



FCC / ISED & Test Report

For:
Jiobit

Marketing Name:
Jiobit

Model:
TP101

Product Description:
Jiobit Location Monitor

FCC ID: 2AKLI-TP101

Applied Rules and Standards:
47 CFR Parts 27
RSS 130 Issue 2

REPORT #: EMC_JIOBI_005_22001_FCC_27_Rev1

DATE: 2023-06-30



A2LA Accredited

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3462B

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1 Assessment

The following device as further described in section 3 of this report was evaluated against the applicable criteria specified in the Code of Federal Regulations Title 47 parts 27, and Industry Canada Standards RSS-130 issue 2.

No deficiencies were ascertained.

Company	Description	Model #
Jiobit	Jiobit Location Monitor	TP101

Responsible for Testing Laboratory:

Arndt Stoecker

2023-06-30

Compliance

(Director of Regulatory Services)

Date	Section	Name	Signature
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Responsible for the Report:

Art Thammanavarat

2023-06-30

Compliance

(Senior EMC Engineer)

Date	Section	Name	Signature
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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
EMC Lab Manager:	Arndt Stoecker
Responsible Project Leader:	Phillip Quintal

2.2 Identification of the Client

Client Firm/Name:	Jiobit Inc.
Street Address:	30 N. LaSalle St. Suite 2630
City/Zip Code	Chicago, IL 60602
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

Brand:	Jiobit
Marketing Name:	Jiobit
Product Description:	Jiobit Location Monitor
Model Name :	TP101
FCC-ID :	2AKLI-TP101
HW Version :	TP101 review A
SW Version :	V21.39
Bands/Modes Supported	<u>Cellular Modules</u> RF Module FCC ID: 2AAGMGM02SA <u>Wireless Technologies</u> LTE CAT-M1 Band: 13
Antenna information	<u>Main Antenna</u> Manufacturer: JIOBIT, PCB IFA Model Number: 15000007003 Maximum Gain: -5.5 dBi Frequency Range: 777-787 MHz
Other Radios included in the device	Bluetooth LE, Wi-Fi 2.4GHz, GPS
Power Supply/ Rated Operating Voltage Range	3VDC
Operating Temperature Range	Low :-10 °C Norm to High 50 °C
Sample Revision	☒ Production ☐ Pre-Production
EUT Dimensions	37mm x 50mm x 12mm
Weight	18g
EUT Diameter	☒ < 60 cm ☐ Other _____

3.2 EUT Sample details

EUT #	Model Number	HW Version	SW Version	Comments
1	TP101	TP101 review A	V21.39	N/A

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	Mobile Device	Pixel 6 pro	Google	G1832778

3.4 Test Sample Configuration

Set-up #	EUT / AE used for set-up	Comments
1	EUT#1	Radiated Emissions

3.5 Mode of Operation

Operating Mode	Note	Comments
Op. 1	Cellular + BLE	During the testing process, the EUT was tested with Cellular sets on mid channels, and highest possible 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. Cellular transmits simultaneously with BLE.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to evaluate the compliance of the EUT against the relevant requirements specified in the Code of Federal Regulations Title 47 parts 27 and ISSED Standards RSS-130 issue 2.

5 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=2.

Radiated measurement

Measurement System	EMC 1	EMC 2
Conducted emissions (mains port)	1.12 dB	0.46 dB
Radiated emissions (< 30 MHz)	3.66 dB	3.88 dB
(30 MHz – 1GHz)	3.17 dB	3.34 dB
(1 GHz – 3 GHz)	5.01 dB	4.45 dB
(>3 GHz)	4.0 dB	4.79 dB

RF conducted measurement ± 0.5 dB

According to ANSI C63.26 (2015) 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 3dB to the limit.

5.1 Environmental Conditions During Testing:

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

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

5.2 Dates of Testing:

2023-05-01 – 2023-05-25

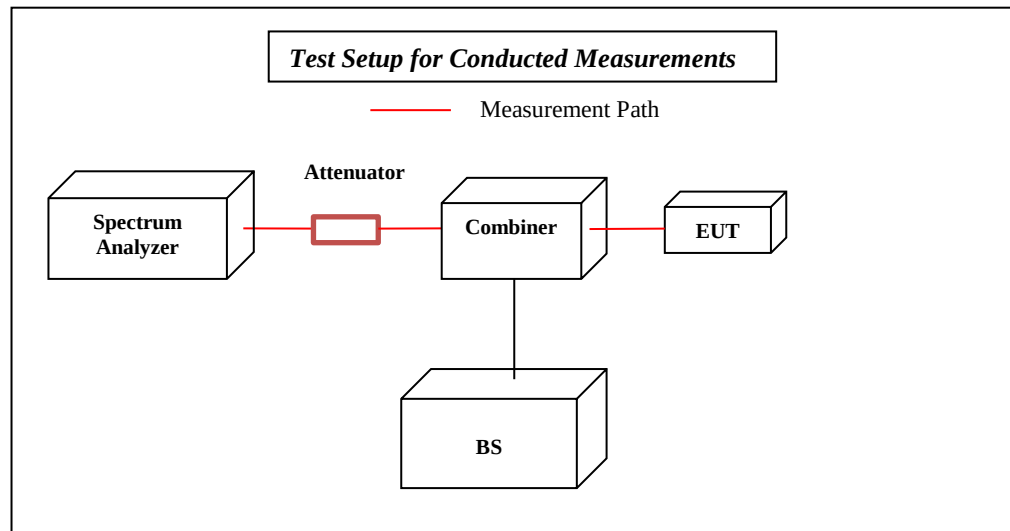
5.3 Decision Rule:

Cetecom advanced follows ILAC G8:2019 chapter 4.2.1 (Simple Acceptance Rule).

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3. The measurement uncertainty is mentioned in this test report, See chapter 9, but is not taken into account – neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong.

6 Measurement Procedures

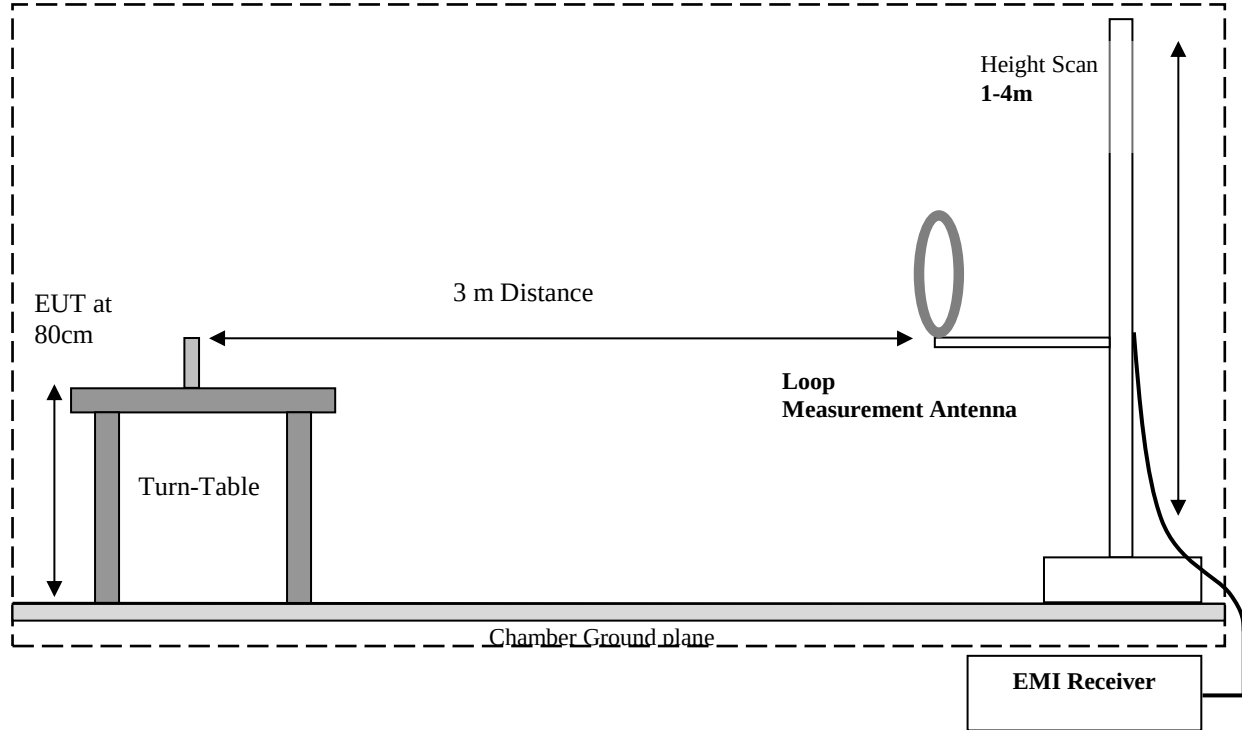
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03r01 – “Measurement Guidance for Certification of Licensed Digital Transmitters” and according to relevant parts of ANSI C63.26 (2025) as detailed below.



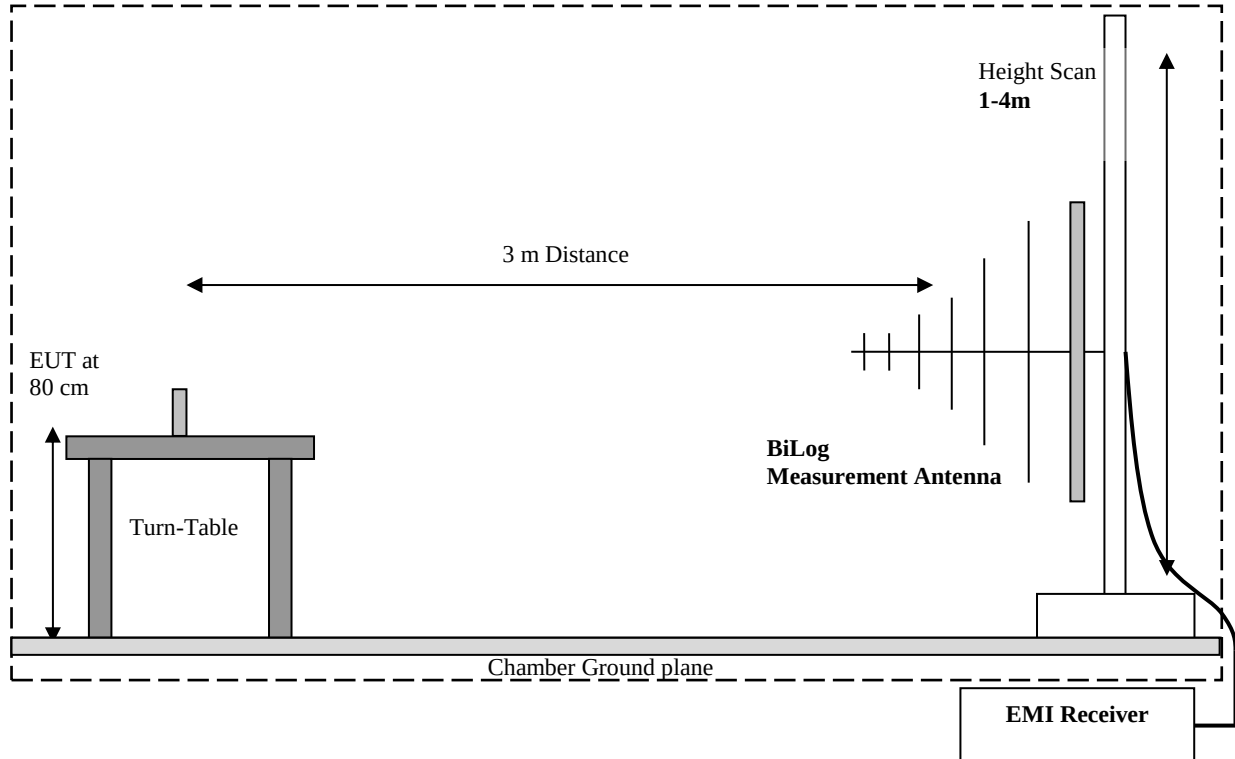
6.1 Radiated Measurement

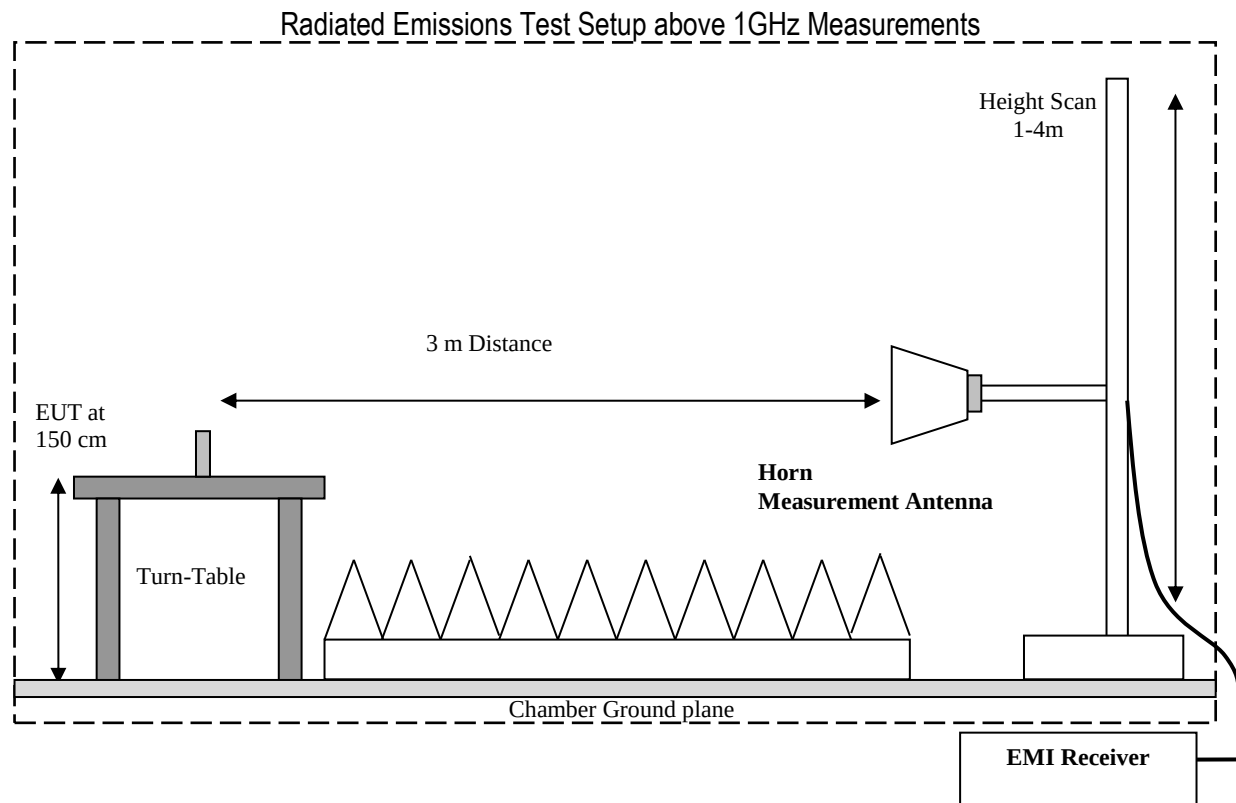
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to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





6.2 Sample Calculations for Field Strength Measurements

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

- Measured reading in dB μ V
- Cable Loss between the receiving antenna and SA in dB and
- 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 Measurement Results Summary

7.1 FCC 27 / RSS-139

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §27.50	RF Output Power	Nominal	Op. 1	■	□	□	□	Note 2
§2.1055; §27.54	Frequency Stability	Extreme Temperature and Voltage		□	□	□	■	Note 3
§2.1049; §27.53	Occupied Bandwidth	Nominal		□	□	□	■	Note 4
§2.1051; §27.53	Band Edge Compliance	Nominal		□	□	□	■	Note 5
§2.1051; §27.53	Conducted Spurious Emissions	Nominal		□	□	□	■	Note 1
§2.1053; §27.53	Radiated Spurious Emissions	Nominal	Op. 1	■	□	□	□	Complies

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from report # (NIE) 71605RRF.003A2, Section RF Output Power Page 13 (FCC ID: 2AAGMGM02SA)

Note 3: Leveraged from report # (NIE) 71605RRF.003A2, Section Frequency Stability Page 27 (FCC ID: 2AAGMGM02SA)

Note 4: Leveraged from report # (NIE) 71605RRF.003A2, Section Occupied Bandwidth Page 36 (FCC ID: 2AAGMGM02SA)

Note 5: Leveraged from report # (NIE) 71605RRF.003A2, Spurious Emissions at Antenna Terminals at Block Edges Page 73 (FCC ID: 2AAGMGM02SA)

8 Test Result Data

8.1 RF Output Power Verifications

8.1.1 Conducted Measurement utilizing KDB 971168 D01 Power Meas License Digital Systems v03r01

Spectrum Analyzer settings for CCDF procedure for PAPR measurements:

- $RBW \geq OBW$
- Number of counts = 10000
- Sweep time ≥ 1 ms
- Record the maximum PAPR level associated with a probability of 0.1%

8.1.2 Test conditions and setup:

Ambient Temperature (C)	EUT Set-Up #	EUT operating mode	Power Input
20.9	1	Op. 1	3VDC

8.1.3 Measurement result:

Channel	EUT operating mode	Frequency (MHz)	E.I.R.P (dBm)
Mid	LTE 13	782.0	20.33

8.2 Radiated Spurious Emissions

8.2.1 Measurement utilizing KDB 971168 D01 Power Meas License Digital Systems v03r01, and according to ANSI/TIA-603-D-2010

Spectrum Analyzer Settings for FCC 22

Frequency Range	30MHz – 1 GHz	1 – 1.58 GHz	1.58 – 9 GHz
Resolution Bandwidth	100 kHz	1 MHz	1 MHz
Video Bandwidth	100 kHz	1 MHz	1 MHz
Detector	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto

Spectrum Analyzer Settings for FCC 24

Frequency Range	30MHz – 1 GHz	1 – 2.7 GHz	2.7 – 18 GHz	18 – 19.1 GHz
Resolution Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz
Video Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz
Detector	Peak	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto	Auto

8.2.2 Limits:

8.2.2.1 FCC Part 22.917 (a); FCC Part 24.238 (a); FCC Part 27.53 (h)

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

8.2.2.2 RSS-132 Part 5.5; RSS-133 Part 6.5; RSS-139 Part 6.6 Transmitter Unwanted Emissions

Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts).

ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

Note: The limit calculation result is a constant of -13 dBm.

8.2.3 Test conditions and setup:

Ambient Temperature (C)	EUT Set-Up #	EUT operating mode	Power Input
20.9	1	Op. 1	3VDC

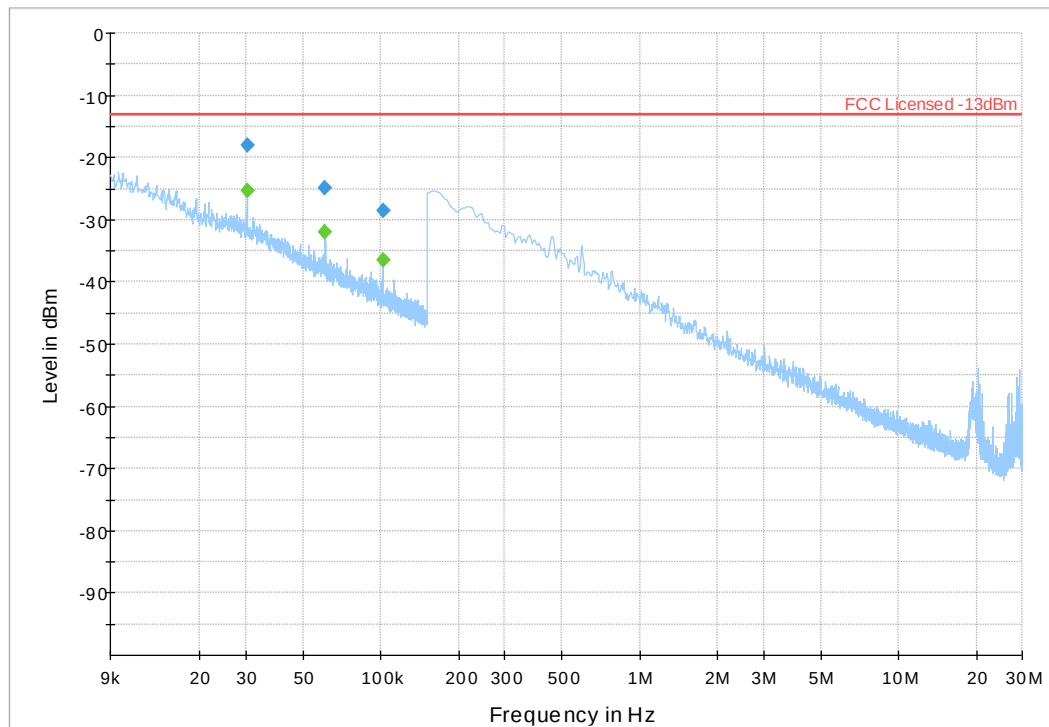
8.2.4 Measurement result:

Plot #	Channel	EUT operating mode	Scan Frequency	Limit (dBm)	Result
1	Mid	LTE 13 + BLE	9 kHz – 30 MHz	-13	Pass
2	Mid	LTE 13 + BLE	30 MHz – 1000 MHz	-13	Pass
3	Mid	LTE 13 + BLE	1 GHz – 3 GHz	-13	Pass
4	Mid	LTE 13 + BLE	3 GHz – 9 GHz	-13	Pass

8.2.5 Measurement Plots:

Plot # 1 (9KHz – 30MHz) LTE_B13_BLE MID CH

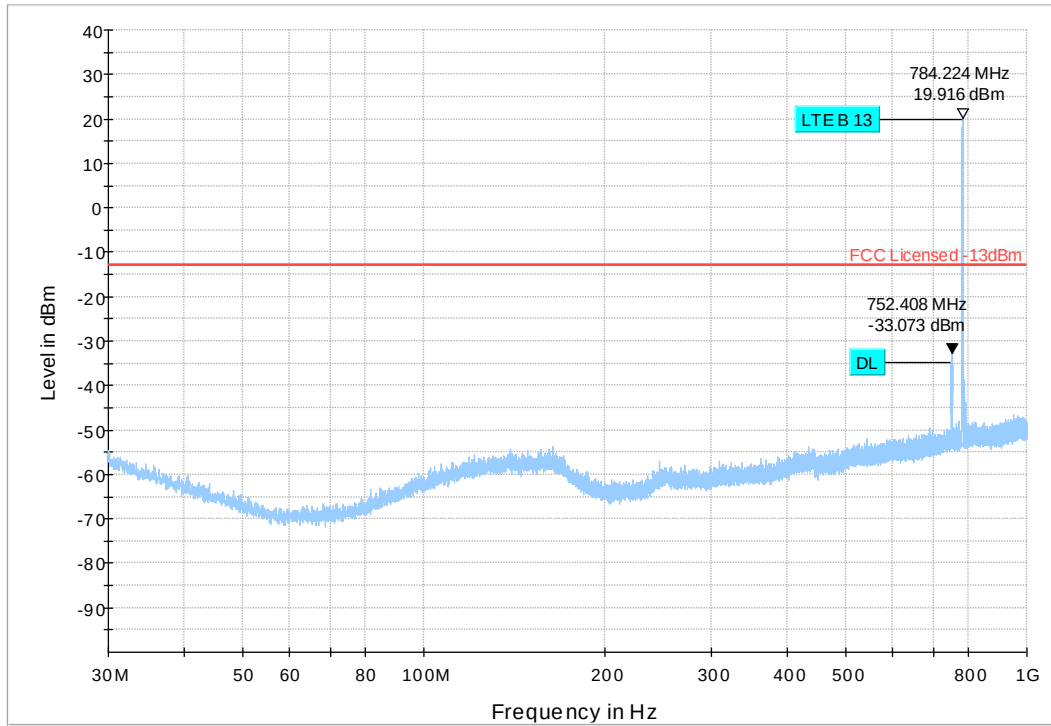
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.03	---	-25.43	---	---	500.0	1.0	100.0	V	79.0	-73.3
0.03	-17.97	---	-13.00	4.97	500.0	1.0	100.0	V	79.0	-73.3
0.06	-24.99	---	-13.00	11.99	500.0	1.0	100.0	V	292.0	-76.2
0.06	---	-32.04	---	---	500.0	1.0	100.0	V	292.0	-76.2
0.10	-28.64	---	-13.00	15.64	500.0	1.0	100.0	V	265.0	-76.9
0.10	---	-36.43	---	---	500.0	1.0	100.0	V	265.0	-76.9



— Preview Result 1-PK+ — FCC Licensed -13dBm ◆ Final_Result PK+ ◆ Final_Result RM

Plot # 2 (30 MHz – 1000MHz) LTE_B13_BLE MID CH

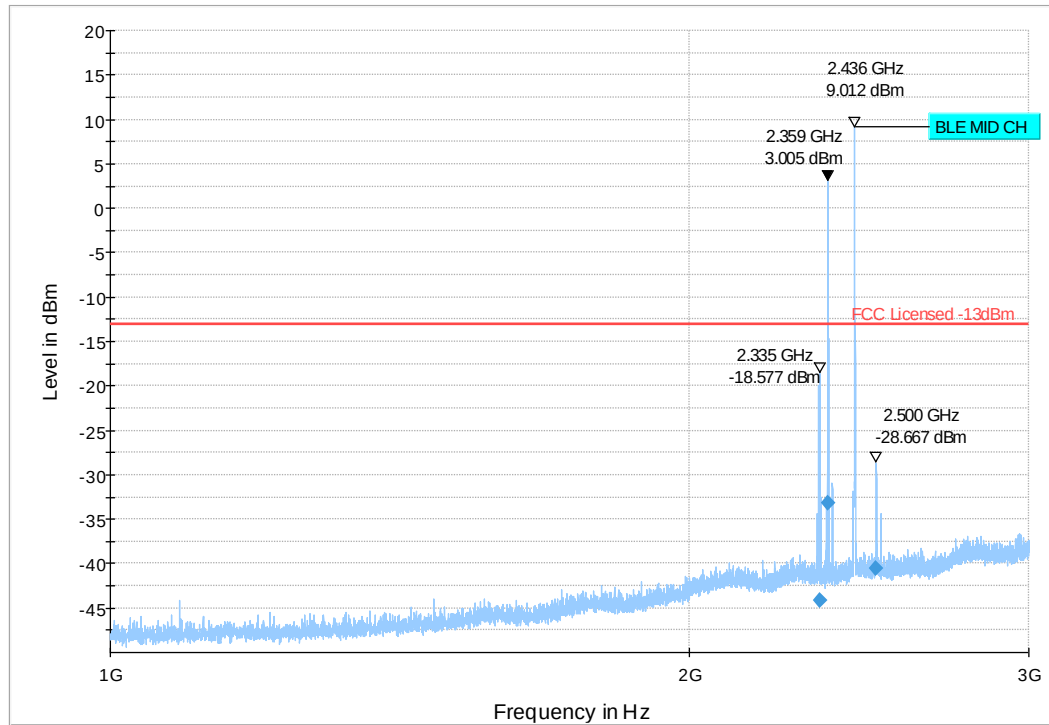
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
---	---	---	---	---	---	---	---	---	---	---



Preview Result 1-PK+ FCC Licensed -13dBm Final_Result PK+ Final_Result RM

Plot # 3 (1 GHz – 3 GHz) LTE B13 BLE MID CH

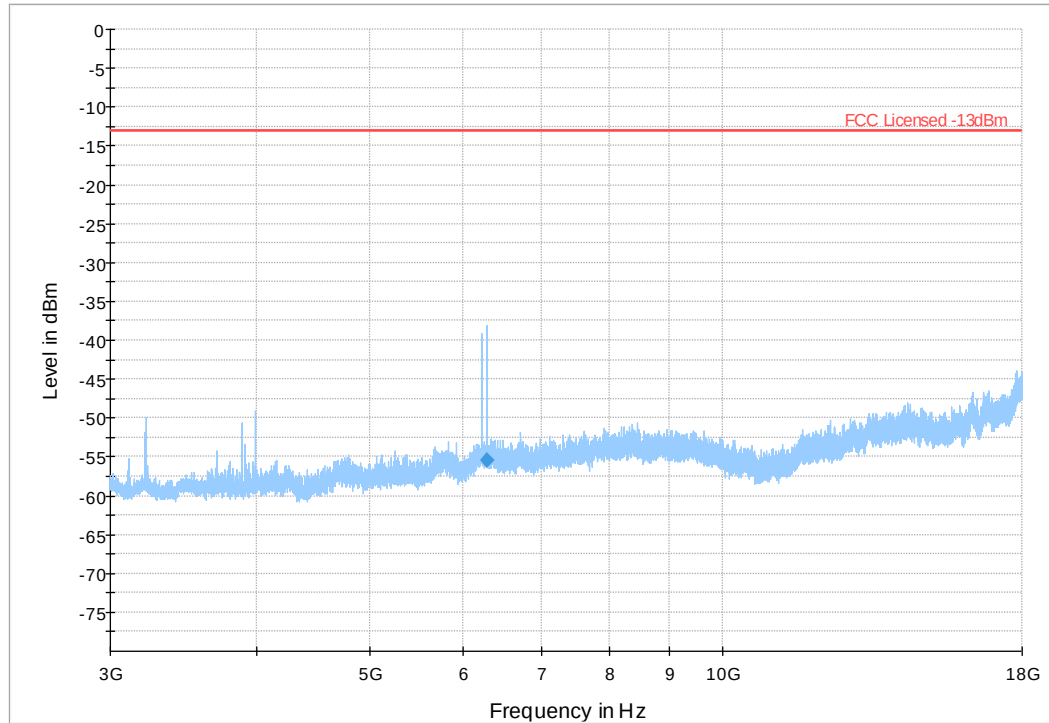
Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
2335.25	-44.10	-13.00	31.10	500.0	1000.0	150.0	H	70.0	-60.46	
2359.00	-33.19	-13.00	20.19	500.0	1000.0	149.0	H	271.0	-60.48	
2500.00	-40.60	-13.00	27.60	500.0	1000.0	150.0	H	-4.0	-59.67	



Preview Result 1-PK+ FCC Licensed -13dBm Final_Result RMS

Plot # 4 (3 GHz – 9 GHz) LTE B13 BLE MID CH

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
6292.00	-55.39	-13.00	42.39	500.0	1000.0	150.0	H	-15.0	-95.09	



Preview Result 1-PK+ FCC Licensed -13dBm Final_Result RMS

9 Test setup photos

Setup photos are included in supporting file name: "EMC_JIOBI_005_22001_FCC_Setup_Photos"

10 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
BILOG ANTENNA	ETS.LINDGREN	3142E	00166067	3 YEARS	10/21/2021
HORN ANTENNA	EMCO	3115	00035111	3 YEARS	09/30/2021
HORN ANTENNA	ETS.LINDGREN	3116	00070497	3 YEARS	11/23/2020
TEST RECEIVER	R&S	ESU40	100251	3 YEARS	09/13/2021
DIGITAL THERMOMETER	CONTROL COMPANY	36934-164	181230565	3 YEARS	10/20/2021

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	Prepared by
2023-06-20	EMC_JIOBI_005_22001_FCC_27	Initial Version	Art Thammanavarat
2023-06-29	EMC_JIOBI_005_22001_FCC_27_Rev1	<u>Report revised</u> 1. <u>Section 7.1: Added note.</u>	Art Thammanavarat

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