FCC/ISED Test Report

FOR:
Motive Technologies, Inc.

Model Name:
LBB-3.6CA-b

Product Description:
LBB-3.6CA-b is a Vehicle Gateway. Its purpose is to act as the primary gateway between various pieces of hardware and software in a motor vehicle and the Motive Technologies database back-end in the cloud.

FCC ID: 2AQM7-36B
IC ID: 24516-36B

Applied Rules and Standards:
47 CFR: Part 22, Part 24, Part 27
RSS-130 Issue 2; RSS-132 Issue 3; RSS-133 Issue 6; RSS-139 Issue 3

REPORT #: EMC_KPTRK-030-22001_FCC_22_24_27

DATE: 08-15-2022

A2LA Accredited

IC recognized #
3462B-2
CABID: US0187

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: info@cetecom.com ◆ http://www.cetecom.com
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 for radiated spurious emissions in simultaneous transmission of cellular and unlicensed radios according to criteria specified in the Code of Federal Regulations Title 47 parts 22, 24, 27 and Industry Canada Radio Standard Specifications RSS: 130 Issue 2, 132 Issue 3, 133 Issue 6 and 139 Issue 3.

Company	Description	Model #
Motive Technologies, Inc.	LBB-3.6CA-b is a Vehicle Gateway. Its purpose is to act as the primary gateway between various pieces of hardware and software in a motor vehicle and the Motive Technologies database back-end in the cloud.	LBB-3.6CA-b

No deficiencies were ascertained.

Responsible for Testing Laboratory:

Date	Section	Name	Signature
08-15-2022	Compliance	Kevin Wang (Lab Manager)	kevin.wang@cetecom.com Digitally signed by: kevin.wang@cetecom.com DN: CN = kevin.wang@cetecom.com Date: 2022.09.26 16:44:43 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
08-15-2022	Compliance	Kris Lazarov (Test Engineer)	Kris Lazarov Digitally signed by Kris Lazarov Date: 2022.09.26 16:22:43 -07'00'

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
Lab Manager:	Kevin Wang
Responsible Project Leader:	Akanksha Baskaran

2.2 Identification of the Client

Client's Name:	Motive Technologies, Inc.
Street Address:	55 Hawthorne Street #400
City/Zip Code	San Francisco, California 94105
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:	LBB-3.6CA-b
HW Version :	1
SW Version :	75012
FCC-ID :	2AQM7-36B
ISED-ID:	24516-36B
FWIN:	N/A
HVIN:	LBB-3.6CA-b
PMN:	Vehicle Gateway
Product Description:	LBB-3.6CA-b is a Vehicle Gateway. Its purpose is to act as the primary gateway between various pieces of hardware and software in a motor vehicle and the Motive Technologies database back-end in the cloud.
Radio Information:	Sierra Wireless module number RC7612 FCC ID: N7NRC76C ISED ID: 2417C-RC76C
Antenna Information as declared:	Model Name : WCDMA/LTE Main Antenna Part No : CWT0020P Type & Gain : Inverted–F Antenna (IFA); Max Gain 2.7dBi
Power Supply/ Rated Operating Voltage Range:	Vmin: 6 VDC/ Vnom: 12 VDC / Vmax: 32 VDC
Operating Temperature Range	Low -20ºC, Nominal 20ºC, High 85ºC
Other Radios included in the device:	WLAN & Bluetooth Manufacture: Laird Connectivity module number: LSR 450-0159R FCC ID: TFB-1003 ISED ID: 5969A-1003
Sample Revision	☐Prototype Unit; ☐Production Unit; ■Pre-Production
EUT Dimensions(mm)	110 X 105 X 25
Weight(grams):	260

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	AABL36MC270022	1	75012	Radiated Measurement

3.3 Accessory Equipment details

AE #	Type	Model	Manufacturer	Serial Number
1	Vehicle Cable	-	-	-

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT# 1 +AE# 1	

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	Co-transmission Cellular & WLAN	Cellular was tested on Mid, Channel for each supported LTE/UMTS band at the maximum power, and co-transmitting with WLAN, also at the mid channel.

3.6 Justification for Worst Case Mode of Operation

During the testing process the EUT was tested with transmitter sets on mid channel and co-transmitting with WLAN mid channel at the maximum power transmission. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

4 Subject of Investigation

This test report is to support a new equipment authorization under the FCC ID: 2AQM7-36B, and ISED ID: 24516-36B

The pre-certified module to be integrated is Sierra Wireless RC7612, as described in Section 3, Radiated Spurious Emissions test was performed. Results have been checked to meet limits per Code of Federal Regulations Title 47 parts 22, 24, 27 and Industry Canada Radio Standard Specifications RSS: 130 Issue 2, 132 Issue 3, 133 Issue 6 and 139 Issue 3.

4.1 Dates of Testing:

08/03/2022 – 08/18/2022

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.

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

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%

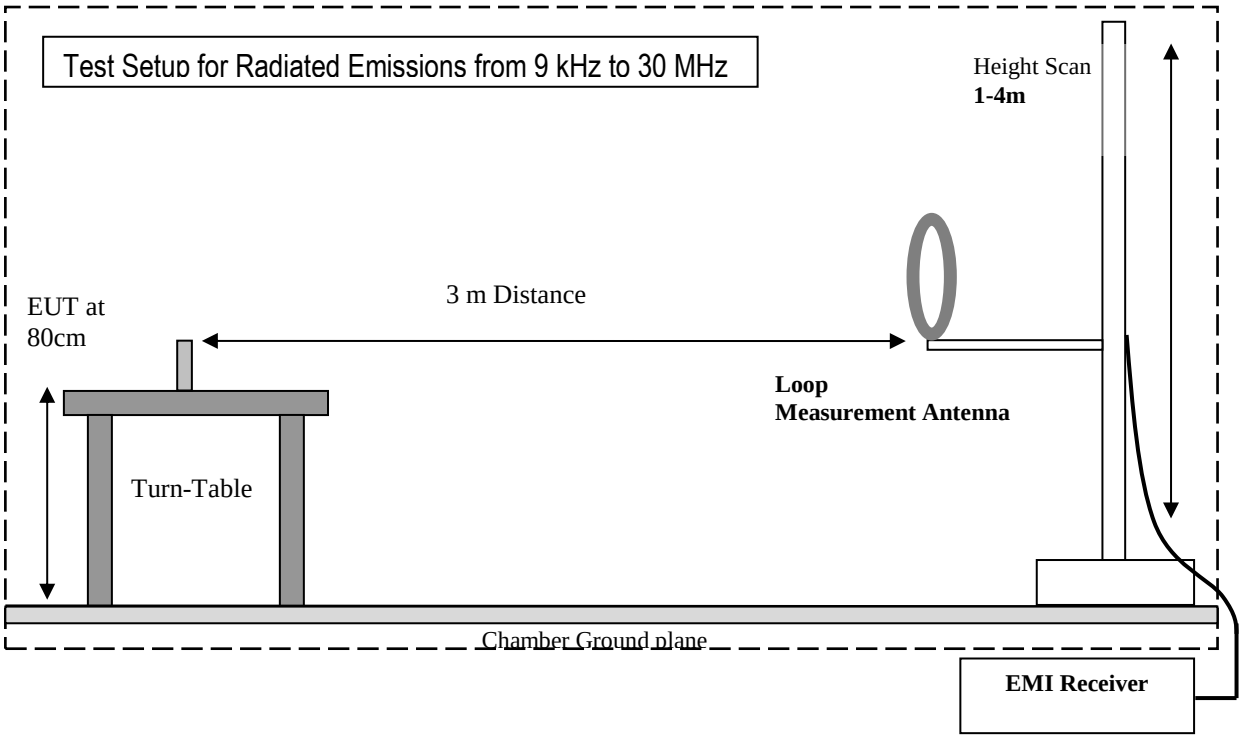
Deviating test conditions are indicated at individual test description where applicable.

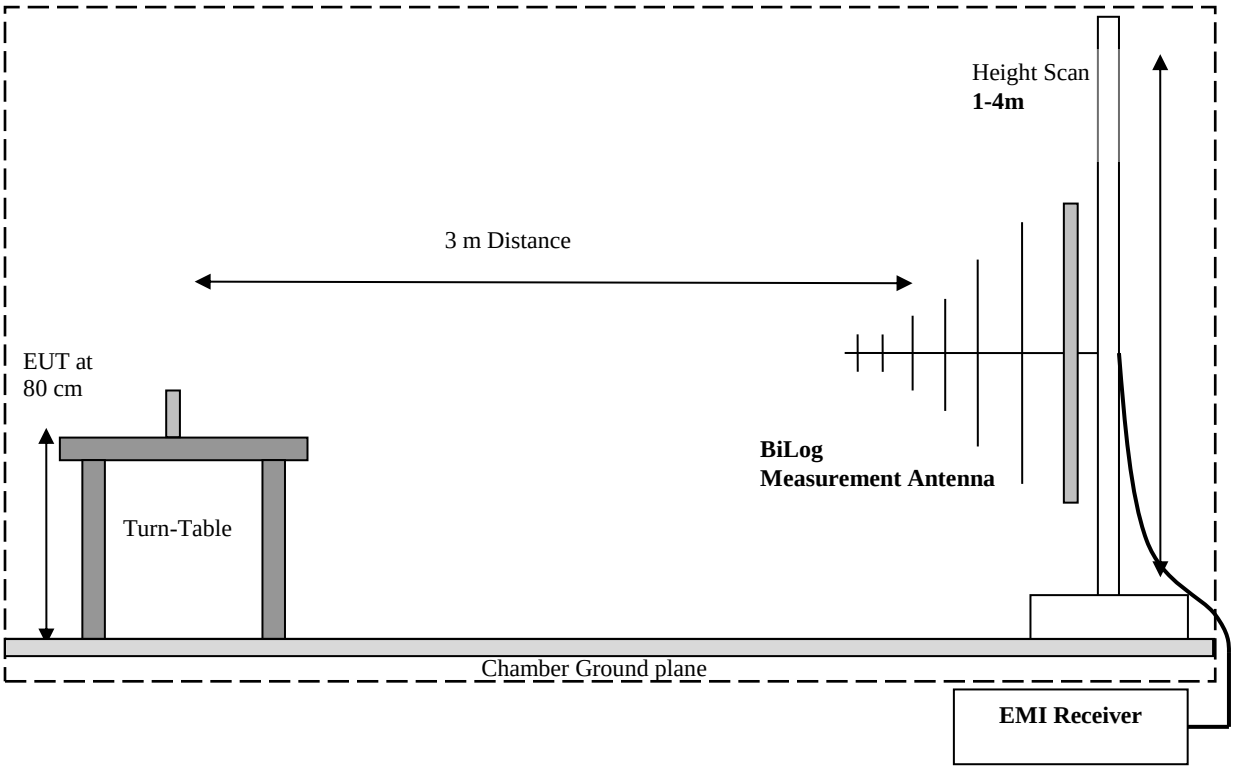
5 Measurement Procedures

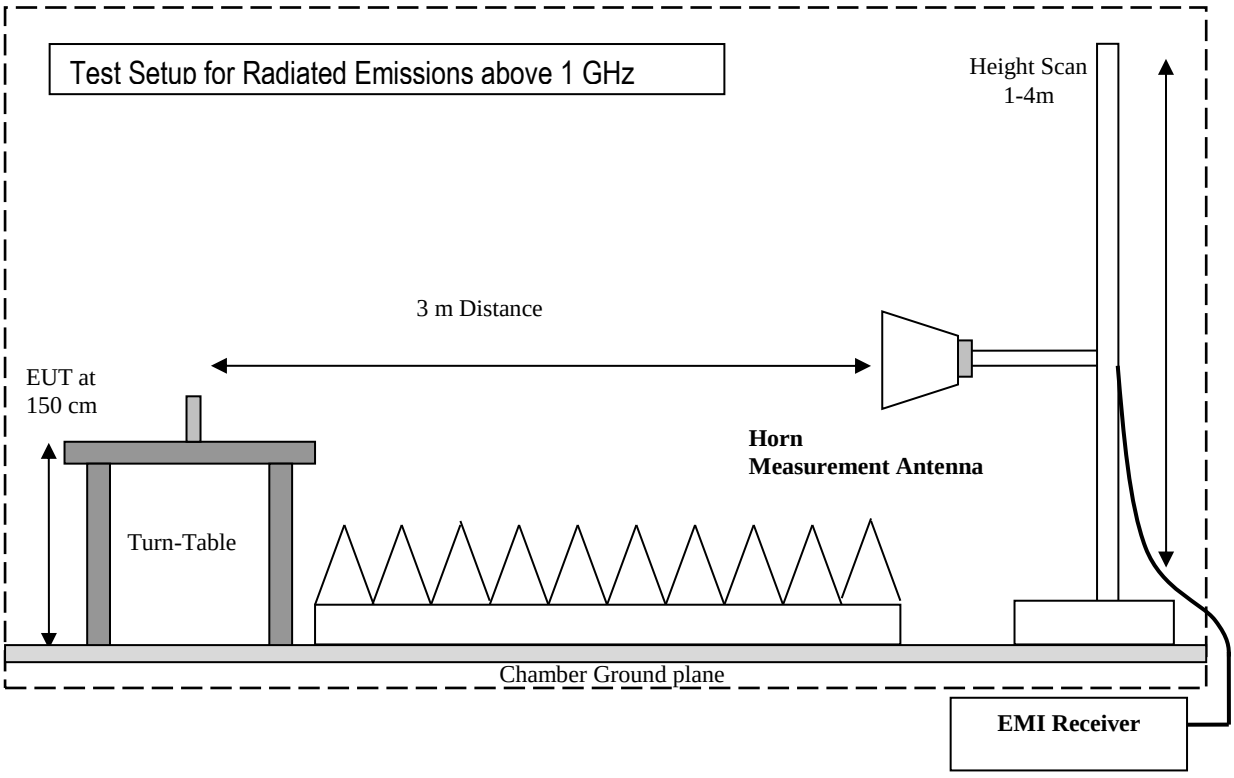
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03 – "Measurement Guidance for Certification of Licensed Digital Transmitters" and according to ANSI C63.26 as detailed below.

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.




Height Scan
1-4m
3 m Distance
EUT at
80 cm
BiLog
Measurement Antenna
Turn-Table
Chamber Ground plane
EMI Receiver


Test Setup for Radiated Emissions above 1 GHz
Height Scan
1-4m
3 m Distance
EUT at
150 cm
Horn
Measurement Antenna
Turn-Table
Chamber Ground plane
EMI Receiver

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 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, 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 Note 2
§2.1055; §22.355	Frequency Stability	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1049; §22.917	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §22.917	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §22.917	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1053; §22.917(a); RSS-132 Issue 3-5.5;	Radiated Spurious Emissions	Nominal	Op.1	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification FCC ID: / IC ID: N7NRC76C / 2417C-RC76C and documented in Reports No.: BTL-FCCP-1-2203T030, BTL-FCCP-2-2203T030, Report No.: BTL-FCCP-3-2203T030 Issue Date: 2022/6/21 (Technology: UMTS & LTE)

6.2 FCC 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 Note 2
§2.1055; §24.235	Frequency Stability	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1049; §24.238	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §24.238	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §24.238	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1053; §24.238(a); RSS-133 Issue 6-6.5.1;	Radiated Spurious Emissions	Nominal	Op.1	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification FCC ID: / IC ID: N7NRC76C / 2417C-RC76C and documented in Relevant Reports No.: BTL-FCCP-1-2203T030, BTL-FCCP-2-2203T030, Report No.: BTL-FCCP-3-2203T030 Issue Date: 2022/6/21 (Technology: UMTS & LTE)

6.3 FCC 27, RSS-130, RSS-139:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §27.50 (d)	RF Output Power	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1055; §27.54	Frequency Stability	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1049; §27.53	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §27.53	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §27.53	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1053; §27.53(g); §27.53(h); RSS-130 Issue 2-4.6; RSS-139 Issue 3-6.6;	Radiated Spurious Emissions	Nominal	Op.1	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification FCC ID: / IC ID: N7NRC76C / 2417C-RC76C and documented in Relevant Reports No.: BTL-FCCP-1-2203T030, BTL-FCCP-2-2203T030, Report No.: BTL-FCCP-3-2203T030 Issue Date: 2022/6/21 (Technology: UMTS & LTE)

6.4 E.I.R.P. Calculated

Band	Frequency Range (MHz)	Power conducted (W)	Emission Designator	Antenna Gain (dBi)	Linear Gain	(W) EIRP[1]	(W) ERP[1]	(ppm) Frequency deviation	Limit ERP (W)
WCDMA II	1850.0 - 1910.0	0.171	4M14F9W	2.7	1.862	0.318	-	2.5	2
WCDMA IV	1710.0 - 1755.0	0.182	4M14F9W	2.7	1.862	0.339	-	2.5	1
WCDMA V	824.0 - 849.0	0.197	4M13F9W	2.7	1.862	0.367	0.224	2.5	7
LTE 2	1850.0 - 1910.0	0.191	17M9G7D	2.7		0.356	-	2.5	2
LTE 2	1850.0 - 1910.0	0.157	17M9W7D	2.7	1.862	0.292	-	2.5	2
LTE 4	1710.0 - 1755.0	0.17	17M9G7D	2.7		0.317	-	2.5	1
LTE 4	1710.0 - 1755.0	0.141	17M9W7D	2.7	1.862	0.263	0.194	2.5	1
LTE 5	824.0 - 849.0	0.171	8M96G7D	2.7		0.318	0.194	2.5	7
LTE 5	824.0 - 849.0	0.142	8M98W7D	2.7	1.862	0.264	0.161	2.5	7
LTE 12	699.0 - 716.0	0.17	9M02G7D	2.7		0.317	0.193	2.5	3
LTE 12	699.0 - 716.0	0.141	8M97W7D	2.7	1.862	0.263	0.160	2.5	3
LTE 13	777.0 - 787.0	0.166	8M92G7D	2.7		0.309	0.188	2.5	3
LTE 13	777.0 - 787.0	0.137	8M90W7D	2.7	1.862	0.255	0.156	2.5	3

Note 1: E.I.R.P. are calculated from maximum power in the grant of cellular module RC7612 from sierra Wireless and adding the maximum gain of the utilized cellular antenna per operational description.

7 Test Result Data

7.1 Radiated Spurious Emissions

7.1.1 Measurement according to FCC: CFR 47 Part 2.1053; CFR Part 22.917; CFR Part 24.238 and Part 27.53 utilizing KDB 971168 D01 Power Meas License Digital Systems v03, and according to ANSI C63.26 2017

Spectrum Analyzer Settings for FCC 22

Frequency Range	30 MHz – 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); FCC Part 24.238 (a); FCC Part 27.53 (h); FCC Part 90.699 (a)
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.
2020. 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.

7.1.3 Test conditions and setup:

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

7.1.4 Measurement result:

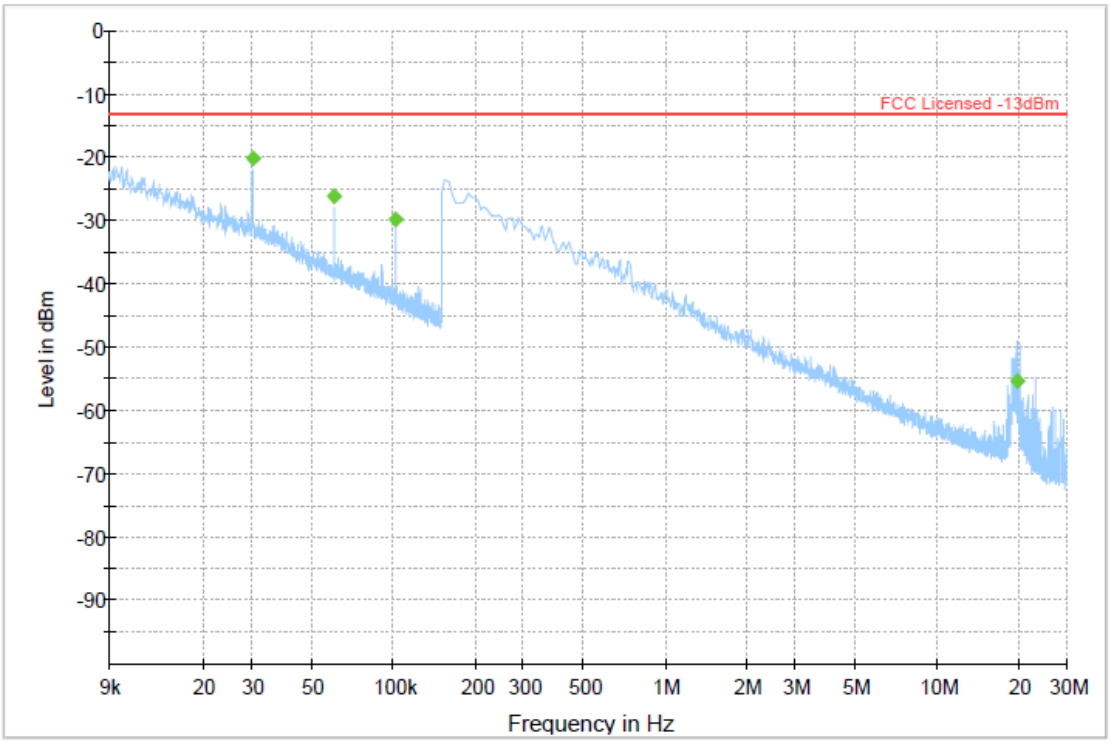
Plot #	EUT Operating Mode	Transmitter Configuration	Scan Frequency	Limit (dBm)	Result
1-4	1	UMTS V + WLAN	9 kHz – 9 GHz	-13	Pass
5-8	1	LTE 5 + WLAN	9 kHz – 9 GHz	-13	Pass
9-12	1	UMTS II + WLAN	9 kHz – 18 GHz	-13	Pass
13-16	1	LTE 2 + WLAN	9 kHz – 18 GHz	-13	Pass
17-20	1	UMTS IV + WLAN	9 kHz – 18 GHz	-13	Pass
21-14	1	LTE 4 + WLAN	9 kHz – 18 GHz	-13	Pass
25-28	1	LTE 12 + WLAN	9 kHz – 9 GHz	-13	Pass
29-32	1	LTE 13 + WLAN	9 kHz – 9 GHz	-13	Pass

7.1.5 Measurement Plots:

Plot # 1 Radiated Emissions: 9 kHz - 30 MHz

Mid Channels UMTS V & WLAN

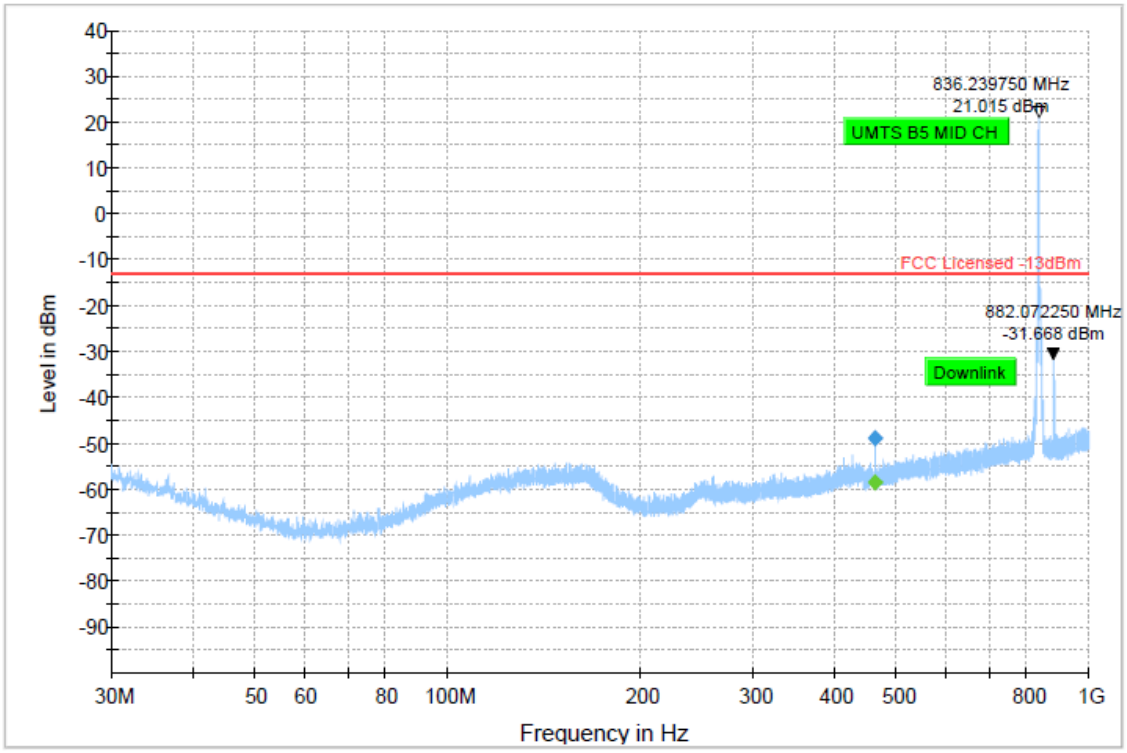
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.03	---	-20.23	---	---	500.0	9.0	100.0	H	-6.0	-73.3
0.06	---	-26.15	---	---	500.0	9.0	100.0	H	88.0	-76.2
0.10	---	-29.90	---	---	500.0	9.0	100.0	V	161.0	-76.9
19.71	---	-55.38	---	---	500.0	9.0	100.0	V	56.0	-78.7



Plot # 2 Radiated Emissions: 30 MHz – 1GHz

Mid Channels UMTS V & WLAN

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
463.52	---	-58.67	---	---	500.0	100.0	107.0	H	157.0	-69.9
463.52	-48.80	---	-13.00	35.80	500.0	100.0	107.0	H	157.0	-69.9

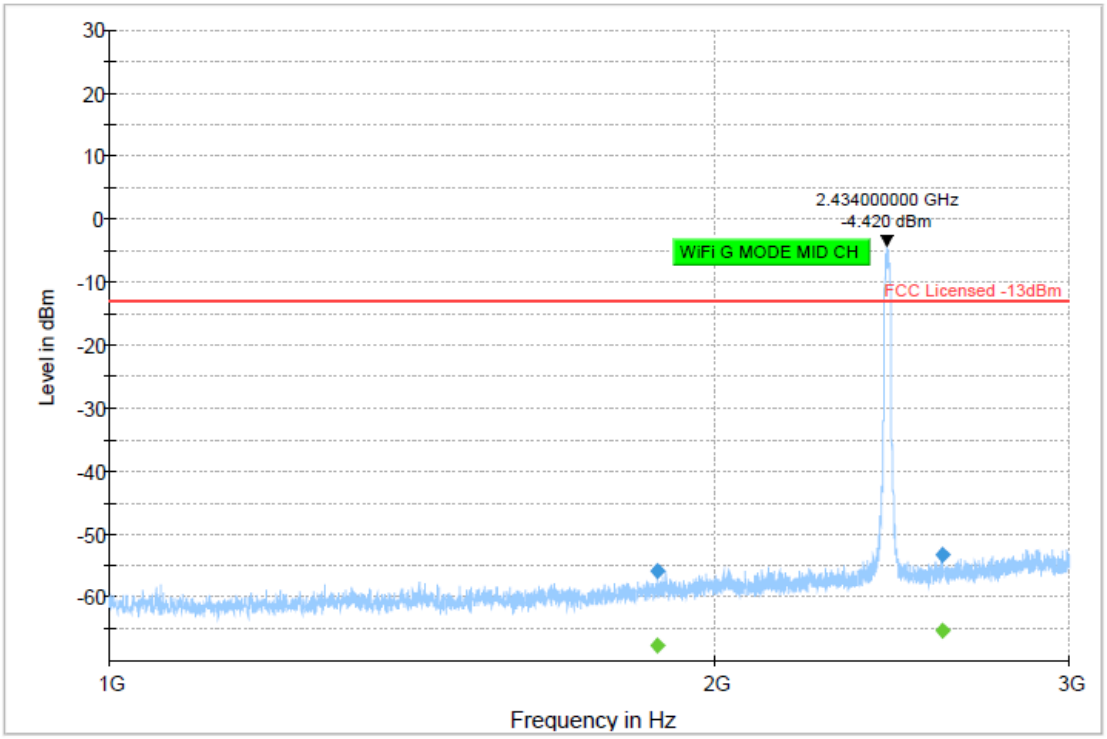


Preview Result 1-PK+ FCC Licensed -13dBm Final_Result PK+ Final_Result RMS

Plot # 3 Radiated Emissions: 1 GHz - 3 GHz

Mid Channels UMTS V & WLAN

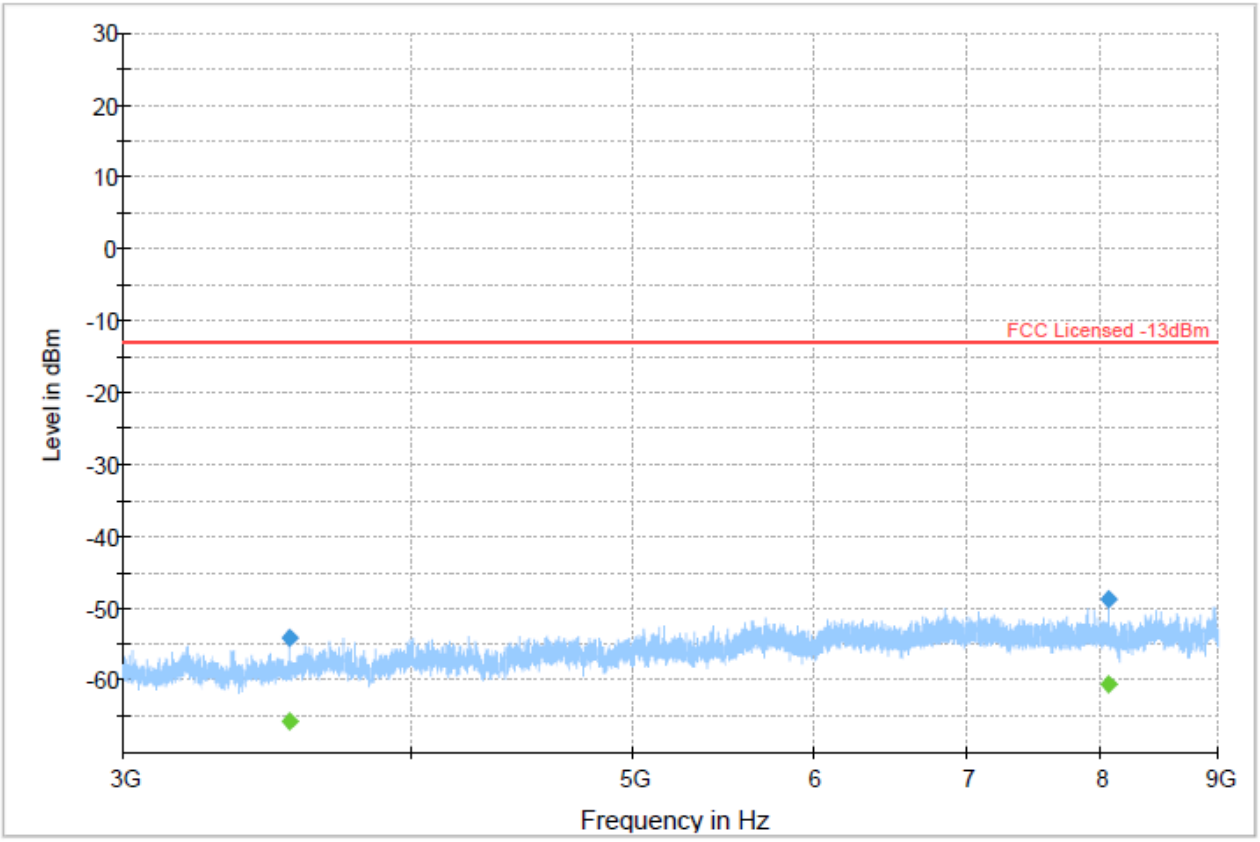
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1872.50	---	-67.65	---	---	500.0	1000.0	295.0	V	122.0	-90.7
1872.50	-55.76	---	-13.00	42.76	500.0	1000.0	295.0	V	122.0	-90.7
2593.75	---	-65.24	---	---	500.0	1000.0	134.0	V	207.0	-88.4
2593.75	-53.28	---	-13.00	40.28	500.0	1000.0	134.0	V	207.0	-88.4



Plot # 4 Radiated Emissions: 3 GHz – 9 GHz

Mid Channels UMTS V & WLAN

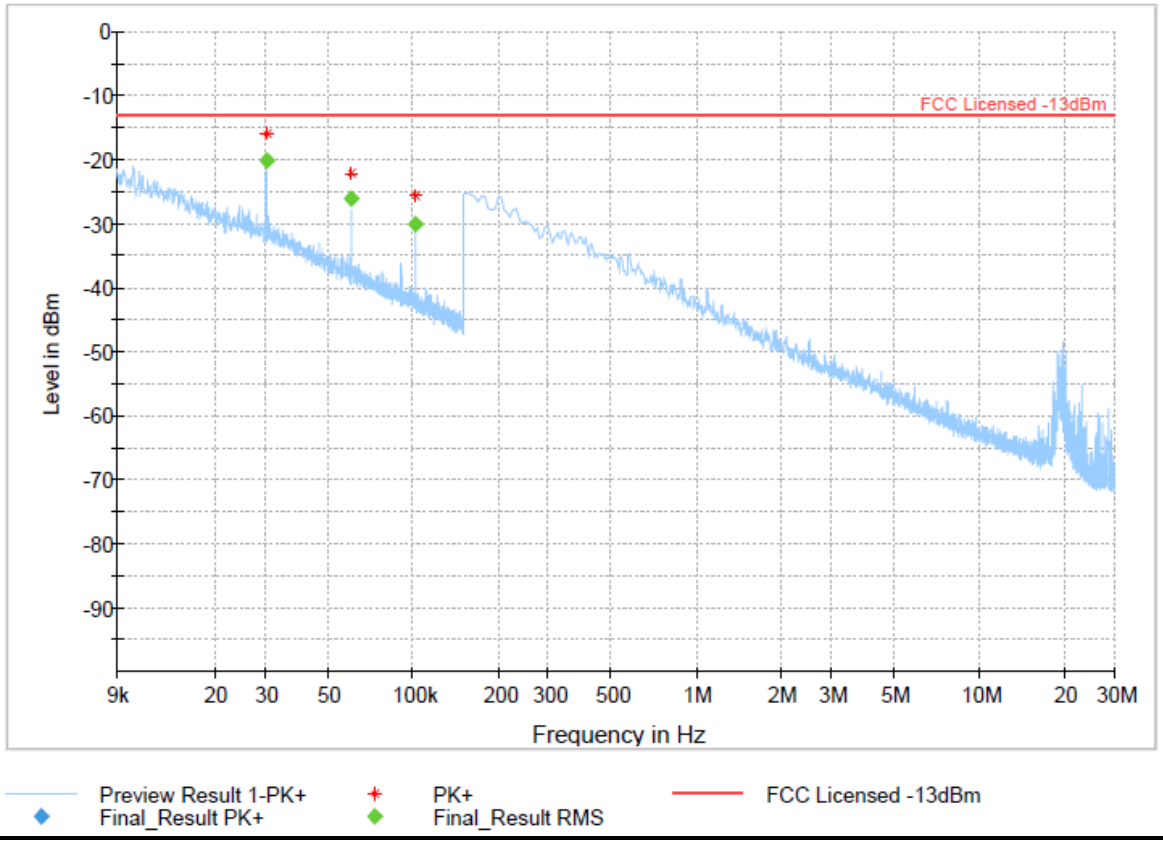
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3546.25	---	-65.66	---	---	500.0	1000.0	260.0	H	335.0	-102.0
3546.25	-54.06	---	-13.00	41.06	500.0	1000.0	260.0	H	335.0	-102.0
8059.00	---	-60.46	---	---	500.0	1000.0	177.0	V	127.0	-94.8
8059.00	-48.68	---	-13.00	35.68	500.0	1000.0	177.0	V	127.0	-94.8



Plot # 5 Radiated Emissions: 9 kHz - 30 MHz

Mid Channels LTE 5 & WLAN

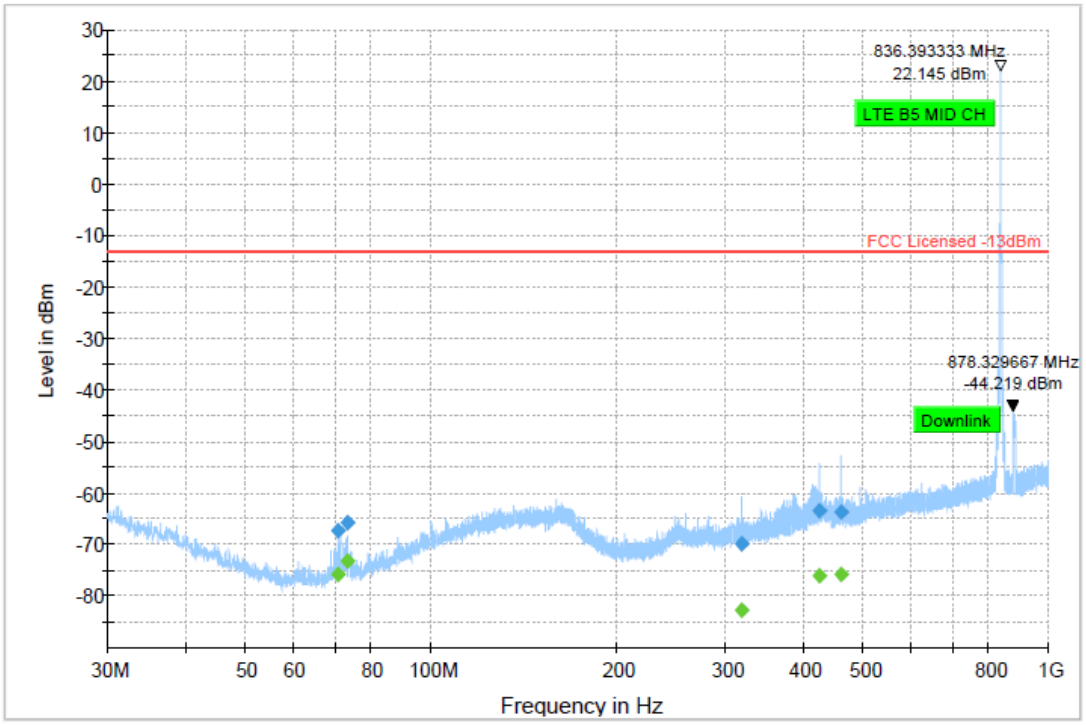
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.03	---	-20.19	---	---	500.0	9.0	100.0	H	11.0	-73.3
0.06	---	-26.05	---	---	500.0	9.0	100.0	H	196.0	-76.2
0.10	---	-30.01	---	---	500.0	9.0	100.0	V	5.0	-76.9



Plot # 6 Radiated Emissions: 30 MHz – 1GHz

Mid Channels LTE 5 & WLAN

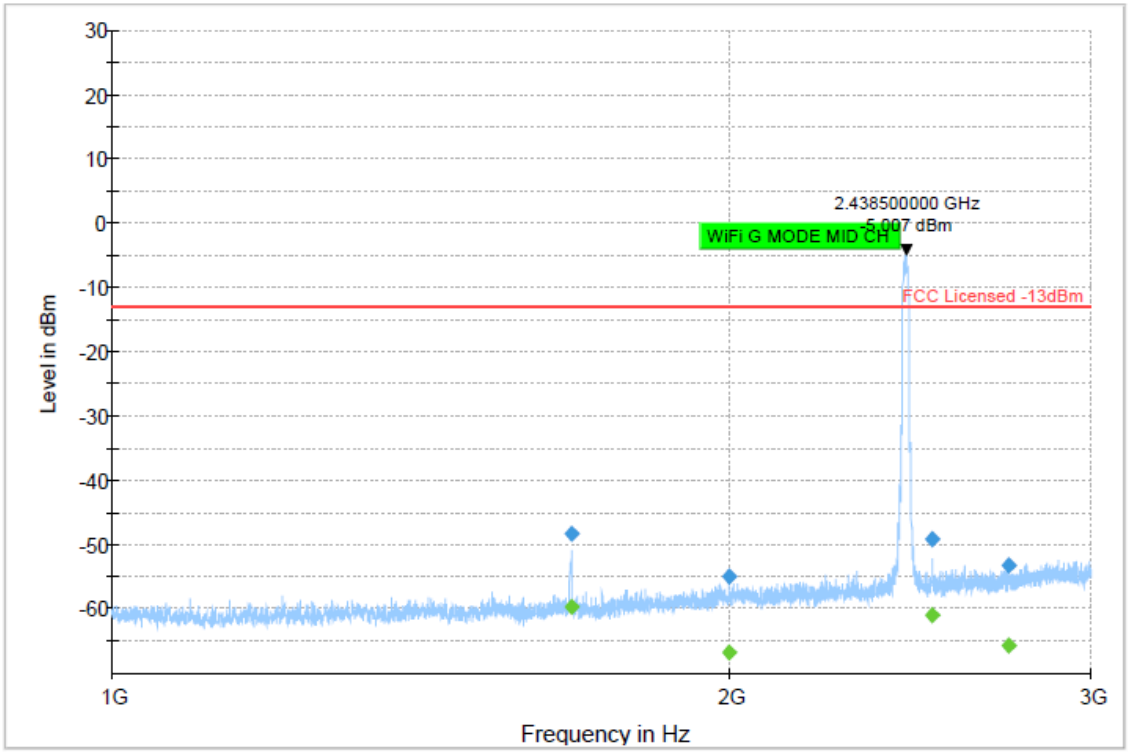
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
70.77	-67.39	---	-13.00	54.39	500.0	100.0	159.0	V	311.0	-81.8
70.77	---	-75.92	---	---	500.0	100.0	159.0	V	311.0	-81.8
73.20	-65.82	---	-13.00	52.82	500.0	100.0	100.0	V	297.0	-81.5
73.20	---	-73.36	---	---	500.0	100.0	100.0	V	297.0	-81.5
319.22	---	-82.89	---	---	500.0	100.0	116.0	H	260.0	-73.5
319.22	-69.97	---	-13.00	56.97	500.0	100.0	116.0	H	260.0	-73.5
425.63	-63.46	---	-13.00	50.46	500.0	100.0	117.0	H	98.0	-71.8
425.63	---	-76.01	---	---	500.0	100.0	117.0	H	98.0	-71.8
460.97	-63.84	---	-13.00	50.84	500.0	100.0	107.0	H	-72.0	-69.9
460.97	---	-75.71	---	---	500.0	100.0	107.0	H	-72.0	-69.9



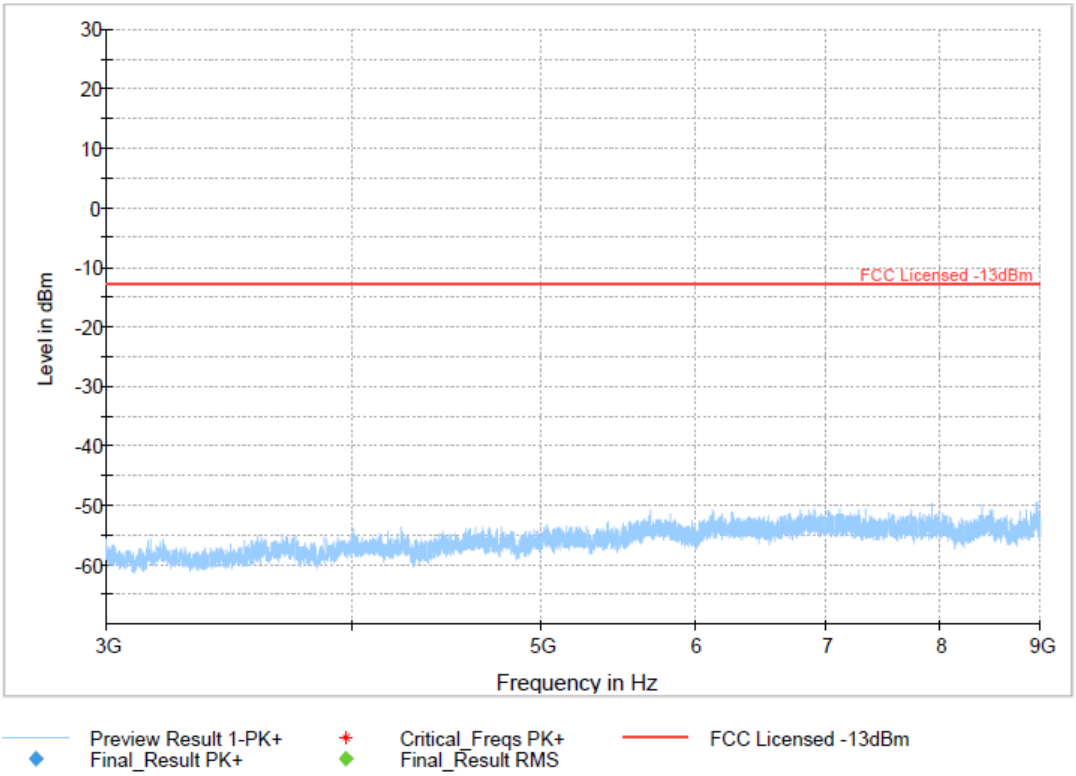
Plot # 7 Radiated Emissions: 1 GHz - 3 GHz

Mid Channels LTE 5 & WLAN

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1674.50	---	-59.71	---	---	500.0	1000.0	133.0	H	156.0	-91.7
1674.50	-48.23	---	-13.00	35.23	500.0	1000.0	133.0	H	156.0	-91.7
1999.25	-55.01	---	-13.00	42.01	500.0	1000.0	314.0	H	298.0	-90.2
1999.25	---	-66.88	---	---	500.0	1000.0	314.0	H	298.0	-90.2
2510.50	-49.20	---	-13.00	36.20	500.0	1000.0	125.0	H	294.0	-88.6
2510.50	---	-61.08	---	---	500.0	1000.0	125.0	H	294.0	-88.6
2734.25	---	-65.80	---	---	500.0	1000.0	254.0	V	226.0	-88.0
2734.25	-53.29	---	-13.00	40.29	500.0	1000.0	254.0	V	226.0	-88.0



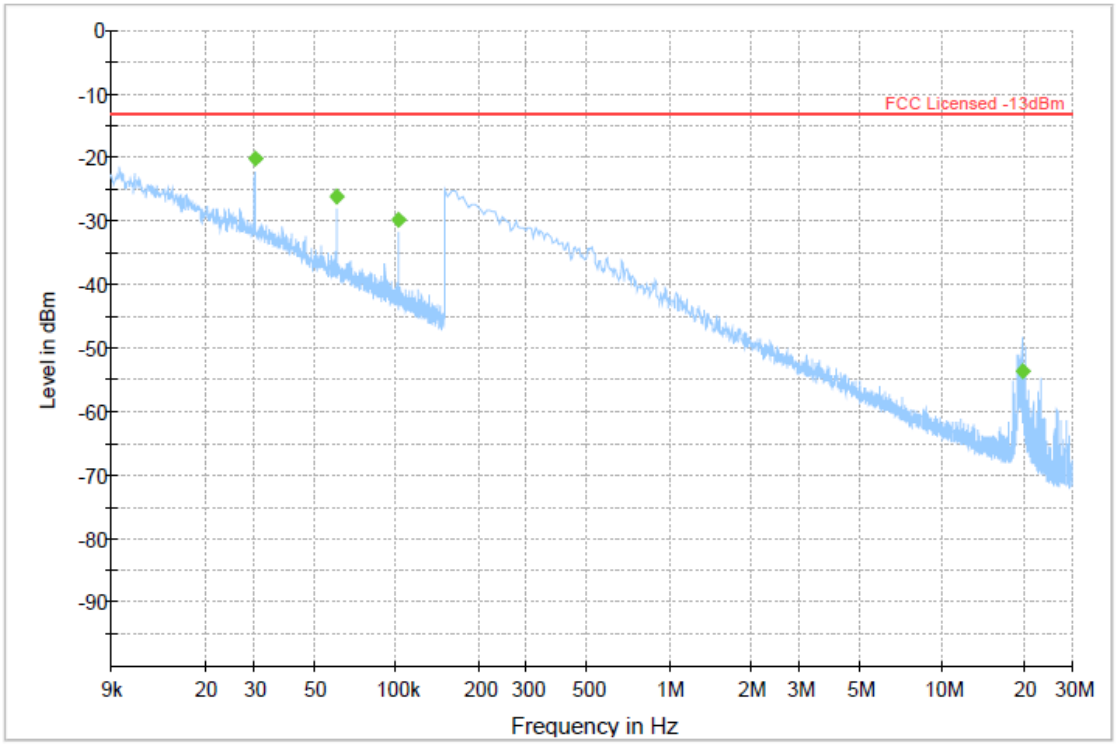
Plot # 8 Radiated Emissions: 3 GHz – 9 GHz
Mid Channels LTE 5 & WLAN



Plot # 9 Radiated Emissions: 9 kHz - 30 MHz

Mid Channels UMTS II & WLAN

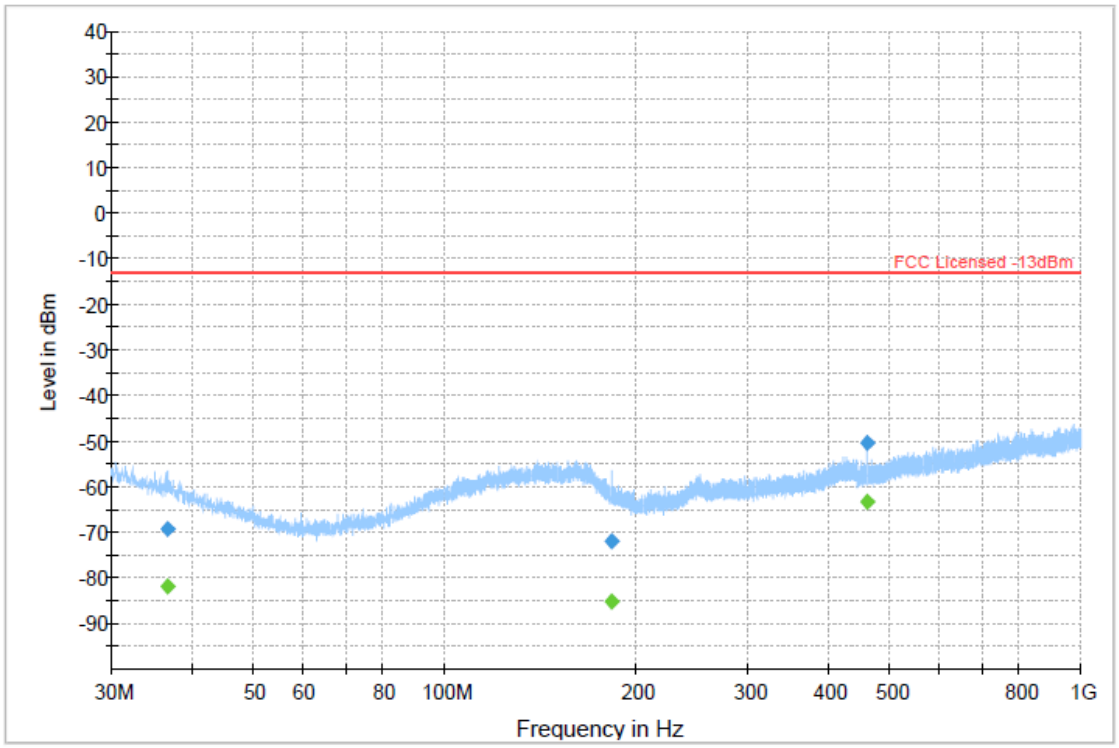
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.03	---	-20.24	---	---	500.0	9.0	100.0	H	276.0	-73.3
0.06	---	-26.13	---	---	500.0	9.0	100.0	H	13.0	-76.2
0.10	---	-29.78	---	---	500.0	9.0	100.0	V	355.0	-76.9
19.71	---	-53.70	---	---	500.0	9.0	100.0	V	134.0	-78.7



Plot # 10 Radiated Emissions: 30 MHz – 1GHz

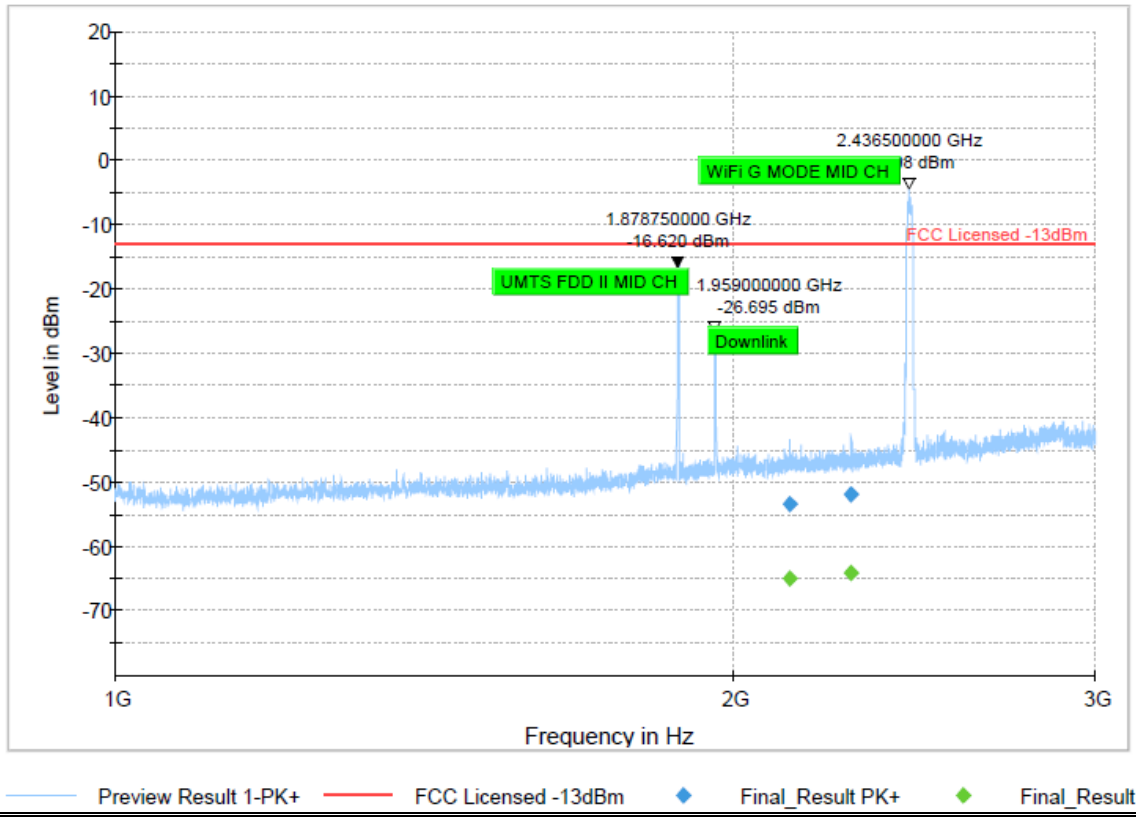
Mid Channels UMTS II & WLAN

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.69	---	-81.95	---	---	500.0	100.0	100.0	H	-43.0	-74.0
36.69	-69.28	---	-13.00	56.28	500.0	100.0	100.0	H	-43.0	-74.0
183.11	-72.18	---	-13.00	59.18	500.0	100.0	177.0	V	166.0	-73.7
183.11	---	-85.38	---	---	500.0	100.0	177.0	V	166.0	-73.7
462.91	-50.57	---	-13.00	37.57	500.0	100.0	151.0	H	173.0	-69.9
462.91	---	-63.37	---	---	500.0	100.0	151.0	H	173.0	-69.9



Plot # 11 Radiated Emissions: 1 GHz - 3 GHz

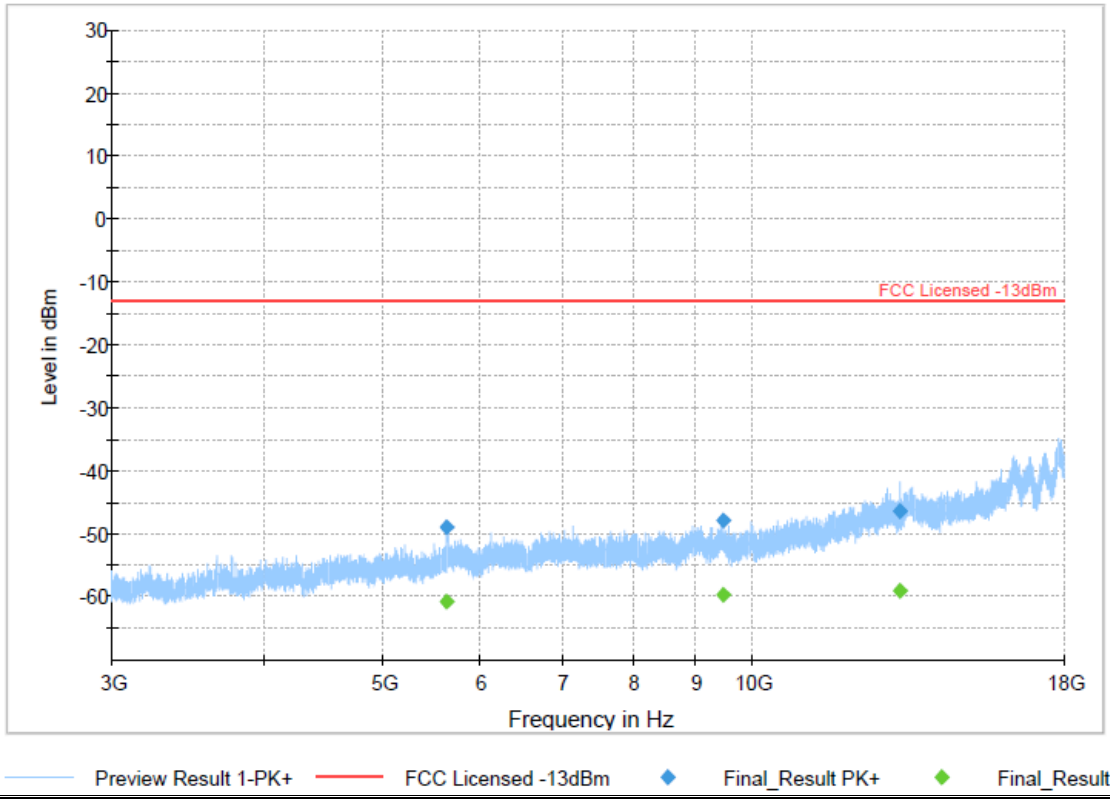
Mid Channels UMTS II & WLAN



Plot # 12 Radiated Emissions: 3 GHz – 18 GHz

Mid Channels UMTS II & WLAN

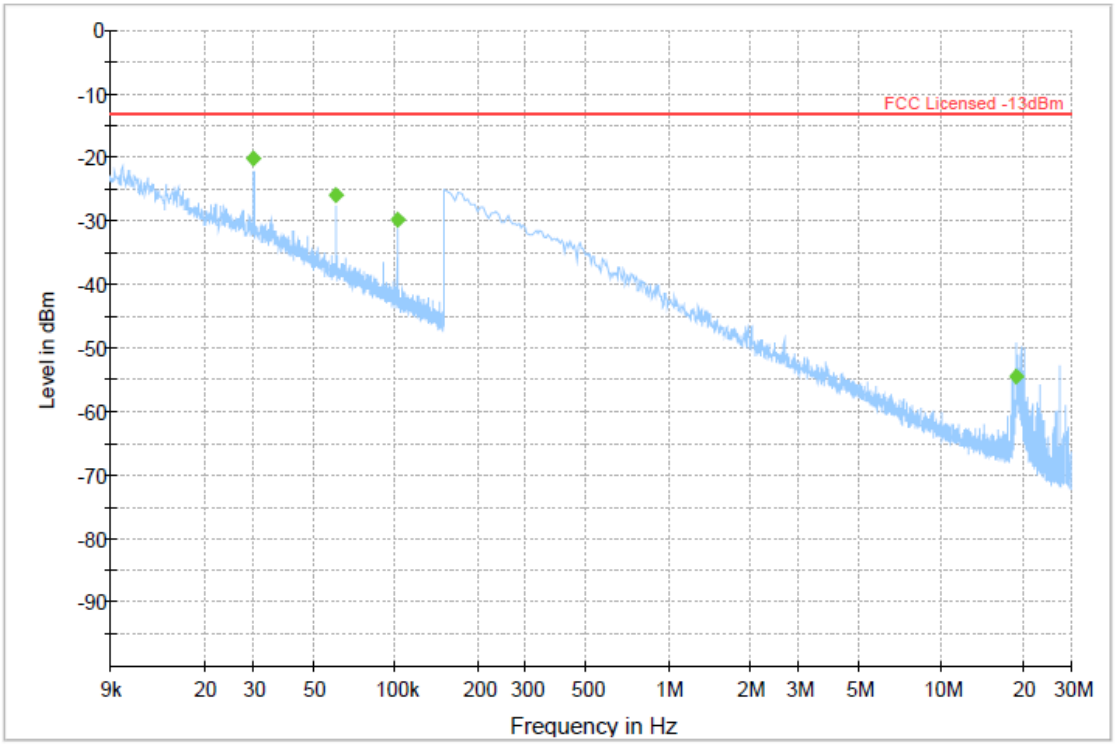
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
5641.00	---	-60.77	---	---	500.0	1000.0	175.0	H	154.0	-96.3
5641.00	-48.99	---	-13.00	35.99	500.0	1000.0	175.0	H	154.0	-96.3
9476.50	---	-59.76	---	---	500.0	1000.0	315.0	H	63.0	-92.6
9476.50	-47.99	---	-13.00	34.99	500.0	1000.0	315.0	H	63.0	-92.6
13220.50	---	-58.99	---	---	500.0	1000.0	230.0	V	239.0	-86.7
13220.50	-46.38	---	-13.00	33.38	500.0	1000.0	230.0	V	239.0	-86.7



Plot # 13 Radiated Emissions: 9 kHz - 30 MHz

Mid Channels LTE 2 & WLAN

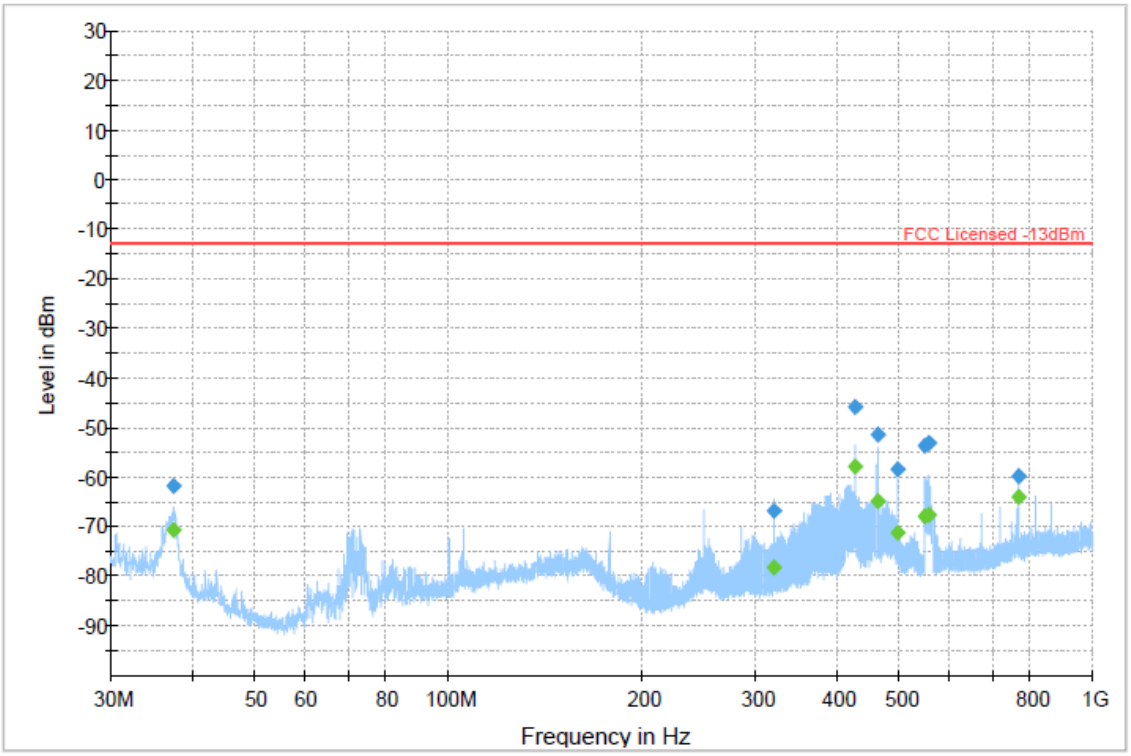
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.03	---	-20.22	---	---	500.0	9.0	100.0	H	196.0	-73.3
0.06	---	-25.95	---	---	500.0	9.0	100.0	H	209.0	-76.2
0.10	---	-29.75	---	---	500.0	9.0	100.0	V	185.0	-76.9
18.92	---	-54.52	---	---	500.0	9.0	100.0	V	32.0	-78.7



Plot # 14 Radiated Emissions: 30 MHz – 1 GHz

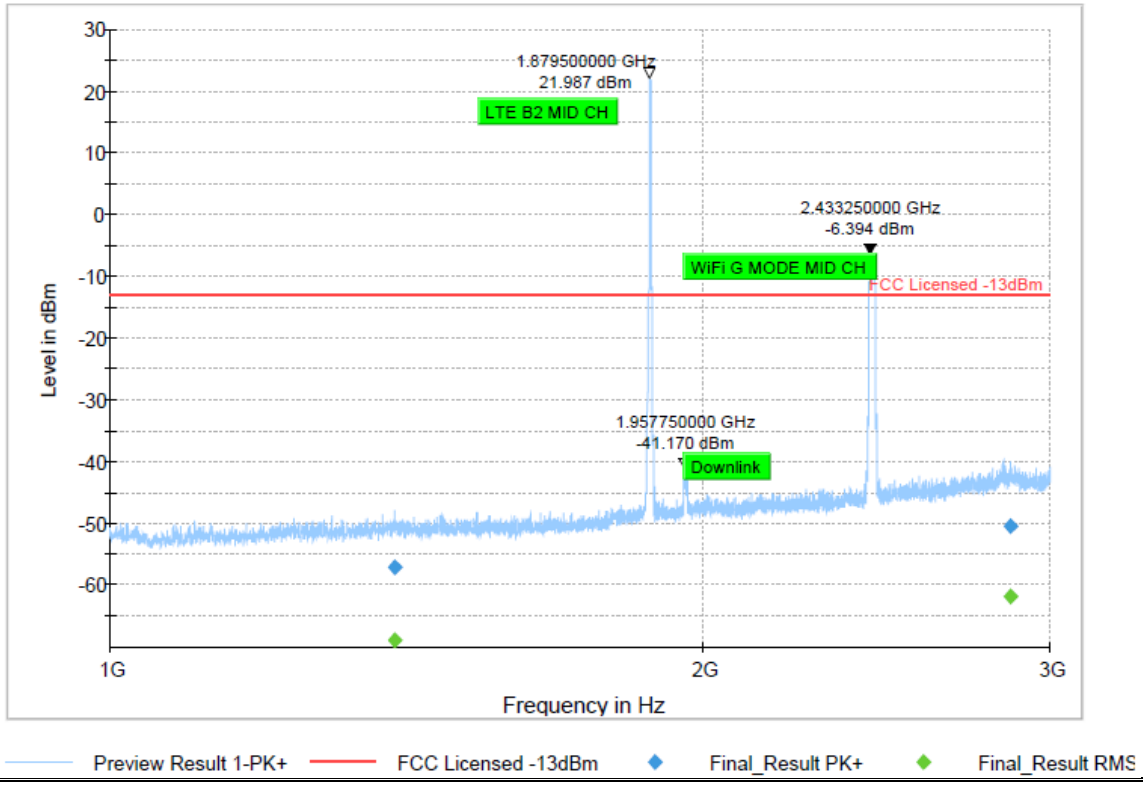
Mid Channels LTE 2 & WLAN

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.52	-61.73	---	-13.00	48.73	500.0	120.0	100.0	V	58.0	-110.0
37.52	---	-70.66	---	---	500.0	120.0	100.0	V	58.0	-110.0
320.68	---	-78.21	---	---	500.0	120.0	100.0	H	244.0	-108.8
320.68	-66.87	---	-13.00	53.87	500.0	120.0	100.0	H	244.0	-108.8
427.68	-45.82	---	-13.00	32.82	500.0	120.0	107.0	H	97.0	-107.2
427.68	---	-57.96	---	---	500.0	120.0	107.0	H	97.0	-107.2
463.20	-51.34	---	-13.00	38.34	500.0	120.0	169.0	H	261.0	-105.2
463.20	---	-64.78	---	---	500.0	120.0	169.0	H	261.0	-105.2
498.80	---	-71.13	---	---	500.0	120.0	126.0	H	170.0	-104.6
498.80	-58.42	---	-13.00	45.42	500.0	120.0	126.0	H	170.0	-104.6
550.11	-53.66	---	-13.00	40.66	500.0	120.0	100.0	H	158.0	-103.5
550.11	---	-67.86	---	---	500.0	120.0	100.0	H	158.0	-103.5
558.09	-53.24	---	-13.00	40.24	500.0	120.0	100.0	H	163.0	-103.5
558.09	---	-67.54	---	---	500.0	120.0	100.0	H	163.0	-103.5
768.02	-59.91	---	-13.00	46.91	500.0	120.0	100.0	H	95.0	-99.8
768.02	---	-64.15	---	---	500.0	120.0	100.0	H	95.0	-99.8



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

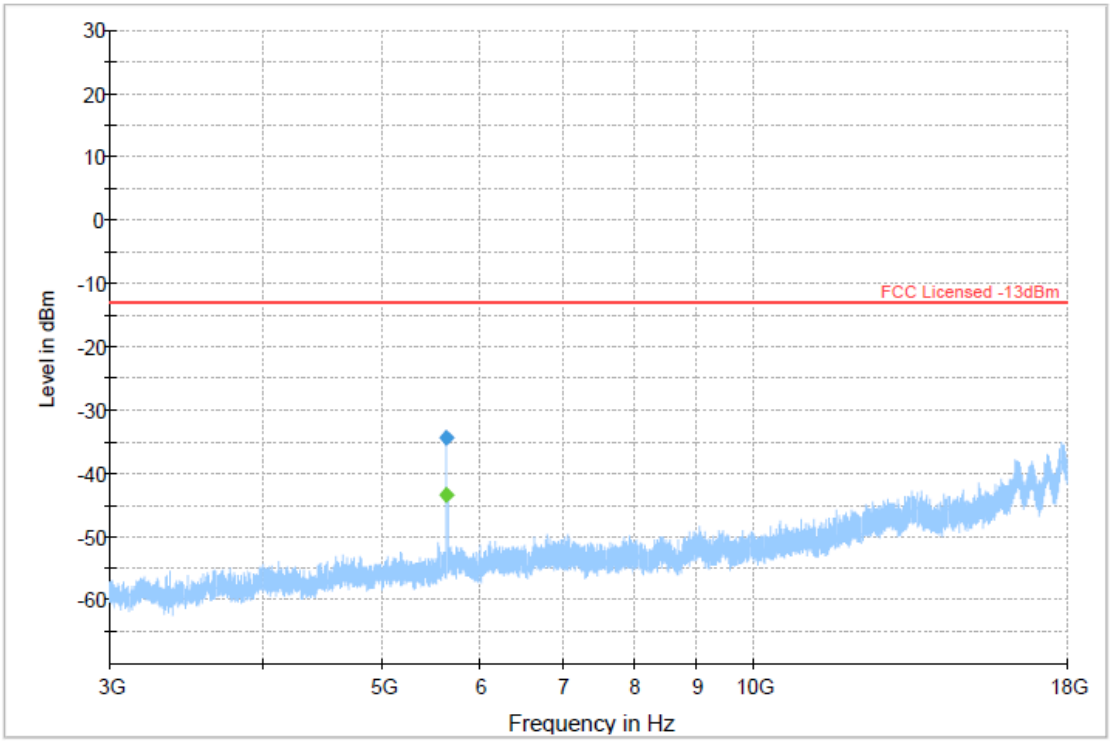
Plot # 15 Radiated Emissions: 1 GHz - 3 GHz
Mid Channels LTE 2 & WLAN



Plot # 16 Radiated Emissions: 3 GHz – 18GHz

Mid Channels LTE 2 & WLAN

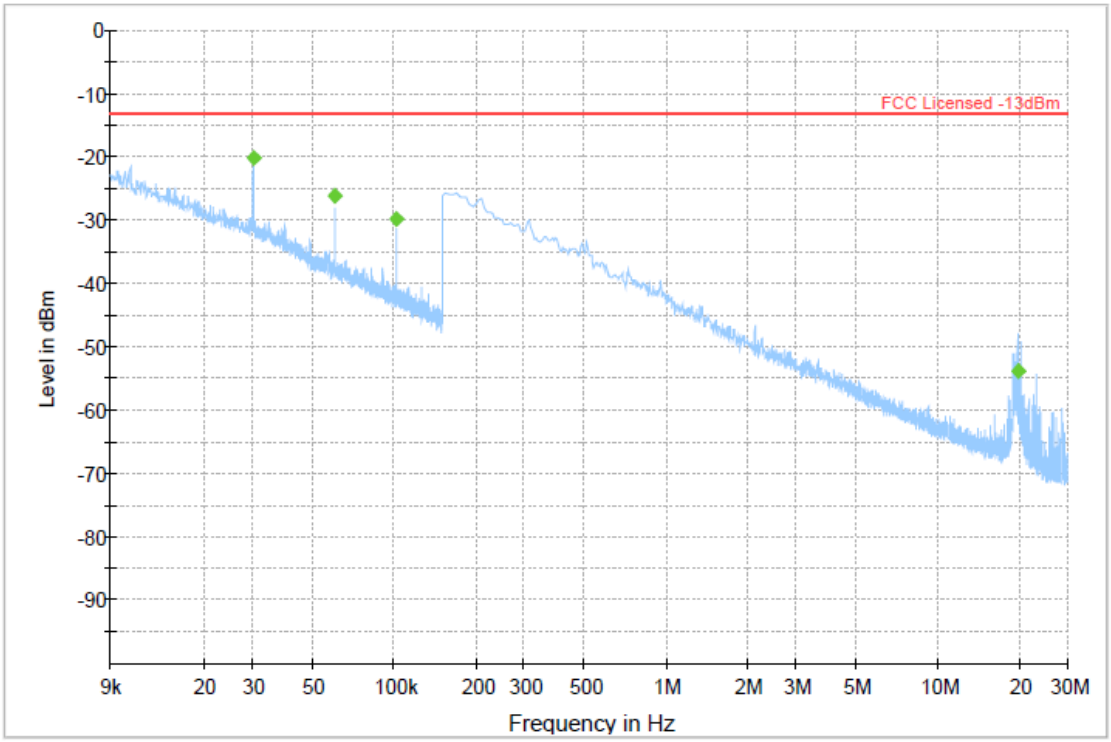
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
5639.25	---	-43.45	---	---	500.0	1000.0	183.0	H	226.0	-96.3
5639.25	-34.42	---	-13.00	21.42	500.0	1000.0	183.0	H	226.0	-96.3



Plot # 17 Radiated Emissions: 9 kHz - 30 MHz

Mid Channels UMTS IV & WLAN

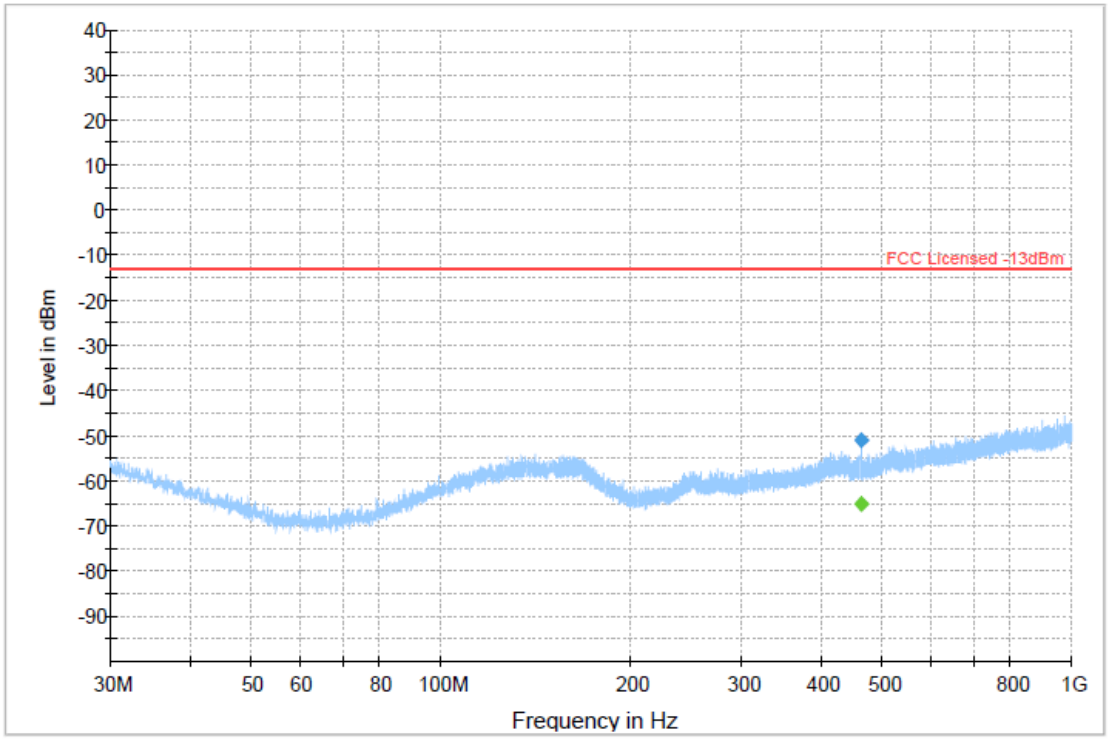
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.03	---	-20.18	---	---	500.0	9.0	100.0	H	90.0	-73.3
0.06	---	-26.17	---	---	500.0	9.0	100.0	H	108.0	-76.2
0.10	---	-29.85	---	---	500.0	9.0	100.0	V	40.0	-76.9
19.71	---	-53.93	---	---	500.0	9.0	100.0	H	305.0	-78.7



Plot # 18 Radiated Emissions: 30 MHz – 1 GHz

Mid Channels UMTS IV & WLAN

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
463.15	---	-65.10	---	---	500.0	100.0	158.0	H	179.0	-69.9
463.15	-50.90	---	-13.00	37.90	500.0	100.0	158.0	H	179.0	-69.9

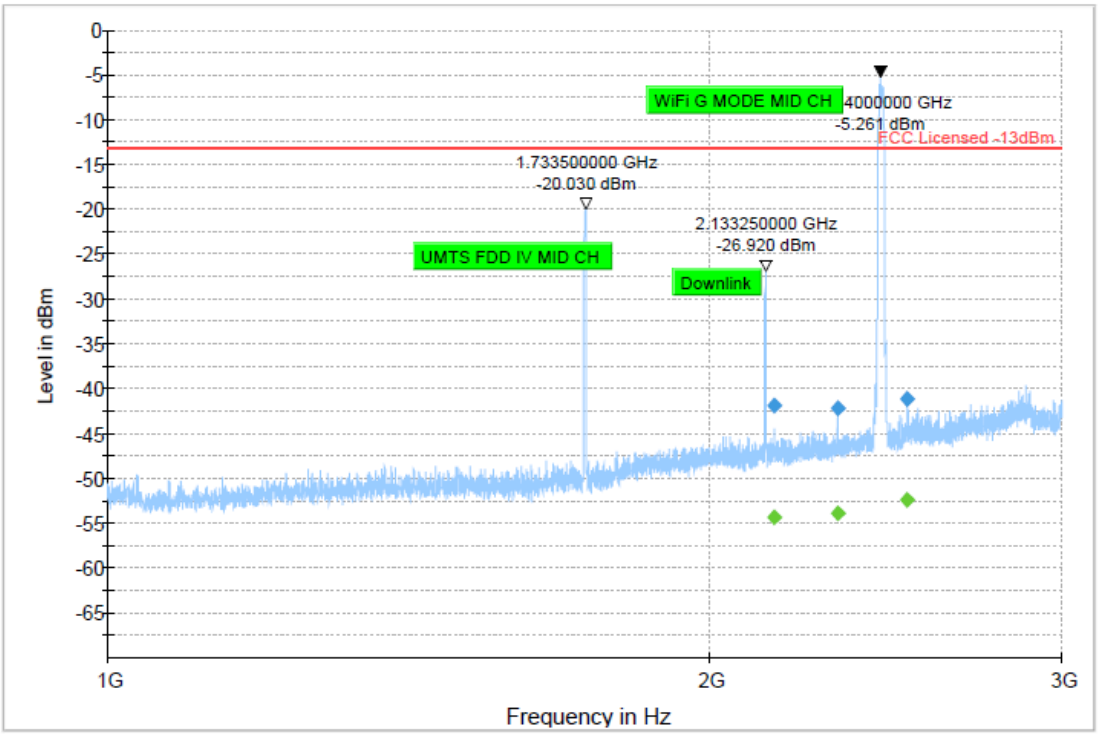


Preview Result 1-PK+ FCC Licensed -13dBm Final_Result PK+ Final_Result RMS

Plot # 19 Radiated Emissions: 1 GHz - 3 GHz

Mid Channels UMTS IV & WLAN

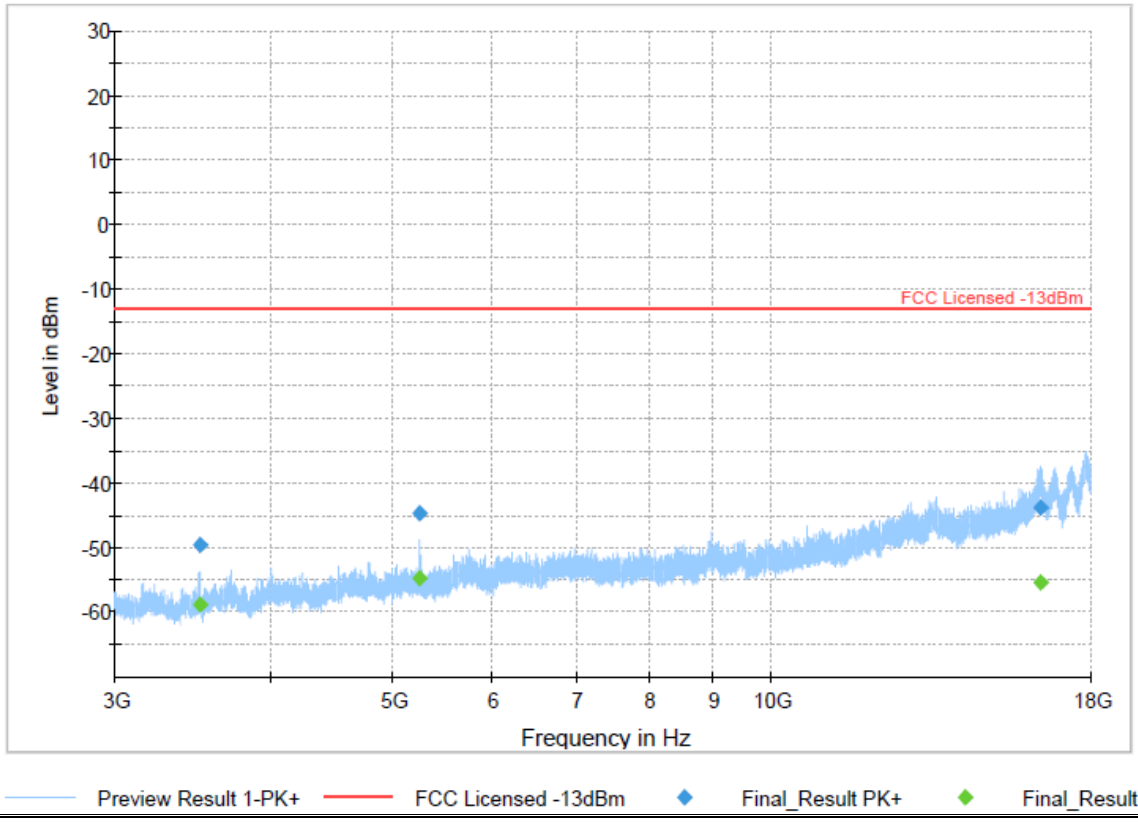
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2155.25	---	-54.41	---	---	500.0	1000.0	285.0	V	50.0	-63.4
2155.25	-41.85	---	-13.00	28.85	500.0	1000.0	285.0	V	50.0	-63.4
2316.50	---	-53.90	---	---	500.0	1000.0	231.0	H	325.0	-62.7
2316.50	-42.14	---	-13.00	29.14	500.0	1000.0	231.0	H	325.0	-62.7
2509.75	---	-52.45	---	---	500.0	1000.0	133.0	V	279.0	-61.8
2509.75	-41.15	---	-13.00	28.15	500.0	1000.0	133.0	V	279.0	-61.8



Plot # 20 Radiated Emissions: 3 GHz – 18GHz

Mid Channels UMTS IV & WLAN

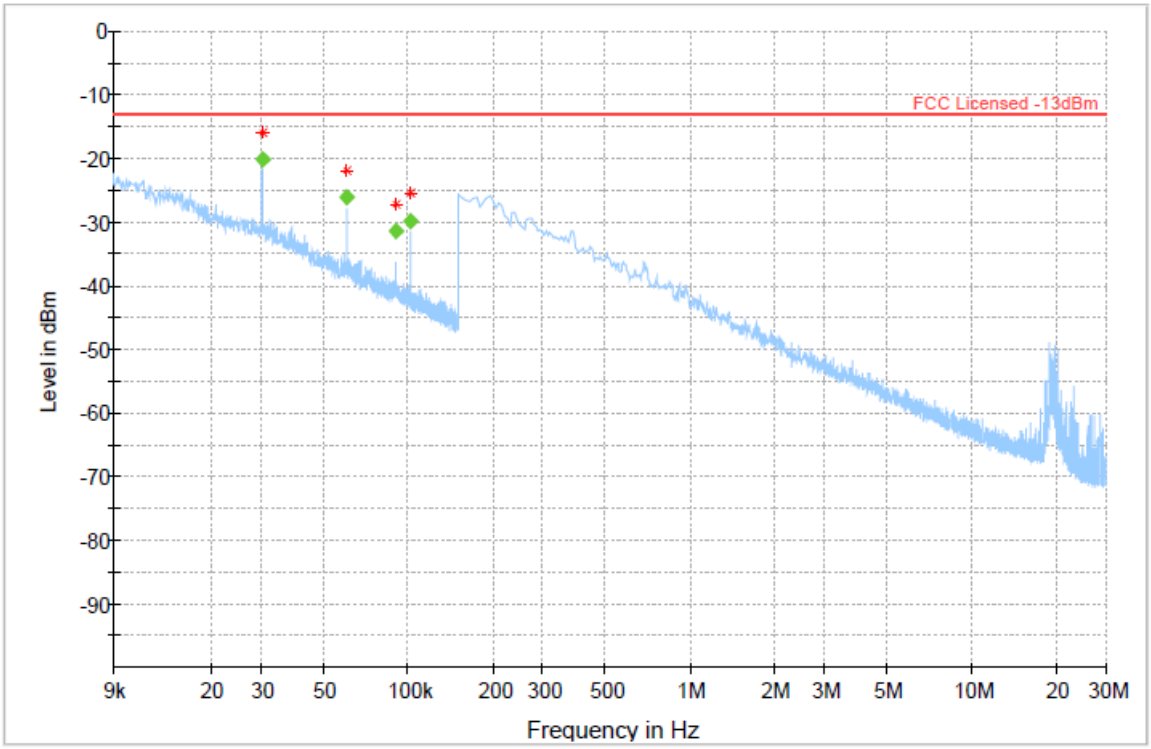
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3506.25	---	-58.82	---	---	500.0	1000.0	248.0	H	175.0	-102.2
3506.25	-49.56	---	-13.00	36.56	500.0	1000.0	248.0	H	175.0	-102.2
5254.75	---	-54.68	---	---	500.0	1000.0	100.0	V	105.0	-97.2
5254.75	-44.61	---	-13.00	31.61	500.0	1000.0	100.0	V	105.0	-97.2
16411.75	---	-55.42	---	---	500.0	1000.0	160.0	H	323.0	-81.3
16411.75	-43.73	---	-13.00	30.73	500.0	1000.0	160.0	H	323.0	-81.3



Plot # 21 Radiated Emissions: 9 kHz - 30 MHz

Mid Channels LTE 4 & WLAN

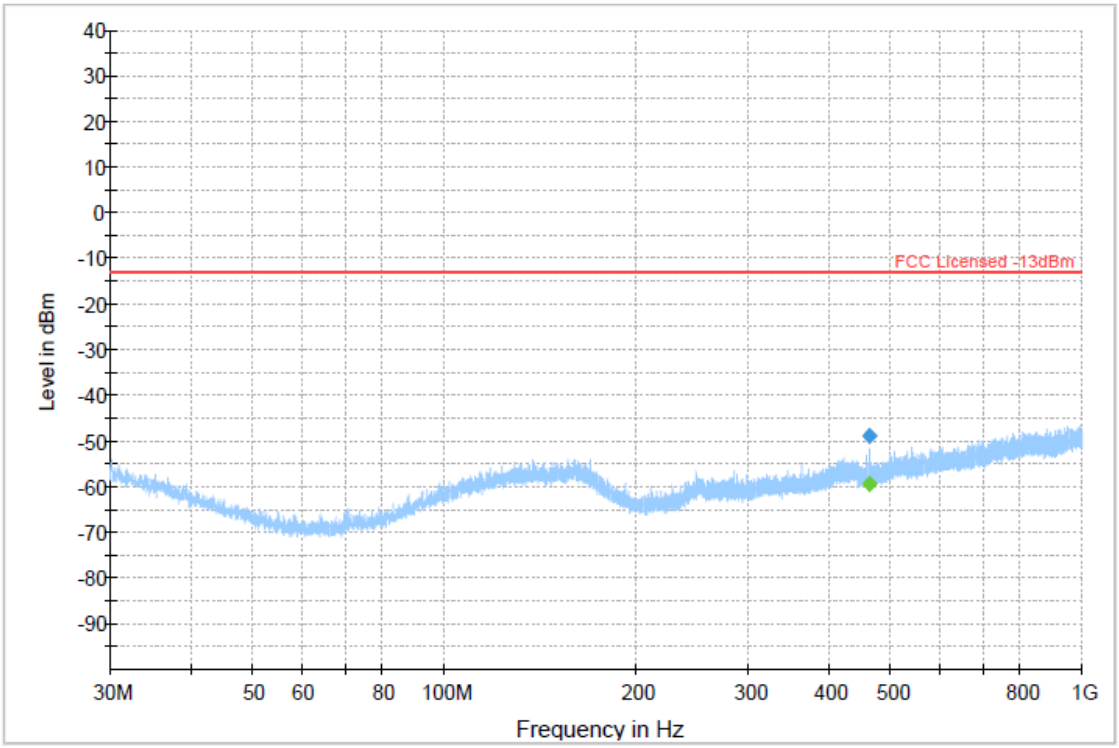
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.03	---	-20.13	---	---	500.0	9.0	100.0	H	165.0	-73.3
0.06	---	-26.11	---	---	500.0	9.0	100.0	H	17.0	-76.2
0.09	---	-31.44	---	---	500.0	9.0	100.0	H	-53.0	-76.8
0.10	---	-29.88	---	---	500.0	9.0	100.0	V	220.0	-76.9



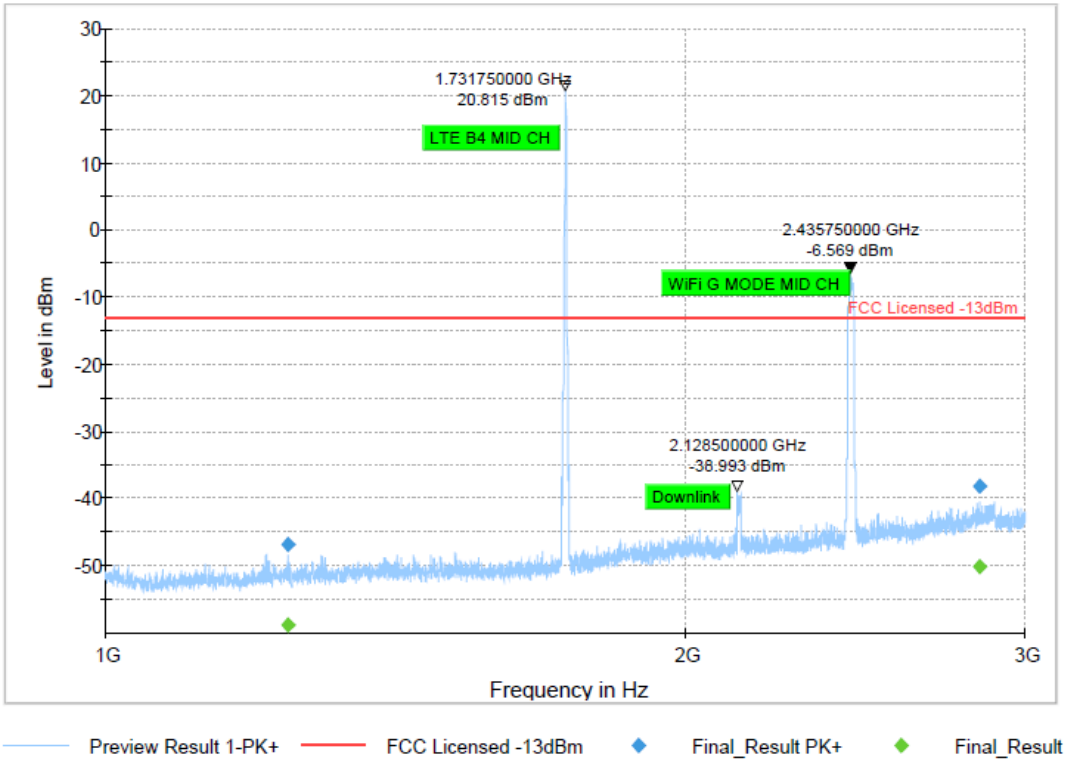
Plot # 22 Radiated Emissions: 30 MHz – 1 GHz

Mid Channels LTE 4 & WLAN

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
463.76	---	-59.42	---	---	500.0	100.0	133.0	H	164.0	-69.9
463.76	-49.01	---	-13.00	36.01	500.0	100.0	133.0	H	164.0	-69.9



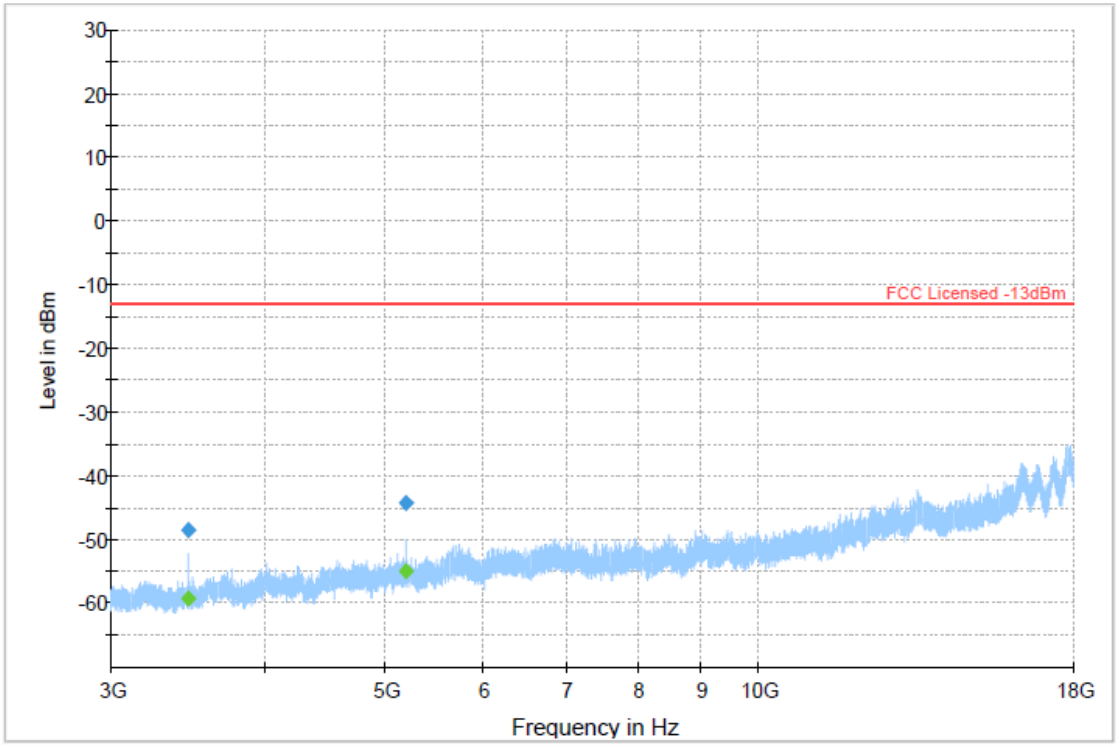
Plot # 23 Radiated Emissions: 1 GHz - 3 GHz
Mid Channels LTE 4 & WLAN



Plot # 24 Radiated Emissions: 3 GHz – 18GHz

Mid Channels LTE 4 & WLAN

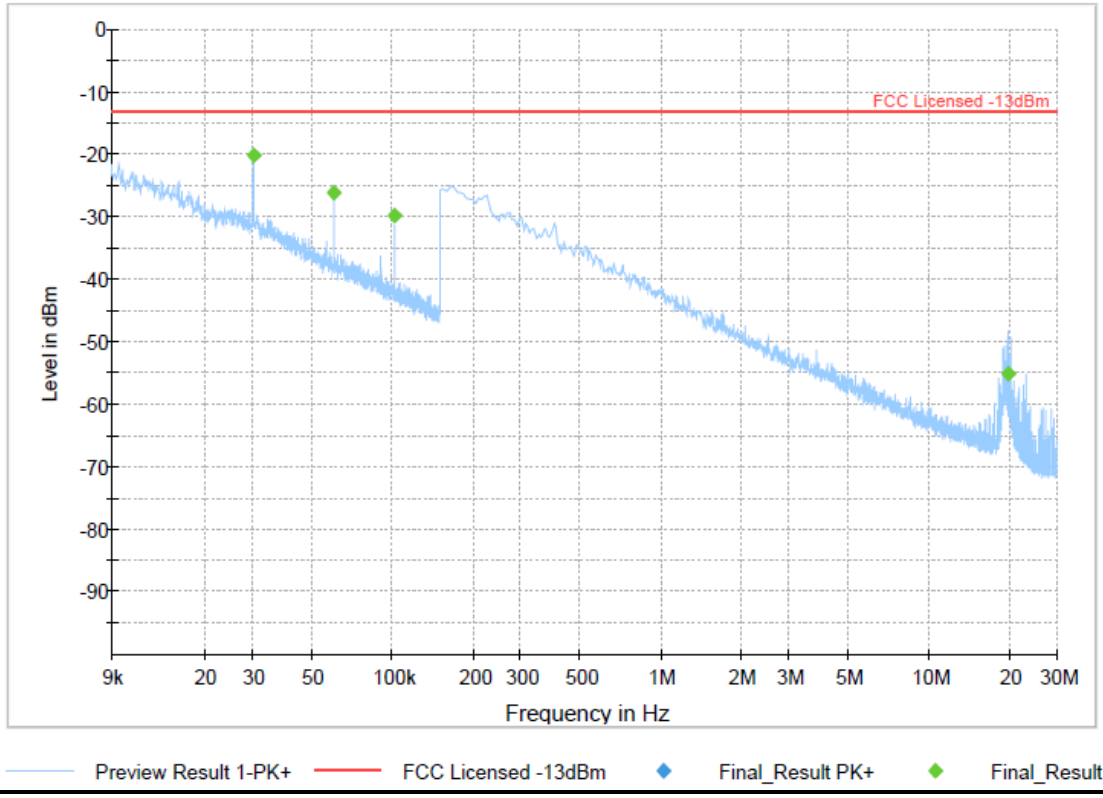
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3463.75	---	-59.18	---	---	500.0	1000.0	134.0	H	172.0	-102.2
3463.75	-48.61	---	-13.00	35.61	500.0	1000.0	134.0	H	172.0	-102.2
5197.50	---	-54.90	---	---	500.0	1000.0	284.0	V	269.0	-97.7
5197.50	-44.32	---	-13.00	31.33	500.0	1000.0	284.0	V	269.0	-97.7



Plot # 25 Radiated Emissions: 9 kHz - 30 MHz

Mid Channels LTE 12 & WLAN

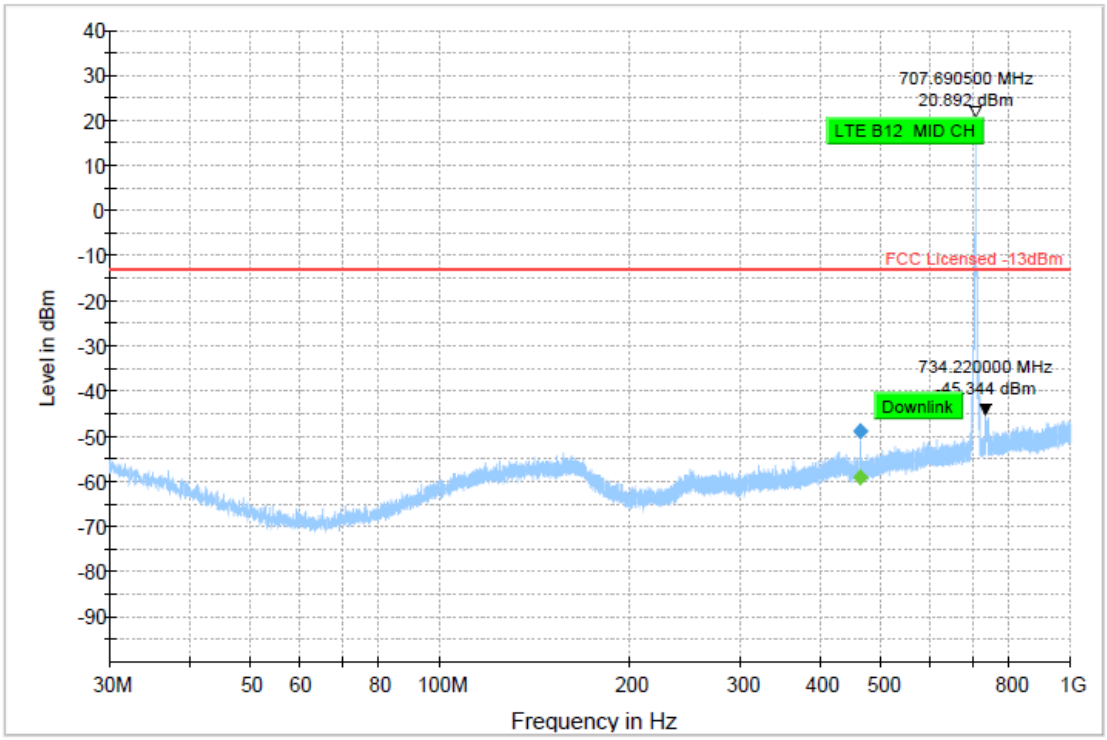
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.03	---	-20.19	---	---	500.0	9.0	100.0	H	-18.0	-73.3
0.06	---	-26.07	---	---	500.0	9.0	100.0	H	70.0	-76.2
0.10	---	-29.91	---	---	500.0	9.0	100.0	V	83.0	-76.9
19.71	---	-55.21	---	---	500.0	9.0	100.0	V	194.0	-78.7



Plot # 26 Radiated Emissions: 30 MHz – 1 GHz

Mid Channels LTE 12 & WLAN

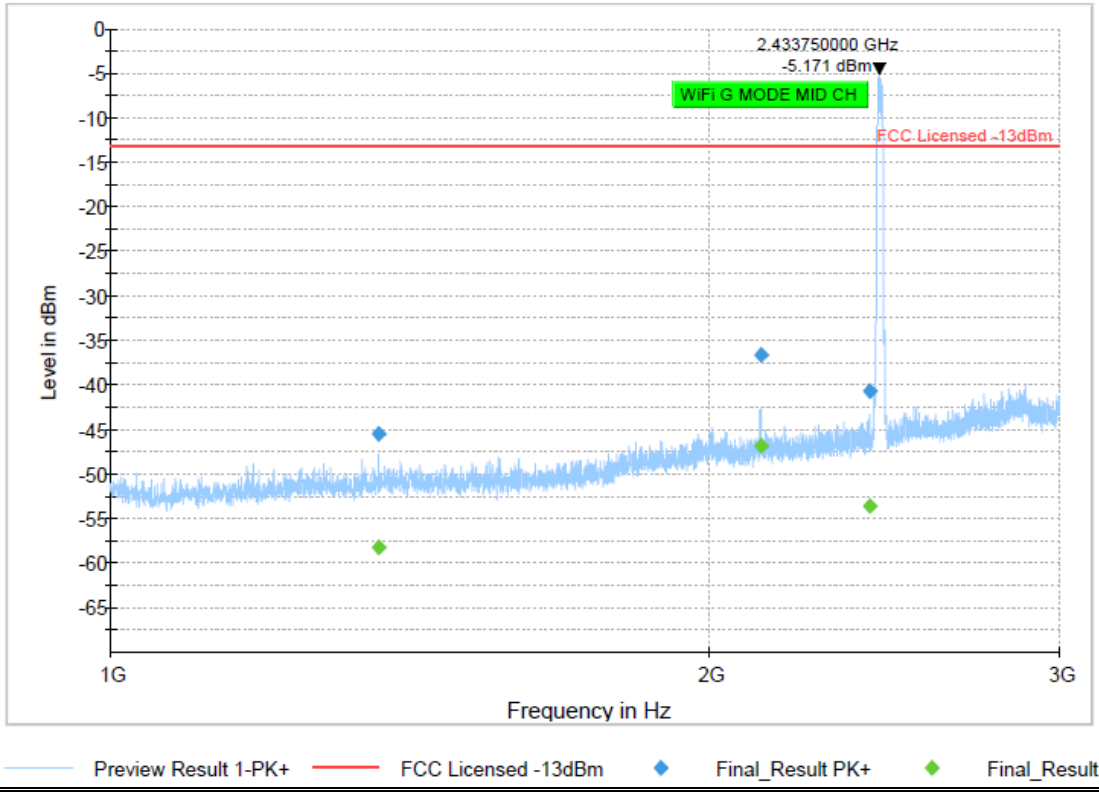
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
463.66	---	-59.08	---	---	500.0	100.0	125.0	H	156.0	-69.9
463.66	-48.81	---	-13.00	35.81	500.0	100.0	125.0	H	156.0	-69.9



Plot # 27 Radiated Emissions: 1 GHz - 3 GHz

Mid Channels LTE 12 & WLAN

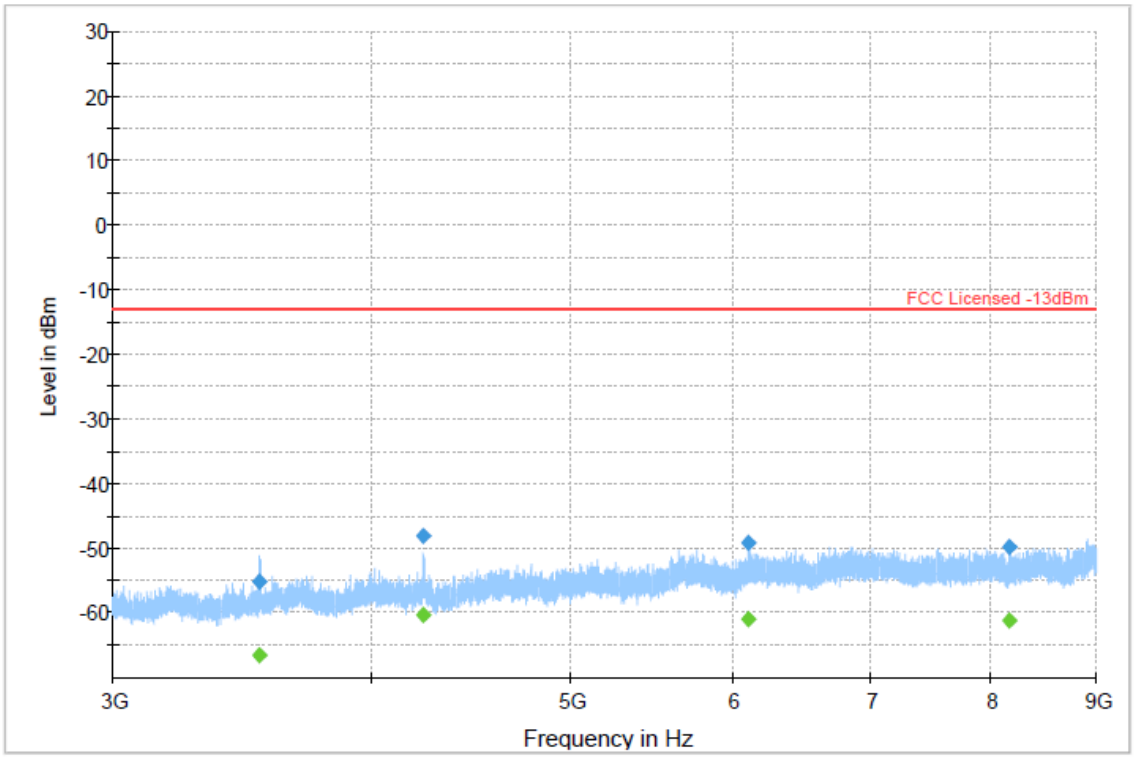
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1363.50	---	-58.26	---	---	500.0	1000.0	100.0	H	45.0	-66.4
1363.50	-45.50	---	-13.00	32.50	500.0	1000.0	100.0	H	45.0	-66.4
2122.25	---	-46.91	---	---	500.0	1000.0	125.0	H	311.0	-63.4
2122.25	-36.67	---	-13.00	23.67	500.0	1000.0	125.0	H	311.0	-63.4
2408.75	---	-53.64	---	---	500.0	1000.0	151.0	H	338.0	-62.4
2408.75	-40.76	---	-13.00	27.76	500.0	1000.0	151.0	H	338.0	-62.4



Plot # 28 Radiated Emissions: 3 GHz – 9GHz

Mid Channels LTE 12 & WLAN

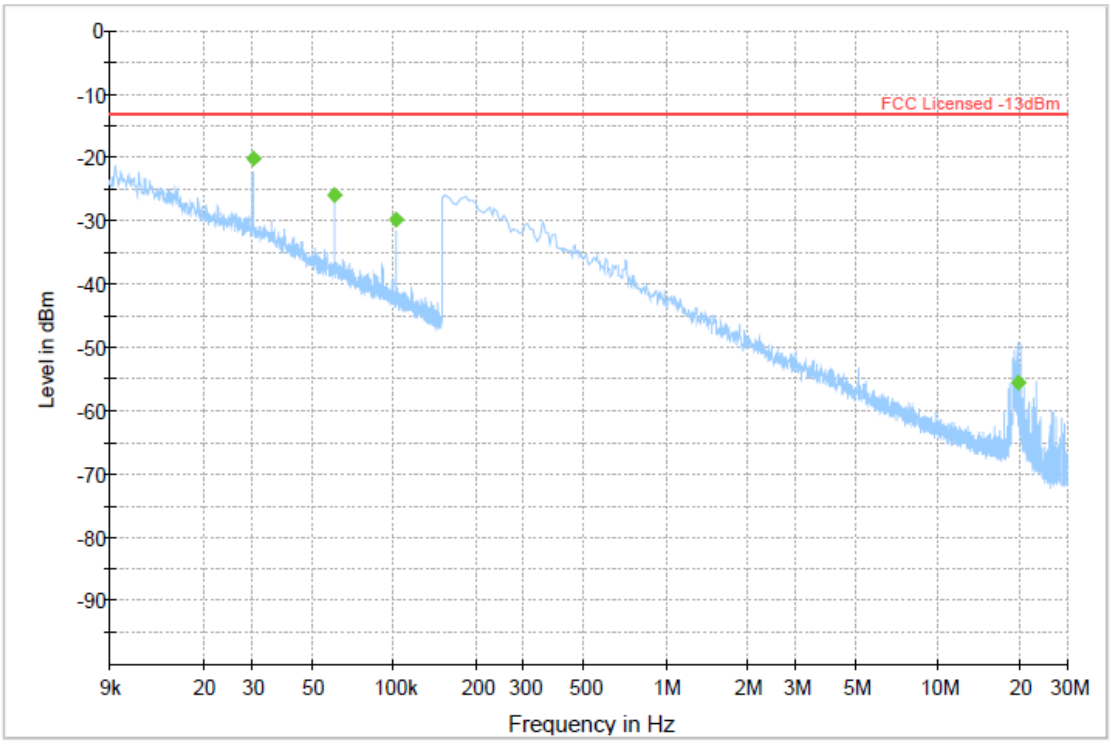
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3537.20	---	-66.57	---	---	500.0	1000.0	201.0	H	24.0	-102.1
3537.20	-55.25	---	-13.00	42.25	500.0	1000.0	201.0	H	24.0	-102.1
4248.20	---	-60.34	---	---	500.0	1000.0	116.0	V	334.0	-98.9
4248.20	-48.07	---	-13.00	35.07	500.0	1000.0	116.0	V	334.0	-98.9
6100.30	---	-61.01	---	---	500.0	1000.0	195.0	V	132.0	-96.0
6100.30	-49.21	---	-13.00	36.21	500.0	1000.0	195.0	V	132.0	-96.0
8170.80	---	-61.30	---	---	500.0	1000.0	296.0	V	221.0	-95.5
8170.80	-49.89	---	-13.00	36.89	500.0	1000.0	296.0	V	221.0	-95.5



Plot # 29 Radiated Emissions: 9 kHz - 30 MHz

Mid Channels LTE 13 & WLAN

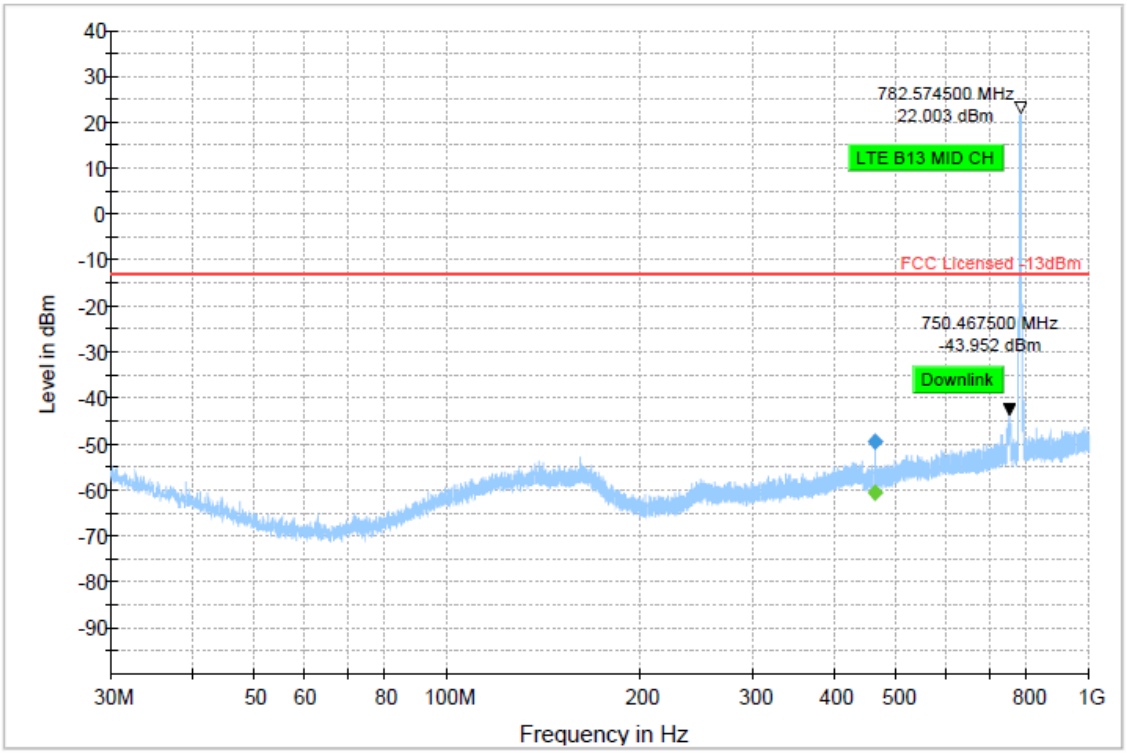
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.03	---	-20.18	---	---	500.0	9.0	100.0	H	145.0	-73.3
0.06	---	-26.04	---	---	500.0	9.0	100.0	H	33.0	-76.2
0.10	---	-29.82	---	---	500.0	9.0	100.0	V	3.0	-76.9
19.71	---	-55.64	---	---	500.0	9.0	100.0	H	297.0	-78.7



Plot # 30 Radiated Emissions: 30 MHz – 1 GHz

Mid Channels LTE 13 & WLAN

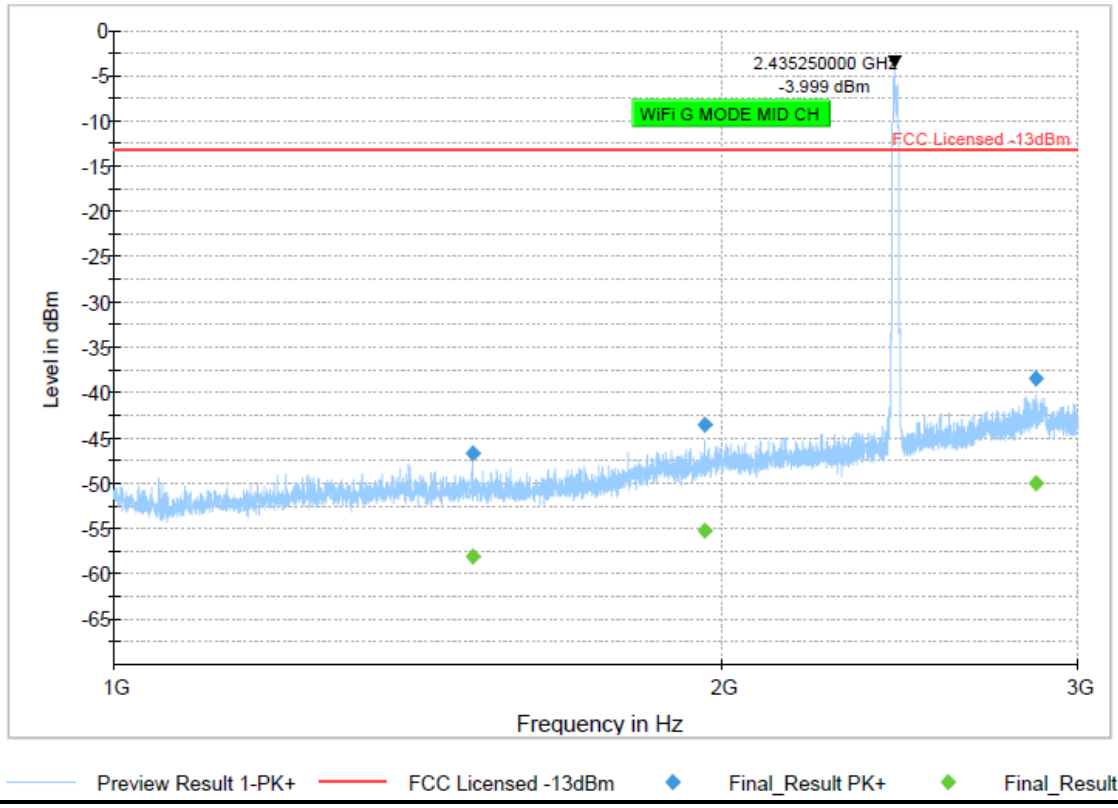
Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
463.49	---	-60.52	---	---	500.0	100.0	120.0	H	153.0	-69.9
463.49	-49.45	---	-13.00	36.45	500.0	100.0	120.0	H	153.0	-69.9



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

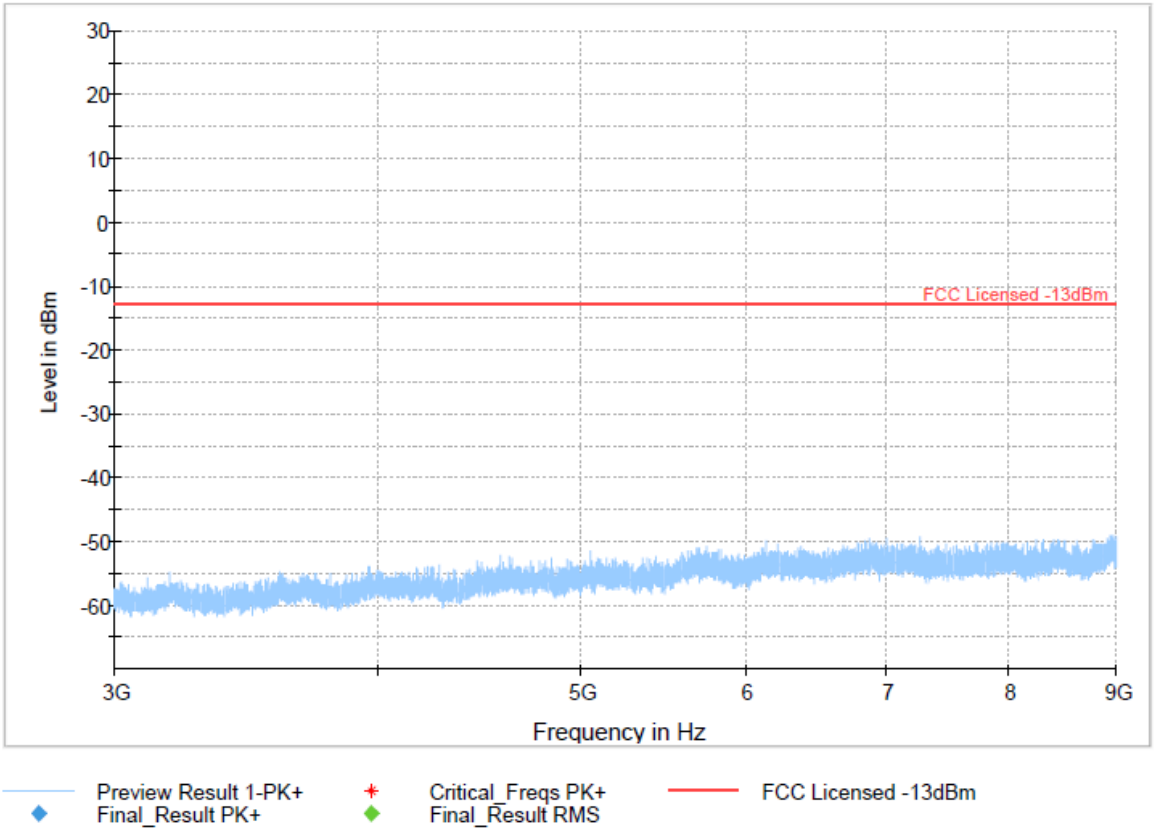
Plot # 31 Radiated Emissions: 1 GHz - 3 GHz

Mid Channels LTE 13 & WLAN



Plot # 32 Radiated Emissions: 3 GHz – 9GHz

Mid Channels LTE 13 & WLAN



8 Test setup photo

Setup photos are included in supporting file name: "EMC_KPTRK-030-22001_Setup_Photos.pdf"

9 Test Equipment and Ancillaries Used For Testing

Equipment Name/Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
EMI Receiver	Rohde & Schwarz	ESW44	101715	3 Years	9/13/2021
Signal Analyzer	Rohde & Schwarz	FSV40	101022	3 Years	9/14/2021
Active Loop antenna	ETS Lindgren	6507	161344	3 Years	10/30/2020
Loop antenna	ETS Lindgren	6512	164698	3 Years	8/14/2020
Biconlog Antenna	AH systems	BiLA2G	569	3 years	12/1/2020
Horn Antenna	EMCO	3115	35111	3 years	9/30/2021
Horn Antenna	ETS Lindgren	3117-PA	169547	3 years	9/1/2020
Horn Antenna	ETS Lindgren	3116C-PA	169535	3 years	9/30/2020
Digital Thermometer	Control Company	36934-164	191872028	3 Years	10/20/2021
Digital Barometer	VWR	10510-922	200236891	3 Years	4/13/2020

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.

10 Revision History

Date	Report Name	Changes to report	Report prepared by
08-15-2022	EMC_KPTRK-030-22001_FCC_22_24_27	Initial Draft version	Kris Lazarov

<<The End>>