FCC Test Report

Product Name	Fruit and Vegetable Cleanliness Detector
Model No.	PD100
FCC ID.	MSQ-PD100

Applicant	ASUSTeK COMPUTER INC.
Address	1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan

Date of Receipt	Aug. 11, 2020
Issued Date	May 10, 2021
Report No.	2130834R-E3032110109
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.
The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Report

Issued Date: May 10, 2021
Report No.: 2130834R-E3032110109

Product Name	Fruit and Vegetable Cleanliness Detector
Applicant	ASUSTeK COMPUTER INC.
Address	1F., No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
Manufacturer	ASUSTeK COMPUTER INC.
Model No.	PD100
FCC ID.	MSQ-PD100
EUT Rated Voltage	DC 3.7V Power by Battery
EUT Test Voltage	DC 5V Power by USB
Trade Name	ASUS
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Joanne Lin

(Senior Adm. Specialist / Joanne Lin)

Tested By : Bill Lin

(Senior Engineer / Bill Lin)

Approved By :

(Director / Vincent Lin)

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Revision History

Report No.	Version	Description	Issued Date
2130834R-E3032110109	V1.0	Initial issue of report.	2021-05-10

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Fruit and Vegetable Cleanliness Detector
Trade Name	ASUS
Model No.	PD100
FCC ID.	MSQ-PD100
Frequency Range	2402-2480MHz
Channel Number	V5.0: 40CH
Type of Modulation	V5.0: GFSK
Channel Separation	2MHz
Antenna Type	PIFA Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
PureGo Wireless charger	MFR: ASUS, M/N: PD100

Antenna List

No.	Manufacturer	Part No.	ASUS No.	Antenna Type	Peak Gain
1	INPAQ	WA-P-LA-02-230	14008-03740000	PIFA Antenna	-0.22dBi for 2.4GHz

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

Center Frequency of Each Channel: (For Bluetooth V5.0)

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 Fruit and Vegetable Cleanliness Detector with built-in Bluetooth V5.0 transceiver and Wireless power receiver, this report for Bluetooth V5.0.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of 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 1Mbps
	Mode 2: Charge

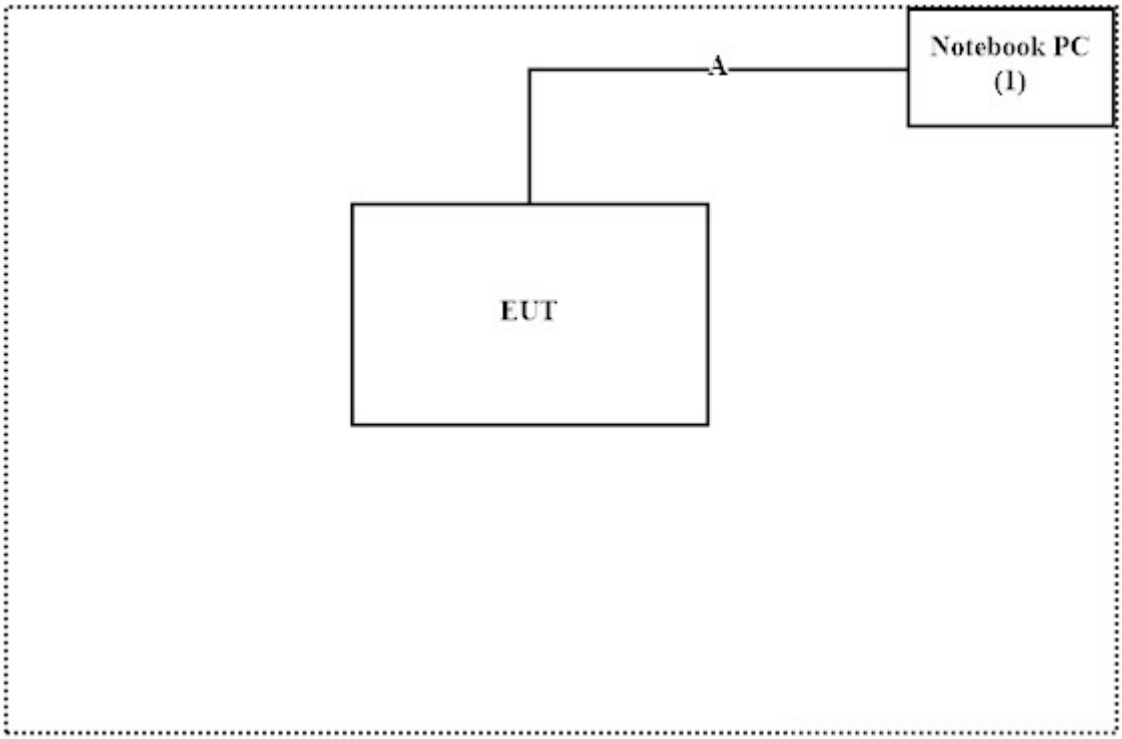
1.2. Tested System Details

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	4V5JPJ2	Non-shielded, 1.8m

Signal Cable Type		Manufacturer	Model No.	Signal cable Description
A	USB Cable	DEKRA	Cable-01	Non-shielded, 1.0m

1.3. Configuration of Tested System



1.4. EUT Exercise Software

(1) Setup the EUT as shown in Section 1.3.

(2) Execute software “BTool v1.42.16” 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.

1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Radiated Emission	Temperature (°C)	10~40 °C	23.8°C
	Humidity (%RH)	10~90 %	59.9%
Radiated Emission	Temperature (°C)	10~40 °C	21.2 °C
	Humidity (%RH)	10~90 %	59.6 %
Conductive	Temperature (°C)	10~40 °C	22 °C
	Humidity (%RH)	10~90 %	55 %

USA : FCC Registration Number: TW0023

Canada : IC Registration Number: 25880

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan, R.O.C.
Phone number : 886-2-2602-7968
Fax number : 866-2-2602-3286
Email address : info.tw@dekra.com
Website : http://www.dekra.com.tw

1.6. List of Test Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
	EMI Test Receiver	R&S	ESR7	101601	2021.01.04	2022.01.03
	Two-Line V-Network	R&S	ENV216	101306	2021.04.08	2022.04.07
	Two-Line V-Network	R&S	ENV216	101307	2020.04.17	2021.04.16
	Coaxial Cable	DEKRA	RG400_BNC	RF001	2020.05.24	2021.05.23

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 : DEKRA Testing System V2.0

For Conducted measurements /ASR2

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103466	2020.12.28	2021.12.27
X	Peak Power Analyzer	KEYSIGHT	8900B	MY51000539	2020.05.13	2021.05.12
X	Power Sensor	KEYSIGHT	N1923A	MY59240002	2020.05.22	2021.05.21
X	Power Sensor	KEYSIGHT	N1923A	MY59240003	2020.05.22	2021.05.21

Note:
1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : DEKRA Conduction Test System V9.0.5

For Radiated measurements /ACB1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2021.03.16	2022.03.15
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-953	2021.01.29	2022.01.28
X	Horn Antenna	ETS-Lindgren	3117	00203800	2020.12.22	2021.12.21
X	Horn Antenna	Com-Power	AH-840	101087	2020.06.08	2021.06.07
X	Pre-Amplifier	EMCI	EMC001330	980316	2020.06.23	2021.06.22
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2020.06.23	2021.06.22
X	Pre-Amplifier	EMCI	EMC05820SE	980310	2020.06.24	2021.06.23
X	Pre-Amplifier	EMCI	EMC184045SE	980314	2020.06.10	2021.06.09
X	Filter	MICRO TRONICS	BRM50702	G251	2020.09.17	2021.09.16
	Filter	MICRO TRONICS	BRM50716	G188	2020.09.17	2021.09.16
X	EMI Test Receiver	R&S	ESR7	101602	2021.02.25	2022.02.24
X	Spectrum Analyzer	R&S	FSV40	101894	2021.03.10	2022.03.09
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2020.07.03	2021.07.02
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2020.06.10	2021.06.09

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 : DEKRA Testing System V2.0

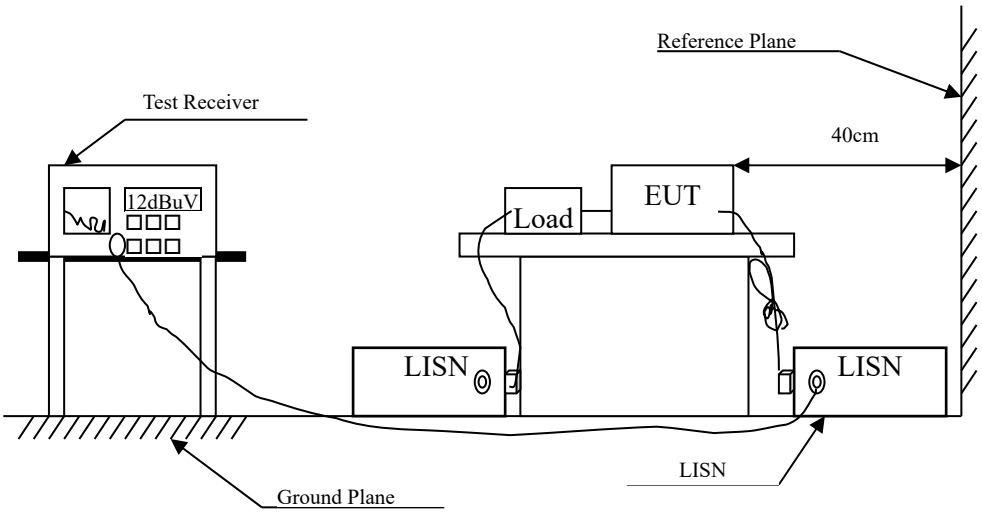
1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.
Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test item	**Uncertainty**	
Conducted Emission	±3.42 dB	
Peak Power Output	±0.91 dB	
Radiated Emission	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
RF Antenna Conducted Test	±2.53 dB	
Band Edge	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
6dB Bandwidth	±682.83 Hz	
Power Density	±2.53 dB	
Duty Cycle	±2.31 ms	

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.)

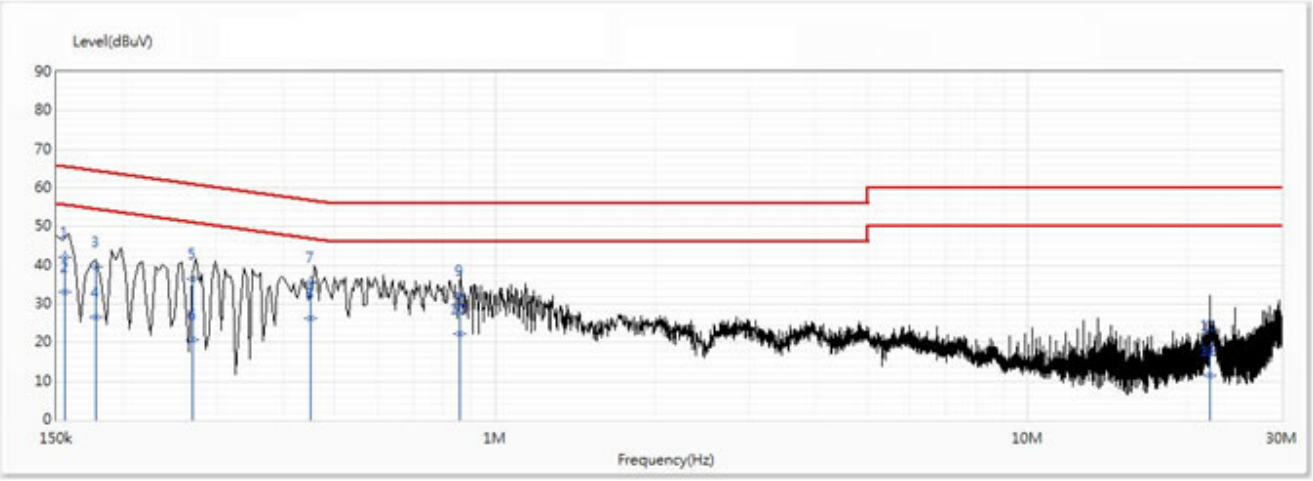
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

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. Test Result of Conducted Emission

Product : Fruit and Vegetable Cleanliness Detector
Test Item : Conducted Emission
Power Line : L 1
Test Mode : Mode 2: Charge
Test Date : 2020/08/17

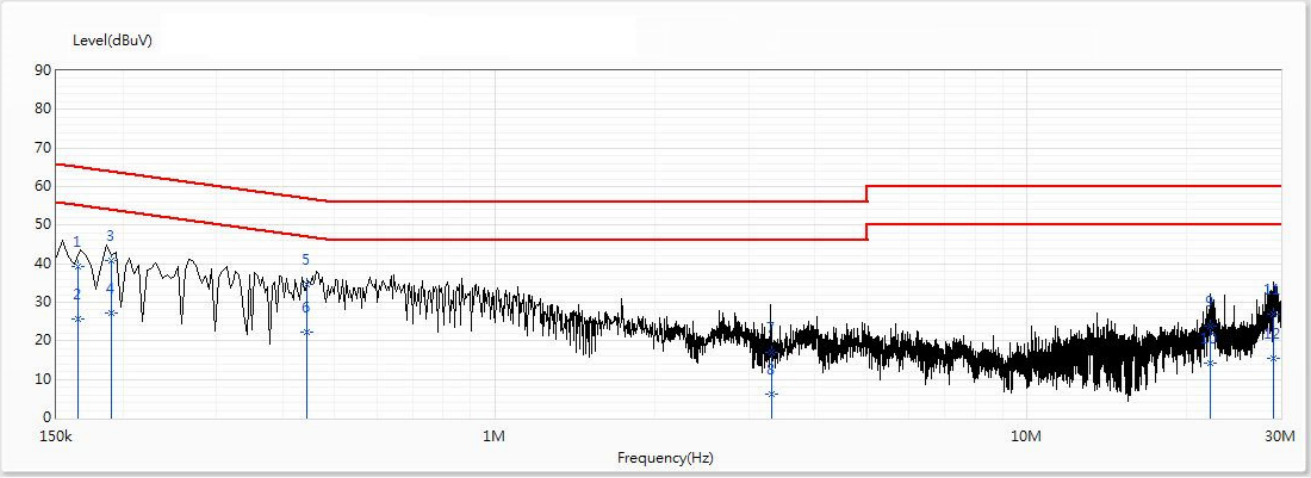


No	Frequency (MHz)	Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB)	Detector Type
1	0.156	42.18	65.69	-23.52	32.52	9.66	QP
2	0.156	33.20	55.69	-22.49	23.54	9.66	AV
3	0.178	39.71	64.57	-24.86	30.05	9.65	QP
4	0.178	26.59	54.57	-27.98	16.94	9.65	AV
5	0.27	36.41	61.12	-24.71	26.76	9.65	QP
6	0.27	20.84	51.12	-30.28	11.19	9.65	AV
7	0.451	35.44	56.86	-21.42	25.79	9.66	QP
*8	0.451	26.39	46.86	-20.47	16.73	9.66	AV
9	0.859	32.25	56.00	-23.75	22.57	9.68	QP
10	0.859	22.18	46.00	-23.82	12.50	9.68	AV
11	21.974	18.09	60.00	-41.91	8.13	9.96	QP
12	21.974	11.32	50.00	-38.68	1.35	9.96	AV

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Conducted Emission
Power Line : N
Test Mode : Mode 2: Charge
Test Date : 2020/08/17



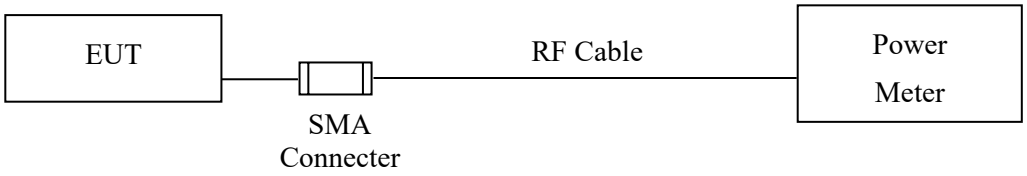
No	Frequency (MHz)	Emission Level (dBµV)	Limit (dBµV)	Margin (dB)	Reading Level (dBµV)	Correct Factor (dB)	Detector Type
1	0.165	39.21	65.22	-26.01	29.54	9.67	QP
2	0.165	25.82	55.22	-29.40	16.15	9.67	AV
3	0.19	40.93	64.04	-23.11	31.26	9.67	QP
4	0.19	27.19	54.04	-26.85	17.52	9.67	AV
*5	0.443	34.63	57.00	-22.37	24.96	9.67	QP
6	0.443	22.38	47.00	-24.61	12.71	9.67	AV
7	3.307	17.01	56.00	-38.99	7.24	9.77	QP
8	3.307	6.18	46.00	-39.82	-3.59	9.77	AV
9	22.163	23.73	60.00	-36.27	13.67	10.06	QP
10	22.163	14.09	50.00	-35.91	4.03	10.06	AV
11	29.098	26.96	60.00	-33.04	16.87	10.09	QP
12	29.098	15.34	50.00	-34.66	5.24	10.09	AV

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

The EUT was tested according to C63.10:2013 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using C63.10:2013 Section 11.9.1.3 PKPM1 Peak power meter method.

3.4. Test Result of Peak Power Output

Product : Fruit and Vegetable Cleanliness Detector
Test Item : Peak Power Output
Test Mode : Mode 1: Transmit - BLE 1Mbps
Test Date : 2020/08/19

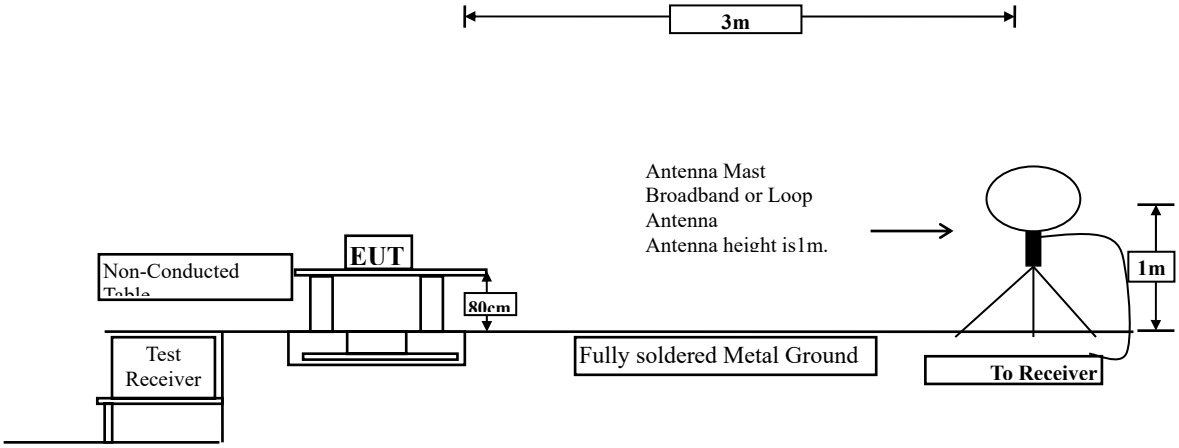
Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	4.53	1 Watt= 30 dBm	Pass
Channel 19	2440.00	4.29	1 Watt= 30 dBm	Pass
Channel 39	2480.00	4.06	1 Watt= 30 dBm	Pass

Test Result of Peak Power Output	**PASS**

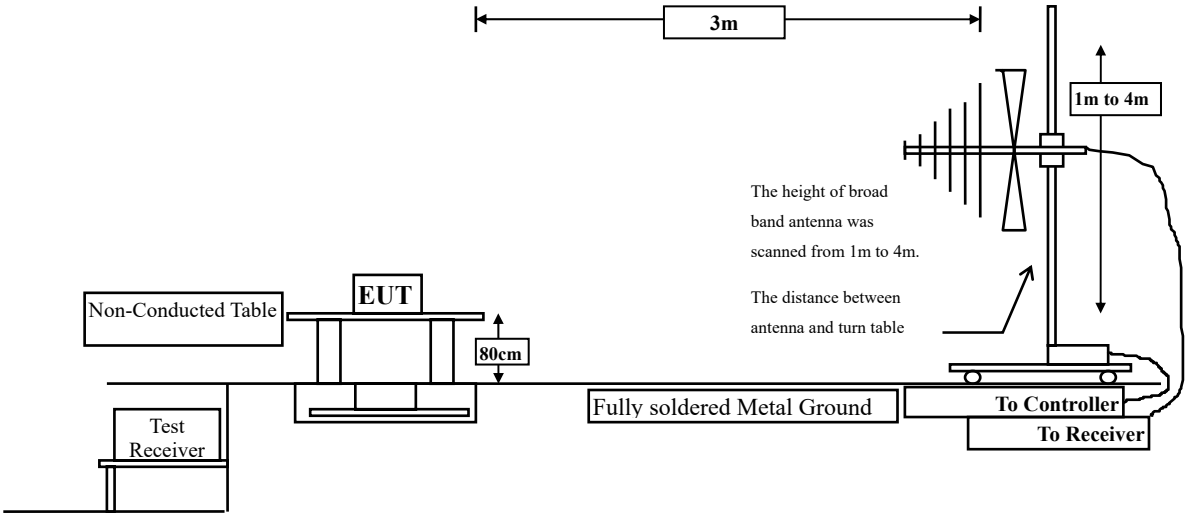
4. Radiated Emission

4.1. Test Setup

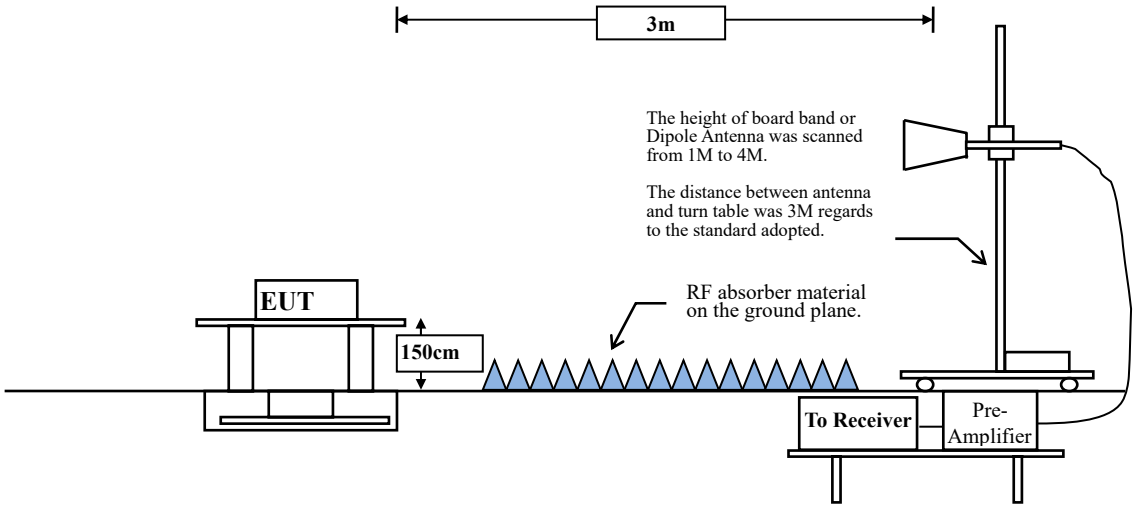
Radiated Emission Under 30MHz



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 (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 C63.10:2013 Section 11.12.1 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 form 9kHz - 10th Harmonic of fundamental was investigated.

RBW and VBW Parameter setting:

According to C63.10 Section 11.12.2.4 Peak 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 C63.10 Section 11.12.2.5 Average 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.)

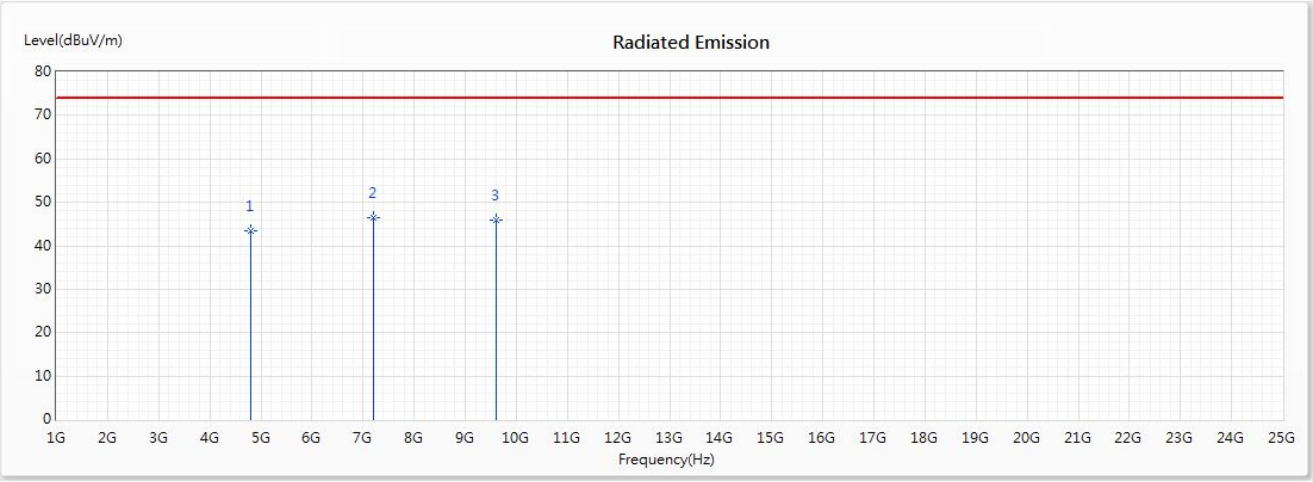
2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE	66.28	0.4130	2421	3000

Note: Duty Cycle Refer to Section 9.

4.4. Test Result of Radiated Emission

Product : Fruit and Vegetable Cleanliness Detector
Test Item : Harmonic Radiated Emission
Test Mode : Mode 1: Transmit - BLE 1Mbps (2402MHz)
Test Date : 2020/08/15

Horizontal



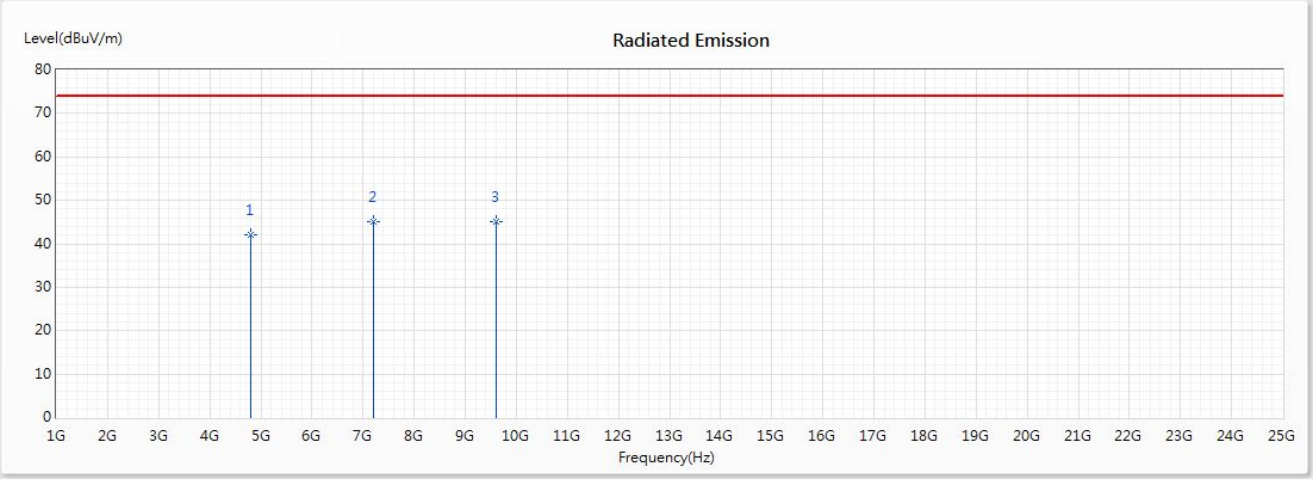
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	4804	43.54	74.00	-30.46	44.61	-1.07	PK
* 2	7206	46.48	74.00	-27.52	44.28	2.20	PK
3	9608	45.85	74.00	-28.15	41.70	4.15	PK

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Harmonic Radiated Emission
Test Mode : Mode 1: Transmit - BLE 1Mbps (2402MHz)
Test Date : 2020/08/15

Vertical



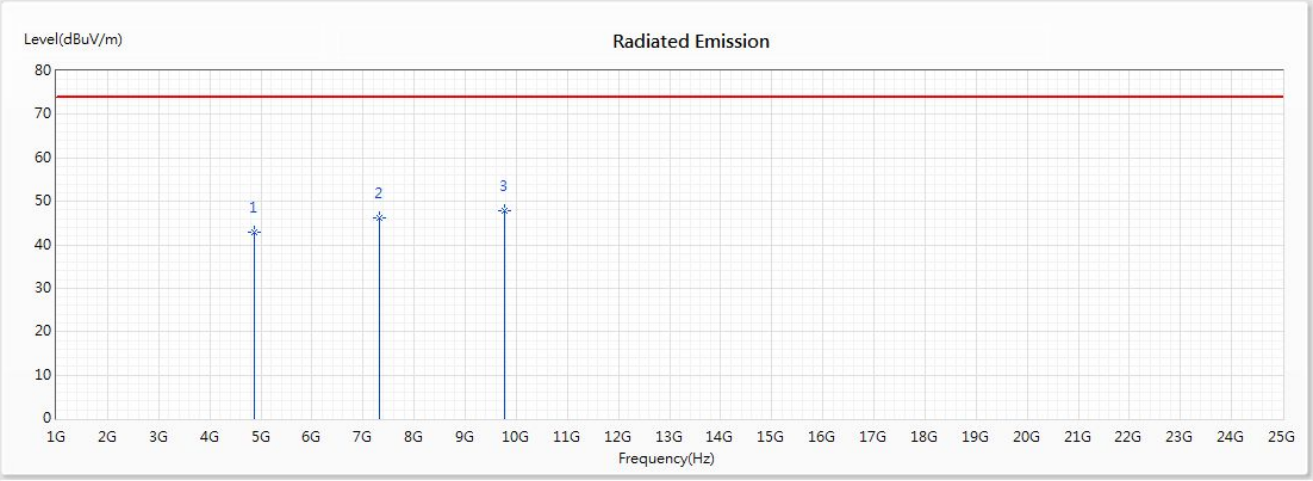
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	4804	42.02	74.00	-31.98	43.09	-1.07	PK
2	7206	44.96	74.00	-29.04	42.76	2.20	PK
* 3	9608	45.02	74.00	-28.98	40.87	4.15	PK

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Harmonic Radiated Emission
Test Mode : Mode 1: Transmit - BLE 1Mbps (2440MHz)
Test Date : 2020/08/15

Horizontal



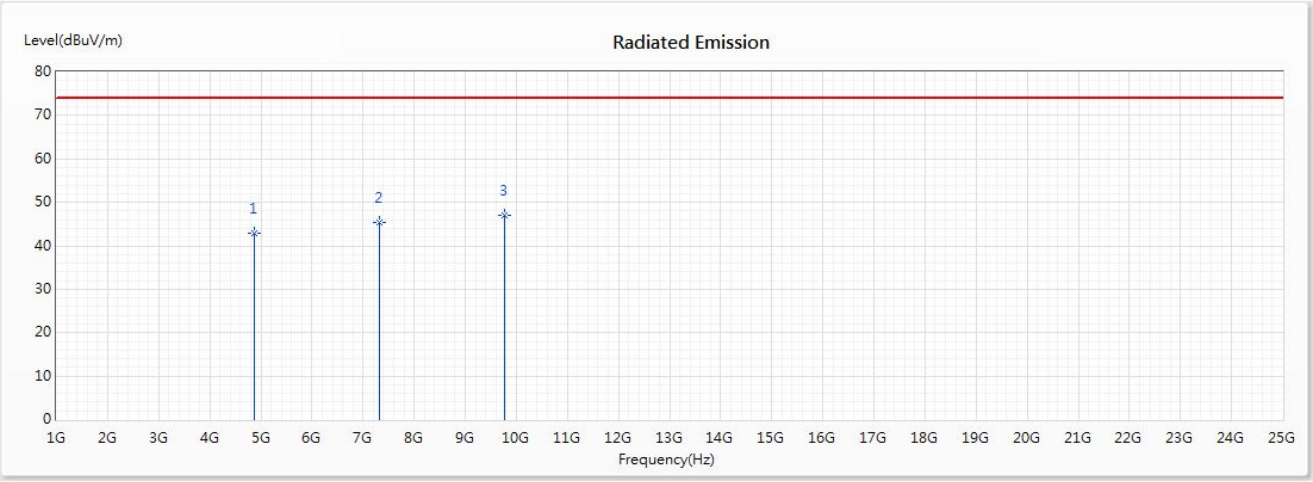
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	4880	42.81	74.00	-31.19	43.72	-0.91	PK
2	7320	46.11	74.00	-27.89	43.94	2.17	PK
* 3	9760	47.87	74.00	-26.13	43.45	4.42	PK

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	:	Fruit and Vegetable Cleanliness Detector
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit - BLE 1Mbps (2440MHz)
Test Date	:	2020/08/15

Vertical



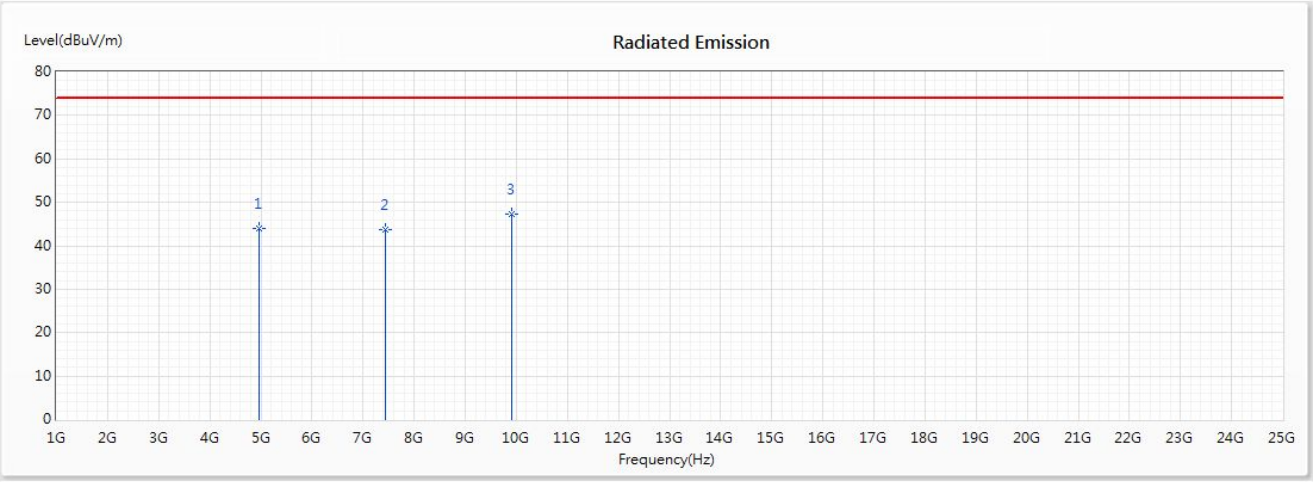
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	4880	42.77	74.00	-31.23	43.68	-0.91	PK
2	7320	45.32	74.00	-28.68	43.15	2.17	PK
* 3	9760	46.94	74.00	-27.06	42.52	4.42	PK

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	:	Fruit and Vegetable Cleanliness Detector
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit - BLE 1Mbps (2480MHz)
Test Date	:	2020/08/15

Horizontal



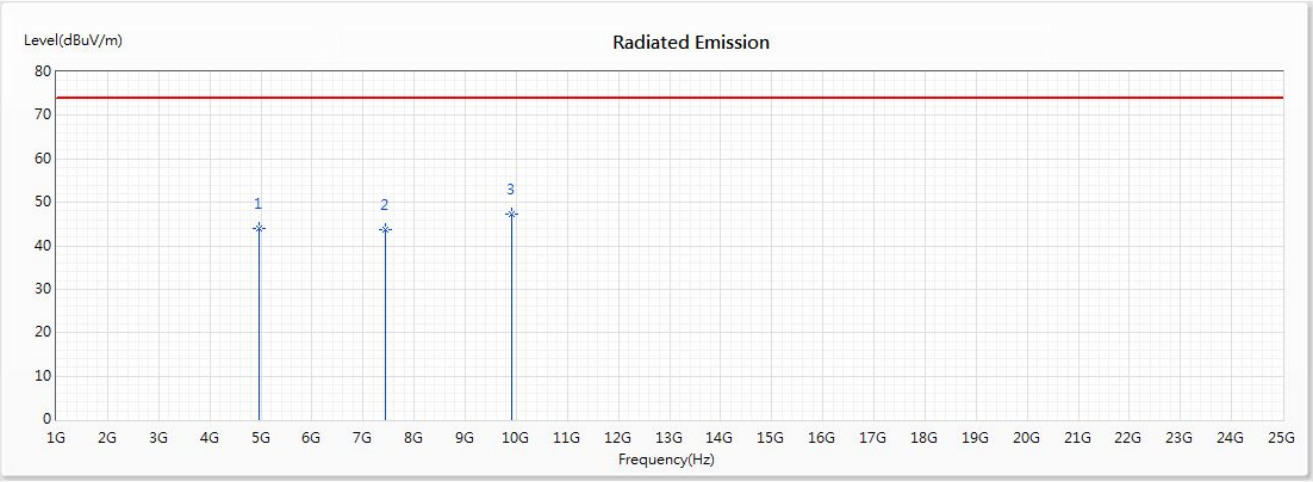
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	4960	43.91	74.00	-30.09	44.71	-0.80	PK
2	7440	43.80	74.00	-30.20	41.67	2.13	PK
* 3	9920	47.40	74.00	-26.60	42.71	4.69	PK

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Harmonic Radiated Emission
Test Mode : Mode 1: Transmit - BLE 1Mbps (2480MHz)
Test Date : 2020/08/15

Vertical



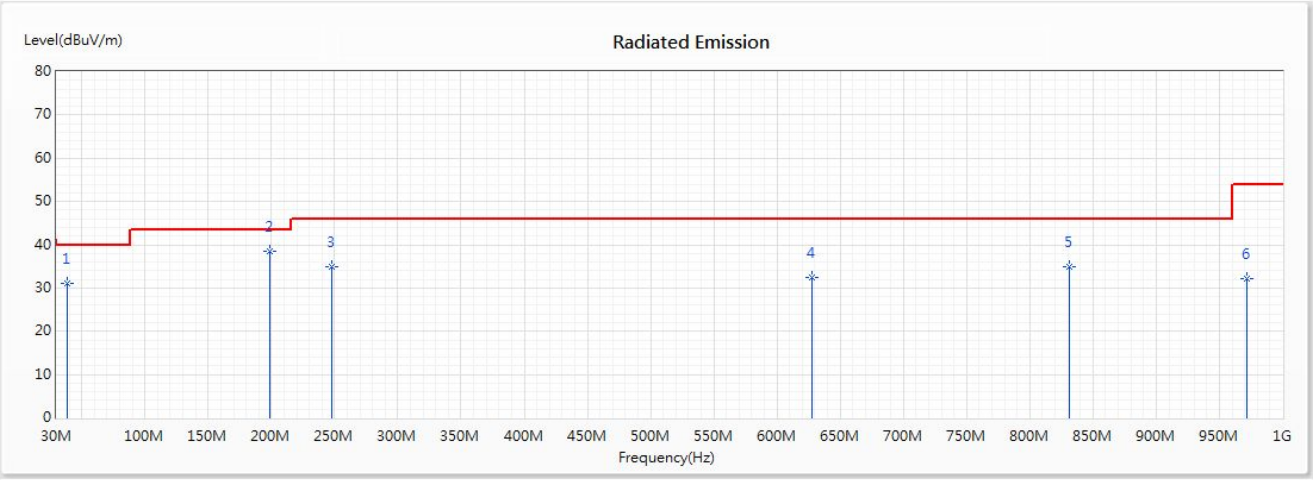
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	4960	43.91	74.00	-30.09	44.71	-0.80	PK
2	7440	43.75	74.00	-30.25	41.62	2.13	PK
* 3	9920	47.25	74.00	-26.75	42.56	4.69	PK

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	:	Fruit and Vegetable Cleanliness Detector
Test Item	:	General Radiated Emission
Test Mode	:	Mode 1: Transmit - BLE 1Mbps (2440MHz)
Test Date	:	2020/08/15

Horizontal



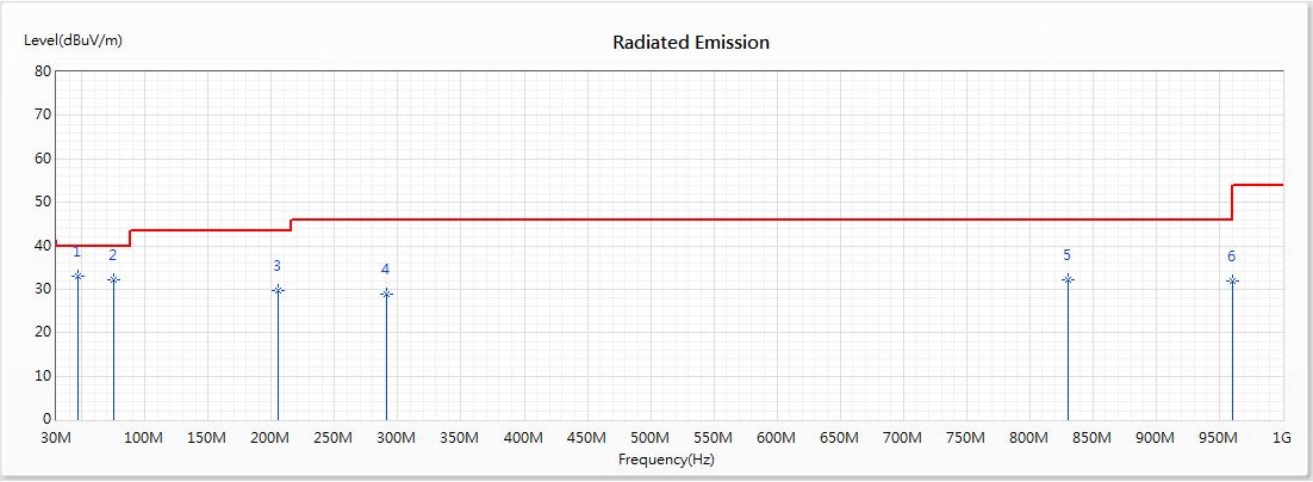
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	38.435	31.12	40.00	-8.88	42.15	-11.03	QP
* 2	198.696	38.42	43.50	-5.08	50.61	-12.19	QP
3	247.899	34.81	46.00	-11.19	45.67	-10.86	QP
4	627.464	32.36	46.00	-13.64	34.33	-1.97	QP
5	831.304	34.90	46.00	-11.10	33.96	0.94	QP
6	971.884	32.18	54.00	-21.82	29.53	2.65	QP

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	:	Fruit and Vegetable Cleanliness Detector
Test Item	:	General Radiated Emission
Test Mode	:	Mode 1: Transmit - BLE 1Mbps (2440MHz)
Test Date	:	2020/08/15

Vertical



No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
* 1	46.87	33.09	40.00	-6.91	43.36	-10.27	QP
2	74.986	32.04	40.00	-7.96	45.87	-13.83	QP
3	205.725	29.65	43.50	-13.85	41.99	-12.34	QP
4	291.478	28.96	46.00	-17.04	38.20	-9.24	QP
5	829.899	32.16	46.00	-13.84	31.26	0.90	QP
6	960.638	31.86	54.00	-22.14	29.20	2.66	QP

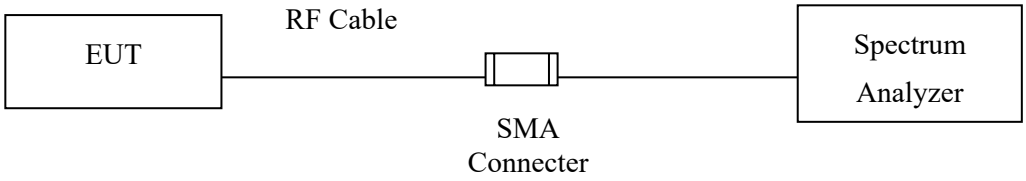
Note:

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.

Test Result of Radiated Emission	**PASS**

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 C63.10:2013 Section 11.11 for compliance to FCC 47CFR 15.247 requirements.

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

5.4. Test Result of RF Antenna Conducted Test

Product	:	Fruit and Vegetable Cleanliness Detector
Test Item	:	RF Antenna Conducted Test
Test Mode	:	Mode 1: Transmit - BLE 1Mbps
Test Date	:	2020/08/19

Figure Channel 00:

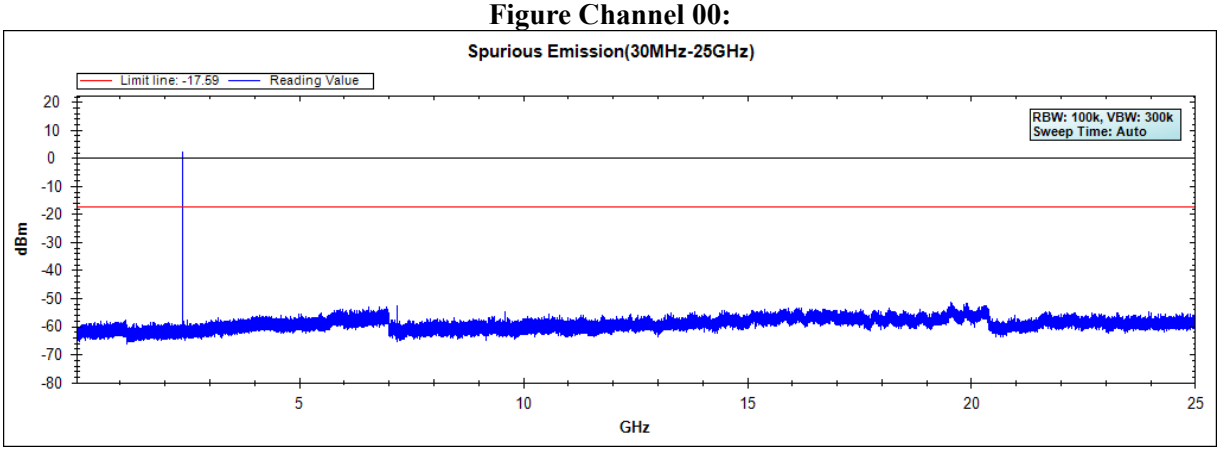


Figure Channel 19:

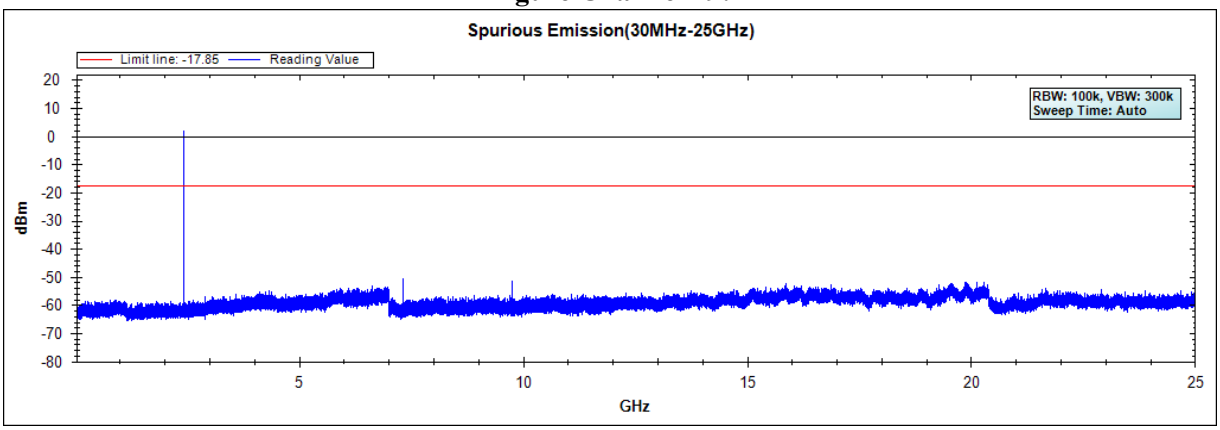
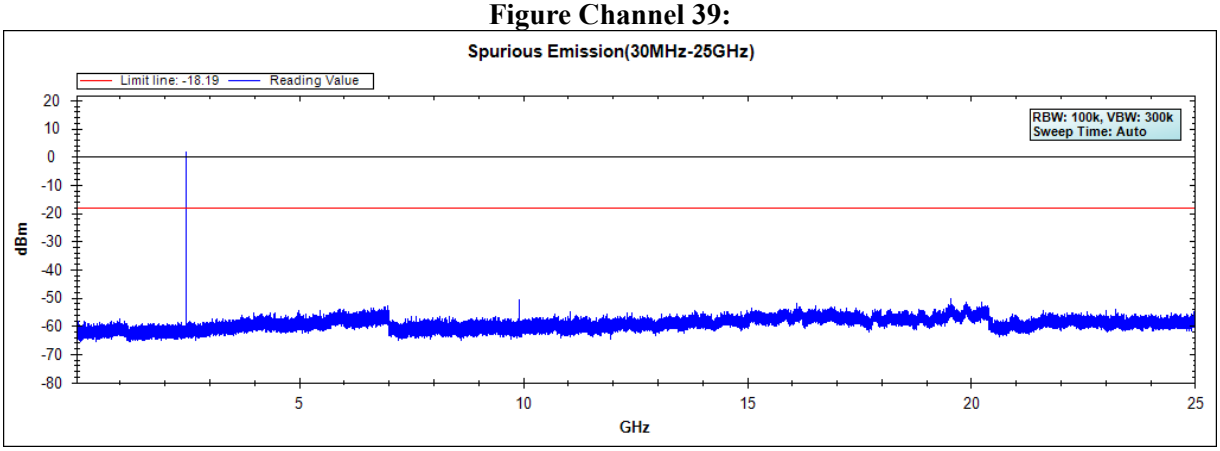


Figure Channel 39:



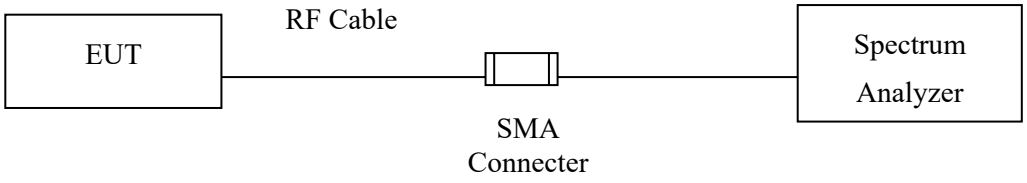
Note: The above test pattern is synthesized by multiple of the frequency range.

Test Result of RF Antenna Conducted Test	**PASS**

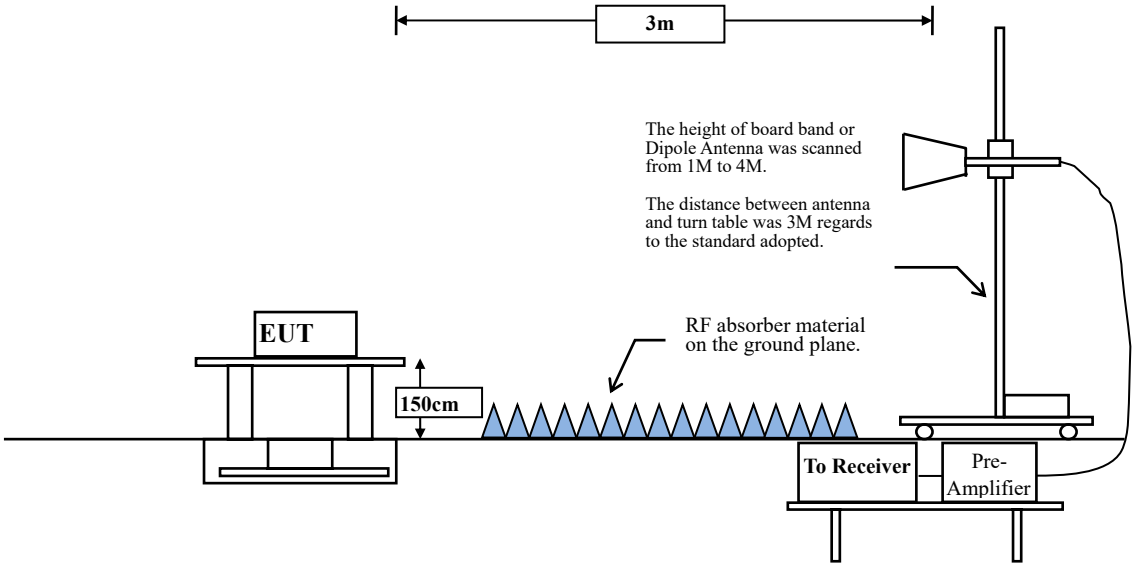
6. Band Edge

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 C63.10:2013 Section 11.12.1 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 C63.10 Section 11.12.2.4 Peak 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 C63.10 Section 11.12.2.5 Average 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.)

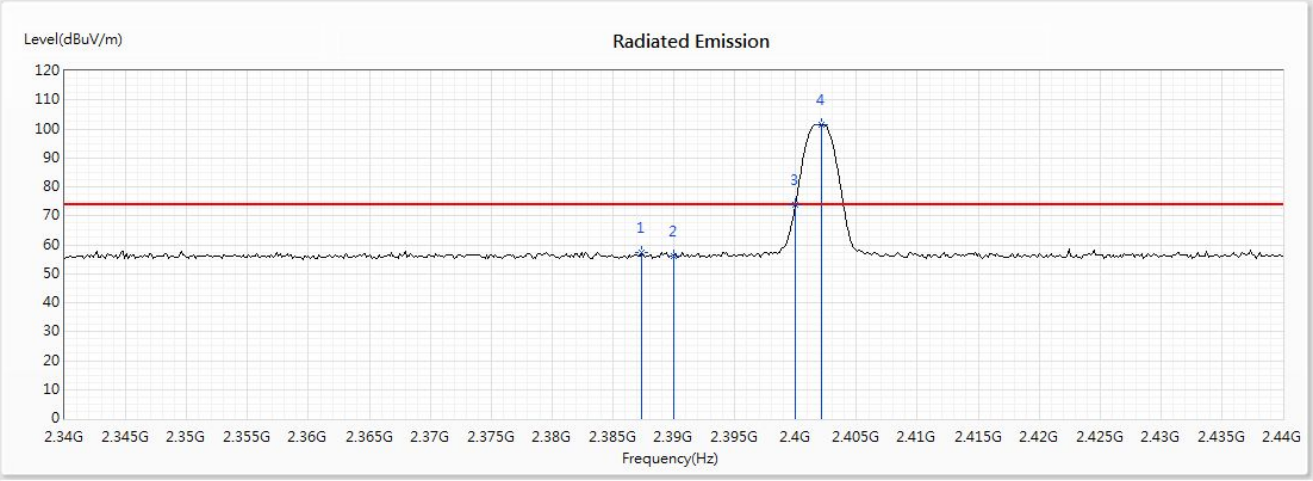
2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE	66.28	0.4130	2421	3000

Note: Duty Cycle Refer to Section 9.

6.4. Test Result of Band Edge

Product : Fruit and Vegetable Cleanliness Detector
Test Item : Band Edge
Test Mode : Mode 1: Transmit - BLE 1Mbps (2402MHz)
Test Date : 2020/08/15

Horizontal



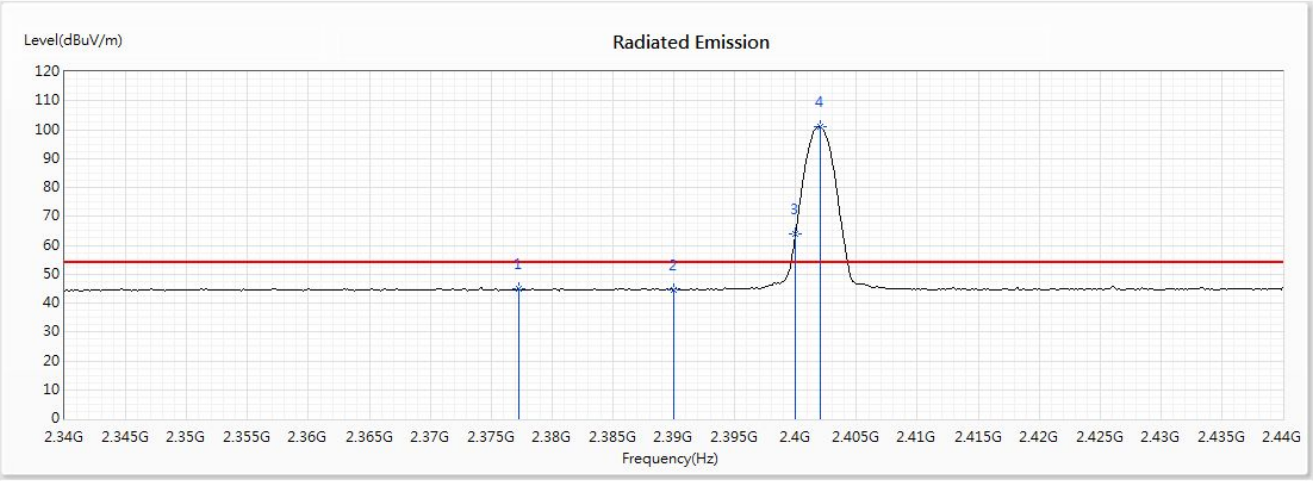
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	2387.391	57.26	74.00	-16.74	43.81	13.45	PK
2	2390	56.09	74.00	-17.91	42.63	13.46	PK
3	2400	73.92	--	--	60.43	13.49	PK
4	2402.174	101.56	--	--	88.07	13.49	PK

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Band Edge
Test Mode : Mode 1: Transmit - BLE 1Mbps (2402MHz)
Test Date : 2020/08/15

Horizontal



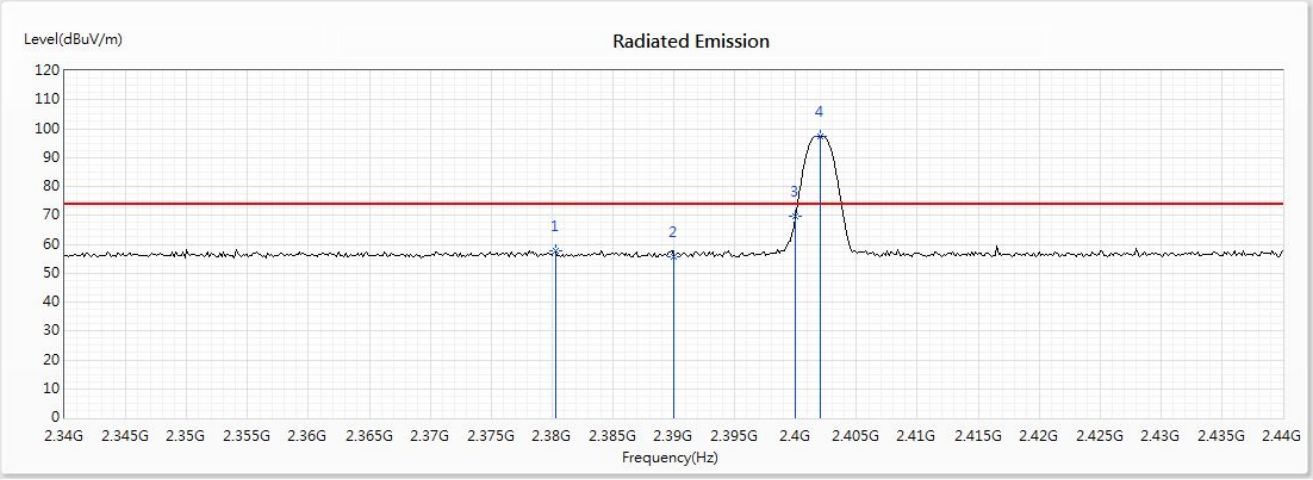
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	2377.246	44.86	54.00	-9.14	31.43	13.43	AV
2	2390	44.51	54.00	-9.49	31.05	13.46	AV
3	2400	64.09	--	--	50.60	13.49	AV
4	2402.029	100.92	--	--	87.43	13.49	AV

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Band Edge
Test Mode : Mode 1: Transmit - BLE 1Mbps (2402MHz)
Test Date : 2020/08/15

Vertical



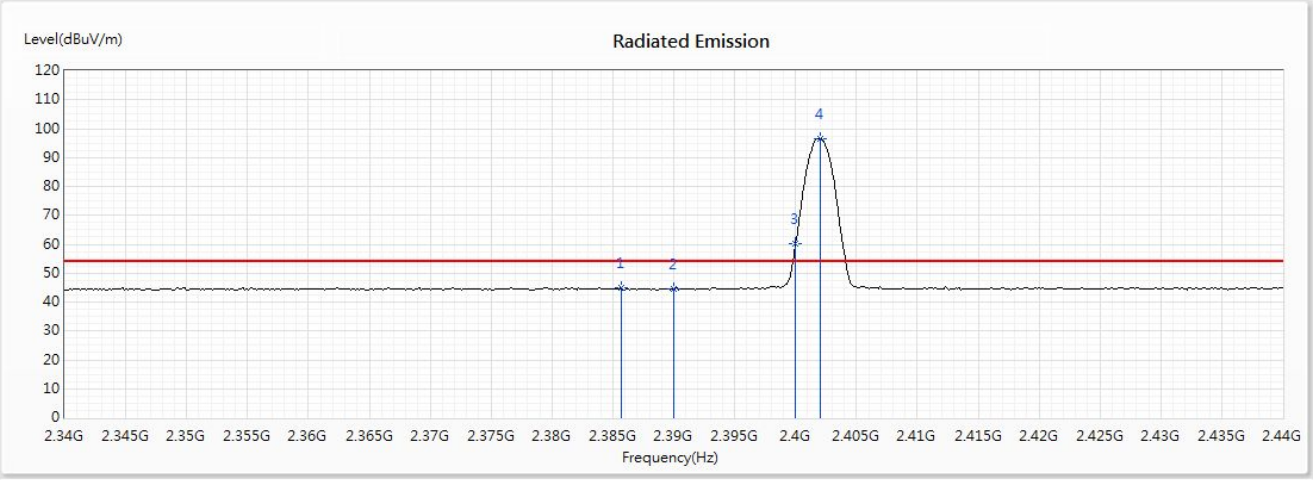
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	2380.29	57.62	74.00	-16.38	44.18	13.44	PK
2	2390	55.82	74.00	-18.18	42.36	13.46	PK
3	2400	69.54	--	--	56.05	13.49	PK
4	2402.029	97.34	--	--	83.85	13.49	PK

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Band Edge
Test Mode : Mode 1: Transmit - BLE 1Mbps (2402MHz)
Test Date : 2020/08/15

Vertical



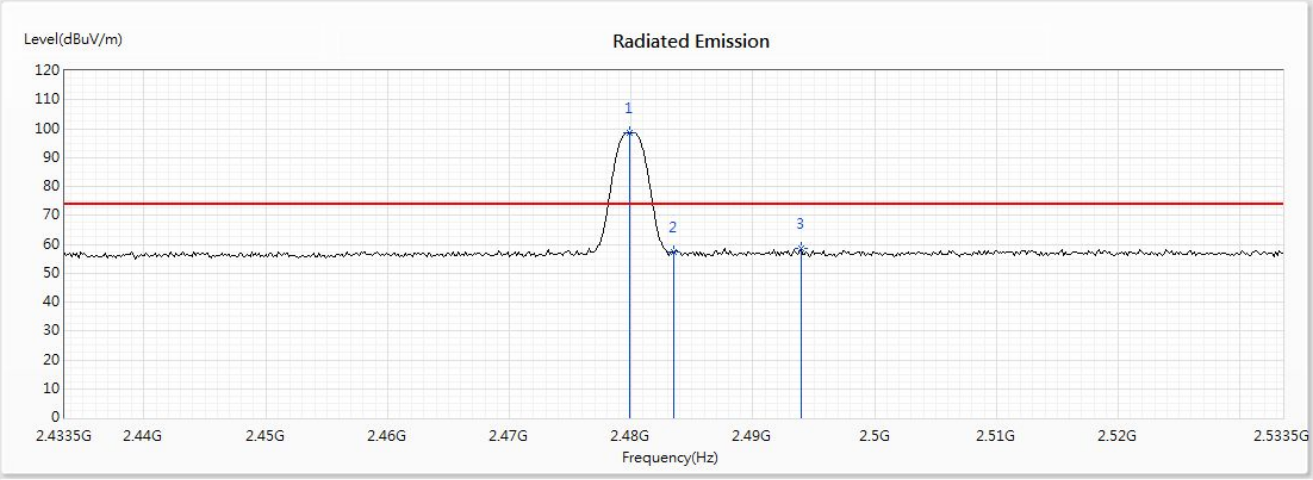
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	2385.652	45.05	54.00	-8.95	31.60	13.45	AV
2	2390	44.45	54.00	-9.55	30.99	13.46	AV
3	2400	60.16	--	--	46.67	13.49	AV
4	2402.029	96.66	--	--	83.17	13.49	AV

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Band Edge
Test Mode : Mode 1: Transmit - BLE 1Mbps (2480MHz)
Test Date : 2020/08/15

Horizontal



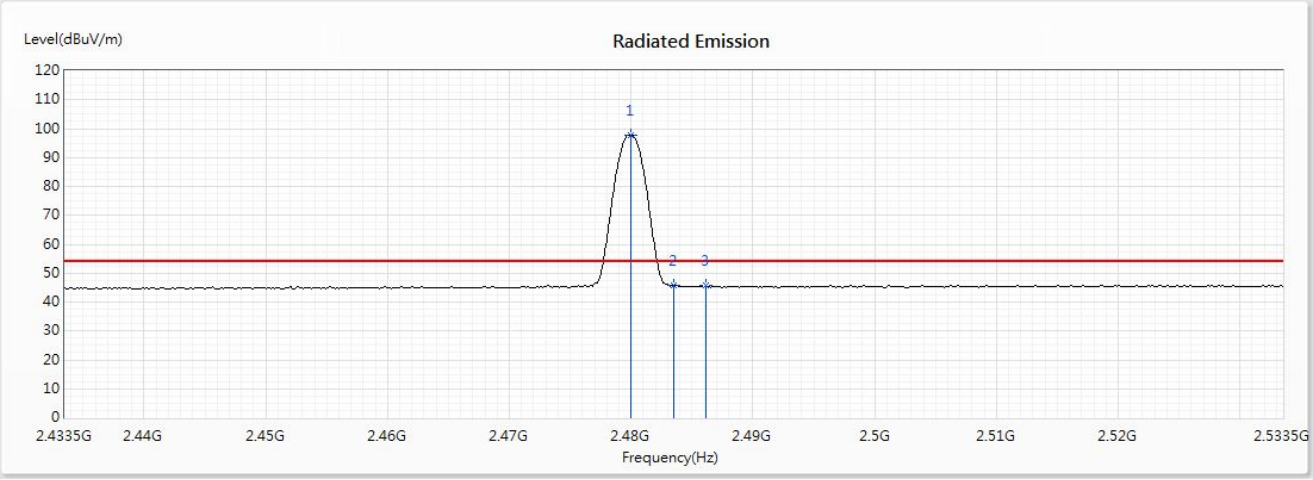
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	2479.877	98.60	--	--	84.69	13.91	PK
2	2483.5	57.16	74.00	-16.84	43.24	13.92	PK
3	2493.935	58.68	74.00	-15.32	44.67	14.01	PK

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Band Edge
Test Mode : Mode 1: Transmit - BLE 1Mbps (2480MHz)
Test Date : 2020/08/15

Horizontal



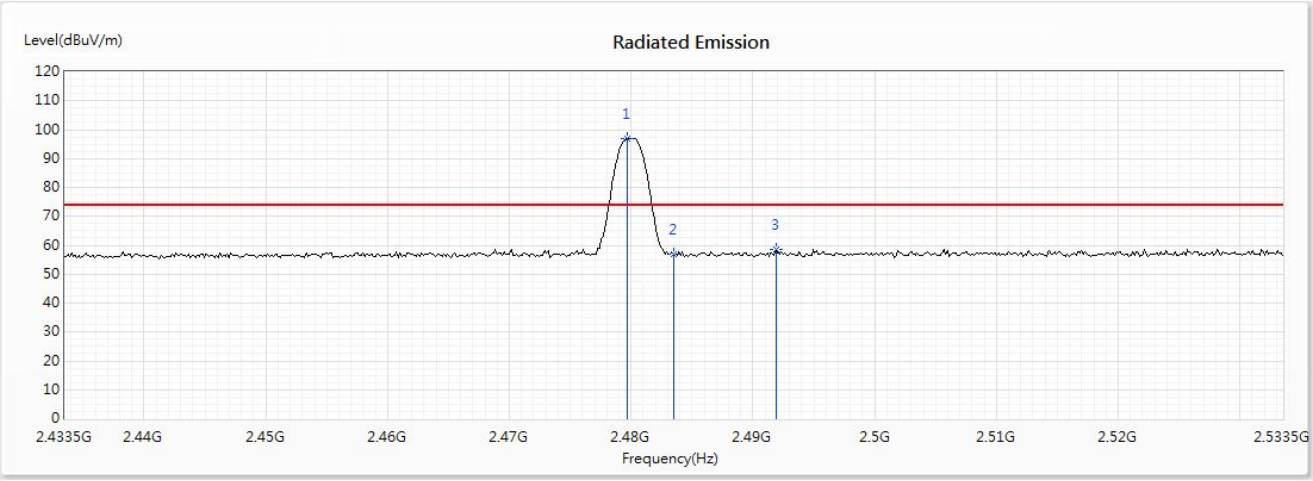
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	2480.022	97.92	--	--	84.01	13.91	AV
2	2483.5	45.63	54.00	-8.37	31.71	13.92	AV
3	2486.109	45.77	54.00	-8.23	31.82	13.95	AV

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	:	Fruit and Vegetable Cleanliness Detector
Test Item	:	Band Edge
Test Mode	:	Mode 1: Transmit - BLE 1Mbps (2480MHz)
Test Date	:	2020/08/15

Vertical



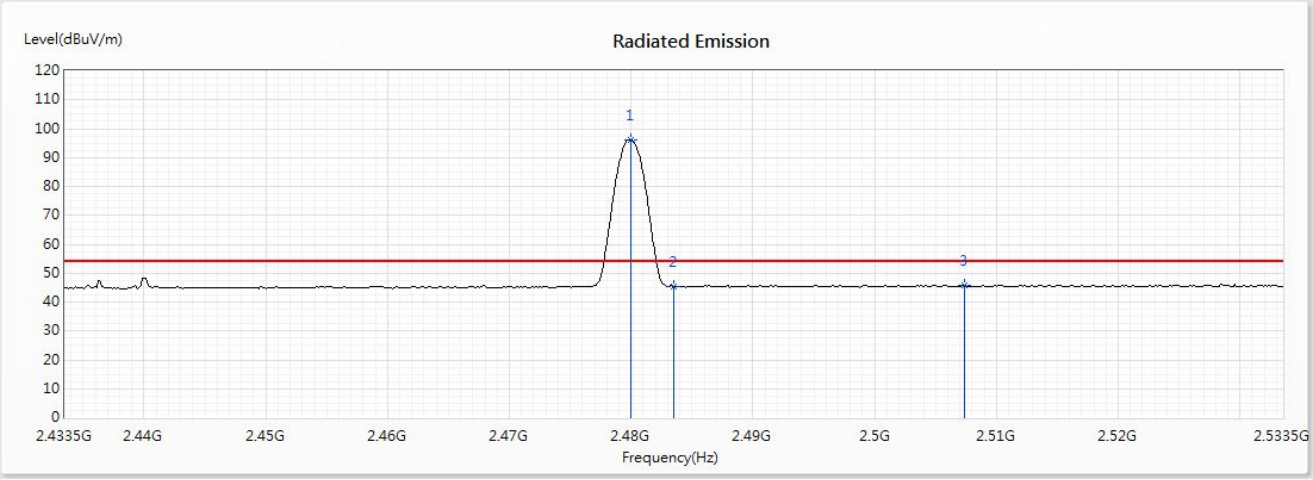
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	2479.732	96.80	--	--	82.89	13.91	PK
2	2483.5	56.87	74.00	-17.13	42.95	13.92	PK
3	2491.906	58.70	74.00	-15.30	44.71	13.99	PK

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 : Fruit and Vegetable Cleanliness Detector
Test Item : Band Edge
Test Mode : Mode 1: Transmit - BLE 1Mbps (2480MHz)
Test Date : 2020/08/15

Vertical



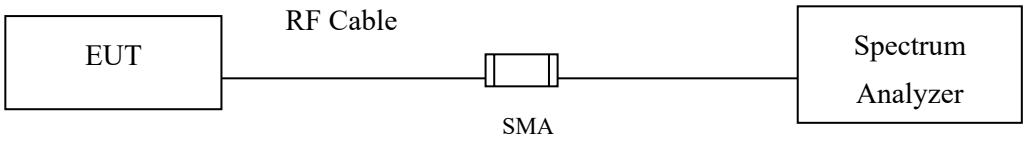
No	Frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Reading Level (dBμV)	Correct Factor (dB/m)	Detector Type
1	2480.022	96.14	--	--	82.23	13.91	AV
2	2483.5	45.29	54.00	-8.71	31.37	13.92	AV
3	2507.413	45.97	54.00	-8.03	31.92	14.05	AV

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.

Test Result of Band Edge	**PASS**

7. 6dB Bandwidth

7.1. Test Setup



7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

7.3. Test Procedure

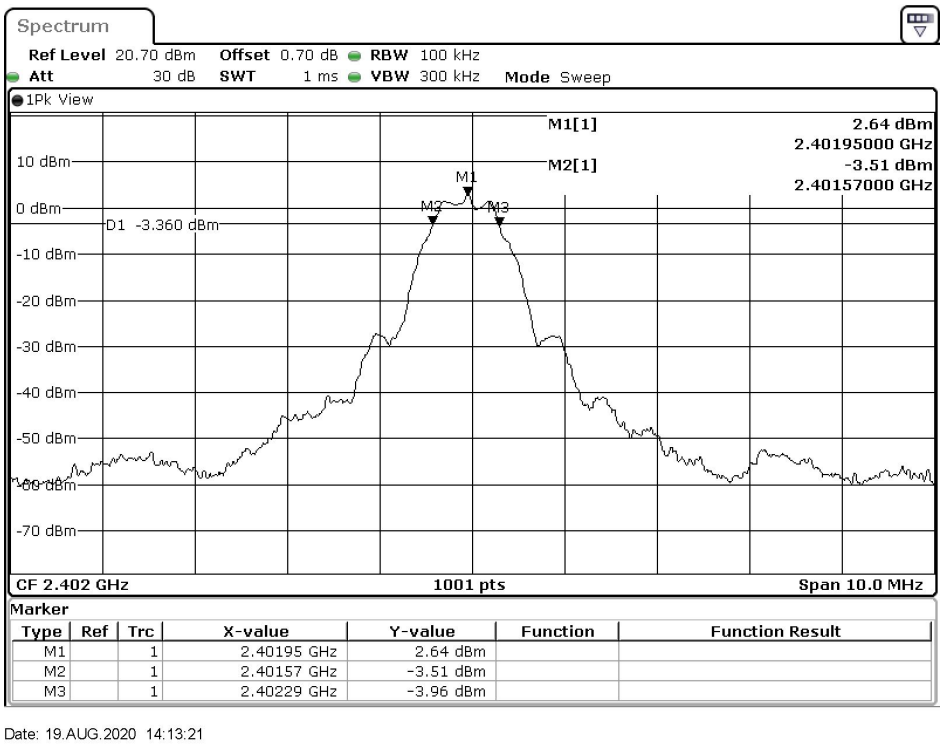
The EUT was setup according to ANSI C63.4, 2014; tested according to ANSI C63.10 Section 11.8 for compliance to FCC 47CFR 15.247 requirements.

7.4. Test Result of 6dB Bandwidth

Product : Fruit and Vegetable Cleanliness Detector
Test Item : 6dB Bandwidth Data
Test Mode : Mode 1: Transmit - BLE 1Mbps

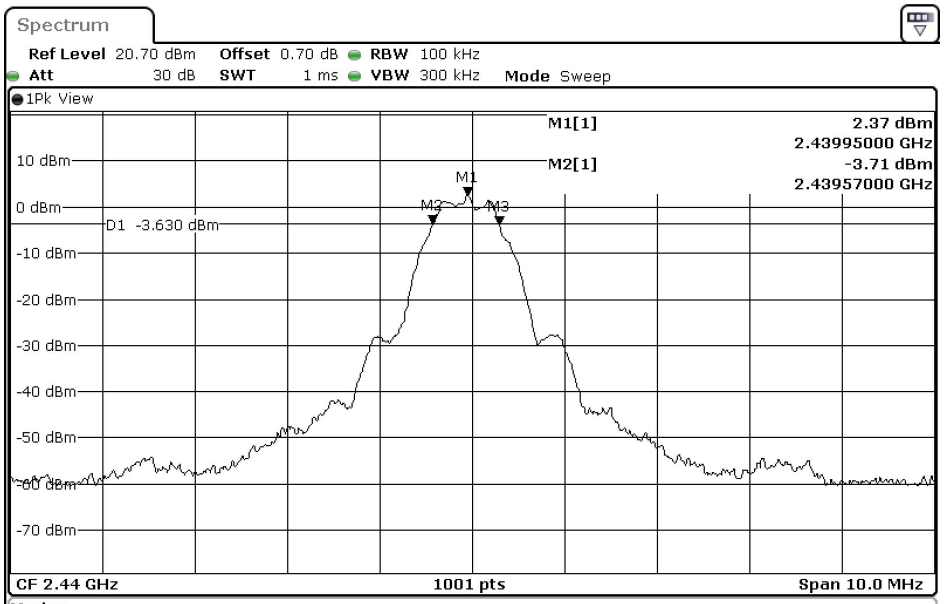
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	720	>500	Pass
19	2440	720	>500	Pass
39	2480	710	>500	Pass

Figure Channel 00:



Date: 19.AUG.2020 14:13:21

Figure Channel 19:

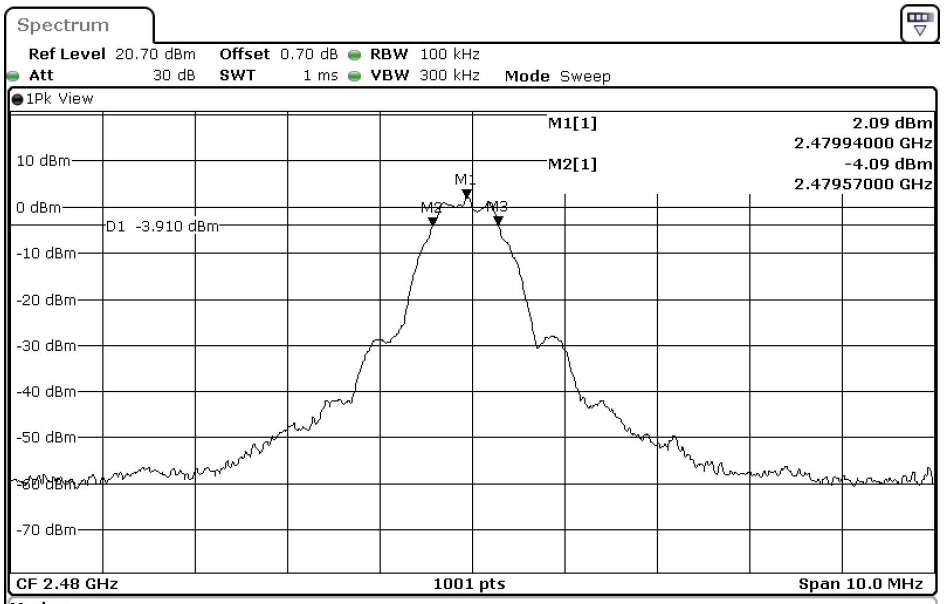


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.43995 GHz	2.37 dBm		
M2		1	2.43957 GHz	-3.71 dBm		
M3		1	2.44029 GHz	-3.91 dBm		

Date: 19.AUG.2020 14:17:22

Figure Channel 39:



Marker

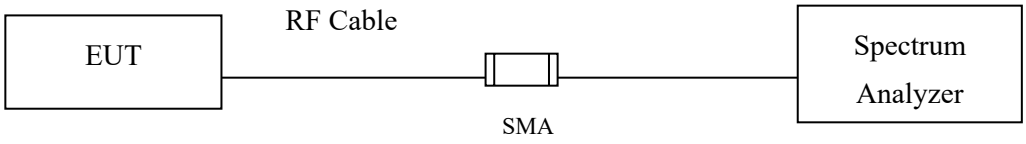
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47994 GHz	2.09 dBm		
M2		1	2.47957 GHz	-4.09 dBm		
M3		1	2.48028 GHz	-3.96 dBm		

Date: 19.AUG.2020 14:21:13

Test Result of 6dB Bandwidth	**PASS**

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; tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

The maximum power spectral density using C63.10 Section 11.10.2 Method PKPSD (peak PSD)

8.4. Test Result of Power Density

Product : Fruit and Vegetable Cleanliness Detector
Test Item : Power Density Data
Test Mode : Mode 1: Transmit - BLE 1Mbps

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	2.41	≦8dBm	Pass
19	2440	2.15	≦8dBm	Pass
39	2480	1.81	≦8dBm	Pass

Figure Channel 00:

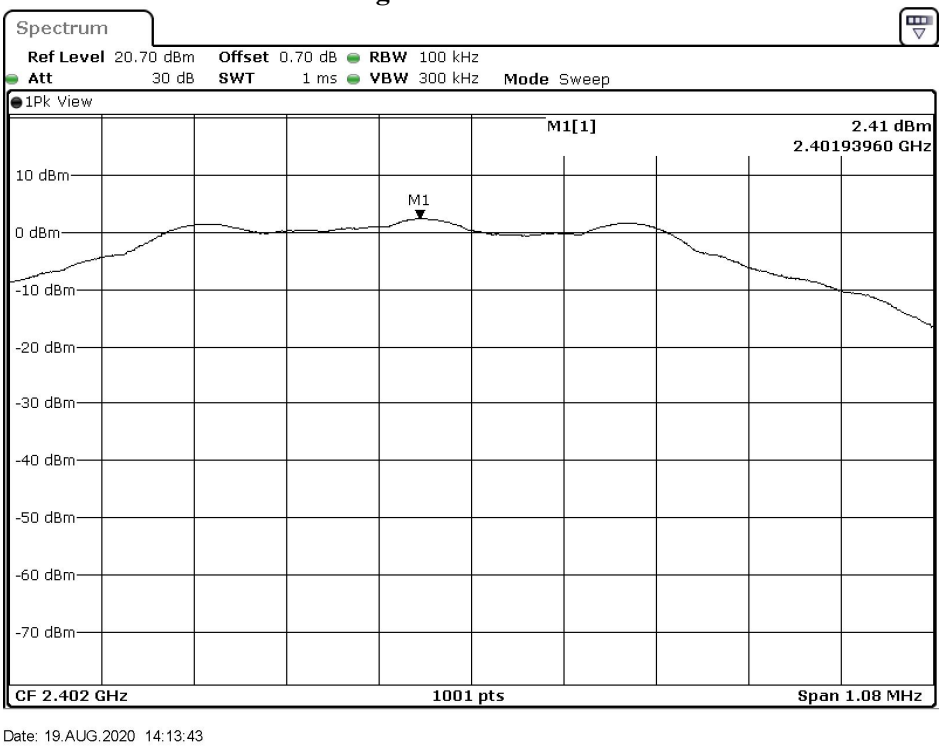
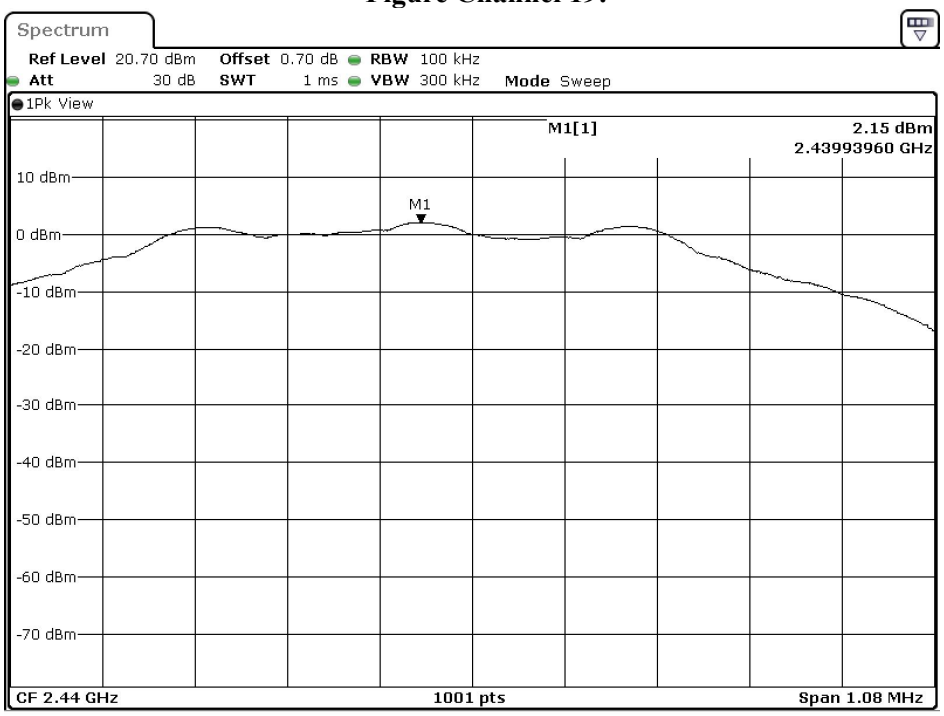
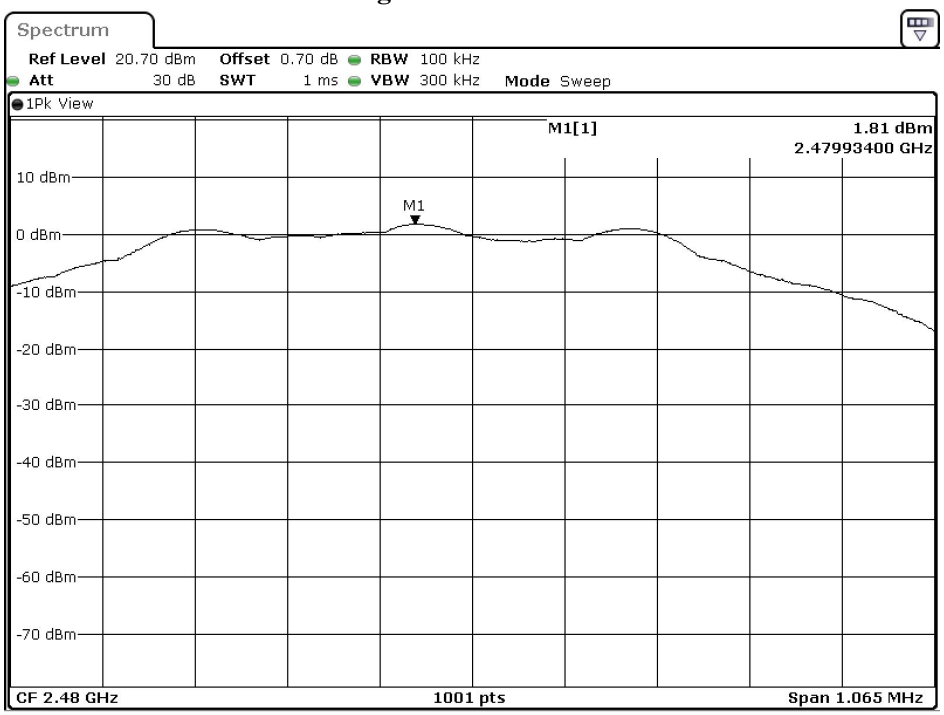


Figure Channel 19:



Date: 19.AUG.2020 14:17:43

Figure Channel 39:



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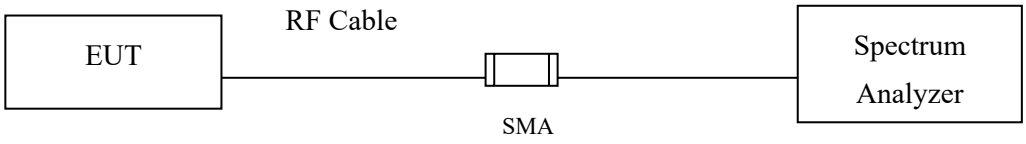
Test Result of Power Density	**PASS**

9. Duty Cycle

9.1. Test Setup



9.2. Test Procedure

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

9.3. Test Result of Duty Cycle

Product : Fruit and Vegetable Cleanliness Detector
Test Item : Duty Cycle
Test Mode : Mode 1: Transmit - BLE 1Mbps

Duty Cycle Formula:

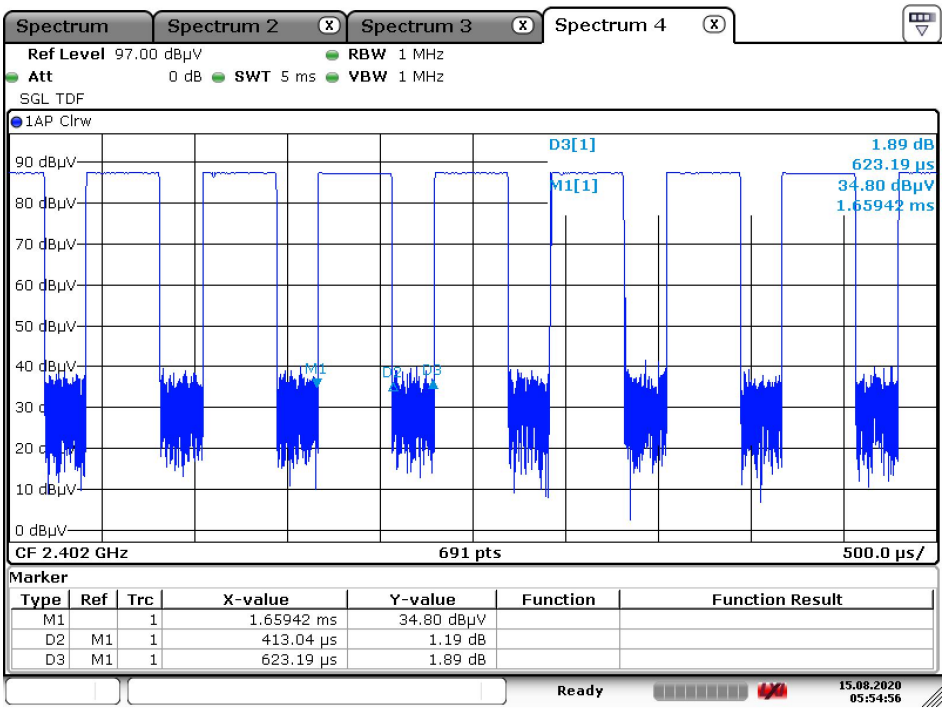
Duty Cycle = Ton / (Ton + Toff)

Duty Factor = 10 Log (1/Duty Cycle)

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
BLE	0.4130	0.6232	66.28	1.79

BLE



Date: 15.AUG.2020 05:54:56

10. EMI Reduction Method During Compliance Testing

No modification was made during testing.