FCC/IC Test Report

For:

FIO Corporation

Model Name:

Deki Reader V200

Product Description:

Portable camera-based diagnostic device

FCC ID: 2ANVA-V200
IC ID: 22342-V200

Applied Rules and Standards:
47 CFR: Part 22, Part 24, Part 27,
RSS: 132 Issue 3, 133 Issue 6, 139 Issue 3

REPORT #: EMC_FIOIN-002-17001_FCC_22_24_27

DATE: 2017-11-07

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 radiated spurious emission of the EUT against selected applicable criteria specified in the Code of Federal Regulations Title 47 parts 22, 24, 27, and Industry Canada Radio Standard Specifications RSS: 132 Issue 3, 133 Issue 6, 139 Issue 3.No deficiencies were ascertained.

WWAN Module Telit HE910-D (FCC ID: RI7HE910 / IC ID: 5131A-HE910) is used in this device as client declared.

Company Name	Product Description	Model
FIO Corporation	Portable diagnostic device	Deki Reader V200

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2017-11-07	Compliance	Dr. Peter Nevermann (Director Radio Communications and EMC)	Digitally signed by peter.nevermann@cetecom.com Date: 2017.12.18 20:46:04 +01'00'

Responsible for the Report:

Date	Section	Name	Signature
2017-11-07	Compliance	Cindy Li (EMC Engineer)	Digitally signed by Cindy Li DN: cn=Cindy Li, o=CETECOM Inc., ou=EMC, email=cindy.li@cetecom.com, c=US Date: 2017.11.30 12:35:50 -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 Com. and EMC:	Peter Nevermann
Responsible Project Leader:	Ruther Navarro

2.2 Identification of the Client

Applicant's Name:	FIO Corporation
Street Address:	111 Queen St. East, Suite 500
City/Zip Code	Toronto, ON M5C 1S2
Country	Canada
Contact Person:	Hongtao Yan
Phone No.	416 368 8882
e-mail:	hyan@fio.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Client
Manufacturers Address:	-------
City/Zip Code	-------
Country	-------

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No		V200			
HW Version		2.0.0.0			
SW Version		1.89			
FCC-ID		2ANVA-V200			
IC-ID:		22342-V200			
HVIN:		Deki Reader V200			
PMN:		Deki Reader V200			
Product Description		Portable camera-based diagnostic device			
Module Information		Module: Telit HE910-D		FCC-ID: RI7HE910	
Mode	GSM	Band	UL Frequency (MHz)	DL Frequency (MHz)	Modulation
		850	824.2–849.2	869.2–894.2	GMSK, QPSK, 8PSK, 16-QAM
		1900	1,850.2–1,909.8	1,930.2–1,989.8	
	WCDMA	II	1850 – 1910	1930 – 1990	QPSK, 16QAM, 64QAM
		IV	1710 – 1755	2110 – 2155	
		V	824 – 849	869 – 894	
Max. declared antenna gain		Taoglas antenna FXUB63.07.0150C, peak gain is 5dBi			
Max. declared average conducted output power from module report		GSM 850 = 33 dBm GSM 1900= 29.9 dBm FDD Band II = 26.39 dBm FDD Band IV = 26.4 dBm FDD Band V = 26.63 dBm			
Operating Voltage Range		Vmin: 7.0 VDC/ Vnom: 12 VDC / Vmax: 16 VDC			
Operating Temperature Range		0 ºC to 40 ºC			
Other Radios included in the device		Telit HE910-D: GSM: 900 1800; UMTS FDD: Band I Band VIII Telit JF2: GPS L1 Tiwi BLE: WLAN 802.11b/g/n; Bluetooth 2.1+EDR; BLE 4.0			
Sample Revision		☐Prototype ■Production ☐ Pre-Production			
EUT Dimensions		25cm X 11cm X 12cm			
EUT Diameter		■ < 60 cm ☐ Other _____			

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Comments
1	FH21098	2.0.0.0	1.89	Radiated Emissions

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	P/N
1	AC/DC adapter	GlobTek, Inc	GTM46101-1005-USB	WR9QA2000USBNMEDR6B

3.4 Test Sample Configuration

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

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: 2ANVA-V200 and IC ID: 22342-V200.
According to the guidelines from FCC KDB 996369 for the product under evaluation, and the pre-certified module to be integrated (Telit HE910-D) as described in Section 3, the output power has been verified to be within the specified production tolerances and measurement uncertainties, and where relevant test procedures did not change the conducted test results from module certification are re-used. Full Radiated Spurious Emissions test was performed, per Code of Federal Regulations Title 47 parts 22, 24, 27, and Industry Canada Radio Standard Specifications RSS: 132 Issue 3, 133 Issue 6, and 139 Issue 3.
WIFI was turned on and configured to the highest power in order to measure spurious emission during co-transmission and catch the worst case.

The module test data can be obtained under the FCC Filing ID: RI7HE910.

4.1 Dates of Testing:

10/18/2017 - 10/27/2017

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)

Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)
RF conducted measurement	±0.5 dB

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%

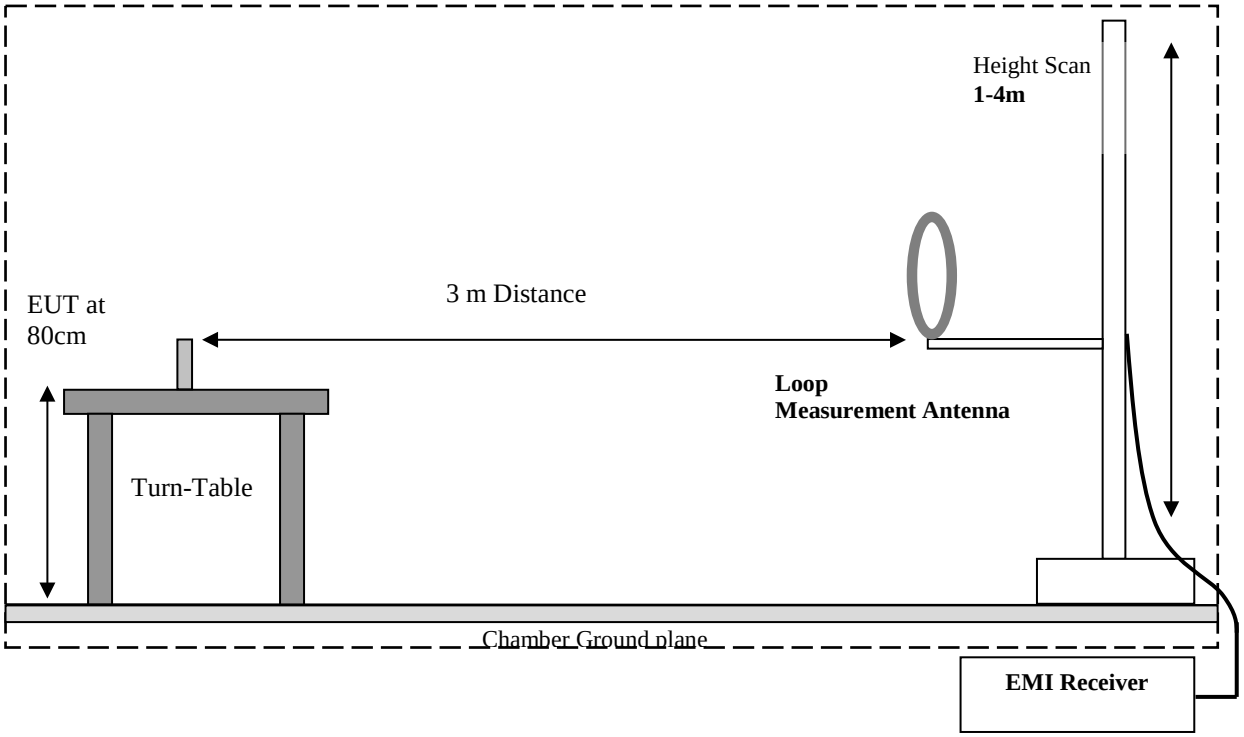
Deviating test conditions are indicated at individual test description where applicable.

5 Measurement Procedures

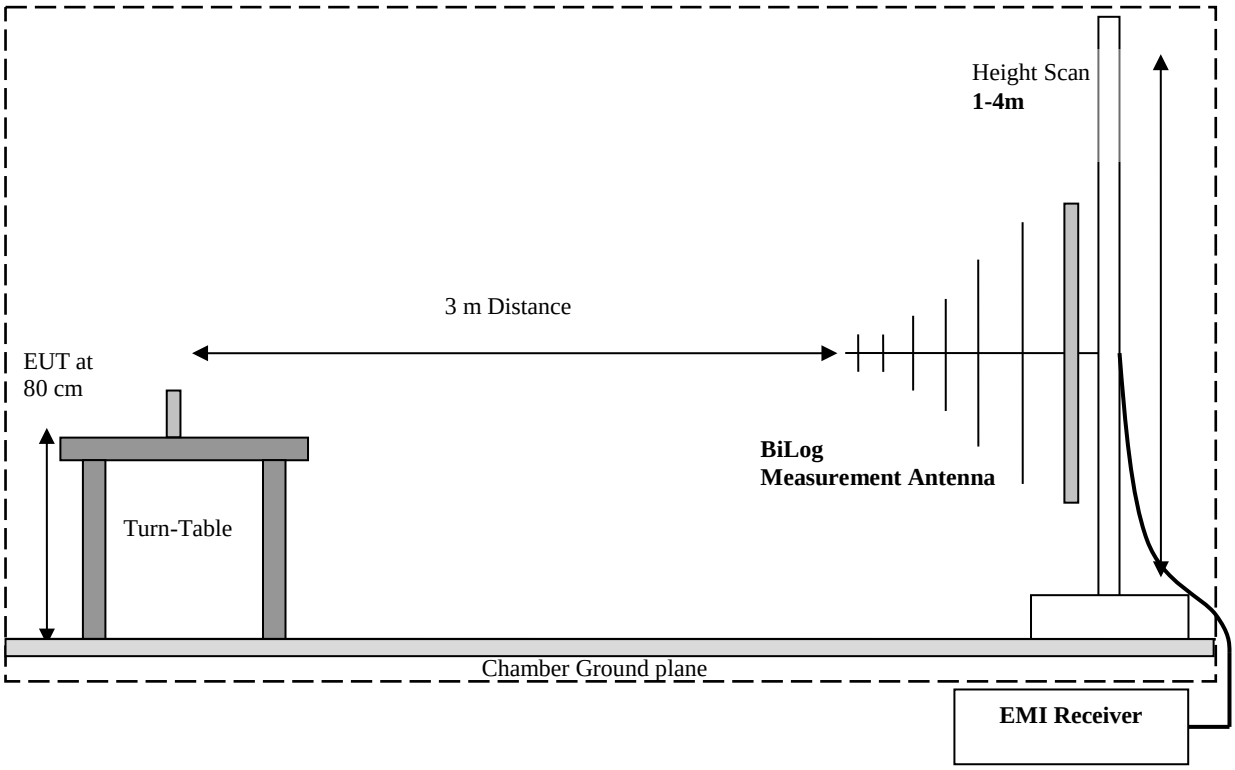
5.1 Radiated Measurement

- 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.

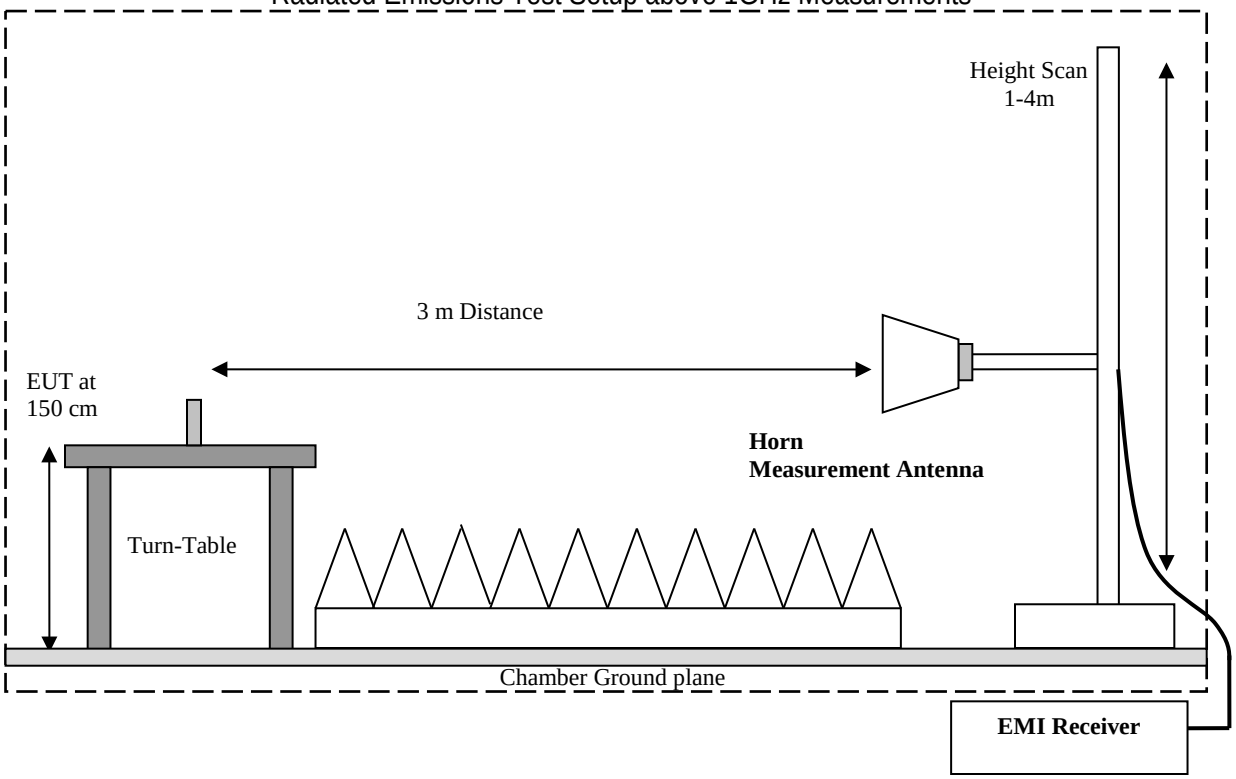
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



5.2 Sample Calculations for Field Strength Measurements

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

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

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

FS (dBµV/m) = Measured Value on SA (dBµV)- Cable Loss (dB)+ Antenna Factor (dB/m)

Example:

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

6 Measurement Results Summary

6.1 FCC 22 / RSS-132:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §22.913 (a) RSS-132 5.4	RF Output Power	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1055; §22.355 RSS-132 5.3	Frequency Stability	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1049; §22.917 RSS-132 5.2	Occupied Bandwidth	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1051; §22.917 RSS-132 5.5	Band Edge Compliance	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1051; §22.917 RSS-132 5.5	Conducted Spurious Emissions	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1053; §22.917 RSS-132 5.5	Radiated Spurious Emissions	Nominal	GSM WCDMA	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification.

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); RSS-133 6.4	RF Output Power	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1055; §24.235; RSS-133 6.3	Frequency Stability	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1049; §24.238; RSS-133 6.2	Occupied Bandwidth	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1051; §24.238; RSS-133 6.5	Band Edge Compliance	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1051; §24.238; RSS-133 6.5	Conducted Spurious Emissions	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1053; §24.238; RSS-133 6.5	Radiated Spurious Emissions	Nominal	GSM WCDMA	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification.

6.3 FCC 27 / RSS-139:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §27.50 (d); RSS-139 6.5	RF Output Power	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1055; §27.54; RSS-139 6.4	Frequency Stability	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1049; §27.53; RSS-139 6.2	Occupied Bandwidth	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1051; §27.53; RSS-139 6.6	Band Edge Compliance	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1051; §27.53; RSS-139 6.6	Conducted Spurious Emissions	Nominal	GSM WCDMA	☐	☐	☐	■	Complies Note 2
§2.1053; §27.53; RSS-139 6.6	Radiated Spurious Emissions	Nominal	GSM WCDMA	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: Leveraged from module certification.

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; Part 24.238; Part 27.53; RSS-132 5.5; RSS-133 6.5; RSS-139 6.6, utilizing KDB 971168 D01 Power Meas License Digital Systems v02r02, and according to TIA-603C 2004- 2.2.12

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 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:

7.1.2.1 FCC Part 22.917 (a), Part 24.238 (a), and Part 27.53 (h)

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)

7.1.2.2 RSS-132 5.5; RSS-133 6.5; RSS-139 6.6

Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

i.In the first 1.0 MHz band immediately outside and adjacent to each of the equipment's operating frequency block, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p (watts).

ii.After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts).

7.1.3 Test conditions and setup:

Ambient Temperature (°C)	EUT Set-Up #	EUT operating mode	Power Input
23	1	GSM 850/1900; UMTS FDD II / FDD IV; + WIFI 802.11b	120VAC

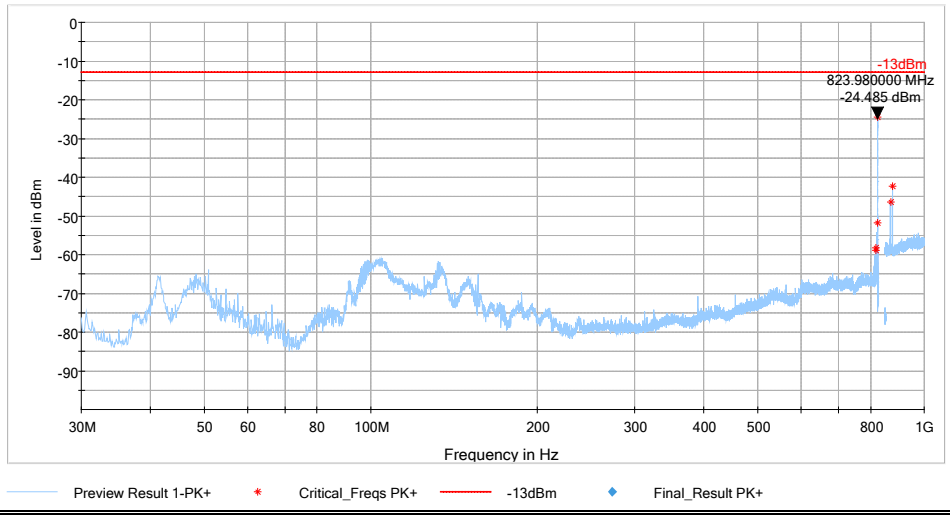
7.1.4 Measurement result:

Plot #	Channel #	EUT operating mode	Scan Frequency	Limit (dBm)	Result
1-3	Low	GSM 850	30 MHz – 9 GHz	-13	Pass
4-7	Mid	GSM 850	9 kHz – 9 GHz	-13	Pass
8-10	High	GSM 850	30 MHz – 9 GHz	-13	Pass
11-13	Low	GSM 1900	30 MHz – 18 GHz	-13	Pass
14-18	Mid	GSM 1900	9 kHz – 26 GHz	-13	Pass
19-21	High	GSM 1900	30 MHz – 18 GHz	-13	Pass
22-24	Low	FDD II	30 MHz – 18 GHz	-13	Pass
25-29	Mid	FDD II	9 kHz – 26 GHz	-13	Pass
30-32	High	FDD II	30 MHz – 18 GHz	-13	Pass
33-35	Low	FDD IV	30 MHz – 18 GHz	-13	Pass
36-40	Mid	FDD IV	9 kHz – 26 GHz	-13	Pass
41-43	High	FDD IV	30 MHz – 18 GHz	-13	Pass
44-46	Low	FDD V	30 MHz – 9 GHz	-13	Pass
47-50	Mid	FDD V	9 kHz – 9 GHz	-13	Pass
51-53	High	FDD V	30 MHz – 9 GHz	-13	Pass

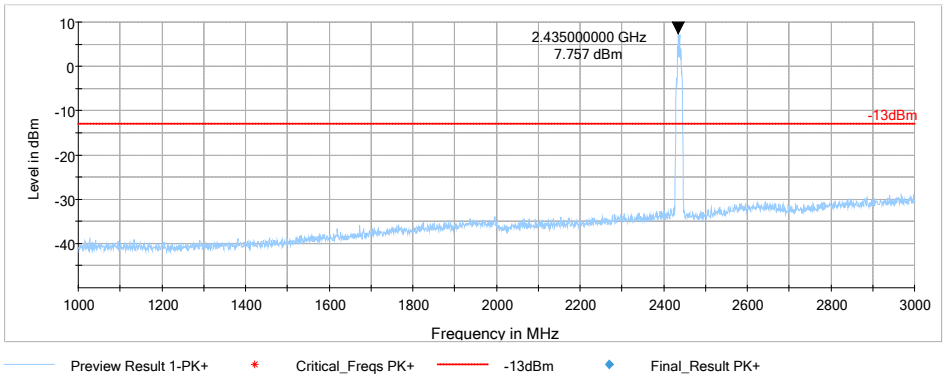
7.1.5 Measurement Plots:

GSM 850

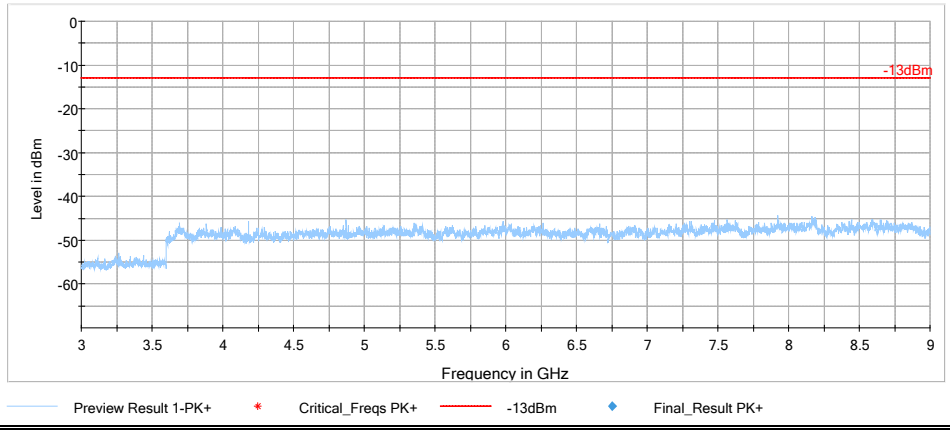
Plot #1 Radiated Emissions: 30 MHz – 1GHz
Channel: Low



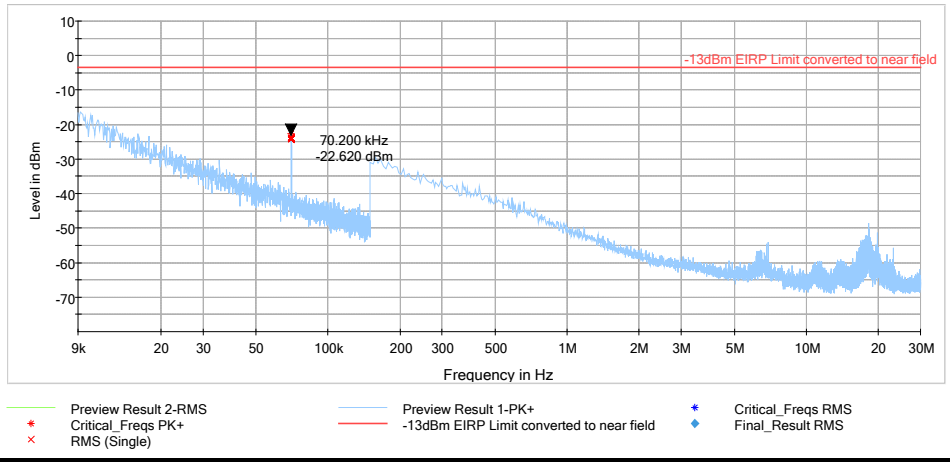
Plot # 2 Radiated Emissions: 1-3 GHz
Channel: Low



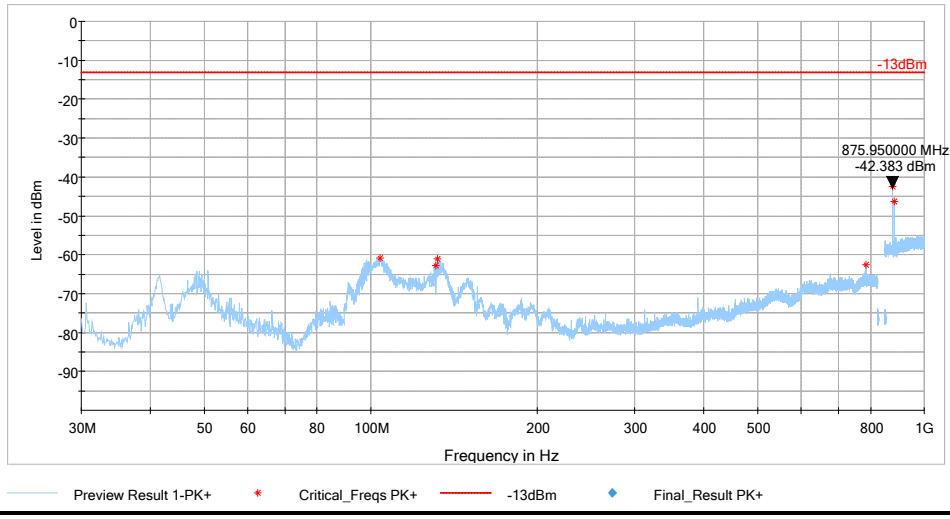
Plot # 3 Radiated Emissions: 3-9 GHz
Channel: Low



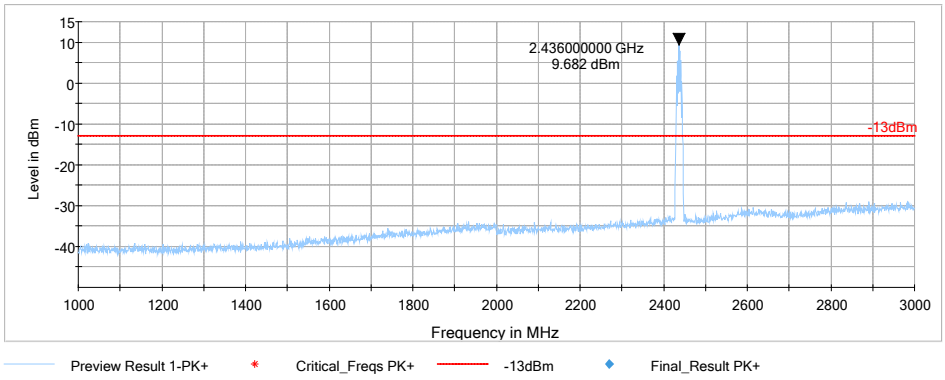
Plot # 4 Radiated Emissions: 9 kHz-30 MHz
Channel: Mid



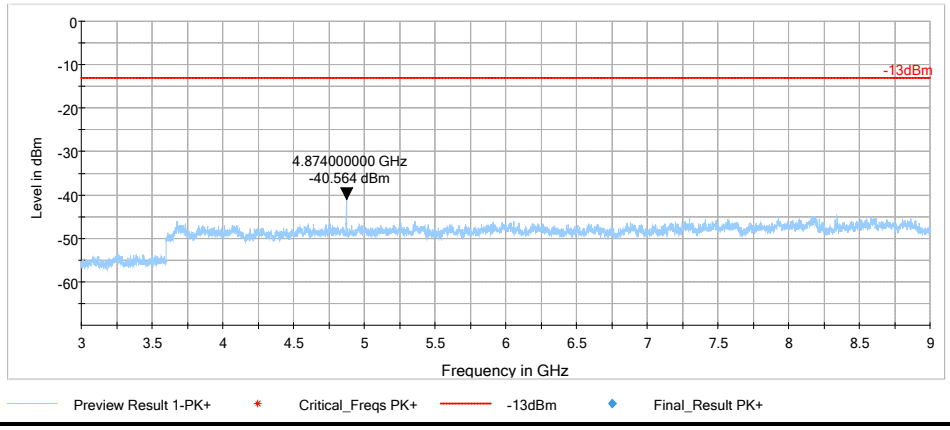
Plot #5 Radiated Emissions: 30 MHz – 1GHz
Channel: Mid



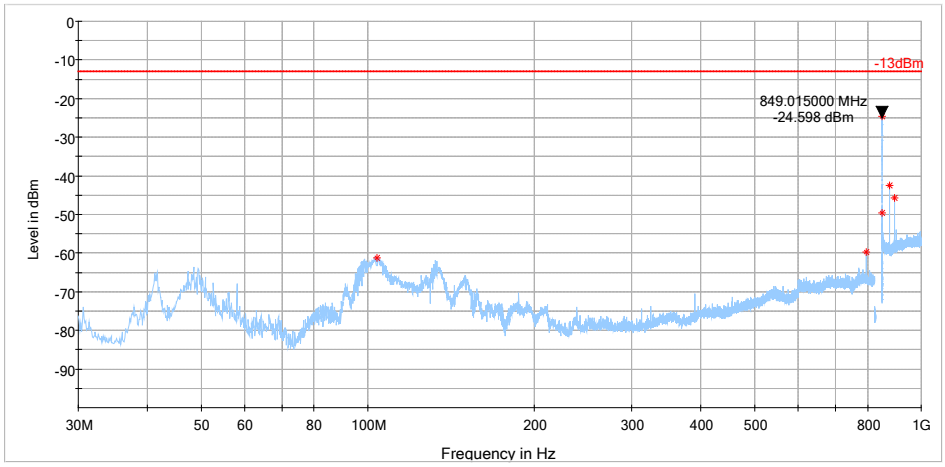
Plot #6 Radiated Emissions: 1-3 GHz
Channel: Mid



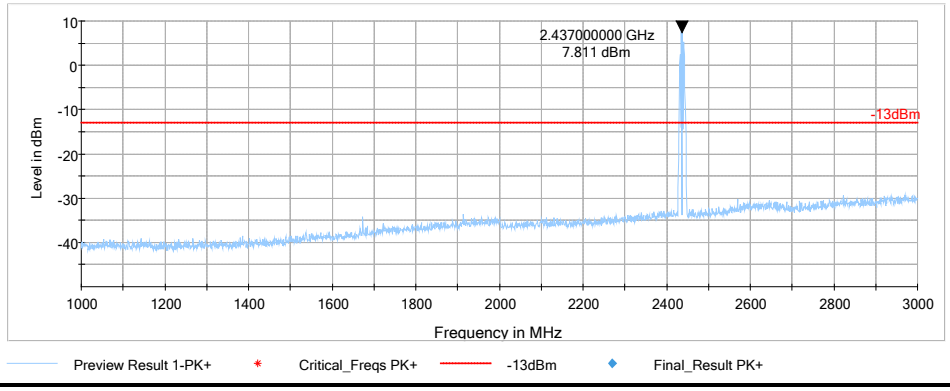
Plot #7 Radiated Emissions: 3-9 GHz
Channel: Mid



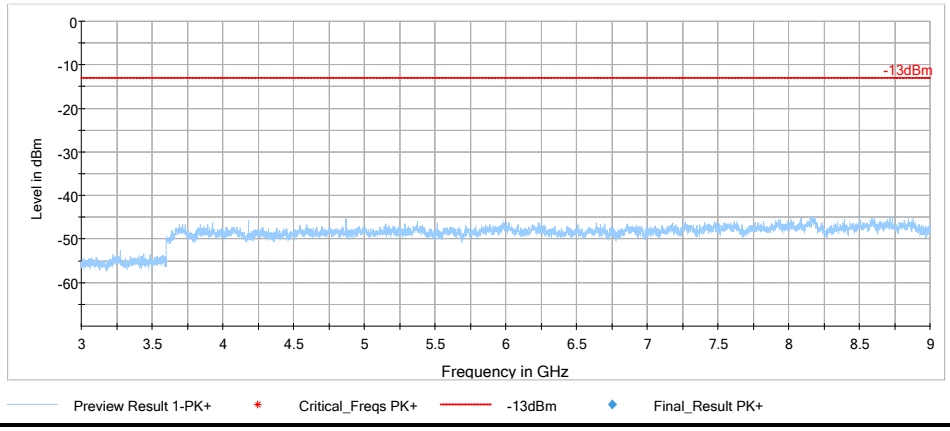
Plot #8 Radiated Emissions: 30 MHz – 1GHz
Channel: High



Plot #9 Radiated Emissions: 1-3 GHz
Channel: High

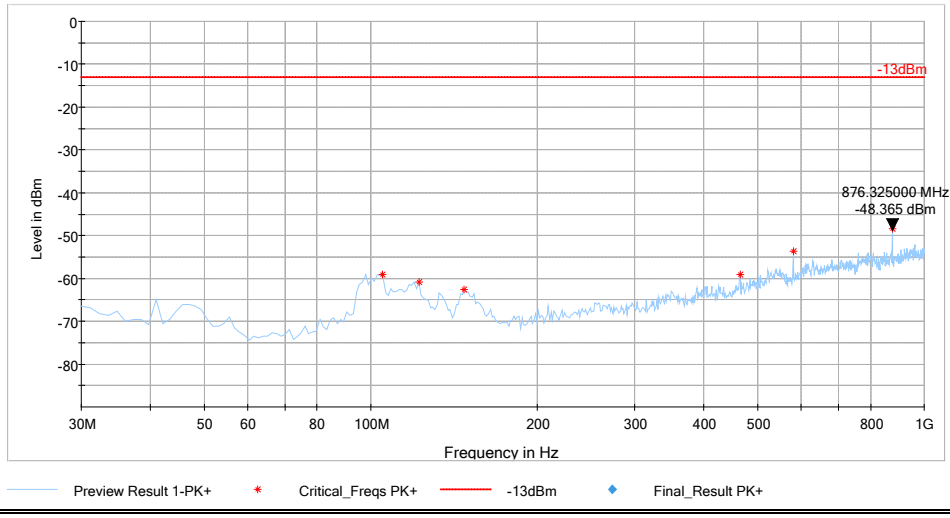


Plot #10 Radiated Emissions: 3-9 GHz
Channel: High

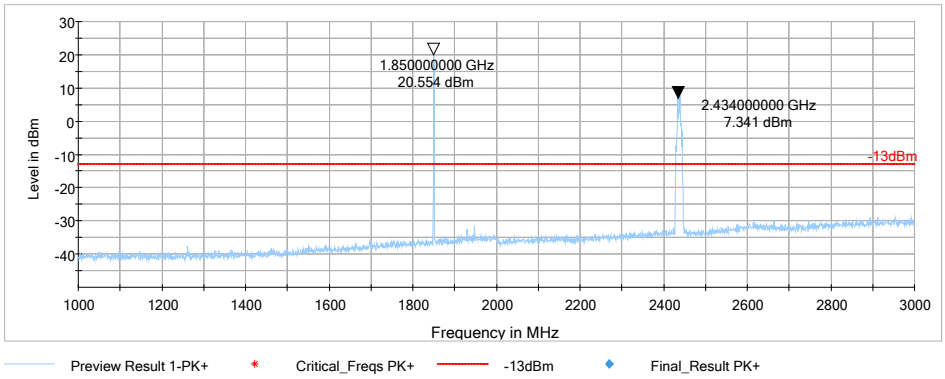


GSM 1900

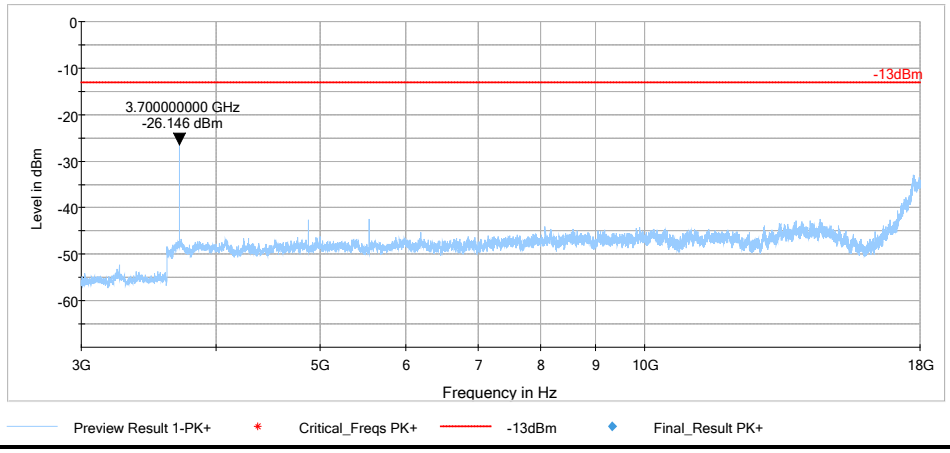
Plot #11 Radiated Emissions: 30 MHz – 1GHz
Channel: Low



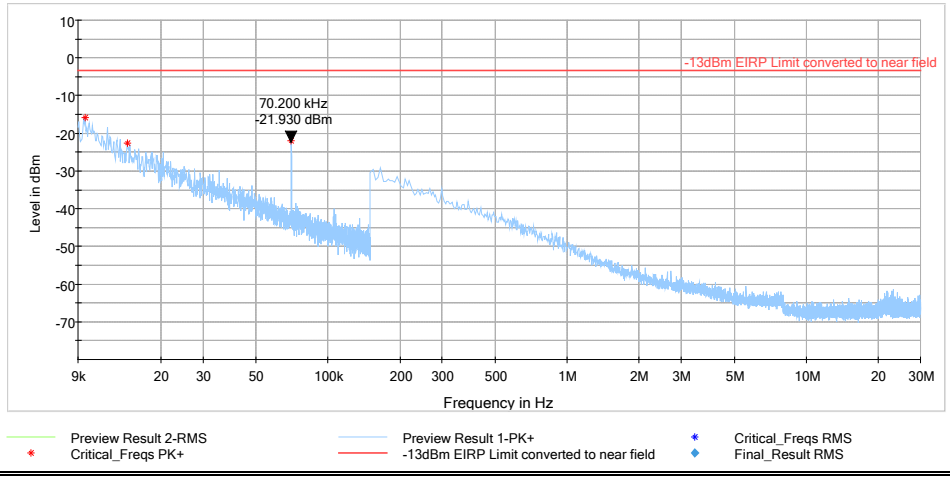
Plot # 12 Radiated Emissions: 1-3 GHz
Channel: Low



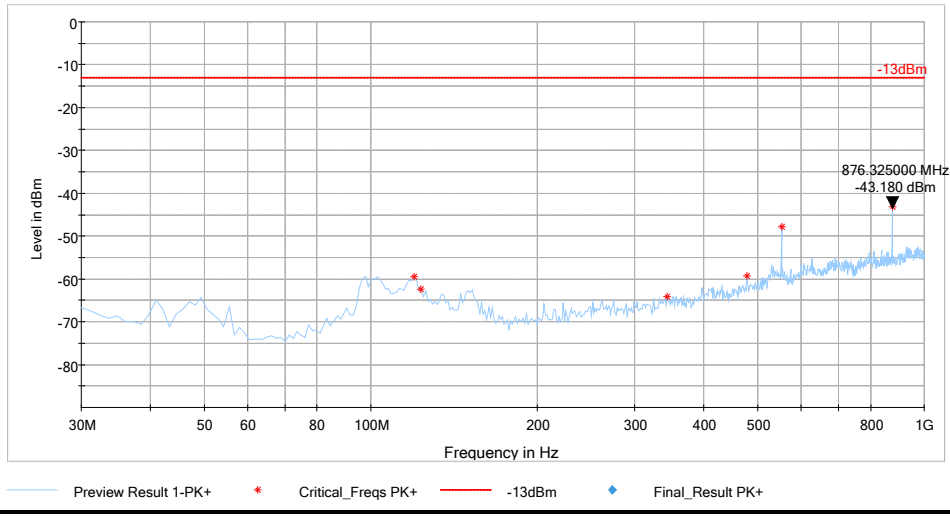
Plot # 13 Radiated Emissions: 3-18 GHz
Channel: Low



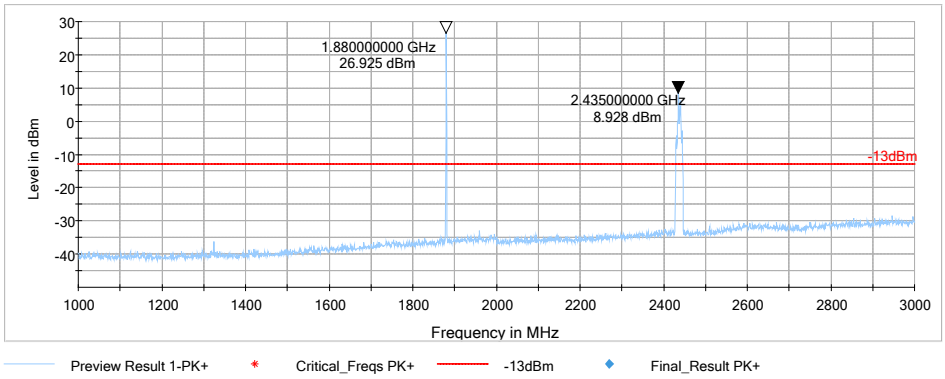
Plot # 14 Radiated Emissions: 9 kHz-30 MHz
Channel: Mid



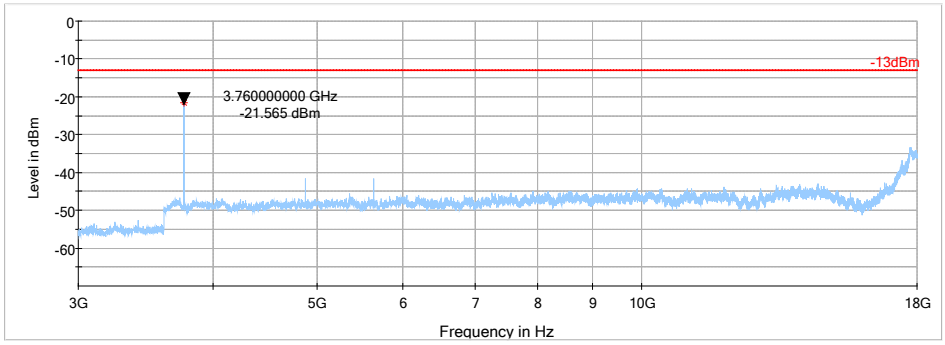
Plot # 15 Radiated Emissions: 30 MHz – 1GHz
Channel: Mid



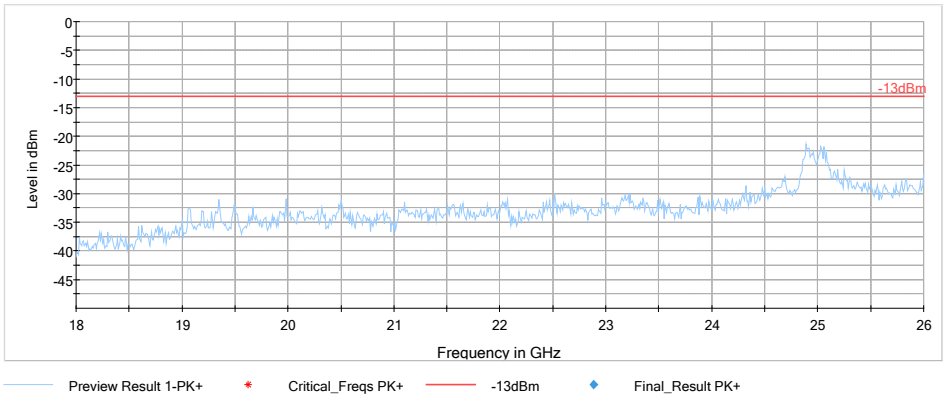
Plot #16 Radiated Emissions: 1-3 GHz
Channel: Mid



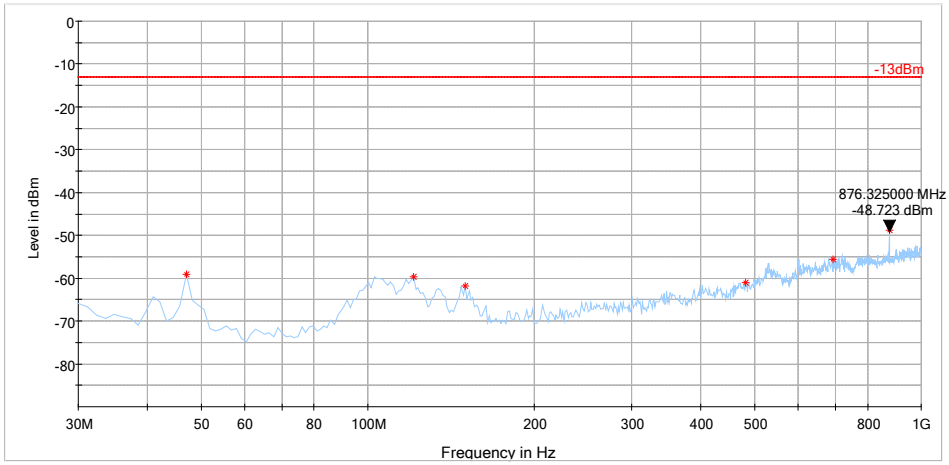
Plot #17 Radiated Emissions: 3-18 GHz
Channel: Mid



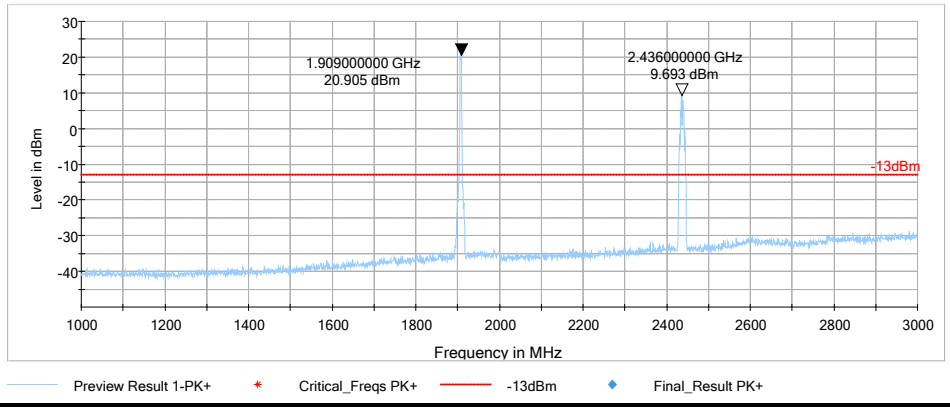
Plot #18 Radiated Emissions: 18-26 GHz
Channel: Mid



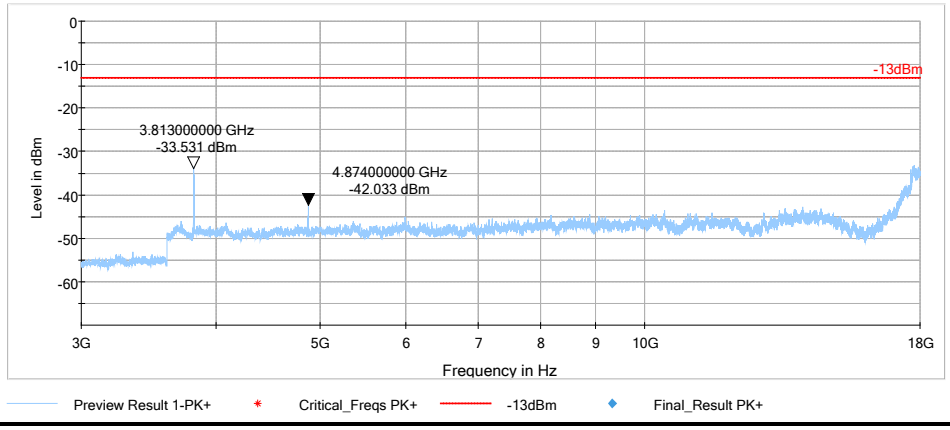
Plot #19 Radiated Emissions: 30 MHz – 1GHz
Channel: High



Plot #20 Radiated Emissions: 1-3 GHz
Channel: High

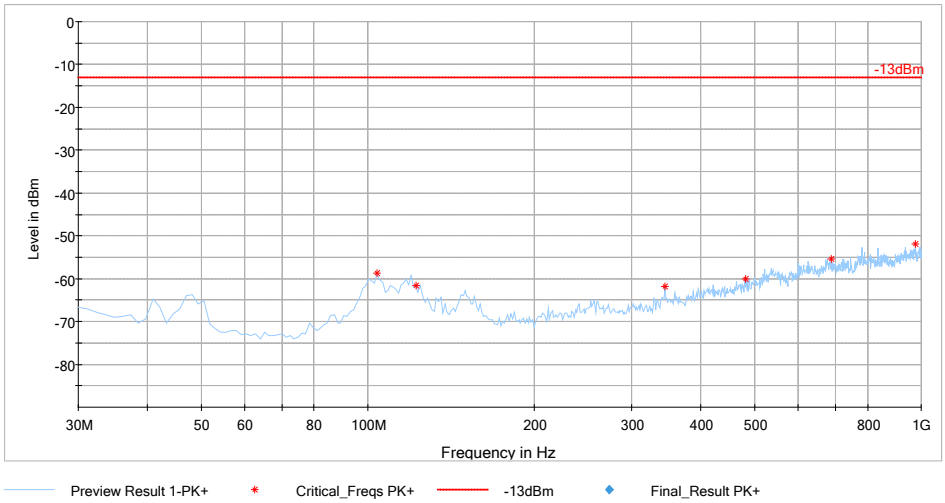


Plot #21 Radiated Emissions: 3-18 GHz
Channel: High

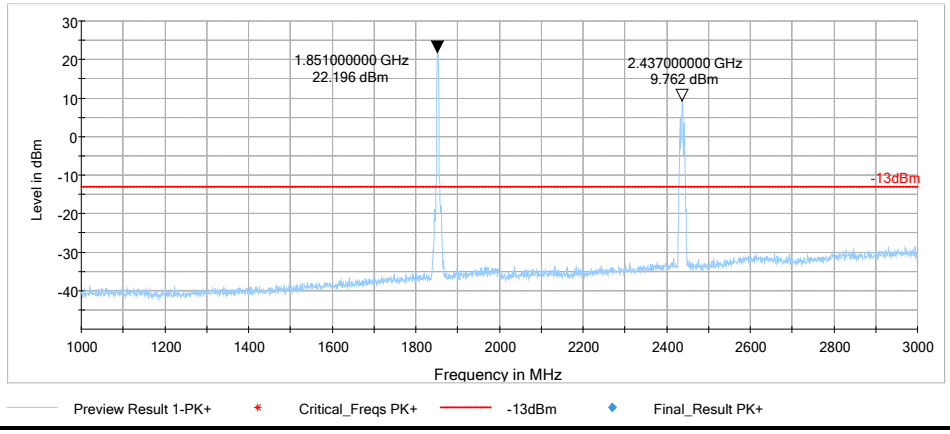


UMTS Band II

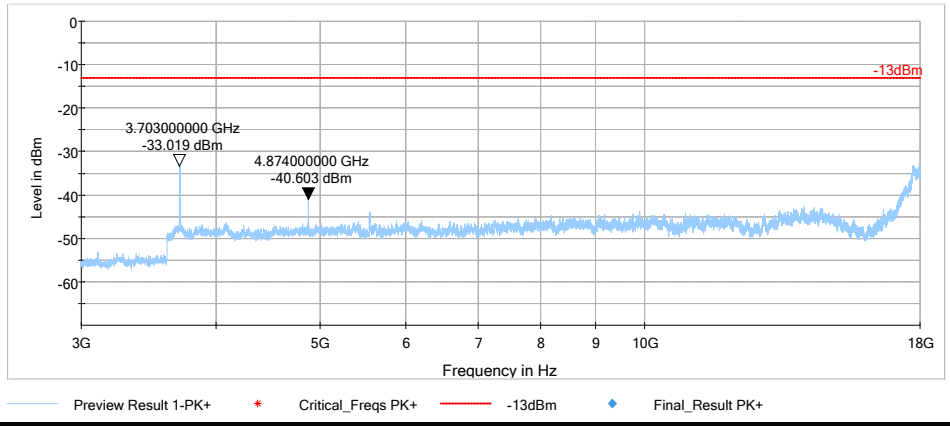
Plot #22 Radiated Emissions: 30 MHz – 1GHz
Channel: Low



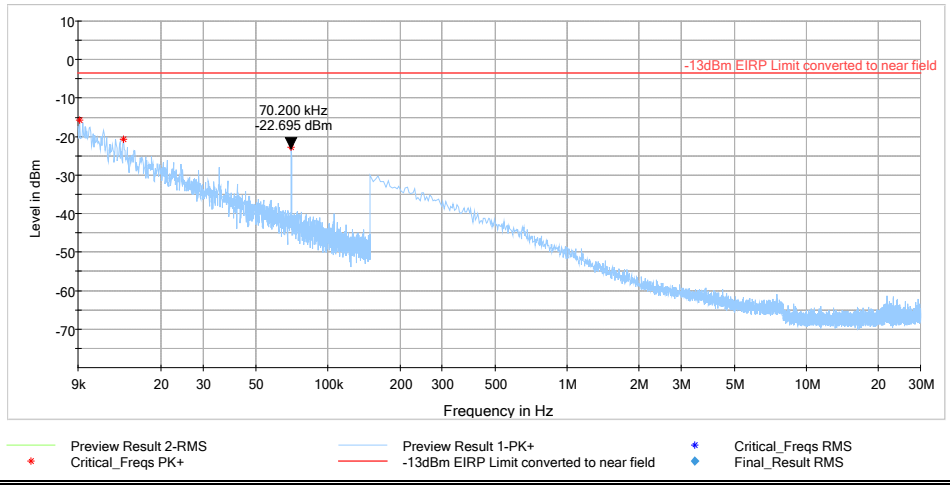
Plot # 23 Radiated Emissions: 1-3 GHz
Channel: Low



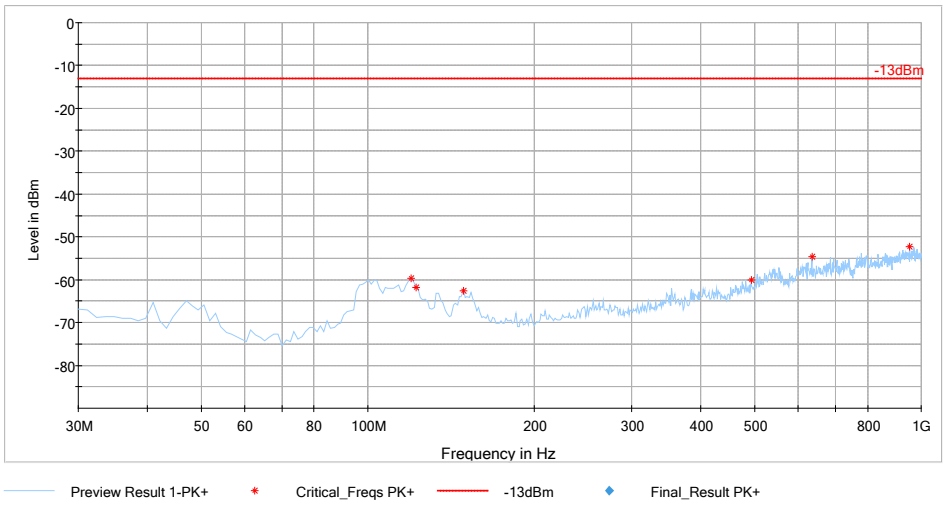
Plot # 24 Radiated Emissions: 3-18 GHz
Channel: Low



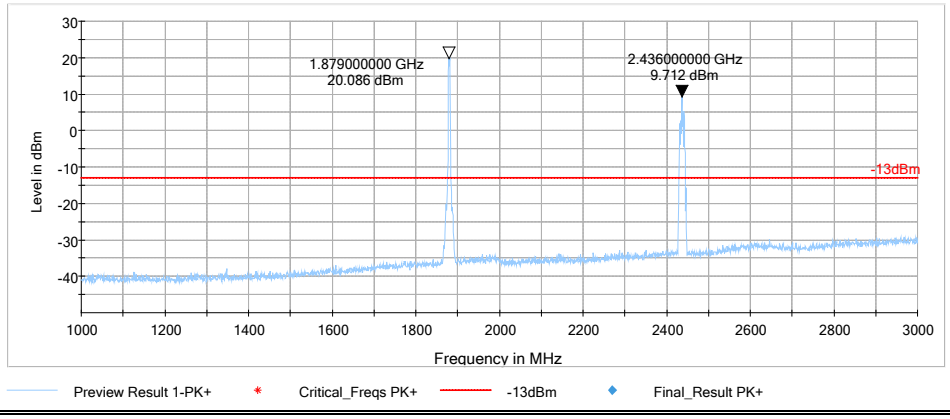
Plot # 25 Radiated Emissions: 9 kHz-30 MHz
Channel: Mid



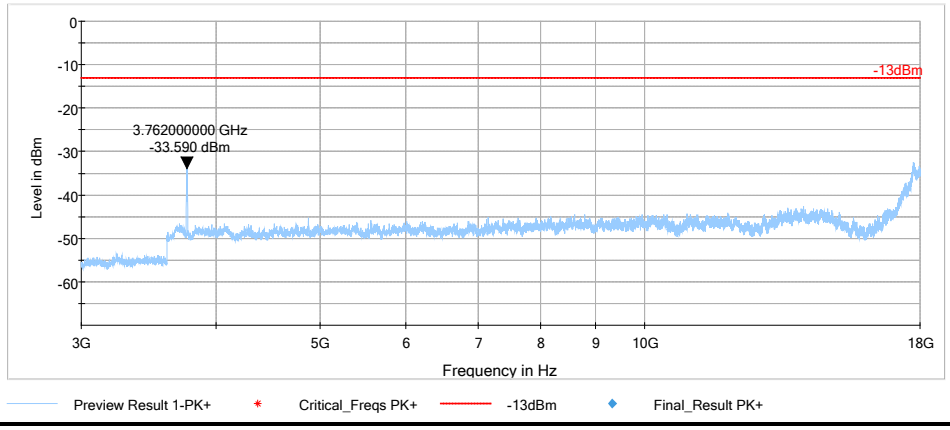
Plot #26 Radiated Emissions: 30 MHz – 1GHz
Channel: Mid



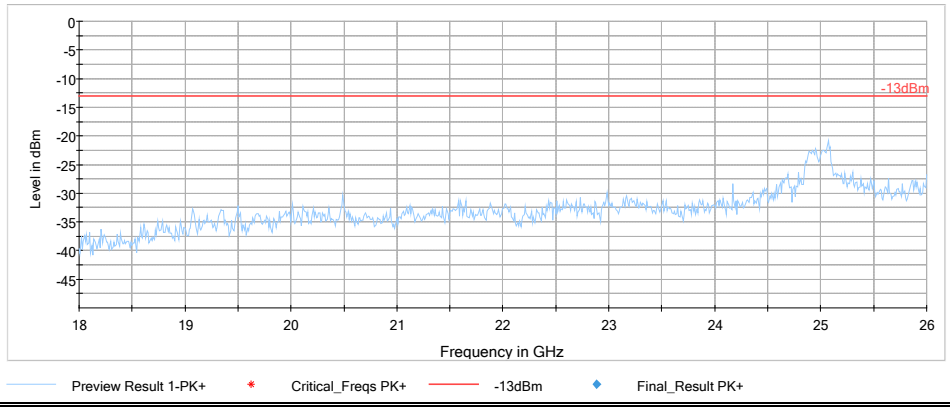
Plot #27 Radiated Emissions: 1-3 GHz
Channel: Mid



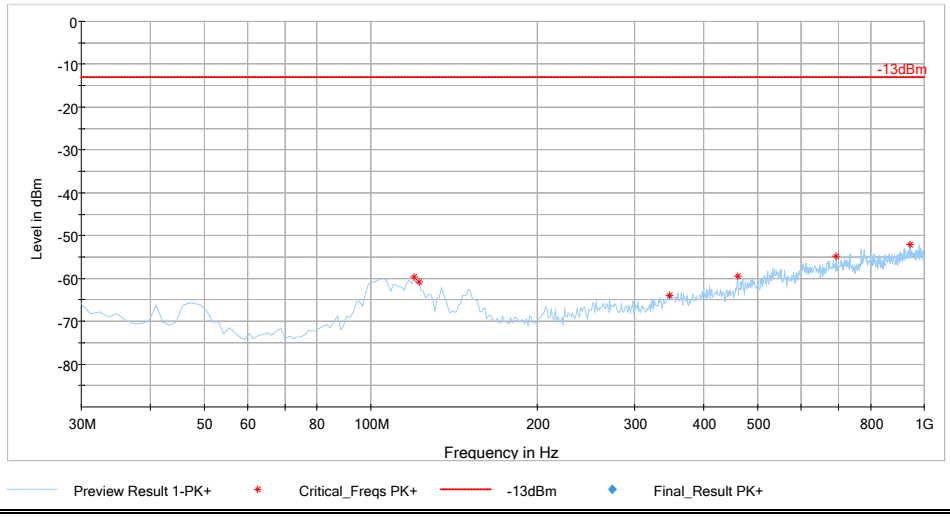
Plot #28 Radiated Emissions: 3-18 GHz
Channel: Mid



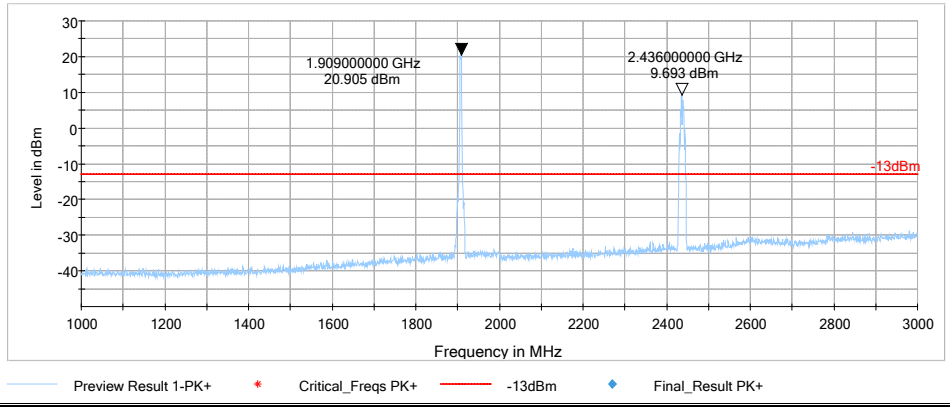
Plot #29 Radiated Emissions: 18-26 GHz
Channel: Mid



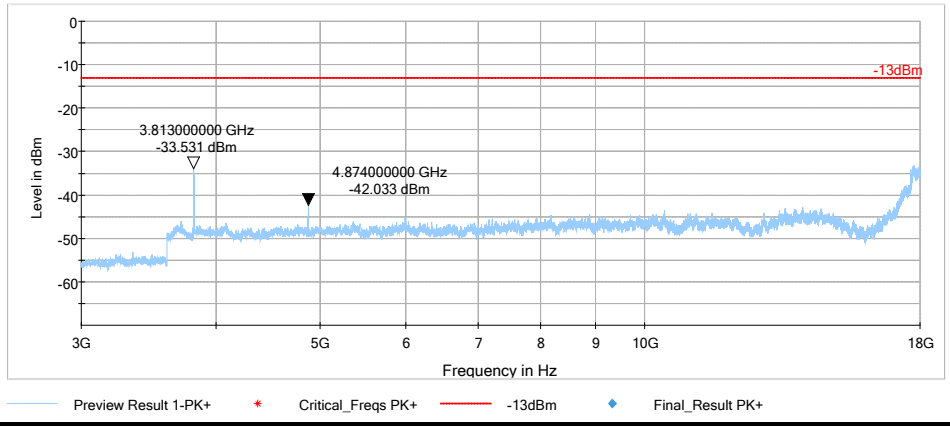
Plot #30 Radiated Emissions: 30 MHz – 1GHz
Channel: High



Plot #31 Radiated Emissions: 1-3 GHz
Channel: High

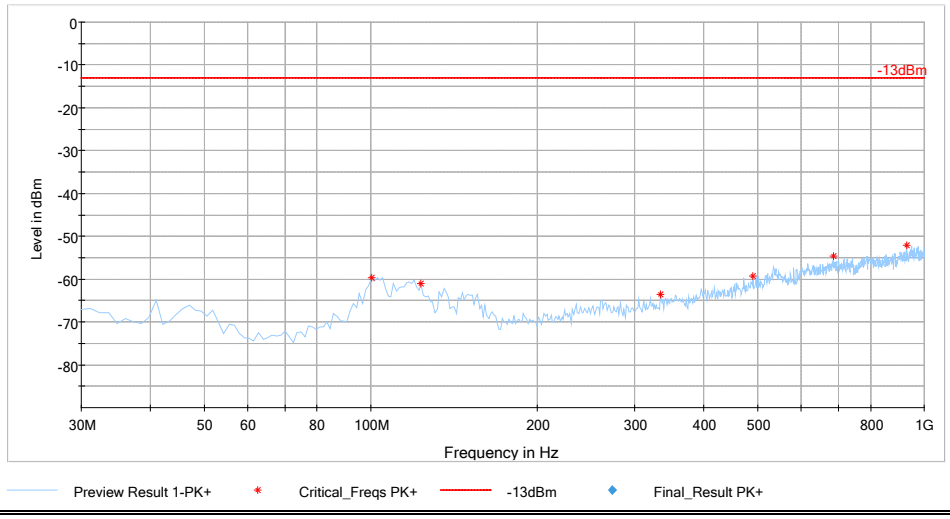


Plot #32 Radiated Emissions: 3-18 GHz
Channel: High

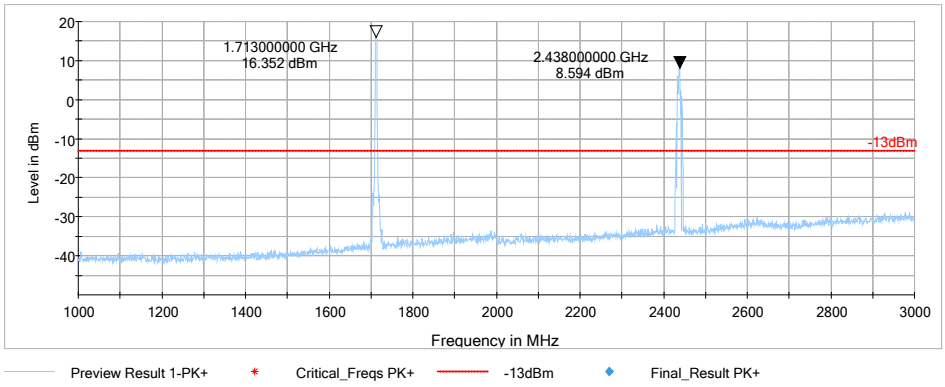


UMTS Band IV

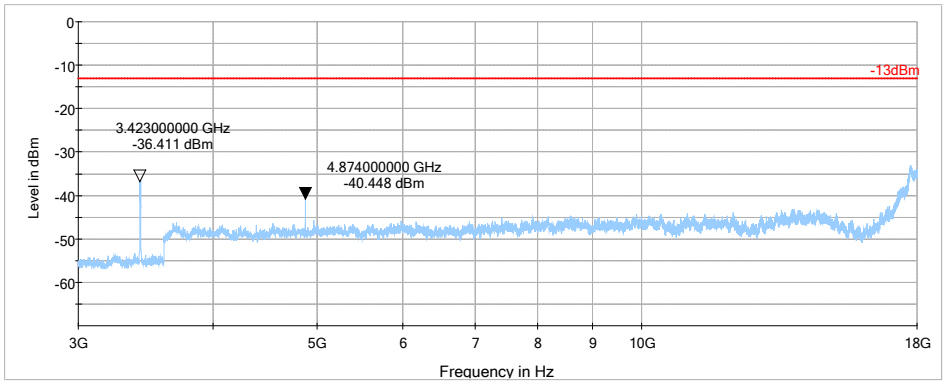
Plot #33 Radiated Emissions: 30 MHz – 1GHz
Channel: Low



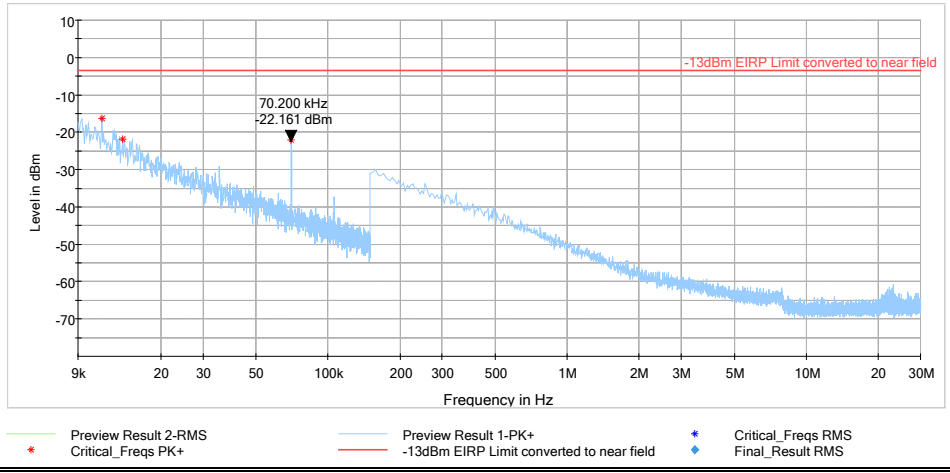
Plot # 34 Radiated Emissions: 1-3 GHz
Channel: Low



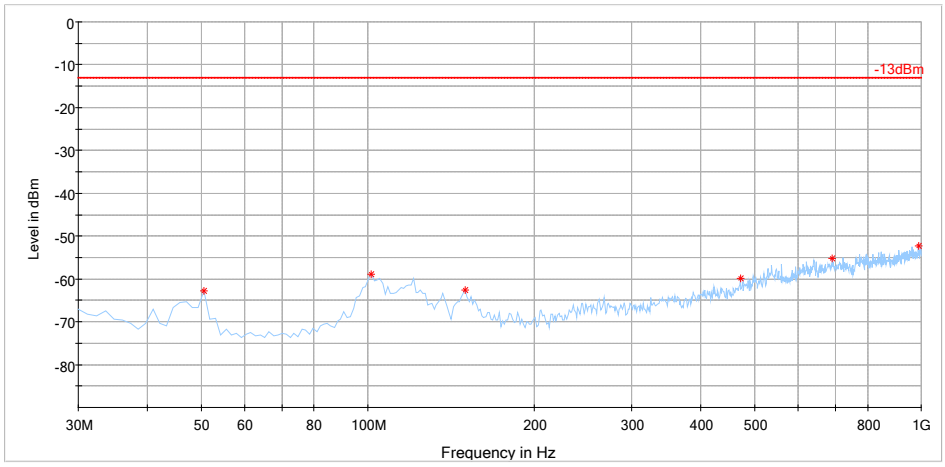
Plot # 35 Radiated Emissions: 3-18 GHz
Channel: Low



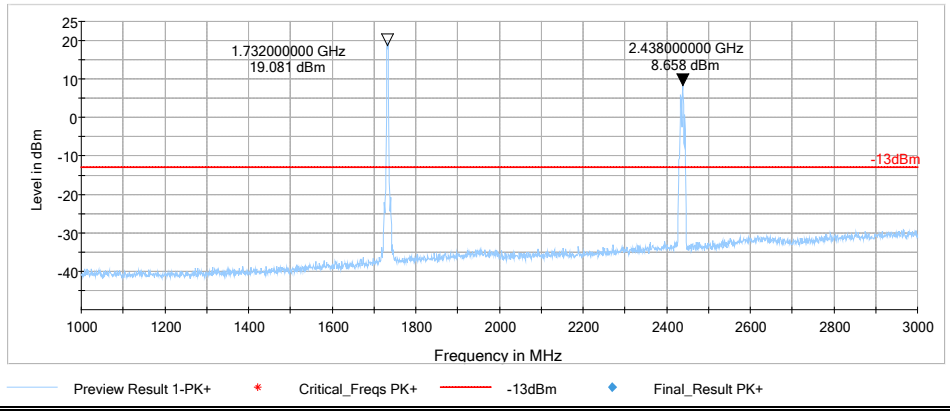
Plot # 36 Radiated Emissions: 9 kHz-30 MHz
Channel: Mid



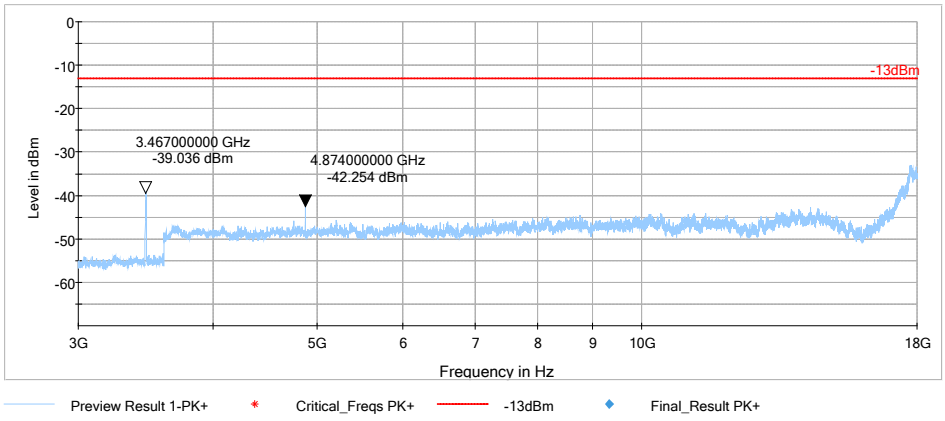
Plot # 37 Radiated Emissions: 30 MHz – 1GHz
Channel: Mid



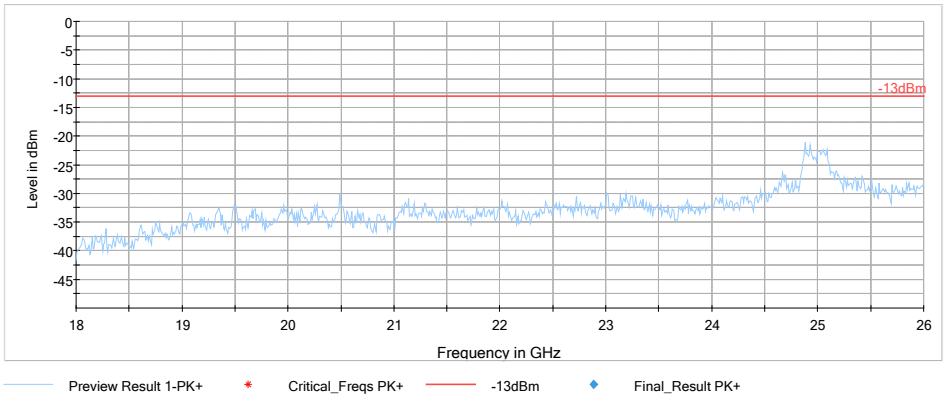
Plot #38 Radiated Emissions: 1-3 GHz
Channel: Mid



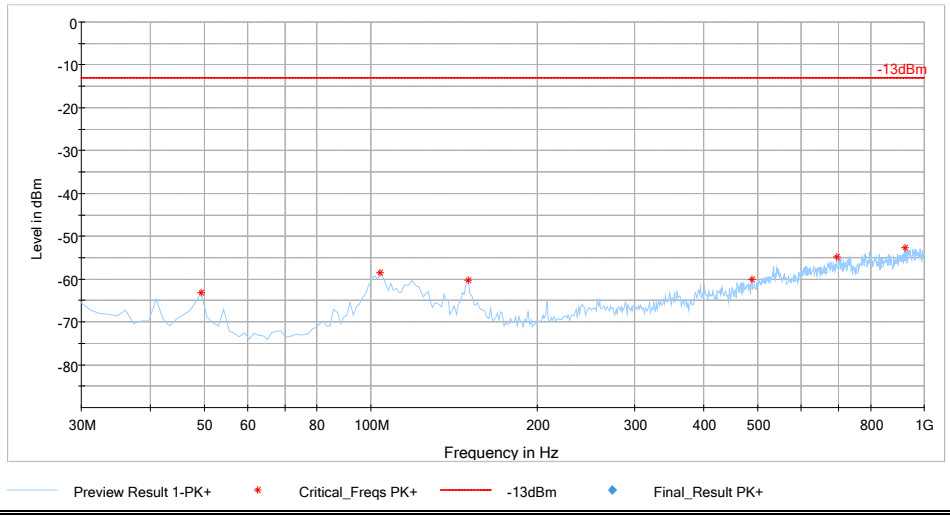
Plot # 39 Radiated Emissions: 3-18 GHz
Channel: Mid



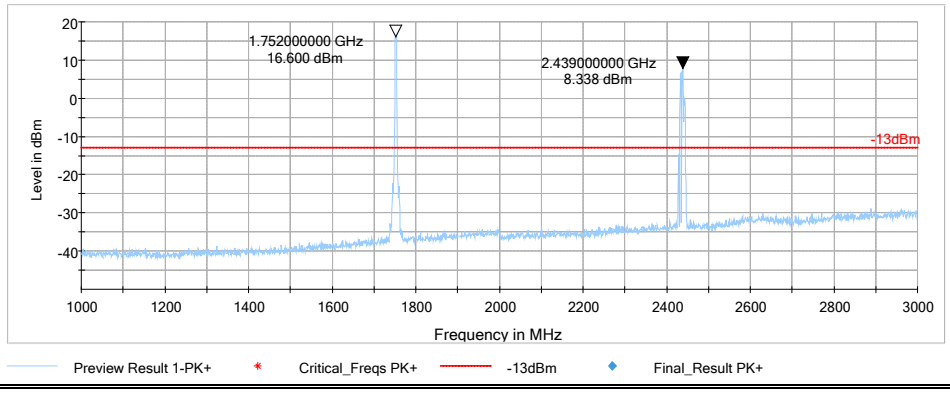
Plot #40 Radiated Emissions: 18-26 GHz
Channel: Mid



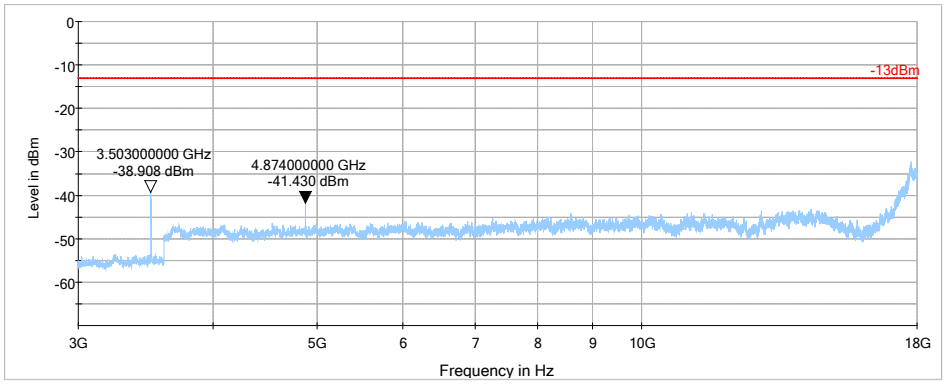
Plot #41 Radiated Emissions: 30 MHz – 1GHz
Channel: High



Plot #42 Radiated Emissions: 1-3 GHz
Channel: High

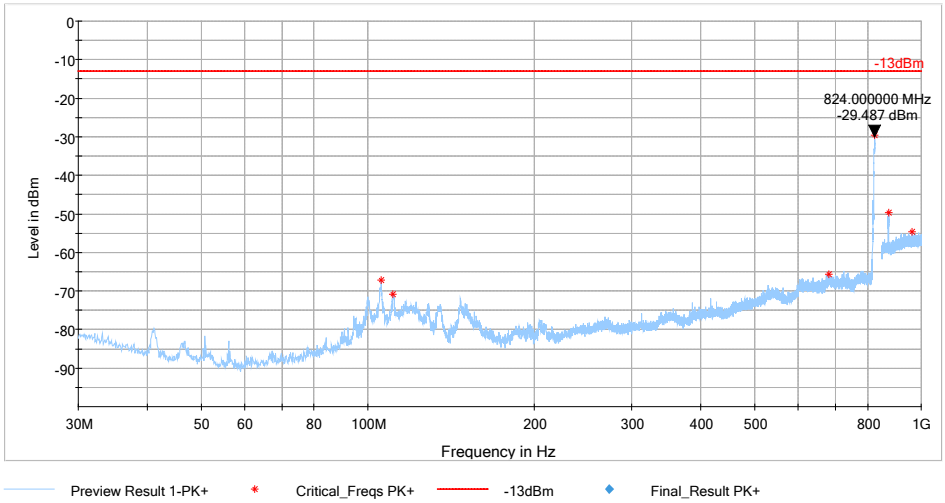


Plot #43 Radiated Emissions: 3-18 GHz
Channel: High

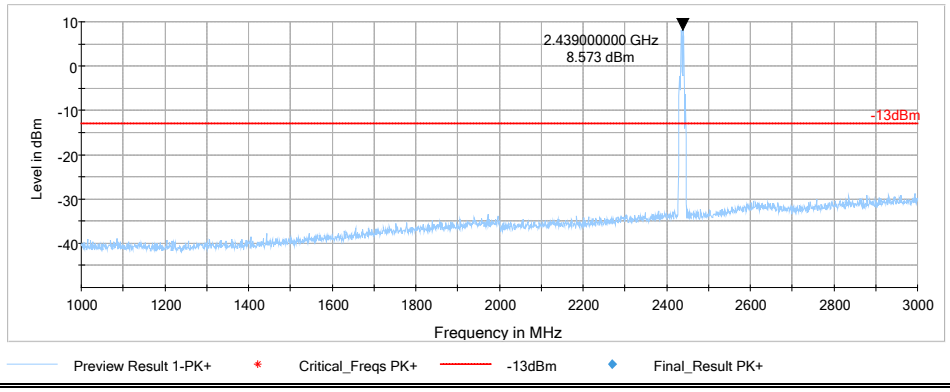


UMTS Band V

Plot #44 Radiated Emissions: 30 MHz – 1GHz
Channel: Low

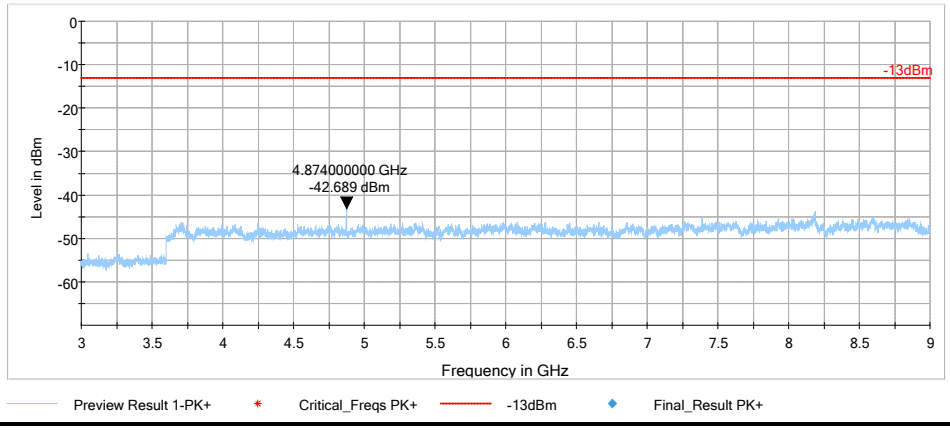


Plot # 45 Radiated Emissions: 1-3 GHz
Channel: Low



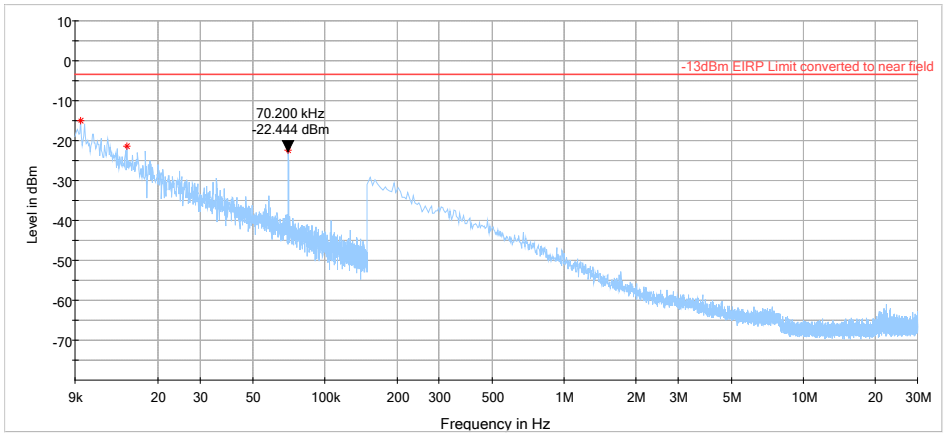
Plot # 46 Radiated Emissions: 3-9 GHz

Channel: Low

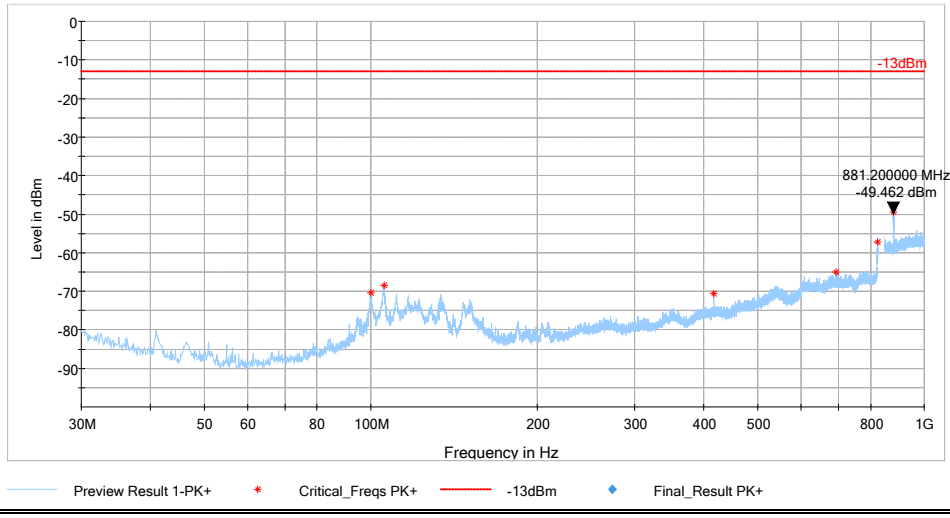


Plot # 47 Radiated Emissions: 9 kHz-30 MHz

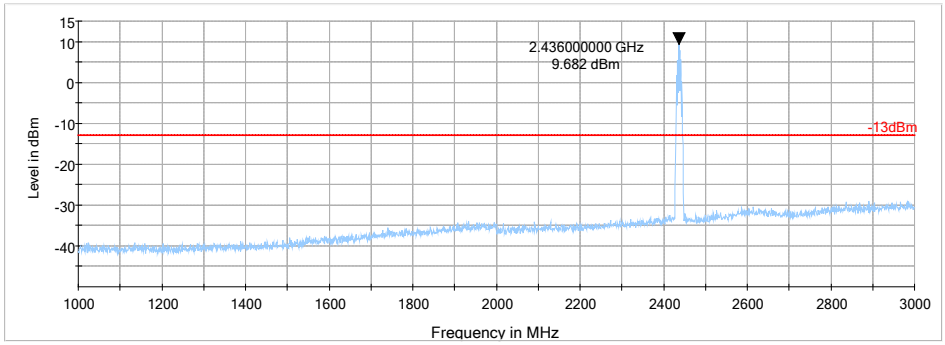
Channel: Mid



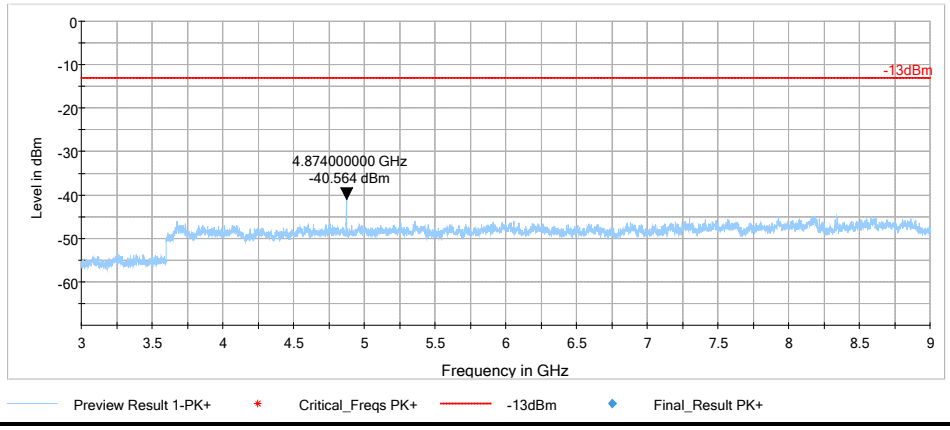
Plot #48 Radiated Emissions: 30 MHz – 1GHz
Channel: Mid



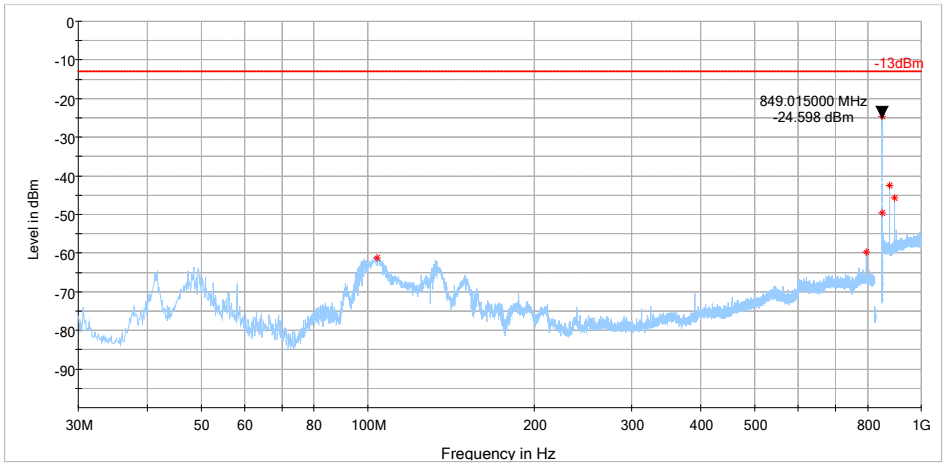
Plot #49 Radiated Emissions: 1-3 GHz
Channel: Mid



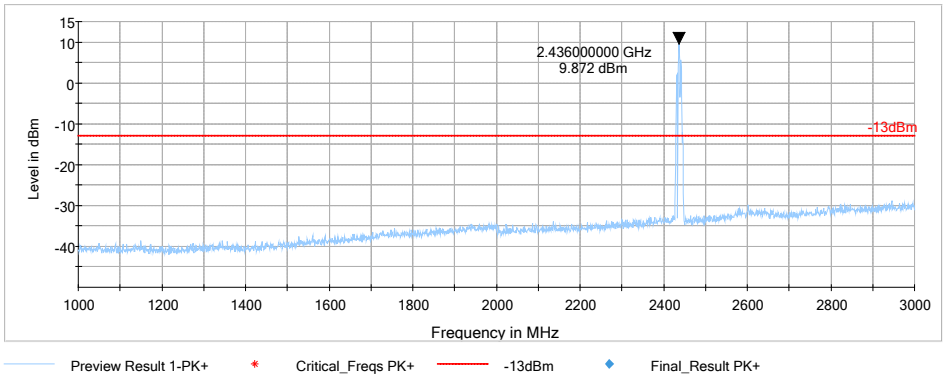
Plot #50 Radiated Emissions: 3-9 GHz
Channel: Mid



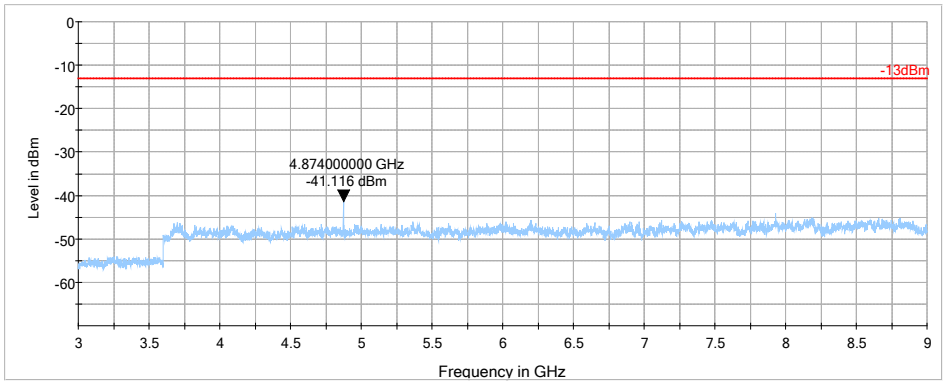
Plot #51 Radiated Emissions: 30 MHz – 1GHz
Channel: High



Plot #52 Radiated Emissions: 1-3 GHz
Channel: High



Plot #53 Radiated Emissions: 3-9 GHz
Channel: High



8 Test setup photos

Setup photos are included in supporting file name: "EMC_FIOIN-002-17001_FCC_22_24_27_Setup_Photos"

9 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	Biconlog Antenna	EMCO	3142E	166067	3 years	6/27/2017
Magnetic Loop Antenna	Loop Antenna	ETS Lindgren	6512	164698	3 years	7/8/2017
Antenna Horn 3117-PA	Horn Antenna	ETS Lindgren	3117-PA	169547	3 years	8/8/2017
Digital Barometer	Compact Digital Barometer	Control Company	35519-055	91119547	2 Years	6/8/2017
FSV40	Spectrum Analyzer	R&S	FSV40	101022	2 years	5/7/2017
FSU26	Spectrum Analyzer	R&S	FSU26	200302	2 years	7/5/2017
Thermometer Humidity TM320	Thermometer Humidity	Dickson	TM320	1625369	1 Year	6/1/2017

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
2017-11-07	EMC_FIOIN-002-17001_FCC_22_24_27	Initial Version	Cindy Li