FCC/ISED Test Report

FOR: ChargePoint Inc.

Marketing name: CPNK

Model Name: CPNK500

Product Description: CPNK500 is to provide communication between the Chargepoint network and the charging station.

FCC ID: W38-28010106
IC ID: 8854A-28010106

Per:
47 CFR: Part 22, Part 24, Part 27
RSS-130; RSS-132 Issue 3; RSS-133 Issue 6; RSS-139 Issue 3

REPORT #: EMC_CHARG_017_18501_FCC_22_24_27_ISED

DATE: 12/11/2018

A2LA Accredited

IC recognized #
3462B-2

***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

TABLE OF CONTENTS

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, 132 Issue 3, 133 Issue 6 and 139 Issue3.

No deficiencies were ascertained.

Responsible for Testing Laboratory:

Date	Section	Name	Signature
12/11/2018	Compliance	Cindy Li (Lab Manager)	Digitally signed by Cindy Li DN: cn=Cindy Li, o=Cetecom Inc., ou=EMC, email=cindy.li@cetecom.com, c=US Date: 2018.12.11 18:00:23 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
12/11/2018	Compliance	Issa Ghanma (EMC Engineer)	Digitally signed by: Issa Ghanma DN: CN = Issa Ghanma email = issa.ghanma@cetecom.com C = US O = CETECOM INC. OU = EMC Date: 2018.12.11 16:35:29 -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
Lab Manager:	Cindy Li
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client

Applicant's Name:	ChargePoint Inc.
Street Address:	254 E. Hacienda Ave.
City/Zip Code	Campbell, CA 95008-6617
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:	CPNK500			
FWIN:	7.0.3			
HVIN:	27-010106			
PMN:	CPNK500, CPNK			
Module Name:	Gemato PLS8-X			
Model Number:	PLS8-X			
FCC ID:	QIPPLS8-X			
IC ID:	7830A-PLS8X			
Band	**Frequency range (MHz)**	**Maximum conducted output power from modular grant. (Watts)**	**Maximum ERP/EIRP (Watts)**	**Type of modulation**
GSM 850	824.2 - 848.8	1.84	2.04*1	GMSK, 8-PSK
GSM 1900	1850.2 - 1909.8	1.0	1.77*2	GMSK, 8-PSK
WCDMA II	1852.4 – 1907.6	0.264	0.39*1	QPSK, 16-QAM
WCDMA IV	1712.4 – 1752.6	0.262	0.72*1	QPSK, 16-QAM
WCDMA V	826.4 – 846.4	0.244	0.27*1	QPSK, 16-QAM
LTE 2	1852.5 – 1907.5	0.182	0.36*1	QPSK, 16-QAM
LTE 4	1715.0 – 1750.0	0.2	0.37*1	QPSK, 16-QAM
LTE 5	824.7 – 848.3	0.178	0.18*1	QPSK, 16-QAM
LTE 13	779.5 – 784.5	0.162	0.18*1	QPSK, 16-QAM
LTE 17	706.5 – 713.5	0.158	0.18*1	QPSK, 16-QAM
Antenna (Main & Diversity) Information as declared:	Manufacturer: Ethertronics Manufacturer item #: ANTENNA,EMBEDDED,OCTA-BAND,LTE Manufacturer item name: P822601 Gain: 4.4 dBi Manufacturer: Ethertronics Manufacturer item #: ANTENNA,EMBEDDED,OCTA-BAND,LTE Manufacturer item name: P822602 Gain: 4.4 dBi			

Power Supply/ Rated Operating Voltage Range:	Low 23 VDC, Nominal 24 VDC, High 25 VDC
Operating Temperature Range:	Low -30º C, Nominal 25º C, High 50º C
Sample Revision	☐Prototype Unit; ■Production Unit; ☐Pre-Production
EUT Dimensions(mm):	190x180x20
Weight(grams):	229
EUT Diameter	■ < 60 cm ☐ Other _____
Other Radios included in the device:	Redpine Module: Radios: • Bluetooth low energy GFSK modulation 2402 MHz (ch0) – 2480 MHz (ch39), 40 channels. • Bluetooth Classic 4.0 / Modulation: GFSK, DQPSK, 8DPSK • 2.4GHz operate on b/g/n modulation on channel 1-11 • 5GHz operate a/n modulation on Band 1 and Band 3 channel 36-48 and 149-165 FCC ID: XF6-RS9113DB / IC: 8407ARS9113DB

*1: ERP / EIRP are calculated from maximum power in grant of cellular module QIPPLS8-X adding the maximum gain of the utilized cellular antenna Ethertronics Part No. P822601 / P822602.

*2: EIRP was measured in an anechoic chamber setup for low mid and high channel.

3.2 EUT Sample details

EUT #	Unit number	HW Version	SW Version	Notes/Comments
1	Unit #3	27-01016	7.0.3	Radiated Emissions

3.3 Accessory Equipment

AE #	Comments
-	NA

3.4 Test Sample Configuration

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

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	Cellular and Wi-Fi Co-Transmission	Cellular was tested on Low, Mid, High Channels at the maximum power in a co-transmission mode. 2XBatteries 24V Provided by the customer Adapter was connected to the equipment under test while testing.

3.6 Justification for Worst Case Mode of Operation

During the testing process the EUT was tested with transmitter sets on low, mid and high channels at the maximum power simultaneous transmission with Wi-Fi 2.4 GHz, n-Mode, 65 Mbps, Mid channel. Which it is the worst case of the radios supported, based on the maximum conducted output power from the modular grant and reports.

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

The objective of the evaluation conducted by CETECOM Inc. is to support a request for new equipment authorization under **FCC ID:** W38-28010106 / **IC ID**: 8854A-28010106

The pre-certified module to be integrated (Gemato PLS8-X) 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, 132 Issue 3, 133 Issue 6 and 139 Issue 3.

The conducted module test data that can be obtained under the **FCC Filing ID:** QIPPLS8-X / **IC ID:** 7830A-PLS8X is applicable for the host described in section 3.

4.1 Dates of Testing:

10/12/2018 – 10/20/2018

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)

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%

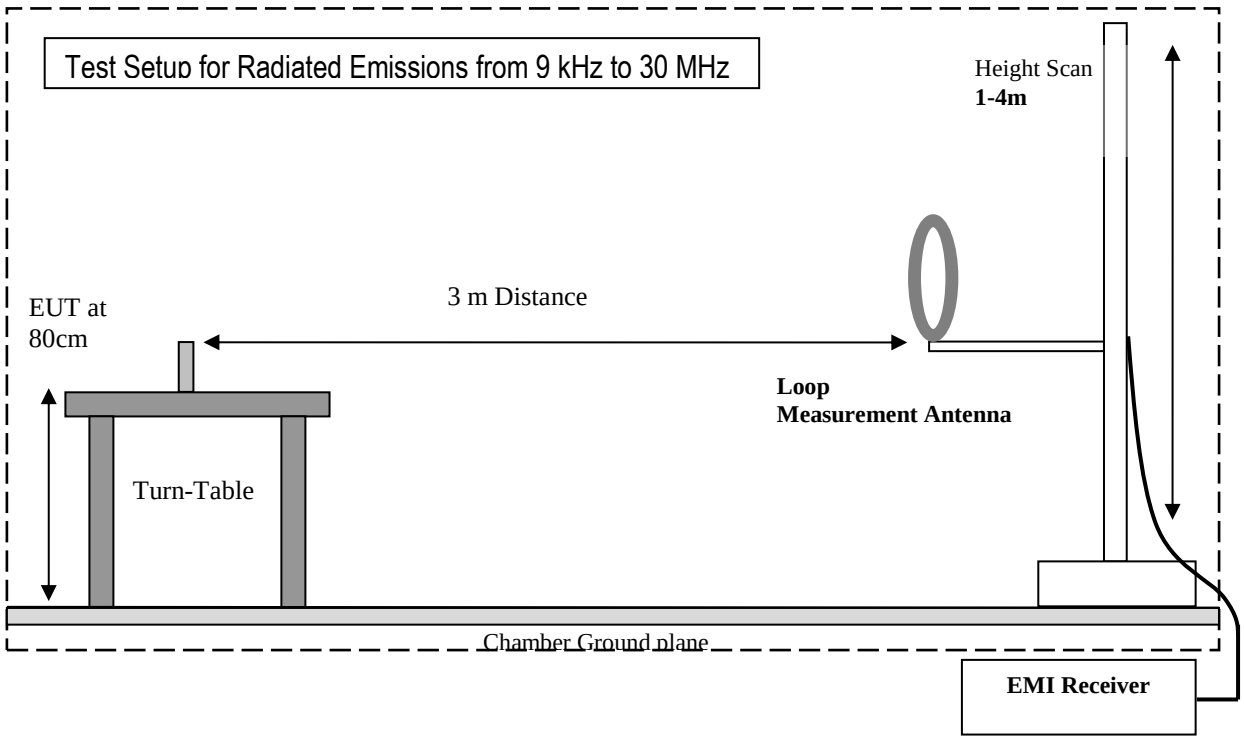
Deviating test conditions are indicated at individual test description where applicable.

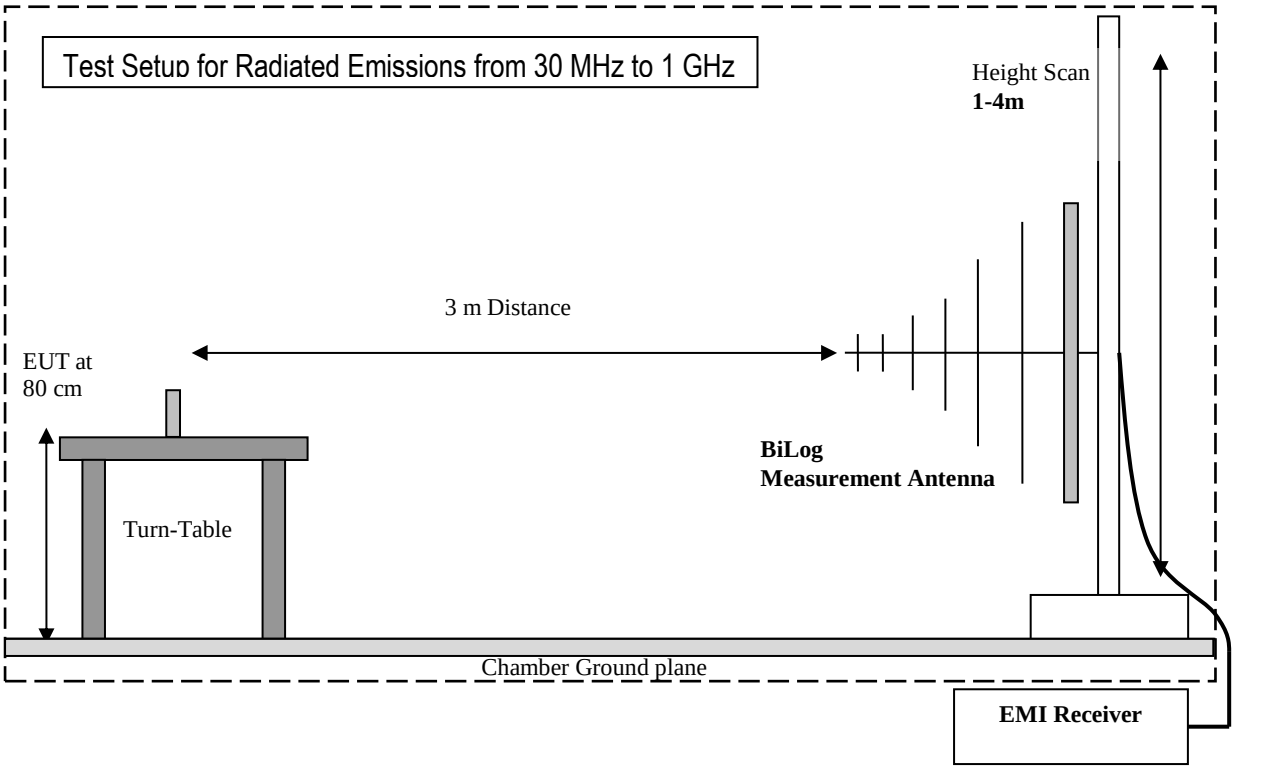
5 Measurement Procedures

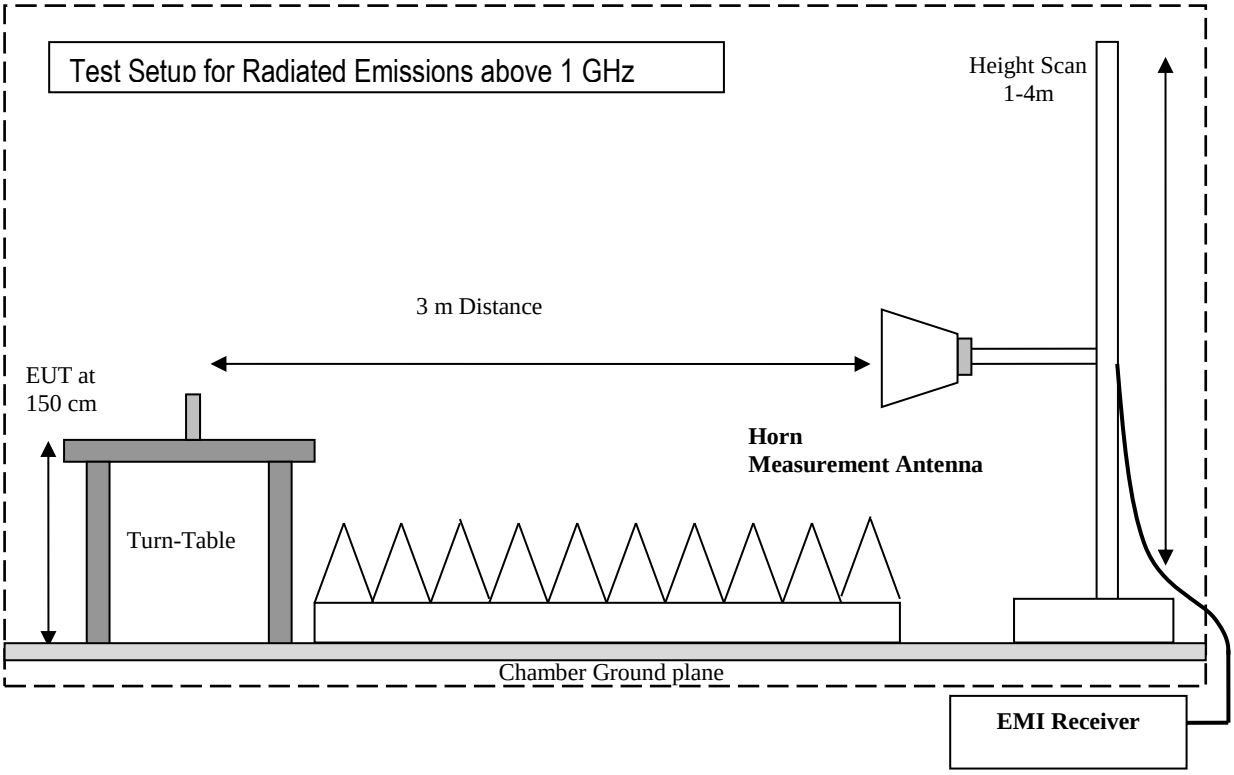
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03 – "Measurement Guidance for Certification of Licensed Digital Transmitters" and according to ANSI C63.26 as detailed below.

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.




Test Setup for Radiated Emissions from 30 MHz to 1 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	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1055; §22.355	Frequency Stability	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1049; §22.917	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1051; §22.917	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1051; §22.917	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1053; §22.917(a); RSS-132 Issue 3-5.5;	Radiated Spurious Emissions	Nominal	WCDMA LTE	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification Gemato PLS8-X FCC ID: QIPPLS8-X / IC ID: 7830A-PLS8X

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

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification Gemato PLS8-X FCC ID: QIPPLS8-X / IC ID: 7830A-PLS8X

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	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1055; §27.54	Frequency Stability	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1049; §27.53	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1051; §27.53	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1051; §27.53	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Complies Note 1 Note 2
§2.1053; §27.53(g); §27.53(h); RSS-130 Issue 1-4.6; RSS-139 Issue 3-6.6;	Radiated Spurious Emissions	Nominal	WCDMA LTE	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification Gemato PLS8-X FCC ID: QIPPLS8-X / IC ID: 7830A-PLS8X

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, 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:

- **FCC Part 22.917(a) and Part 24.238(a), Part 27.53 (g), and Part 27.53 (h)**
- **RSS-130-4.6, RSS-132 Issue 3 5.5, RSS-133 Issue 6 6.5.1, RSS-139 Issue 3 6.6**

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB = (-13dBm)

7.1.3 Test conditions and setup:

Ambient Temperature (C)	EUT operating mode	Power Input
22	Op. 1	24 VDC

7.1.4 Measurement result:

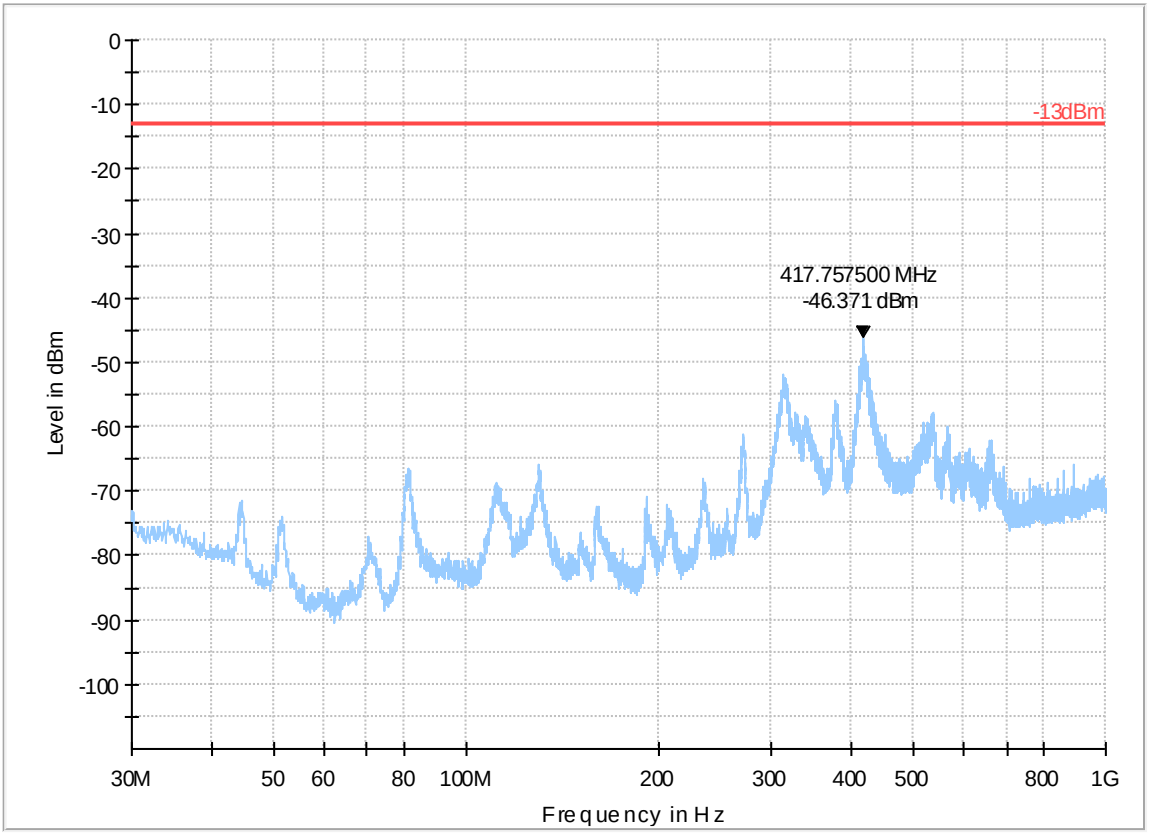
Plot #	Cellular Channel	EUT operating mode	Scan Frequency	Limit [dBm]	Frequency of highest emission [MHz]	Highest emission [dBm]	Result
1 – 3	Low	WCDMA II	30 MHz – 18 GHz	-13	3817.5	-45.14	Pass
4 – 8	Mid	WCDMA II	9 kHz – 26 GHz	-13	0.011	-29.48	Pass
9 – 11	High	WCDMA II	30 MHz – 18 GHz	-13	3707	-45.597	Pass
12 – 14	Low	WCDMA IV	30 MHz – 18 GHz	-13	3256	-47.823	Pass
15 – 18	Mid	WCDMA IV	9 kHz – 18 GHz	-13	0.03	-28.49	Pass
19 – 21	High	WCDMA IV	30 MHz – 18 GHz	-13	3255.5	-46.785	Pass
22 - 24	Low	WCDMA V	30 MHz – 9 GHz	-13	3269.4	-49.074	Pass
25 – 28	Mid	WCDMA V	9 kHz – 9 GHz	-13	0.012	-31.20	Pass
29 – 31	High	WCDMA V	30 MHz – 9 GHz	-13	3256.1	-46.57	Pass
32 – 34	Low	LTE 2	30 MHz – 18 GHz	-13	3255.5	-47.069	Pass
35 – 39	Mid	LTE 2	9 kHz – 26 GHz	-13	0.03	-30.16	Pass
40 - 42	High	LTE 2	30 MHz – 18 GHz	-13	3810.0	-44.969	Pass
43 - 45	Low	LTE 4	30 MHz – 18 GHz	-13	3255.5	-46.551	Pass
46 – 49	Mid	LTE 4	9 kHz – 18 GHz	-13	0.03	-29.35	Pass
50 - 52	High	LTE 4	30 MHz – 18 GHz	-13	3256.0	-47.793	Pass
53 - 55	Low	LTE 5	30 MHz – 9 GHz	-13	3272.5	-48.501	Pass
56 - 59	Mid	LTE 5	9 kHz – 9 GHz	-13	0.01	-18.15	Pass
60 - 62	High	LTE 5	30 MHz – 9 GHz	-13	3255.5	-49.19	Pass
63 – 66	Mid	LTE 13	9 kHz – 9 GHz	-13	0.011	-26.16	Pass
67 - 69	Low	LTE 17	30 MHz – 9 GHz	-13	3256.0	-48.959	Pass
70 – 71	Mid	LTE 17	9 kHz – 1 GHz	-13	0.014	-14.00	Pass
72 – 74	High	LTE 17	30 MHz – 9 GHz	-13	3255.5	-49.564	Pass

7.1.5 Measurement Plots:

WCDMA Band II

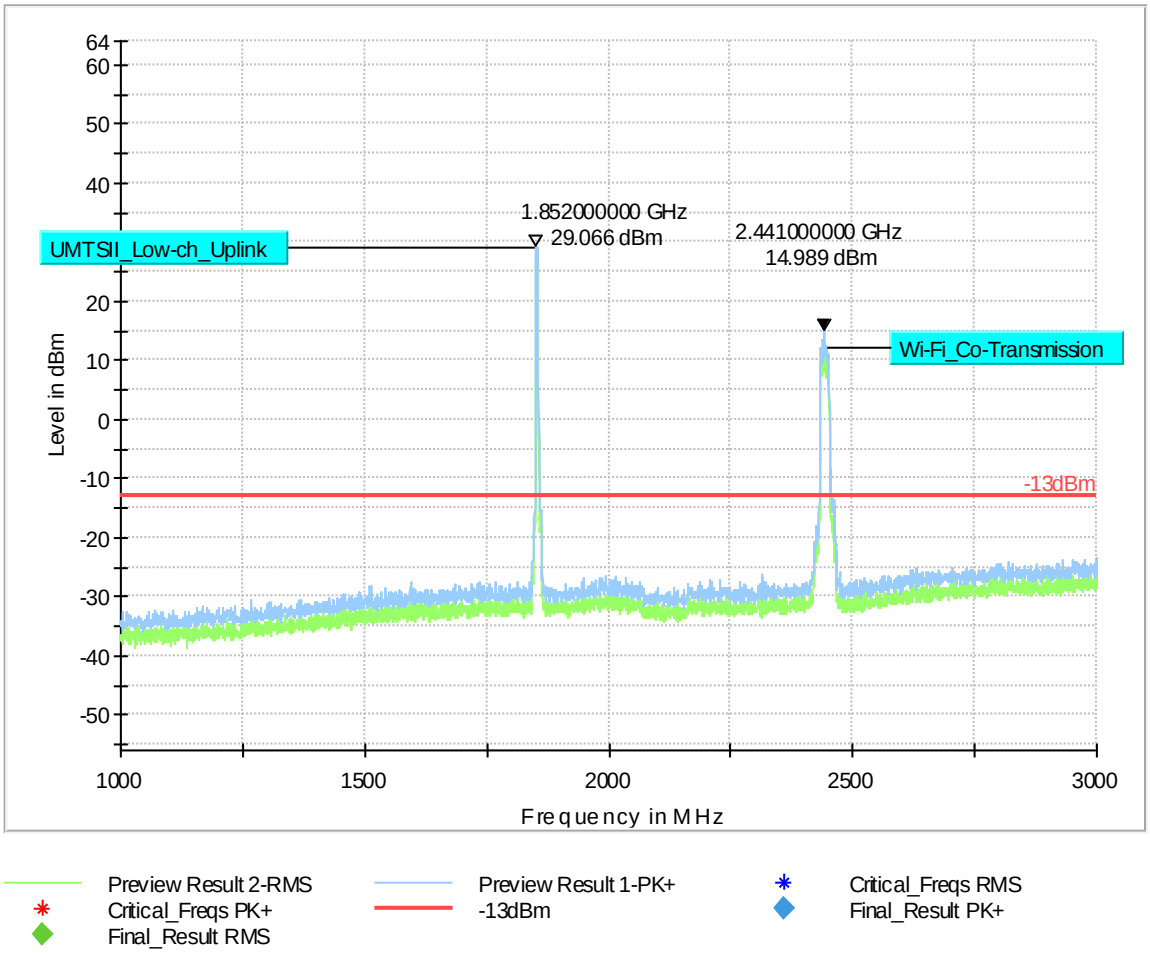
Plot # 1 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



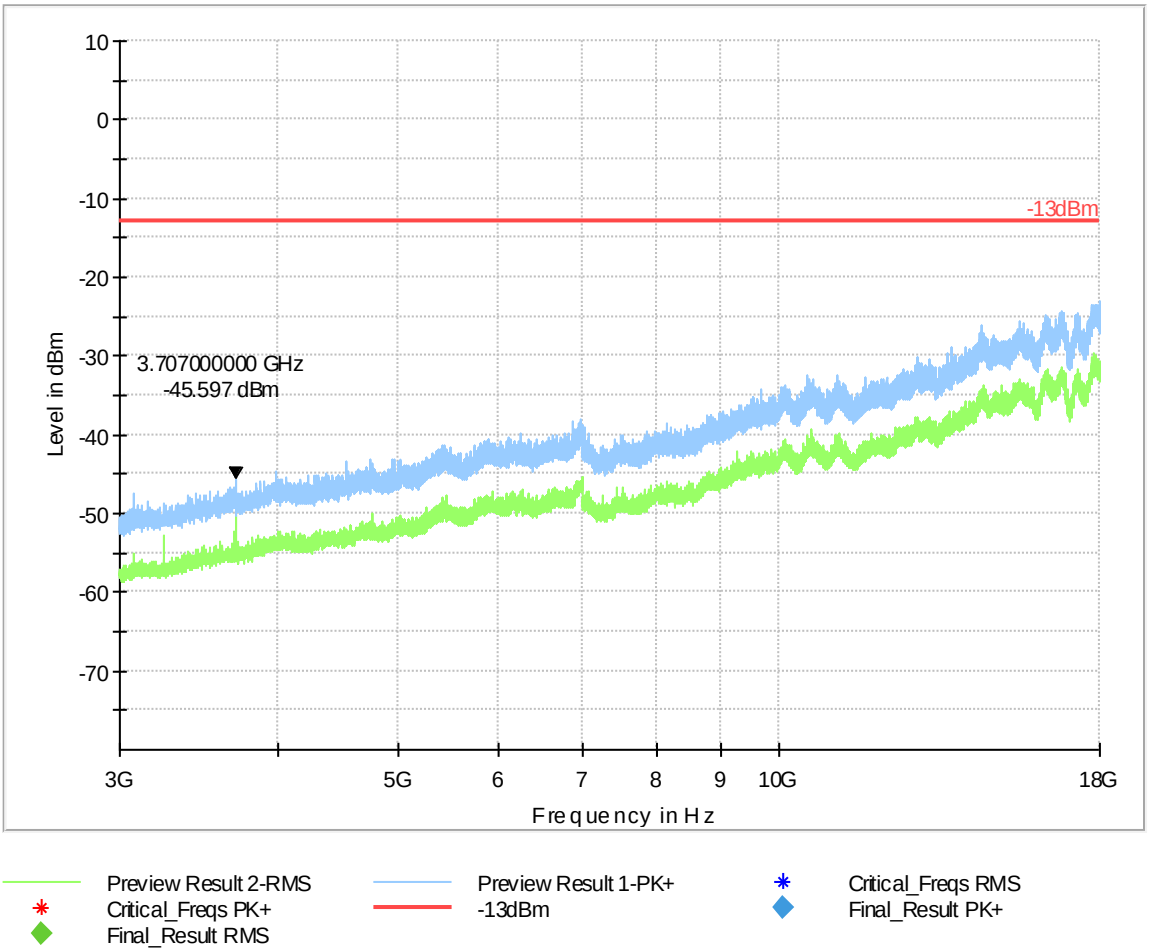
Plot # 2 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 3 Radiated Emissions: 3 GHz - 18 GHz

Channel: Low

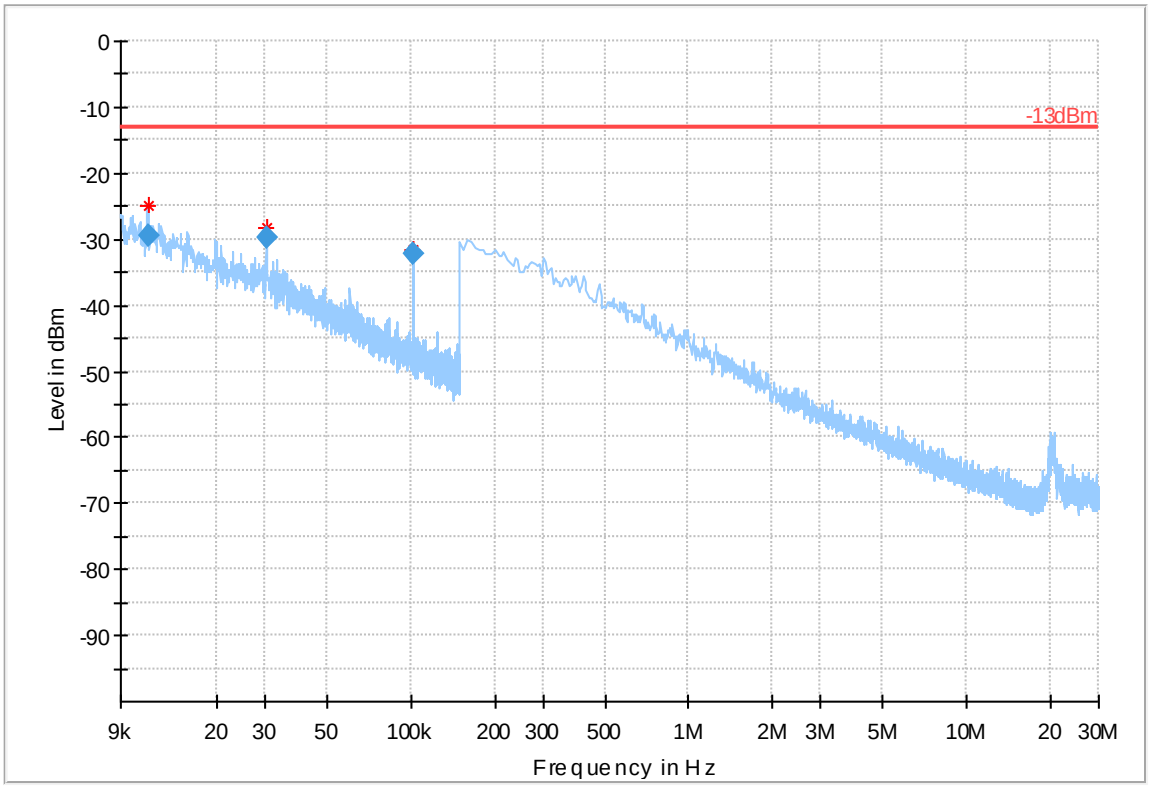


Plot # 4 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

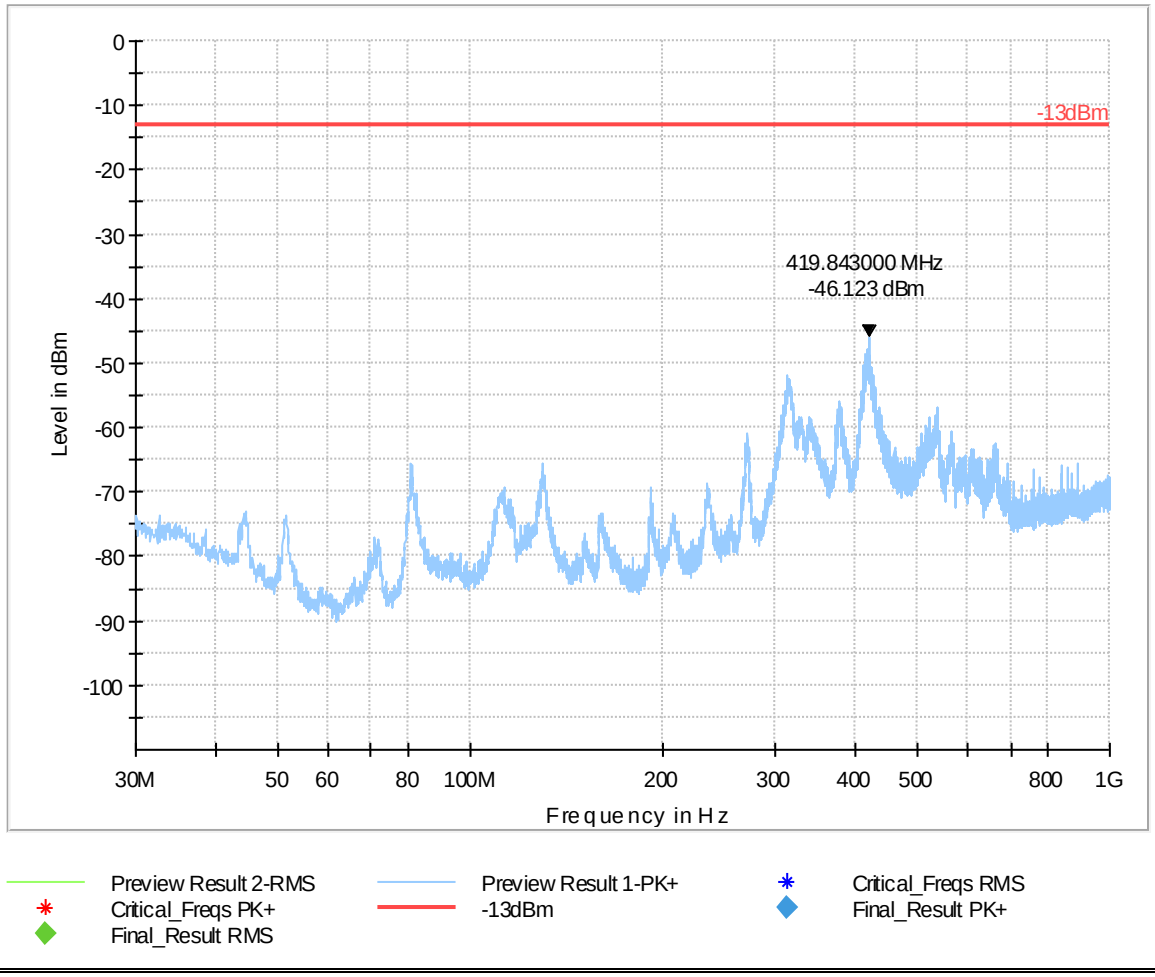
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.011275	-29.48	-13.00	16.48	100.0	0.100	200.0	H	226.0	-69.4	8:49:29 PM - 10/17/2018
0.030084	-29.92	-13.00	16.92	100.0	0.100	107.0	H	153.0	-75.5	8:51:57 PM - 10/17/2018
0.101286	-32.13	-13.00	19.13	100.0	0.100	100.0	H	26.0	-79.7	8:47:30 PM - 10/17/2018



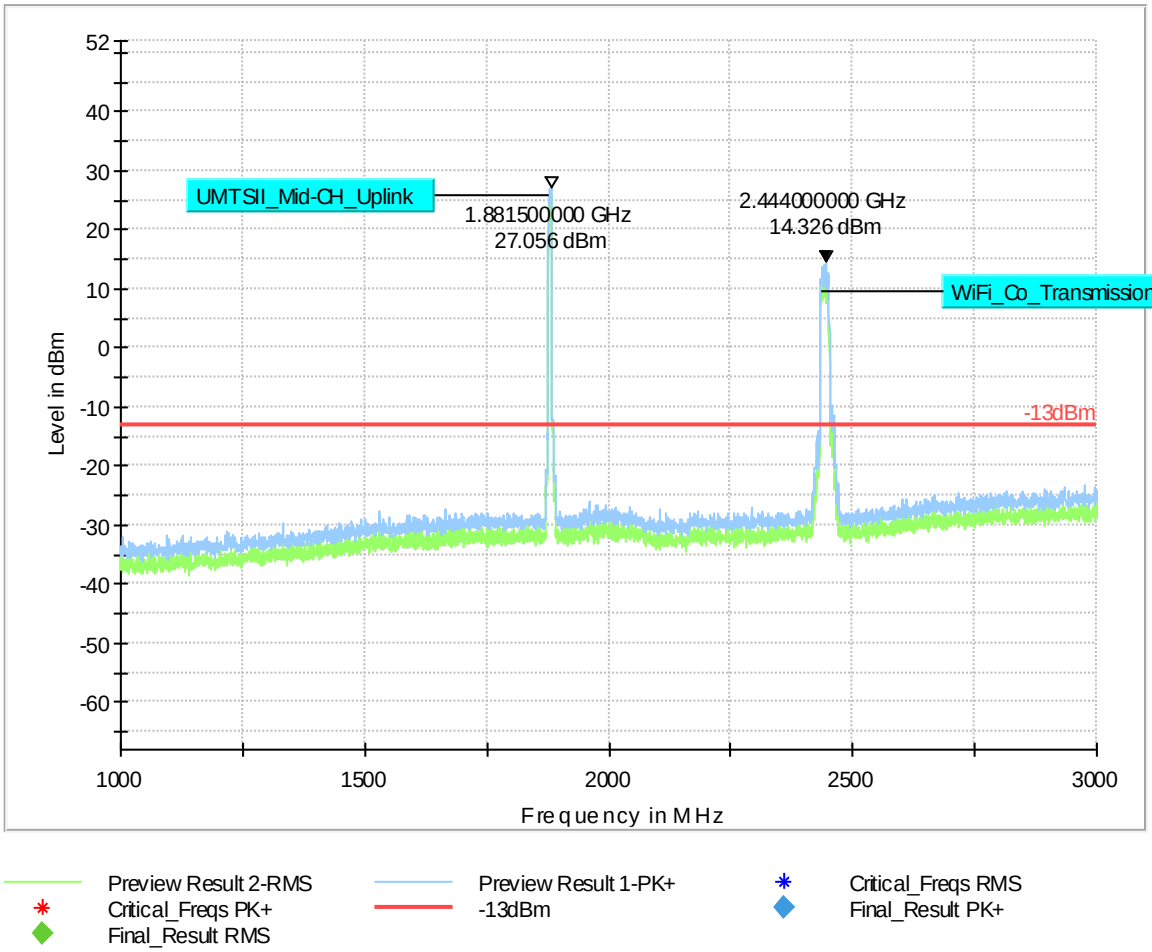
Plot # 5 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



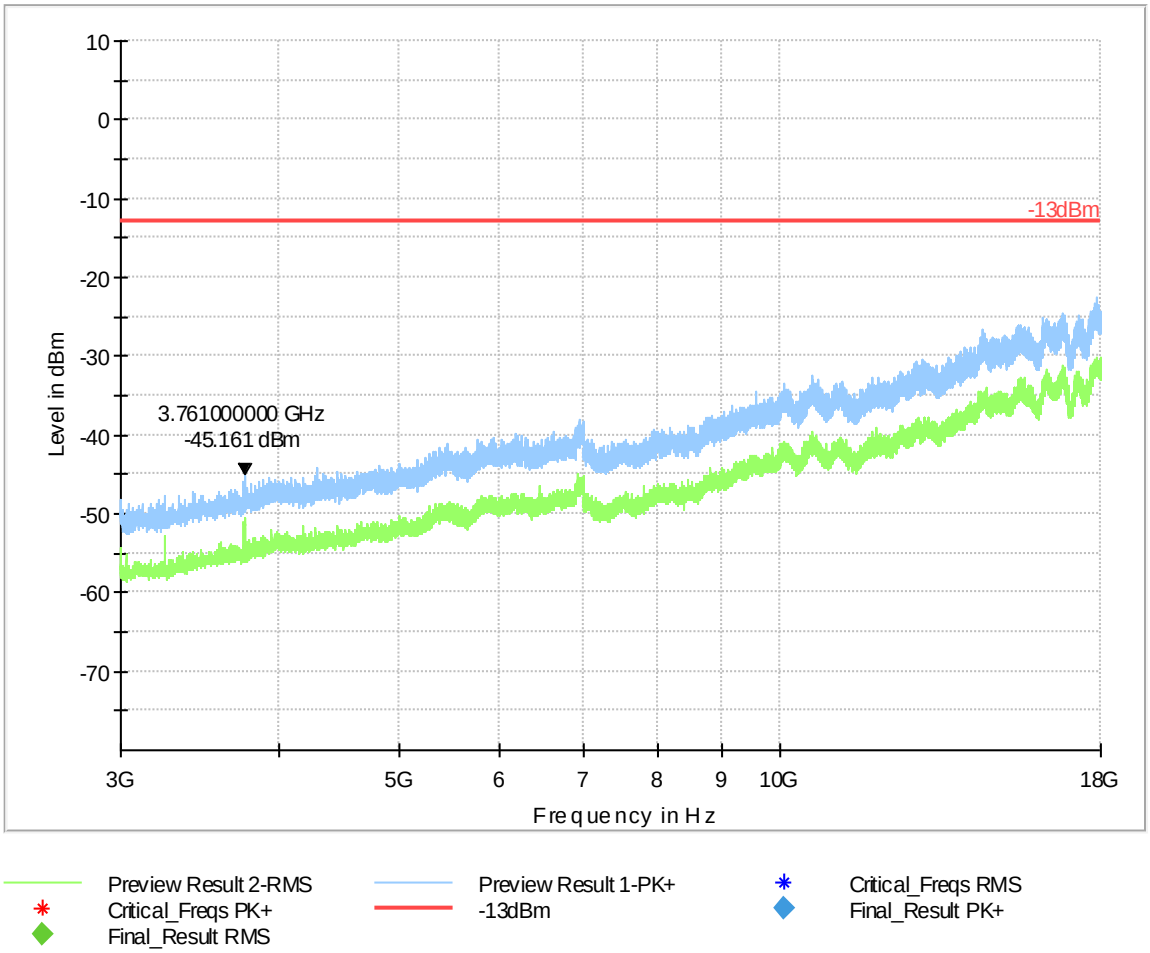
Plot # 6 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



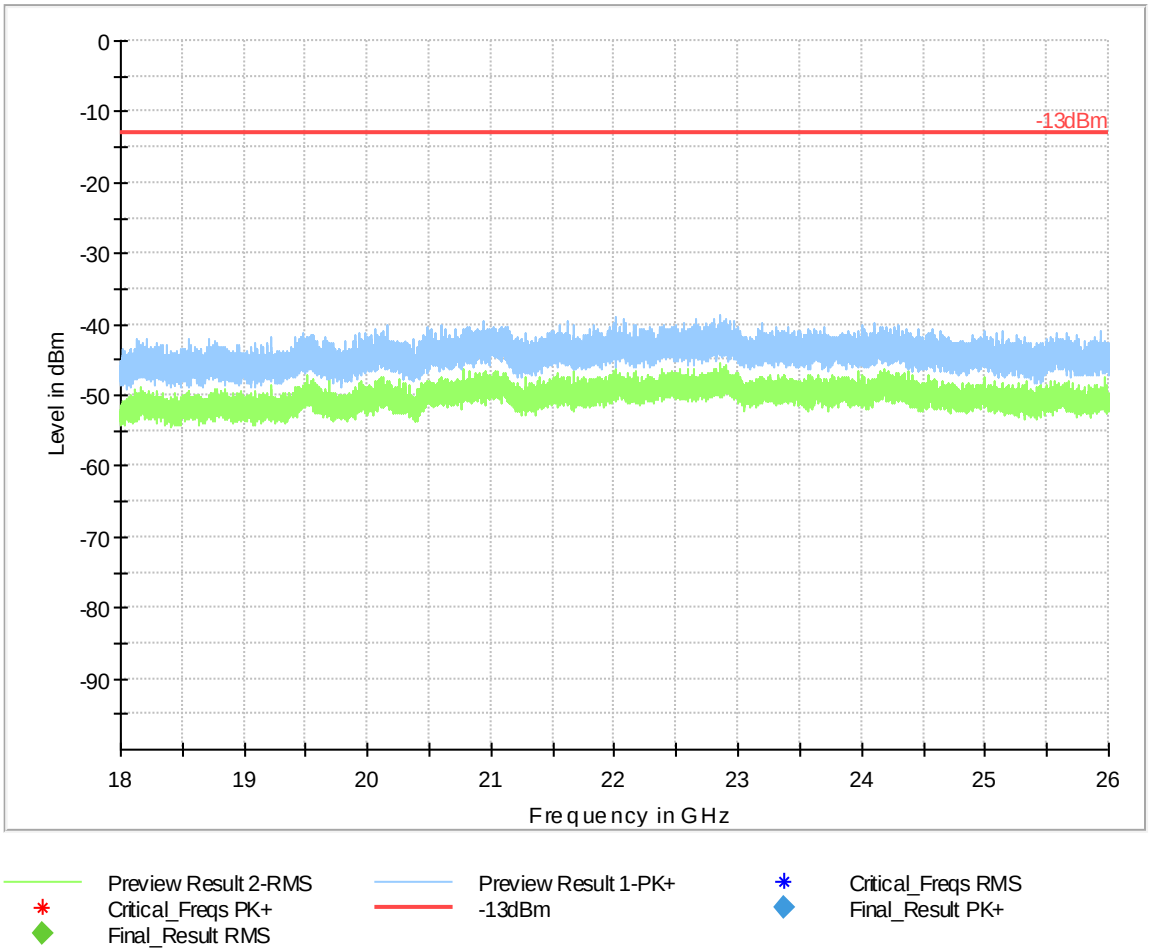
Plot # 7 Radiated Emissions: 3 GHz – 18 GHz

Channel: Mid



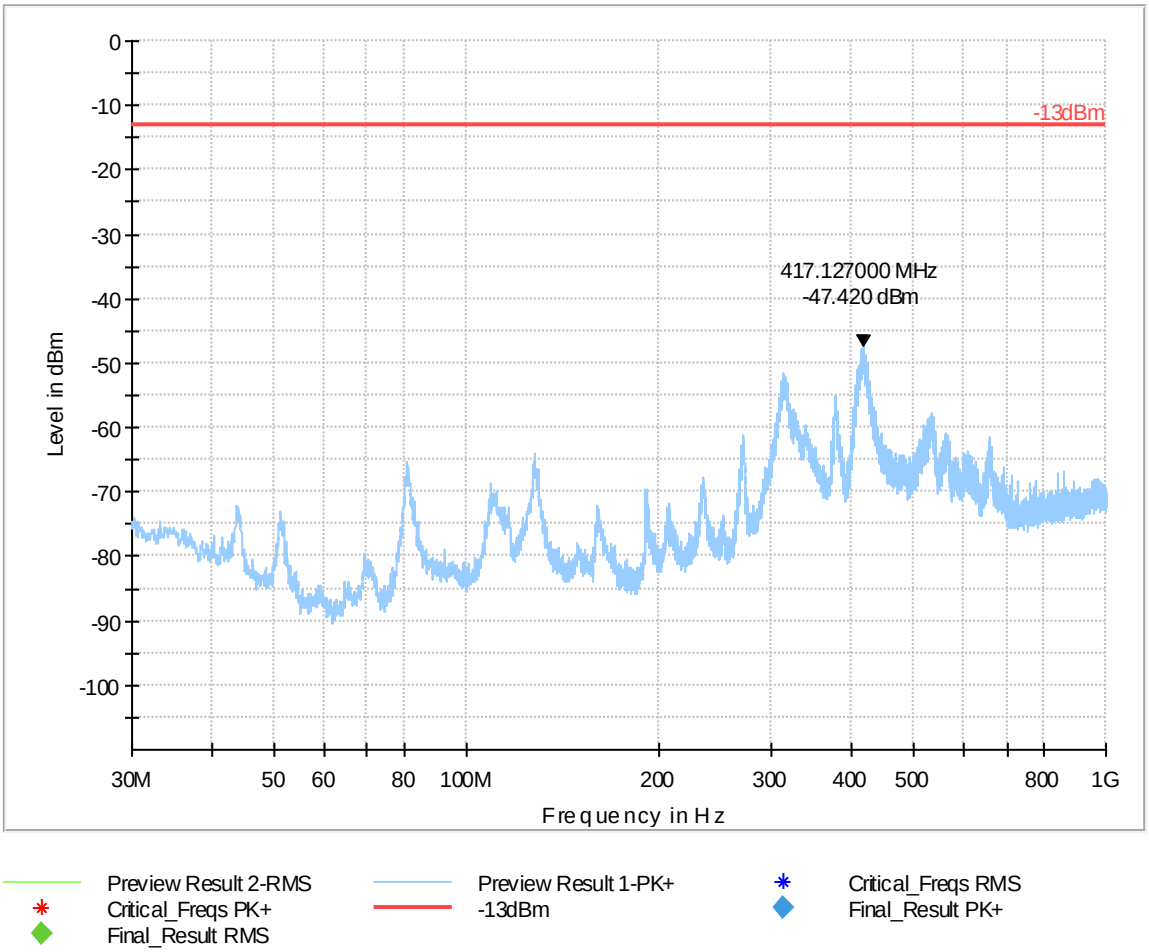
Plot # 8 Radiated Emissions: 18 GHz – 26 GHz

Channel: Mid



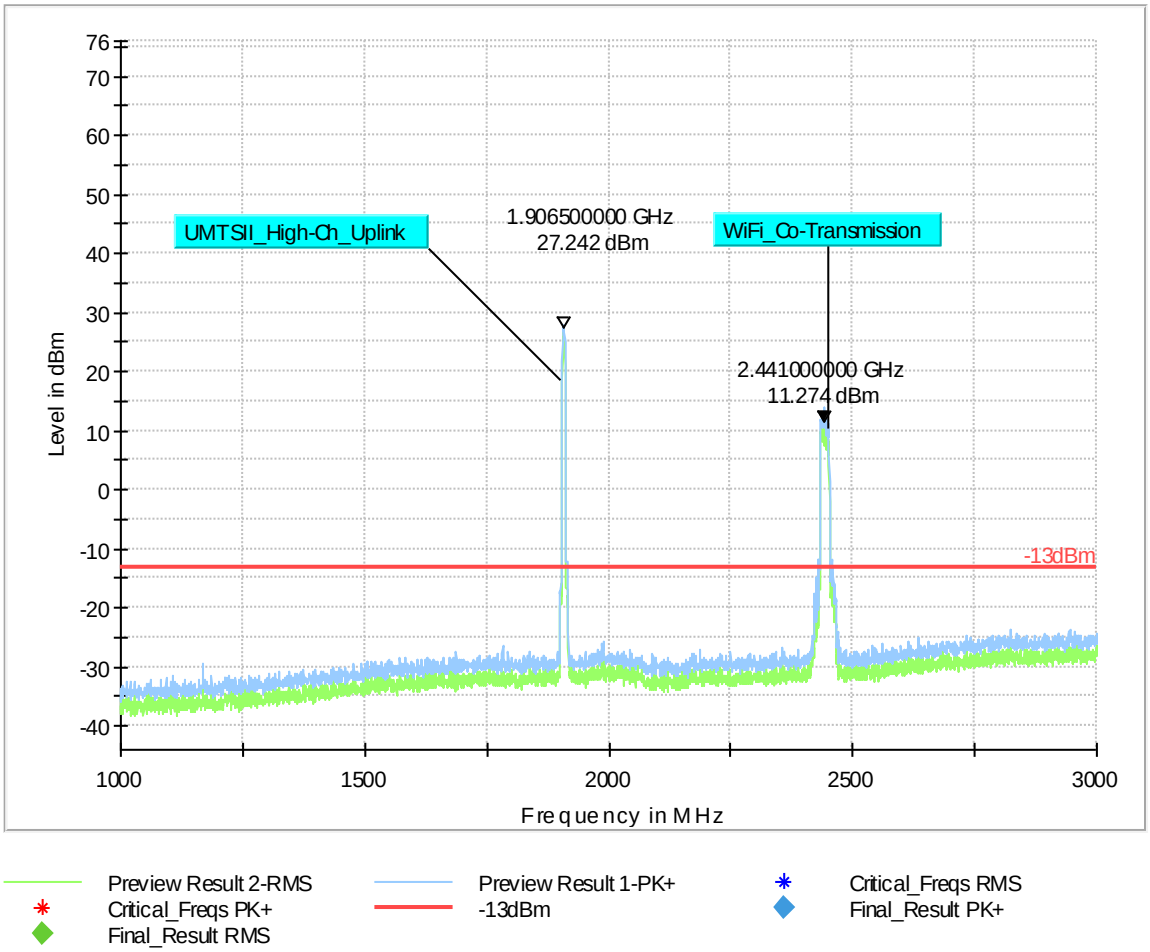
Plot # 9 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



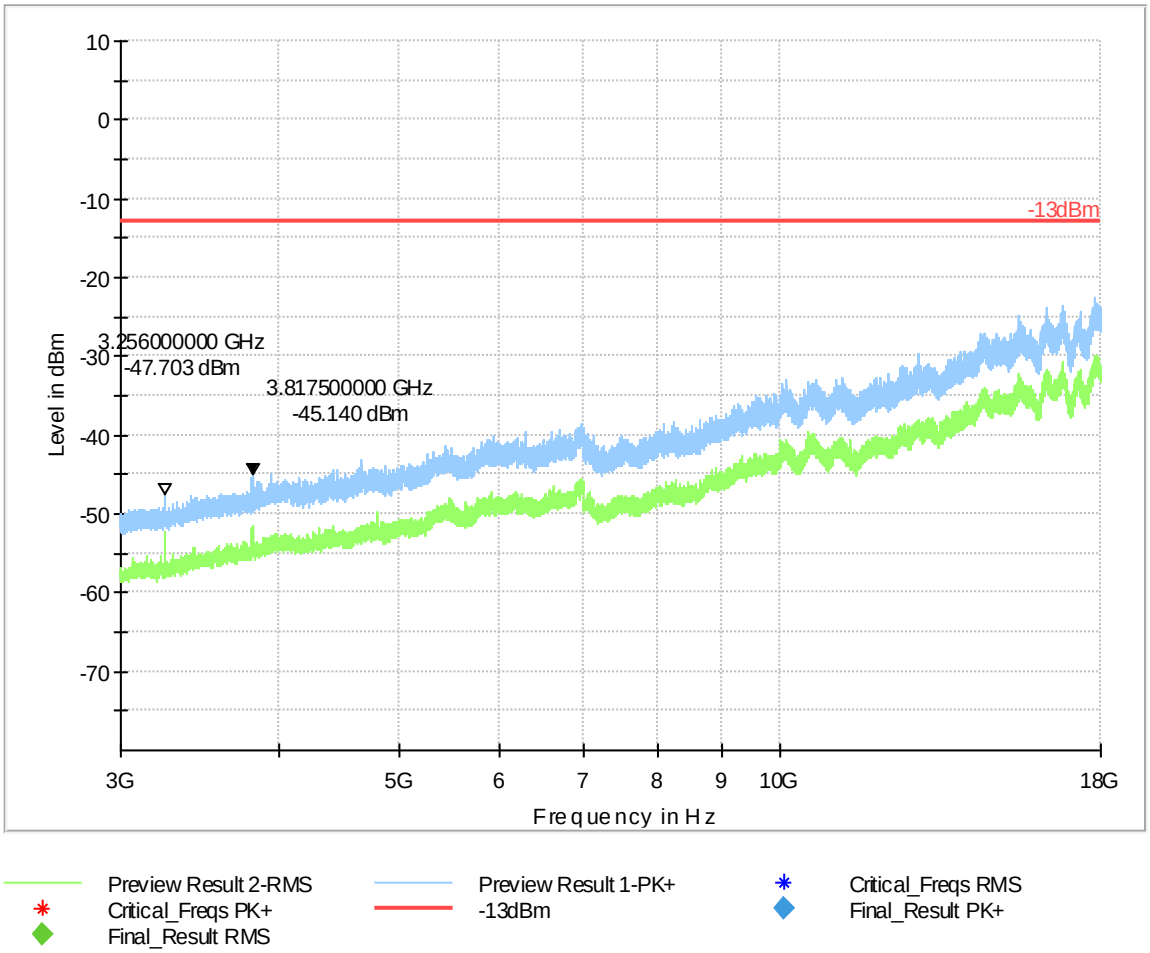
Plot # 10 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 11 Radiated Emissions: 3 GHz - 18 GHz

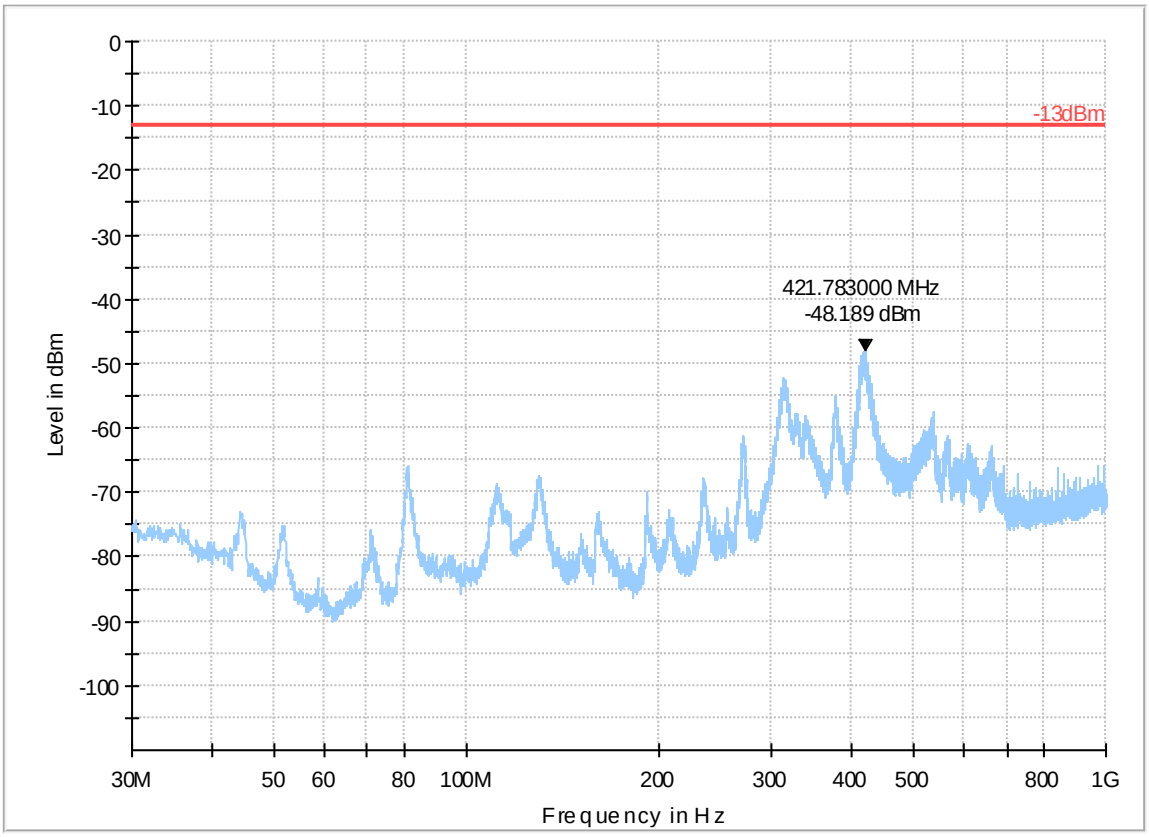
Channel: High



WCDMA Band IV

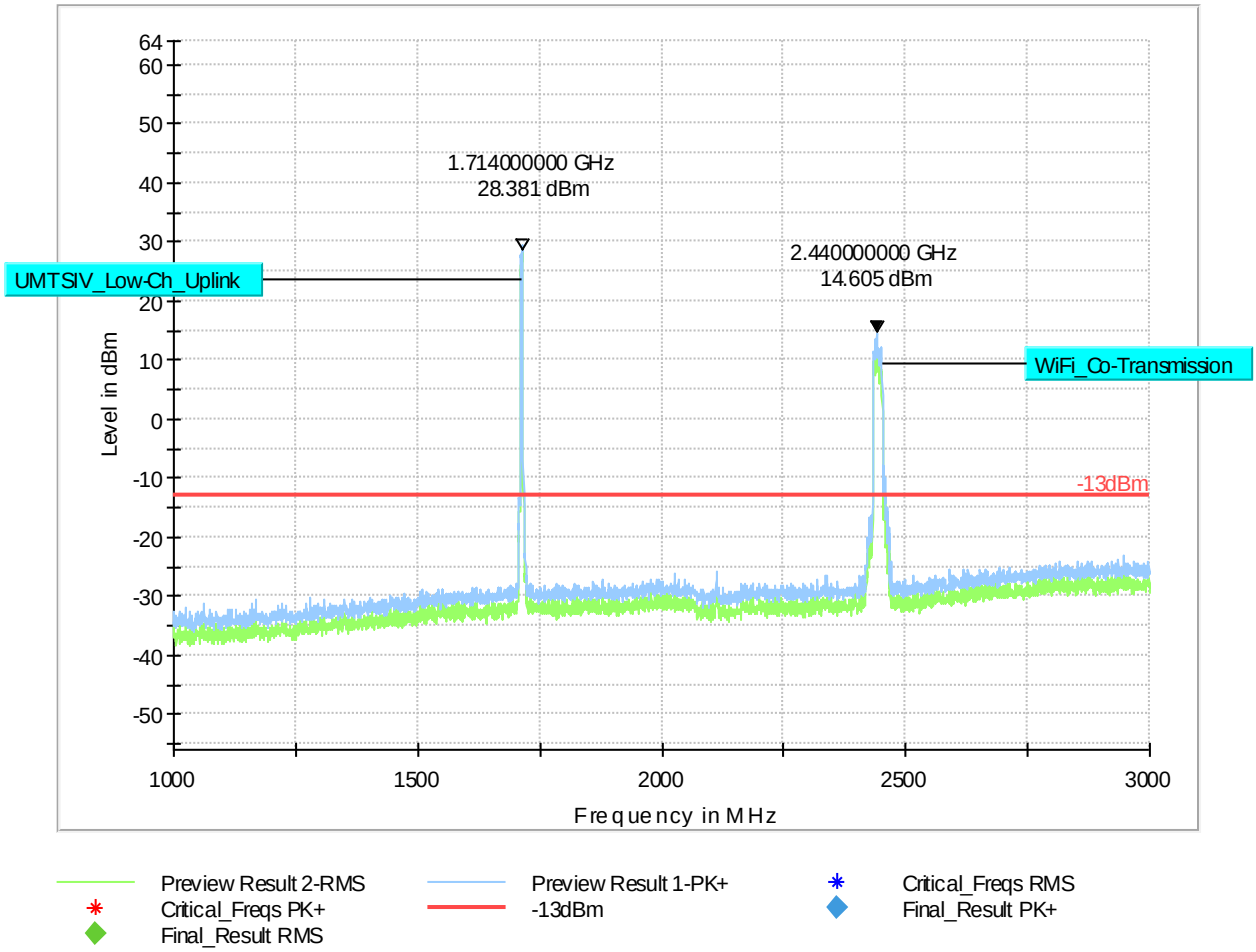
Plot # 12 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



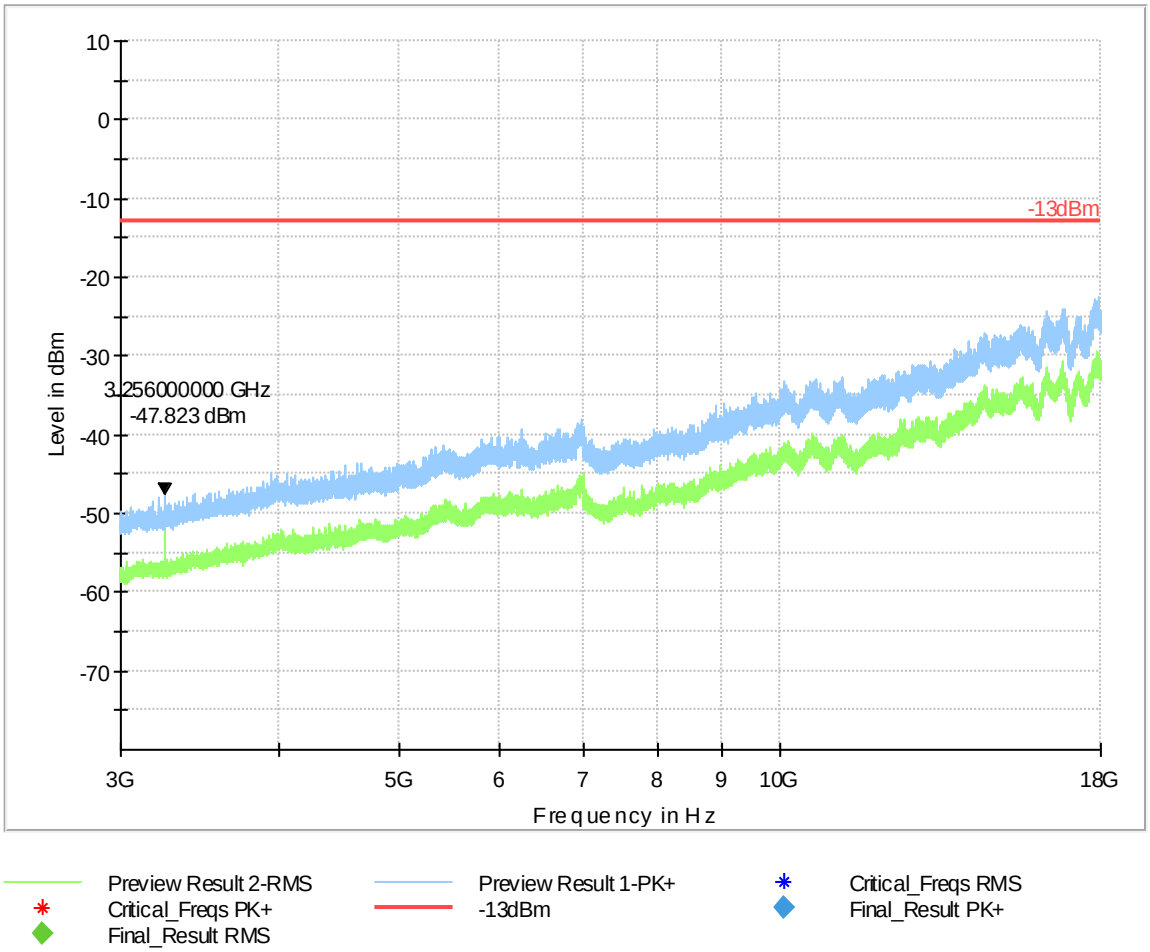
Plot # 13 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 14 Radiated Emissions: 3 GHz - 18 GHz

Channel: Low

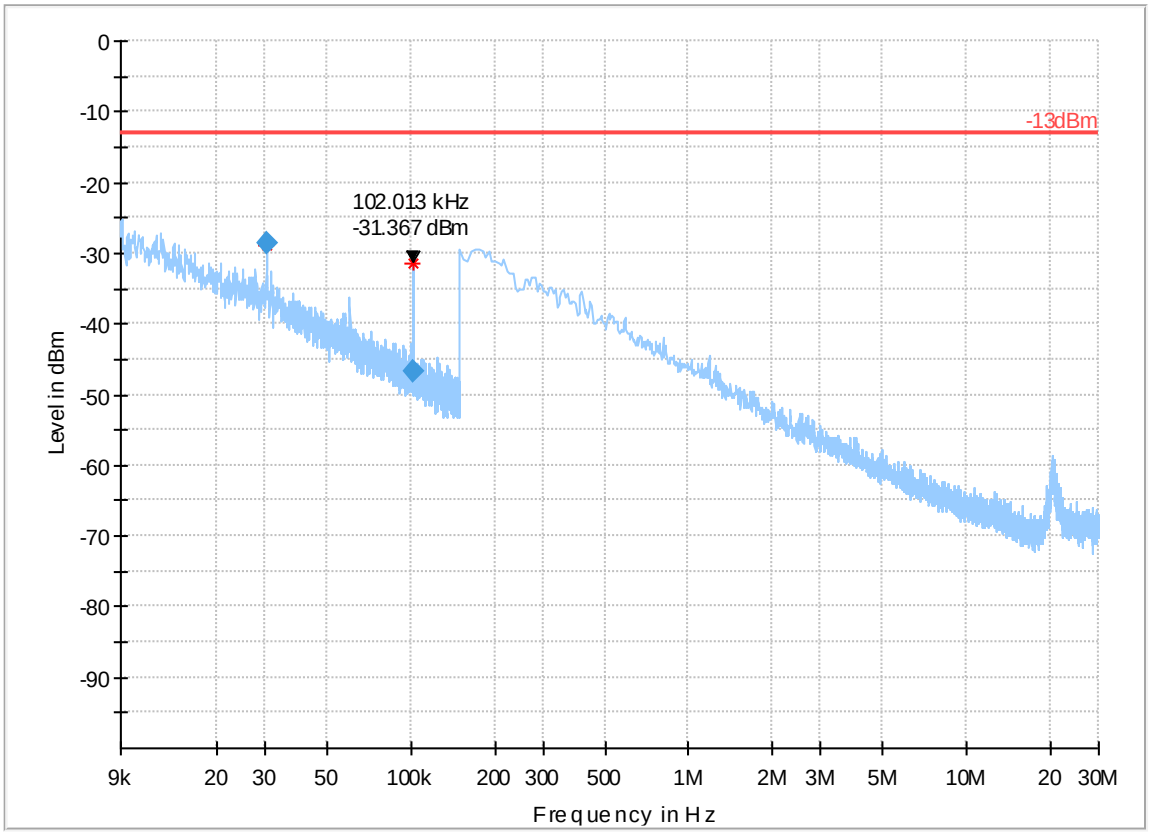


Plot # 15 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

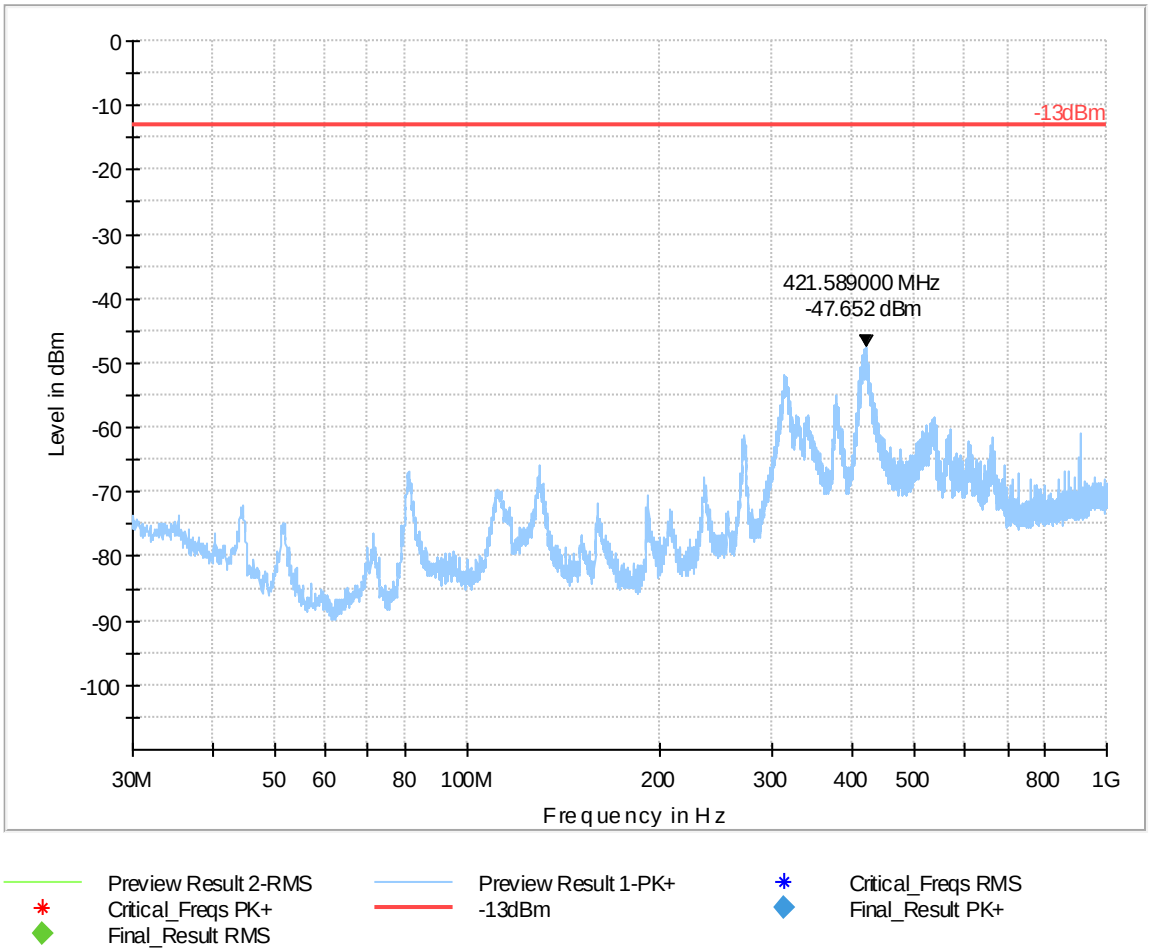
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.030135	-28.49	-13.00	15.49	100.0	0.100	107.0	H	289.0	-75.6	8:31:07 PM - 10/17/2018
0.101976	-46.61	-13.00	33.61	100.0	0.100	124.0	H	281.0	-79.7	8:38:59 PM - 10/17/2018



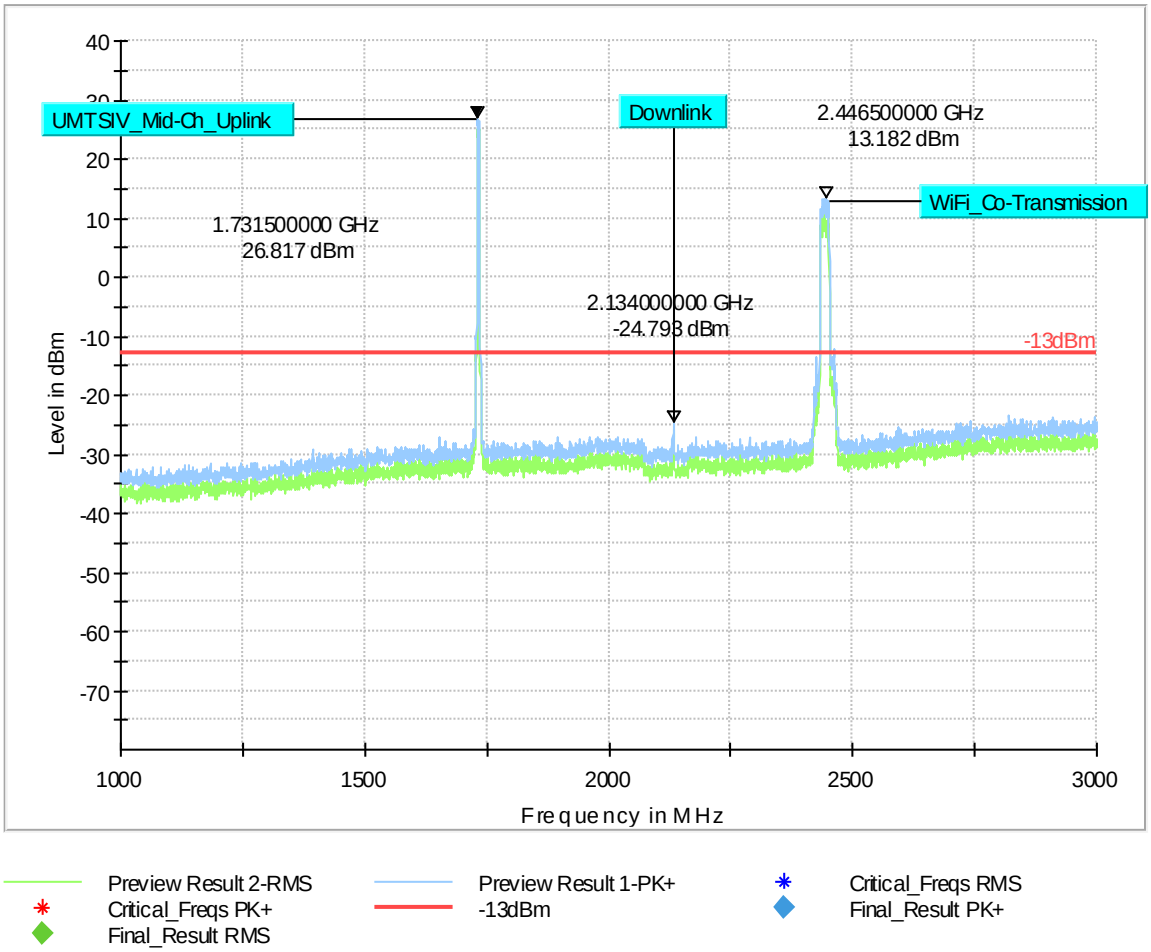
Plot # 16 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



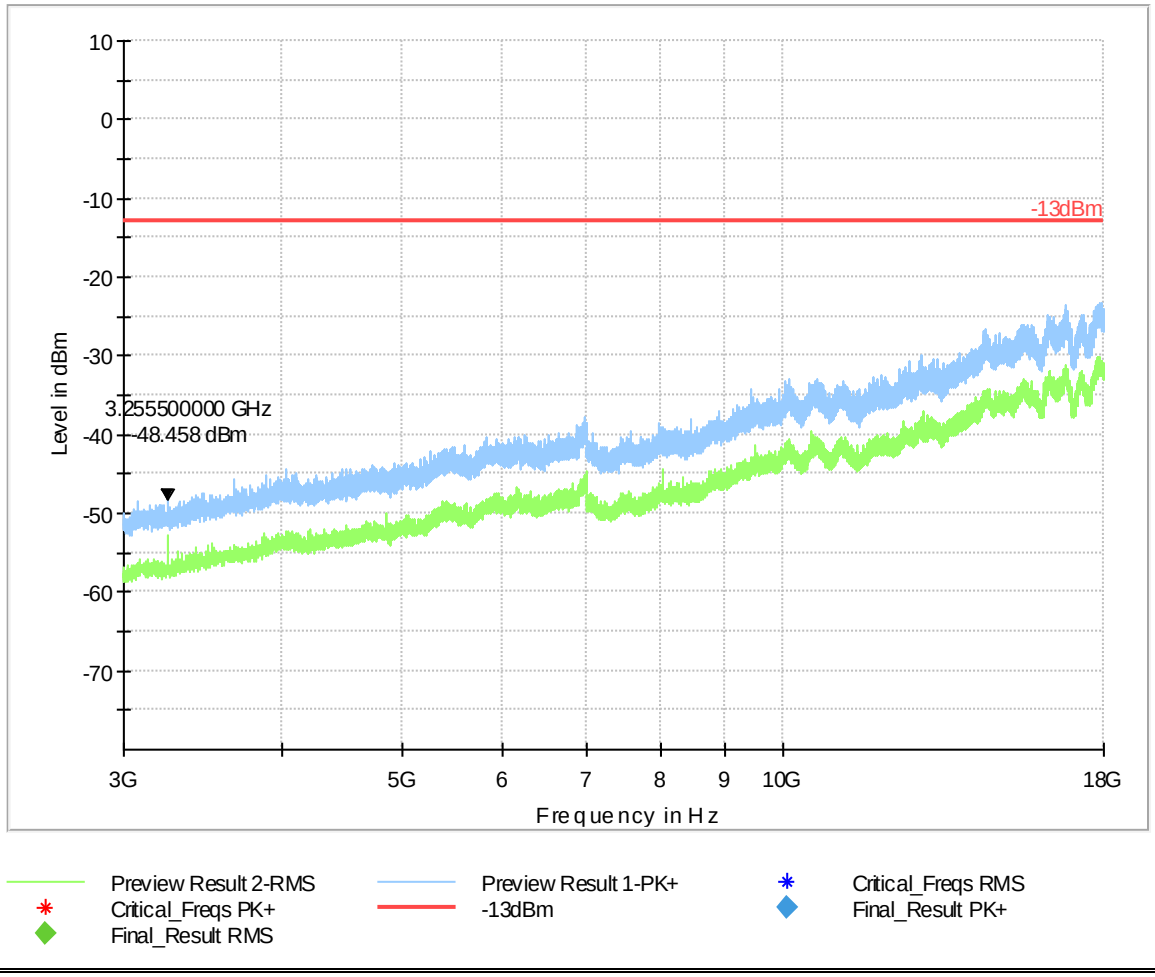
Plot #17 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



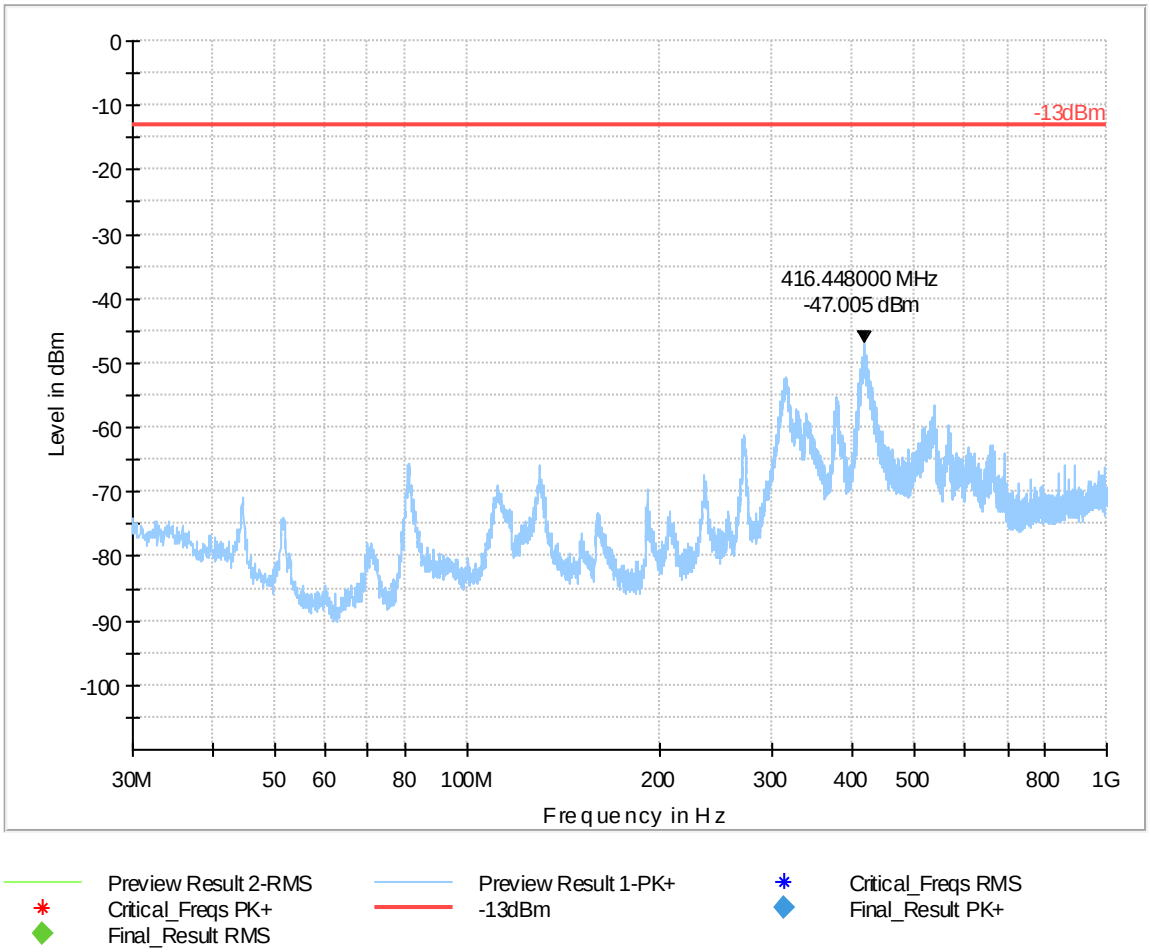
Plot # 18 Radiated Emissions: 3 GHz – 18GHz

Channel: Mid



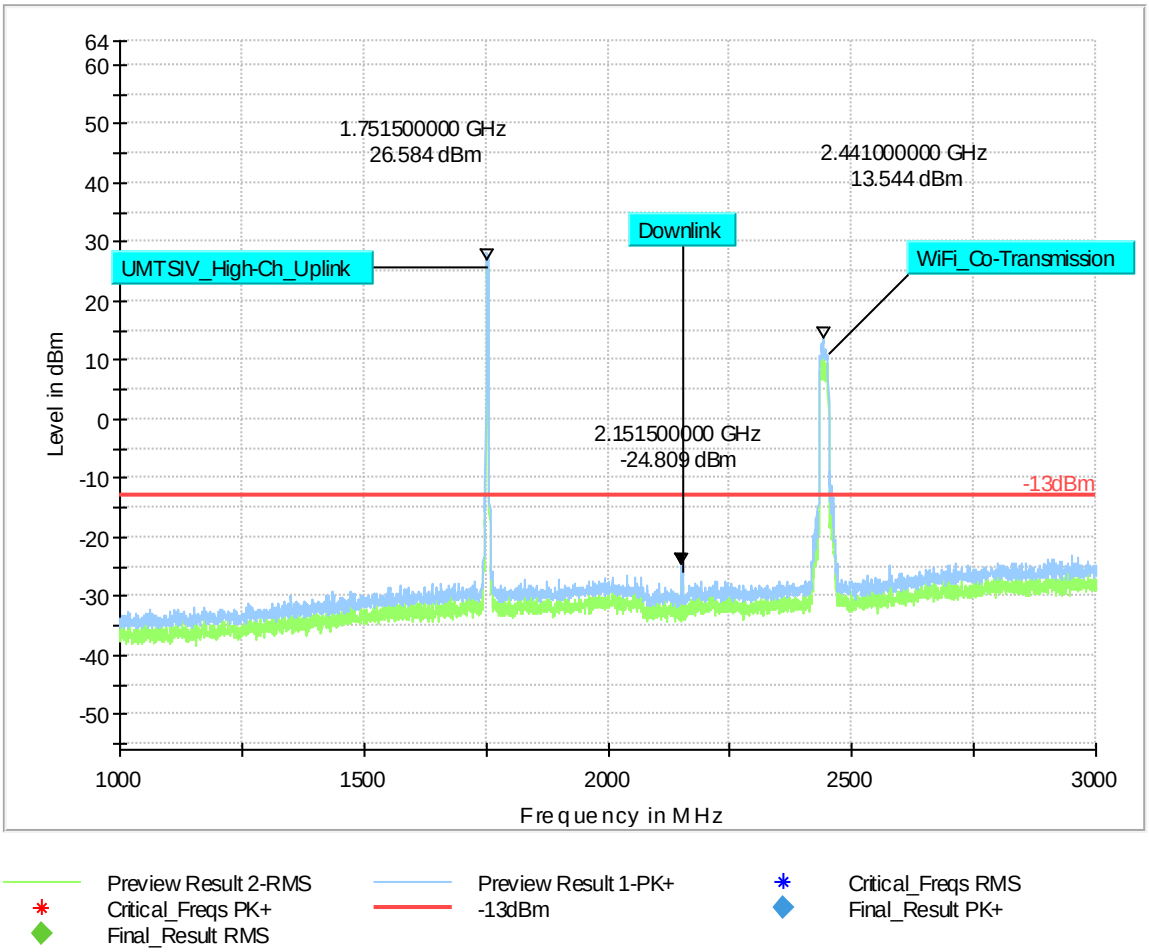
Plot # 19 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



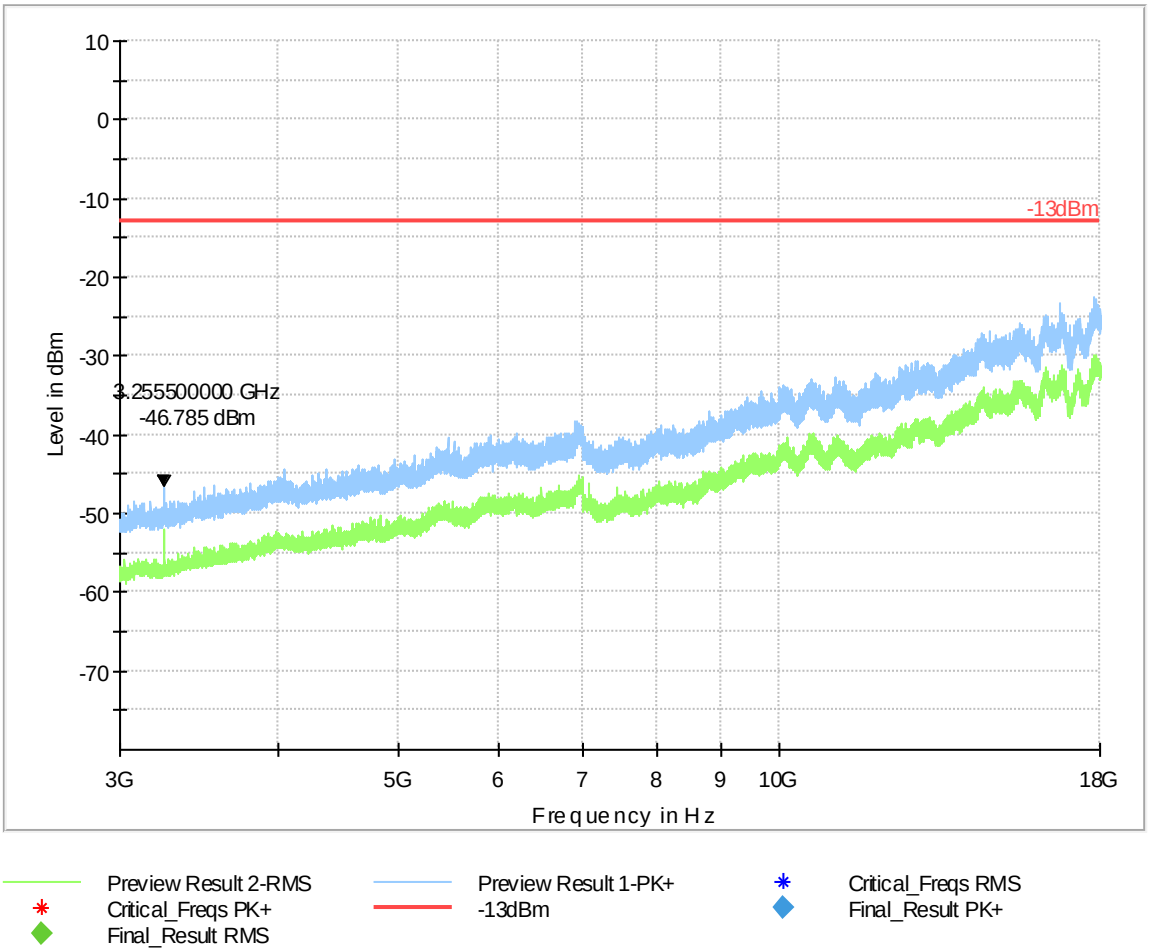
Plot # 20 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 21 Radiated Emissions: 3 GHz - 18 GHz

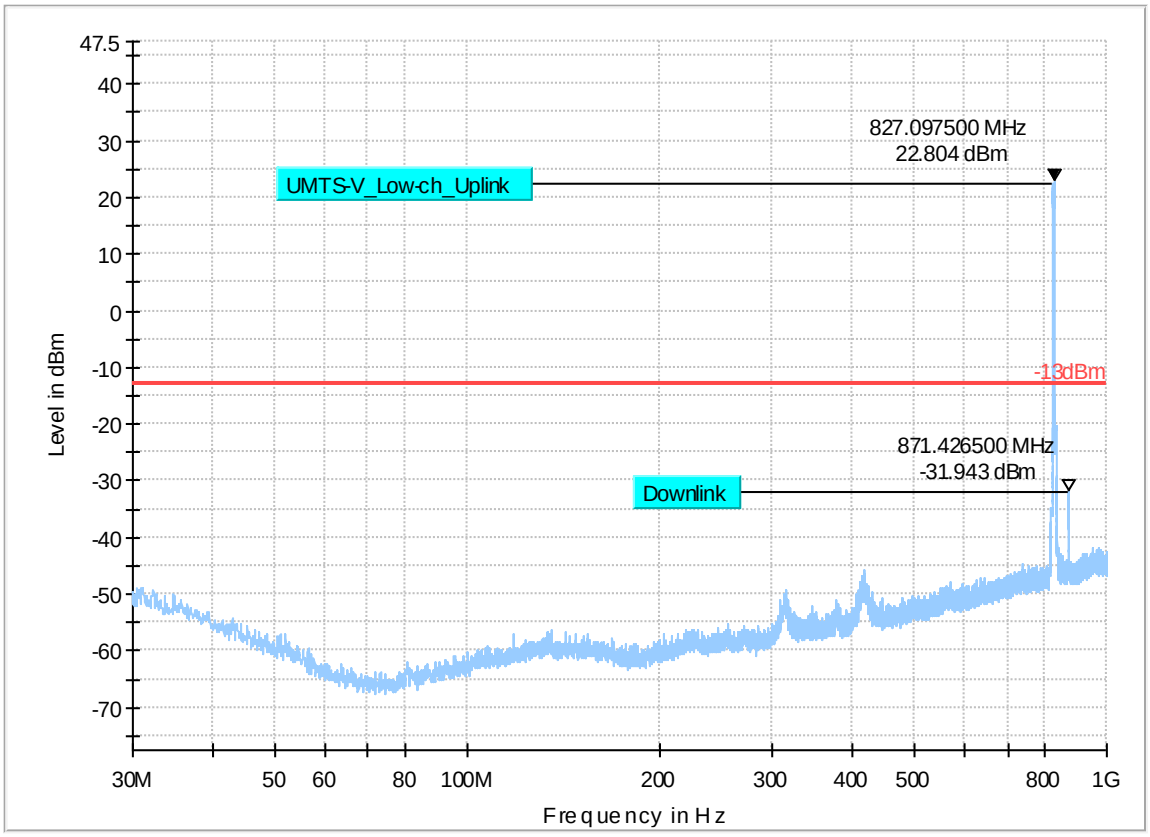
Channel: High



WCDMA Band V

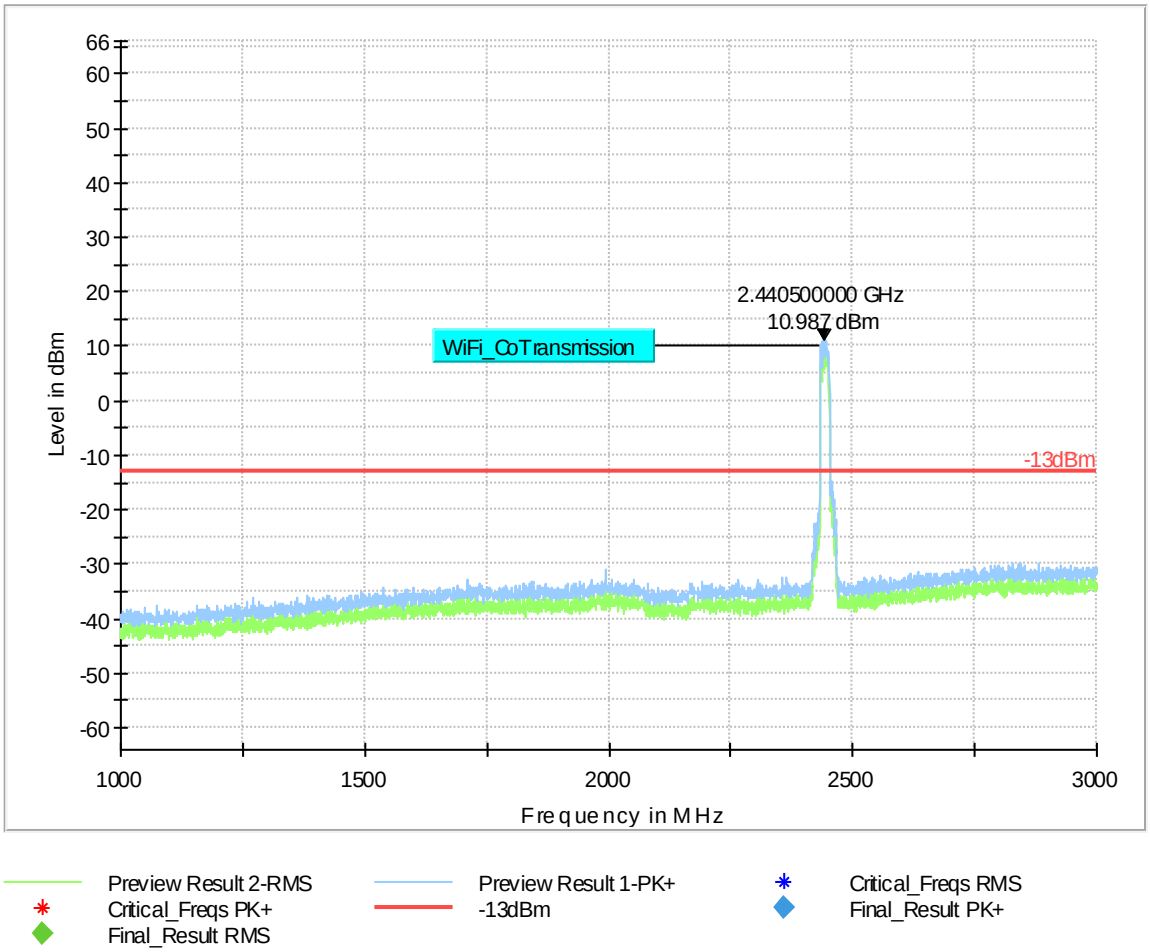
Plot # 22 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



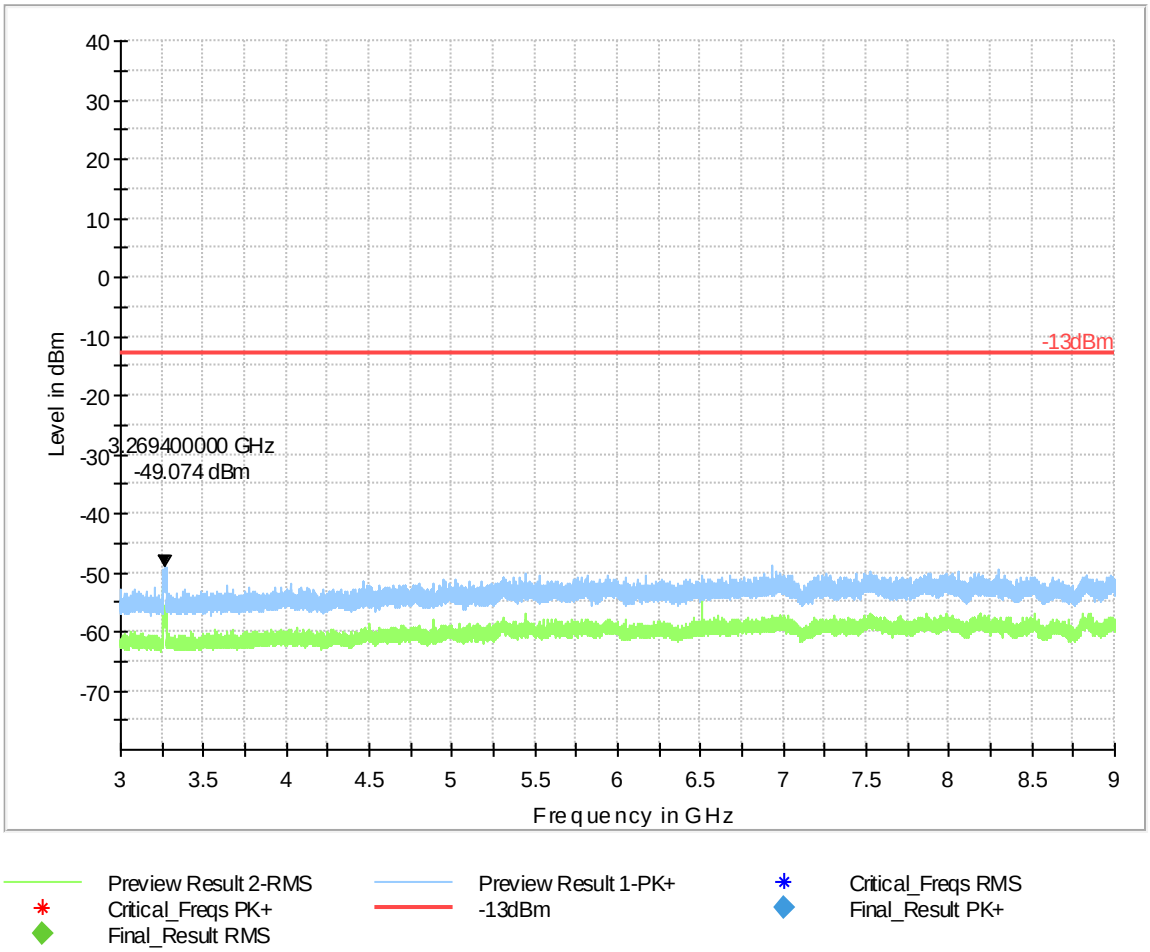
Plot # 23 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 24 Radiated Emissions: 3 GHz - 9 GHz

Channel: Low

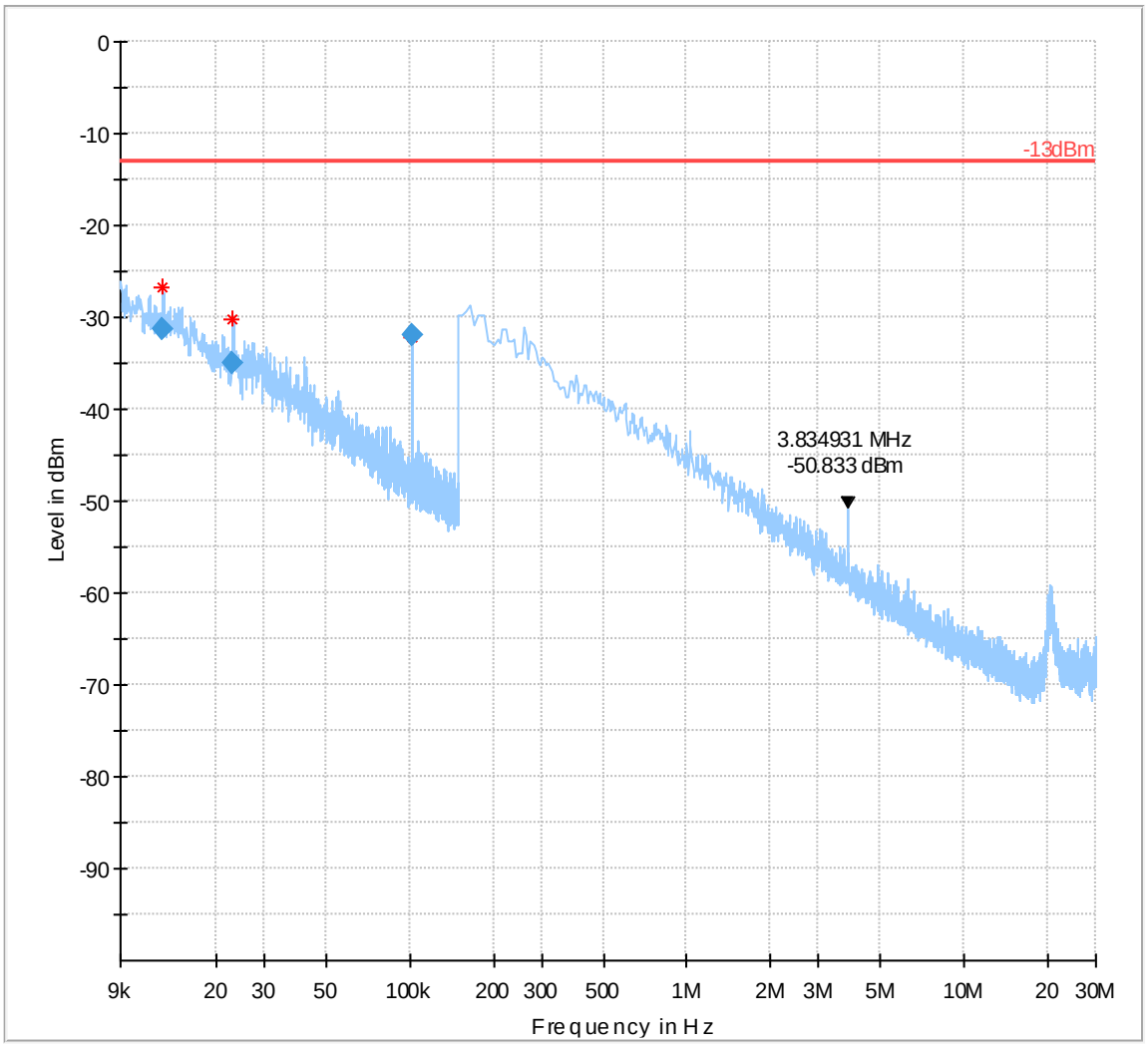


Plot # 25 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

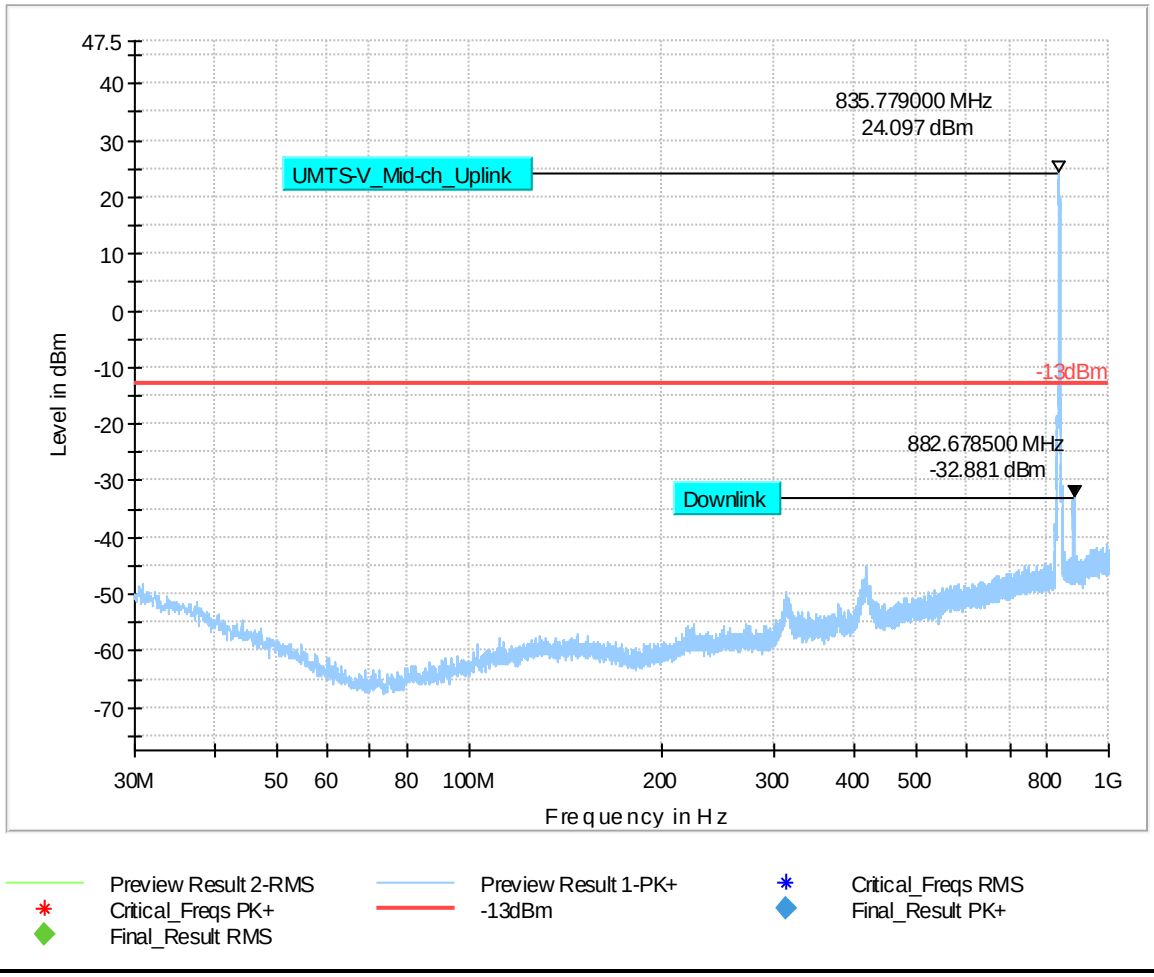
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.012857	-31.20	-13.00	18.20	100.0	0.100	107.0	H	213.0	-70.3	8:12:26 PM - 10/17/2018
0.023010	-35.03	-13.00	22.03	100.0	0.100	144.0	H	264.0	-74.5	8:14:37 PM - 10/17/2018
0.101982	-31.95	-13.00	18.95	100.0	0.100	100.0	H	331.0	-79.7	8:16:50 PM - 10/17/2018



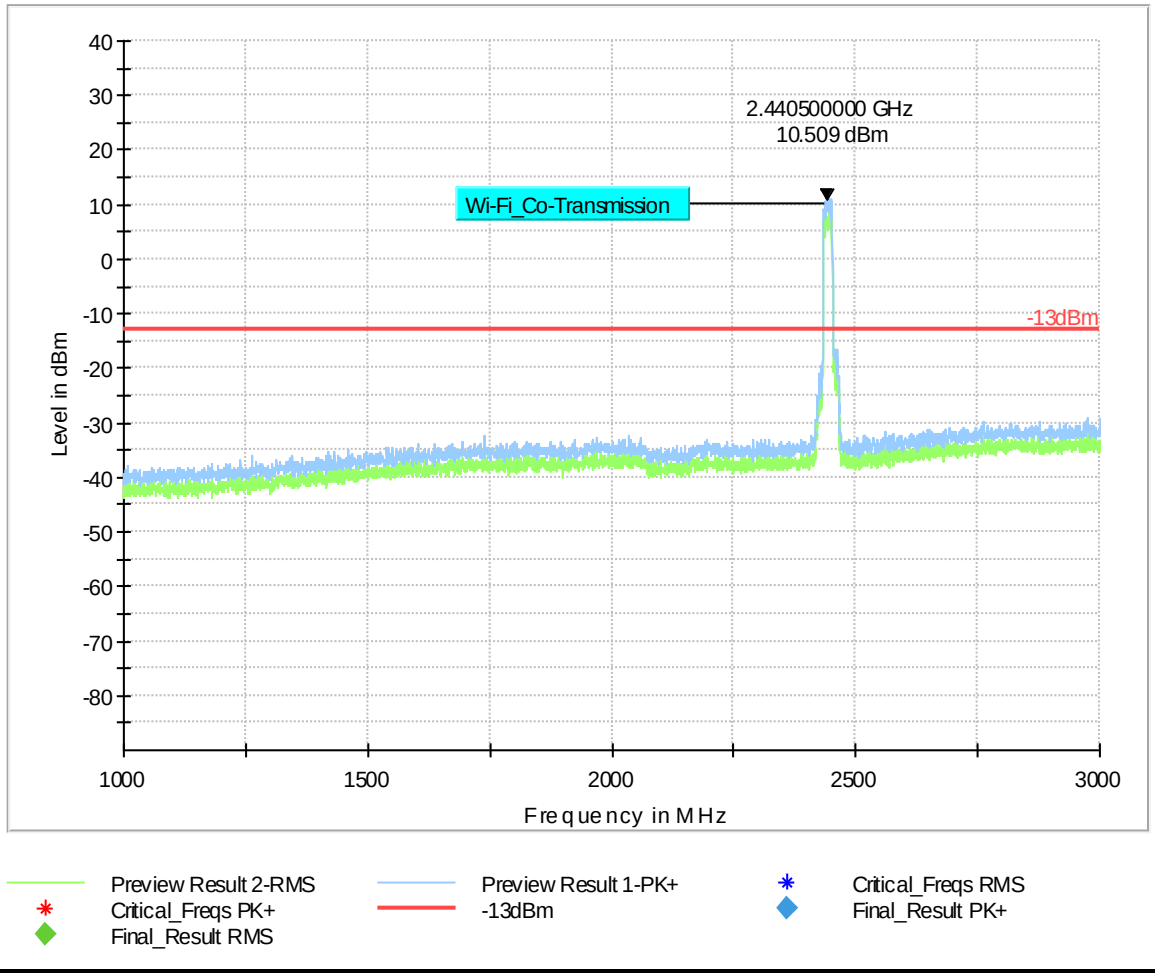
Plot # 26 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



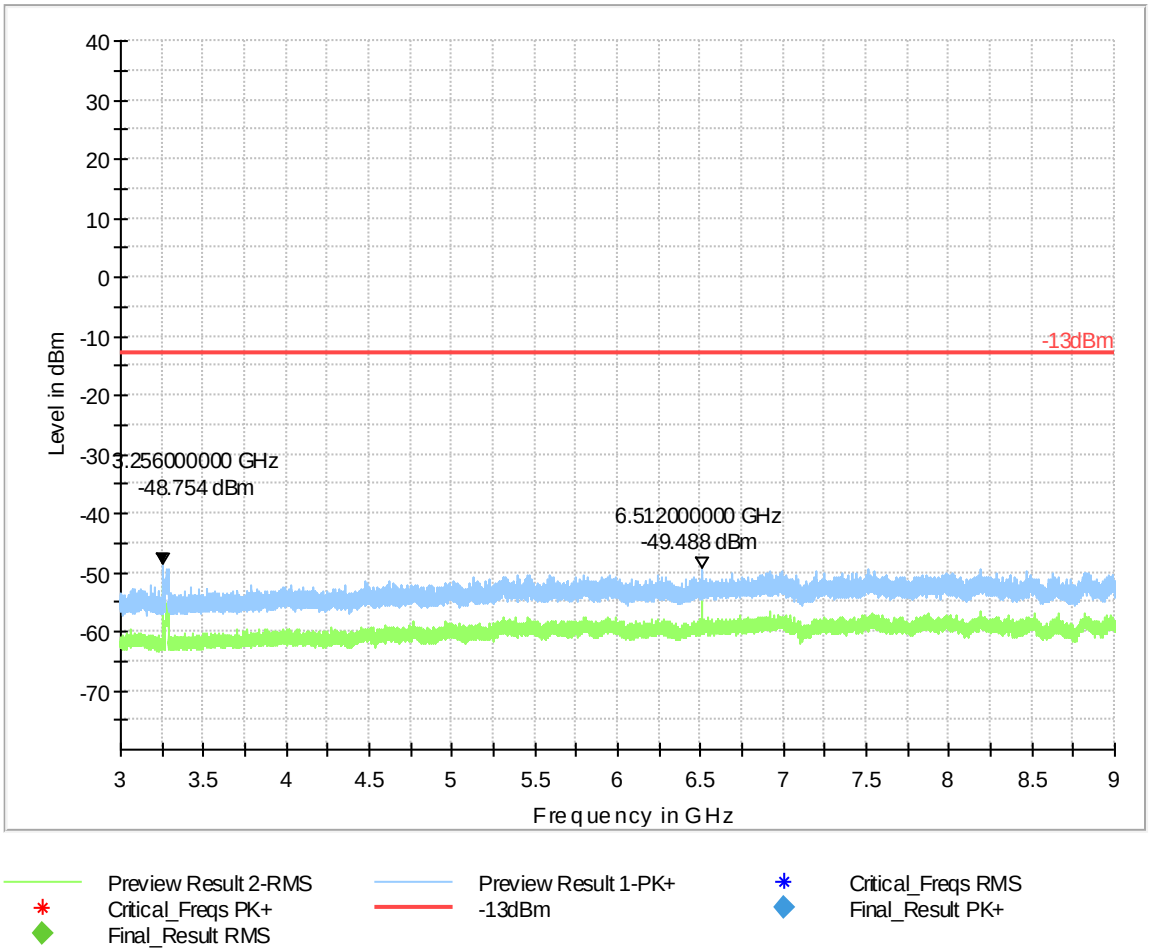
Plot # 27 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



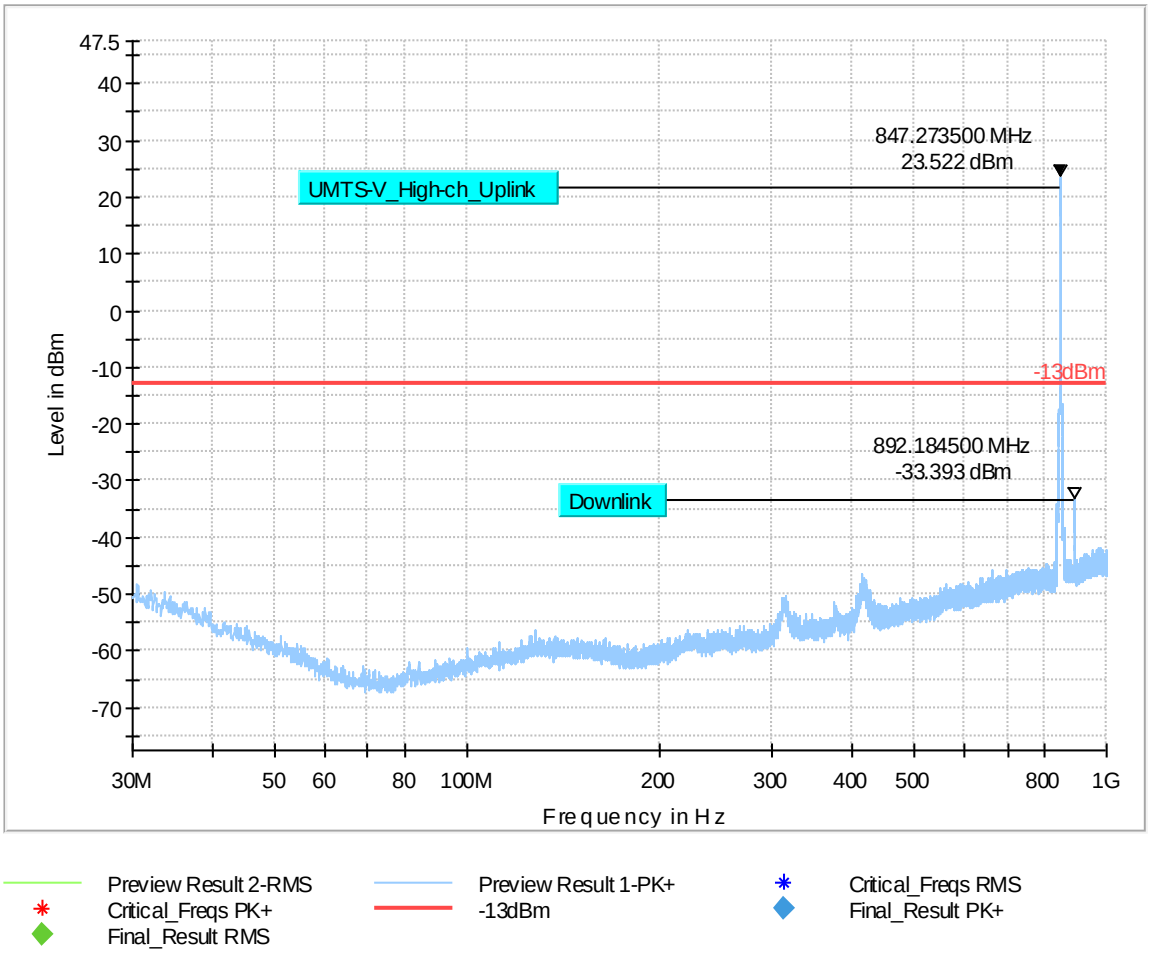
Plot # 28 Radiated Emissions: 3 GHz – 9GHz

Channel: Mid



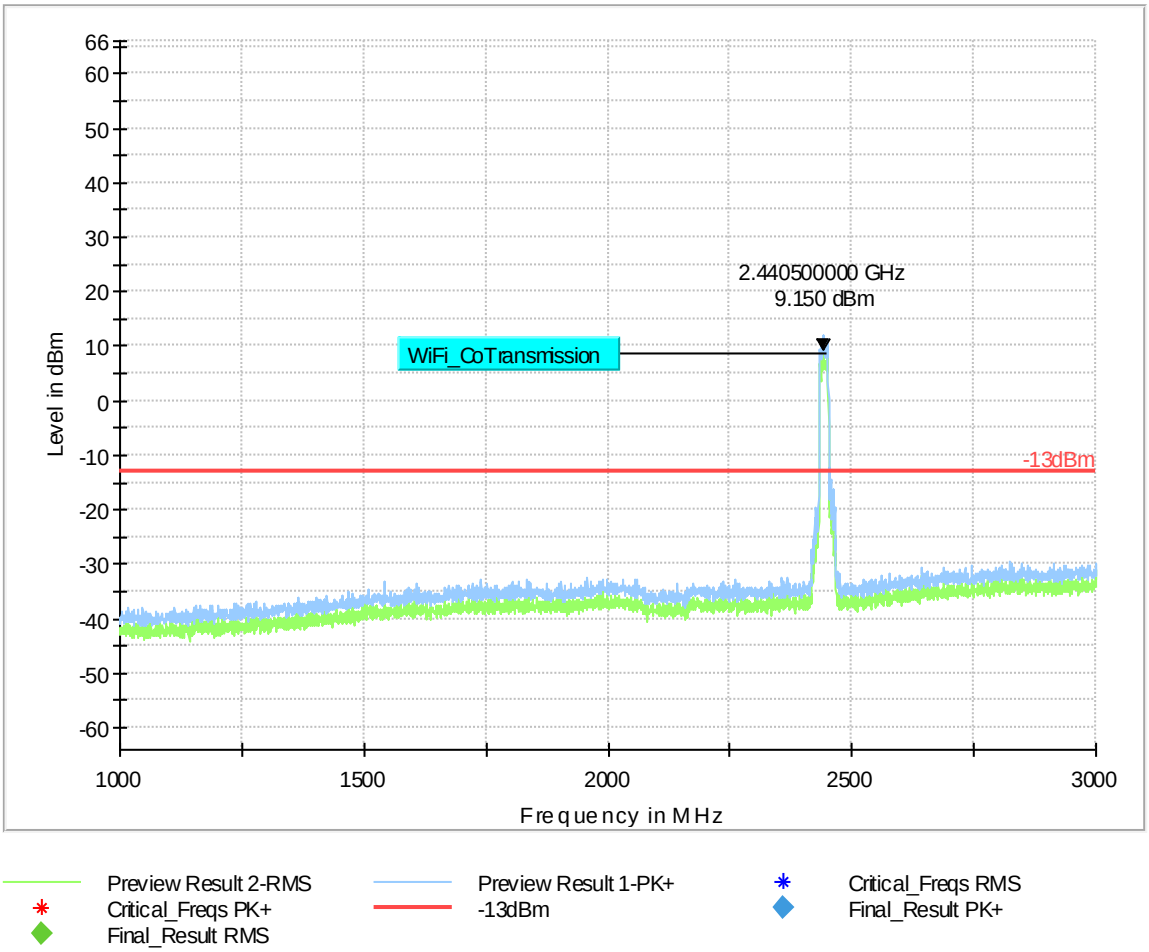
Plot # 29 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



Plot # 30 Radiated Emissions: 1 GHz - 3 GHz

Channel: High

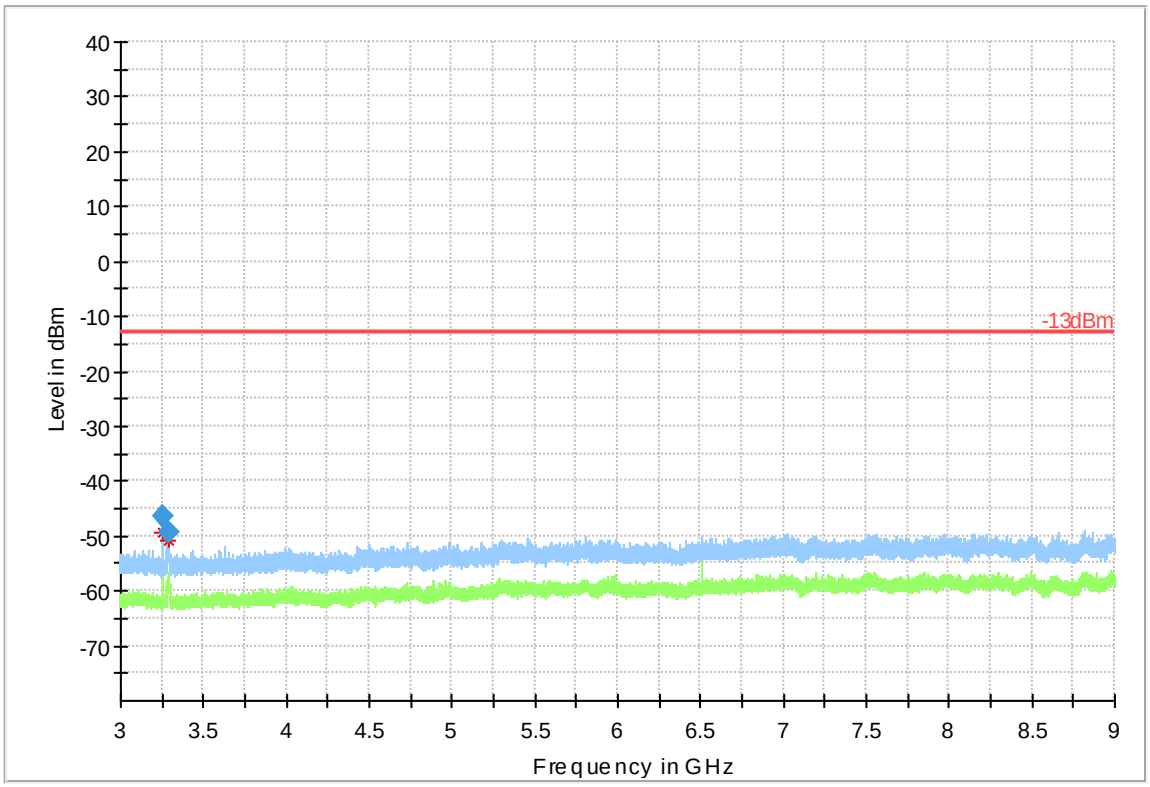


Plot # 31 Radiated Emissions: 3 GHz - 9 GHz

Channel: High

Final_Result

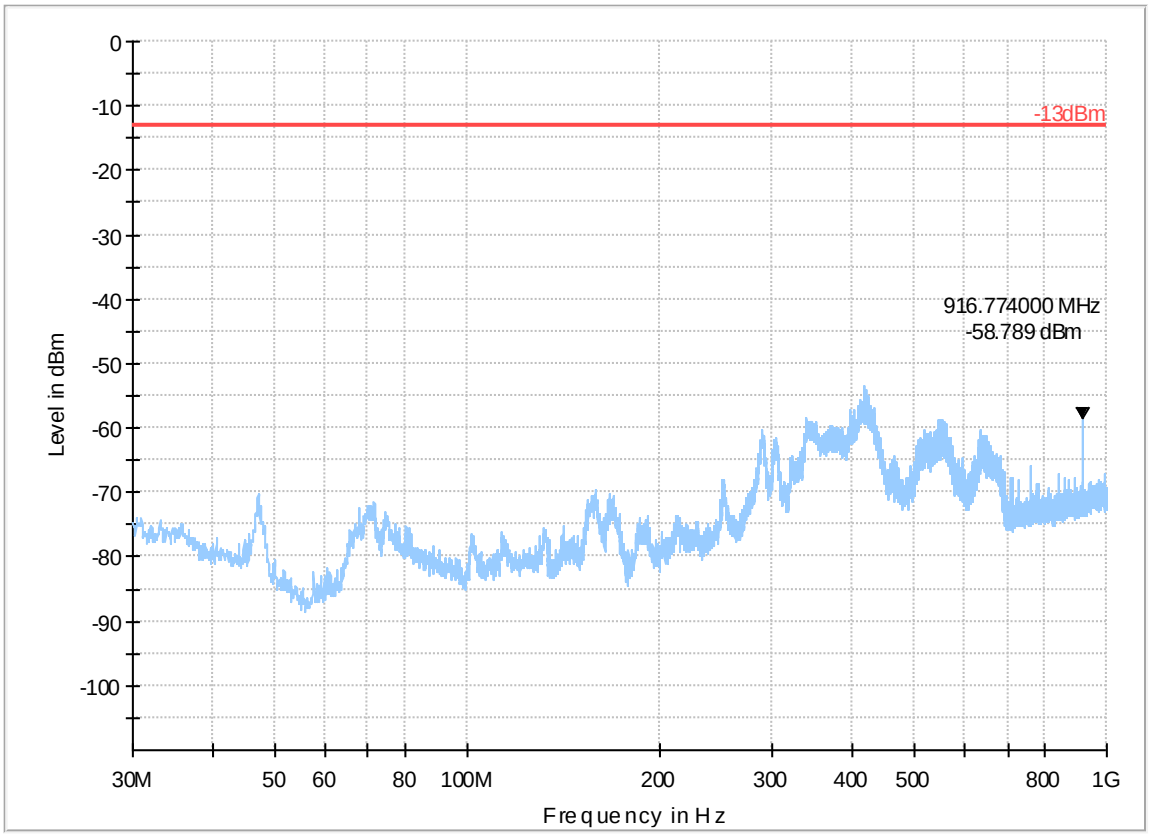
Frequency (MHz)	MaxPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
3256.142667	-46.57	-13.00	33.57	500.0	1000.000	332.0	H	263.0	-132.1	7:31:21 PM - 10/15/2018
3289.198000	-49.22	-13.00	36.22	500.0	1000.000	208.0	H	256.0	-132.0	7:28:30 PM - 10/15/2018



LTE Band 2

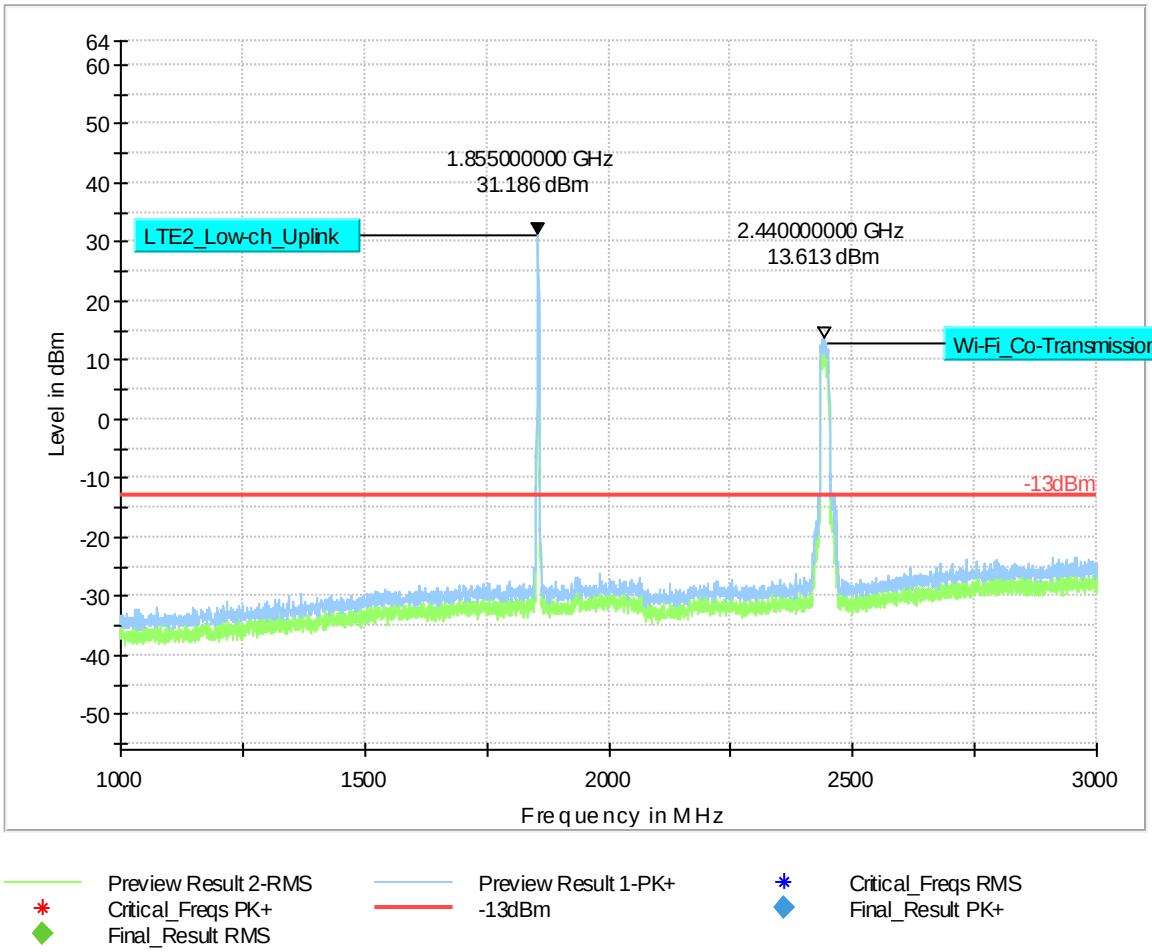
Plot # 32 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



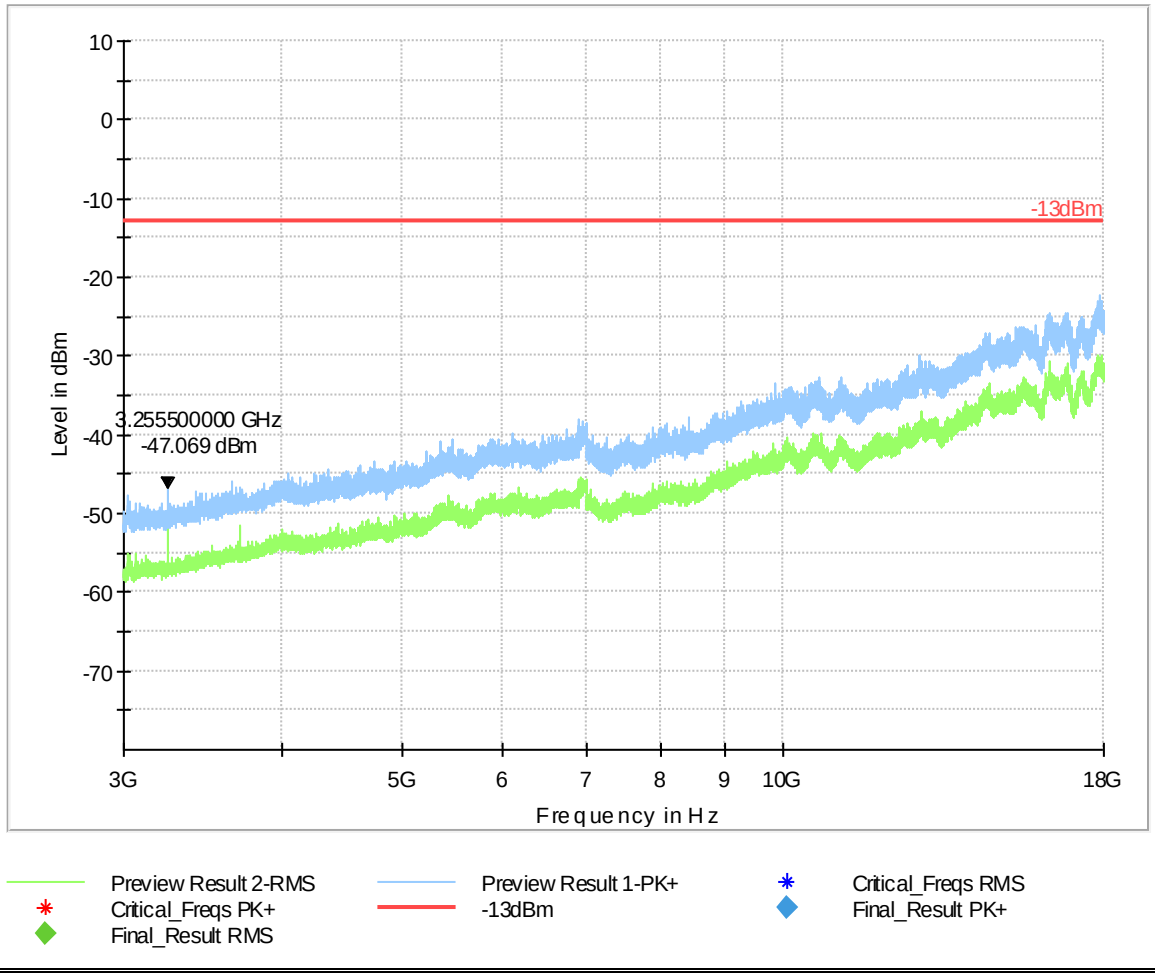
Plot # 33 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 34 Radiated Emissions: 3 GHz - 18 GHz

Channel: Low

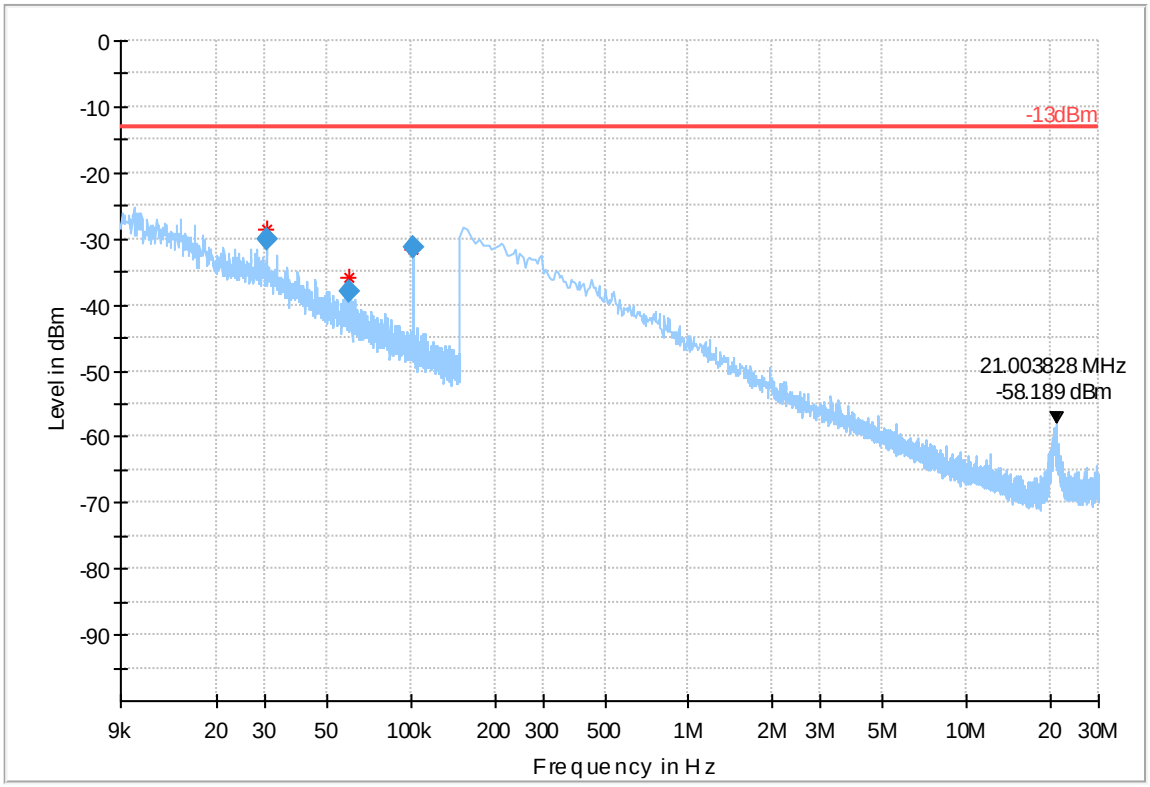


Plot # 35 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

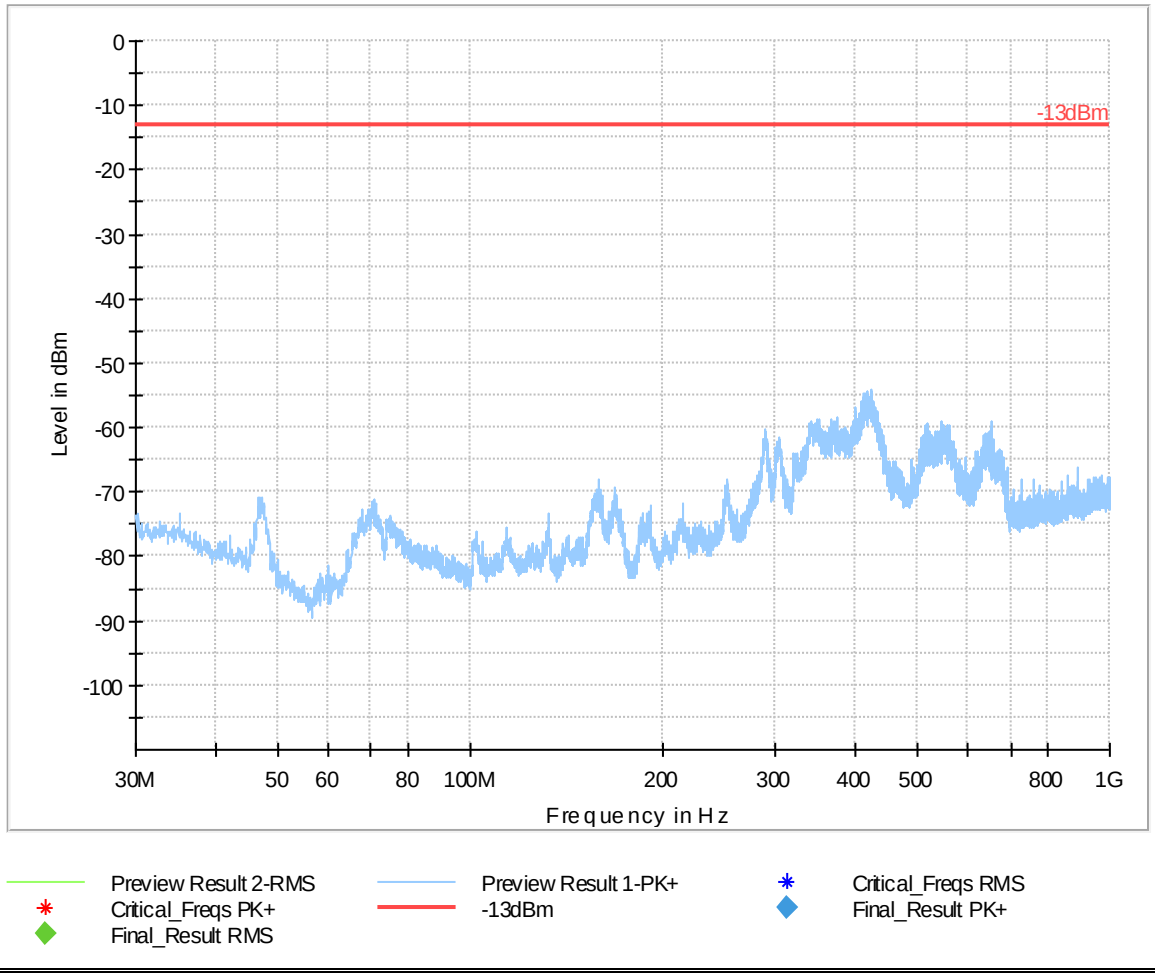
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.030133	-30.16	-13.00	17.16	100.0	0.100	107.0	H	220.0	-75.6	9:56:08 PM - 10/17/2018
0.060314	-37.94	-13.00	24.94	100.0	0.100	107.0	H	53.0	-78.8	9:51:07 PM - 10/17/2018
0.101360	-31.43	-13.00	18.43	100.0	0.100	100.0	H	80.0	-79.7	9:53:37 PM - 10/17/2018



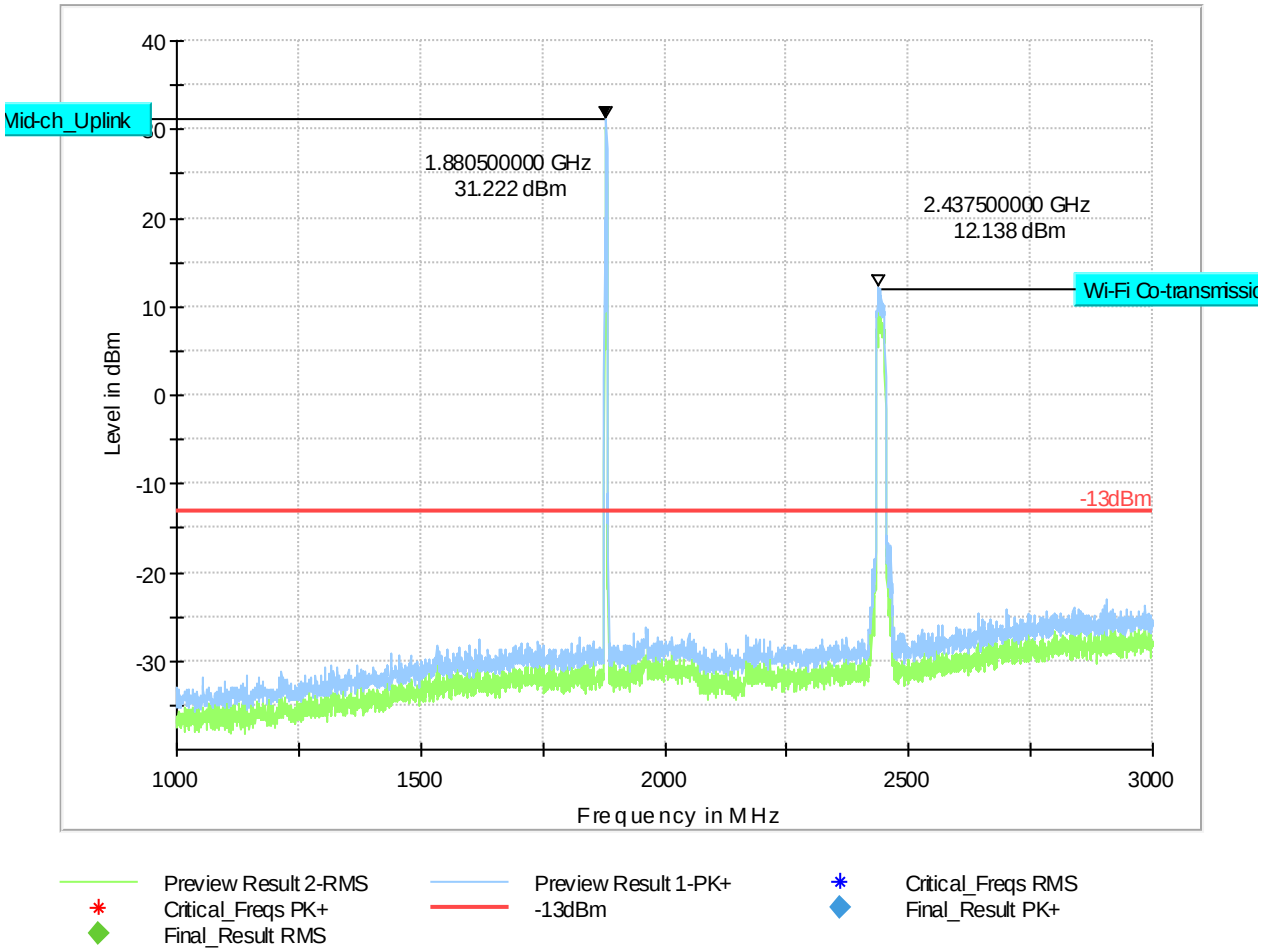
Plot # 36 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



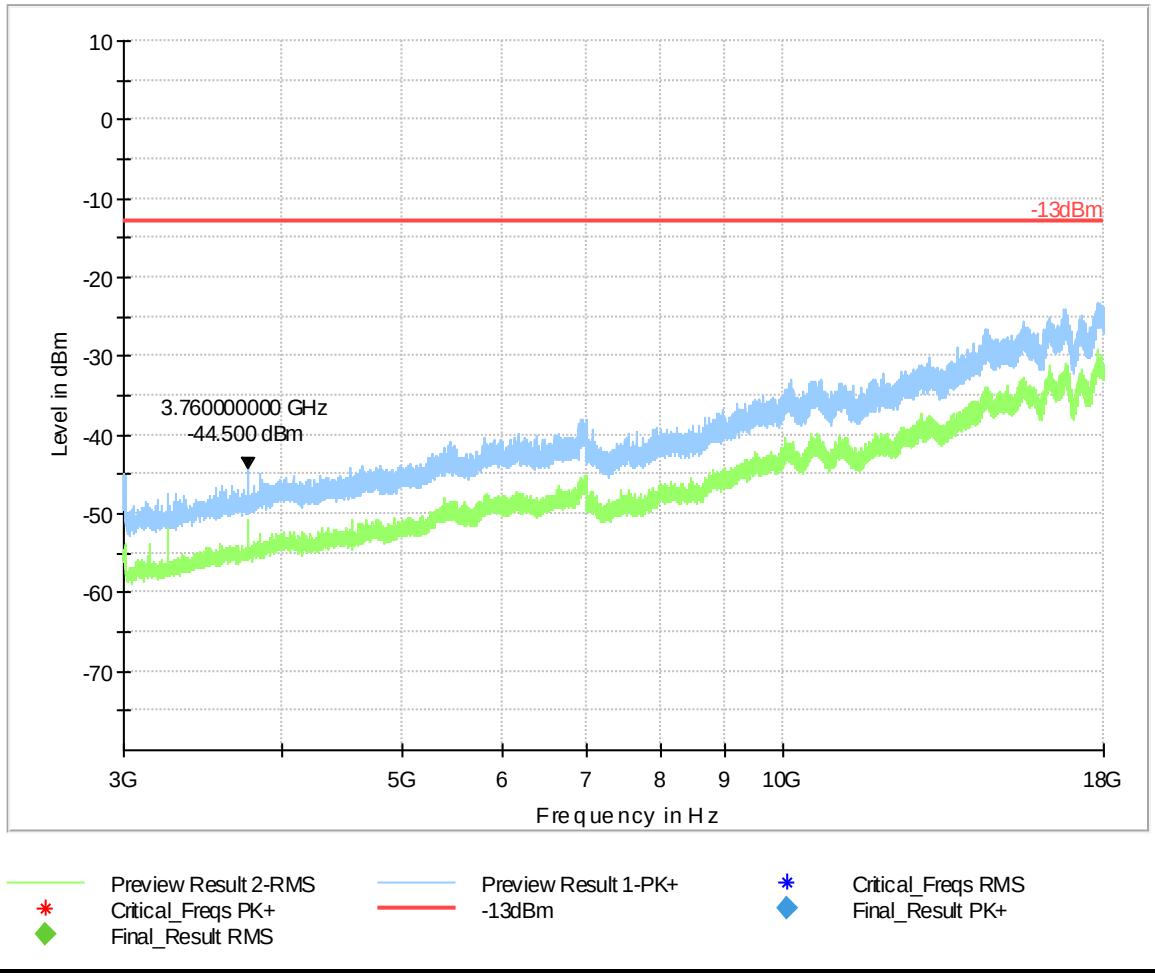
Plot # 37 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



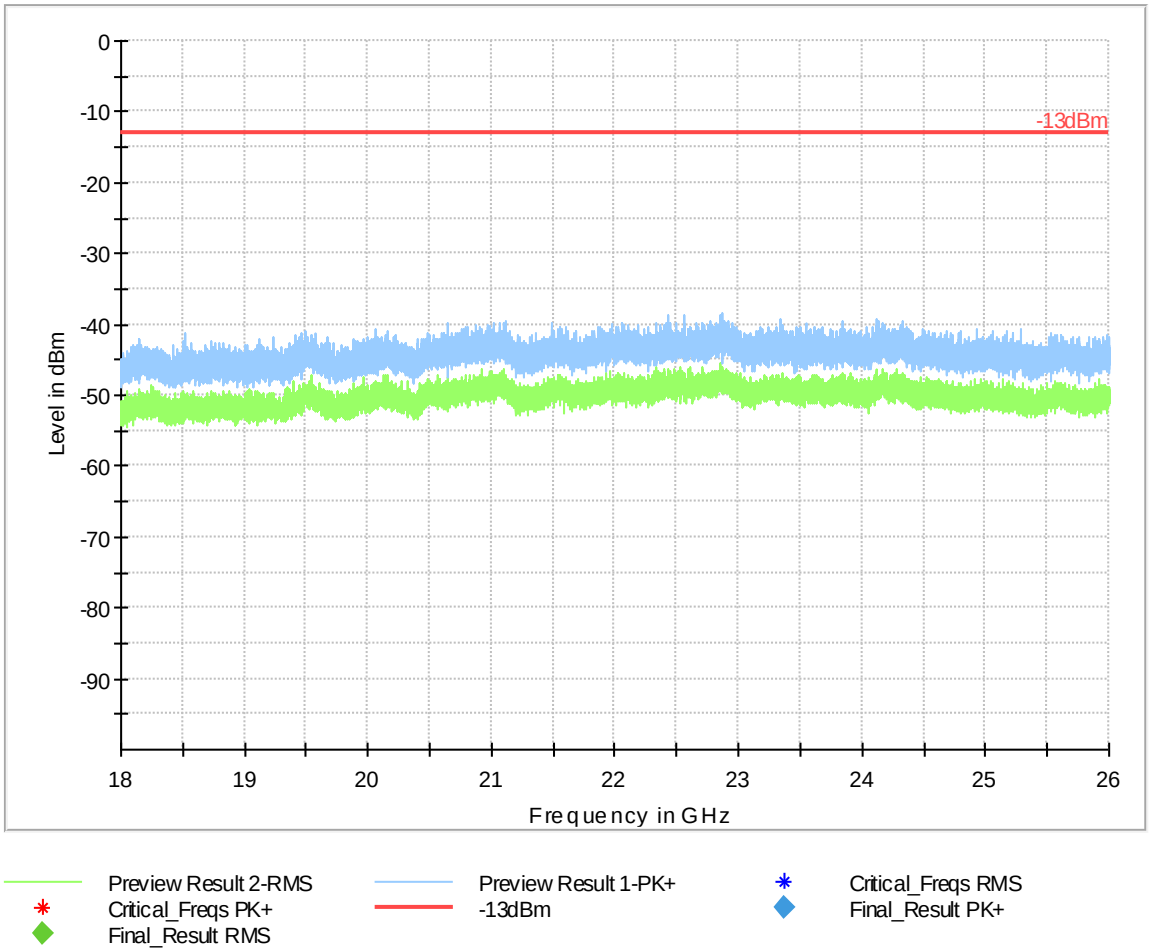
Plot # 38 Radiated Emissions: 3 GHz – 18 GHz

Channel: Mid



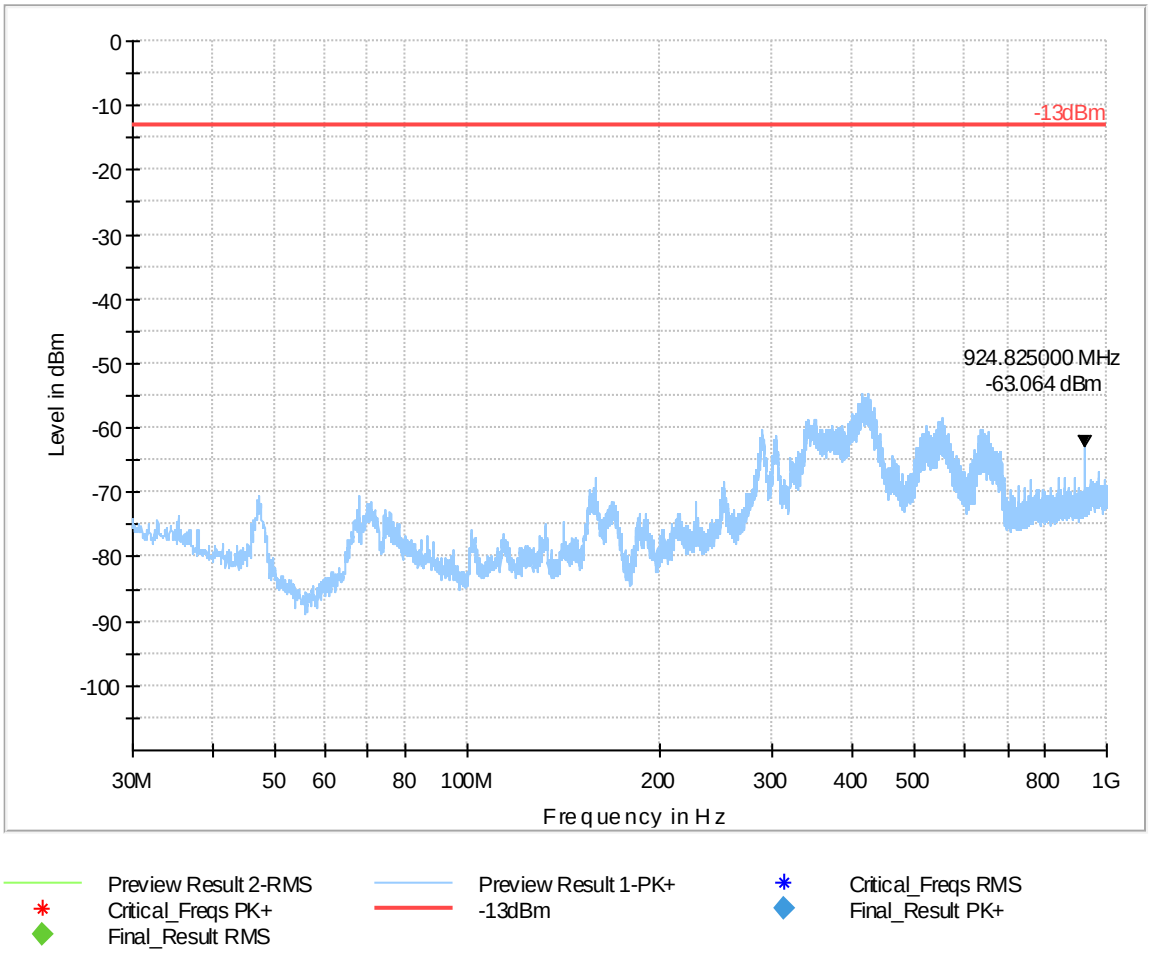
Plot # 39 Radiated Emissions: 18 GHz – 26 GHz

Channel: Mid



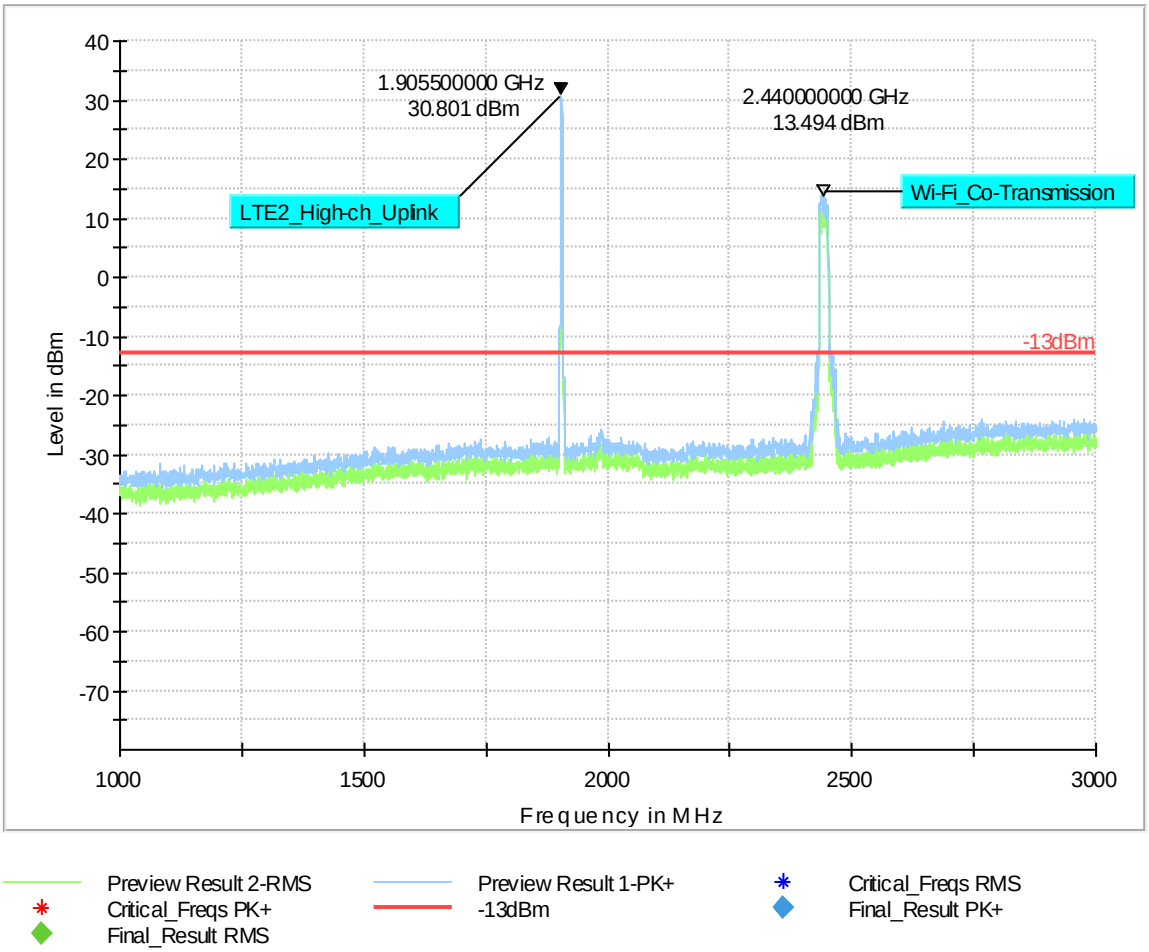
Plot # 40 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



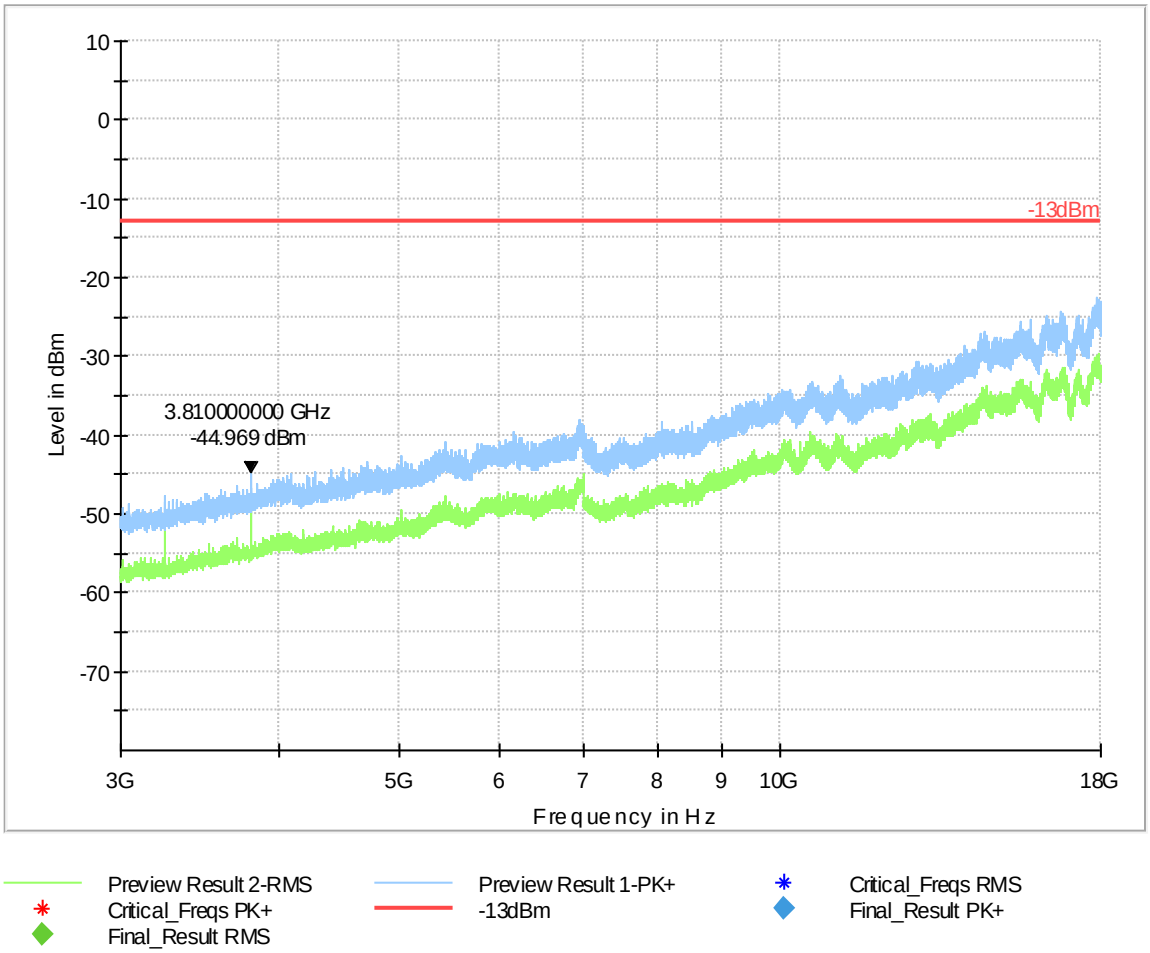
Plot # 41 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 42 Radiated Emissions: 3 GHz - 18 GHz

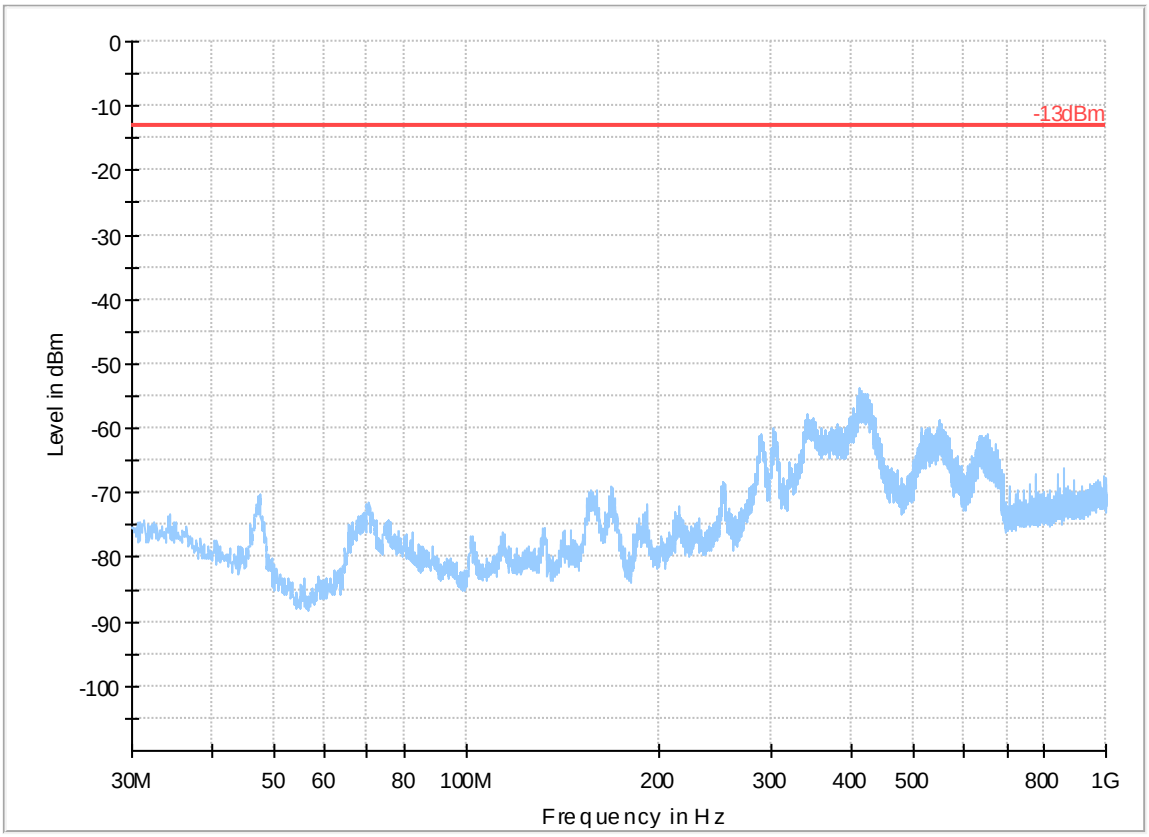
Channel: High



LTE Band 4

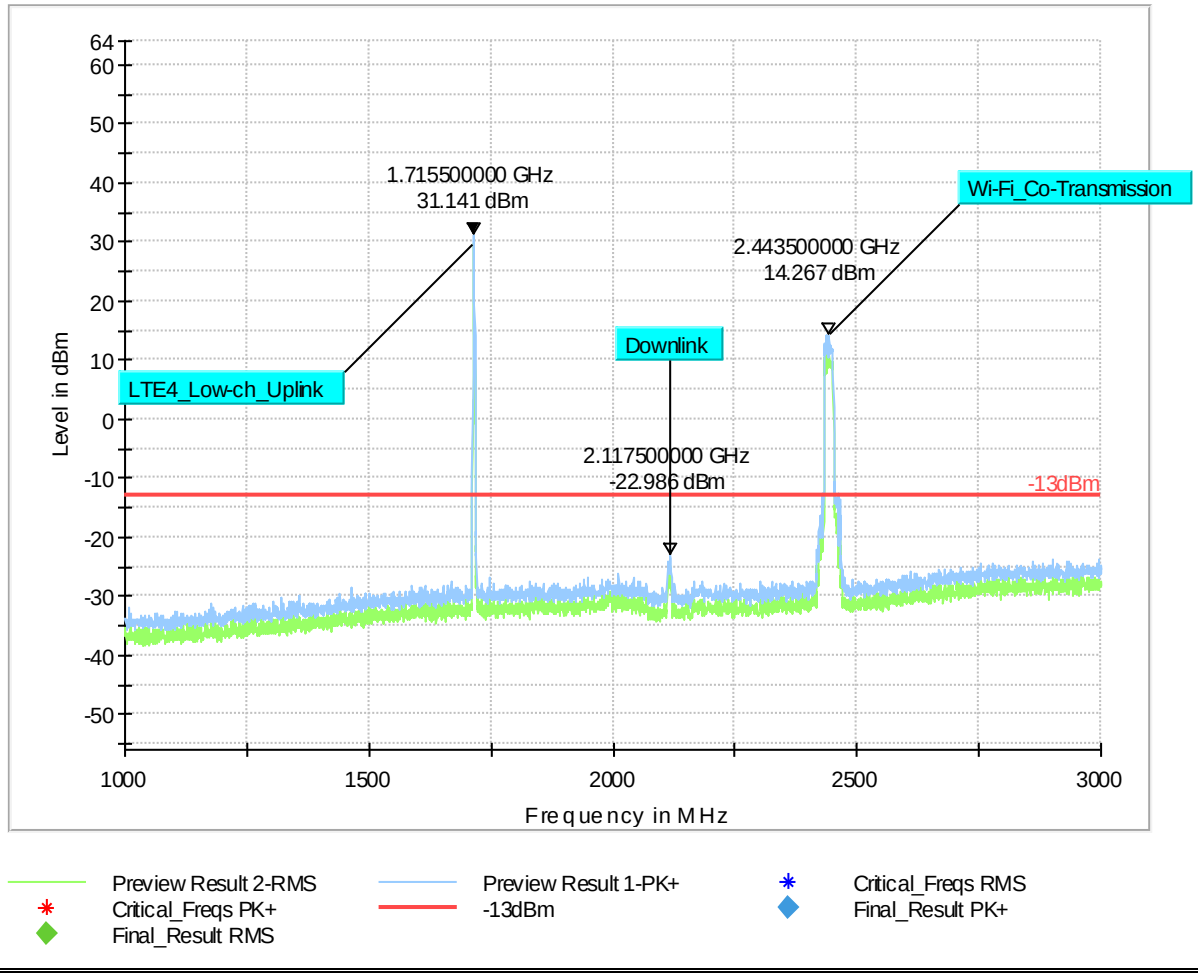
Plot # 43 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



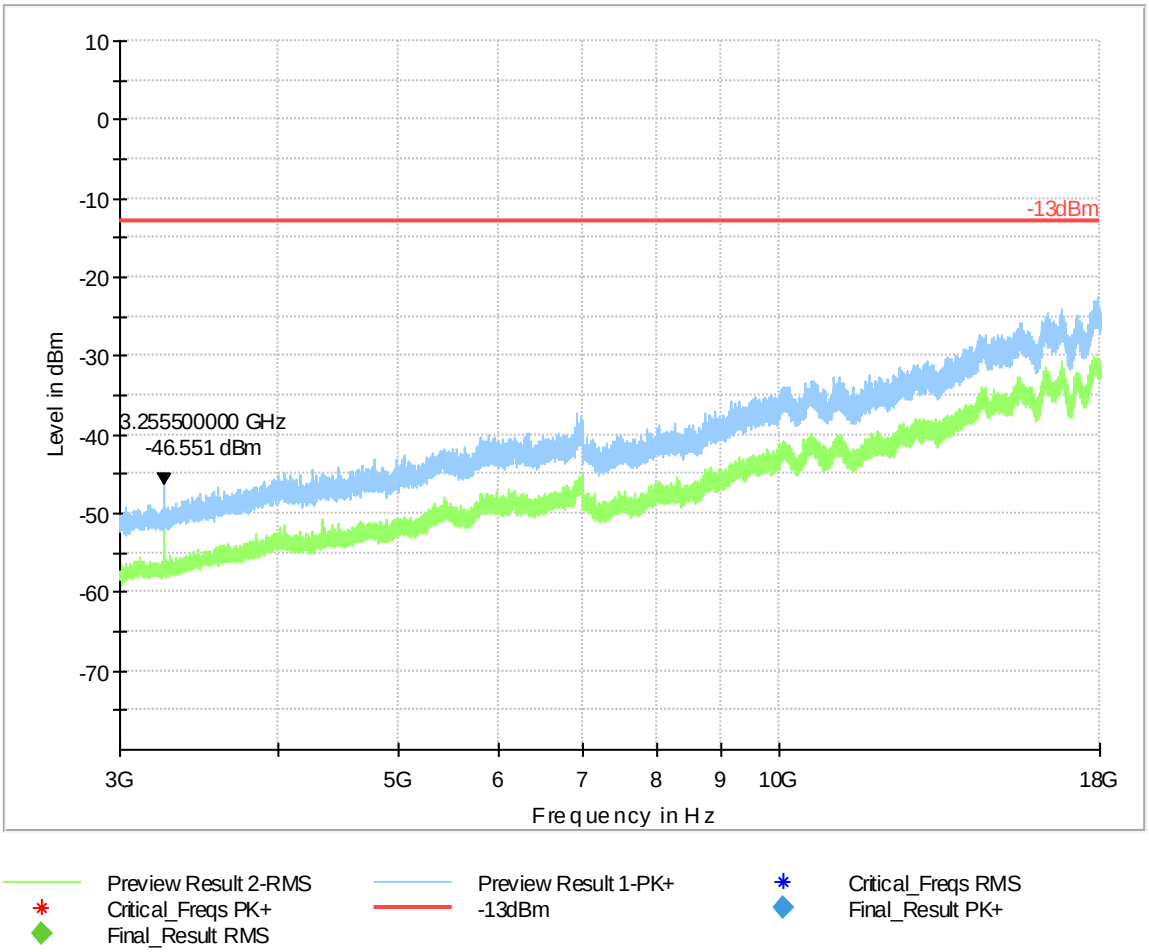
Plot # 44 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 45 Radiated Emissions: 3 GHz - 18 GHz

Channel: Low

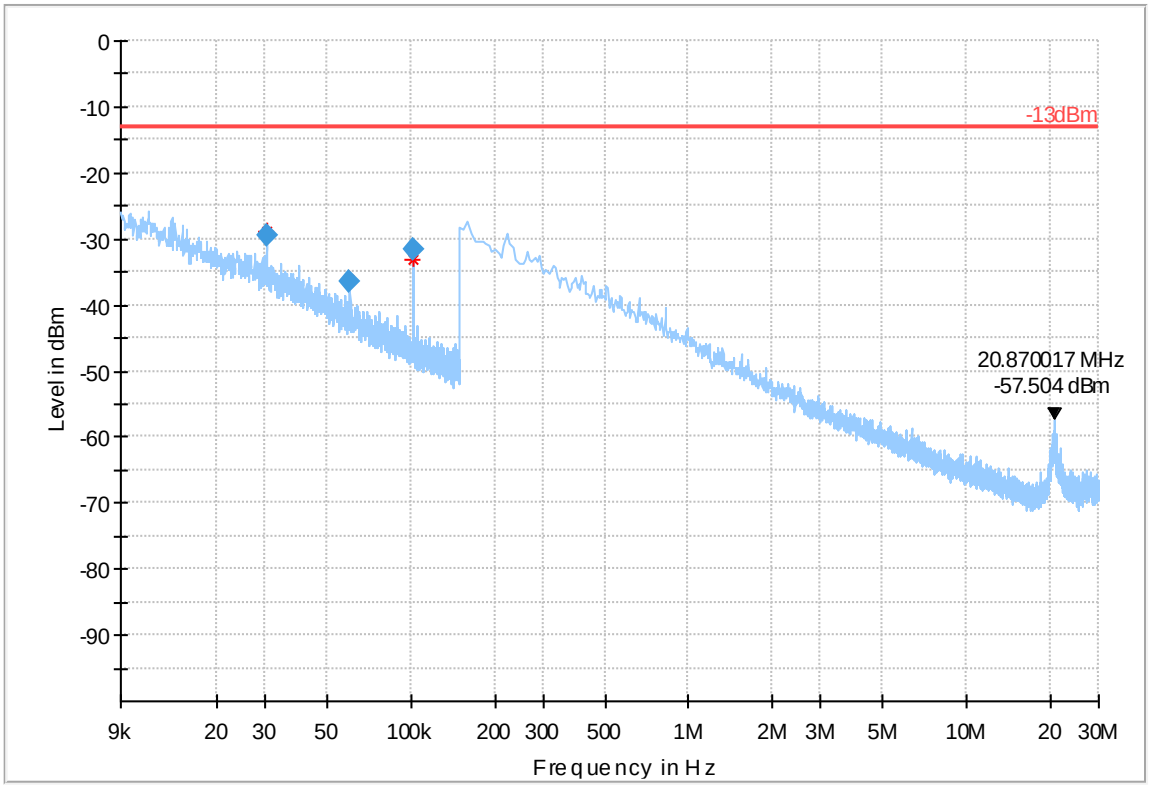


Plot # 46 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

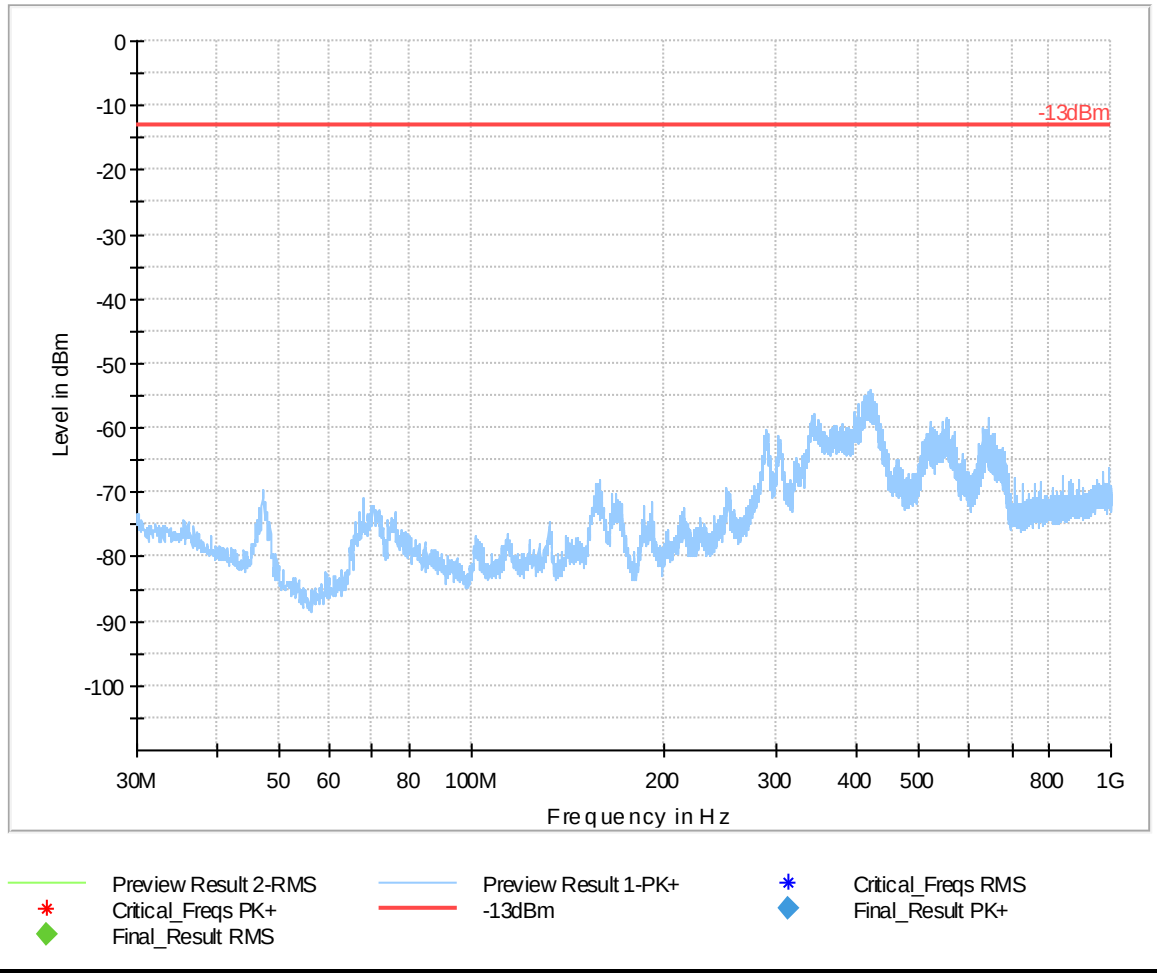
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.030150	-29.35	-13.00	16.35	100.0	0.100	107.0	H	177.0	-75.6	9:35:08 PM - 10/17/2018
0.060258	-36.57	-13.00	23.57	100.0	0.100	107.0	H	203.0	-78.8	9:39:33 PM - 10/17/2018
0.101336	-31.59	-13.00	18.59	100.0	0.100	100.0	H	235.0	-79.7	9:37:15 PM - 10/17/2018



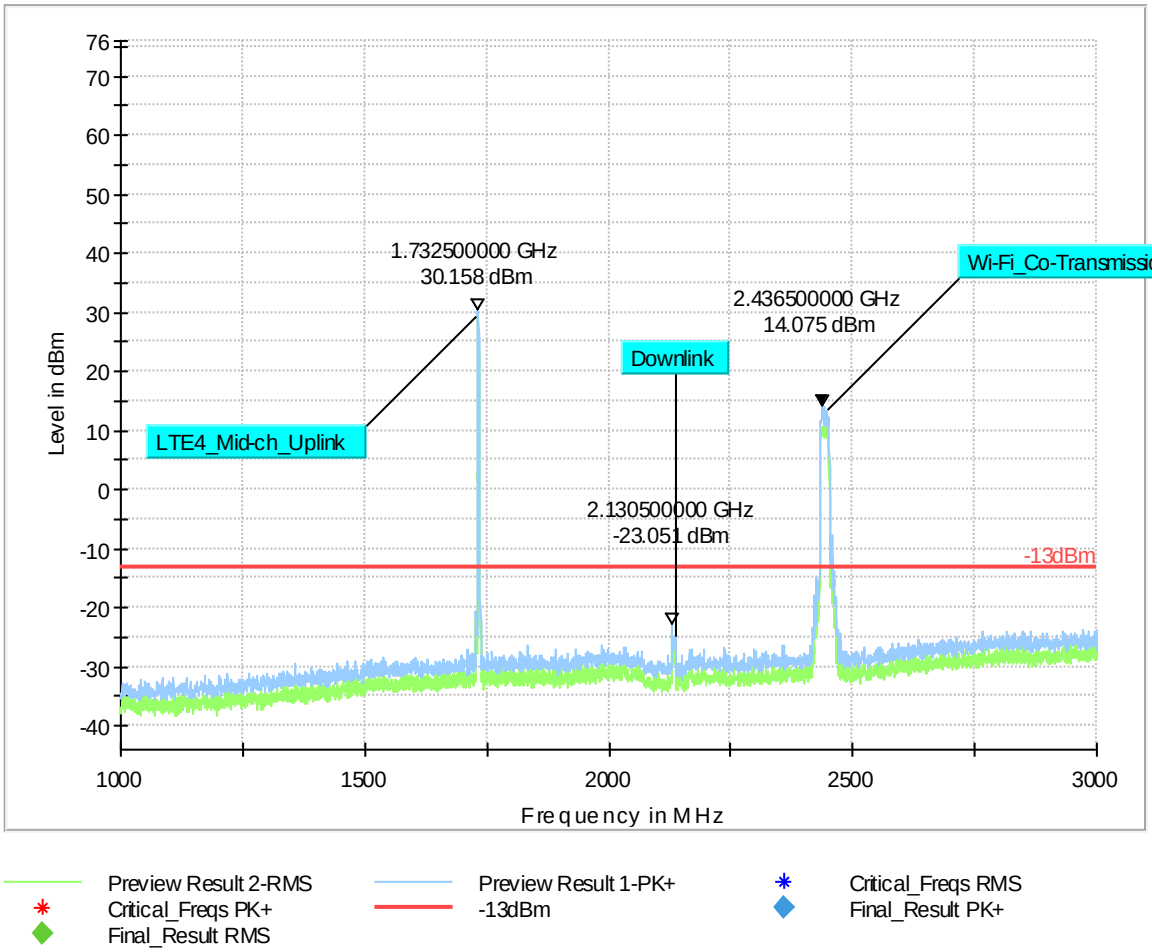
Plot # 47 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



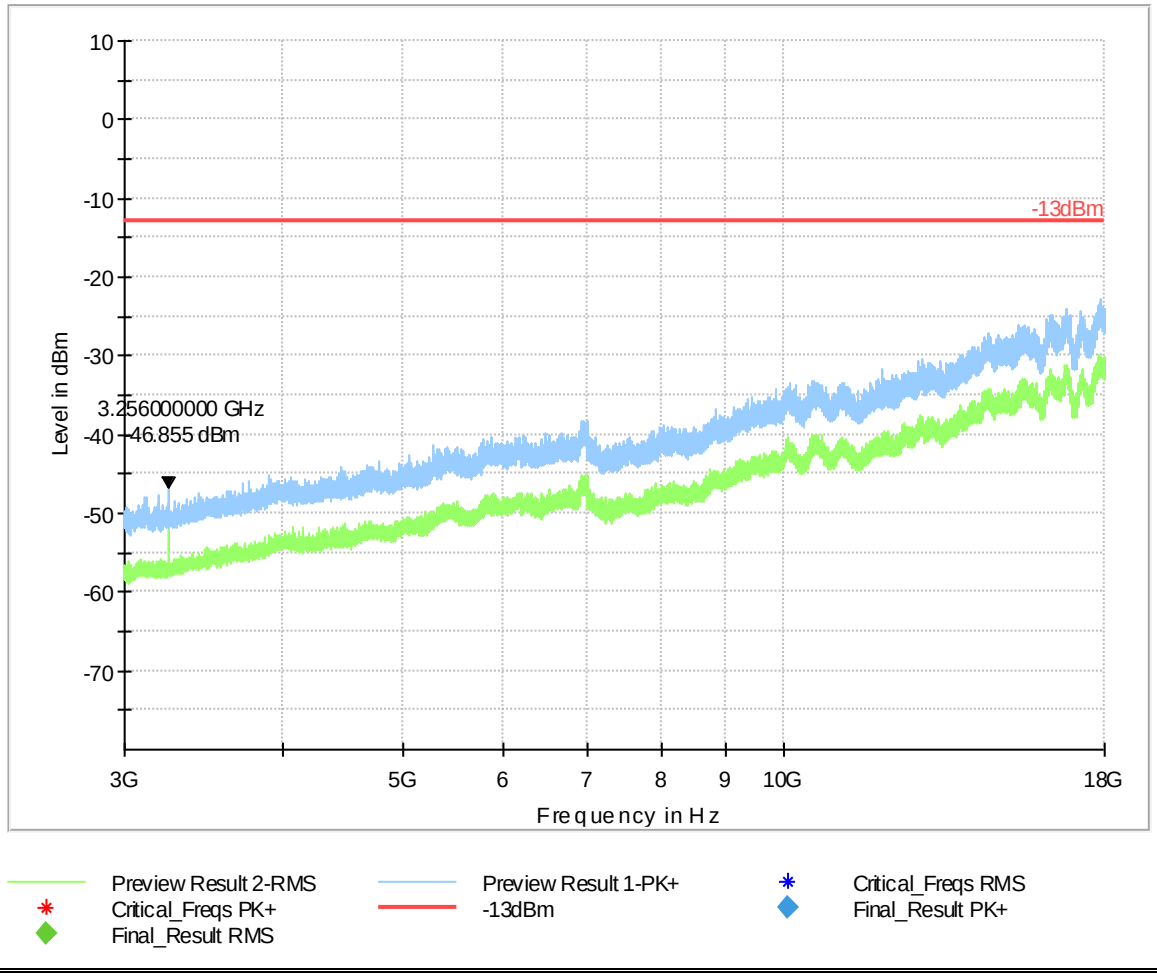
Plot # 48 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



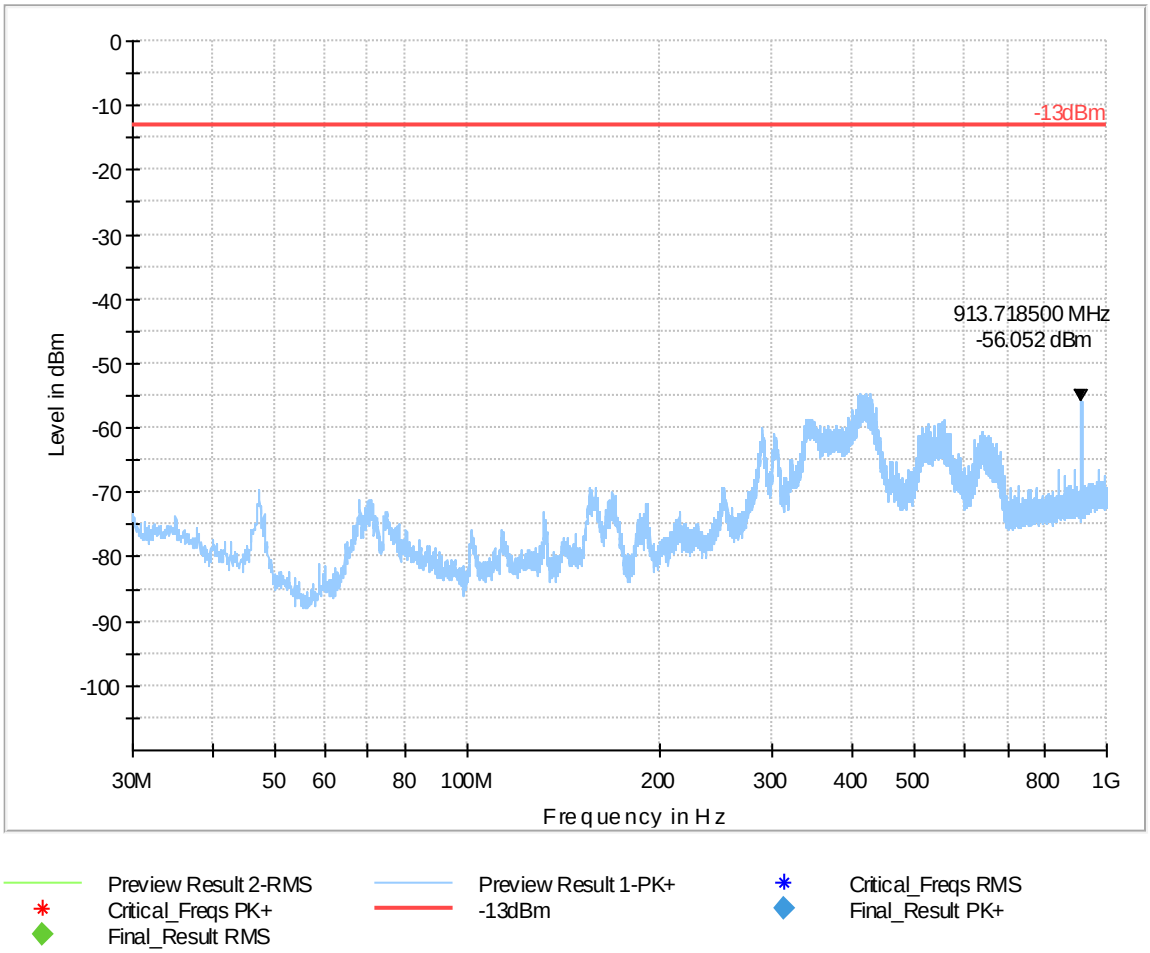
Plot # 49 Radiated Emissions: 3 GHz – 18GHz

Channel: Mid



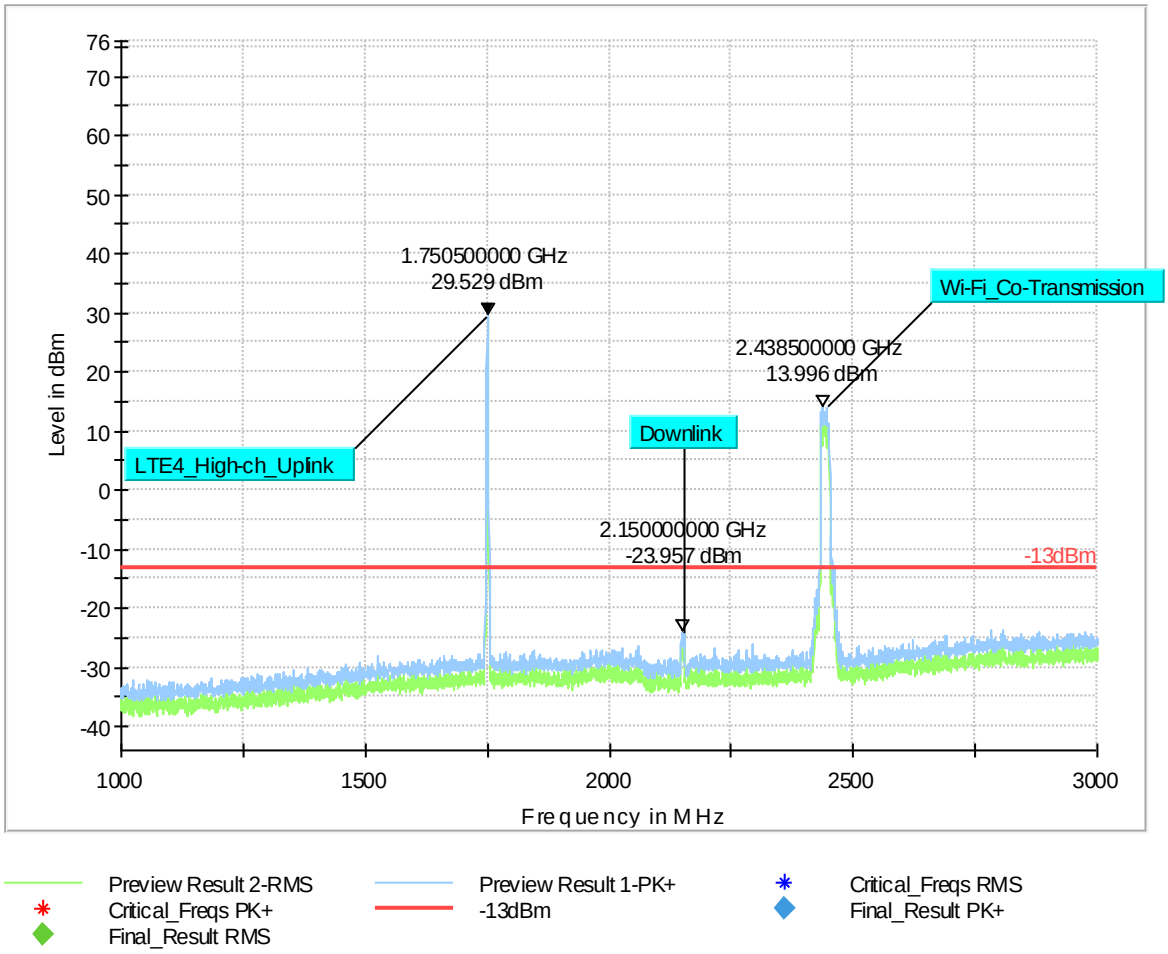
Plot # 50 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



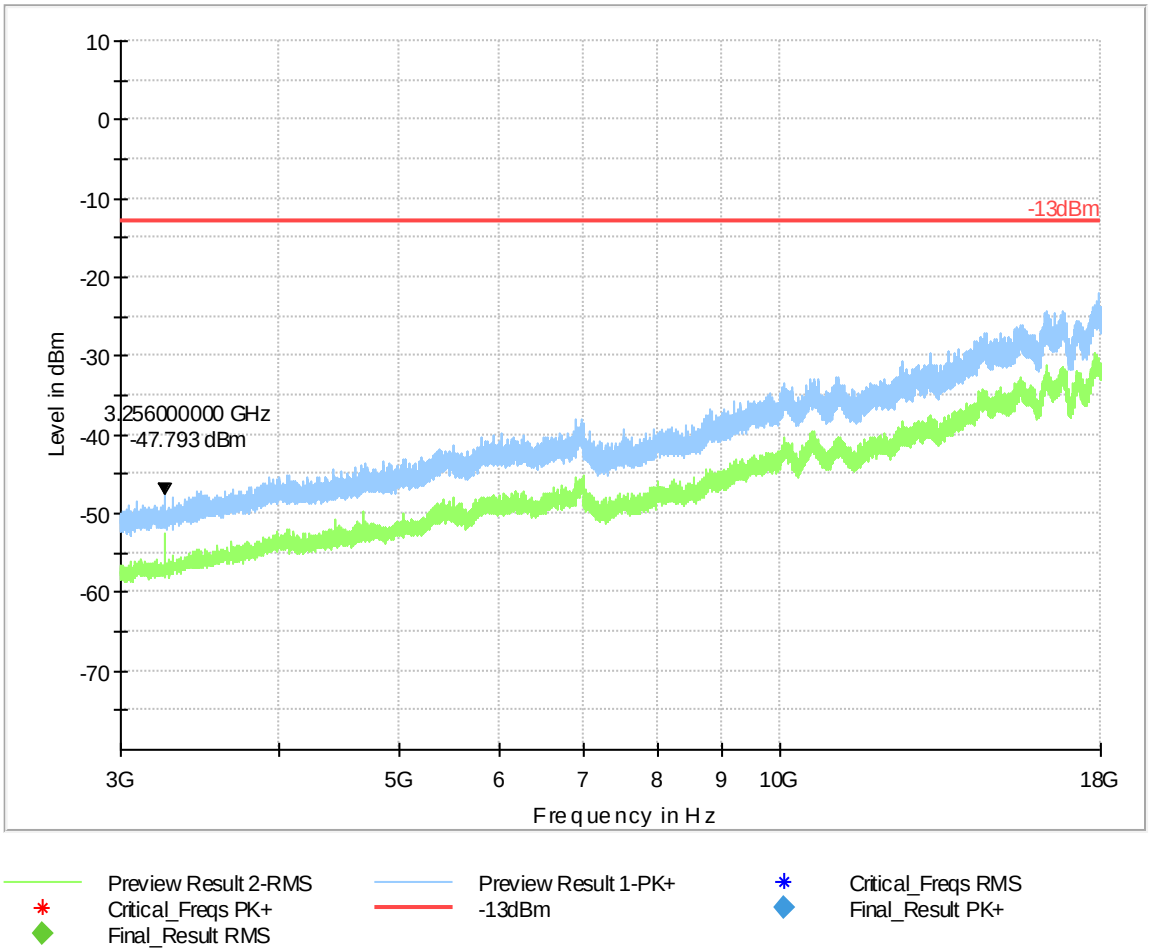
Plot # 51 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 52 Radiated Emissions: 3 GHz - 18 GHz

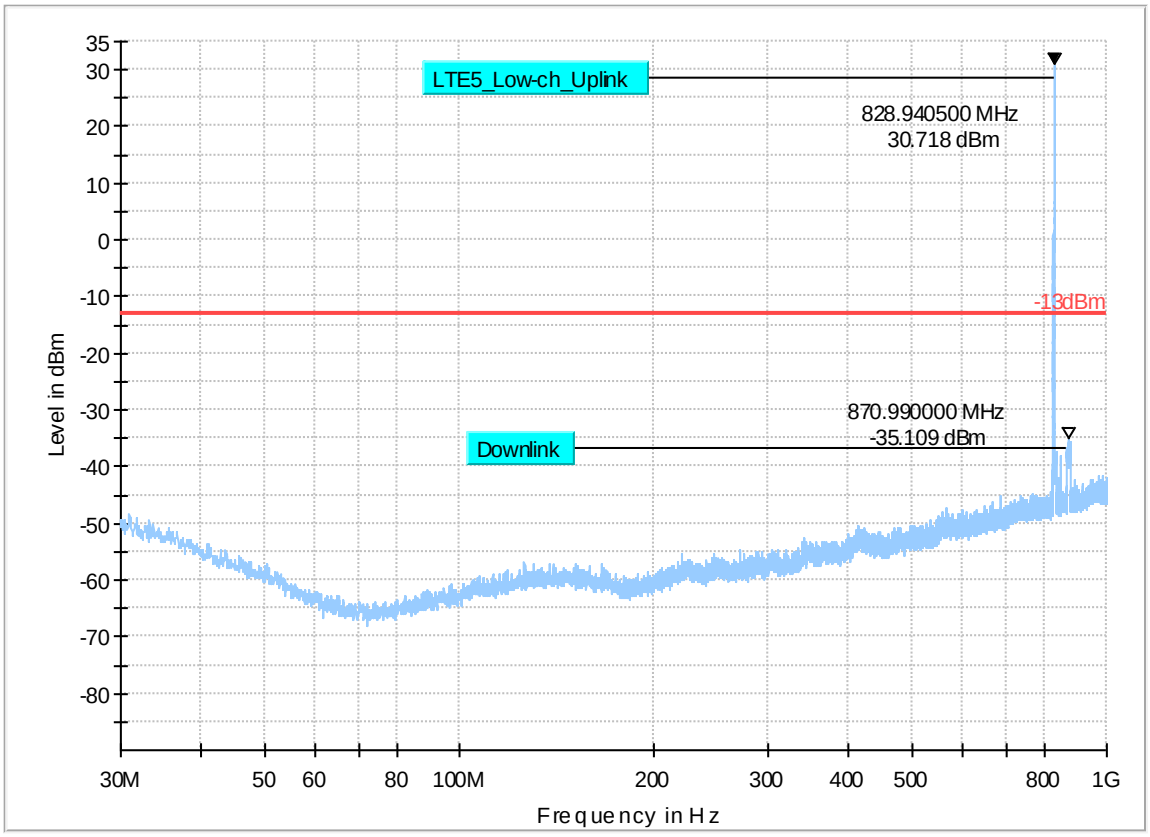
Channel: High



LTE Band 5

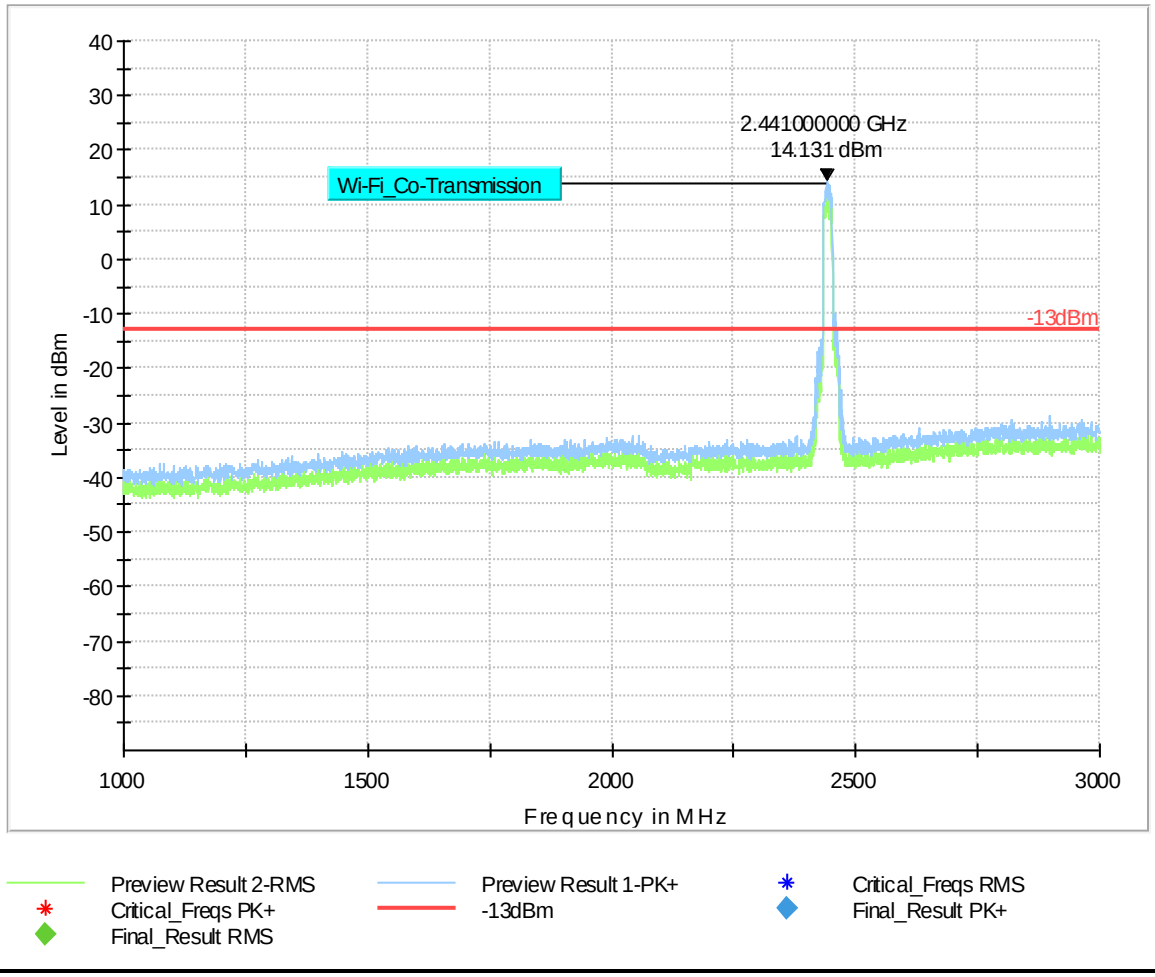
Plot # 53 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



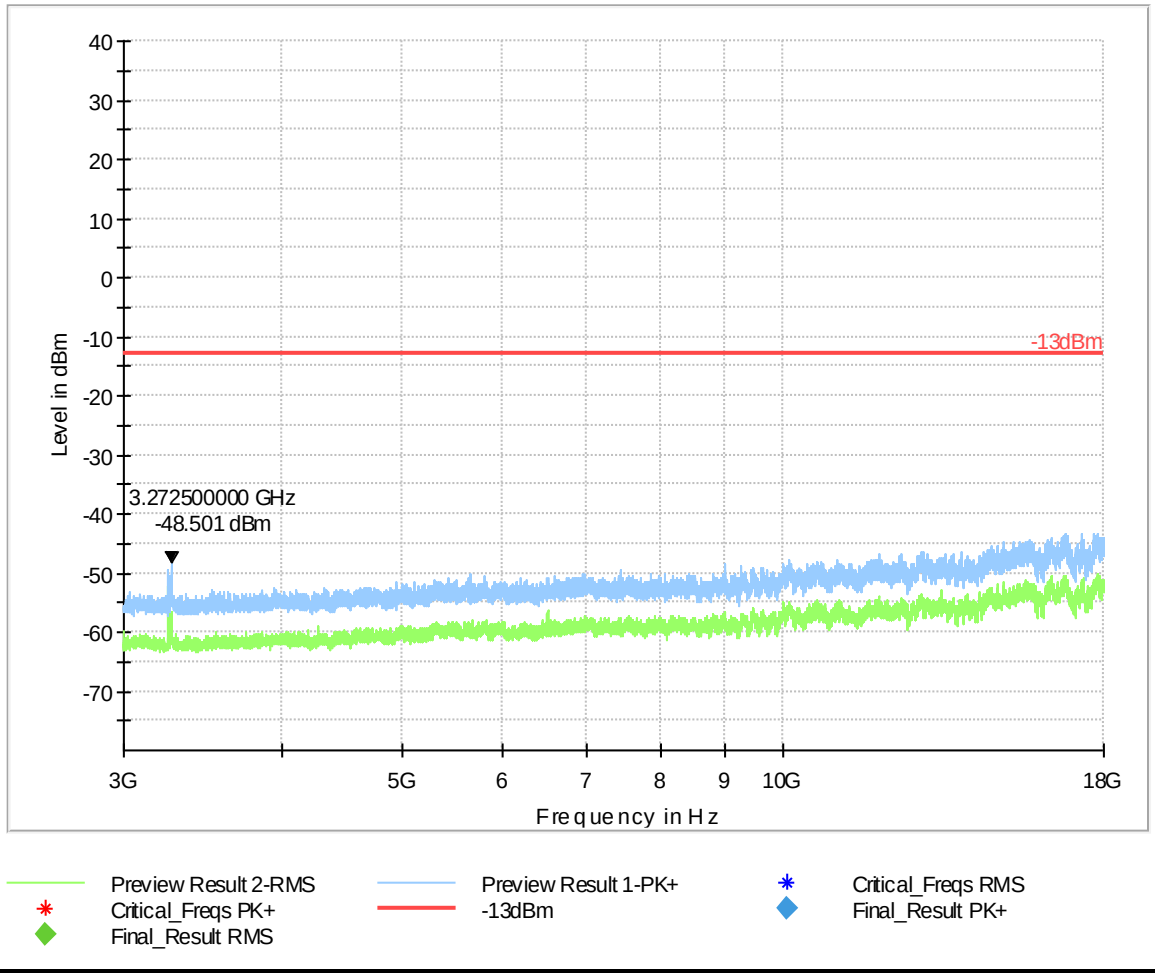
Plot # 54 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 55 Radiated Emissions: 3 GHz - 9 GHz

Channel: Low

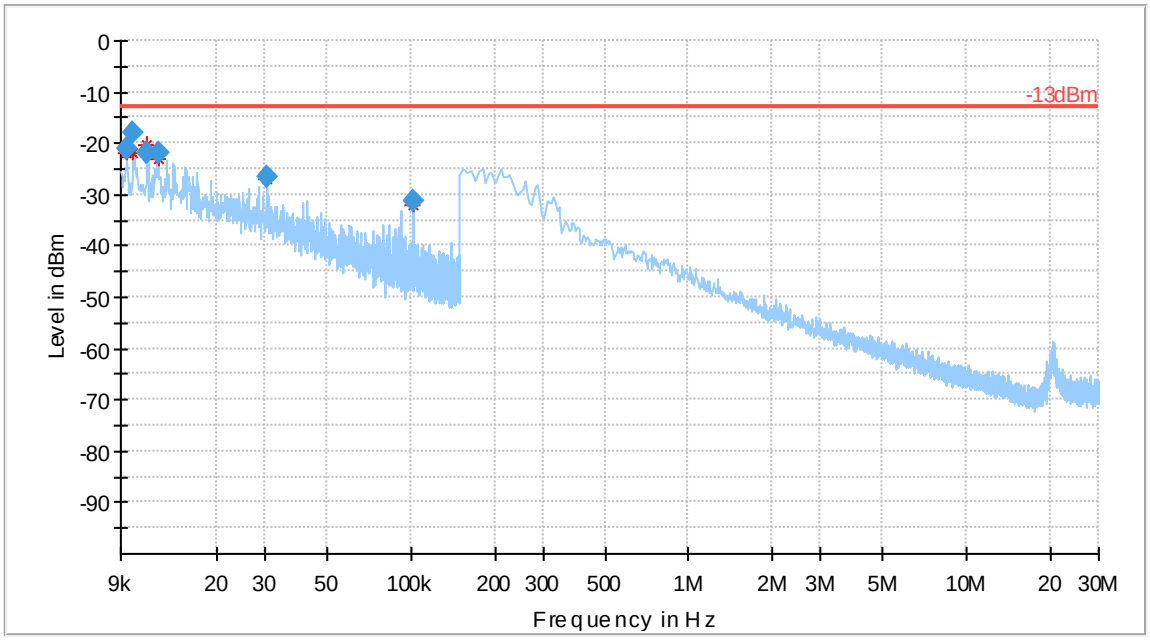


Plot # 56 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

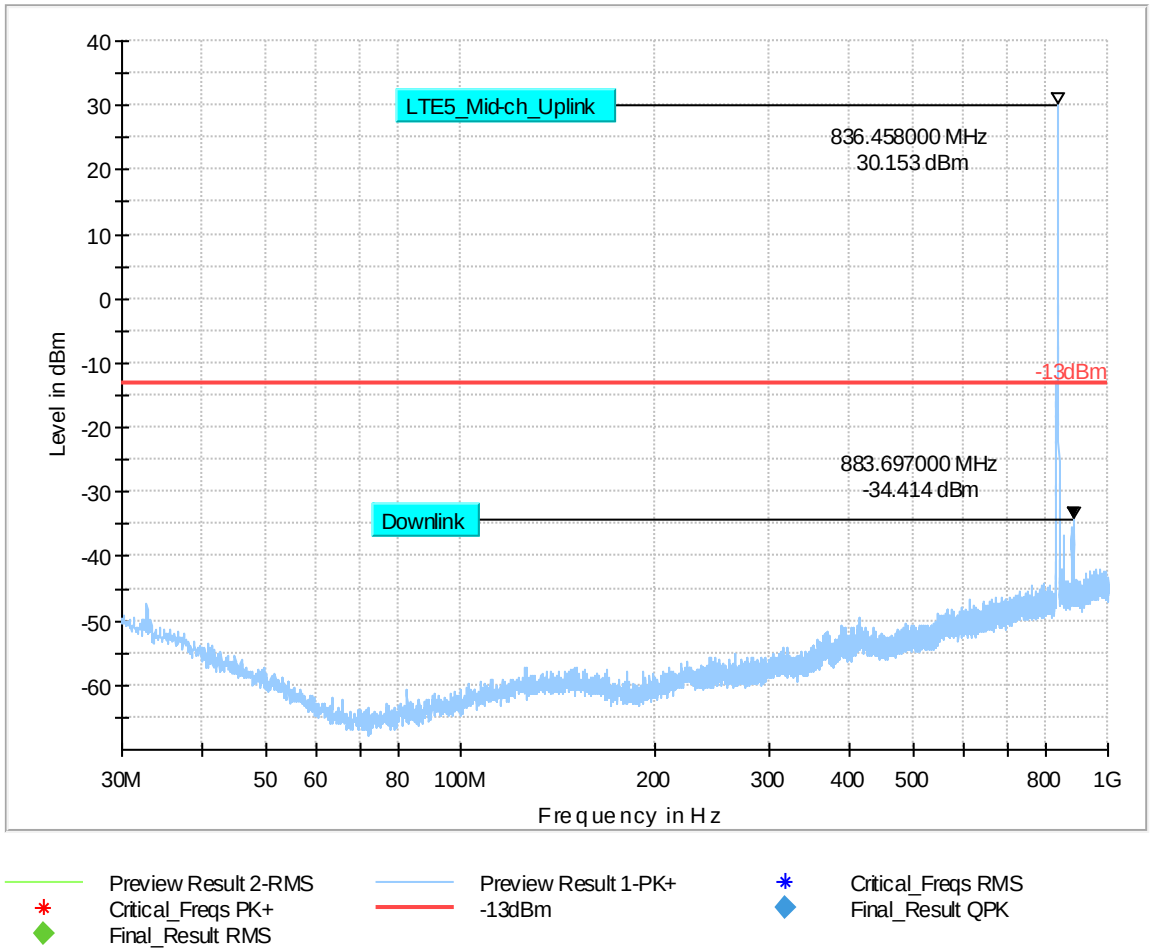
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.009472	-21.11	-13.00	8.11	100.0	0.100	107.0	H	189.0	-68.1	9:05:05 PM - 10/17/2018
0.010024	-18.15	-13.00	5.15	100.0	0.100	107.0	H	192.0	-68.8	9:07:21 PM - 10/17/2018
0.011227	-21.71	-13.00	8.71	100.0	0.100	100.0	H	176.0	-69.4	9:09:39 PM - 10/17/2018
0.012293	-21.95	-13.00	8.95	100.0	0.100	107.0	H	187.0	-70.0	9:11:53 PM - 10/17/2018
0.030133	-26.46	-13.00	13.46	100.0	0.100	107.0	H	195.0	-75.6	9:14:18 PM - 10/17/2018
0.101293	-31.22	-13.00	18.22	100.0	0.100	100.0	H	191.0	-79.7	9:16:37 PM - 10/17/2018



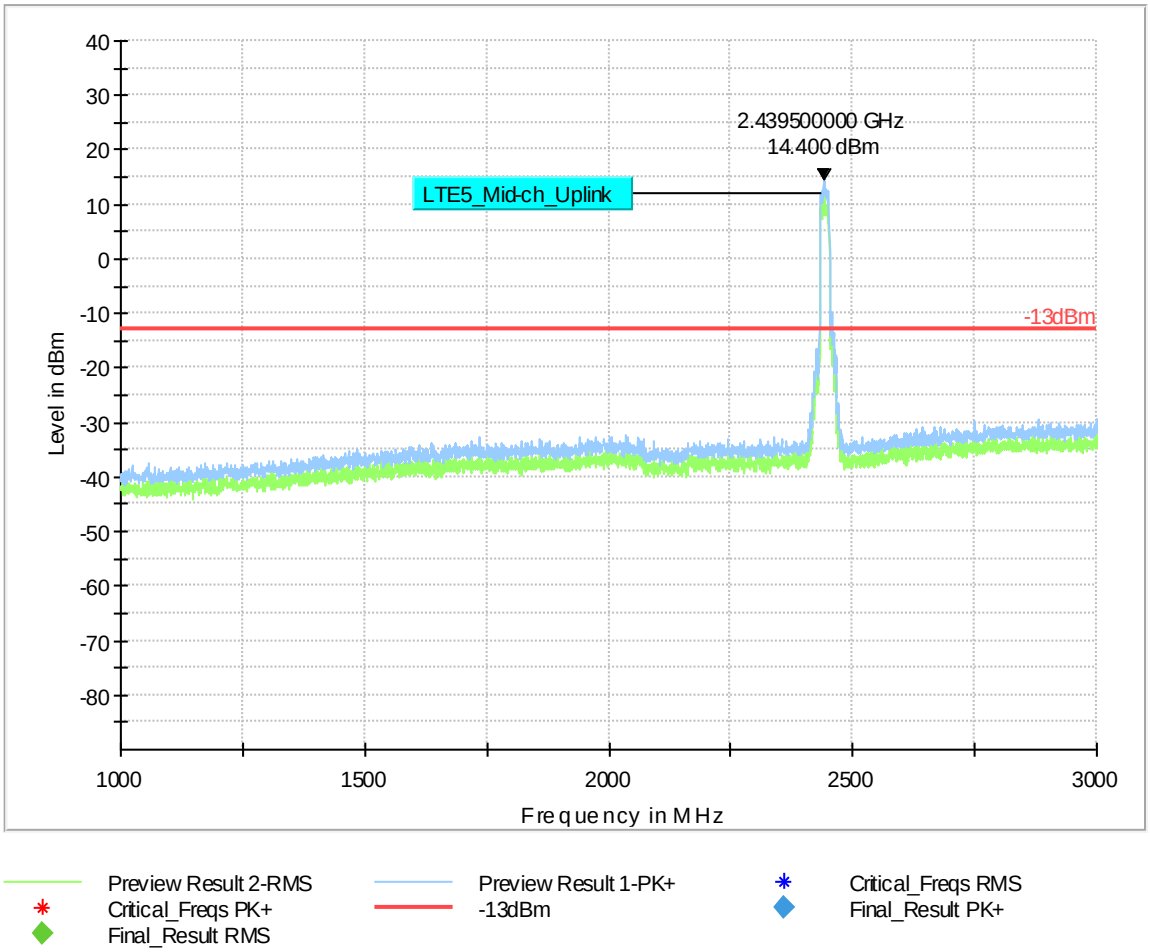
Plot # 57 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



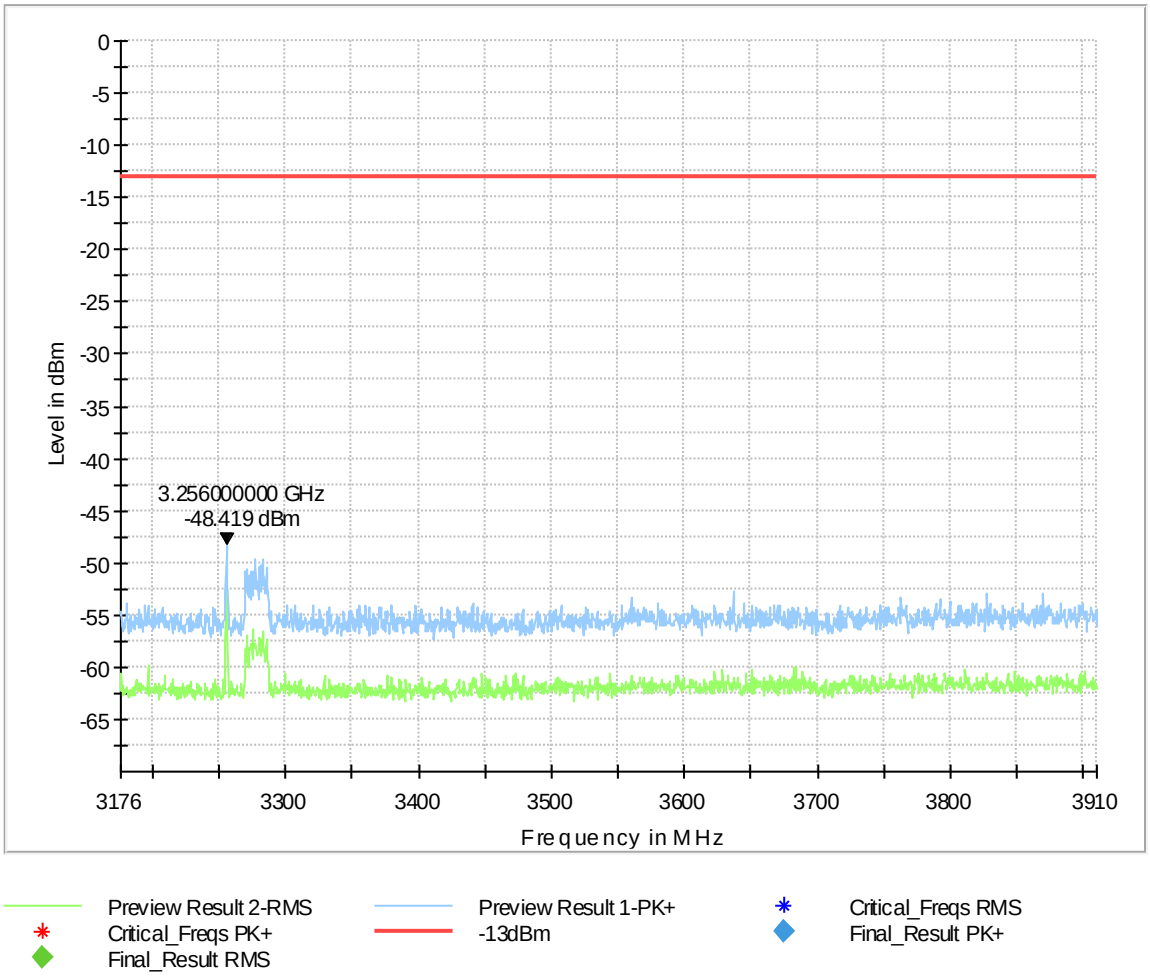
Plot # 58 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



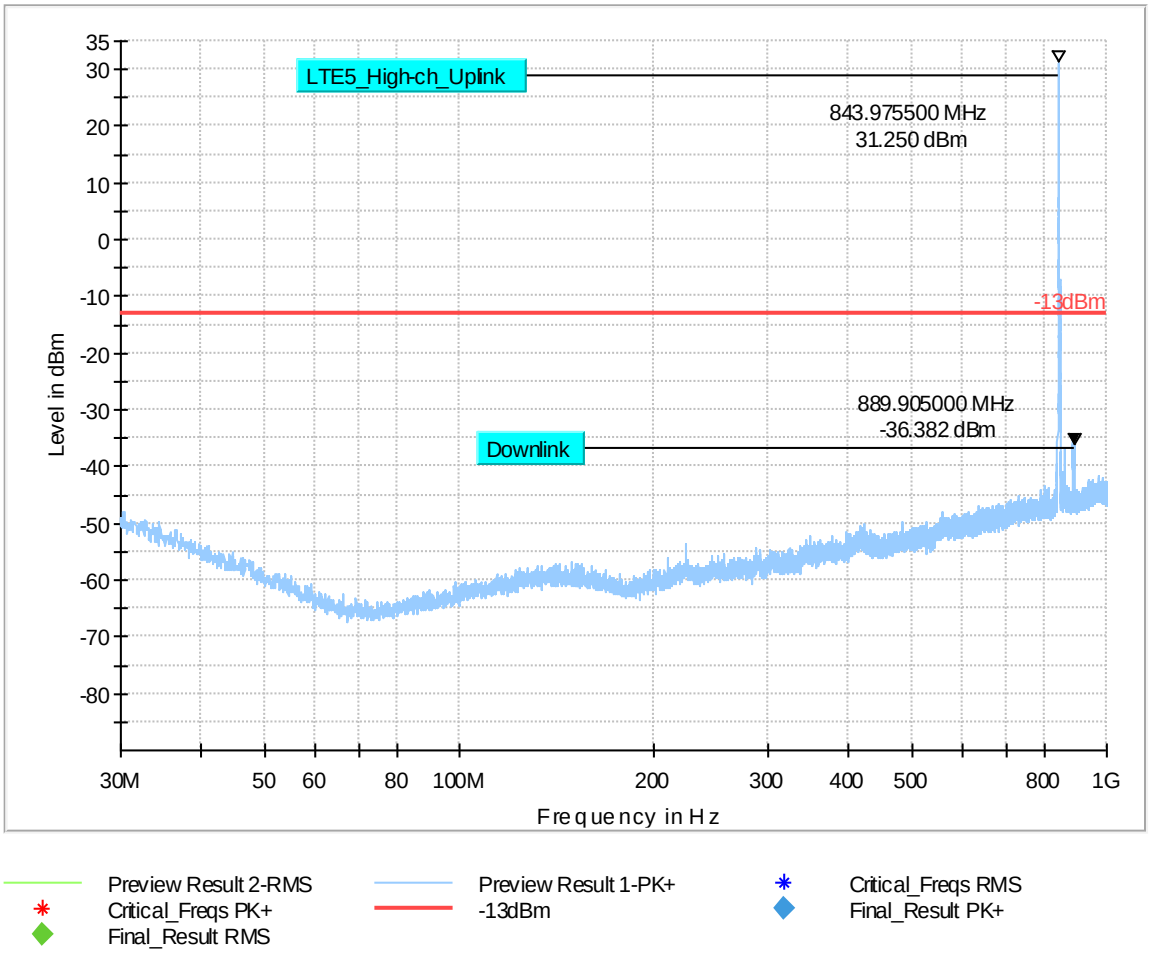
Plot # 59 Radiated Emissions: 3 GHz – 9 GHz

Channel: Mid



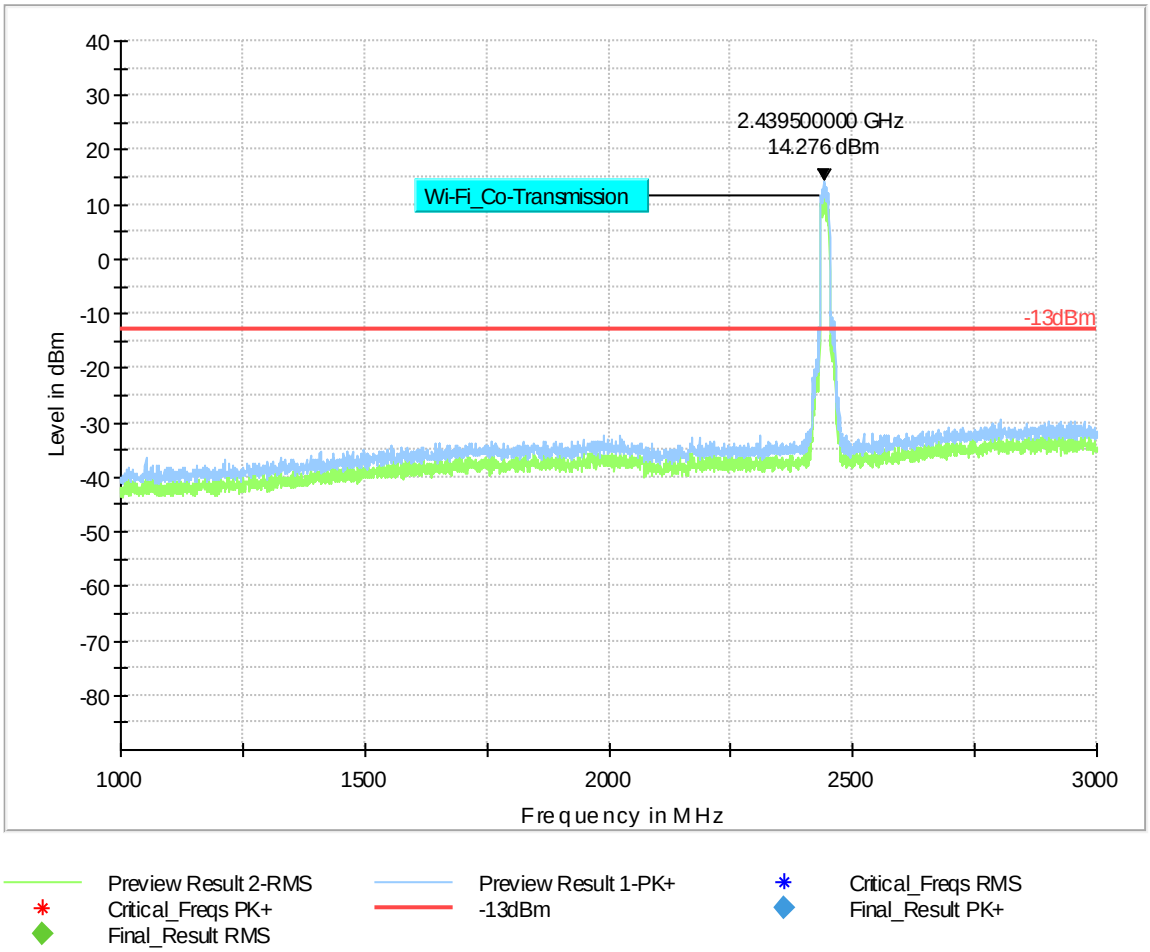
Plot # 60 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



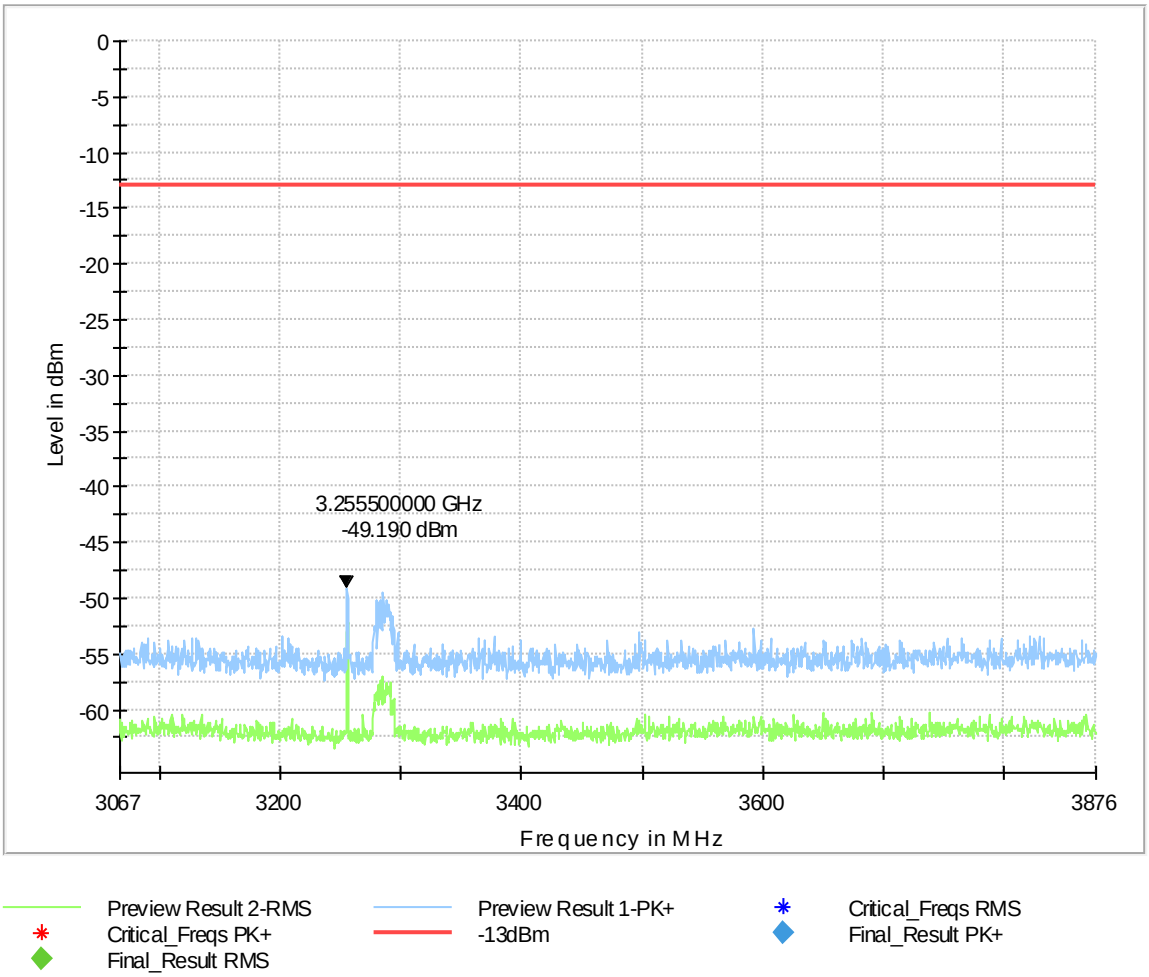
Plot # 61 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 62 Radiated Emissions: 3 GHz - 9 GHz

Channel: High



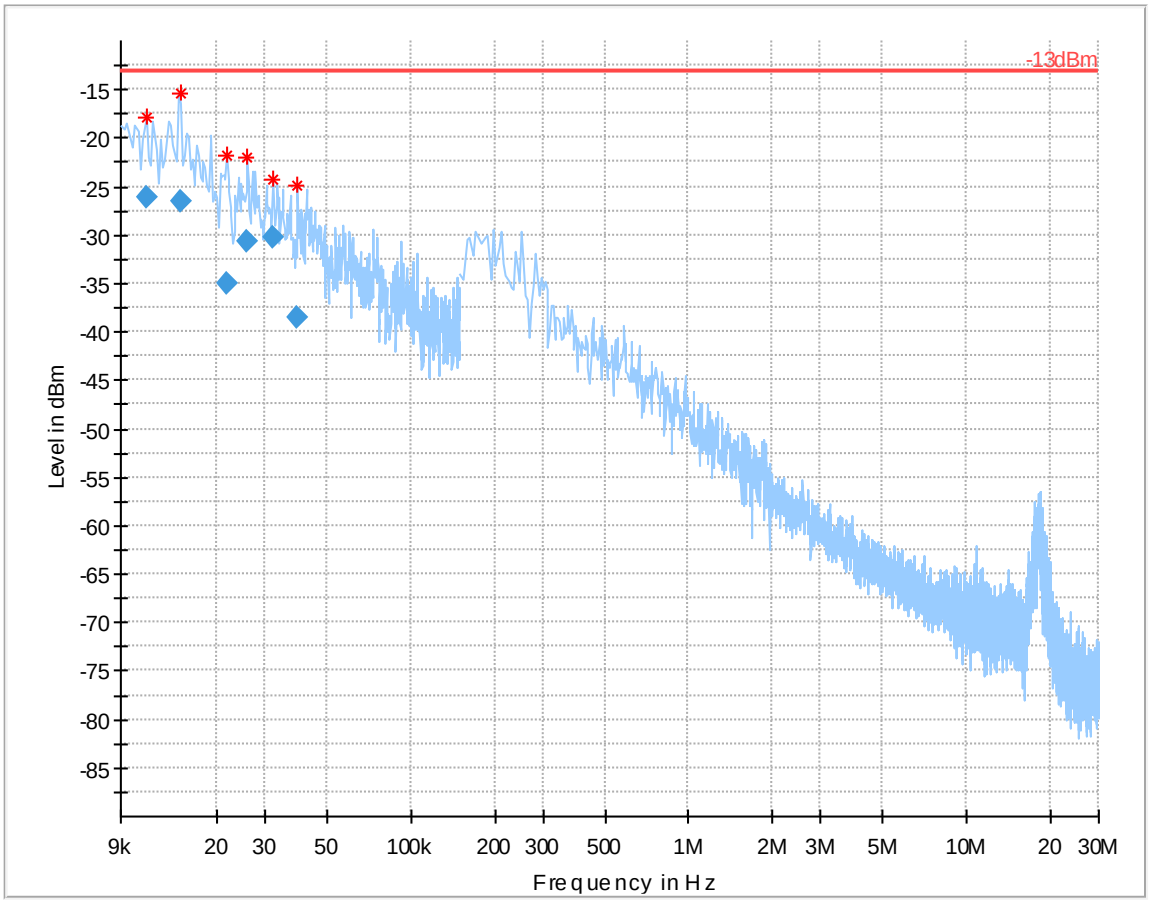
LTE Band 13

Plot # 63 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

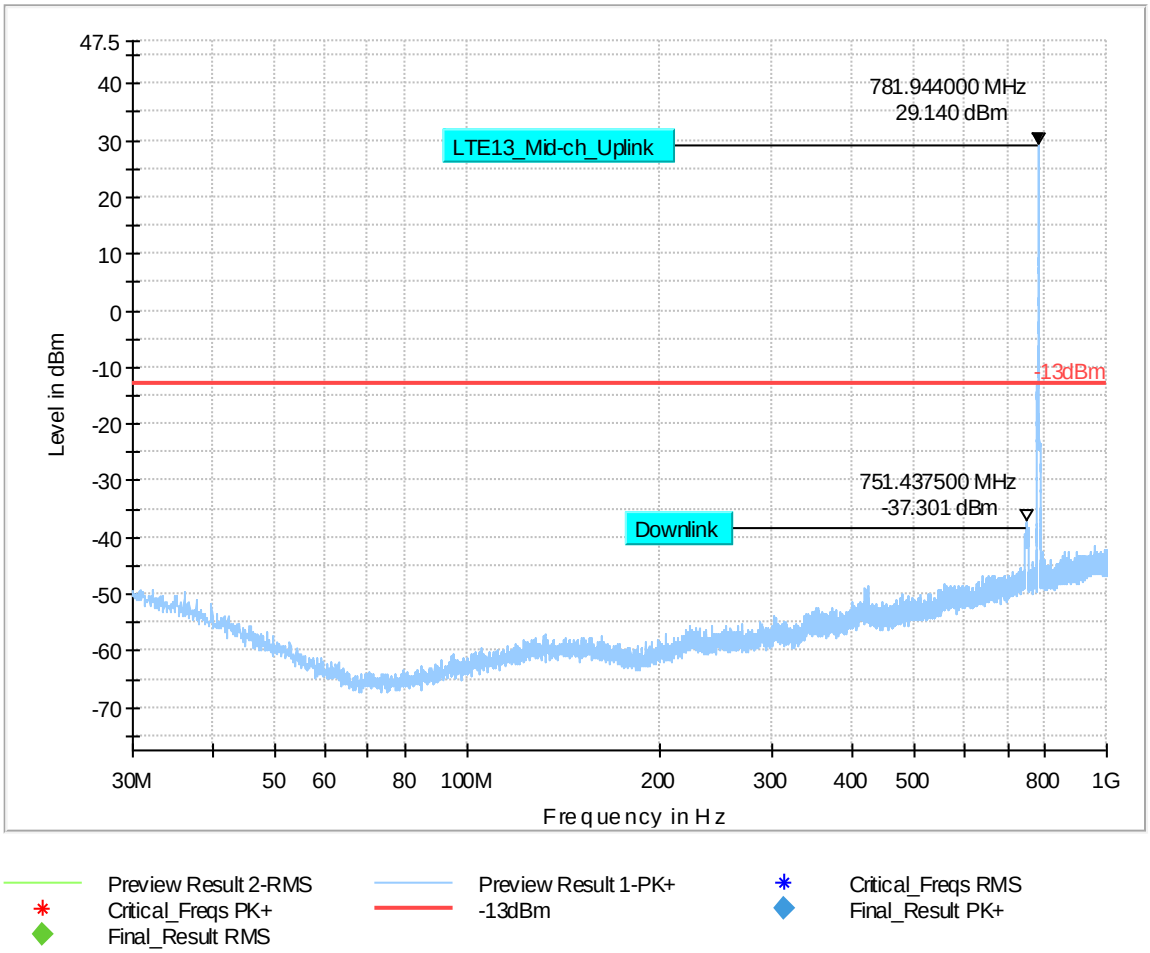
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.011215	-26.16	-13.00	13.16	100.0	0.200	215.0	V	-90.0	-65.9	10:35:46 AM - 10/19/2018
0.014740	-26.48	-13.00	13.48	100.0	0.200	149.0	V	174.0	-67.8	10:41:27 AM - 10/19/2018
0.021790	-35.08	-13.00	22.08	100.0	0.200	225.0	V	180.0	-70.9	10:43:12 AM - 10/19/2018
0.025585	-30.72	-13.00	17.72	100.0	0.200	150.0	V	180.0	-71.5	10:45:03 AM - 10/19/2018
0.032010	-30.29	-13.00	17.29	100.0	0.200	221.0	V	-90.0	-72.4	10:37:36 AM - 10/19/2018
0.038980	-38.57	-13.00	25.57	100.0	0.200	221.0	V	0.0	-73.5	10:39:33 AM - 10/19/2018



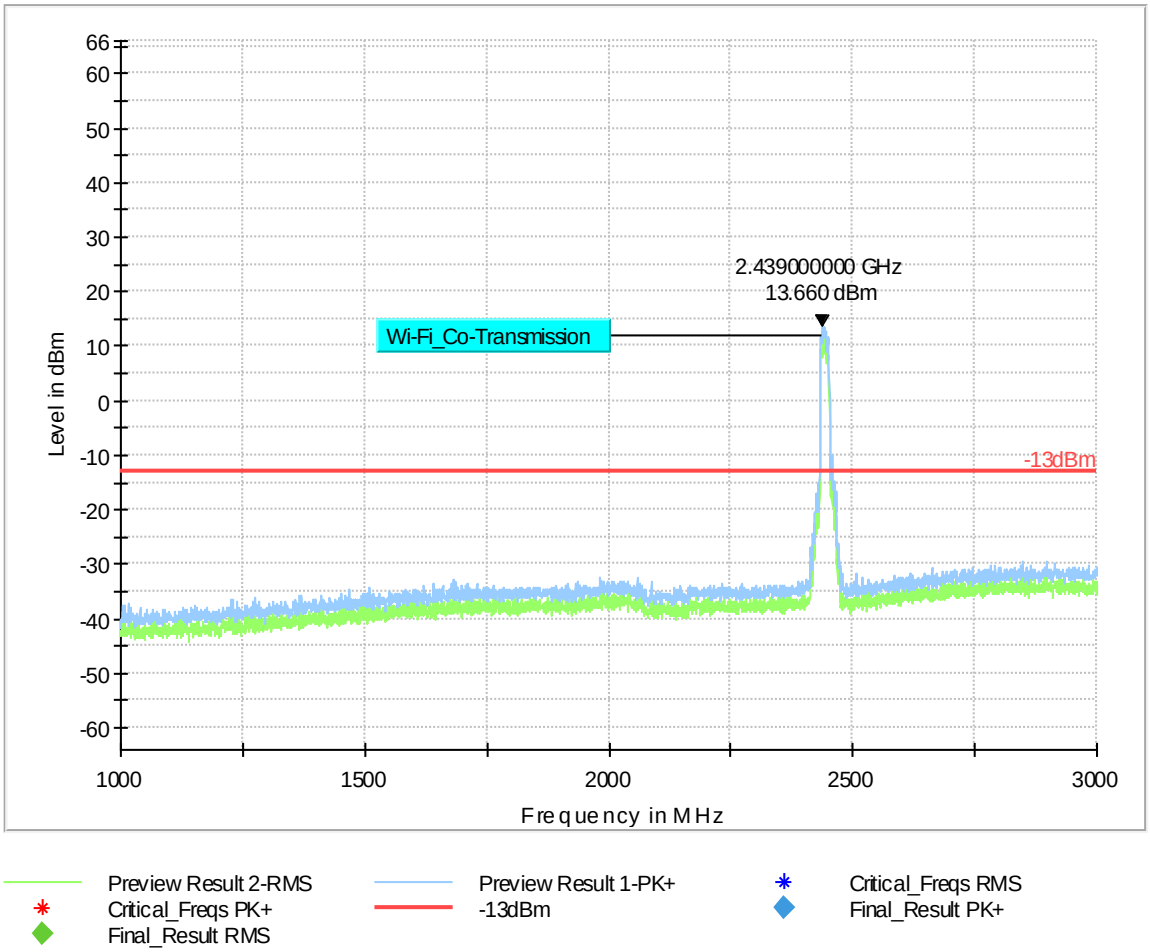
Plot # 64 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



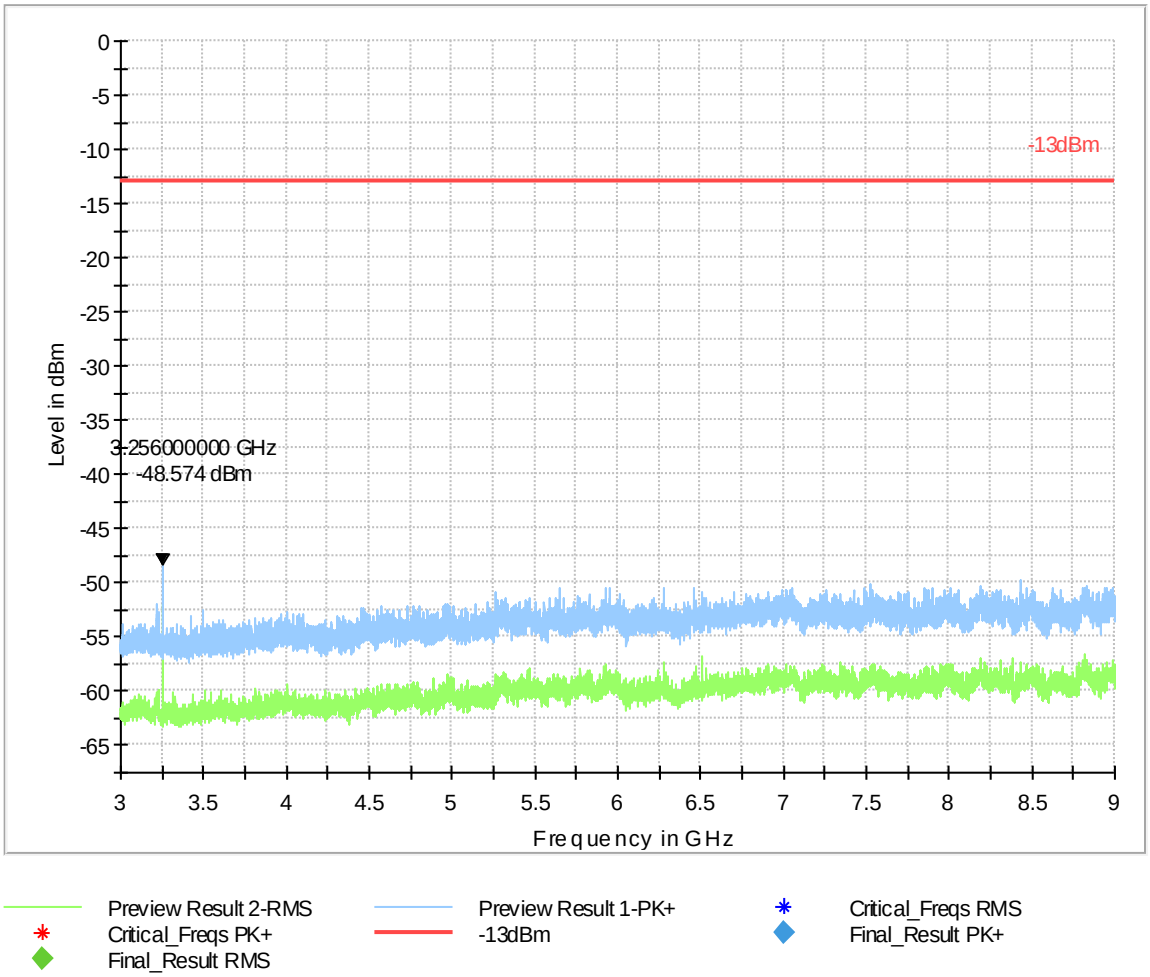
Plot # 65 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



Plot # 66 Radiated Emissions: 3 GHz – 9 GHz

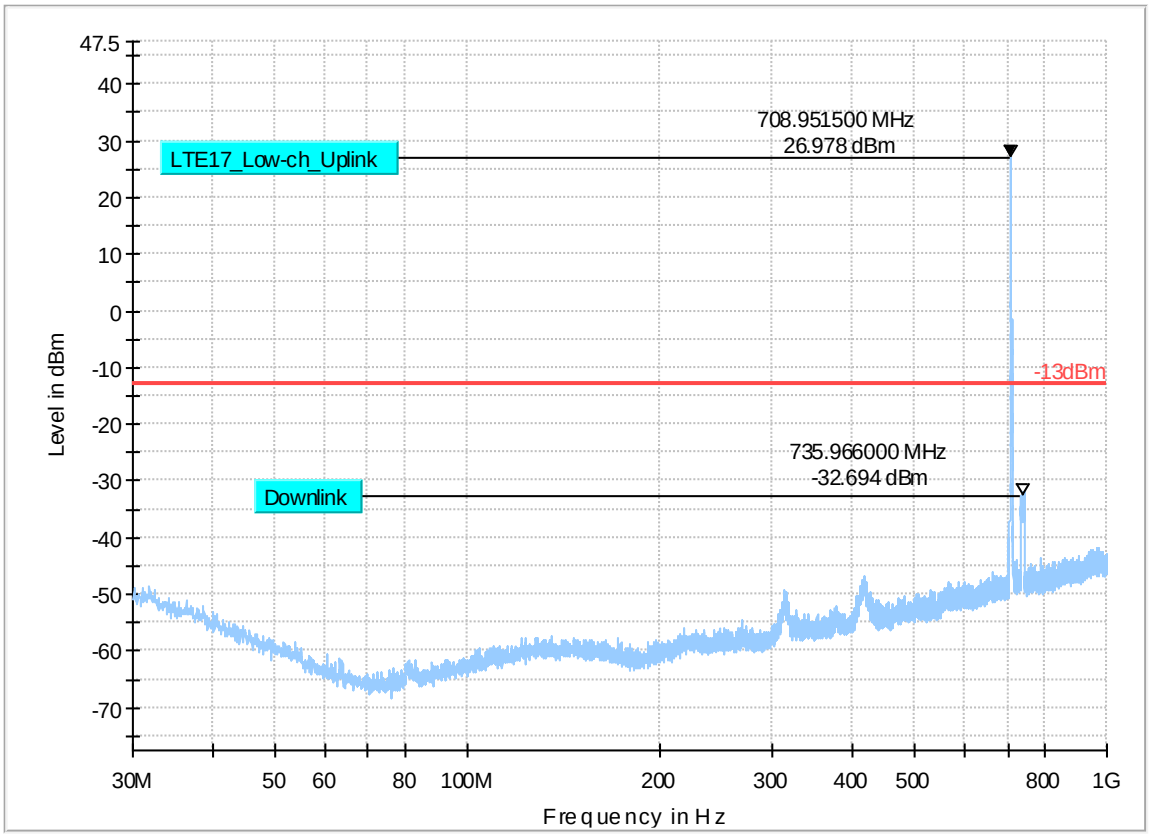
Channel: Mid



LTE Band 17

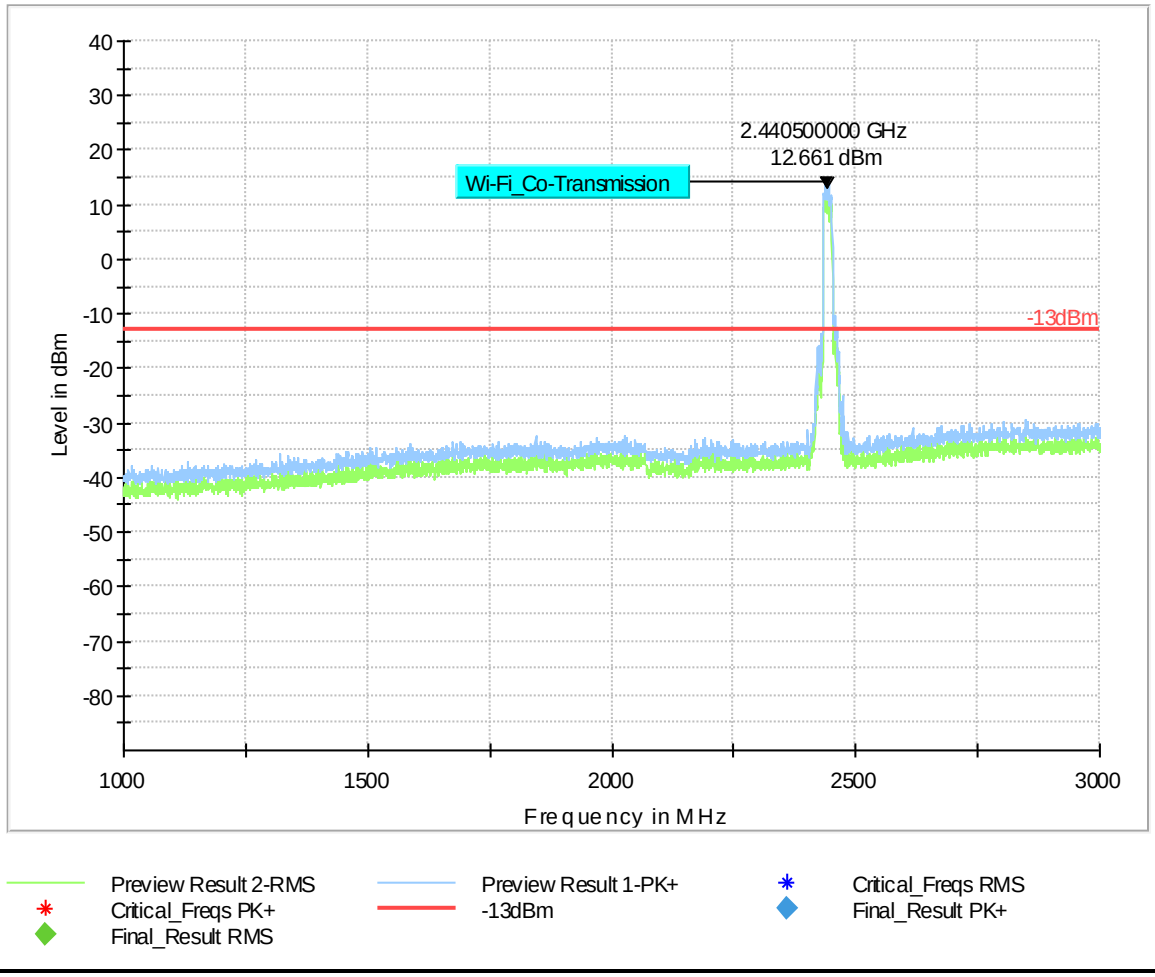
Plot # 67 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



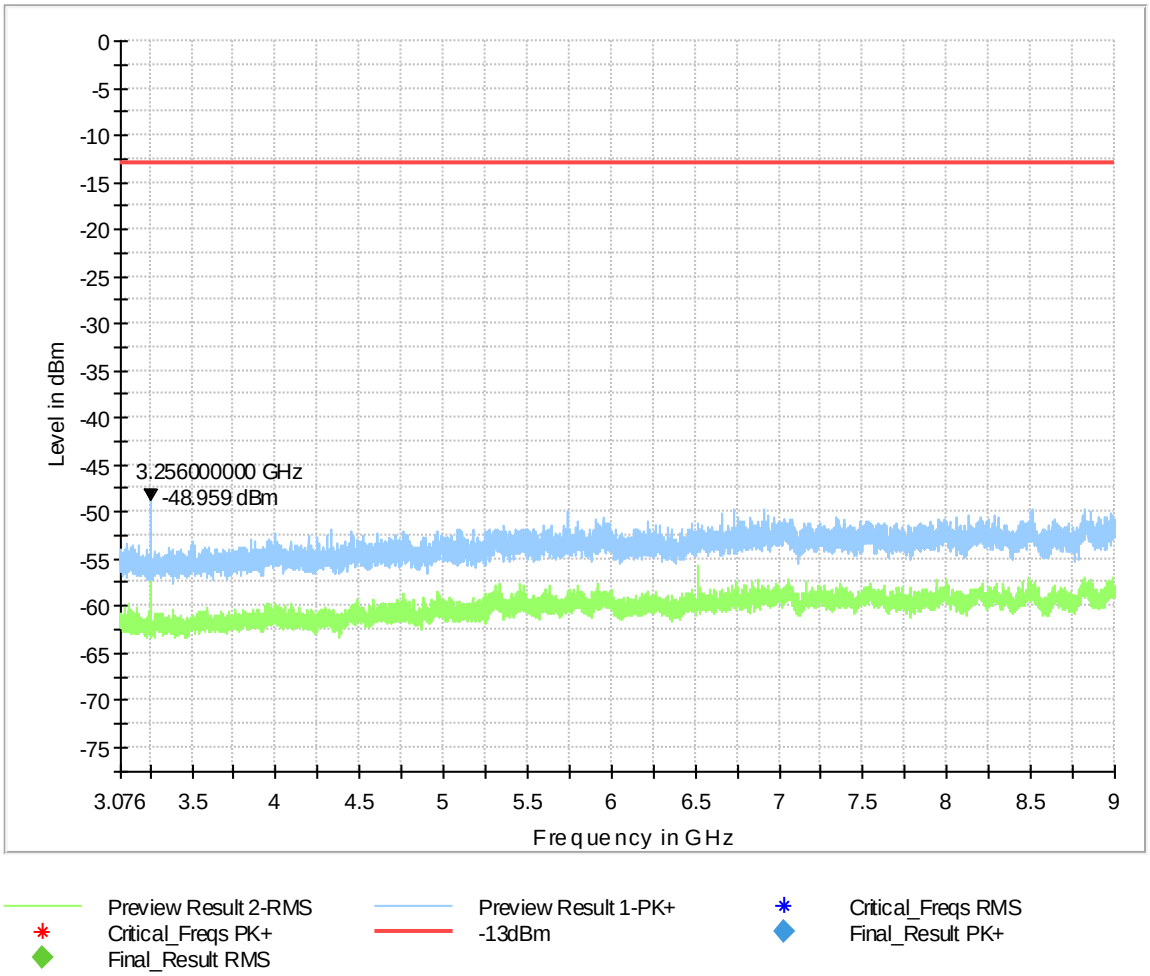
Plot # 68 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 69 Radiated Emissions: 3 GHz - 9 GHz

Channel: Low

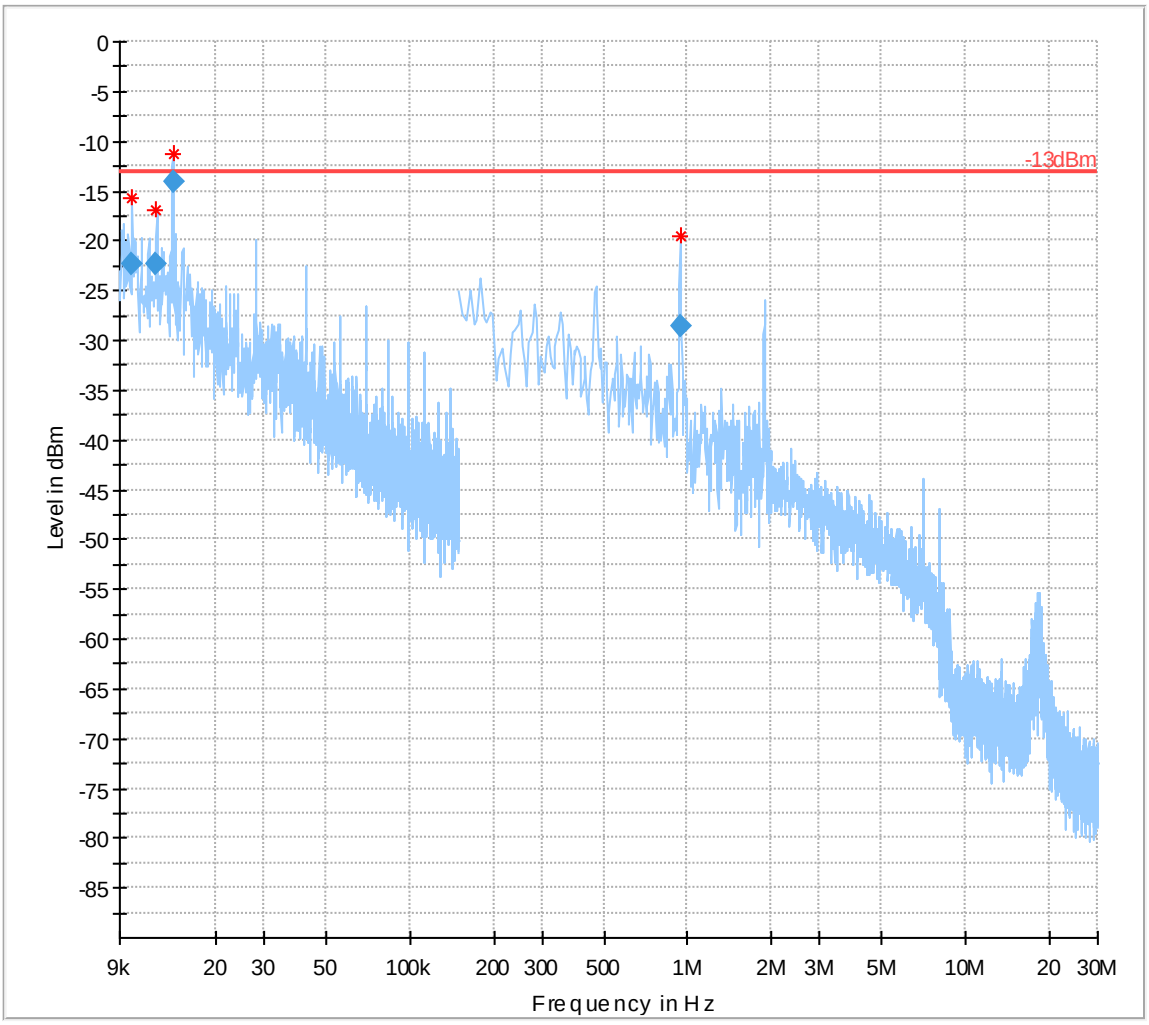


Plot # 70 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

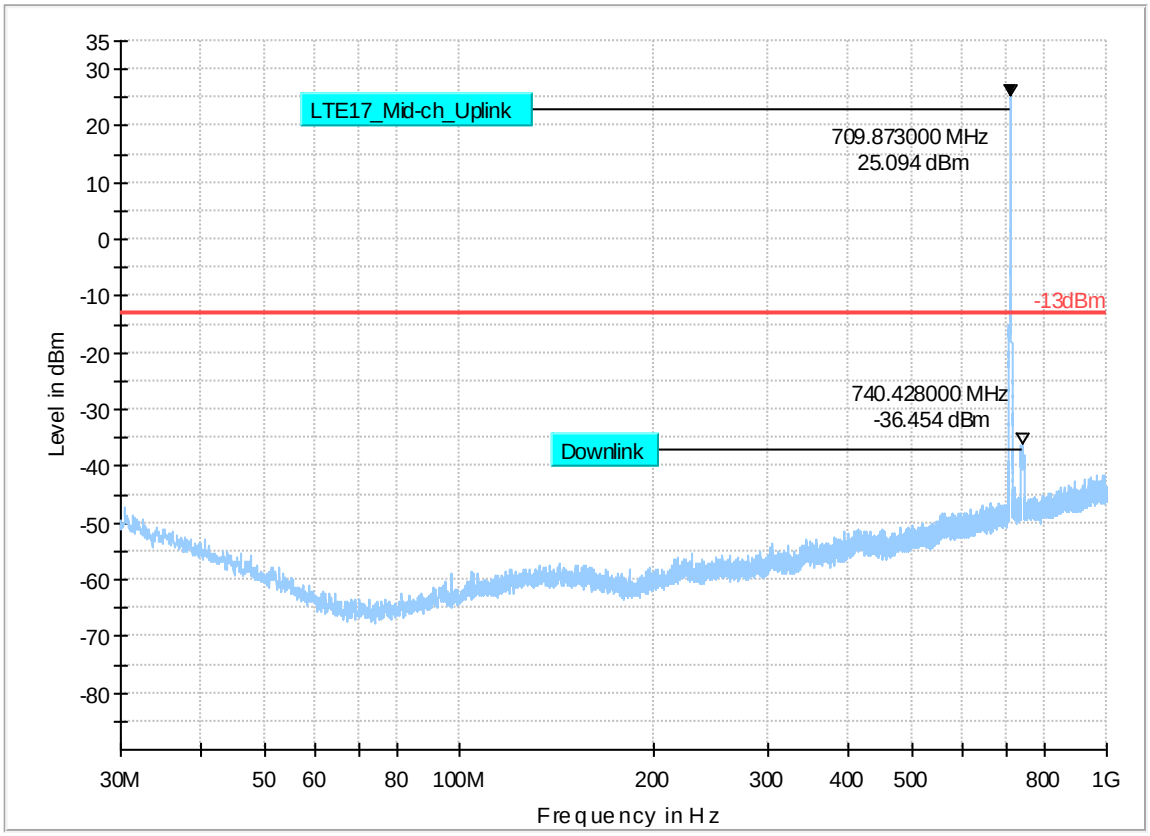
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.010020	-22.34	-13.00	9.34	100.0	0.200	149.0	H	53.0	-65.2	2:29:28 PM - 10/19/2018
0.012237	-22.34	-13.00	9.34	100.0	0.200	140.0	H	54.0	-66.4	2:31:07 PM - 10/19/2018
0.014014	-14.00	-13.00	1.00	100.0	0.200	140.0	H	54.0	-67.4	2:32:47 PM - 10/19/2018
0.945255	-28.52	-13.00	15.52	100.0	9.000	150.0	H	84.0	-76.6	2:34:24 PM - 10/19/2018



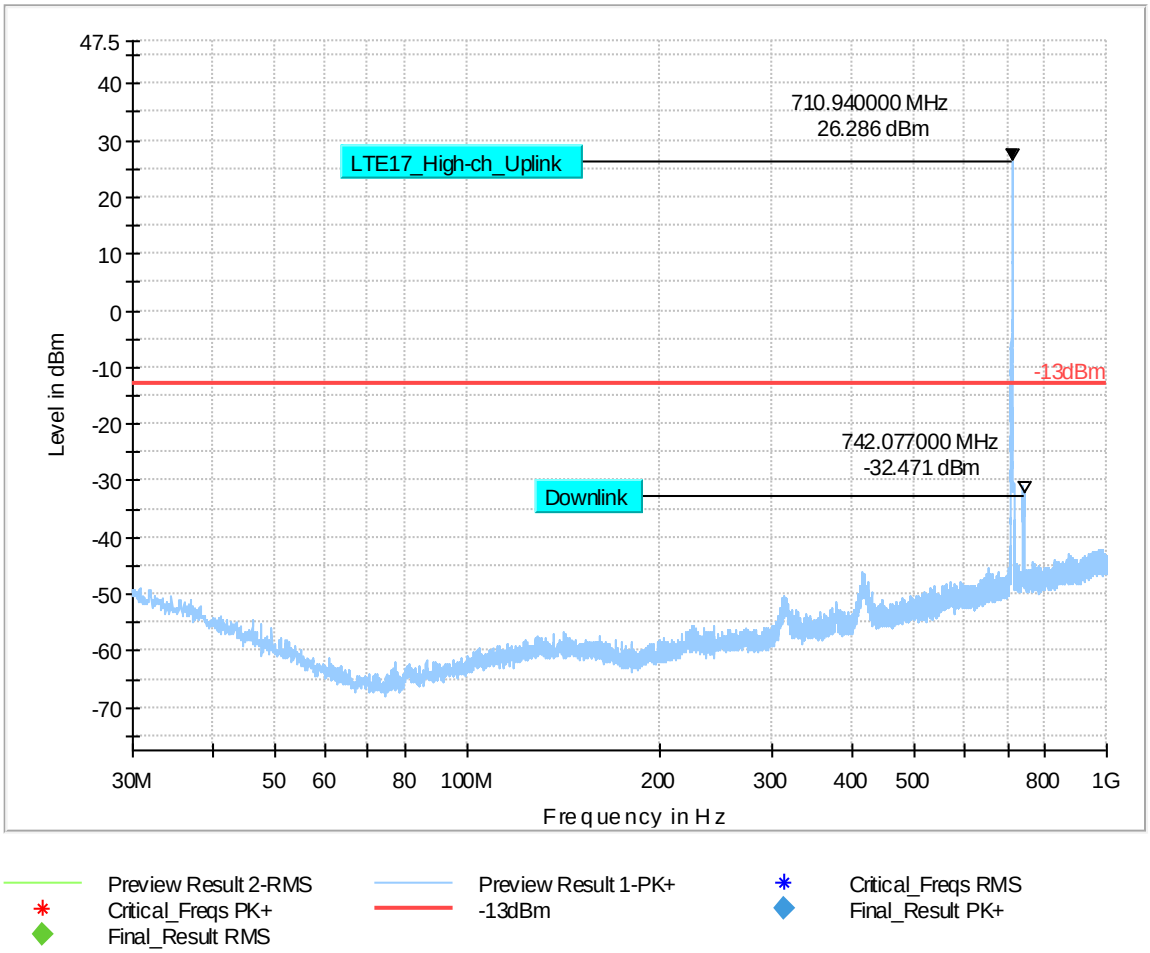
Plot # 71 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



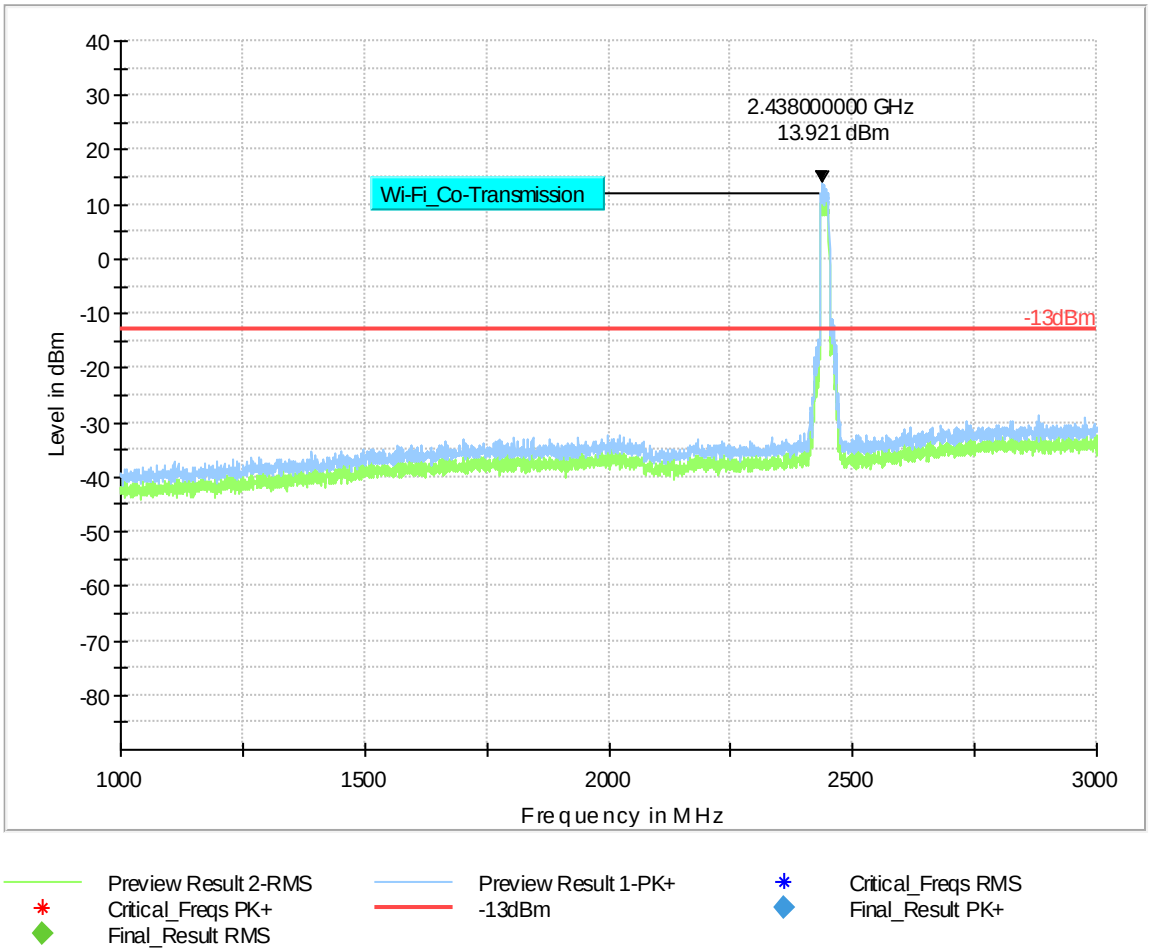
Plot # 72 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



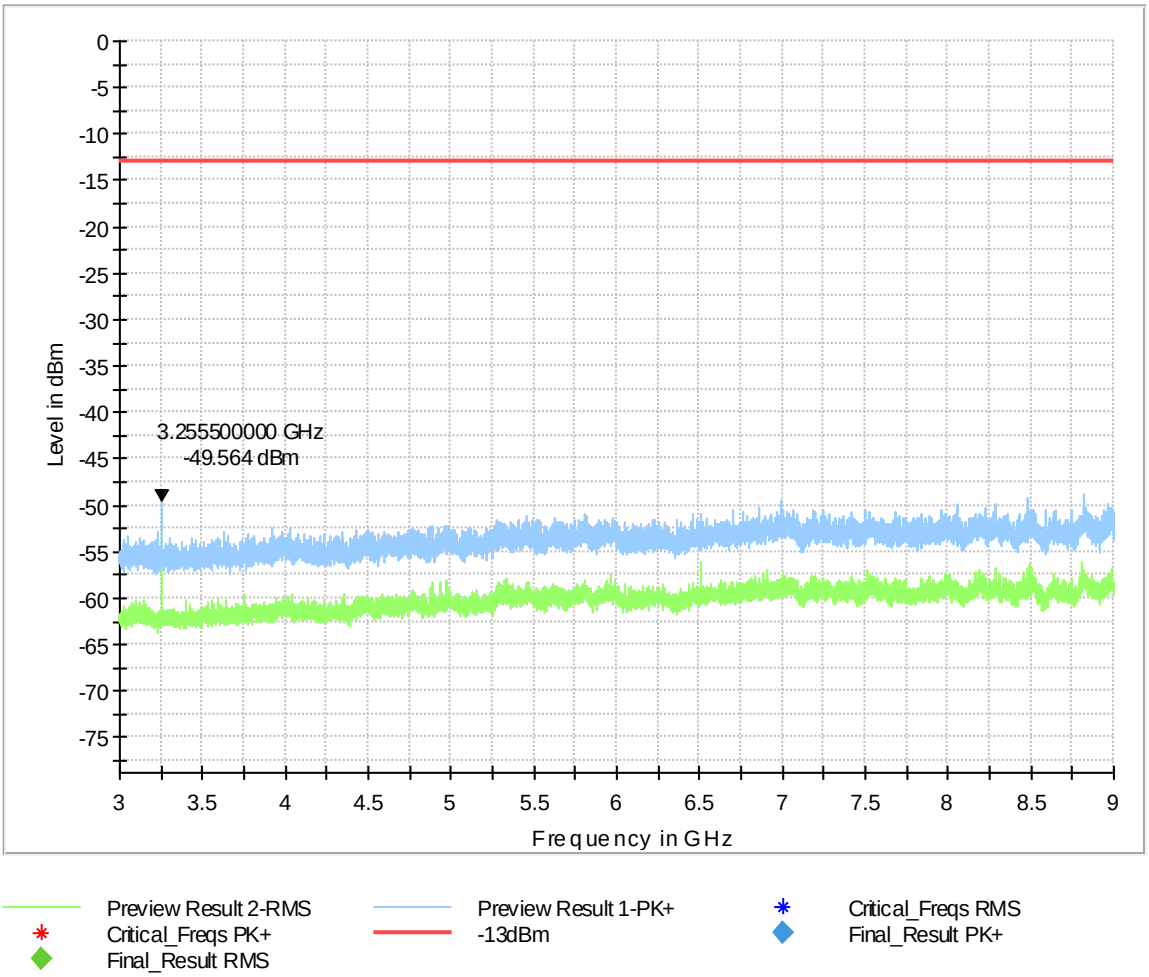
Plot # 73 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 74 Radiated Emissions: 3 GHz - 9 GHz

Channel: High



8 Test setup photos

Setup photos are included in supporting file name: "EMC_CHARG_017_18501_FCC_ISED_Setup_Photos.pdf"

9 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
ACTIVE LOOP ANTENNA	ETS LINDGREN	6507	00066145	3 YEARS	11/12/2017
PASSIVE LOOP ANTENNA	ETS LINDGREN	6512	00164698	3 YEARS	08/08/2017
BILOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
HORN ANTENNA	EMCO	3115	00035111	3 YEARS	11/17/2015
HORN ANTENNA	ETS LINDGREN	3117	00167061	3 YEARS	08/08/2017
HORN ANTENNA	ETS LINDGREN	3116C	00166821	3 YEARS	09/24/2017
UNIVERSAL RADIO COMMUNICATION TESTER	R&S	CMU 200	101821	2 YEARS	07/06/2017
WIDEBAND RADIO COMMUNICATION	R&S	CMW500	127068	2 YEARS	07/01/2017
SIGNAL ANALYZER	R&S	FSV 40	101022	2 YEARS	07/05/2017
COMPACT DIGITAL BAROMETER	CONTROL COMPANY	35519-055	91119547	2 YEARS	6/20/2017
THRMOMETER HUMIDIY	DICKSON	TM320	16253639	3 YEARS	11/02/2017

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
12/11/2018	EMC_CHARG_017_18501_FCC_22_24_27_ISED	Initial Version	Issa Ghanma