

FCC Test Report

Product Name	VistaHub Wifi only
Model No.	VISTA HUB-W
FCC ID.	RZ5-VISTA HUB-W

Applicant	Onyx Healthcare Inc.
Address	2F., No.135, LANE 235, PAO CHIAO RD., XINDIAN DIST., NEW TAIPEI CITY 231, TAIWAN (R.O.C.)

Date of Receipt	Aug. 08, 2017
Issued Date	Nov. 06, 2017
Report No.	1790230R-RFUSP01V00-A
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.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.

Test Report

Issued Date: Nov. 06, 2017

Report No.: 1790230R-RFUSP01V00-A



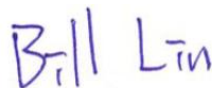
Product Name	VistaHub Wifi only
Applicant	Onyx Healthcare Inc.
Address	2F., No.135, LANE 235, PAO CHIAO RD., XINDIAN DIST., NEW TAIPEI CITY 231, TAIWAN (R.O.C.)
Manufacturer	VitalConnect, Inc.
Model No.	VISTAHUB-W
FCC ID.	RZ5-VISTAHUB-W
EUT Rated Voltage	AC 100-240V, 50/60Hz
EUT Test Voltage	AC 120V/60Hz
Trade Name	VitalConnect
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2016 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v04
Test Result	Complied

Documented By :



(Senior Adm. Specialist / Genie Chang)

Tested By :



(Engineer / Bill Lin)

Approved By :



(Director / Vincent Lin)

TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION	4
1.1. EUT Description	4
1.2. Operational Description	6
1.3. Tested System Details	7
1.4. Configuration of Tested System	7
1.5. EUT Exercise Software	7
1.6. Test Facility	8
1.7. List of Test Equipment	9
2. CONDUCTED EMISSION	10
2.1. Test Setup	10
2.2. Limits	10
2.3. Test Procedure	11
2.4. Uncertainty	11
2.5. Test Result of Conducted Emission	12
3. PEAK POWER OUTPUT	16
3.1. Test Setup	16
3.2. Limit	16
3.3. Test Procedure	16
3.4. Uncertainty	16
3.5. Test Result of Peak Power Output	17
4. RADIATED EMISSION	18
4.1. Test Setup	18
4.2. Limits	19
4.3. Test Procedure	20
4.4. Uncertainty	21
4.5. Test Result of Radiated Emission	22
5. RF ANTENNA CONDUCTED TEST	27
5.1. Test Setup	27
5.2. Limits	27
5.3. Test Procedure	27
5.4. Uncertainty	27
5.5. Test Result of RF Antenna Conducted Test	28
6. BAND EDGE	29
6.1. Test Setup	29
6.2. Limit	30
6.3. Test Procedure	30
6.4. Uncertainty	31
6.5. Test Result of Band Edge	32
7. 6DB BANDWIDTH	36
7.1. Test Setup	36
7.2. Limits	36
7.3. Test Procedure	36
7.4. Uncertainty	36
7.5. Test Result of 6dB Bandwidth	37
8. POWER DENSITY	40
8.1. Test Setup	40
8.2. Limits	40
8.3. Test Procedure	40
8.4. Uncertainty	40
8.5. Test Result of Power Density	41
9. DUTY CYCLE	44
9.1. Test Setup	44
9.2. Test Procedure	44
9.3. Uncertainty	44
9.4. Test Result of Duty Cycle	45
10. EMI REDUCTION METHOD DURING COMPLIANCE TESTING	46
Attachment 1: EUT Test Photographs	
Attachment 2: EUT Detailed Photographs	

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	VistaHub Wifi only
Trade Name	VitalConnect
Model No.	VISTA HUB-W
FCC ID.	RZ5-VISTA HUB-W
Frequency Range	2402 – 2480MHz
Channel Number	V4.0: 40CH
Type of Modulation	V4.0: GFSK(1Mbps)
Antenna Type	Dipole Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
Power Adapter (1)	M/N: ATM020-W050U Input: AC 100-240V~50-60Hz 0.45-0.27A Output: DC 5V, 3.5A Cable Out: Non-shielded, 1.8m
Power Adapter (2)	M/N: ATM036T-A050 Input: AC 100-240V~50-60Hz 1A-0.45 Output: DC 5V, 5A Cable IN: Non-shielded, 1.8m Cable Out: Non-shielded, 1.5m

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ARISTOTLE	RFA-02-C2M2-M32-3	Dipole Antenna	2.42dBi for WLAN
2	ARISTOTLE	RFA-02-C2M2-M32-3	Dipole Antenna	2.42dBi for Bluetooth

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

Center Frequency of Each Channel: (For V4.0)

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 a VistaHub Wifi only with built-in Bluetooth V4.0 、 V2.1+EDR transceiver, this report for Bluetooth V4.0.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth V4.0 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
-----------	------------------------

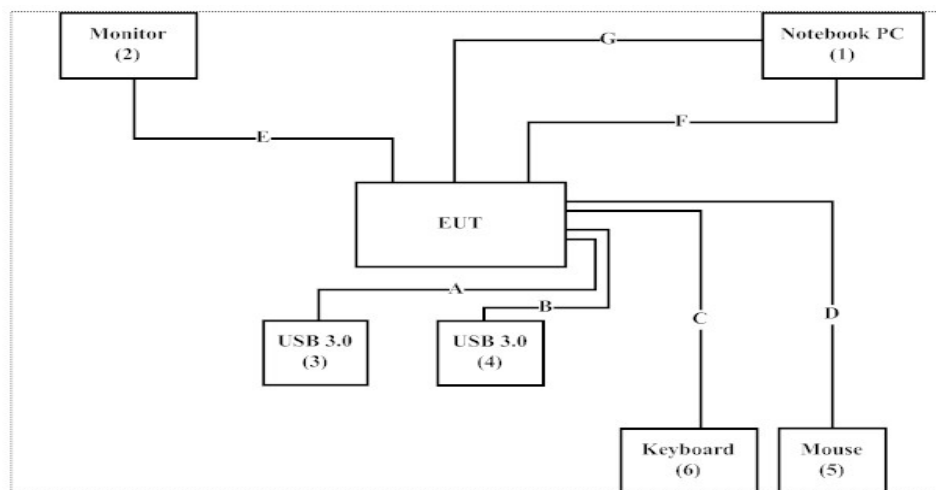
1.3. Tested System Details

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	P62G	229FJC2	N/A
2 Monitor	DELL	U2415	CN-01RMGX-74261-63H-09UL-A02	N/A
3 USB 3.0	WD	WDBUZG0010BBK-PESN	WX11A166S2Y3	N/A
4 USB 3.0	WD	WDBUZG0010BBK-PESN	WXR1AC5478U6	N/A
5 Mouse	Logitech	U0026	N/A	N/A
6 Keyboard	Logitech	K120	N/A	N/A

Signal Cable Type	Signal cable Description
A HDD USB 3.0 Cable	Shielded, 0.47m
B HDD USB 3.0 Cable	Shielded, 0.47m
C USB Keyboard Cable	Shielded, 1.8m
D USB Moue Cable	Shielded, 1.8m
E HDM Cable	Shielded, 2.0m
F USB Cable (Signal Cable)	Shielded, 0.78m
G USB Cable (Signal Cable)	Shielded, 0.78m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4.
- (2) Execute software "Blue Test 3 v2.6.2" 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

Site Name: DEKRA Testing and Certification Co., Ltd.
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan.
TEL: 886-2-2602-7968 / FAX : 866-2-2602-3286
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

1.7. List of Test Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	101601	2017.01.06	2018.01.05
X	Two-Line V-Network	R&S	ENV216	101306	2017.02.16	2018.02.15
X	Two-Line V-Network	R&S	ENV216	101307	2017.03.17	2018.03.16
X	Coaxial Cable	Quietek	RG400_BNC	RF001	2017.05.24	2018.05.23

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

For Conducted measurements /ASR4

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103464	2017.01.09	2018.01.08
X	Power Meter	Anritsu	ML2496A	1548003	2016.12.15	2017.12.14
X	Power Sensor	Anritsu	MA2411B	1531024	2016.12.15	2017.12.14
X	Power Sensor	Anritsu	MA2411B	1531025	2016.12.15	2017.12.14
	Bluetooth Tester	R&S	CBT	101238	2017.01.03	2018.01.02

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 Conduction Test System V8.0.110

For Radiated measurements /ACB1

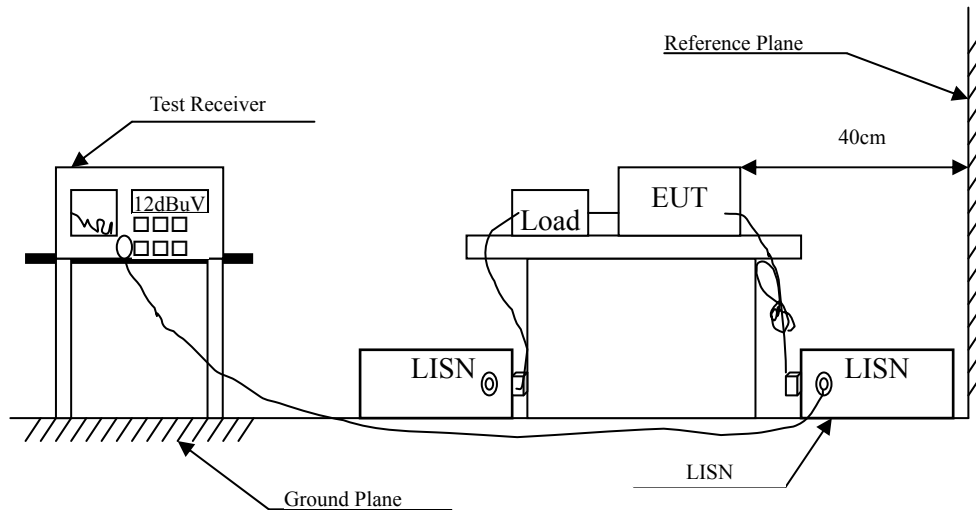
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	TESEQ	HLA6121	37133	2016.03.18	2018.03.17
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-674	2017.02.13	2018.02.12
X	Horn Antenna	ETS-Lindgren	3117	00203800	2016.10.13	2017.10.12
X	Horn Antenna	Com-Power	AH-840	101087	2017.05.24	2018.05.23
X	Pre-Amplifier	EMCI	EMC001330	980316	2017.05.16	2018.05.15
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2017.05.17	2018.05.16
X	Pre-Amplifier	EMCI	EMC05820SE	980310	2017.05.17	2018.05.16
X	Pre-Amplifier	EMCI	EMC184045SE	980314	2017.05.17	2018.05.16
X	Filter	MICRO TRONICS	BRM50702	G249	2017.08.11	2018.08.10
	Filter	MICRO TRONICS	BRM50716	G187	2017.08.16	2018.08.15
X	EMI Test Receiver	R&S	ESR7	101602	2016.12.15	2017.12.14
X	Spectrum Analyzer	R&S	FSV40	101148	2017.01.24	2018.01.23
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2017.05.25	2018.05.24
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2017.08.11	2018.08.10

Note:

1. Loop Antenna is calibrated every two year, the other 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 : VistaHub Wifi only
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Transmit - BLE (2440MHz)_ Adapter: ATM020-W050U
 Test Date : 2017/10/02

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 1					
Quasi-Peak					
0.160	9.560	37.605	47.165	-18.549	65.714
0.180	9.560	35.614	45.174	-19.969	65.143
0.600	9.580	35.699	45.279	-10.721	56.000
2.300	9.583	34.255	43.838	-12.162	56.000
2.672	9.587	30.420	40.007	-15.993	56.000
2.960	9.589	27.514	37.103	-18.897	56.000
Average					
0.160	9.560	23.613	33.173	-22.541	55.714
0.180	9.560	24.386	33.946	-21.197	55.143
0.600	9.580	27.470	37.050	-8.950	46.000
2.300	9.583	28.158	37.741	-8.259	46.000
2.672	9.587	23.487	33.074	-12.926	46.000
2.960	9.589	20.435	30.025	-15.975	46.000

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 : VistaHub Wifi only
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 1: Transmit - BLE (2440MHz)_ Adapter: ATM020-W050U
 Test Date : 2017/10/02

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.157	9.552	37.842	47.394	-18.406	65.800
0.204	9.559	32.280	41.839	-22.618	64.457
0.600	9.575	33.807	43.381	-12.619	56.000
2.300	9.583	34.798	44.381	-11.619	56.000
2.700	9.587	28.978	38.565	-17.435	56.000
3.000	9.590	27.002	36.592	-19.408	56.000
Average					
0.157	9.552	25.160	34.712	-21.088	55.800
0.204	9.559	21.024	30.583	-23.874	54.457
0.600	9.575	25.403	34.978	-11.022	46.000
2.300	9.583	28.078	37.661	-8.339	46.000
2.700	9.587	23.051	32.638	-13.362	46.000
3.000	9.590	20.892	30.482	-15.518	46.000

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 : VistaHub Wifi only
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Transmit - BLE (2440MHz) _ Adapter: ATM036T-A050
 Test Date : 2017/10/02

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.159	9.560	28.264	37.824	-27.919	65.743
0.390	9.572	32.097	41.669	-17.474	59.143
2.367	9.584	36.857	46.441	-9.559	56.000
2.700	9.587	32.400	41.987	-14.013	56.000
2.978	9.590	30.001	39.591	-16.409	56.000
3.339	9.593	24.922	34.515	-21.485	56.000
Average					
0.159	9.560	18.757	28.317	-27.426	55.743
0.390	9.572	24.007	33.580	-15.563	49.143
2.367	9.584	30.073	39.656	-6.344	46.000
2.700	9.587	24.607	34.194	-11.806	46.000
2.978	9.590	22.892	32.482	-13.518	46.000
3.339	9.593	18.040	27.633	-18.367	46.000

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 : VistaHub Wifi only
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 1: Transmit - BLE (2440MHz) _ Adapter: ATM036T-A050
 Test Date : 2017/10/02

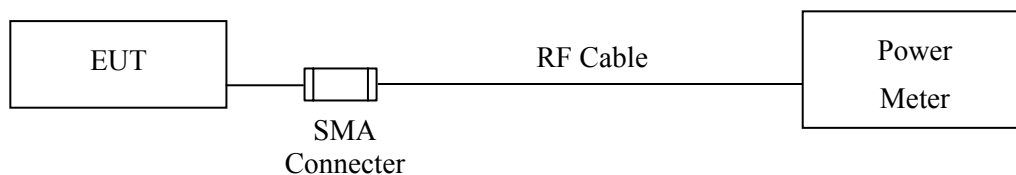
Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.160	9.552	29.736	39.288	-26.426	65.714
0.390	9.567	32.825	42.392	-16.751	59.143
2.346	9.583	37.768	47.351	-8.649	56.000
2.700	9.587	31.946	41.533	-14.467	56.000
3.000	9.590	27.708	37.298	-18.702	56.000
3.400	9.594	23.526	33.120	-22.880	56.000
Average					
0.160	9.552	19.630	29.182	-26.532	55.714
0.390	9.567	25.165	34.732	-14.411	49.143
2.346	9.583	30.321	39.904	-6.096	46.000
2.700	9.587	25.052	34.639	-11.361	46.000
3.000	9.590	22.040	31.630	-14.370	46.000
3.400	9.594	16.604	26.198	-19.802	46.000

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 9.1.2 PKPM1 Peak power meter method.

3.4. Uncertainty

± 0.86 dB

3.5. Test Result of Peak Power Output

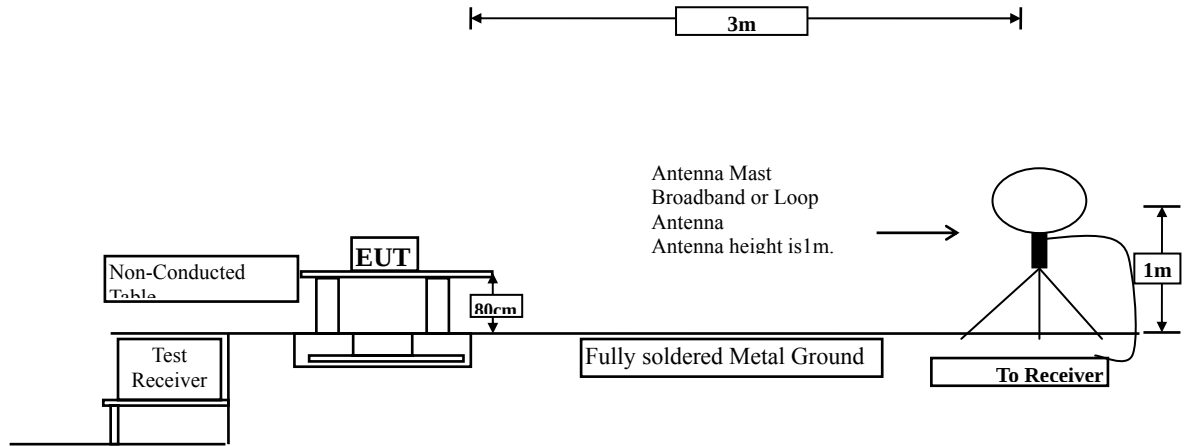
Product : VistaHub Wifi only
Test Item : Peak Power Output
Test Mode : Mode 1: Transmit - BLE
Test Date : 2017/09/20

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402	5.34	1 Watt= 30 dBm	Pass
Channel 19	2440	6.40	1 Watt= 30 dBm	Pass
Channel 39	2480	6.91	1 Watt= 30 dBm	Pass

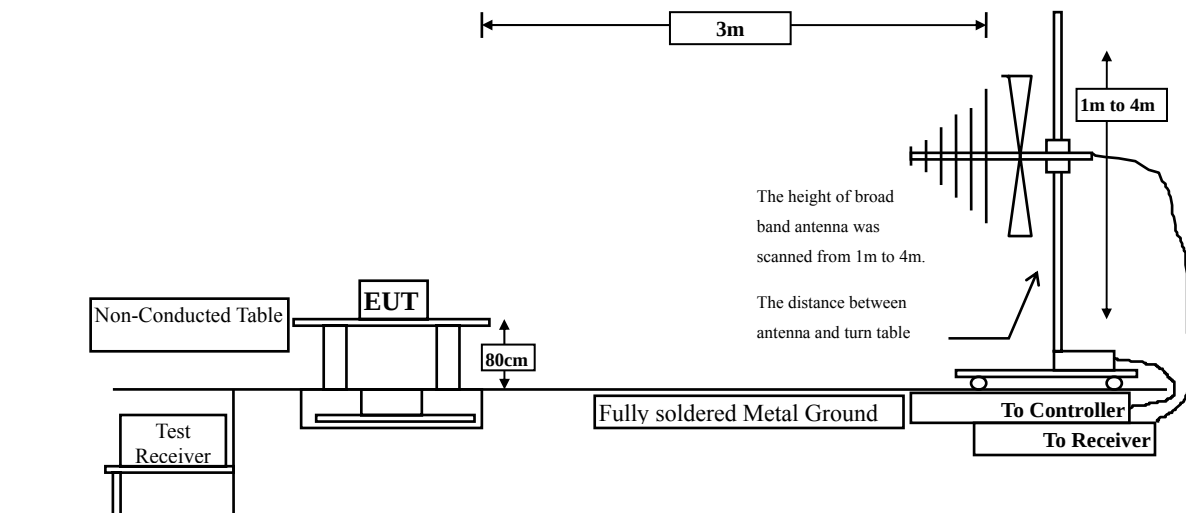
4. Radiated Emission

4.1. Test Setup

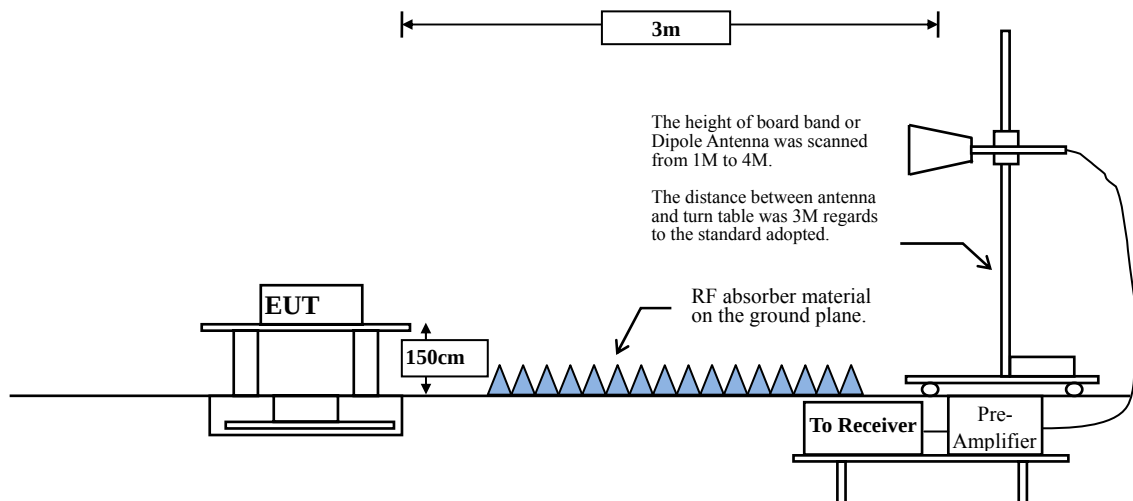
Radiated Emission Under 30MHz



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	62.95	0.4087	2447	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 : VistaHub Wifi only
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit - BLE(2402MHz)_Adapter: ATM020-W050U
 Test Date : 2017/09/14

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4804.000	-2.875	50.090	47.216	-26.784	74.000
7206.000	0.384	45.020	45.404	-28.596	74.000
9608.000	2.338	42.800	45.138	-28.862	74.000
Average					
Detector:					
--					54.000
Vertical					
Peak Detector:					
4804.000	-2.875	53.110	50.236	-23.764	74.000
7206.000	0.384	47.260	47.644	-26.356	74.000
9608.000	2.338	42.990	45.328	-28.672	74.000
Average					
Detector:					
--					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 : VistaHub Wifi only
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit - BLE (2440MHz)_Adapter: ATM020-W050U
 Test Date : 2017/09/14

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4880.000	-2.817	52.390	49.572	-24.428	74.000
7320.000	0.464	48.410	48.874	-25.126	74.000
9760.000	2.608	43.760	46.367	-27.633	74.000
Average					
Detector:					
--					54.000
Vertical					
Peak Detector:					
4880.000	-2.817	56.600	53.782	-20.218	74.000
7320.000	0.464	49.060	49.524	-24.476	74.000
9760.000	2.608	43.500	46.107	-27.893	74.000
Average					
Detector:					
--					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 : VistaHub Wifi only
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit - BLE (2480MHz)_Adapter: ATM020-W050U
 Test Date : 2017/09/14

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4960.000	-2.791	53.160	50.369	-23.631	74.000
7440.000	0.499	48.340	48.839	-25.161	74.000
9920.000	2.917	42.900	45.817	-28.183	74.000
Average					
Detector:					
--					54.000
Vertical					
Peak Detector:					
4960.000	-2.791	55.850	53.059	-20.941	74.000
7440.000	0.499	49.790	50.289	-23.711	74.000
9920.000	2.917	42.650	45.567	-28.433	74.000
Average					
Detector:					
--					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 : VistaHub Wifi only
 Test Item : General Radiated Emission
 Test Mode : Mode 1: Transmit - BLE (2440MHz)_Adapter: ATM020-W050U
 Test Date : 2017/10/03

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
186.043	-12.887	52.207	39.320	-4.180	43.500
238.058	-11.986	53.489	41.503	-4.497	46.000
399.725	-7.349	49.845	42.496	-3.504	46.000
700.565	-1.650	39.563	37.913	-8.087	46.000
770.855	-0.656	43.601	42.944	-3.056	46.000
924.087	1.169	38.042	39.210	-6.790	46.000
Vertical					
184.638	-12.729	53.394	40.666	-2.834	43.500
399.725	-7.349	49.324	41.975	-4.025	46.000
533.275	-4.610	43.837	39.227	-6.773	46.000
616.217	-2.930	44.029	41.099	-4.901	46.000
770.855	-0.656	45.248	44.591	-1.409	46.000
924.087	1.169	43.642	44.810	-1.190	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 : VistaHub Wifi only
 Test Item : General Radiated Emission
 Test Mode : Mode 1: Transmit - BLE (2440MHz)_Adapter: ATM036T-A050
 Test Date : 2017/10/03

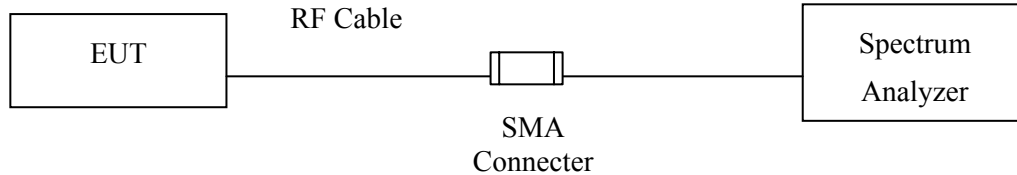
Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
195.884	-13.430	55.946	42.516	-0.984	43.500
326.623	-9.293	49.060	39.768	-6.232	46.000
399.725	-7.349	51.172	43.823	-2.177	46.000
461.580	-5.967	45.637	39.670	-6.330	46.000
770.855	-0.656	41.010	40.353	-5.647	46.000
924.087	1.169	40.450	41.618	-4.382	46.000
Vertical					
32.812	-11.890	51.578	39.688	-0.312	40.000
194.478	-13.411	54.155	40.744	-2.756	43.500
399.725	-7.349	47.539	40.190	-5.810	46.000
616.217	-2.930	43.790	40.860	-5.140	46.000
770.855	-0.656	45.358	44.701	-1.299	46.000
924.087	1.169	40.920	42.088	-3.912	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 : VistaHub Wifi only
Test Item : RF Antenna Conducted Test
Test Mode : Mode 1: Transmit - BLE
Test Date : 2017/09/15

Figure Channel 00:

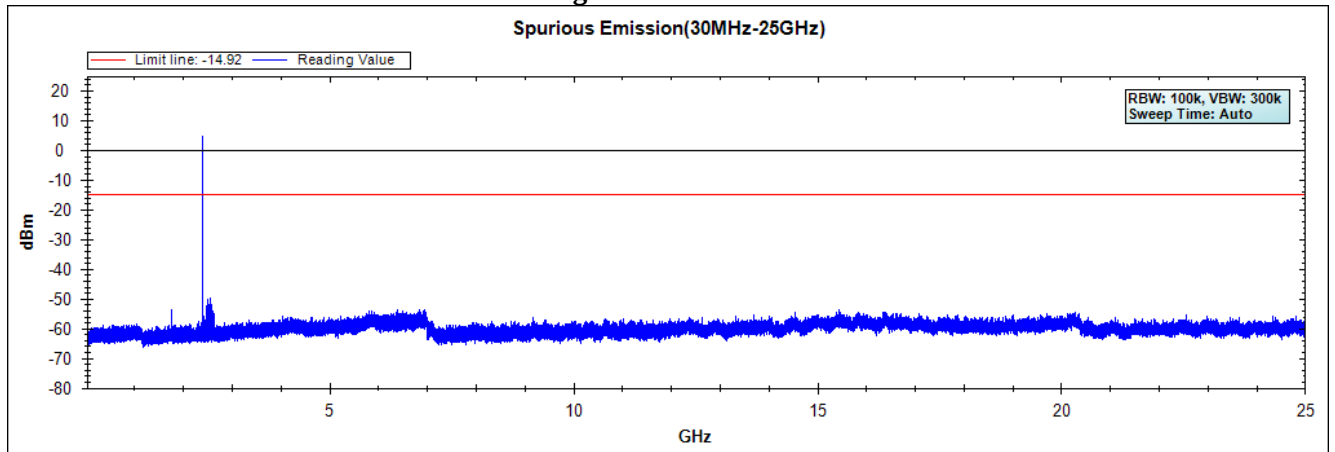


Figure Channel 19:

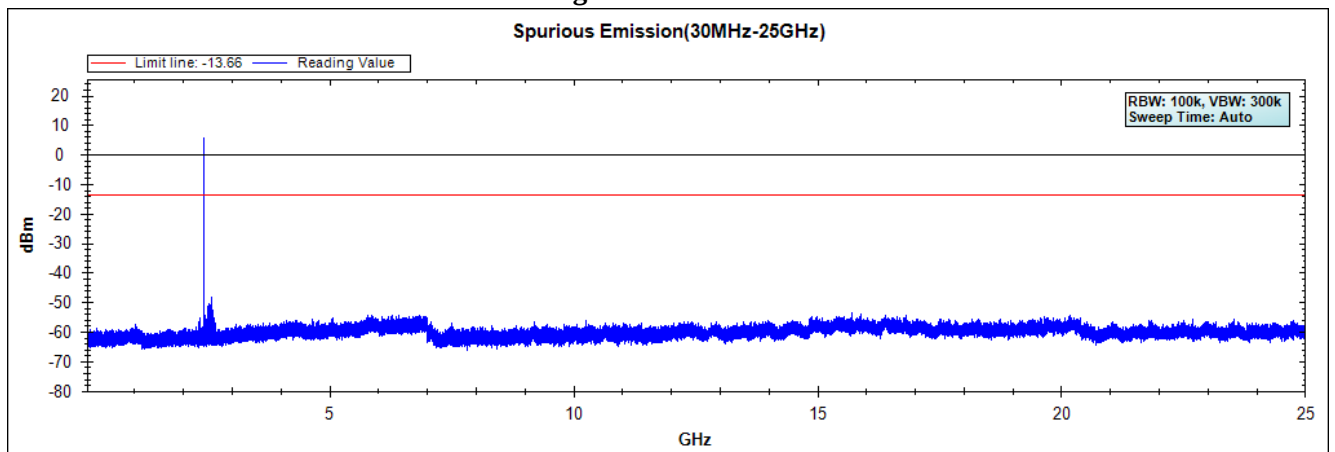
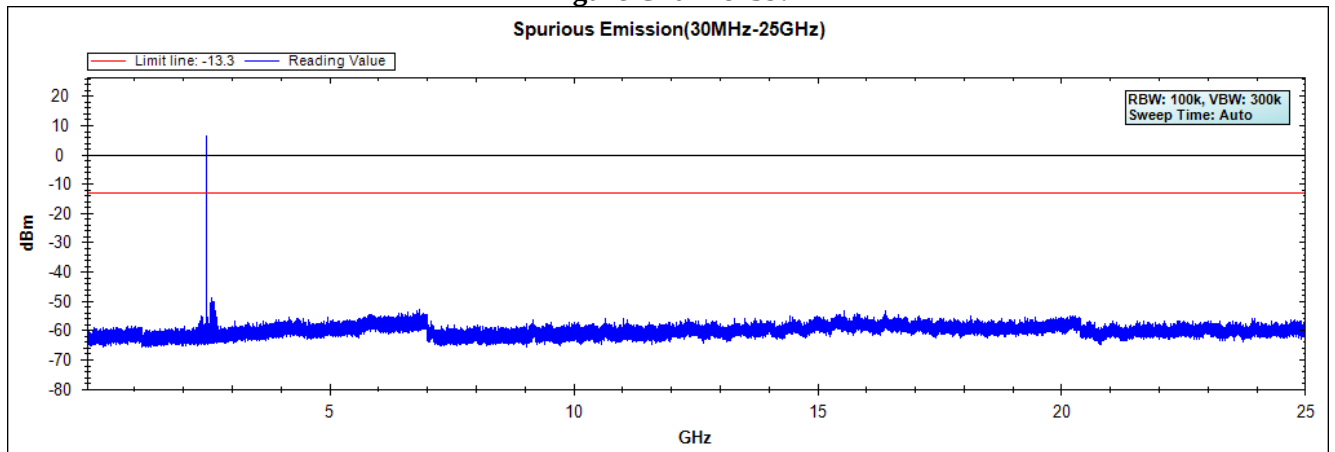


Figure Channel 39:

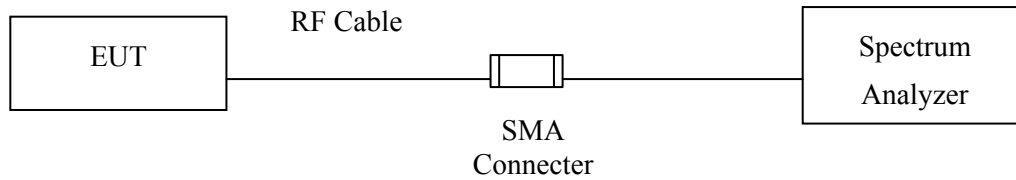


Note: The above test pattern is synthesized by multiple of the frequency range.

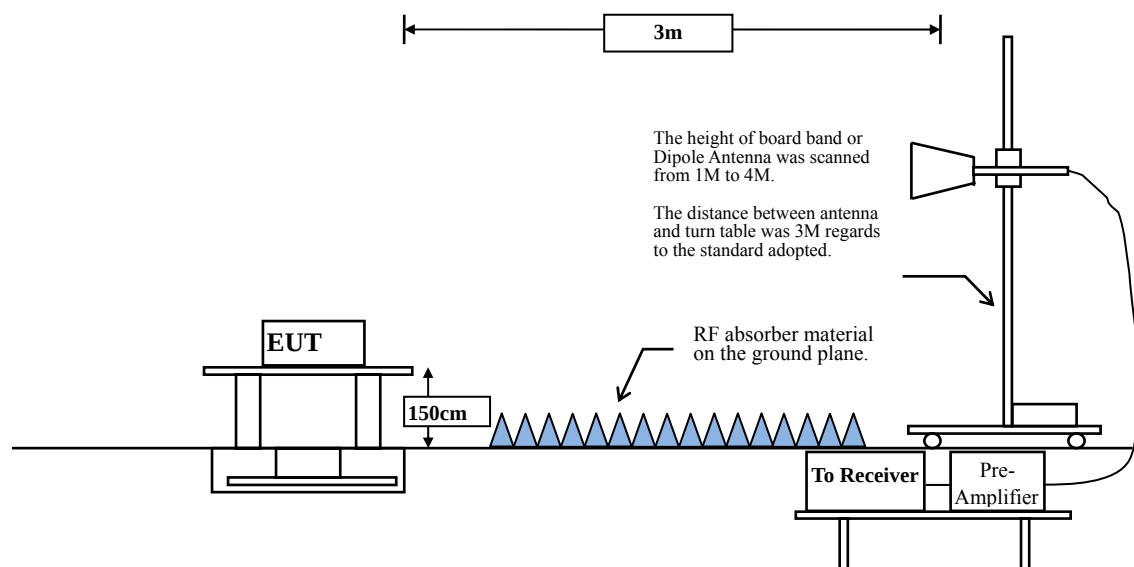
6. Band Edge

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	62.95	0.4087	2447	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 : VistaHub Wifi only
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - BLE
 Test Date : 2017/09/14

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)	2376.087	12.108	33.713	45.821	74.00	54.00	Pass
00 (Peak)	2390.000	12.148	29.284	41.432	74.00	54.00	Pass
00 (Peak)	2400.000	12.176	60.952	73.128	--	--	Pass
00 (Peak)	2402.319	12.182	93.259	105.441	--	--	--
00 (Average)	2375.797	12.107	25.657	37.764	74.00	54.00	Pass
00 (Average)	2390.000	12.148	18.430	30.578	74.00	54.00	Pass
00 (Average)	2400.000	12.176	50.908	63.084	--	--	Pass
00 (Average)	2402.029	12.182	92.434	104.615	--	--	--

Figure Channel 00:

Horizontal (Peak)

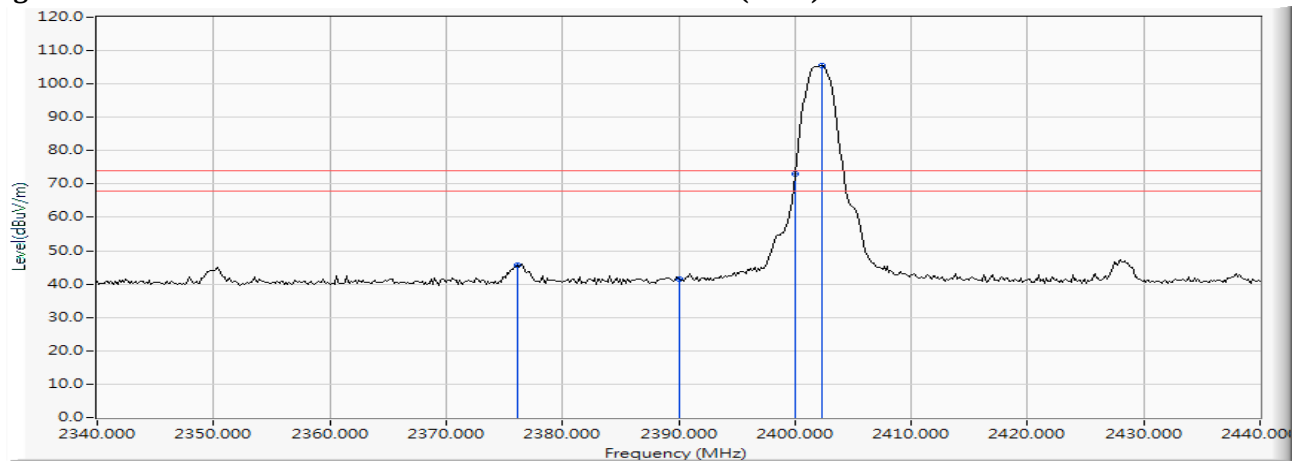
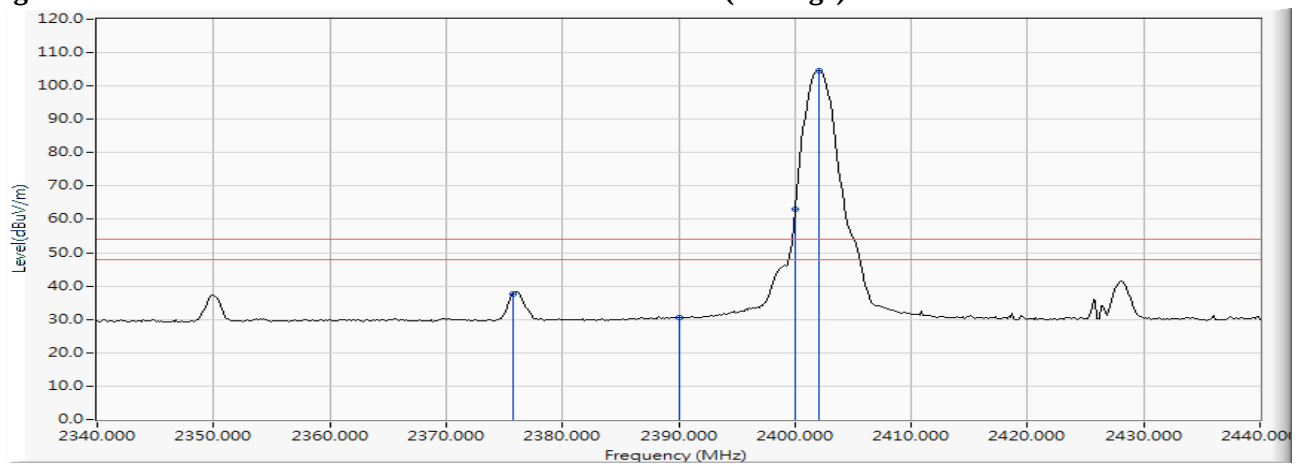


Figure Channel 00:

Horizontal (Average)



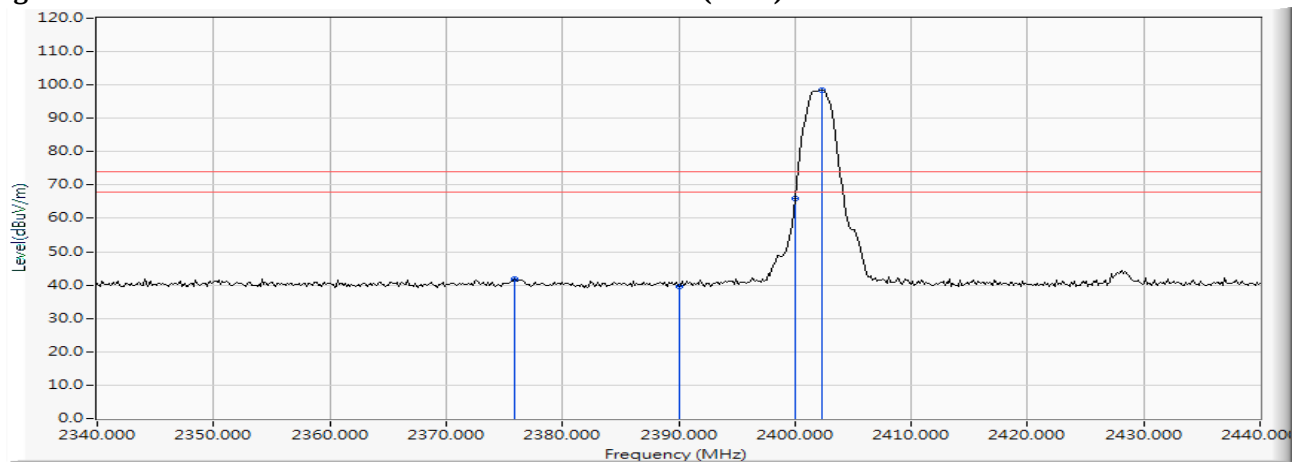
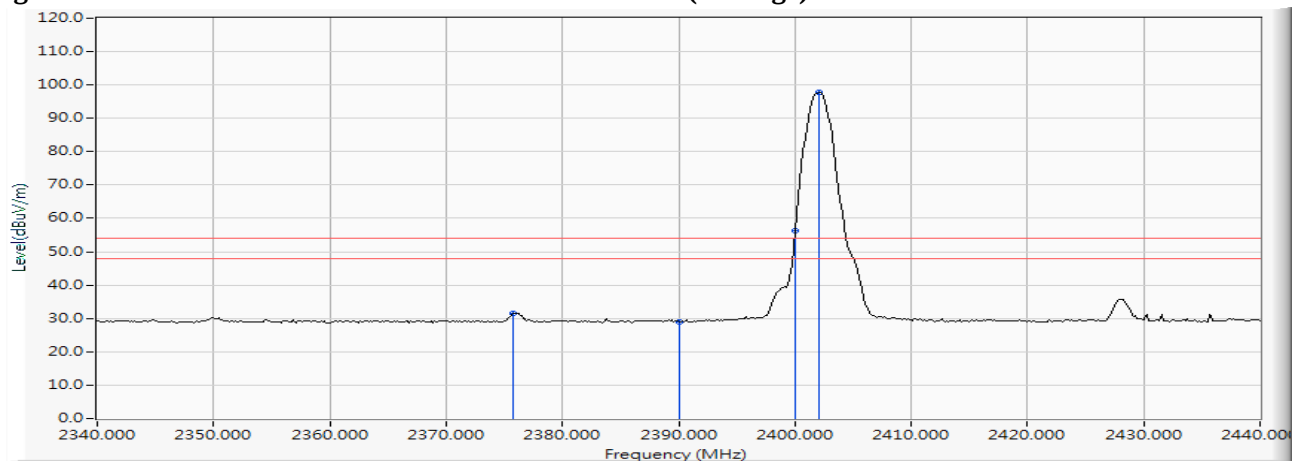
Note:

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 : VistaHub Wifi only
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - BLE
 Test Date : 2017/09/14

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)	2375.942	12.108	29.838	41.946	74.00	54.00	Pass
00 (Peak)	2390.000	12.148	27.266	39.414	74.00	54.00	Pass
00 (Peak)	2400.000	12.176	53.900	66.076	--	--	Pass
00 (Peak)	2402.319	12.182	86.399	98.581	--	--	--
00 (Average)	2375.797	12.107	19.523	31.630	74.00	54.00	Pass
00 (Average)	2390.000	12.148	16.926	29.074	74.00	54.00	Pass
00 (Average)	2400.000	12.176	44.022	56.198	--	--	Pass
00 (Average)	2402.029	12.182	85.568	97.749	--	--	--

Figure Channel 00: Vertical (Peak)**Figure Channel 00: Vertical (Average)**

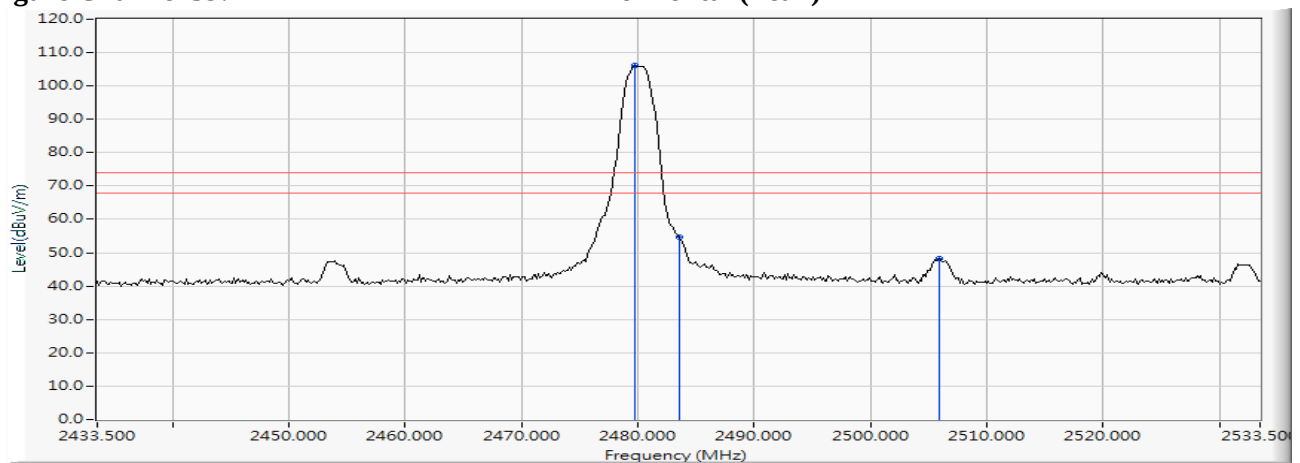
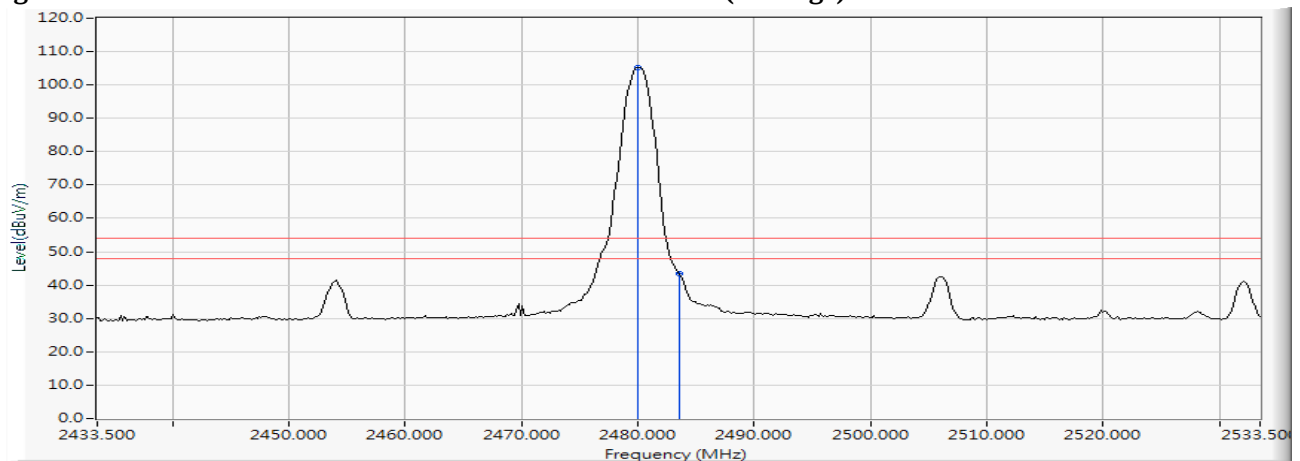
Note:

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 : VistaHub Wifi only
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - BLE
 Test Date : 2017/09/14

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)	2479.732	12.392	93.616	106.008	--	--	--
39 (Peak)	2483.500	12.403	42.334	54.737	74.00	54.00	Pass
39 (Peak)	2505.964	12.459	35.754	48.212	74.00	54.00	Pass
39 (Average)	2480.022	12.393	92.878	105.271	--	--	--
39 (Average)	2483.500	12.403	31.109	43.512	74.00	54.00	Pass

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

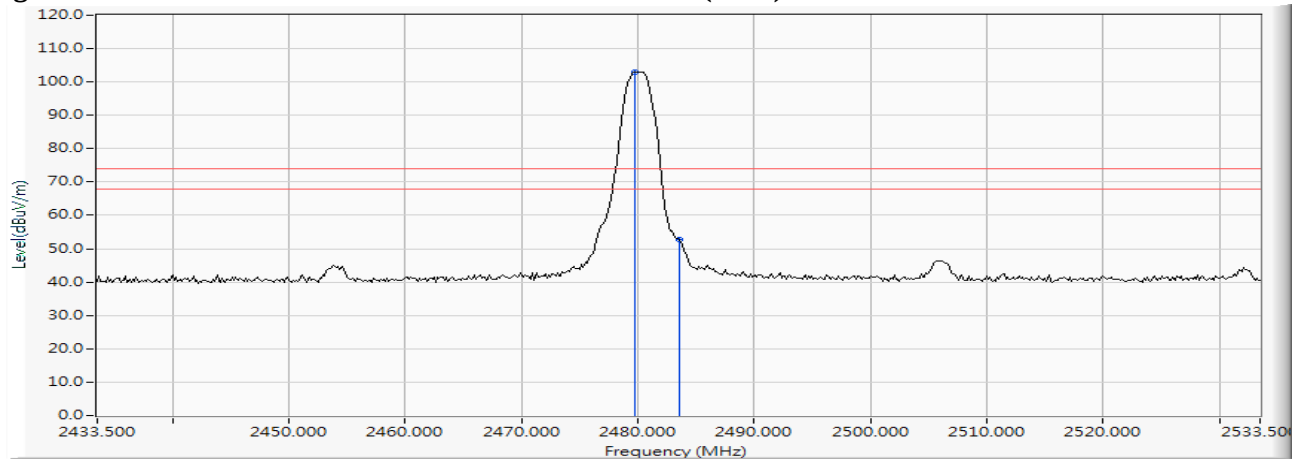
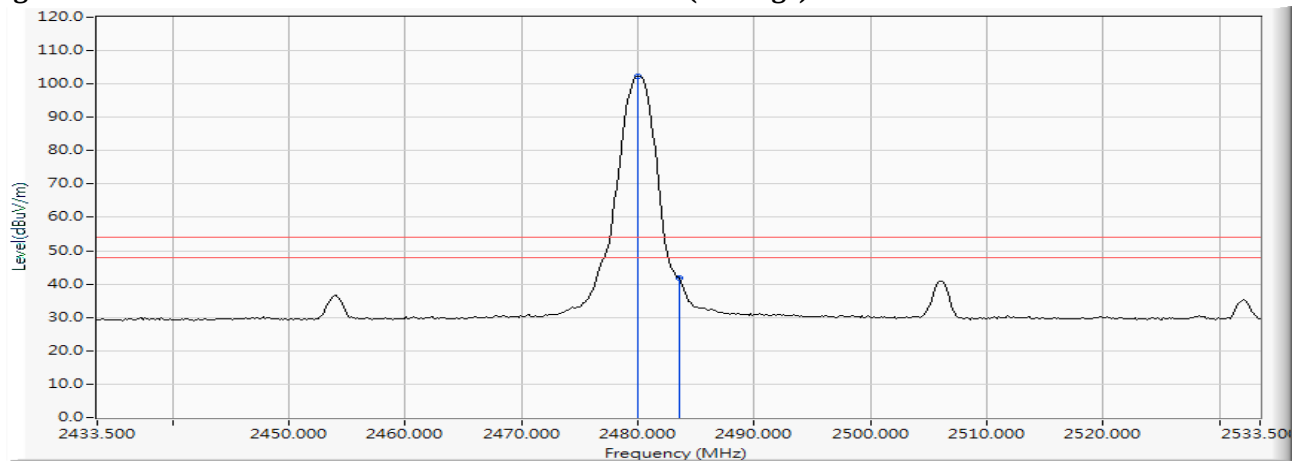
Note:

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 : VistaHub Wifi only
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit - BLE
 Test Date : 2017/09/14

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)	2479.732	12.392	90.694	103.086	--	--	--
39 (Peak)	2483.500	12.403	40.442	52.845	74.00	54.00	Pass
39 (Average)	2480.022	12.393	89.990	102.383	--	--	--
39 (Average)	2483.500	12.403	29.360	41.763	74.00	54.00	Pass

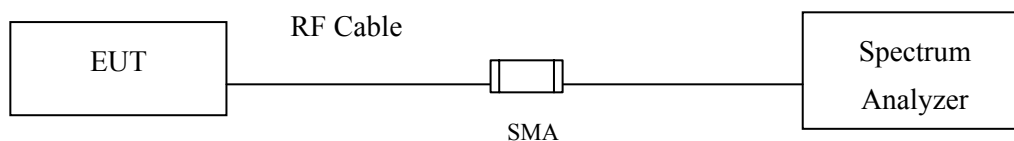
Figure Channel 39:**Vertical (Peak)****Figure Channel 39:****Vertical (Average)**

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, $VBW \geq 3 * RBW$

7.4. Uncertainty

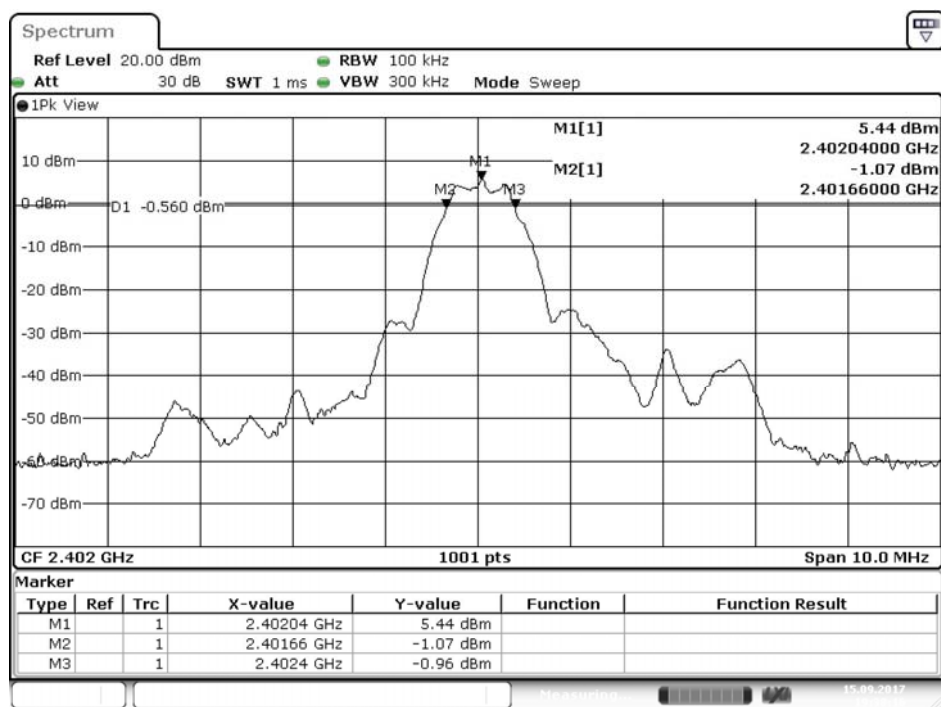
$\pm 279.2 \text{ Hz}$

7.5. Test Result of 6dB Bandwidth

Product : VistaHub Wifi only
 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:

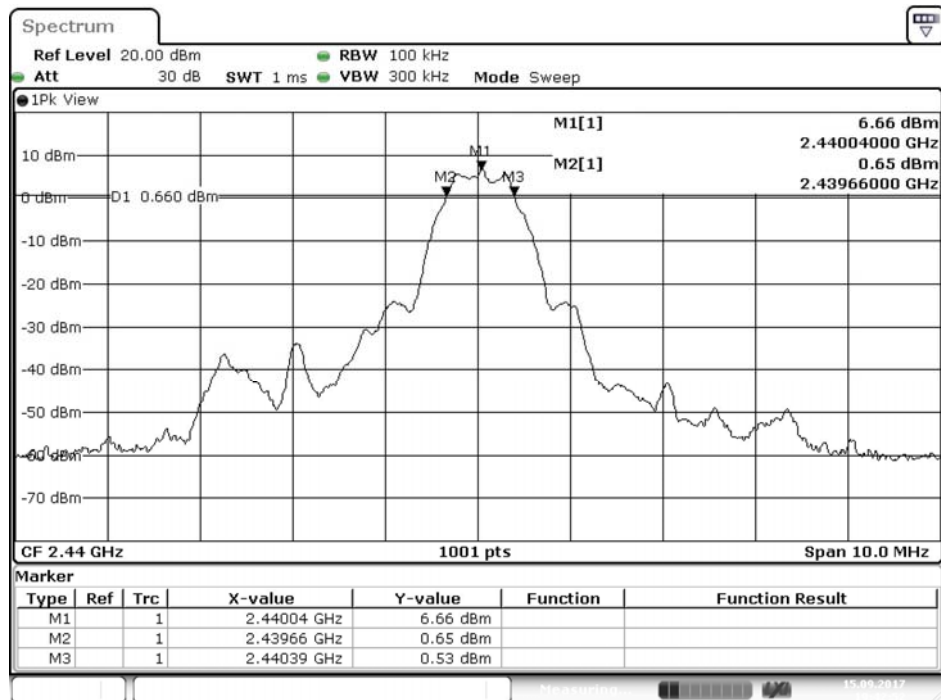


Date: 15.SEP.2017 19:38:16

Product : VistaHub Wifi only
 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	730	>500	Pass

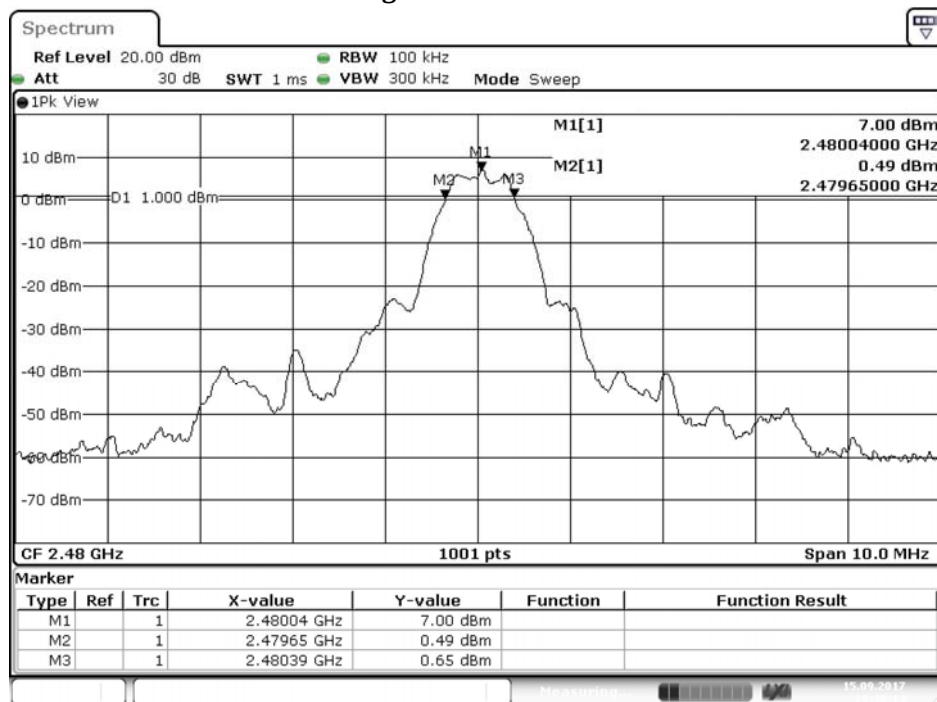
Figure Channel 19:



Product : VistaHub Wifi only
 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

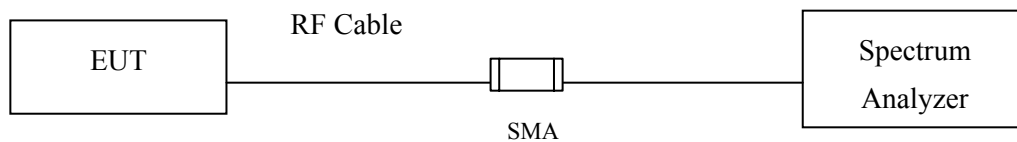
Figure Channel 39:



Date: 15.SEP.2017 19:48:15

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

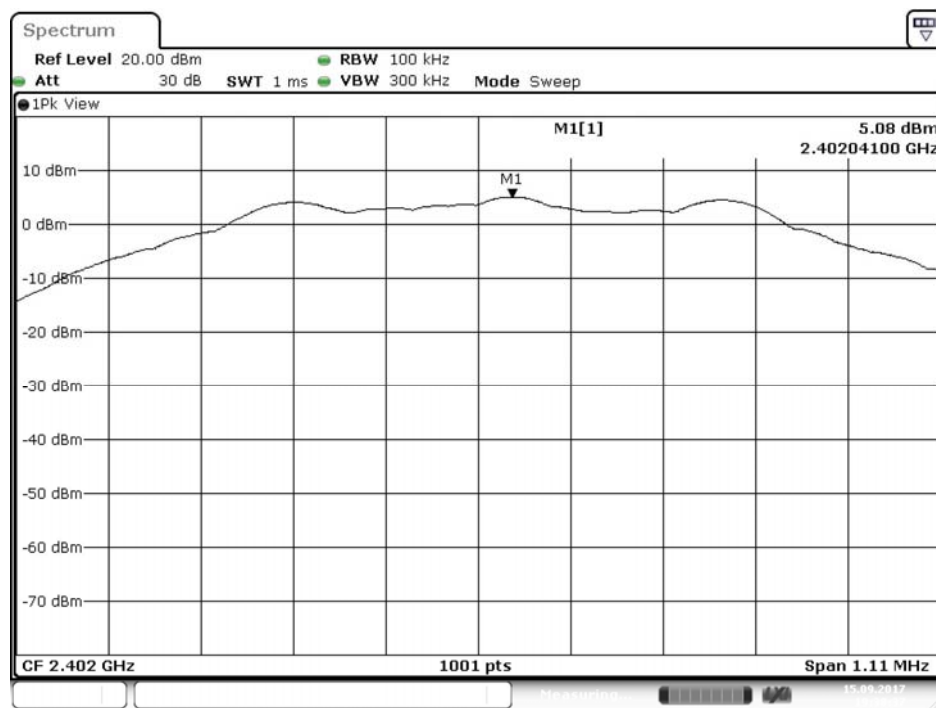
$\pm 1.23\text{dB}$

8.5. Test Result of Power Density

Product : VistaHub Wifi only
 Test Item : Power Density Data
 Test Mode : Mode 1: Transmit - BLE (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	5.08	$\leq 8\text{dBm}$	Pass

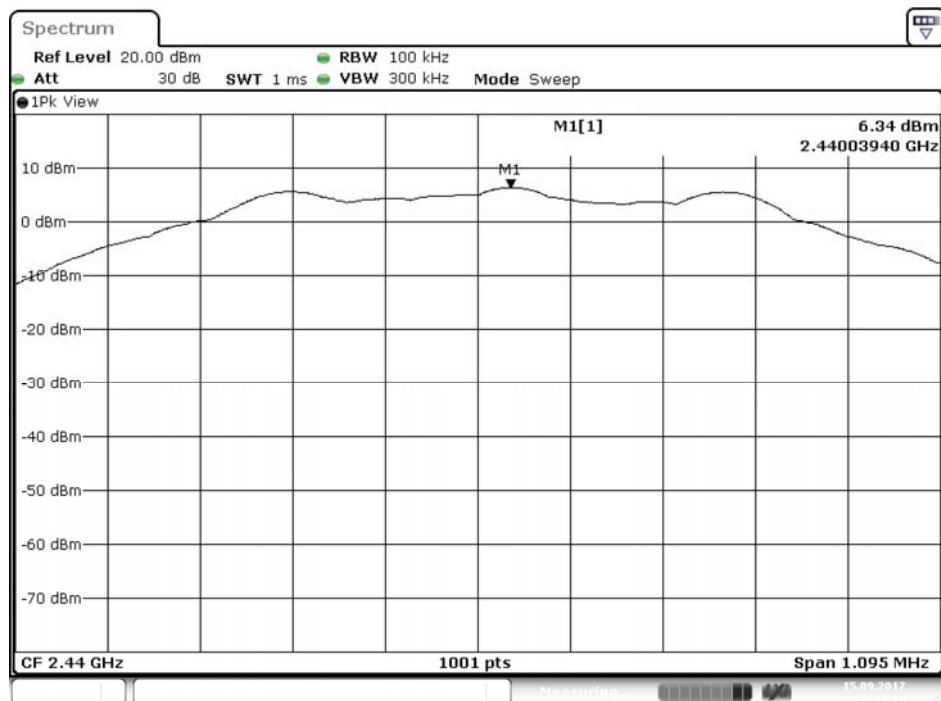
Figure Channel 00:



Product : VistaHub Wifi only
 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	6.34	$\leq 8\text{dBm}$	Pass

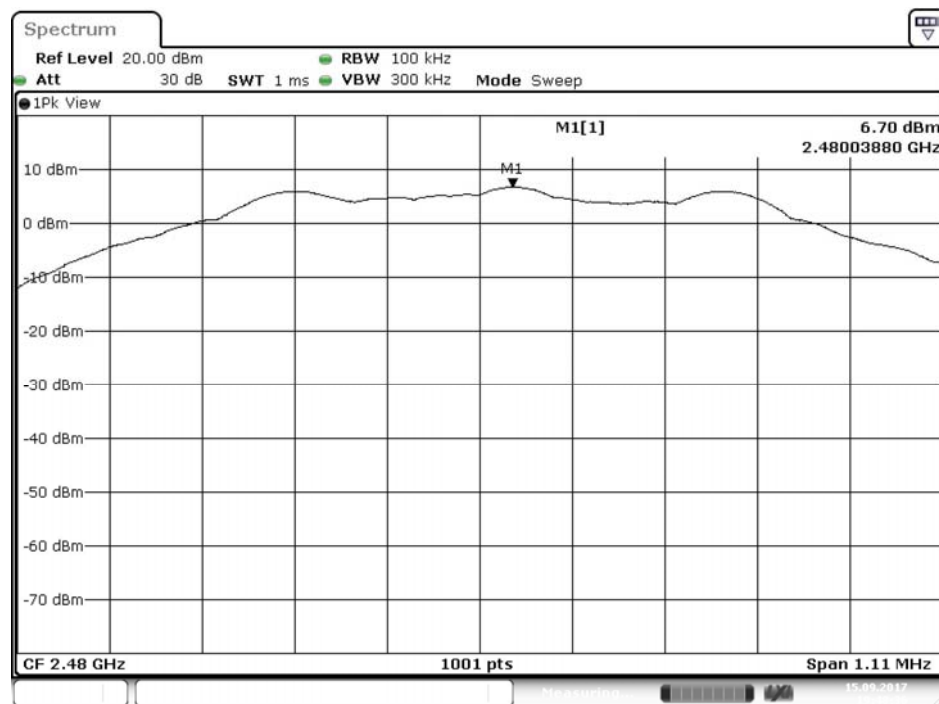
Figure Channel 19:



Product : VistaHub Wifi only
 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	6.7	$\leq 8\text{dBm}$	Pass

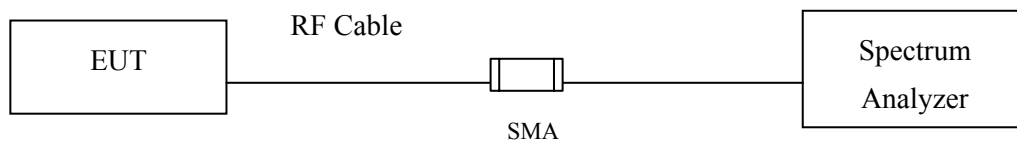
Figure Channel 39:



Date: 15.SEP.2017 19:48:36

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 : VistaHub Wifi only
 Test Item : Duty Cycle
 Test Mode : Mode 1: Transmit - BLE

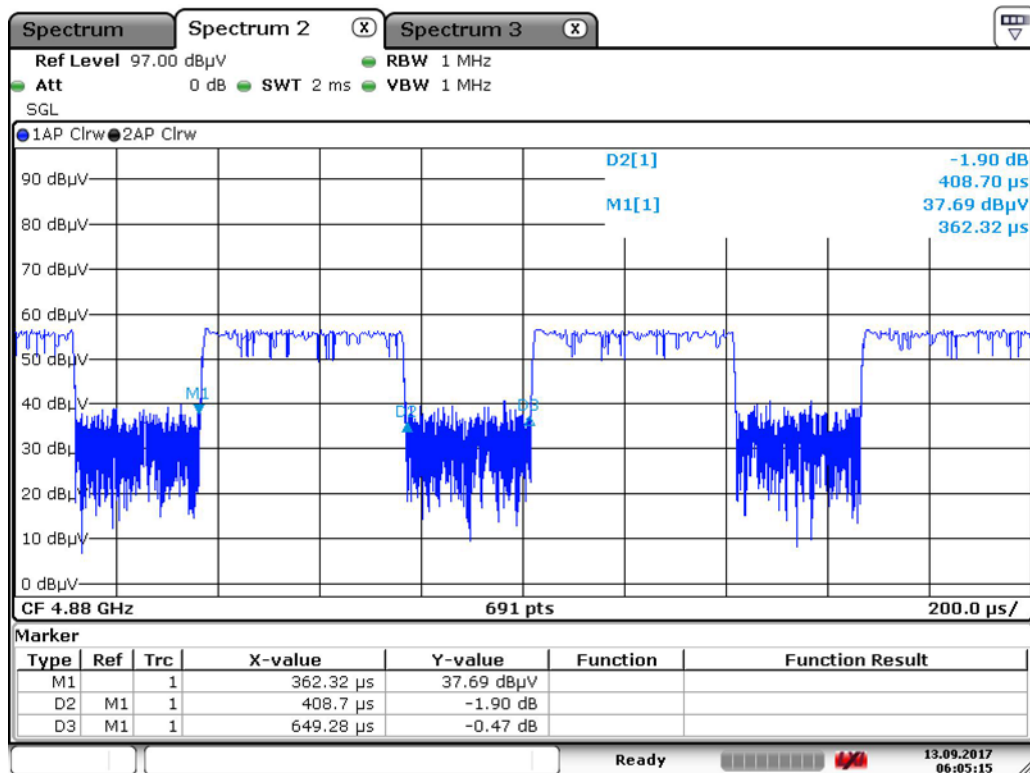
Duty Cycle Formula:

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	0.4087	0.6493	62.95	2.01



Date: 13.SEP.2017 06:05:15

10. EMI Reduction Method During Compliance Testing

No modification was made during testing.