



FCC / ISED & Test Report

For:
Philips Respironics

Model Name:
LAX410H15C, LAX420H15C,
LAX520H15C, ARX410H15C,
ARX420H15C, ARX520H15C

Product Description:
CPAP machine with integral Cell modem and BT

Applied Rules and Standards:
47 CFR Parts 22, 24
RSS: 132 Issue 3, 133 Issue 6

FCC ID: TH01141623

REPORT #: EMC_PHIL4_089_21001_FCC_22_24_Rev2

DATE: 2021-11-15



A2LA Accredited

IC recognized #
3462B-1

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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 (AE) DETAILS	6
3.4	TEST SAMPLE CONFIGURATION	6
4	SUBJECT OF INVESTIGATION	7
4.1	DATES OF TESTING:	7
4.2	MEASUREMENT UNCERTAINTY	7
4.3	ENVIRONMENTAL CONDITIONS DURING TESTING:	7
5	MEASUREMENT PROCEDURES	8
5.1	RADIATED MEASUREMENT	8
5.2	SAMPLE CALCULATIONS FOR FIELD STRENGTH MEASUREMENTS	10
6	MEASUREMENT RESULTS SUMMARY	11
6.1	PART 22 / RSS-132	11
6.2	PART 24 / RSS-133	11
6.3	§15.207(A)	11
7	TEST RESULT DATA	12
7.1	RADIATED SPURIOUS EMISSIONS	12
7.2	AC POWER LINE CONDUCTED EMISSIONS	56
8	TEST EQUIPMENT AND ANCILLARIES USED FOR TESTING	62
9	REVISION HISTORY	63

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 and 24, and Industry Canada Standards RSS-GEN issue 3, RSS-132 issue 3, RSS-133 issue 6.

No deficiencies were ascertained.

Company Name	Product Description	Model #
Philips Respironics	CPAP machine with integral Cell modem and BT	LAX410H15C LAX420H15C LAX520H15C ARX410H15C ARX420H15C ARX520H15C

Responsible for Testing Laboratory:

2021-11-15	Compliance	Kevin Wang (EMC Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2021-11-15	Compliance	Cheng Song (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
EMC Lab Manager:	Kevin Wang
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client

Client's Name:	Philips Respironics
Street Address:	6501 Living Place
City/Zip Code	Pittsburgh, PA 15206
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	LAX410H15C LAX420H15C LAX520H15C ARX410H15C ARX420H15C ARX520H15C
HW Version	01
SW Version	V1.0.0.3212
FCC-ID	THO1141623
Product Description	CPAP machine with integral Cell modem and BT.
Radios included in the device	Satellite Radio: Cellular: <ul style="list-style-type: none"> • Model Name: u-blox • Model Number: SARA-U201 • FCC ID: XPY1CGM5NNN • Frequency of Operation: <ul style="list-style-type: none"> ○ GSM 850 / GSM 900 / GSM 1800 / GSM 1900 ○ UMTS I / UMTS II / UMTS V / UMTS VIII Bluetooth: <ul style="list-style-type: none"> • Bluetooth 5.0 Low Energy: Dialog DA14585 • Nominal band: 2400 MHz – 2483.5 MHz; • Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels
Max. declared antenna gain	Flexible Polymer Antenna, Internal, Peak Gain: 4 dBi
Power Supply/ Rated Operating Voltage Range	10.8V (Low) / 12V (Nominal) / 13.2V (Max)
Operating Temperature Range	Tmin: 5 °C / Tmax: 35 °C / Tnom: 21 °C
Sample Revision	<input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Comments
1	D1314413188FFF	01	V1.0.0.3212	

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	AC / DC Adapter	MEA-080A12C	Delta Electronics, Inc.	70TW12H06ET

3.4 Test Sample Configuration

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

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 and ISSED Standards RSS-132 issue 3, RSS-133 issue 6.

4.1 Dates of Testing:

07/01/2021 – 07/07/2021

4.2 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)
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RF conducted measurement	± 0.5 dB
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4.3 Environmental Conditions during Testing:

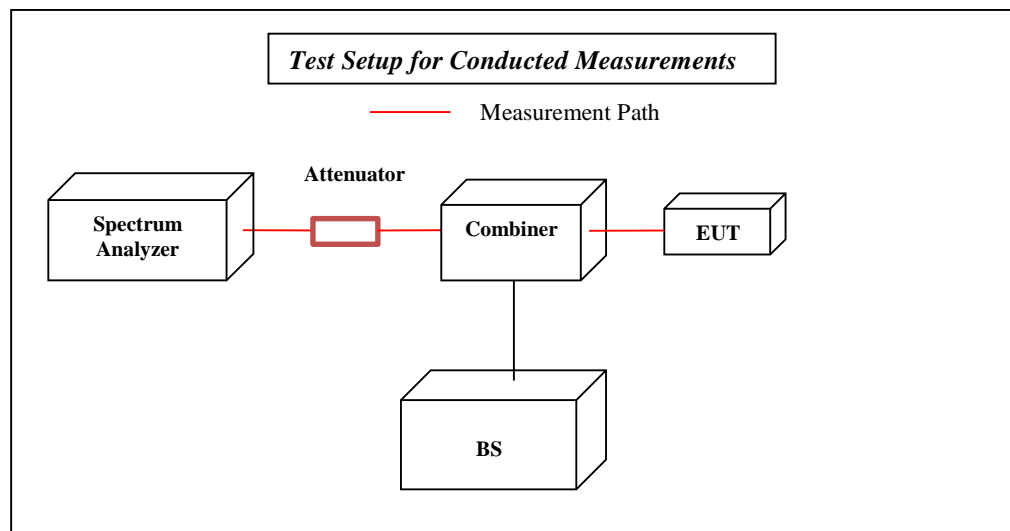
The following environmental conditions were maintained during the course of testing:

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

Deviating test conditions are indicated at individual test description where applicable.

5 Measurement Procedures

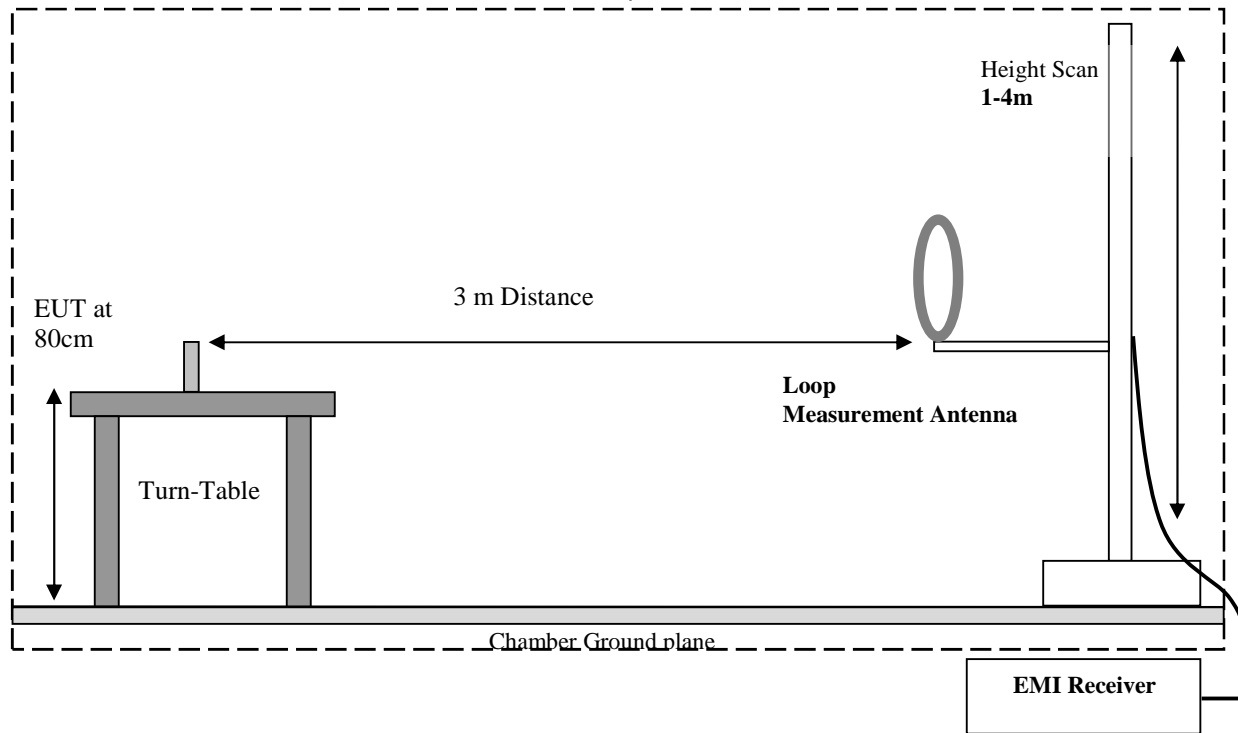
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03r01 – “Measurement Guidance for Certification of Licensed Digital Transmitters” and according to relevant parts of ANSI/TIA-603-D-2010 as detailed below.



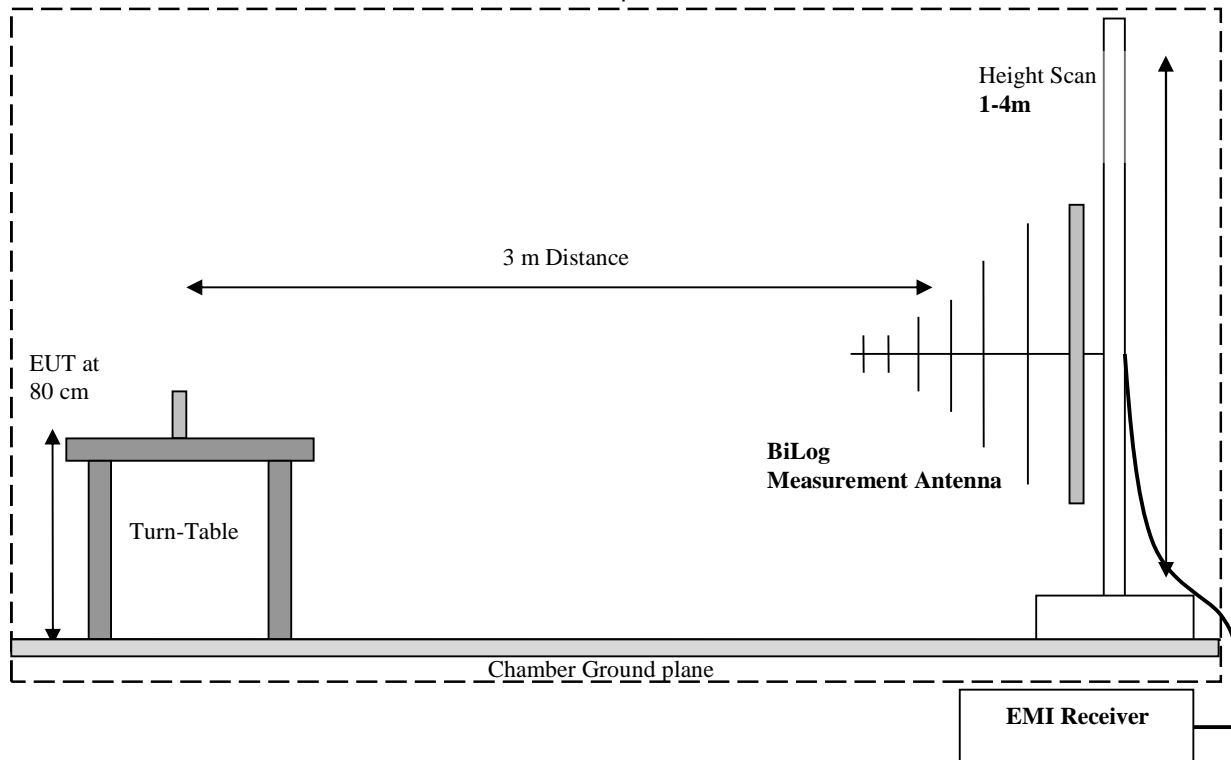
5.1 Radiated Measurement

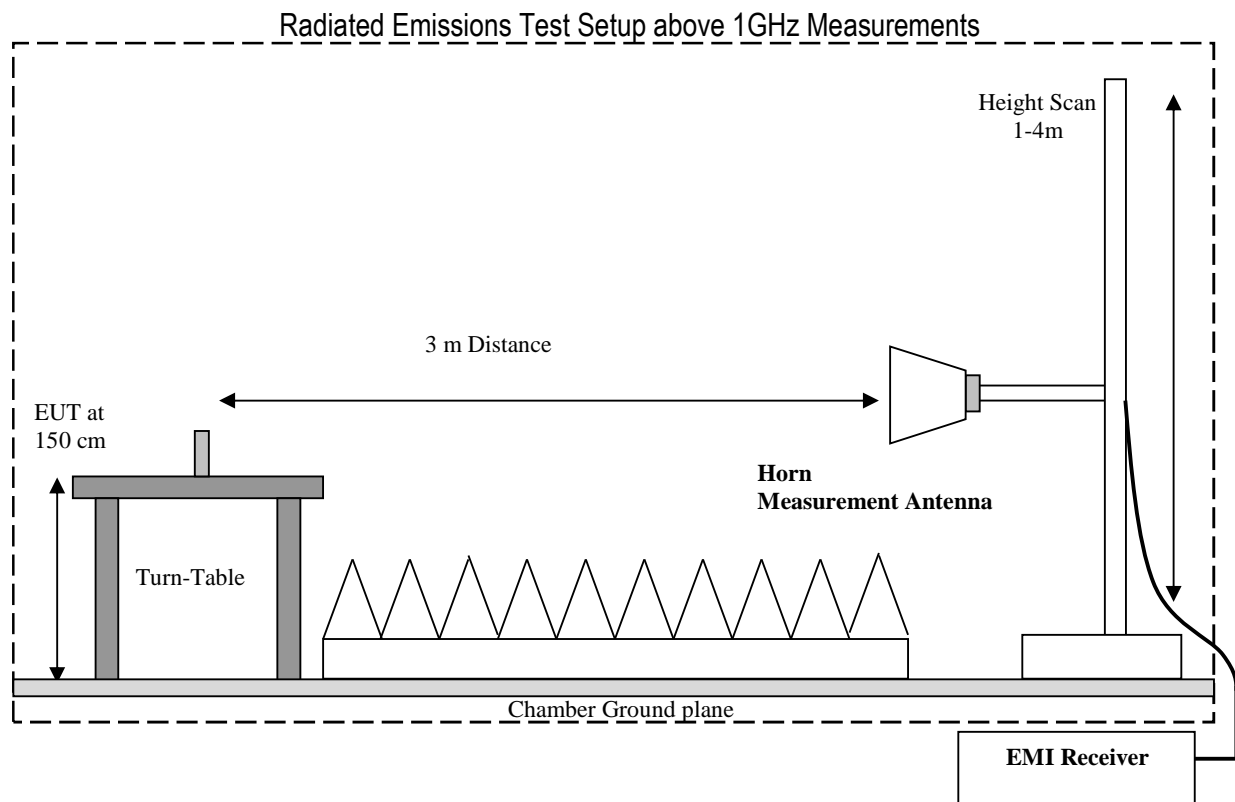
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to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





5.2 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

6 Measurement Results Summary

6.1 Part 22 / RSS-132

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §22.913 (a)	RF Output Power	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1055; §22.355	Frequency Tolerance	Extreme Temperature and Voltage		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1049; §22.917	Occupied Bandwidth	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1051; §22.917	Band Edge Compliance	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1051; §22.917	Conducted Spurious Emissions	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1053; §22.917	Radiated Spurious Emissions	Nominal	GSM 850 UMTS V	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

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

Note 2: Leveraged from module certification report(s), Under FCC ID: XPY1CGM5NNN.

6.2 Part 24 / RSS-133

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §24.232 (a)	RF Output Power	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1055; §24.235	Frequency Stability	Extreme Temperature and Voltage		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1049; §24.238	Occupied Bandwidth	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1051; §24.238	Band Edge Compliance	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1051; §24.238	Conducted Spurious Emissions	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	Note 2
§2.1053; §24.238	Radiated Spurious Emissions	Nominal	GSM 1900 UMTS II	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

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

Note 2: Leveraged from module certification report(s), Under FCC ID: XPY1CGM5NNN.

6.3 §15.207(a)

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§15.207(a)	AC Conducted Emissions	Nominal	BLE+GSM 850 BLE+GSM 1900 BLE+UMTS II BLE+UMTS V	■	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

7 Test Result Data

7.1 Radiated Spurious Emissions

7.1.1 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

7.1.2 Limits:

7.1.2.1 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.

7.1.2.2 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.

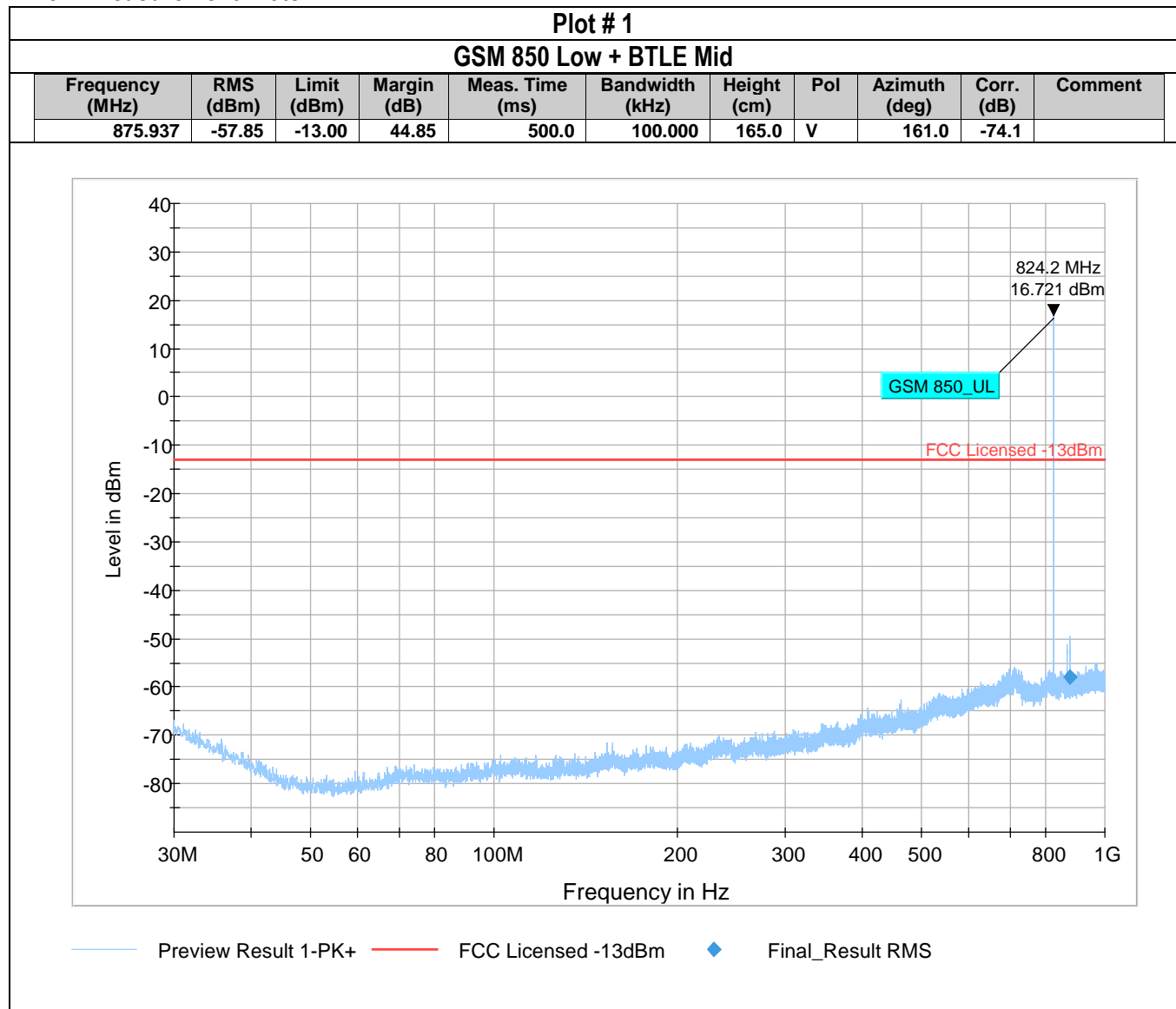
7.1.3 Test conditions and setup:

Ambient Temperature (C)	EUT Set-Up #	EUT operating mode	Power Input
24	1	GSM 850 / 1900 FDD II / FDD V Co-Tx BTLE	120 VAC

7.1.4 Measurement result:

Plot #	EUT operating mode	Scan Frequency	Limit (dBm)	Result
1-3	GSM 850 Low + BTLE Mid	30 MHz – 18 GHz	-13	Pass
4-7	GSM 850 Mid + BTLE Mid	9 kHz – 18 GHz	-13	Pass
8-10	GSM 850 High + BTLE Mid	30 MHz – 18 GHz	-13	Pass
11-13	UMTS V Low + BTLE Mid	30 MHz – 18 GHz	-13	Pass
14-17	UMTS V Mid + BTLE Mid	9 kHz – 18 GHz	-13	Pass
18-20	UMTS V High + BTLE Mid	30 MHz – 18 GHz	-13	Pass
21-23	GSM 1900 Low + BTLE Mid	30 MHz – 18 GHz	-13	Pass
24-28	GSM 1900 Mid + BTLE Mid	9 kHz – 26 GHz	-13	Pass
29-31	GSM 1900 High + BTLE Mid	30 MHz – 18 GHz	-13	Pass
32-34	UMTS II Low + BTLE Mid	30 MHz – 18 GHz	-13	Pass
35-39	UMTS II Mid + BTLE Mid	9 kHz – 26 GHz	-13	Pass
40-42	UMTS II High + BTLE Mid	30 MHz – 18 GHz	-13	Pass

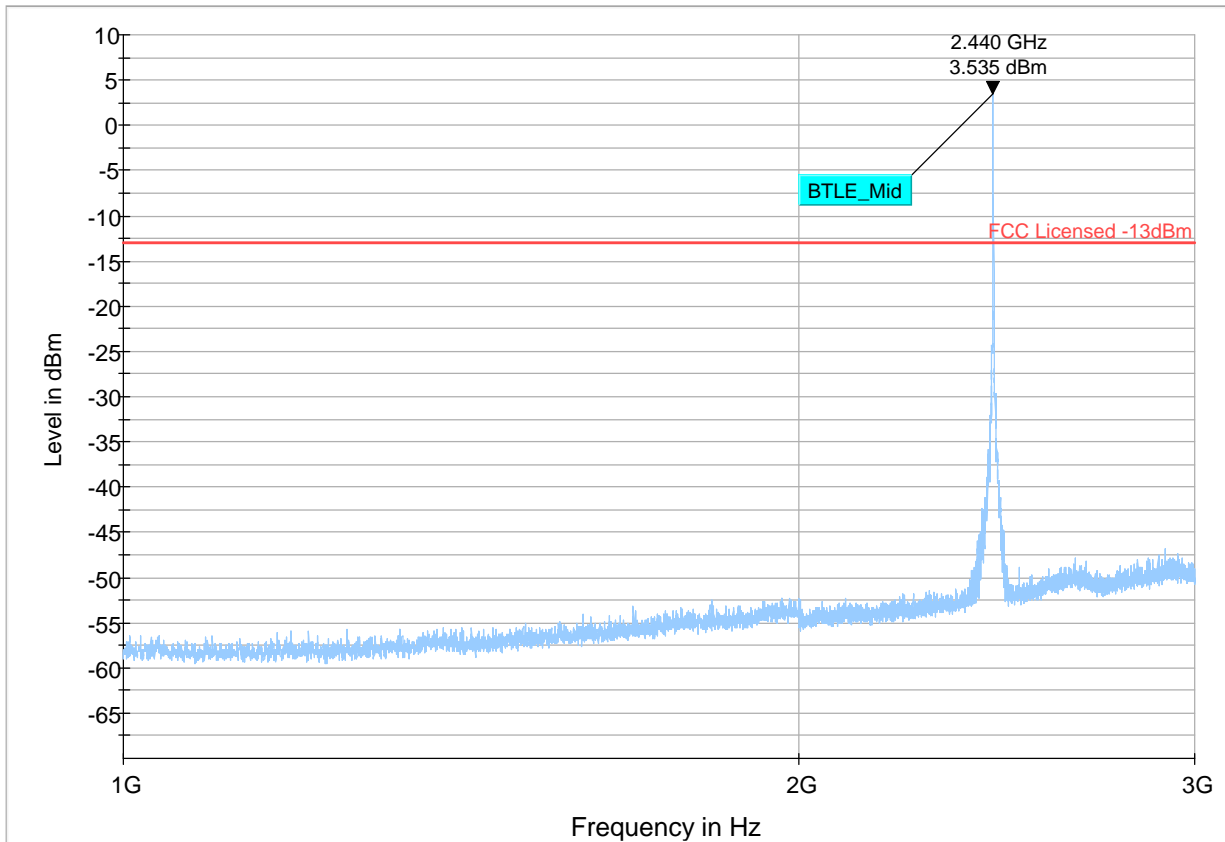
7.1.5 Measurement Plots:



Plot # 2

GSM 850 Low + BTLE Mid

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

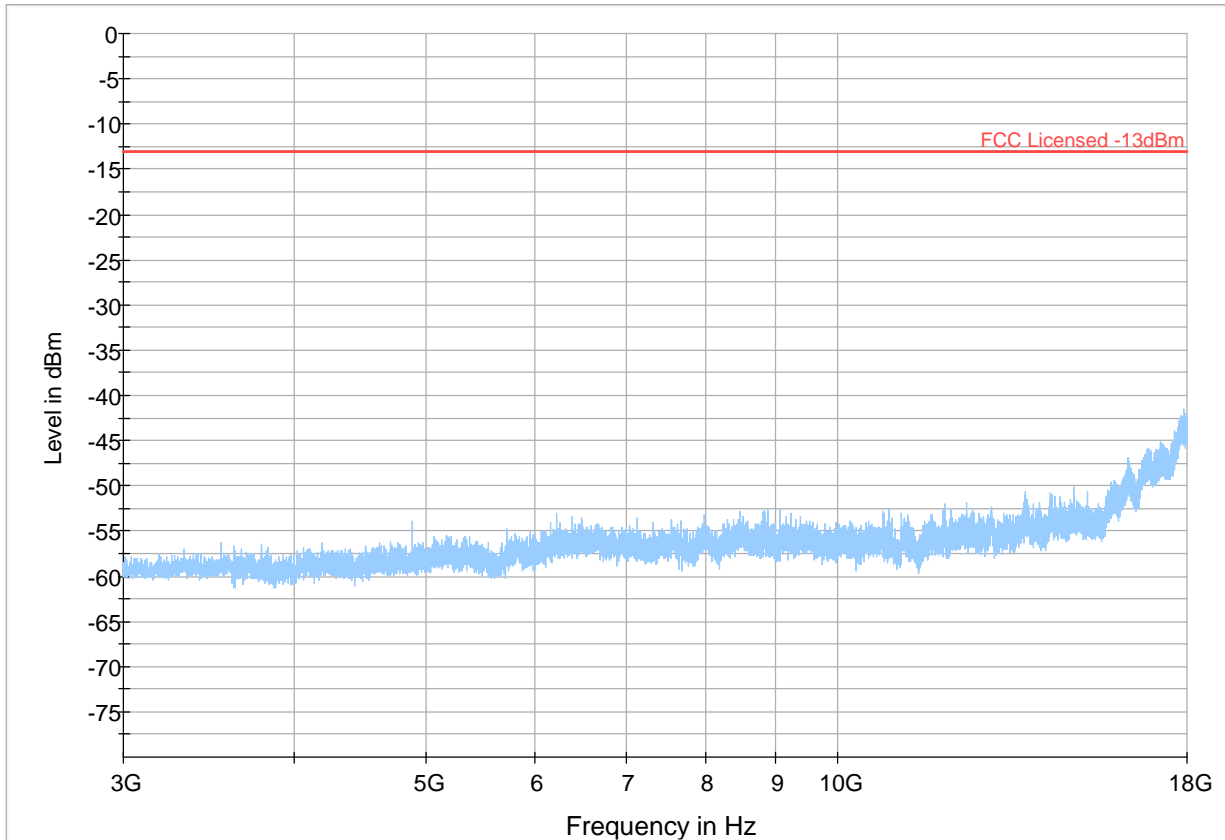


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 3

GSM 850 Low + BTLE Mid

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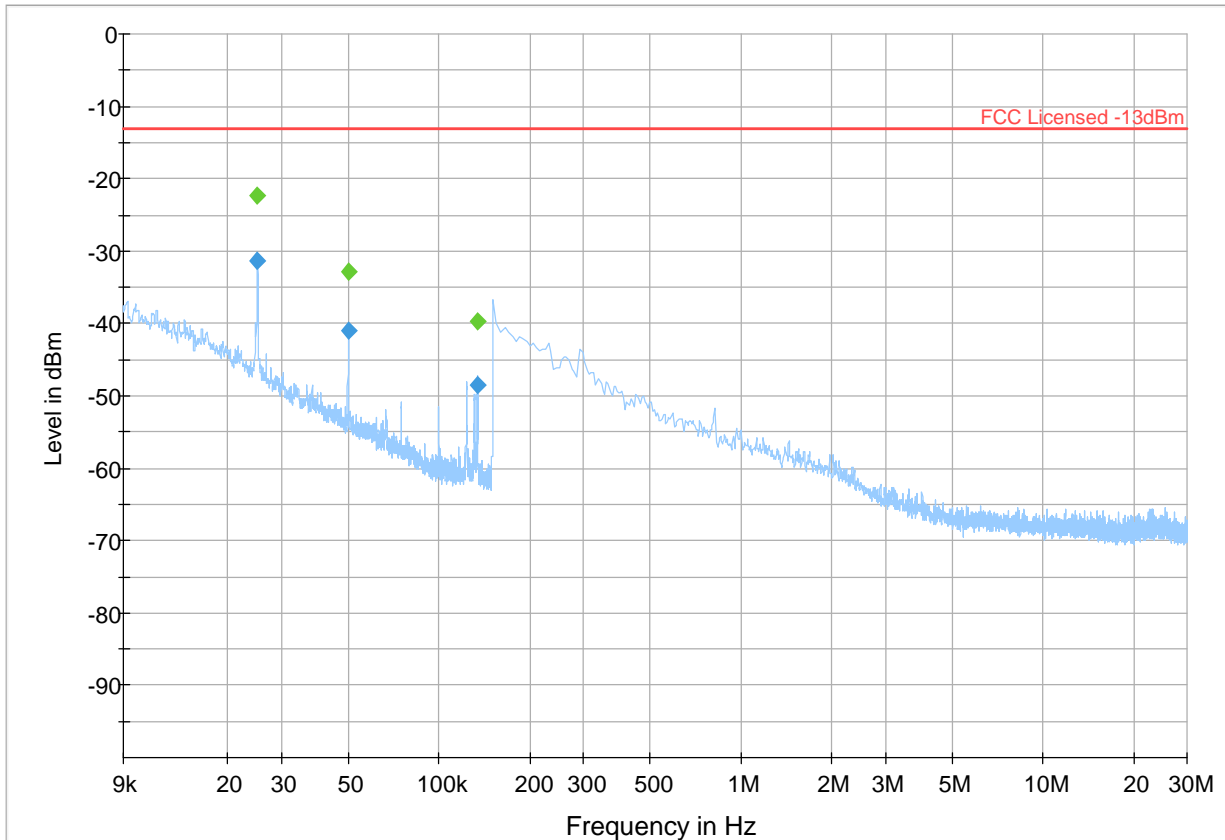


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 4

GSM 850 Mid + BTLE Mid

Frequency (MHz)	RMS (dBm)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.025	---	-22.33	---	---	500.0	1.000	100.0	V	80.0	-17.9	
0.025	-31.41	---	-13.00	18.41	500.0	1.000	100.0	V	80.0	-17.9	
0.050	---	-32.92	---	---	500.0	1.000	100.0	V	252.0	-24.6	
0.050	-40.94	---	-13.00	27.94	500.0	1.000	100.0	V	252.0	-24.6	
0.134	---	-39.78	---	---	500.0	1.000	100.0	V	244.0	-32.2	
0.134	-48.54	---	-13.00	35.54	500.0	1.000	100.0	V	244.0	-32.2	

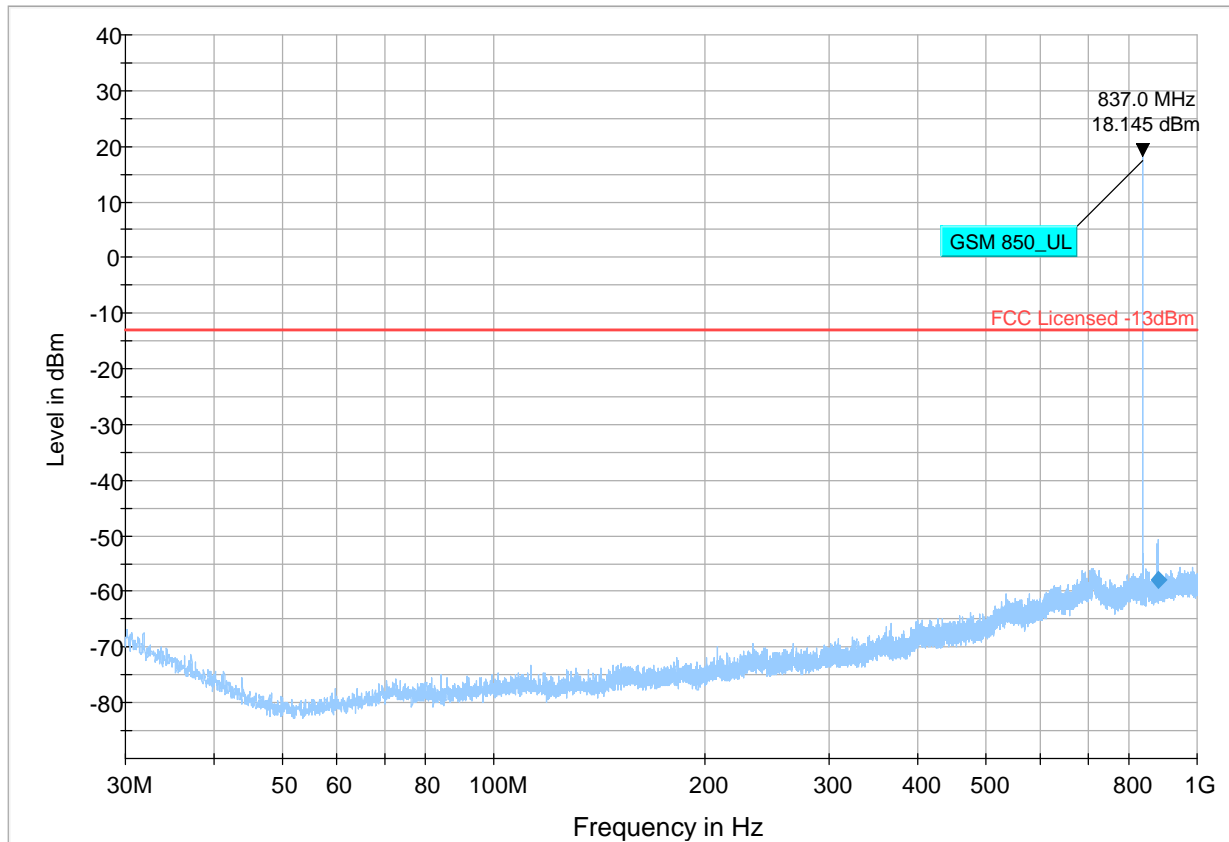


— Preview Result 1-PK+ — FCC Licensed -13dBm ◆ Final_Result RMS ◆ Final_Result PK

Plot # 5

GSM 850 Mid + BTLE Mid

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
882.080	-58.05	-13.00	45.05	500.0	100.000	155.0	V	179.0	-74.0	

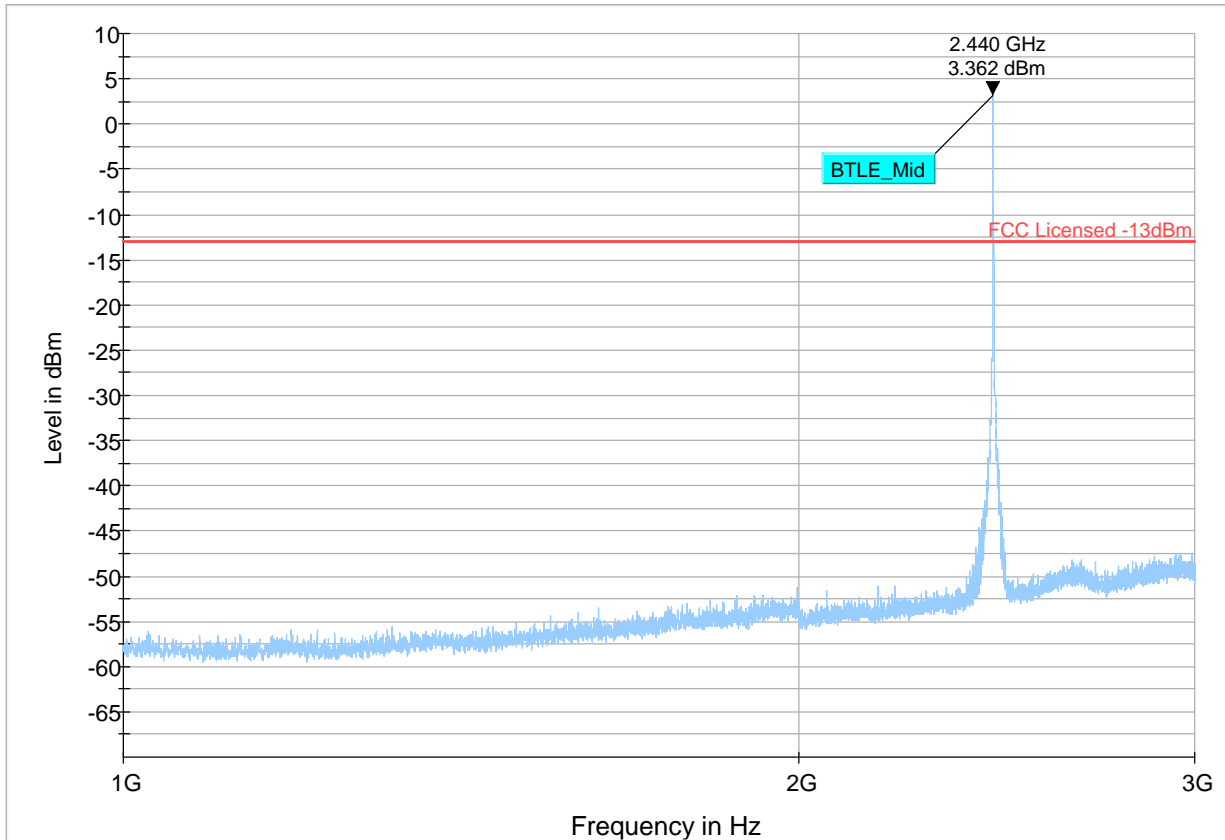


— Preview Result 1-PK+ — FCC Licensed -13dBm ◆ Final_Result RMS

Plot # 6

GSM 850 Mid + BTLE Mid

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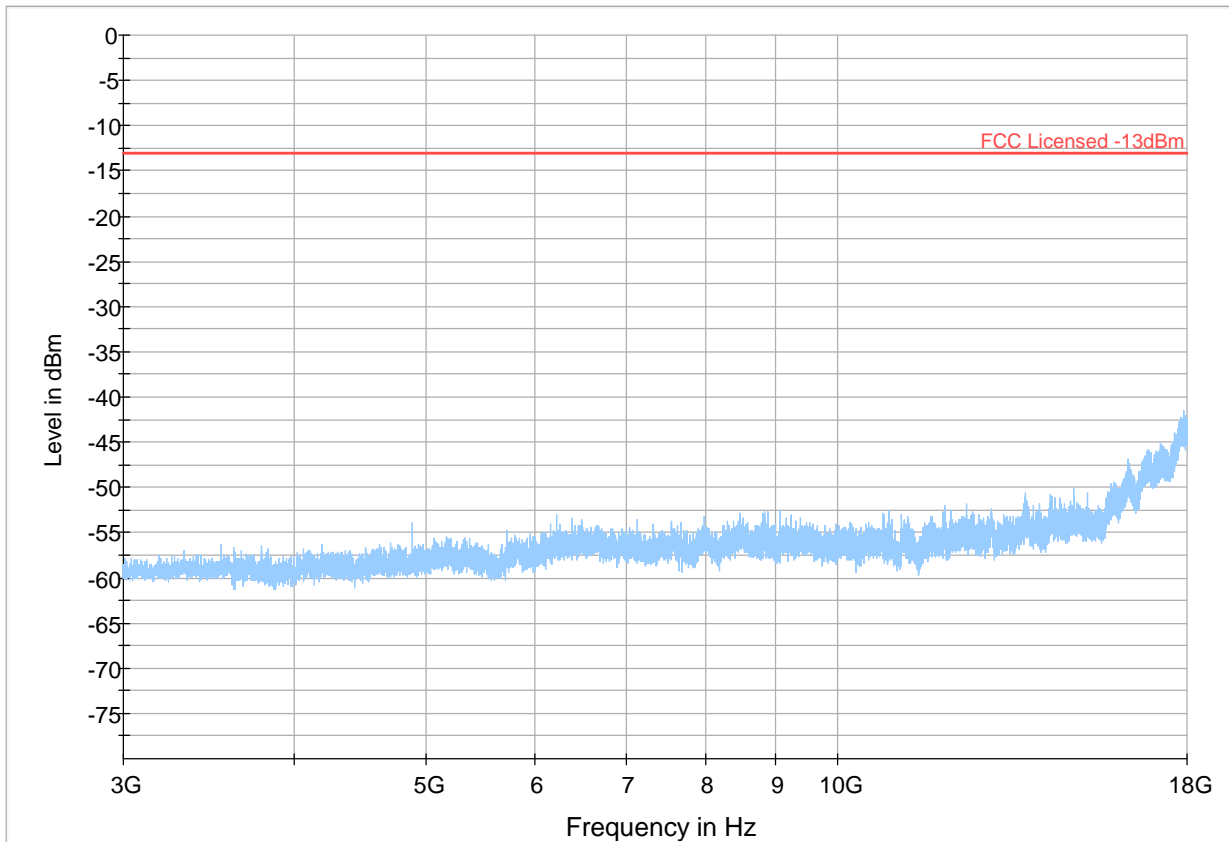


Preview Result 1-PK+ * Critical_Freqs PK+ FCC Licensed -13dBm ♦ Final_Result RM

Plot # 7

GSM 850 Mid + BTLE Mid

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

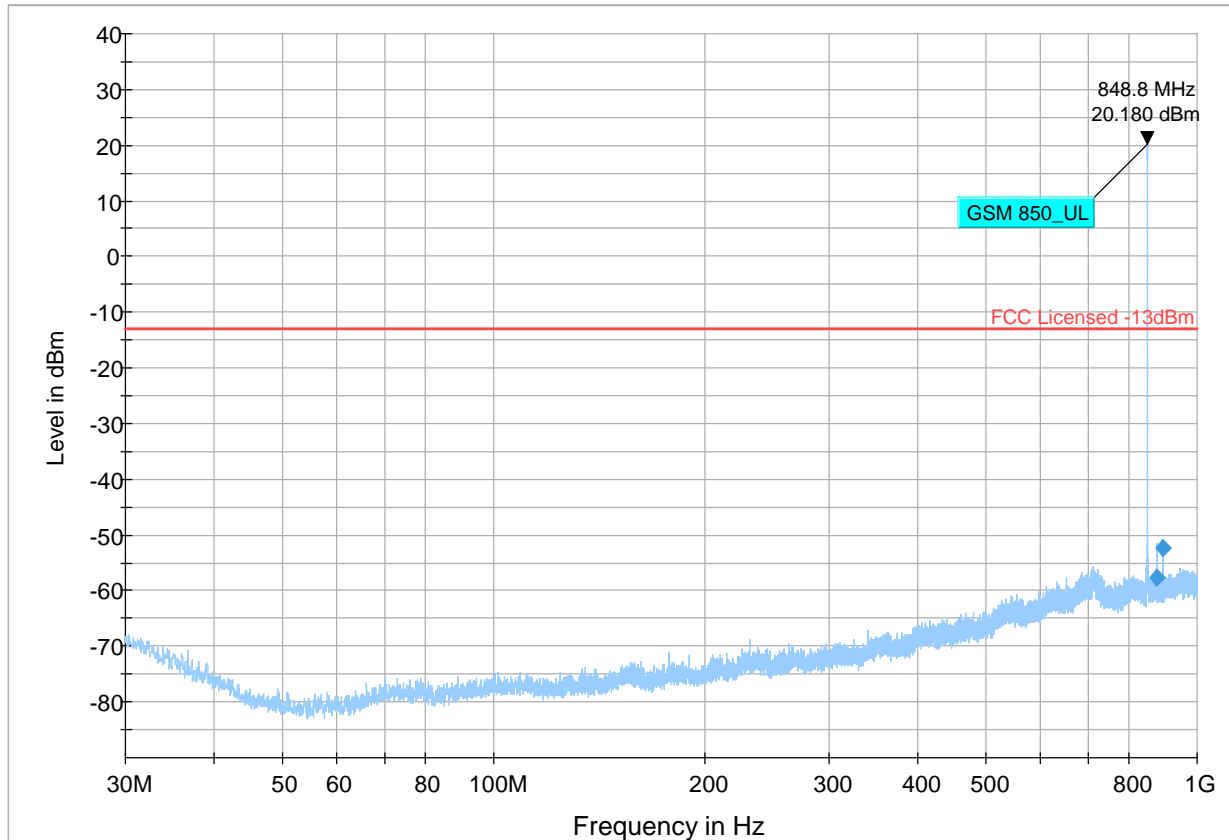


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 8

GSM 850 High + BTLE Mid

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
875.969	-57.56	-13.00	44.56	500.0	100.000	153.0	V	157.0	-74.1	
893.817	-52.33	-13.00	39.33	500.0	100.000	155.0	V	158.0	-73.7	

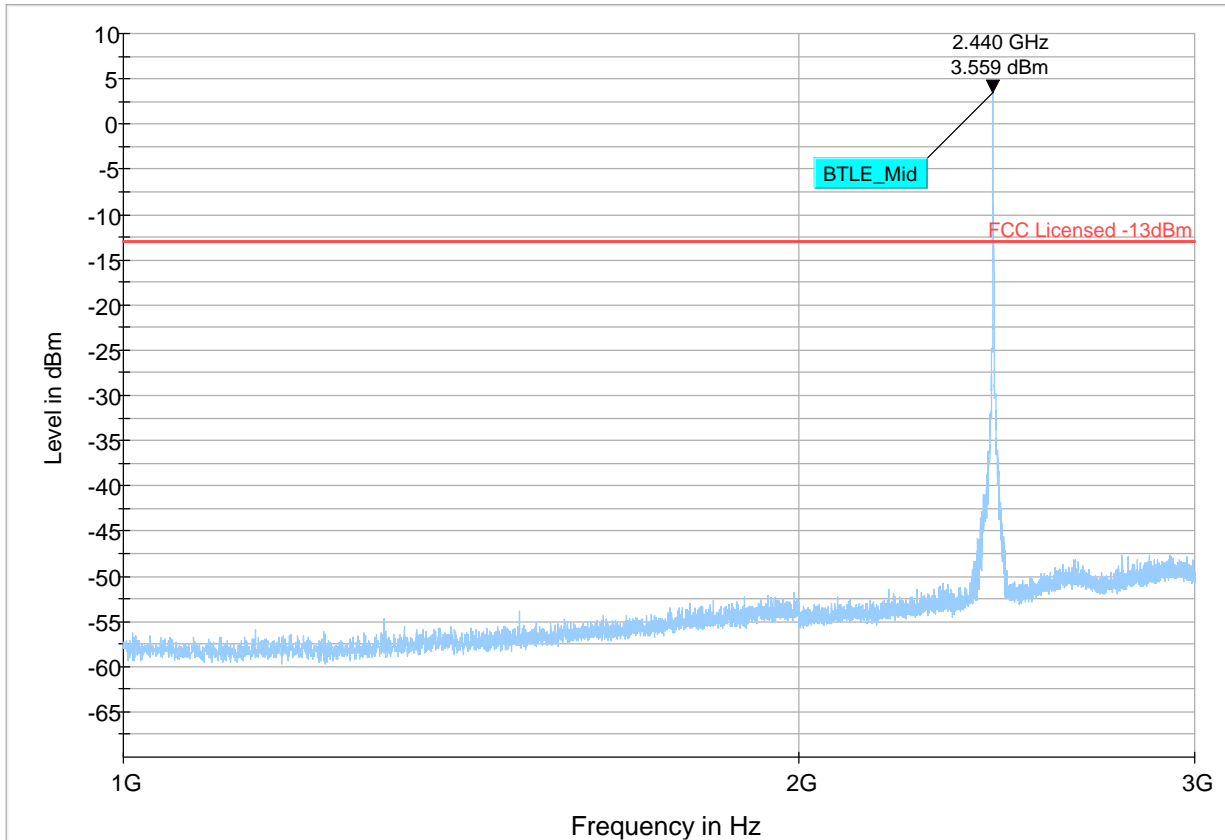


— Preview Result 1-PK+ — FCC Licensed -13dBm ◆ Final_Result RMS

Plot # 9

GSM 850 High + BTLE Mid

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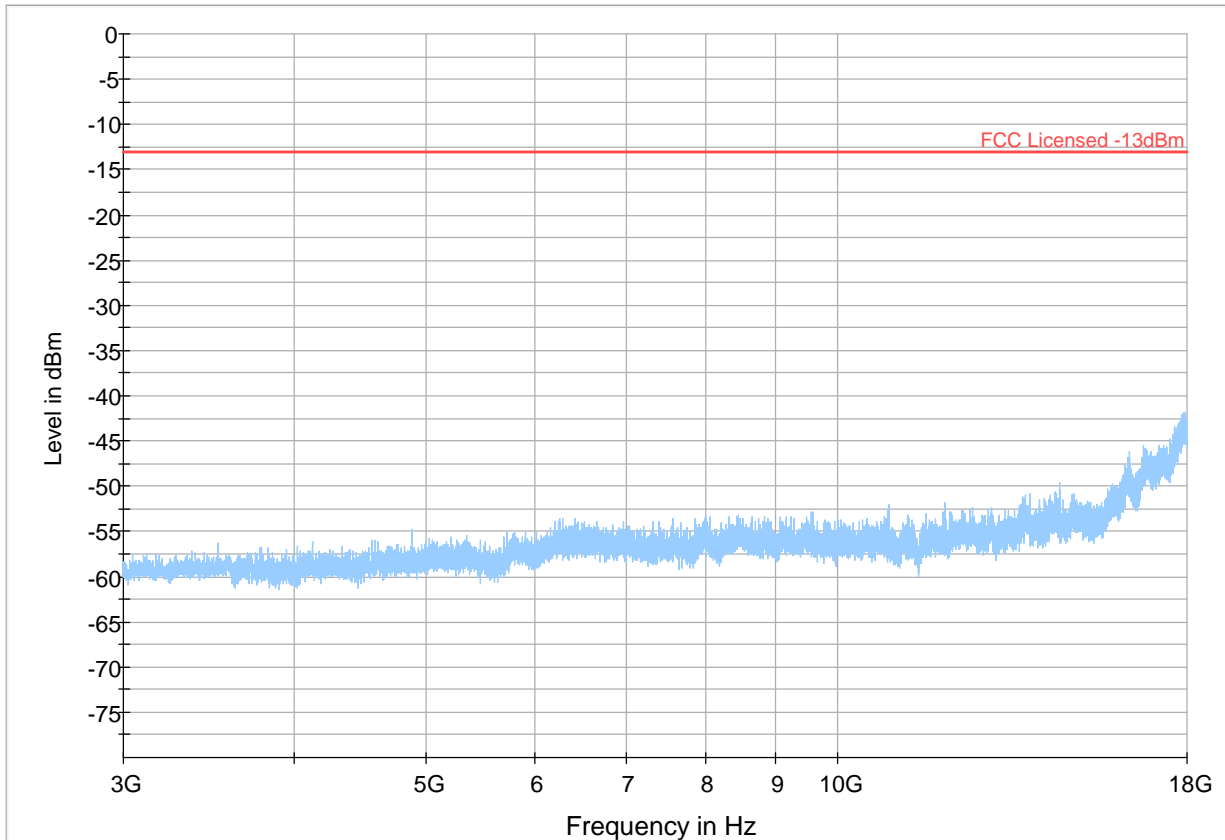


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 10

GSM 850 High + BTLE Mid

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

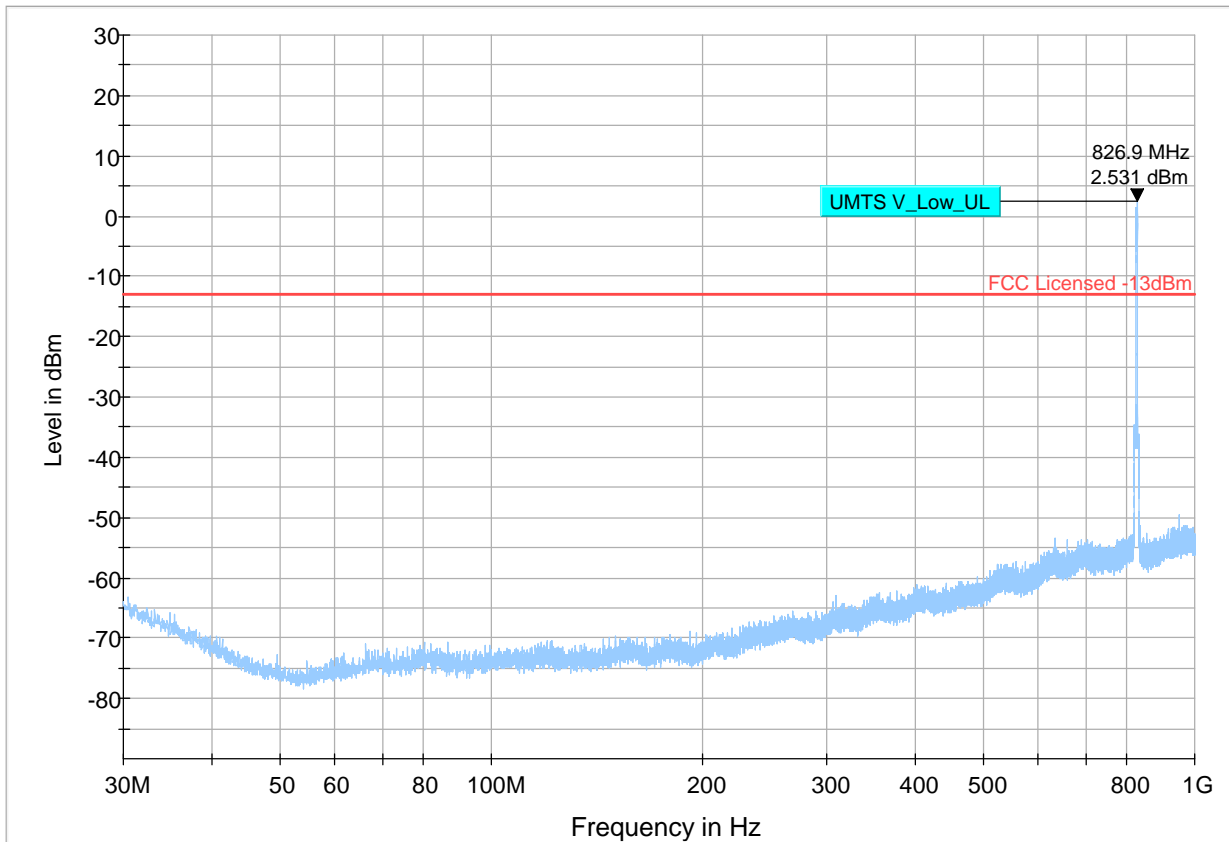


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 11

UMTS V Low + BTLE Mid

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

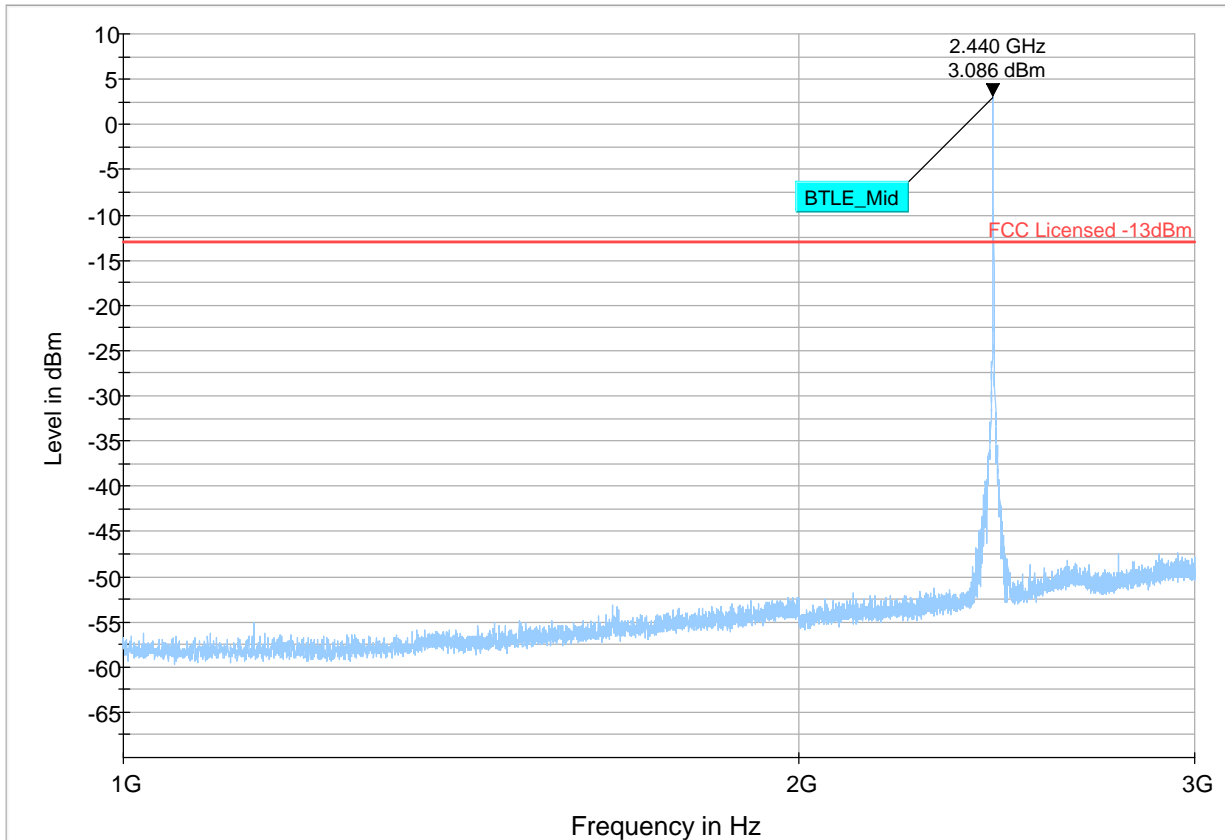


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 12

UMTS V Low + BTLE Mid

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

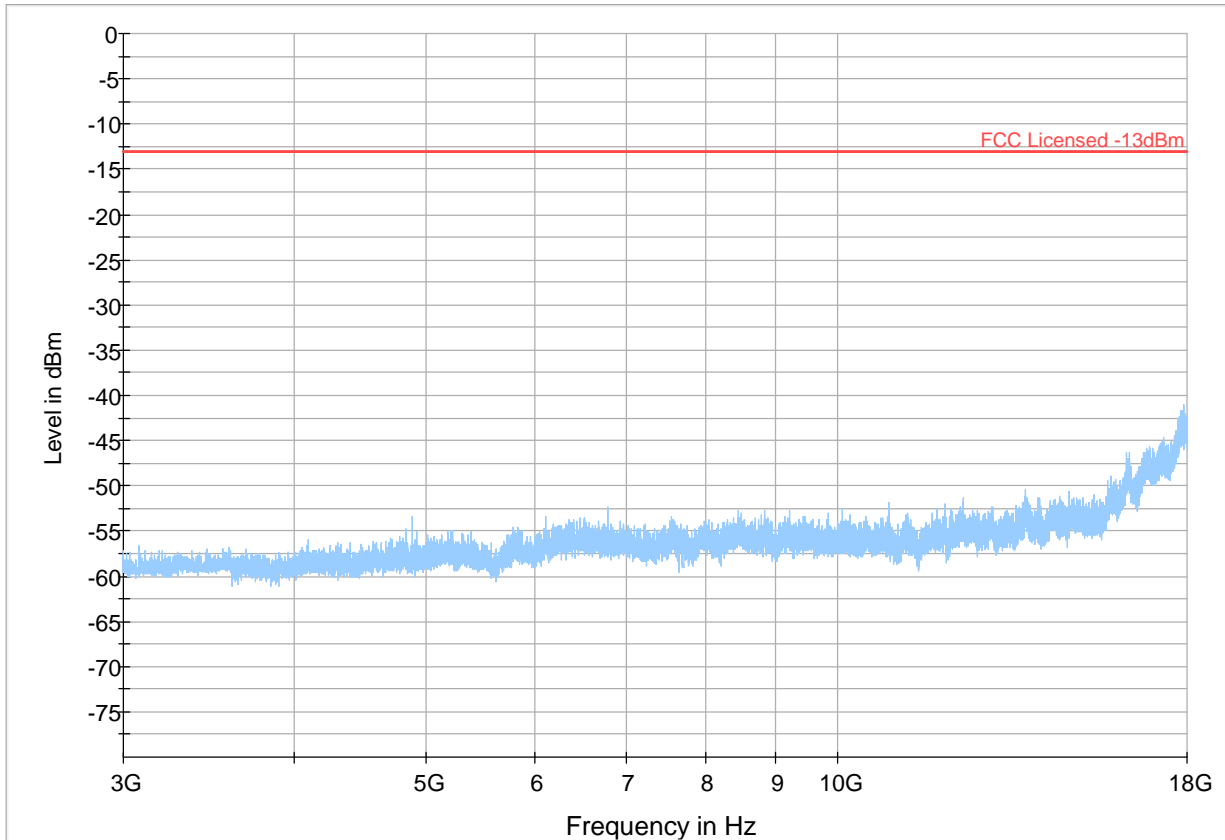


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 13

UMTS V Low + BTLE Mid

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

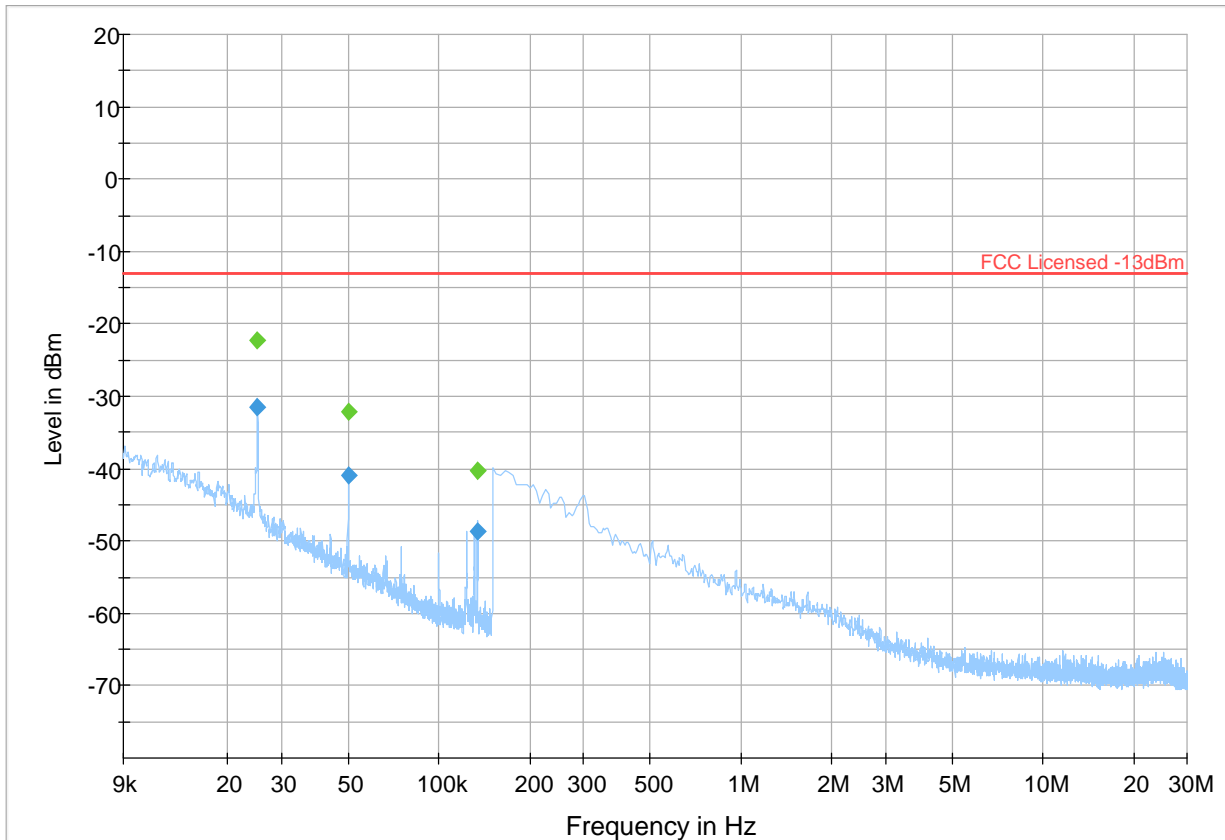


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 14

UMTS V Mid + BTLE Mid

Frequency (MHz)	RMS (dBm)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.025	-31.40	---	-13.00	18.40	500.0	1.000	100.0	V	188.0	-17.9	
0.025	---	-22.29	---	---	500.0	1.000	100.0	V	188.0	-17.9	
0.050	---	-32.11	---	---	500.0	1.000	100.0	V	-2.0	-24.6	
0.050	-40.98	---	-13.00	27.98	500.0	1.000	100.0	V	-2.0	-24.6	
0.134	-48.61	---	-13.00	35.61	500.0	1.000	100.0	H	227.0	-32.2	
0.134	---	-40.30	---	---	500.0	1.000	100.0	H	227.0	-32.2	

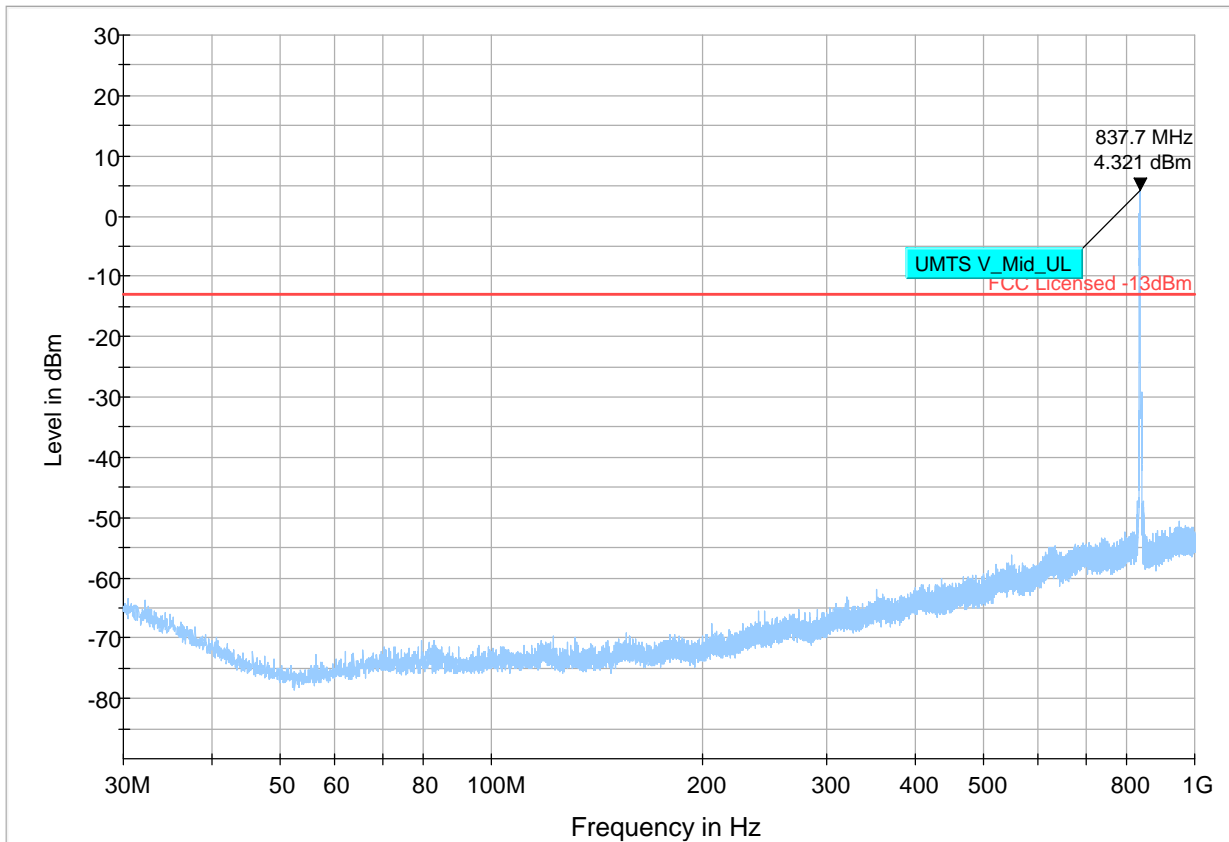


Preview Result 1-PK+ FCC Licensed -13dBm Final_Result RMS Final_Result PK

Plot # 15

UMTS V Mid + BTLE Mid

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

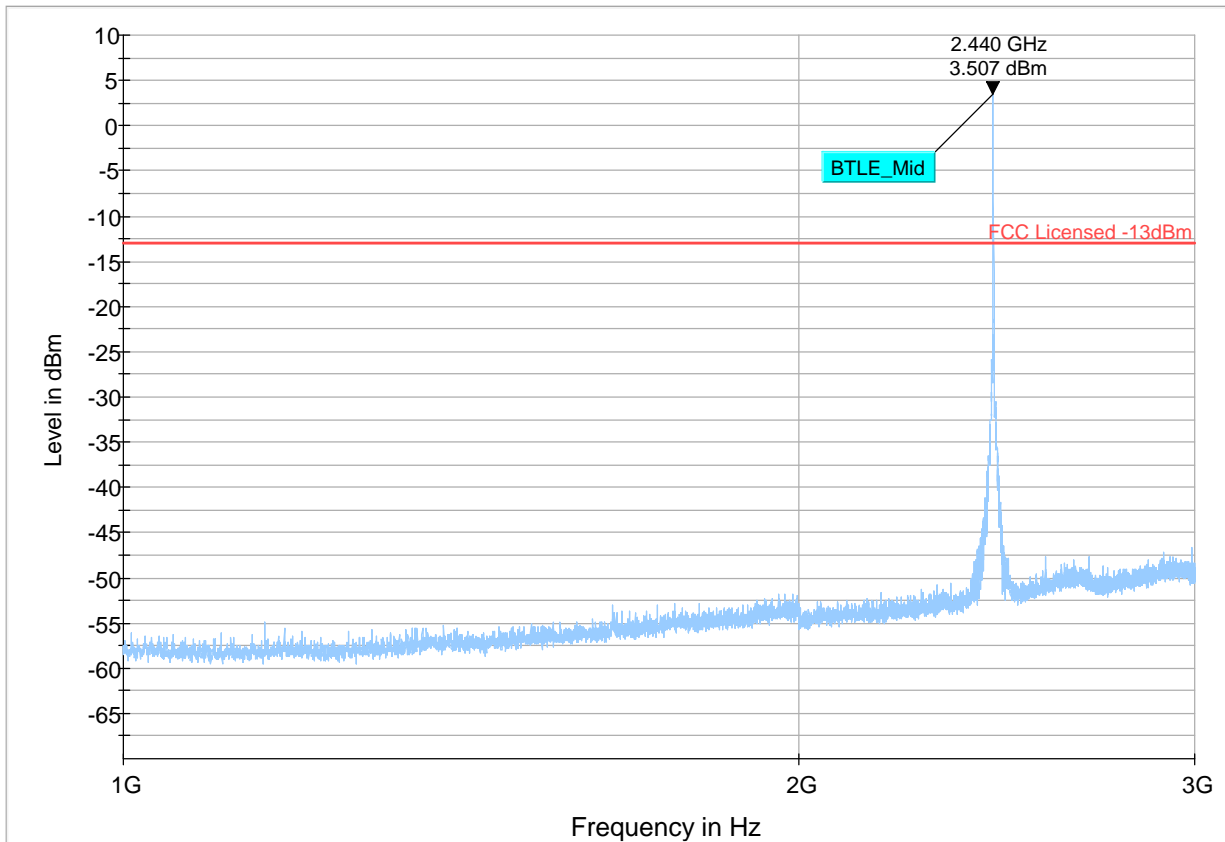


Preview Result 1-PK+ * Critical_Freqs PK+ FCC Licensed -13dBm ◆ Final_Result RM

Plot # 16

UMTS V Mid + BTLE Mid

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

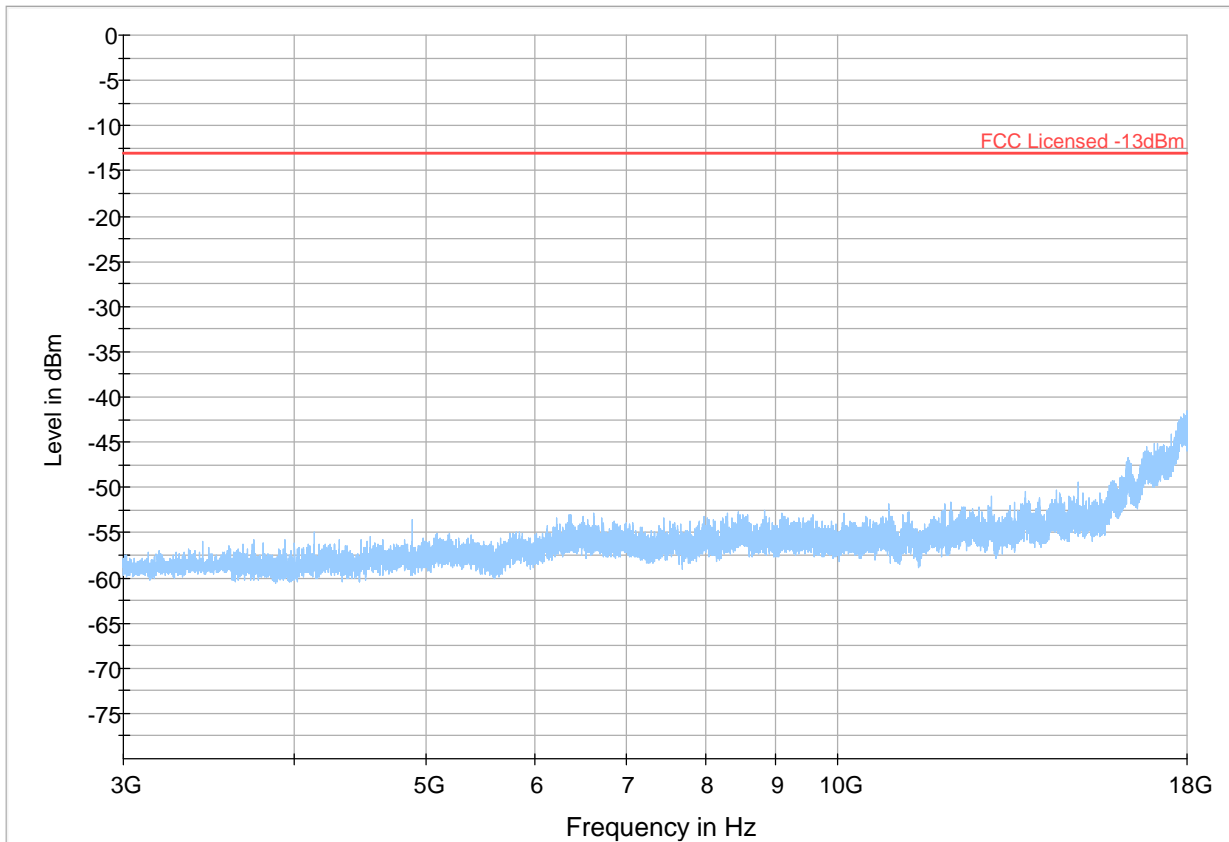


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 17

UMTS V Mid + BTLE Mid

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

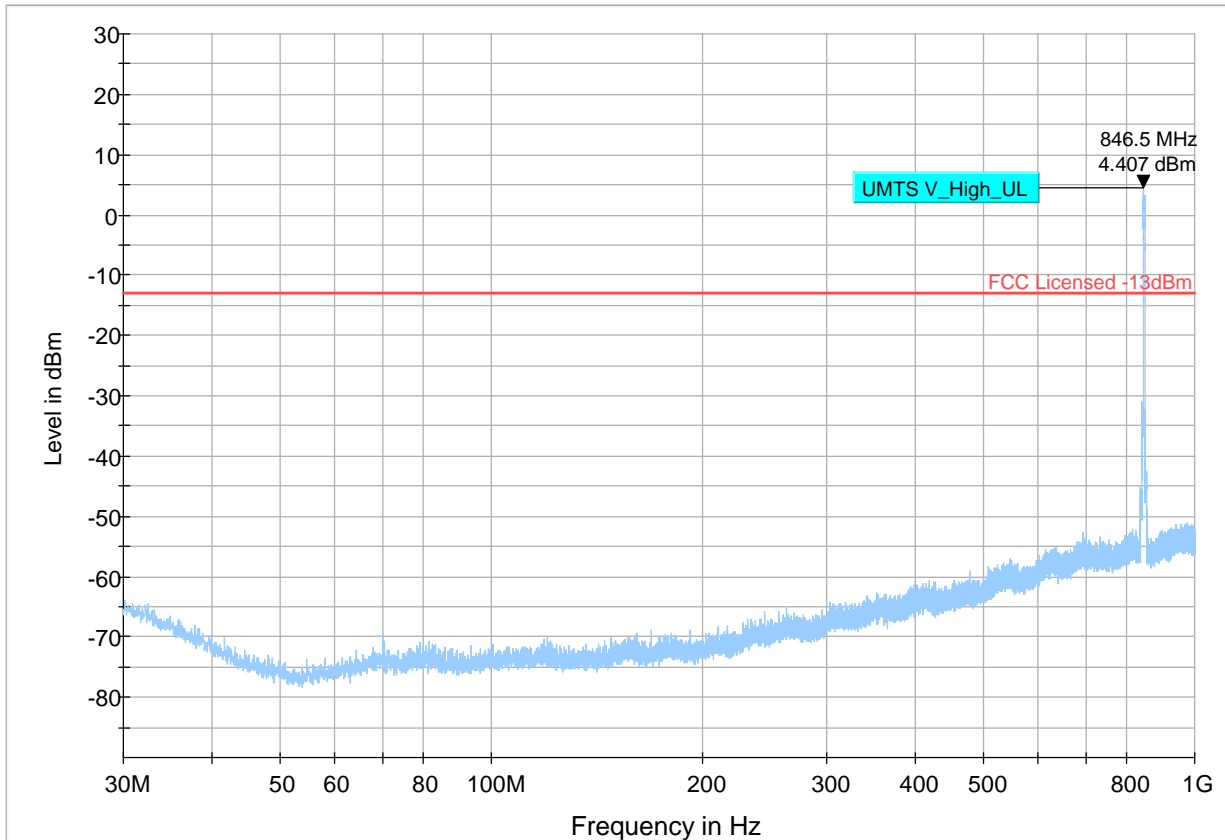


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 18

UMTS V High + BTLE Mid

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

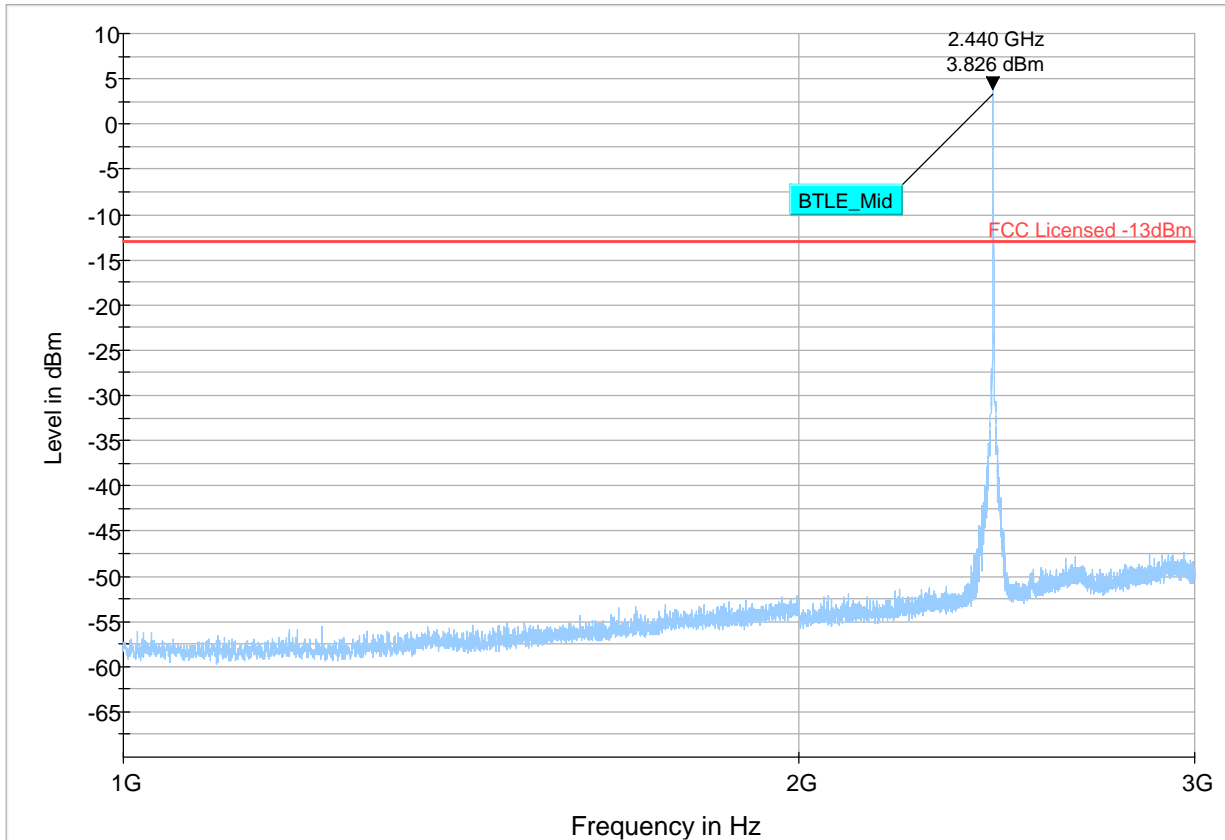


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 19

UMTS V High + BTLE Mid

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

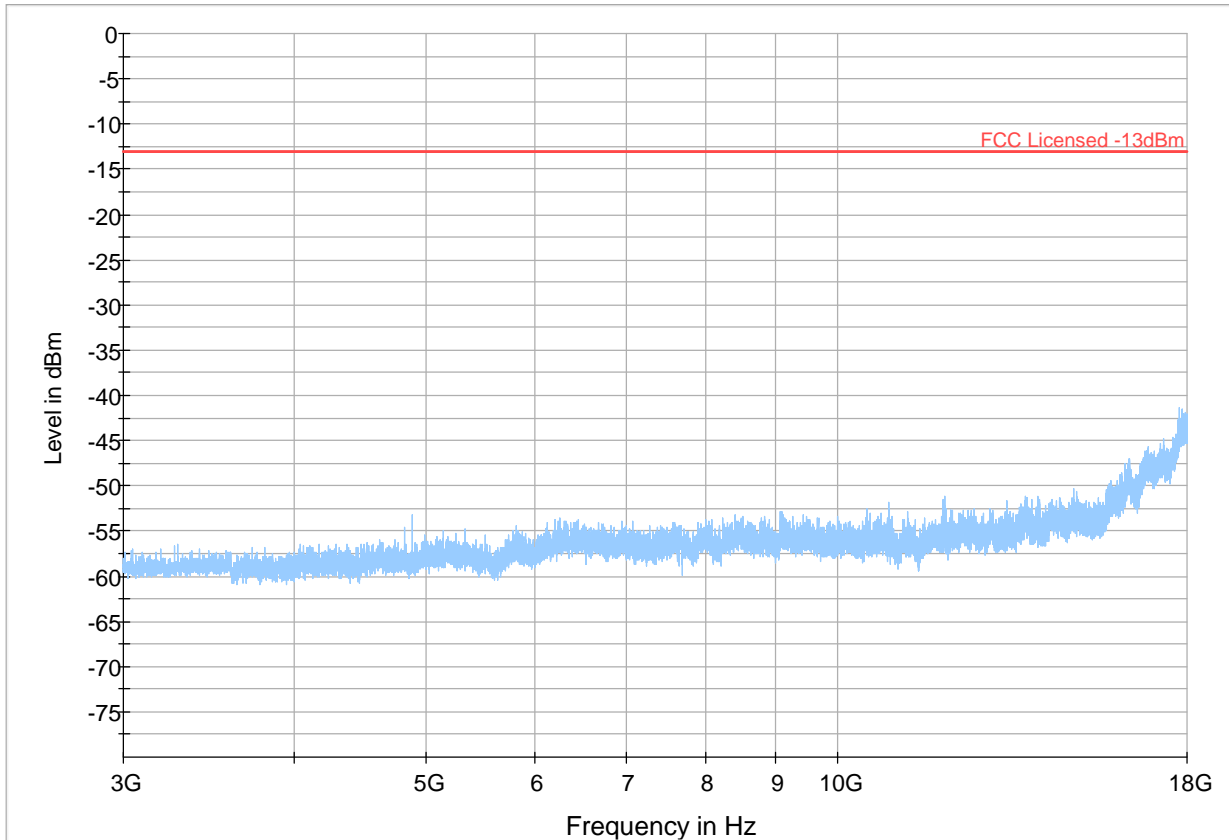


Preview Result 1-PK+ * Critical_Freqs PK+ FCC Licensed -13dBm ◆ Final_Result RM

Plot # 20

UMTS V High + BTLE Mid

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

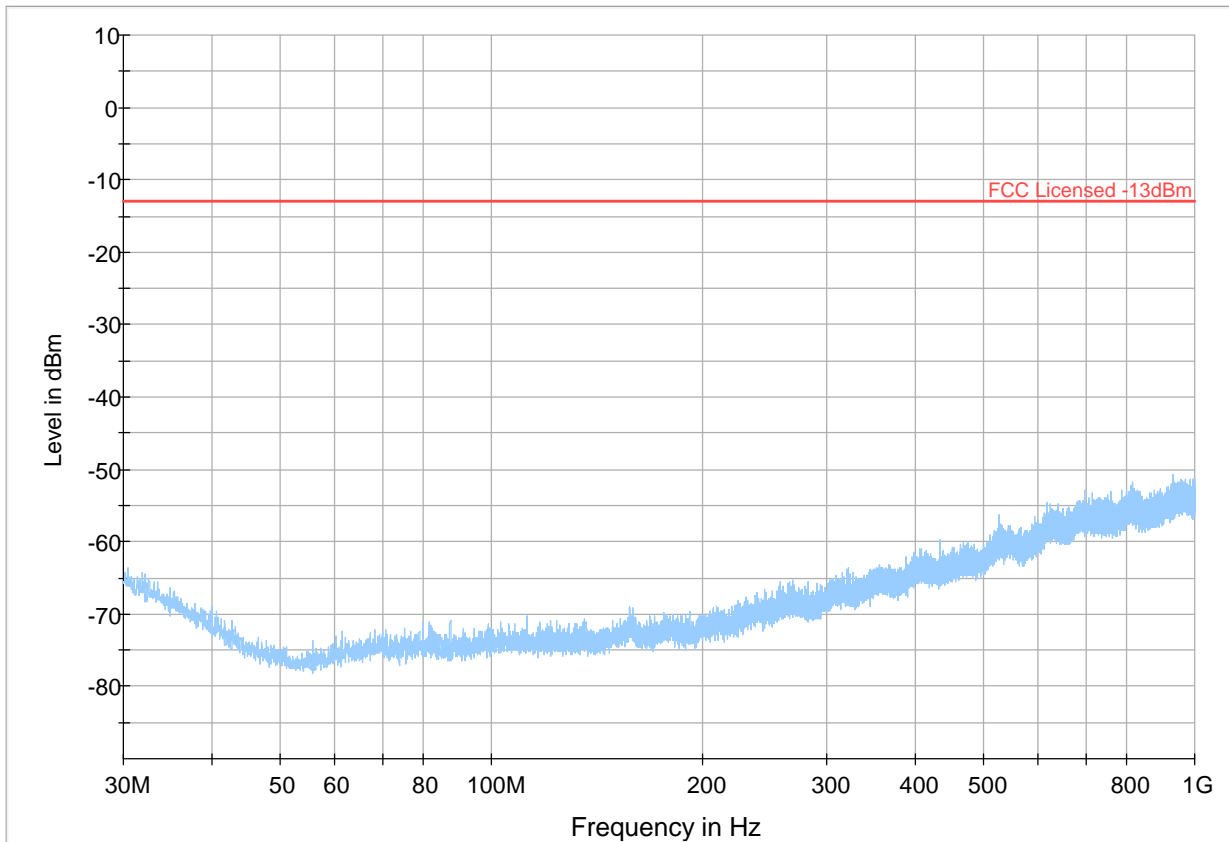


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 21

GSM 1900 Low + BTLE Mid

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

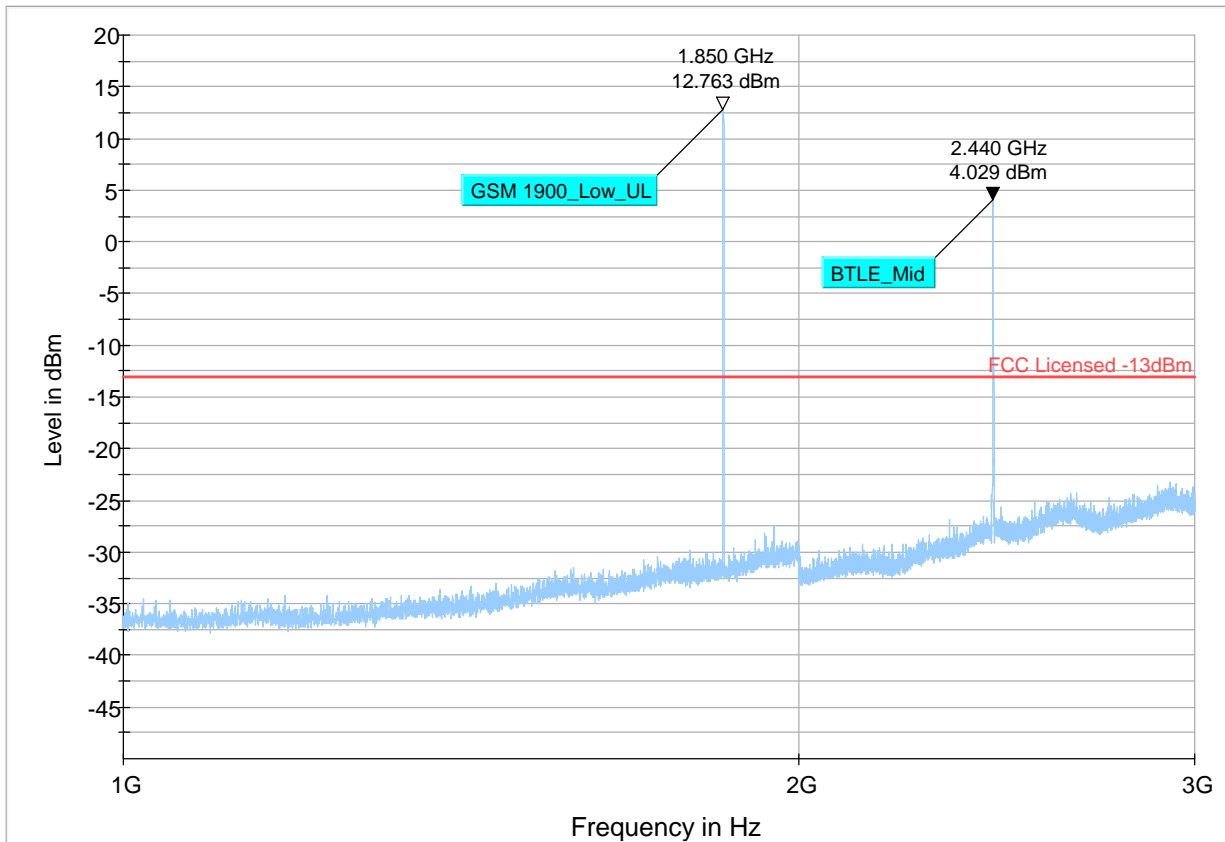


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 22

GSM 1900 Low + BTLE Mid

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

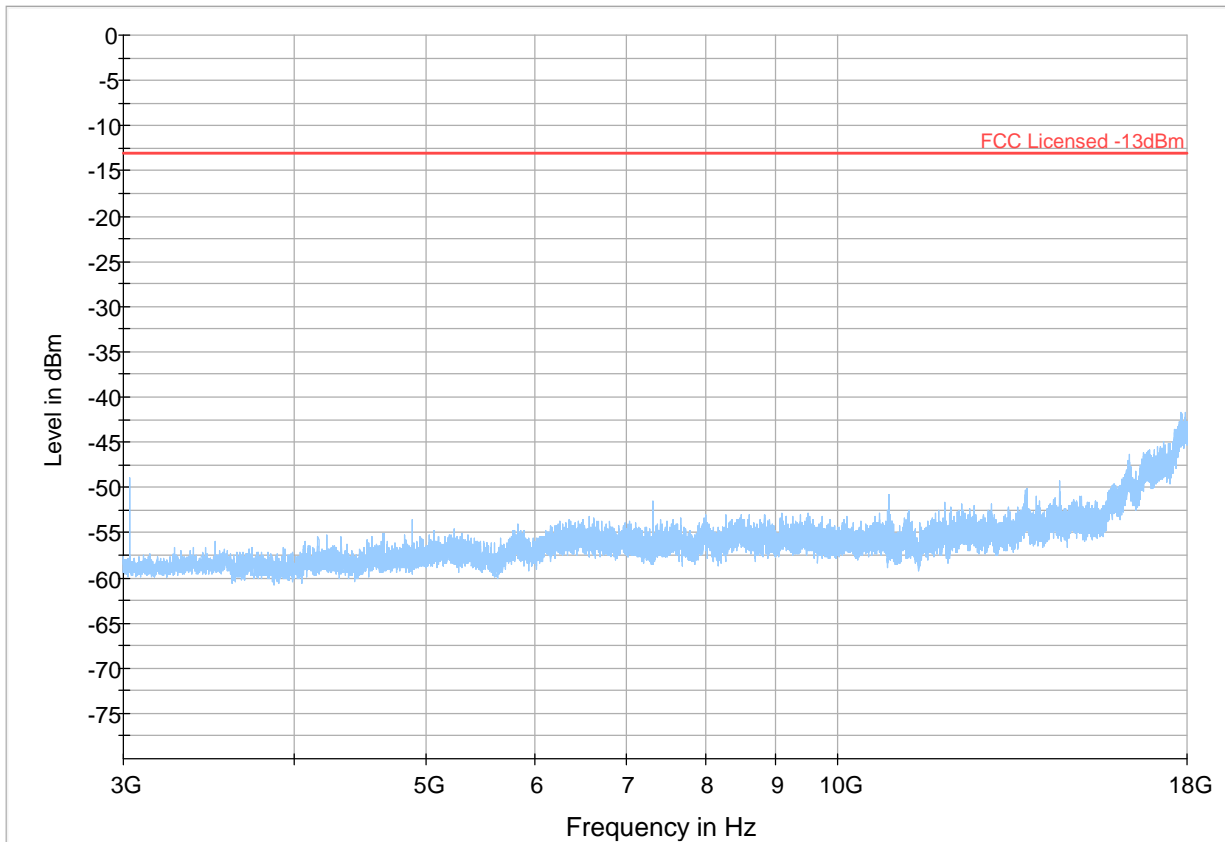


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 23

GSM 1900 Low + BTLE Mid

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

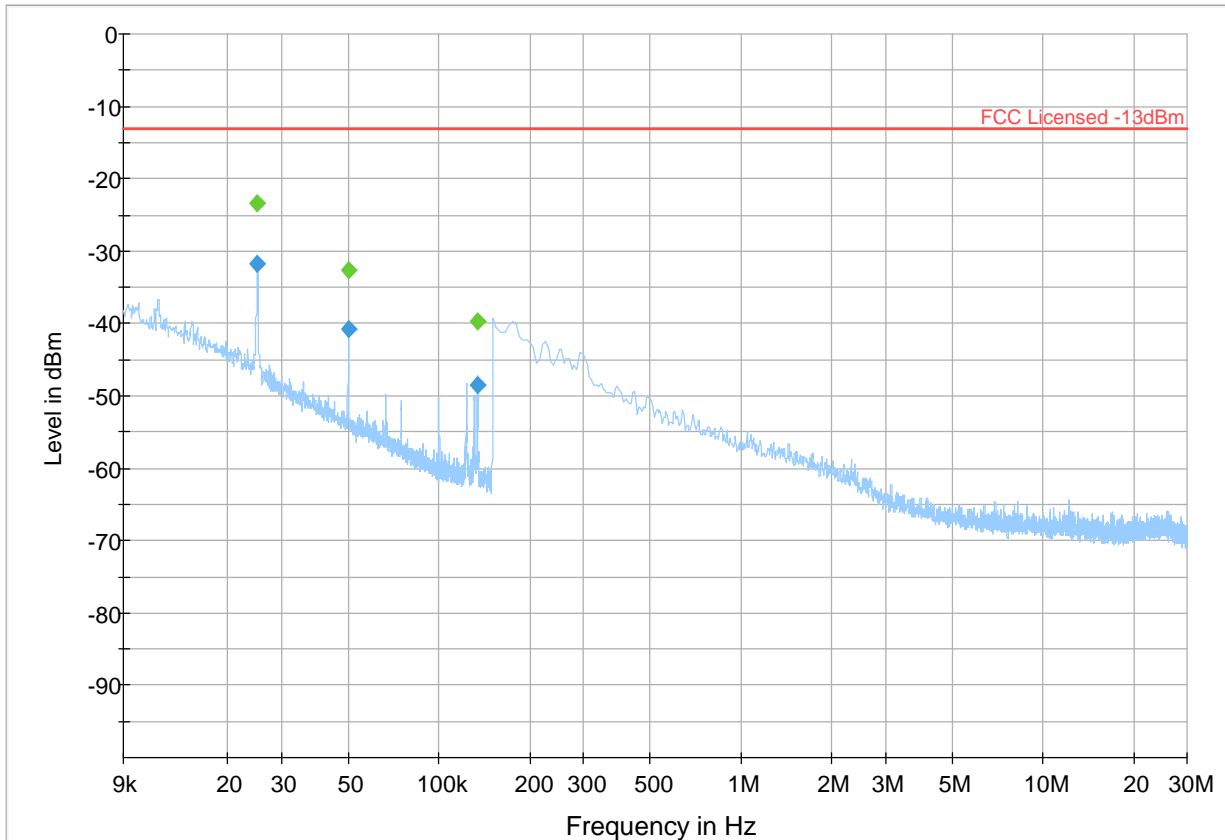


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 24

GSM 1900 Mid + BTLE Mid

Frequency (MHz)	RMS (dBm)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.025	-31.80	---	-13.00	18.80	500.0	1.000	100.0	V	0.0	-17.9	
0.025	---	-23.30	---	---	500.0	1.000	100.0	V	0.0	-17.9	
0.050	---	-32.69	---	---	500.0	1.000	100.0	V	90.0	-24.6	
0.050	-40.72	---	-13.00	27.72	500.0	1.000	100.0	V	90.0	-24.6	
0.134	-48.44	---	-13.00	35.44	500.0	1.000	100.0	H	39.0	-32.2	
0.134	---	-39.60	---	---	500.0	1.000	100.0	H	39.0	-32.2	

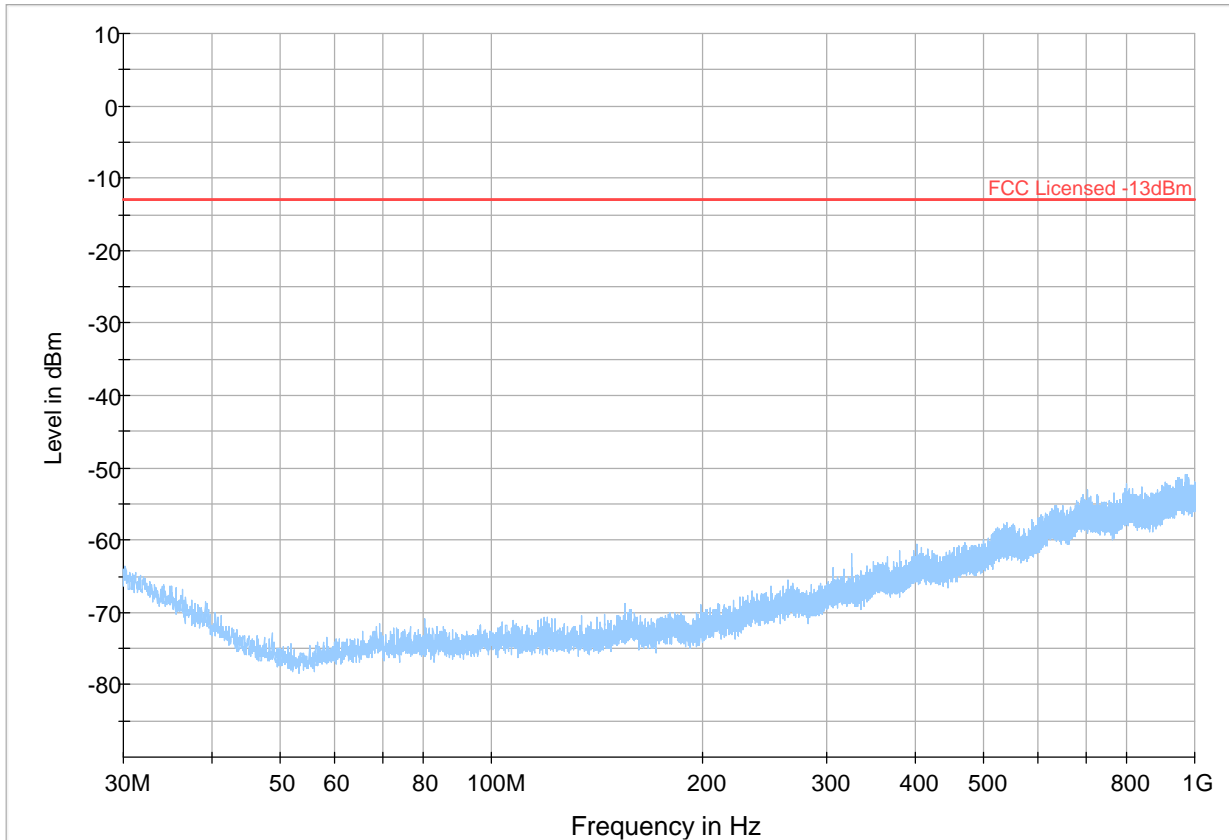


Preview Result 1-PK+ FCC Licensed -13dBm Final_Result RMS Final_Result PK

Plot # 25

GSM 1900 Mid + BTLE Mid

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

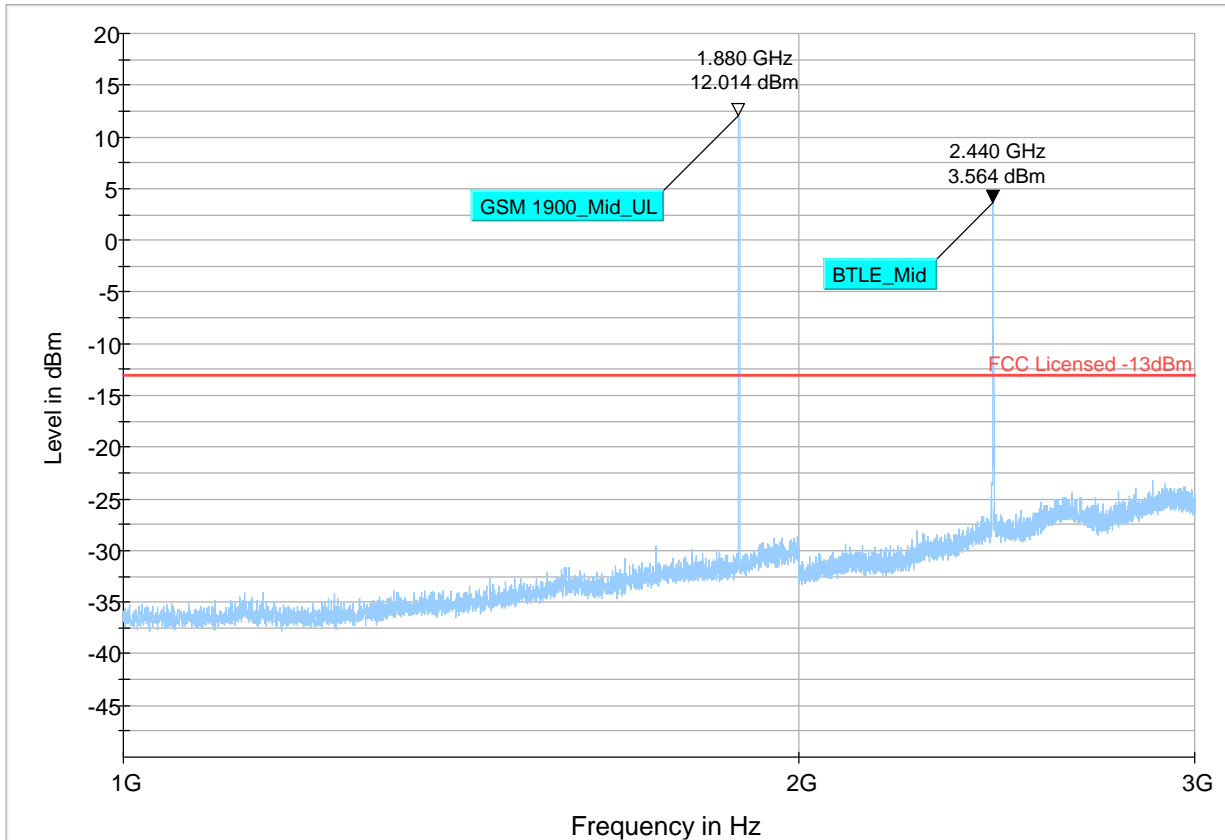


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 26

GSM 1900 Mid + BTLE Mid

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

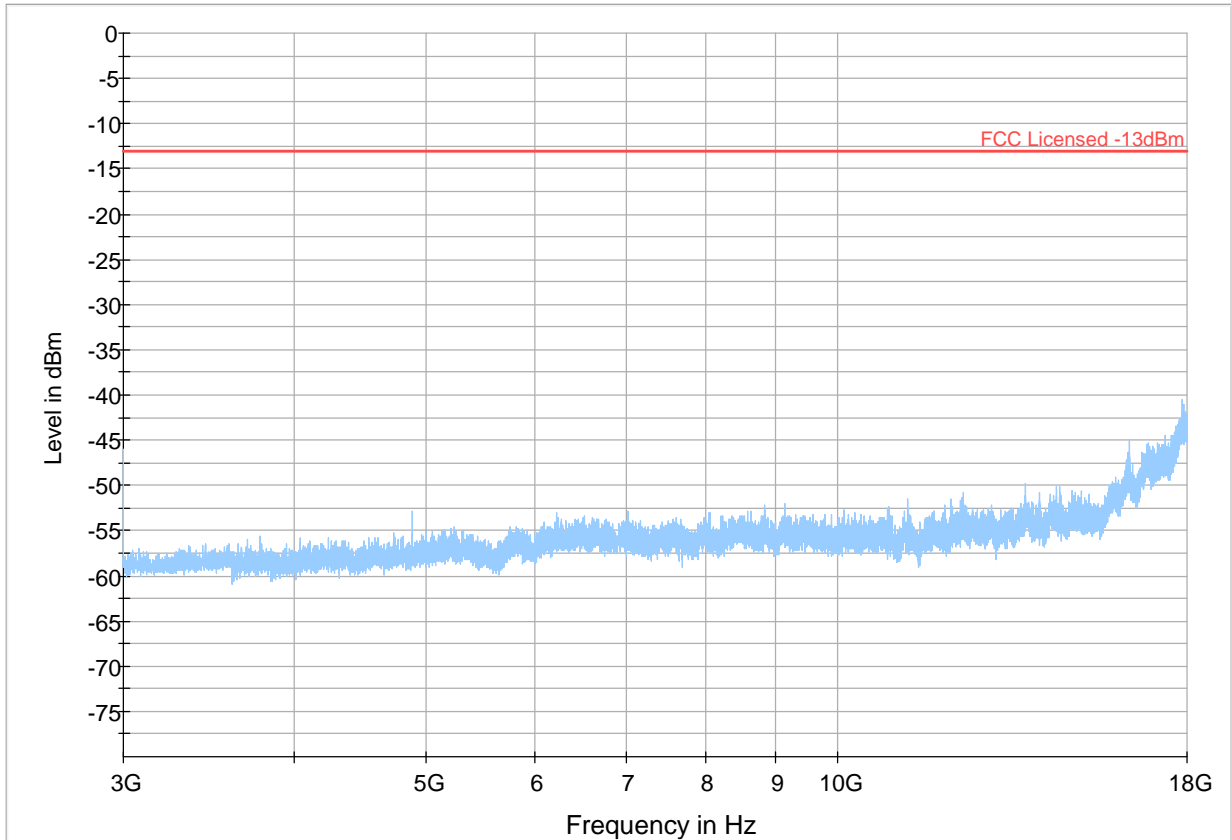


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 27

GSM 1900 Mid + BTLE Mid

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

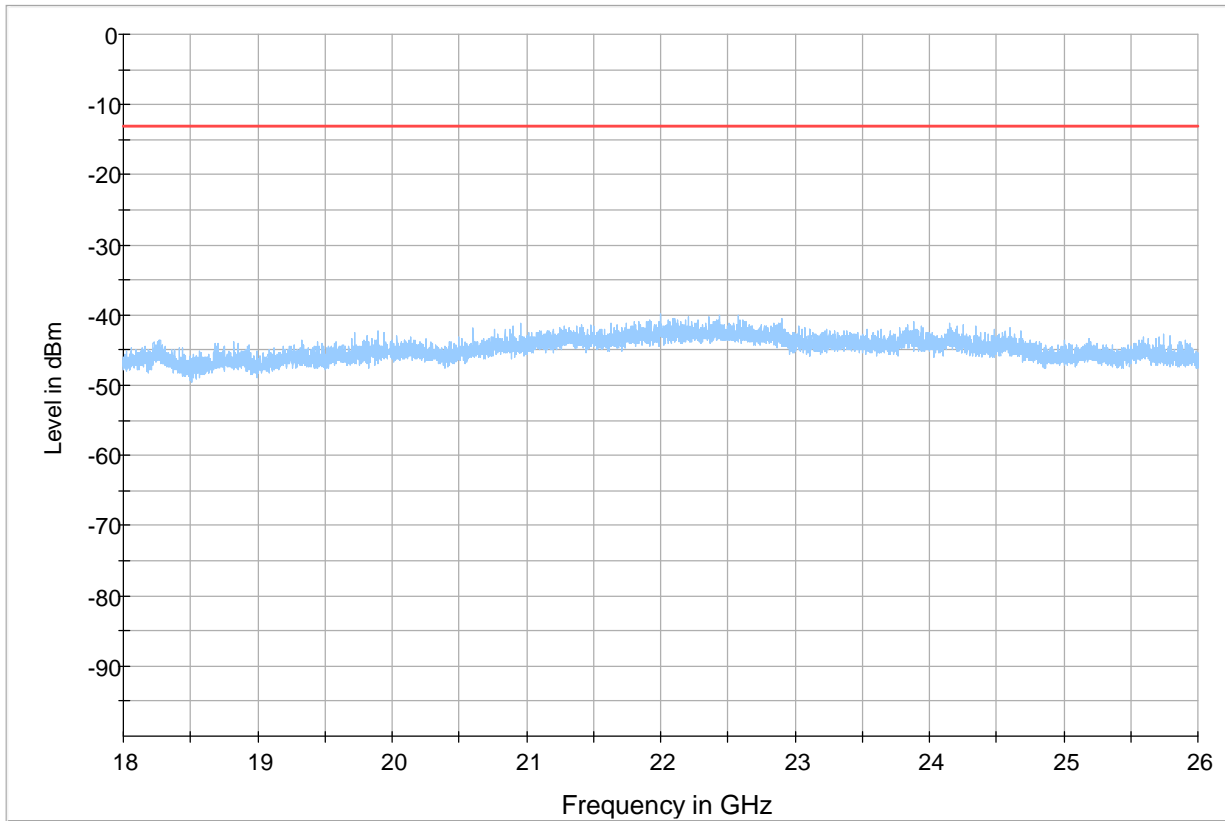


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 28

GSM 1900 Mid + BTLE Mid

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

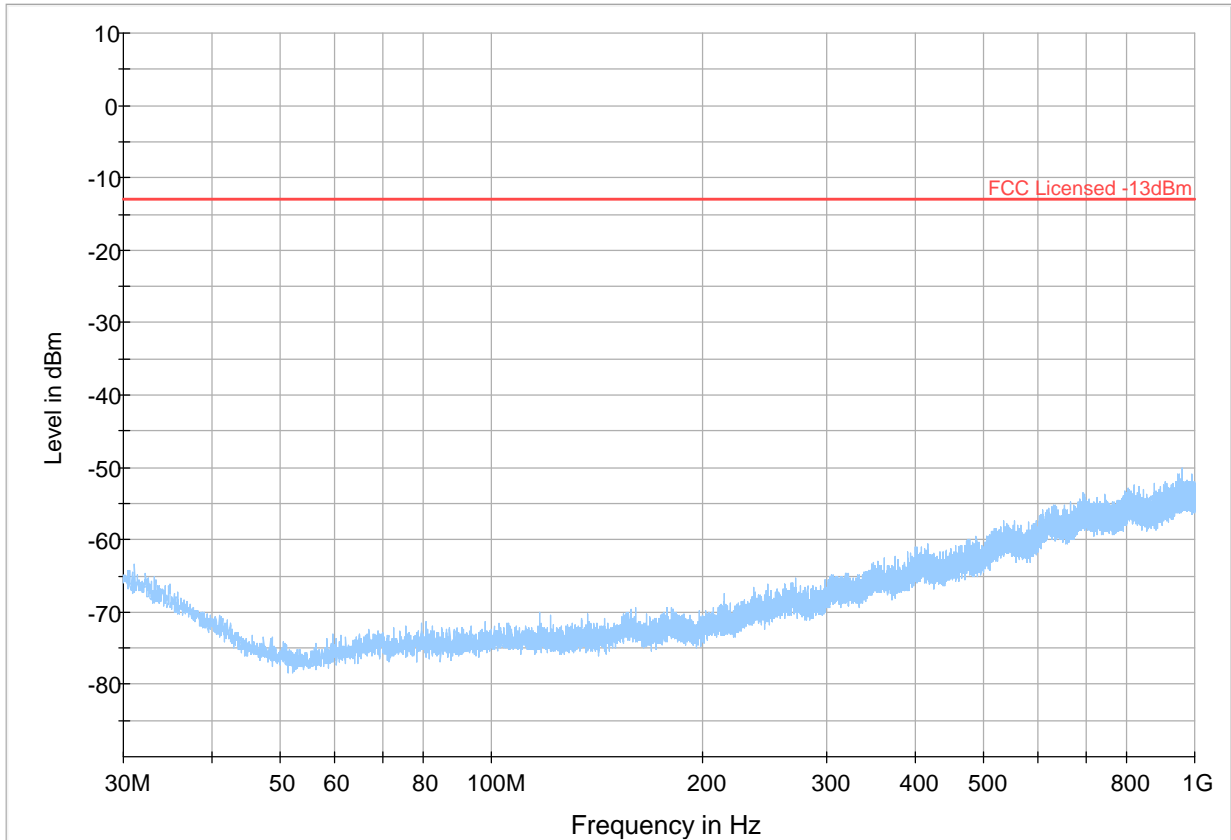


—◆— Preview Result 1-PK+ Final_Result RMS
 ◆ Critical_Freqs PK+ Final_Result PK+
 — FCC Licensed -13dBm

Plot # 29

GSM 1900 High + BTLE Mid

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

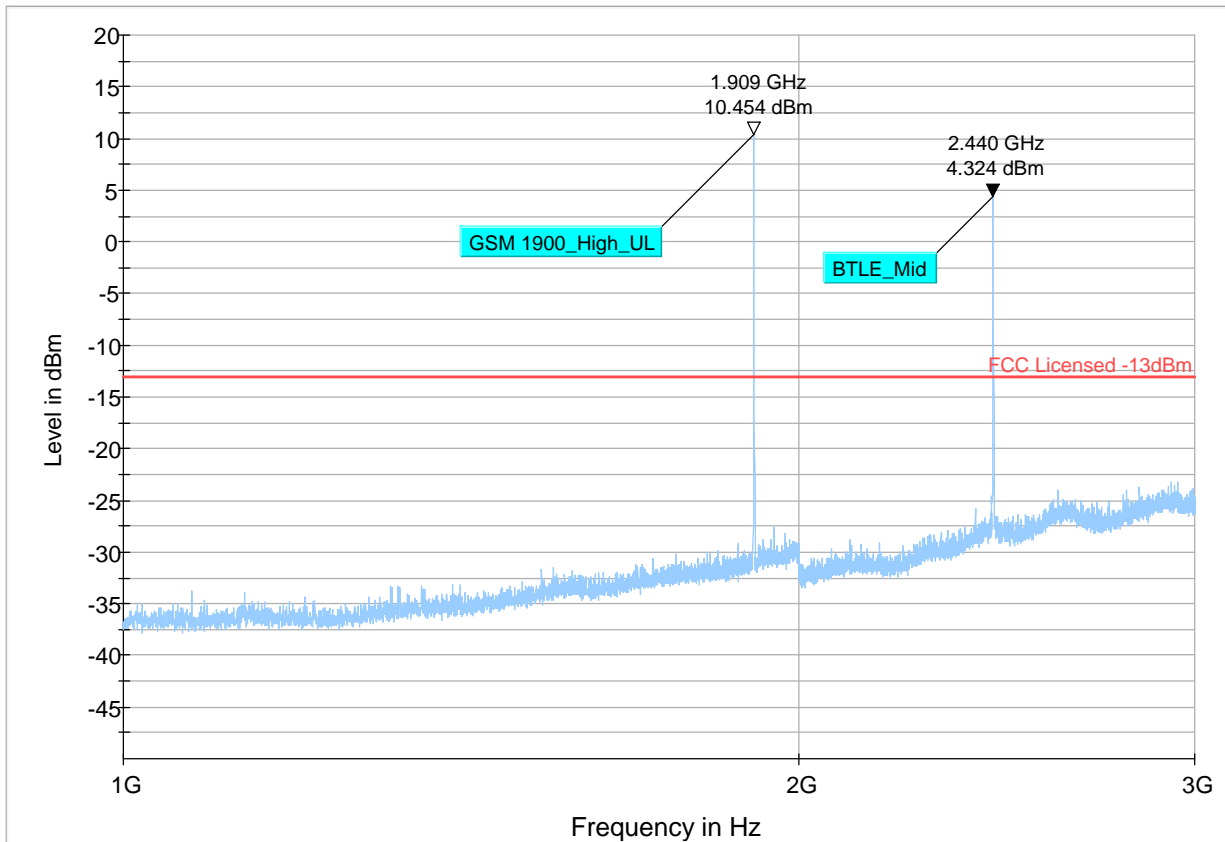


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 30

GSM 1900 High + BTLE Mid

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

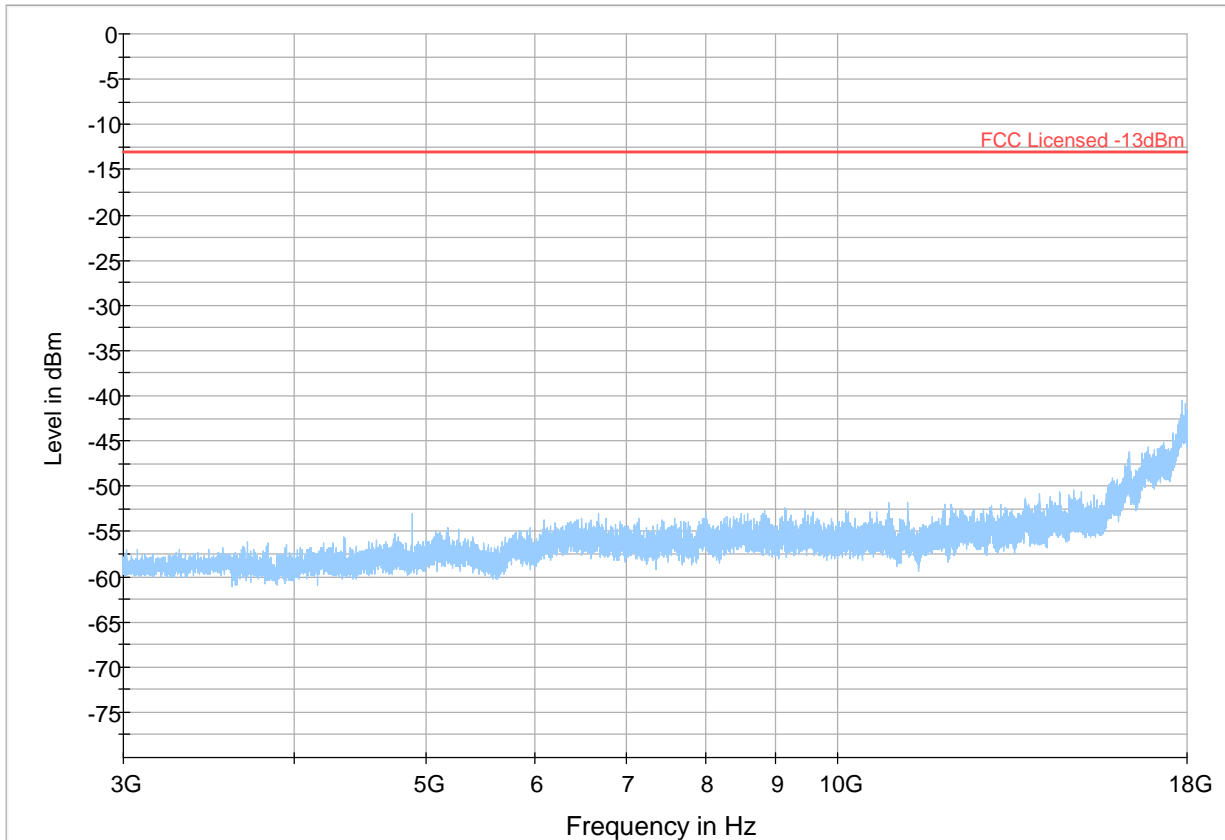


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 31

GSM 1900 High + BTLE Mid

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

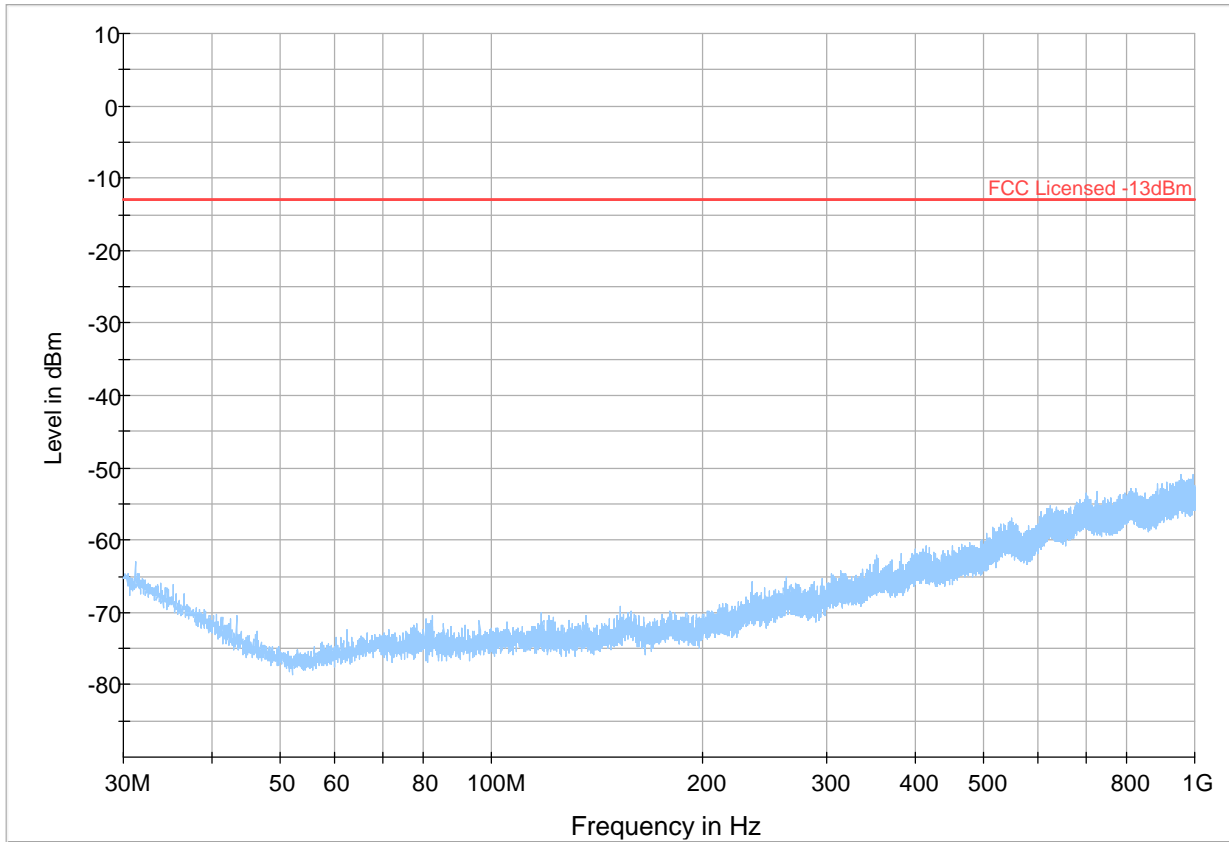


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 32

UMTS II Low + BTLE Mid

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

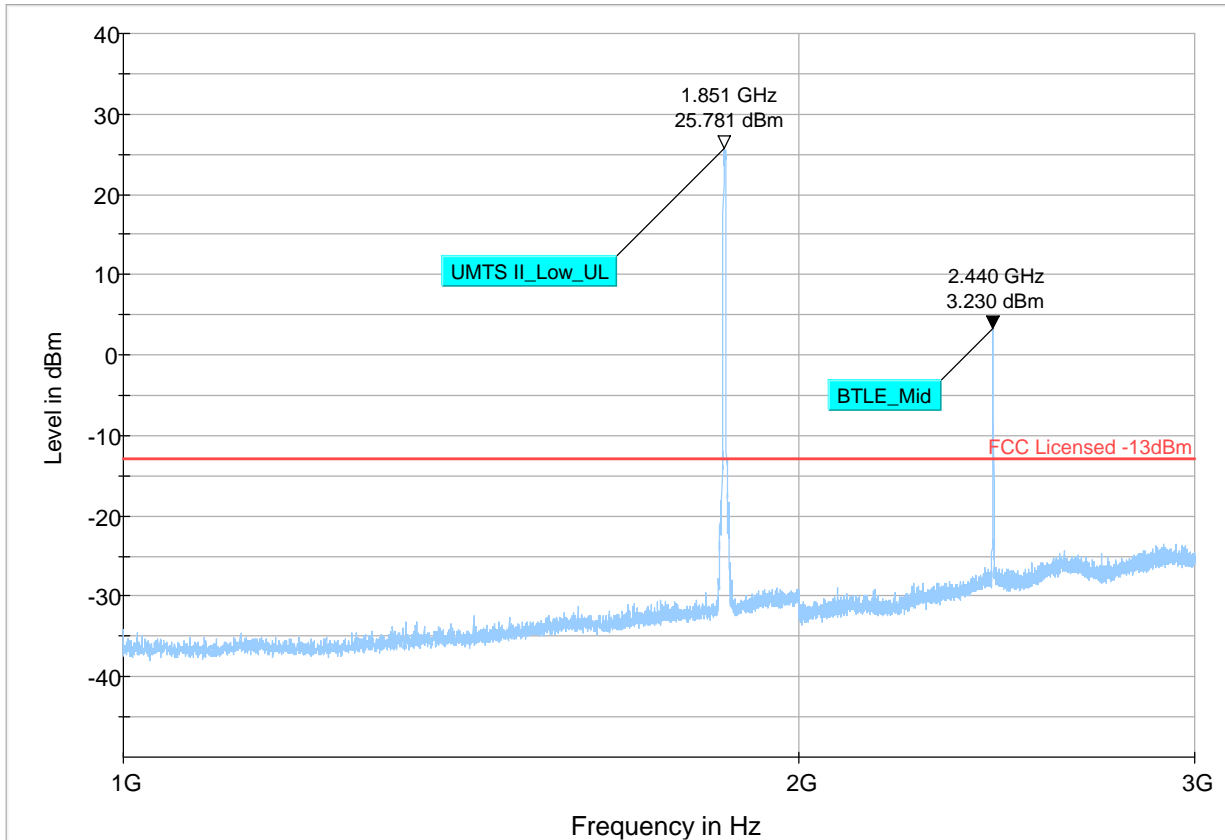


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 33

UMTS II Low + BTLE Mid

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

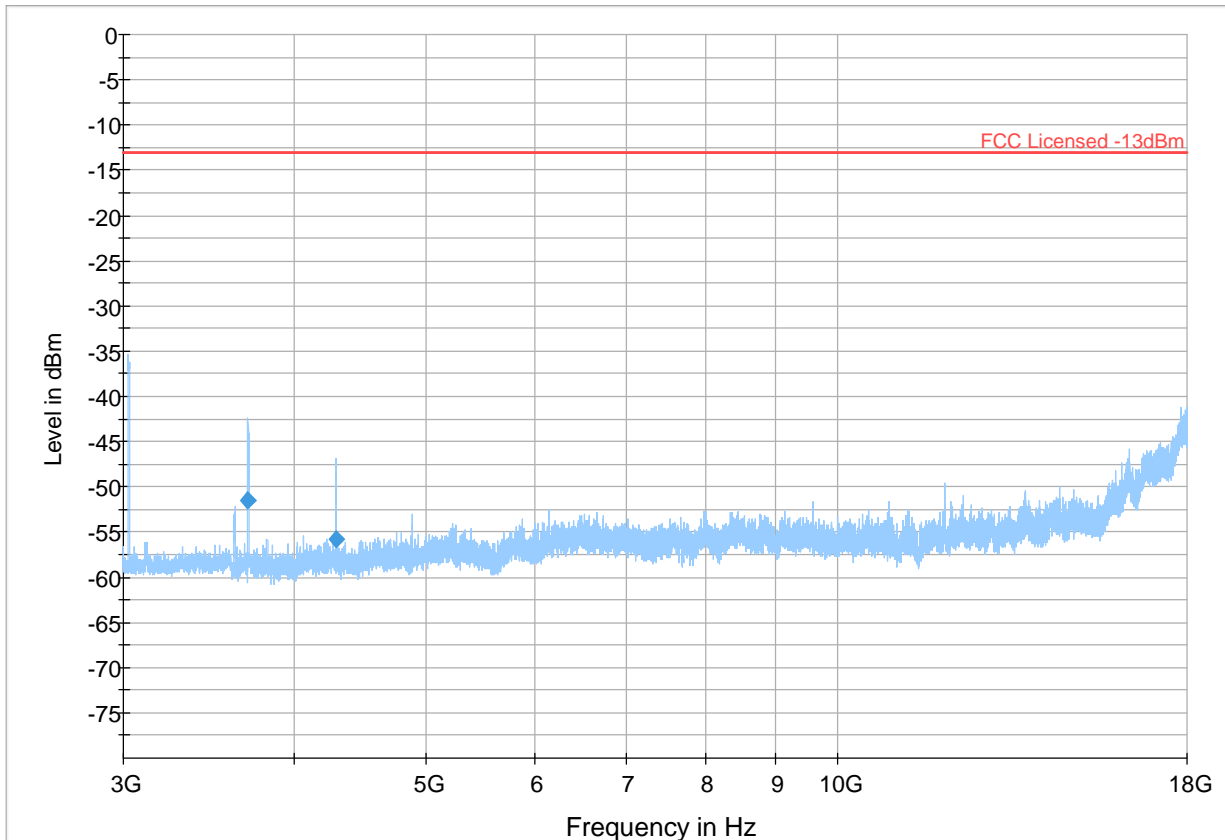


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 34

UMTS II Low + BTLE Mid

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
3703.000	-51.45	-13.00	38.45	500.0	1000.000	140.0	H	238.0	-101.7	
4293.500	-55.77	-13.00	42.77	500.0	1000.000	140.0	H	263.0	-100.4	

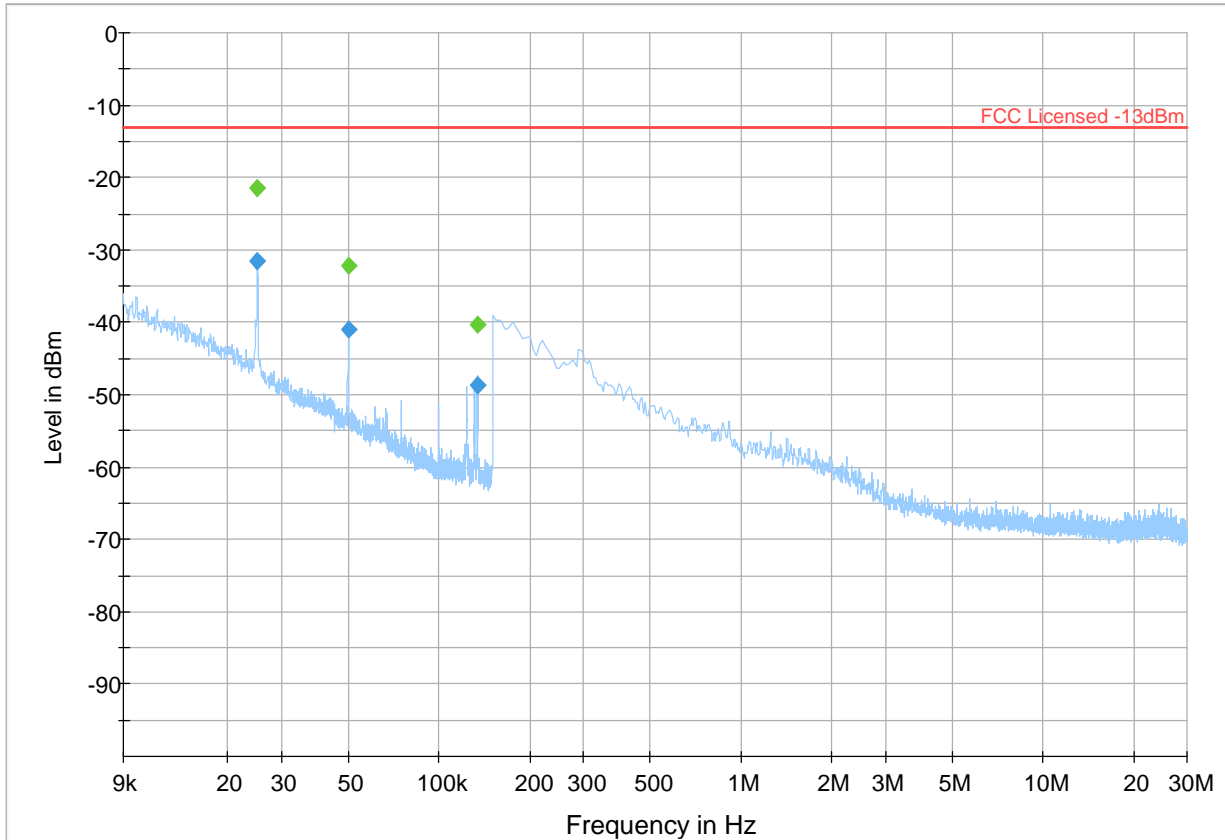


— Preview Result 1-PK+ — FCC Licensed -13dBm ◆ Final_Result RMS

Plot # 35

UMTS II Mid + BTLE Mid

Frequency (MHz)	RMS (dBm)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.025	---	-21.56	---	---	500.0	1.000	100.0	H	42.0	-17.9	
0.025	-31.45	---	-13.00	18.45	500.0	1.000	100.0	H	42.0	-17.9	
0.050	-40.91	---	-13.00	27.91	500.0	1.000	100.0	V	185.0	-24.6	
0.050	---	-32.22	---	---	500.0	1.000	100.0	V	185.0	-24.6	
0.134	-48.61	---	-13.00	35.61	500.0	1.000	100.0	H	130.0	-32.2	
0.134	---	-40.25	---	---	500.0	1.000	100.0	H	130.0	-32.2	

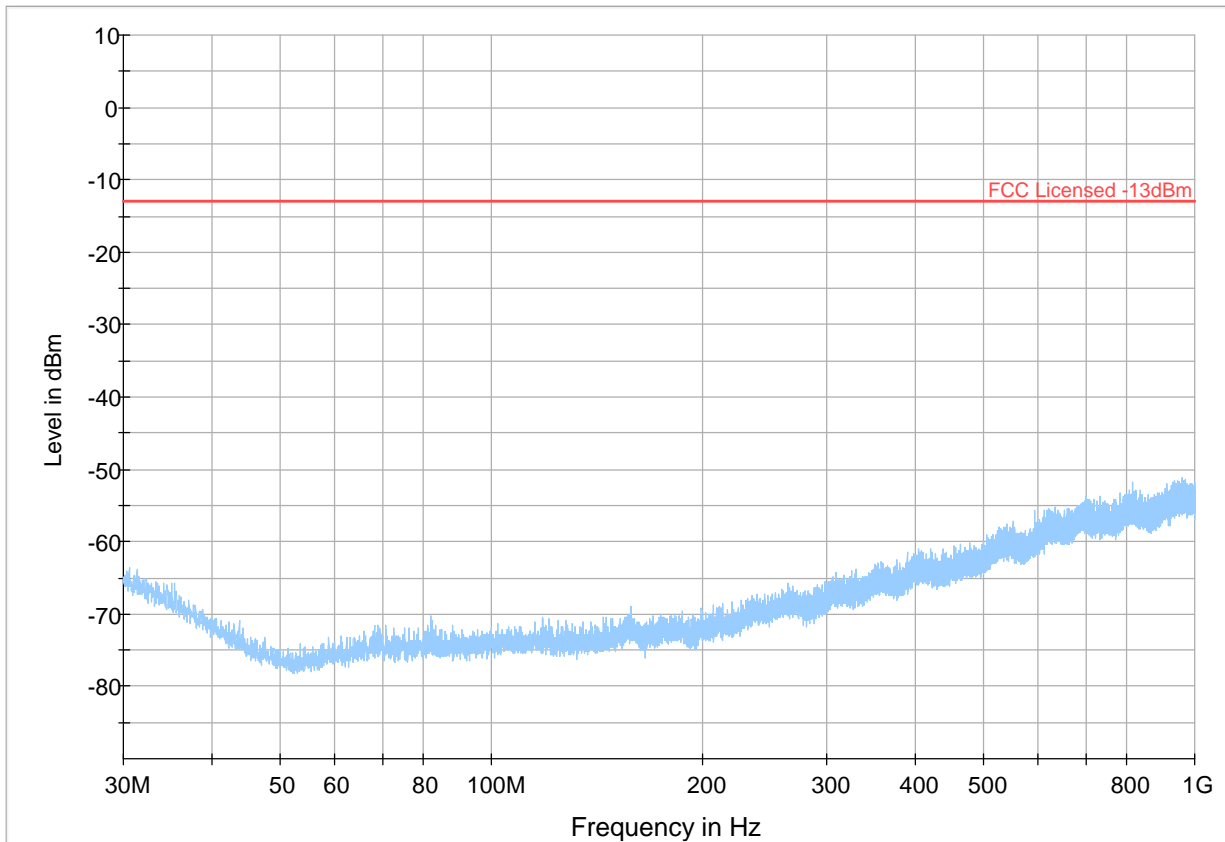


Preview Result 1-PK+ FCC Licensed -13dBm Final_Result RMS Final_Result PK

Plot # 36

UMTS II Mid + BTLE Mid

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

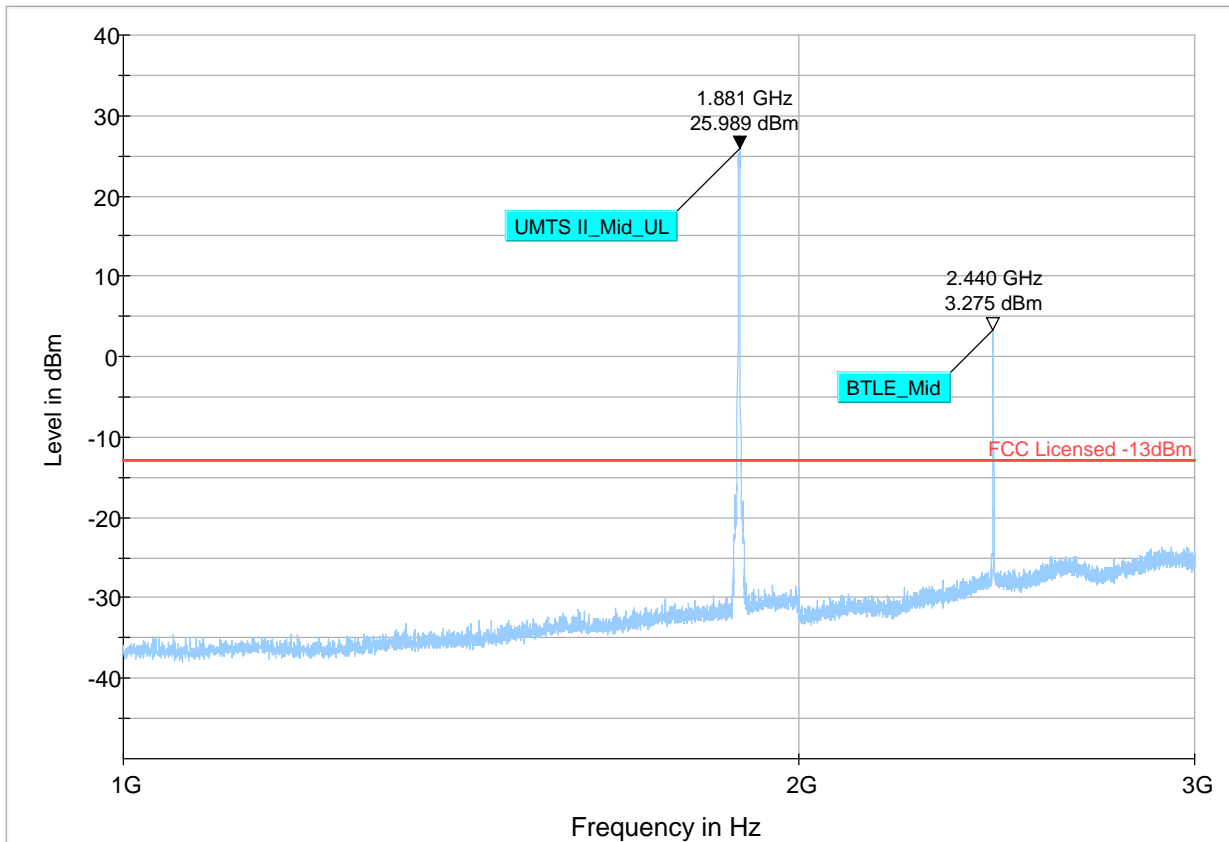


— Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm ◆ Final_Result RM

Plot # 37

UMTS II Mid + BTLE Mid

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

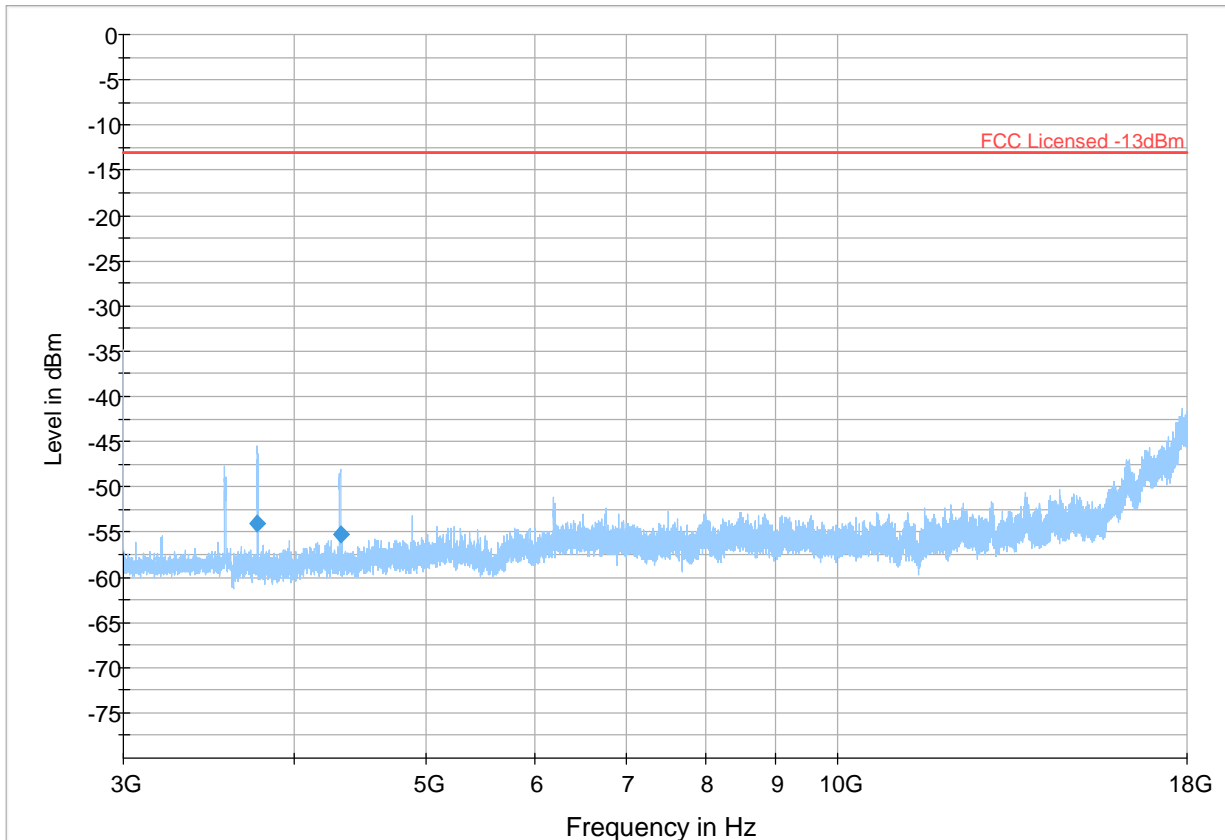


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 38

UMTS II Mid + BTLE Mid

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
3761.000	-54.13	-13.00	41.13	500.0	1000.000	140.0	H	235.0	-101.8	
4321.500	-55.35	-13.00	42.35	500.0	1000.000	140.0	H	255.0	-100.4	

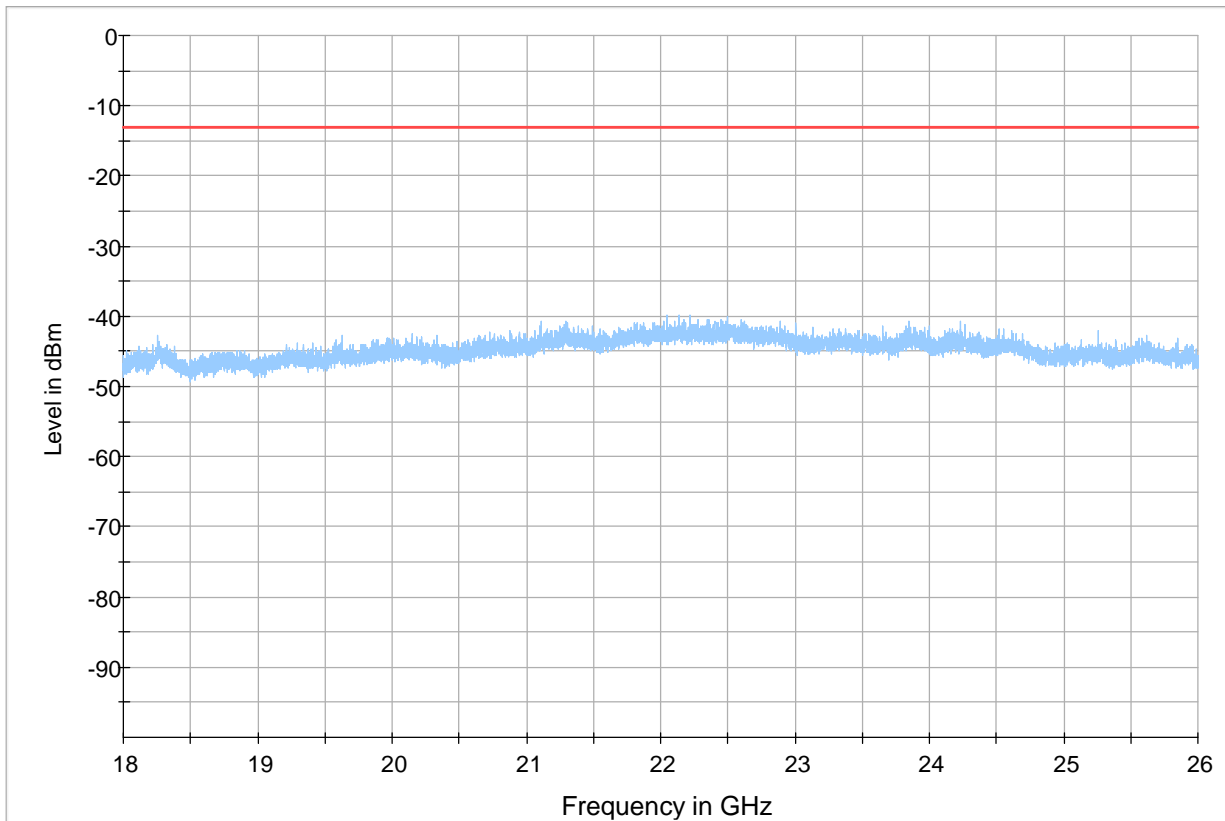


— Preview Result 1-PK+ — FCC Licensed -13dBm ◆ Final_Result RMS

Plot # 39

UMTS II Mid + BTLE Mid

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

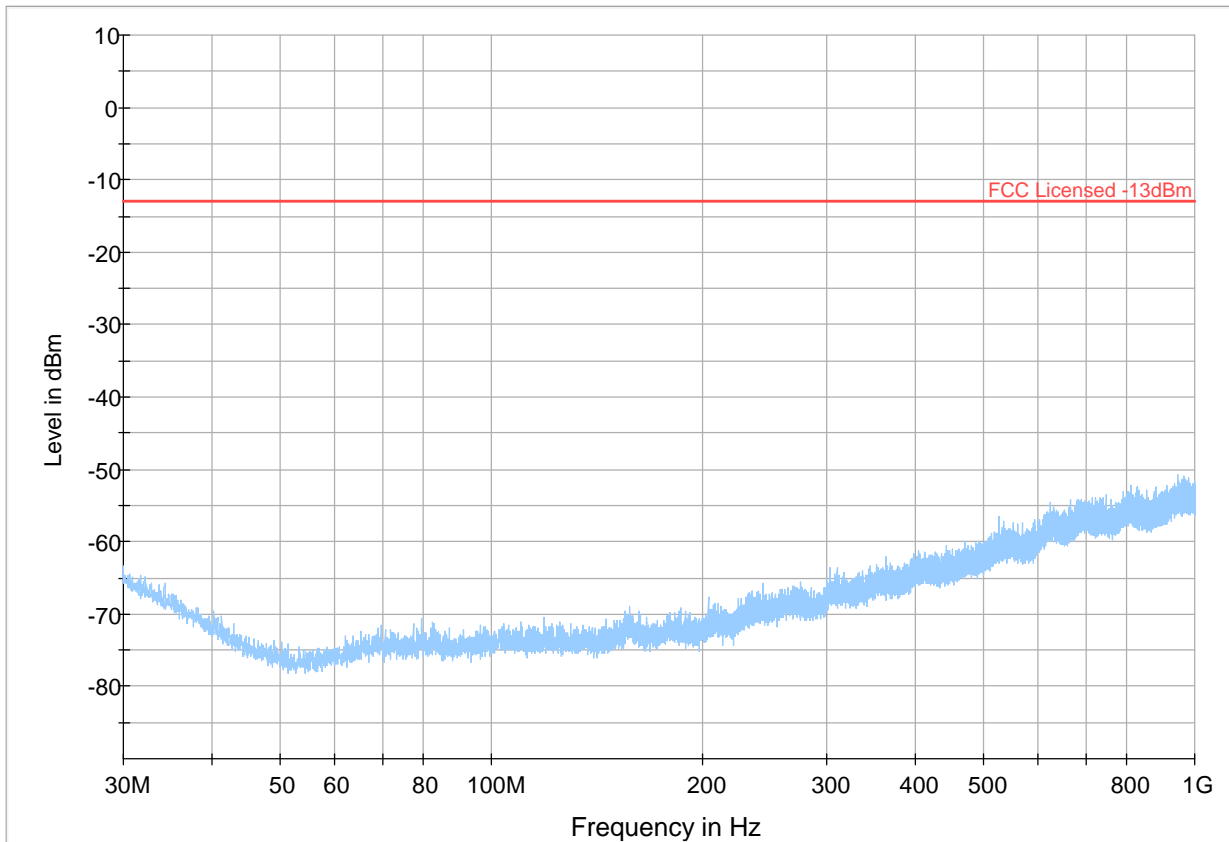


◆ Preview Result 1-PK+ * Critical_Freqs PK+ — FCC Licensed -13dBm
◆ Final_Result RMS ◆ Final_Result PK+

Plot # 40

UMTS II High + BTLE Mid

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

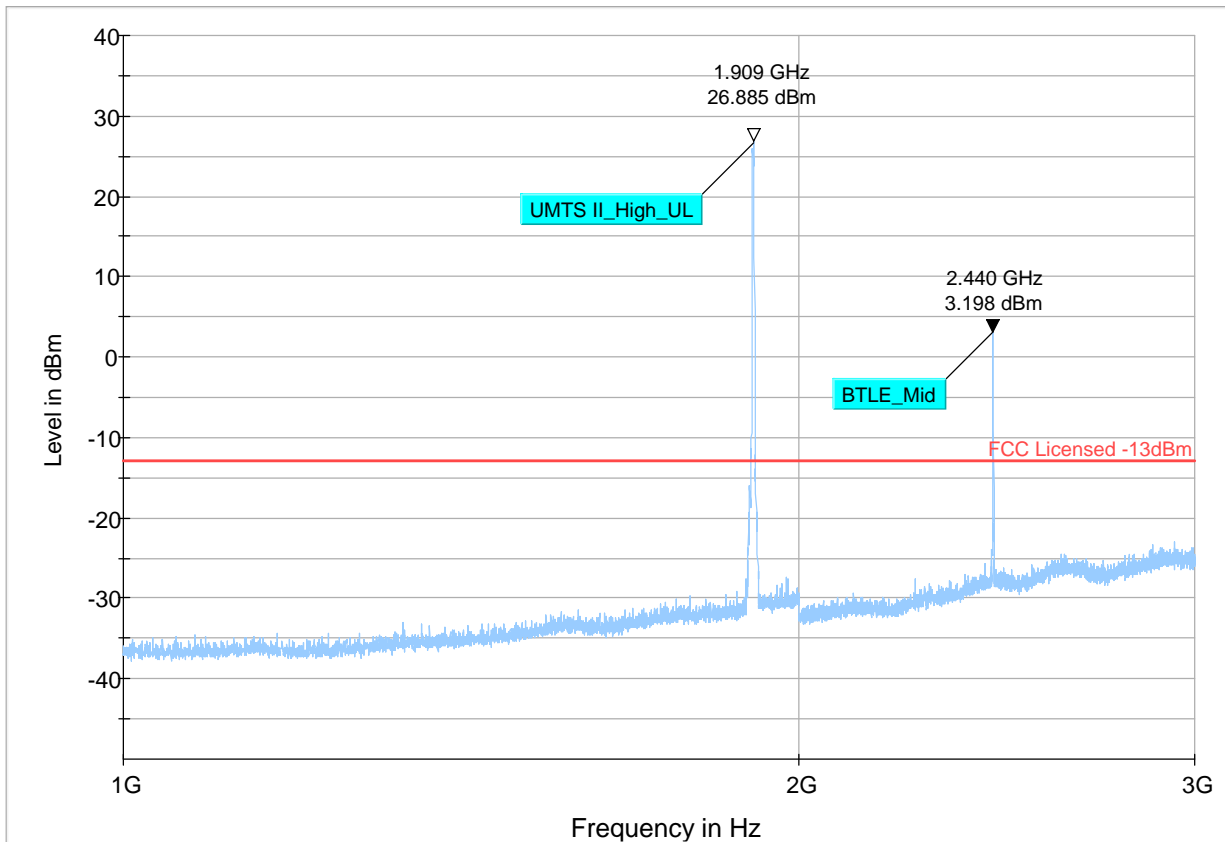


Preview Result 1-PK+ * Critical_Freqs PK+ FCC Licensed -13dBm Final_Result RM

Plot # 41

UMTS II High + BTLE Mid

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

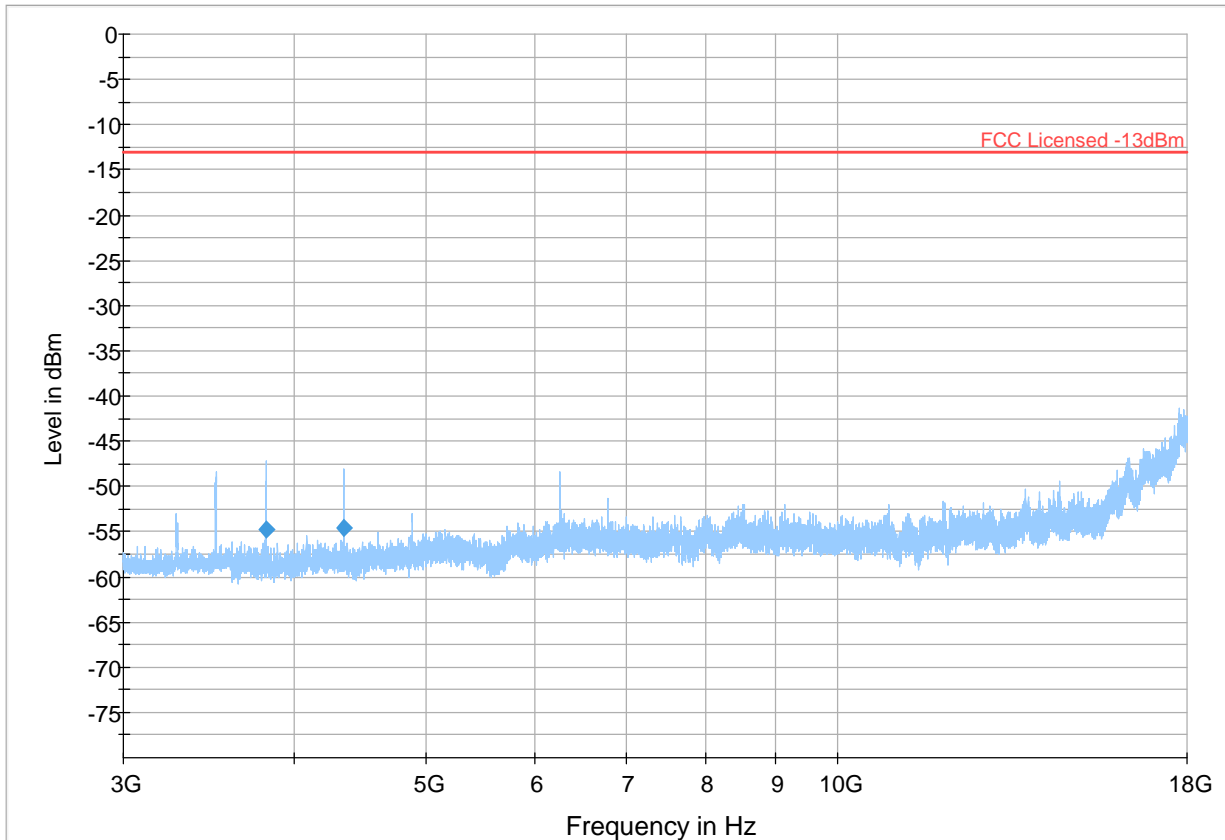


— Preview Result 1-PK+
 * Critical_Freqs PK+
 — FCC Licensed -13dBm
 ◆ Final_Result RM

Plot # 42

UMTS II High + BTLE Mid

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
3813.500	-54.81	-13.00	41.81	500.0	1000.000	195.0	H	243.0	-101.6	
4348.500	-54.51	-13.00	41.51	500.0	1000.000	140.0	H	256.0	-100.5	



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

7.2 AC Power Line Conducted Emissions

7.2.1 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

7.2.2 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 μ H/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 (dB μ V)	
	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.

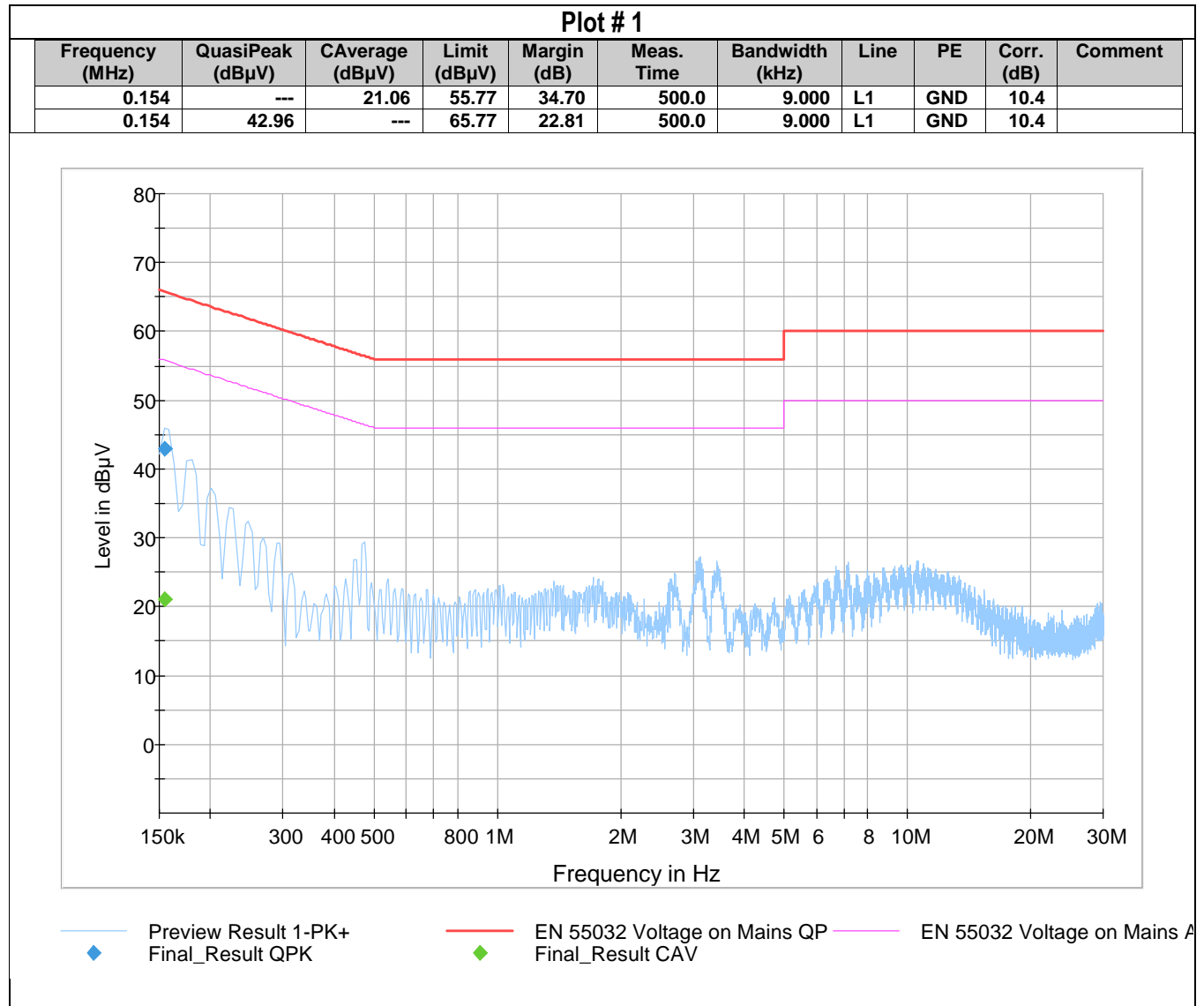
7.2.3 Test conditions and setup:

Ambient Temperature $^{\circ}$ C	EUT Set-Up #	Power line (L1, L2, L3, N)	Power Input
22 $^{\circ}$ C	1	Line & Neutral	120V / 60Hz

7.2.4 Measurement Result:

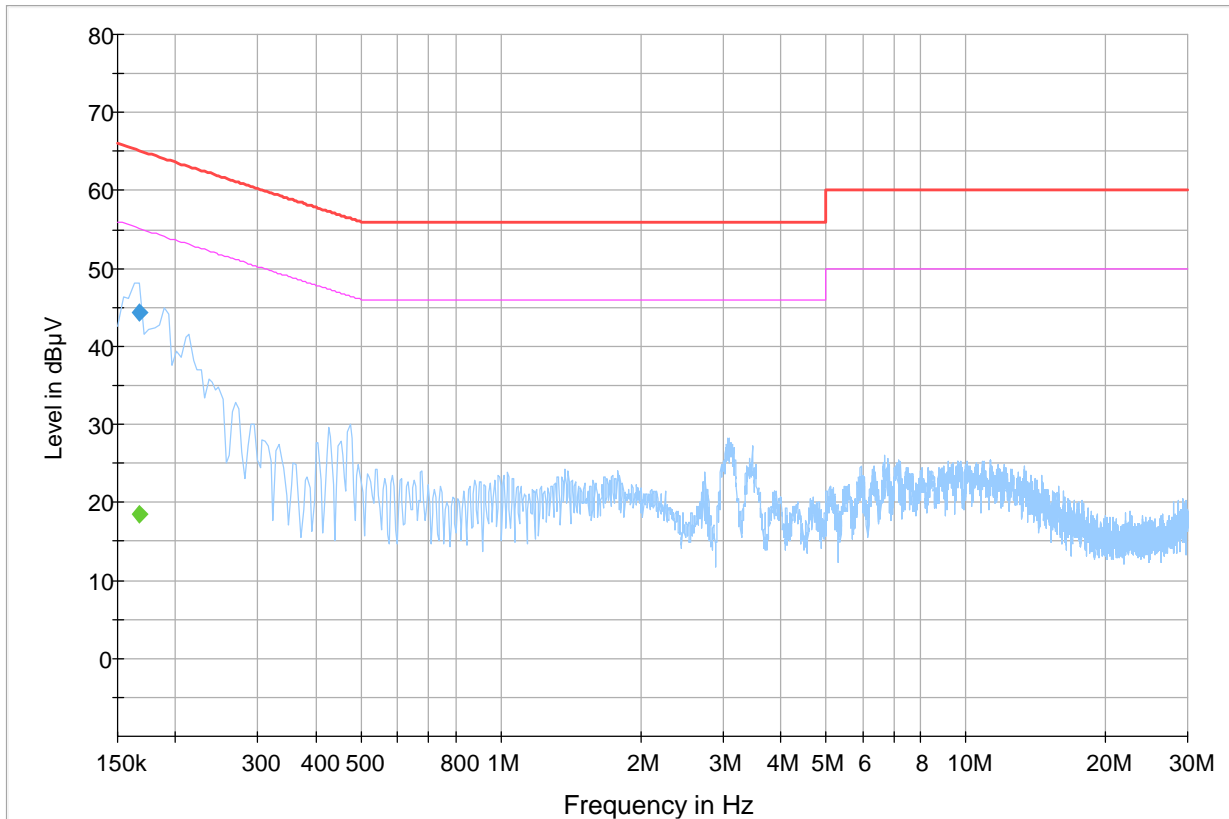
Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Result
1	AC / DC Adapter	1	BLE + GSM 850	150 kHz – 30 MHz	Pass
2	AC / DC Adapter	1	BLE + GSM 1900	150 kHz – 30 MHz	Pass
3	AC / DC Adapter	1	BLE + UMTS II	150 kHz – 30 MHz	Pass
4	AC / DC Adapter	1	BLE + UMTS V	150 kHz – 30 MHz	Pass

7.2.5 Measurement Plots:



Plot # 2

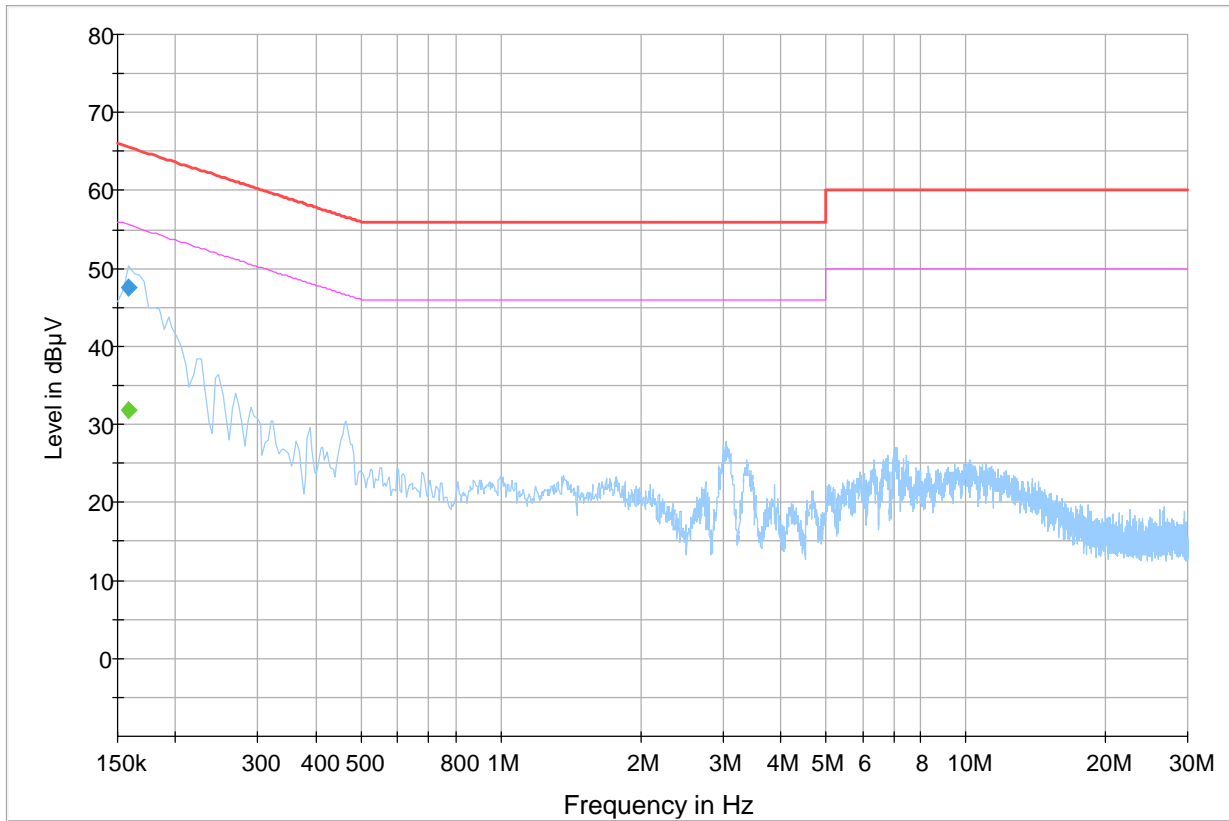
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.167	---	18.48	55.11	36.63	500.0	9.000	L1	GND	10.6	
0.167	44.33	---	65.11	20.77	500.0	9.000	L1	GND	10.6	



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

Plot # 3

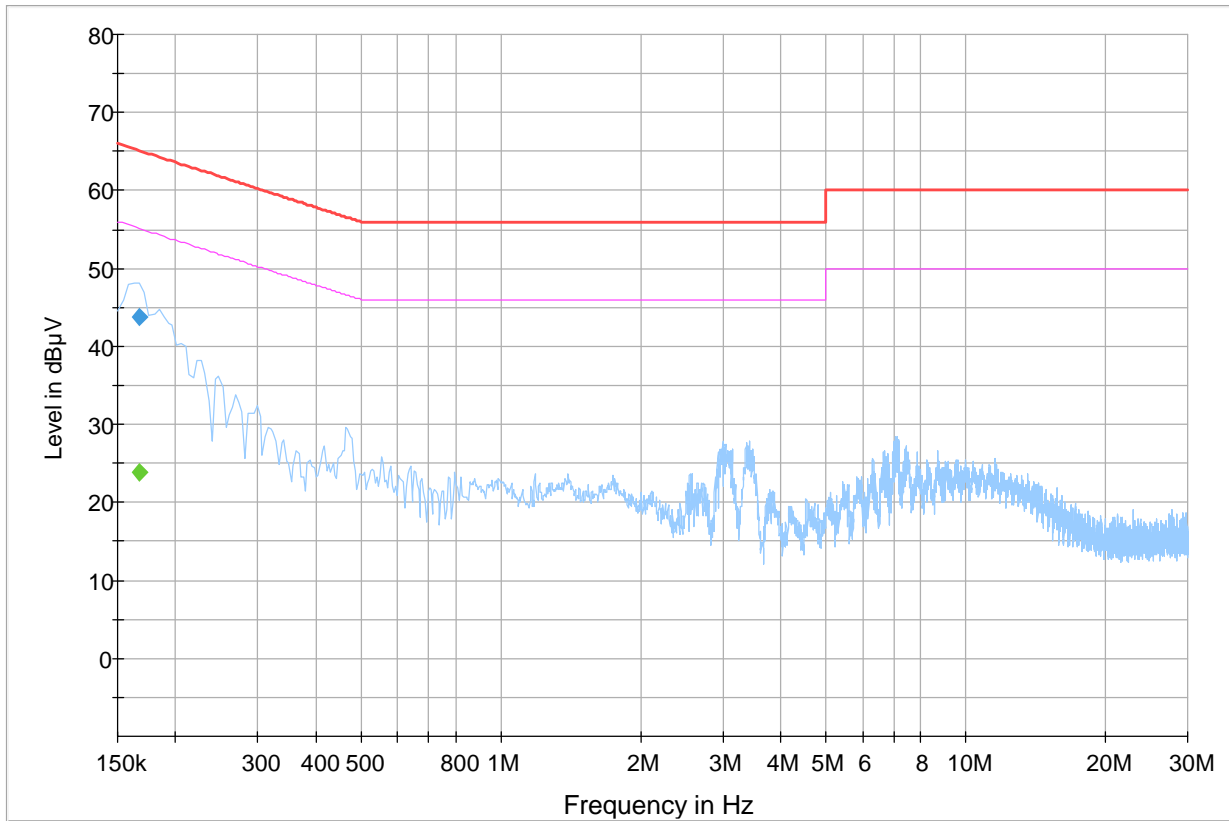
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.159	---	31.82	55.54	23.72	500.0	9.000	N	GND	10.4	
0.159	47.58	---	65.54	17.96	500.0	9.000	N	GND	10.4	



— Preview Result 1-PK+ Final_Result QPK
 — EN 55032 Voltage on Mains QP
 — EN 55032 Voltage on Mains A
◆ ◆

Plot # 4

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.167	---	23.78	55.11	31.32	500.0	9.000	N	GND	10.3	
0.167	43.82	---	65.11	21.29	500.0	9.000	N	GND	10.3	



— Preview Result 1-PK+ Final_Result QPK
 — EN 55032 Voltage on Mains QP
 — EN 55032 Voltage on Mains A
◆ ◆

8 Test Equipment And Ancillaries Used For Testing

Equipment Name/Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Biconilog Antenna	ETS Lindgren	3142E	166067	3 years	03/20/2020
Horn Antenna	ETS Lindgren	3115	35114	3 years	10/10/2020
Horn Antenna	ETS Lindgren	3117-PA	215984	3 years	08/08/2020
Active Loop Antenna	ETS Lindgren	6507	161344	3 years	10/30/2020
Horn Antenna	ETS Lindgren	3116C	70497	3 years	11/23/2020
Spectrum Analyzer	R&S	ESU40	100251	3 years	07/16/2019
Spectrum Analyzer	R&S	FSU26	200065	3 years	07/03/2020
Universal Radio Communication Tester	R&S	CMU 200	121673	3 years	12/20/2019
Thermometer Humidity Monitor	Dickson	TM320	5280063	3 years	11/02/2020

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.

9 Revision History

Date	Template Revision	Changes to report	Prepared by
2021-07-09	EMC_PHIL4_089_21001_FCC_22_24	Initial Version	Cheng Song
2021-11-12	EMC_PHIL4_089_21001_FCC_22_24_Rev1	Updated Section 7.1 Radiated Spurious Emissions Updated Section 7.2 AC Power Line Conducted Emissions	Cheng Song
2021-11-15	EMC_PHIL4_089_21001_FCC_22_24_Rev2	Removed Test Setup Photos and EUT Photos section	Cheng Song

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