

Impinj Inc.

TEST REPORT FOR

**Impinj R705 Portal Gateway Reader
Model: IPJ-R705-FGX**

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

**15.207 & 15.247
(FHSS 902-928MHz)**

Report No.: 106839-2

Date of issue: July 28, 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: P010357

DATE OF EQUIPMENT RECEIPT:**DATE(S) OF TESTING:****REPORT PREPARED BY:**

Viviana Prado
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 106839

June 8, 2022

June 8 and 10, 2022

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.

A handwritten signature in black ink, reading "Steve Behm", is positioned above a horizontal line.

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)(i)	Occupied Bandwidth	NA	NP
15.247(a)(1)	Carrier Separation	NA	NP
15.247(a)(1)(i)	Number of Hopping Channels	NA	NP
15.247(a)(1)(i)	Average Time of Occupancy	NA	NP
15.247(b)(2)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	NP
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

NP = CKC Laboratories was not contracted to perform test.

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

None

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 Tested:

Device	Manufacturer	Model #	S/N
Impinj R705 Portal Gateway Reader	Impinj, Inc.	IPJ-R705-FGX	37022171428

Support Equipment:

Device	Manufacturer	Model #	S/N
POE Injector/Hub	Phihong	POE29U-1AT(PL)	NA
Router	Belkin	F5D7230-4	20828723009696
Laptop	HP	EliteBook 840	REG-5CG51713S2
Laptop PSU	HP	PPP009D	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Operating Frequency Range:	902.75 - 927.25MHz
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:	100% tested as worst case
Number of TX Chains:	1
Antenna Type(s) and Gain:	Patch Antenna Array, 7.1 to 7.4dBi for the configuration tested
Beamforming Type:	NA
Antenna Connection Type:	External Connector (antenna is attached to the unit)
Nominal Input Voltage:	120VAC applied to PoE injector
Firmware / Software used for Test:	ItemTest V2.0.0-Preview-580
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)



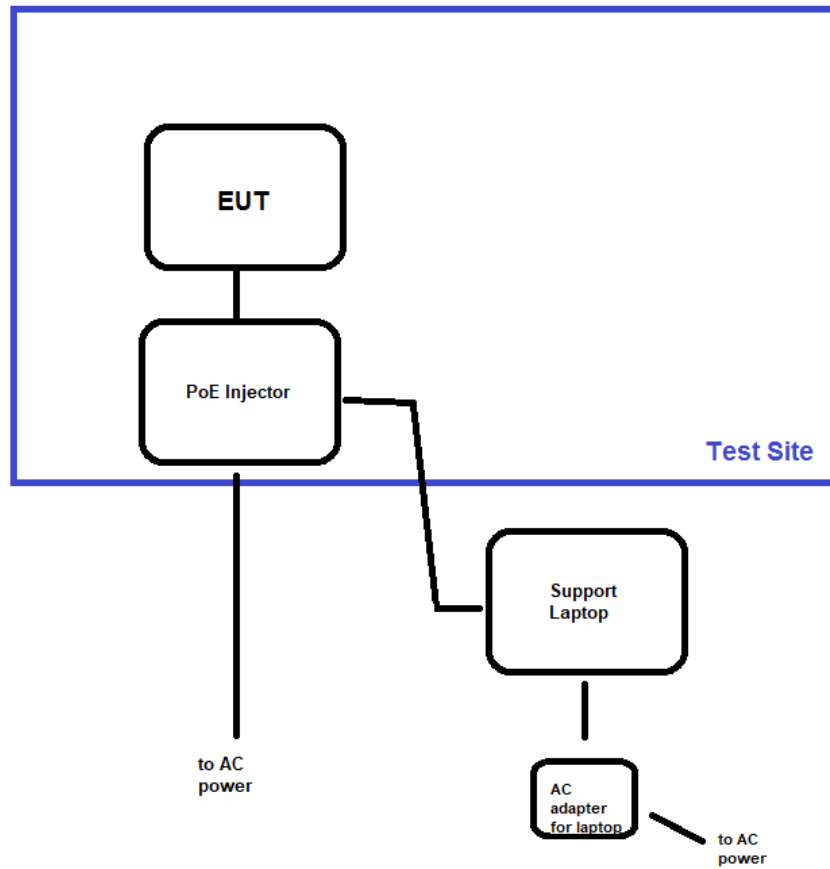
PoE



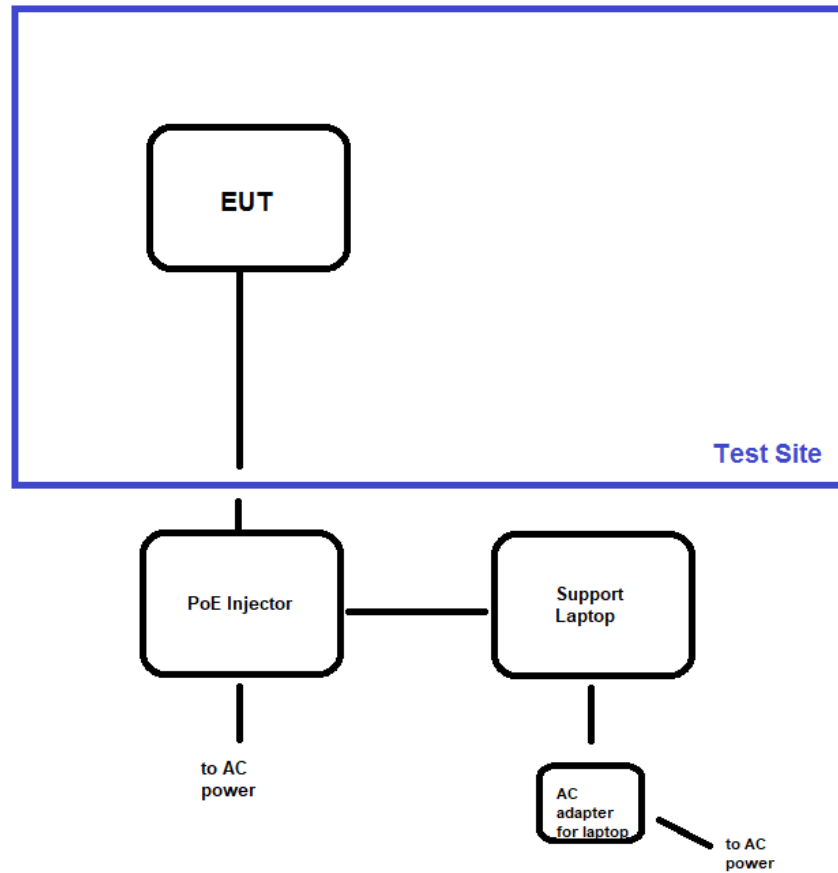
Laptop & Router

Block Diagram of Test Setup(s)

Test Setup Block Diagram



Test Setup Block Diagram



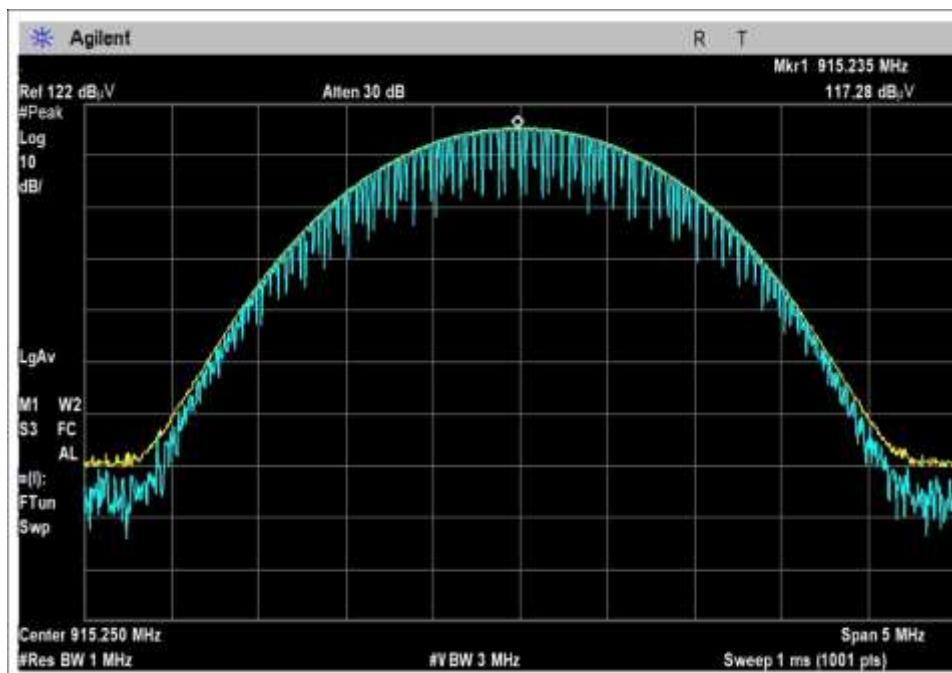
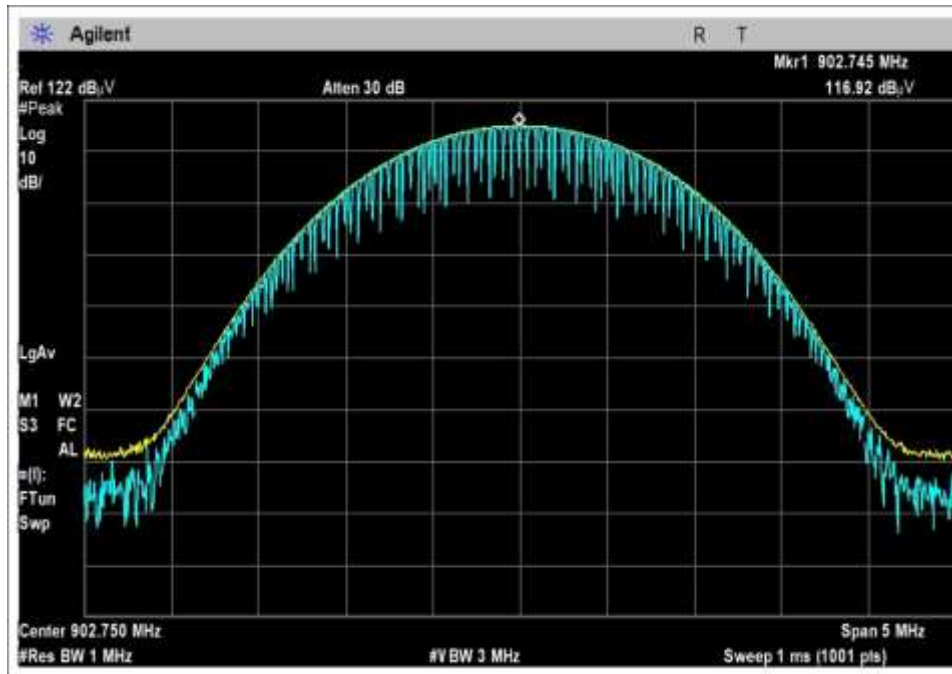
FCC Part 15 Subpart C

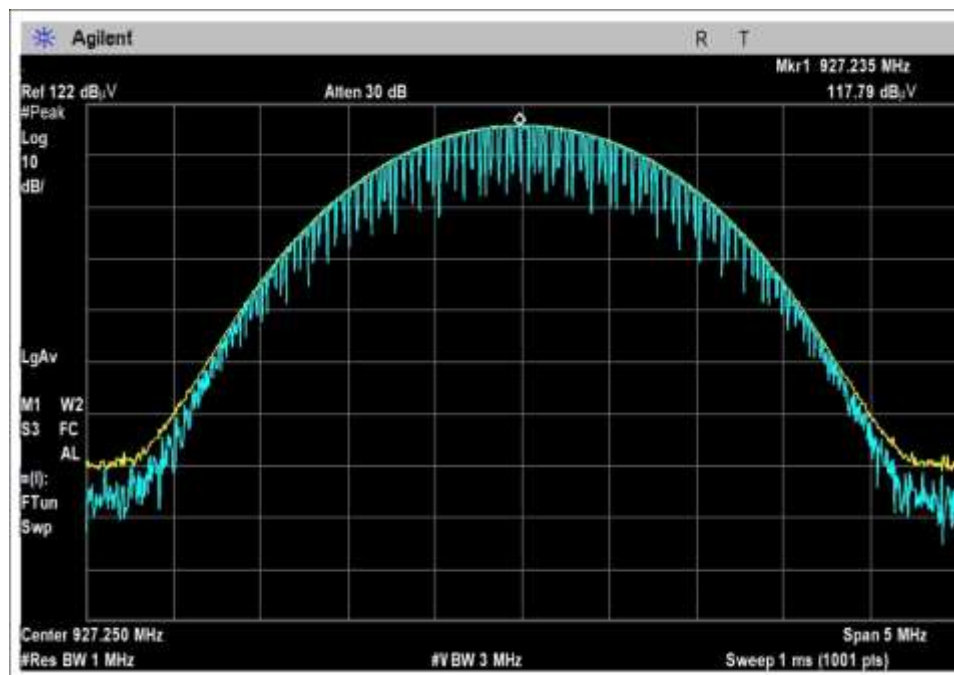
15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	6/10/2022
Configuration:	1		
Test Setup:	<p>Duty Cycle: 100% (Test Mode)</p> <p>Test Mode: Continuously transmitting</p> <p>Test Setup: EUT is transmitting through the antenna port connector and is attached to the spectrum analyzer with appropriate cables/attenuation. The customer has a declared cable loss of 2.5dB, which is accounted as a factor in the datasheet.</p> <p>Voltage variations not contracted for this permissive change testing per the manufacturer. Tested with nominal 120VAC to the PoE injector.</p>		

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	Patch/7.1dBi	27.7	≤30	Pass
915.25	ASK	Patch/7.4dBi	28.2	≤30	Pass
927.25	ASK	Patch/7.1dBi	28.7	≤30	Pass

Plots





Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Impinj Inc.**
 Specification: **15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**
 Work Order #: **104294** Date: 6/10/2022
 Test Type: **Conducted Emissions** Time: 13:04:39
 Tested By: Michael Atkinson Sequence#: 8
 Software: EMITest 5.03.20 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

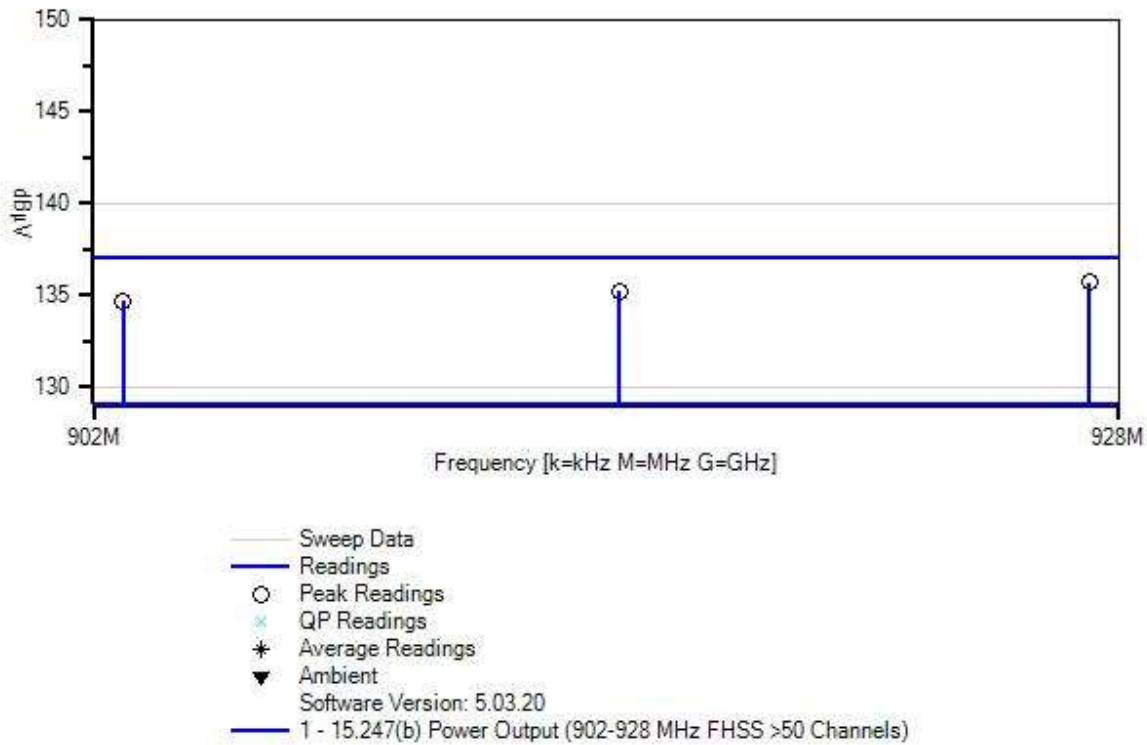
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 24°C Humidity: 39% Pressure: 101.5kPa Frequency Range: 902-928MHz Frequencies Tested: 902.75, 915.25, 927.25 Test Method: ANSI C63.10 (2013) Test Mode: Constantly transmitting a modulated signal. Setup: EUT setup for conducted measurements. It is connected to a POE hub and a PC via Ethernet cable. The antenna port is connected to the analyzer via cable and attenuator.
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Impinj Inc. W/O#: 104294 Sequence#: 8 Date: 6/10/2022
15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 120V 60Hz Antenna Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN	Cable	Multiple	No Cal Required	No Cal Required
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T2	ANP07623	Attenuator	47-20-34	3/16/2022	3/16/2024
T3	ANP05546	Cable	Helix	7/12/2021	7/12/2023

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	927.235M	117.8	+2.5	+19.7	+0.7		+0.0	135.7	137.0	-1.3	Anten
2	915.235M	117.3	+2.5	+19.7	+0.7		+0.0	135.2	137.0	-1.8	Anten
3	902.745M	116.9	+2.5	+19.7	+0.6		+0.0	134.7	137.0	-2.3	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 • (425) 402-1717
 Customer: **Impinj Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **106839** Date: 6/10/2022
 Test Type: **Maximized Emissions** Time: 12:12:40
 Tested By: M. Harrison/M. Atkinson Sequence#: 2
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

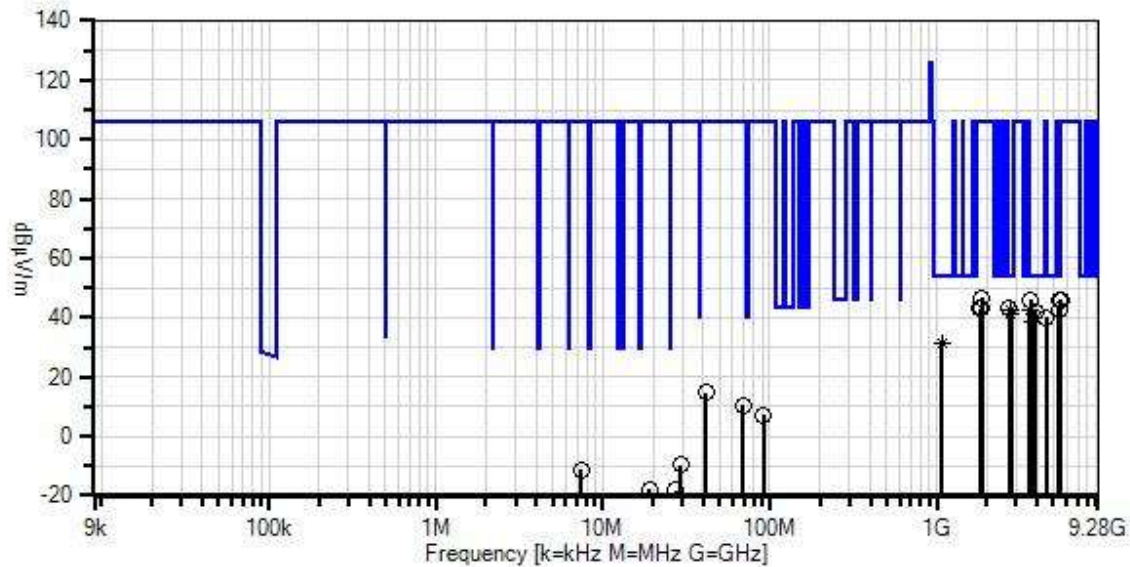
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

<p>Test Environment Conditions:</p> <p>Temperature: 24°C</p> <p>Humidity: 39%</p> <p>Pressure: 101.5kPa</p> <p>Frequency Range: 9k-10GHz</p> <p>Frequencies Tested: 902.75, 915.25, 927.25</p> <p>Test Method: ANSI C63.10 (2013)</p> <p>Test Mode: Constantly transmitting a modulated signal.</p> <p>Setup: EUT is on foam test table. It is connected to a remote POE hub and a remote PC via Ethernet cable.</p> <p>Low, Mid, and High channels along with X, Y, & Z EUT axis investigated, worst case reported.</p> <p>Horizontal and Vertical polarities investigated, worst case reported.</p> <p>Notes:</p> <p>No EUT emissions found within 20dB of the limit below 30MHz.</p> <p>Investigated with and without USB cables attached, worst case reported.</p>
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Impinj Inc. WO#: 106839 Sequence#: 2 Date: 6/10/2022
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Para



— 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	ANP06515	Cable	Heliacx	7/1/2020	7/1/2022
T2	ANP06540	Cable	Heliacx	1/17/2022	1/17/2024
T3	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T4	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T5	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T6	AN02307	Preamp	8447D	1/6/2022	1/6/2024
	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023
T7	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023
T8	AN03540	Preamp	83017A	5/14/2021	5/14/2023
T9	ANP07504	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
T10	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
T11	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	3660.980M	43.4	+3.4 +0.0 +0.4	+0.6 +0.0 +31.7	+0.0 +0.2 +0.0	+0.0 -33.8	+0.0	45.9	54.0 Mid	-8.1	Horiz
2	2708.440M	44.0	+2.9 +0.0 +0.5	+0.5 +0.0 +29.5	+0.0 +0.2 +0.0	+0.0 -34.1	+0.0	43.5	54.0 Low	-10.5	Horiz
3	2781.726M Ave	43.4	+2.9 +0.0 +0.5	+0.5 +0.0 +29.3	+0.0 +0.3 +0.0	+0.0 -34.1	+0.0	42.8	54.0 High	-11.2	Horiz
^	2781.780M	48.8	+2.9 +0.0 +0.5	+0.5 +0.0 +29.3	+0.0 +0.3 +0.0	+0.0 -34.1	+0.0	48.2	54.0 High	-5.8	Horiz
5	5416.500M	35.6	+4.3 +0.0 +0.6	+0.8 +0.0 +34.7	+0.0 +0.4 +0.0	+0.0 -33.6	+0.0	42.8	54.0 Low	-11.2	Horiz
6	3611.060M Ave	39.9	+3.4 +0.0 +0.4	+0.5 +0.0 +31.7	+0.0 +0.3 +0.0	+0.0 -33.8	+0.0	42.4	54.0 Low	-11.6	Horiz
^	3611.060M	46.4	+3.4 +0.0 +0.4	+0.5 +0.0 +31.7	+0.0 +0.3 +0.0	+0.0 -33.8	+0.0	48.9	54.0 Low	-5.1	Horiz
8	3916.000M	38.9	+3.5 +0.0 +0.3	+0.5 +0.0 +32.3	+0.0 +0.3 +0.0	+0.0 -33.7	+0.0	42.1	54.0	-11.9	Vert
9	2745.730M Ave	42.0	+2.9 +0.0 +0.5	+0.5 +0.0 +29.3	+0.0 +0.3 +0.0	+0.0 -34.1	+0.0	41.4	54.0 Mid	-12.6	Horiz
^	2745.730M	48.7	+2.9 +0.0 +0.5	+0.5 +0.0 +29.3	+0.0 +0.3 +0.0	+0.0 -34.1	+0.0	48.1	54.0 Mid	-5.9	Horiz
11	4513.750M	36.5	+3.7 +0.0 +0.3	+0.6 +0.0 +32.2	+0.0 +0.5 +0.0	+0.0 -33.6	+0.0	40.2	54.0 Low	-13.8	Horiz
12	3709.012M Ave	35.7	+3.5 +0.0 +0.3	+0.6 +0.0 +32.0	+0.0 +0.2 +0.0	+0.0 -33.8	+0.0	38.5	54.0 High	-15.5	Horiz
^	3708.990M	44.1	+3.5 +0.0 +0.3	+0.6 +0.0 +32.0	+0.0 +0.2 +0.0	+0.0 -33.8	+0.0	46.9	54.0 High	-7.1	Horiz
14	1072.000M Ave	31.8	+1.8 +0.0 +0.2	+0.3 +0.0 +24.4	+0.0 +9.4 +0.0	+0.0 -36.7	+0.0	31.2	54.0	-22.8	Horiz
^	1072.000M	47.4	+1.8 +0.0 +0.2	+0.3 +0.0 +24.4	+0.0 +9.4 +0.0	+0.0 -36.7	+0.0	46.8	54.0	-7.2	Horiz

16	1854.480M	50.0	+2.4 +0.0 +0.3	+0.4 +0.0 +27.7	+0.0 +0.6 +0.0	+0.0 -34.7	+0.0	46.7	105.9 High	-59.2	Horiz
17	5491.550M	38.8	+4.4 +0.0 +0.5	+0.8 +0.0 +34.7	+0.0 +0.4 +0.0	+0.0 -33.6	+0.0	46.0	105.9 Mid	-59.9	Horiz
18	5563.510M	38.4	+4.4 +0.0 +0.5	+0.8 +0.0 +34.5	+0.0 +0.5 +0.0	+0.0 -33.6	+0.0	45.5	105.9 High	-60.4	Horiz
19	1830.490M	46.6	+2.4 +0.0 +0.3	+0.4 +0.0 +27.5	+0.0 +0.6 +0.0	+0.0 -34.7	+0.0	43.1	105.9 Mid	-62.8	Horiz
20	1805.510M	46.8	+2.3 +0.0 +0.3	+0.4 +0.0 +27.3	+0.0 +0.6 +0.0	+0.0 -34.7	+0.0	43.0	105.9 Low	-62.9	Horiz
21	41.600M	26.4	+0.3 +0.5 +0.0	+0.1 -27.8 +0.0	+0.0 +0.0 +0.0	+15.2 +0.0	+0.0	14.7	105.9	-91.2	Vert
22	68.800M	24.4	+0.4 +0.5 +0.0	+0.1 -27.8 +0.0	+0.0 +0.0 +0.0	+12.9 +0.0	+0.0	10.5	105.9	-95.4	Vert
23	92.100M	20.7	+0.5 +0.6 +0.0	+0.1 -27.7 +0.0	+0.0 +0.0 +0.0	+12.9 +0.0	+0.0	7.1	105.9	-98.8	Vert
24	29.230M	26.2	+0.3 +0.0 +0.0	+0.1 +0.0 +0.0	+0.0 +0.0 +3.9	+0.0 +0.0	-40.0	-9.5	105.9	-115.4	Para
25	7.408M	19.8	+0.1 +0.0 +0.0	+0.1 +0.0 +0.0	+0.0 +0.0 +8.9	+0.0 +0.0	-40.0	-11.1	105.9	-117.0	Para
26	18.910M	15.2	+0.2 +0.0 +0.0	+0.1 +0.0 +0.0	+0.0 +0.0 +6.7	+0.0 +0.0	-40.0	-17.8	105.9	-123.7	Para
27	27.160M	16.4	+0.3 +0.0 +0.0	+0.1 +0.0 +0.0	+0.0 +0.0 +4.9	+0.0 +0.0	-40.0	-18.3	105.9	-124.2	Para
28	165.700k	49.5	+0.0 +0.0 +0.0	+0.1 +0.0 +0.0	+0.0 +0.0 +9.4	+0.0 +0.0	-80.0	-21.0	105.9	-126.9	Para

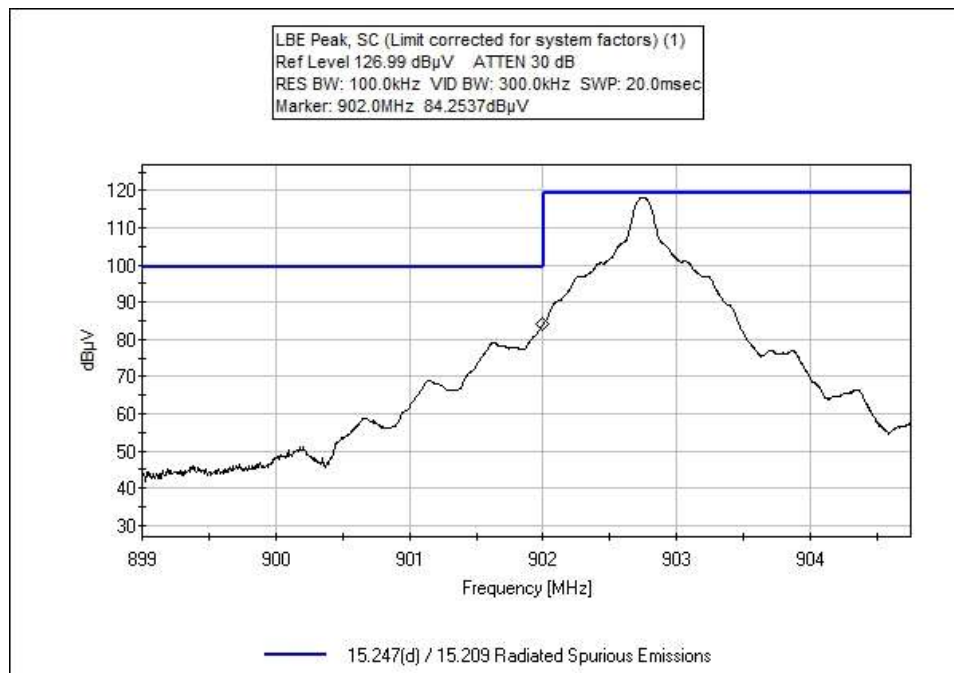
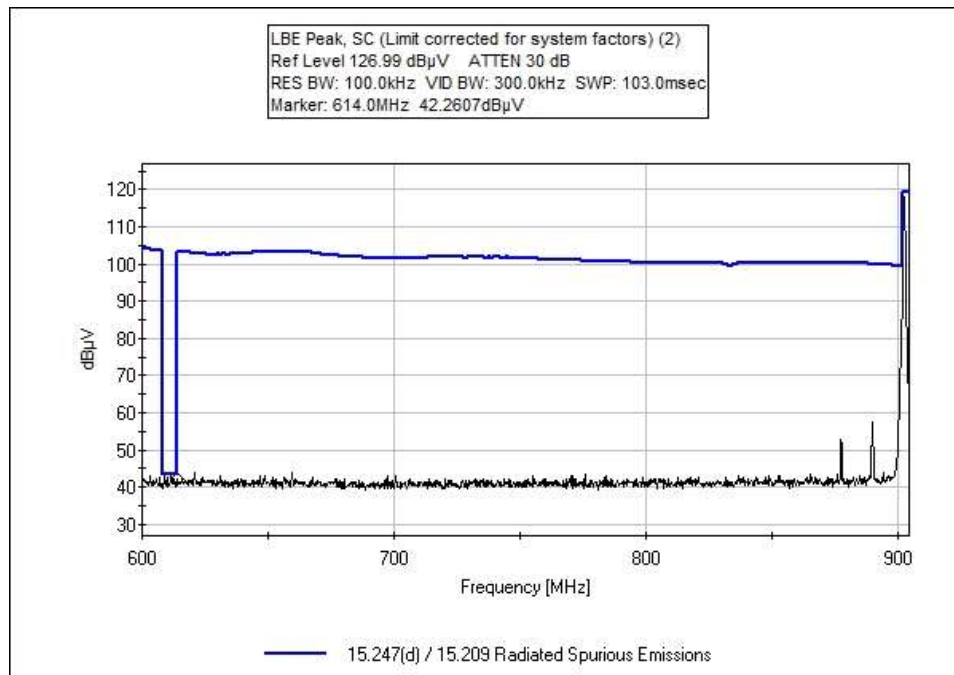
Band Edge

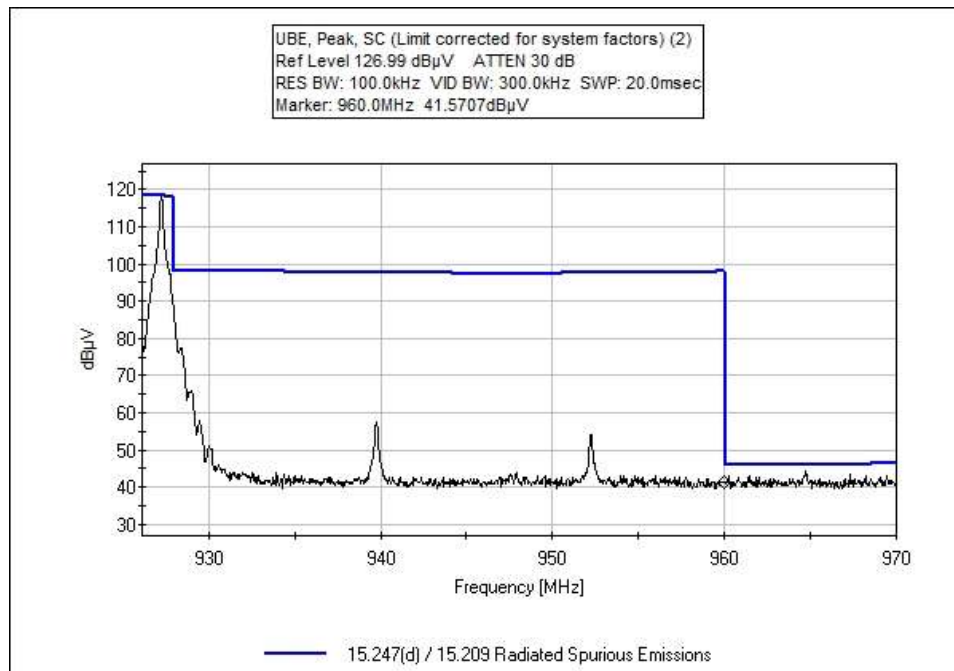
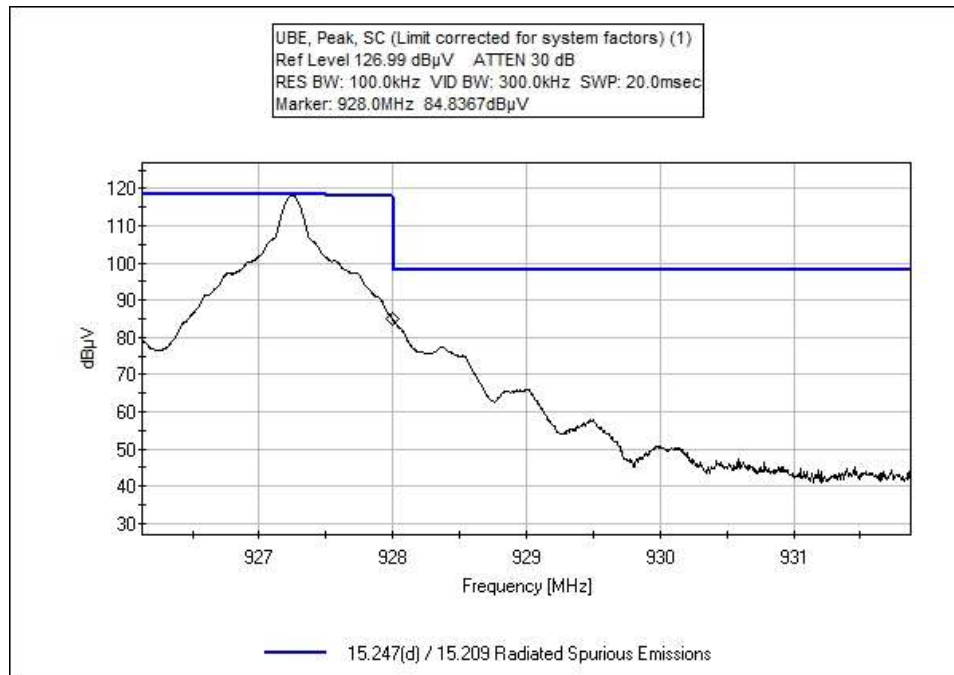
Band Edge Summary

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614 (QP)	ASK	Patch	25.1	<46	Pass
902	ASK	Patch	90.7	<105.9	Pass
928	ASK	Patch	92.4	< 105.9	Pass
960	ASK	Patch	49.5	<54	Pass

Band Edge Plots





Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Impinj Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **106839** Date: 6/8/2022
 Test Type: **Maximized Emissions** Time: 10:12:01
 Tested By: Matthew 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: 24°C Humidity: 39% Pressure: 101.5kPa Frequency Range: 600-970MHz Frequencies Tested: 902.75, 927.25 Test Method: ANSI C63.10: 2013 Test Mode: Constantly transmitting a modulated signal. Setup: EUT is on foam test table. It is connected to a remote 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. Horizontal and Vertical polarities investigated, worst case reported.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06515	Cable	Heliast	7/1/2020	7/1/2022
T2	ANP06540	Cable	Heliast	1/17/2022	1/17/2024
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T3	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T4	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T5	AN02307	Preamplifier	8447D	1/6/2022	1/6/2024
	ANP05503	Attenuator	766-10	6/8/2021	6/8/2023

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	960.000M	41.6	+1.7 -27.2	+0.3	+30.7	+2.4	+0.0	49.5	54.0	-4.5	Horiz
2	928.000M	84.8	+1.6 -27.3	+0.3	+30.6	+2.4	+0.0	92.4	105.9	-13.5	Horiz
3	902.000M	84.3	+1.6 -27.4	+0.3	+29.6	+2.3	+0.0	90.7	105.9	-15.2	Horiz
4	614.000M QP	22.5	+1.3 -28.1	+0.3	+27.2	+1.9	+0.0	25.1	46.0	-20.9	Horiz
^	614.000M	42.3	+1.3 -28.1	+0.3	+27.2	+1.9	+0.0	44.9	46.0	-1.1	Horiz

Test Setup Photo(s)



Below 1GHz



Above 1GHz



X-Axis



Y-Axis



Z-Axis

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
 Customer: **Impinj Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **106839** Date: 6/9/2022
 Test Type: **Conducted Emissions** Time: 15:39:31
 Tested By: Michael Atkinson Sequence#: 5
 Software: EMITest 5.03.20 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

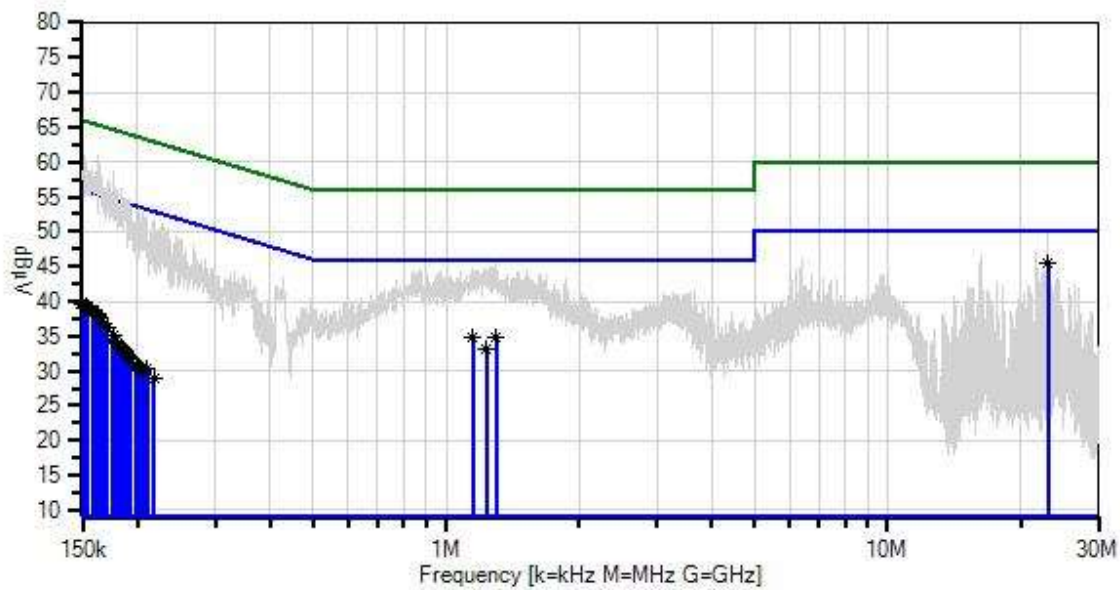
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 24°C Humidity: 39% Pressure: 101.5kPa Frequency Range: 0.15-30MHz Test Method: ANSI C63.10 (2013) Test Mode: EUT is reading tags; this is representative of worst case between standby and continuous TX mode. Setup: EUT is on foam test table. It is connected to a remote POE hub and a remote PC via Ethernet cable.

Impinj Inc. WO#: 106839 Sequence#: 5 Date: 6/9/2022
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
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T1	ANP06540	Cable	Heliac	1/17/2022	1/17/2024
T2	ANP06515	Cable	Heliac	5/23/2022	5/23/2024
T3	ANP06219	Attenuator	768-10	3/23/2022	3/23/2024
T4	AN02611	High Pass Filter	HE9615-150K-50-720B	1/5/2022	1/5/2024
T5	AN01311	50uH LISN-Line1 (L)	3816/2	2/23/2022	2/23/2024
	AN01311	50uH LISN-Line2 (N)	3816/2	2/23/2022	2/23/2024

<i>Measurement Data:</i>			Reading listed by margin.					Test Lead: Line			
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	23.130M	35.9	+0.1	+0.3	+9.1	+0.1	+0.0	45.5	50.0	-4.5	Line
	Ave		+0.0								
^	23.130M	40.2	+0.1	+0.3	+9.1	+0.1	+0.0	49.8	50.0	-0.2	Line
			+0.0								
3	1.152M	25.5	+0.1	+0.0	+9.1	+0.1	+0.0	34.9	46.0	-11.1	Line
	Ave		+0.1								
^	1.152M	35.4	+0.1	+0.0	+9.1	+0.1	+0.0	44.8	46.0	-1.2	Line
			+0.1								
5	1.297M	25.5	+0.1	+0.0	+9.1	+0.1	+0.0	34.9	46.0	-11.1	Line
	Ave		+0.1								
^	1.297M	36.2	+0.1	+0.0	+9.1	+0.1	+0.0	45.6	46.0	-0.4	Line
			+0.1								
7	1.234M	23.8	+0.1	+0.0	+9.1	+0.1	+0.0	33.2	46.0	-12.8	Line
	Ave		+0.1								
^	1.234M	35.4	+0.1	+0.0	+9.1	+0.1	+0.0	44.8	46.0	-1.2	Line
			+0.1								
9	153.458k	29.3	+0.1	+0.0	+9.1	+0.7	+0.0	39.3	55.8	-16.5	Line
	Ave		+0.1								
10	150.629k	28.4	+0.1	+0.0	+9.1	+1.8	+0.0	39.5	56.0	-16.5	Line
	Ave		+0.1								
11	154.402k	29.1	+0.1	+0.0	+9.1	+0.7	+0.0	39.1	55.8	-16.7	Line
	Ave		+0.1								
12	151.677k	28.7	+0.1	+0.0	+9.1	+1.1	+0.0	39.1	55.9	-16.8	Line
	Ave		+0.1								
^	151.676k	50.7	+0.1	+0.0	+9.1	+1.1	+0.0	61.1	55.9	+5.2	Line
			+0.1								
^	150.628k	47.7	+0.1	+0.0	+9.1	+1.8	+0.0	58.8	56.0	+2.8	Line
			+0.1								
15	158.069k	28.8	+0.1	+0.0	+9.1	+0.6	+0.0	38.7	55.6	-16.9	Line
	Ave		+0.1								
^	153.458k	49.8	+0.1	+0.0	+9.1	+0.7	+0.0	59.8	55.8	+4.0	Line
			+0.1								
^	154.401k	48.7	+0.1	+0.0	+9.1	+0.7	+0.0	58.7	55.8	+2.9	Line
			+0.1								
18	162.261k	28.3	+0.1	+0.0	+9.1	+0.5	+0.0	38.1	55.3	-17.2	Line
	Ave		+0.1								
^	158.069k	49.2	+0.1	+0.0	+9.1	+0.6	+0.0	59.1	55.6	+3.5	Line
			+0.1								
20	163.414k	28.2	+0.1	+0.0	+9.1	+0.4	+0.0	37.9	55.3	-17.4	Line
	Ave		+0.1								
21	164.881k	28.0	+0.1	+0.0	+9.1	+0.4	+0.0	37.7	55.2	-17.5	Line
	Ave		+0.1								
^	162.261k	51.2	+0.1	+0.0	+9.1	+0.5	+0.0	61.0	55.3	+5.7	Line
			+0.1								
^	163.414k	48.9	+0.1	+0.0	+9.1	+0.4	+0.0	58.6	55.3	+3.3	Line
			+0.1								

24	168.444k Ave	27.2	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	36.8	55.0	-18.2	Line
^	164.881k	50.2	+0.1 +0.1	+0.0	+9.1	+0.4	+0.0	59.9	55.2	+4.7	Line
26	171.169k Ave	26.5	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	36.1	54.9	-18.8	Line
^	171.169k	47.6	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	57.2	54.9	+2.3	Line
^	168.444k	46.8	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	56.4	55.0	+1.4	Line
29	176.200k Ave	25.4	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	35.0	54.7	-19.7	Line
30	179.029k Ave	24.7	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	34.3	54.5	-20.2	Line
31	180.182k Ave	24.5	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	34.1	54.5	-20.4	Line
^	176.199k	49.1	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	58.7	54.7	+4.0	Line
^	179.029k	46.6	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	56.2	54.5	+1.7	Line
34	185.841k Ave	23.6	+0.1 +0.1	+0.0	+9.1	+0.2	+0.0	33.1	54.2	-21.1	Line
35	184.374k Ave	23.6	+0.1 +0.1	+0.0	+9.1	+0.2	+0.0	33.1	54.3	-21.2	Line
^	180.181k	46.4	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	56.0	54.5	+1.5	Line
37	187.413k Ave	23.3	+0.1 +0.1	+0.0	+9.1	+0.2	+0.0	32.8	54.2	-21.4	Line
^	184.373k	46.7	+0.1 +0.1	+0.0	+9.1	+0.2	+0.0	56.2	54.3	+1.9	Line
39	189.928k Ave	22.8	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	32.2	54.0	-21.8	Line
^	185.840k	45.2	+0.1 +0.1	+0.0	+9.1	+0.2	+0.0	54.7	54.2	+0.5	Line
41	190.976k Ave	22.7	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	32.1	54.0	-21.9	Line
^	187.412k	45.4	+0.1 +0.1	+0.0	+9.1	+0.2	+0.0	54.9	54.2	+0.7	Line
43	193.282k Ave	22.3	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	31.7	53.9	-22.2	Line
^	190.976k	45.5	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	54.9	54.0	+0.9	Line
^	189.928k	45.2	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	54.6	54.0	+0.6	Line
^	193.281k	44.2	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	53.6	53.9	-0.3	Line
47	198.836k Ave	21.6	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	31.0	53.7	-22.7	Line
48	201.665k Ave	21.3	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	30.7	53.5	-22.8	Line

49	200.408k Ave	21.3	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	30.7	53.6	-22.9	Line
^	198.835k	43.7	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	53.1	53.7	-0.6	Line
^	200.407k	43.3	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	52.7	53.6	-0.9	Line
52	209.211k Ave	20.9	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	30.3	53.2	-22.9	Line
53	210.154k Ave	20.9	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	30.3	53.2	-22.9	Line
54	205.962k Ave	20.7	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	30.1	53.4	-23.3	Line
^	201.665k	43.9	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	53.3	53.5	-0.2	Line
^	205.962k	43.5	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	52.9	53.4	-0.5	Line
^	210.154k	42.9	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	52.3	53.2	-0.9	Line
^	209.210k	42.6	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	52.0	53.2	-1.2	Line
59	217.909k Ave	19.6	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	29.0	52.9	-23.9	Line
^	217.909k	42.4	+0.1 +0.1	+0.0	+9.1	+0.1	+0.0	51.8	52.9	-1.1	Line



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
Customer: **Impinj Inc.**
Specification: **15.207 AC Mains - Average**
Work Order #: **106839** Date: 6/9/2022
Test Type: **Conducted Emissions** Time: 15:53:40
Tested By: Michael Atkinson Sequence#: 6
Software: EMITest 5.03.20 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

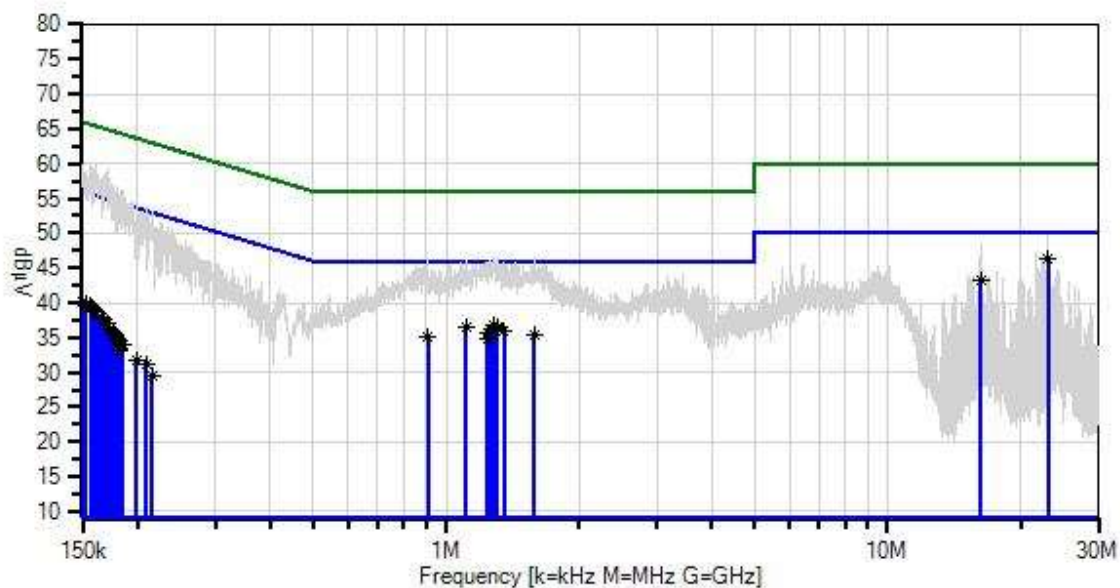
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 24°C Humidity: 39% Pressure: 101.5kPa Frequency Range: 0.15-30MHz Test Method: ANSI C63.10 (2013) Test Mode: EUT is reading tags; this is representative of worst case between standby and continuous TX mode. Setup: EUT is on foam test table. It is connected to a remote POE hub and a remote PC via Ethernet cable.

Impinj Inc. W/O#: 106839 Sequence#: 6 Date: 6/9/2022
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
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T1	ANP06540	Cable	Heliac	1/17/2022	1/17/2024
T2	ANP06515	Cable	Heliac	5/23/2022	5/23/2024
T3	ANP06219	Attenuator	768-10	3/23/2022	3/23/2024
T4	AN02611	High Pass Filter	HE9615-150K-50-720B	1/5/2022	1/5/2024
	AN01311	50uH LISN-Line1 (L)	3816/2	2/23/2022	2/23/2024
T5	AN01311	50uH LISN-Line2 (N)	3816/2	2/23/2022	2/23/2024

Measurement Data:

Reading listed by margin.

Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	23.130M	36.6	+0.1	+0.3	+9.1	+0.1	+0.0	46.3	50.0	-3.7	Neutr
	Ave		+0.1								
^	23.130M	40.2	+0.1	+0.3	+9.1	+0.1	+0.0	49.9	50.0	-0.1	Neutr
			+0.1								
3	16.230M	33.9	+0.0	+0.2	+9.1	+0.0	+0.0	43.2	50.0	-6.8	Neutr
	Ave		+0.0								
^	16.230M	38.9	+0.0	+0.2	+9.1	+0.0	+0.0	48.2	50.0	-1.8	Neutr
			+0.0								
5	1.278M	27.3	+0.1	+0.0	+9.1	+0.1	+0.0	36.7	46.0	-9.3	Neutr
	Ave		+0.1								
^	1.278M	37.3	+0.1	+0.0	+9.1	+0.1	+0.0	46.7	46.0	+0.7	Neutr
			+0.1								
7	1.303M	27.2	+0.1	+0.0	+9.1	+0.1	+0.0	36.6	46.0	-9.4	Neutr
	Ave		+0.1								
^	1.303M	37.2	+0.1	+0.0	+9.1	+0.1	+0.0	46.6	46.0	+0.6	Neutr
			+0.1								
9	1.112M	27.0	+0.1	+0.0	+9.1	+0.1	+0.0	36.4	46.0	-9.6	Neutr
	Ave		+0.1								
^	1.112M	36.7	+0.1	+0.0	+9.1	+0.1	+0.0	46.1	46.0	+0.1	Neutr
			+0.1								
11	1.354M	26.5	+0.1	+0.0	+9.1	+0.1	+0.0	35.9	46.0	-10.1	Neutr
	Ave		+0.1								
^	1.354M	36.4	+0.1	+0.0	+9.1	+0.1	+0.0	45.8	46.0	-0.2	Neutr
			+0.1								
13	1.259M	26.2	+0.1	+0.0	+9.1	+0.1	+0.0	35.6	46.0	-10.4	Neutr
	Ave		+0.1								
^	1.259M	36.6	+0.1	+0.0	+9.1	+0.1	+0.0	46.0	46.0	+0.0	Neutr
			+0.1								
15	1.248M	26.2	+0.1	+0.0	+9.1	+0.1	+0.0	35.6	46.0	-10.4	Neutr
	Ave		+0.1								
16	1.586M	25.9	+0.1	+0.1	+9.1	+0.1	+0.0	35.4	46.0	-10.6	Neutr
	Ave		+0.1								
^	1.586M	36.9	+0.1	+0.1	+9.1	+0.1	+0.0	46.4	46.0	+0.4	Neutr
			+0.1								
18	908.288k	25.8	+0.1	+0.0	+9.1	+0.1	+0.0	35.2	46.0	-10.8	Neutr
	Ave		+0.1								
^	908.287k	36.6	+0.1	+0.0	+9.1	+0.1	+0.0	46.0	46.0	+0.0	Neutr
			+0.1								
20	1.241M	25.3	+0.1	+0.0	+9.1	+0.1	+0.0	34.7	46.0	-11.3	Neutr
	Ave		+0.1								
^	1.241M	36.5	+0.1	+0.0	+9.1	+0.1	+0.0	45.9	46.0	-0.1	Neutr
			+0.1								
^	1.248M	36.4	+0.1	+0.0	+9.1	+0.1	+0.0	45.8	46.0	-0.2	Neutr
			+0.1								
23	150.419k	28.9	+0.1	+0.0	+9.1	+2.0	+0.0	40.2	56.0	-15.8	Neutr
	Ave		+0.1								

24	156.602k Ave	29.6	+0.1 +0.1	+0.0	+9.1	+0.6	+0.0	39.5	55.6	-16.1	Neutr
25	152.620k Ave	29.7	+0.1 +0.1	+0.0	+9.1	+0.8	+0.0	39.8	55.9	-16.1	Neutr
^	150.419k	48.7	+0.1 +0.1	+0.0	+9.1	+2.0	+0.0	60.0	56.0	+4.0	Neutr
^	152.619k	48.9	+0.1 +0.1	+0.0	+9.1	+0.8	+0.0	59.0	55.9	+3.1	Neutr
28	158.279k Ave	29.3	+0.1 +0.1	+0.0	+9.1	+0.6	+0.0	39.2	55.6	-16.4	Neutr
29	159.222k Ave	29.2	+0.1 +0.1	+0.0	+9.1	+0.5	+0.0	39.0	55.5	-16.5	Neutr
30	161.423k Ave	28.9	+0.1 +0.1	+0.0	+9.1	+0.5	+0.0	38.7	55.4	-16.7	Neutr
^	156.602k	49.9	+0.1 +0.1	+0.0	+9.1	+0.6	+0.0	59.8	55.6	+4.2	Neutr
^	159.222k	49.6	+0.1 +0.1	+0.0	+9.1	+0.5	+0.0	59.4	55.5	+3.9	Neutr
^	158.279k	49.6	+0.1 +0.1	+0.0	+9.1	+0.6	+0.0	59.5	55.6	+3.9	Neutr
34	165.824k Ave	28.2	+0.1 +0.1	+0.0	+9.1	+0.4	+0.0	37.9	55.2	-17.3	Neutr
^	161.422k	50.3	+0.1 +0.1	+0.0	+9.1	+0.5	+0.0	60.1	55.4	+4.7	Neutr
36	168.025k Ave	27.9	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	37.5	55.1	-17.6	Neutr
^	165.824k	48.3	+0.1 +0.1	+0.0	+9.1	+0.4	+0.0	58.0	55.2	+2.8	Neutr
38	170.855k Ave	27.4	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	37.0	54.9	-17.9	Neutr
^	168.025k	48.5	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	58.1	55.1	+3.0	Neutr
40	173.056k Ave	26.7	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	36.3	54.8	-18.5	Neutr
^	170.854k	49.8	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	59.4	54.9	+4.5	Neutr
42	176.514k Ave	26.0	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	35.6	54.6	-19.0	Neutr
43	177.562k Ave	25.7	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	35.3	54.6	-19.3	Neutr
^	173.055k	48.3	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	57.9	54.8	+3.1	Neutr
45	180.077k Ave	25.2	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	34.8	54.5	-19.7	Neutr
46	180.915k Ave	24.9	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	34.5	54.4	-19.9	Neutr
^	176.513k	47.0	+0.1 +0.1	+0.0	+9.1	+0.3	+0.0	56.6	54.6	+2.0	Neutr
48	183.535k Ave	24.5	+0.1 +0.1	+0.0	+9.1	+0.2	+0.0	34.0	54.3	-20.3	Neutr
49	184.793k Ave	24.4	+0.1 +0.1	+0.0	+9.1	+0.2	+0.0	33.9	54.3	-20.4	Neutr

50	181.963k	23.6	+0.1	+0.0	+9.1	+0.3	+0.0	33.2	54.4	-21.2	Neutr
	Ave		+0.1								
^	180.077k	47.0	+0.1	+0.0	+9.1	+0.3	+0.0	56.6	54.5	+2.1	Neutr
			+0.1								
^	180.915k	46.8	+0.1	+0.0	+9.1	+0.3	+0.0	56.4	54.4	+2.0	Neutr
			+0.1								
^	184.792k	46.7	+0.1	+0.0	+9.1	+0.2	+0.0	56.2	54.3	+1.9	Neutr
			+0.1								
^	183.535k	46.7	+0.1	+0.0	+9.1	+0.2	+0.0	56.2	54.3	+1.9	Neutr
			+0.1								
^	177.561k	46.4	+0.1	+0.0	+9.1	+0.3	+0.0	56.0	54.6	+1.4	Neutr
			+0.1								
^	181.963k	45.8	+0.1	+0.0	+9.1	+0.3	+0.0	55.4	54.4	+1.0	Neutr
			+0.1								
57	209.735k	21.9	+0.1	+0.0	+9.1	+0.1	+0.0	31.3	53.2	-21.9	Neutr
	Ave		+0.1								
^	209.734k	44.6	+0.1	+0.0	+9.1	+0.1	+0.0	54.0	53.2	+0.8	Neutr
			+0.1								
59	198.941k	22.4	+0.1	+0.0	+9.1	+0.1	+0.0	31.8	53.7	-21.9	Neutr
	Ave		+0.1								
^	198.940k	45.3	+0.1	+0.0	+9.1	+0.1	+0.0	54.7	53.7	+1.0	Neutr
			+0.1								
61	215.918k	20.1	+0.1	+0.0	+9.1	+0.1	+0.0	29.5	53.0	-23.5	Neutr
	Ave		+0.1								
^	215.917k	43.6	+0.1	+0.0	+9.1	+0.1	+0.0	53.0	53.0	+0.0	Neutr
			+0.1								

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 $\text{dB}\mu\text{V}/\text{m}$, the spectrum analyzer reading in $\text{dB}\mu\text{V}$ 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	($\text{dB}\mu\text{V}$)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	($\text{dB}\mu\text{V}/\text{m}$)

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.