



FCC/IC Test Report

For:
NetraDyne, Inc.

Model:
DRI-128

Product Description:
Intelligent Driving Monitoring System Smart Connected Dash Cam

FCC ID: **2AM8R-DRI128**
IC ID: **23098-DRI128**

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

REPORT #: EMC_NETRA_002_17001_FCC_24_27_ISED

DATE: 1/25/2018



A2LA Accredited

IC recognized #
3462B-2

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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 24, 27 and Industry Canada Radio Standard Specifications RSS: 133 Issue 6, and 139 Issue 3.

No deficiencies were ascertained.

Company Name	Product Description	Model
NetraDyne, Inc.	Intelligent Driving Monitoring System Connected Dash Cam	DRI-128

Responsible for Testing Laboratory:

01/25/2018	Compliance	James Donnellan (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

01/25/2018	Compliance	Issa Ghanma (EMC 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:	James Donnellan
Responsible Project Leader:	Josephine Mena

2.2 Identification of the Client

Applicant's Name:	NetraDyne, Inc.
Street Address:	4350 Executive DR., suite 150
City/Zip Code	San Diego, CA 92127
Country	USA
Contact Person:	Sandeep Pandya
Phone No.	8582455169
e-mail:	Sandeep.pandya@netradyne.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		DRI-128			
HW Version		RevD			
SW Version		0.2.1			
FCC-ID		2AM8R-DRI128			
IC-ID:		23098-DRI128			
FWIN:		0.2.1			
HVIN:		RevD			
PMN:		Driver i			
Product Description		Intelligent Driving Monitoring System Smart Connected Dash Cam			
Module Information					
Module Name and Number:		WP7504			
FCC ID:		N7NWP7			
IC ID:		2417C-WP7			
Mode	Technology	Band	UL Frequency (MHz)	DL Frequency (MHz)	Modulation
	LTE	2	1850 – 1910	1930– 1990	QPSK, 16QAM
		4	1710 – 1755	2110 – 2155	QPSK, 16QAM
	WCDMA	II	1850 – 1910	1930 – 1990	QPSK
		IV	1710 – 1755	2110 – 2155	QPSK
Max. documented antennan name and gain		Flex MIMO Antenna Antenna 1(Main):3.5 dB Antenna 2: 3.5 dB			
Max. documented average conducted form module report# B16W00042-FCC-RF		WCDMA Band II: 23.1dBm WCDMA Band IV: 23.46dBm LTE Band 2: 23.55dBm LTE Band 4: 23.36dBm			
Operating Voltage Range		Low 10.5 VDC, Nominal 12 VDC, High 14.5 VDC			
Operating Temperature Range		-20 ⁰ to 55 ⁰ C			

Other Radios included in the device	GPS, BT, BLE, WLAN(Wi-Fi)2.4 and 5GHz.
Sample Revision	☐ Prototype Unit; ☒ Production Unit; ☐ Pre-Production
EUT Dimensions	20X8X8cm
Weight	300 grams
EUT Diameter	☒ < 60 cm ☐ Other _____

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Comments
1	16300054	RevD	0.2.1	Radiated Measurements

3.3 Accessory Equipment

AE #	Comments
1	Superstar 12V Car Battery

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 and High Channels Co-Transmission with Wi-Fi 5GHz Channel 60(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: 2AM8R-DRI128/ IC ID: 23098-DRI128

According to the guidelines from FCC KDB 996369 for the host product under evaluation, and the pre-certified module to be integrated (WP7504) 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 24, 27, and Industry Canada Radio Standard Specifications RSS: 133 Issue 6, and 139 Issue 3.

The conducted module test data that can be obtained under the FCC Filing ID: N7NWP7 / IC ID: 2417C-WP7 is applicable for the host described in section 3.

4.1 Dates of Testing:

11/14/2017 – 11/28/2017

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%

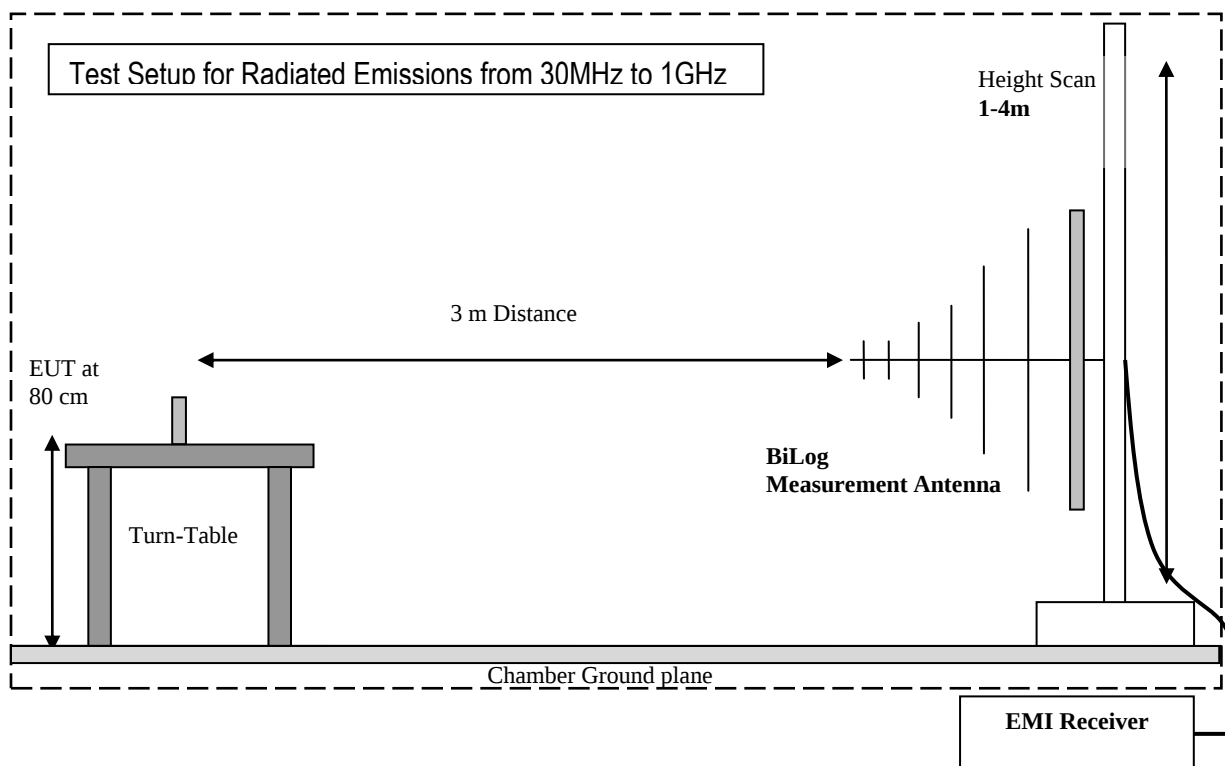
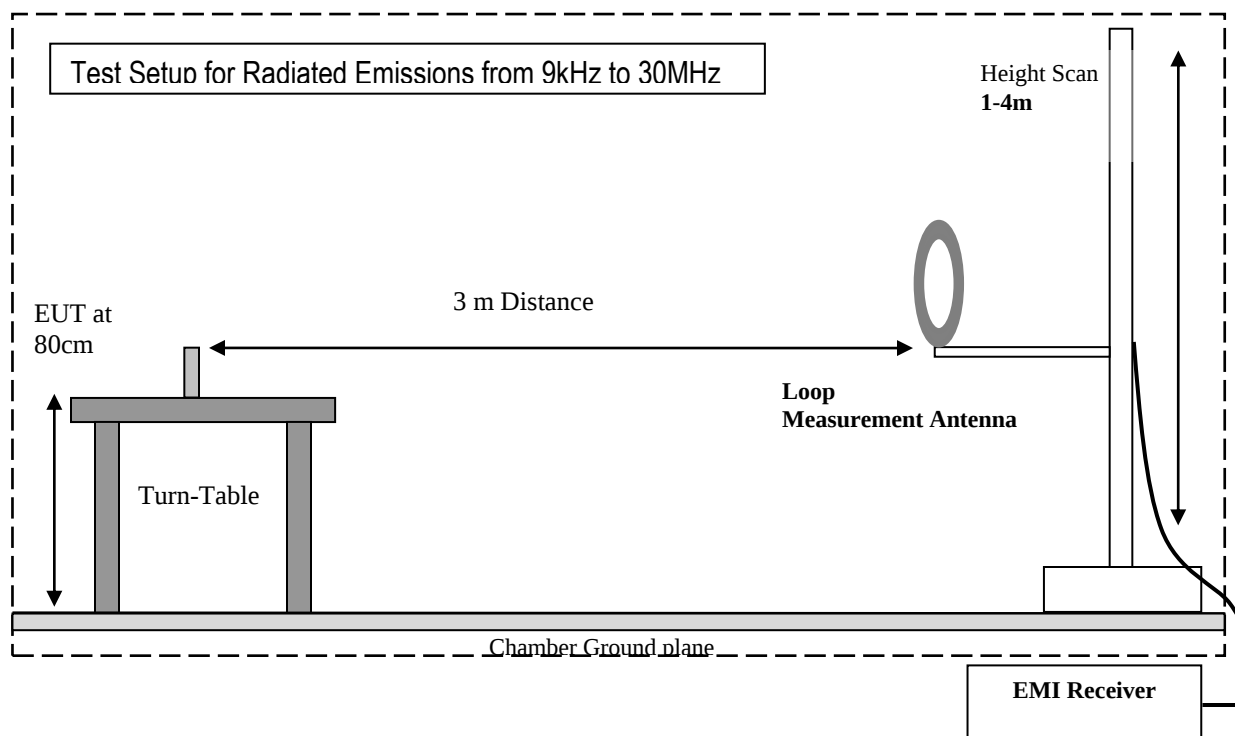
Deviating test conditions are indicated at individual test description where applicable.

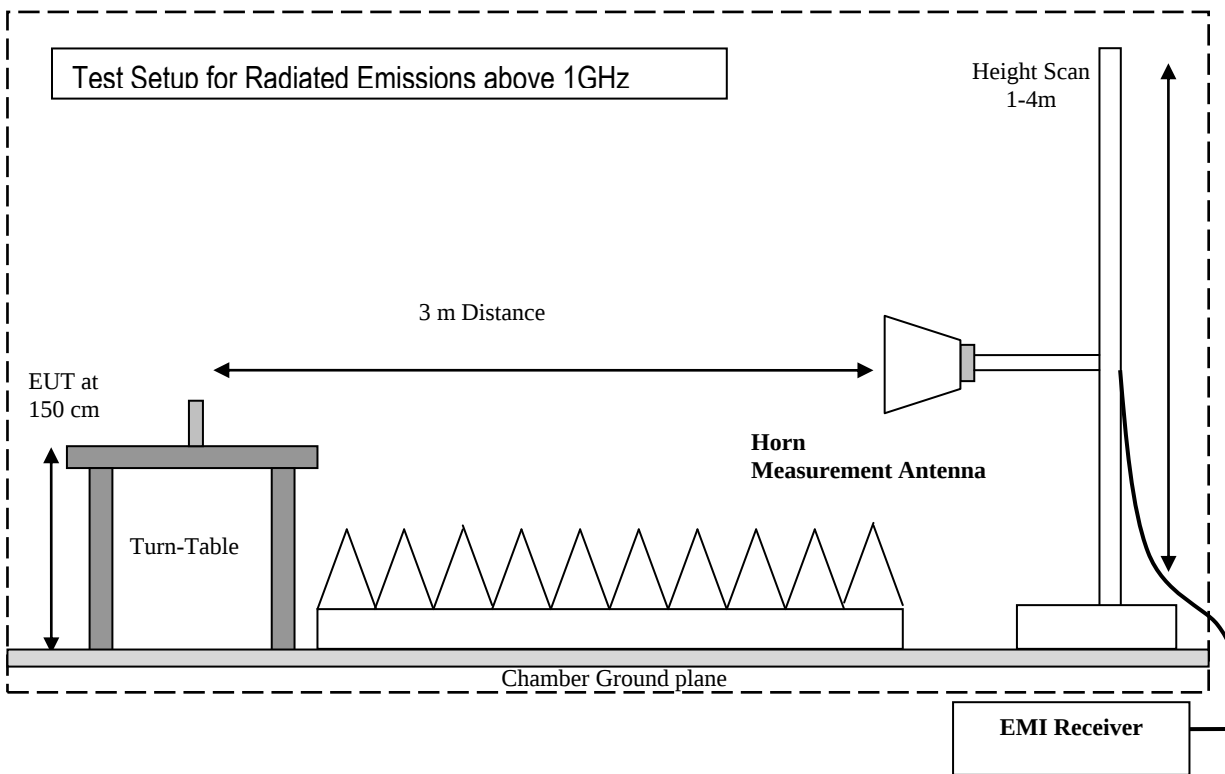
5 Measurement Procedures

Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v02r02 – “Measurement Guidance for Certification of Licensed Digital Transmitters” and according to relevant parts of TIA-603C 2004 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 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	UMTS LTE	☐	☐	☐	■	Complies Note 2
§2.1055; §24.235	Frequency Stability	Nominal	UMTS LTE	☐	☐	☐	■	Complies Note 2
§2.1049; §24.238	Occupied Bandwidth	Nominal	UMTS LTE	☐	☐	☐	■	Complies Note 2
§2.1051; §24.238	Band Edge Compliance	Nominal	UMTS LTE	☐	☐	☐	■	Complies Note 2
§2.1051; §24.238	Conducted Spurious Emissions	Nominal	UMTS LTE	☐	☐	☐	■	Complies Note 2
§2.1053; §24.238(a); RSS-133 Issue 6-6.5.1	Radiated Spurious Emissions	Nominal	UMTS LTE	■	☐	☐	☐	Complies

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

Note 2: Leveraged from module certification WP7504 FCC ID: N7NWP7 / IC ID: 2417C-WP7.

6.2 FCC 27, 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	UMTS LTE	☐	☐	☐	☒	Complies Note 2
§2.1055; §27.54	Frequency Stability	Nominal	UMTS LTE	☐	☐	☐	☒	Complies Note 2
§2.1049; §27.53	Occupied Bandwidth	Nominal	UMTS LTE	☐	☐	☐	☒	Complies Note 2
§2.1051; §27.53	Band Edge Compliance	Nominal	UMTS LTE	☐	☐	☐	☒	Complies Note 2
§2.1051; §27.53	Conducted Spurious Emissions	Nominal	UMTS LTE	☐	☐	☐	☒	Complies Note 2
§2.1053; §27.53(h); RSS-139 Issue 3-6.6;	Radiated Spurious Emissions	Nominal	UMTS LTE	☒	☐	☐	☐	Complies

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

Note 2: Leveraged from module certification WP7504 FCC ID: N7NWP7 / IC ID: 2417C-WP7.

7 Test Result Data

7.1 Radiated Spurious Emissions

7.1.1 Measurement according to FCC: CFR 47 Part 2.1053; CFR Part 24.238; Part 27.53, utilizing KDB 971168 D01 Power Meas License Digital Systems v02r02, and according to TIA-603C 2004- 2.2.12

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 24.238 (a) and Part 27.53 (h)
- 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:

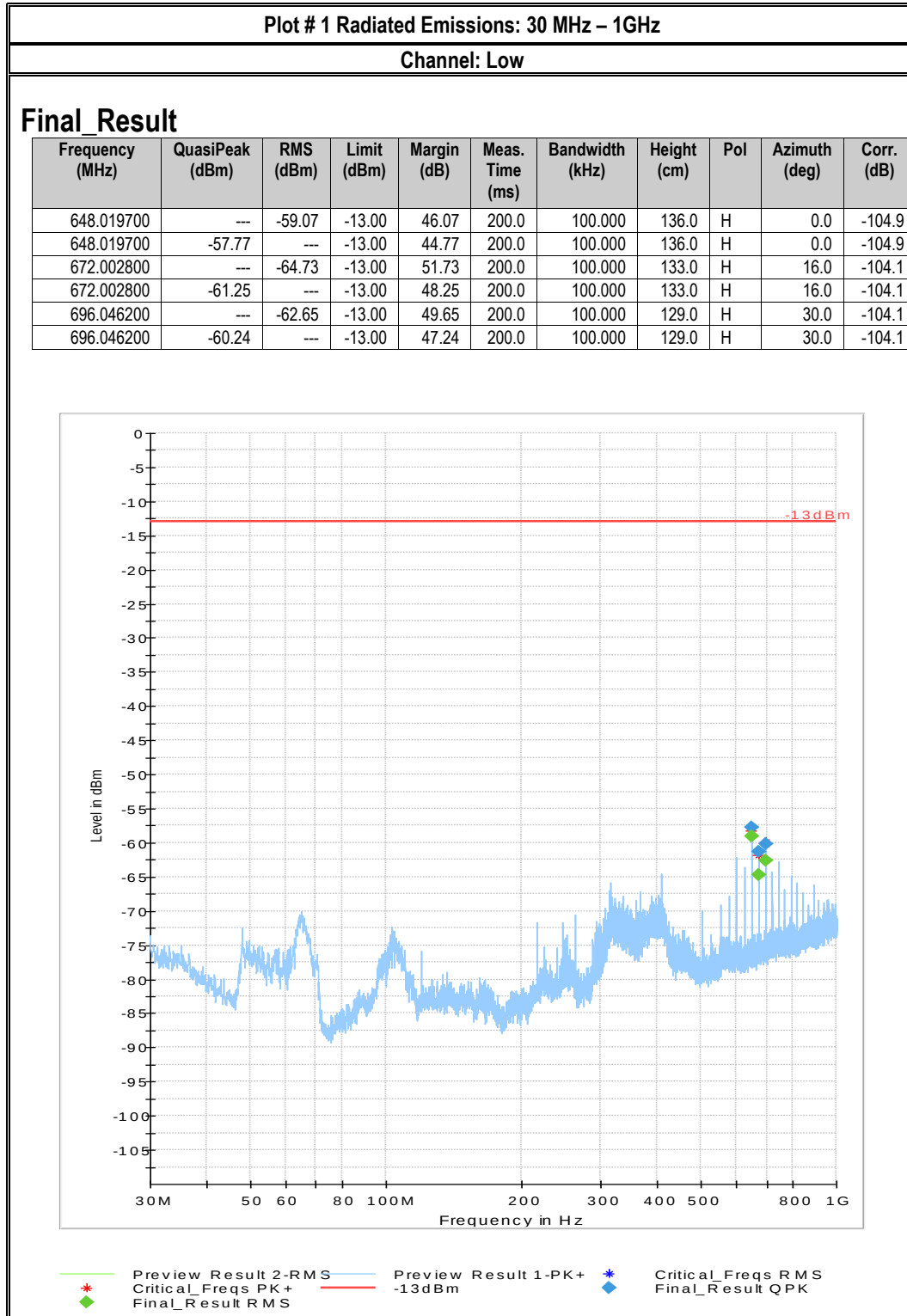
Ambient Temperature (C)	EUT Set-Up #	EUT operating mode	Power Input
22	1	LTE,FDD co-transmitting with Wi-Fi 5GHz	Vehicle 12 VDC

7.1.4 Measurement result:

Plot #	Cellular Channel	Wi-Fi Channel	EUT operating mode	Scan Frequency	Limit (dBm)	Result
1 - 3	Low	60	FDD II	30 MHz – 18 GHz	-13	Pass
4 - 8	Mid	60	FDD II	9 kHz – 40 GHz	-13	Pass
9 - 11	High	60	FDD II	30 MHz – 18 GHz	-13	Pass
12 – 14	Low	60	FDD IV	30 MHz – 18 GHz	-13	Pass
15 – 18	Mid	60	FDD IV	9 kHz – 18 GHz	-13	Pass
19 – 21	High	60	FDD IV	30 MHz – 18 GHz	-13	Pass
22 – 24	Low	60	LTE 2	30 MHz – 18 GHz	-13	Pass
25 – 29	Mid	60	LTE 2	9 kHz – 40 GHz	-13	Pass
30 – 32	High	60	LTE 2	30 MHz – 18 GHz	-13	Pass
33 – 35	Low	60	LTE 4	30 MHz – 18 GHz	-13	Pass
36 – 39	Mid	60	LTE 4	9 kHz – 18 GHz	-13	Pass
40 – 42	High	60	LTE 4	30 MHz – 18 GHz	-13	Pass

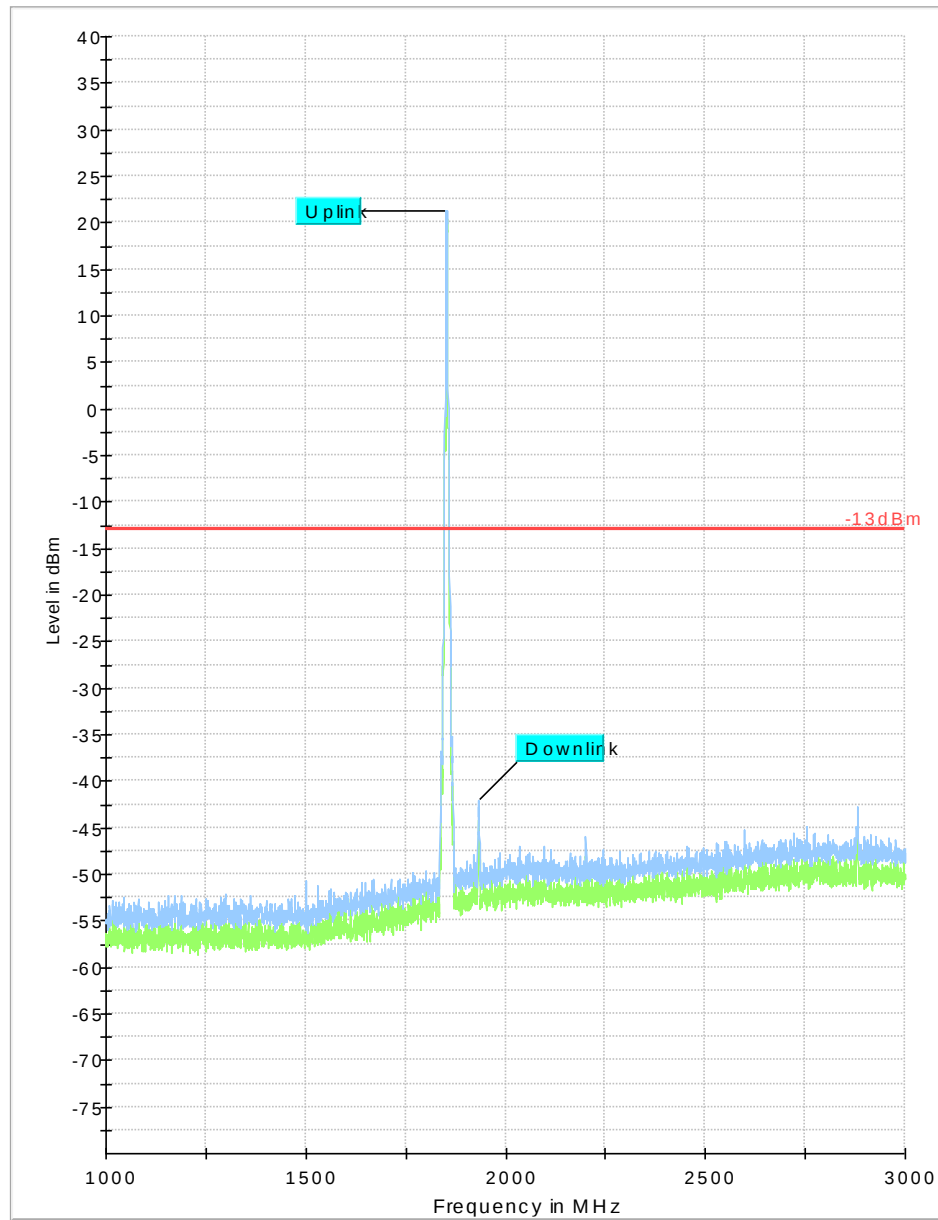
7.1.5 Measurement Plots:

FDD II



Plot # 2 Radiated Emissions: 1 GHz-3 GHz

Channel: Low



Preview Result 2-RMS
Critical_Freqs PK+
Final_Result RMS

Preview Result 1-PK+
-13dBm

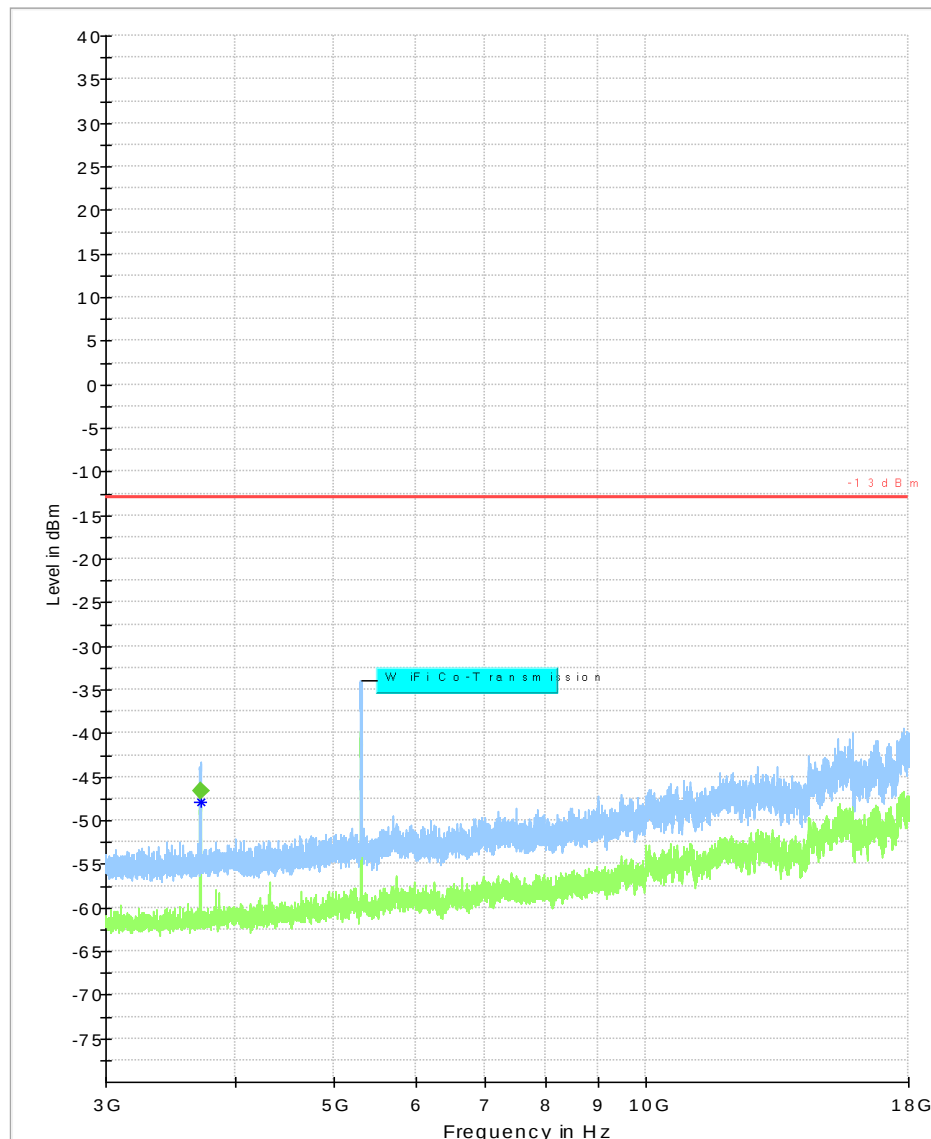
Critical_Freqs RMS
Final_Result QPK

Plot # 3 Radiated Emissions: 3 GHz-18 GHz

Channel: Low

Final_Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3706.384667	---	-46.57	-13.00	43.57	200.0	1000.000	298.0	H	333.0



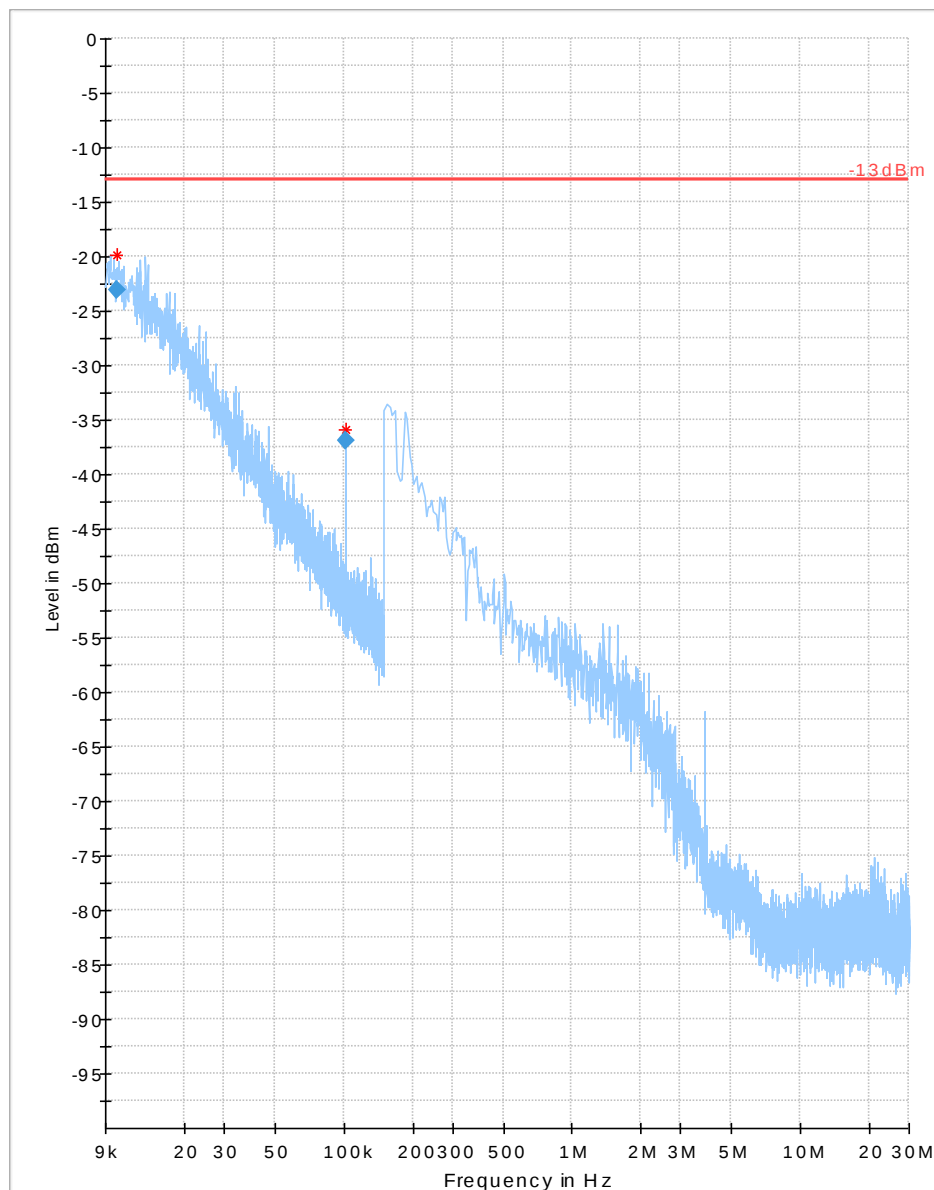
— Preview Result 2-RMS — Preview Result 1-PK+ ◆ Critical_Freqs RMS Final_Result QPK
* Critical_Freqs PK+ — -13dBm

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)
0.010080	-23.08	---	-13.00	10.08	500.0	0.200	108.0	V	78.0	-35.0
0.101269	-36.98	---	-13.00	23.98	500.0	0.200	100.0	H	237.0	-56.6



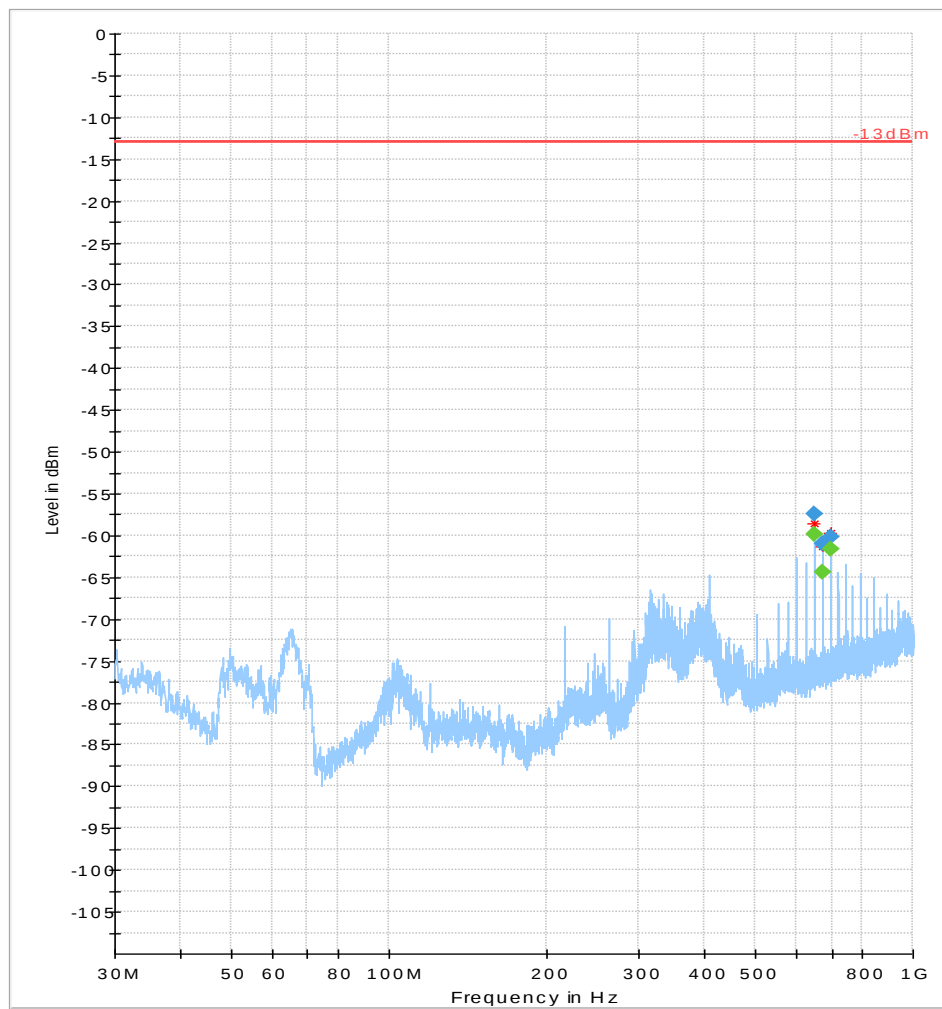
— Preview Result 2-RMS
* Critical_Freqs PK+
◆ Final_Result RMS
 — Preview Result 1-PK+
— -13dBm
◆ Critical_Freqs RMS
◆ Final_Result QPK

Plot # 5 Radiated Emissions: 30 MHz – 1GHz

Channel: Mid

Final_Result

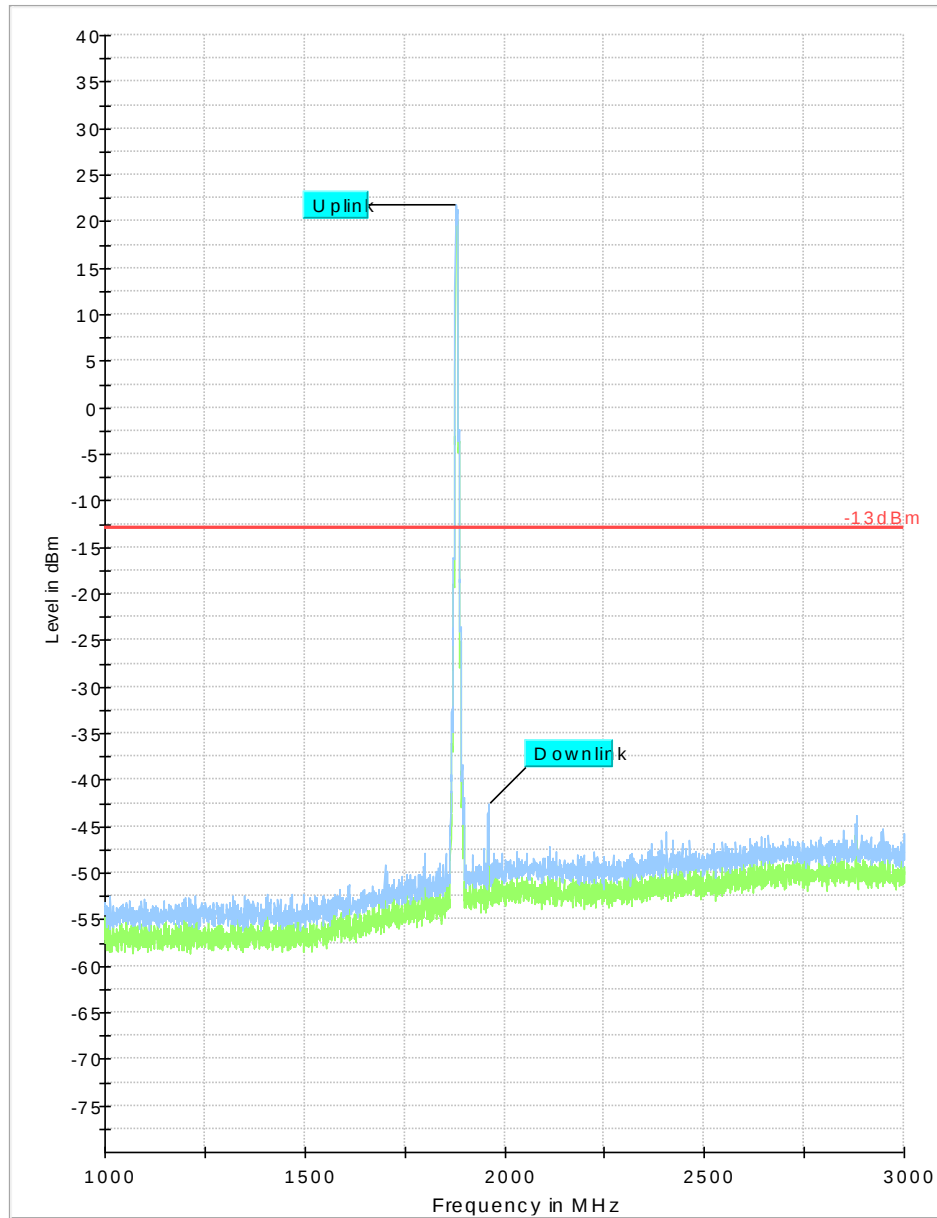
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
648.046100	-57.49	---	-13.00	44.49	200.0	100.000	134.0	H	18.0	-104.9
648.046100	---	-59.80	-13.00	46.80	200.0	100.000	134.0	H	18.0	-104.9
672.007100	---	-64.37	-13.00	51.37	200.0	100.000	133.0	H	32.0	-104.1
672.007100	-61.05	---	-13.00	48.05	200.0	100.000	133.0	H	32.0	-104.1
696.026800	-60.14	---	-13.00	47.14	200.0	100.000	127.0	H	40.0	-104.1
696.026800	---	-61.63	-13.00	48.63	200.0	100.000	127.0	H	40.0	-104.1



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

Plot # 6 Radiated Emissions: 1 GHz-3 GHz

Channel: Mid



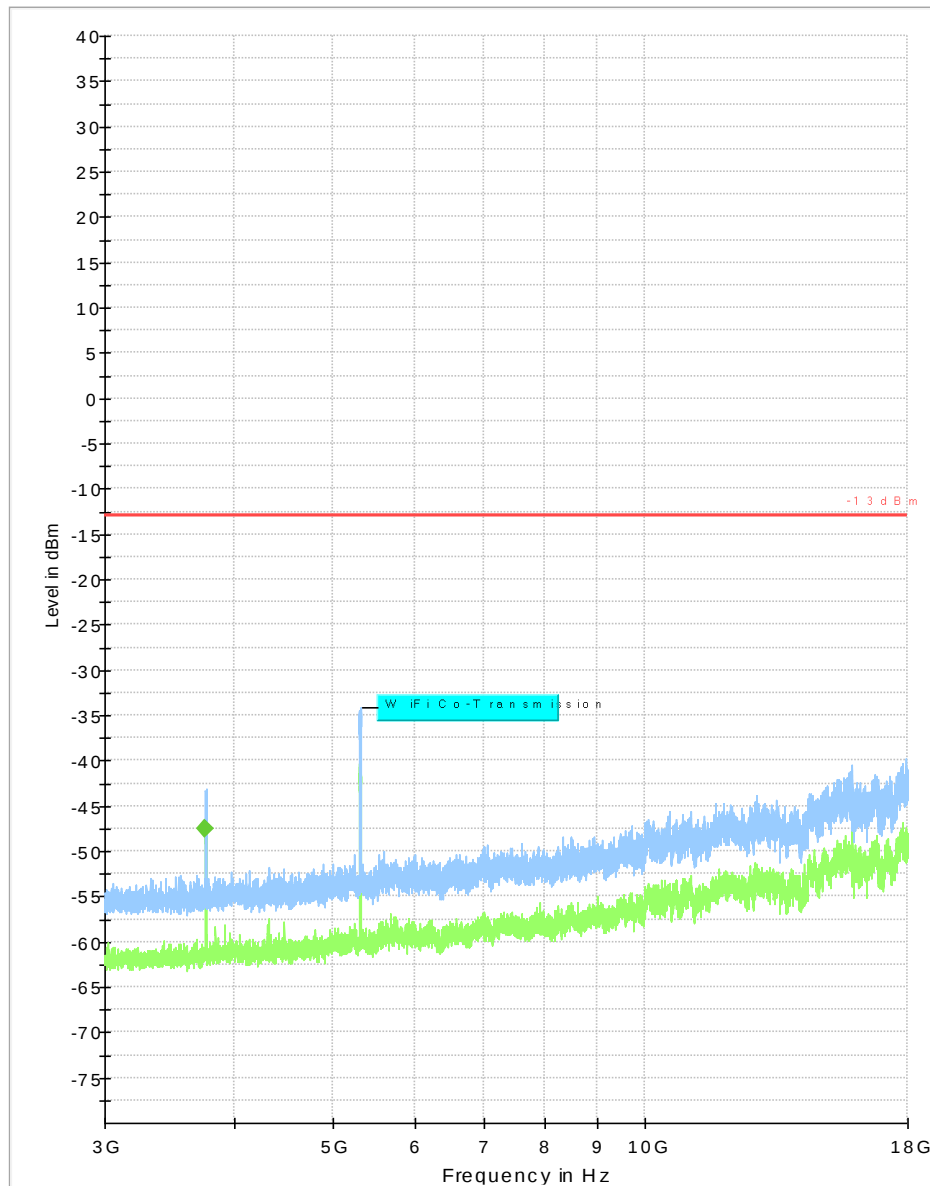
Preview Result 2-RMS * Critical_Freqs PK+ Final_Result RMS
Preview Result 1-PK+ -13dBm Critical_Freqs RMS Final_Result QPK

Plot # 7 Radiated Emissions: 3 GHz – 18GHz

Channel: Mid

Final Result

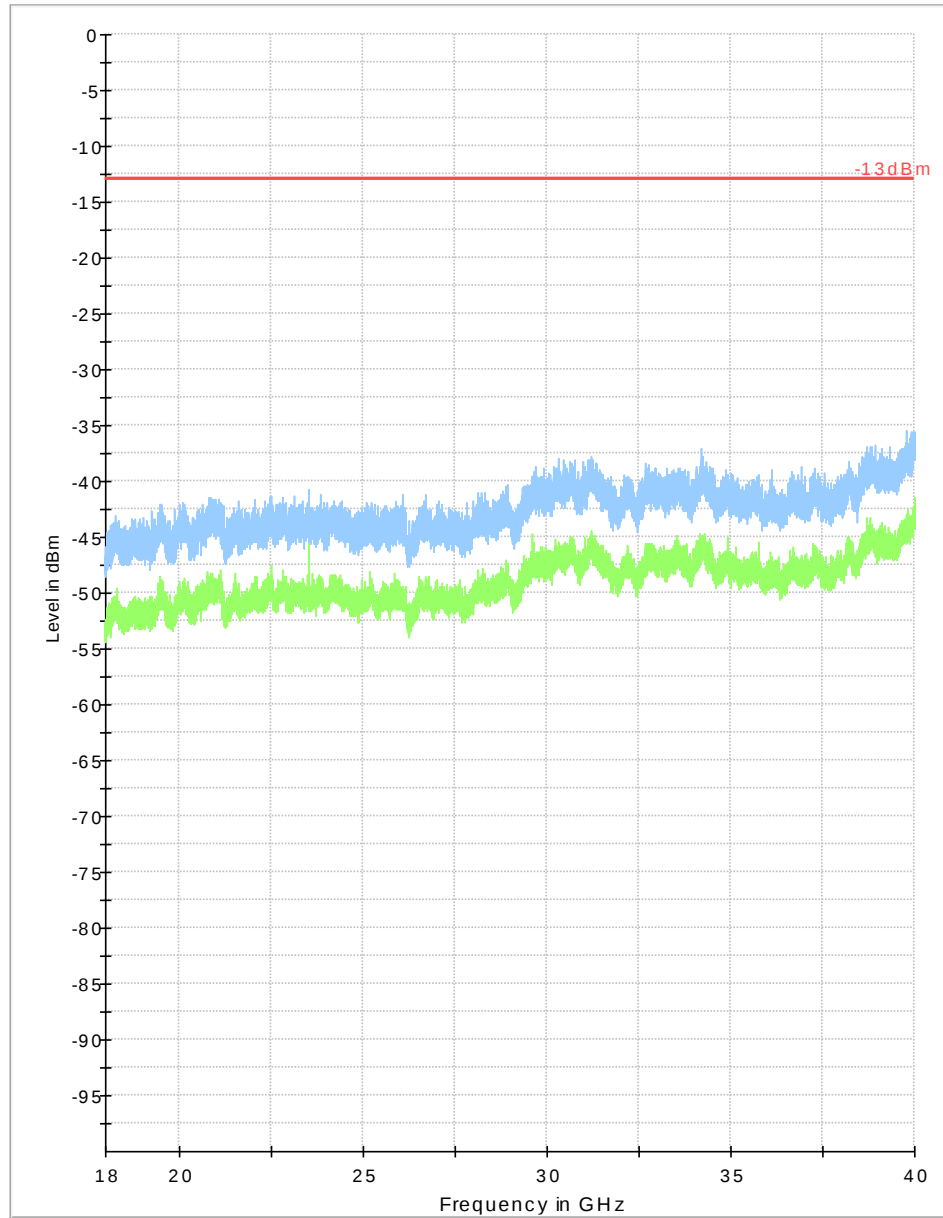
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3757.602000	---	-47.48	-13.00	34.48	200.0	1000.000	288.0	H	332.0



— Preview Result 2-RMS — Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ — -13dBm ◆ Final_Result QPK
◆ Final_Result RMS

Plot # 8 Radiated Emissions: 18 GHz – 40GHz

Channel: Mid



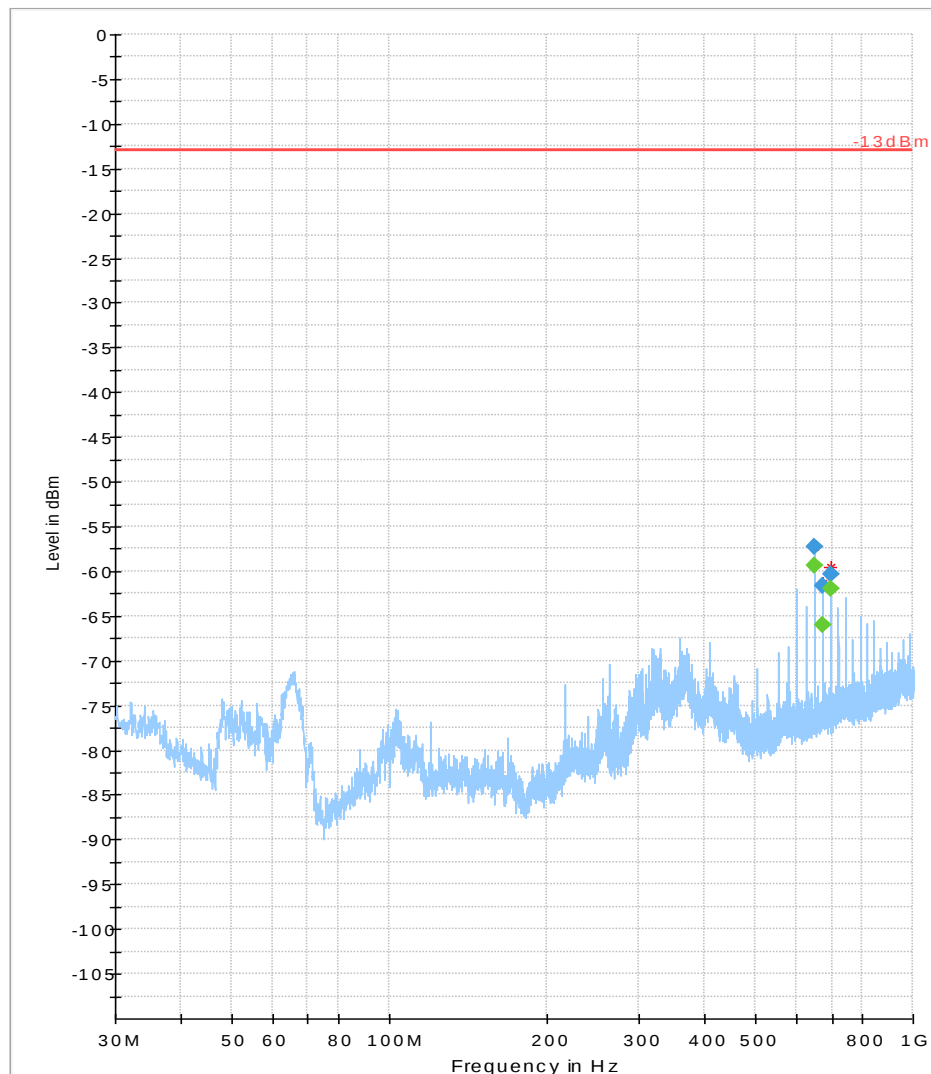
—	Preview Result 2-RMS	—	Preview Result 1-PK+	*	Critical_Freqs RMS
*	Critical_Freqs PK+	—	-13dBm	◆	Final_Result QPK
◆	Final_Result RMS				

Plot # 9 Radiated Emissions: 30 MHz – 1GHz

Channel: High

Final_Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	P ol	Azimuth (deg)	Corr. (dB)
648.04160	---	-59.34	-13.00	46.34	200.0	100.000	134.0	H	6.0	-104.9
648.04160	-57.32	---	-13.00	44.32	200.0	100.000	134.0	H	6.0	-104.9
671.97930	-61.69	---	-13.00	48.69	200.0	100.000	133.0	H	16.0	-104.1
671.97930	---	-65.93	-13.00	52.93	200.0	100.000	133.0	H	16.0	-104.1
696.00560	-60.31	---	-13.00	47.31	200.0	100.000	126.0	H	23.0	-104.1
696.00560	---	-62.01	-13.00	49.01	200.0	100.000	126.0	H	23.0	-104.1

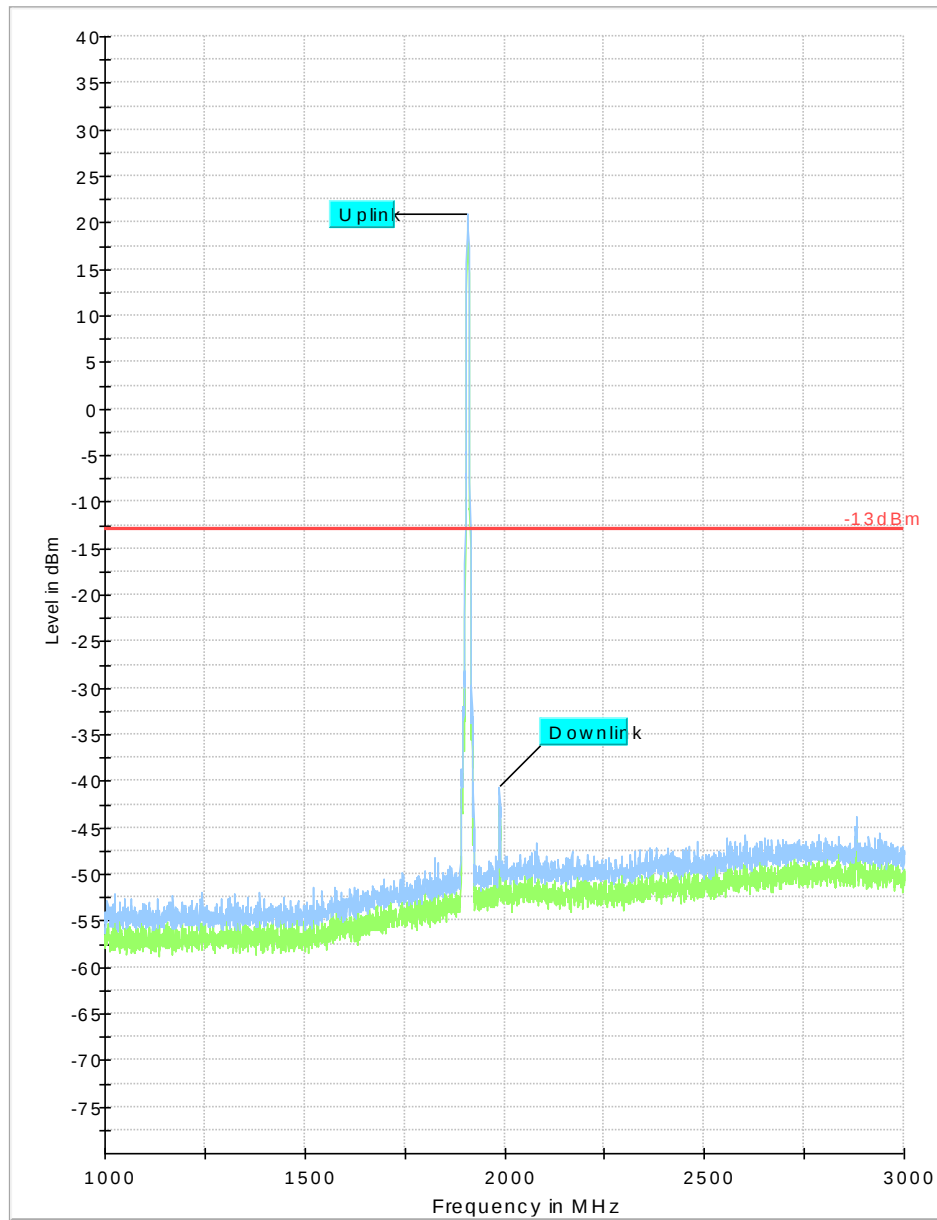


◆ Preview Result 2-RMS
★ Critical_Freqs PK+
◆ Final_Result RMS

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

Plot # 10 Radiated Emissions: 1 GHz-3 GHz

Channel: High



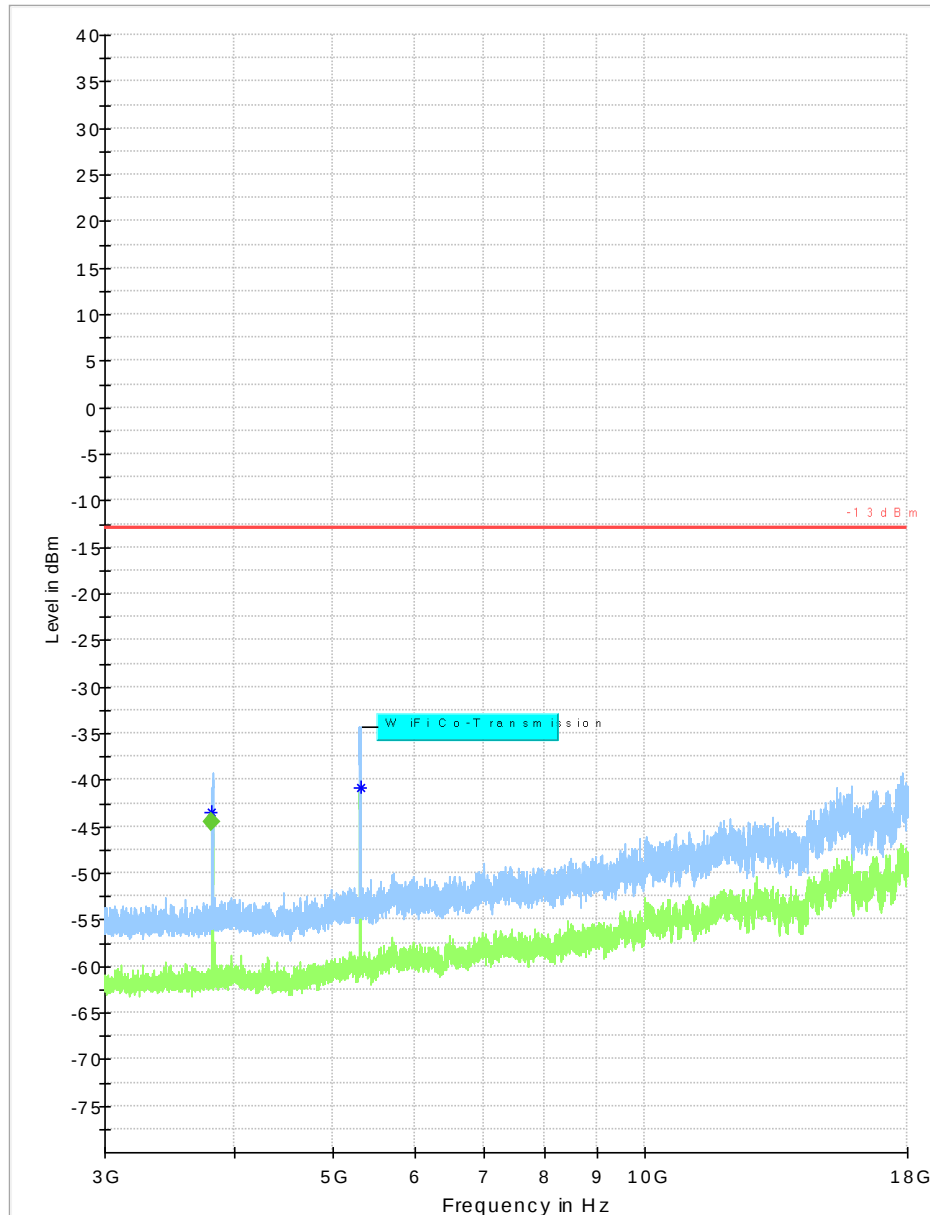
Preview Result 2-RMS Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ -13dBm * Final_Result QPK
◆ Final_Result RMS

Plot # 11 Radiated Emissions: 3 GHz-18 GHz

Channel: High

Final_Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3813.582667	---	-44.57	-13.00	31.57	200.0	1000.000	293.0	H	317.0



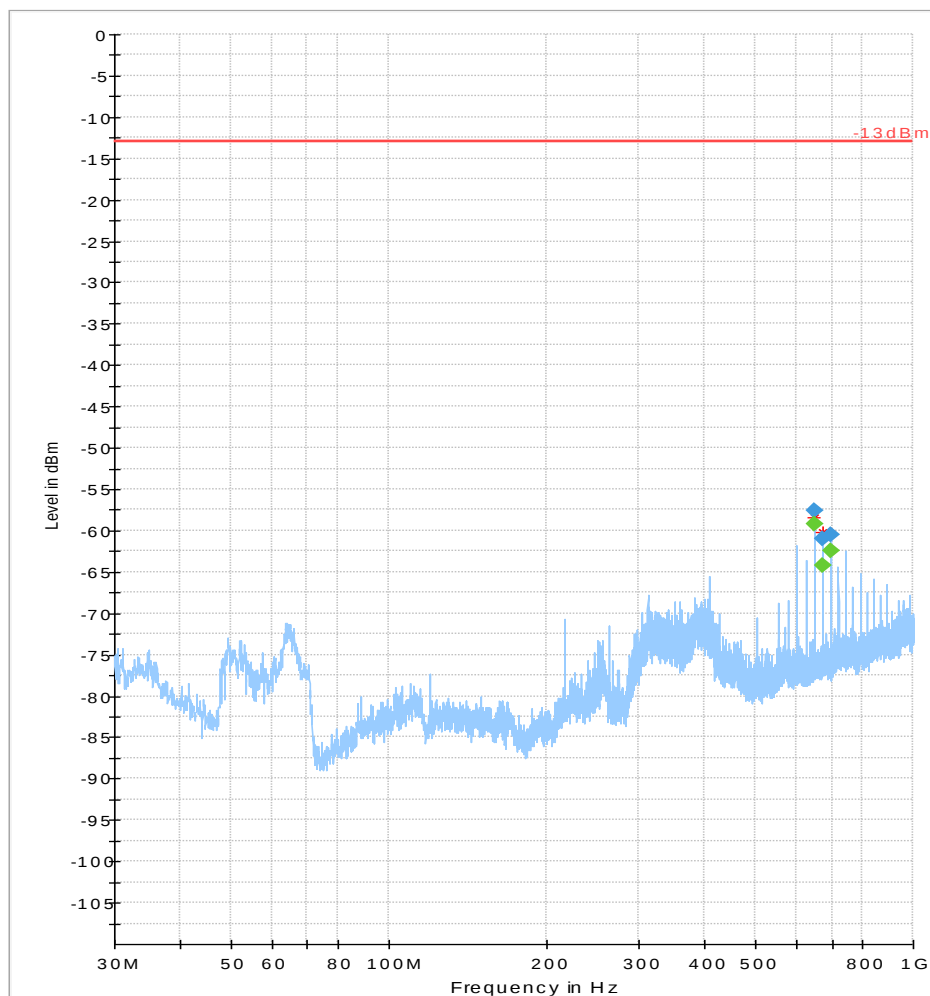
— Preview Result 2-RMS — Preview Result 1-PK+ ★ Critical_Freqs RMS
★ Critical_Freqs PK+ — -13dBm ◆ Final_Result QPK
◆ Final_Result RMS

Plot # 12 Radiated Emissions: 30MHz – 1GHz

Channel: Low

Final_Result

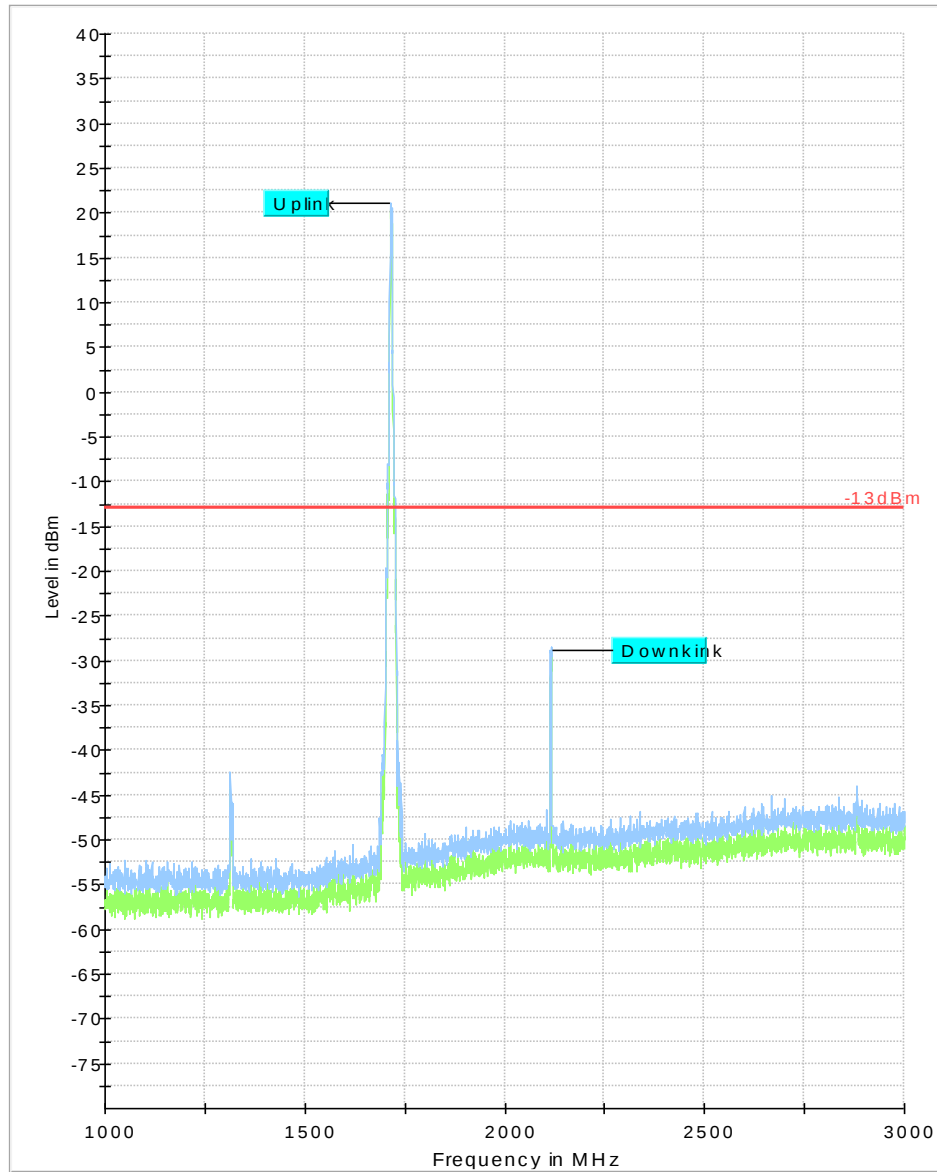
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
648.032800	---	-59.16	-13.00	46.16	200.0	100.000	136.0	H	18.0	-104.9
648.032800	-57.56	---	-13.00	44.56	200.0	100.000	136.0	H	18.0	-104.9
672.009900	---	-64.29	-13.00	51.29	200.0	100.000	133.0	H	32.0	-104.1
672.009900	-61.02	---	-13.00	48.02	200.0	100.000	133.0	H	32.0	-104.1
696.038800	---	-62.39	-13.00	49.39	200.0	100.000	131.0	H	42.0	-104.1
696.038800	-60.43	---	-13.00	47.43	200.0	100.000	131.0	H	42.0	-104.1



— Preview Result 2-RMS
* Critical_Freqs PK+ — Preview Result 1-PK+ * Critical_Freqs RMS
◆ Final_Result RMS — -13dBm ◆ Final_Result QPK

Plot # 13 Radiated Emissions: 1GHz-3GHz

Channel: Low



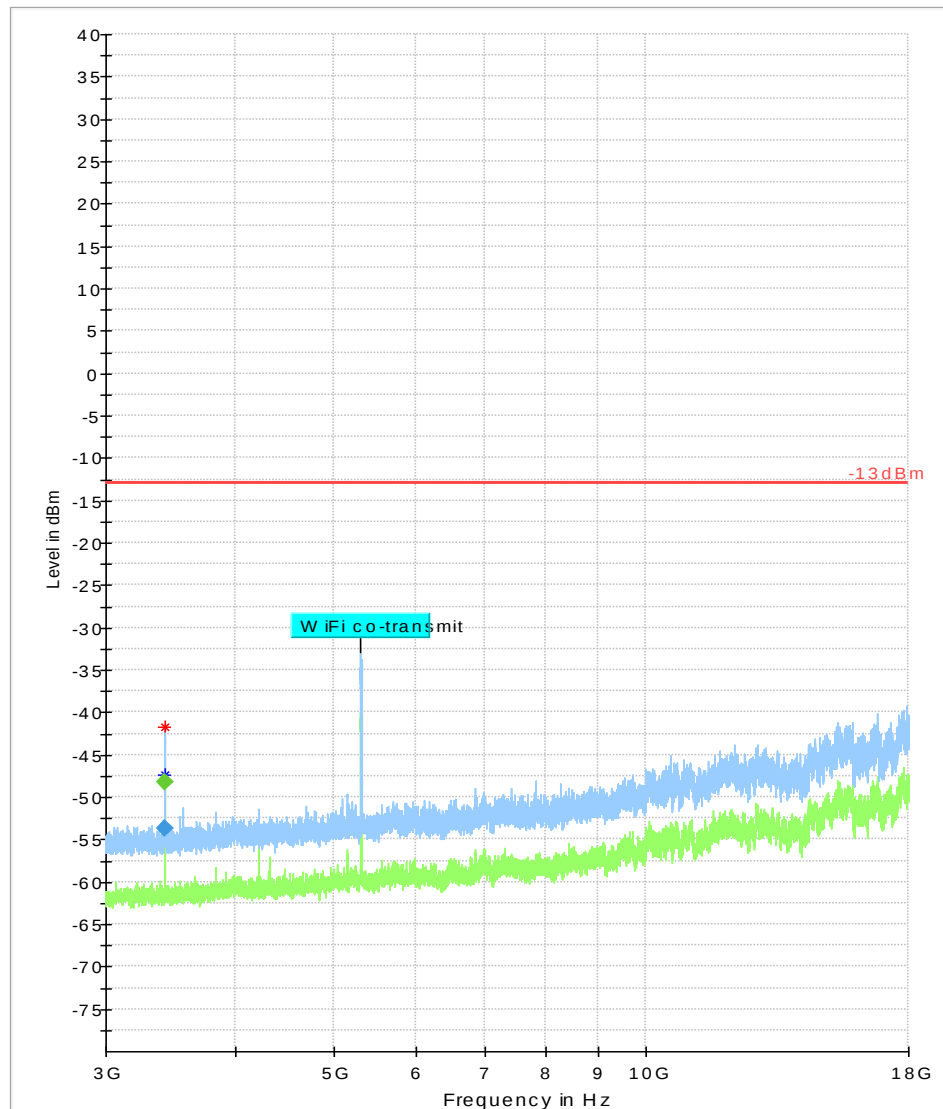
Preview Result 2-RMS Preview Result 1-PK+ Critical_Freqs RMS
Critical_Freqs PK+ -13dBm Final_Result QPK
Final_Result RMS

Plot # 14 Radiated Emissions: 3GHz-18GHz

Channel: Low

Final Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3426.350000	---	-48.18	-13.00	35.18	200.0	1000.000	249.0	V	259.0
3427.070000	-53.69	---	-13.00	40.69	200.0	1000.000	273.0	V	250.0



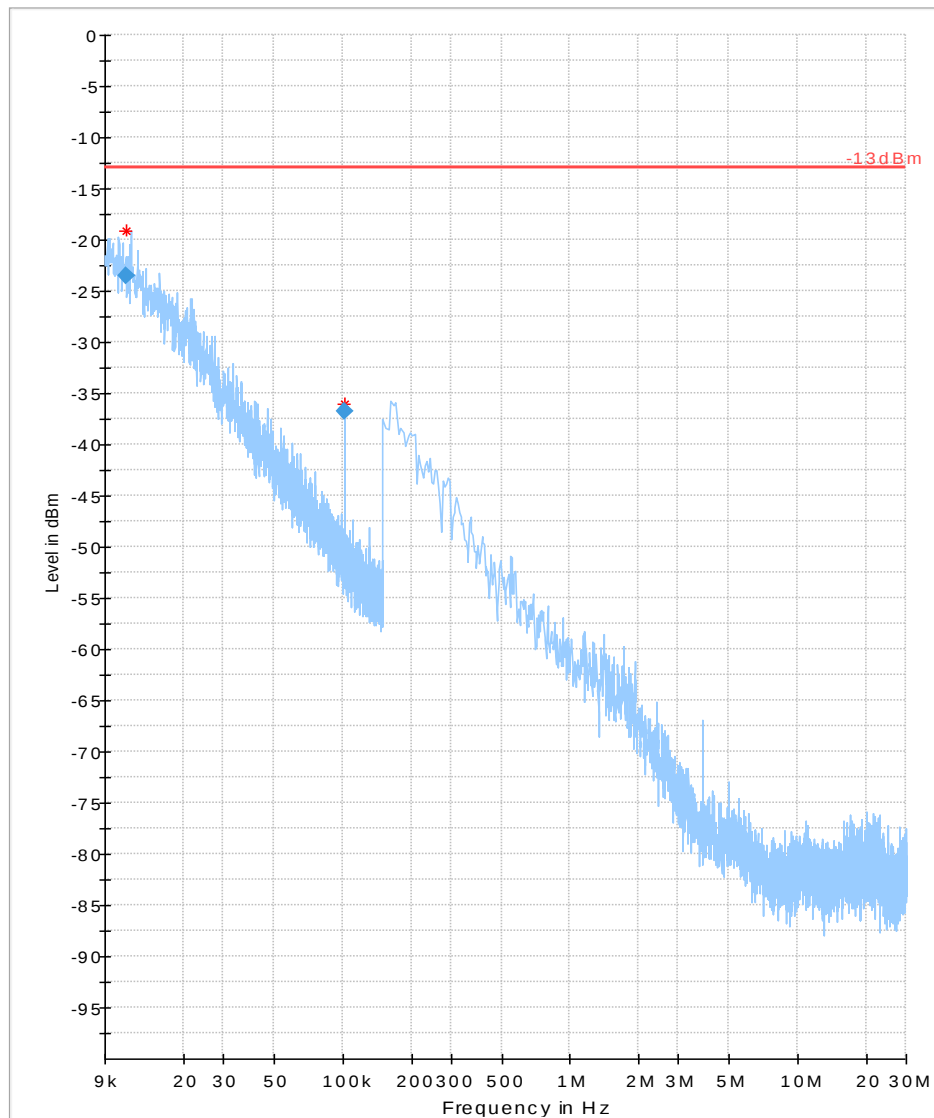
◆ Preview Result 2-RMS ◆ Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ — -13dBm ◆ Final_Result QPK
◆ Final_Result RMS

Plot # 15 Radiated Emissions: 9KHz-30MHz

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)
0.011203	-23.58	---	-13.00	10.58	500.0	0.200	135.0	H	192.0	-35.6
0.101275	-36.80	---	-13.00	23.80	500.0	0.200	100.0	H	314.0	-56.6



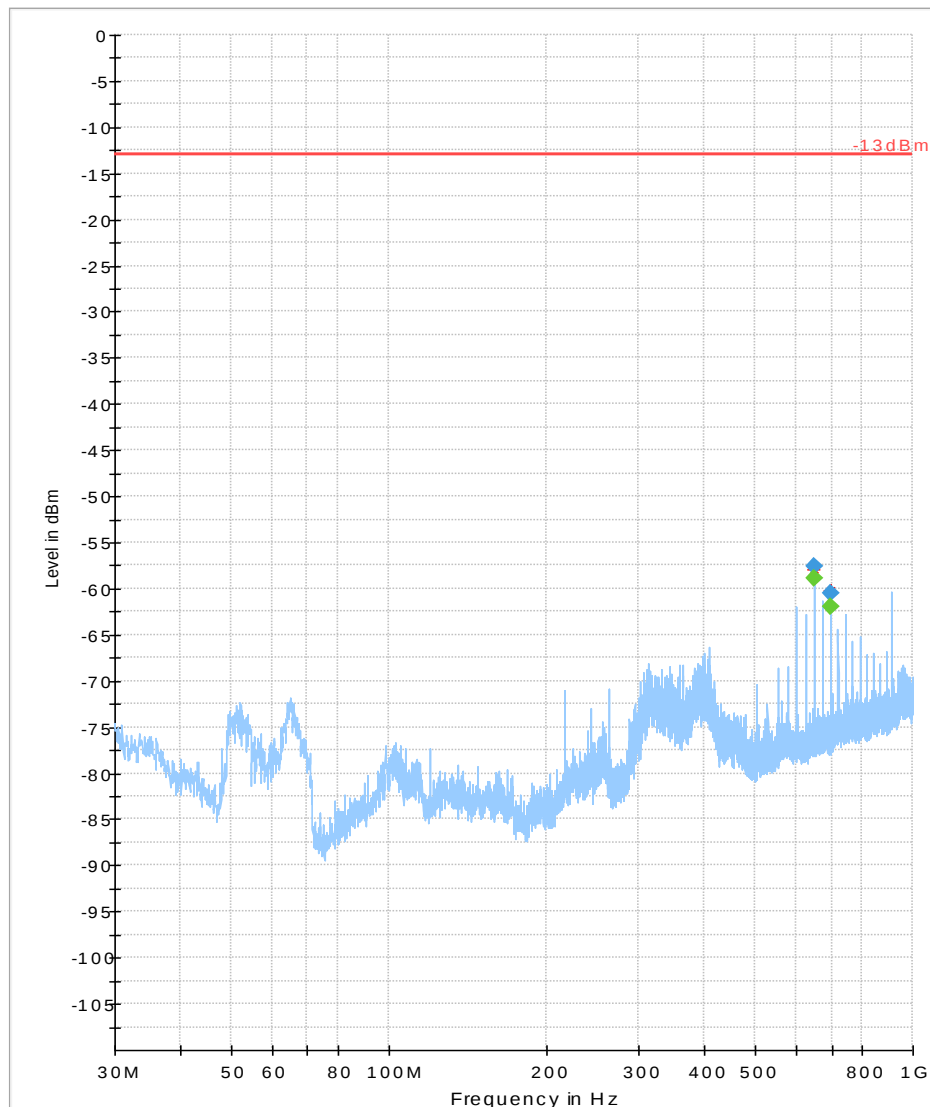
— Preview Result 2-RMS — Preview Result 1-PK+ ◆ Critical_Freqs RMS
* Critical_Freqs PK+ — -13dBm ◆ Final_Result RMS

Plot # 16 Radiated Emissions: 30MHz-1GHz

Channel: Mid

Final_Result

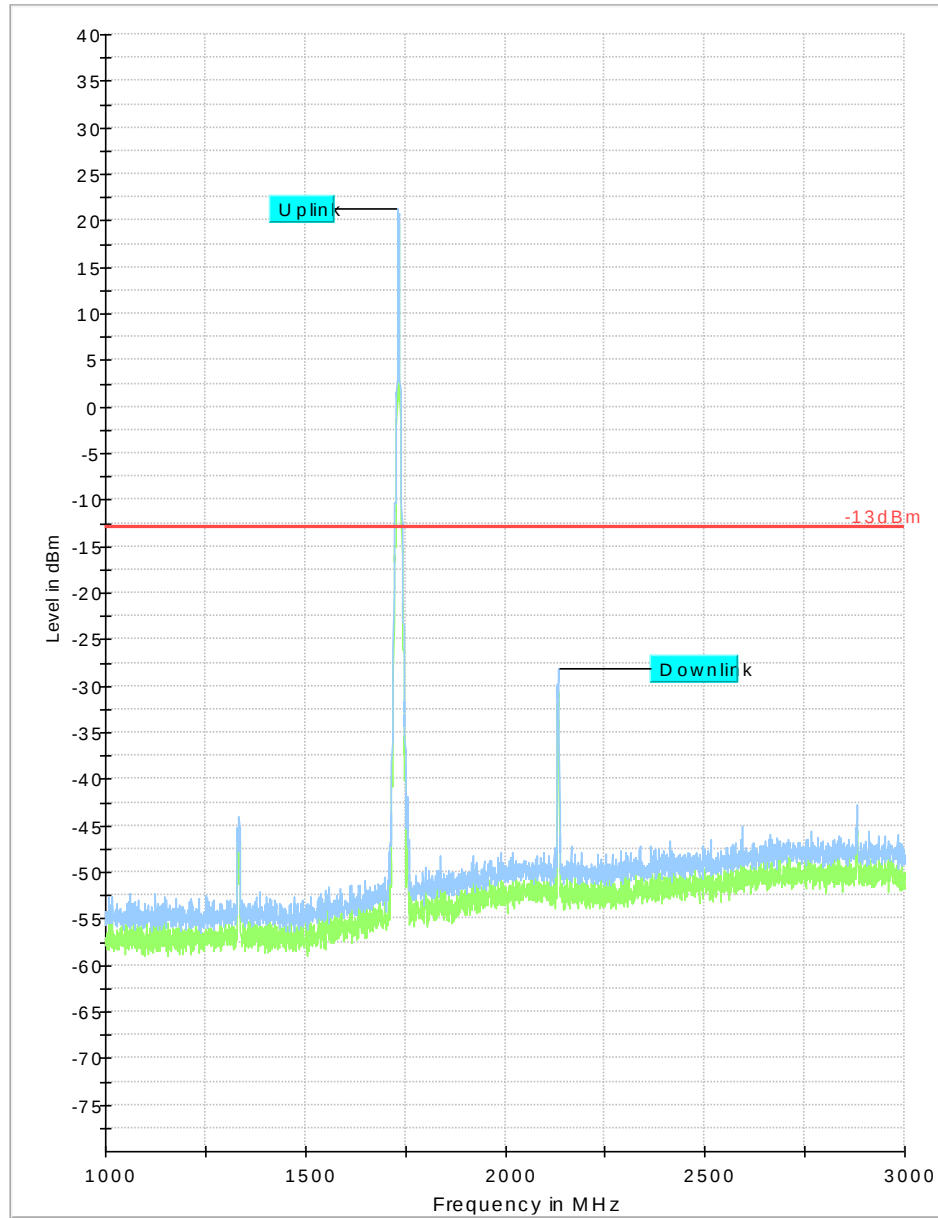
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
648.013600	-57.52	---	-13.00	44.52	200.0	100.000	133.0	H	19.0	-104.9
648.013600	---	-58.84	-13.00	45.84	200.0	100.000	133.0	H	19.0	-104.9
696.013200	-60.45	---	-13.00	47.45	200.0	100.000	127.0	H	40.0	-104.1
696.013200	---	-61.97	-13.00	48.97	200.0	100.000	127.0	H	40.0	-104.1



— Preview Result 2-RMS — Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ — -13dBm ♦ Final_Result QPK
♦ Final_Result RMS

Plot # 17 Radiated Emissions: 1GHz-3GHz

Channel: Mid



Preview Result 2-RMS
Critical_Freqs PK+
Final_Result RMS

Preview Result 1-PK+
-13dBm

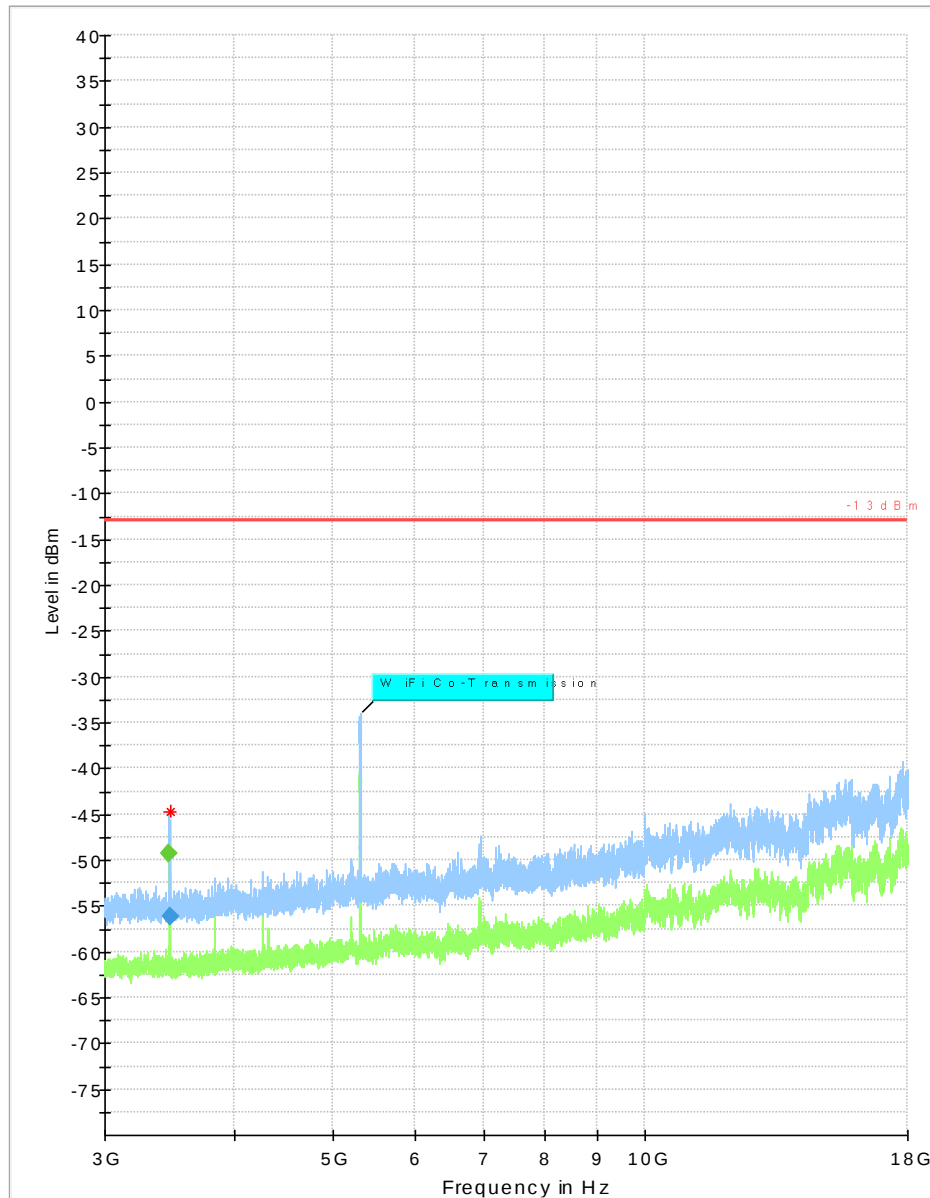
Critical_Freqs RMS
Final_Result QPK

Plot # 18 Radiated Emissions: 3GHz-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)
3463.607333	---	-49.25	-13.00	36.25	200.0	1000.000	181.0	H	276.0
3467.475333	-56.20	---	-13.00	43.20	200.0	1000.000	188.0	H	125.0



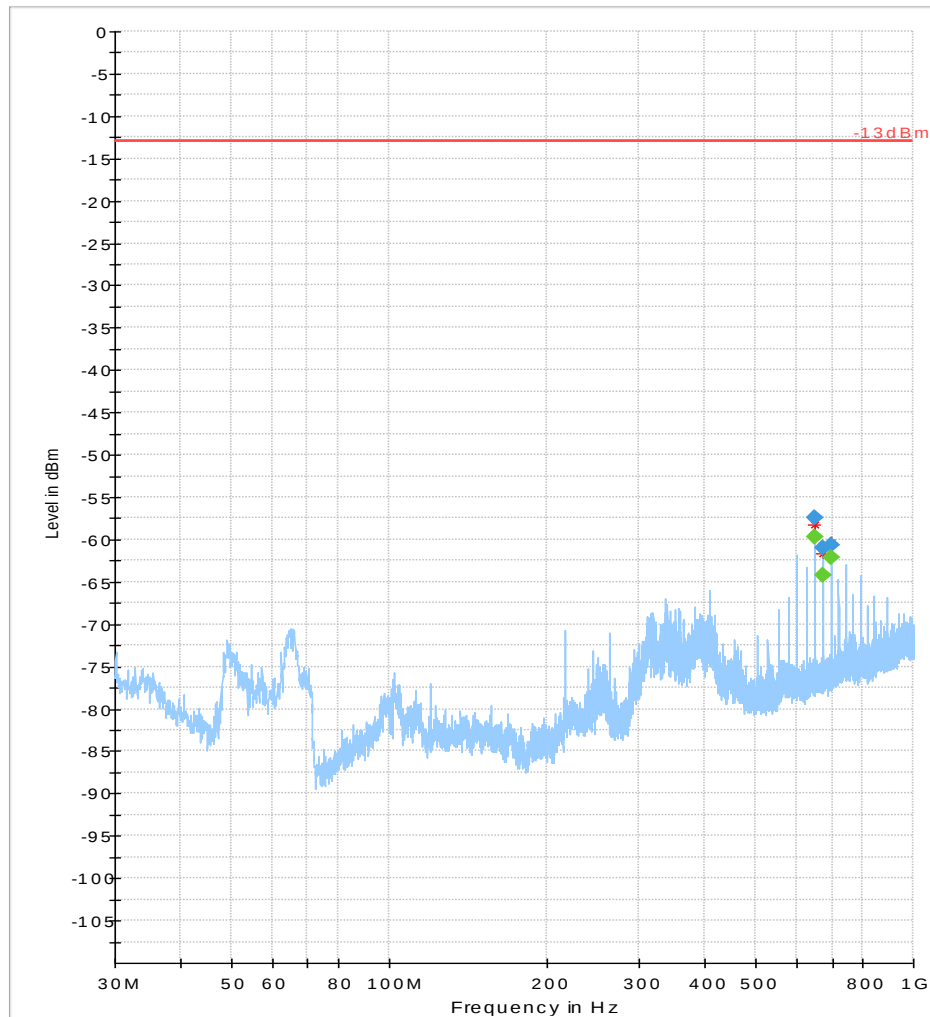
— Preview Result 2-RMS — Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ — -13dBm ♦ Final_Result QPK
♦ Final_Result RMS

Plot #19 Radiated Emissions: 30MHz – 1GHz

Channel: High

Final_Result

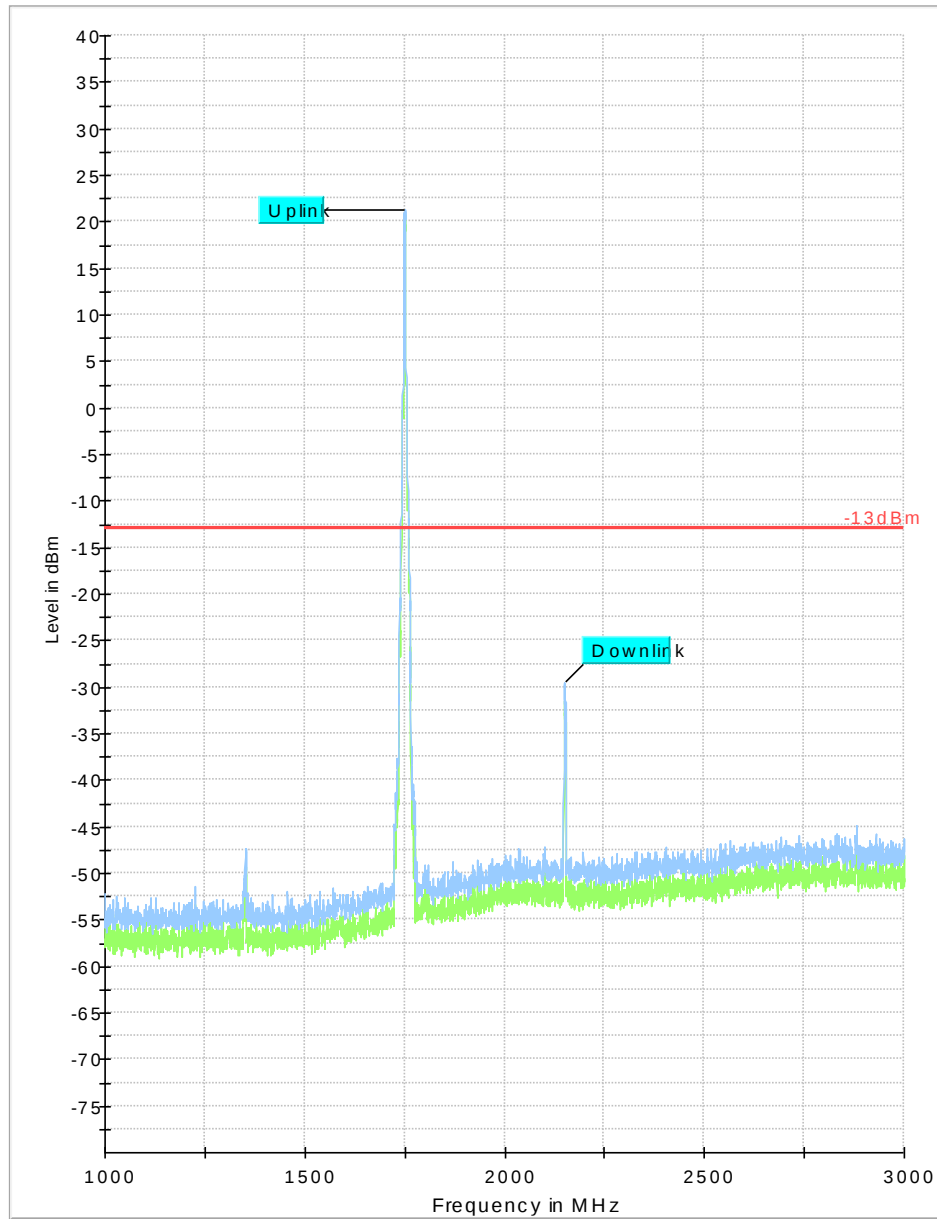
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
648.044100	-57.48	---	-13.00	44.48	200.0	100.000	133.0	H	20.0	-104.9
648.044100	---	-59.72	-13.00	46.72	200.0	100.000	133.0	H	20.0	-104.9
672.007800	---	-64.25	-13.00	51.25	200.0	100.000	133.0	H	30.0	-104.1
672.007800	-60.94	---	-13.00	47.94	200.0	100.000	133.0	H	30.0	-104.1
696.013900	-60.63	---	-13.00	47.63	200.0	100.000	127.0	H	40.0	-104.1
696.013900	---	-62.08	-13.00	49.08	200.0	100.000	127.0	H	40.0	-104.1



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

Plot #20 Radiated Emissions: 1GHz – 3GHz

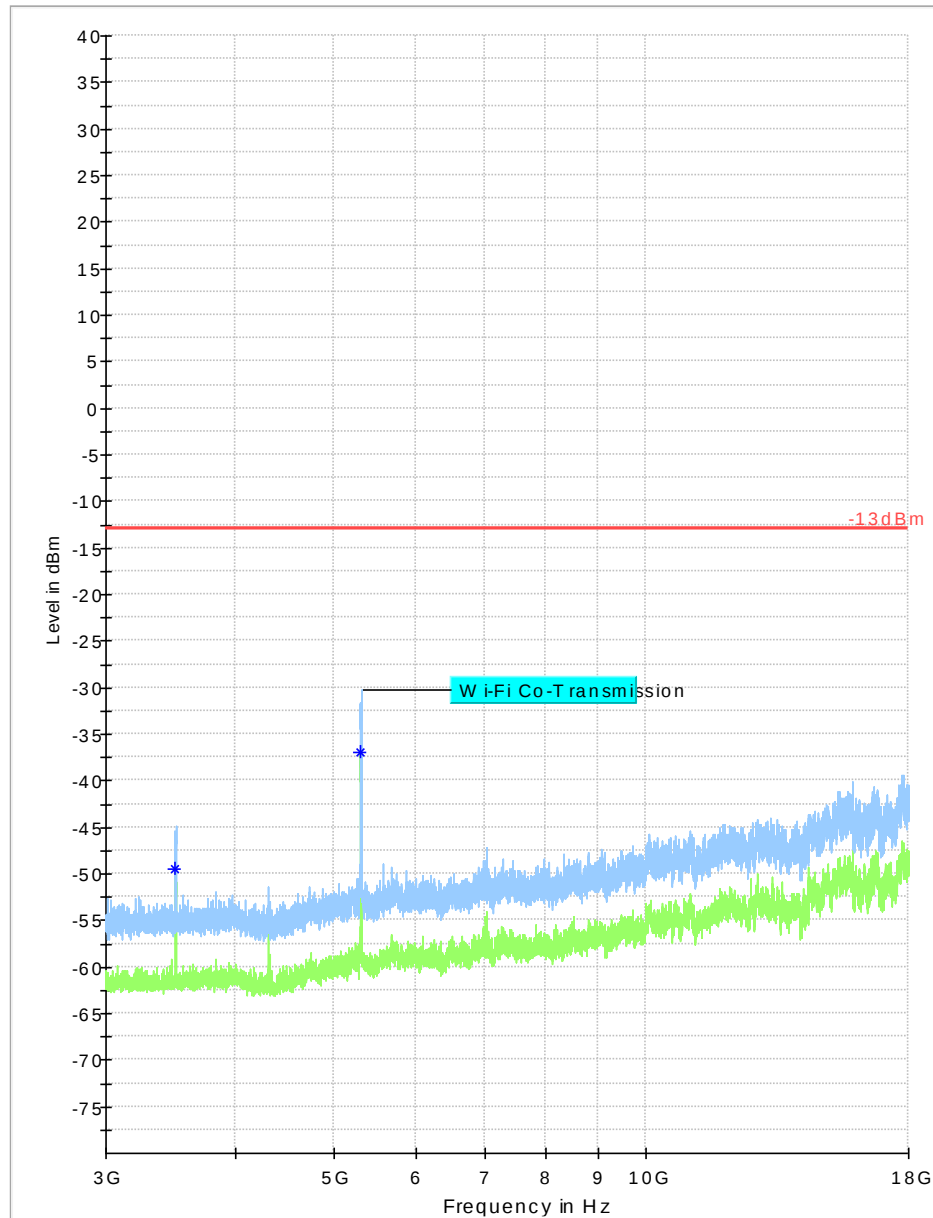
Channel: High



Preview Result 2-RMS Preview Result 1-PK+ Critical_Freqs RMS
Critical_Freqs PK+ Final_Result RMS
Final_Result RMS

Plot #21 Radiated Emissions: 3GHz – 18GHz

Channel: High



— Preview Result 2-RMS	— Preview Result 1-PK+	* Critical_Freqs RMS
* Critical_Freqs PK+	— -13dBm	◆ Final_Result QPK
◆ Final_Result RMS	x QuasiPeak-QPK (Single)	+ RMS (Single)

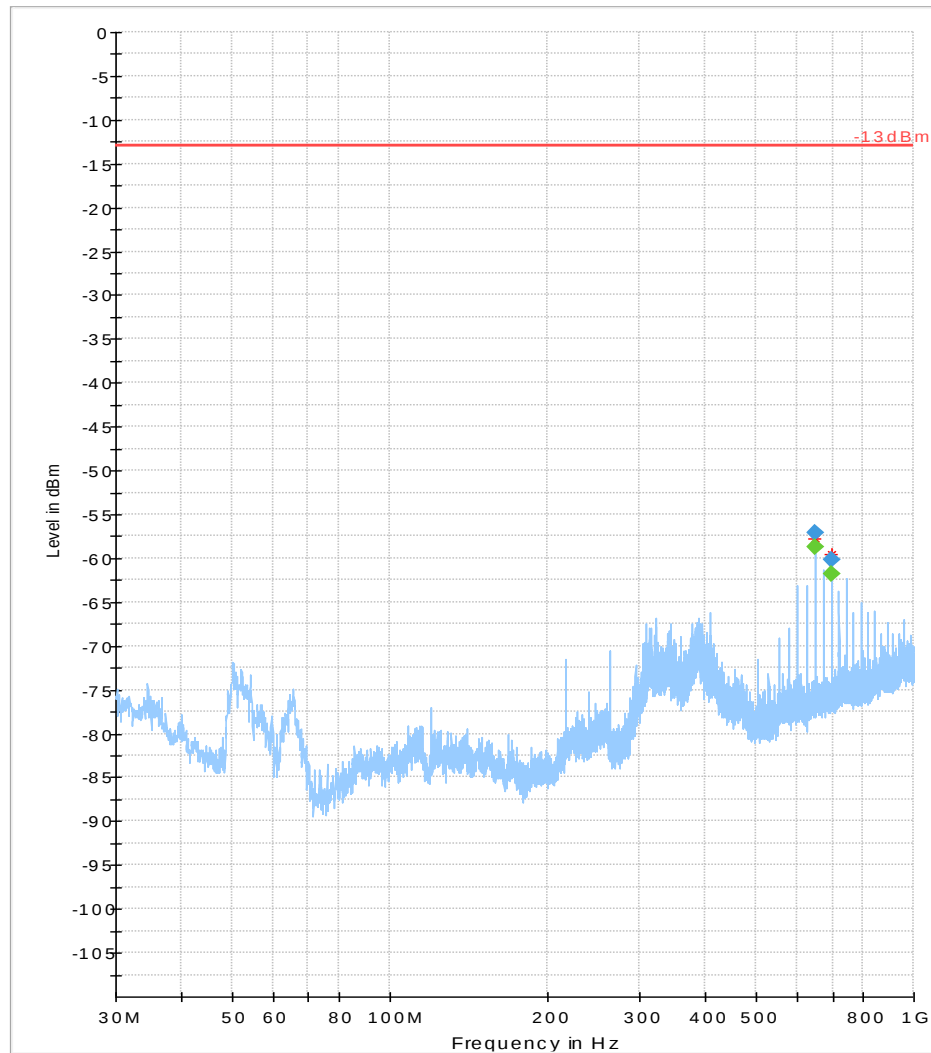
LTE 2

Plot # 22 Radiated Emissions: 30 MHz – 1GHz

Channel: Low

Final Result

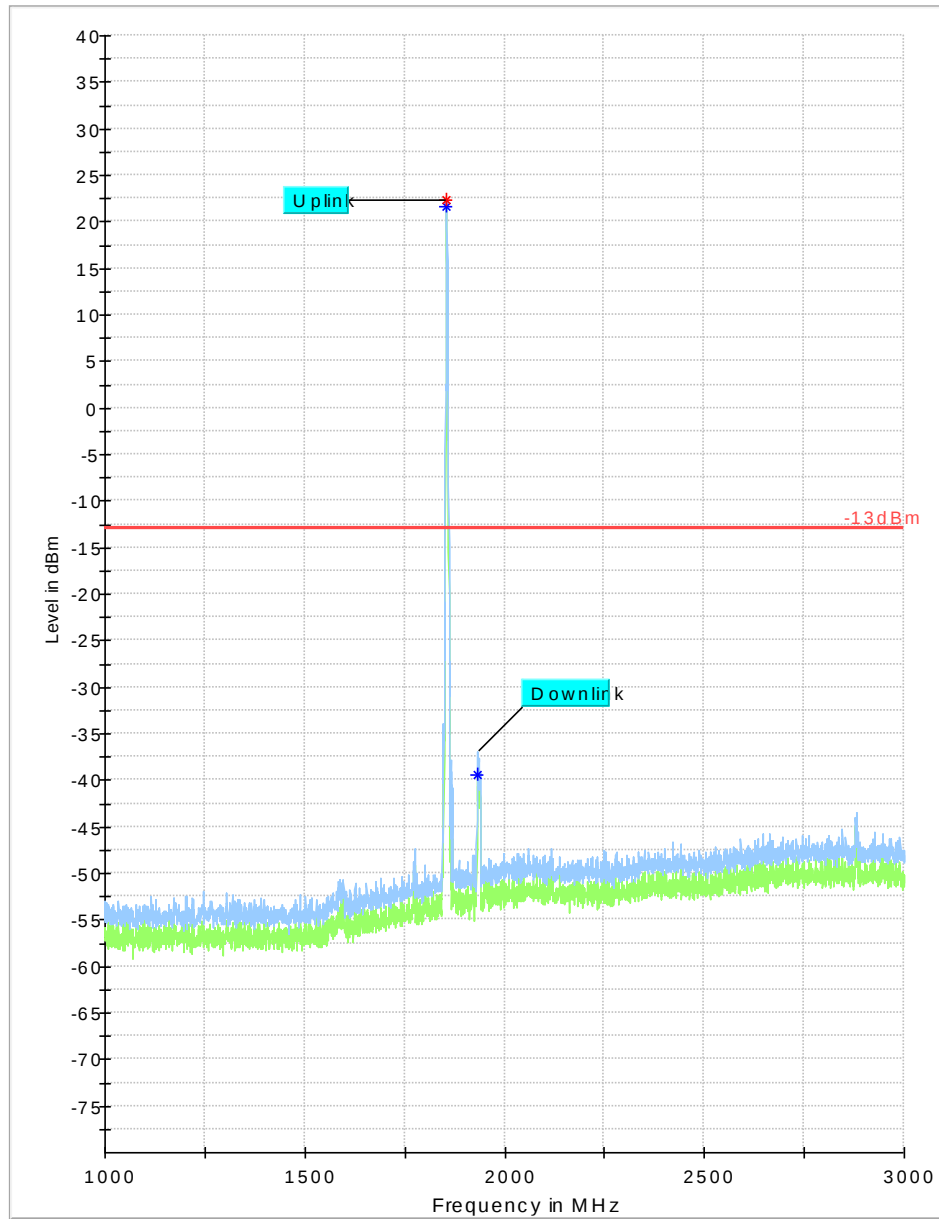
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
648.032700	---	-58.77	-13.00	45.77	200.0	100.000	133.0	H	-4.0	-104.9
648.032700	-57.04	---	-13.00	44.04	200.0	100.000	133.0	H	-4.0	-104.9
696.006600	---	-61.86	-13.00	48.86	200.0	100.000	133.0	H	42.0	-104.1
696.006600	-60.11	---	-13.00	47.11	200.0	100.000	133.0	H	42.0	-104.1



— Preview Result 2-RMS — Preview Result 1-PK+ ◆ Critical_Freqs RMS
* Critical_Freqs PK+ — -13dBm ◆ Final_Result QPK
◆ Final_Result RMS

Plot # 23 Radiated Emissions: 1GHz – 3GHz

Channel: Low



Preview Result 2-RMS
Critical_Freqs PK+
Final_Result RMS

Preview Result 1-PK+
-13dBm

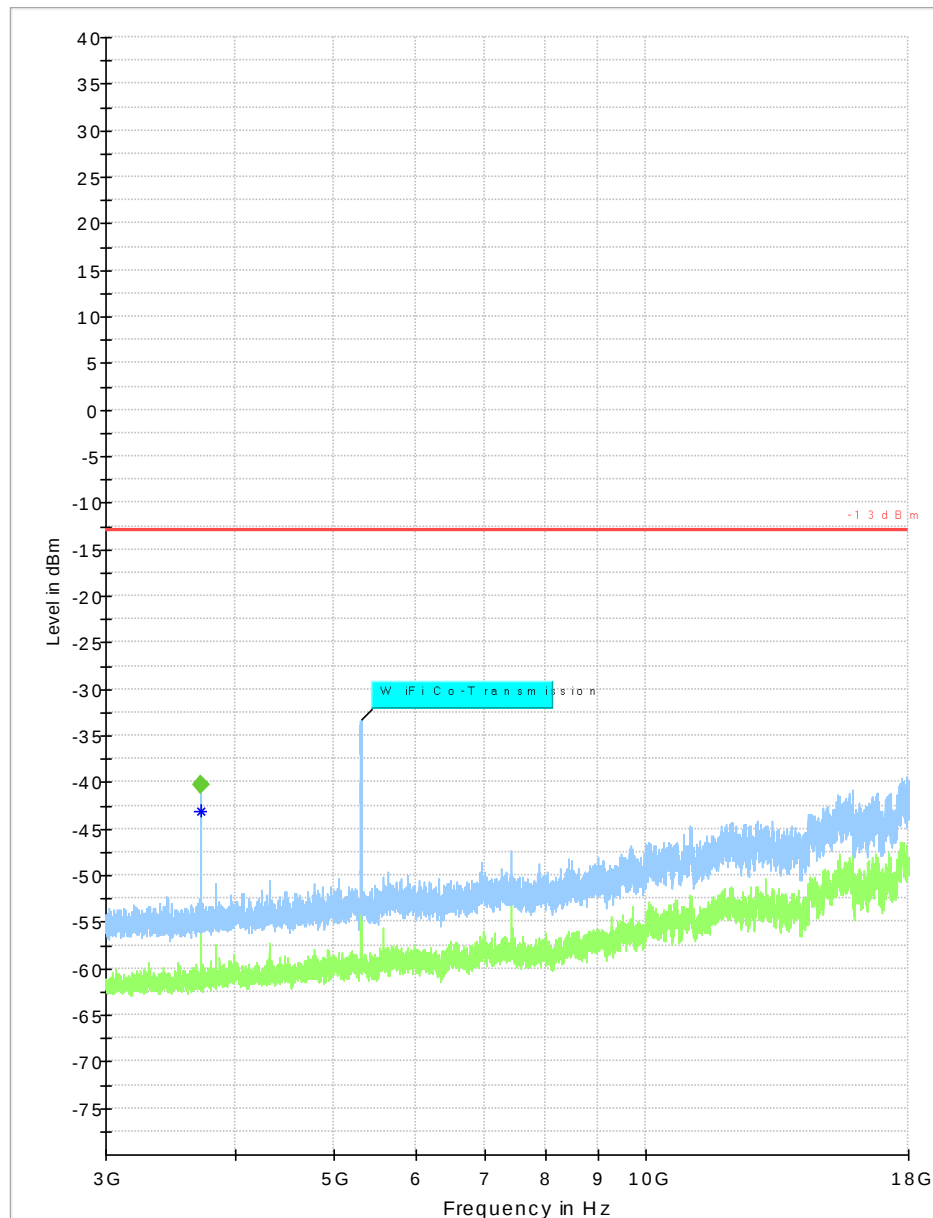
Critical_Freqs RMS
Final_Result QPK

Plot # 24 Radiated Emissions: 3GHz – 18GHz

Channel: Low

Final_Result

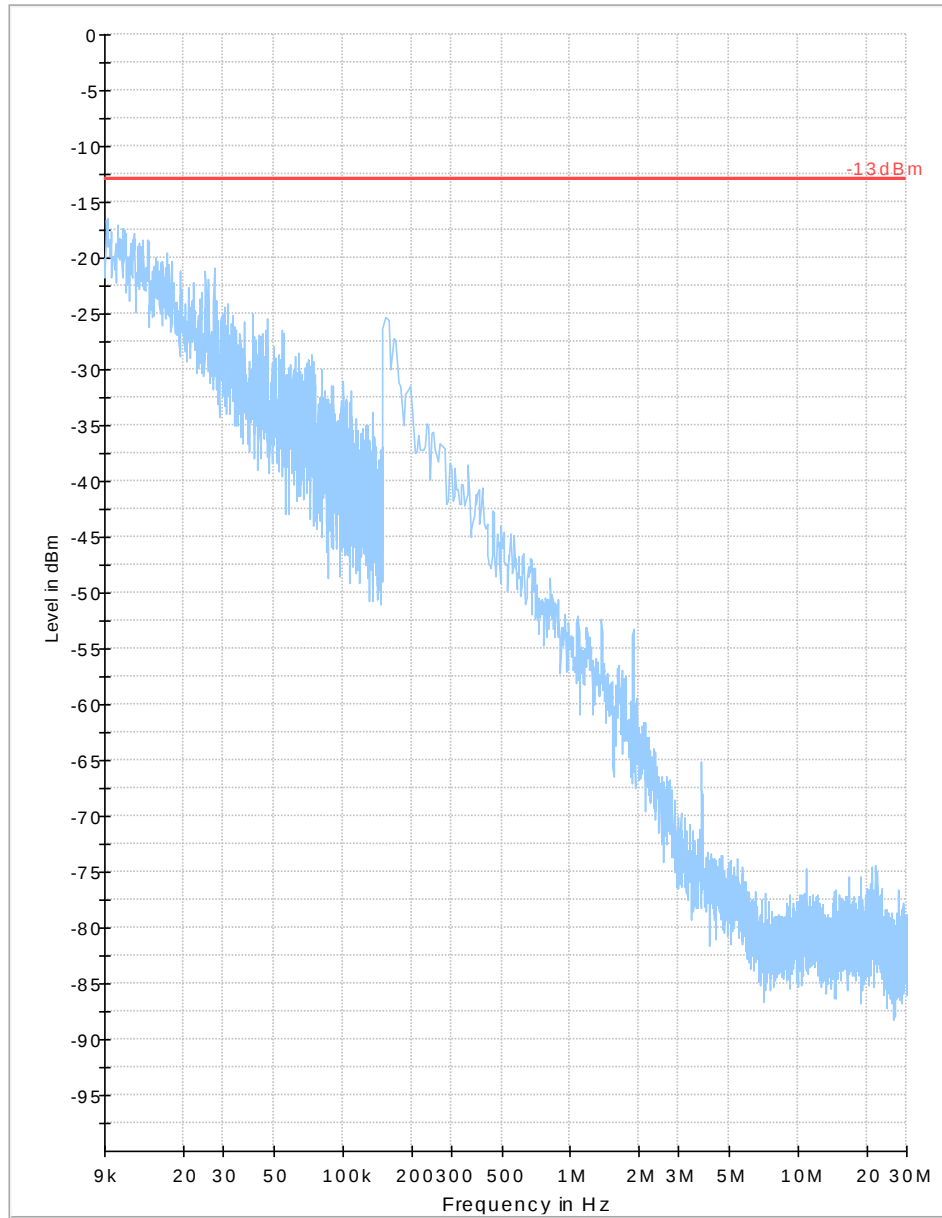
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3709.794667	---	-40.38	-13.00	27.38	200.0	1000.000	272.0	H	328.0



— Preview Result 2-RMS — Preview Result 1-PK+ * Critical_Freqs RMS
— Critical_Freqs PK+ — -13dBm ◆ Final_Result QPK
◆ Final_Result RMS

Plot # 25 Radiated Emissions: 9KHz – 30MHz

Channel: Mid



Preview Result 2-RMS
Critical_Freqs PK+
Final_Result RMS

Preview Result 1-PK+
-13dBm

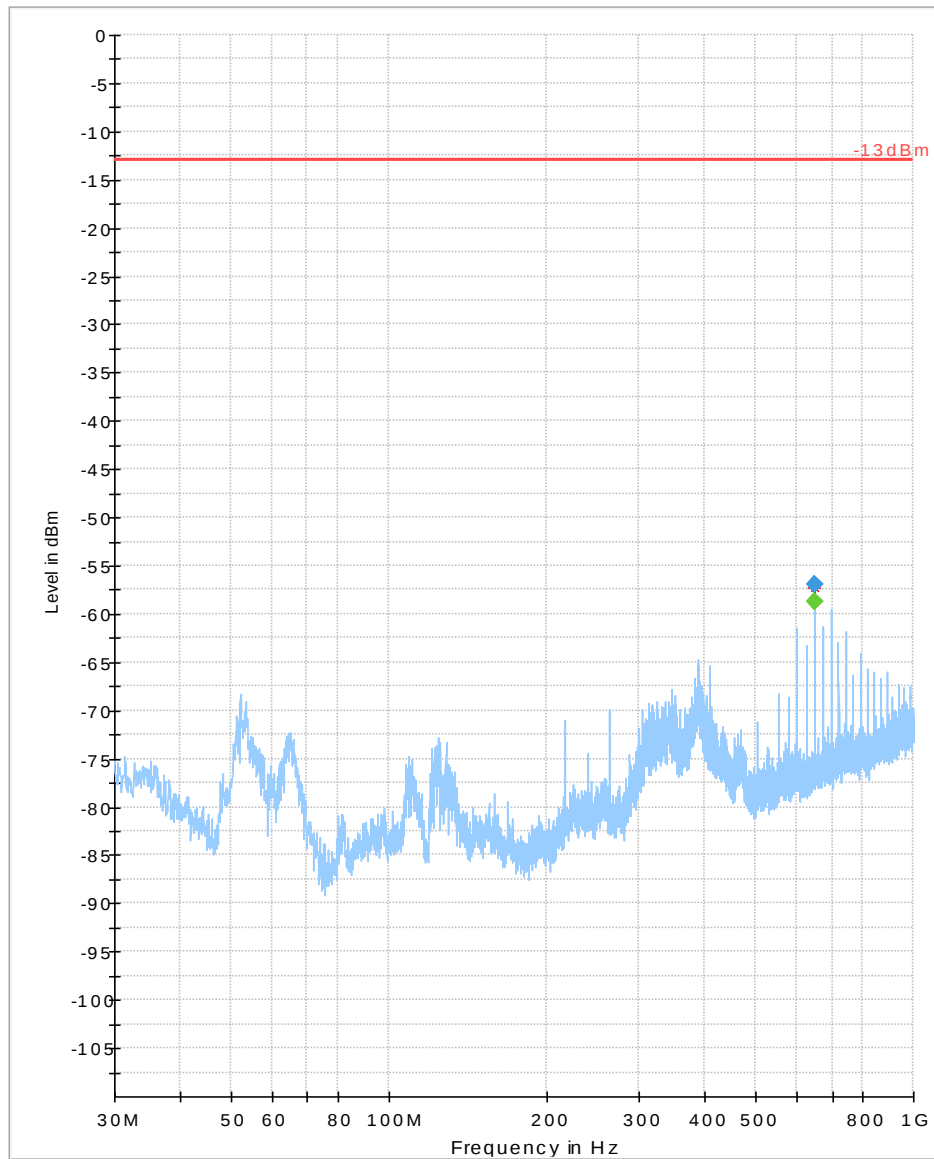
Critical_Freqs RMS
Final_Result QPK

Plot # 26 Radiated Emissions: 30MHz – 1GHz

Channel: Mid

Final Result

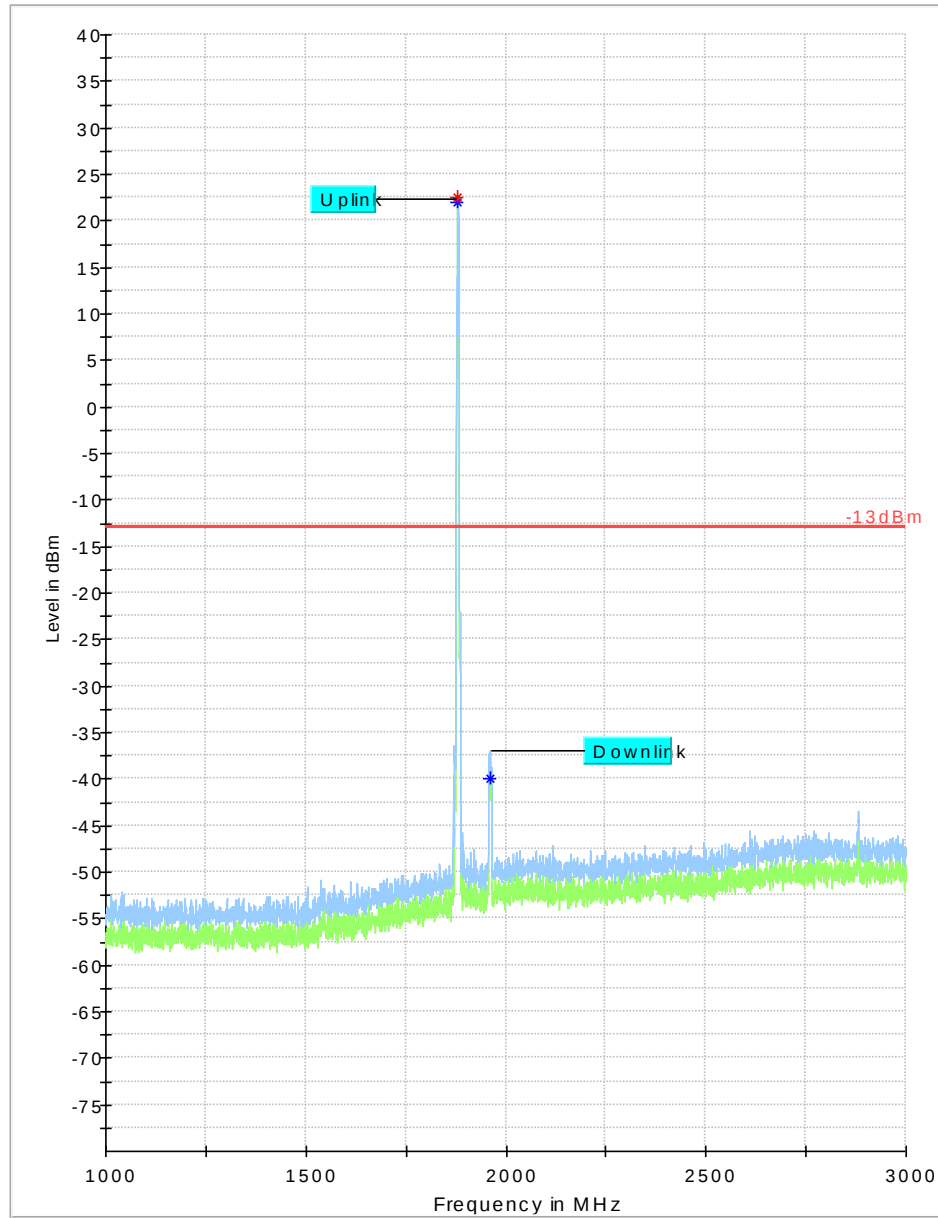
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
648.035700	---	-58.80	-13.00	45.80	200.0	100.000	138.0	H	-4.0	-104.9
648.035700	-56.94	---	-13.00	43.94	200.0	100.000	138.0	H	-4.0	-104.9



— Preview Result 2-RMS — Preview Result 1-PK+ ◆ Critical_Freqs RMS
* Critical_Freqs PK+ — -13dBm ◆ Final_Result QPK
◆ Final_Result RMS

Plot # 27 Radiated Emissions: 1GHz – 3GHz

Channel: Mid



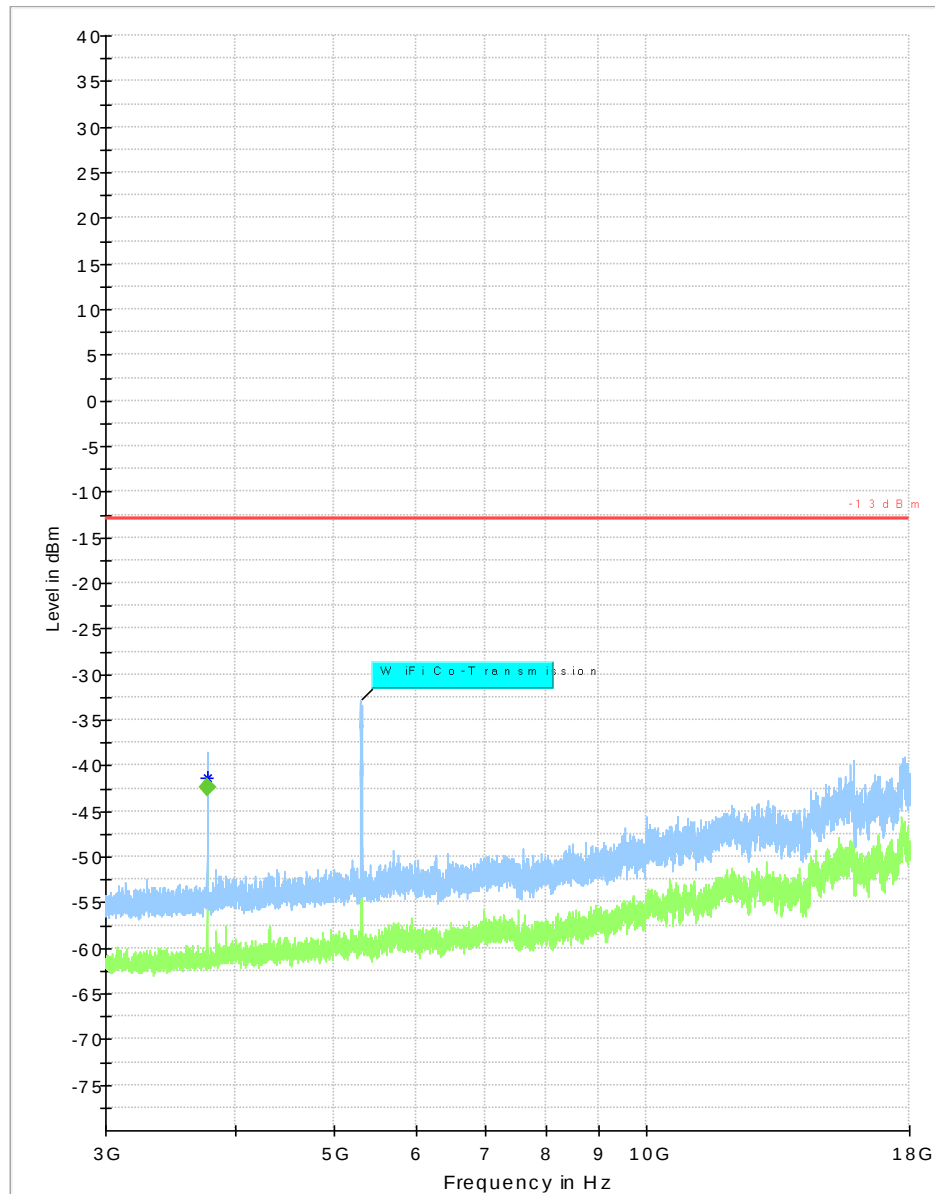
Preview Result 2-RMS Preview Result 1-PK+ * Critical_Freqs RMS
Critical_Freqs PK+ -13dBm ♦ Final_Result QPK
Final_Result RMS

Plot # 28 Radiated Emissions: 3GHz – 18GHz

Channel: Mid

Final_Result

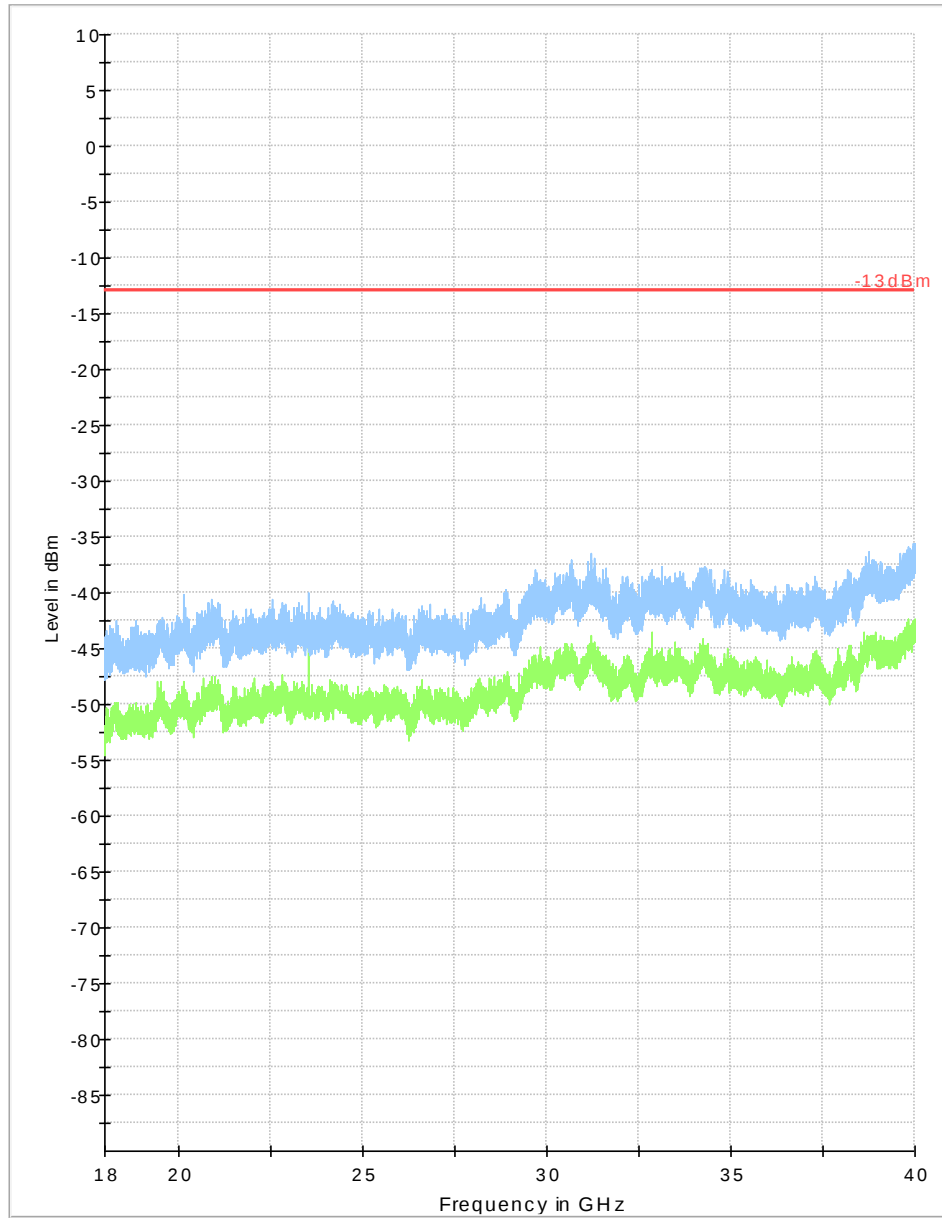
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3759.761333	---	-42.42	-13.00	29.42	200.0	1000.000	278.0	V	174.0



— Preview Result 2-RMS — Preview Result 1-PK+ ◆ Critical_Freqs RMS Final_Result QPK
* Critical_Freqs PK+ — -13dBm

Plot # 29 Radiated Emissions: 18GHz – 40GHz

Channel: Mid



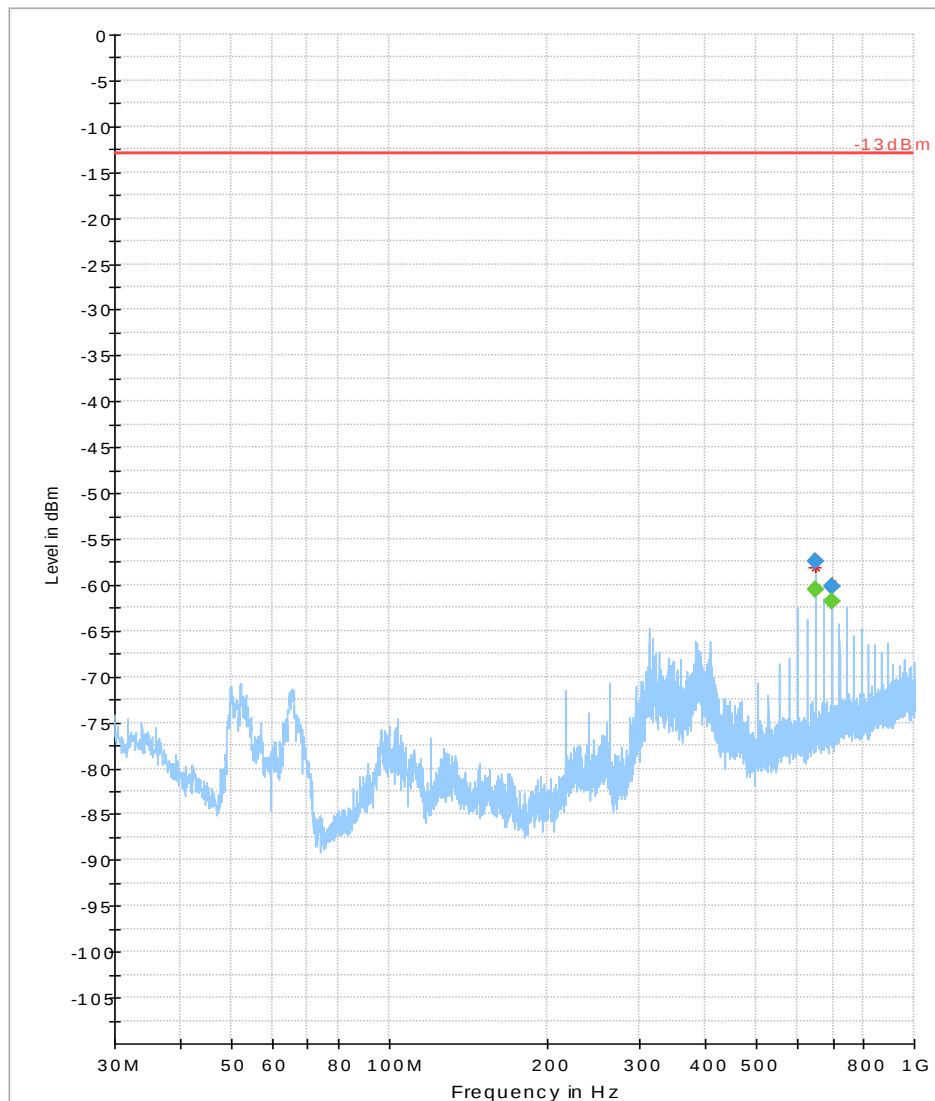
Preview Result 2-RMS Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ -13dBm * Final_Result QPK
◆ Final_Result RMS

Plot # 30 Radiated Emissions: 30MHz – 1GHz

Channel: High

Final_Result

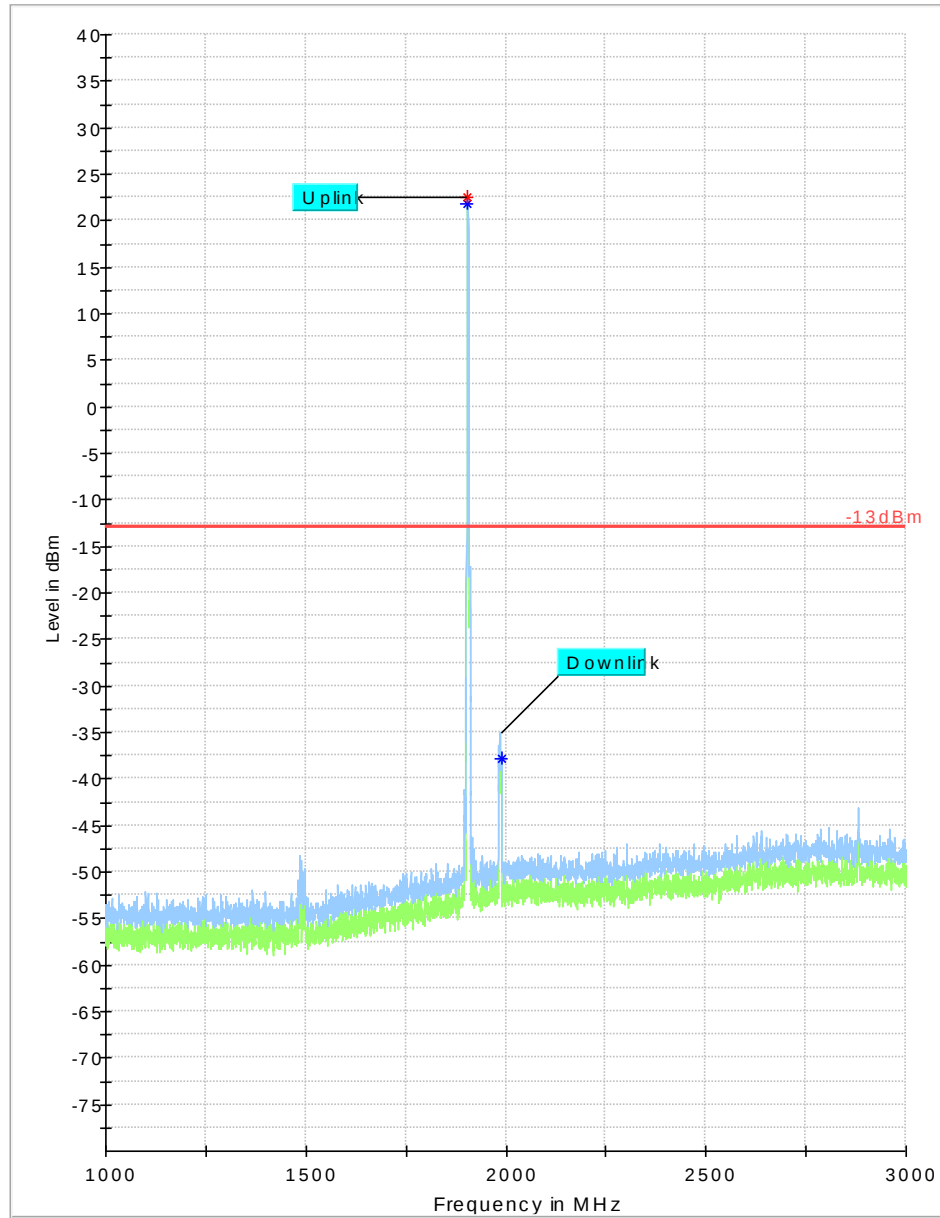
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
648.055500	---	-60.43	-13.00	47.43	200.0	100.000	133.0	H	-3.0	-104.9
648.055500	-57.48	---	-13.00	44.48	200.0	100.000	133.0	H	-3.0	-104.9
696.008500	---	-61.81	-13.00	48.81	200.0	100.000	131.0	H	42.0	-104.1
696.008500	-60.22	---	-13.00	47.22	200.0	100.000	131.0	H	42.0	-104.1



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

Plot # 31 Radiated Emissions: 1GHz – 3GHz

Channel: High



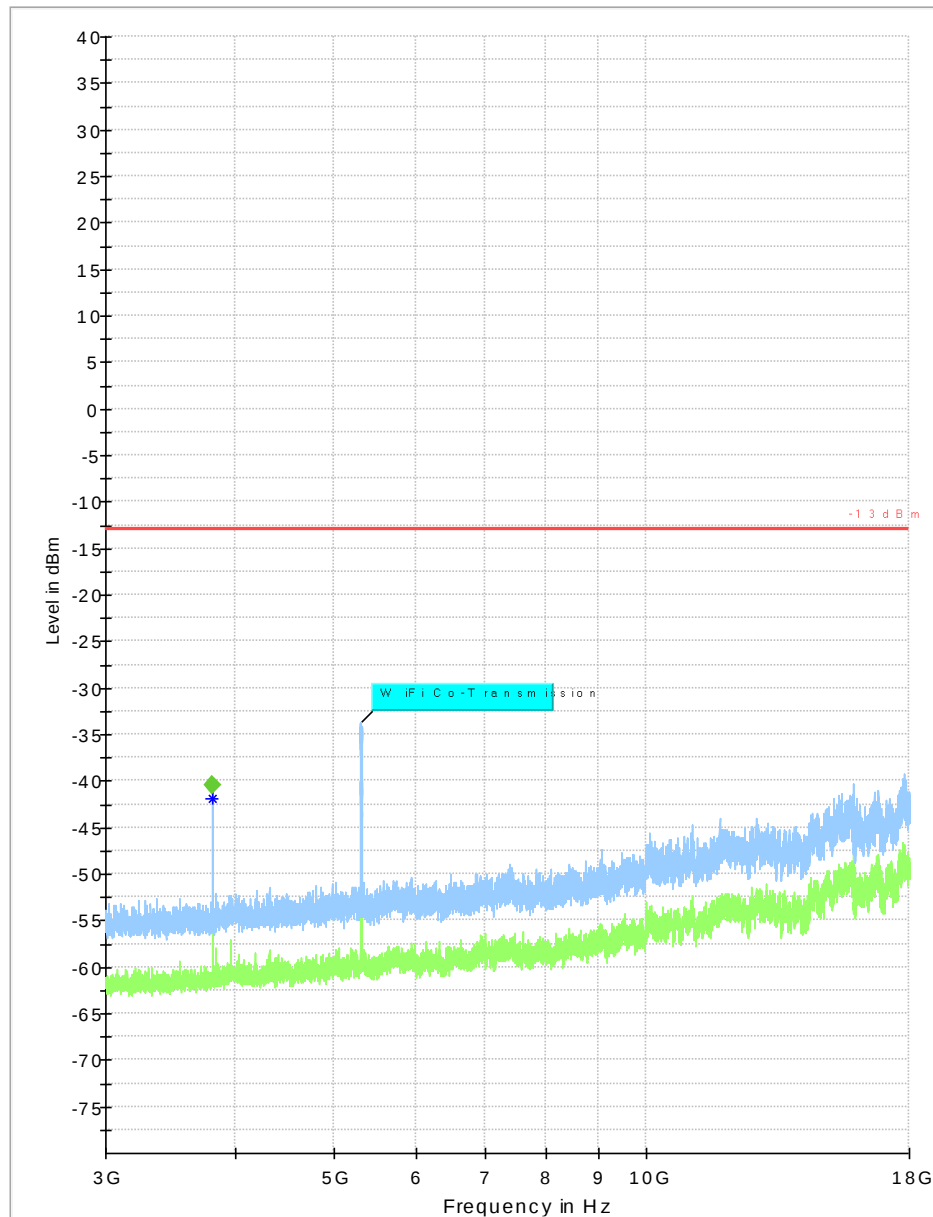
Preview Result 2-RMS Critical_Freqs PK+ Final_Result RMS
Preview Result 1-PK+ -13dBm Critical_Freqs RMS Final_Result QPK

Plot # 32 Radiated Emissions: 3GHz – 18GHz

Channel: High

Final_Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3809.935333	---	-40.44	-13.00	27.44	200.0	1000.000	257.0	H	325.0



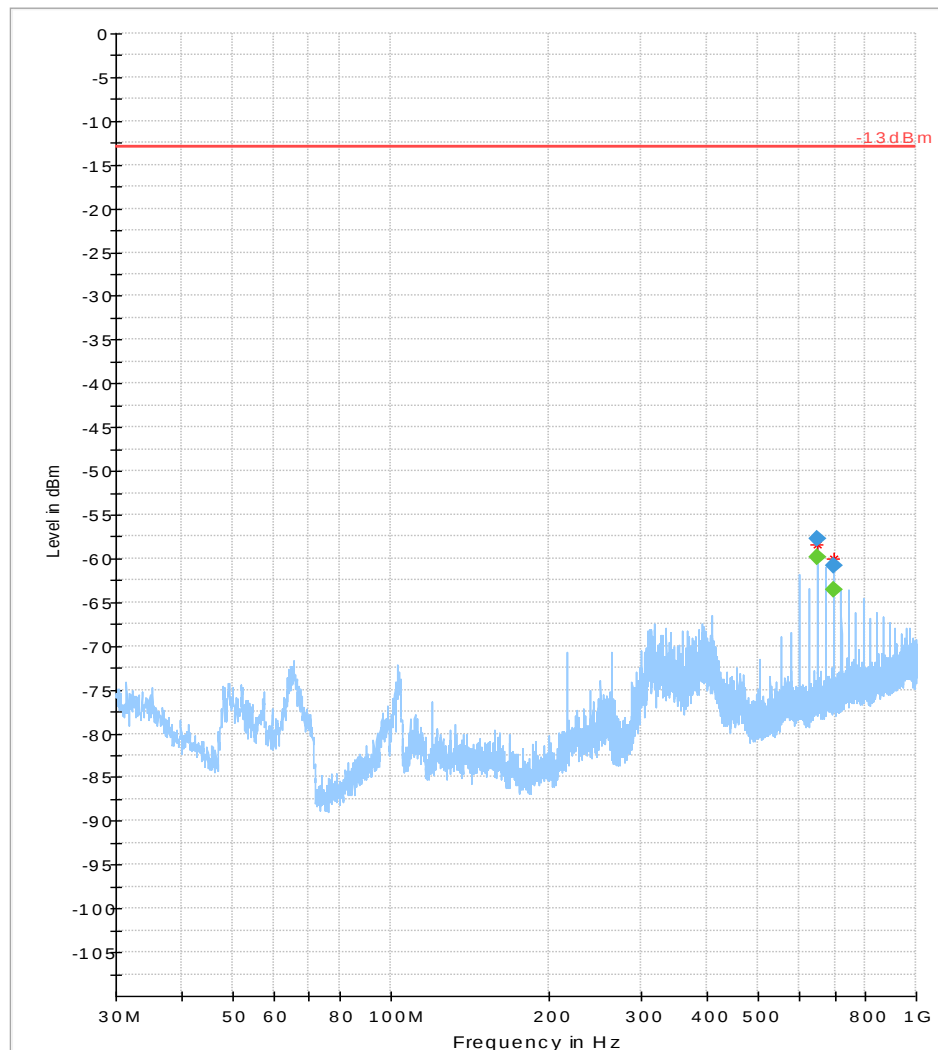
LTE 4

Plot # 33 Radiated Emissions: 30MHz – 1GHz

Channel: Low

Final Result

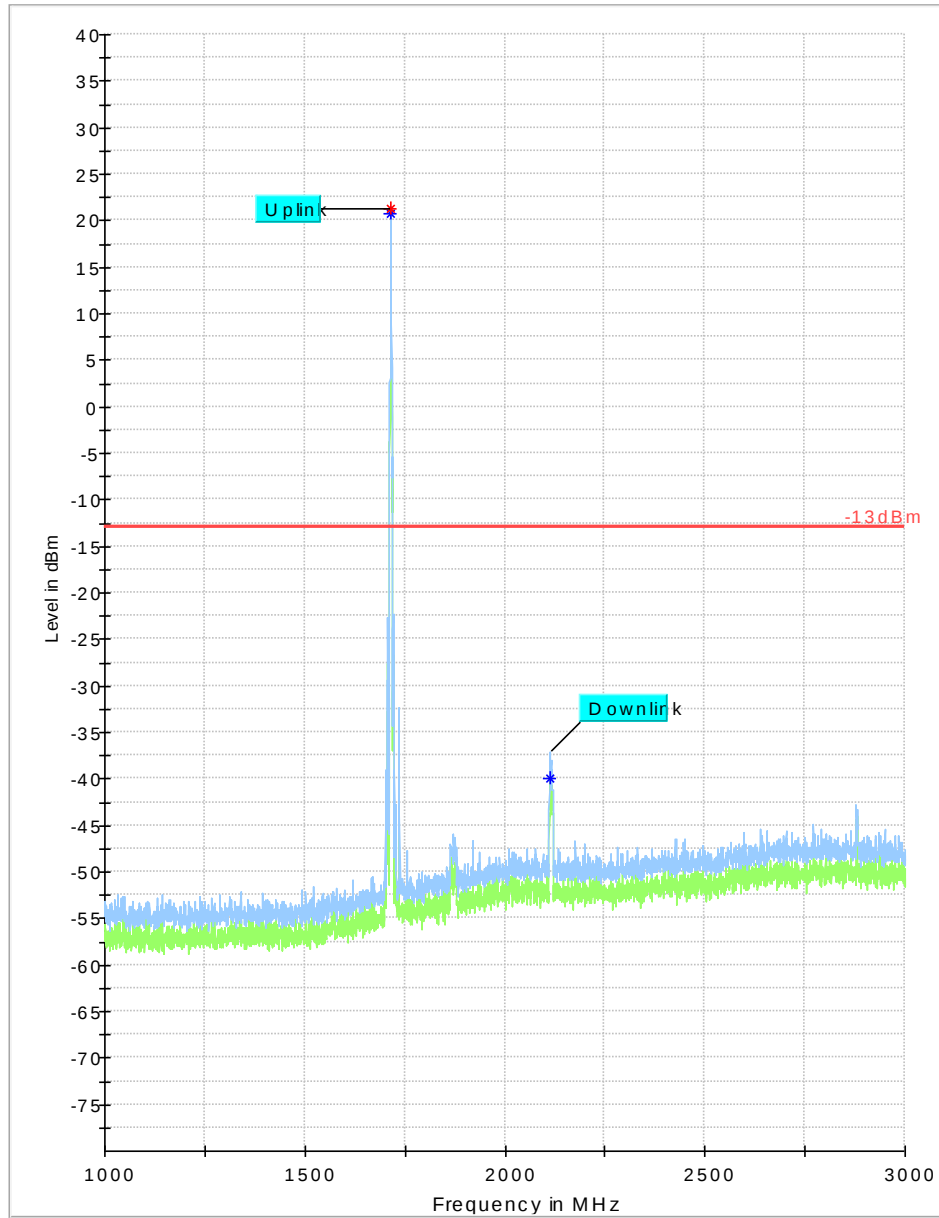
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
647.993200	---	-59.87	-13.00	46.87	200.0	100.000	138.0	H	-3.0	-104.9
647.993200	-57.71	---	-13.00	44.71	200.0	100.000	138.0	H	-3.0	-104.9
695.988000	---	-63.50	-13.00	50.50	200.0	100.000	129.0	H	42.0	-104.1
695.988000	-60.76	---	-13.00	47.76	200.0	100.000	129.0	H	42.0	-104.1



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

Plot # 34 Radiated Emissions: 1GHz – 3GHz

Channel: Low



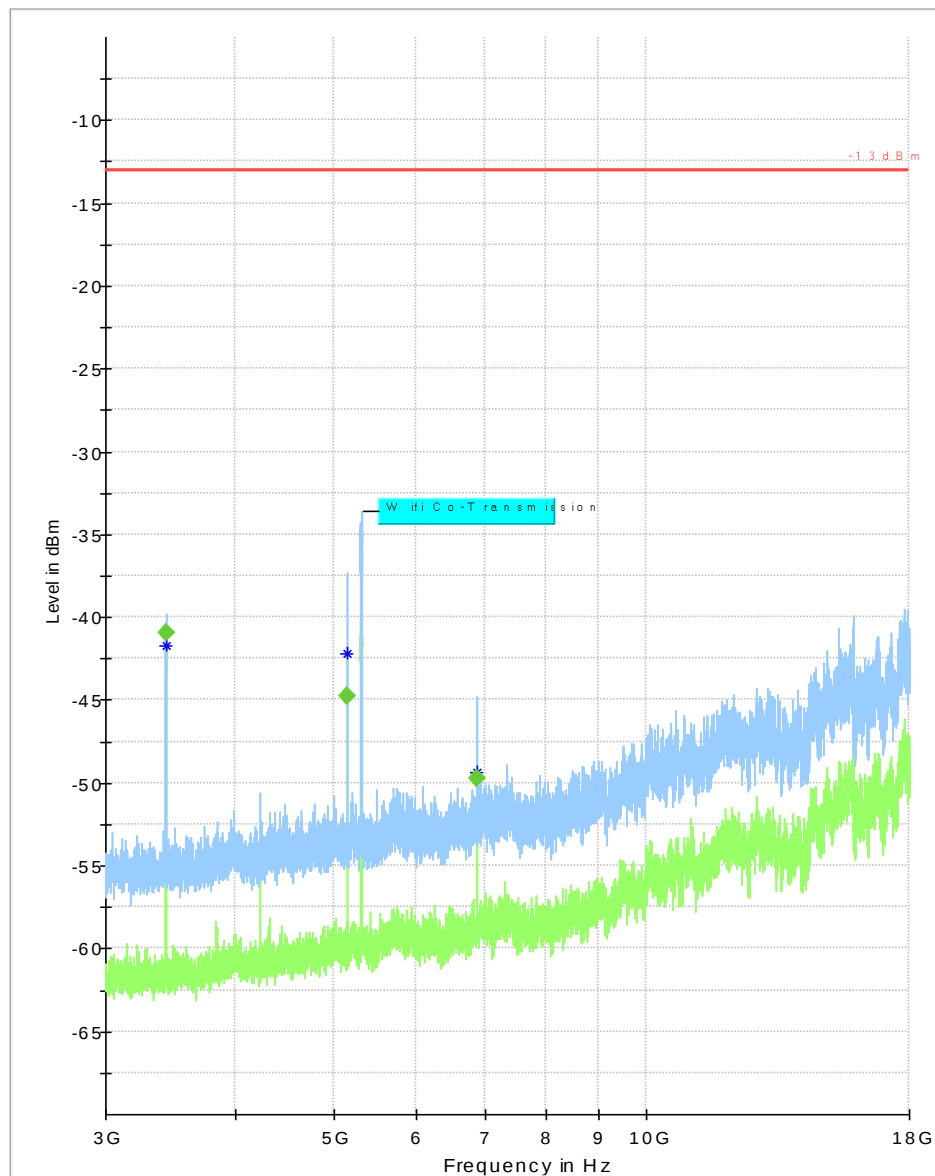
— Preview Result 2-RMS	— Preview Result 1-PK+	* Critical_Freqs RMS	◆ Final_Result QPK
* Critical_Freqs PK+	— -13dBm		
◆ Final_Result RMS			

Plot # 35 Radiated Emissions: 3GHz – 18GHz

Channel: Low

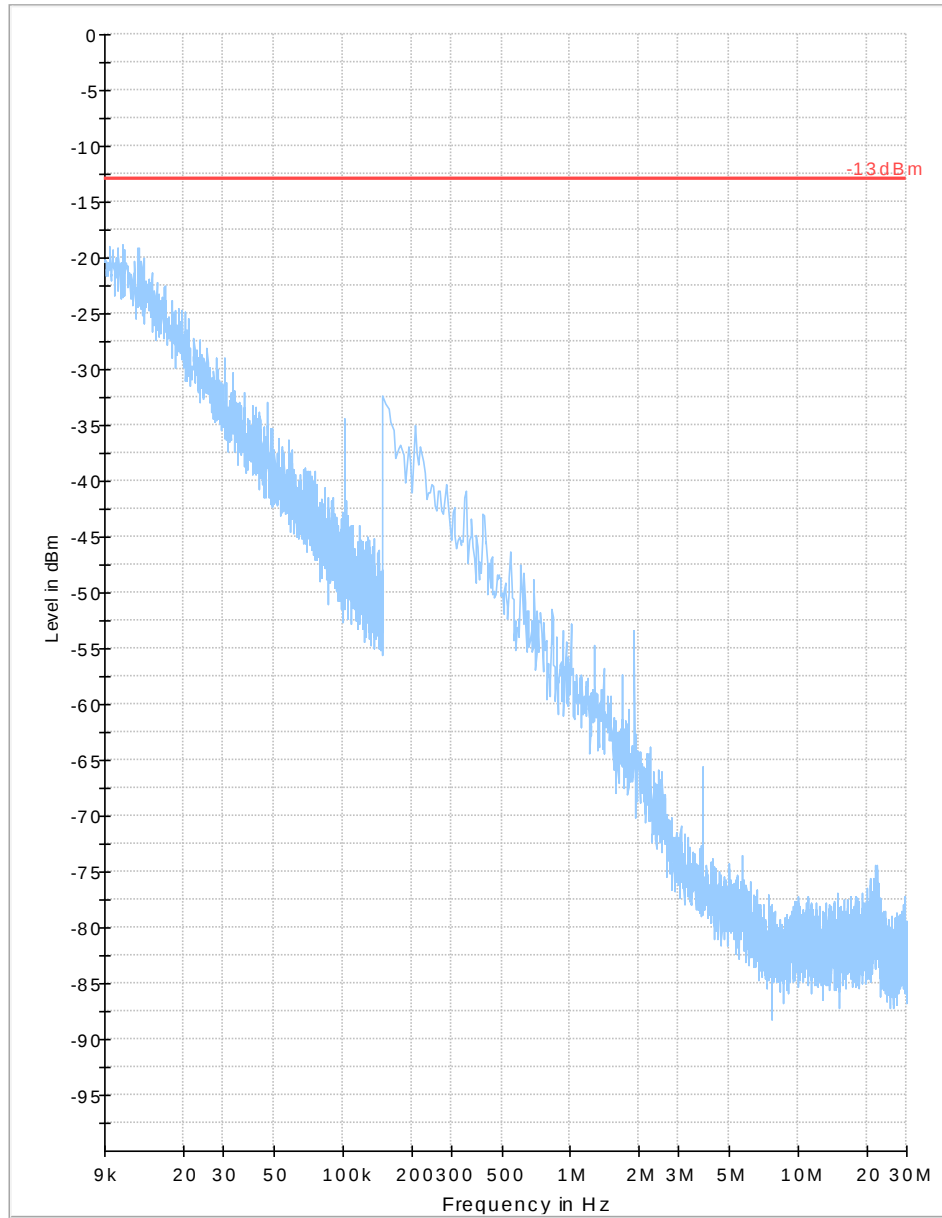
Final Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3429.769333	---	-40.98	-13.00	27.98	200.0	1000.000	187.0	V	242.0
5144.912000	---	-44.80	-13.00	31.80	200.0	1000.000	287.0	H	125.0
6859.583333	---	-49.73	-13.00	36.73	200.0	1000.000	247.0	V	24.0



Plot # 36 Radiated Emissions: 9KHz – 30MHz

Channel: Mid



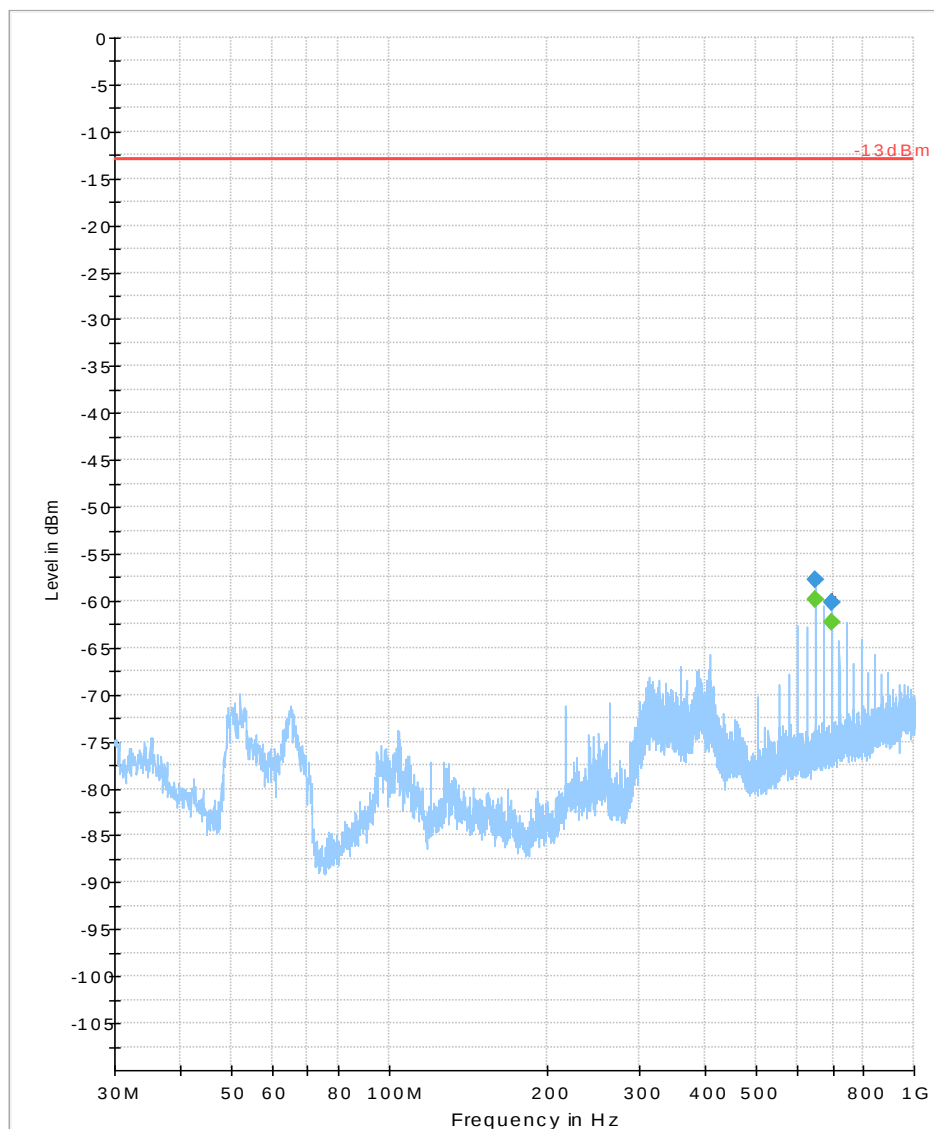
Preview Result 2-RMS	Preview Result 1-PK+	* Critical_Freqs RMS
* Critical_Freqs PK+	-13dBm	* Final_Result QPK
◆ Final_Result RMS		

Plot # 37 Radiated Emissions: 30MHz – 1GHz

Channel: Mid

Final Result

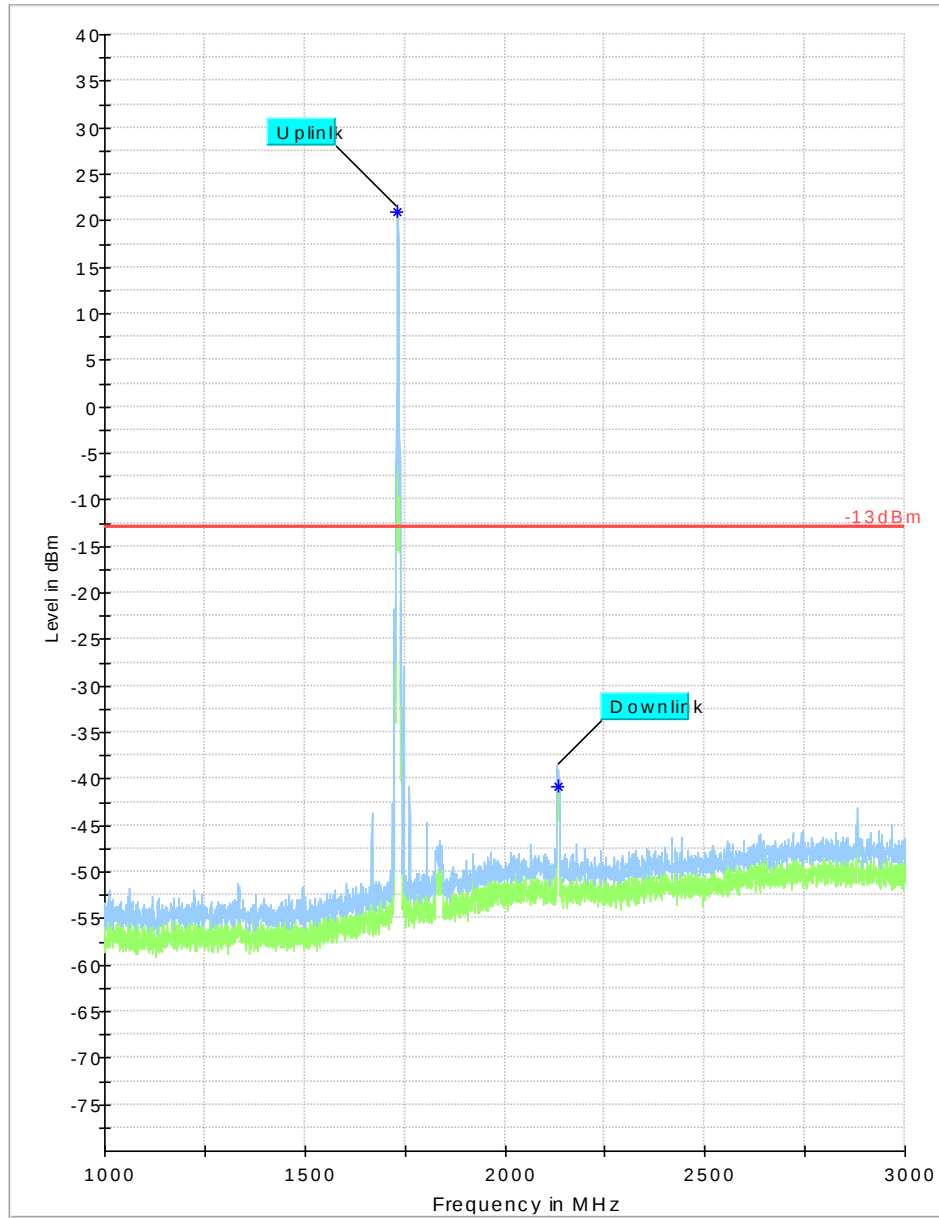
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
647.994100	---	-59.82	-13.00	46.82	200.0	100.000	136.0	H	-4.0	-104.9
647.994100	-57.72	---	-13.00	44.72	200.0	100.000	136.0	H	-4.0	-104.9
696.040300	---	-62.35	-13.00	49.35	200.0	100.000	125.0	H	41.0	-104.1
696.040300	-60.23	---	-13.00	47.23	200.0	100.000	125.0	H	41.0	-104.1



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

Plot # 38 Radiated Emissions: 1GHz – 3GHz

Channel: Mid



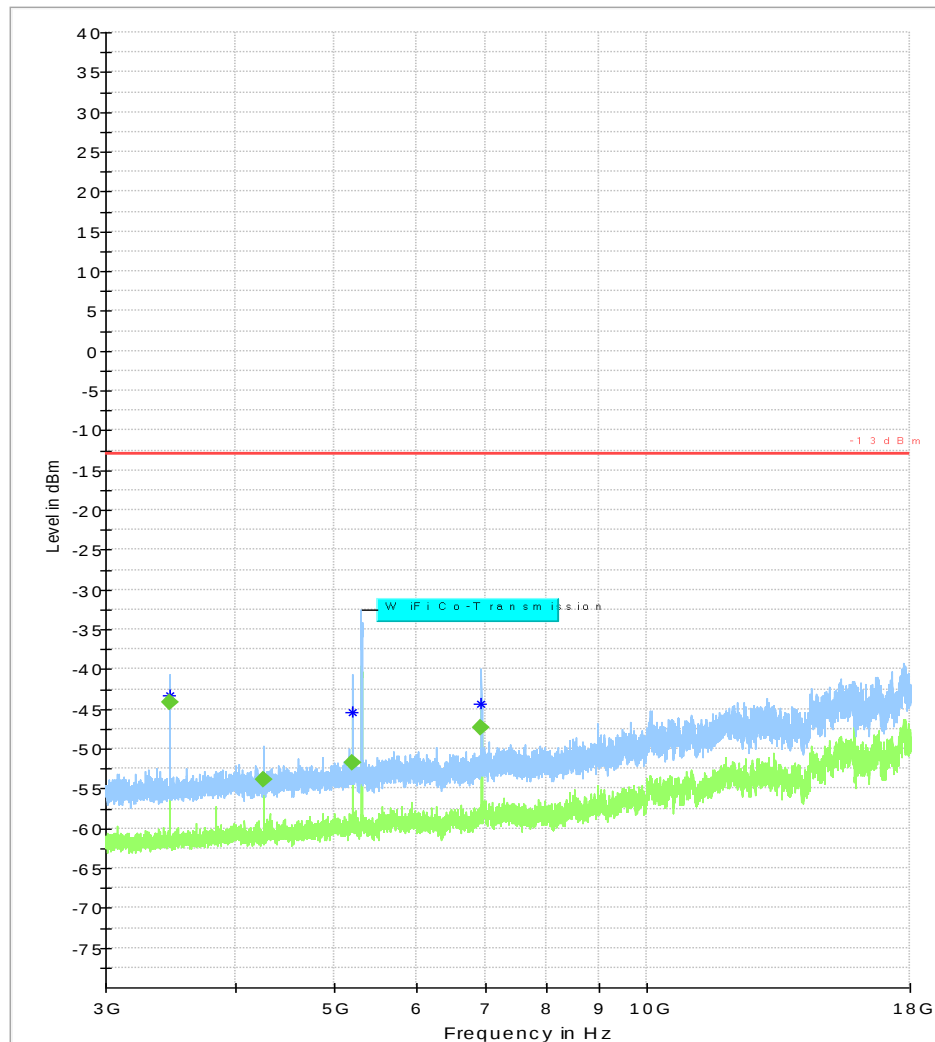
Preview Result 2-RMS Preview Result 1-PK+ Critical_Freqs RMS
Critical_Freqs PK+ Final_Result RMS Final_Result QPK
-13dBm

Plot # 39 Radiated Emissions: 3GHz – 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)
3464.872000	---	-44.10	-13.00	31.10	200.0	1000.000	170.0	H	234.0
4264.872000	---	-53.93	-13.00	40.93	200.0	1000.000	133.0	H	314.0
5196.836667	---	-51.83	-13.00	38.83	200.0	1000.000	271.0	H	135.0
6929.815333	---	-47.44	-13.00	34.44	200.0	1000.000	164.0	V	319.0



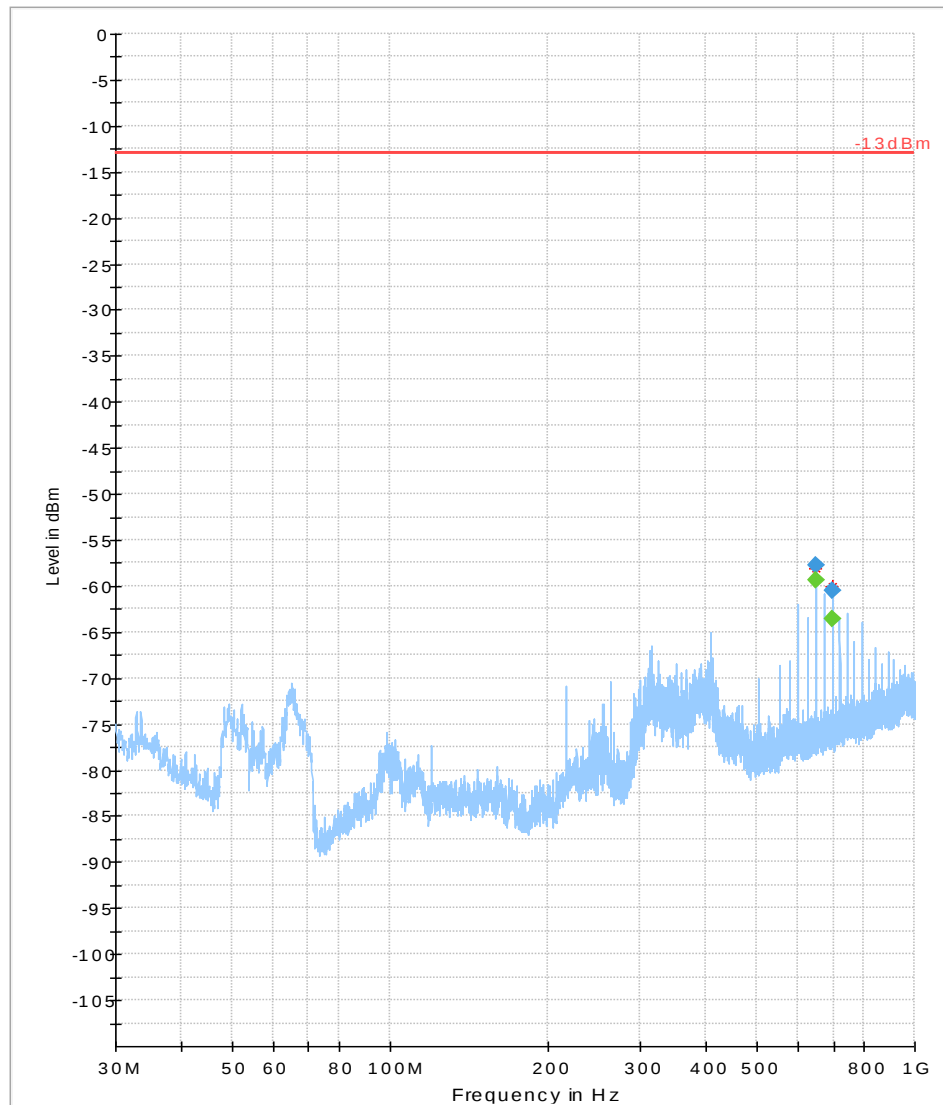
◆ Preview Result 2-RMS
★ Critical_Freqs PK+
◆ Final_Result RMS
★ Preview Result 1-PK+
— -13dBm
★ Critical_Freqs RMS
◆ Final_Result QPK

Plot # 40 Radiated Emissions: 30MHz – 1GHz

Channel: High

Final_Result

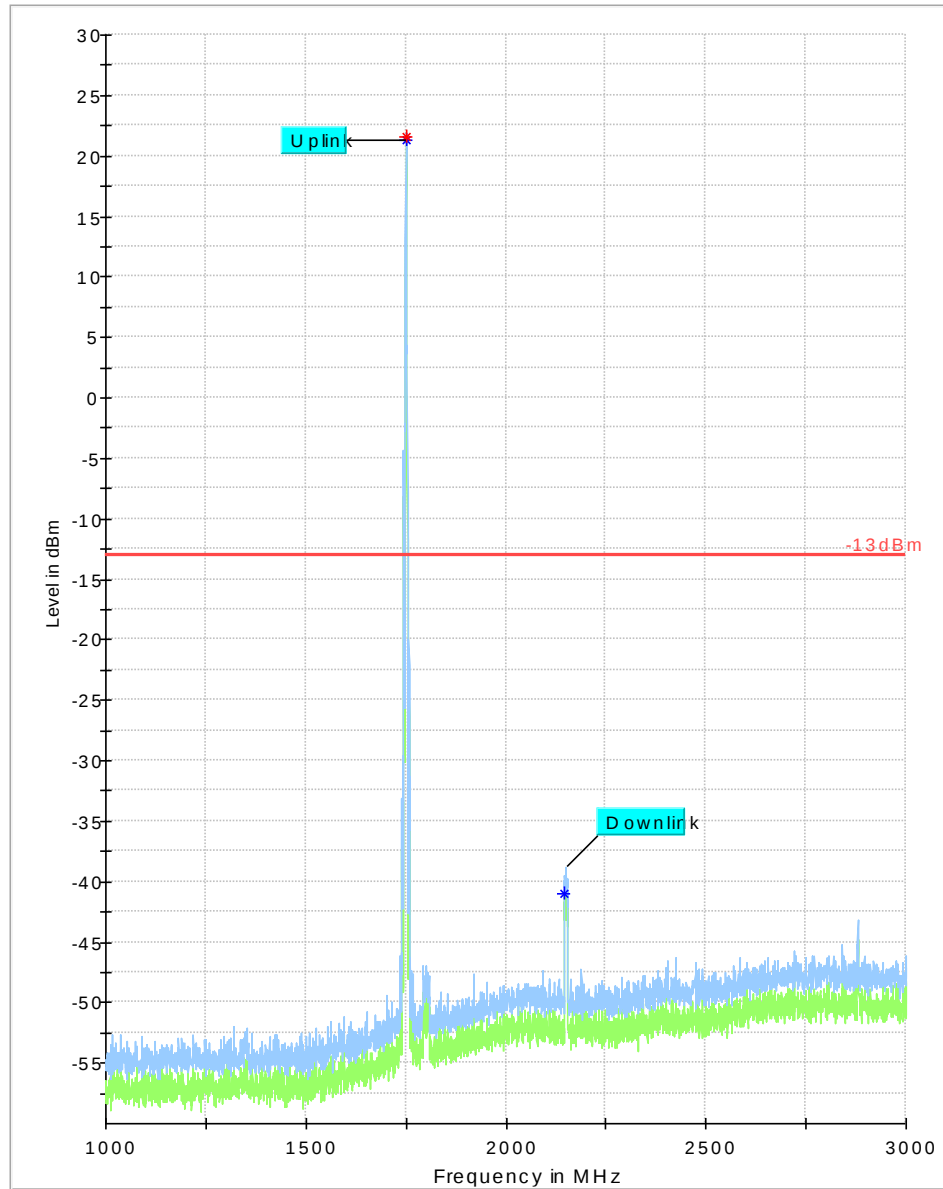
Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
648.002600	---	-59.32	-13.00	46.32	200.0	100.000	136.0	H	18.0	-104.9
648.002600	-57.68	---	-13.00	44.68	200.0	100.000	136.0	H	18.0	-104.9
696.057500	---	-63.57	-13.00	50.57	200.0	100.000	124.0	H	41.0	-104.1
696.057500	-60.45	---	-13.00	47.45	200.0	100.000	124.0	H	41.0	-104.1



* Preview Result 2-RMS
♦ Critical_Freqs PK+ Final_Result RMS
* Preview Result 1-PK+
♦ Critical_Freqs RMS Final_Result QPK
— -13dBm

Plot # 41 Radiated Emissions: 1GHz – 3GHz

Channel: High



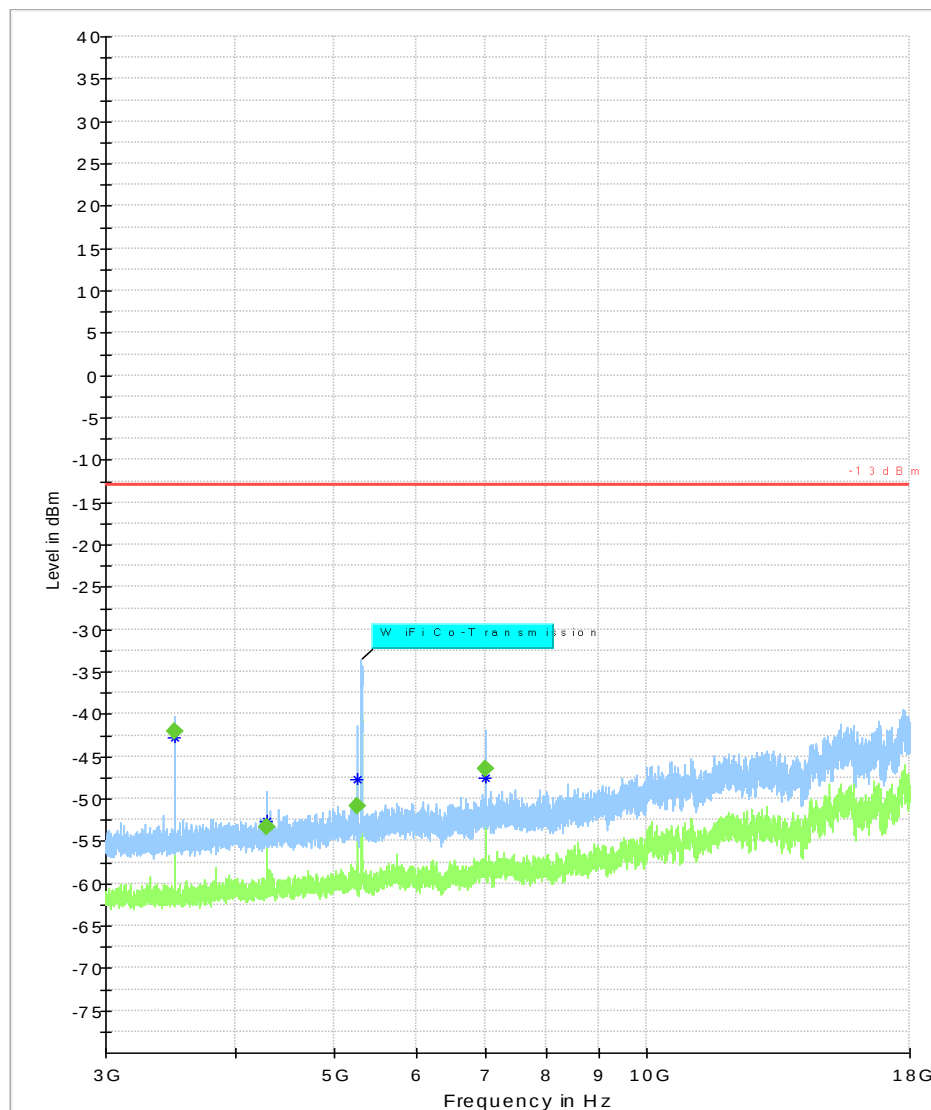
Preview Result 2-RMS	Uplink	Preview Result 1-PK+	Critical_Freqs RMS
* Critical_Freqs PK+			* Final_Result QPK
◆ Final_Result RMS		◆ -13dBm	

Plot # 42 Radiated Emissions: 3GHz – 18GHz

Channel: High

Final Result

Frequency (MHz)	QuasiPeak (dBm)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3499.892667	---	-41.98	-13.00	28.98	200.0	1000.000	257.0	V	256.0
4300.039333	---	-53.35	-13.00	40.35	200.0	1000.000	141.0	H	320.0
5249.976000	---	-50.84	-13.00	37.84	200.0	1000.000	163.0	H	-16.0
6999.852000	---	-46.39	-13.00	33.39	200.0	1000.000	208.0	H	161.0



◆ Preview Result 2-RMS
★ Critical_Freqs PK+
◆ Final_Result RMS
◆ Preview Result 1-PK+
— -13dBm
★ Critical_Freqs RMS
◆ Final_Result QPK

8 Test setup photos

Setup photos are included in supporting file name: "EMC_NETRA_002_17001_FCC_ISED_Setup_Photos.pdf"

9 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
PASSIVE LOOP ANTENNA	LOOP ANTENNA	ETS LINDGREN	6512	00164698	3 YEARS	08/08/2017
CBL 6141B BILOG ANTENNA	BOLOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
3117 HORN ANTENNA	HORN ANTENNA	ETS LINDGREN	3117	00167061	3 YEARS	08/08/2017
3116C HORN ANTENNA	HORN ANTENNA	ETS LINDGREN	3116C	00166821	3 YEARS	09/24/2017
SPECTRUM ANALYZER FSU26	SIGNAL ANALYZER	R&S	FSU26	200065	2 YEARS	03/07/2007
CMU200	UNIVERSAL RADIO COMMUNICATION	R&S	CMU200	121673	2 YEARS	06/07/2017
CMW500	WIDEBAND RADIO COMMUNICATION	R&S	CMW500	125231	2 YEARS	10/07/2017
FSV	SIGNAL ANALYZER	R&S	FSV 40	101022	2 YEARS	07/05/2017
DIGITAL BAROMETER	COMPACT DIGITAL BAROMETER	CONTROL COMPANY	35519-055	91119547	1 YEARS	06/05/2017
TM320	THRMOMETER HUMIDIY	DICKSON	TM320	16253639	1 YEARS	11/02/2017

Note:

1. 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
1/25/2018	EMC_NETRA_002_17001_FCC_24_27_ISED	Initial Version	Issa Ghanma