



FCC / IC Test Report

FOR:

Jio, Inc.

Model Name:

Jiobit

Product Description:

Jiobit Smart Tag Location Tracker

FCC ID: 2AKLI-080715

IC ID: 22220-080715

Applied Rules and Standards:

47 CFR Part 15.247 (DTS)

RSS-247 Issue 2 (DTSS) & RSS-Gen Issue 4

REPORT #: EMC_JIO_JIOBI_001_17001-15-247_BTLE

DATE: November 27, 2017



A2LA Accredited

IC recognized #
3462B-2

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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 Issue 1, and RSS-Gen Issue 4.

No deviations were ascertained.

Company	Description	Model #
Jio, Inc	Jiobit Smart Tag Location Tracker	4188N8762W

Responsible for Testing Laboratory:

11/27/2017	Compliance	James Donnellan (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

11/27/2017	Compliance	Elijah Garcia (EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.
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
Lab Manager:	James Donnellan
Responsible Project Leader:	Elijah Garcia

2.2 Identification of the Client

Applicant's Name:	Jio, Inc.
Street Address:	351 W. Hubbard St., Suite 400
City/Zip Code	Chicago, IL 60654
Country	USA
Contact Person:	Tom Wied
Phone No.	847-707-7294
e-mail:	tom@jiobit.com

2.3 Identification of the Manufacturer

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

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No	4188N8762W
HW Version	1.0
SW Version	2.0
FCC-ID	2AKLI-080715
IC-ID	22220-080715
HVIN	4188N8762W
PMN	Jiobit
Product Description	Jiobit Smart Tag Location Tracker
Frequency Range / number of channels	Nominal band: 2402 MHz (Ch. 1) – 2480 (Ch.79), 79 channels
Type(s) of Modulation	Bluetooth Low Energy: GFSK
Antenna Information as declared	max gain 0.67 dBi
Max. Output Powers	10 dBm
Power Supply/ Rated Operating Voltage Range	2.9V dc (min) / 3.8V dc (nom) / 4.35V dc (max)
Operating Temperature Range	-40 °C to 65°C
Other Radios included in the device	802.11b: DSSS 802.11g/n: OFDM 802.11n: MCS (20 & 40 MHz) Cellular (Sierra Wireless HL8548-G): (GSM: Quad band, UMTS: FDDI, FDDII, FDDV, FDDVIII)
Sample Revision	☐ Prototype Unit ☐ Production Unit ☒ Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	38000F	1.0	2.0	

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	USB cable	N/A	Jio, Inc	N/A

3.4 Ancillary Test Equipment (ATE) details

ATE #	Type	Model	Manufacturer	Serial Number
1	Power adaptor	SC1402	Salcomp	1309500070936

3.5 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT #1 + AE #1	N/A
2	EUT #1 + AE #1+ ATE#1	N/A

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, and 100% duty cycle.

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 Issue 2 of ISED Canada.

This test report is to support a request for new equipment authorization under the FCC ID: 2AKLI-080715 IC ID: 22220-080715

Testing procedures are based on 558074 D01 DTS Meas Guidance v04 – “GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247” - April 5, 2017, 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)(2) RSS-247 5.2(a)	Emission Bandwidth	Nominal	BTLE	☐	☐	☒	Note 2
§15.247(e) RSS-247 5.2(b)	Power Spectral Density	Nominal	BTLE	☐	☐	☒	Note 2
§15.247(b)(3) RSS-247 5.4(d)	Maximum Conducted Output Power and EIRP	Nominal	BTLE	☐	☐	☒	Note 2
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	BTLE	☐	☐	☒	Note 2
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	BTLE	☐	☐	☒	Note 2
§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	-	-	☐	☐	☒	-

Note: NA= Not Applicable; NP= Not Performed.

Note 2: was leveraged from the module conducted reports for FCC ID: VPYLB1DX , IC ID: 772C-LB1DX

6 Measurements

6.1 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)
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RF conducted measurement	±0.5 dB
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6.2 Environmental Conditions During Testing:

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

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

6.3 Dates of Testing:

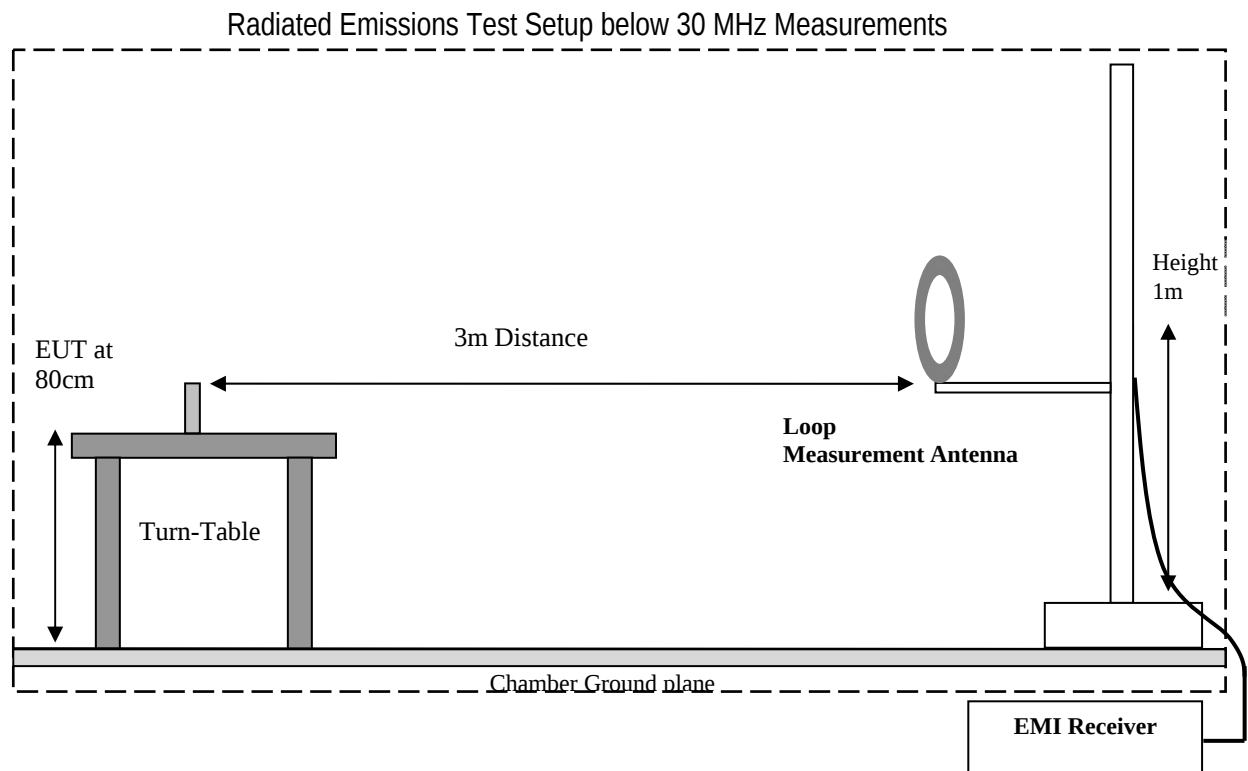
10/23/2017 – 11/03/2017

7 Measurement Procedures

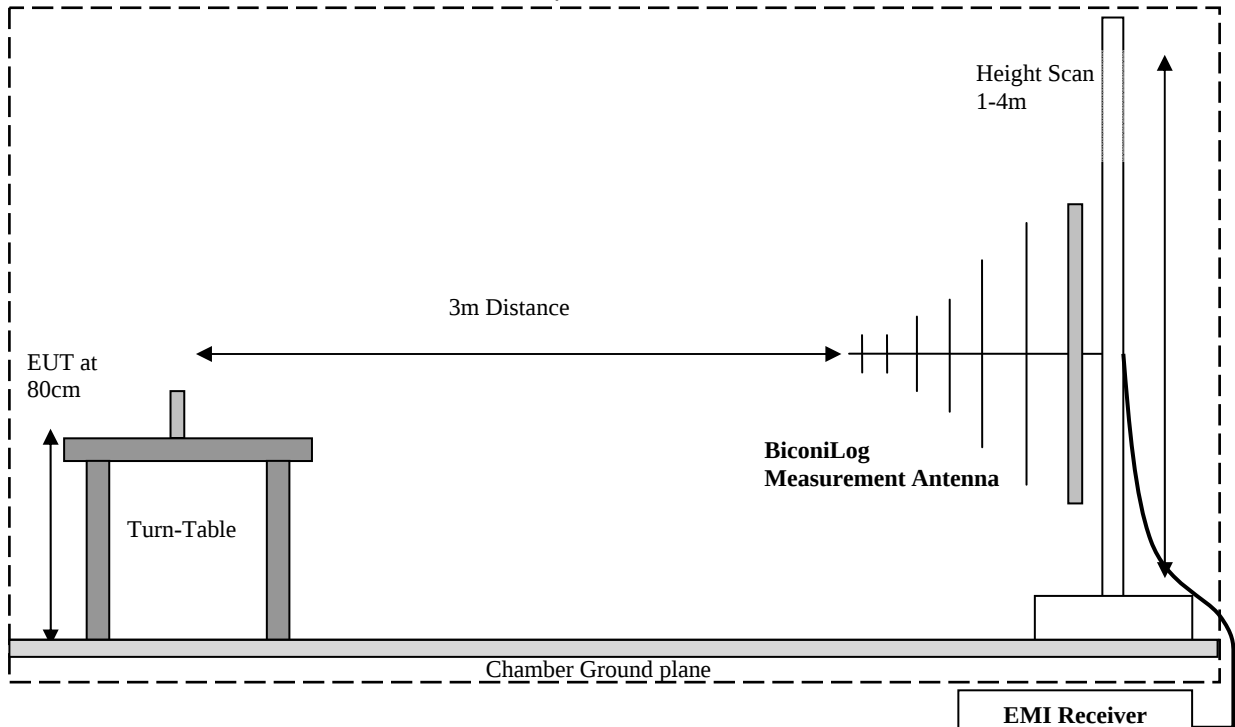
7.1 Radiated Measurement

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

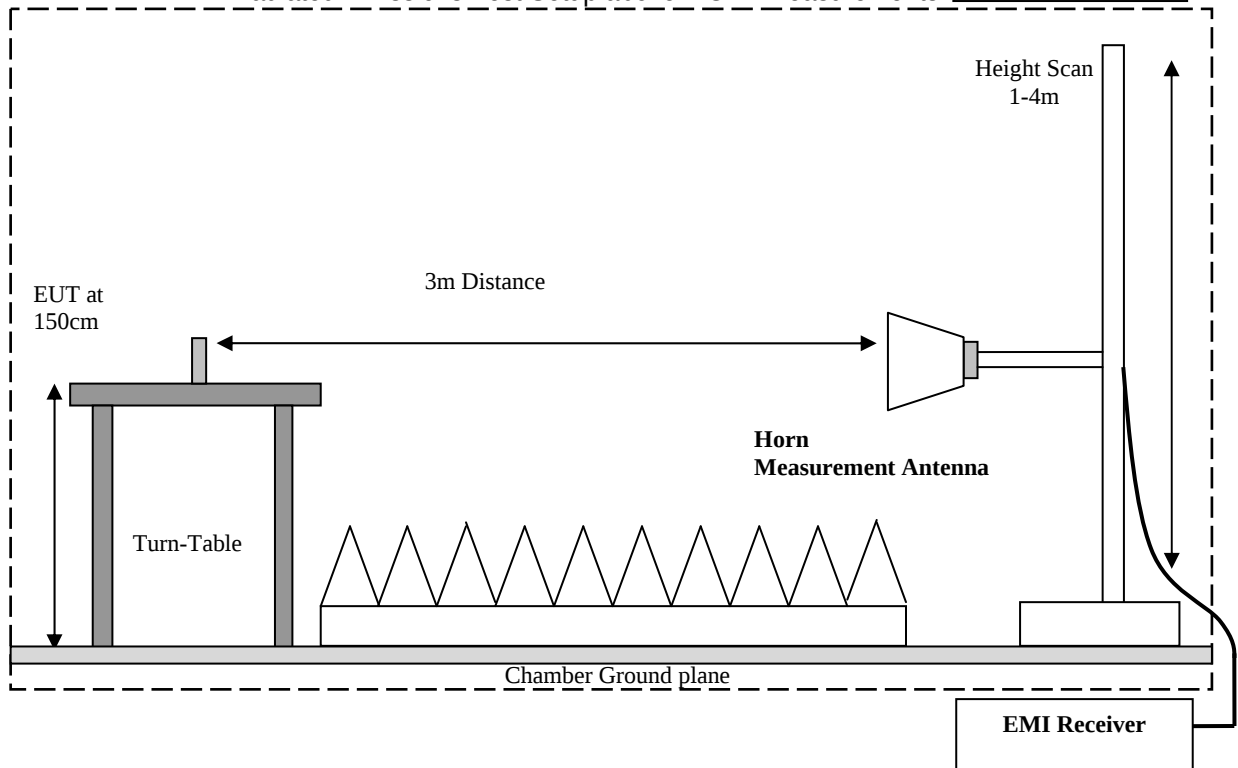
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to 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 30 MHz-1 GHz Measurements



Radiated Emissions Test Setup above 1 GHz 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 dB μ V
2. Cable Loss between the receiving antenna and Spectrum Analyzer 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:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} - \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

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

7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.10 (2013)

7.3 RF Conducted Measurement Procedure

Reference: ANSI C63.10 (2013) Section 6.9, 6.10, and 7.8



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.

8 Test Result Data

8.1 Transmitter Spurious Emissions and Restricted Bands

8.1.1 Measurement according to ANSI C63.10 (2013)

Analyzer Settings:

- Frequency = 9 kHz – 30 MHz
- RBW = 9 kHz
- Detector = Peak

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

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

Radiated spurious are 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.

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) = $40 \log (D/d) = 40 \log (300\text{m} / 3\text{m}) = 80\text{dB}$.

8.1.2 Limits: FCC 15.247(d)/15.209(a)

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
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= 74dB μV/m
- AVG. LIMIT= 54dB μV/m

8.1.3 Test conditions and setup:

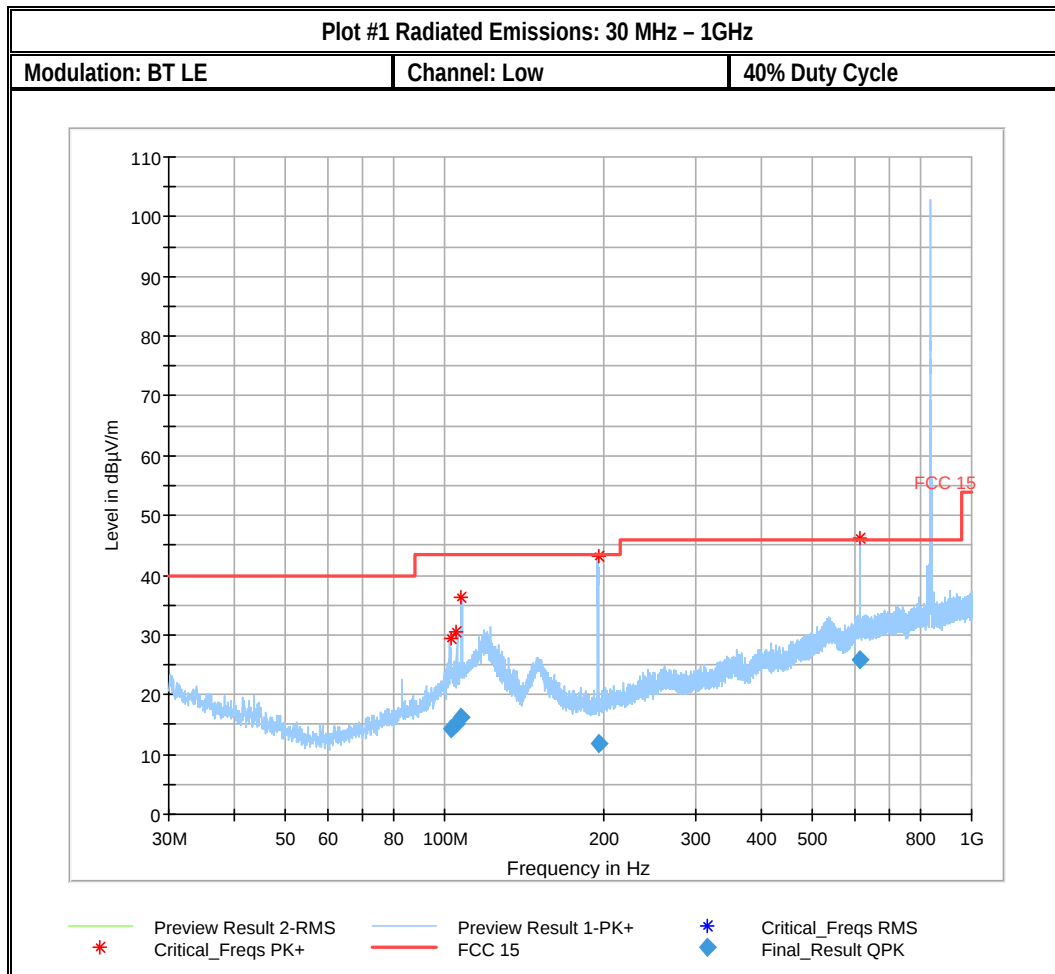
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23.2° C	1 + 2	Transmit	5V DC

8.1.4 Measurement result:

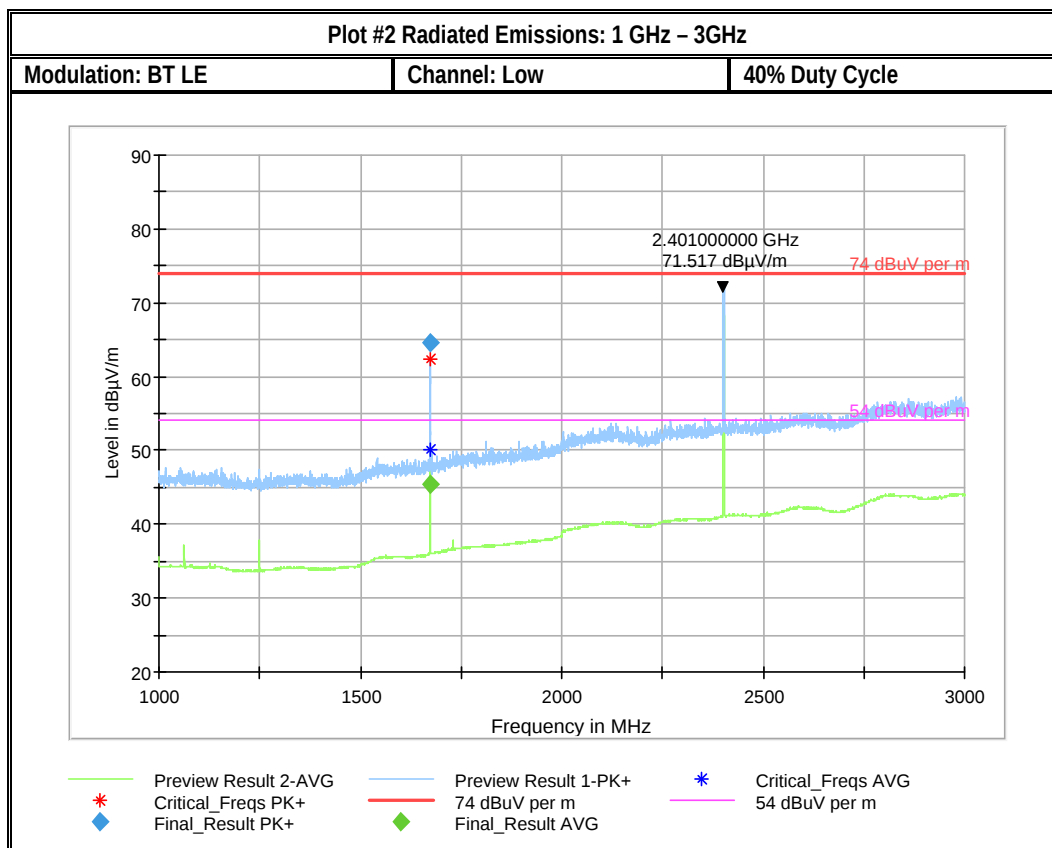
Plot #	Channel	Scan Frequency	Limit	Result
1-3	Low	30 MHz – 18 GHz	See section 8.2.2	Pass
4-8	Mid	9 kHz – 26 GHz	See section 8.2.2	Pass
9-11	High	30 MHz – 18 GHz	See section 8.2.2	Pass

8.1.5 Measurement Plots:

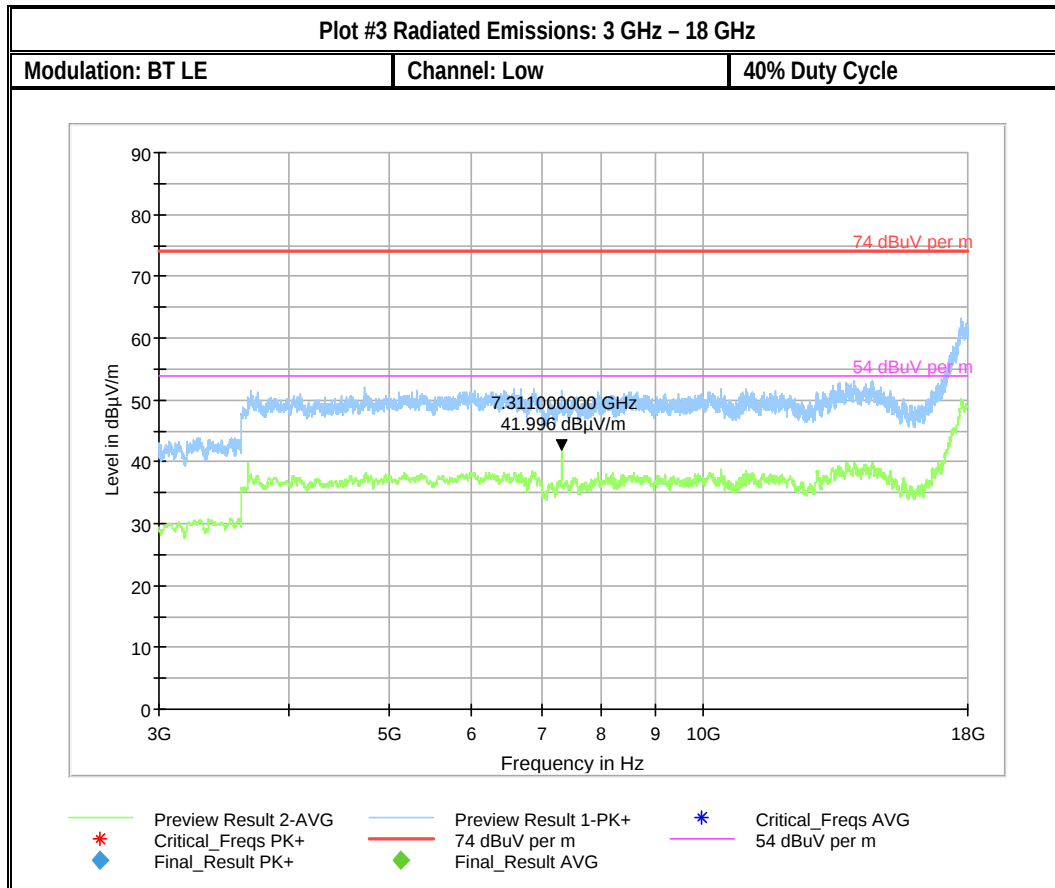
Please note that the following plots were taken with both cellular radio and Bluetooth co transmitting.

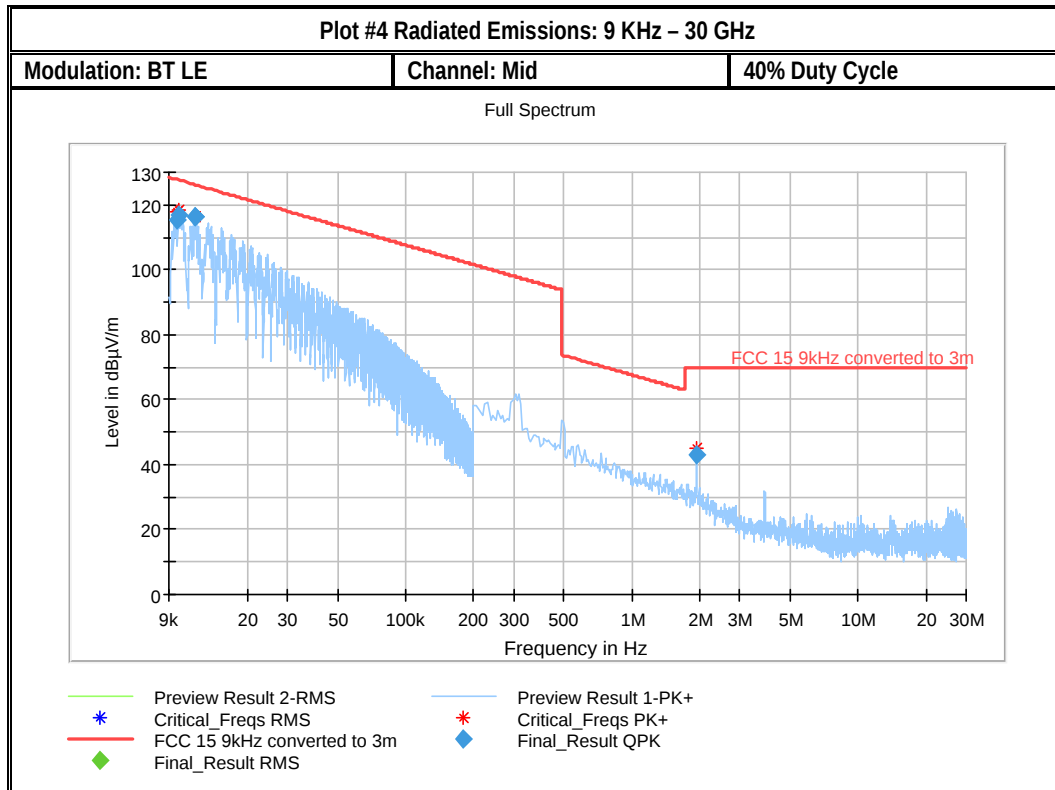


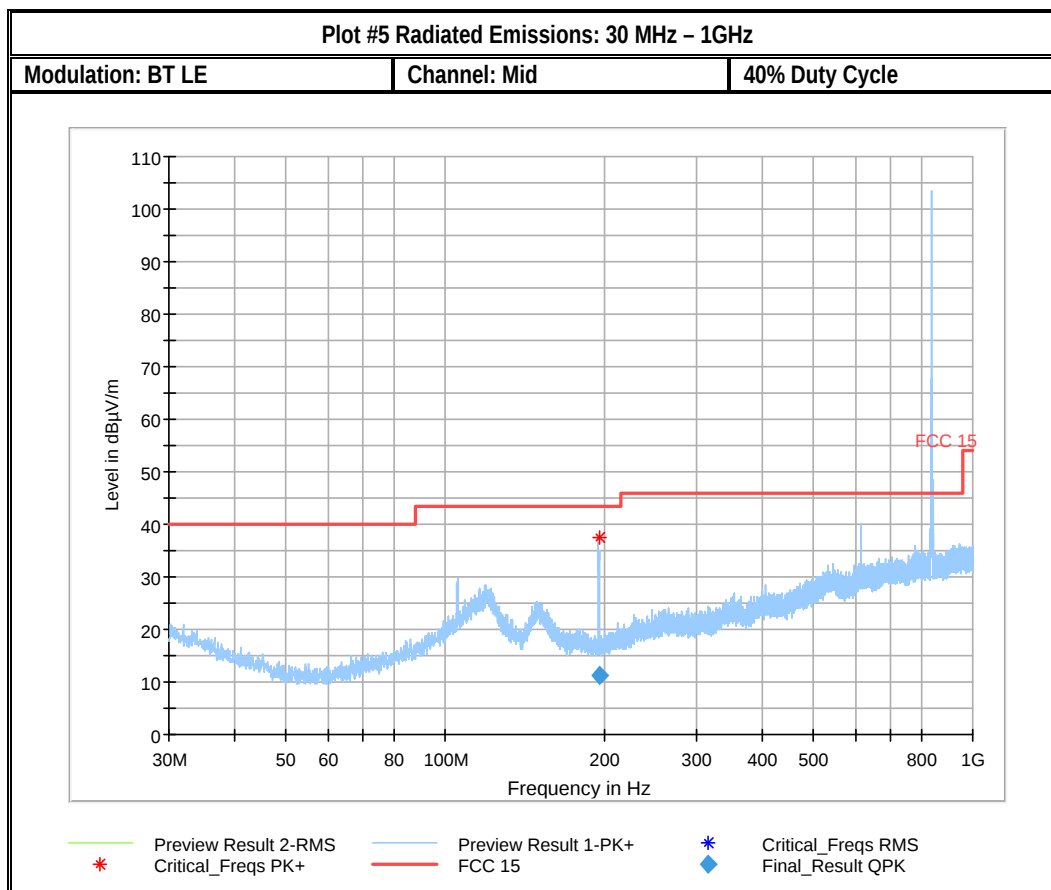
Note: Signals above the limits are the cellular



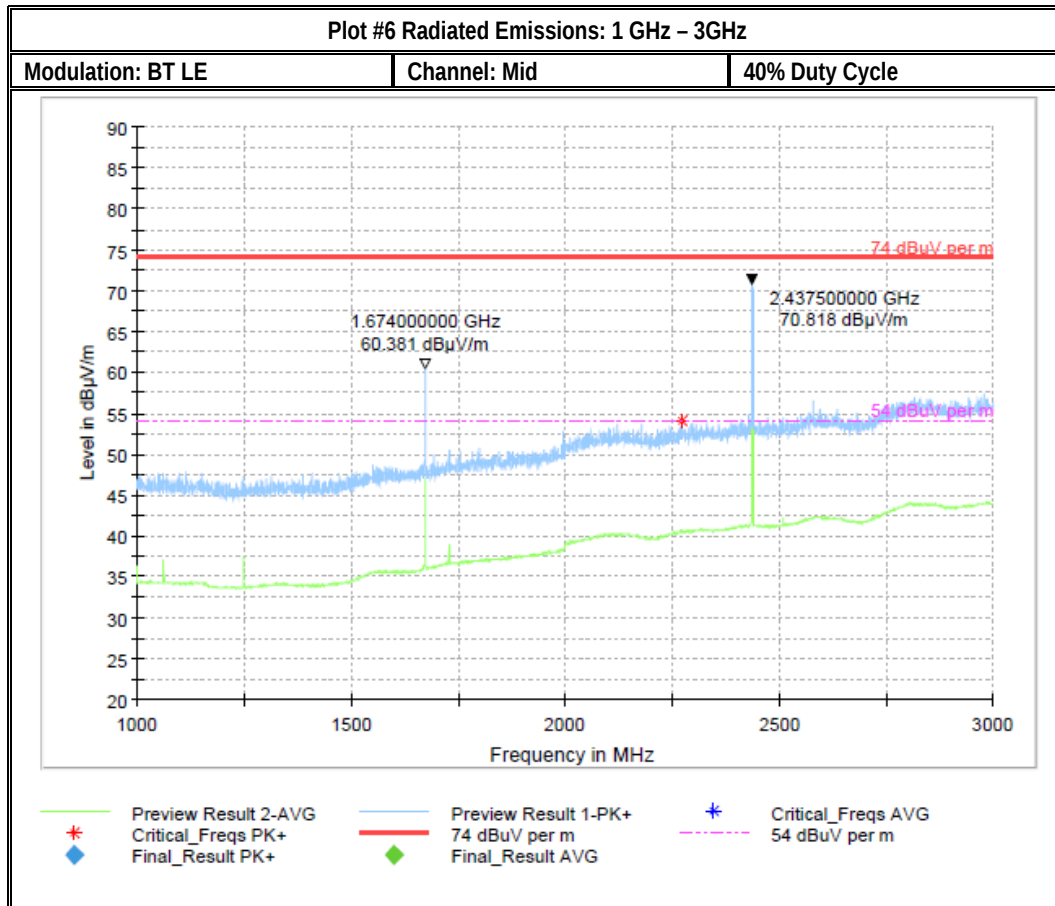
Note: Signal above the limits is the BT Fundamental



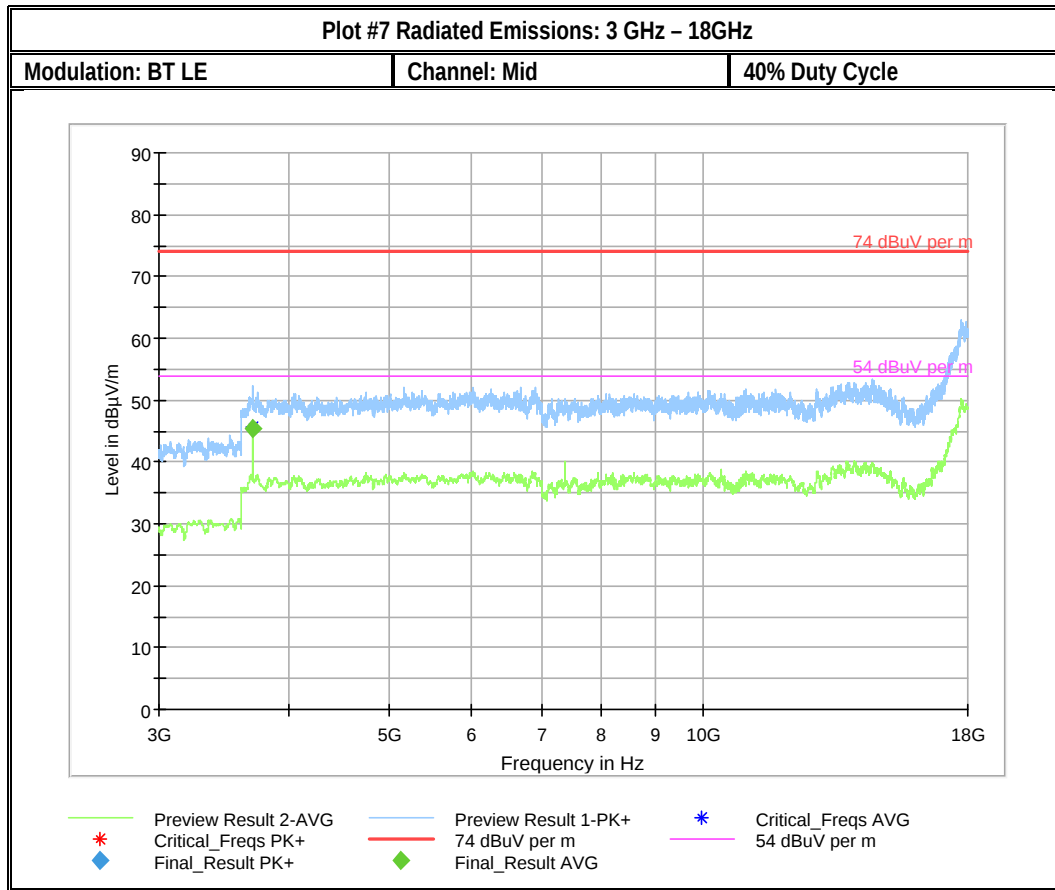


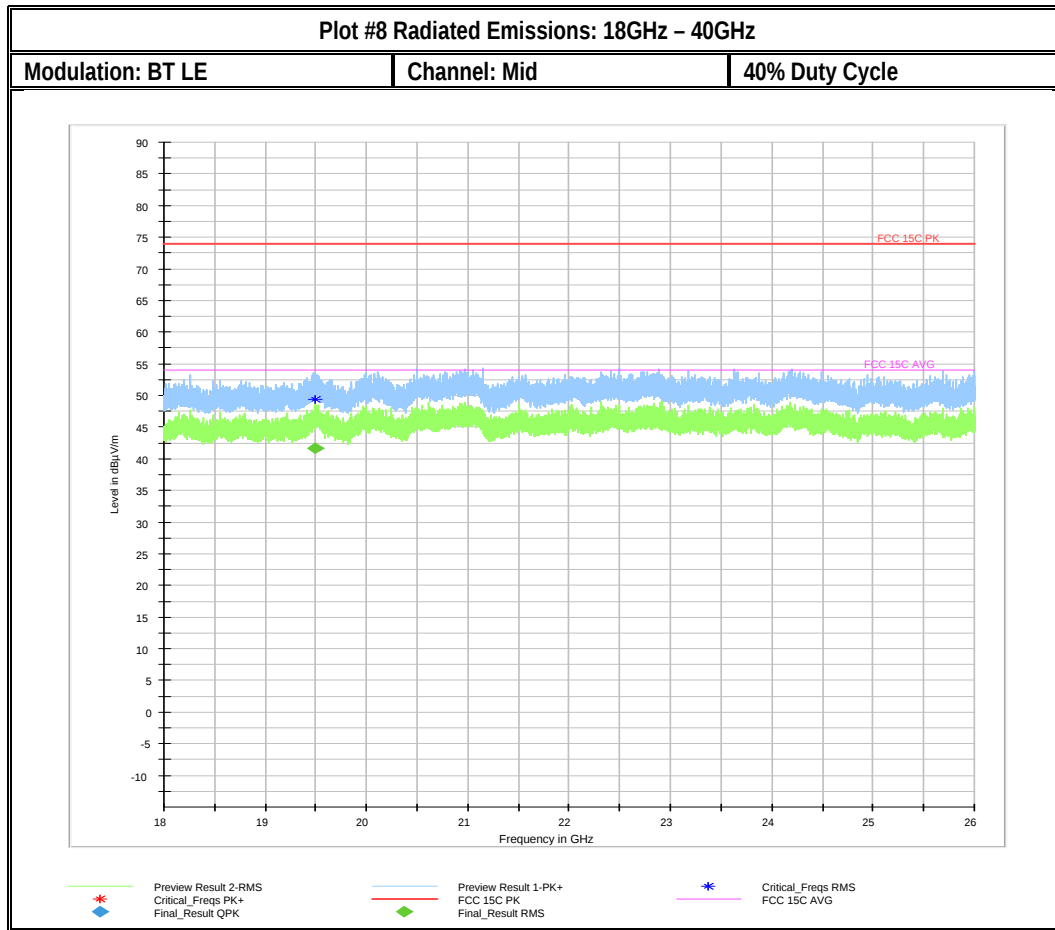


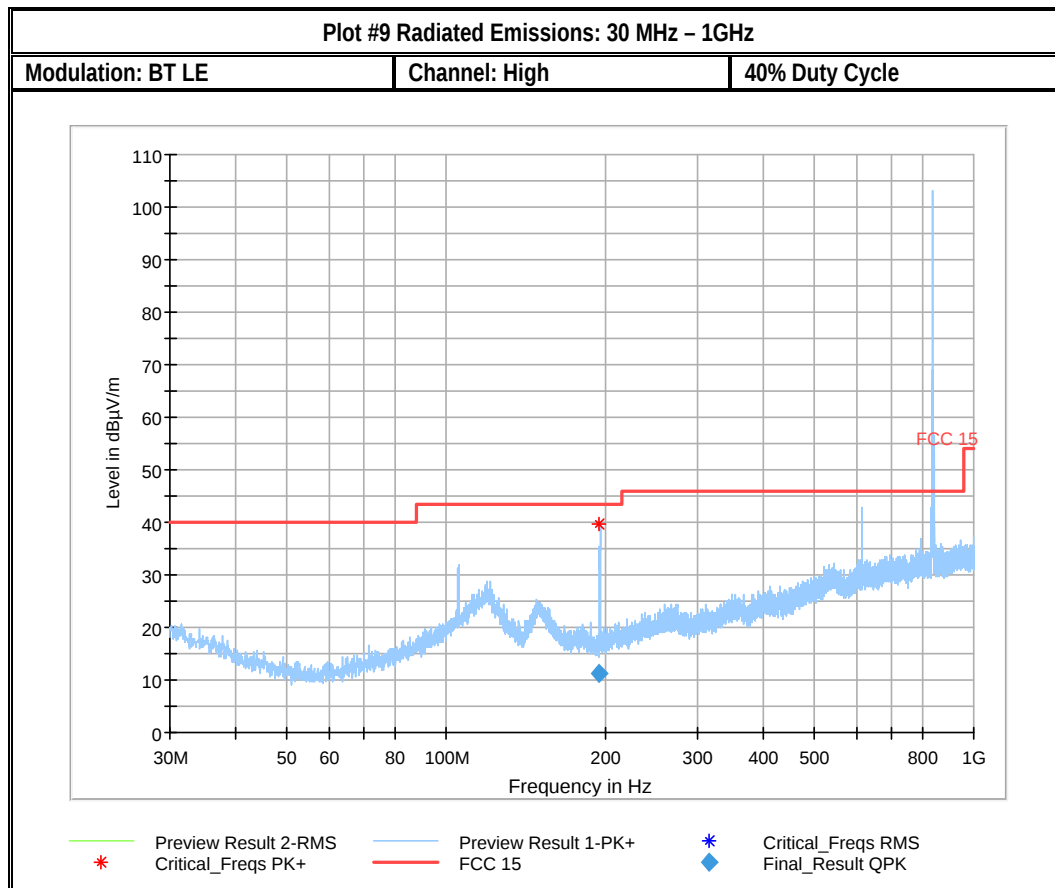
Note: Signals above the limits are the cellular



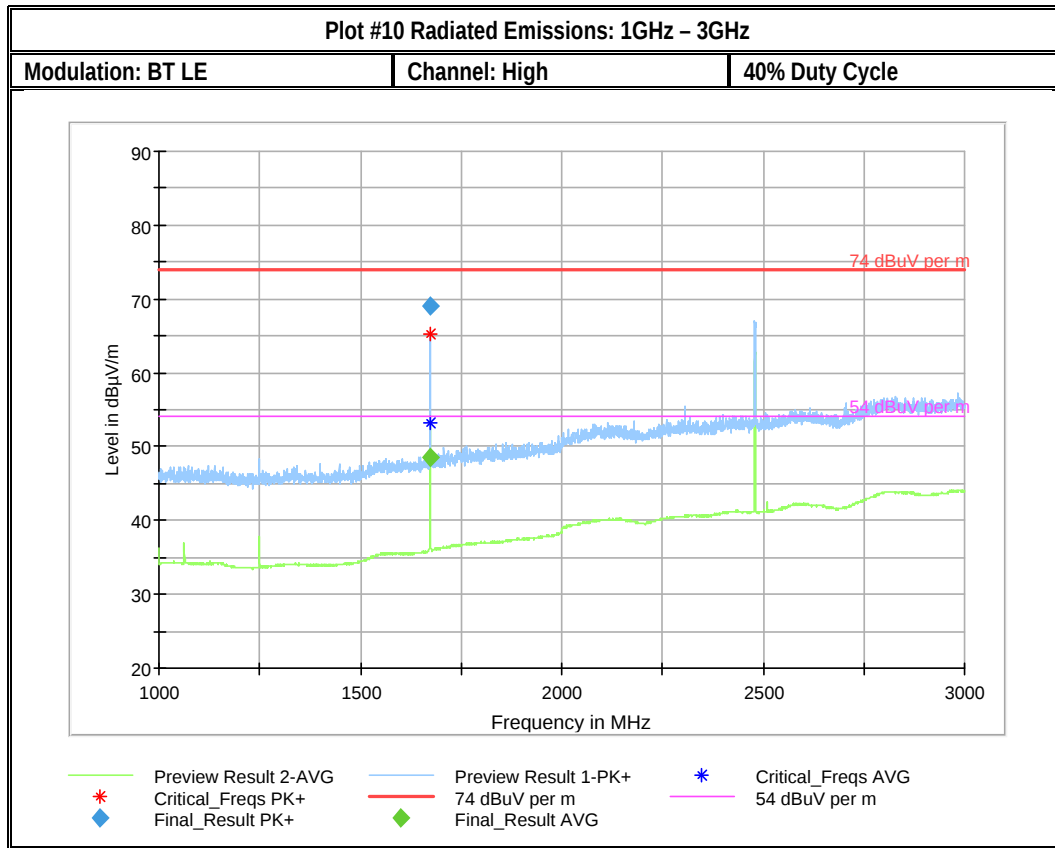
Note: Signal above the limits is the BT Fundamental



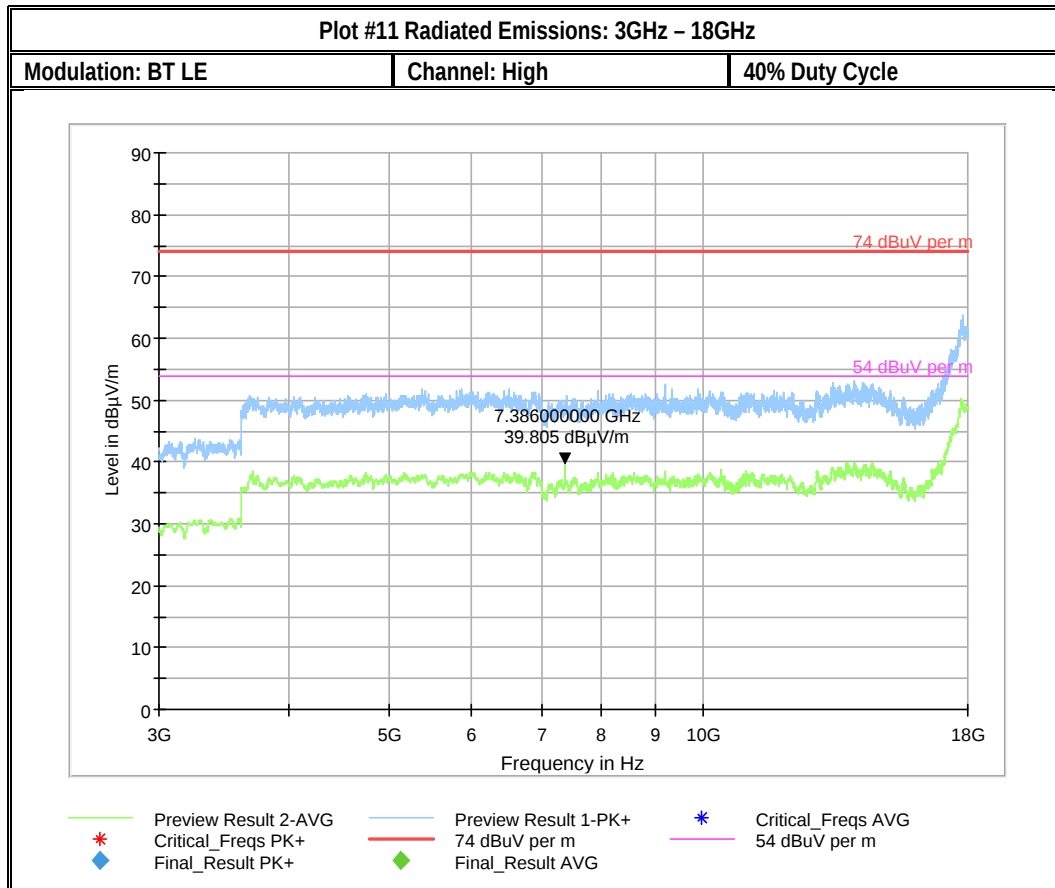




Note: Signals above the limits are the cellular



Note: The BT Fundamental signal is present.



9 Test setup photos

Setup photos are included in supporting file name: "EMC_JIO_JIOBI_001_17001-FCC-15-247-Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	Biconlog Antenna	EMCO	3142E	166067	3 years	6/27/2017
Magnetic Loop Antenna	Loop Antenna	ETS Lindgren	6512	164698	3 years	7/8/2017
Antenna Horn 3117-PA	Horn Antenna	ETS Lindgren	3117-PA	169547	3 years	8/8/2017
Digital Radio Comm. Tester	Digital Radio Comm. Tester	R&S	CMU 200 #1	101821	2 Years	7/6/2017
Digital Barometer	Compact Digital Barometer	Control Company	35519-055	91119547	2 Years	6/8/2017
FSV40	Spectrum Analyzer	R&S	FSV40	101022	2 years	5/7/2017
FSU26	Spectrum Analyzer	R&S	FSU26	200302	2 years	7/5/2017
Thermometer Humidity TM320	Thermometer Humidity	Dickson	TM320	1625369	1 Year	6/1/2017

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
11/27/2017	EMC_JIO_JIOBI_001_17001-15-247_BTLE	Initial Release	Elijah Garcia