FCC / ISED Test Report

FOR:
Innophase Inc.

Model Name:
INP1014

Product Description:
Low Power WiFi/BLE IOT Module

FCC ID: 2AVAL-INP2045A
IC ID: 25715-INP2045A

Applied Rules and Standards:
47 CFR Part 15.247 (DTS)
RSS-247 Issue 2 (DTS) & RSS-Gen Issue 5

REPORT #: EMC_INNOP-018-21001_INP1014_15.247_BT_DTS

DATE: 2021-12-16

A2LA Accredited

IC recognized #
3462B-1
CABID: US0187

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: contact@cetecom.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

© Copyright by *CETECOM*

TABLE OF CONTENTS

1 ASSESSMENT 3

2 ADMINISTRATIVE DATA 4

2.1 IDENTIFICATION OF THE TESTING LABORATORY ISSUING THE EMC TEST REPORT 4
2.2 IDENTIFICATION OF THE CLIENT 4
2.3 IDENTIFICATION OF THE MANUFACTURER 4

3 EQUIPMENT UNDER TEST (EUT) 5

3.1 EUT SPECIFICATIONS 5
3.2 EUT SAMPLE DETAILS 6
3.3 ACCESSORY EQUIPMENT DETAILS 6
3.4 SUPPORT EQUIPMENT (SE) DETAILS 6
3.5 TEST SAMPLE CONFIGURATION 6
3.6 JUSTIFICATION FOR WORST CASE MODE OF OPERATION 6

4 SUBJECT OF INVESTIGATION 6

5 MEASUREMENT RESULTS SUMMARY 7

6 MEASUREMENT UNCERTAINTY 8

6.1 ENVIRONMENTAL CONDITIONS DURING TESTING: 8
6.2 DATES OF TESTING: 8

7 MEASUREMENT PROCEDURES 9

7.1 RADIATED MEASUREMENT 9

8 TEST RESULT DATA 12

8.1 BAND EDGE COMPLIANCE 12
8.2 RADIATED TRANSMITTER SPURIOUS EMISSIONS AND RESTRICTED BANDS 13
8.3 AC POWER LINE CONDUCTED EMISSIONS 26

9 TEST SETUP PHOTOS 28

10 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTING 28

11 REVISION HISTORY 29

1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

Company	Description	Model #
Innophase Inc.	Low Power WiFi/BLE IOT Module	INP1014

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2021-12-16	Compliance	Kevin Wang (EMC Lab Manager)	kevin.wang@cetecom.com Digitally signed by: kevin.wang@cetecom.com DN: CN = kevin.wang@cetecom.com Date: 2021.12.16 16:46:30 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
2021-12-16	Compliance	Yuchan Lu (Test Engineer)	Yuchan Lu Digitally signed by: Yuchan Lu DN: CN = Yuchan Lu email = Yuchan.Lu@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2021.12.16 16:26:49 -08'00'

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Kevin Wang
Responsible Project Leader:	Akanksha Baskaran

2.2 Identification of the Client

Client's Name:	Innophase Inc.
Street Address:	6815 Flanders Drive
City/Zip Code:	San Diego, CA 92121
Country:	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	INP1014
HW Version :	REV1.0
SW Version :	Rel2.2
FCC-ID:	2AVAL-INP2045A
IC-ID:	25715-INP2045A
HVIN:	INP1014
PMN:	Talaria TWO
Product Description:	Low Power WiFi/BLE IOT Module
Frequency Range / number of channels:	Module name: Talaria TWO Module number: INP2045-H FCC/IC ID: 2AVAL-INP2045/25715-INP2045 Nominal band: 2400 MHz – 2483.5 MHz; Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels
Type(s) of Modulation:	Bluetooth Low Energy, using Dynamic Sequence Spread Spectrum with GFSK modulation.
Modes of Operation:	Bluetooth LE in both advertising and connected mode of operation
Antenna Information as declared:	PCB Antenna 5.33 dBi
Max. Peak Output Power:	Conducted Power 8.24 dBm
Power Supply/ Rated Operating Voltage Range:	Low 3.0 VDC, High 3.6 VDC
Operating Temperature Range:	Low -40ºC, High 85ºC
Other Radios included in the device:	❖ WLAN • Module name: Talaria TWO • Module number: INP2045-H • FCC/IC ID: 2AVAL-INP2045/25715-INP2045
Sample Revision:	☐Prototype Unit; ☐Production Unit; ■Pre-Production

3.2 EUT Sample details

EUT #	Sample Number	HW Version	SW Version	Notes/Comments
1	14120005	REV1.0	Rel2.2	Radiated Emissions

3.3 Accessory Equipment details

AE #	Type	Manufacture	Model	P/N
1	USB Power Cable	-	-	-

3.4 Support Equipment (SE) details

SE #	Type	Model	Manufacturer	Serial Number
1	AC/DC Adapter	PSAI05R-050Q	Switching Power Supply	-

3.5 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1 + AE#1	Special commands through command window used to configure the BLE radio to low, mid and high channels provided by the client that will not be available to the end user.

3.6 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid and high channels. The EUT was configured to the highest duty cycle and output power at 5 dBm through commands.

For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

Testing procedures are based on 558074 D01 DTS Meas Guidance v05r02 – “GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247” - April 2, 2019, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(a)(1) RSS-247 5.2(1)	Emission Bandwidth	Nominal	BTLE	☐	☐	■	Note1 Note2
§15.247(e) RSS-247 5.2(2)	Power Spectral Density	Nominal	BTLE	☐	☐	■	Note1 Note2
§15.247(b)(1) RSS-247 5.4(4)	Maximum Conducted Output Power and EIRP	Nominal	BTLE	☐	☐	■	Note1 Note2
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	BTLE	☐	☐	■	Note1 Note2
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	BTLE	■	☐	☐	Complies
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	BTLE	■	☐	☐	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	BTLE	■	☐	☐	Complies

Note1: NA= Not Applicable; NP= Not Performed.
Note2: The conducted measurements are leveraged from report EMC_INNOP-018-21001_INP1015_15.247_BT_DTS for compliance against the applicable rules.

6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

9 kHz to 30 MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)

RF conducted measurement	±0.5 dB

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: http://physics.nist.gov/cuu/Uncertainty/typeb.html. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

6.1 Environmental Conditions during Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

6.2 Dates of Testing:

09/23/2021-10/07/2021

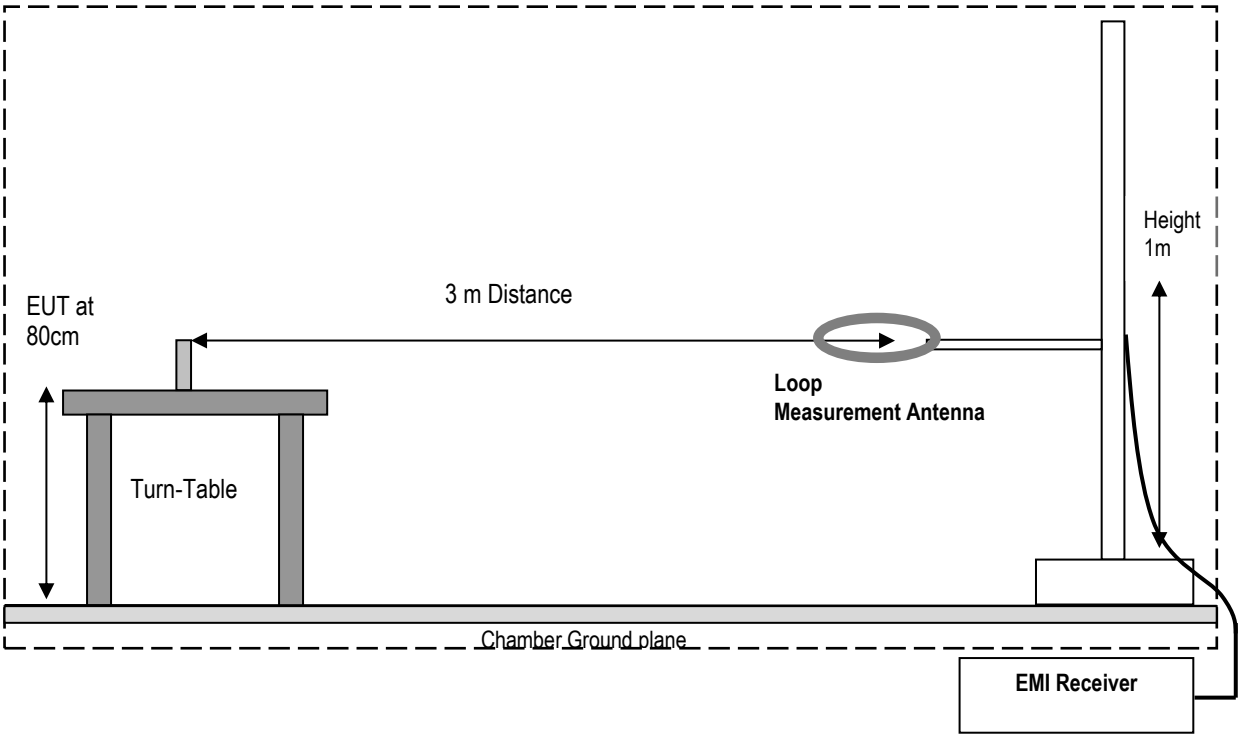
7 Measurement Procedures

7.1 Radiated Measurement

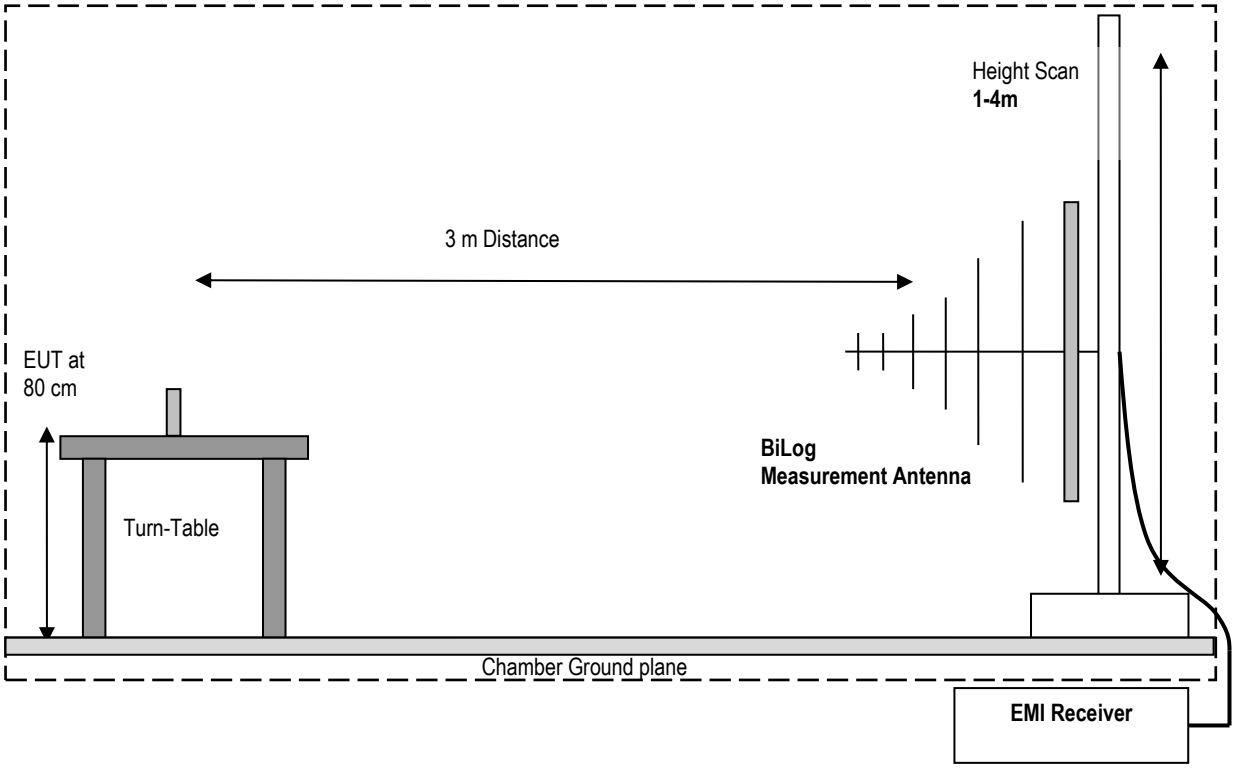
The radiated measurement is performed according to ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

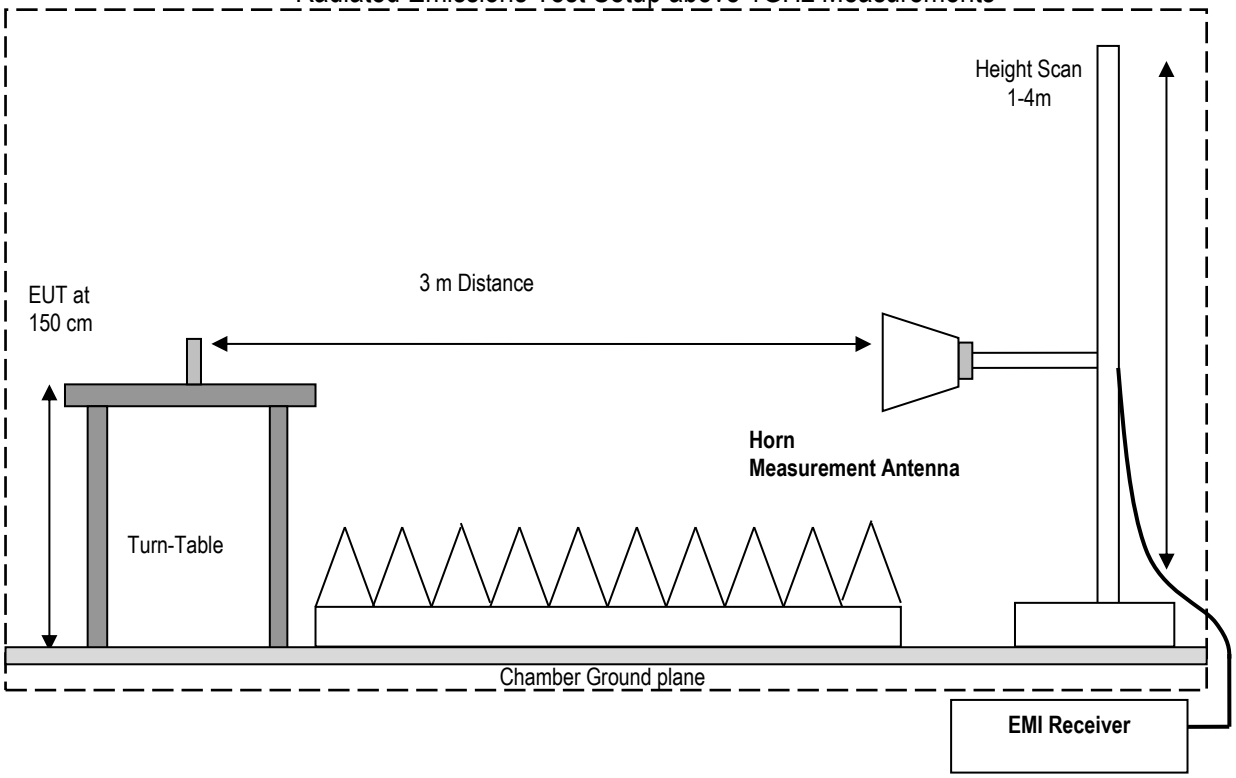
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

FS (dBµV/m) = Measured Value on SA (dBµV) + Cable Loss (dB) + Antenna Factor (dB/m)

Example:

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

8 Test Result Data

8.1 Band Edge Compliance

8.1.1 Limits restricted band §15.247/15.209/15.205 and RSS-Gen 8.9/8.10

- *PEAK LIMIT= 74 dBµV/m @3m =-21.23 dBm
- *AVG LIMIT= 54 dBµV/m @3m =-41.23 dBm
- Start frequency & stop frequency according to frequency range specified in the restricted band table in FCC section 15.205 & RSS-Gen 8.10
- Measurements with a peak detector were used to show compliance to average limits, thus showing compliance to both peak and average limits.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

(b)

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	Above 38.6
13.36-13.41			

8.1.2 Measurement Results

EUT operating mode	Band Edge	Measured Peak Value (dBm)	Corrected by duty cycle	Corrected by Antenna Gain (dBm)	Limit (dBm)	Result
GFSK continuous fixed channel	Upper Restricted peak	-30.23	NA	-24.9	-21.23 Peak	Pass
GFSK continuous fixed channel	Upper Restricted Average	-49.06	-48.96	-43.63	-41.23 AVG	Pass

Note: the conducted results leveraged from report: EMC_INNOP-018-21001_INP1015_15.247_BT_DTS.

8.2 Radiated Transmitter Spurious Emissions and Restricted Bands

8.2.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) = 40 log (D/d) = 40 log (300m / 3m) = 80dB

8.2.2 Limits:

FCC §15.247

- 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)	Field strength @ 3m (dBµV/m)
0.009–0.490	2400/F(kHz) / ---------	300	-
0.490–1.705	24000/F(kHz) / --------	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBµV/m
88–216	150	3	43.5 dBµV/m
216–960	200	3	46 dBµV/m
Above 960	500	3	54 dBµV/m

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

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	Above 38.6
13.36-13.41			

- 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)).
  *PEAK LIMIT= 74 dBµV/m
  *AVG. LIMIT= 54 dBµV/m

8.2.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	GFSK continuous fixed channel	110 VAC

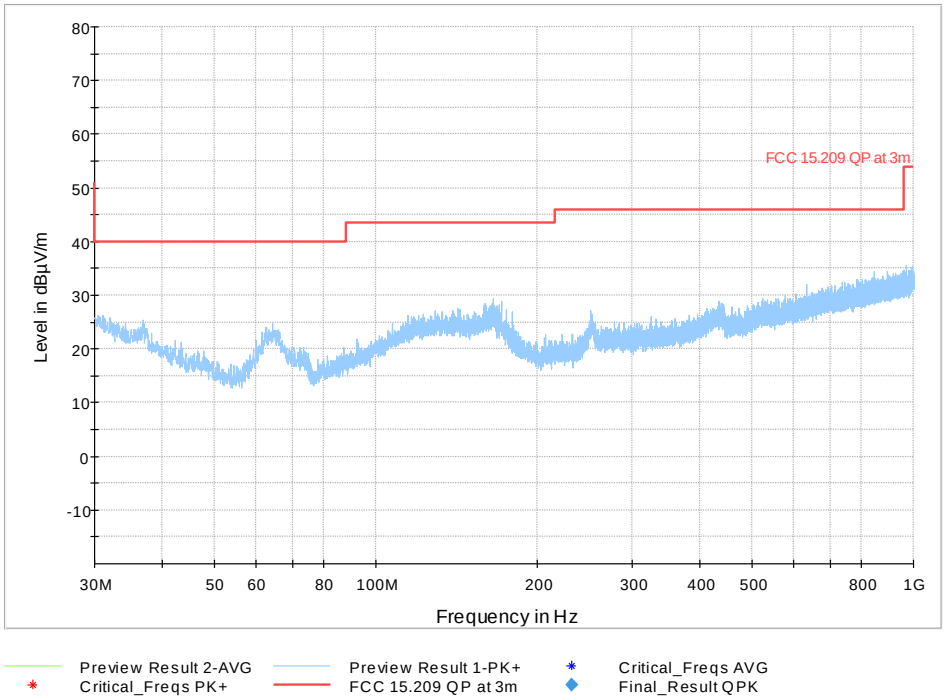
8.2.4 Measurement result:

Plot #	Channel #	Scan Frequency	Limit	Result
1-3	Low	30 MHz – 18 GHz	See section 8.2.2	Pass
4-8	Mid	9 kHz – 26 GHz	See section 8.2.2	Pass
9-11	High	30 MHz – 18 GHz	See section 8.2.2	Pass

8.2.5 Measurement Plots:

Plot #1 Radiated Emissions: 30 MHz – 1GHz

Modulation: GFSK | **Channel: Low**

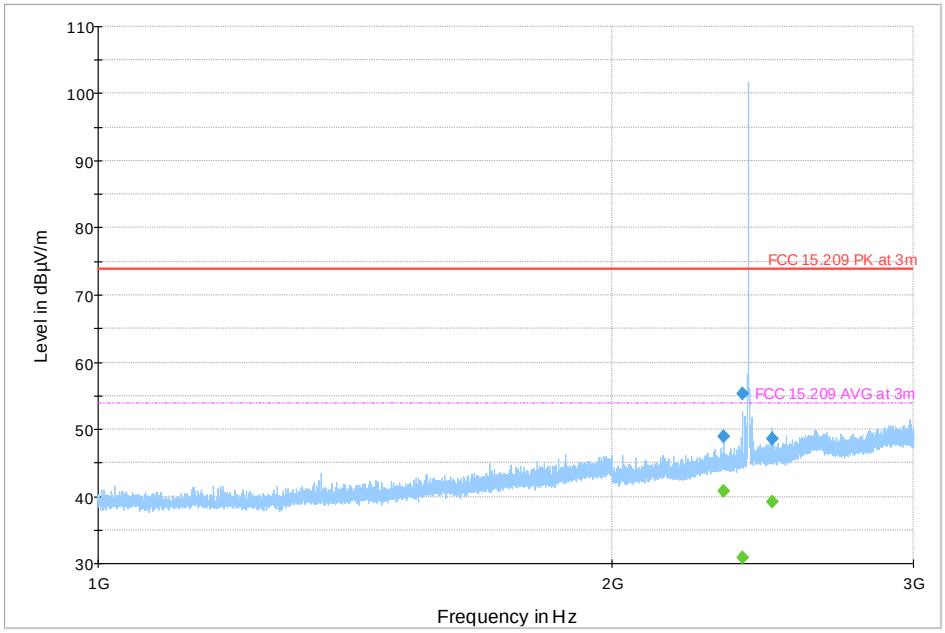


Plot #2 Radiated Emissions: 1-3 GHz

Modulation: GFSK	Channel: Low

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
2322.286	48.91	---	73.98	25.07	500.0	1000.000	184.0	H	179.0	9.2	
2322.286	---	40.79	53.98	13.19	500.0	1000.000	184.0	H	179.0	9.2	
2382.000	55.34	---	73.98	18.64	500.0	1000.000	124.0	H	146.0	9.2	
2382.000	---	30.85	53.98	23.12	500.0	1000.000	124.0	H	146.0	9.2	
2481.714	---	39.23	53.98	14.75	500.0	1000.000	125.0	H	121.0	9.6	
2481.714	48.50	---	73.98	25.48	500.0	1000.000	125.0	H	121.0	9.6	



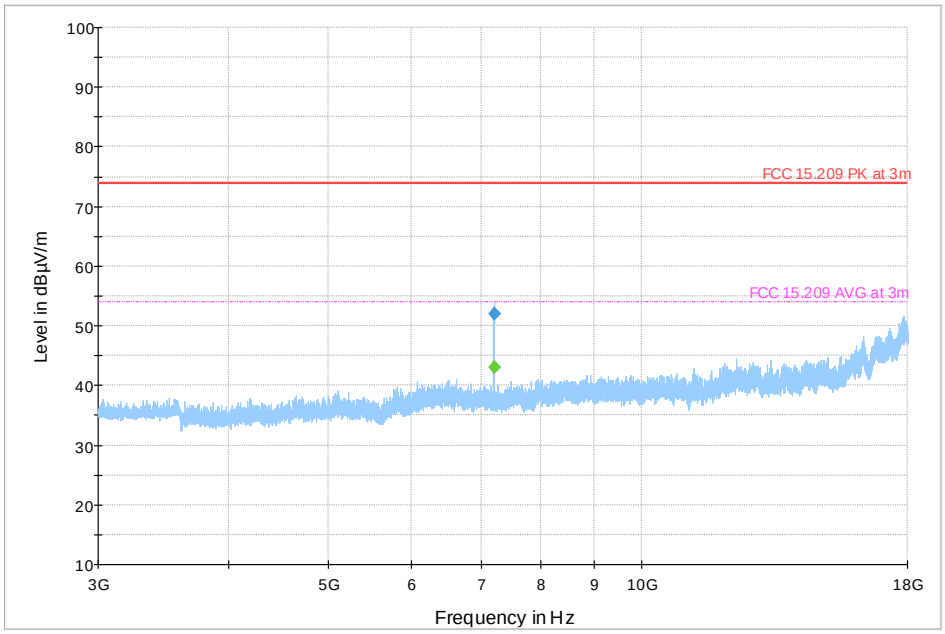
Preview Result 2-QPK
FCC 15.209 AVG at 3m
Preview Result 1-PK+
Final_Result PK+
FCC 15.209 PK at 3m
Final_Result CAV

Plot #3 Radiated Emissions: 3-18 GHz

Modulation: GFSK	Channel: Low

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
7207.000	---	42.99	53.98	10.99	500.0	1000.000	290.0	H	295.0	-0.6	
7207.000	52.01	---	73.98	21.97	500.0	1000.000	290.0	H	295.0	-0.6	



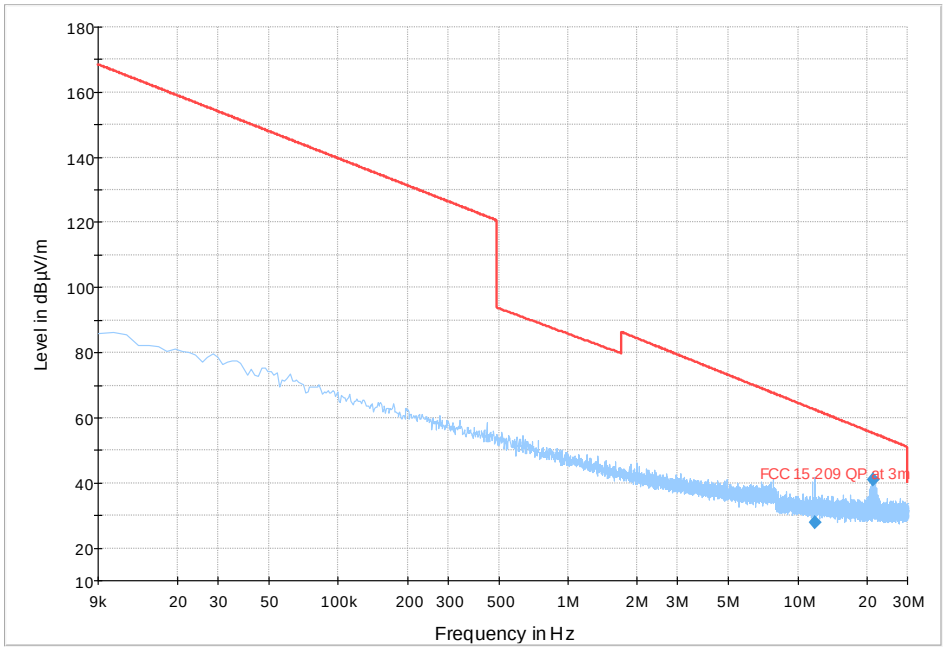
Preview Result 2-QPK
FCC 15.209 AVG at 3m
Preview Result 1-PK+
Final_Result PK+
FCC 15.209 PK at 3m
Final_Result CAV

Plot #4 Radiated Emissions: 9 KHz – 30 MHz

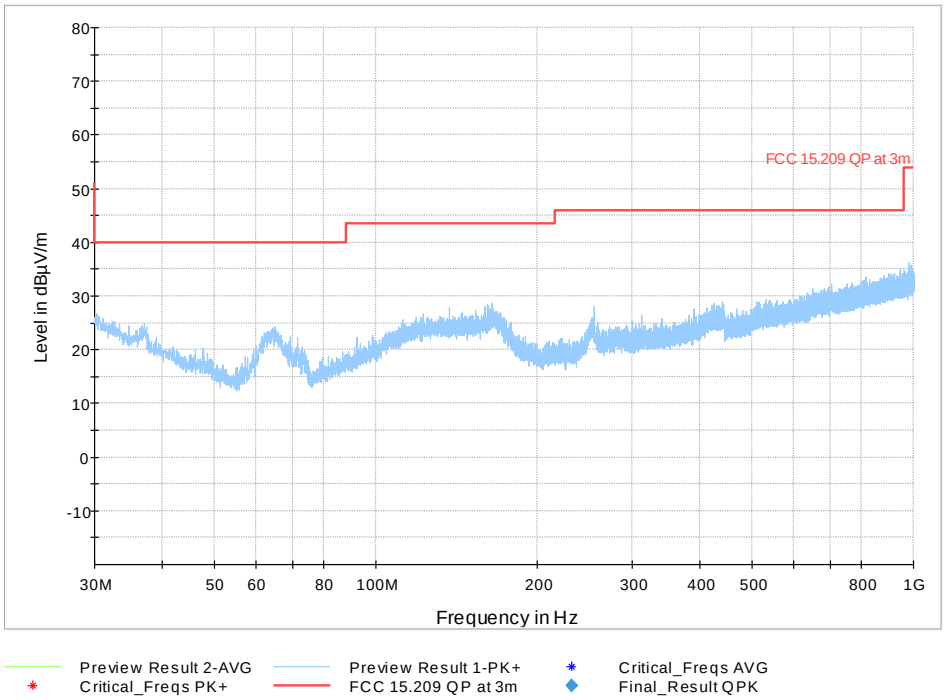
Modulation: GFSK	Channel: Mid

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
11.906	27.83	62.42	34.59	500.0	9.000	216.0	H	293.0	17.4	
21.349	41.02	55.23	14.21	500.0	9.000	140.0	V	33.0	16.7	



Plot #5 Radiated Emissions: 30 MHz – 1GHz	
Modulation: GFSK	**Channel: Mid**

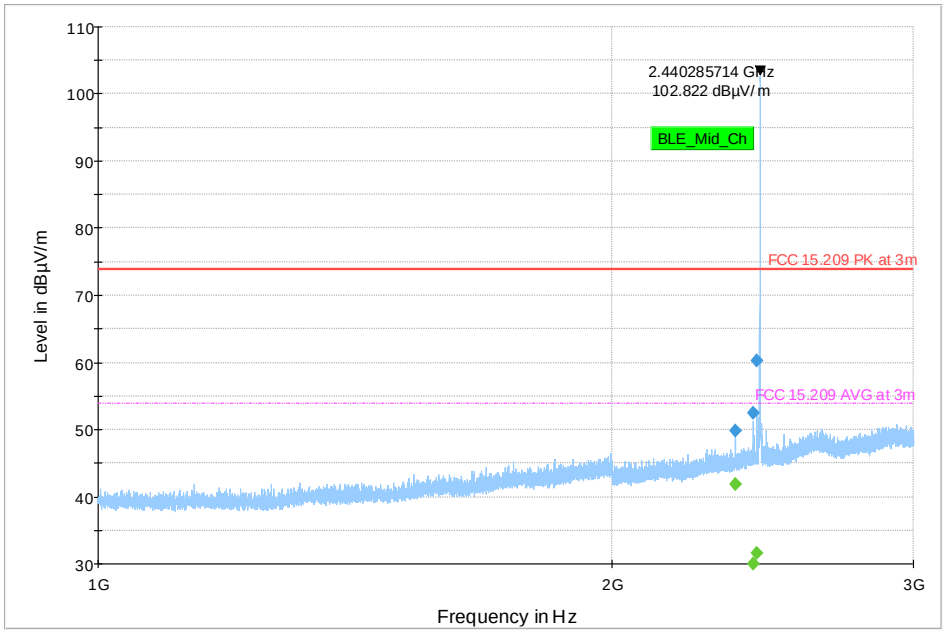


Plot #6 Radiated Emissions: 1-3 GHz

Modulation: GFSK	Channel: Mid

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
2359.714	---	41.83	53.98	12.15	500.0	1000.000	137.0	H	174.0	9.2	
2359.714	49.77	---	73.98	24.21	500.0	1000.000	137.0	H	174.0	9.2	
2417.286	52.39	---	73.98	21.59	500.0	1000.000	192.0	H	41.0	9.3	
2417.286	---	30.06	53.98	23.92	500.0	1000.000	192.0	H	41.0	9.3	
2428.429	60.34	---	73.98	13.64	500.0	1000.000	125.0	H	173.0	9.4	
2428.429	---	31.51	53.98	22.47	500.0	1000.000	125.0	H	173.0	9.4	



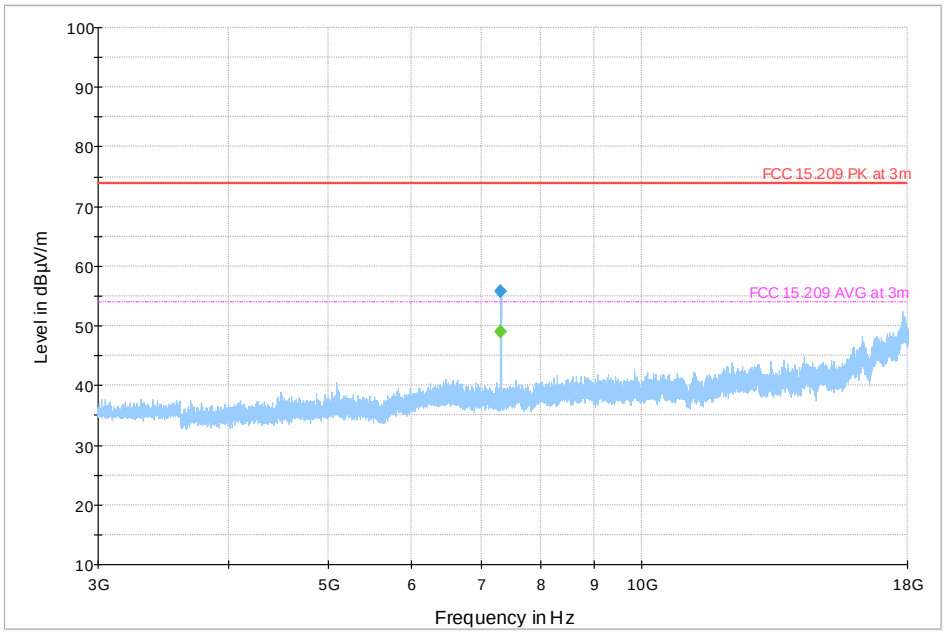
Preview Result 2-QPK
FCC 15.209 AVG at 3m
Preview Result 1-PK+
Final_Result PK+
FCC 15.209 PK at 3m
Final_Result CAV

Plot #7 Radiated Emissions: 3-18 GHz

Modulation: GFSK	Channel: Mid

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
7319.500	---	49.04	53.98	4.94	500.0	1000.000	125.0	H	294.0	-0.5	
7319.500	55.76	---	73.98	18.22	500.0	1000.000	125.0	H	294.0	-0.5	



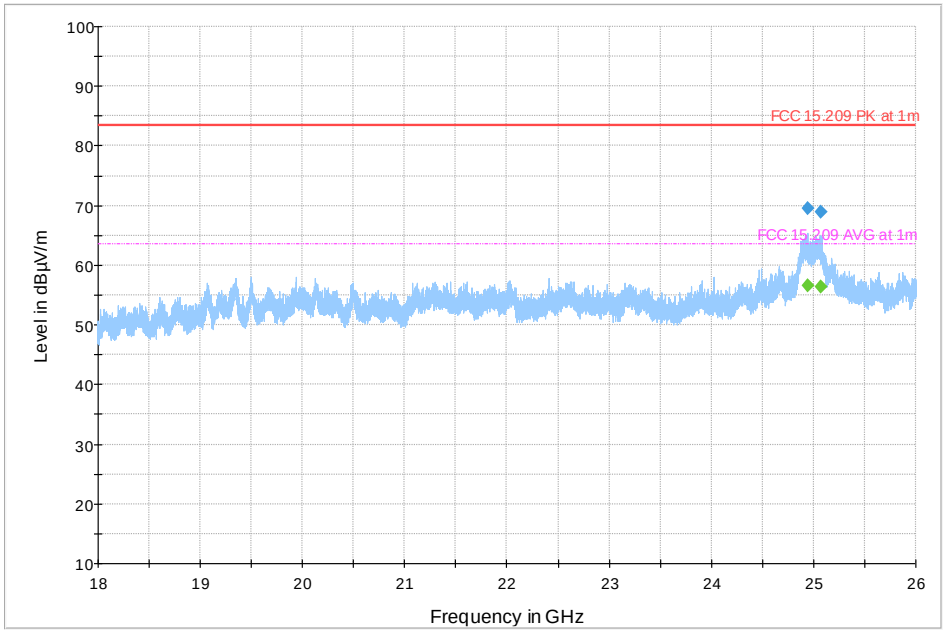
Preview Result 2-QPK
FCC 15.209 AVG at 3m
Preview Result 1-PK+
Final_Result PK+
FCC 15.209 PK at 3m
Final_Result CAV

Plot #8 Radiated Emissions: 18-26 GHz

Modulation: GFSK | **Channel: Mid**

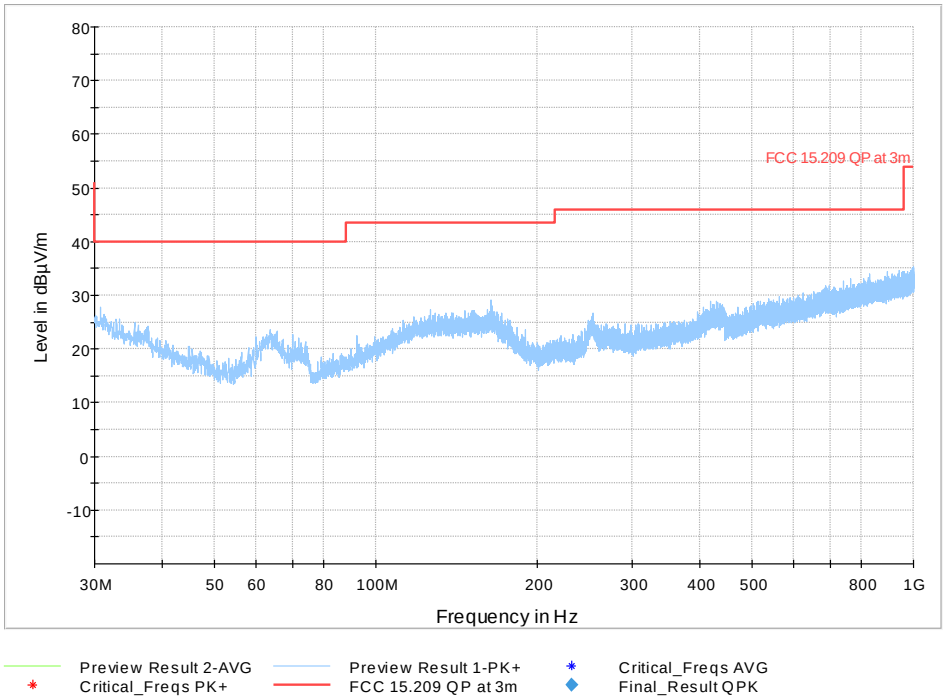
Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
24938.391	69.60	---	83.50	13.90	500.0	1000.000	224.0	H	254.0	30.0	
24938.391	---	56.58	63.50	6.92	500.0	1000.000	224.0	H	254.0	30.0	
25074.125	68.99	---	83.50	14.51	500.0	1000.000	175.0	H	152.0	30.2	
25074.125	---	56.36	63.50	7.14	500.0	1000.000	175.0	H	152.0	30.2	



Preview Result 2-QPK
FCC 15.209 AVG at 1m
Preview Result 1-PK+
Final_Result PK+
FCC 15.209 PK at 1m
Final_Result CAV

Plot #9 Radiated Emissions: 30 MHz – 1GHz	
Modulation: GFSK	**Channel: High**

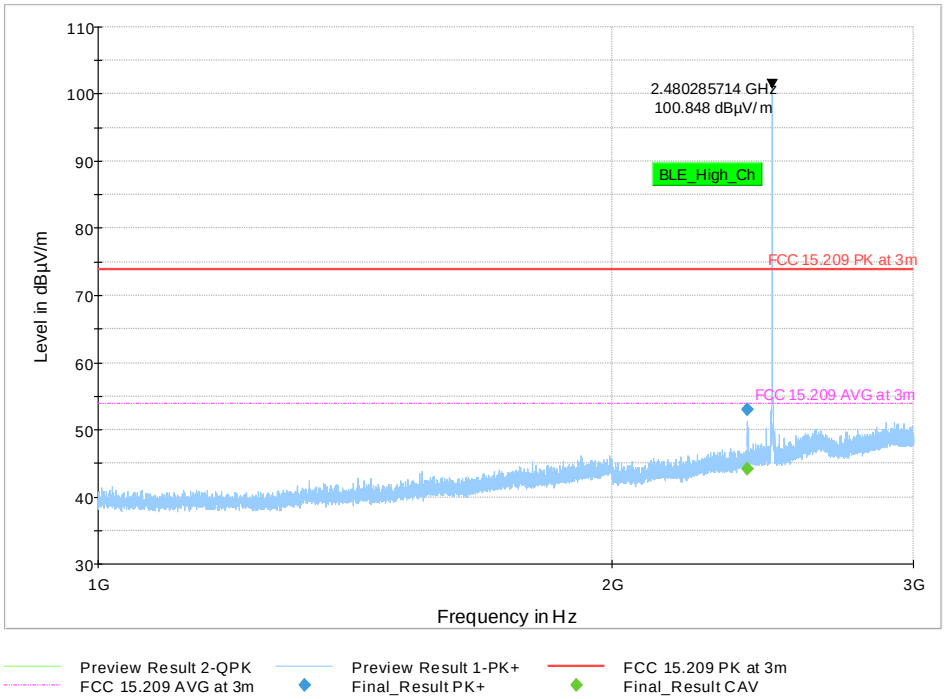


Plot #10 Radiated Emissions: 1-3 GHz

Modulation: GFSK	Channel: High

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
2399.714	---	44.15	53.98	9.83	500.0	1000.000	203.0	H	179.0	9.2	
2399.714	53.09	---	73.98	20.89	500.0	1000.000	203.0	H	179.0	9.2	

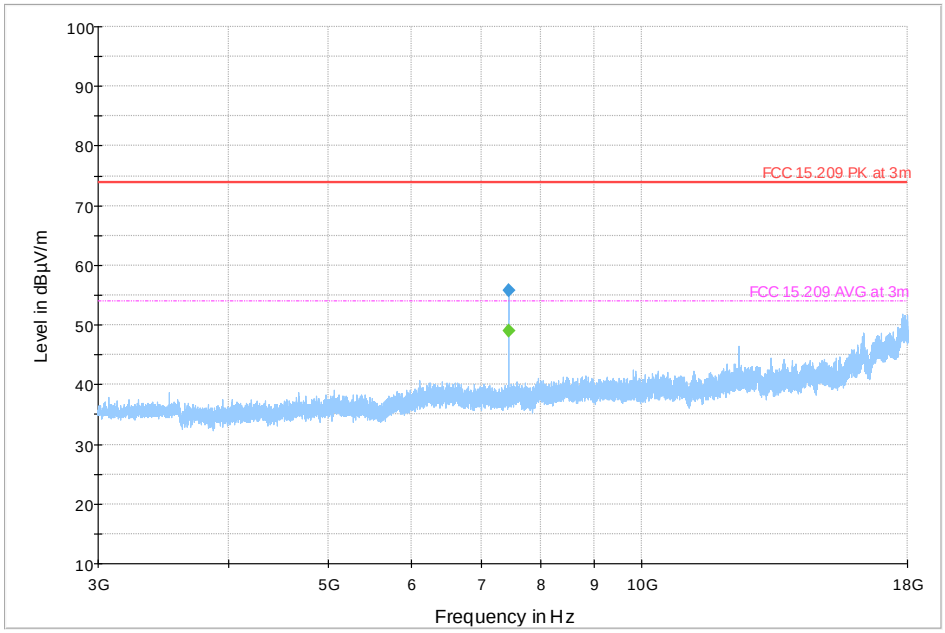


Plot #11 Radiated Emissions: 3-18 GHz

Modulation: GFSK	Channel: High

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
7439.500	---	49.11	53.98	4.87	500.0	1000.000	125.0	H	298.0	-0.2	
7439.500	55.89	---	73.98	18.09	500.0	1000.000	125.0	H	298.0	-0.2	



8.3 AC Power Line Conducted Emissions

8.3.1 Measurement according to ANSI C63.4

Analyzer Settings:

- RBW = 9 KHz (CISPR Bandwidth)
- Detector: Peak / Average for Pre-scan
- Quasi-Peak/Average for Final Measurements

8.3.2 Limits: §15.207 & RSS-Gen 8.8

FCC §15.207(a) & RSS-Gen 8.8

- Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, 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 limits in the following table (1), as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

8.3.3 Test conditions and setup:

Ambient Temperature ©	EUT Set-Up #	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
22° C	1	BT LE continuous fixed channel	Line & Neutral	110VAC

8.3.4 Measurement Result:

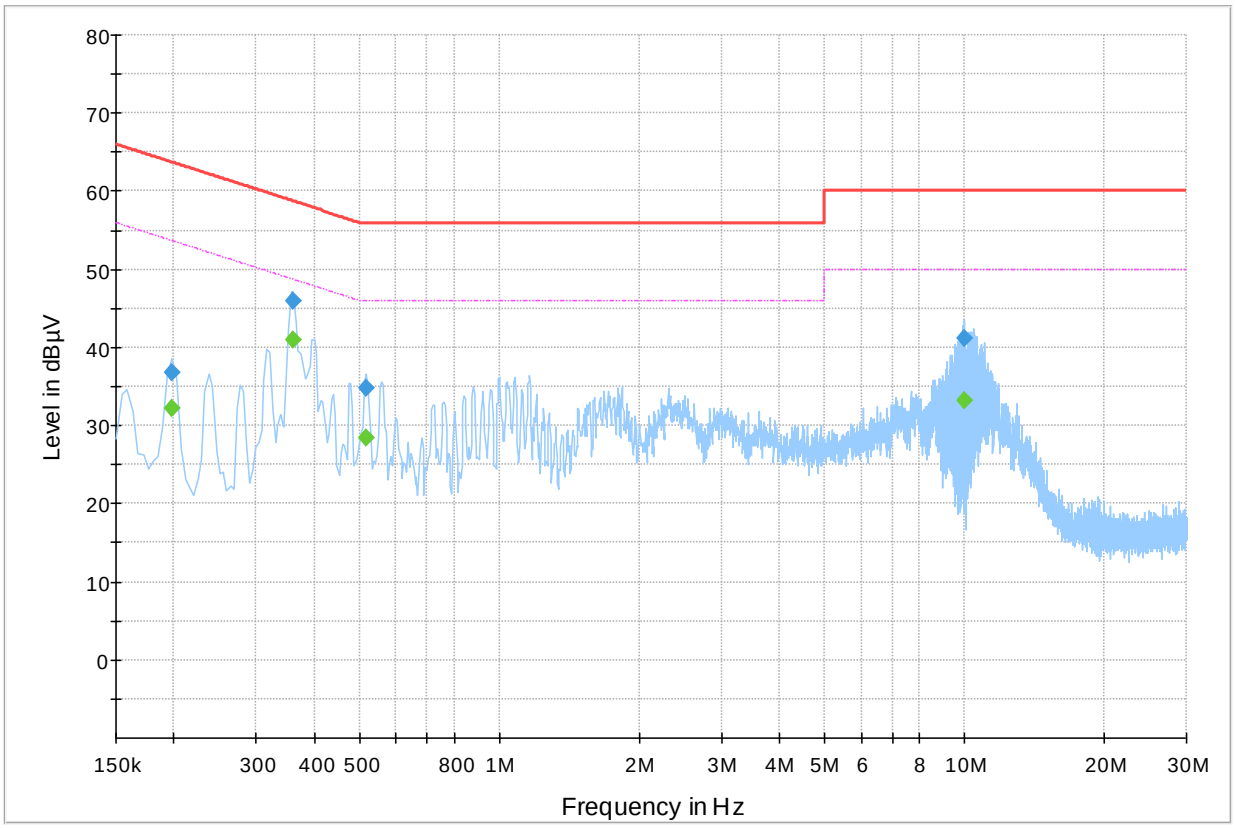
Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	1	BT LE continuous fixed channel	150 kHz – 30 MHz	See section 8.3.2	Pass

8.3.5 Measurement Plots:

Plot # 1

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.198	---	32.22	53.68	21.46	500.0	9.000	L1	GND	10.2	
0.198	36.73	---	63.68	26.95	500.0	9.000	L1	GND	10.2	
0.361	---	41.06	48.71	7.66	500.0	9.000	L1	GND	10.0	
0.361	45.93	---	58.71	12.78	500.0	9.000	L1	GND	10.0	
0.519	---	28.45	46.00	17.55	500.0	9.000	L1	GND	10.0	
0.519	34.85	---	56.00	21.15	500.0	9.000	L1	GND	10.0	
10.018	---	33.15	50.00	16.85	500.0	9.000	L1	GND	10.1	
10.018	41.10	---	60.00	18.90	500.0	9.000	L1	GND	10.1	



Preview Result 1-PK+
Final_Result QPK
EN 55032 Voltage on Mains QP
Final_Result CAV
EN 55032 Voltage on Mains AV

9 Test setup photos

Setup photos are included in supporting file name: "EMC_INNOP_018_21001_INP1014_Setup_Photos.pdf"

10 Test Equipment and Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
ACTIVE LOOP ANTENNA	ETS LINDGREN	6507	00161344	2 YEARS	10/30/2020
BILOG ANTENNA	ETS.LINDGREN	3142E	00166067	2 YEARS	03/12/2020
HORN ANTENNA	EMCO	3115	00035114	2 YEARS	08/10/2020
HORN ANTENNA	ETS.LINDGREN	3117	00215984	2 YEARS	01/31/2021
HORN ANTENNA	ETS.LINDGREN	3116	00070497	2 YEARS	11/23/2020
TEST RECEIVER	R&S	ESU40	100251	2 YEARS	09/13/2021
COMPACT DIGITAL BAROMETER	CONTROL COMPANY	10510-922	200236891	2 YEARS	04/13/2020
DIGITAL THRMOMETER	CONTROL COMPANY	36934-164	181230565	3 YEARS	01/10/2019
LINE IMPEDANCE STABILIZATION NETWORK	FCC	FCC-LISN-50-25-2-08	08014	2 YEARS	08/31/2021

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 Revision History

Date	Report Name	Changes to report	Report prepared by
2021-12-16	EMC_INNOP_018_21001_INP1014_15.247_BT_DTS	Initial version	Yuchan Lu

<<The End>>