108.0	-44.9
24134.280	43.4	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	62.9	108.0	-45.1
24134.280	43.0	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	62.5	108.0	-45.5
24222.470	42.9	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	62.5	108.0	-45.5
24158.140	42.6	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	62.1	108.0	-45.9
24116.640	41.8	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	61.3	108.0	-46.7
24074.100	41.0	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	60.5	108.0	-47.5
24224.550	40.9	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	60.5	108.0	-47.5
24136.350	40.3	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	59.8	108.0	-48.2
24114.560	40.2	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	59.7	108.0	-48.3
24081.360	40.1	0.0	1.2	40.4	8.6	0.0	Horz	PK	-29.5	59.6	108.0	-48.4
24247.380	40.0	0.0	1.2	40.4	8.7	0.0	Horz	PK	-29.5	59.6	108.0	-48.4
24102.110	40.1	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	59.6	108.0	-48.4
24234.920	40.0	0.0	1.2	40.4	8.7	0.0	Vert	PK	-29.5	59.6	108.0	-48.4
24091.740	39.5	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	59.0	108.0	-49.0
24089.660	38.0	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	57.5	108.0	-50.5
24110.410	37.1	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	56.6	108.0	-51.4
24108.340	33.9	0.0	1.2	40.4	8.6	0.0	Vert	PK	-29.5	53.4	108.0	-54.6

FIELD STRENGTH OF FUNDAMENTAL



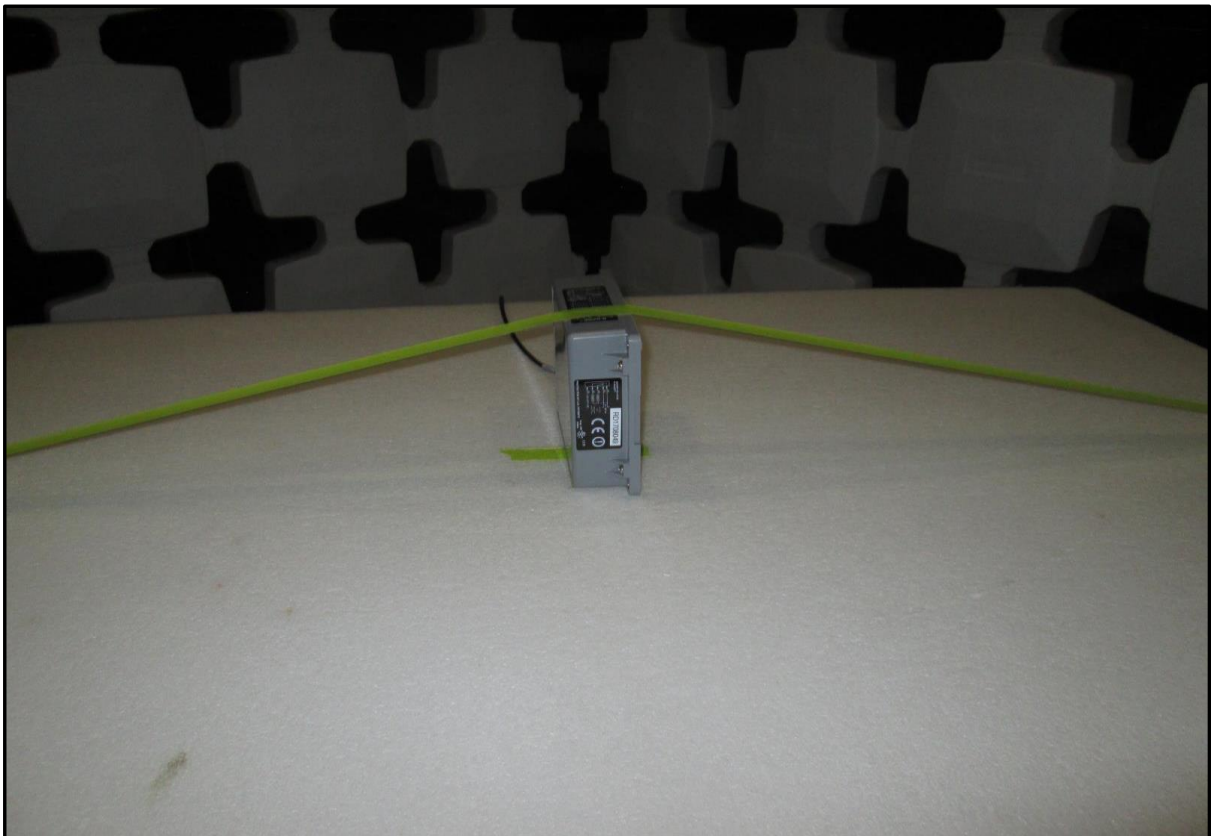
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