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TEST REPORT

SCOPE OF WORK
EMC TESTING – Model DS5000

REPORT NUMBER
103794632BOX-001a

ISSUE DATE
February 6, 2019

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April 1, 2019

PAGES
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DOCUMENT CONTROL NUMBER
Non-Specific Radio Report Shell Rev. December 2017

EMISSIONS TEST REPORT

(FULL COMPLIANCE)

Report Number: 103794632BOX-001a
Project Number: G103794632

Report Issue Date: 02/06/2019
Report Re-issued Date: 04/01/2019

Model(s) Tested: DS5000
Model(s) Partially Tested: None
Model(s) Not Tested but declared equivalent by the client: None

Standards: CFR47 FCC Part 15.247 Subpart C: 01/2019,
CFR47 FCC Part 15 Subpart B: 01/2019

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
The Procter & Gamble Company
One Procter & Gamble Plaza
Cincinnati, Ohio 45202
United States of America

Report prepared by reviewer

Kouma Sinn / EMC Staff Engineer

Report reviewed by reviewer

Vathana Ven / EMC Staff Engineer

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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	System Setup and Method	--
6	Maximum Peak Output Power CFR47 FCC Part 15 Subpart C:01/2019, Section 15.247 (b)(3)	Pass
7	6 dB Bandwidth and Occupied Bandwidth CFR47 FCC Part 15 Subpart C: 01/2019, Section 15.247 (a)(2)	Pass
8	Maximum Power Spectral Density CFR47 FCC Part 15 Subpart C: 01/2019, Section 15.247 (e)	Pass
9	Band Edge Compliance CFR47 FCC Part 15 Subpart C: 01/2019, Section 15.247 (d)	Pass
10	Transmitter spurious emissions CFR47 FCC Part 15 Subpart C: 01/2019, Section 15.247 (d)	Pass
--	AC Mains Conducted Emissions FCC 47CFR Part 15.107: 01/2019	N/A*
11	Revision History	--

*Notes: Not applicable as the EUT powers from internal battery with no connection to AC mains.

3 Client Information

This EUT was tested at the request of:

Client: The Procter & Gamble Company
One Procter & Gamble Plaza
Cincinnati, Ohio 45202
United States of America

4 Description of Equipment Under Test and Variant Models

Manufacturer: The Procter & Gamble Company
One Procter & Gamble Plaza
Cincinnati, Ohio 45202
United States of America

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Diaper Sensor	The Procter & Gamble Company	DS5000	None

Receive Date:	01/23/2019
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
Environmental and physiological diapers sensors unit with Bluetooth low energy transmission functionality for broadcasting of sensor readings

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
3.1 VDC max	35mA max	N/A	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Pre-programmed to transmit at Low, Mid, and High channels

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	None

Radio/Receiver Characteristics	
Frequency Band(s)	2402-2480 MHz
Modulation Type(s)	GFSK
Maximum Conducted Output Power	Low Channel (2402 MHz): 11.4 dBm Mid Channel (2442 MHz): 11.4 dBm High Channel (2480 MHz): 11.5 dBm
Test Channels	Low Channel (2402 MHz) Mid Channel (2442 MHz) High Channel (2480 MHz)
Occupied Bandwidth	Low Channel (2402 MHz): 1.168 MHz Mid Channel (2442 MHz): 1.188 MHz High Channel (2480 MHz): 1.208 MHz
Frequency Hopper: Number of Hopping Channels	N/A
Frequency Hopper: Channel Dwell Time	N/A
Frequency Hopper: Max interval between two instances of use of the same channel	N/A
MIMO Information (# of Transmit and Receive antenna ports)	1
Equipment Type	Standalone
ETSI LBT/Adaptivity	Non-Adaptive
ETSI Adaptivity Type	N/A
ETSI Temperature Category (I, II, III)	N/A
ETSI Receiver Category (1, 2, 3)	3
Antenna Type and Gain	Integrated, -15 dBi

Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

5 System Setup and Method

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
--	None	--	--	--	--

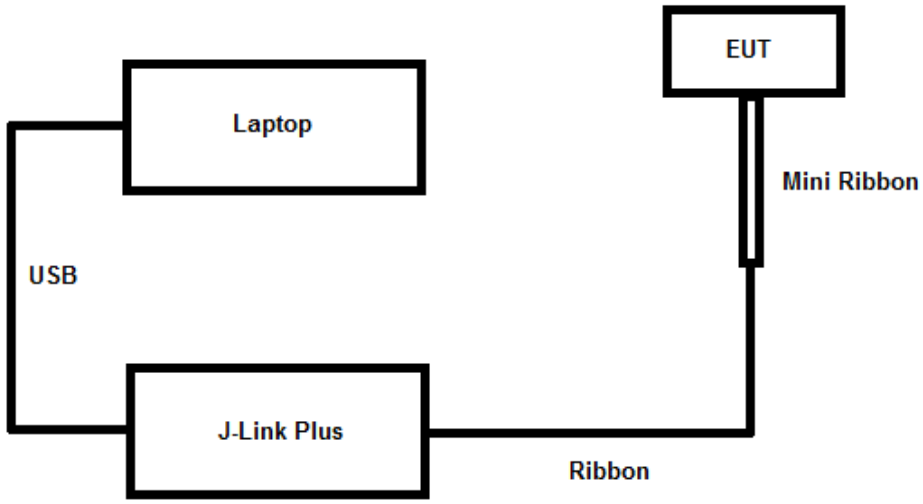
Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	ACE	WS-576-392H	NXGRYAA001841188997600
Router	Segger	J-Link Plus	600105807
2.4 GHz USB Dongle	None	None	None
Voltage Regulator	None	None	None

5.1 Method:

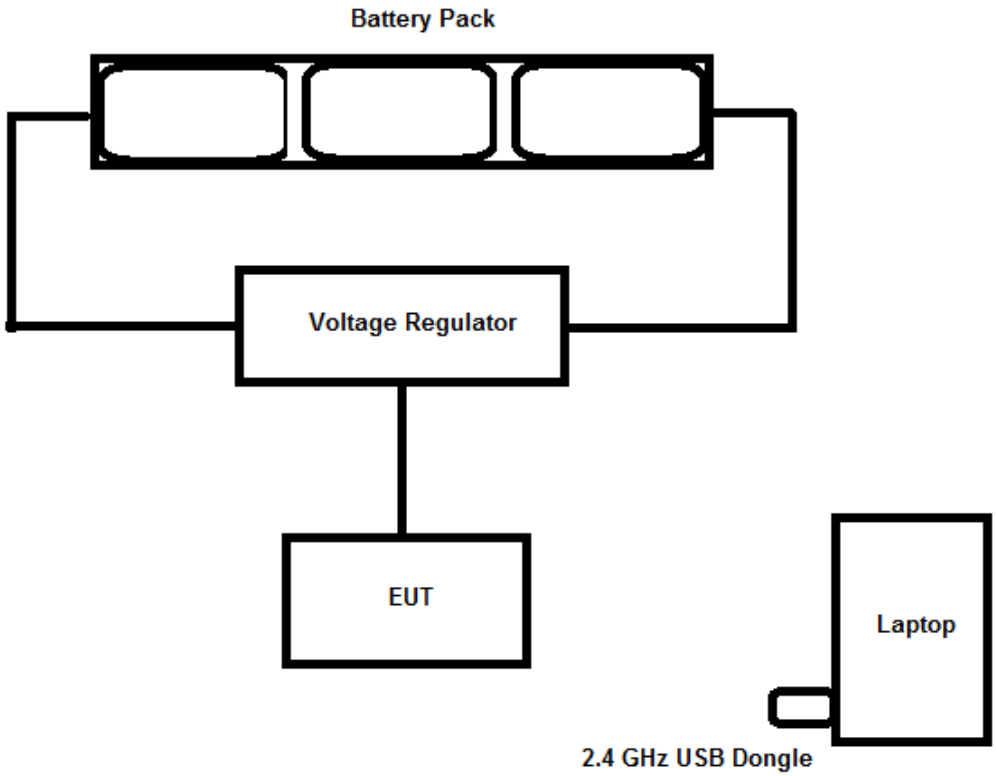
Configuration as required by Configuration as required by FCC Part 15 Subpart C 15.247: 01/2019, FCC Part 15 Subpart B: 01/2019, ANSI C 63.10: 2013, and ANSI C 63.4: 2014.

5.2 EUT Block Diagram:

Antenna Port Conducted Setup



Radiated Emissions Setup



Notes: During testing the battery pack/voltage regulator were located below the ground plane and the laptop was removed from the test setup.

6 Maximum Peak Output Power

6.1 Method

Tests are performed in accordance with CFR47 FCC Part 15.247 and ANSI C63.10.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DS40'	Temp, humidity, pressure gauge	Digi Sense	68000-49	181717625	11/06/2018	11/06/2019
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	10/15/2018	10/15/2019
DUT 1'	Coaxial Cable	UTIFLEX MICRO-COAX	UFA210A-1-0787-300300	101709	02/01/2018	02/01/2019
--	20 dB Attenuator	Pasternack	PE7004-20	None	VBU	Verified

Software Utilized:

Name	Manufacturer	Version
R&S EMC32/AMS32/WMS32	Rohde & Schwarz	10.30.00

6.3 Results:

The sample tested was found to Comply.

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt or 30 dBm.

6.4 Setup Photographs:

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6.5 Plots/Data:

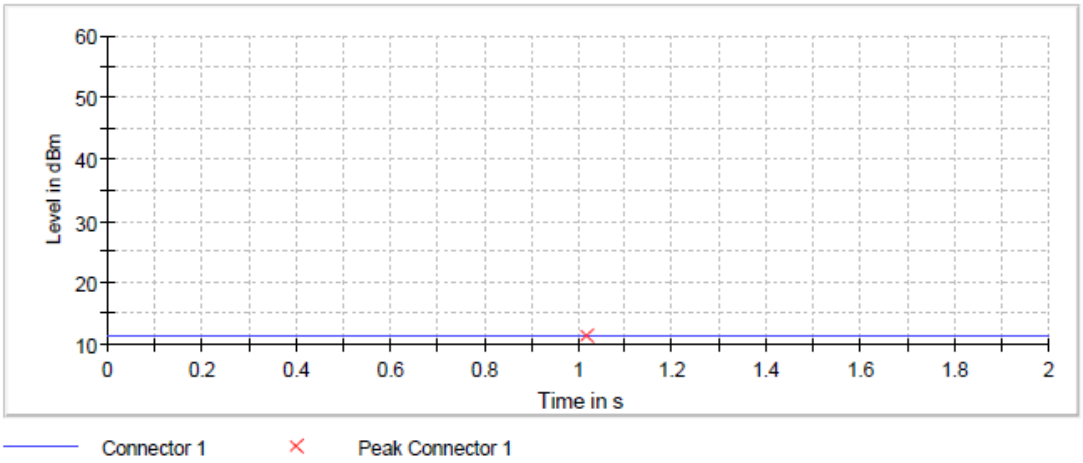
Peak output power (ZeroSpan) (2402 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 0.8 dB

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2402.000000	11.4	30.0	PASS



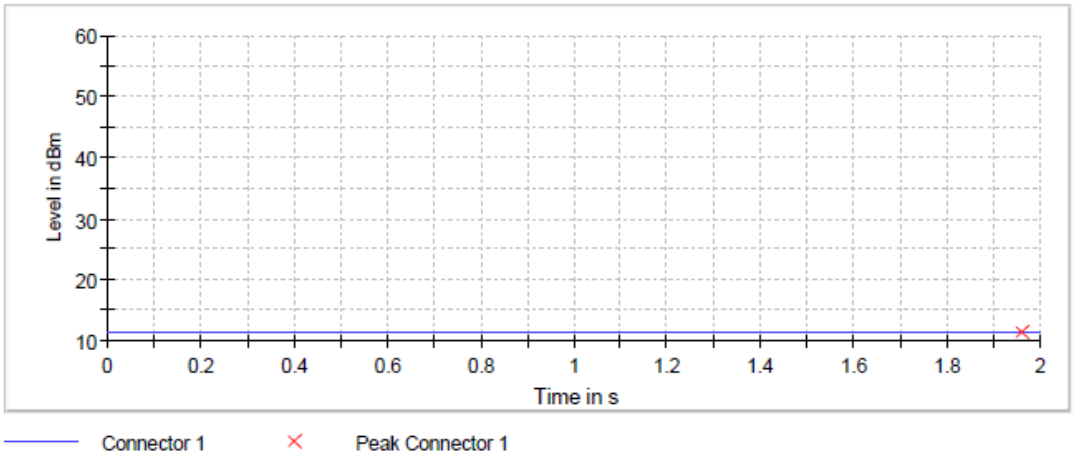
Peak output power (ZeroSpan) (2440 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 0.8 dB

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2440.000000	11.4	30.0	PASS



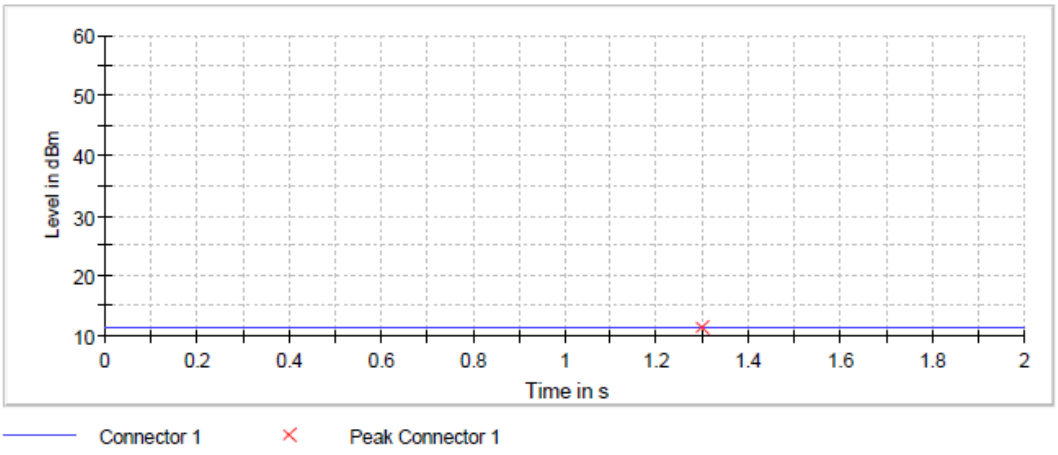
Peak output power (ZeroSpan) (2480 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 0.8 dB

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2480.000000	11.5	30.0	PASS



Test Personnel: Kouma Sinn KPS
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: CFR47 FCC Part 15.247
Input Voltage: Internal Battery Powered
Pretest Verification w/ Ambient Signals or BB Source: N/A

Test Date: 1/23/2019
Limit Applied: See report section 6.3
Ambient Temperature: 22 ºC
Relative Humidity: 12 %
Atmospheric Pressure: 1052 mbars

Deviations, Additions, or Exclusions: None

7 6 dB Bandwidth and Occupied Bandwidth

7.1 Method

Tests are performed in accordance with CFR47 FCC Part 15.247 and ANSI C63.10.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DS40'	Temp, humidity, pressure gauge	Digi Sense	68000-49	181717625	11/06/2018	11/06/2019
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/07/2017	11/07/2018
DUT 1'	Coaxial Cable	UTIFLEX MICRO-COAX	UFA210A-1-0787-300300	101709	02/01/2018	02/01/2019
--	20 dB Attenuator	Pasternack	PE7004-20	None	VBU	Verified

Software Utilized:

Name	Manufacturer	Version
R&S EMC32/AMS32/WMS32	Rohde & Schwarz	10.30.00

7.3 Results:

The sample tested was found to Comply.

§15.247 (a) (2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.4 Setup Photographs:

CONFIDENTIAL

7.5 Plots/Data:

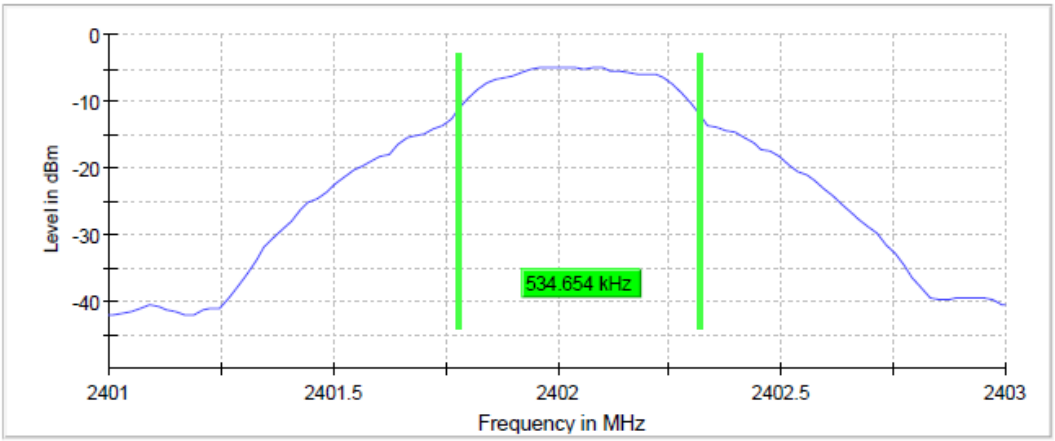
Minimum Emission Bandwidth 6 dB (2402 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Uncertainty (K=2) < 2%

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2402.000000	0.534654	0.500000	---	2401.782178	2402.316832	-4.7	PASS



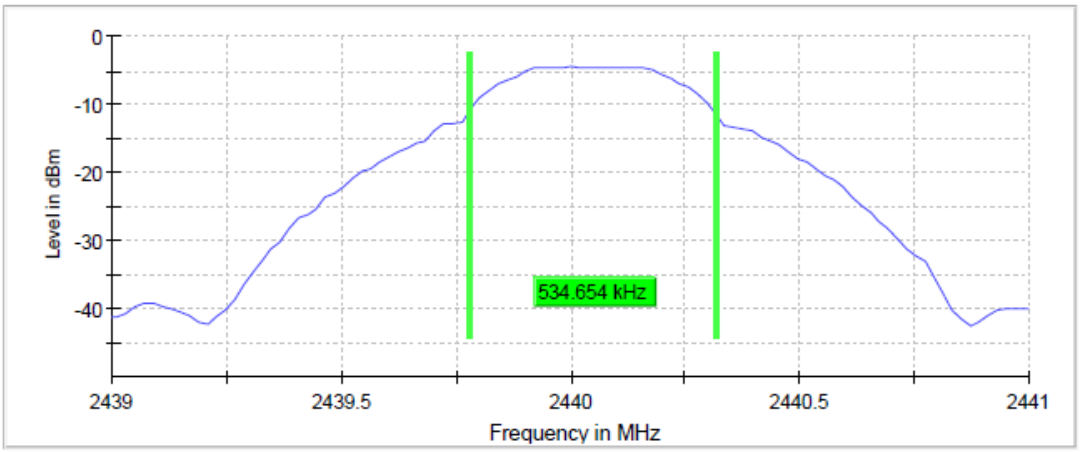
Minimum Emission Bandwidth 6 dB (2440 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Uncertainty (K=2) < 2%

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2440.000000	0.534654	0.500000	---	2439.782178	2440.316832	-4.4	PASS



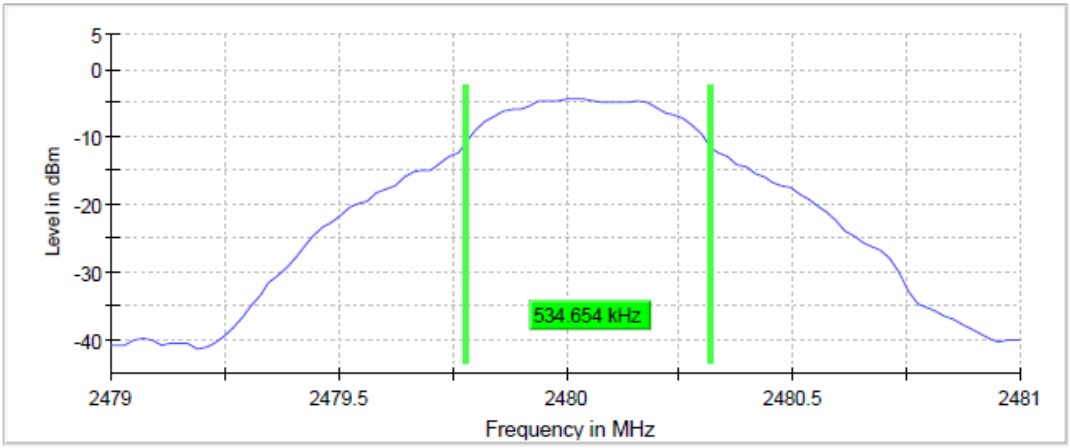
Minimum Emission Bandwidth 6 dB (2480 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Uncertainty (K=2) < 2%

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2480.000000	0.534654	0.500000	---	2479.782178	2480.316832	-4.4	PASS



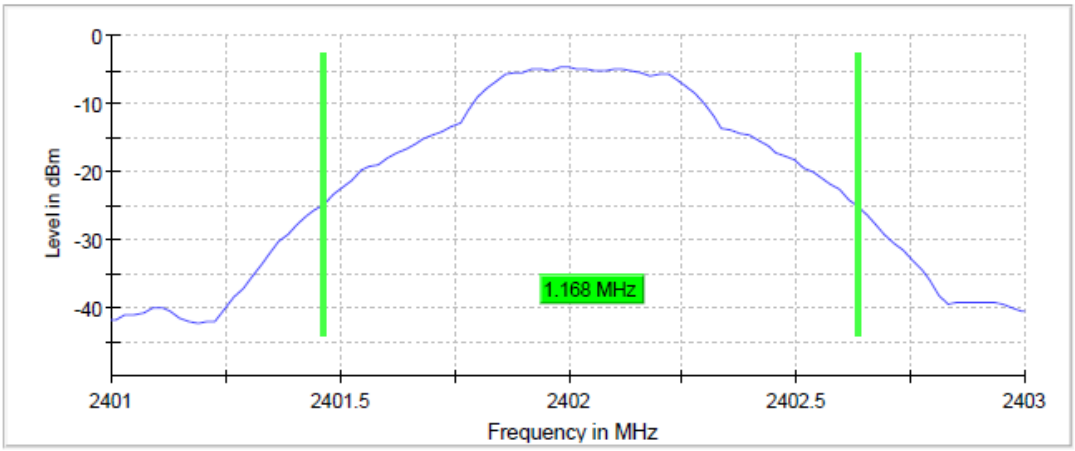
Emission Bandwidth 20 dB (2402 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Uncertainty (K=2) < 2%

20 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2402.000000	1.168316	---	---	2401.465347	2402.633663	-4.7	PASS



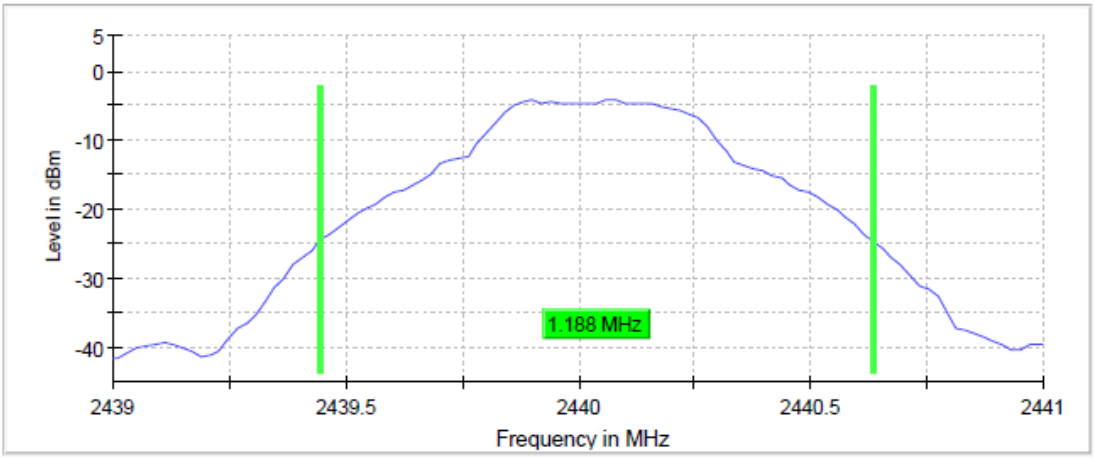
Emission Bandwidth 20 dB (2440 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Uncertainty (K=2) < 2%

20 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2440.000000	1.188118	---	---	2439.445545	2440.633663	-4.1	PASS



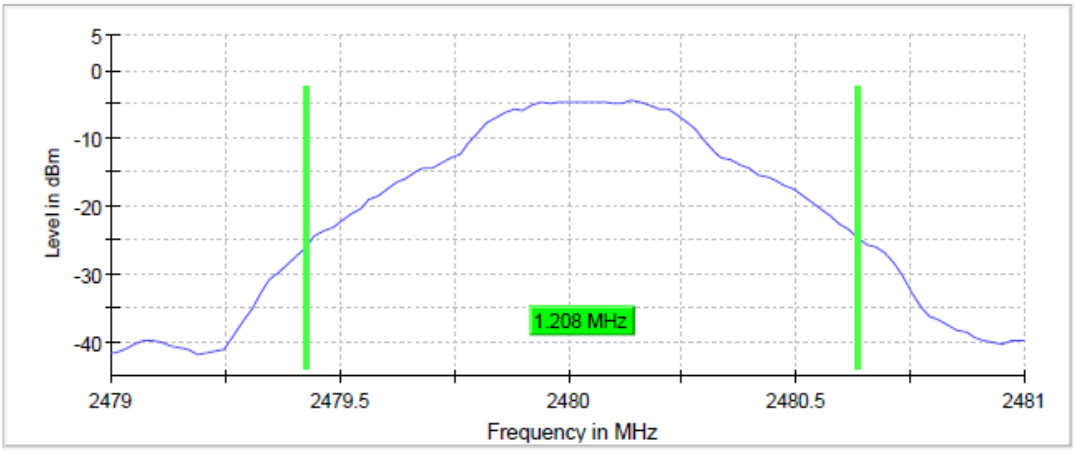
Emission Bandwidth 20 dB (2480 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Uncertainty (K=2) < 2%

20 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2480.000000	1.207920	---	---	2479.425743	2480.633663	-4.5	PASS



Test Personnel: Kouma Sinn KPS
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: CFR47 FCC Part 15.247
Input Voltage: Internal Battery Powered
Pretest Verification w/ Ambient Signals or BB Source: N/A

Test Date: 01/23/2019
Limit Applied: See report section 7.3
Ambient Temperature: 22 ºC
Relative Humidity: 12 %
Atmospheric Pressure: 1052 mbars

Deviations, Additions, or Exclusions: None

8 Maximum Power Spectral Density

8.1 Method

Tests are performed in accordance with CFR47 FCC Part 15.247 and ANSI C63.10.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DS40'	Temp, humidity, pressure gauge	Digi Sense	68000-49	181717625	11/06/2018	11/06/2019
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	10/15/2018	10/15/2019
DUT 1'	Coaxial Cable	UTIFLEX MICRO-COAX	UFA210A-1-0787-300300	101709	02/01/2018	02/01/2019
--	20 dB Attenuator	Pasternack	PE7004-20	None	VBU	Verified

Software Utilized:

Name	Manufacturer	Version
R&S EMC32/AMS32/WMS32	Rohde & Schwarz	10.30.00

8.3 Results:

The sample tested was found to Comply.

§15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.4 Setup Photograph:

CONFIDENTIAL

8.5 Plots/Data:

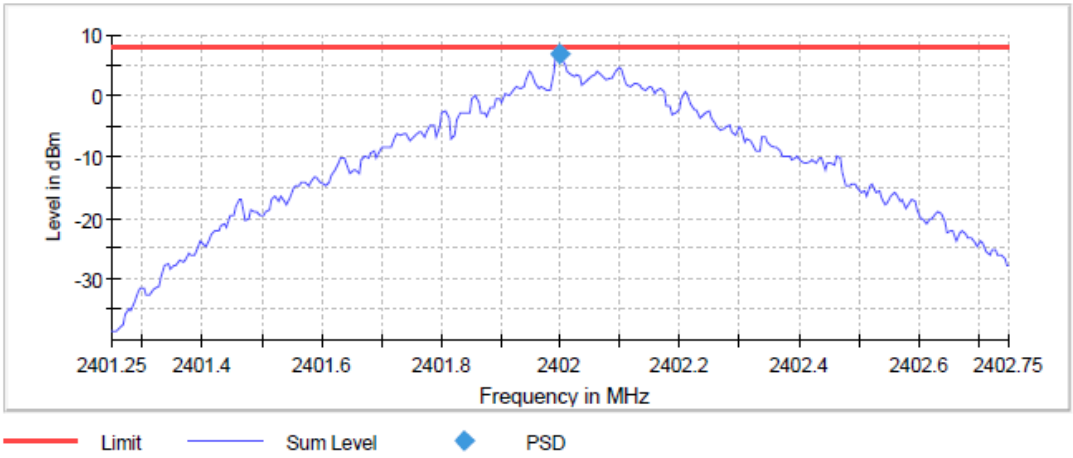
Peak Power Spectral Density (2402 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Uncertainty (K=2) < 1.1 dB

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2402.000000	2401.997500	7.004	8.0	PASS



Peak Power Spectral Density (2440 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Uncertainty (K=2) < 1.1 dB

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2440.000000	2440.002500	5.640	8.0	PASS

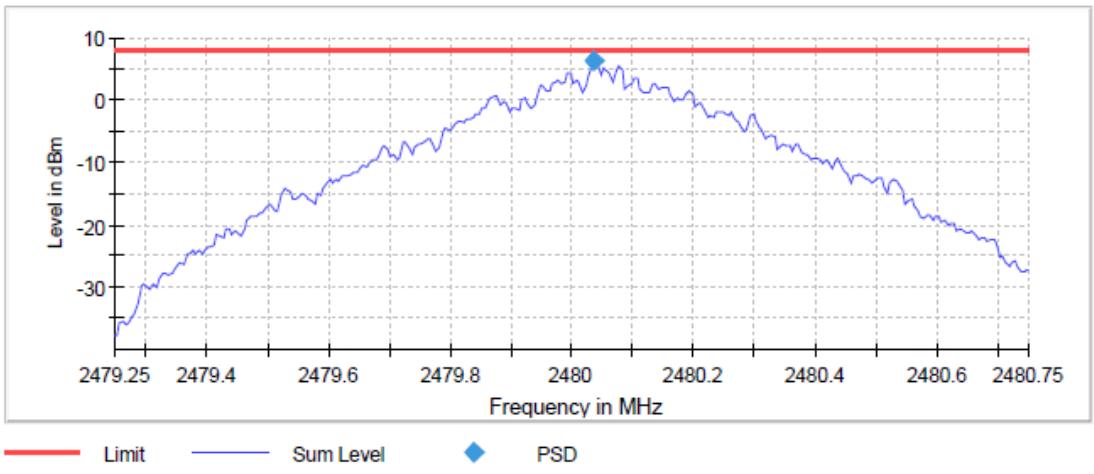
Peak Power Spectral Density (2480 MHz; Conducted Power (13 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Uncertainty (K=2) < 1.1 dB

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2480.000000	2480.037500	6.387	8.0	PASS



Test Personnel:	Kouma Sinn KPS	Test Date:	01/23/2019
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	CFR47 FCC Part 15.247	Limit Applied:	See report section 8.3
Input Voltage:	Internal Battery Powered		
Pretest Verification w/ Ambient Signals or BB Source:	N/A	Ambient Temperature:	22 ºC
		Relative Humidity:	12 %
		Atmospheric Pressure:	1052 mbars

Deviations, Additions, or Exclusions: None

9 Band Edge Compliance

9.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C 15.247, ANSI C 63.10, and ANSI C 63.4.

TEST SITE: EMC Lab & 10m ALSE

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

9.2 Test Equipment Used:

Equipment Used For Antenna Port Band Edge Emissions Measurements

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DS40'	Temp, humidity, pressure gauge	Digi Sense	68000-49	181717625	11/06/2018	11/06/2019
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	10/15/2018	10/15/2019
DUT 1'	Coaxial Cable	UTIFLEX MICRO-COAX	UFA210A-1-0787-300300	101709	02/01/2018	02/01/2019
--	20 dB Attenuator	Pasternack	PE7004-20	None	VBU	Verified

Software Utilized:

Name	Manufacturer	Version
R&S EMC32/AMS32/WMS32	Rohde & Schwarz	10.30.00

Equipment Used Radiated For Band Edge Emissions Measurements

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
BAR1'	Digital 4 Line Barometer	Mannix	0ABA116	BAR1	04/30/2018	04/30/2019
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/22/2018	03/22/2019
145-416'	Cables 145-420 145-423 145-425 145-408	Huber + Suhner	3m Track B cables	multiple	07/25/2018	07/25/2019
ETS005'	1-18GHz horn antenna	ETS-Lindgren	3117	00218279	05/14/2018	05/14/2019

Software Utilized:

Name	Manufacturer	Version
None	--	--

9.3 Results:

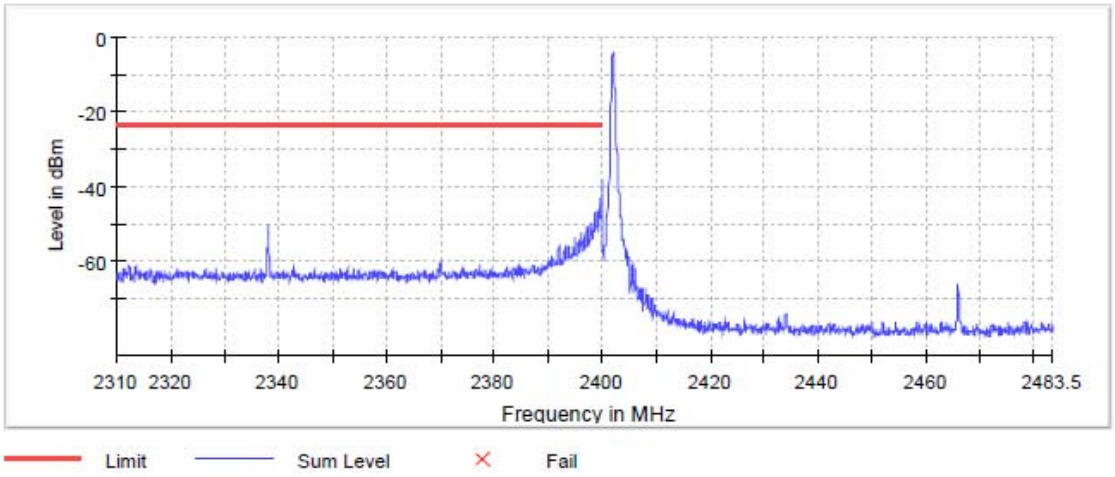
The sample tested was found to Comply.

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))

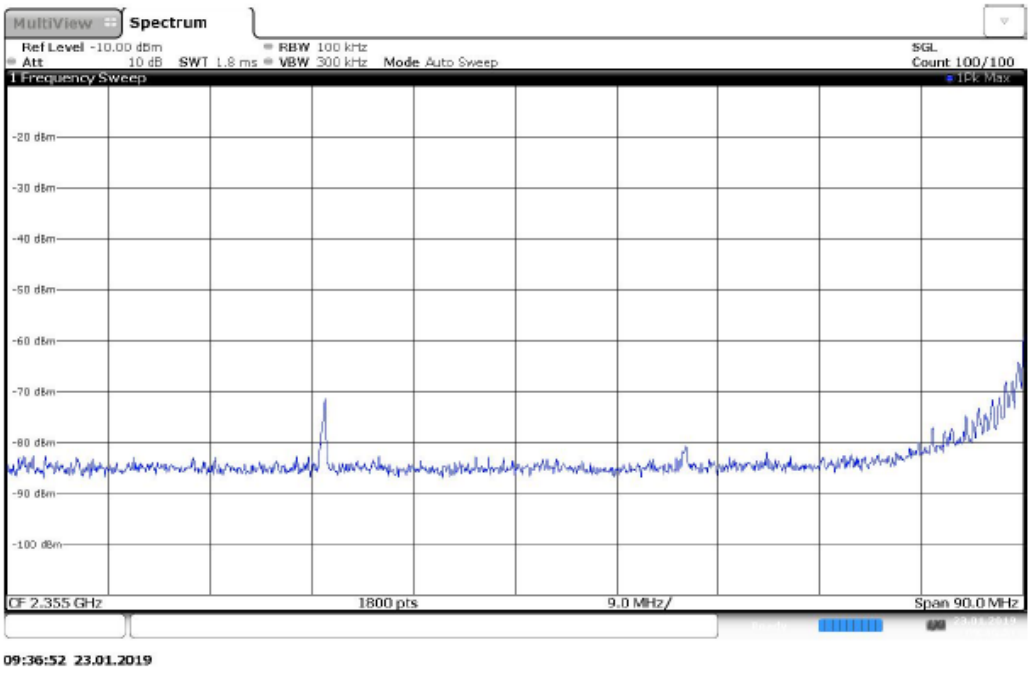
9.4 Setup Photograph:

CONFIDENTIAL

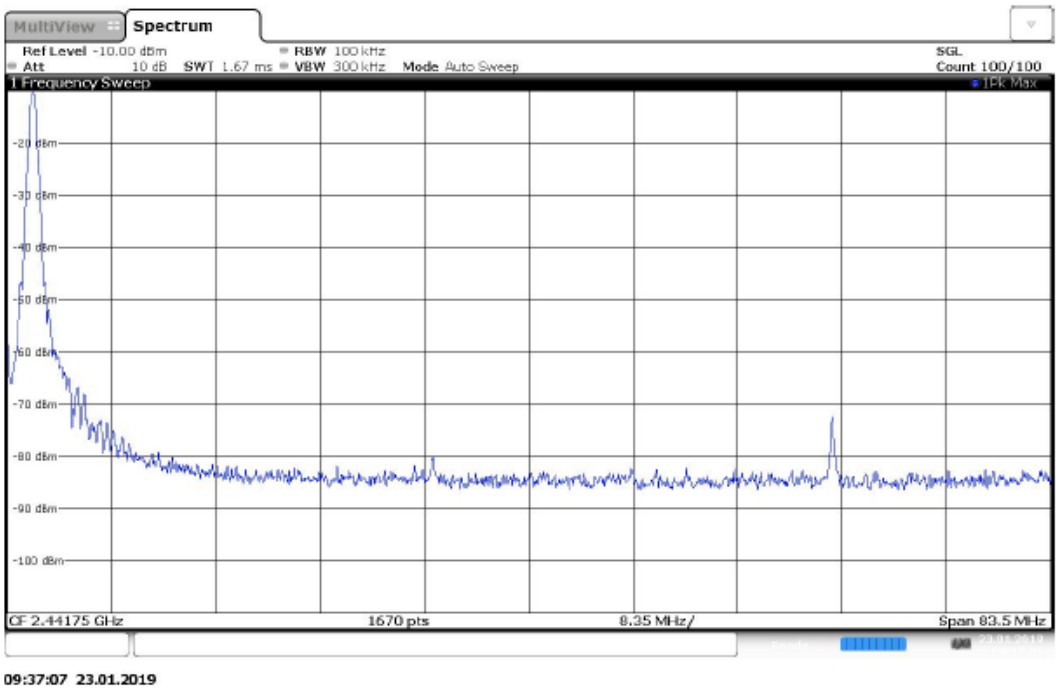
9.5 Plots/Data:

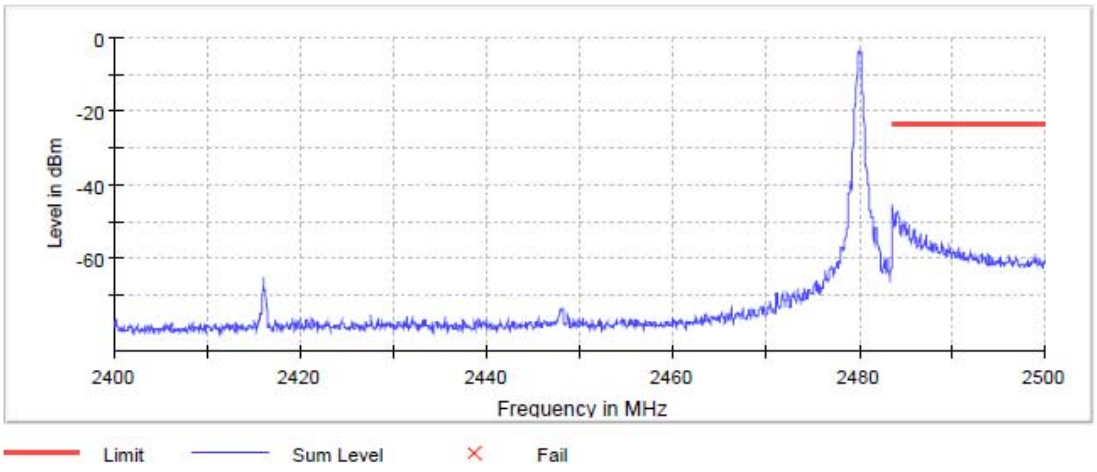


Band Edge Connector 1_0

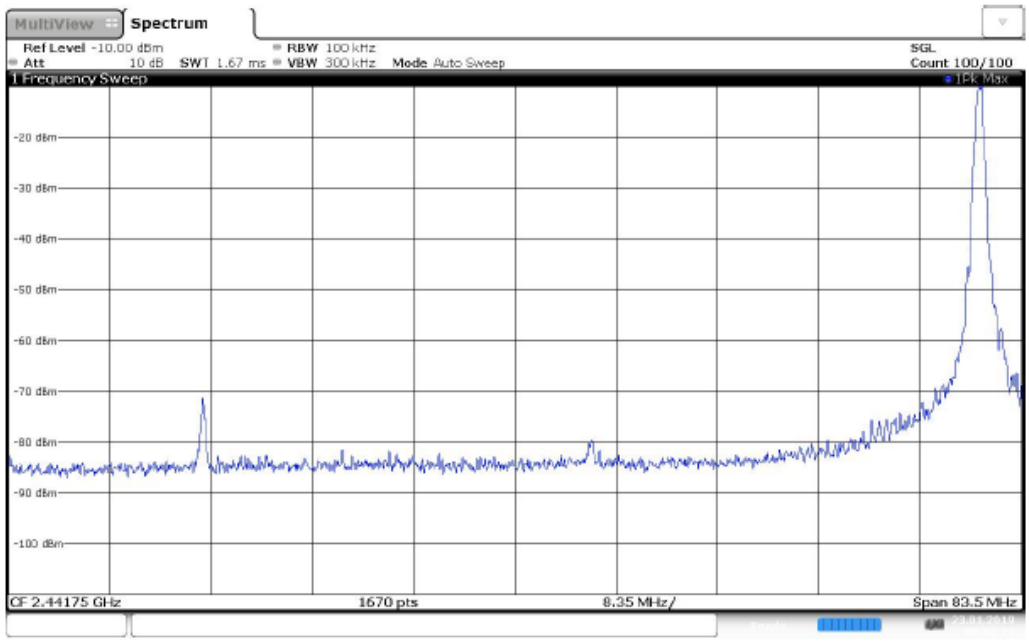


Band Edge Connector 1_1



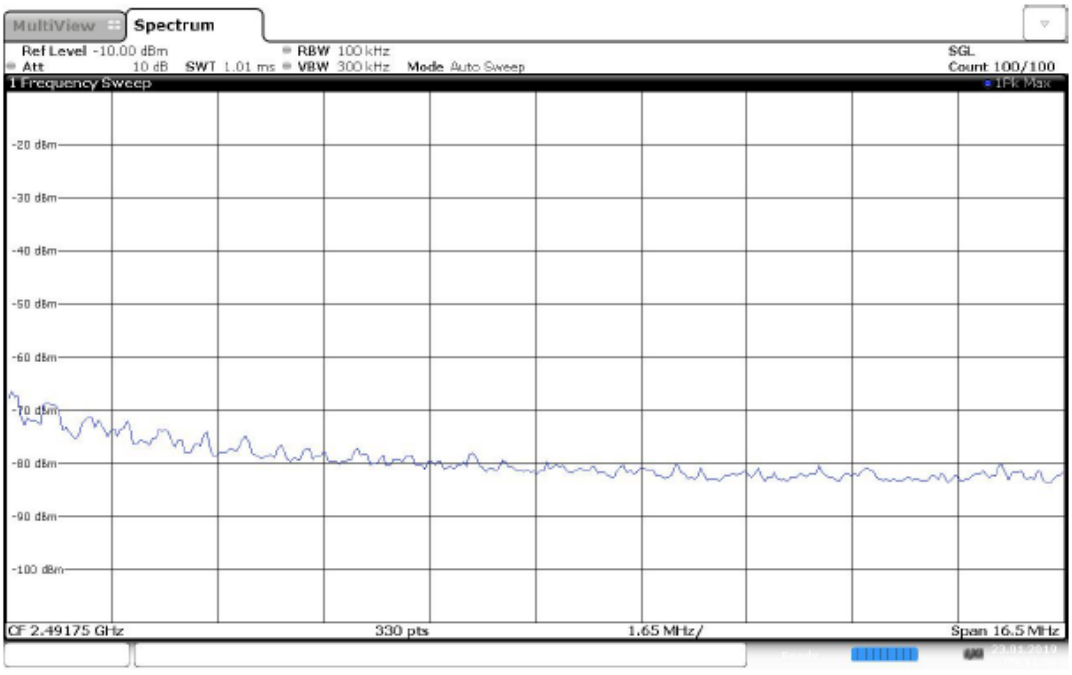


Band Edge Connector 1_0



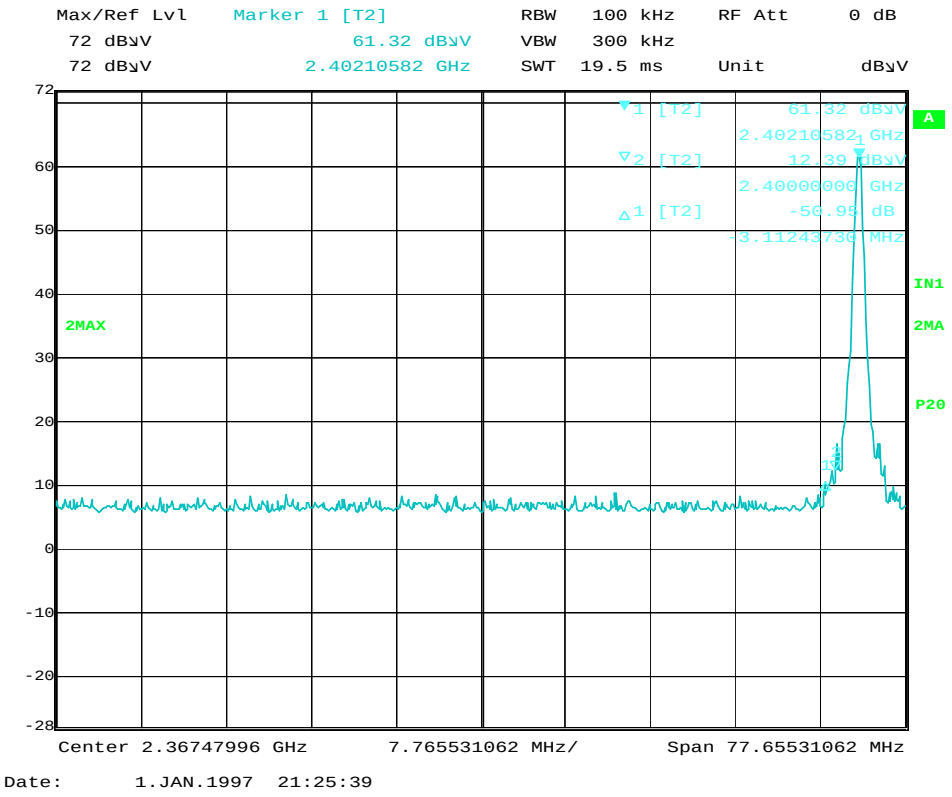
09:41:19 23.01.2019

Band Edge Connector 1_1

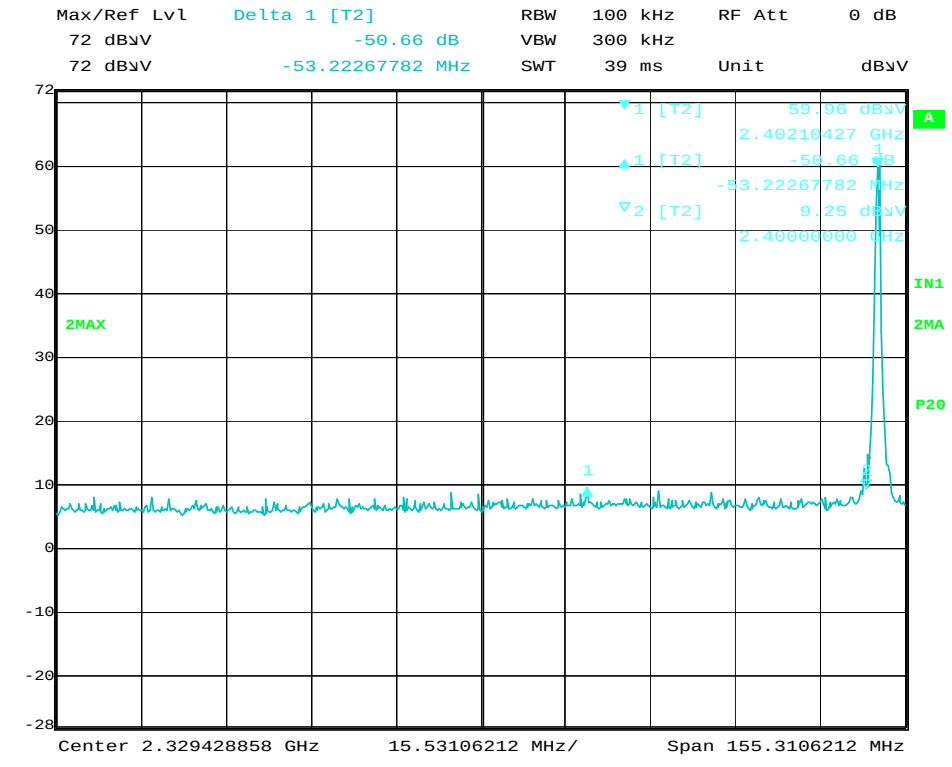


09:41:35 23.01.2019

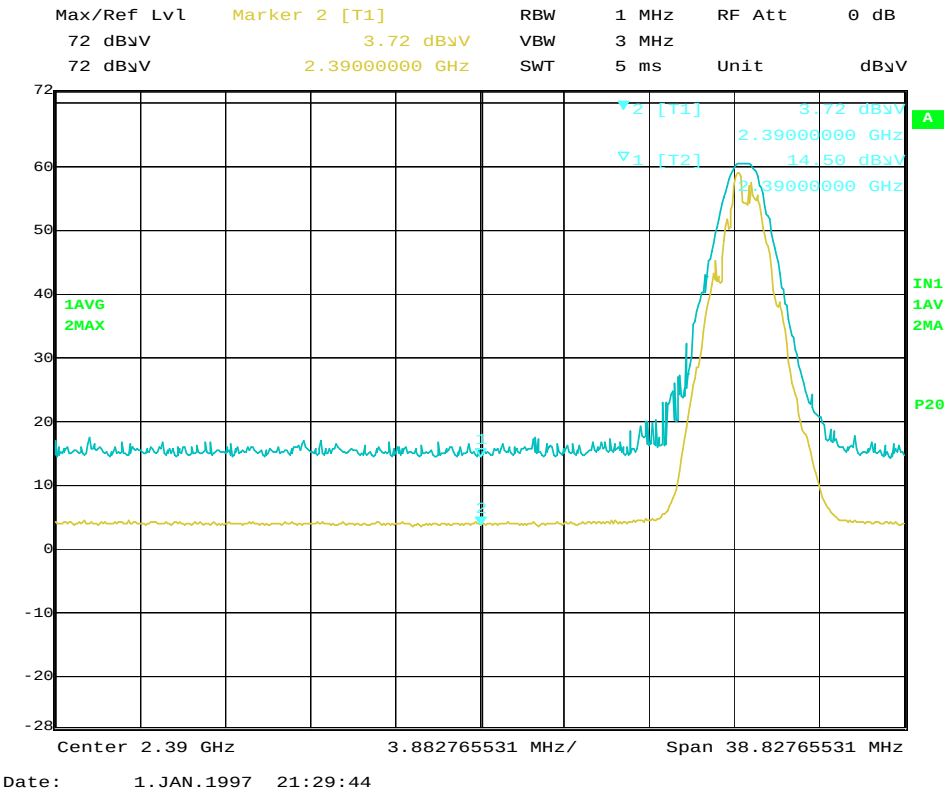
Radiated Lower Band Edge Emissions (ResBW = 100 kHz)



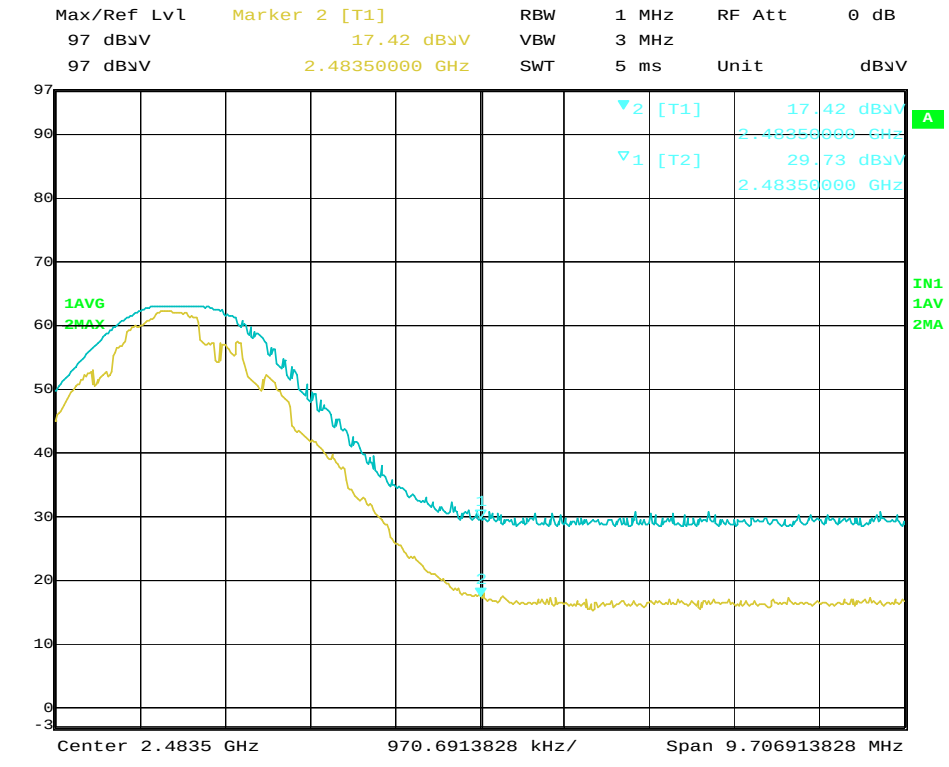
Radiated Lower Band Edge Emissions (ResBW = 100 kHz)



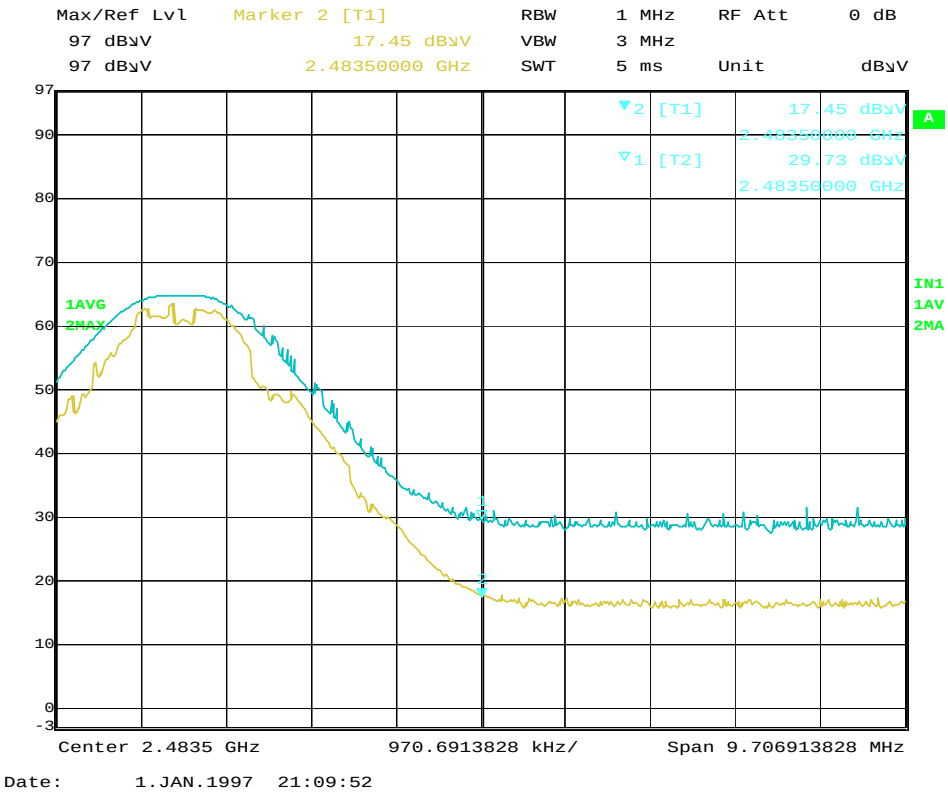
Radiated Lower Band Edge Emissions (ResBW = 1 MHz)



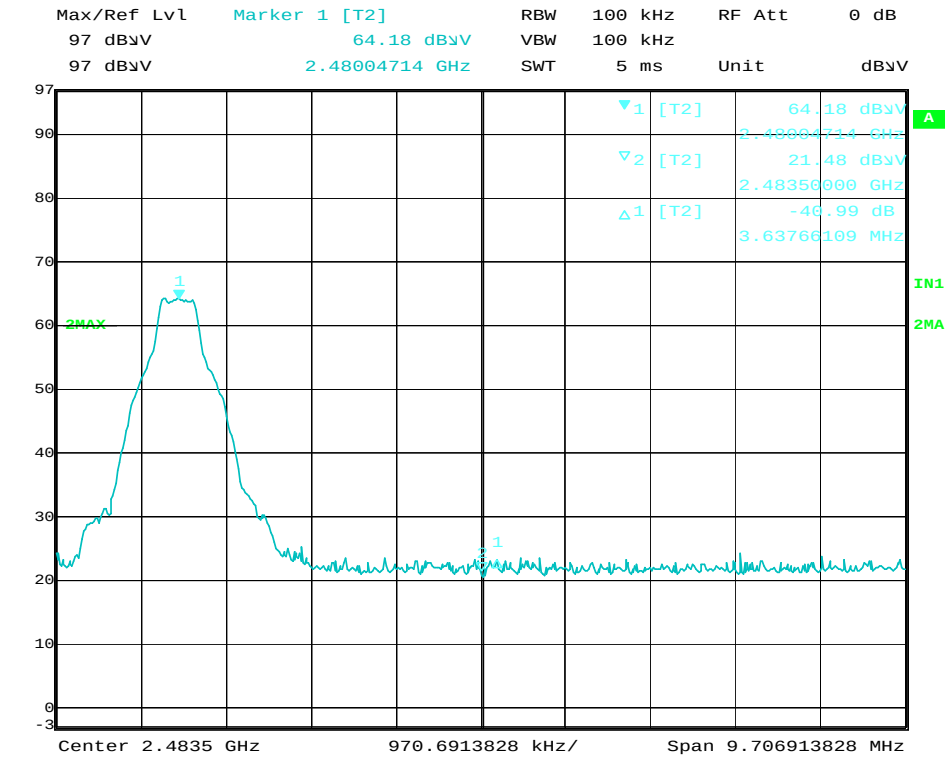
Radiated Upper Band Edge Emissions



Radiated Upper Band Edge Emissions



Radiated Upper Band Edge Emissions



Radiated Emissions

Company: The Procter & Gamble Company
Model #: DS5000
Serial #: None
Engineers: Vathana Ven
Project #: G103794632
Standard: FCC Part 15 Subpart C 15.247
Receiver: R&S ESI (145-128) 03-22-2019
PreAmp: 145-020__9-14-2019.txt
PreAmp Used? (Y or N): N
Location: 10M
Date(s): 01/24/19
Limit Distance (m): 3
Test Distance (m): 2
Voltage/Frequency: Battery power
Antenna & Cables: HF
Antenna: ETS005_Vertical_5-14-2019.txt ETS005_Horizontal_5-14-2019.txt
Cable(s): 145-416__11-15-2019.txt NONE.
Barometer: BAR1
Temp/Humidity/Pressure: 21 deg C 31% 980 mB
Bands: N, LF, HF, SHF
Filter: REA008
Frequency Range: 1-25 GHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Lower BEC													
PK	H	2390.000	16.00	32.10	6.77	0.00	3.52	51.35	74.00	-22.65	1/3 MHz	RB	RB
AVG	H	2390.000	4.00	32.10	6.77	0.00	3.52	39.35	54.00	-14.65	1/3 MHz	RB	RB
Upper BEC													
PK	H	2483.500	30.00	32.27	6.91	0.00	3.52	65.65	74.00	-8.35	1/3 MHz	RB	
AVG	H	2483.500	17.42	32.27	6.91	0.00	3.52	53.07	54.00	-0.93	1/3 MHz	RB	

Test Personnel: Kouma Sinn KPS / Vathana Ven VJV
Test Date: 01/23/2019 01/24/2019
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: CFR47 FCC Part 15.247
Input Voltage: Internal Battery Powered
Limit Applied: See report section 9.3
Pretest Verification w/ Ambient Signals or BB Source: N/A
Ambient Temperature: 22, 21 ºC
Relative Humidity: 12, 31 %
Atmospheric Pressure: 1052, 980 mbars

Deviations, Additions, or Exclusions: None

10 Transmitter spurious emissions

10.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C 15.247, FCC Part 15 Subpart B, ANSI C 63.10, and ANSI C 63.4.

TEST SITE: EMC Lab & 10m ALSE

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

Alternately, when BAT-EMC Emission Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. The “Correction” includes Antenna Factor, Preamp, and Cable Loss. These are already accounted for in the “Level” column.

10.2 Test Equipment Used:

Equipment Used For Antenna Port Spurious Emissions Measurements

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DS40'	Temp, humidity, pressure gauge	Digi Sense	68000-49	181717625	11/06/2018	11/06/2019
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	10/15/2018	10/15/2019
CBL030'	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	11/15/2018	11/15/2019
--	20 dB Attenuator	HRS	AT-120V	001160	VBU	Verified

Software Utilized:

Name	Manufacturer	Version
None	--	--

Equipment Used Radiated Spurious Emissions Measurements

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
BAR1'	Digital 4 Line Barometer	Mannix	0ABA116	BAR1	04/30/2018	04/30/2019
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/22/2018	03/22/2019
ETS005'	1-18GHz horn antenna	ETS-Lindgren	3117	00218279	05/14/2018	05/14/2019
145-410'	Cables 145-420 145-421 145-422 145-406	Huber + Suhner	10m Track A Cables	multiple	07/25/2018	07/25/2019
145-416'	Cables 145-420 145-423 145-425 145-408	Huber + Suhner	3m Track B cables	multiple	07/25/2018	07/25/2019
PRE11'	50dB gain pre-amp	Keith H	PRE11	PRE11	10/27/2018	10/27/2019
REA008'	band reject filter 2.4GHz	Reactel, Inc	12RX7-2441.75-x140 S	17-01	07/13/2018	07/13/2019
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	05/16/2018	05/16/2019

Software Utilized:

Name	Manufacturer	Version
BAT-EMC	Nexio	3.17.0.3

10.3 Results:

The sample tested was found to Comply.

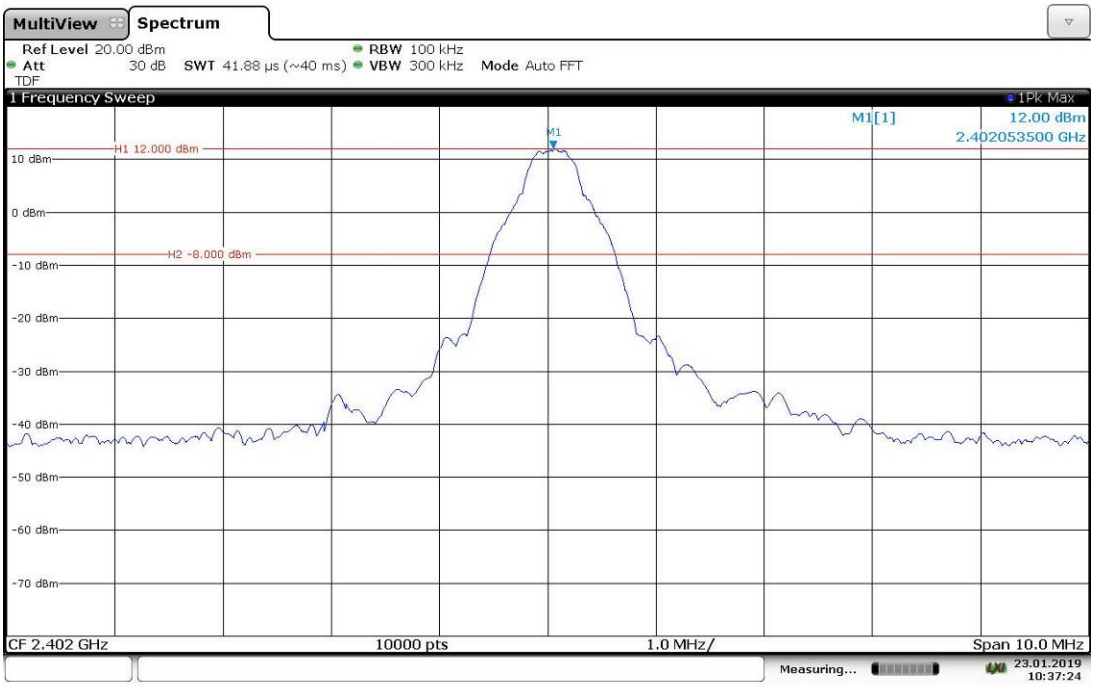
15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that 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))

10.4 Setup Photographs:

CONFIDENTIAL

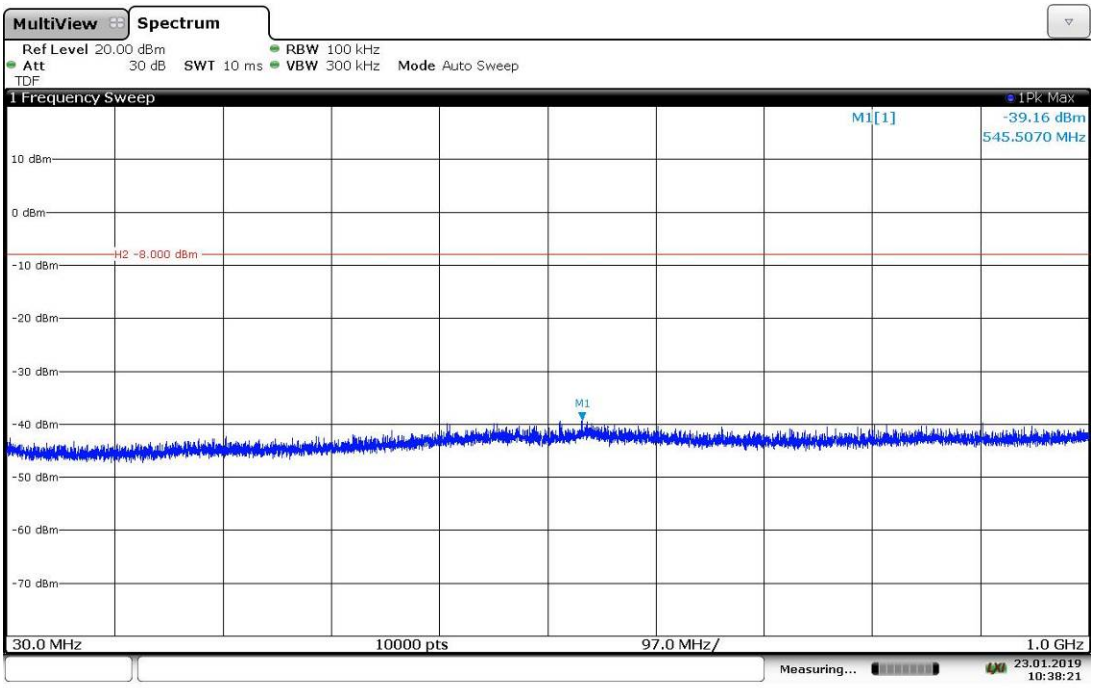
10.5 Plots/Data:

Low channel 20 dB down from carrier limit



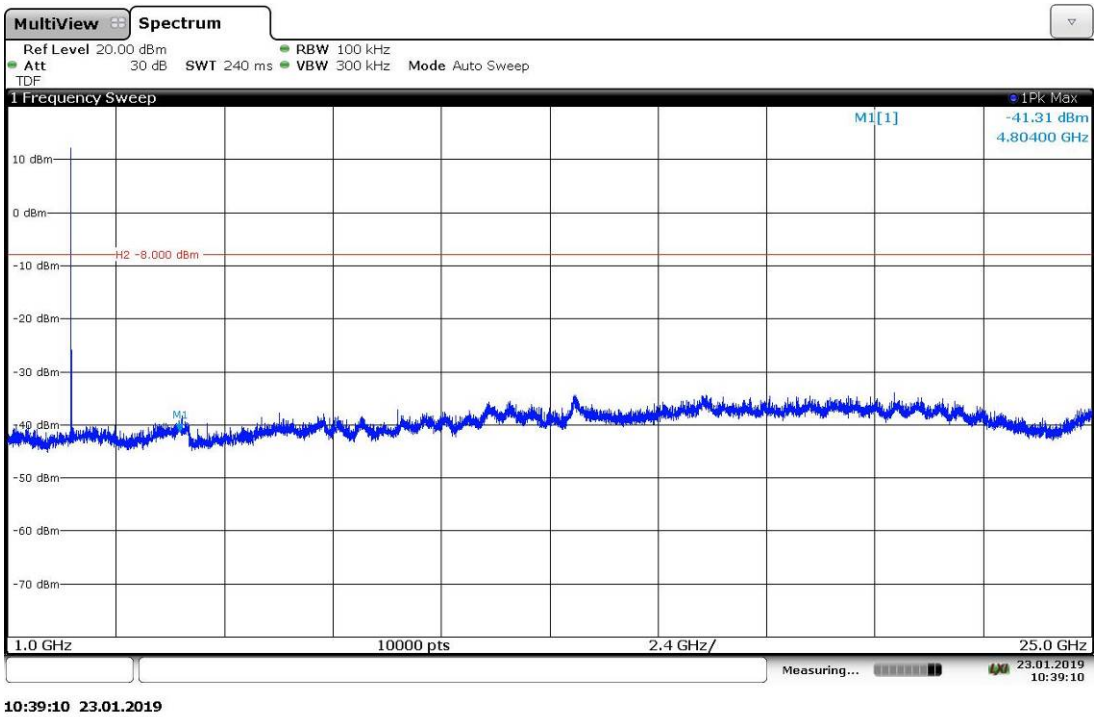
10:37:24 23.01.2019

Low Channel Conducted Spurious Emission From 30-1000 MHz



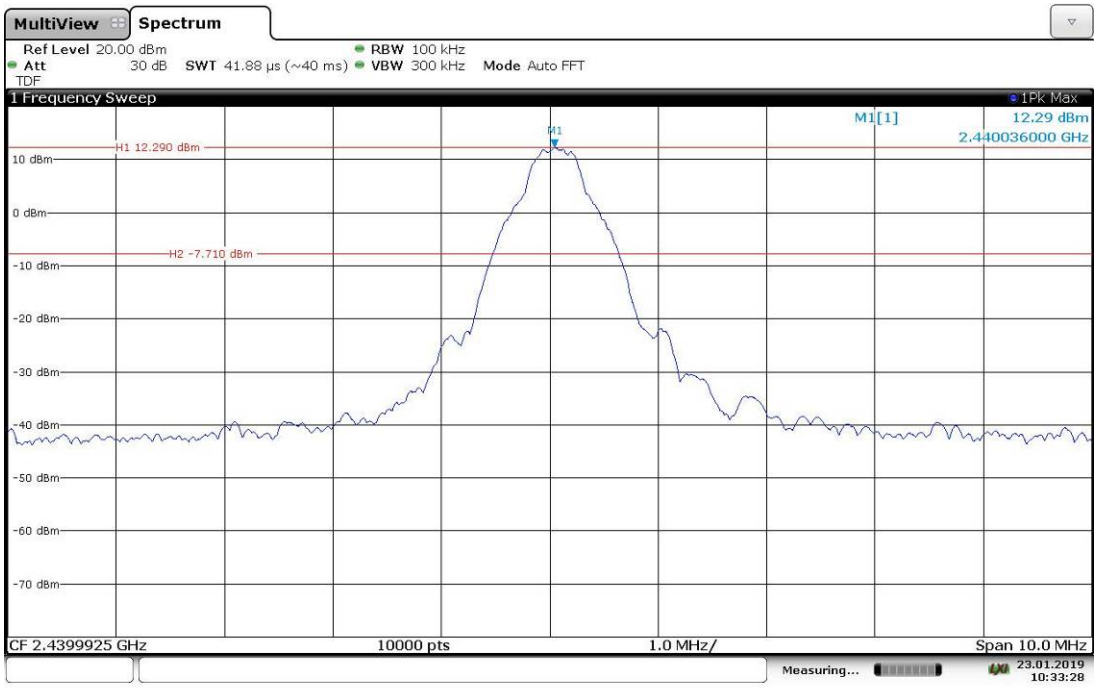
10:38:22 23.01.2019

Low Channel Conducted Spurious Emission From 1-25 GHz



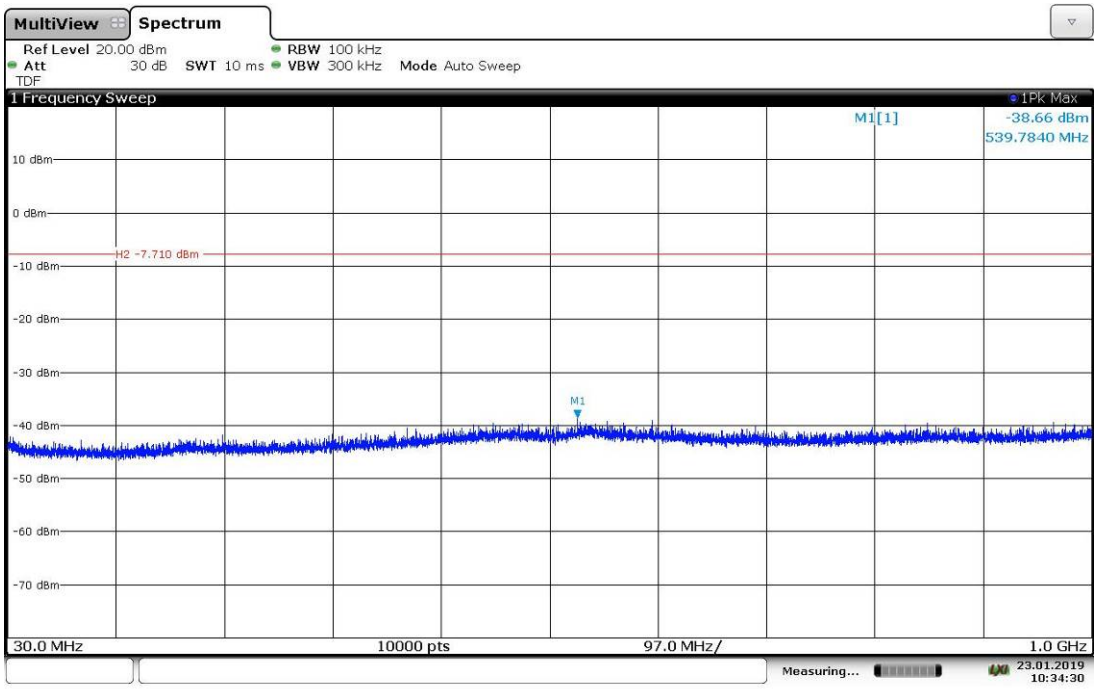
10:39:10 23.01.2019

Mid channel 20 dB down from carrier limit



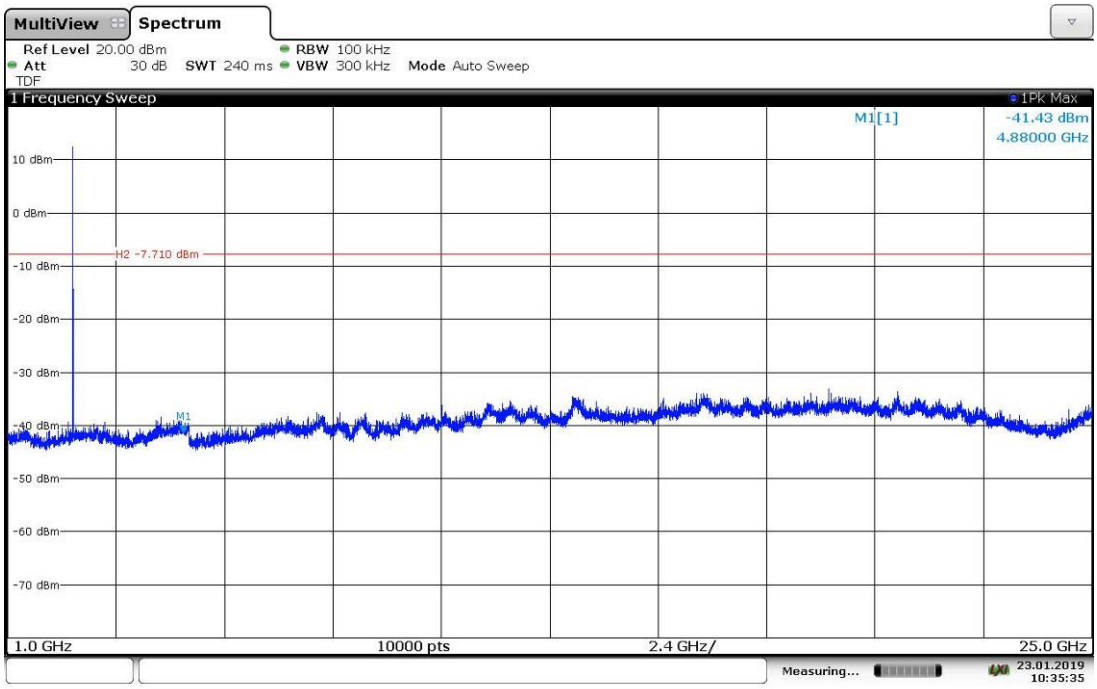
10:33:28 23.01.2019

Mid Channel Conducted Spurious Emission From 30-1000 MHz



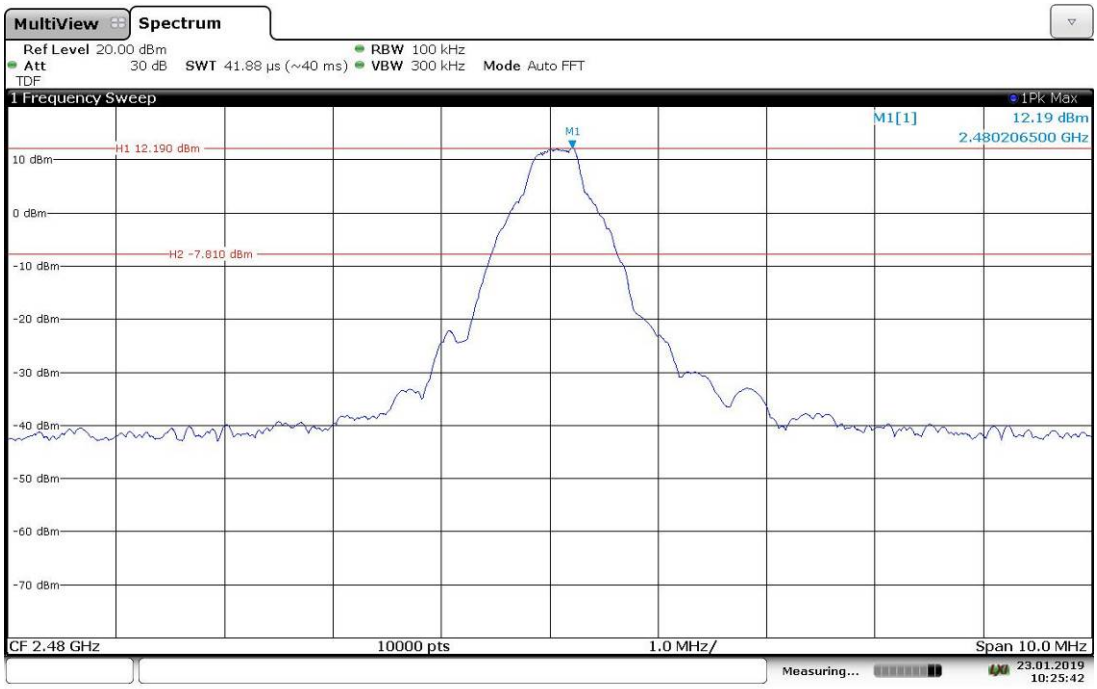
10:34:30 23.01.2019

Mid Channel Conducted Spurious Emission From 1-25 GHz



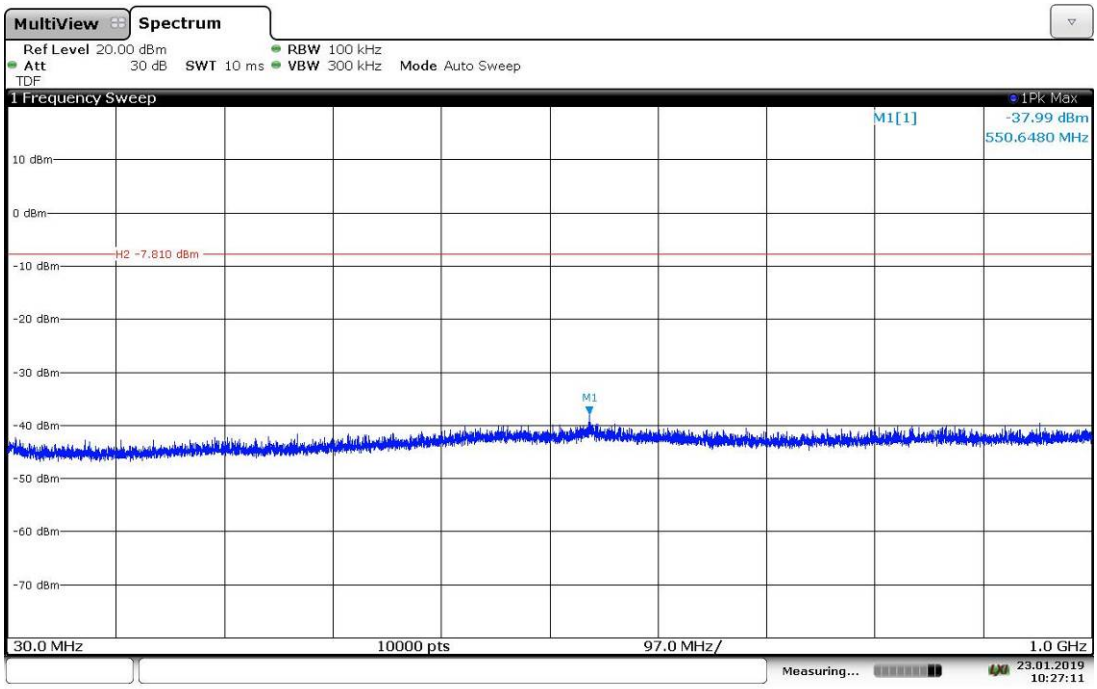
10:35:35 23.01.2019

High channel 20 dB down from carrier limit



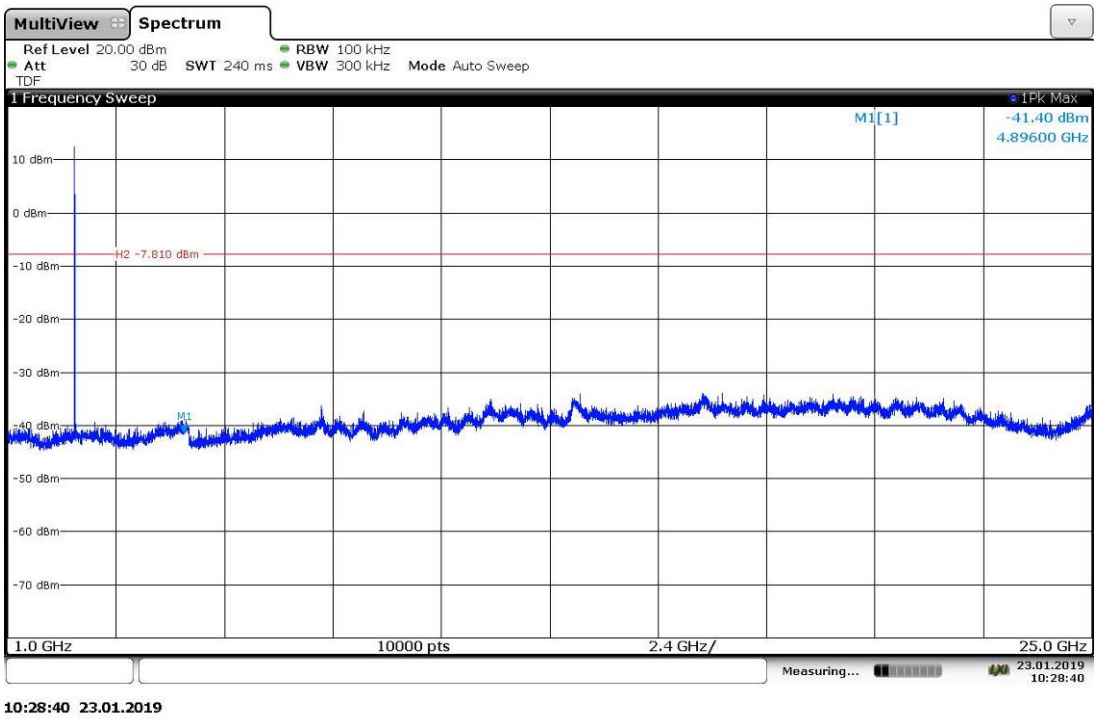
10:25:43 23.01.2019

High Channel Conducted Spurious Emission From 30-1000 MHz



10:27:11 23.01.2019

High Channel Conducted Spurious Emission From 1-25 GHz

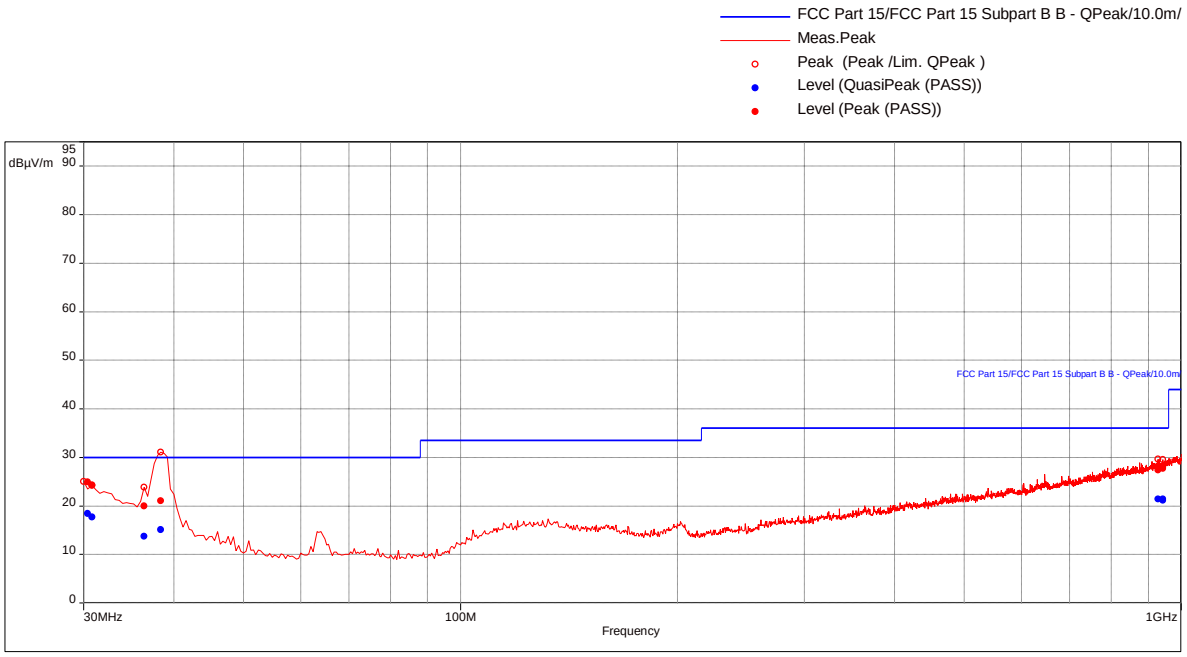


Radiated Spurious Emissions, Transmits Low Channel, EUT on X Axis, 30-1000 MHz

Test Information:

Date and Time	1/23/2019 5:55:28 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	22%
Atmospheric Pressure	1007 mB
Comments	RE 30-1000MHz_Battery_Tx mode_Low channel_X-Axis

Graph:



Results:

QuasiPeak (PASS) (7)

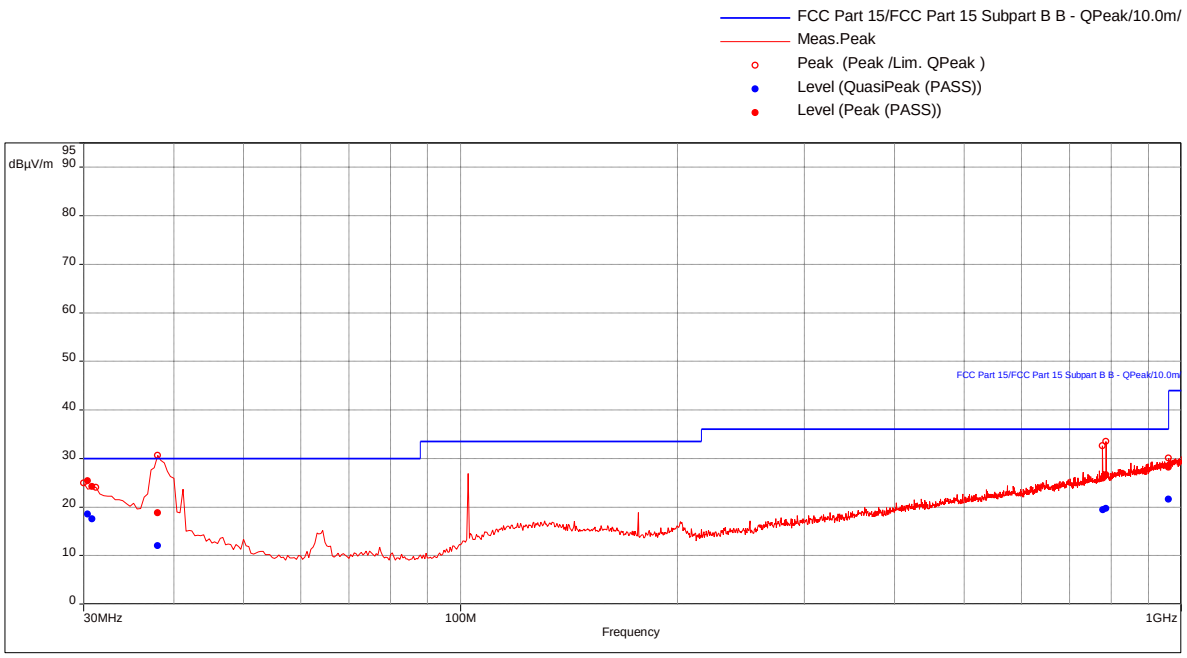
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
30.28421053	18.42	30.00	-11.58	359.00	2.71	Horizontal	120000.00	-11.17
30.73684211	17.67	30.00	-12.33	224.00	2.70	Horizontal	120000.00	-11.52
36.4	13.77	30.00	-16.23	26.00	3.15	Vertical	120000.00	-15.87
38.55789474	15.05	30.00	-14.95	62.00	2.91	Vertical	120000.00	-17.52
927.9052632	21.39	36.00	-14.61	128.00	2.54	Vertical	120000.00	-4.91
942.3578947	21.42	36.00	-14.58	351.00	2.56	Vertical	120000.00	-4.82
942.8105263	21.13	36.00	-14.87	269.00	2.10	Horizontal	120000.00	-4.81

Radiated Spurious Emissions, Transmits Low Channel, EUT on Y Axis, 30-1000 MHz

Test Information:

Date and Time	1/23/2019 7:34:43 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	22%
Atmospheric Pressure	1007 mB
Comments	RE 30-1000MHz_Battery_Tx mode_Low channel_Y-Axis

Graph:



Results:

QuasiPeak (PASS) (6)

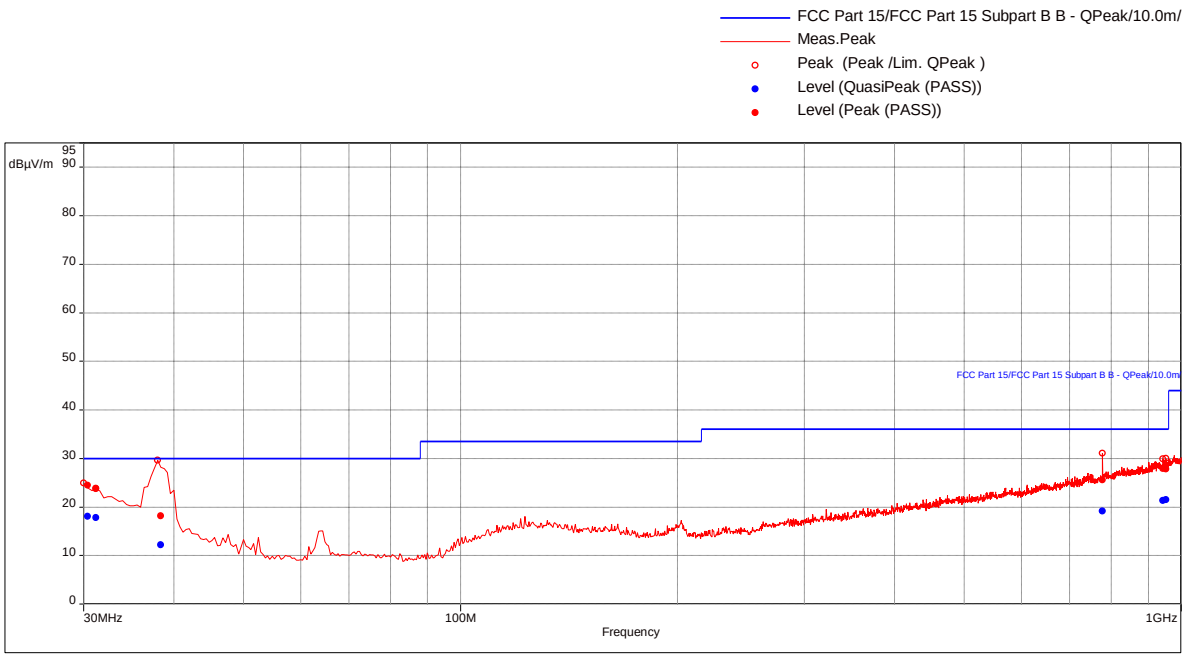
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
30.26842105	18.53	30.00	-11.47	234.00	3.82	Horizontal	120000.00	-11.16
30.75789474	17.55	30.00	-12.45	189.00	1.26	Vertical	120000.00	-11.54
38.15789474	11.99	30.00	-18.01	62.00	1.38	Horizontal	120000.00	-17.25
777.9789474	19.39	36.00	-16.61	290.00	1.52	Vertical	120000.00	-7.33
786.2736842	19.66	36.00	-16.34	3.00	3.98	Vertical	120000.00	-7.06
959.8736842	21.57	36.00	-14.43	359.00	3.57	Horizontal	120000.00	-4.38

Radiated Spurious Emissions, Transmits Low Channel, EUT on Z Axis, 30-1000 MHz

Test Information:

Date and Time	1/23/2019 6:50:42 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	22%
Atmospheric Pressure	1007 mB
Comments	RE 30-1000MHz_Battery_Tx mode_Low channel_Z-Axis

Graph:



Results:

QuasiPeak (PASS) (6)

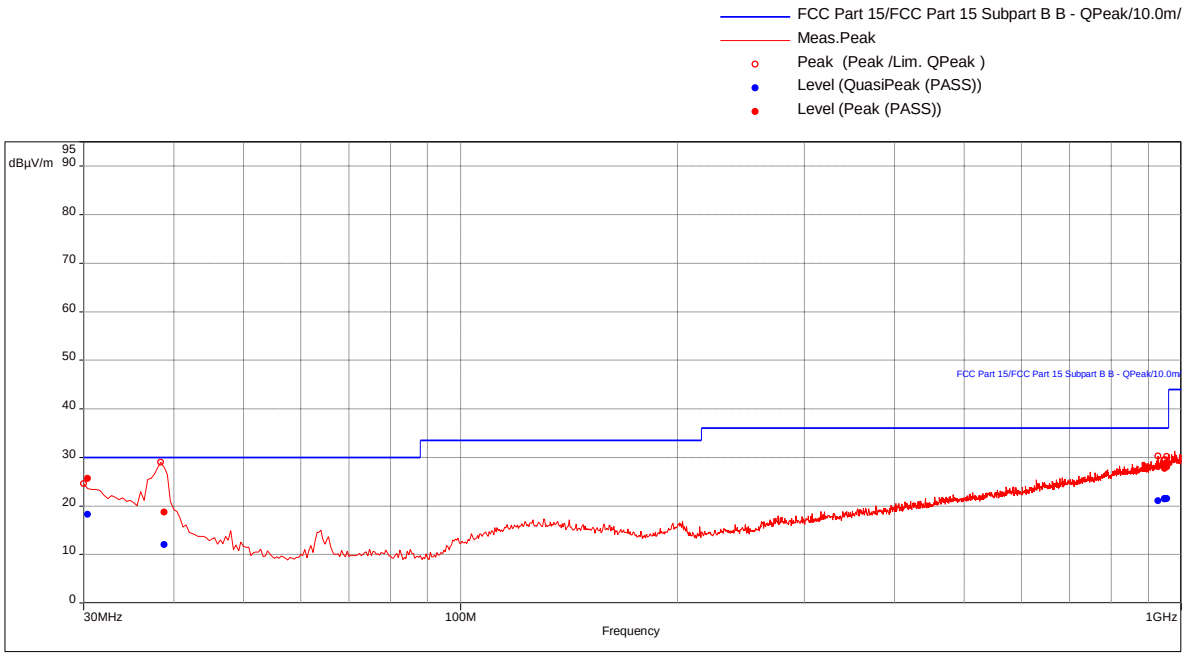
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
30.31578947	18.10	30.00	-11.90	239.00	1.50	Vertical	120000.00	-11.19
31.16842105	17.77	30.00	-12.23	203.00	3.05	Vertical	120000.00	-11.86
38.22105263	12.20	30.00	-17.80	62.00	1.65	Vertical	120000.00	-17.29
777.6	19.18	36.00	-16.82	254.00	3.94	Vertical	120000.00	-7.33
943.7263158	21.29	36.00	-14.71	180.00	1.15	Vertical	120000.00	-4.80
952.5789474	21.48	36.00	-14.52	195.00	2.62	Vertical	120000.00	-4.54

Radiated Spurious Emissions, Transmits High Channel, EUT on X Axis, 30-1000 MHz

Test Information:

Date and Time	1/23/2019 8:24:50 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	22%
Atmospheric Pressure	1007 mB
Comments	RE 30-1000MHz_Battery_Tx mode_High channel_X-Axis

Graph:



Results:

QuasiPeak (PASS) (6)

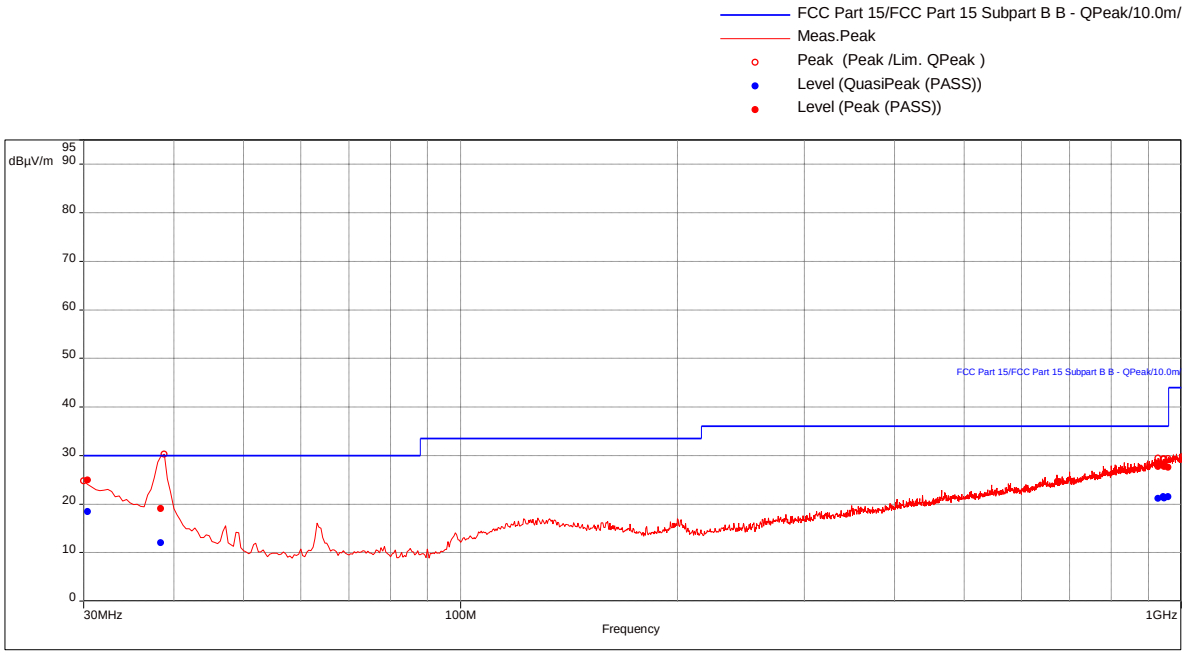
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
30.47368421	18.27	30.00	-11.73	315.00	3.93	Horizontal	120000.00	-11.32
38.68421053	12.03	30.00	-17.97	25.00	3.94	Vertical	120000.00	-17.61
929.2631579	21.05	36.00	-14.95	173.00	3.27	Vertical	120000.00	-4.90
947.8210526	21.49	36.00	-14.51	283.00	1.29	Vertical	120000.00	-4.67
948.7894737	21.43	36.00	-14.57	70.00	2.41	Horizontal	120000.00	-4.66
954.4315789	21.49	36.00	-14.51	172.00	2.57	Horizontal	120000.00	-4.52

Radiated Spurious Emissions, Transmits High Channel, EUT on Y Axis, 30-1000 MHz

Test Information:

Date and Time	1/23/2019 9:09:00 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	22%
Atmospheric Pressure	1007 mB
Comments	RE 30-1000MHz_Battery_Tx mode_High channel_Y-Axis

Graph:



Results:

QuasiPeak (PASS) (6)

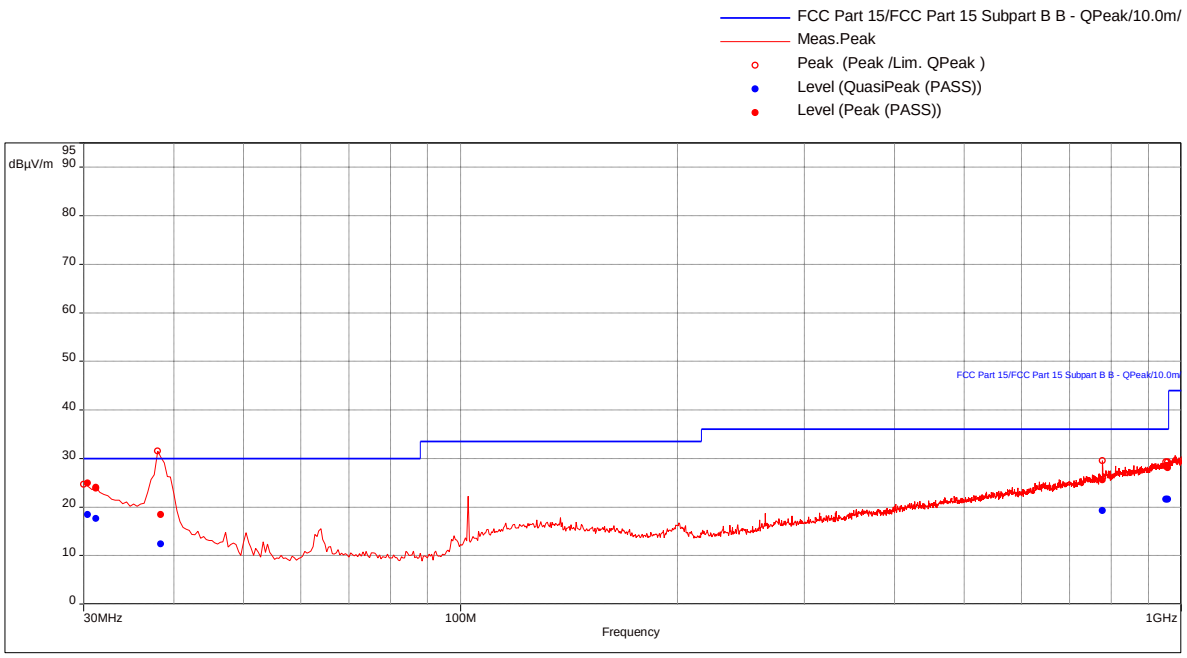
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
30.20526316	18.43	30.00	-11.57	359.00	3.93	Horizontal	120000.00	-11.11
38.51578947	12.05	30.00	-17.95	62.00	2.04	Vertical	120000.00	-17.49
929.0105263	21.12	36.00	-14.88	344.00	3.51	Vertical	120000.00	-4.90
944.1789474	21.46	36.00	-14.54	298.00	2.19	Vertical	120000.00	-4.78
947.0105263	21.27	36.00	-14.73	283.00	2.11	Vertical	120000.00	-4.67
958.5894737	21.51	36.00	-14.49	247.00	1.73	Horizontal	120000.00	-4.43

Radiated Spurious Emissions, Transmits High Channel, EUT on Z Axis, 30-1000 MHz

Test Information:

Date and Time	1/23/2019 9:52:44 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	22%
Atmospheric Pressure	1007 mB
Comments	RE 30-1000MHz_Battery_Tx mode_High channel_Z-Axis

Graph:



Results:

QuasiPeak (PASS) (6)

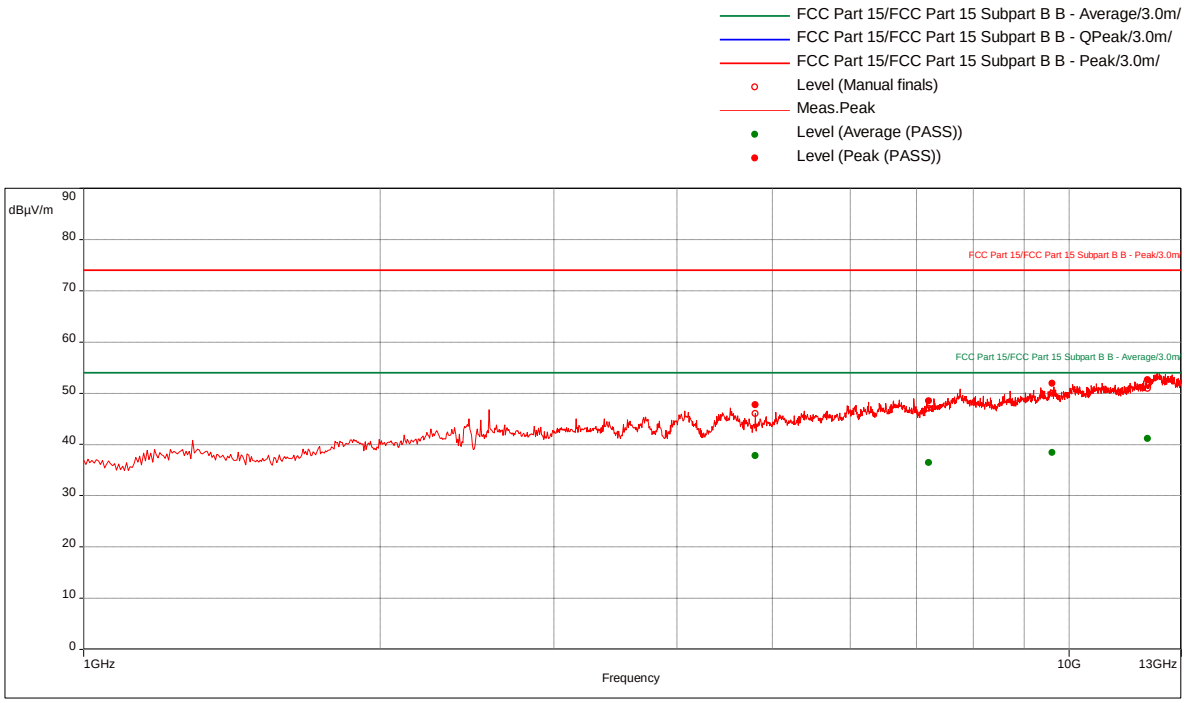
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
30.28421053	18.47	30.00	-11.53	25.00	3.20	Vertical	120000.00	-11.17
31.23157895	17.58	30.00	-12.42	320.00	1.23	Horizontal	120000.00	-11.91
38.22105263	12.39	30.00	-17.61	26.00	1.90	Vertical	120000.00	-17.29
777.6	19.25	36.00	-16.75	0.00	3.13	Horizontal	120000.00	-7.33
951.7263158	21.55	36.00	-14.45	152.00	2.24	Horizontal	120000.00	-4.54
957.7789474	21.59	36.00	-14.41	357.00	1.74	Horizontal	120000.00	-4.50

Radiated Spurious Emissions, Transmits Low Channel, EUT on X Axis, 1-25 GHz

Test Information:

Date and Time	1/24/2019 9:06:58 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	31%
Atmospheric Pressure	980 mB
Comments	RE 1 to 13 GHz_Battery_Tx mode_X-Axis

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4803.947368	47.78	74.00	-26.22	97.00	2.70	Vertical	1000000.00	6.49
7205.263158	48.54	74.00	-25.46	16.00	3.94	Horizontal	1000000.00	9.97
9611.578947	51.90	74.00	-22.10	341.00	2.19	Horizontal	1000000.00	11.96
12008.42105	52.65	74.00	-21.35	225.00	3.34	Vertical	1000000.00	15.44

Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4803.947368	37.85	54.00	-16.15	97.00	2.70	Vertical	1000000.00	6.49
7205.263158	36.42	54.00	-17.58	16.00	3.94	Horizontal	1000000.00	9.97
9611.578947	38.40	54.00	-15.60	341.00	2.19	Horizontal	1000000.00	11.96
12008.42105	41.17	54.00	-12.83	225.00	3.34	Vertical	1000000.00	15.44

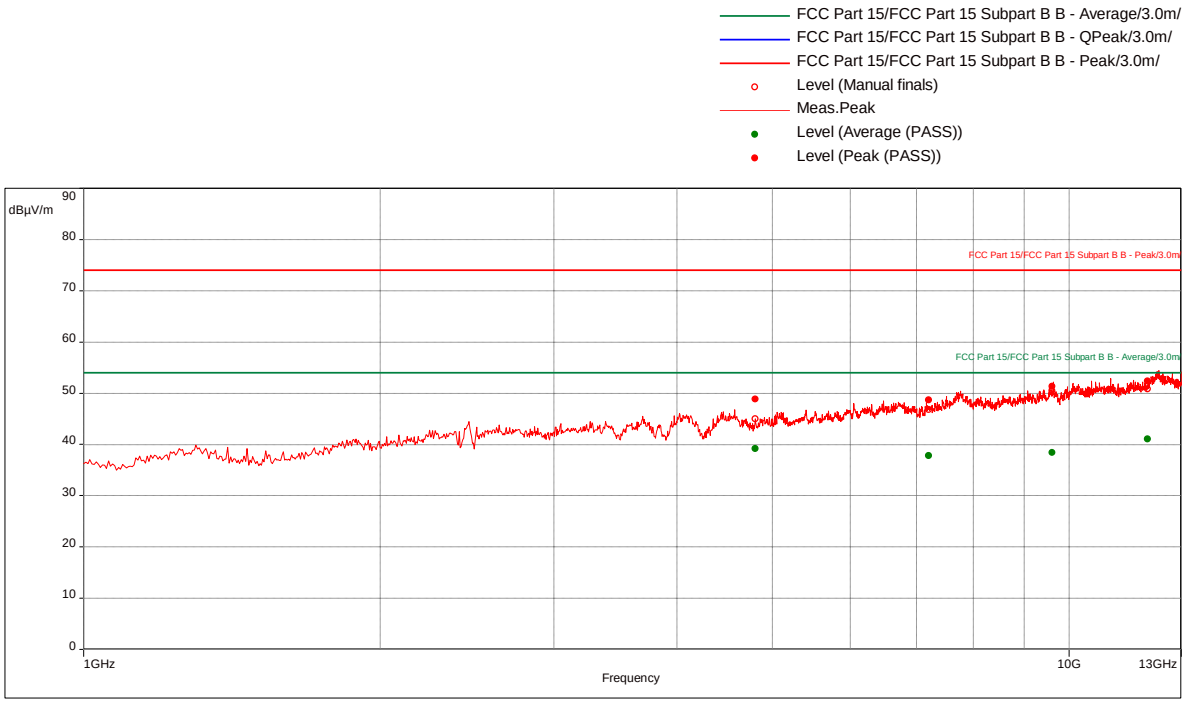
Note: Scans from 13-25 GHz were performed manually and no emissions were detected above the measuring equipment noise floor.

Radiated Spurious Emissions, Transmits Low Channel, EUT on Y Axis, 1-25 GHz

Test Information:

Date and Time	1/24/2019 9:33:21 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	31%
Atmospheric Pressure	980 mB
Comments	RE 1 to 13 GHz_Battery_Tx mode_Low channel_Y-Axis

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4804.210526	48.87	74.00	-25.13	169.00	1.55	Vertical	1000000.00	6.49
7206.578947	48.68	74.00	-25.32	359.00	1.65	Horizontal	1000000.00	9.98
9613.421053	51.34	74.00	-22.66	313.00	2.94	Horizontal	1000000.00	11.96
12010	52.39	74.00	-21.61	54.00	3.04	Vertical	1000000.00	15.45

Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4804.210526	39.16	54.00	-14.84	169.00	1.55	Vertical	1000000.00	6.49
7206.578947	37.82	54.00	-16.18	359.00	1.65	Horizontal	1000000.00	9.98
9613.421053	38.40	54.00	-15.60	313.00	2.94	Horizontal	1000000.00	11.96
12010	41.10	54.00	-12.90	54.00	3.04	Vertical	1000000.00	15.45

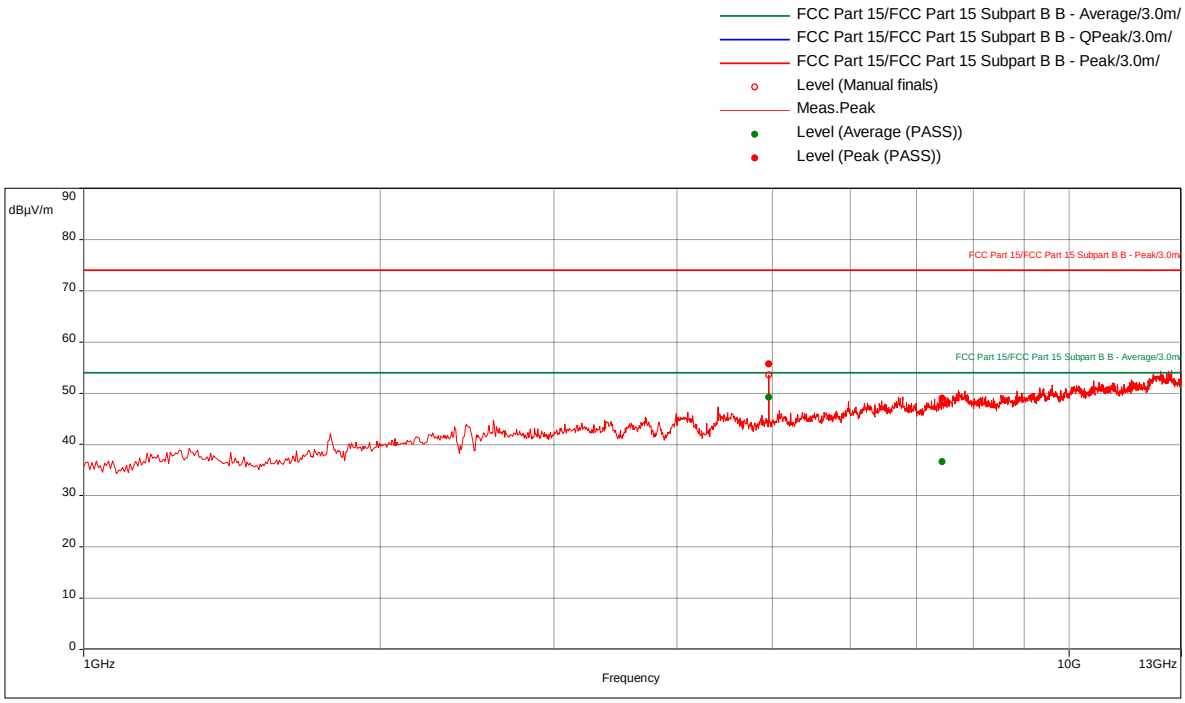
Note: Scans from 13-25 GHz were performed manually and no emissions were detected above the measuring equipment noise floor.

Radiated Spurious Emissions, Transmits Low Channel, EUT on Z Axis, 1-25 GHz

Test Information:

Date and Time	1/25/2019 2:03:06 AM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	31%
Atmospheric Pressure	980 mB
Comments	RE 1 to 13 GHz_Battery_Tx mode_High channel_Z-Axis

Graph:



Results:

Peak (PASS) (2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4959.736842	55.74	74.00	-18.26	97.00	1.55	Vertical	1000000.00	6.59
7438.947368	48.99	74.00	-25.01	132.00	3.64	Horizontal	1000000.00	10.70

Average (PASS) (2)

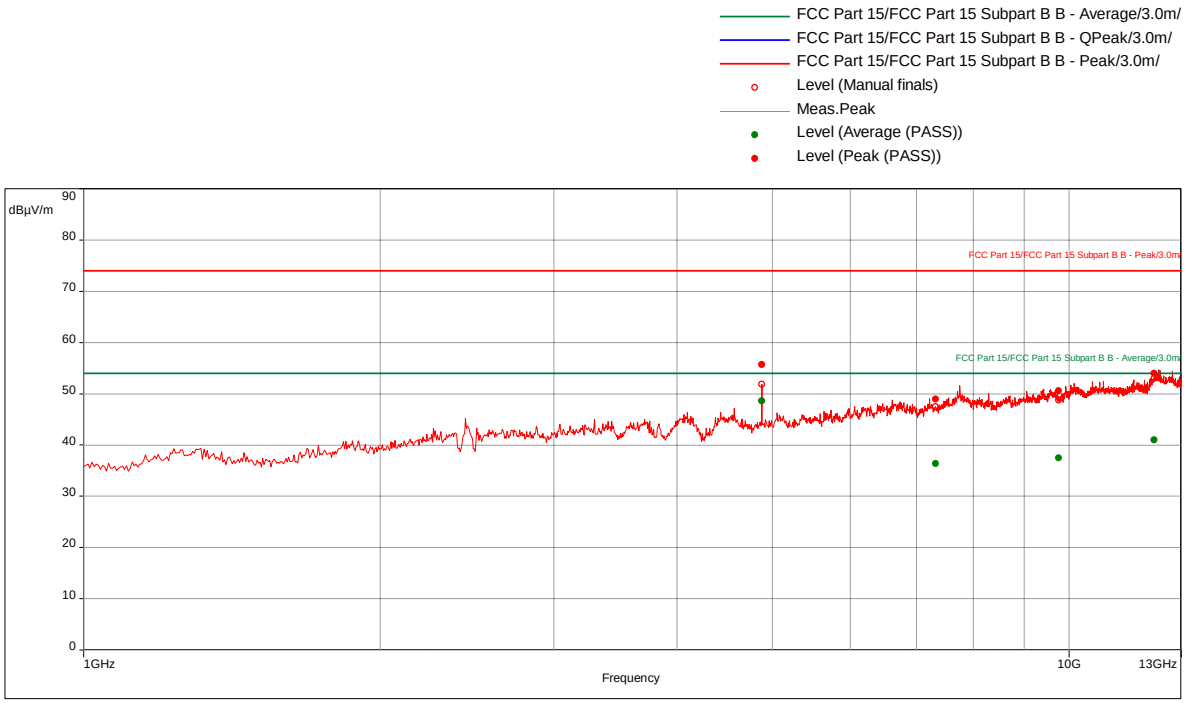
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4959.736842	49.18	54.00	-4.82	97.00	1.55	Vertical	1000000.00	6.59
7438.947368	36.65	54.00	-17.35	132.00	3.64	Horizontal	1000000.00	10.70

Radiated Spurious Emissions, Transmits Mid Channel, EUT on X Axis, 1-25 GHz

Test Information:

Date and Time	1/24/2019 11:36:52 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	31%
Atmospheric Pressure	980 mB
Comments	RE 1 to 13 GHz_Battery_Tx mode_Mid channel_X-Axis

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4879.736842	55.67	74.00	-18.33	111.00	2.64	Horizontal	1000000.00	6.52
7320	48.98	74.00	-25.02	10.00	3.04	Horizontal	1000000.00	10.27
9758.684211	50.54	74.00	-23.46	95.00	1.25	Horizontal	1000000.00	12.11
12202.63158	54.00	74.00	-20.00	66.00	3.74	Horizontal	1000000.00	16.12

Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4879.736842	48.57	54.00	-5.43	111.00	2.64	Horizontal	1000000.00	6.52
7320	36.36	54.00	-17.64	10.00	3.04	Horizontal	1000000.00	10.27
9758.684211	37.45	54.00	-16.55	95.00	1.25	Horizontal	1000000.00	12.11
12202.63158	40.98	54.00	-13.02	66.00	3.74	Horizontal	1000000.00	16.12

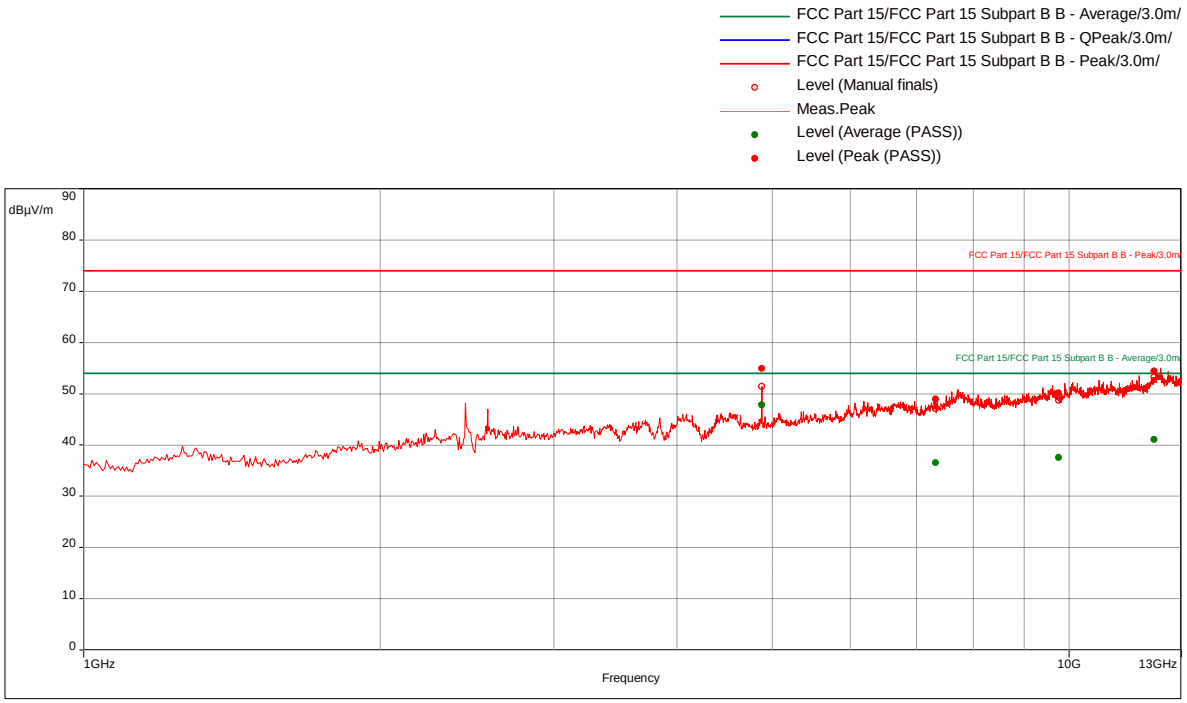
Note : Scans from 13-25 GHz were performed manually and no emissions were detected above the measuring equipment noise floor.

Radiated Spurious Emissions, Transmits Mid Channel, EUT on Y Axis, 1-25 GHz

Test Information:

Date and Time	1/24/2019 11:58:57 PM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	31%
Atmospheric Pressure	980 mB
Comments	Copy RE 1 to 13 GHz_Battery_Tx mode_Mid channel_Y-Axis

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4879.736842	54.91	74.00	-19.09	111.00	1.45	Horizontal	1000000.00	6.52
7317.631579	48.97	74.00	-25.03	241.00	1.65	Horizontal	1000000.00	10.26
9758.684211	50.13	74.00	-23.87	60.00	2.09	Horizontal	1000000.00	12.11
12200.26316	54.41	74.00	-19.59	205.00	2.19	Horizontal	1000000.00	16.11

Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4879.736842	47.84	54.00	-6.16	111.00	1.45	Horizontal	1000000.00	6.52
7317.631579	36.50	54.00	-17.50	241.00	1.65	Horizontal	1000000.00	10.26
9758.684211	37.53	54.00	-16.47	60.00	2.09	Horizontal	1000000.00	12.11
12200.26316	41.06	54.00	-12.94	205.00	2.19	Horizontal	1000000.00	16.11

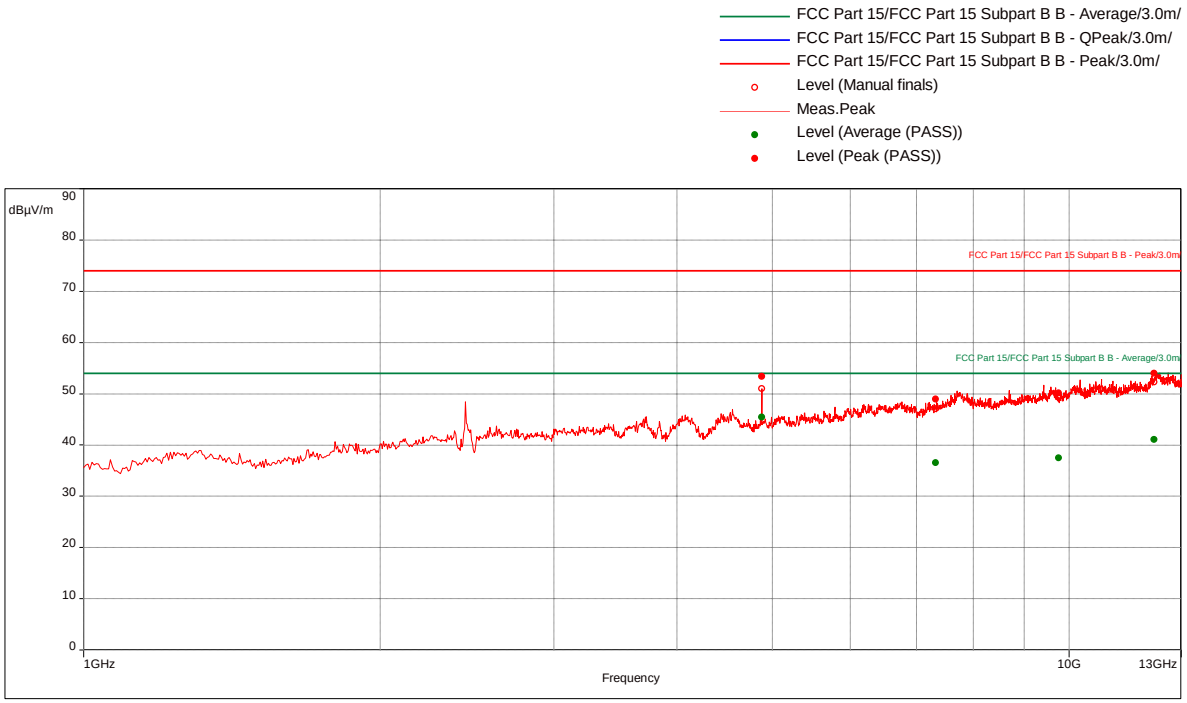
Note : Scans from 13-25 GHz were performed manually and no emissions were detected above the measuring equipment noise floor.

Radiated Spurious Emissions, Transmits Mid Channel, EUT on Z Axis, 1-25 GHz

Test Information:

Date and Time	1/25/2019 12:21:19 AM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	31%
Atmospheric Pressure	980 mB
Comments	RE 1 to 13 GHz_Battery_Tx mode_Mid channel_Z-Axis

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4879.736842	53.35	74.00	-20.65	112.00	1.50	Horizontal	1000000.00	6.52
7319.473684	48.97	74.00	-25.03	74.00	2.04	Vertical	1000000.00	10.27
9760.263158	50.13	74.00	-23.87	212.00	1.80	Horizontal	1000000.00	12.11
12199.47368	53.99	74.00	-20.01	182.00	2.54	Vertical	1000000.00	16.11

Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4879.736842	45.41	54.00	-8.59	112.00	1.50	Horizontal	1000000.00	6.52
7319.473684	36.57	54.00	-17.43	74.00	2.04	Vertical	1000000.00	10.27
9760.263158	37.45	54.00	-16.55	212.00	1.80	Horizontal	1000000.00	12.11
12199.47368	41.05	54.00	-12.95	182.00	2.54	Vertical	1000000.00	16.11

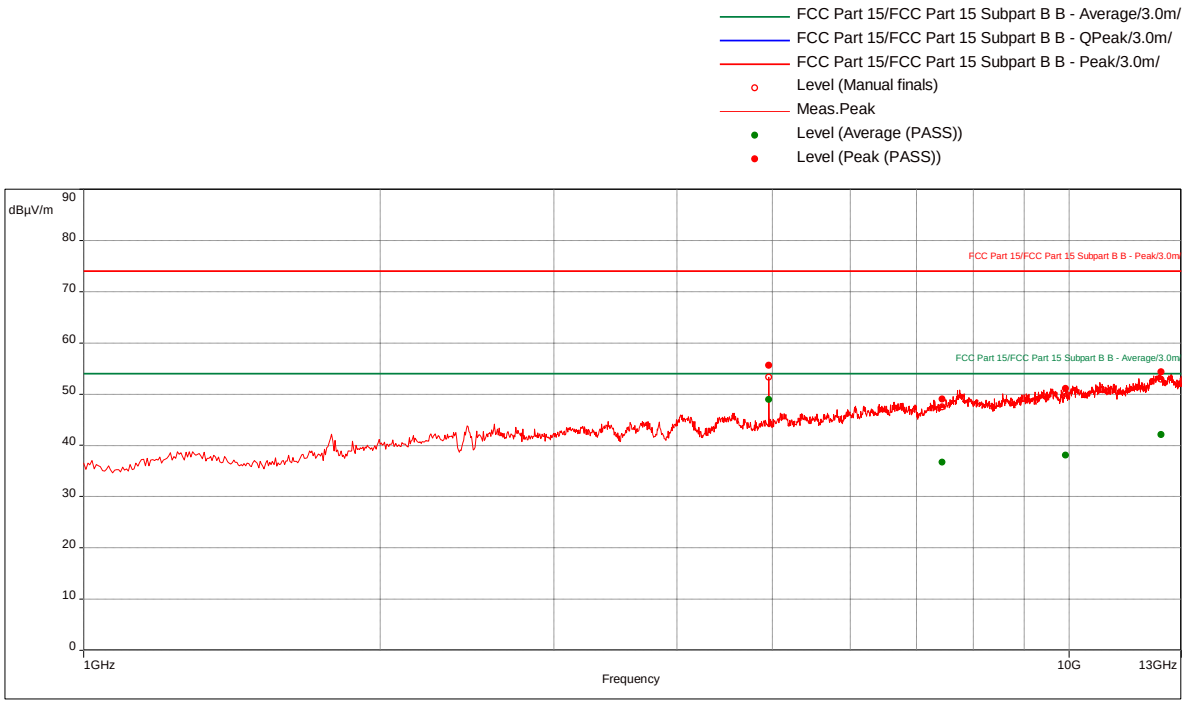
Note : Scans from 13-25 GHz were performed manually and no emissions were detected above the measuring equipment noise floor.

Radiated Spurious Emissions, Transmits High Channel, EUT on X Axis, 1-25 GHz

Test Information:

Date and Time	1/25/2019 12:48:17 AM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	31%
Atmospheric Pressure	980 mB
Comments	RE 1 to 13 GHz_Battery_Tx mode_High channel_X-Axis

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4959.736842	55.61	74.00	-18.39	10.00	1.45	Horizontal	1000000.00	6.59
7439.210526	49.00	74.00	-25.00	198.00	2.74	Vertical	1000000.00	10.70
9922.368421	51.08	74.00	-22.92	241.00	2.49	Horizontal	1000000.00	12.24
12399.21053	54.37	74.00	-19.63	0.00	1.40	Horizontal	1000000.00	16.49

Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4959.736842	48.92	54.00	-5.08	10.00	1.45	Horizontal	1000000.00	6.59
7439.210526	36.72	54.00	-17.28	198.00	2.74	Vertical	1000000.00	10.70
9922.368421	38.11	54.00	-15.89	241.00	2.49	Horizontal	1000000.00	12.24
12399.21053	42.06	54.00	-11.94	0.00	1.40	Horizontal	1000000.00	16.49

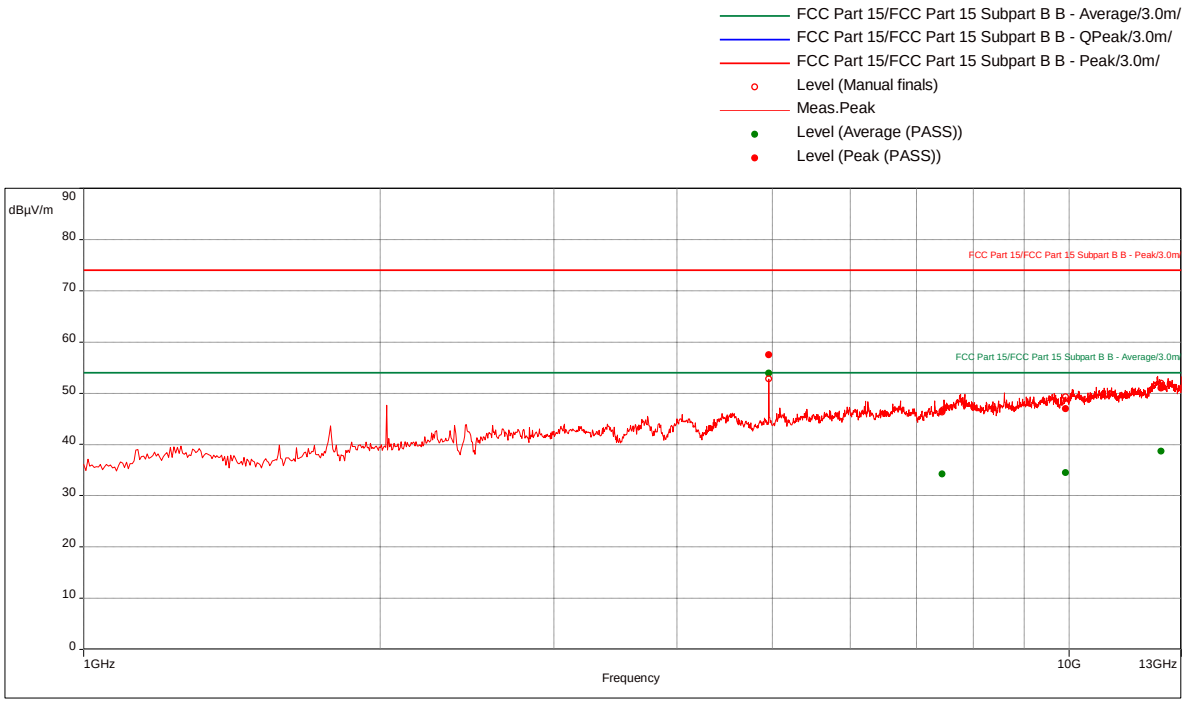
Note: Scans from 13-25 GHz were performed manually and no emissions were detected above the measuring equipment noise floor.

Radiated Spurious Emissions, Transmits High Channel, EUT on Y Axis, 1-25 GHz

Test Information:

Date and Time	1/25/2019 1:11:01 AM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	31%
Atmospheric Pressure	980 mB
Comments	RE 1 to 13 GHz_Battery_Tx mode_High channel_Y-Axis

Graph:



Results:

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4959.736842	57.46	74.00	-16.54	104.00	1.35	Horizontal	1000000.00	6.59
7439.473684	46.57	74.00	-27.43	126.00	1.05	Horizontal	1000000.00	10.71
9921.052632	46.99	74.00	-27.01	83.00	1.65	Vertical	1000000.00	12.24
12398.15789	50.97	74.00	-23.03	25.00	2.74	Horizontal	1000000.00	16.49

Average (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4959.736842	53.92	54.00	-0.08	104.00	1.35	Horizontal	1000000.00	6.59
7439.473684	34.22	54.00	-19.78	126.00	1.05	Horizontal	1000000.00	10.71
9921.052632	34.51	54.00	-19.49	83.00	1.65	Vertical	1000000.00	12.24
12398.15789	38.65	54.00	-15.35	25.00	2.74	Horizontal	1000000.00	16.49

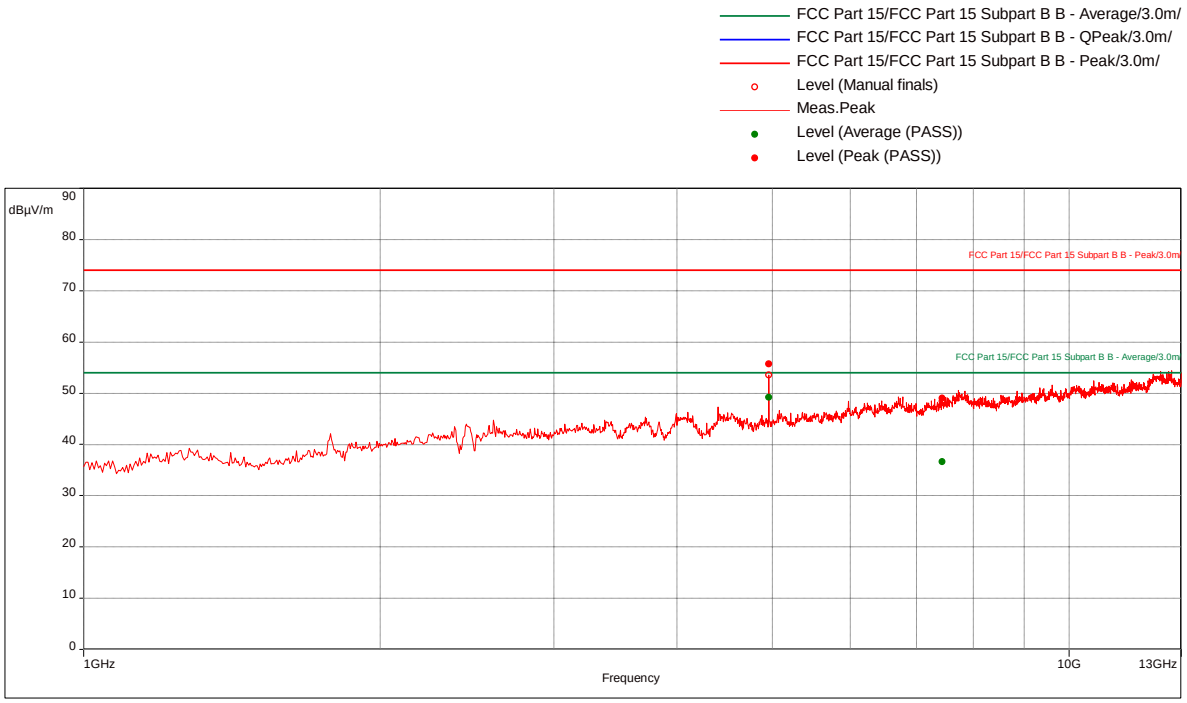
Note: Scans from 13-25 GHz were performed manually and no emissions were detected above the measuring equipment noise floor.

Radiated Spurious Emissions, Transmits High Channel, EUT on Z Axis, 1-25 GHz

Test Information:

Date and Time	1/25/2019 2:03:06 AM
Client and Project Number	The Procter & Gamble Company_G103794632
Engineer	Vathana Ven
Temperature	21 deg C
Humidity	31%
Atmospheric Pressure	980 mB
Comments	Run #2_RE 1 to 13 GHz_Battery_Tx mode_High channel_Z-Axis

Graph:



Results:

Peak (PASS) (2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4959.736842	55.74	74.00	-18.26	97.00	1.55	Vertical	1000000.00	6.59
7438.947368	48.99	74.00	-25.01	132.00	3.64	Horizontal	1000000.00	10.70

Average (PASS) (2)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°) (dB)	Height (m) (dB)	Pol. (dB)	RBW (dB)	Correction (dB)
4959.736842	49.18	54.00	-4.82	97.00	1.55	Vertical	1000000.00	6.59
7438.947368	36.65	54.00	-17.35	132.00	3.64	Horizontal	1000000.00	10.70

Note : Scans from 13-25 GHz were performed manually and no emissions were detected above the measuring equipment noise floor.

Test Personnel:	Kouma Sinn KPS	Test Date:	1/23/2019 (1st shift)
	Vathana Ven VSV		1/23/2019 (2nd shift), 1/25/2019
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	CFR47 FCC Part 15.247	Limit Applied:	See report section 10.3
Input Voltage:	Internal Battery Powered		
Pretest Verification w/ Ambient Signals or BB Source:	BB Source	Ambient Temperature:	22, 21, 21 ºC
		Relative Humidity:	12, 22, %
		Atmospheric Pressure:	1052, 1007, 980 mbars

Deviations, Additions, or Exclusions: None

11 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	02/06/2019	103794632BOX-001a	KPS KPS	VFV VFV	Original Issue
1	02/20/2019	103794632BOX-001a	KPS KPS	VFV VFV	Removed test setup photos for confidentiality
2	04/01/2019	103794632BOX-001a	KPS KPS	VFV VFV	1) Removed Human RF exposure on pages 6 and 13, 2) Corrected the conducted output power on page 6, 3) Replaced EIRP power with conducted output power on pages 10-12, 4) Removed SAR exemption calculation on page 13, 5) Removed power spectral density from pages 24-25