

# Impinj Inc.

REVISED TEST REPORT TO 106101-3

Impinj R510 RAIN RFID Reader  
Model: IPJ-R510-341

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247  
(FHSS 902-928MHz)

Report No.: 106101-3A

Date of issue: February 2, 2022



Test Certificate # 803.01

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

Impinj Inc.  
400 Fairview Ave N, Suite 1200  
Seattle, WA 98109

Representative: Greg Robinson  
Customer Reference Number: P002949

**DATE OF EQUIPMENT RECEIPT:**

**DATE(S) OF TESTING:**

**REPORT PREPARED BY:**

Dianne Dudley  
CKC Laboratories, Inc.  
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Mariposa, CA 95338

Project Number: 106101

November 24, 2021

November 24 and 29, 2021

December 1, 2021

### Revision History

**Original:** Testing of the Impinj R510 RAIN RFID Reader Model: IPJ-R510-341 to 15.207 & 15.247 (FHSS 902-928MHz).

**Revision A:** To replace Section 15.247(d) Radiated Spurious Emissions test data.

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



**Steve Behm**  
*Director of Quality Assurance & Engineering Services*  
*CKC Laboratories, Inc.*

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
Canyon Park  
22116 23rd Drive S.E., Suite A  
Bothell, WA 98021

## Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.20

## Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	A-0136

\*CKC's list of NIST designated countries can be found at: <https://standards.gov/cabs/designations.html>

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part 15 Subpart C - 15.247 (FHSS 902-928MHz)

Test Procedure	Description	Modifications	Results
15.247(a)(1)	Occupied Bandwidth	NA	PASS
15.247(a)(1)	Carrier Separation	NA	PASS
15.247(a)(1)(iii)	Number of Hopping Channels	NA	PASS
15.247(a)(1)(iii)	Average Time of Occupancy	NA	PASS
15.247(b)(2)	Output Power	NA	PASS
15.247(d)	RF Conducted Emissions & Band Edge	NA	PASS
15.247(d)	Radiated Emissions & Band Edge	NA	PASS
15.207	AC Conducted Emissions	NA	PASS

NA = Not Applicable

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

### Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

**Modifications listed above must be incorporated into all production units.**

### Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
Note 1: Configuration 6 uses Port 1 and Port 2. At time of test the manufacturer declared the EUT ports to be identical, however, they did not declare this on the 2 ports on the antenna, so both of those ports were investigated/tested.
Note 2: *Configuration 7 = Tested with Minimum cable length specified by manufacturer.

## EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

### Configuration 1

**Equipment Under Test:**

Device	Manufacturer	Model #	S/N
Impinj R510 RAIN RFID Reader	Impinj, Inc.	IPJ-R510-341	37021420179
Antenna (Circular Polarized)	Laird	S9028PCLJ	NA
Manufacturers Declared Cable	Beldin	RG-58 A/U (4.8m)	NA

**Support Equipment:**

Device	Manufacturer	Model #	S/N
POE Injector	Phihong	POE29zu-1AT(PL)	NA
Ethernet switch	Belkin	F5D7230-4	20828723009696
Laptop	HP	EliteBook 840	TDAP5ZSF42IHC
Laptop PSU	NA	SK90185350	SMJGLJ19459
Mouse	Logitech	M310	1542LZ0RJ8V8

### Configuration 2

**Equipment Under Test:**

Device	Manufacturer	Model #	S/N
Impinj R510 RAIN RFID Reader	Impinj, Inc.	IPJ-R510-341	37021420179
Antenna (Mini-Guardrail)	Impinj, Inc.	A0303	Lot 1708
Manufacturers Declared Cable	Beldin	RG-58 A/U (4.8m)	NA

**Support Equipment:**

Device	Manufacturer	Model #	S/N
POE Injector	Phihong	POE29zu-1AT(PL)	NA
Ethernet switch	Belkin	F5D7230-4	20828723009696
Laptop	HP	EliteBook 840	TDAP5ZSF42IHC
Laptop PSU	NA	SK90185350	SMJGLJ19459
Mouse	Logitech	M310	1542LZ0RJ8V8

### Configuration 3

**Equipment Under Test:**

Device	Manufacturer	Model #	S/N
Impinj R510 RAIN RFID Reader	Impinj, Inc.	IPJ-R510-341	37021420179
Antenna (RFID Near-Field Reader)	Convergence System Limited	CS777-2 Brickyard	V251452001505

**Support Equipment:**

Device	Manufacturer	Model #	S/N
POE Injector	Phihong	POE29zu-1AT(PL)	NA
Ethernet switch	Belkin	F5D7230-4	20828723009696
Laptop	HP	EliteBook 840	TDAP5ZSF42IHC
Laptop PSU	NA	SK90185350	SMJGLJ19459
Mouse	Logitech	M310	1542LZ0RJ8V8

## Configuration 4

### Equipment Under Test:

Device	Manufacturer	Model #	S/N
Impinj R510 RAIN RFID Reader	Impinj, Inc.	IPJ-R510-341	37021420179
Antenna (Matchbox)	Impinj, Inc.	A0404	Lot 1709

### Support Equipment:

Device	Manufacturer	Model #	S/N
POE Injector	Phihong	POE29zu-1AT(PL)	NA
Ethernet switch	Belkin	F5D7230-4	20828723009696
Laptop	HP	EliteBook 840	TDAP5ZSF42IHC
Laptop PSU	NA	SK90185350	SMJGLJ19459
Mouse	Logitech	M310	1542LZ0RJ8V8

## Configuration 5

### Equipment Under Test:

Device	Manufacturer	Model #	S/N
Impinj R510 RAIN RFID Reader	Impinj, Inc.	IPJ-R510-341	37021420179
Antenna (Threshold)	Impinj, Inc.	A0311 USA	Lot 1712

### Support Equipment:

Device	Manufacturer	Model #	S/N
POE Injector	Phihong	POE29zu-1AT(PL)	NA
Ethernet switch	Belkin	F5D7230-4	20828723009696
Laptop	HP	EliteBook 840	TDAP5ZSF42IHC
Laptop PSU	NA	SK90185350	SMJGLJ19459
Mouse	Logitech	M310	1542LZ0RJ8V8

## Configuration 6

### Equipment Under Test:

Device	Manufacturer	Model #	S/N
Impinj R510 RAIN RFID Reader	Impinj, Inc.	IPJ-R510-341	37021420179
Antenna (Guardwall)	Impinj, Inc.	A0402USA	Lot 1709

### Support Equipment:

Device	Manufacturer	Model #	S/N
POE Injector	Phihong	POE29zu-1AT(PL)	NA
Ethernet switch	Belkin	F5D7230-4	20828723009696
Laptop	HP	EliteBook 840	TDAP5ZSF42IHC
Laptop PSU	NA	SK90185350	SMJGLJ19459
Mouse	Logitech	M310	1542LZ0RJ8V8

### Configuration 7

**Equipment Under Test:**

Device	Manufacturer	Model #	S/N
Impinj R510 RAIN RFID Reader	Impinj, Inc.	IPJ-R510-341	37021420179
Manufacturers Declared Cable	Beldin	RG-58 A/U (4.8m)	NA

**Support Equipment:**

Device	Manufacturer	Model #	S/N
POE Injector	Phihong	POE29zu-1AT(PL)	NA
Ethernet switch	Belkin	F5D7230-4	20828723009696
Laptop	HP	EliteBook 840	TDAP5ZSF42IHC
Laptop PSU	NA	SK90185350	SMJGLJ19459
Mouse	Logitech	M310	1542LZ0RJ8V8

### Configuration 8

**Equipment Under Test:**

Device	Manufacturer	Model #	S/N
Impinj R510 RAIN RFID Reader	Impinj, Inc.	IPJ-R510-341	37021420179

**Support Equipment:**

Device	Manufacturer	Model #	S/N
POE Injector	Phihong	POE29zu-1AT(PL)	NA
Ethernet switch	Belkin	F5D7230-4	20828723009696
Laptop	HP	EliteBook 840	TDAP5ZSF42IHC
Laptop PSU	NA	SK90185350	SMJGLJ19459
Mouse	Logitech	M310	1542LZ0RJ8V8



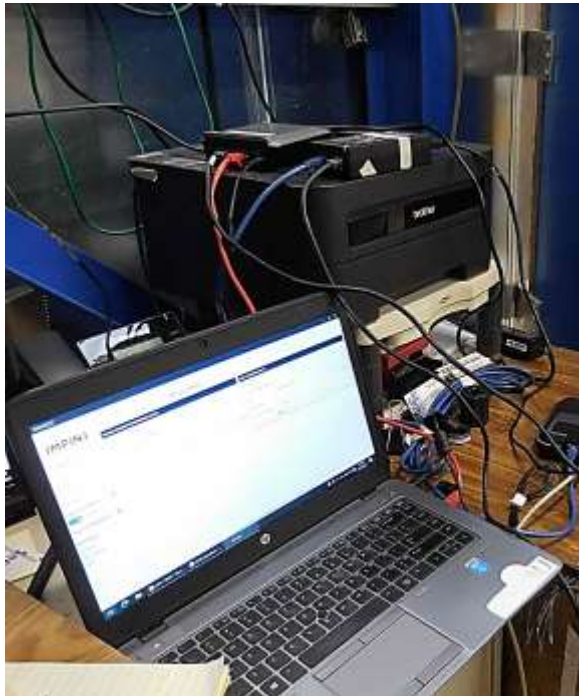
## General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Operating Frequency Range:	902.75-927.25 MHz
Number of Hopping Channels:	50
Receiver Bandwidth and Synchronization:	The manufacturer declares the receiver input bandwidth matches the transmit channel bandwidth and shifts frequencies in synchronization with the transmitter.
Modulation Type(s):	ASK
Maximum Duty Cycle:	Tested 100% as worst case
Number of TX Chains:	1
Antenna Type(s) and Gain:	Mini-Guardrail / -20dBi Circular Polarized / +9dBiC RFID Near-Field Reader / +2dBi Matchbox / -20dBi Threshold / +6dBi Guardwall / +6dBi
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	48VDC
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

## EUT Photo(s)

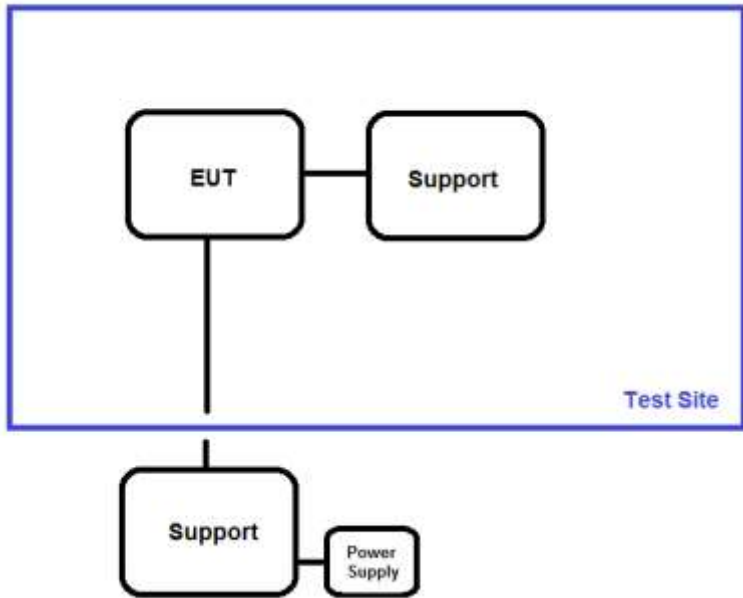


**Support Equipment Photo(s)**

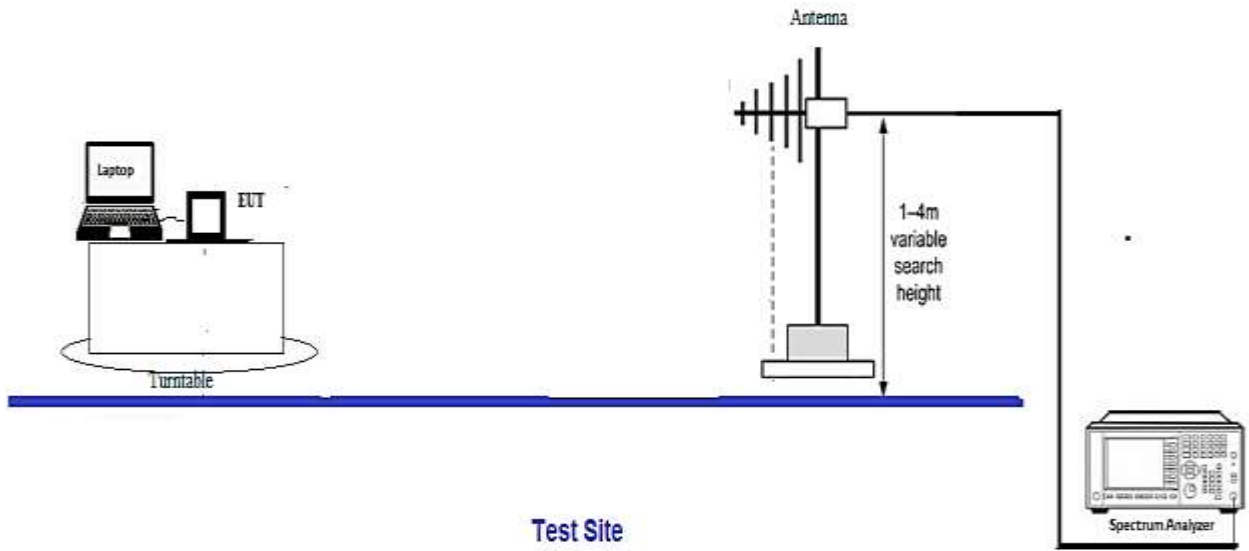


**Block Diagram of Test Setup(s)**

**Test Setup Block Diagram**



Radiated test setup



# FCC Part 15 Subpart C

## 15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/29/2021
Configuration:	7 & 8		
Test Setup:	Duty Cycle: 100% (Test Mode)  Test Mode: Continuously transmitting Test Setup: EUT is transmitting through the antenna port connector and is attached to the spectrum analyzer, insertion loss of other equipment is accounted for and programmed into the Spectrum Analyzer.		

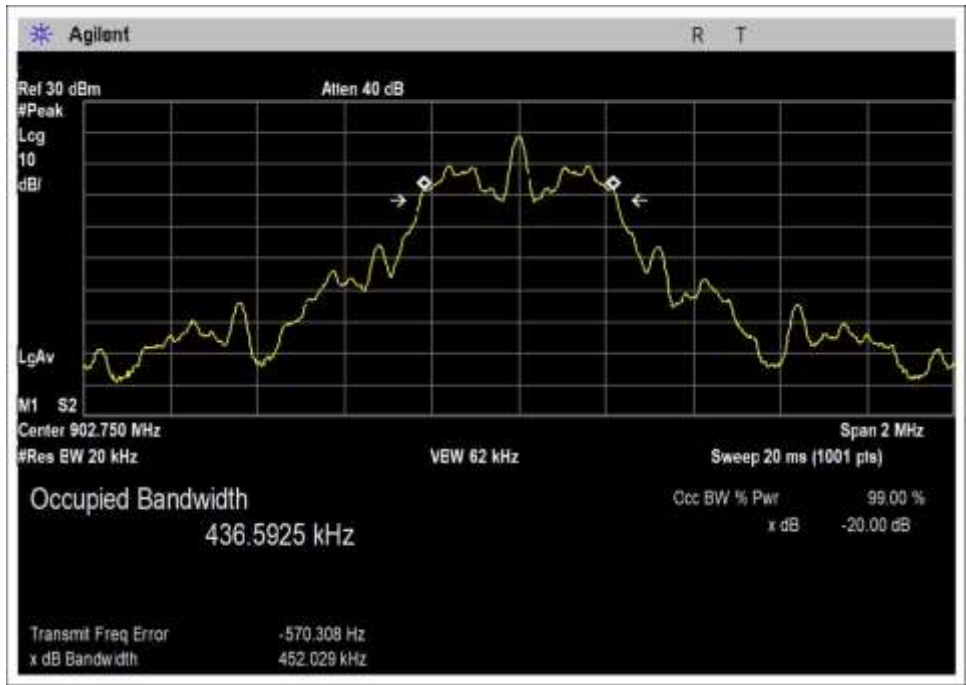
Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	56

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02673	Spectrum Analyzer	Agilent	E4446A	2/3/2021	2/3/2023
P05503	Attenuator	Narda	766-10	6/8/2021	6/8/2023

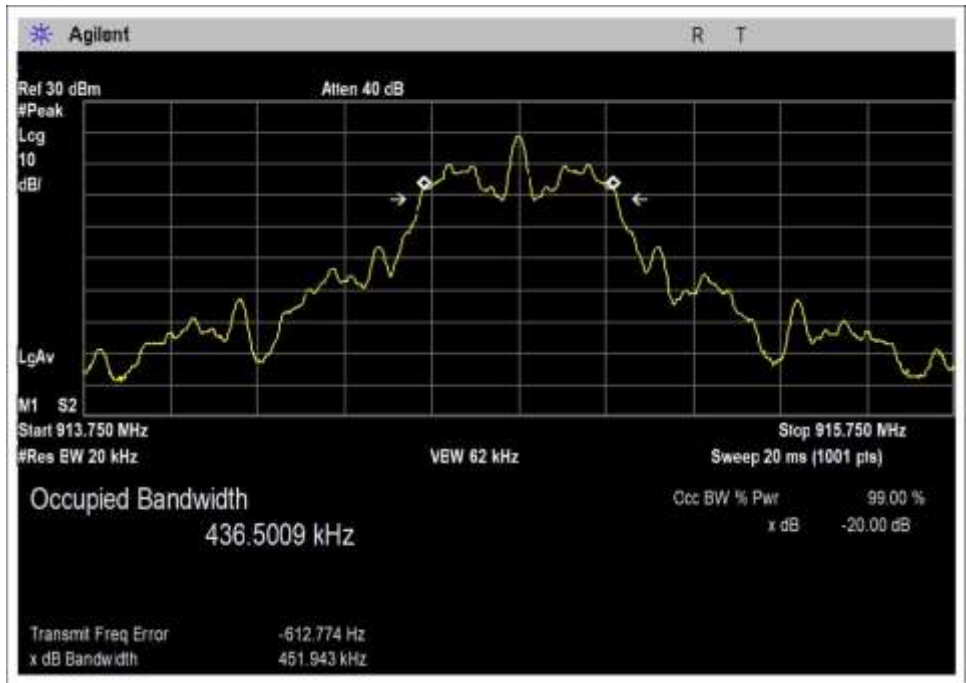
### 15.247(a)(1) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.75	1	ASK	452	≤500	Pass
914.75	1	ASK	452	≤500	Pass
927.25	1	ASK	452	≤500	Pass

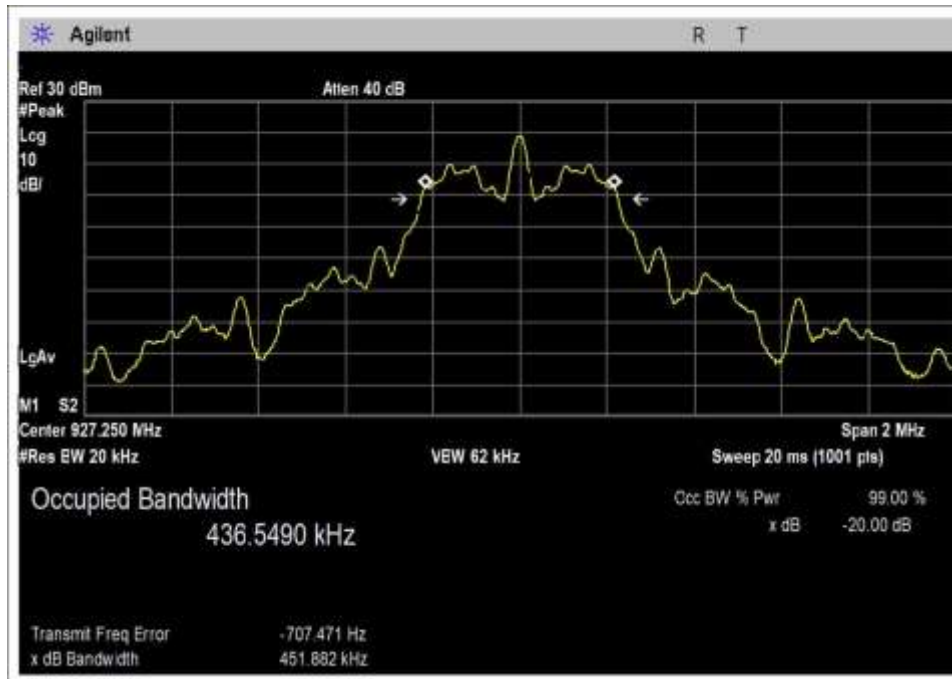
**Plot(s)**



Low Channel



Middle Channel

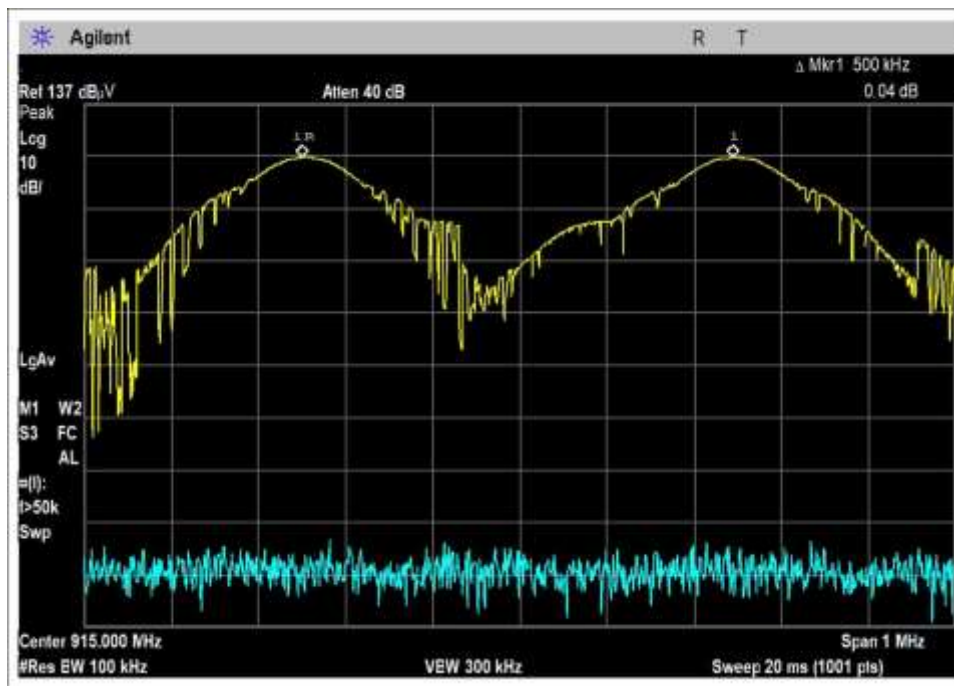


High Channel

### 15.247(a)(1) Carrier Separation

Test Data Summary				
Limit applied: minimum 25kHz.				
Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	Hopping	500	>25	Pass

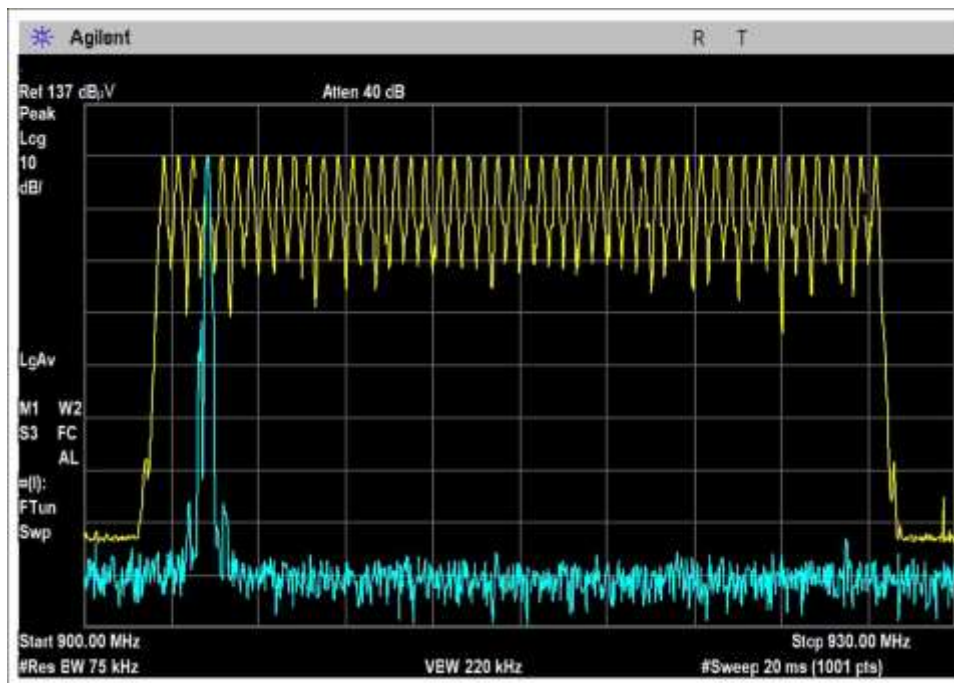
### Plot(s)



### 15.247(a)(1)(iii) Number of Hopping Channels

Test Data Summary				
$Limit = \begin{cases} 50 \text{ Channels} &   20 \text{ dB BW} < 250\text{kHz} \\ 25 \text{ Channels} &   20 \text{ dB BW} \geq 250\text{kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
1	Hopping	50	$\geq 25$	Pass

### Plot(s)





### 15.247(a)(1)(iii) Time of Occupancy

Test Data Summary				
Observation Period, P <sub>obs</sub> is derived from the following: $P_{obs} = \begin{cases} 20 \text{ Seconds} &   20 \text{ dB BW} < 250\text{kHz} \\ 10 \text{ Seconds} &   20 \text{ dB BW} \geq 250\text{kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (ms)	Limit (ms/P <sub>obs</sub> )	Results
1	Hopping	106.8	≤400	Pass

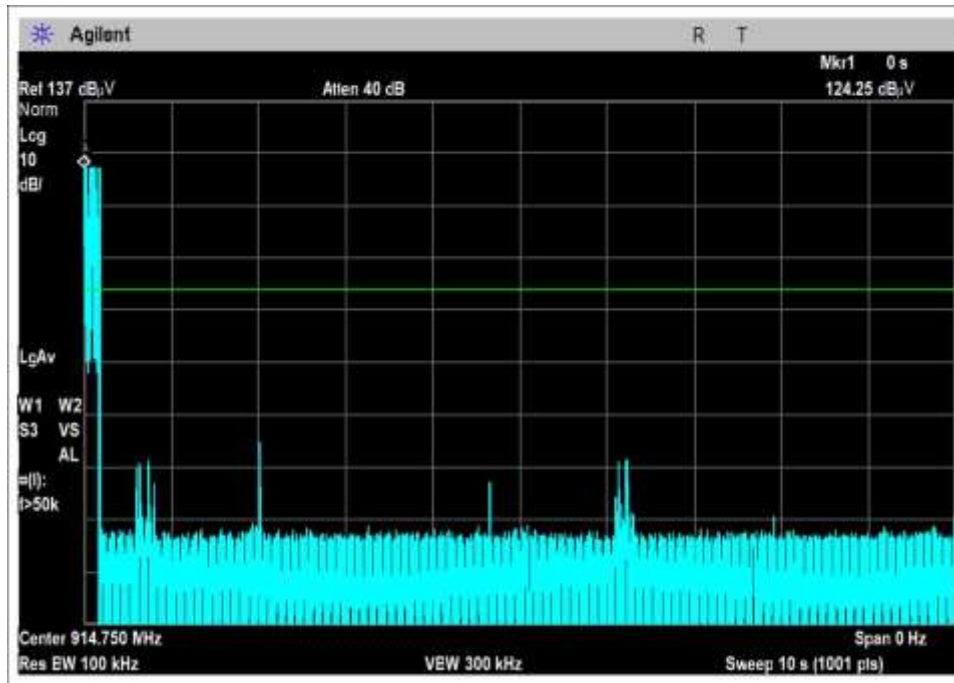
Measured results are calculated as follows:

$$Dwell\ time = \left( \sum_{Bursts} RF\ Burst\ On\ Time + \sum_{Control} Control\ Signal\ On\ time \right) \Big|_{P_{obs}}$$

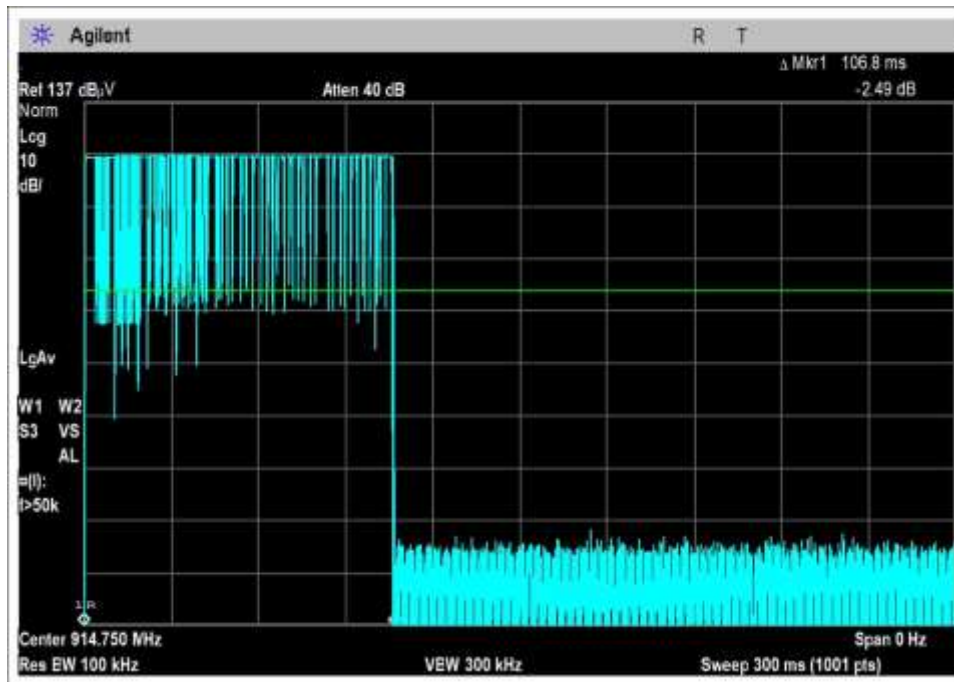
Actual Calculated Values:

Parameter	Value
Observation Period (P <sub>obs</sub> ):	10s
Number of RF Bursts / P <sub>obs</sub> :	1
On time of RF Burst:	106.8mS
Number of Control or other signals / P <sub>obs</sub> :	0
On time of Control or other Signals:	0
Total Measured On Time:	106.8mS

Plot(s)

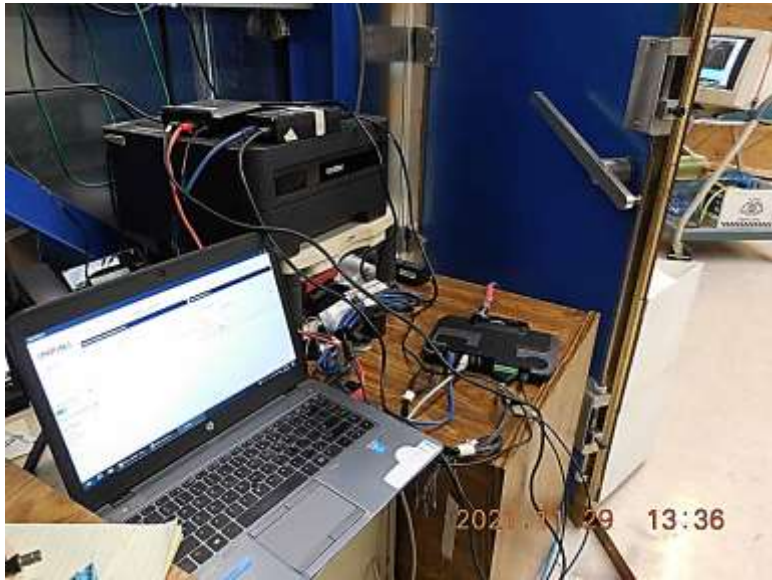


10s



Pulse

**Test Setup Photo(s)**



## 15.247(b)(1) Output Power

Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013)	Test Date(s):	11/29/2021
Configurations:	7 & 8		
Test Setup:	Duty Cycle: 100% (Test Mode)  Test Mode: Continuously transmitting  Test Setup: EUT is transmitting through the antenna port connector and is attached to the spectrum analyzer, insertion loss of other equipment is accounted for and programmed into the Spectrum Analyzer.  *Configuration 7 = Tested with Minimum cable length specified by manufacturer.		

Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	56

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02673	Spectrum Analyzer	Agilent	E4446A	2/3/2021	2/3/2023
P05503	Attenuator	Narda	766-10	6/8/2021	6/8/2023

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V <sub>Minimum</sub> (dBm)	V <sub>Nominal</sub> (dBm)	V <sub>Maximum</sub> (dBm)	Max Deviation from V <sub>Nominal</sub> (dB)
902.75	ASK / 1	29.8	29.9	29.9	0.1
914.75	ASK / 1	29.9	29.9	29.9	0.1
927.25	ASK / 1	29.8	29.8	29.8	0.0

Test performed using operational mode with the highest output power, representing worst case.

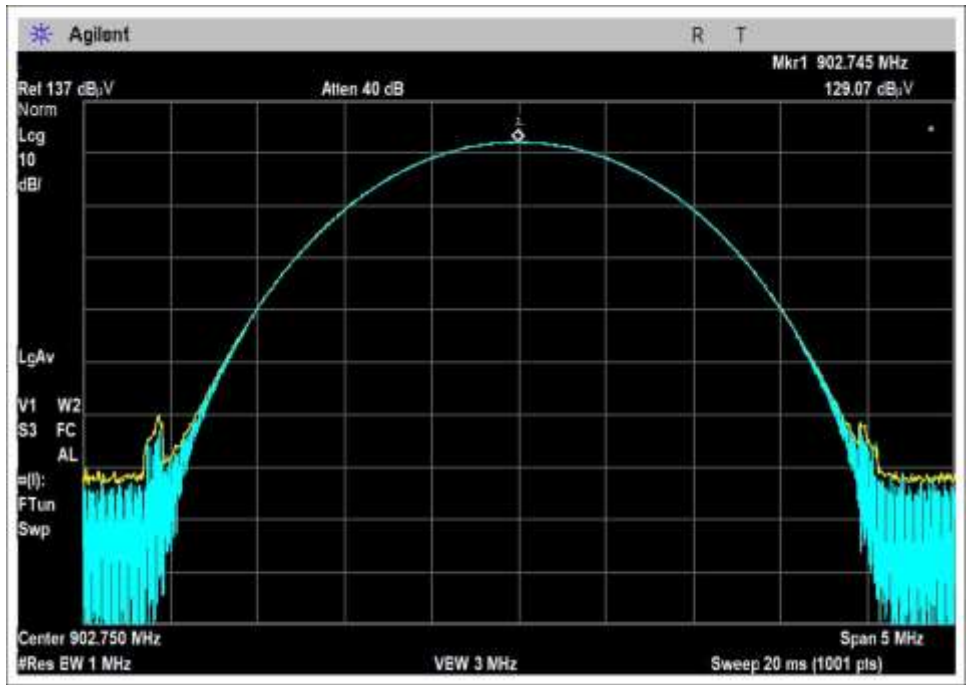
### **Parameter Definitions:**

Measurements performed at input voltage V<sub>Nominal</sub> ± 15%.

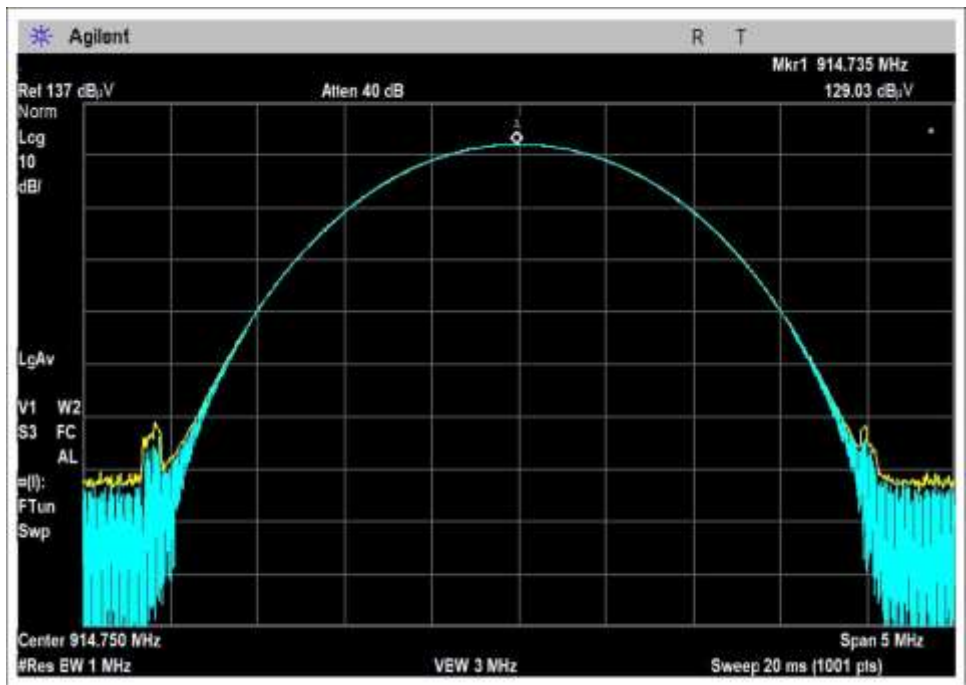
Parameter	Value
V <sub>Nominal</sub> :	115
V <sub>Minimum</sub> :	97
V <sub>Maximum</sub> :	132

Test Data Summary - RF Conducted Measurement					
$\text{Limit} = \begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} &   \geq 50 \text{ Channels} \\ 24\text{dBm Conducted}/30\text{dBm EIRP} &   < 50 \text{ Channels (min 25)} \end{cases}$					
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.75	ASK	Circular Polarized / +9dBiC (+6dBi)	29.8	≤30	Pass
914.75	ASK	Circular Polarized / +9dBiC (+6dBi)	29.7	≤30	Pass
927.25	ASK	Circular Polarized / +9dBiC (+6dBi)	29.8	≤30	Pass
902.75	ASK	Mini-Guardrail / -20dBi	29.8	≤30	Pass
914.75	ASK	Mini-Guardrail / -20dBi	29.7	≤30	Pass
927.25	ASK	Mini-Guardrail / -20dBi	29.8	≤30	Pass
902.75	ASK	RFID Near-Field Reader / +2dBi	29.9	≤30	Pass
914.75	ASK	RFID Near-Field Reader / +2dBi	29.9	≤30	Pass
927.25	ASK	RFID Near-Field Reader / +2dBi	29.6	≤30	Pass
902.75	ASK	Matchbox / -20dBi	29.9	≤30	Pass
914.75	ASK	Matchbox / -20dBi	29.9	≤30	Pass
927.25	ASK	Matchbox / -20dBi	29.6	≤30	Pass
902.75	ASK	Threshold / +6dBi	29.9	≤30	Pass
914.75	ASK	Threshold / +6dBi	29.9	≤30	Pass
927.25	ASK	Threshold / +6dBi	29.6	≤30	Pass
902.75	ASK	Guardwall / +6dBi	29.9	≤30	Pass
914.75	ASK	Guardwall / +6dBi	29.9	≤30	Pass
927.25	ASK	Guardwall / +6dBi	29.6	≤30	Pass

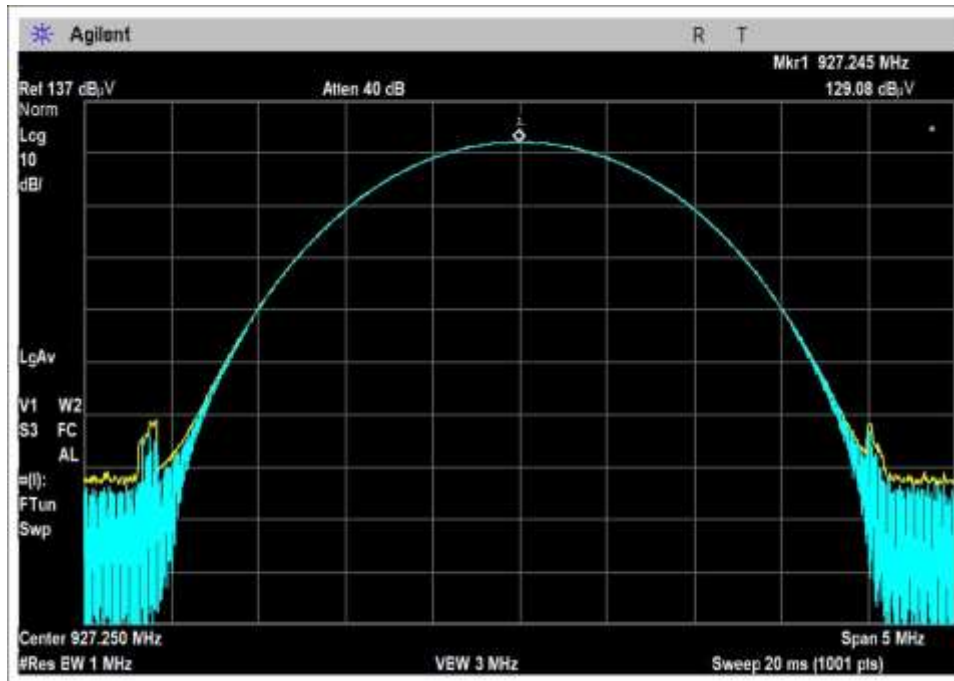
**Plots**



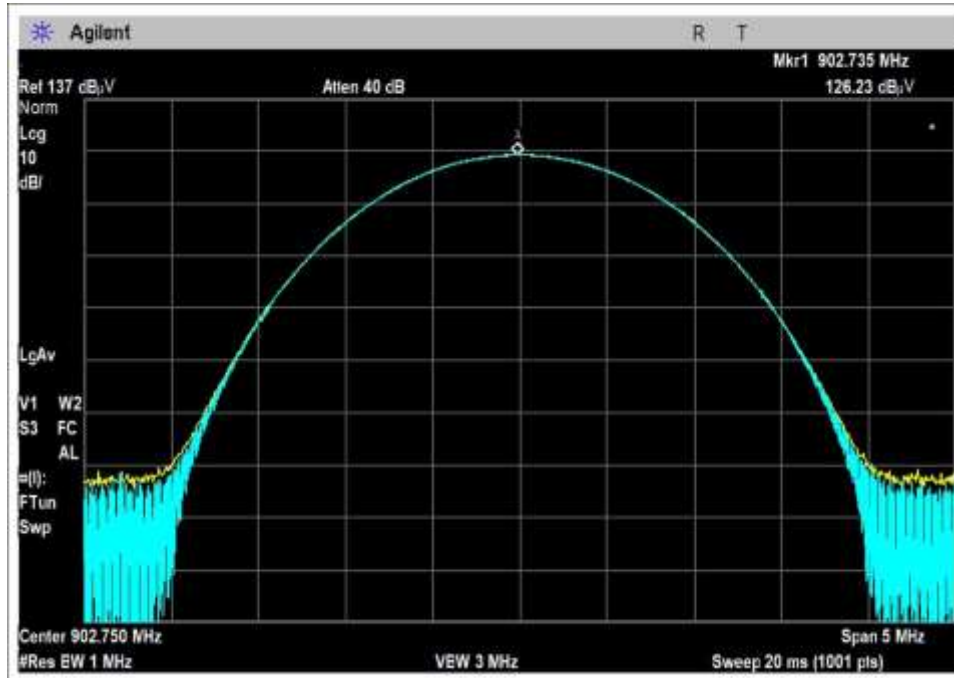
\*Configuration 7; Low Channel



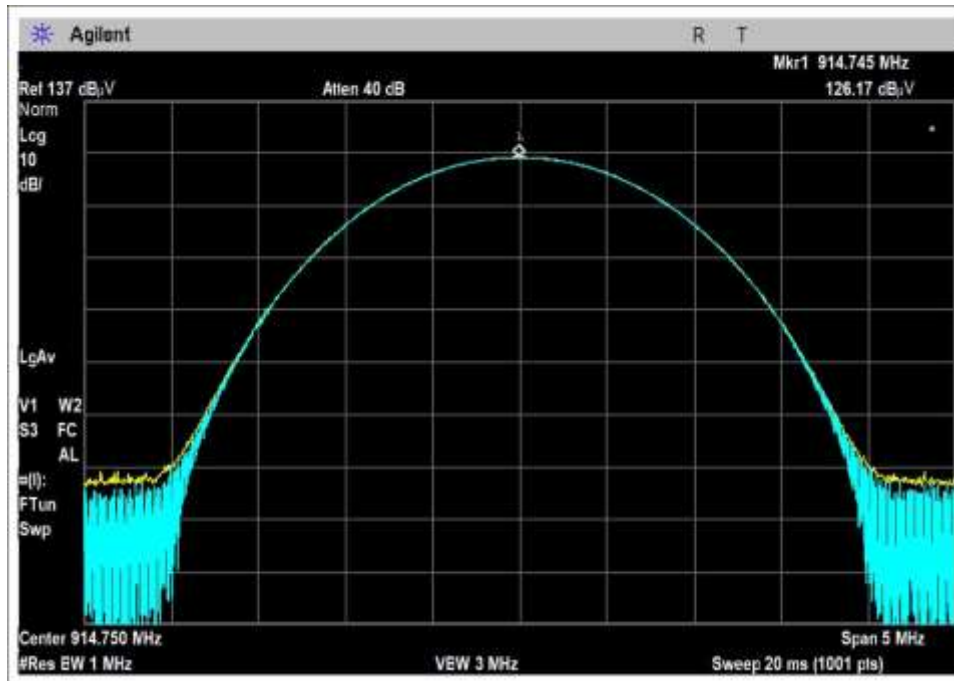
\*Configuration 7; Middle Channel



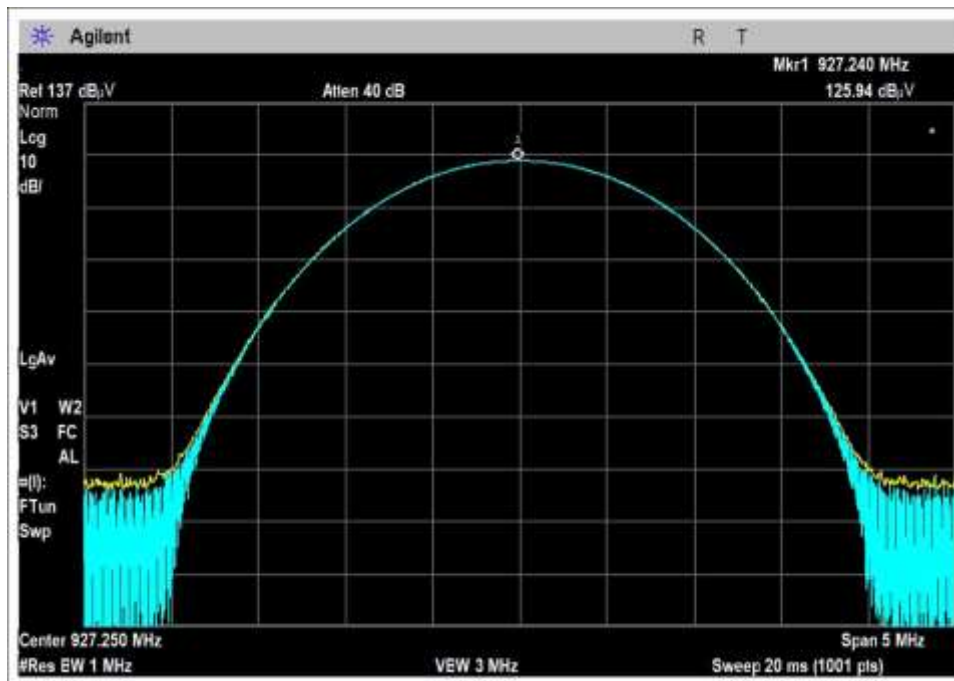
\*Configuration 7; High Channel



Configuration 8; Low Channel



Configuration 8; Middle Channel



Configuration 8; High Channel



**Test Setup / Conditions / Data**

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**  
 Work Order #: **106101** Date: 11/29/2021  
 Test Type: **Conducted Emissions** Time: 10:56:23  
 Tested By: Matt Harrison Sequence#: 15  
 Software: EMITest 5.03.20 120V 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
*Configuration 7			

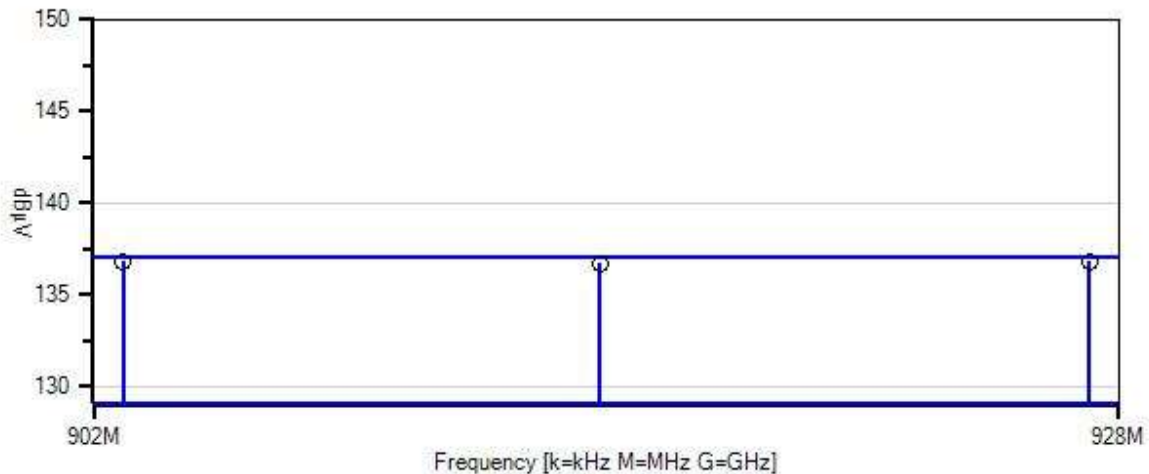
***Support Equipment:***

Device	Manufacturer	Model #	S/N
*Configuration 7			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 902-928MHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is setup for conducted measurements. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, Mid, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.

Impinj, Inc. WO#: 106101 Sequence#: 15 Date: 11/29/2021  
 15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 120V 60Hz Antenna Port



— Sweep Data  
 — Readings  
 ○ Peak Readings  
 × QP Readings  
 \* Average Readings  
 ▼ Ambient  
 Software Version: 5.03.20  
 1 - 15.247(b) Power Output (902-928 MHz FHSS >50 Channels)

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T2	ANP05961	Cable	Heliac	6/9/2021	6/9/2023
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T3	AN	Cable	Multiple	NCR	NCR

NCR = No calibration Required

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	902.745M	129.1	+10.1	+0.6	+3.0	+0.0		136.8	137.0	-0.2	Anten
2	927.245M	129.1	+10.1	+0.6	+3.0	+0.0		136.8	137.0	-0.2	Anten
3	914.735M	129.0	+10.1	+0.6	+3.0	+0.0		136.7	137.0	-0.3	Anten



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**  
 Work Order #: **106101** Date: 11/29/2021  
 Test Type: **Conducted Emissions** Time: 11:02:01  
 Tested By: Matt Harrison Sequence#: 16  
 Software: EMITest 5.03.20 120V 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 8			

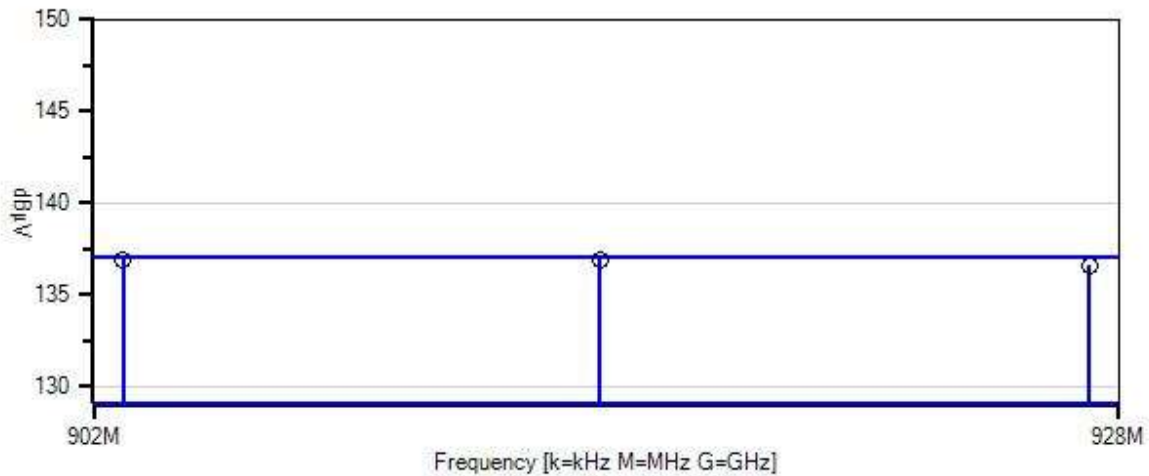
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 8			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 902-928MHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is setup for conducted measurements. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, Mid, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.

Impinj, Inc. WO#: 106101 Sequence#: 16 Date: 11/29/2021  
 15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 120V 60Hz Antenna Port



- Sweep Data
- Readings
- Peak Readings
- × QP Readings
- \* Average Readings
- ▼ Ambient
- Software Version: 5.03.20
- 1 - 15.247(b) Power Output (902-928 MHz FHSS >50 Channels)

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T2	ANP05961	Cable	Heliacx	6/9/2021	6/9/2023
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023

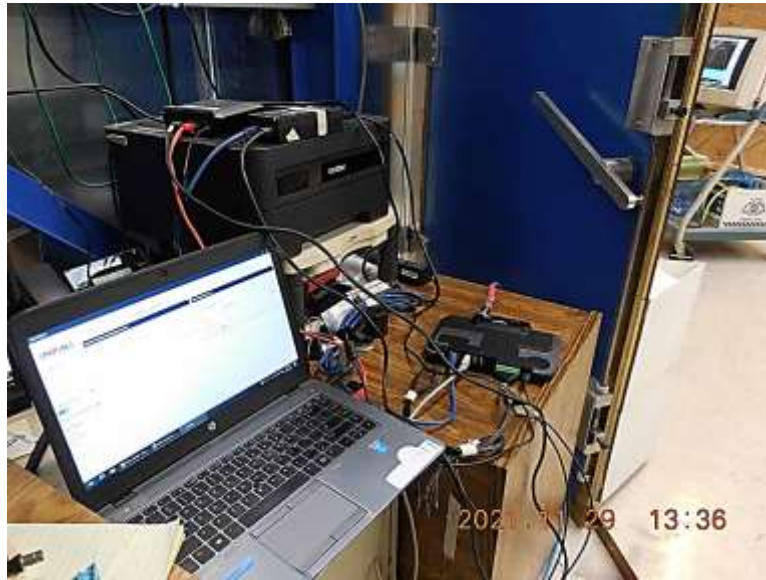
**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Anten
1	914.745M	126.2	+10.1	+0.6		+0.0	136.9	137.0	-0.1	Anten
2	902.735M	126.2	+10.1	+0.6		+0.0	136.9	137.0	-0.1	Anten
3	927.240M	125.9	+10.1	+0.6		+0.0	136.6	137.0	-0.4	Anten

**Test Setup Photo(s)**



## 15.247(d) RF Conducted Emissions & Band Edge

### Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **106101** Date: 11/29/2021  
 Test Type: **Conducted Emissions** Time: 15:26:26  
 Tested By: Matt Harrison Sequence#: 20  
 Software: EMITest 5.03.20 120V 60Hz

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 7			

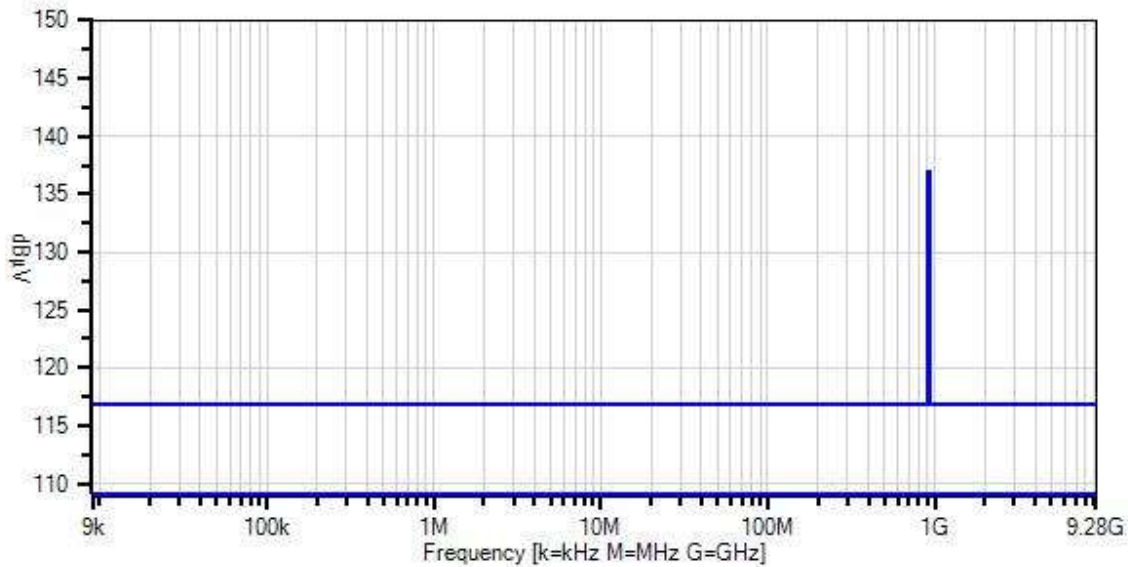
#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 7			

#### Test Conditions / Notes:

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 902-928MHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is setup for conducted measurements. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, Mid, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.

Impinj, Inc. W/D#: 106101 Sequence#: 20 Date: 11/29/2021  
 15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port



○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.20  
 — Sweep Data  
 — Readings  
 × QP Readings  
 ▼ Ambient  
 — 1 - 15.247(d) Conducted Spurious Emissions

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T2	ANP05961	Cable	Heliac	6/9/2021	6/9/2023
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	Dist dB	Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	1805.505M	55.7	+10.2	+0.8		+0.0	66.7	116.9	-50.2	Anten
2	1829.490M	55.0	+10.2	+0.8		+0.0	66.0	116.9	-50.9	Anten
3	1854.500M	54.9	+10.2	+0.8		+0.0	65.9	116.9	-51.0	Anten



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **106101** Date: 11/29/2021  
 Test Type: **Conducted Emissions** Time: 15:24:08  
 Tested By: Matt Harrison Sequence#: 19  
 Software: EMITest 5.03.20 120V 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 8			

***Support Equipment:***

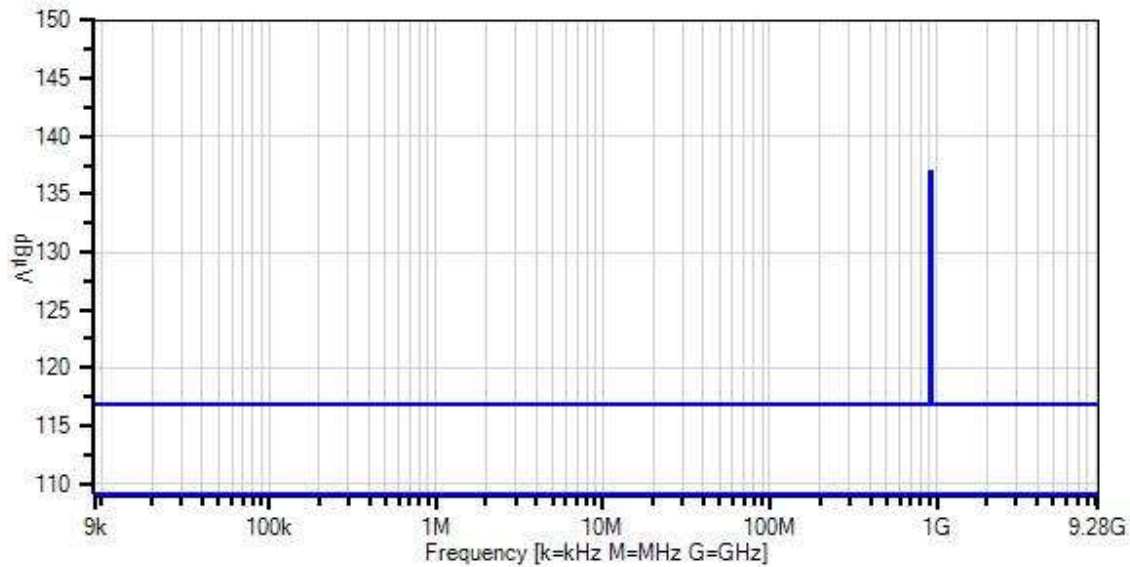
Device	Manufacturer	Model #	S/N
Configuration 8			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 902-928MHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is setup for conducted measurements. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, Mid, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.



Impinj, Inc. W/O#: 106101 Sequence#: 19 Date: 11/29/2021  
 15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port



○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.20  
 — Sweep Data  
 — Readings  
 × QP Readings  
 ▼ Ambient  
 — 1 - 15.247(d) Conducted Spurious Emissions

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T2	ANP05961	Cable	Heliac	6/9/2021	6/9/2023
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	Dist dB	Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	1854.505M	52.9	+10.2	+0.8		+0.0	63.9	116.9	-53.0	Anten
2	1829.485M	52.3	+10.2	+0.8		+0.0	63.3	116.9	-53.6	Anten
3	1805.490M	52.0	+10.2	+0.8		+0.0	63.0	116.9	-53.9	Anten
4	2781.745M	46.7	+10.2	+1.1		+0.0	58.0	116.9	-58.9	Anten

### Band Edge

#### Band Edge Summary

Configuration 7  
 Limit applied: Max Power/100kHz - 20dB.  
 Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Measured (dBμV)	Limit (dBμV)	Results
902	ASK	78.9	<116.9	Pass
928	ASK	79.0	<116.9	Pass

#### Band Edge Summary

Configuration 7  
 Limit applied: Max Power/100kHz - 20dB.  
 Operating Mode: Hopping

Frequency (MHz)	Modulation	Measured (dBμV)	Limit (dBμV)	Results
902	ASK	73.1	<116.9	Pass
928	ASK	69.8	<116.9	Pass

#### Band Edge Summary

Configuration 8  
 Limit applied: Max Power/100kHz - 20dB.  
 Operating Mode: Single Channel (Low and High)

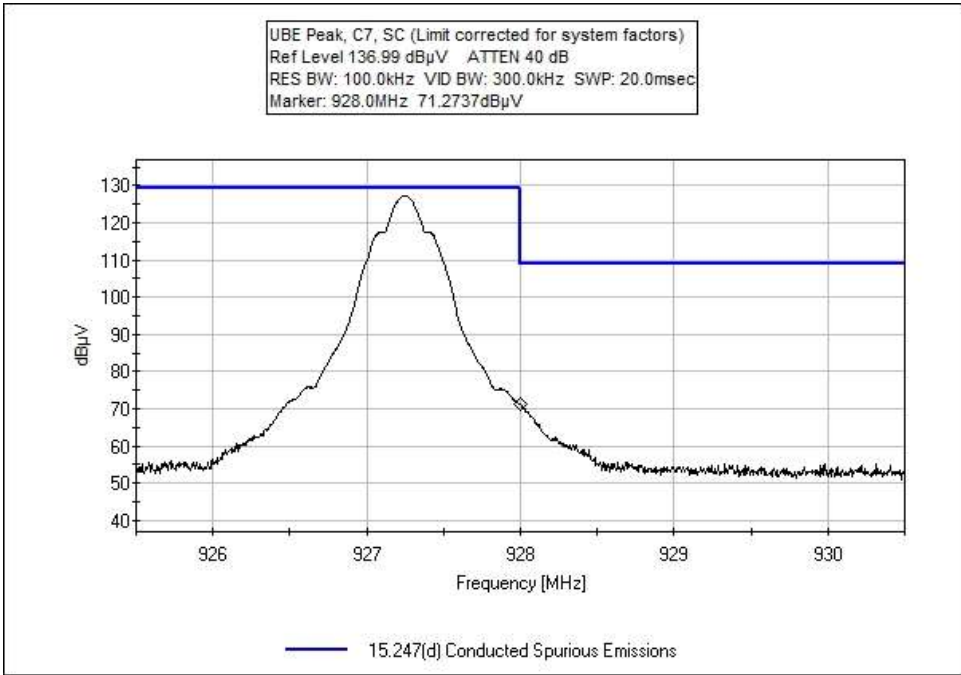
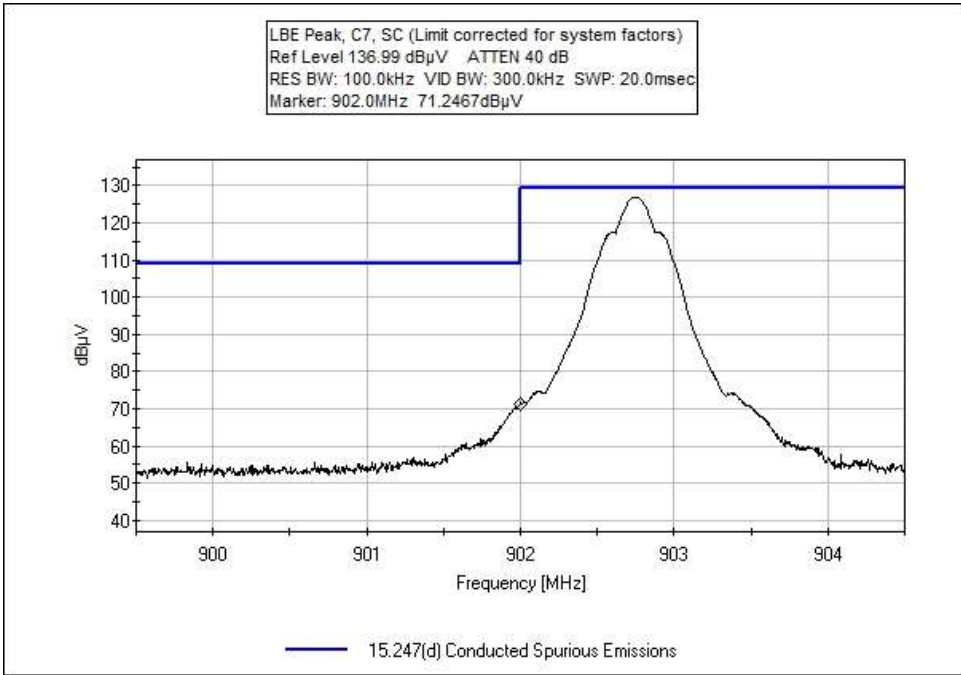
Frequency (MHz)	Modulation	Measured (dBμV)	Limit (dBμV)	Results
902	ASK	71.8	<116.9	Pass
928	ASK	73.8	<116.9	Pass

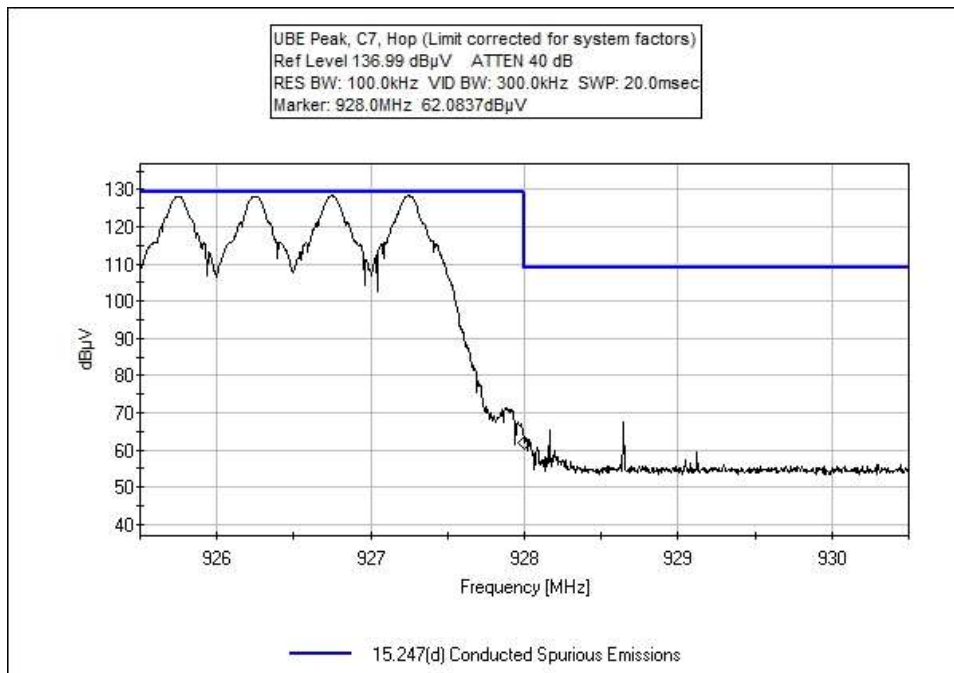
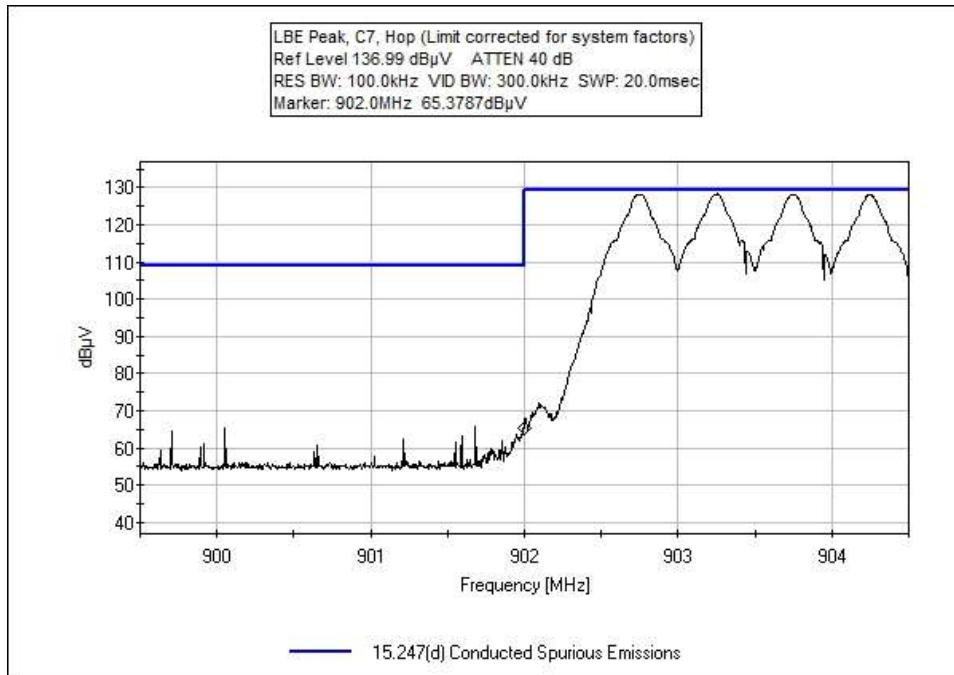
#### Band Edge Summary

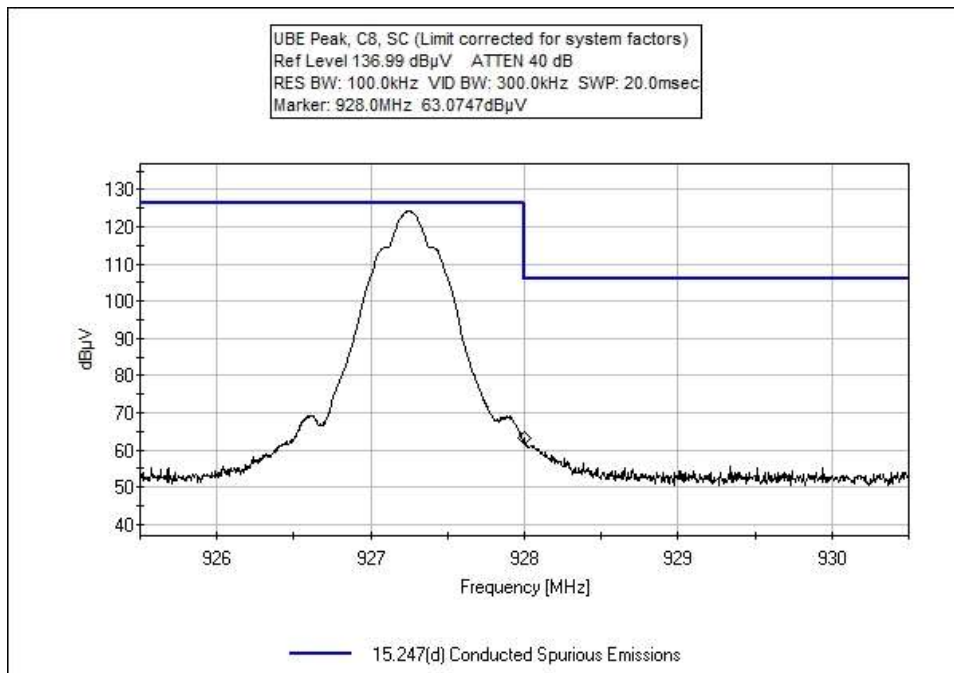
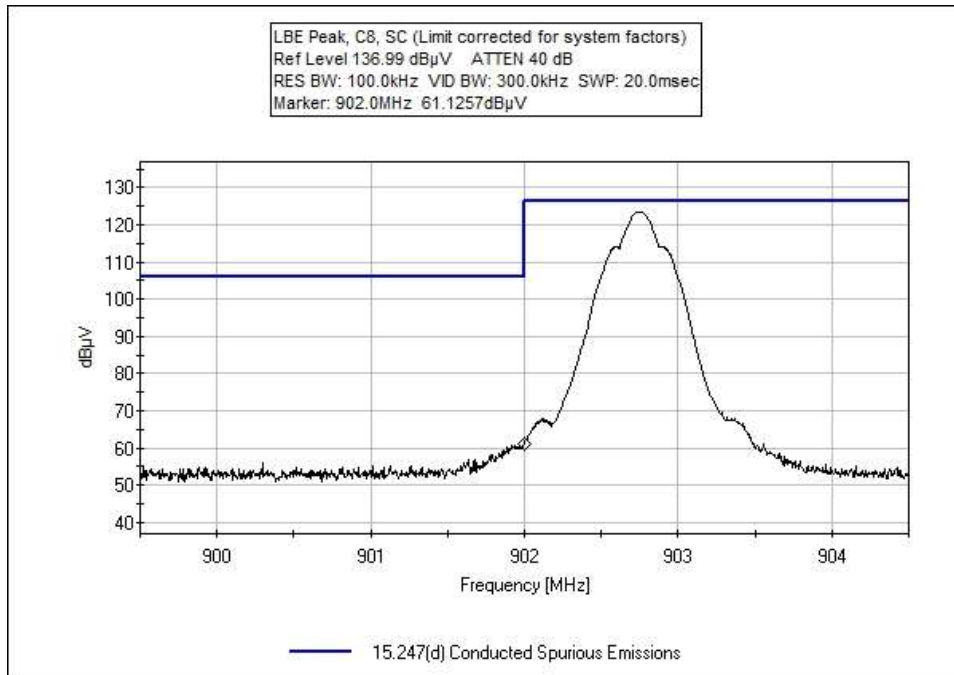
Configuration 8  
 Limit applied: Max Power/100kHz - 20dB.  
 Operating Mode: Hopping

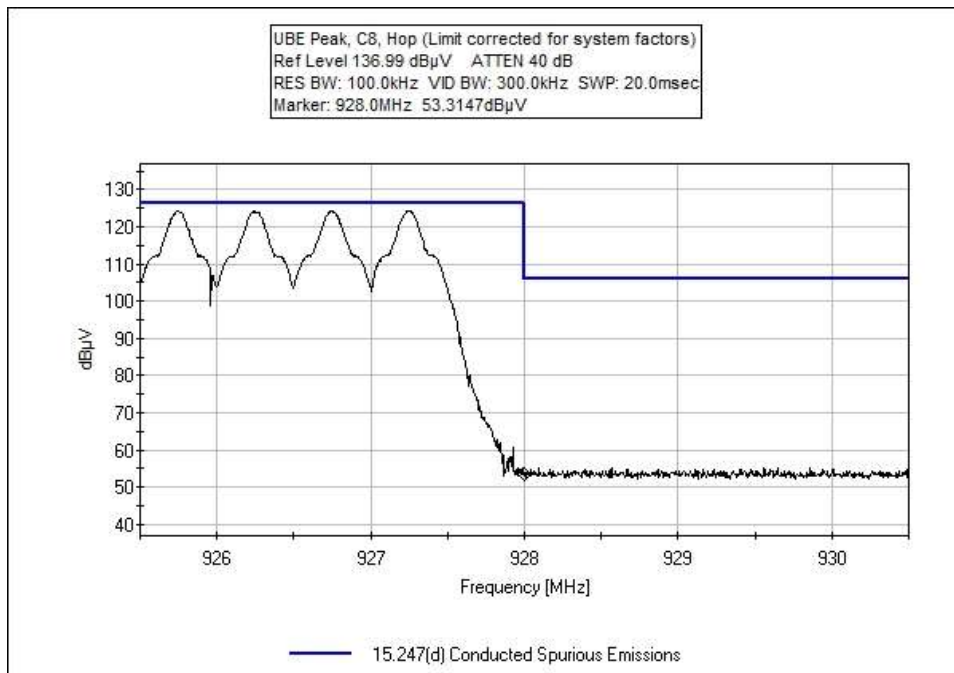
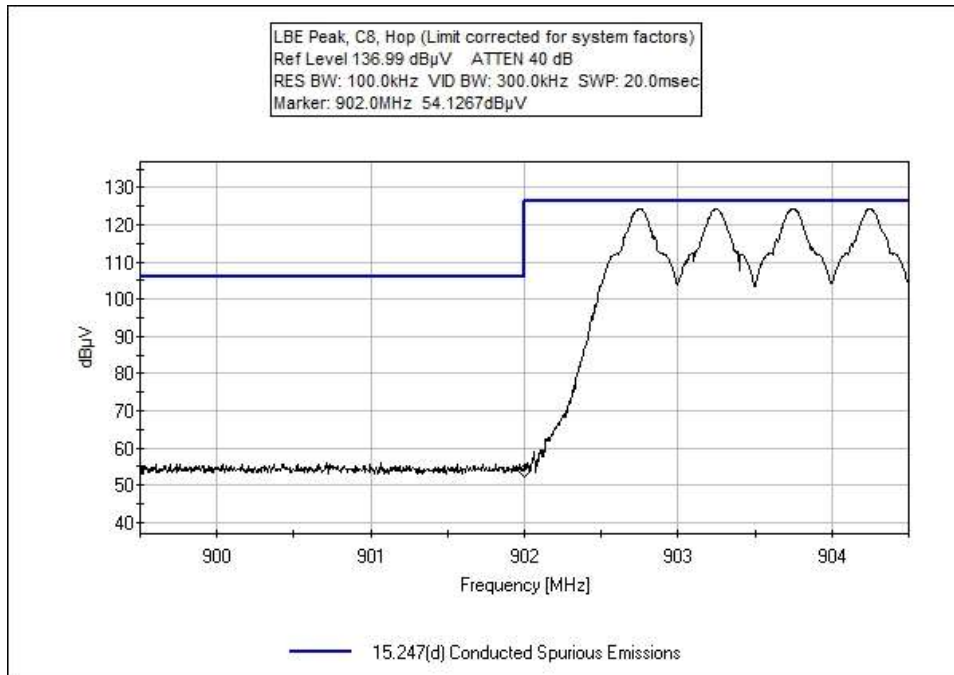
Frequency (MHz)	Modulation	Measured (dBμV)	Limit (dBμV)	Results
902	ASK	64.8	<116.9	Pass
928	ASK	64.0	<116.9	Pass

## Band Edge Plots









**Test Setup / Conditions / Data**

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **106101** Date: 11/29/2021  
 Test Type: **Conducted Emissions** Time: 15:11:42  
 Tested By: Matt Harrison Sequence#: 17  
 Software: EMITest 5.03.20 120V 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 7			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 7			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 902-928MHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is setup for conducted measurements. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, Mid, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T2	ANP05961	Cable	Heliac	6/9/2021	6/9/2023
T3	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T4	AN	Cable	Multiple	No Cal Required	No Cal Required

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	928.000M	71.3	+10.1	+0.6	+0.0	+3.0	+0.0	79.0	116.9 SC	-37.9	Anten
2	902.000M	71.2	+10.1	+0.6	+0.0	+3.0	+0.0	78.9	116.9 SC	-38.0	Anten
3	902.000M	65.4	+10.1	+0.6	+0.0	+3.0	+0.0	73.1	116.9 Hop	-43.8	Anten
4	928.000M	62.1	+10.1	+0.6	+0.0	+3.0	+0.0	69.8	116.9 Hop	-47.1	Anten





Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc..**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **106101** Date: 11/29/2021  
 Test Type: **Conducted Emissions** Time: 15:17:28  
 Tested By: Matt Harrison Sequence#: 18  
 Software: EMITest 5.03.20 120V 60Hz

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 8			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 8			

**Test Conditions / Notes:**

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 902-928MHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is setup for conducted measurements. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, Mid, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T2	ANP05961	Cable	Heliac	6/9/2021	6/9/2023
T3	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023

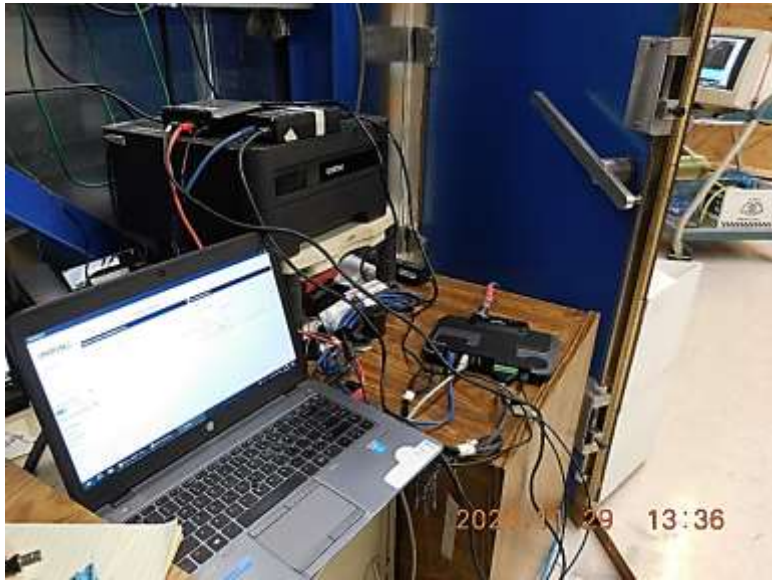
**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	928.000M	63.1	+10.1	+0.6	+0.0		+0.0	73.8	116.9 SC	-43.1	Anten
2	902.000M	61.1	+10.1	+0.6	+0.0		+0.0	71.8	116.9 SC	-45.1	Anten
3	902.000M	54.1	+10.1	+0.6	+0.0		+0.0	64.8	116.9 Hop	-52.1	Anten
4	928.000M	53.3	+10.1	+0.6	+0.0		+0.0	64.0	116.9 Hop	-52.9	Anten

**Test Setup Photo(s)**



## 15.247(d) Radiated Emissions & Band Edge

### Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 12/1/2021  
 Test Type: **Maximized Emissions** Time: 12:20:03  
 Tested By: Matt Harrison/Mike Atkinson Sequence#: 14  
 Software: EMITest 5.03.20

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

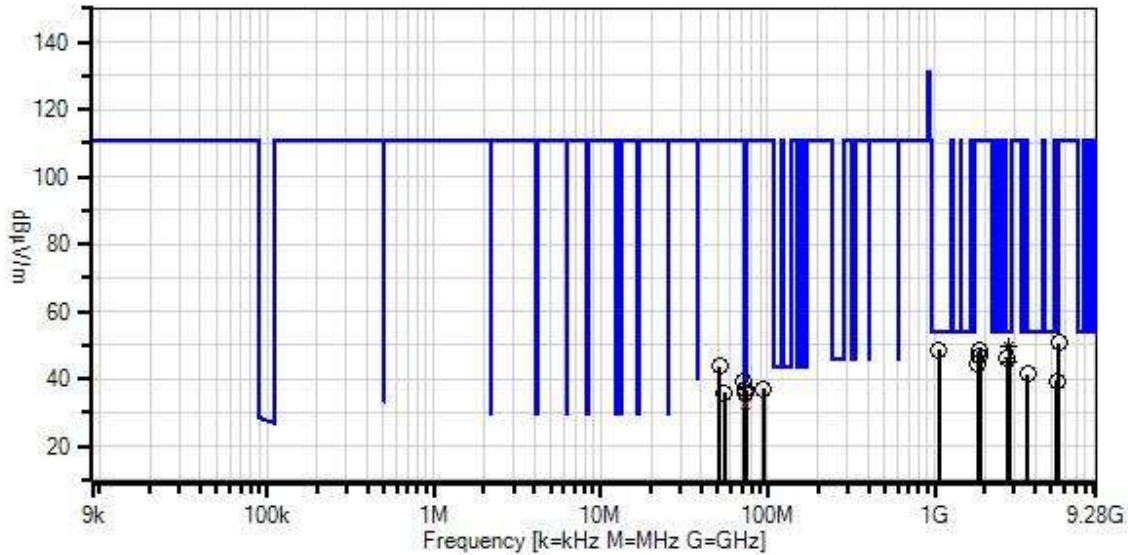
#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 9k-10GHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Circular Polarized Patch  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated above 30MHz, 3 x orthogonal axes investigated below 30MHz, worst case reported.  
  
**Note: No EUT emission found within 20dB of the limit below 30MHz**

Impinj, Inc. W/O#: 106101 Sequence#: 14 Date: 12/1/2021  
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



- Readings
- × QP Readings
- ▼ Ambient
- 1 - 15.247(d) / 15.209 Radiated Spurious Emissions
- Peak Readings
- \* Average Readings
- Software Version: 5.03.20

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T5	ANP06515	Cable	Heliac	7/1/2020	7/1/2022
	AN03540	Preamp	83017A	5/14/2021	5/14/2023
	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
	ANP07505	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

**Measurement Data:** Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	73.600M	22.9	+0.0 +0.4	+12.8	+0.5	+0.2	+0.0	36.8	40.0	-3.2	Vert
2	2781.750M Ave	45.3	+0.0 +2.9	+0.0	+0.0	+1.4	+0.0	49.6	54.0 927.25	-4.4	Horiz
^	2781.780M	52.9	+0.0 +2.9	+0.0	+0.0	+1.4	+0.0	57.2	54.0 927.25	+3.2	Horiz
4	1065.000M	43.7	+0.0 +1.8	+0.0	+2.4	+0.8	+0.0	48.7	54.0	-5.3	Vert
5	73.711M QP	18.5	+0.0 +0.4	+12.8	+0.5	+0.2	+0.0	32.4	40.0	-7.6	Vert
6	2708.250M	42.1	+0.0 +2.9	+0.0	+0.0	+1.3	+0.0	46.3	54.0 902.75	-7.7	Horiz
7	2744.270M Ave	41.0	+0.0 +2.9	+0.0	+0.0	+1.3	+0.0	45.2	54.0 914.75	-8.8	Horiz
^	2744.300M	49.6	+0.0 +2.9	+0.0	+0.0	+1.3	+0.0	53.8	54.0 914.75	-0.2	Horiz
9	3611.000M	36.3	+0.0 +3.4	+0.0	+0.0	+1.6	+0.0	41.3	54.0 902.75	-12.7	Horiz
10	5416.500M	33.0	+0.0 +4.3	+0.0	+0.0	+1.9	+0.0	39.2	54.0 902.75	-14.8	Horiz
11	5563.510M	44.4	+0.0 +4.4	+0.0	+0.0	+1.9	+0.0	50.7	110.9 927.25	-60.2	Vert
12	1854.450M	45.1	+0.0 +2.4	+0.0	+0.0	+1.1	+0.0	48.6	110.9 927.25	-62.3	Vert
13	1829.520M	44.7	+0.0 +2.4	+0.0	+0.0	+1.1	+0.0	48.2	110.9 914.75	-62.7	Vert
14	1854.530M	43.3	+0.0 +2.4	+0.0	+0.0	+1.1	+0.0	46.8	110.9 927.25	-64.1	Horiz
15	1805.500M	40.8	+0.0 +2.3	+0.0	+0.0	+1.1	+0.0	44.2	110.9 902.75	-66.7	Vert
16	51.300M	30.3	+0.0 +0.4	+12.3	+0.4	+0.2	+0.0	43.6	110.9	-67.3	Vert
17	71.700M	24.9	+0.0 +0.4	+12.9	+0.5	+0.2	+0.0	38.9	110.9	-72.0	Vert
18	94.000M	22.5	+0.0 +0.5	+13.1	+0.6	+0.2	+0.0	36.9	110.9	-74.0	Vert
19	55.200M	22.6	+0.0 +0.4	+12.3	+0.4	+0.2	+0.0	35.9	110.9	-75.0	Horiz
20	72.700M	21.7	+0.0 +0.4	+12.9	+0.5	+0.2	+0.0	35.7	110.9	-75.2	Vert



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 12/1/2021  
 Test Type: **Maximized Emissions** Time: 12:11:21  
 Tested By: Matt Harrison/Mike Atkinson Sequence#: 13  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 2			

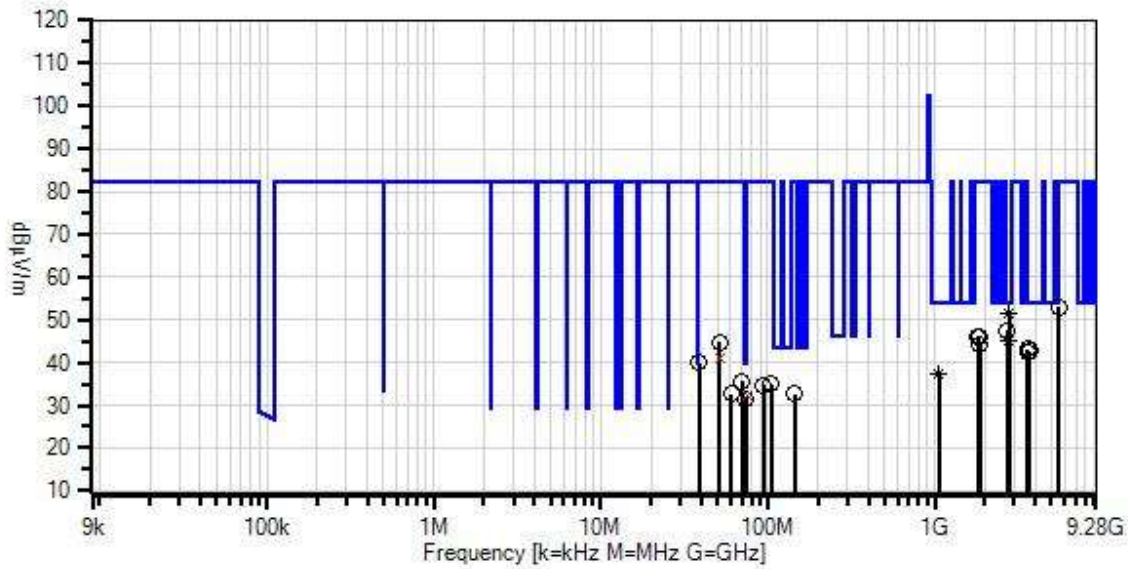
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 2			

***Test Conditions / Notes:***

Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 9k-10GHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Mini-Guardrail  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated above 30MHz, 3 x orthogonal axes investigated below 30MHz, worst case reported.  
  
**Note: No EUT emission found within 20dB of the limit below 30MHz**

Impinj, Inc. W/O#: 106101 Sequence#: 13 Date: 12/1/2021  
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



- Readings
- × QP Readings
- ▼ Ambient
- 1 - 15.247(d) / 15.209 Radiated Spurious Emissions
- Peak Readings
- \* Average Readings
- Software Version: 5.03.20

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T1	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T2	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T3	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T4	ANP06515	Cable	Heliac	7/1/2020	7/1/2022
	AN03540	Preamp	83017A	5/14/2021	5/14/2023
	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
	ANP07505	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

**Measurement Data:** Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	2781.750M Ave	47.1	+0.0	+0.0	+1.4	+2.9	+0.0	51.4	54.0 927.25	-2.6	Horiz
^	2781.760M	54.1	+0.0	+0.0	+1.4	+2.9	+0.0	58.4	54.0 927.25	+4.4	Horiz
3	2708.210M	43.2	+0.0	+0.0	+1.3	+2.9	+0.0	47.4	54.0 902.75	-6.6	Horiz
4	74.555M QP	18.3	+12.8	+0.5	+0.2	+0.4	+0.0	32.2	40.0	-7.8	Vert
^	74.600M	20.2	+12.8	+0.5	+0.2	+0.4	+0.0	34.1	40.0	-5.9	Vert
6	2744.250M Ave	40.9	+0.0	+0.0	+1.3	+2.9	+0.0	45.1	54.0 914.75	-8.9	Horiz
^	2744.220M	48.9	+0.0	+0.0	+1.3	+2.9	+0.0	53.1	54.0 914.75	-0.9	Horiz
8	3610.960M	38.1	+0.0	+0.0	+1.6	+3.4	+0.0	43.1	54.0 902.75	-10.9	Horiz
9	3709.010M	37.7	+0.0	+0.0	+1.5	+3.5	+0.0	42.7	54.0 927.25	-11.3	Horiz
10	3659.070M	37.4	+0.0	+0.0	+1.5	+3.4	+0.0	42.3	54.0 914.75	-11.7	Horiz
11	1055.000M Ave	32.2	+0.0	+2.4	+0.8	+1.7	+0.0	37.1	54.0	-16.9	Vert
^	1055.000M	44.7	+0.0	+2.4	+0.8	+1.7	+0.0	49.6	54.0	-4.4	Vert
13	5563.510M	46.6	+0.0	+0.0	+1.9	+4.4	+0.0	52.9	82.4 927.25	-29.5	Horiz
14	1805.460M	42.8	+0.0	+0.0	+1.1	+2.3	+0.0	46.2	82.4 902.75	-36.2	Horiz
15	1829.390M	42.5	+0.0	+0.0	+1.1	+2.4	+0.0	46.0	82.4 914.75	-36.4	Horiz
16	51.300M	31.5	+12.3	+0.4	+0.2	+0.4	+0.0	44.8	82.4	-37.6	Vert
17	1854.510M	40.9	+0.0	+0.0	+1.1	+2.4	+0.0	44.4	82.4 927.25	-38.0	Horiz
18	51.118M QP	27.5	+12.3	+0.4	+0.2	+0.4	+0.0	40.8	82.4	-41.6	Vert
19	38.700M	22.5	+16.7	+0.3	+0.1	+0.3	+0.0	39.9	82.4	-42.5	Vert
20	69.800M	21.6	+12.9	+0.5	+0.2	+0.4	+0.0	35.6	82.4	-46.8	Vert
21	104.700M	19.5	+14.2	+0.6	+0.2	+0.5	+0.0	35.0	82.4	-47.4	Vert



22	94.000M	20.2	+13.1	+0.6	+0.2	+0.5	+0.0	34.6	82.4	-47.8	Vert
23	145.400M	17.1	+14.0	+0.7	+0.3	+0.6	+0.0	32.7	82.4	-49.7	Vert
24	60.100M	19.0	+12.6	+0.4	+0.2	+0.4	+0.0	32.6	82.4	-49.8	Horiz
25	72.700M	17.5	+12.9	+0.5	+0.2	+0.4	+0.0	31.5	82.4	-50.9	Horiz



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 12/1/2021  
 Test Type: **Maximized Emissions** Time: 10:44:56  
 Tested By: Matt Harrison/Mike Atkinson Sequence#: 12  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 3			

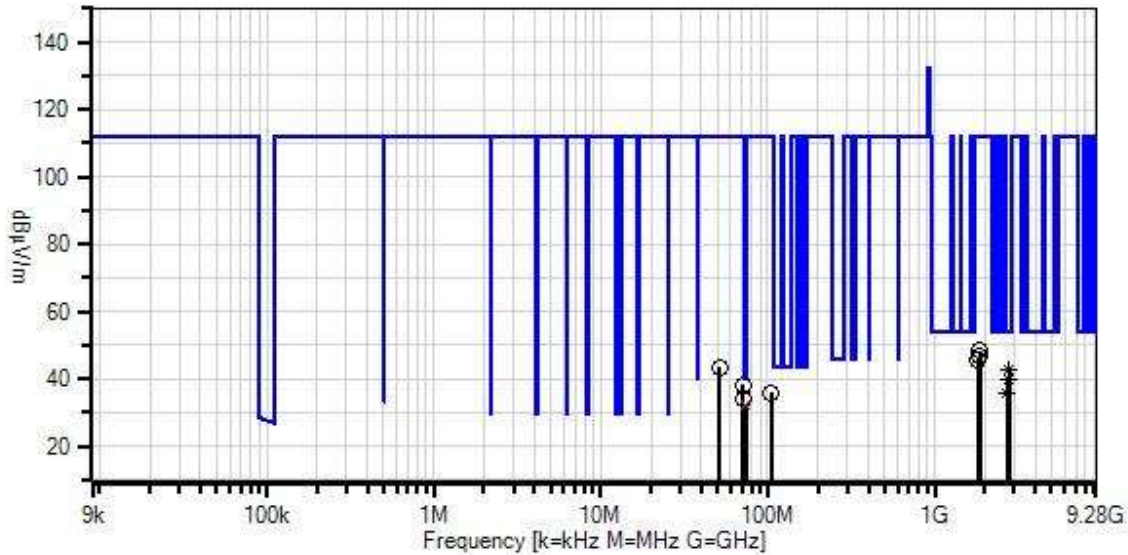
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 3			

***Test Conditions / Notes:***

Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 9k-10GHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: RFID Near-Field Reader  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated above 30MHz, 3 x orthogonal axes investigated below 30MHz, worst case reported.  
  
**Note: No EUT emission found within 20dB of the limit below 30MHz**

Impinj, Inc. WO#: 106101 Sequence#: 12 Date: 12/1/2021  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.20

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T5	ANP06515	Cable	Heliac	7/1/2020	7/1/2022
	AN03540	Preamp	83017A	5/14/2021	5/14/2023
	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
	ANP07505	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

**Measurement Data:** Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	73.934M QP	18.1	+0.0 +0.4	+12.8	+0.5	+0.2	+0.0	32.0	40.0	-8.0	Vert
^	73.934M	20.5	+0.0 +0.4	+12.8	+0.5	+0.2	+0.0	34.4	40.0	-5.6	Vert
3	2781.750M Ave	38.6	+0.0 +2.9	+0.0	+0.0	+1.4	+0.0	42.9	54.0	-11.1	Horiz
^	2781.750M	48.1	+0.0 +2.9	+0.0	+0.0	+1.4	+0.0	52.4	54.0	-1.6	Horiz
5	2744.250M Ave	35.6	+0.0 +2.9	+0.0	+0.0	+1.3	+0.0	39.8	54.0	-14.2	Horiz
^	2744.250M	46.4	+0.0 +2.9	+0.0	+0.0	+1.3	+0.0	50.6	54.0	-3.4	Horiz
7	2708.220M Ave	31.6	+0.0 +2.9	+0.0	+0.0	+1.3	+0.0	35.8	54.0	-18.2	Horiz
^	2708.220M	43.4	+0.0 +2.9	+0.0	+0.0	+1.3	+0.0	47.6	54.0	-6.4	Horiz
9	1854.435M	44.8	+0.0 +2.4	+0.0	+0.0	+1.1	+0.0	48.3	112.1	-63.8	Vert
10	1829.480M	43.1	+0.0 +2.4	+0.0	+0.0	+1.1	+0.0	46.6	112.1	-65.5	Vert
11	1805.470M	42.4	+0.0 +2.3	+0.0	+0.0	+1.1	+0.0	45.8	112.1	-66.3	Vert
12	51.300M	30.1	+0.0 +0.4	+12.3	+0.4	+0.2	+0.0	43.4	112.1	-68.7	Vert
13	70.700M	24.1	+0.0 +0.4	+12.9	+0.5	+0.2	+0.0	38.1	112.1	-74.0	Vert
14	104.700M	20.4	+0.0 +0.5	+14.2	+0.6	+0.2	+0.0	35.9	112.1	-76.2	Vert
15	70.700M	20.2	+0.0 +0.4	+12.9	+0.5	+0.2	+0.0	34.2	112.1	-77.9	Horiz



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 12/1/2021  
 Test Type: **Maximized Emissions** Time: 10:34:28  
 Tested By: Matt Harrison/Mike Atkinson Sequence#: 11  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 4			

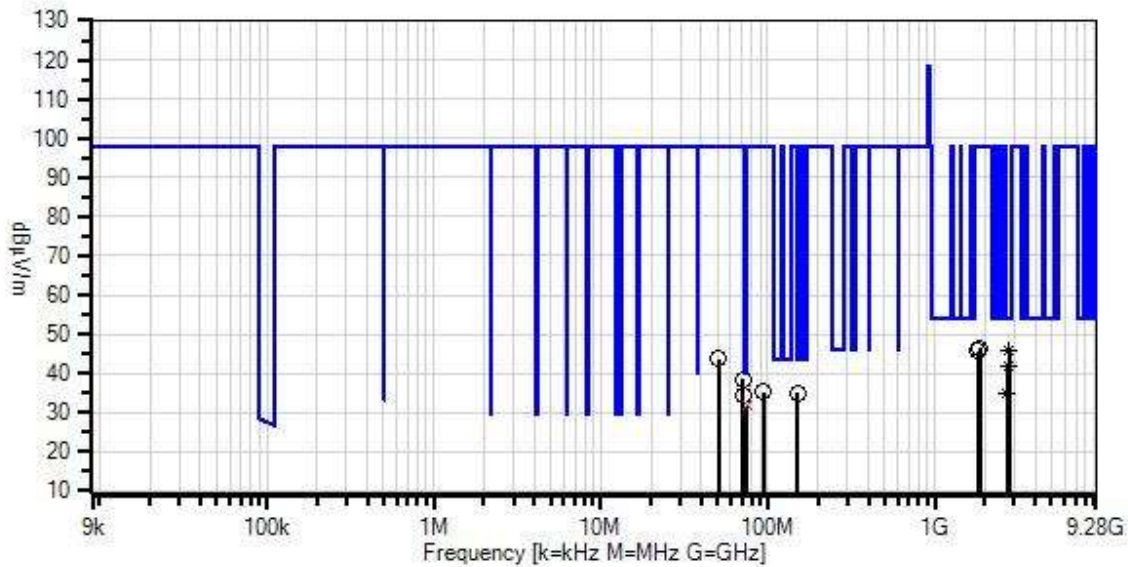
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 4			

***Test Conditions / Notes:***

Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 9k-10GHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Matchbox  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated above 30MHz, 3 x orthogonal axes investigated below 30MHz, worst case reported.  
  
**Note: No EUT emission found within 20dB of the limit below 30MHz**

Impinj, Inc. WO#: 106101 Sequence#: 11 Date: 12/1/2021  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.20

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T1	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T2	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T3	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T4	ANP06515	Cable	Heliac	7/1/2020	7/1/2022
	AN03540	Preamp	83017A	5/14/2021	5/14/2023
	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
	ANP07505	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	2781.750M Ave	41.7	+0.0	+0.0	+1.4	+2.9	+0.0	46.0	54.0	-8.0	Horiz
^	2781.750M	50.5	+0.0	+0.0	+1.4	+2.9	+0.0	54.8	54.0	+0.8	Horiz
3	74.567M QP	17.8	+12.8	+0.5	+0.2	+0.4	+0.0	31.7	40.0	-8.3	Vert
^	74.600M	19.3	+12.8	+0.5	+0.2	+0.4	+0.0	33.2	40.0	-6.8	Vert
5	2744.250M Ave	37.6	+0.0	+0.0	+1.3	+2.9	+0.0	41.8	54.0	-12.2	Horiz
^	2744.250M	47.9	+0.0	+0.0	+1.3	+2.9	+0.0	52.1	54.0	-1.9	Horiz
7	2708.250M Ave	30.9	+0.0	+0.0	+1.3	+2.9	+0.0	35.1	54.0	-18.9	Horiz
^	2708.250M	43.5	+0.0	+0.0	+1.3	+2.9	+0.0	47.7	54.0	-6.3	Horiz
9	1854.490M	43.1	+0.0	+0.0	+1.1	+2.4	+0.0	46.6	98.1	-51.5	Horiz
10	1805.705M	42.3	+0.0	+0.0	+1.1	+2.3	+0.0	45.7	98.1	-52.4	Horiz
11	50.400M	30.4	+12.4	+0.4	+0.2	+0.4	+0.0	43.8	98.1	-54.3	Vert
12	70.700M	24.6	+12.9	+0.5	+0.2	+0.4	+0.0	38.6	98.1	-59.5	Vert
13	94.000M	20.8	+13.1	+0.6	+0.2	+0.5	+0.0	35.2	98.1	-62.9	Vert
14	151.200M	17.9	+15.3	+0.7	+0.3	+0.7	+0.0	34.9	98.1	-63.2	Vert
15	70.700M	20.2	+12.9	+0.5	+0.2	+0.4	+0.0	34.2	98.1	-63.9	Horiz



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 12/1/2021  
 Test Type: **Maximized Emissions** Time: 10:26:32  
 Tested By: Matt Harrison/Mike Atkinson Sequence#: 10  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 5			

***Support Equipment:***

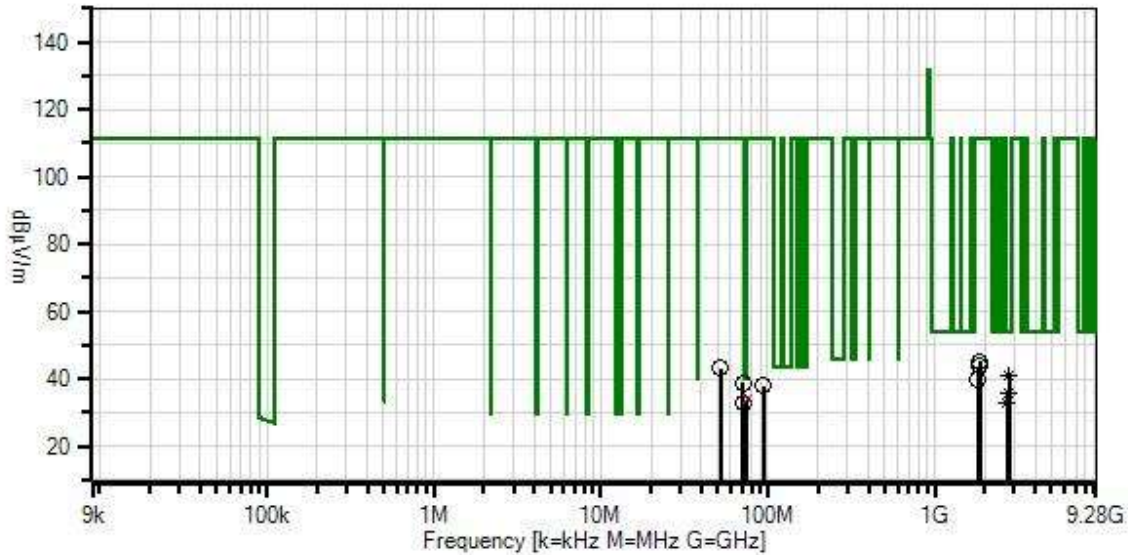
Device	Manufacturer	Model #	S/N
Configuration 5			

***Test Conditions / Notes:***

Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 9k-10GHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Threshold  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated above 30MHz, 3 x orthogonal axes investigated below 30MHz, worst case reported.  
  
**Note: No EUT emission found within 20dB of the limit below 30MHz**



Impinj, Inc. W/O#: 106101 Sequence#: 10 Date: 12/1/2021  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.20

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T1	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T2	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T3	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T4	ANP06515	Cable	Heliac	7/1/2020	7/1/2022
T5	AN03540	Preamp	83017A	5/14/2021	5/14/2023
T6	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
T7	ANP07505	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
T8	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 T8 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	74.578M QP	20.0	+12.8 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	33.9	40.0	-6.1	Vert
^	74.600M	21.2	+12.8 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	35.1	40.0	-4.9	Vert
3	2781.750M Ave	40.8	+0.0 -34.1	+0.0 +29.3	+1.4 +0.3	+2.9 +0.3	+0.0	40.9	54.0	-13.1	Horiz
^	2781.750M	49.5	+0.0 -34.1	+0.0 +29.3	+1.4 +0.3	+2.9 +0.3	+0.0	49.6	54.0	-4.4	Horiz
5	2744.250M Ave	35.9	+0.0 -34.1	+0.0 +29.3	+1.3 +0.3	+2.9 +0.3	+0.0	35.9	54.0	-18.1	Horiz
^	2744.250M	46.4	+0.0 -34.1	+0.0 +29.3	+1.3 +0.3	+2.9 +0.3	+0.0	46.4	54.0	-7.6	Horiz
7	2708.250M Ave	32.4	+0.0 -34.1	+0.0 +29.5	+1.3 +0.3	+2.9 +0.2	+0.0	32.5	54.0	-21.5	Horiz
^	2708.250M	43.3	+0.0 -34.1	+0.0 +29.5	+1.3 +0.3	+2.9 +0.2	+0.0	43.4	54.0	-10.6	Horiz
9	1854.475M	47.8	+0.0 -34.7	+0.0 +27.7	+1.1 +0.3	+2.4 +0.6	+0.0	45.2	111.5	-66.3	Horiz
10	1829.540M	46.4	+0.0 -34.7	+0.0 +27.5	+1.1 +0.3	+2.4 +0.6	+0.0	43.6	111.5	-67.9	Horiz
11	52.300M	29.8	+12.3 +0.0	+0.4 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	43.1	111.5	-68.4	Vert
12	1805.400M	42.7	+0.0 -34.7	+0.0 +27.3	+1.1 +0.3	+2.3 +0.6	+0.0	39.6	111.5	-71.9	Horiz
13	70.700M	24.6	+12.9 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	38.6	111.5	-72.9	Vert
14	94.000M	23.4	+13.1 +0.0	+0.6 +0.0	+0.2 +0.0	+0.5 +0.0	+0.0	37.8	111.5	-73.7	Vert
15	70.700M	18.6	+12.9 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	32.6	111.5	-78.9	Horiz



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 11/24/2021  
 Test Type: **Maximized Emissions** Time: 16:02:15  
 Tested By: Matt Harrison/Mike Atkinson Sequence#: 8  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 6			

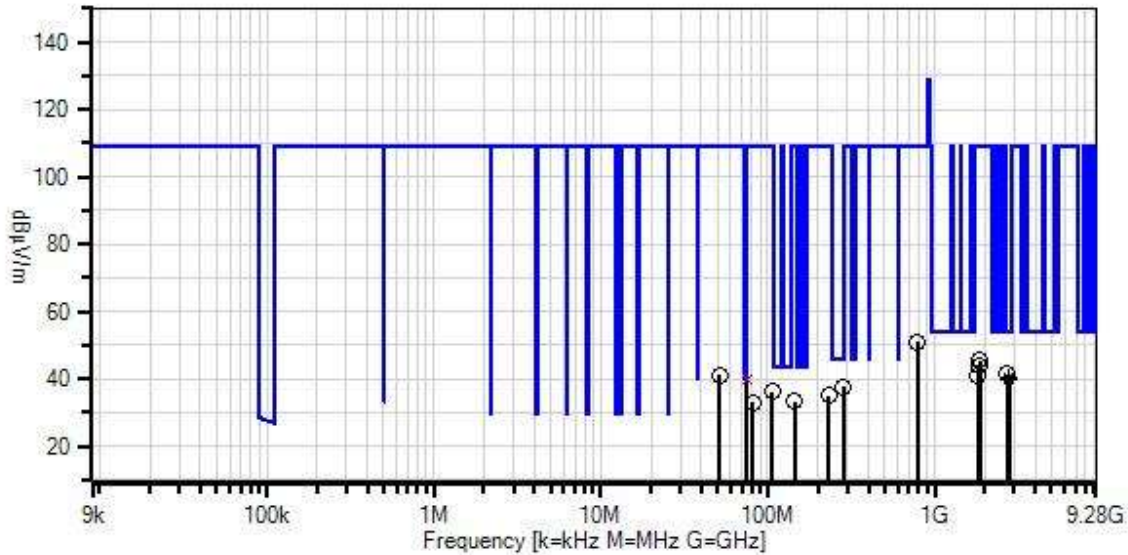
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 6			

***Test Conditions / Notes:***

Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 9k-10GHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Guardwall Port 1  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated above 30MHz, 3 x orthogonal axes investigated below 30MHz, worst case reported.  
  
**Note: No EUT emission found within 20dB of the limit below 30MHz**

Impinj, Inc. W/O#: 106101 Sequence#: 8 Date: 11/24/2021  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



— Readings  
 × QP Readings  
 ▼ Ambient  
 — 1 - 15.247(d) / 15.209 Radiated Spurious Emissions  
 ○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.20

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T1	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T2	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T3	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T4	ANP06515	Cable	Heliac	7/1/2020	7/1/2022
T5	AN03540	Preamp	83017A	5/14/2021	5/14/2023
T6	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
T7	ANP07505	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
T8	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

**Measurement Data:** Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 T8 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	74.563M QP	25.6	+12.8 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	39.5	40.0	-0.5	Vert
^	74.600M	26.1	+12.8 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	40.0	40.0	+0.0	Vert
3	282.200M	17.1	+18.1 +0.0	+1.0 +0.0	+0.4 +0.0	+0.9 +0.0	+0.0	37.5	46.0	-8.5	Horiz
4	2708.330M	41.3	+0.0 -34.1	+0.0 +29.5	+1.3 +0.3	+2.9 +0.2	+0.0	41.4	54.0	-12.6	Horiz
5	2781.760M Ave	40.5	+0.0 -34.1	+0.0 +29.3	+1.4 +0.3	+2.9 +0.3	+0.0	40.6	54.0	-13.4	Vert
^	2781.760M	49.7	+0.0 -34.1	+0.0 +29.3	+1.4 +0.3	+2.9 +0.3	+0.0	49.8	54.0	-4.2	Vert
7	2744.250M Ave	39.7	+0.0 -34.1	+0.0 +29.3	+1.3 +0.3	+2.9 +0.3	+0.0	39.7	54.0	-14.3	Vert
^	2744.250M	48.7	+0.0 -34.1	+0.0 +29.3	+1.3 +0.3	+2.9 +0.3	+0.0	48.7	54.0	-5.3	Vert
9	785.600M	17.7	+29.0 +0.0	+1.9 +0.0	+0.7 +0.0	+1.5 +0.0	+0.0	50.8	109.0	-58.2	Horiz
10	1854.504M	47.9	+0.0 -34.7	+0.0 +27.7	+1.1 +0.3	+2.4 +0.6	+0.0	45.3	109.0	-63.7	Vert
11	1829.425M	46.9	+0.0 -34.7	+0.0 +27.5	+1.1 +0.3	+2.4 +0.6	+0.0	44.1	109.0	-64.9	Vert
12	1805.490M	44.2	+0.0 -34.7	+0.0 +27.3	+1.1 +0.3	+2.3 +0.6	+0.0	41.1	109.0	-67.9	Horiz
13	51.300M	27.8	+12.3 +0.0	+0.4 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	41.1	109.0	-67.9	Vert
14	106.600M	20.6	+14.2 +0.0	+0.6 +0.0	+0.2 +0.0	+0.5 +0.0	+0.0	36.1	109.0	-72.9	Vert
15	230.800M	15.8	+17.2 +0.0	+0.9 +0.0	+0.4 +0.0	+0.8 +0.0	+0.0	35.1	109.0	-73.9	Vert
16	145.400M	17.5	+14.0 +0.0	+0.7 +0.0	+0.3 +0.0	+0.6 +0.0	+0.0	33.1	109.0	-75.9	Vert
17	81.400M	19.3	+12.5 +0.0	+0.5 +0.0	+0.2 +0.0	+0.5 +0.0	+0.0	33.0	109.0	-76.0	Horiz



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 11/24/2021  
 Test Type: **Maximized Emissions** Time: 15:41:08  
 Tested By: Matt Harrison/Mike Atkinson Sequence#: 9  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 6			

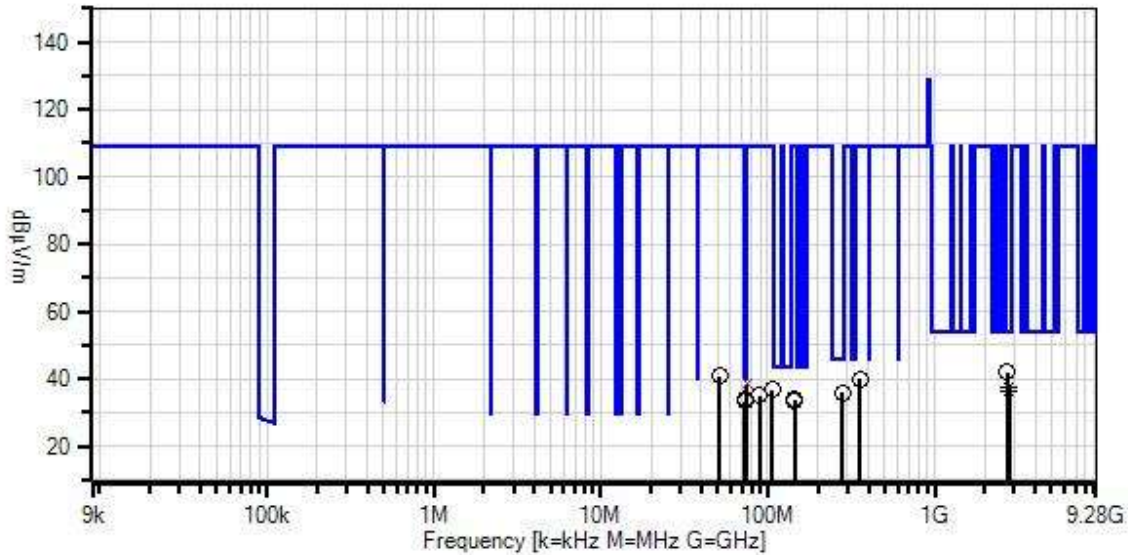
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 6			

***Test Conditions / Notes:***

Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 9k-10GHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Guardwall Port 2  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated above 30MHz, 3 x orthogonal axes investigated below 30MHz, worst case reported.  
  
**Note: No EUT emission found within 20dB of the limit below 30MHz**

Impinj, Inc. WO#: 106101 Sequence#: 9 Date: 11/24/2021  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



— Readings  
 × QP Readings  
 ▼ Ambient  
 ○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.20

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T1	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T2	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T3	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T4	ANP06515	Cable	Heliac	7/1/2020	7/1/2022
T5	AN03540	Preamp	83017A	5/14/2021	5/14/2023
T6	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
T7	ANP07505	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
T8	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 T8 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	74.562M QP	24.6	+12.8 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	38.5	40.0	-1.5	Vert
^	74.600M	25.7	+12.8 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	39.6	40.0	-0.4	Vert
3	73.600M	19.9	+12.8 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	33.8	40.0	-6.2	Horiz
4	281.200M	15.2	+18.2 +0.0	+1.0 +0.0	+0.4 +0.0	+0.9 +0.0	+0.0	35.7	46.0	-10.3	Vert
5	2708.045M	41.9	+0.0 -34.1	+0.0 +29.5	+1.3 +0.3	+2.9 +0.2	+0.0	42.0	54.0	-12.0	Vert
6	2744.250M Ave	37.2	+0.0 -34.1	+0.0 +29.3	+1.3 +0.3	+2.9 +0.3	+0.0	37.2	54.0	-16.8	Horiz
7	2744.250M Ave	37.2	+0.0 -34.1	+0.0 +29.3	+1.3 +0.3	+2.9 +0.3	+0.0	37.2	54.0	-16.8	Horiz
8	2781.750M Ave	36.0	+0.0 -34.1	+0.0 +29.3	+1.4 +0.3	+2.9 +0.3	+0.0	36.1	54.0	-17.9	Horiz
^	2781.750M	45.4	+0.0 -34.1	+0.0 +29.3	+1.4 +0.3	+2.9 +0.3	+0.0	45.5	54.0	-8.5	Horiz
10	51.300M	27.5	+12.3 +0.0	+0.4 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	40.8	109.0	-68.2	Vert
11	355.900M	15.9	+21.5 +0.0	+1.2 +0.0	+0.4 +0.0	+1.0 +0.0	+0.0	40.0	109.0	-69.0	Vert
12	106.600M	21.2	+14.2 +0.0	+0.6 +0.0	+0.2 +0.0	+0.5 +0.0	+0.0	36.7	109.0	-72.3	Vert
13	89.200M	21.3	+12.6 +0.0	+0.5 +0.0	+0.2 +0.0	+0.5 +0.0	+0.0	35.1	109.0	-73.9	Vert
14	145.400M	18.1	+14.0 +0.0	+0.7 +0.0	+0.3 +0.0	+0.6 +0.0	+0.0	33.7	109.0	-75.3	Vert
15	145.400M	17.8	+14.0 +0.0	+0.7 +0.0	+0.3 +0.0	+0.6 +0.0	+0.0	33.4	109.0	-75.6	Vert
16	72.700M	19.2	+12.9 +0.0	+0.5 +0.0	+0.2 +0.0	+0.4 +0.0	+0.0	33.2	109.0	-75.8	Horiz



**Band Edge**

<b>Band Edge Summary</b>					
Configuration 1					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Circular Polarized	40.2	<46.0	Pass
902	ASK	Circular Polarized	73.6	<110.9	Pass
928	ASK	Circular Polarized	74.4	<110.9	Pass
960	ASK	Circular Polarized	44.9	<54.0	Pass

<b>Band Edge Summary</b>					
Configuration 1					
Operating Mode: Hopping					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Circular Polarized	40.1	<46.0	Pass
902	ASK	Circular Polarized	65.2	<110.9	Pass
928	ASK	Circular Polarized	66.1	<110.9	Pass
960	ASK	Circular Polarized	44.8	<54.0	Pass

<b>Band Edge Summary</b>					
Configuration 2					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Mini-Guardrail	40.1	<46.0	Pass
902	ASK	Mini-Guardrail	50.0	<82.4	Pass
928	ASK	Mini-Guardrail	50.5	<82.4	Pass
960	ASK	Mini-Guardrail	47.8	<54.0	Pass

<b>Band Edge Summary</b>					
Configuration 2					
Operating Mode: Hopping					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Mini-Guardrail	40.1	<46.0	Pass
902	ASK	Mini-Guardrail	48.4	<82.4	Pass
928	ASK	Mini-Guardrail	49.4	<82.4	Pass
960	ASK	Mini-Guardrail	44.7	<54.0	Pass

Band Edge Summary					
Configuration 3					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	RFID Near-Field Reader	42.1	<46.0	Pass
902	ASK	RFID Near-Field Reader	68.5	<112.1	Pass
928	ASK	RFID Near-Field Reader	69.4	<112.1	Pass
960	ASK	RFID Near-Field Reader	50.5	<54.0	Pass

Band Edge Summary					
Configuration 3					
Operating Mode: Hopping					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	RFID Near-Field Reader	42.0	<46.0	Pass
902	ASK	RFID Near-Field Reader	61.8	<112.1	Pass
928	ASK	RFID Near-Field Reader	65.3	<112.1	Pass
960	ASK	RFID Near-Field Reader	50.9	<54.0	Pass

Band Edge Summary					
Configuration 4					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Matchbox	40.1	<46.0	Pass
902	ASK	Matchbox	57.8	<98.1	Pass
928	ASK	Matchbox	56.8	<98.1	Pass
960	ASK	Matchbox	47.9	<54.0	Pass

Band Edge Summary					
Configuration 4					
Operating Mode: Hopping					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Matchbox	44.7	<46.0	Pass
902	ASK	Matchbox	47.9	<98.1	Pass
928	ASK	Matchbox	57.0	<98.1	Pass
960	ASK	Matchbox	48.0	<54.0	Pass

Band Edge Summary					
Configuration 5					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Threshold	42.0	<46.0	Pass
902	ASK	Threshold	69.1	<111.5	Pass
928	ASK	Threshold	68.4	<111.5	Pass
960	ASK	Threshold	46.9	<54.0	Pass

Band Edge Summary					
Configuration 5					
Operating Mode: Hopping					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Threshold	42.0	<46.0	Pass
902	ASK	Threshold	64.0	<111.5	Pass
928	ASK	Threshold	68.1	<111.5	Pass
960	ASK	Threshold	46.7	<54.0	Pass

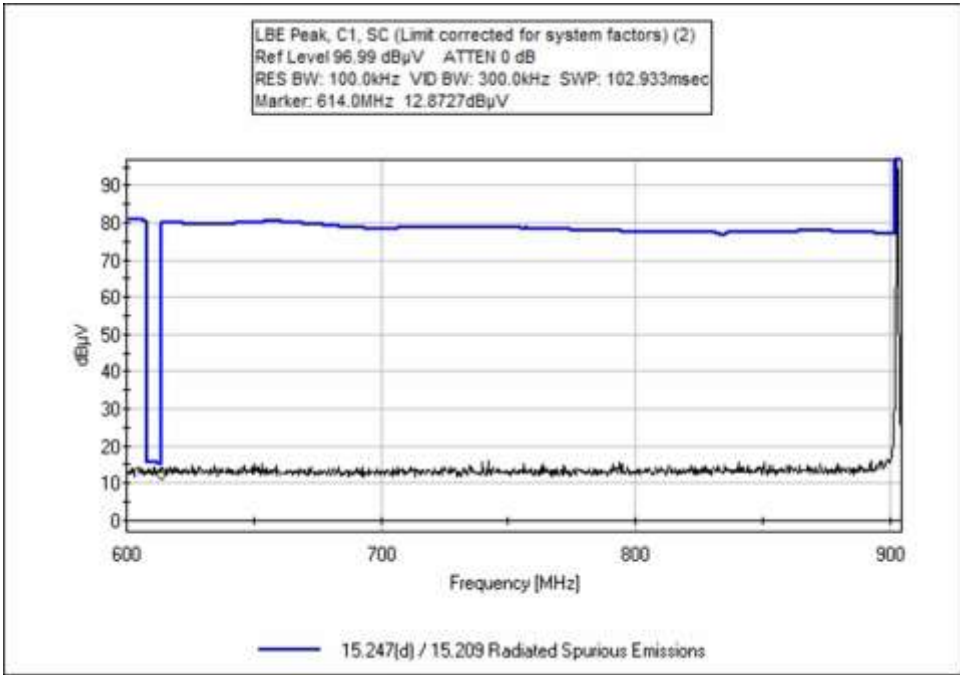
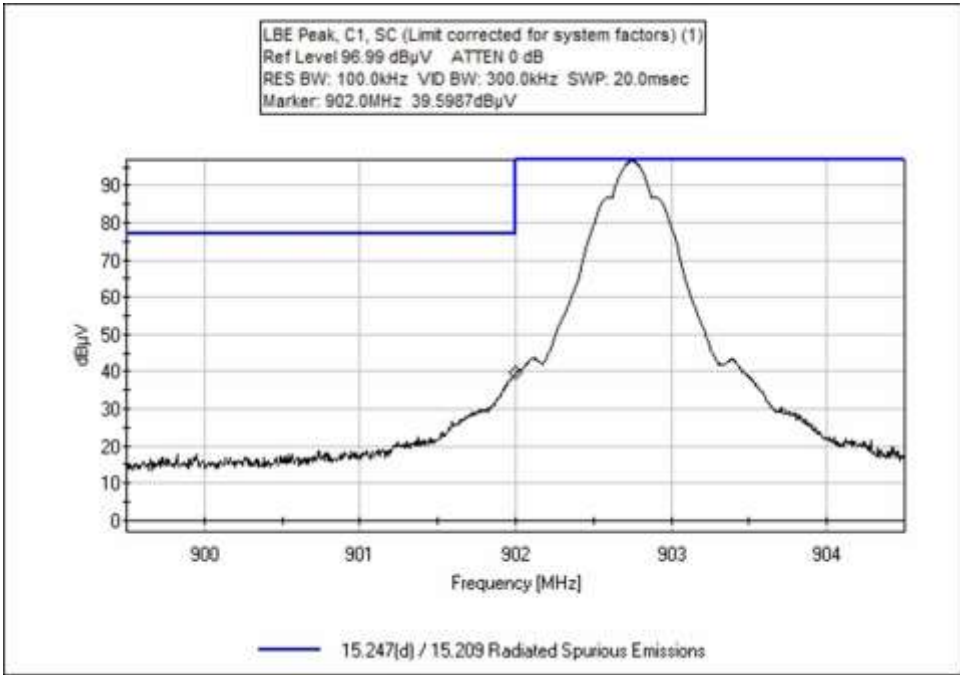
Band Edge Summary					
Configuration 6, Port 1					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Guardwall	40.2	<46.0	Pass
902	ASK	Guardwall	67.8	<109.0	Pass
928	ASK	Guardwall	65.0	<109.0	Pass
960	ASK	Guardwall	47.8	<54.0	Pass

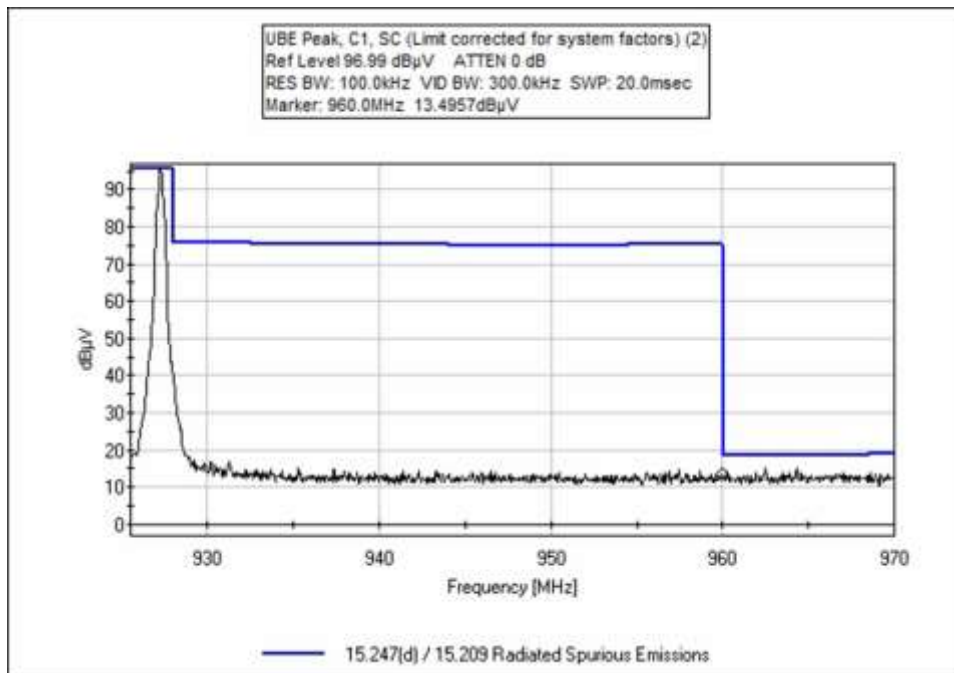
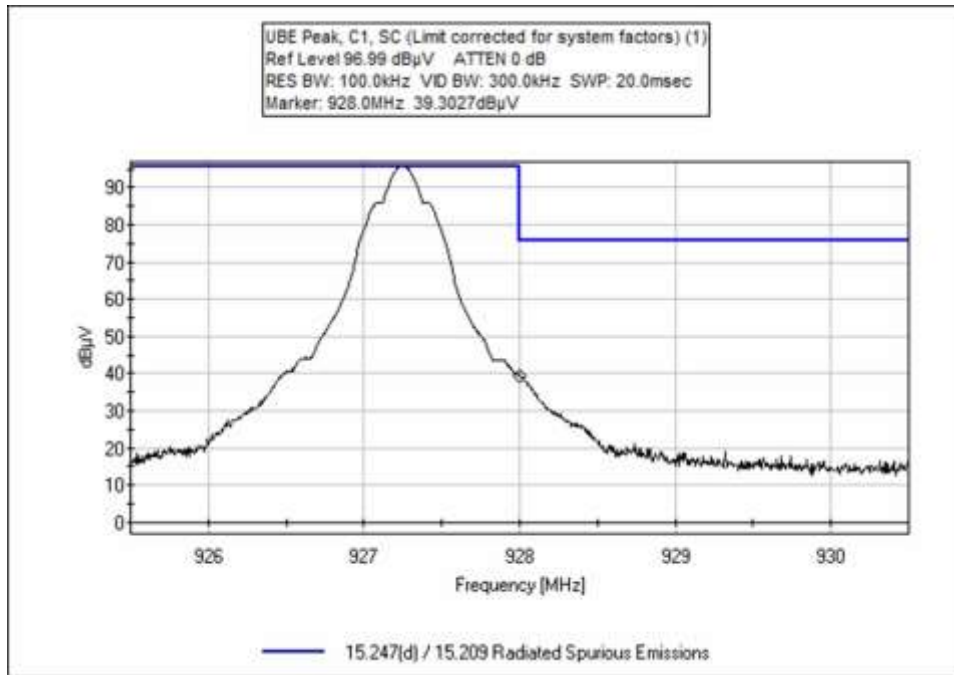
Band Edge Summary					
Configuration 6, Port 1					
Operating Mode: Hopping					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Guardwall	40.1	<46.0	Pass
902	ASK	Guardwall	67.8	<109.0	Pass
928	ASK	Guardwall	61.7	<109.0	Pass
960	ASK	Guardwall	48.8	<54.0	Pass

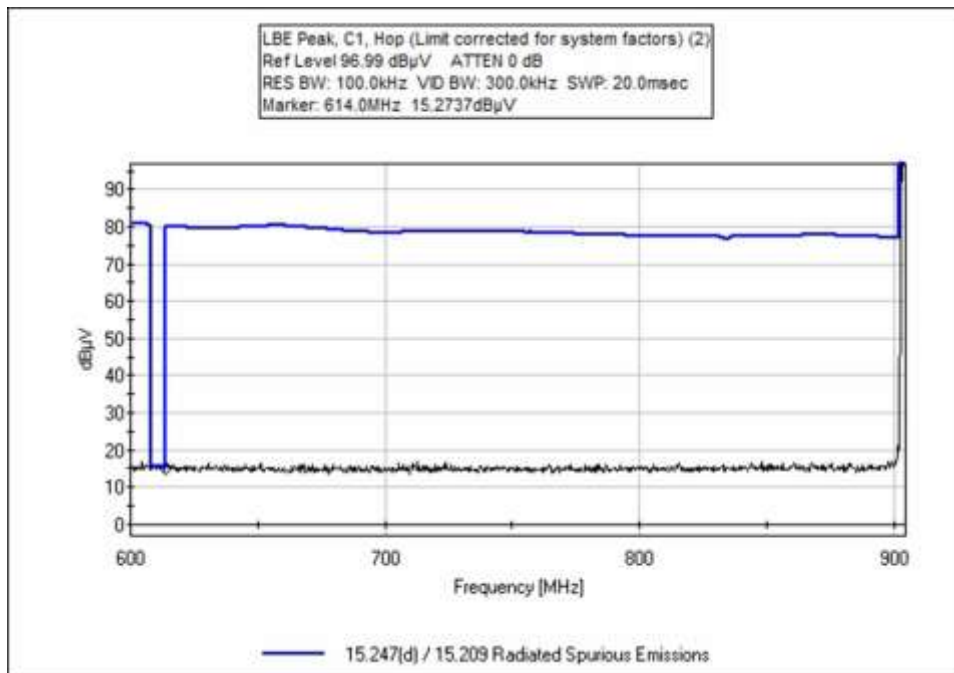
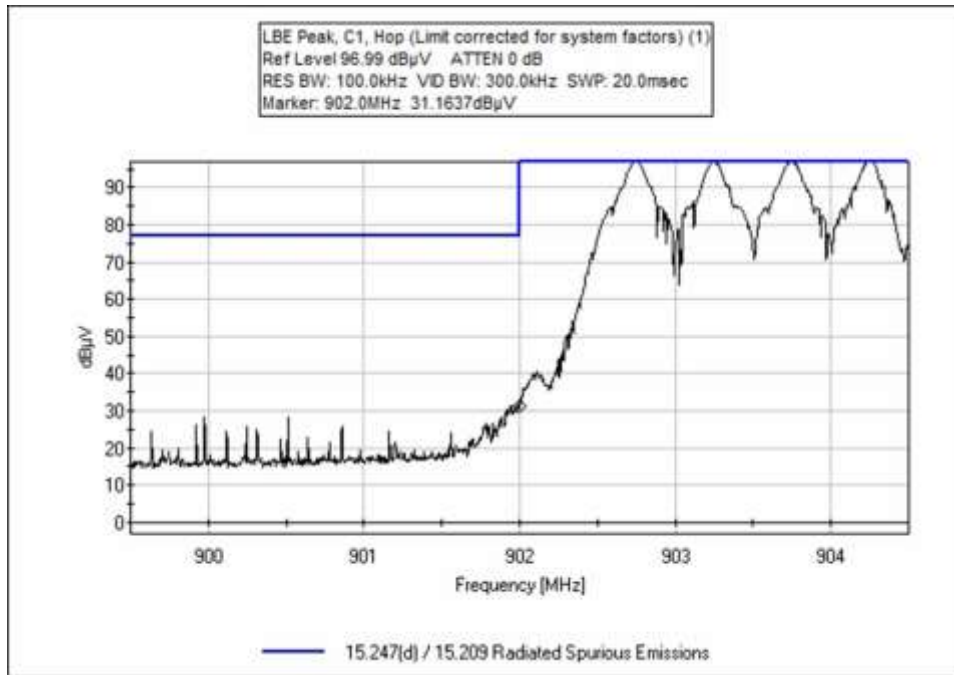
Band Edge Summary					
Configuration 6, Port 2					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Guardwall	40.2	<46.0	Pass
902	ASK	Guardwall	66.9	<109.0	Pass
928	ASK	Guardwall	64.7	<109.0	Pass
960	ASK	Guardwall	47.5	<54.0	Pass

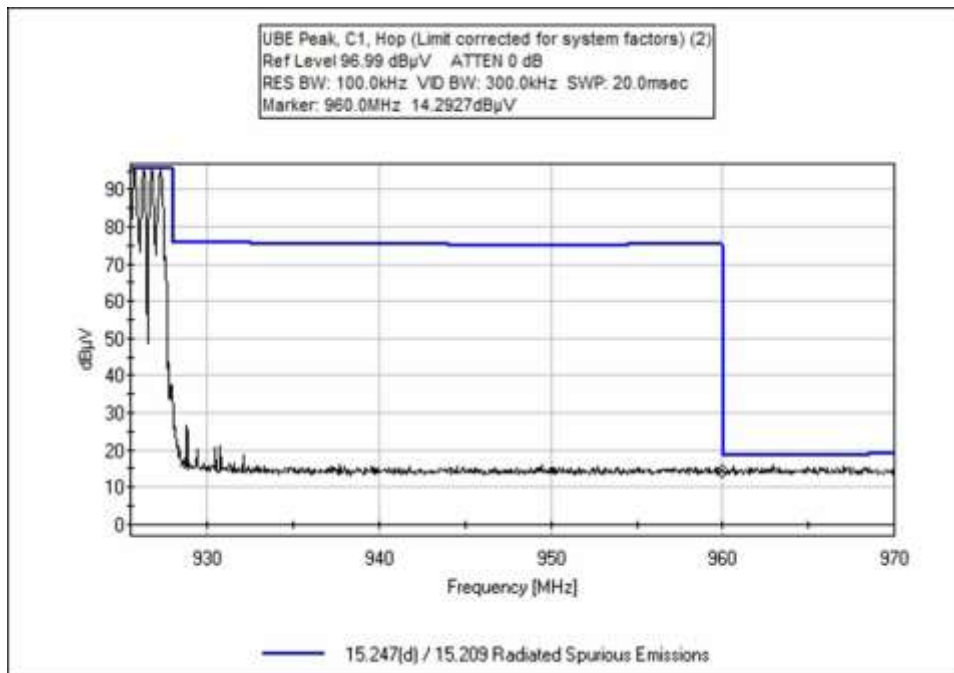
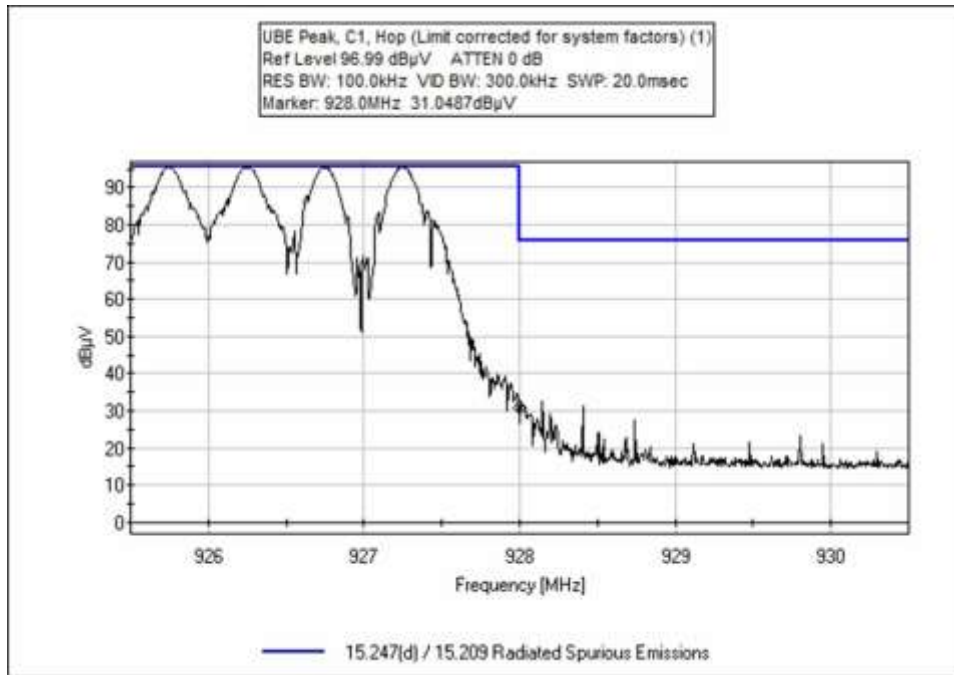
Band Edge Summary					
Configuration 6, Port 2					
Operating Mode: Hopping					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	ASK	Guardwall	40.1	<46.0	Pass
902	ASK	Guardwall	69.2	<109.0	Pass
928	ASK	Guardwall	62.8	<109.0	Pass
960	ASK	Guardwall	48.2	<54.0	Pass

**Configuration 1 Band Edge Plots**



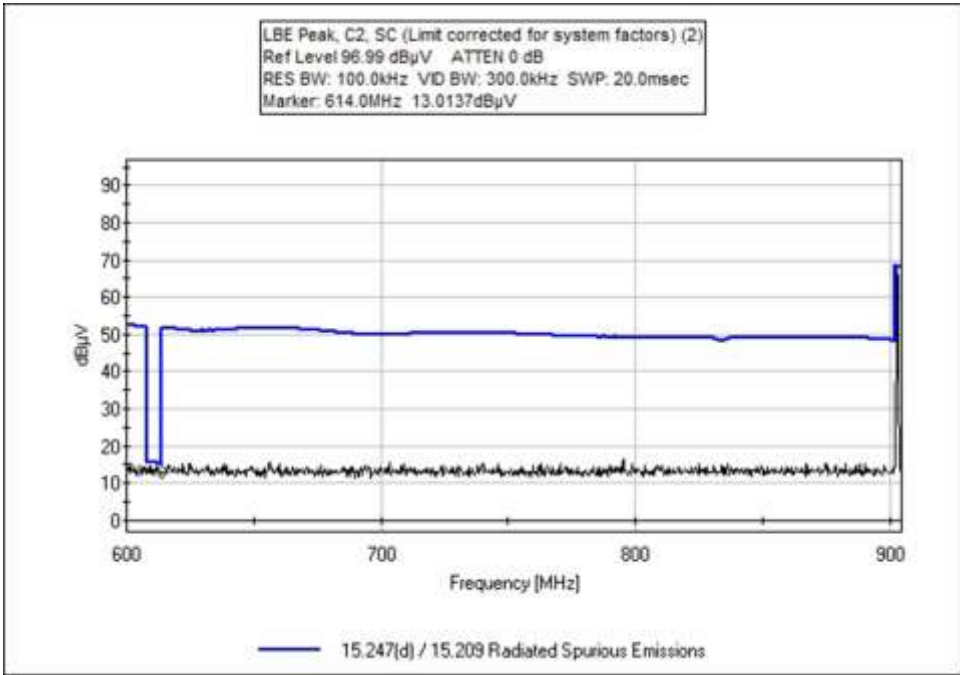
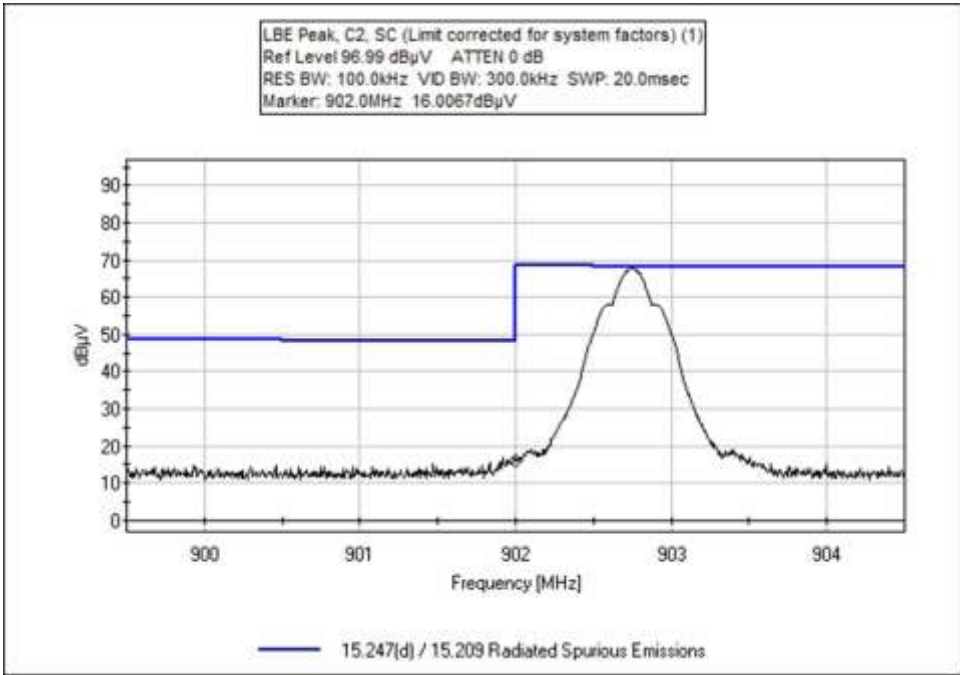


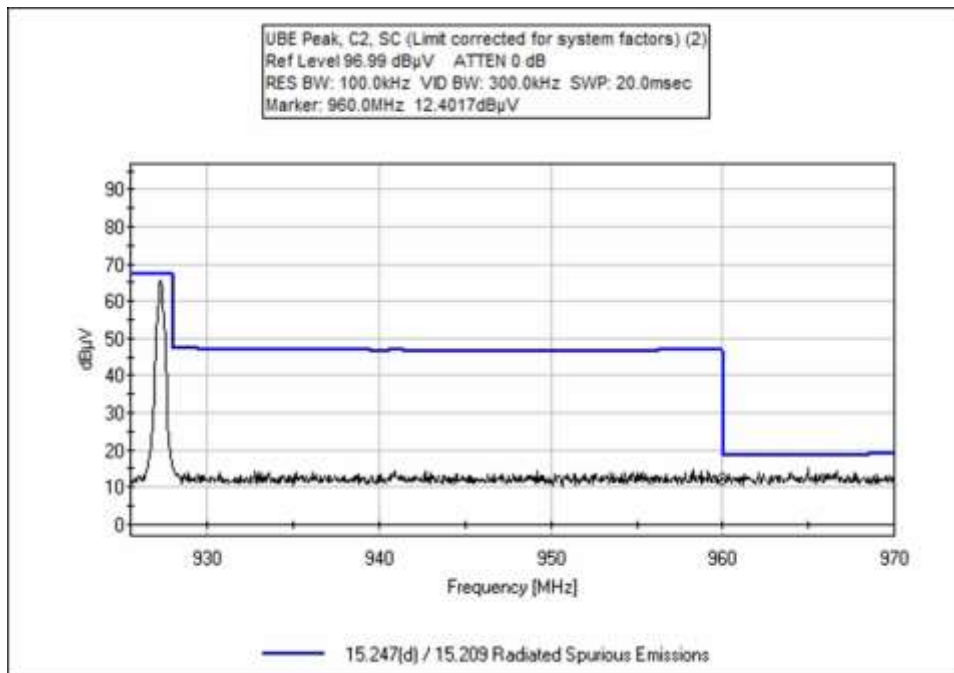
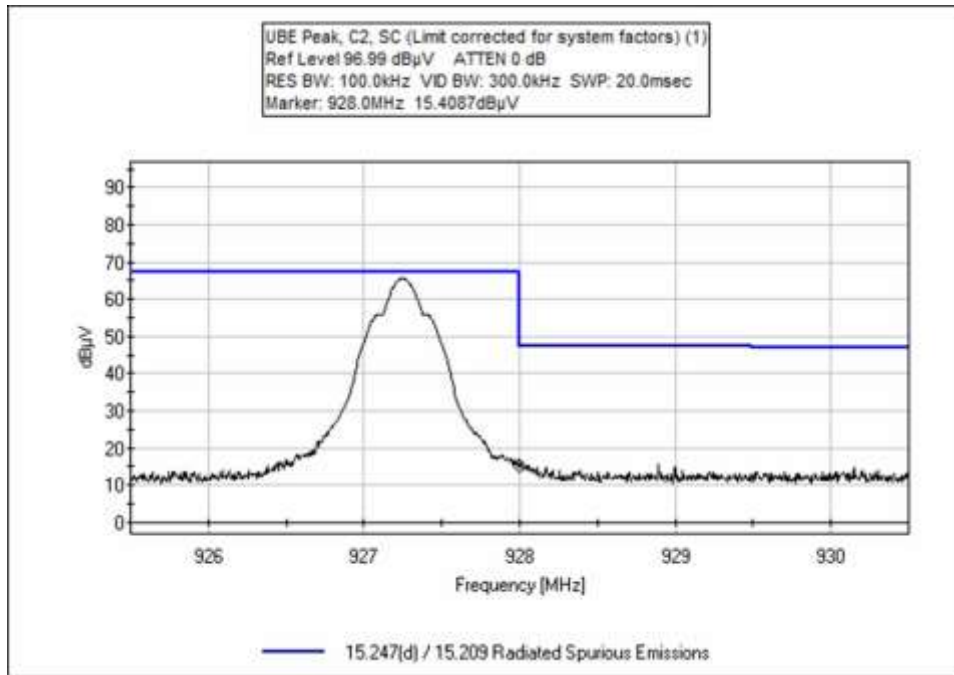


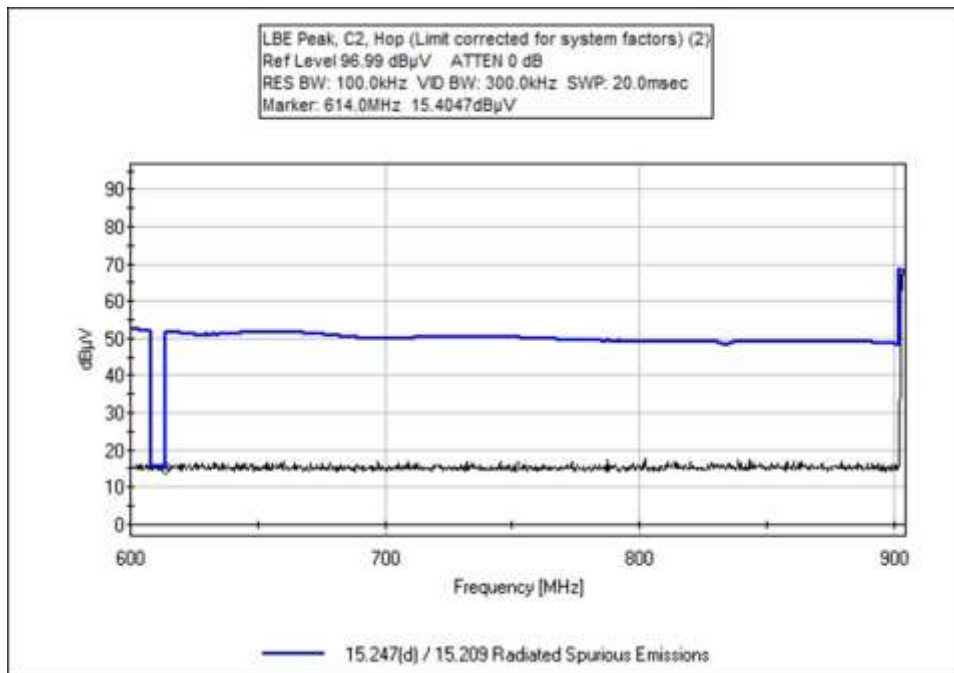
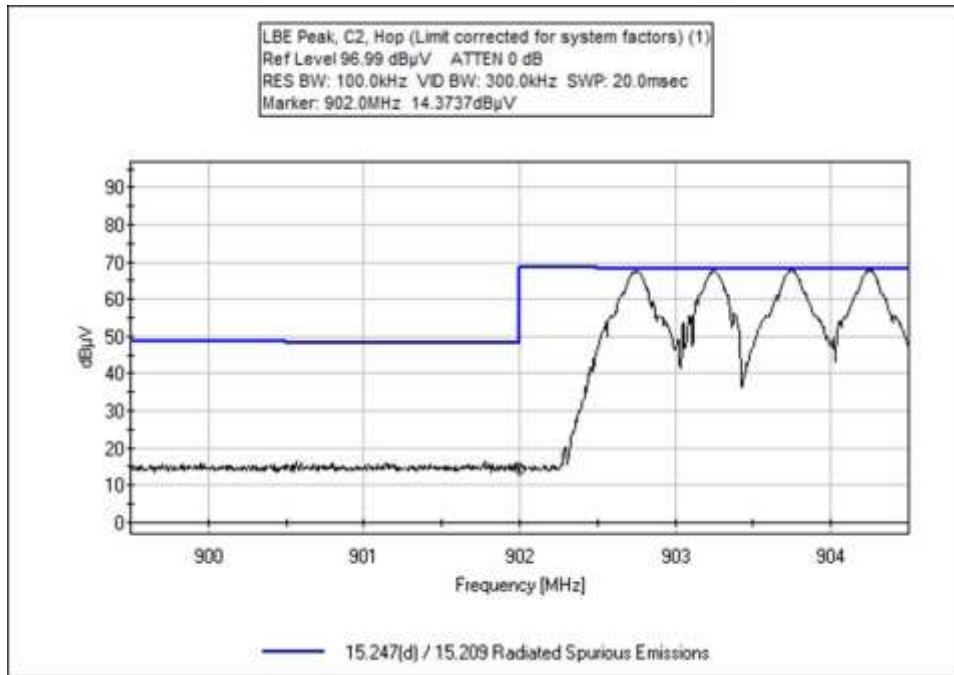


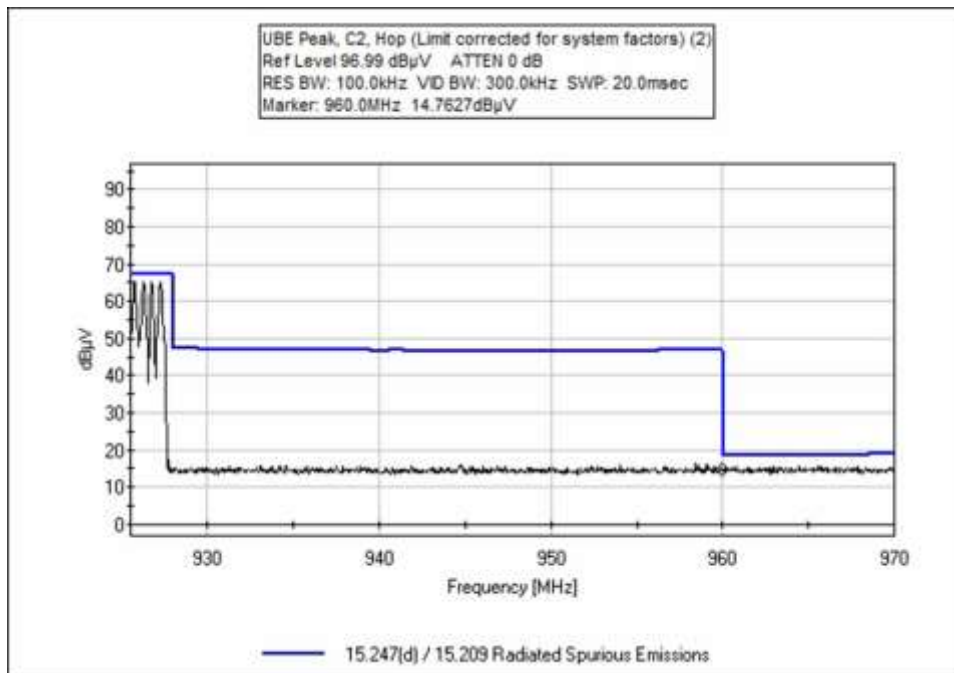
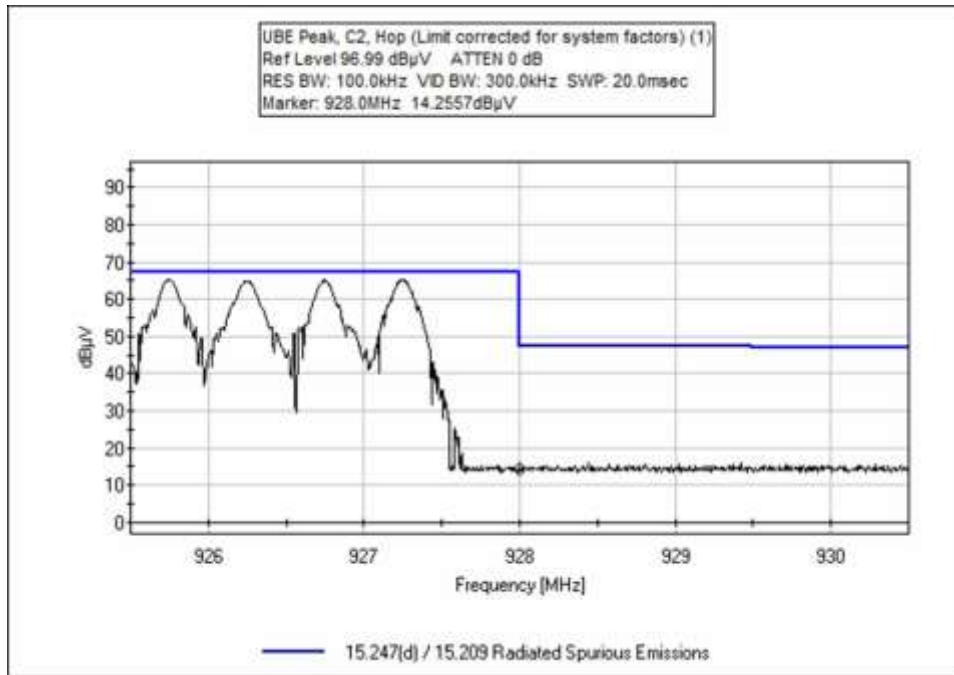


**Configuration 2 Band Edge Plots**

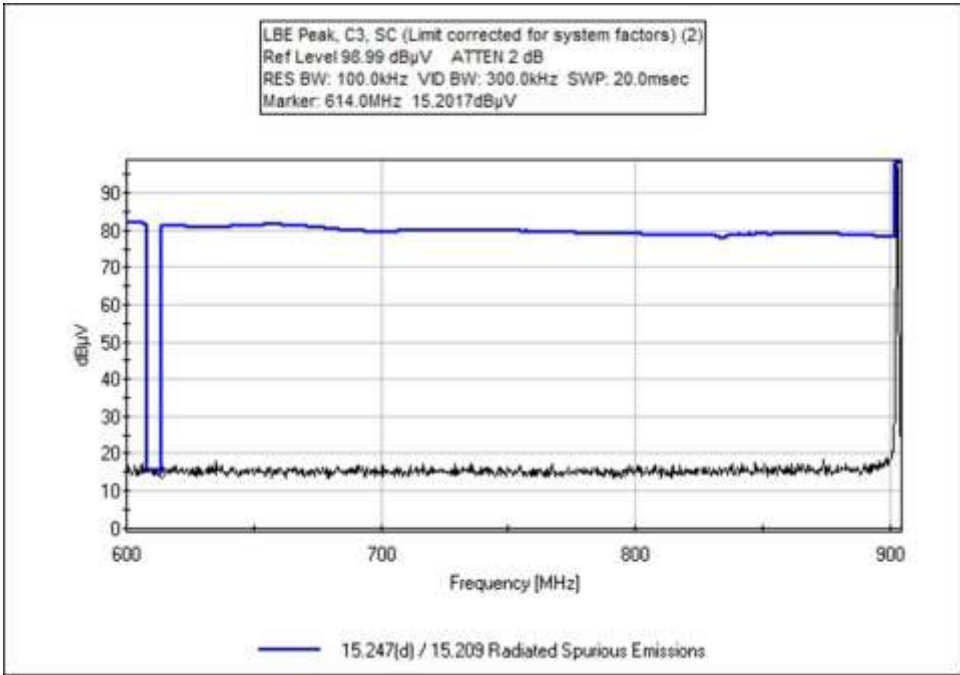
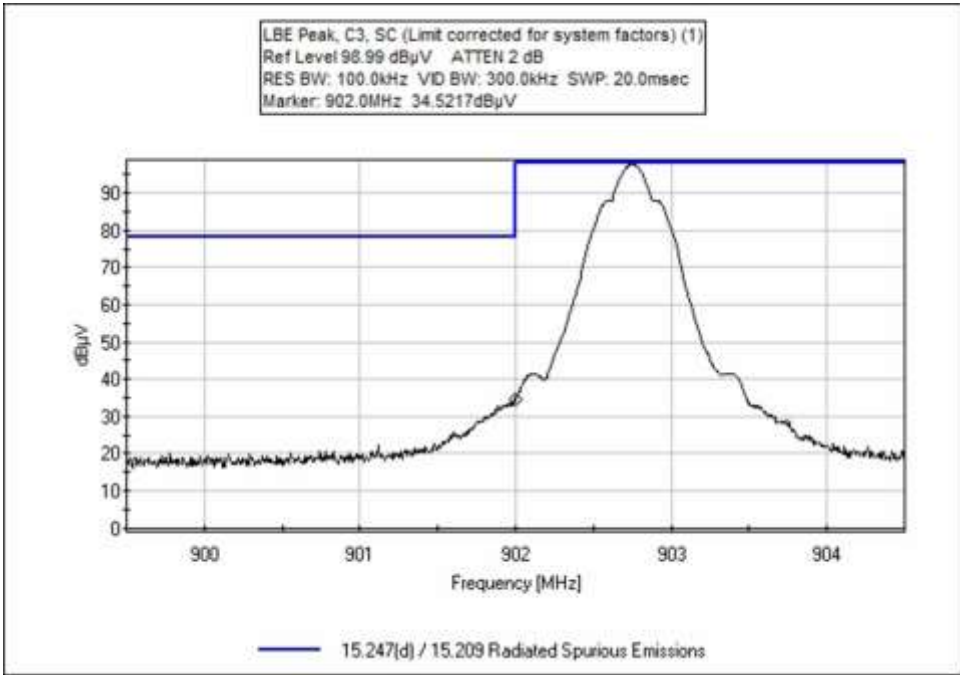


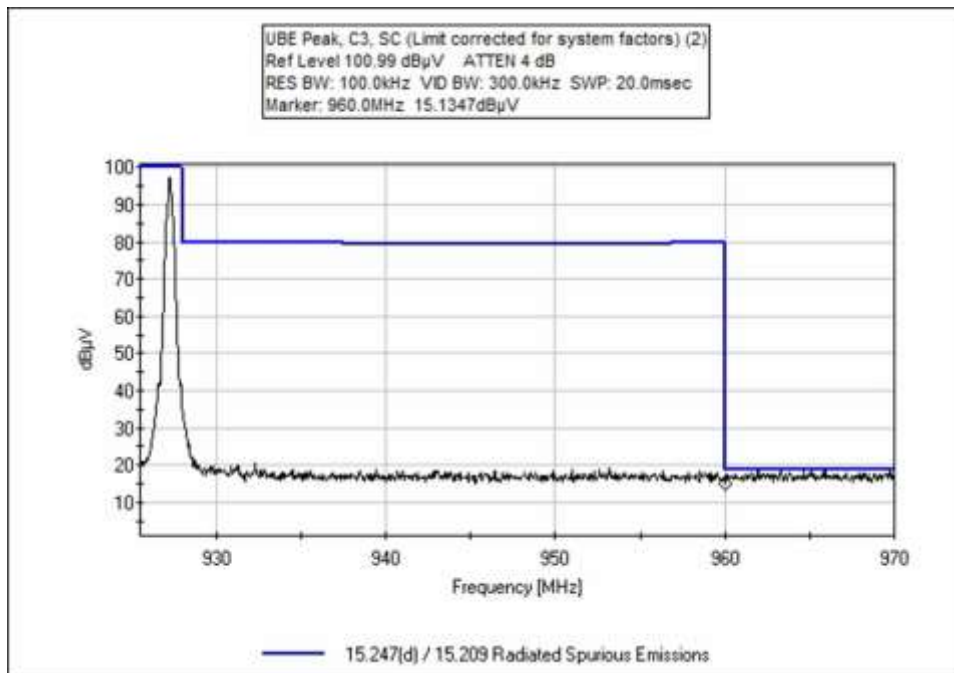
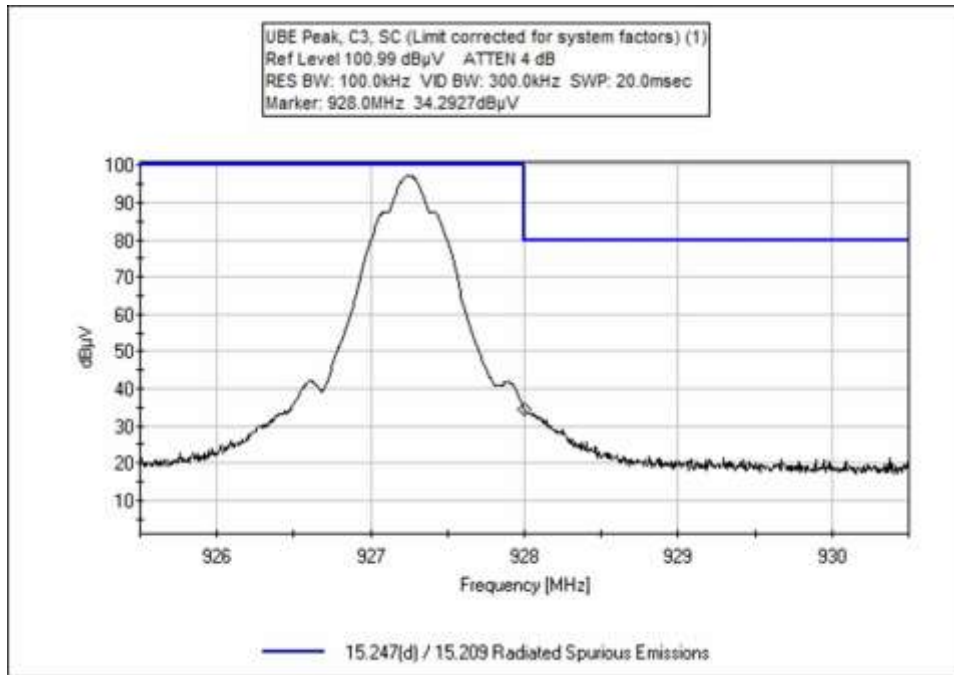


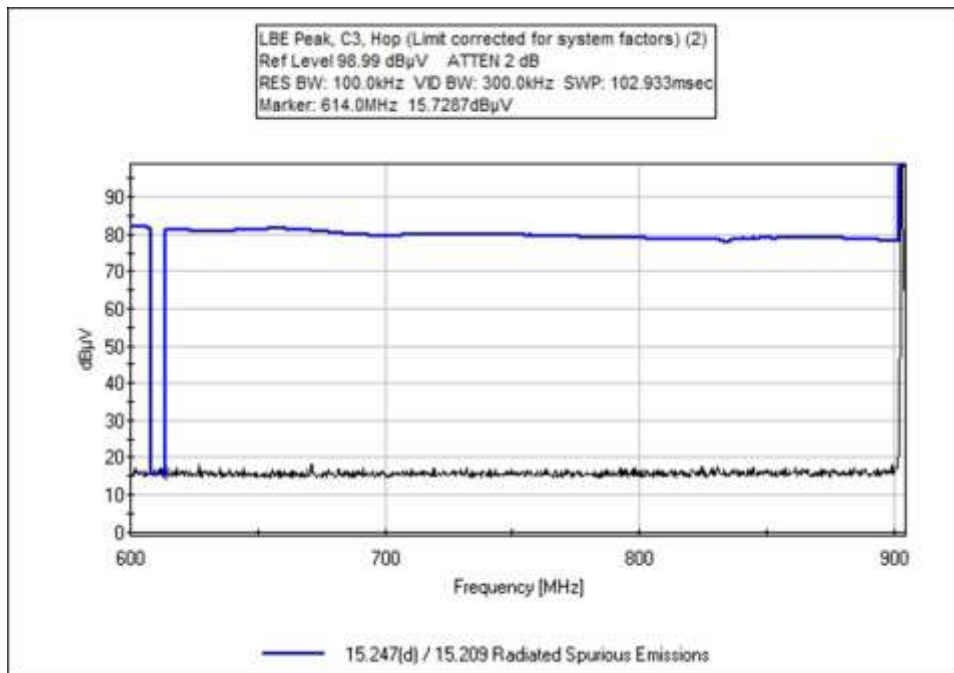
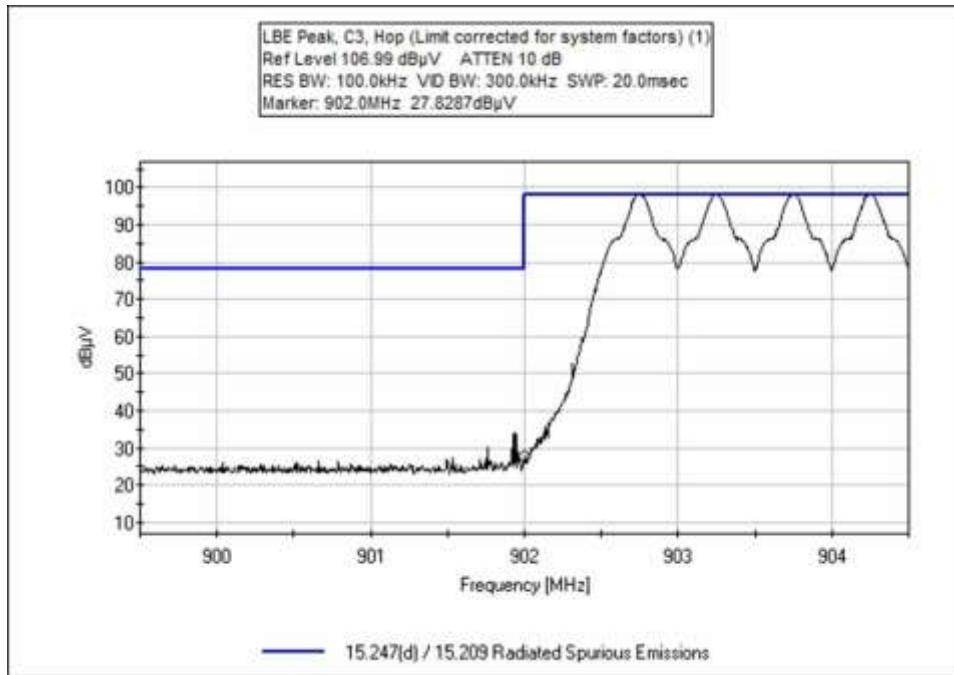


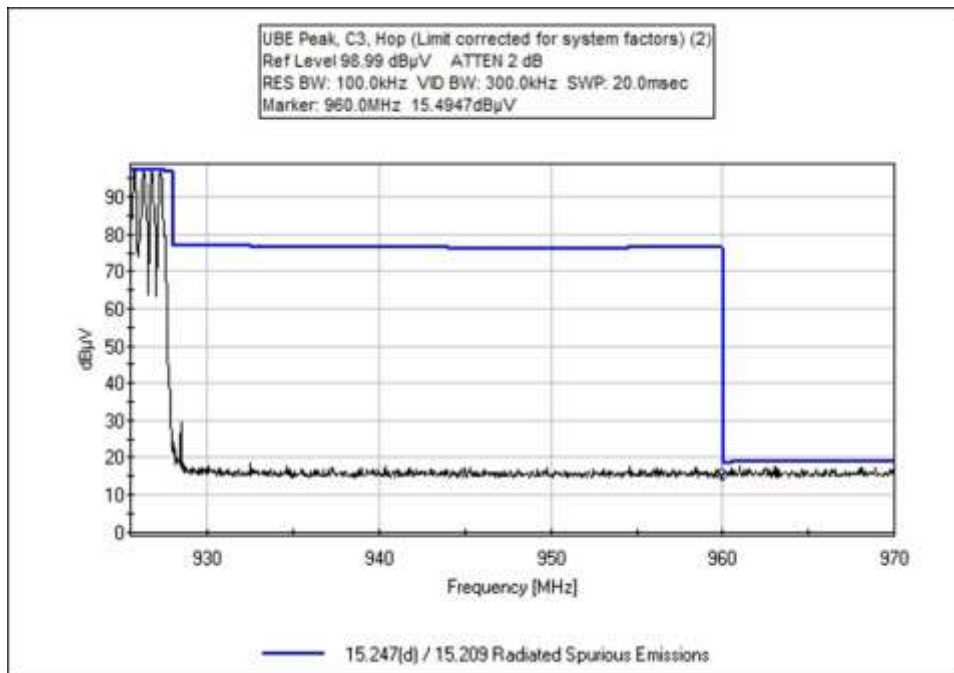
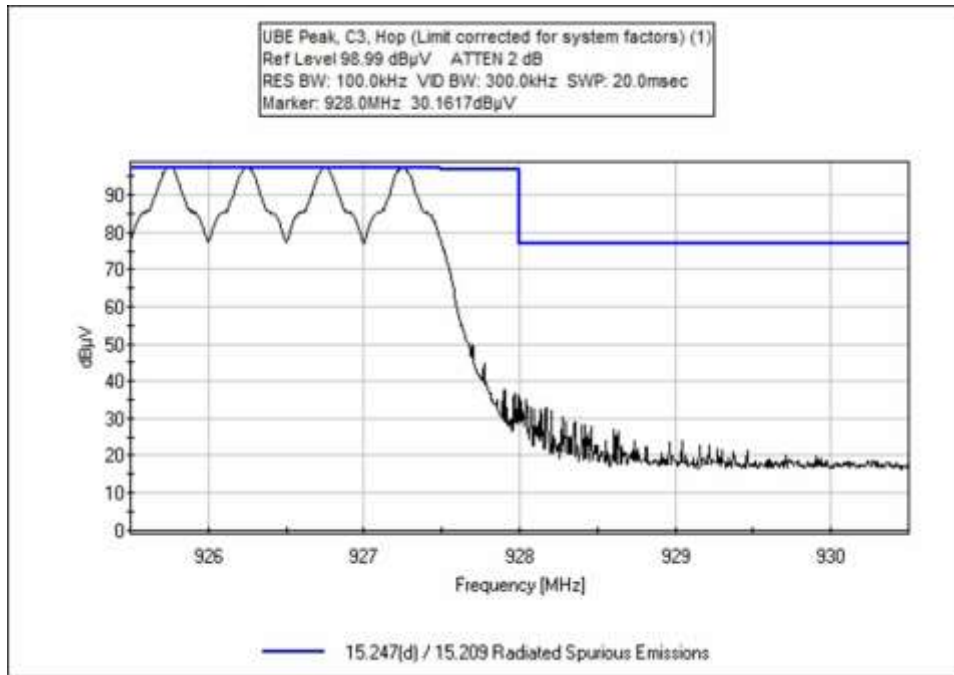


**Configuration 3 Band Edge Plots**



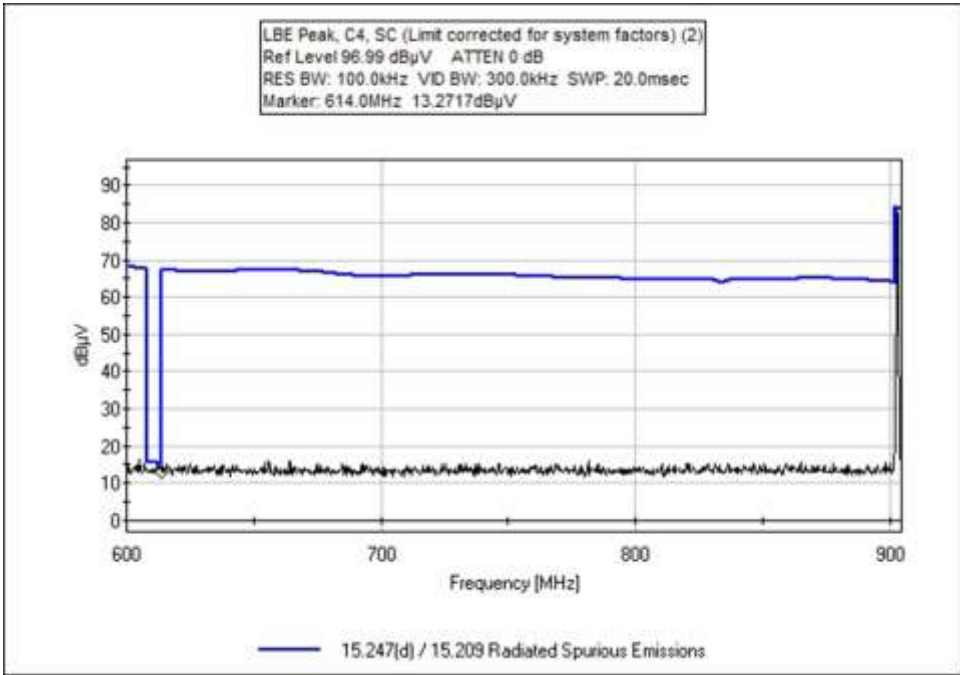
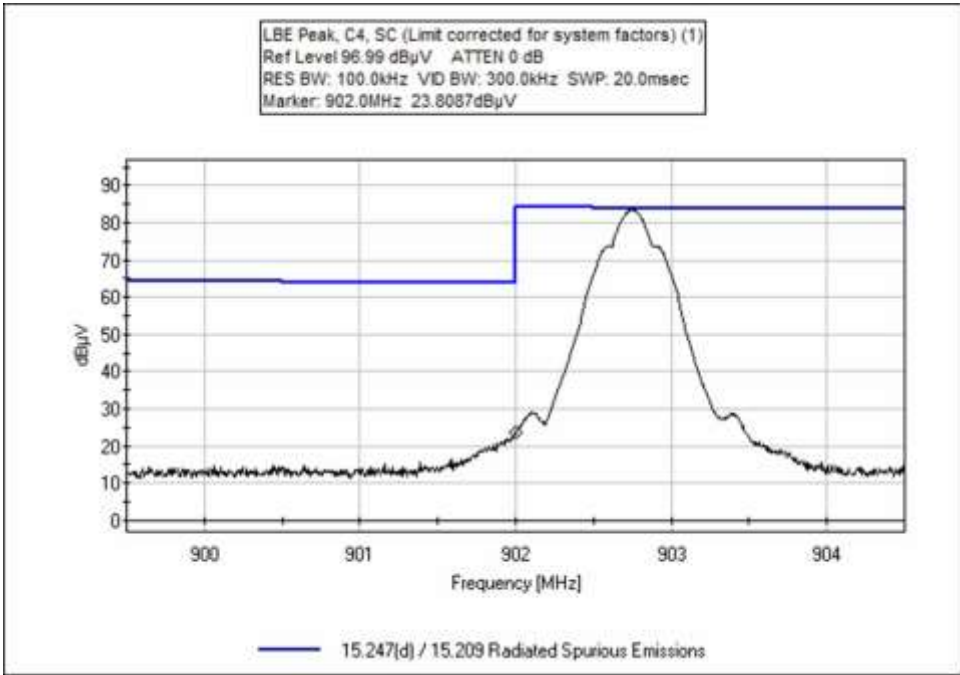


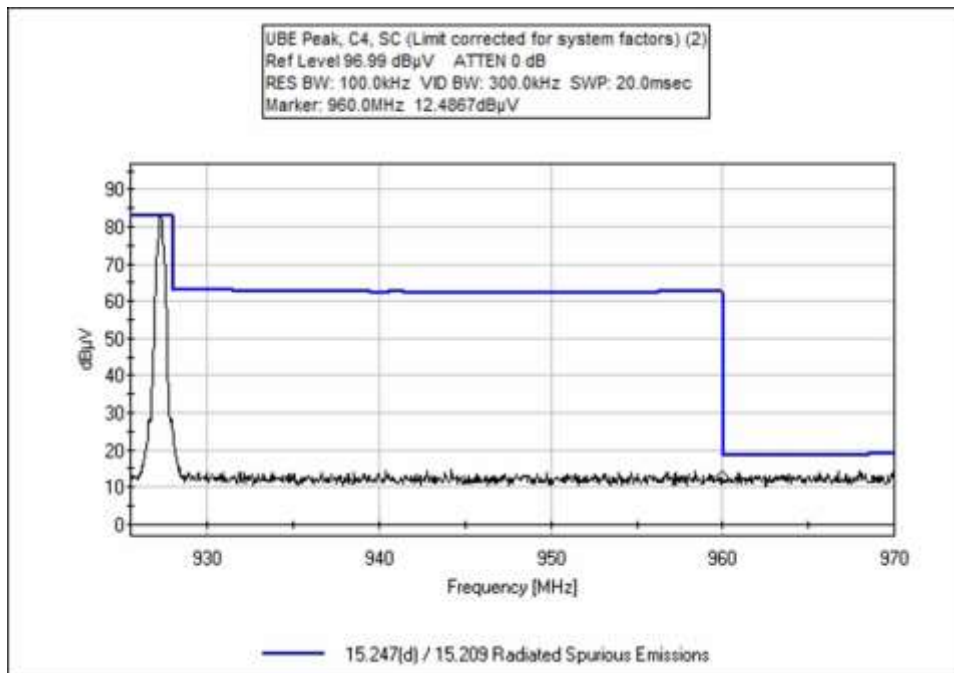
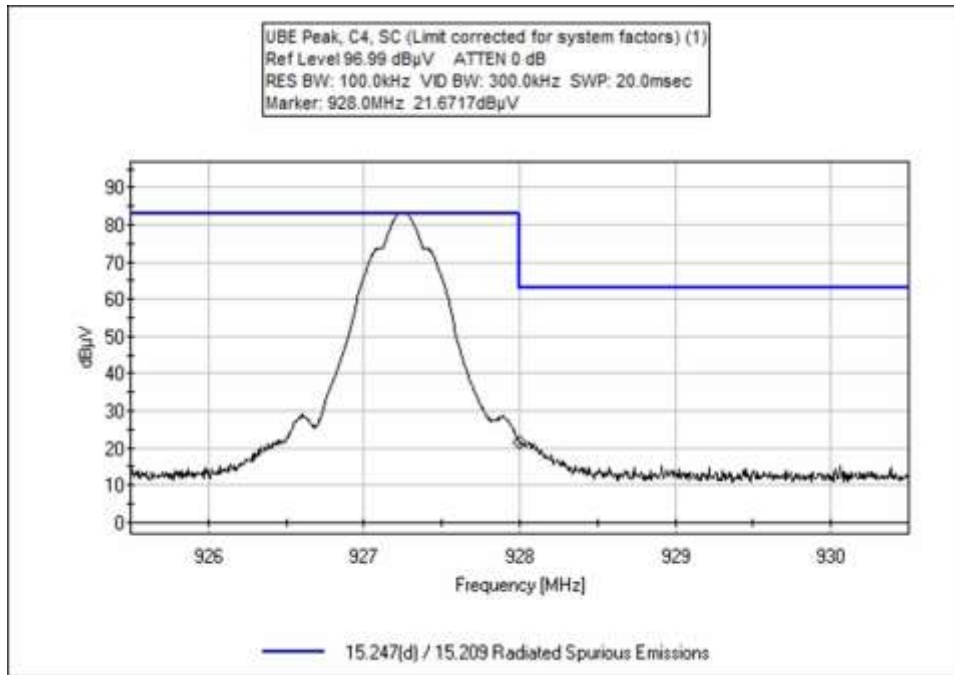


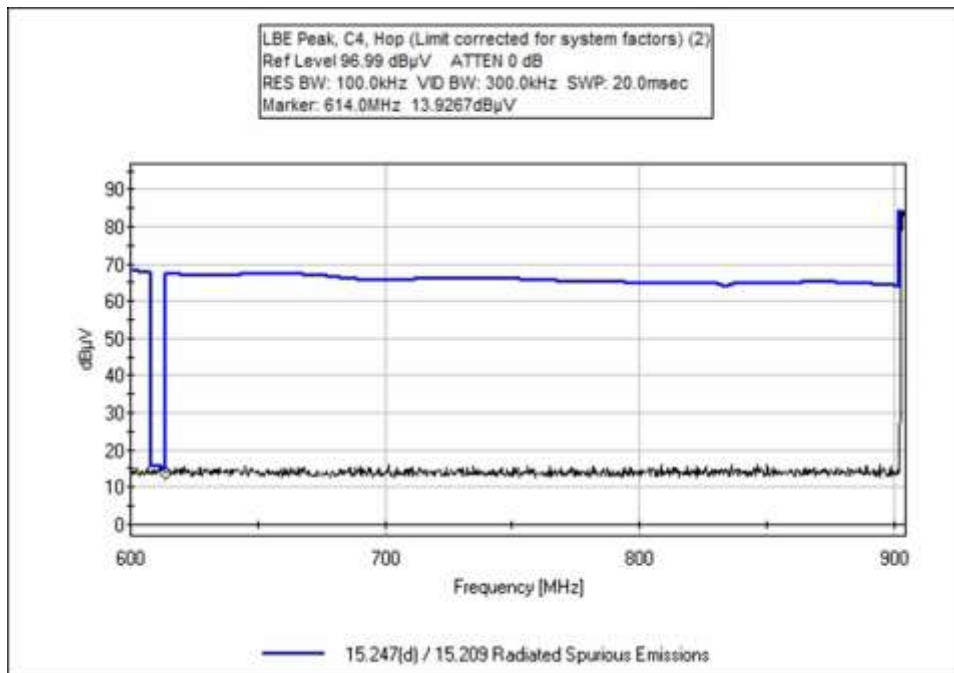
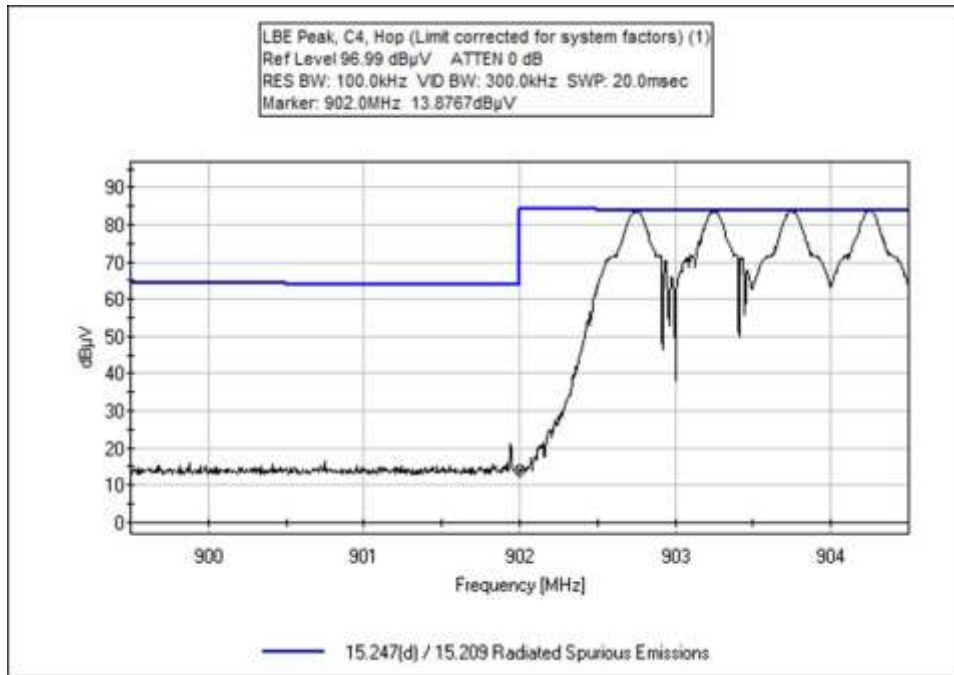


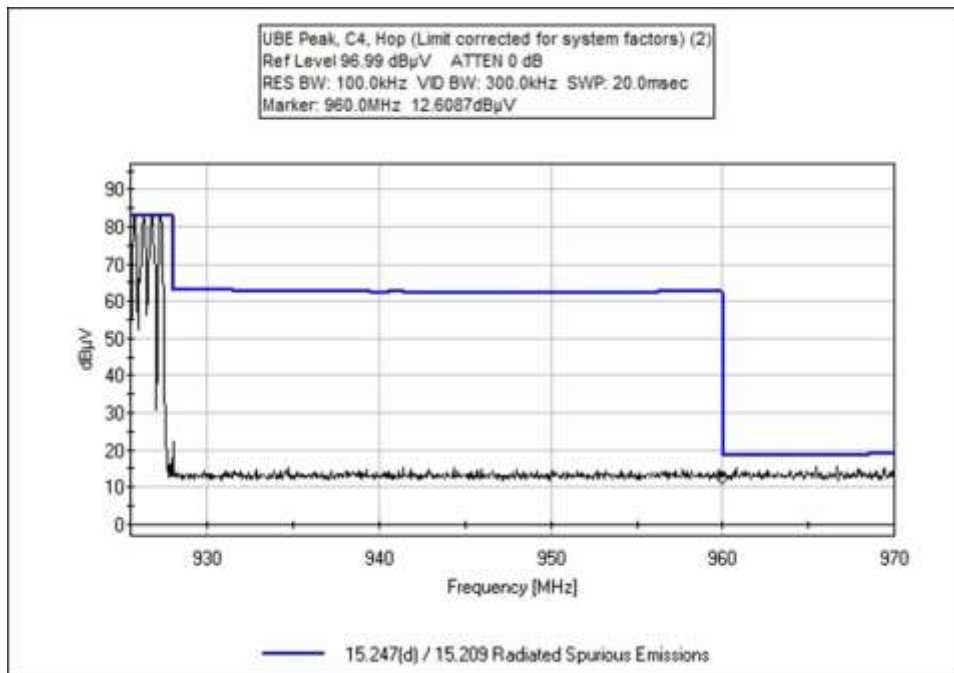
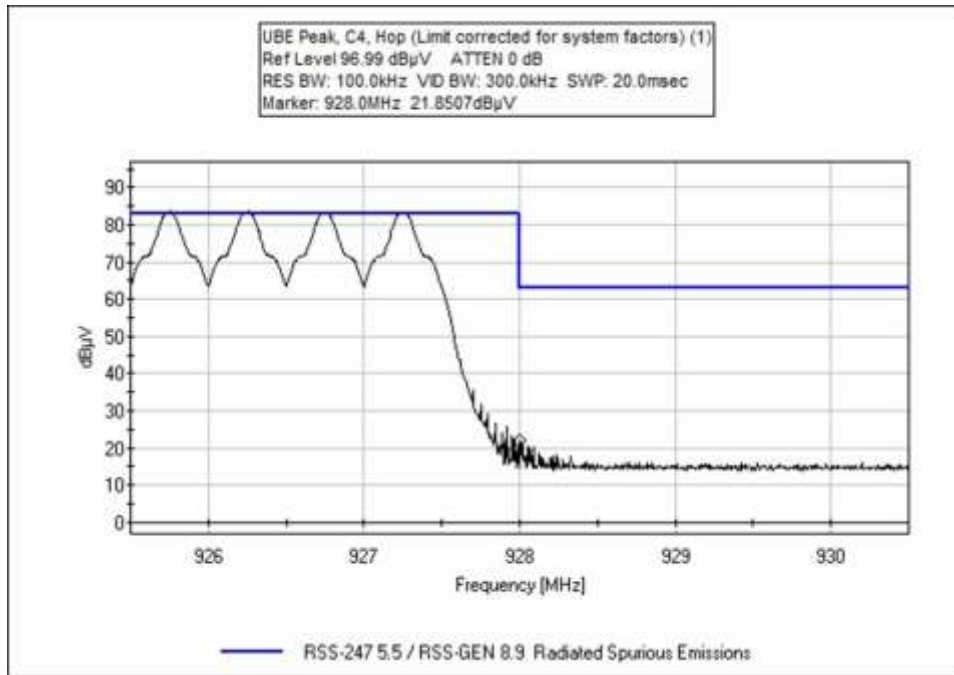


**Configuration 4 Band Edge Plots**

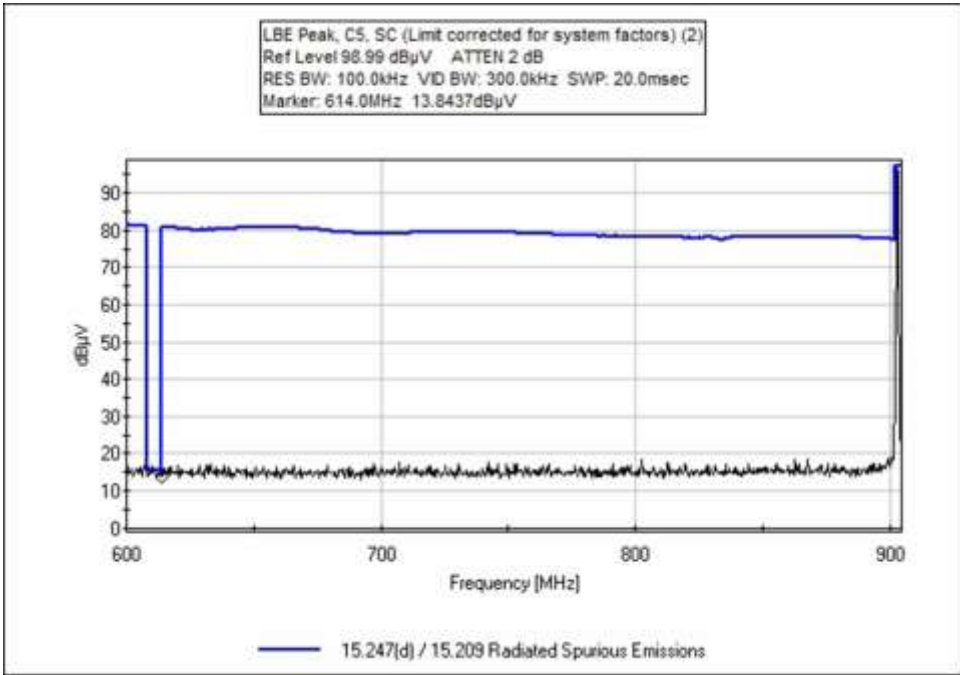
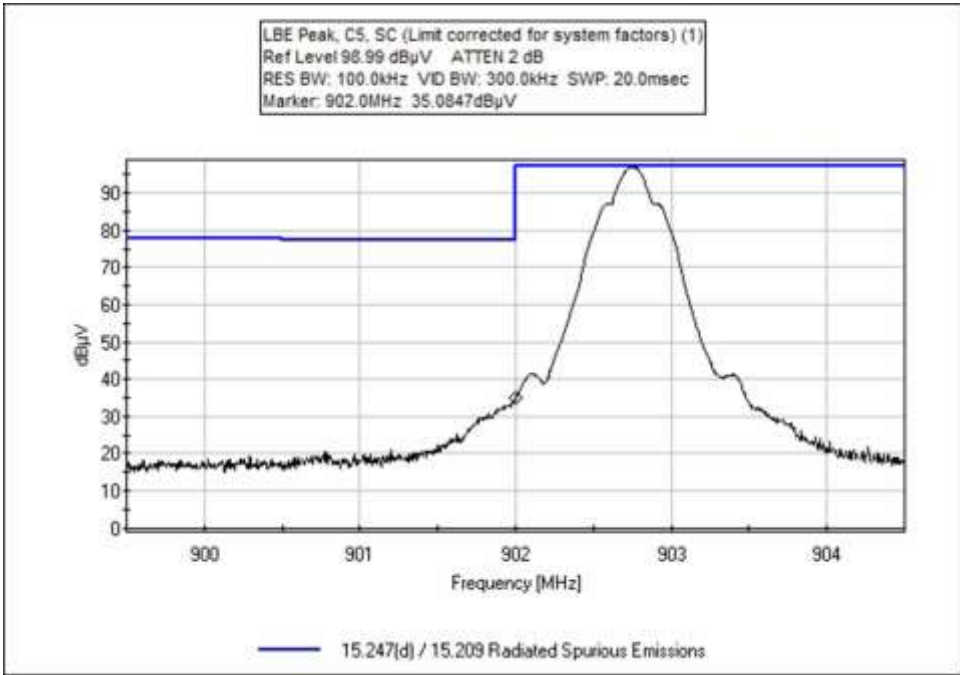


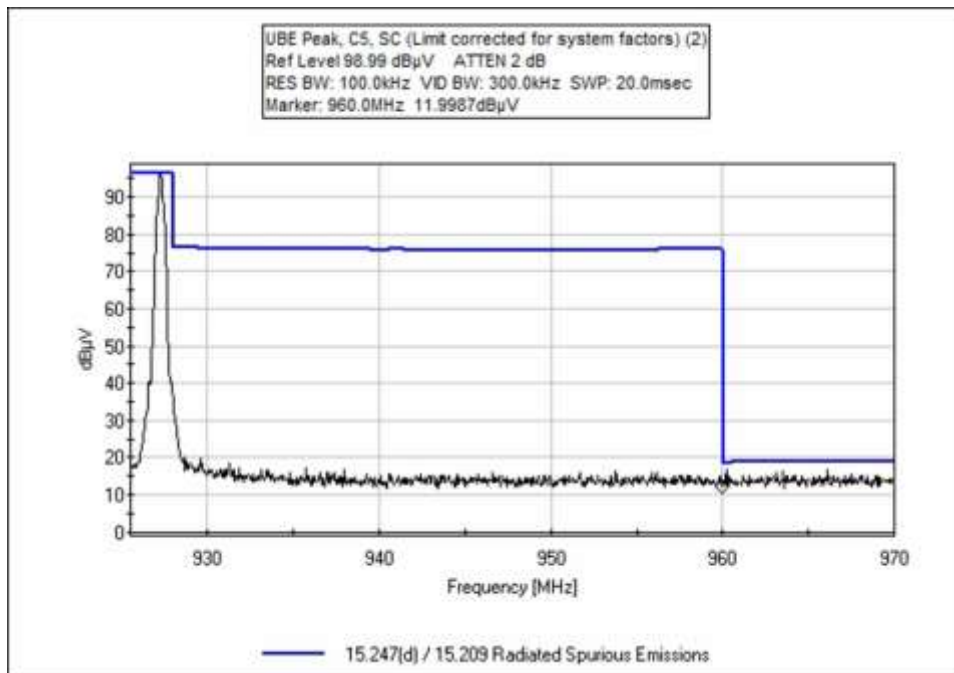
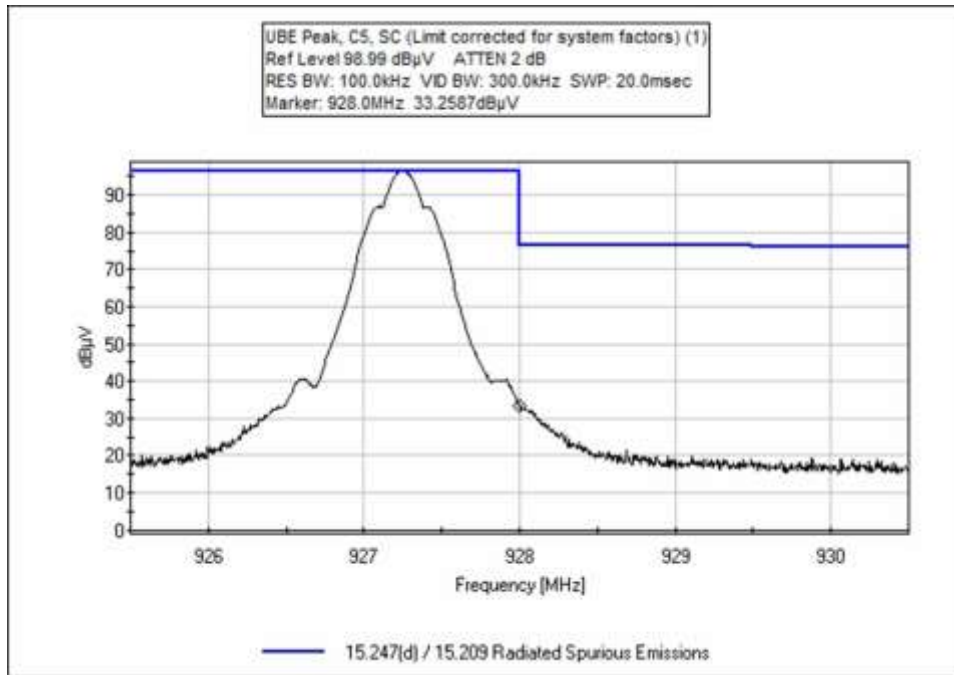


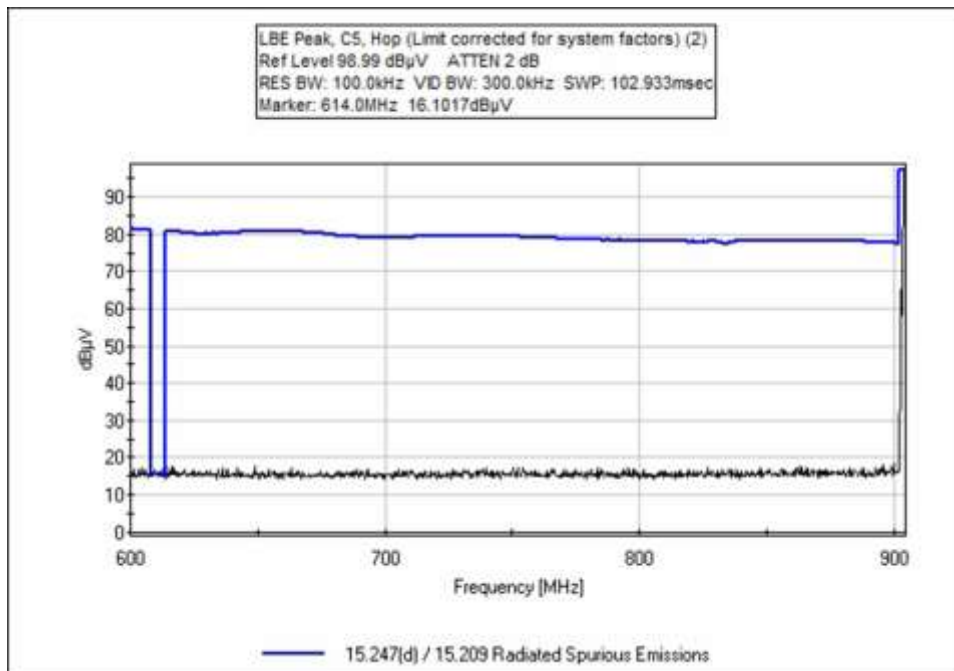
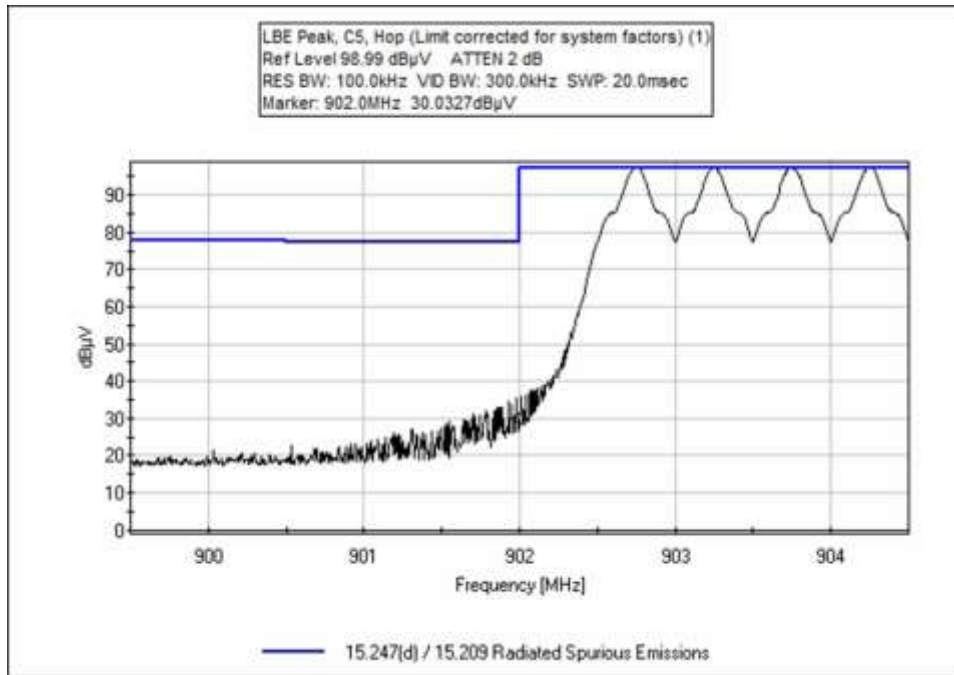


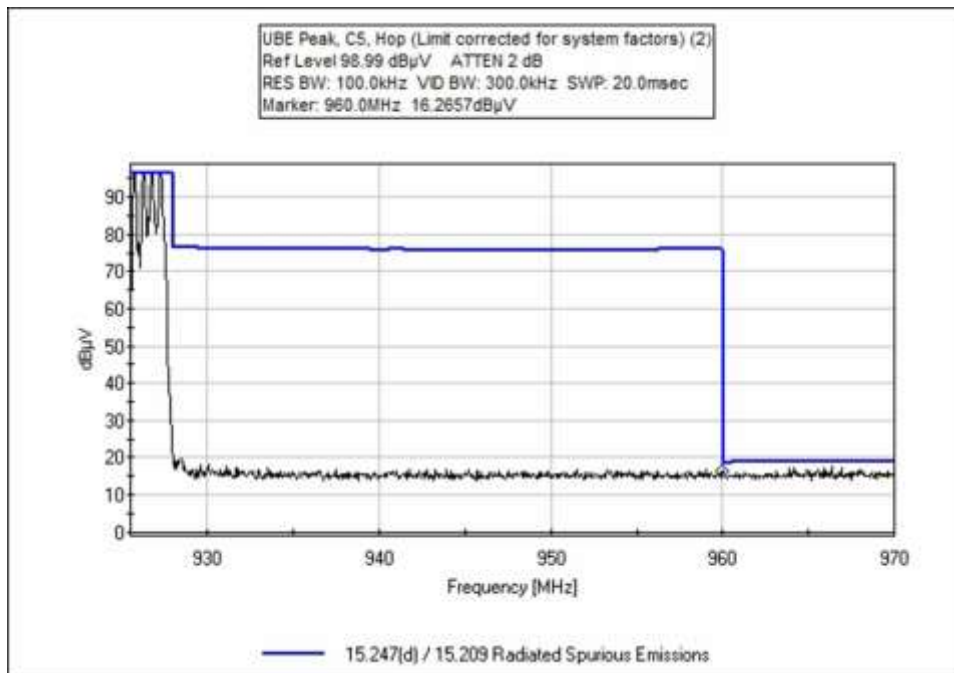
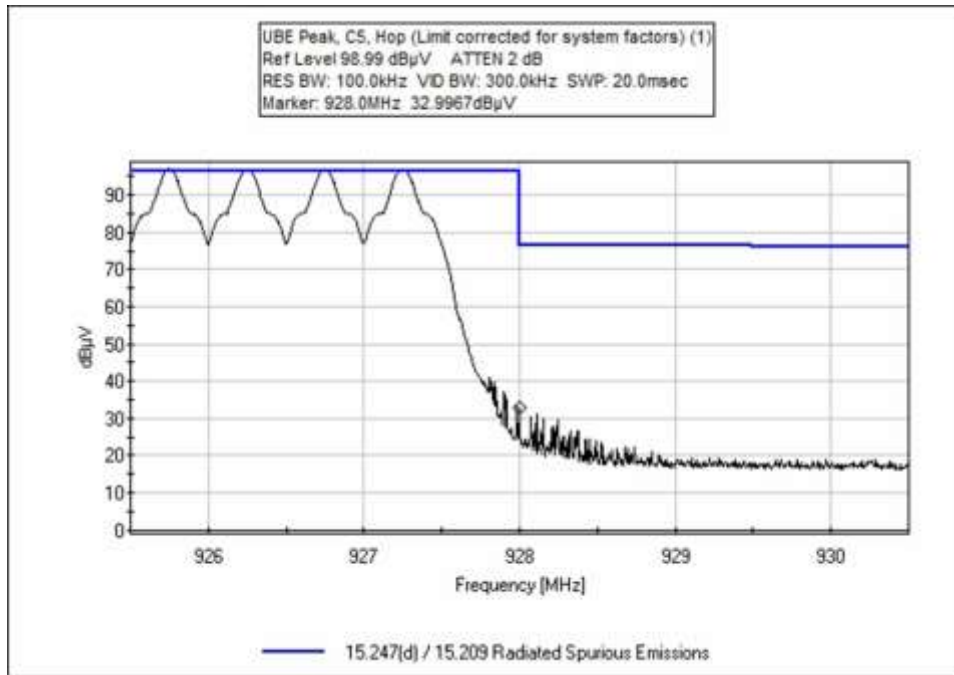


**Configuration 5 Band Edge Plots**



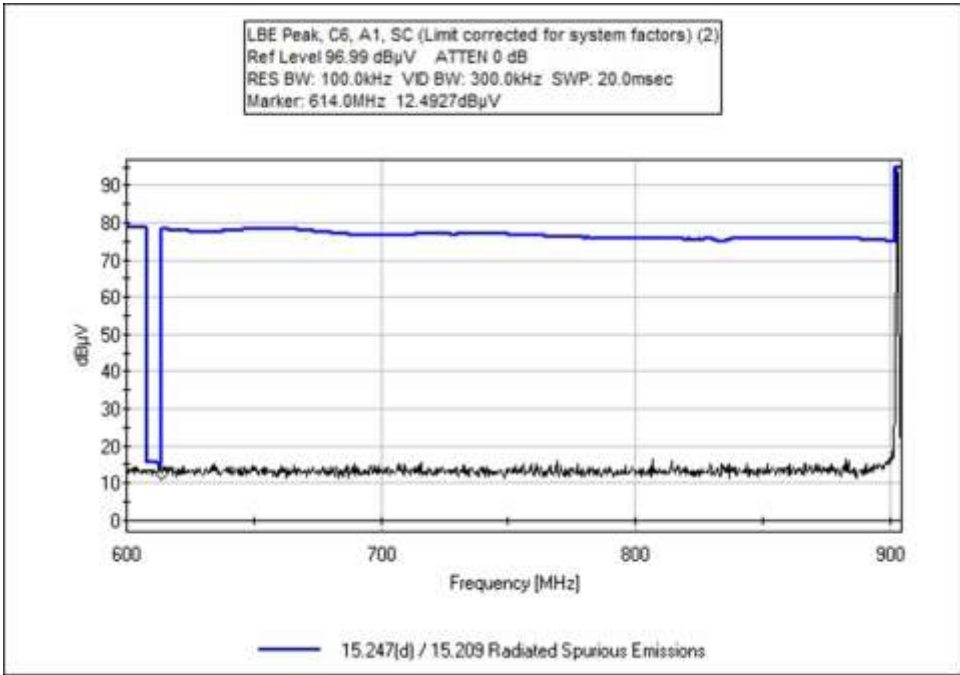
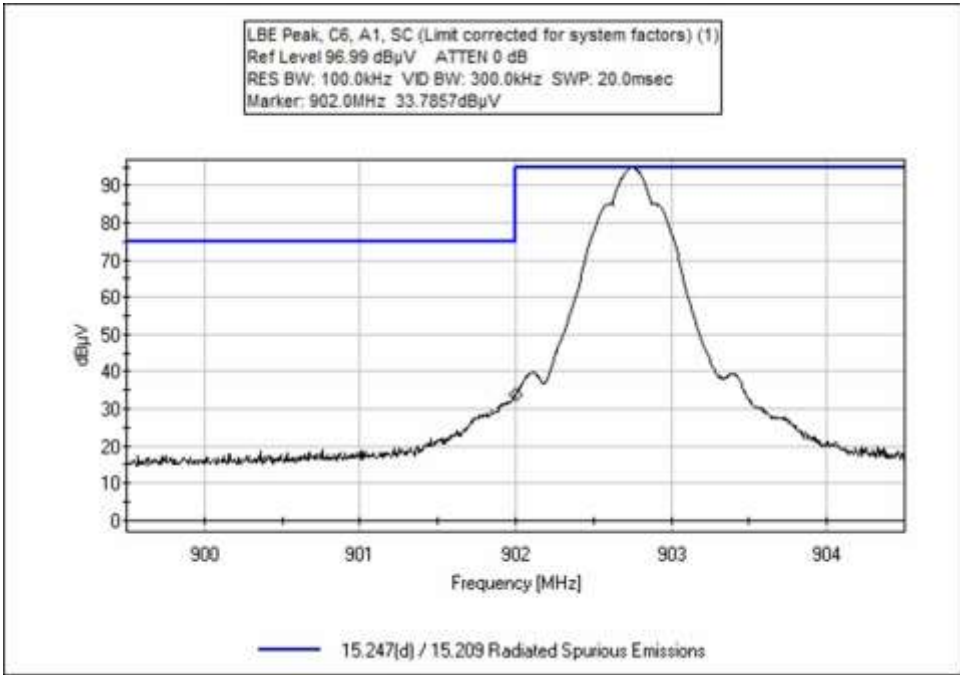


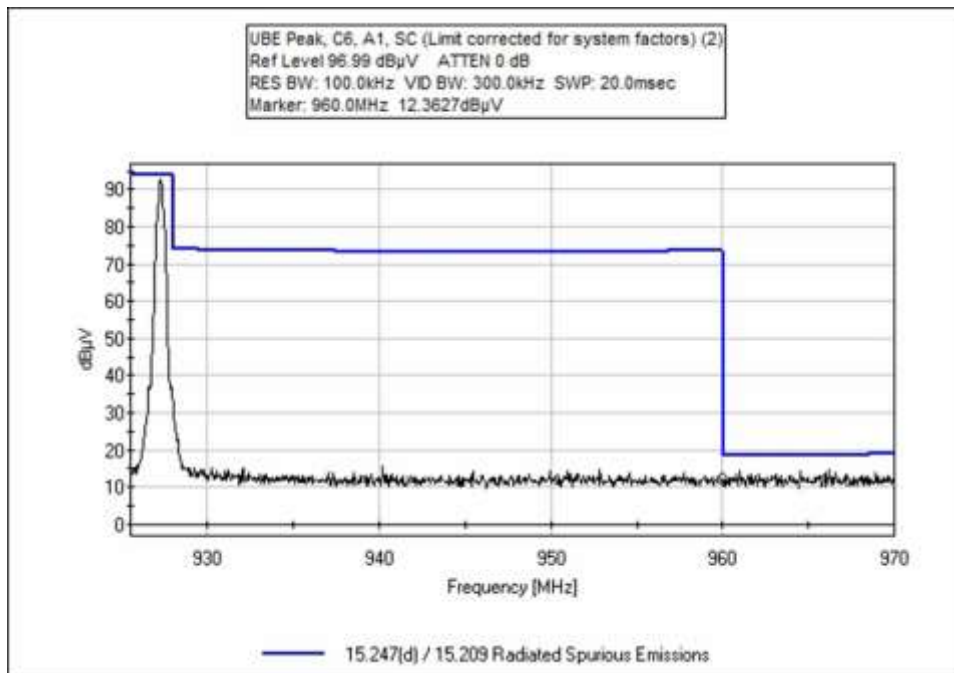
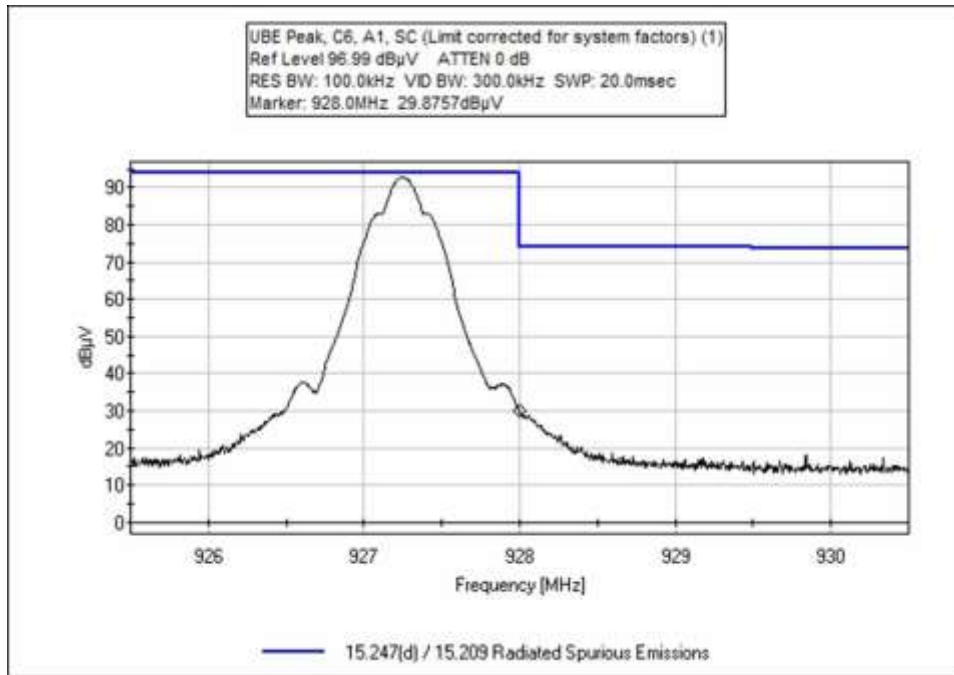


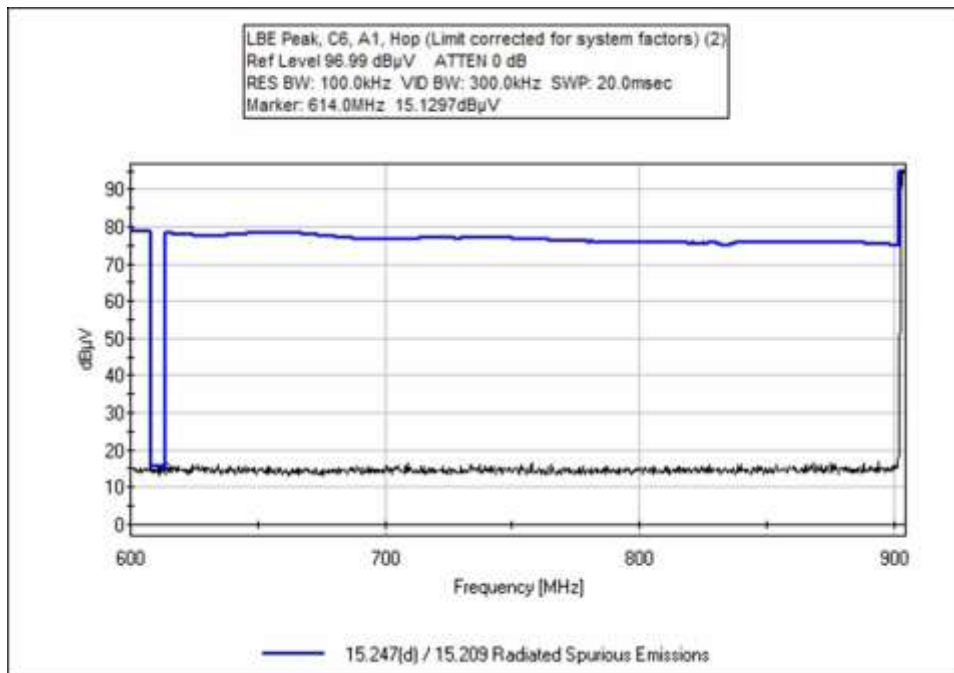
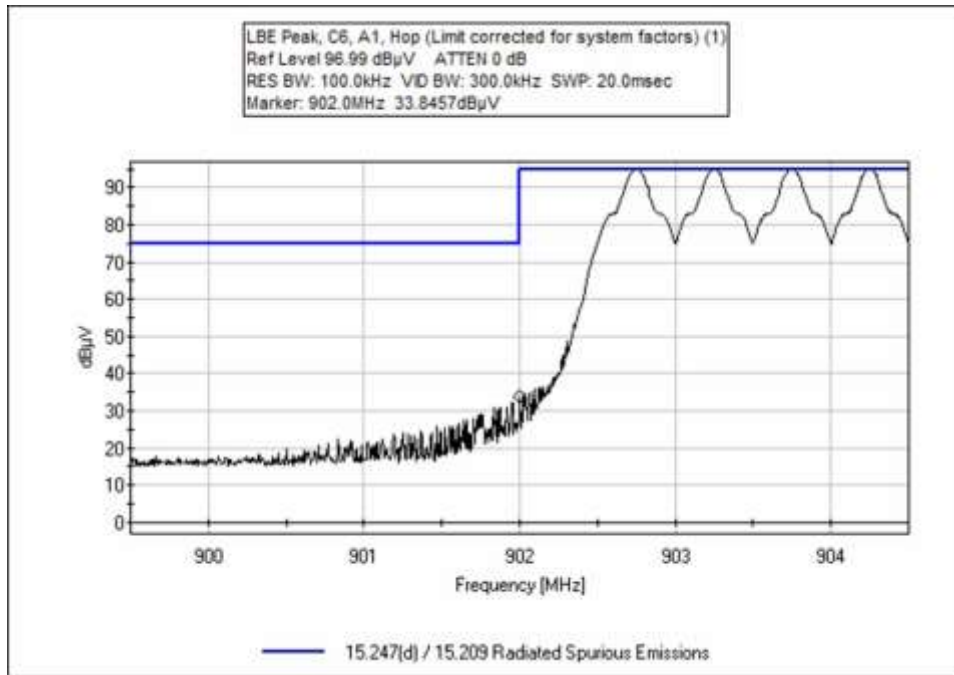


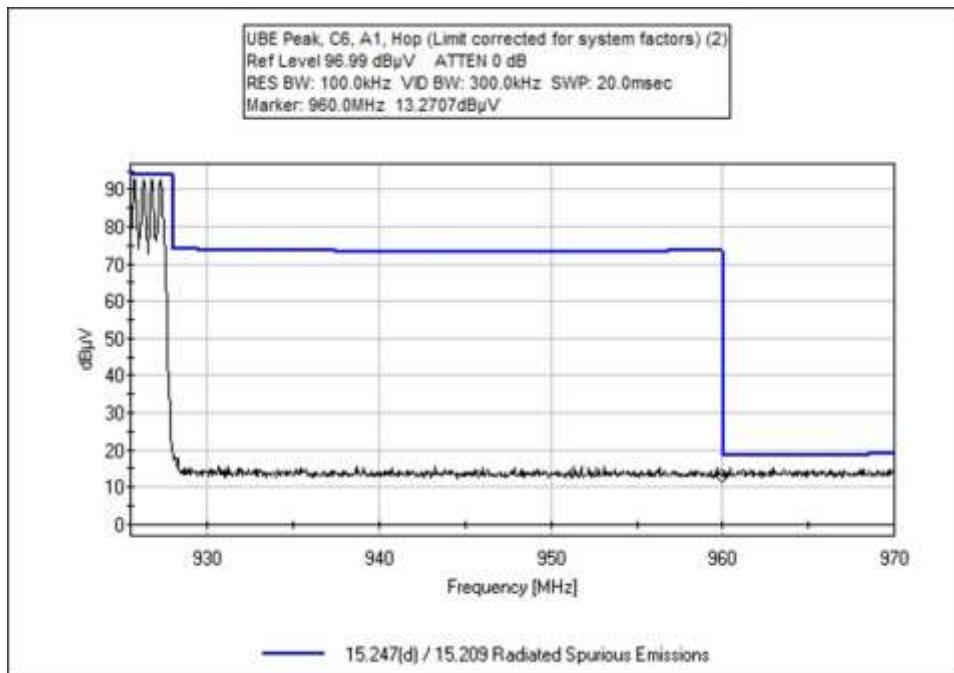
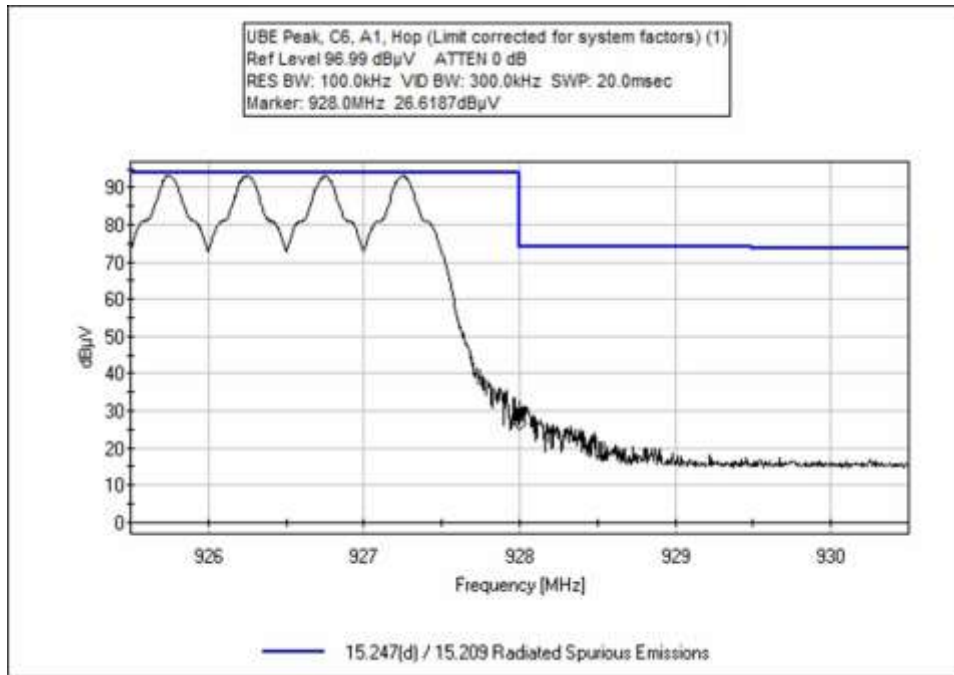


**Configuration 6 Port 1 Band Edge Plots**

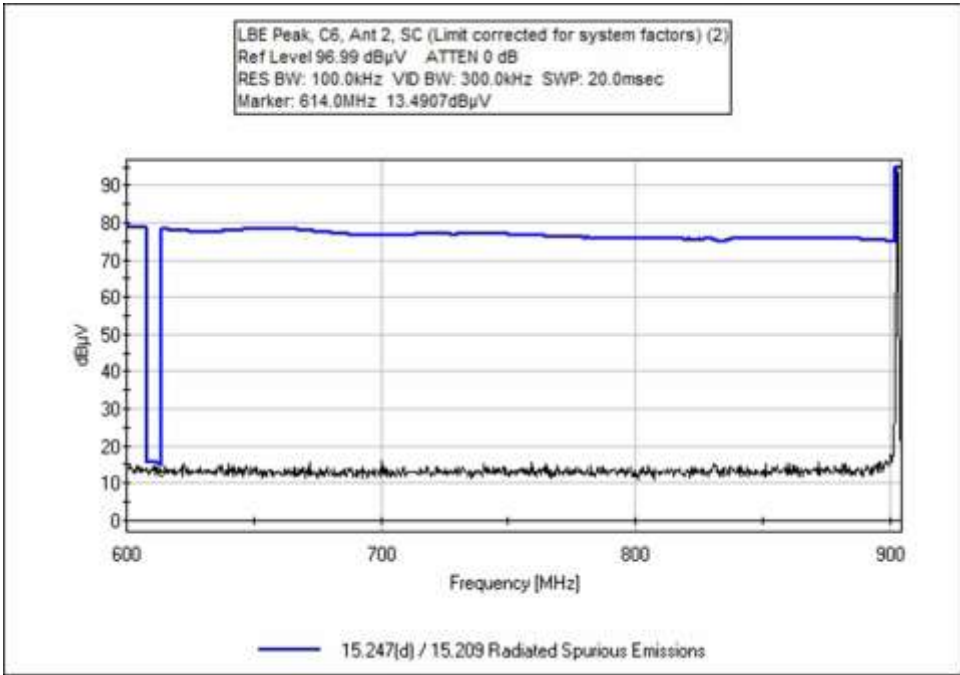
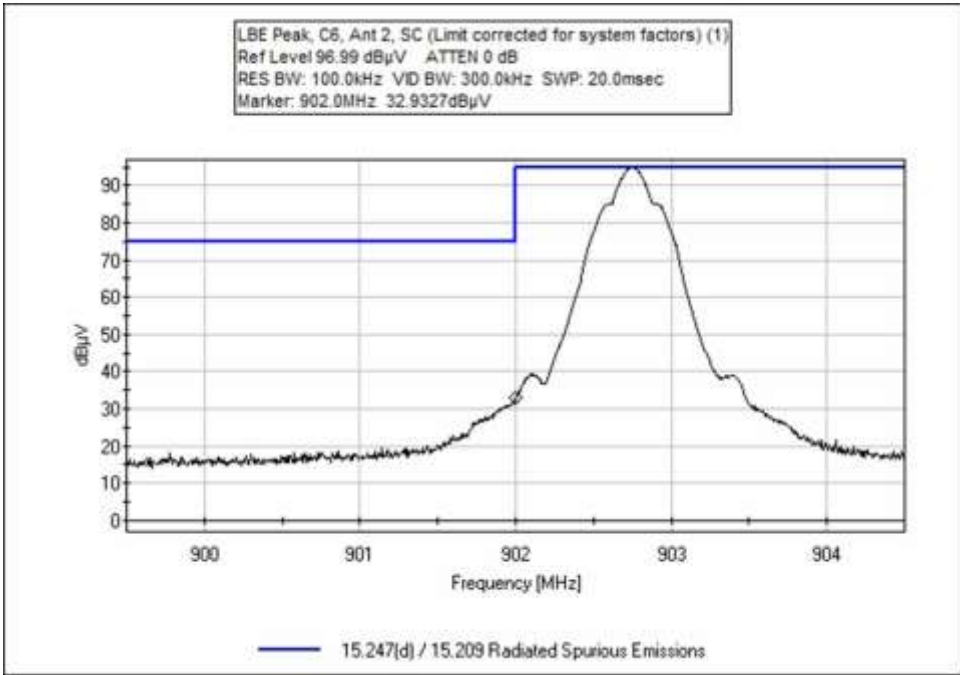


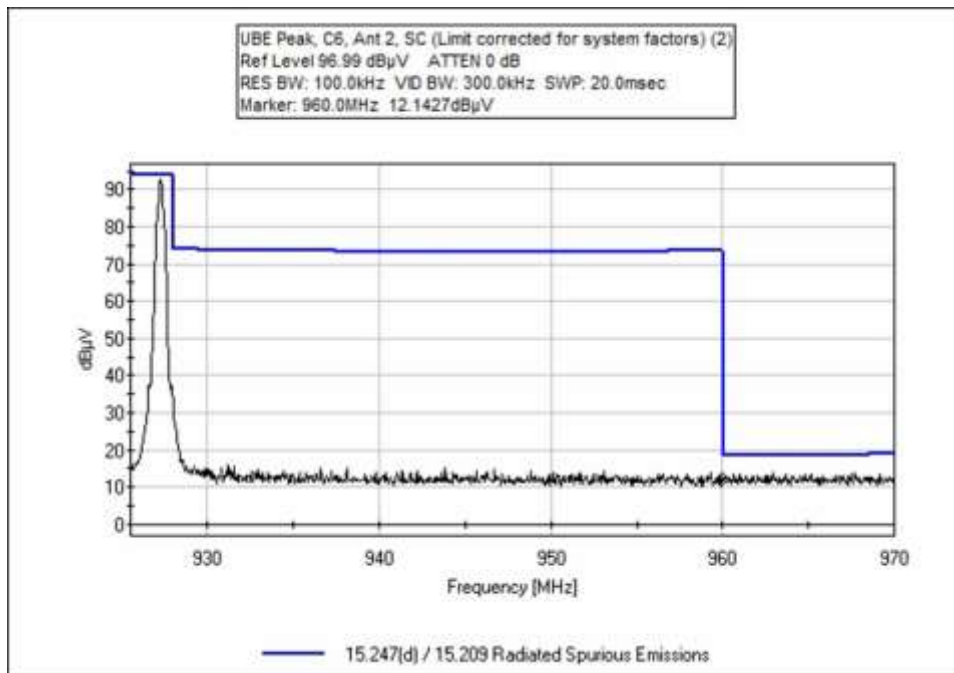
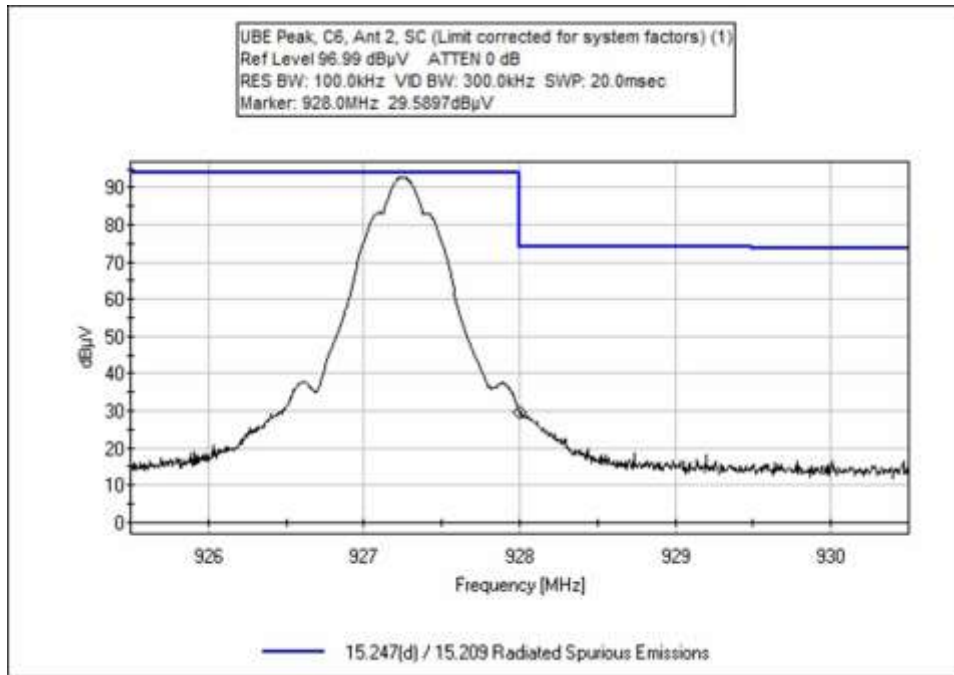


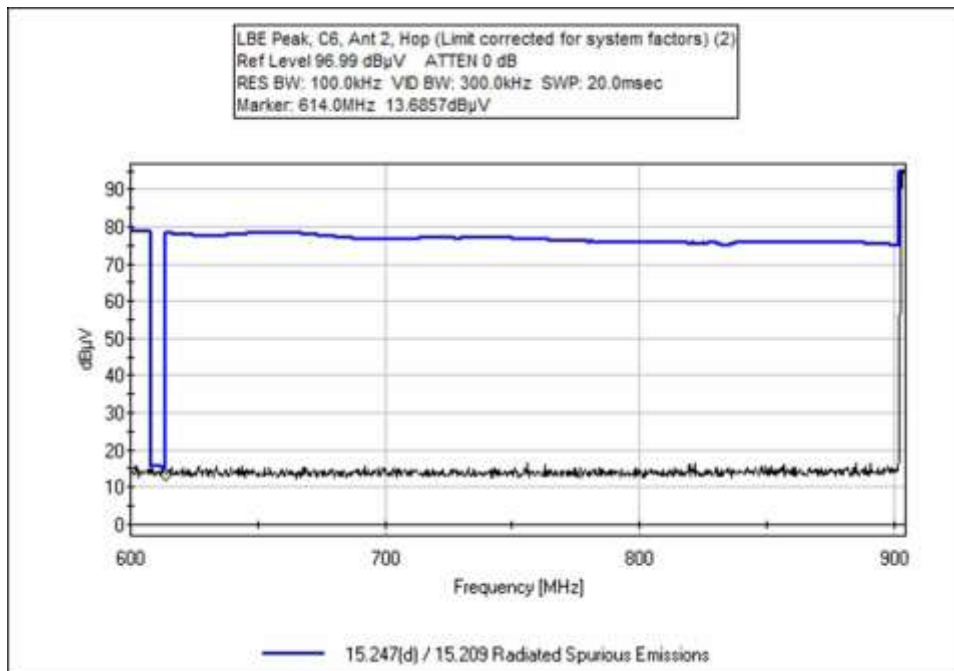
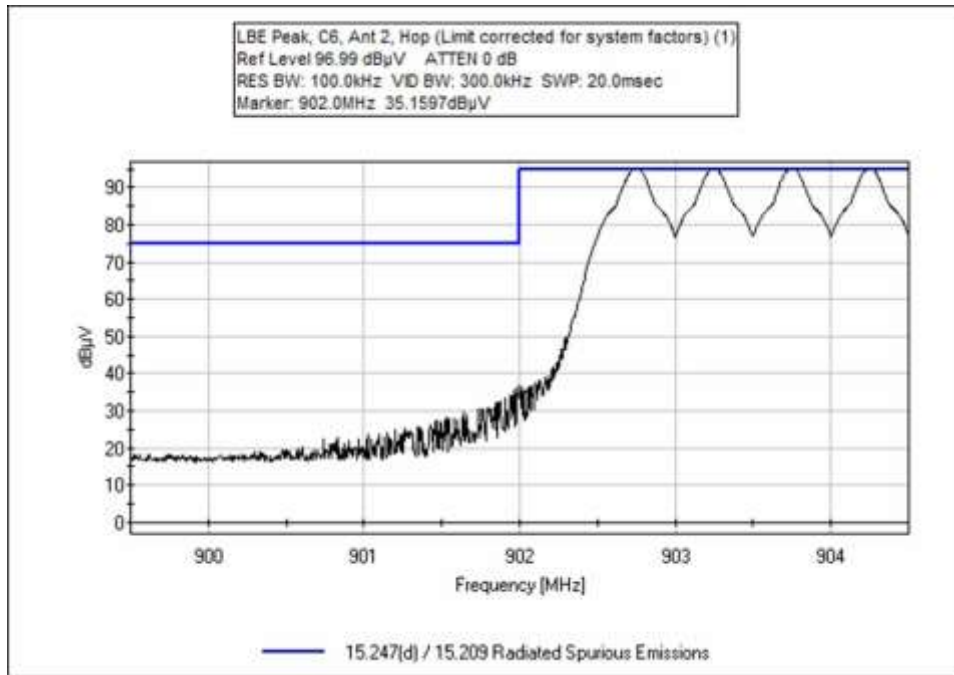


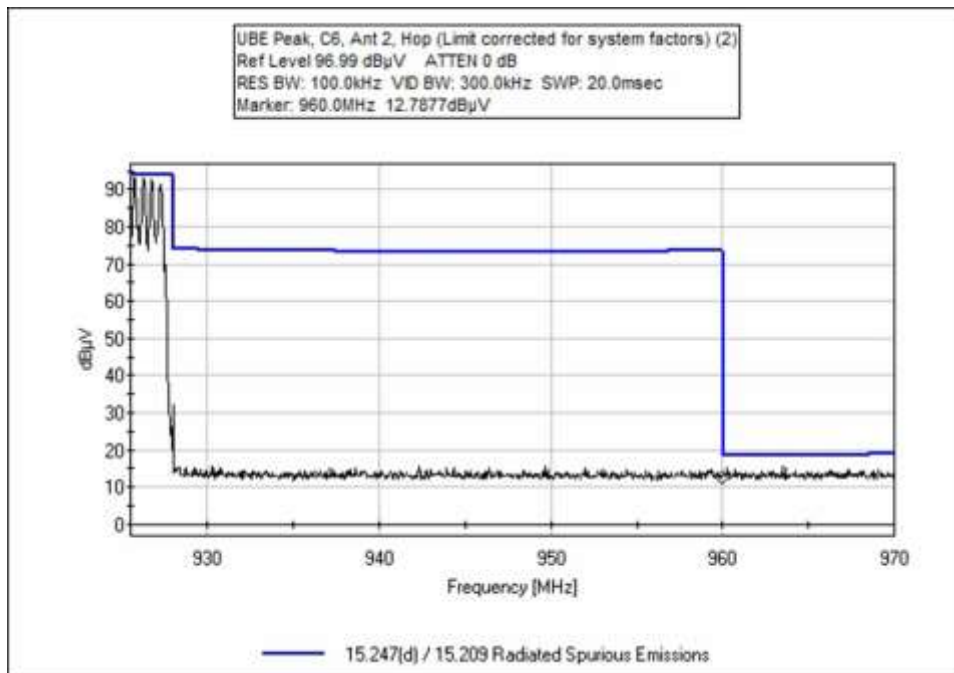
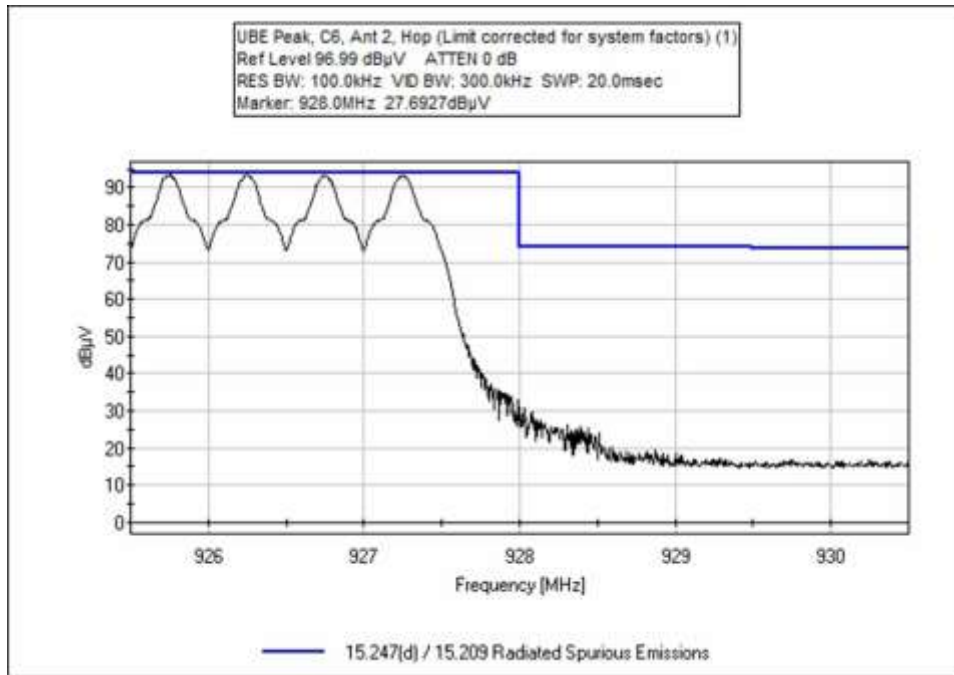


**Configuration 6 Port 2 Band Edge Plots**











**Test Setup / Conditions / Data**

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 11/17/2021  
 Test Type: **Maximized Emissions** Time: 10:17:52  
 Tested By: Matt Harrison Sequence#: 1  
 Software: EMITest 5.03.20

**Equipment Tested:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Support Equipment:**

Device	Manufacturer	Model #	S/N
Configuration 1			

**Test Conditions / Notes:**

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa

Frequency Range: 600-970MHz

Frequencies Tested: 902.75, 927.25

Test Method: ANSI C63.10: 2013

Antenna: Circular Polarized Patch

Test Mode: Constantly transmitting a modulated signal.

Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.

Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.

Horizontal and Vertical polarities investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T5	ANP06515	Cable	Heliac	7/1/2020	7/1/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	902.748M	96.8	+0.0 +1.6	+29.7	+2.1	+0.7	+0.0 116	130.9	130.9 Z-Axis	+0.0	Vert 22
2	614.000M QP	9.4	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	40.2	46.0 SC	-5.8	Vert
3	614.000M QP	9.3	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	40.1	46.0 Hop	-5.9	Vert
^	614.000M	15.3	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	46.1	46.0 Hop	+0.1	Vert
^	614.000M	12.9	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	43.7	46.0 SC	-2.3	Vert
6	960.000M QP	9.5	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	44.9	54.0 SC	-9.1	Vert
7	960.000M QP	9.4	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	44.8	54.0 Hop	-9.2	Vert
^	960.000M	14.3	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	49.7	54.0 Hop	-4.3	Vert
^	960.000M	13.5	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	48.9	54.0 SC	-5.1	Vert
10	928.000M	39.3	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	74.4	110.9 SC	-36.5	Vert
11	902.000M	39.6	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	73.6	110.9 SC	-37.3	Vert
12	928.000M	31.0	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	66.1	110.9 Hop	-44.8	Vert
13	902.000M	31.2	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	65.2	110.9 Hop	-45.7	Vert



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 11/17/2021  
 Test Type: **Maximized Emissions** Time: 13:27:54  
 Tested By: Matt Harrison Sequence#: 2  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 2			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 2			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 600-970MHz  
  
 Frequencies Tested: 902.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Mini-Guardrail  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T5	ANP06515	Cable	Heliac	7/1/2020	7/1/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB $\mu$ V	dB	dB	dB	dB	Table	dB $\mu$ V/m	dB $\mu$ V/m	dB	Ant
1	902.749M	68.3	+0.0 +1.6	+29.7	+2.1	+0.7	+0.0 30	102.4	102.4 Y-Axis	+0.0	Vert 131
2	614.000M QP	9.3	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	40.1	46.0 Hop	-5.9	Vert
3	614.000M QP	9.3	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	40.1	46.0 SC	-5.9	Vert
^	614.000M	15.4	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	46.2	46.0 Hop	+0.2	Vert
^	614.000M	13.0	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	43.8	46.0 SC	-2.2	Vert
6	960.000M QP	9.3	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	44.7	54.0 Hop	-9.3	Vert
^	960.000M	14.8	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	50.2	54.0 Hop	-3.8	Vert
^	960.000M	12.4	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	47.8	54.0 SC	-6.2	Vert
9	928.000M	15.4	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	50.5	82.4 SC	-31.9	Vert
10	902.000M	16.0	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	50.0	82.4 SC	-32.4	Vert
11	928.000M	14.3	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	49.4	82.4 Hop	-33.0	Vert
12	902.000M	14.4	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	48.4	82.4 Hop	-34.0	Vert



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 11/18/2021  
 Test Type: **Maximized Emissions** Time: 14:37:19  
 Tested By: Matt Harrison Sequence#: 3  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 3			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 3			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 600-970MHz  
  
 Frequencies Tested: 902.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: RFID Near-Field Reader  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T5	ANP06515	Cable	Heliac	7/1/2020	7/1/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	902.751M	98.0	+0.0 +1.6	+29.7	+2.1	+0.7	+0.0	132.1	132.1 100kHz Ref	+0.0	Vert
2	960.000M	15.5	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	50.9	54.0 Hop	-3.1	Vert
3	960.000M	15.1	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	50.5	54.0 SC	-3.5	Vert
4	614.000M QP	11.3	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	42.1	46.0 SC	-3.9	Vert
5	614.000M QP	11.2	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	42.0	46.0 Hop	-4.0	Vert
^	614.000M	15.7	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	46.5	46.0 Hop	+0.5	Vert
^	614.000M	15.2	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	46.0	46.0 SC	+0.0	Vert
8	928.000M	34.3	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	69.4	112.1 SC	-42.7	Vert
9	902.000M	34.5	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	68.5	112.1 SC	-43.6	Vert
10	928.000M	30.2	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	65.3	112.1 Hop	-46.8	Vert
11	902.000M	27.8	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	61.8	112.1 Hop	-50.3	Vert



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 11/18/2021  
 Test Type: **Maximized Emissions** Time: 16:11:36  
 Tested By: Matt Harrison Sequence#: 4  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 4			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 4			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 600-970MHz  
  
 Frequencies Tested: 902.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Matchbox Antenna  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T5	ANP06515	Cable	Heliac	7/1/2020	7/1/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB $\mu$ V	dB	dB	dB	dB	Table	dB $\mu$ V/m	dB $\mu$ V/m	dB	Ant
1	902.749M	84.0	+0.0 +1.6	+29.7	+2.1	+0.7	+0.0 100	118.1	118.1 X-Axis	+0.0	Horiz 106
2	614.000M QP	9.3	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	40.1	46.0 SC	-5.9	Horiz
^	614.000M	13.9	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	44.7	46.0 Hop	-1.3	Horiz
^	614.000M	13.3	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	44.1	46.0 SC	-1.9	Horiz
5	960.000M	12.6	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	48.0	54.0 Hop	-6.0	Horiz
6	960.000M	12.5	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	47.9	54.0 SC	-6.1	Horiz
7	902.000M	23.8	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	57.8	98.1 SC	-40.3	Horiz
8	928.000M	21.9	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	57.0	98.1 Hop	-41.1	Horiz
9	928.000M	21.7	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	56.8	98.1 SC	-41.3	Horiz
10	902.000M	13.9	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	47.9	98.1 Hop	-50.2	Horiz





Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 11/19/2021  
 Test Type: **Maximized Emissions** Time: 08:14:03  
 Tested By: Matt Harrison Sequence#: 5  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 5			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 5			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 600-970MHz  
  
 Frequencies Tested: 902.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Threshold  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T5	ANP06515	Cable	Heliac	7/1/2020	7/1/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	902.751M	97.4	+0.0 +1.6	+29.7	+2.1	+0.7	+0.0 10	131.5	131.5 Y-Axis	+0.0	Vert 134
2	614.000M QP	11.2	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	42.0	46.0 Hop	-4.0	Vert
3	614.000M QP	11.2	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	42.0	46.0 SC	-4.0	Vert
^	614.000M	16.1	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	46.9	46.0 Hop	+0.9	Vert
^	614.000M	13.8	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	44.6	46.0 SC	-1.4	Vert
6	960.000M QP	11.5	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	46.9	54.0 SC	-7.1	Vert
7	960.000M QP	11.3	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	46.7	54.0 Hop	-7.3	Vert
^	960.000M	16.3	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	51.7	54.0 Hop	-2.3	Vert
^	960.000M	12.0	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	47.4	54.0 SC	-6.6	Vert
10	902.000M	35.1	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	69.1	111.5 SC	-42.4	Vert
11	928.000M	33.3	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	68.4	111.5 SC	-43.1	Vert
12	928.000M	33.0	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	68.1	111.5 Hop	-43.4	Vert
13	902.000M	30.0	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	64.0	111.5 Hop	-47.5	Vert



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 11/19/2021  
 Test Type: **Maximized Emissions** Time: 11:22:36  
 Tested By: Matt Harrison Sequence#: 6  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 6			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 6			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 600-970MHz  
  
 Frequencies Tested: 902.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Guardwall  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T5	ANP06515	Cable	Heliac	7/1/2020	7/1/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	902.750M	94.9	+0.0 +1.6	+29.7	+2.1	+0.7	+0.0 150	129.0	129.0 Y-Axis	+0.0	Horiz 150
2	960.000M	13.4	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	48.8	54.0 Hop	-5.2	Horiz
3	614.000M QP	9.4	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	40.2	46.0 SC	-5.8	Horiz
4	614.000M QP	9.3	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	40.1	46.0 Hop	-5.9	Horiz
^	614.000M	15.1	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	45.9	46.0 Hop	-0.1	Horiz
^	614.000M	12.5	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	43.3	46.0 SC	-2.7	Horiz
7	960.000M	12.4	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	47.8	54.0 SC	-6.2	Horiz
8	902.000M	33.8	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	67.8	109.0 SC	-41.2	Horiz
9	902.000M	33.8	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	67.8	109.0 Hop	-41.2	Horiz
10	928.000M	29.9	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	65.0	109.0 SC	-44.0	Horiz
11	928.000M	26.6	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	61.7	109.0 Hop	-47.3	Horiz



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **106101** Date: 11/19/2021  
 Test Type: **Maximized Emissions** Time: 13:38:55  
 Tested By: Matt Harrison Sequence#: 7  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 6			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 6			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 20°C  
 Humidity: 40%  
 Pressure: 102.6kPa  
  
 Frequency Range: 600-970MHz  
  
 Frequencies Tested: 902.75, 927.25  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Guardwall  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is on foam test table. It is connected to a POE hub and a remote PC via Ethernet cable.  
  
 Low, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.  
  
 Horizontal and Vertical polarities investigated, worst case reported.

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T3	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T4	ANP06454	Cable	Heliac	1/20/2020	1/20/2022
T5	ANP06515	Cable	Heliac	7/1/2020	7/1/2022

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	960.000M	12.8	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	48.2	54.0 Hop	-5.8	Horiz
2	614.000M QP	9.4	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	40.2	46.0 SC	-5.8	Horiz
3	614.000M QP	9.3	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	40.1	46.0 Hop	-5.9	Horiz
^	614.000M	13.7	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	44.5	46.0 Hop	-1.5	Horiz
^	614.000M	13.5	+0.0 +1.3	+27.2	+1.7	+0.6	+0.0	44.3	46.0 SC	-1.7	Horiz
6	960.000M	12.1	+0.0 +1.7	+30.7	+2.2	+0.8	+0.0	47.5	54.0 SC	-6.5	Horiz
7	902.000M	35.2	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	69.2	109.0 Hop	-39.8	Horiz
8	902.000M	32.9	+0.0 +1.6	+29.6	+2.1	+0.7	+0.0	66.9	109.0 SC	-42.1	Horiz
9	928.000M	29.6	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	64.7	109.0 SC	-44.3	Horiz
10	928.000M	27.7	+0.0 +1.6	+30.6	+2.2	+0.7	+0.0	62.8	109.0 Hop	-46.2	Horiz

**Configuration 1 Test Setup Photo(s)**



X Axis



Y Axis



Z Axis





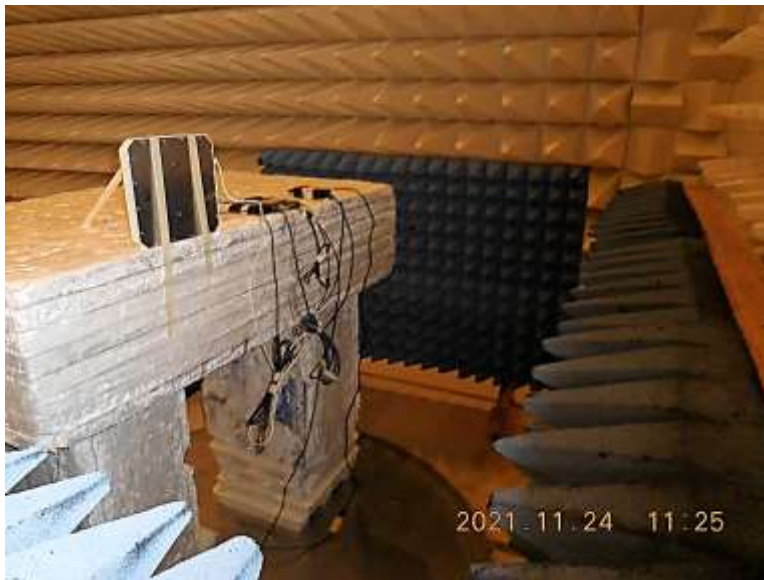
Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

**Configuration 2 Test Setup Photo(s)**



X Axis



Y Axis



Z Axis



Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

**Configuration 3 Test Setup Photo(s)**



X Axis



Y Axis



Z Axis

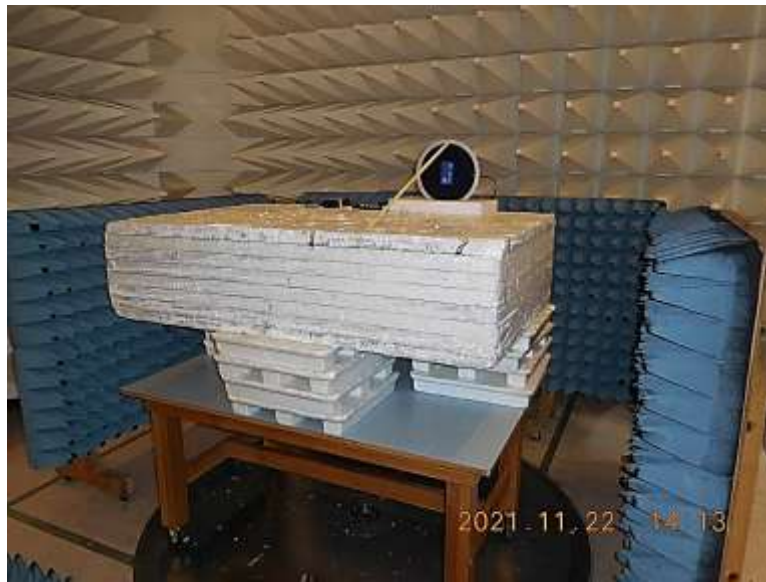




Below 1GHz



Below 1GHz



Above 1GHz, 1.5m



Above 1GHz, 1.5m

**Configuration 4 Test Setup Photo(s)**



X Axis



Y Axis



Z Axis



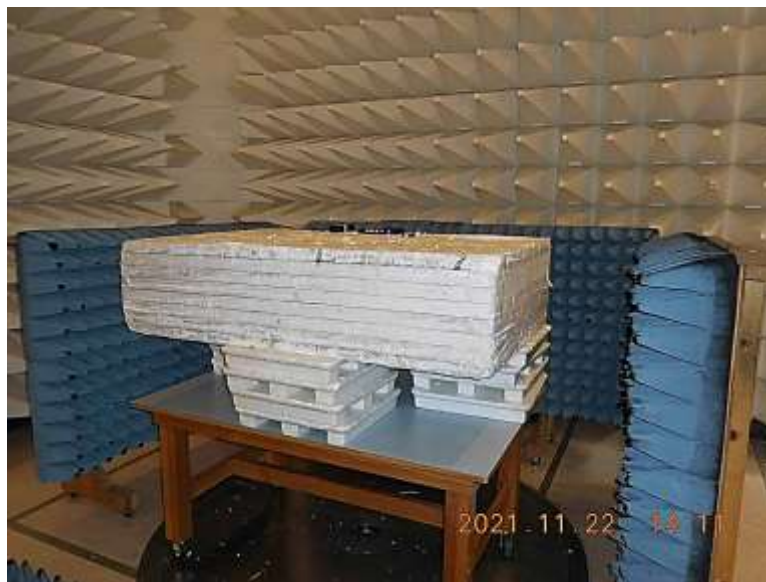
Below 1GHz



Below 1GHz



Above 1GHz, 1.5m



Above 1GHz, 1.5m

**Configuration 5 Test Setup Photo(s)**



X Axis



Y Axis



Z Axis





Below 1GHz



Below 1GHz



Above 1GHz, 1.5m



Above 1GHz, 1.5m

**Configuration 6 Test Setup Photo(s)**



X Axis



Y Axis



Z Axis



Below 1GHz



Below 1GHz



Above 1GHz, 1.5m



Above 1GHz, 1.5m

## 15.207 AC Conducted Emissions

### Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **106101** Date: 12/1/2021  
 Test Type: **Conducted Emissions** Time: 15:12:51  
 Tested By: Michael Atkinson Sequence#: 51  
 Software: EMITest 5.03.20 120V 60Hz

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

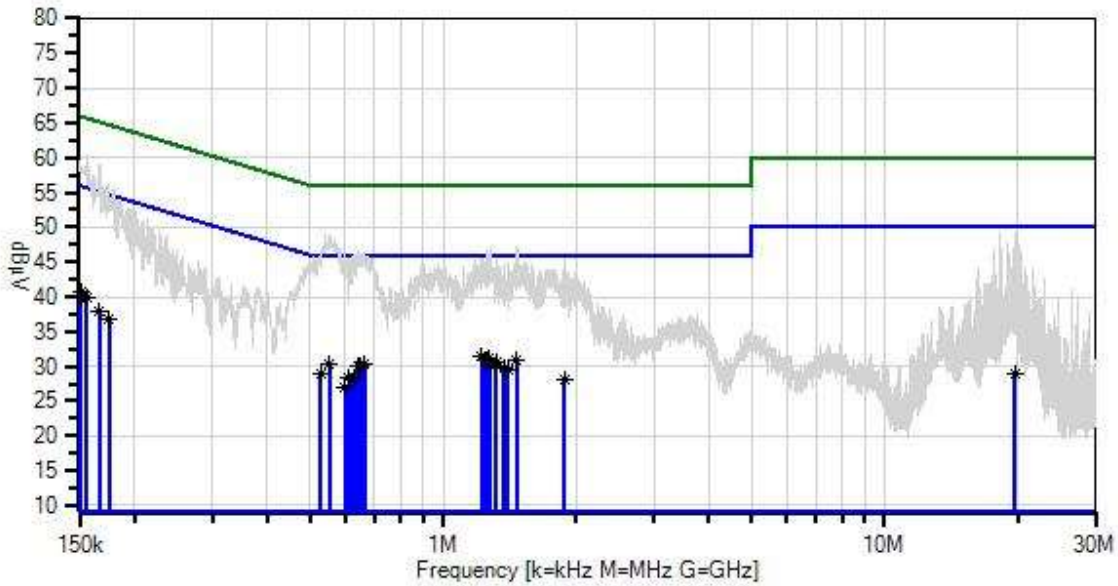
#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

Test Environment Conditions:  
 Temperature: 22°C  
 Humidity: 50%  
 Pressure: 101.6kPa  
  
 Frequency Range: 9kHz-30MHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25 investigated, representative data collected at mid channel.  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Circular Polarized at 33dBm (also investigated configuration 2, 3, 4, 5, 6 at appropriate power setting).  
 Configuration 1 is representative of worst case for all configurations.  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is setup for on a Styrofoam table. It is connected to a POE hub and a remote PC via Ethernet cable.

Impinj, Inc. WO#: 106101 Sequence#: 51 Date: 12/1/2021  
 15.207 AC Mains - Average Test Lead: 120V 60Hz Line



— Sweep Data  
 × QP Readings  
 Software Version: 5.03.20  
 — Readings  
 \* Average Readings  
 — 1 - 15.207 AC Mains - Average  
 ○ Peak Readings  
 ▼ Ambient  
 — 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05961	Cable	Heliacx	6/9/2021	6/9/2023
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	ANP06219	Attenuator	768-10	4/7/2020	4/7/2022
T3	ANP06515	Cable	Heliacx	7/1/2020	7/1/2022
T4	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022
T5	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022



**Measurement Data:**

Reading listed by margin.

Test Lead: Line

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	1.221M	21.6	+0.0	+9.1	+0.1	+0.2	+0.0	31.3	46.0	-14.7	Line
	Ave		+0.3								
^	1.221M	35.9	+0.0	+9.1	+0.1	+0.2	+0.0	45.6	46.0	-0.4	Line
			+0.3								
3	1.272M	21.4	+0.0	+9.1	+0.1	+0.2	+0.0	31.1	46.0	-14.9	Line
	Ave		+0.3								
4	150.870k	28.3	+0.0	+9.1	+0.0	+1.6	+0.0	40.8	56.0	-15.2	Line
	Ave		+1.8								
5	1.252M	21.1	+0.0	+9.1	+0.1	+0.2	+0.0	30.8	46.0	-15.2	Line
	Ave		+0.3								
^	1.252M	37.0	+0.0	+9.1	+0.1	+0.2	+0.0	46.7	46.0	+0.7	Line
			+0.3								
7	1.470M	21.2	+0.0	+9.1	+0.0	+0.2	+0.0	30.8	46.0	-15.2	Line
	Ave		+0.3								
^	1.470M	37.6	+0.0	+9.1	+0.0	+0.2	+0.0	47.2	46.0	+1.2	Line
			+0.3								
9	1.318M	20.8	+0.0	+9.1	+0.1	+0.2	+0.0	30.5	46.0	-15.5	Line
	Ave		+0.3								
^	1.318M	35.6	+0.0	+9.1	+0.1	+0.2	+0.0	45.3	46.0	-0.7	Line
			+0.3								
11	663.527k	20.6	+0.0	+9.1	+0.0	+0.3	+0.0	30.4	46.0	-15.6	Line
	Ave		+0.4								
^	663.527k	36.7	+0.0	+9.1	+0.0	+0.3	+0.0	46.5	46.0	+0.5	Line
			+0.4								
13	552.553k	20.4	+0.0	+9.1	+0.0	+0.3	+0.0	30.2	46.0	-15.8	Line
	Ave		+0.4								
^	552.553k	39.1	+0.0	+9.1	+0.0	+0.3	+0.0	48.9	46.0	+2.9	Line
			+0.4								
15	155.973k	28.2	+0.0	+9.1	+0.0	+0.8	+0.0	39.8	55.7	-15.9	Line
	Ave		+1.7								
16	639.942k	20.3	+0.0	+9.1	+0.0	+0.3	+0.0	30.1	46.0	-15.9	Line
	Ave		+0.4								
^	639.941k	37.0	+0.0	+9.1	+0.0	+0.3	+0.0	46.8	46.0	+0.8	Line
			+0.4								
18	652.037k	20.3	+0.0	+9.1	+0.0	+0.3	+0.0	30.1	46.0	-15.9	Line
	Ave		+0.4								
^	652.036k	36.5	+0.0	+9.1	+0.0	+0.3	+0.0	46.3	46.0	+0.3	Line
			+0.4								
20	1.278M	20.3	+0.0	+9.1	+0.1	+0.2	+0.0	30.0	46.0	-16.0	Line
	Ave		+0.3								
^	1.278M	37.5	+0.0	+9.1	+0.1	+0.2	+0.0	47.2	46.0	+1.2	Line
			+0.3								
^	1.272M	36.4	+0.0	+9.1	+0.1	+0.2	+0.0	46.1	46.0	+0.1	Line
			+0.3								

23	151.290k	27.7	+0.0	+9.1	+0.0	+1.3	+0.0	39.9	55.9	-16.0	Line
	Ave		+1.8								
^	155.973k	48.7	+0.0	+9.1	+0.0	+0.8	+0.0	60.3	55.7	+4.6	Line
			+1.7								
^	151.290k	46.5	+0.0	+9.1	+0.0	+1.3	+0.0	58.7	55.9	+2.8	Line
			+1.8								
^	150.870k	46.0	+0.0	+9.1	+0.0	+1.6	+0.0	58.5	56.0	+2.5	Line
			+1.8								
27	1.375M	20.3	+0.0	+9.1	+0.0	+0.2	+0.0	29.9	46.0	-16.1	Line
	Ave		+0.3								
^	1.375M	35.1	+0.0	+9.1	+0.0	+0.2	+0.0	44.7	46.0	-1.3	Line
			+0.3								
29	1.401M	19.9	+0.0	+9.1	+0.0	+0.2	+0.0	29.5	46.0	-16.5	Line
	Ave		+0.3								
^	1.401M	35.4	+0.0	+9.1	+0.0	+0.2	+0.0	45.0	46.0	-1.0	Line
			+0.3								
31	527.758k	19.0	+0.0	+9.1	+0.0	+0.3	+0.0	28.8	46.0	-17.2	Line
	Ave		+0.4								
^	527.757k	36.5	+0.0	+9.1	+0.0	+0.3	+0.0	46.3	46.0	+0.3	Line
			+0.4								
33	166.872k	26.7	+0.0	+9.1	+0.0	+0.5	+0.0	37.9	55.1	-17.2	Line
	Ave		+1.6								
^	166.872k	48.0	+0.0	+9.1	+0.0	+0.5	+0.0	59.2	55.1	+4.1	Line
			+1.6								
35	613.030k	18.7	+0.0	+9.1	+0.0	+0.3	+0.0	28.5	46.0	-17.5	Line
	Ave		+0.4								
^	613.029k	35.8	+0.0	+9.1	+0.0	+0.3	+0.0	45.6	46.0	-0.4	Line
			+0.4								
37	626.637k	18.5	+0.0	+9.1	+0.0	+0.3	+0.0	28.3	46.0	-17.7	Line
	Ave		+0.4								
^	626.636k	36.3	+0.0	+9.1	+0.0	+0.3	+0.0	46.1	46.0	+0.1	Line
			+0.4								
39	175.047k	25.9	+0.0	+9.1	+0.0	+0.4	+0.0	36.8	54.7	-17.9	Line
	Ave		+1.4								
^	175.046k	45.3	+0.0	+9.1	+0.0	+0.4	+0.0	56.2	54.7	+1.5	Line
			+1.4								
41	1.884M	18.2	+0.1	+9.1	+0.1	+0.2	+0.0	28.0	46.0	-18.0	Line
	Ave		+0.3								
^	1.884M	35.8	+0.1	+9.1	+0.1	+0.2	+0.0	45.6	46.0	-0.4	Line
			+0.3								
43	599.725k	17.1	+0.0	+9.1	+0.0	+0.3	+0.0	26.9	46.0	-19.1	Line
	Ave		+0.4								
^	599.724k	36.3	+0.0	+9.1	+0.0	+0.3	+0.0	46.1	46.0	+0.1	Line
			+0.4								
45	19.700M	18.5	+0.1	+9.1	+0.2	+0.2	+0.0	29.0	50.0	-21.0	Line
	Ave		+0.9								
^	19.700M	39.5	+0.1	+9.1	+0.2	+0.2	+0.0	50.0	50.0	+0.0	Line
			+0.9								



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)  
 Customer: **Impinj, Inc.**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **106101** Date: 12/1/2021  
 Test Type: **Conducted Emissions** Time: 16:40:50  
 Tested By: Michael Atkinson Sequence#: 52  
 Software: EMITest 5.03.20 120V 60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

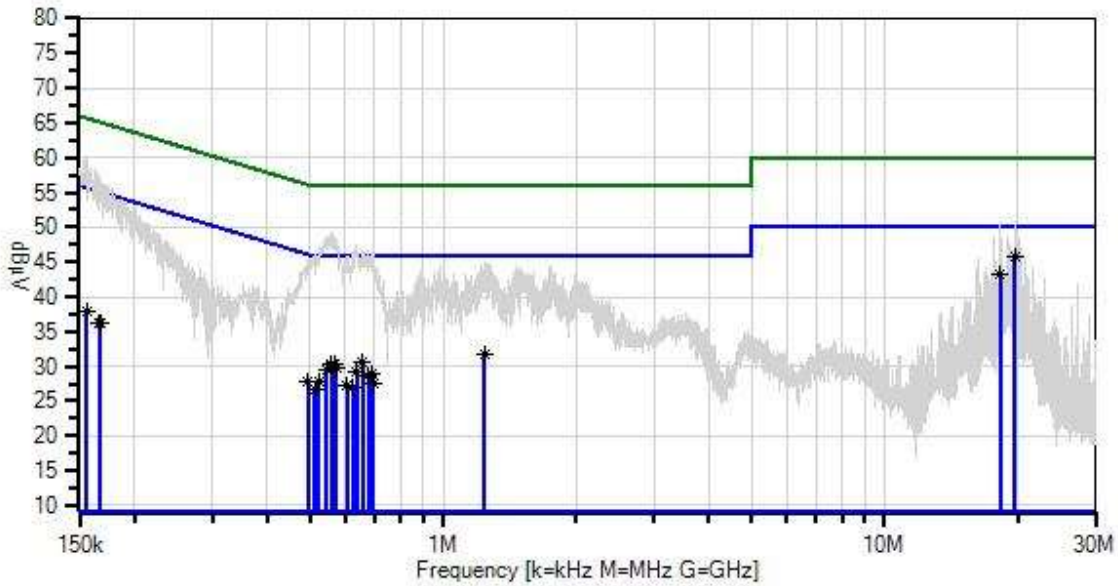
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

Test Environment Conditions:  
 Temperature: 22°C  
 Humidity: 50%  
 Pressure: 101.6kPa  
  
 Frequency Range: 9kHz-30MHz  
  
 Frequencies Tested: 902.75, 914.75, 927.25 investigated, representative data collected at mid channel.  
  
 Test Method: ANSI C63.10: 2013  
  
 Antenna: Circular Polarized at 33dBm (also investigated configuration 2, 3, 4, 5, 6 at appropriate power setting).  
 Configuration 1 is representative of worst case for all configurations.  
  
 Test Mode: Constantly transmitting a modulated signal.  
  
 Setup: EUT is setup for on a Styrofoam table. It is connected to a POE hub and a remote PC via Ethernet cable.

Impinj, Inc. WO#: 106101 Sequence#: 52 Date: 12/1/2021  
 15.207 AC Mains - Average Test Lead: 120V 60Hz Neutral



— Sweep Data  
 × QP Readings  
 Software Version: 5.03.20  
 — Readings  
 \* Average Readings  
 — 1 - 15.207 AC Mains - Average  
 ○ Peak Readings  
 ▼ Ambient  
 — 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05961	Cable	Heliacx	6/9/2021	6/9/2023
	AN02673	Spectrum Analyzer	E4446A	2/3/2021	2/3/2023
T2	ANP06219	Attenuator	768-10	4/7/2020	4/7/2022
T3	ANP06515	Cable	Heliacx	7/1/2020	7/1/2022
T4	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022
	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
T5	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022

Measurement Data: Reading listed by margin. Test Lead: Neutral

#	Freq MHz	Rdng dB $\mu$ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	19.706M	35.3	+0.1	+9.1	+0.2	+0.2	+0.0	45.8	50.0	-4.2	Neutr
	Ave		+0.9								
^	19.706M	39.8	+0.1	+9.1	+0.2	+0.2	+0.0	50.3	50.0	+0.3	Neutr
			+0.9								
3	18.247M	32.8	+0.1	+9.1	+0.2	+0.2	+0.0	43.2	50.0	-6.8	Neutr
	Ave		+0.8								
^	18.247M	40.1	+0.1	+9.1	+0.2	+0.2	+0.0	50.5	50.0	+0.5	Neutr
			+0.8								
5	1.241M	22.1	+0.0	+9.1	+0.1	+0.2	+0.0	31.8	46.0	-14.2	Neutr
	Ave		+0.3								
^	1.241M	35.3	+0.0	+9.1	+0.1	+0.2	+0.0	45.0	46.0	-1.0	Neutr
			+0.3								
7	657.782k	20.9	+0.0	+9.1	+0.0	+0.3	+0.0	30.7	46.0	-15.3	Neutr
	Ave		+0.4								
^	657.782k	36.9	+0.0	+9.1	+0.0	+0.3	+0.0	46.7	46.0	+0.7	Neutr
			+0.4								
9	557.996k	20.6	+0.0	+9.1	+0.0	+0.3	+0.0	30.4	46.0	-15.6	Neutr
	Ave		+0.4								
^	557.996k	39.5	+0.0	+9.1	+0.0	+0.3	+0.0	49.3	46.0	+3.3	Neutr
			+0.4								
11	567.672k	20.5	+0.0	+9.1	+0.0	+0.3	+0.0	30.3	46.0	-15.7	Neutr
	Ave		+0.4								
12	571.603k	19.9	+0.0	+9.1	+0.0	+0.3	+0.0	29.7	46.0	-16.3	Neutr
	Ave		+0.4								
^	567.672k	38.7	+0.0	+9.1	+0.0	+0.3	+0.0	48.5	46.0	+2.5	Neutr
			+0.4								
^	571.603k	38.7	+0.0	+9.1	+0.0	+0.3	+0.0	48.5	46.0	+2.5	Neutr
			+0.4								
15	543.482k	19.7	+0.0	+9.1	+0.0	+0.3	+0.0	29.5	46.0	-16.5	Neutr
	Ave		+0.4								
^	543.481k	38.8	+0.0	+9.1	+0.0	+0.3	+0.0	48.6	46.0	+2.6	Neutr
			+0.4								
17	638.127k	19.4	+0.0	+9.1	+0.0	+0.3	+0.0	29.2	46.0	-16.8	Neutr
	Ave		+0.4								
^	638.127k	37.9	+0.0	+9.1	+0.0	+0.3	+0.0	47.7	46.0	+1.7	Neutr
			+0.4								
19	690.137k	19.0	+0.0	+9.1	+0.0	+0.3	+0.0	28.8	46.0	-17.2	Neutr
	Ave		+0.4								
20	675.925k	18.9	+0.0	+9.1	+0.0	+0.3	+0.0	28.7	46.0	-17.3	Neutr
	Ave		+0.4								
^	675.925k	36.8	+0.0	+9.1	+0.0	+0.3	+0.0	46.6	46.0	+0.6	Neutr
			+0.4								
22	155.448k	26.2	+0.0	+9.1	+0.0	+0.8	+0.0	37.8	55.7	-17.9	Neutr
	Ave		+1.7								
^	155.448k	48.3	+0.0	+9.1	+0.0	+0.8	+0.0	59.9	55.7	+4.2	Neutr
			+1.7								
24	522.920k	18.0	+0.0	+9.1	+0.0	+0.2	+0.0	27.7	46.0	-18.3	Neutr
	Ave		+0.4								

^	522.919k	37.4	+0.0 +0.4	+9.1	+0.0	+0.2	+0.0	47.1	46.0	+1.1	Neutr
26	694.370k Ave	17.9	+0.0 +0.4	+9.1	+0.0	+0.3	+0.0	27.7	46.0	-18.3	Neutr
^	690.137k	36.6	+0.0 +0.4	+9.1	+0.0	+0.3	+0.0	46.4	46.0	+0.4	Neutr
^	694.370k	36.5	+0.0 +0.4	+9.1	+0.0	+0.3	+0.0	46.3	46.0	+0.3	Neutr
29	494.798k Ave	18.0	+0.0 +0.4	+9.1	+0.0	+0.2	+0.0	27.7	46.1	-18.4	Neutr
^	494.798k	35.5	+0.0 +0.4	+9.1	+0.0	+0.2	+0.0	45.2	46.1	-0.9	Neutr
31	606.982k Ave	17.4	+0.0 +0.4	+9.1	+0.0	+0.3	+0.0	27.2	46.0	-18.8	Neutr
^	606.982k	36.1	+0.0 +0.4	+9.1	+0.0	+0.3	+0.0	45.9	46.0	-0.1	Neutr
33	623.613k Ave	17.2	+0.0 +0.4	+9.1	+0.0	+0.3	+0.0	27.0	46.0	-19.0	Neutr
^	623.613k	36.5	+0.0 +0.4	+9.1	+0.0	+0.3	+0.0	46.3	46.0	+0.3	Neutr
35	167.081k Ave	25.0	+0.0 +1.5	+9.1	+0.0	+0.5	+0.0	36.1	55.1	-19.0	Neutr
36	166.138k Ave	25.0	+0.0 +1.5	+9.1	+0.0	+0.5	+0.0	36.1	55.2	-19.1	Neutr
^	166.137k	46.6	+0.0 +1.5	+9.1	+0.0	+0.5	+0.0	57.7	55.2	+2.5	Neutr
^	167.081k	45.7	+0.0 +1.5	+9.1	+0.0	+0.5	+0.0	56.8	55.1	+1.7	Neutr
39	511.732k Ave	17.0	+0.0 +0.4	+9.1	+0.0	+0.2	+0.0	26.7	46.0	-19.3	Neutr
^	511.731k	36.6	+0.0 +0.4	+9.1	+0.0	+0.2	+0.0	46.3	46.0	+0.3	Neutr

**Test Setup Photo(s)**



# SUPPLEMENTAL INFORMATION

## Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories’ sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

## Emissions Test Details

### TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

### CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBμV/m, the spectrum analyzer reading in dBμV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBμV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBμV/m)



**TEST INSTRUMENTATION AND ANALYZER SETTINGS**

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

**SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS**

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

**Peak**

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

**Quasi-Peak**

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

**Average**

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.