FCC Test Report

FOR:

Jio, Inc.

Model Name:

Jiobit

Product Description:

JioBit Smart Tag Location Tracker

FCC ID: 2AKLI-080715
IC ID: 22220-080715

Per:
47 CFR: Part 22, Part 24.

Report #: EMC_JIO_JIOBI_001_17001-FCC-22-24

Date: November 28, 2017

A2LA Accredited

IC recognized #
3462B-2

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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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 22, 24, 27. No deviations were ascertained during the course of the tests performed.

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

Responsible for Testing Laboratory:

Date	Section	Name	Signature
November 28, 2017	Compliance	James Donnellan (Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
November 28, 2017	Compliance	(EMC Engineer)	Elijah Garcia Digitally signed by Elijah Garcia DN: cn=Elijah Garcia, o=Cetecom Inc., ou=RC&E, email=elijah.garcia@cetecom.com, c=US Date: 2017.11.28 18:27:41 -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
Lab Manager:	James Donnellan
Project Engineer:	

2.2 Identification of the Client

Applicant's Name:	Tom Wied
Street Address:	351 W. Hubbard St., Suite 400
City/Zip Code	Chicago, IL 60654
Country	USA

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	GSM: Quad band, UMTS: FDDI, FDDII, FDDV, FDDVIII
Type(s) of Modulation	Cellular (Sierra Wireless HL8548-G): (GSM: Quad band, UMTS: FDDI, FDDII, FDDV, FDDVIII)
Antenna Information as declared	max gain 0.75 dBi
Max. Output Powers	25 dBm
Power Supply/ Rated Operating Voltage Range	2.9V dc (min) / 3.8V dc (nom) / 4.35V dc (max)
Operating Temperature Range	-40ºC to 65ºC
Other Radios included in the device	Bluetooth Low Energy: GFSK 802.11b: DSSS 802.11g/n: OFDM 802.11n: MCS (20 & 40 MHz)
Sample Revision	☐Prototype Unit ☐Production Unit ■Pre-Production

3.2 EUT Sample details

EUT #	Model Number	HW Version	SW Version	Notes/Comments
1	4188N8762W	1.0	2.0	N/A

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	N/A
2	EUT #1 + AE #1+ ATE#1	N/A

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 22, 24, 27 to support the equipment certification under FCC ID: 2AKLI-080715 IC ID: 22220-080715.

The module test data can be obtained under the FCC Filing ID: N7NHL8548, IC ID: 2417C-HL8548.

5 Measurement

5.1 Date of Testing:

10/23/2017 – 11/02/2017

5.2 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 30MHz	±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

5.3 Environmental Conditions during Testing:

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

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

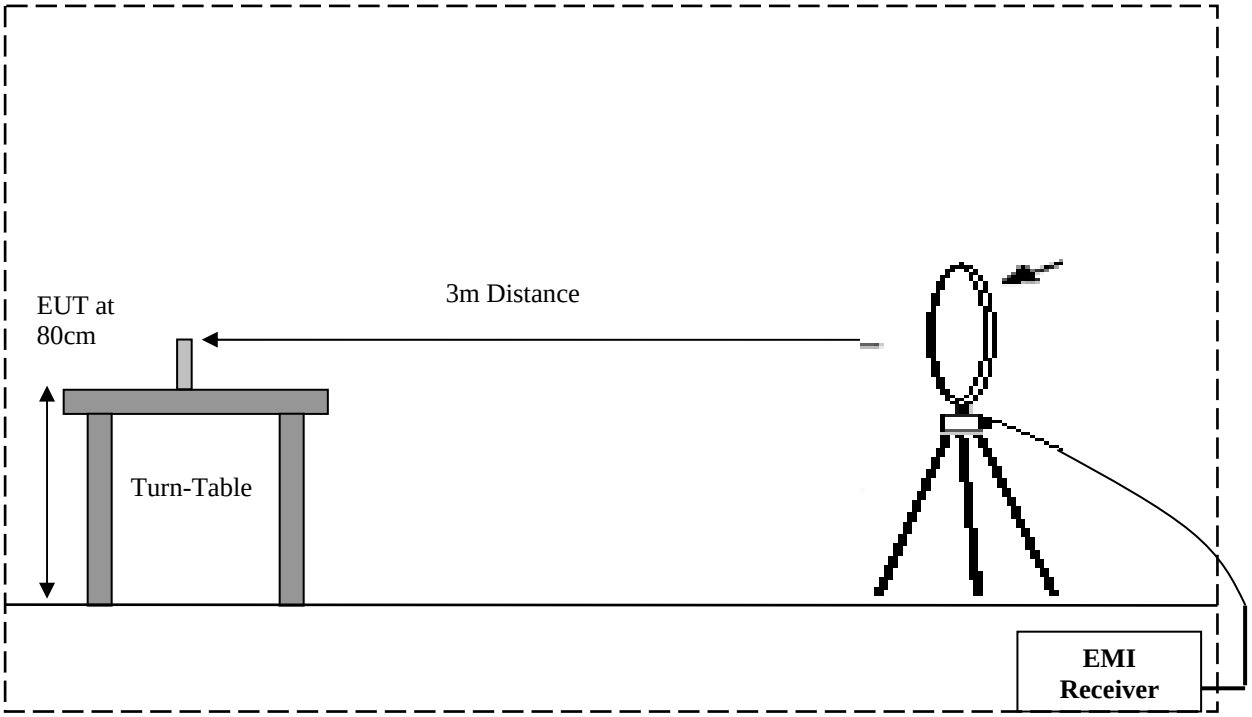
5.4 Dates of testing:

10/23/2017 – 11/02/2017

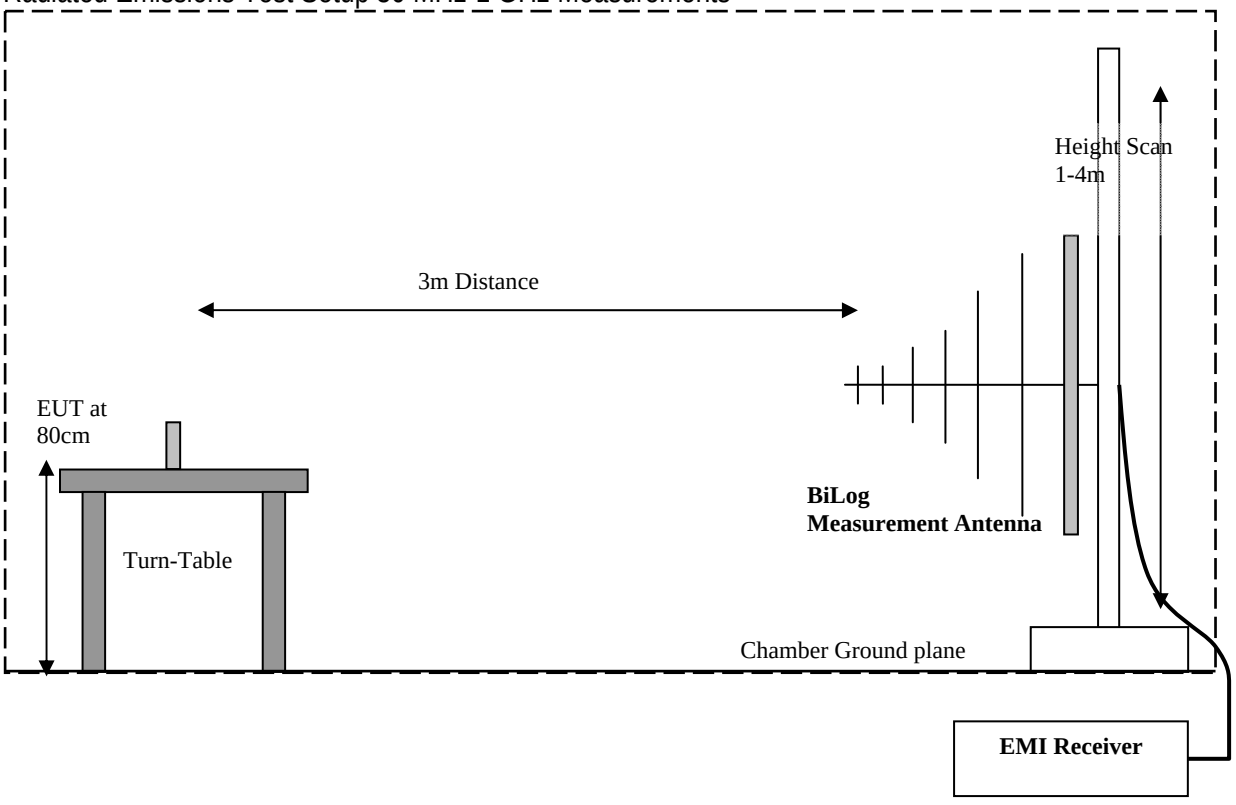
5.5 Radiated Measurement

- 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.

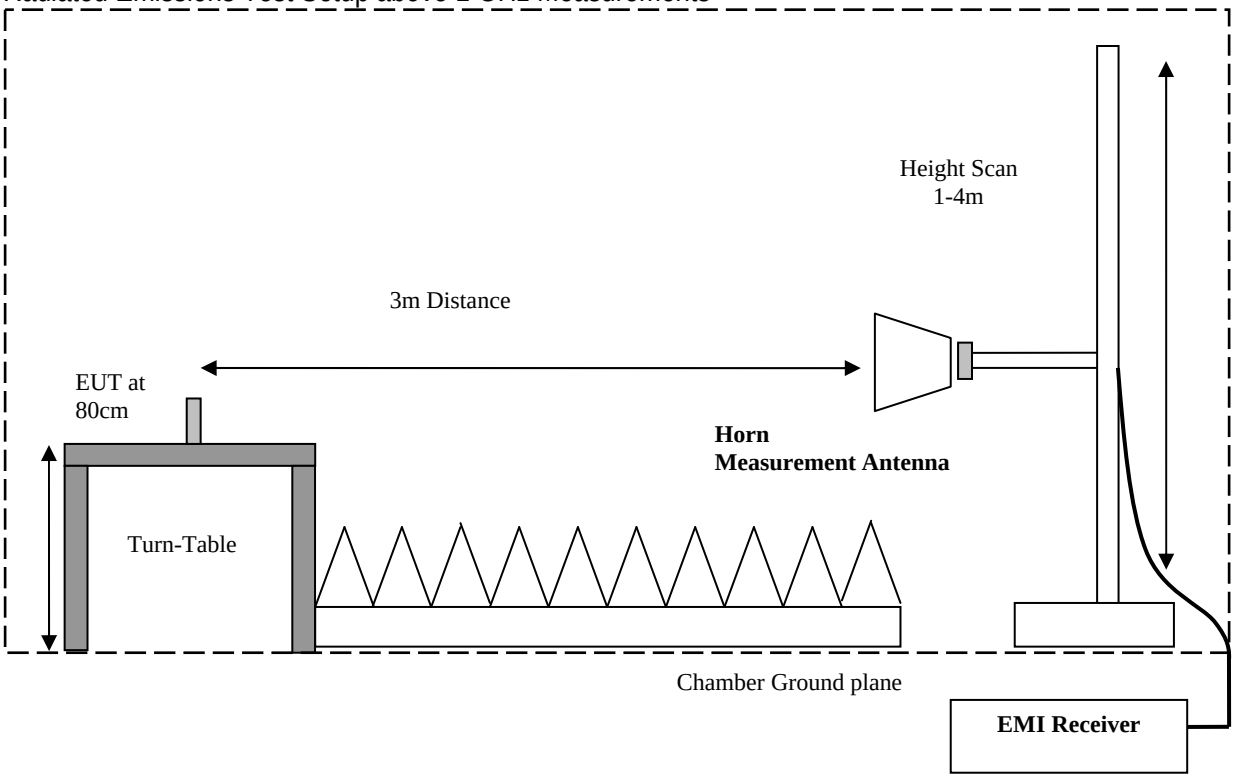
Radiated Emissions Test Setup below 30 MHz Measurements



Radiated Emissions Test Setup 30 MHz-1 GHz Measurements



Radiated Emissions Test Setup above 1 GHz Measurements



5.6 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 dBµV
- 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 (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

6 Measurement Results Summary

6.1 FCC 22:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a) RSS-132 5.4	RF Output Power	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1055 §22.355 RSS-132 5.3	Frequency Stability	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1049 §22.917(b) RSS-132 5.2	Occupied Bandwidth	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1051 §22.917 RSS-132 5.5	Band Edge Compliance	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1051 §22.917 RSS-132 5.5	Conducted Spurious Emissions	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1053 §22.917 RSS-132 5.5	Radiated Spurious Emissions	Nominal	GSM / WCDMA	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: was leveraged from the module conducted reports for FCC ID: N7NHL8548, IC ID: 2417C-HL8548.

6.2 FCC 24:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §24.232 (a); §27.50 (d) RSS-133 6.4	RF Output Power	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1055; §24.235; §27.54 RSS-133 6.3	Frequency Stability	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1049; §24.238; §27.53 RSS-133 6.2	Occupied Bandwidth	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1051; §24.238; §27.53 RSS-133 6.5	Band Edge Compliance	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1051; §24.238; §27.53 RSS-133 6.5	Conducted Spurious Emissions	Nominal	GSM / WCDMA	☐	☐	☐	■	Note 2
§2.1053; §24.238; §27.53 RSS-133 6.5	Radiated Spurious Emissions	Nominal	GSM / WCDMA	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: was leveraged from the module conducted reports for FCC ID: N7NHL8548, IC ID: 2417C-HL8548.

7 Radiated Spurious Emissions

7.1 Radiated Spurious Emissions

7.1.1 Measurement according to FCC: CFR 47 Part 2.1053; CFR Part 22.917; Part 24.238; Part 27.53; RSS-132 5.5; RSS-133 6.5; RSS-139 6.6, utilizing KDB 971168 D01 Power Meas License Digital Systems v02r02, and according to TIA-603C 2004- 2.2.12

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 and 27

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

7.1.2 Limits:

7.1.2.1 FCC Part 22.917 (a), Part 24.238 (a), and Part 27.53 (h)

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 = (-13dBm)

7.1.2.2 RSS-132 5.5; RSS-133 6.5; RSS-139 6.6

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 equipment's operating frequency block, 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 log10p (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 log10 p (watts).

7.1.3 Test conditions and setup:

Ambient Temperature (C)	EUT Set-Up #	EUT operating mode	Power Input
23.2	1 + 2	FDD II / FDD V 1900 MHz /850 MHz	5V DC

7.2 Summary Measurement result:

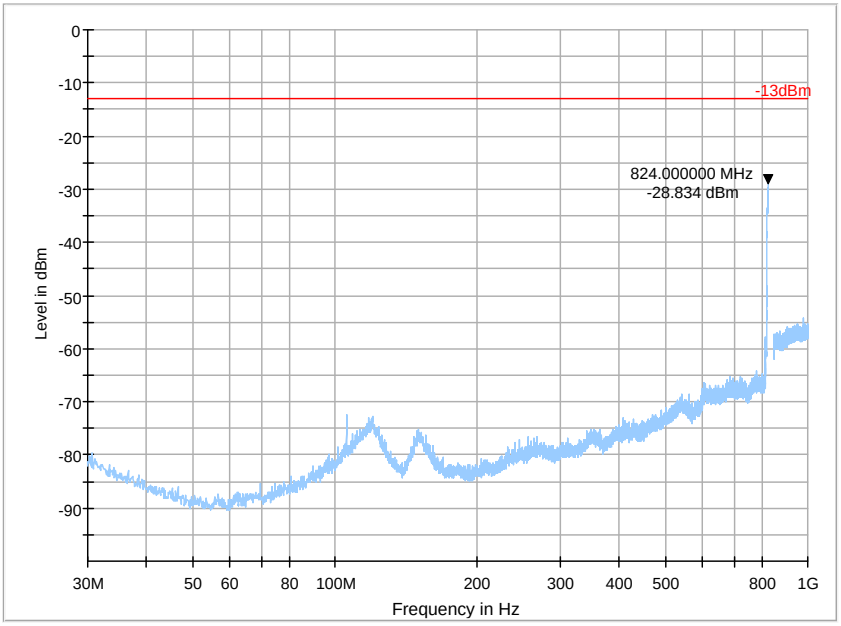
Plot #	Channel	EUT Operating Mode	Scan Frequency	Limit (dBm)	Result
1-2	Low	850 MHz	30 MHz – 9 GHz	-13	PASS
3-5	Mid	850 MHz	9 kHz – 9 GHz	-13	PASS
6-7	High	850 MHz	30 MHz – 9 GHz	-13	PASS
8-10	Low	1900 MHz	30 MHz – 18 GHz	-13	PASS
11-14	Mid	1900 MHz	9 kHz – 18 GHz	-13	PASS
15-17	High	1900 MHz	30 MHz – 18 GHz	-13	PASS
18-19	Low	FDD V	30 MHz – 9 GHz	-13	PASS
20-22	Mid	FDD V	9 kHz – 9 GHz	-13	PASS
23-24	High	FDD V	30 MHz – 9 GHz	-13	PASS
25-27	Low	FDD II	30 MHz – 18 GHz	-13	PASS
28-31	Mid	FDD II	9 kHz – 18 GHz	-13	PASS
32- 34	High	FDD II	30 MHz – 18 GHz	-13	PASS

7.3 Measurement Plots

850 MHz

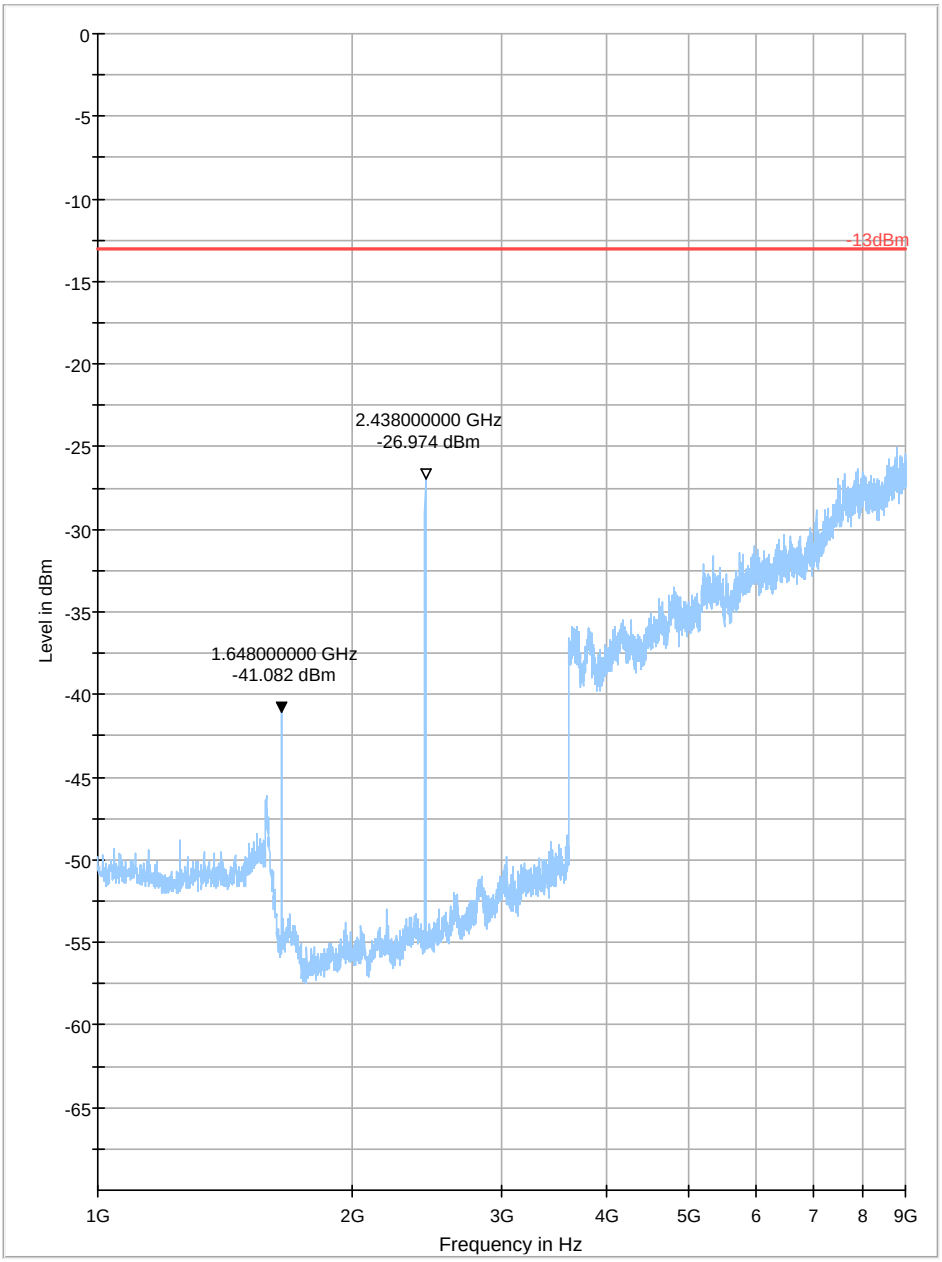
Plot #1 Radiated Emissions: 30MHz –1GHz

Channel: low



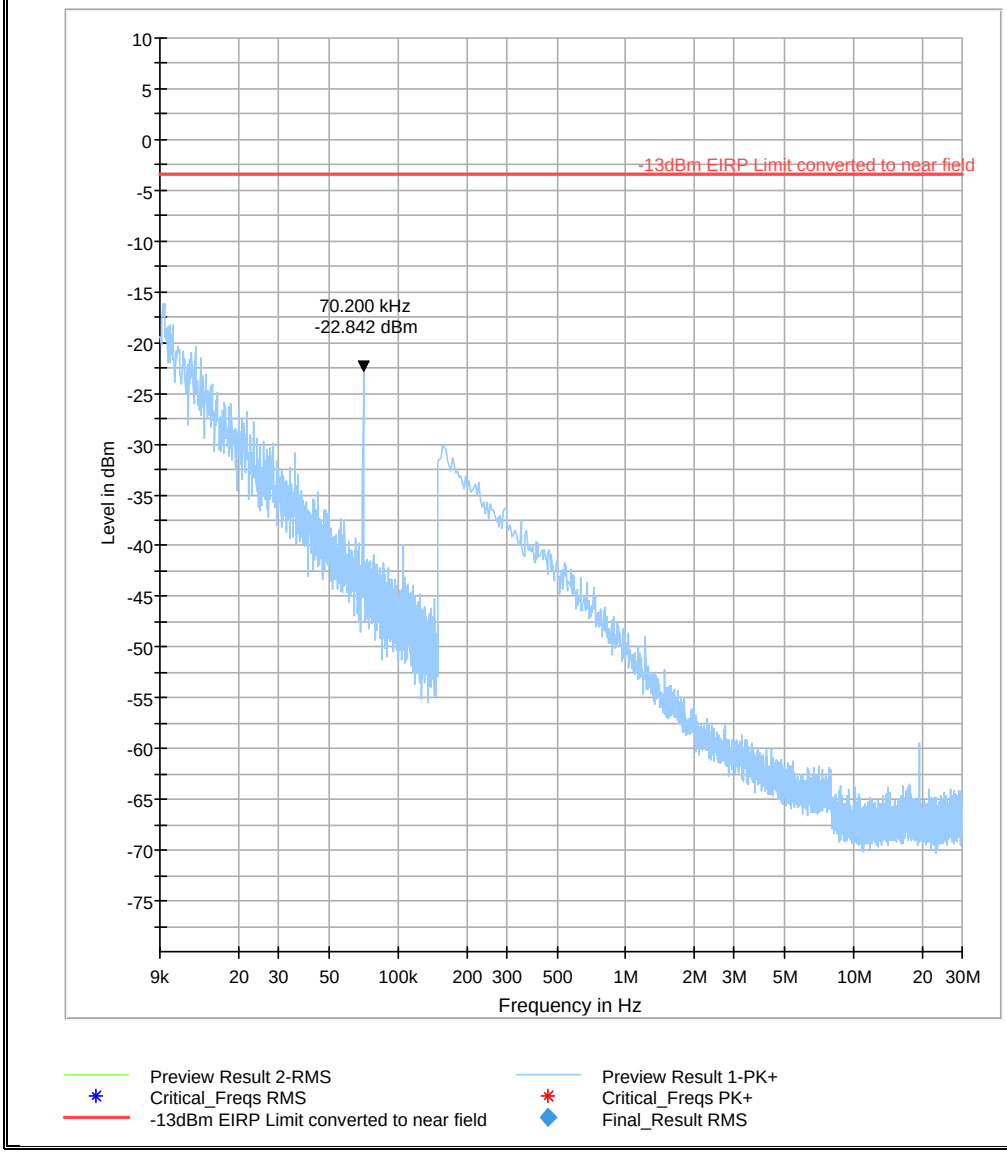
Plot #2 Radiated Emissions: 1GHz –9GHz

Channel: Mid



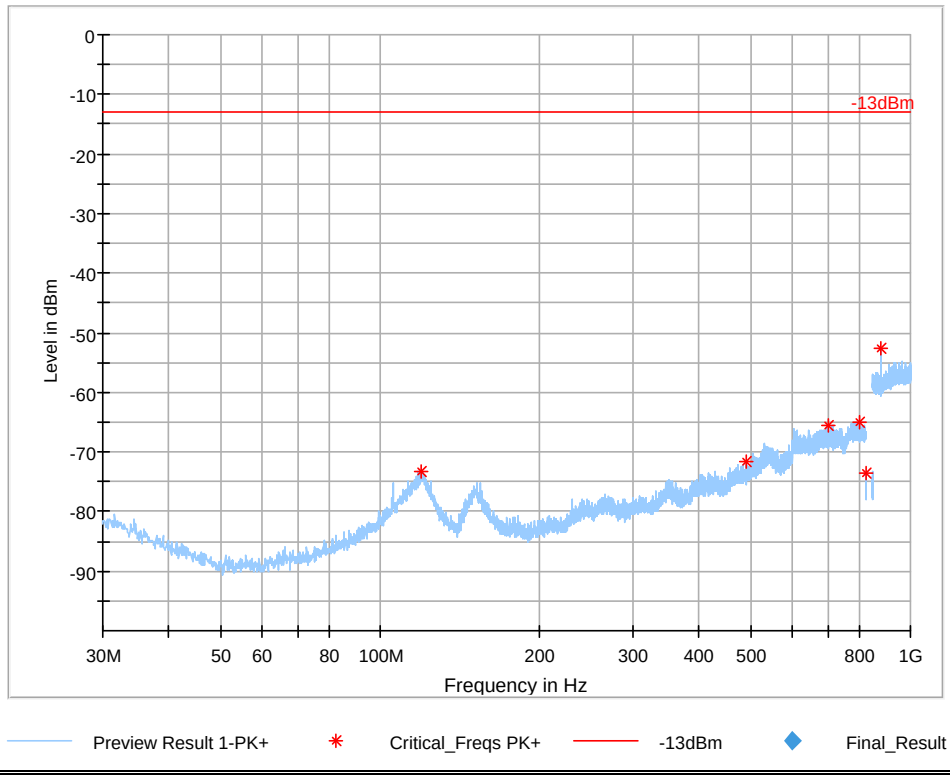
Plot #3 Radiated Emissions: 9KHz –30MHz

Channel: Mid



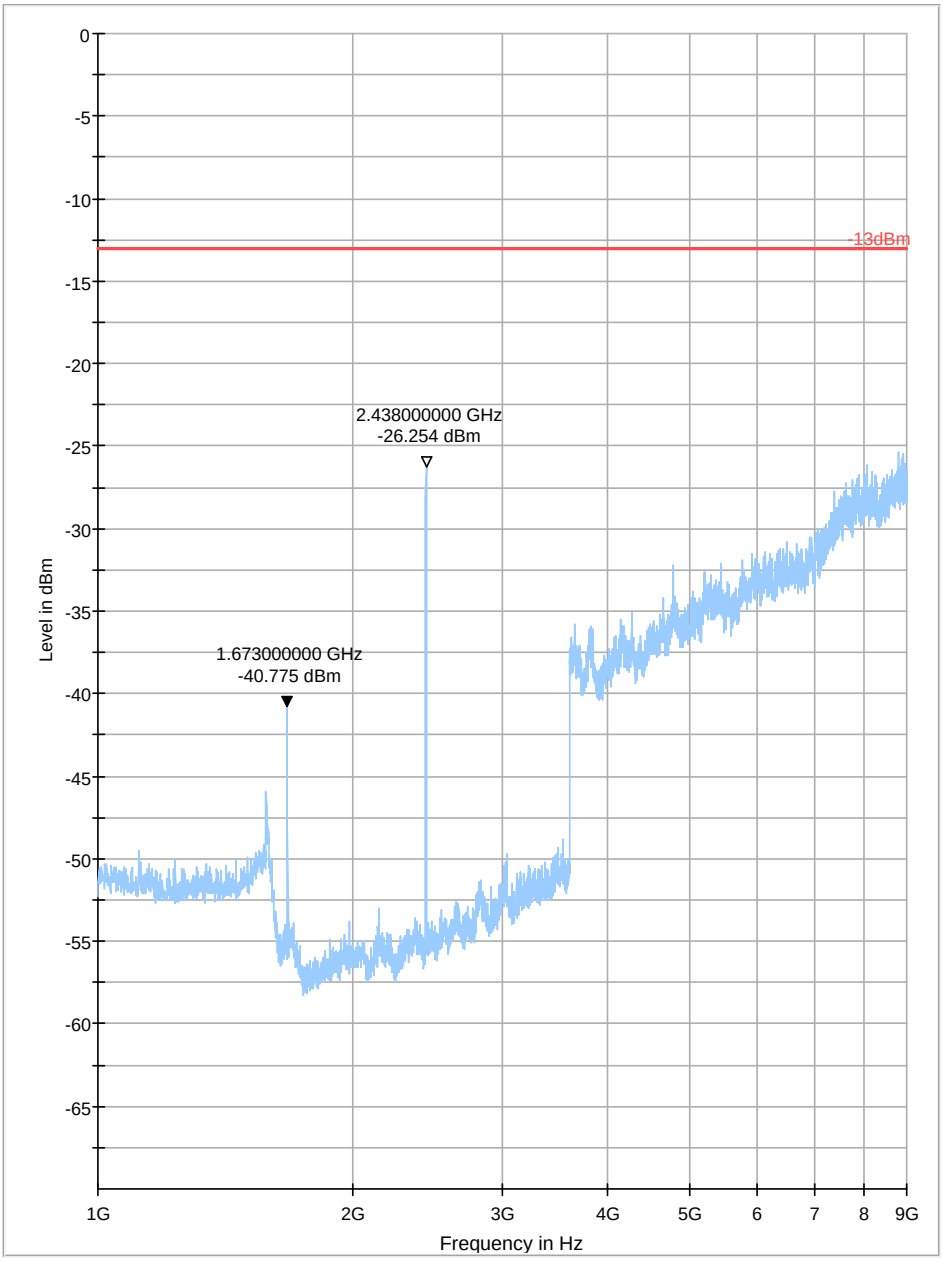
Plot #4 Radiated Emissions: 30MHz –1GHz

Channel: Mid



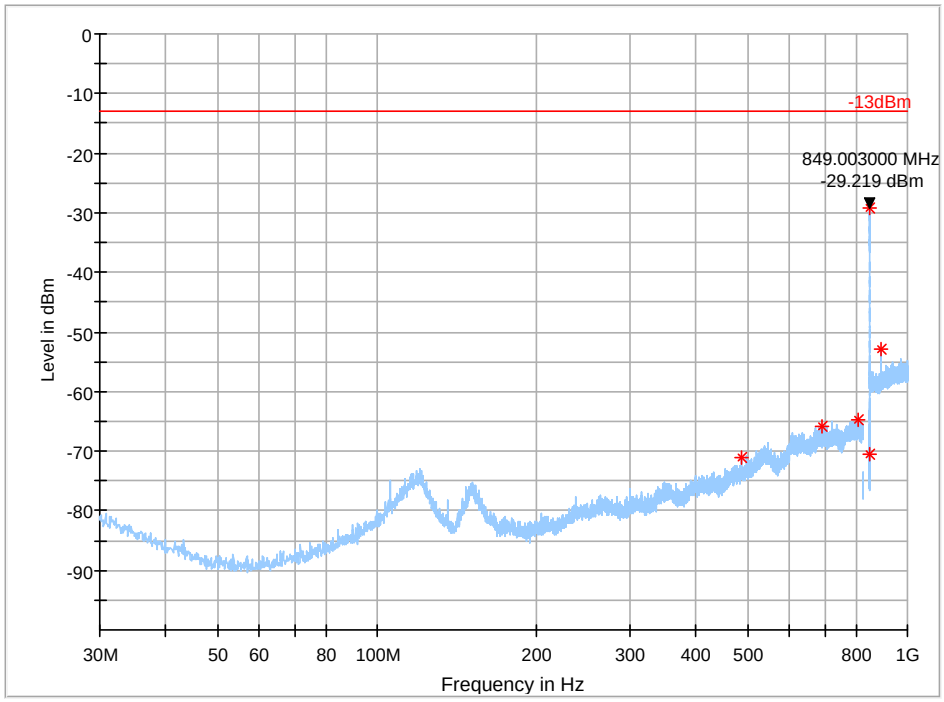
Plot #5 Radiated Emissions: 1GHz –9GHz

Channel: Mid



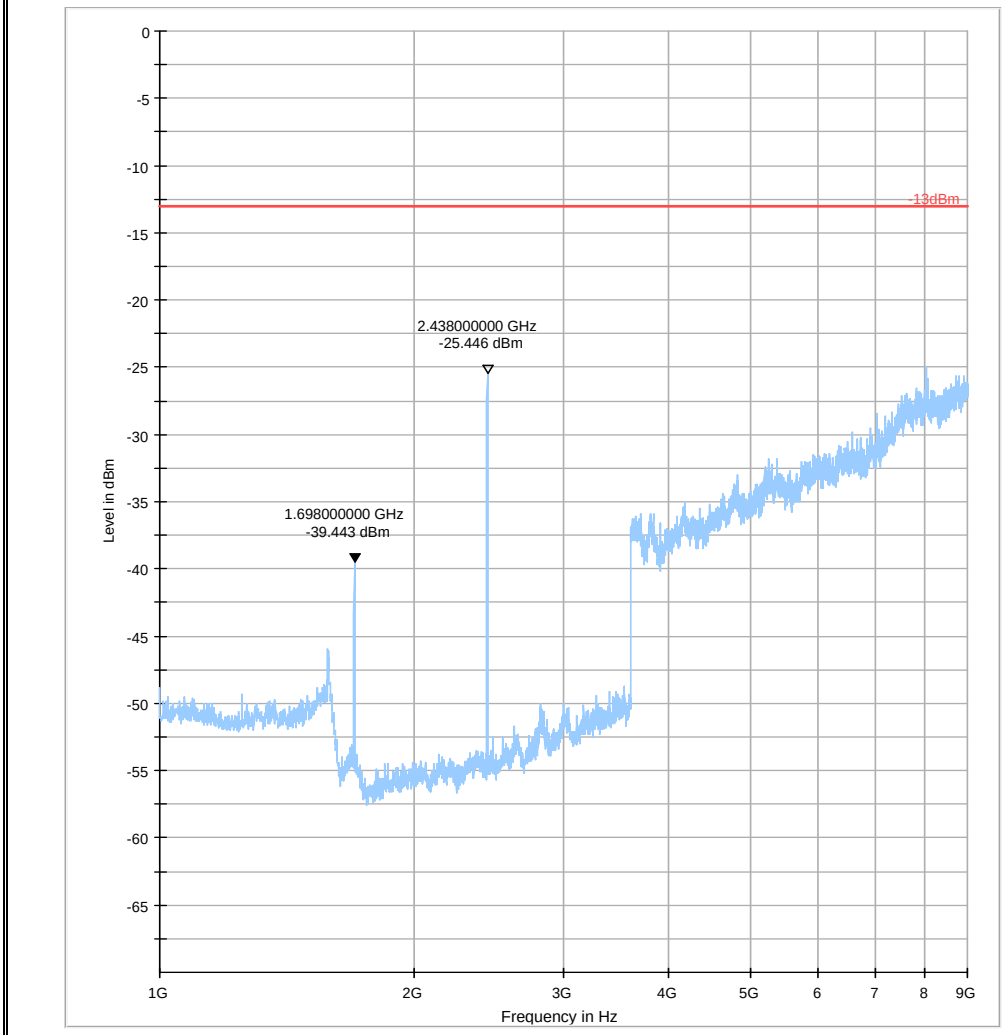
Plot #6 Radiated Emissions: 30MHz –1GHz

Channel: High



Plot #7 Radiated Emissions: 1GHz –9GHz

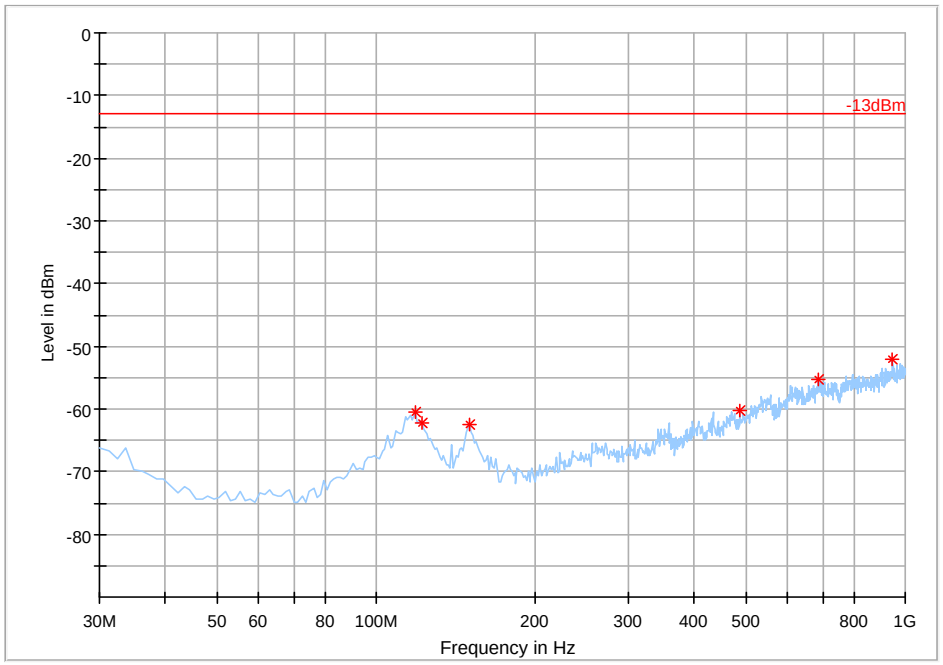
Channel: High



1900 MHz

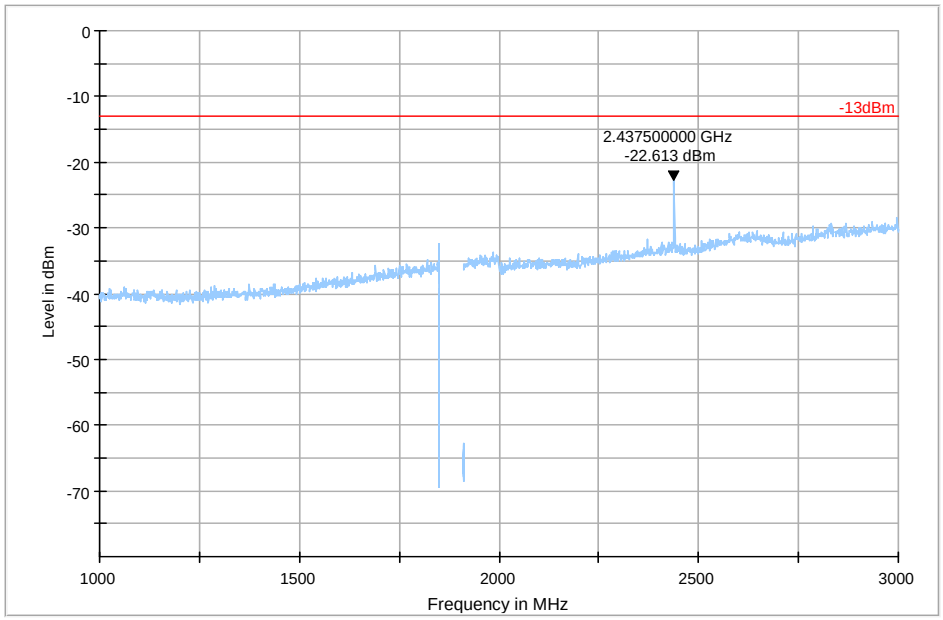
Plot #8 Radiated Emissions: 30MHz –1GHz

Channel: Low



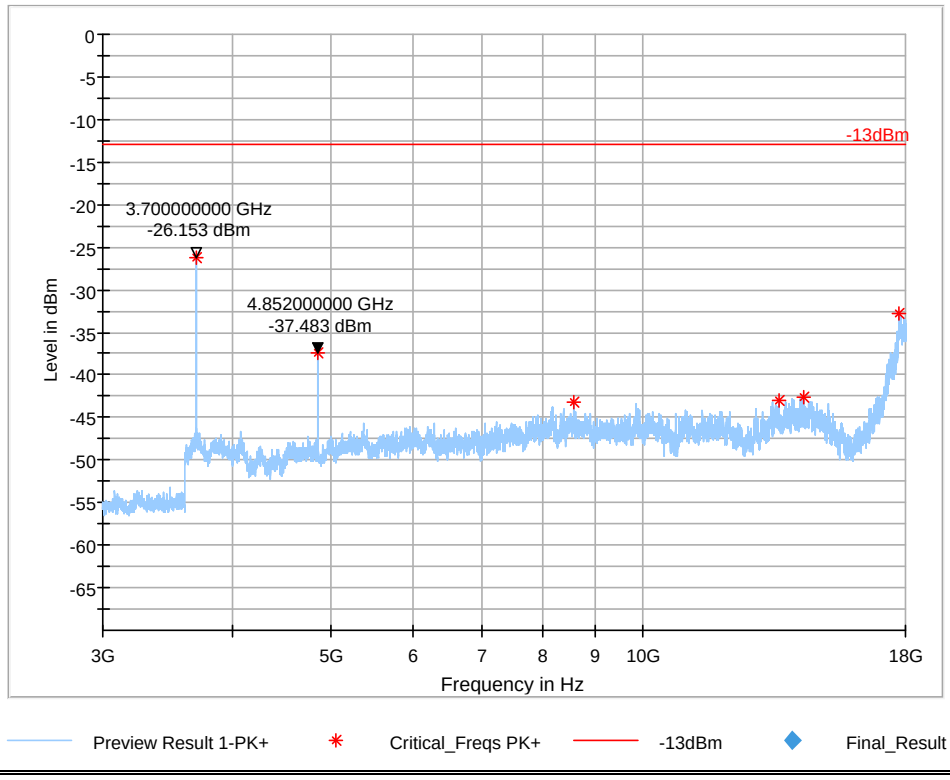
Plot #9 Radiated Emissions: 1GHz –3GHz

Channel: Low



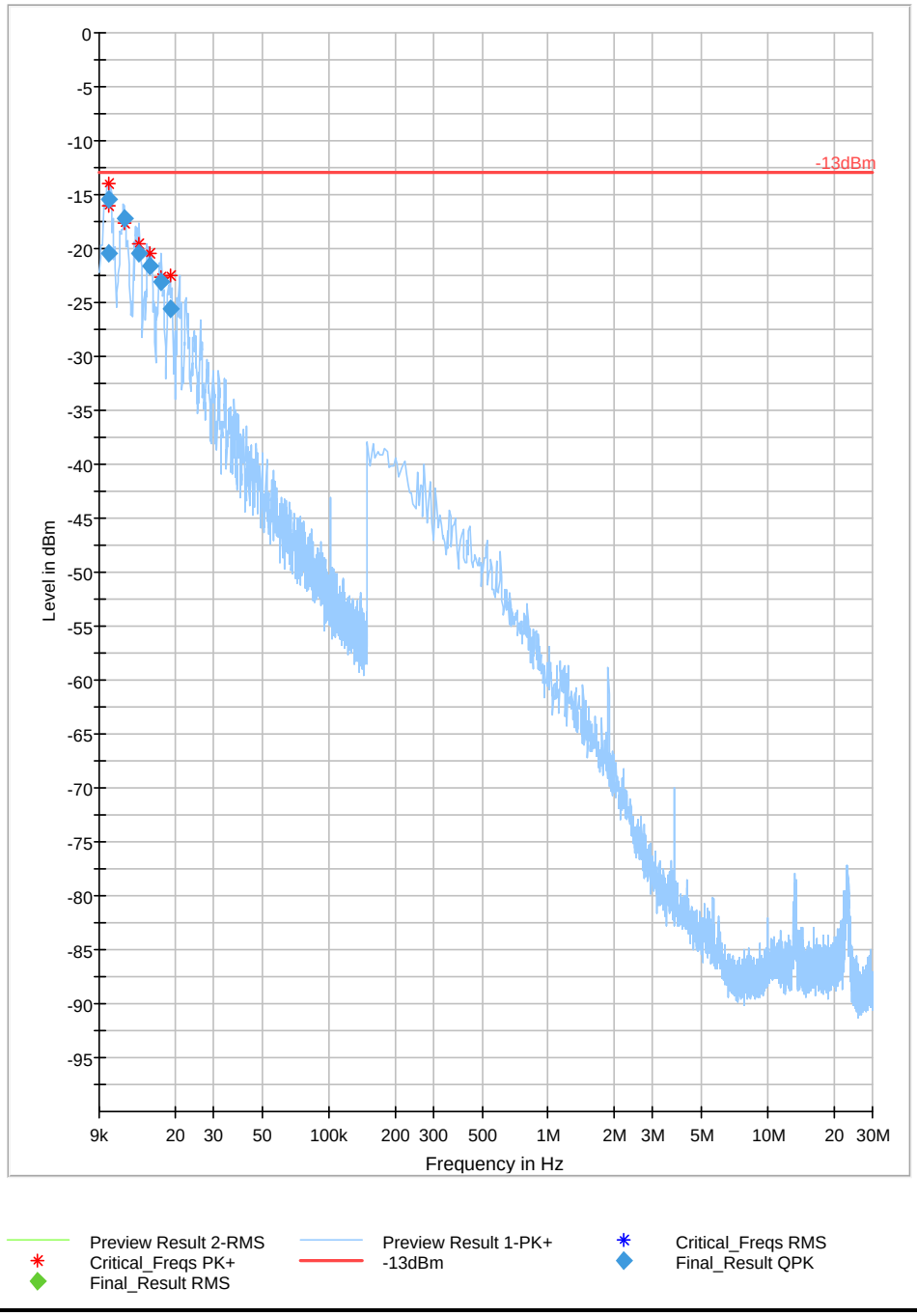
Plot #10 Radiated Emissions: 3GHz –18GHz

Channel: Low



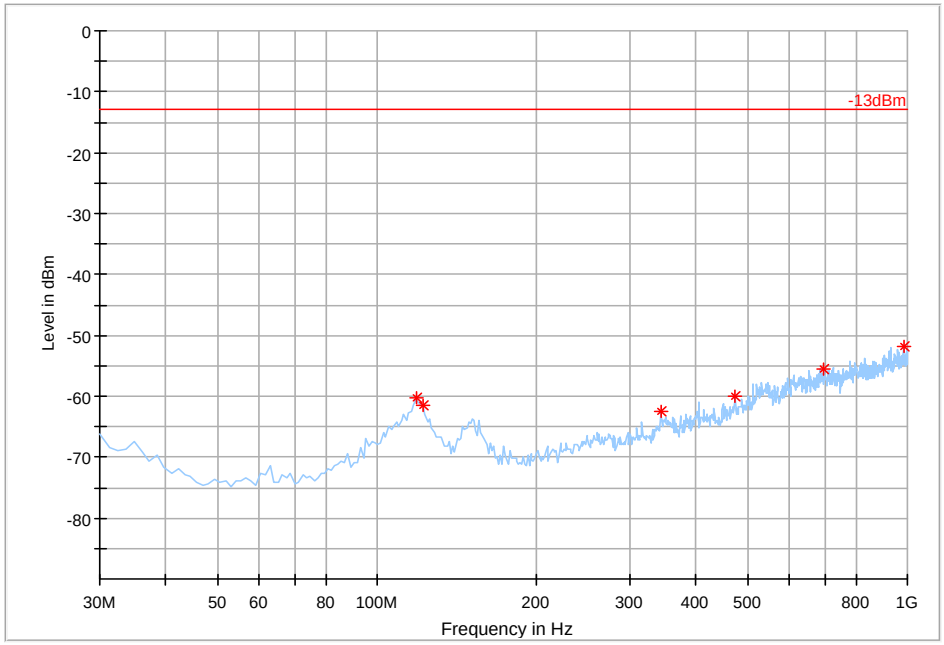
Plot #11 Radiated Emissions: 9KHz –30MHz

Channel: Mid



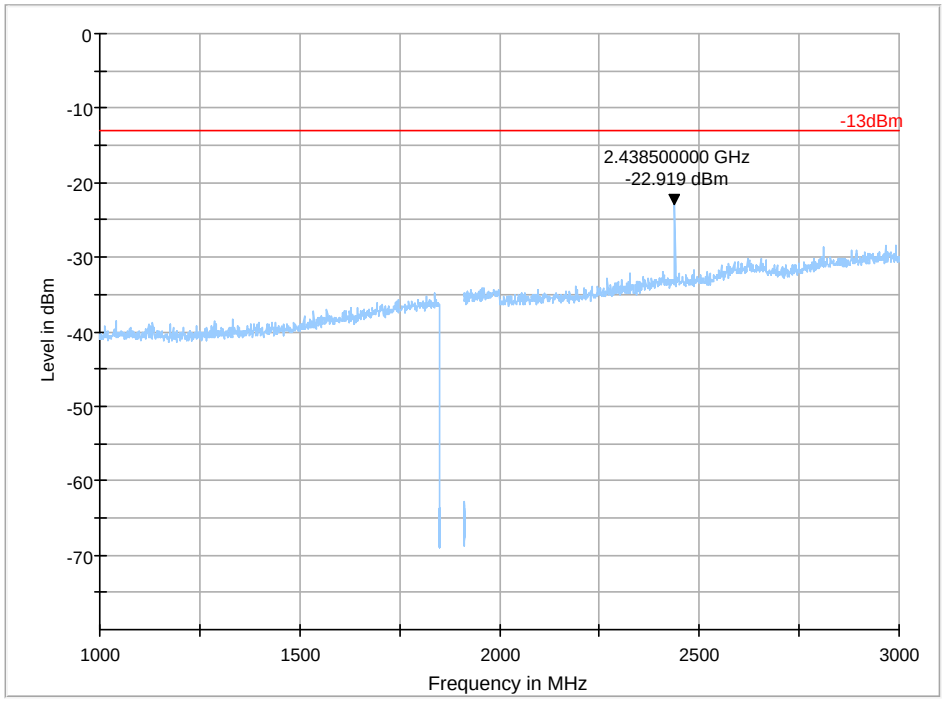
Plot #12 Radiated Emissions: 30MHz –1GHz

Channel: Mid



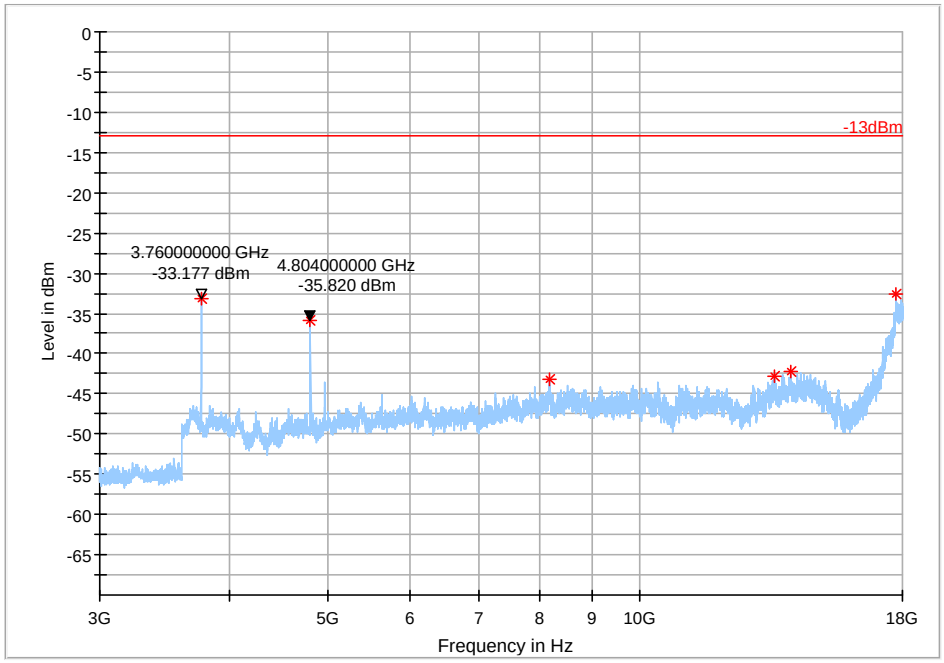
Plot #13 Radiated Emissions:1GHz –3GHz

Channel: Mid



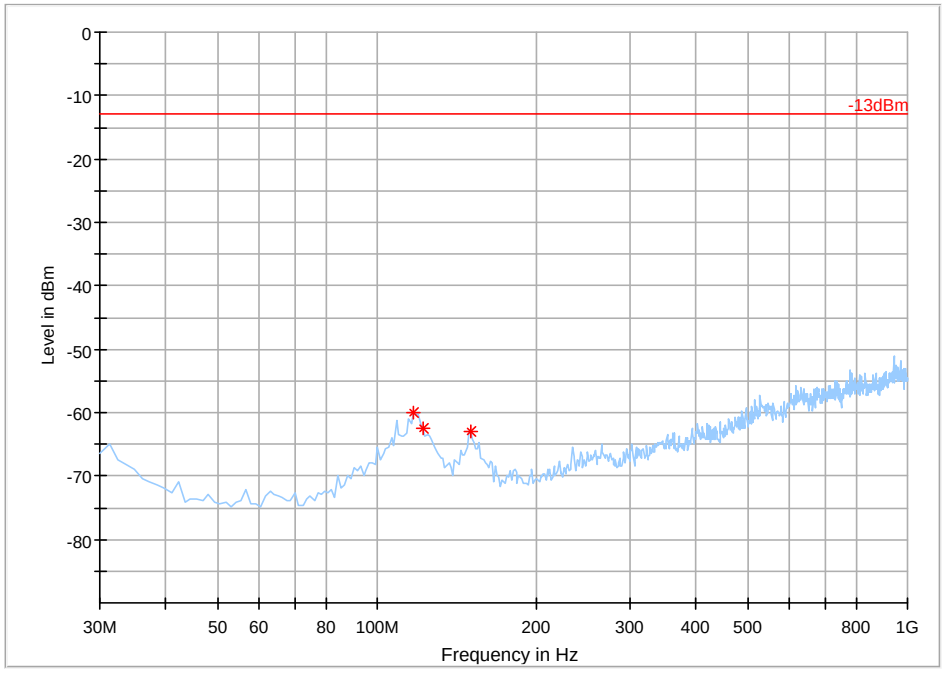
Plot #14 Radiated Emissions: 3GHz –18GHz

Channel: Mid

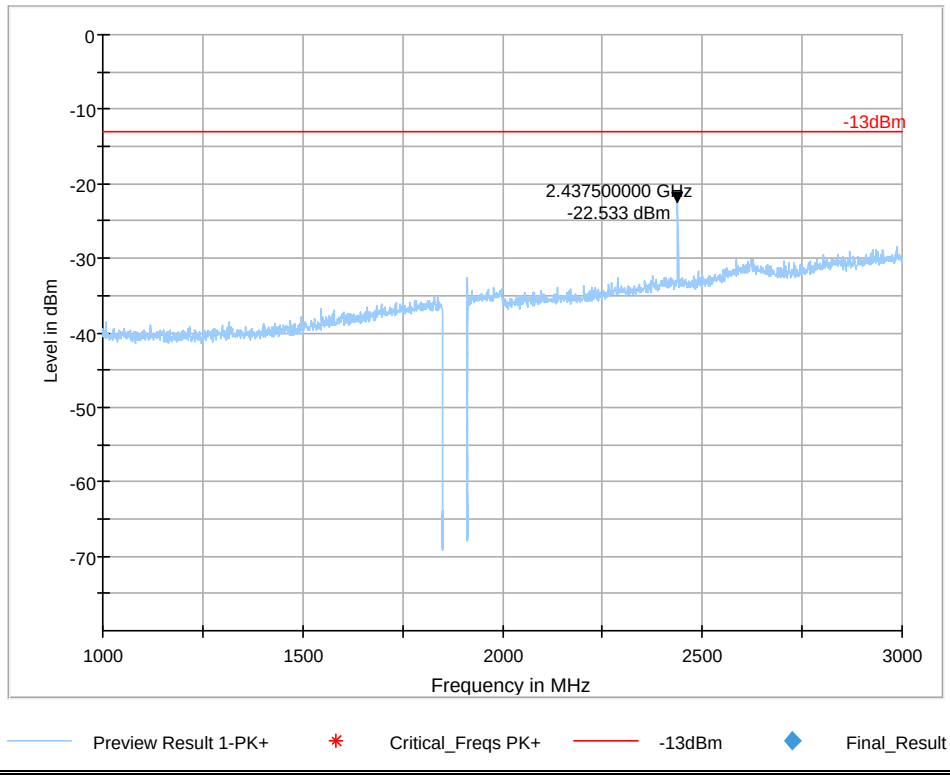


Plot #15 Radiated Emissions: 30MHz –1GHz

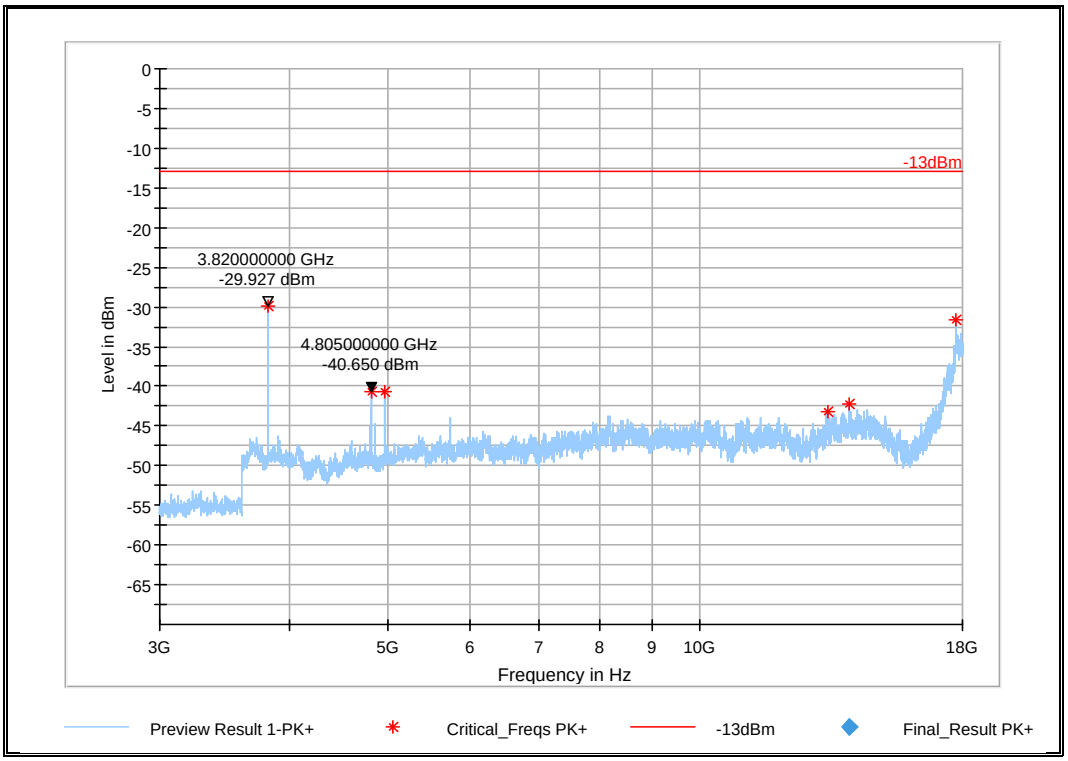
Channel: High



Plot #16 Radiated Emissions: 1GHz –3GHz
Channel: High



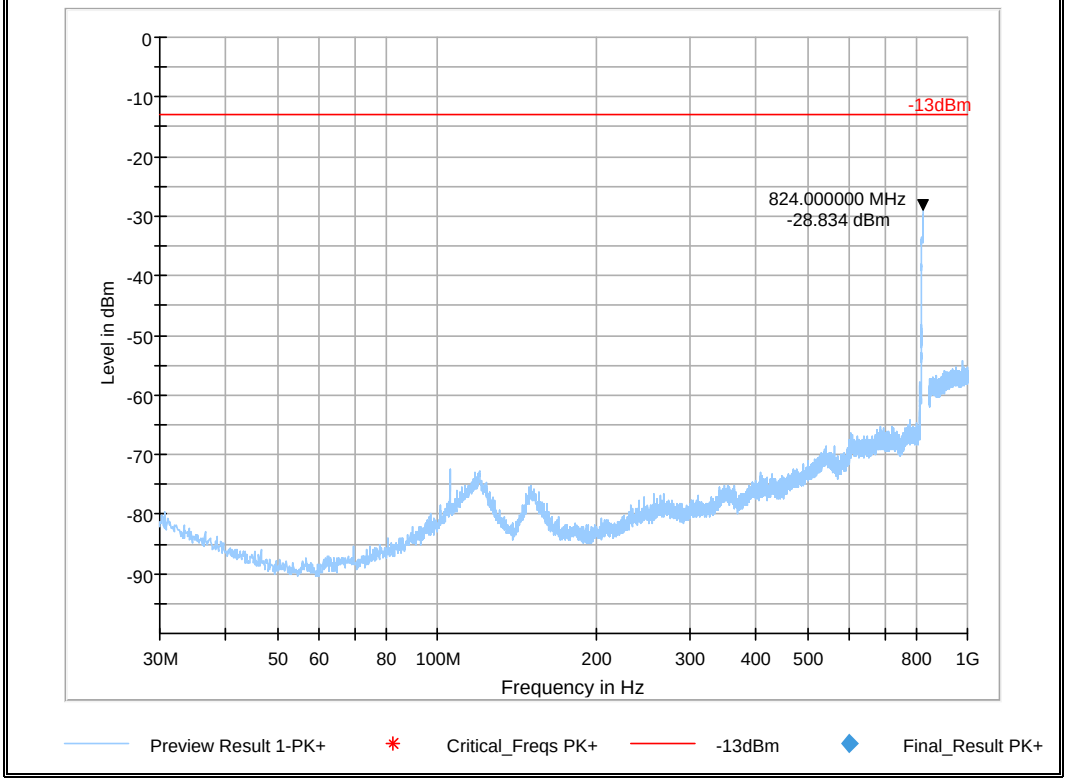
Plot #17 Radiated Emissions: 3GHz –18GHz
Channel: High



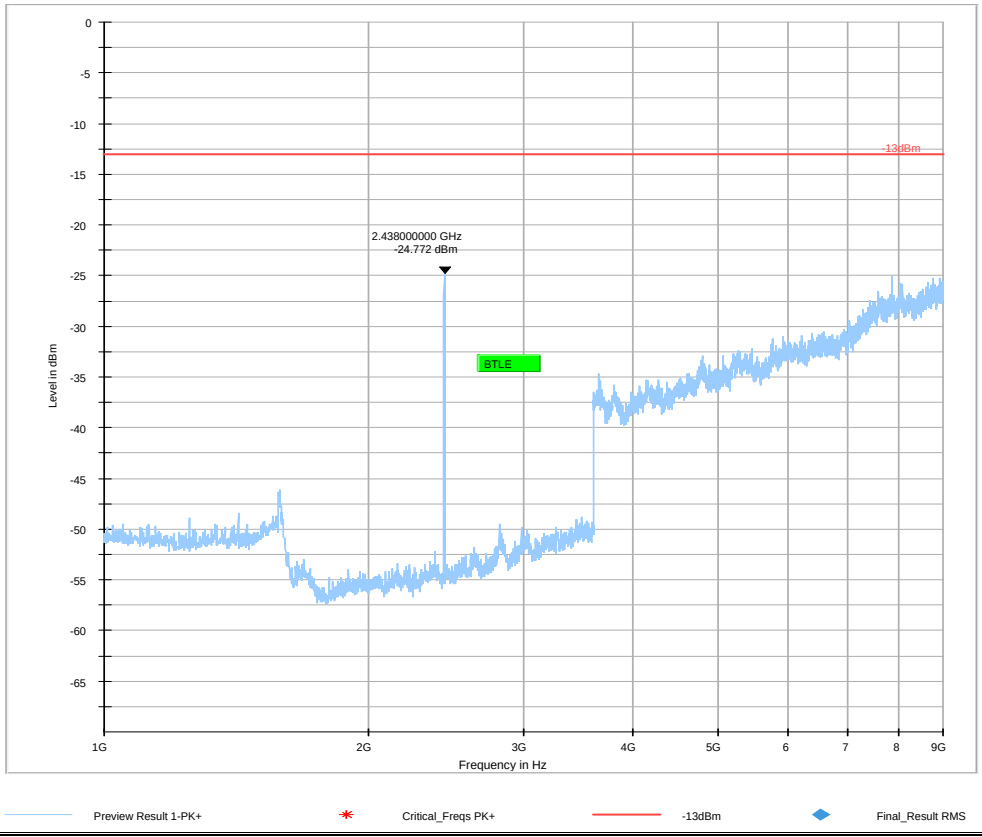
FDD V

Plot #18 Radiated Emissions: 30MHz –1GHz

Channel: Low

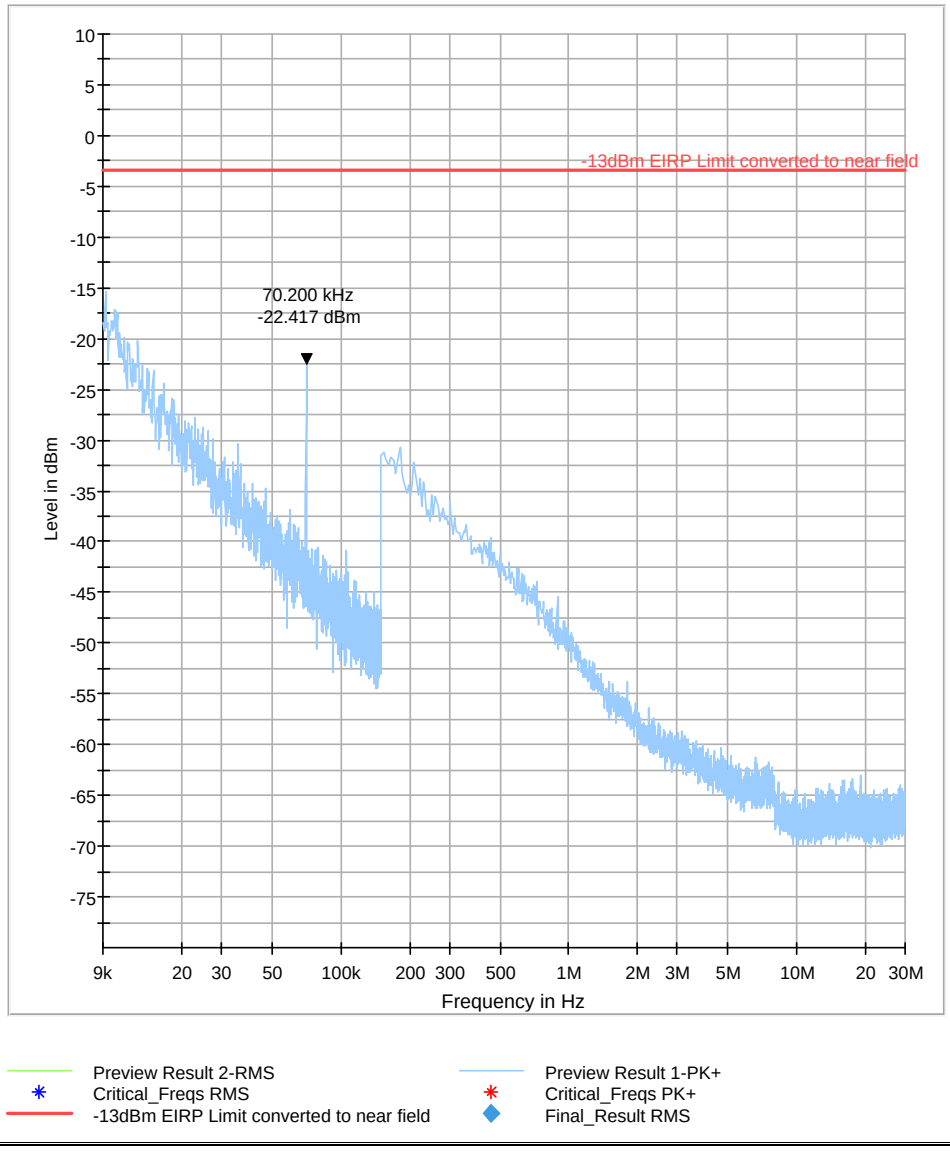


Plot #19 Radiated Emissions: 1GHz –9GHz
Channel: Low



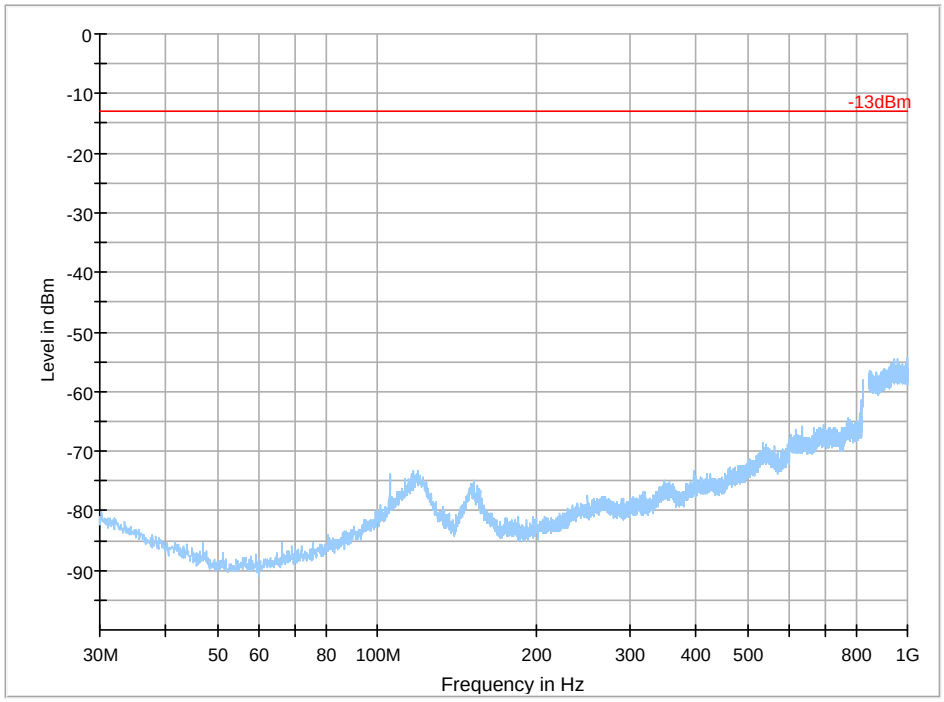
Plot #20 Radiated Emissions: 9KHz –30MHz

Channel: Mid

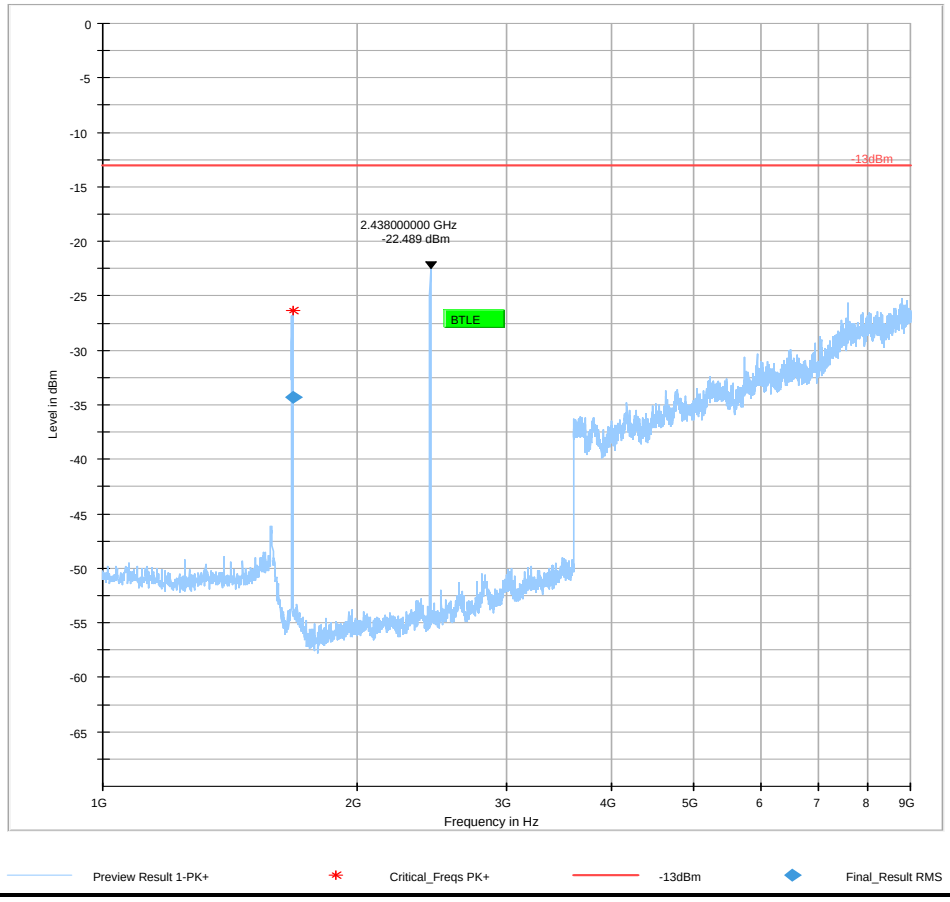


Plot #21 Radiated Emissions: 30MHz –1GHz

Channel: Mid

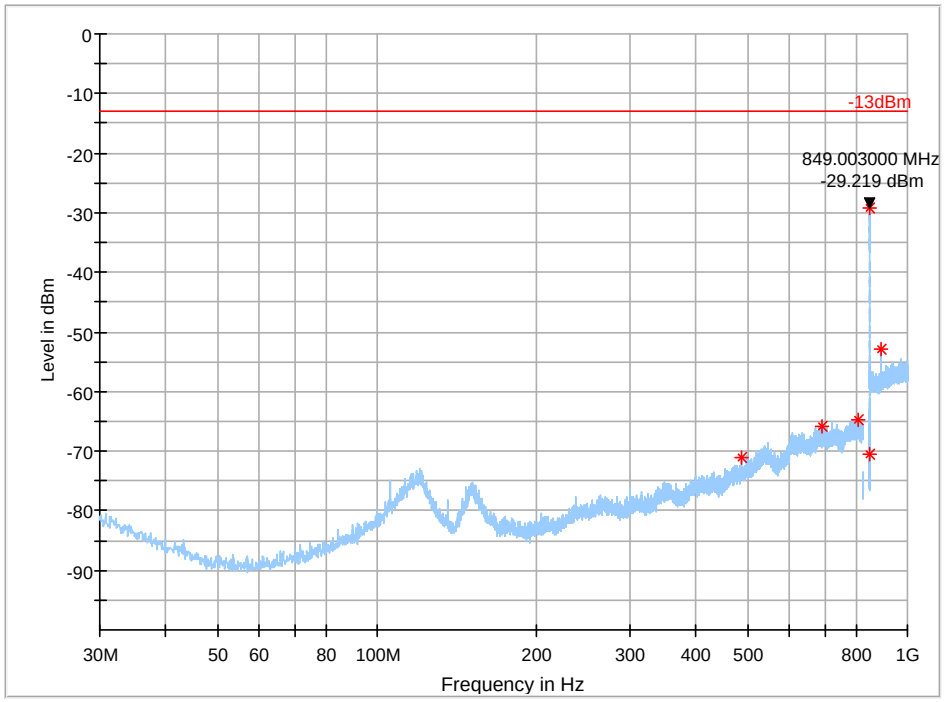


Plot #22 Radiated Emissions: 1GHz –9GHz
Channel: Mid



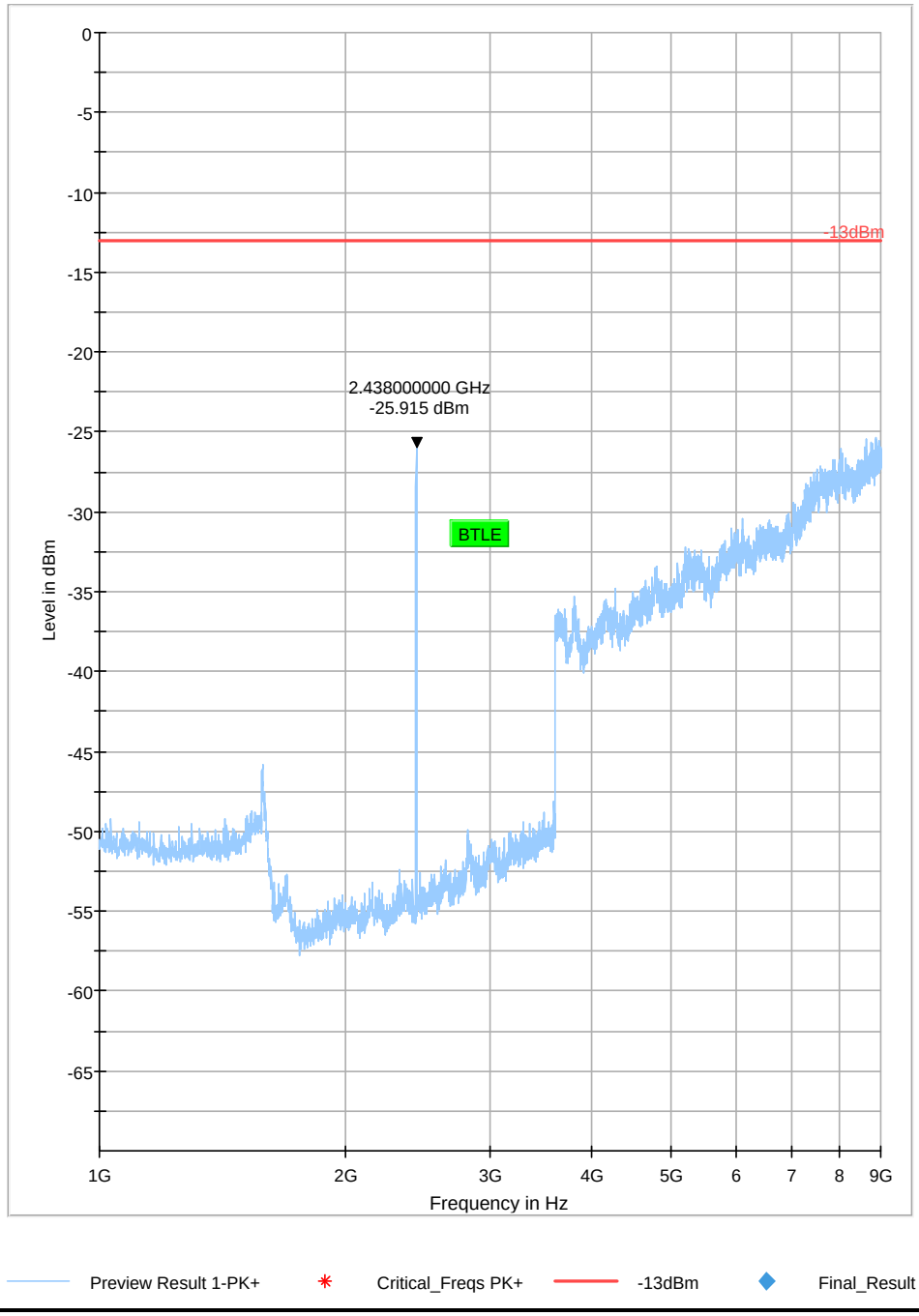
Plot #23 Radiated Emissions: 30MHz –1GHz

Channel: High



Plot #24 Radiated Emissions: 1GHz –9GHz

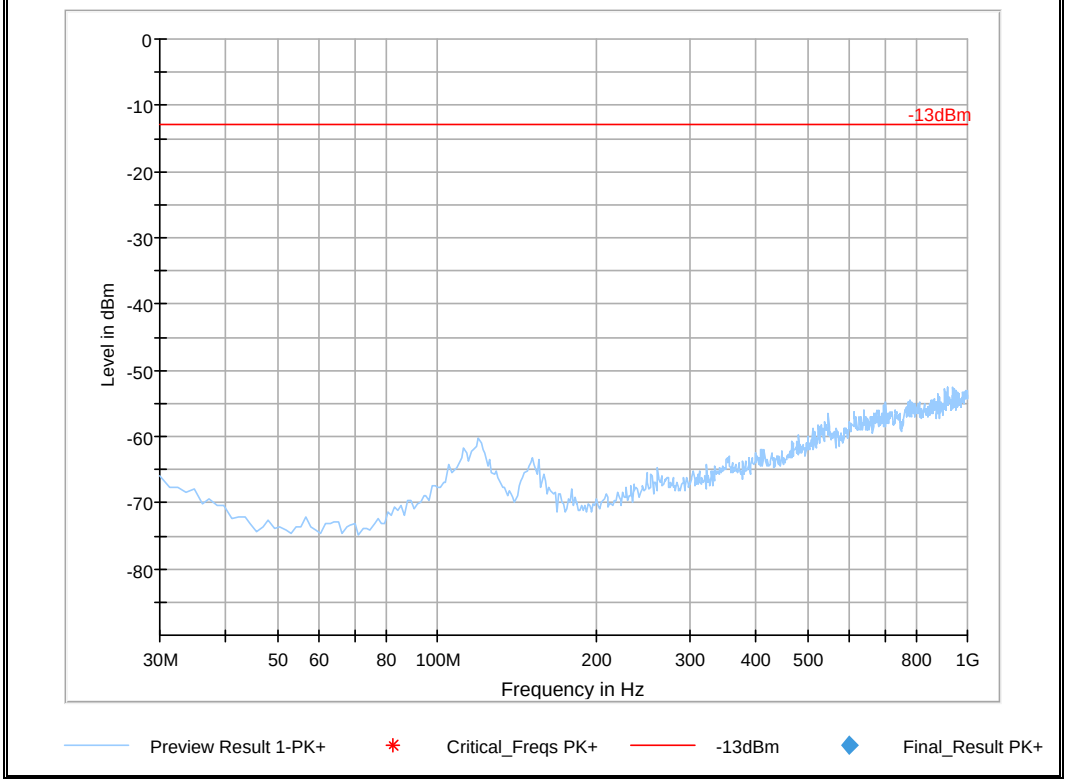
Channel: High



FDD II

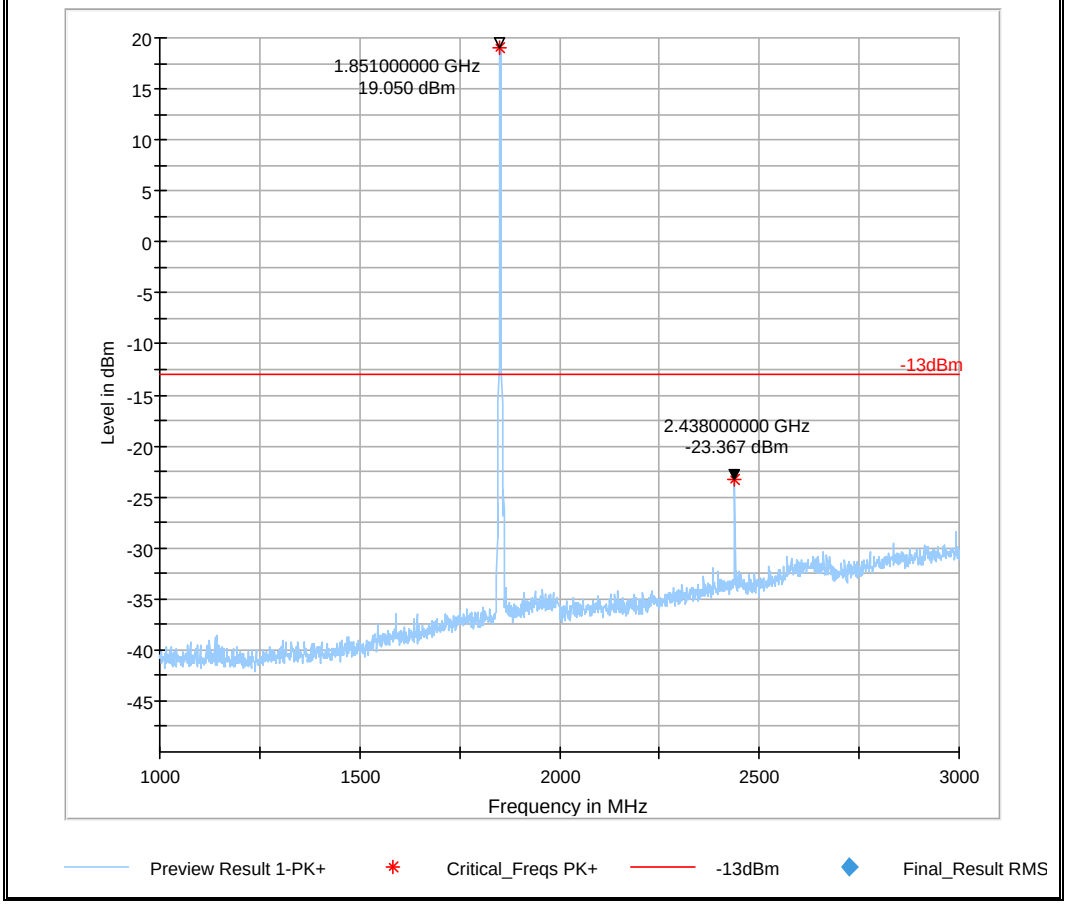
Plot #25 Radiated Emissions: 30MHz –1GHz

Channel: Low



Plot #26 Radiated Emissions: 1GHz –3GHz

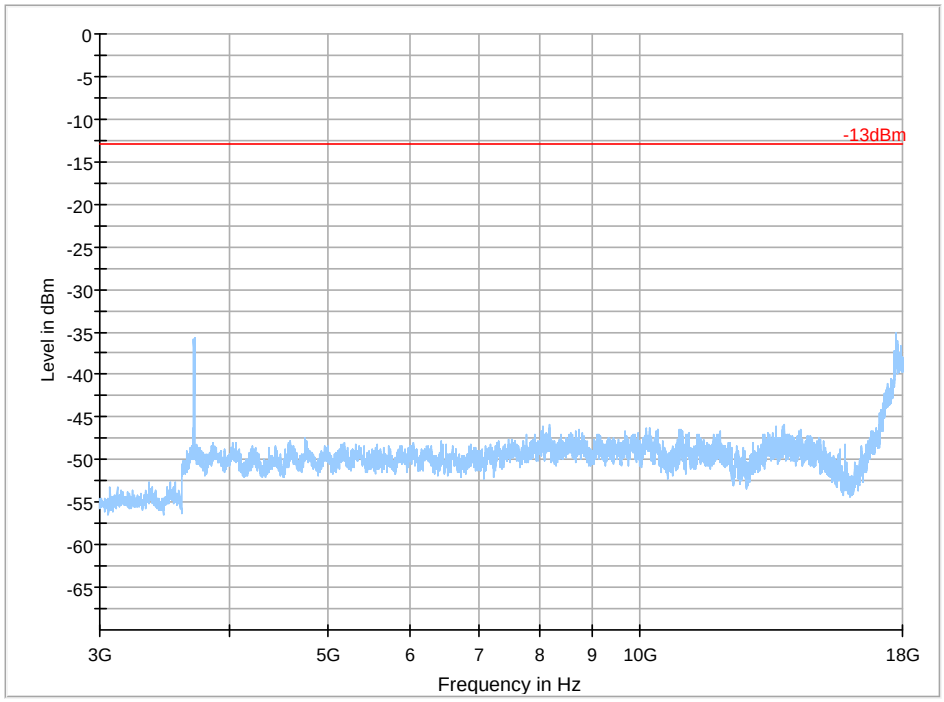
Channel: Low



Note: Signals above the limits are the cellular

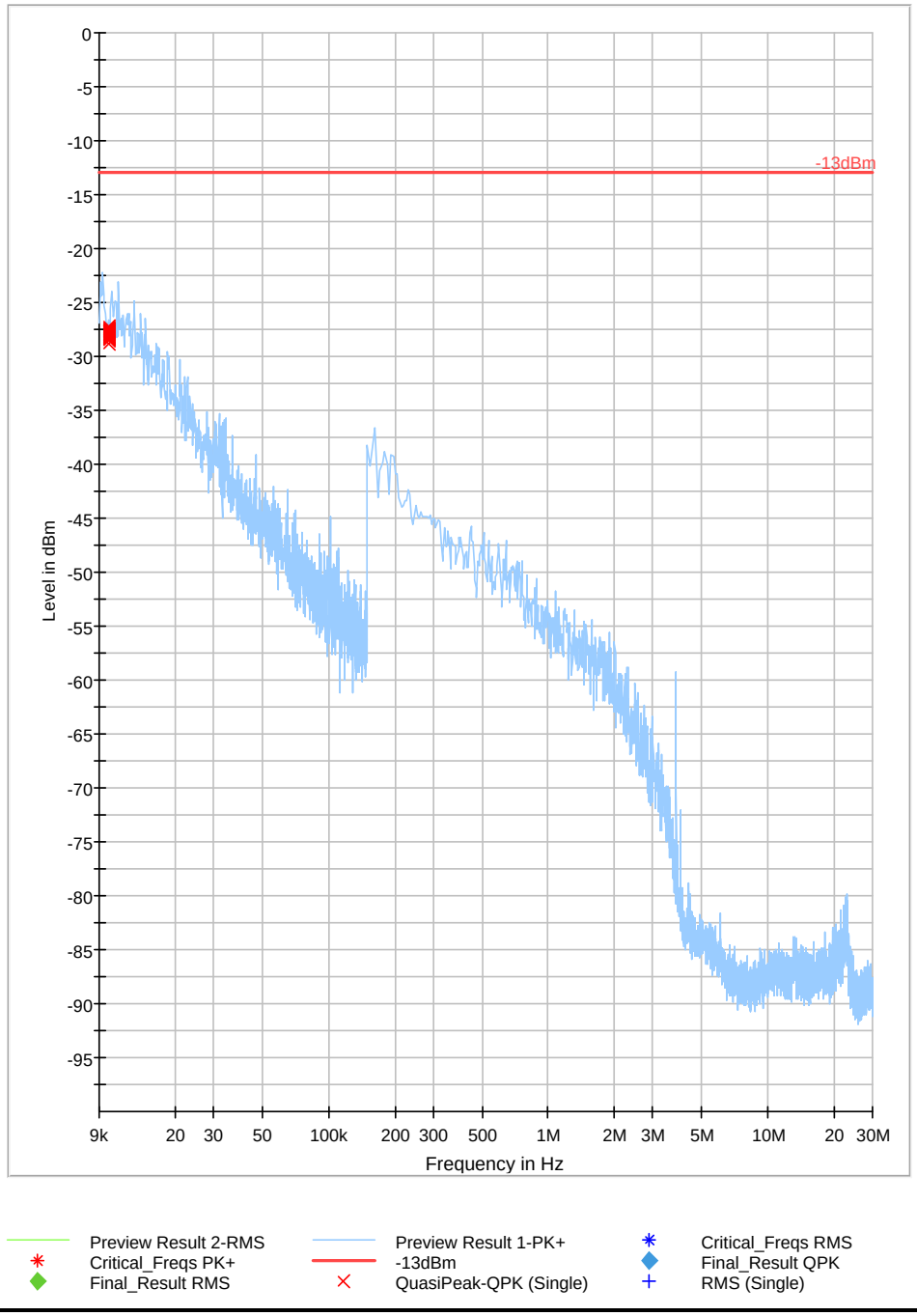
Plot #27 Radiated Emissions: 3GHz –18GHz

Channel: Low



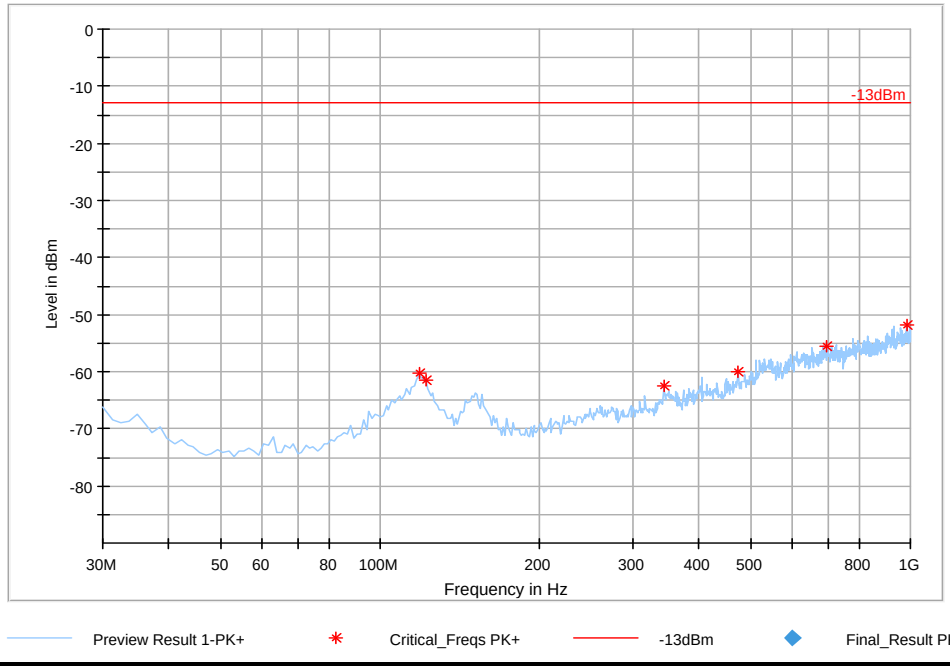
Plot # 28 Radiated Emissions: 9KHz –30MHz

Channel: Mid



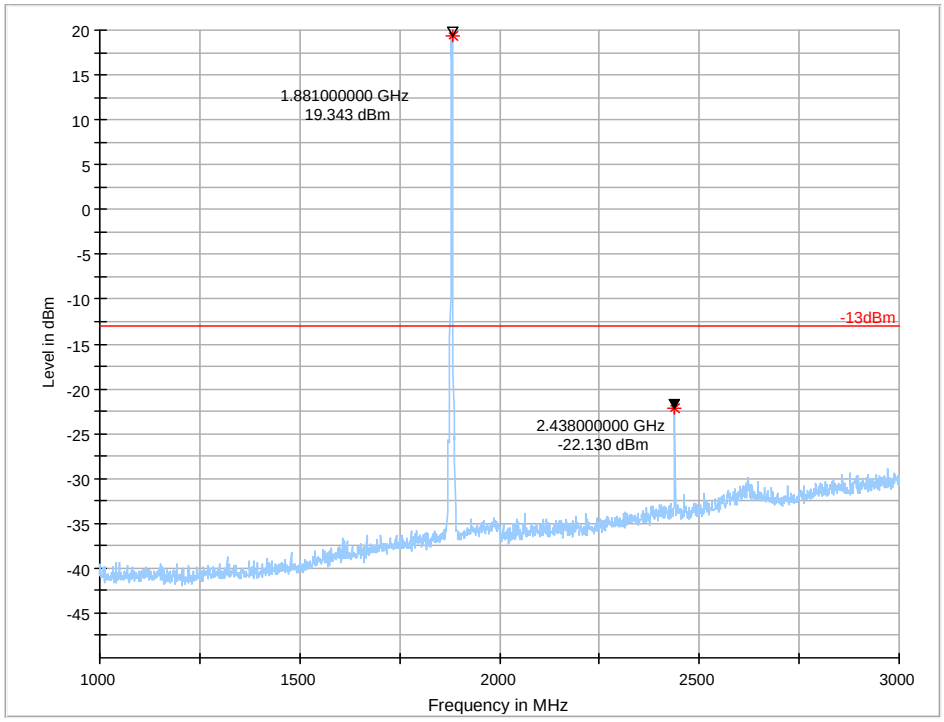
Plot # 29 Radiated Emissions: 30MHz –1GHz

Channel: Mid



Plot # 30 Radiated Emissions: 1GHz – 3GHz

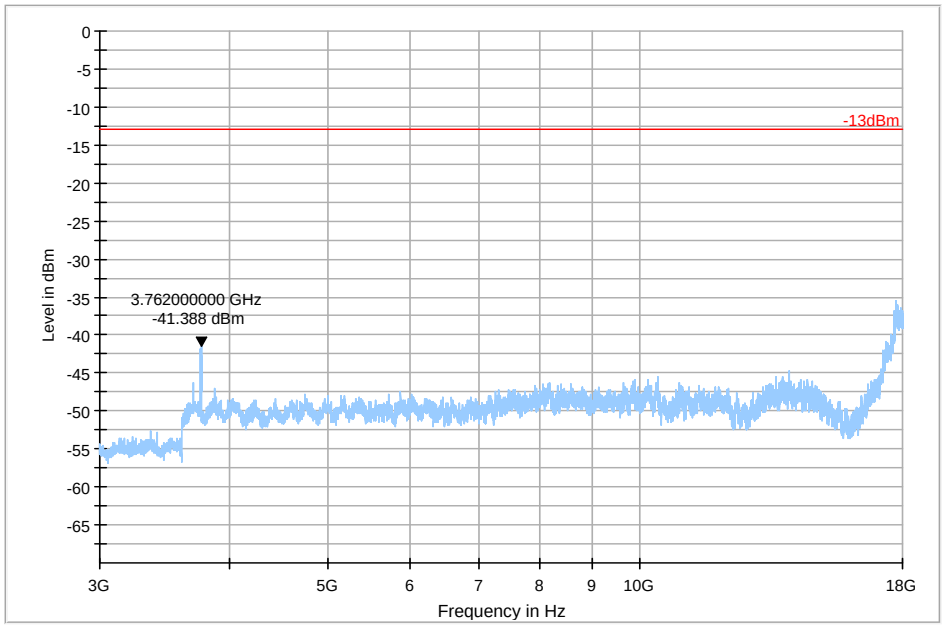
Channel: Mid



Note: Signals above the limits are the cellular

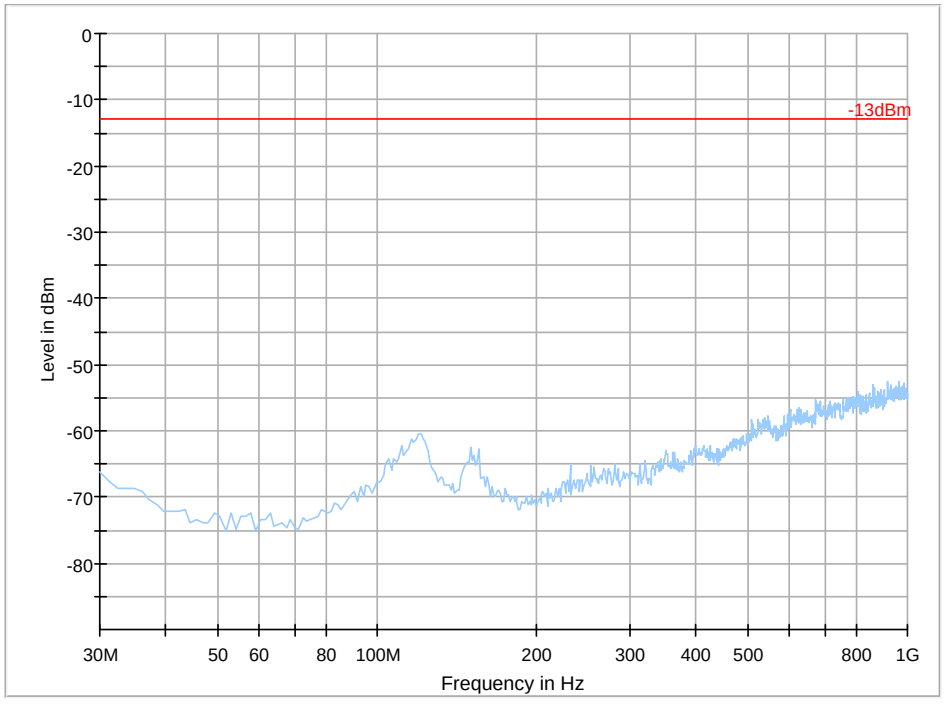
Plot # 31 Radiated Emissions: 3GHz –18GHz

Channel: Mid



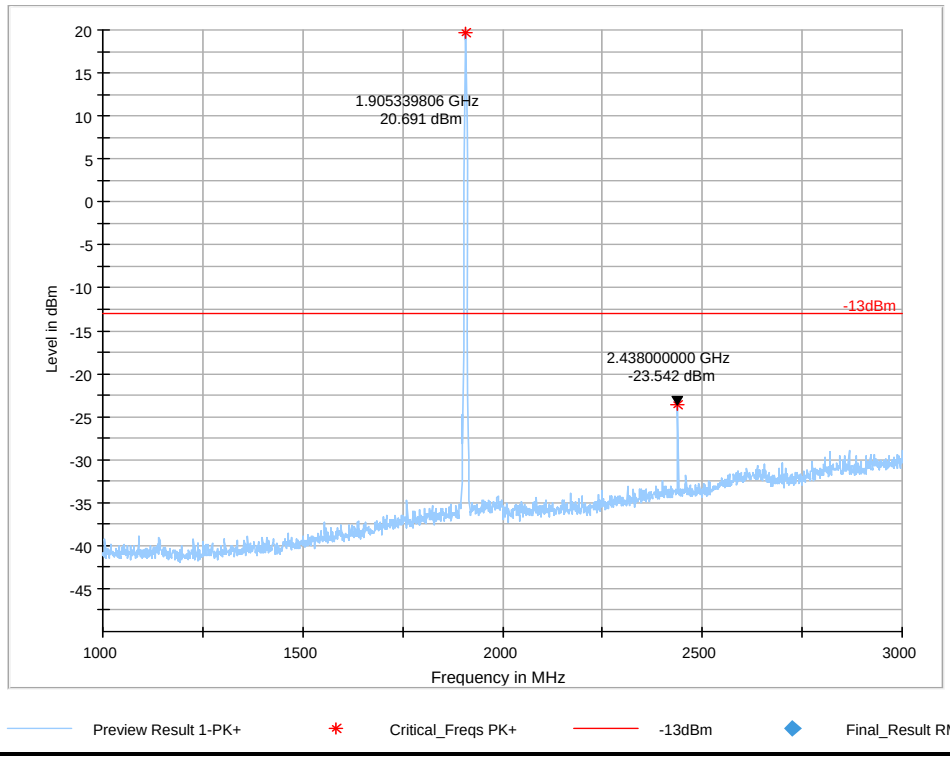
Plot # 32 Radiated Emissions: 30MHz –1GHz

Channel: High



Plot # 33 Radiated Emissions: 1GHz –3GHz

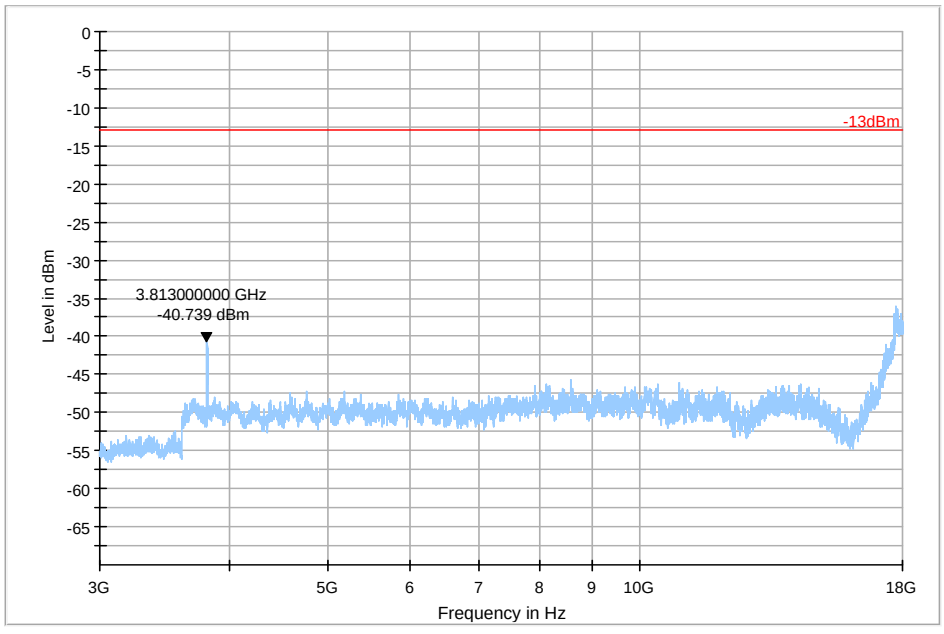
Channel: High



Note: Signals above the limits are the cellular

Plot # 34 Radiated Emissions: 3GHz –18GHz

Channel: High



8 Test Setup Photos

Setup photos are included in supporting file name: EMC_JIO_JIOBI_001_17001-FCC-22-24-Setup_Photos.pdf

9 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	BiconiLog Antenna	EMCO	3142E	166067	3 years	6/27/2017
Magnetic Loop Antenna	Loop Antenna	ETS Lindgren	6512	00049838	3 years	7/28/2017
Antenna Horn 3115	Horn Antenna	EMCO	3115	35111	3 years	7/24/2015
Antenna Horn 3116	Horn Antenna	ETS Lindgren	3116	70497	3 years	7/22/2015
Digital Barometer, Temperature, Humidity	Compact Digital Barometer	Control Company	35519-055	91119547	1 Years	06/08/2018
Digital Radio Comm. Tester	Digital Radio Comm. Tester	R&S	CMU 200 #1	101821	2 Years	7/6/2017
FSU26	Spectrum Analyzer	R&S	FSU26	200256	2 years	07/04/2017
LISN	Line Impedance Stabilization Network	FCC	FCC-LISN-50-25-2-08	8014	1 Year	11/10/2016

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.

10 Revision History

Date	Report Name	Changes to report	Report prepared by
11/28/2017	EMC_JIO_JIOBI_001_17001-FCC-22-24	Initial Release	Elijah Garcia