

Test Report # 317347 C

Equipment Under Test:	PHC-11AC1-A
Requirement	FCC 15.247, ISED Canada RSS-247 for a Bluetooth Low Energy device
Test Date(s):	5/1/2019 – 1/24/2020
Prepared for:	Philips North America LLC Attn: Mark Nolin 3000 Minuteman Road Andover, MA 1810

Report Issued by: Shane Dock, EMC Engineer

Signature:



Date: 4/15/2020

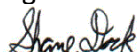
Report Reviewed by: Adam Alger, Quality Manager

Signature: 

Date: 4/15/2020

Report Constructed by: Shane Dock, EMC Engineer

Signature:



Date: 1/15/2020

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Company: Philips North America LLC	Page 1 of 39	Name: PHC-11AC1-A
Report: TR 317347 C		Model: PHC-11AC1-A
Job: C-3013		Serial: Engineering samples

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Laird Connectivity Test Services in Review

The Laird Connectivity. laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein, unless otherwise noted.



Federal Communications Commission (FCC) – USA

Accredited recognition of two 3 meter Semi-Anechoic Chambers

Accredited Test Firm Registration Number: 953492



**Government
of Canada**

Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

Company: Philips North America LLC	Page 3 of 39	Name: PHC-11AC1-A
Report: TR 317347 C		Model: PHC-11AC1-A
Job: C-3013		Serial: Engineering samples

1 TEST REPORT SUMMARY

During **5/1/2019 – 1/24/2020** the Equipment Under Test (EUT), **PHC-11AC1-A**, as provided by **Philips North America LLC** was tested to the following requirements:

CFR 47 15.247 and RSS-247

Requirement	Description	Specification	Method	Result
FCC: 15.247 (a)(2) IC: RSS-247 5.2 (a)	Digital Modulation System 6 dB bandwidth	500 kHz	ANSI C63.10	Compliant
FCC: 2.1049 IC: RSS-GEN 6.7	Occupied Bandwidth	Reported	ANSI C63.10	Reported
FCC: 15.247 (b)(3) IC: RSS-247 5.4 (d)	Maximum Conducted Output Power	30 dBm	ANSI C63.10	Compliant
FCC: 15.247 (e) IC: RSS-247 5.2 (b)	Digital Modulation System Power Spectral Density	8 dBm / 3 kHz	ANSI C63.10	Compliant
FCC: 15.247 (d) IC: RSS-247 5.5	RF Spurious Emissions at the Transmitter Antenna Terminal	20 dBc	ANSI C63.10	Compliant
FCC: 15.247 (d) IC: RSS-GEN 8.10	Spurious Radiated Emissions in Restricted Bands	FCC 15.209 RSS-GEN 8.9	ANSI C63.10	Compliant
FCC: 2.1055 (d) IC: RSS-GEN 6.11	Frequency Stability	Reported	ANSI C63.10	Reported
FCC: 15.207 IC: RSS-GEN 8.8	AC Power Line Conducted Emissions	0.150-30 MHz	ANSI C63.10	Compliant

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

2 CLIENT INFORMATION

Company Name	Philips North America LLC
Contact Person	Mark Nolin
Address	3000 Minuteman Road Andover, MA 01810

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	PHC-11AC1-A
Model Number	PHC-11AC1-A
Serial Number	Engineering Samples
Radio number	FCC ID: 2ATC9-PHC-11AC1 IC ID: 25528-PHC11AC1

2.2 Product Description

Combined 802.11 a/b/g/n/ac WLAN and Bluetooth Classic and Low Energy module.

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Programming Information

The EUT was programmed using the following hcitool commands via TeraTerm v4.99.

Low Channel (2402 MHz)

hcitool cmd 08 01E 00 25 00

Mid Channel (2440 MHz)

hcitool cmd 08 01E 13 25 00

High Channel (2480 MHz)

hcitool cmd 08 01E 27 25 00

2.6 Additional Information

EUT is a module provided with 3.3 VDC and was tested on a Host board with an antenna port termination for radiated emissions testing (Conducted Testing assumes a 5.5 dBi antenna gain). The EUT was programmed via the serial connection through a devkit facilitated through a terminal connection program. The hcitool command set was used to program the EUT. Channels from 2402 – 2480 MHz were tested. Firmware version is 003.001.025.0111.0000. The USI part number for this module is 8501-601900-01.

3 REFERENCES

Publication	Edition	Date	AMD 1
CFR 47 Part 15	-	2020	
ANSI C63.10	-	2014	2017
RSS-GEN	5	2014	2019
RSS-247	2	2017	-

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of $k = 2$.

References	Version / Date
CISPR 16-4-1	Ed. 2 (2009-02)
CISPR 16-4-2	Ed. 2 (2011-06)
CISPR 32	Ed. 1 (2012-01)
ANSI C63.23	2012
A2LA P103	February 4, 2016
A2LA P103c	August 10, 2015
ETSI TR 100-028	V1.3.1 (2001-03)

Measurement Type	Configuration	Uncertainty $\pm$
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

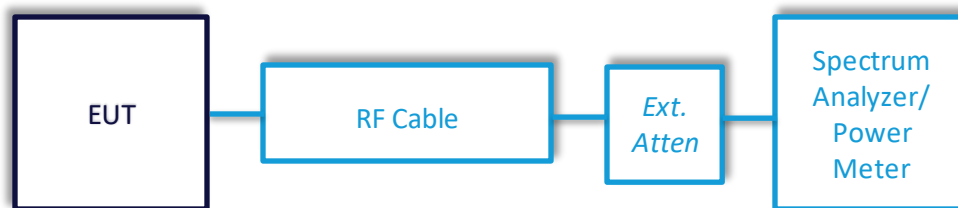
Parameter	ETSI U.C. $\pm$	U.C. $\pm$
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter. The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.
Example Calculations	Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm) Margin (dB) = Limit (dBm) – Corrected Reading (dBm)

Block Diagram



5.1.1 Digital Modulation System 6dB Bandwidth

Operator	Zach Wilson	QA	Aidi Zainal
Temperature	70°F	R.H.	50%
Test Date	9/19/2018	Location	Bench area
Requirement	FCC 15.247 Section (a)(2) RSS-247 Section 5.2 (a)	Method	ANSI C63.10 11.8

Requirement:

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Parameters

Frequency	2402-2480 MHz	Setup	Conducted
RBW	100 kHz	VBW	300 kHz
Detector(s)	Peak	X dB	-6.00
Sweep	1 ms	Span	3 MHz
Ext gain	10.0 dB attenuator		

Instrumentation



Date : 19-Mar-2018

Test : Conducted Radio

Job : C-3013

PE : Shane Dock

Customer : Philips Healthcare

Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	1/11/2018	1/11/2019	Active Calibration
2	AA 960160	Cable	Micro-Coax	UFC142A-0-0720-20C	218652-001	11/15/2017	11/15/2018	Active Verification

EUT Parameters

Input Power	3.3 vdc	Mode	Transmit (Tx)
Frequency	2402, 2440, 2480 MHz		

Data

Frequency (MHz)	DTS BW (kHz)	DTS BW Limit (kHz)	Margin (kHz)
2402	721.6	500.0	221.6
2440	722.7	500.0	222.7
2480	719.2	500.0	219.2

Plots



5.1.2 Occupied Bandwidth

Operator	Zach Wilson	QA	Aidi Zainal
Temperature	70°F	R.H.	50%
Test Date	9/19/2018	Location	Bench area
Requirement	FCC 2.1049 RSS-GEN Section 6.6	Method	ANSI C63.10 Section 6.9.3

Test Parameters

Frequency	2402, 2440, 2480 MHz	Setup	Conducted
RBW	20 kHz	VBW	62 kHz
Detector(s)	Peak	OBW Power	99.00%
Sweep	7.2 ms	Span	3 MHz
Ext gain	-10.0 dB		

Instrumentation



Date : 19-Mar-2018 Test : Conducted Radio Job : C-3013
 PE : Shane Dock Customer : Philips Healthcare Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	1/11/2018	1/11/2019	Active Calibration
2	AA 960160	Cable	Micro-Coax	UFC142A-0-0720-20C	218652-001	11/15/2017	11/15/2018	Active Verification

EUT Parameters

Input Power	3.3 vdc	Mode	Transmit (Tx)
Frequency	2402, 2440, 2480 MHz		

Data

Frequency (MHz)	99% BW (kHz)
2402	1065.7
2440	1065.3
2480	1063.6

Plots



5.1.3 Maximum Peak Conducted Output Power

Operator	Zach Wilson	QA	Aidi Zainal
Temperature	70°F	R.H.	50%
Test Date	9/19/2018	Location	Bench area
Requirement	FCC 15.247 (b)(3) RSS-247 Section 5.4 (d)	Method	ANSI C63.10 11.9.1.1

Requirement:

Test Parameters

Frequency	2402, 2440, 2480 MHz	Setup	Conducted
RBW	1.0 MHz	VBW	3.0 MHz
Detector(s)	Peak	Span	3.0MHz
Sweep	1.33 ms	# points	10000
Ext gain	-10.0 dB		

Instrumentation



Date : 19-Mar-2018

Test : Conducted Radio

Job : C-3013

PE : Shane Dock

Customer : Philips Healthcare

Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	1/11/2018	1/11/2019	Active Calibration
2	AA 960160	Cable	Micro-Coax	UFC142A-0-0720-20C	218652-001	11/15/2017	11/15/2018	Active Verification

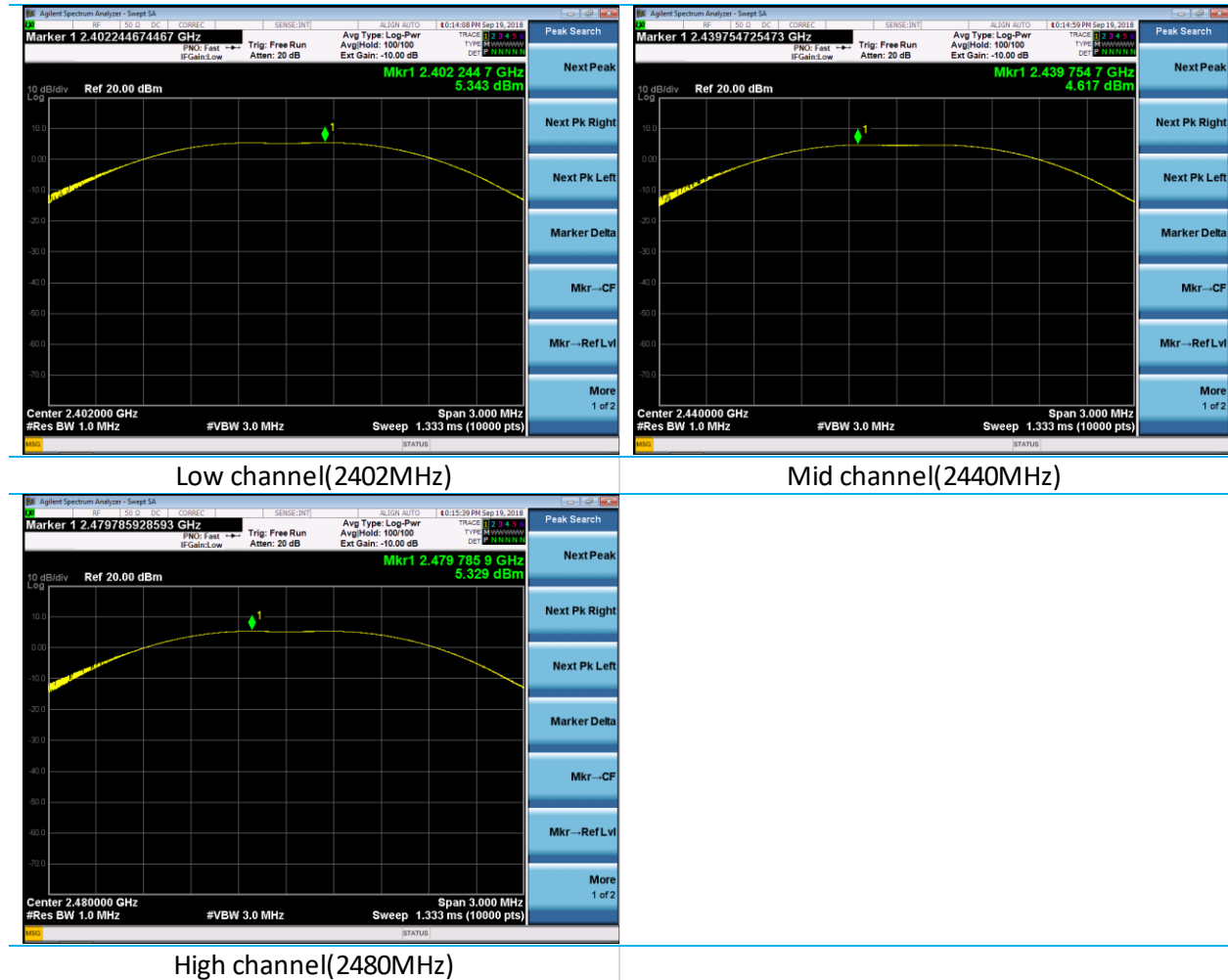
EUT Parameters

Input Power	3.3 vdc	Mode	Transmit (Tx)
Frequency	2402, 2440, 2480 MHz		

Data

Frequency (MHz)	Peak Pout (dBm)	Peak Pout Limit (dBm)	Margin (dB)
2402	5.3	30.0	24.7
2440	4.6	30.0	25.4
2480	5.3	30.0	24.7

Plots



5.1.4 Maximum Power Spectral Density

Operator	Zach Wilson	QA	Aidi Zainal
Temperature	70°F	R.H.	50%
Test Date	9/19/2018	Location	Bench area
Requirement	FCC 15.247 (e) RSS-247 Section 5.2 (b)	Method	ANSI C63.10 11.10.2

Requirement:

Limit (dBm/3kHz)
8

Test Parameters

Frequency	2402, 2440, 2480 MHz		
RBW	100 kHz	VBW	300 kHz
Detector(s)	Peak	X dB	-6.00
Sweep	1 ms	Span	3 MHz
Ext gain	-10.0 dB		

Instrumentation



Date : 19-Mar-2018 Test : Conducted Radio Job : C-3013
 PE : Shane Dock Customer : Philips Healthcare Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	1/11/2018	1/11/2019	Active Calibration
2	AA 960160	Cable	Micro-Coax	UFC142A-0-0720-20C	218652-001	11/15/2017	11/15/2018	Active Verification

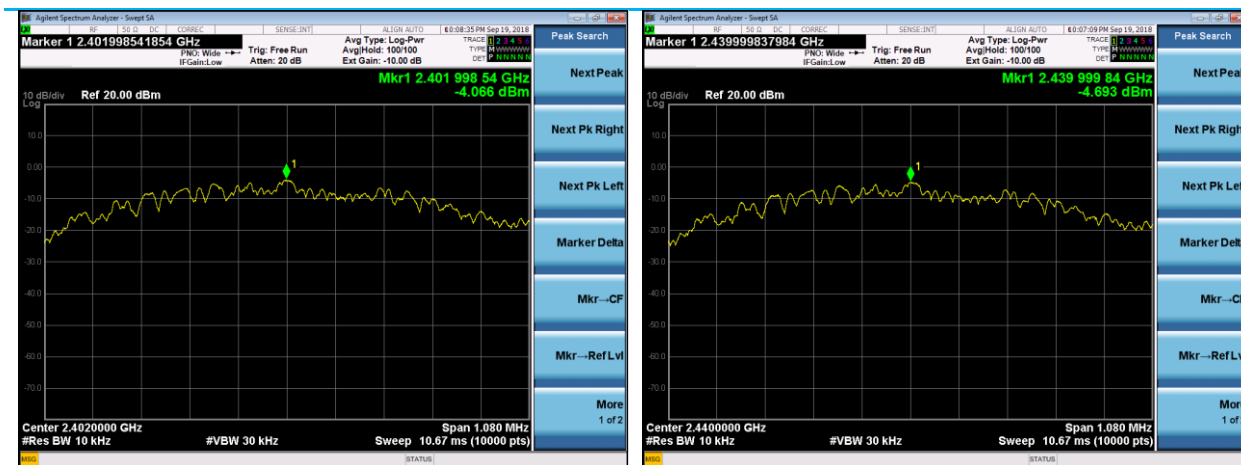
EUT Parameters

Input Power	3.3 vdc	Mode	Transmit (Tx)
Frequency	2402, 2440, 2480 MHz		

Data

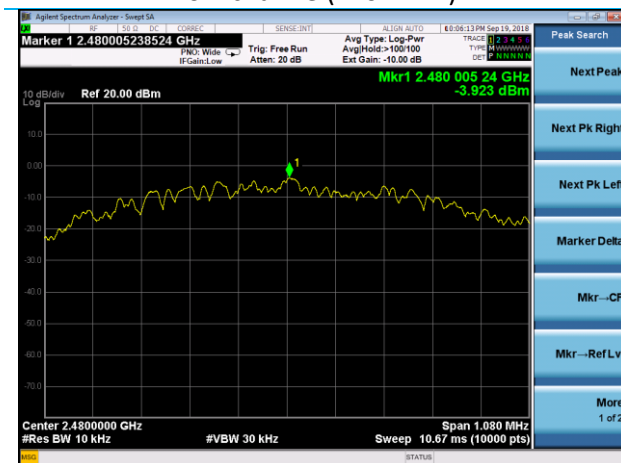
Frequency (MHz)	Peak PSD Reading (dBm)	Peak PSD Limit (dBm)	Margin (dB)
2402	-4.1	8.0	12.1
2440	-4.7	8.0	12.7
2480	-3.9	8.0	11.9

Plots



Low channel(2402MHz)

Mid channel(2440MHz)



High channel(2480MHz)

5.1.5 Emissions in Non-restricted Frequency Bands

Operator	Zach Wilson	QA	Aidi Zainal
Temperature	70°F	R.H.	50%
Test Date	9/19/2018	Location	Bench area
Requirement	FCC 15.247 (d) RSS-247 Section 5.5	Method	ANSI C63.10 11.11

Requirement:

15.247(d) 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)).

Test Parameters

Frequency	30 – 2400 MHz 2483.5 – 5000 MHz 5000 – 25000 MHz	Setup	Conducted
RBW	100 kHz	VBW	300 kHz
Detector(s)	Peak	# points	30000
Ext gain	-10.0 dB		

Instrumentation



Date : 19-Mar-2018

Test : Conducted Radio

Job : C-3013

PE : Shane Dock

Customer : Philips Healthcare

Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	1/11/2018	1/11/2019	Active Calibration
2	AA 960160	Cable	Micro-Coax	UFC142A-0-0720-20C	218652-001	11/15/2017	11/15/2018	Active Verification

EUT Parameters

Input Power	3.3 vdc	Mode	Transmit (Tx)
Frequency	2402, 2440, 2480 MHz		

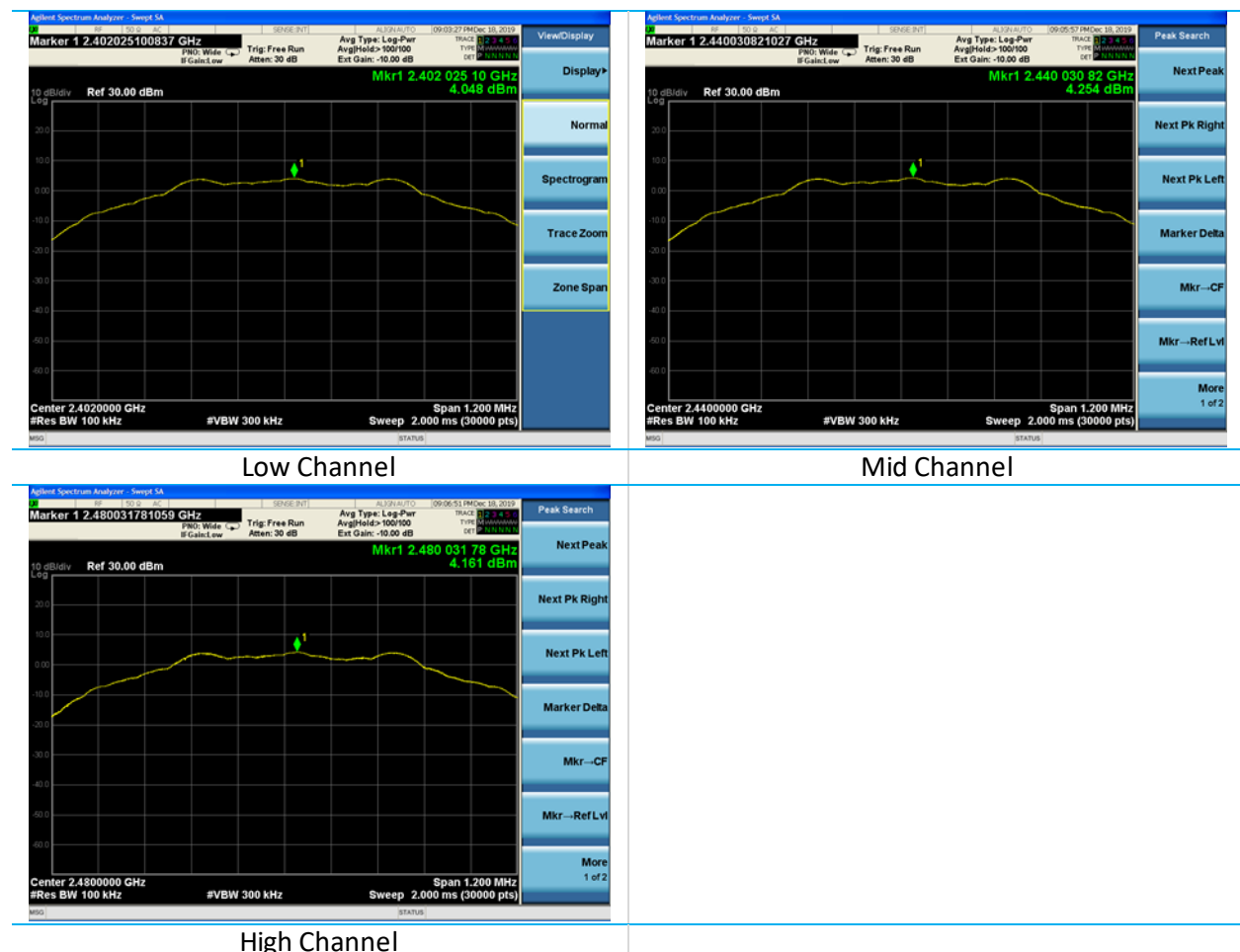
Company: Philips North America LLC		Name: PHC-11AC1-A
Report: TR 317347 C	Page 17 of 39	Model: PHC-11AC1-A
Job: C-3013		Serial: Engineering samples

Data

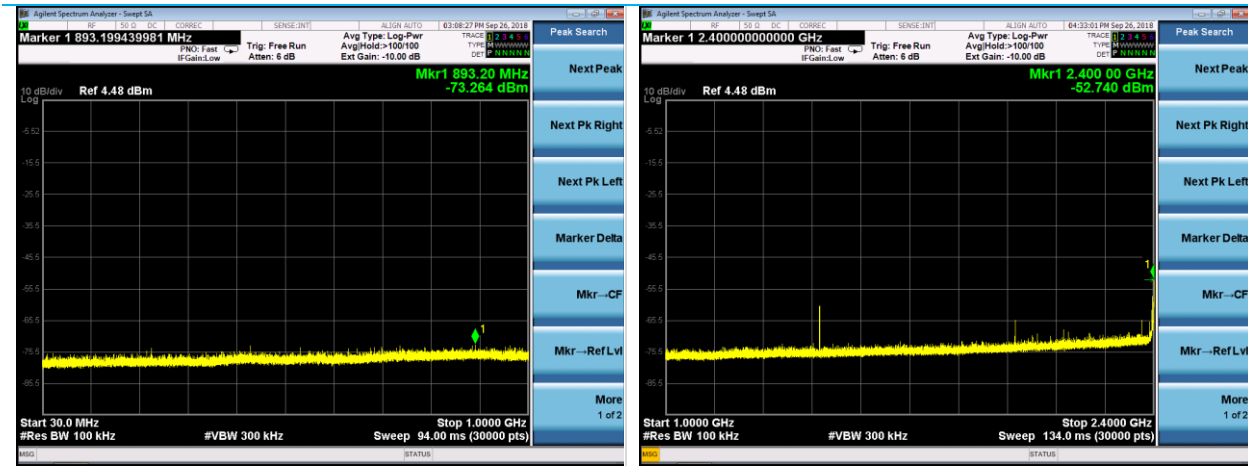
Channel	Frequency (MHz)	Peak Reading (dBm)	Peak Limit (dBm)	Peak Margin (dB)
Low	2400.0	-52.7	-16.0	36.7
Low	4803.5	-65.3	-16.0	49.3
Mid	1464.0	-60.6	-15.7	44.9
Mid	2515.0	-64.4	-15.7	48.7
High	1488.1	-59.9	-15.8	44.1
High	2487.6	-60.6	-15.8	44.8

Plots

Reference Levels

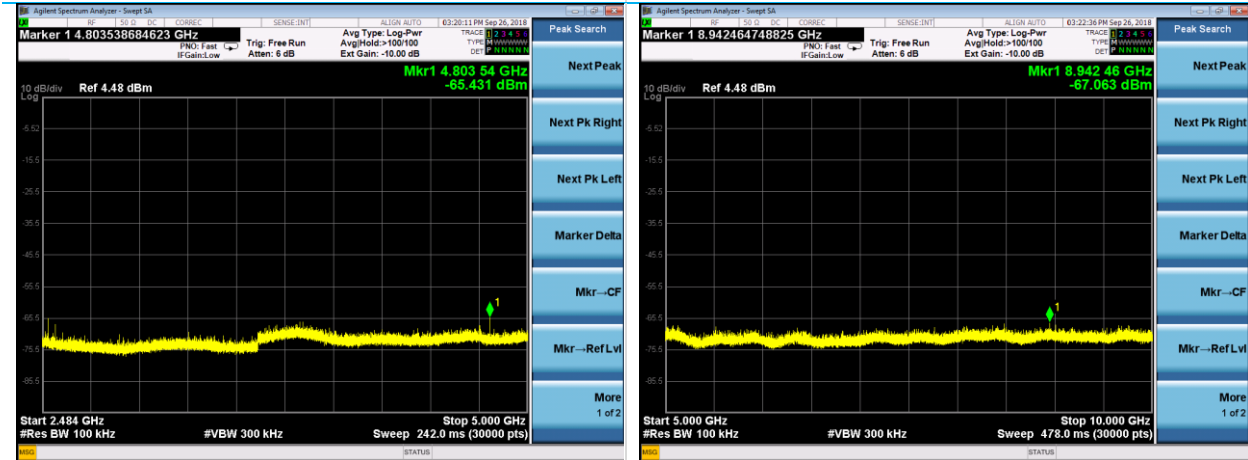


Low Channel (2402MHz)



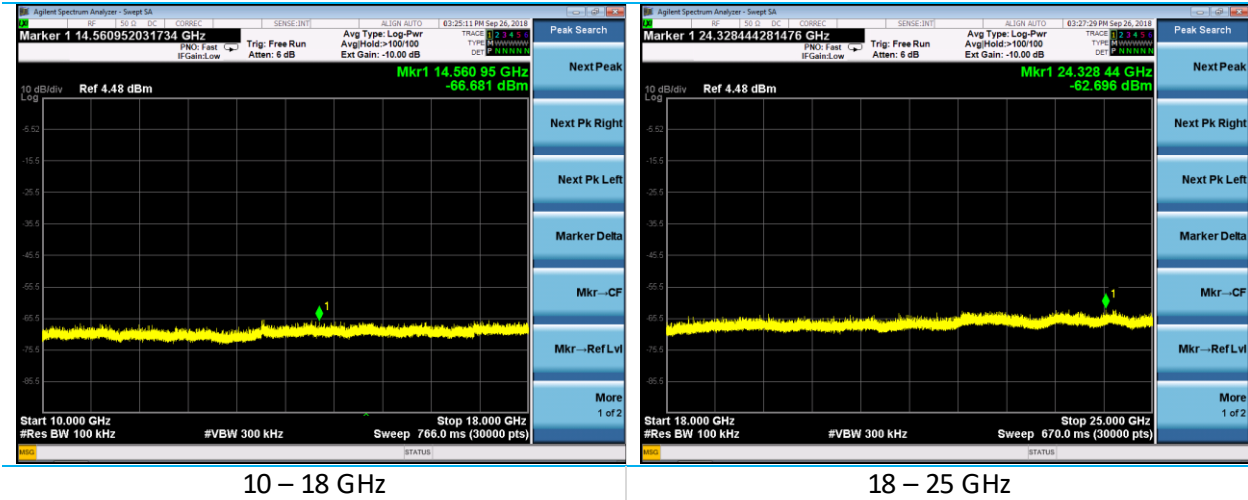
30 – 1000 MHz

1000 – 2400 MHz

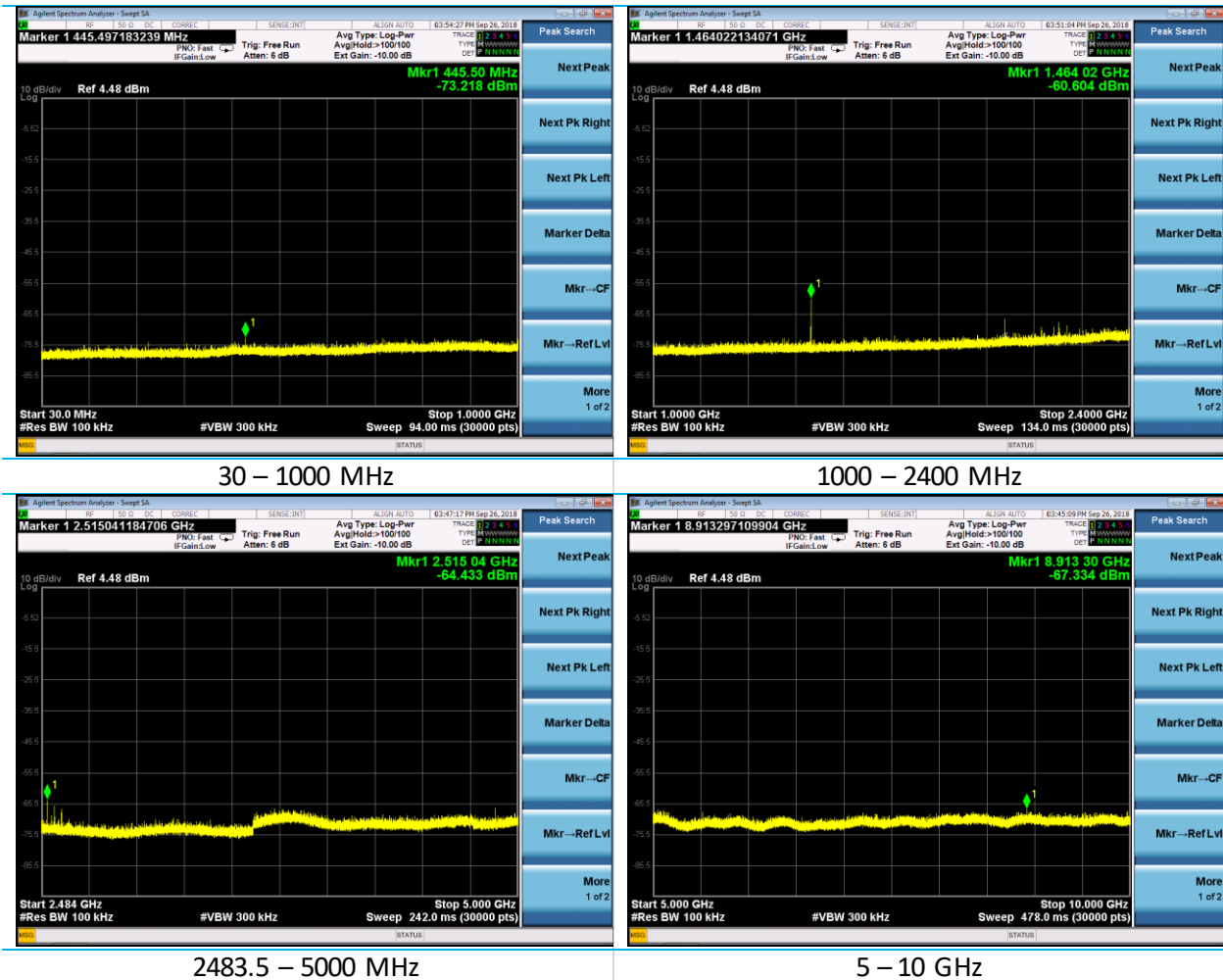


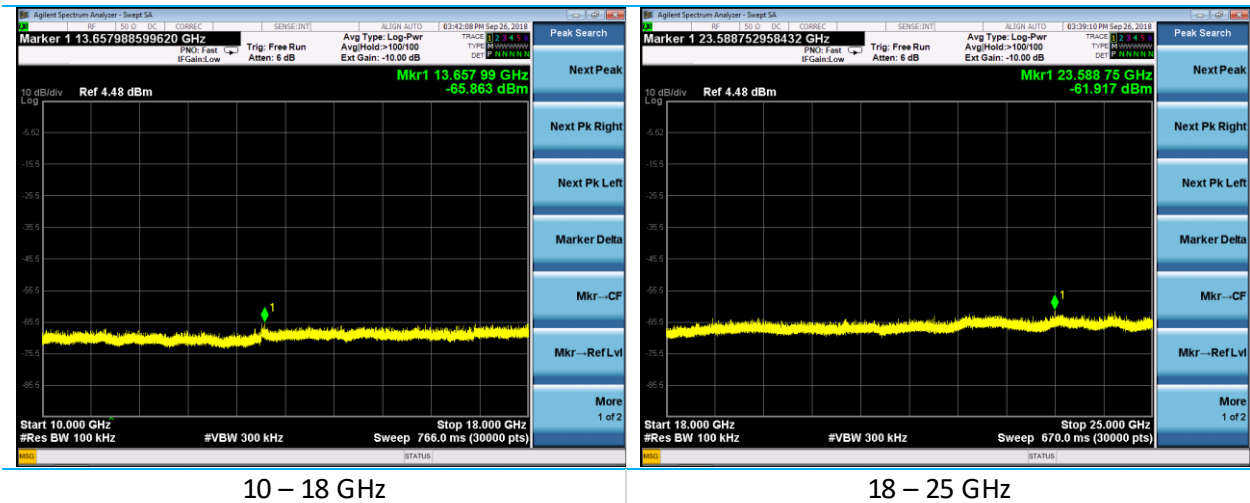
2483.5 – 5000 MHz

5 – 10 GHz

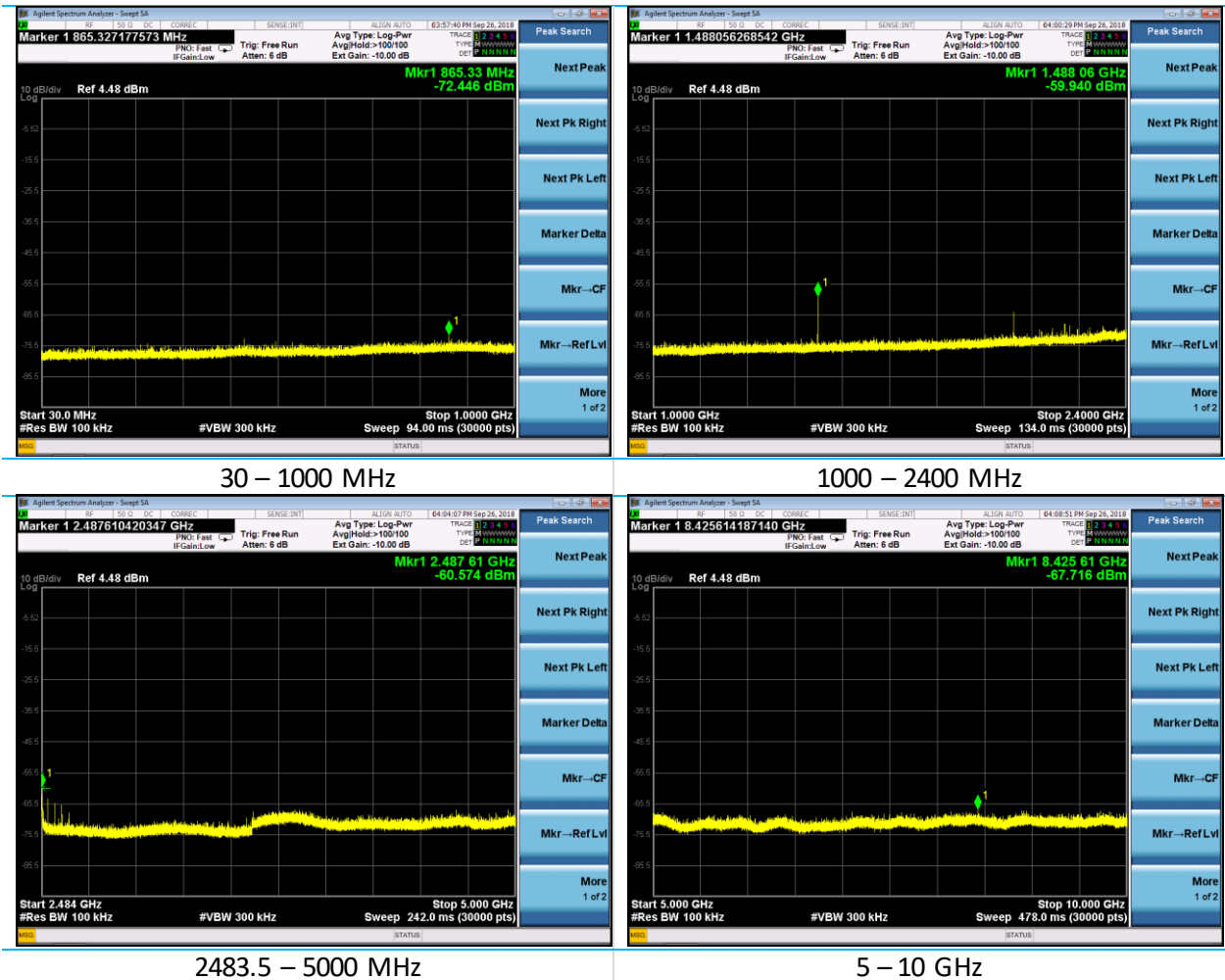


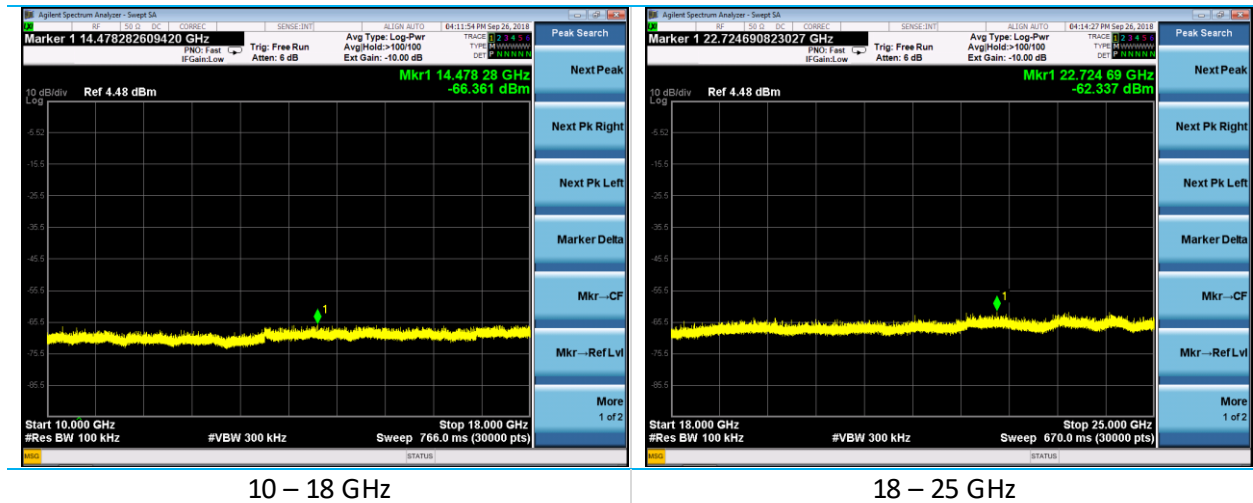
Mid Channel (2440MHz)





High Channel (2480MHz)





5.1.6 Emissions in restricted frequency bands

Operator	Zach Wilson, Shane Dock	QA	Aidi Zainal
Temperature	70°F	R.H.	50%
Test Date	9/19/2018, 12/16/2019	Location	Bench area
Requirement	FCC 15.247 (d) RSS-GEN Section 8.10	Method	ANSI C63.10 11.12

Requirement:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

Test Parameters

Frequency	30 – 2400 MHz 2483.5 – 5000 MHz 5000 – 25000 MHz	Setup	conducted
RBW	100 kHz (< 1 GHz) 1 MHz (>1GHz)	VBW	300 kHz (<1GHz) 3 MHz (>1GHz)
Detector(s)	Peak	# points	30000
Ext gain	-10.0 dB		

Instrumentation



Date : 19-Mar-2018 Test : Conducted Radio Job : C-3013
PE : Shane Dock Customer : Philips Healthcare Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	1/11/2018	1/11/2019	Active Calibration
2	AA 960160	Cable	Micro-Coax	UFC142A-0-0720-20C	218652-001	11/15/2017	11/15/2018	Active Verification

Company: Philips North America LLC	Page 23 of 39	Name: PHC-11AC1-A
Report: TR 317347 C		Model: PHC-11AC1-A
Job: C-3013		Serial: Engineering samples

Date : 19-Mar-2018

Test : Conducted Radio

Job : C-3013

PE : Shane Dock

Customer : Philips Healthcare

Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960203	Analyzer - EMI Receiver	Keysight	N9038A	MY56400072	7/29/2019	7/29/2020	Active Calibration
2	AA 960173	Cable	A.H. Systems, Inc	SAC-26G-1	388	12/9/2019	12/9/2020	Active Verification

EUT Parameters

Input Power	3.3 vdc	Mode	Transmit (Tx)
Frequency	2402, 2440, 2480 MHz	Channel	0, 19, 39
Antenna Gain	5.5 dBi	-	-
Notes	Under 1 GHz peak data compared against restricted bands quasi peak limits as worst case. Peak Measurements done per ANSI C63.10 11.12.2.4. Average Measurements done per 11.12.2.5.2.		

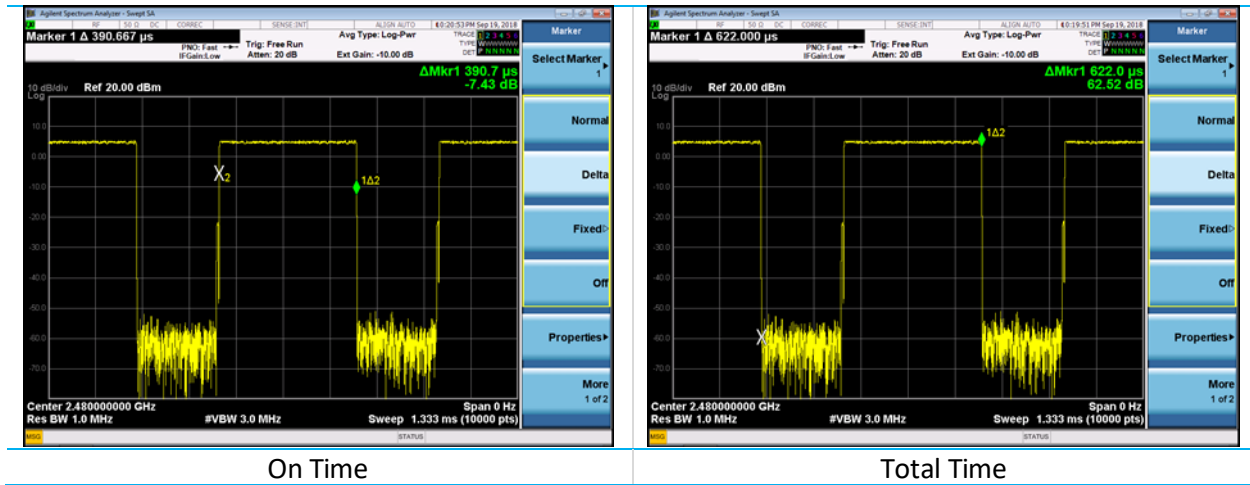
Data

Frequency (MHz)	Channel	Peak Measurement (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1441.1	Low	-59.1	5.5	-53.6	-21.2	32.4
1464.2	Mid	-58.8	5.5	-53.3	-21.2	32.1
1488.4	High	-58.4	5.5	-52.9	-21.2	31.7
2364.3	Low	-58.5	5.5	-53.0	-21.2	31.8
2483.6	High	-47.5	5.5	-42.0	-21.2	20.8

Frequency (MHz)	Channel	Average Measurement (dBm)	Duty Cycle Correction (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1441.3	Low	-64.1	2.0	5.5	-56.6	-41.2	15.4
1463.9	Mid	-63.8	2.0	5.5	-56.3	-41.2	15.1
1488.2	High	-63.4	2.0	5.5	-55.9	-41.2	14.7
2364.6	Low	-68.6	2.0	5.5	-61.1	-41.2	19.9
2483.7	High	-57.6	2.0	5.5	-50.1	-41.2	8.9

Plots

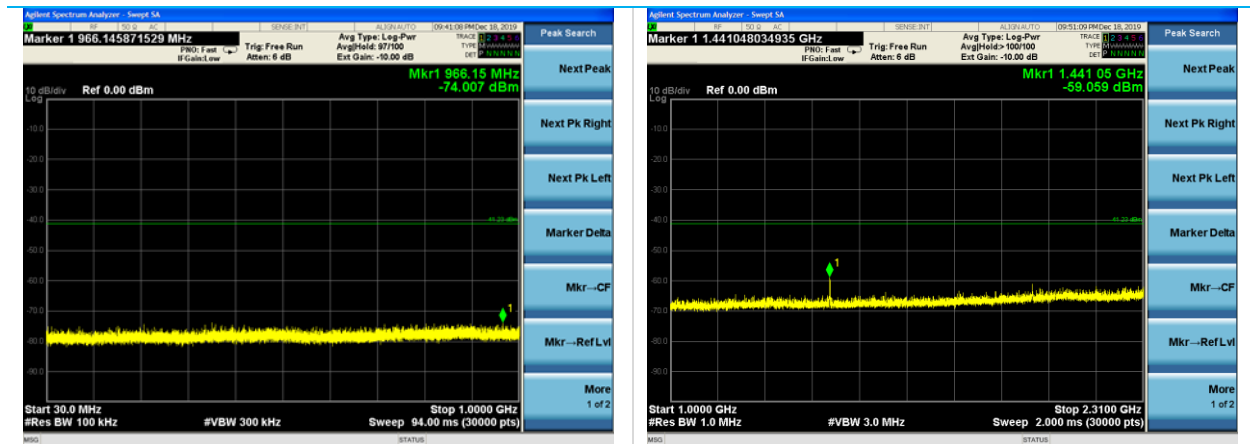
Duty Cycle



$$\text{Duty Cycle} = 391 \text{ us} / 622 \text{ us}$$

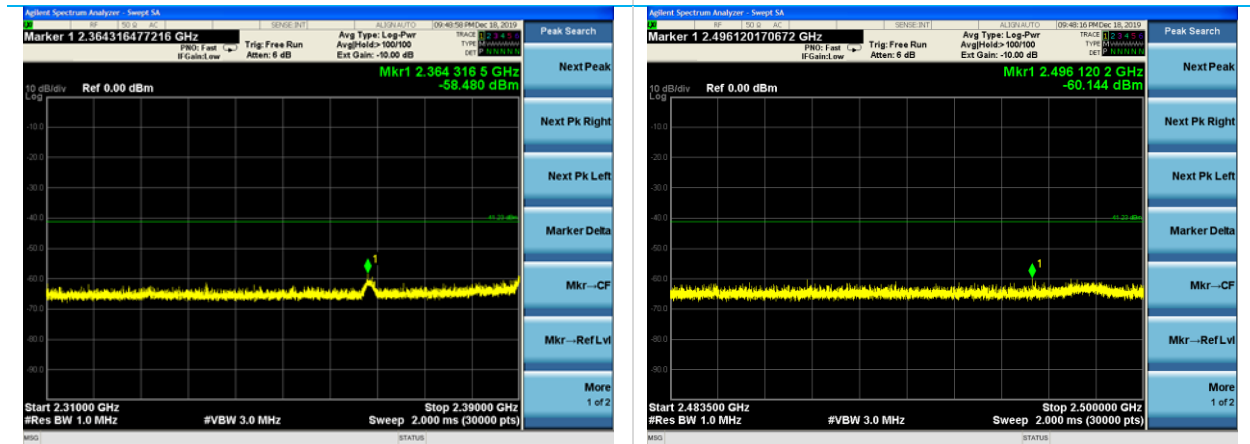
$$\text{Duty Cycle Correction Factor} = 10 * \log (1/0.628) = 2.0 \text{ dB}$$

Low Channel (2402MHz)



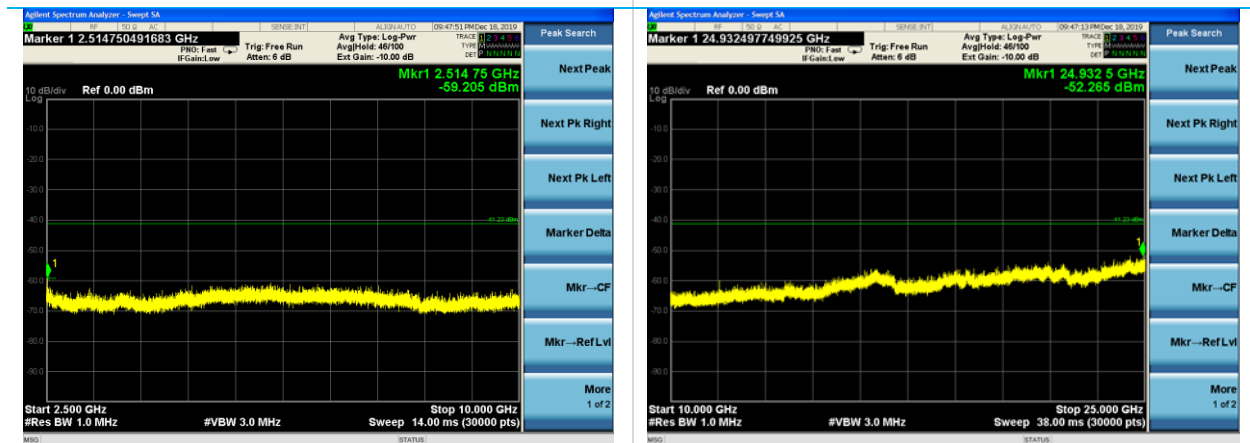
30 – 1000 MHz

1000 – 2310 MHz



2310-2390 MHz

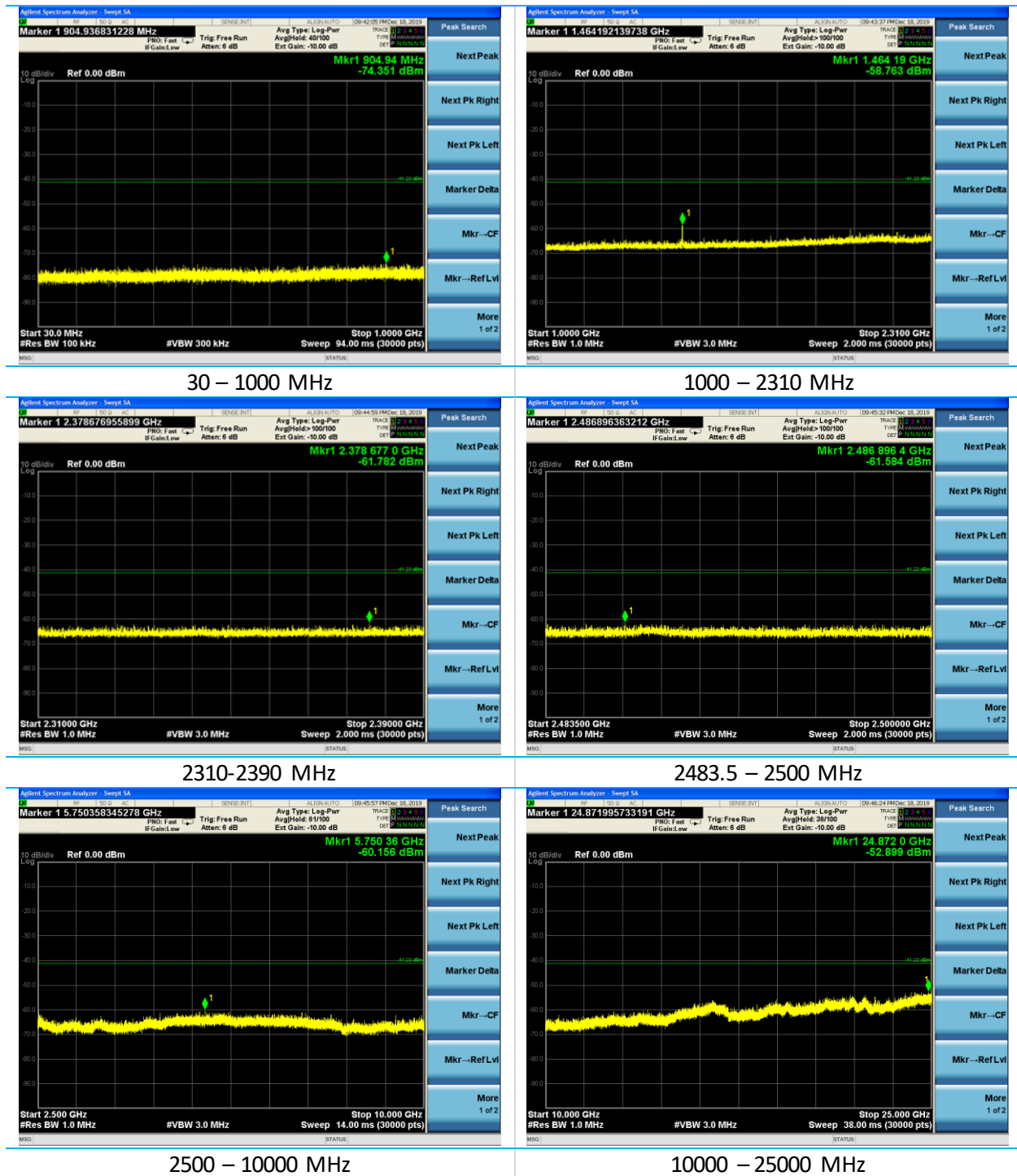
2483.5 – 2500 MHz



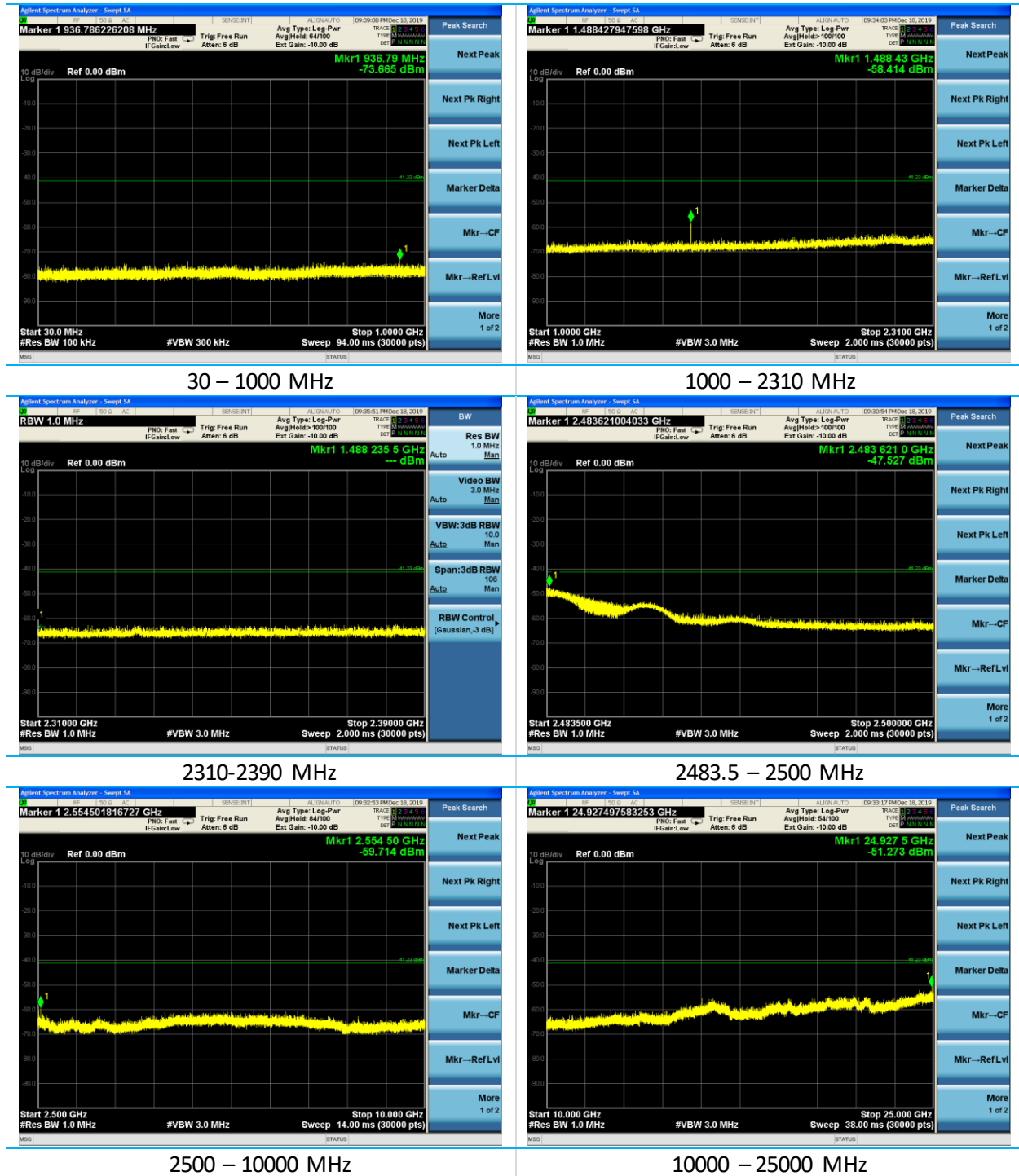
2500 – 10000 MHz

10000 – 25000 MHz

Mid Channel (2440MHz)



High Channel (2480MHz)



5.1.7 Frequency Stability

Operator	Anthony Smith	QA	Zach Wilson
Temperature	21.7°F	R.H.	49%
Test Date	10/21/2019	Location	Bench area
Requirement	FCC 2.1055 (d) RSS-GEN 6.11	Method	ANSI C63.10 Section 6.8

Limits: Reported

Test Parameters

Frequency	Channel (2440 MHz)	Data Rate	BLE
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EUT Parameters

Input Power	3.3 VDC provided via bench Supply 3.3 VDC via Bench Supply as reference, and varied per Table.	Mode	CW Mode
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Instrumentation



Date : 11-Sep-2018 Test : Conducted Radio Job : C-3013
PE : Shane Dock Customer : Philips Healthcare Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/24/2019	4/24/2020	Active Calibration
2	AA 960171	Cable	A.H. Systems, Inc	SAC-26G-6	386	11/12/2018	11/12/2019	Active Verification

Table

Input Power (VDC)	Frequency (Hz)	Deviation (Hz)
3.3	2402012207	0
2.8	2402015602	3395
3.8	2402020742	8535

Note: Deviation is with respect to the 3.3 VDC value.

5.2 Radiated Emissions

Description of Measurement	The frequency spectrum is investigated for intentional and / or unintentional signals emanating from the EUT by use of a standardized test site and measurement antenna. The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed allowing the data to be gathered and reported as corrected values. The maximum emissions from the EUT are determined by turn-table azimuth rotation (360°) and scanning of the measurement antenna. Maximized levels are noted at degree values of azimuth, measurement antenna height, and measurement antenna polarity.
Example Calculations	Measurement (dBμV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBμV/m) Margin (dB) = Limit (dBμV/m) - Corrected Reading (dBμV/m) Example at 4000 MHz: Reading = 40 dBμV + 3.4 dB + 0.9 dB + 6.5 dB/m = 50.8 dBμV/m Average Limit = 20 log (500) = 54 dBμV/m Margin = 54 dBμV/m - 50.8 dBμV/m = 3.2 dB

Block Diagram



5.2.1 Radiated Emissions

Operator	Anthony Smith, Jon Dille	QA	Zach Wilson, Shane Dock
Temperature	23.8 degrees C	R.H. %	33.9%
Test Date	5/1/19 – 5/2/19, 12/19/19	Location	Chamber 3
Requirement	FCC Part 15.209 ISED: RSS-247	Method	ANSI C63.10

Limits:

Frequency (MHz)	Field Strength (dBμV/m) at 3 meters
30-88	40.0
88-216	43.5
216-960	46.0
Above 960	54.0

Note: The limit above is a Quasi-Peak Limit below 1 GHz, and Average above 1 GHz. The peak limit above 1 GHz is 20 dB higher than the limit noted above.

Test Parameters

Frequency	30 MHz – 25 GHz	Distance	3m
Detector(s)	Quasi-Peak, below 1 GHz Average, Peak above 1 GHz	Table height	0.8 m below 1 GHz 1.5 m above 1 GHz
RBW	120 kHz, below 1 GHz 1 MHz above 1 GHz	VBW	>= 3x RBW
Notes	VBW reduction method used for average measurements. For these, VBW = 30 kHz.	Notes	Emissions below 1 GHz are not a function of the EUT.

Instrumentation



Date : 11-Sep-2018 Test : Radiated Emissions Job : C-3013
 PE : Shane Dock Customer : Philips Healthcare Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960176	Cable	A.H. Systems, Inc	SAC-26G-6	395	6/4/2018	6/4/2019	Active Verification
2	EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/24/2018	4/24/2019	Active Calibration
3	AA 960153	Filter - High Pass 2.4 GHz	KWM	HPF-L-14186	7272-04	4/25/2018	4/25/2019	Active Calibration
4	EE 960160	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	977711030	9/12/2018	9/12/2019	Active Calibration
5	AA 960007	Antenna - Double Ridge Horn	EMCO	3115	9311-4138	9/12/2018	9/12/2019	Active Calibration
6	AA 960162	Cable	MegaPhase	EM26-S1S1-120	12024301 001	11/15/2017	11/15/2018	Active Verification
7	AA 960174	Antenna - Small Horn	ETS Lindgren	3116C-PA	00206880	5/15/2018	5/15/2019	Active Calibration
8	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/25/2018	4/25/2019	Active Calibration
9	AA 960195	Antenna - Log Periodic	A.H. Systems, Inc	SAS-512-2	557	1/30/2018	1/30/2019	Active Calibration
10	AA 960150	Antenna - Biconical	ETS Lindgren	3110B	0003-3346	4/20/2018	4/20/2019	Active Calibration
11	AA 960171	Cable	A.H. Systems, Inc	SAC-26G-6	386	11/15/2017	11/15/2018	Active Verification
12	AA 960161	Filter - Highpass 5 GHz	K&L Microw ave	11SH10-8000	2	4/25/2018	4/25/2019	Active Calibration
13	EE 960160	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	977711030	9/12/2018	9/12/2019	Active Calibration
14	EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	4/24/2018	4/24/2019	Active Calibration
15	AA 960081	Antenna - Double Ridge Horn	EMCO	3115	6907	4/16/2018	4/16/2019	Active Calibration



Date : 12-Apr-2019 Test : Radiated Spurious Job : C-3160
 PE : Shane Dock Customer : Philips Healthcare Quote : 319013

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960176	Cable	A.H. Systems, Inc	SAC-26G-6	395	6/4/2018	6/4/2020	Active Verification
2	EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/24/2019	4/24/2020	Active Calibration
3	AA 960153	Filter - High Pass 2.4 GHz	KWM	HPF-L-14186	7272-04	4/22/2019	4/22/2020	Active Calibration
4	EE 960160	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	977711030	9/12/2018	9/12/2019	Active Calibration
5	AA 960007	Antenna - Double Ridge Horn	EMCO	3115	9311-4138	9/12/2018	9/12/2019	Active Calibration
6	AA 960162	Cable	MegaPhase	EM2-S1S1-120	51503501 001	11/12/2018	11/12/2019	Active Verification
7	AA 960174	Antenna - Small Horn	ETS Lindgren	3116C-PA	00206880	5/15/2018	5/15/2020	Active Calibration
8	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/24/2019	4/24/2020	Active Calibration
9	AA 960195	Antenna - Log Periodic	A.H. Systems, Inc	SAS-512-2	557	1/30/2018	1/30/2020	Active Calibration
10	AA 960150	Antenna - Biconical	ETS Lindgren	3110B	0003-3346	4/20/2018	4/20/2020	Active Calibration
11	AA 960171	Cable	A.H. Systems, Inc	SAC-26G-6	386	11/12/2018	11/12/2019	Active Verification
12	AA 960161	Filter - Highpass 5 GHz	K&L Microw ave	11SH10-8000	2	4/22/2019	4/22/2020	Active Calibration
13	EE 960160	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	977711030	9/12/2018	9/12/2019	Active Calibration
14	EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	4/23/2019	4/23/2020	Active Calibration
15	AA 960081	Antenna - Double Ridge Horn	EMCO	3115	6907	4/16/2018	4/16/2020	Active Calibration

EUT Parameters

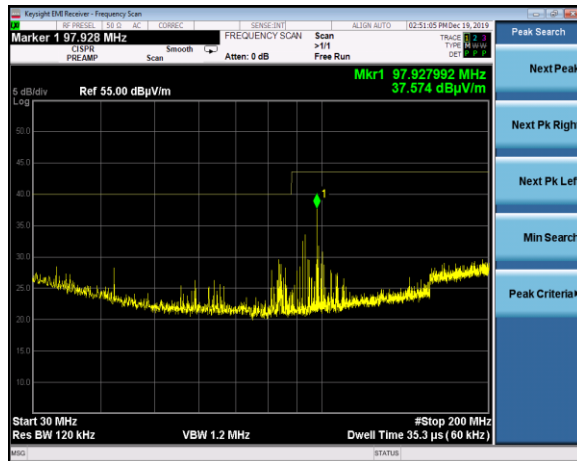
Input Power	3.3 VDC	Mode	Tx Modulated Test Mode on Low, Mid, High Channels.
EUT	See Section 2 for details. EUT tested with the antenna port terminated method.		

Table

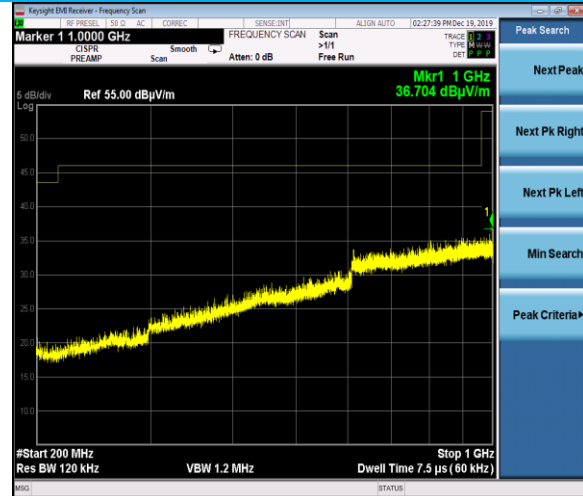
Frequency (MHz)	Channel	EUT Orientation	Antenna Polarity	Height (cm)	Azimuth (degree)	Average Reading (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)
2494.6	High	Flat	V	140	75	35.3	54.0	18.7
2373.3	Low	Flat	V	140	75	35.2	54.0	18.8
2170.7	Low	Flat	V	150	120	36.1	54.0	17.9
3593.2	Low	Flat	V	150	0	36.0	54.0	18.0
2159.2	Low	Flat	H	150	244	36.3	54.0	17.7

Frequency (MHz)	Channel	EUT Orientation	Antenna Polarity	Height (cm)	Azimuth (degree)	Peak Reading (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)
2170.7	High	Flat	V	150	120	42.4	74.0	31.6
3593.2	Low	Flat	V	150	0	43.3	74.0	30.7
2159.2	Low	Flat	H	150	244	42.0	74.0	32.0
2191.1	Low	Flat	H	150	0	44.4	74.0	29.6
3484.2	Low	Flat	H	150	0	49.6	74.0	24.4

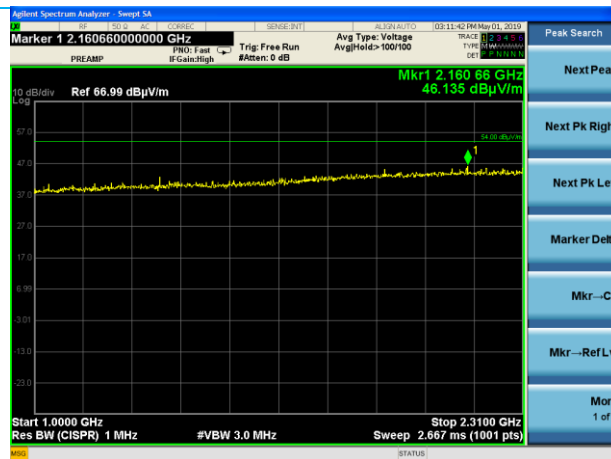
Plots



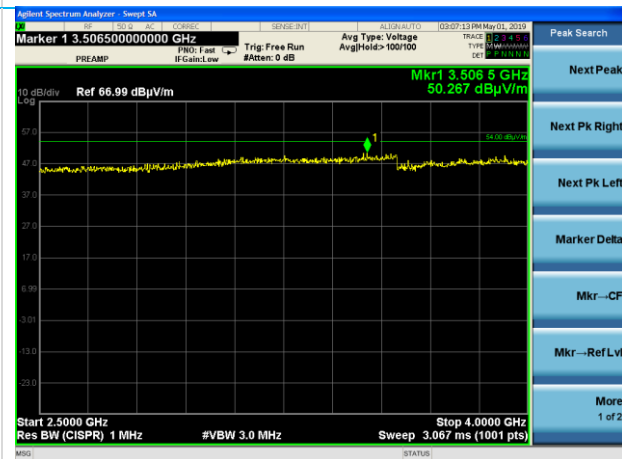
30 MHz – 200 MHz



200 – 1000 MHz



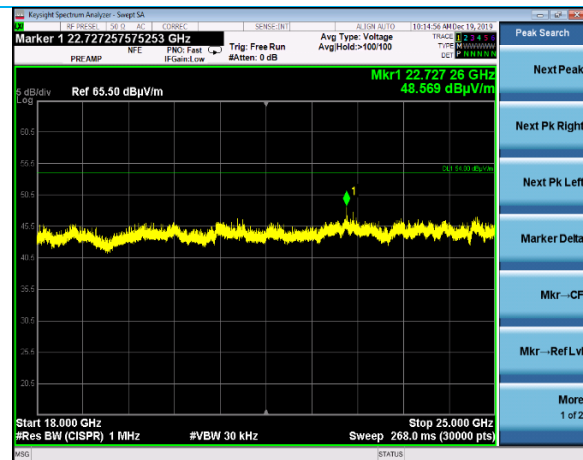
1 – 2.31 GHz Horizontal Orientation



2.5 - 4 GHz Horizontal Orientation

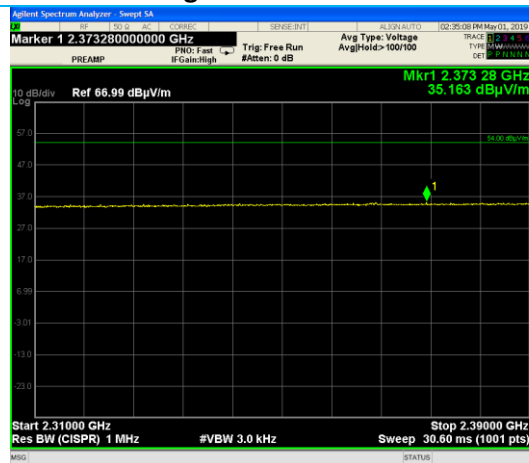


4 - 18 GHz

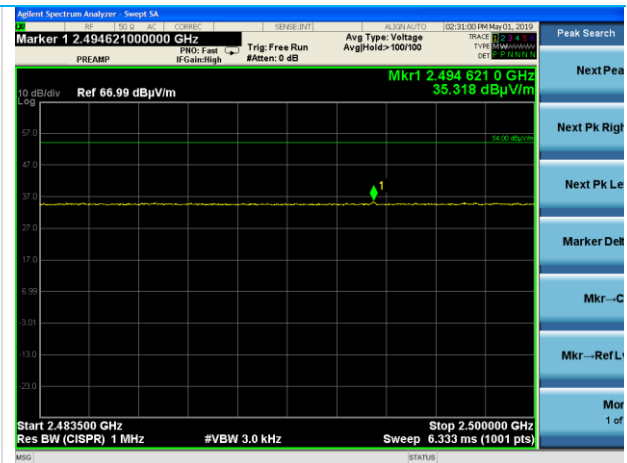


18 – 25 GHz

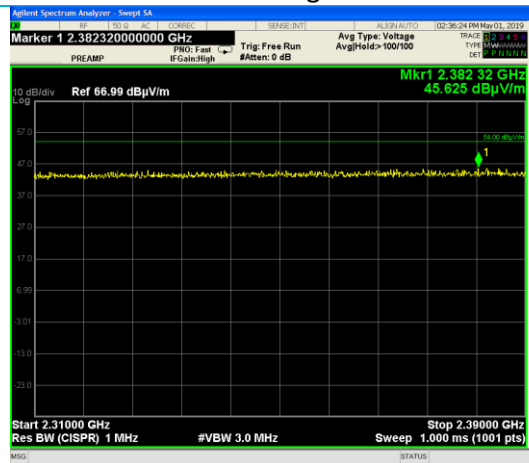
Plots – Band Edges



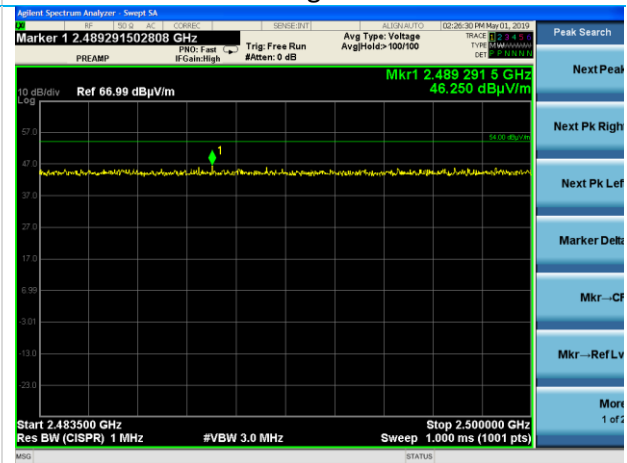
Average LBE



Average UBE



Peak LBE



Peak UBE

5.3 AC Mains Conducted Emissions

A line impedance stabilization network (LISN) or artificial mains network (AMN) allows the emissions of the power supply conductors to be measured while isolating the EUT from the supply mains.

Description of Measurement

The AMN, cable, and other necessary measurement system correction factors are loaded onto the EMI receiver when the measurements are performed. The data is gathered and reported as the corrected values.

Maximum emissions are determined with a peak max hold trace then measurements at a selection of the highest points are made with quasi-peak and average detectors. Results are recorded and compared to limit for each line. (e.g. line and neutral)

Example Calculations

Measurement (dBμV) + Cable factor (dB) + Other (dB) = Corrected Reading (dBμV)

Margin (dB) = Limit (dBμV) - Corrected Reading (dBμV)

Block Diagram



5.3.1 AC Mains Conducted Emissions

Operator	Shane Dock
QA	Anthony Smith
Test Date	1/24/2020
Location	Conducted Bench
Temp. / R.H.	21.3°C, 38.7 % RH
Requirement	FCC Part 15.207 RSS-GEN 8.8
Method	ANSI C63.10 Section 6.2

Limits:

Frequency (MHz)	Conducted Limit (dBμV)	
	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

Test Parameters

Frequency	0.15 – 30 MHz	Distance	40 cm from VCP
Detector(s)	Quasi-Peak, Average	Table height	80 cm
RBW	9 kHz	VBW	90 kHz
Notes	BLE 2402 MHz data shown (Worst Case)		

Instrumentation



Date : 19-Sep-2019

Test : Conducted Emissions

Job : C-3013

PE : Shane Dock

Customer : Philips Healthcare

Quote : 317347

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960088	Analyzer - EMI Receive	Agilent	N9038A	MY51210138	4/23/2019	4/23/2020	Active Calibration
2	EE 960162	LISN	COM-POWER	LI-215A	191969	4/22/2019	4/22/2020	Active Calibration
3	LSC-200	Cable	Micro-Coax	UFB311A-0-1440-70U70U	64639 224071	12/9/2019	12/9/2020	Active Verification

Company: Philips North America LLC	Page 37 of 39	Name: PHC-11AC1-A
Report: TR 317347 C		Model: PHC-11AC1-A
Job: C-3013		Serial: Engineering samples

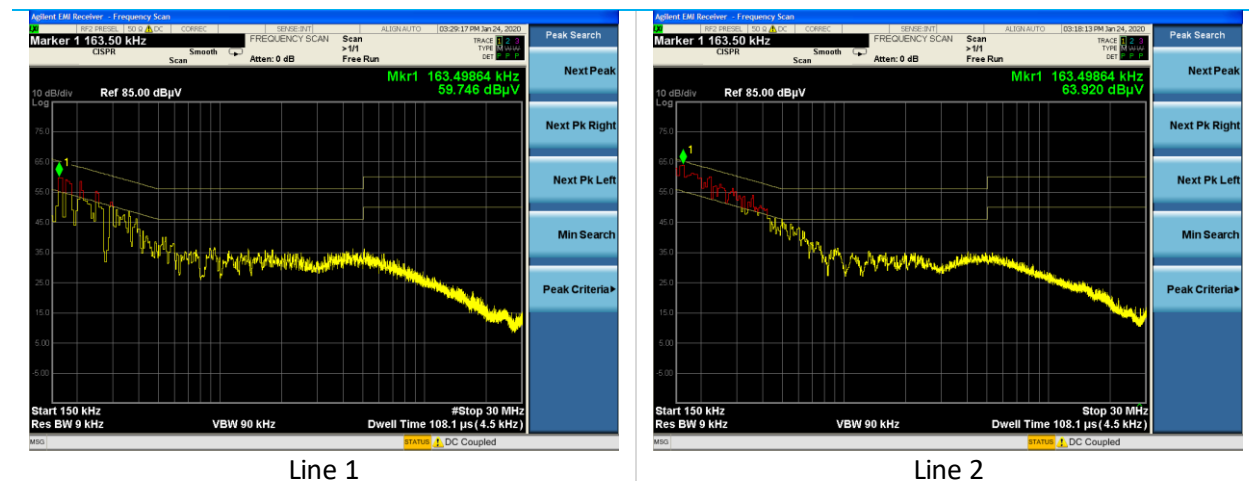
EUT Parameters

Input Power	Module powered by 3.3 VDC provided by AC-DC converter	Mode	Modulated Tx
EUT	EUT Connected to Host board	EUT	

Table

Frequency (MHz)	Line	Quasi-Peak Reading (dBμV)	Quasi-Peak Limit (dBμV)	Quasi-Peak Margin (dB)	Average Reading (dBμV)	Average Limit (dBμV)	Average Margin (dB)
0.159	L1	36.5	65.5	29.0	24.3	55.5	31.2
0.226	L1	38.7	62.6	23.9	26.6	52.6	26.0
0.327	L1	43.0	59.5	16.5	32.4	49.5	17.1
0.150	L2	51.6	66.0	14.4	27.7	56.0	28.3
0.168	L2	49.9	65.1	15.2	25.1	55.1	30.0
0.244	L2	42.8	62.0	19.2	26.0	52.0	26.0

Plots



6 REVISION HISTORY

Version	Date	Notes	Person
V0	12/12/2019	Initial released	Jeysson Gonzalez
V1	1/15/2020	Added/fixed sections, draft created	Shane Dock
V2	1/31/2020	First Round of Updates	Shane Dock
V3	2/4/2020	Second Round of Updates	Shane Dock
V4	3/17/2020	Third Round of Updates	Shane Dock
V5	4/14/2020	Review Concluded	Shane Dock

END OF REPORT