FCC Test Report

For:
Trapeze Software Group, Inc.

Model:
Ranger 4 EVDO A

Product Description:
Rugged and compact vehicular compute

FCC ID: RZ3RAN45728A

Per:
47 CFR: Part 22, Part 24

REPORT #: EMC_TRAPZ_006_18001_FCC_22_24

DATE: 02/26/2018

A2LA Accredited

IC recognized #
3462B-2

***CETECOM* Inc.**
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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.

No deficiencies were ascertained.

Responsible for Testing Laboratory:

Date	Section	Name	Signature
02/26/2018	Compliance	Peter Nevermann (Director Radio, EMC & Smartcard Services, Compliance)	Digitally signed by peter.nevermann@cetecom.com Date: 2018.02.26 18:46:32 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
02/26/2018	Compliance	Issa Ghanma (EMC Engineer)	ISSA GHANMA Digitally signed by ISSA GHANMA DN: cn=ISSA GHANMA, c=US, o=CETECOM Inc., email=issa.ghanma@cetecom.com Date: 2018.02.26 10:06:32 -08'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Director Radio, EMC & Smartcard Services, Compliance:	Peter Nevermann
Responsible Project Leader:	Laith Saman

2.2 Identification of the Client

Applicant's Name:	Trapeze Software Group, Inc.
Street Address:	10, 2175 29 Street NE
City/Zip Code	Calgary, AB, T17 7H8
Country	Canada
Contact Person:	Stephen Hickle
Phone No.	403-777-3760 x826
e-mail:	stephen.hickle@trapezegroup.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as applicant.
Manufacturers Address:	----------
City/Zip Code	----------
Country	----------
Contact	----------
Phone No.	----------
e-mail:	----------

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No	Ranger 4 EVDO A			
FCC-ID	RZ3RAN45728A			
Product Description	Rugged and compact vehicular compute			
Module Information				
Module Name and Number:	Sierra Wireless MC5728			
FCC ID:	N7N-MC5728			
Technology	**Band**	**UL Frequency (MHz)**	**DL Frequency (MHz)**	**Modulation**
CDMA	BC0	815 – 849	860 – 894	EVDO
	BC1	1850 – 1910	1930 – 1990	EVDO
Max. documented antenna name and gain:	Monopole printed trace with 0.54 dBi at 850MHz and 1.89 dBi at 1900MHz			
Max. documented peak conducted form module grant:	0.9594 Watts			
Operating Voltage Range	Low 6V / Nom 12V / High 36V			
Operating Temperature Range	-30 °C to 65 °C			
Other Radios included in the device	Wi-Fi: Redpine RS9110-N-11-02/ FCC ID: XF6-RS9110N1102, GPS LEA-6H			
Sample Revision	☐Prototype Unit; ■Production Unit; ☐Pre-Production			
EUT Dimensions	7 in X 8 in X 4 in			
Weight	2.5 lbs.			
EUT Diameter	■ < 60 cm ☐ Other _____			

3.2 EUT Sample details

EUT #	Unit ID NO.	HW Version	SW Version	Comments
1	31-7038016	4.3	1.03	Radiated Measurements

3.3 Accessory Equipment

AE #	Type	Model	Manufacturer	Serial Number	Comments
1	Power supply	3A-621DN12	CUI INC	ETS120500UTC-P5P-SZ	In realty the unit will be connected to a vehicular battery. This accessory used for testing only.

3.4 Test Sample Configuration

Set-up #	EUT / AE used for set-up	Comments
1	EUT #1 + AE #1	Radiated Measurements

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	Cellular and Wi-Fi Co-location	Cellular was tested on Low, Mid, High Channels Co-Transmission with Wi-Fi 2.4GHz b mode Low channel (worst case).

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: RZ3RAN45728A

The pre-certified module to be integrated (Sierra Wireless MC5728) as described in Section 3, Radiated Spurious Emissions test was performed for simultaneous transmission case. Results have been checked to meet limits per Code of Federal Regulations Title 47 parts 22, 24.

The conducted module test data that can be obtained under the FCC Filing ID: N7N-MC5728 is applicable for the host described in section 3.

4.1 Dates of Testing:

01/19/2018 – 02/12/2018

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%

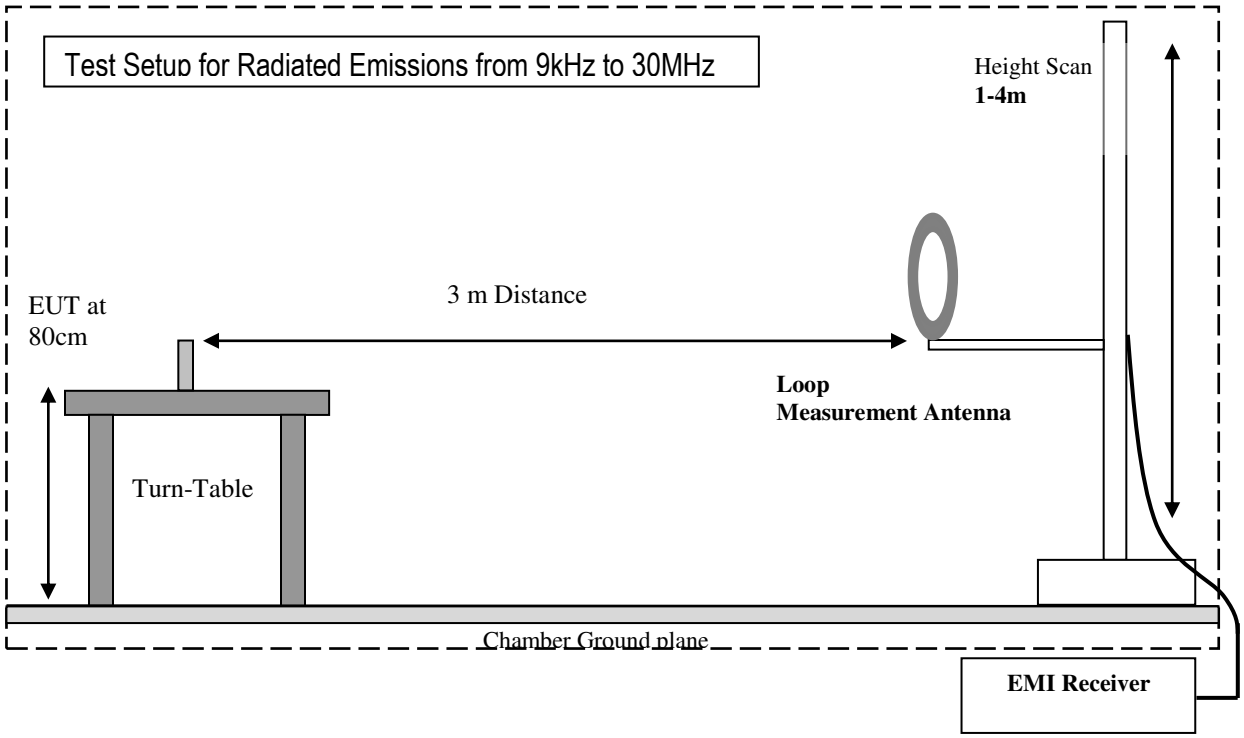
Deviating test conditions are indicated at individual test description where applicable.

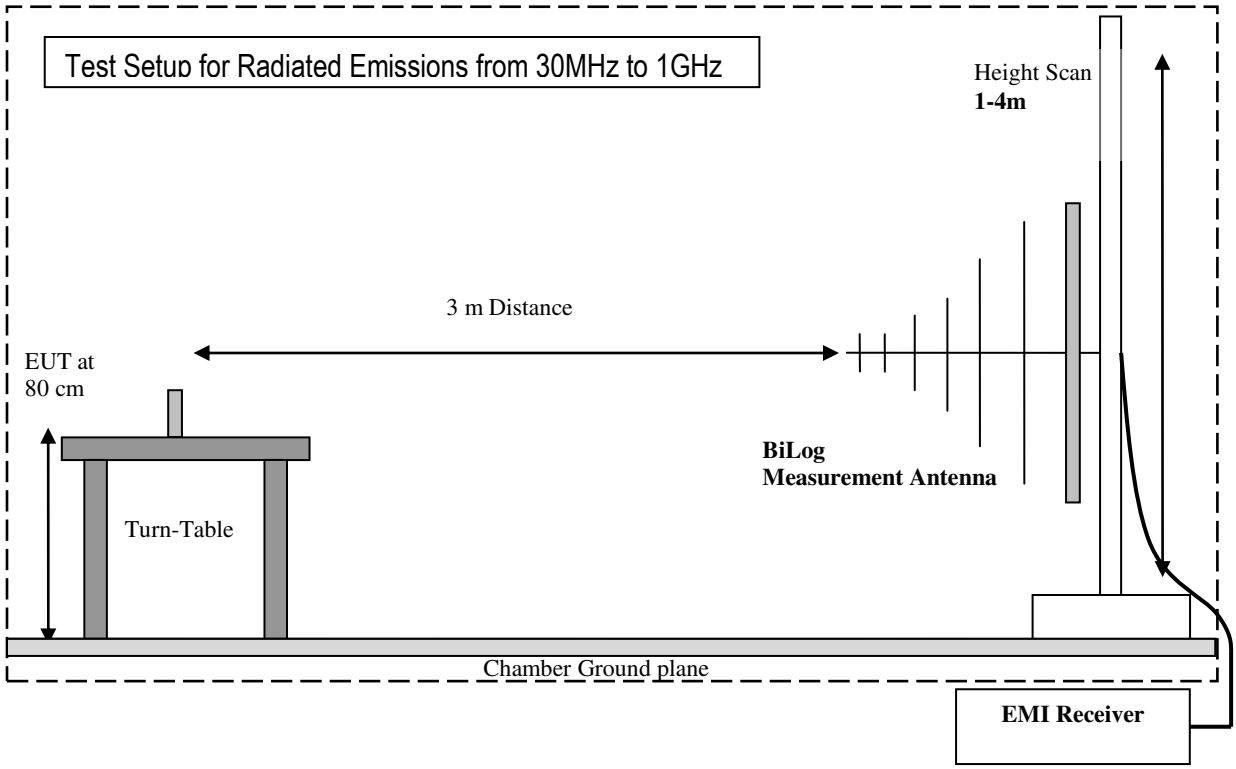
5 Measurement Procedures

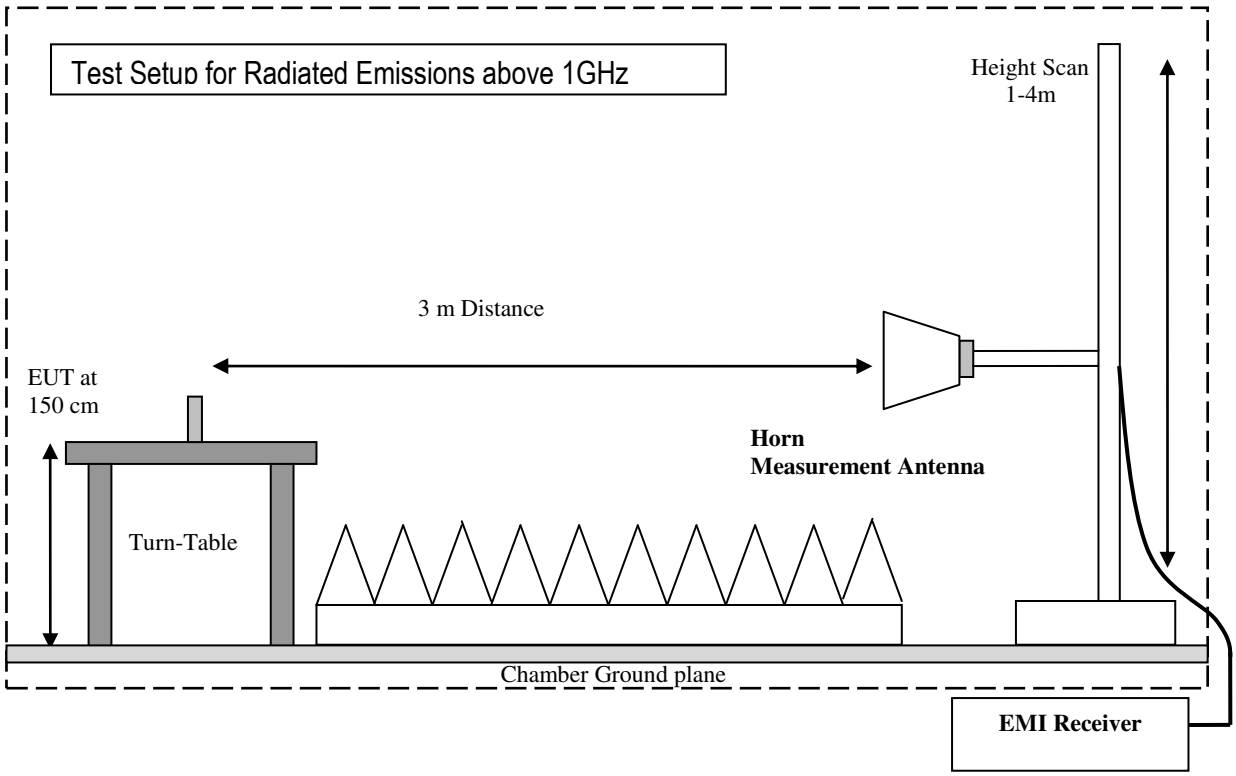
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03 – "Measurement Guidance for Certification of Licensed Digital Transmitters" and according to ANSI C63.26 as detailed below.

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 9kHz to 30MHz
Height Scan
1-4m
3 m Distance
EUT at
80cm
Loop
Measurement Antenna
Turn-Table
Chamber Ground plane
EMI Receiver


Test Setup for Radiated Emissions from 30MHz to 1GHz
Height Scan
1-4m
3 m Distance
EUT at
80 cm
BiLog
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:

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 2
§2.1055; §22.355	Frequency Stability	Nominal	-	☐	☐	☐	■	Complies Note 2
§2.1049; §22.917	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Complies Note 2
§2.1051; §22.917	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Complies Note 2
§2.1051; §22.917	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Complies Note 2
§2.1053; §22.917(a);	Radiated Spurious Emissions	Nominal	CDMA 800	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification Sierra Wireless MC5728 FCC ID: N7N-MC5728

6.2 FCC 24:

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 2
§2.1055; §24.235	Frequency Stability	Nominal	-	☐	☐	☐	■	Complies Note 2
§2.1049; §24.238	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Complies Note 2
§2.1051; §24.238	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Complies Note 2
§2.1051; §24.238	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Complies Note 2
§2.1053; §24.238(a);	Radiated Spurious Emissions	Nominal	CDMA 1900 PCS	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification Sierra Wireless MC5728 FCC ID: N7N-MC5728

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, 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	30MHz – 1 GHz	1 – 1.58 GHz	1.58 – 9 GHz
Resolution Bandwidth	100 kHz	1 MHz	1 MHz
Video Bandwidth	100 kHz	1 MHz	1 MHz
Detector	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto

Spectrum Analyzer Settings for FCC 24

Frequency Range	30MHz – 1 GHz	1 – 2.7 GHz	2.7 – 18 GHz	18 – 19.1 GHz
Resolution Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz
Video Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz
Detector	Peak	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto	Auto

7.1.2 Limits:

- **FCC Part 22.917(a) and Part 24.238(a)**

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

7.1.3 Test conditions and setup:

Ambient Temperature (C)	EUT Set-Up #	EUT operating mode	Power Input
22	1	CDMA 800 co-transmitting with Wi-Fi 2.4 GHz	Power supply

7.1.4 Measurement result:

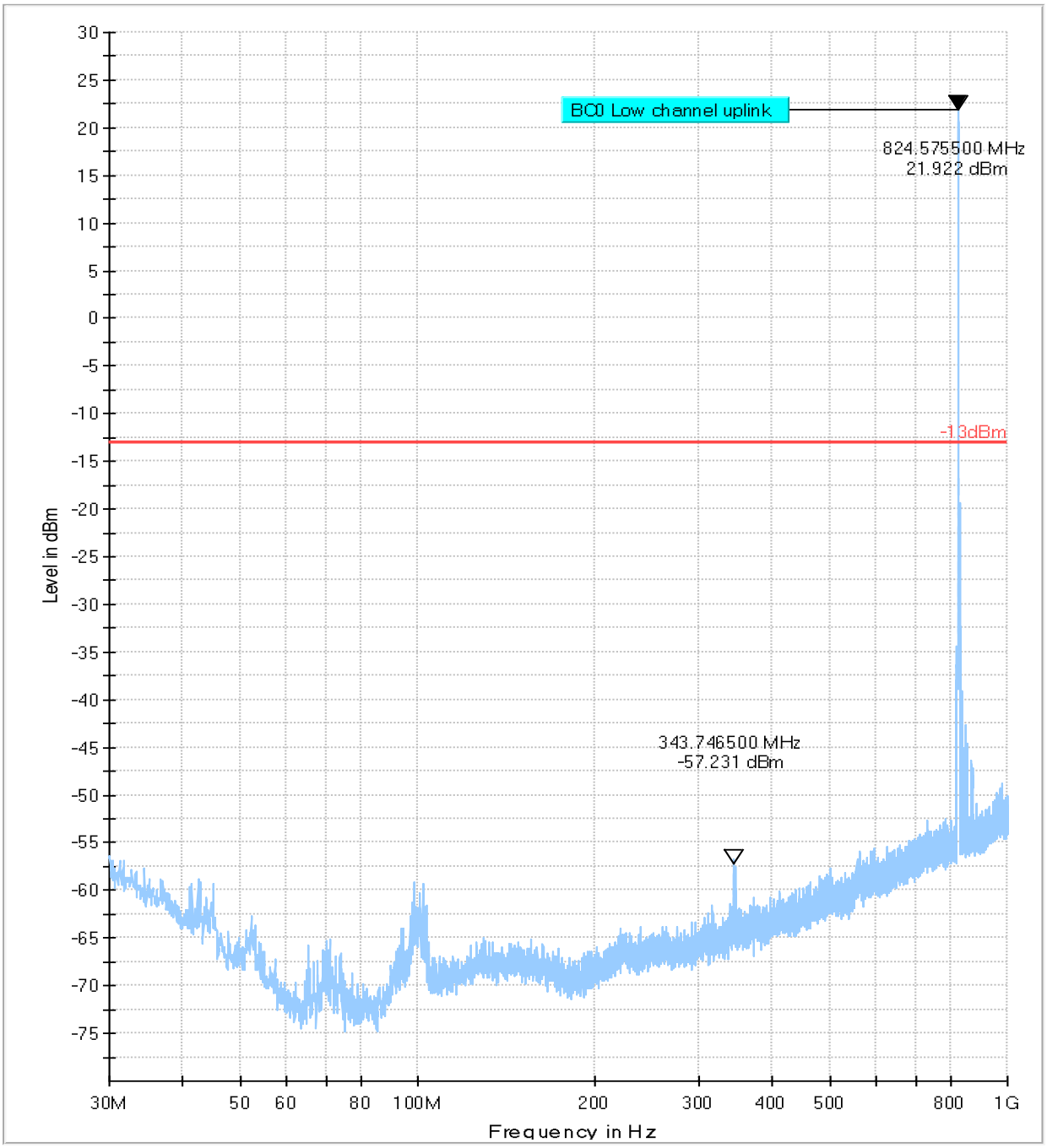
Plot #	Cellular Channel	Wi-Fi Channel	EUT operating mode	Scan Frequency	Limit (dBm)	Highest emission in dB	Frequency of highest emission in MHz	Result
1 – 3	Low	1	CDMA BC0	30 MHz – 18 GHz	-13	-43.934	4125	Pass
4 – 7	Mid	1	CDMA BC0	9 kHz – 18 GHz	-13	-14.15	0.236	Pass
8 – 10	High	1	CDMA BC0	30 MHz – 18 GHz	-13	-43.346	1698	Pass
11 – 13	Low	1	CDMA BC1	30 MHz – 18 GHz	-13	-25.32	1286	Pass
14 – 18	Mid	1	CDMA BC1	9 kHz – 26 GHz	-13	-20.03	1347	Pass
19 – 21	High	1	CDMA BC1	30 MHz – 18 GHz	-13	-26.62	3820	Pass

7.1.5 Measurement Plots:

CDMA BC0

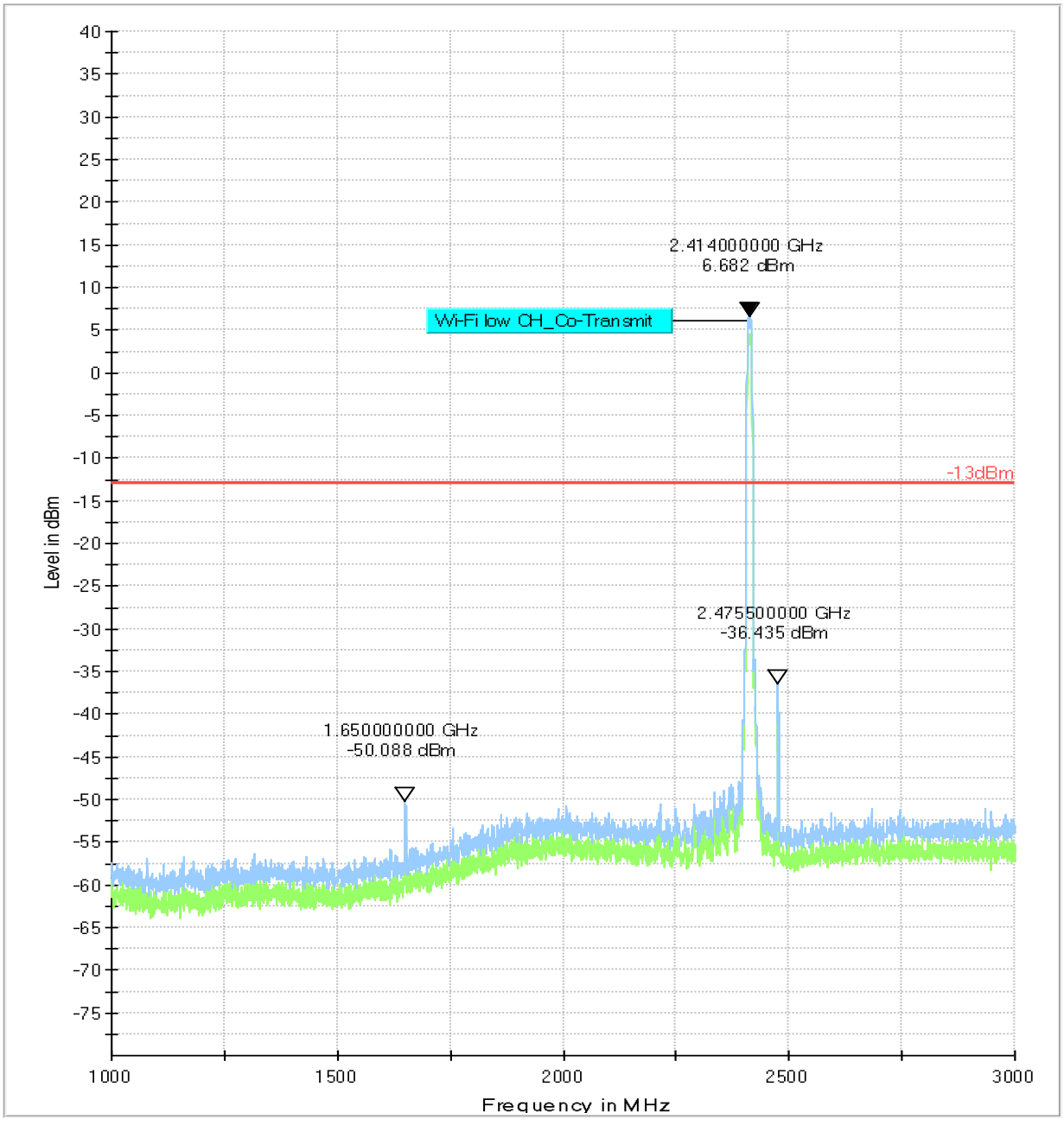
Plot # 1 Radiated Emissions: 30 MHz-1 GHz

Channel: Low



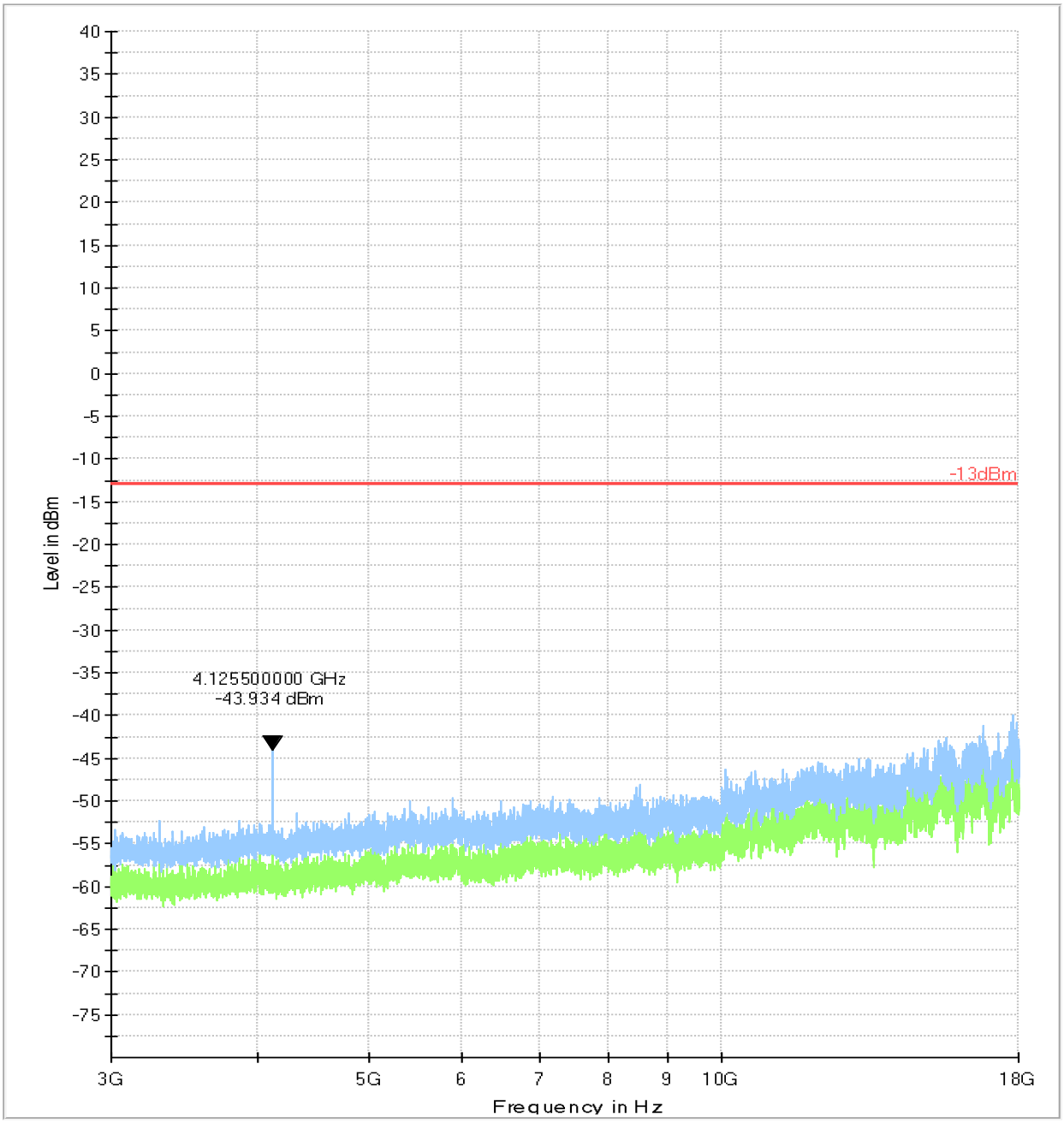
Plot # 2 Radiated Emissions: 1 GHz-3 GHz

Channel: Low



Plot # 3 Radiated Emissions: 3 GHz-18 GHz

Channel: Low

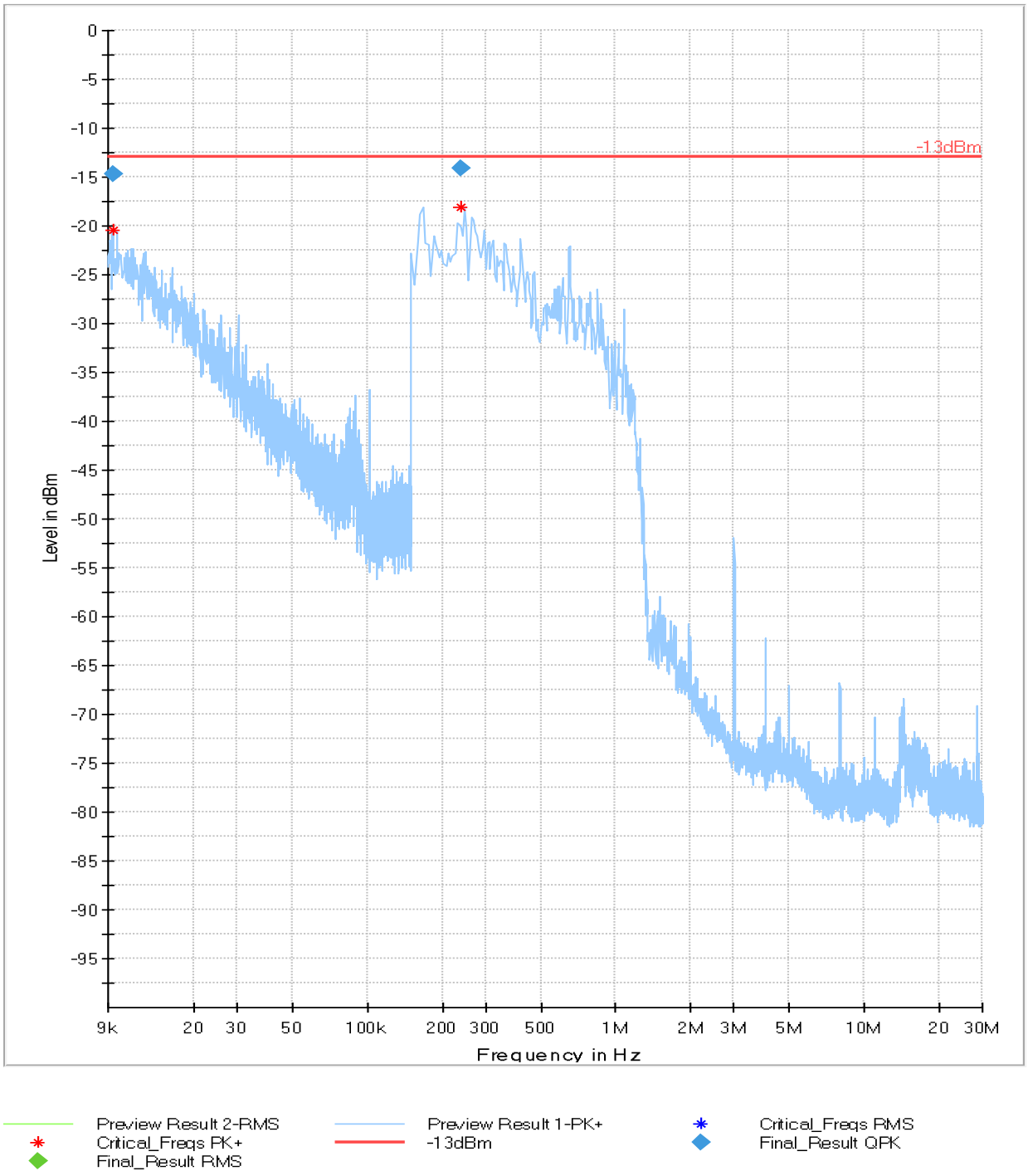


Plot # 4 Radiated Emissions: 9 kHz-30 MHz

Channel: Mid

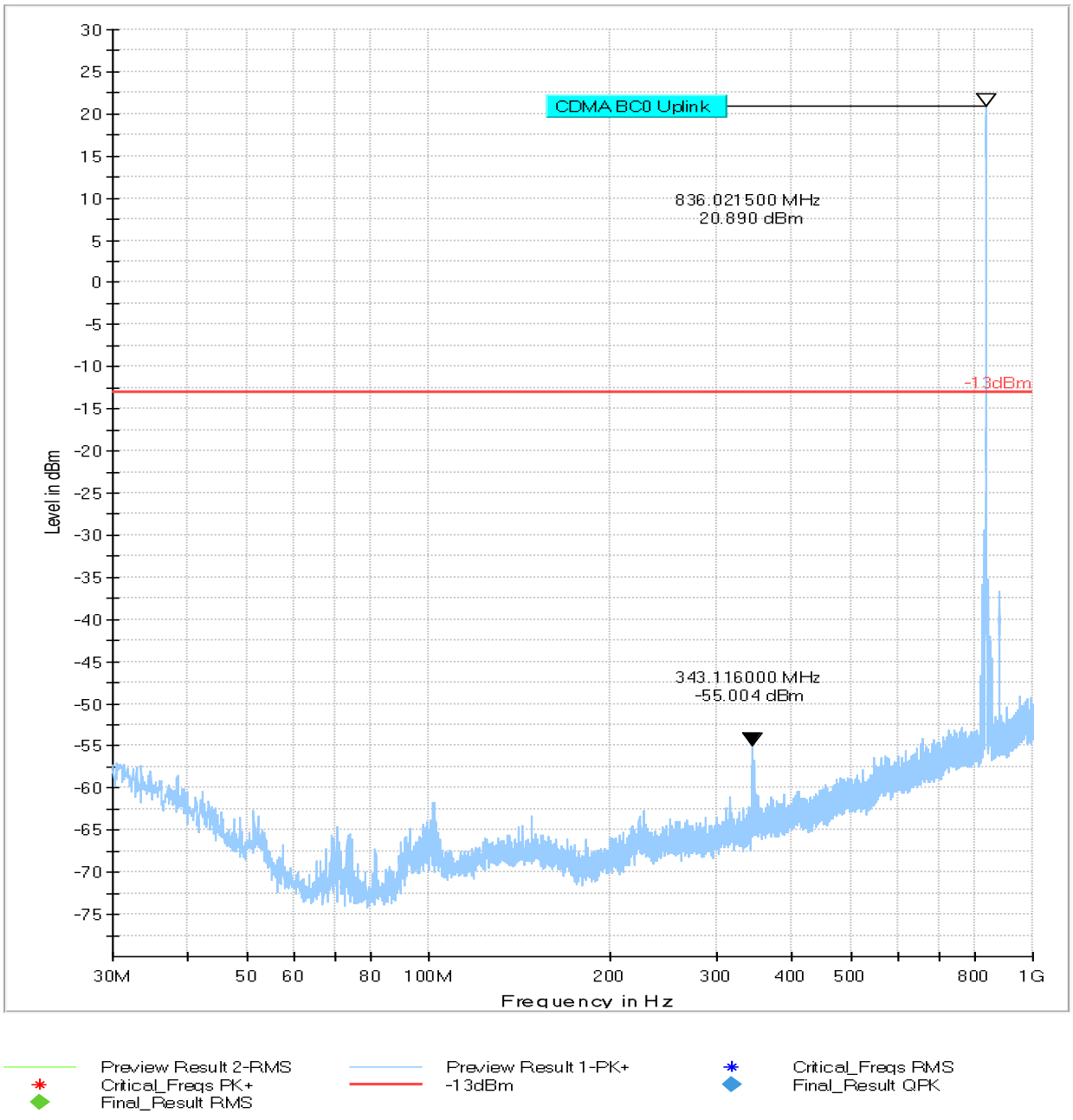
Final_Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.009455	-14.66	---	-13.00	1.66	500.0	0.200	108.0	H	315.0	-34.5
0.236427	-14.15	---	-13.00	1.15	500.0	9.000	120.0	H	-37.0	-62.8



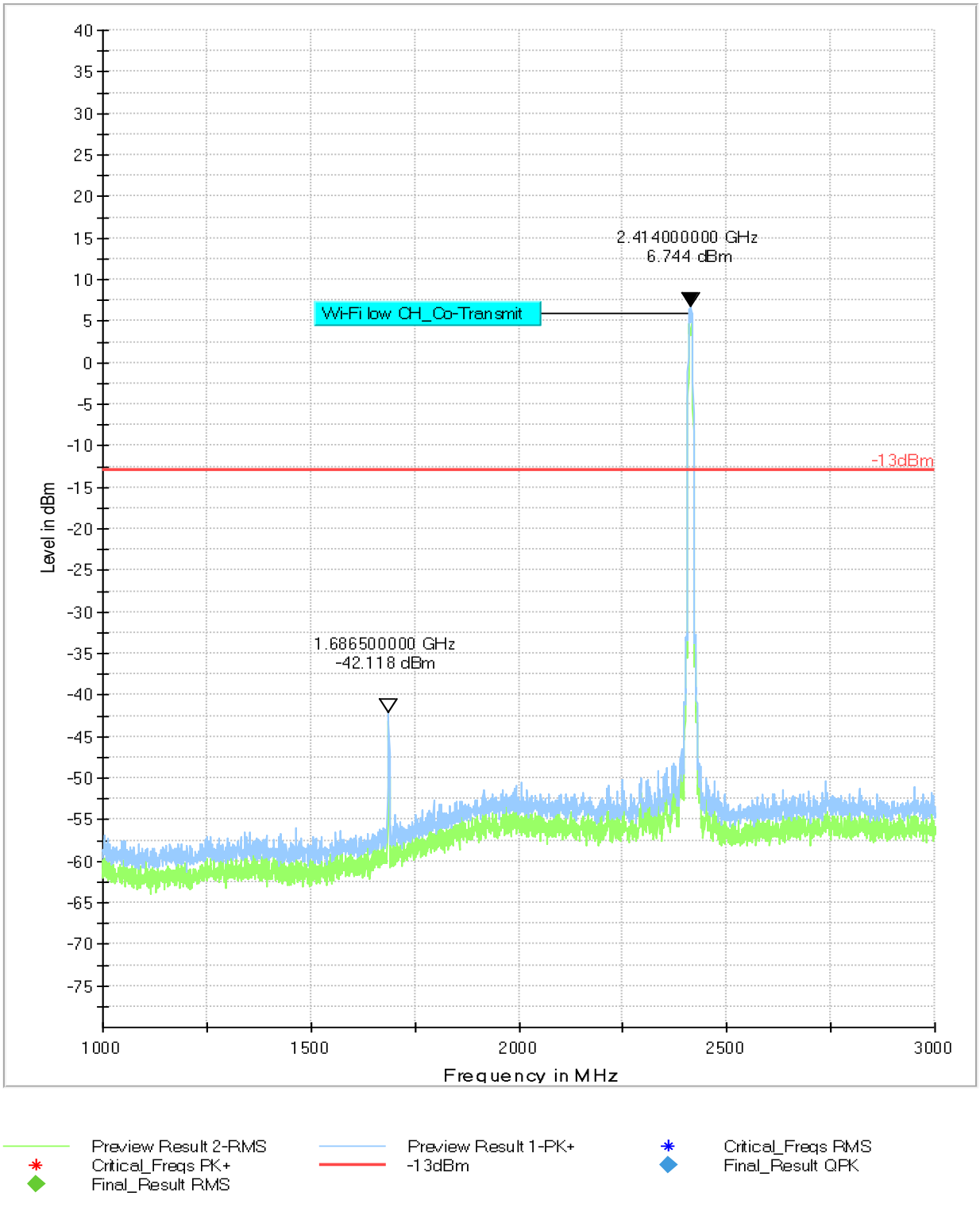
Plot # 5 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid



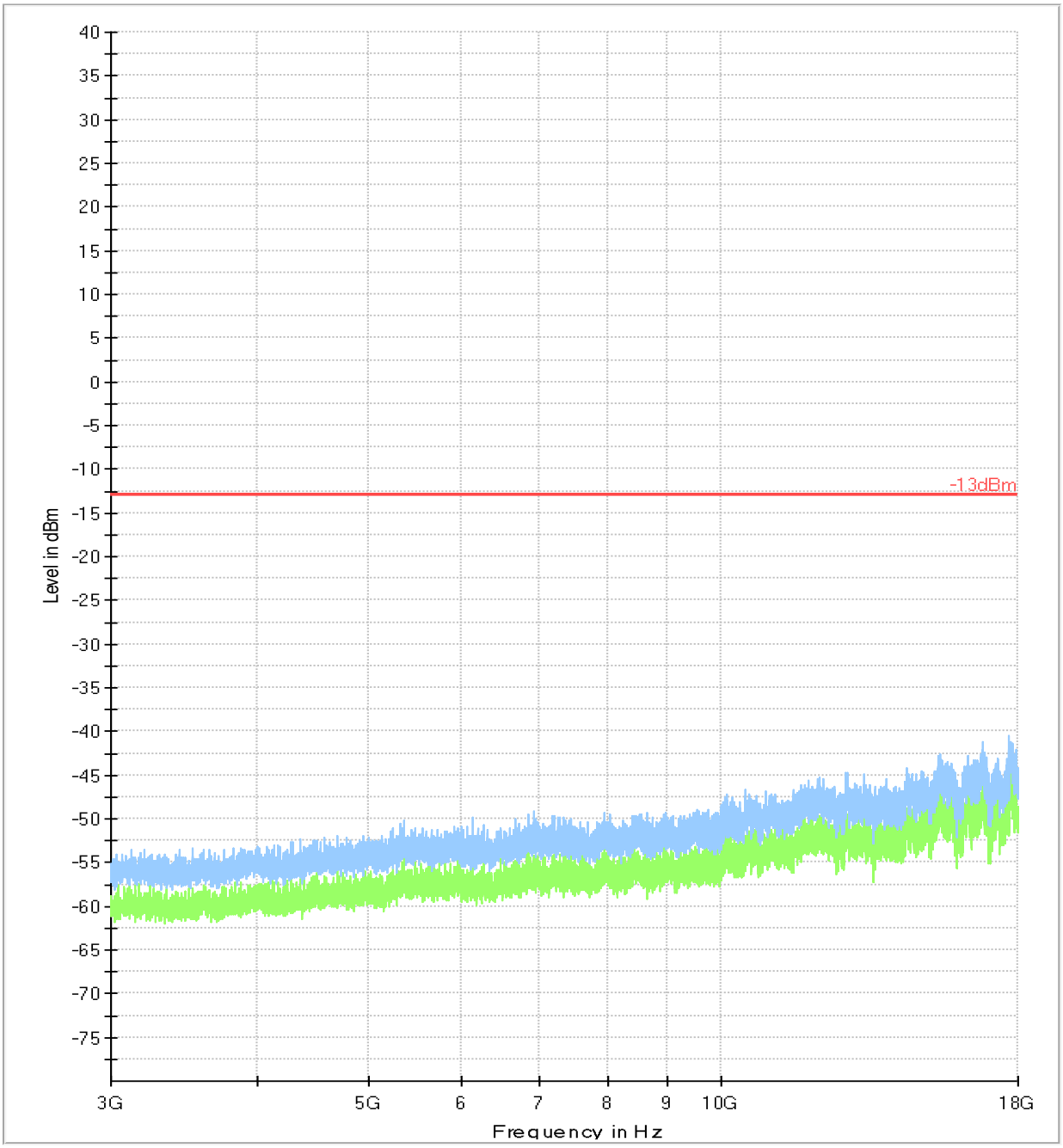
Plot # 6 Radiated Emissions: 1 GHz-3 GHz

Channel: Mid



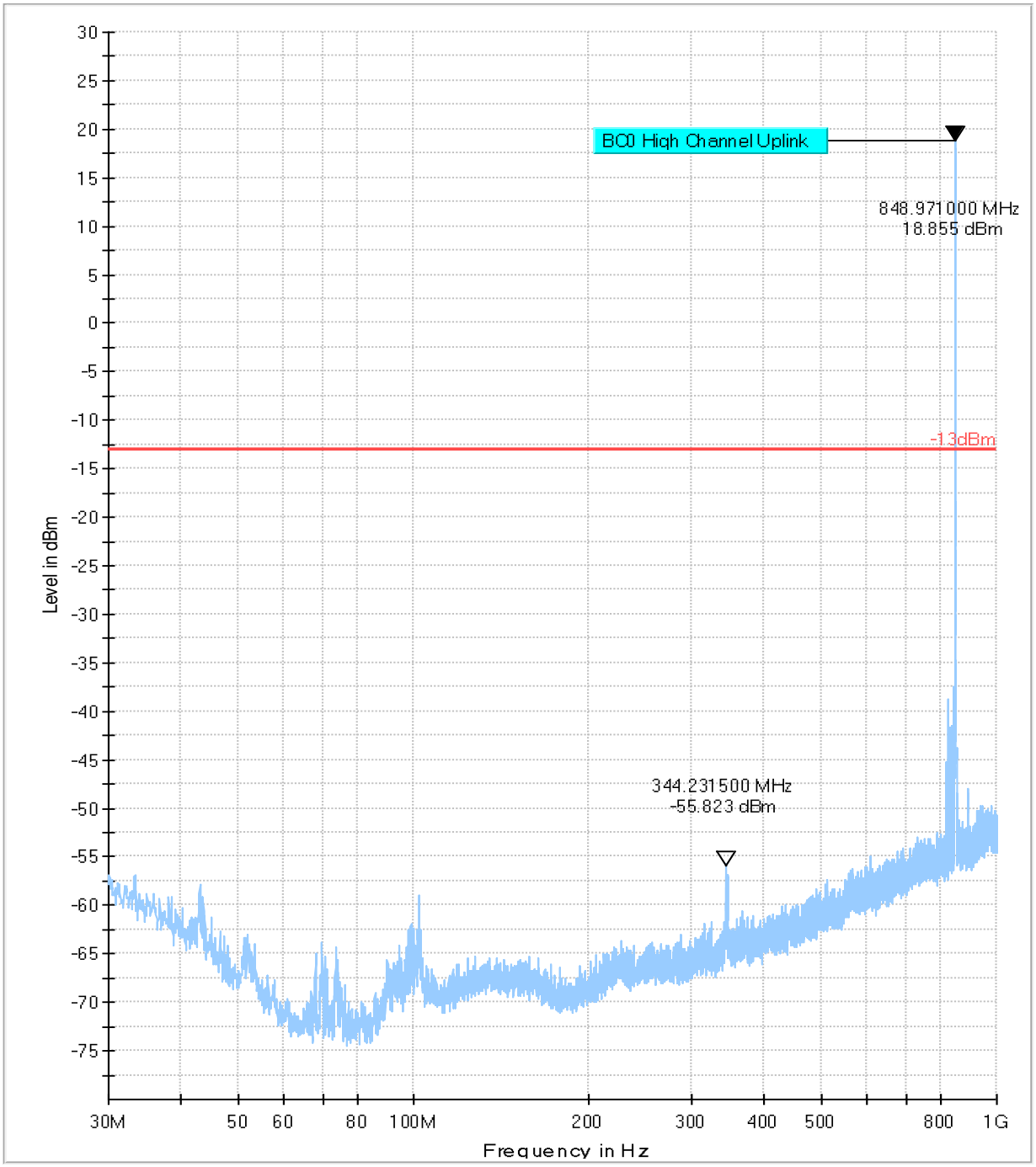
Plot # 7 Radiated Emissions: 3 GHz – 18GHz

Channel: Mid



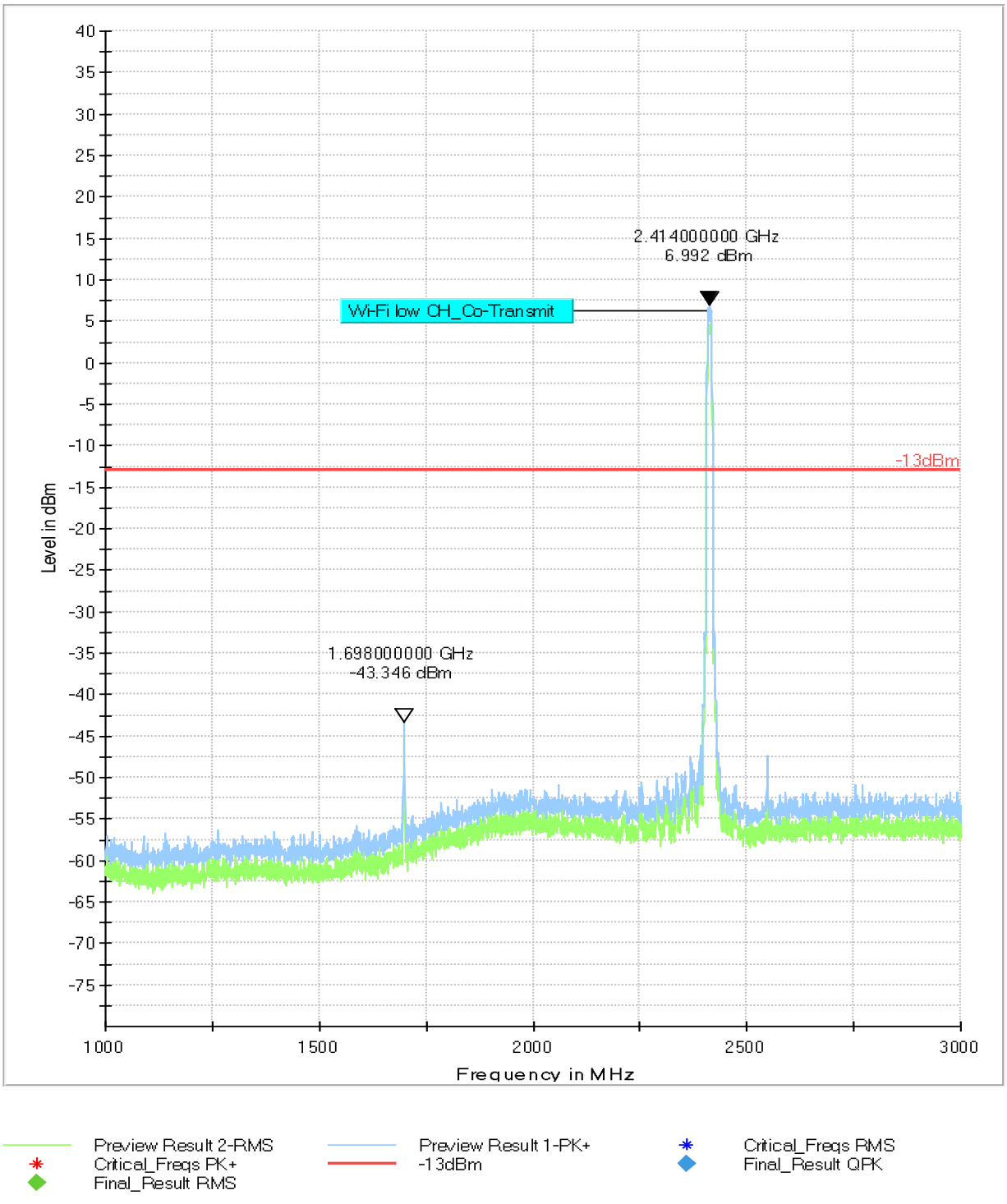
Plot # 8 Radiated Emissions: 30 MHz-1 GHz

Channel: High



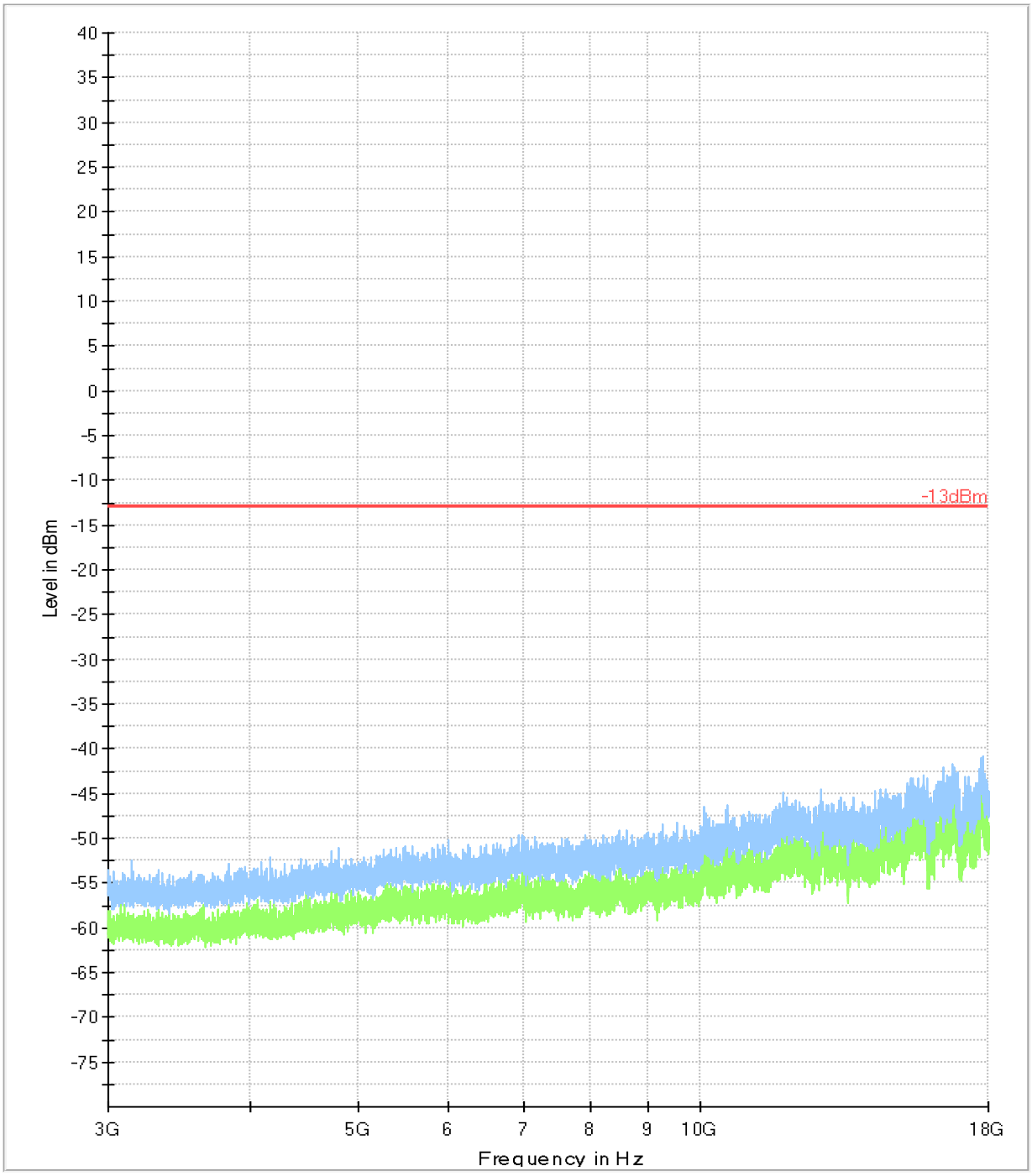
Plot # 9 Radiated Emissions: 1 GHz-3 GHz

Channel: High



Plot # 10 Radiated Emissions: 3 GHz-18 GHz

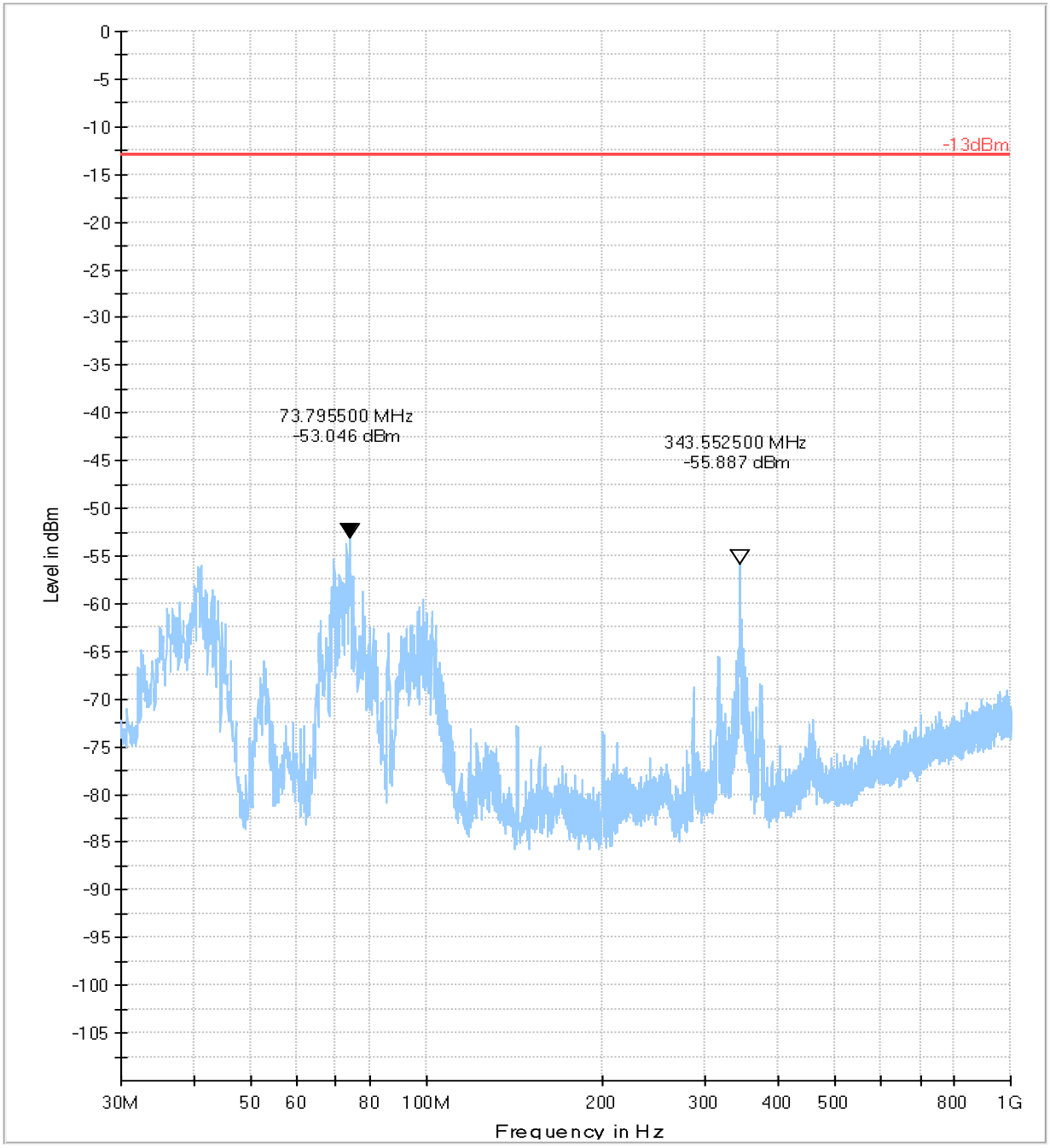
Channel: High



CDMA BC1

Plot # 11 Radiated Emissions: 30 MHz-1 GHz

Channel: Low

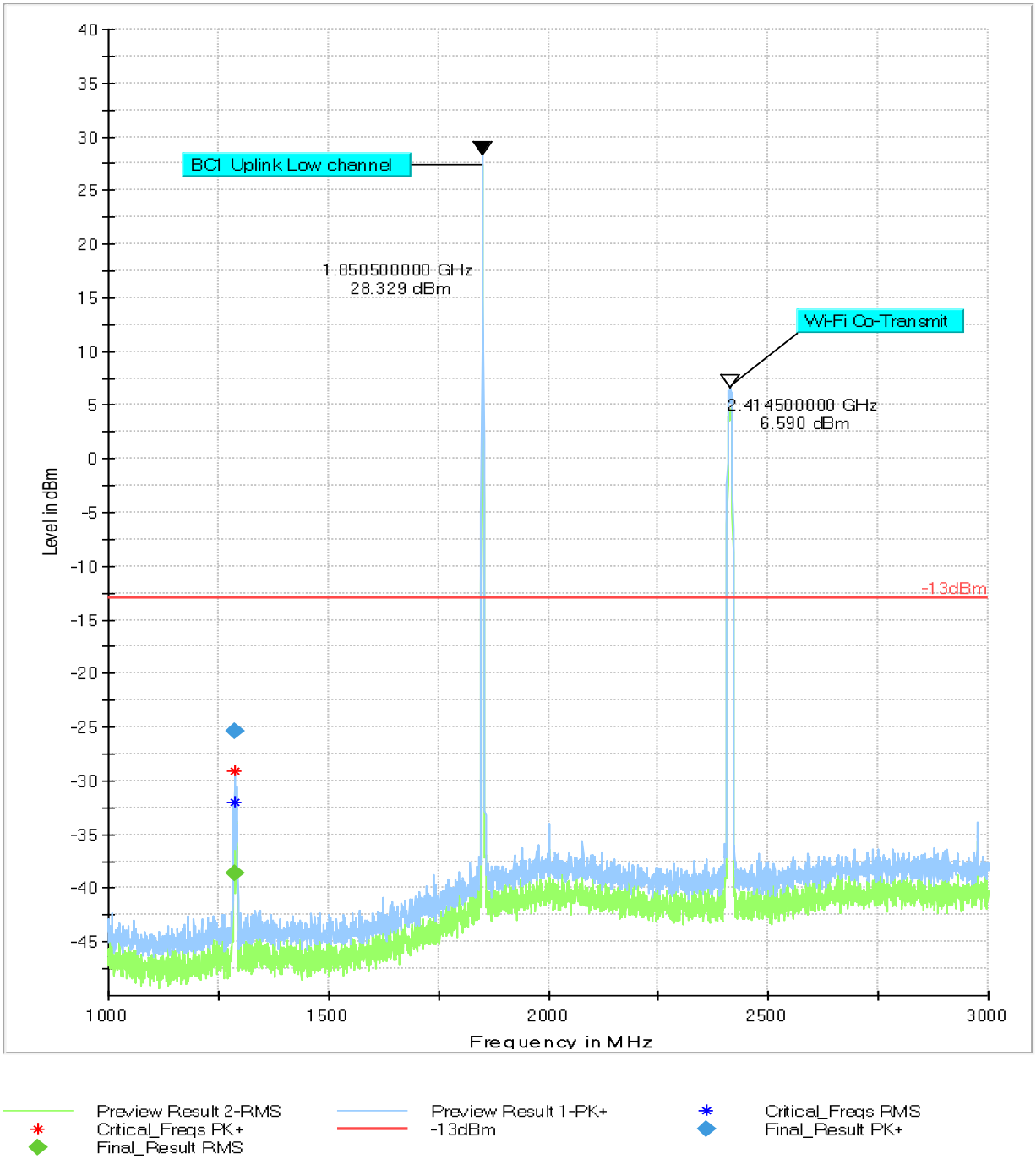


Plot # 12 Radiated Emissions: 1 GHz-3 GHz

Channel: Low

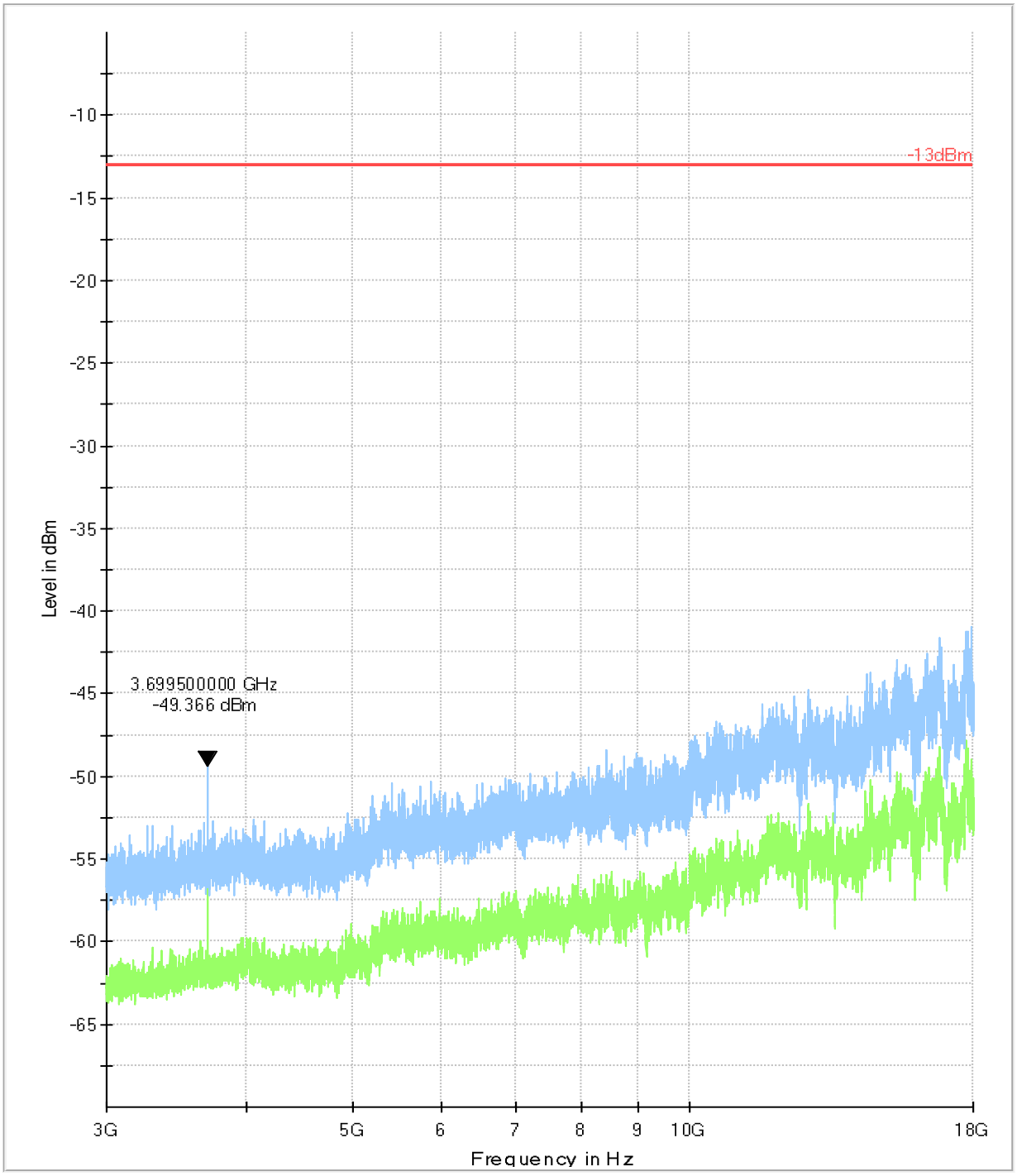
Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1286.620000	-25.32	---	-13.00	12.32	200.0	1000.000	100.0	V	112.0	-97.1
1286.734500	---	-38.58	-13.00	25.58	200.0	1000.000	100.0	V	113.0	-97.1



Plot # 13 Radiated Emissions: 3 GHz-18 GHz

Channel: Low

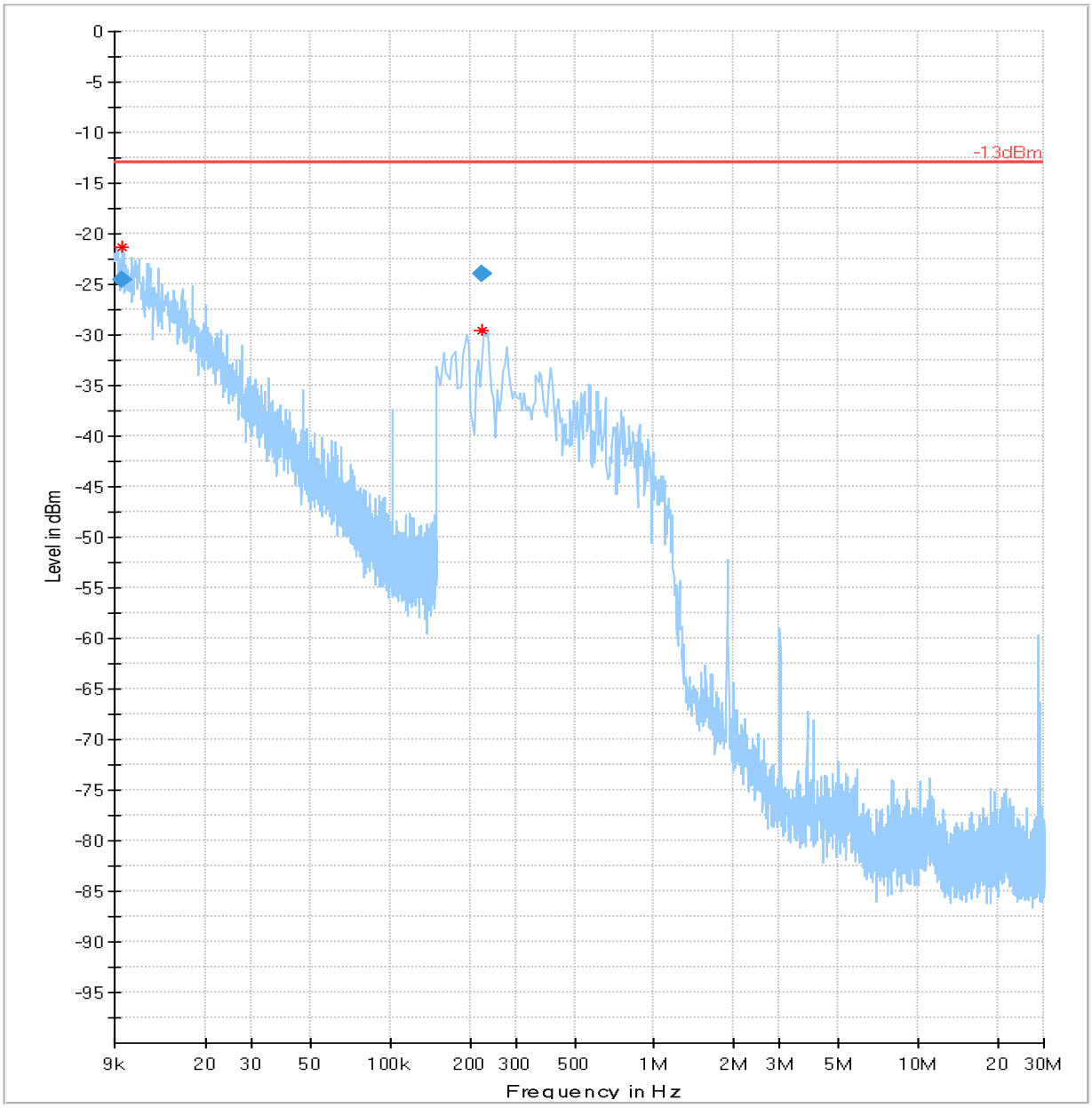


Plot # 14 Radiated Emissions: 9 kHz-30 MHz

Channel: Mid

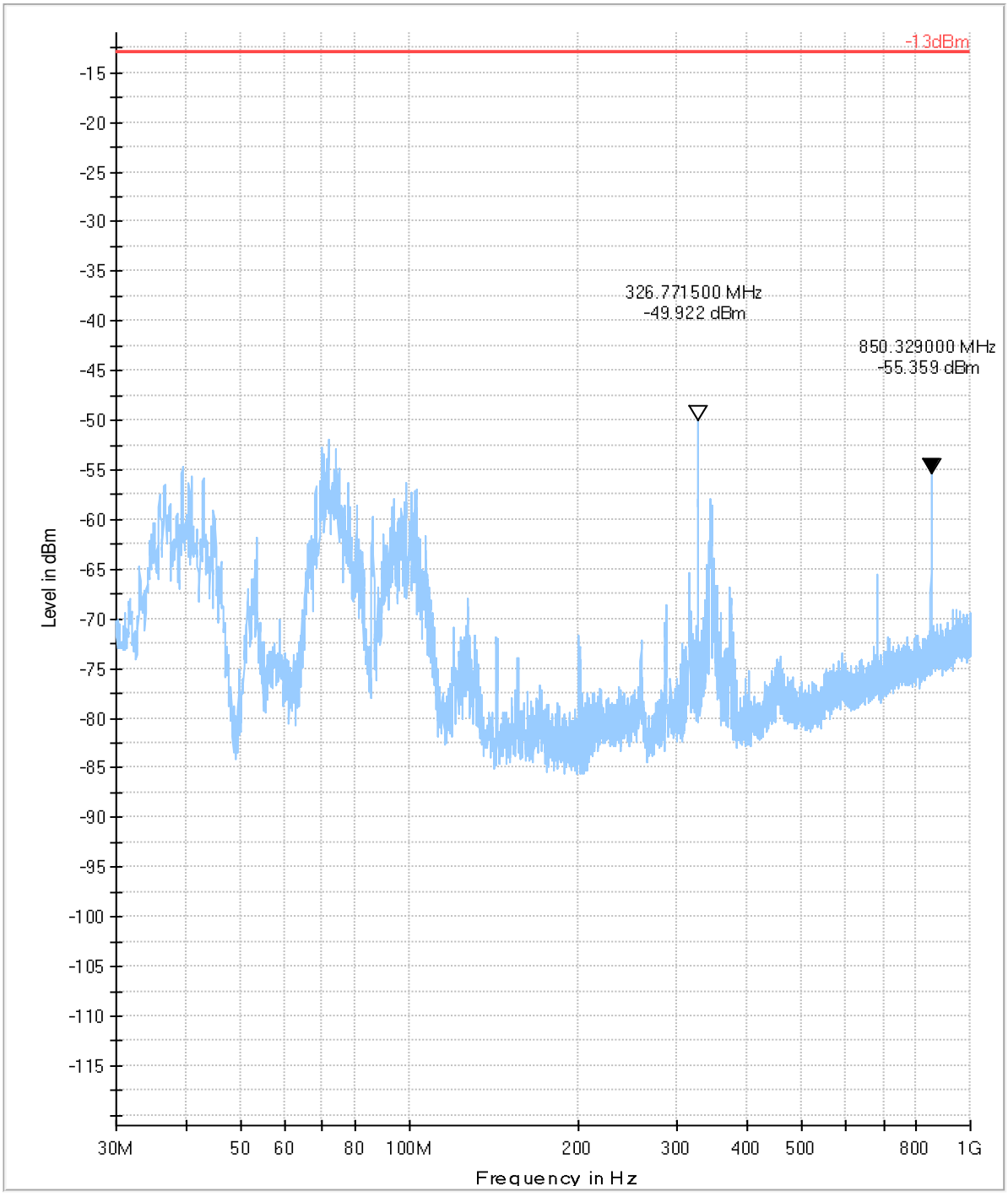
Final_Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.009593	-24.56	---	-13.00	11.56	500.0	0.200	120.0	H	124.0	-34.6
0.221346	-23.91	---	-13.00	10.91	500.0	9.000	100.0	V	156.0	-62.1



Plot # 15 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid

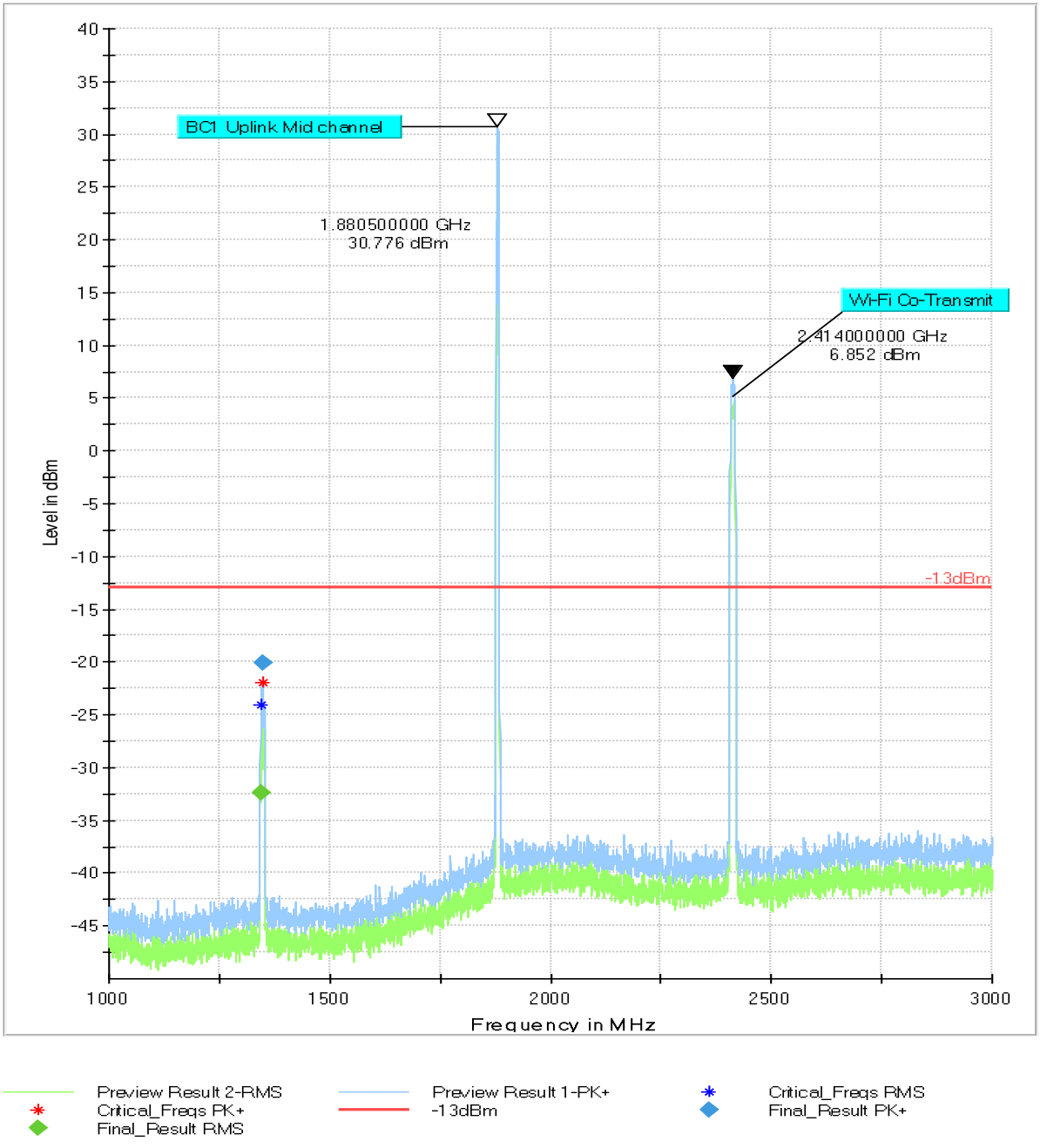


Plot #16 Radiated Emissions: 1 GHz-3 GHz

Channel: Mid

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1344.932750	---	-32.42	-13.00	19.42	200.0	1000.000	100.0	V	147.0	-96.8
1347.067500	-20.03	---	-13.00	7.03	200.0	1000.000	100.0	V	146.0	-96.8

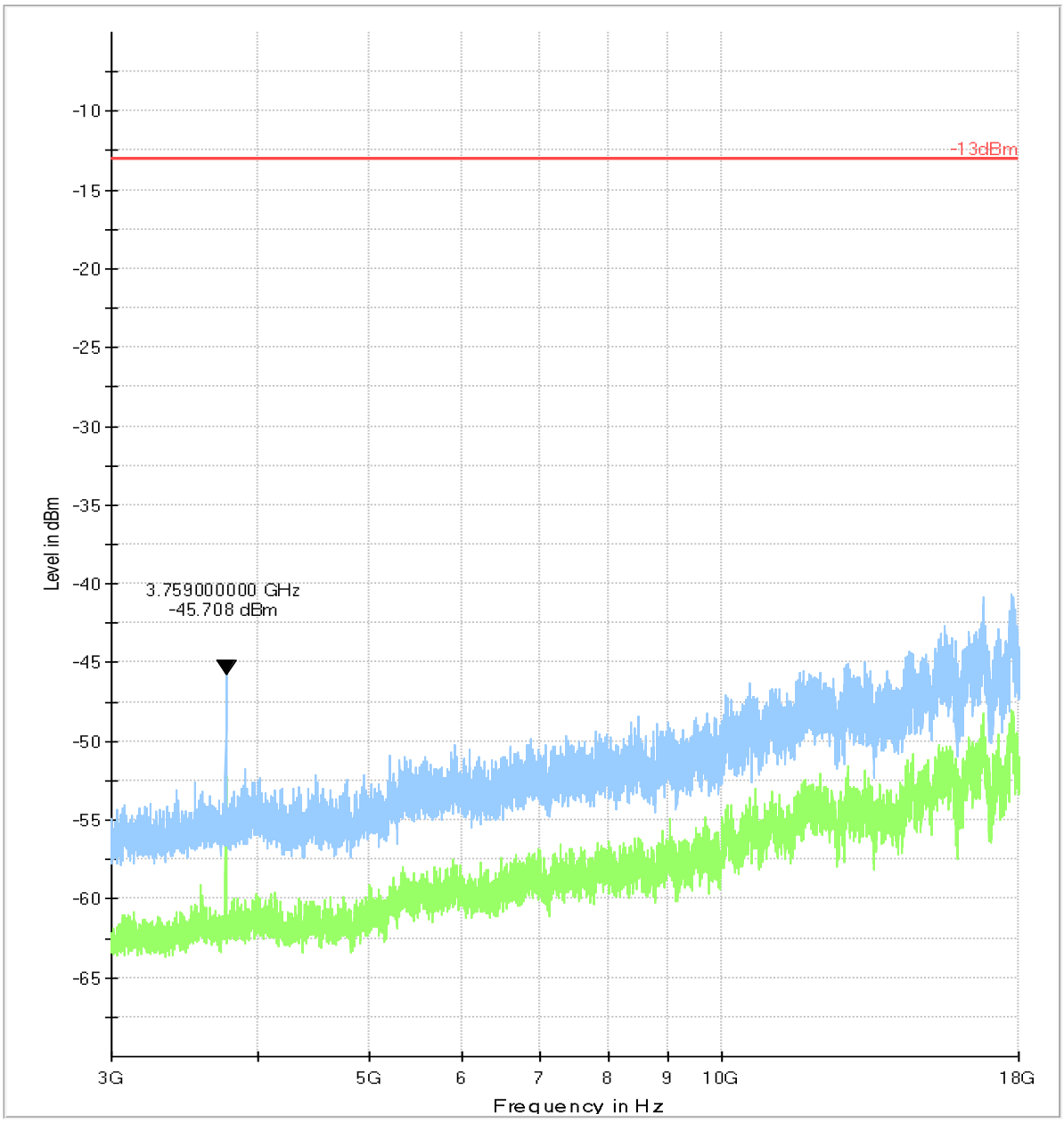


Plot # 17 Radiated Emissions: 3 GHz – 18GHz

Channel: Mid

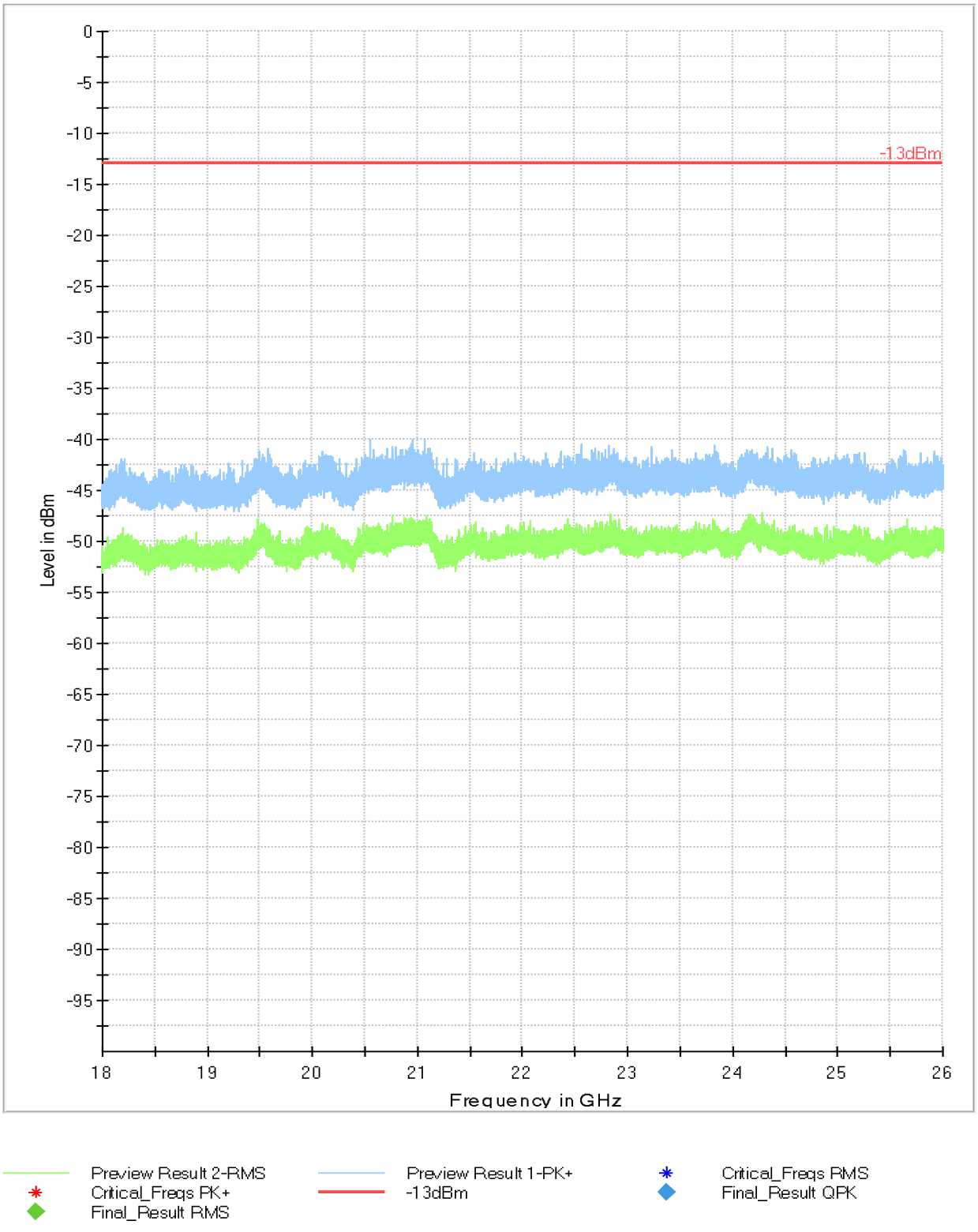
Final_Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3759.280000	---	-55.04	-13.00		200.0	1000.000	118.0	V	181.0
3759.326000	-57.77	---	-13.00	44.77	200.0	1000.000	164.0	V	113.0



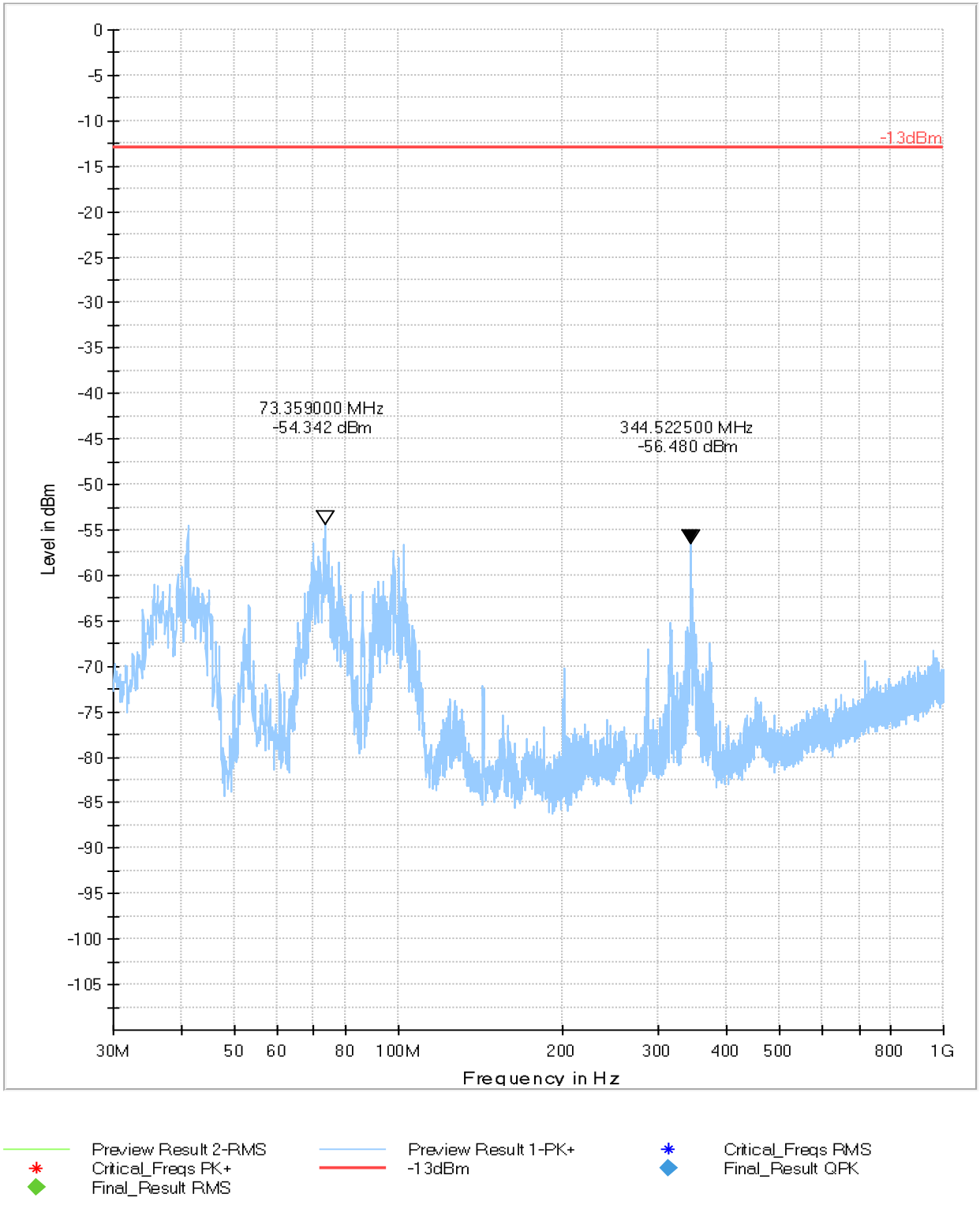
Plot # 18 Radiated Emissions: 18 GHz – 26GHz

Channel: Mid



Plot # 19 Radiated Emissions: 30 MHz-1 GHz

Channel: High

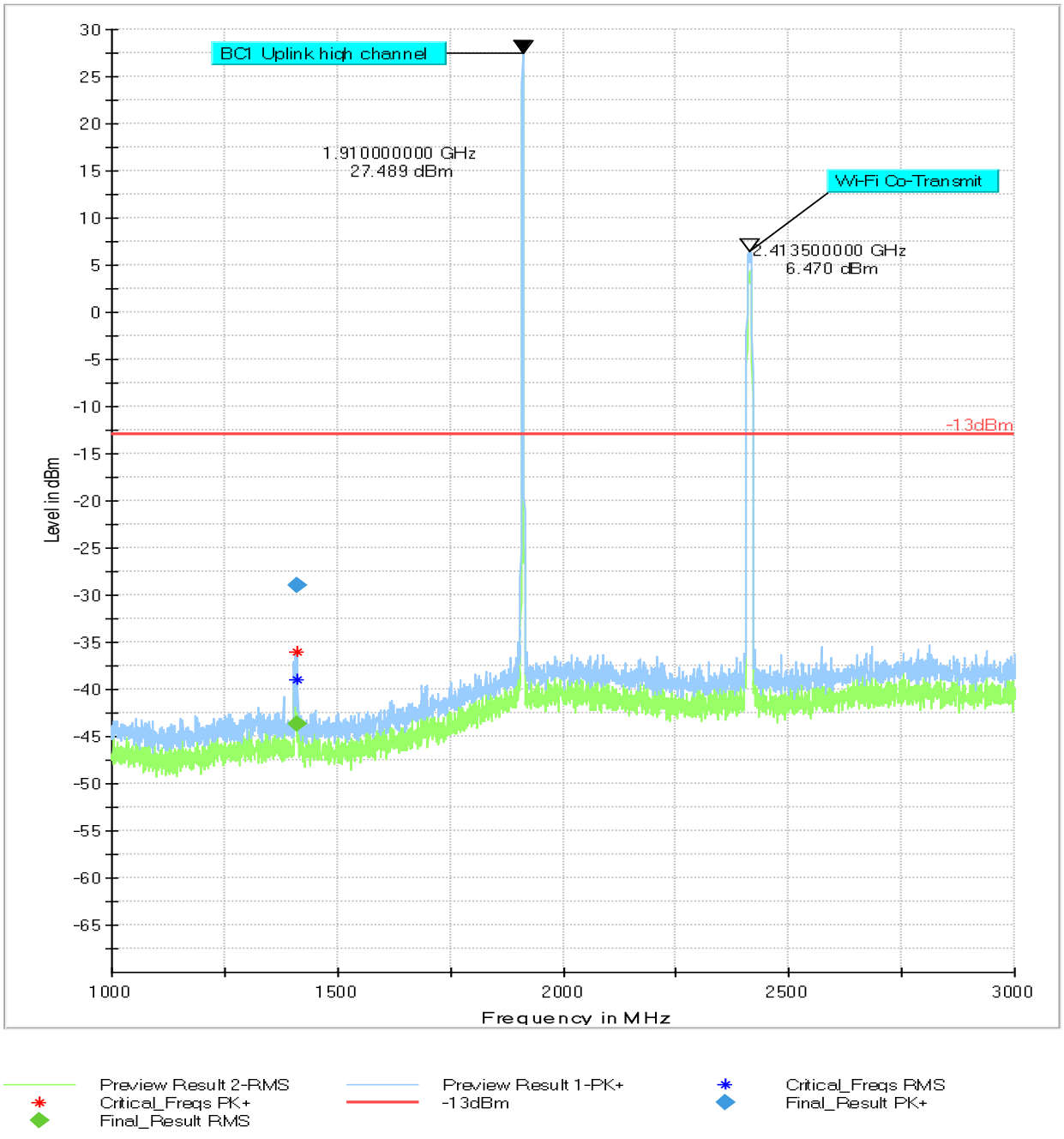


Plot # 20 Radiated Emissions: 1 GHz-3 GHz

Channel: High

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1408.824250	-28.92	---	-13.00	15.92	200.0	1000.000	100.0	V	158.0	-97.2
1409.399250	---	-43.66	-13.00	30.66	200.0	1000.000	100.0	V	156.0	-97.2

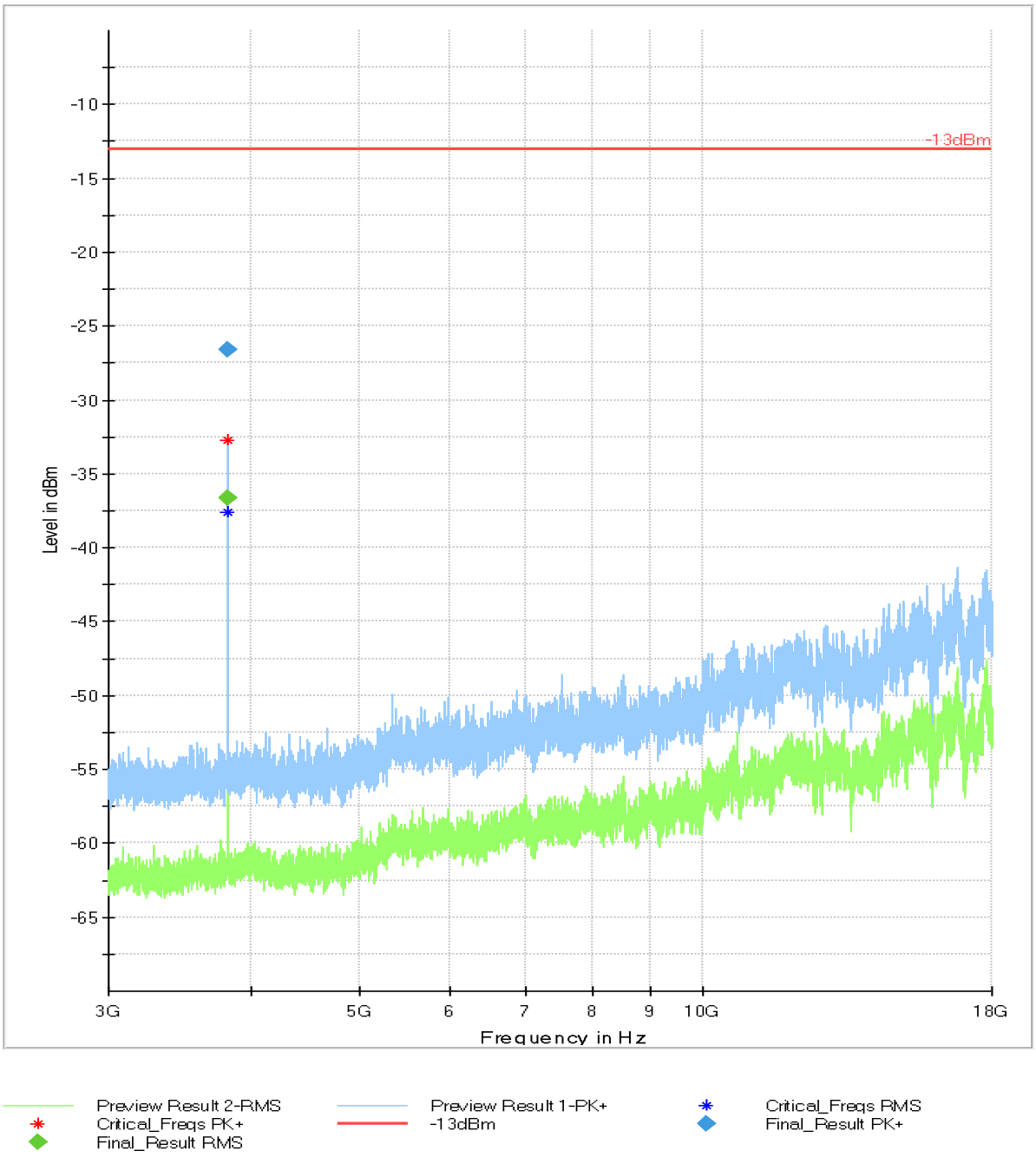


Plot # 21 Radiated Emissions: 3 GHz-18 GHz

Channel: High

Final_Result

Frequency (MHz)	MaxPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3819.902000	---	-36.64	-13.00	23.64	200.0	1000.000	175.0	H	64.0	-129.0
3820.452667	-26.62	---	-13.00	13.62	200.0	1000.000	175.0	H	66.0	-129.0



8 Test setup photos

Setup photos are included in supporting file name: "EMC_TRAPZ_006_18001_FCC_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	6512	00164698	3 YEARS	08/08/2017
BILOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
HORN ANTENNA	ETS LINDGREN	3117	00167061	3 YEARS	08/08/2017
HORN ANTENNA	ETS LINDGREN	3116C	00166821	3 YEARS	09/24/2017
SPECTRUM ANALYZER	R&S	FSU26	200065	2 YEARS	03/07/2017
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	1 YEARS	06/05/2017
THRMOMETER HUMIDIY	DICKSON	TM320	16253639	1 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
02/26/2018	EMC_TRAPZ_002_18001_FCC_22_24	Initial Version	Issa Ghanma