FCC Test Report

Product Name	DIGITAL CAMERA
Model No.	R03030
FCC ID.	BBP-R03030

Applicant	Ricoh Company Ltd
Address	2-7-1 Izumi Ebina Kanagawa, 243-0460 Japan.

Date of Receipt	Aug. 21, 2019
Issued Date	Sep. 10, 2019
Report No.	1980322R-RFUSP73V00
Report Version	V1.0

Testing Laboratory
3023

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.

Test Report

Issued Date: Sep. 10, 2019
Report No.: 1980322R-RFUSP73V00

Product Name	DIGITAL CAMERA
Applicant	Ricoh Company Ltd
Address	2-7-1 Izumi Ebina Kanagawa, 243-0460 Japan.
Manufacturer	Ricoh Company, Ltd.
Model No.	R03030
FCC ID.	BBP-R03030
EUT Rated Voltage	DC 3.7V by Battery
EUT Test Voltage	DC 3.7V by Battery
Trade Name	RICOH
Serial No.	A0K8WN000026
FW	V0.2B
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2018 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 15.247 Meas Guidance v05
Test Result	Complied

Documented By : Rita Huang

(Senior Adm. Specialist / Rita Huang)

Tested By : Yun Che Chen

(Engineer / Yunche Chen)

Approved By :

(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	DIGITAL CAMERA
Trade Name	RICOH
Model No.	R03030
FCC ID.	BBP-R03030
Frequency Range	2402 – 2480MHz
Channel Number	V4.2: 40CH
Type of Modulation	V4.2: GFSK(1Mbps)
Antenna Type	Chip Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
USB Cable	Shielded, 0.3m, with one ferrite core bonded.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	YAGEO	ANT8010LL04R2400A	Chip Antenna	0.2dBi for 2.4GHz

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 a DIGITAL CAMERA with a built-in Bluetooth V4.2, V3.0, V2.1+EDR transceiver, this report for Bluetooth V4.2.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth 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 (GFSK)

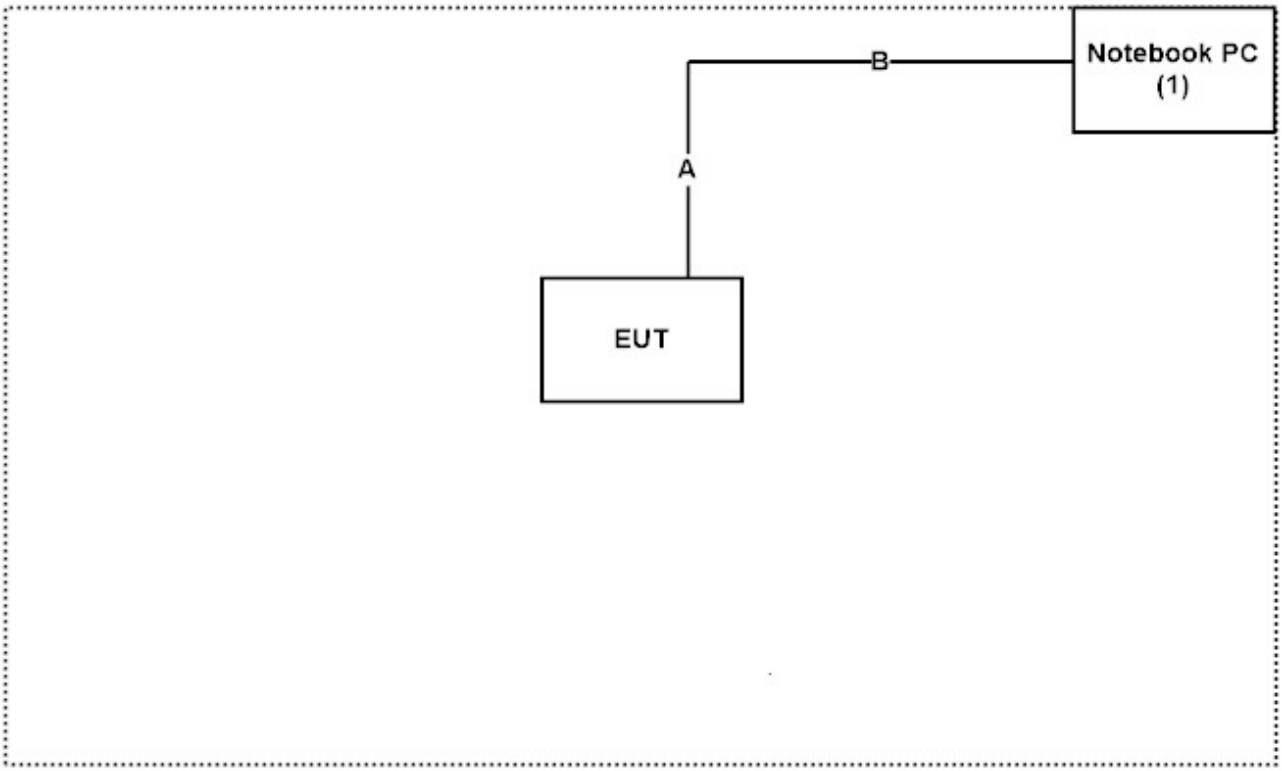
1.3. Tested System Details

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	B6TYTZ1	Non-Shielded, 0.8m

Signal Cable Type		Signal cable Description
A	USB Cable	Non-Shielded, 0.3m, with one ferrite core bonded.
B	USB Cable	Non-Shielded, 1.7m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software “VendorCommandTool, Version.01.03.20190705” on the EUT.
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	30-65
Barometric pressure (mbar)	860-1060	950-1000

USA : FCC Registration Number: TW3023

Canada : IC Registration Number: 4075A

Site Description: Accredited by TAF
Accredited Number: 3023

Test Laboratory: DEKRA Testing and Certification Co., Ltd
Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
Phone number: 886-2-8601-3788
Fax number: 886-2-8601-3789
Email address: info.tw@dekra.com
Website: http://www.dekra.com.tw

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2019/02/26	2020/02/25
X	Spectrum Analyzer	Agilent	N9010A	MY53470892	2018/09/27	2019/09/26
X	Peak Power Analyzer	Keysight	8990B	MY51000410	2019/08/01	2020/07/31
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2019/07/25	2020/07/24
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2019/07/25	2020/07/24
X	EMI Test Receiver	R&S	ESCS 30	100369	2018/11/19	2019/11/18
X	LISN	R&S	ENV216	101105	2019/03/30	2020/03/29
X	LISN	R&S	ESH3-Z5	836679/014	2019/04/02	2020/04/01
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2019/06/21	2020/06/20

For Radiated measurements /Site3/CB8

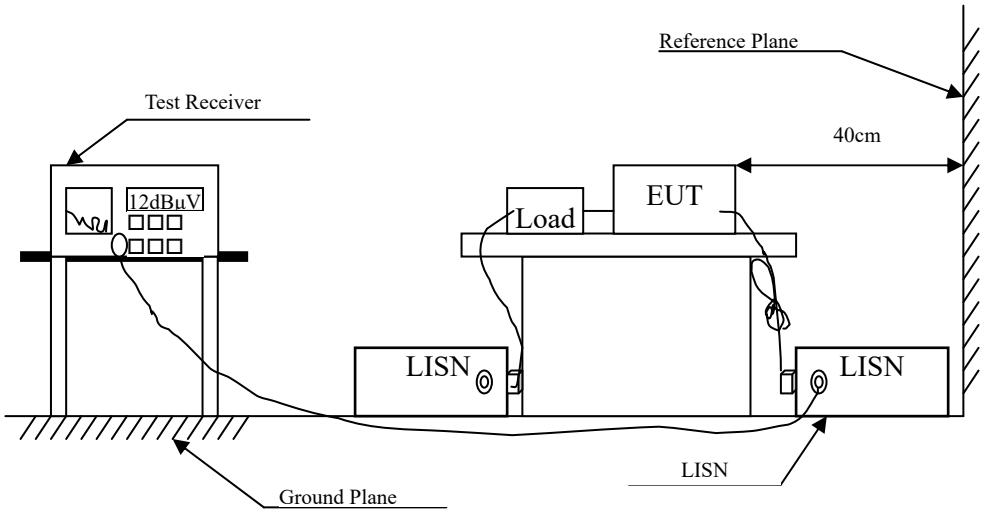
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2019/03/11	2020/03/10
X	Loop Antenna	Teseq	HLA6121	37133	2018/10/13	2019/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2019/06/24	2020/06/23
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2019/06/14	2020/06/13
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330010	2019/06/14	2020/06/13
X	Horn Antenna	ETS-Lindgren	3117	00135205	2019/05/03	2020/05/02
X	Horn Antenna	SCHWARZBECK	9120D	576	2018/12/18	2019/12/17
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2019/04/10	2020/04/09
	Horn Antenna	Com-Power	AH-840	101043	2019/01/09	2020/01/08
	Amplifier + Cable	EMCI	EMC184045SE	980370	2019/03/21	2020/03/20
X	Filter	MICRO-TRONICS	BRM50702	G270	2019/08/06	2020/08/05
	Filter	MICRO-TRONICS	BRM50716	G196	2019/08/06	2020/08/05

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 (dBµV) 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 invested 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.

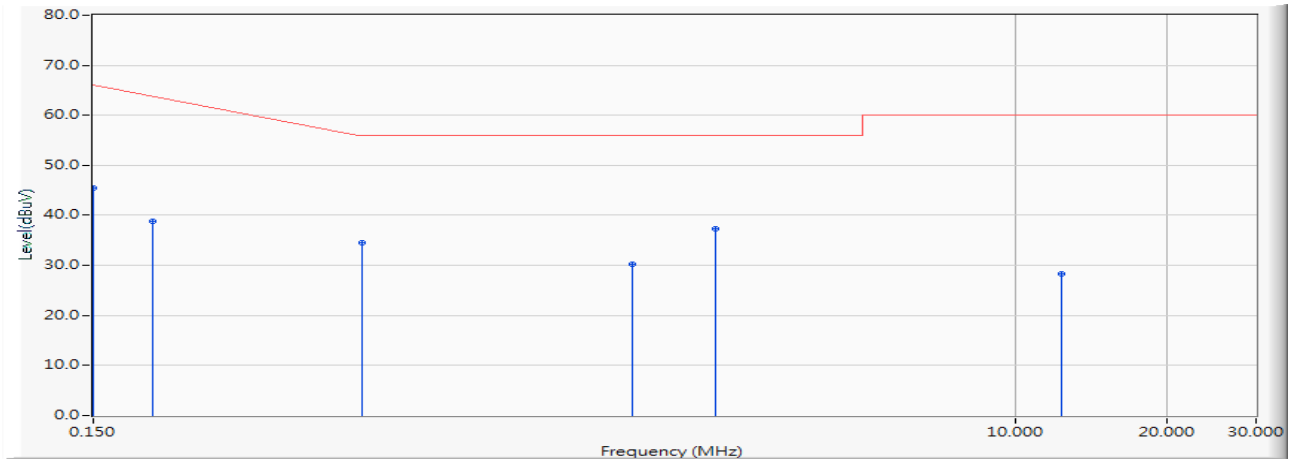
2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : DIGITAL CAMERA
Test Item : Conducted Emission Test
Test date : 2019/08/28
Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Line1



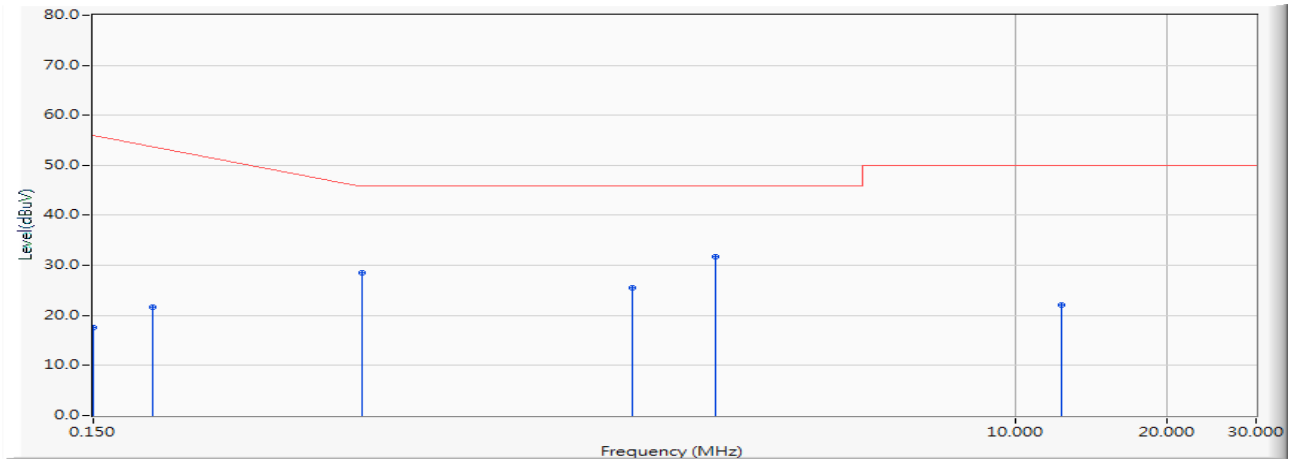
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.150	9.668	35.700	45.368	-20.632	66.000	QUASIPEAK
2		0.197	9.670	29.100	38.770	-25.887	64.657	QUASIPEAK
3		0.509	9.687	24.800	34.487	-21.513	56.000	QUASIPEAK
4		1.755	9.765	20.420	30.185	-25.815	56.000	QUASIPEAK
5	*	2.556	9.798	27.520	37.318	-18.682	56.000	QUASIPEAK
6		12.377	10.049	18.280	28.329	-31.671	60.000	QUASIPEAK

Note:

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

Product	:	DIGITAL CAMERA
Test Item	:	Conducted Emission Test
Test date	:	2019/08/28
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2440MHz)

Line1



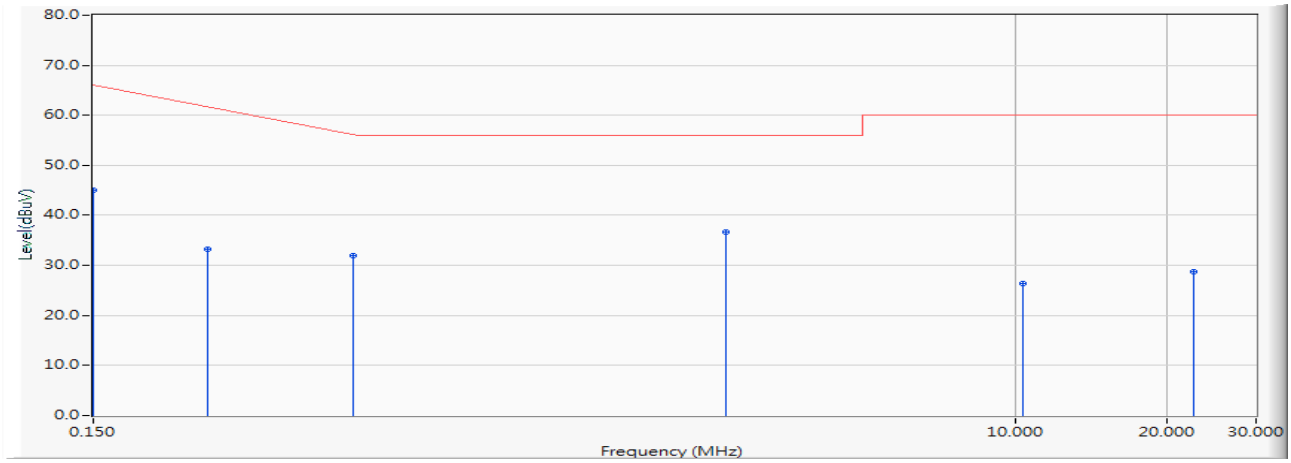
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.150	9.668	8.020	17.688	-38.312	56.000	AVERAGE
2		0.197	9.670	12.020	21.690	-32.967	54.657	AVERAGE
3		0.509	9.687	18.930	28.617	-17.383	46.000	AVERAGE
4		1.755	9.765	15.760	25.525	-20.475	46.000	AVERAGE
5	*	2.556	9.798	21.950	31.748	-14.252	46.000	AVERAGE
6		12.377	10.049	12.020	22.069	-27.931	50.000	AVERAGE

Note:

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

Product : DIGITAL CAMERA
Test Item : Conducted Emission Test
Test date : 2019/08/28
Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Line2



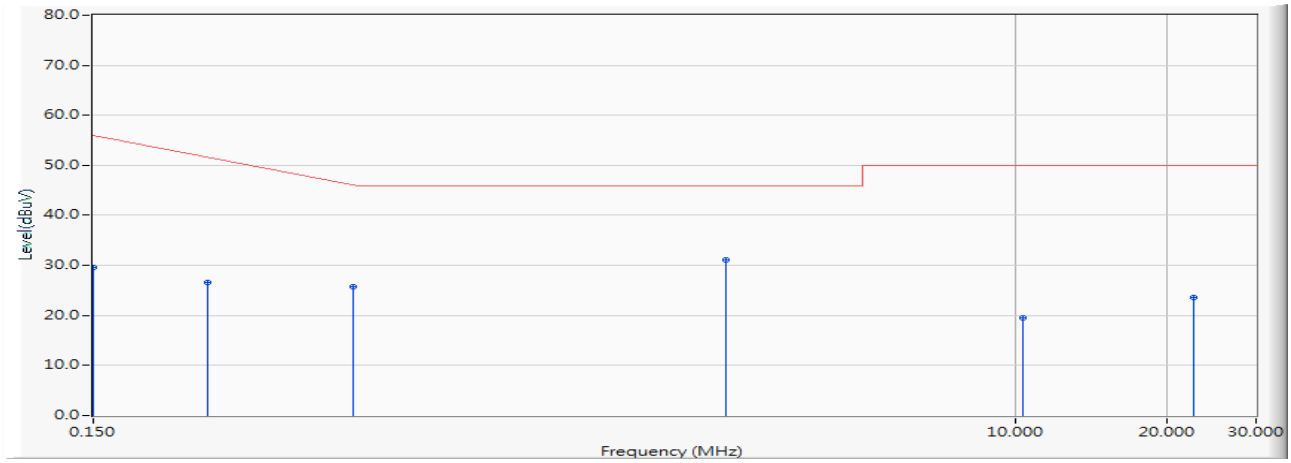
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.150	9.708	35.300	45.008	-20.992	66.000	QUASIPEAK
2		0.252	9.703	23.600	33.303	-29.783	63.086	QUASIPEAK
3		0.490	9.716	22.280	31.996	-24.290	56.286	QUASIPEAK
4	*	2.685	9.841	26.820	36.661	-19.339	56.000	QUASIPEAK
5		10.357	10.091	16.340	26.431	-33.569	60.000	QUASIPEAK
6		22.611	10.405	18.380	28.785	-31.215	60.000	QUASIPEAK

Note:

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

Product : DIGITAL CAMERA
Test Item : Conducted Emission Test
Test date : 2019/08/28
Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Line2



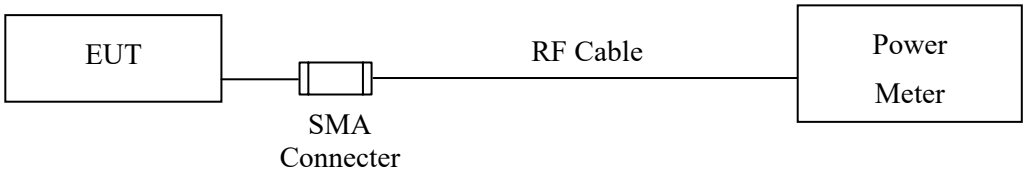
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.150	9.708	19.840	29.548	-26.452	56.000	AVERAGE
2		0.252	9.703	16.850	26.553	-26.533	53.086	AVERAGE
3		0.490	9.716	15.930	25.646	-20.640	46.286	AVERAGE
4	*	2.685	9.841	21.180	31.021	-14.979	46.000	AVERAGE
5		10.357	10.091	9.330	19.421	-30.579	50.000	AVERAGE
6		22.611	10.405	13.150	23.555	-26.445	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is 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

± 1.19 dB

3.5. Test Result of Peak Power Output

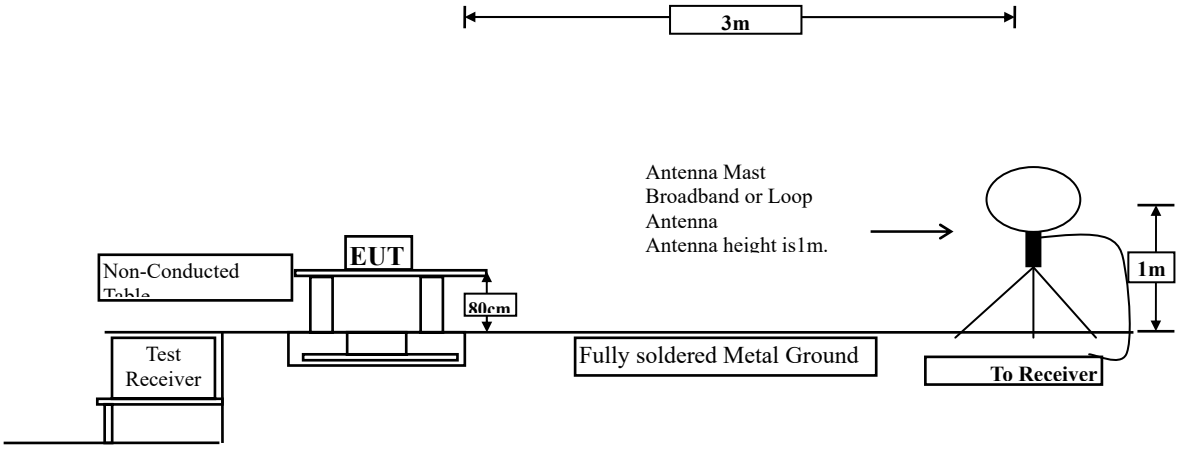
Product : DIGITAL CAMERA
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2019/09/04
Test Mode : Mode 1: Transmit - BLE (GFSK)

Channel No.	Frequency (MHz)	Peak Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	5.18	1 Watt= 30 dBm	Pass
Channel 19	2440.00	4.83	1 Watt= 30 dBm	Pass
Channel 39	2480.00	4.91	1 Watt= 30 dBm	Pass

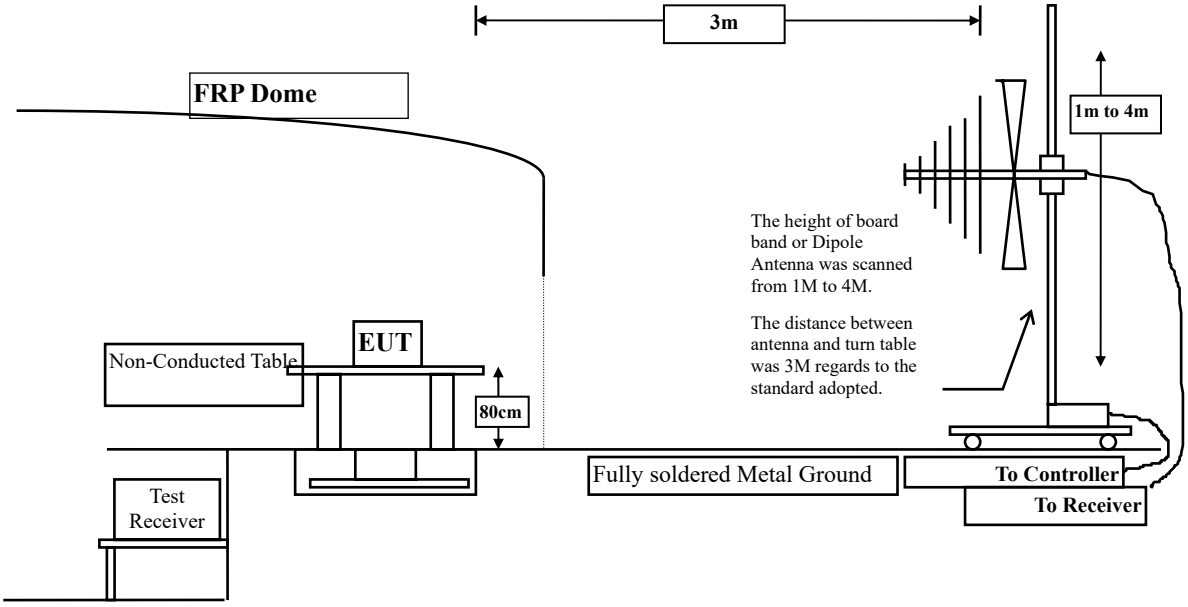
4. Radiated Emission

4.1. Test Setup

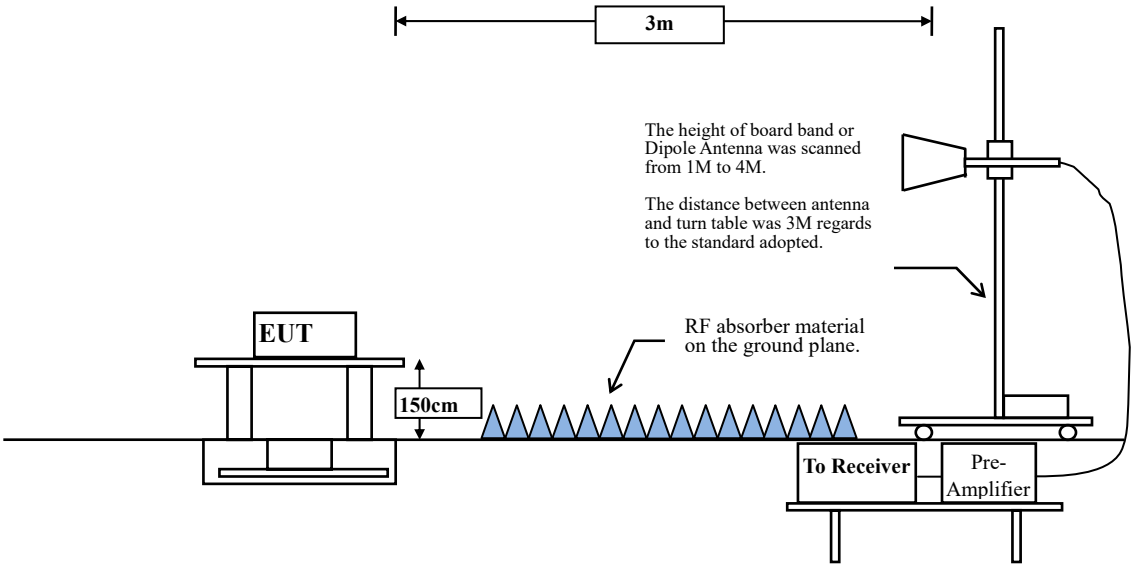
Under 30MHz



Below 1GHz



Above 1GHz


3m
The height of board band or Dipole Antenna was scanned from 1M to 4M.
The distance between antenna and turn table was 3M regards to the standard adopted.
EUT
150cm
RF absorber material on the ground plane.
To Receiver
Pre-Amplifier

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 (dBμV) = 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 worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range form 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 ≥ 3 x 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 ≥ 98 %

VBW ≥ 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	62.79	0.3913	2556	3000

Note: Duty Cycle Refer to Section 9

4.4. Uncertainty

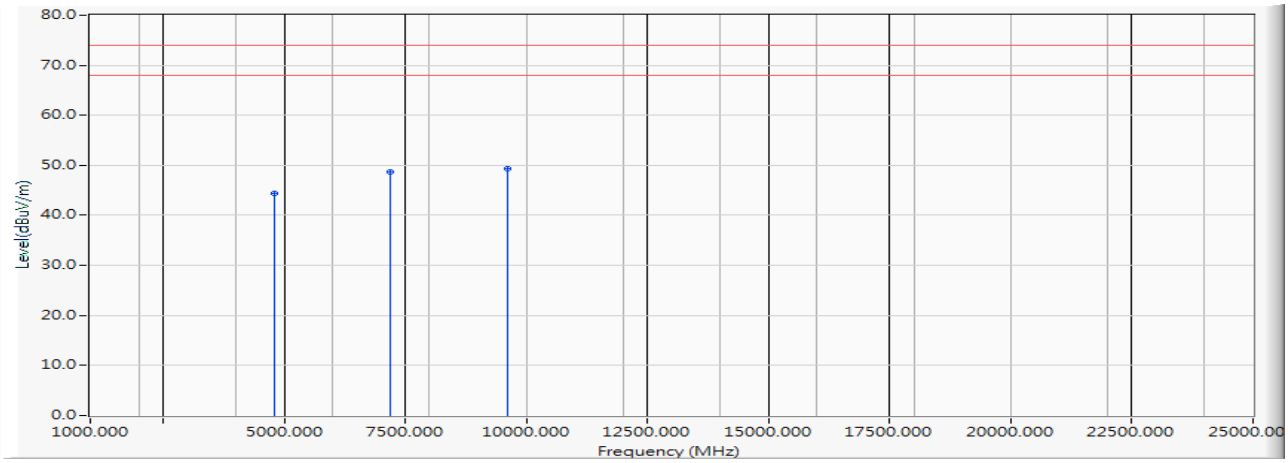
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

Product : DIGITAL CAMERA
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/08/28
Test Mode : Mode 1: Transmit - BLE (GFSK)(2402MHz)

Horizontal



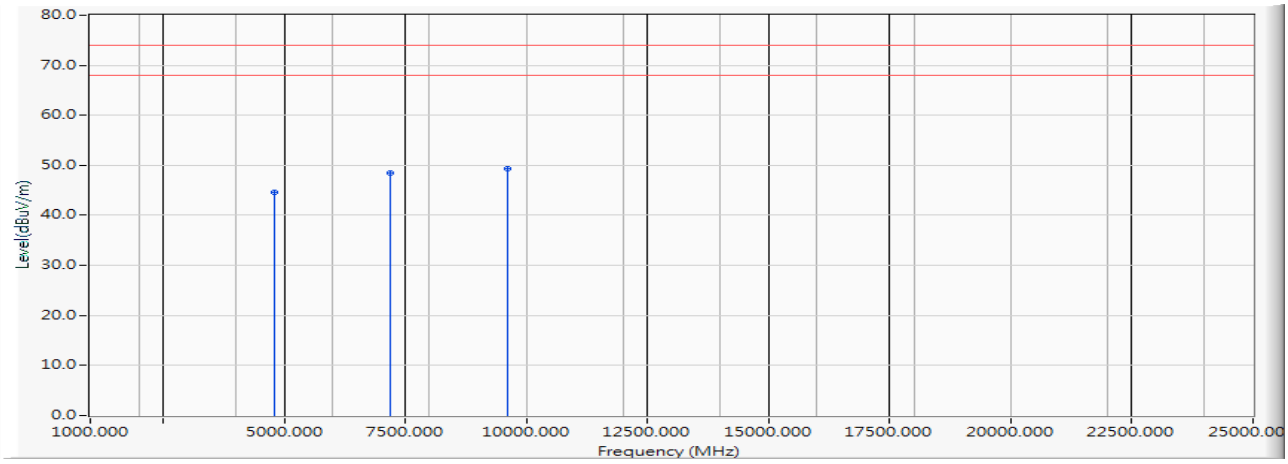
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	4.604	39.856	44.460	-29.540	74.000	PEAK
2		7206.000	11.659	36.937	48.596	-25.404	74.000	PEAK
3	*	9608.000	11.907	37.526	49.433	-24.567	74.000	PEAK

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 : DIGITAL CAMERA
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/08/28
Test Mode : Mode 1: Transmit - BLE (GFSK)(2402MHz)

Vertical



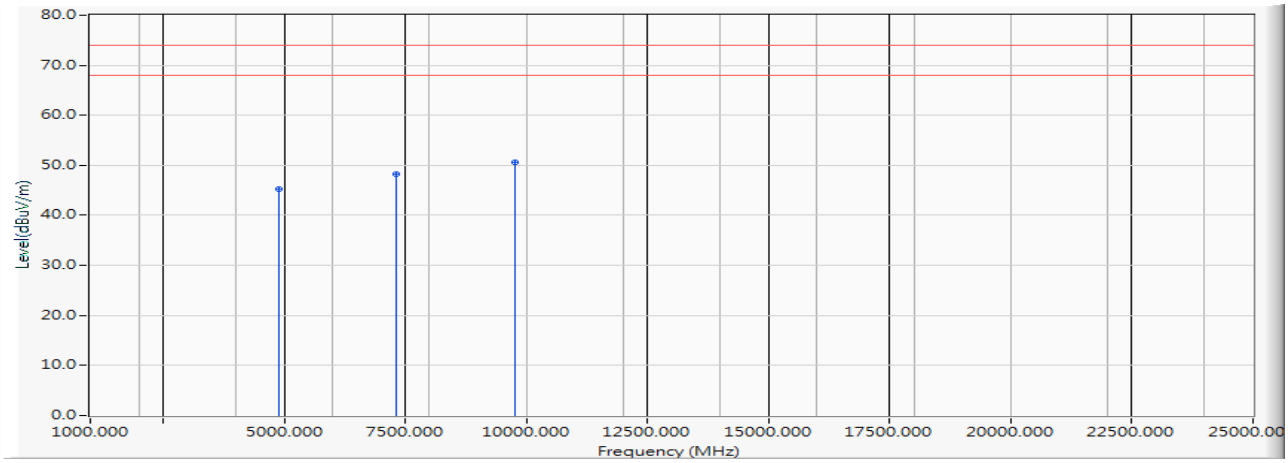
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	4.604	40.104	44.708	-29.292	74.000	PEAK
2		7206.000	11.659	36.879	48.538	-25.462	74.000	PEAK
3	*	9608.000	11.907	37.319	49.226	-24.774	74.000	PEAK

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	:	DIGITAL CAMERA
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2019/08/28
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2440MHz)

Horizontal



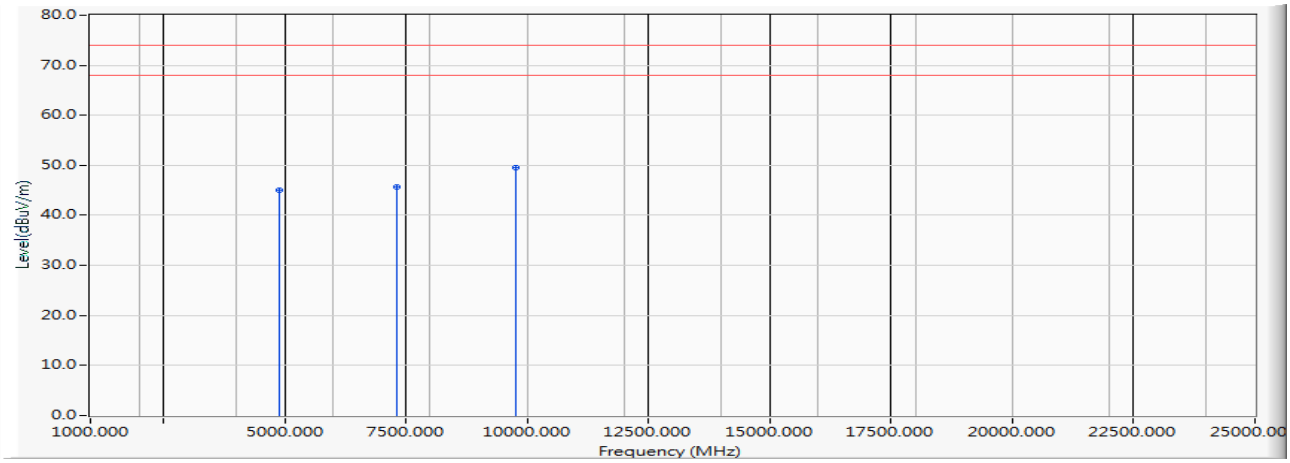
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4880.000	5.302	39.903	45.205	-28.795	74.000	PEAK
2		7320.000	11.795	36.357	48.152	-25.848	74.000	PEAK
3	*	9760.000	11.929	38.731	50.661	-23.339	74.000	PEAK

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 : DIGITAL CAMERA
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/08/28
Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Vertical



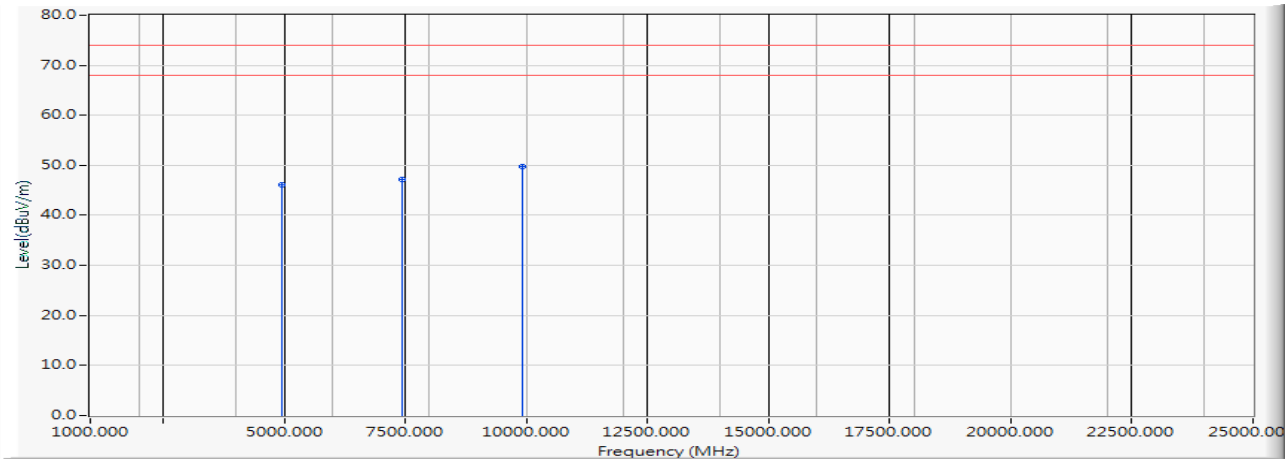
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4880.000	5.302	39.767	45.069	-28.931	74.000	PEAK
2		7320.000	11.795	33.863	45.658	-28.342	74.000	PEAK
3	*	9760.000	11.929	37.676	49.606	-24.394	74.000	PEAK

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 : DIGITAL CAMERA
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/08/28
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Horizontal



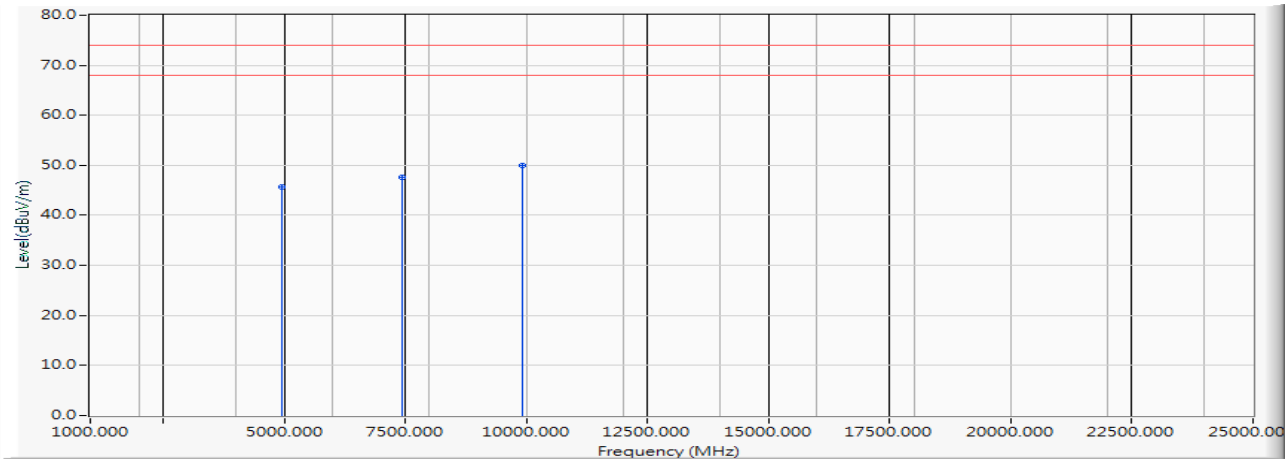
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	6.035	39.983	46.018	-27.982	74.000	PEAK
2		7440.000	10.977	36.233	47.210	-26.790	74.000	PEAK
3	*	9920.000	12.758	36.956	49.713	-24.287	74.000	PEAK

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 : DIGITAL CAMERA
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/08/28
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Vertical



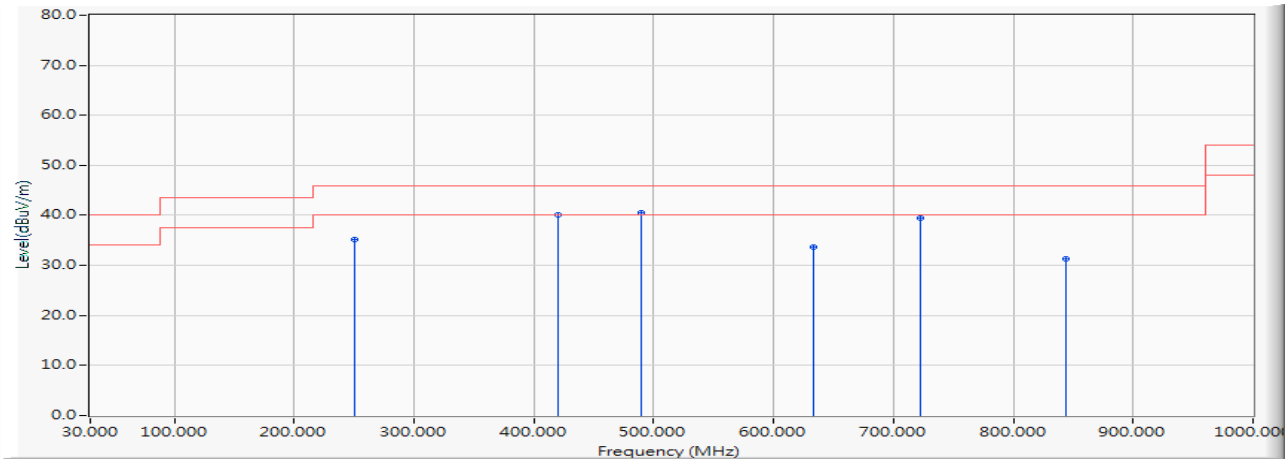
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	6.035	39.672	45.707	-28.293	74.000	PEAK
2		7440.000	10.977	36.655	47.632	-26.368	74.000	PEAK
3	*	9920.000	12.758	37.235	49.992	-24.008	74.000	PEAK

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	:	DIGITAL CAMERA
Test Item	:	General Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2019/08/28
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2440MHz)

Horizontal



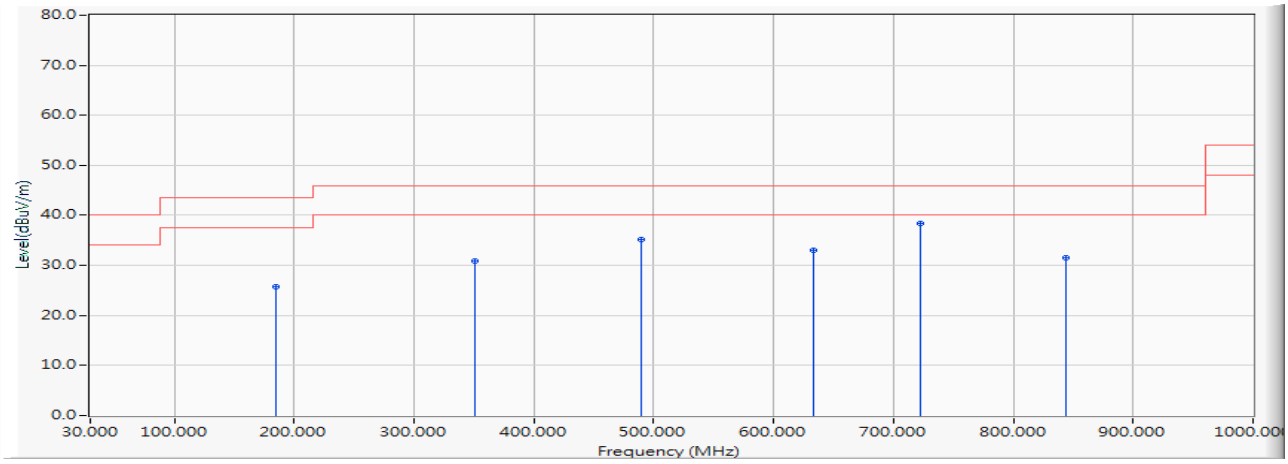
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		250.710	-15.465	50.699	35.235	-10.765	46.000	QUASIPEAK
2		420.812	-10.291	50.336	40.045	-5.955	46.000	QUASIPEAK
3	*	489.696	-9.730	50.285	40.554	-5.446	46.000	QUASIPEAK
4		633.087	-7.188	40.955	33.768	-12.232	46.000	QUASIPEAK
5		723.058	-8.326	47.775	39.449	-6.551	46.000	QUASIPEAK
6		843.957	-6.810	38.157	31.347	-14.653	46.000	QUASIPEAK

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	:	DIGITAL CAMERA
Test Item	:	General Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2019/08/28
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2440MHz)

Vertical



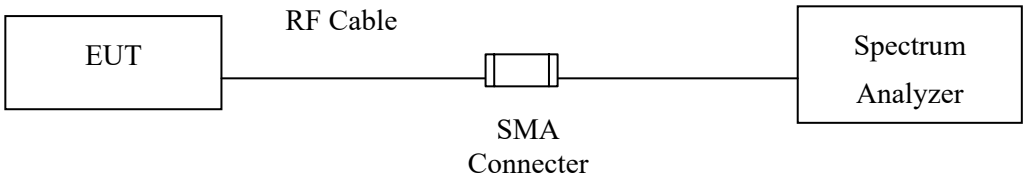
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		184.638	-17.722	43.465	25.743	-17.757	43.500	QUASIPEAK
2		350.522	-10.768	41.646	30.878	-15.122	46.000	QUASIPEAK
3		489.696	-9.730	44.959	35.228	-10.772	46.000	QUASIPEAK
4		633.087	-7.188	40.273	33.086	-12.914	46.000	QUASIPEAK
5	*	723.058	-8.326	46.668	38.342	-7.658	46.000	QUASIPEAK
6		843.957	-6.810	38.272	31.462	-14.538	46.000	QUASIPEAK

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.

5.4. Uncertainty

± 1.20dB

5.5. Test Result of RF Antenna Conducted Test

Product : DIGITAL CAMERA
Test Item : RF Antenna Conducted Test
Test Site : No.3 OATS
Test date : 2019/08/28
Test Mode : Mode 1: Transmit - BLE (GFSK)

Figure Channel 00:

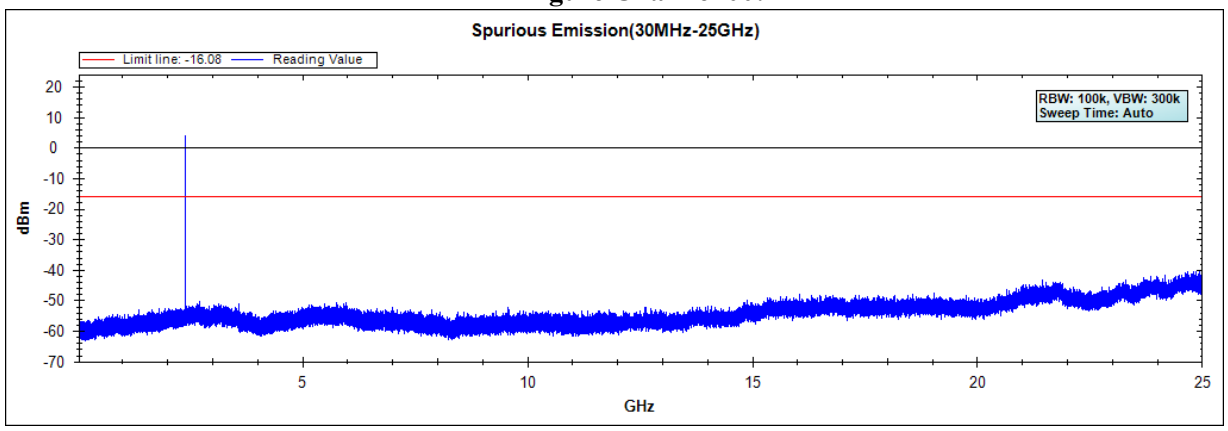


Figure Channel 19:

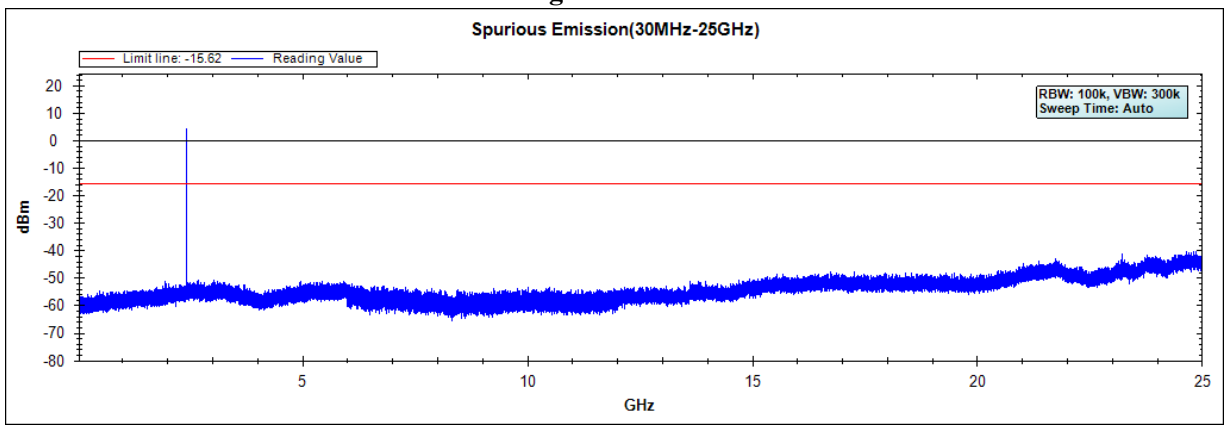
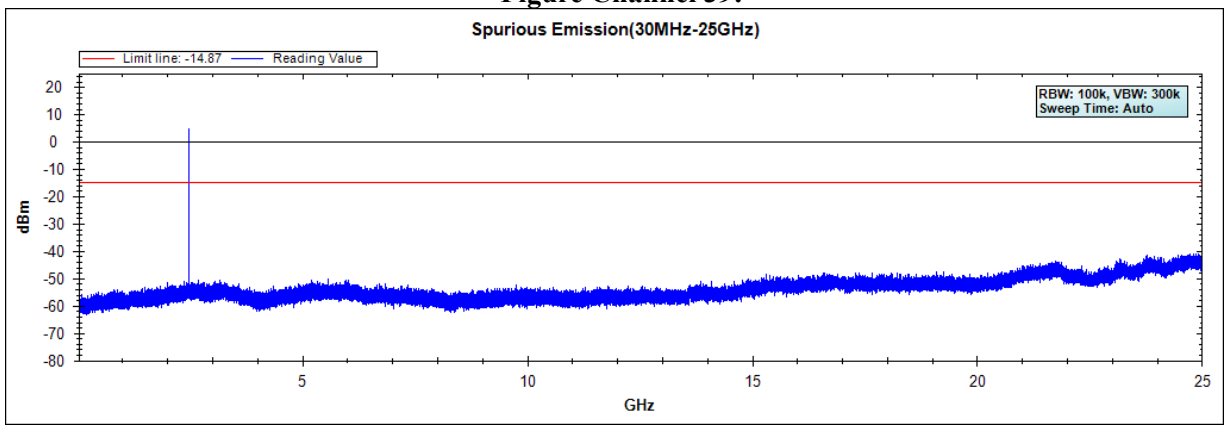


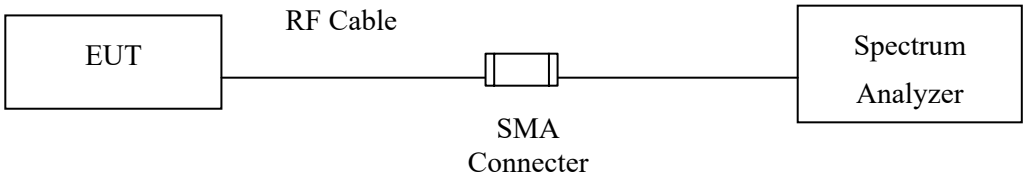
Figure Channel 39:



6. Band Edge

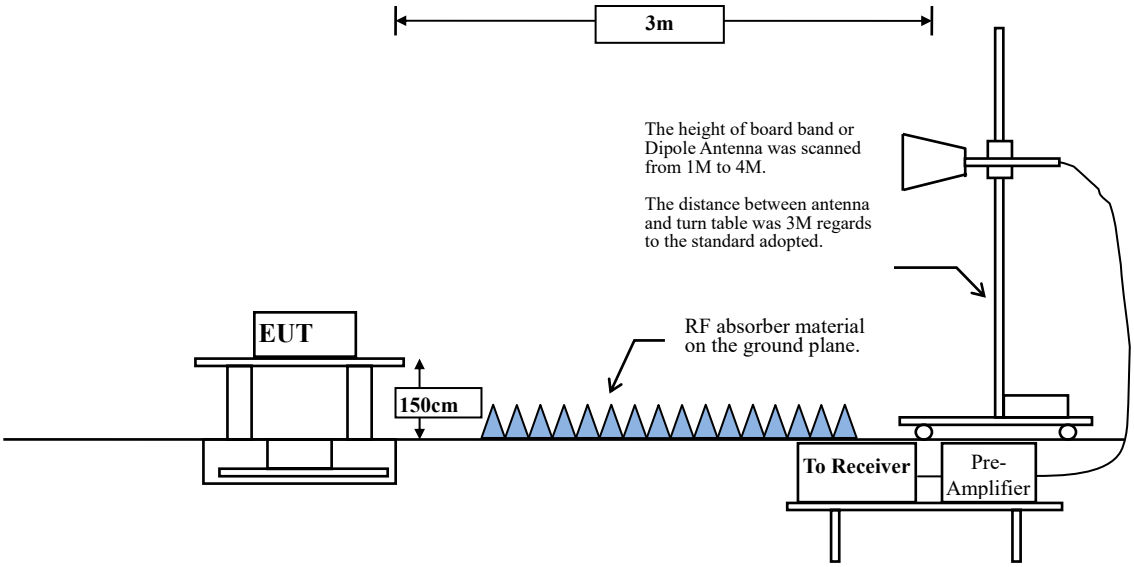
6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:

Above 1GHz



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 ≥ 3 x 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 ≥ 98 %

VBW ≥ 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	62.79	0.3913	2556	3000

Note: Duty Cycle Refer to Section 9

6.4. Uncertainty

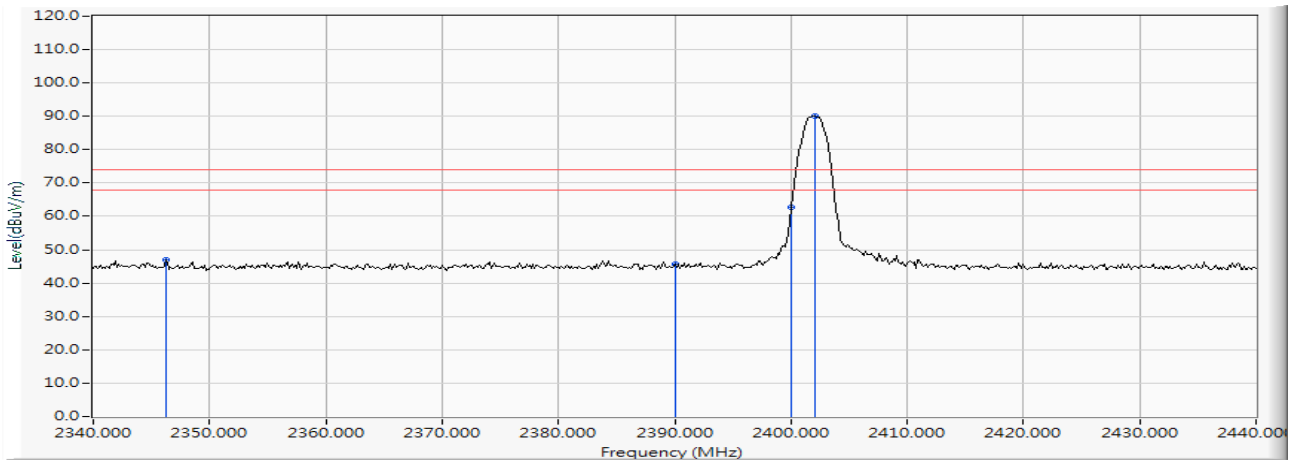
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

6.5. Test Result of Band Edge

Product : DIGITAL CAMERA
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/09/03
Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Horizontal



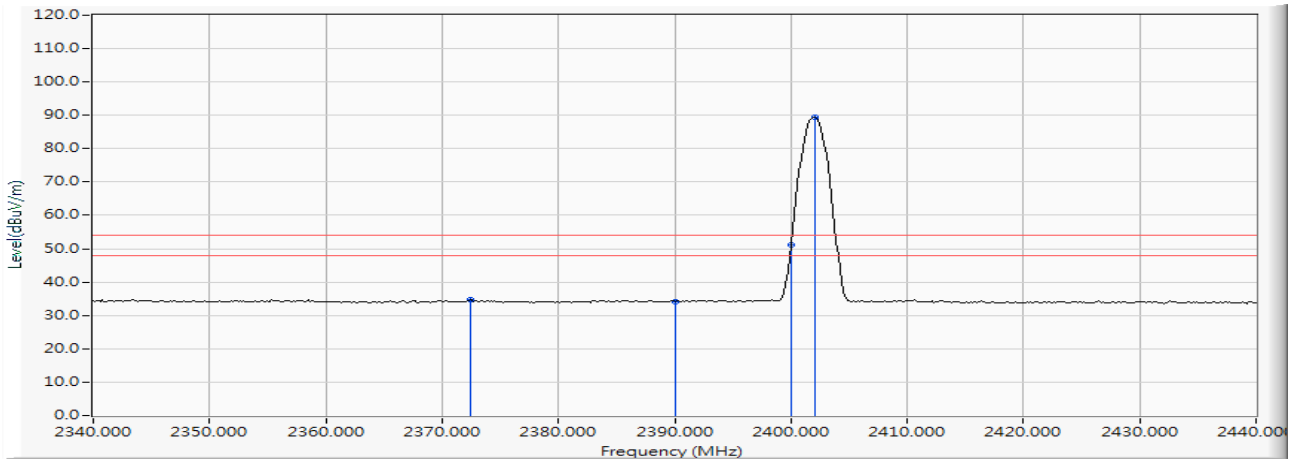
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2346.232	-1.280	48.240	46.959	-27.041	74.000	PEAK
2		2390.000	-1.550	47.365	45.815	-28.185	74.000	PEAK
3		2400.000	-1.612	64.447	62.835	--	--	PEAK
4	*	2402.029	-1.624	91.616	89.992	--	--	PEAK

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 : DIGITAL CAMERA
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/09/03
Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Horizontal



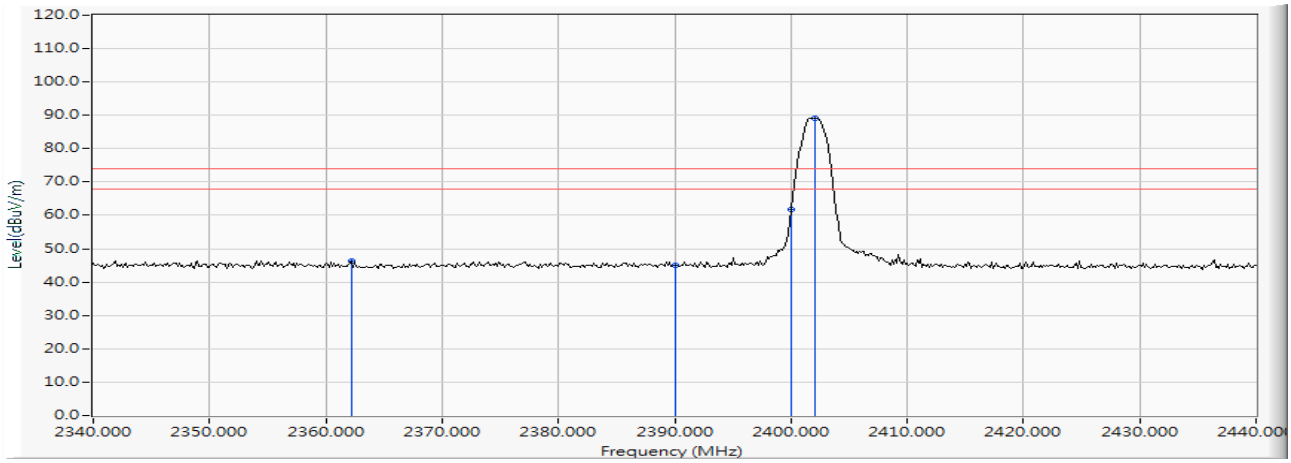
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2372.464	-1.442	36.146	34.704	-19.296	54.000	AVERAGE
2		2390.000	-1.550	35.744	34.194	-19.806	54.000	AVERAGE
3		2400.000	-1.612	52.811	51.199	--	--	AVERAGE
4	*	2402.029	-1.624	90.950	89.326	--	--	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	:	DIGITAL CAMERA
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2019/09/03
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2402MHz)

Vertical



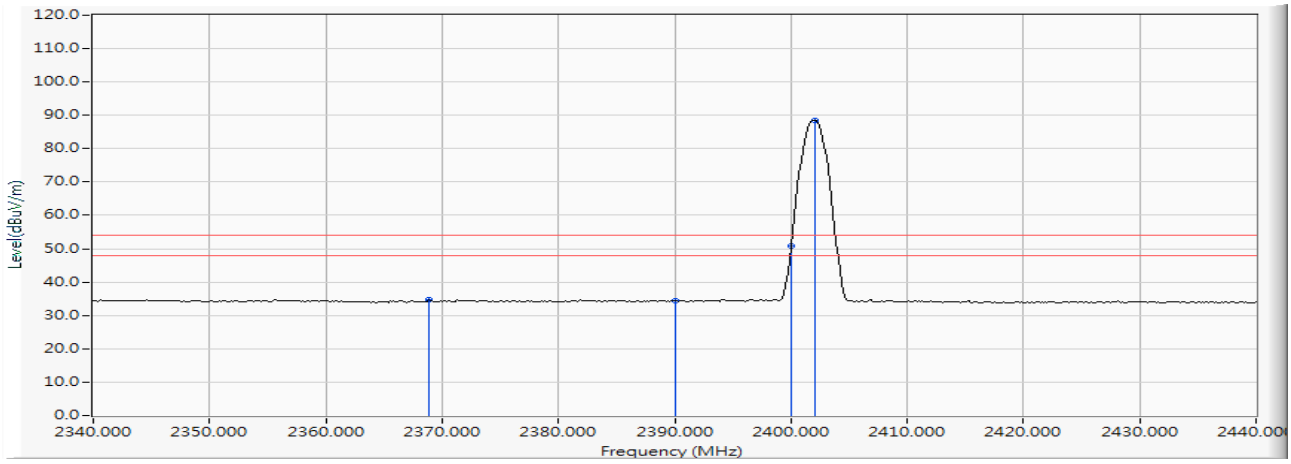
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2362.174	-1.378	47.752	46.374	-27.626	74.000	PEAK
2		2390.000	-1.550	46.460	44.910	-29.090	74.000	PEAK
3		2400.000	-1.612	63.307	61.695	--	--	PEAK
4	*	2402.029	-1.624	90.832	89.208	--	--	PEAK

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 : DIGITAL CAMERA
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/09/03
Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Vertical



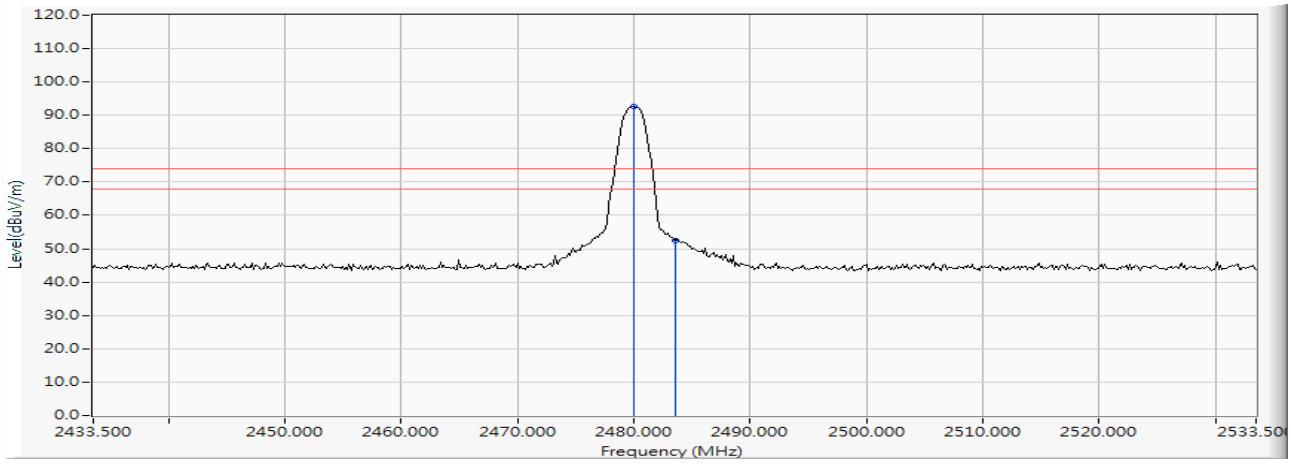
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2368.841	-1.419	36.136	34.716	-19.284	54.000	AVERAGE
2		2390.000	-1.550	35.961	34.411	-19.589	54.000	AVERAGE
3		2400.000	-1.612	52.548	50.936	--	--	AVERAGE
4	*	2402.029	-1.624	90.220	88.596	--	--	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 : DIGITAL CAMERA
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/09/03
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Horizontal



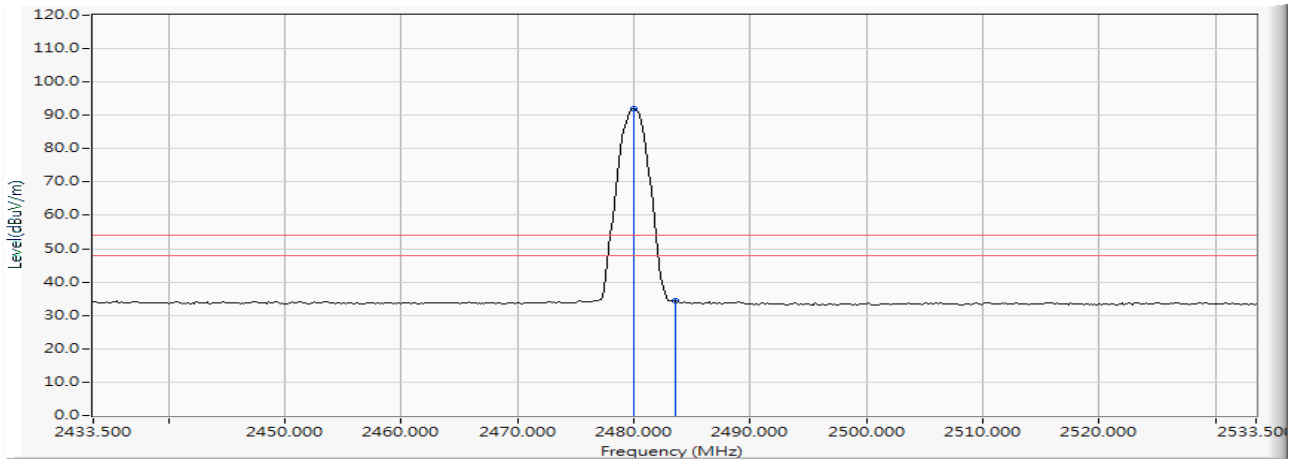
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-2.105	94.696	92.591	--	--	PEAK
2		2483.500	-2.127	54.538	52.411	-21.589	74.000	PEAK

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 : DIGITAL CAMERA
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/09/03
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Horizontal



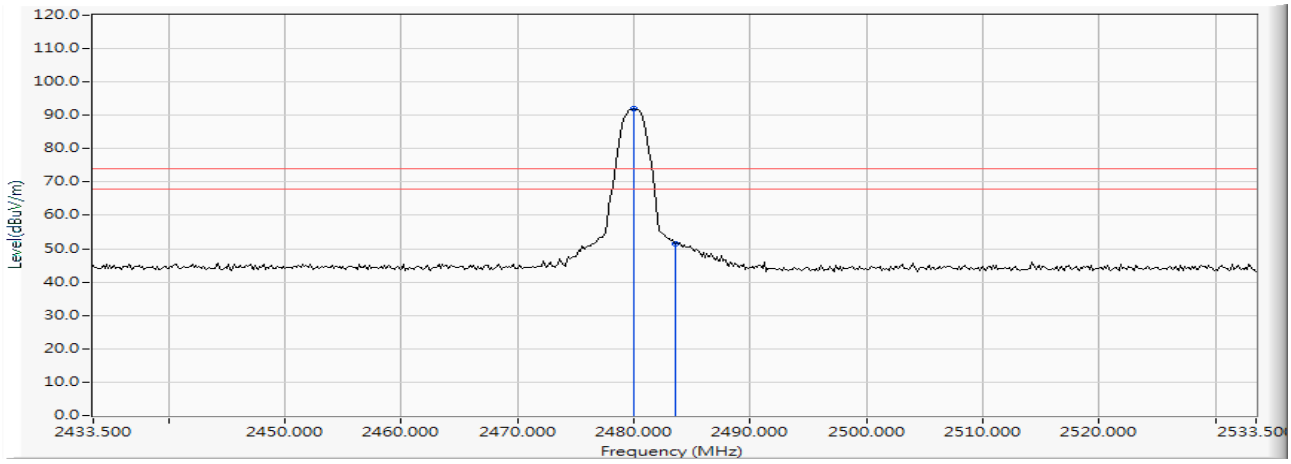
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-2.105	94.029	91.924	--	--	AVERAGE
2		2483.500	-2.127	36.434	34.307	-19.693	54.000	AVERAGE

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	:	DIGITAL CAMERA
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2019/09/03
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2480MHz)

Vertical



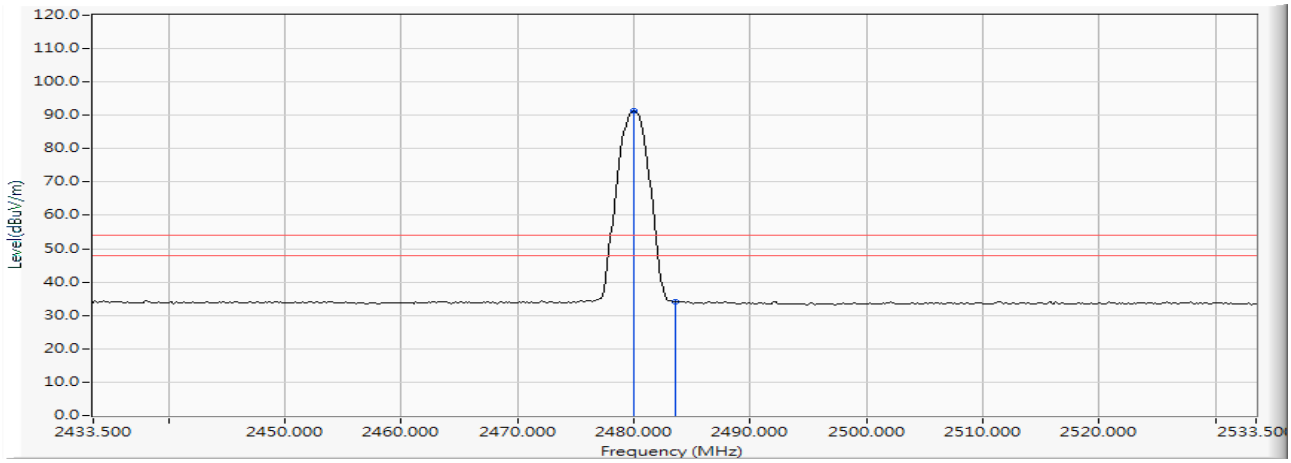
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-2.105	93.959	91.854	--	--	PEAK
2		2483.500	-2.127	53.484	51.357	-22.643	74.000	PEAK

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 : DIGITAL CAMERA
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/09/03
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Vertical



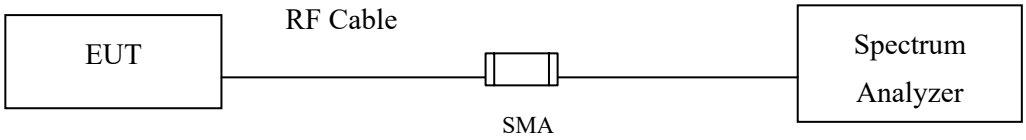
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-2.105	93.331	91.226	--	--	AVERAGE
2		2483.500	-2.127	36.142	34.015	-19.985	54.000	AVERAGE

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≥3*RBW

7.4. Uncertainty

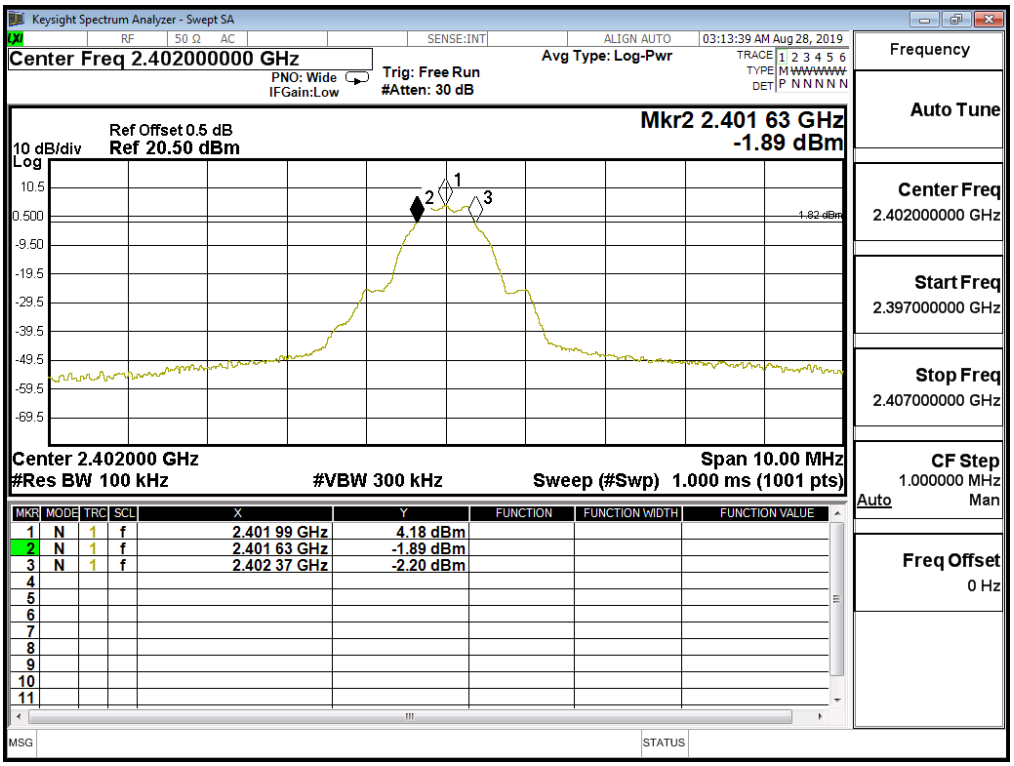
± 283Hz

7.5. Test Result of 6dB Bandwidth

Product : DIGITAL CAMERA
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

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

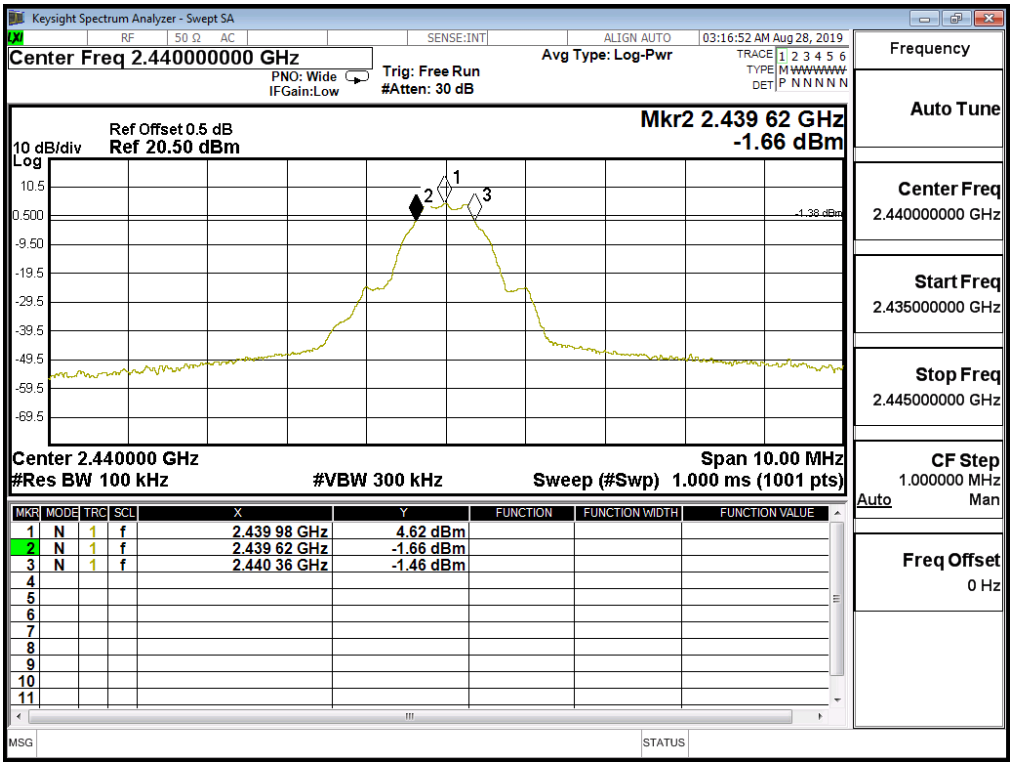
Figure Channel 00:



Product : DIGITAL CAMERA
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

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

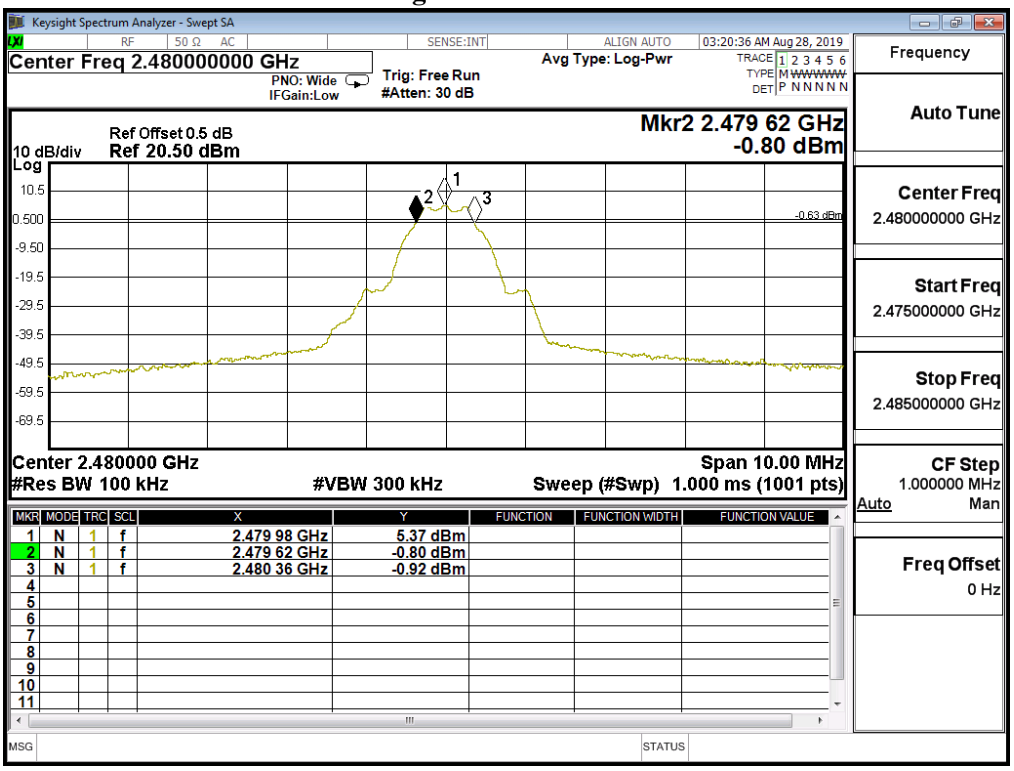
Figure Channel 19:



Product : DIGITAL CAMERA
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

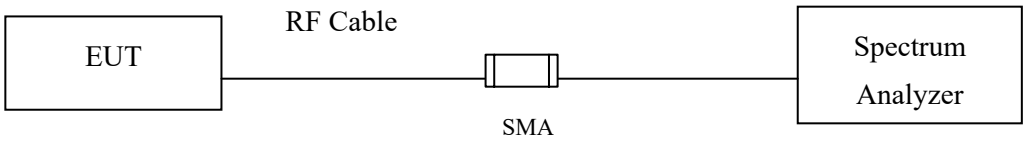
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2480	740	>500	Pass

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

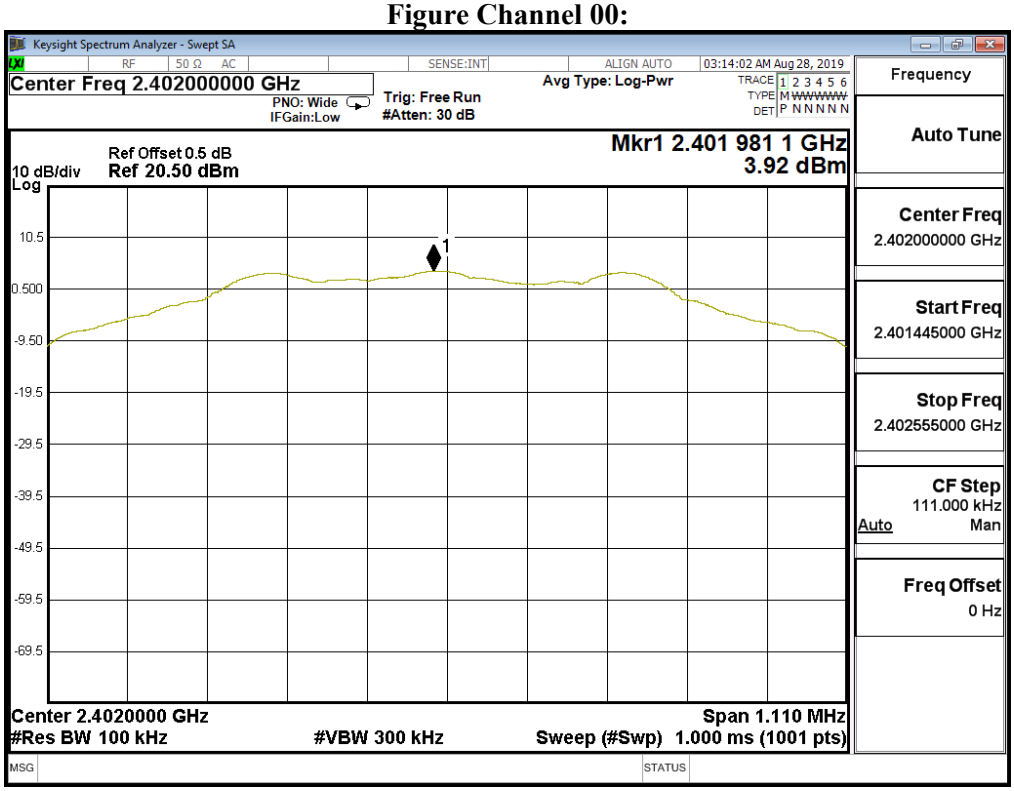
± 1.20 dB

8.5. Test Result of Power Density

Product : DIGITAL CAMERA
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	3.92	≦8dBm	Pass

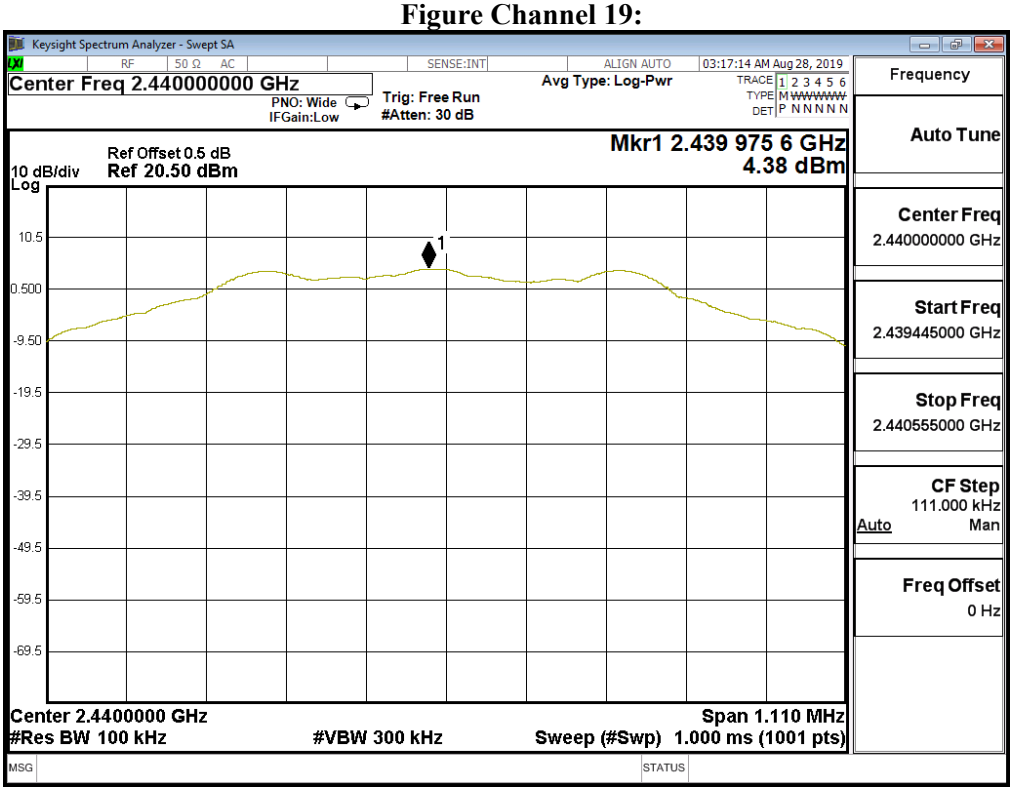
Figure Channel 00:



Product : DIGITAL CAMERA
Test Item : Power Density Data
Test Site : No.3OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
19	2440	4.38	≦8dBm	Pass

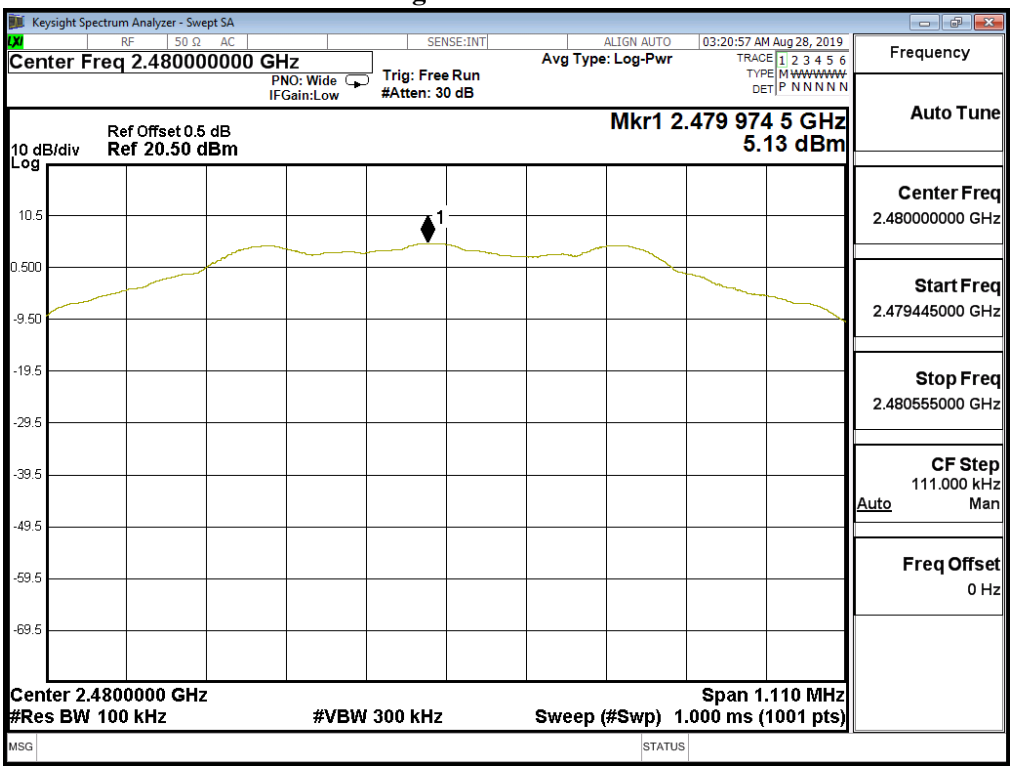
Figure Channel 19:



Product : DIGITAL CAMERA
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

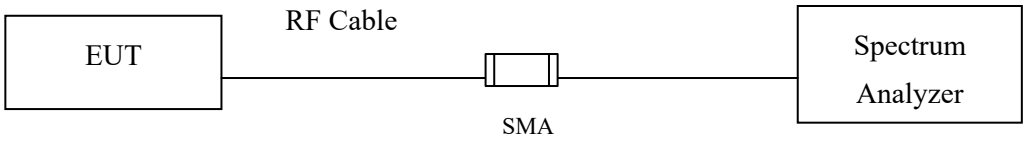
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	5.13	≦8dBm	Pass

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

± 2.31msec

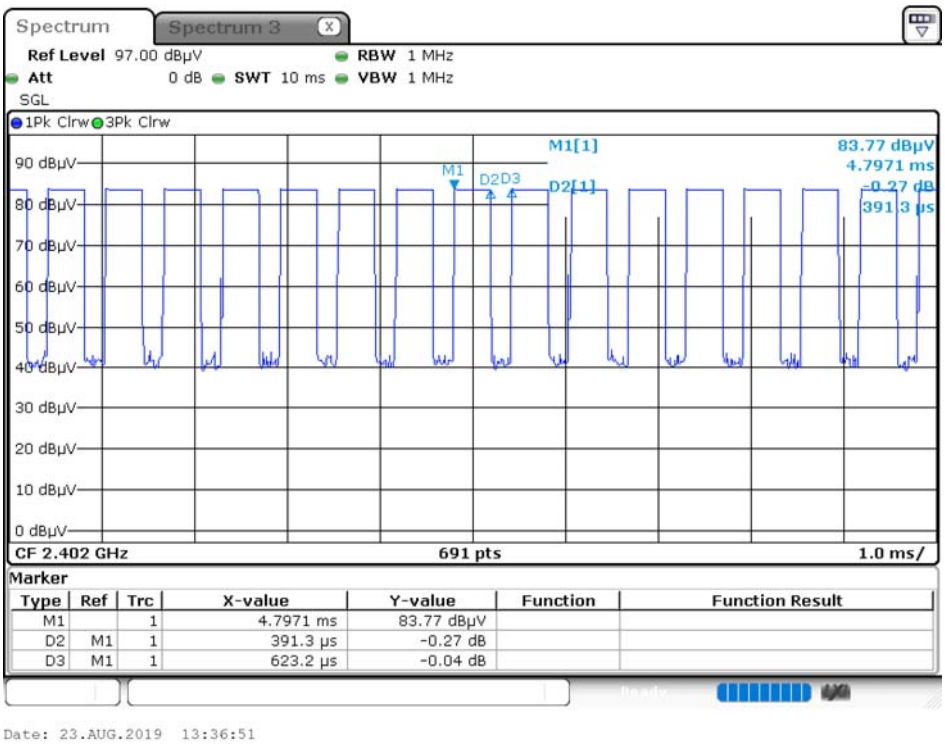
9.4. Test Result of Duty Cycle

Product : DIGITAL CAMERA
Test Item : Duty Cycle
Test Mode : Mode 1: Transmit - BLE (GFSK)

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	0.3913	0.6232	62.79	2.02



10. EMI Reduction Method During Compliance Testing

No modification was made during testing.