



FCC / IC Test Report

FOR:
Philips Respironics Inc

Model Name:
DreamStation

Product Description:
Continuous Airway Pressure Device with Bluetooth and LTE Radio

FCC ID: THO1116426
IC ID: 3234B-1116426, Model: 1116426

Applied Rules and Standards:
47 CFR Part 15.247
RSS-247 Issue 2 & RSS-Gen Issue 4

REPORT #: EMC_PHIL4-040-18001_FCC_15.247

DATE: 03/01/2018



A2LA Accredited

IC recognized #
3462B-2

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1 Assessment

The following device was evaluated radiated spurious emission against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISSED Canada standard RSS-247.

No deviations were ascertained.

Company	Description	Model #
Philips Respironics Inc	Continuous Airway Pressure Device with Bluetooth and LTE Radio	200603C 200604C

Responsible for Testing Laboratory:

03/01/2018	Compliance	James Donnellan (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

03/01/2018	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: 2018.03.05 14:57:41 -08'00'
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
Director Radio Com. and EMC:	Peter Nevermann
Responsible Project Leader:	Cindy Li

2.2 Identification of the Client

Applicant's Name:	Philips Respironics Inc
Street Address:	1740 Goldn Mile Highway
City/Zip Code	Monroeville, PA 15146
Country	USA
Contact Person:	Jerry Shore
Phone No.	724 387 7578
e-mail:	jerry.shore@philips.com

2.3 Identification of the Manufacturer

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

3 Equipment under Test (EUT)

3.1 EUT Specifications

Model No:	200603C, 200604C
HW Version :	-00
SW Version :	V 3.00.02
FCC-ID :	THO1116426
IC-ID:	3234B-1116426 / M/N: 1116426
FWIN:	DreamStation
HVIN:	DreamStation
PMN:	DreamStation
Product Description:	Continuous Airway Pressure Device with Bluetooth and LTE Radio
Frequency Range / number of channels:	Nominal band: 2400 MHz – 2483.5 MHz; Bluetooth LE 4.0: Center to center: 2402 MHz – 2480 MHz, 40 channels Bluetooth 2.1+EDR: Center to center: 2402 MHz – 2480 MHz ,79 channels
Type(s) of Modulation:	Bluetooth 2.1+EDR: GFSK, $\pi/4$ DQPSK, 8DPSK BLE 4.0: GFSK
Modes of Operation:	Fix channel transmission
Antenna Information as declared:	Internal, PIFA PCB, peak gain = 1.5dBi (typ.)
Max. Peak Conducted Output Power Documented:	5.13dBm
Power Supply/ Rated Operating Voltage Range:	AC/DC Adapter
Operating Temperature Range	5-35 ⁰ C(acc. host manual)
Other Radios included in the device:	Modem module LTE Cat M1 Band13
Sample Revision	☐ Prototype Unit; ☒ Production Unit; ☐ Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	J188514909770	-00	V3.00.02	Radiated Sample

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	LTE Modem module	DreamStation cellular modem	Philips Respironics Inc	CTEB100291988
2	AC/DC adapter	MDS-080AAS12 A	Delta Electronics Inc	70HW65K04KU

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	2-DH5	Per previous test report ¹ , EUT Generates the highest output power with 2-DH5 modulation type, which will be the worst case for radiated spurious emission test.

Note1: Test report EMC_PHIL4-007-14001_15.247_BT_EDR is leveraged

3.6 Justification for Worst Case Mode of Operation

Previous report EMC_PHIL4-007-14001_15.247_BT_EDR has shown the highest output power when transmitting with operation mode 2-DH5 ($\pi/4$ DQPSK with 5 slot package) which is therefore the worst case for unwanted emission measurements. The target mode was selected by using "NirvanaBTTestSuite" provided by client. The radiated spurious emissions test result in this report also covers BTLE mode since the same hardware is used.

During the testing process the EUT was tested with transmitter sets on low, mid and high channels. 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 measurements done by CETECOM Inc. was to assess the transmitter spurious emission of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 Issue 2 of ISED Canada.

This test report is to support a request for new equipment authorization under the:

- FCC ID: THO1116426
- IC ID: 3234B-1116426

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(d) §15.209(a) RSS-Gen 6.13	TX Spurious emissions- Radiated	Nominal	2-DH5	■	□	□	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	2-DH5	■	□	□	Complies

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

6 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 30 MHz	±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

RF conducted measurement	±0.5 dB
--------------------------	---------

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: <http://physics.nist.gov/cuu/Uncertainty/typeb.html>. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

6.2 Dates of Testing:

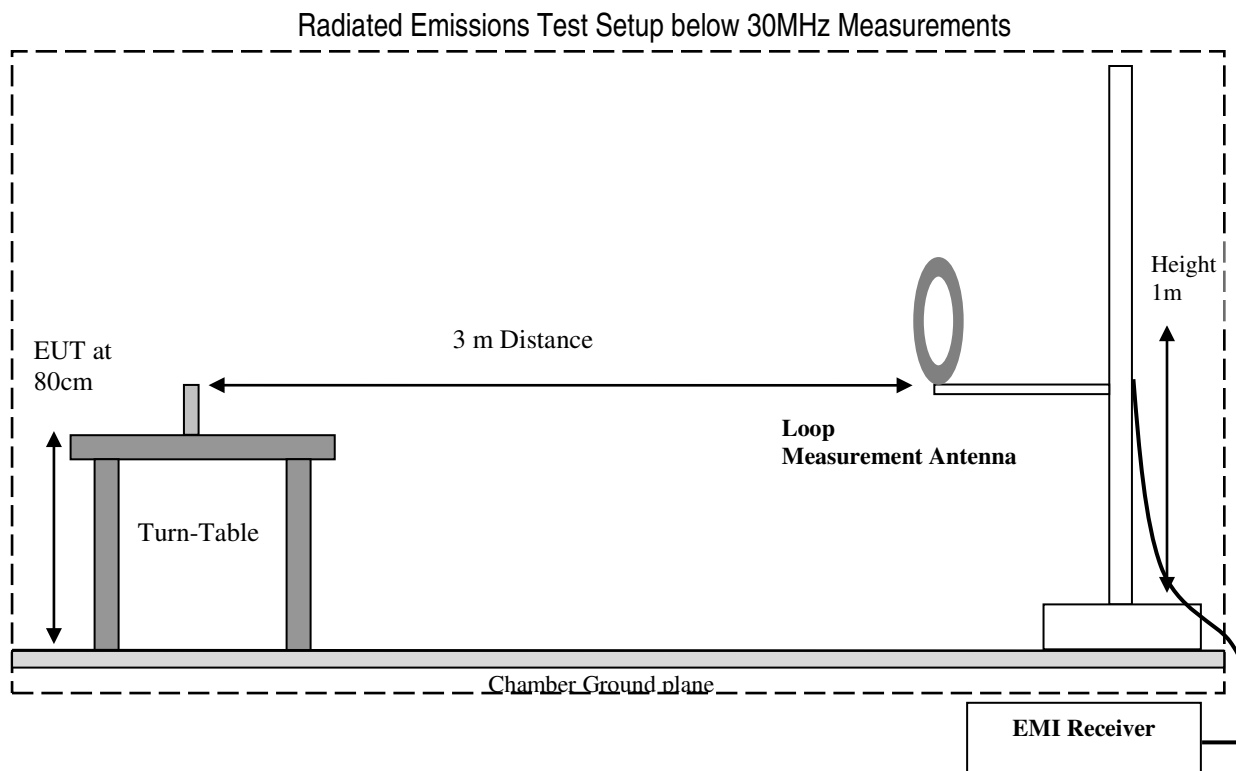
02/12/2018 – 03/01/2018

7 Measurement Procedures

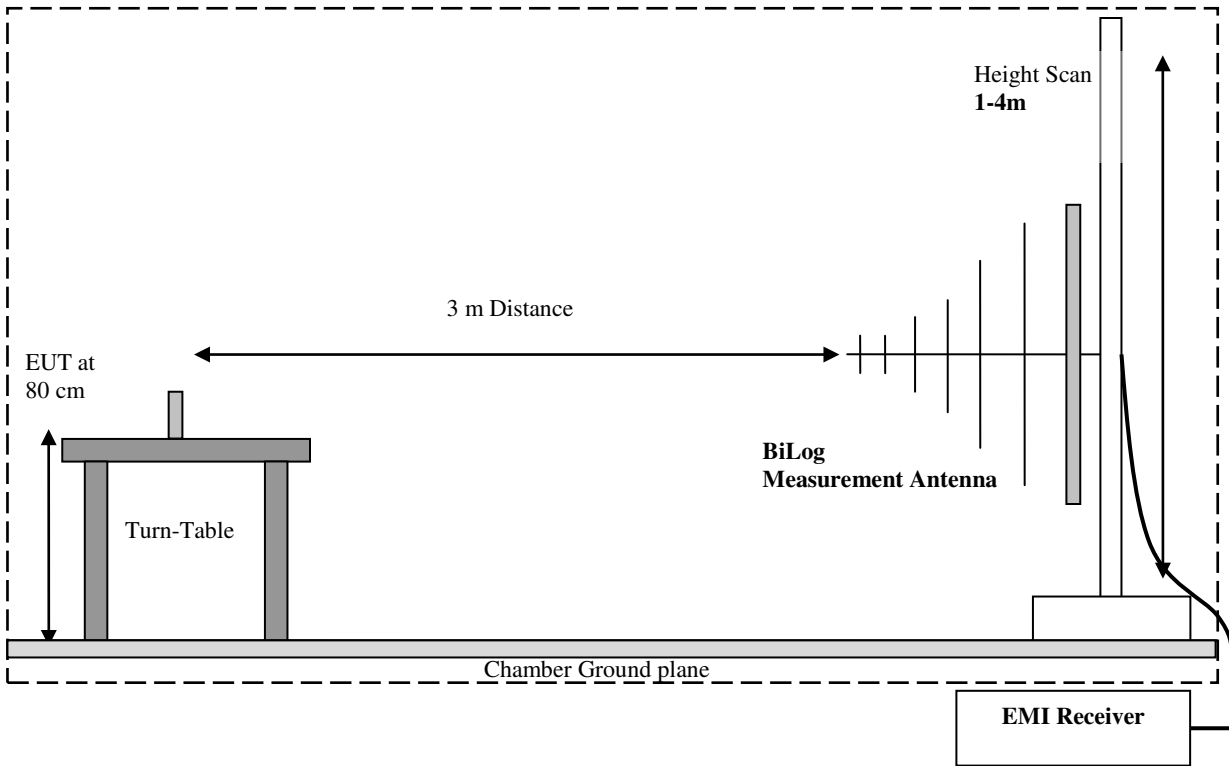
7.1 Radiated Measurement

The radiated measurement is performed according to ANSI C63.10 (2013)

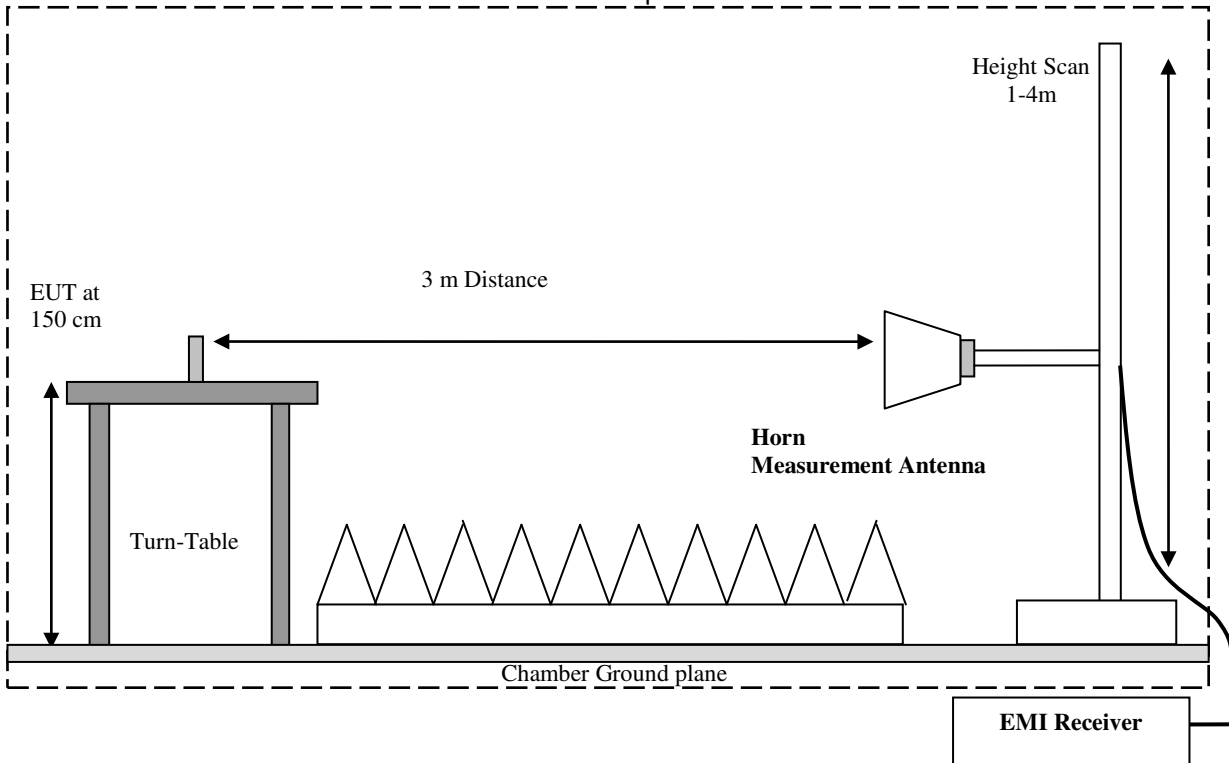
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to 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 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

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

1. Measured reading in dB μ V
2. Cable Loss between the receiving antenna and SA in dB and
3. 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

8 Test Result Data

8.1 Radiated Transmitter Spurious Emissions and Restricted Bands

8.1.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) = $40 \log (D/d) = 40 \log (300m / 3m) = 80dB$

8.1.2 Limits:

FCC §15.247

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength ($\mu\text{V/m}$)	Measurement Distance (m)	Field strength @ 3m (dB $\mu\text{V/m}$)
0.009–0.490	2400/F(kHz) / -----	300	-
0.490–1.705	24000/F(kHz) / -----	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dB $\mu\text{V/m}$
88–216	150	3	43.5 dB $\mu\text{V/m}$
216–960	200	3	46 dB $\mu\text{V/m}$
Above 960	500	3	54 dB $\mu\text{V/m}$

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

*PEAK LIMIT= 74 dB $\mu\text{V/m}$

*AVG. LIMIT= 54 dB $\mu\text{V/m}$

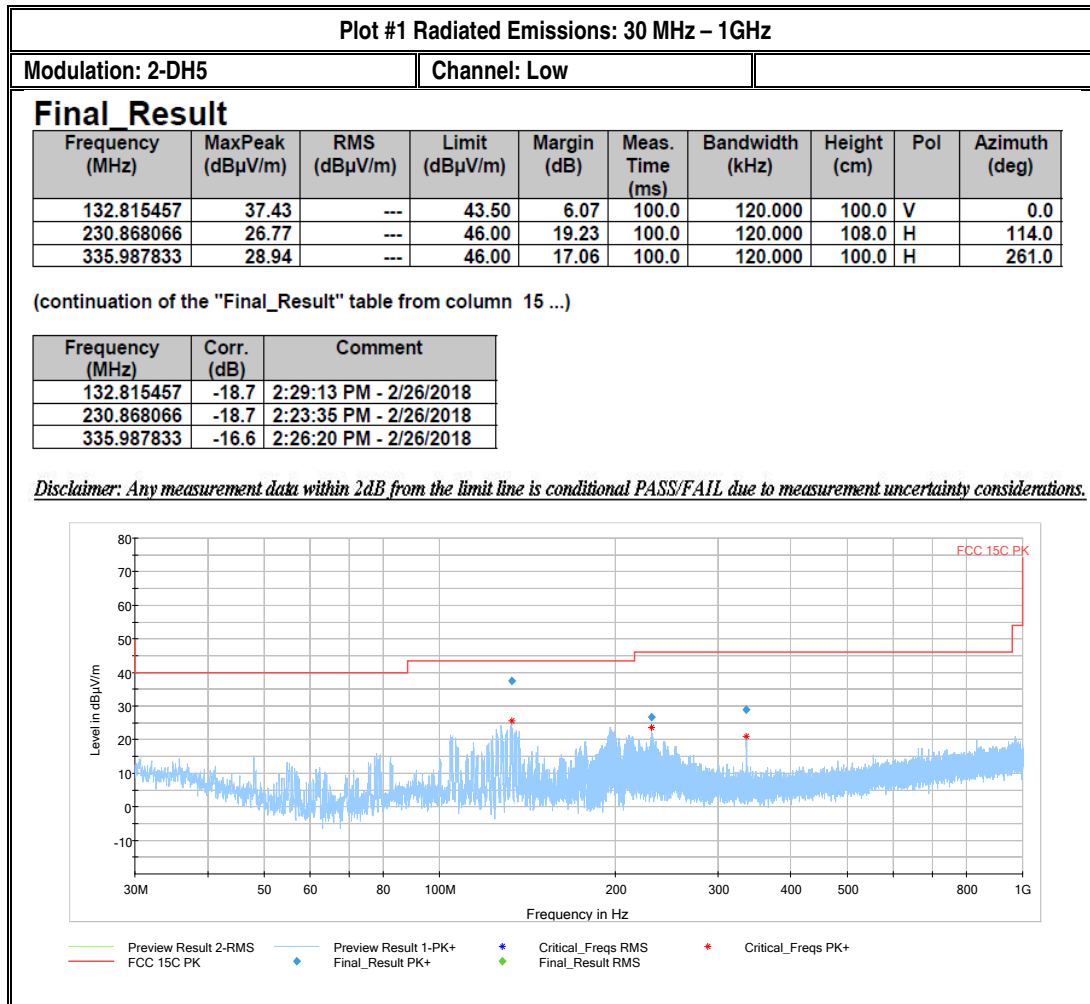
8.1.3 Test conditions and setup:

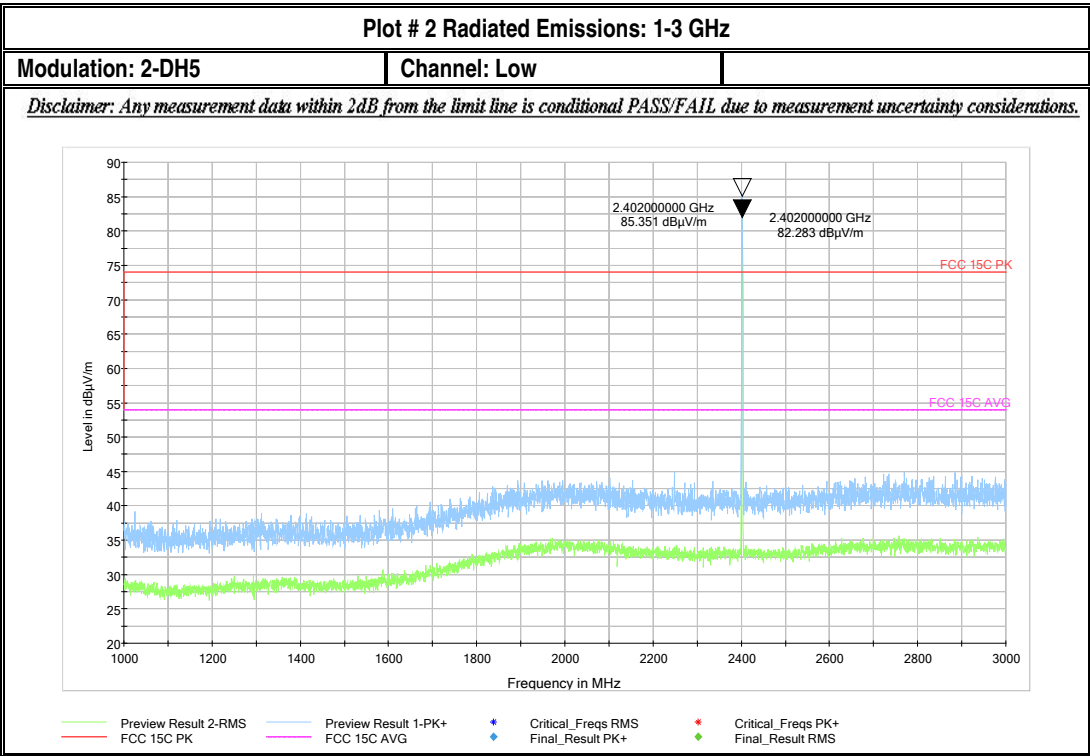
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	1	AC/DC Adapter

8.1.4 Measurement result:

Plot #	Mode	Channel #	Scan Frequency	Limit	Result
1-3	2-DH5	Low	30 MHz – 18 GHz	See section 8.1.2	Pass
4-8	2-DH5	Mid	9 kHz – 26 GHz	See section 8.1.2	Pass
9-11	2-DH5	High	30 MHz – 18 GHz	See section 8.1.2	Pass

8.1.5 Measurement Plots:





Note: The peak signal above is the Bluetooth transmit signal.

Plot # 3 Radiated Emissions: 3-18 GHz

Modulation: 2-DH5

Channel: Low

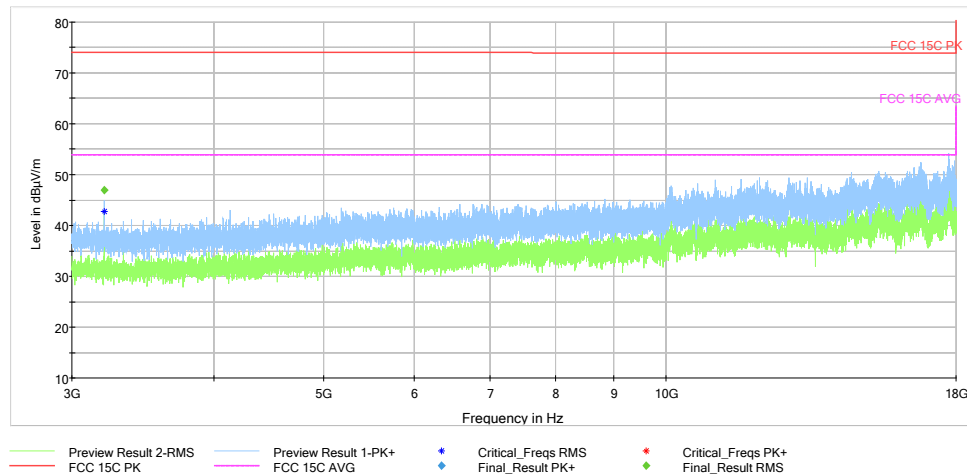
Final_Result

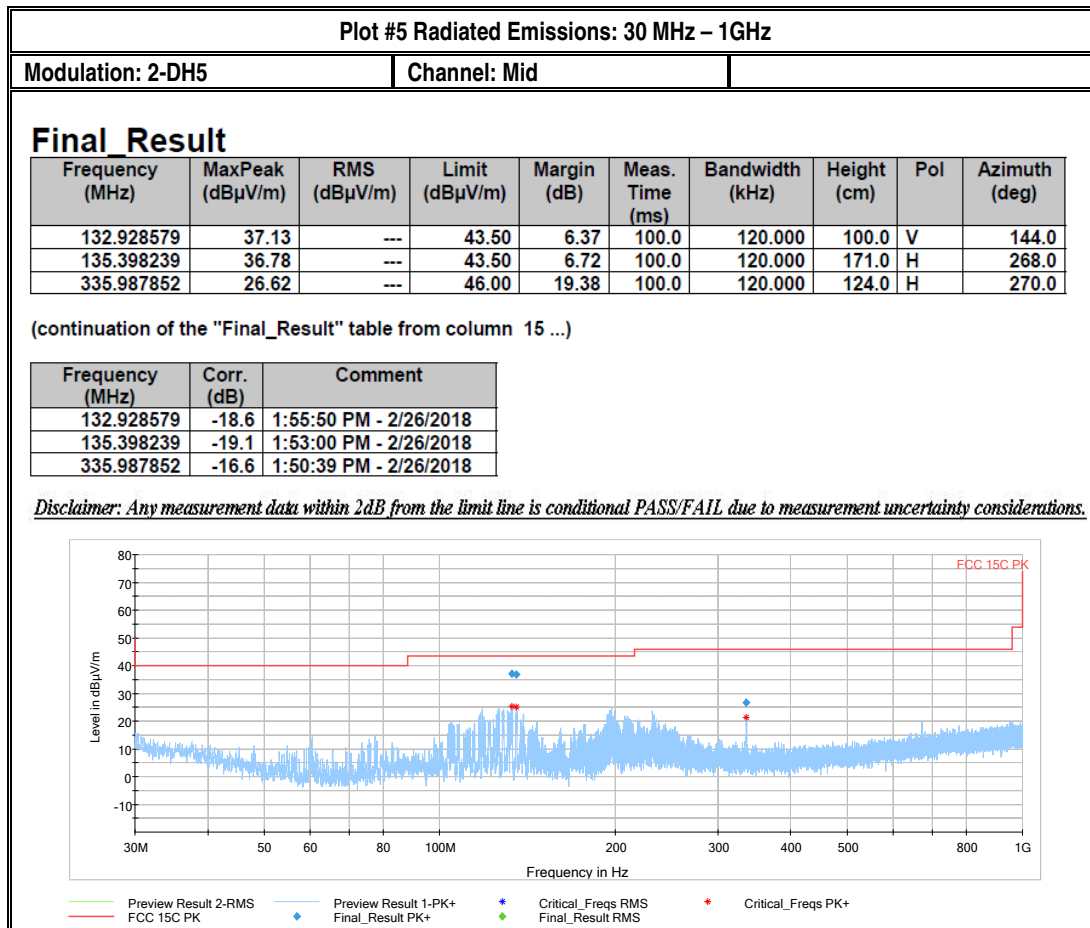
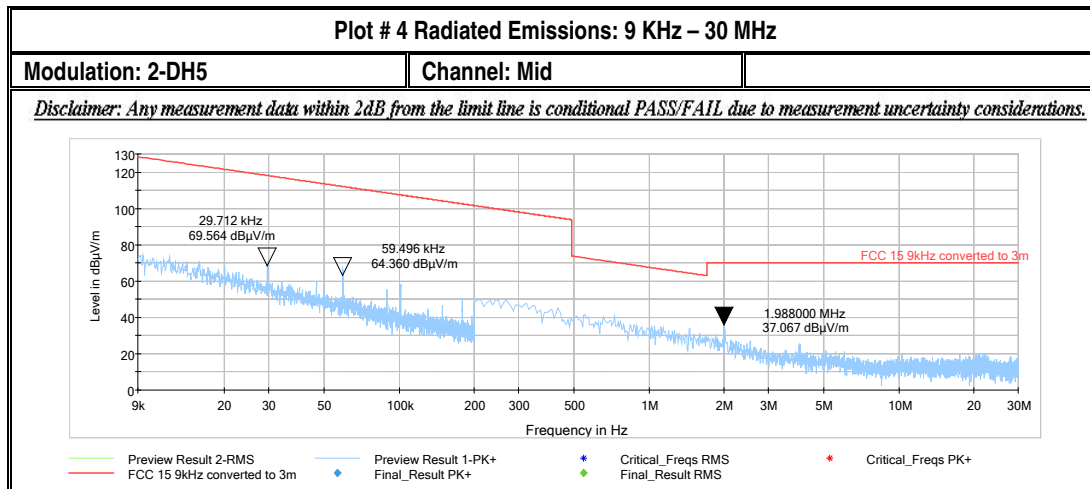
Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3202.723667	---	46.98	53.98	7.00	200.0	1000.000	247.0	V	15.0

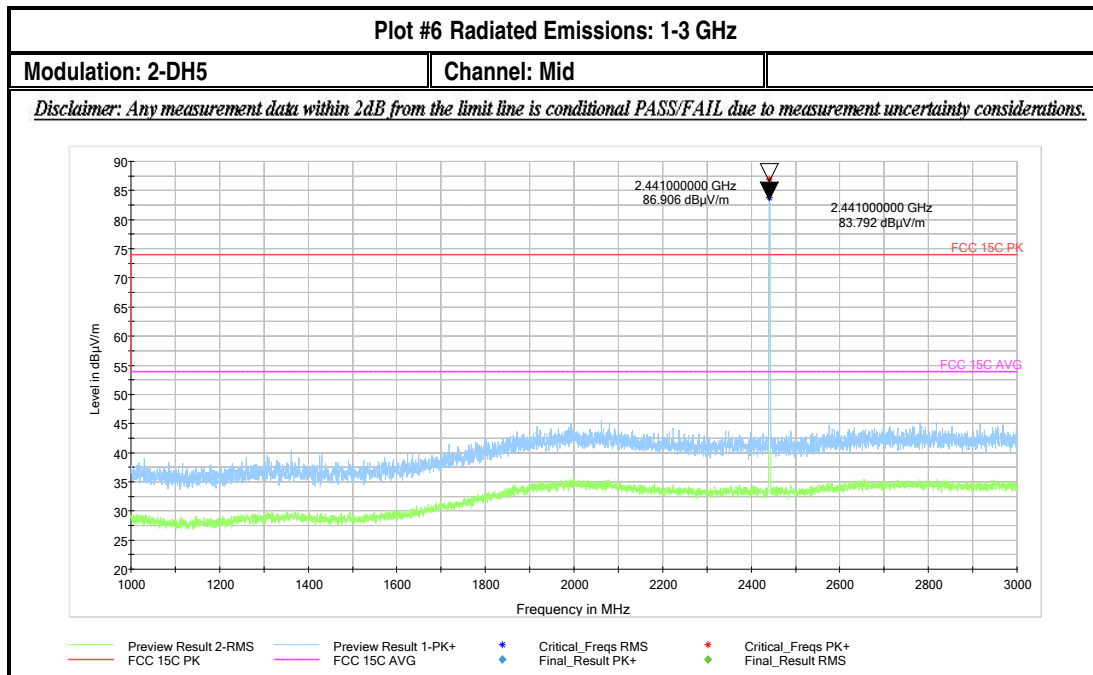
(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
3202.723667	-35.8	2:45:04 PM - 2/26/2018

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.







Note: The peak signal above is the Bluetooth transmit signal.

Plot #7 Radiated Emissions: 3-18 GHz

Modulation: 2-DH5

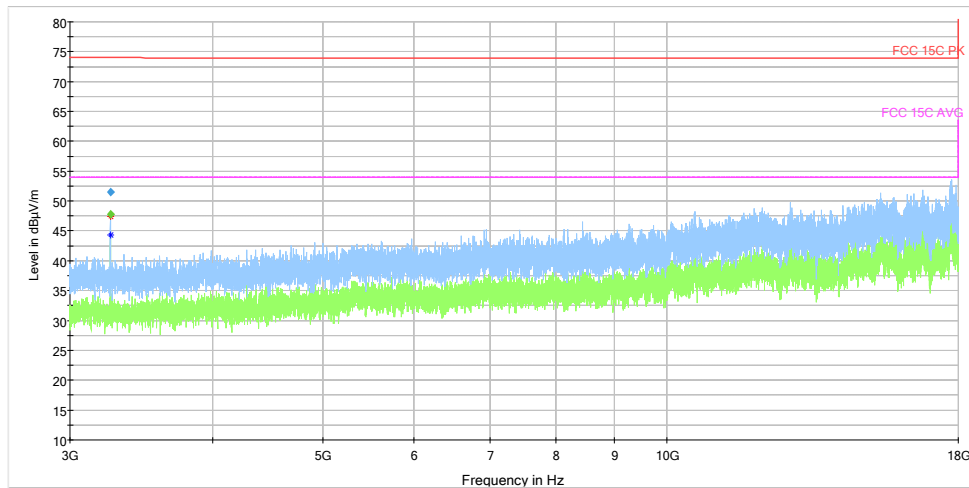
Channel: Mid

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
3254.797333	51.45	---	73.99	22.54	200.0	1000.000	291.0	H	-12.0
3254.803267	---	47.85	53.98	6.13	200.0	1000.000	289.0	H	-13.0

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

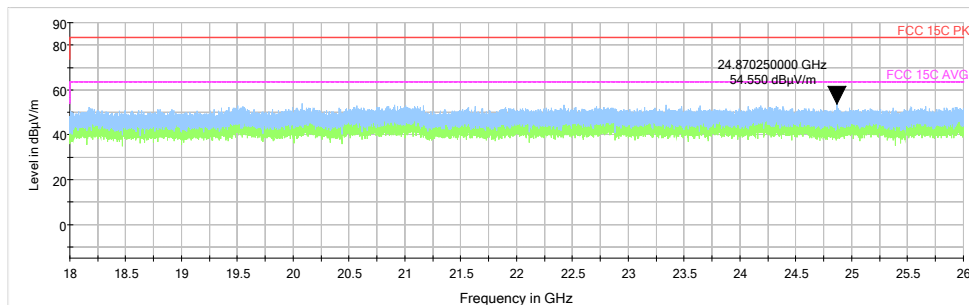
Frequency (MHz)	Corr. (dB)	Comment
3254.797333	-35.8	8:13:44 PM - 2/23/2018
3254.803267	-35.8	8:17:16 PM - 2/23/2018

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.

Plot #8 Radiated Emissions: 18-26 GHz

Modulation: 2-DH5

Channel: Mid

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.

Plot #9 Radiated Emissions: 30 MHz – 1GHz

Modulation: 2-DH5

Channel: High

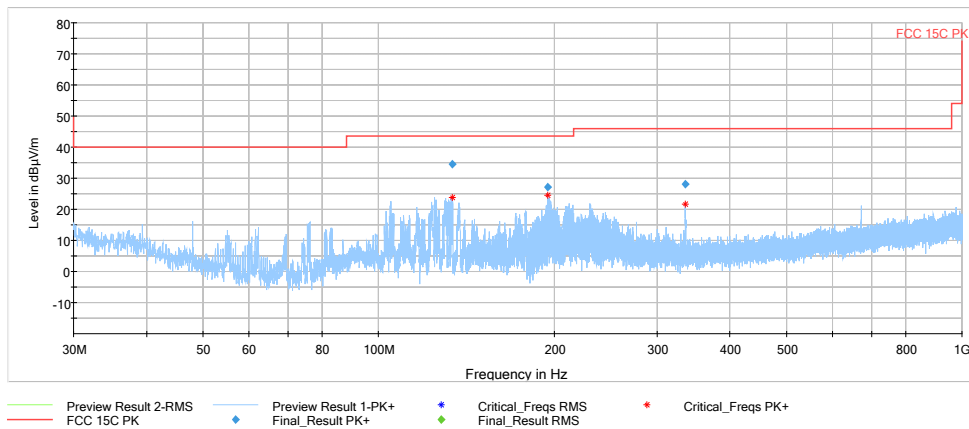
Final_Result

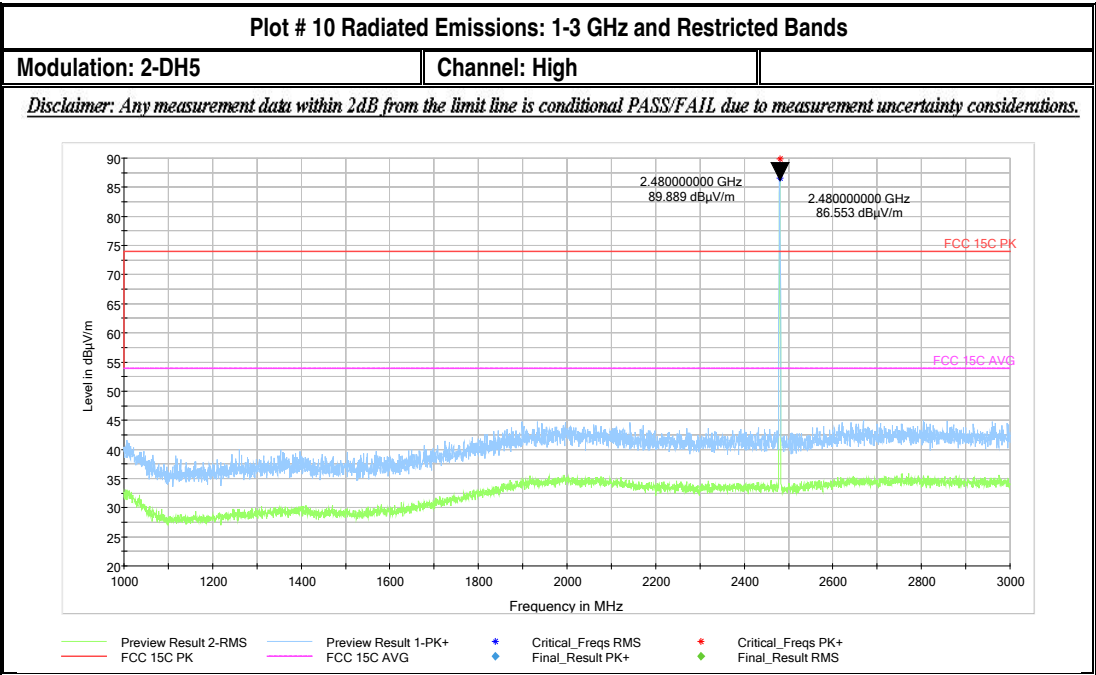
Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
133.918645	34.42	---	43.50	9.08	100.0	120.000	100.0	V	25.0
194.754696	27.19	---	43.50	16.31	100.0	120.000	124.0	H	81.0
335.921288	28.14	---	46.00	17.86	100.0	120.000	108.0	H	181.0

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

Frequency (MHz)	Corr. (dB)	Comment
133.918645	-18.7	2:13:05 PM - 2/26/2018
194.754696	-20.2	2:07:23 PM - 2/26/2018
335.921288	-16.6	2:10:16 PM - 2/26/2018

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.





Note: The peak signal above is the Bluetooth transmit signal.

Plot #11 Radiated Emissions: 3-18 GHz

Modulation: 2-DH5

Channel: High

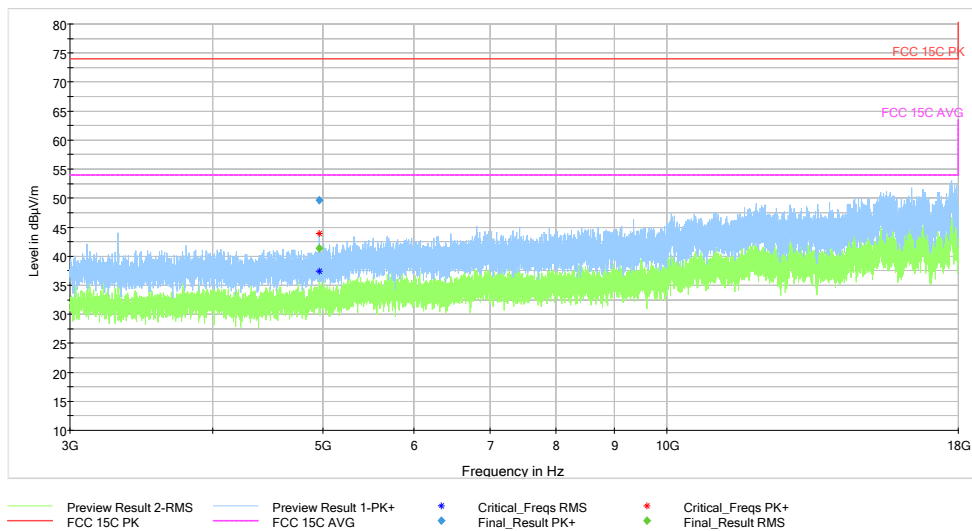
Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4959.980967	---	41.39	53.98	12.58	200.0	1000.000	210.0	V	18.0
4960.115533	49.61	---	73.99	24.38	200.0	1000.000	210.0	V	22.0

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

Frequency (MHz)	Corr. (dB)	Comment
4959.980967	-31.8	7:53:19 PM - 2/23/2018
4960.115533	-31.8	7:49:48 PM - 2/23/2018

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



8.2 AC Power Line Conducted Emissions

8.2.1 Measurement according to ANSI C63.10 (2013)

Analyzer Settings:

- RBW = 9 KHz (CISPR Bandwidth)
- Detector: Peak / Average for Pre-scan
- Quasi-Peak/Average for Final Measurements

8.2.2 Limits: §15.207 & RSS-Gen 8.8

FCC §15.207(a) & RSS-Gen 8.8

- Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

8.2.3 Test conditions and setup:

Ambient Temperature ©	EUT Set-Up #	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
22	1	1	Line & Neutral	AC/DC Adapter

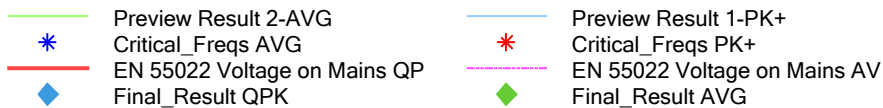
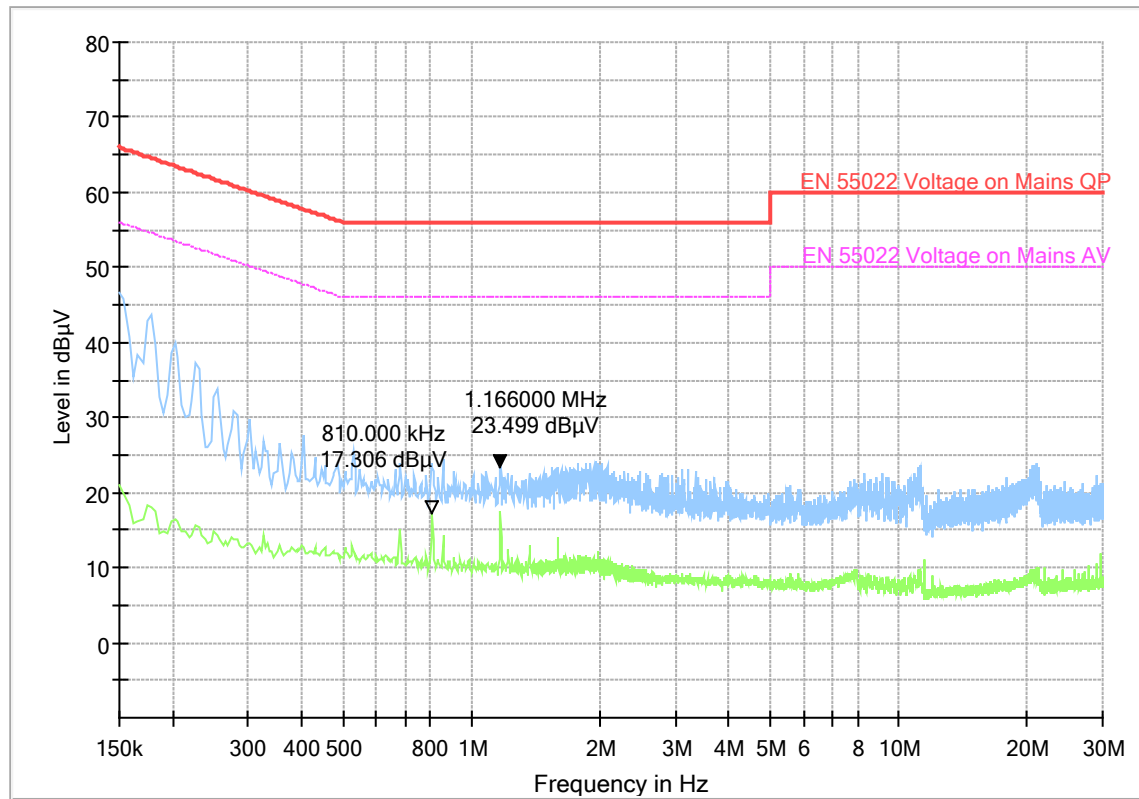
8.2.4 Measurement Result:

Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	1	1	150 kHz – 30 MHz	See section 8.2.2	Pass

8.2.5 Measurement Plots:

Plot #1

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



9 Test setup photos

Setup photos are included in supporting file name: "EMC_PHIL4-040-18001_FCC_15.247_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	Biconilog Antenna	EMCO	3142E	166067	3 years	6/27/2017
Active Loop 6507	Loop Antenna	ETS Lindgren	6507	00161344	3 years	10/26/2017
Antenna Horn 3115	Horn Antenna	EMCO	3115	35111	3 years	11/17/2015
Antenna Horn 3116	Horn Antenna	ETS Lindgren	3116	70497	3 years	10/31/2017
Digital Barometer	Compact Digital Barometer	Control Company	35519-055	91119547	3 Years	6/8/2017
CMU 200	Universal Communication Tester	R&S	CMU 200	110229	3 years	5/18/2017
FSU	Spectrum Analyzer	R&S	FSU	200302	2 Years	7/5/2017
ESU	EMI Test Receiver	R&S	ESU	1302.6005K40-100251-KB	2 years	7/10/2017
Thermometer Humidity TM320	Thermometer Humidity	Dickson	AY1072	0528	1 Year	11/2/2016

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.

11 Revision History

Date	Report Name	Changes to report	Report prepared by
03/01/2018	EMC_PHIL4-040-18001_FCC_15.247	Initial Version	Cindy Li