FCC / ISED & Test Report

For:
CalAmp

Model:
HMU3640LB

Product Description:
Heavy Duty Telematics Gateway

Applied Rules and Standards:
47 CFR Parts 22, 24, 27, and 90
RSS-GEN Issue 5 RSS: 130 Issue 2, 132 Issue 4, 133 Issue 6, 139 Issue 4, 199 Issue 4

FCC ID: APV-3640LB
IC: 5843C-3640LB

REPORT #: EMC_CALAM_136_23001_FCC_22_24_27_90_Rev1

DATE: 2023-12-13

A2LA Accredited

IC recognized #
3462B-1

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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 and 24, and Industry Canada Standards RSS-GEN Issue 5 RSS: 130 Issue 2, 132 Issue 4, 133 Issue 6, 139 Issue 4, 199 Issue 4.

No deficiencies were ascertained.

Company Name	Product Description	Model #
CalAmp	Heavy Duty Telematics Gateway	HMU3640LB

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2023-12-13	Compliance	Arndt Stoecker (Director of Regulatory Services)	Arndt Stoecker Digitally signed by: Arndt Stoecker DN: CN = Arndt Stoecker email = arndt.stoecker@cetecom.com C = US O = CETECOM Inc Date: 2023.12.13 17:54:27 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
2023-12-13	Compliance	Cheng Song (EMC Engineer)	cheng.song@cetecom.com Digitally signed by: cheng.song@cetecom.com DN: CN = cheng.song@cetecom.com Date: 2023.12.13 17:21:28 -08'00'

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
Director of Regulatory Services:	Arndt Stoecker
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client

Client's Name:	CalAmp
Street Address:	2200 Faraday Ave #220
City/Zip Code	Carlsbad, CA 92008
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(1)

Model No:	HMU3640LB
HW Version :	REV A
SW Version :	8.6L
FCC-ID :	APV-3640LB
IC:	5843C-3640LB
FVIN:	N/A
HVIN:	HMU3640LB
PMN:	HMU3640LB
Product Description:	Heavy Duty Telematics Gateway
Radio Information:	Cellular: • Module: Quectel EG21-GL_D • FCC ID: XMR202212EG21GL; IC: 10224A-2022EG21GL • LTE, UMTS, GSM
Antenna Information as declared:	Cellular: • Taoglas PCS.06.A Bluetooth: • AVX/Ethertronics 1001312
Power Supply/ Rated Operating Voltage Range:	Battery powered only: 9-30 VDC
Operating Temperature Range	-30 C to 60 C
Other Radios included in the device:	Bluetooth: • Chipset: TI SimpleLink™ CC2652R7 • 2400 MHz – 2483.5 MHz
Sample Revision	☐Prototype Unit; ☐Production Unit; ■Pre-Production

Note 1: Information provided by the customer

3.2 EUT Sample details(1)

EUT #	Model Number	HW Version	SW Version	Comments
1	HMU3640LB	REV A	8.6L	

Note 1: Information provided by the customer

3.3 Accessory Equipment (AE) details(1)

AE #	Type	Model	Manufacturer	Serial Number
1	Vehicle Cable		CalAmp	

Note 1: Information provided by the customer

3.4 Test Sample Configuration

Set-up #	EUT / AE used for set-up	Comments
1	EUT#1 + AE#1	Radiated RF measurements were performed with EUT configured via the client provided scripts.

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	Cellular + BLE	Cellular was tested on Mid Channel at maximum power in a co-transmission mode. BLE was configured to fixed channel transmitting mode using special scripts provided by the client that will not be available to the end user.

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 ISED Standards RSS-GEN Issue 5 RSS: 130 Issue 2, 132 Issue 4, 133 Issue 6, 139 Issue 4, 199 Issue 4.

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

2023-03-24 – 2023-05-30

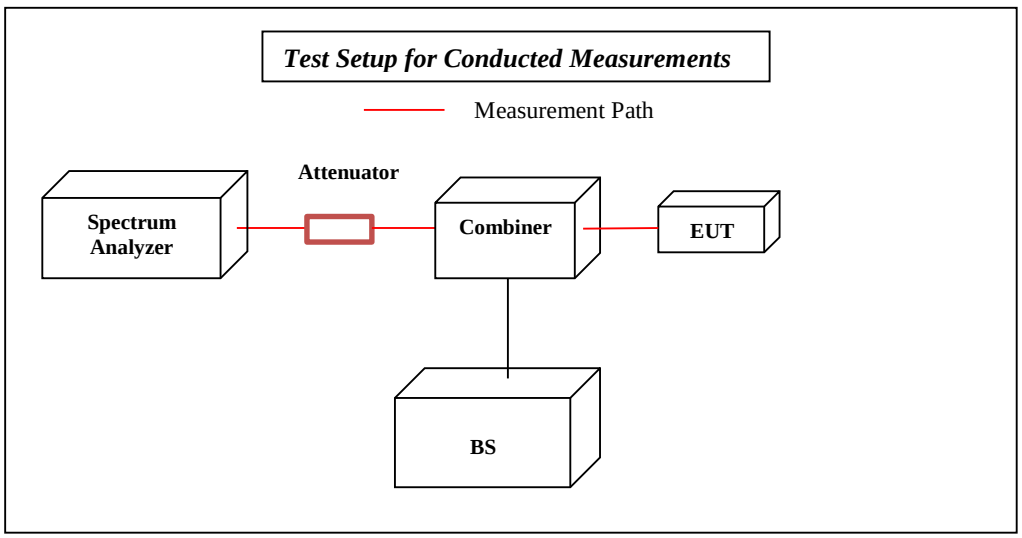
5.3 Decision Rule:

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

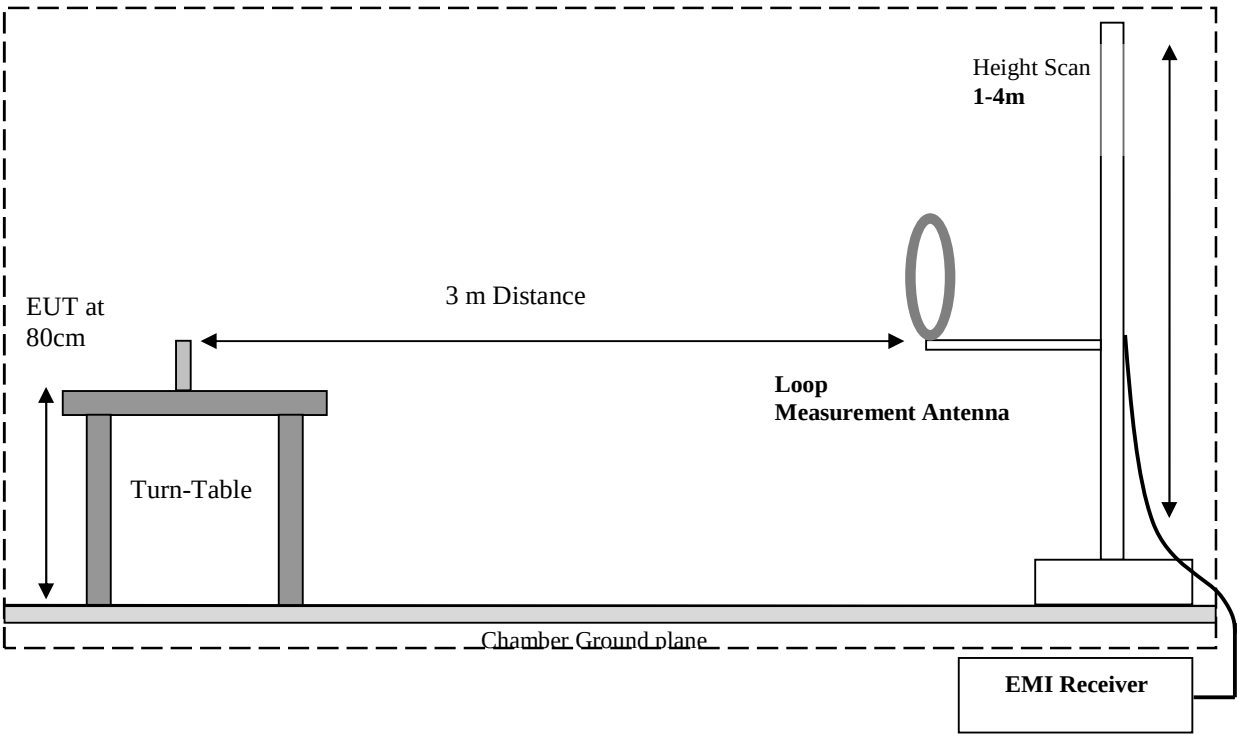
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03r01 – "Measurement Guidance for Certification of Licensed Digital Transmitters" and according to relevant parts of ANSI/TIA-603-D-2010 as detailed below.



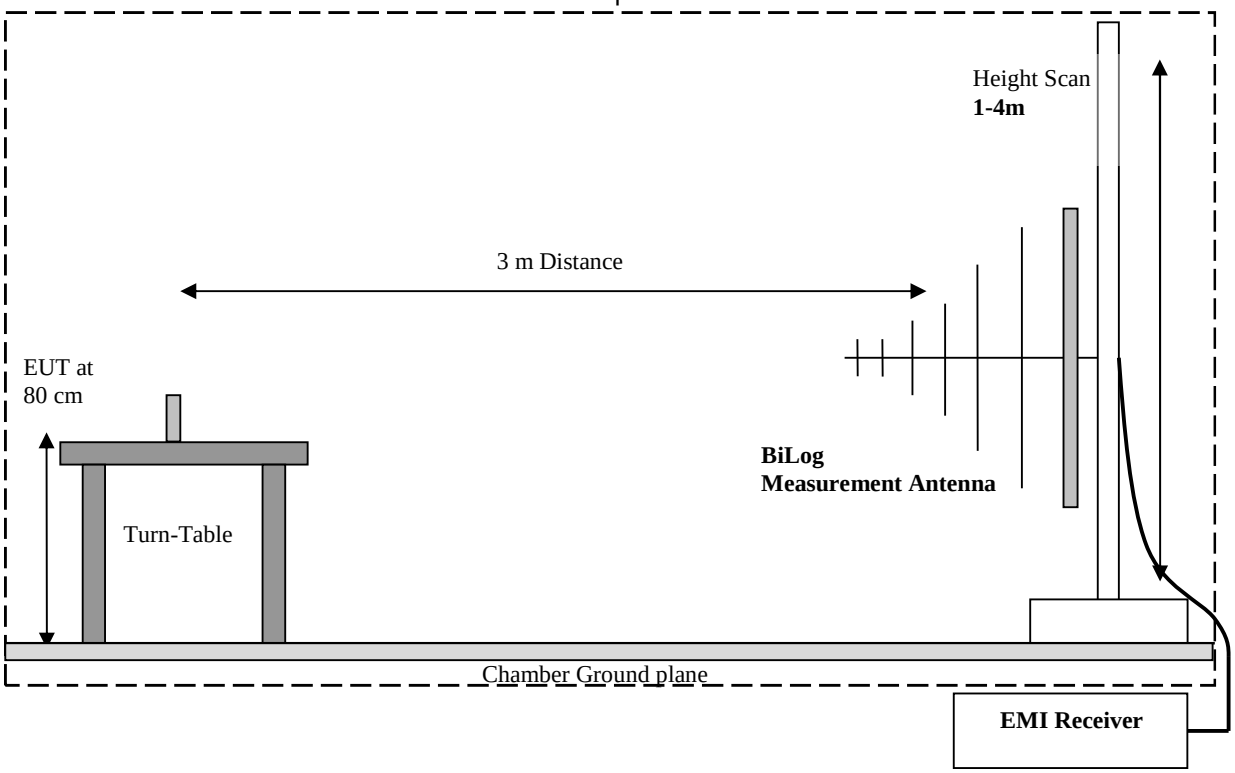
6.1 Radiated Measurement

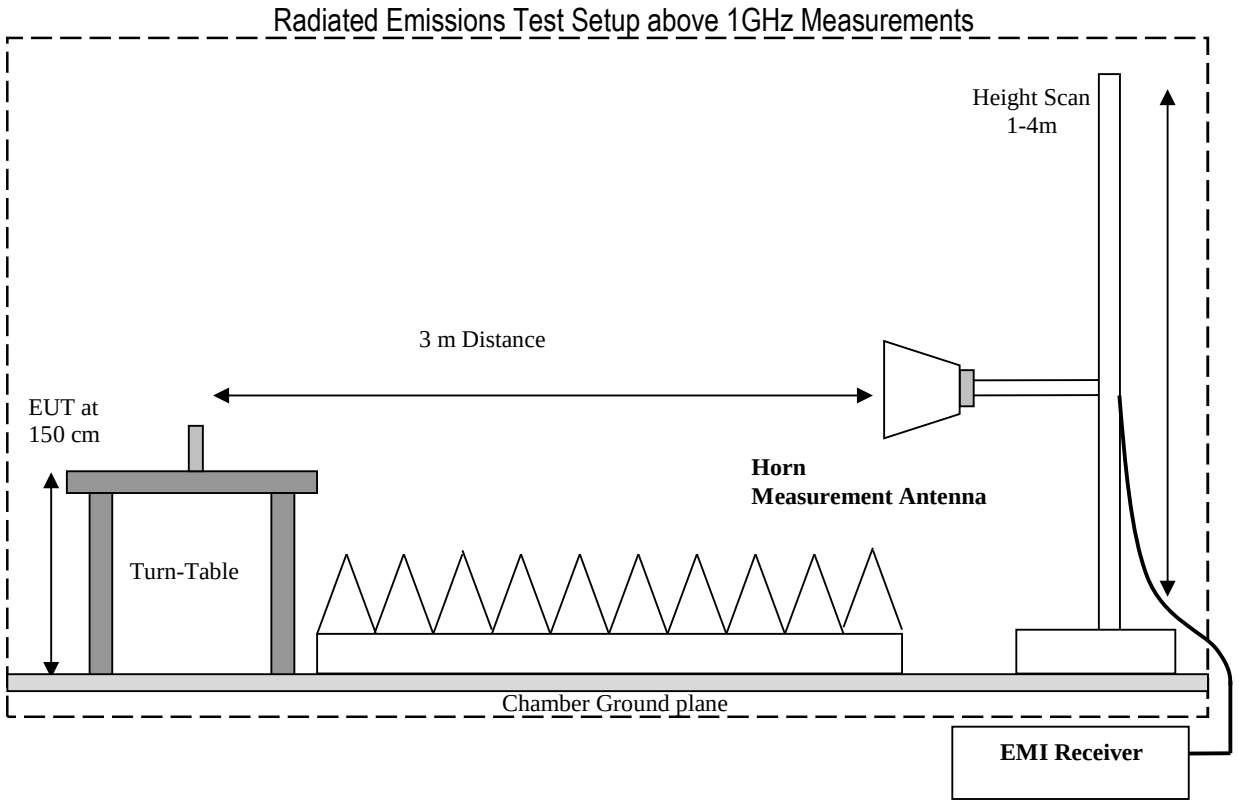
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to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

7 Measurement Results Summary

7.1 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		☐	☐	☐	■	Note 1
§2.1049; §22.917	Occupied Bandwidth	Nominal		☐	☐	☐	■	Note 2
§2.1051; §22.917	Band Edge Compliance	Nominal		☐	☐	☐	■	Note 3
§2.1055; §22.355	Frequency Tolerance	Extreme Temperature and Voltage		☐	☐	☐	■	Note 4
§2.1053; §22.917	Radiated Spurious Emissions	Nominal	Op. 1	■	☐	☐	☐	Complies

Note 1: Leveraged from Report # 2212RSU048-U1, section 5.2;
Leveraged from Report # 2212RSU048-U2, section 5.3
Note 2: Leveraged from Report # 2212RSU048-U2, section 5.2
Note 3: Leveraged from Report # 2212RSU048-U1, section 5.3;
Leveraged from Report # 2212RSU048-U2, section 5.4
Note 4: Leveraged from Report # Report No.: 2211RSU065-U2 A.2

7.2 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		☐	☐	☐	■	Note 1
§2.1049; §24.238	Occupied Bandwidth	Nominal		☐	☐	☐	■	Note 2
§2.1051; §24.238	Band Edge Compliance	Nominal		☐	☐	☐	■	Note 3
§2.1055; §24.235	Frequency Stability	Extreme Temperature and Voltage		☐	☐	☐	■	Note 4
§2.1053; §24.238	Radiated Spurious Emissions	Nominal	Op. 1	■	☐	☐	☐	Complies

Note 1: Leveraged from Report # 2212RSU048-U1, section 5.2;
Leveraged from Report # 2212RSU048-U2, section 5.3
Note 2: Leveraged from Report # 2212RSU048-U2, section 5.2
Note 3: Leveraged from Report # 2212RSU048-U1, section 5.3;
Note 4: Leveraged from Report # 2212RSU048-U2, section 5.4

7.3 FCC 27 / RSS-139; FCC 90 / RSS-199

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

Note 1: Leveraged from Report # 2212RSU048-U1, section 5.2;
Leveraged from Report # 2212RSU048-U2, section 5.3;
Leveraged from Report # 2212RSU048-U3, section 5.3
Note 2: Leveraged from Report # 2212RSU048-U2, section 5.2;
Leveraged from Report # 2212RSU048-U3, section 5.2
Note 3: Leveraged from Report # 2212RSU048-U1, section 5.3;
Note 4: Leveraged from Report # 2212RSU048-U2, section 5.4;

Leveraged from Report # 2212RSU048-U3, section 5.4

7.4 ERP/EIRP of Intentional Emissions

Conducted power from the modular reports and the antenna gain are used to derive the ERP/EIRP for the device.

Freq L (MHZ)	Freq H (MHz)	Conducted Pwr.	Frequency Tolerance ppm	Emission Designator	EIRP	E[I]RP
699.7	715.3	0.1552	0.0055	1M08W7D	0.148	0.090
701.5	713.5	0.2104	0.0055	4M47G7D	0.200	0.122
704	711	0.2056	0.0055	8M93G7D	0.196	0.119
704	711	0.1517	0.0055	4M89W7D	0.145	0.088
779.5	784.5	0.2084	0.0066	4M47G7D	0.199	0.121
779.5	784.5	0.1618	0.0066	4M47W7D	0.154	0.094
782	782	0.2	0.0066	8M92G7D	0.191	0.116
782	782	0.1517	0.0066	4M88W7D	0.145	0.088
824.2	848.8	1.9907	0.0121	244KGXW	2.377	1.449
824.2	848.8	1.9409	0.0121	247KG7W	2.317	1.413
825.5	847.5	0.1687	0.0088	2M68W7D	0.201	0.123
826.4	846.6	0.2234	0.0113	4M13F9W	0.267	0.163
829	844	0.2193	0.0088	8M92G7D	0.262	0.160
829	844	0.1629	0.0088	4M89W7D	0.195	0.119
831.5	841.5	0.2173	0.0088	13M4G7D	0.259	0.158
831.5	841.5	0.1694	0.0088	4M95W7D	0.202	0.123
1712.4	1752.6	0.2483	0.0111	4M13F9W	0.486	0.486
1717.5	1747.5	0.2153	0.0023	13M4G7D	0.435	0.435
1717.5	1747.5	0.1663	0.0023	4M95W7D	0.336	0.336
1717.5	1772.5	0.2153	0.0023	13M4G7D	0.435	0.435
1717.5	1772.5	0.1663	0.0023	4M95W7D	0.336	0.336
1720	1745	0.2128	0.0023	17M8G7D	0.430	0.430
1720	1745	0.1622	0.0023	5M00W7D	0.327	0.327
1720	1770	0.2128	0.0023	17M8G7D	0.430	0.430
1720	1770	0.1622	0.0023	5M00W7D	0.327	0.327
1850.2	1909.8	0.9886	0.0107	245KGXW	1.937	1.937
1850.2	1909.8	0.9954	0.0107	246KG7W	1.950	1.950
1851.5	1908.5	0.1679	0.006	2M68W7D	0.329	0.329
1851.5	1913.5	0.1679	0.006	2M68W7D	0.329	0.329
1852.4	1907.6	0.2655	0.0064	4M12F9W	0.520	0.520
1860	1900	0.2183	0.006	17M8G7D	0.428	0.428
1860	1900	0.166	0.006	5M01W7D	0.325	0.325
1860	1905	0.2183	0.006	17M8G7D	0.428	0.428
1860	1905	0.166	0.006	5M01W7D	0.325	0.325

2498.5	2687.5	0.1432	0.0049	4M47W7D	0.337	0.337
2503.5	2682.5	0.2051	0.0049	13M4G7D	0.483	0.483
2506	2680	0.1832	0.0049	17M8G7D	0.431	0.431
2506	2680	0.1368	0.0049	5M11W7D	0.322	0.322
2507.5	2562.5	0.15	0.0019	4M94W7D	0.143	0.143
2510	2560	0.1977	0.0019	17M8G7D	0.236	0.236
2510	2560	0.1393	0.0019	5M00W7D	0.133	0.133
2572.5	2617.5	0.1432	0.0049	4M47W7D	0.337	0.337
2577.5	2612.5	0.2051	0.0049	13M4G7D	0.483	0.483
2580	2610	0.1832	0.0049	17M8G7D	0.431	0.431
2580	2610	0.1368	0.0049	5M11W7D	0.322	0.322
821.5	821.5	0.2089	0.0099	13M4G7D	0.249	0.152
821.5	821.5	0.1671	0.0099	4M95W7D	0.200	0.122
1717.5	1747.5	232.8	0.0023	13M4G7D	0.470	0.470
1717.5	1772.5	232.8	0.0023	13M4G7D	0.470	0.470
2502.5	2687.5	0.1432	0.0049	4M47W7D	0.337	0.337
2507.5	2682.5	0.2051	0.0049	13M4G7D	0.483	0.483
2510	2680	187.9	0.0019	17M8G7D	0.443	0.443
2510	2680	141.3	0.0019	5M04W7D	0.333	0.333
2580	2610	187.9	0.0049	17M8G7D	0.443	0.443
2580	2610	141.3	0.0049	5M04W7	0.333	0.333

8 Test Result Data

8.1 Radiated Spurious Emissions

8.1.1 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

8.1.2 Limits:

8.1.2.1 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.

8.1.2.2 RSS-132 Part 5.5; RSS-133 Part 6.5; RSS-139 Part 5.6, RSS-199 Part 5.6 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 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). 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.

Note: For LTE Band 7 and 41, the limit calculation result is a constant of -25 dBm

8.1.3 Test conditions and setup:

Ambient Temperature (C)	EUT Set-Up #	EUT operating mode	Power Input
22	1	Op. 1	12 VDC

8.1.4 Measurement result:

Plot #	EUT operating mode	Scan Frequency	Spurious Emission dBm	Limit (dBm)	Result
1-4	LTE B2 + BTLE	30 MHz – 26 GHz	-40.2	-13	Pass
5-7	LTE B4 + BTLE	30 MHz – 18 GHz	-28.7	-13	Pass
8-10	LTE B5 + BTLE	30 MHz – 9 GHz	-44	-13	Pass
11-14	LTE B7 + BTLE	30 MHz – 26 GHz	-29.2	-25	Pass
15-17	LTE B12 + BTLE	30 MHz – 18 GHz	-39.9	-13	Pass
18-20	LTE B13 + BTLE	30 MHz – 18 GHz	-40	-13	Pass
21-24	LTE B25 + BTLE	30 MHz – 26 GHz	-40.2	-13	Pass
25-27	LTE B26 + BTLE	30 MHz – 9 GHz	-44	-13	Pass
28-31	LTE B38 + BTLE	30 MHz – 26 GHz	-34	-13	Pass
32-35	LTE B41 + BTLE	30 MHz – 26 GHz	-29.2	-25	Pass
36-38	LTE B66 + BTLE	30 MHz – 18 GHz	-30	-13	Pass
39-42	UMTS II + BTLE	30 MHz – 26 GHz	-29.1	-13	Pass
43-45	UMTS IV + BTLE	30 MHz – 18 GHz	-28.7	-13	Pass
46-48	UMTS V + BTLE	30 MHz – 9 GHz	-46	-13	Pass
49-51	GSM 850 + BTLE	30 MHz – 9 GHz	-36.8	-13	Pass
52-55	GSM 1900 + BTLE	30 MHz – 26 GHz	-40.2	-13	Pass

8.1.5 Measurement Plots:

Plot # 1

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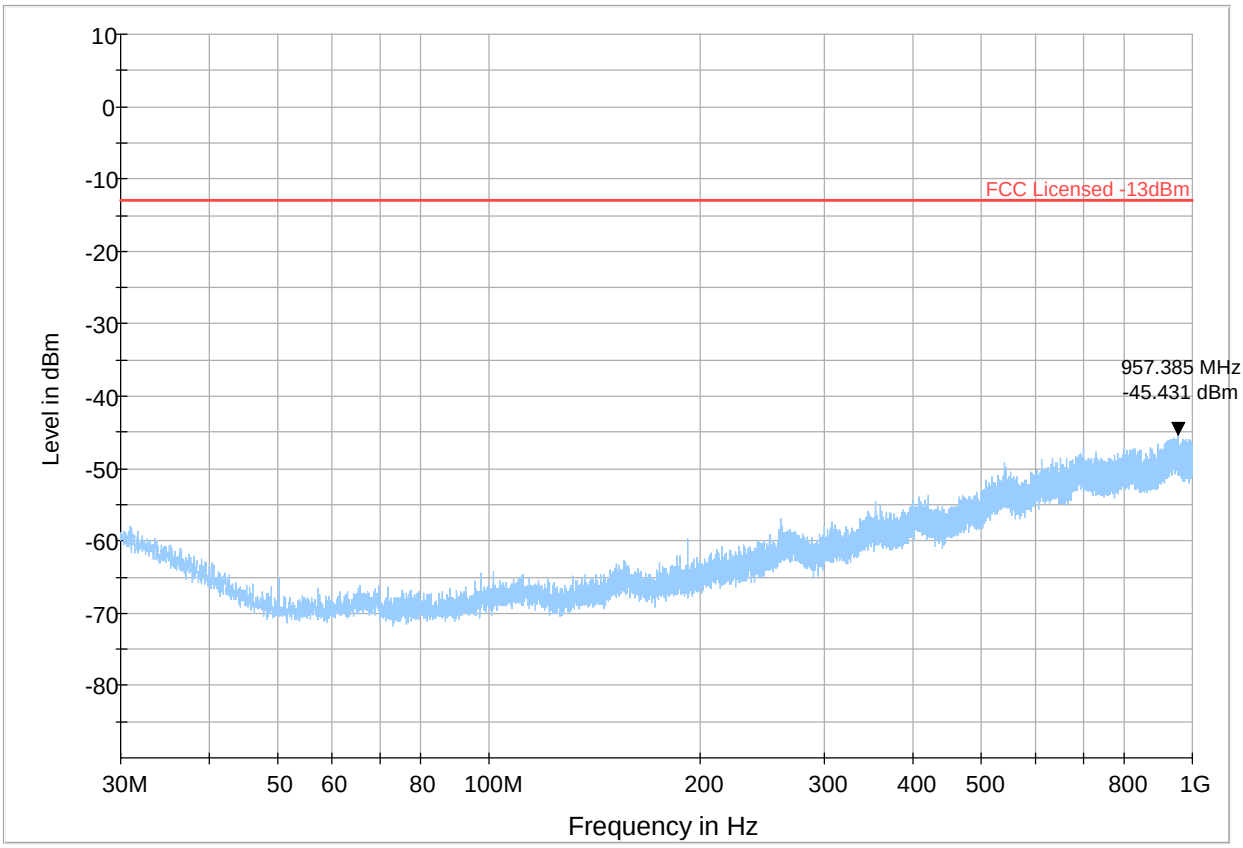

Plot # 2

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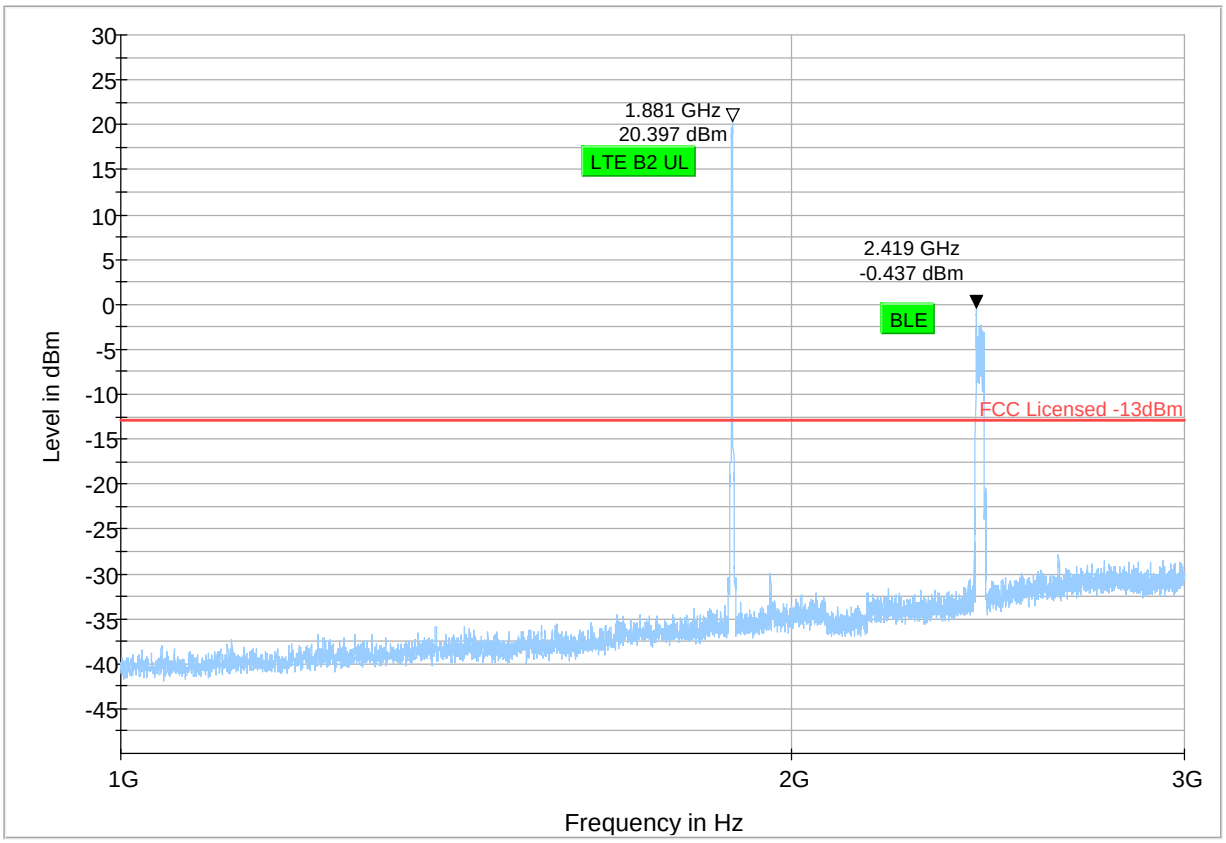
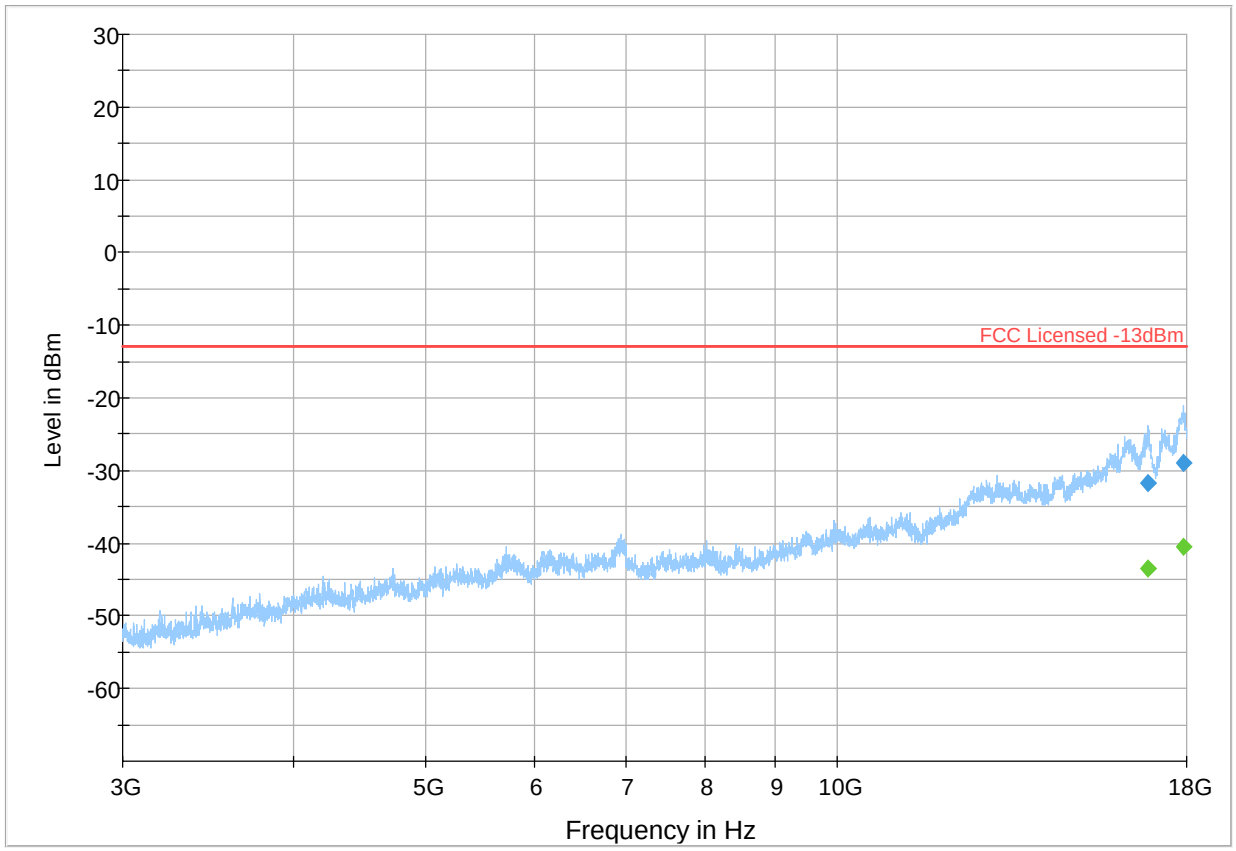


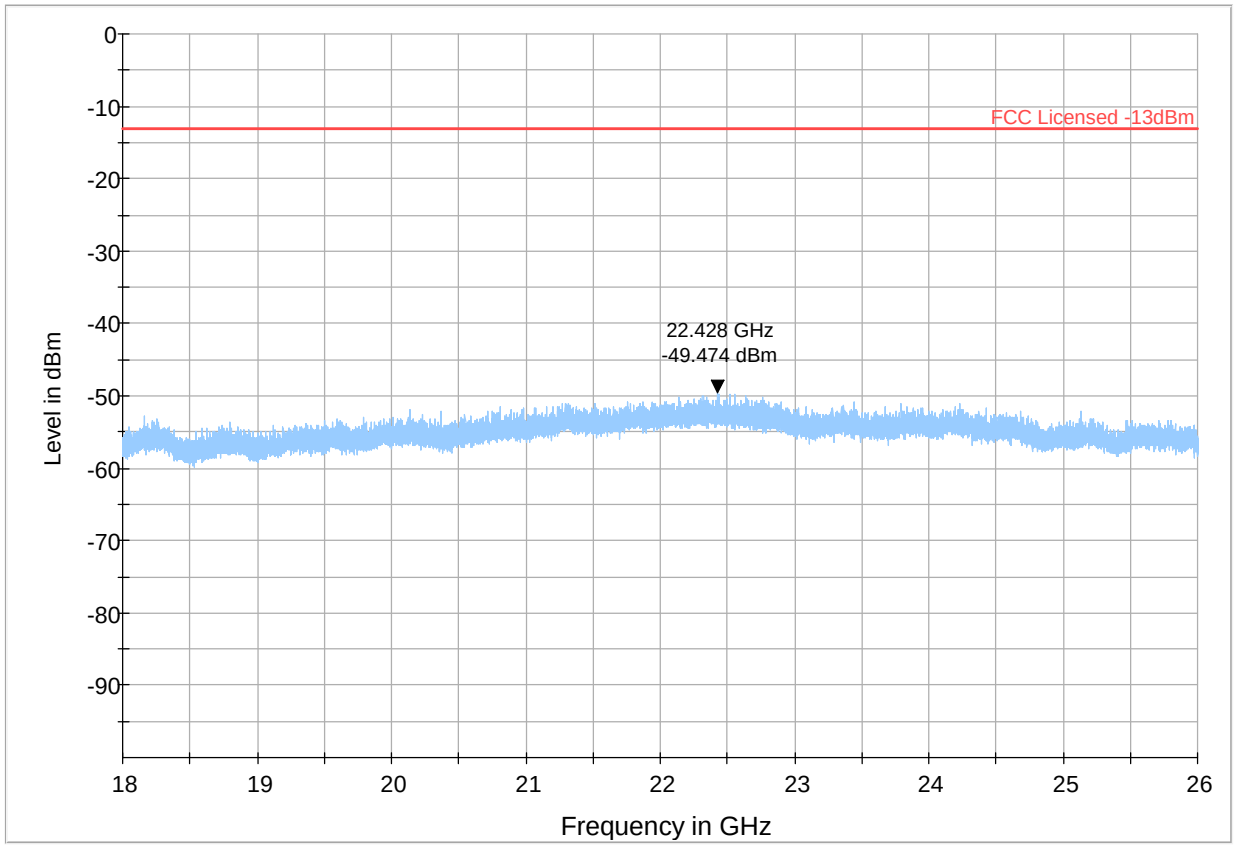
Plot # 3

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
16852.500	-31.74	---	-13.00	18.74	500.0	1000.000	281.0	H	36.0	-80.8	16.0	0.0	-96.8	49.1
16852.500	---	-43.43	---	---	500.0	1000.000	281.0	H	36.0	-80.8	16.0	0.0	-96.8	37.4
17916.094	-29.03	---	-13.00	16.03	500.0	1000.000	228.0	H	296.0	-77.2	16.2	0.0	-93.4	48.1
17916.094	---	-40.58	---	---	500.0	1000.000	228.0	H	296.0	-77.2	16.2	0.0	-93.4	36.6



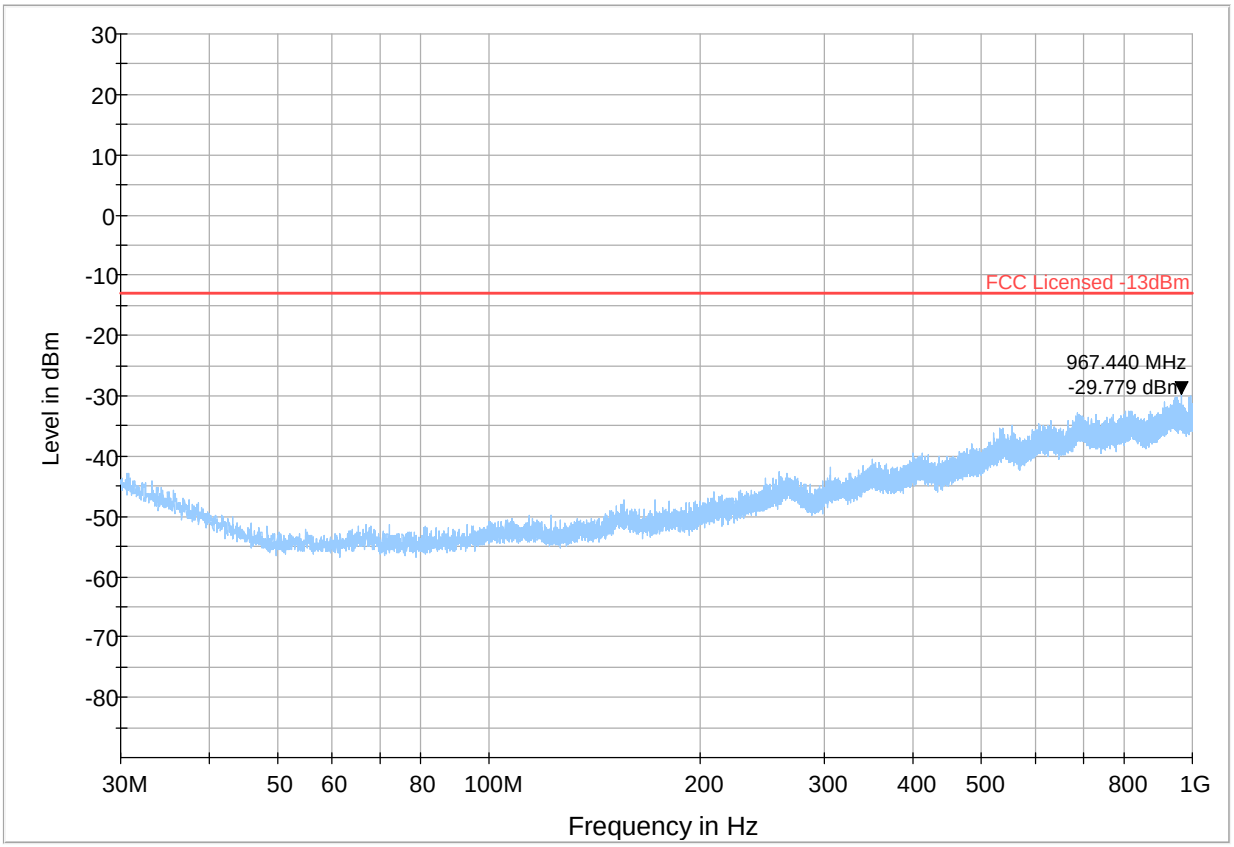
Plot # 4

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



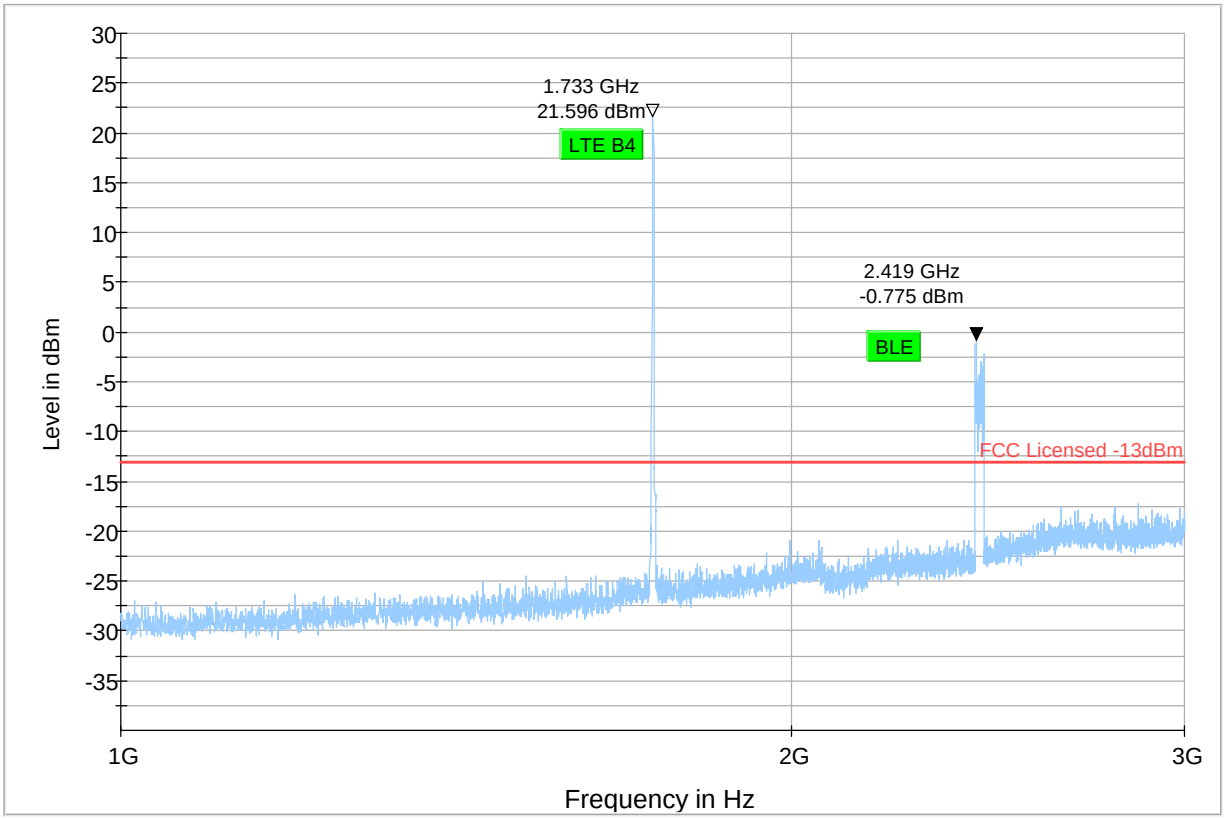
Plot # 5

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



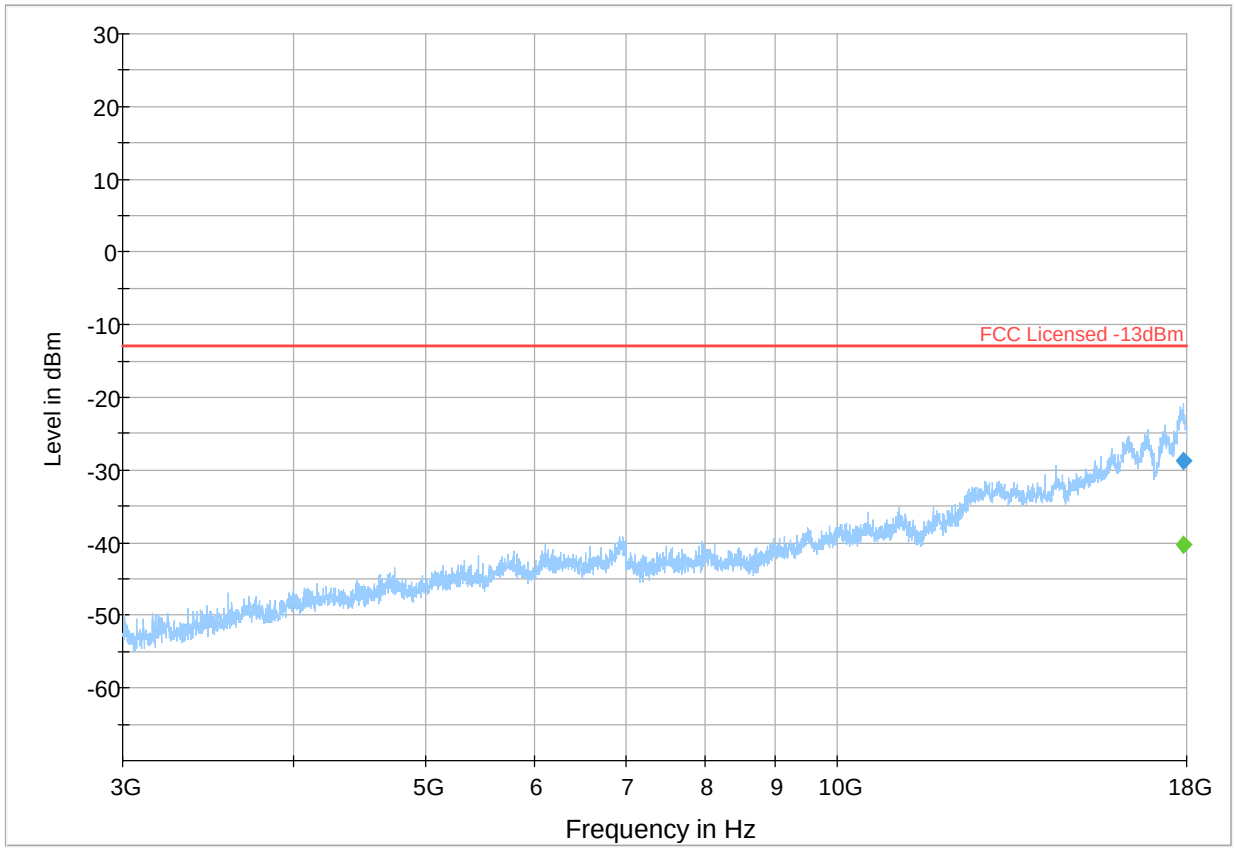
Plot # 6

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



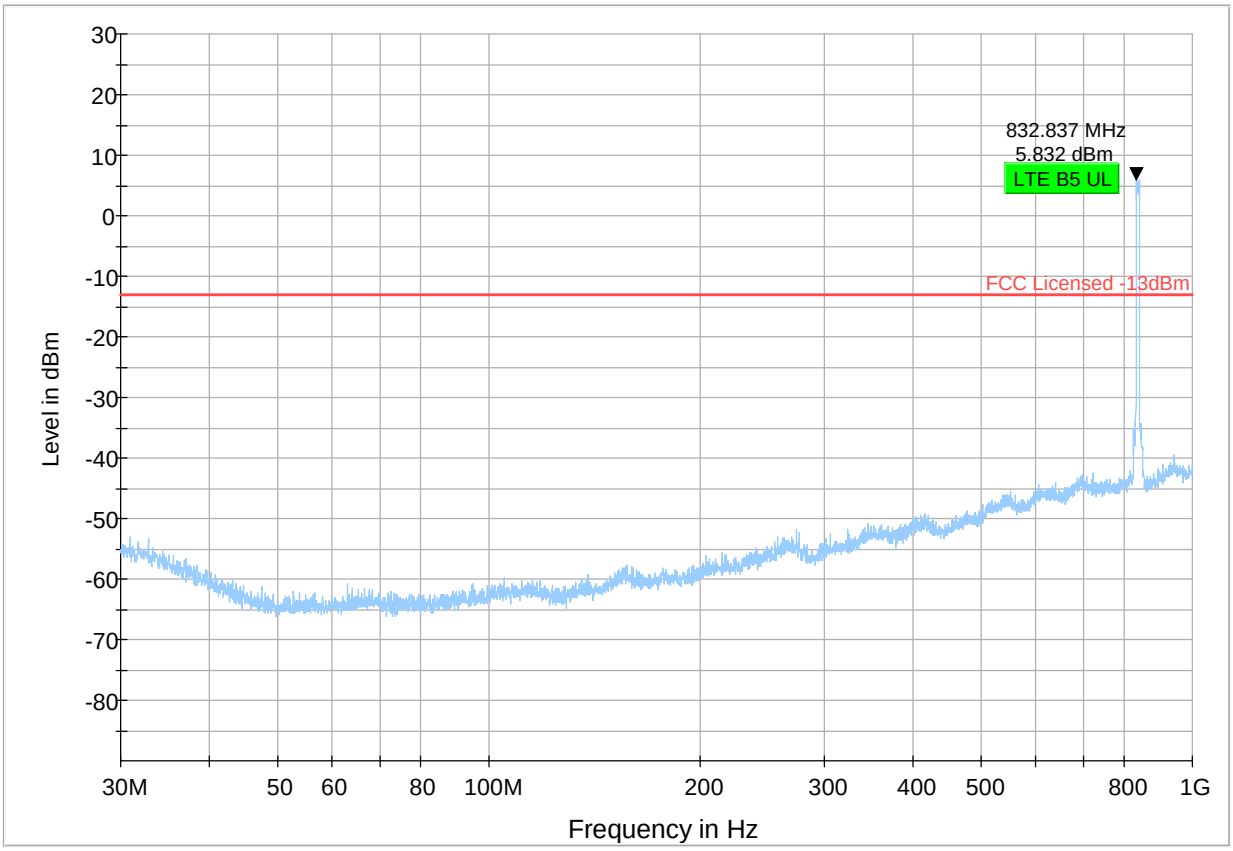
Plot # 7

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
17892.656	---	-40.25	---	---	500.0	1000.000	350.0	H	333.0	-76.9	16.2	0.0	-93.1	36.7
17892.656	-28.69	---	-13.00	15.69	500.0	1000.000	350.0	H	333.0	-76.9	16.2	0.0	-93.1	48.2



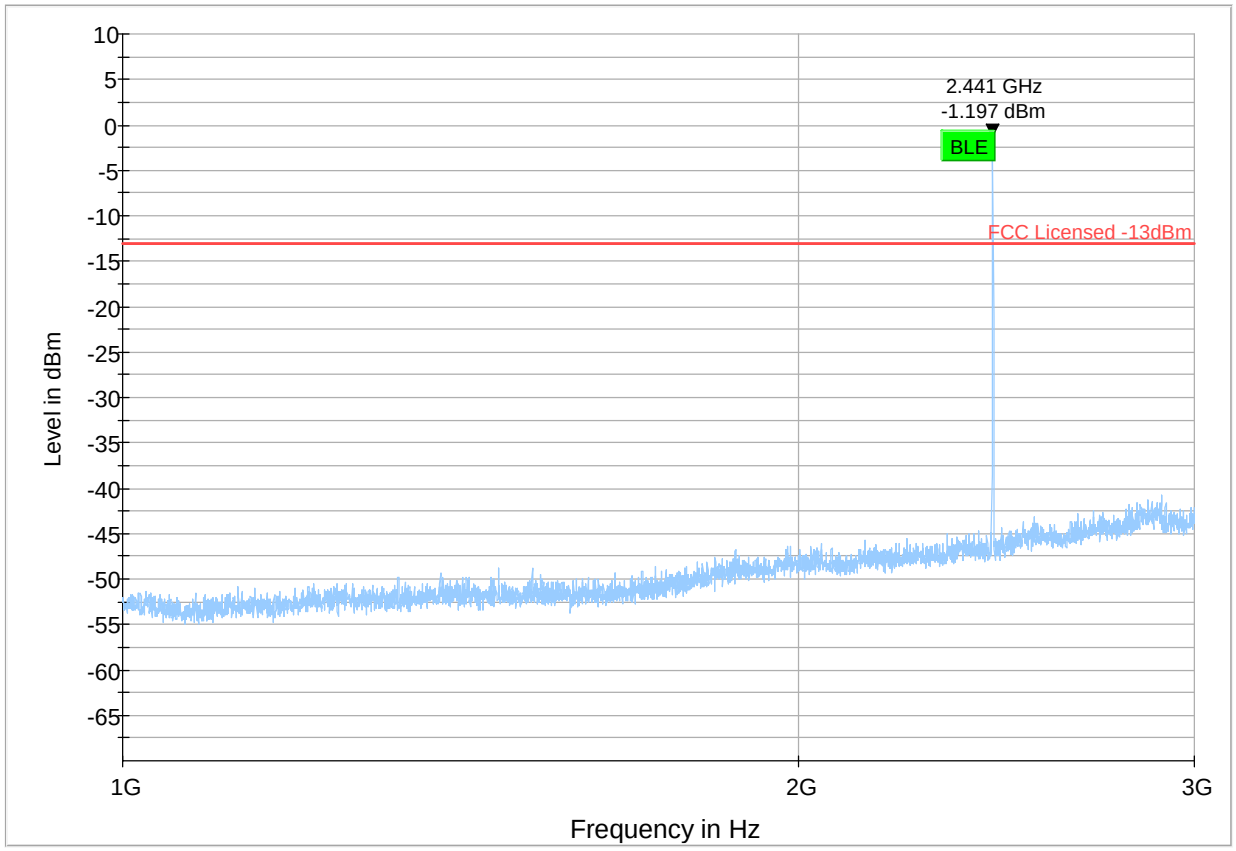
Plot # 8

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



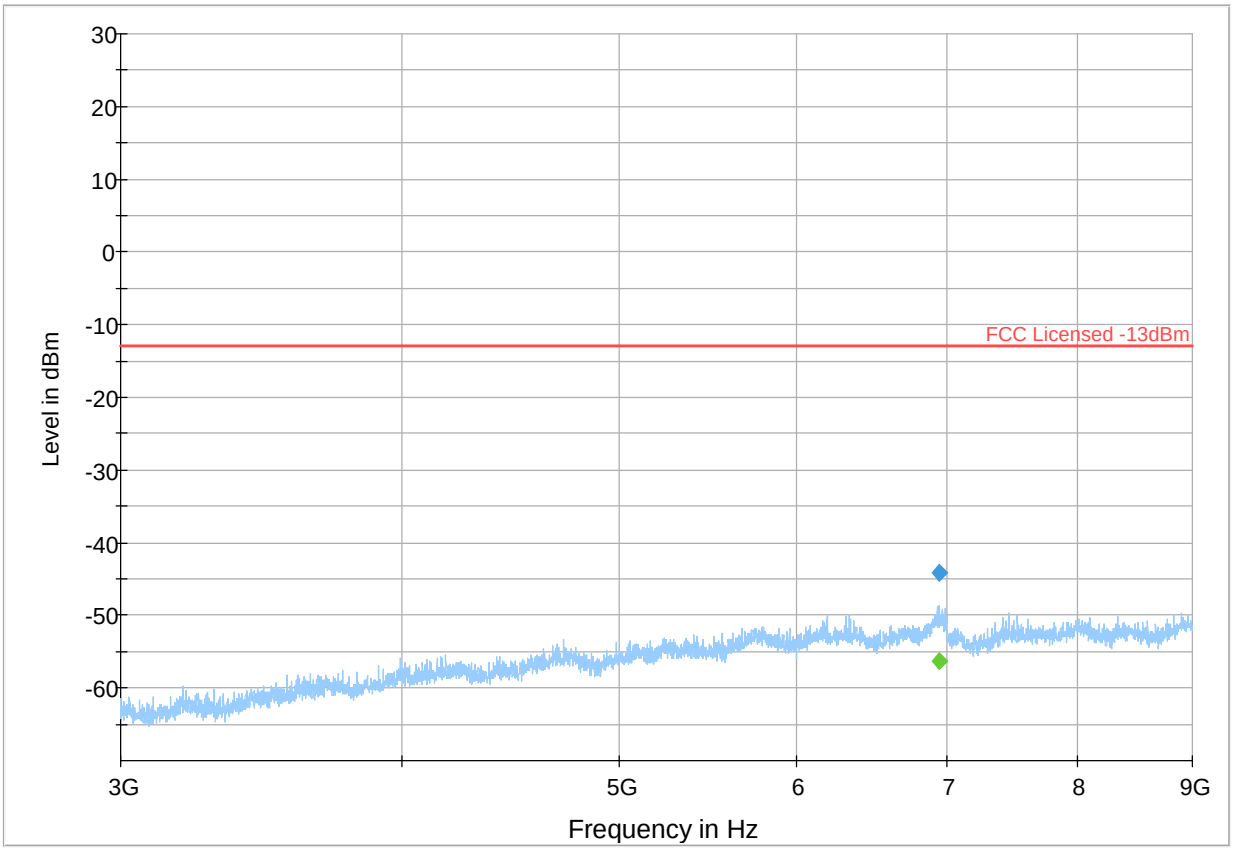
Plot # 9

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



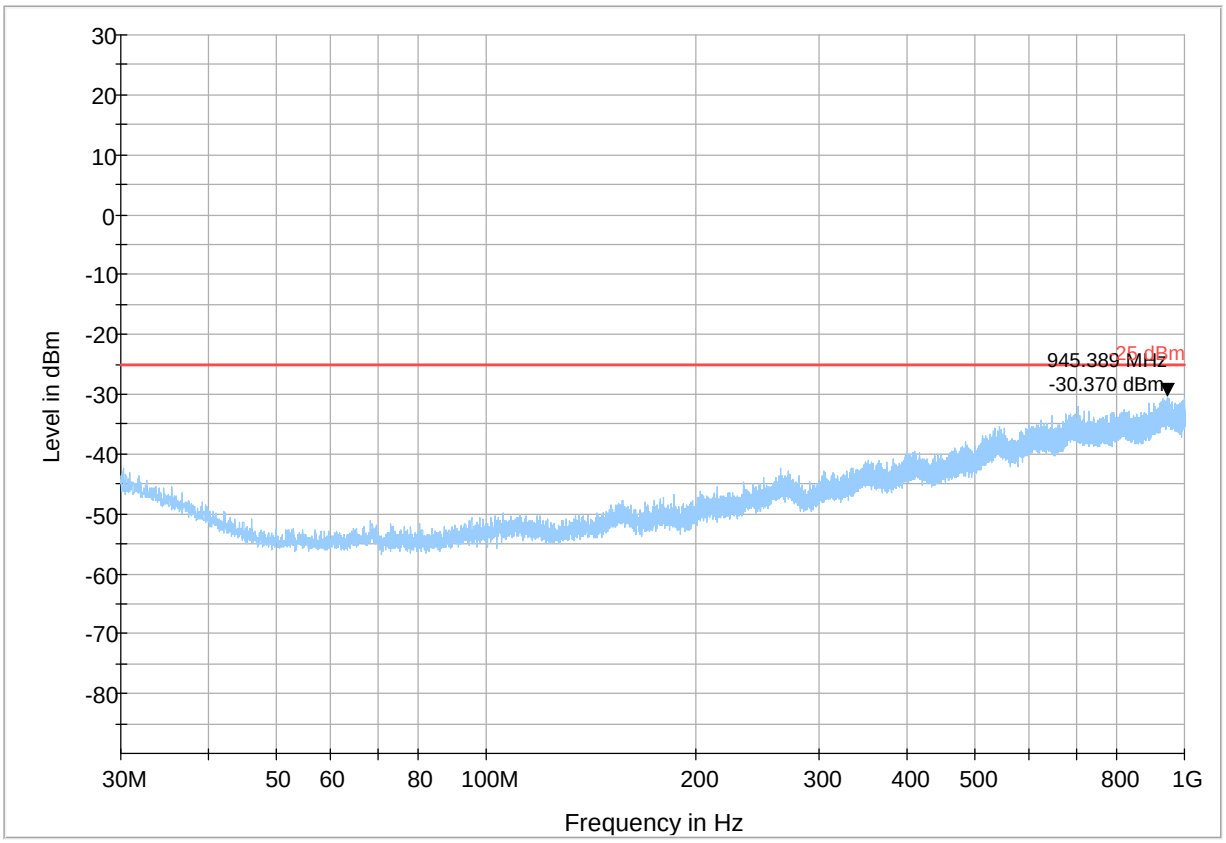
Plot # 10

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
6944.500	---	-56.27	---	---	500.0	1000.000	132.0	H	176.0	-95.3
6944.500	-44.10	---	-13.00	31.10	500.0	1000.000	132.0	H	176.0	-95.3



Plot # 11

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

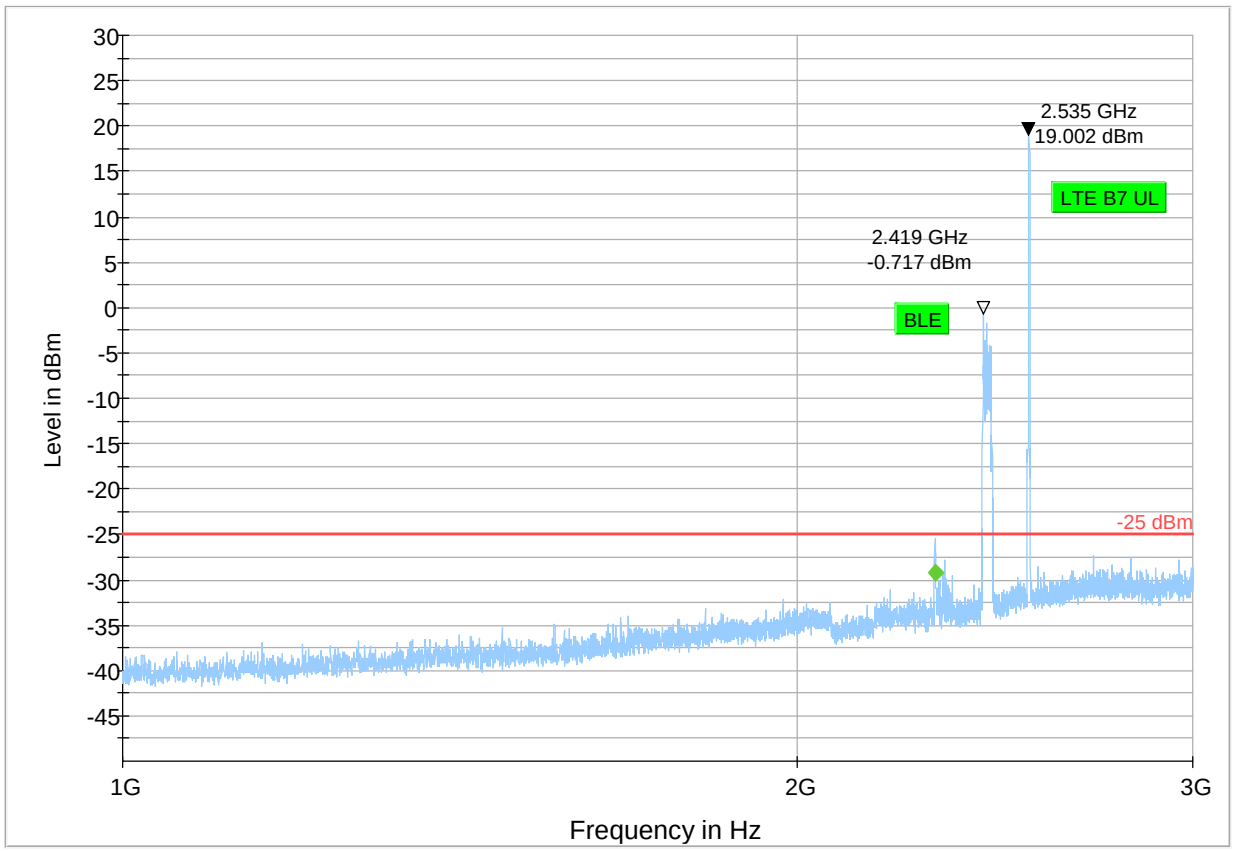


Plot # 12

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB)
2301.500	---	-29.18	-25	4.18	500.0	1000.000	140.0	H	337.0	-63.4	4.5	0.0	-67.9

(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBµV)
2301.500	34.2

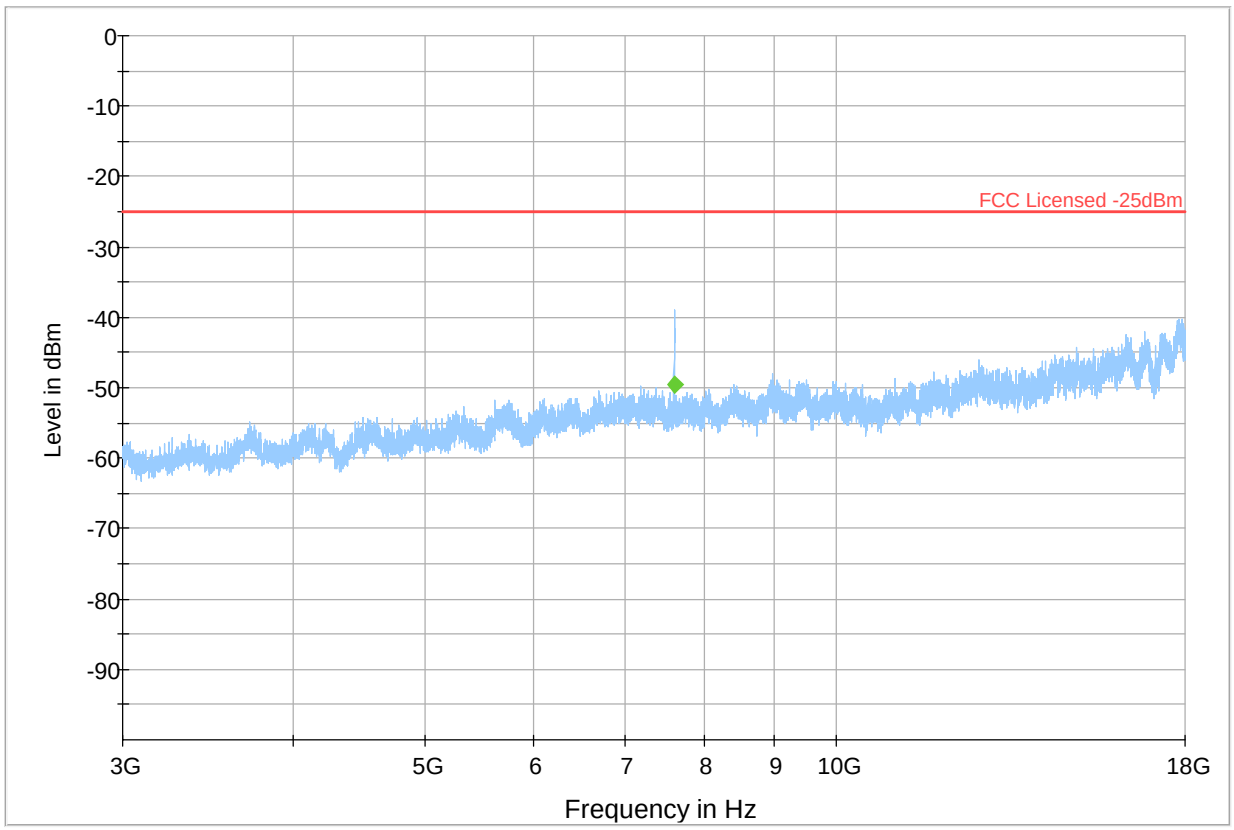


Plot # 13

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB)
7604.531	---	-49.55	-25	24.55	500.0	1000.000	245.0	V	266.0	-95.1	10.2	0.0	-105.3

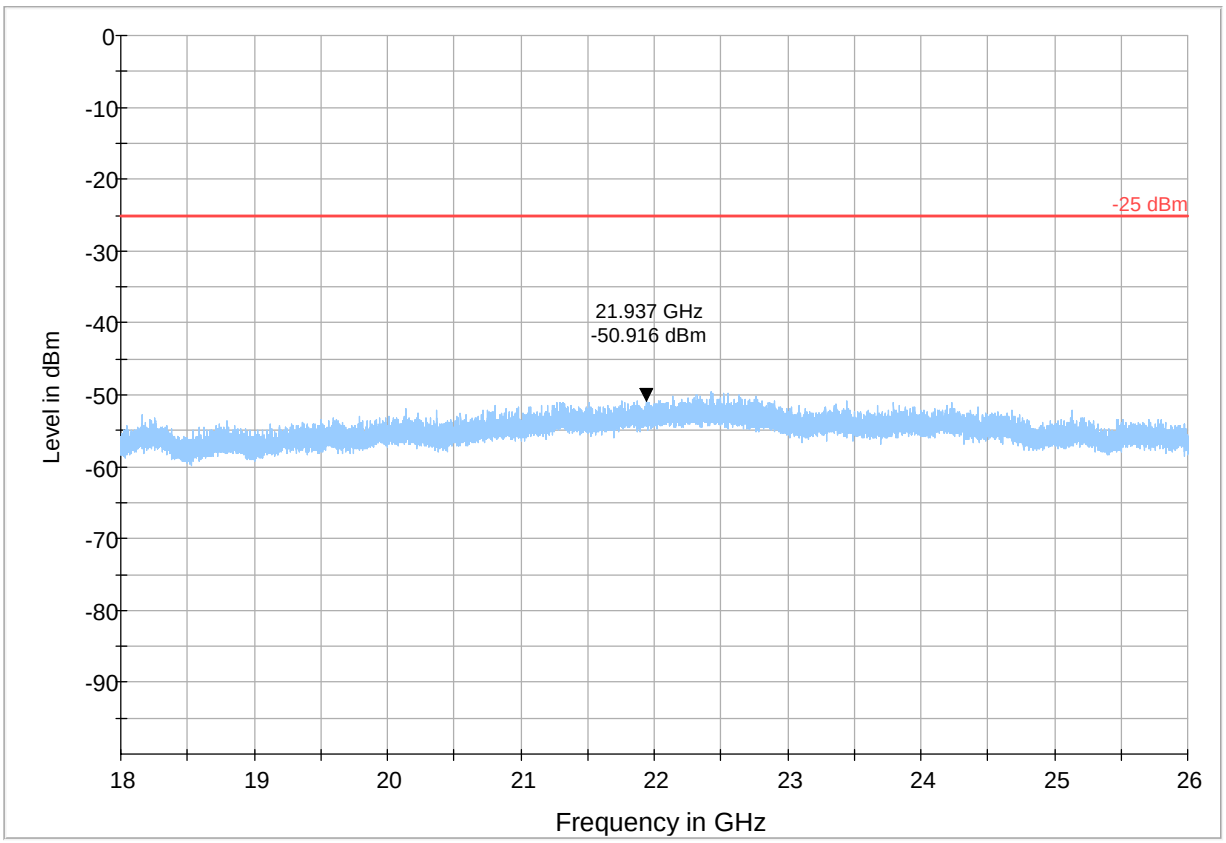
(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBµV)
7604.531	45.5



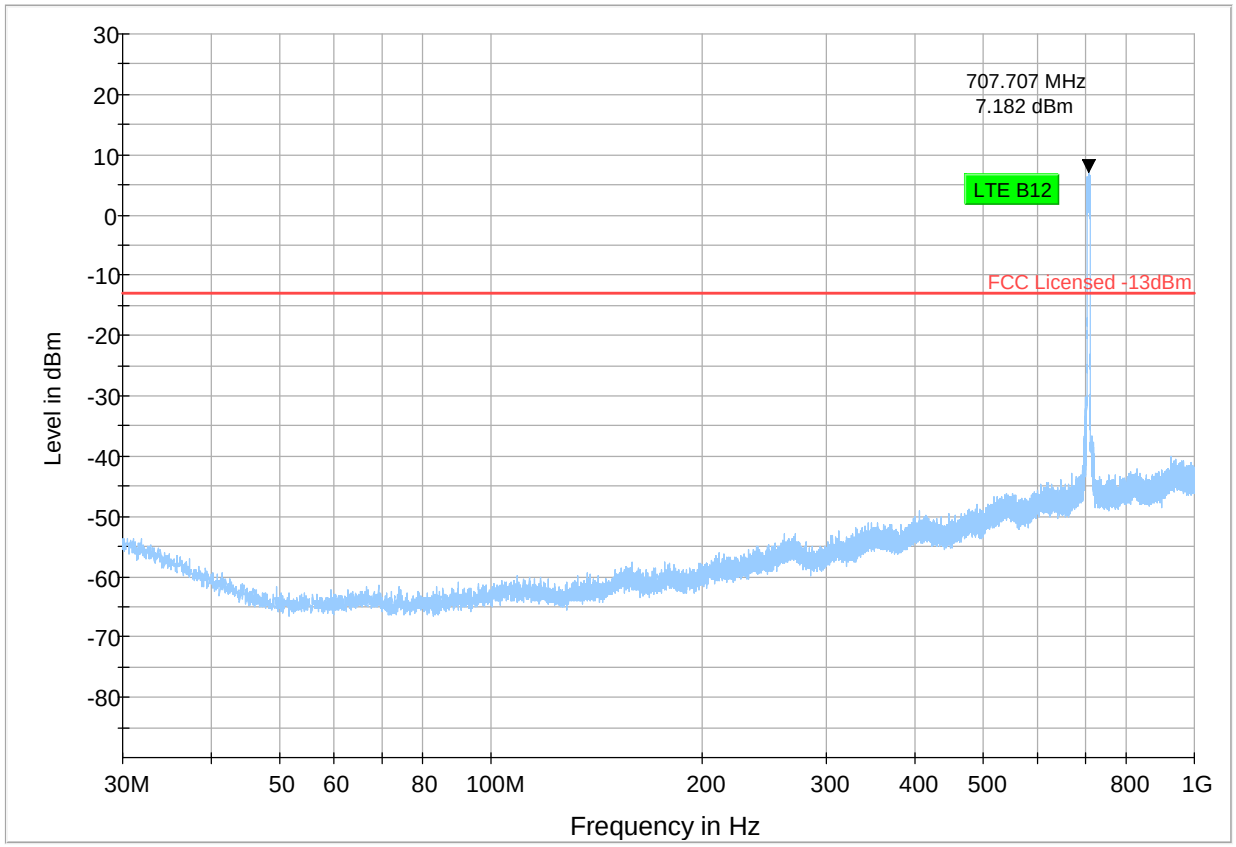
Plot # 14

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



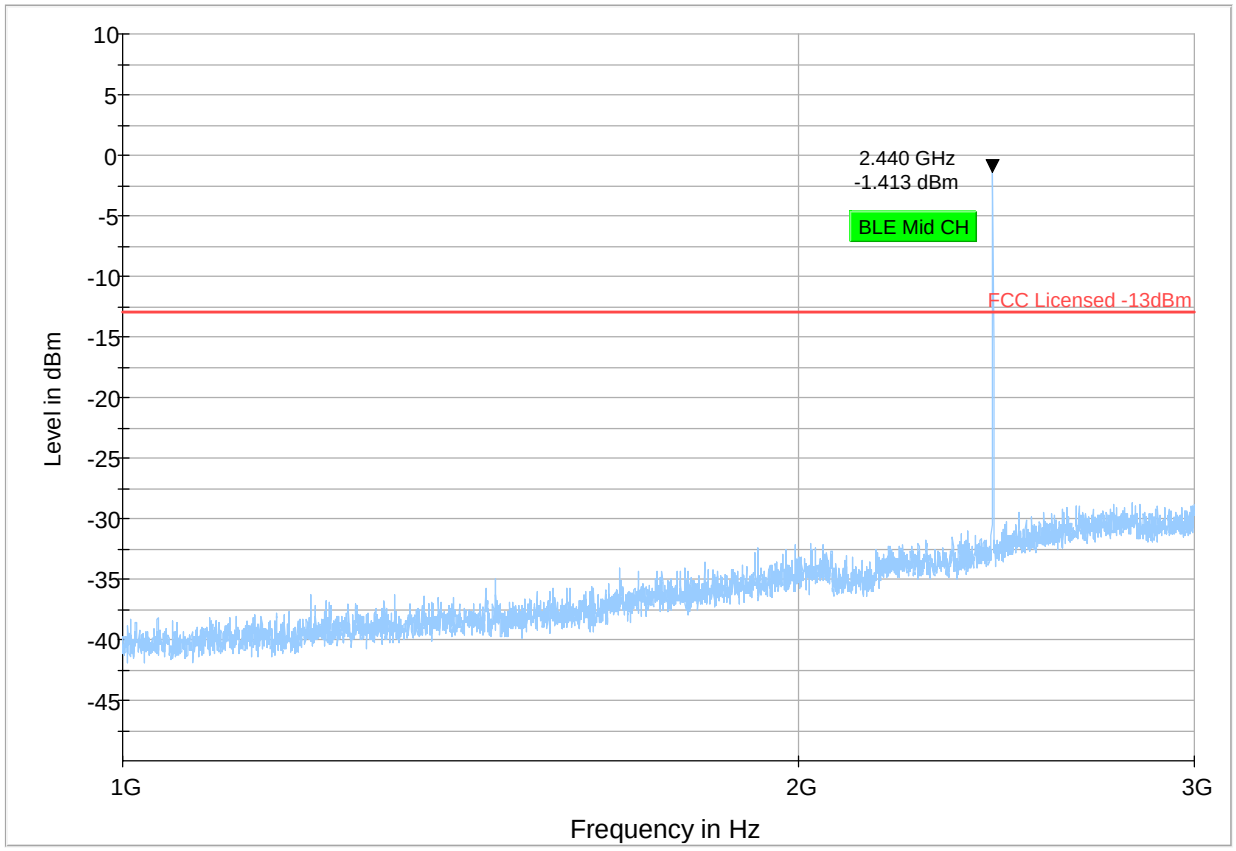
Plot # 15

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



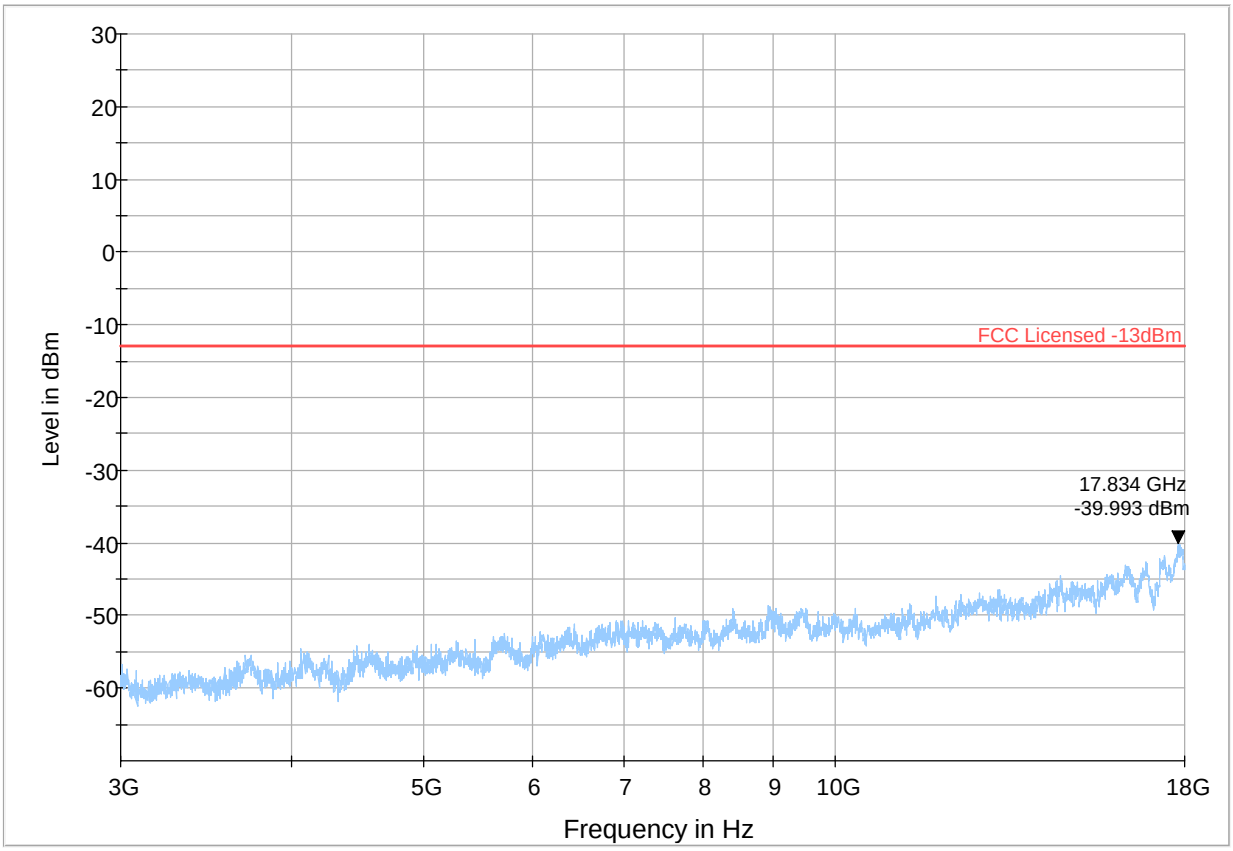
Plot # 16

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



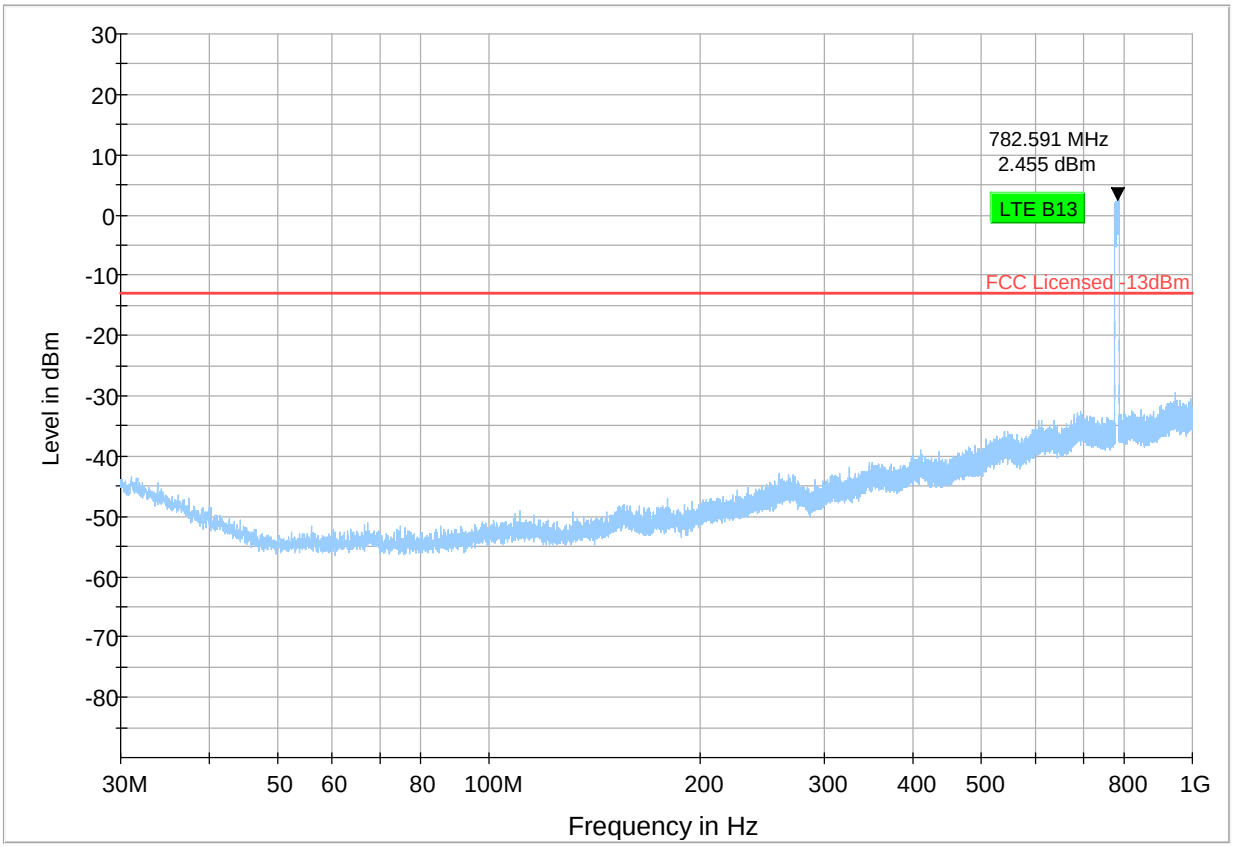
Plot # 17

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



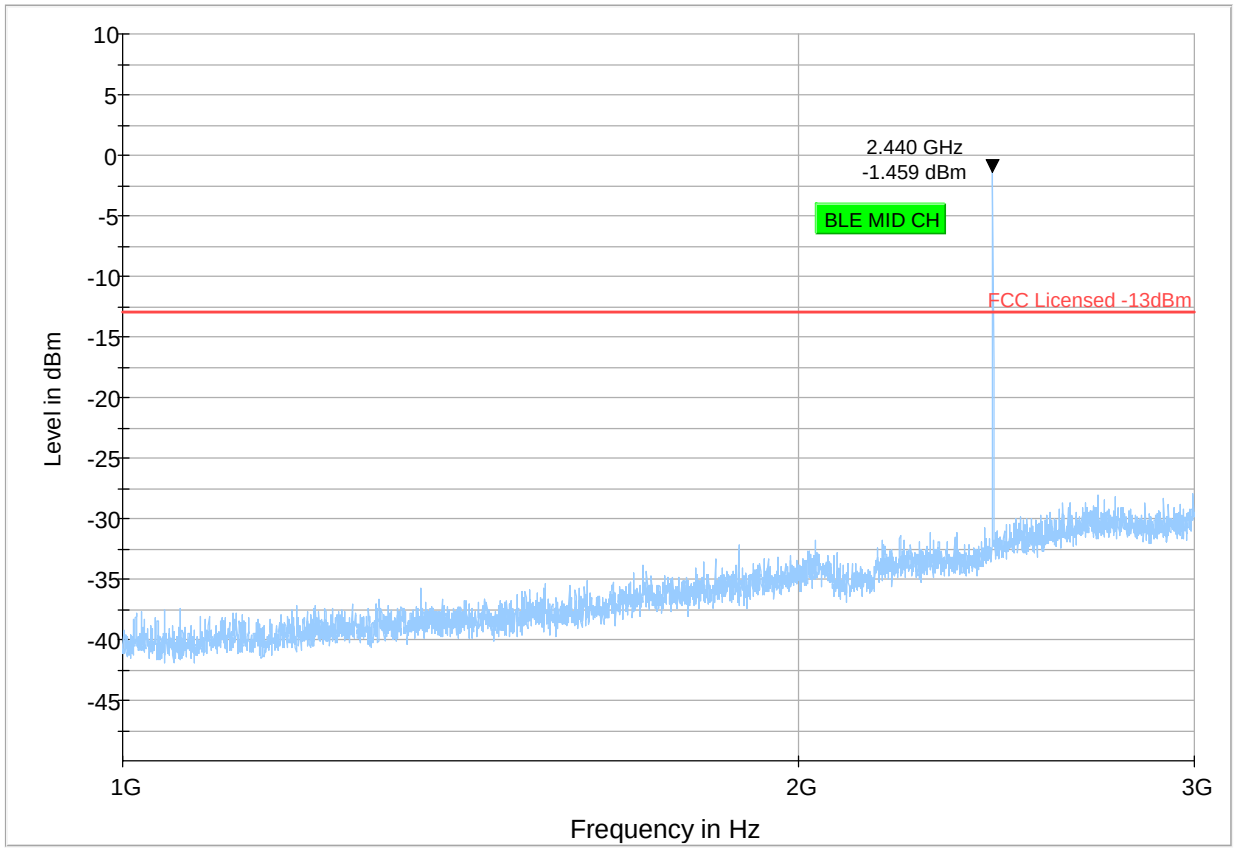
Plot # 18

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



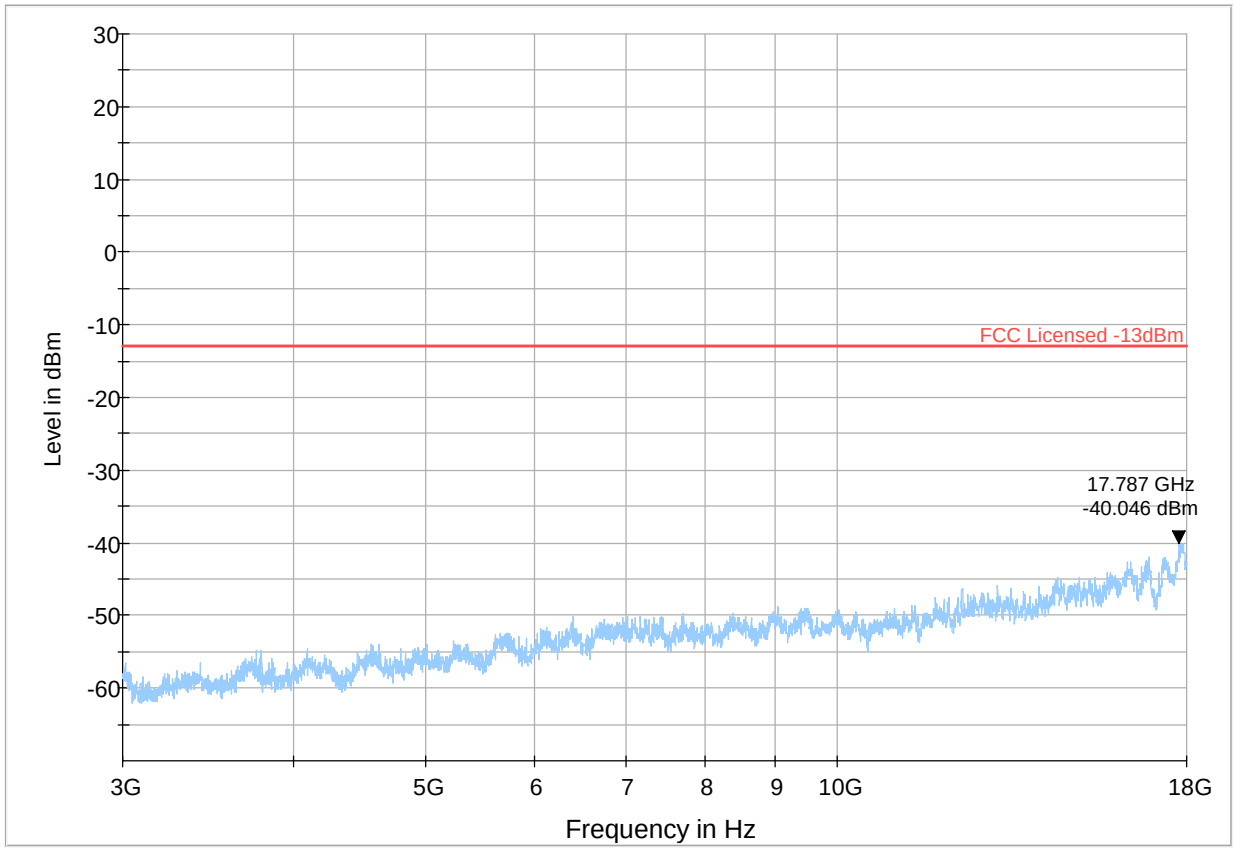
Plot # 19

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



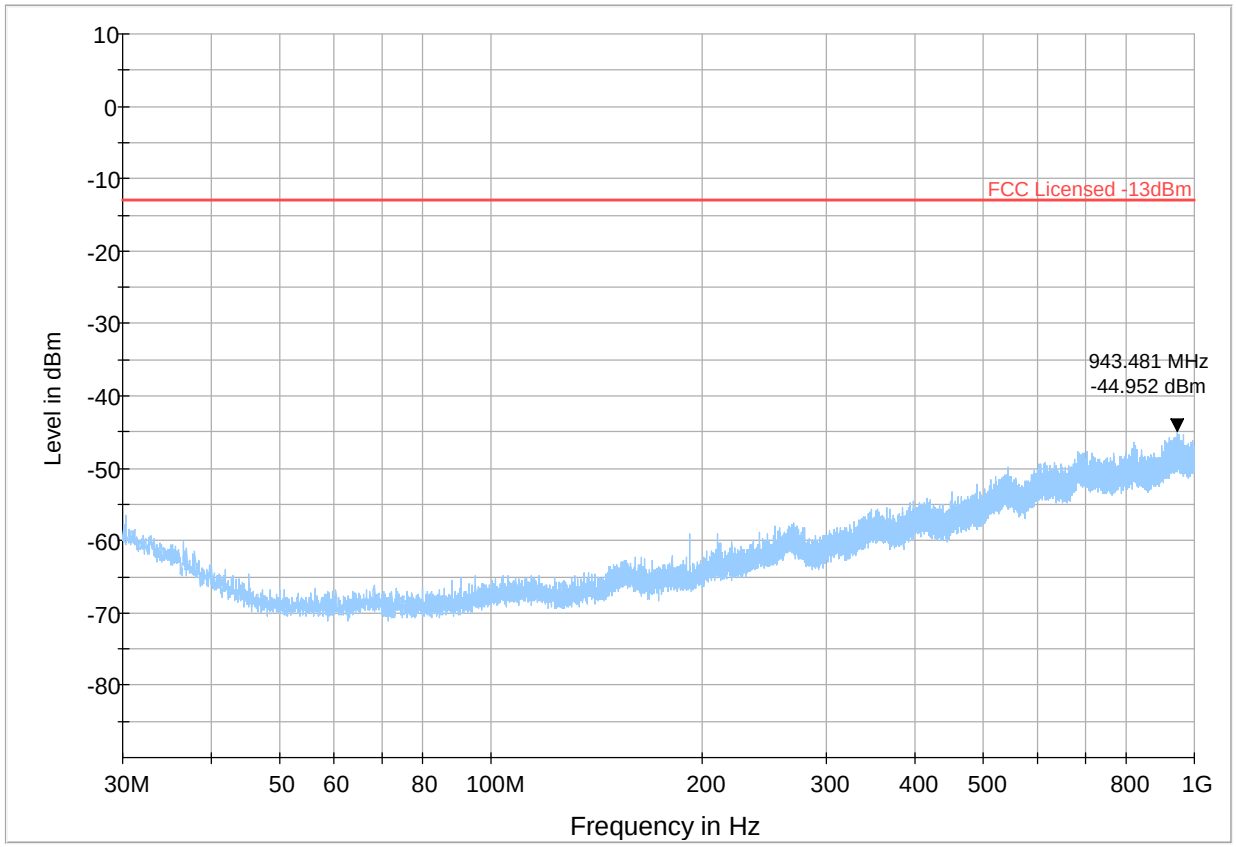
Plot # 20

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



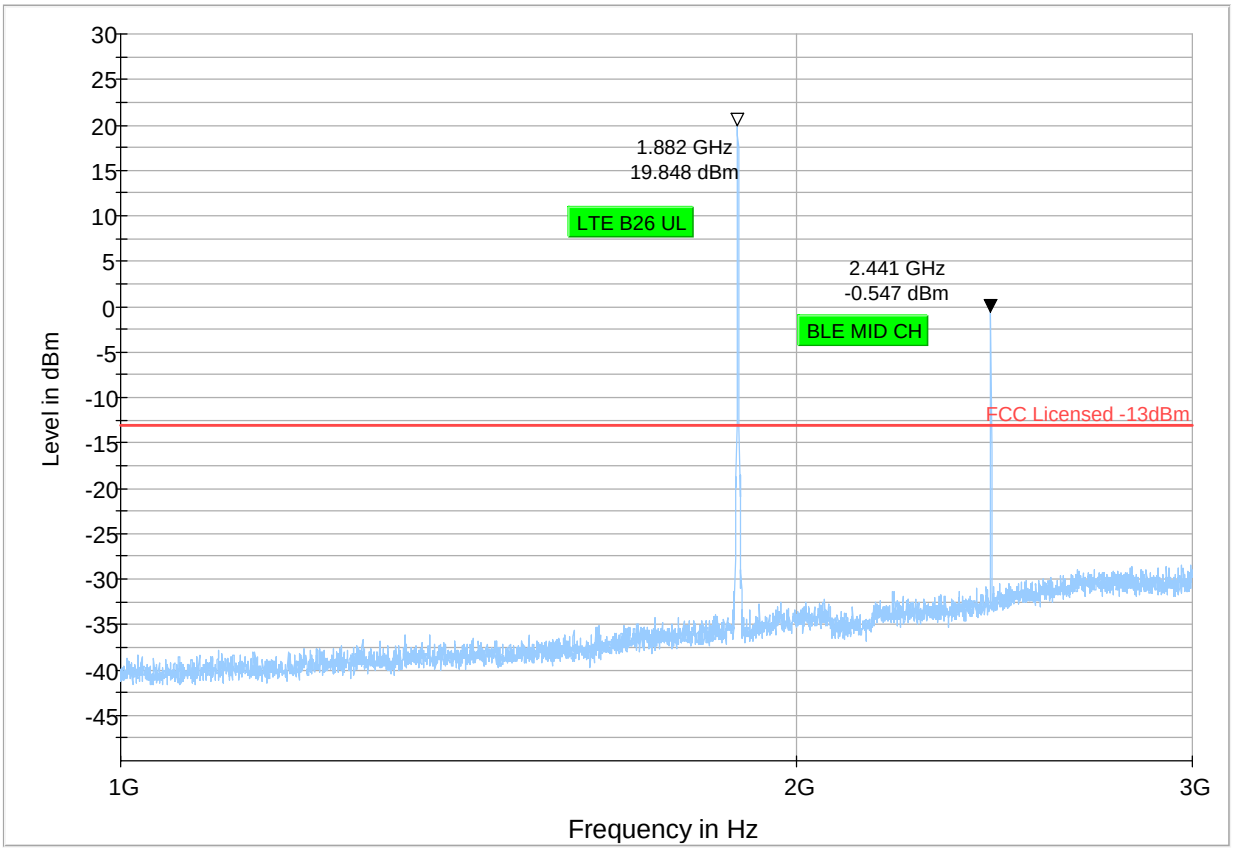
Plot # 21

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



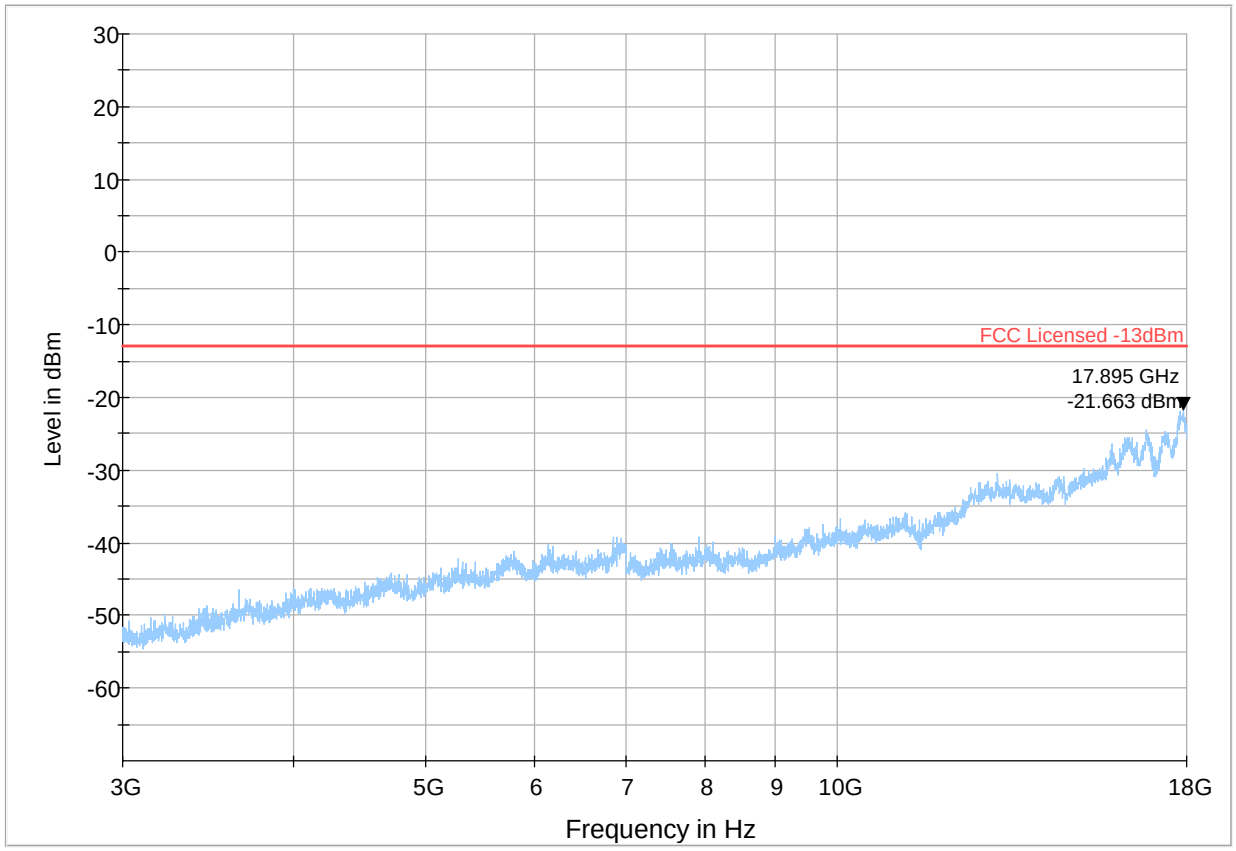
Plot # 22

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



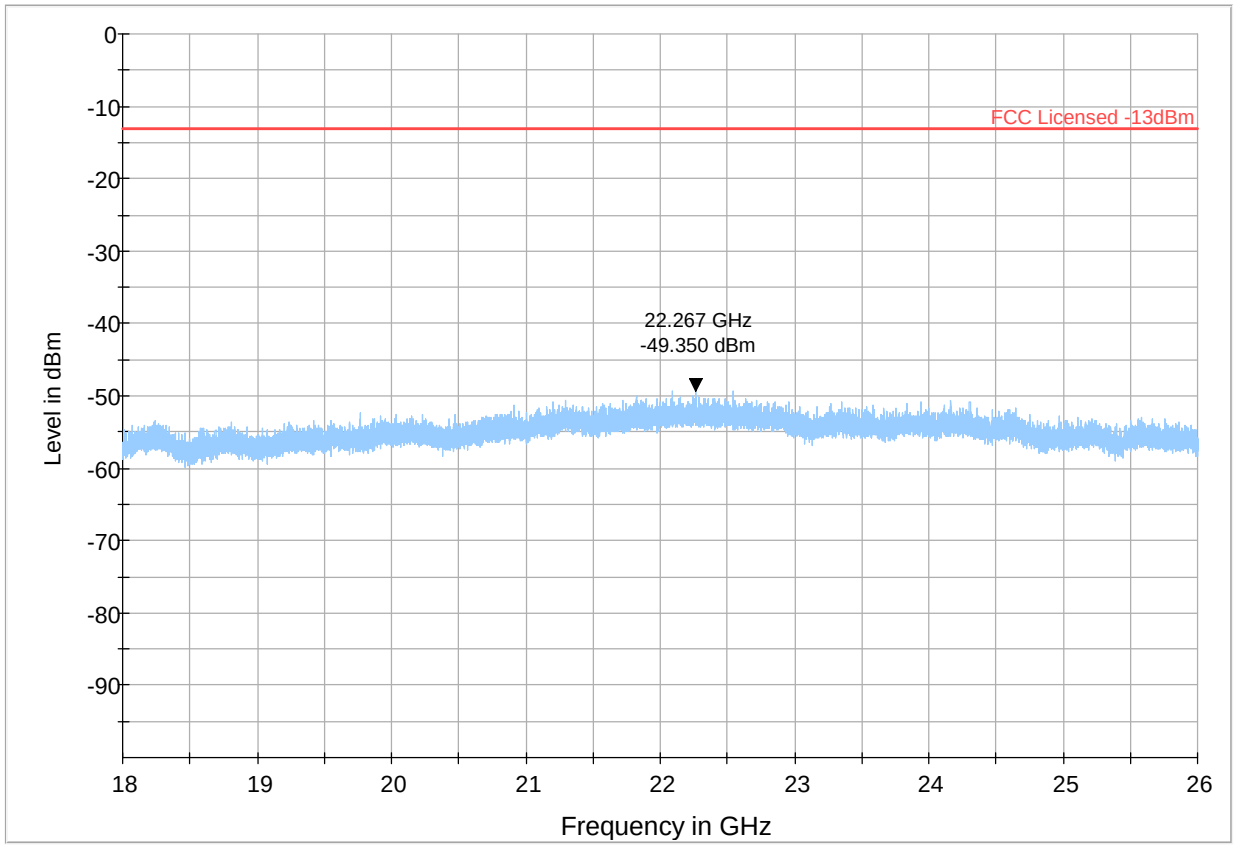
Plot # 23

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



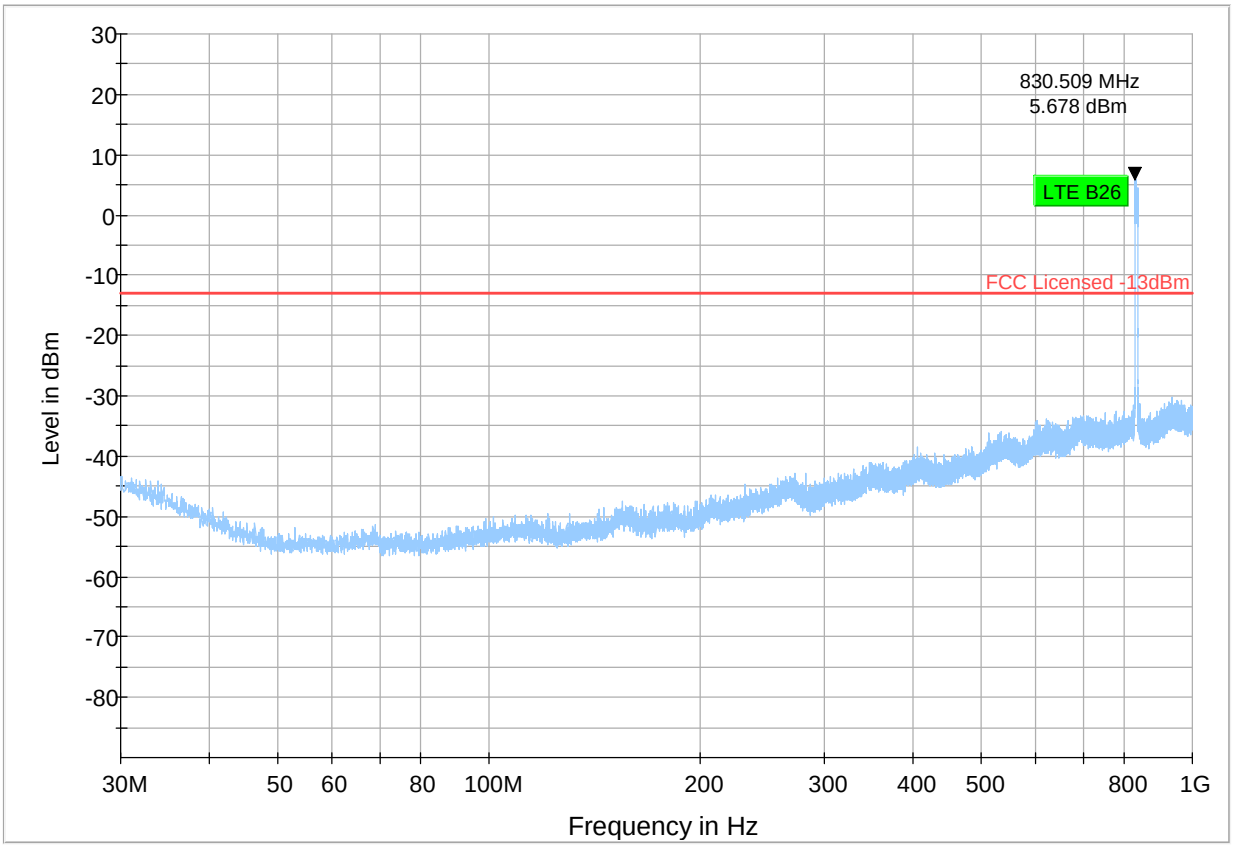
Plot # 24

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



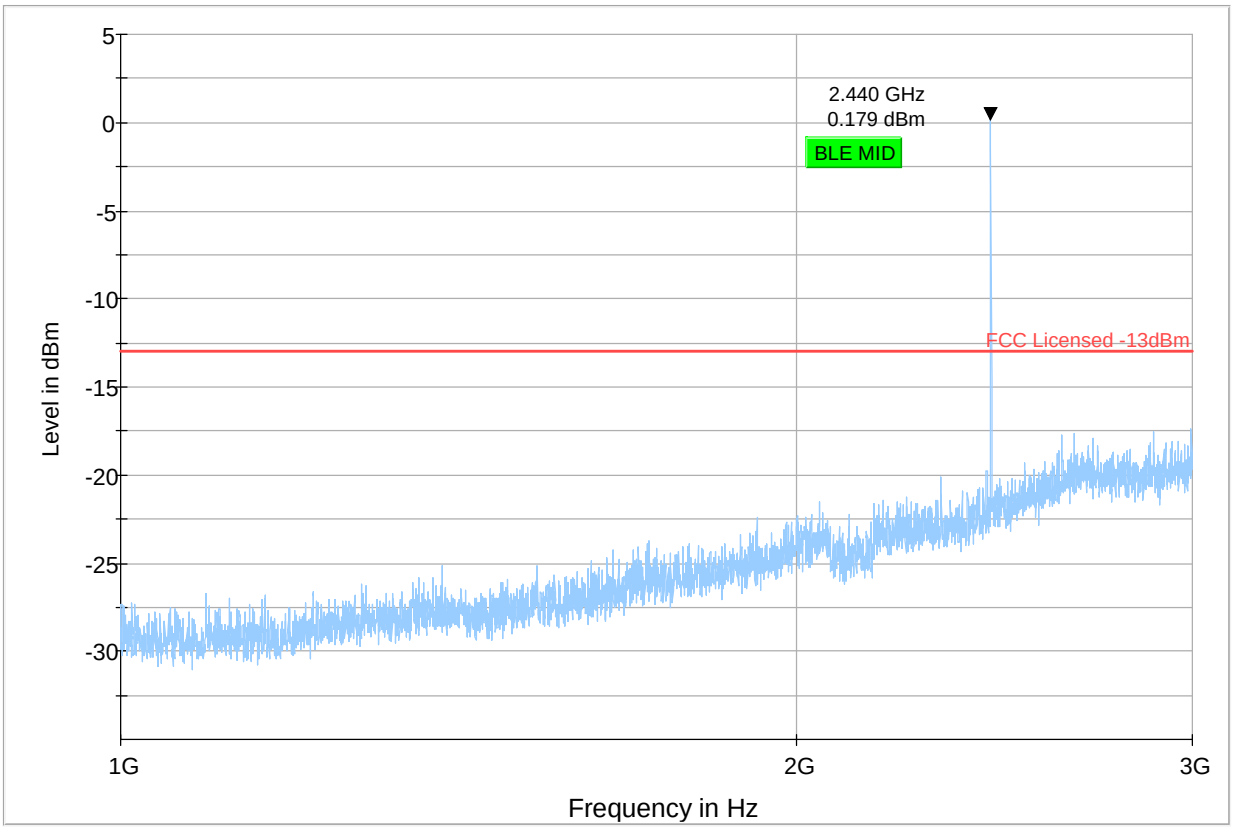
Plot # 25

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



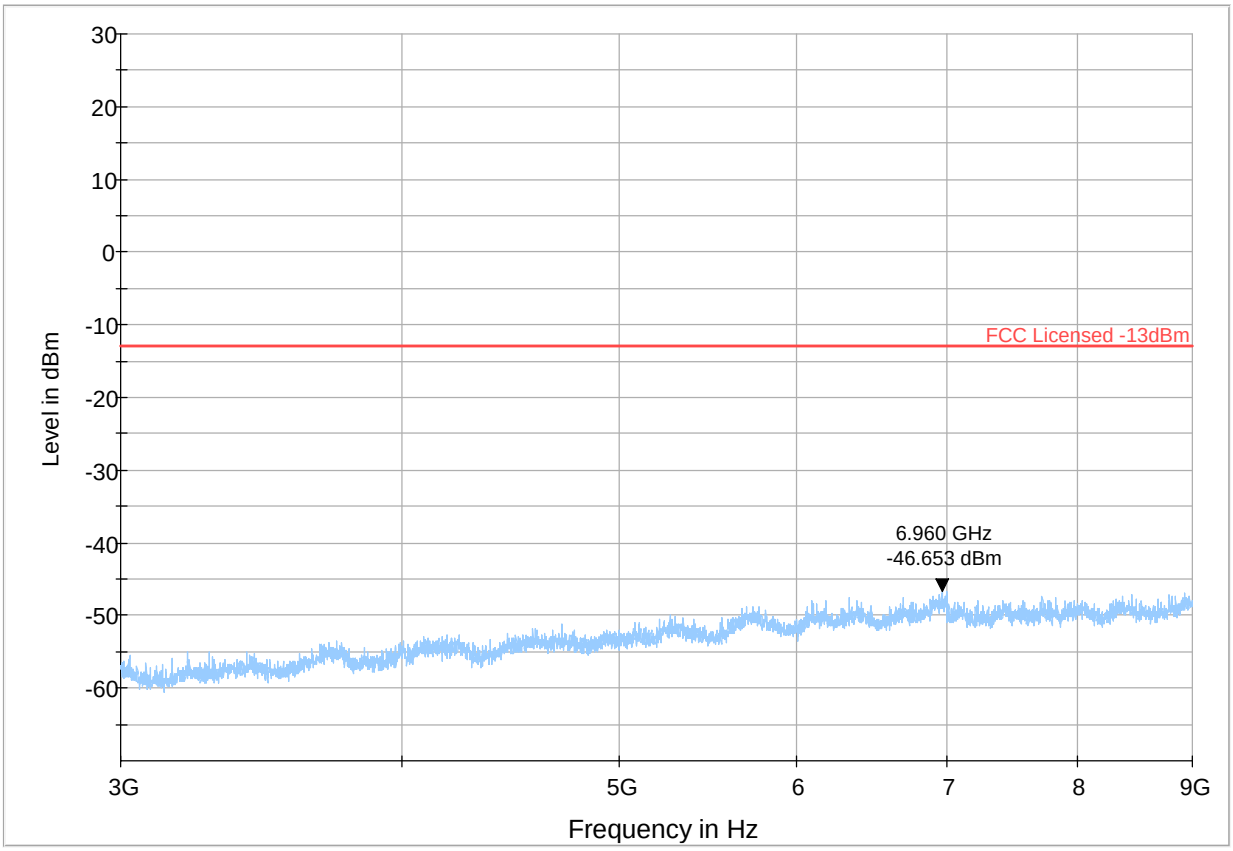
Plot # 26

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



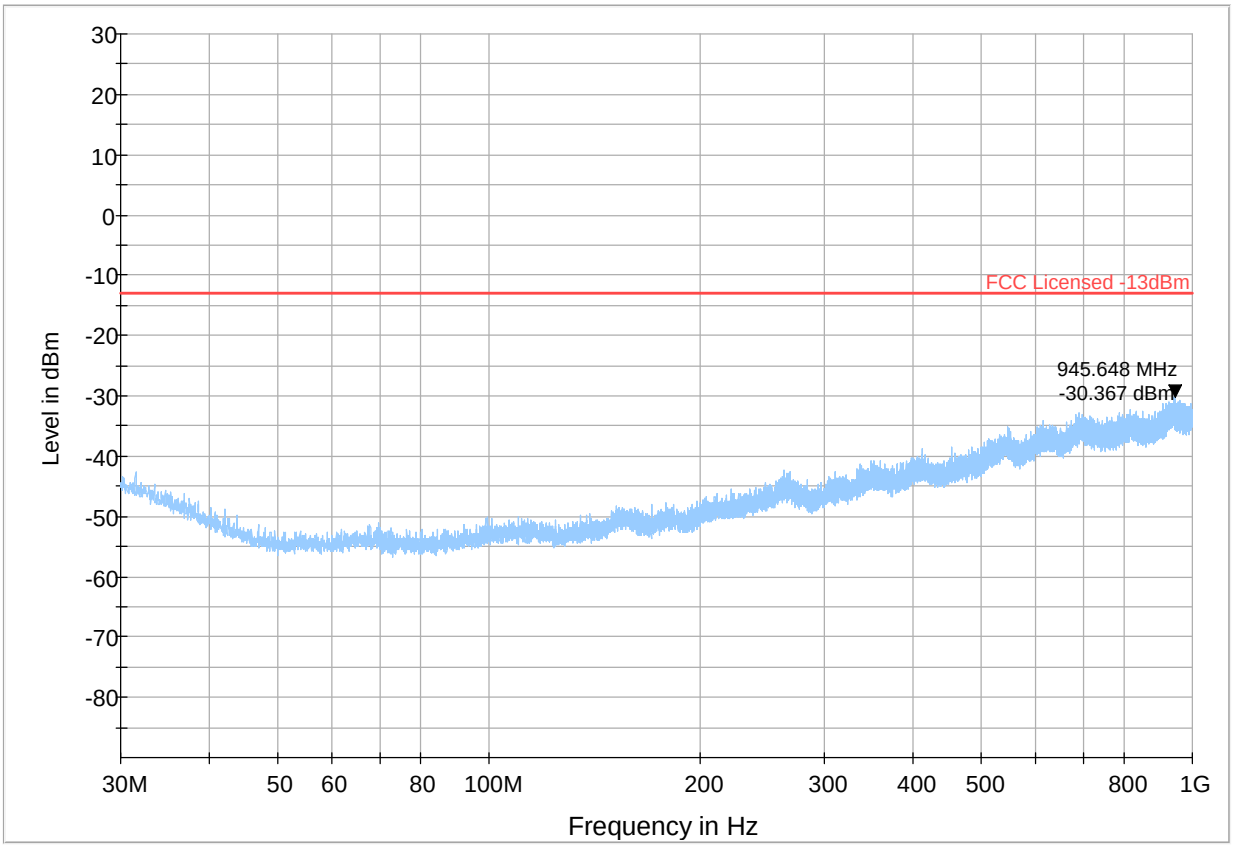
Plot # 27

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



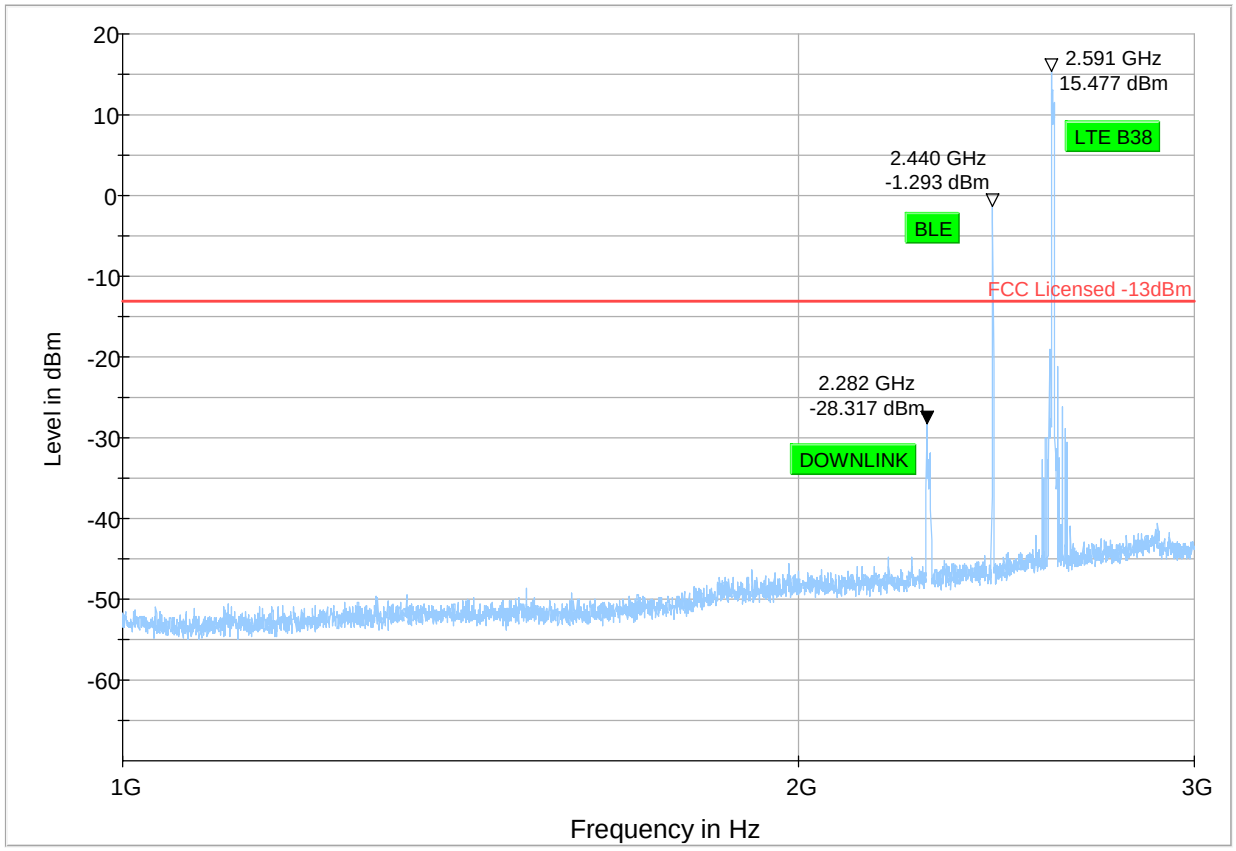
Plot # 28

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



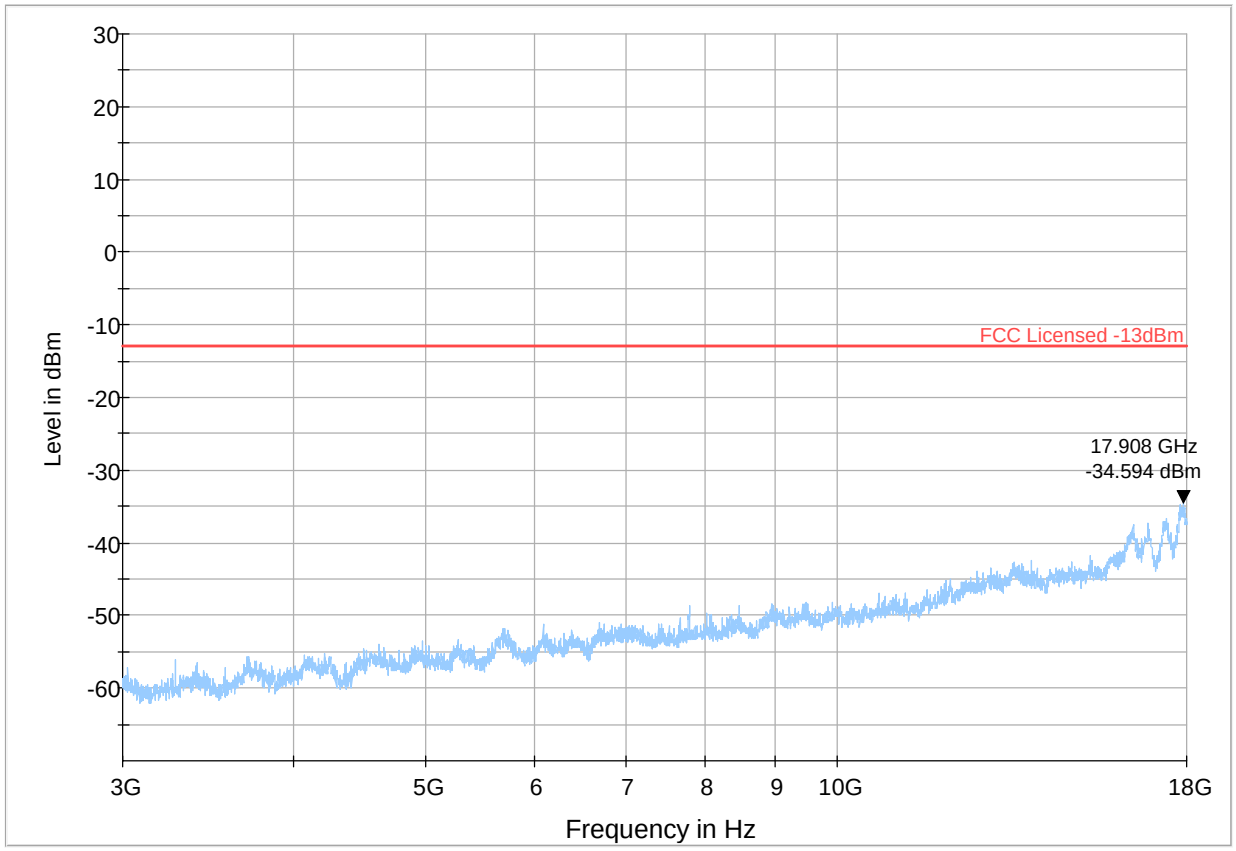
Plot # 29

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



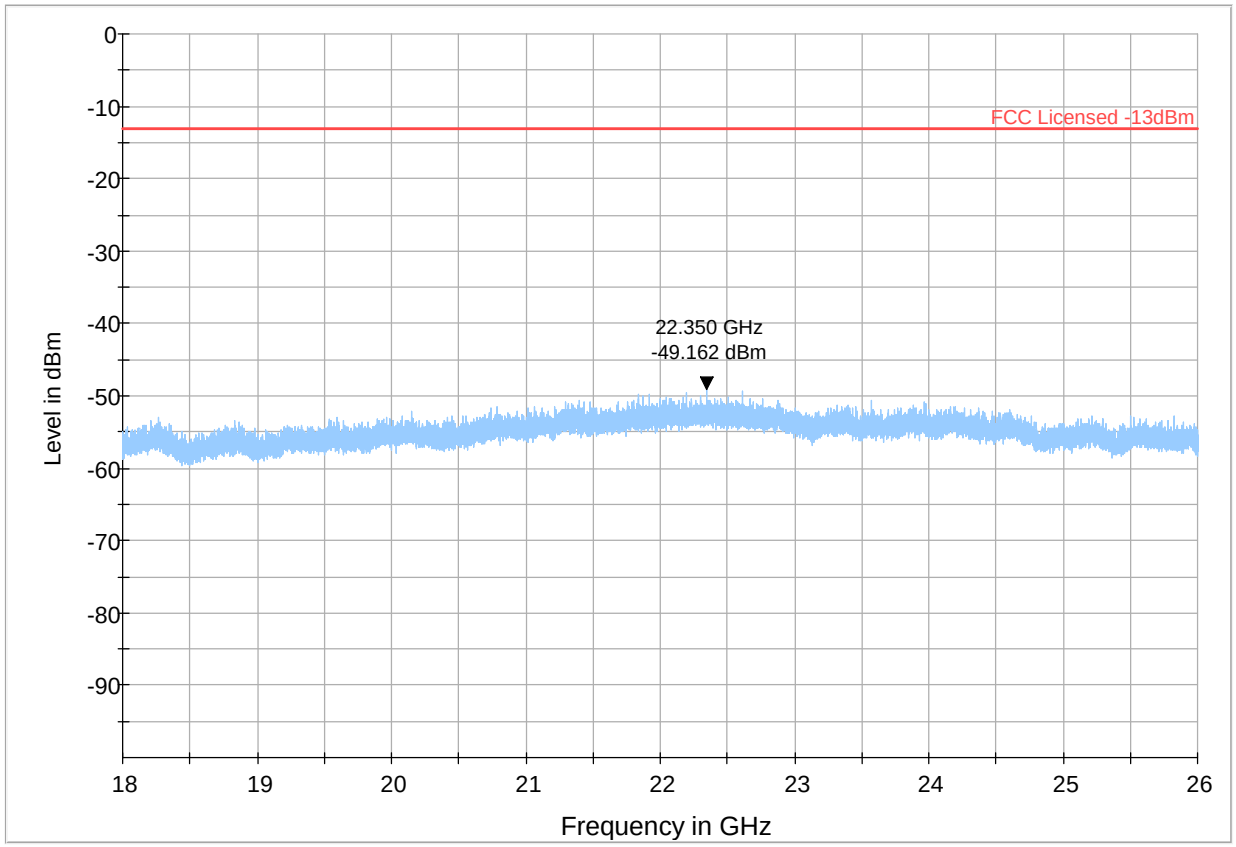
Plot # 30

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



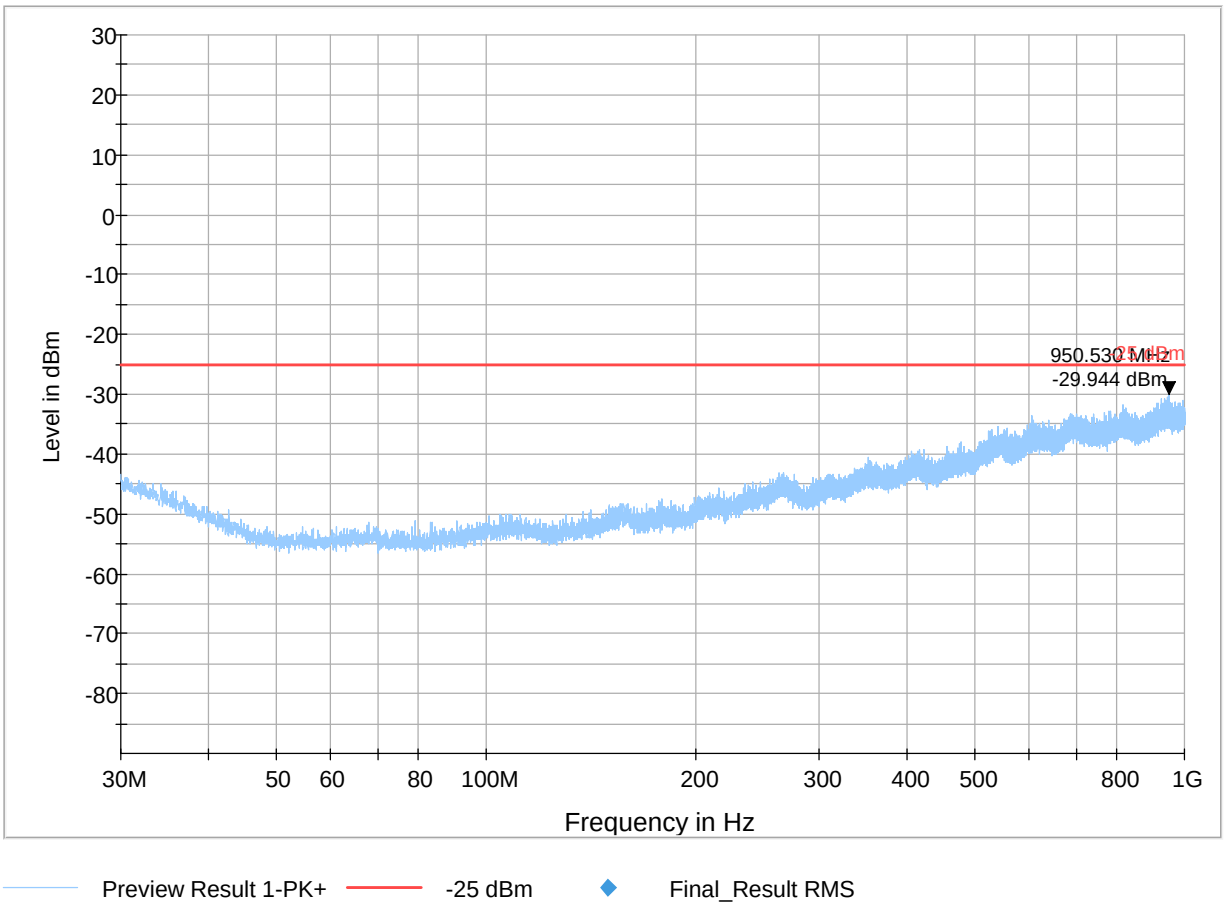
Plot # 31

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



Plot # 32

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

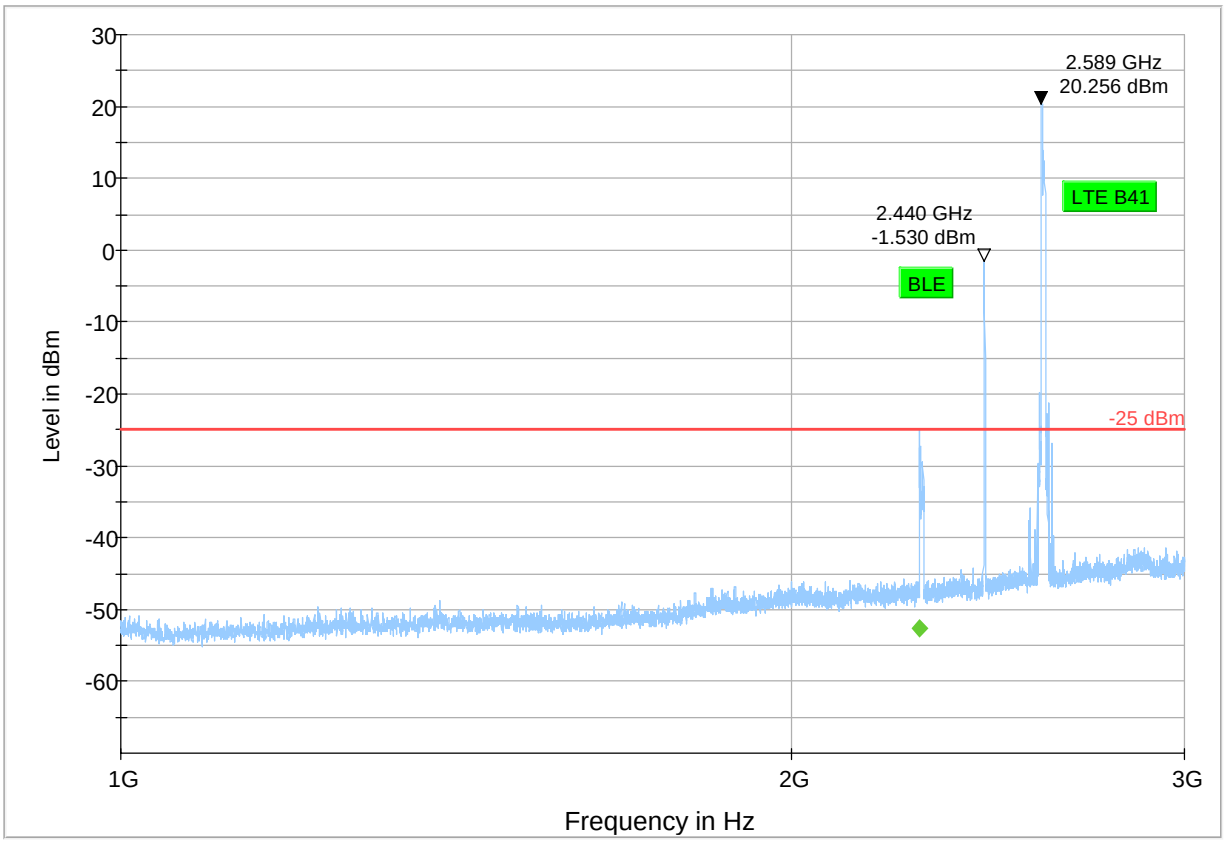


Plot # 33

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB)
2281.750	---	-52.57	-25	27.57	500.0	1000.000	107.0	V	314.0	-62.8	4.4	0.0	-67.2

(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBµV)
2281.750	10.2



Plot # 34

Frequency	MaxPeak	RMS (dBm	Limit (dBm	Margin	Meas.	Bandwidth	Height	Pol	Azimuth	Corr.	Sig Pat	Preamp	Trd Corr
---	---	---	---	---	---	---	---		---	---	---	---	---

(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBµV)
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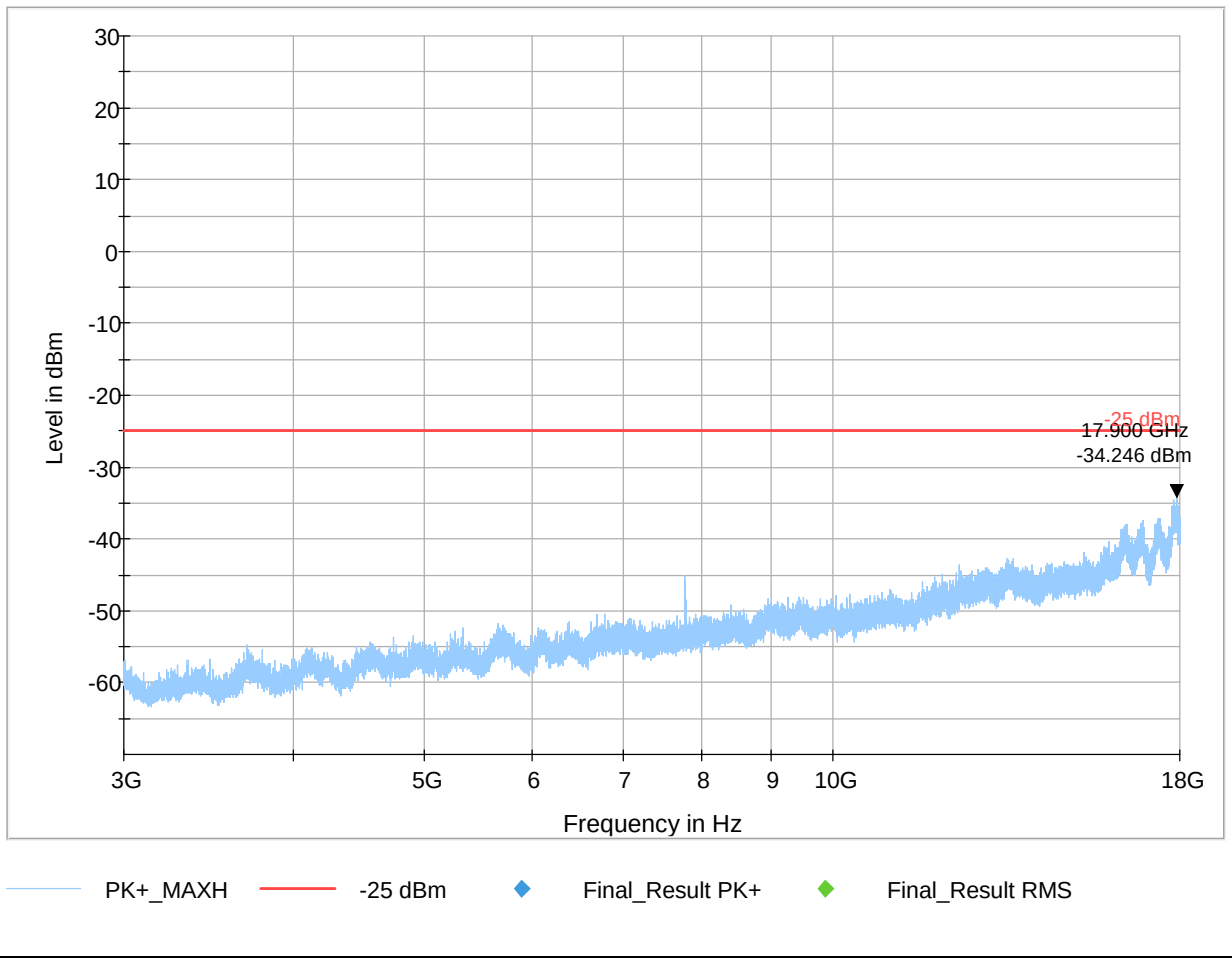
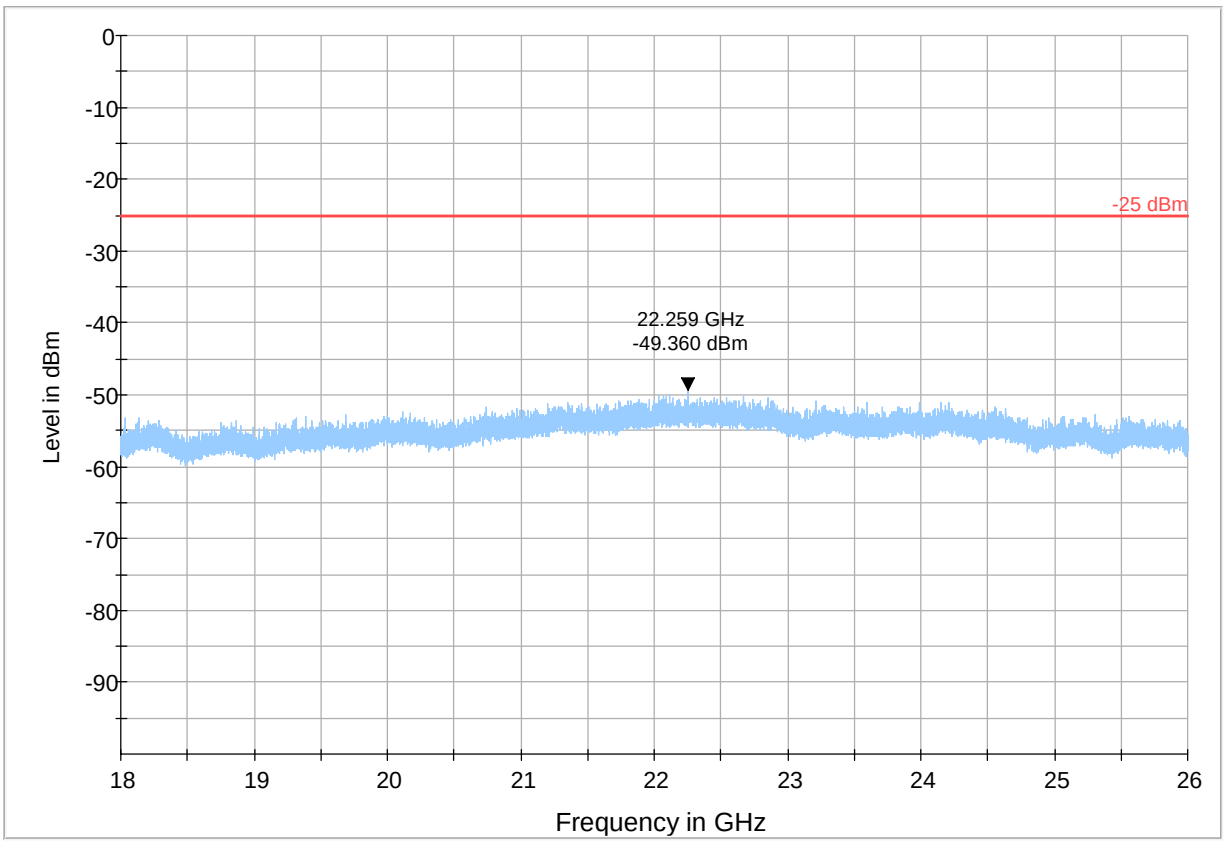


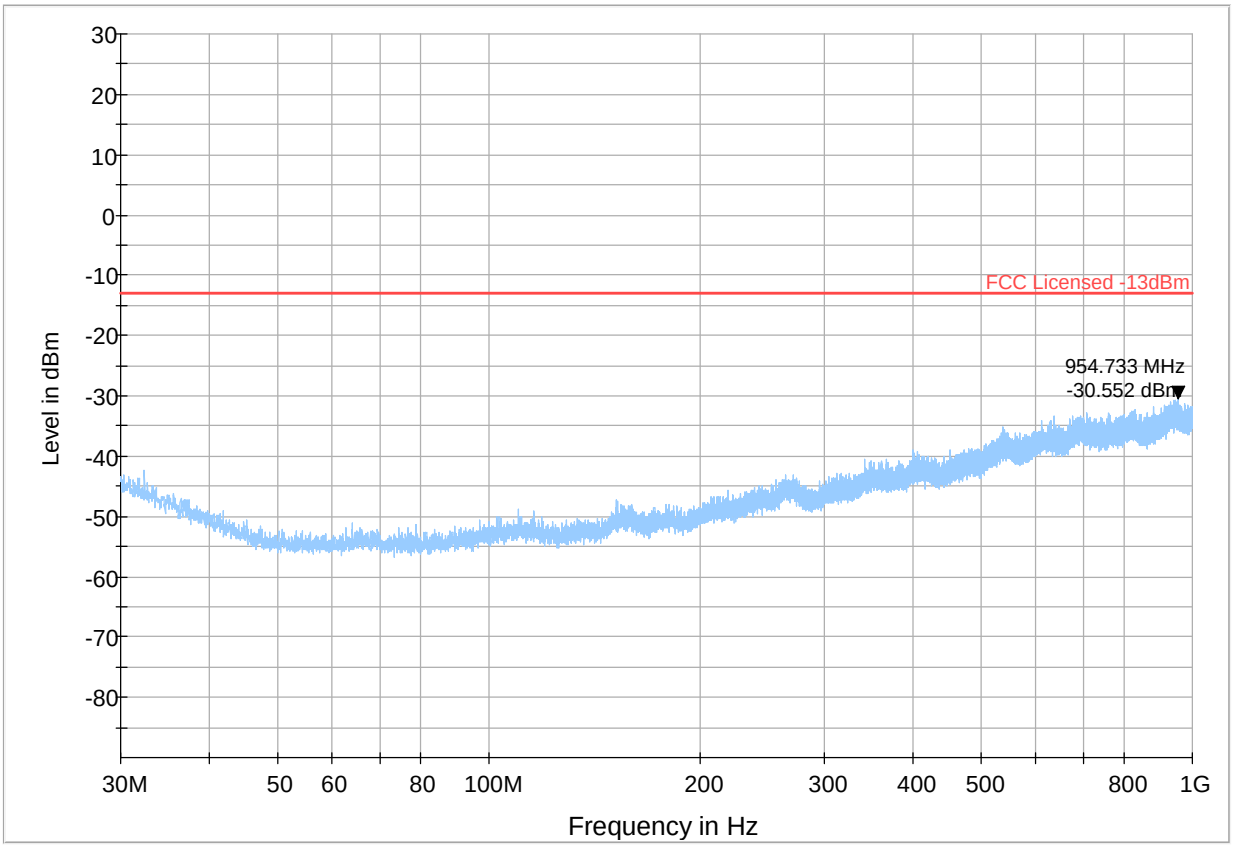
Plot # 35

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



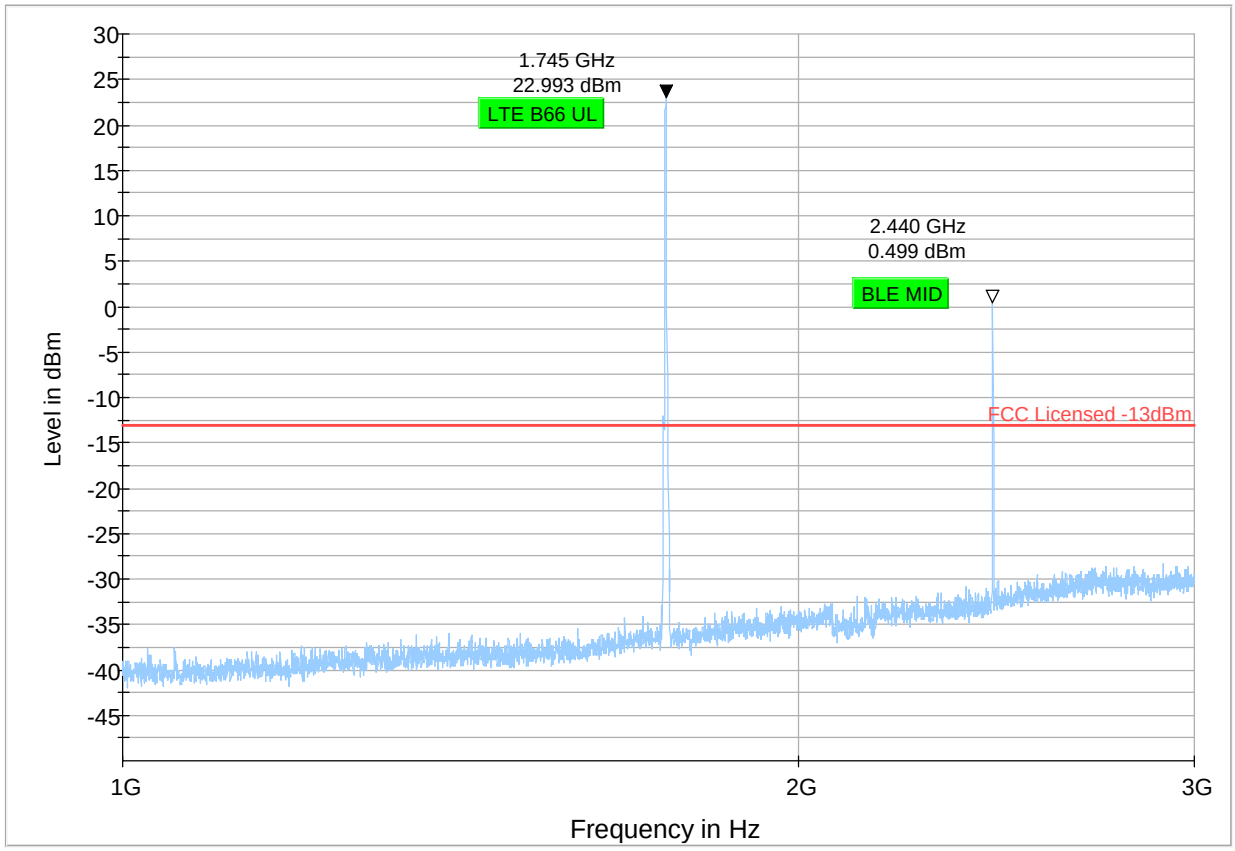
Plot # 36

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



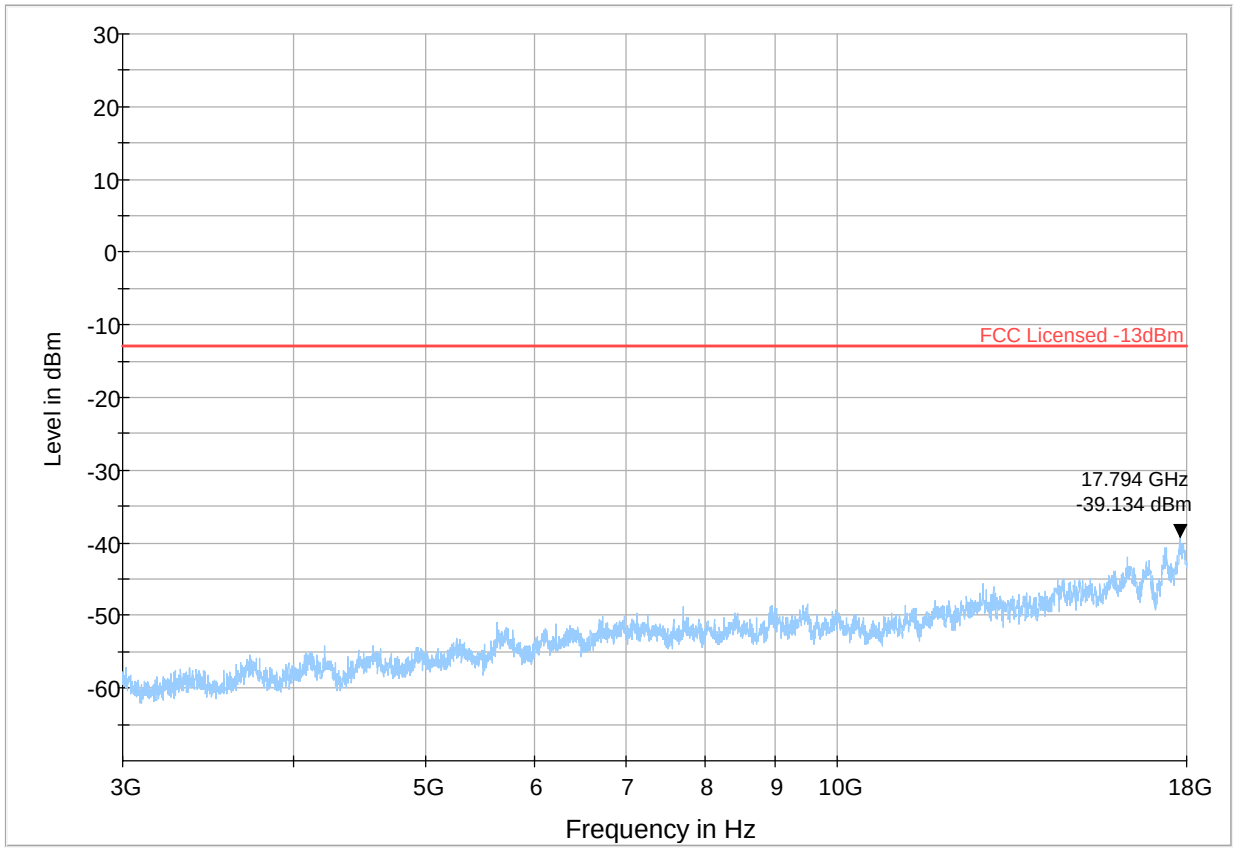
Plot # 37

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



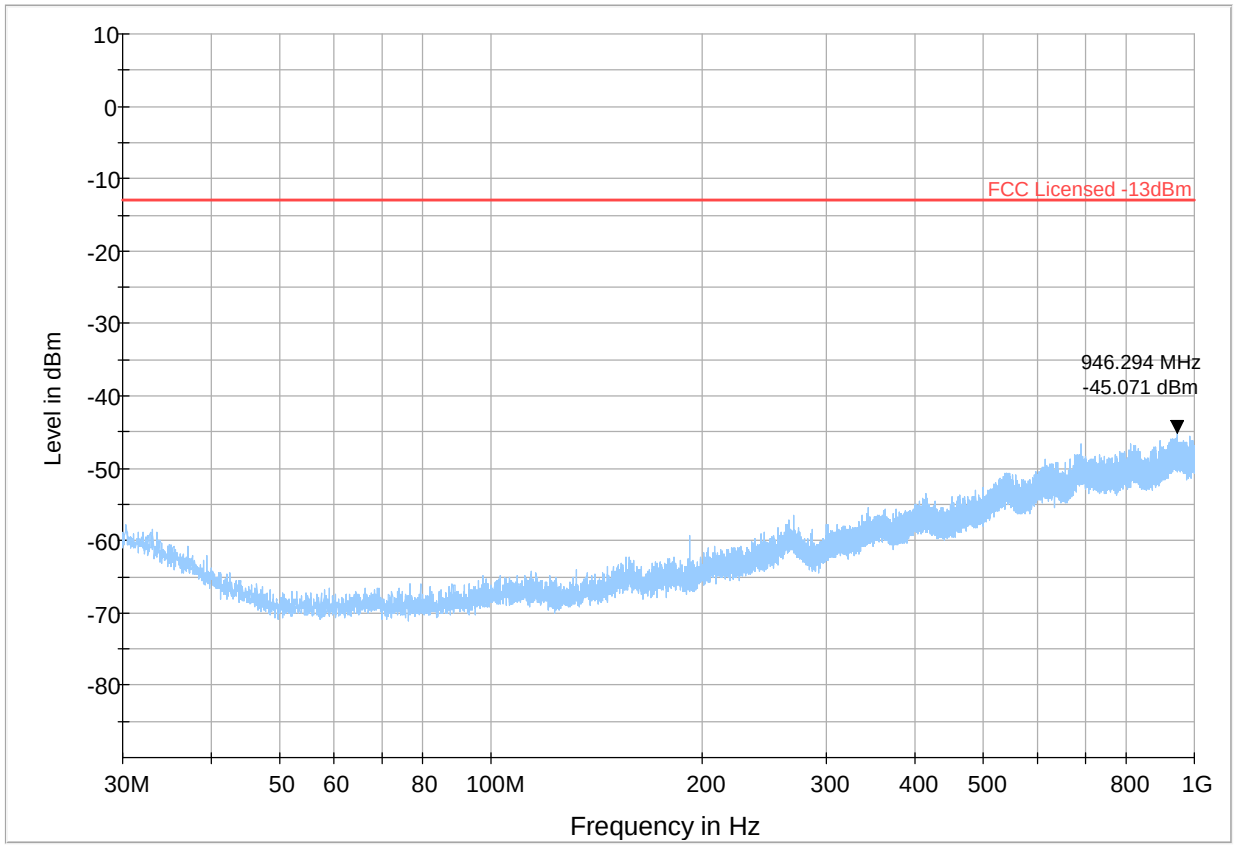
Plot # 38

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



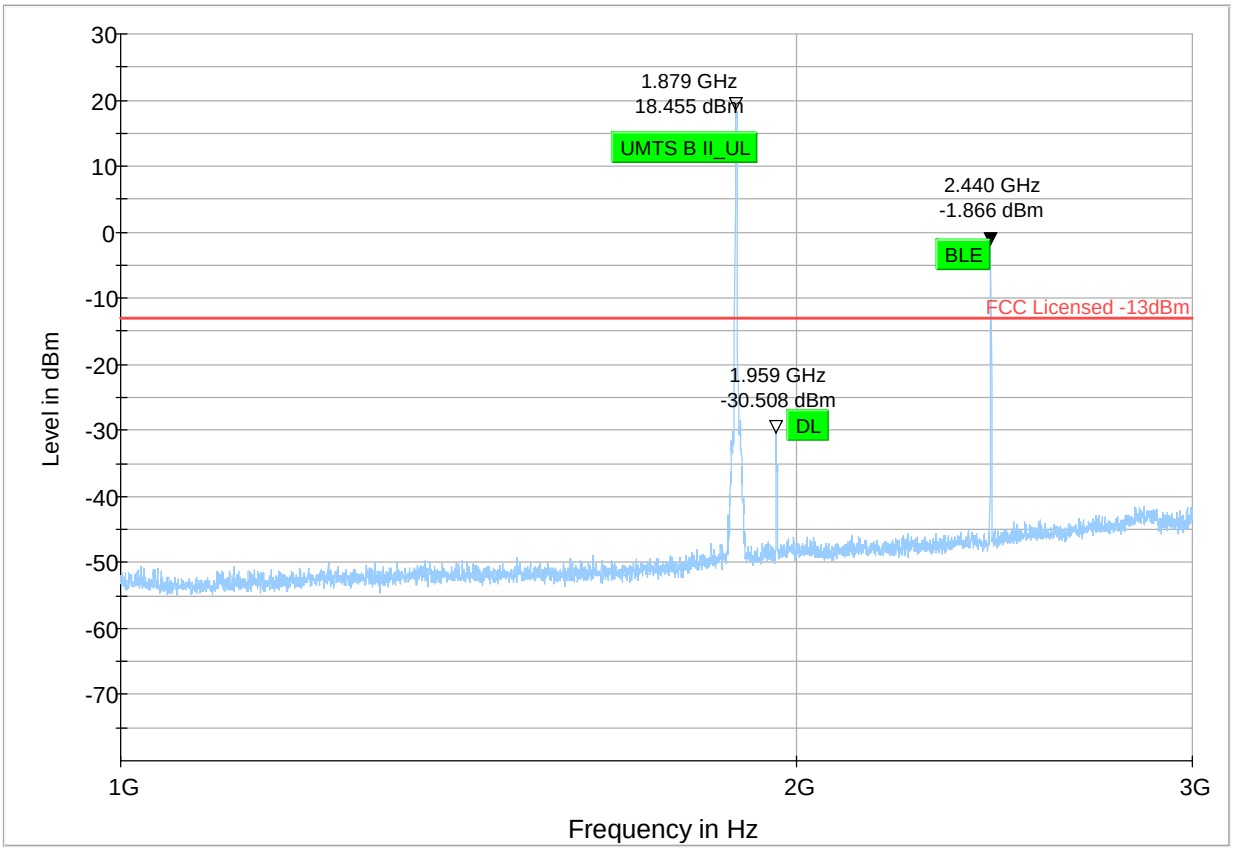
Plot # 39

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



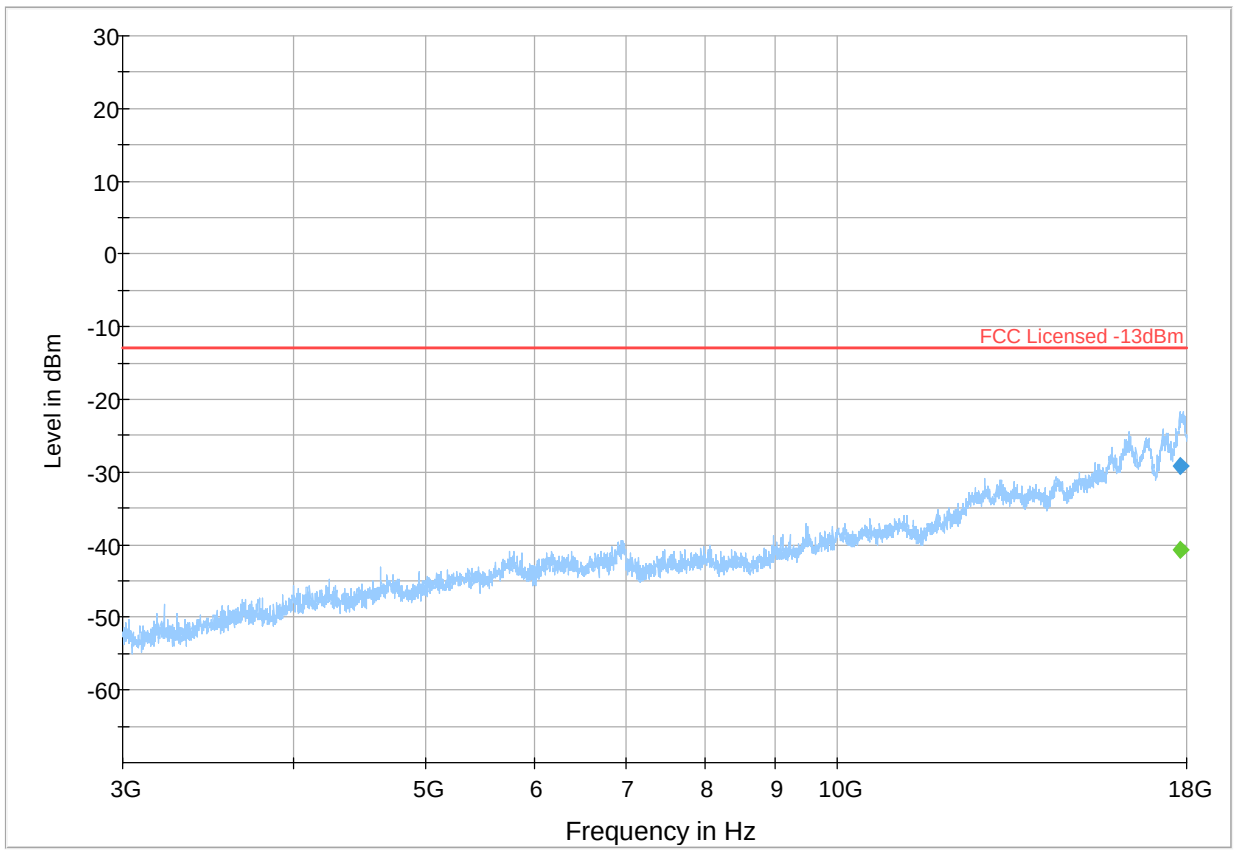
Plot # 40

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



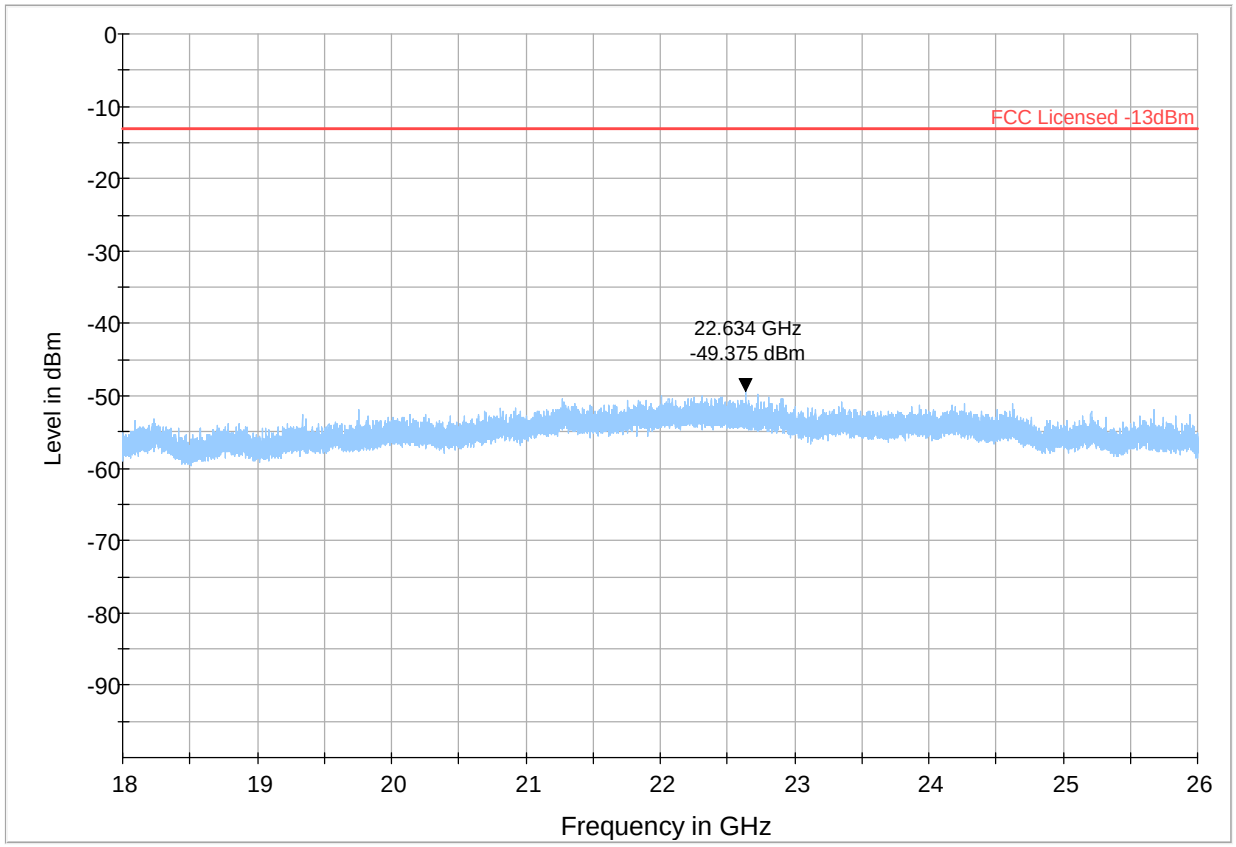
Plot # 41

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
17790.469	---	-40.78	---	---	500.0	1000.000	164.0	H	342.0	-77.7	16.1	0.0	-93.8	36.9
17790.469	-29.11	---	-13.00	16.11	500.0	1000.000	164.0	H	342.0	-77.7	16.1	0.0	-93.8	48.5



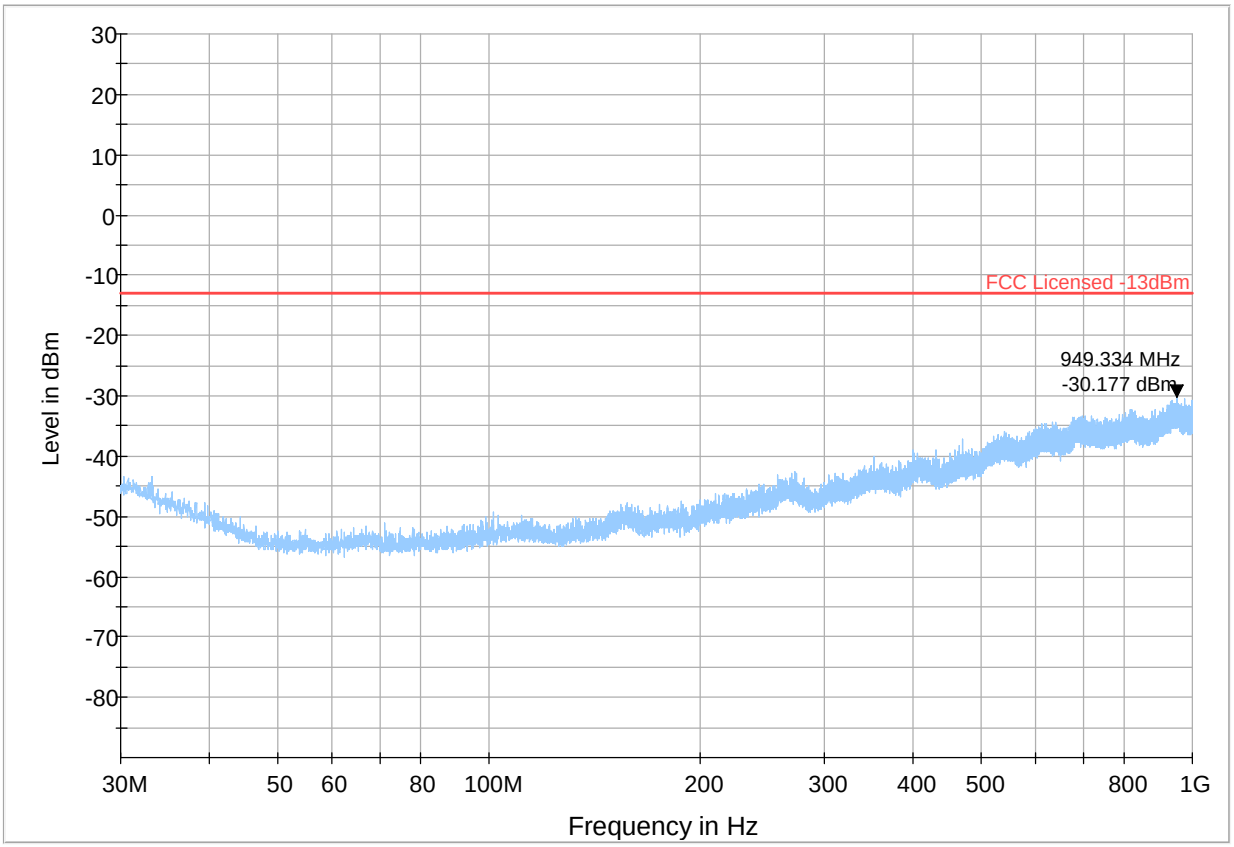
Plot # 42

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



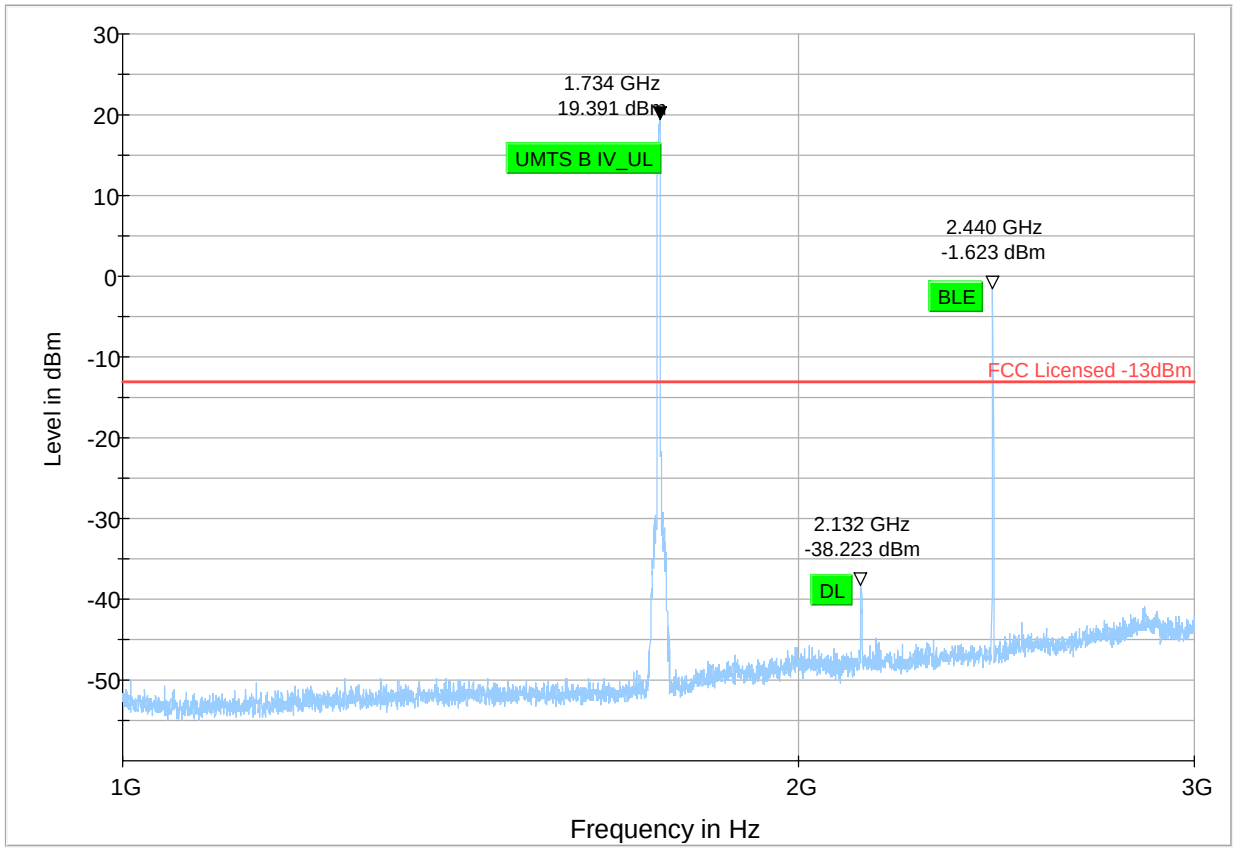
Plot # 43

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



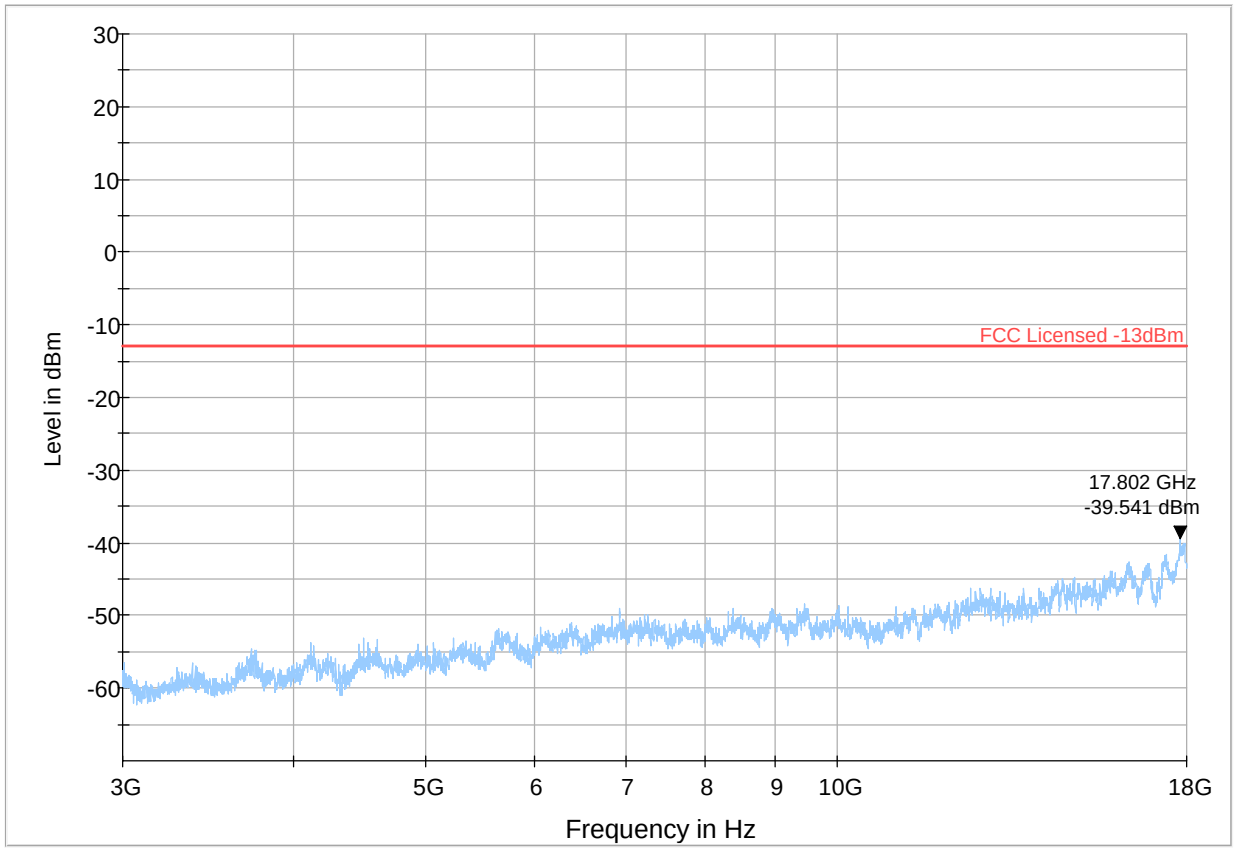
Plot # 44

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



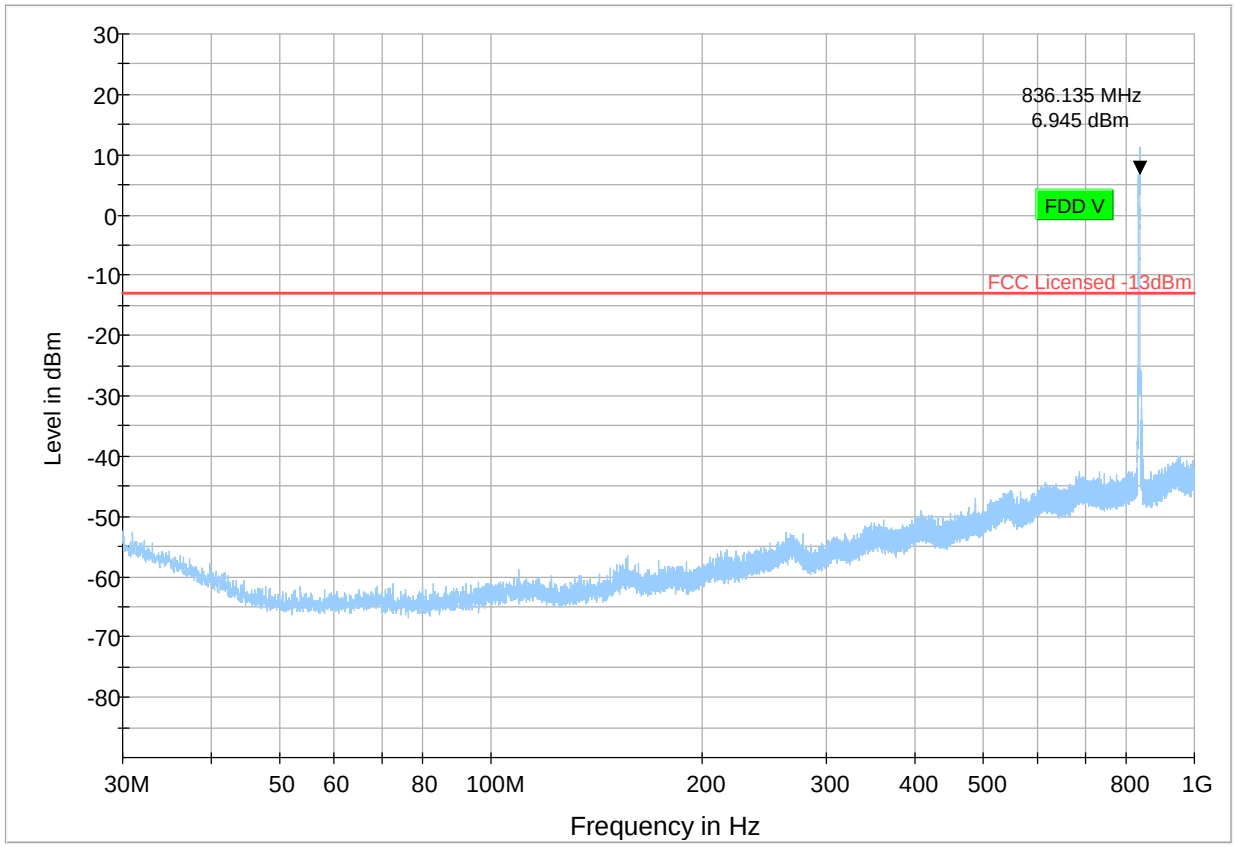
Plot # 45

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



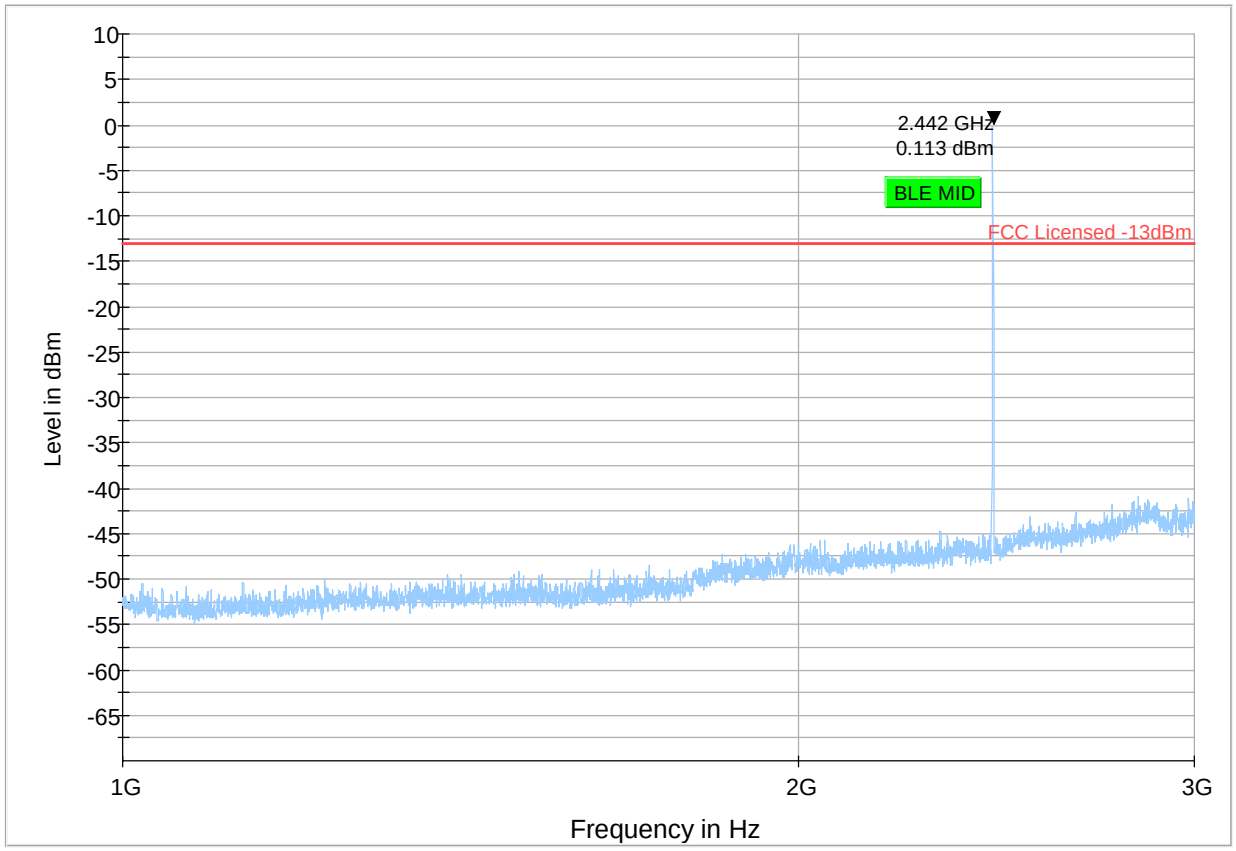
Plot # 46

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



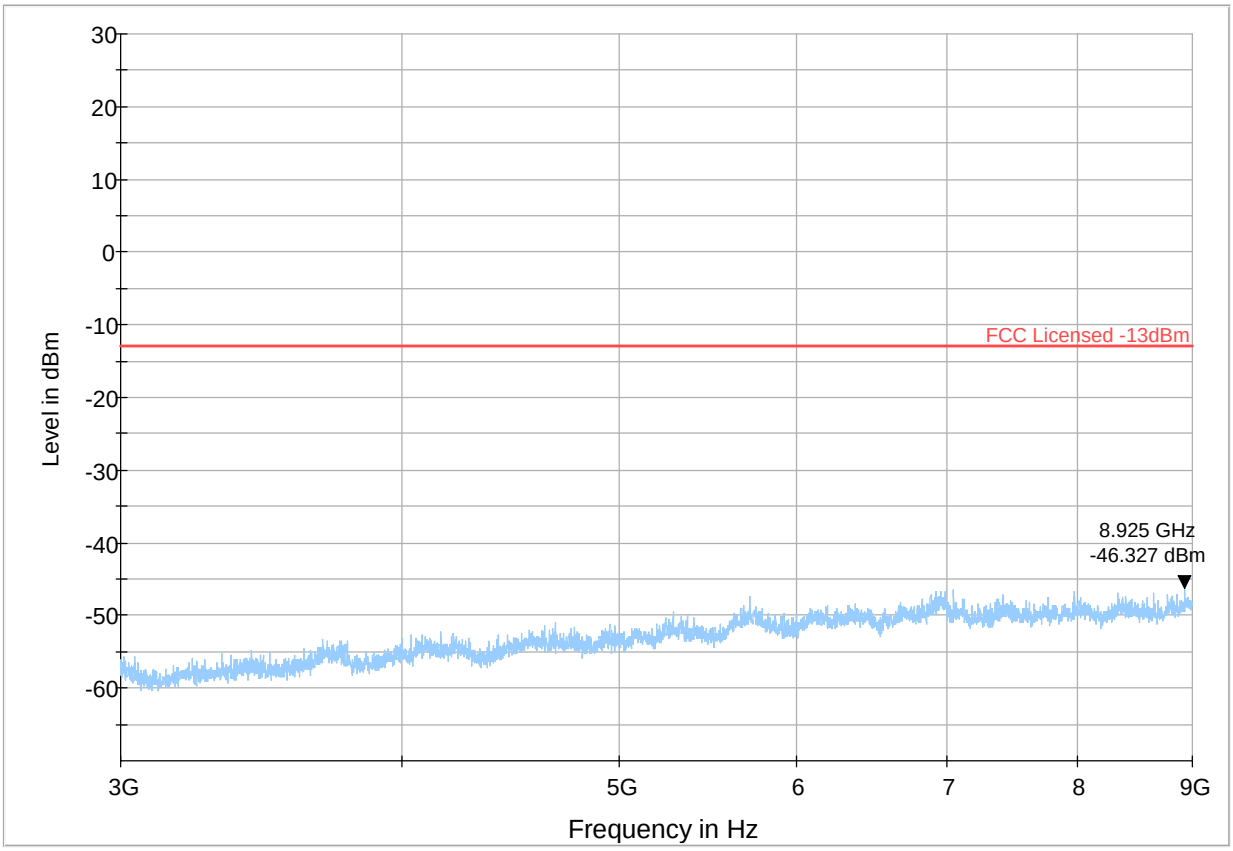
Plot # 47

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
---	---	---	---	---	---	---	---		---	---	---	---	---	---



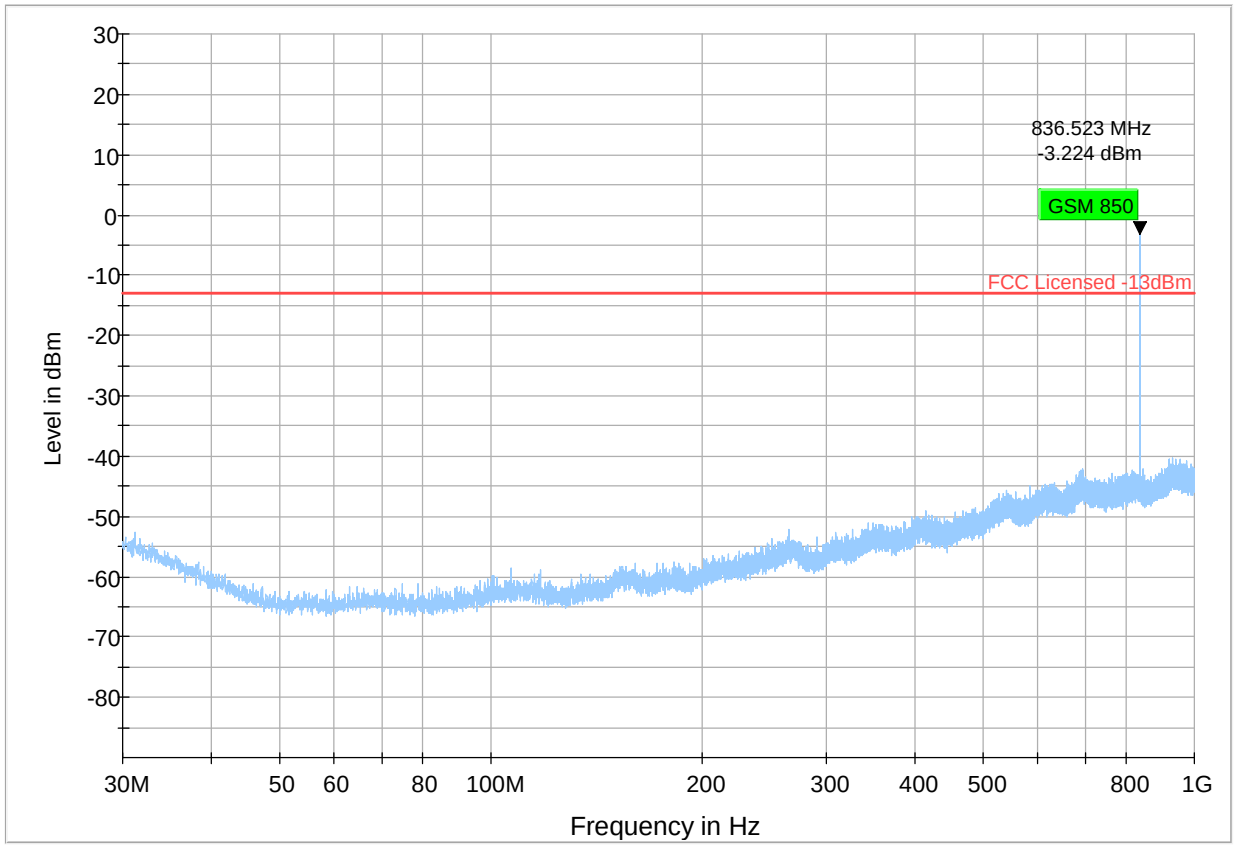
Plot # 48

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



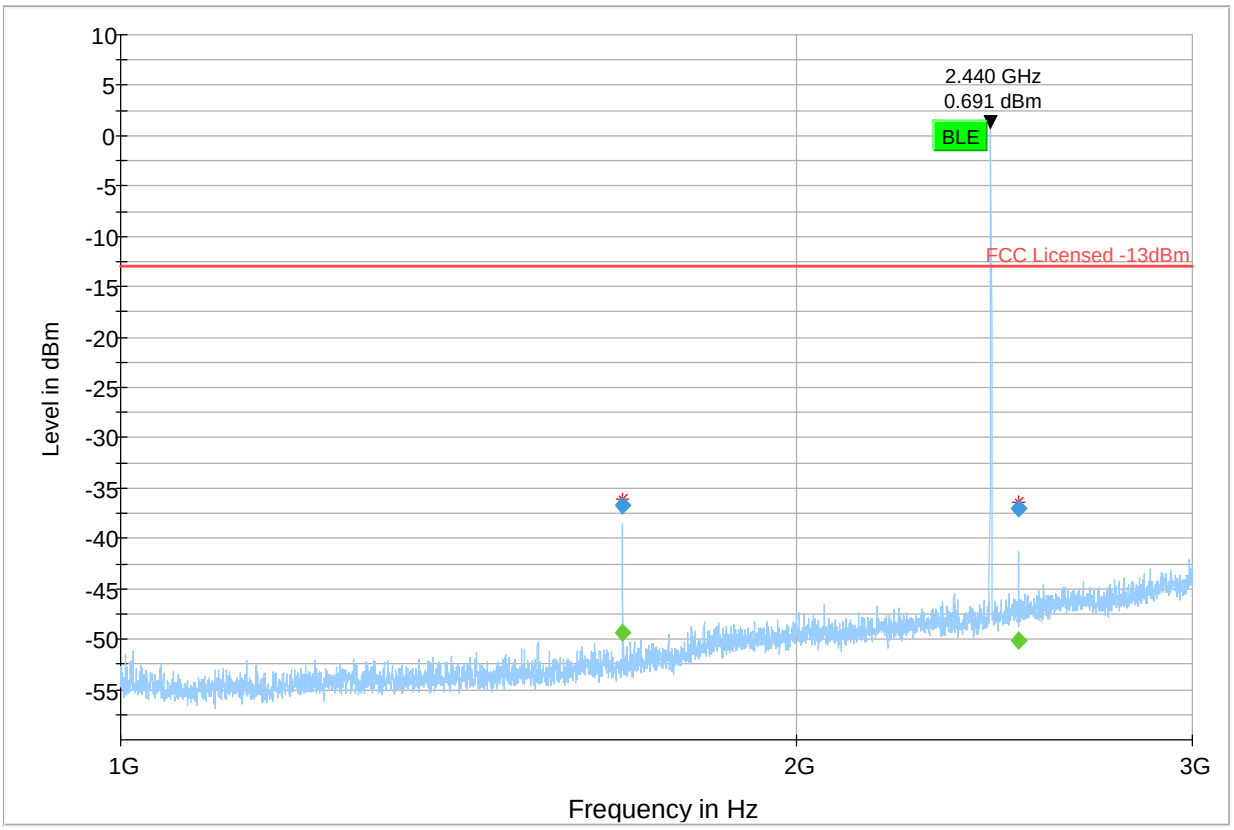
Plot # 49

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



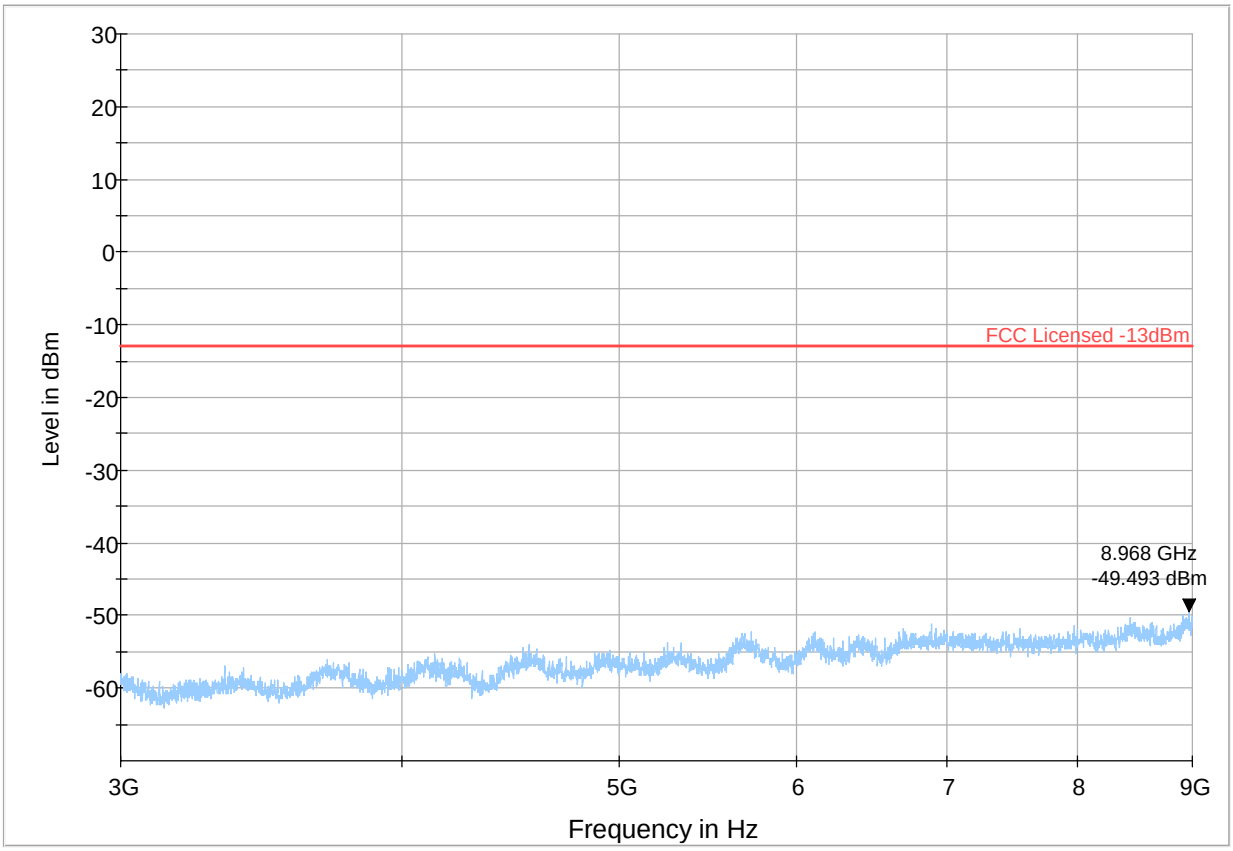
Plot # 50

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1673.000	-36.79	---	-13.00	23.79	500.0	1000.000	134.0	V	261.0	-64.9
1673.000	---	-49.42	---	---	500.0	1000.000	134.0	V	261.0	-64.9
2509.750	-37.08	---	-13.00	24.08	500.0	1000.000	142.0	V	127.0	-61.4
2509.750	---	-50.14	---	---	500.0	1000.000	142.0	V	127.0	-61.4



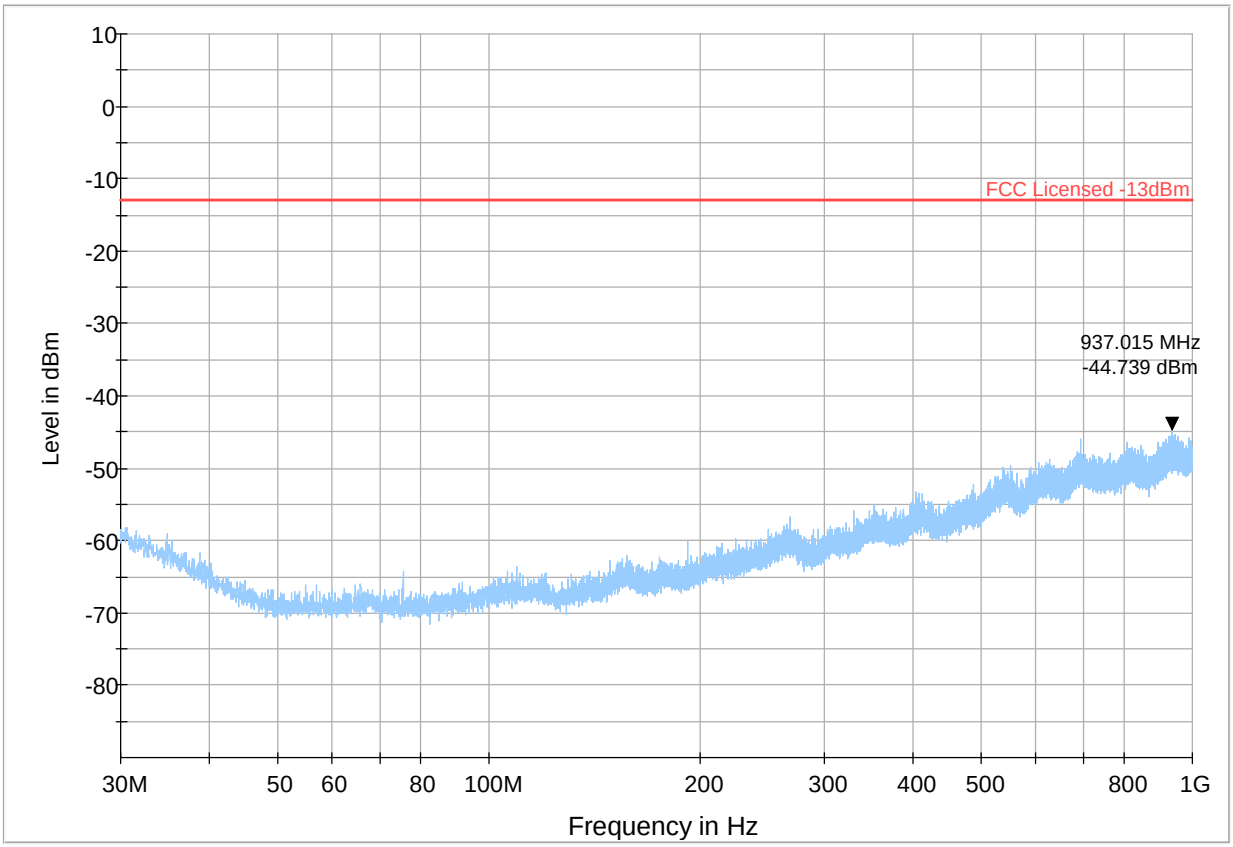
Plot # 51

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



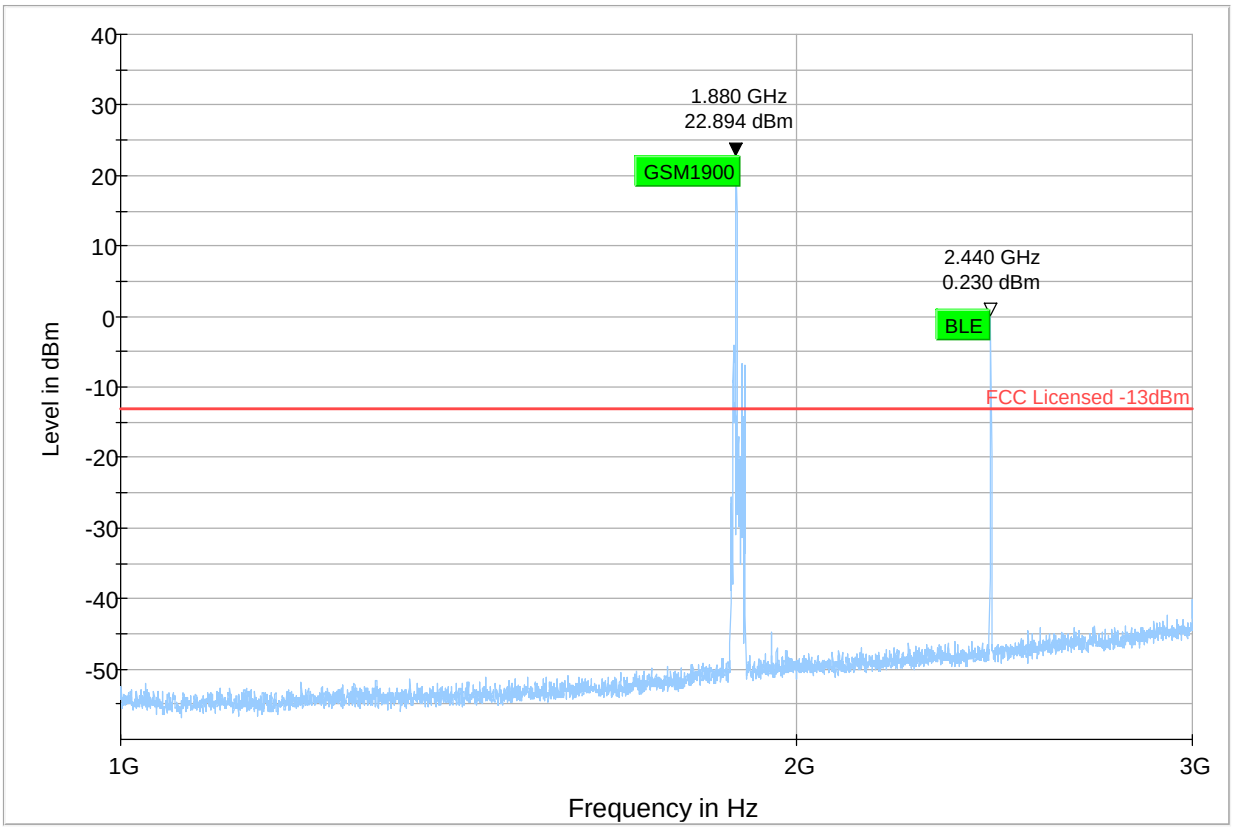
Plot # 52

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



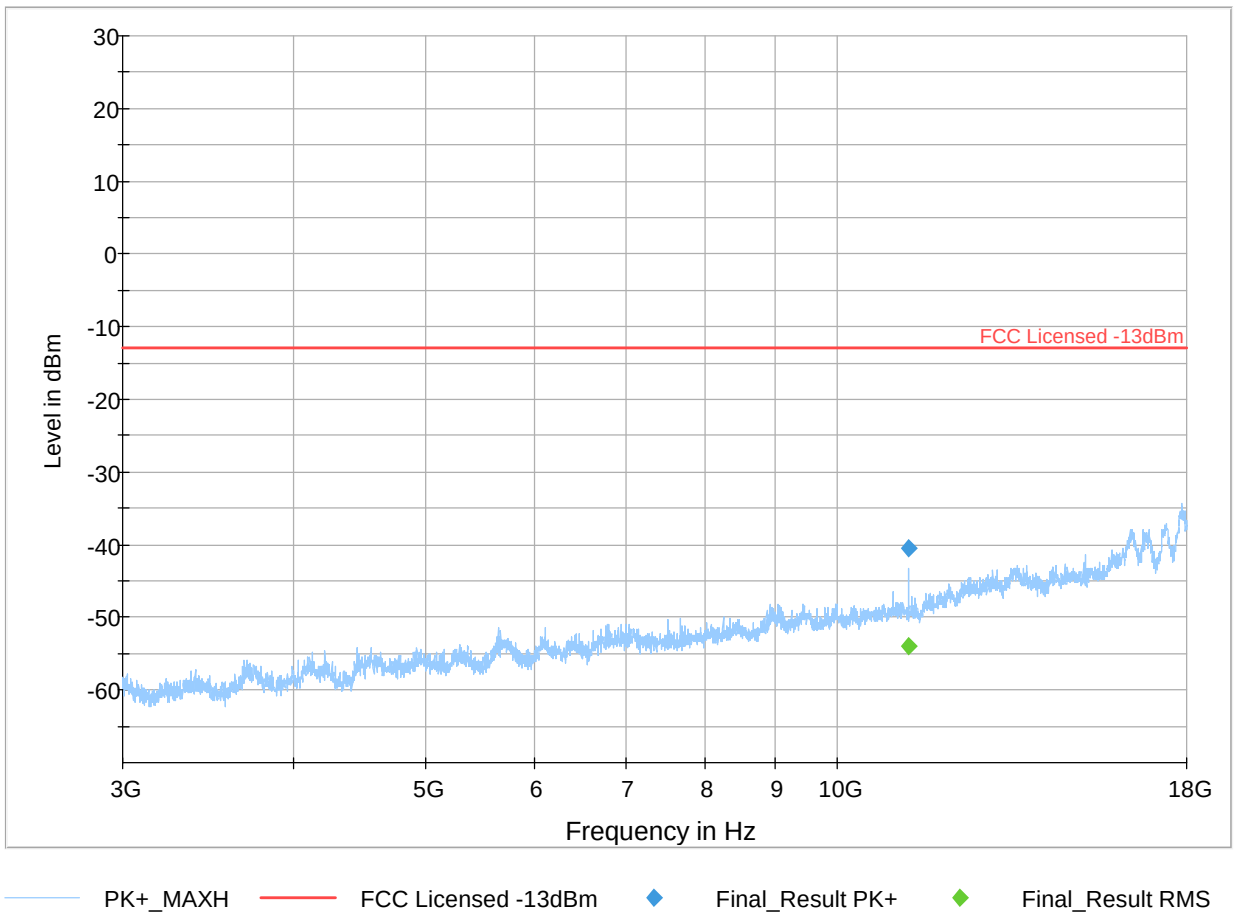
Plot # 53

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



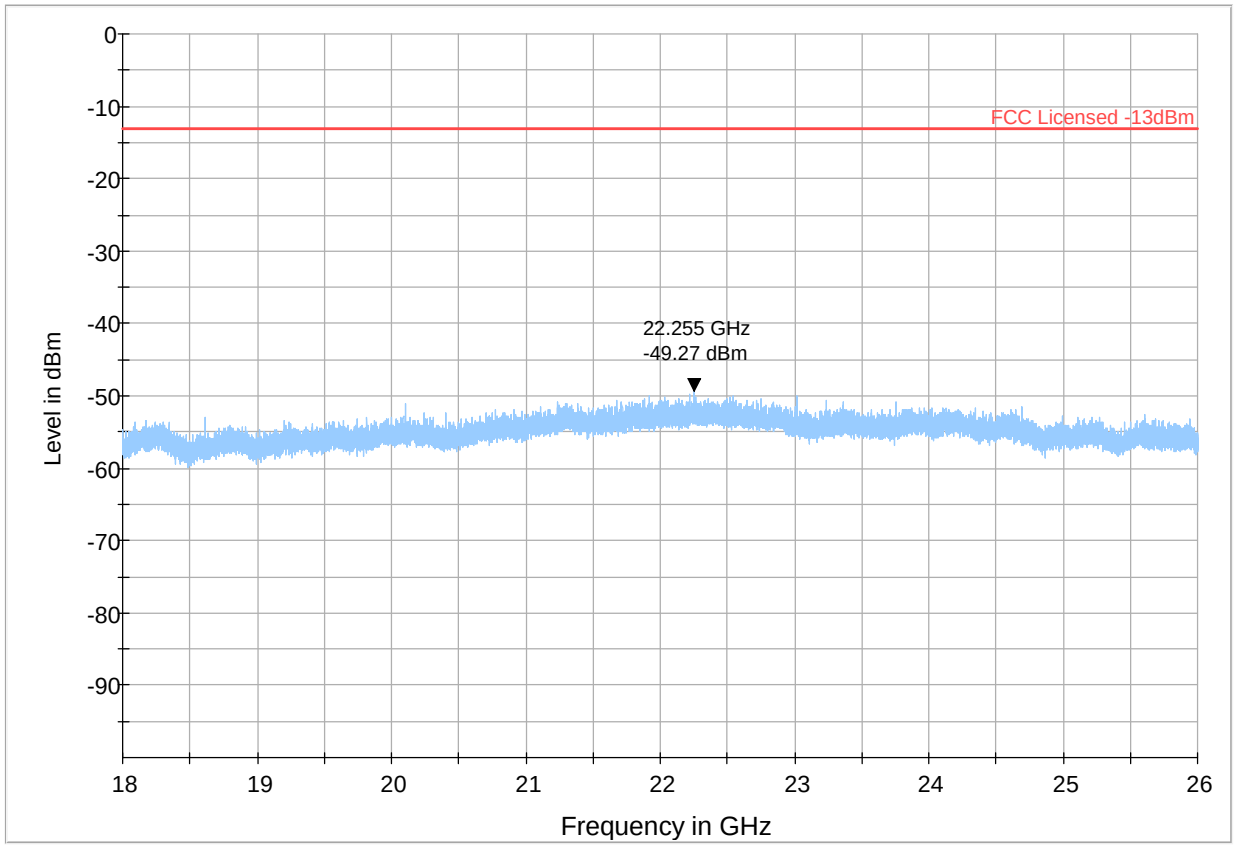
Plot # 54

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec
11280.000	---	-53.92	---	---	500.0	1000.000	241.0	V	87.0	-91.9	11.9	0.0	-103.8	38.0
11280.000	-40.51	---	-13.00	27.51	500.0	1000.000	241.0	V	87.0	-91.9	11.9	0.0	-103.8	51.4



Plot # 55

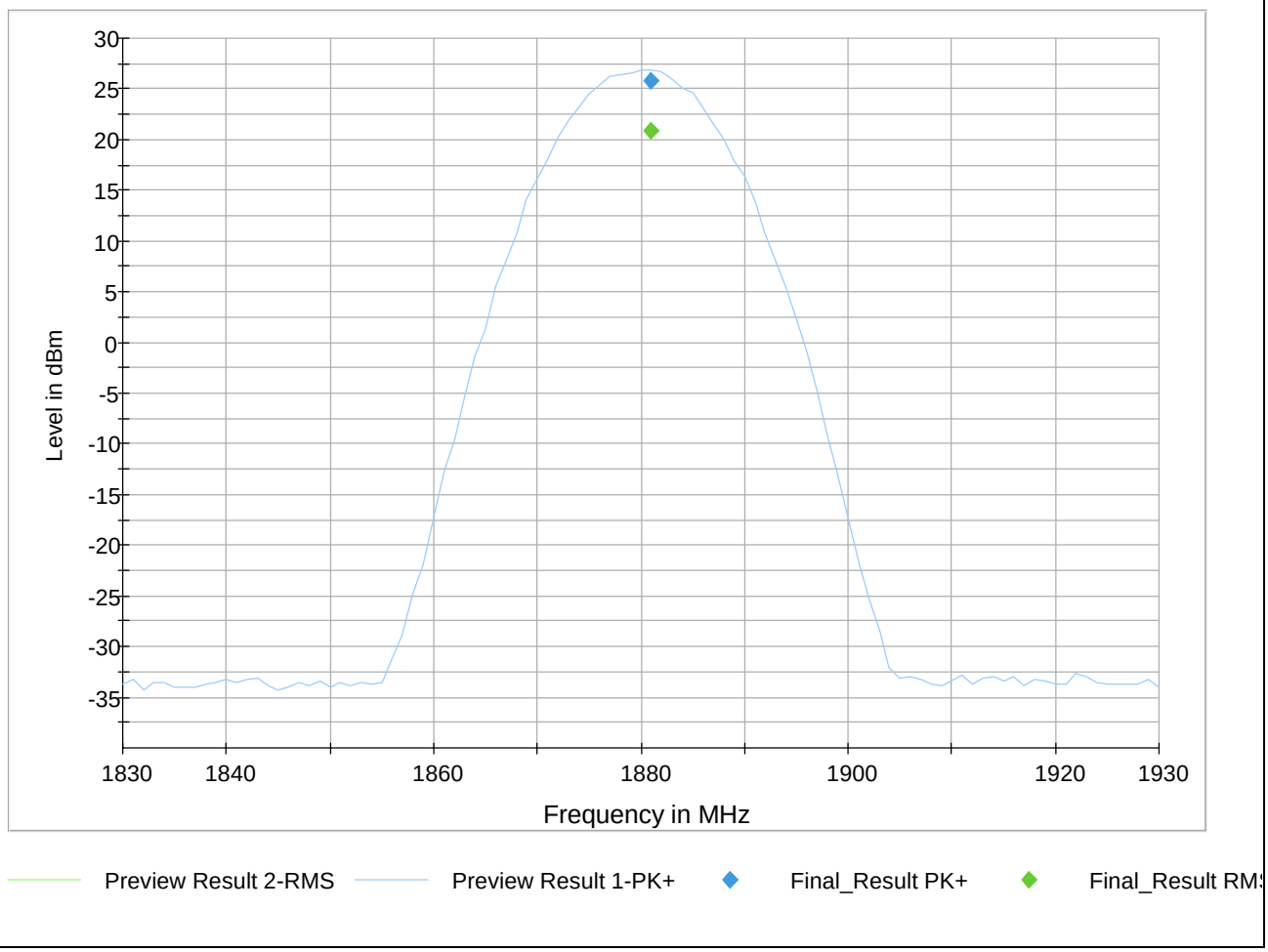
Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
---	---	---	---	---	---	---		---	---	



8.2 Power Verification

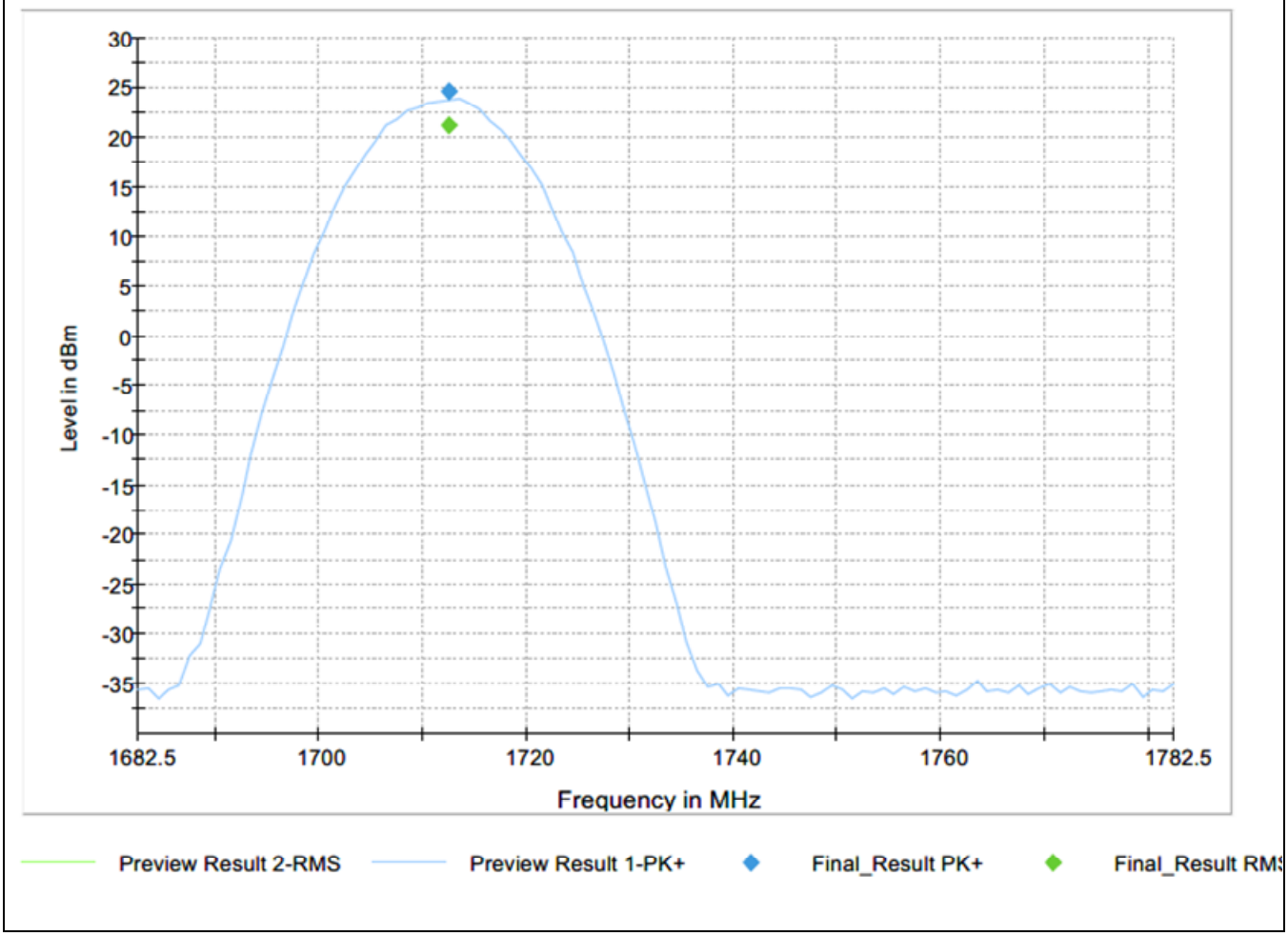
EIRP LTE B2

Frequency	MaxPeak	RMS (dBm	Limit (dBm	Margin	Meas.	Bandwidth	Height	Pol	Azimuth	Corr.	Sig Pat	Preamp	Trd Corr	Raw Rec	Comment
1881.000	---	20.89	---	---	500.0	50000.000	234.0	H	197.0	-	4.1	0.0	-	85.0	
1881.000	25.83	---	---	---	500.0	50000.000	234.0	H	197.0	-	4.1	0.0	-	89.9	



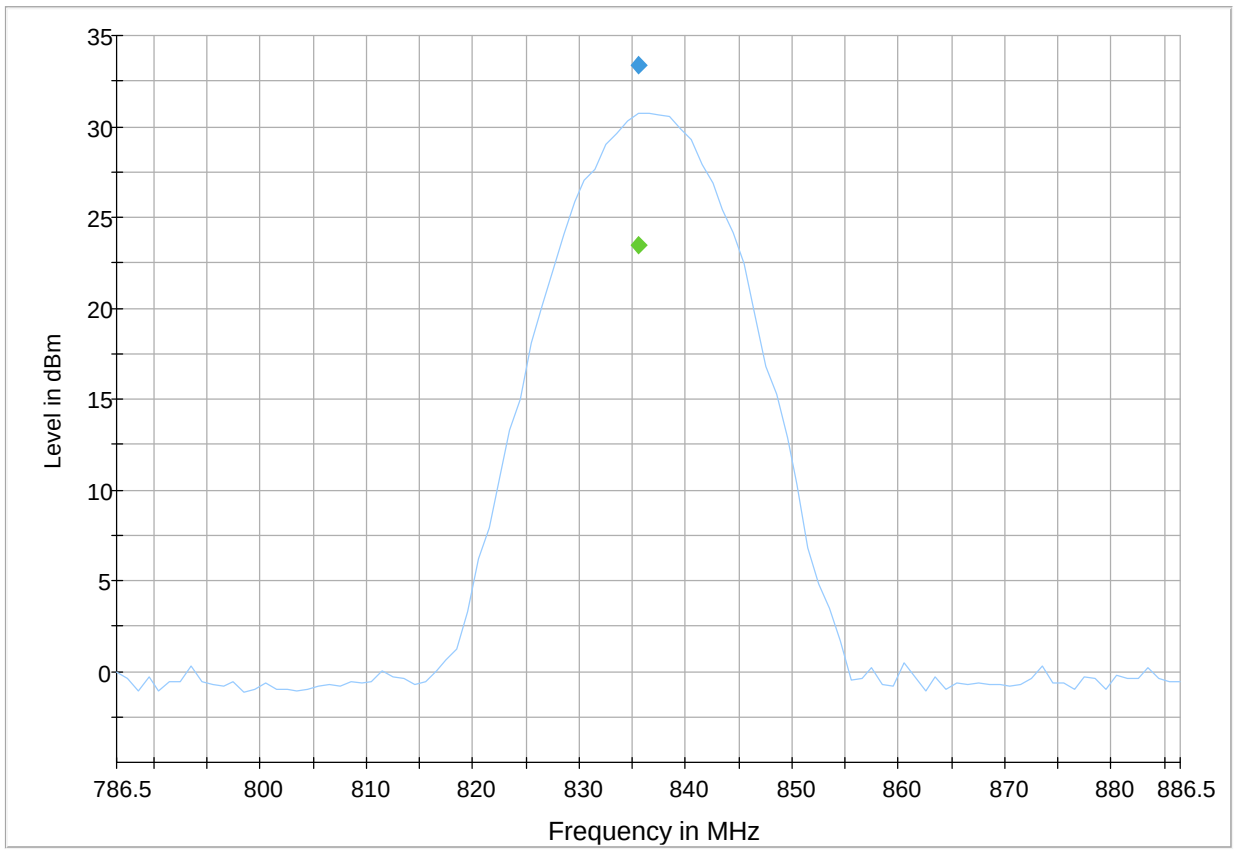
EIRP UMTS IV

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Sig Path	Preamp (dB)	Trd Corr.	Raw Rec	Comment
1712.500	---	21.15	---	---	500.0	50000.000	140.0	H	337.0	-65.3	3.9	0.0	-69.2	86.5	
1712.500	24.65	---	---	---	500.0	50000.000	140.0	H	337.0	-65.3	3.9	0.0	-69.2	90.0	



EIRP GSM 850

Frequency	MaxPeak	RMS (dBm	Limit (dBm	Margin	Meas.	Bandwidth	Height	Pol	Azimuth	Corr.	Sig Pat	Preamp	Trd Corr	Raw Rec	Comment
835.500	---	23.48	---	---	500.0	10000.000	100.0	V	93.0	-	2.4	0.0	-	88.1	
835.500	33.37	---	---	---	500.0	10000.000	100.0	V	93.0	-	2.4	0.0	-	98.0	



9 Test setup photos

Setup photos are included in supporting file name: “EMC_CALAM_136_23001_FCC_Setup_Photos”

10 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
BILOG ANTENNA	A.H. SYSTEMS	BiLA2G	569	2 YEARS	10/30/2023
HORN ANTENNA	EMCO	3115	00035111	2 YEARS	10/26/2023
HORN ANTENNA	ETS LINDGREN	3117-PA	00169547	2 YEARS	9/25/2023
HORN ANTENNA	ETS LINDGREN	3116C-PA	00169535	2 YEARS	10/26/2023
ESW.EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW44	101715	2 YEARS	10/24/2023

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	Template Revision	Changes to report	Prepared by
2023-12-11	EMC_CALAM_136_23001_FCC_22_24_27_90	Initial Version	Cheng Song
2023-12-13	EMC_CALAM_136_23001_FCC_22_24_27_90_Rev1	Updated section 7 Updated section 8.1.4	Cheng Song

<<< The End >>>