TEST REPORT

Report Number: 104059097MPK-001
Project Numbers: G104059097, G103539437
September 03, 2019

Testing performed on the
PowerLine Coordinator™
Model: P105467

FCC ID: QPS01007
IC: 22326-01007

To
FCC Part 15 Subpart C (15.247)
Industry Canada RSS-247 Issue 2
FCC Part 15 Subpart B
Industry Canada ICES-003

For

Smart Wires, Inc.

Test Performed by:	Test Authorized by:
Intertek	Smart Wires, Inc.
1365 Adams Court	3292 Whipple Rd.
Menlo Park, CA 94025 USA	Union City, CA 94587 USA

Prepared by: _____ **Date:** September 03, 2019
Anderson Soungpanya

Reviewed by: _____ **Date:** September 03, 2019
Krishna K Vemuri

Report No. 104059097MPK-001

Equipment Under Test:	PowerLine Coordinator™
Trade Name:	Smart Wires, Inc.
Model Number(s):	P105467
Applicant:	Smart Wires, Inc.
Contact:	Karamjit Singh
Address:	Smart Wires, Inc. 3292 Whipple Rd. Union City, CA 94587
Country	USA
Tel. Number:	(510) 952-2668
Email:	karamjit.singh@smartwires.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) Industry Canada RSS-247 Issue 2 FCC Part 15, Subpart B Industry Canada ICES-003 Issue 6
Date of Test:	June 7 - 25, 2018

We attest to the accuracy of this report:

Anderson Soungpanya
Project Engineer

Krishna K Vemuri
Engineering Team Lead

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1.0 Introduction

This report is designed to show compliance of the 900 MHz transceiver with the requirements of FCC Part 15 Subpart C (15.247) and RSS-247. This test report covers only the FHSS radio.

1.1 Summary of Tests

TEST	Reference FCC	Reference Industry Canada	RESULTS
RF Output Power	15.247(b)	RSS-247, 5.4.b)	Complies
20-dB Bandwidth	15.247(a)(1)	RSS-247, 5.1.a)	Complies
Channel Separation	15.247(a)(1)	RSS-247, 5.1.b)	Complies
Number of Hopping Channels	15.247(a)(1)	RSS-247, 5.1.d)	Complies
Average Channel Occupancy Time	15.247(a)(1)	RSS-247, 5.1.d)	Complies
Out-of-Band Antenna Conducted Emission	15.247(d)	RSS-247, 5.5	Complies
Transmitter Radiated Emissions	15.247(d), 15.209, 15.205	RSS-GEN	Complies
RF Exposure	15.247(i)	RSS-102	Complies
AC Conducted Emission	15.207	RSS-GEN	Complies
Antenna Requirement	15.203	RSS-GEN	Complies (Professional Installation)
Radiated Emission	15.109	RSS-GEN	Complies
AC Line Conducted Emission	15.107	RSS-GEN	Complies

2.0 General Description

2.1 Product Description

Smart Wires, Inc. supplied the following description of the EUT:

The PowerLine Coordinator is a rugged and reliable communication device that serves as an intermediary between the Smart Wires Field Devices (SWFDs) for power flow control and the PowerLine Gateway ™. It is responsible for managing the industrial Scientific and Medical (ISM) mesh and communication with the PowerLine Gateway for control and status reporting. The communication with PowerLine Gateway is done via proprietary and secure, authenticated protocol over TCP/IP. The PowerLine Coordinator is a robust and reliable communication device that acts on behalf of PowerLine Gateway ™.

For more information, see user's manual provided by the manufacturer.

Information about the 900 MHz radio is presented below:

Applicant	Smart Wires, Inc.
Model No.	P105467
FCC Identifier	QPS01007
IC Identifier	22326-01007
Type of Transmission	Frequency Hopping Spread Spectrum
Rated RF Output	19.48 dBm
Antenna(s) & Gain	PowerLine Coordinator™ - External Antenna, Gain: 5.00 dBi
Frequency Range	902.400 – 926.944 MHz
Number of Channel(s)	64
Modulation Type	2-FSK
Applicant Name & Address	Smart Wires, Inc. 3292 Whipple Rd. Union City, CA 94587 USA

EUT receive date: June 01, 2018

EUT receive condition: The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.

Test start date: June 07, 2018

Test completion date: June 25, 2018

The test results in this report pertain only to the item tested.

2.2 Related Submittal(s) Grants

None.

2.3 Test Methodology

Antenna conducted measurements were performed according to the FCC documents “GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES” (KDB 558074 D01 DTS Meas Guidance v05r02), and RSS-247 Issue 2, RSS-GEN Issue 5.

Radiated emissions and AC mains conducted emissions measurements were performed according to the procedures in ANSI C63.4:2014 and ANSI C63.10:2013. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this report.

Following is the channel test plan:

Channels in 900 MHz band			
Test Channel		Frequency, MHz	Tested
Low	0	902.400	√
Middle	32	914.867	√
High	63	926.944	√

2.4 Test Facility

The test site used to collect the radiated data is site 1 (10-m semi-anechoic chamber). This test facility and site measurement data have been fully placed on file with the FCC, IC and A2LA accredited.

3.0 System Test Configuration

3.1 Support Equipment

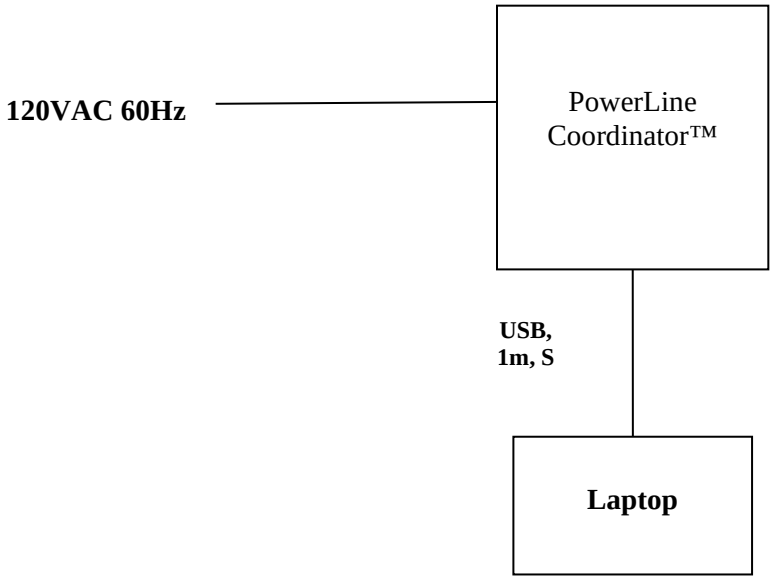
Description	Manufacturer	Model Number
Laptop	DELL	Latitude 5480
DC Power Supply	HP	6012B

3.2 Block Diagram of Test Setup

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Communication Device	Smart Wires, Inc.	PowerLine Coordinator™	13718-006-AD-0C-S-00

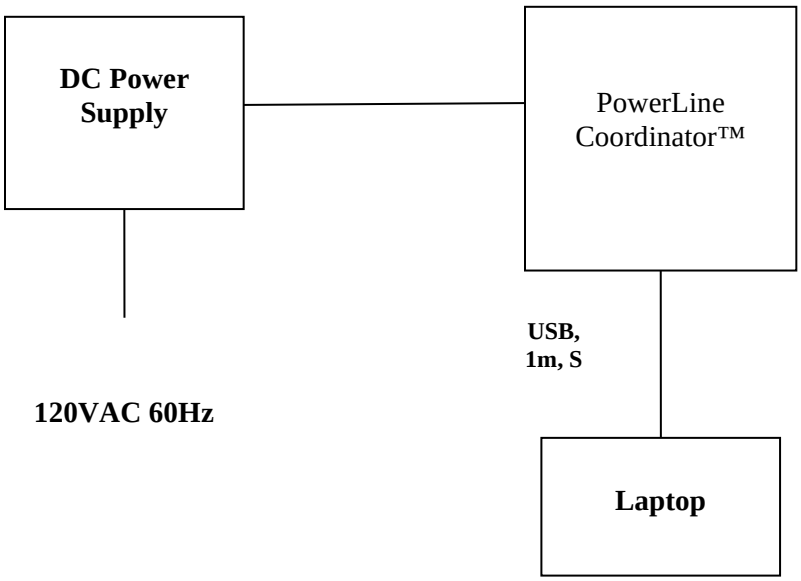
Antenna was removed and co-axial connector with a cable was installed for Conducted Measurements.

AC Configuration



Antenna was removed and co-axial connector with a cable was installed for Conducted Measurements.

DC Configuration



S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT is attached to peripherals and they are connected and operational (as typical as possible). The EUT is wired to transmit full power. During testing, all cables are manipulated to produce worst-case emissions.

3.4 Mode of Operation During Test

During transmitter testing, the transmitter was setup to transmit continuously at maximum RF power on the low channel, middle channel, high channel and with hopping channels enabled.

The Maximum power allowed by the manufacturer's provided GUI is RF Power = 19

3.5 Modifications Required for Compliance

Intertek installed no modifications during compliance testing in order to bring the product into compliance.

3.6 Additions, Deviations and Exclusions from Standards

No additions, deviations or exclusions from the standard were made.

4.0 Emissions Measurement Results

4.1 20dB Bandwidth, and 99% Occupied Bandwidth
FCC Rule 15.247(a)(1)

4.1.1 Procedure

The Procedure described in the ANSI C63.10:2013 for Frequency Hopping Spread Spectrum Systems was used to determine the 20dB bandwidth.

- Span = Approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel
- RBW = 1% of the 20dB bandwidth
- VBW = 3 x RBW
- Sweep = Auto
- Detector function = Peak
- Trace = Max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

For 99% power bandwidth measurement, the bandwidth was determined by using the built-in 99% occupied bandwidth function of the spectrum analyzer.

The antenna port of the EUT was connected to the input of a spectrum analyzer (SA). For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A Peak output reading was taken, a Display line was drawn for 20dB lower than Peak level. The 20dB bandwidth was determined from where the channel output spectrum intersected the display line.

Tested By	Test Date
Anderson Soungpanya	June 7, 2018

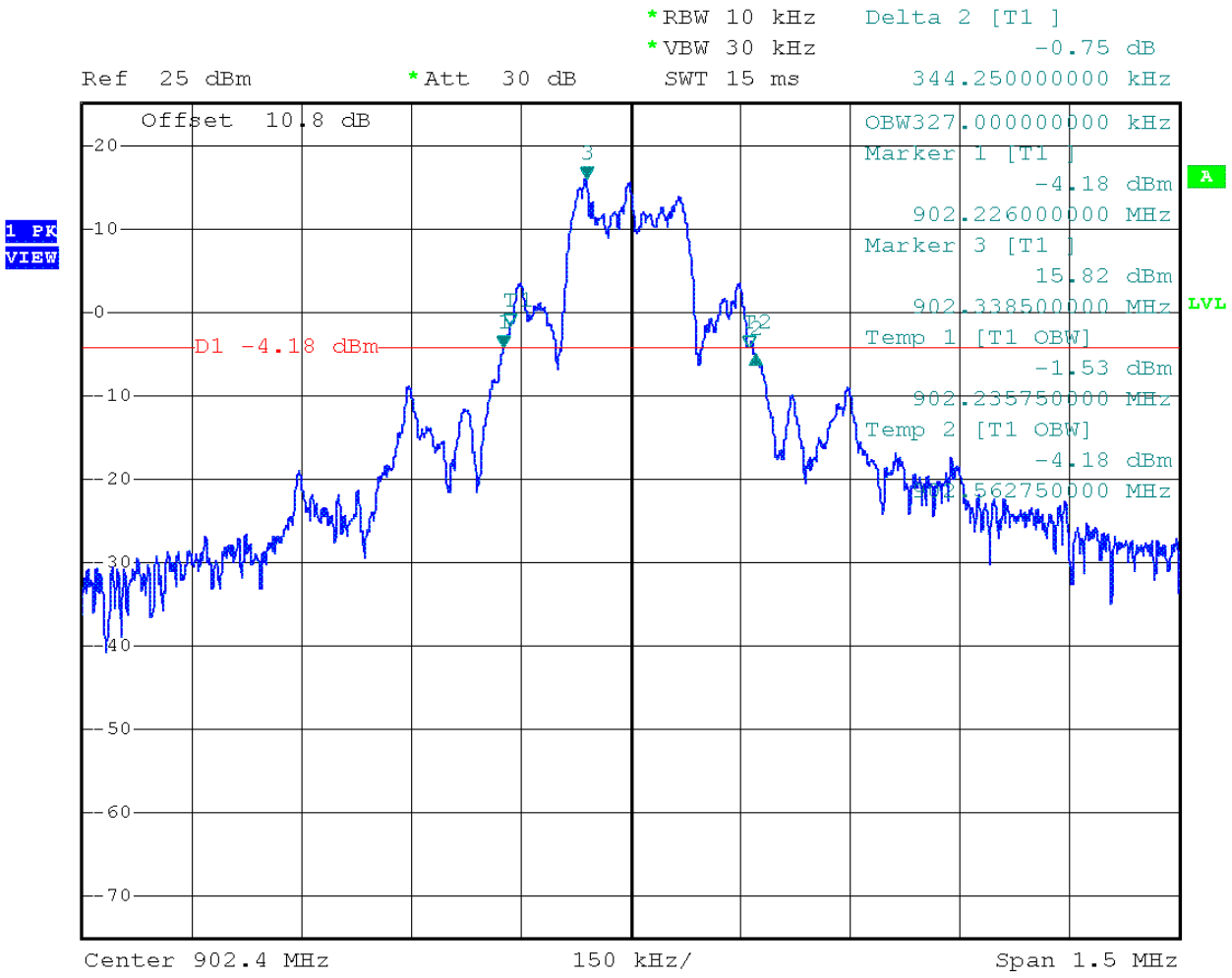
4.1.2 Test Result

Frequency MHz	20 dB FCC Bandwidth, MHz	99% Bandwidth, MHz	Plot #
902.400	0.34425	0.32700	1.1
914.867	0.34450	0.32325	1.2
926.944	0.34125	0.32250	1.3

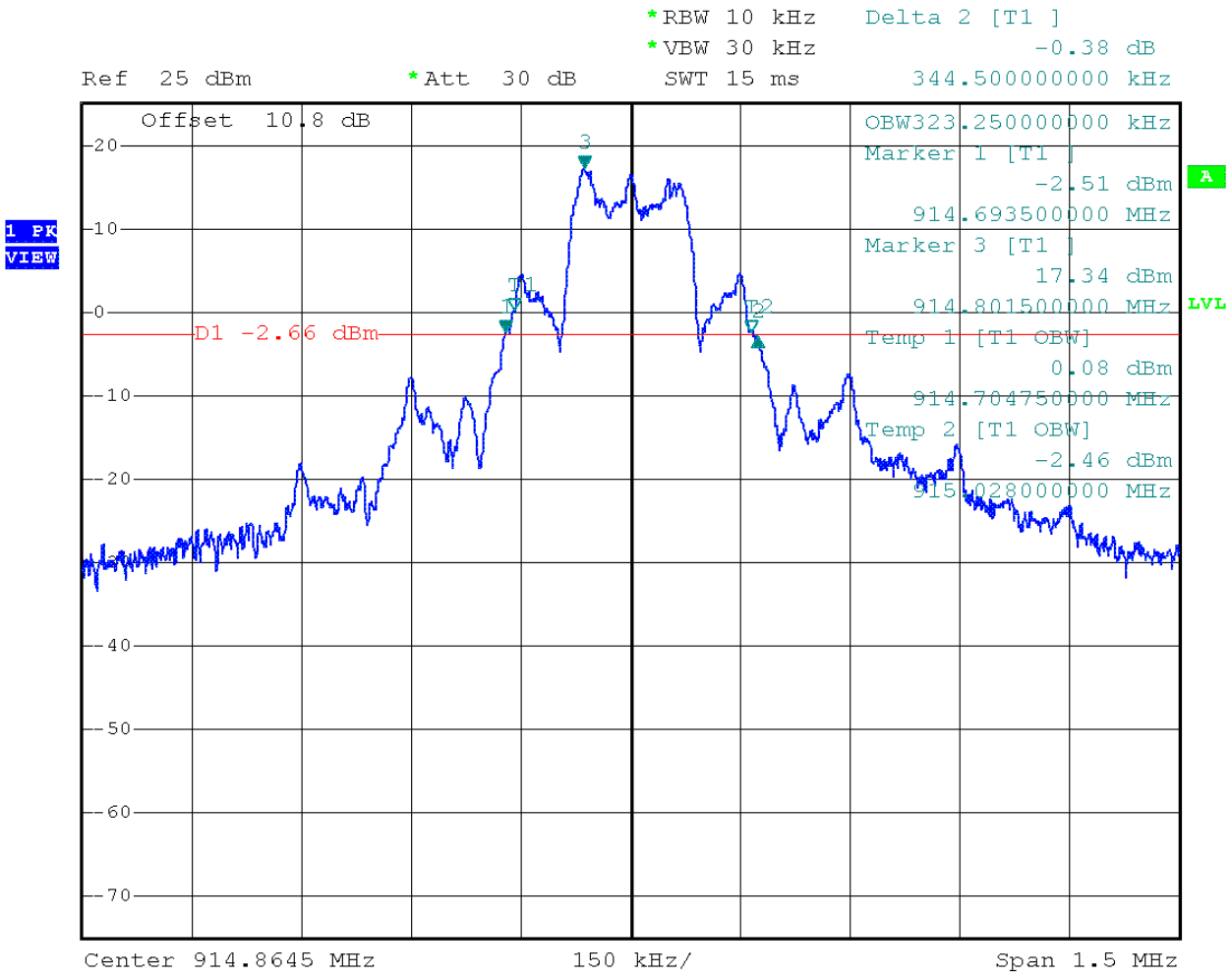
For frequency hopping systems operating in the 902-928 MHz band, the maximum allowed 20 dB bandwidth of the hopping channel is 0.500 MHz.

Results	Complies

Plot 1. 1 – 20dB Bandwidth and 99% Bandwidth Low Channel

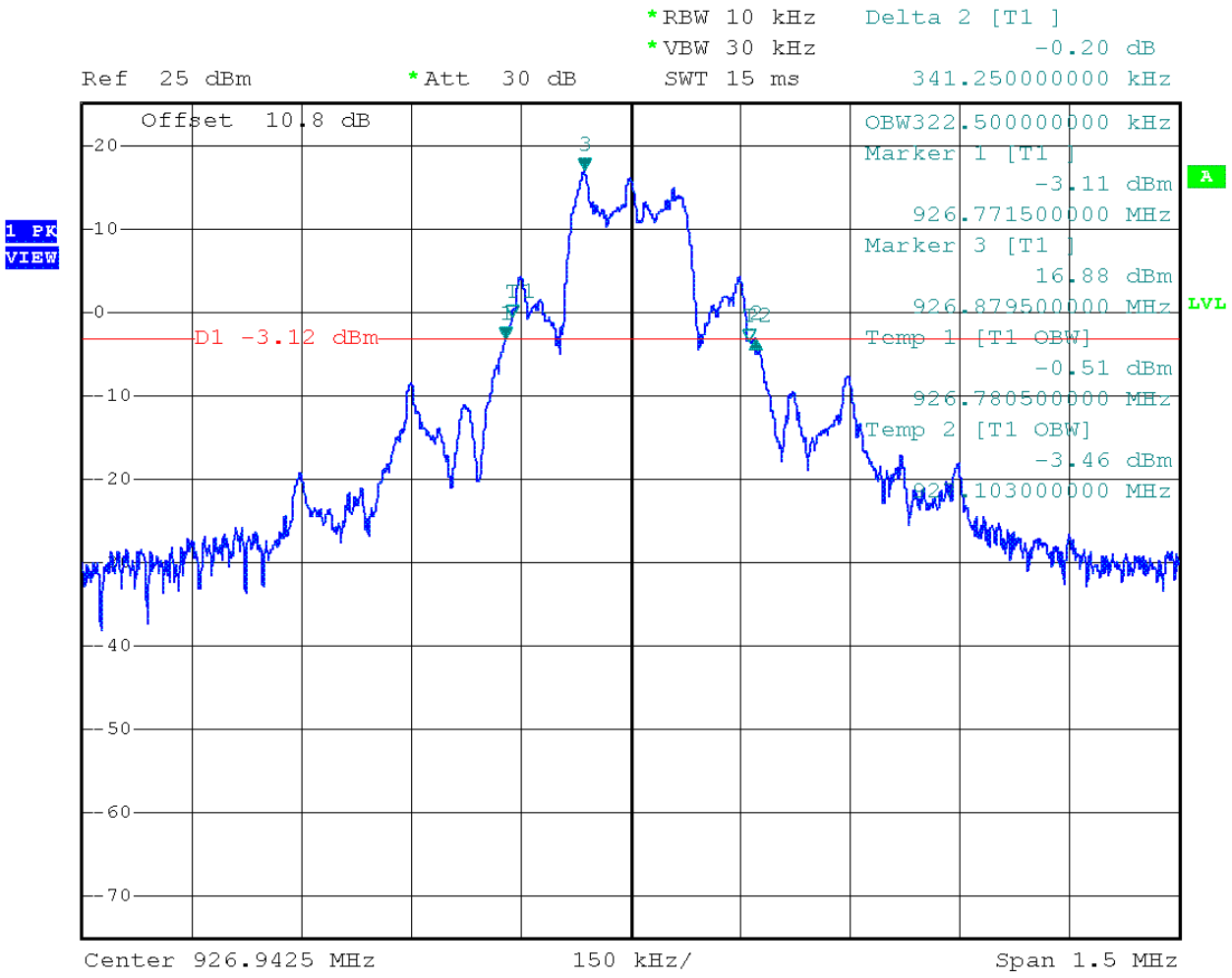


Plot 1. 2 – 20dB Bandwidth and 99% Bandwidth Middle Channel



Date: 7.JUN.2018 14:03:00

Plot 1. 3 – 20dB Bandwidth and 99% Bandwidth High Channel



Date: 7.JUN.2018 14:21:04

4.2 Conducted Output Power at Antenna Terminals
FCC Rule 15.247(b)(1)

4.2.1 Requirement

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels

4.2.2 Procedure

The Procedure described in the ANSI C63.10:2013 for Frequency Hopping Spread Spectrum Systems was used to determine the RF Output Power.

- Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
- RBW > the 20 dB bandwidth of the emission being measured
- VBW = 3 x RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold

Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (see the NOTE above regarding external attenuation and cable loss). The limit is specified in one of the subparagraphs of this Section. Submit this plot.

The antenna port of the EUT was connected to the input of a spectrum analyzer. Power was read directly from the spectrum analyzer and cable loss correction was added to the reading to obtain the power at the antenna terminals.

Tested By	Test Date
Anderson Soungpanya	June 7, 2018

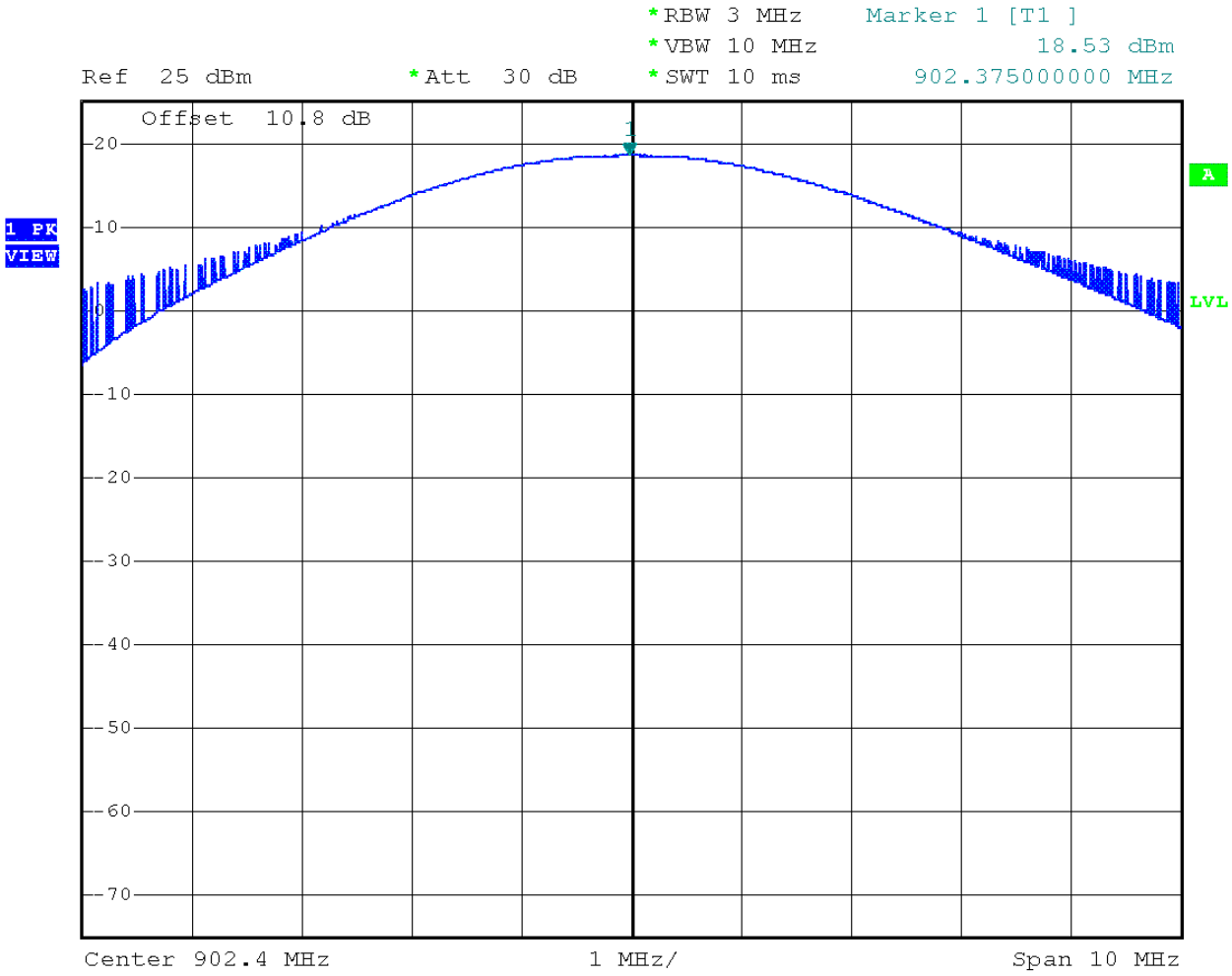
4.3.3 Test Result

Refer to the following plots for the test result:

Frequency MHz	Conducted Peak Power dBm	Conducted Peak Power mW	Plot #
902.400	18.93	78.163	2.1
914.867	19.48	88.716	2.2
926.944	19.14	82.035	2.3

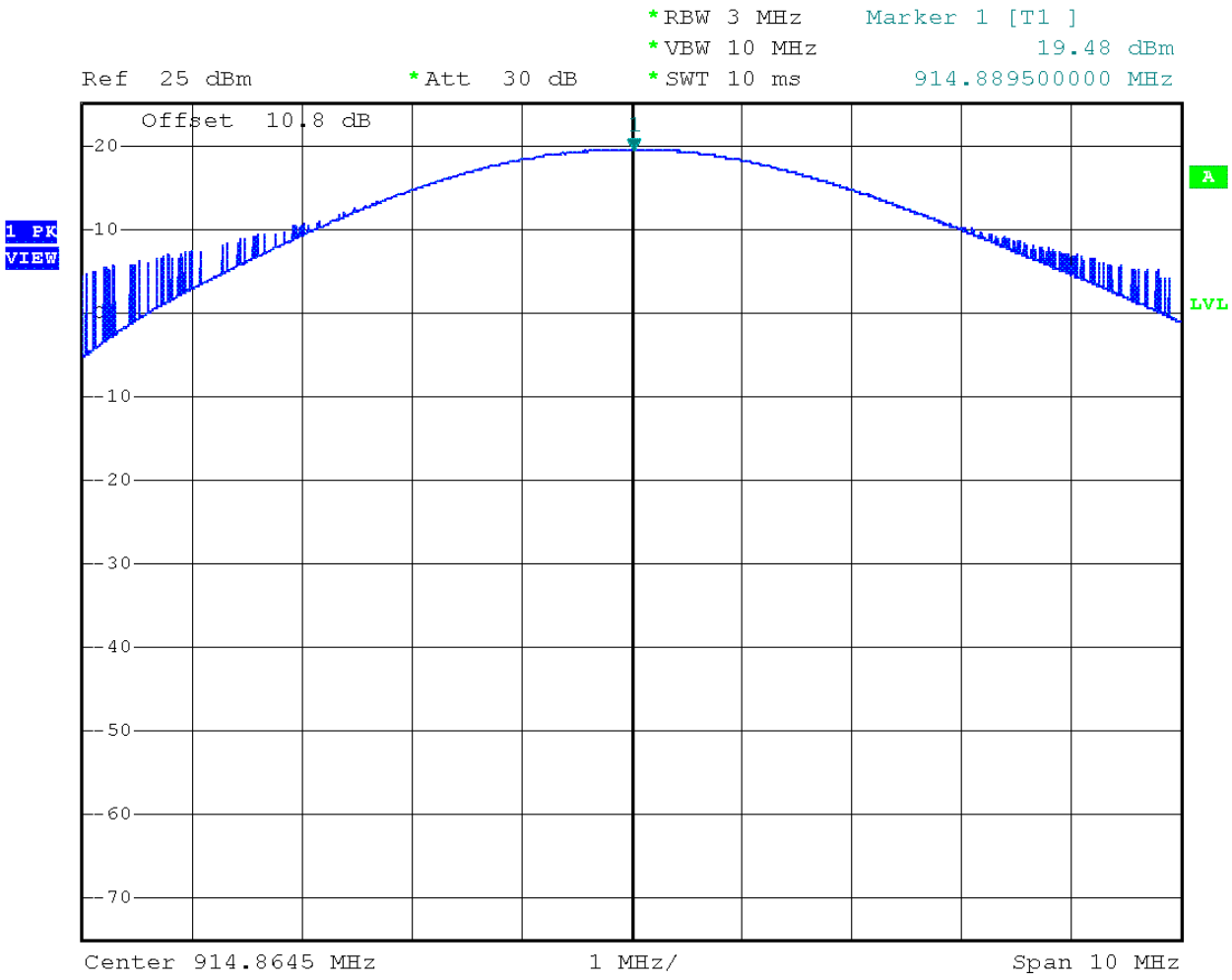
Results	Complies

Plot 2. 2 – Output Power Low Channel

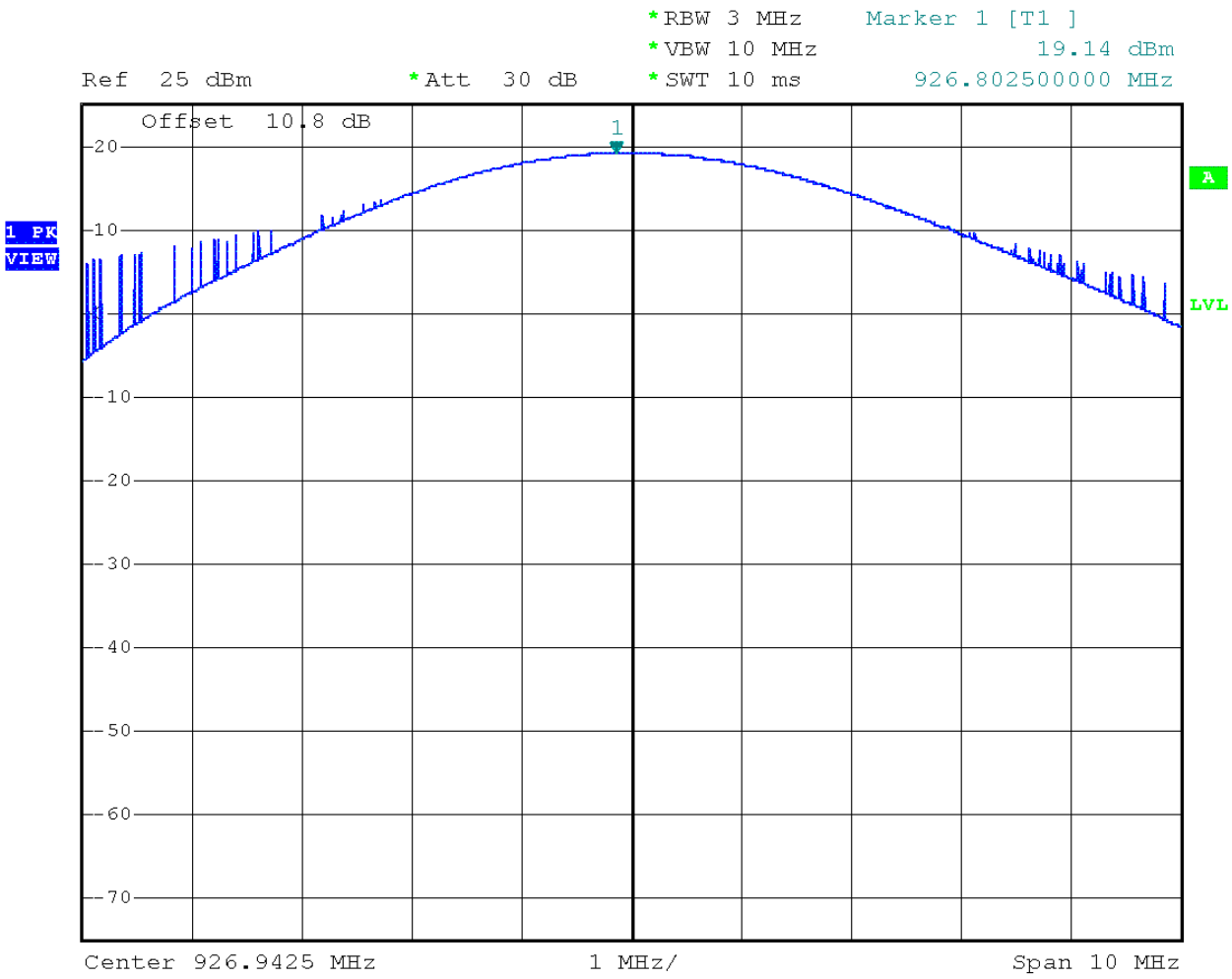


Date: 7.JUN.2018 14:44:50

Plot 2. 2 – Output Power Middle Channel



Plot 2. 3 – Output Power High Channel



4.3 Carrier Frequency Separation
FCC 15.247 (a)(1)

4.3.1 Requirement

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

4.3.2 Procedure

The Procedure described in the ANSI C63.10:2013 for Frequency Hopping Spread Spectrum Systems was used to determine the Carrier Frequency Separation.

- The EUT must have its hopping function enabled
- Span = wide enough to capture the peaks of two adjacent channels
- Resolution (or IF) Bandwidth (RBW) = 1% of the span
- Video (or Average) Bandwidth (VBW) = 3 x RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold

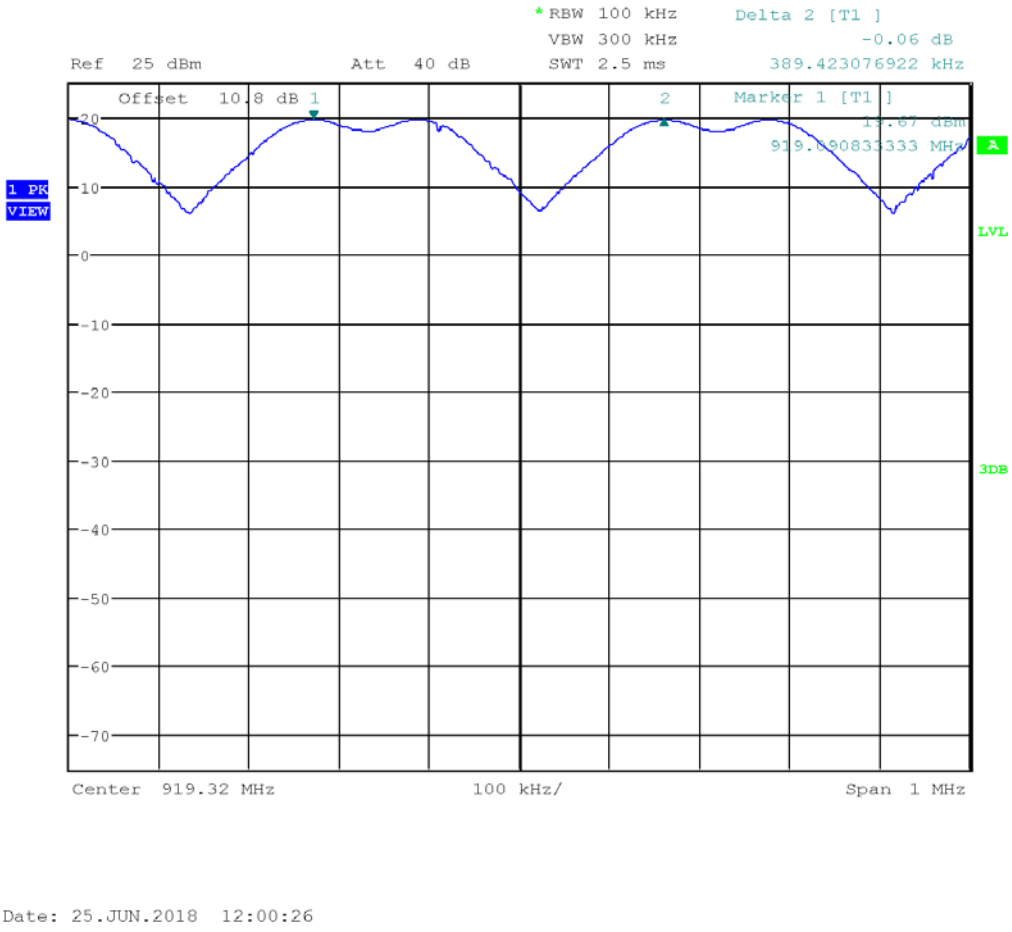
Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Tested By	Test Date
Anderson Soungpanya	June 25, 2018

4.3.3 Test Result

The worst case 20dB Bandwidth is 344.5 kHz, therefore the minimum Carrier Frequency Separation shall be greater than 344.5 kHz. The measured channel separation is 389.42 kHz. Carrier Frequency Separation meets the minimum requirement. Please refer to spectrum analyzer Plot 3.1 below for the test result.

Plot 3.1– Channel Separation



Results	Complies

4.4 Number of Channels
FCC 15.247 (a)(1)(iii)

4.4.1 Requirement

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

4.4.2 Procedure

The Procedure described in the ANSI C63.10:2013 for Frequency Hopping Spread Spectrum Systems was used to determine the Number of Channels.

- The EUT must have its hopping function enabled.
- Span = the frequency band of operation
- RBW = 1% of the span
- VBW = 3 x RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold

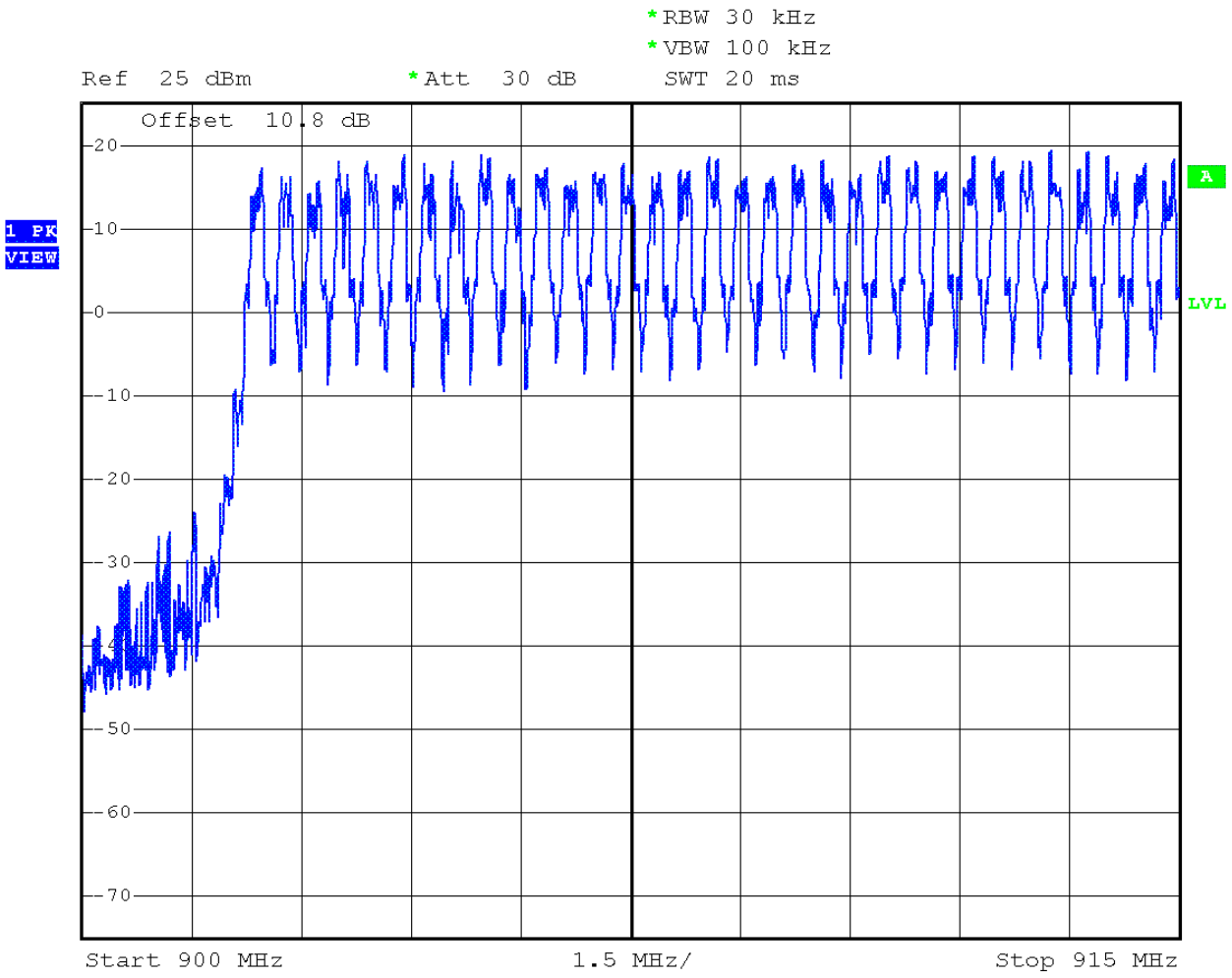
Allow the trace to stabilize. It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies.

With the analyzer set to MAX HOLD, readings were taken once channels were filled in. The channel peaks were recorded and compared to the minimum number of channels required in the regulation.

Tested By	Test Date
Anderson Soungpanya	June 7, 2018

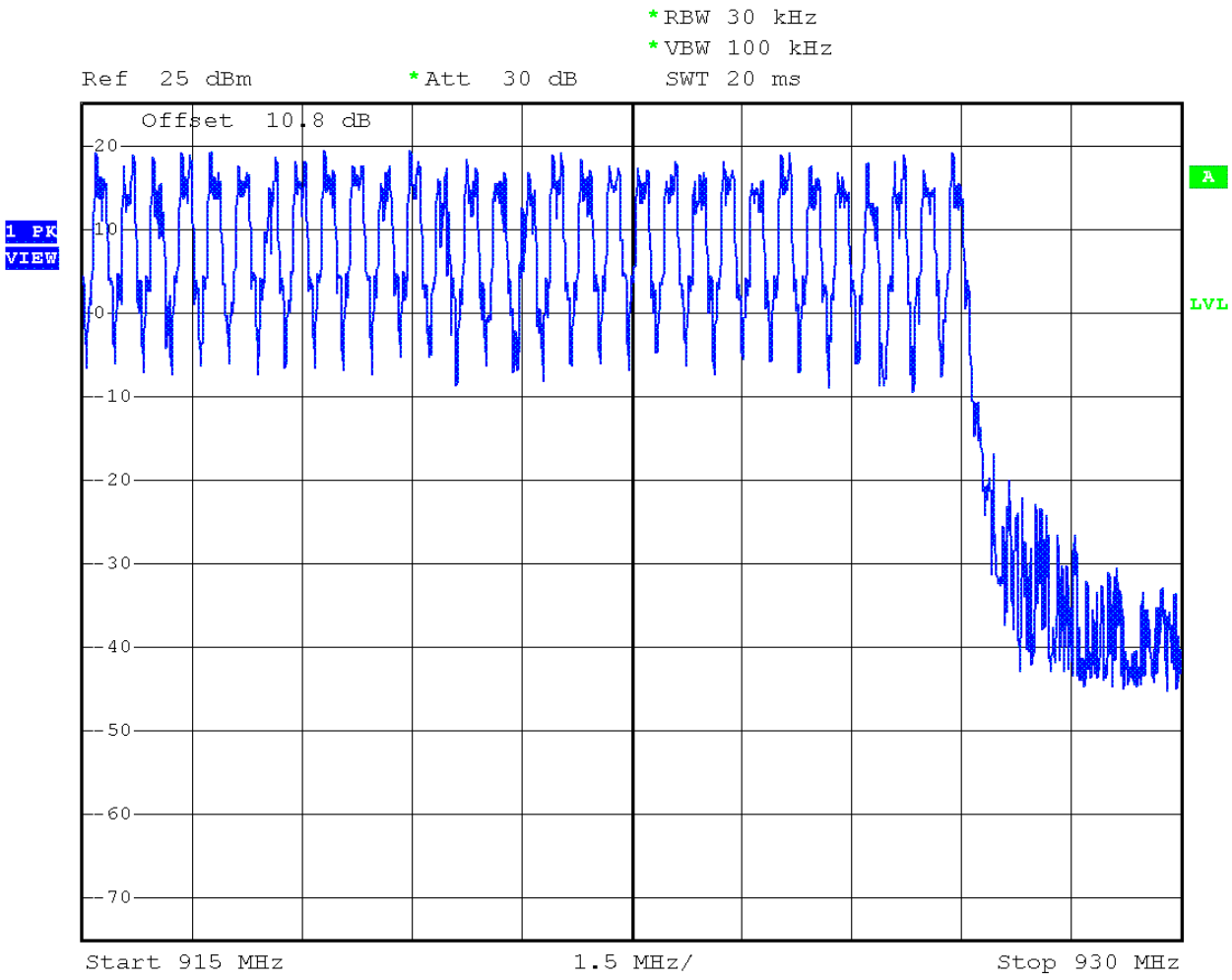
4.4.3 Test Result

Plot 4.1 - Number of hopping channels, 900 - 915MHz



4.4.3 Test Result (Continued)

Plot 4.2 - Number of hopping channels, 915 - 930MHz



Results	Complies, 64 Channels

4.5 Average Channel Occupancy Time
FCC 15.247(a)(1)

4.5.1 Requirement

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

4.5.2 Procedure

The Procedure described in the ANSI C63.10:2013 for Frequency Hopping Spread Spectrum Systems was used to determine the Average Channel Occupancy Time.

- The EUT must have its hopping function enabled.
- Span = zero span, centered on a hopping channel
- RBW = 1 MHz
- VBW = 3 x RBW
- Sweep = as necessary to capture the entire dwell time per hopping channel
- Detector function = peak
- Trace = max hold

If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. An oscilloscope may be used instead of a spectrum analyzer.

The spectrum analyzer center frequency was set to one of the known hopping channels, the SPAN was set to ZERO SPANS, and the TRIGGER was set to VIDEO. The time duration of the transmission so captured was measured with the MARKER DELTA function.

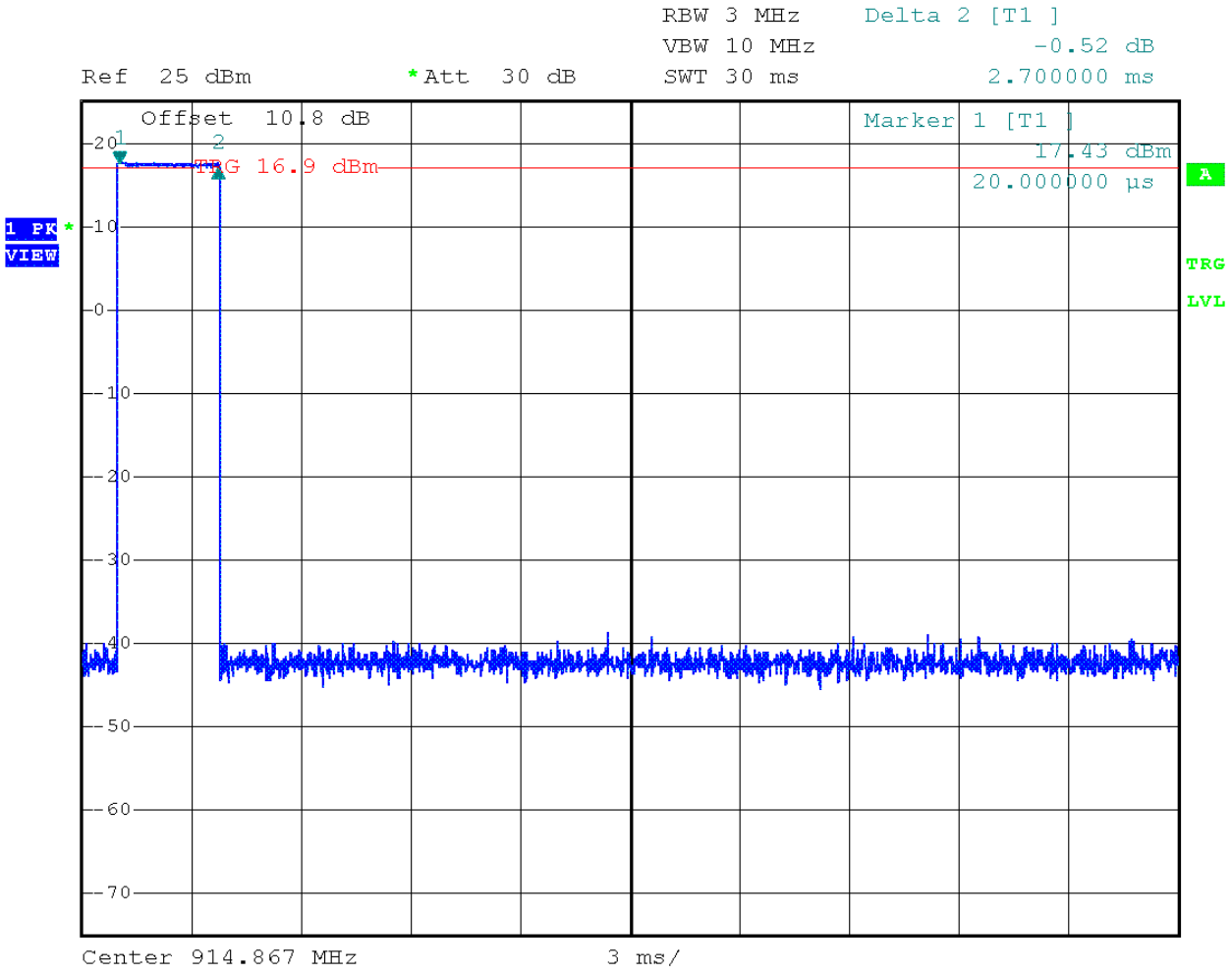
Tested By	Test Date
Anderson Soungpanya	June 7, 2018

4.5.3 Test Results

No. of Burst in 10 seconds	Burst On Time (ms)	Dwell Time (ms)	Dwell Time limit (ms)
9	2.7	24.3	400

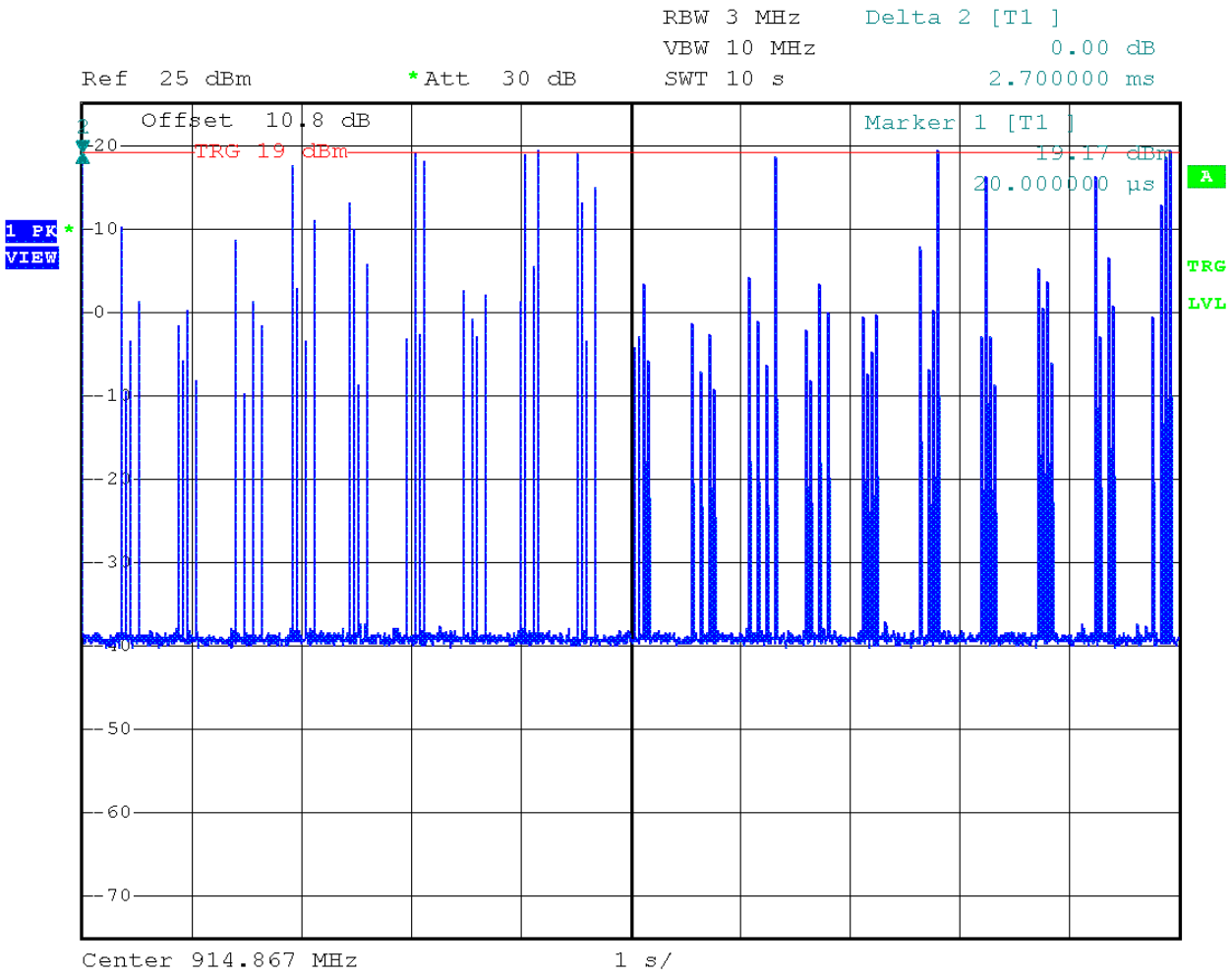
The 20-dB bandwidth of the hopping channel is greater than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Burst Time



4.5.3 Test Results (Continued)

Number of Burst in 10 seconds



Date: 7.JUN.2018 15:35:00

Results	Complies

4.6 Out-of-Band Conducted Emissions
FCC 15.247(d)

4.6.1 Requirement

In any 100 kHz bandwidths outside the EUT pass-band, the RF power shall be at least 20dB (peak) or 30 dB (average) below that of the maximum in-band 100 kHz emissions.

4.6.2 Procedure

The Procedure described in the ANSI C63.10:2013 for Frequency Hopping Spread Spectrum Systems was used to determine the Out-of-Band Conducted Emissions.

- Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.
- RBW = 100 kHz
- VBW = 3 x RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold

Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this Section.

A spectrum analyzer was connected to the antenna port of the transmitter. Analyzer Resolution Bandwidth was set to 100 kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 30 MHz to 26 GHz.

Tested By	Test Date
Anderson Soungpanya	June 7, 2018

4.6.3 Test Result

Refer to the following plots and out-of-band conducted spurious emissions at the Band-Edge, Table 4.1 & 4.2 for the test results:

Table 4.1

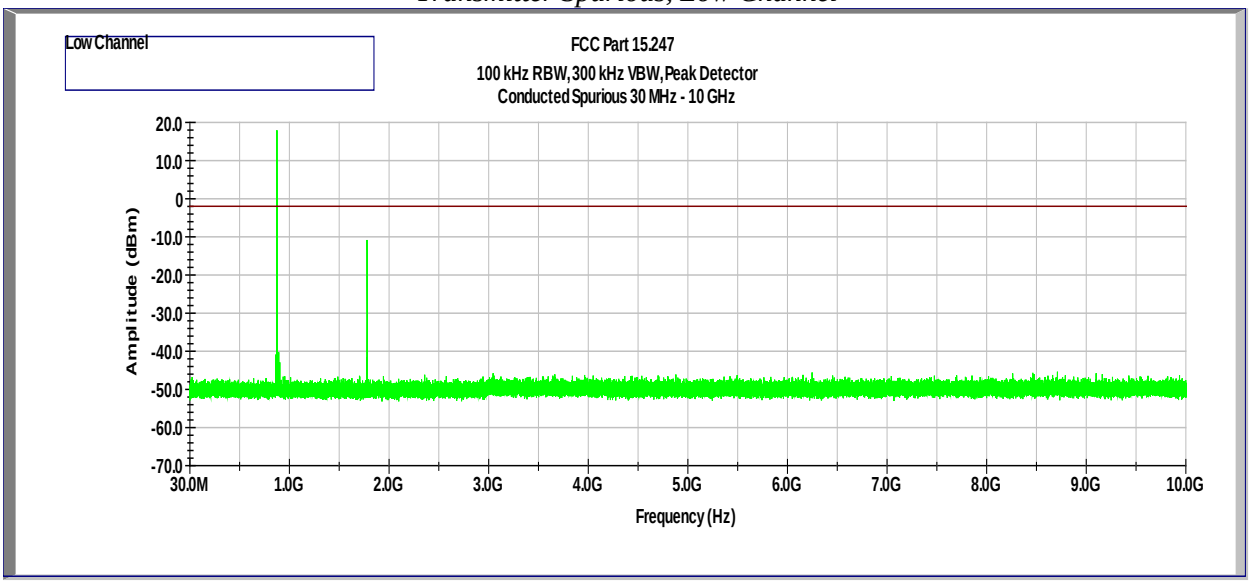
Frequency MHz	Description	Plot #
902.400	Scan 30 MHz – 26 GHz	4.1
914.867	Scan 30 MHz – 26 GHz	4.2
926.944	Scan 30 MHz – 26 GHz	4.3

Out-of-Band Conducted Spurious Emissions at the Band-Edge:

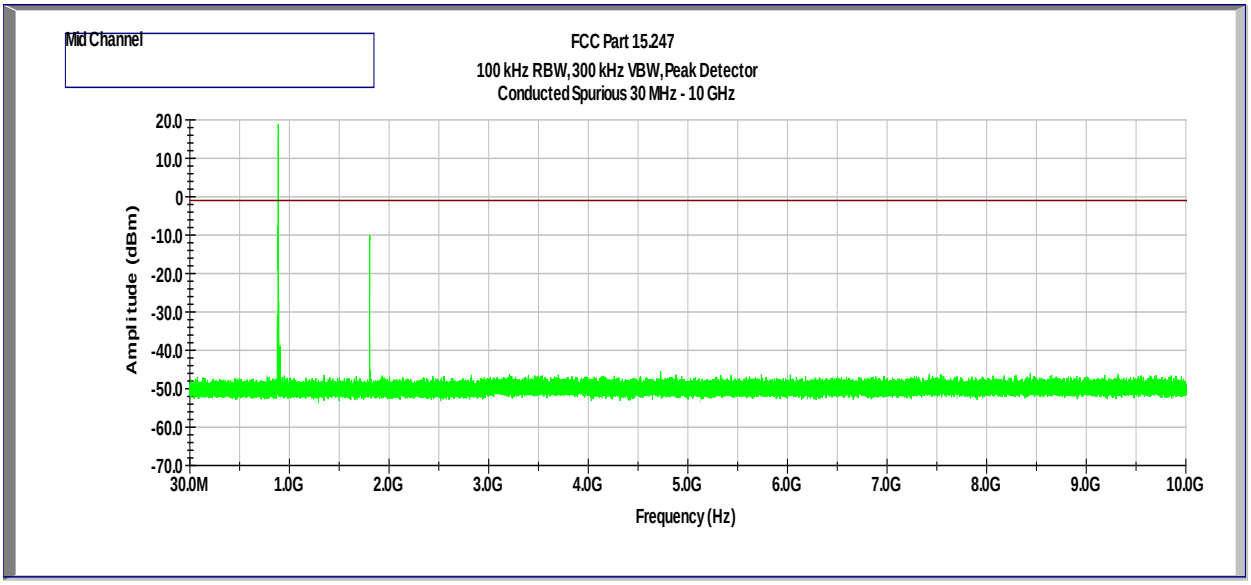
Table 4.2

Channel	Frequency MHz	Out-band emissions margin to In-band emissions	Plot #
0	902.400	Complies	4.4
Hopping	Low Band Edge	Complies	4.5
63	926.944	Complies	4.6
Hopping	High Band Edge	Complies	4.7

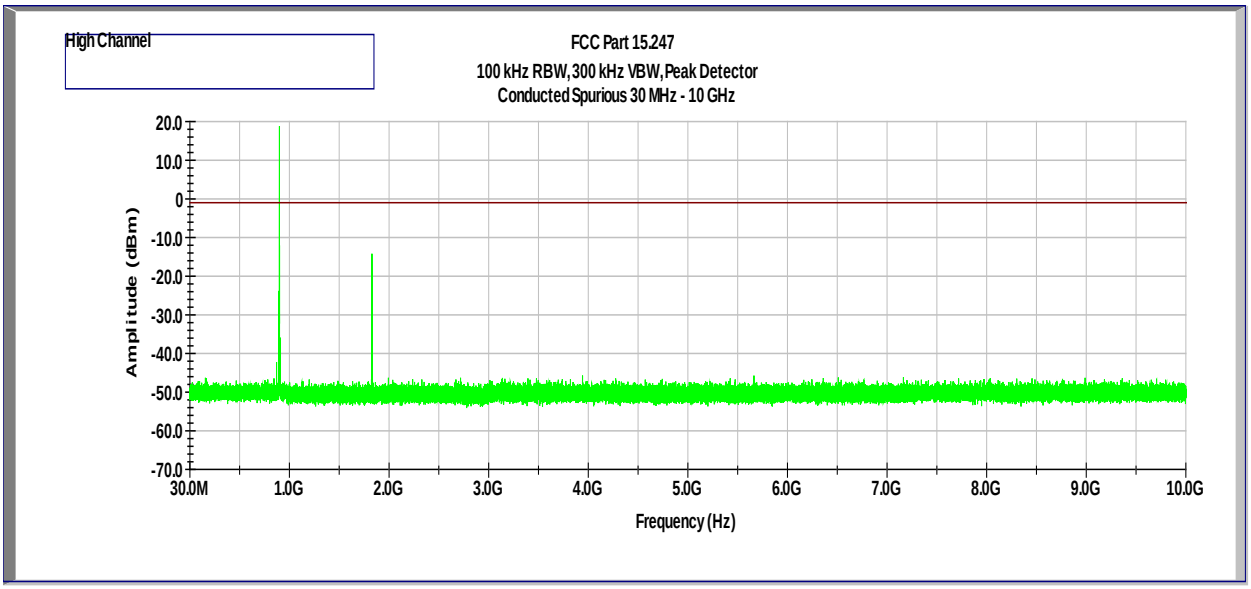
Plot 4.1
Transmitter Spurious, Low Channel



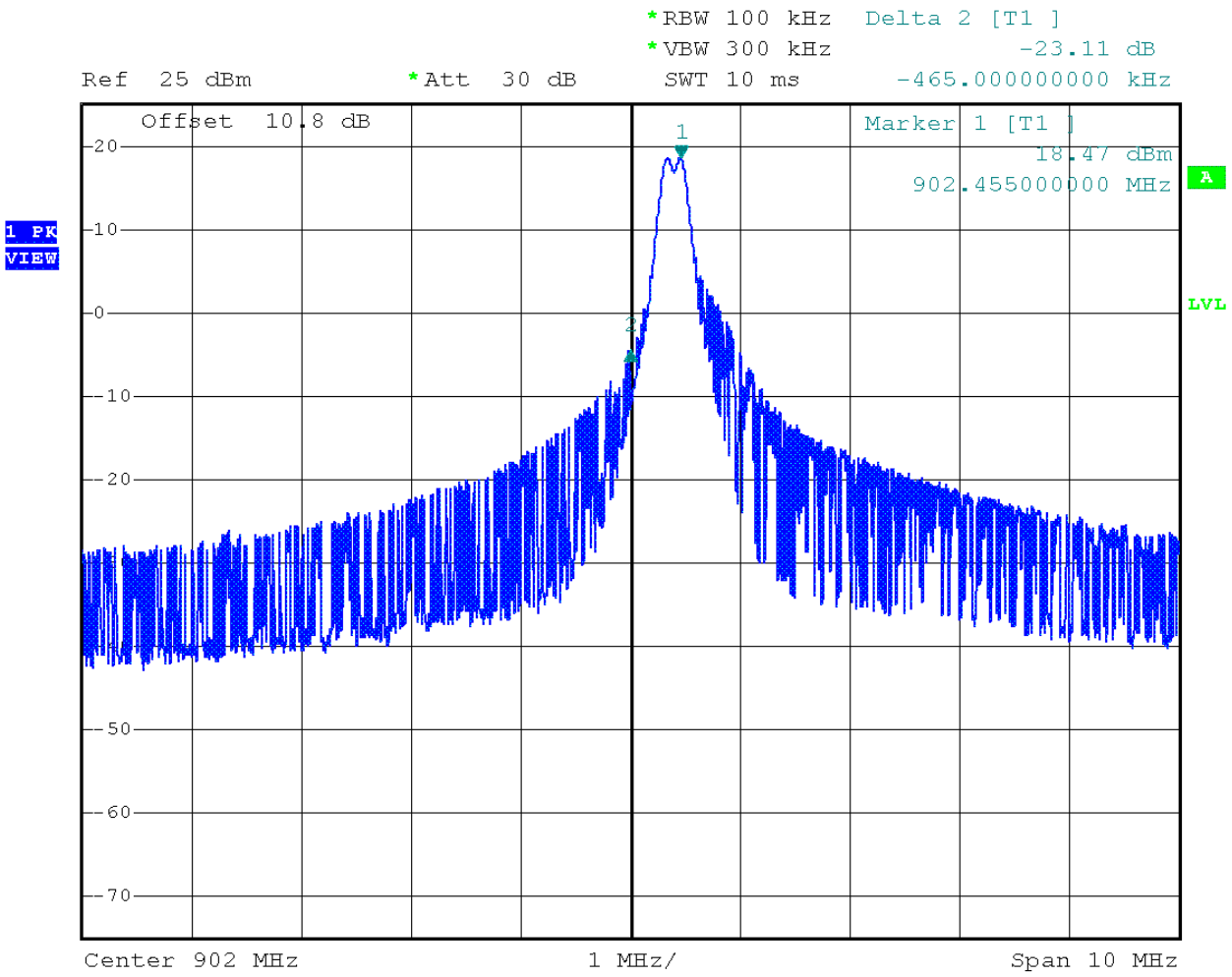
Plot 4.2
Transmitter Spurious, Middle Channel



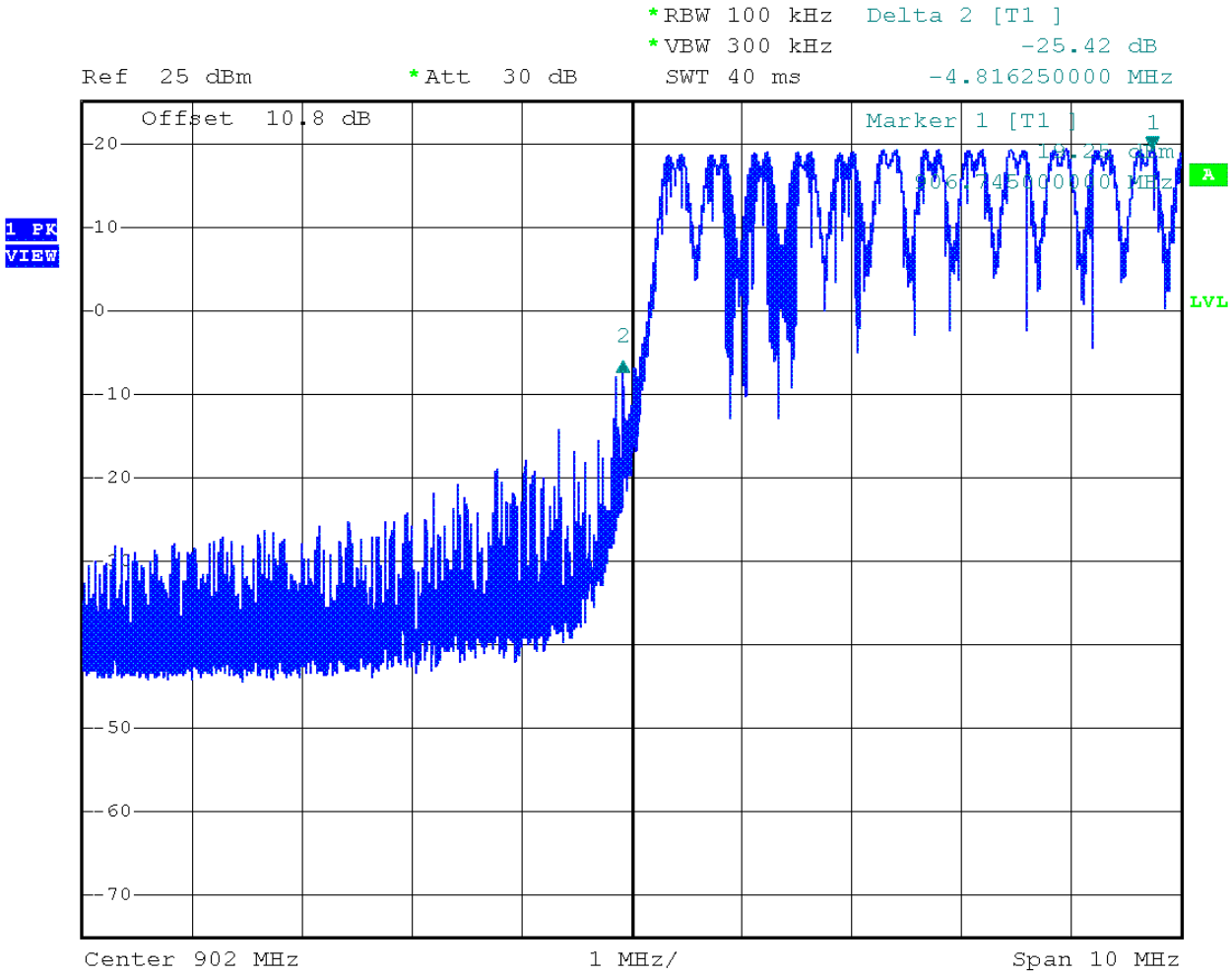
Plot 4.3
Transmitter Spurious, High Channel



Plot 4.4
Conducted Band Edge, Low Channel

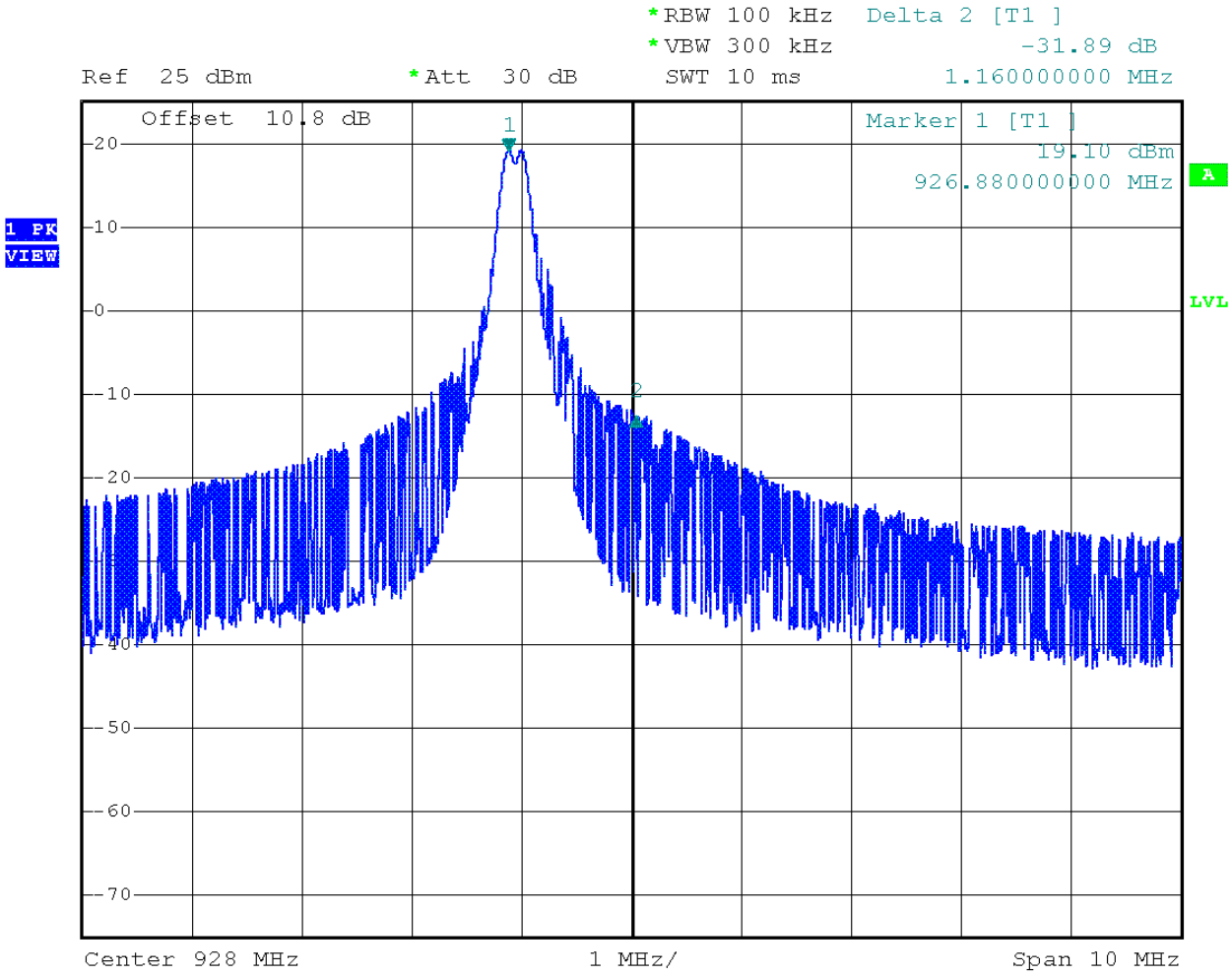


Plot 4.11
Conducted Band Edge (Hopping)



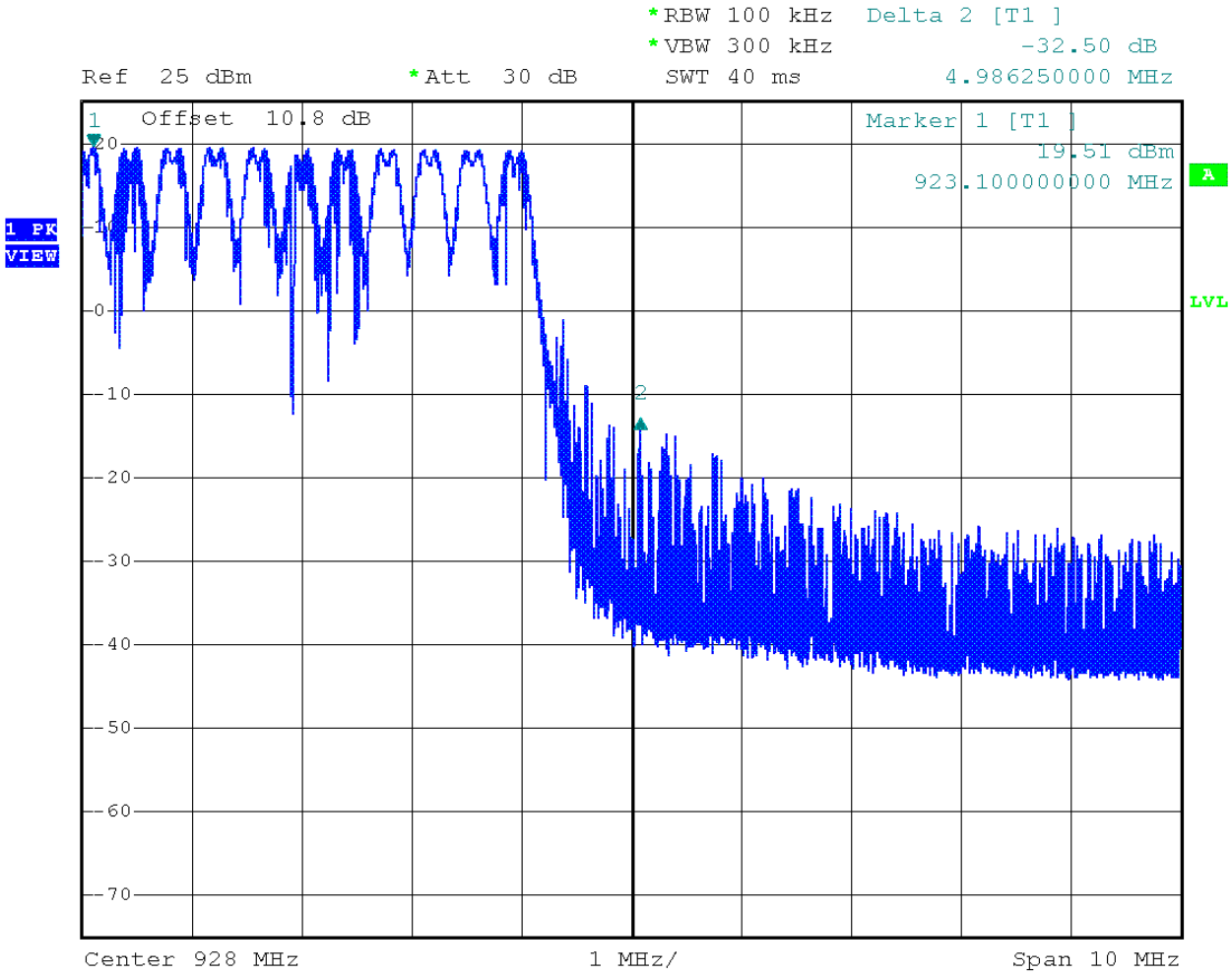
Date: 7.JUN.2018 11:35:13

Plot 4.12
Conducted Band Edge, High Channel



Date: 7.JUN.2018 13:11:25

Plot 4.13
Conducted Band Edge (Hopping)



Date: 7.JUN.2018 12:14:03

Results	Complies

4.7 Transmitter Radiated Emissions
FCC Rule 15.247(d), 15.209, 15.205

4.7.1 Requirement

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

For out of band radiated emissions (except for frequencies in restricted bands), in any 100 kHz bandwidths outside the EUT pass-band, the RF power shall be at least 20dB (peak) or 30 dB (average) below that of the maximum in-band 100 kHz emissions.

4.7.2 Procedure

Radiated emission measurements were performed from 30 MHz to 10,000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz for frequencies above 1000 MHz.

The EUT is placed on a plastic turntable that is 1.5 m in height above 1 GHz and 80cm below 1GHz. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at 10 meters for below 1GHz and at 3 meters for above 1GHz.

All measurements were made with a Peak Detector and compared to QP limits for 30MHz – 1GHz and Average or Peak limits for 1GHz – 10GHz where applicable.

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels).

EUT was tested with Antenna in place.

4.7.3 Field Strength Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG; if measurement is performed at a distance other than specified in the rule, a Distance Correction Factor (DCF) shall be added.

Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV); AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB; AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.0 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
FS = 52.0+7.4+1.6-29.0 = 32 dB(μV/m).
Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m.

4.7.4 Test Results

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Radiated emission measurements were performed up to 10GHz. No other emissions were detected above the noise floor which is at least 10 dB below the limit.

Tested By	Test Date
Anderson Soungpanya	June 7 & June 15, 2018

4.7.4.1 Test Results: PowerLine Coordinator™

15.209 Out-of-Band Radiated Spurious Emissions, 902.400MHz

Radiated Spurious Emissions 30 MHz – 10 GHz

Frequency (MHz)	Channel No.	Measured Data (dBuV/m)	Limit@10m (dBuV/m)	Margin (dB)	Detector	Antenna Polarization	Turntable Degree	Antenna Height (cm)
83.673	0	22.51	29.5	-6.99	QP	V	282	192
99.970	0	29.75	33.0	-3.25	QP	H	64	368
105.693	0	28.03	33.0	-4.97	QP	V	212	100
113.129	0	27.61	33.0	-5.39	QP	V	96	102
350.003	0	28.61	35.5	-6.89	QP	H	308	212
1061.800	0	29.85	54	-24.15	AVE	V	151	115
		37.97	74	-36.03	PK			
1804.800*	0	83.23	99.23 (20 dBc)	-16.00	PK	V	12	175
2707.200	0	33.01	54	-20.99	AVE	V	125	211
		42.34	74	-31.66	PK			
3609.600	0	37.73	54	-16.27	AVE	V	238	139
		47.35	74	-26.65	PK			
4512.000	0	34.42	54	-19.58	AVE	V	14	246
		48.48	74	-25.52	PK			
5414.400	0	37.42	54	-16.58	AVE	V	261	149
		49.65	74	-24.35	PK			
6316.800	0	38.36	54	-15.64	AVE	V	159	139
		51.83	74	-22.17	PK			
7219.200	0	41.40	54	-12.60	AVE	V	301	201
		54.79	74	-19.21	PK			
8121.600	0	42.14	54	-11.86	AVE	V	155	140
		55.57	74	-18.43	PK			
9024.000	0	42.55	54	-11.45	AVE	V	92	177
		56.86	74	-17.14	PK			

*Spurious emission frequencies does not fall under the restricted bands of 15.205, therefore the 15.209 limits does not apply to these frequencies.

Results	Complies

4.7.4.1 Test Results: PowerLine Coordinator™ (Continued)

Test Results: 15.209 Out-of-Band Radiated Spurious Emissions, 914.867 MHz

Radiated Spurious Emissions 30 MHz – 10 GHz

Frequency (MHz)	Channel No.	Measured Data (dBuV/m)	Limit@10m (dBuV/m)	Margin (dB)	Detector	Antenna Polarization	Turntable Degree	Antenna Height (cm)
83.641	32	22.44	29.5	-7.06	QP	V	161	100
100.001	32	31.18	33.0	-1.82	QP	H	108	114
103.623	32	29.92	33.0	-3.08	QP	V	321	100
112.676	32	30.29	33.0	-2.71	QP	V	76	100
350.003	32	28.73	35.5	-6.77	QP	H	308	213
1829.734*	32	85.69	99.23 (20 dBc)	-13.54	PK	V	27	272
2744.601	32	30.44	54	-23.56	AVE	V	85	165
		43.36	74	-30.64	PK			
3659.468	32	33.99	54	-20.01	AVE	V	100	237
		45.86	74	-28.14	PK			
4574.335	32	34.25	54	-19.75	AVE	V	239	199
		47.38	74	-26.62	PK			
5489.202	32	37.30	54	-16.70	AVE	V	112	176
		50.89	74	-23.11	PK			
6404.069	32	38.15	54	-15.85	AVE	V	174	140
		53.49	74	-20.51	PK			
7318.936	32	41.47	54	-12.53	AVE	V	223	219
		54.92	74	-19.08	PK			
8233.803	32	42.69	54	-11.31	AVE	V	187	145
		55.45	74	-18.55	PK			
9148.670	32	43.28	54	-10.72	AVE	V	350	159
		56.17	74	-17.83	PK			

*Spurious emission frequencies does not fall under the restricted bands of 15.205, therefore the 15.209 limits does not apply to these frequencies.

Results	Complies

4.7.4.1 Test Results: PowerLine Coordinator™ (Continued)

Test Results: 15.209 Out-of-Band Radiated Spurious Emissions, 926.944 MHz

Radiated Spurious Emissions 30 MHz – 10 GHz

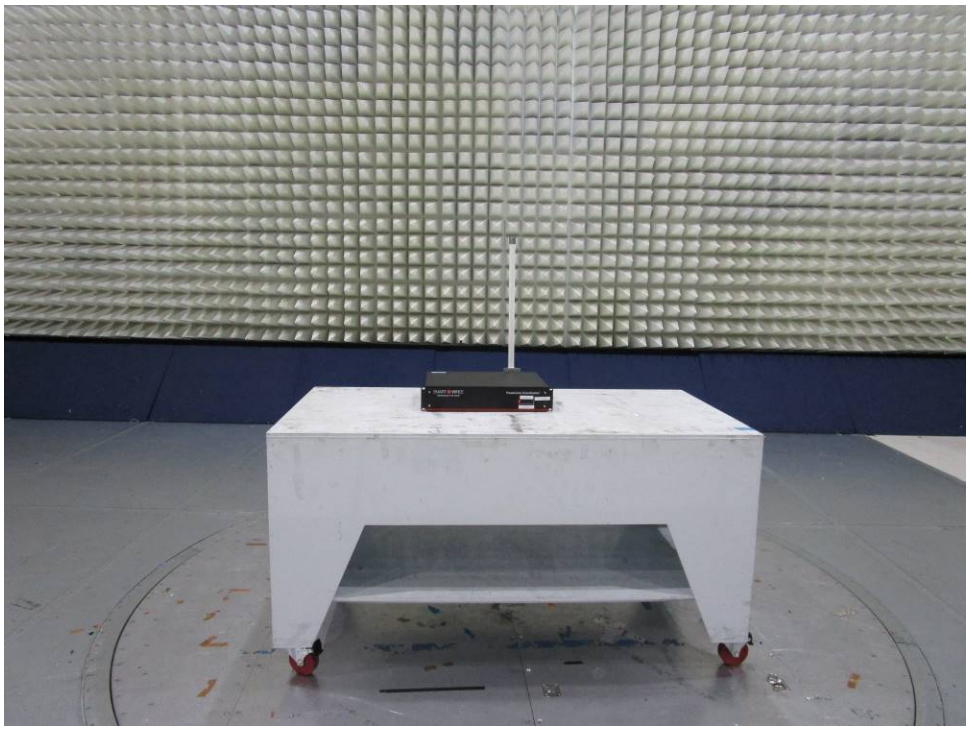
Frequency (MHz)	Channel No.	Measured Data (dBuV/m)	Limit@10m (dBuV/m)	Margin (dB)	Detector	Antenna Polarization	Turntable Degree	Antenna Height (cm)
57.257	63	22.70	29.5	-6.80	QP	V	121	375
83.738	63	22.93	29.5	-6.57	QP	V	19	100
99.970	63	30.11	33.0	-2.89	QP	H	334	112
350.003	63	29.11	35.5	-6.39	QP	H	305	200
1853.888*	63	80.12	99.23 (20 dBc)	-19.11	PK	V	237	159
2780.832	63	34.17	54	-19.83	AVE	V	169	159
		44.73	74	-29.27	PK			
3707.776	63	34.26	54	-19.74	AVE	V	10	250
		46.25	74	-27.75	PK			
4634.720	63	34.12	54	-19.88	AVE	V	335	143
		47.28	74	-26.72	PK			
5561.664	63	37.75	54	-16.25	AVE	V	55	190
		49.72	74	-24.28	PK			
6488.608	63	40.23	54	-13.77	AVE	V	132	156
		52.23	74	-21.77	PK			
7415.552	63	41.77	54	-12.23	AVE	V	269	200
		54.87	74	-19.13	PK			
8342.496	63	42.54	54	-11.46	AVE	V	72	221
		55.60	74	-18.40	PK			
9269.440	63	42.97	54	-11.03	AVE	V	43	136
		55.32	74	-18.68	PK			

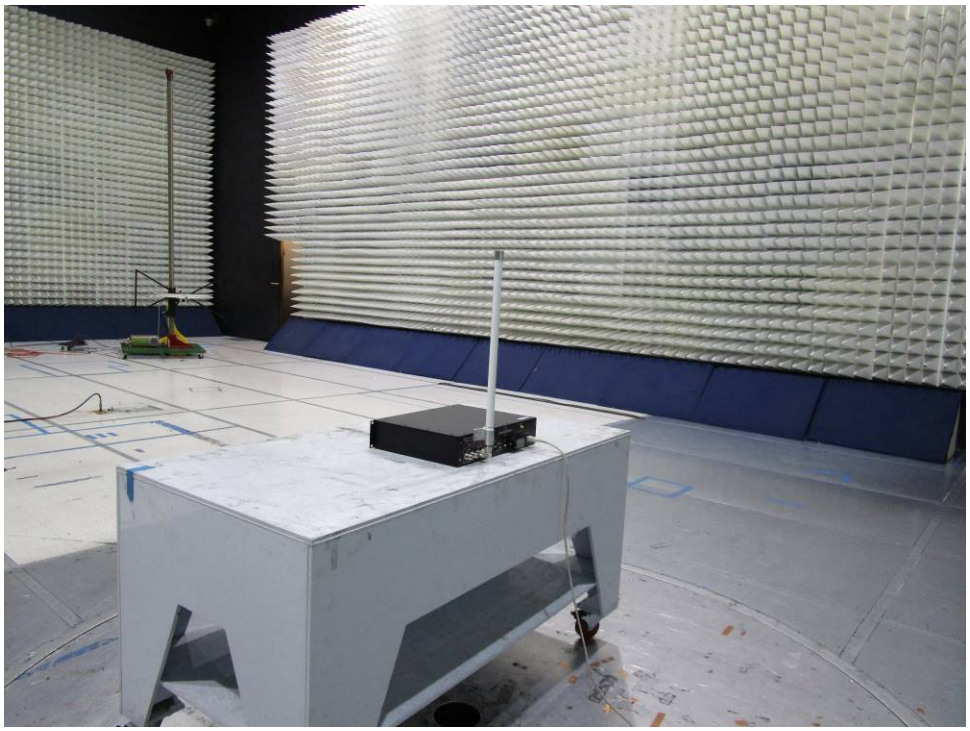
*Spurious emission frequencies does not fall under the restricted bands of 15.205, therefore the 15.209 limits does not apply to these frequencies.

Results	Complies

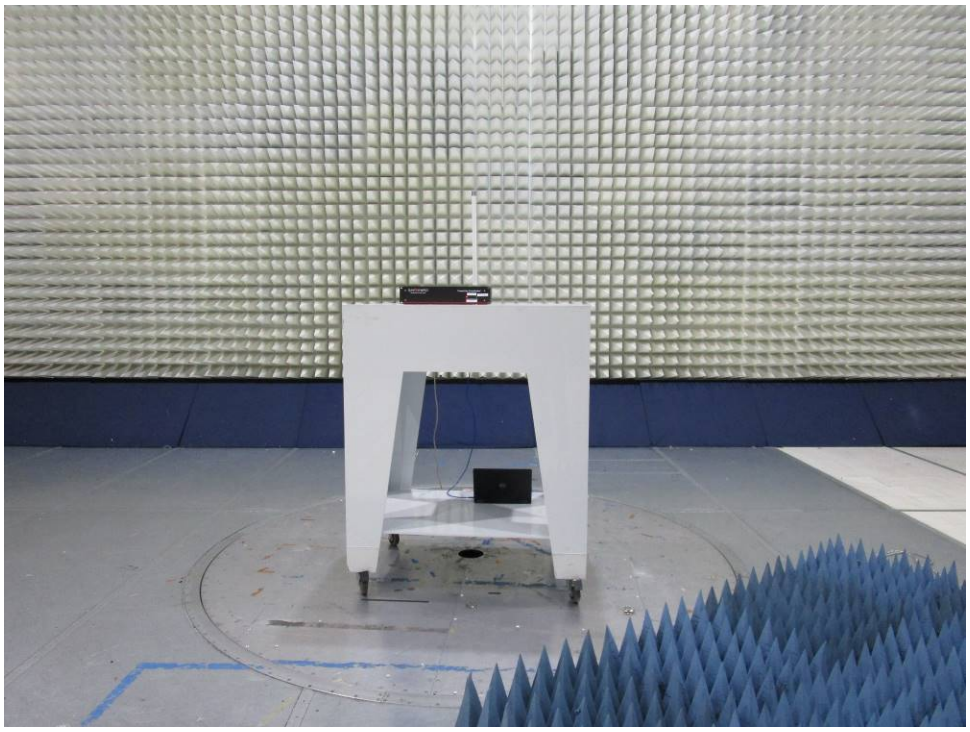
4.7.5 Test Setup Photographs

The following photographs show the testing configurations used.





4.7.5 Test Setup Photographs (Continued)



4.8 Digital Radiated Emissions

FCC Ref: 15.109, ICES 003

4.8.1 Requirement

Limits for Electromagnetic Radiated Emissions FCC Section 15.109(b), ICES 003*, RSS GEN

Frequency (MHz)	Class A at 10m dB(µV/m)	Class B at 3m dB(µV/m)
30-88	39	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

* According to FCC Part 15.109(g) an alternative to the radiated emission limits shown above, digital devices may be shown to comply with the limit of CISPR Pub. 22

4.8.2 Procedures

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to 1000 MHz and with the average detector instrument in the frequency range above 1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data or limit line to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4: 2014

4.8.3 Test Results

Radiated emission measurements were performed from 30 MHz to 1000 MHz. The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

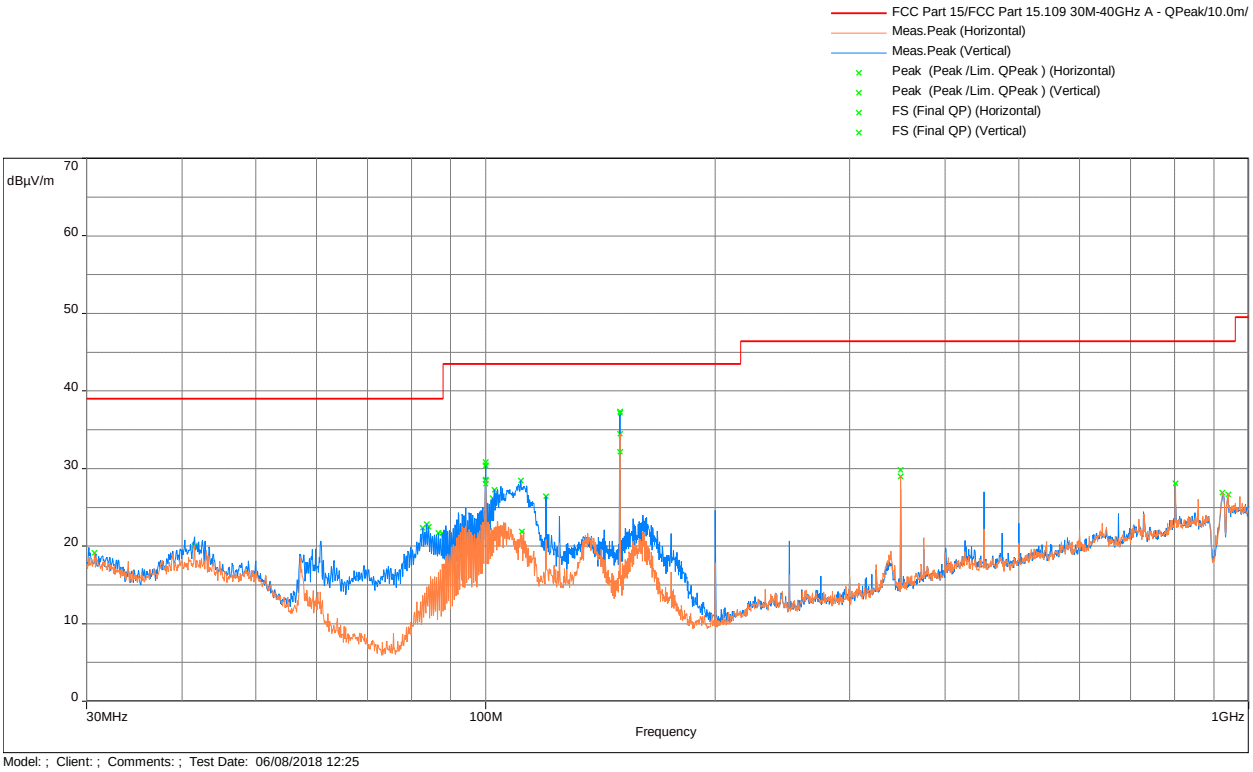
An inverse proportionality factor of 20 dB per decade was used to normalize the limit line of 30MHz to 1000MHz to the specified distance for determining compliance

Note: Radiated emission measurements were performed up to 18GHz.

Tested By	Test Date
Anderson Soungpanya	June 8 - 18, 2018

4.8.3.1 Test Results: PowerLine Coordinator™

Radiated Emissions 30 MHz – 1000, Tested with AC Power Configuration

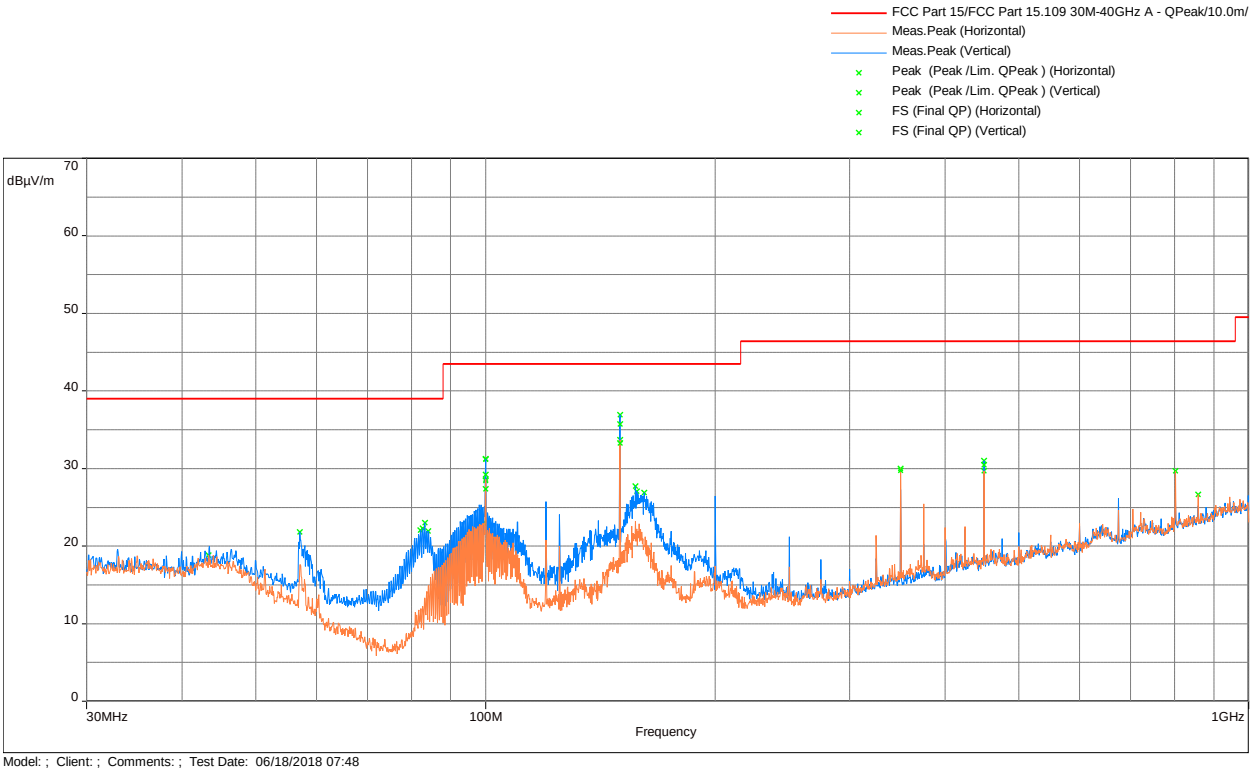


Model: ; Client: ; Comments: ; Test Date: 06/08/2018 12:25

Frequency MHz	FS dBµV/m	Limit dBuV/m	Margin (dB)	Azimuth (deg)	Height (m)	Polarity	RA (dBuV)	Correction (dB)
99.996	28.03	43.5	-15.47	70	4.00	Horizontal	42.98	-14.95
149.992	32.16	43.5	-11.34	231	3.84	Horizontal	50.38	-18.22
350.008	29.78	46.4	-16.62	100	2.33	Horizontal	41.04	-11.26
100.004	30.84	43.5	-12.66	223	1.08	Vertical	45.79	-14.95
111.620	21.89	43.5	-21.61	144	1.00	Vertical	37.87	-15.98
149.995	37.17	43.5	-6.33	360	1.04	Vertical	55.39	-18.22
Result:	Complies by 6.33 dB							

4.8.3.1 Test Results: PowerLine Coordinator™ (Continued)

Radiated Emissions 30 MHz – 1000, Tested with DC Power Configuration

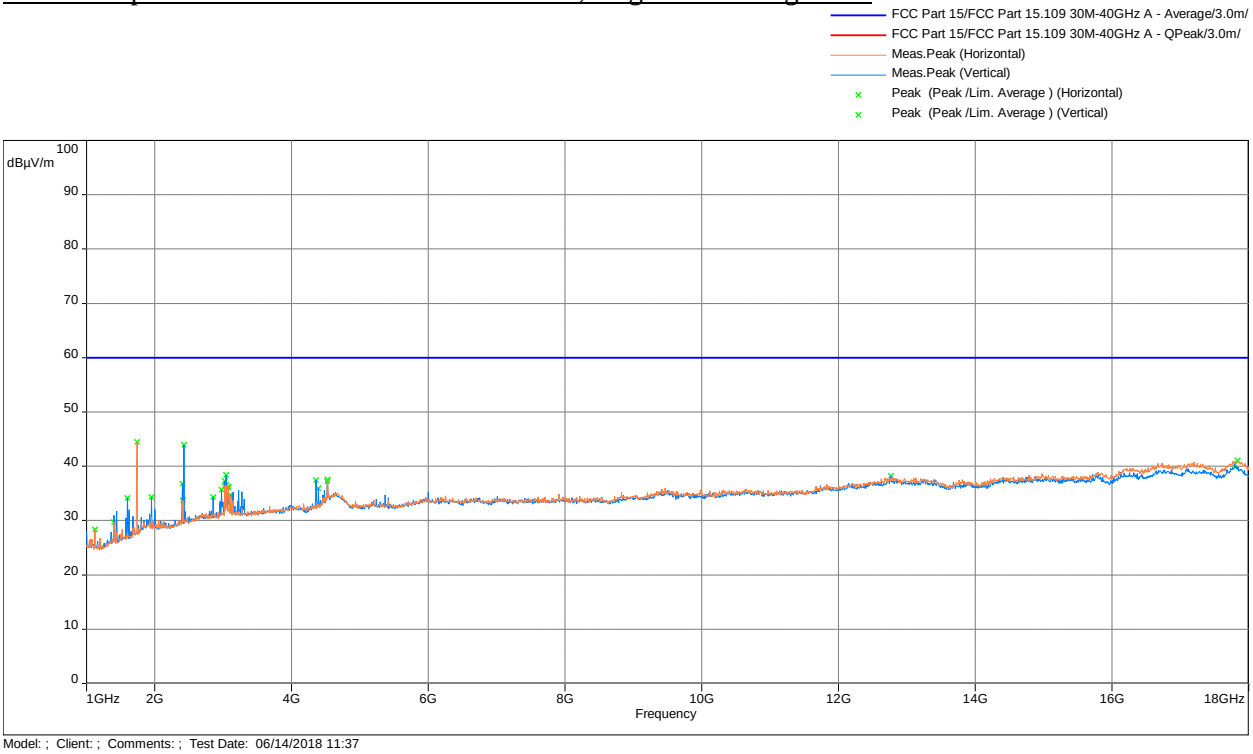


Model: ; Client: ; Comments: ; Test Date: 06/18/2018 07:48

Frequency MHz	FS dBµV/m	Limit dBuV/m	Margin (dB)	Azimuth (deg)	Height (m)	Polarity	RA (dBuV)	Correction (dB)
99.996	29.18	43.5	-14.32	334.75	1.04	Vertical	44.14	-14.95
99.996	27.33	43.5	-16.17	84.25	4.00	Horizontal	42.29	-14.95
150.001	35.71	43.5	-7.79	281.5	1.00	Vertical	53.93	-18.22
150.010	33.27	43.5	-10.23	254.75	3.92	Horizontal	51.5	-18.22
350.004	29.77	46.4	-16.63	116.25	2.42	Horizontal	41.03	-11.26
449.995	30.46	46.4	-15.94	312.5	3.80	Vertical	39.07	-8.61
Result:	Complies by 7.79 dB							

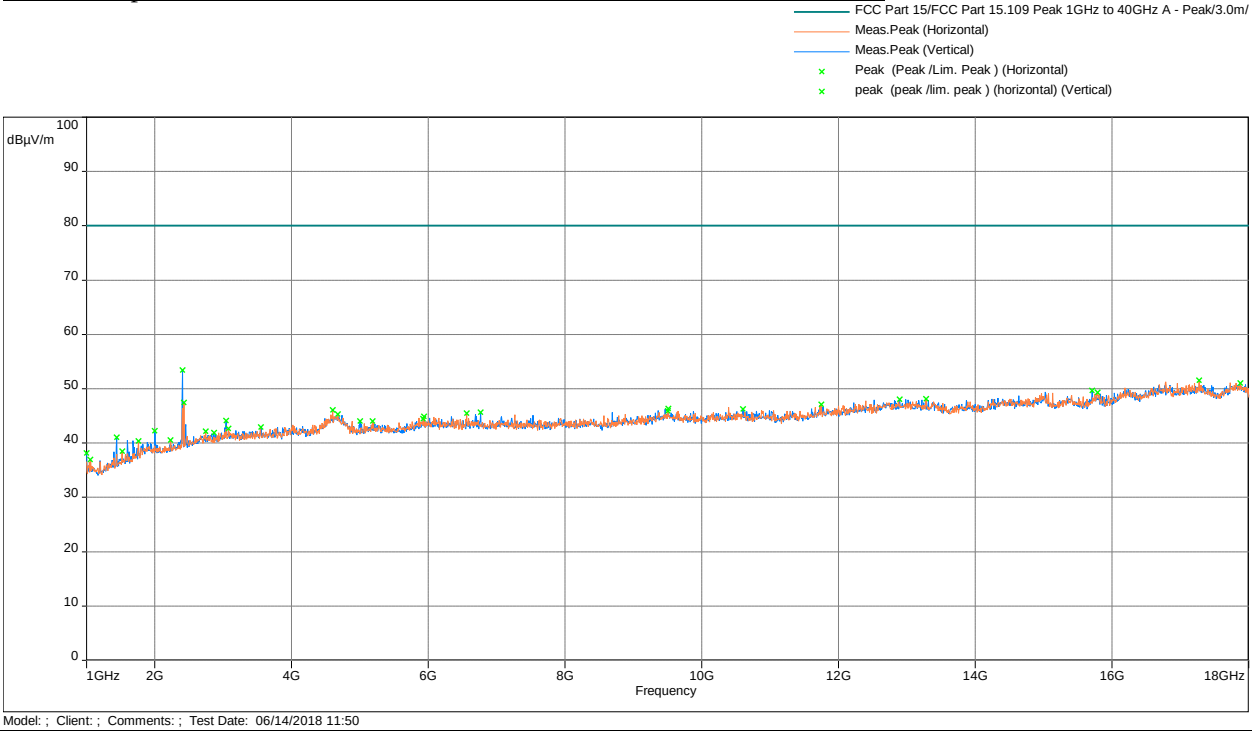
4.8.3.1 Test Results: PowerLine Coordinator™ (Continued)

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



Model: ; Client: ; Comments: ; Test Date: 06/14/2018 11:37

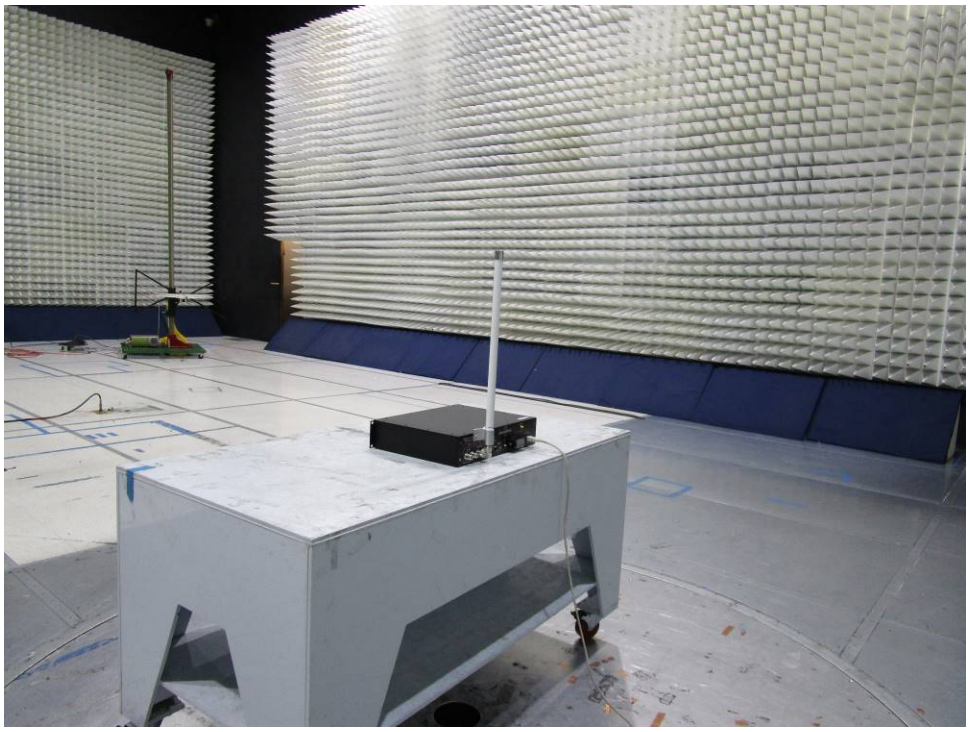
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit

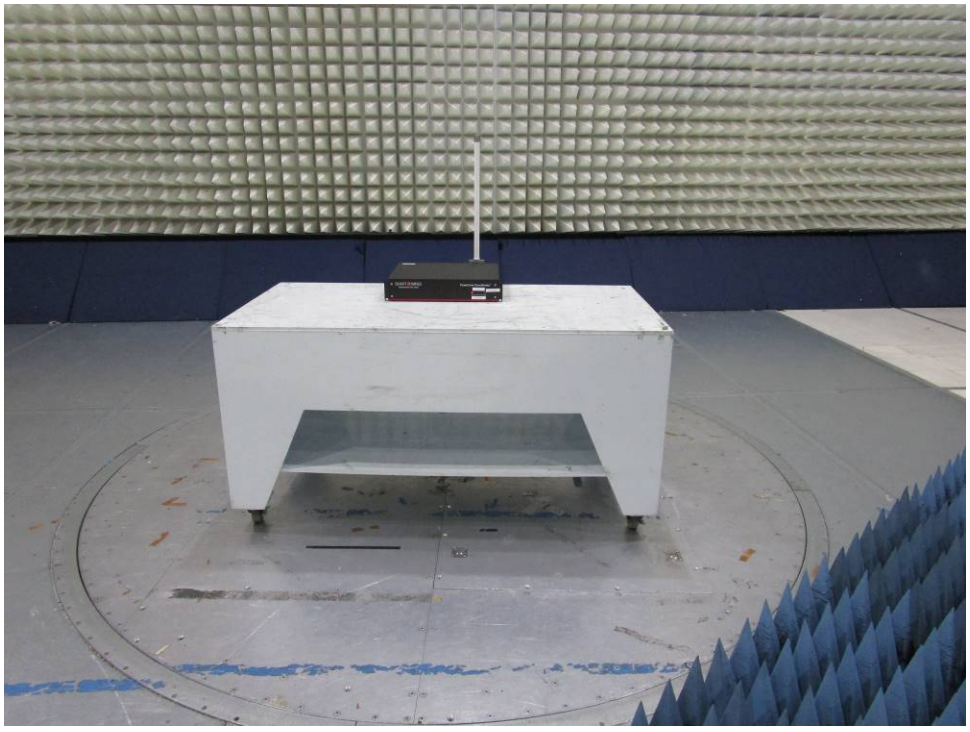


Model: ; Client: ; Comments: ; Test Date: 06/14/2018 11:50

Results	Complies

4.8.4 Test Configuration Photographs





4.9 AC Line Conducted Emission
FCC: 15.207, 15.107; RSS-GEN;

4.9.1 Requirement

Frequency Band MHz	Class B Limit dB(µV)		Class A Limit dB(µV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *	79	66
0.50-5.00	56	46	73	60
5.00-30.00	60	50	73	60

*Note: *Decreases linearly with the logarithm of the frequency*
At the transition frequency the lower limit applies.

4.9.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4:2014 and ANSI C63.10:2013.

4.9.3 Test Results

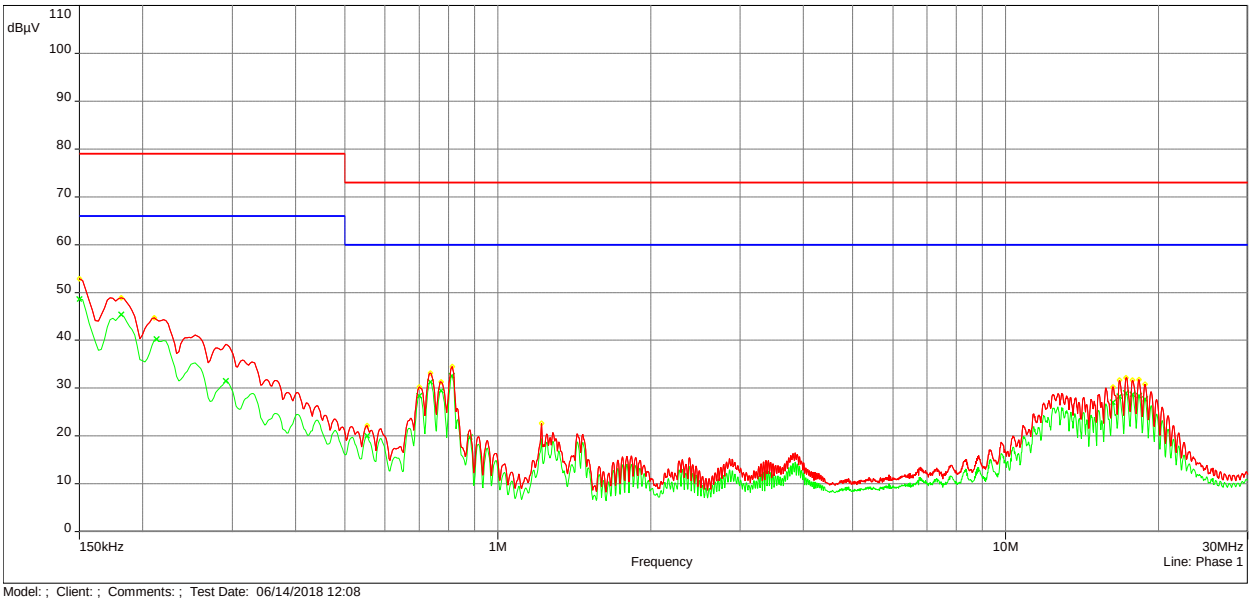
Tested By	Test Date
Anderson Soungpanya	June 11 - 18, 2018

4.9.3.1 Test Results: PowerLine Coordinator™
15.107: Conducted Emissions 120VAC 60Hz, Tested with AC Power Configuration

Phase 1

Sub-range 1
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On
Line:Phase 1

FCC Part 15/FCC Part 15.107 A - Average/
FCC Part 15/FCC Part 15.107 A - QPeak/
Meas.QPeak (Phase 1)
Mes. CISPR AVG (Phase 1)
QPeak (QPeak /Lim. QPeak) (Phase 1)
CISPR AVG (CISPR AVG /Lim. Average) (Phase 1)

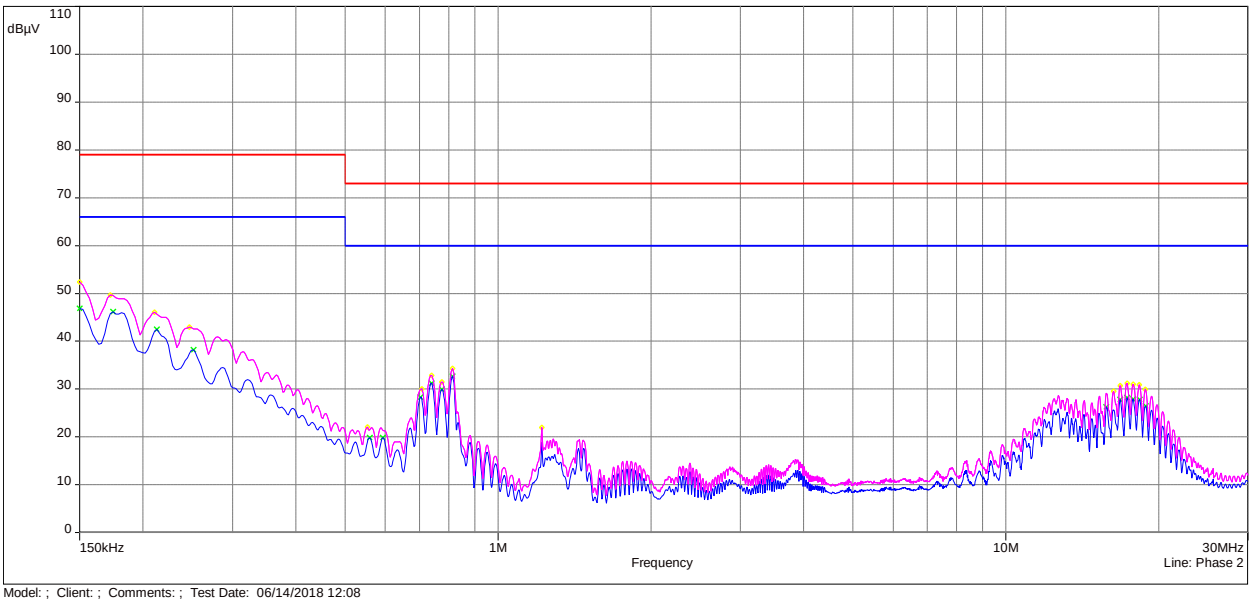


Model: ; Client: ; Comments: ; Test Date: 06/14/2018 12:08

Phase 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: On
Line:Phase 2

FCC Part 15/FCC Part 15.107 A - Average/
FCC Part 15/FCC Part 15.107 A - QPeak/
Meas.QPeak (Phase 2)
Mes. CISPR AVG (Phase 2)
QPeak (QPeak /Lim. QPeak) (Phase 2)
CISPR AVG (CISPR AVG /Lim. Average) (Phase 2)



Model: ; Client: ; Comments: ; Test Date: 06/14/2018 12:08

4.9.3.1 Test Results: PowerLine Coordinator™ (Continued)
15.107: Conducted Emissions 120VAC 60Hz, Tested with AC Power Configuration

Quasi Peak Table					
Frequency (MHz)	QPeak (dBµV)	Lim. QPeak (dBµV)	QPeak-Lim (dB)	Phase	Correction (dB)
0.150	52.89	79.00	-26.11	Phase 1	11.51
0.150	52.37	79.00	-26.63	Phase 2	11.51
0.173	49.66	79.00	-29.34	Phase 2	11.52
0.182	48.90	79.00	-30.10	Phase 1	11.53
0.211	44.72	79.00	-34.28	Phase 1	11.55
0.211	46.06	79.00	-32.94	Phase 2	11.55
0.247	42.95	79.00	-36.05	Phase 2	11.55
0.553	22.12	73.00	-50.88	Phase 1	11.59
0.553	22.07	73.00	-50.93	Phase 2	11.59
0.701	30.20	73.00	-42.80	Phase 1	11.60
0.708	30.02	73.00	-42.98	Phase 2	11.61
0.737	33.17	73.00	-39.83	Phase 1	11.61
0.740	32.85	73.00	-40.15	Phase 2	11.61
0.773	31.30	73.00	-41.70	Phase 1	11.62
0.776	31.49	73.00	-41.51	Phase 2	11.62
0.814	34.33	73.00	-38.67	Phase 2	11.62
0.814	34.46	73.00	-38.54	Phase 1	11.62
1.219	22.63	73.00	-50.37	Phase 1	11.62
1.221	21.99	73.00	-51.01	Phase 2	11.62
16.294	30.22	73.00	-42.78	Phase 1	11.93
16.314	29.53	73.00	-43.47	Phase 2	11.93
16.773	31.67	73.00	-41.33	Phase 1	11.93
16.807	30.74	73.00	-42.26	Phase 2	11.93
17.284	32.18	73.00	-40.82	Phase 1	11.92
17.331	31.16	73.00	-41.84	Phase 2	11.92
17.797	31.71	73.00	-41.29	Phase 1	11.93
17.831	30.97	73.00	-42.03	Phase 2	11.93
18.314	31.79	73.00	-41.21	Phase 1	11.93
18.317	30.86	73.00	-42.14	Phase 2	11.93
18.827	30.78	73.00	-42.22	Phase 1	11.94
18.845	29.90	73.00	-43.10	Phase 2	11.94

4.9.3.1 Test Results: PowerLine Coordinator™ (Continued)
15.107: Conducted Emissions 120VAC 60Hz, Tested with AC Power Configuration

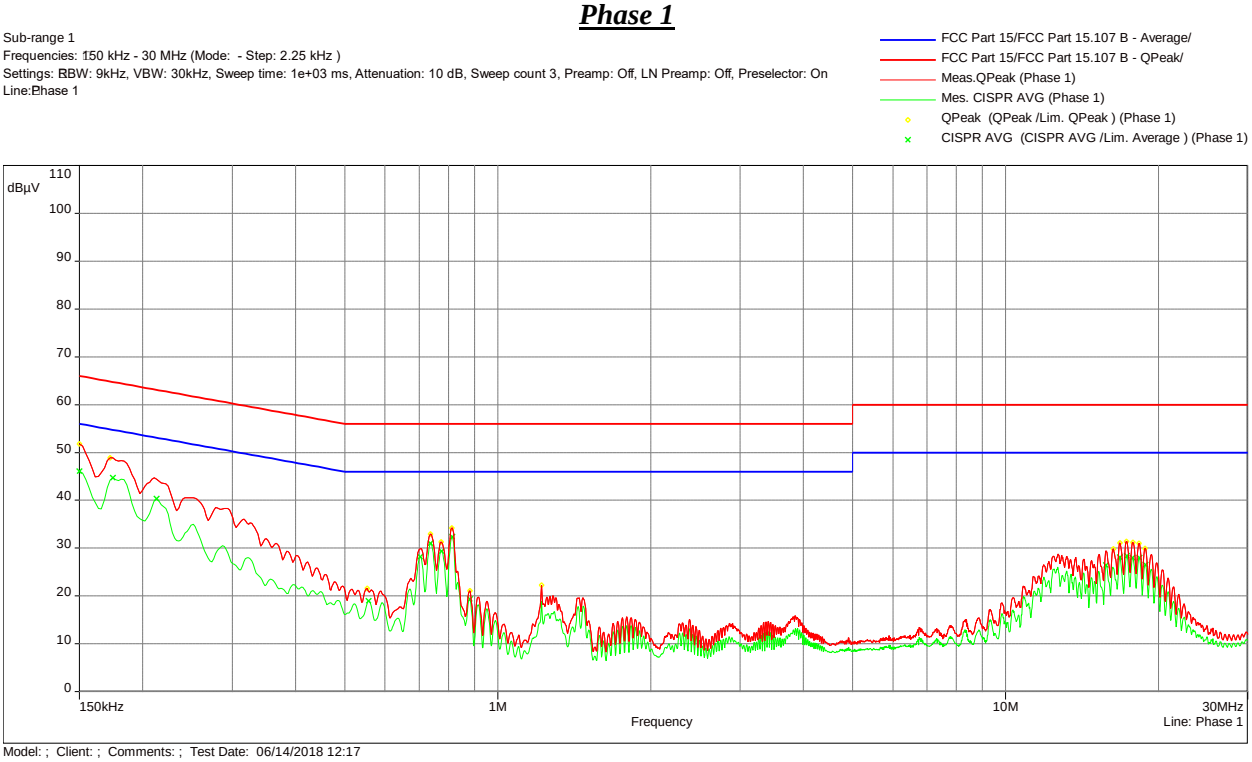
Average Table					
Frequency (MHz)	AVG (dBµV)	Lim. Average (dBµV)	AVG-Lim (dB)	Phase	Correction (dB)
0.150	48.57	66.00	-17.43	Phase 1	11.51
0.150	46.89	66.00	-19.11	Phase 2	11.51
0.175	46.14	66.00	-19.86	Phase 2	11.52
0.182	45.38	66.00	-20.62	Phase 1	11.53
0.213	40.25	66.00	-25.75	Phase 1	11.55
0.213	42.43	66.00	-23.57	Phase 2	11.55
0.251	38.20	66.00	-27.80	Phase 2	11.55
0.292	31.48	66.00	-34.52	Phase 1	11.59
0.553	20.06	60.00	-39.94	Phase 1	11.59
0.560	19.78	60.00	-40.22	Phase 2	11.59
0.593	19.86	60.00	-40.14	Phase 2	11.59
0.701	28.35	60.00	-31.65	Phase 1	11.60
0.704	28.26	60.00	-31.74	Phase 2	11.60
0.737	31.32	60.00	-28.68	Phase 1	11.61
0.740	31.23	60.00	-28.77	Phase 2	11.61
0.773	29.45	60.00	-30.55	Phase 1	11.62
0.776	29.90	60.00	-30.10	Phase 2	11.62
0.812	32.54	60.00	-27.46	Phase 1	11.62
0.814	32.62	60.00	-27.38	Phase 2	11.62
0.881	19.75	60.00	-40.25	Phase 1	11.63
15.783	26.23	60.00	-33.77	Phase 2	11.94
16.292	27.05	60.00	-32.95	Phase 1	11.93
16.769	28.24	60.00	-31.76	Phase 1	11.93
16.809	27.79	60.00	-32.21	Phase 2	11.93
17.282	28.94	60.00	-31.06	Phase 1	11.92
17.329	28.17	60.00	-31.83	Phase 2	11.92
17.795	28.72	60.00	-31.28	Phase 1	11.92
17.831	27.86	60.00	-32.14	Phase 2	11.93
18.310	28.42	60.00	-31.58	Phase 1	11.93
18.355	27.82	60.00	-32.18	Phase 2	11.93
18.825	27.70	60.00	-32.30	Phase 1	11.94

Results: **Complies** by 17.43 dB

4.9.3.1 Test Results: PowerLine Coordinator™ (Continued)
15.207: Conducted Emissions 120VAC 60Hz, Tested with AC Power Configuration

Phase 1

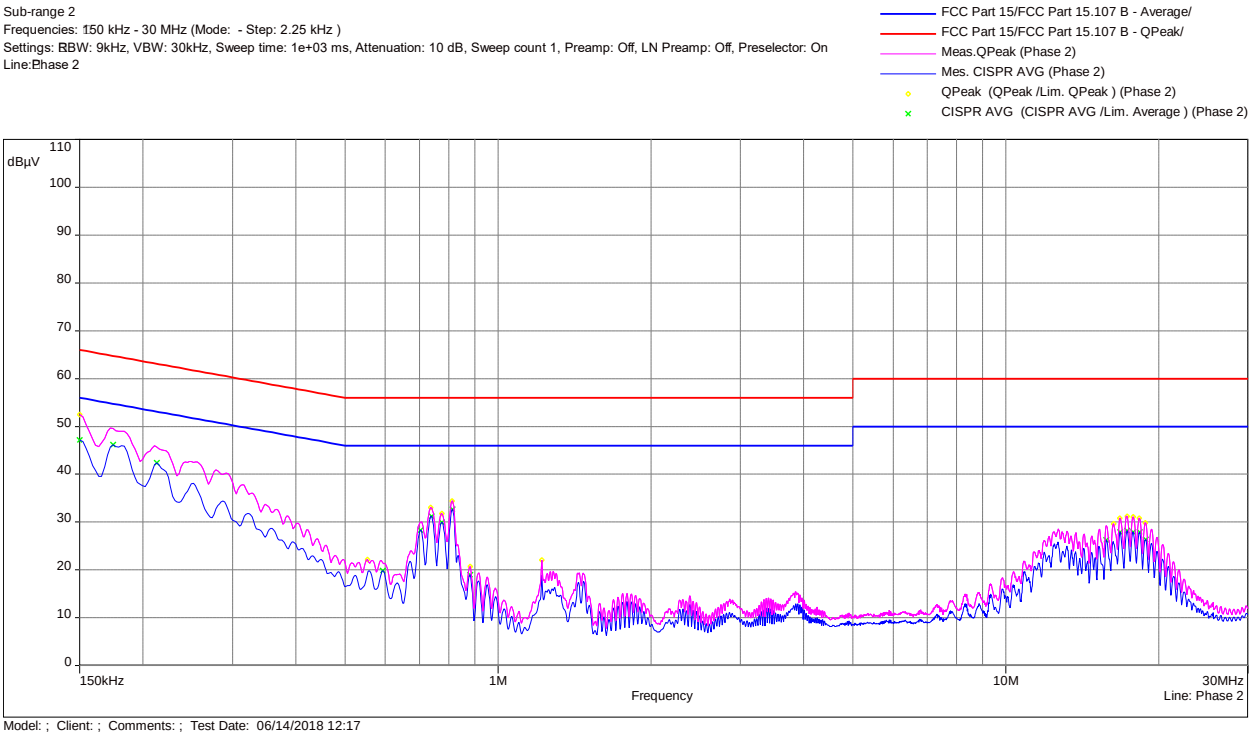
Sub-range 1
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On
Line:Phase 1



Model: ; Client: ; Comments: ; Test Date: 06/14/2018 12:17

Phase 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: On
Line:Phase 2



Model: ; Client: ; Comments: ; Test Date: 06/14/2018 12:17

4.9.3.1 Test Results: PowerLine Coordinator™ (Continued)
15.207: Conducted Emissions 120VAC 60Hz, Tested with AC Power Configuration

Quasi Peak Table					
Frequency (MHz)	QPeak (dBµV)	Lim. QPeak (dBµV)	QPeak-Lim (dB)	Phase	Correction (dB)
0.150	51.78	66.00	-14.22	Phase 1	11.51
0.150	52.52	66.00	-13.48	Phase 2	11.51
0.173	48.91	64.84	-15.93	Phase 1	11.52
0.553	22.20	56.00	-33.80	Phase 2	11.59
0.553	21.56	56.00	-34.44	Phase 1	11.59
0.737	33.01	56.00	-22.99	Phase 2	11.61
0.737	32.96	56.00	-23.04	Phase 1	11.61
0.773	31.30	56.00	-24.70	Phase 1	11.62
0.776	31.77	56.00	-24.23	Phase 2	11.62
0.812	34.44	56.00	-21.56	Phase 2	11.62
0.812	34.26	56.00	-21.74	Phase 1	11.62
0.881	20.66	56.00	-35.34	Phase 2	11.63
0.881	21.06	56.00	-34.94	Phase 1	11.63
1.219	22.29	56.00	-33.71	Phase 1	11.62
1.221	22.05	56.00	-33.95	Phase 2	11.62
16.314	29.85	60.00	-30.15	Phase 1	11.93
16.321	29.64	60.00	-30.36	Phase 2	11.93
16.775	30.85	60.00	-29.15	Phase 2	11.93
16.809	31.12	60.00	-28.88	Phase 1	11.93
17.288	31.39	60.00	-28.61	Phase 1	11.92
17.331	31.21	60.00	-28.79	Phase 2	11.92
17.831	31.08	60.00	-28.92	Phase 2	11.93
17.833	31.19	60.00	-28.81	Phase 1	11.93
18.314	30.85	60.00	-29.15	Phase 2	11.93
18.319	31.01	60.00	-28.99	Phase 1	11.93
18.843	29.98	60.00	-30.02	Phase 1	11.94
18.845	29.88	60.00	-30.12	Phase 2	11.94

4.9.3.1 Test Results: PowerLine Coordinator™ (Continued)
15.207: Conducted Emissions 120VAC 60Hz, Tested with AC Power Configuration

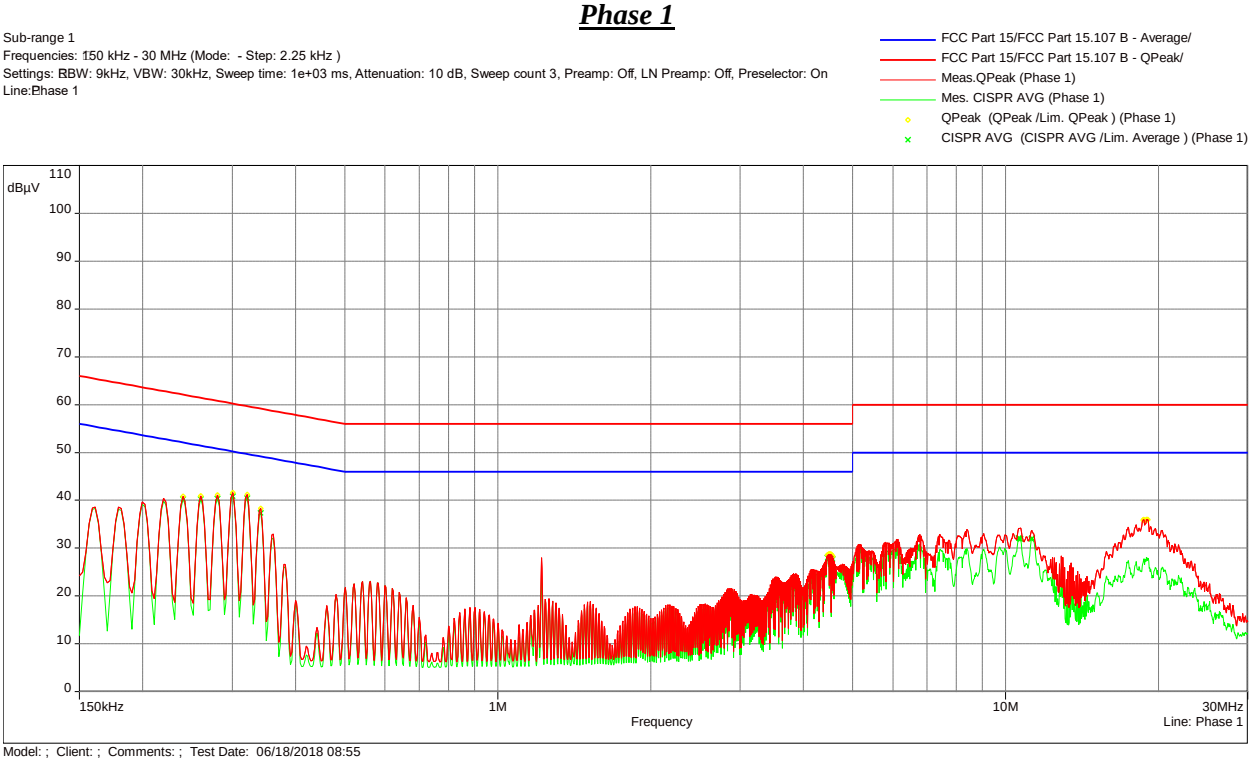
Average Table					
Frequency (MHz)	AVG (dBµV)	Lim. Average (dBµV)	AVG-Lim (dB)	Phase	Correction (dB)
0.150	46.04	56.00	-9.96	Phase 1	11.51
0.150	47.09	56.00	-8.91	Phase 2	11.51
0.175	44.71	54.73	-10.02	Phase 1	11.52
0.175	46.17	54.73	-8.56	Phase 2	11.52
0.213	40.33	53.09	-12.76	Phase 1	11.55
0.213	42.40	53.09	-10.69	Phase 2	11.55
0.557	18.97	46.00	-27.03	Phase 1	11.59
0.593	19.85	46.00	-26.15	Phase 2	11.59
0.704	28.26	46.00	-17.74	Phase 2	11.60
0.704	28.16	46.00	-17.84	Phase 1	11.60
0.737	31.05	46.00	-14.95	Phase 1	11.61
0.740	31.25	46.00	-14.75	Phase 2	11.61
0.776	29.39	46.00	-16.61	Phase 1	11.62
0.776	29.94	46.00	-16.06	Phase 2	11.62
0.814	32.61	46.00	-13.39	Phase 2	11.62
0.814	32.41	46.00	-13.59	Phase 1	11.62
0.881	18.99	46.00	-27.01	Phase 2	11.63
0.881	19.32	46.00	-26.68	Phase 1	11.63
15.783	26.47	50.00	-23.53	Phase 1	11.94
15.783	26.27	50.00	-23.73	Phase 2	11.94
16.809	28.06	50.00	-21.94	Phase 1	11.93
16.809	27.88	50.00	-22.12	Phase 2	11.93
17.329	28.20	50.00	-21.80	Phase 2	11.92
17.329	28.34	50.00	-21.66	Phase 1	11.92
17.795	28.00	50.00	-22.00	Phase 1	11.92
17.831	27.93	50.00	-22.07	Phase 2	11.93
18.353	27.85	50.00	-22.15	Phase 2	11.93
18.353	27.97	50.00	-22.03	Phase 1	11.93
18.875	26.35	50.00	-23.65	Phase 2	11.94
18.877	26.51	50.00	-23.49	Phase 1	11.94

Results: Complies by 8.56 dB

4.9.3.1 Test Results: PowerLine Coordinator™ (Continued)
15.207: Conducted Emissions 120VAC 60Hz, Tested with DC Power Configuration

Phase 1

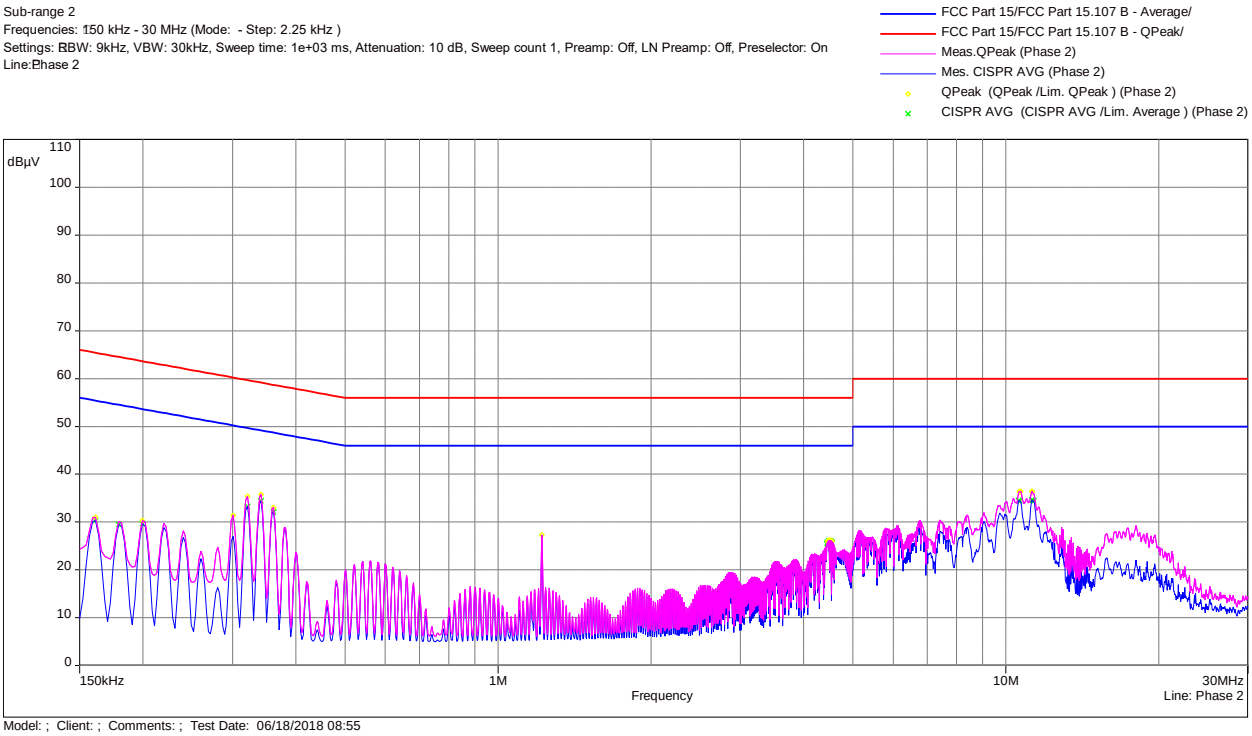
Sub-range 1
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On
Line:Phase 1



Model: ; Client: ; Comments: ; Test Date: 06/18/2018 08:55

Phase 2

Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: - Step: 2.25 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 1e+03 ms, Attenuation: 10 dB, Sweep count 1, Preamp: Off, LN Preamp: Off, Preselector: On
Line:Phase 2



Model: ; Client: ; Comments: ; Test Date: 06/18/2018 08:55

4.9.3.1 Test Results: PowerLine Coordinator™ (Continued)
15.207: Conducted Emissions 120VAC 60Hz, Tested with DC Power Configuration

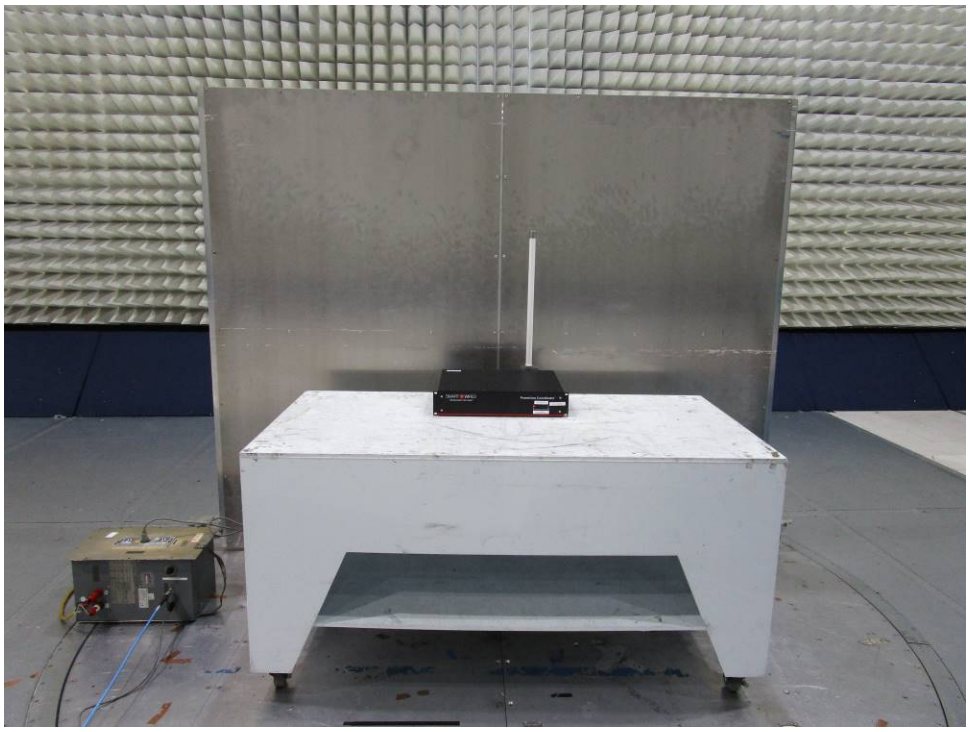
Quasi Peak Table					
Frequency (MHz)	QPeak (dBµV)	Lim. QPeak (dBµV)	QPeak-Lim (dB)	Phase	Correction (dB)
0.161	30.96	65.40	-34.44	Phase 2	11.52
0.200	30.37	63.63	-33.26	Phase 2	11.54
0.240	40.85	62.10	-21.25	Phase 1	11.55
0.260	40.94	61.42	-20.49	Phase 1	11.56
0.281	41.10	60.80	-19.70	Phase 1	11.58
0.301	41.57	60.22	-18.65	Phase 1	11.59
0.301	31.35	60.22	-28.87	Phase 2	11.59
0.321	41.24	59.68	-18.44	Phase 1	11.59
0.321	35.37	59.68	-24.31	Phase 2	11.59
0.341	38.28	59.17	-20.89	Phase 1	11.59
0.341	35.79	59.17	-23.39	Phase 2	11.59
0.362	33.06	58.69	-25.64	Phase 2	11.58
1.221	27.33	56.00	-28.67	Phase 2	11.62
4.486	26.22	56.00	-29.78	Phase 2	11.76
4.486	28.78	56.00	-27.22	Phase 1	11.76
4.506	26.18	56.00	-29.82	Phase 2	11.76
4.506	28.79	56.00	-27.21	Phase 1	11.76
4.547	28.61	56.00	-27.39	Phase 1	11.76
4.547	25.97	56.00	-30.03	Phase 2	11.76
4.567	28.31	56.00	-27.69	Phase 1	11.76
10.635	36.36	60.00	-23.64	Phase 2	11.87
10.655	36.38	60.00	-23.62	Phase 2	11.87
10.676	36.38	60.00	-23.62	Phase 2	11.87
10.696	36.46	60.00	-23.54	Phase 2	11.87
11.256	36.41	60.00	-23.59	Phase 2	11.89
11.276	36.31	60.00	-23.69	Phase 2	11.89
18.665	35.91	60.00	-24.09	Phase 1	11.94
18.726	35.99	60.00	-24.01	Phase 1	11.94
18.746	35.87	60.00	-24.13	Phase 1	11.94
18.967	35.97	60.00	-24.03	Phase 1	11.94
19.007	35.91	60.00	-24.09	Phase 1	11.94
19.086	35.95	60.00	-24.05	Phase 1	11.94

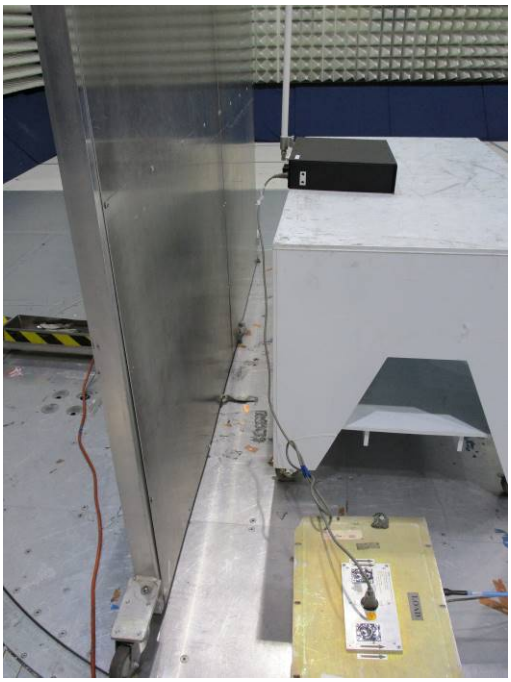
4.9.3.1 Test Results: PowerLine Coordinator™ (Continued)
15.207: Conducted Emissions 120VAC 60Hz, Tested with DC Power Configuration

Average Table					
Frequency (MHz)	AVG (dBµV)	Lim. Average (dBµV)	AVG-Lim (dB)	Phase	Correction (dB)
0.161	30.29	55.40	-25.10	Phase 2	11.52
0.179	29.49	54.52	-25.03	Phase 2	11.52
0.200	29.61	53.63	-24.02	Phase 2	11.54
0.240	40.20	52.10	-11.89	Phase 1	11.55
0.260	40.24	51.42	-11.18	Phase 1	11.56
0.281	40.37	50.80	-10.43	Phase 1	11.58
0.301	40.83	50.22	-9.40	Phase 1	11.59
0.321	40.45	49.68	-9.23	Phase 1	11.59
0.321	33.23	49.68	-16.45	Phase 2	11.59
0.341	37.31	49.17	-11.86	Phase 1	11.59
0.341	34.39	49.17	-14.78	Phase 2	11.59
0.362	32.11	48.69	-16.58	Phase 2	11.58
4.466	28.03	46.00	-17.97	Phase 1	11.76
4.486	28.27	46.00	-17.73	Phase 1	11.76
4.486	26.03	46.00	-19.97	Phase 2	11.76
4.506	28.22	46.00	-17.78	Phase 1	11.76
4.506	25.95	46.00	-20.05	Phase 2	11.76
4.526	28.20	46.00	-17.80	Phase 1	11.76
4.526	25.96	46.00	-20.04	Phase 2	11.76
4.547	25.67	46.00	-20.33	Phase 2	11.76
4.547	27.94	46.00	-18.06	Phase 1	11.76
4.567	27.67	46.00	-18.33	Phase 1	11.76
10.635	31.96	50.00	-18.04	Phase 1	11.87
10.635	34.44	50.00	-15.56	Phase 2	11.87
10.655	34.43	50.00	-15.57	Phase 2	11.87
10.655	31.96	50.00	-18.04	Phase 1	11.87
10.696	31.88	50.00	-18.12	Phase 1	11.87
11.256	31.92	50.00	-18.08	Phase 1	11.89
11.256	34.58	50.00	-15.42	Phase 2	11.89
11.276	32.04	50.00	-17.96	Phase 1	11.89
11.276	34.63	50.00	-15.37	Phase 2	11.89
11.355	34.45	50.00	-15.55	Phase 2	11.89

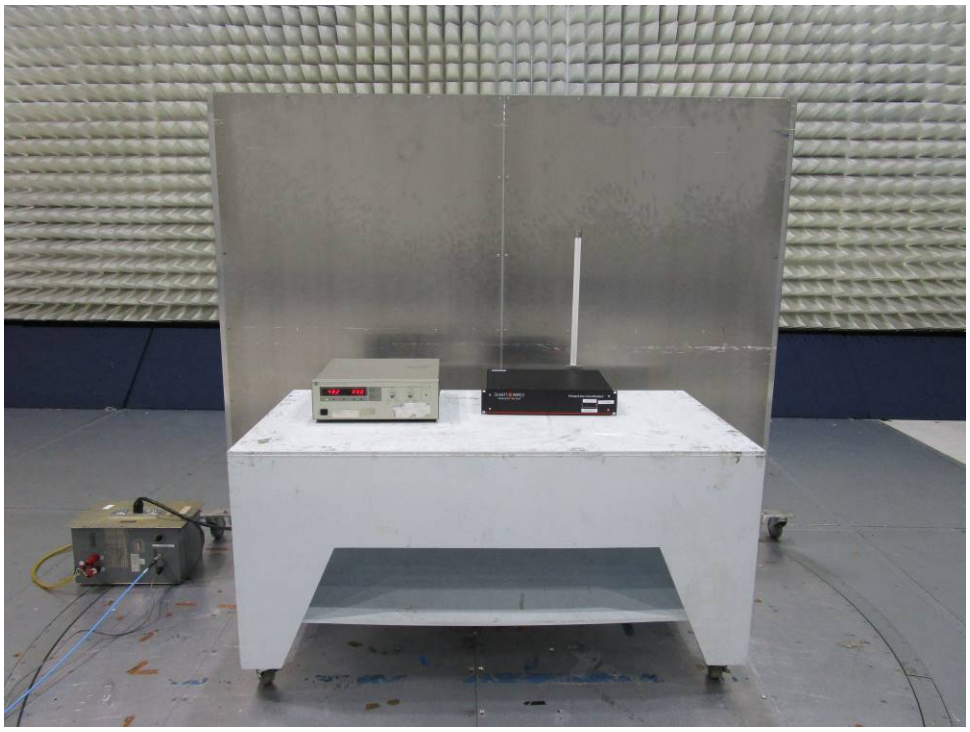
Results: **Complies** by 9.23dB

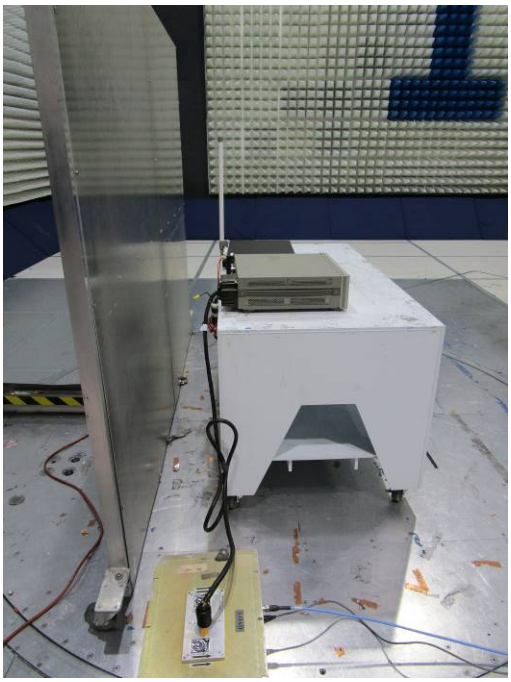
4.9.4 Test Configuration Photographs





4.9.4 Test Configuration Photographs (Continued)





5.0 List of Test Equipment and Software

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment Description	Manufacturer	Model/ Type	Asset No.	Monthly Cal Interval	Cal Due
Pre-Amplifier	Sonoma Instrument	310	ITS 01493	12	10/20/18
EMI Receiver	Rohde and Schwarz	ESR7	ITS 01607	12	10/09/18
BI-Log Antenna	Antenna Research	LPB-2513	ITS 00355	12	02/21/19
LISN	FCC	FCC-LISN-PA-NEMA-5-15	ITS 00552	12	11/14/18
RE Cable	TRU Corporation	TRU CORE 300	ITS 1462	12	08/19/18
RE Cable	TRU Corporation	TRU CORE 300	ITS 1465	12	08/19/18
RE Cable	TRU Corporation	TRU CORE 300	ITS 1470	12	08/19/18
Transient Limiter	COM-POWER	LIT-153A	ITS 1452	12	06/19/18
Spectrum Analyzer	Rohde and Schwarz	FSU	ITS 00913	12	01/24/19
Spectrum Analyzer	Rohde and Schwarz	FSP	ITS 01200	12	01/08/19
Pre-Amplifier (1-18GHz)	Miteq	AMF-4D-001180-24-10P	ITS 00526	12	01/19/19
Horn Antenna	ETS-Lindgren	3117	ITS 01325	12	01/25/19
Horn Antenna	ETS-Lindgren	3117-PA	ITS 01636	12	01/11/19
Notch Filter	Micro-Tronics	BRC50722	ITS 01170	12	01/26/19
High Pass Filter	Reactel	THS-4/18 S11	ITS 01171	12	01/28/19
RE Cable	TRU Corporation	TRU Core 300	ITS 01330	12	11/29/18
Pre-Amplifier	Sonoma Instrument	310	ITS 00942	12	01/26/19
Attenuator	Narda	FSCM99899	ITS 01583	12	08/31/18

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
Tile	Quantum Change	3.4.K.22	Conducted Spurious_30M-26GHz
BAT-EMC	Nexio	3.16.0.64	Smartwires_Radio_G104059097.bpp
RS Commander	Rohde Schwarz	1.6.4	Not Applicable (Screen grabber)

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewers Initials	Date	Change
1.0 / G104059097	AS/TM	KV	September 03, 2019	Original Document (This report was issued in reference to 103539437MPK-001)