

FCC Test Report

Product Name	ASUS VivoWatch BP
Model No.	HC-A04
FCC ID.	MSQ-HC-A04

Applicant	ASUSTeK COMPUTER INC.
Address	4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan

Date of Receipt	May. 22, 2018
Issued Date	Jul. 27, 2018
Report No.	1850291R-RFUSP01V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Test Report

Issued Date: Jul. 27, 2018

Report No.: 1850291R-RFUSP01V00



Product Name	ASUS VivoWatch BP
Applicant	ASUSTeK COMPUTER INC.
Address	4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan
Manufacturer	ASUSTeK COMPUTER INC.
Model No.	HC-A04
FCC ID.	MSQ-HC-A04
EUT Rated Voltage	DC 3.8 (Power by Battery)
EUT Test Voltage	DC 3.8(Power by Battery)
Trade Name	ASUS
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v04
Test Result	Complied

Documented By

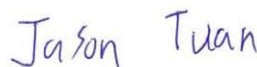
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Tested By

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(Engineer / Jason Tuan)

Approved By

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(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	ASUS VivoWatch BP
Trade Name	ASUS
Model No.	HC-A04
FCC ID.	MSQ-HC-A04
Frequency Range	2402 – 2480MHz
Channel Number	V4.2: 40CH
Type of Modulation	V4.2: GFSK(1Mbps)
Antenna Type	PIFA Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
USB Cable	Non-shielded, 0.85m
Charging stand	Brand Name: ASUS

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ASUS	N/A	PIFA Antenna	0.39 dBi for 2.4 GHz

Note: The antenna of EUT is conforming to FCC 15.203.

Center Frequency of Each Channel: (For V4.2)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 01:	2404 MHz	Channel 02:	2406 MHz	Channel 03:	2408 MHz
Channel 04:	2410 MHz	Channel 05:	2412 MHz	Channel 06:	2414 MHz	Channel 07:	2416 MHz
Channel 08:	2418 MHz	Channel 09:	2420 MHz	Channel 10:	2422 MHz	Channel 11:	2424 MHz
Channel 12:	2426 MHz	Channel 13:	2428 MHz	Channel 14:	2430 MHz	Channel 15:	2432 MHz
Channel 16:	2434 MHz	Channel 17:	2436 MHz	Channel 18:	2438 MHz	Channel 19:	2440 MHz
Channel 20:	2442 MHz	Channel 21:	2444 MHz	Channel 22:	2446 MHz	Channel 23:	2448 MHz
Channel 24:	2450 MHz	Channel 25:	2452 MHz	Channel 26:	2454 MHz	Channel 27:	2456 MHz
Channel 28:	2458 MHz	Channel 29:	2460 MHz	Channel 30:	2462 MHz	Channel 31:	2464 MHz
Channel 32:	2466 MHz	Channel 33:	2468 MHz	Channel 34:	2470 MHz	Channel 35:	2472 MHz
Channel 36:	2474 MHz	Channel 37:	2476 MHz	Channel 38:	2478 MHz	Channel 39:	2480 MHz

Note:

1. The EUT is an ASUS VivoWatch BP with built-in Bluetooth V4.2 transceiver.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth V4.2 transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit - BLE
	Mode 2: Charge mode

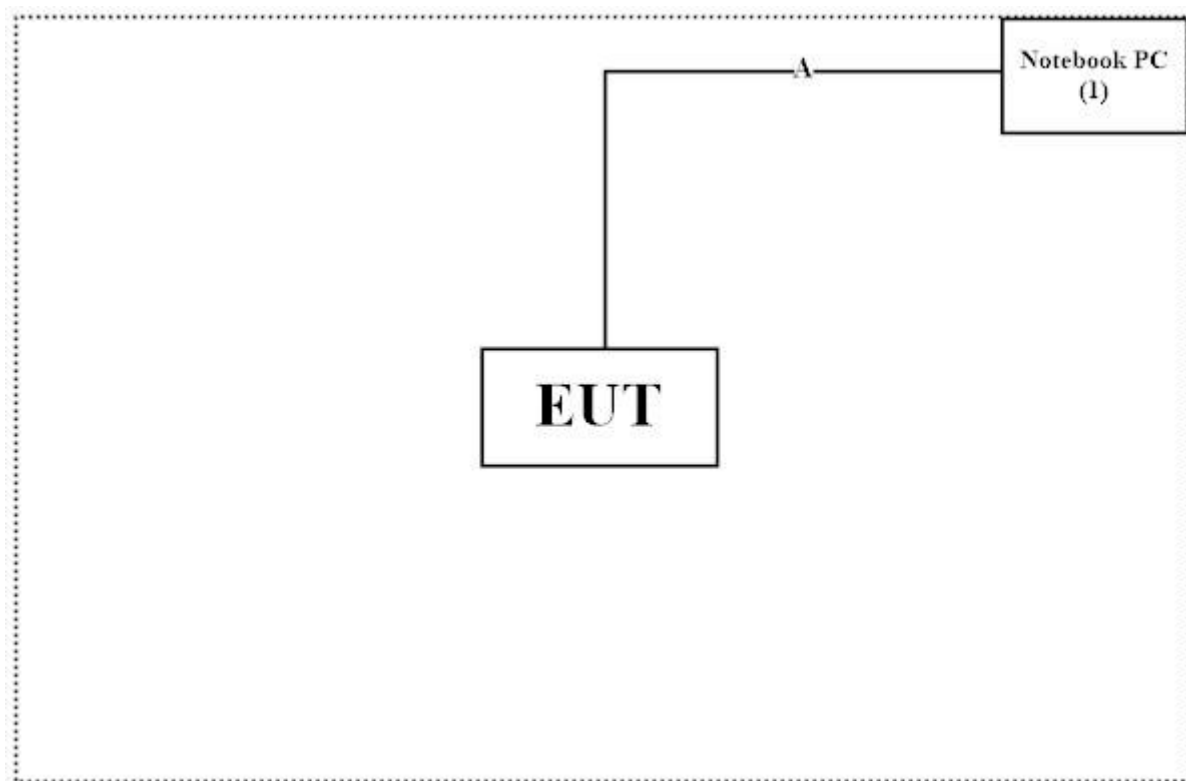
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	Latitude E5440	74BTK32	N/A

Signal Cable Type		Signal cable Description
A	USB Cable	Non-shielded, 0.85m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4.
- (2) Execute software "nRFgo-Studio V.1.21.2.10" on the Notebook PC.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Press "OK" to start the continuous Transmit.
- (5) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en

Site Description: Accredited by TAF
Accredited Number: 3023

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E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW0023

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2018/2/12	2019/2/11
X	Spectrum Analyzer	Agilent	N9010A	MY48030495	2017/10/13	2018/10/12
X	Peak Power Analyzer	Keysight	8990B	MY51000410	2018/7/19	2019/7/18
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2018/7/6	2019/7/5
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2018/7/6	2019/7/5
X	EMI Test Receiver	R&S	ESCS 30	100369	2017/11/7	2018/11/6
X	LISN	R&S	ESH3-Z5	836679/017	2018/2/9	2019/2/8
X	LISN	R&S	ENV216	100097	2018/2/9	2019/2/8
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2018/6/22	2019/6/21

For Radiated measurements /Site3/CB8

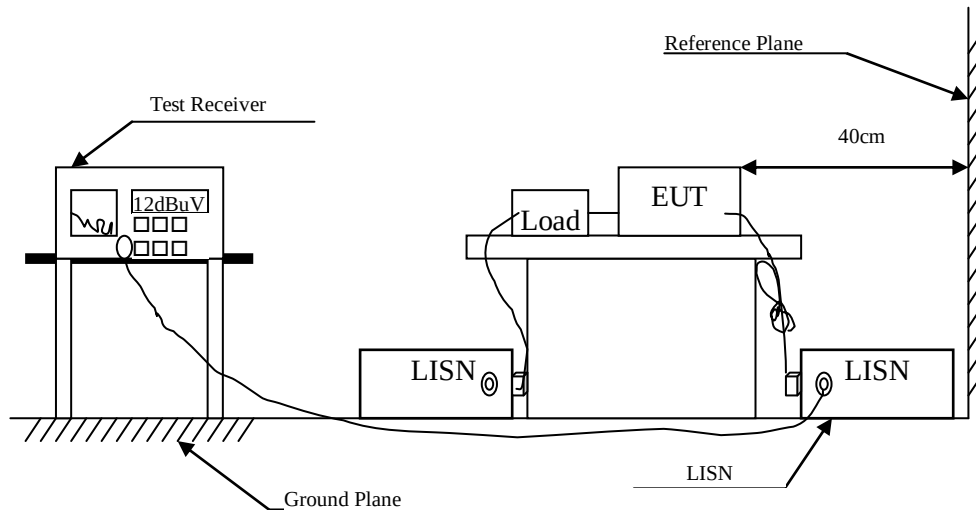
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSP40	100170	2018/3/12	2019/3/11
	Loop Antenna	Teseq	HLA6121	37133	2017/10/13	2018/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2018/6/25	2019/6/24
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2018/6/15	2019/6/14
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330010	2018/7/19	2019/7/18
X	Horn Antenna	ETS-Lindgren	3117	00135205	2018/5/3	2019/5/2
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2018/4/10	2019/4/9
X	Coaxial Cable	QuieTek	SF-106	LC035/37/41-SF	2018/6/21	2019/6/20
	Amplifier + Cable	EMCI	EMC184045SE	980370	2018/3/21	2019/3/20
	Horn Antenna	Com-Power	AH-840	101043	2018/1/9	2019/1/8
X	Filter	MicroTRON	BRM50701	019	2017/11/21	2018/11/20
	Filter	Microwave Circuits	N0257881	36681	2018/1/22	2019/1/21

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version :QuieTek EMI 2.0 V2.1.113.

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2014; tested to DTS test procedure of FCC KDB-558074 for compliance to FCC 47CFR Subpart C requirements.

2.4. Uncertainty

$\pm 2.35\text{dB}$

2.5. Test Result of Conducted Emission

Product : ASUS VivoWatch BP
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Transmit - BLE (2440MHz)
 Test Date : 2018/06/23

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 1					
Quasi-Peak					
0.197	9.738	17.700	27.438	-37.219	64.657
0.279	9.741	22.280	32.021	-30.293	62.314
0.490	9.750	31.560	41.310	-14.976	56.286
1.662	9.808	22.840	32.648	-23.352	56.000
3.502	9.874	28.680	38.554	-17.446	56.000
9.470	10.062	25.580	35.642	-24.358	60.000
Average					
0.197	9.738	2.810	12.548	-42.109	54.657
0.279	9.741	9.200	18.941	-33.373	52.314
0.490	9.750	27.080	36.830	-9.456	46.286
1.662	9.808	14.520	24.328	-21.672	46.000
3.502	9.874	19.990	29.864	-16.136	46.000
9.470	10.062	19.620	29.682	-20.318	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : ASUS VivoWatch BP
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 1: Transmit - BLE (2440MHz)
 Test Date : 2018/06/23

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.158	9.736	39.800	49.536	-16.235	65.771
0.486	9.740	30.080	39.820	-16.580	56.400
0.627	9.745	26.080	35.825	-20.175	56.000
1.572	9.804	24.920	34.724	-21.276	56.000
3.634	9.872	27.940	37.812	-18.188	56.000
9.517	10.073	19.200	29.273	-30.727	60.000
Average					
0.158	9.736	34.220	43.956	-11.815	55.771
0.486	9.740	22.070	31.810	-14.590	46.400
0.627	9.745	16.210	25.955	-20.045	46.000
1.572	9.804	18.430	28.234	-17.766	46.000
3.634	9.872	22.770	32.642	-13.358	46.000
9.517	10.073	13.450	23.523	-26.477	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : ASUS VivoWatch BP
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 2: Charge mode
 Test Date : 2018/06/23

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dBuV
	dB	dBuV	dBuV		
LINE 1					
Quasi-Peak					
0.154	9.748	43.940	53.688	-12.198	65.886
0.498	9.750	26.880	36.630	-19.427	56.057
1.400	9.797	23.940	33.737	-22.263	56.000
1.951	9.819	23.320	33.139	-22.861	56.000
3.416	9.867	29.520	39.387	-16.613	56.000
9.431	10.061	26.840	36.901	-23.099	60.000
Average					
0.154	9.748	34.220	43.968	-11.918	55.886
0.498	9.750	17.050	26.800	-19.257	46.057
1.400	9.797	14.520	24.317	-21.683	46.000
1.951	9.819	17.950	27.769	-18.231	46.000
3.416	9.867	26.080	35.947	-10.053	46.000
9.431	10.061	21.840	31.901	-18.099	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : ASUS VivoWatch BP
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 2: Charge mode
 Test Date : 2018/06/23

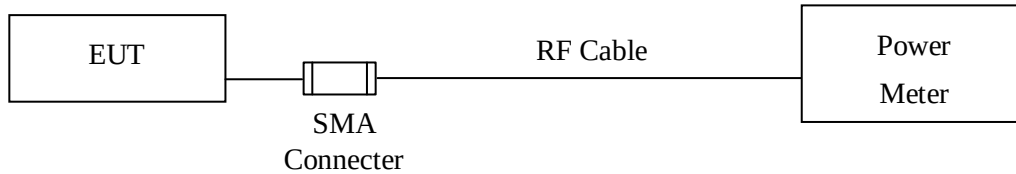
Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.150	9.739	44.300	54.039	-11.961	66.000
0.509	9.740	31.380	41.120	-14.880	56.000
0.896	9.766	21.060	30.826	-25.174	56.000
1.935	9.819	24.280	34.099	-21.901	56.000
3.685	9.874	28.180	38.054	-17.946	56.000
9.357	10.070	20.400	30.470	-29.530	60.000
Average					
0.150	9.739	22.500	32.239	-23.761	56.000
0.509	9.740	26.950	36.690	-9.310	46.000
0.896	9.766	15.010	24.776	-21.224	46.000
1.935	9.819	16.130	25.949	-20.051	46.000
3.685	9.874	21.030	30.904	-15.096	46.000
9.357	10.070	14.810	24.880	-25.120	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method.

3.4. Uncertainty

± 0.86 dB

3.5. Test Result of Peak Power Output

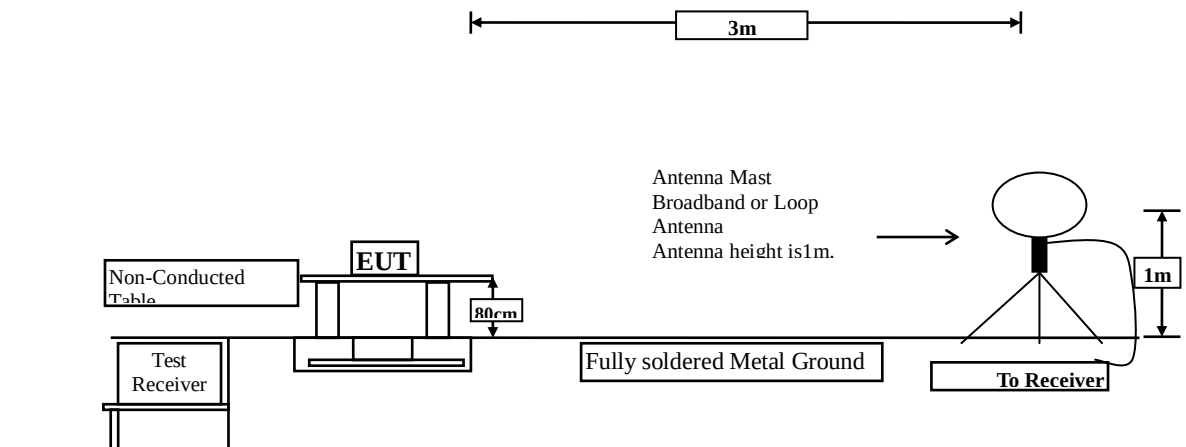
Product : ASUS VivoWatch BP
Test Item : Peak Power Output
Test Mode : Mode 1: Transmit - BLE
Test Date : 2018/05/30

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	1.50	1 Watt= 30 dBm	Pass
Channel 19	2440.00	1.60	1 Watt= 30 dBm	Pass
Channel 39	2480.00	2.13	1 Watt= 30 dBm	Pass

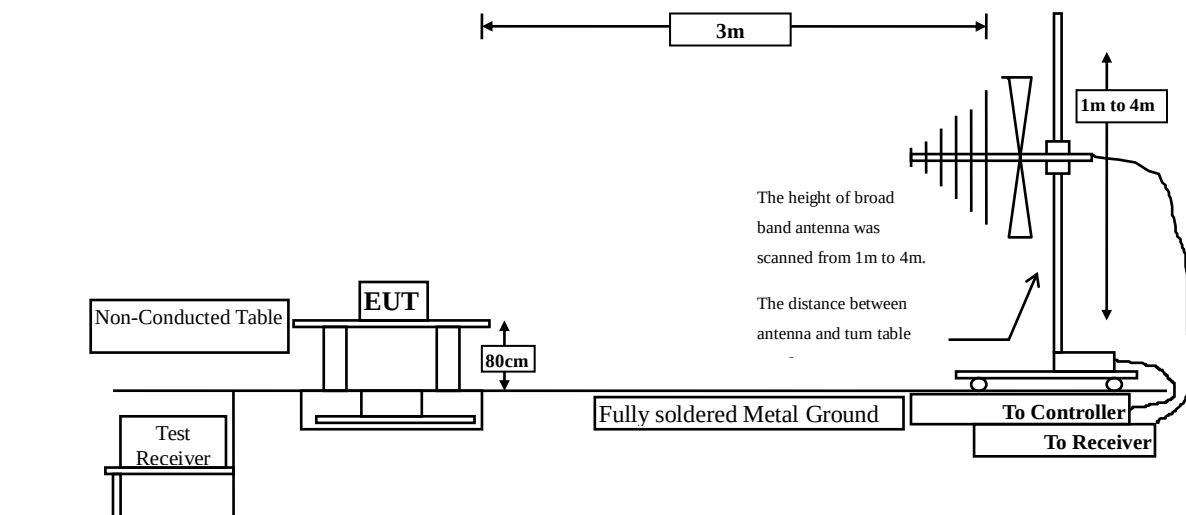
4. Radiated Emission

4.1. Test Setup

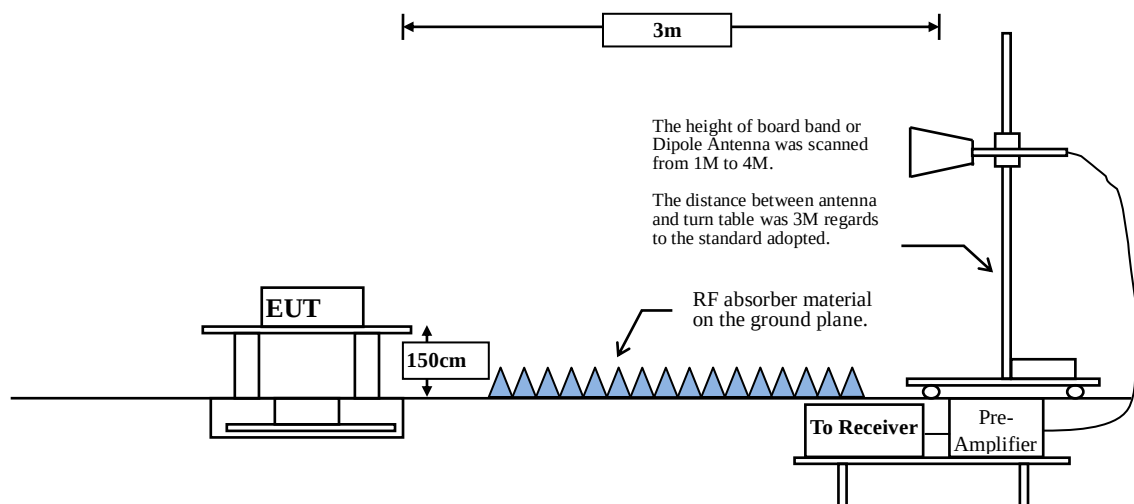
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.2. Limits

➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle $\geq 98\%$

$VBW \geq 1/T$, when duty cycle $< 98\%$

(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE	62.68	0.3916	2554	3k

Note: Duty Cycle Refer to Section 9

4.4. Uncertainty

Horizontal polarization :

30-300MHz: $\pm 4.08\text{dB}$; 300M-1GHz: $\pm 3.86\text{dB}$; 1-18GHz: $\pm 3.77\text{dB}$; 18-40GHz: $\pm 3.98\text{dB}$

Vertical polarization :

30-300MHz: $\pm 4.81\text{dB}$; 300M-1GHz: $\pm 3.87\text{dB}$; 1-18GHz : $\pm 3.83\text{dB}$; 18-40GHz: $\pm 3.98\text{dB}$

4.5. Test Result of Radiated Emission

Product : ASUS VivoWatch BP
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit - BLE(2402MHz)
 Test Date : 2018/05/22

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4804.000	2.511	45.381	47.891	-26.109	74.000
7206.000	9.511	50.425	59.936	-14.064	74.000
9608.000	10.394	39.065	49.459	-24.541	74.000
Average Detector:					
7206.000	9.511	35.610	45.121	-8.879	54.000
Vertical					
Peak Detector:					
4804.000	2.923	41.816	44.738	-29.262	74.000
7206.000	9.988	48.262	58.251	-15.749	74.000
9608.000	10.847	34.814	45.661	-28.339	74.000
Average Detector:					
7206.000	9.988	34.180	44.169	-9.831	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : ASUS VivoWatch BP
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit - BLE (2440MHz)
 Test Date : 2018/05/22

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4880.000	2.038	46.332	48.370	-25.630	74.000
7320.000	9.699	51.311	61.010	-12.990	74.000
9760.000	9.665	37.676	47.341	-26.659	74.000
Average					
Detector:					
7320.000	9.699	36.230	45.929	-8.071	54.000
Vertical					
Peak Detector:					
4880.000	2.499	44.784	47.283	-26.717	74.000
7320.000	10.303	46.621	56.924	-17.076	74.000
9760.000	10.299	34.408	44.708	-29.292	74.000
Average					
Detector:					
7320.000	10.303	33.139	43.442	-10.558	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : ASUS VivoWatch BP
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit - BLE (2480MHz)
 Test Date : 2018/05/22

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4960.000	2.582	45.664	48.246	-25.754	74.000
7440.000	10.555	47.232	57.787	-16.213	74.000
9920.000	10.206	37.035	47.241	-26.759	74.000
Average					
Detector:					
7440.000	10.555	33.134	43.689	-10.311	54.000
Vertical					
Peak Detector:					
4960.000	3.398	44.545	47.944	-26.056	74.000
7440.000	11.214	44.893	56.107	-17.893	74.000
9920.000	11.245	34.271	45.516	-28.484	74.000
Average					
Detector:					
7440.000	11.214	31.454	42.668	-11.332	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : ASUS VivoWatch BP
 Test Item : General Radiated Emission
 Test Mode : Mode 1: Transmit - BLE (2440MHz)
 Test Date : 2018/05/22

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
84.320	-12.384	43.801	31.417	-8.583	40.000
282.200	-6.074	34.822	28.748	-17.252	46.000
352.040	-1.282	35.976	34.694	-11.306	46.000
423.820	-0.231	32.919	32.688	-13.312	46.000
492.690	1.502	38.233	39.735	-6.265	46.000
833.160	6.616	27.038	33.654	-12.346	46.000
Vertical					
157.070	-5.195	33.434	28.239	-15.261	43.500
380.170	0.962	25.120	26.082	-19.918	46.000
499.480	-0.199	27.807	27.607	-18.393	46.000
604.240	2.199	24.390	26.590	-19.410	46.000
796.300	2.639	28.807	31.446	-14.554	46.000
833.160	1.716	30.119	31.835	-14.165	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : ASUS VivoWatch BP
 Test Item : General Radiated Emission
 Test Mode : Mode 2: Charge mode
 Test Date : 2018/06/22

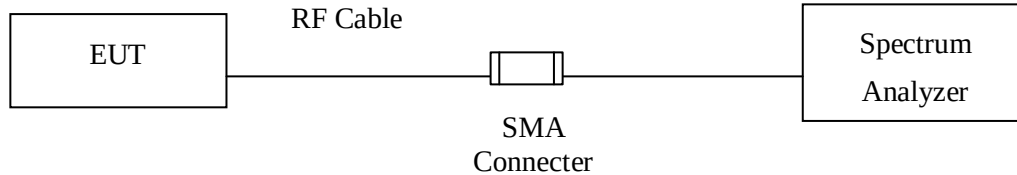
Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
39.700	-3.625	36.628	33.003	-6.997	40.000
244.370	-6.512	35.028	28.515	-17.485	46.000
373.380	0.873	36.137	37.010	-8.990	46.000
663.410	1.877	36.479	38.356	-7.644	46.000
724.520	3.835	36.482	40.317	-5.683	46.000
822.490	7.179	28.909	36.088	-9.912	46.000
Vertical					
84.320	-4.204	34.047	29.843	-10.157	40.000
211.390	-5.703	33.297	27.594	-15.906	43.500
348.160	-0.890	29.620	28.730	-17.270	46.000
544.100	1.503	26.110	27.613	-18.387	46.000
703.180	-0.592	40.057	39.465	-6.535	46.000
822.490	3.059	28.711	31.770	-14.230	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

The EUT was tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

5.4. Uncertainty

±1.23dB

5.5. Test Result of RF Antenna Conducted Test

Product : ASUS VivoWatch BP
Test Item : RF Antenna Conducted Test
Test Mode : Mode 1: Transmit - BLE
Test Date : 2018/05/22

Figure Channel 00:

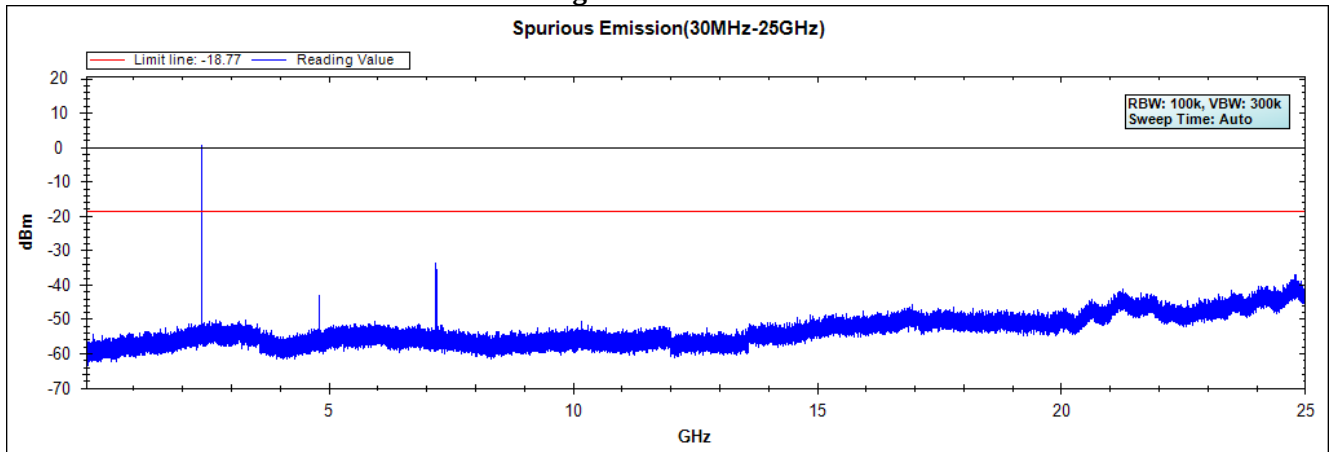


Figure Channel 19:

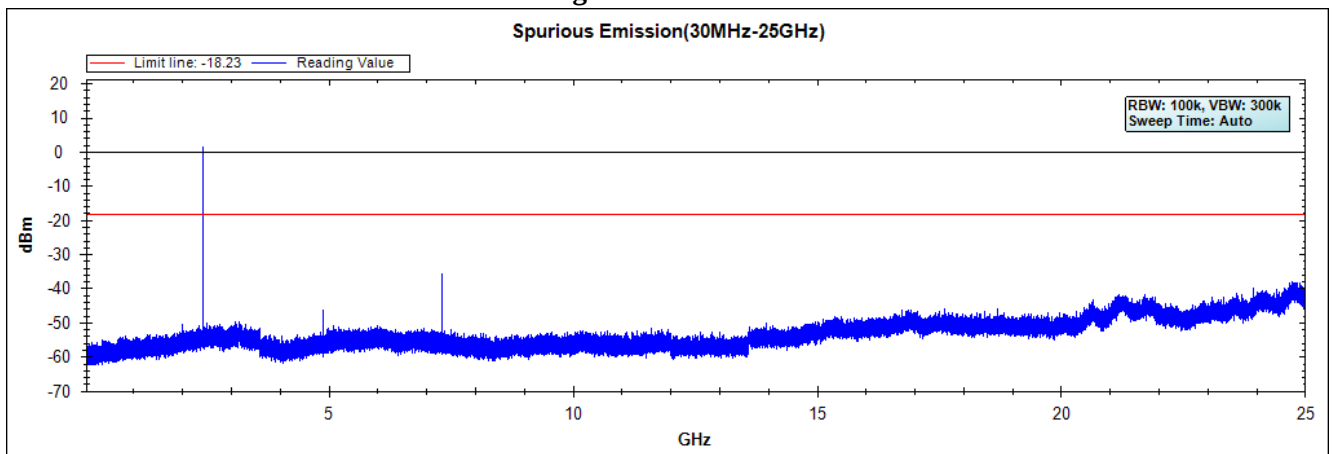
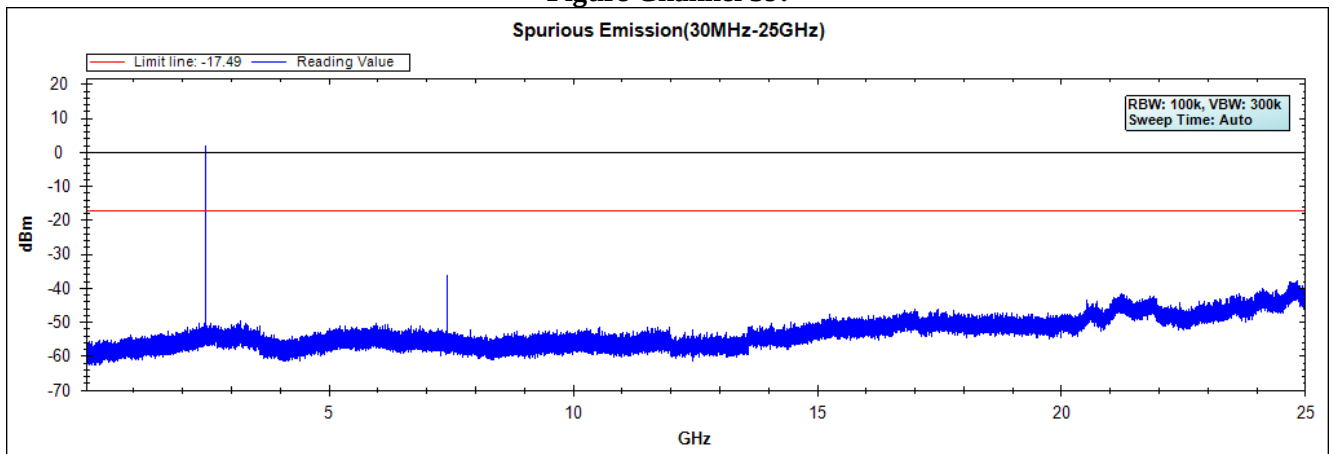


Figure Channel 39:

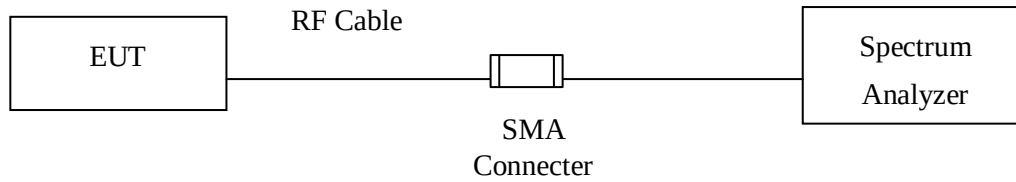


Note: The above test pattern is synthesized by multiple of the frequency range.

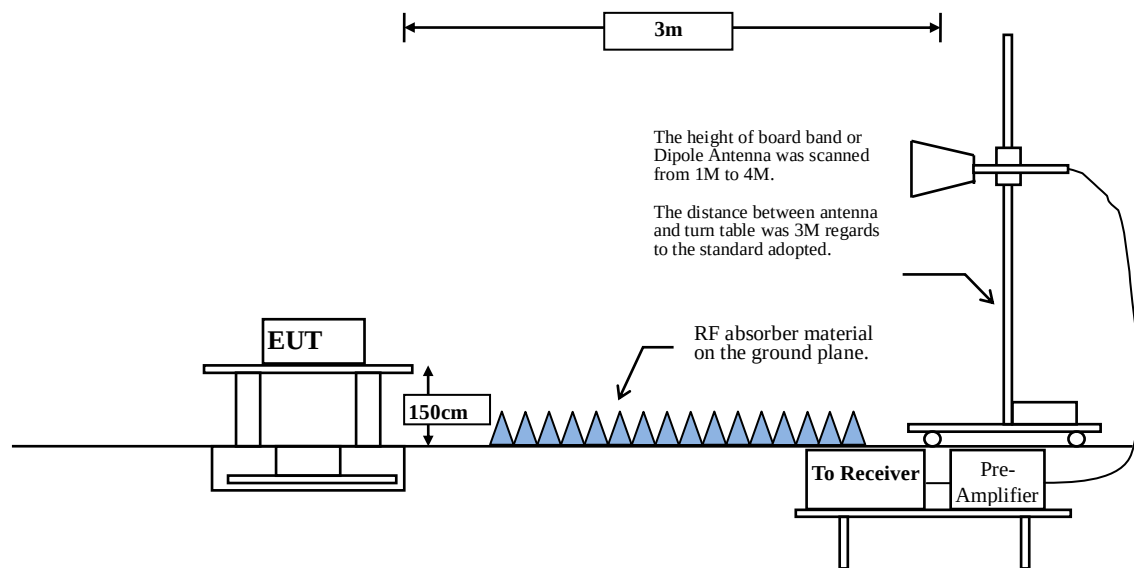
6. Band Edge

6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:



6.2. Limit

According to FCC Section 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle $\geq 98\%$

$VBW \geq 1/T$, when duty cycle $< 98\%$

(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE	62.68	0.3916	2554	3k

Note: Duty Cycle Refer to Section 9

6.4. Uncertainty

Conducted: $\pm 1.23\text{dB}$

Radiated:

Horizontal polarization : 1-18GHz: $\pm 3.77\text{dB}$

Vertical polarization : 1-18GHz : $\pm 3.83\text{dB}$

6.5. Test Result of Band Edge

Product : ASUS VivoWatch BP
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - BLE(2402MHz)
 Test Date : 2018/05/22

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2387.100	-2.699	46.959	44.259	74.00	54.00	Pass
00 (Peak)	2390.000	-2.687	46.804	44.117	74.00	54.00	Pass
00 (Peak)	2400.000	-2.660	65.525	62.865	--	--	--
00 (Peak)	2401.800	-2.658	100.336	97.678	--	--	--
00 (Average)	2370.100	-2.775	33.052	30.277	74.00	54.00	Pass
00 (Average)	2390.000	-2.687	31.808	29.121	74.00	54.00	Pass
00 (Average)	2400.000	-2.660	53.528	50.868	--	--	--
00 (Average)	2402.100	-2.657	95.562	92.905	--	--	--

Figure Channel 00:

Horizontal (Peak)

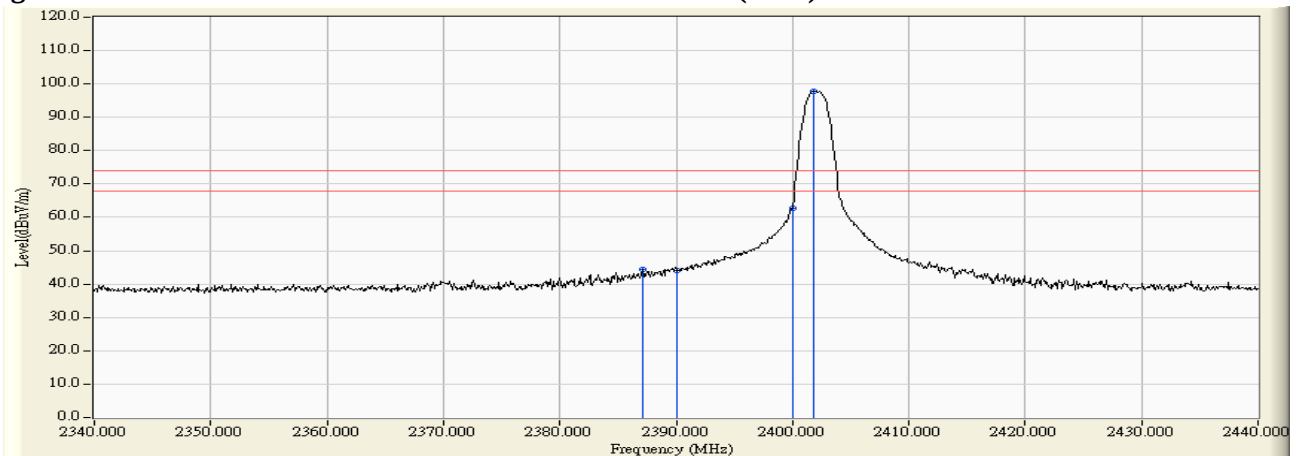
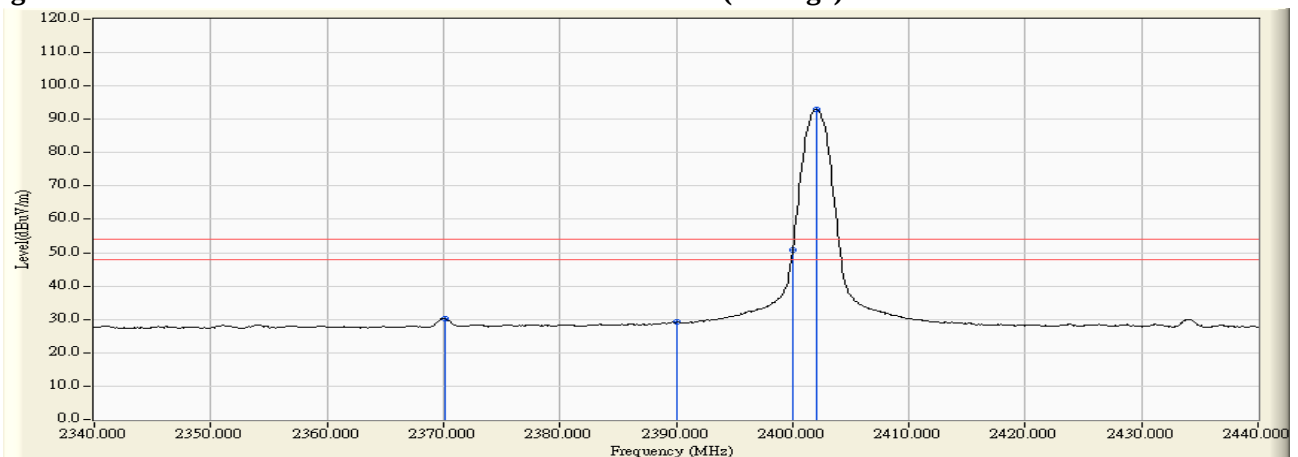


Figure Channel 00:

Horizontal (Average)



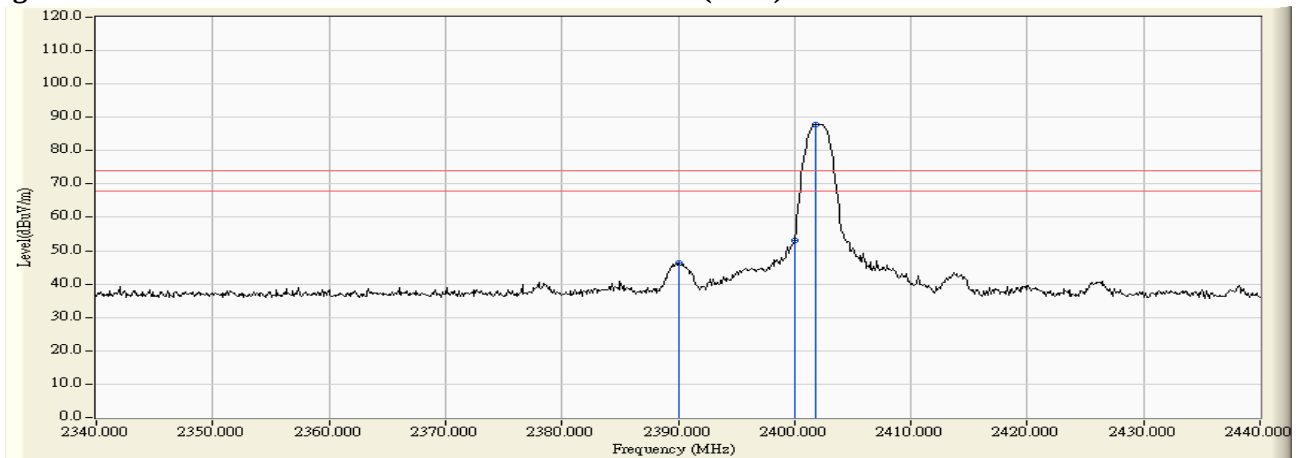
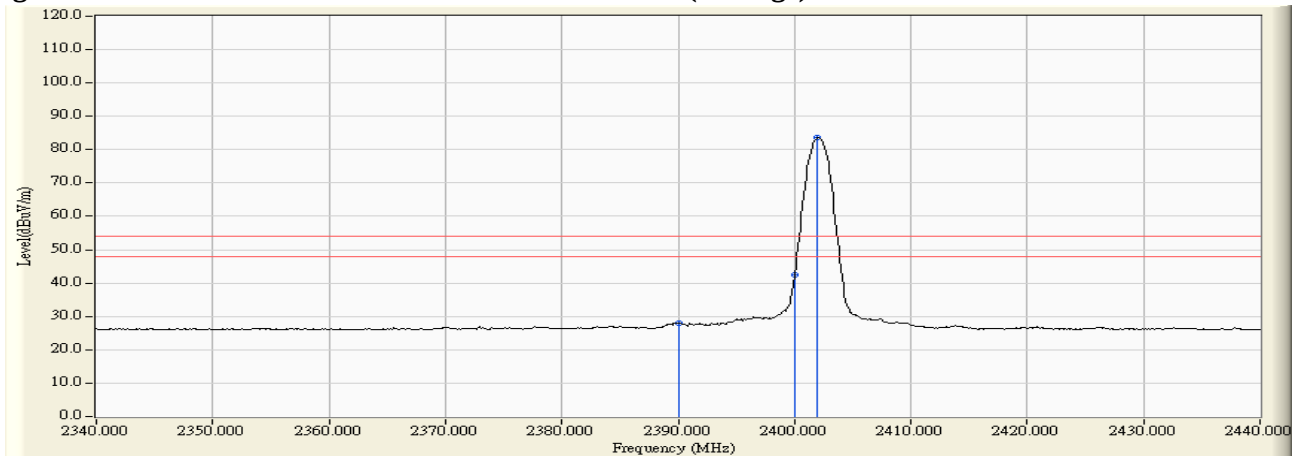
Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : ASUS VivoWatch BP
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - BLE(2402MHz)
 Test Date : 2018/05/22

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2390.000	-4.159	50.335	46.176	74.00	54.00	Pass
00 (Peak)	2400.000	-4.171	57.359	53.188	--	--	--
00 (Peak)	2401.800	-4.171	92.088	87.917	--	--	--
00 (Average)	2390.000	-4.159	32.272	28.113	74.00	54.00	Pass
00 (Average)	2400.000	-4.171	46.539	42.368	--	--	--
00 (Average)	2402.000	-4.171	87.788	83.617	--	--	--

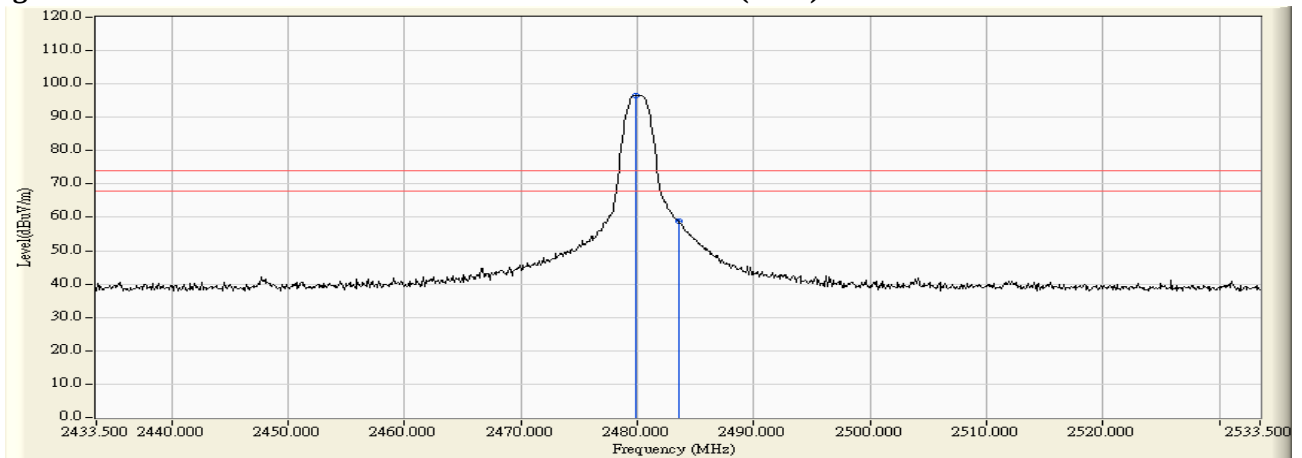
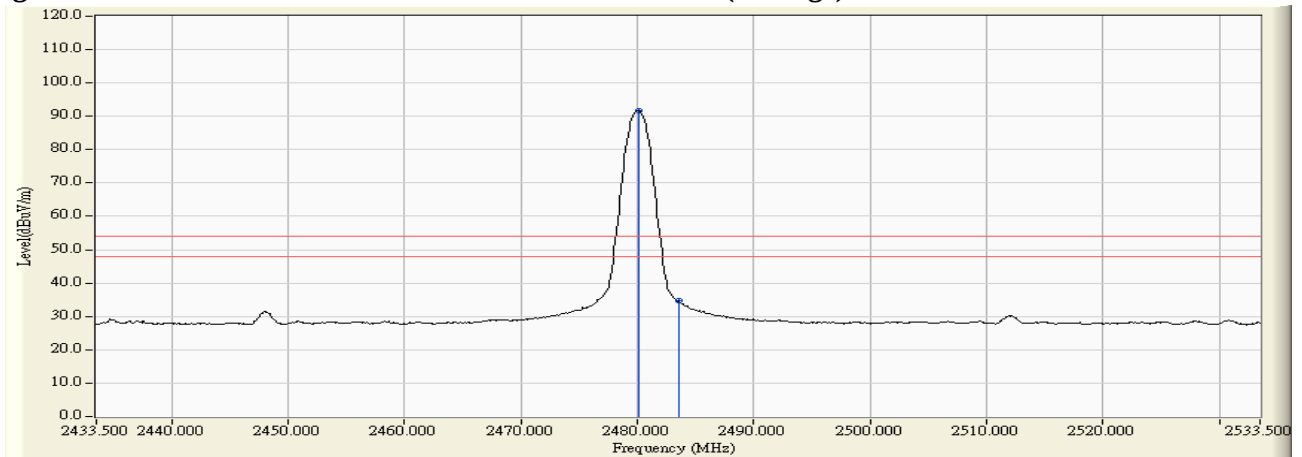
Figure Channel 00: Vertical (Peak)

Figure Channel 00: Vertical (Average)

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : ASUS VivoWatch BP
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - BLE(2480MHz)
 Test Date : 2018/05/22

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
39 (Peak)	2479.800	-2.605	99.165	96.560	--	--	--
39 (Peak)	2483.500	-2.601	61.472	58.870	74.00	54.00	Pass
39 (Average)	2480.100	-2.605	94.449	91.844	--	--	--
39 (Average)	2483.500	-2.601	37.289	34.687	74.00	54.00	Pass

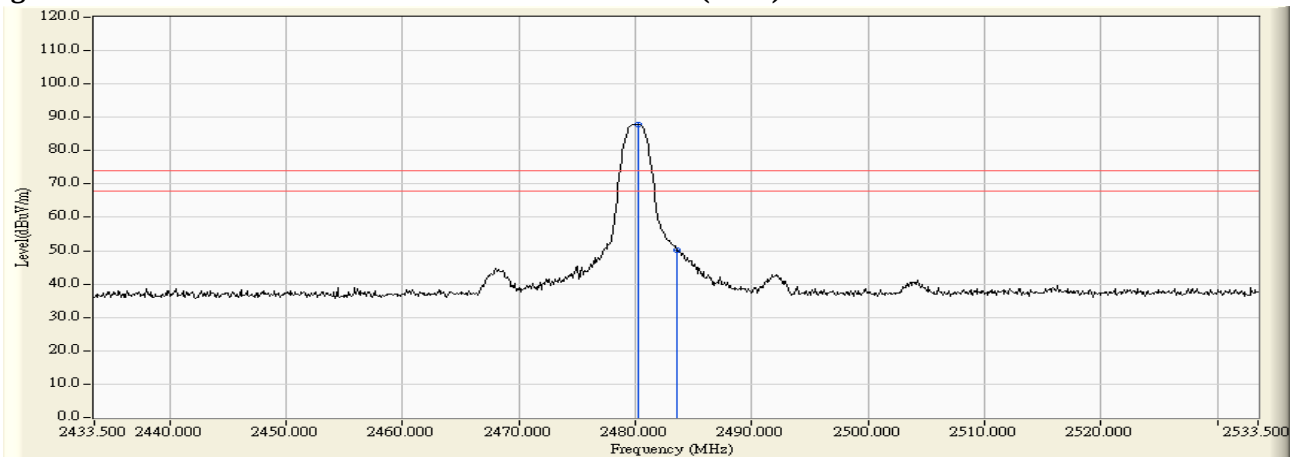
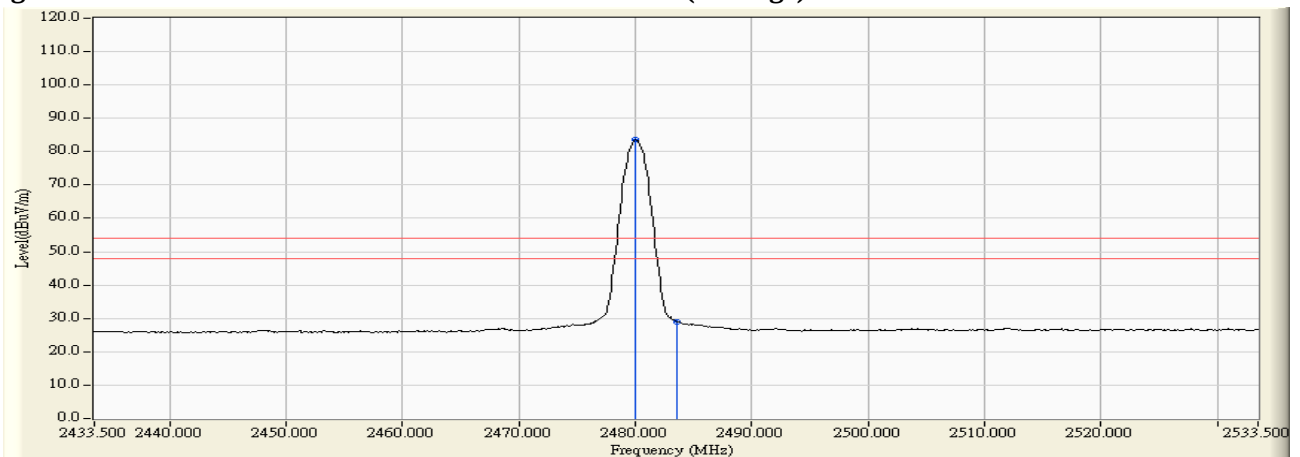
Figure Channel 39: Horizontal (Peak)**Figure Channel 39: Horizontal (Average)****Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : ASUS VivoWatch BP
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - BLE(2480MHz)
 Test Date : 2018/05/22

RF Radiated Measurement (Vertical):

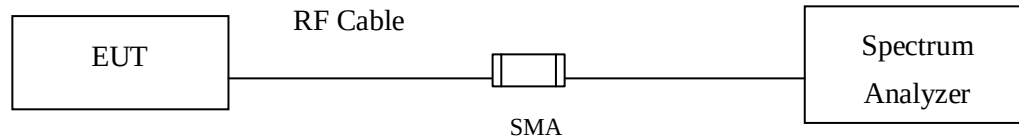
Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
39 (Peak)	2480.300	-3.977	91.760	87.783	--	--	--
39 (Peak)	2483.500	-3.966	54.232	50.265	74.00	54.00	Pass
39 (Average)	2480.000	-3.978	87.473	83.495	--	--	--
39 (Average)	2483.500	-3.966	33.009	29.042	74.00	54.00	Pass

Figure Channel 39:**Vertical (Peak)****Figure Channel 39:****Vertical (Average)****Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

7. 6dB Bandwidth

7.1. Test Setup



7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

7.3. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 1-5% of the emission bandwidth, $VBW \geq 3 \cdot RBW$

7.4. Uncertainty

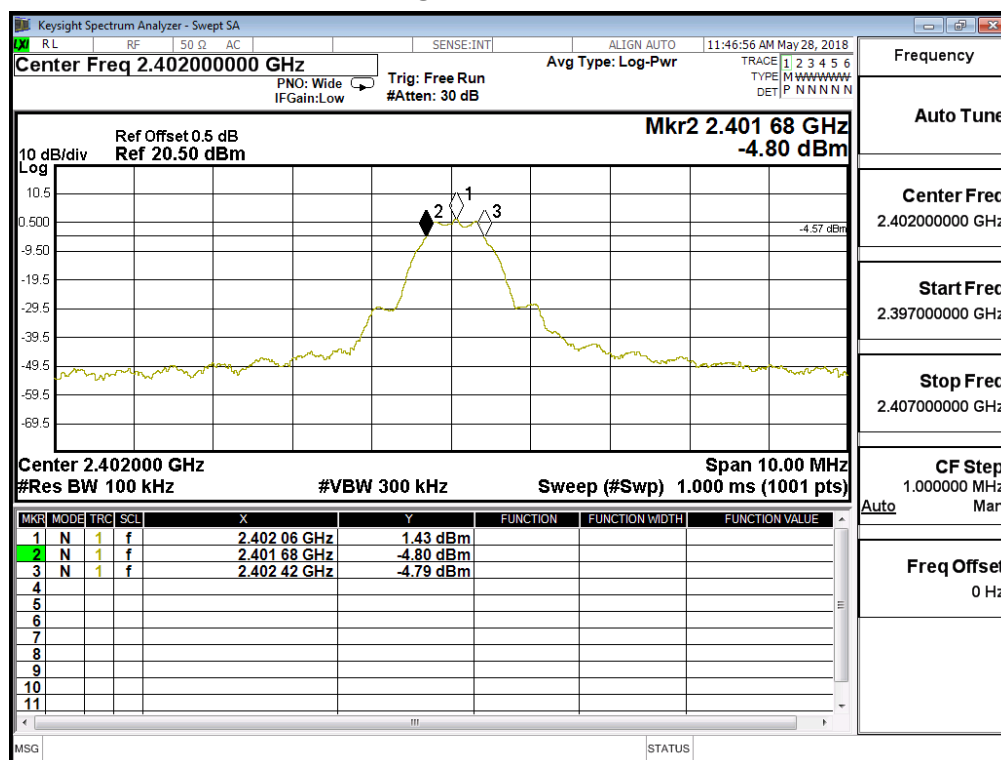
$\pm 279.2\text{Hz}$

7.5. Test Result of 6dB Bandwidth

Product : ASUS VivoWatch BP
 Test Item : 6dB Bandwidth Data
 Test Mode : Mode 1: Transmit - BLE (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	740	>500	Pass

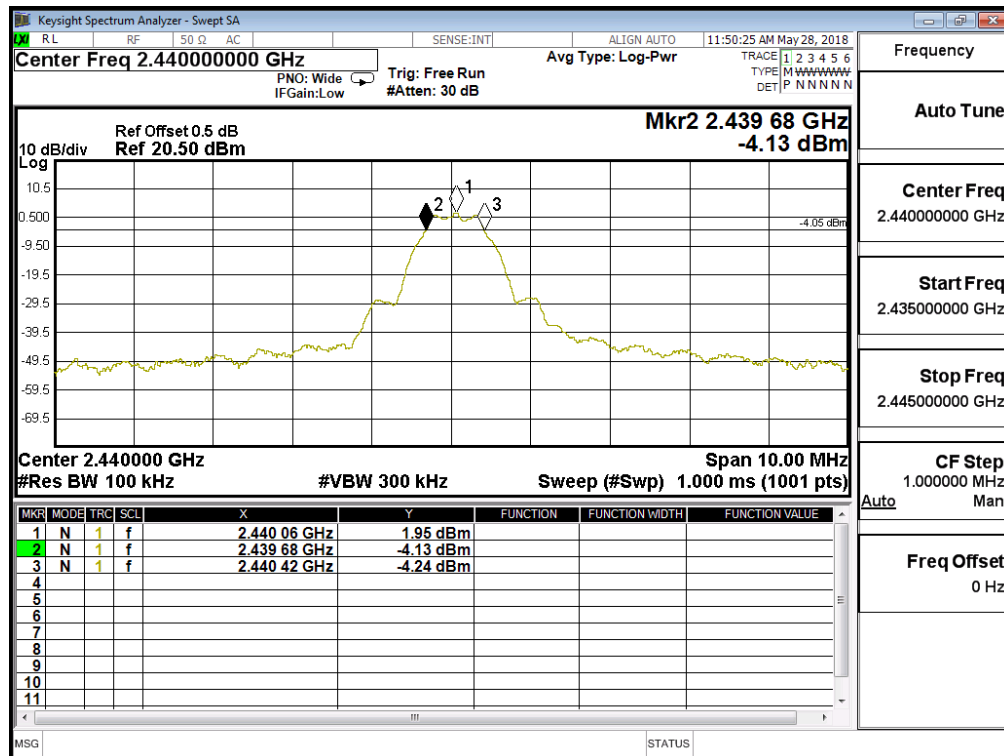
Figure Channel 00:



Product : ASUS VivoWatch BP
 Test Item : 6dB Bandwidth Data
 Test Mode : Mode 1: Transmit - BLE (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
19	2440	740	>500	Pass

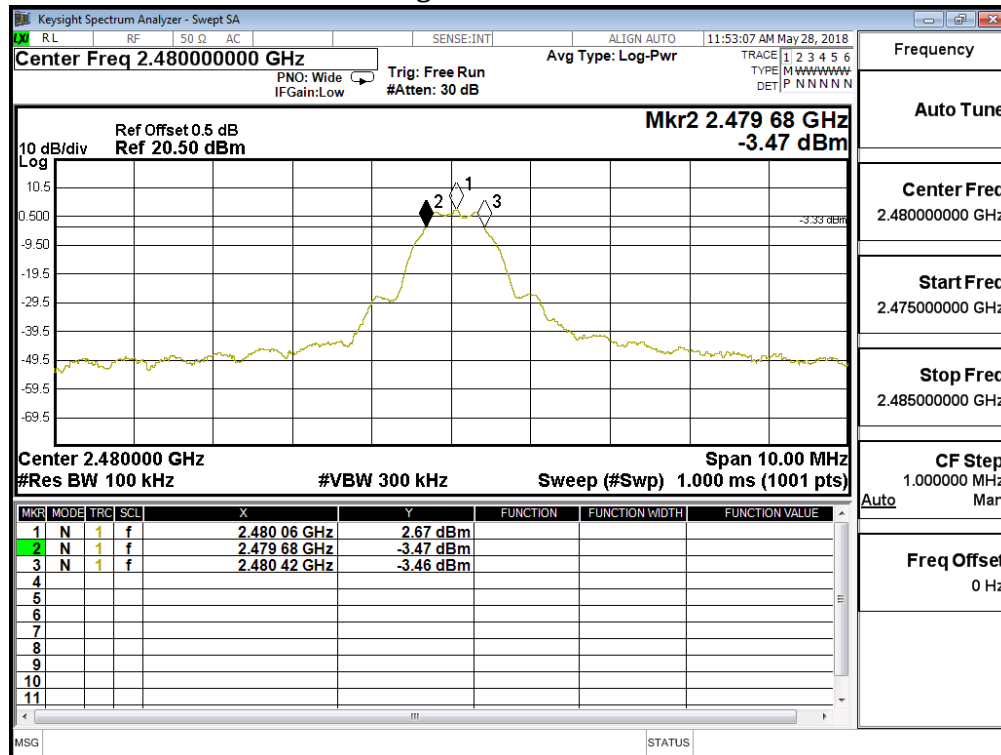
Figure Channel 19:



Product : ASUS VivoWatch BP
 Test Item : 6dB Bandwidth Data
 Test Mode : Mode 1: Transmit - BLE (2480MHz)

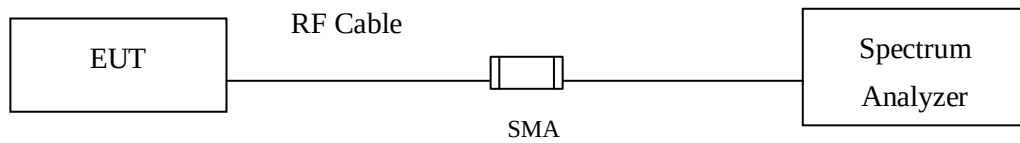
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2480	740	>500	Pass

Figure Channel 39:



8. Power Density

8.1. Test Setup



8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

8.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013, the maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

8.4. Uncertainty

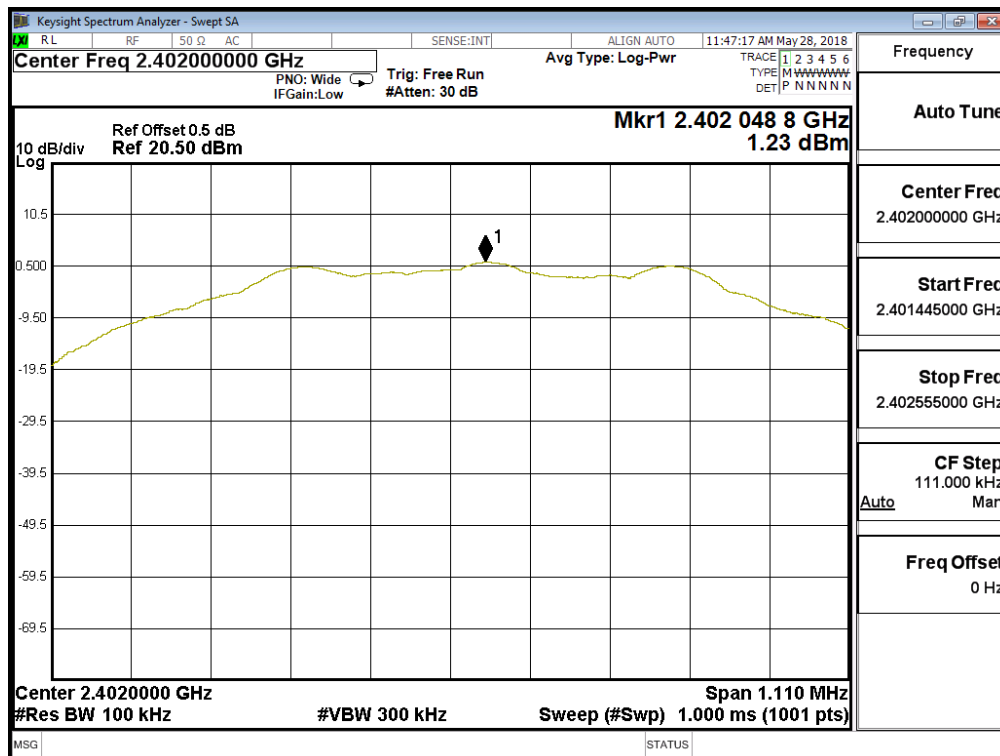
$\pm 1.23\text{dB}$

8.5. Test Result of Power Density

Product : ASUS VivoWatch BP
 Test Item : Power Density Data
 Test Mode : Mode 1: Transmit - BLE (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	1.230	$\leq 8\text{dBm}$	Pass

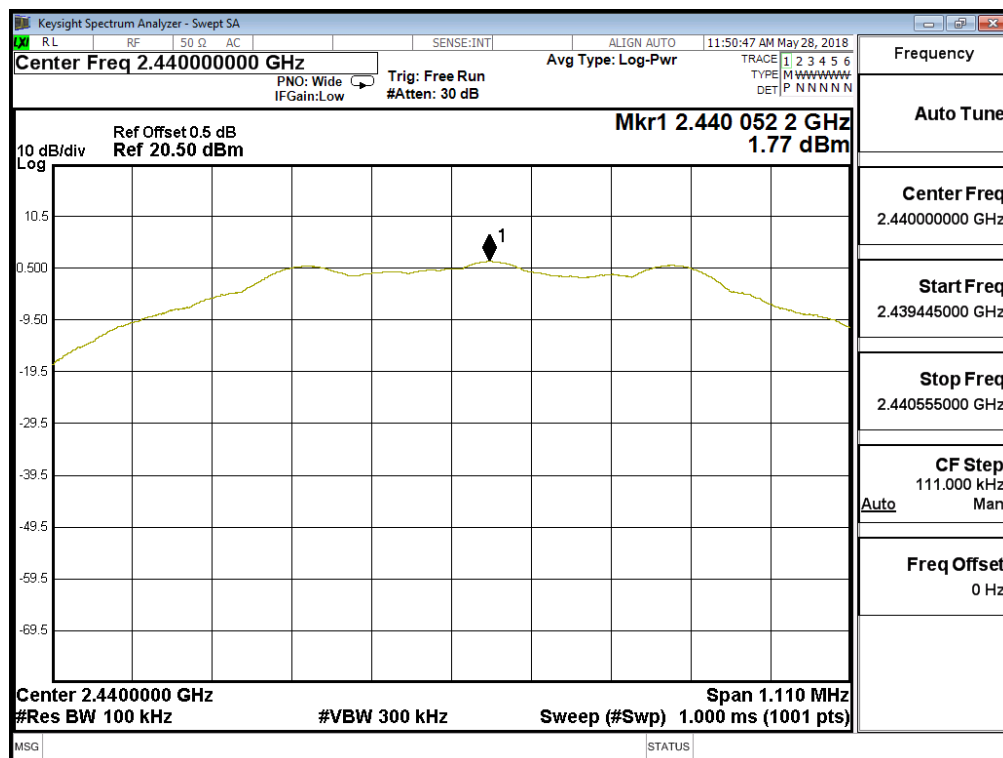
Figure Channel 00:



Product : ASUS VivoWatch BP
 Test Item : Power Density Data
 Test Mode : Mode 1: Transmit - BLE (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
19	2440	1.770	$\leq 8\text{dBm}$	Pass

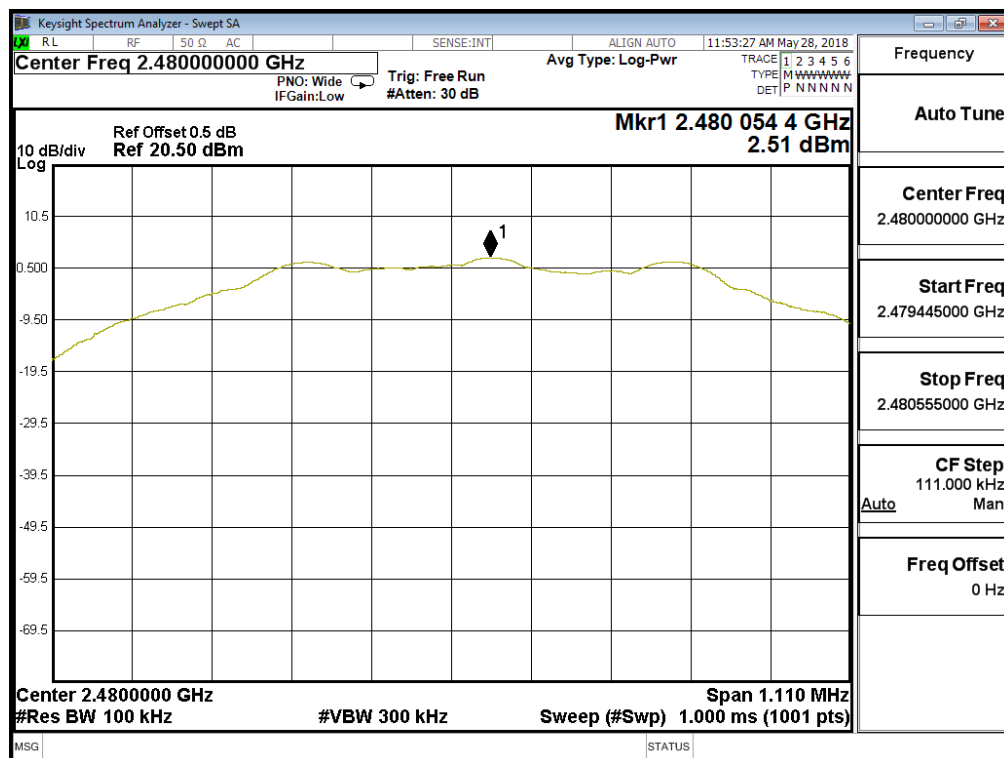
Figure Channel 19:



Product : ASUS VivoWatch BP
 Test Item : Power Density Data
 Test Mode : Mode 1: Transmit - BLE (2480MHz)

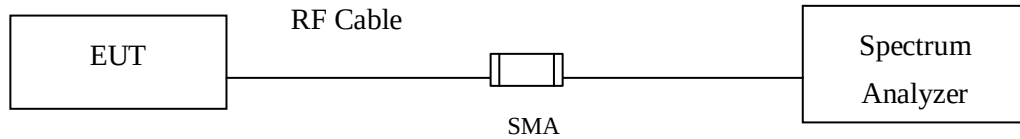
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	2.510	$\leq 8\text{dBm}$	Pass

Figure Channel 39:



9. Duty Cycle

9.1. Test Setup



9.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

9.3. Uncertainty

$\pm 2.31\text{msec}$

9.4. Test Result of Duty Cycle

Product : ASUS VivoWatch BP
 Test Item : Duty Cycle
 Test Mode : Mode 1: Transmit - BLE

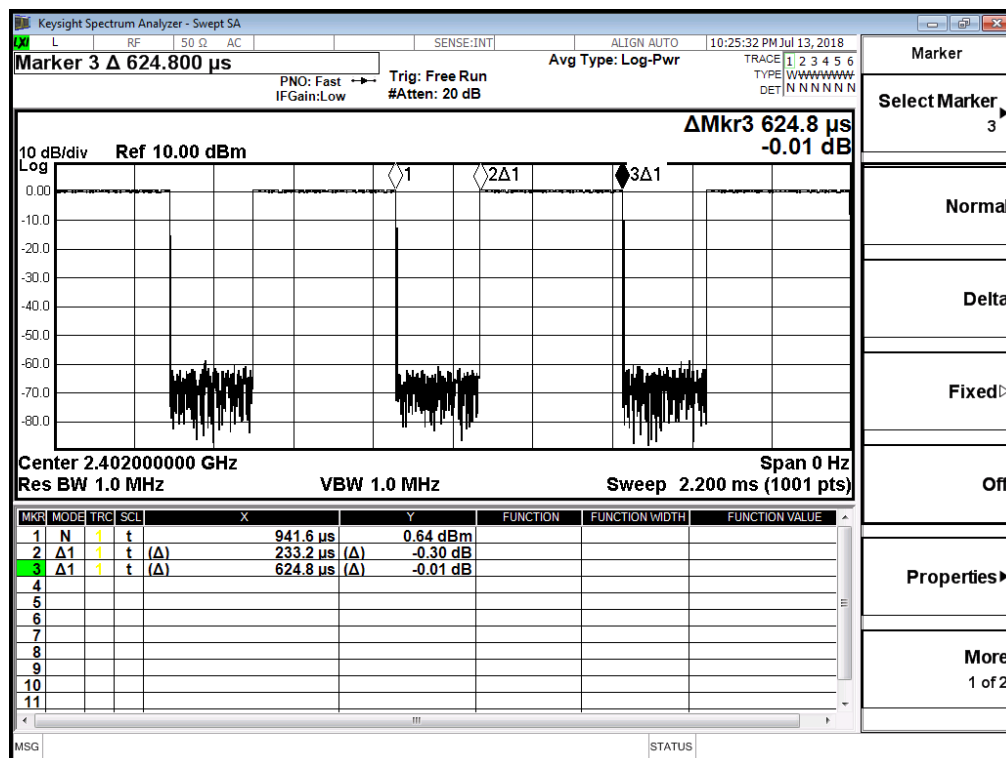
Duty Cycle Formula:

Duty Cycle = Ton / (Ton + Toff)

Duty Factor = 10 Log (1/Duty Cycle)

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
BLE	0.3916	0.6248	62.68	2.03



10. EMI Reduction Method During Compliance Testing

No modification was made during testing.