INTENTIONAL RADIATOR
TEST REPORT

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Laboratory Accreditations (per ISO/IEC 17025:2017)

CERT #3657.02

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Manufacturer:	**Cooper Industries (Electrical) Inc.**
Address:	74 – 1833 Coast Meridian Rd. Port Coquitlam BC V3E 6G5, Canada.

Equipment Tested:	**Wireless Remote**
HVIN Number	TPCB-3612-03
PMN Number(s):	XPD900
FCC ID:	IA9XPD900A
ISED ID:	IC:1338B-XPD900A

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REVISION HISTORY

Date	Title	Details	Author's Initials
April 28, 2022	E10788-2103_Cooper Electrical_XPD900_FCC-ISED_**Rev 1.1**	Updates	TW
June 28, 2021	E10788-2103_Cooper Electrical_XPD900_FCC-ISED_**Rev 1.0**	Final	RS
March 5, 2021	E10788-2103_Cooper Electrical_XPD900_FCC-ISED_**Rev 0.0**	Draft	RS
All previous versions of this report have been superseded by the latest dated revision as listed in the above table. Please dispose of all previous electronic and paper printed revisions accordingly.			

REPORT AUTHORIZATION

The data documented in this report is for the test equipment provided by the manufacturer. The tests were conducted on the sample equipment as requested by the manufacturer for the purpose of demonstrating compliance with the standards outlined in Section I of this report as agreed upon by the Manufacturer under the quote 21SH01291.

The Manufacturer is responsible for the tested product configurations, continued product compliance, and for the appropriate auditing of subsequent products as required.

This report may comprise a partial list of tests that are required for FCC and ISED Declaration of Conformity can only be produced by the manufacturer. This is to certify that the following report is true and correct to the best of our knowledge.

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QAI EMC ACCREDITATION

QAI EMC is your one-stop regulatory compliance partner for electromagnetic compatibility (EMC) and electromagnetic interference (EMI). Products are tested to the latest and applicable EMC/EMI requirements for domestic and international markets. QAI EMC goes above and beyond being a testing facility—we are your regulatory compliance partner. QAI EMC has the capability to perform RF Emissions and Immunity for all types of electronics manufacturing including Industrial, Scientific, Medical, Information Technology, Telecom, Wireless, Automotive, Marine and Avionics.

EMC Laboratory Location	FCC Designation (3m SAC)	IC Registration (3m SAC)	A2LA Certificate
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Section I: EXECUTIVE SUMMARY OF STANDARDS AND LIMITS

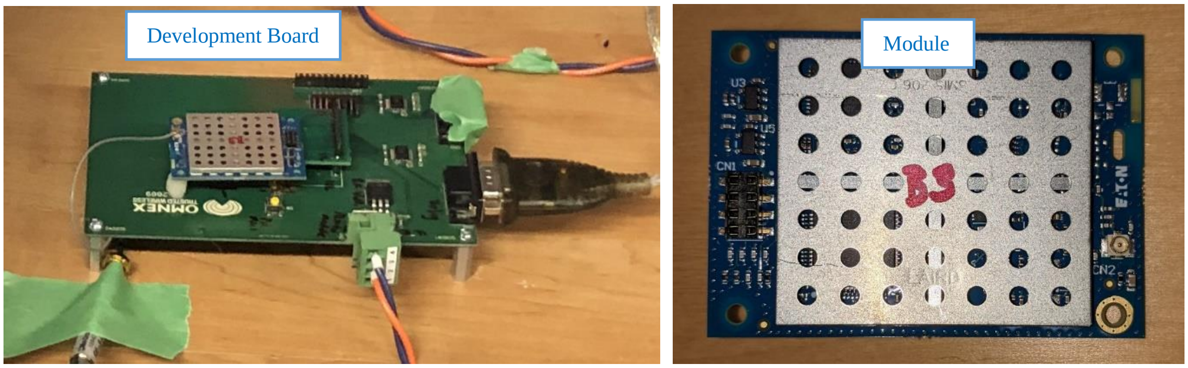
1.1 Applicable Standards and Results

No.	Test	Applicable Standard	Result
1	Antenna Requirement	FCC 47 CFR Part 15.203 RSS-Gen Issue 5 Section 6.8	Complies
2	20-dB & 99 % Bandwidth	FCC 47 CFR Part 15.247(a)(1)(i) RSS-247 Issue 2 (5.1) (c)	Complies
3	Number of Channels	FCC 47 CFR Part 15.247(a)(1)(i) RSS-247 Issue 2 (5.1) (c)	Complies
4	Channel Separation	FCC 47 CFR Part 15.247(a)(1) RSS-247 Issue 2 (5.1) (b)	Complies
5	Time of Occupancy	FCC 47 CFR Part 15.247(a)(1)(i) RSS-247 Issue 2 (5.1) (c)	Complies
6	Hopping Requirements	FCC 47 CFR Part 15.247(a)(1) RSS-247 Issue 2 (5.1) (a)	Complies
7	Max. Peak Conducted Output Power	FCC 47 CFR Part 15.247(a)(1) RSS-247 Issue 2 (5.1) (b)	Complies
8	Out-of-Band Emissions (Bandedge)	FCC 47 CFR Part 15.247(d)	Complies
9	Radiated Emissions	FCC Subpart C §15.205(a), §15.209 (a) & §15.247 (d) FCC Title 47 CFR Part 15: Subpart B - §15.109 RSS-Gen Issue 5 (8.9), (8.10) ICES-003 Issue 6	Complies
		FCC Title 47 CFR Part 15: Subpart B - §15.109 ICES-003 Issue 6	Complies
10	RF Exposure Evaluation	FCC 47 CFR §2.1093 (e) & 1.1310 (d) KDB 447498 D01 v06 (4.2.3) RSS-102 (2.5.1)	Complies

The tests documented in this report were performed in accordance with ANSI C63.4-2014, ANSI C63.10-2013, and KDB 447498 D01 General RF Exposure Guidance v06

1.2 Product Description

The information provided in this section is for the Equipment Under Test (EUT) and the corresponding Auxiliary Equipment needed to perform the tests as a complete system.



Product Under Test

Equipment Under Test (EUT)

Equipment	Description	Manufacturer	HVIN No.	Serial No.
Radio Module	900 MHz Spread Spectrum Data Transceiver Module	Cooper Industries (Electrical) Inc.	TPCB-3612-03	1E347842
Clock frequencies tuned upon within the EUT:	1.625MHz, 13MHz, 659 to 684 MHz ,243 MHz 10 kHz, 902.2-927.7MHz			
Highest frequency generated within the EUT:	927.7 MHz			

Equipment Under Test (EUT) - RF Information

RF device type	Transceiver
HVIN No.	TPCB-3612-03
PMN No.	XPD900
Operating frequency	902.2MHz – 927.7MHz
Number of available channels/Transmitter	256 (1/4 used at a time)
Channel separation	400 kHz
Channel bandwidth	25 kHz
Output Power/Transmitter	21 dBm (conducted) – adjustable
Modulation type	2-level FSK
Test Channels (L, M, H)	902.2, 914.9, 927.7MHz
Data Rate2	10.4167 kbps
Adaptive	No
Geo-location-capable	No
Number of antennas	4
Antenna 1 Type	5/8λ over 1/4 λ monopole whip (5.4 dBi)
Antenna 2 Type	1/4 λ monopole dome (2.5 dBi)
Antenna 3 Type	1/4 λ monopole smt antenna (0.3 dBi)
Antenna 4 Type	1/4 λ monopole wire antenna (2.54 dBi)

Equipment Under Test (EUT) - General Information

Tested as	Table-top
Dimensions	13.5 x 7.1 x 3.3 (cm)
Declared operating temperature range:	-40 to +80C
Input power	Linear Power Supply
Grounded	No
Device use	Portable (within 20 cm of human body)

Note: EUT has not I/O cables.

Test Modes

Test	Transmitter state	Power
Pre-scans	1) Transmitting Continuously 2) Modulated fixed-frequency transmission 3) Hopping 4) Receiver mode	

EUT Input Power

Type	Count	Description	Output	Manufacturer	Model #
DC	N/A	Power Supply	6.5Vdc	Korad	KD3005D

Auxiliary Equipment Information

Equipment	Count	Specification	Manufacturer	Model No.	Serial No.
Development Board	1	Supplies DC power to the module and a PC connection for radio module configuration	Cooper	N/A	N/A
Cable	1	I-PEX MHF to SMA jack cable, to connect module to antenna type 1 and type 2	Wellshow	W0291	N/A
Cable	1	U.FL to U.FL coax cable to connect module to antenna 3	Zargo	W0272	N/A
Antenna	1	Antenna type 1, whip antenna Larsen NMO3E900B with NMOHFMID mount, TMBR34 bracket. LMR195 coaxial cable 6’ long with SMA connector.	---	---	---
Antenna	1	Antenna type 2, dome antenna, Larsen SLPT698/2170NMOHF with NMOHFMID mount, TMBR34 bracket. LMR195 coaxial cable 6’ long with SMA connector.	---	---	---
Antenna	1	Antenna type 3, Linx ANT-916-uSP SMT antenna on TD1141 (Rev. 2) host product.	---	---	---
Antenna	1	Antenna type 3, Linx ANT-916-uSP SMT antenna on TD3100 (Rev. 4 display PCB) host product.	---	---	---
Antenna	1	Antenna type 3, Linx ANT-916-uSP SMT antenna on TD2100 (Rev. 3 switch PCB) host product.	---	---	---
Antenna	1	Antenna type 4, internal wire antenna on R260 Rev. 7 and Rev. 13 host product.	---	---	---
Antenna	1	Antenna type 4, internal wire antenna on R270 Rev.3 host product.	---	---	---

1.3 Environmental Conditions

The equipment under test was operated and tested under the following environmental conditions:

Parameter	Conditions
Location	Indoors
Temperature	24 ºC
Relative Humidity	25.2%
Atmospheric Pressure	100kPa

1.4 Measurement Uncertainty

Parameter	Uncertainty
Radiated Emissions, 10kHz.-1GHz.	± 2.40 dB
Radiated Emissions, 1GHz.-40GHz.	± 2.48 dB
Conducted Emissions, 10kHz. to 40GHz.	± 2.82 dB
Radio Frequency	±1.5 x 10-5 MHz
Total RF Power Conducted	±1.36 dB
Spurious Emissions, Conducted	±1.36 dB
RF Power Density, Conducted	±1.36 dB
Temperature	±1ºC
Humidity	±5 %
DC and low frequency voltages	±3 %

1.5 Sample Calculations of Emissions Data

Radiated and conducted emissions were performed using EMC32 software developed by Rohdes & Schwarz. Transducer factors like Antenna factors, Cable Losses and Amplifier gains were stored in the test templates which are used to perform the emissions measurements. After test is finished, data is generated from the EMC32 consisting of product details, emission plots and final data tables as shown below.

Frequency (MHz)	Q-Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Ant. Ht. (cm)	Pol	Turntable Position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
42.663900	33.0	1000.000	120.000	100.0	H	70.0	13.2	7.5	40.5

Quasi-Peak reading shown in the table above is already corrected by the software using the correction factor shown in column “Corr.” The correction factor listed under “Corr.” table calculated as:

Corr.(dB) = Antenna factor + Cable loss

Or

Corr.(dB) = Antenna factor + Cable Loss - Amp gain (if pre-amplifier was used)

The final Quasi peak reading shown in the data is calculated by the software using following equation:

Corrected Quasi-Peak (dBµV/m) = Raw Quasi-Peak Reading + Antenna factor + Cable loss

To obtain the final Quasi-Peak or Average reading during power line conducted emissions, transducer factors are included in the final measurement as shown below.

Frequency (MHz)	Q-Peak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	44.3	1000.000	9.000	GND	0.6	21.7	66.0

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	27.2	1000.000	9.000	GND	0.6	28.8	56.0

Quasi Peak or Average reading shown in above table is already corrected by the software using the correction factor shown in column “Corr.” The correction factor listed under “Corr.” table calculated as:

Corr.(dB) = Antenna factor + Cable loss

The final Quasi-peak or Average reading shown in the data is calculated by the software using the following equation:

Corr. Quasi-Peak/Average Reading (dBµV) = Raw Quasi-Peak/Average Reading + Antenna factor + Cable loss

The allowable margin from the limits, as per the standards, were calculated for both radiated and conducted emissions:

Margin(dB) = Limit – Quasi-Peak or Average reading

1.6 Test Equipment List

The tables below contain all the equipment used by QAI Laboratories in conducting all tests on the Equipment Under Test (EUT) as per Section 1.

Emissions Test Equipment

Sl. NO.	Manufacturer	Model	Description	Serial No.	S/W Version	Calibration Due Date
1	ETS Lindgren	2165	Turntable	00043677	N/A	N/A
2	ETS Lindgren	2125	Mast	00077487	N/A	N/A
3	EMCO	6502	Loop Antenna 9 kHz – 30 MHz	2016	N/A	2022-Feb-19
4	Sunol Sciences	JB3	Biconilog Antenna 30MHz – 3GHz	A042004	N/A	2021-Nov-10
5	ETS-Lindgren	3117	Horn Antenna 1GHz-18GHz	75944	N/A	2021-Aug-29
7	Rohde & Schwarz	ESU40	EMI Receiver	100011	EMC32 v10.35.10/ FV 4.73 SP4	2021-Dec-01
8	Hewlett Packard	8449B OPT H02	Preamplifier (1-26.5GHz)	2933A00198	N/A	2022-Jun-22
9	Rohde & Schwarz	FSU	Spectrum Analyzer 20 Hz – 67 GHz	101388	N./A	2022-Jan-19
10	Rohde & Schwarz	NRP	Power Meter	101283	N/A	2022-Feb-18
11	ETS Lindgren	S201	5-meter Semi Anechoic Chamber	1030	N/A	N/A

Note: Equipment listed above have 3 years calibration interval.

Measurement Software List

Sl. No.	Manufacturer	Model	Version	Description
1	Rhode & Schwarz	EMC 32	10.35.10	Emissions Test Software

Section II: DATA & TEST RESULTS

2.1 Antenna Requirements

- **Test Standard:** FCC 47 CFR Part 15.203 and RSS-Gen Issue 5 (6.8)

Requirement:

The purpose of this requirement is to make certain that no other antenna, except for that provided by the responsible party, shall be used with the Equipment-Under-Test (EUT) as defined in FCC CFR 47 Part 15.203 & RSS-Gen Issue 5:

"An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited." … "the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded."

Antenna Information:

Antenna 1

Manufacturer	Pulse/Larsen Electronics Inc.
Model Number	NM03E900B
Part number	AKIT-3591-04
Center frequency	914.9MHz
Dimensions	Maximum Height 13.5 inches
Connection	SMA
Bandwidth	70MHz
Wavelength	Collinear Array 5/8λ over 1/2λ
VSWR	2:1
Peak gain	5.4dBi
Impedance	50 Ohms

Antenna 2

Manufacturer	Pulse/Larsen Electronics Inc.
Model Number	SLPT698/2170NMOHF
Part number	AKIT-3591-07
Center frequency	914.9MHz
Dimensions	3.10x1.496 Inches
Connection	SMA
Bandwidth	262MHz
Wavelength	1/4λ monopole (at 900MHz)
VSWR	3.3:1
Peak gain	3.52dBi
Impedance	50 Ohms

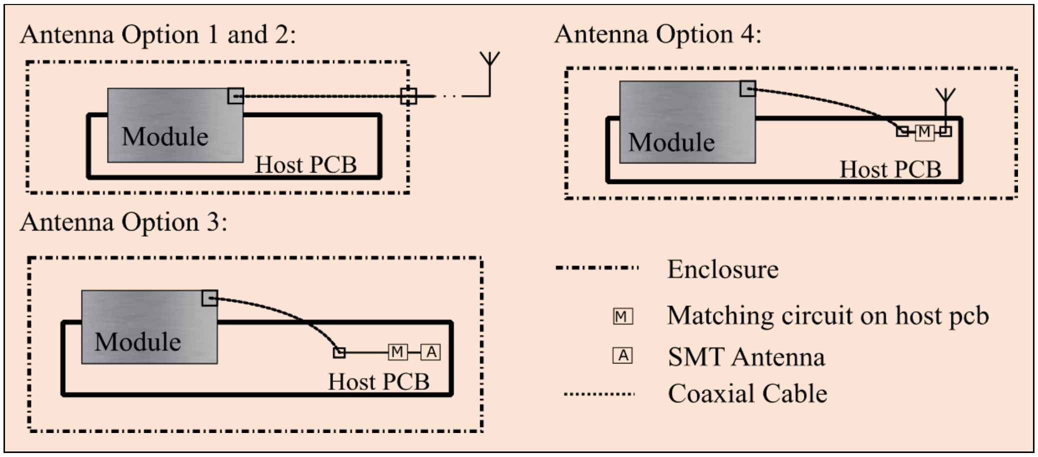
Antenna 3 (Host product antenna tested: TD1141, TD3100, TD2100)

Manufacturer	Linx Technologies
Model Number	ANT-916-uSP
Part number	A0042
Center frequency	916MHz
Dimensions	0.5x.36 inches
Connection	Surface Mount
Bandwidth	25MHz
Wavelength	1/4λ monopole
VSWR	≤2.0 typical at centre
Peak gain	2.54dBi
Impedance	50 Ohms

Antenna 4 (Host product antenna tested: R260 and R270)

Manufacturer	Eaton design
Model Number	
Part number	ACAB-2683-07
Center frequency	915MHz
Dimensions	2.75 inches long
Connection	Through hole solder mount
Bandwidth	
Wavelength	1/4λ monopole
VSWR	3:1
Peak gain	2.54dBi
Impedance	50 Ohms

Three versions of Antenna 3 and three versions of Antenna 4 were tested because the host PCB RF trace is considered part of the antenna. The following figure and table describe the details.



Antenna Details

Antenna	Host Product	Revision	Module Connection
1	R260	7	Coaxial
2	R260	7	Coaxial
4	R260	7	Matching circuit on PCB
1	R260	13	Coaxial
2	R260	13	Coaxial
4	R260	13	Matching circuit on PCB
1	R270	3	Coaxial
2	R270	3	Coaxial
4	R270	3	Matching circuit on PCB
3	TD3100	4	Matching circuit on Display PCB
3	TD2100	3	Matching circuit and Switch PCB
3	TD1141	2	Matching circuit on PCB

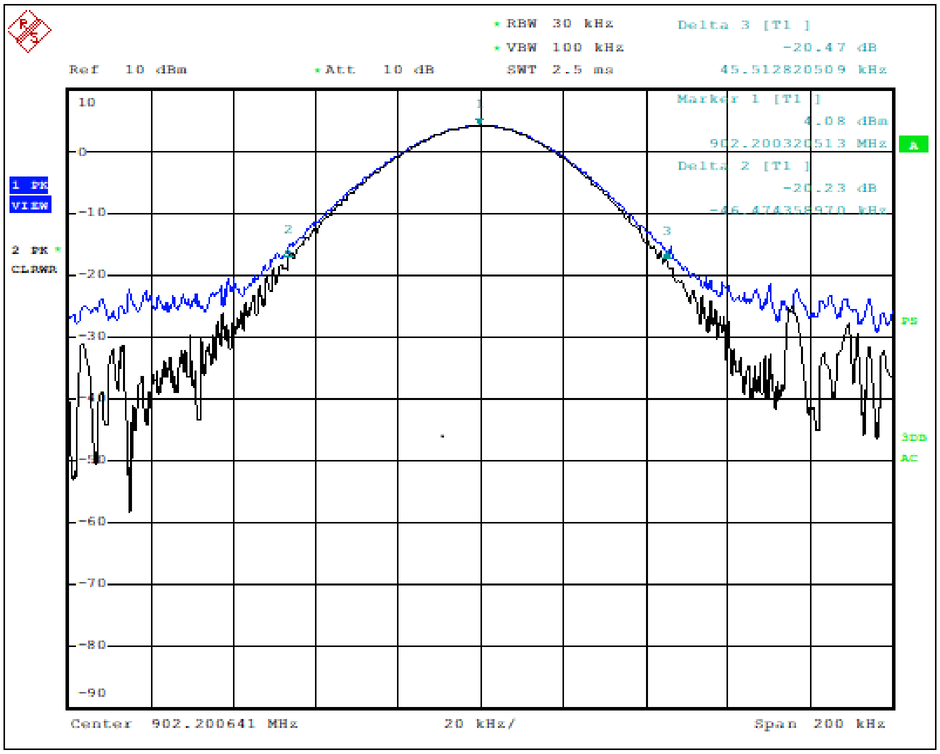
Result:

An integrated antenna is used on this product and is not field-replaceable.
EUT Complies.

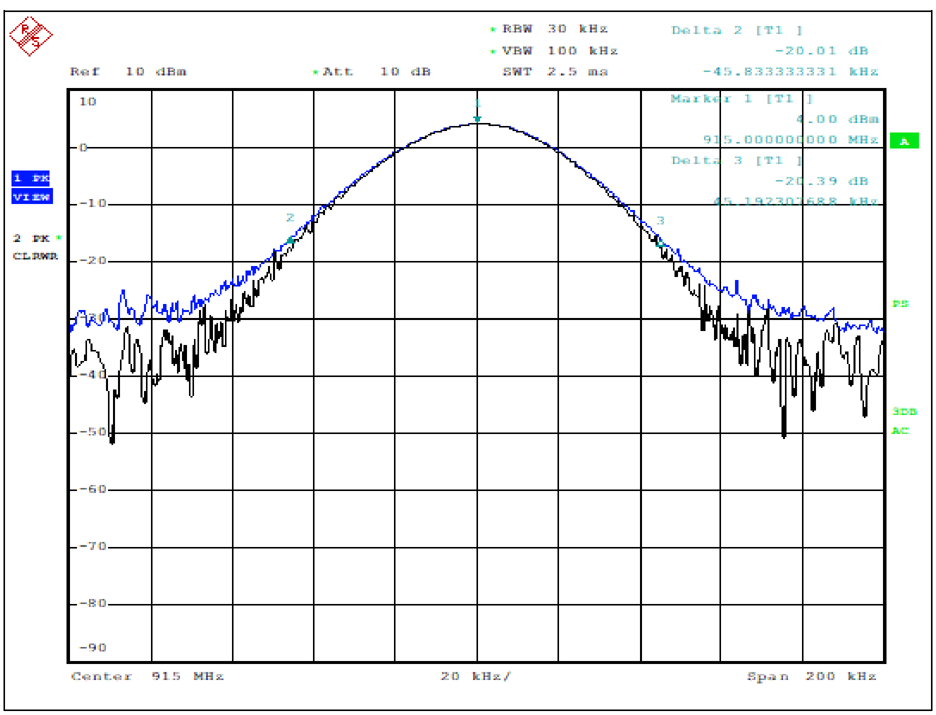
2.2 Occupied Bandwidth (20dB) & (99%)

- **Date Performed:** Feb 25 & March 1, 2021
- **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.
- **Test Set-up:** Conducted measurement at antenna port using spectrum analyzer.
  Span = 200kHz. RBW = 30kHz, VBW = 100 kHz
- **Modifications:** EUT configured to transmit at 100% duty cycle at fixed modulated frequency. Integrated antenna removed.
- **Result:** 20-dB Bandwidth is less than 250 kHz

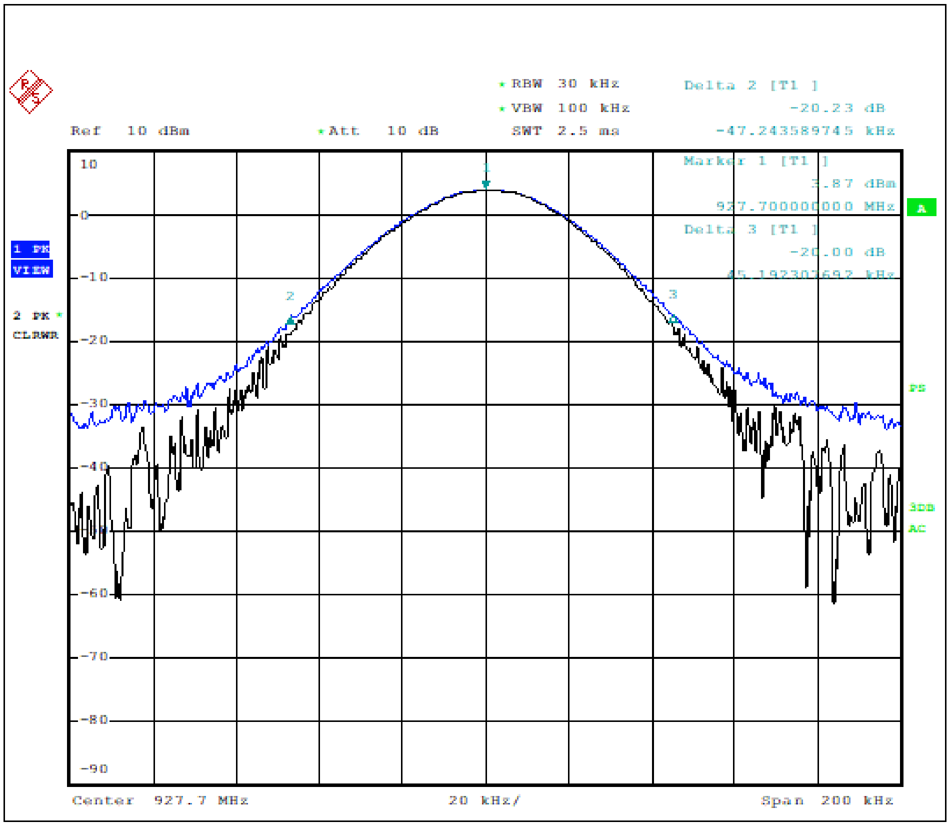
Data & Plots:



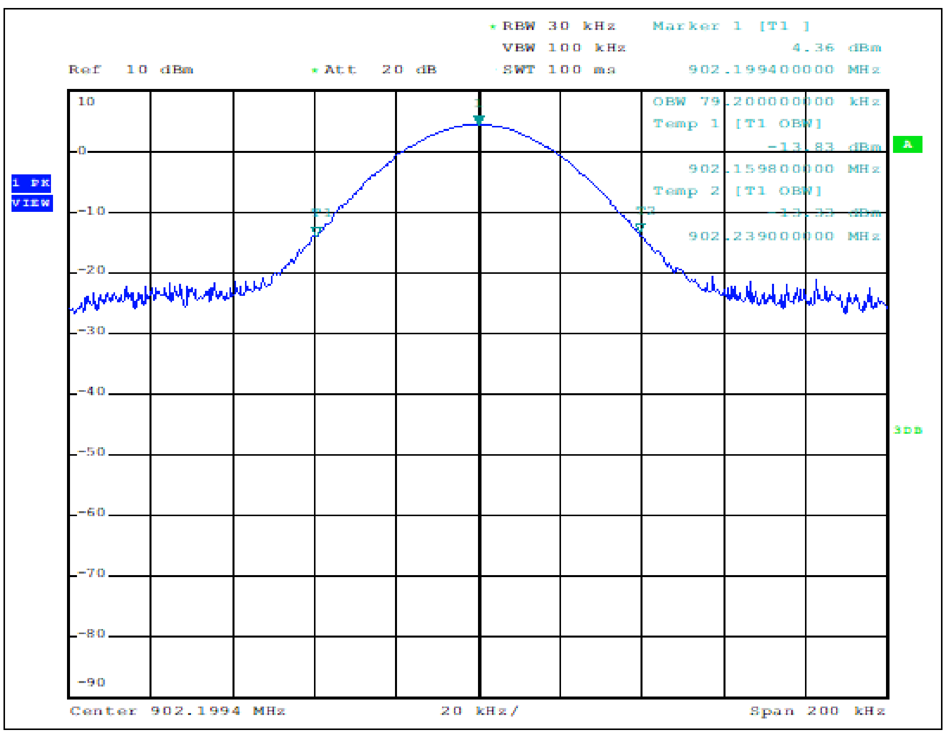
Plot 1: Low Channel



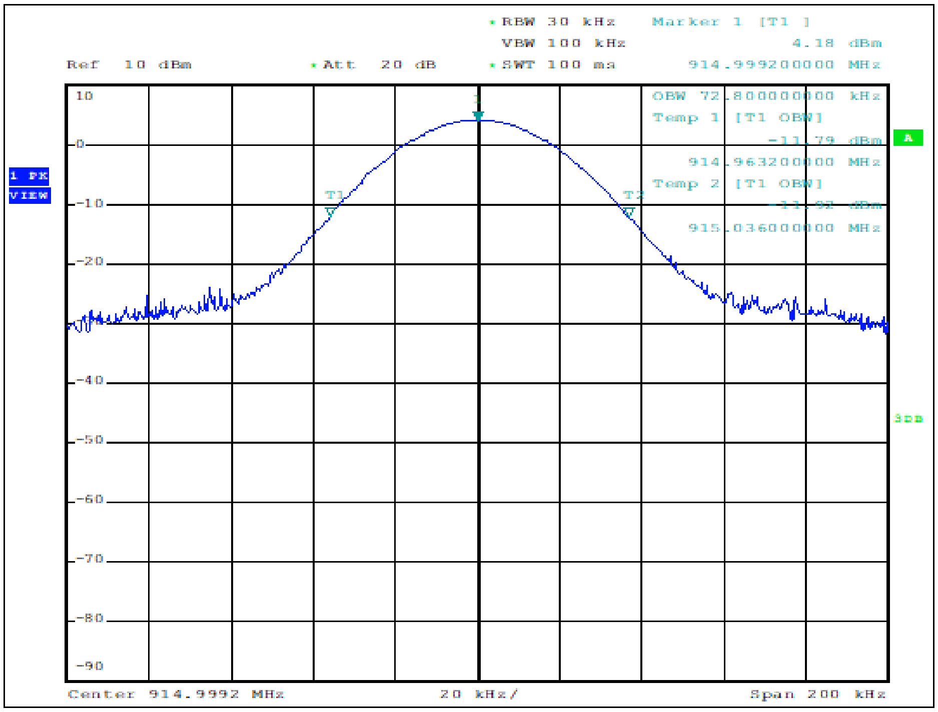
Plot 2: Mid Channel



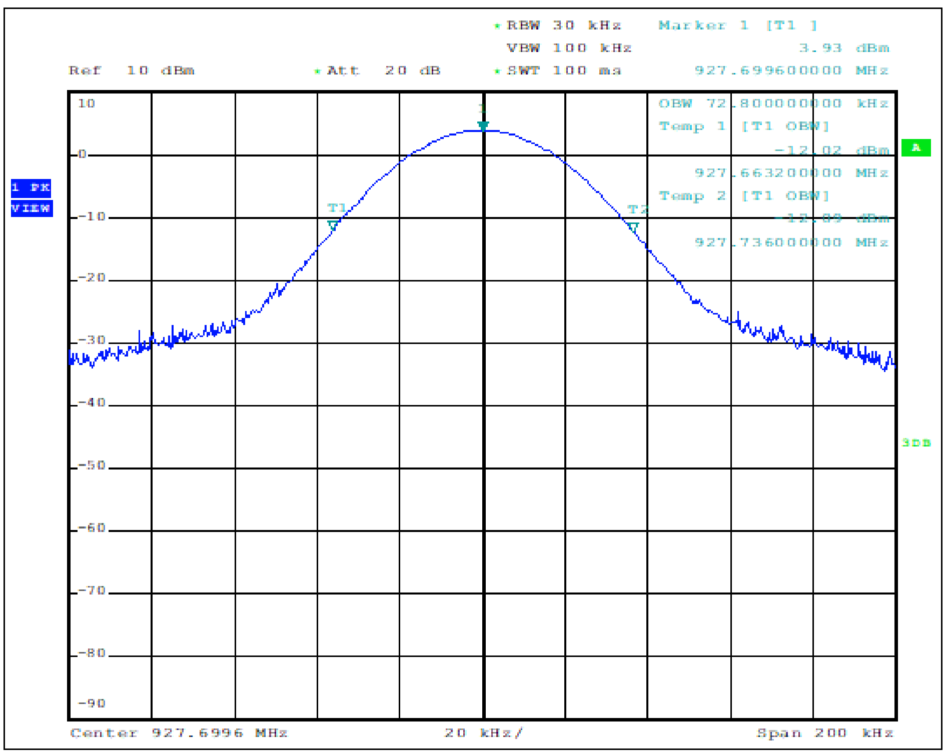
Plot 3: High Channel



Plot 4: Low Channel



Plot 5: Mid Channel



Plot 6: High Channel

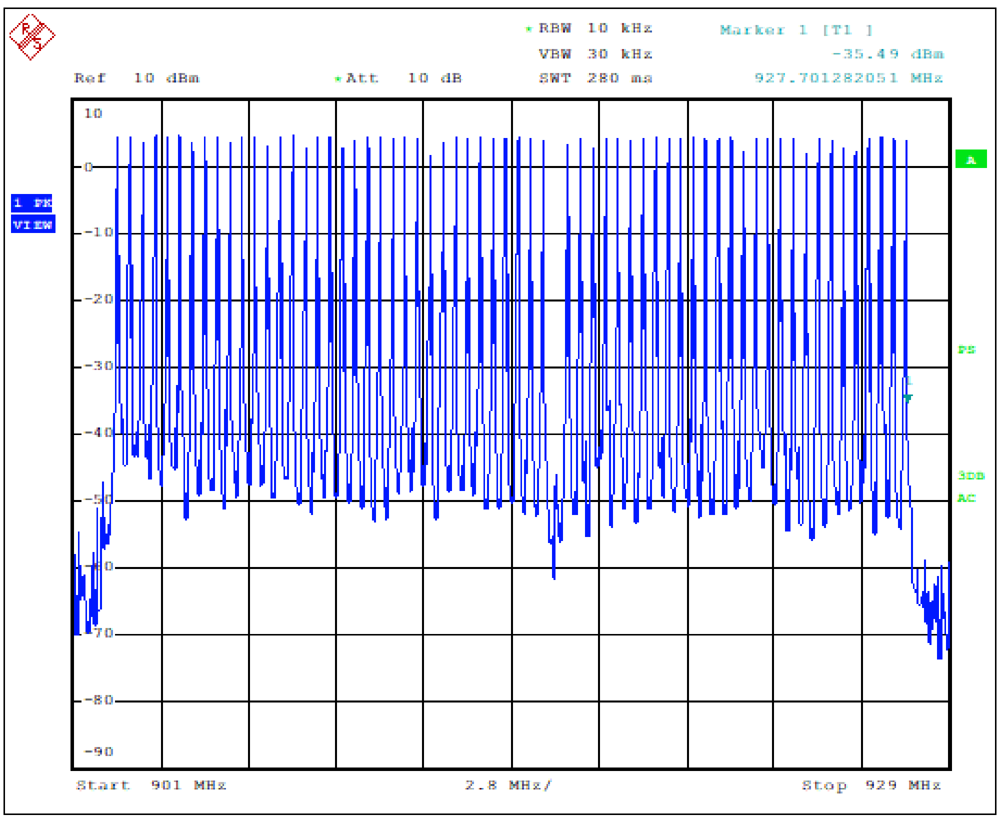
Table 1: Occupied Bandwidth

Frequency MHz	20-dB BW (kHz)	99% BW (kHz)
902.2	91.99	79.20
914.9	91.03	72.80
927.7	92.44	72.80

2.3 Number of Channels

- **Date Performed:** February 26, 2021
- **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.
- **Test Set-up:** Conducted measurement at antenna port using spectrum analyzer.
Span = 28 MHz, RBW = 10kHz, VBW = 30 kHz
Sweep time: 280 ms, trace stabilization time: 3.5 minutes.
- **Modifications:** EUT configured to transmit at 100% duty cycle in frequency hopping mode. Integrated antenna removed.
- **Result:** EUT uses 63 channels > 50, EUT complies

Plot:

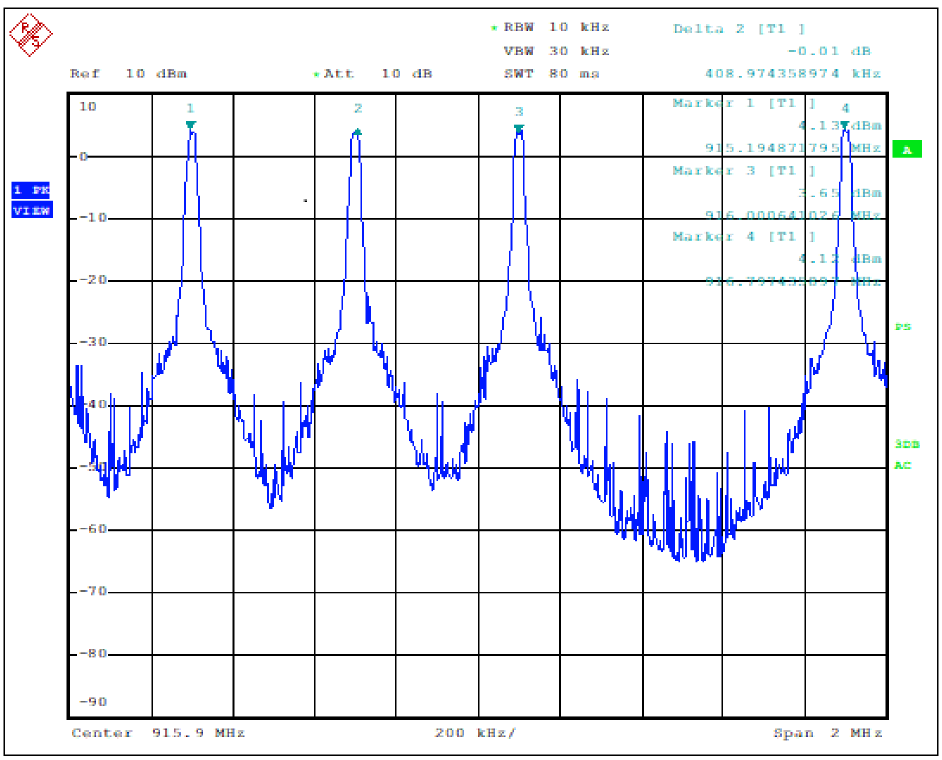


Plot 7: Number of channels

2.4 Channel Separation

- **Date Performed:** February 26, 2021
- **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.
- **Test Set-up:** Conducted measurement at antenna port using spectrum analyzer.
  Span = 2 MHz
  RBW = 10kHz, VBW = 30 kHz
  Sweep time: 80 ms
- **Modifications:** EUT configured to transmit at 100% duty cycle in frequency hopping mode. Integrated antenna removed.
- **Result:** Channel separation is 409 kHz > max. (25 kHz). EUT complies.

Plot:

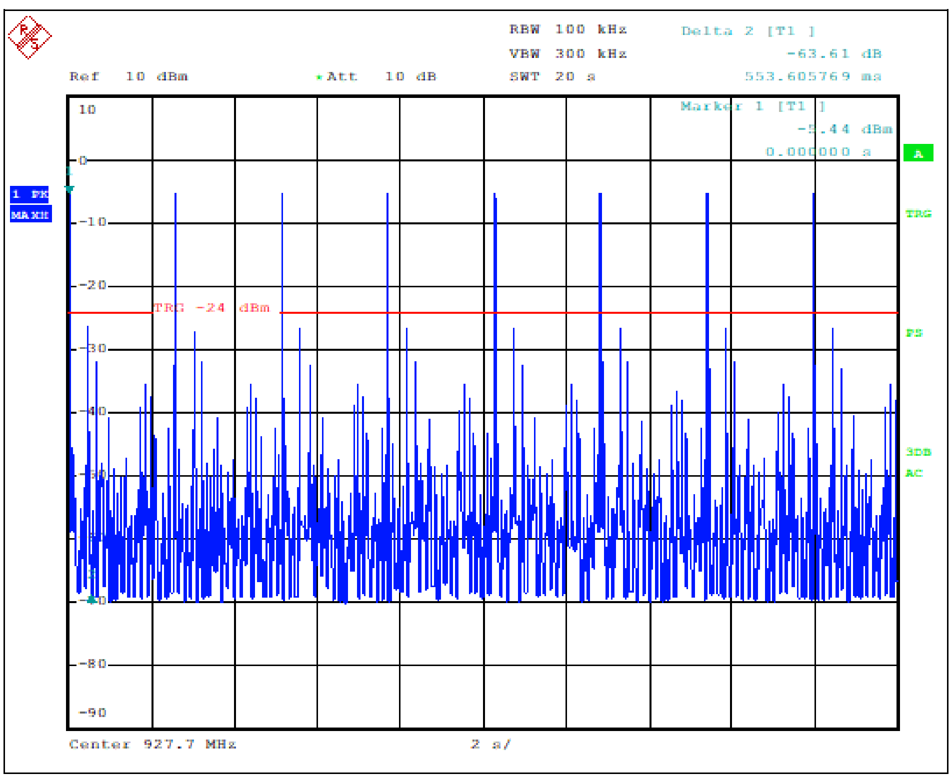


Plot 8: Channel separation

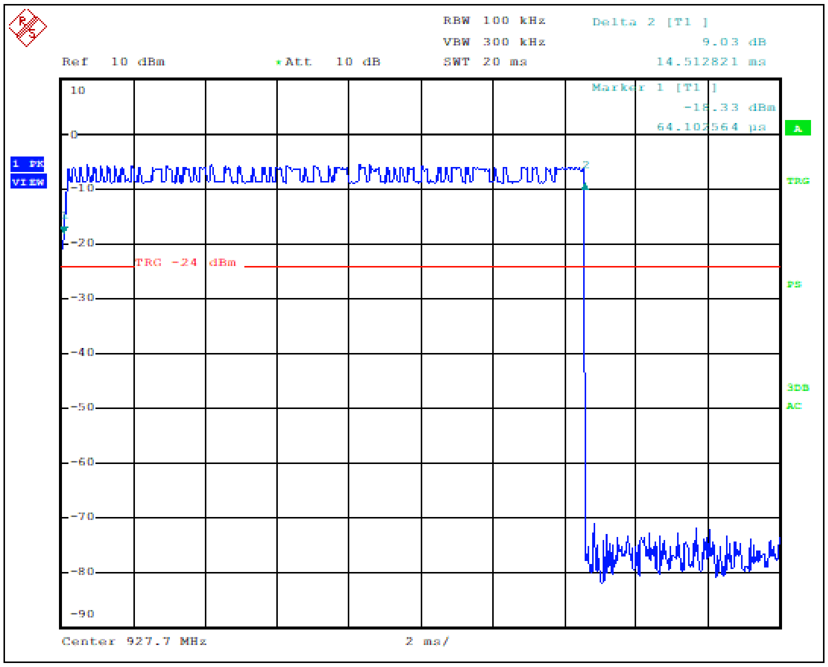
2.5 Time of Occupancy

- **Date Performed:** February 26, 2021
- **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 average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.
- **Test Set-up:** Conducted measurement at antenna port using spectrum analyzer.
  Span = 0 Hz.
  RBW = 10kHz, VBW = 30 kHz
  Sweep time: 20 s.
- **Modifications:** EUT configured to transmit at 100% duty cycle in frequency hopping mode. Integrated antenna removed.
- **Result:** Time of occupancy is 116.10 ms or 112.24ms < 400 ms. EUT complies.

Data & Plots:



Plot 9: Time of Occupancy

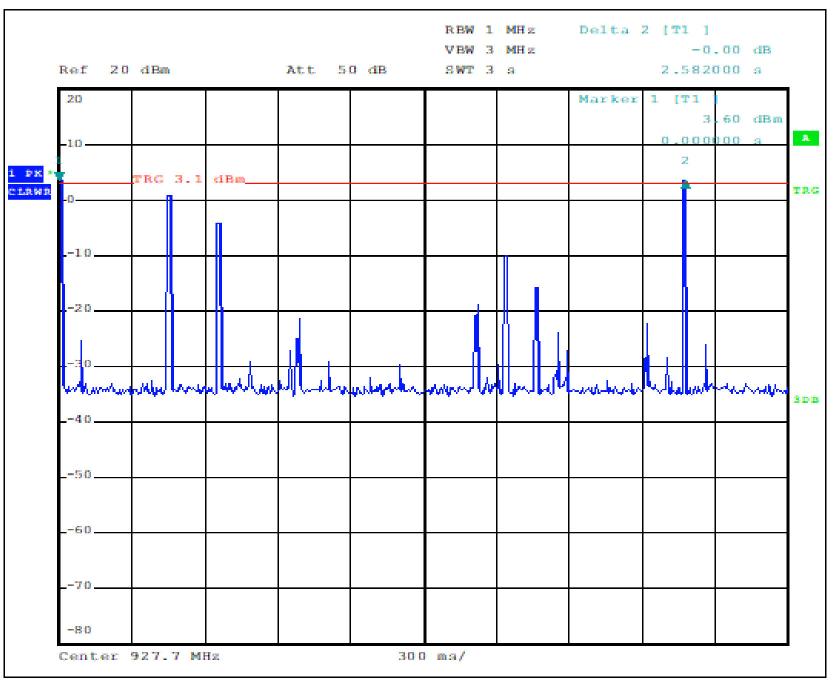


Plot 10: Time of Occupancy

Table 2: Bursts in 20 s (Left) and duty cycle of each burst (Right)

Test Channel (MHz)	Number of Bursts in 20 s	Burst Duty Cycle (ms)	Time of Occupancy (ms)
915	8	14.512	116.10

Second Method



Plot 11:Time of Occupancy

Time between 2 consecutive transmissions on the same frequency is 2.582s. Dwell time per frequency is 14.513ms Therefore, occupancy time per frequency within 20 seconds' period is (0.01451s ×20s)/ 2.582s = 112.24ms

2.6 Hopping Requirements

- **Date Performed:** Feb 26, 2021

- **Requirement:**

The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

- **Manufacturer's Description of Hopping:**

The XPD900 transceiver module can be set to operate on any of 256 frequency channels in the 902.2 – 927.7 MHz band. The frequencies are divided into four groups of 64 frequencies, each group using every fourth available frequency. These 64 frequencies in a group are then used equally by the spread spectrum transmitter in a pseudo random sequence.

The hop sequence is a sequence of 63 numbers randomly generated with a Reed-Solomon algorithm. The unique serial number of the transmitter is used as a seed to the random number generator. The list of 63 numbers (channels) is used to lookup in the frequency table to determine the next transmit frequency.

Here are the first five sequences:

Seq(1): 0 59 54 35 44 7 6 45 24 28 13 50 11 42 26 56 47 34 55 27 25 43 36 9 21 15 20 10 51 33 48 61 30 18 4 23 46 57 53 60 49 14 22 5 8 37 17 31 41 12 29 62 39 3 19 16 38 63 2 40 32 52 58
Seq(2): 59 0 60 55 36 45 8 7 46 25 29 14 51 12 43 27 57 48 35 56 28 26 44 37 10 22 16 21 11 52 34 49 62 31 19 5 24 47 58 54 61 50 15 23 6 9 38 18 32 42 13 30 63 40 4 20 17 39 1 3 41 33 53
Seq(3): 54 60 0 61 56 37 46 9 8 47 26 30 15 52 13 44 28 58 49 36 57 29 27 45 38 11 23 17 22 12 53 35 50 63 32 20 6 25 48 59 55 62 51 16 24 7 10 39 19 33 43 14 31 1 41 5 21 18 40 2 4 42 34
Seq(4): 35 55 61 0 62 57 38 47 10 9 48 27 31 16 53 14 45 29 59 50 37 58 30 28 46 39 12 24 18 23 13 54 36 51 1 33 21 7 26 49 60 56 63 52 17 25 8 11 40 20 34 44 15 32 2 42 6 22 19 41 3 5 43
Seq(5): 44 36 56 62 0 63 58 39 48 11 10 49 28 32 17 54 15 46 30 60 51 38 59 31 29 47 40 13 25 19 24 14 55 37 52 2 34 22 8 27 50 61 57 1 53 18 26 9 12 41 21 35 45 16 33 3 43 7 23 20 42 4 6

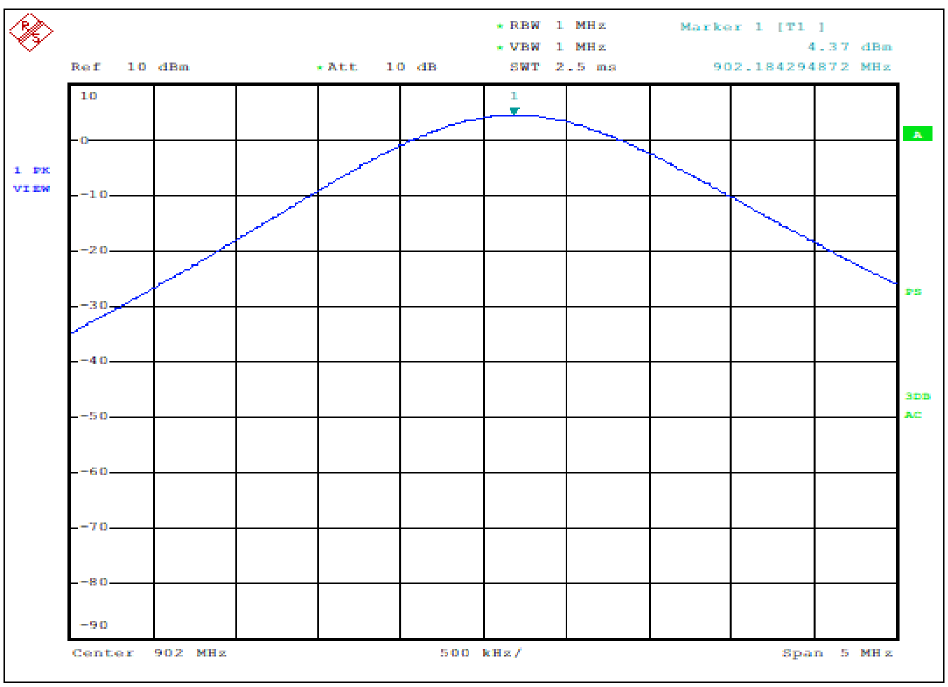
After the receiver reaches the last channel, it starts again from the beginning.

- **Result:** EUT complies.

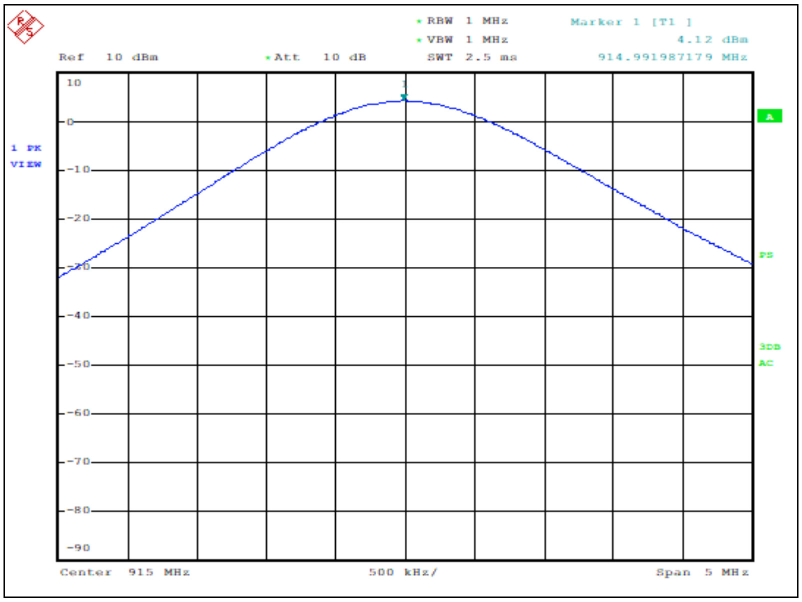
2.7 Conducted RF Output Power

- **Date Performed:** February 26, 2021
- **Requirement:** The maximum peak conducted output power of the intentional radiator shall not exceed the following:
  For frequency hopping systems operating in the 902-928 MHz band: 1 watt (30 dBm) for systems employing at least 50 hopping channels.
- **Test Set-up:** Conducted measurement at antenna port using power meter.
- **Modifications:** EUT configured to transmit at 100% duty cycle at fixed modulated frequency. Integrated antenna removed.
- **Result:** Max. peak conducted output power is < 30 dBm. EUT complies.

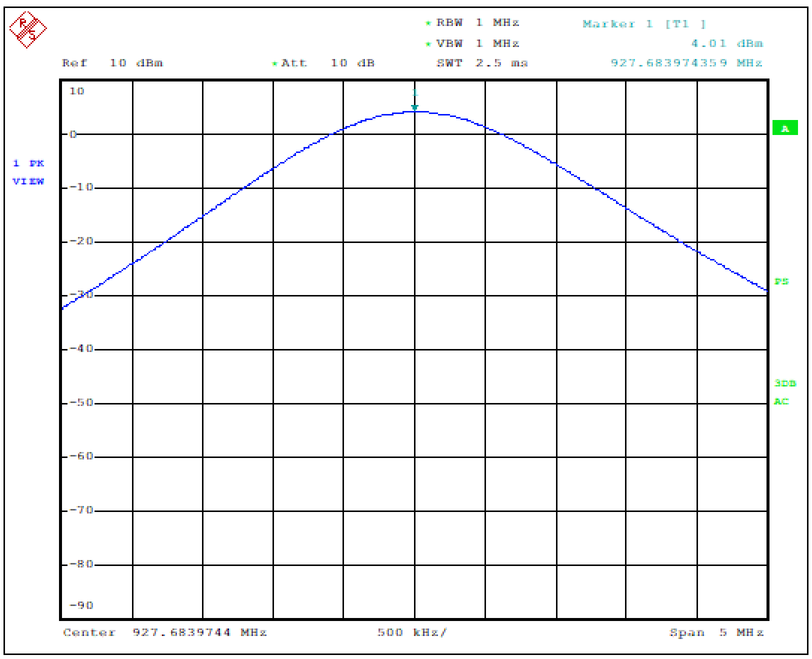
Measurements:



Plot 12: Low Channel



Plot 13: Mid Channel



Plot 14: High Channel

Table 3:Conducted RF Output Power

Frequency MHz	Cable Loss (dB)	Correction Factor (dB)	Raw Data (dBm)	Output Power (dBm)
902.2	0.47	16.47	4.37	20.84
914.9	0.48	16.48	4.12	20.60
927.7	0.55	16.55	4.01	20.56

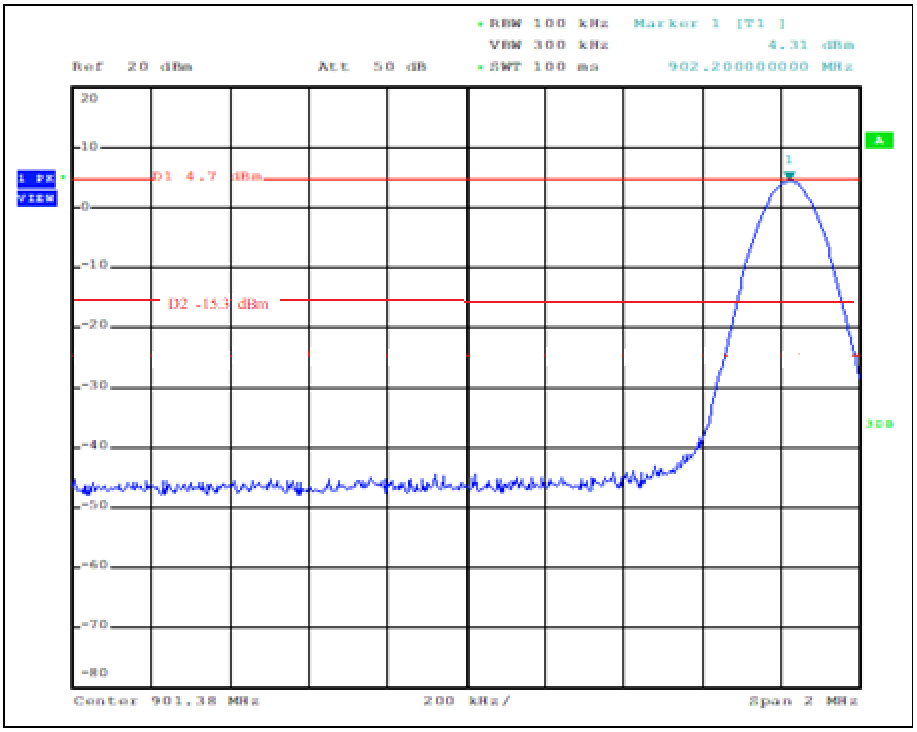
Correction Factor = Attenuation + Cable Loss **Attenuation used = 16dB**

Blue Cable Loss (C583-141-18)	Brown Cable Loss (Eaton)
• 902.2 MHz = 0.15dB	• 902.2 MHz = 0.32 dB
• 915 MHz = 0.14dB	• 915 MHz = 0.34 dB
• 927.7 MHz = 0.19dB	• 927.7 MHz = 0.36 dB

2.8 Out-of-Band Emissions (Band edge)

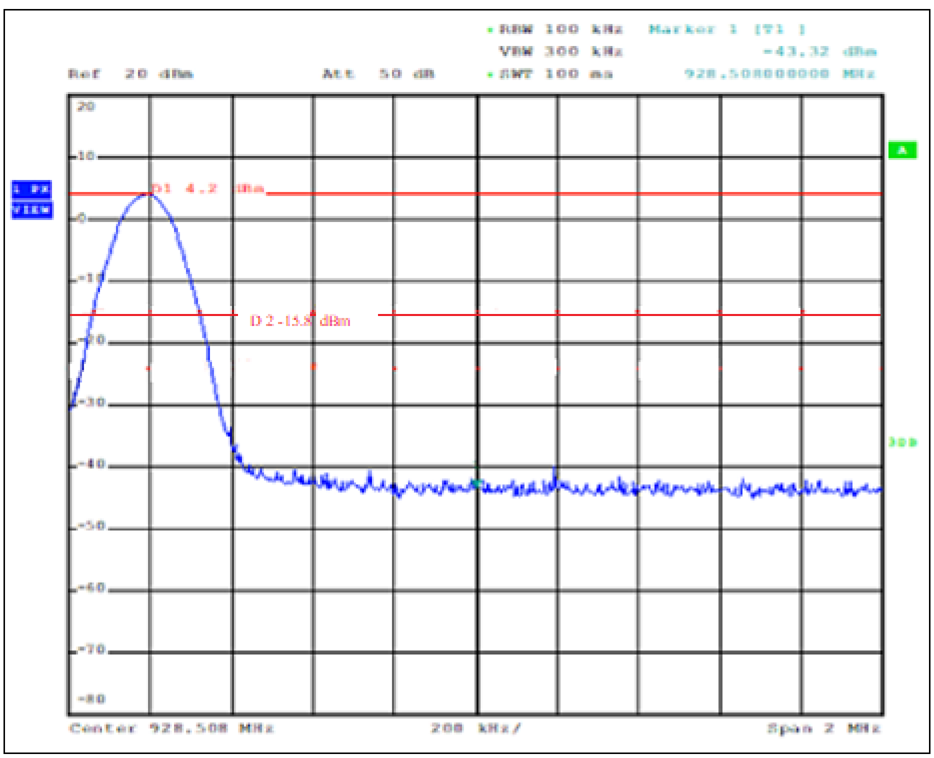
- **Date Performed:** March 6, 2020
- **Requirement:** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.
- **Test Set-up:** Conducted measurement at antenna port using spectrum analyzer.
  Span = 2 MHz, RBW = 100 kHz, VBW = 300 kHz
  Attenuation: 15 dB, trace stabilization time: 3.5 minutes.
- **Modifications:** EUT configured to transmit at 100% duty cycle with integrated antenna removed 1) in hopping mode, and 2) at lowest and highest frequency – modulated.
- **Result:** EUT complies.

Plots:



Plot 15: Low Channel

Note: 20dBc is at -15.3



Plot 16: High Channel

Note: 20dBc is at -15.8

2.9 Radiated Emissions

Test Standards:

Test or Measurement	Applicable Standards	Investigated Spectrum
Radiated Emissions	ICES-003 Issue 6 CFR Title 47 FCC Part 15 Subpart B	The radiated emissions are measured in the 30-1000MHz range or **upto** the highest EUT frequency required by the standard.
	RSS-247-Issue 2, RSS-Gen Issue 5 (8.9) & (8.10) FCC Subpart C §15.205(a), 15.209(a) & 15.247(d) and 15.33(a)(1) & (4)	From the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Required Limits:

1) Radiated emission limits; general requirements – unintentional radiators:

The field strength of radiated emissions from a Class A digital device, as determined at a distance of 3 meters, shall not exceed the following as per §15.109:

Frequency, *f* (MHz)	Maximum Field strength Quasi-peak (dBµV/m at 3 m)
30 – 88	49.50
88 – 216	53.5
216 – 960	56.0
above 960	59.50

Note 1: The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.
Note 2: The emissions limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

2) Radiated emission limits; general requirements – intentional radiators:

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table as per §15.209:

Frequency, *f* (MHz)	Maximum Field strength Quasi-peak (dBµV/m at 3 m)
0.009 – 0.490	2400/F(kHz)
0.490 – 1.705	24000/F(kHz)
1.705 – 30.0	49.5
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

Note 1: The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.
Note 2: The emissions limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Maximum Field Strength (dB mV/m at 3 m)		
Frequency (GHz)	**Peak**	**Average**
1-40	60	80

Note 1: The lower limit shall apply at the transition frequency
Note 2: Additional provisions may be required for cases where interference occurs

3) Restricted bands of operation:

Unwanted emissions that fall into the restricted bands specified on the table below shall comply with the limits specified on the table limits above as per §15.209 and Clause 8.9 of RSS-Gen.

Restricted Bands – RSS Gen Issue 5

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	Certain frequency bands listed in table 2 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138	--	

Restricted Bands – FCC Part

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

Measurement Method:

The EUT was positioned at the edge of the turntable in the 3m SAC with all cables draped down the side, 40 cm off the ground plate. EUT was rotated 360 deg at each antenna height to identify maximum emissions. Emissions were measured in the frequency range of 30 MHz – 12 GHz using the appropriate components and equipment.

Emissions in both horizontal and vertical polarizations were measured. EUT was placed 3 m from the antenna.
30 MHz – 12 GHz: antenna height was varied 1-4 m.

Permutations of test modes listed in the table below was investigated. Only the worst case is reported.

Refer to Section 1.5 of this report for Sample Calculations of Emissions Data.

Modifications:

EUT with integrated antenna configured using firmware to transmit at 100% RF duty cycle in transmission modes above.

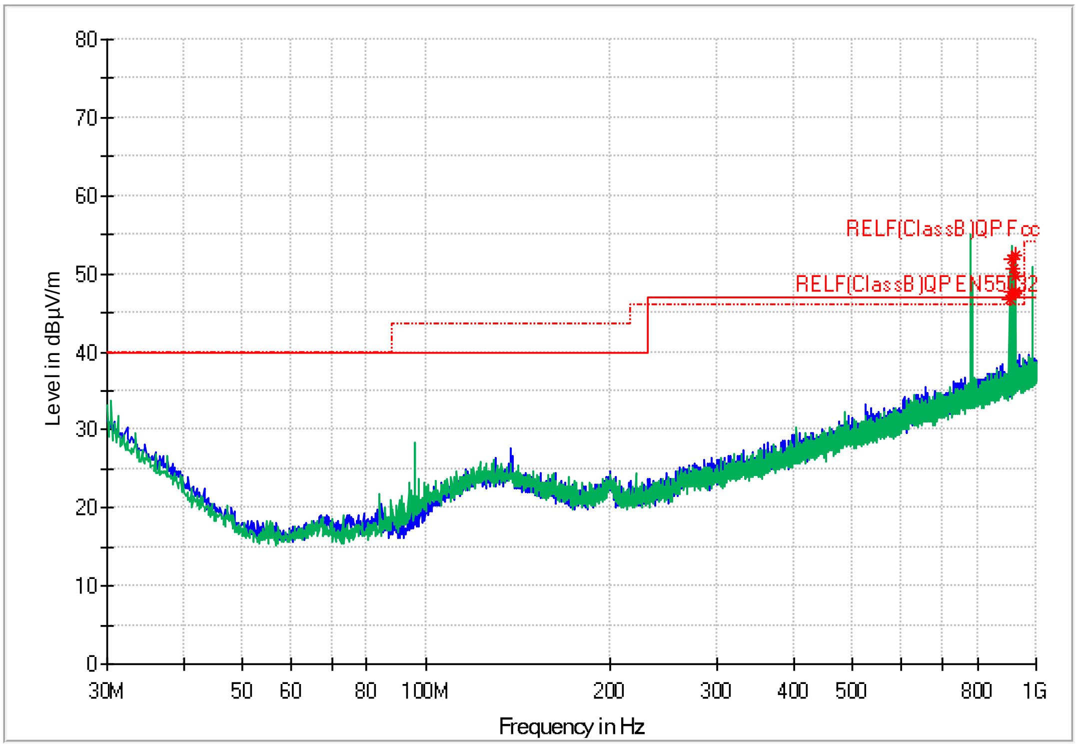
Result: The EUT complies with the applicable standards.

Measurement Data:

Part 1 – Radiated Emissions from 30 MHz to 1 GHz

- **Date performed:** March 3, 2021
- **Antenna** 1

Tx = 902.2 to 927.7MHz – On (Hopping Mode)

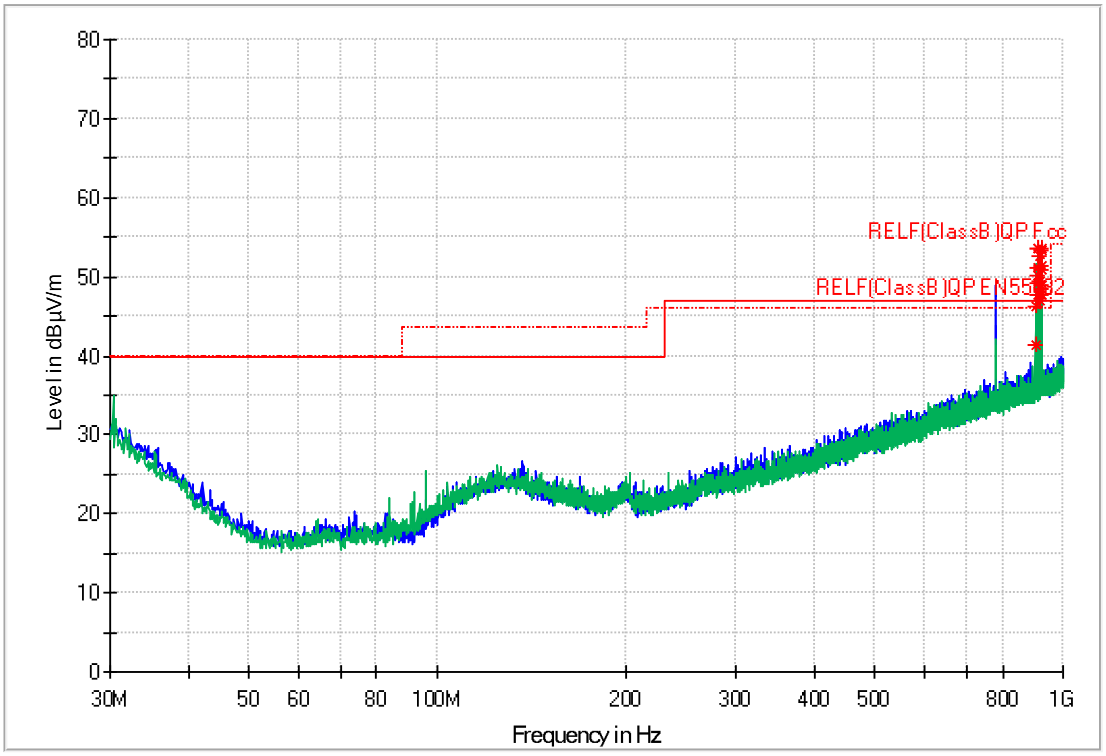


Plot 17: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter was added during testing,
All signals were more than 20dB below the limit except the fundamental frequency

- **Date performed:** March 3, 2021
- **Antenna** 2

Tx = 902.2 to 927.7MHz – On (Hopping Mode)

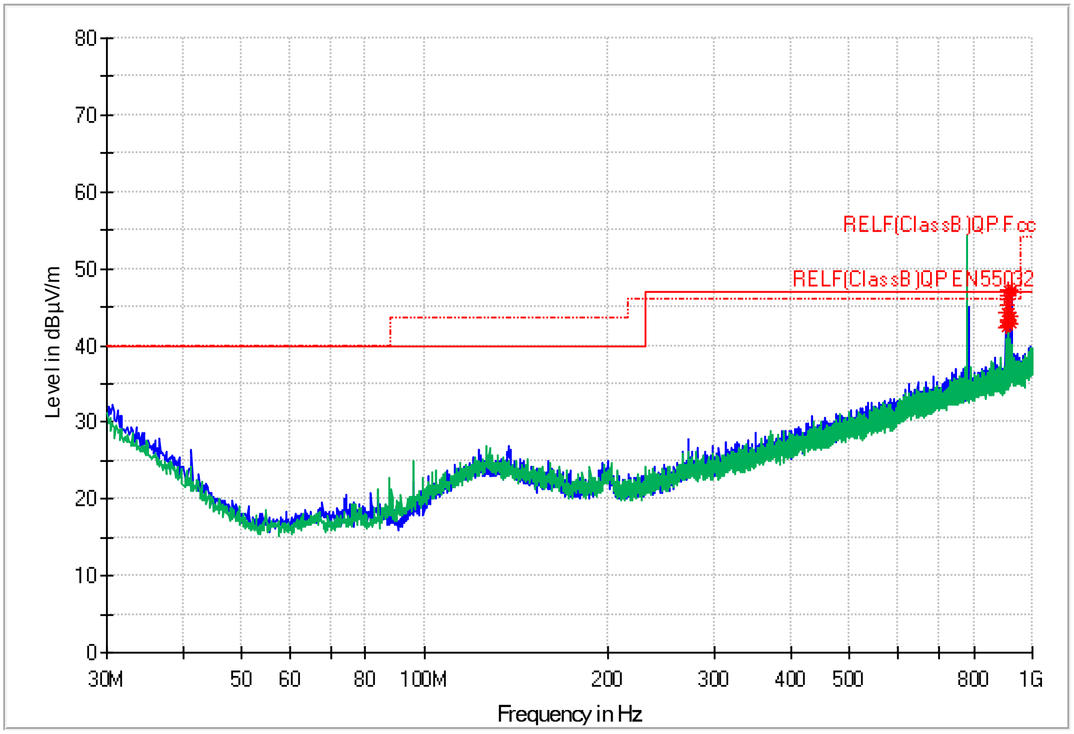


Plot 18: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter was added during testing.
All signals were more than 20dB below the limit except the fundamental frequencies in the hopping mode.

- **Date performed:** March 3, 2021
- **Antenna** 3

Tx = 902.2 to 927.7MHz – On (Hopping Mode)

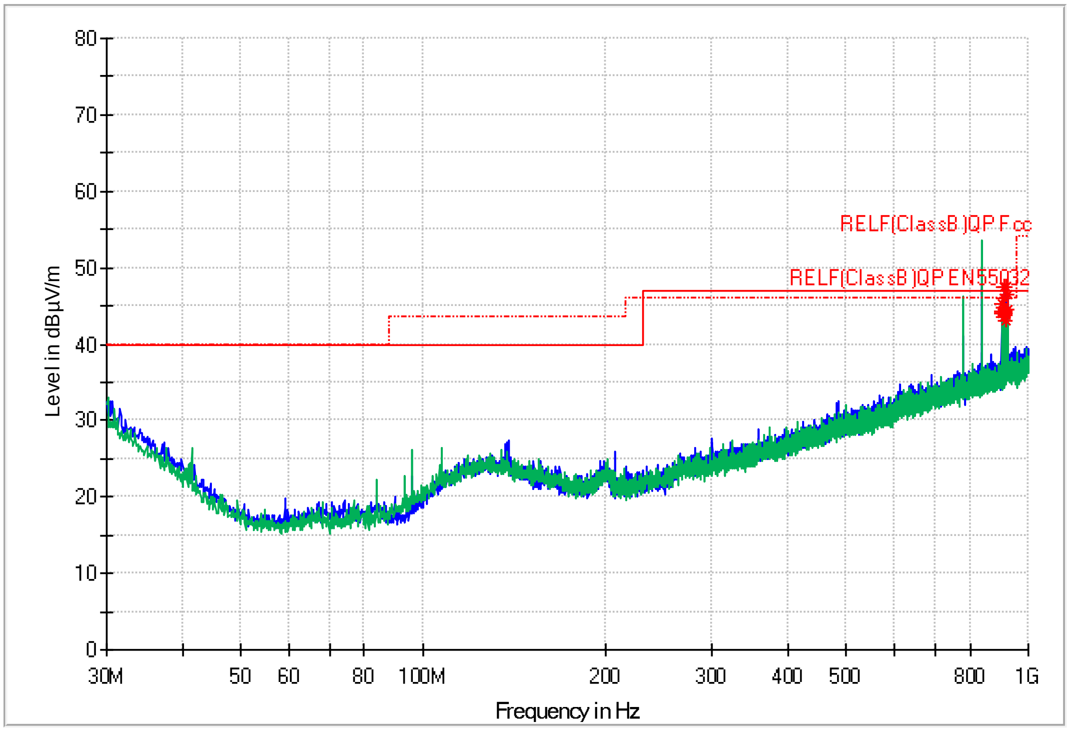


Plot 19: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter was added during testing.
All signals were more than 20dB below the limit except the fundamental frequencies in the hopping mode.

- **Date performed:** March 3, 2021
- **Antenna** 4

Tx = 902.2 to 927.7MHz – On (Hopping Mode)



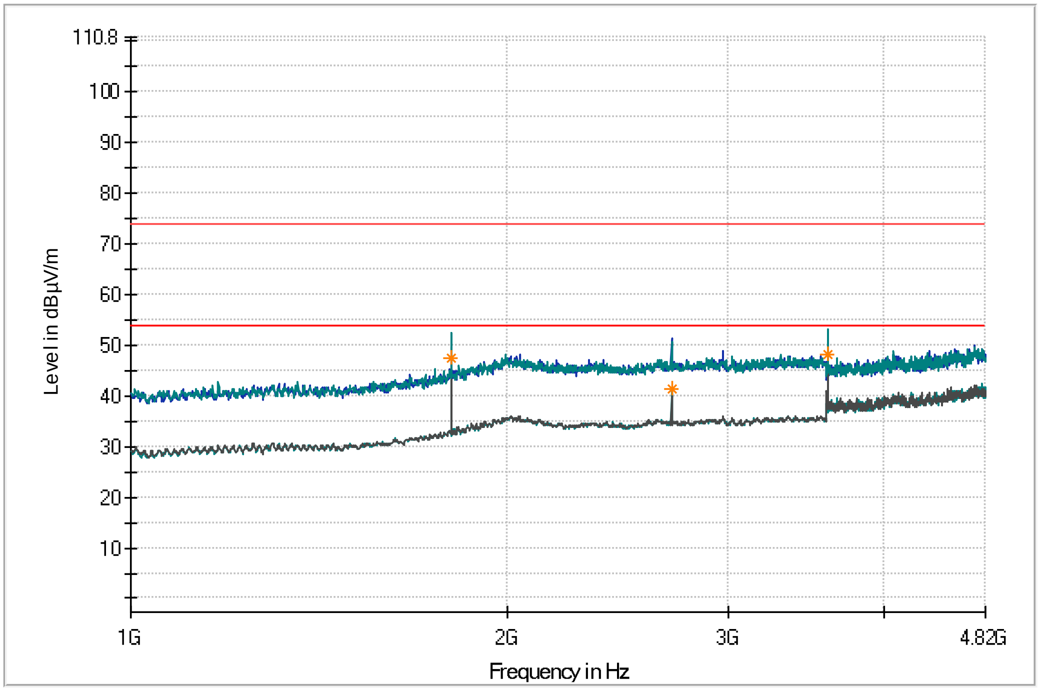
Plot 20: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter was added during testing.
All signals were more than 20dB below the limit except the fundamental frequencies in the hopping mode.

Part 2 – Radiated Emissions above 1GHz

- **Date performed:** March 2, 2021
- **Antenna** 1

Tx = 902.2MHz – On



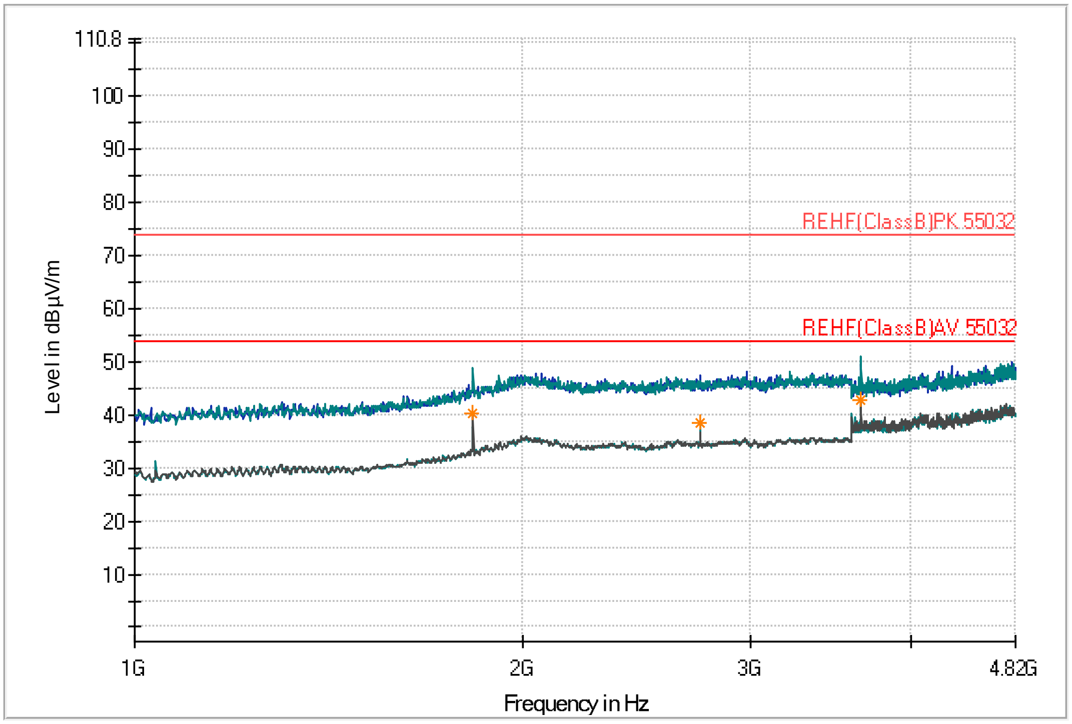
Plot 21: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz

Table 4: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2705.1000	41.40	54.00	12.60	350.0	H	345	-0.2
3607.8000	48.13	54.00	5.87	300.0	V	185	1.2
1804.1000	47.47	54.00	6.53	250.0	V	253	-2.9

Tx = 914.9MHz – On



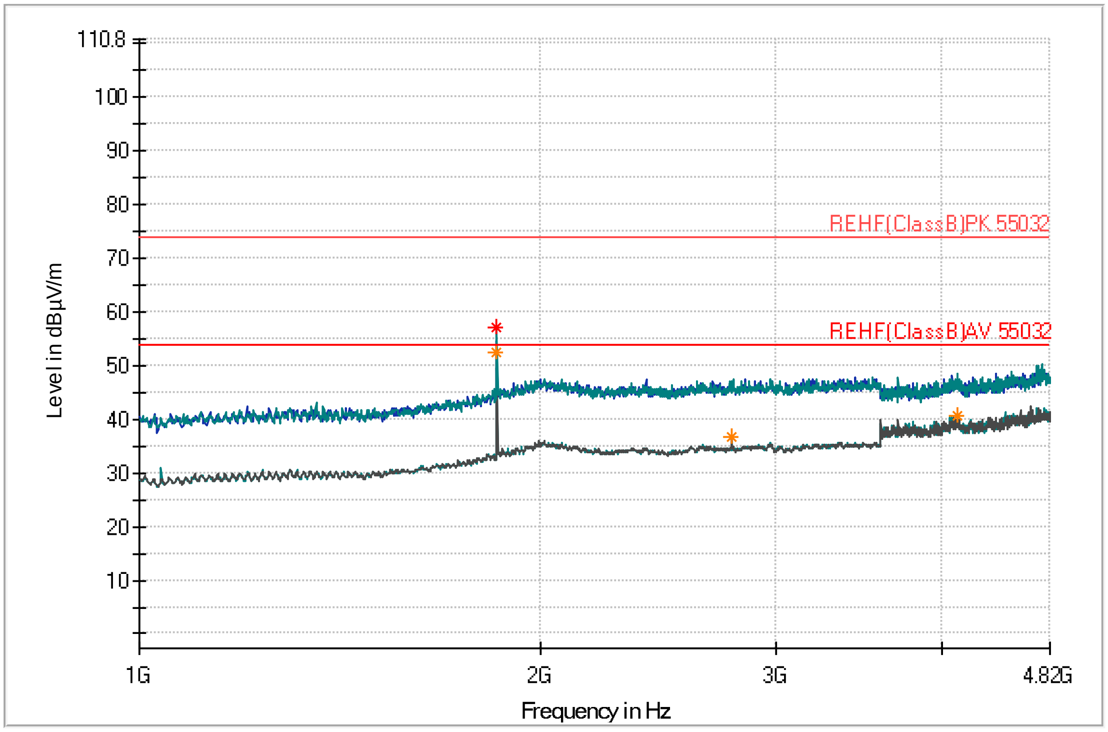
Plot 22: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 5: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2744.2000	38.32	54.00	15.68	300.0	H	348	-0.2
3658.8000	42.86	54.00	11.14	250.0	V	199	1.4
1829.6000	40.13	54.00	13.87	200.0	V	346	-2.5

Tx – 927.7MHz



Plot 23: Radiated Emissions scanned at 3m SAC

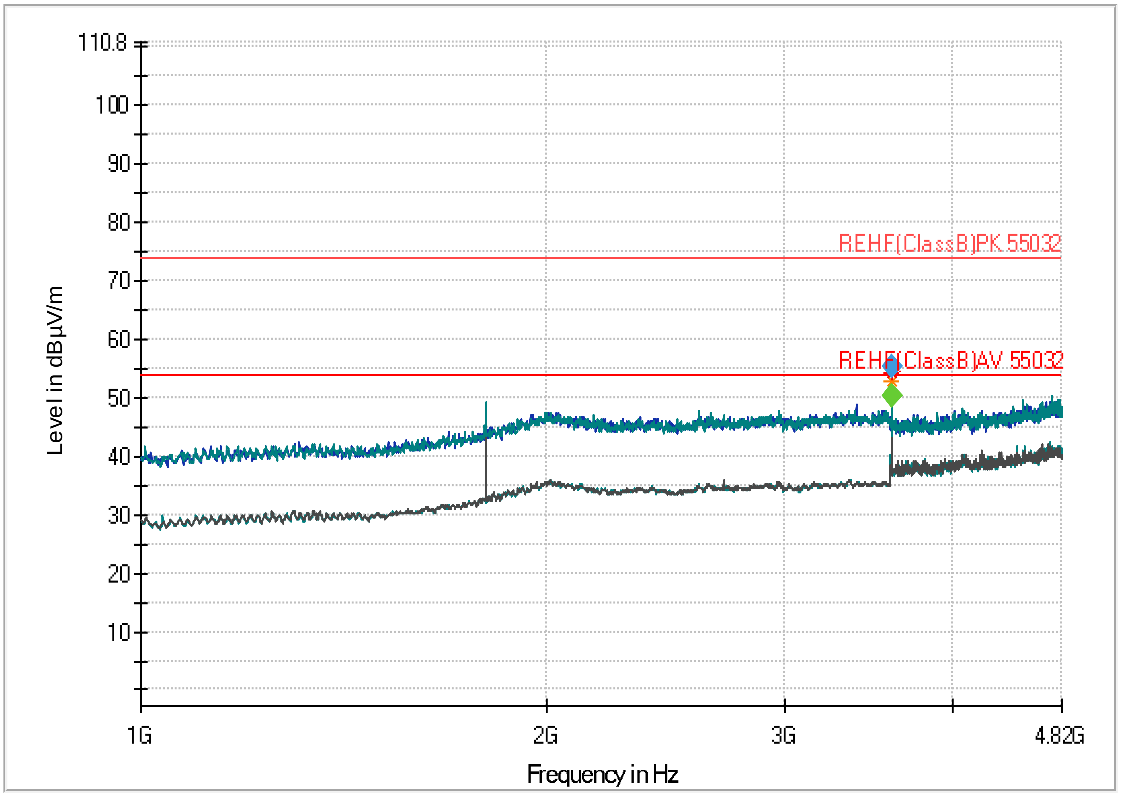
Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 6: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1855.1000	---	50.10	54.00	3.90	250.0	V	0	-2.0
1855.1000	57.12	---	74.00	16.88	250.0	V	0	-2.0
2781.6000	---	36.58	54.00	17.42	250.0	V	0	-0.1

- **Date performed:** March 2, 2021
- **Antenna** 2

Tx = 902.2MHz-On



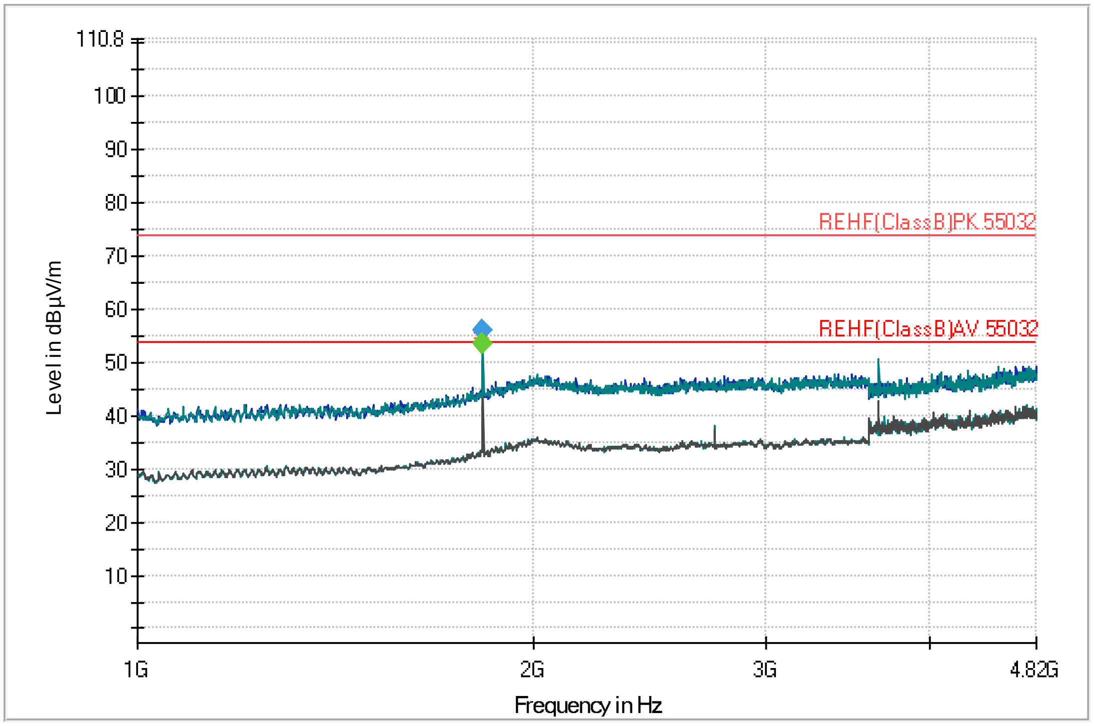
Plot 24: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 7: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1804.1000		43.60	54.00	10.40	150.0	V	0	-2.9
3608.7760	54.06	---	74.00	19.94	300.0	V	215	1.2
3608.8640	---	50.25	54.00	3.75	300.0	V	215	1.2

Tx = 914.9 MHz – On



Plot 25: Radiated Emissions scanned at 3m SAC

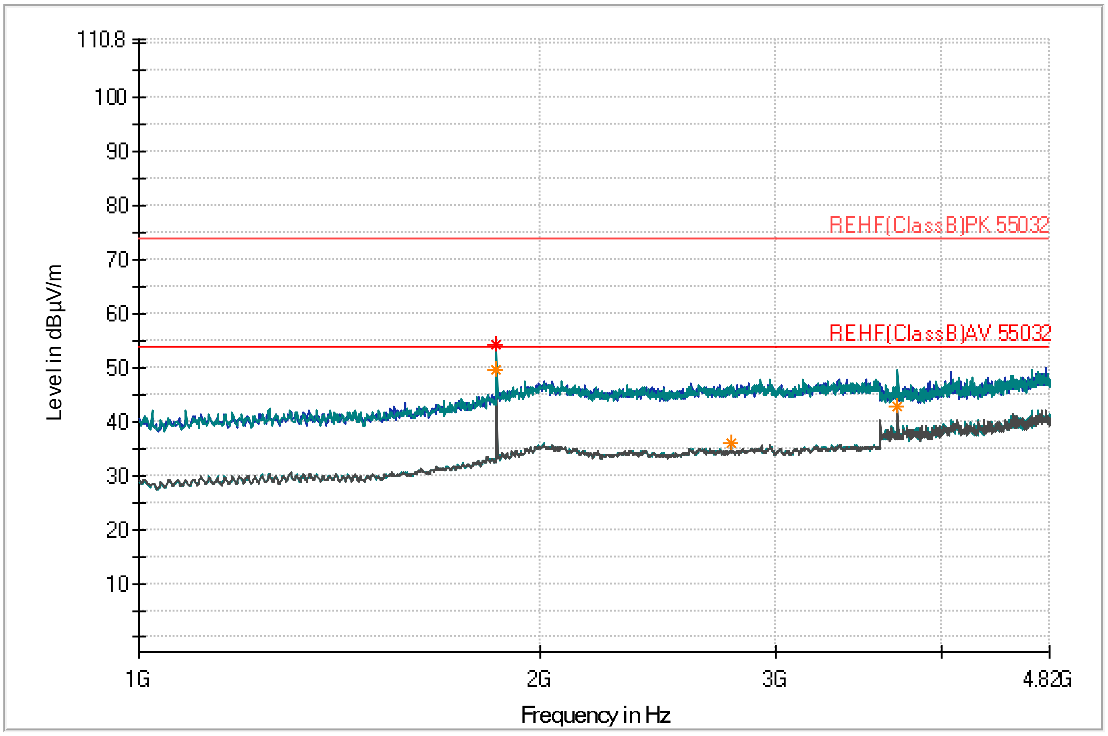
Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 8: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1829.6000	55.39	---	74.00	18.61	100.0	V	0	-2.5
1829.6000	---	48.29	54.00	5.71	100.0	V	0	-2.5
2744.2000	---	37.97	54.00	16.03	300.0	H	340	-0.2
3658.8000	---	42.88	54.00	11.12	250.0	V	193	1.4

Note: 1829.6000 MHz measured manually was 48.29dBuV/m (Avg)

Tx = 927.7MHz – On



Plot 26: Radiated Emissions scanned at 3m SAC

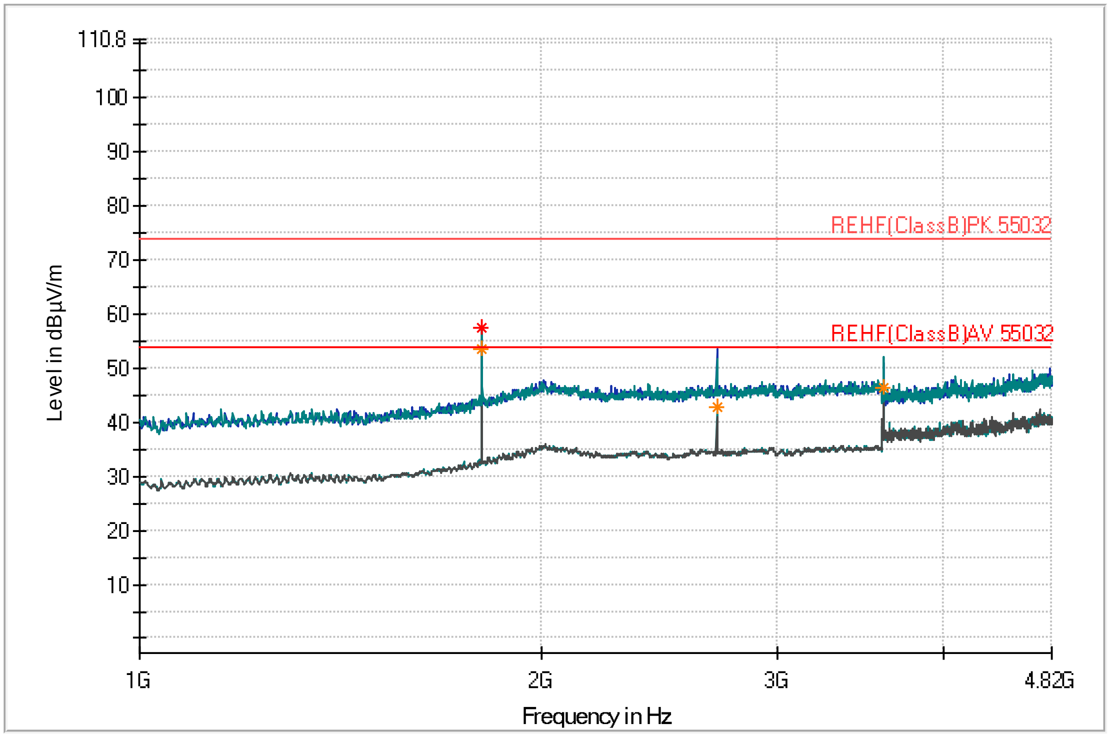
Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 9: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1855.1000	---	49.45	54.00	4.55	100.0	V	36	-2.0
1855.1000	54.15	---	74.00	19.85	100.0	V	36	-2.0
3709.8000	---	42.61	54.00	11.39	300.0	V	227	1.6

- **Date performed**: March 2, 2021
- **Antenna** 3

Tx = 902.2MHz - On



Plot 27: Radiated Emissions scanned at 3m SAC

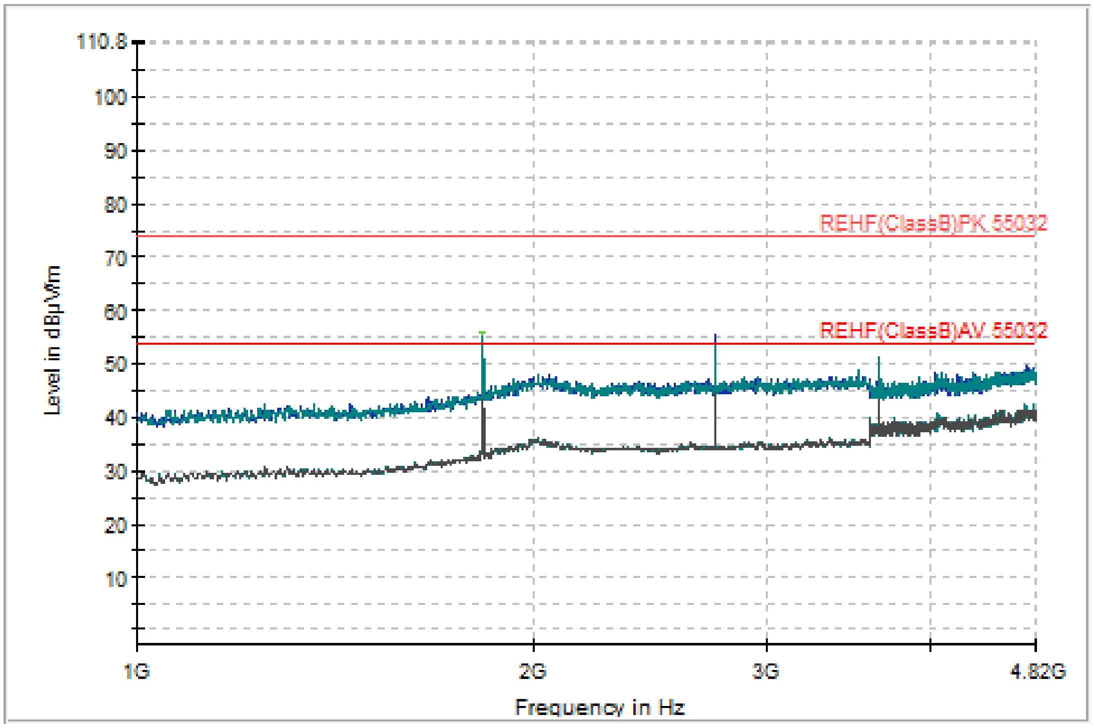
Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 10: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2705.1000	---	42.71	54.00	11.29	400.0	H	60	-0.2
1804.1000	---	50.19	54.00	3.81	300.0	V	0	-2.9
1804.1000	57.49	---	74.00	16.51	300.0	V	0	-2.9
6030.3000	---	43.78	54.00	10.22	100.0	V	55	5.7
3607.8000	---	46.19	54.00	7.81	300.0	V	193	1.2

Note – 1804.100MHz measured manually was 50.19dBuV/m (Avg)

Tx = 914.9MHz – On



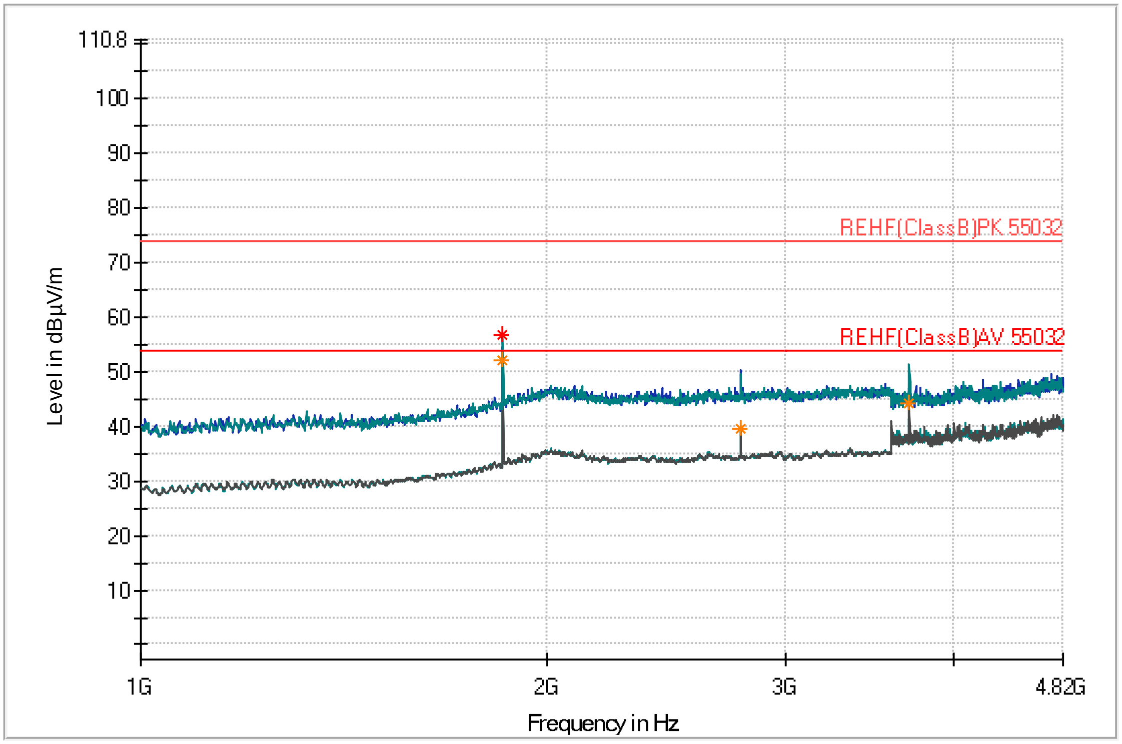
Plot 28: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 11: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2744.2000	---	49.53	54.00	4.47	350.0	H	37	-0.2
2744.2000	55.33	---	74.00	18.67	350.0	H	37	-0.2
1829.6000	---	50.05	54.00	3.95	100.0	V	154	-2.5
1829.6000	57.64	---	74.00	16.36	100.0	V	154	-2.5
3658.8000	---	42.99	54.00	11.01	400.0	V	192	1.4

Tx = 927.7MHz – On



Plot 29: Radiated Emissions scanned at 3m SAC

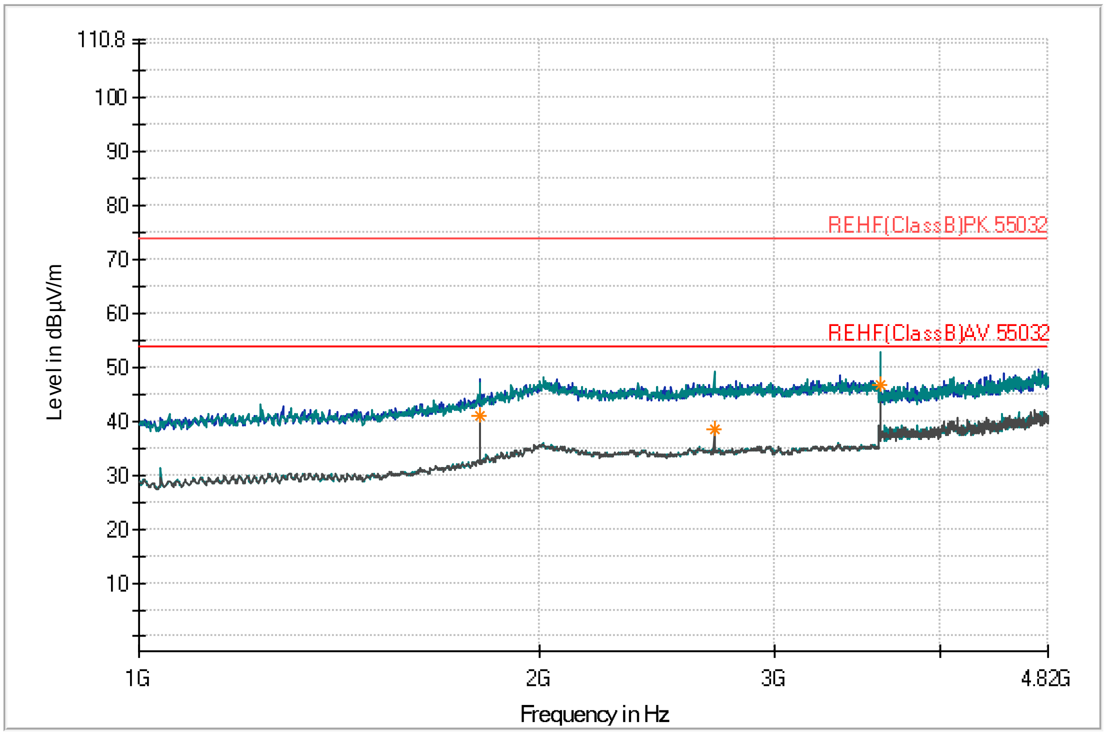
Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 12: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2781.6000	---	39.66	54.00	14.34	350.0	H	39	-0.1
1855.1000	56.63	---	74.00	17.37	150.0	V	138	-2.0
1855.1000	---	51.00	54.00	3.00	150.0	V	138	-2.0
3709.8000	---	44.25	54.00	9.75	100.0	V	327	1.6

- **Date performed:** March 2, 2021
- **Antenna** 4

Tx = 902.2 MHz – On



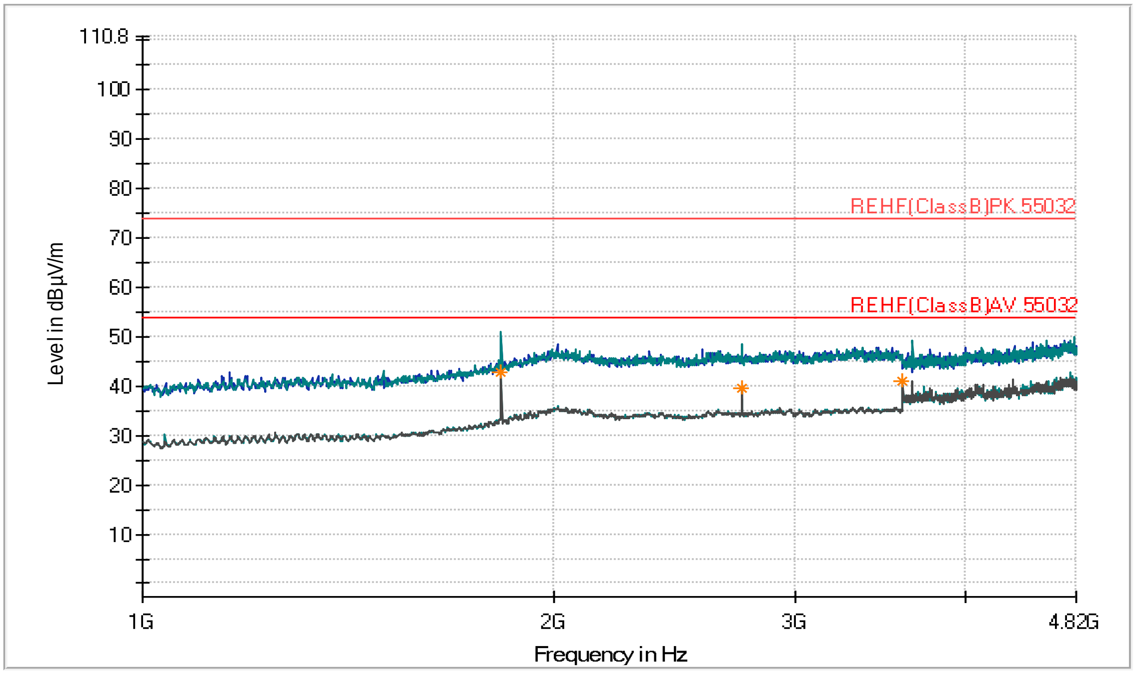
Plot 30: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 13: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1804.1000	---	41.02	54.00	12.98	100.0	H	209	-2.9
2705.1000	---	38.62	54.00	15.38	150.0	V	114	-0.2
3607.8000	---	46.61	54.00	7.40	350.0	V	228	1.2

Tx = 914.9 MHz – On



Plot 31: Radiated Emissions scanned at 3m SAC

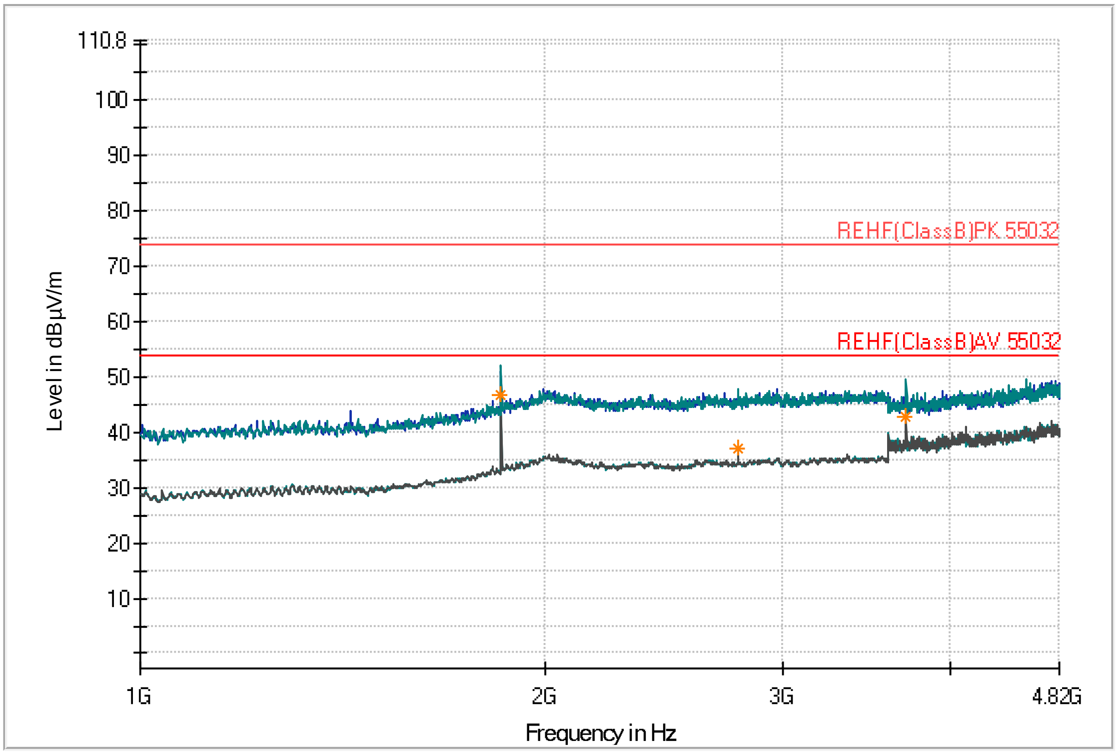
Notes:

- 900MHz Notch Filter added during testing
- No emissions of significance were observed above 4.82GHz.

Table 14: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1829.6000	---	42.75	54.00	11.25	200.0	H	211	-2.5
2744.2000	---	39.49	54.00	14.51	250.0	V	97	-0.2
3599.3000	---	41.09	54.00	12.91	150.0	V	80	1.2

Tx = 927.7MHz – On



Plot 32: Radiated Emissions scanned at 3m SAC

Notes: 900MHz Notch Filter added during testing
No emissions of significance were observed above 4.82GHz.

Table 15: Max-Average Data of Radiated Emissions measured at 3m–FCC /ISED Class B Limit

Frequency (MHz)	Max Peak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3709.8000	---	42.81	54.00	11.19	250.0	V	0	1.6
2781.6000	---	36.93	54.00	17.07	250.0	V	98	-0.1
1855.1000	---	46.87	54.00	7.13	200.0	V	103	-2.0

2.10 Radiated Emissions – Receiver Mode

- **Date Performed:** March 3, 2021
- **Test Standard:** FCC Title 47 CFR Part 15: Subpart B - §15.109
  ICES-003 Issue 6
- **Test Method:** ANSI C63.4-2014
- **Modifications:** EUT with integrated antenna was set in receive mode.
- **Result:** EUT complies with the applicable standard.

Required Limit:

The field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency, *f* (MHz)	**Maximum Field strength Quasi-peak (dBμV/m at 3 m)**
30 – 88	49.50
88 – 216	53.5
216 – 960	56.0
above 960	59.50
Note 1: The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges. **Note 2:** The emissions limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.	

Receiver mode – no significant emissions were observed.

2.11 Conducted Emissions – AC Mains

- **Date Performed:** March 3, 2021
- **Test Standard:** FCC Title 47 CFR Part 15: Subpart B - §15.107
  FCC Title 47 CFR Part 15: Subpart B - §15.207
  RSS-Gen Issue 4 Clause 8.8
- **Test Method:** ANSI C63.4-2014
- **Modifications:** No modification was required to comply for this test.
- **Result:** EUT complies with the applicable standard.

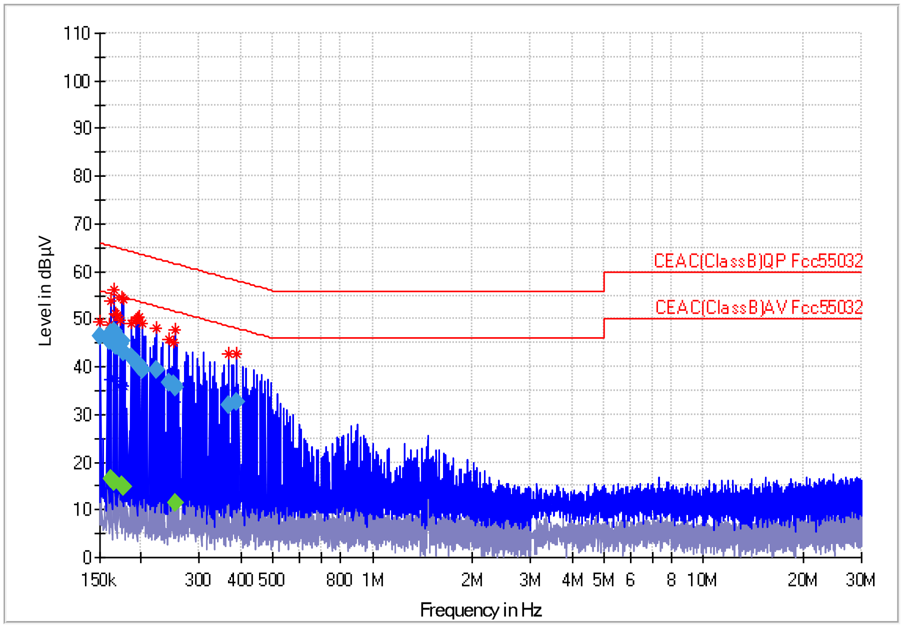
Required Limit:

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the following limits.

Frequency, *f* **(MHz)**	**Conducted Limits** **(dBµV/m)**
0.15 – 0.50	56 to 46
0.50 – 5.0	46
5.0 – 30.0	50
Note 1: The lower limit shall apply at the transition frequencies.	

Measurement Data: **Part 1 – Conducted Emissions from 150 kHz to 30 MHz**

- Test Voltage Used: 120VAC/60Hz **Line 1**
- Frequency Range: 150 kHz to 30 MHz
- Antenna 1



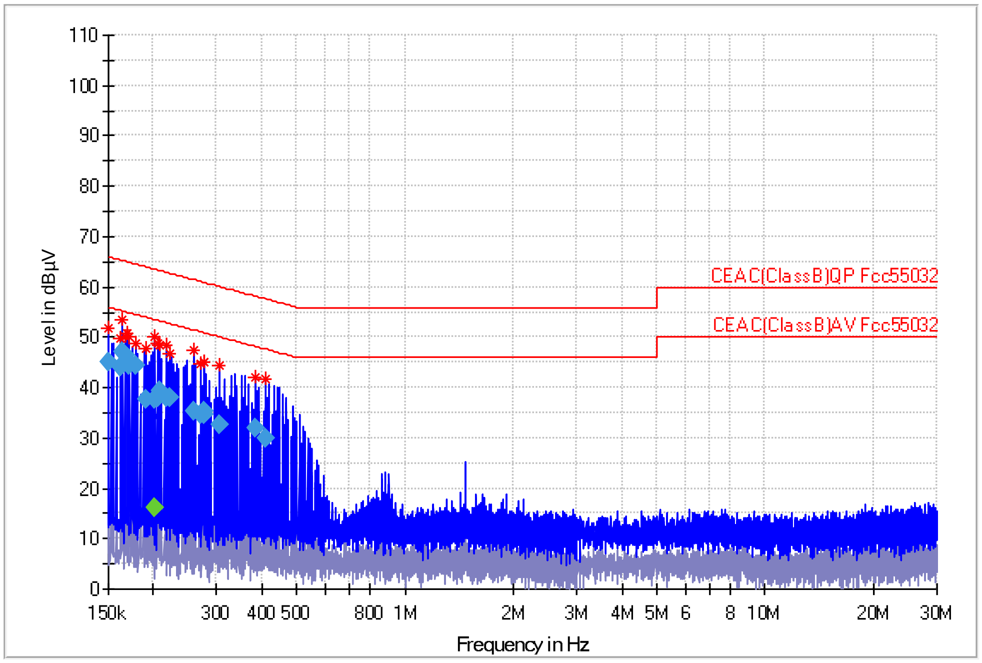
Plot 33: Conducted Emissions–Line 1

Note: No emissions of significance were observed

Table 16: Quasi-Peak and Average Data of Conducted Emissions–Class B Limit–Line 1

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	PE
0.1508	46.5	---	66.0	19.4	1000	9.000	GND
0.1600	45.5	---	65.5	19.9	1000	9.000	GND
0.1624	---	16.4	55.3	38.9	1000	9.000	GND
0.1624	46.9	---	65.3	18.4	1000	9.000	GND
0.1648	---	15.7	55.2	39.5	1000	9.000	GND
0.1648	47.5	---	65.2	17.7	1000	9.000	GND
0.1672	44.5	---	65.1	20.5	1000	9.000	GND
0.1696	44.6	---	65.0	20.4	1000	9.000	GND
0.1720	44.6	---	64.9	20.2	1000	9.000	GND
0.1744	---	15.1	54.7	39.6	1000	9.000	GND
0.1744	45.5	---	64.7	19.3	1000	9.000	GND
0.1768	43.0	---	64.6	21.6	1000	9.000	GND
0.1768	---	14.7	54.6	40.0	1000	9.000	GND
0.1860	42.0	---	64.2	22.2	1000	9.000	GND
0.1932	40.9	---	63.9	23.0	1000	9.000	GND
0.1956	40.7	---	63.8	23.1	1000	9.000	GND
0.1980	39.9	---	63.7	23.8	1000	9.000	GND
0.2004	39.4	---	63.6	24.2	1000	9.000	GND
0.2216	39.3	---	62.8	23.5	1000	9.000	GND
0.2428	36.5	---	62.0	25.5	1000	9.000	GND
0.2500	36.2	---	61.8	25.5	1000	9.000	GND
0.2524	---	11.5	51.7	40.2	1000	9.000	GND
0.2524	35.8	---	61.7	25.9	1000	9.000	GND
0.3660	32.0	---	58.6	26.6	1000	9.000	GND
0.3896	32.8	---	58.1	25.3	1000	9.000	GND

- Test Voltage Used: 120VAC/60Hz **Line 2**
- Frequency Range: 150 kHz to 30 MHz
- Antenna 1

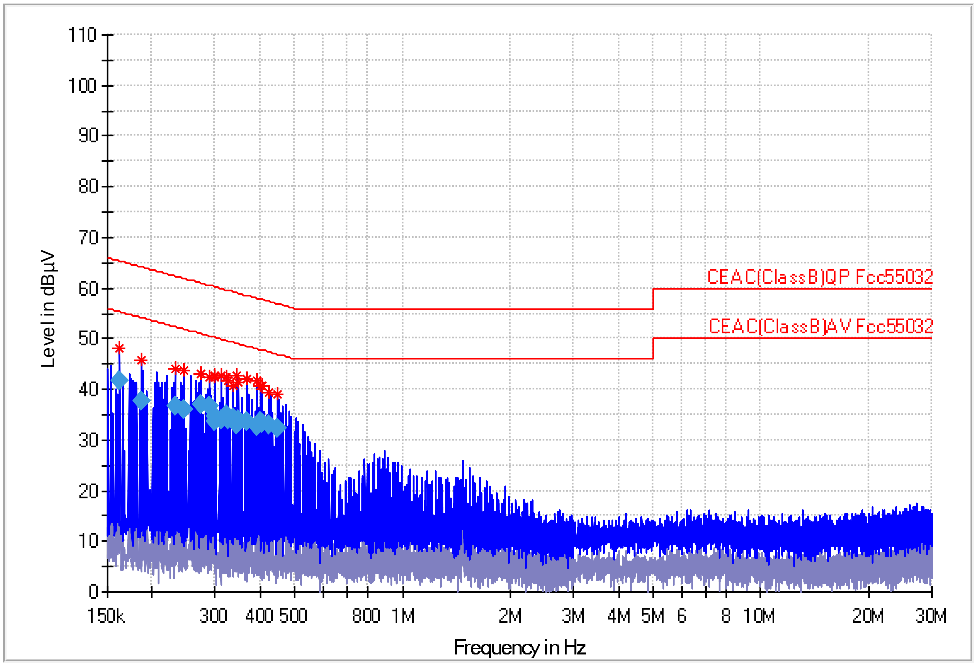


Plot 34: Conducted Emissions–Line 2

Table 17: Quasi-Peak and Average Data of Conducted Emissions–Class B Limit–Line 2

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	PE
0.1504	45.0	---	66.0	21.0	1000	9.000	GND
0.1620	44.0	---	65.4	21.4	1000	9.000	GND
0.1644	47.1	---	65.2	18.2	1000	9.000	GND
0.1668	46.3	---	65.1	18.8	1000	9.000	GND
0.1692	45.4	---	65.0	19.6	1000	9.000	GND
0.1716	44.4	---	64.9	20.5	1000	9.000	GND
0.1788	44.4	---	64.5	20.2	1000	9.000	GND
0.1904	37.8	---	64.0	26.2	1000	9.000	GND
0.2024	37.7	---	63.5	25.8	1000	9.000	GND
0.2024	---	16.1	53.5	37.5	1000	9.000	GND
0.2048	38.1	---	63.4	25.4	1000	9.000	GND
0.2072	39.4	---	63.3	23.9	1000	9.000	GND
0.2164	38.1	---	63.0	24.8	1000	9.000	GND
0.2212	38.2	---	62.8	24.6	1000	9.000	GND
0.2592	35.4	---	61.5	26.0	1000	9.000	GND
0.2708	34.7	---	61.1	26.4	1000	9.000	GND
0.2756	35.2	---	60.9	25.7	1000	9.000	GND
0.2780	34.8	---	60.9	26.1	1000	9.000	GND
0.3040	32.5	---	60.1	27.6	1000	9.000	GND
0.3844	32.0	---	58.2	26.2	1000	9.000	GND
0.4080	30.0	---	57.7	27.7	1000	9.000	GND

- Test Voltage Used: 120VAC/60Hz **Line 1**
- Frequency Range: 150 kHz to 30 MHz
- Antenna 2

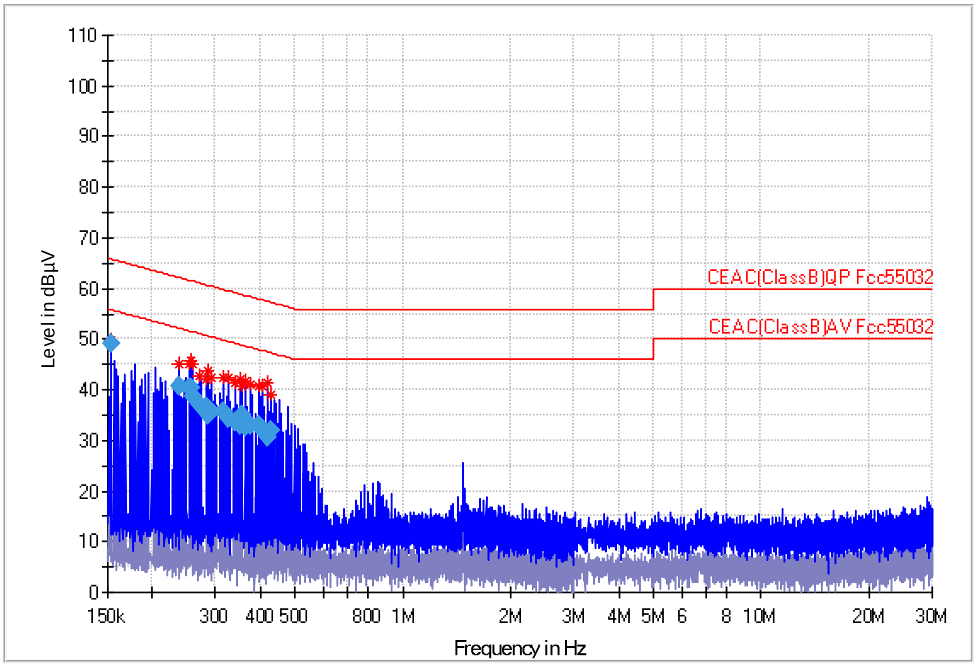


Plot 35: Conducted Emissions–Line 1

Table 18: Quasi-Peak and Average Data of Conducted Emissions–Class B Limit–Line 1

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	PE
0.1628	41.6	---	65.3	23.7	1000	9.000	GND
0.1864	37.7	---	64.2	26.5	1000	9.000	GND
0.2312	36.5	---	62.4	25.9	1000	9.000	GND
0.2456	35.9	---	61.9	26.1	1000	9.000	GND
0.2740	37.0	---	61.0	24.0	1000	9.000	GND
0.2880	36.8	---	60.6	23.8	1000	9.000	GND
0.2976	33.8	---	60.3	26.5	1000	9.000	GND
0.3000	34.7	---	60.2	25.6	1000	9.000	GND
0.3116	34.0	---	59.9	25.9	1000	9.000	GND
0.3212	35.0	---	59.7	24.6	1000	9.000	GND
0.3260	33.9	---	59.6	25.7	1000	9.000	GND
0.3352	34.2	---	59.3	25.2	1000	9.000	GND
0.3448	33.0	---	59.1	26.1	1000	9.000	GND
0.3496	34.1	---	59.0	24.8	1000	9.000	GND
0.3684	33.6	---	58.5	25.0	1000	9.000	GND
0.3920	32.7	---	58.0	25.3	1000	9.000	GND
0.4016	33.6	---	57.8	24.2	1000	9.000	GND
0.4064	33.4	---	57.7	24.4	1000	9.000	GND
0.4252	33.1	---	57.3	24.3	1000	9.000	GND
0.4488	32.3	---	56.9	24.6	1000	9.000	GND

- Test Voltage Used: 120VAC/60Hz **Line 2**
- Frequency Range: 150 kHz to 30 MHz
- Antenna 2

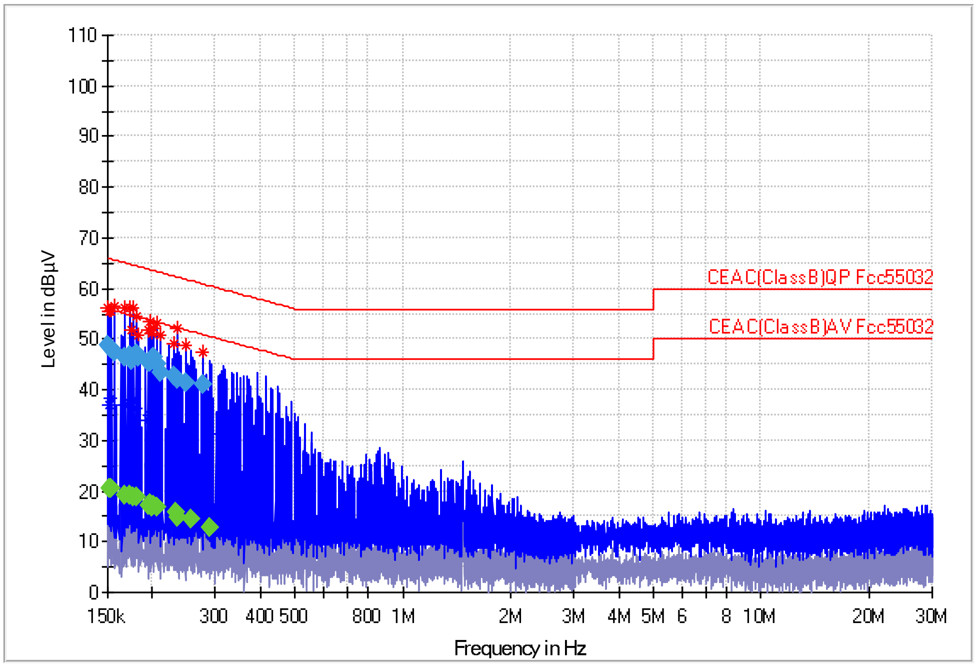


Plot 36: Conducted Emissions–Line 2

Table 19: Quasi-Peak and Average Data of Conducted Emissions–Class B Limit–Line 2

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	PE
0.1536	49.0	---	65.8	16.8	1000	9.000	GND
0.2364	40.9	---	62.2	21.4	1000	9.000	GND
0.2528	40.3	---	61.7	21.4	1000	9.000	GND
0.2552	40.3	---	61.6	21.3	1000	9.000	GND
0.2600	38.8	---	61.4	22.6	1000	9.000	GND
0.2696	37.1	---	61.1	24.0	1000	9.000	GND
0.2836	36.8	---	60.7	23.9	1000	9.000	GND
0.2860	34.9	---	60.6	25.7	1000	9.000	GND
0.2932	35.6	---	60.4	24.8	1000	9.000	GND
0.3168	35.7	---	59.8	24.1	1000	9.000	GND
0.3264	34.4	---	59.5	25.1	1000	9.000	GND
0.3404	33.6	---	59.2	25.6	1000	9.000	GND
0.3500	33.1	---	59.0	25.9	1000	9.000	GND
0.3548	35.0	---	58.8	23.8	1000	9.000	GND
0.3640	32.6	---	58.6	26.0	1000	9.000	GND
0.3736	33.0	---	58.4	25.4	1000	9.000	GND
0.3972	33.0	---	57.9	24.9	1000	9.000	GND
0.4068	32.0	---	57.7	25.7	1000	9.000	GND
0.4208	30.6	---	57.4	26.8	1000	9.000	GND
0.4304	32.0	---	57.2	25.2	1000	9.000	GND

- Test Voltage Used: 120VAC/60Hz **Line 1**
- Frequency Range: 150 kHz to 30 MHz
- Antenna 3

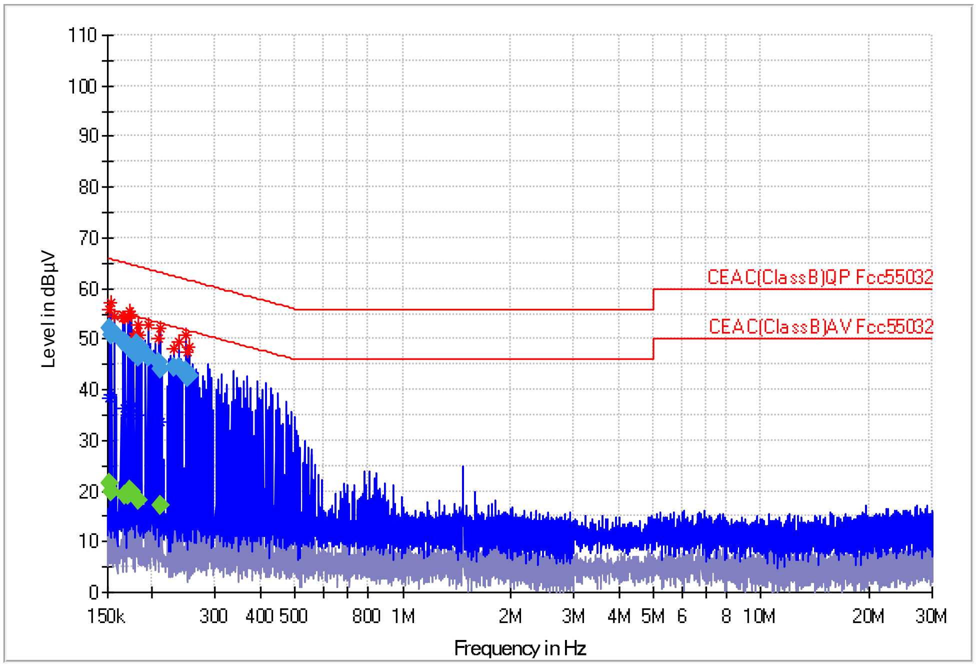


Plot 37: Conducted Emissions–Line 1

Table 20: Quasi-Peak and Average Data of Conducted Emissions–Class B Limit–Line 1

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	PE
0.1500	48.6	---	66.0	17.4	1000	9.000	GND
0.1516	48.4	---	65.9	17.5	1000	9.000	GND
0.1516	---	20.5	55.9	35.4	1000	9.000	GND
0.1540	48.1	---	65.8	17.7	1000	9.000	GND
0.1540	---	20.5	55.8	35.3	1000	9.000	GND
0.1564	47.5	---	65.7	18.1	1000	9.000	GND
0.1680	46.4	---	65.1	18.7	1000	9.000	GND
0.1680	---	19.2	55.1	35.9	1000	9.000	GND
0.1728	46.6	---	64.8	18.2	1000	9.000	GND
0.1728	---	19.2	54.8	35.7	1000	9.000	GND
0.1752	45.8	---	64.7	18.9	1000	9.000	GND
0.1776	---	18.8	54.6	35.8	1000	9.000	GND
0.1776	46.4	---	64.6	18.2	1000	9.000	GND
0.1800	47.1	---	64.5	17.4	1000	9.000	GND
0.1800	---	18.7	54.5	35.8	1000	9.000	GND
0.1824	46.5	---	64.4	17.9	1000	9.000	GND
0.1940	45.5	---	63.9	18.4	1000	9.000	GND
0.1940	---	17.3	53.9	36.6	1000	9.000	GND
0.1964	---	17.5	53.8	36.2	1000	9.000	GND
0.1964	45.3	---	63.8	18.5	1000	9.000	GND
0.1988	---	16.9	53.7	36.8	1000	9.000	GND
0.1988	45.9	---	63.7	17.7	1000	9.000	GND
0.2012	46.3	---	63.6	17.3	1000	9.000	GND
0.2012	---	17.2	53.6	36.3	1000	9.000	GND
0.2060	---	16.7	53.4	36.7	1000	9.000	GND
0.2060	44.9	---	63.4	18.4	1000	9.000	GND
0.2108	43.4	---	63.2	19.7	1000	9.000	GND
0.2296	42.7	---	62.5	19.8	1000	9.000	GND
0.2320	---	15.7	52.4	36.7	1000	9.000	GND
0.2344	41.9	---	62.3	20.4	1000	9.000	GND
0.2344	---	14.8	52.3	37.5	1000	9.000	GND
0.2484	41.3	---	61.8	20.6	1000	9.000	GND
0.2556	---	14.3	51.6	37.2	1000	9.000	GND
0.2768	41.2	---	60.9	19.8	1000	9.000	GND
0.2888	---	12.8	50.6	37.7	1000	9.000	GND

- Test Voltage Used: 120VAC/60Hz **Line 2**
- Frequency Range: 150 kHz to 30 MHz
- Antenna 3



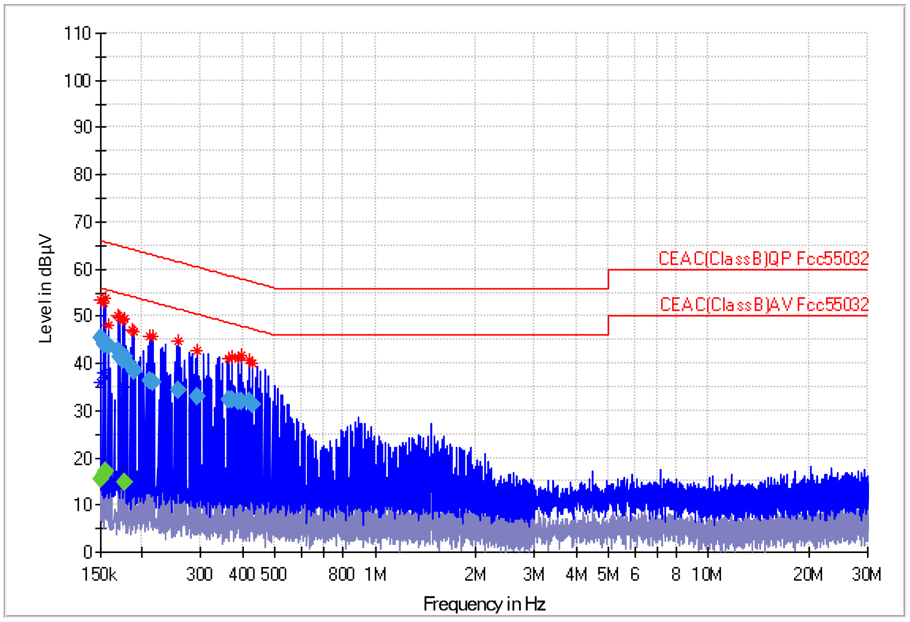
Plot 38: Conducted Emissions–Line 2

Table 21: Quasi-Peak and Average Data of Conducted Emissions–Class B Limit–Line 2

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	PE
0.1516	---	21.4	55.9	34.5	1000	9.000	GND
0.1516	52.0	---	65.9	13.9	1000	9.000	GND
0.1540	---	19.7	55.8	36.1	1000	9.000	GND
0.1540	50.9	---	65.8	14.9	1000	9.000	GND
0.1564	51.3	---	65.7	14.4	1000	9.000	GND
0.1656	49.4	---	65.2	15.8	1000	9.000	GND
0.1680	---	19.3	55.1	35.7	1000	9.000	GND
0.1680	49.4	---	65.1	15.7	1000	9.000	GND
0.1704	48.8	---	64.9	16.1	1000	9.000	GND
0.1704	---	19.1	54.9	35.8	1000	9.000	GND
0.1728	48.2	---	64.8	16.6	1000	9.000	GND
0.1728	---	20.2	54.8	34.6	1000	9.000	GND
0.1752	---	20.0	54.7	34.8	1000	9.000	GND
0.1752	48.1	---	64.7	16.6	1000	9.000	GND
0.1776	47.3	---	64.6	17.3	1000	9.000	GND
0.1800	49.2	---	64.5	15.3	1000	9.000	GND
0.1824	46.3	---	64.4	18.1	1000	9.000	GND
0.1824	---	18.2	54.4	36.1	1000	9.000	GND
0.1848	48.3	---	64.3	15.9	1000	9.000	GND
0.1940	46.5	---	63.9	17.4	1000	9.000	GND
0.2084	45.5	---	63.3	17.7	1000	9.000	GND
0.2108	44.0	---	63.2	19.2	1000	9.000	GND
0.2108	---	17.1	53.2	36.1	1000	9.000	GND
0.2296	44.3	---	62.5	18.2	1000	9.000	GND
0.2368	44.5	---	62.2	17.7	1000	9.000	GND
0.2484	43.6	---	61.8	18.2	1000	9.000	GND
0.2508	42.5	---	61.7	19.3	1000	9.000	GND
0.2532	42.8	---	61.7	18.8	1000	9.000	GND

- Test Voltage Used: 120VAC/60Hz **Line 1**
- Frequency Range: 150 kHz to 30 MHz
- Antenna 4

Tx = 902.2 to 927.7MHz – On (Hopping Mode)

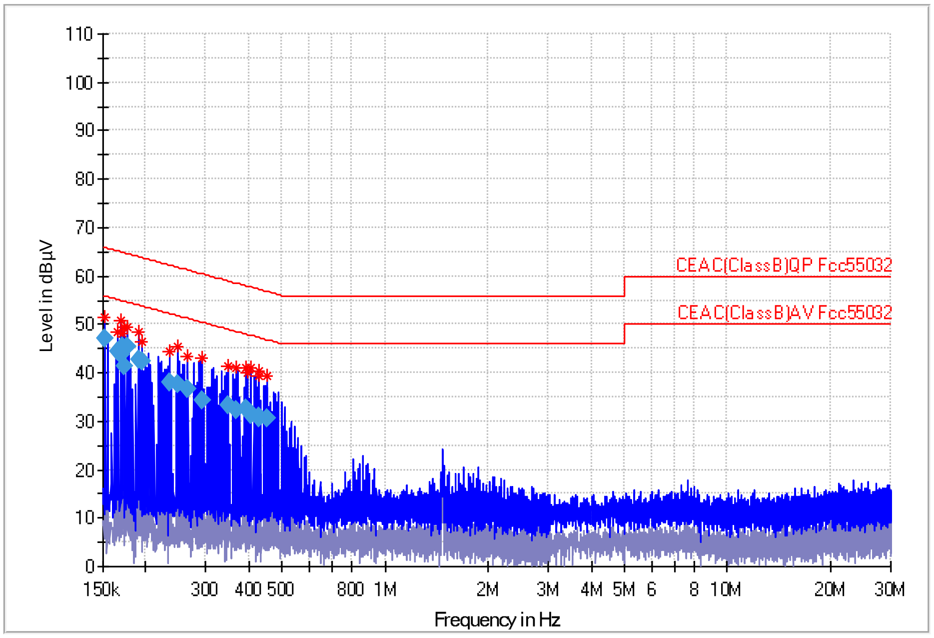


Plot 39: Conducted Emissions–Line 1

Table 22: Quasi-Peak and Average Data of Conducted Emissions–Class B Limit–Line 1

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	PE
0.1504	45.4	---	66.0	20.6	1000	9.000	GND
0.1504	---	15.5	56.0	40.5	1000	9.000	GND
0.1528	44.2	---	65.8	21.7	1000	9.000	GND
0.1528	---	16.3	55.8	39.5	1000	9.000	GND
0.1552	44.0	---	65.7	21.7	1000	9.000	GND
0.1552	---	17.0	55.7	38.7	1000	9.000	GND
0.1576	43.7	---	65.6	21.9	1000	9.000	GND
0.1692	42.8	---	65.0	22.2	1000	9.000	GND
0.1716	41.3	---	64.9	23.6	1000	9.000	GND
0.1740	40.8	---	64.8	24.0	1000	9.000	GND
0.1764	41.4	---	64.7	23.2	1000	9.000	GND
0.1764	---	14.8	54.7	39.9	1000	9.000	GND
0.1860	39.1	---	64.2	25.1	1000	9.000	GND
0.1884	38.3	---	64.1	25.8	1000	9.000	GND
0.2096	36.3	---	63.2	26.9	1000	9.000	GND
0.2144	35.9	---	63.0	27.1	1000	9.000	GND
0.2568	34.2	---	61.5	27.4	1000	9.000	GND
0.2924	33.1	---	60.5	27.3	1000	9.000	GND
0.3632	32.3	---	58.7	26.3	1000	9.000	GND
0.3728	32.3	---	58.4	26.1	1000	9.000	GND
0.3868	31.9	---	58.1	26.2	1000	9.000	GND
0.3964	32.0	---	57.9	25.9	1000	9.000	GND
0.4200	32.1	---	57.4	25.4	1000	9.000	GND
0.4296	31.2	---	57.3	26.1	1000	9.000	GND

- Test Voltage Used: 120VAC/60Hz **Line 2**
- Frequency Range: 150 kHz to 30 MHz
- Antenna 4



Plot 40: Conducted Emissions–Line 2

Table 23: Quasi-Peak and Average Data of Conducted Emissions–Class B Limit–Line 2

Frequency (MHz)	Quasi Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	PE
0.1524	47.2	---	65.9	18.6	1000	9.000	GND
0.1664	44.6	---	65.1	20.6	1000	9.000	GND
0.1688	43.7	---	65.0	21.3	1000	9.000	GND
0.1712	45.5	---	64.9	19.4	1000	9.000	GND
0.1736	41.4	---	64.8	23.4	1000	9.000	GND
0.1760	45.3	---	64.7	19.4	1000	9.000	GND
0.1900	42.7	---	64.0	21.3	1000	9.000	GND
0.1948	42.3	---	63.8	21.6	1000	9.000	GND
0.2352	38.1	---	62.3	24.2	1000	9.000	GND
0.2468	37.8	---	61.9	24.1	1000	9.000	GND
0.2636	36.7	---	61.3	24.7	1000	9.000	GND
0.2920	34.2	---	60.5	26.2	1000	9.000	GND
0.3488	33.2	---	59.0	25.8	1000	9.000	GND
0.3676	32.4	---	58.6	26.2	1000	9.000	GND
0.3912	32.6	---	58.0	25.5	1000	9.000	GND
0.3960	32.3	---	57.9	25.7	1000	9.000	GND
0.4056	31.3	---	57.7	26.4	1000	9.000	GND
0.4268	31.1	---	57.3	26.2	1000	9.000	GND
0.4292	30.7	---	57.3	26.6	1000	9.000	GND
0.4504	30.7	---	56.9	26.1	1000	9.000	GND

Appendix A: TEST SET-UP PHOTOS

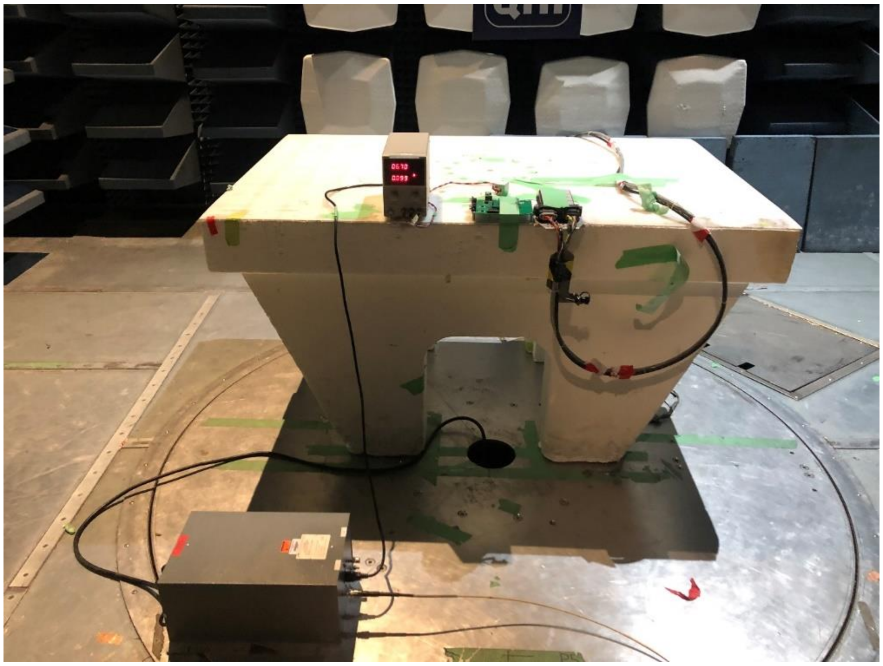


Figure 1: AC Mains Conducted Emissions 150 kHz – 30 MHz

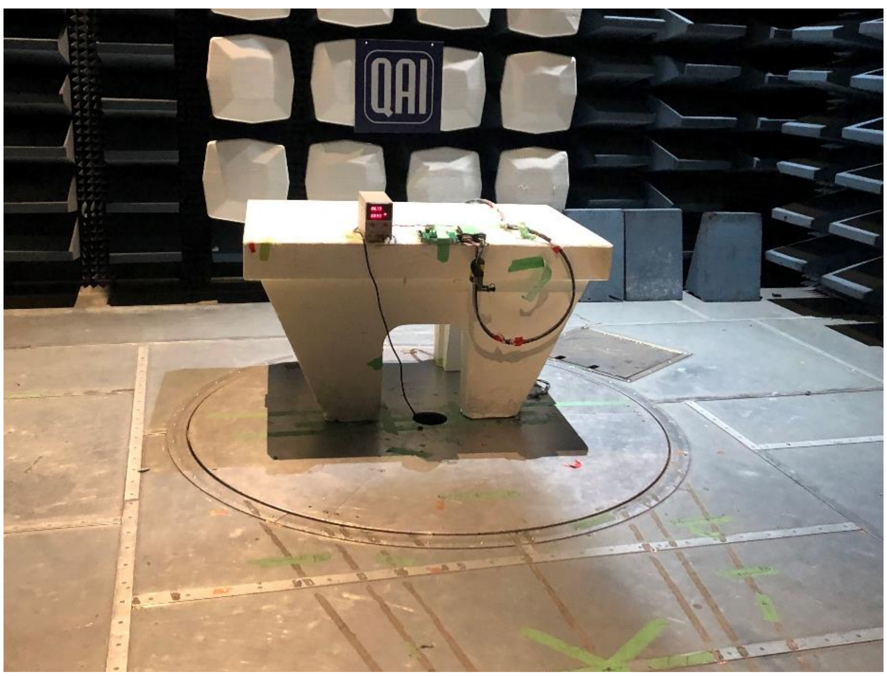


Figure 2: Radiated Emissions 30 MHz – 1 GHz

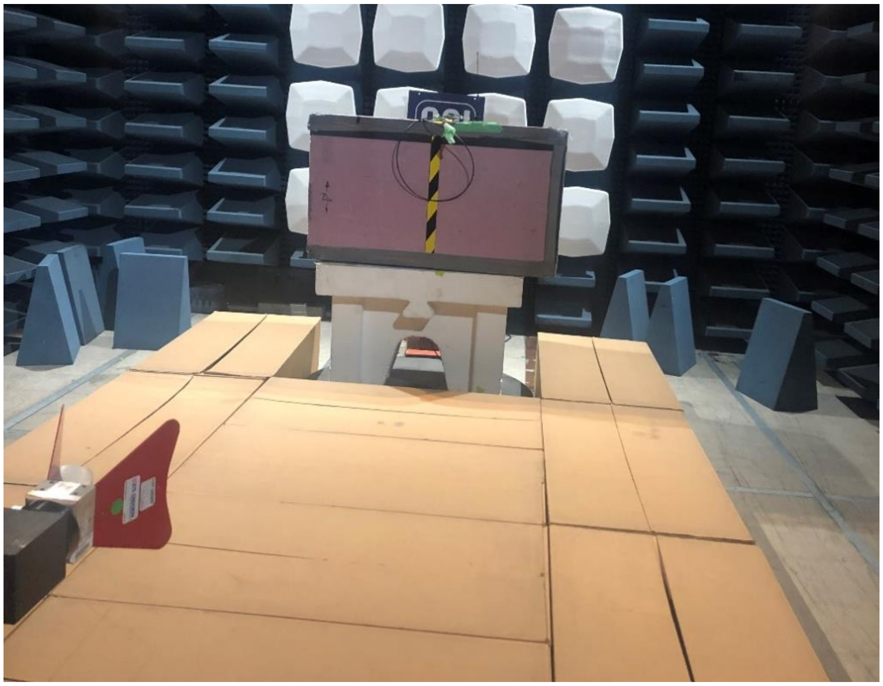


Figure 3: Radiated Emissions 30 MHz – 1 GHZ - OATS

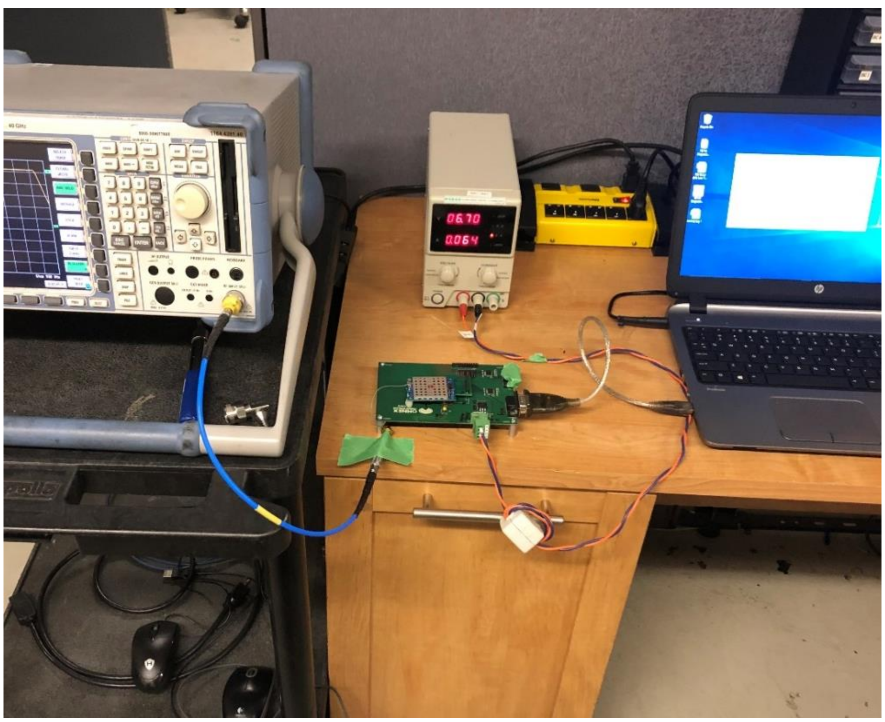


Figure 4: Conducted Radio Measurements

Appendix B: ABBREVIATIONS

Abbreviation	Definition
AC	Alternating Current
AM	Amplitude Modulation
CE	European Conformity
CISPR	Comité International Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference)
DC	Direct Current
EFT	Electrical Fast Transient
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
ESD	Electrostatic Discharge
EUT	Equipment Under Test
FCC	Federal Communications Commission
FVIN	Firmware Version Identification Number FVIN
IC	Industry Canada
ICES	Interference Causing Equipment Standard
IEC	International Electrotechnical Commission
LISN	Line Impedance Stabilizing Network
OATS	Open Area Test Site
RF	Radio Frequency
RMS	Root-Mean-Square
SAC	Semi-Anechoic Chamber

END OF REPORT