FCC/ISED Test Report

FOR:
Pratt & Whitney Engine Services

Model Number:
FAST / FAST-A-010-3_RevF, FAST / FAST-A-010-4_RevF

Product Description:
Data Collection and Transmission Unit

FCC ID: 2AJ6A-FAST34F
IC ID: 22451-FAST34F

Per:
47 CFR: Part 22, Part 24, Part 27
RSS-130 Issue 2; RSS-132 Issue 3; RSS-133 Issue 6; RSS-139 Issue 3; RSS-199 Issue 3

REPORT #: EMC_PRATT-005-19001_FCC_22_24_27_ISED_Rev1

DATE: 2019-11-13

A2LA Accredited

IC recognized # 3462B-1

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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 Issue 2, 132 Issue 3, 133 Issue 6, 139 Issue 3 and 199 Issue 3.

Company	Description	Model #
Pratt & Whitney Engine Services	Data Collection and Transmission Unit	FAST / FAST-A-010-3_RevF, FAST / FAST-A-010-4_RevF

No deficiencies were ascertained.

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2019-11-13	Compliance	Cindy Li (Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2019-11-13	Compliance	Yuchan Lu (Test Engineer)	Yuchan Lu Digitally signed by: Yuchan Lu DN: CN = Yuchan Lu email = Yuchan.Lu@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2019.11.13 15:51:42 -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

Client's Name:	Pratt & Whitney Engine Services
Street Address:	249 Vanderbilt Avenue
City/Zip Code	Norwood, MA 02062
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

Firmware Version Identification Number (FVIN):	N/A
Hardware Version Identification Number (HVIN):	FAST / FAST-A-010-3_RevF, FAST / FAST-A-010-4_RevF
Product Marketing Name (PMN):	Flight-data Acquistion Storage & Transmisasion
Antenna Information as declared:	Laird Technologies, P/N: CFS69271-FSMAF Antenna gains: • GSM 850: 1.5 dBi • GSM 1900: 3.0 dBi • WCDMA II: 3.0 dBi • WCDMA IV: 3.0 dBi • WCDMA V: 1.5 dBi • LTE Band 2: 3.0 dBi • LTE Band 4: 3.0 dBi • LTE Band 5: 1.5 dBi • LTE Band 7: 4.5 dBi • LTE Band 12: 1.5 dBi
Other Radios included in the device:	❖ WLAN • Module name: Ti-Wi BLE • Module number: TFB-TIWI1-01 / 5969A-TIWI101
Power Supply/ Rated Operating Voltage Range:	Low 22 VDC, Nominal 28 VDC, High 32.2 VDC
Operating Temperature Range:	Low -40º C, Nominal 25º C, High 70º C
Sample Revision	☐Prototype Unit; ☐Production Unit; ■Pre-Production
EUT Dimensions(mm):	210 x 68 x 95
Weight(grams):	1000
EUT Diameter	■ < 60 cm ☐ Other _____

Module Information	
Module Name:	Gemalto
Model Number:	PLS62-W
FCC ID:	QIPPLS62-W
IC ID:	7830A-PLS62W

3.2 EUT Sample details

EUT #	IMEI number	HW Version	SW Version	Notes/Comments
1	35824408050399001	Rev F	3.0.0	Radiated Measurement

3.3 Accessory Equipment (AE) Details

AE #	Comments
1	Power cable
2	External Antenna: Laird Technologies, P/N: CFS69271-FSMAF Coaxial cable consisting of: • Right angle SMA Plug, Amphenol-RF P/N: 901-9874 • Straight SMA Plug, Amphenol-RF P/N: 901-9511-1 • Coaxial Cable, RG400; 10 Ft. • Typical loss for a 10ft cable: 698-960 MHz 1.3dB, 1710-2170 MHz 2dB, 2400-2700 MHz 2.4dB

3.4 Support Equipment

SE #	Comments
1	Communication USB Cable
2	Communication Ethernet Cable

3.5 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT# 1 + AE#1 + AE#2 + SE#1 + SE#2	Worst Case

3.6 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	Cellular and WLAN Co-Transmission	Cellular was tested on Low, Mid, High Channels at the maximum power in a co-transmission mode. Special commands through command window used to configure the WLAN Mid channel provided by the client that will not be available to the end user For radiated measurements, the external antenna was connected.

3.7 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 WLAN Mid channel. Which it is the worst case of the radios supported, based on the maximum average conducted output power from the 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:** 2AJ6A-FAST34F / **IC ID**: 22451-FAST34F

The pre-certified module to be integrated (PLS62-W) 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.

The conducted module test data that can be obtained under the **FCC Filing ID:** QIPPLS62-W is applicable for the host described in section 3.

4.1 Dates of Testing:

09/16/2019 – 09/25/2019

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%

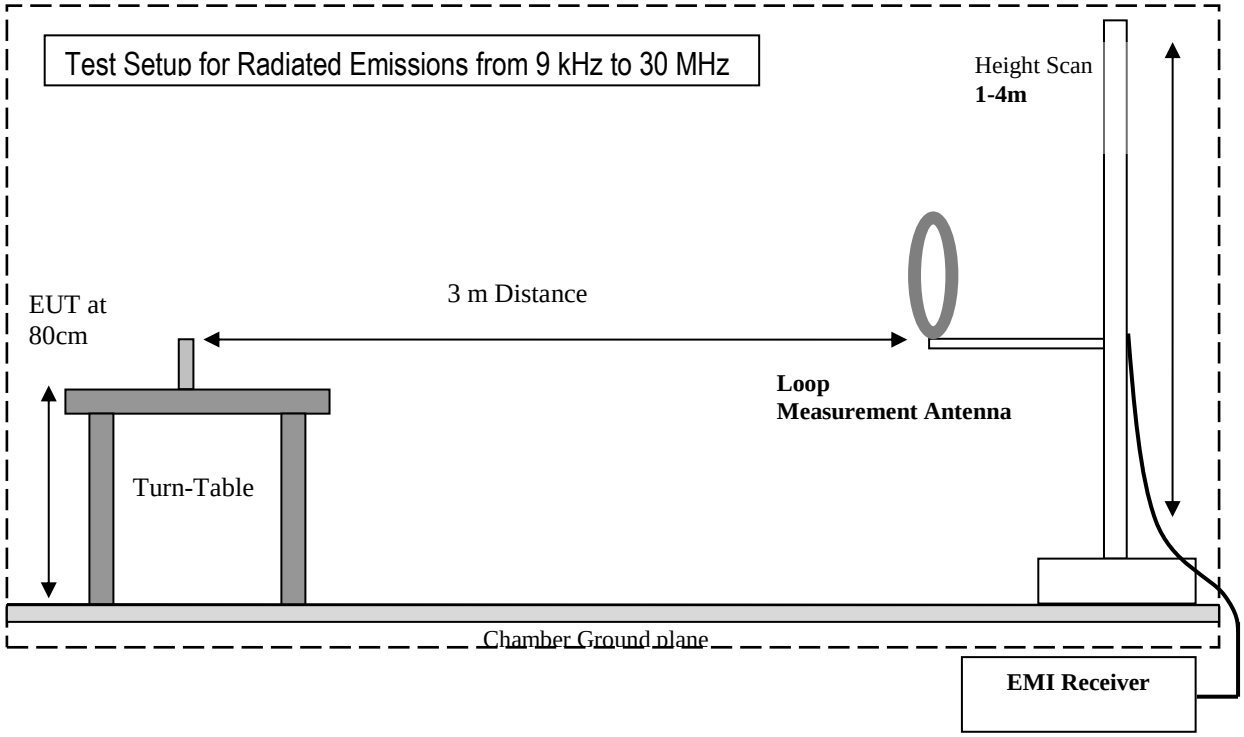
Deviating test conditions are indicated at individual test description where applicable.

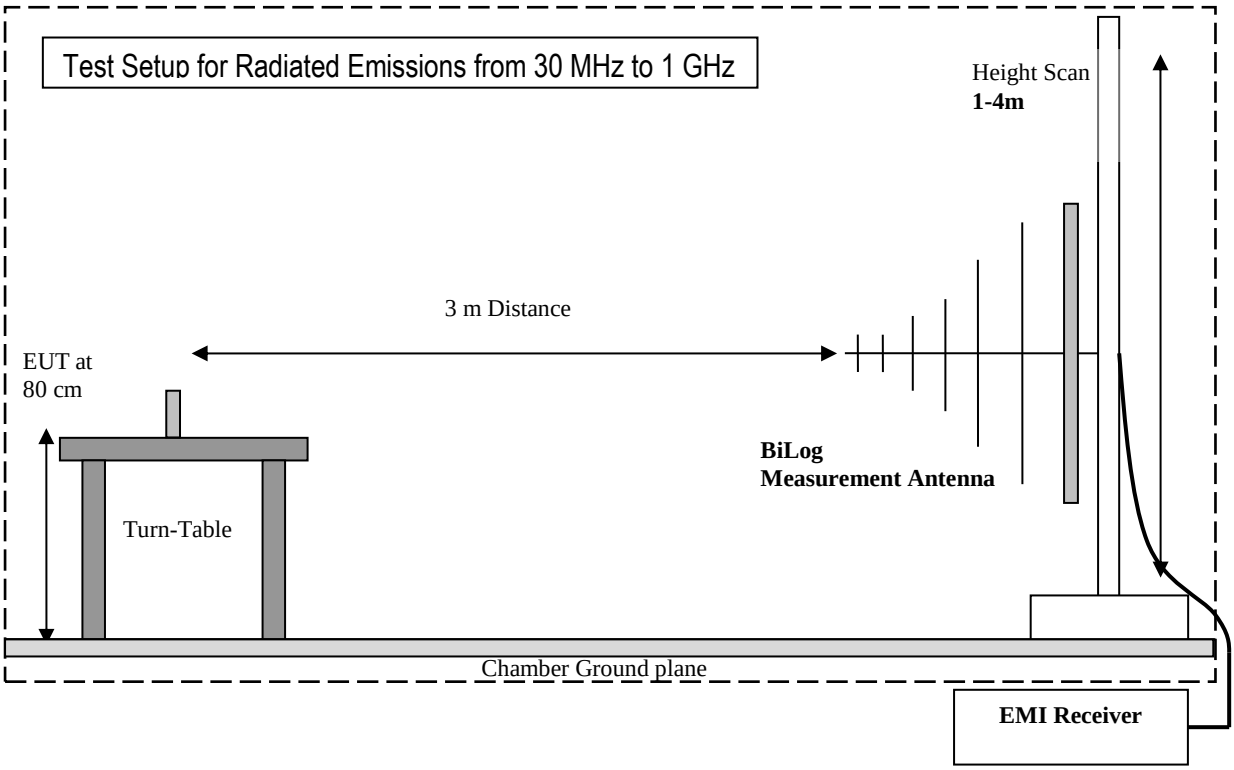
5 Measurement Procedures

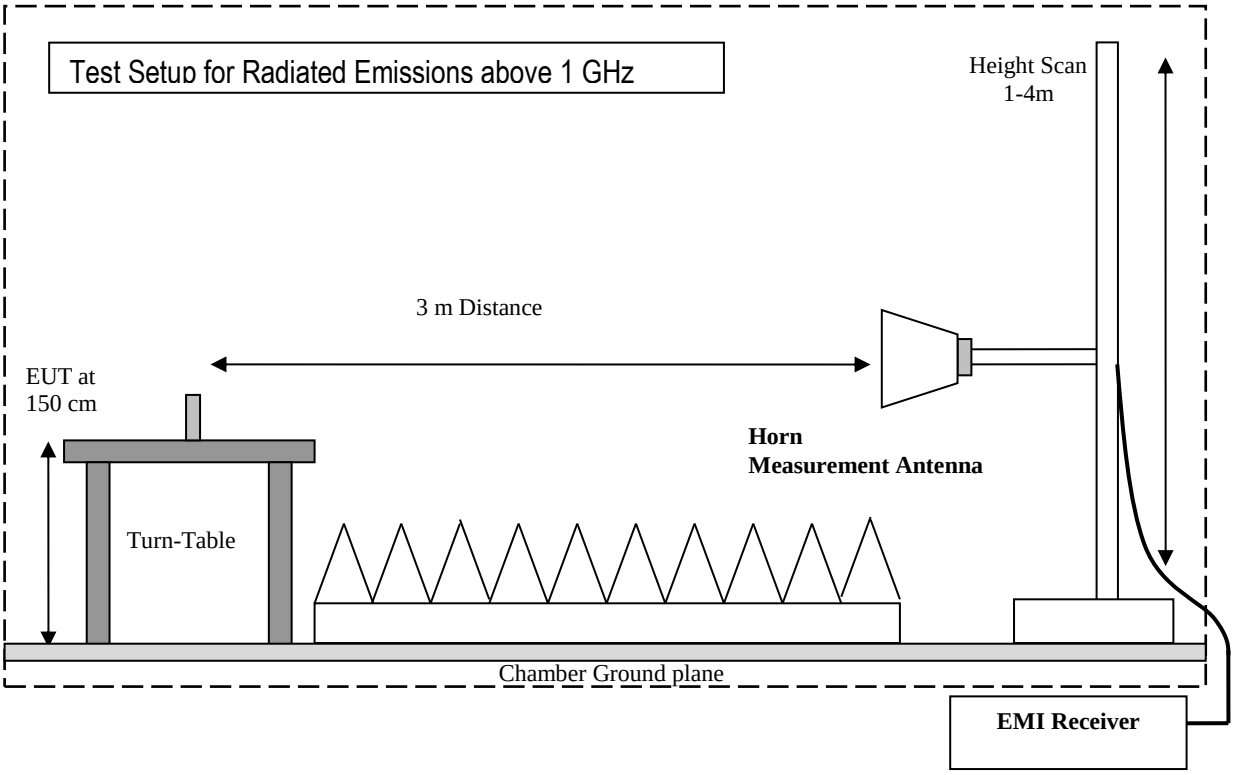
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03 – "Measurement Guidance for Certification of Licensed Digital Transmitters" and according to ANSI C63.26 as detailed below.

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	-	☐	☐	☐	■	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: QIPPLS62-W

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: QIPPLS62-W

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: QIPPLS62-W

7 Test Result Data

7.1 E(I)RP

Band	Frequency Range (MHz)	Power conducted (W)	Emission Designator	Antenna Gain + Cable loss (dBi)	gain linear	EIRP[1] (W)	ERP[1] (W)	Frequency deviation (ppm)	Limit ERP (W)
GSM 850	824.2 – 848.8	2.35	247KGXW	0.2	1.047	2.461	1.500	0.1	7
GSM 850	824.2 – 848.8	0.499	250KG7W	0.2	1.047	0.523	0.319	0.1	7
GSM 1900	1850.2 – 1909.8	1.035	248KGXW	1	1.259	1.303	-	0.1	2
GSM 1900	1850.2 – 1909.8	0.352	260KG7W	1	1.259	0.443	-	0.1	2
WCDMA II	1852.4 – 1907.6	0.17	4M09F9W	1	1.259	0.214	-	0.1	2
WCDMA IV	1712.4 - 1752.6	0.181	4M09F9W	1	1.259	0.228	-	0.1	1
WCDMA V	826.4 – 846.6	0.169	4M09F9W	0.2	1.047	0.177	0.108	0.1	7
LTE 2	1857.5 – 1902.5	0.164	13M6W7D	1	1.259	0.206	-	0.1	2
LTE 2	1860 – 1900	0.163	18M0W7D	1	1.259	0.205	-	0.1	2
LTE 4	1717.5 – 1747.5	0.171	13M6W7D	1	1.259	0.215	-	0.1	1
LTE 4	1720 – 1745	0.167	17M9W7D	1	1.259	0.210	-	0.1	1
LTE 5	824.7 – 848.3	0.203	1M09G7D	0.2	1.047	0.213	0.130	0.1	7
LTE 5	829 – 844	0.166	9M04W7D	0.2	1.047	0.174	0.106	0.1	7
LTE 7	2510 - 2560	0.134	18M1W7D	2.1	1.622	0.217	-	0.1	2
LTE 12	699.7 – 715.3	0.167	1M10W7D	0.2	1.047	0.175	0.107	0.1	3
LTE 12	704 – 711	0.164	9M04W7D	0.2	1.047	0.172	0.105	0.1	3

Note 1: E(I)RP are calculated from maximum power in grant of cellular module PLS62-W adding the maximum gain of the utilized cellular antenna per operational description.

7.2 Radiated Spurious Emissions

7.2.1 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

7.2.2 Limits:

- **FCC Part 22.917(a) and Part 24.238(a), Part 27.53 (g), and Part 27.53 (h)**
- **RSS-130 Issue 2-4.6, 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)

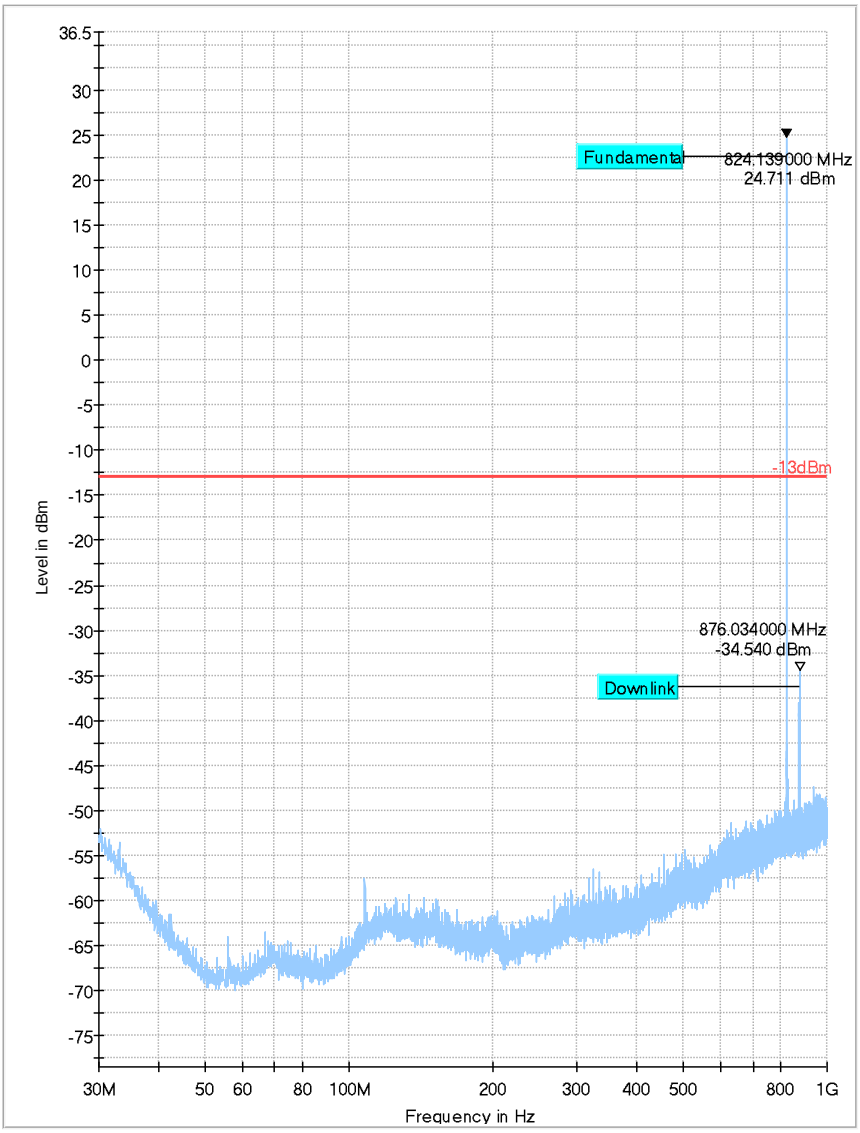
7.2.3 Test conditions and setup:

Ambient Temperature (C)	EUT operating mode	Power Input
22	Op. 1	28 VDC

7.2.4 Measurement Plots:

GSM 850

Plot # 1 Radiated Emissions: 30 MHz - 1 GHz
Channel: Low



Plot # 2 Radiated Emissions: 1 GHz - 3 GHz

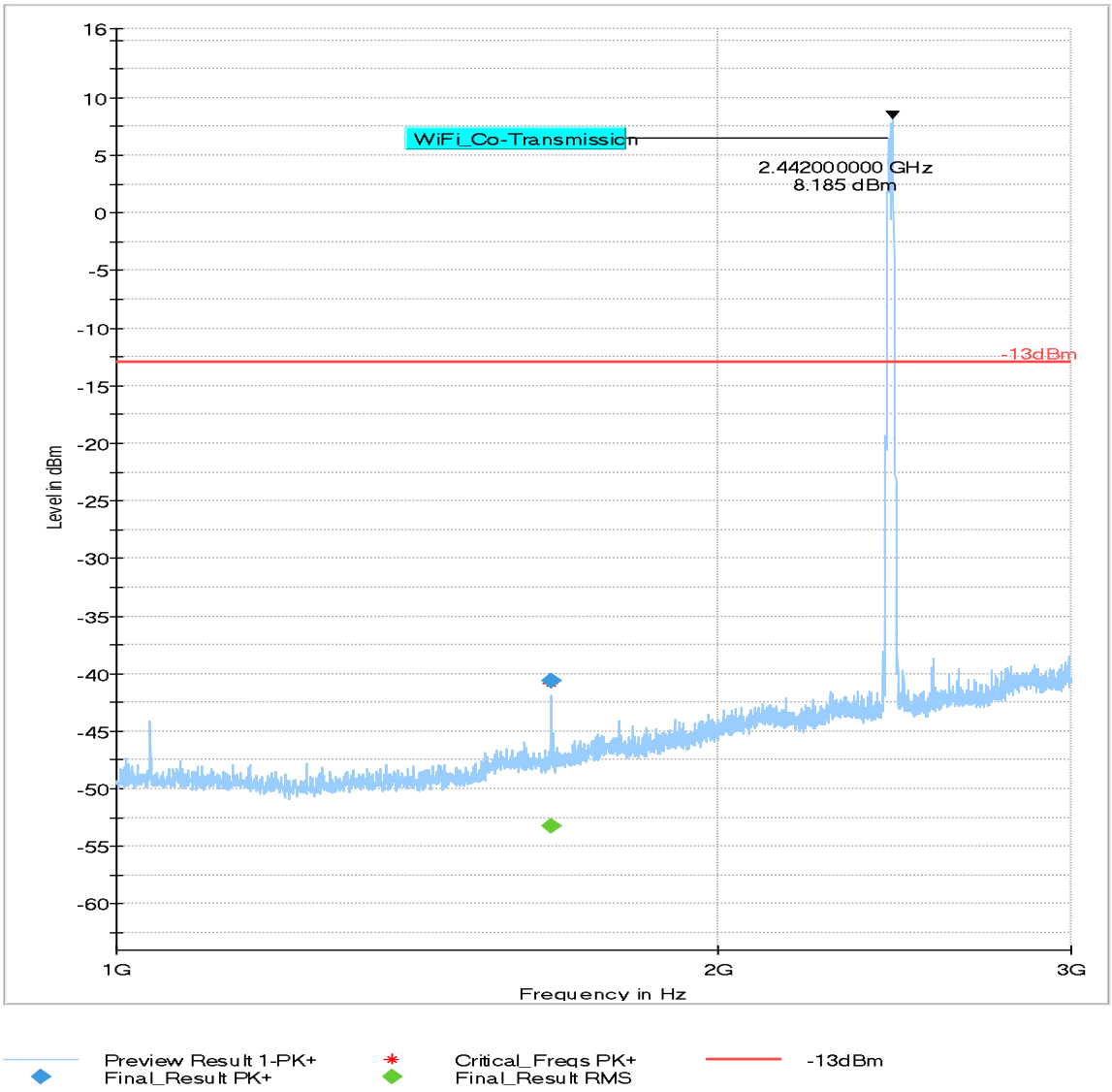
Channel: Low

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1648.540625	---	-53.25	---	---	100.0	1000.000	161.0	V	250.0
1648.540625	-40.64	---	-13.00	27.64	100.0	1000.000	161.0	V	250.0

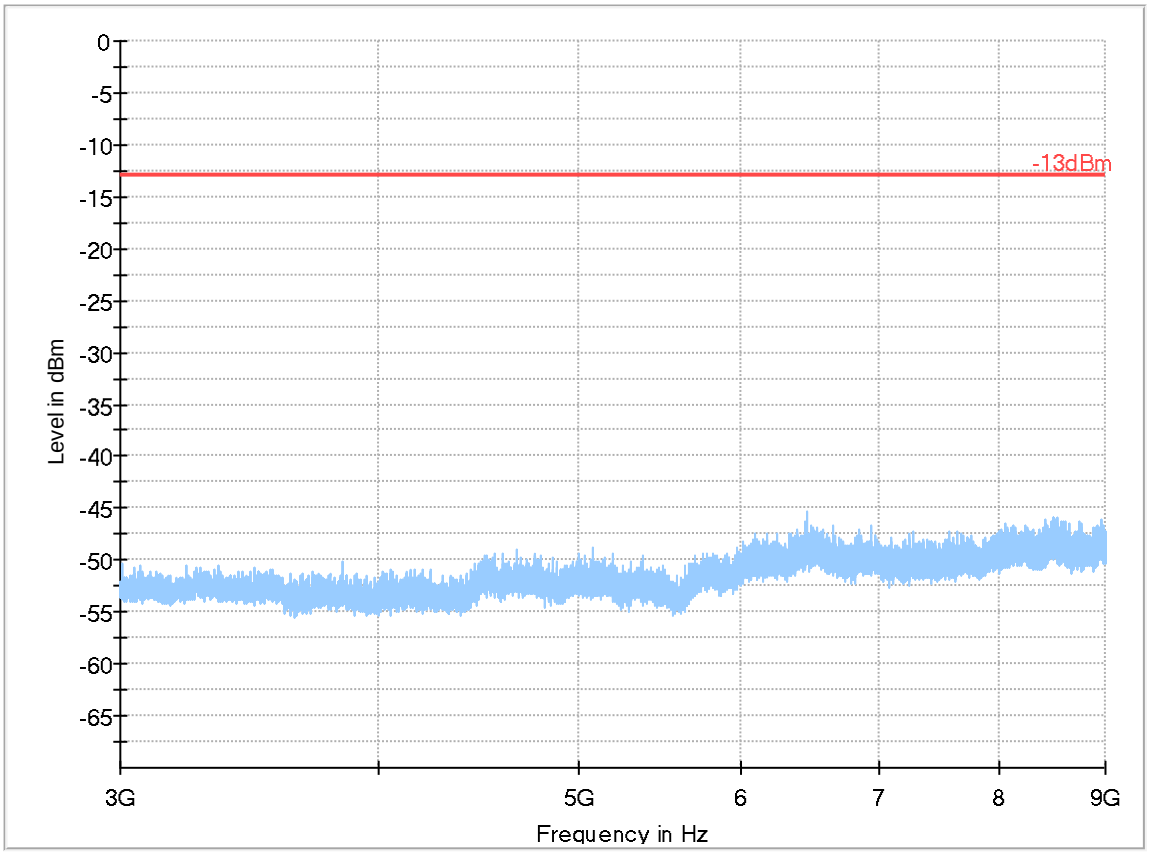
(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
1648.540625	-64.6	5:15:07 PM - 9/20/2019
1648.540625	-64.6	5:15:07 PM - 9/20/2019



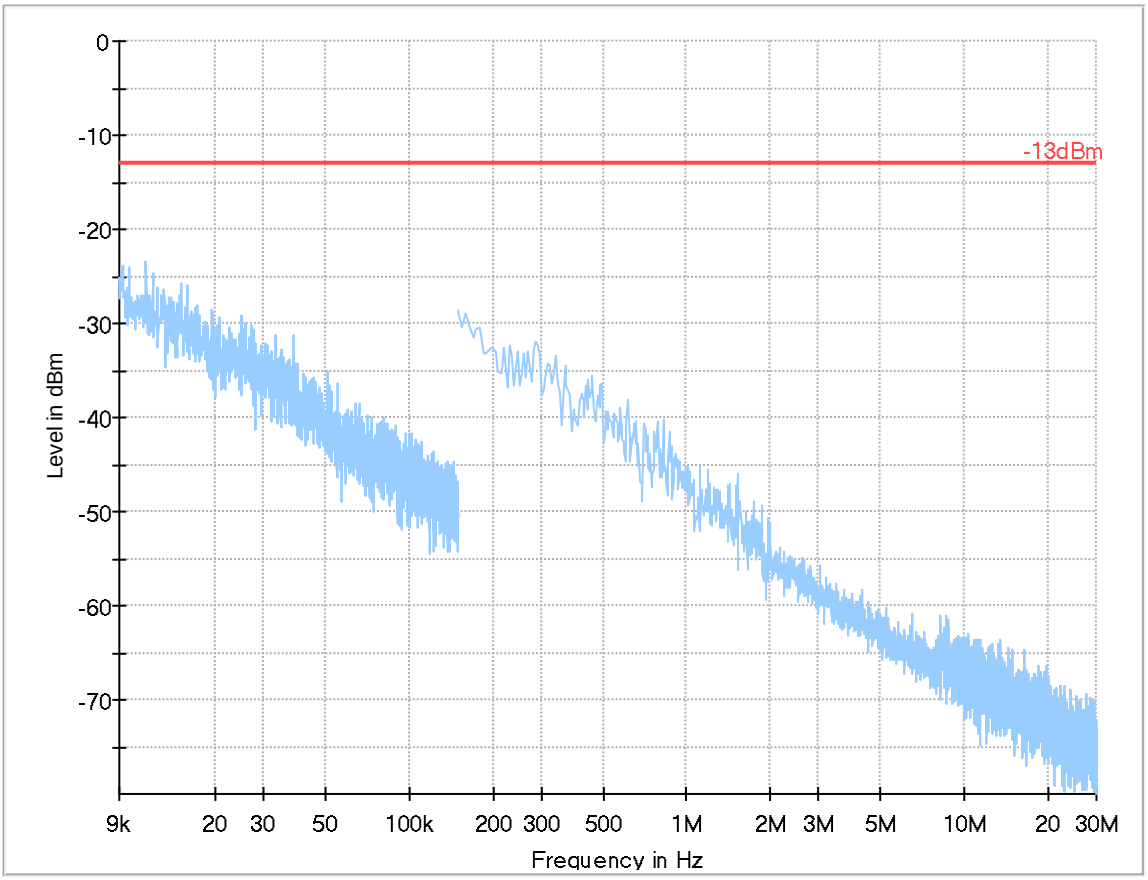
Plot # 3 Radiated Emissions: 3 GHz - 9 GHz

Channel: Low



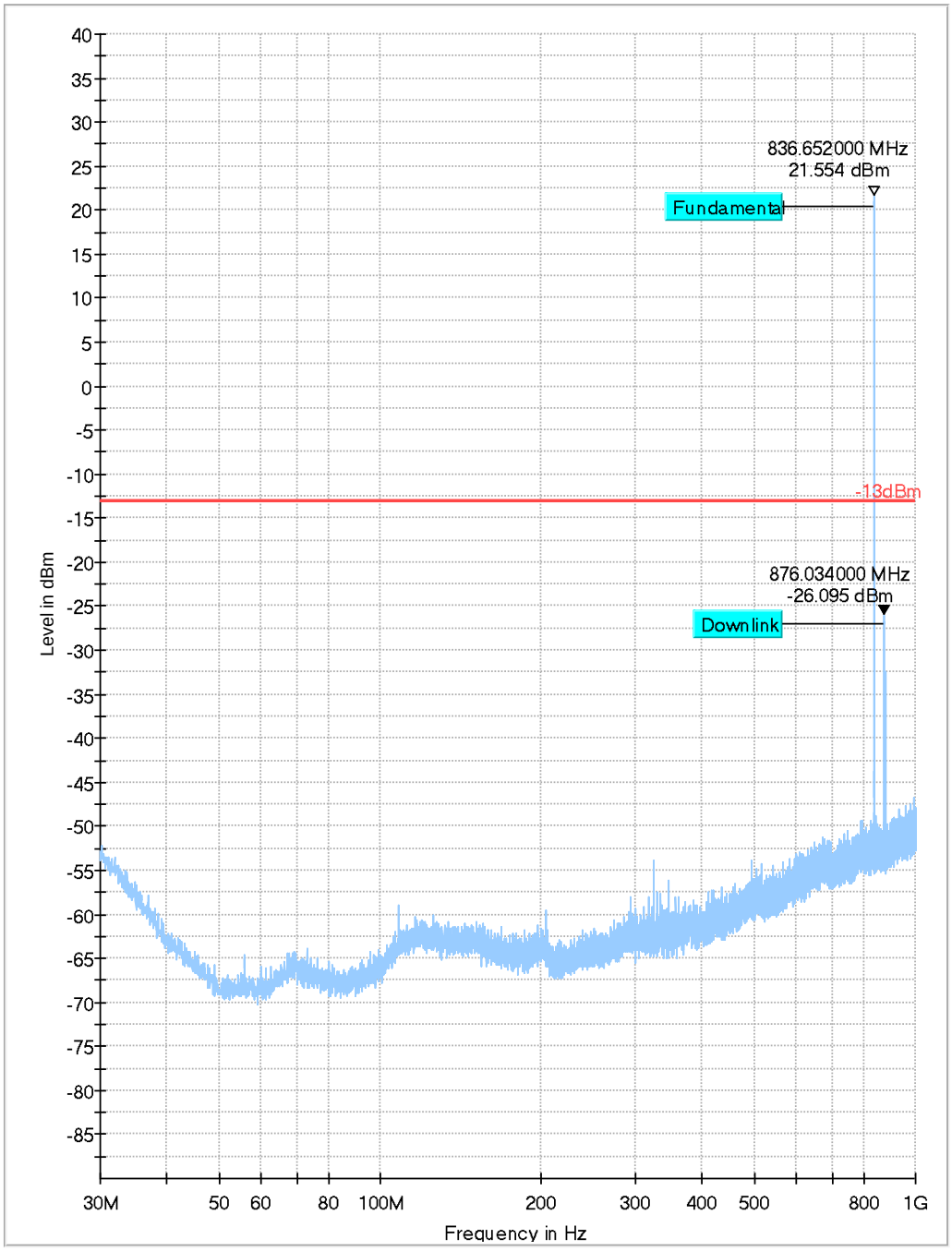
Plot # 4 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



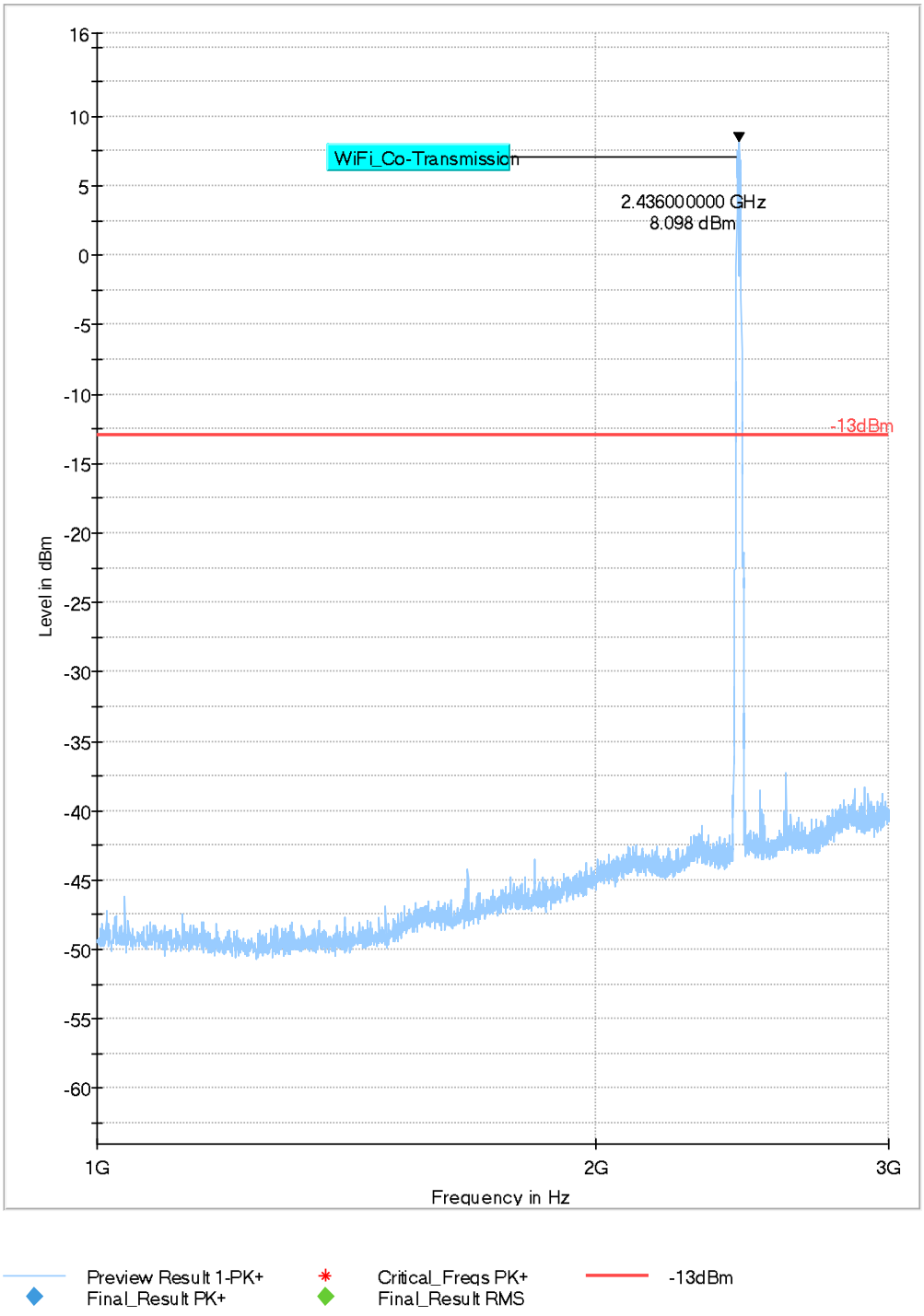
Plot # 5 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



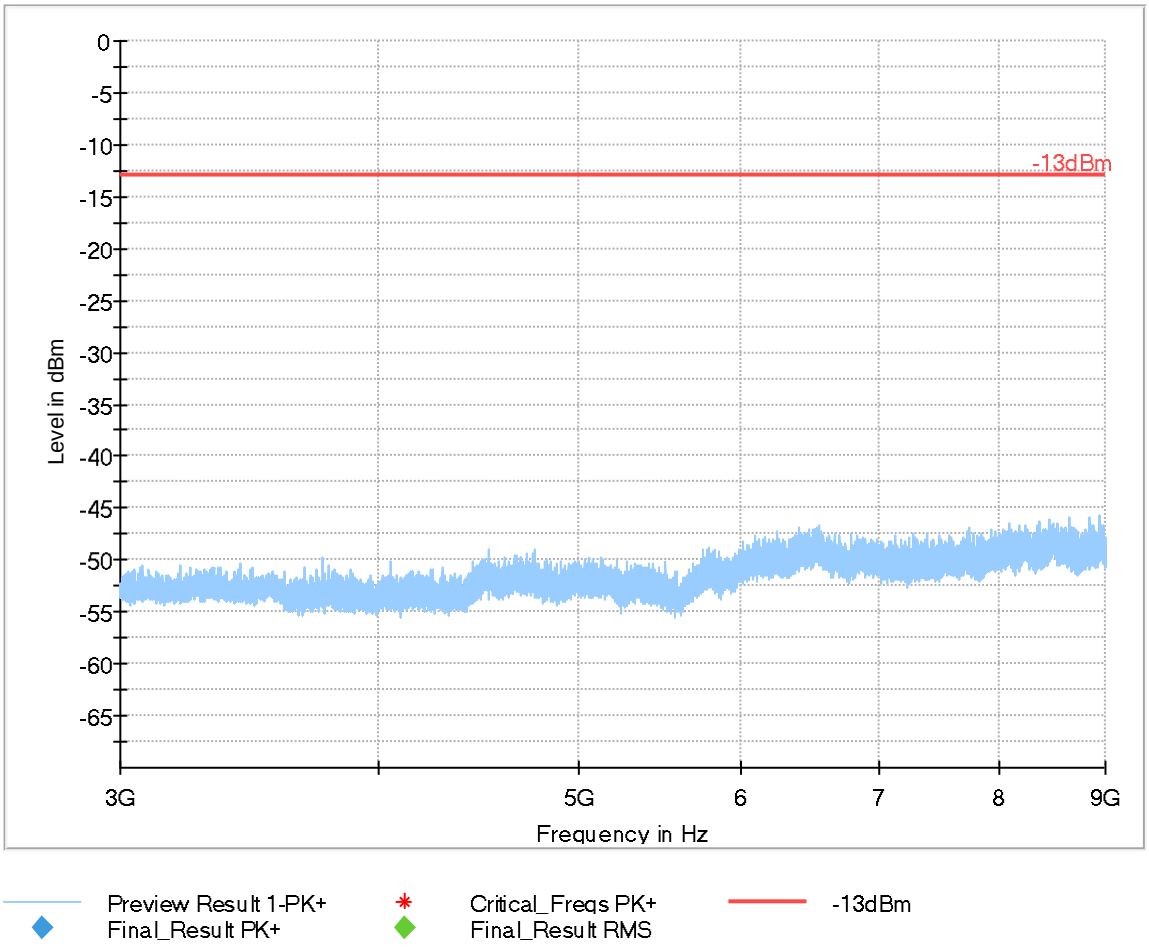
Plot # 6 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



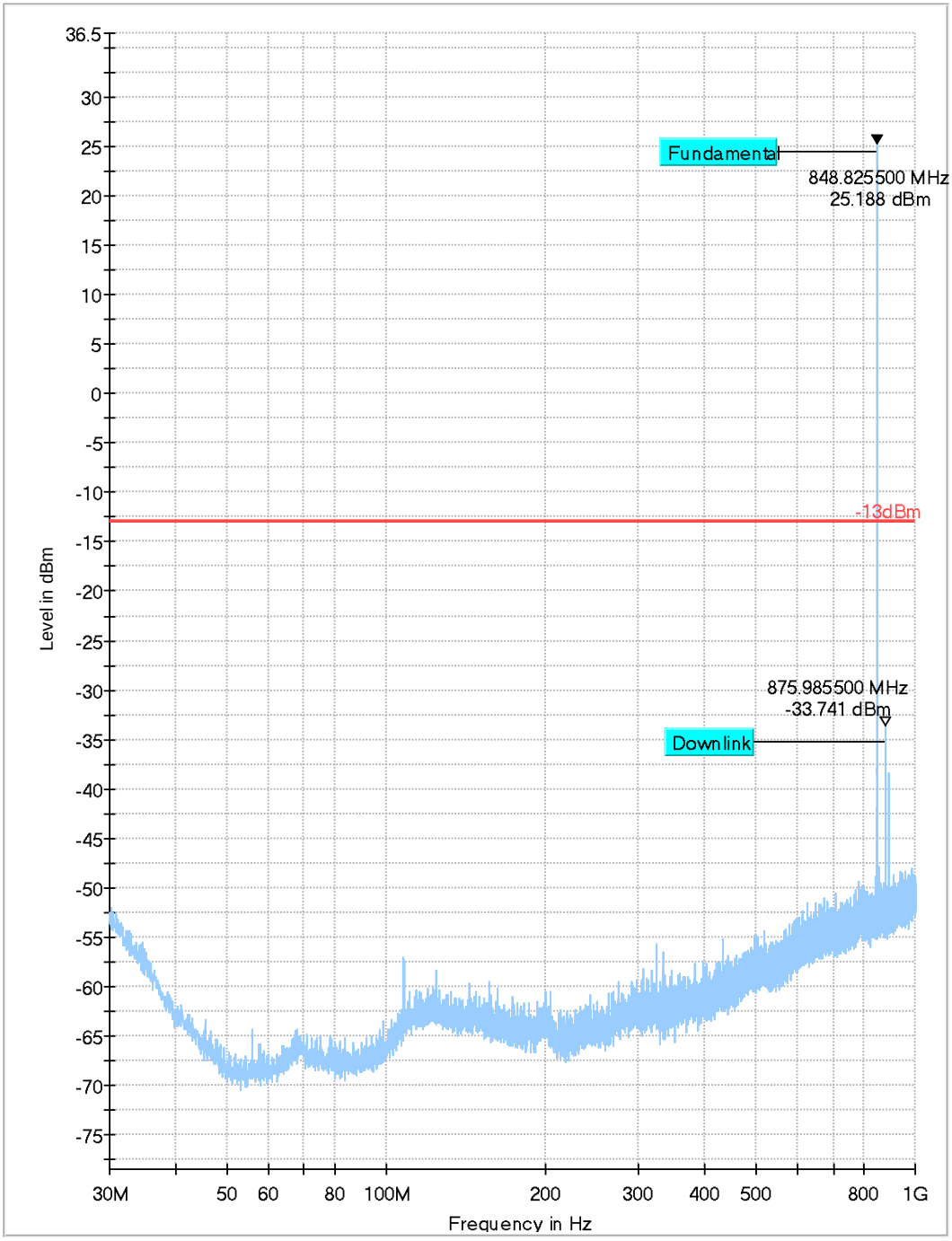
Plot # 7 Radiated Emissions: 3 GHz – 9GHz

Channel: Mid



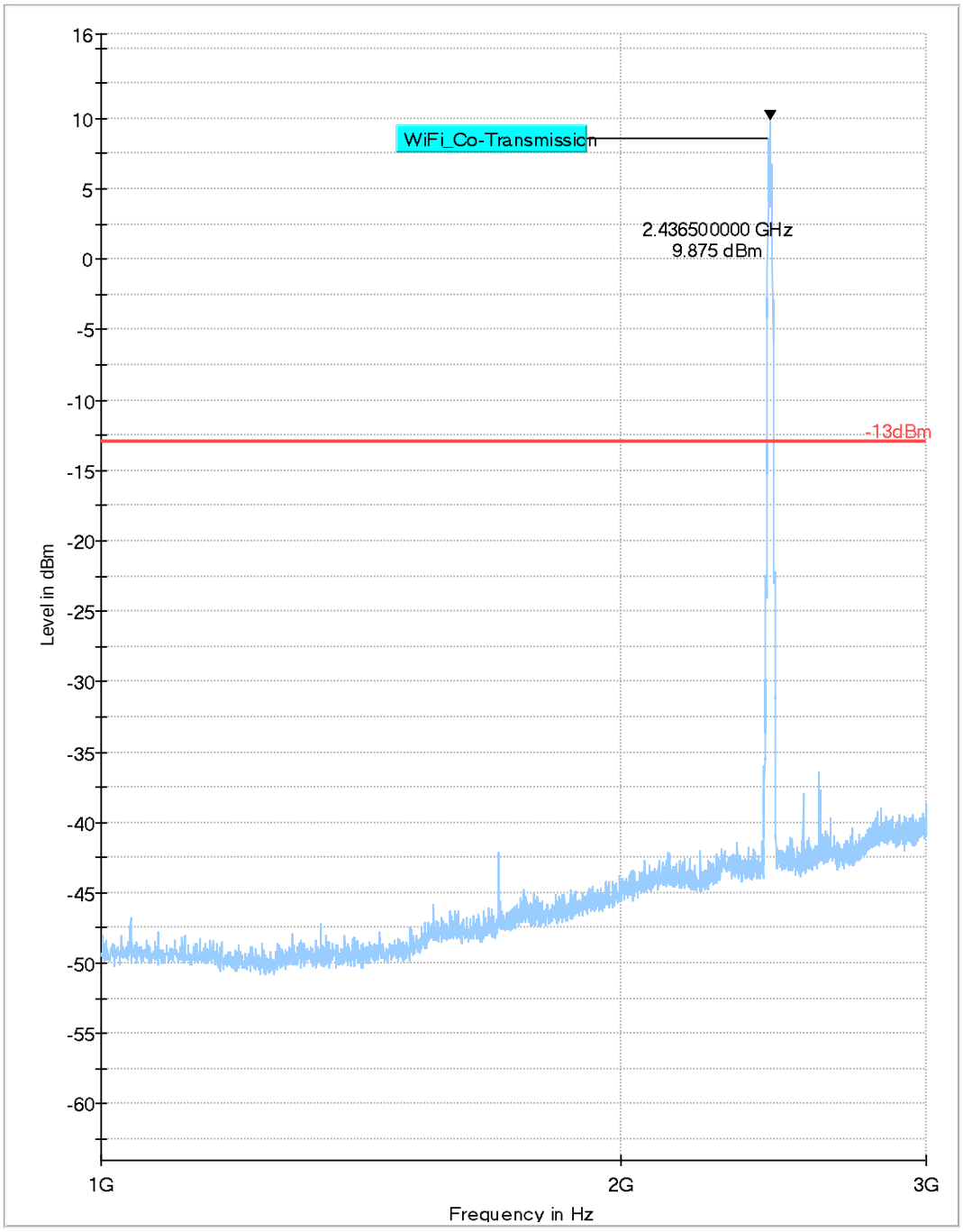
Plot # 8 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



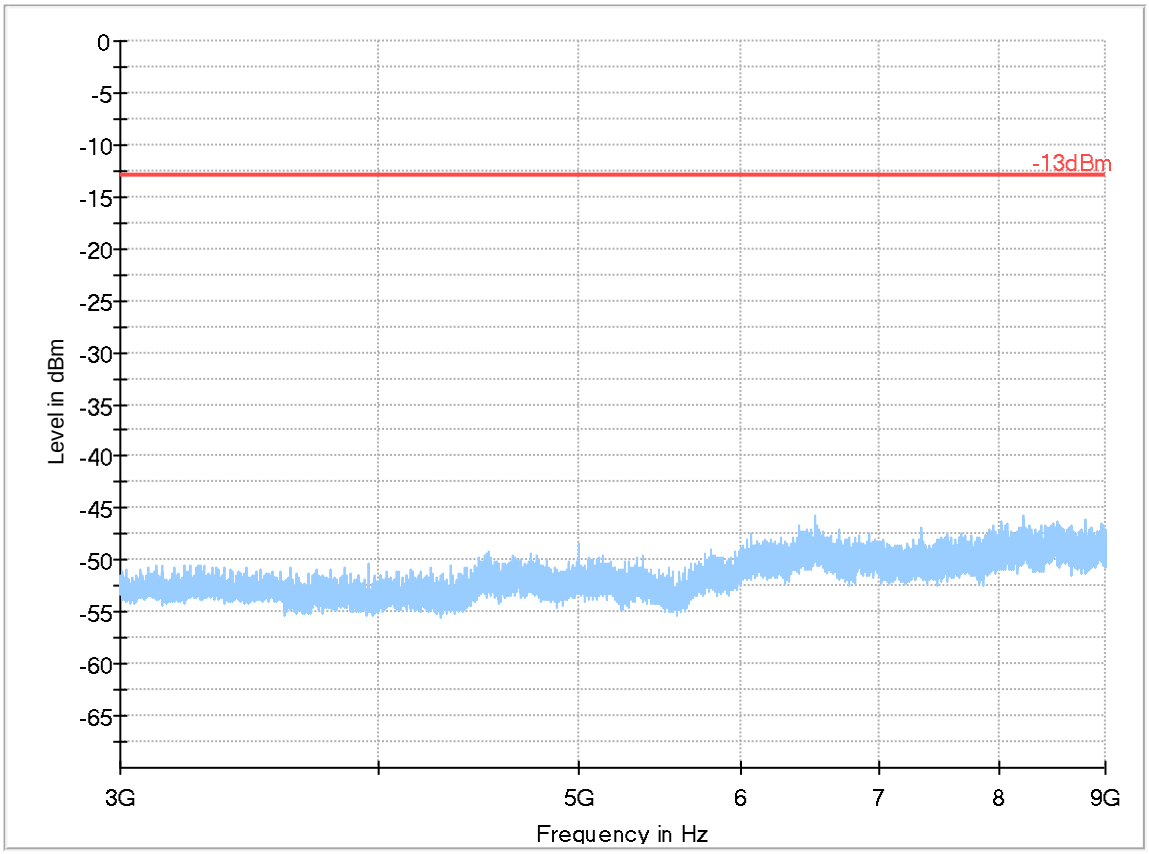
Plot # 9 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 10 Radiated Emissions: 3 GHz - 9 GHz

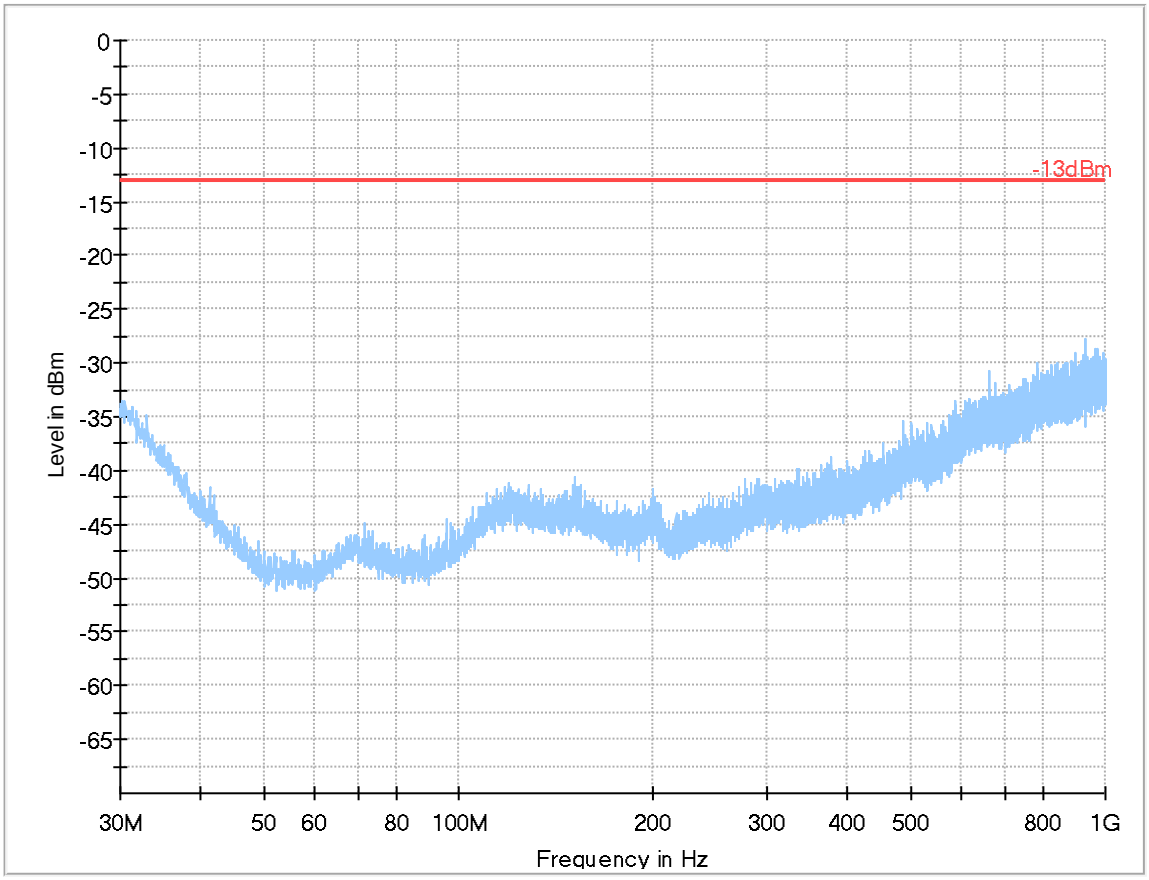
Channel: High



GSM 1900

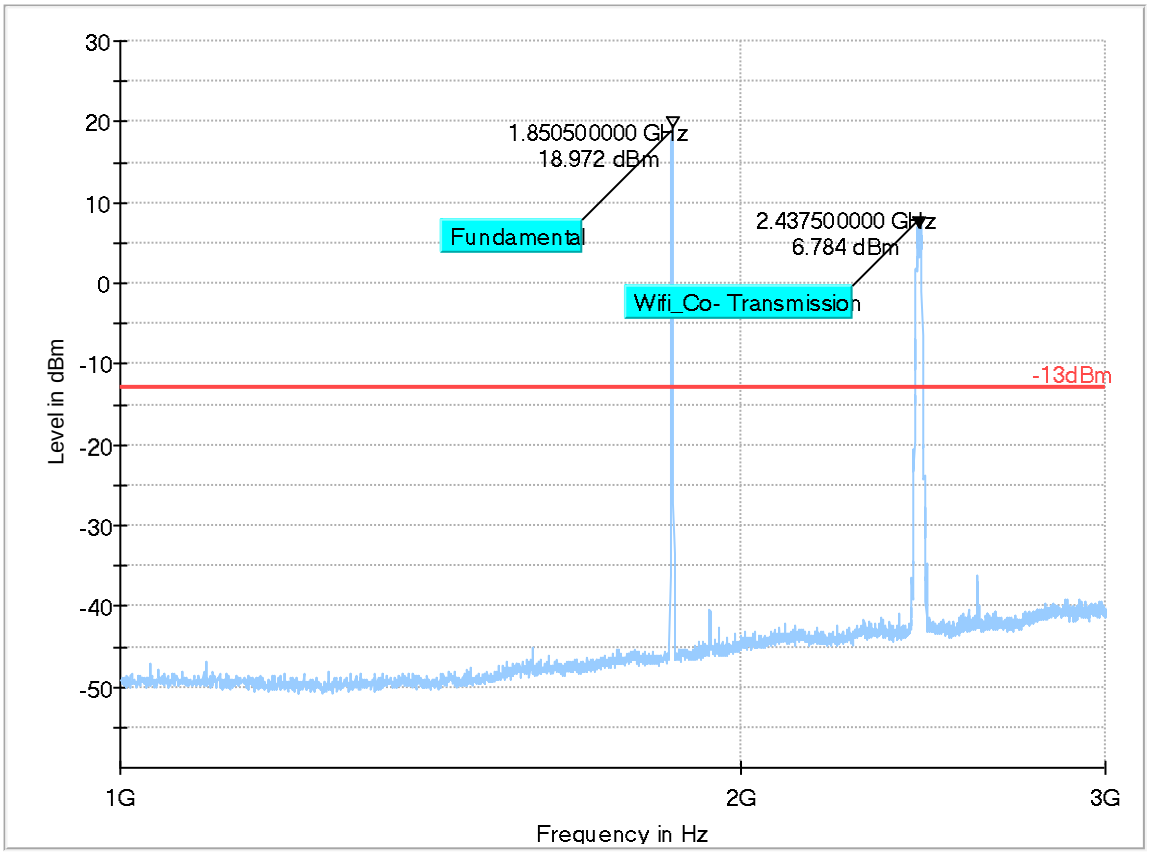
Plot # 11 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



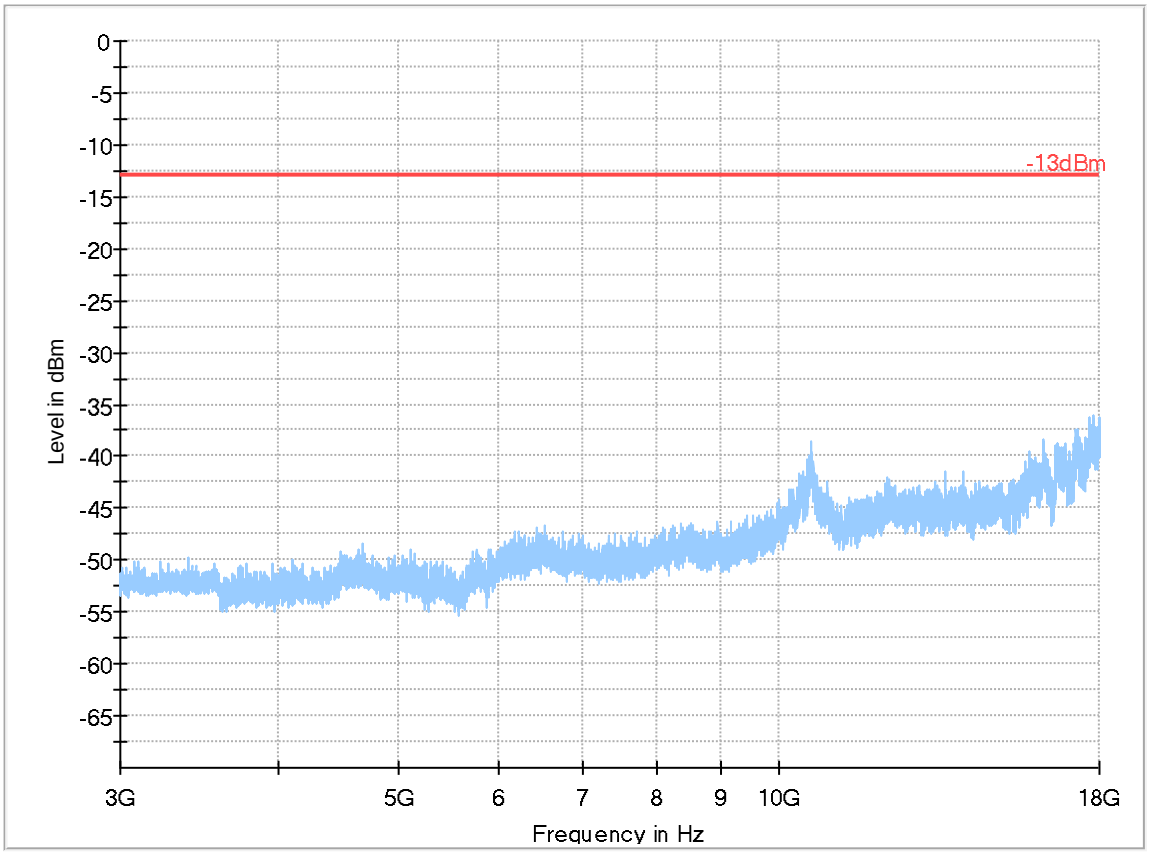
Plot # 12 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



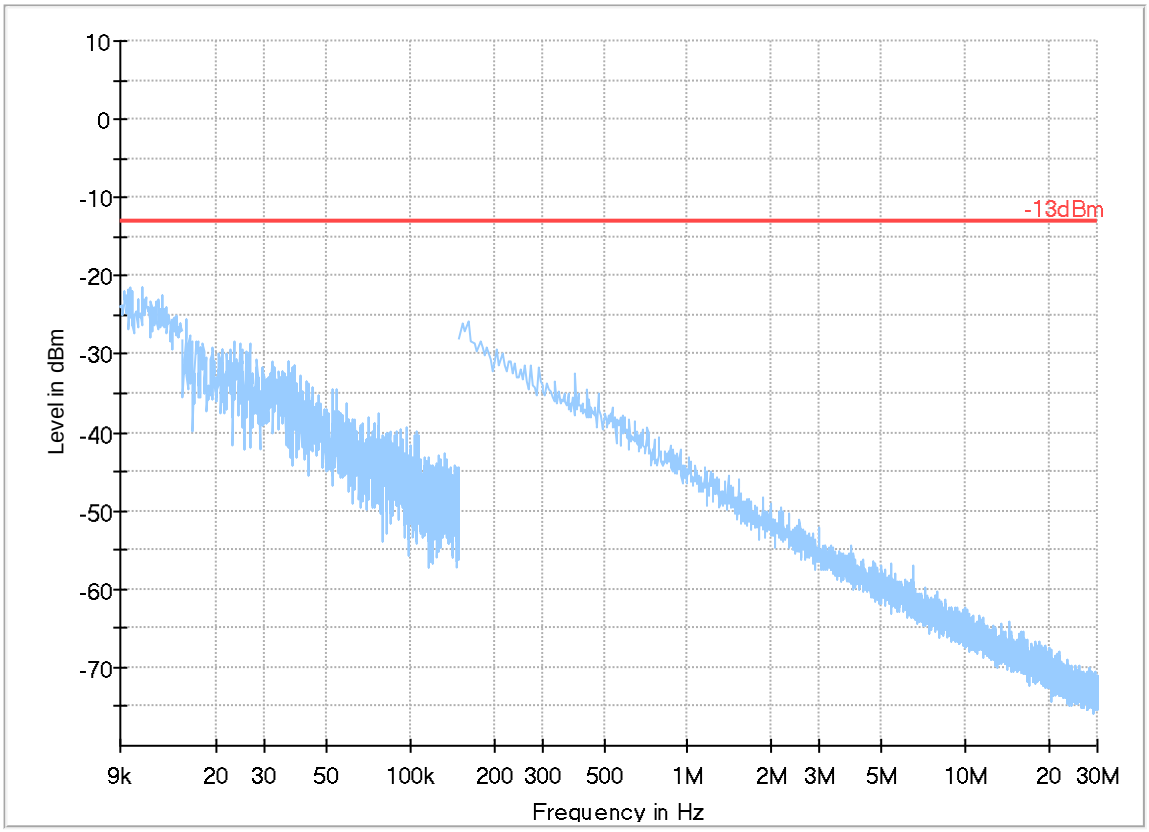
Plot # 13 Radiated Emissions: 3 GHz - 18 GHz

Channel: Low



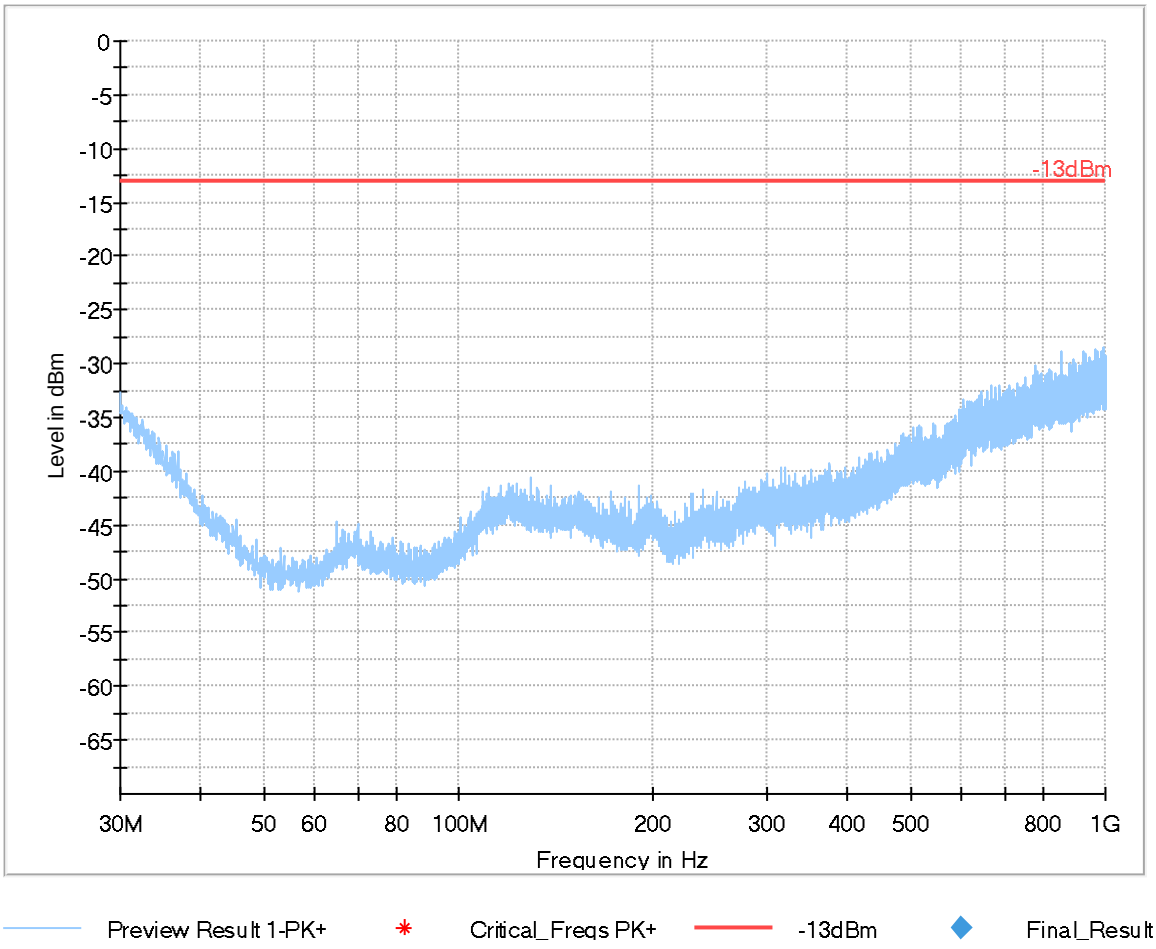
Plot # 14 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



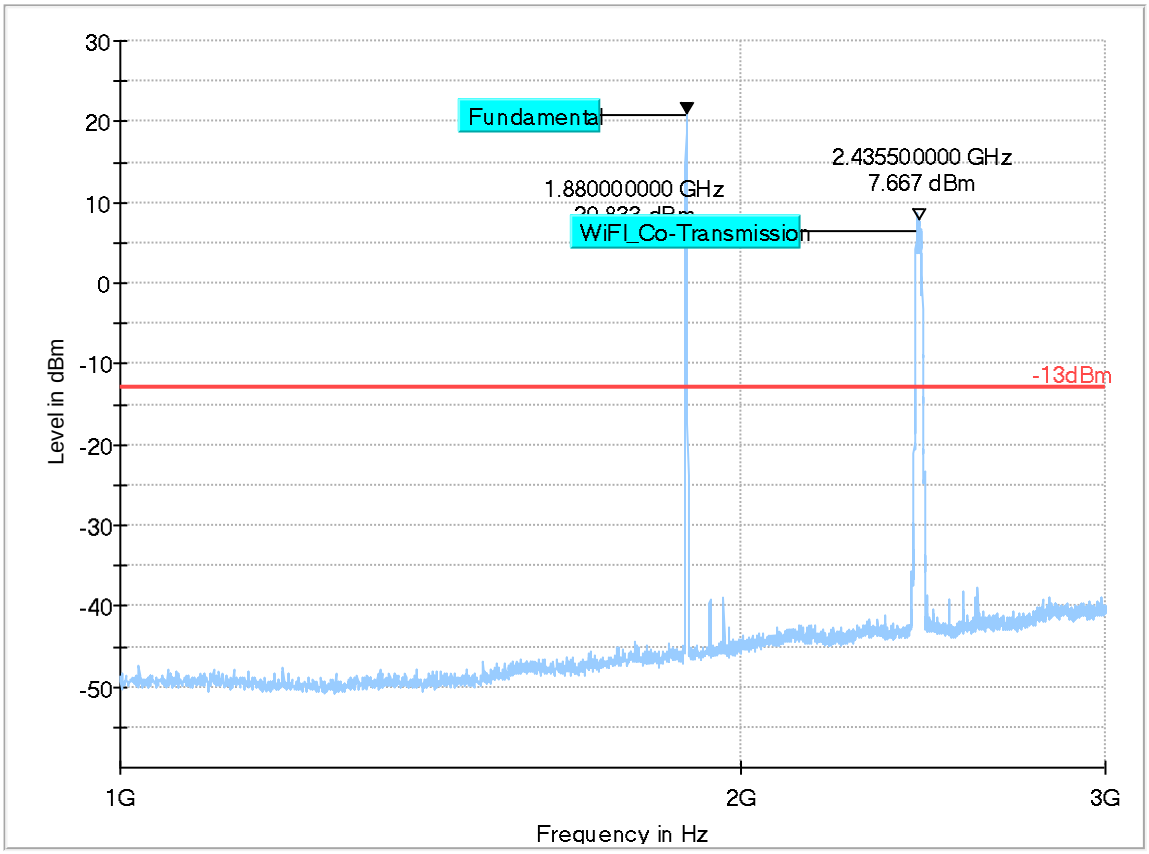
Plot # 15 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



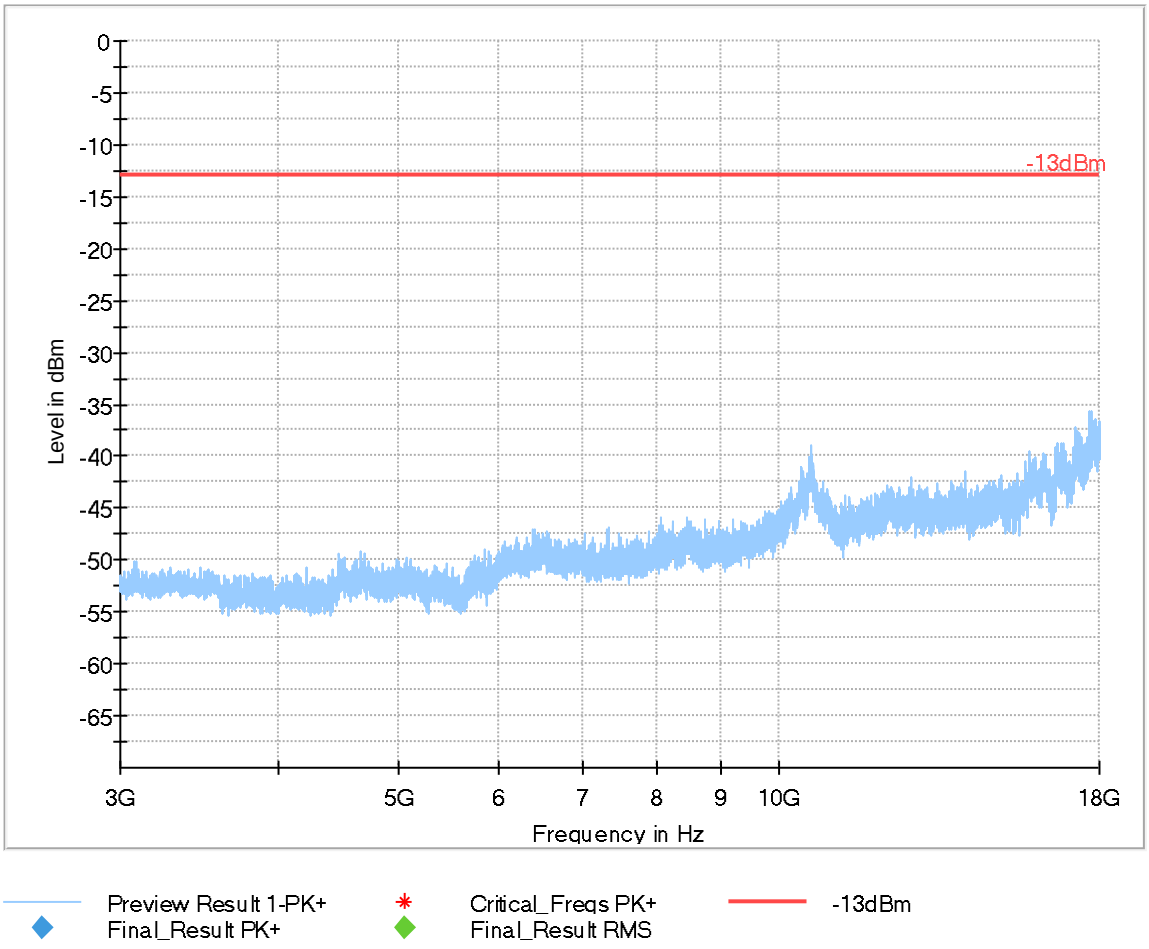
Plot # 16 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



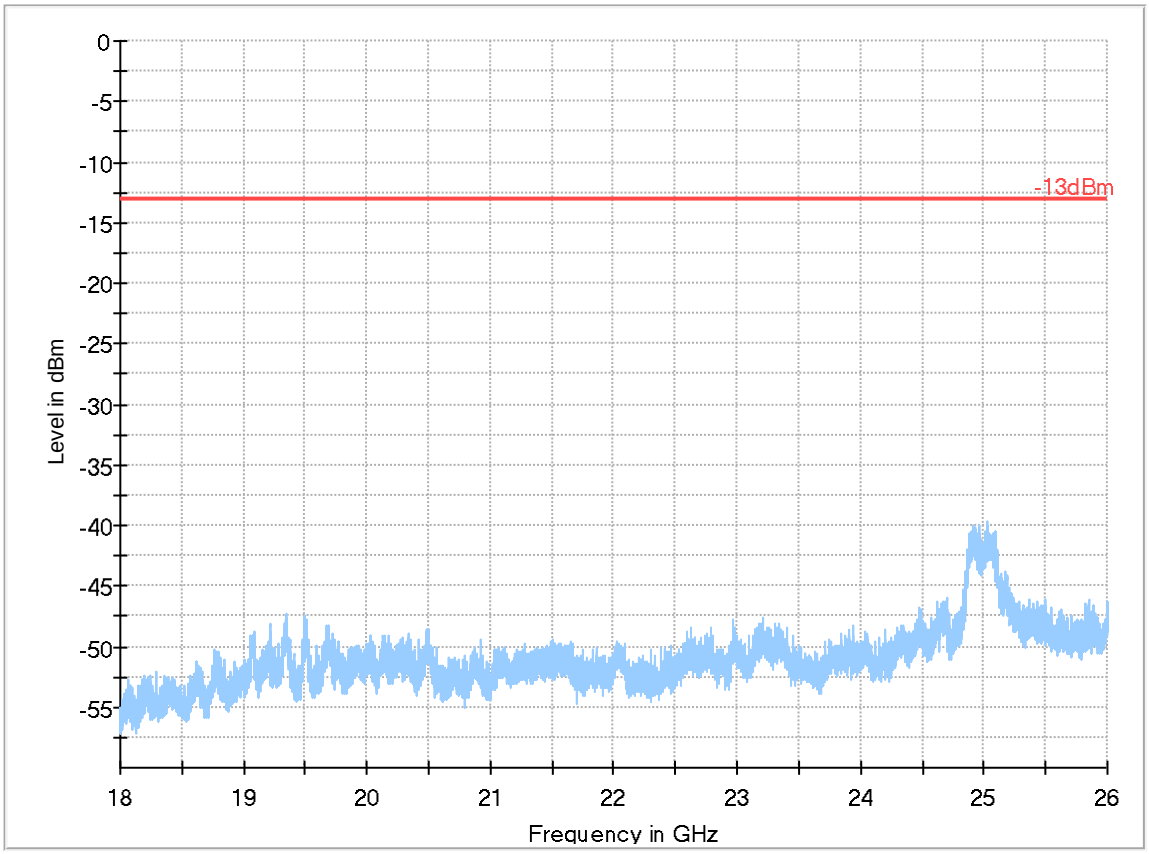
Plot # 17 Radiated Emissions: 3 GHz – 18 GHz

Channel: Mid



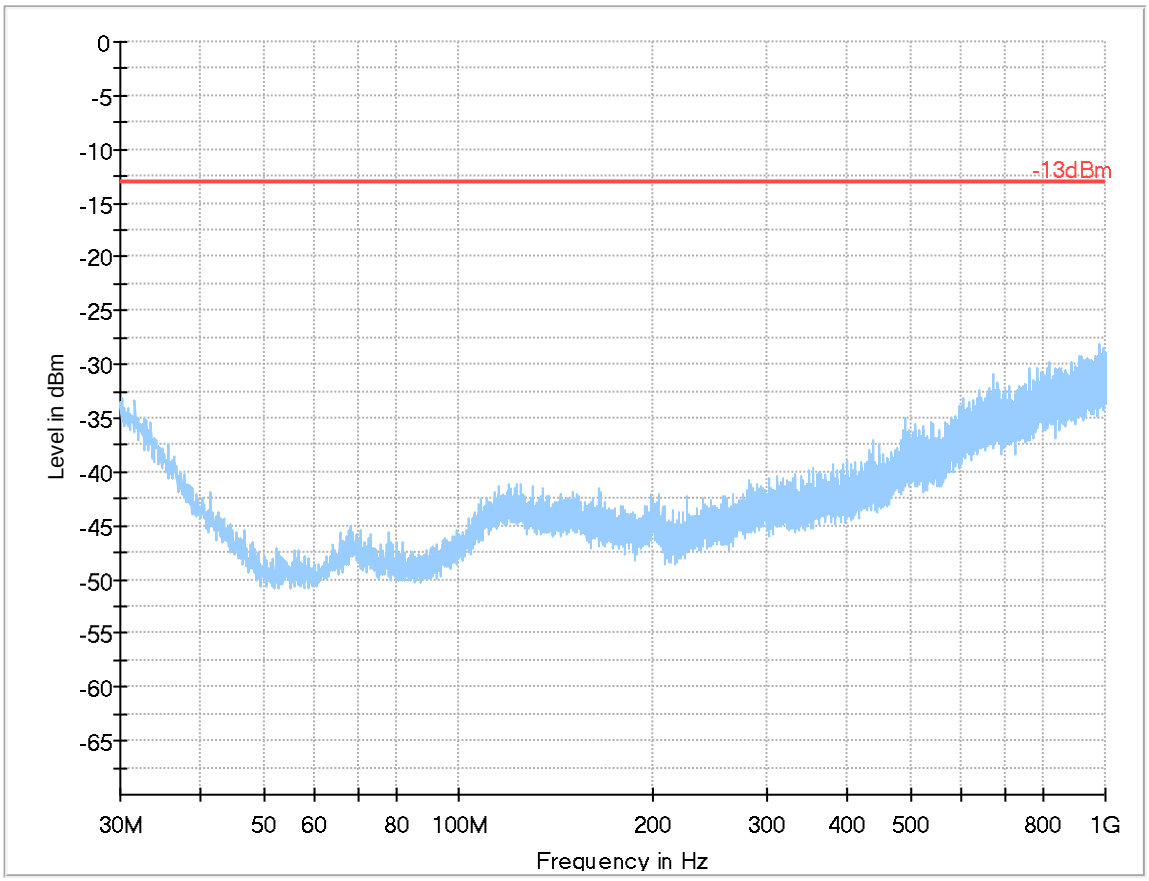
Plot # 18 Radiated Emissions: 18 GHz – 26 GHz

Channel: Mid



Plot # 19 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



Plot # 20 Radiated Emissions: 1 GHz - 3 GHz

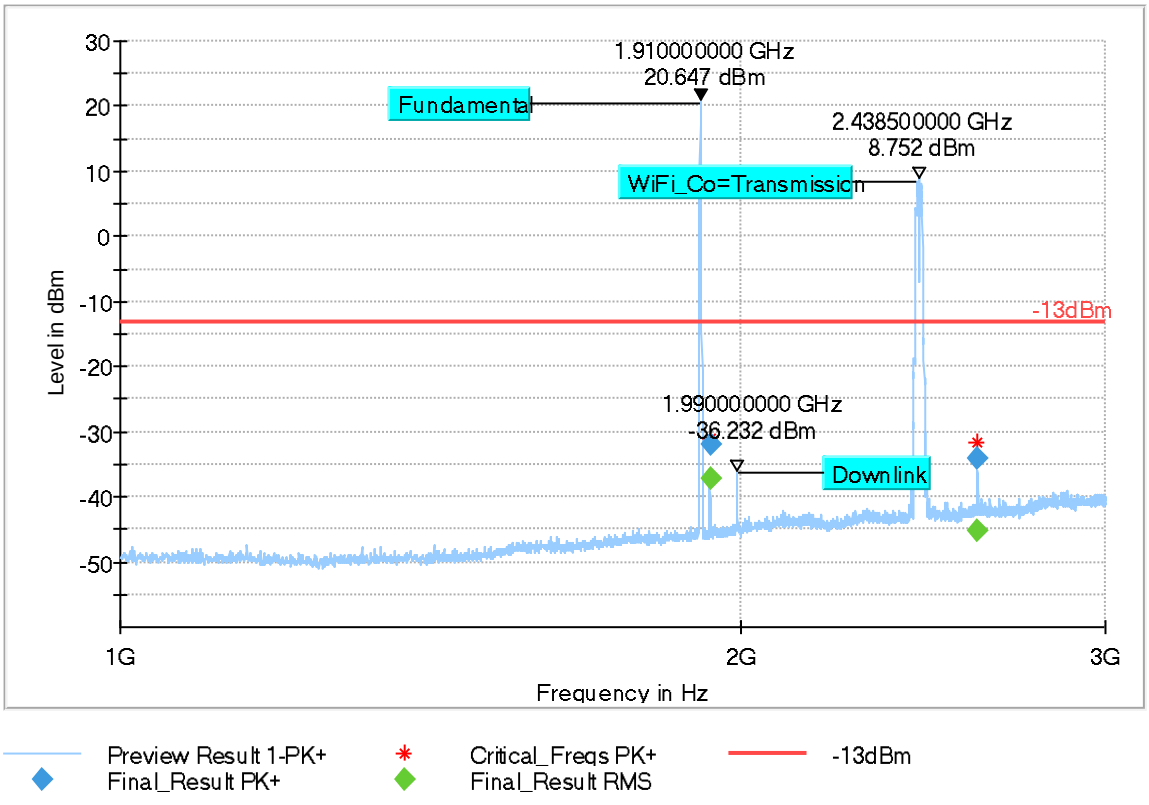
Channel: High

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1930.198250	---	-37.24	---	---	100.0	1000.000	300.0	H	124.0
1930.198250	-31.90	---	-13.00	18.90	100.0	1000.000	300.0	H	124.0
2601.887750	---	-45.27	---	---	100.0	1000.000	280.0	V	176.0
2601.887750	-34.02	---	-13.00	21.02	100.0	1000.000	280.0	V	176.0

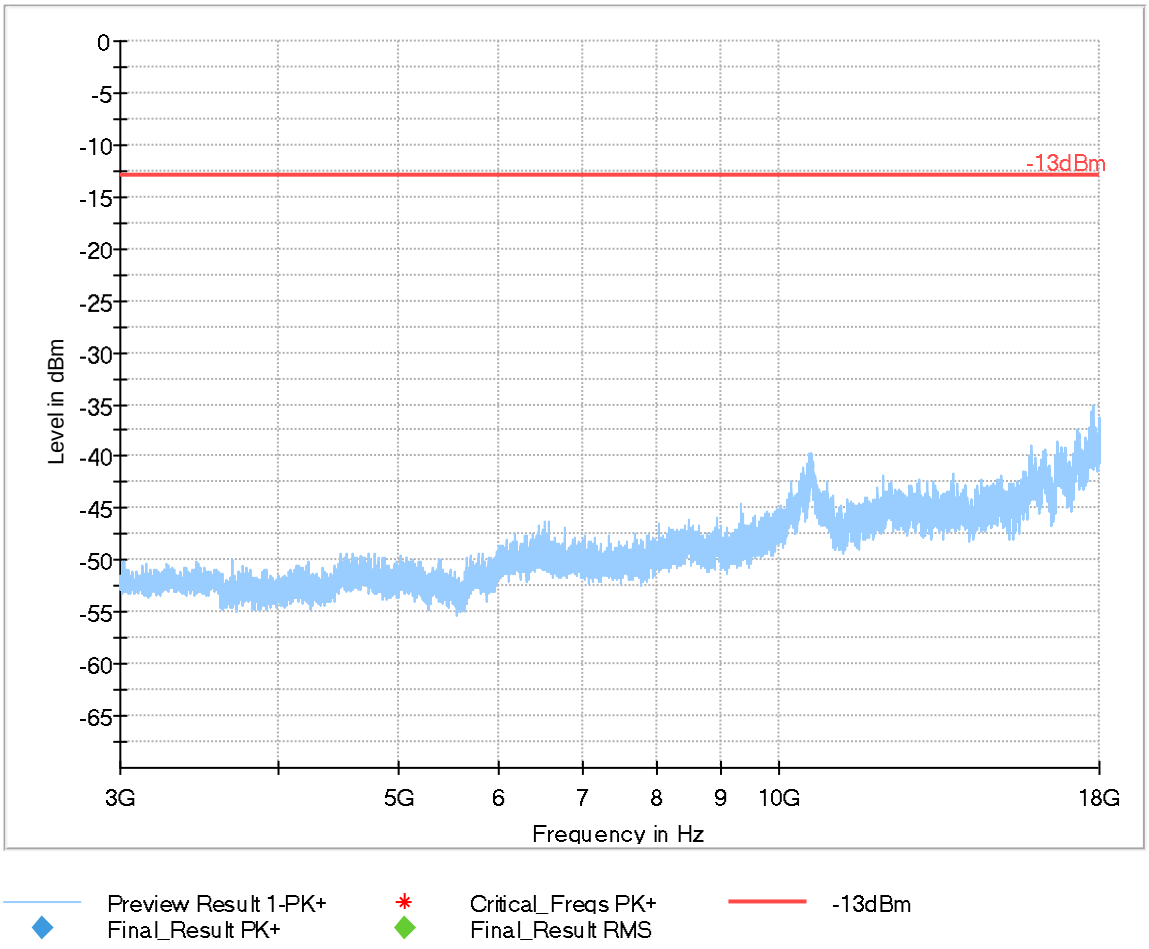
(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
1930.198250	-62.9	10:32:20 AM - 9/23/2019
1930.198250	-62.9	10:32:19 AM - 9/23/2019
2601.887750	-60.6	10:34:01 AM - 9/23/2019
2601.887750	-60.6	10:34:01 AM - 9/23/2019



Plot # 21 Radiated Emissions: 3 GHz - 18 GHz

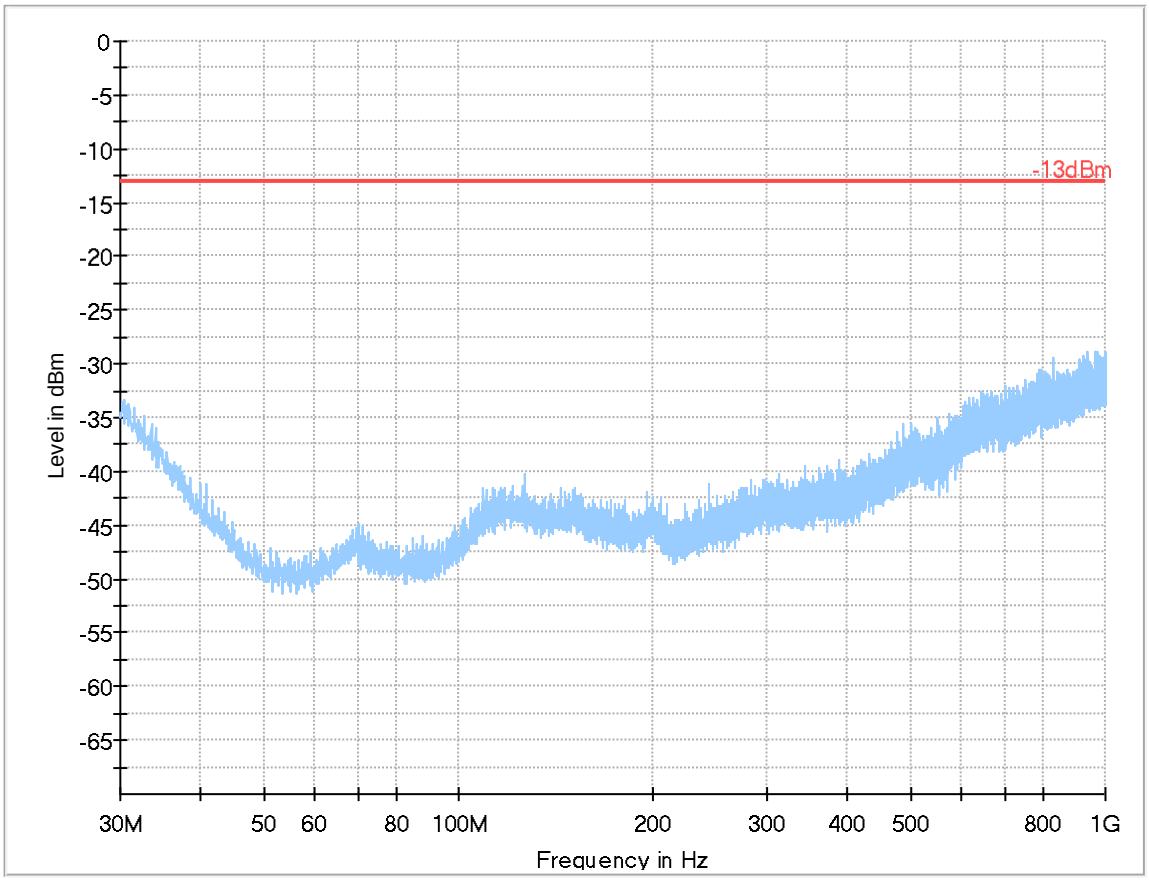
Channel: High



WCDMA Band II

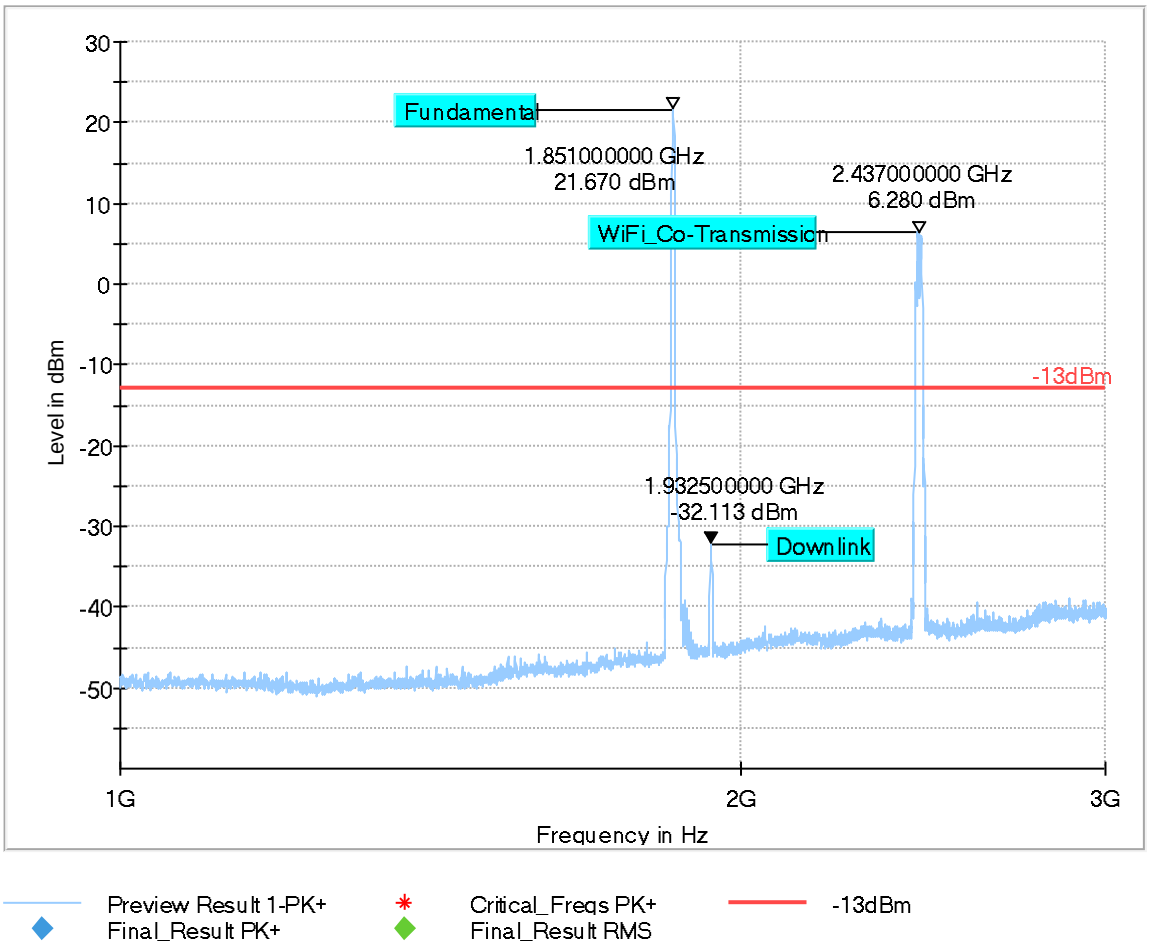
Plot # 22 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



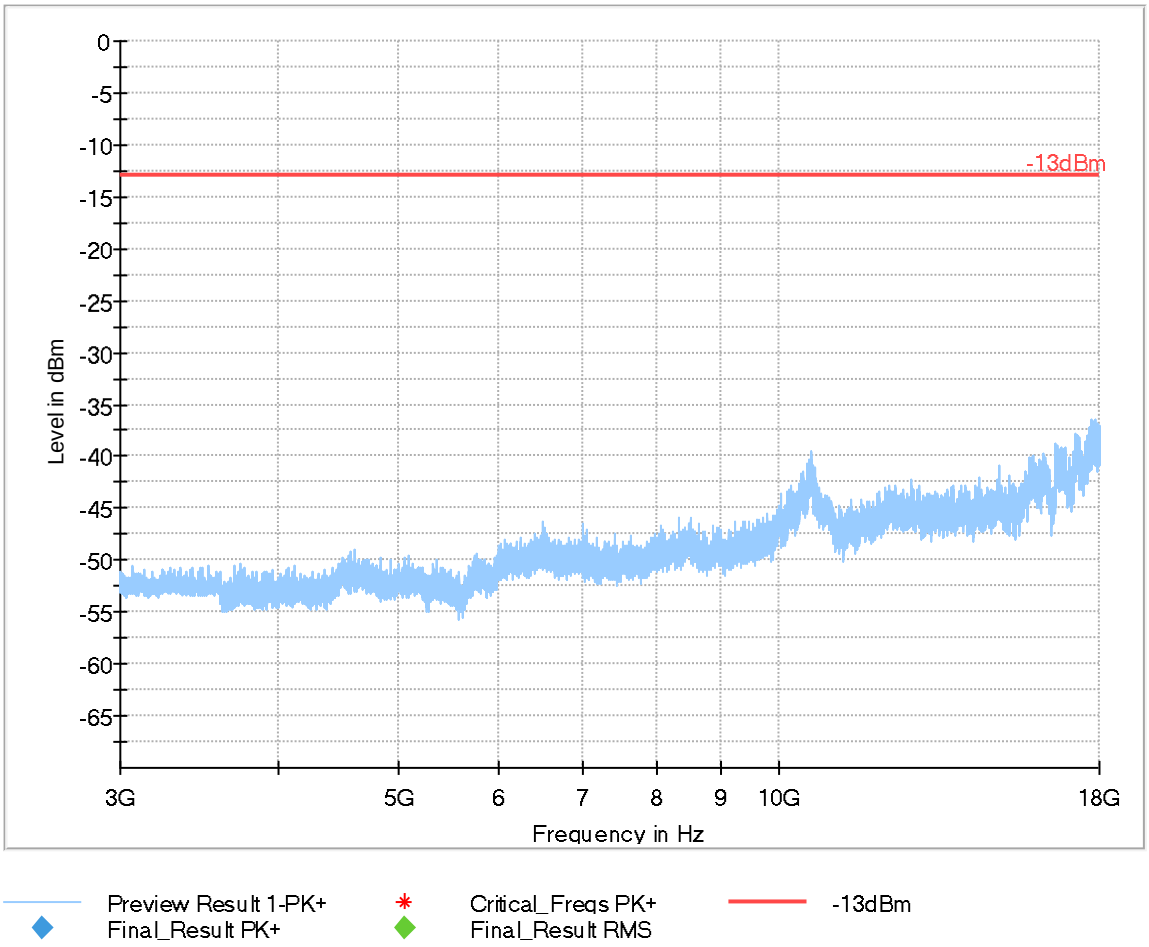
Plot # 23 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



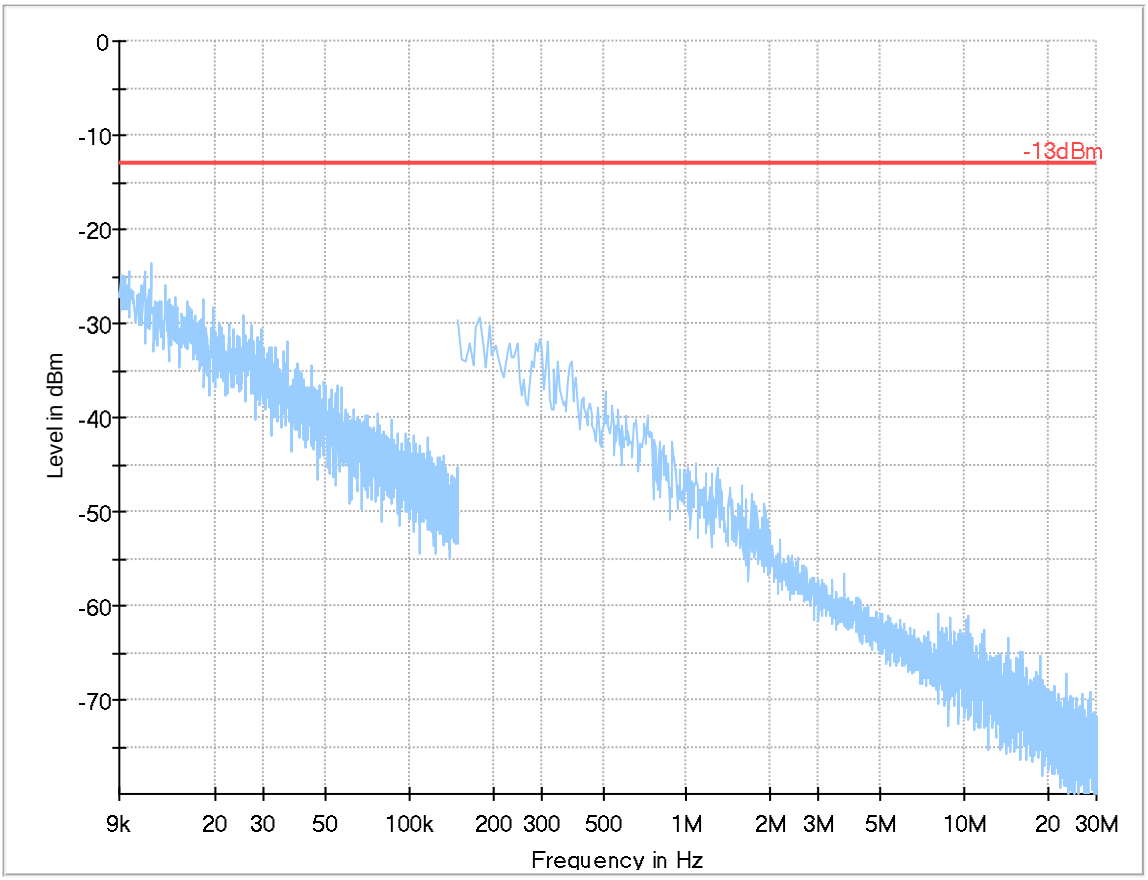
Plot # 24 Radiated Emissions: 3 GHz - 18 GHz

Channel: Low



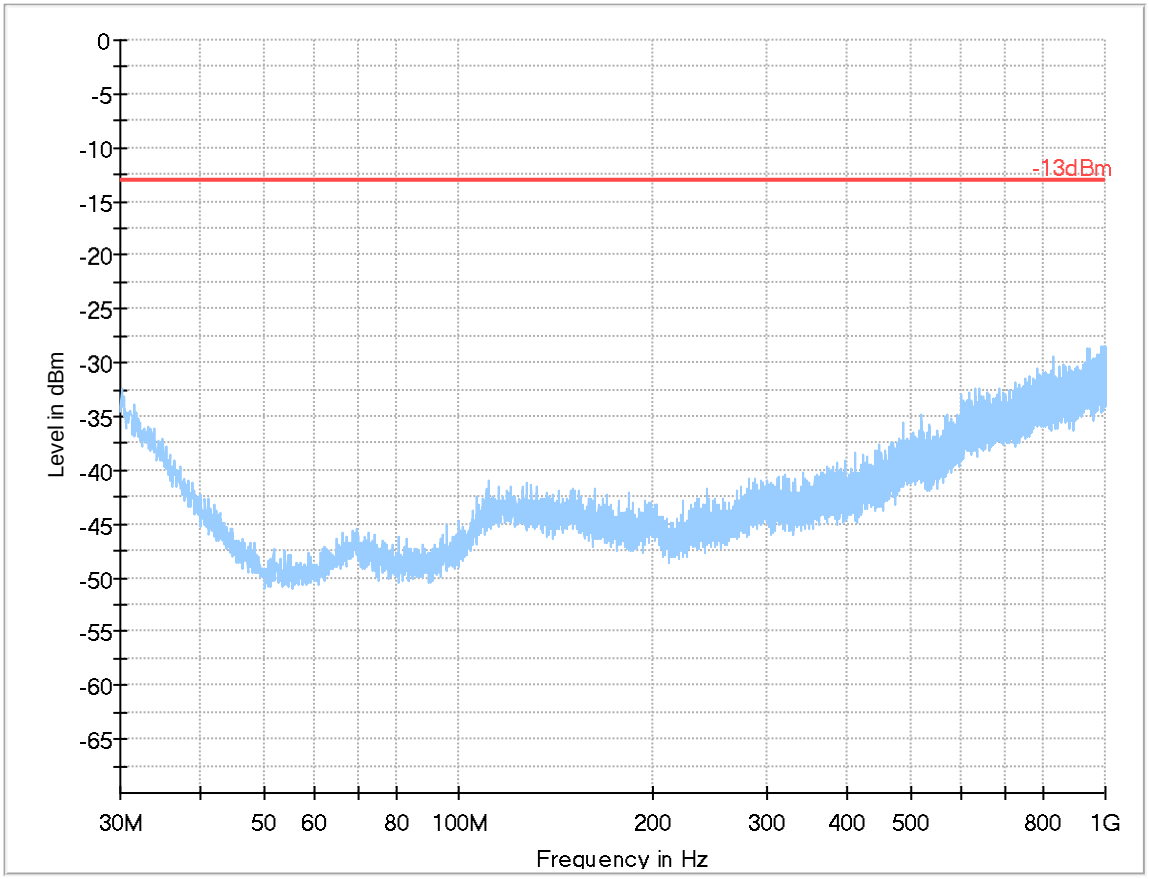
Plot # 25 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



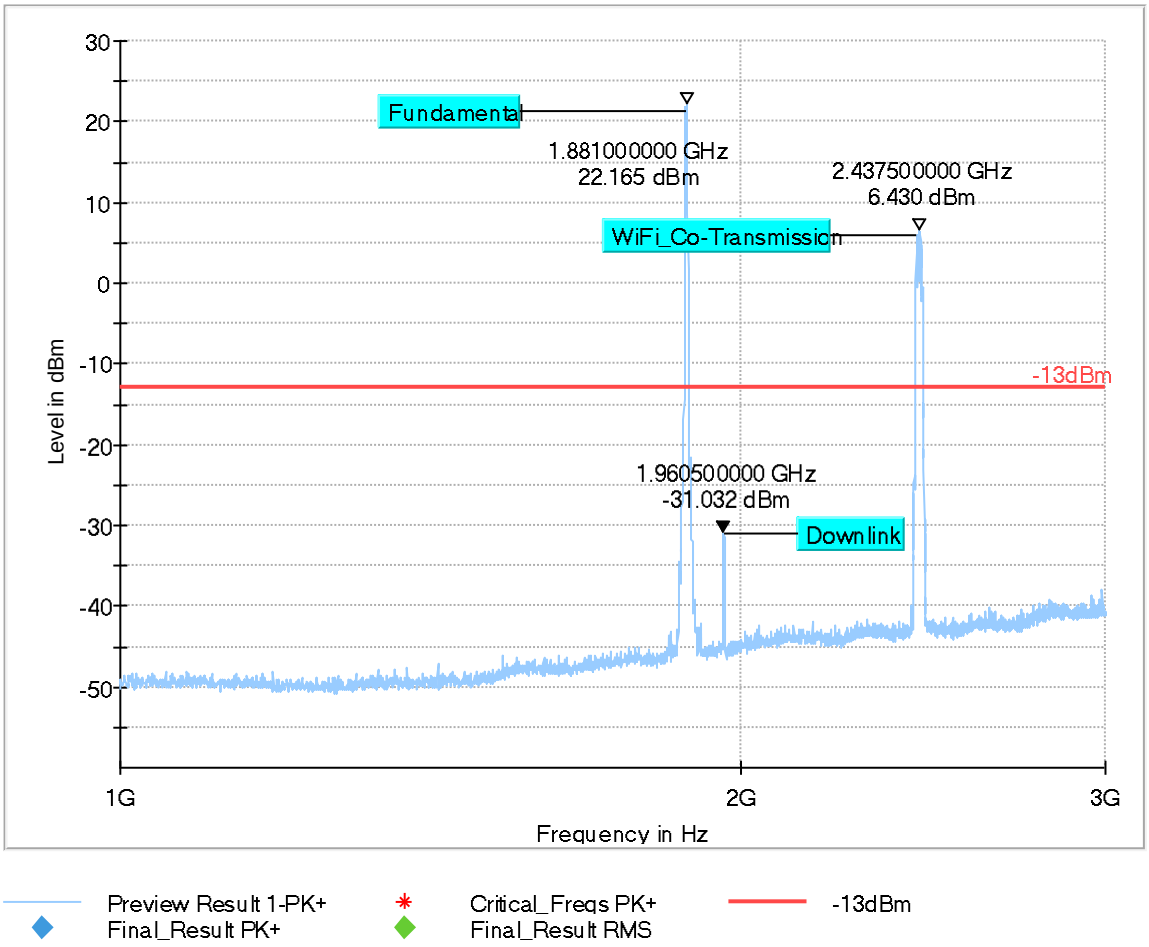
Plot # 26 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



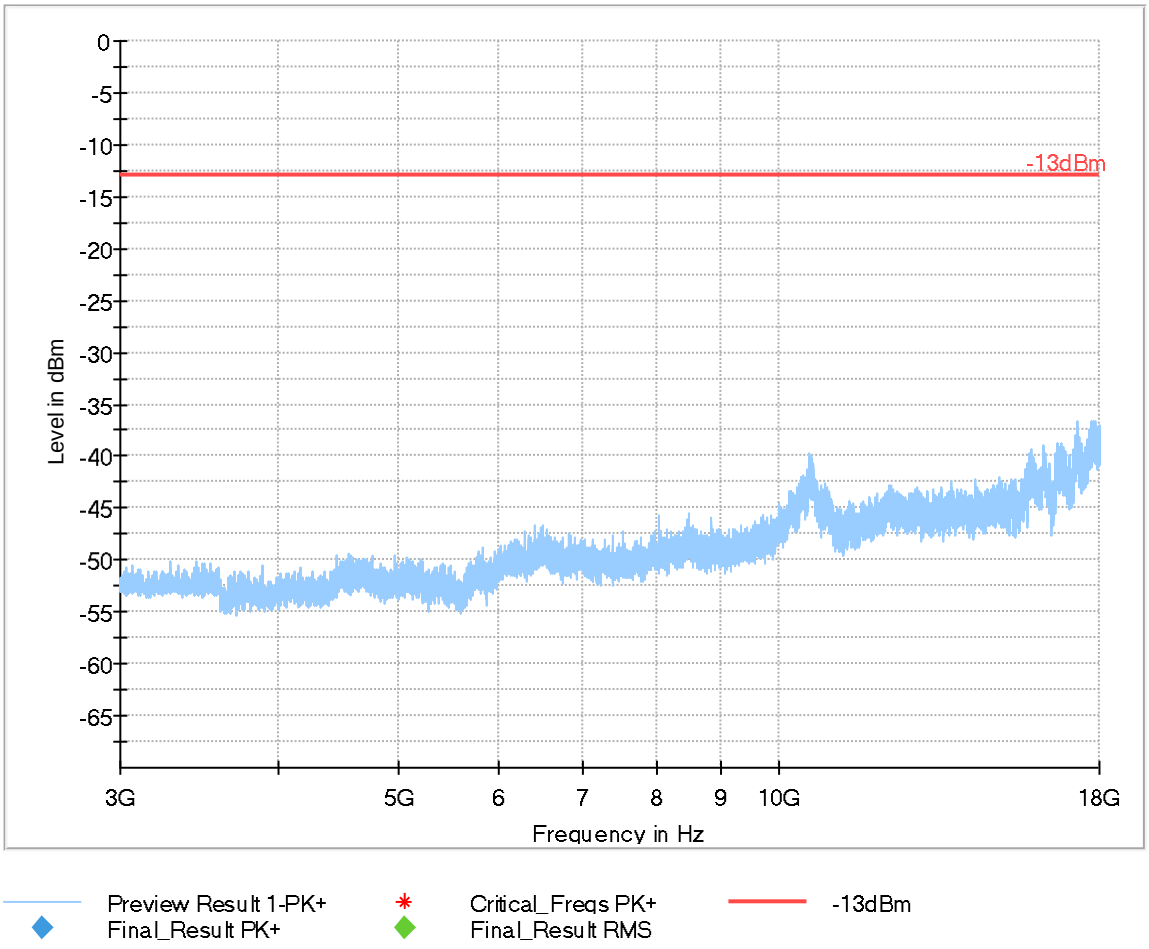
Plot # 27 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



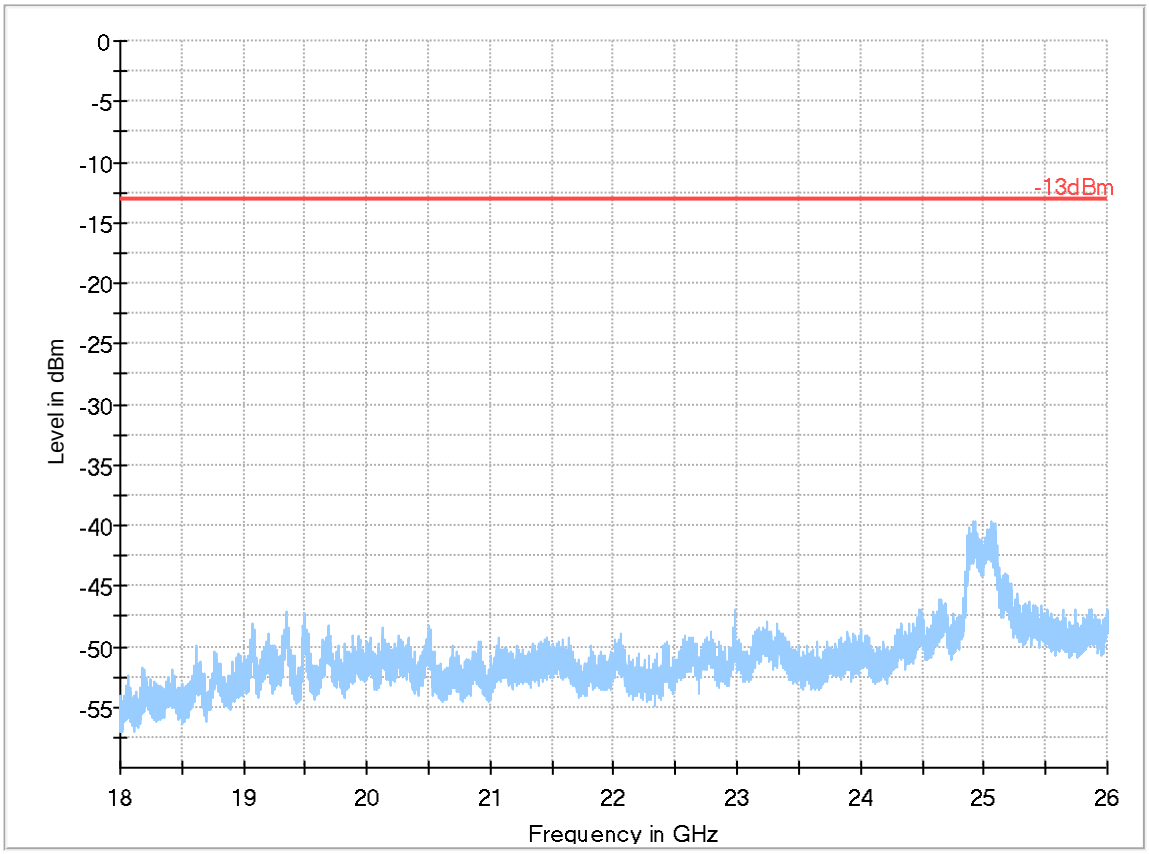
Plot # 28 Radiated Emissions: 3 GHz – 18 GHz

Channel: Mid



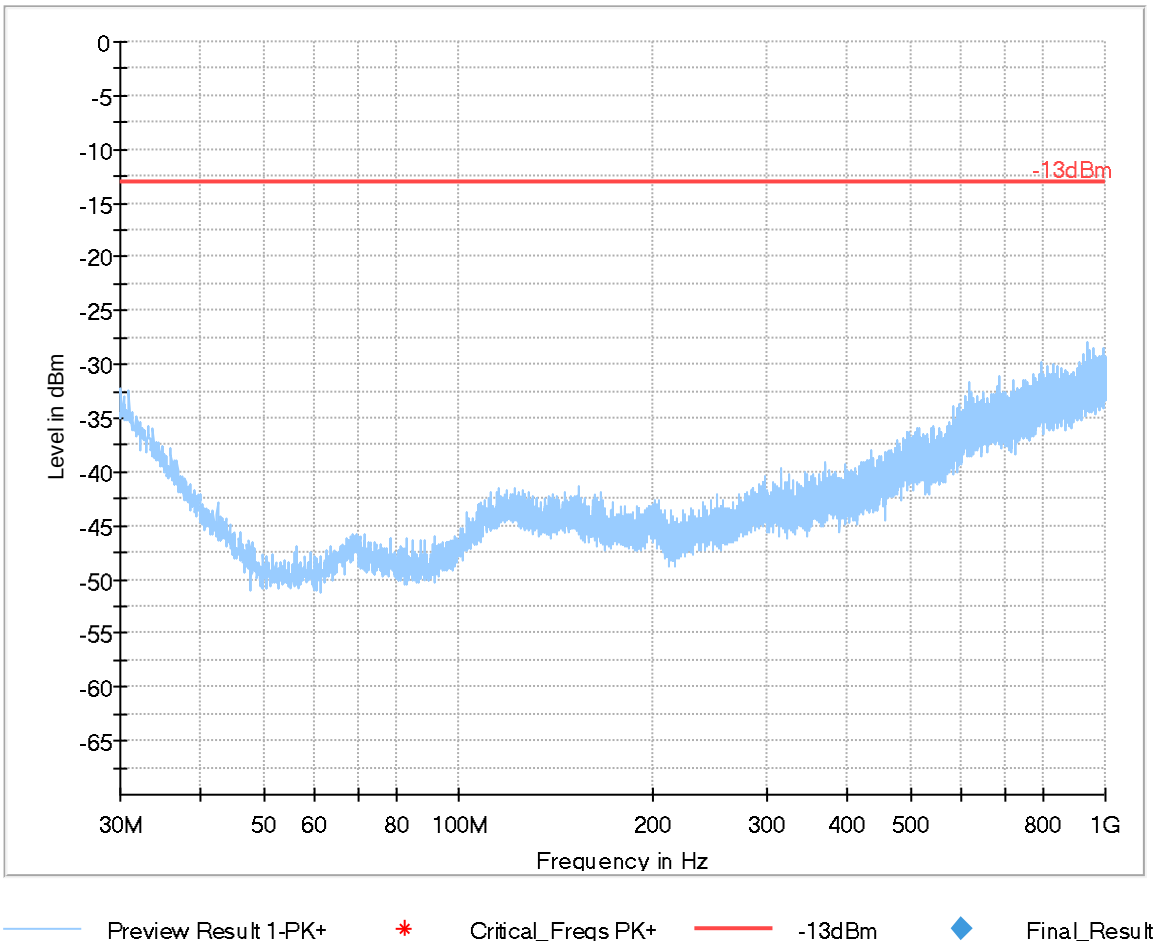
Plot # 29 Radiated Emissions: 18 GHz – 26 GHz

Channel: Mid



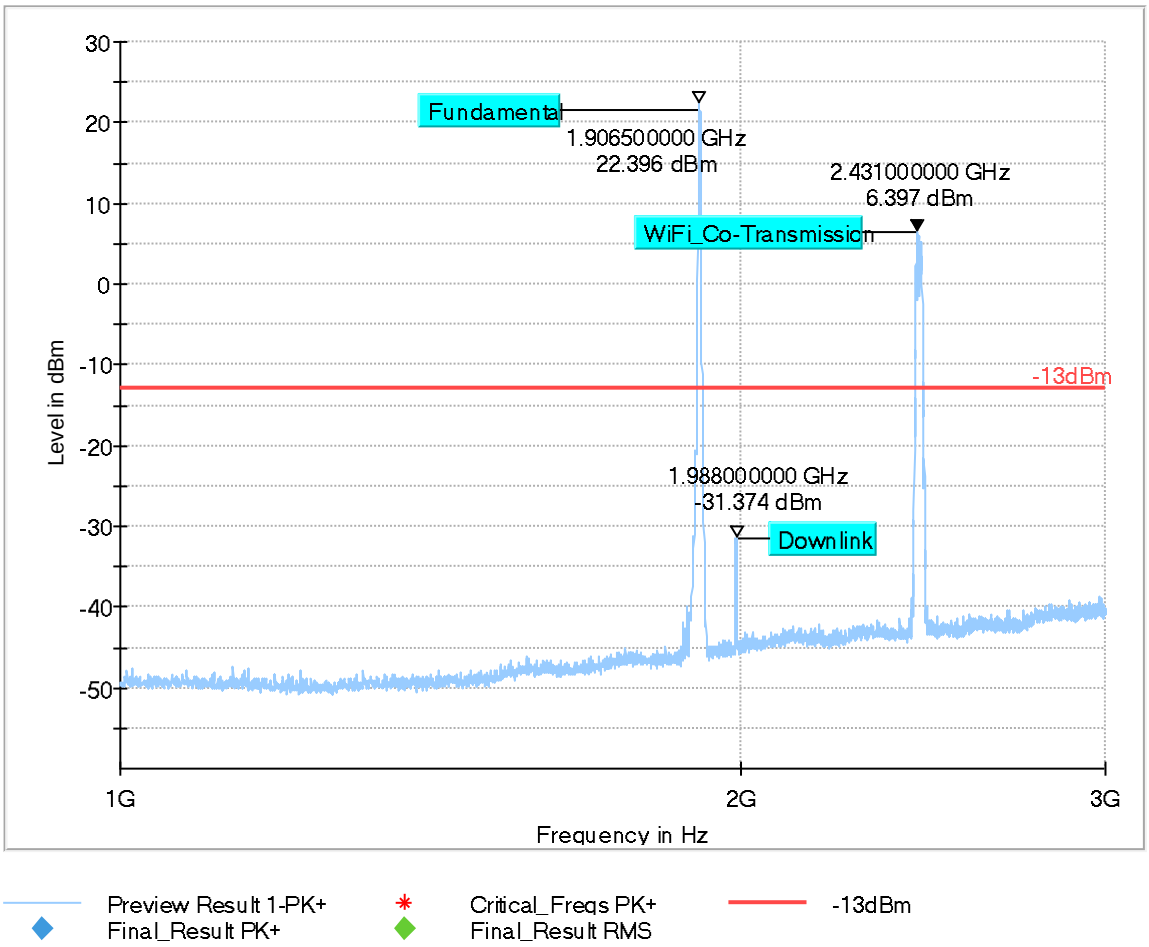
Plot # 30 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



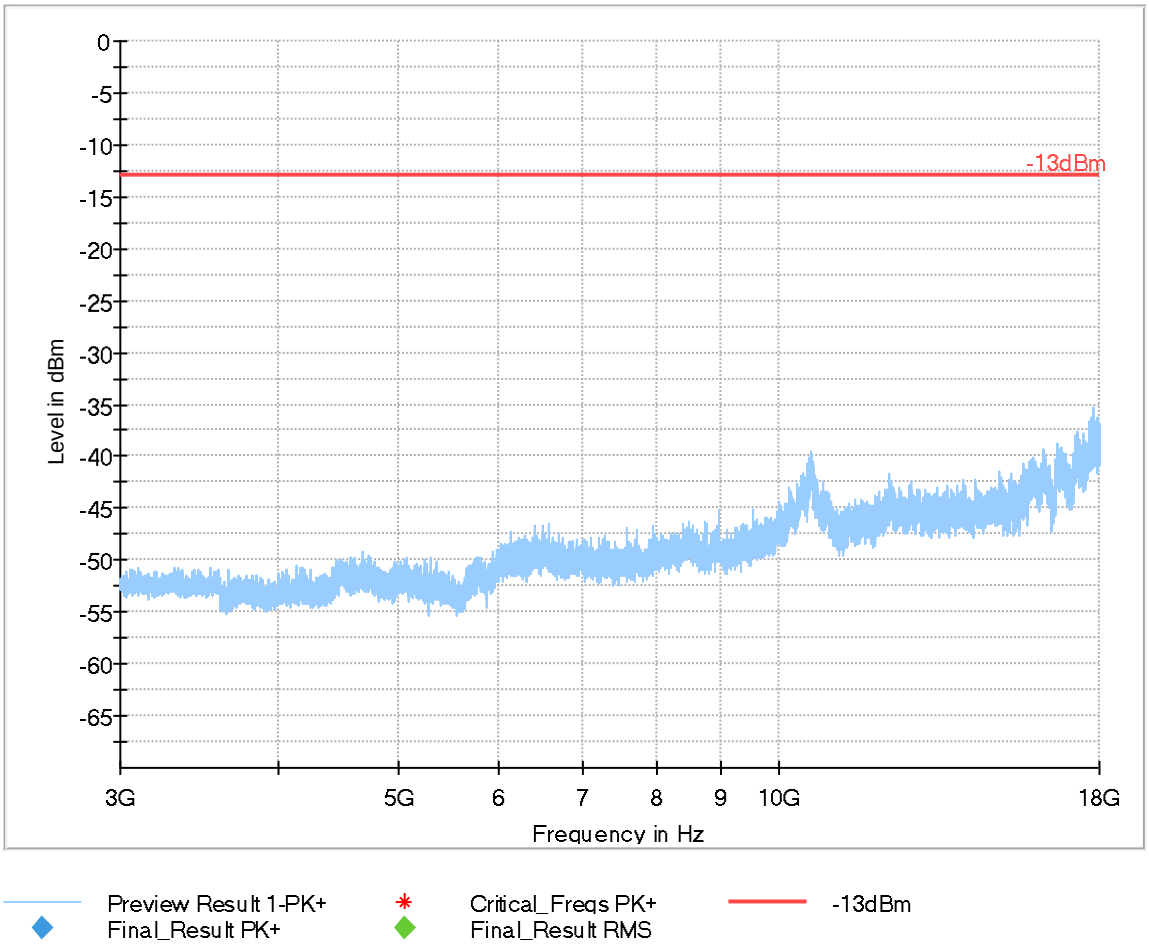
Plot # 31 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 32 Radiated Emissions: 3 GHz - 18 GHz

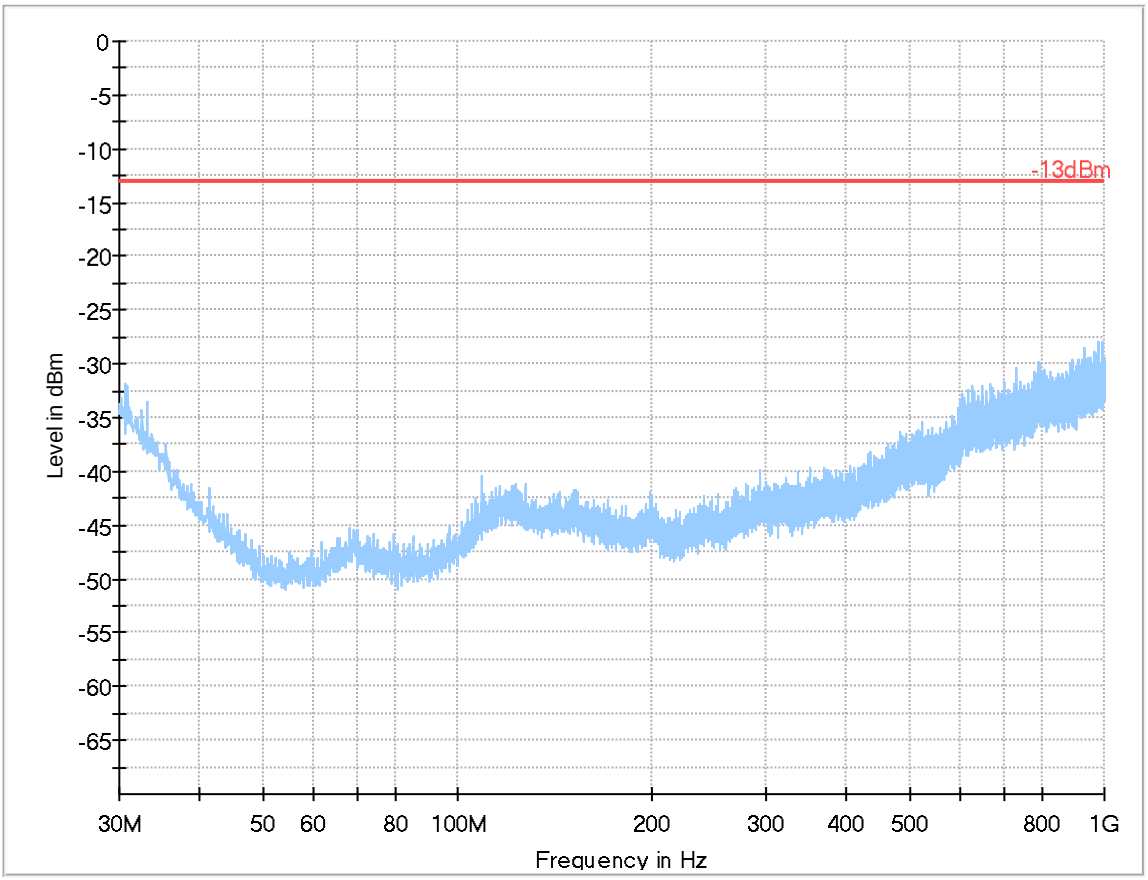
Channel: High



WCDMA Band IV

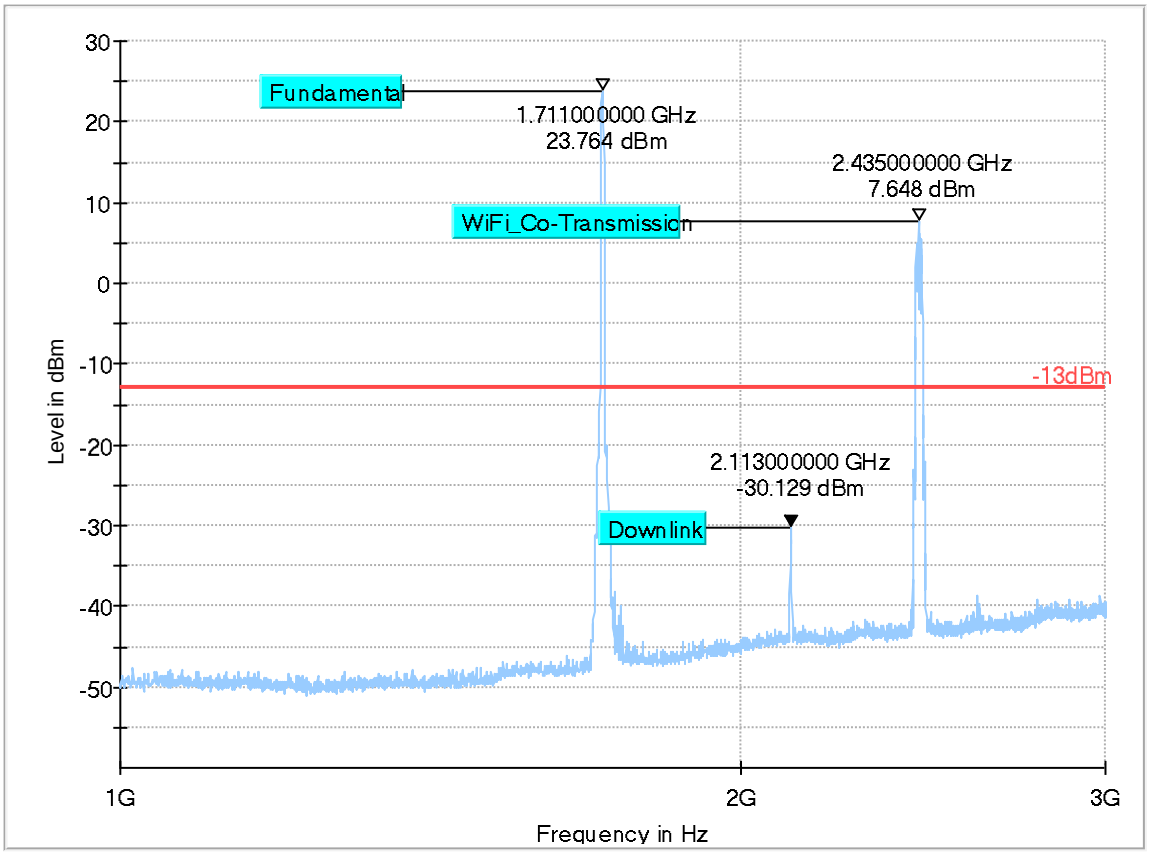
Plot # 33 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



Plot # 34 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 35 Radiated Emissions: 3 GHz - 18 GHz

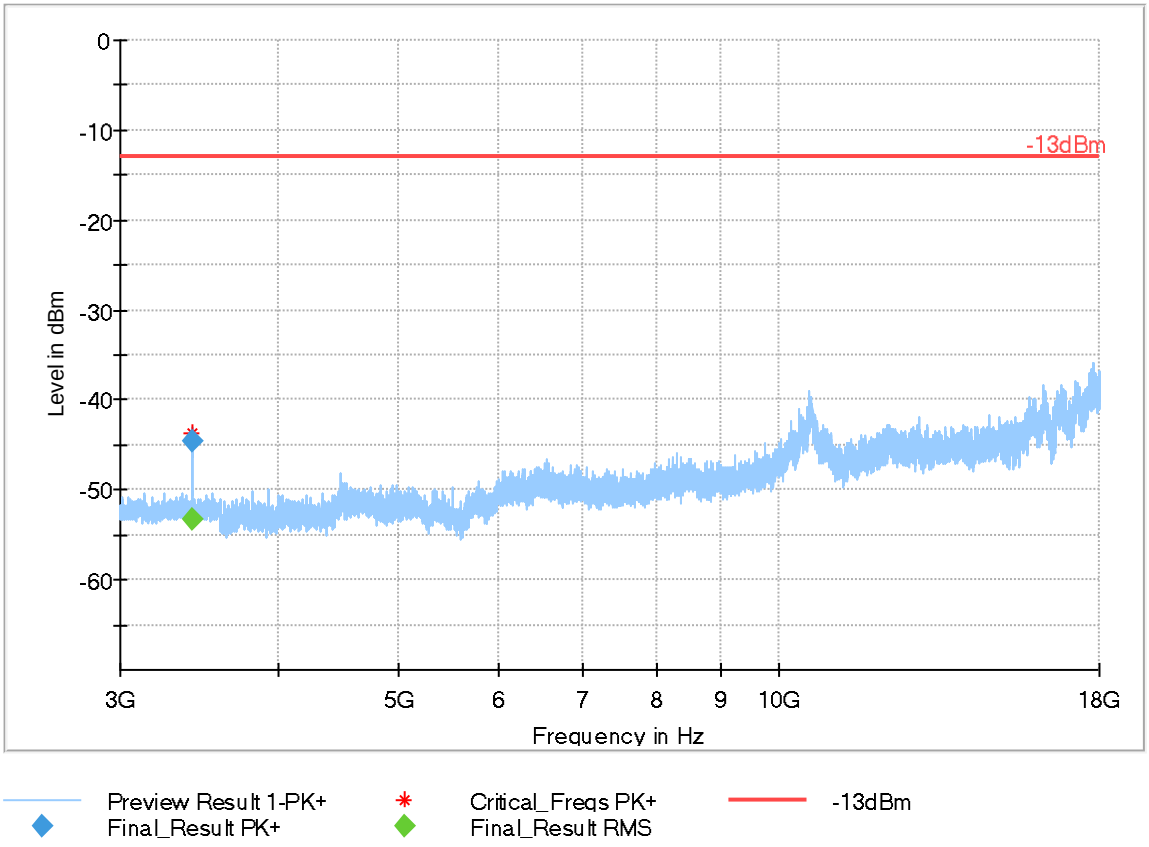
Channel: Low

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3426.124333	---	-53.31	---	---	100.0	1000.000	151.0	H	141.0
3426.124333	-44.51	---	-13.00	31.51	100.0	1000.000	151.0	H	141.0

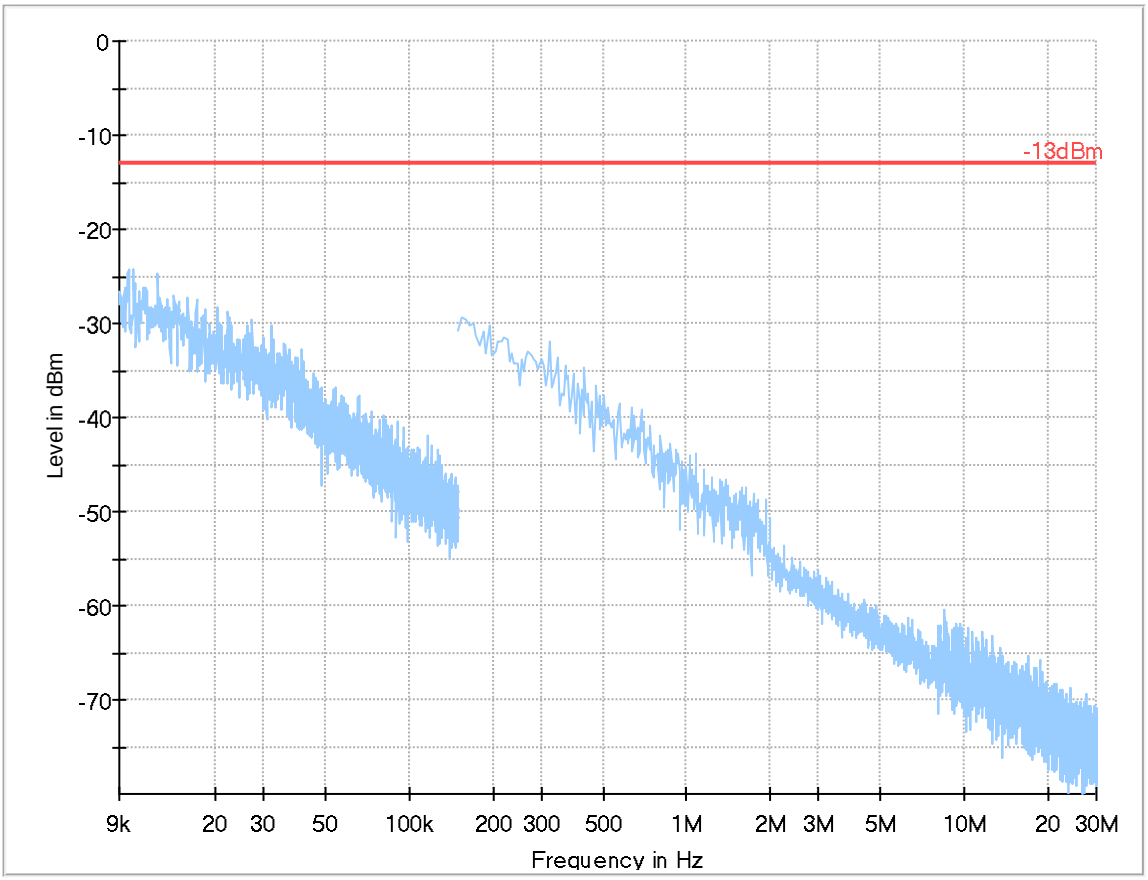
(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
3426.124333	-99.7	2:40:45 PM - 9/23/2019
3426.124333	-99.7	2:40:45 PM - 9/23/2019



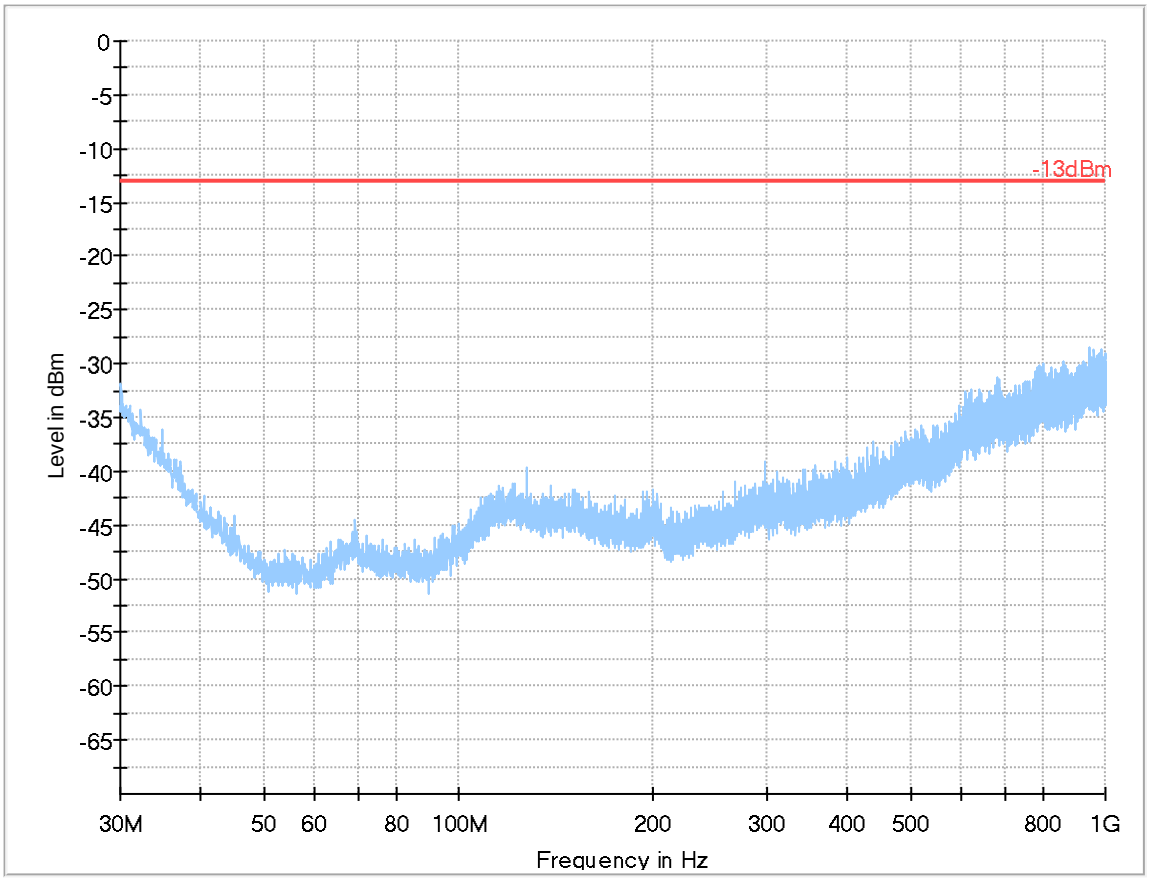
Plot # 36 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



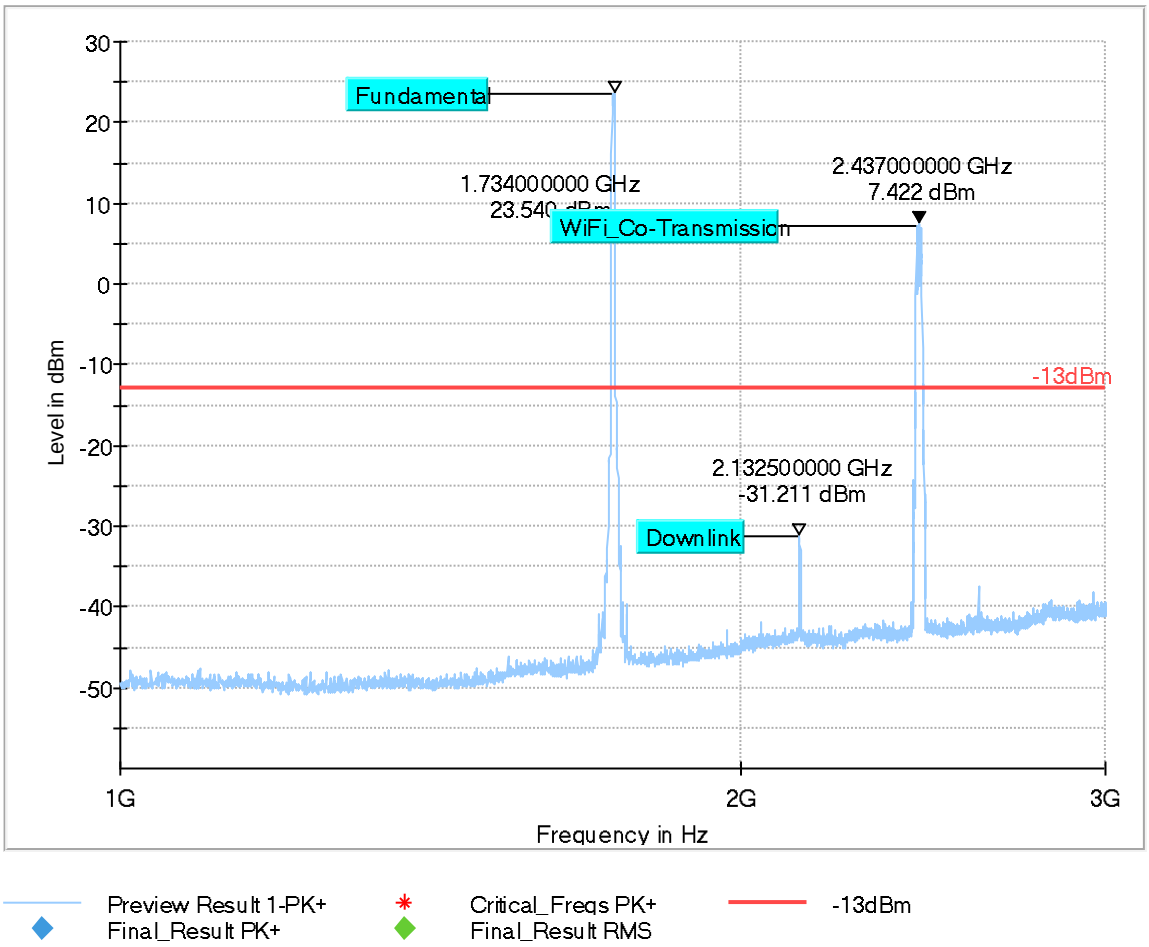
Plot # 37 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



Plot # 38 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



Plot # 39 Radiated Emissions: 3 GHz – 18GHz

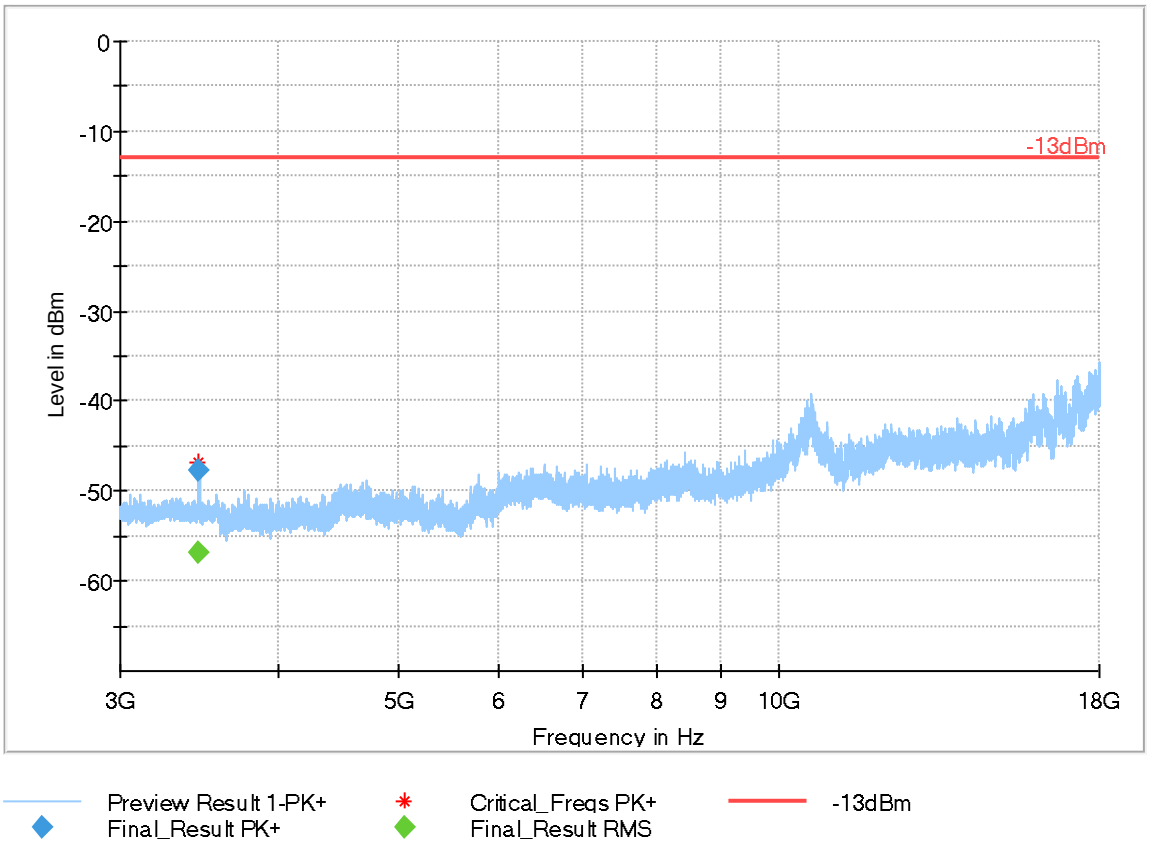
Channel: Mid

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3463.377167	---	-56.81	---	---	100.0	1000.000	162.0	H	132.0
3463.377167	-47.80	---	-13.00	34.80	100.0	1000.000	162.0	H	132.0

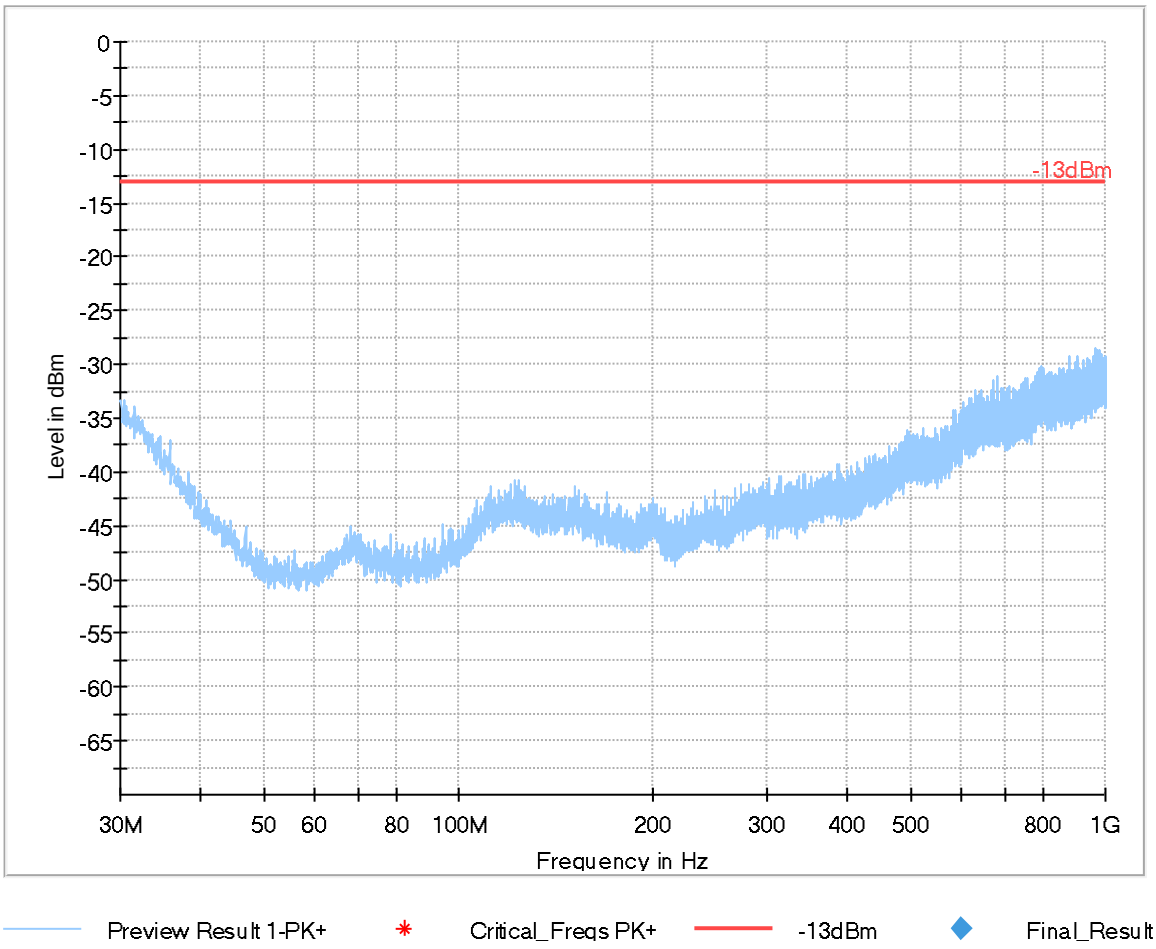
(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
3463.377167	-99.7	2:59:48 PM - 9/23/2019
3463.377167	-99.7	2:59:48 PM - 9/23/2019



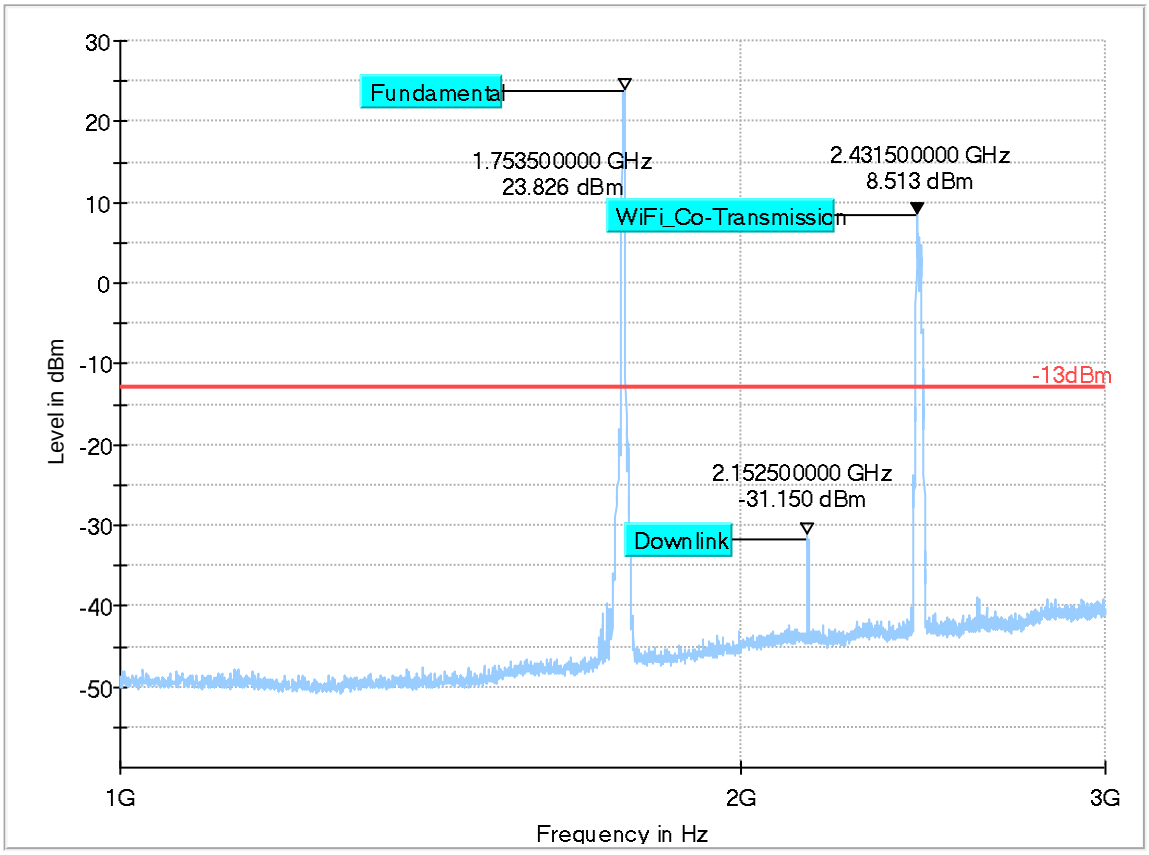
Plot # 40 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



Plot # 41 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 42 Radiated Emissions: 3 GHz - 18 GHz

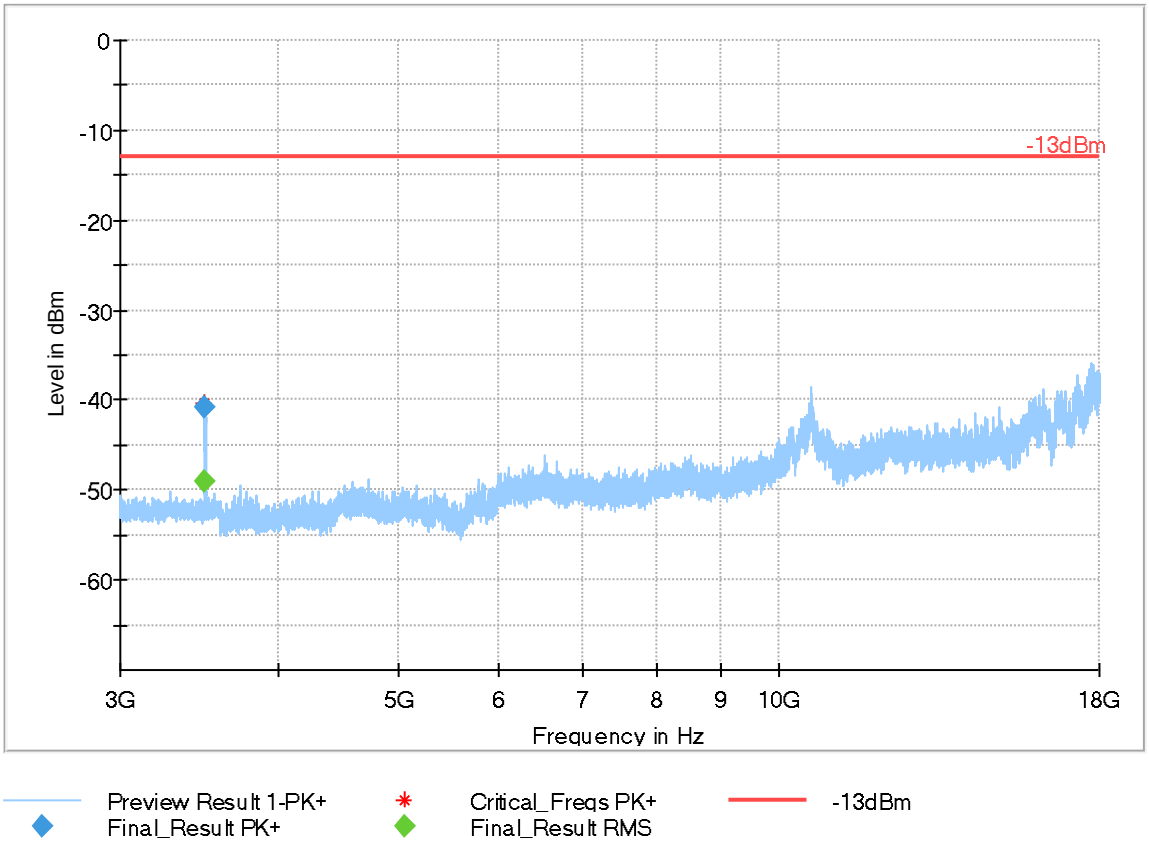
Channel: High

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3503.617000	---	-48.97	---	---	100.0	1000.000	177.0	H	137.0
3503.617000	-40.80	---	-13.00	27.80	100.0	1000.000	177.0	H	137.0

(continuation of the "Final_Result" table from column 15 ...)

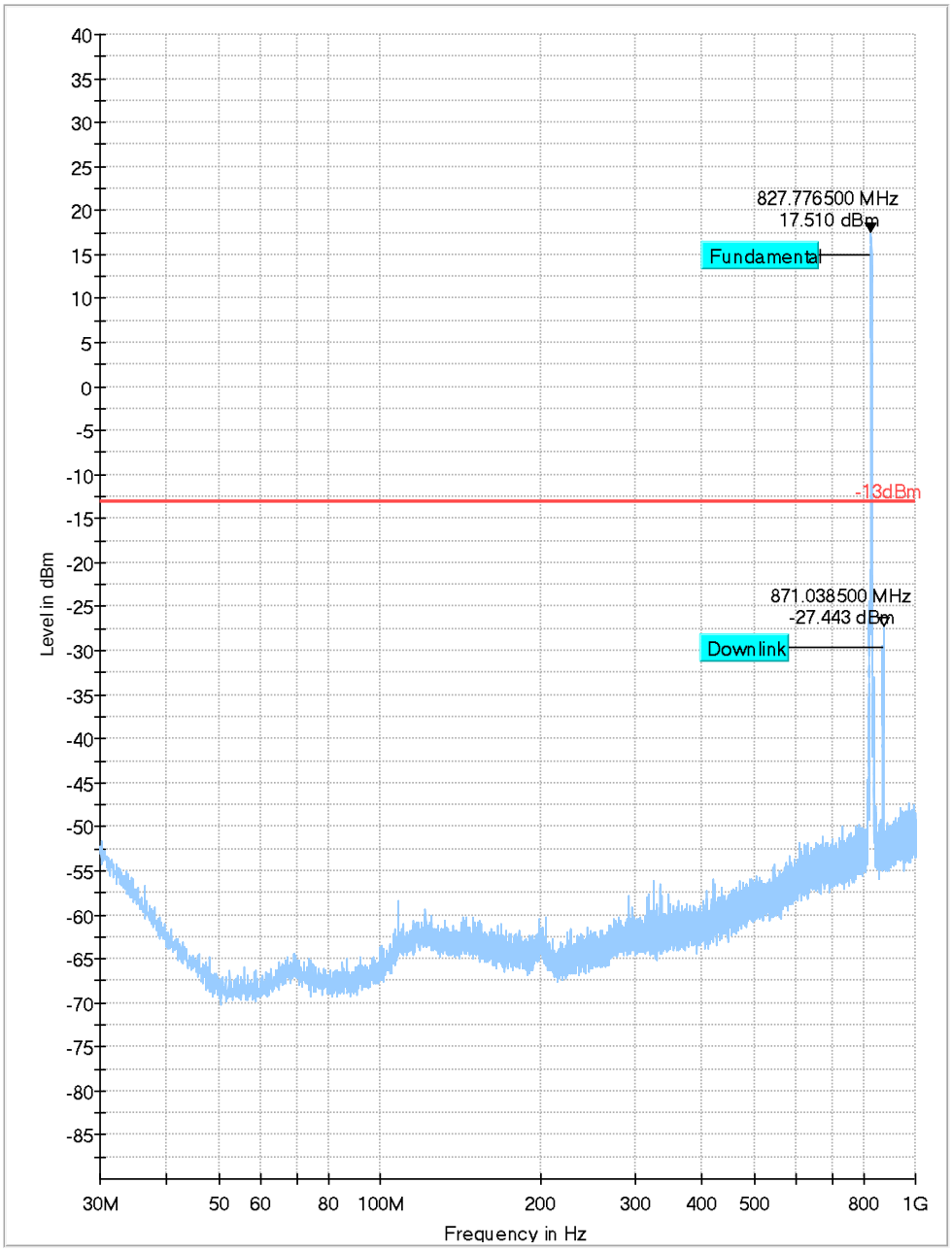
Frequency (MHz)	Corr. (dB)	Comment
3503.617000	-99.6	2:35:52 PM - 9/23/2019
3503.617000	-99.6	2:35:52 PM - 9/23/2019



WCDMA Band V

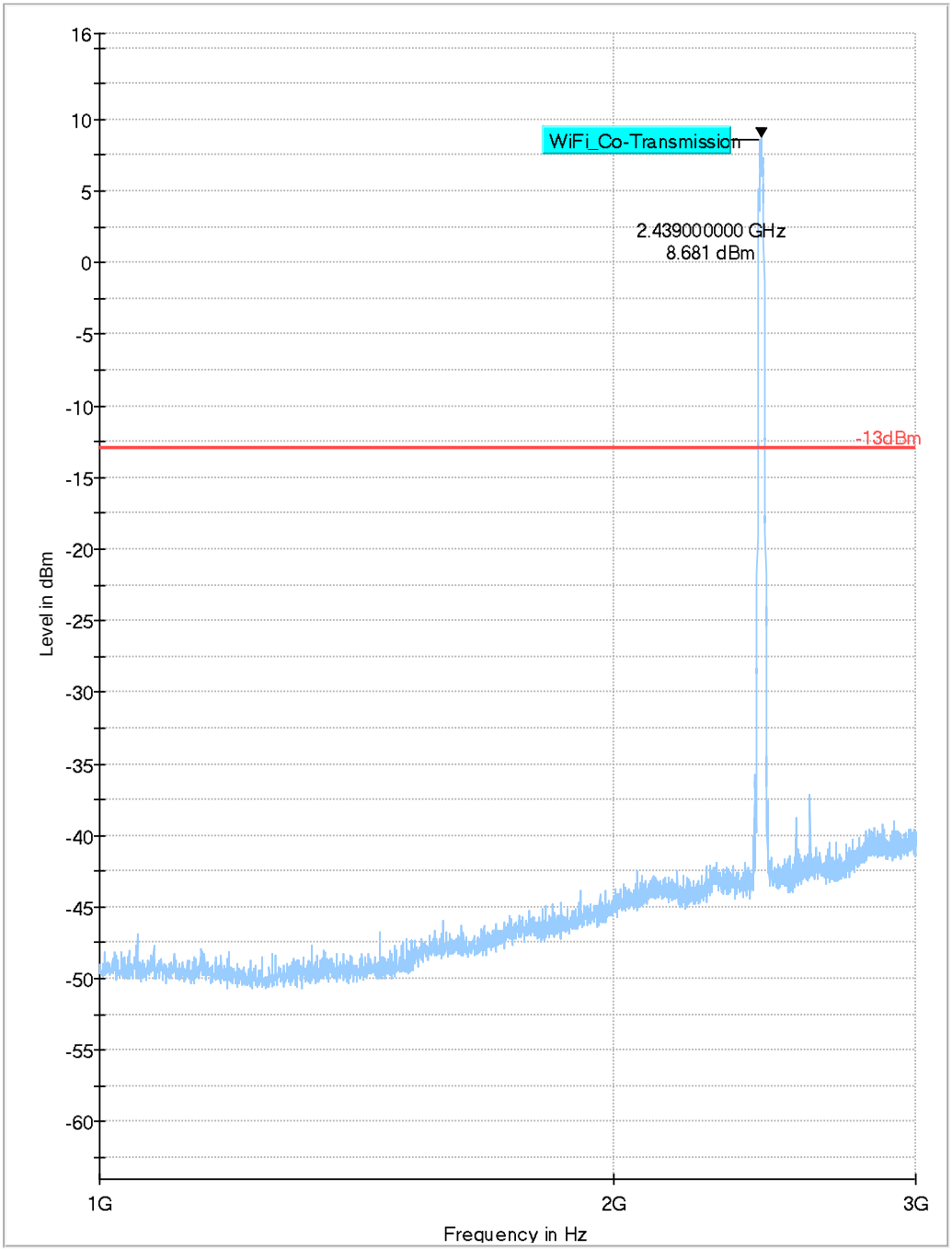
Plot # 43 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



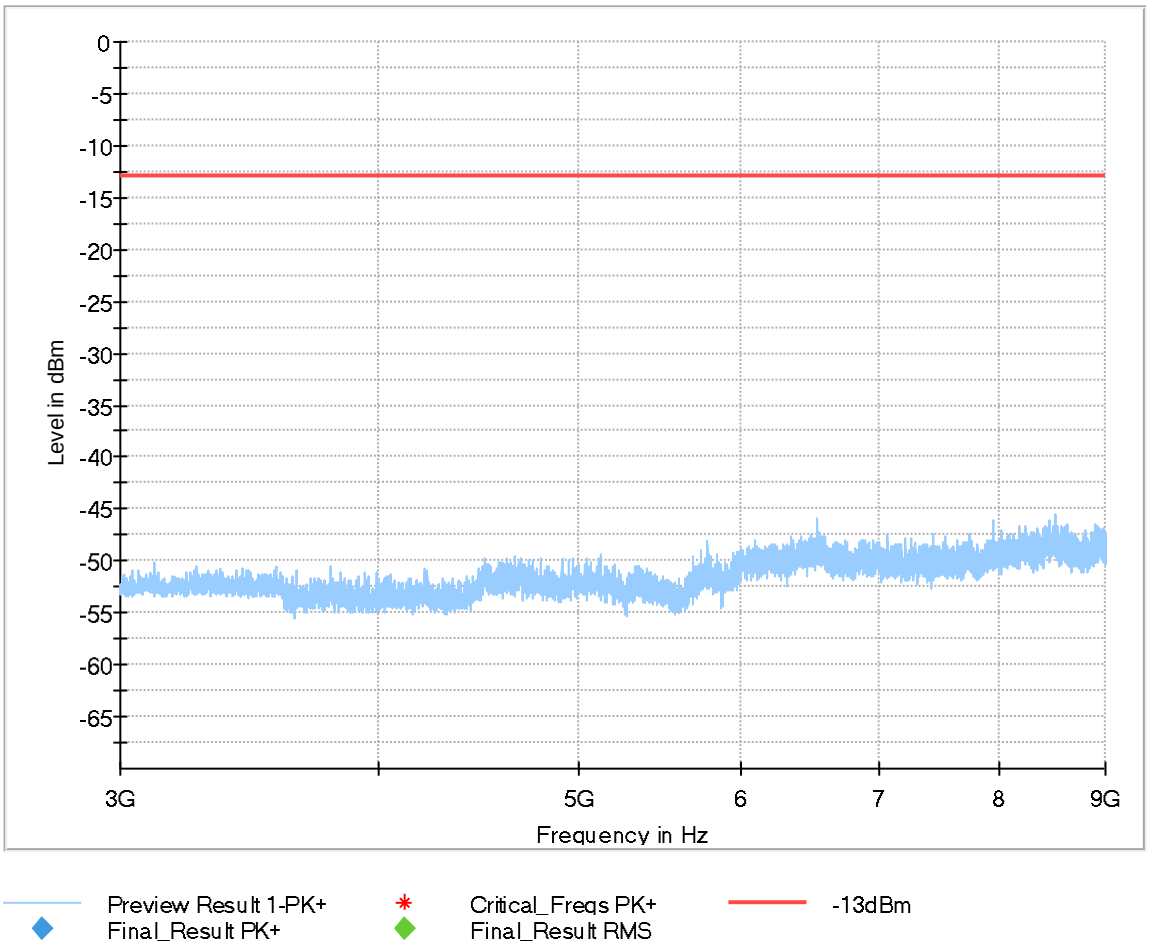
Plot # 44 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



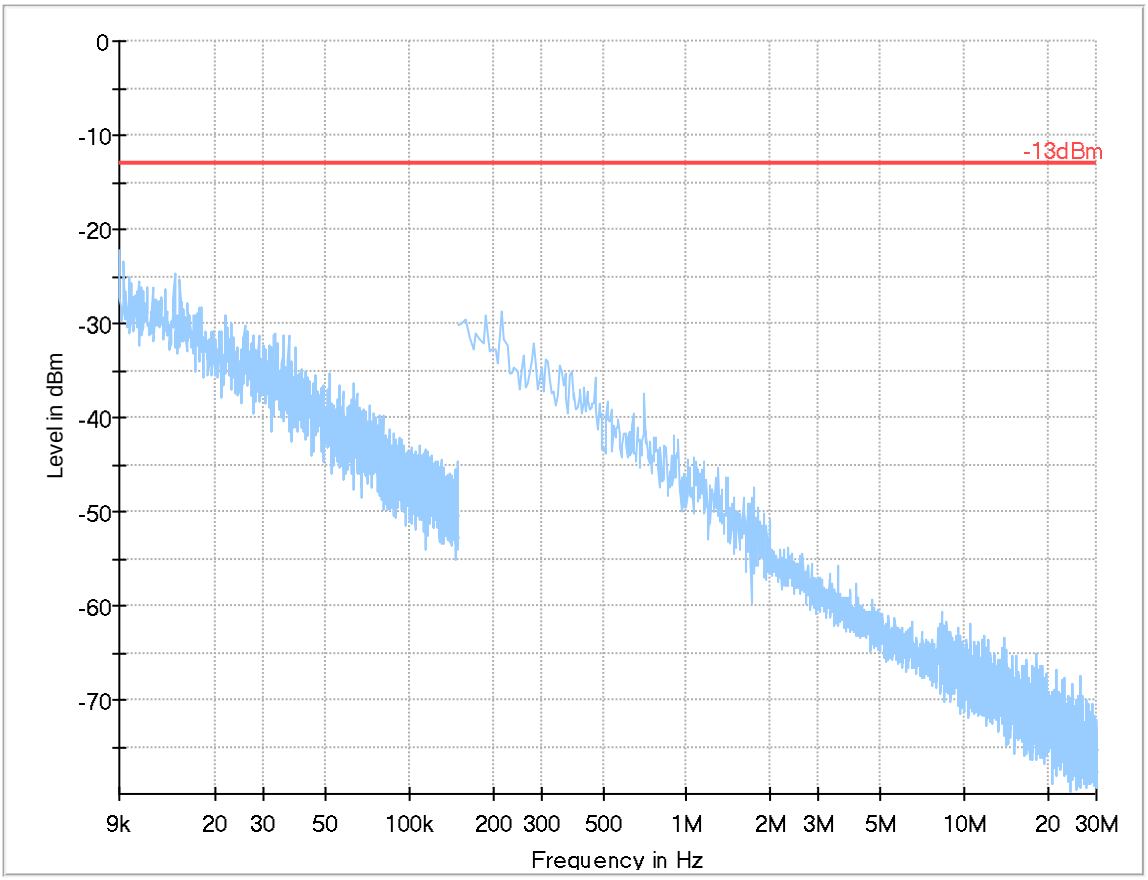
Plot # 45 Radiated Emissions: 3 GHz - 9 GHz

Channel: Low



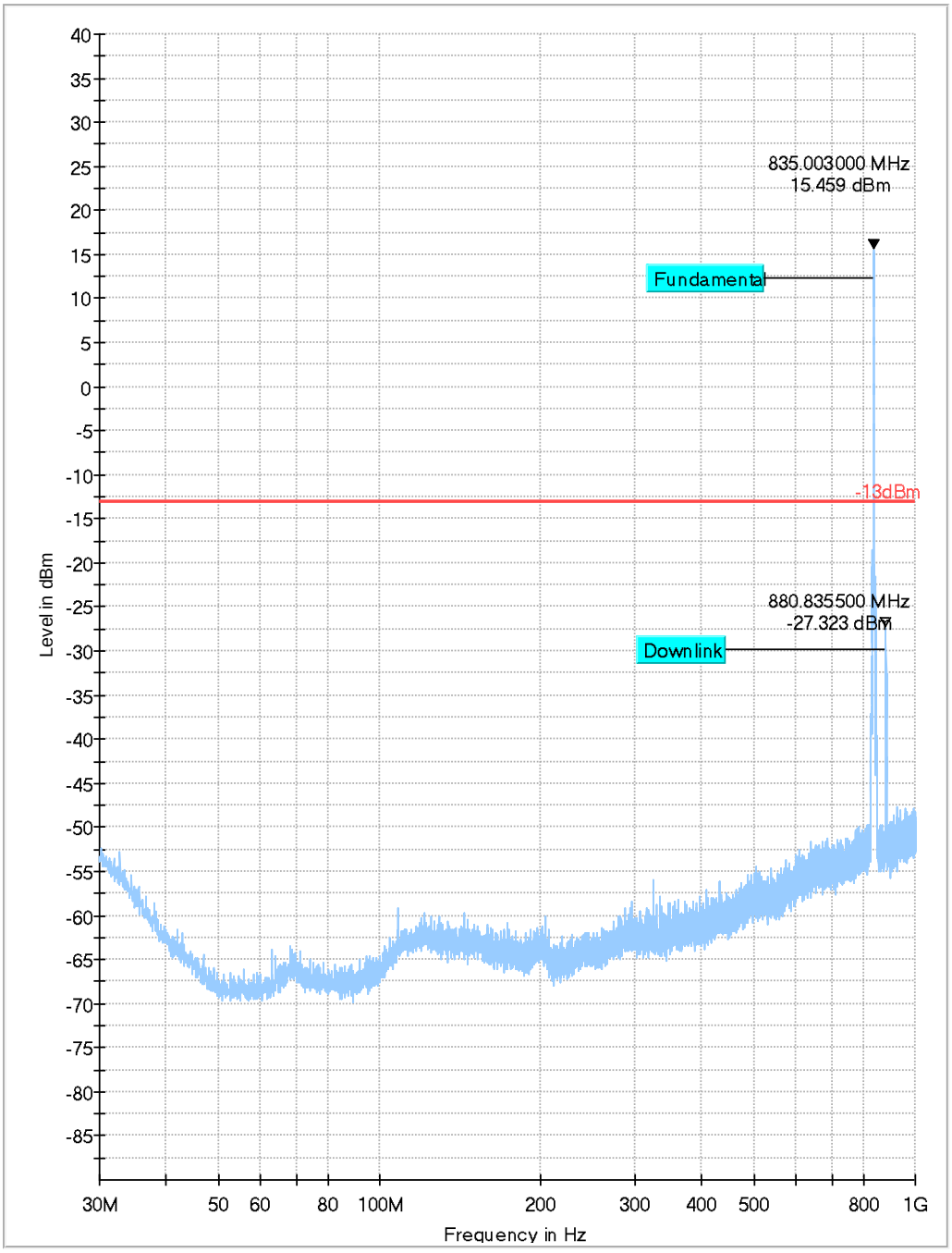
Plot # 46 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



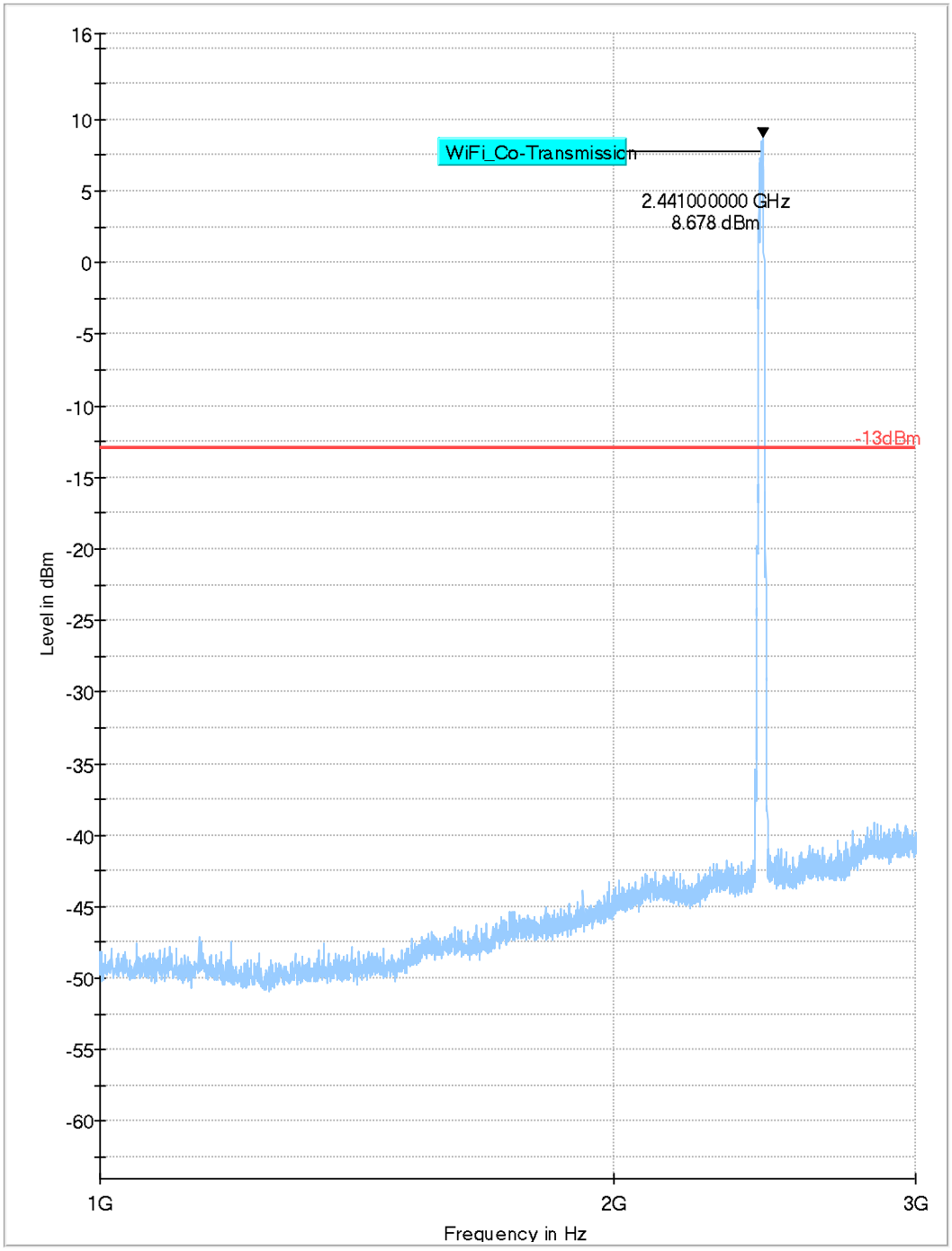
Plot # 47 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



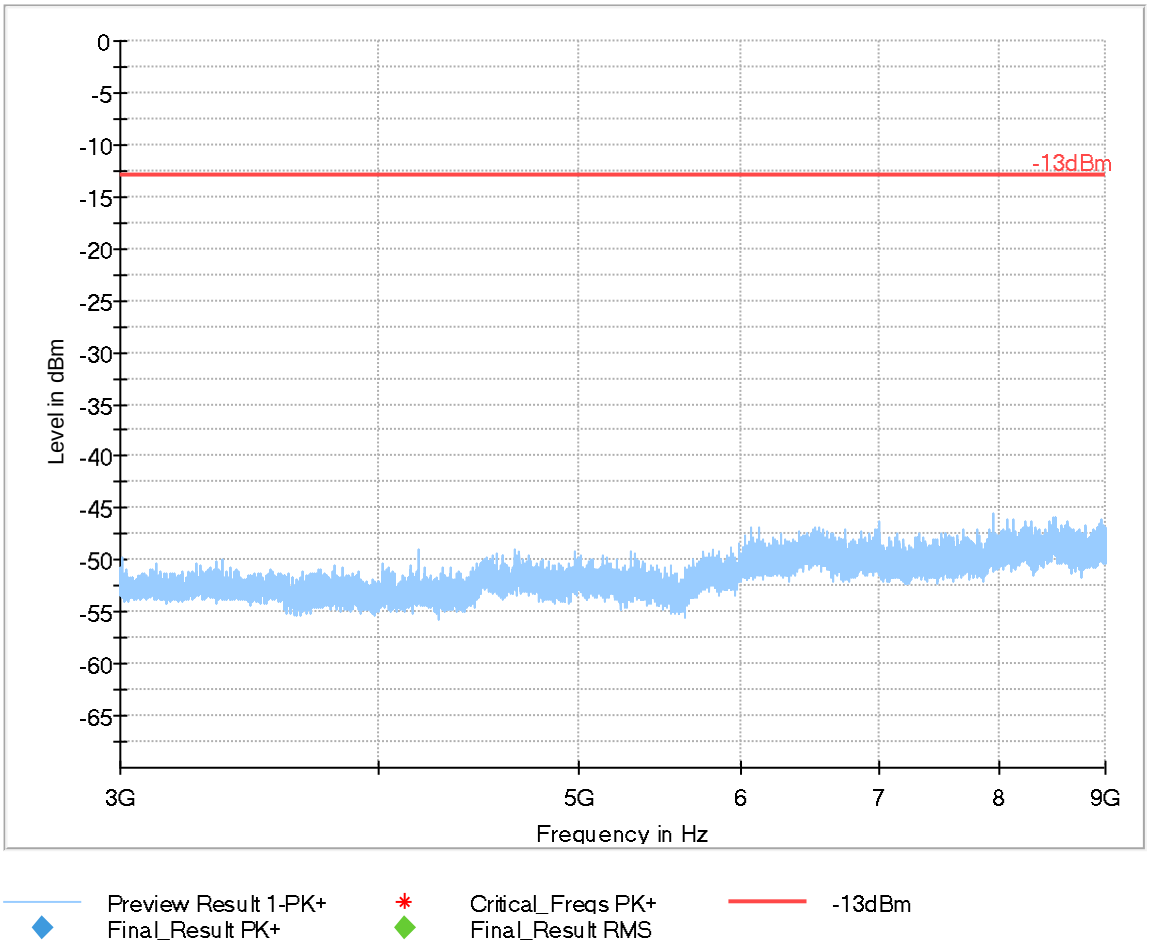
Plot # 48 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



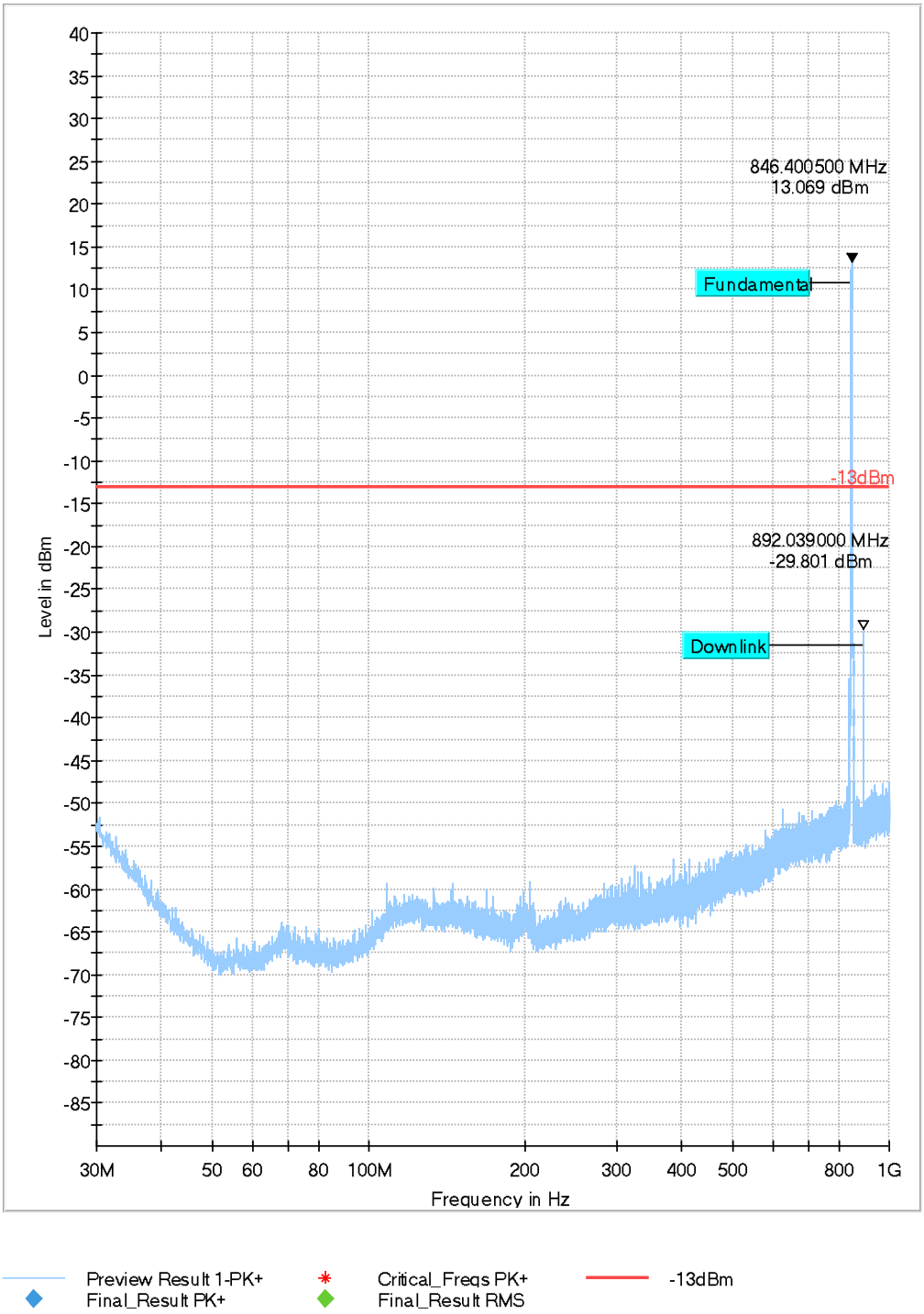
Plot # 49 Radiated Emissions: 3 GHz – 9GHz

Channel: Mid



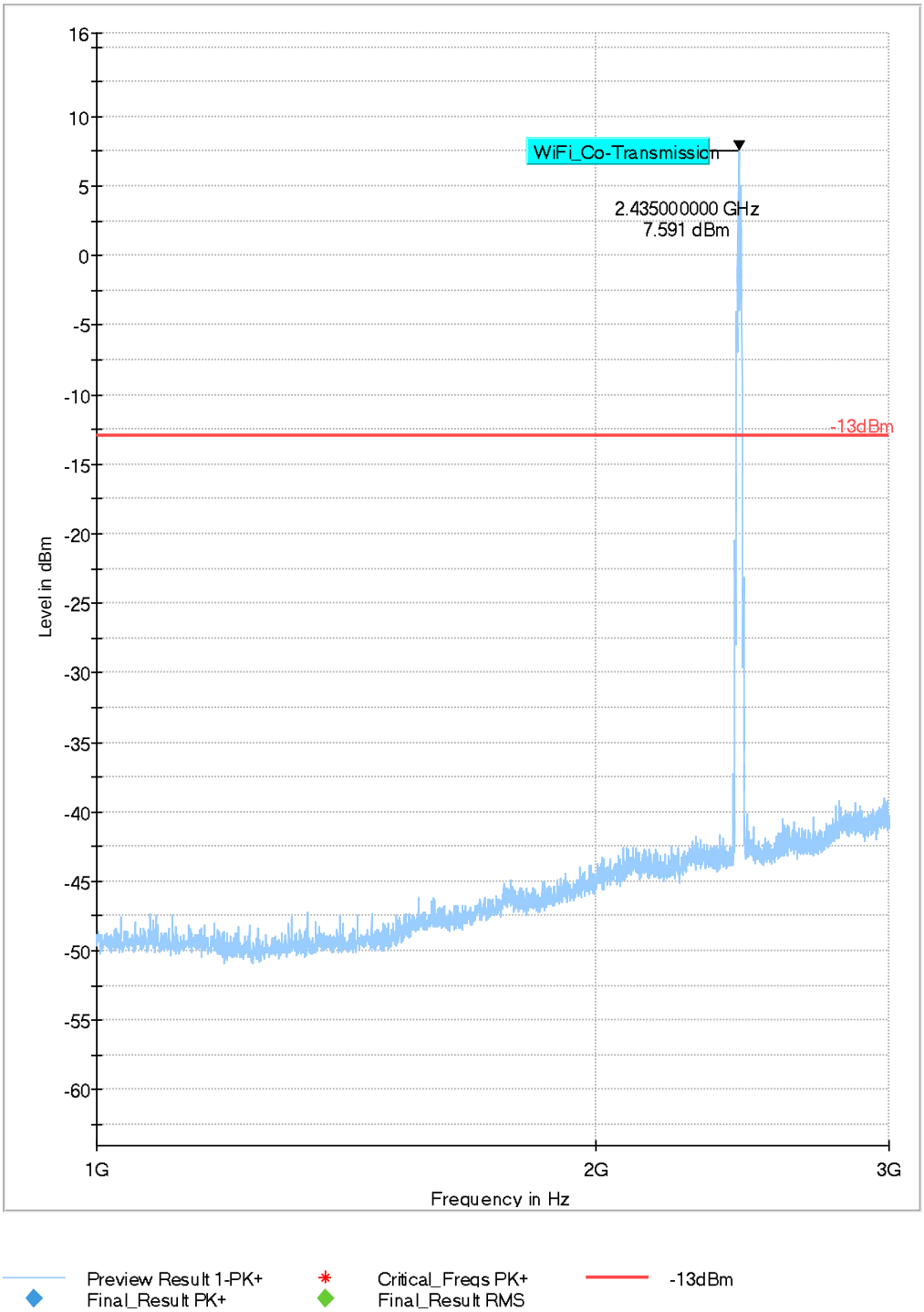
Plot # 50 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



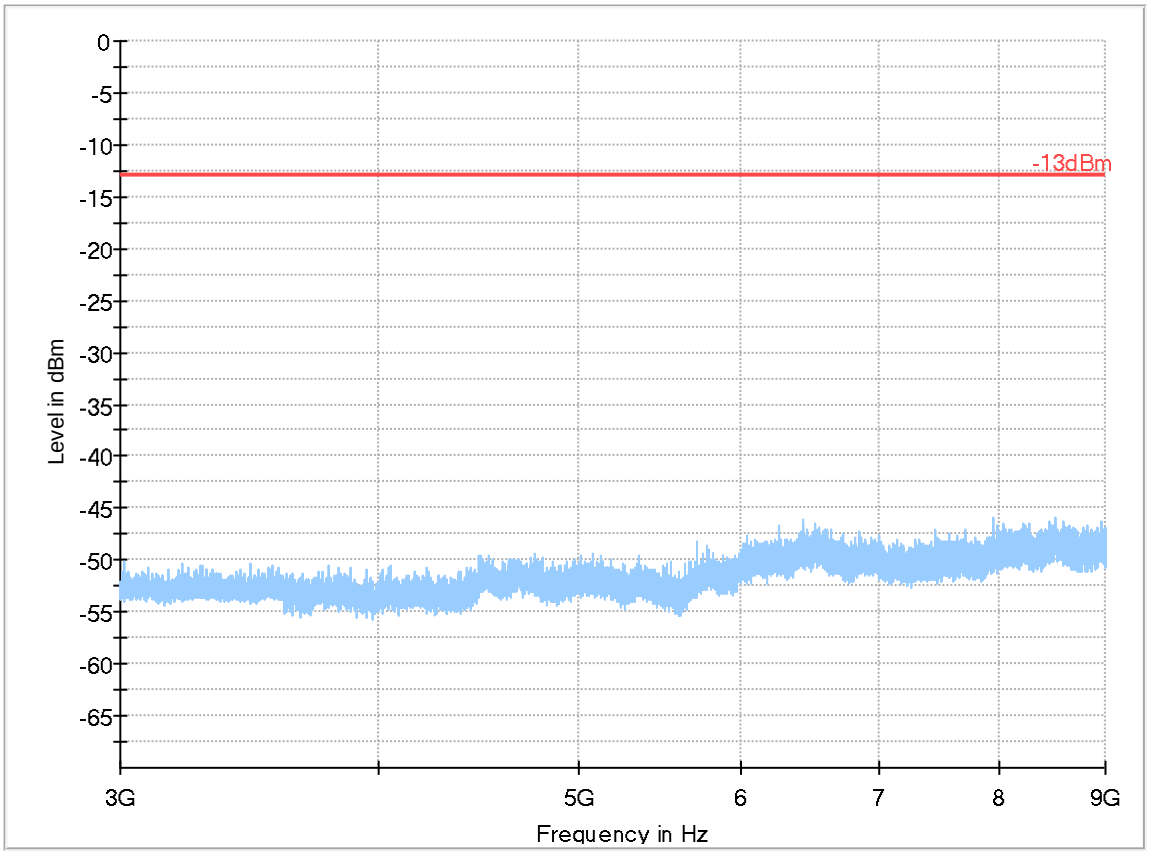
Plot # 51 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 52 Radiated Emissions: 3 GHz - 9 GHz

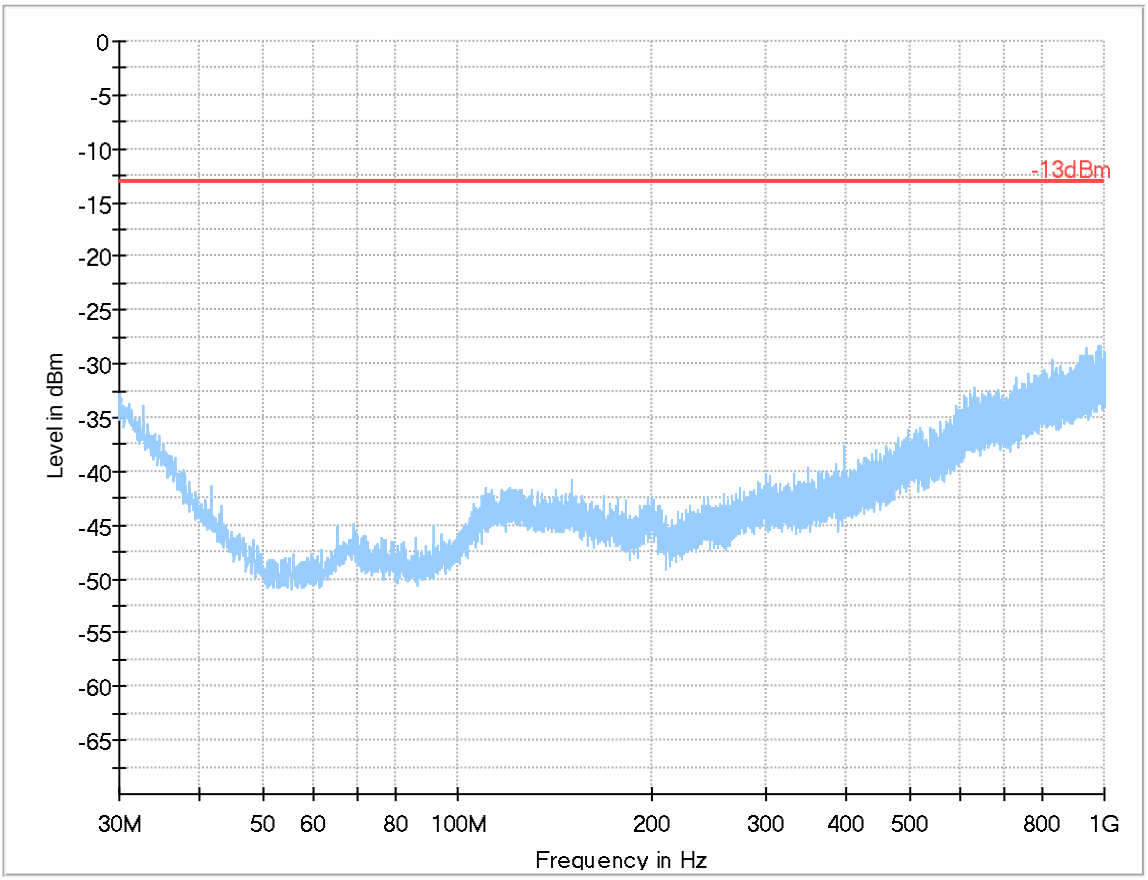
Channel: High



LTE Band 2

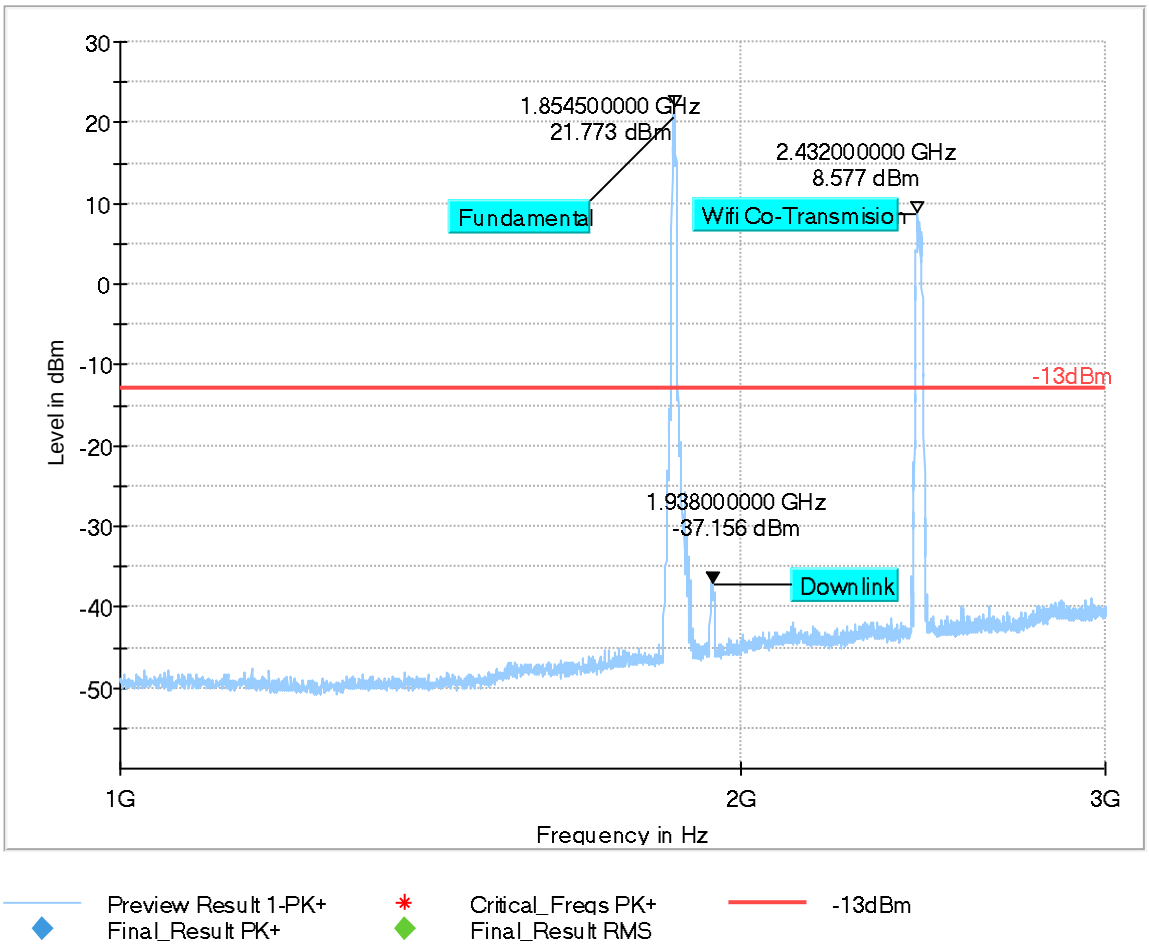
Plot # 53 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



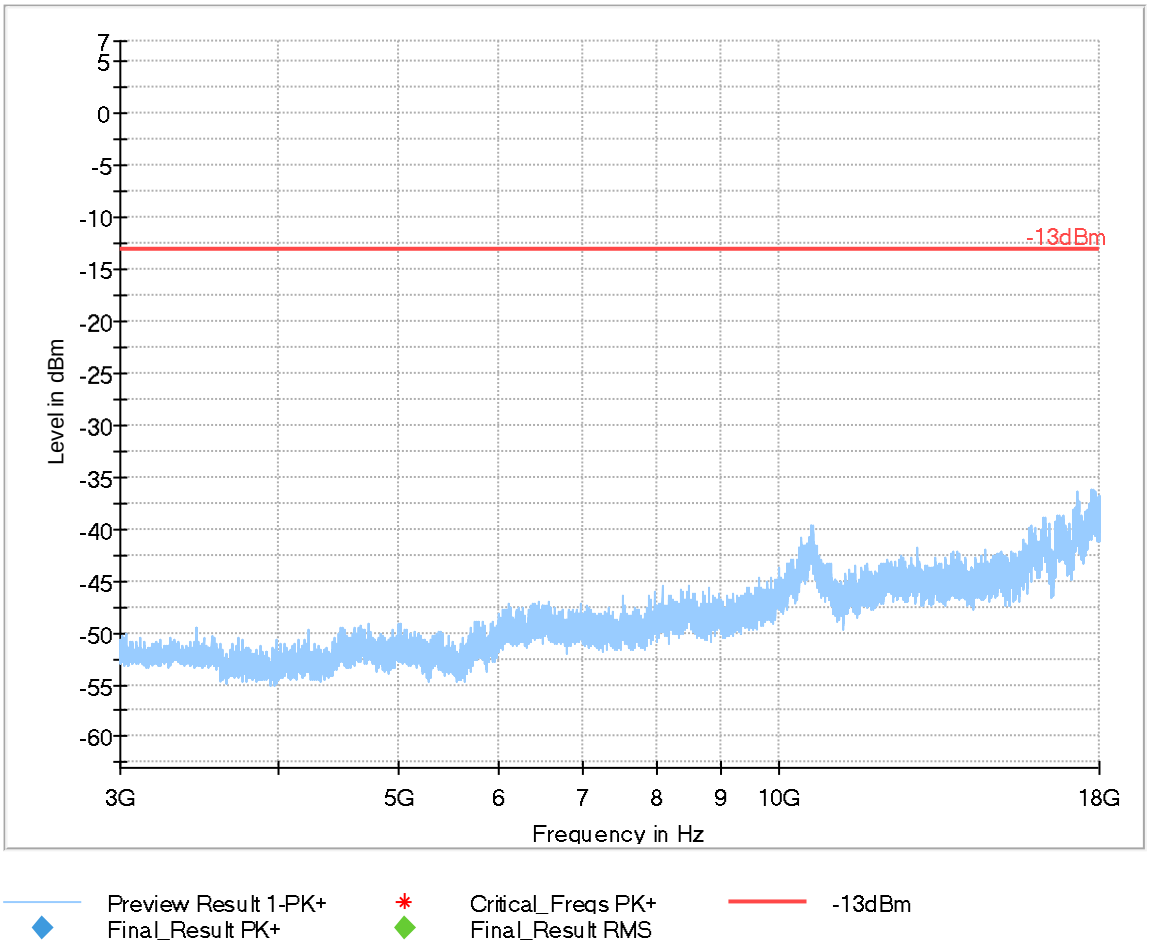
Plot # 54 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



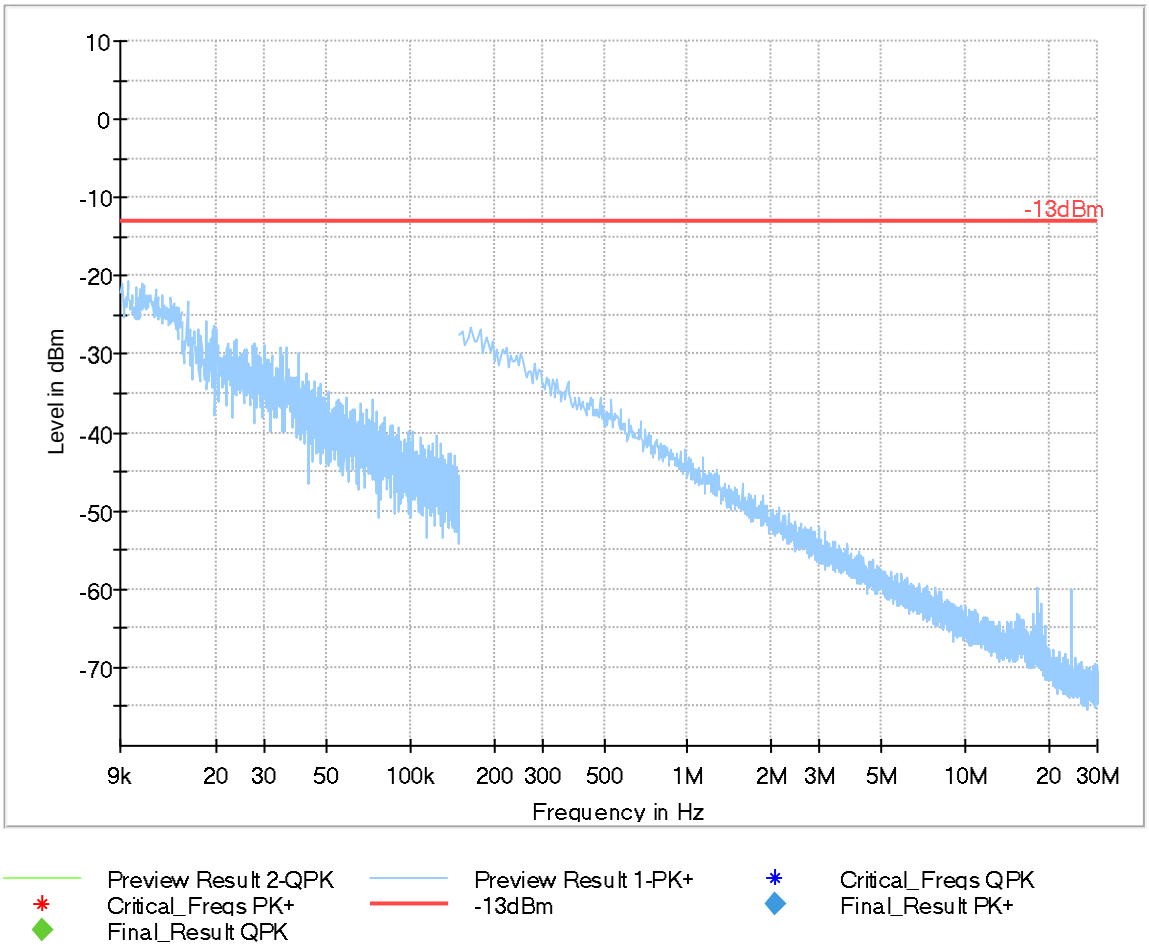
Plot # 55 Radiated Emissions: 3 GHz - 18 GHz

Channel: Low



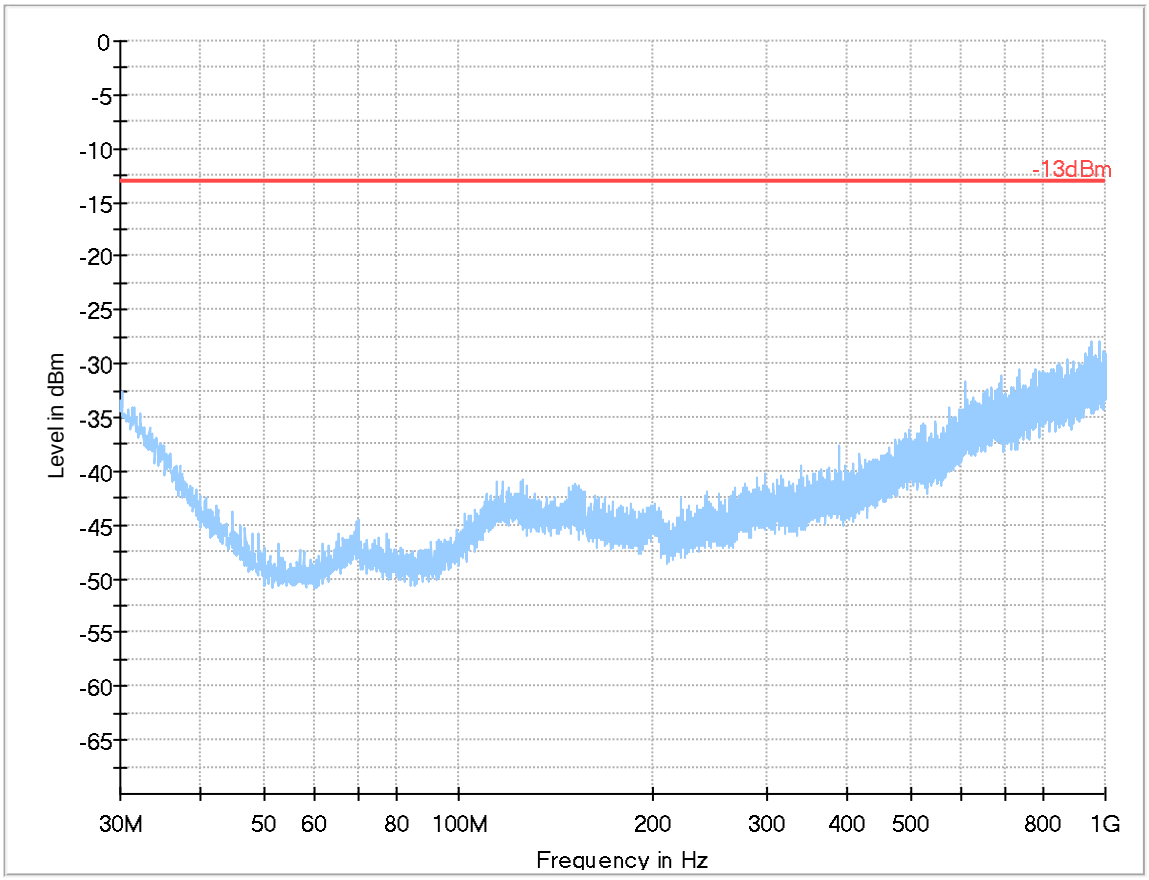
Plot # 56 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



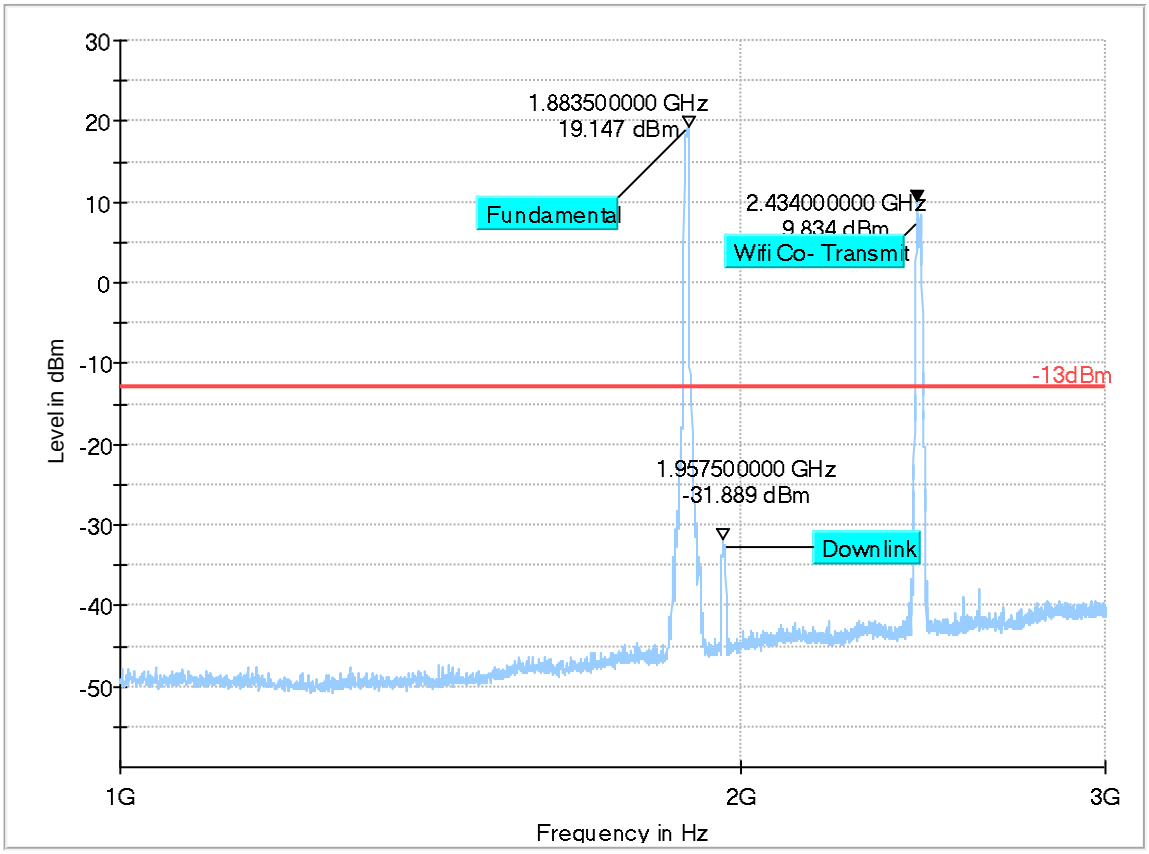
Plot # 57 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



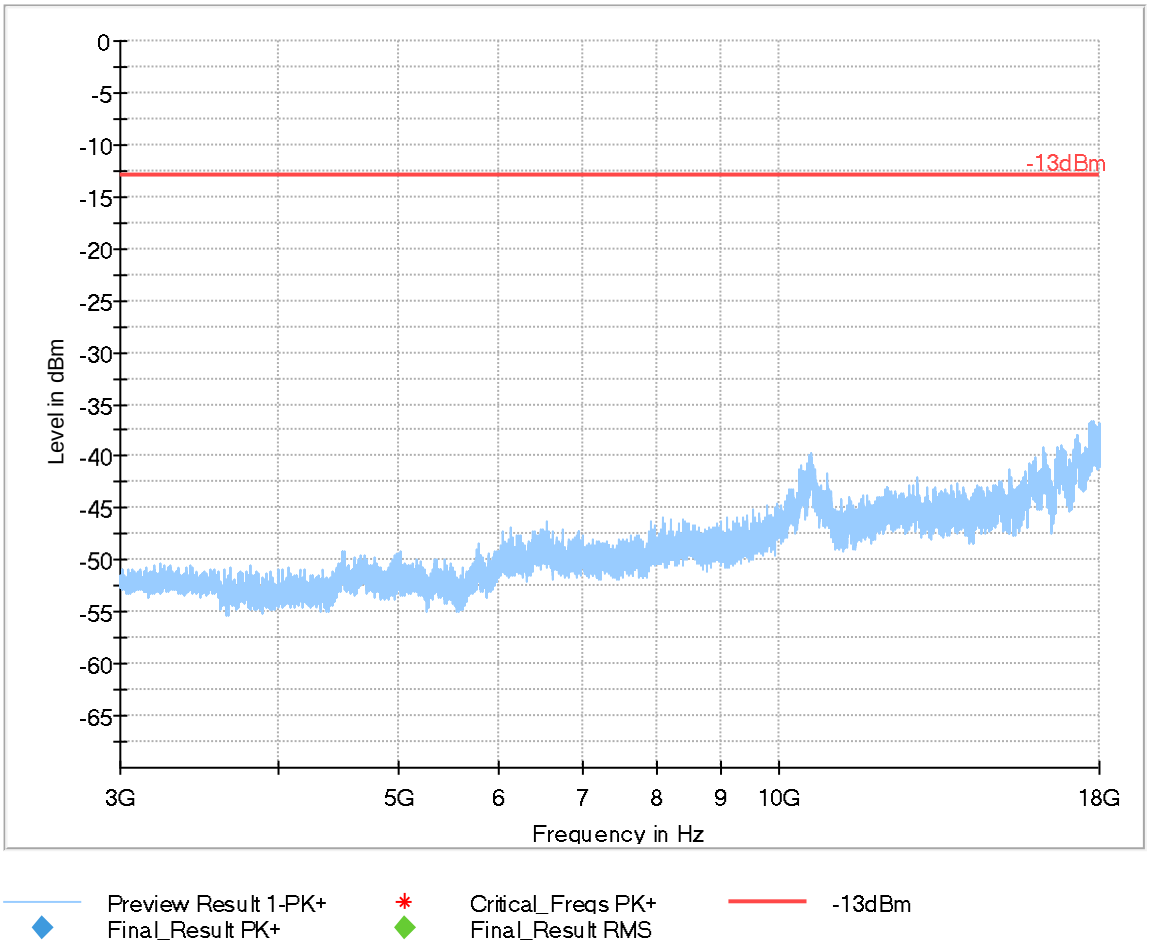
Plot # 58 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



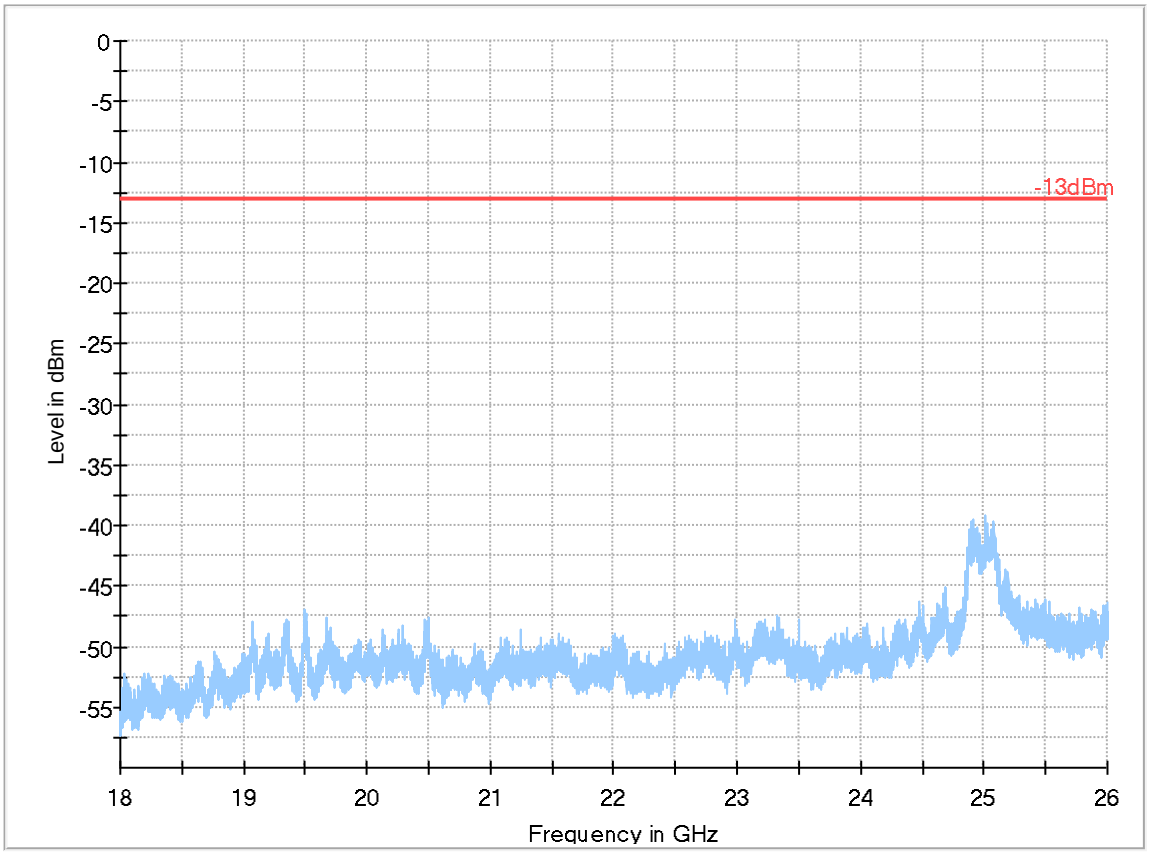
Plot # 59 Radiated Emissions: 3 GHz – 18 GHz

Channel: Mid



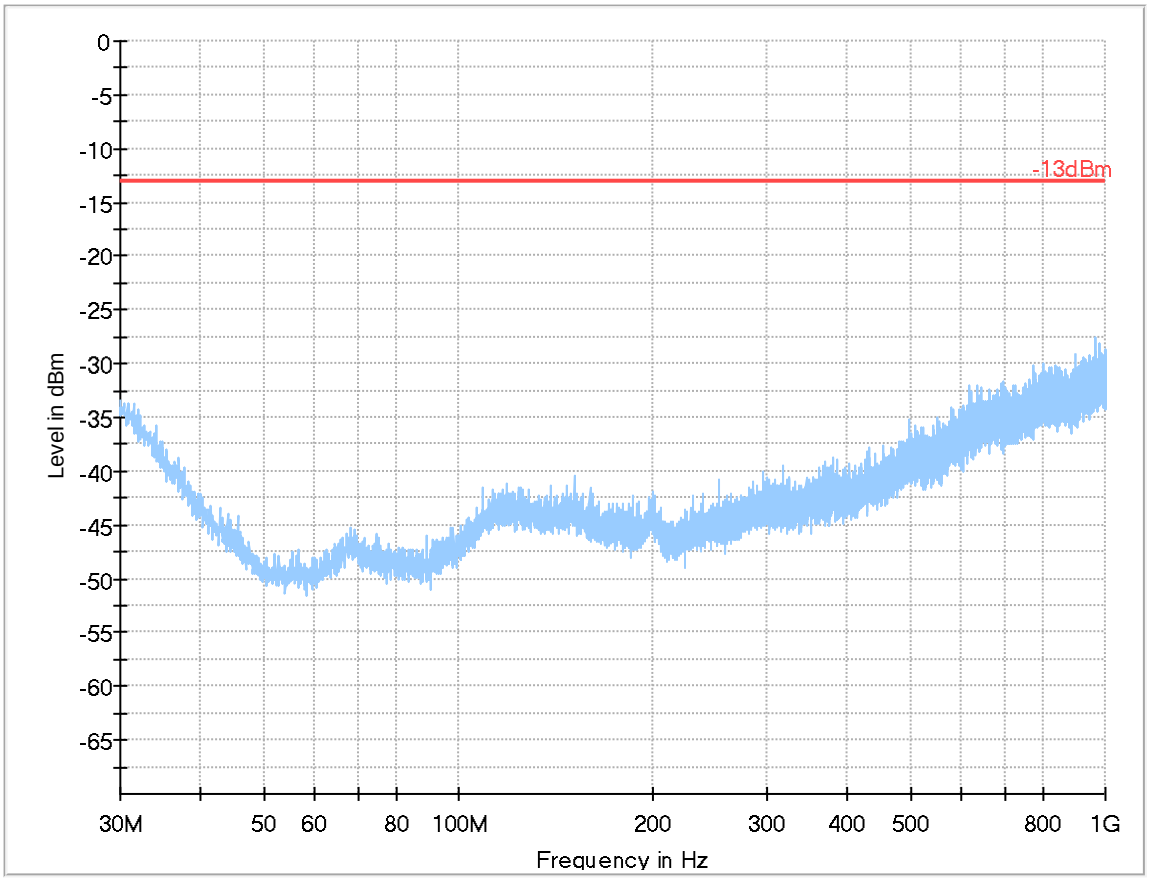
Plot # 60 Radiated Emissions: 18 GHz – 26 GHz

Channel: Mid



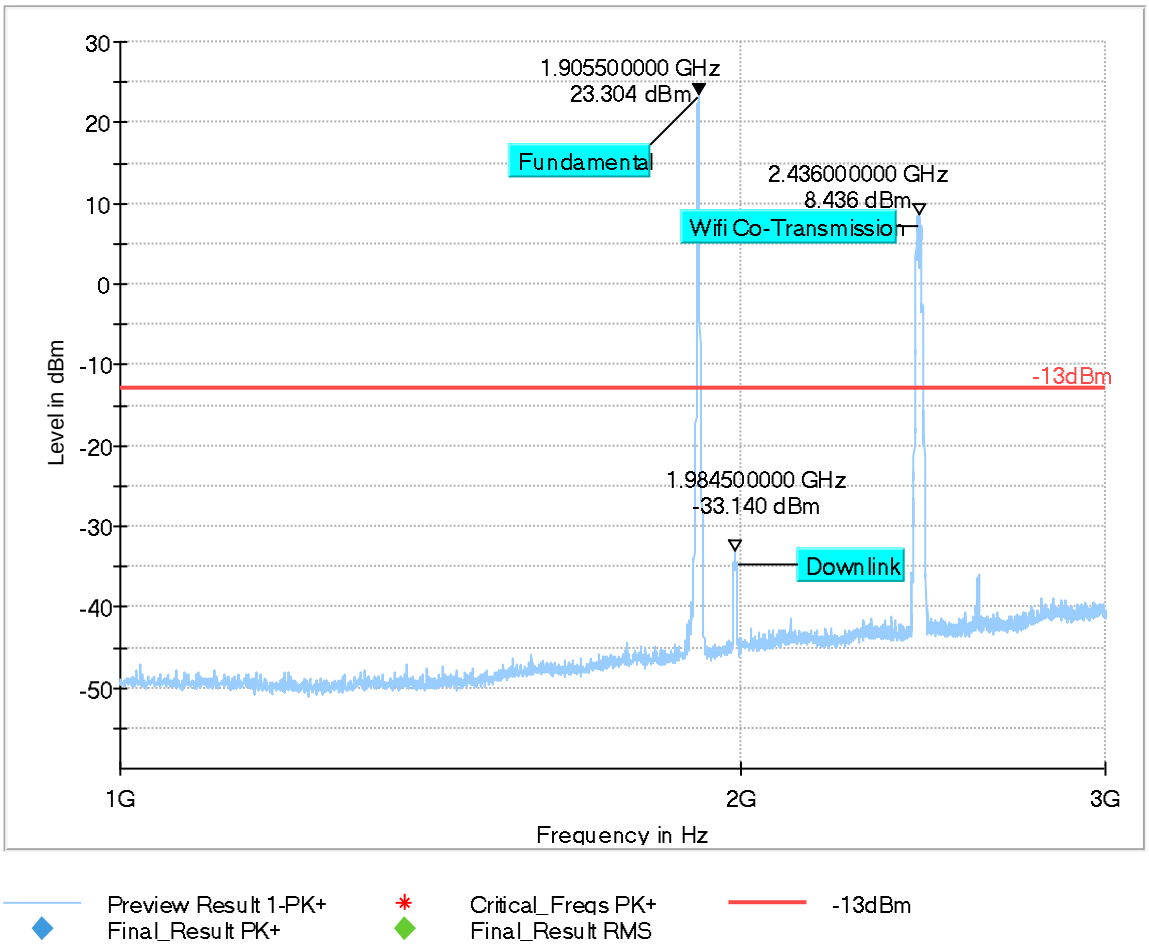
Plot # 61 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



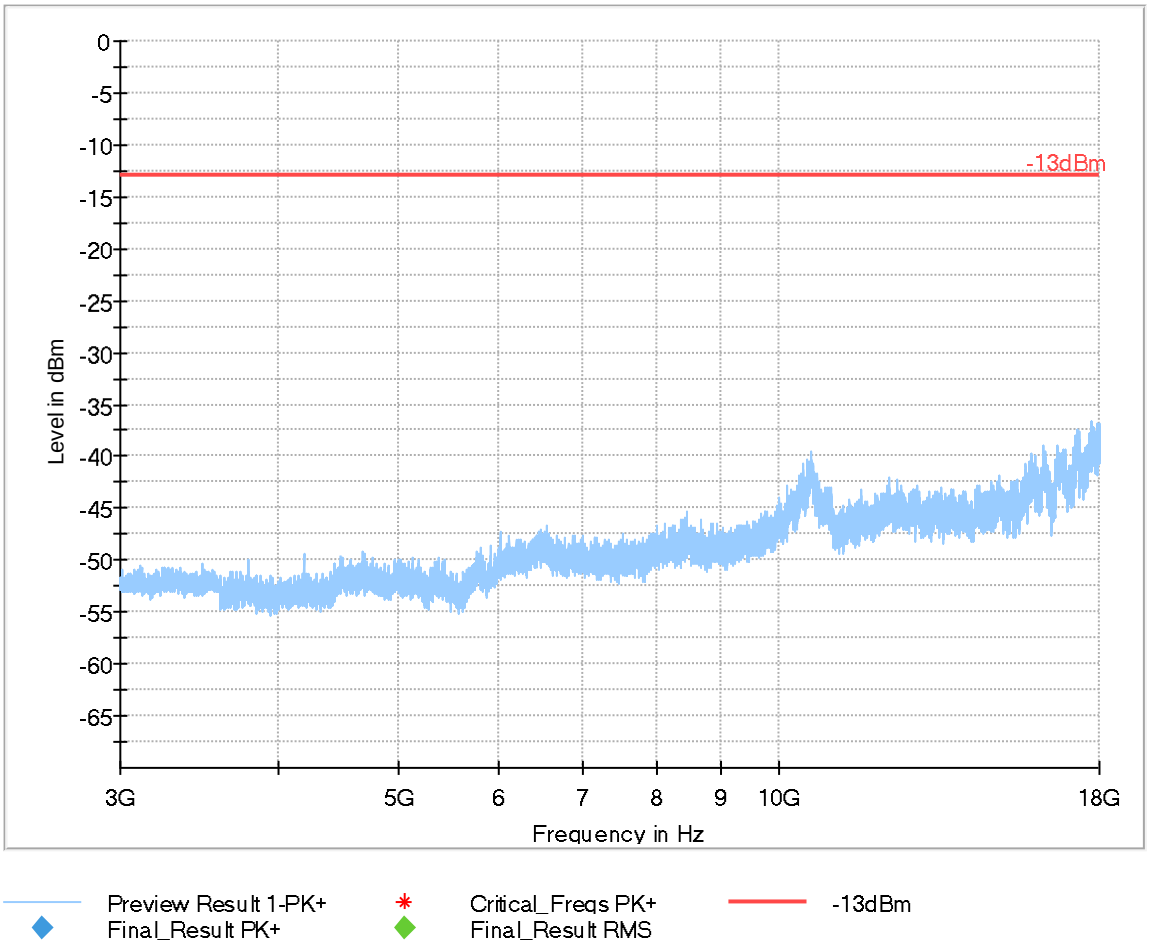
Plot # 62 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 63 Radiated Emissions: 3 GHz - 18 GHz

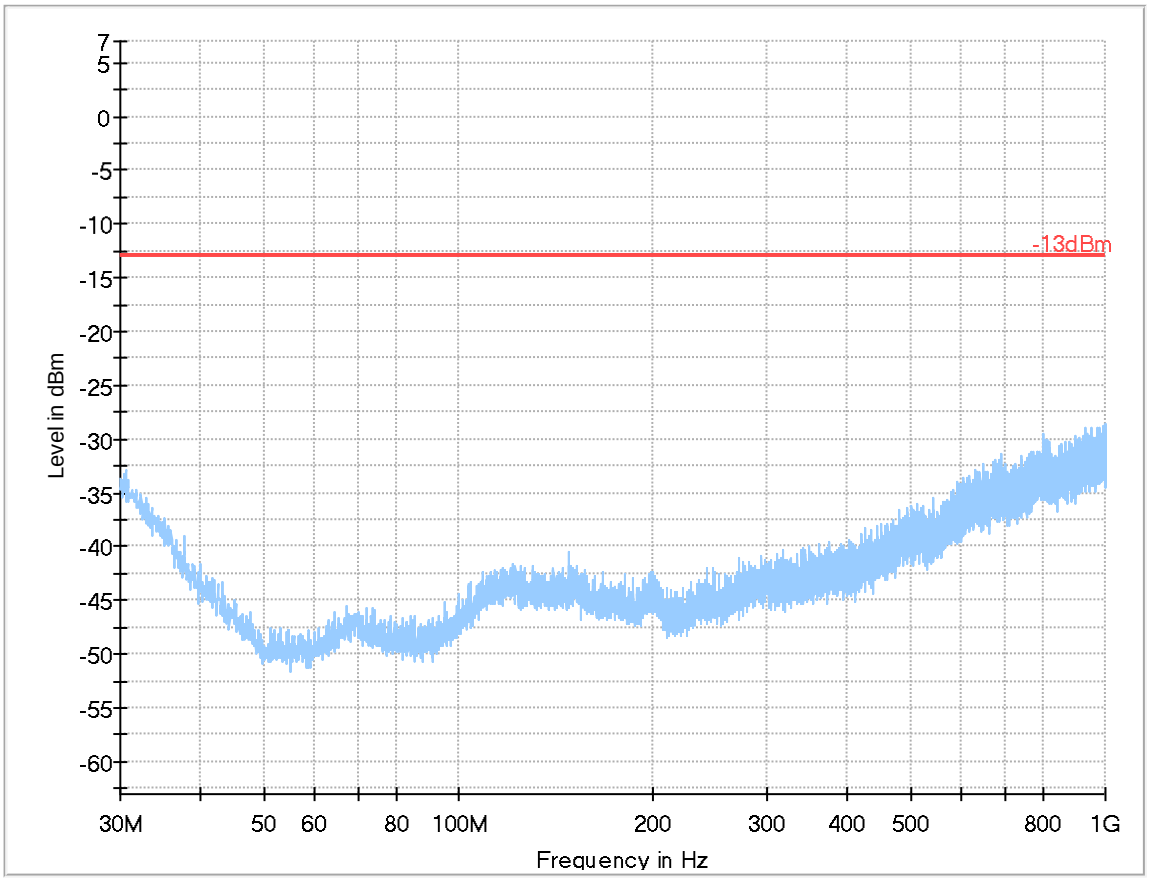
Channel: High



LTE Band 4

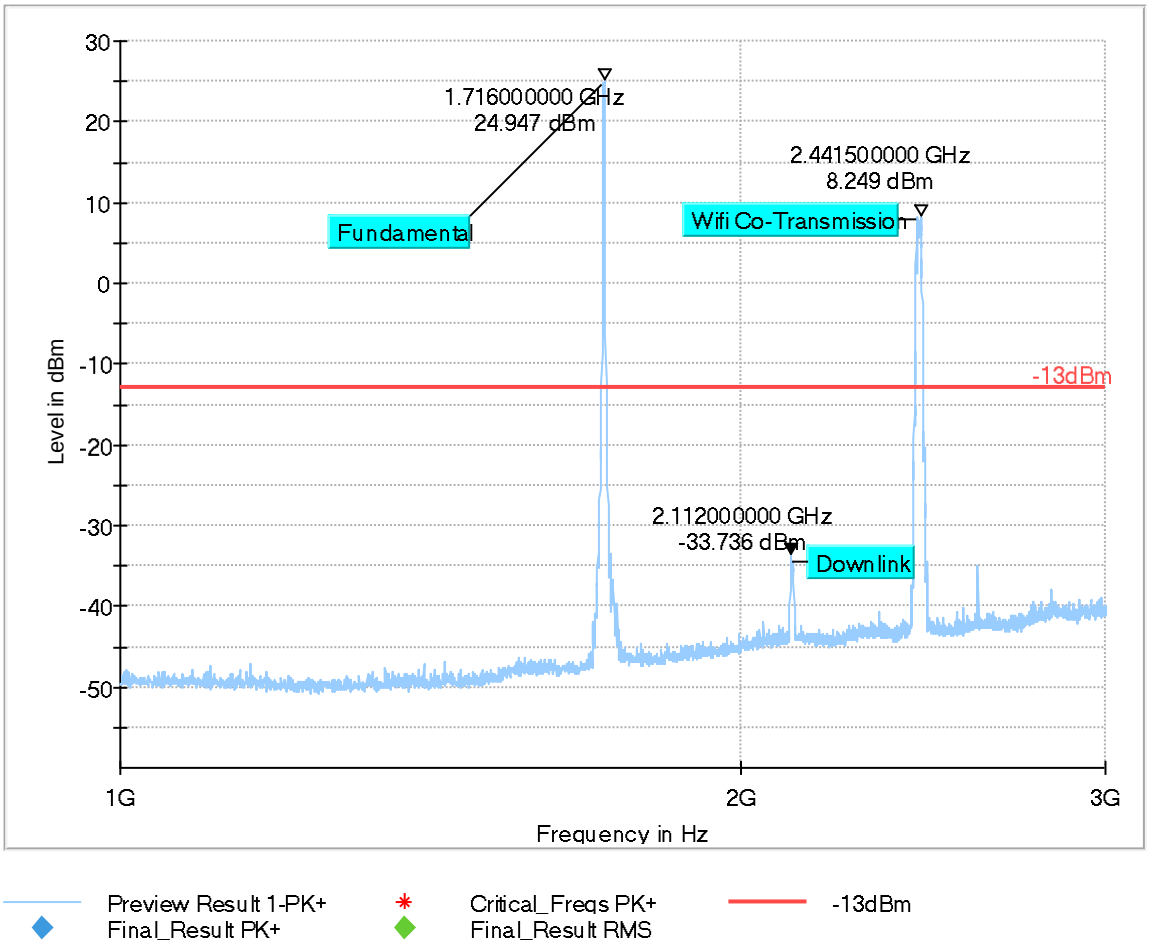
Plot # 64 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



Plot # 65 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 66 Radiated Emissions: 3 GHz - 18 GHz

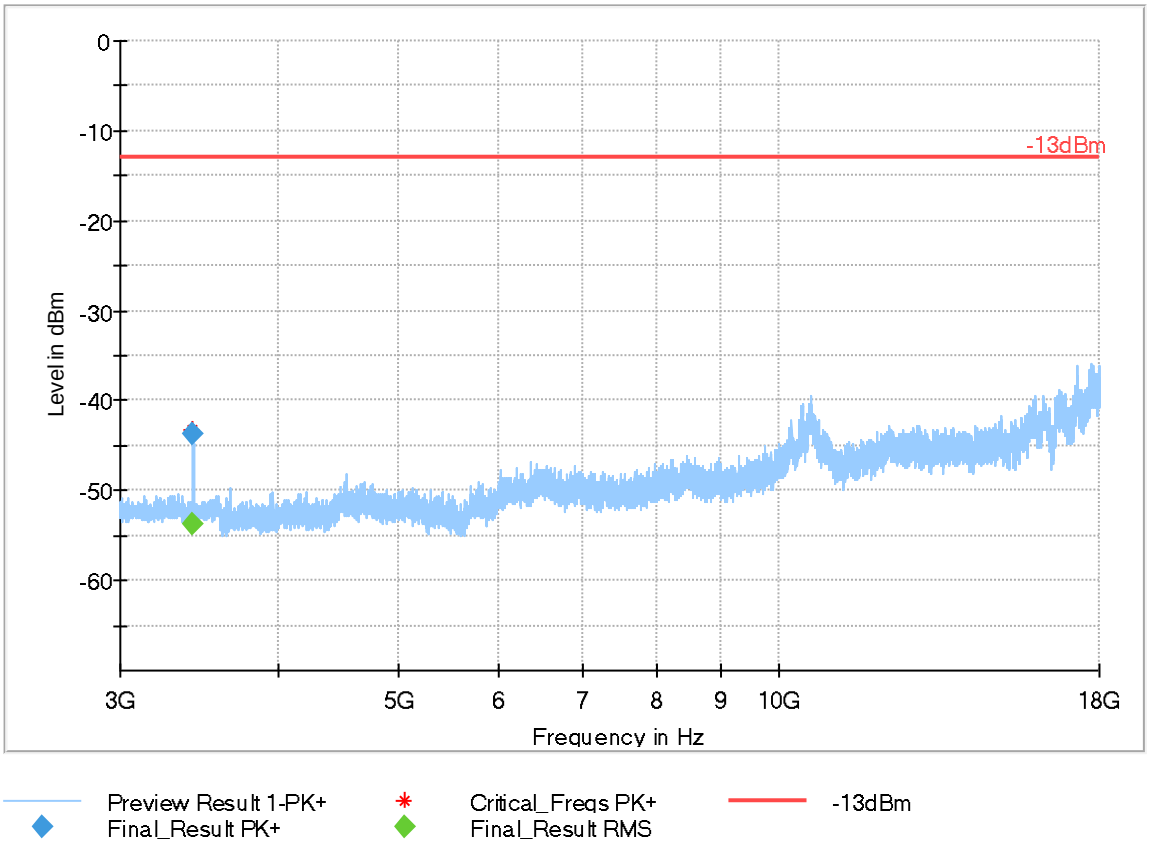
Channel: Low

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3428.740667	---	-53.75	---	---	100.0	1000.000	162.0	H	140.0
3428.740667	-43.80	---	-13.00	30.80	100.0	1000.000	162.0	H	140.0

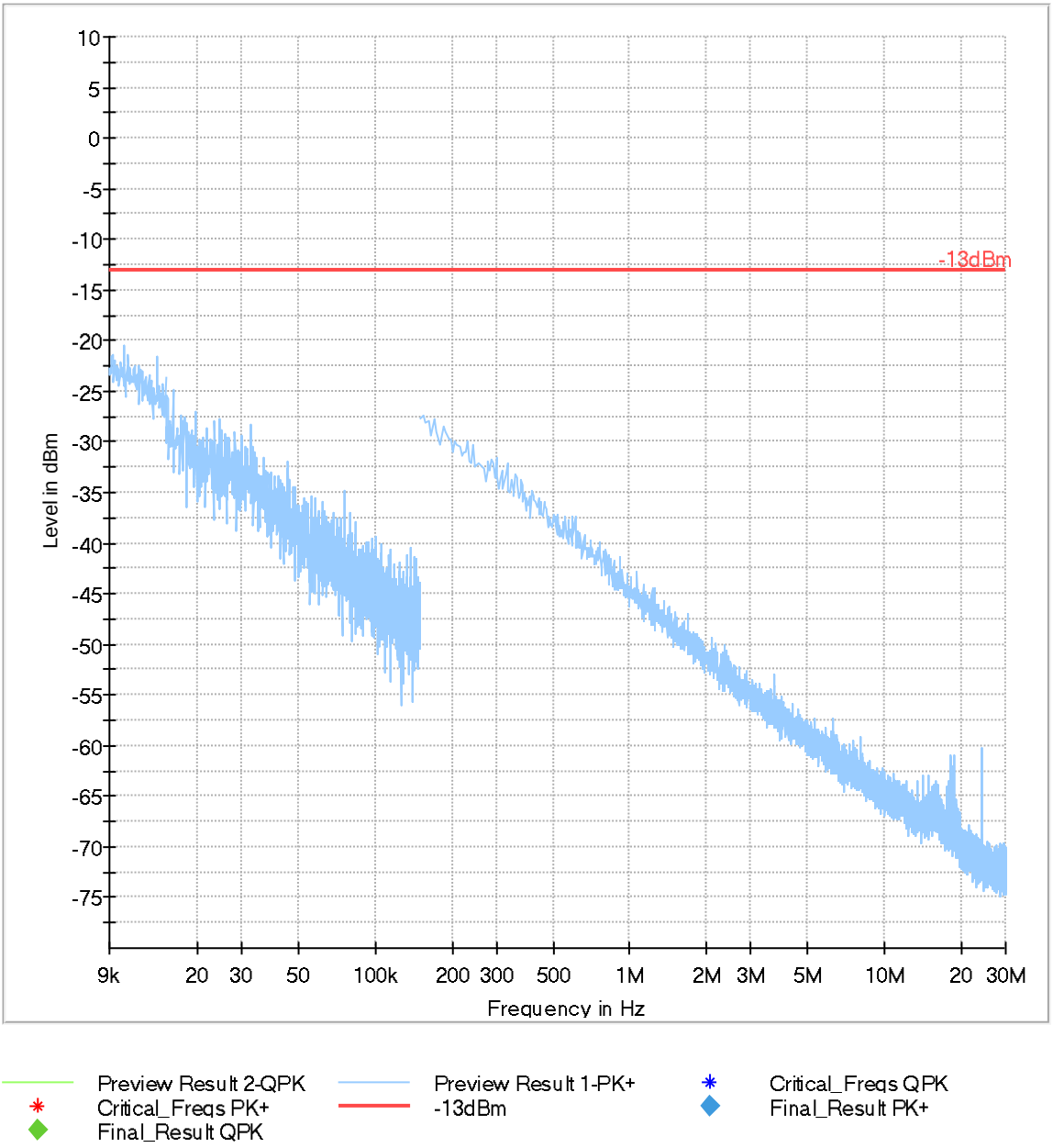
(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
3428.740667	-99.7	3:32:00 PM - 9/23/2019
3428.740667	-99.7	3:32:00 PM - 9/23/2019



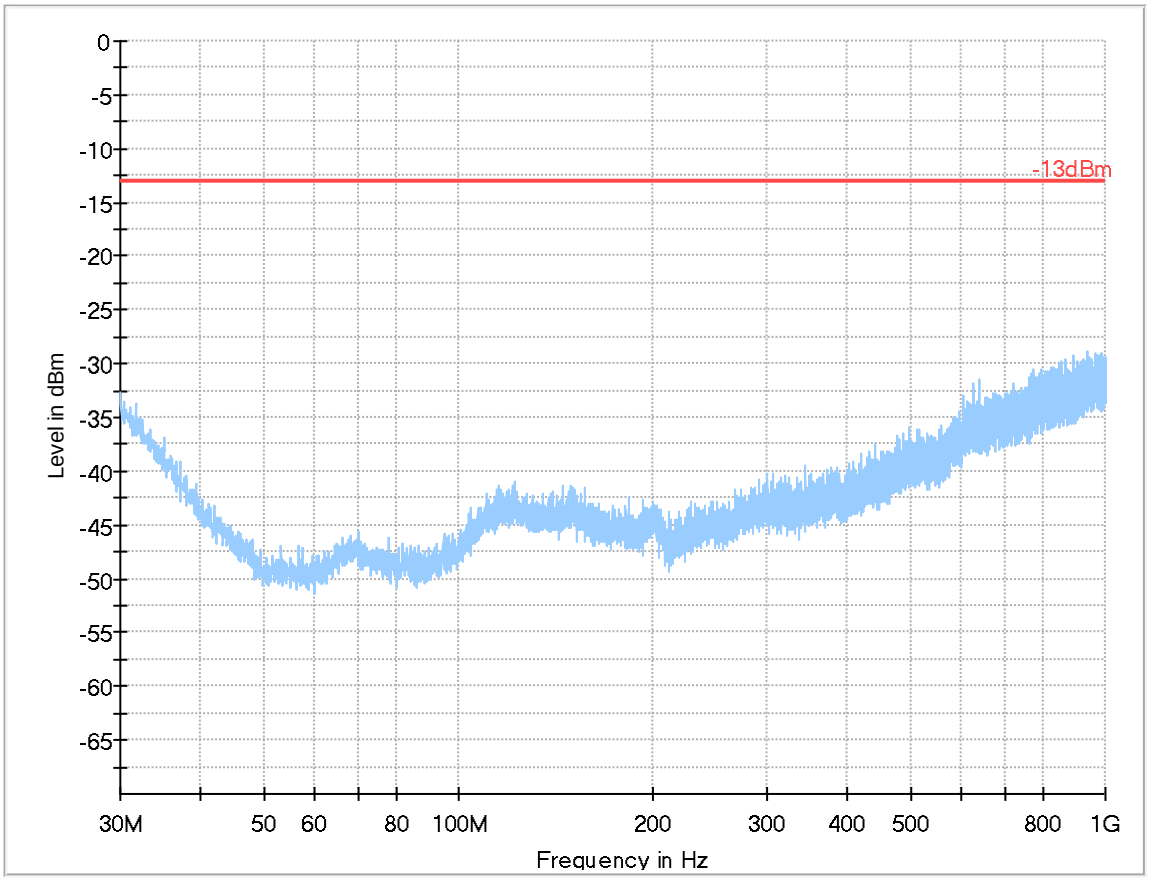
Plot # 67 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



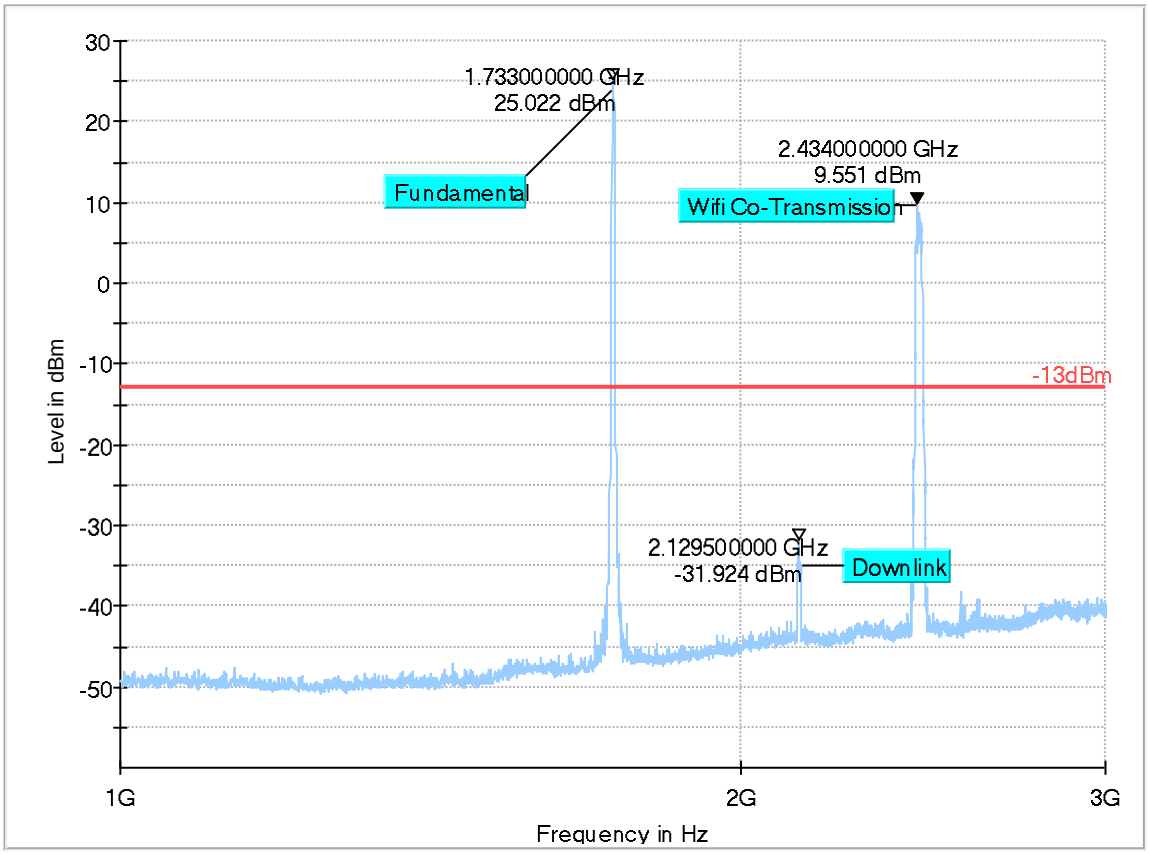
Plot # 68 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



Plot # 69 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



Plot # 70 Radiated Emissions: 3 GHz – 18GHz

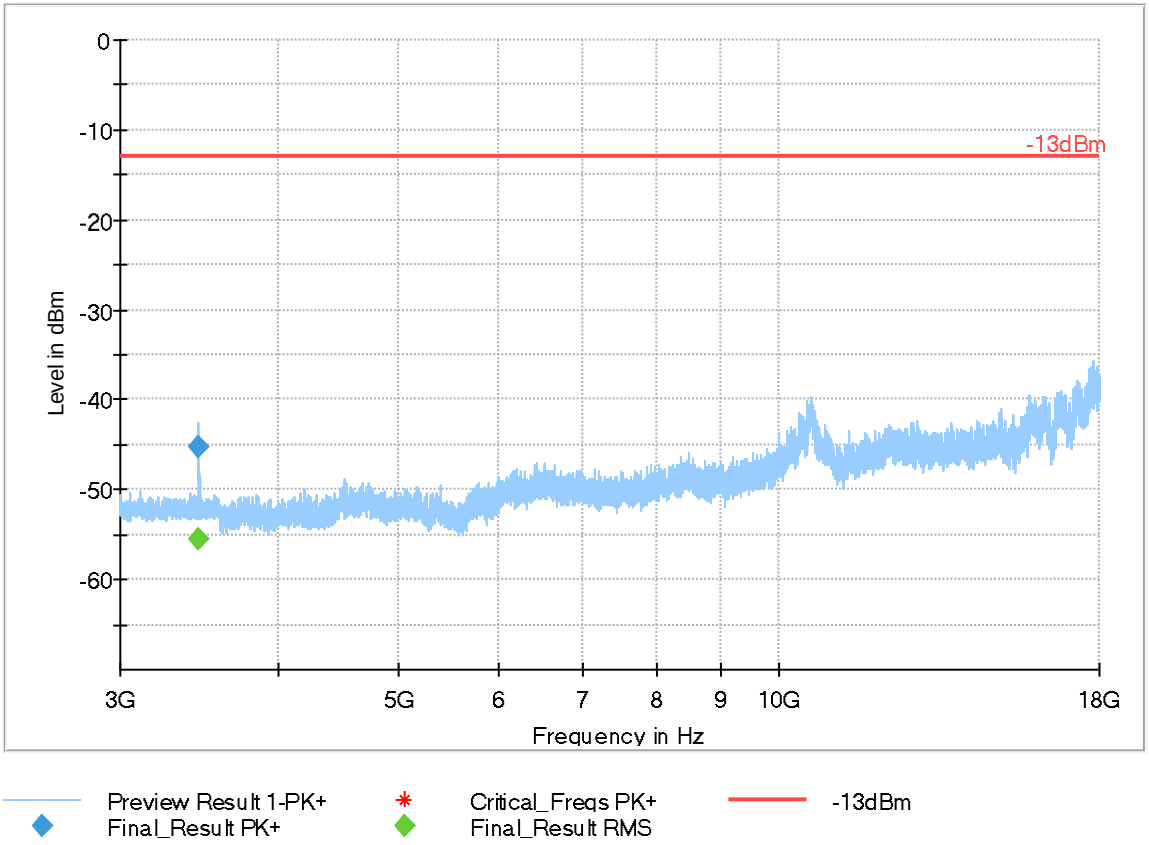
Channel: Mid

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3464.347333	---	-55.56	---	---	100.0	1000.000	140.0	H	143.0
3464.347333	-45.15	---	-13.00	32.15	100.0	1000.000	140.0	H	143.0

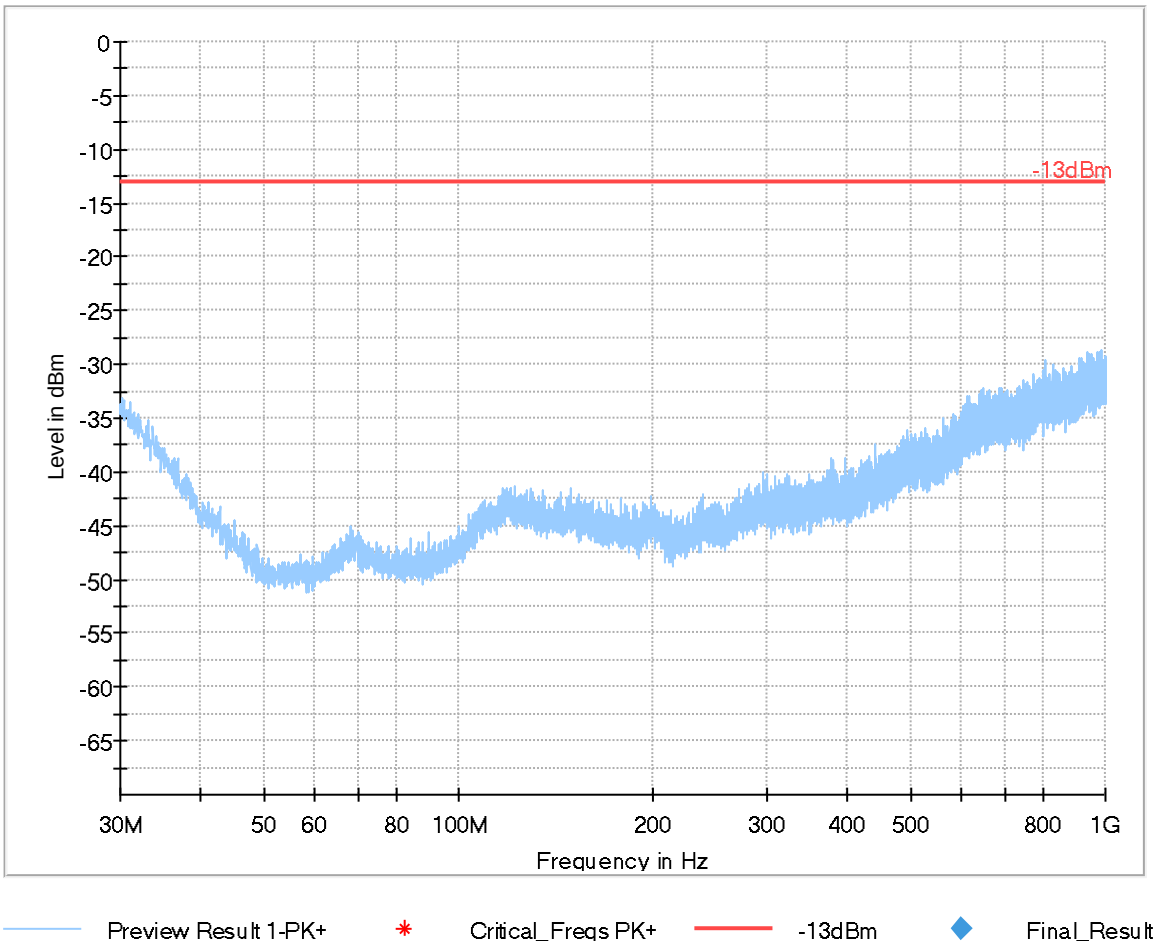
(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
3464.347333	-99.7	3:27:48 PM - 9/23/2019
3464.347333	-99.7	3:27:48 PM - 9/23/2019



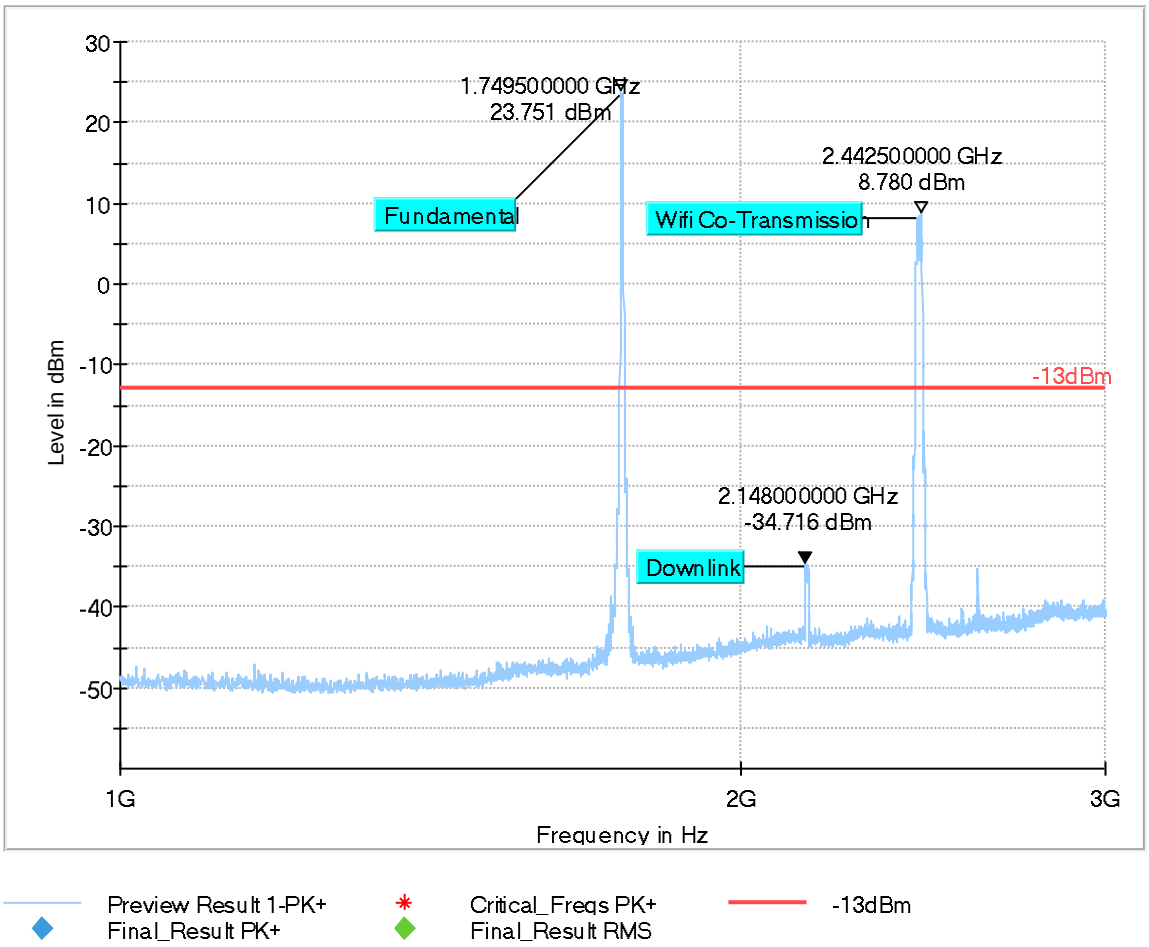
Plot # 71 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



Plot # 72 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 73 Radiated Emissions: 3 GHz - 18 GHz

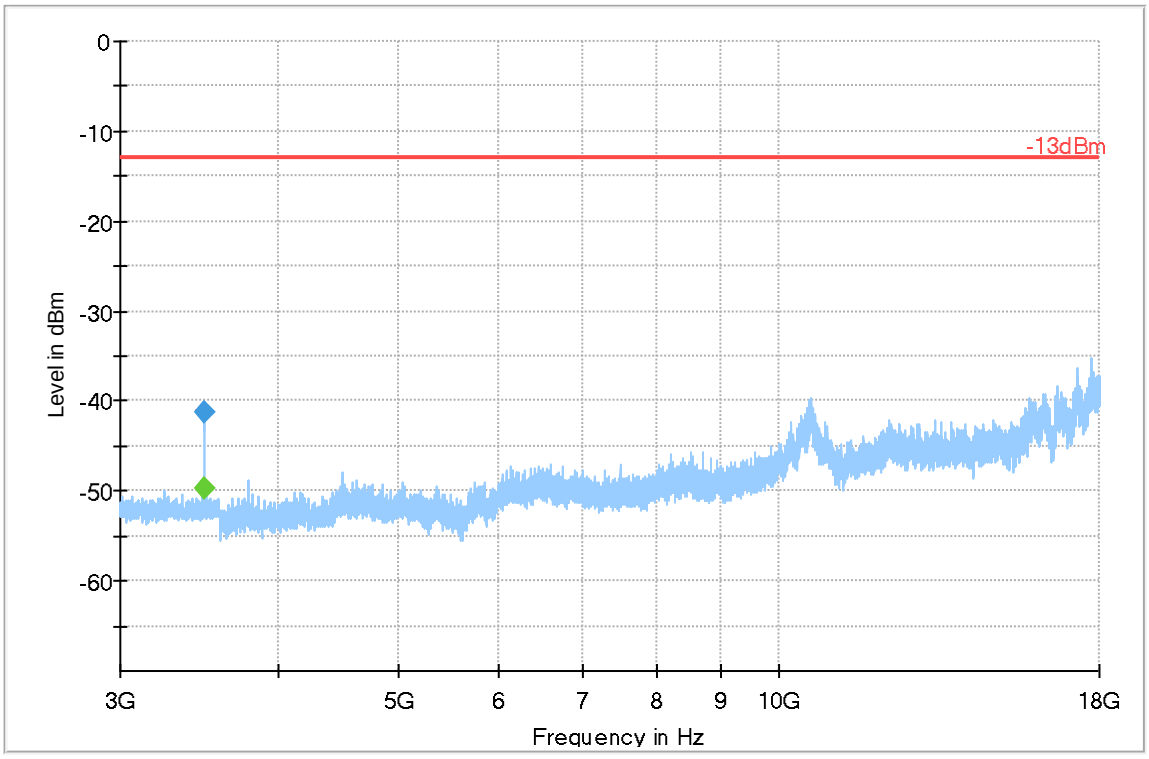
Channel: High

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3499.946167	---	-49.76	---	---	100.0	1000.000	159.0	H	134.0
3499.946167	-41.28	---	-13.00	28.28	100.0	1000.000	159.0	H	134.0

(continuation of the "Final_Result" table from column 15 ...)

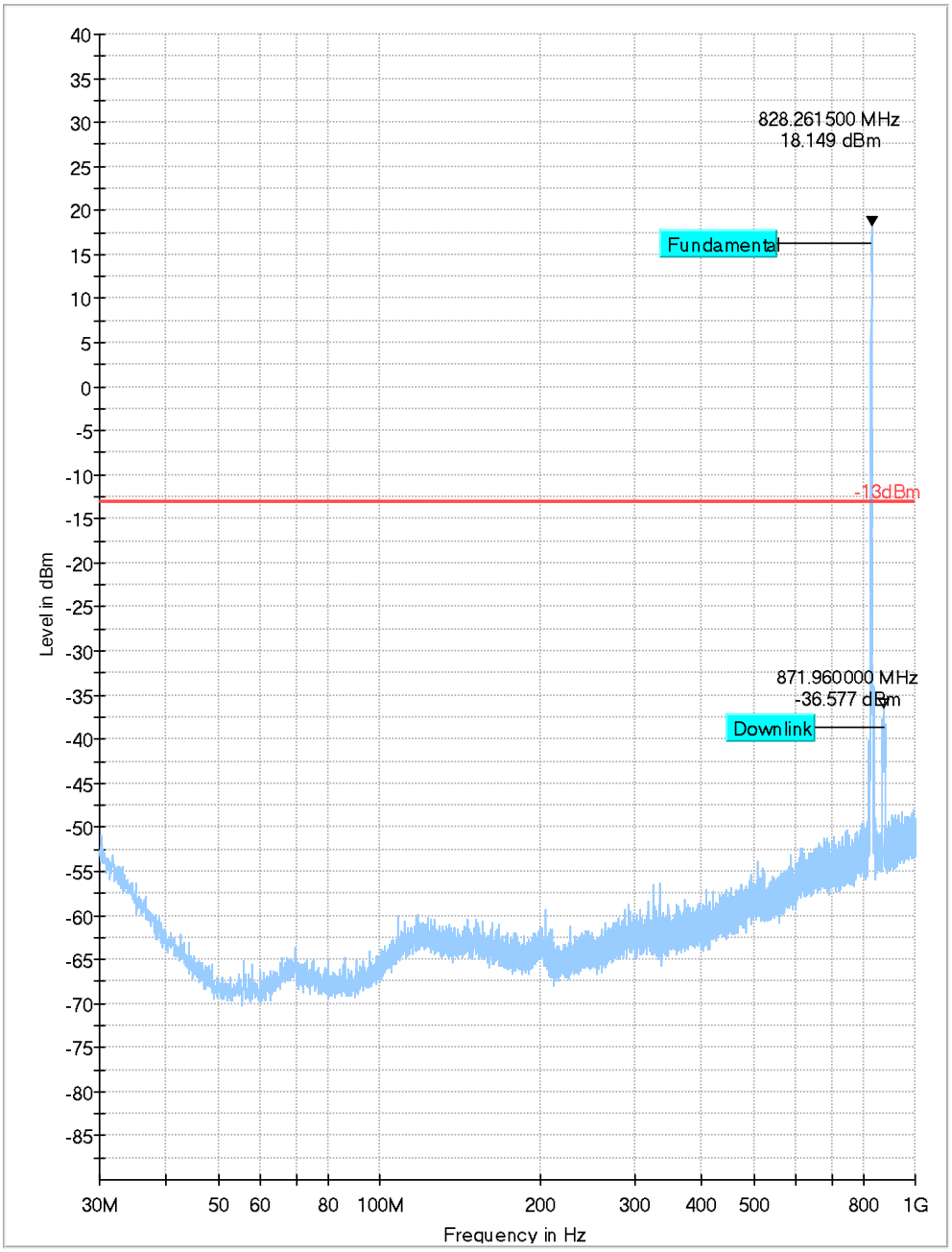
Frequency (MHz)	Corr. (dB)	Comment
3499.946167	-99.6	3:10:17 PM - 9/23/2019
3499.946167	-99.6	3:10:17 PM - 9/23/2019



LTE Band 5

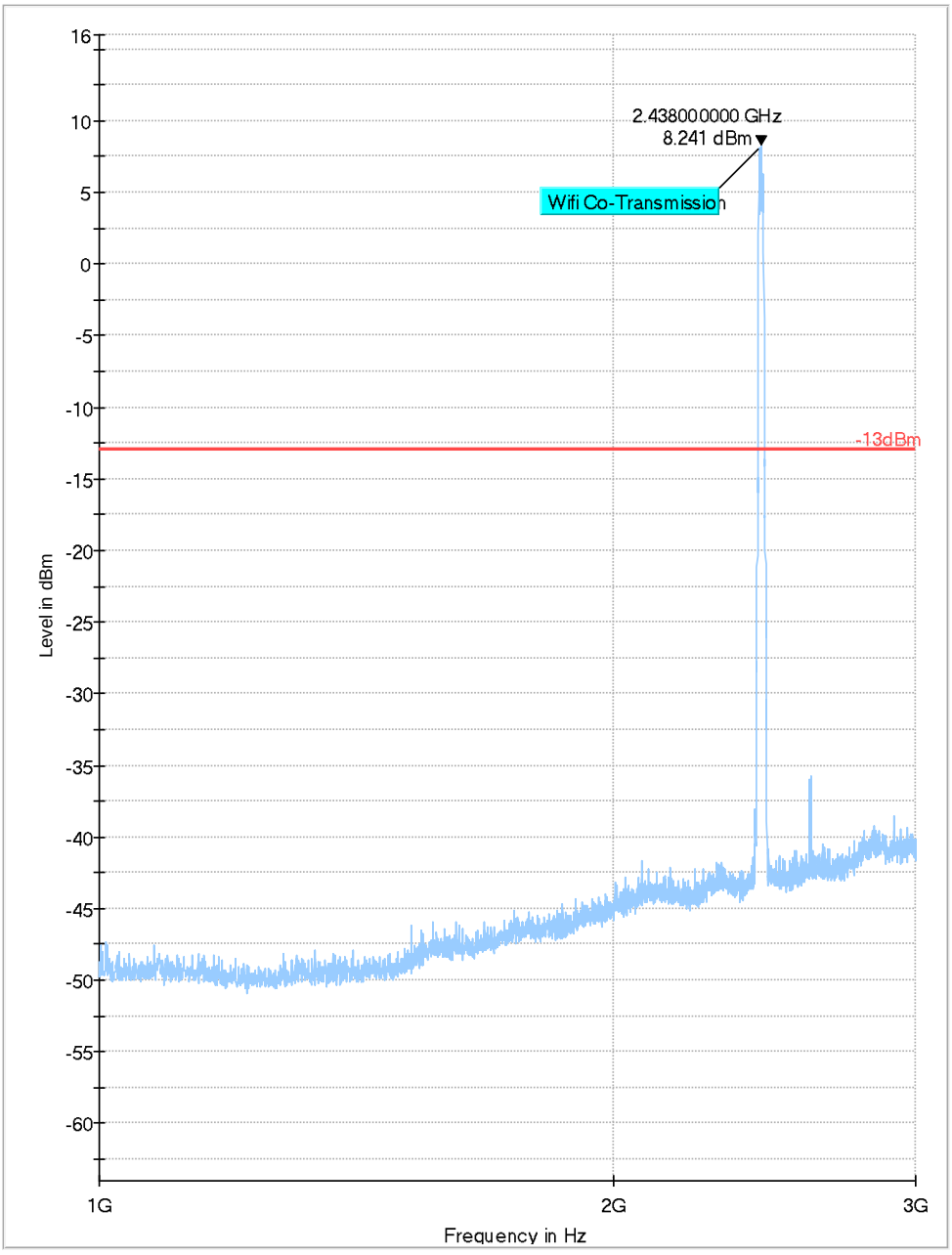
Plot # 74 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



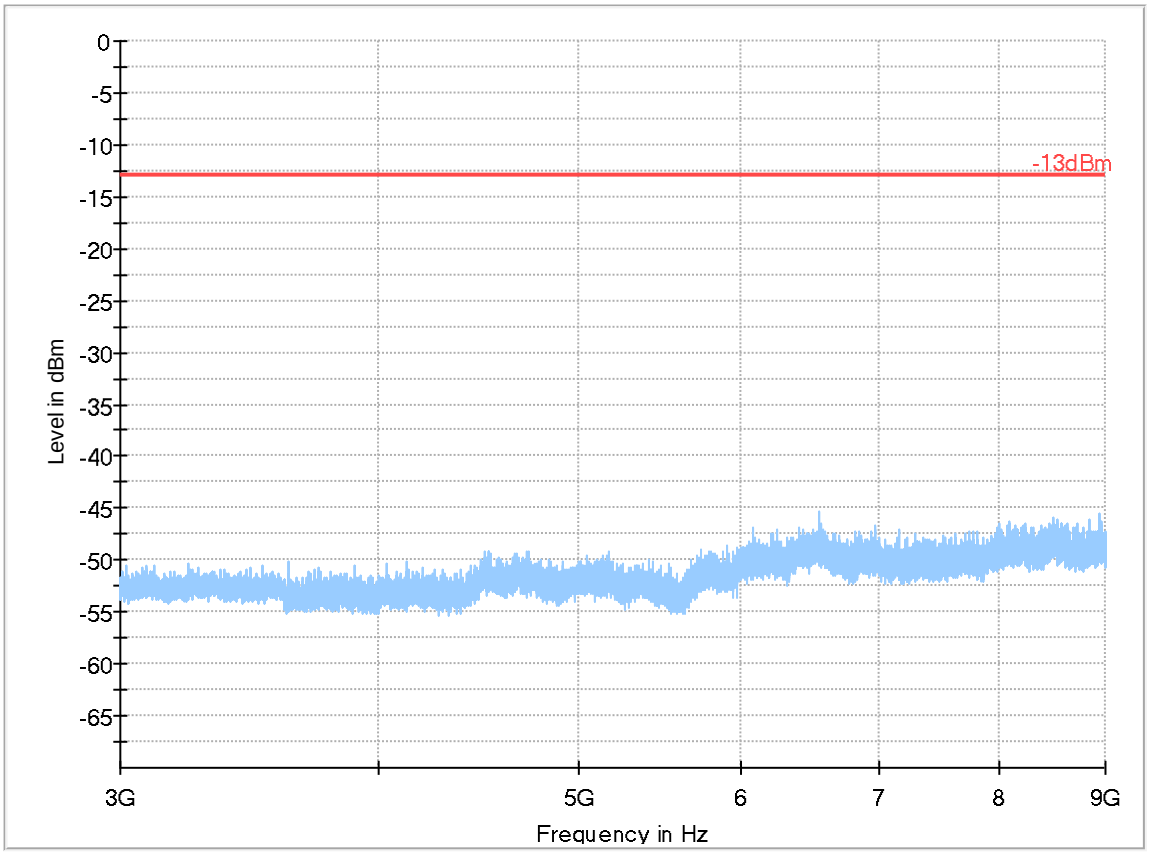
Plot # 75 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



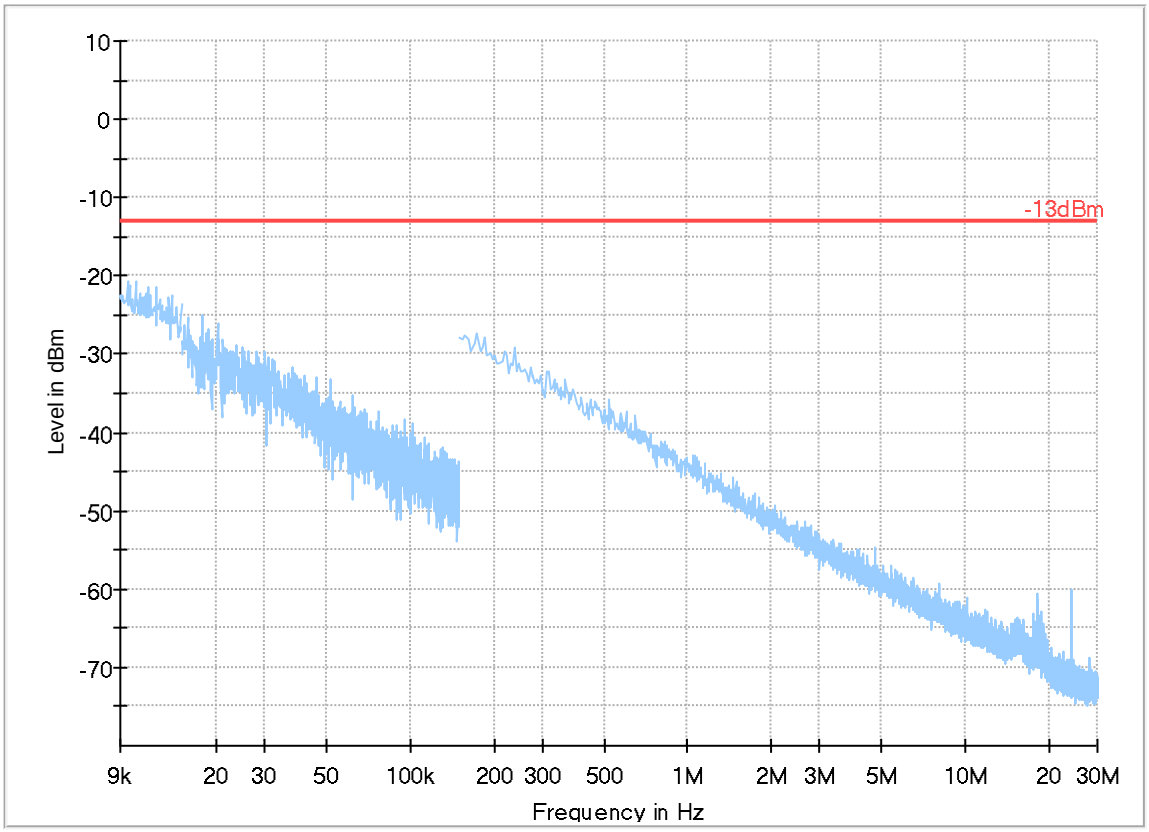
Plot # 76 Radiated Emissions: 3 GHz - 9 GHz

Channel: Low



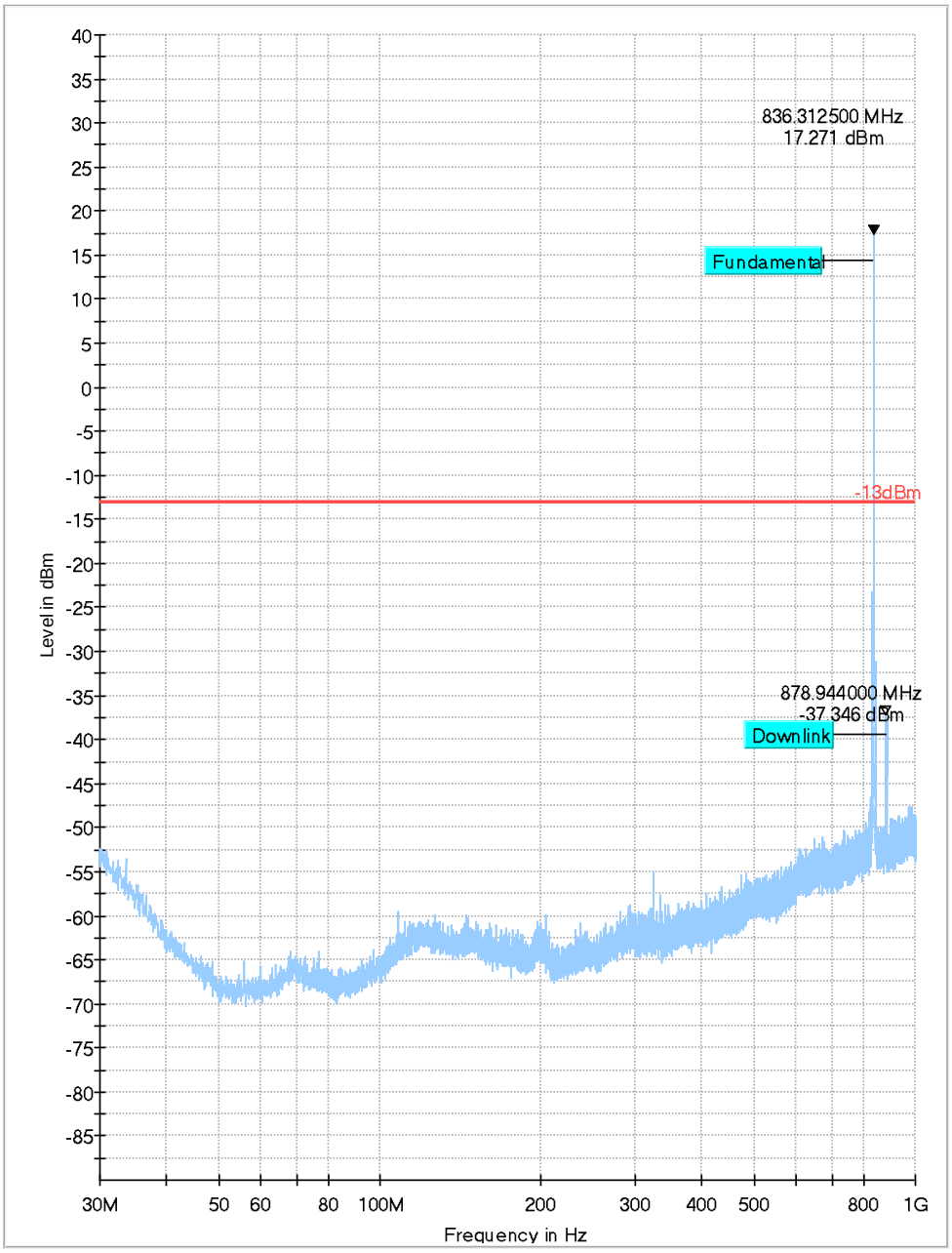
Plot # 77 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



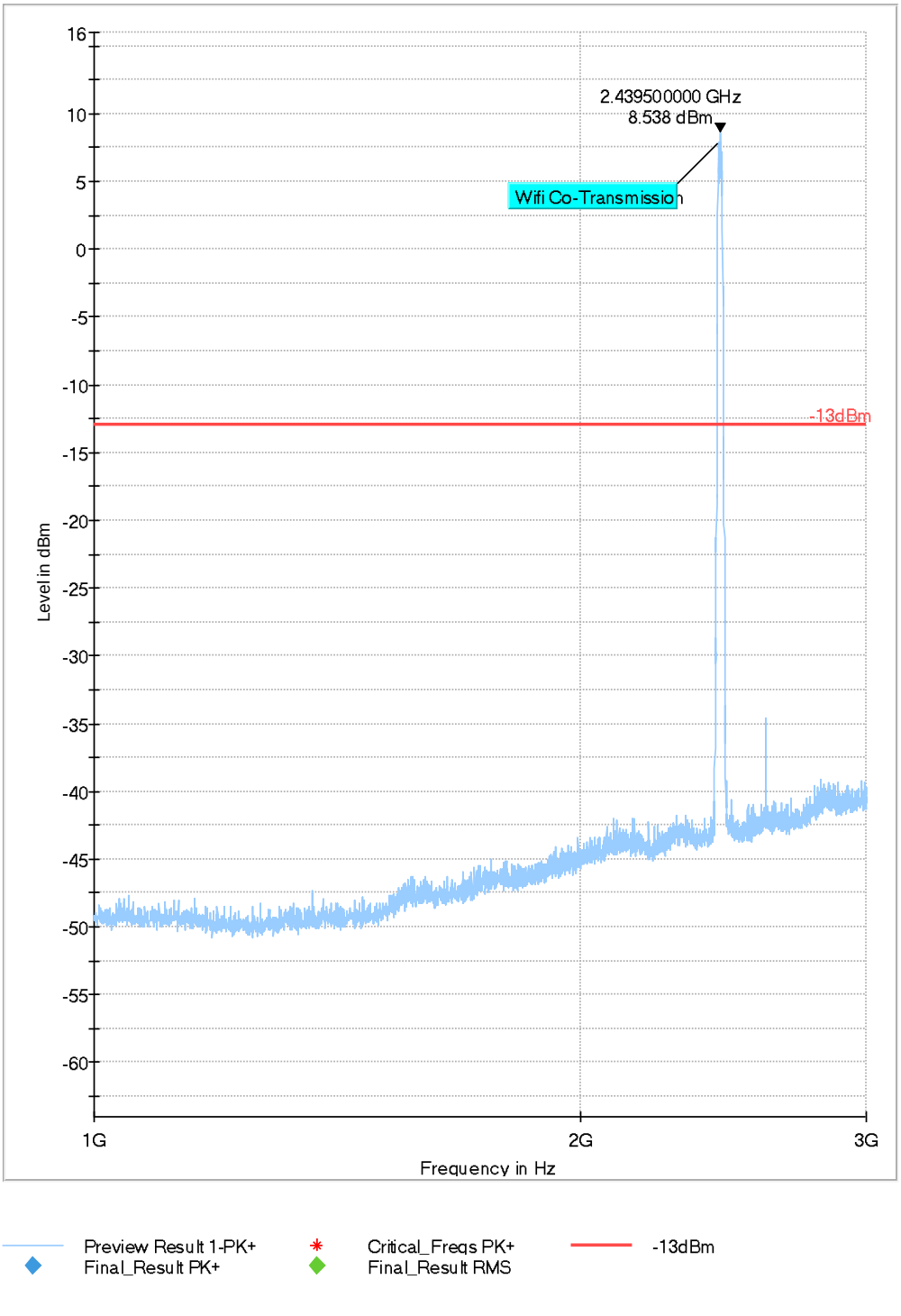
Plot # 78 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



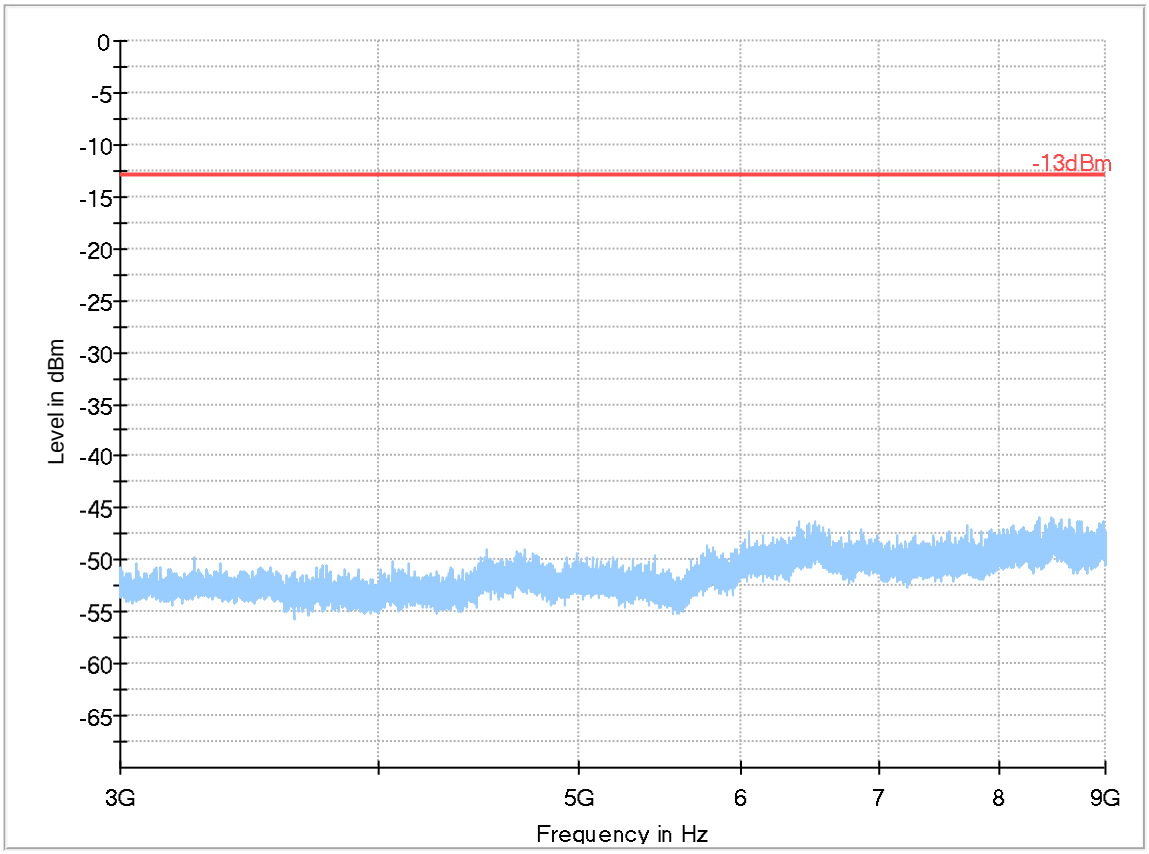
Plot # 79 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



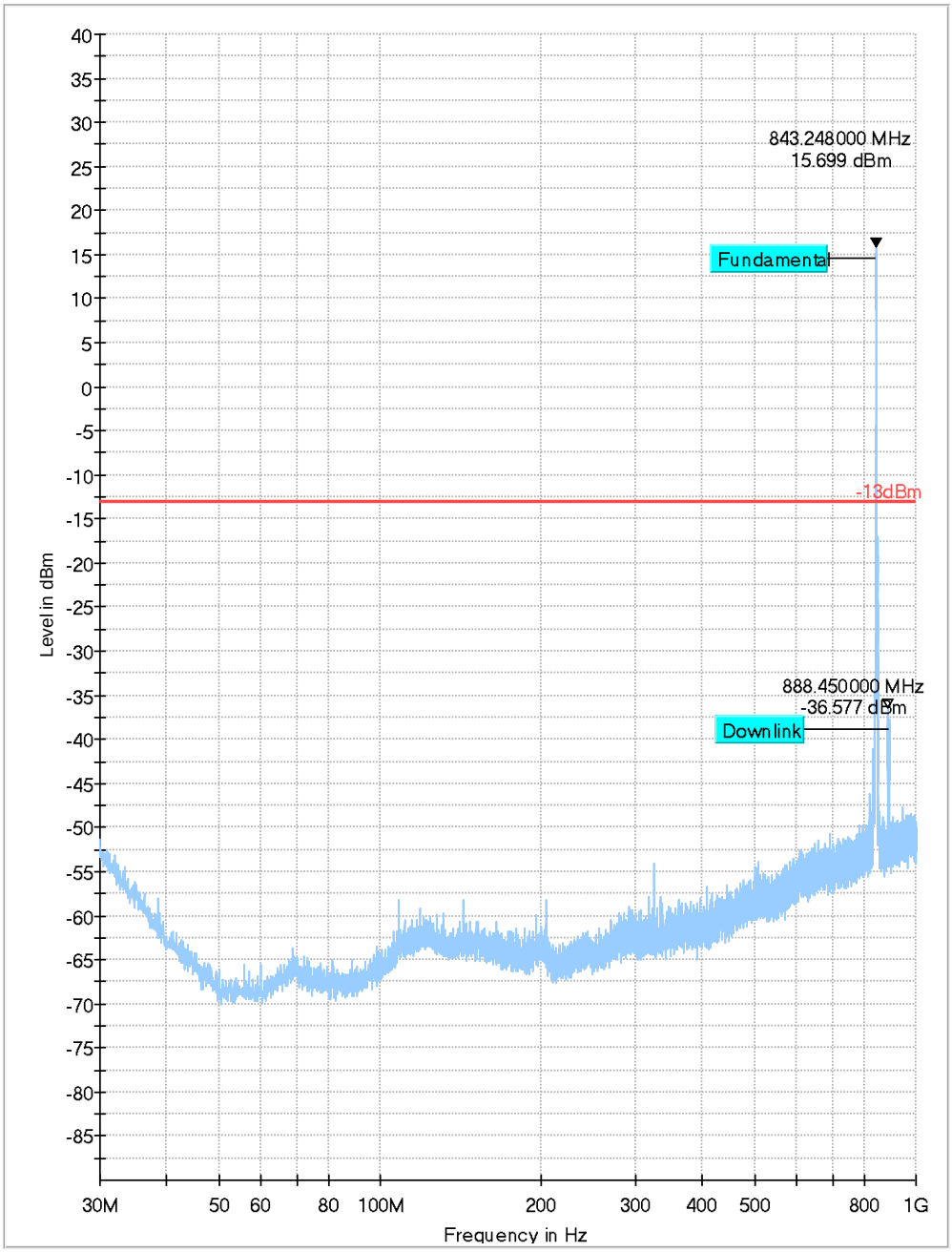
Plot # 80 Radiated Emissions: 3 GHz – 9 GHz

Channel: Mid



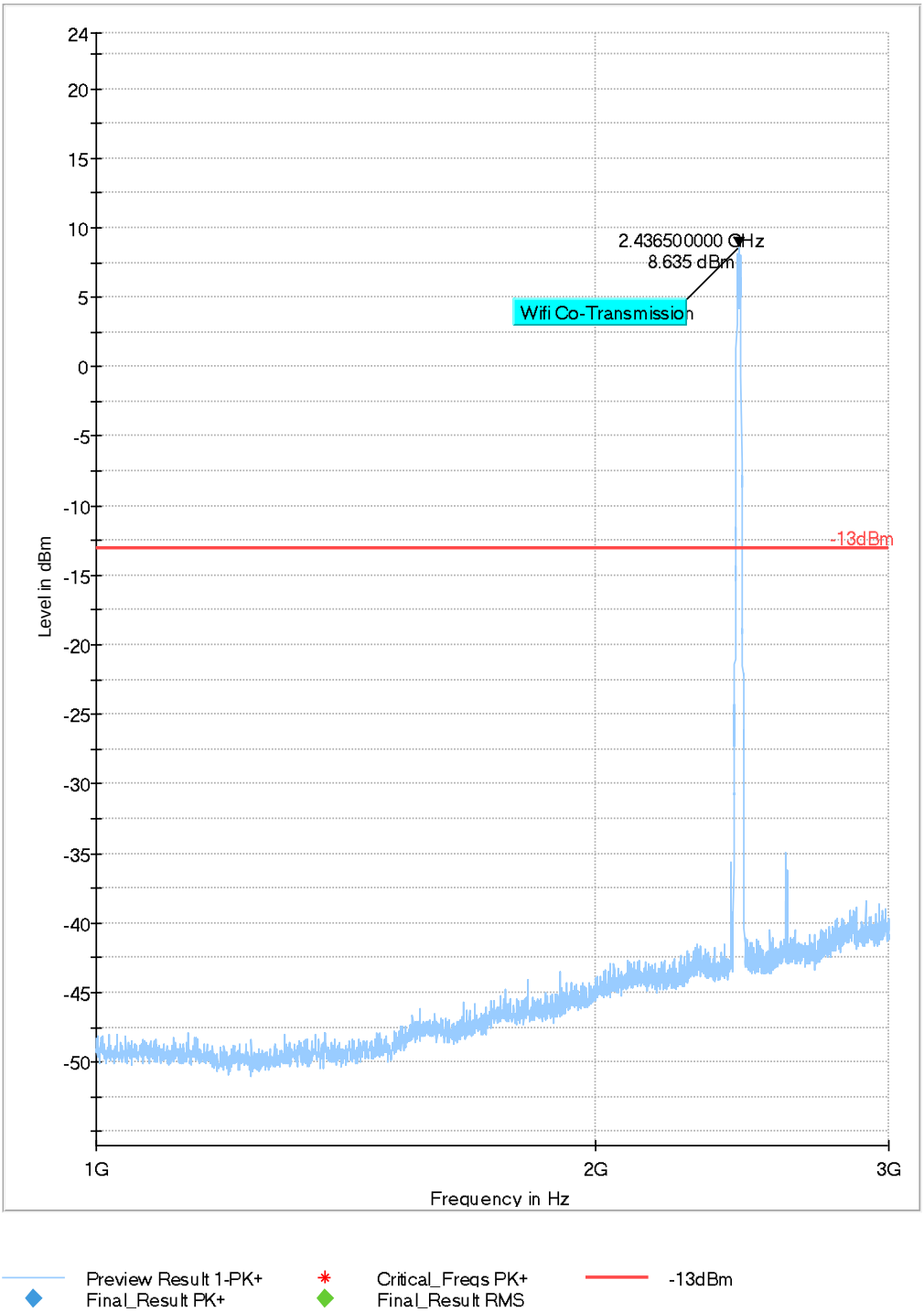
Plot # 81 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



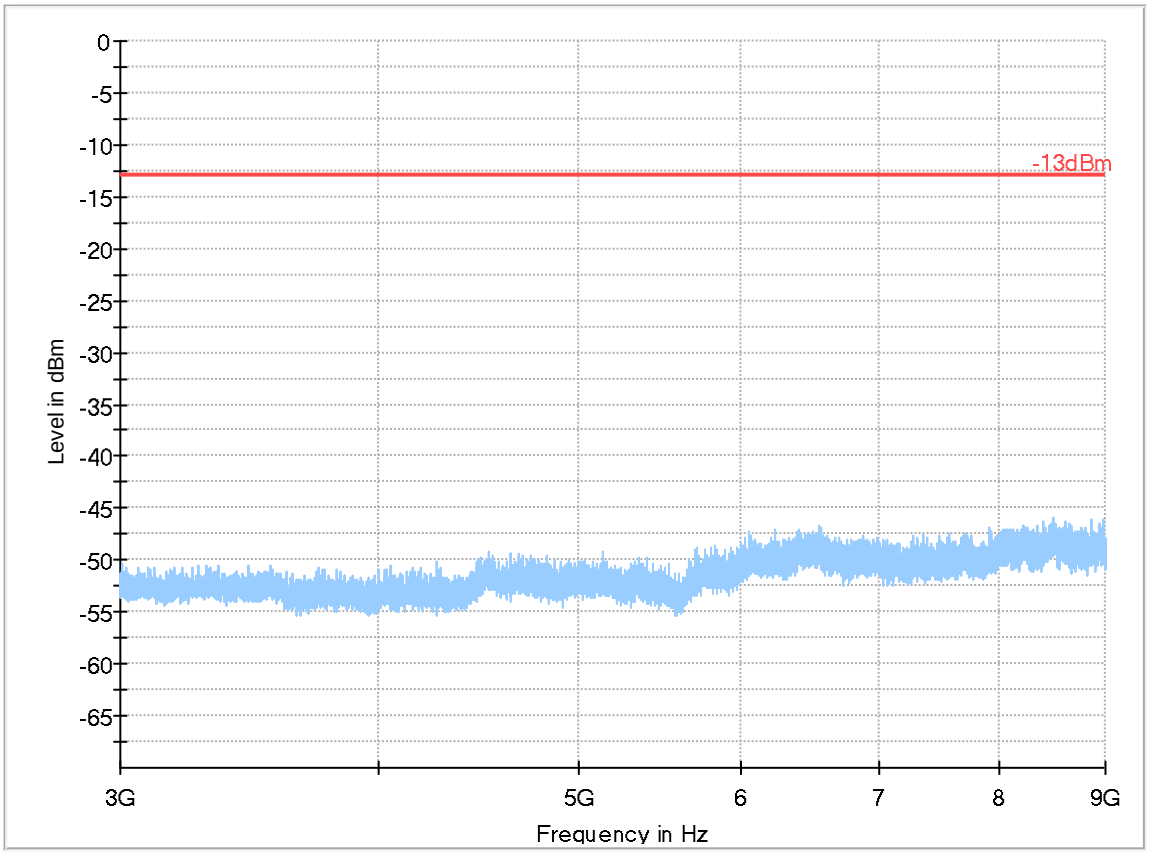
Plot # 82 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 83 Radiated Emissions: 3 GHz - 9 GHz

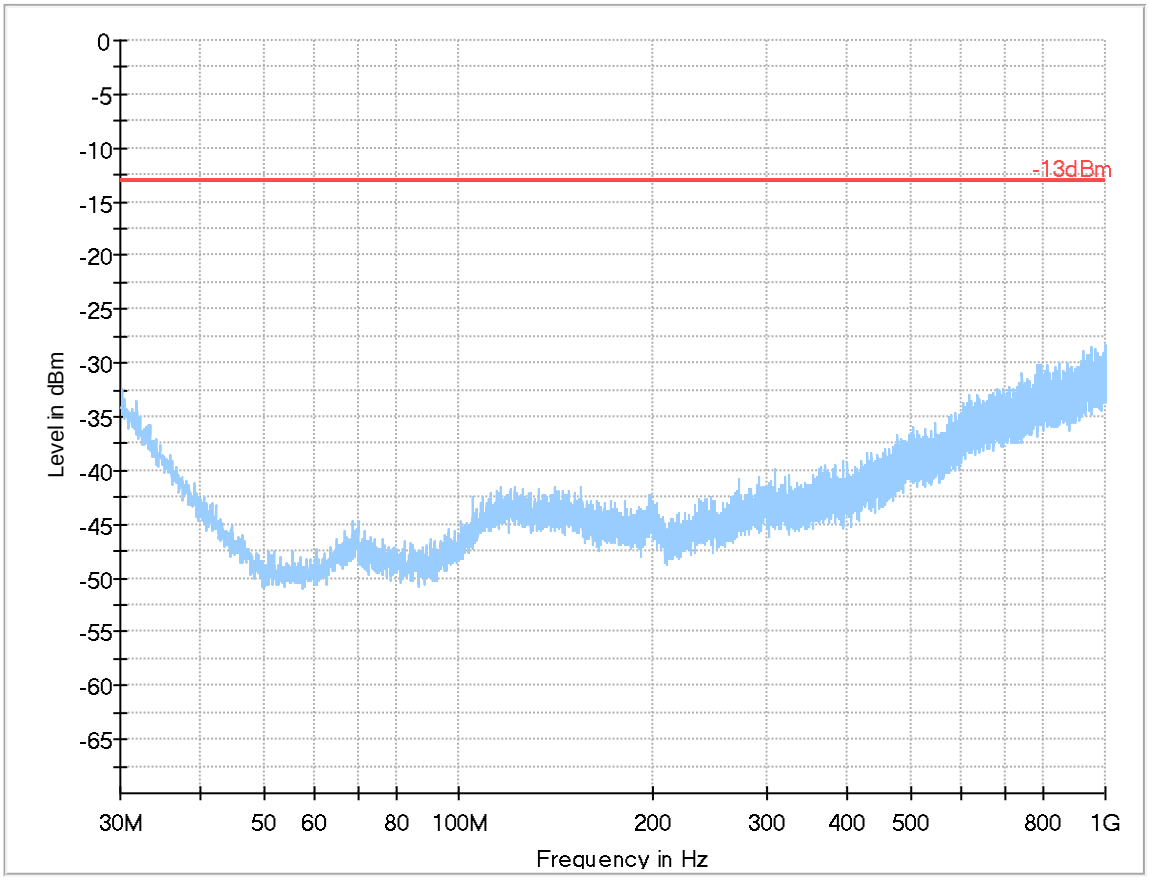
Channel: High



LTE Band 7

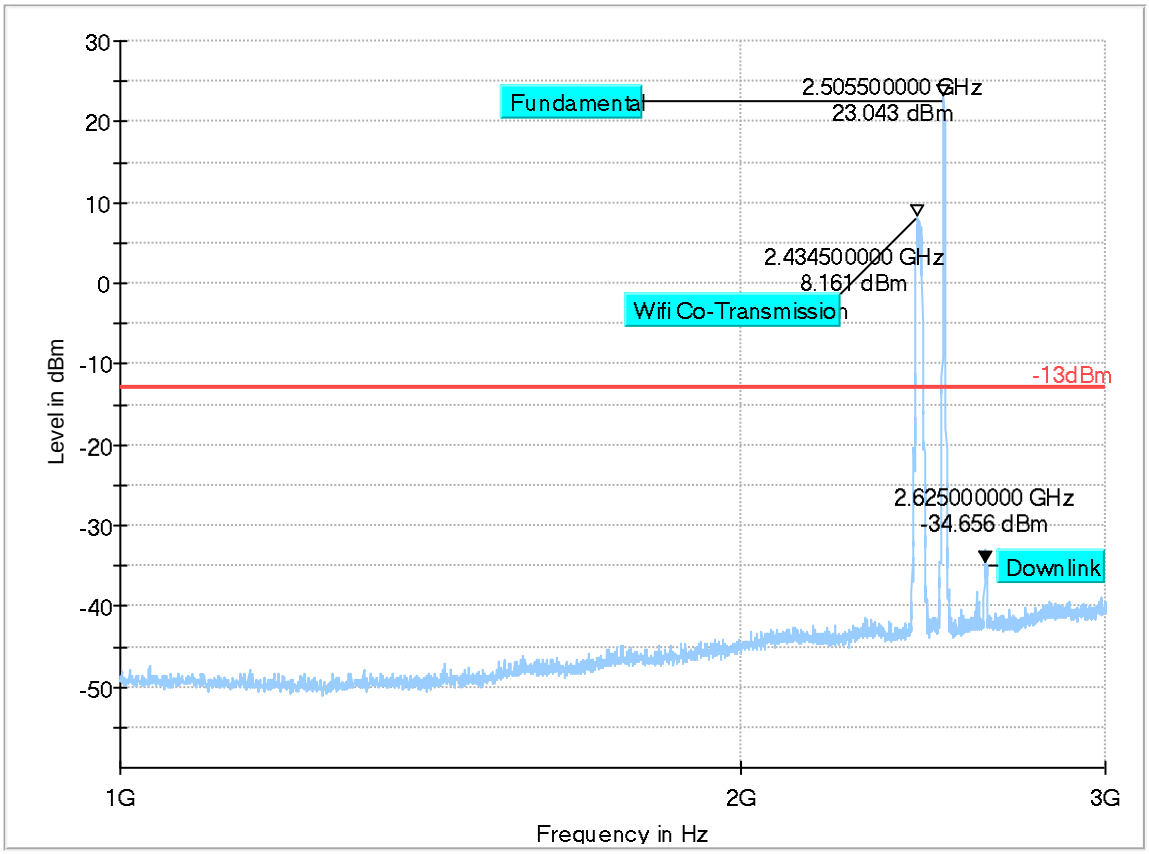
Plot # 84 Radiated Emissions: 30 MHz - 1 GHz

Channel: Low



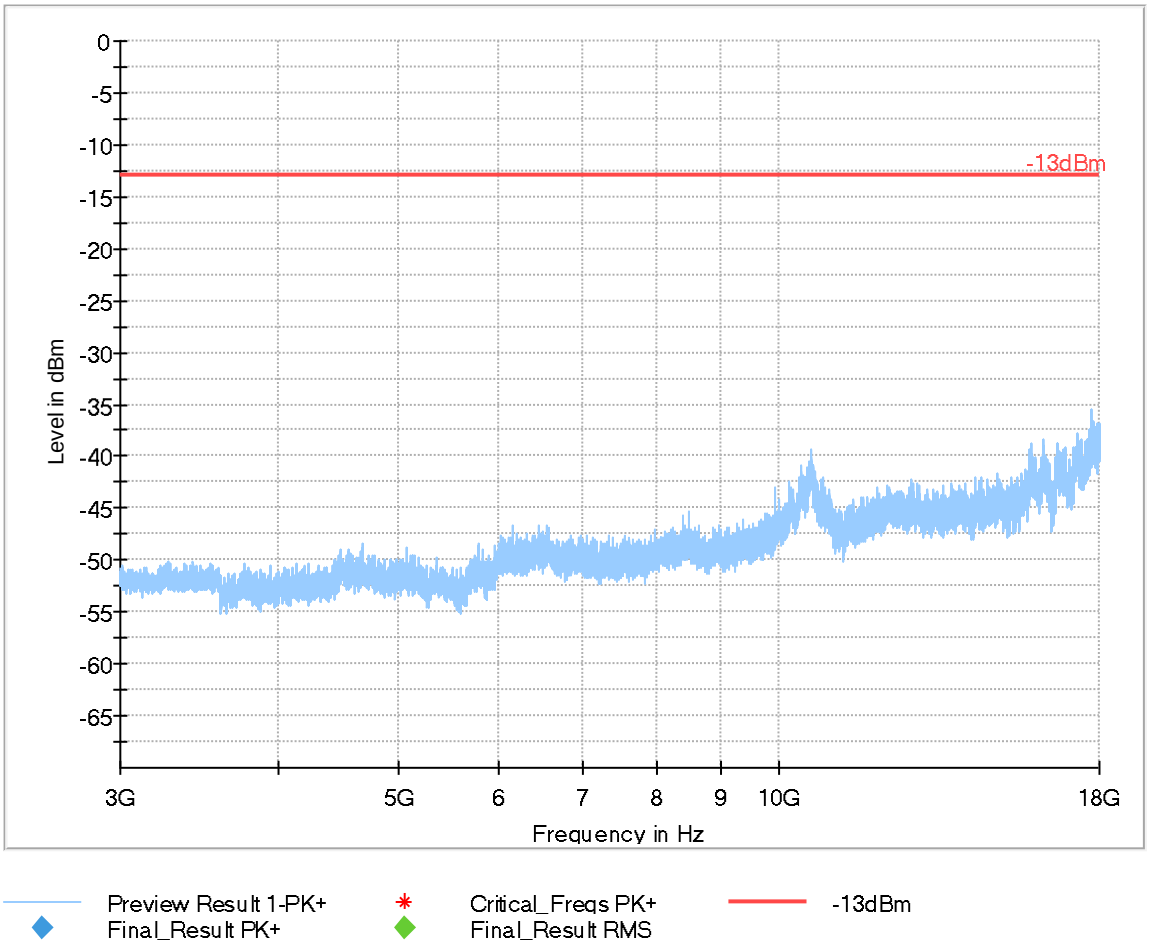
Plot # 85 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



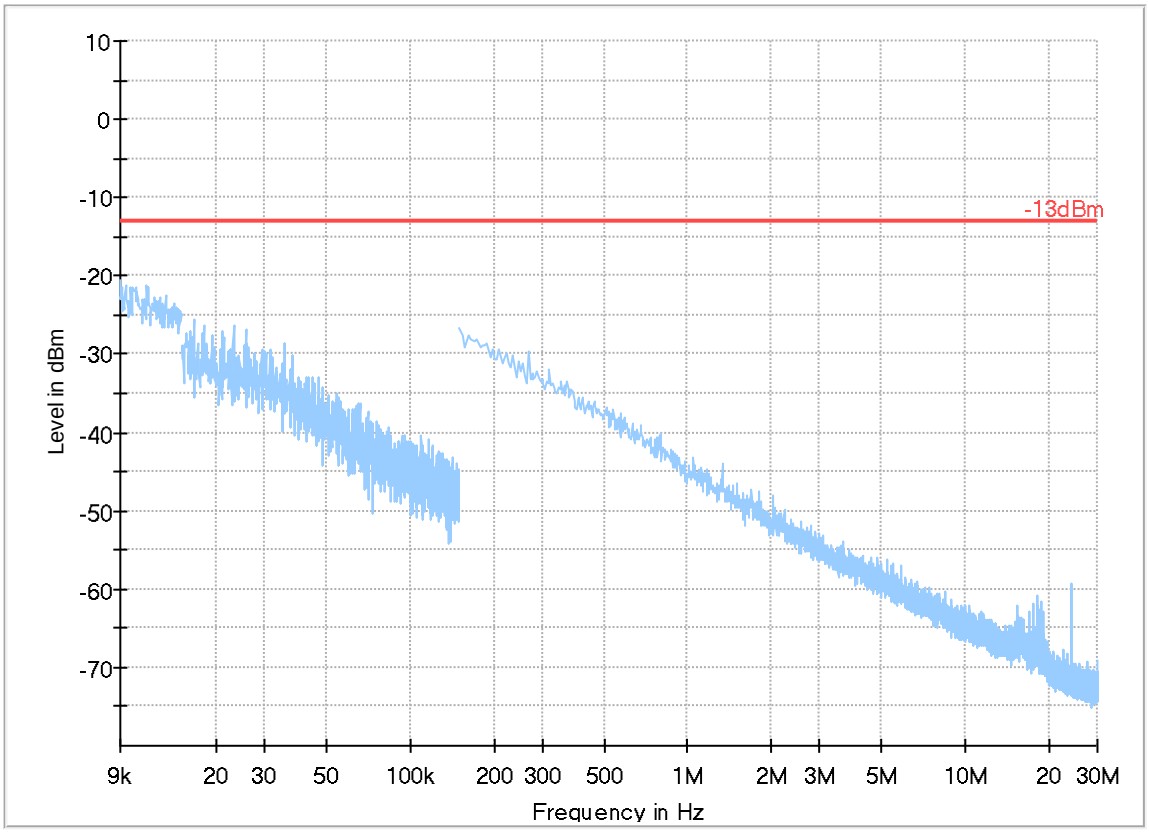
Plot # 86 Radiated Emissions: 3 GHz - 18 GHz

Channel: Low



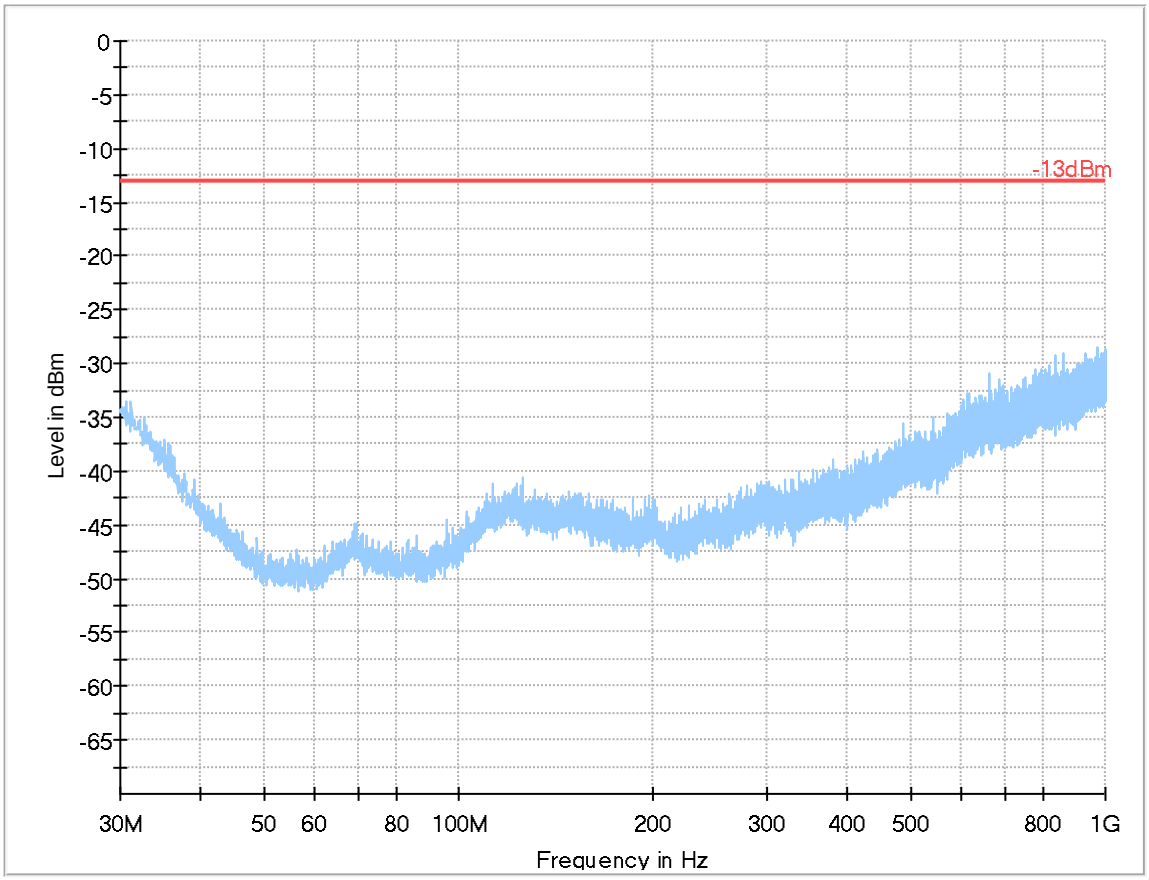
Plot # 87 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



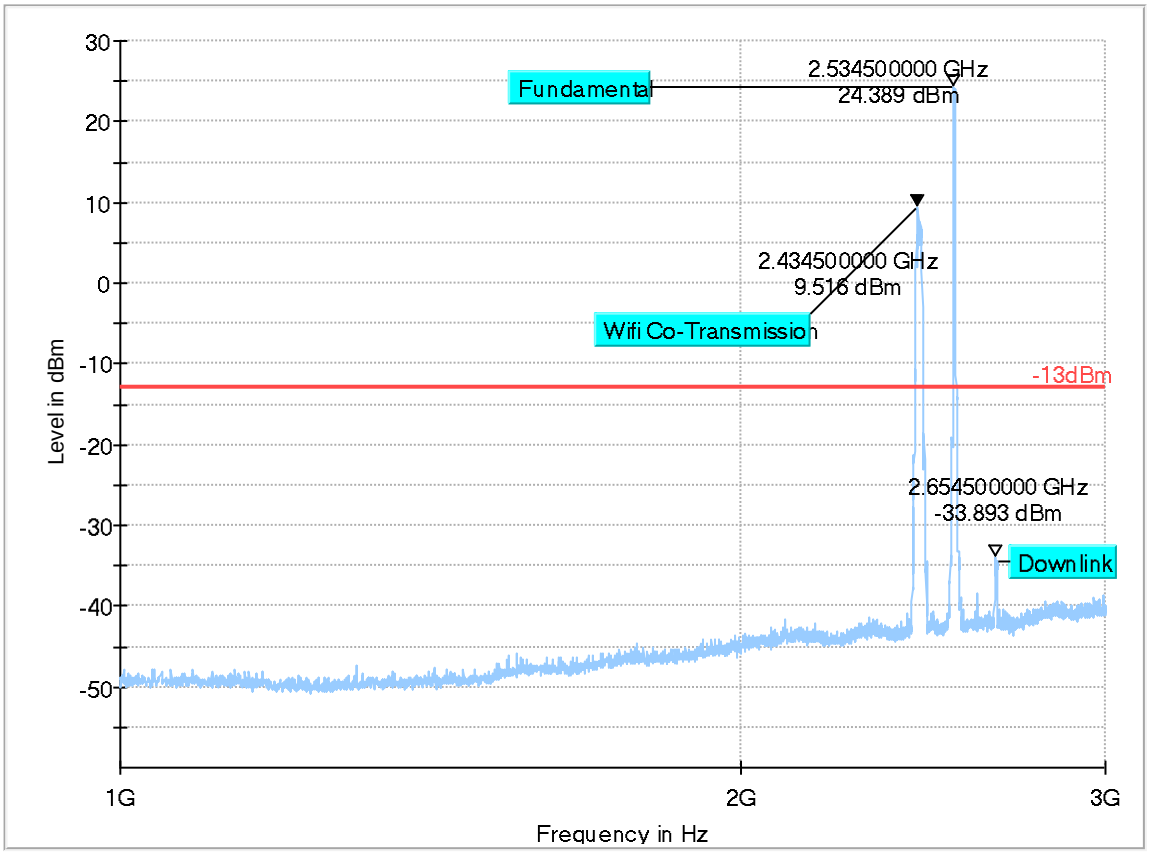
Plot # 88 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



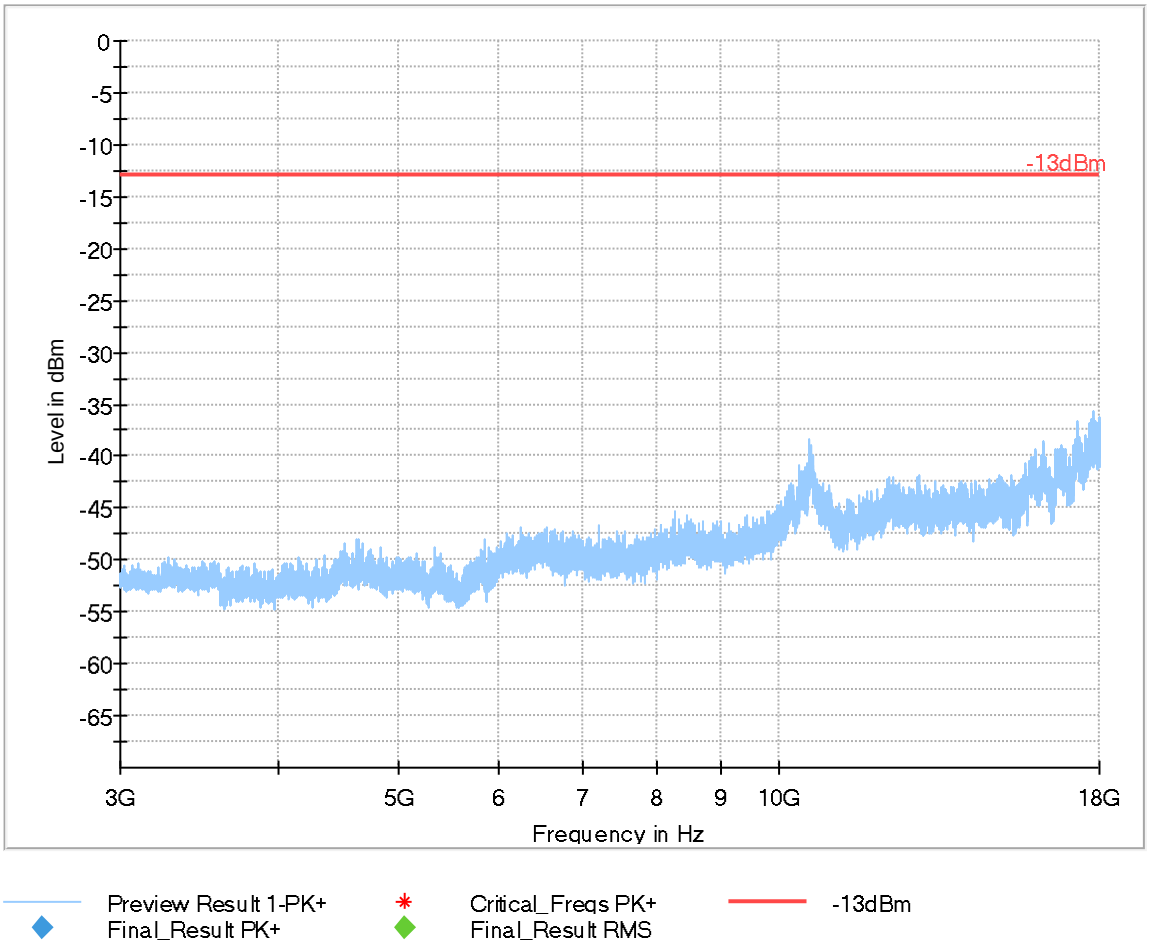
Plot # 89 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



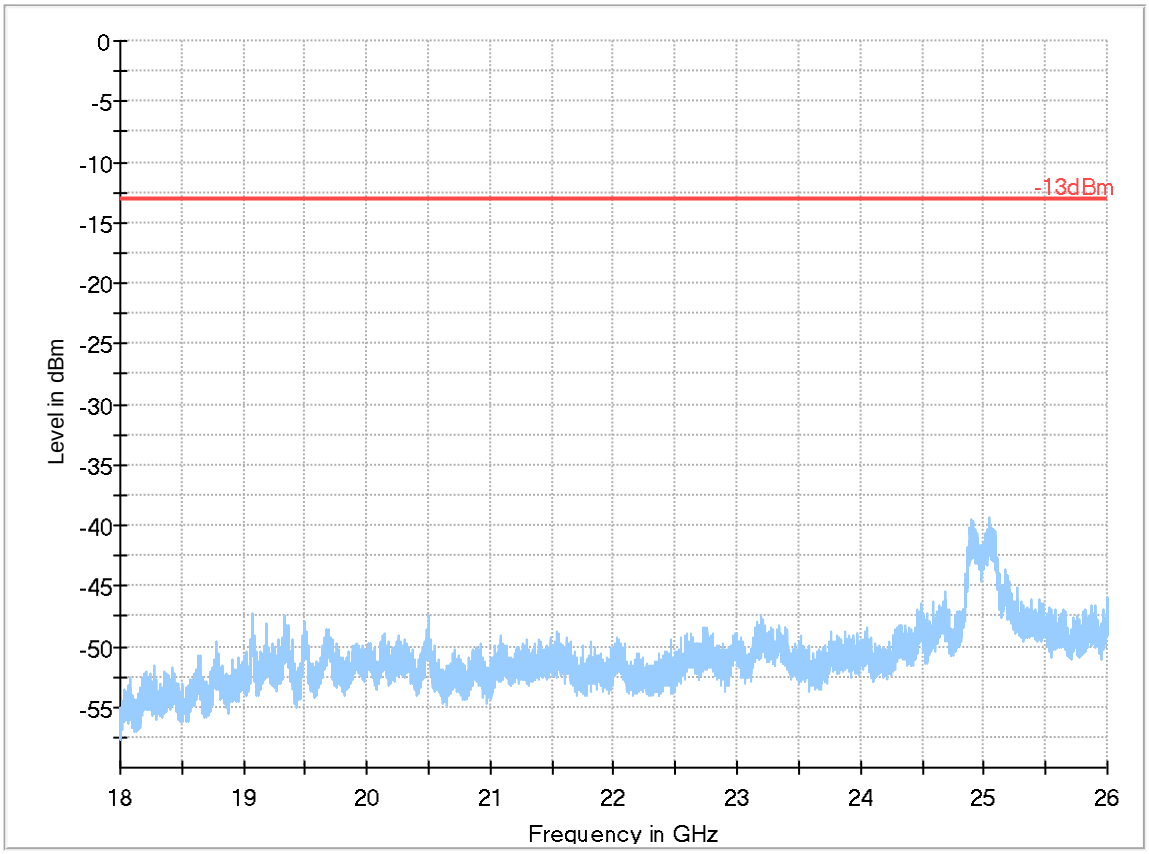
Plot # 90 Radiated Emissions: 3 GHz – 18 GHz

Channel: Mid



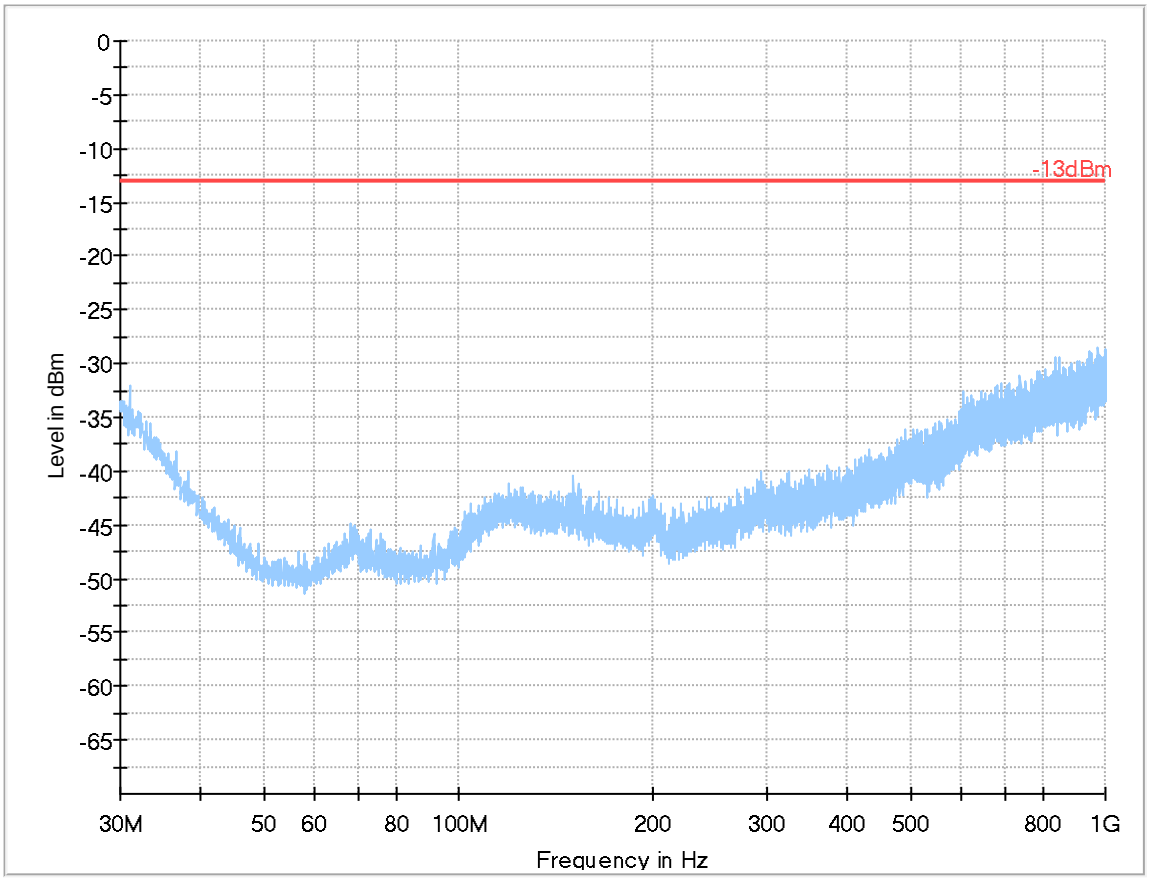
Plot # 91 Radiated Emissions: 18 GHz – 26 GHz

Channel: Mid



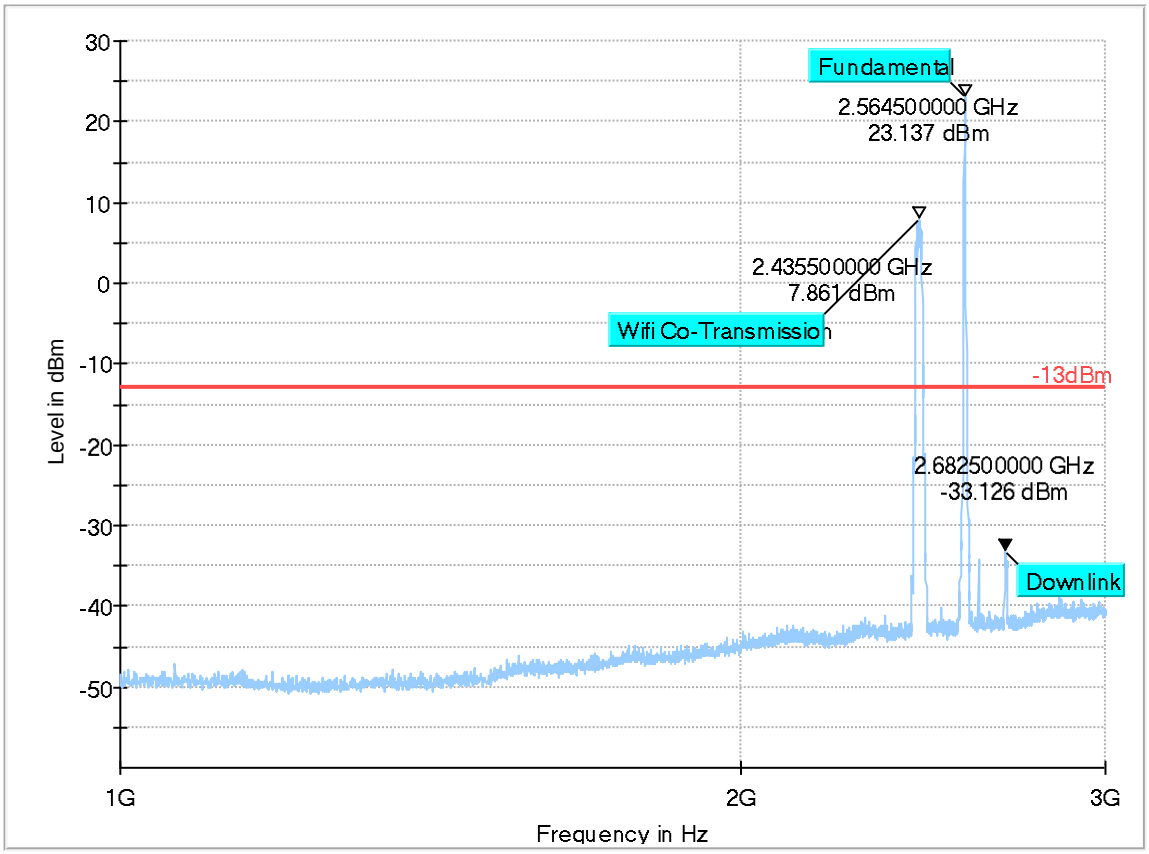
Plot # 92 Radiated Emissions: 30 MHz - 1 GHz

Channel: High



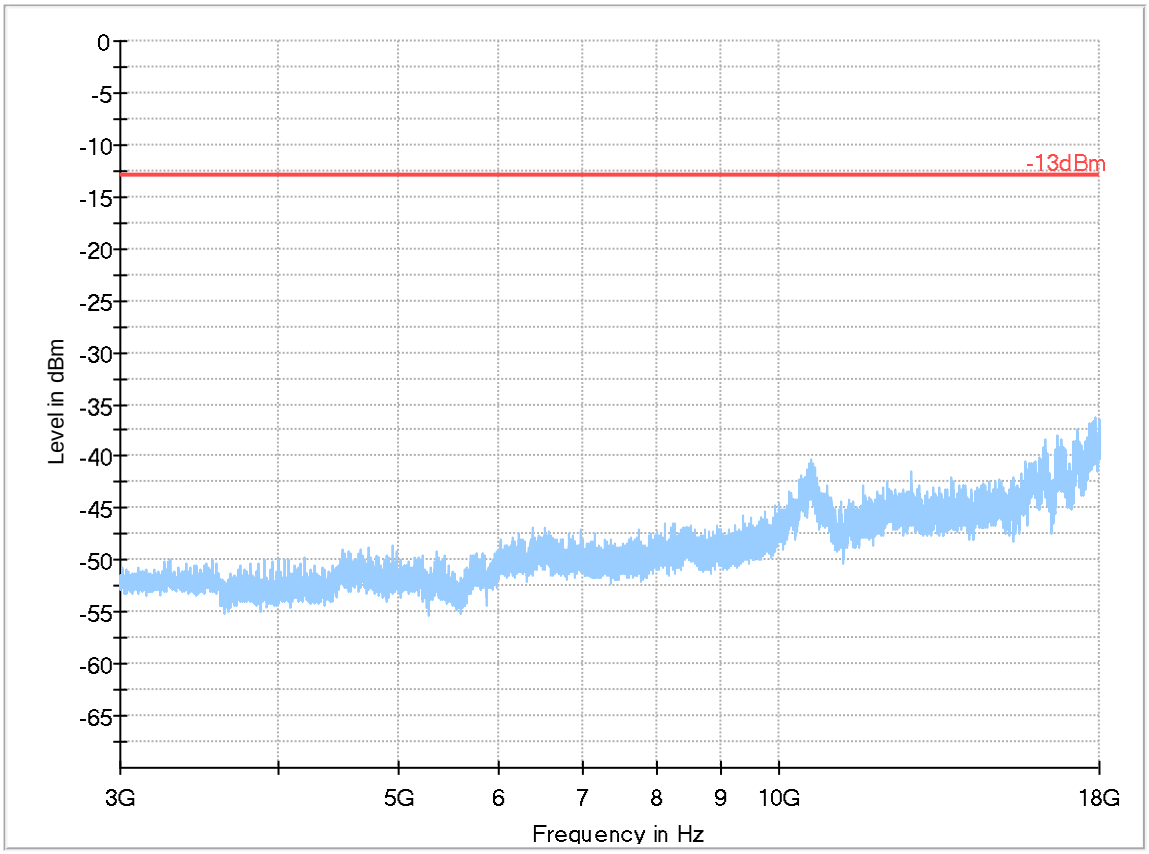
Plot # 93 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



Plot # 94 Radiated Emissions: 3 GHz - 18 GHz

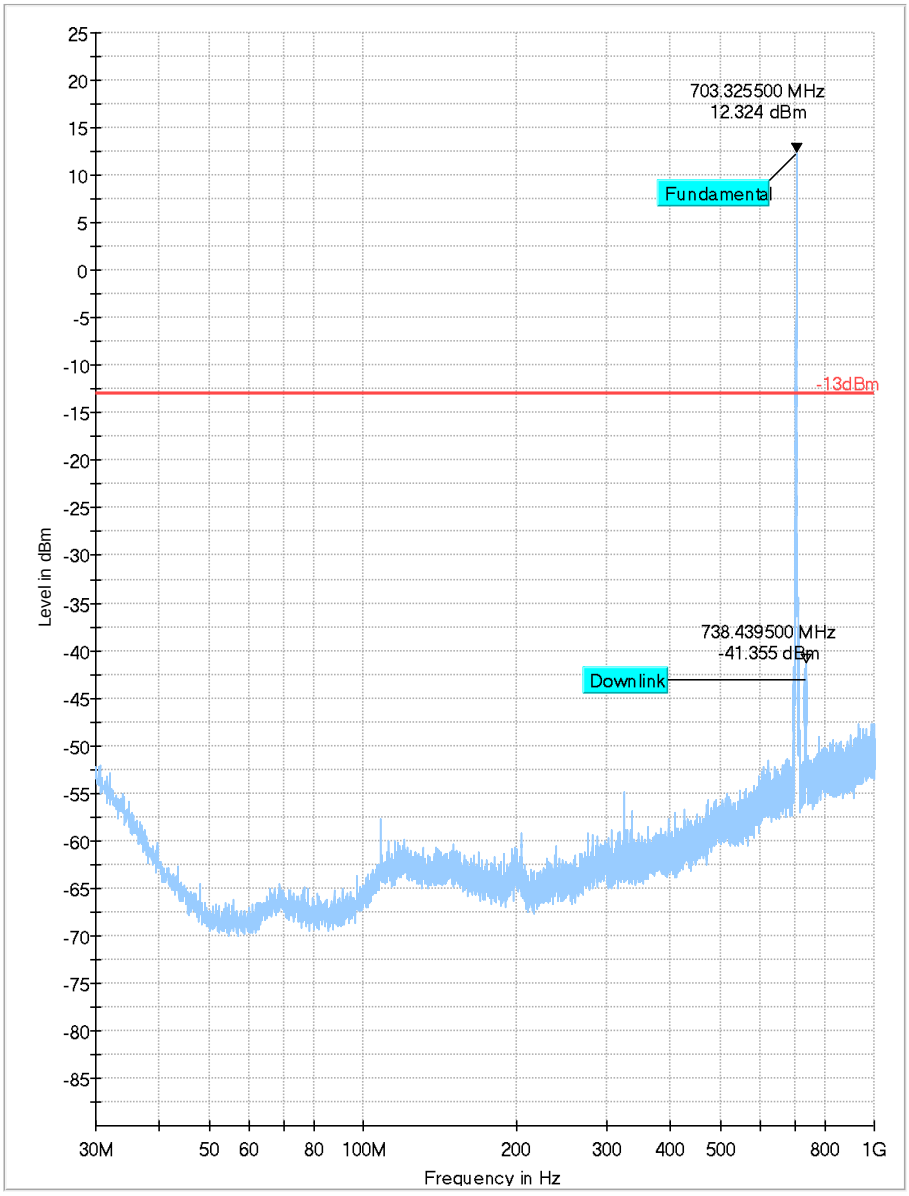
Channel: High



LTE Band 12

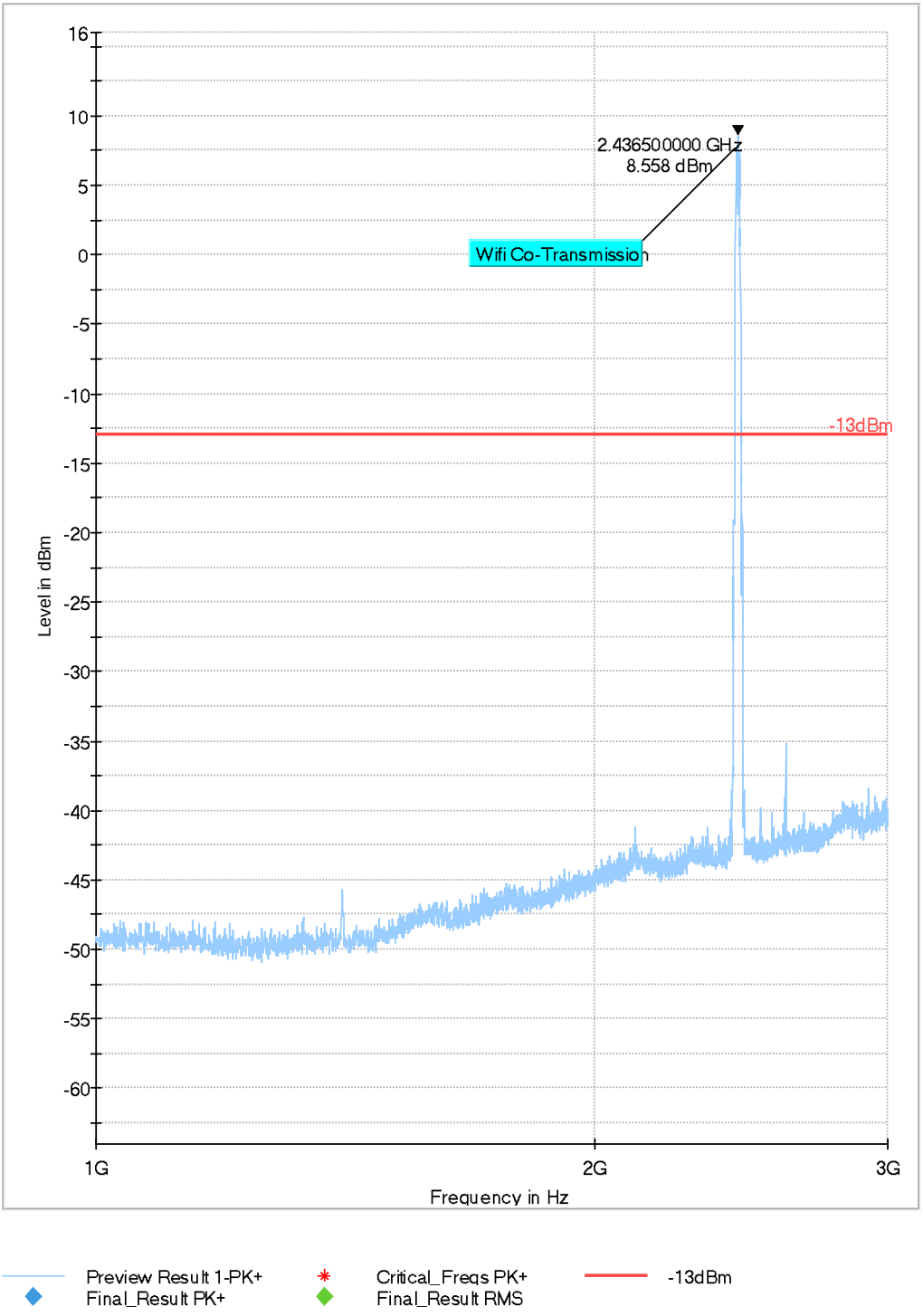
Plot # 95 Radiated Emissions: 30 MHz – 1GHz

Channel: Low



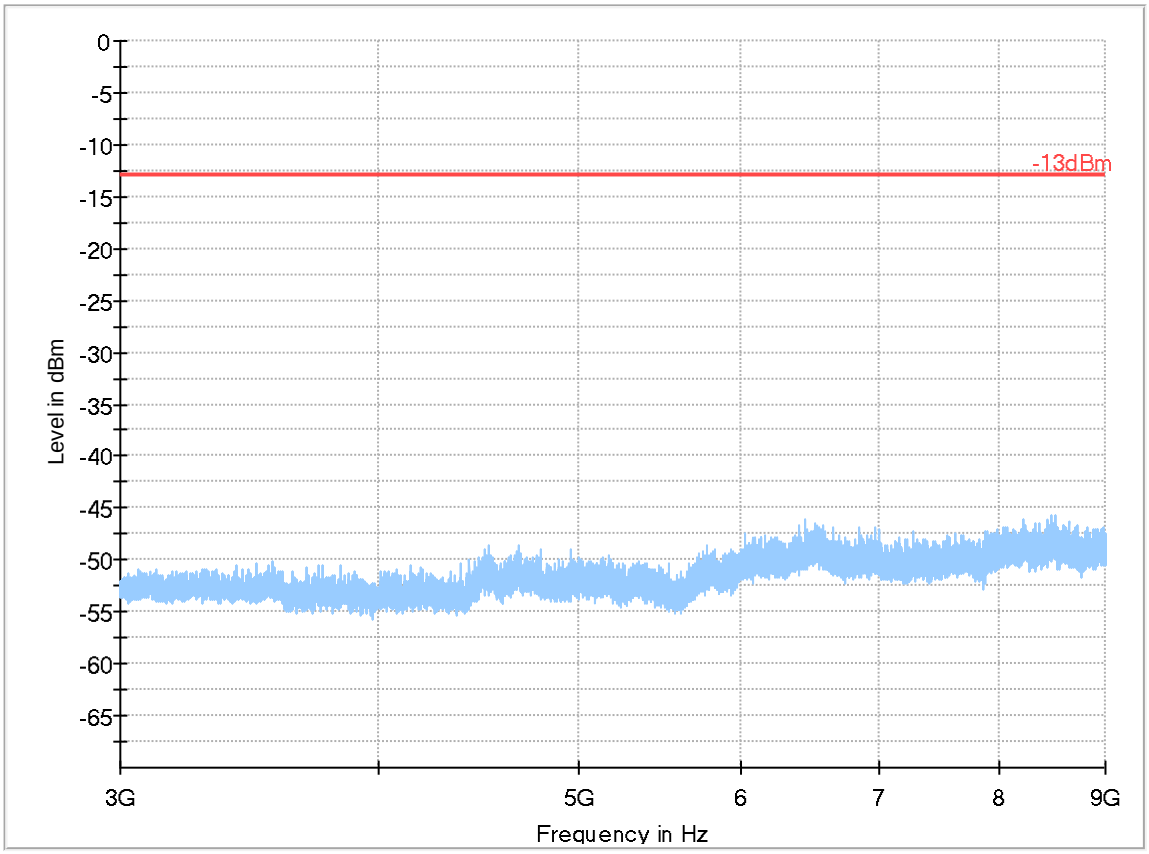
Plot # 96 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



Plot # 97 Radiated Emissions: 3 GHz – 9 GHz

Channel: Low



Plot # 98 Radiated Emissions: 9 kHz - 30 MHz

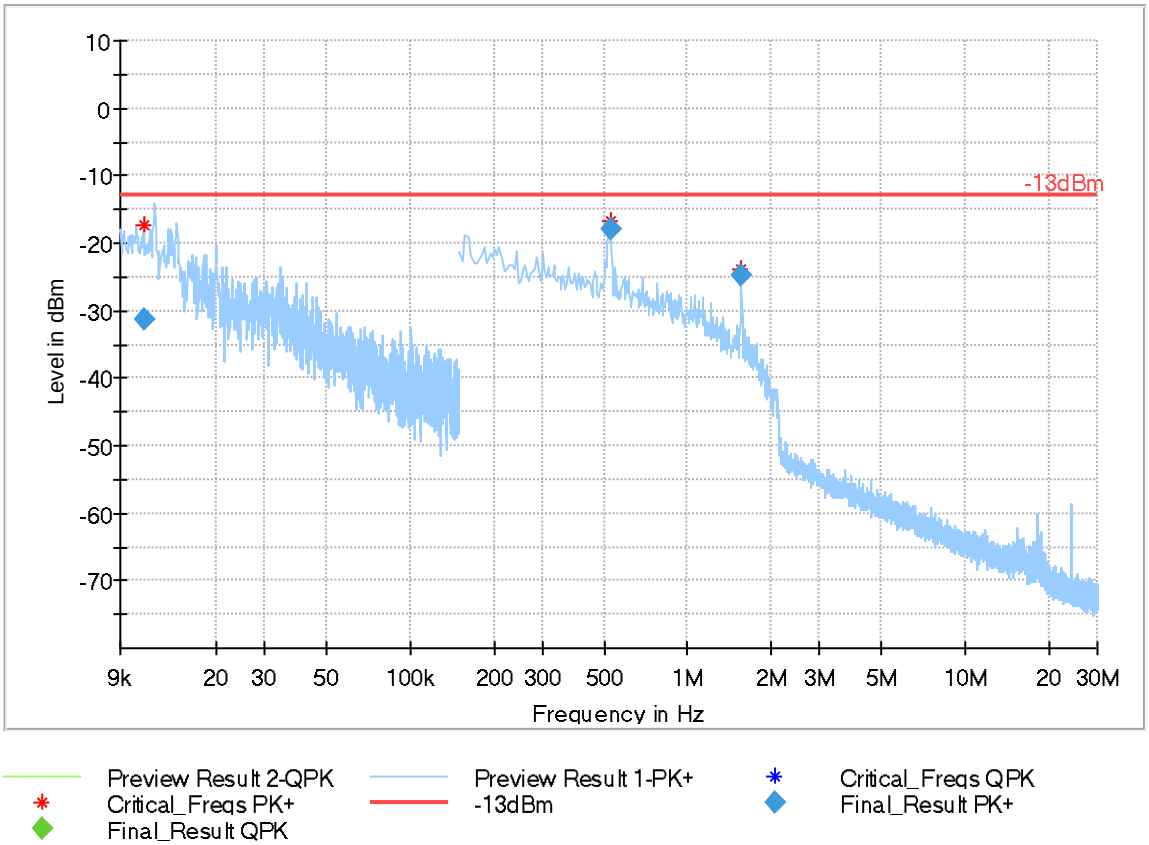
Channel: Mid

Final_Result

Frequency (MHz)	MaxPeak (dBm)	QuasiPeak (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.011000	-31.37	---	-13.00	18.37	2.0	0.200	140.0	H	297.0
0.525000	-17.85	---	-13.00	4.85	2.0	9.000	152.0	H	-61.0
1.561000	-24.62	---	-13.00	11.62	2.0	9.000	152.0	H	-64.0

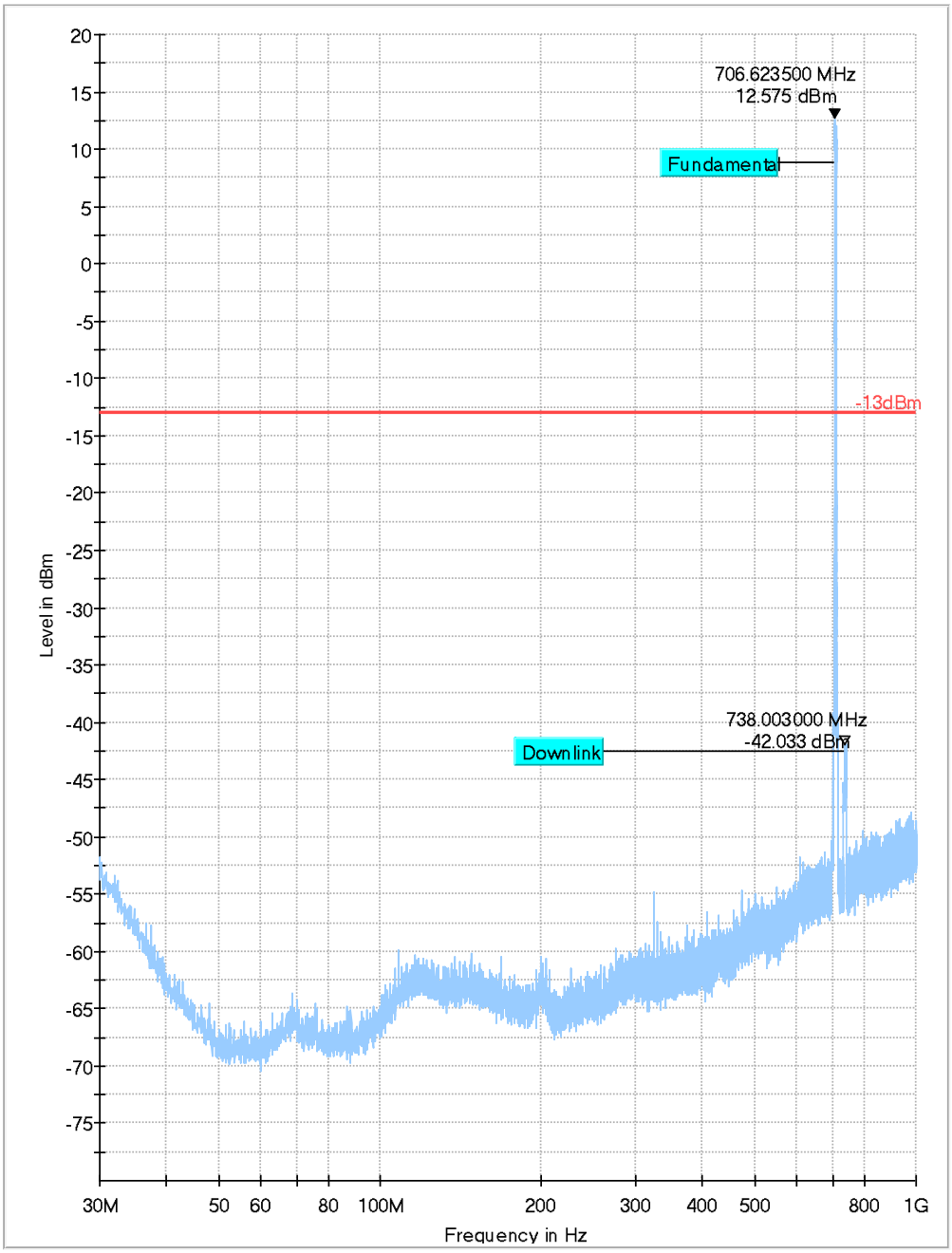
(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
0.011000	-65.6	5:48:00 PM - 9/23/2019
0.525000	-76.3	5:50:07 PM - 9/23/2019
1.561000	-76.1	5:51:57 PM - 9/23/2019



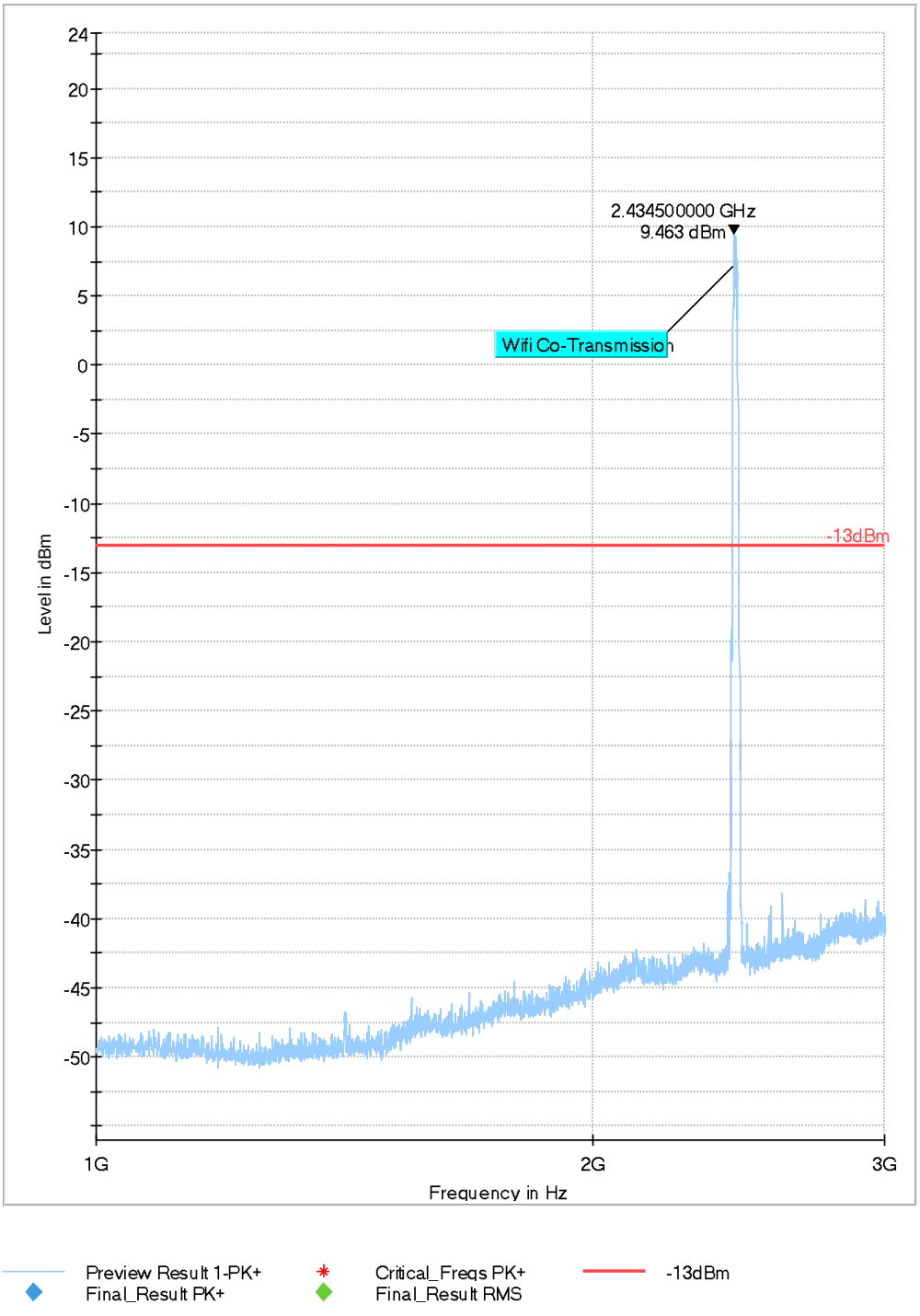
Plot # 99 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



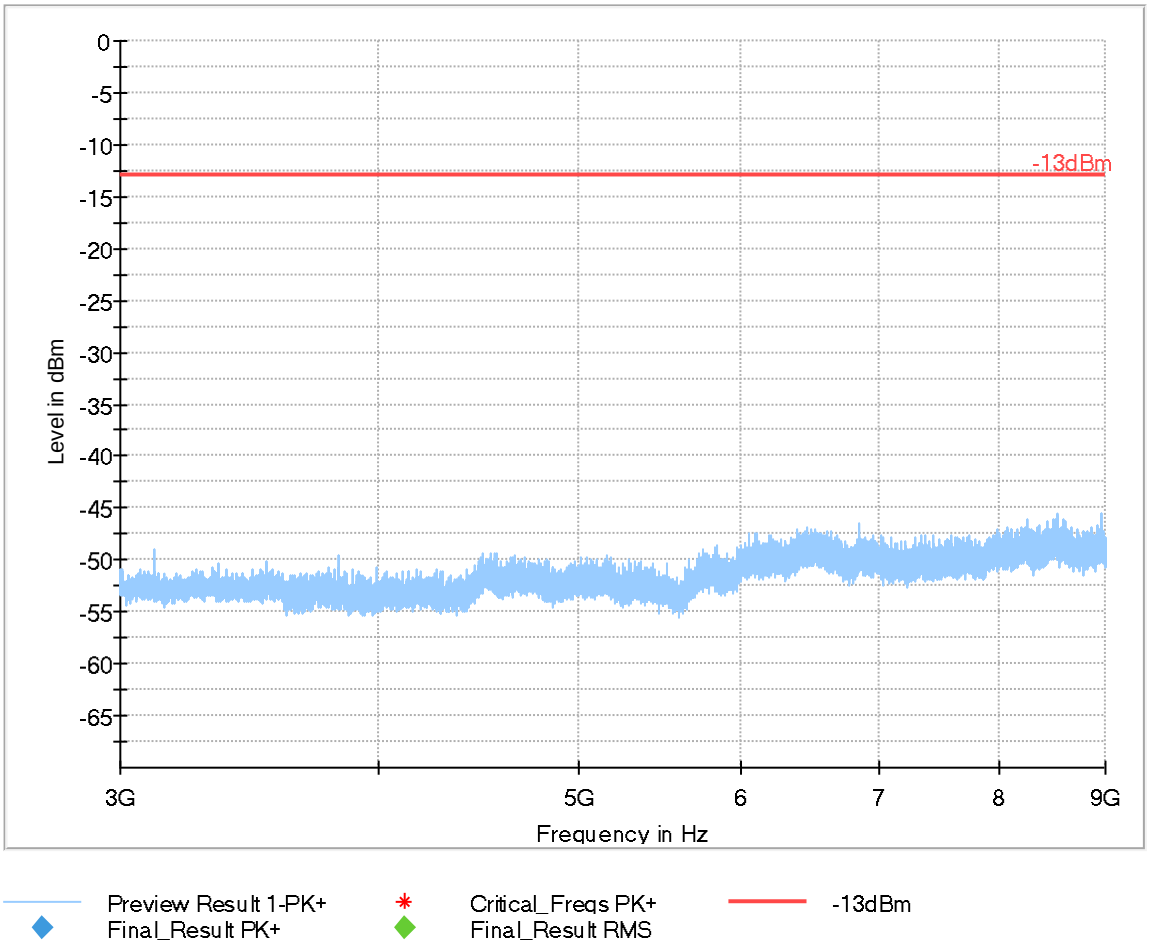
Plot # 100 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



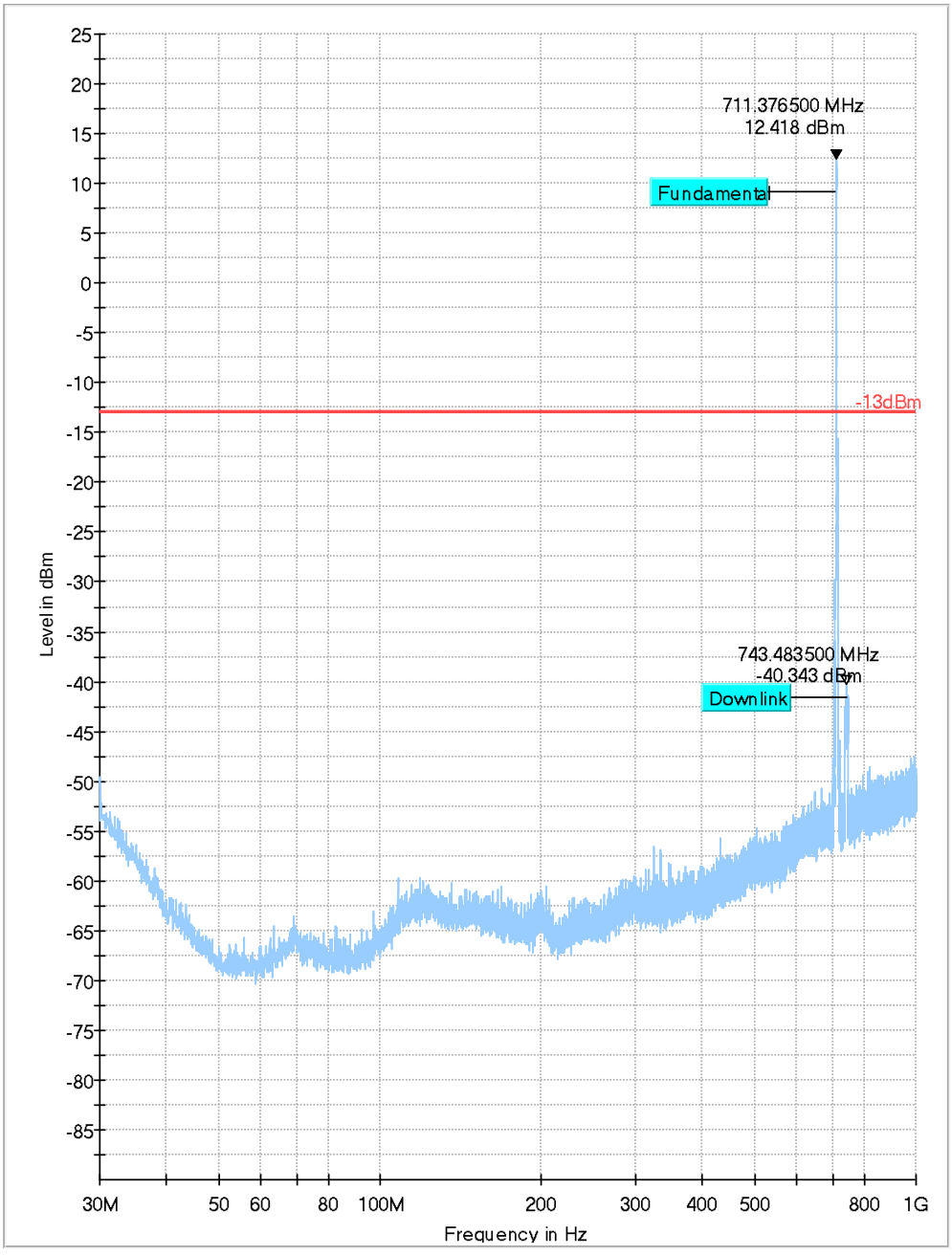
Plot # 101 Radiated Emissions: 3 GHz – 9 GHz

Channel: Mid



Plot # 102 Radiated Emissions: 30 MHz – 1GHz

Channel: High



Plot # 103 Radiated Emissions: 1 GHz - 3 GHz

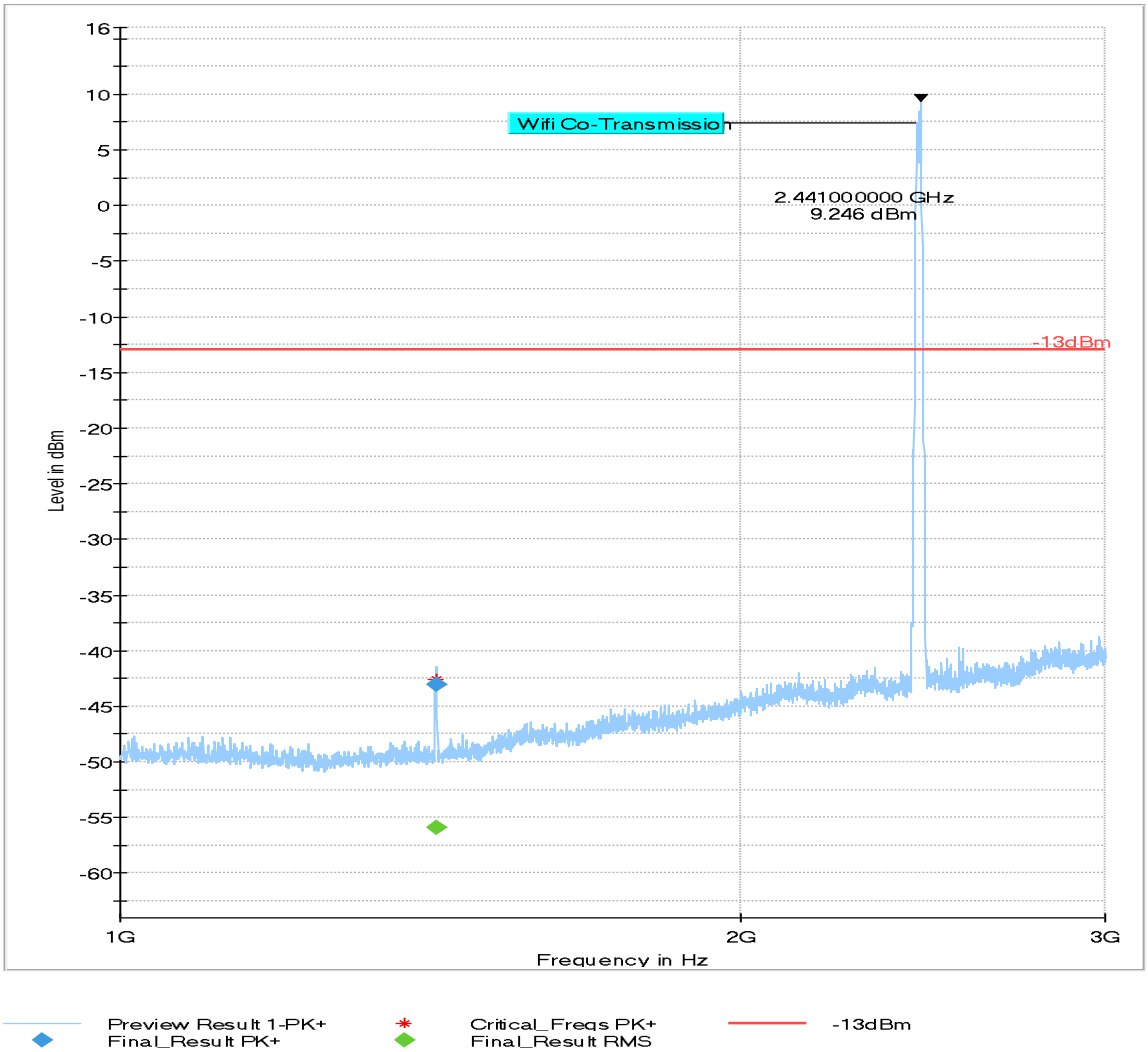
Channel: High

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1423.536875	---	-55.91	---	---	100.0	1000.000	168.0	H	101.0
1423.536875	-43.04	---	-13.00	30.04	100.0	1000.000	168.0	H	101.0

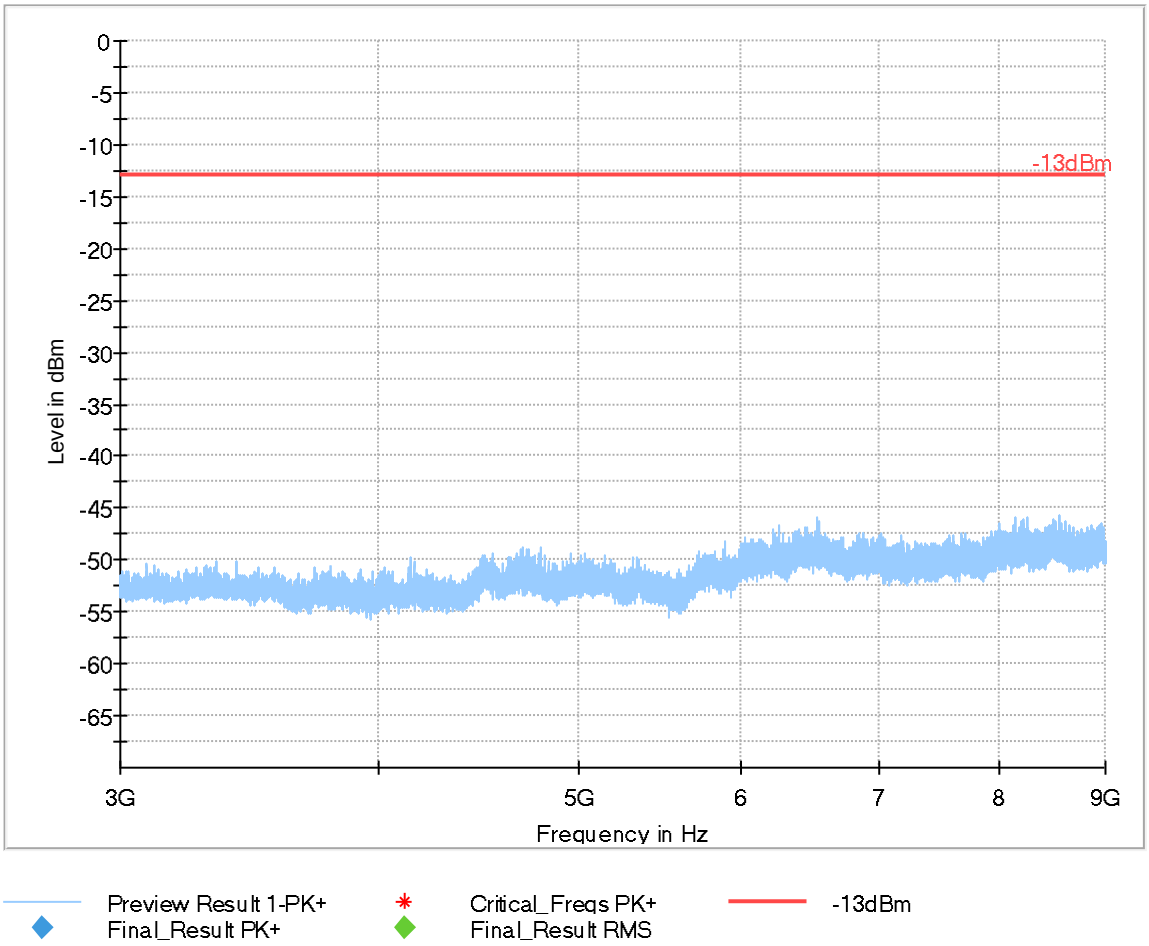
(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
1423.536875	-66.0	11:44:35 AM - 9/23/2019
1423.536875	-66.0	11:44:35 AM - 9/23/2019



Plot # 104 Radiated Emissions: 3 GHz – 9 GHz

Channel: High



8 Test setup photo

Setup photos are included in supporting file name: "EMC_PRATT-005-19001_ISED_Setup_Photos.pdf"

9 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
PASSIVE LOOP ANTENNA	ETS.LINDGREN	6507	00161344	3 YEARS	10/26/2017
BILOG ANTENNA	ETS.LINDGREN	3149	00063983	3 YEARS	07/07/2017
HORN ANTENNA	ETS.LINDGREN	3115	00035111	3 YEARS	04/17/2019
HORN ANTENNA	ETS.LINDGREN	3117	00215984	3 YEARS	01/26/2018
HORN ANTENNA	ETS.LINDGREN	3116	00070497	3 YEARS	10/31/2017
SIGNAL ANALYZER	R&S	FSU26	200065	3 YEARS	07/16/2019
SIGNAL ANALAYZER	R&S	FSV 40	101022	3 YEARS	07/15/2019
TEST RECEIVER	R&S	ESU.EMI	100256	3 YEARS	07/16/2019
COMPACT DIGITAL BAROMETER	CONTROL COMPANY	35519-055	91119547	3 YEARS	06/20/2017
DIGITAL THRMOMETER	CONTROL COMPANY	36934-164	181230565	2 YEARS	01/10/2019

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
2019-11-07	EMC_ PRATT-005-19001_FCC_22_24_27_ISED	Initial version	Yuchan Lu
2019-11-13	EMC_ PRATT-005-19001_FCC_22_24_27_ISED_Rev1	RSS 130 Issue 2 updated	Yuchan Lu