

FCC Test Report

Product Name	Wireless USB Dongle
Model No.	END988W
FCC ID.	BCE-END988W

Applicant	GN Audio A/S
Address	Lautrupbjerg 7,DK-2750 Ballerup,Denmark.

Date of Receipt	Nov. 28, 2017
Issued Date	Jan. 03, 2018
Report No.	17B0489R-RFUSP02V00
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: Jan. 03, 2018

Report No.: 17B0489R-RFUSP02V00



Product Name	Wireless USB Dongle
Applicant	GN Audio A/S
Address	Lautrupbjerg 7,DK-2750 Ballerup,Denmark.
Manufacturer	GN Audio A/S
Model No.	END988W
FCC ID.	BCE-END988W
EUT Rated Voltage	DC 5V
EUT Test Voltage	DC 5V
Trade Name	ALIENWARE
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 / Joanne Lin)

Tested By :



(Engineer / Kevin Liu)

Approved By :



(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless USB Dongle
Trade Name	ALIENWARE
Model No.	END988W
FCC ID.	BCE-END988W
Frequency Range	2403.35-2477.35MHz
Channel Number	38CH
Type of Modulation	$\pi/4$ DQPSK
Antenna Type	IFA Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	GN	N/A	IFA Antenna	-2.81dBi

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

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2403.35 MHz	Channel 02:	2405.35 MHz	Channel 03:	2407.35MHz	Channel 04:	2409.35MHz
Channel 05:	2411.35MHz	Channel 06:	2413.35MHz	Channel 07:	2415.35MHz	Channel 08:	2417.35MHz
Channel 09:	2419.35MHz	Channel 10:	2421.35MHz	Channel 11:	2423.35MHz	Channel 12:	2425.35MHz
Channel 13:	2427.35MHz	Channel 14:	2429.35MHz	Channel 15:	2431.35MHz	Channel 16:	2433.35MHz
Channel 17:	2435.35MHz	Channel 18:	2437.35MHz	Channel 19:	2439.35MHz	Channel 20:	2441.35MHz
Channel 21:	2443.35MHz	Channel 22:	2445.35MHz	Channel 23:	2447.35MHz	Channel 24:	2449.35MHz
Channel 25:	2451.35MHz	Channel 26:	2453.35MHz	Channel 27:	2455.35MHz	Channel 28:	2457.35MHz
Channel 29:	2459.35MHz	Channel 30:	2461.35MHz	Channel 31:	2463.35MHz	Channel 32:	2465.35MHz
Channel 33:	2467.35MHz	Channel 34:	2469.35MHz	Channel 35:	2471.35MHz	Channel 36:	2473.35MHz
Channel 37:	2475.35MHz	Channel 38:	2477.35MHz				

Note:

1. The EUT is a Wireless USB Dongle with a built-in 2.4GHz transmitter.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of 2.4GHz 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.

Test Mode	Mode 1: Transmit
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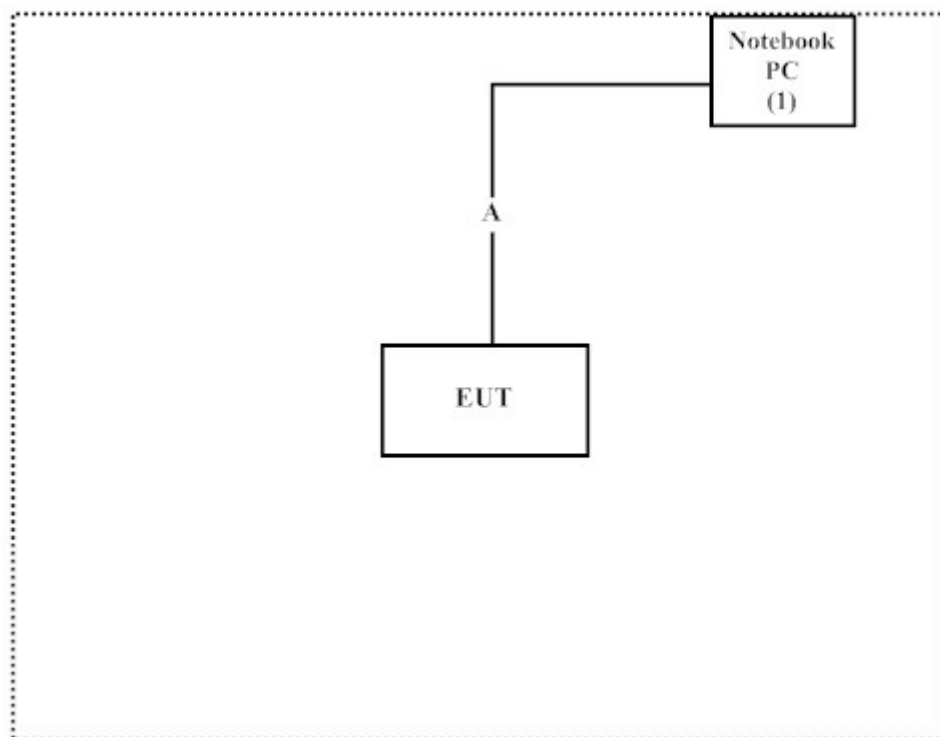
1.3. Tested System Details

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	Inspiron 15 3000	GT5JPJ2	N/A

Signal Cable Type		Signal cable Description
A	USB Cable	Shielded, 1.8m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4.
- (2) Execute "VMidebug V1.1.6.56" program on the Notebook.
- (3) Configure the test mode, the test channel.
- (4) 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: 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	2017.12.11	2018.12.10
X	Power Sensor	Anritsu	MA2411B	1531024	2017.12.11	2018.12.10
X	Power Sensor	Anritsu	MA2411B	1531025	2017.12.11	2018.12.10
	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

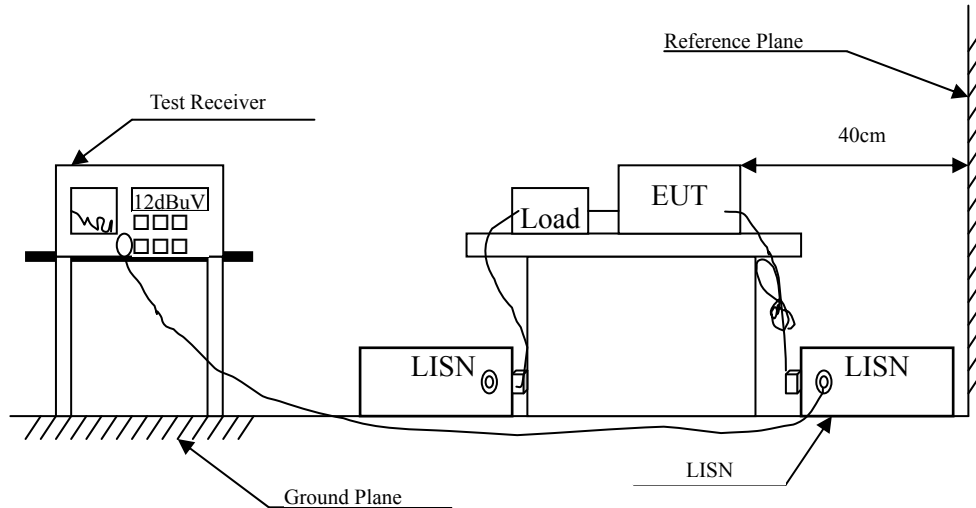
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	TESEQ	HLA6121	37133	2016.03.18	2018.03.17
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-674	2017.02.13	2018.02.12
X	Horn Antenna	ETS-Lindgren	3117	00203800	2017.11.10	2018.11.09
X	Horn Antenna	Com-Power	AH-840	101087	2017.05.24	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	2017.12.11	2018.12.10
X	Spectrum Analyzer	R&S	FSV40	101148	2017.12.11	2018.12.10
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 : Wireless USB Dongle
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Date : 2017/12/03
 Test Mode : Mode 1: Transmit (2441.35MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB μ V	dB μ V	dB	dB μ V
LINE 1					
Quasi-Peak					
0.168	9.652	38.668	48.320	-17.166	65.486
0.361	9.691	32.208	41.898	-18.073	59.971
0.454	9.697	32.271	41.968	-15.346	57.314
1.417	9.730	27.775	37.505	-18.495	56.000
3.100	9.781	24.795	34.576	-21.424	56.000
16.985	10.050	18.148	28.198	-31.802	60.000
Average					
0.168	9.652	28.074	37.726	-17.760	55.486
0.361	9.691	19.727	29.417	-20.554	49.971
0.454	9.697	20.665	30.362	-16.952	47.314
1.417	9.730	17.094	26.824	-19.176	46.000
3.100	9.781	15.463	25.244	-20.756	46.000
16.985	10.050	12.622	22.672	-27.328	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 : Wireless USB Dongle
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Date : 2017/12/03
 Test Mode : Mode 1: Transmit (2441.35MHz)

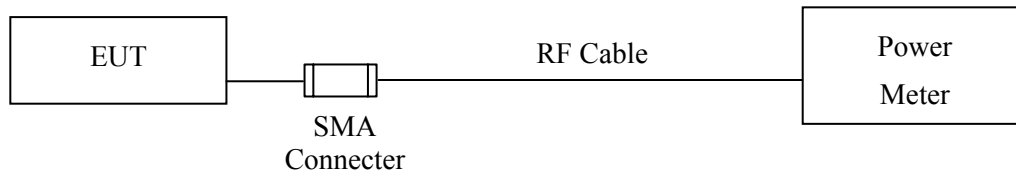
Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB μ V	dB μ V	dB	dB μ V
LINE 2					
Quasi-Peak					
0.166	9.955	36.278	46.233	-19.310	65.543
0.445	9.981	28.217	38.198	-19.373	57.571
0.685	9.951	22.131	32.082	-23.918	56.000
1.437	9.880	20.420	30.300	-25.700	56.000
13.065	10.031	24.148	34.179	-25.821	60.000
16.879	10.095	22.676	32.771	-27.229	60.000
Average					
0.166	9.955	21.491	31.446	-24.097	55.543
0.445	9.981	13.399	23.380	-24.191	47.571
0.685	9.951	11.791	21.742	-24.258	46.000
1.437	9.880	8.112	17.993	-28.007	46.000
13.065	10.031	18.543	28.574	-21.426	50.000
16.879	10.095	16.721	26.816	-23.184	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

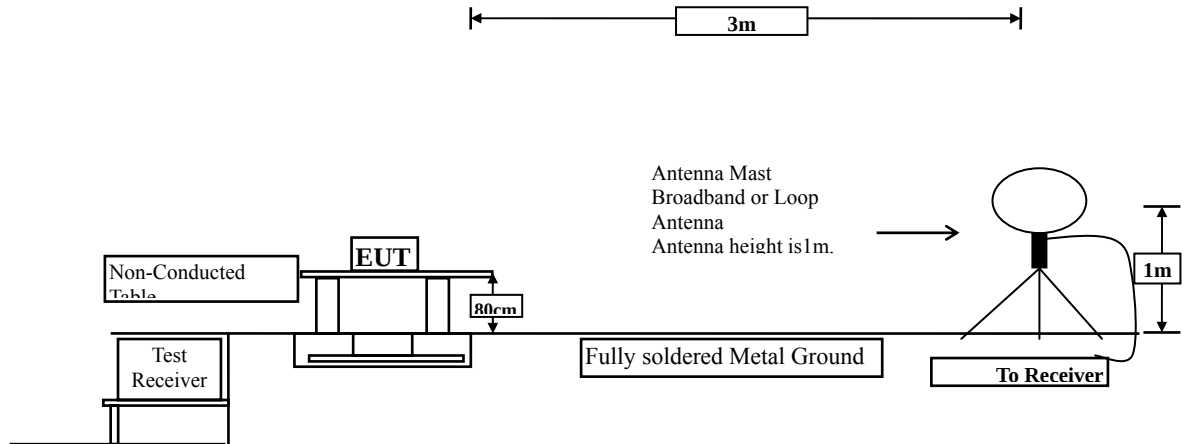
Product : Wireless USB Dongle
Test Item : Peak Power Output
Test Mode : Mode 1: Transmit
Test Date : 2017/12/14

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 01	2403.35	3.95	1 Watt= 30 dBm	Pass
Channel 20	2441.35	4.04	1 Watt= 30 dBm	Pass
Channel 38	2477.35	3.81	1 Watt= 30 dBm	Pass

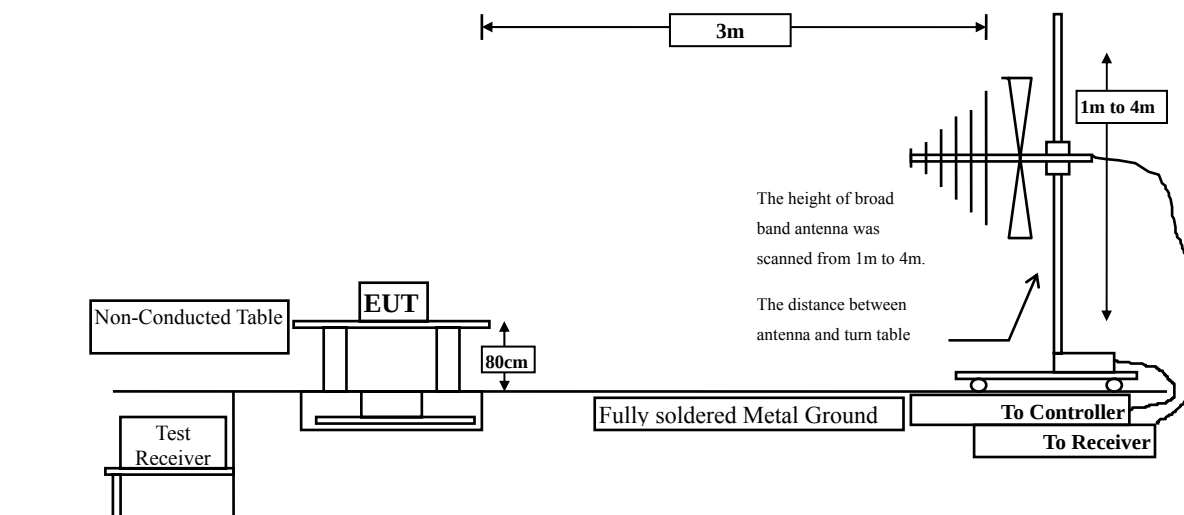
4. Radiated Emission

4.1. Test Setup

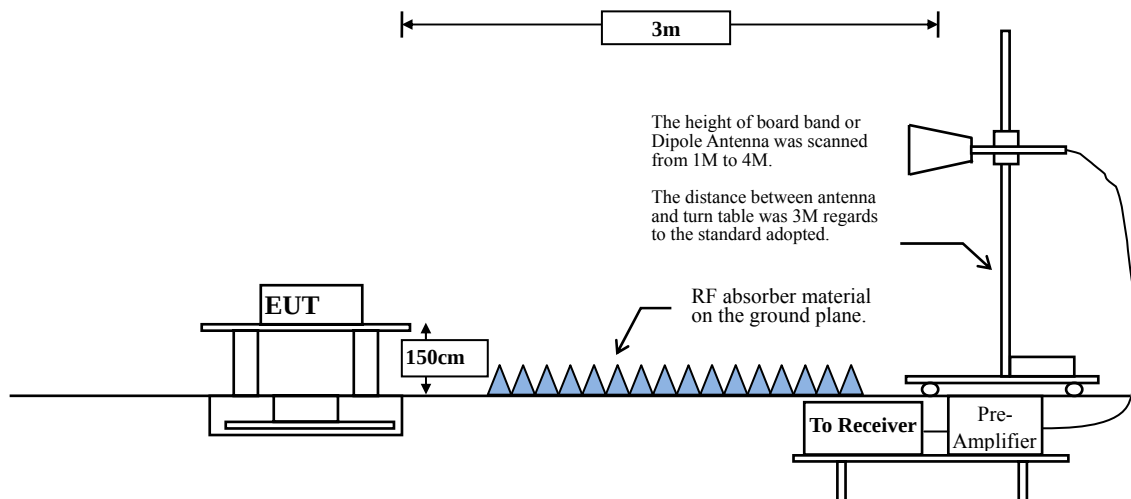
Radiated Emission Under 30MHz



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)
2403.35	100	--	--	10

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 : Wireless USB Dongle
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (2403.35MHz)
 Test Date : 2017/12/05

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4806.700	-2.873	47.450	44.578	-29.422	74.000
7210.050	0.384	51.310	51.693	-22.307	74.000
9613.400	2.348	44.600	46.948	-27.052	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4806.700	-2.873	48.950	46.078	-27.922	74.000
7210.050	0.384	49.380	49.763	-24.237	74.000
9613.400	2.348	45.720	48.068	-25.932	74.000
Average					
Detector:					
--					

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 : Wireless USB Dongle
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (2441.35MHz)
 Test Date : 2017/12/26

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4882.700	-2.813	49.550	46.737	-27.263	74.000
7324.050	0.464	51.110	51.574	-22.426	74.000
9765.400	2.617	46.770	49.387	-24.613	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4882.700	-2.813	49.580	46.767	-27.233	74.000
7432.050	0.495	51.440	51.936	-22.064	74.000
9765.400	2.617	47.020	49.637	-24.363	74.000
Average					
Detector:					
--					

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 : Wireless USB Dongle
 Test Item : Harmonic Radiated Emission
 Test Mode : Mode 1: Transmit (2477.35MHz)
 Test Date : 2017/12/05

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4954.700	-2.787	49.150	46.364	-27.636	74.000
7432.050	0.495	51.050	51.546	-22.454	74.000
9909.400	2.877	46.610	49.487	-24.513	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4954.700	-2.787	48.420	45.634	-28.366	74.000
7432.050	0.495	48.550	49.046	-24.954	74.000
9909.400	2.877	46.320	49.197	-24.803	74.000
Average					
Detector:					
--					

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 : Wireless USB Dongle
 Test Item : General Radiated Emission
 Test Mode : Mode 1: Transmit (2441.35MHz)
 Test Date : 2017/12/06

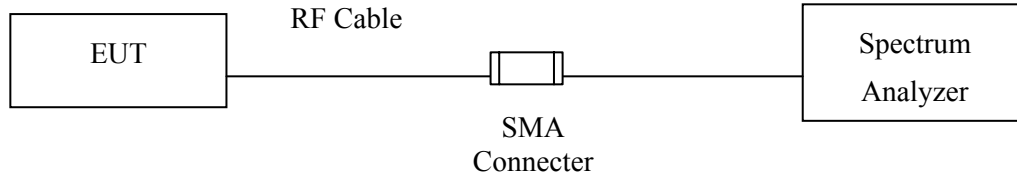
Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
148.087	-10.672	34.332	23.661	-19.839	43.500
374.420	-8.063	27.329	19.266	-26.734	46.000
523.435	-4.813	27.753	22.940	-23.060	46.000
658.391	-2.464	27.260	24.796	-21.204	46.000
793.348	-0.402	27.511	27.108	-18.892	46.000
921.275	1.140	27.684	28.824	-17.176	46.000
Vertical					
152.304	-10.566	35.833	25.267	-18.233	43.500
311.159	-9.650	26.932	17.282	-28.718	46.000
474.232	-5.752	27.318	21.566	-24.434	46.000
609.188	-2.989	27.665	24.676	-21.324	46.000
758.203	-0.793	28.067	27.275	-18.725	46.000
893.159	0.847	28.535	29.381	-16.619	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 : Wireless USB Dongle
Test Item : RF Antenna Conducted Test
Test Mode : Mode 1: Transmit
Test Date : 2017/12/06

Figure Channel 01:

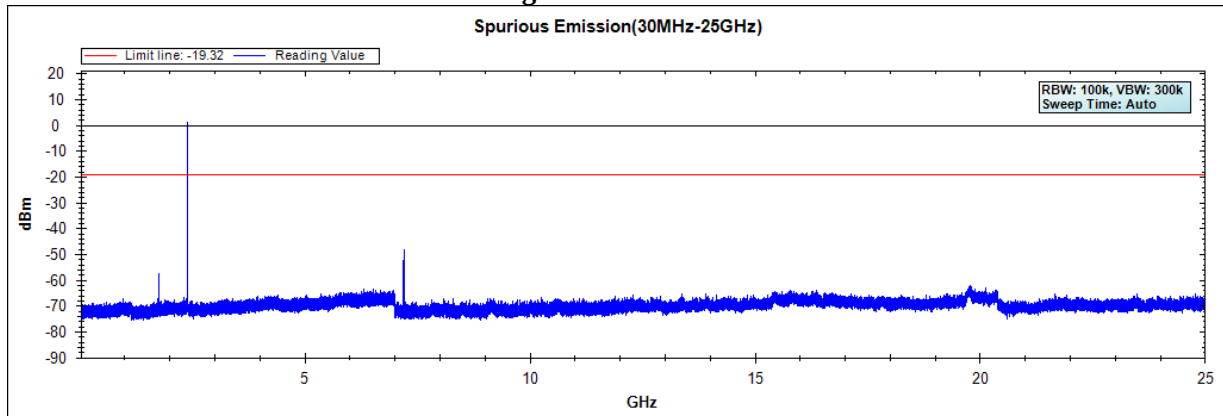


Figure Channel 20:

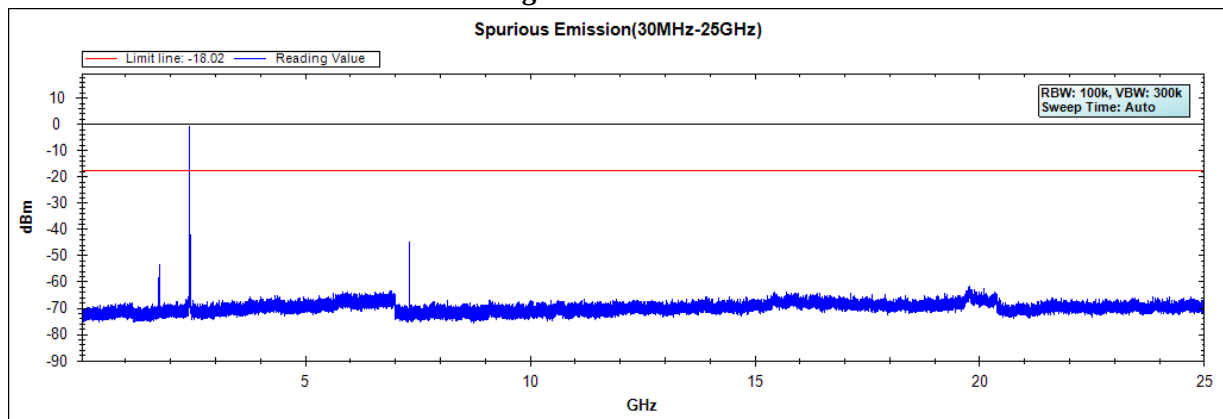
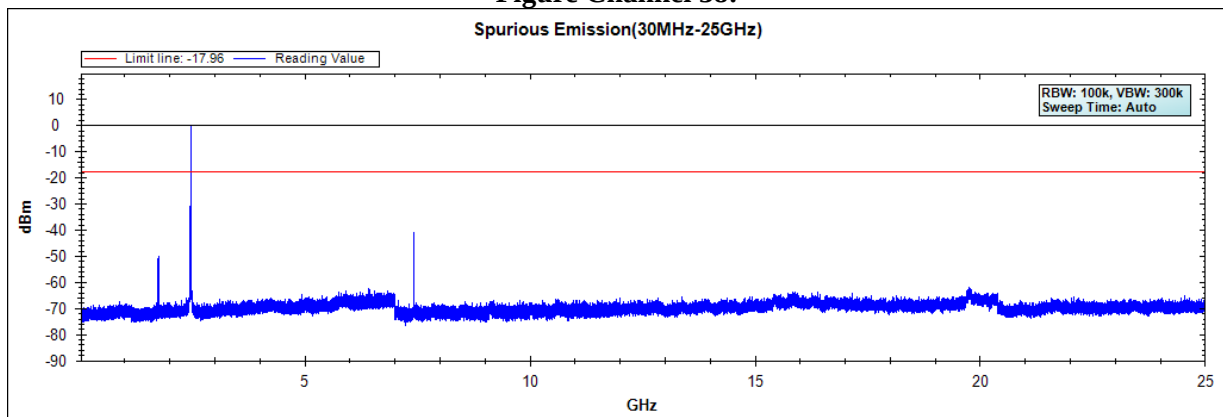


Figure Channel 38:

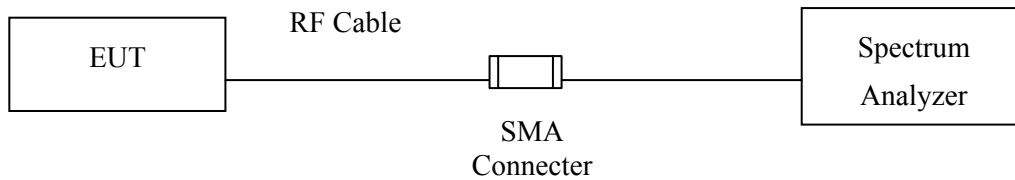


Note: The above test pattern is synthesized by multiple of the frequency range.

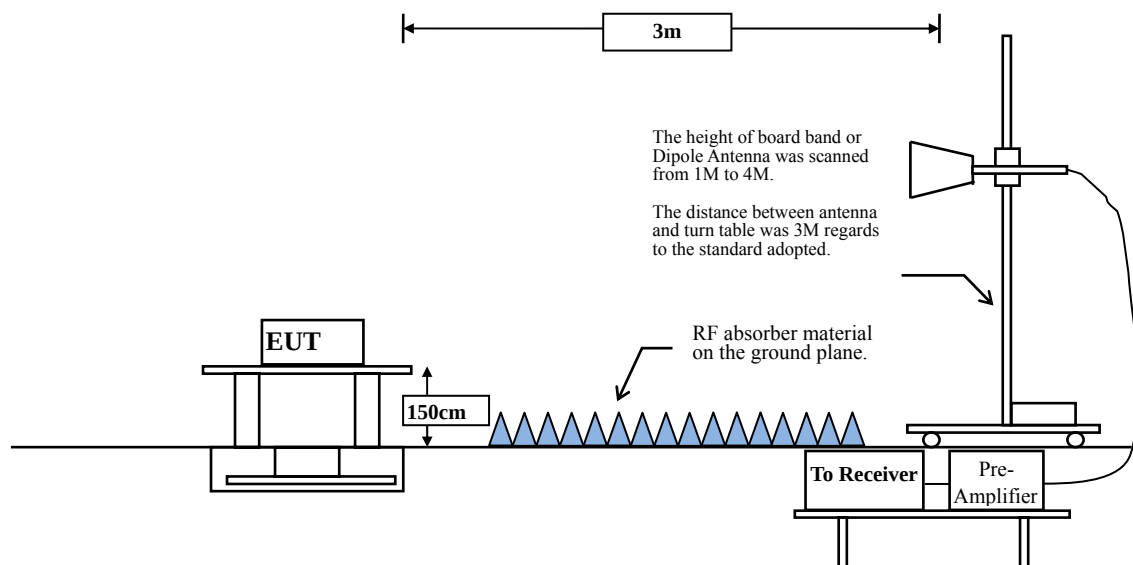
6. Band Edge

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)
2403.35	100	--	--	10

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 : Wireless USB Dongle
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit (2403.35MHz)
 Test Date : 2017/12/05

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
01 (Peak)	2389.420	12.147	31.941	44.087	74.00	54.00	Pass
01 (Peak)	2390.000	12.148	29.854	42.002	74.00	54.00	Pass
01 (Peak)	2400.000	12.176	55.435	67.611	--	--	--
01 (Peak)	2403.188	12.184	90.351	102.535	--	--	--
01 (Average)	2390.000	12.148	23.976	36.124	74.00	54.00	Pass
01 (Average)	2400.000	12.176	47.823	59.999	--	--	--
01 (Average)	2403.333	12.185	86.944	99.128	--	--	--

Figure Channel 01: Horizontal (Peak)

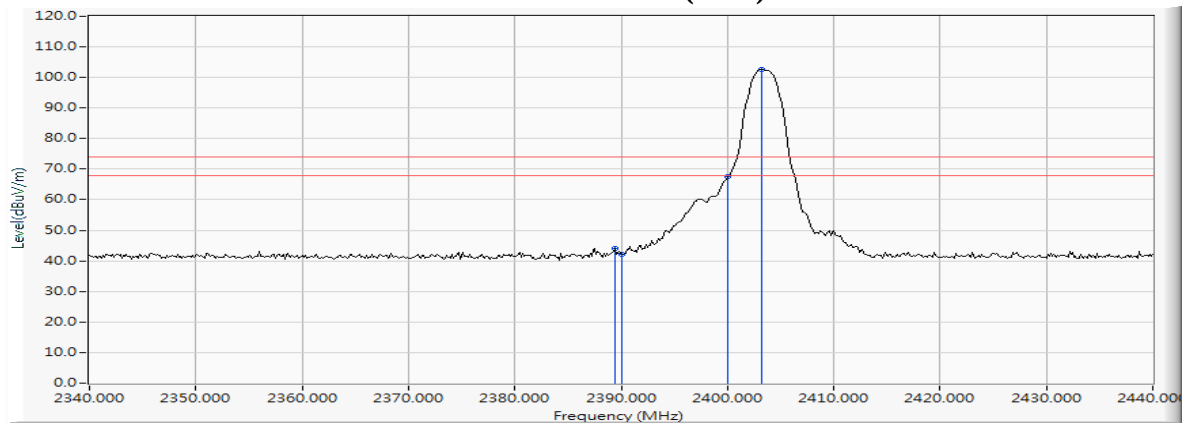
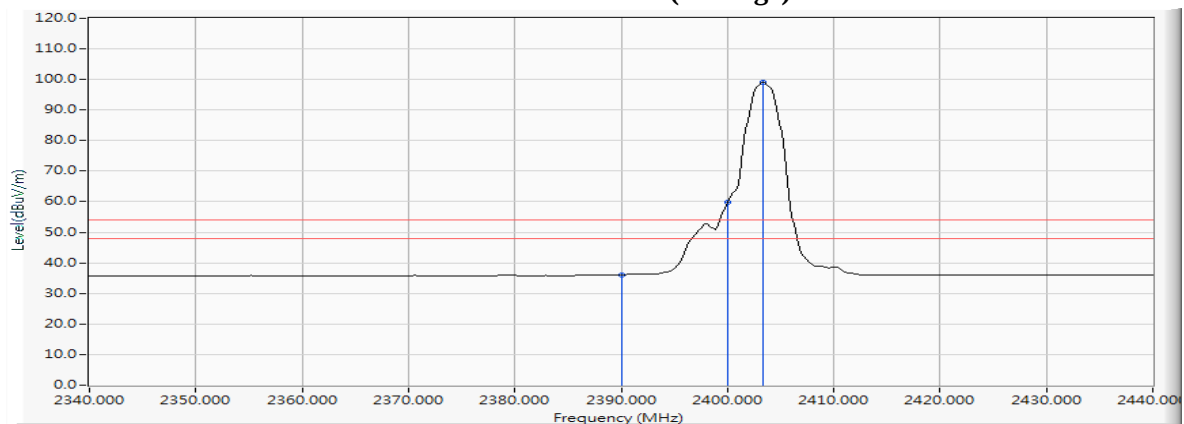


Figure Channel 01: Horizontal (Average)



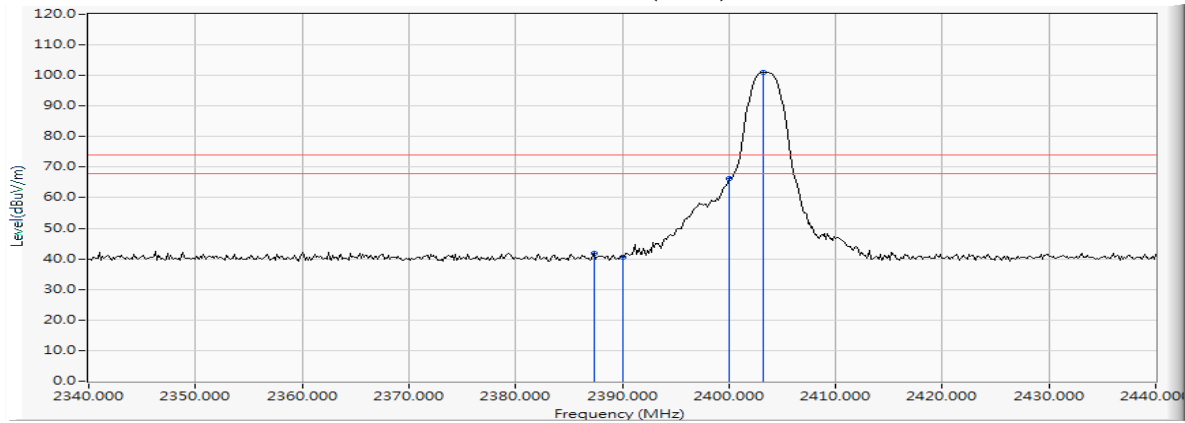
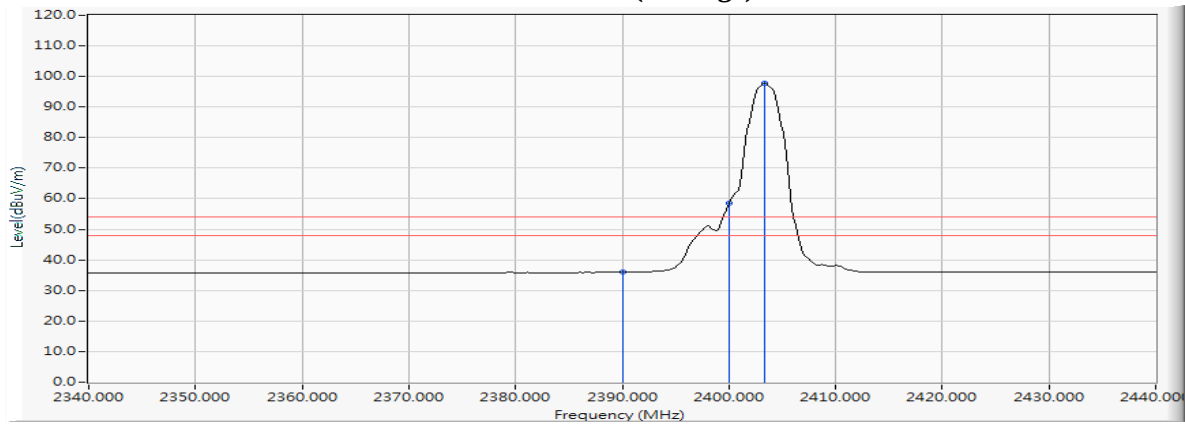
Note:

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 : Wireless USB Dongle
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit (2403.35MHz)
 Test Date : 2017/12/05

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dB μ V)	Emission Level (dB μ V/m)	Peak Limit (dB μ V/m)	Average Limit (dB μ V/m)	Result
01 (Peak)	2387.391	12.141	29.754	41.895	74.00	54.00	Pass
01 (Peak)	2390.000	12.148	28.461	40.609	74.00	54.00	Pass
01 (Peak)	2400.000	12.176	54.014	66.190	--	--	--
01 (Peak)	2403.188	12.184	88.963	101.147	--	--	--
01 (Average)	2390.000	12.148	23.925	36.073	74.00	54.00	Pass
01 (Average)	2400.000	12.176	46.401	58.577	--	--	--
01 (Average)	2403.333	12.185	85.631	97.815	--	--	--

Figure Channel 01: Vertical (Peak)**Figure Channel 01: Vertical (Average)**

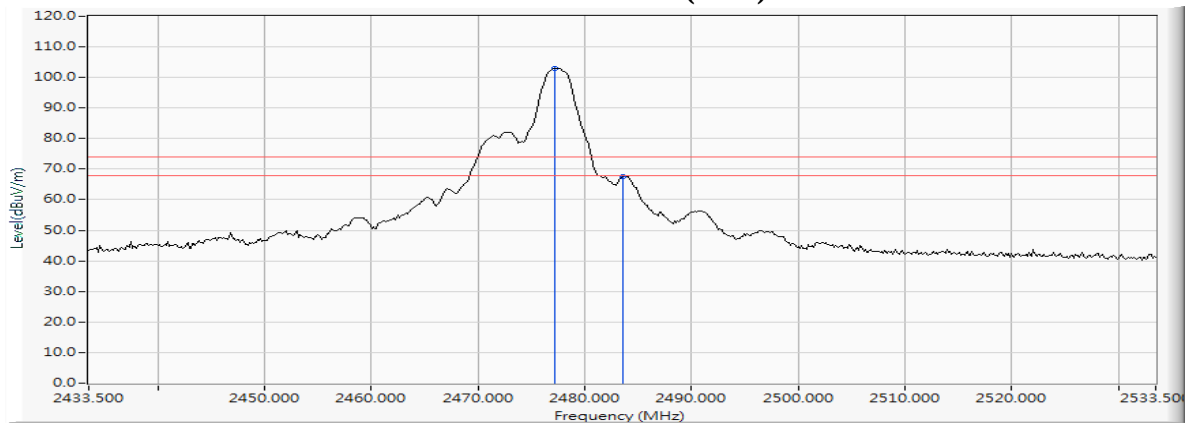
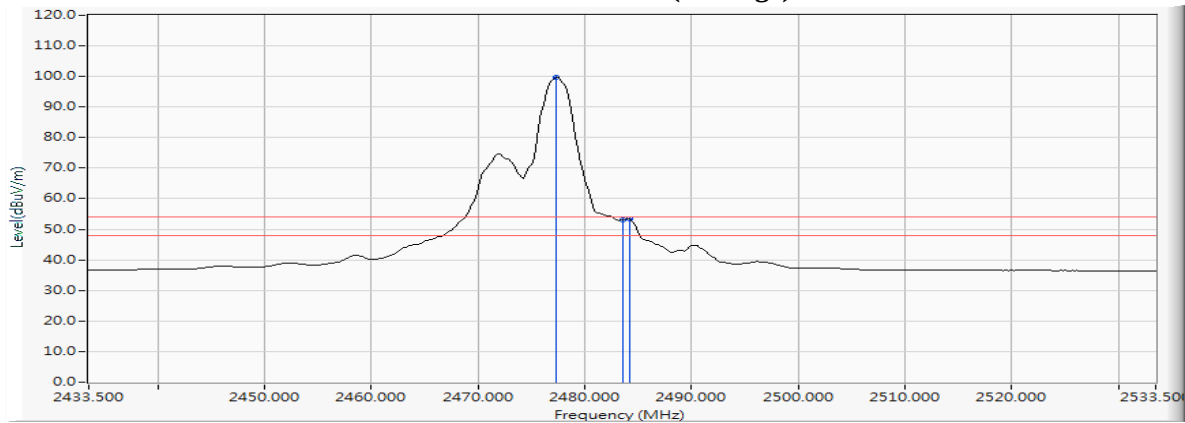
Note:

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 : Wireless USB Dongle
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit (2477.35MHz)
 Test Date : 2017/12/05

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
38 (Peak)	2477.123	12.385	90.567	102.952	--	--	--
38 (Peak)	2483.500	12.403	55.262	67.665	74.00	54.00	Pass
38 (Average)	2477.268	12.386	87.467	99.852	--	--	--
38 (Average)	2483.500	12.403	40.701	53.104	74.00	54.00	Pass
38 (Average)	2484.225	12.404	40.882	53.287	74.00	54.00	Pass

Figure Channel 38: Horizontal (Peak)

Figure Channel 38: Horizontal (Average)


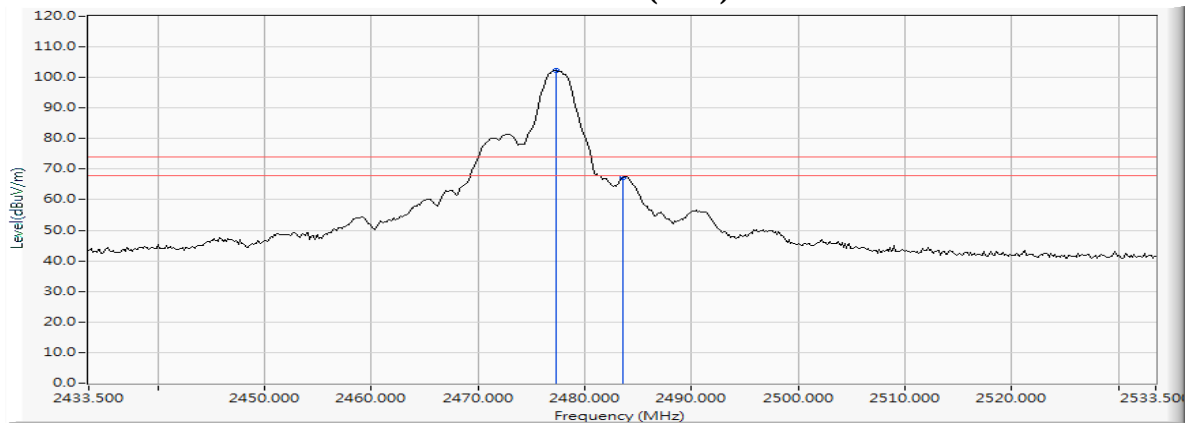
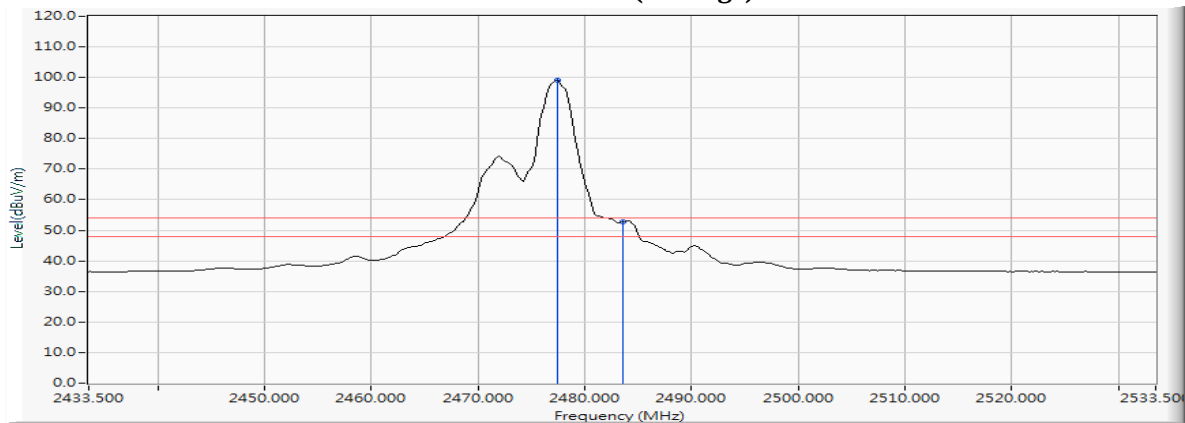
Note:

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 : Wireless USB Dongle
 Test Item : Band Edge
 Test Mode : Mode 1: Transmit (2477.35MHz)
 Test Date : 2017/12/05

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
38 (Peak)	2477.268	12.386	89.773	102.158	--	--	--
38 (Peak)	2483.500	12.403	54.846	67.249	74.00	54.00	Pass
38 (Average)	2477.413	12.386	86.692	99.078	--	--	--
38 (Average)	2483.500	12.403	40.389	52.792	74.00	54.00	Pass

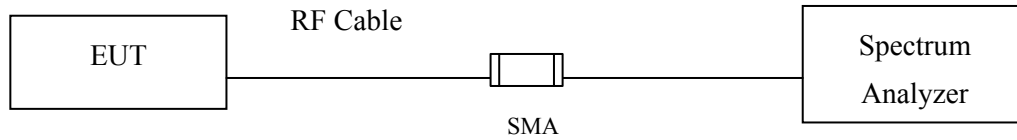
Figure Channel 38: Vertical (Peak)

Figure Channel 38: 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

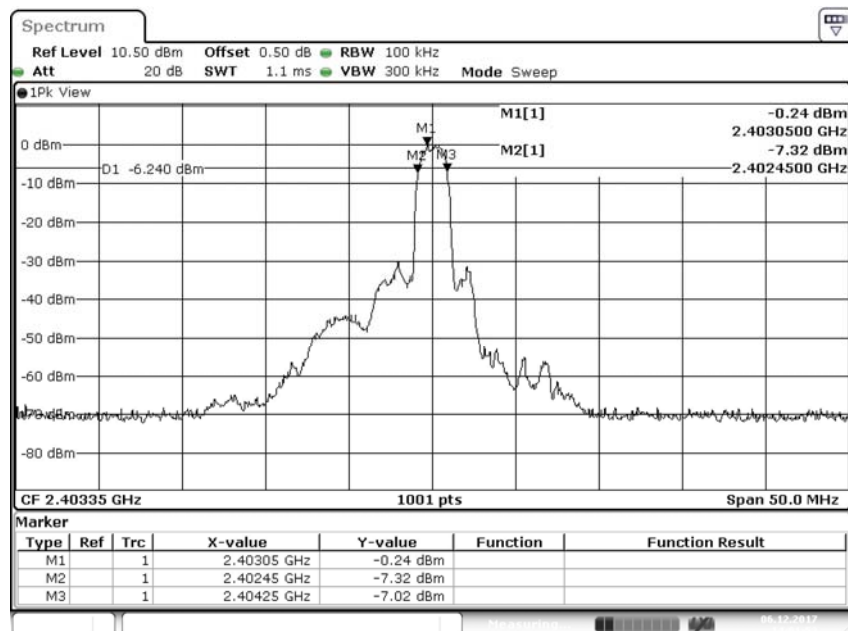
$\pm 279.2 \text{ Hz}$

7.5. Test Result of 6dB Bandwidth

Product : Wireless USB Dongle
 Test Item : 6dB Bandwidth Data
 Test Mode : Mode 1: Transmit

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2403.35	1800	>500	Pass
20	2441.35	1750	>500	Pass
38	2477.35	1750	>500	Pass

Figure Channel 01:



Date: 6.DEC.2017 14:01:54

Figure Channel 20:

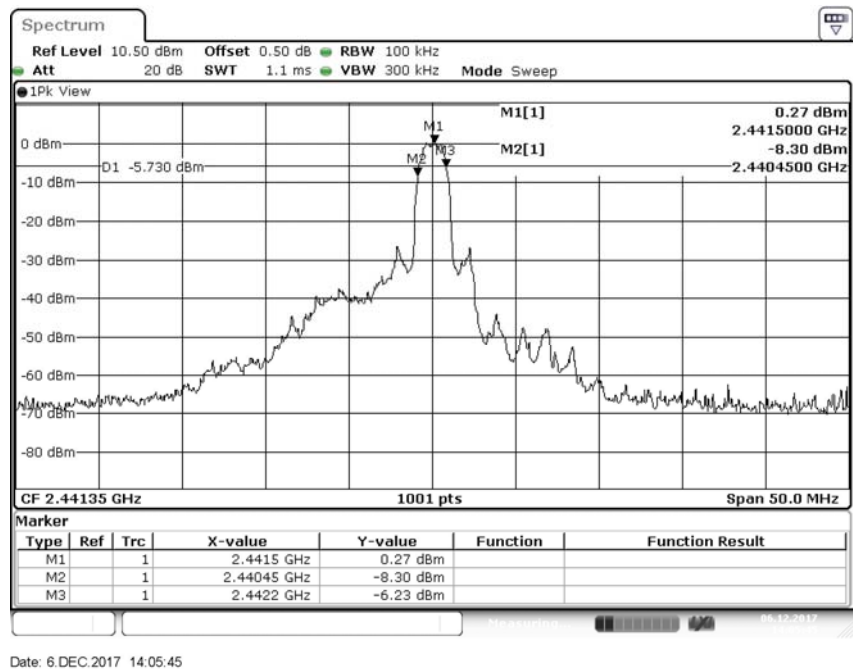
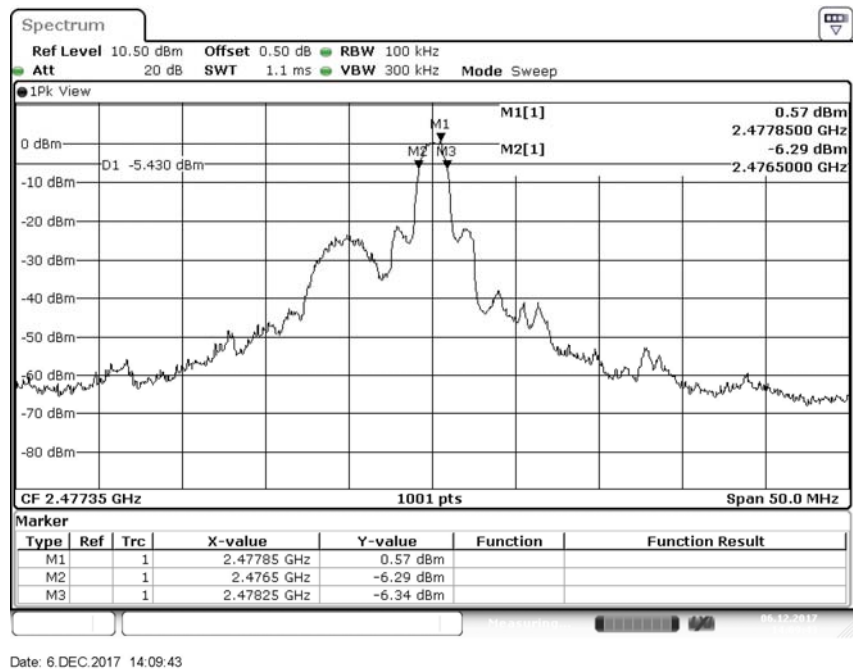
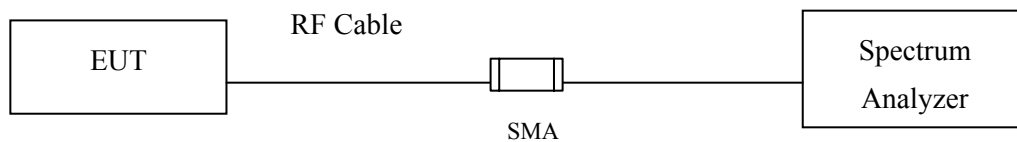


Figure Channel 38:



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

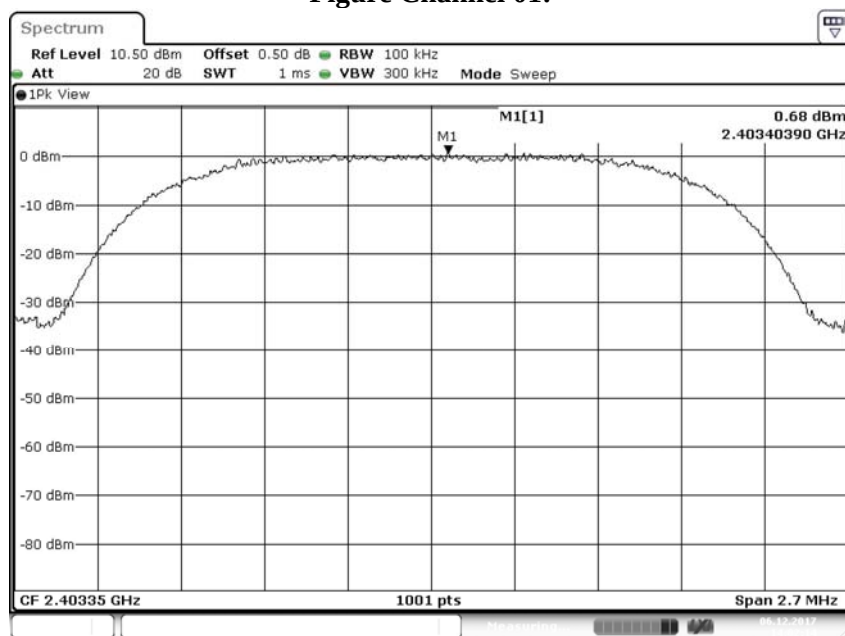
$\pm 1.23\text{dB}$

8.5. Test Result of Power Density

Product : Wireless USB Dongle
 Test Item : Power Density Data
 Test Mode : Mode 1: Transmit

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
01	2403.35	0.680	$\leq 8\text{dBm}$	Pass
20	2441.35	1.980	$\leq 8\text{dBm}$	Pass
38	2477.35	2.040	$\leq 8\text{dBm}$	Pass

Figure Channel 01:



Date: 6 DEC 2017 14:02:15

Figure Channel 20:

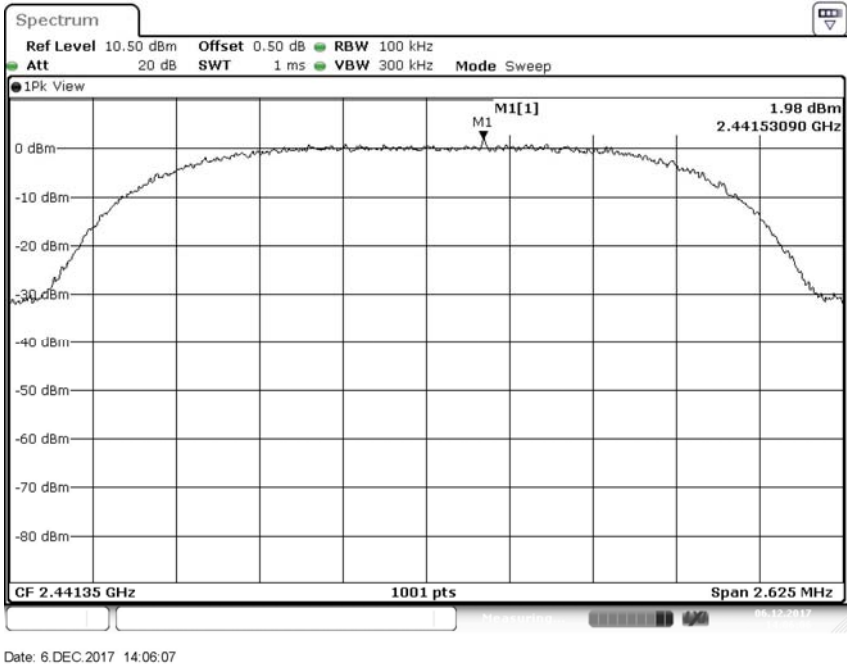
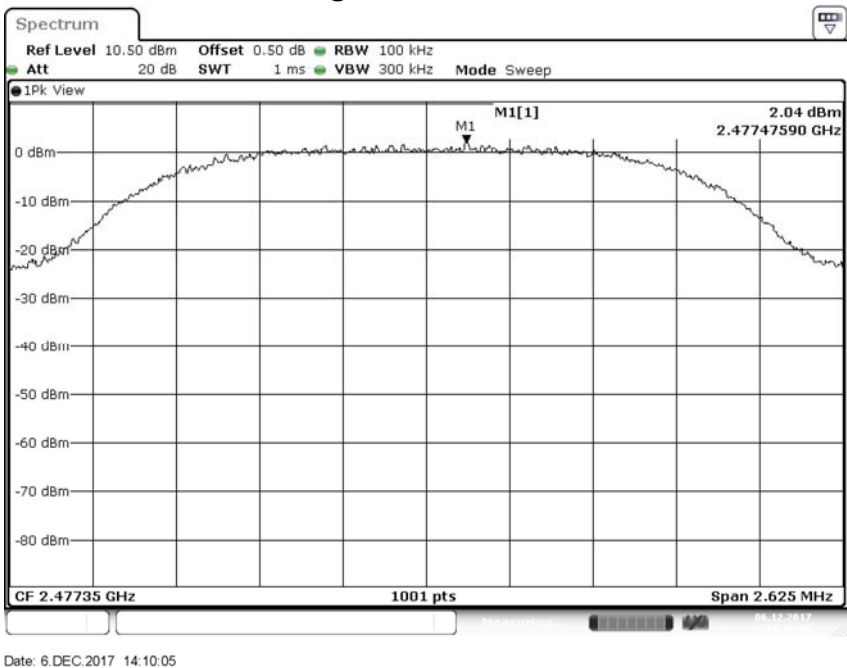
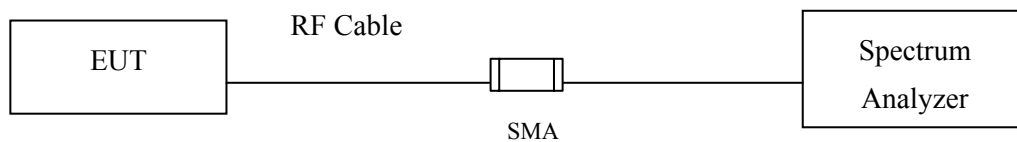


Figure Channel 38:



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 : Wireless USB Dongle
 Test Item : Duty Cycle
 Test Mode : Mode 1: Transmit

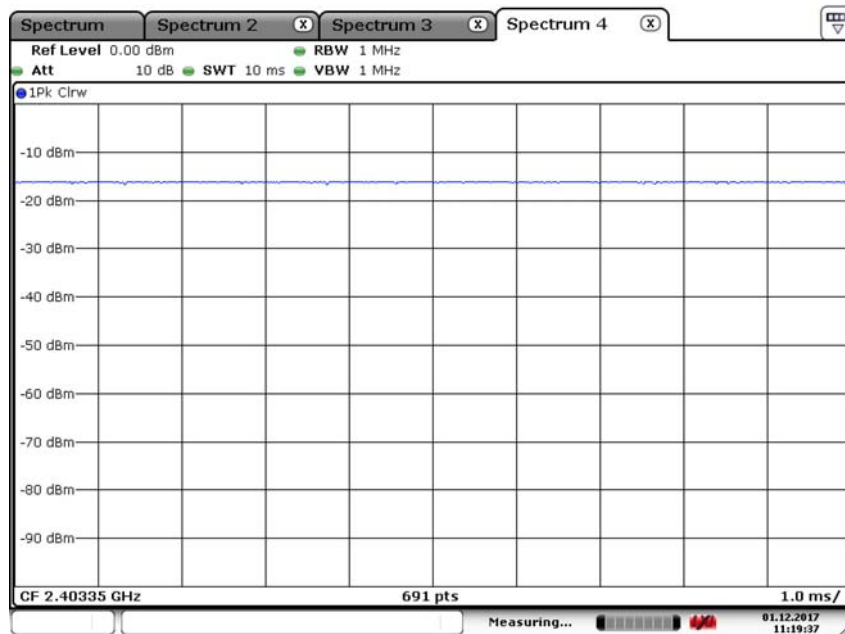
Duty Cycle Formula:

Duty Cycle = $\text{Ton} / (\text{Ton} + \text{Toff})$

Duty Factor = $10 \text{ Log } (1/\text{Duty Cycle})$

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
2403.35	--	--	100	0



Date: 1.DEC.2017 11:19:37

10. EMI Reduction Method During Compliance Testing

No modification was made during testing.