



FCC/ISED Test Report

FOR:

Philips-Respironics

Model Name:

1116426

Product Description:

Continuous Airway Pressure Device with Bluetooth Radio (BDR/EDR) and LTE CAT M cellular modem in accessory, sends and receives data.

FCC ID: THO1116426

IC ID: 3234B-1116426

Per:

Title 47 CFR: Part 22, Part 24, Part 27

RSS-130 Issue 2, RSS-132 Issue 3; RSS-133 Issue 6; RSS-139 Issue 3

REPORT #: EMC_PHIL4_051_19001_FCC_22_24_27_ISED_ATT_C2PC

DATE: 6/11/2019



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 Bluetooth radio according to criteria specified in the Code of Federal Regulations Title 47 CFR: Part 22, Part 24, Part 27 and Industry Canada Radio Standard Specifications RSS-130 Issue 2, RSS-132 Issue 3; RSS-133 Issue 6; RSS-139 Issue 3.

Company	Description	Model #
Philips-Respironics	Continuous Airway Pressure Device with Bluetooth Radio (BDR/EDR) and LTE CAT M cellular modem in accessory, sends and receives data.	1116426

Specifically this report shows that the product fulfills the radiated emission requirements when operating in simultaneous transmission mode, when plugged into a common host together with following radio module:

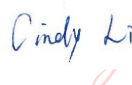
Company	Description	Model #
Philips-Respironics	LTE Cat M Modem sends and receives data on Bands 2, 4, 5, 12	200606C Parent & 200607C Variant

Based on client declaration, only differences in same carrier models is one is a diminutive version where parts are not stuffed to remove a USB port

No deficiencies were ascertained.

According to section 6 of this report, the overall result is PASS.

Responsible for Testing Laboratory:

6/11/2019	Compliance	Cindy Li (Lab Manager)	 Digitally signed by Cindy Li DN: cn=Cindy Li, o=Cetecom Inc., ou=EMC, email=cindy.li@cetecom.co m, c=US Date: 2019.06.11 15:11:31 -07'00'
Date	Section	Name	Signature

Responsible for the Report:

6/11/2019	Compliance	Ghanma, Issa (EMC Engineer)	 Digitally signed by: Issa Ghanma DN: CN = Issa Ghanma email = issa. ghanma@cetecom.com C = US O = CETECOM INC. OU = EMC Date: 2019.06.11 14:57: 18 -07'00'
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:	Li, Cindy
Responsible Project Leader:	Cathy Palacios

2.1 Identification of the Client

Applicant's Name:	Philips-Respironics
Street Address:	1740 Golden Mile Highway
City/Zip Code	Monroeville, PA 15146
Country	USA

2.2 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 #:	1116426
Module name:	Broadcom in DreamStation
FCC ID:	THO1116426
IC ID:	3234B-1116426
Product Description:	Continuous Airway Pressure Device with Bluetooth Radio (BDR/EDR) and LTE CAT M cellular modem in accessory, sends and receives data.
Operating voltage:	Low 100 V, Nominal 115 V, High 240 V See section 3.3 in this document.
Sample Revision	☐ Prototype Unit; ☒ Production Unit; ☐ Pre-Production
EUT Diameter	☒ < 60 cm ☐ Other _____

3.2 EUT Sample details

EUT #	DreamST autoSV H/HT, DS Serial Number	DreamStation Hum Core Pack DOM Serial Number	HW Version	SW Version	Notes/Comments
1	J22657340BAB2	H2264660179E3	00	B0.0.0.2061	-

3.3 Accessory Equipment (AE) details

AE #	Comments
1	- DELTA ELECTRONICS, INC. - S/N : 70HW85E086A - AC/DC ADAPTER - MODEL : MDS-080AAS12 A C.C.:A - INPUT : 100-240V~50-60Hz 2.0-1.0A - OUTPUT : 12V = 6.67A
2	- Cell Modem accessory - Module : DreamStation Cellular Modem - IMEI : 352753092205330 - PMN : DreamStation Cellular Modem - HVIN : 200606C Parent & 200607C Variant - S.W Version : V3.00.04 FCC/IC ID, Operating frequencies and ERP/EIRP listed under section 7.1 in this document.

3.4 Test Sample Configuration

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

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	Cellular NB-IoT & Bluetooth	Cellular was tested on Mid Channel at the maximum power, simultaneous transmission with Bluetooth. Cellular was configured by the client to auto connect, no commands used for cellular radio configuration. “RASP Bluetooth Test Suite” software tool was provided by the client, to configure the Bluetooth radio: ▪ Mode: BT Classic / BLE ▪ Transmit mode: TX / RX ▪ Hopping: Yes / No ▪ Hopping Type: Single Frequency / 79 Channels ▪ Channel: Low, Mid, High, Channel # 39 ▪ Packet Type: DH1, DH3, DH5, 2-DH1, 3-DH1, 3-DH3, 3-DH5 ▪ Modulation: GFSK, QPSK, 8PSK, Unmodulated “RASP Bluetooth Test Suite” will not be available to the end user. The internal antenna was connected.

3.6 Justification for Worst Case Mode of Operation

During the testing process the cellular radio was tested with transmitter sets on mid channel at the maximum power in simultaneous transmission mode with the worst case mode of Bluetooth radio.

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 perform and check radiated spurious emissions against the limits per Code of Federal Regulations Title 47 CFR: Part 22, Part 24, Part 27 and Industry Canada Radio Standard Specifications RSS-130 Issue 2, RSS-132 Issue 3; RSS-133 Issue 6; RSS-139 Issue 3, in simultaneous transmission mode of (DreamStation Cellular Modem U-Blox CAT M1 Modem SARA-R410M-02B-01 FCC/IC ID: XPY2AGQN4NNN/8595A-2AGQN4NNN) and (Broadcom in DreamStation FCC/IC ID: THO1116426/3234B-1116426)

4.1 Dates of Testing:

05/03/2019 – 05/10/2019

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%

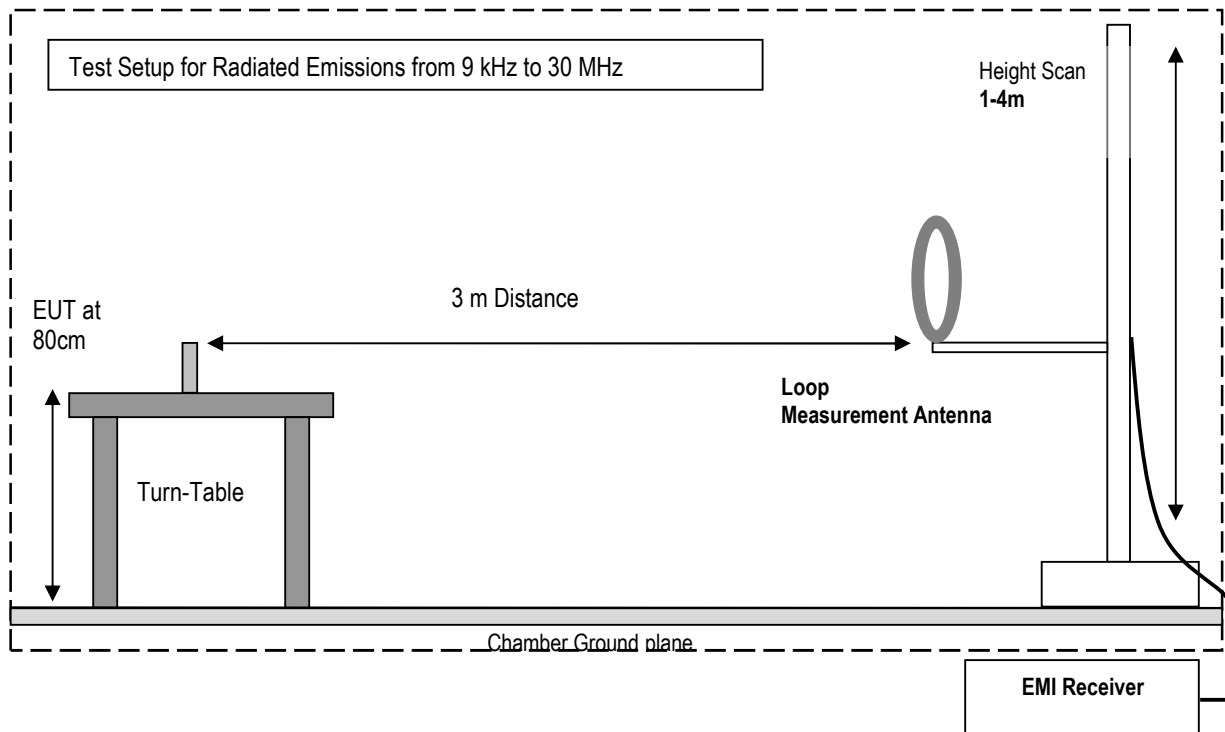
Deviating test conditions are indicated at individual test description where applicable.

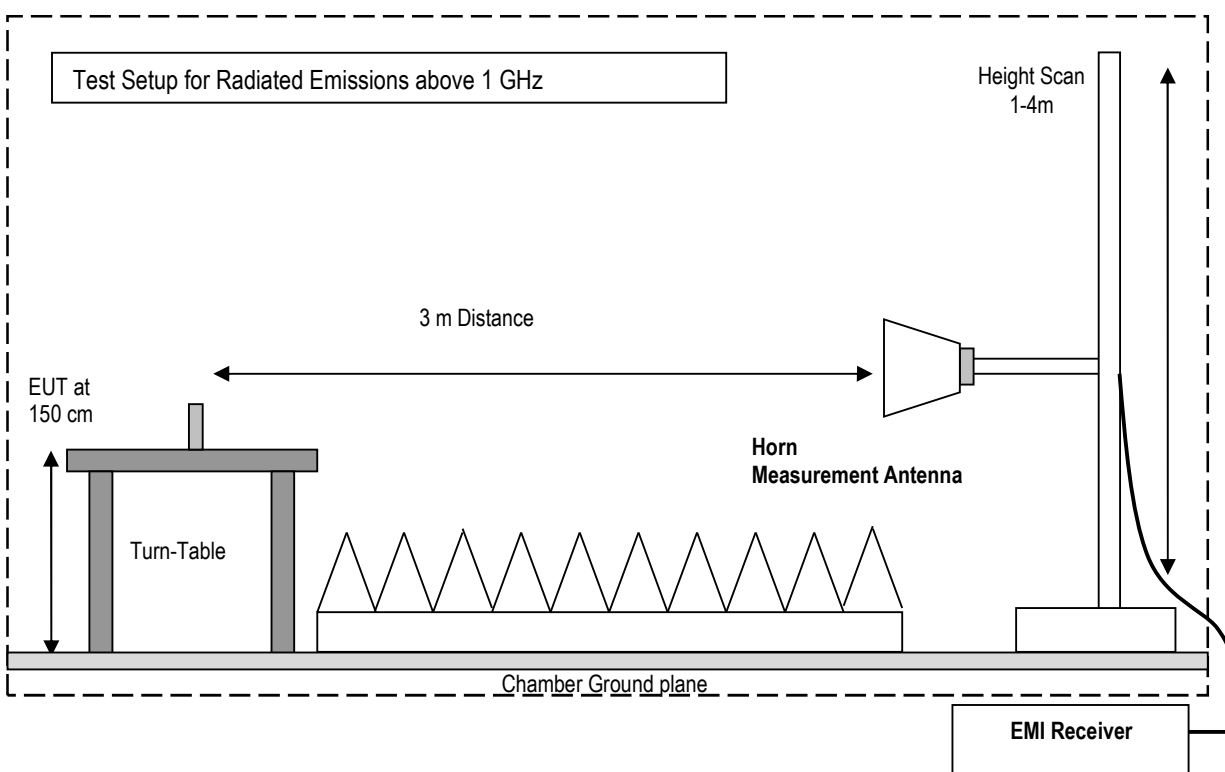
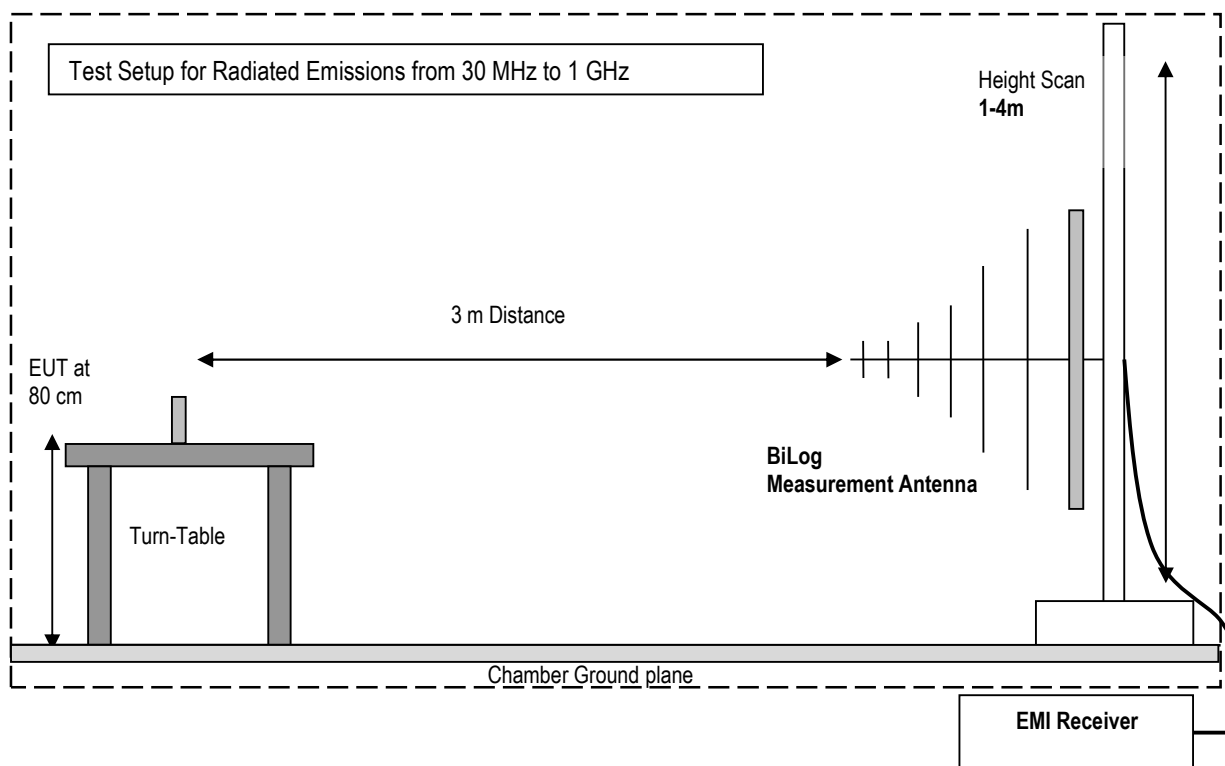
5 Measurement Procedures

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 360° continuous measurement 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	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1055; §22.355	Frequency Stability	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1049; §22.917	Occupied Bandwidth	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §22.917	Band Edge Compliance	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §22.917	Conducted Spurious Emissions	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1053; §22.917(a); RSS-132 Issue 3-5.5;	Radiated Spurious Emissions	Nominal	LTE 5	■	☐	☐	☐	Complies

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

Note 2: Leveraged from module certification U-Blox CAT M1 Modem SARA-R410M-02B-01 FCC ID: XPY2AGQN4NNN/ IC ID: 8595A-2AGQN4NNN

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	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1055; §24.235	Frequency Stability	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1049; §24.238	Occupied Bandwidth	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §24.238	Band Edge Compliance	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §24.238	Conducted Spurious Emissions	-	-	☐	☐	☐	■	Note 1 Note 2
§2.1053; §24.238(a); RSS-133 Issue 6-6.5.1;	Radiated Spurious Emissions	Nominal	LTE 2	■	☐	☐	☐	Complies

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

Note 2: Leveraged from module certification U-Blox CAT M1 Modem SARA-R410M-02B-01FCC ID: XPY2AGQN4NNN/ IC ID: 8595A-2AGQN4NNN

6.3 FCC 27, RSS-130, RSS-139:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §27.50 (d)	RF Output Power	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1055; §27.54	Frequency Stability	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1049; §27.53	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §27.53	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §27.53	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1053; §27.53(g); §27.53(h); RSS-130 Issue 2-4.7; RSS-139 Issue 3-6.6;	Radiated Spurious Emissions	Nominal	LTE 4, 12	■	☐	☐	☐	Complies

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

Note 2: Leveraged from module certification U-Blox CAT M1 Modem SARA-R410M-02B-01FCC ID: XPY2AGQN4NNN/ IC ID: 8595A-2AGQN4NNN

7 Test Result Data

7.1 ERP / EIRP

Module Name:	U-Blox CAT M1 Modem				
Model Number:	SARA-R410M-02B-01				
FCC ID:	XPY2AGQN4NNN				
IC ID:	8595A-2AGQN4NNN				
Antenna Information as declared:	- Antenna 1 (Main) : Printed on Case. - Gain (dBi): - LTE 2 : 3.10 - LTE 4 : 4.20 - LTE 5 : -1.26 - LTE 12 : -0.8				
Band	Frequency range (MHz)	Power (Watts)	Gain (dBi / Lin)	ERP (Watts)	EIRP (Watts)
LTE 2	1850 – 1910	0.302	3.10 / 2.042	-	0.617
LTE 2	1850 – 1915	0.242	3.10 / 2.042	-	0.494
LTE 4	1710 – 1755	0.245	4.20 / 2.630	-	0.644
LTE 5	824 – 849	0.316	-1.26 / 0.748	0.144	0.236
LTE 12	699 – 716	0.269	-0.80 / 0.832	0.136	0.224

Note: ERP / EIRP are calculated from maximum power in grant of cellular module, adding the maximum gain of the utilized cellular antenna.

7.2 Radiated Spurious Emissions

7.2.1 Measurement according to FCC: CFR 47 Part 2.1053; CFR Part 22.917; CFR Part 24.238, Part 27.53 utilizing KDB 971168 D01 Power Meas License Digital Systems v03, and according to ANSI C63.26 2017

Spectrum Analyzer Settings for FCC 22

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

Spectrum Analyzer Settings for FCC 24 and 27

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

7.2.2 Limits:

- FCC Part 22.917(a) and Part 24.238(a), Part 27.53 (h),(g)
- RSS-130 Issue 2, RSS-132 Issue 3 5.5, RSS-133 Issue 6 6.5.1, RSS-139 Issue 3 6.6

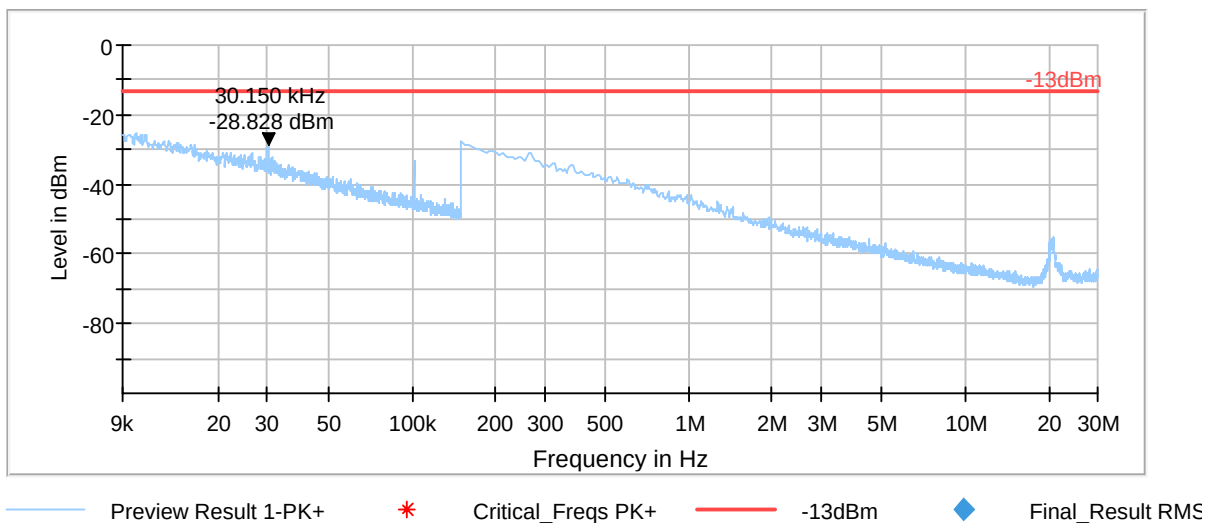
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB = (-13dBm)

7.2.3 Test conditions and setup:

Ambient Temperature (C)	EUT operating mode	Power Input
22	Op. 1	12v DC

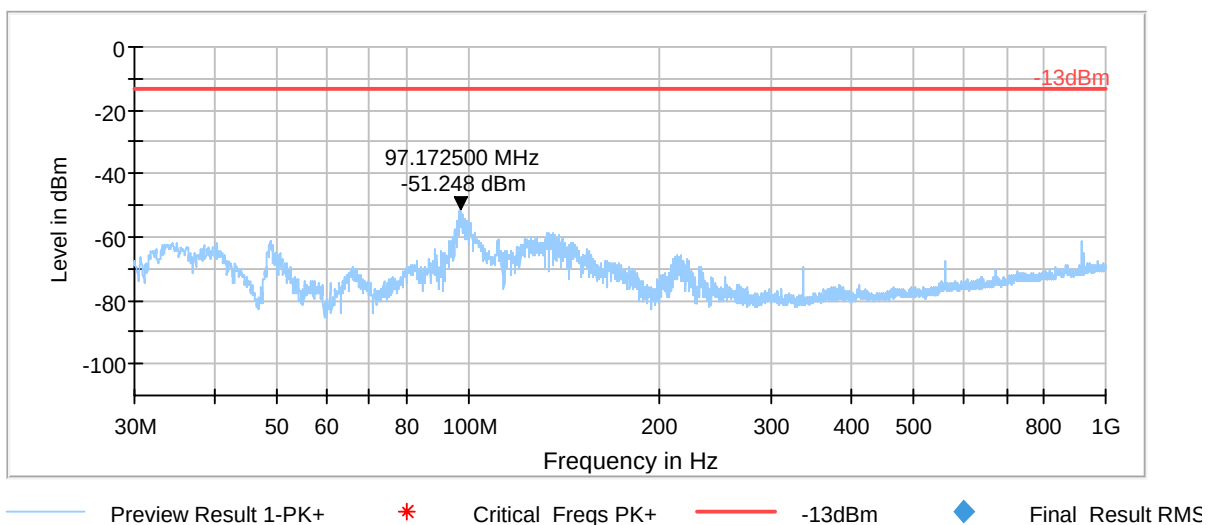
Plot # 1 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



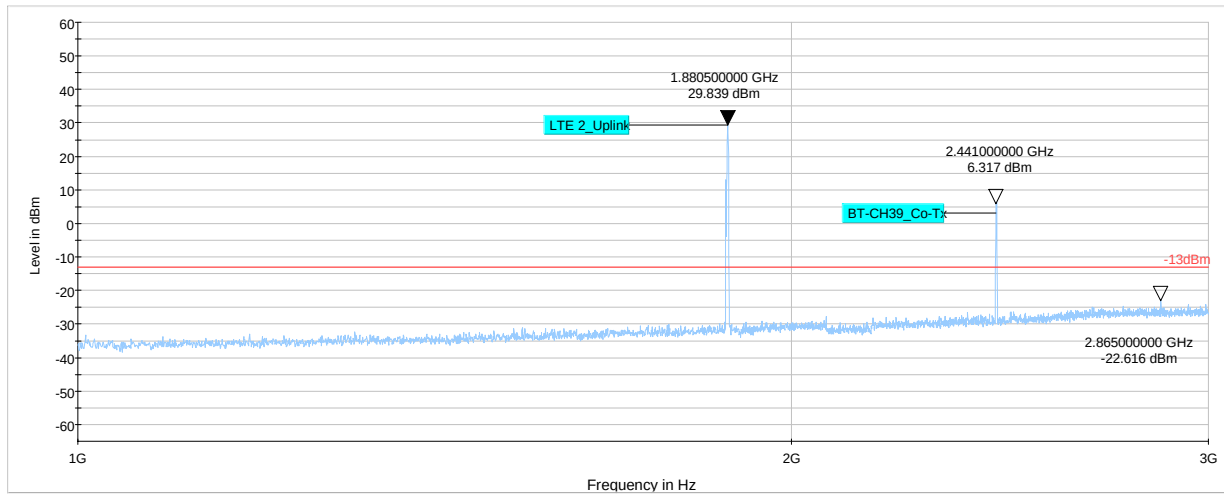
Plot # 2 Radiated Emissions: 30 MHz - 1GHz

Channel: Mid



Plot # 3 Radiated Emissions: 1 GHz - 3 GHz

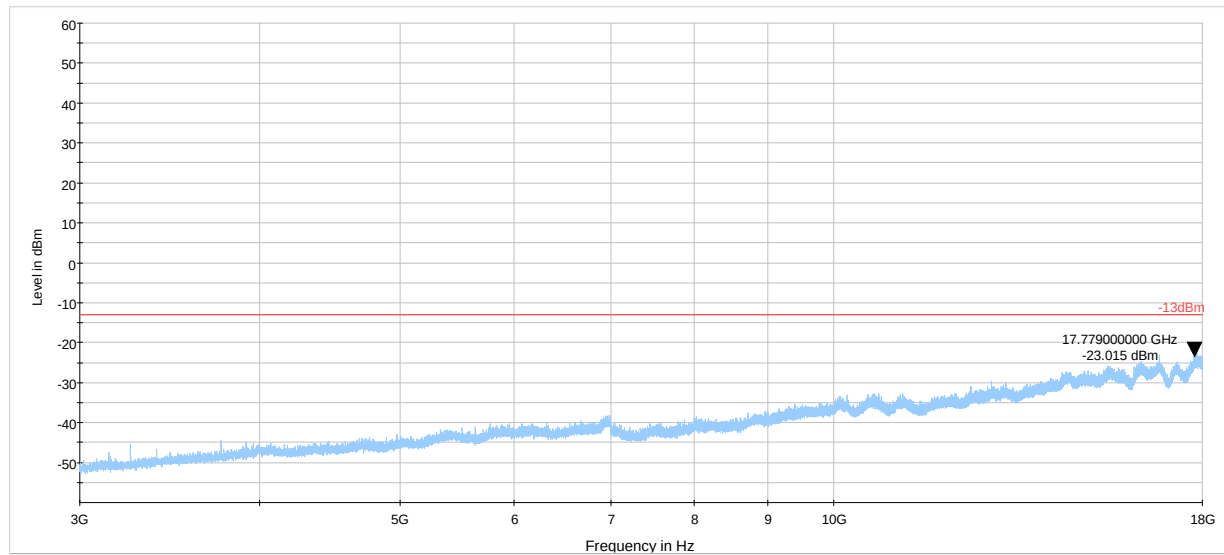
Channel: Mid



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

Plot # 4 Radiated Emissions: 3 GHz - 18 GHz

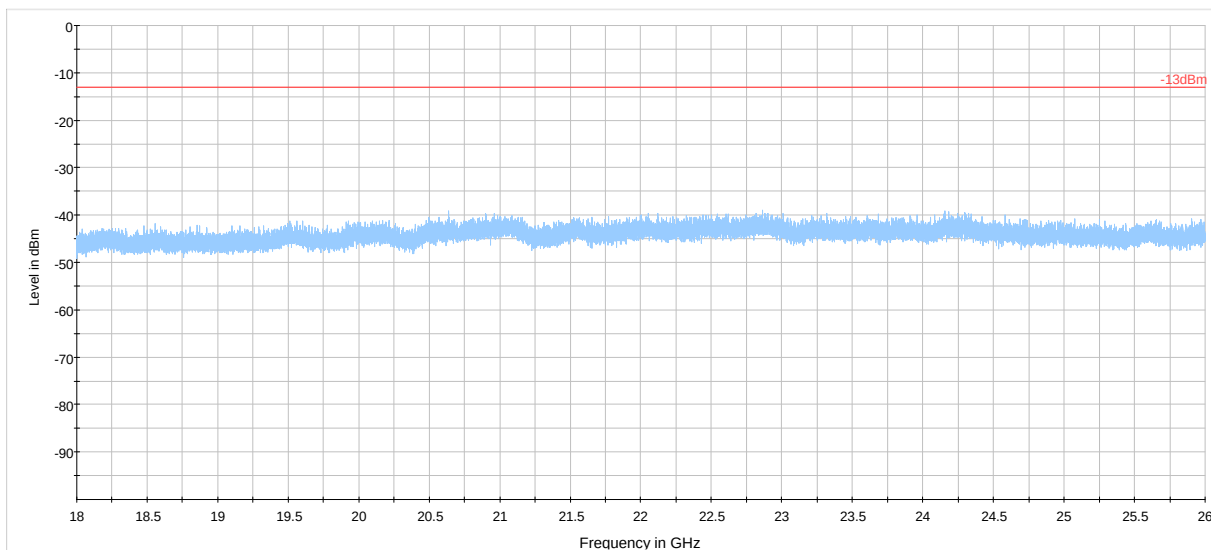
Channel: Mid



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

Plot # 5 Radiated Emissions: 18 GHz – 26 GHz

Channel: Mid

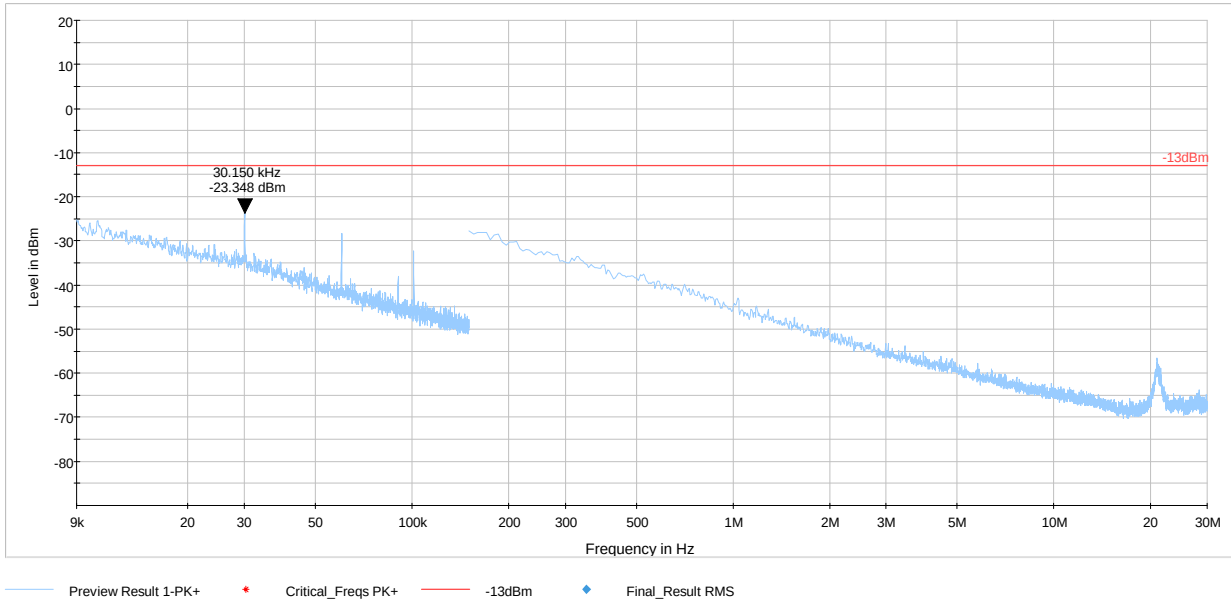


Preview Result 1-PK+ * Critical_Freqs PK+ -13dBm Final_Result RMS

LTE 4

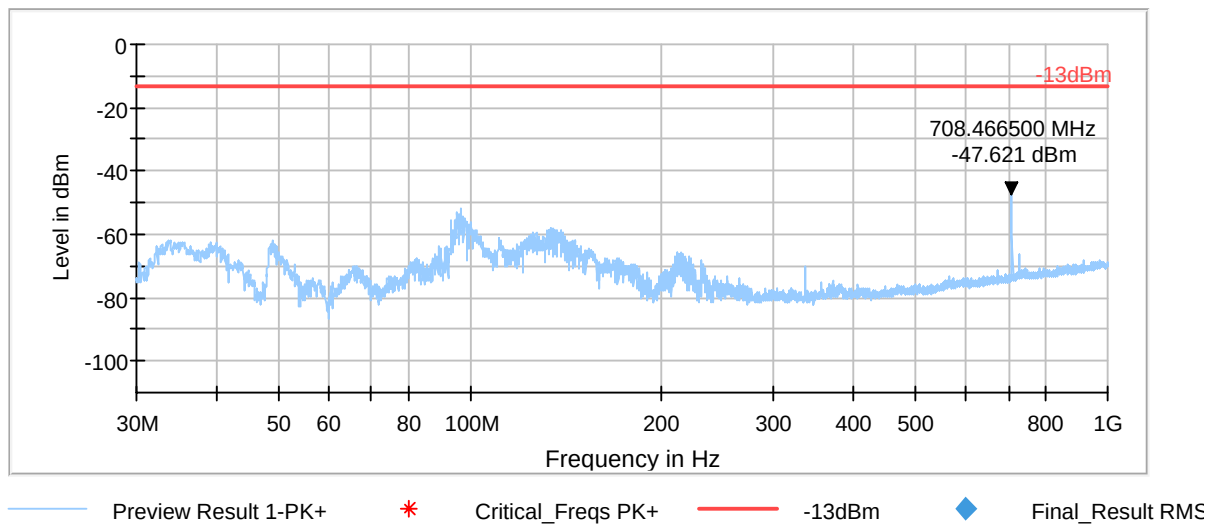
Plot # 6 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid



Plot # 7 Radiated Emissions: 30 MHz – 1GHz

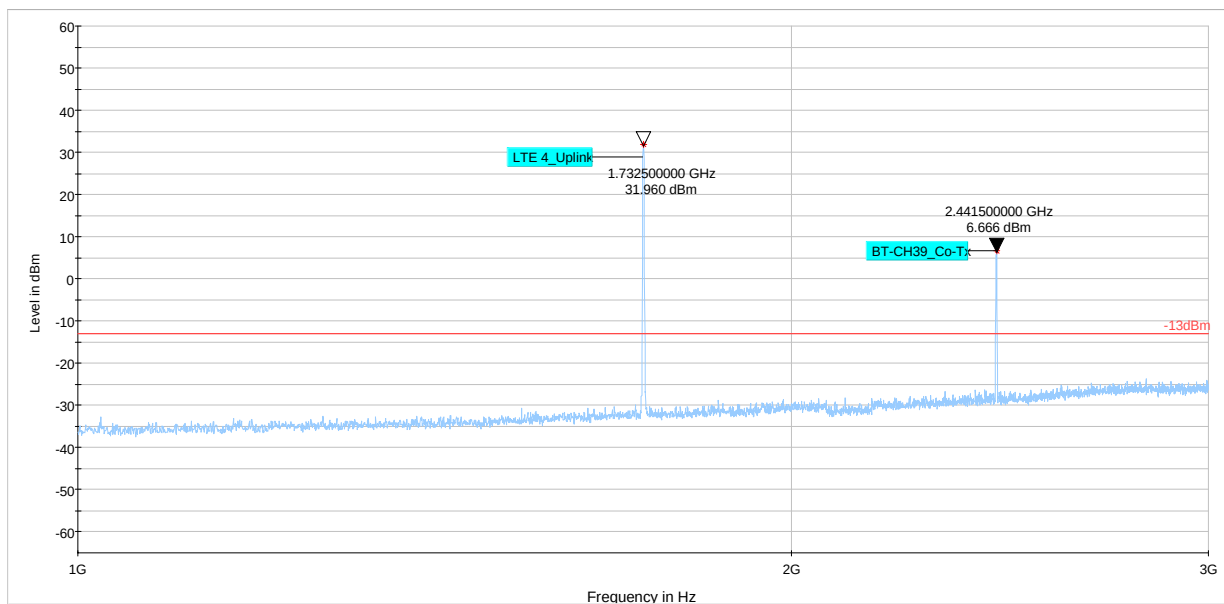
Channel: Mid



Add marker to the highest emission

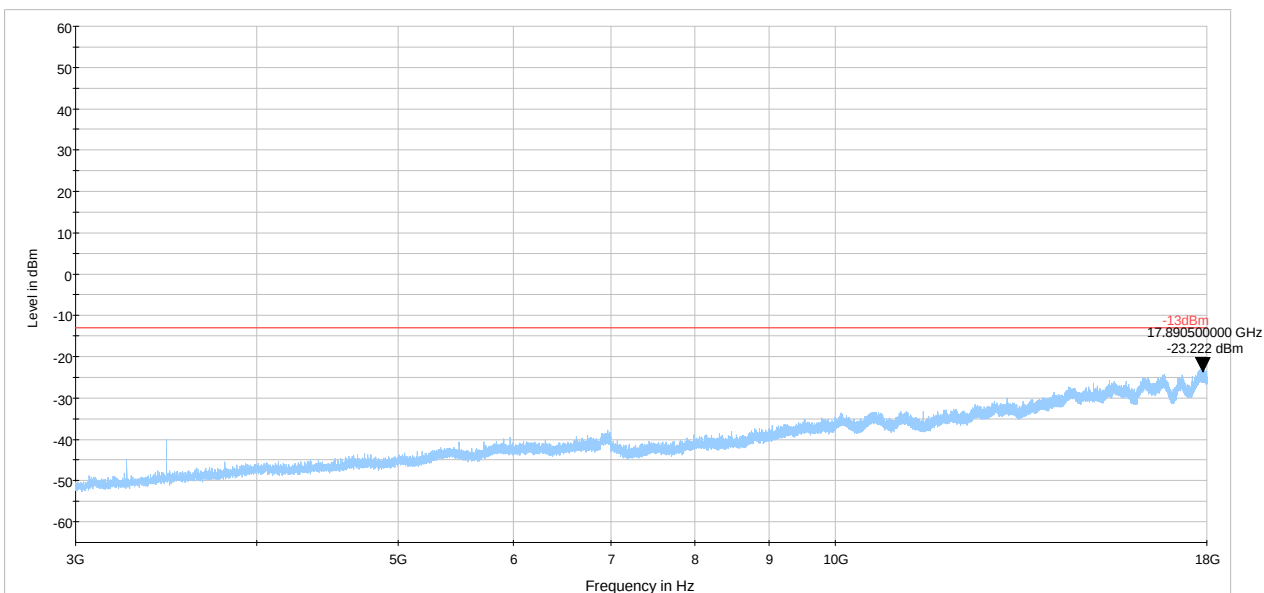
Plot # 8 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



Plot # 9 Radiated Emissions: 3 GHz – 18 GHz

Channel: Mid Add marker to the emissions and check the harmonics



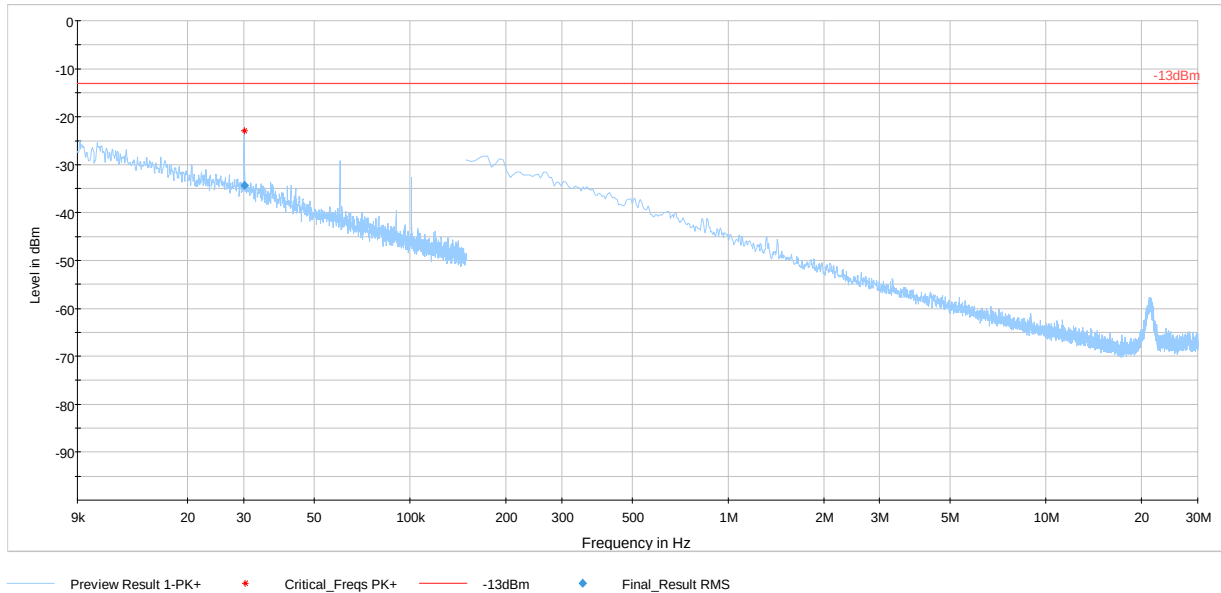
LTE 5

Plot # 10 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

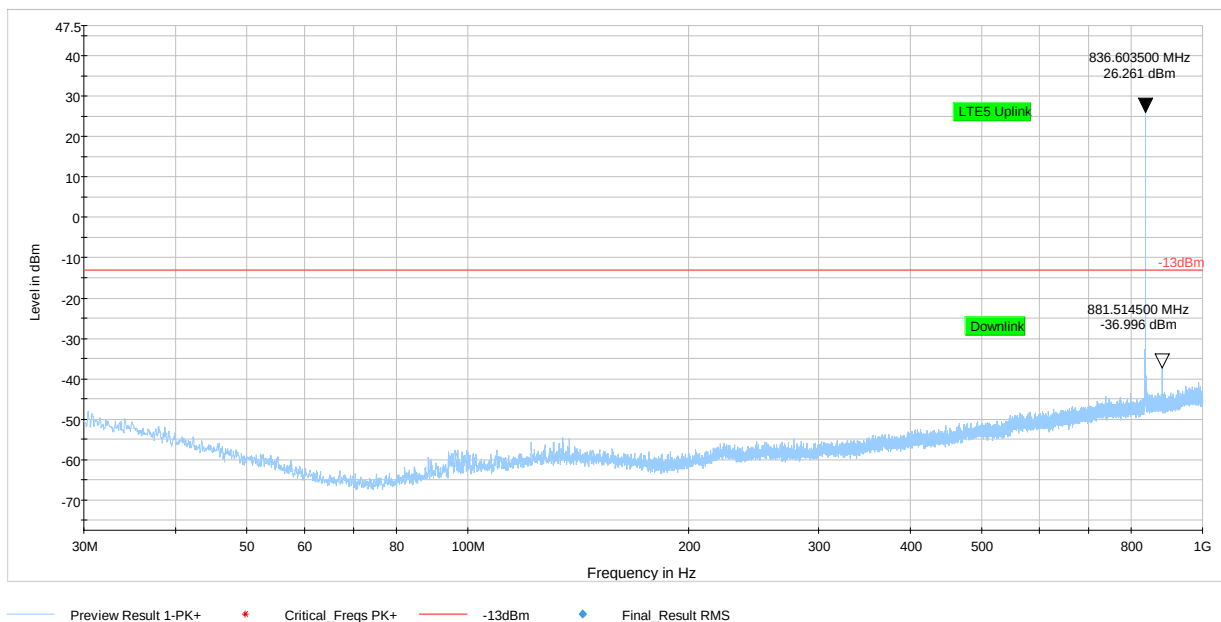
Final Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.030	-34.28	-13.00	21.28	100.0	0.1	100.0	H	162.0	-76	9:45:12 PM - 5/9/2019



Plot # 11 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid

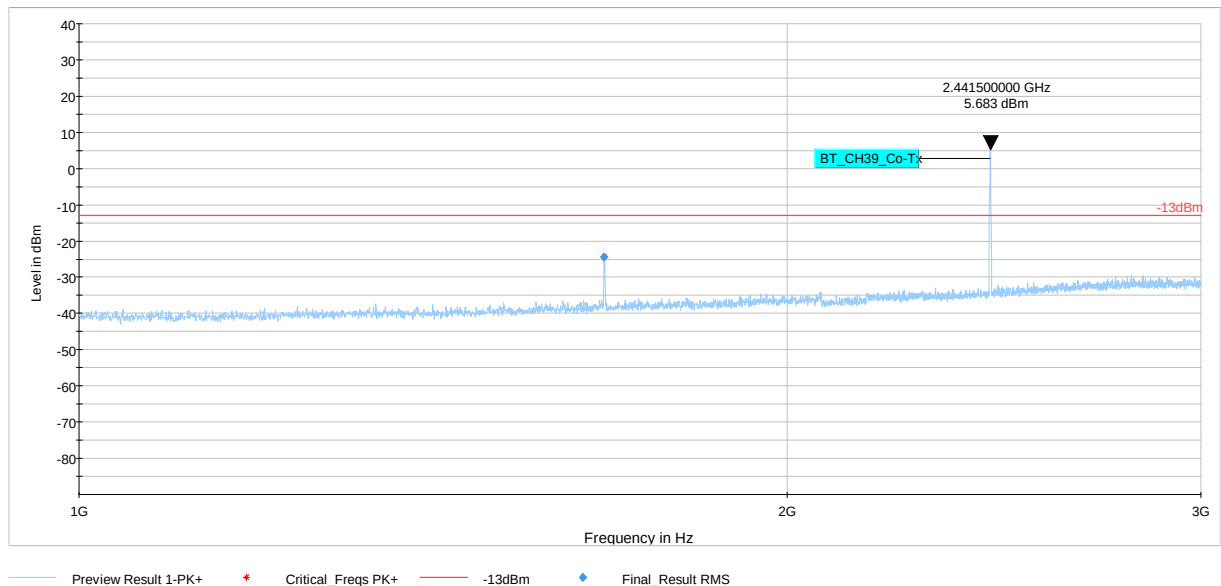


Plot # 12 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid

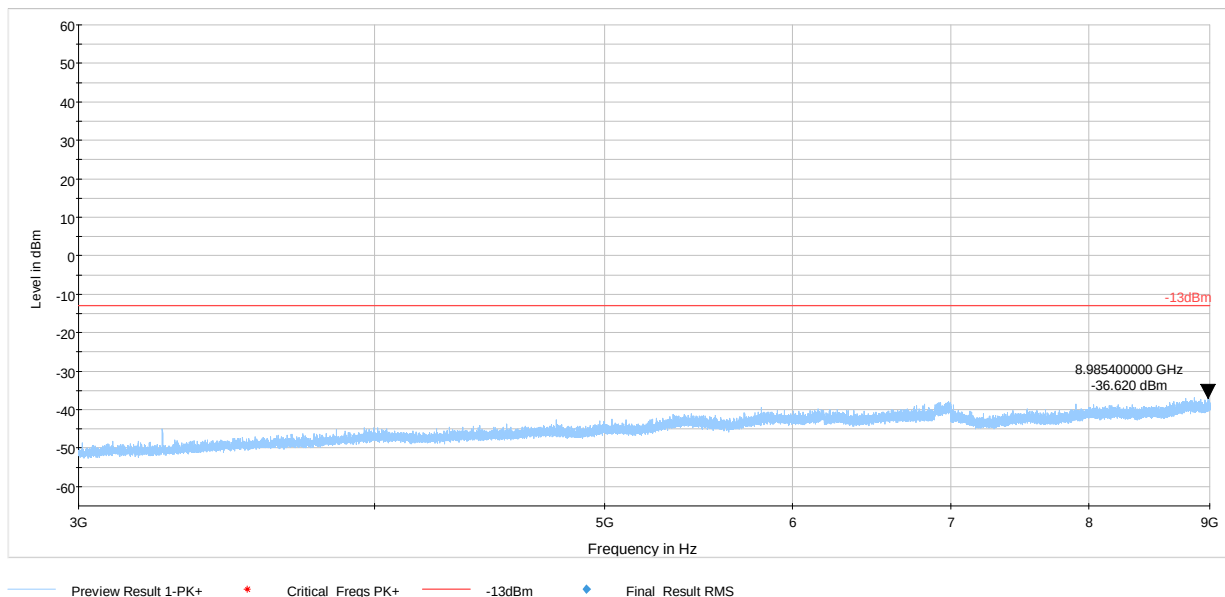
Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
1672.775	-24.41	-13.00	11.41	500.0	1000.0	108.0	H	128.0	-89	1:10:15 PM - 5/6/2019



Plot # 13 Radiated Emissions: 3 GHz – 9GHz

Channel: Mid Add marker to the highest emission and check the harmonics

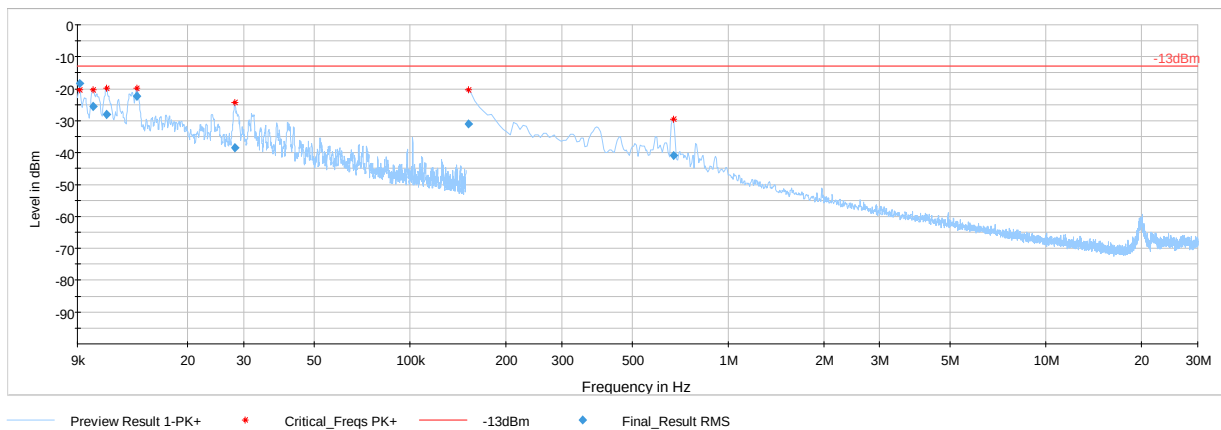


Plot # 14 Radiated Emissions: 9 kHz - 30 MHz

Channel: Mid

Final_Result

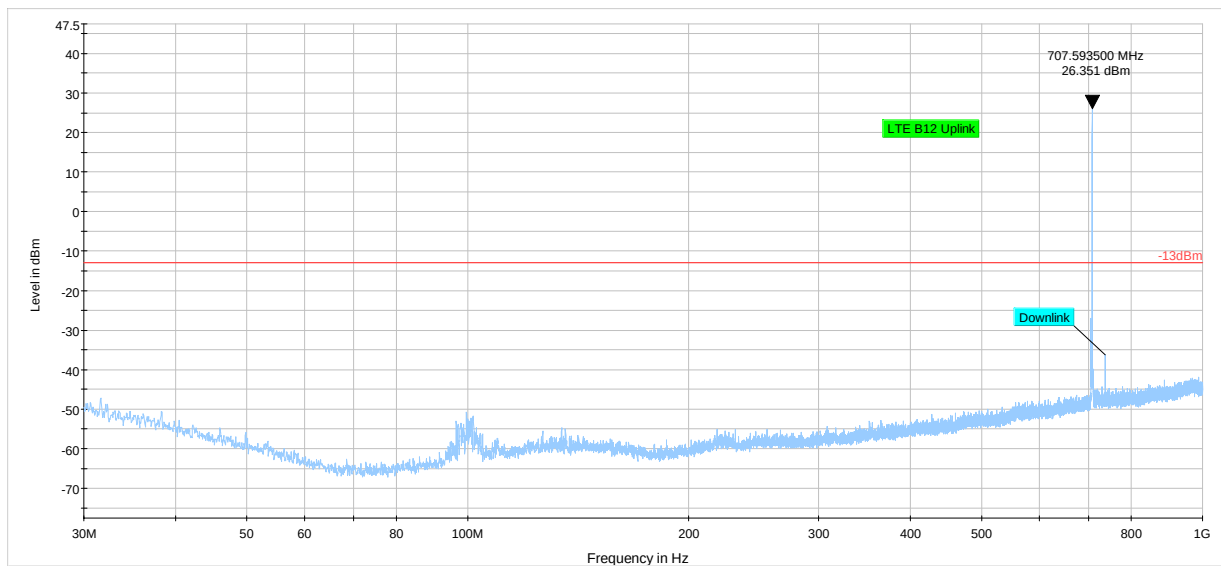
Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
0.009	-18.48	-13.00	5.48	100.0	0.1	132.0	H	209.0	-68	11:45:52 AM - 5/10/2019
0.010	-25.68	-13.00	12.68	100.0	0.1	268.0	V	163.0	-69	11:48:49 AM - 5/10/2019
0.011	-28.14	-13.00	15.14	100.0	0.1	280.0	V	198.0	-69	11:51:44 AM - 5/10/2019
0.014	-22.42	-13.00	9.42	100.0	0.1	129.0	H	13.0	-71	11:55:20 AM - 5/10/2019
0.028	-38.38	-13.00	25.38	100.0	0.1	124.0	H	83.0	-75	11:58:30 AM - 5/10/2019
0.153	-31.00	-13.00	18.00	500.0	9.0	261.0	V	322.0	-80	12:01:30 PM - 5/10/2019
0.673	-40.93	-13.00	27.93	500.0	9.0	125.0	H	-2.0	-79	12:04:54 PM - 5/10/2019



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

Plot # 15 Radiated Emissions: 30 MHz – 1 GHz

Channel: Mid



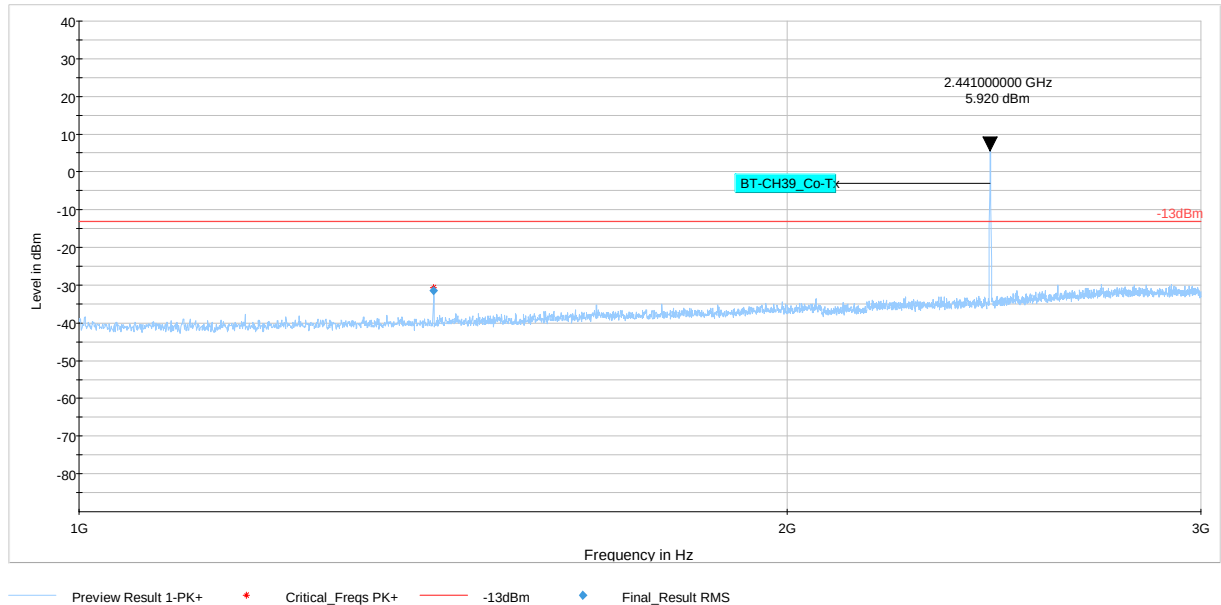
Preview Result 1-PK+ Critical_Freqs PK+ -13dBm Final_Result RMS

Plot # 16 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid

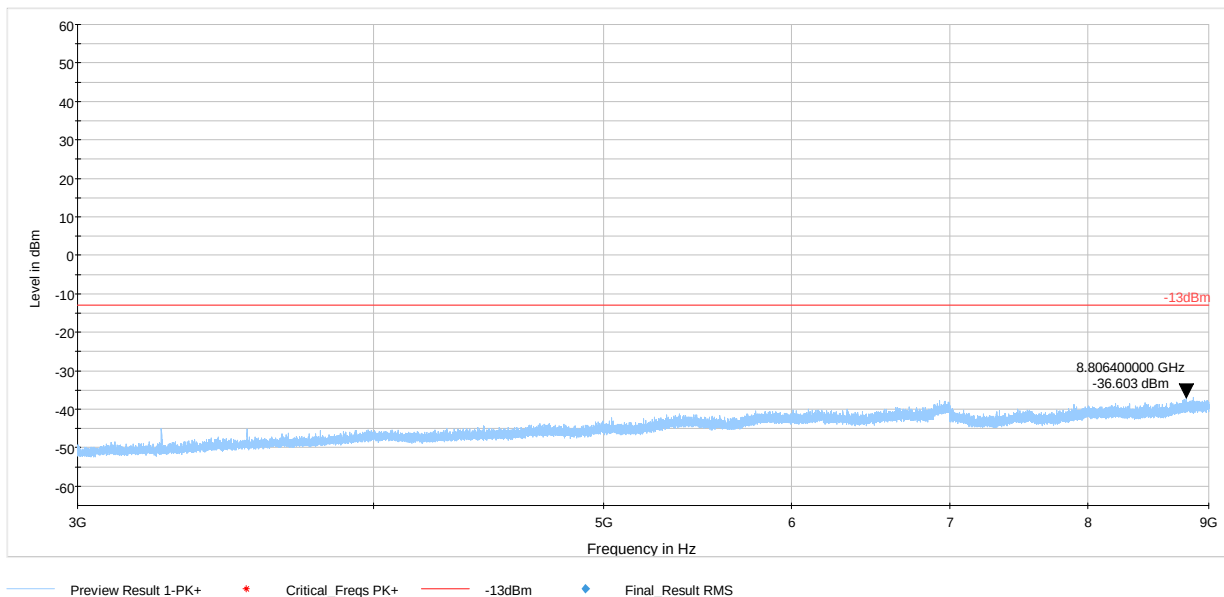
Final Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
1414.580	-31.55	-13.00	18.55	500.0	1000.0	153.0	H	-4.0	-91	2:04:48 PM -



Plot # 17 Radiated Emissions: 3 GHz - 9GHz

Channel: Mid Add marker and check harmonics



Setup photos are included in supporting file name: "EMC_PHIL4_051_19001_FCC_ISED_Setup_Photos.pdf"

9 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
ACTIVE LOOP ANTENNA	ETS LINDGREN	6507	00161344	3 YEARS	10/26/2017
BILOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
HORN ANTENNA	EMCO	3115	00035114	3 YEARS	07/31/2017
HORN ANTENNA	ETS LINDGREN	3117	00167061	3 YEARS	08/08/2017
HORN ANTENNA	ETS LINDGREN	3116C	00166821	3 YEARS	09/24/2017
SIGNAL ANALYZER	R&S	FSV 40	101022	2 YEARS	07/05/2017
VWR THERMOMETER	CONTROL COMPANY	36934-164	191871994	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
06/11/2019	EMC_PHIL4_051_19001_FCC_22_24_27_ISED_ATT_C2PC	Initial Version	Issa Ghanma