



FCC/ISED Test Report

FOR:

Pratt & Whitney, division of UTC

Model Number:

HMU200-1

Product Description:

Collection of aircraft engine and airframe data in flight and wireless transmission of collected data on ground

FCC ID: 2AQWD-HMU200-3G

IC ID: 25562-HMU2003G

Per:

47 CFR: Part 22, Part 24,
RSS-132 Issue 3; RSS-133 Issue 6

REPORT #: EMC_PRATT-006-19001_FCC_22_24_ISED-R1

DATE: 2020-08-28



A2LA Accredited

IC recognized #
3462B-1

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1 Assessment

The following device as further described in section 3 of this report was evaluated for radiated spurious emissions in simultaneous transmission of cellular and unlicensed radios according to criteria specified in the Code of Federal Regulations Title 47 parts 22, 24 and Industry Canada Radio Standard Specifications RSS: 132 Issue 3, and 133 Issue 6.

Company	Description	Model #
Pratt & Whitney, division of UTC	Collection of aircraft engine and airframe data in flight and wireless transmission of collected data on ground	HMU200-1

No deficiencies were ascertained.

Responsible for Testing Laboratory:

2020-08-28	Compliance	Cindy Li (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2020-08-28	Compliance	Yuchan Lu (Test Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3. CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Lab Manager:	Cindy Li
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client

Client's Name:	Pratt & Whitney ,division of UTC
Street Address:	400 Main Street, MS 168-15
City/Zip Code	East Hartford, CT 06118
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Collins Aerospace & Setrix
Manufacturers Address:	400 Main Street, MS 168-15
City/Zip Code	East Hartford, CT 06118
Country	USA

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	HMU200-1
Firmware Version Identification Number (FVIN):	1.24
Hardware Version Identification Number (HVIN):	HMU200-1
Product Marketing Name (PMN):	eFAST
Antenna Information as declared:	Laird Technologies, P/N: IFMULT-SF00 Antenna gains: 3 dBi
Other Radios included in the device:	❖ <u>WLAN</u> <ul style="list-style-type: none"> • Module name: Ti-Wi BLE • Module number: TFB-TIWI1-01 / 5969A-TIWI101
Power Supply/ Rated Operating Voltage Range:	Low 23.8 VDC, Nominal 28 VDC, High 32.2 VDC
Operating Temperature Range:	Low -30° C, Nominal 25° C, High 70° C
Sample Revision	<input type="checkbox"/> Prototype Unit; <input checked="" type="checkbox"/> Production Unit; <input type="checkbox"/> Pre-Production
EUT Dimensions(mm):	365.1 x 92.1 x 161.9
Weight(grams):	3570
EUT Diameter	<input checked="" type="checkbox"/> < 60 cm <input type="checkbox"/> Other _____

Module Information	
Module Name:	PH8-P
Model Number:	PH8-P
FCC ID:	QIPPH8-P
IC ID:	7830A-PH8P

3.2 EUT Sample details

EUT #	IMEI number	HW Version	SW Version	Notes/Comments
1	35962804281794506	3	1.24	Radiated Measurement

3.3 Accessory Equipment (AE) Details

AE #	Comments
1	Power cable
2	External Antenna: Laird Technologies, P/N: IFMULT-SF00 15 ft Coaxial cable PN:311901 consisting of attenuation per 100ft: <ul style="list-style-type: none"> • 12.2 dB at 1000MHz • 15.8 dB at 1600MHz • 18.6 dB at 2400MHz

3.4 Support Equipment

SE #	Comments
1	Communication 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	Worst Case

3.6 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	Cellular and WLAN Co-Transmission	<p>Cellular was tested on Low, Mid, High Channels at the maximum power in a co-transmission mode.</p> <p>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</p> <p>For radiated measurements: The external antenna was connected.</p>

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: 2AQWD-HMU200-3G/ IC ID: 25562-HMU2003G**

The pre-certified module to be integrated (PH8-P) 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 and Industry Canada Radio Standard Specifications RSS: 132 Issue 3, and 133 Issue 6.

The conducted module test data that can be obtained under the **FCC Filing ID: QIPPH8-P** is applicable for the host described in section 3.

4.1 **Dates of Testing:**

10/04/2019 – 10/08/2019

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%

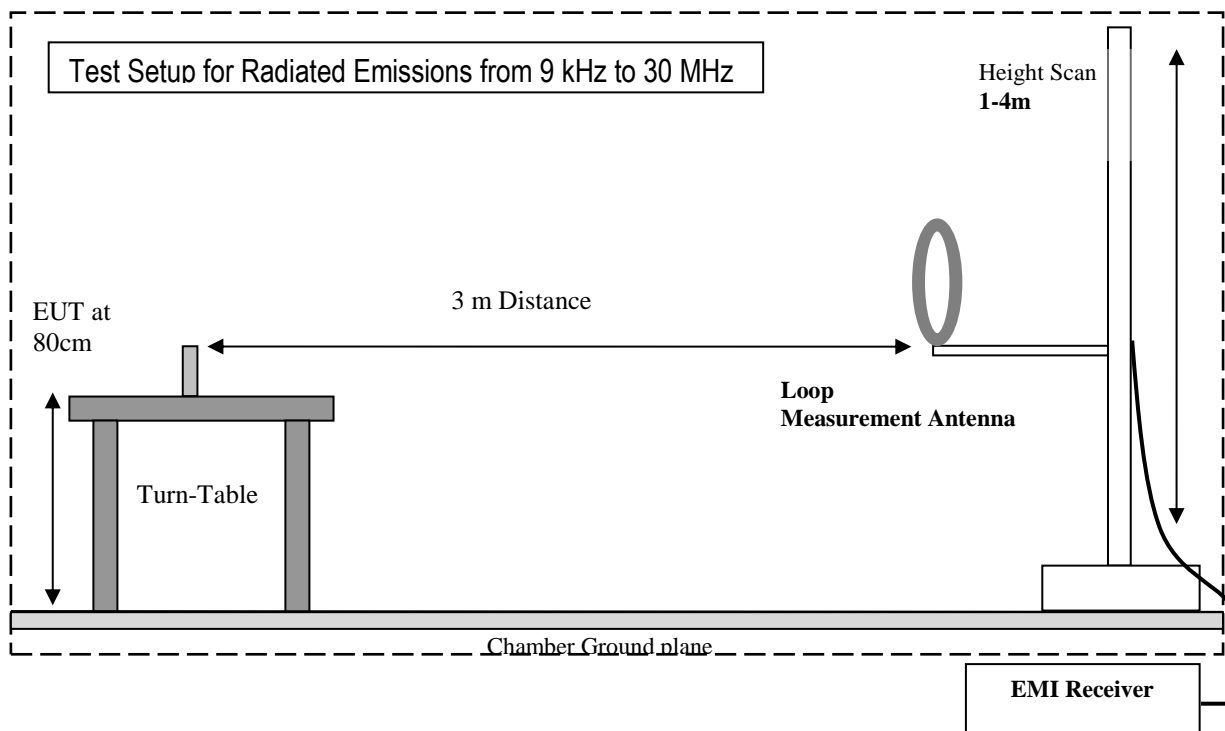
Deviating test conditions are indicated at individual test description where applicable.

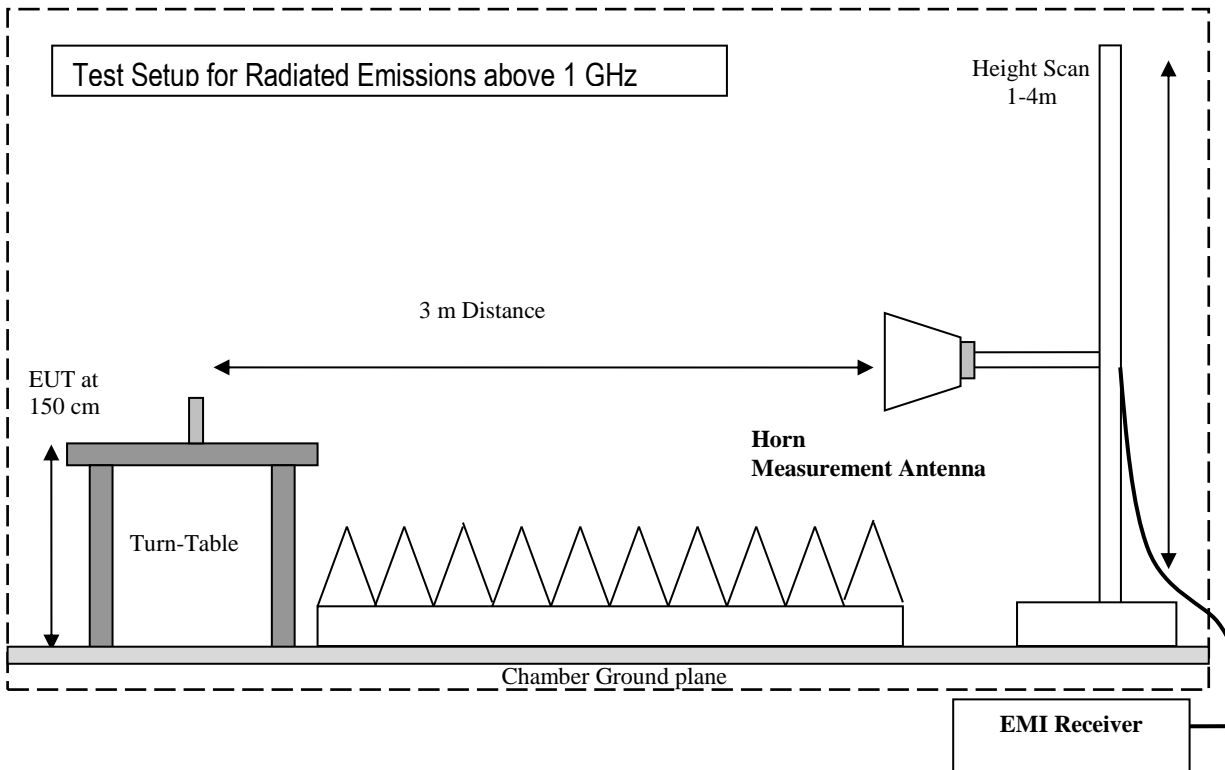
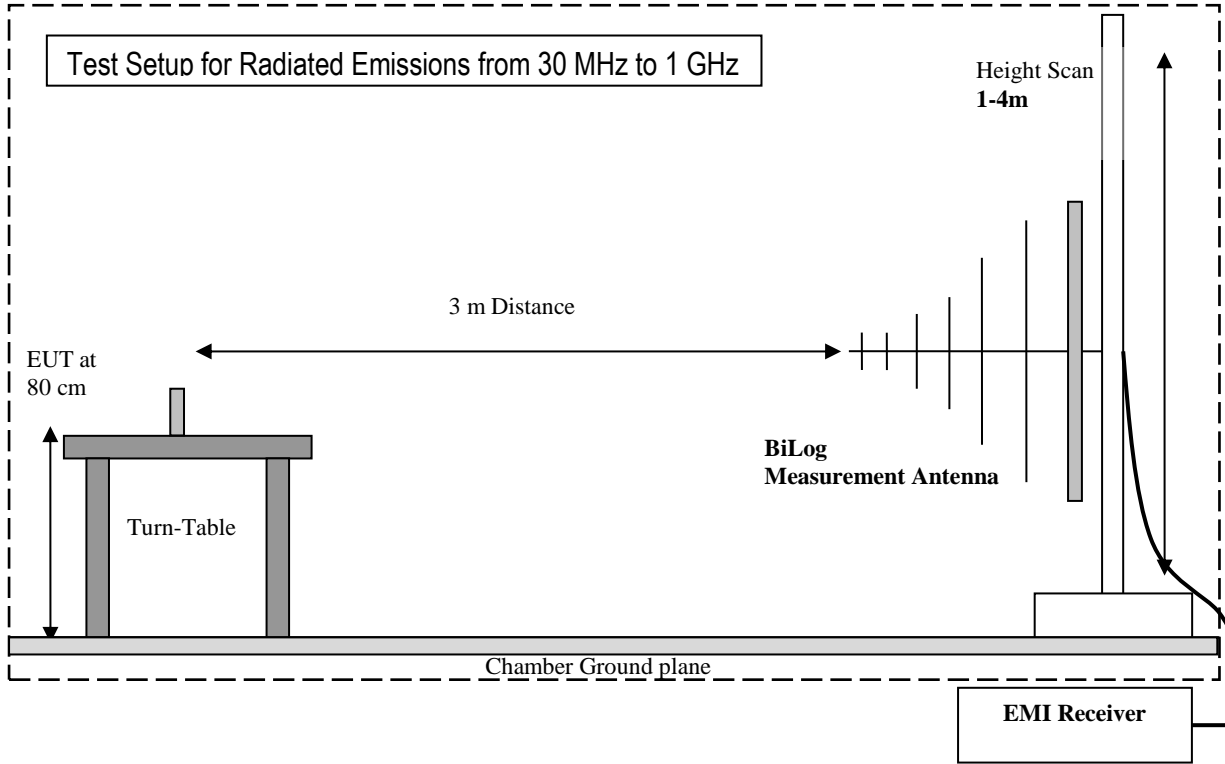
5 Measurement Procedures

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.





5.2 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

- Measured reading in dB μ V
- Cable Loss between the receiving antenna and SA in dB and
- Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} - \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/m)
1000	80.5	3.5	14	98.0



6 Measurement Results Summary

6.1 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	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1055; §22.355	Frequency Stability	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1049; §22.917	Occupied Bandwidth	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1051; §22.917	Band Edge Compliance	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1051; §22.917	Conducted Spurious Emissions	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1053; §22.917(a); RSS-132 Issue 3-5.5;	Radiated Spurious Emissions	Nominal	Op.1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

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

Note 2: Leveraged from module certification FCC ID: QIPPH8-P



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	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1055; §24.235	Frequency Stability	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1049; §24.238	Occupied Bandwidth	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1051; §24.238	Band Edge Compliance	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1051; §24.238	Conducted Spurious Emissions	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note 1 Note 2
§2.1053; §24.238(a); RSS-133 Issue 6-6.5.1;	Radiated Spurious Emissions	Nominal	Op.1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies

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

Note 2: Leveraged from module certification FCC ID: QIPPH8-P

7 Test Result Data

ERP / EIRP

Band	Frequency Range (MHz)	Power conducted (mW)	Emission Designator	Antenna Gain -Cable Loss (dBi)	Gain Linear	ERP < 1 GHz EIRP > 1 GHZ (mW)	Frequency deviation (ppm)	Limit ERP / EIRP (W)
WCDMA V	826.4 - 846.6	1122	4M19F9W--	1.94	1.56	1069.04	2.5	7
WCDMA II	1852.4 - 1907.6	1380	4M17F9W--	1.33	1.36	1874.47	2.5	2
EGPRS 1900	1850.2 - 1909.8	968	251KG7W--	1.33	1.36	1314.85	2.5	2
EGPRS 850	824.2 - 848.8	1107	247KG7W--	1.94	1.56	1054.75	2.5	7
GPRS 1900	1850.2 - 1909.8	1318	249KGXW--	1.33	1.36	1790.26	2.5	2
GPRS 850	824.2 - 848.8	2588	247KGXW--	1.94	1.56	2465.84	2.5	7

Note 1: ERP / EIRP are calculated from maximum power in grant of cellular module PH8-P adding the maximum gain of the utilized cellular antenna with minimum length cable loss as per the operational description.

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 Issue2-4.6, 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	28 VDC

7.1.4 Measurement Plots:

GSM 850

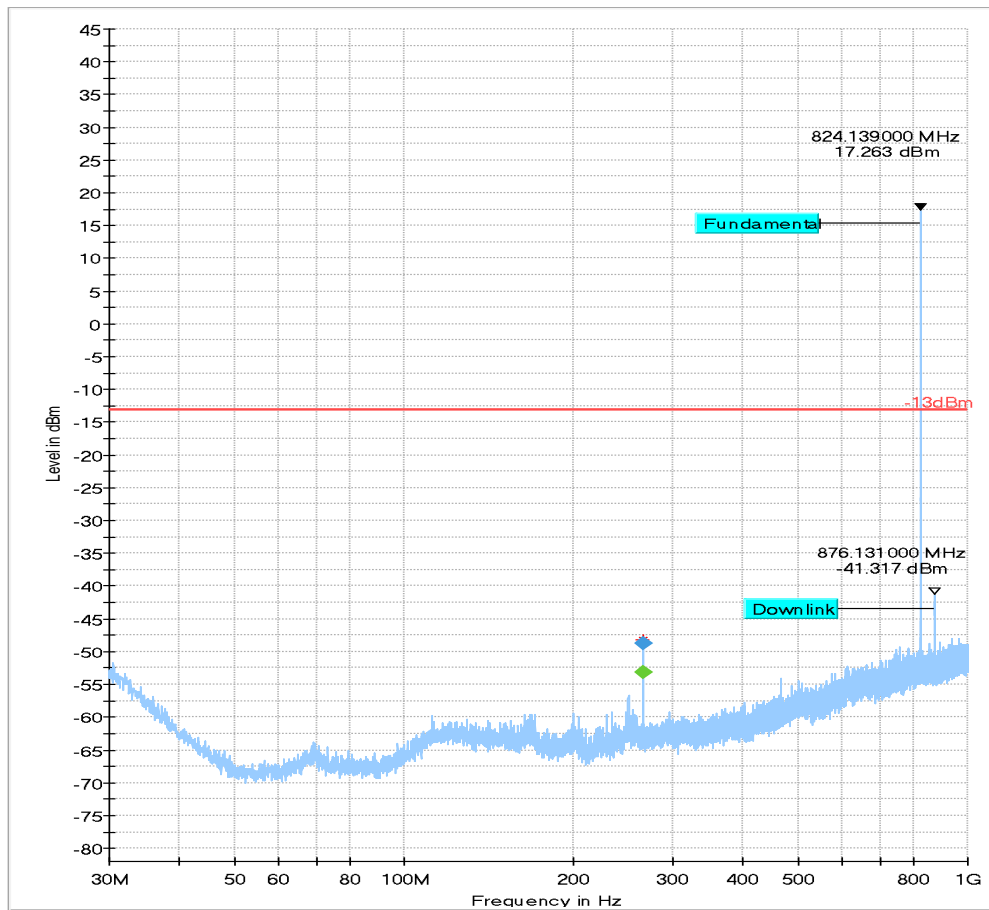
Plot # 1 Radiated Emissions: 30 MHz - 1 GHz
Channel: Low

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
266.396803	---	-53.12	---	---	100.0	100.000	154.0	H	251.0
266.396803	-48.77	---	-13.00	35.77	100.0	100.000	154.0	H	251.0

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

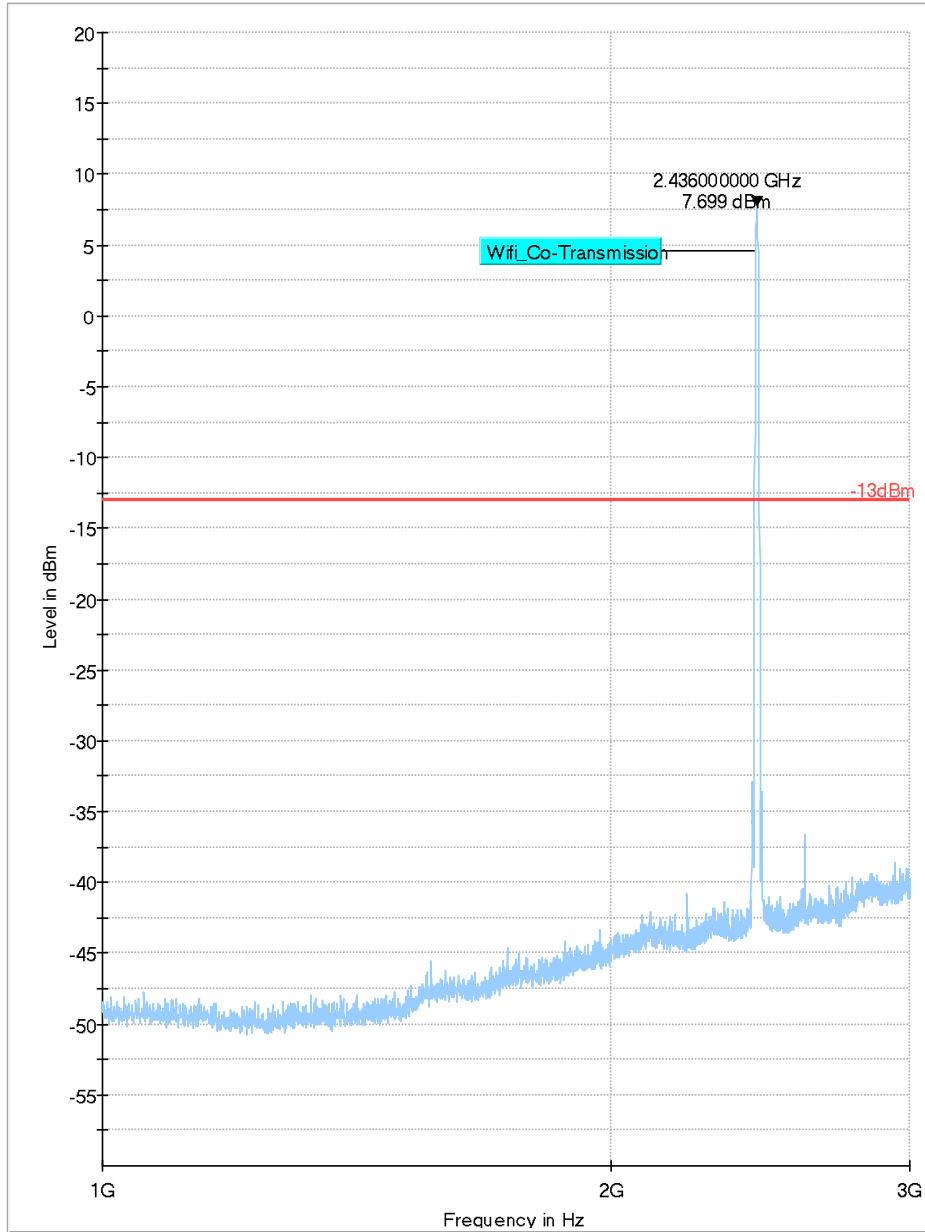
Frequency (MHz)	Corr. (dB)	Comment
266.396803	-75.8	8:32:30 PM - 10/4/2019
266.396803	-75.8	8:32:30 PM - 10/4/2019



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

Plot # 2 Radiated Emissions: 1 GHz - 3 GHz

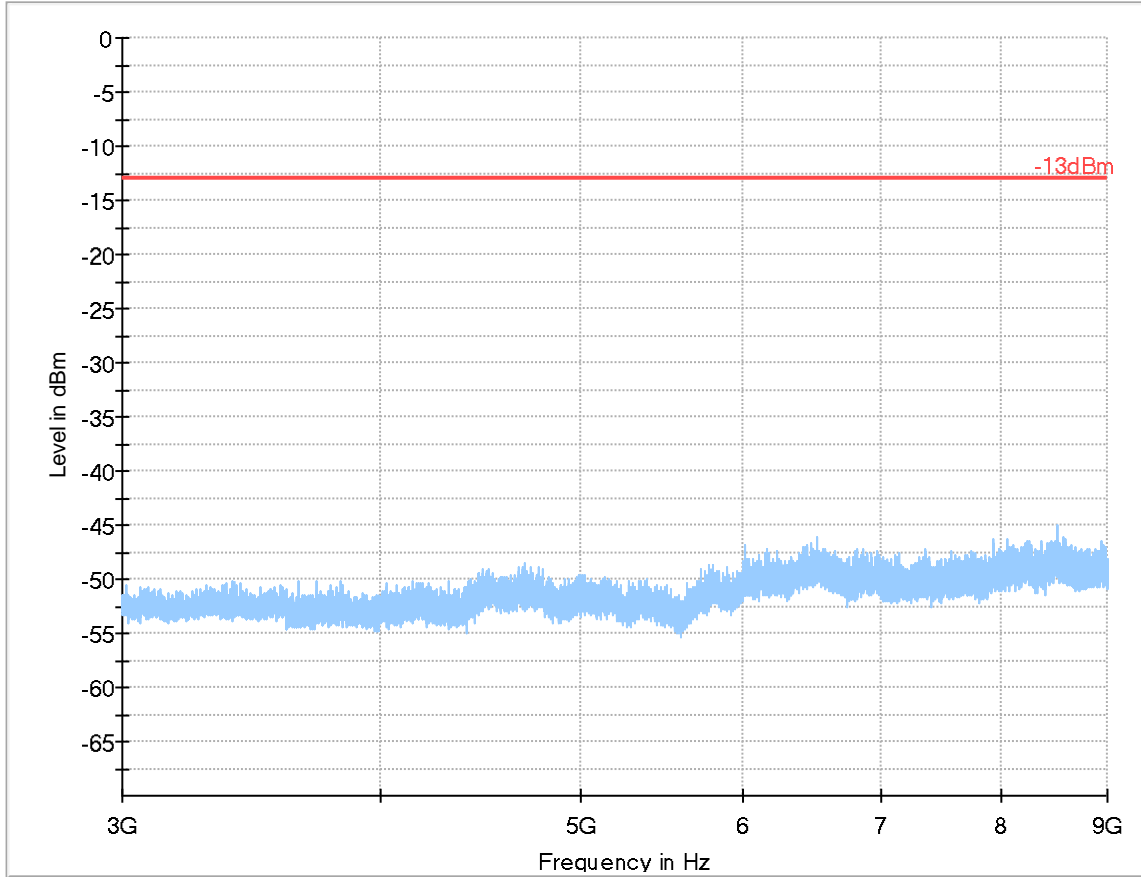
Channel: Low



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

Plot # 3 Radiated Emissions: 3 GHz - 9 GHz

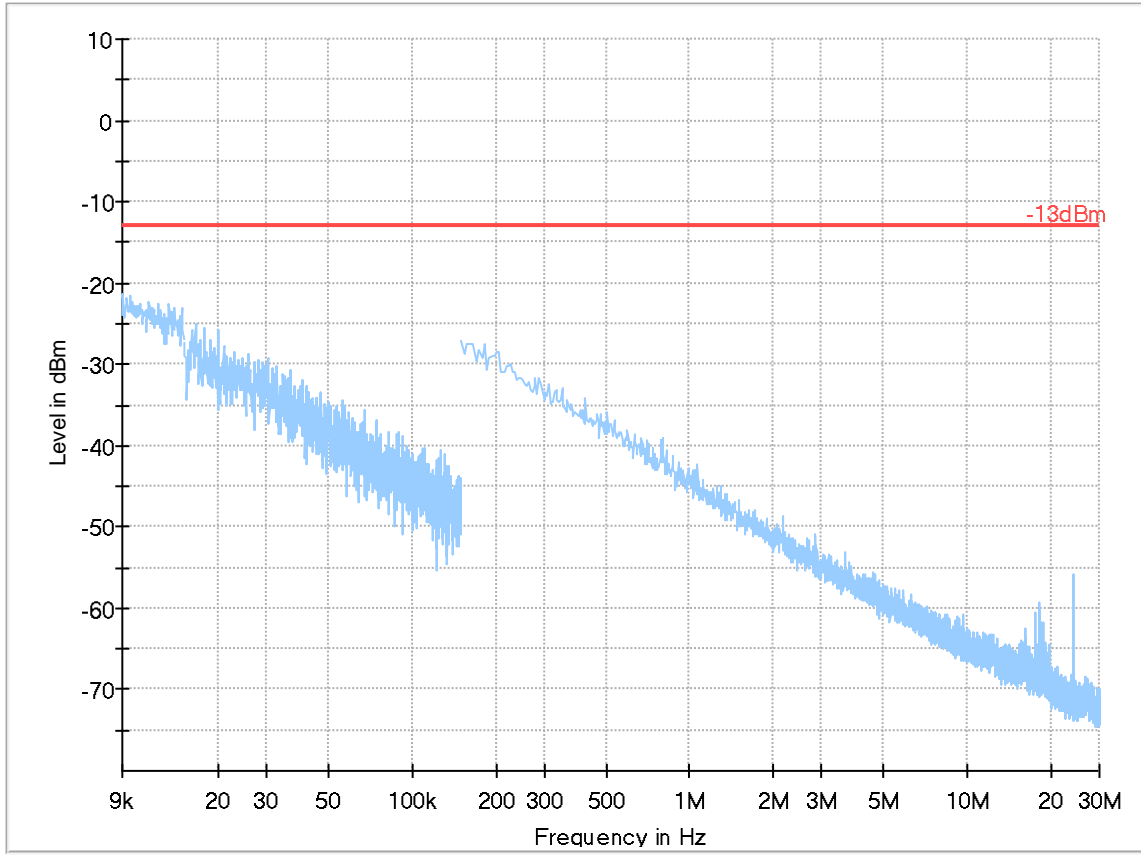
Channel: Low



- Preview Result 1-PK+ Final_Result PK+ (blue line)
- Critical_Freqs PK+ Final_Result RMS (green diamond)
- 13dBm (red line)

Plot # 4 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



- Preview Result 2-QPK
- Preview Result 1-PK+
- Critical_Freqs QPK
- Critical_Freqs PK+
- 13dBm
- Final_Result QPK
- Final_Result PK+

Plot # 5 Radiated Emissions: 30 MHz – 1 GHz

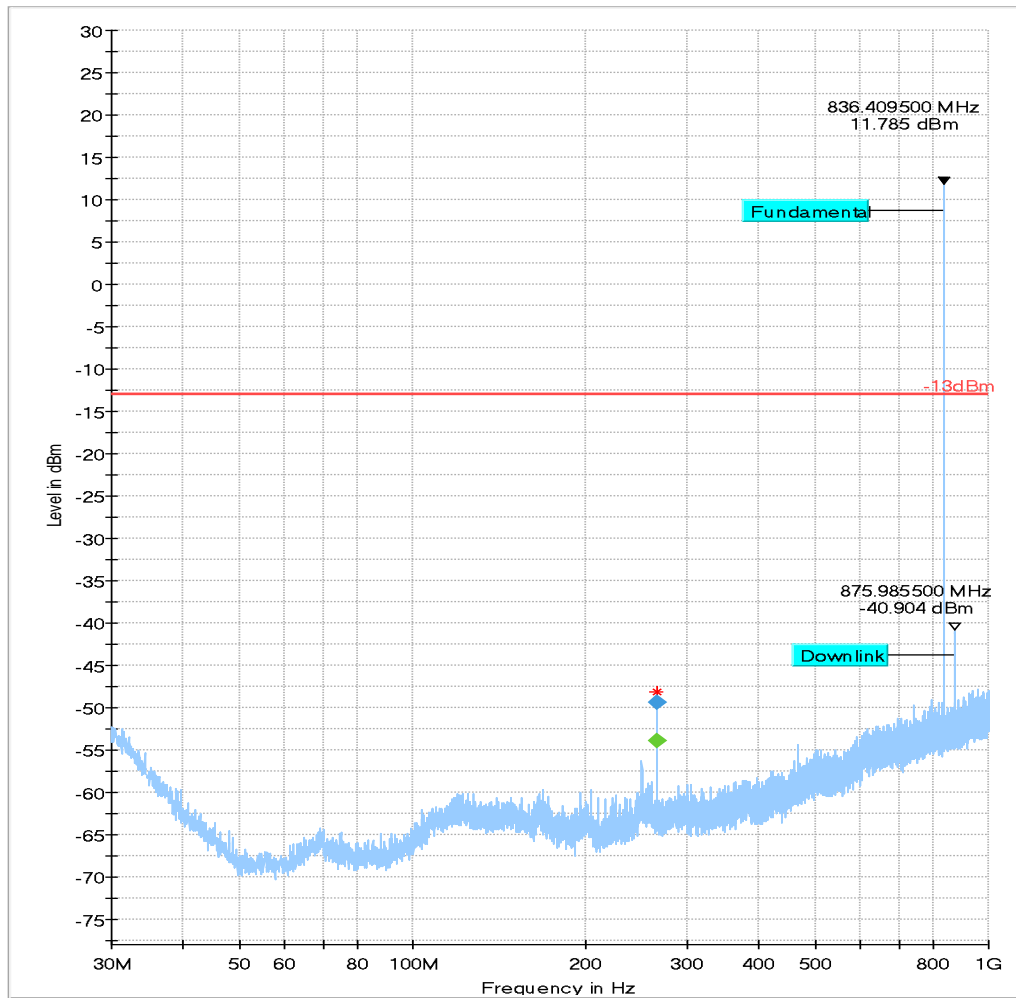
Channel: Mid

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
266.399983	---	-53.97	---	---	100.0	100.000	179.0	H	245.0
266.399983	-49.35	---	-13.00	36.35	100.0	100.000	179.0	H	245.0

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

Frequency (MHz)	Corr. (dB)	Comment
266.399983	-75.8	8:15:53 PM - 10/4/2019
266.399983	-75.8	8:15:53 PM - 10/4/2019



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

Plot # 6 Radiated Emissions: 1 GHz - 3 GHz

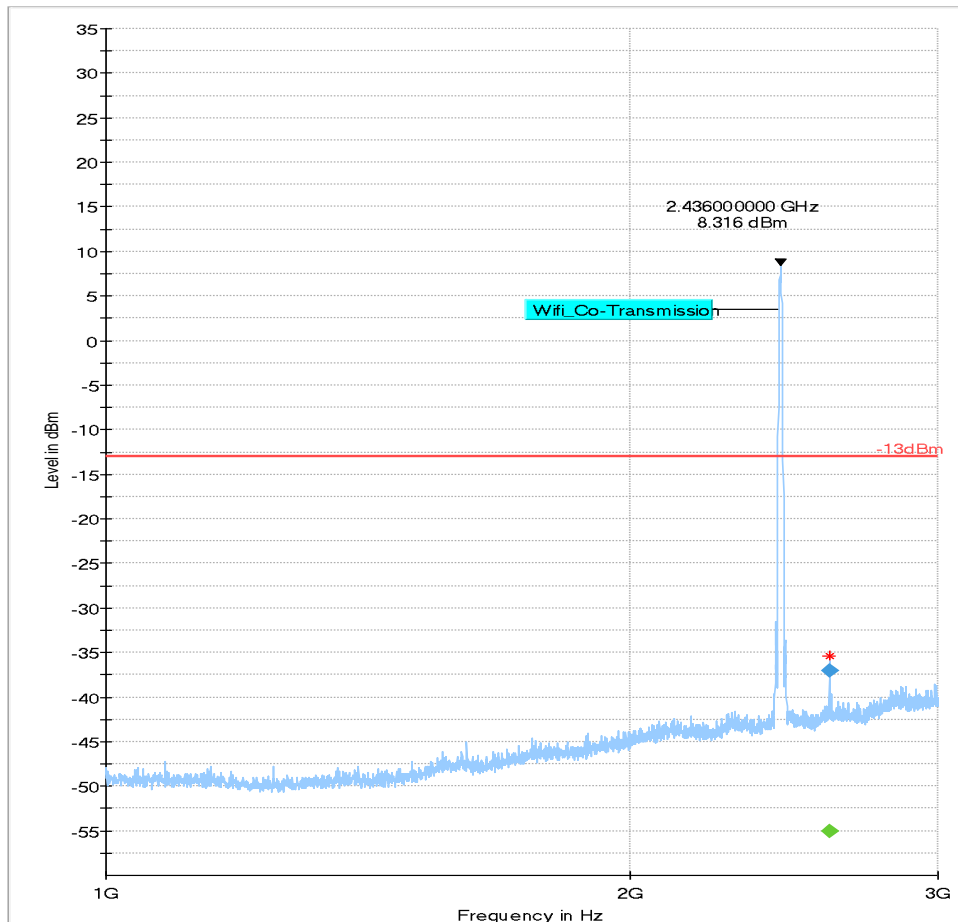
Channel: Mid

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2598.974375	---	-55.01	---	---	100.0	1000.000	325.0	V	109.0
2598.974375	-36.99	---	-13.00	23.99	100.0	1000.000	325.0	V	109.0

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

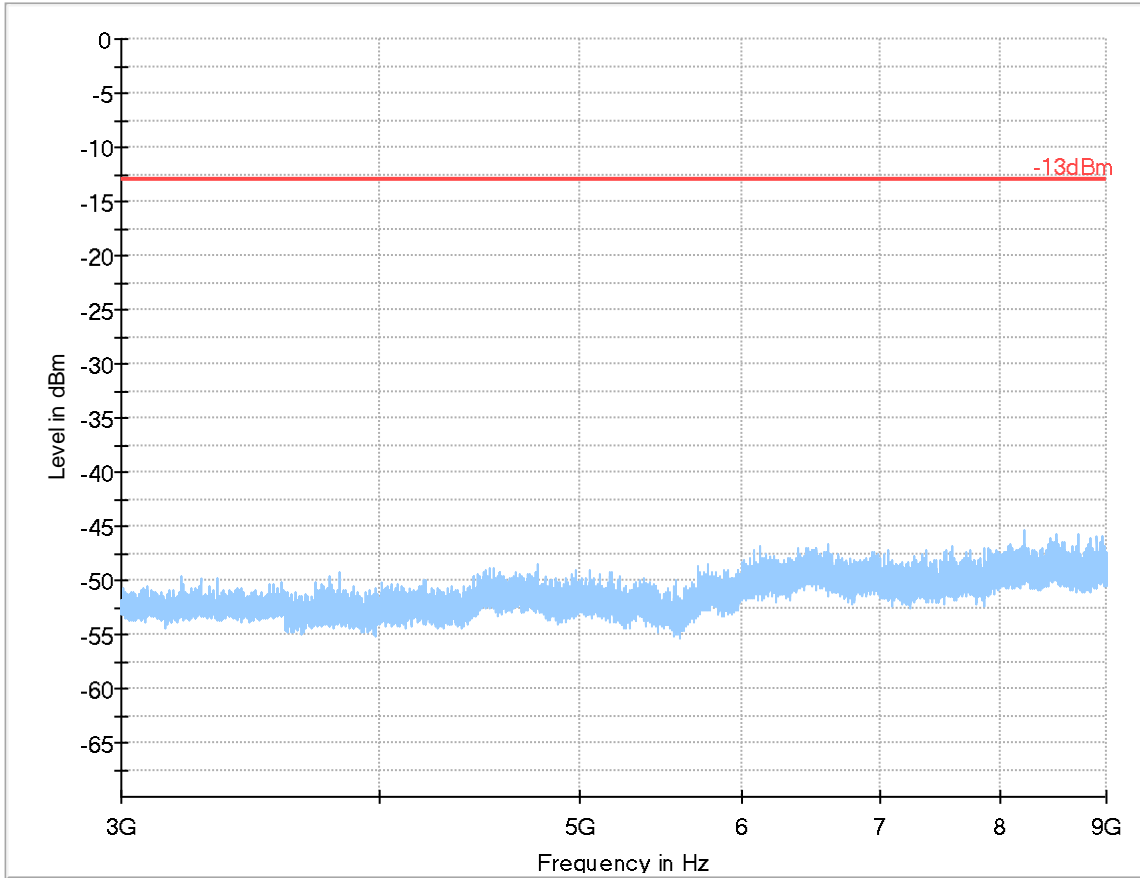
Frequency (MHz)	Corr. (dB)	Comment
2598.974375	-60.6	11:23:43 PM - 10/4/2019
2598.974375	-60.6	11:23:43 PM - 10/4/2019



◆ Preview Result 1-PK+ FinalResult PK+
 * Critical Freqs PK+ FinalResult RMS
 — -13dBm

Plot # 7 Radiated Emissions: 3 GHz – 9GHz

Channel: Mid



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

Plot # 8 Radiated Emissions: 30 MHz - 1 GHz

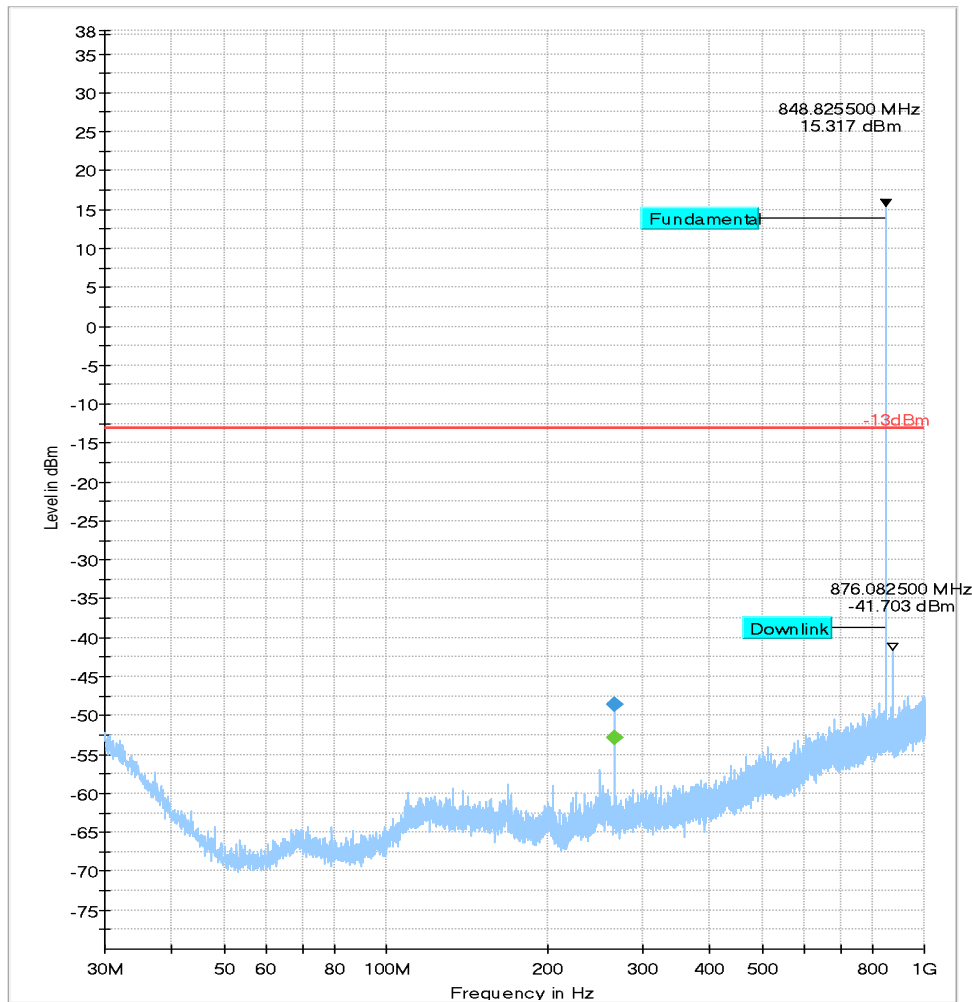
Channel: High

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
266.388907	---	-52.89	---	---	100.0	100.000	152.0	H	250.0
266.388907	-48.51	---	-13.00	35.51	100.0	100.000	152.0	H	250.0

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

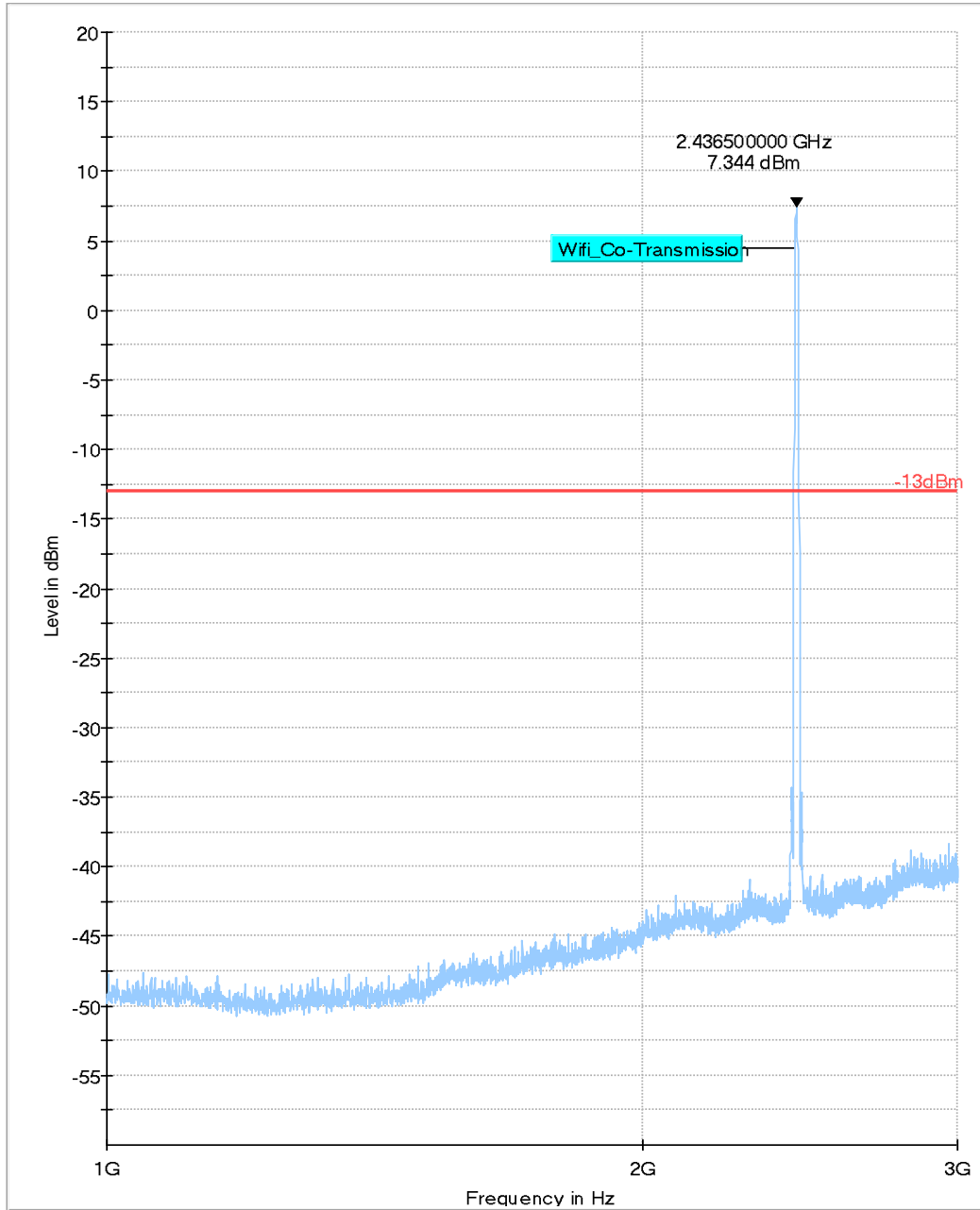
Frequency (MHz)	Corr. (dB)	Comment
266.388907	-75.8	8:47:56 PM - 10/4/2019
266.388907	-75.8	8:47:56 PM - 10/4/2019



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

Plot # 9 Radiated Emissions: 1 GHz - 3 GHz

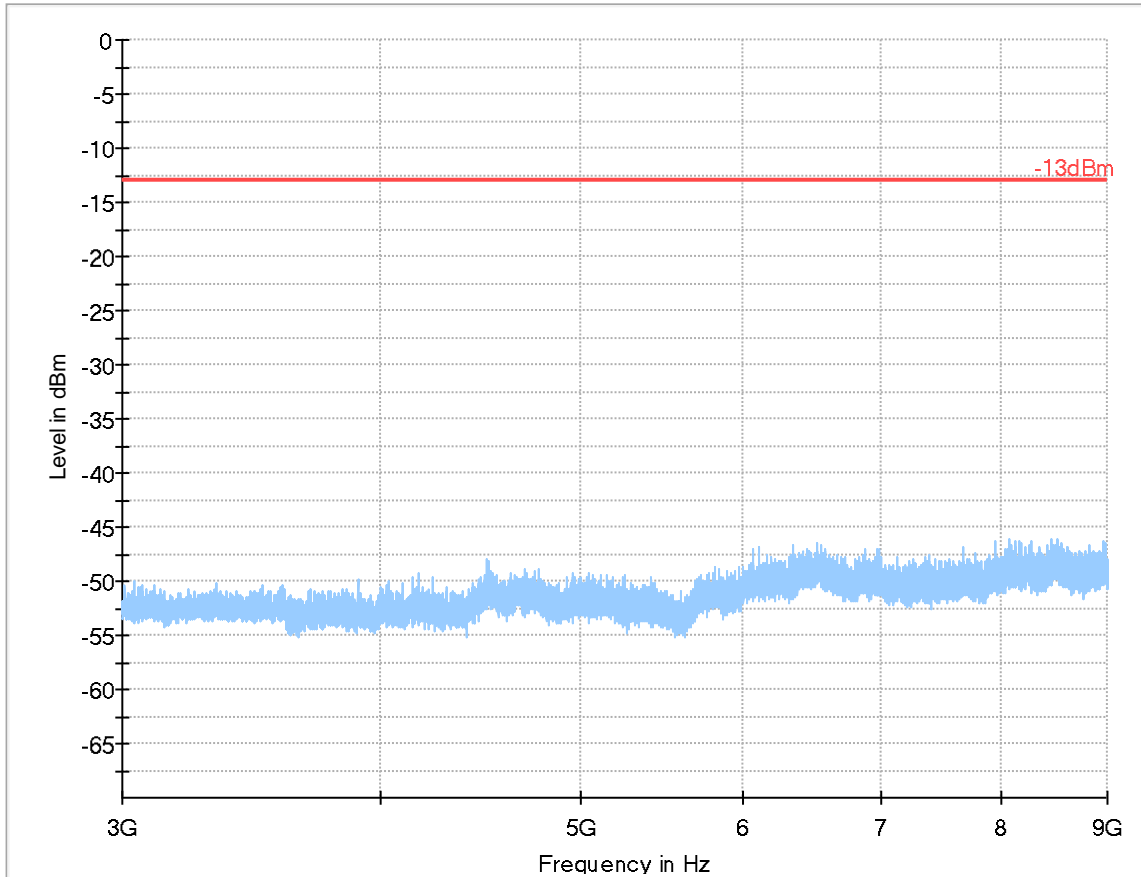
Channel: High



- Preview Result 1-PK+ Final_Result PK+
- Critical_Freqs PK+ Final_Result RMS
- 13dBm

Plot # 10 Radiated Emissions: 3 GHz - 9 GHz

Channel: High

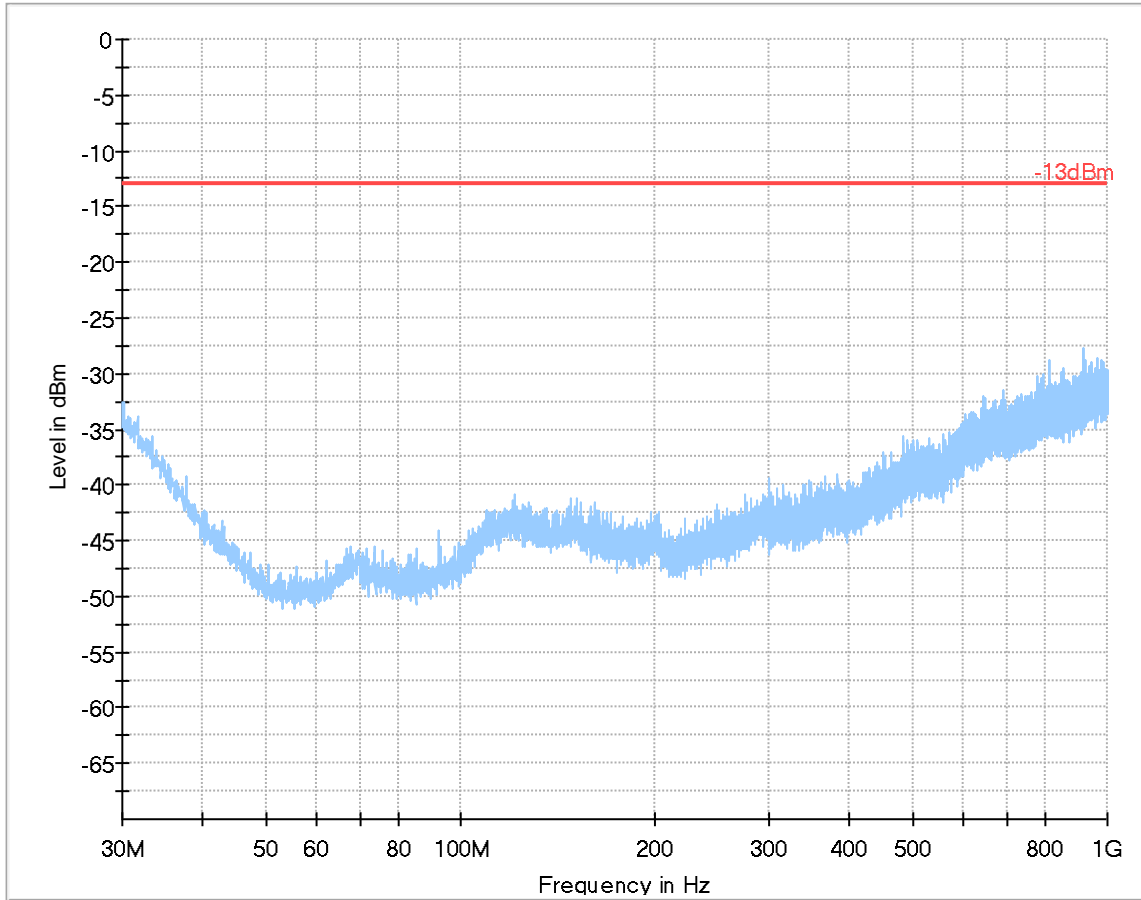


◆ Preview Result 1-PK+ * Critical_Freqs PK+ — -13dBm
◆ Final_Result PK+ ◆ Final_Result RMS

GSM 1900

Plot # 11 Radiated Emissions: 30 MHz - 1 GHz

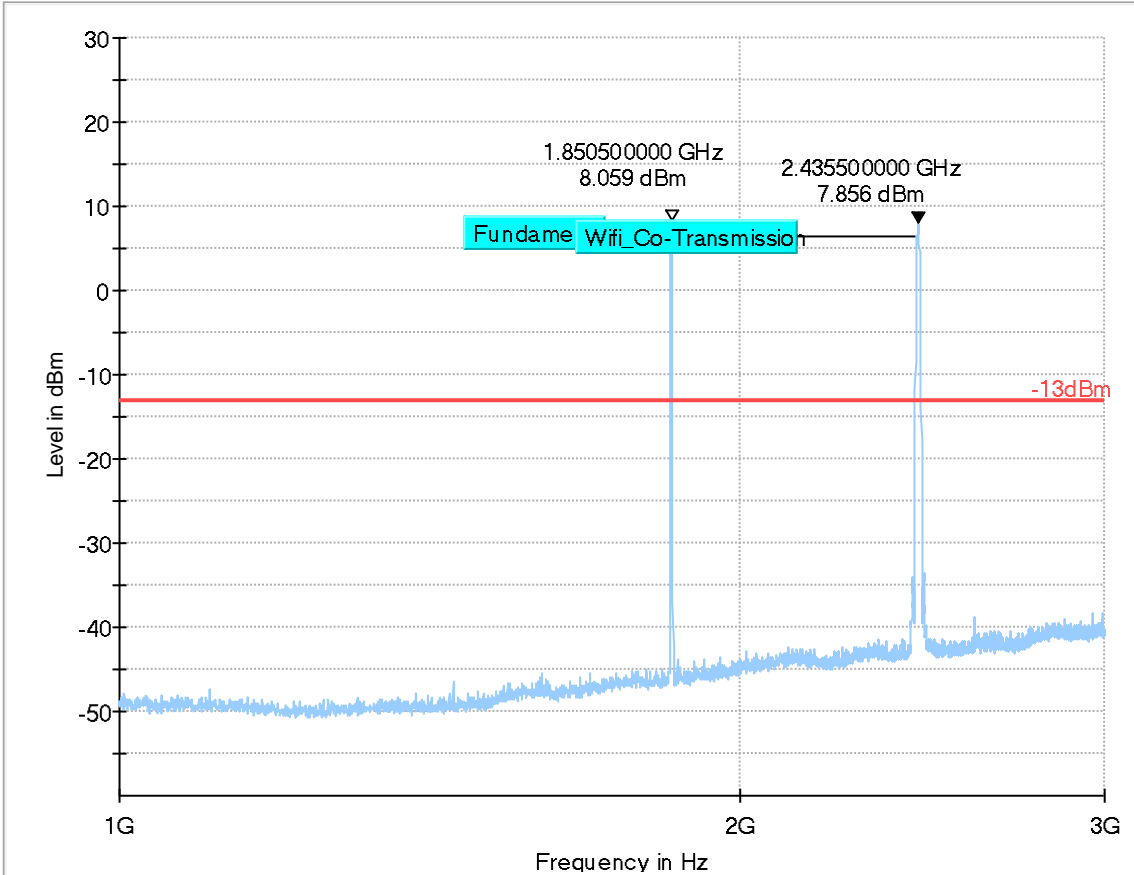
Channel: Low



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

Plot # 12 Radiated Emissions: 1 GHz - 3 GHz

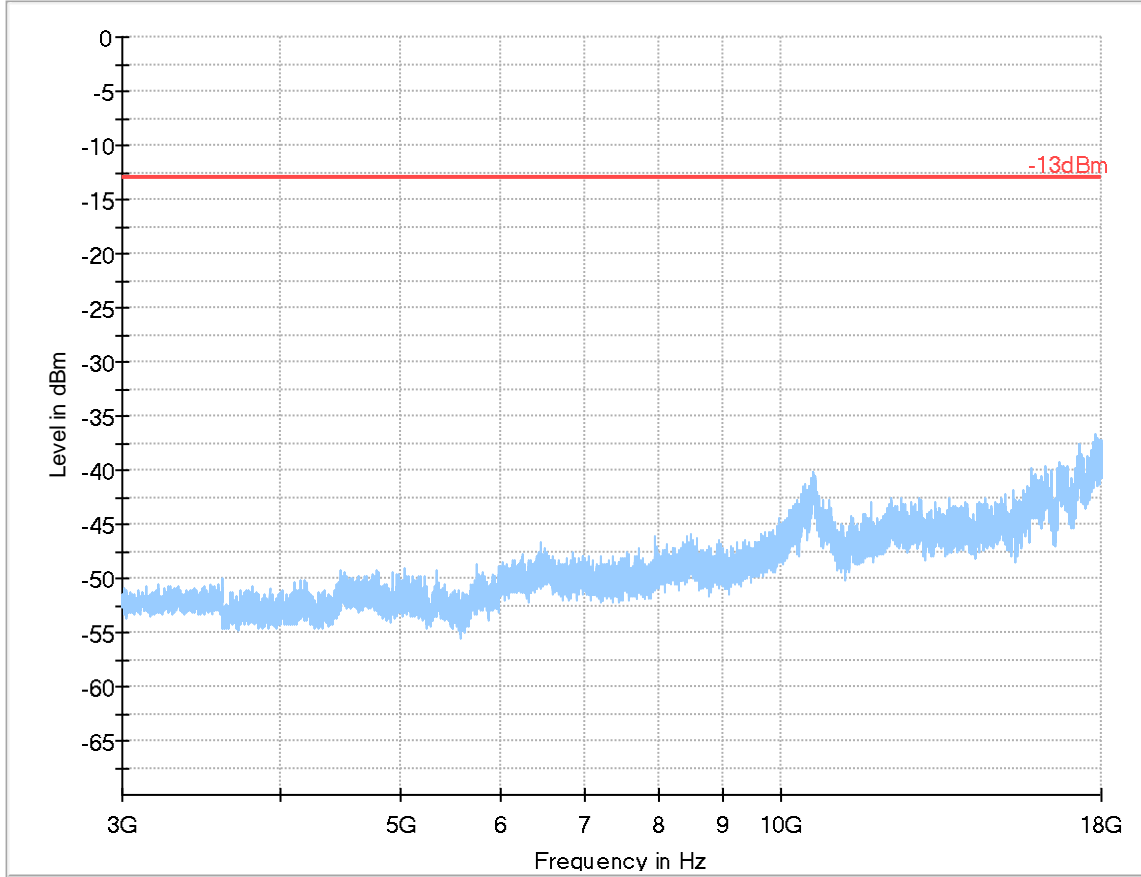
Channel: Low



- Preview Result 1-PK+ Final_Result PK+
- Critical_Freqs PK+ Final_Result RMS
- 13dBm

Plot # 13 Radiated Emissions: 3 GHz - 18 GHz

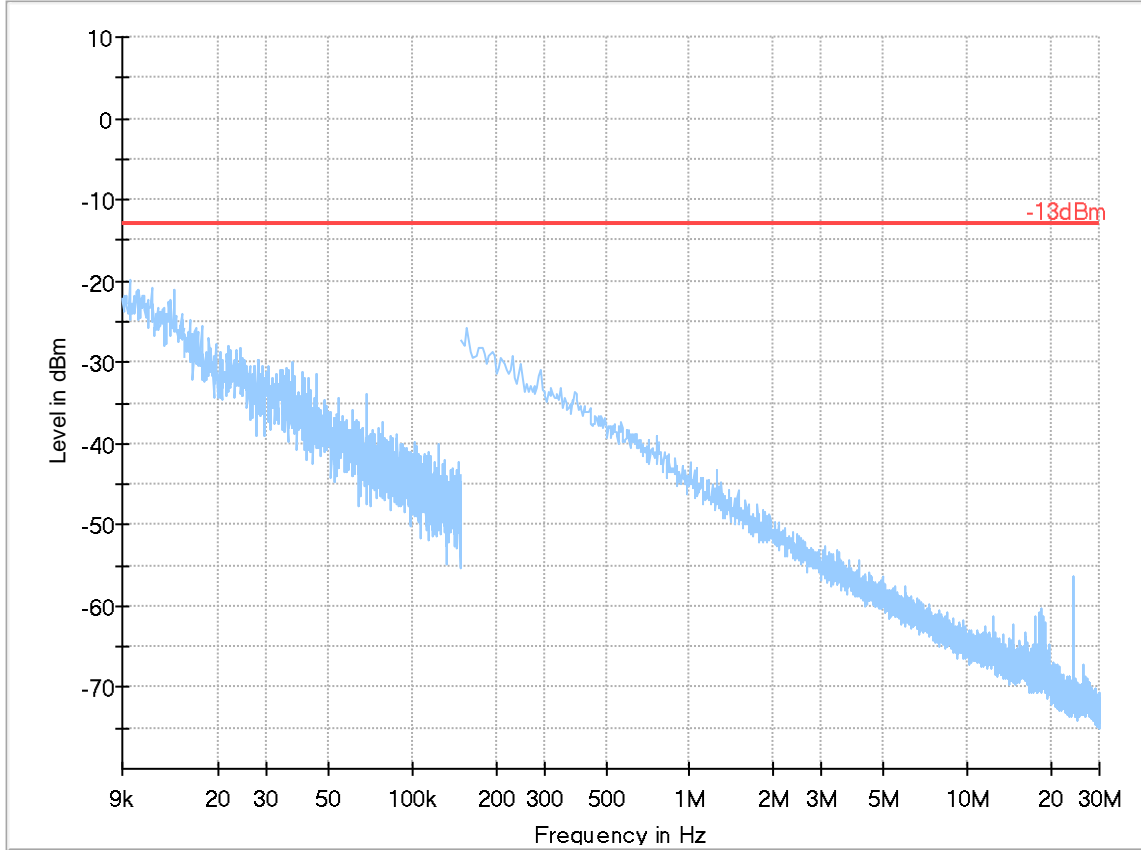
Channel: Low



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

Plot # 14 Radiated Emissions: 9 kHz - 30 MHz

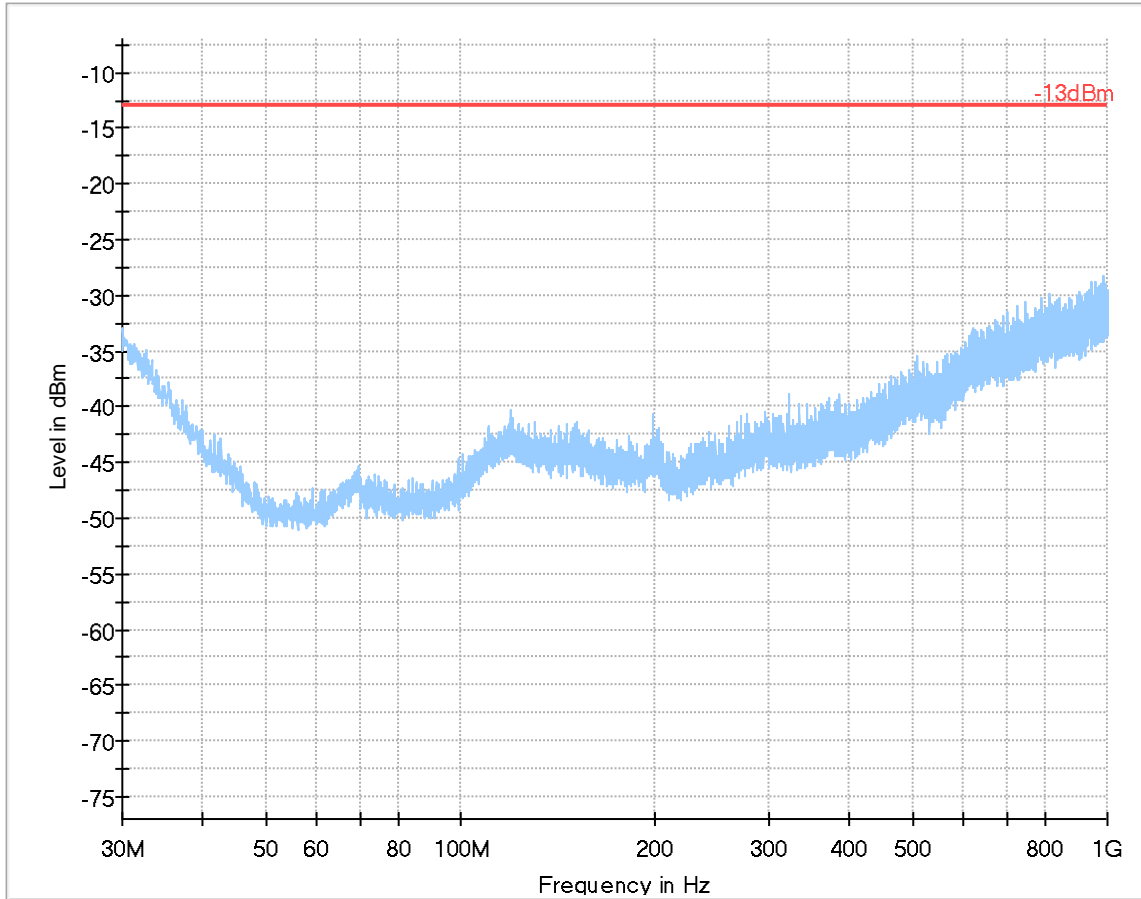
Channel: Mid



- Preview Result 2-QPK
- Preview Result 1-PK+
- Critical_Freqs QPK
- Critical_Freqs PK+
- 13dBm
- Critical_Freqs QPK
- Final_Result QPK
- Final_Result PK+

Plot # 15 Radiated Emissions: 30 MHz – 1GHz

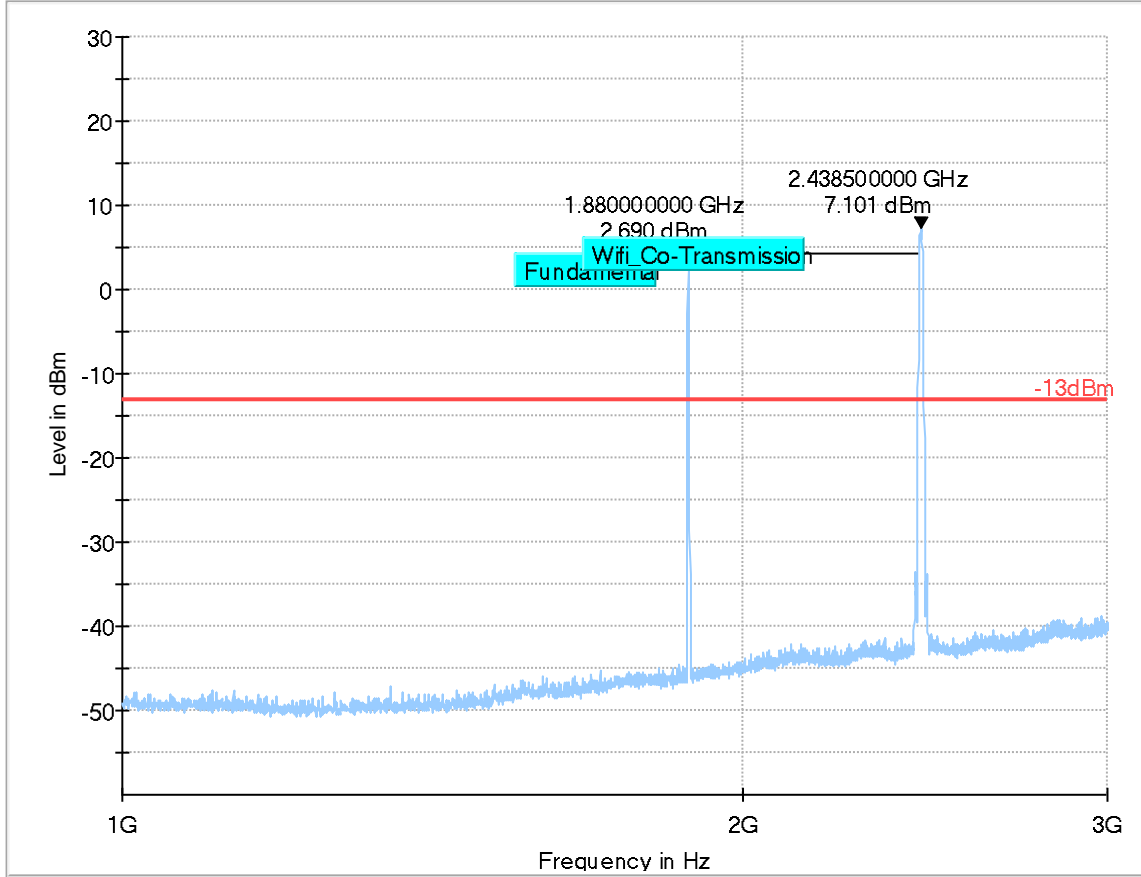
Channel: Mid



Preview Result 1-PK+ * Critical_Freqs PK+ -13dBm ◆ Final_Result RMSE

Plot # 16 Radiated Emissions: 1 GHz - 3 GHz

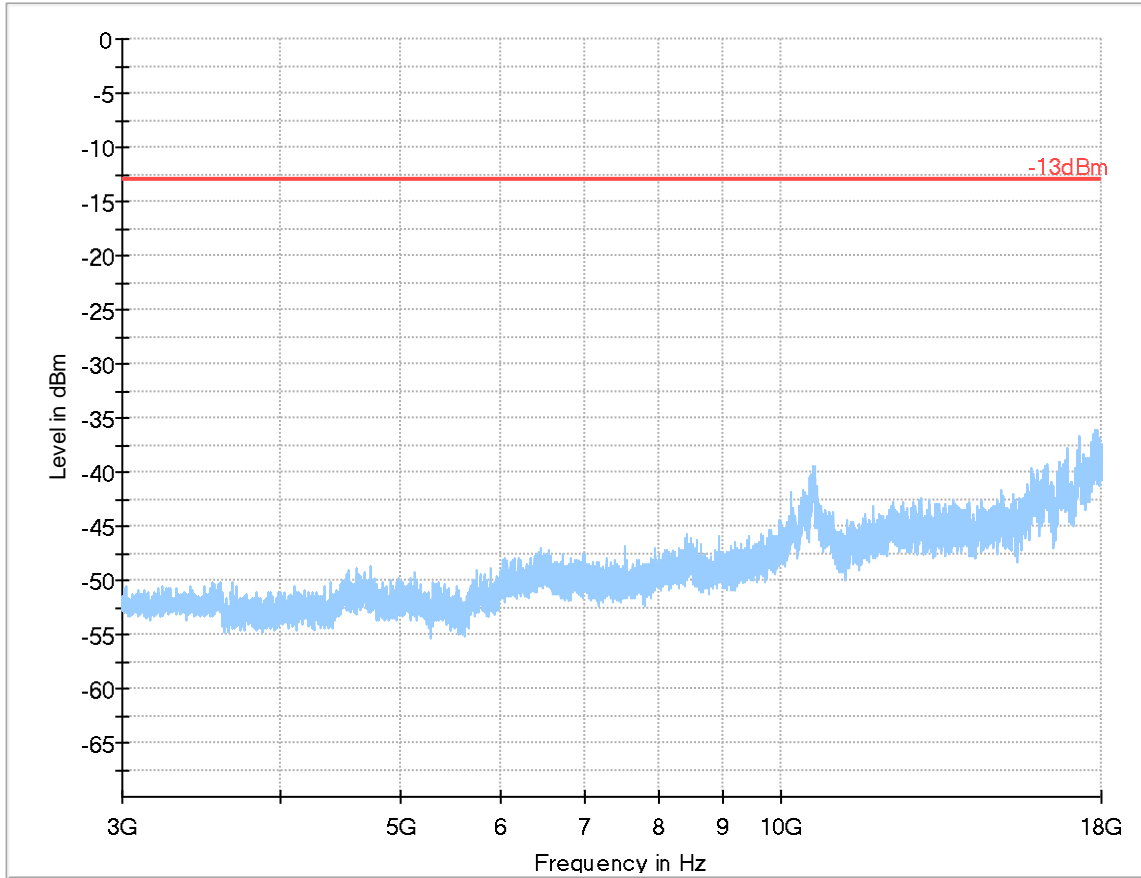
Channel: Mid



- Preview Result 1-PK+ * Critical_Freqs PK+
- Final_Result PK+ ♦ Final_Result RMS
- 13dBm

Plot # 17 Radiated Emissions: 3 GHz – 18 GHz

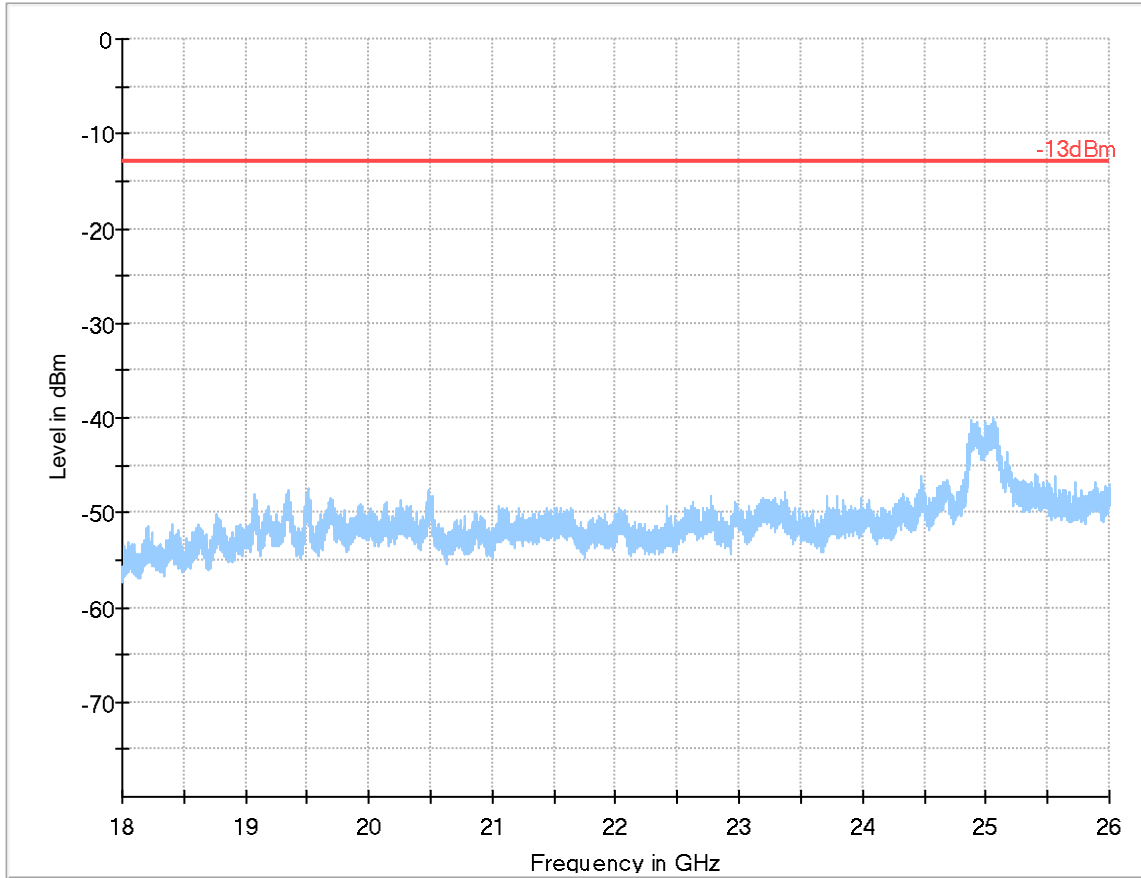
Channel: Mid



- Preview Result 1-PK+
- Fina_Result PK+
- Critical_Freqs PK+
- Fina_Result RMS
- 13dBm

Plot # 18 Radiated Emissions: 18 GHz – 26 GHz

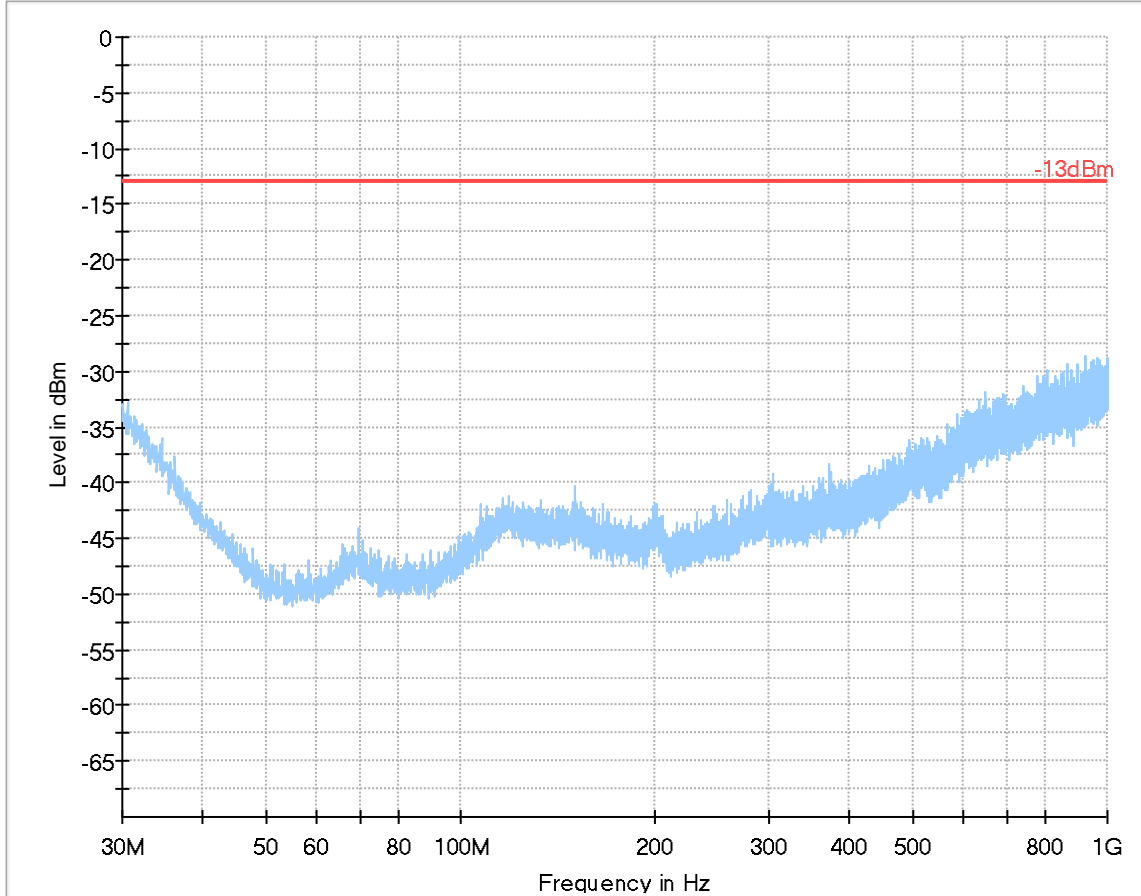
Channel: Mid



- Preview Result 1-PK+ Final_Result PK+
- Critical_Freqs PK+ Final_Result RMS
- 13dBm

Plot # 19 Radiated Emissions: 30 MHz - 1 GHz

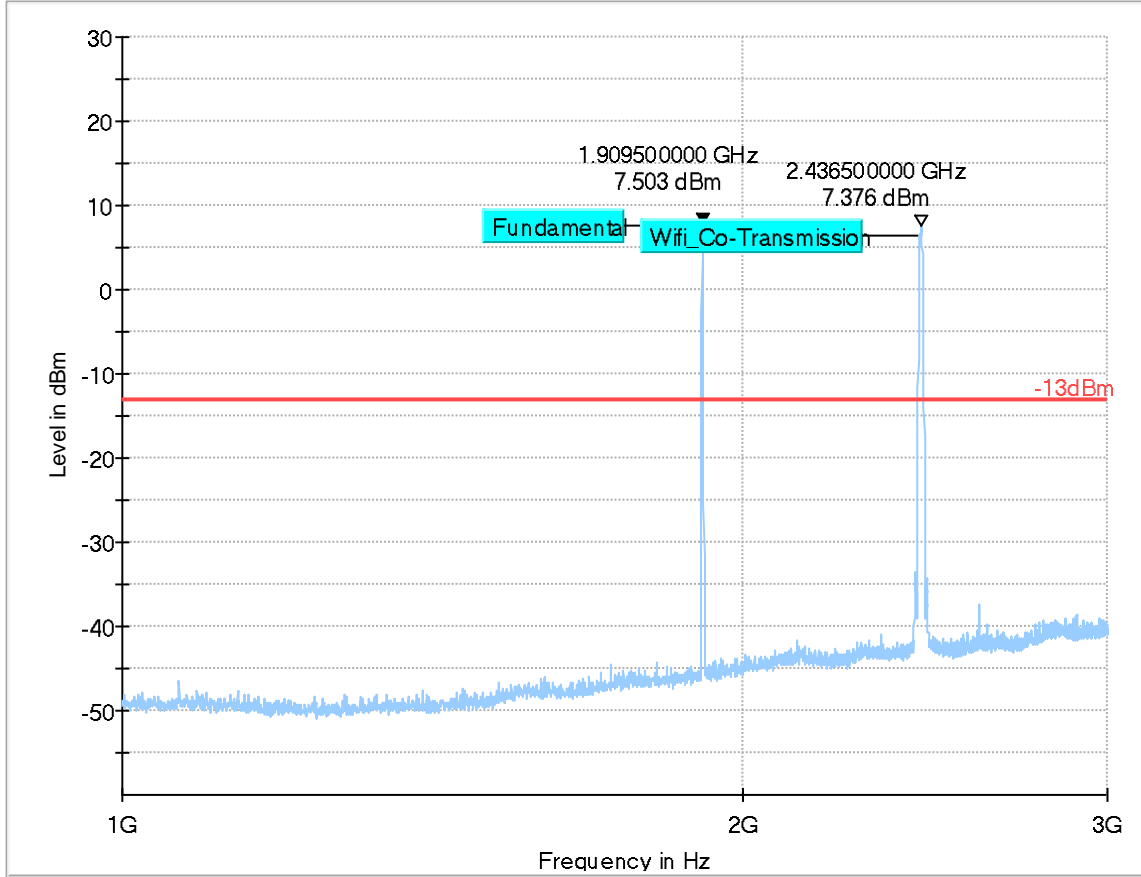
Channel: High



Preview Result 1-PK+ * Critical_Freqs PK+ -13dBm Final_Result RMS

Plot # 20 Radiated Emissions: 1 GHz - 3 GHz

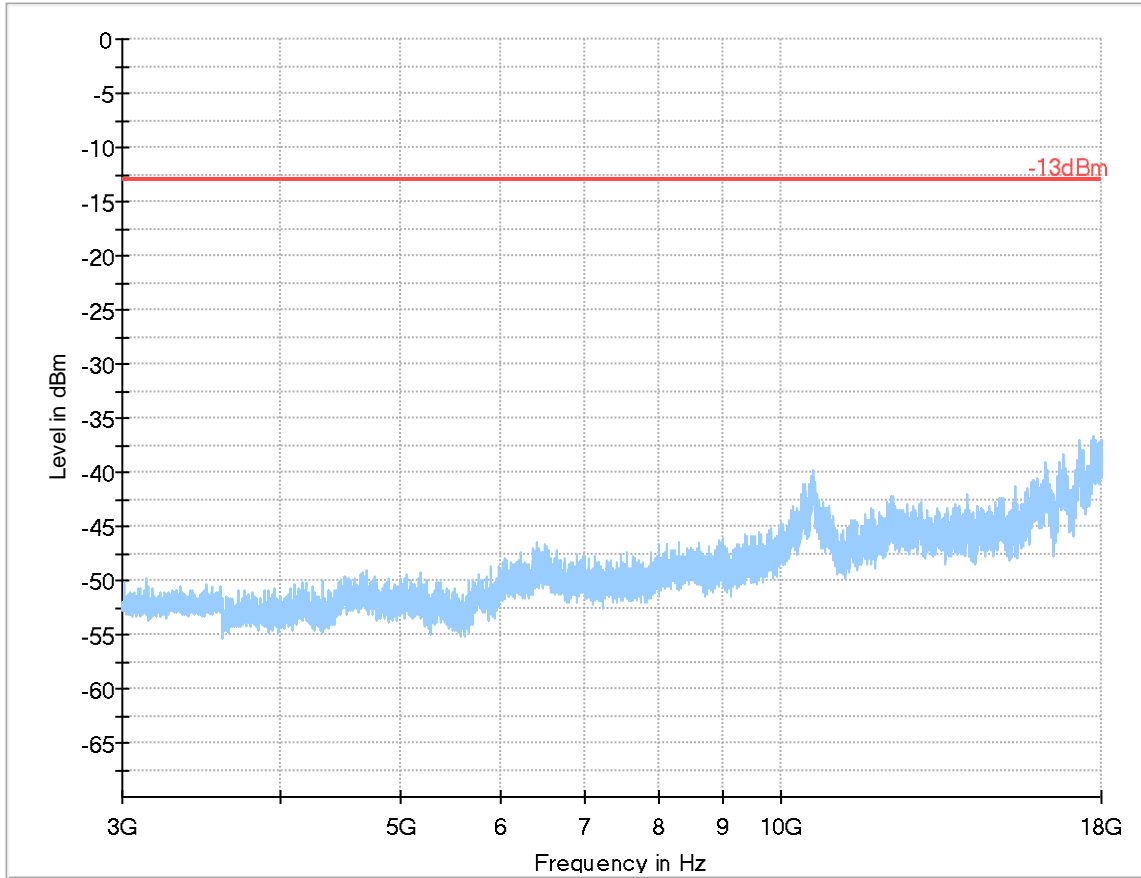
Channel: High



- Preview Result 1-PK+ Final_Result PK+ (Blue diamond)
- Critical_Freqs PK+ Final_Result RMS (Red asterisk)
- 13dBm (Red line)

Plot # 21 Radiated Emissions: 3 GHz - 18 GHz

Channel: High

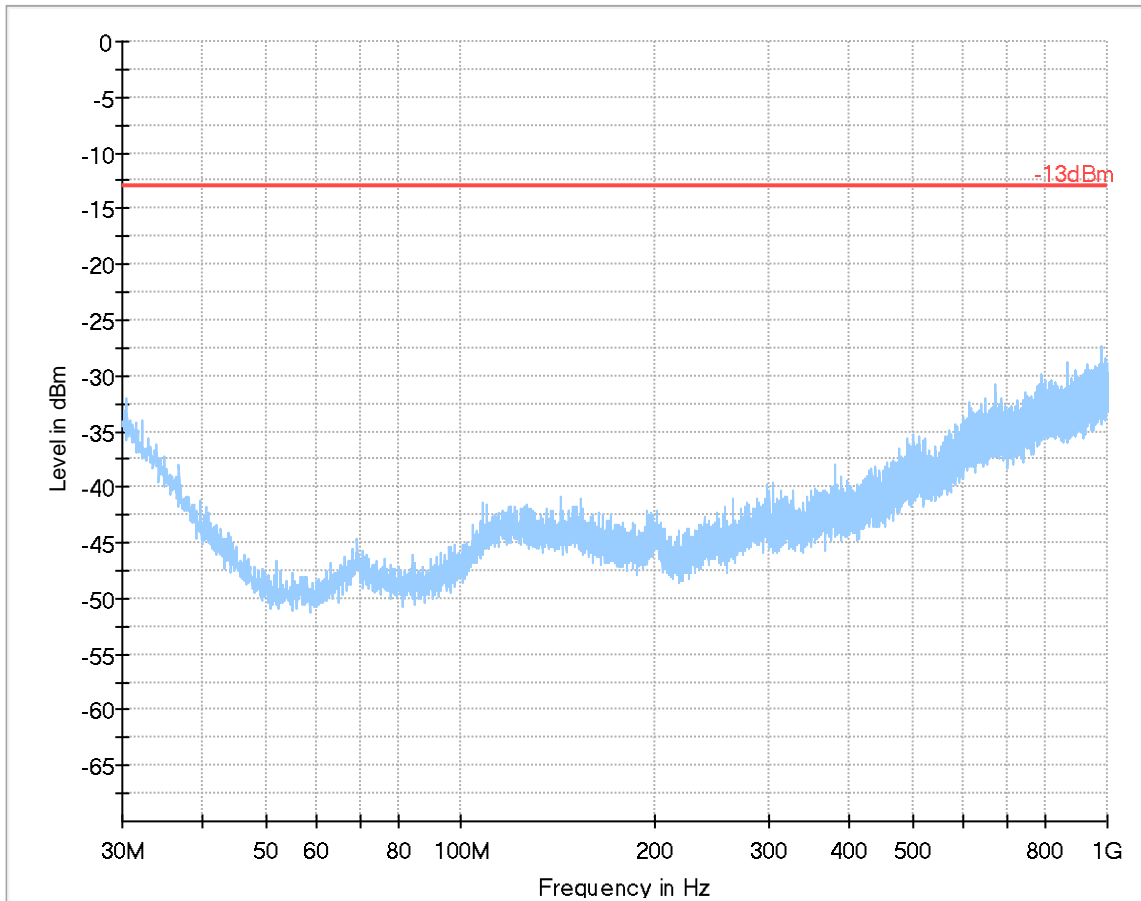


- Preview Result 1-PK+ Final_Result PK+
- Critical_Freqs PK+ Final_Result RMS
- 13dBm

WCDMA Band II

Plot # 22 Radiated Emissions: 30 MHz - 1 GHz

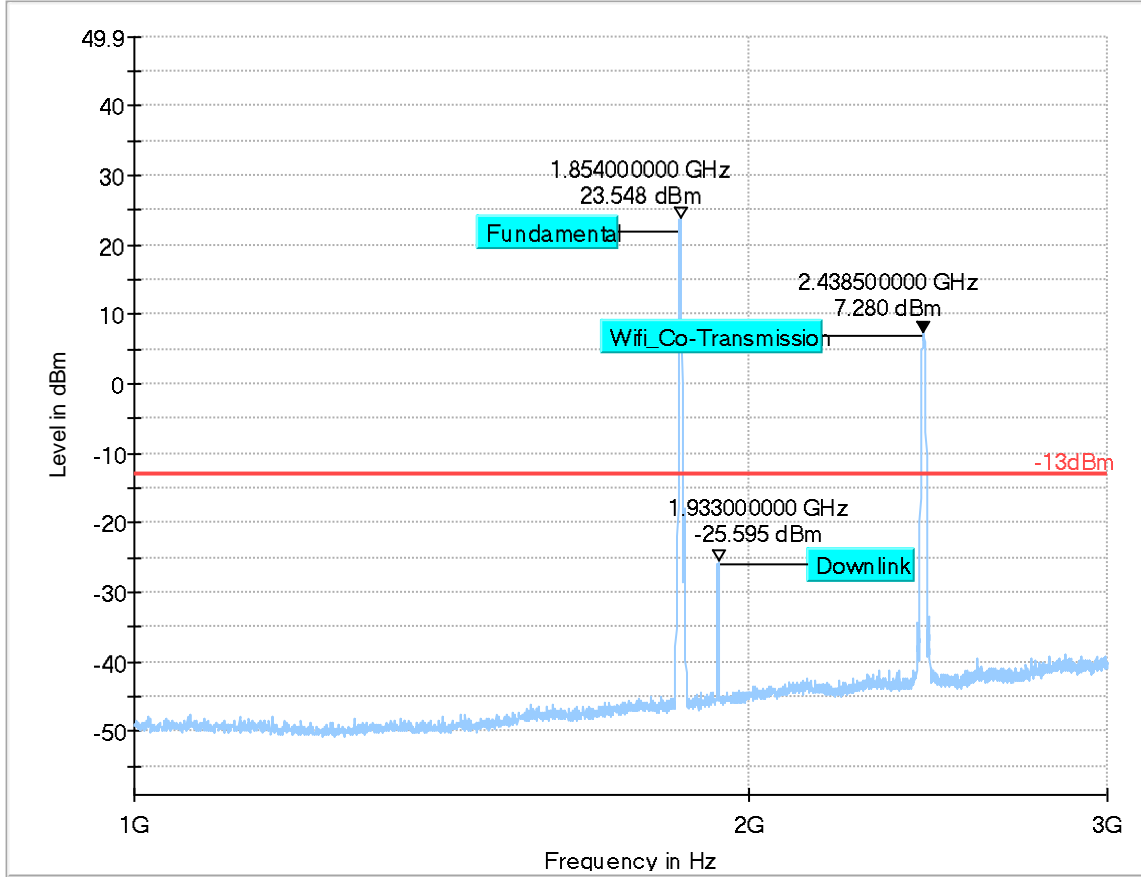
Channel: Low



Preview Result 1-PK+ * Critical_Freqs PK+ -13dBm Final_Result RMC

Plot # 23 Radiated Emissions: 1 GHz - 3 GHz

Channel: Low



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

Plot # 24 Radiated Emissions: 3 GHz - 18 GHz

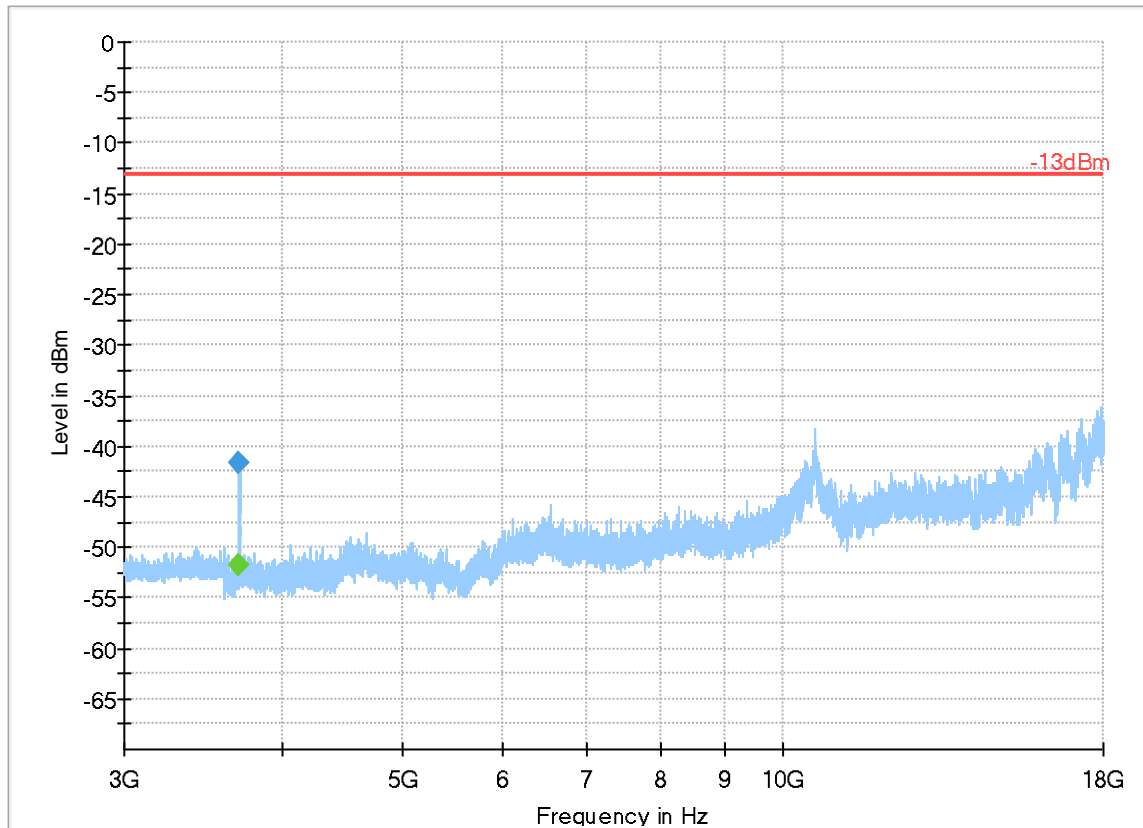
Channel: Low

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3702.147333	---	-51.80	---	---	100.0	1000.000	154.0	V	236.0
3702.147333	-41.74	---	-13.00	28.74	100.0	1000.000	154.0	V	236.0

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

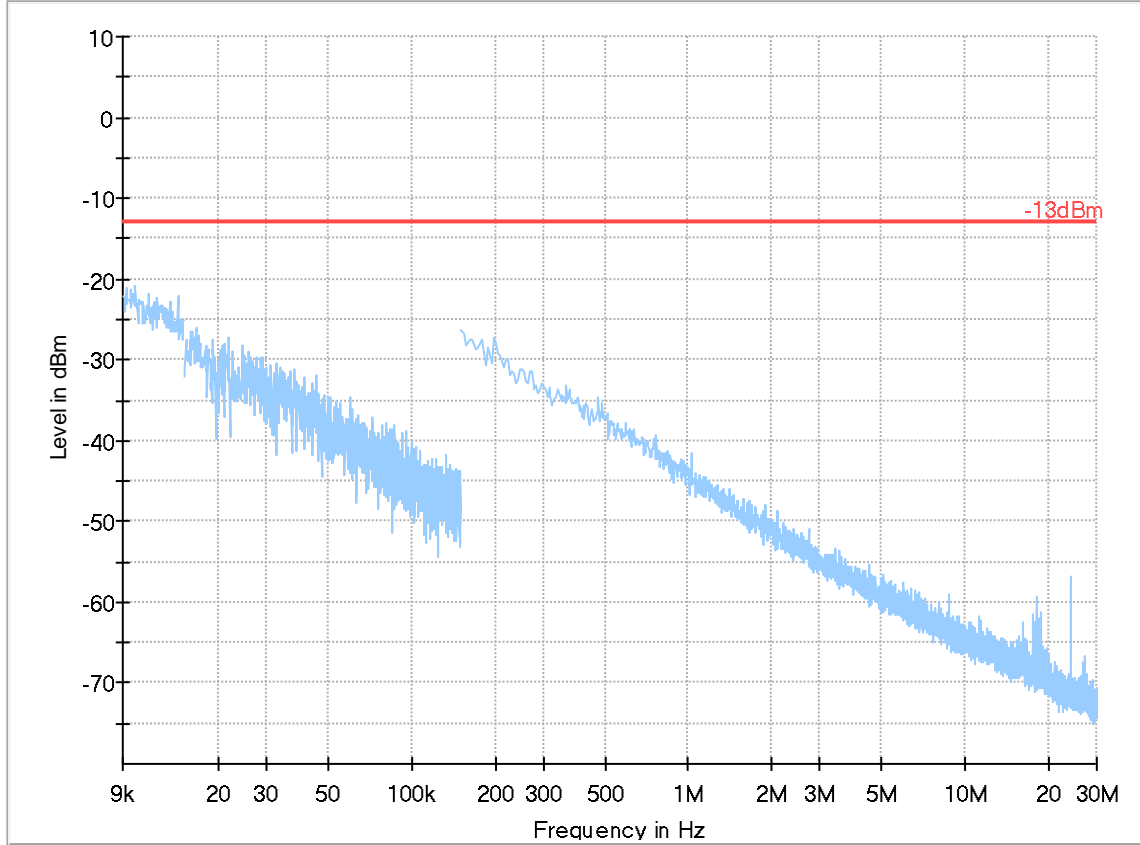
Frequency (MHz)	Corr. (dB)	Comment
3702.147333	-98.4	3:15:47 PM - 10/7/2019
3702.147333	-98.4	3:15:47 PM - 10/7/2019



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

Plot # 25 Radiated Emissions: 9 kHz - 30 MHz

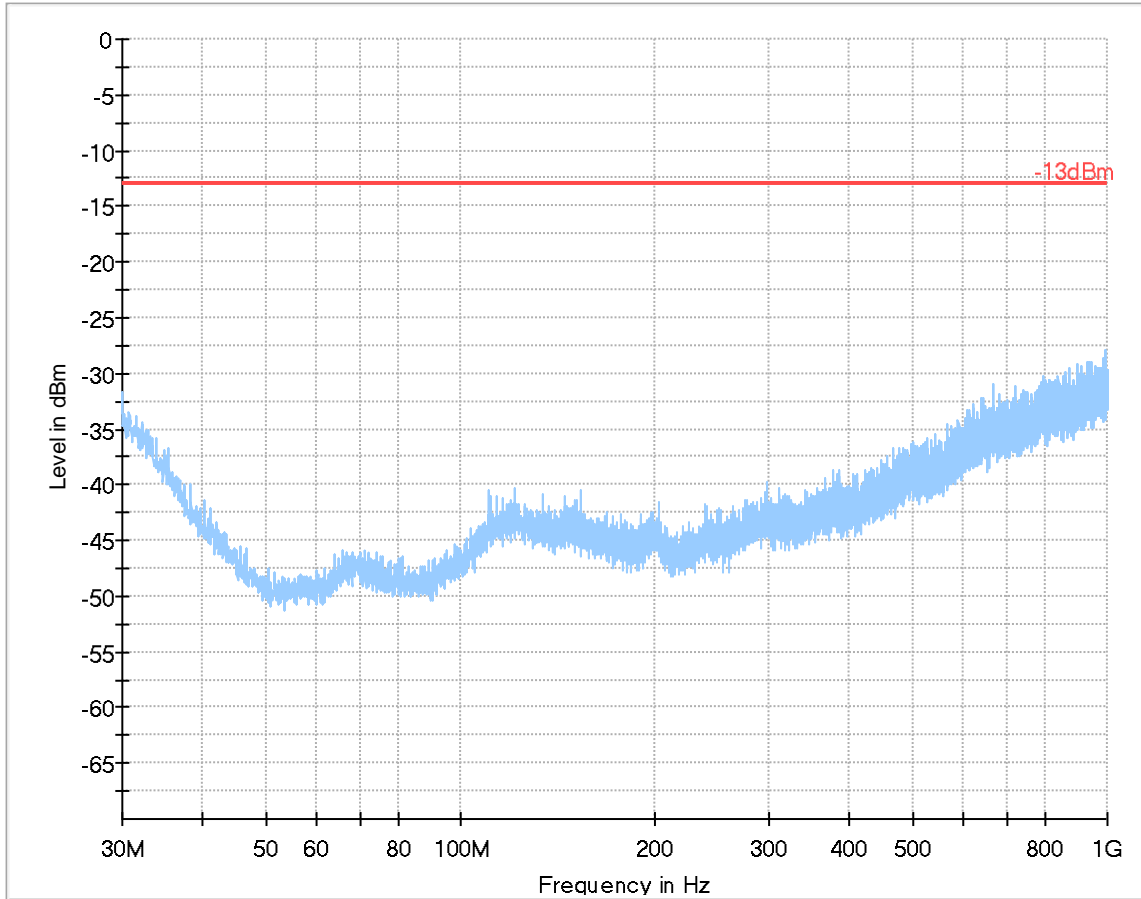
Channel: Mid



- Preview Result 2-QPK
- Critical_Freqs PK+
- Final_Result QPK
- Preview Result 1-PK+
- 13dBm
- Critical_Freqs QPK
- Final_Result PK+

Plot # 26 Radiated Emissions: 30 MHz – 1GHz

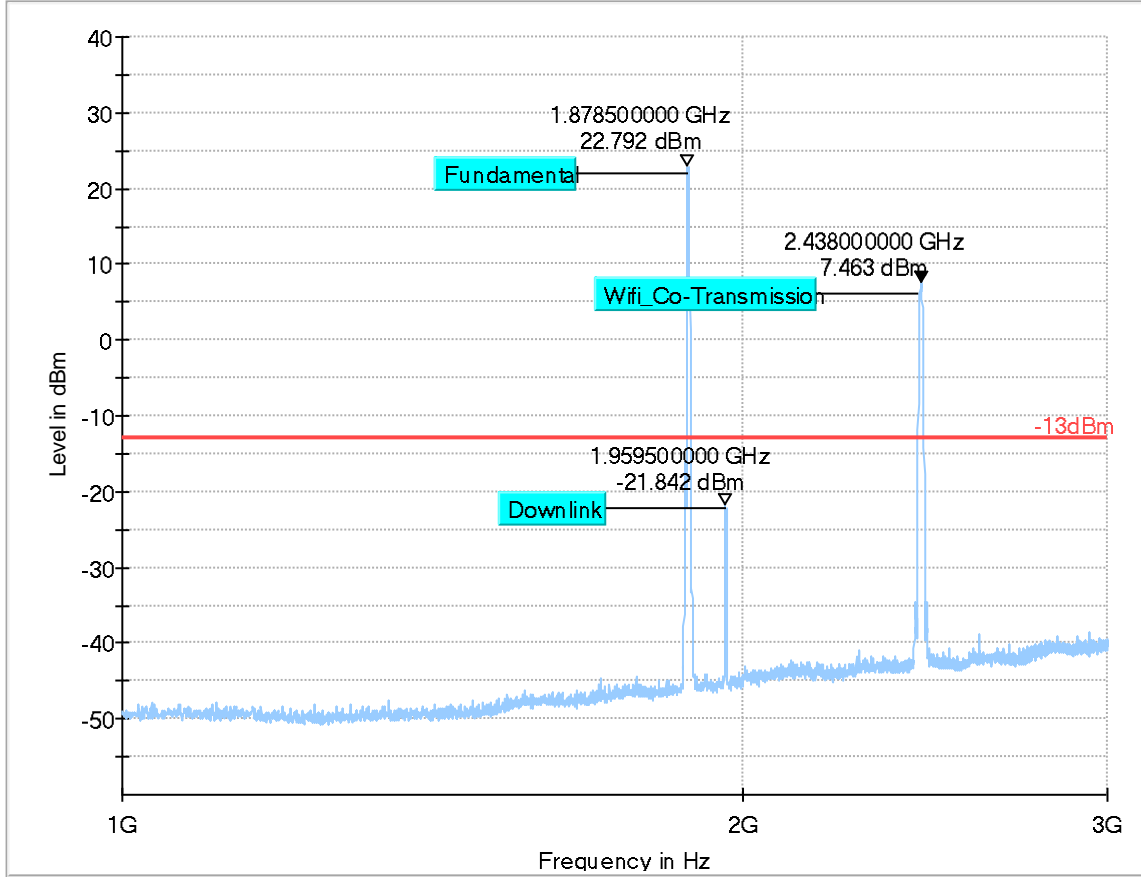
Channel: Mid



Preview Result 1-PK+ * Critical_Freqs PK+ -13dBm ◆ Final_Result RMSE

Plot # 27 Radiated Emissions: 1 GHz - 3 GHz

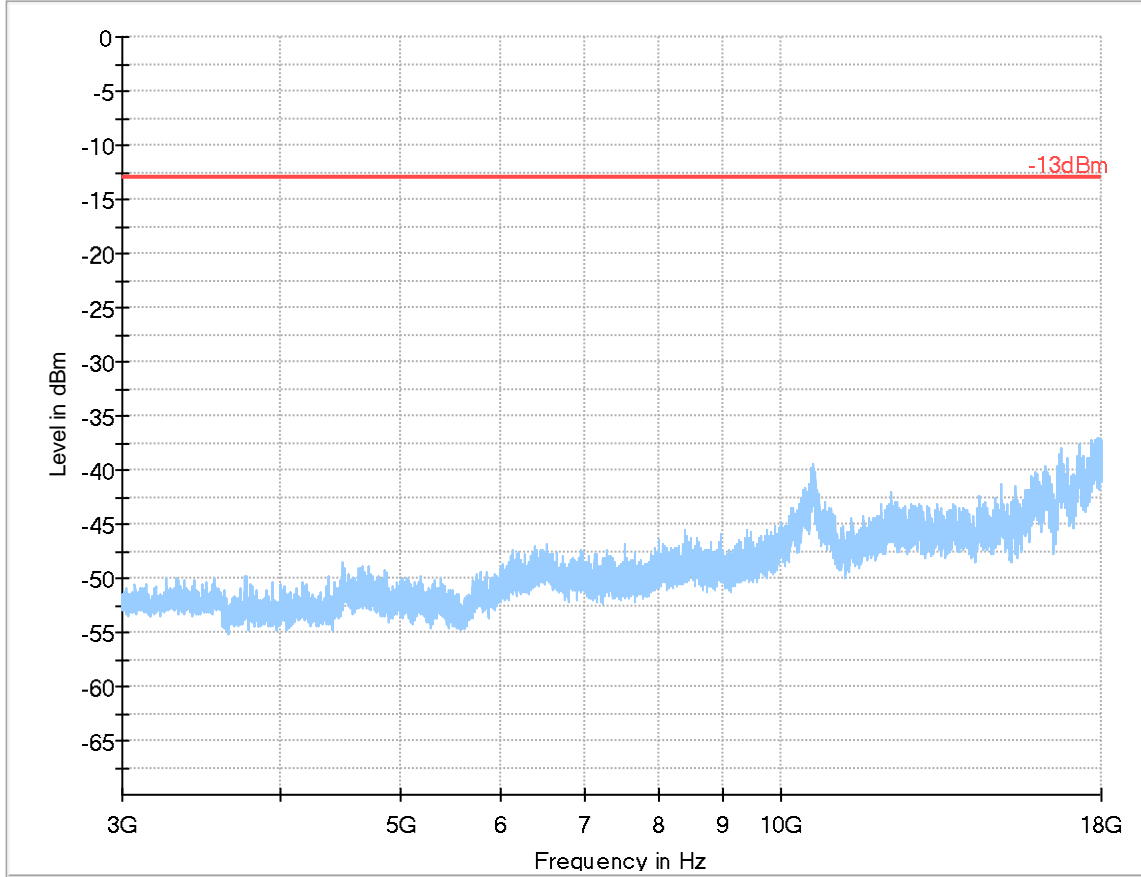
Channel: Mid



- Preview Result 1-PK+ (Blue line)
- Final_Result PK+ (Blue diamond)
- Critical_Freqs PK+ (Red asterisk)
- Final_Result RMS (Green diamond)
- 13dBm (Red line)

Plot # 28 Radiated Emissions: 3 GHz – 18 GHz

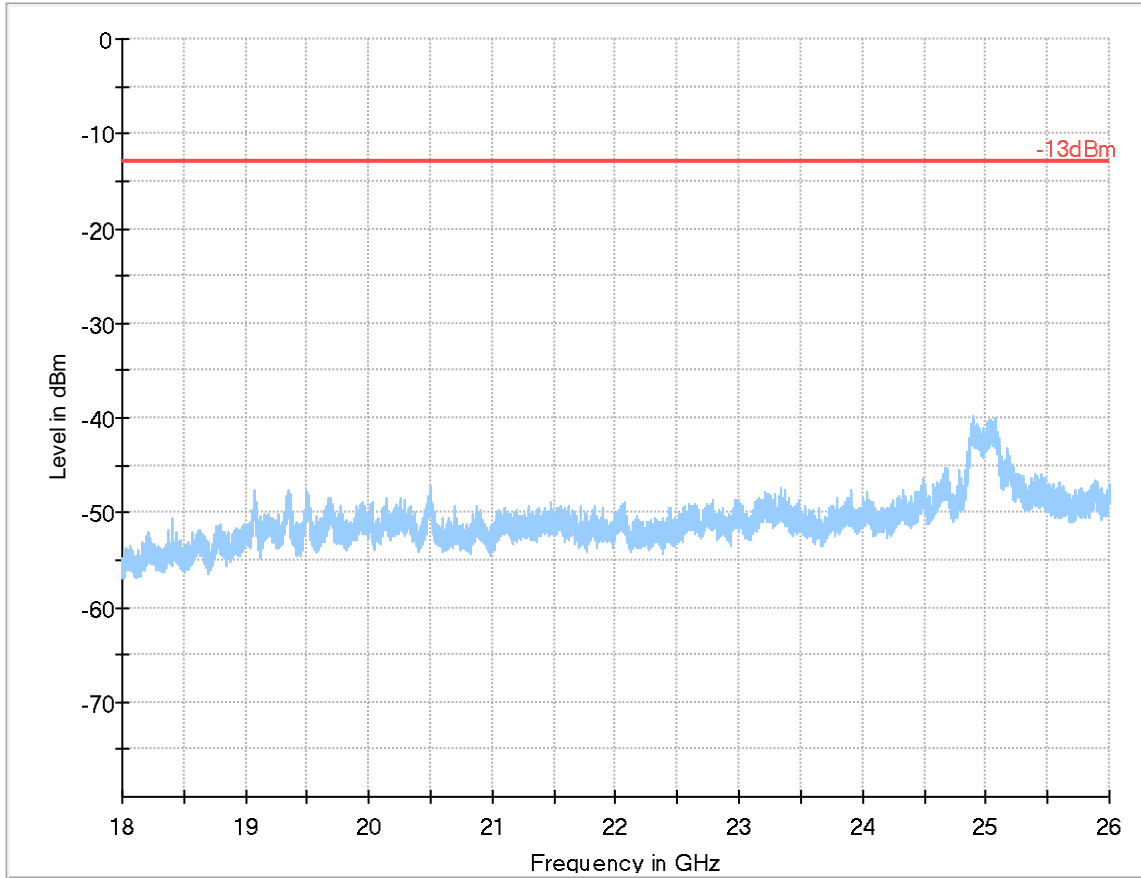
Channel: Mid



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

Plot # 29 Radiated Emissions: 18 GHz – 26 GHz

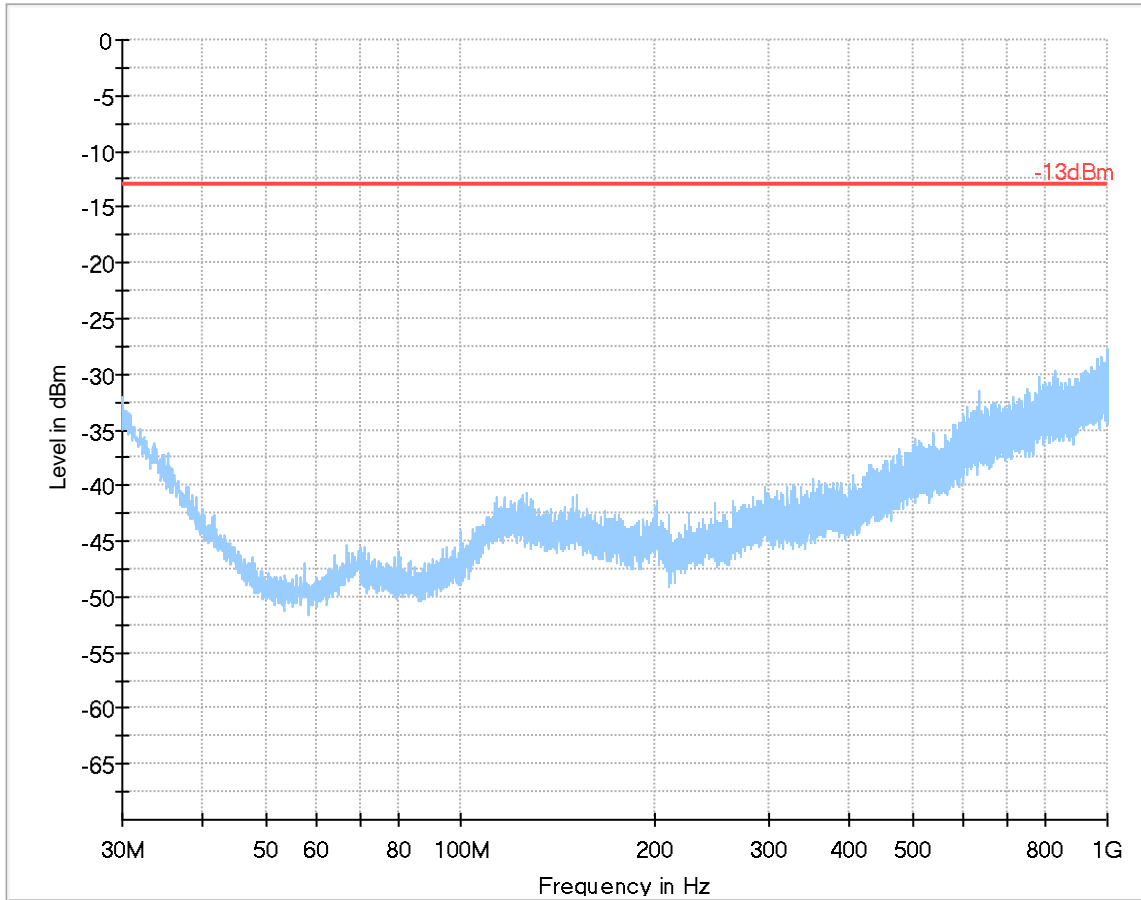
Channel: Mid



- Preview Result 1-PK+ Final_Result PK+
- Critical_Freqs PK+ Final_Result RMS
- 13dBm

Plot # 30 Radiated Emissions: 30 MHz - 1 GHz

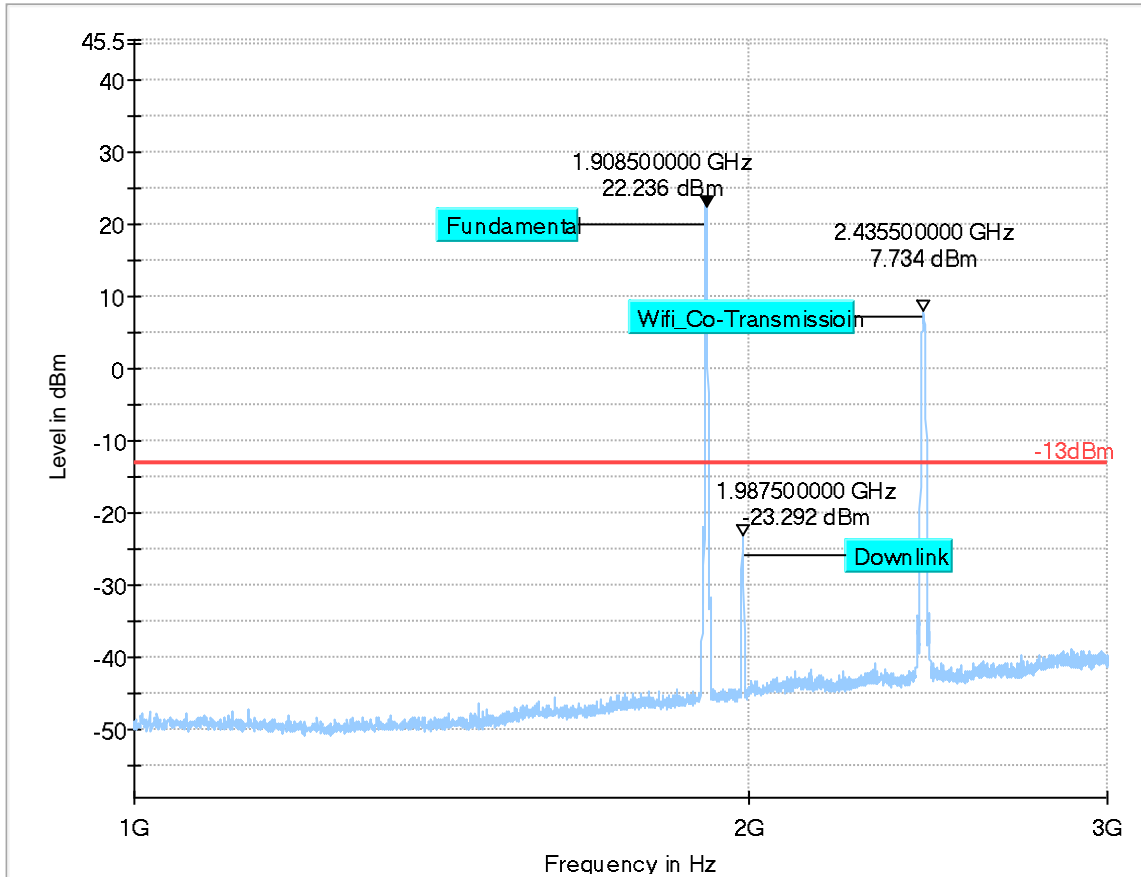
Channel: High



Preview Result 1-PK+ * Critical_Freqs PK+ -13dBm Final_Result RMS

Plot # 31 Radiated Emissions: 1 GHz - 3 GHz

Channel: High



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

Plot # 32 Radiated Emissions: 3 GHz - 18 GHz

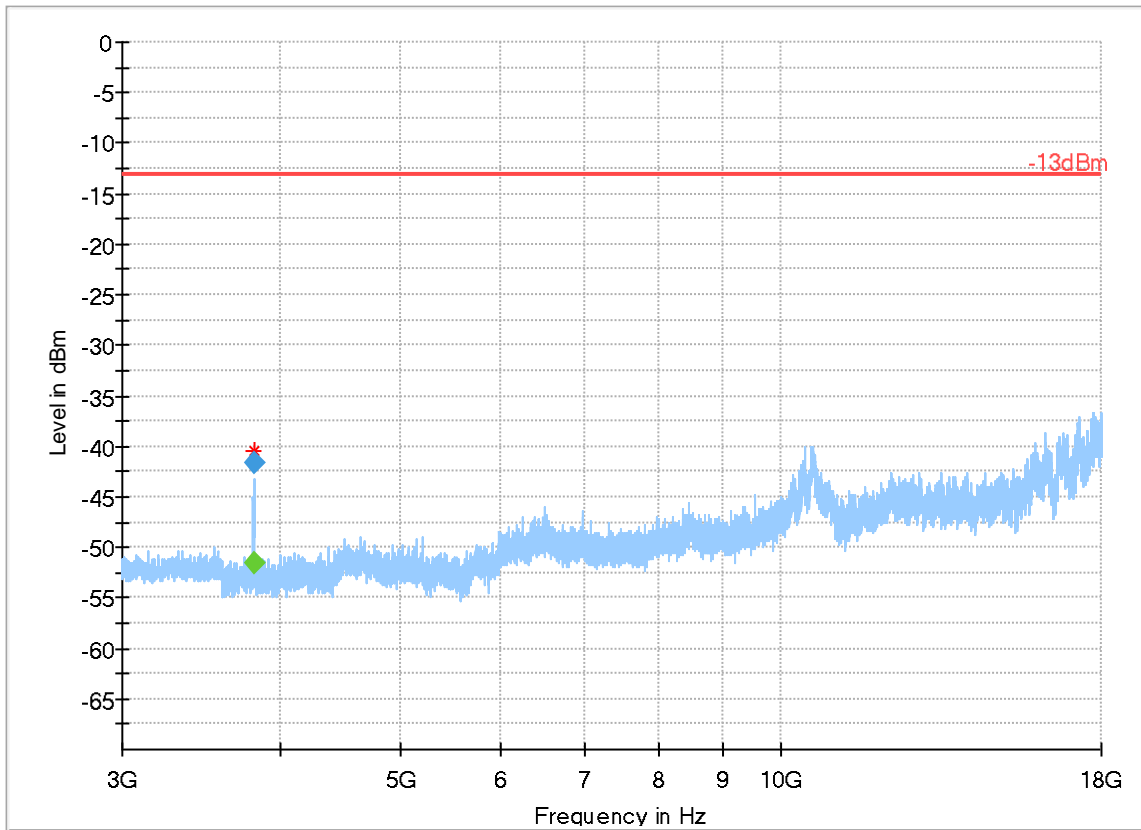
Channel: High

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3817.600167	---	-51.59	---	---	100.0	1000.000	140.0	V	270.0
3817.600167	-41.62	---	-13.00	28.62	100.0	1000.000	140.0	V	270.0

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

Frequency (MHz)	Corr. (dB)	Comment
3817.600167	-98.3	3:28:02 PM - 10/7/2019
3817.600167	-98.3	3:28:02 PM - 10/7/2019



- ◆ Preview Result 1-PK+ Final_Result PK+
- ★ Critical_Freqs PK+
- ◆ Final_Result RMS
- -13dBm

WCDMA Band V

Plot # 33 Radiated Emissions: 30 MHz - 1 GHz

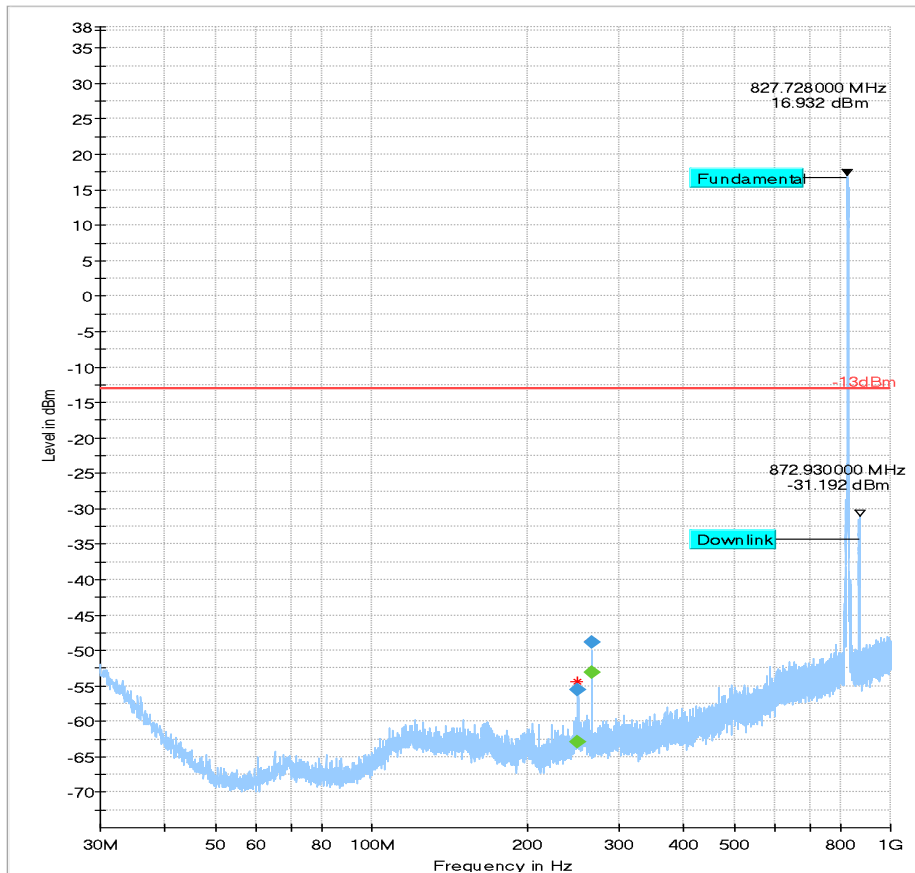
Channel: Low

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
250.004647	---	-62.96	---	---	100.0	100.000	140.0	H	46.0
250.004647	-55.60	---	-13.00	42.60	100.0	100.000	140.0	H	46.0
266.388720	---	-53.16	---	---	100.0	100.000	151.0	H	249.0
266.388720	-48.78	---	-13.00	35.78	100.0	100.000	151.0	H	249.0

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

Frequency (MHz)	Corr. (dB)	Comment
250.004647	-76.3	10:20:17 PM - 10/4/2019
250.004647	-76.3	10:20:17 PM - 10/4/2019
266.388720	-75.8	10:22:27 PM - 10/4/2019
266.388720	-75.8	10:22:27 PM - 10/4/2019



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

Plot # 34 Radiated Emissions: 1 GHz - 3 GHz

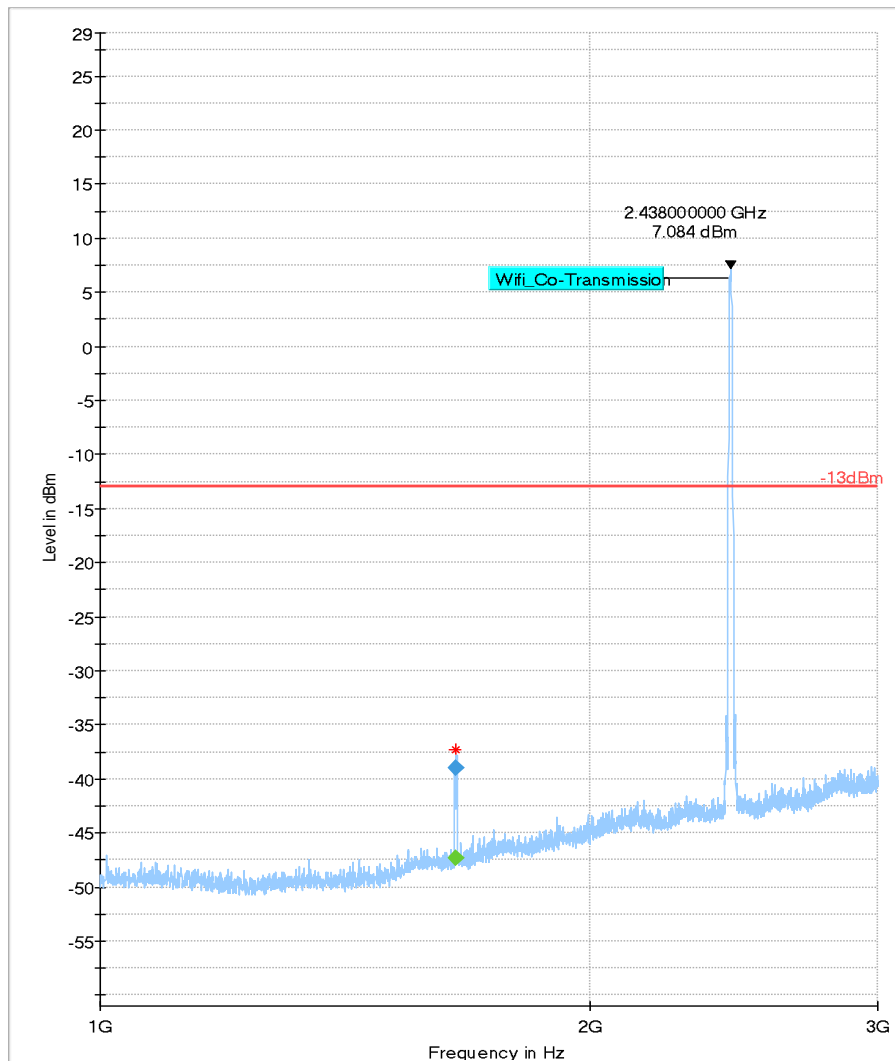
Channel: Low

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1651.458438	---	-47.35	---	---	100.0	1000.000	152.0	V	271.0
1651.458438	-39.05	---	-13.00	26.05	100.0	1000.000	152.0	V	271.0

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

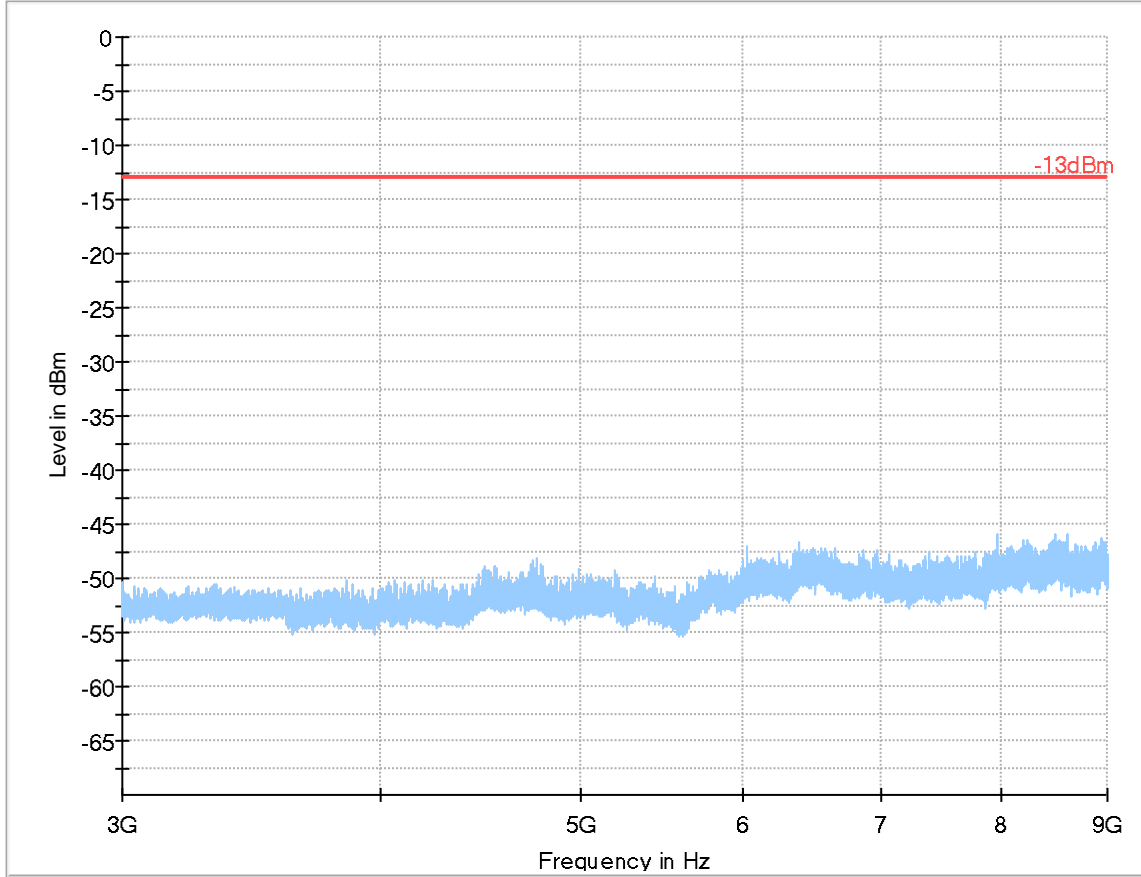
Frequency (MHz)	Corr. (dB)	Comment
1651.458438	-64.5	1:11:57 AM - 10/5/2019
1651.458438	-64.5	1:11:56 AM - 10/5/2019



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

Plot # 35 Radiated Emissions: 3 GHz - 9 GHz

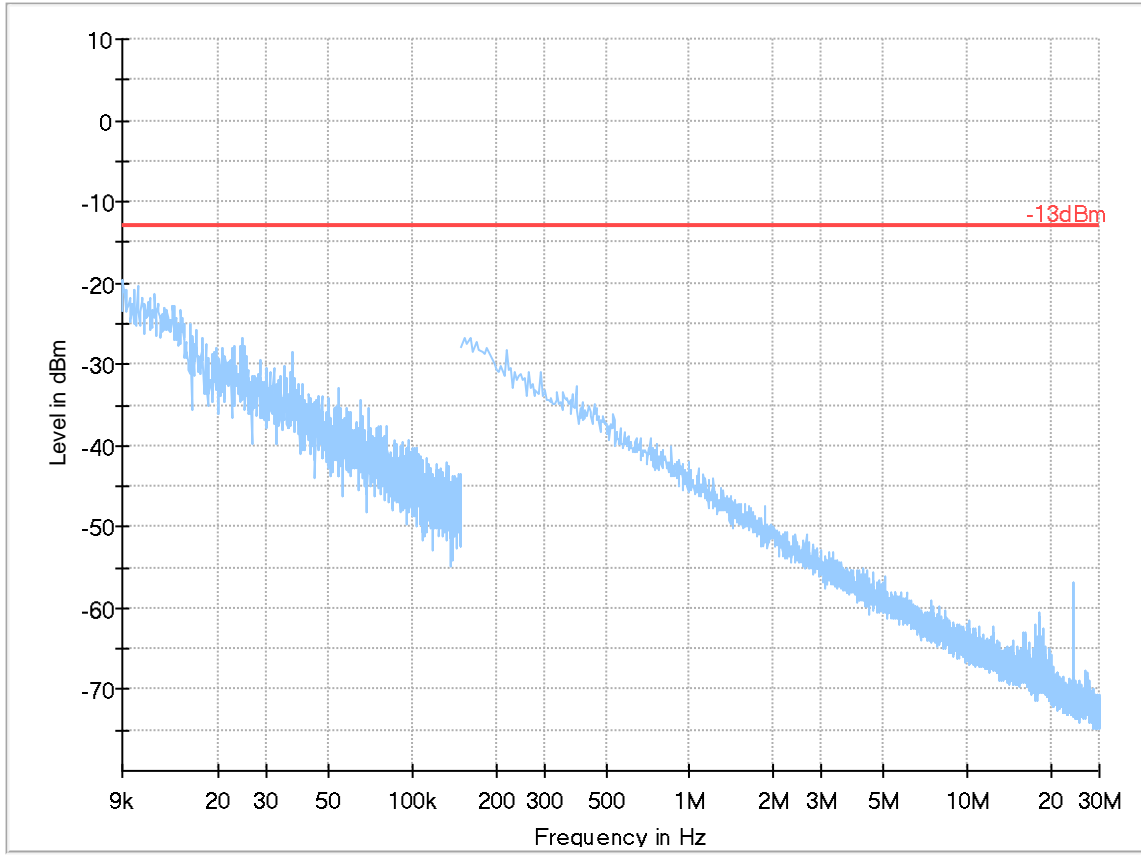
Channel: Low



- Preview Result 1-PK+
- Final Result PK+
- Critical Freqs PK+
- Final Result RMS
- 13dBm

Plot # 36 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



- Preview Result 2-QPK
- Preview Result 1-PK+
- Critical_Freqs QPK
- Critical_Freqs PK+
- 13dBm
- Final_Result QPK
- Final_Result PK+

Plot # 37 Radiated Emissions: 30 MHz – 1 GHz

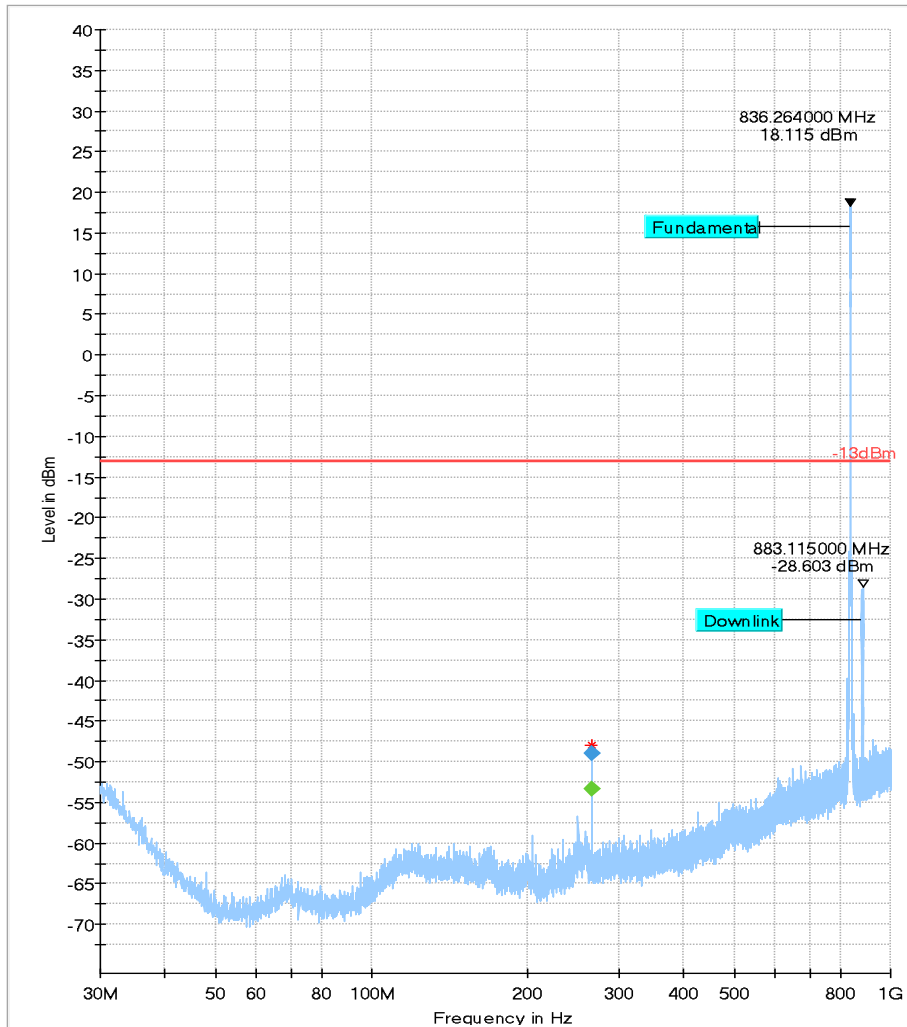
Channel: Mid

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
266.395360	---	-53.31	---	---	100.0	100.000	158.0	H	248.0
266.395360	-48.89	---	-13.00	35.89	100.0	100.000	158.0	H	248.0

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

Frequency (MHz)	Corr. (dB)	Comment
266.395360	-75.8	9:56:33 PM - 10/4/2019
266.395360	-75.8	9:56:33 PM - 10/4/2019



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

Plot # 38 Radiated Emissions: 1 GHz - 3 GHz

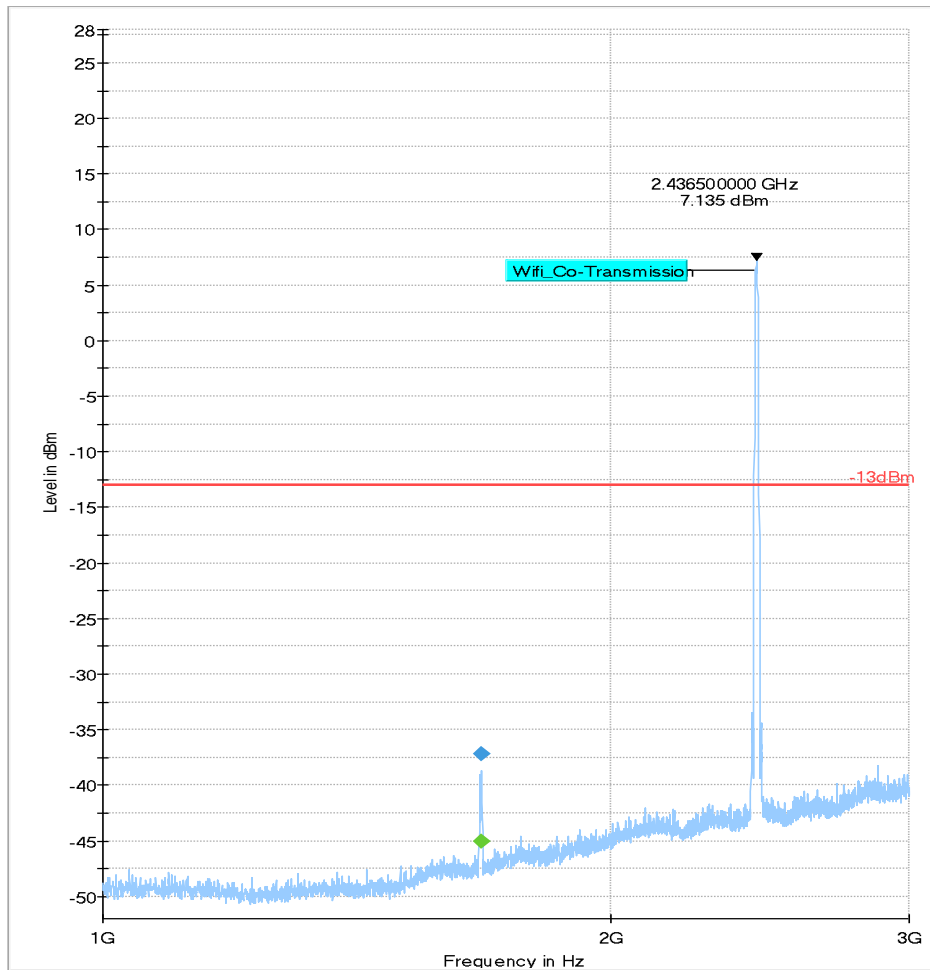
Channel: Mid

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1674.727500	---	-45.07	---	---	100.0	1000.000	140.0	V	275.0
1674.727500	-37.23	---	-13.00	24.23	100.0	1000.000	140.0	V	275.0

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

Frequency (MHz)	Corr. (dB)	Comment
1674.727500	-64.4	1:23:03 AM - 10/5/2019
1674.727500	-64.4	1:23:03 AM - 10/5/2019



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

Plot # 40 Radiated Emissions: 30 MHz - 1 GHz

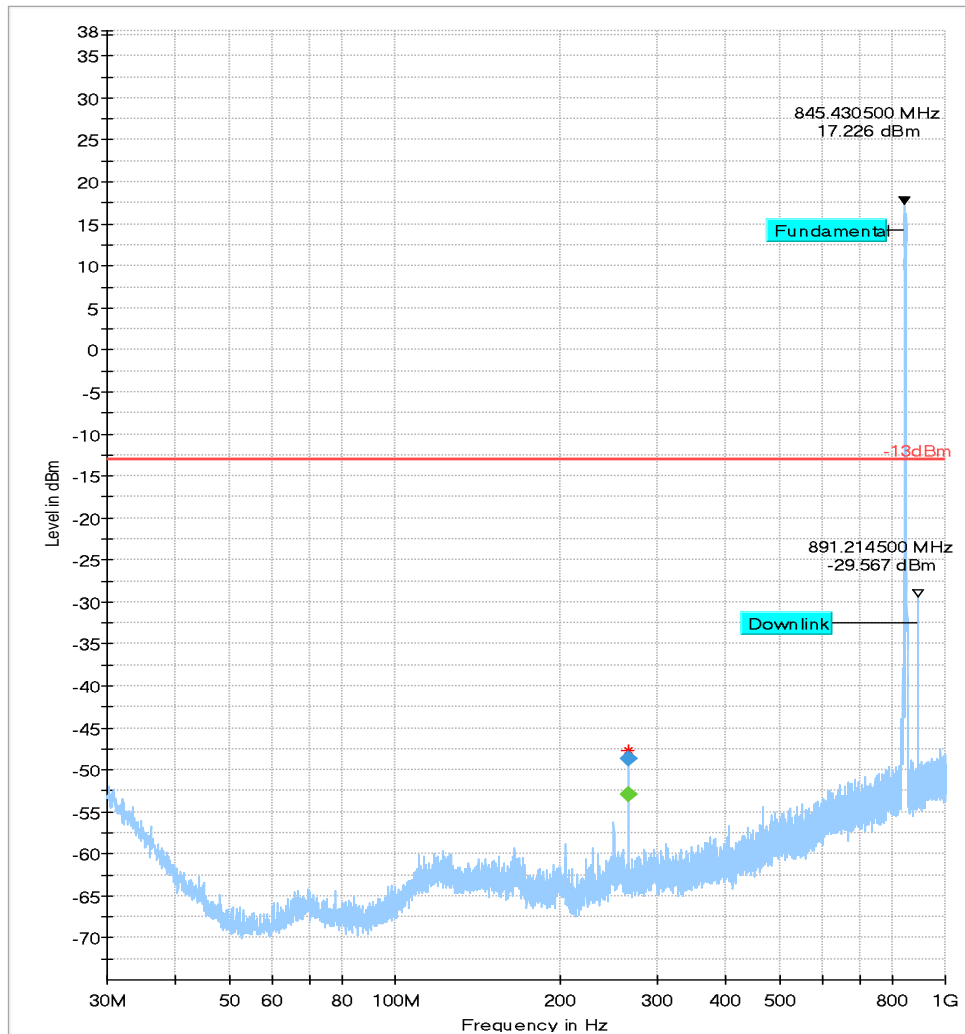
Channel: High

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
266.390023	---	-52.99	---	---	100.0	100.000	140.0	H	248.0
266.390023	-48.68	---	-13.00	35.68	100.0	100.000	140.0	H	248.0

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

Frequency (MHz)	Corr. (dB)	Comment
266.390023	-75.8	10:08:26 PM - 10/4/2019
266.390023	-75.8	10:08:26 PM - 10/4/2019



Plot # 41 Radiated Emissions: 1 GHz - 3 GHz

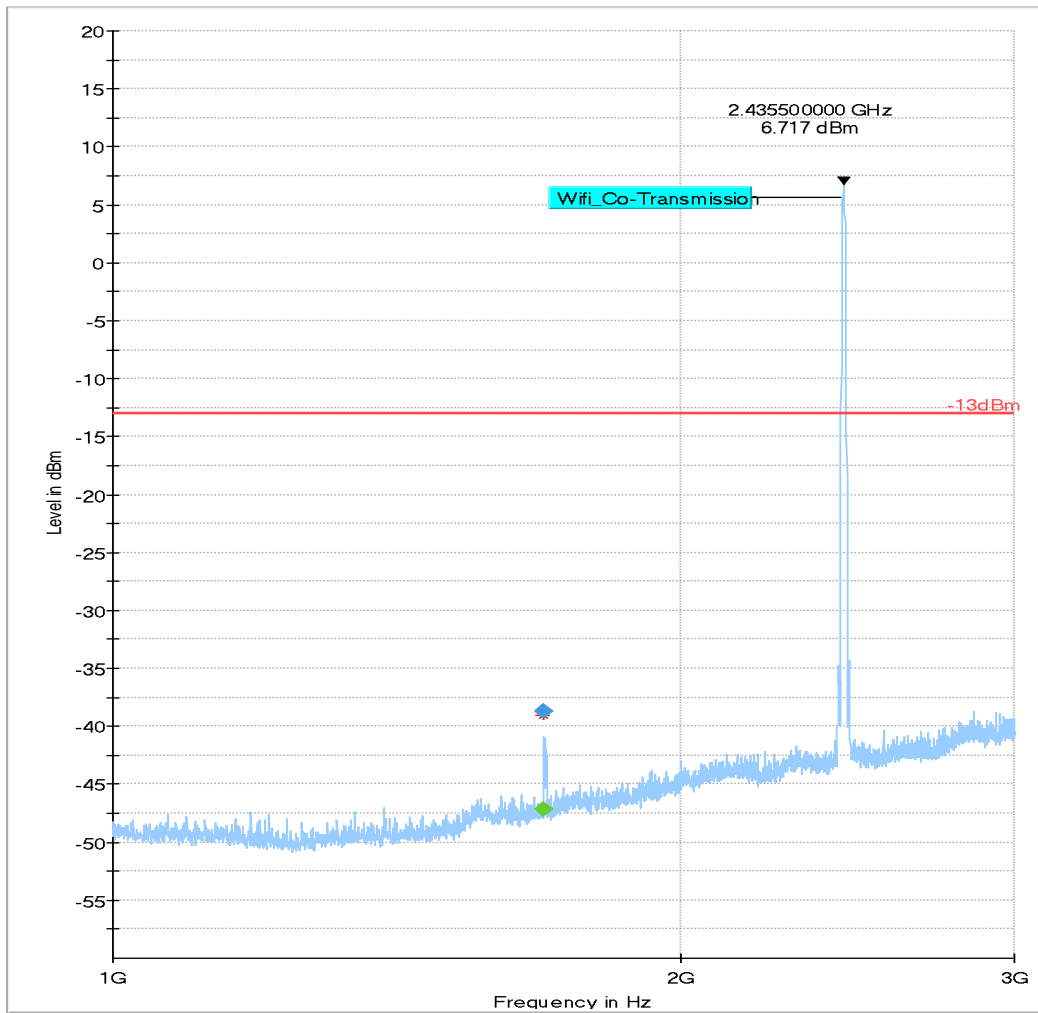
Channel: High

Final Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1691.716250	---	-47.18	---	---	100.0	1000.000	140.0	V	279.0
1691.716250	-38.73	---	-13.00	25.73	100.0	1000.000	140.0	V	279.0

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

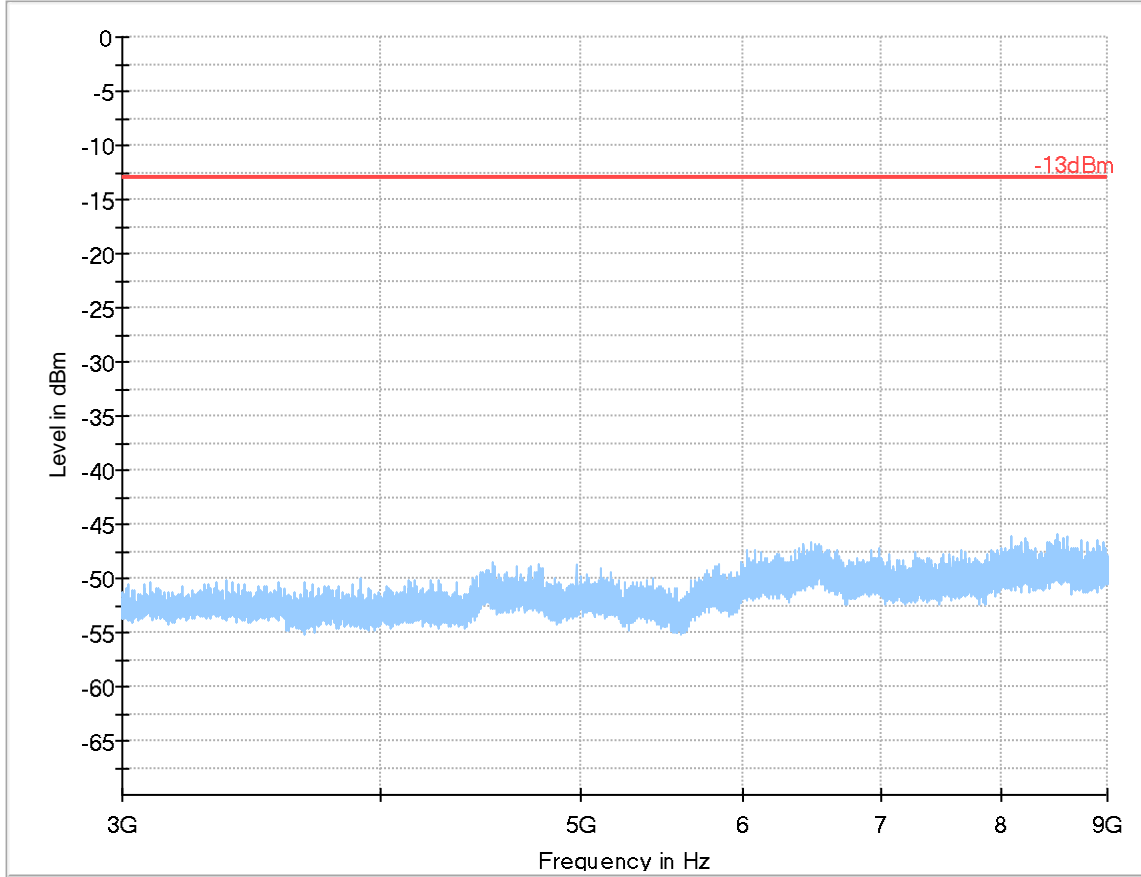
Frequency (MHz)	Corr. (dB)	Comment
1691.716250	-64.3	1:34:07 AM - 10/5/2019
1691.716250	-64.3	1:34:06 AM - 10/5/2019



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

Plot # 42 Radiated Emissions: 3 GHz - 9 GHz

Channel: High



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

8 Test setup photo

Setup photos are included in supporting file name: "EMC_PRATT-006-19001_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 ANALYZER	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
2020-02-11	EMC_PRATT-006-19001_FCC_22_24_27_ISED	Initial version	Yuchan Lu
2020-08-28	EMC_PRATT-006-19001_FCC_22_24_ISED-R1	Updated Section 7 table for EIRP/ERP based on 10ft minimum cable to antenna. Updated section 3.3. Removed references to FCC 27 in report and name	Yuchan Lu