FCC Test Report

Product Name	M2 Nurse Call Module
Model No.	BM-B01
FCC ID.	2AQXIMTN-M2

Applicant	Melten Inc.
Address	7F.-3, No.51, Sec. 4, Zhongyang Rd., Tucheng Dist., New Taipei City 236, Taiwan (R.O.C.)

Date of Receipt	Jun. 05, 2018
Issued Date	Jul. 19, 2018
Report No.	1860048R-RFUSP01V00-B
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..

Test Report

Issued Date: Jul. 19, 2018
Report No.: 1860048R-RFUSP01V00-B

Product Name	M2 Nurse Call Module
Applicant	Melten Inc.
Address	7F.-3, No.51, Sec. 4, Zhongyang Rd., Tucheng Dist., New Taipei City 236, Taiwan (R.O.C.)
Manufacturer	Melten Inc.
Model No.	BM-B01
FCC ID.	2AQXIMTN-M2
EUT Rated Voltage	Power by POE (48V/0.4A)
EUT Test Voltage	AC 120V/60Hz
Trade Name	Melten
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v04
Test Result	Complied

Documented By : Elephant Chen

(Adm. Assistant / Elephant Chen)

Tested By : Jason Tuan

(Engineer / Jason Tuan)

Approved By :

(Director / Vincent Lin)

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Attachment 1: EUT Test Photographs
Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	M2 Nurse Call Module
Trade Name	Melten
Model No.	BM-B01
FCC ID.	2AQXIMTN-M2
Frequency Range	2402 – 2480MHz
Channel Number	V4.0: 40CH
Type of Modulation	V4.0: GFSK(1Mbps)
Antenna Type	Print on PCB Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Melten	N/A	Print on PCB	-1.17dBi for 2.4 GHz

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

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

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

Note:

1. The EUT is a M2 Nurse Call Module with a built-in WLAN、Bluetooth V4.0,V3.0, V2.1+EDR,V4.0 transceiver, this report for Bluetooth V4.0.
2. The WLAN module of EUT has been made in FCC ID:2ALWN-W708.
3. 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.
4. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.

Test Mode	Mode 1: Transmit - BLE (GFSK)

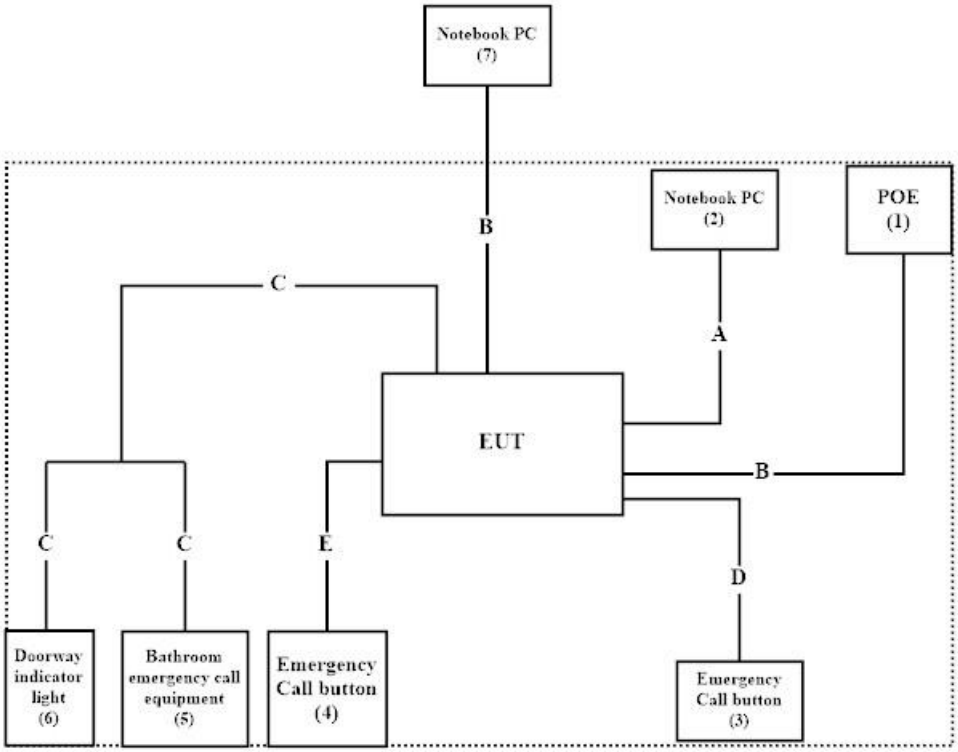
1.3. Tested System Details

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	POE	CERIO	POE-S48V2	AIB WIGW21	N/A
2	Notebook PC	DELL	Latitude E5440	74BTK32	Non-Shielded, 0.8m
3	Emergency Call button	N/A	N/A	N/A	N/A
4	Emergency Call button	N/A	N/A	N/A	N/A
5	Bathroom emergency call equipment	Melten Inc.	TM-A01	TMOAIA1803024	N/A
6	Doorway indicator light	Melten Inc.	DL-A01	N/A	N/A
7	Notebook PC	DELL	Latitude E5440	FS9TK32	Non-Shielded, 0.8m

Signal Cable Type		Signal cable Description
A	USB Cable	Non-shielded, 0.7m
B	LAN Cable	Shielded, 1.0m, two PCS.
C	LAN Cable	Non-shielded, 0.5m, three PCS.
D	Signal Cable	Non-shielded, 2.0m
E	Signal Cable	Non-shielded, 2.0m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software ” Blue Test3 2.5.2” on the Notebook PC.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:
http://www.dekra.com.tw/english/about/certificates.aspx?bval=5
The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en.aspx

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd
Site Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	Agilent	N9010A	MY48030495	2017/7/22	2018/7/21
X	Power Meter	Anritsu	ML2495A	6K00003357	2018/6/23	2018/6/22
X	EMI Test Receiver	R&S	ESCS 30	100369	2017/10/13	2018/10/12
X	LISN	R&S	ESH3-Z5	836679/017	2018/1/7	2019/1/6
X	LISN	R&S	ENV216	100097	2018/1/7	2019/1/6
X	Coaxial Cable	QTK(Arnist)	RG 400	LC018-RG	2018/6/25	2019/6/24

For Radiated measurements /Site3/CB8

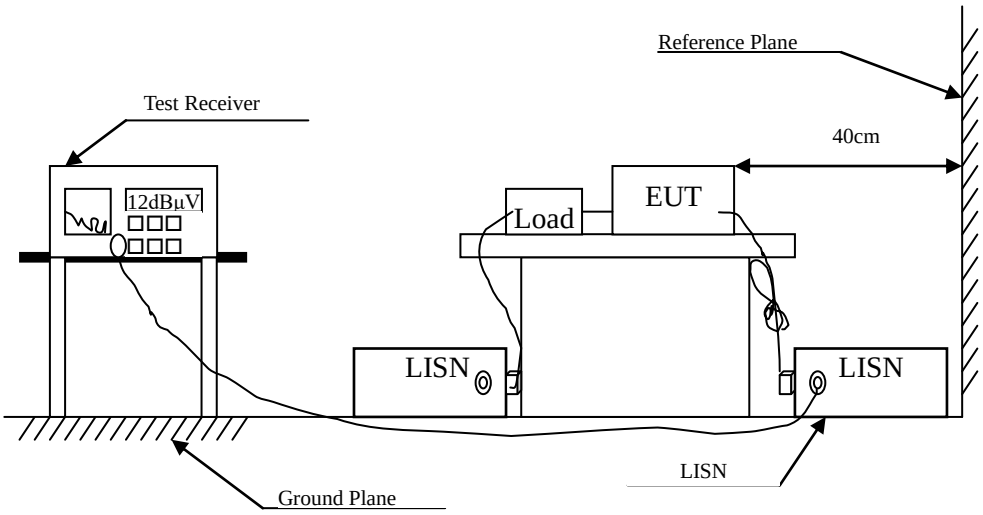
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2018/1/5	2019/1/4
X	Loop Antenna	Teseq	HLA6121	37133	2018/3/18	2019/3/17
X	Bi-Log Antenna	Schaffner Chase	CBL6112B	2707	2017/9/10	2018/9/9
X	Horn Antenna	ETS-Lindgren	3117	00135205	2018/4/6	2019/4/5
X	Horn Antenna	Schwarzbeck	BBHA9170	9170430	2018/1/11	2019/1/10
X	Pre-Amplifier	QTK	AP/0100A	CHM/0901069	2018/6/28	2018/6/27
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2018/1/27	2018/1/26
X	Pre-Amplifier	NARDA WE	DBL-1840N506	013	2017/9/30	2017/9/29
X	Filter	MicroTRON	BRM50701	019	2017/10/20	2018/10/19
X	Filter	Microwave Circuits	N0257881	36681	2017/12/7	2018/12/6
X	EMI Test Receiver	R&S	ESR26	101385	2017/9/29	2018/9/28
X	Coaxial Cable	QTK(Arnist)	SUCOFLEX 106	L1606-015C	2018/6/25	2019/6/24
X	EMI Test Receiver	R&S	ESCS 30	838251/001	2017/7/21	2018/7/20
X	Coaxial Cable	QTK(Arnist)	RG 214	LC003-RG	2018/6/21	2019/6/20
X	Coaxial signal switch	Anritsu	MP59B	6201415889	2018/6/16	2019/6/15

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	:	M2 Nurse Call Module
Test Item	:	Conducted Emission Test
Power Line	:	Line 1
Test date	:	2018/06/23
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV	Margin dB	Limit dBμV
LINE 1					
Quasi-Peak					
0.170	9.743	43.100	52.843	-12.586	65.429
0.338	9.743	39.240	48.983	-11.646	60.629
0.779	9.771	29.440	39.211	-16.789	56.000
2.263	9.831	31.280	41.111	-14.889	56.000
8.029	10.012	30.100	40.112	-19.888	60.000
21.361	10.244	27.280	37.524	-22.476	60.000
Average					
0.170	9.743	39.240	48.983	-6.446	55.429
0.338	9.743	32.970	42.713	-7.916	50.629
0.779	9.771	24.280	34.051	-11.949	46.000
2.263	9.831	26.150	35.981	-10.019	46.000
8.029	10.012	25.790	35.802	-14.198	50.000
21.361	10.244	26.150	36.394	-13.606	50.000

Note:

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

Product	:	M2 Nurse Call Module
Test Item	:	Conducted Emission Test
Power Line	:	Line 2
Test date	:	2018/06/23
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2440MHz)

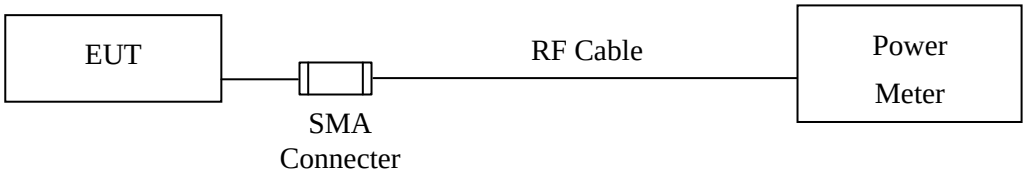
Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV	Margin dB	Limit dBμV
LINE 2					
Quasi-Peak					
0.162	9.736	44.000	53.736	-11.921	65.657
0.357	9.734	37.820	47.554	-12.532	60.086
0.912	9.767	29.860	39.627	-16.373	56.000
3.517	9.870	32.400	42.270	-13.730	56.000
8.134	10.034	30.380	40.414	-19.586	60.000
20.880	10.390	30.280	40.670	-19.330	60.000
Average					
0.162	9.736	35.310	45.046	-10.611	55.657
0.357	9.734	33.710	43.444	-6.642	50.086
0.912	9.767	25.190	34.957	-11.043	46.000
3.517	9.870	28.990	38.860	-7.140	46.000
8.134	10.034	26.950	36.984	-13.016	50.000
20.880	10.390	28.200	38.590	-11.410	50.000

Note:

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

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

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

3.4. Uncertainty

± 1.19 dB

3.5. Test Result of Peak Power Output

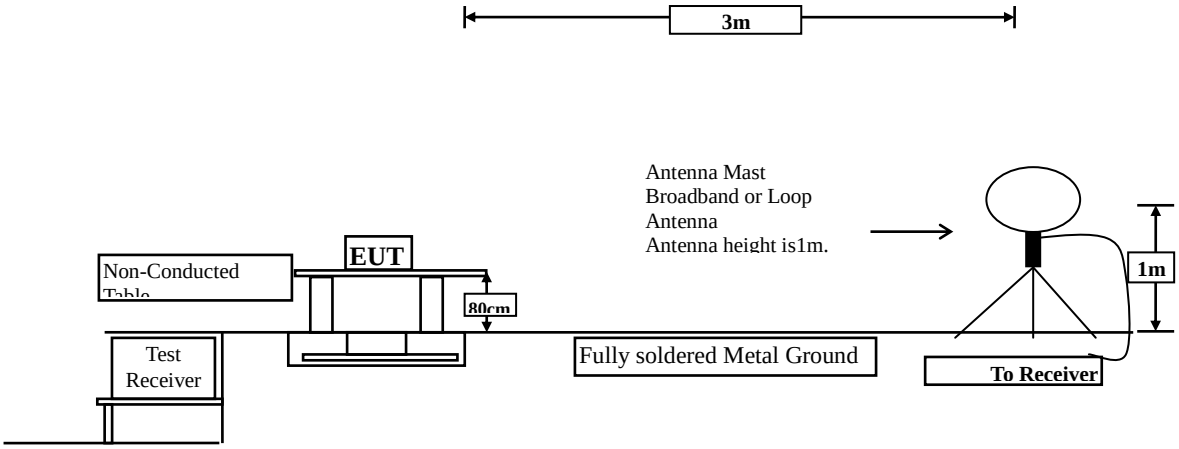
Product : M2 Nurse Call Module
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2018/06/19
Test Mode : Mode 1: Transmit - BLE (GFSK)

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	6.17	1 Watt= 30 dBm	Pass
Channel 19	2440.00	7.51	1 Watt= 30 dBm	Pass
Channel 39	2480.00	8.10	1 Watt= 30 dBm	Pass

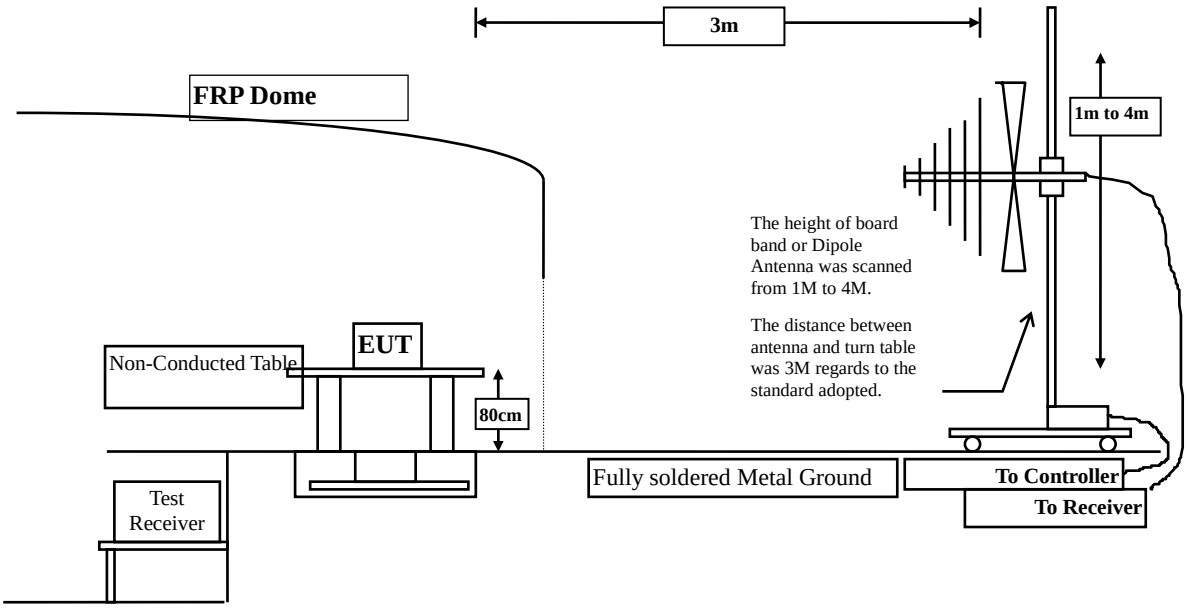
4. Radiated Emission

4.1. Test Setup

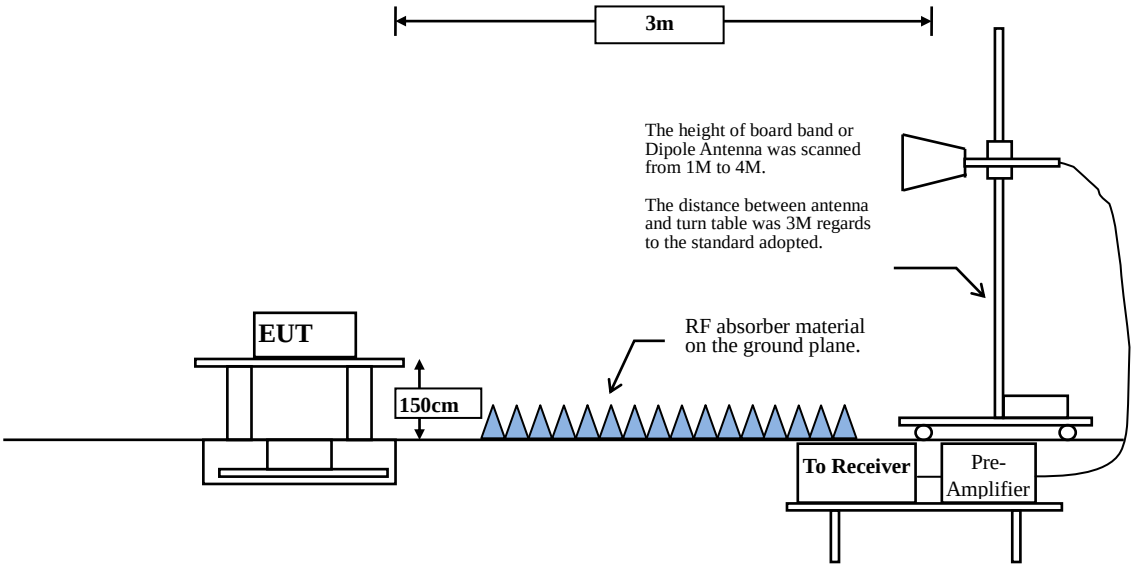
Under 30MHz



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	63.22	0.3986	2509	3k

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	:	M2 Nurse Call Module
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2018/06/25
Test Mode	:	Mode 1: Transmit - BLE (GFSK)(2402MHz)

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV/m	Margin dB	Limit dBμV/m
Horizontal					
Peak Detector:					
4804.000	2.511	43.290	45.800	-28.200	74.000
7206.000	9.511	38.480	47.991	-26.009	74.000
9608.000	10.394	37.680	48.074	-25.926	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	2.923	43.320	46.242	-27.758	74.000
7206.000	9.988	38.490	48.479	-25.521	74.000
9608.000	10.847	37.720	48.567	-25.433	74.000
Average Detector:					
--					

Note:

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

Product	:	M2 Nurse Call Module
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2018/06/25
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV/m	Margin dB	Limit dBμV/m
Horizontal					
Peak Detector:					
4880.000	2.038	45.610	47.648	-26.352	74.000
7320.000	9.699	39.080	48.779	-25.221	74.000
9760.000	9.665	37.970	47.635	-26.365	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4880.000	2.499	43.190	45.689	-28.311	74.000
7320.000	10.303	38.160	48.463	-25.537	74.000
9760.000	10.299	37.900	48.200	-25.800	74.000
Average Detector:					
--					

Note:

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

Product	:	M2 Nurse Call Module
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2018/06/25
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2480MHz)

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV/m	Margin dB	Limit dBμV/m
Horizontal					
Peak Detector:					
4960.000	2.582	46.420	49.002	-24.998	74.000
7440.000	10.555	38.710	49.265	-24.735	74.000
9920.000	10.206	38.390	48.596	-25.404	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4960.000	3.398	44.250	47.649	-26.351	74.000
7440.000	11.214	40.150	51.364	-22.636	74.000
9920.000	11.245	38.270	49.515	-24.485	74.000
Average Detector:					
--					

Note:

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

Product	:	M2 Nurse Call Module
Test Item	:	General Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2018/06/27
Test Mode	:	Mode 1: Transmit - BLE (GFSK) (2440MHz)

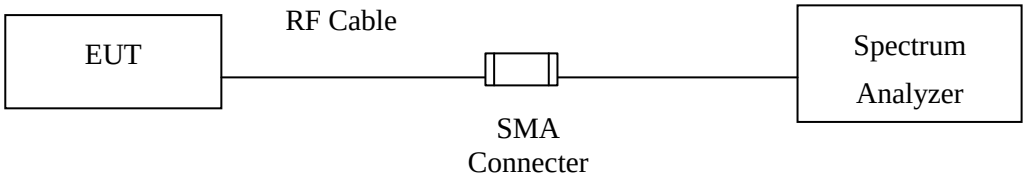
Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV/m	Margin dB	Limit dBμV/m
Horizontal					
191.667	10.073	26.396	36.469	-7.031	43.500
255.401	14.912	27.825	42.737	-3.263	46.000
384.423	20.415	18.627	39.042	-6.958	46.000
737.292	25.816	13.747	39.563	-6.437	46.000
768.381	26.268	13.940	40.209	-5.791	46.000
801.026	26.758	14.902	41.660	-4.340	46.000
Vertical					
191.667	19.343	14.665	34.008	-9.492	43.500
255.401	19.197	20.111	39.308	-6.692	46.000
384.423	19.569	14.335	33.904	-12.096	46.000
511.891	21.122	13.508	34.630	-11.370	46.000
737.292	24.056	11.881	35.937	-10.063	46.000
801.026	24.903	16.410	41.313	-4.687	46.000

Note:

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

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

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

5.4. Uncertainty

± 1.20dB

5.5. Test Result of RF Antenna Conducted Test

Product	:	M2 Nurse Call Module
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test date	:	2018/06/23
Test Mode	:	Mode 1: Transmit - BLE (GFSK)

Figure Channel 00:

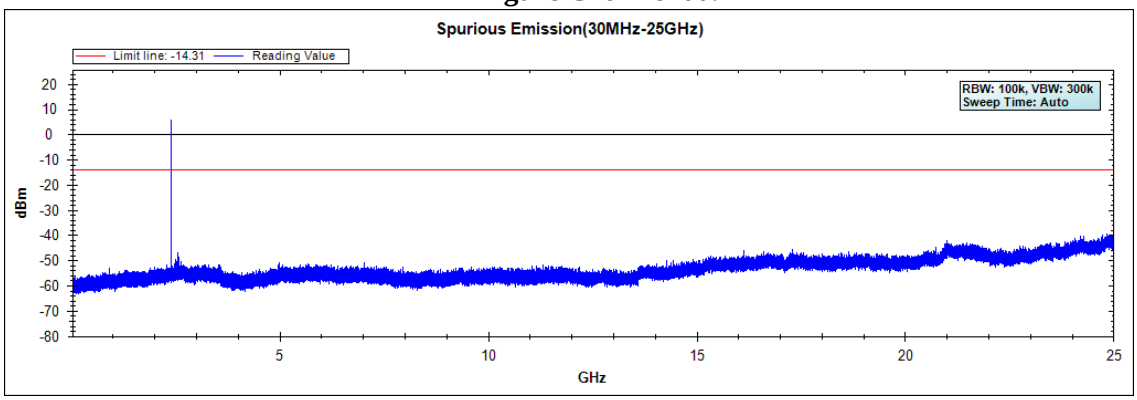


Figure Channel 19:

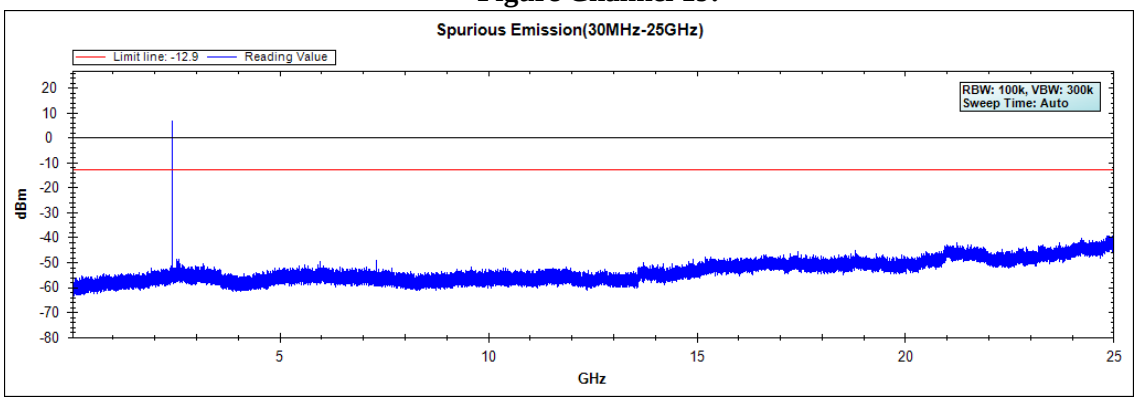
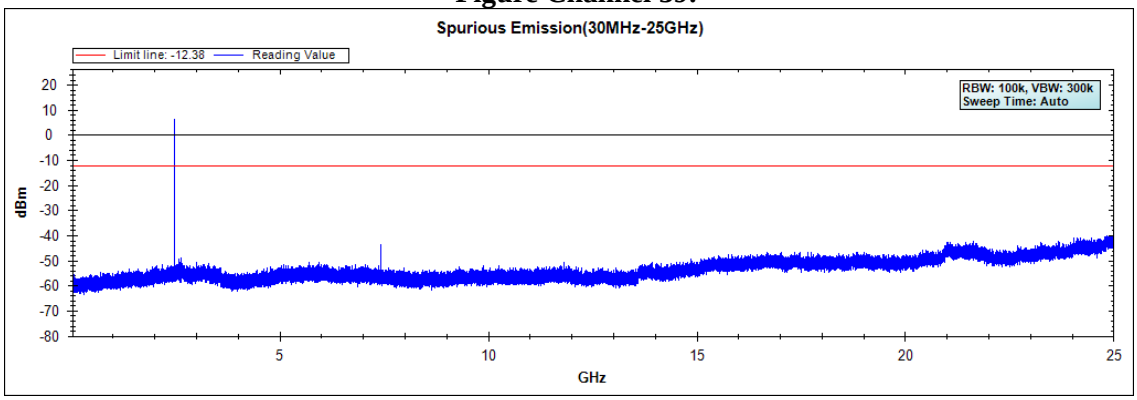


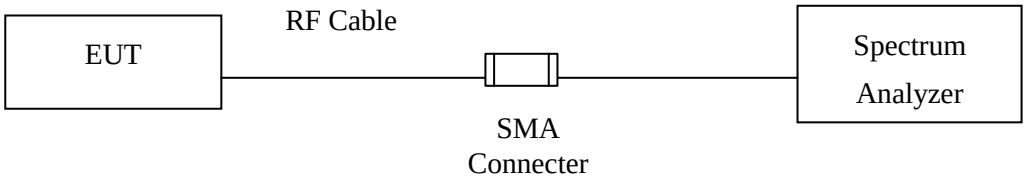
Figure Channel 39:



6. Band Edge

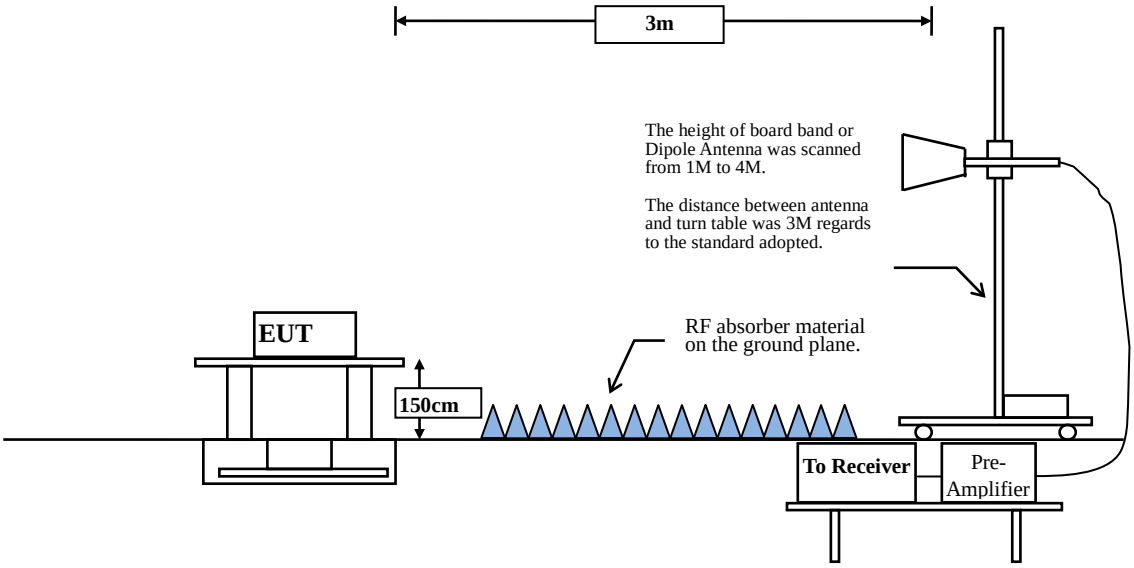
6.1. Test Setup

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	63.22	0.3986	2509	3k

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 : M2 Nurse Call Module
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2018/06/24
Test Mode : Mode 1: Transmit - BLE (GFSK)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2390.000	6.474	41.055	47.530	74.00	54.00	Pass
00 (Peak)	2400.000	6.528	55.229	61.757	--	--	--
00 (Peak)	2402.319	6.542	85.341	91.883	--	--	--
00 (Average)	2390.000	6.474	23.041	29.516	74.00	54.00	Pass
00 (Average)	2400.000	6.528	33.854	40.382	--	--	--
00 (Average)	2402.029	6.540	63.218	69.758	--	--	--

Figure Channel 00: Horizontal (Peak)

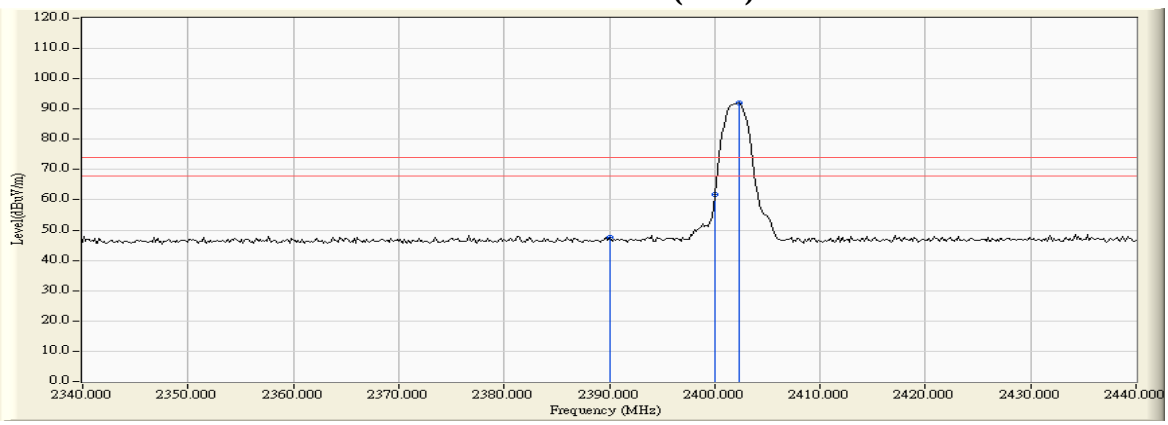
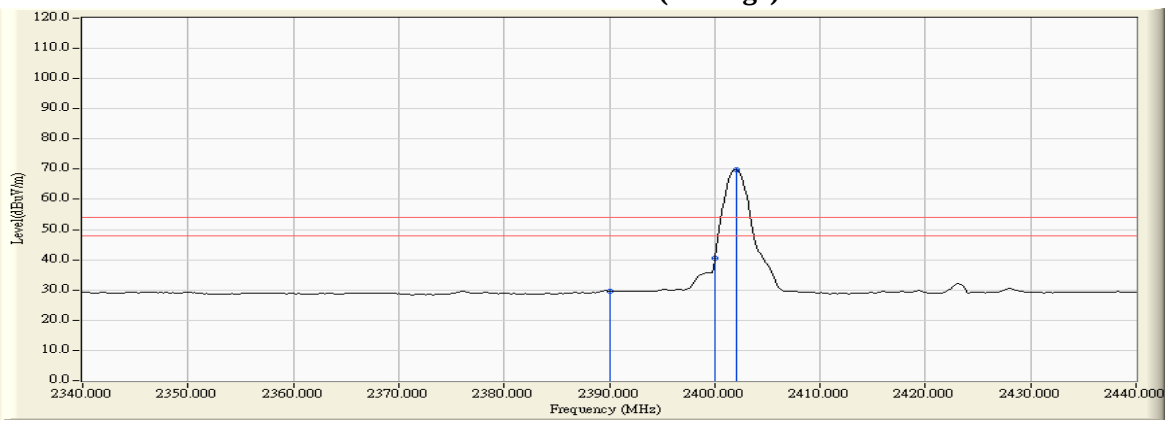


Figure Channel 00: Horizontal (Average)



Note:

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

Product	:	M2 Nurse Call Module
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2018/06/24
Test Mode	:	Mode 1: Transmit - BLE (GFSK)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2390.000	5.880	40.674	46.555	74.00	54.00	Pass
00 (Peak)	2400.000	5.879	53.705	59.584	--	--	--
00 (Peak)	2402.319	5.885	83.985	89.870	--	--	--
00 (Average)	2390.000	5.880	24.592	30.473	74.00	54.00	Pass
00 (Average)	2400.000	5.879	34.085	39.964	--	--	--
00 (Average)	2402.029	5.884	63.025	68.909	--	--	--

Figure Channel 00: Vertical (Peak)

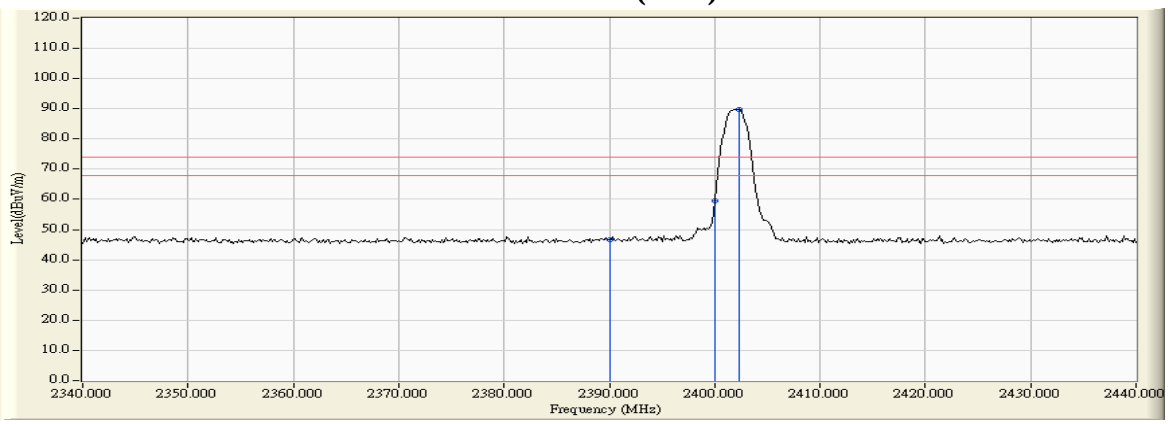
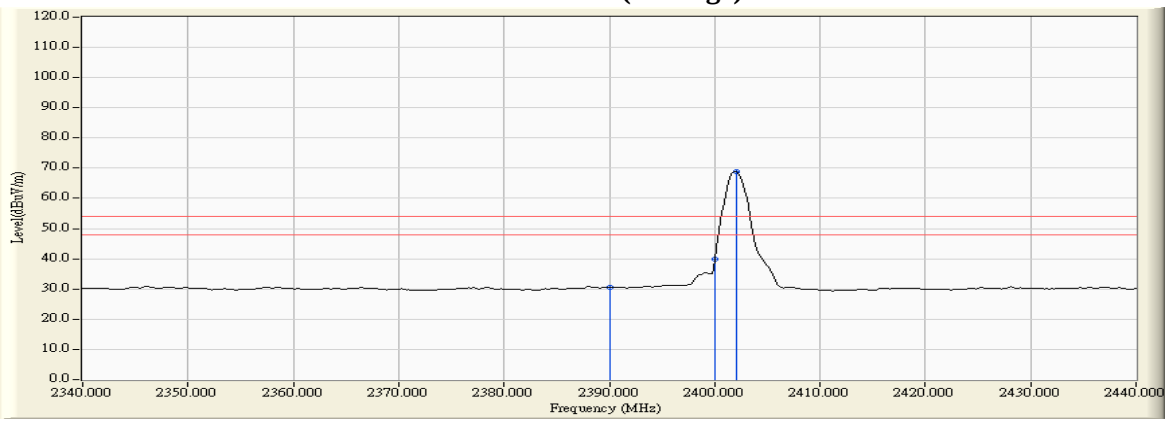


Figure Channel 00: Vertical (Average)



Note:

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

Product	:	M2 Nurse Call Module
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2018/06/24
Test Mode	:	Mode 1: Transmit - BLE (GFSK)

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
39 (Peak)	2479.732	7.084	88.894	95.977	--	--	--
39 (Peak)	2483.500	7.110	50.471	57.581	74.00	54.00	Pass
39 (Average)	2480.022	7.086	65.837	72.922	--	--	--
39 (Average)	2483.500	7.110	31.071	38.181	74.00	54.00	Pass

Figure Channel 39: Horizontal (Peak)

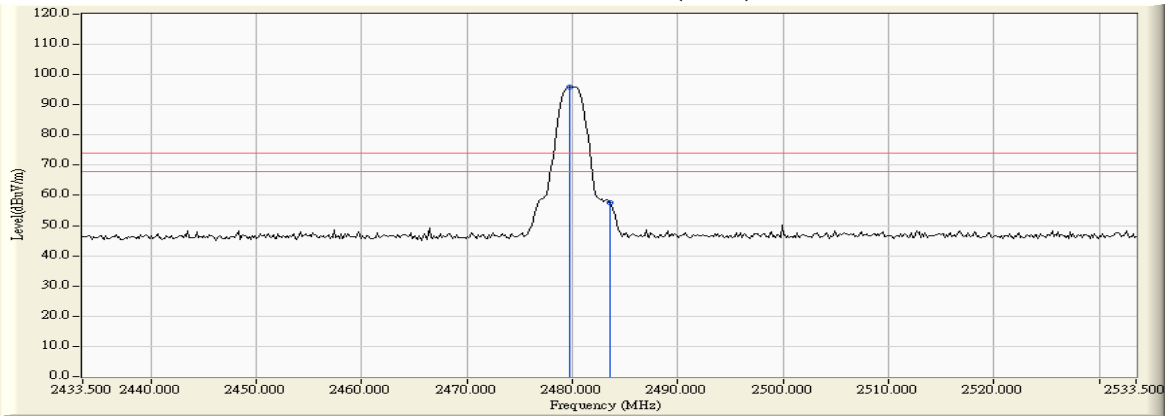
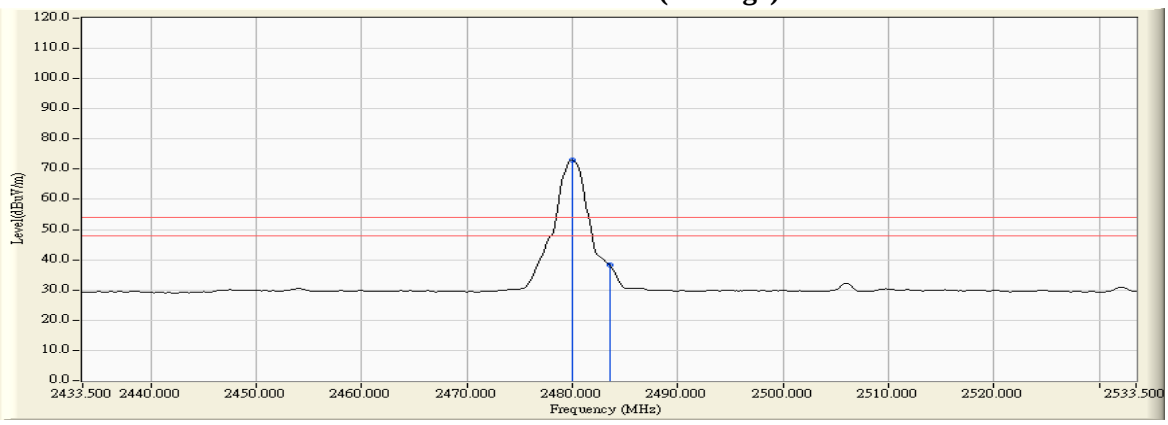


Figure Channel 39: Horizontal (Average)



Note:

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

Product	:	M2 Nurse Call Module
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2018/06/24
Test Mode	:	Mode 1: Transmit - BLE (GFSK)

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
39 (Peak)	2479.732	6.340	87.407	93.747	--	--	--
39 (Peak)	2483.500	6.363	50.326	56.689	74.00	54.00	Pass
39 (Average)	2480.022	6.342	65.487	71.829	--	--	--
39 (Average)	2483.500	6.363	30.584	36.947	74.00	54.00	Pass

Figure Channel 39: Vertical (Peak)

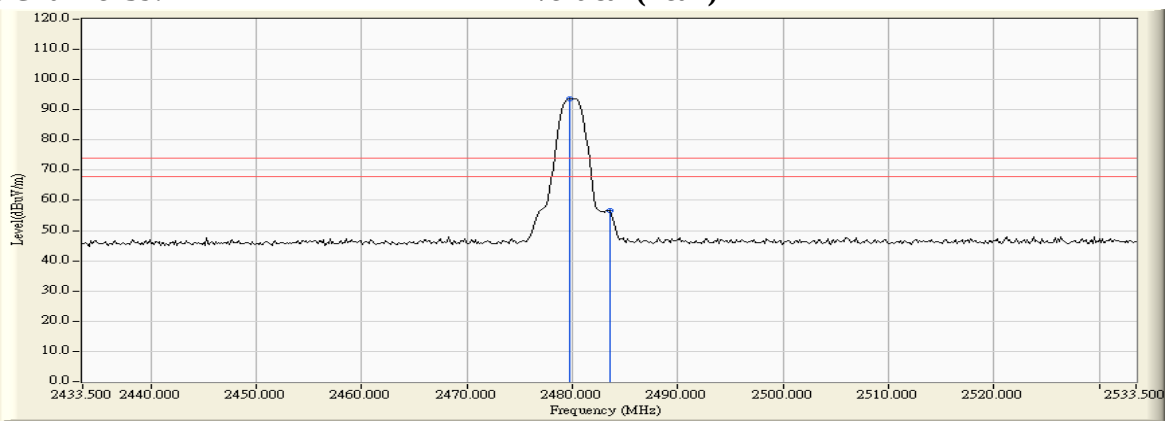
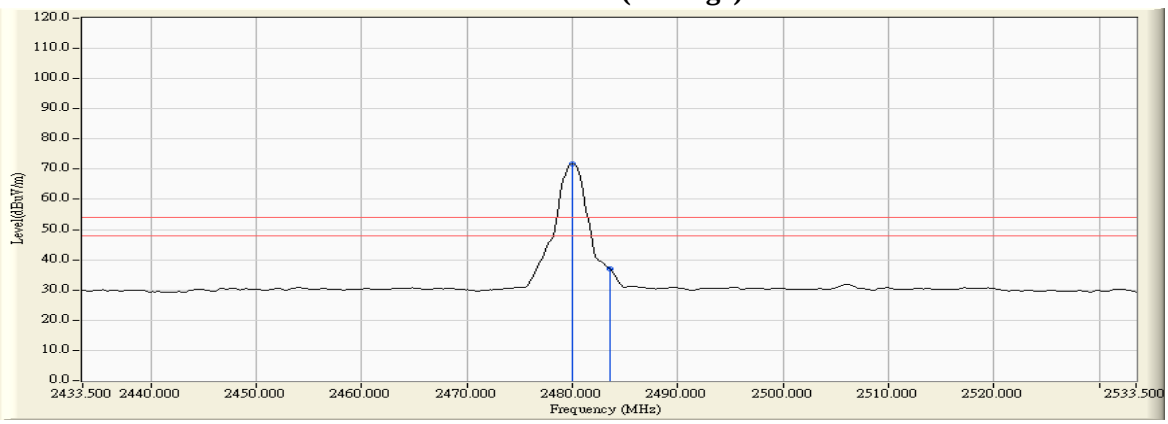


Figure Channel 39: Vertical (Average)

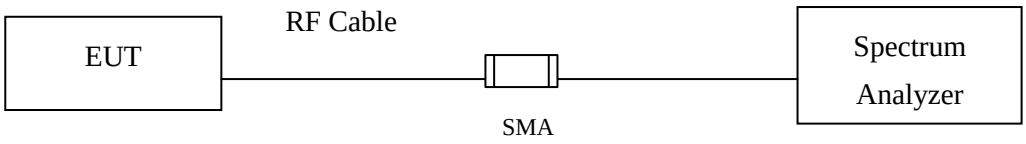


Note:

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

7. 6dB Bandwidth

7.1. Test Setup



7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

7.3. Test Procedure

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

Set RBW = 1-5% of the emission bandwidth, VBW≥3*RBW

7.4. Uncertainty

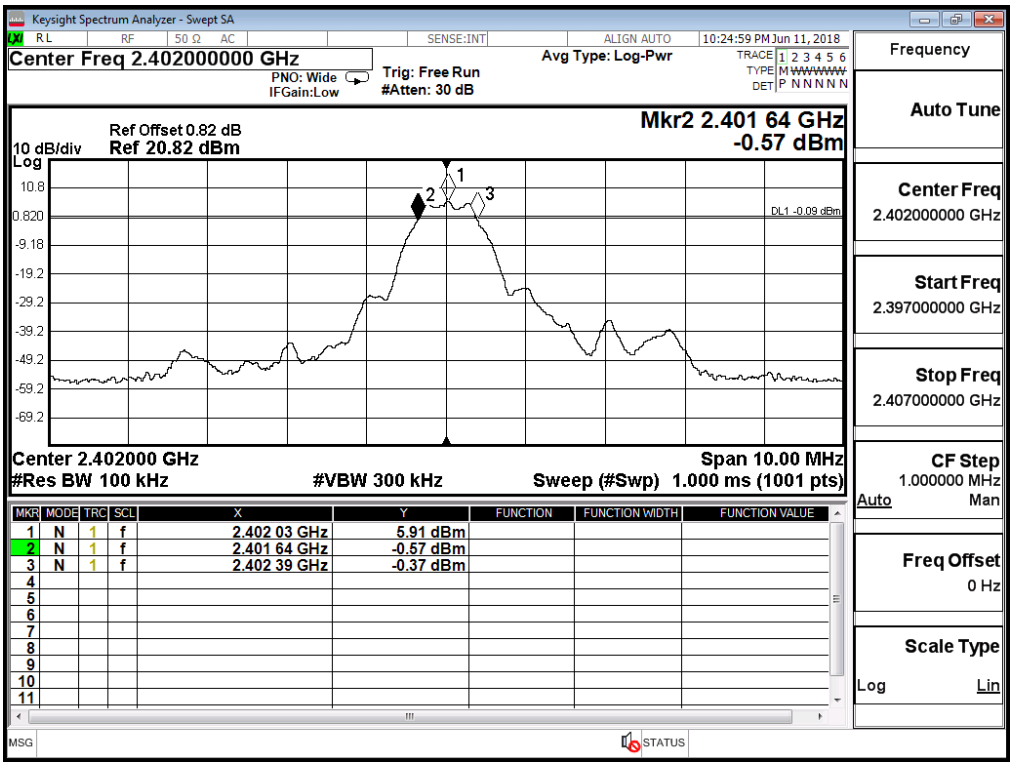
± 283Hz

7.5. Test Result of 6dB Bandwidth

Product : M2 Nurse Call Module
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	750	>500	Pass

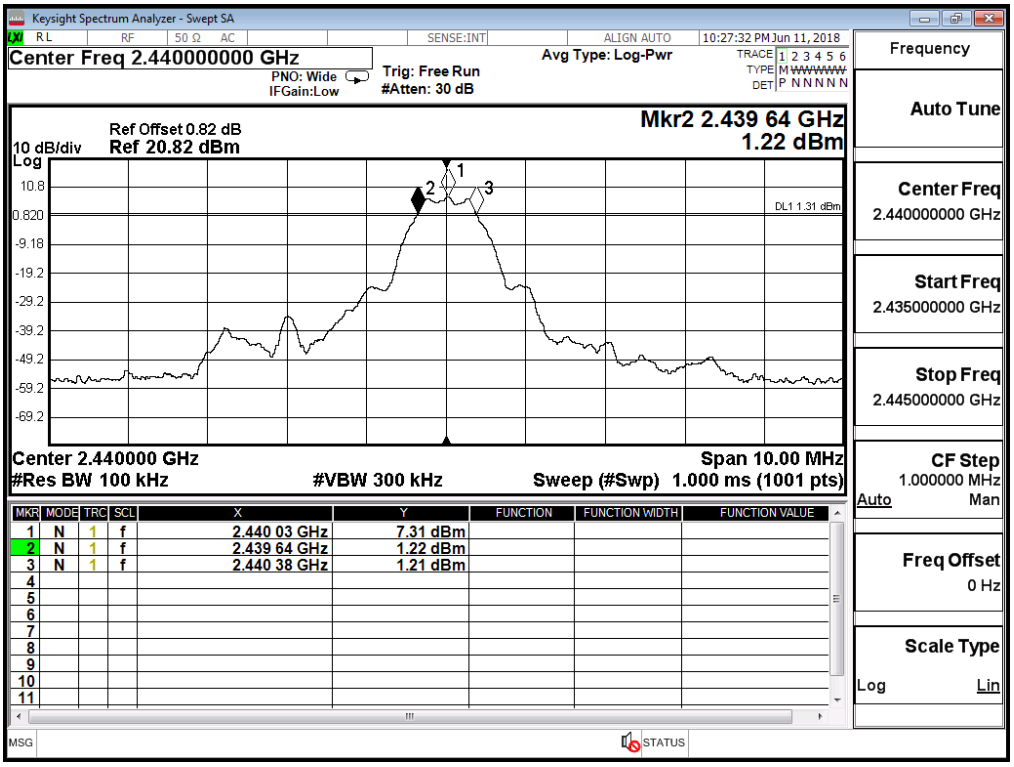
Figure Channel 00:



Product : M2 Nurse Call Module
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

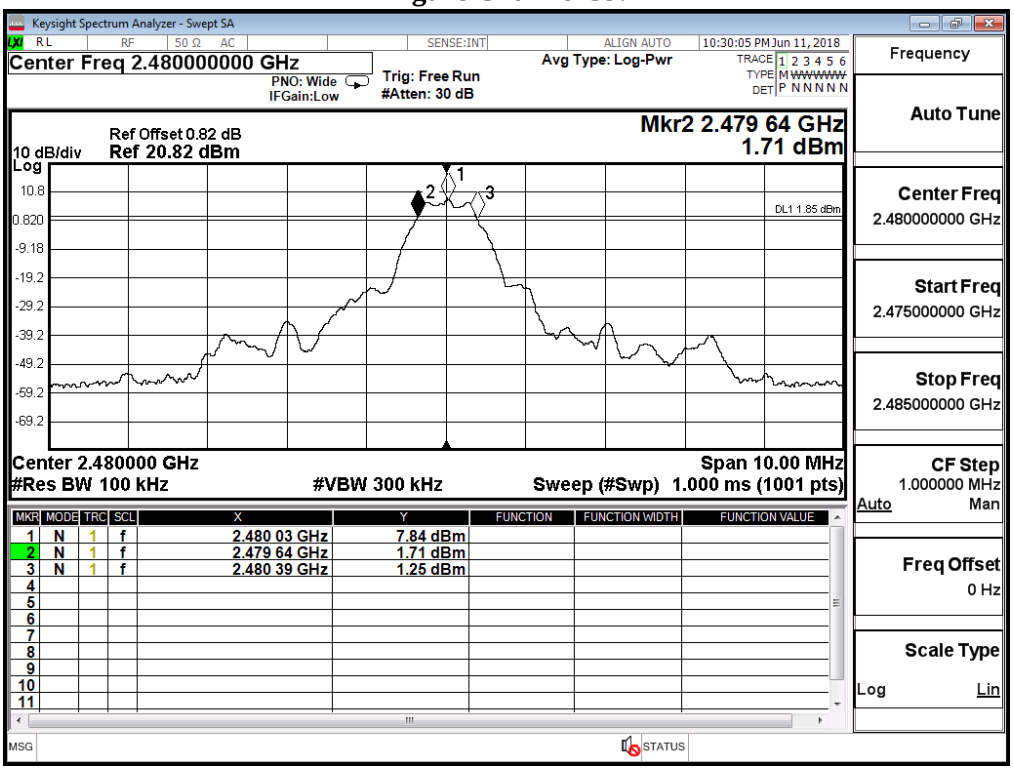
Figure Channel 19:



Product : M2 Nurse Call Module
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

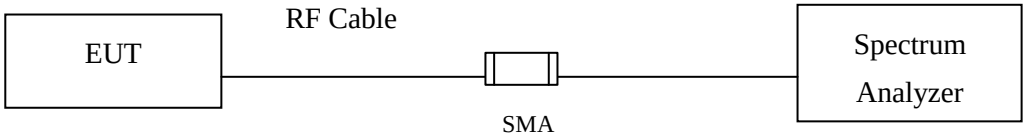
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2480	750	>500	Pass

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

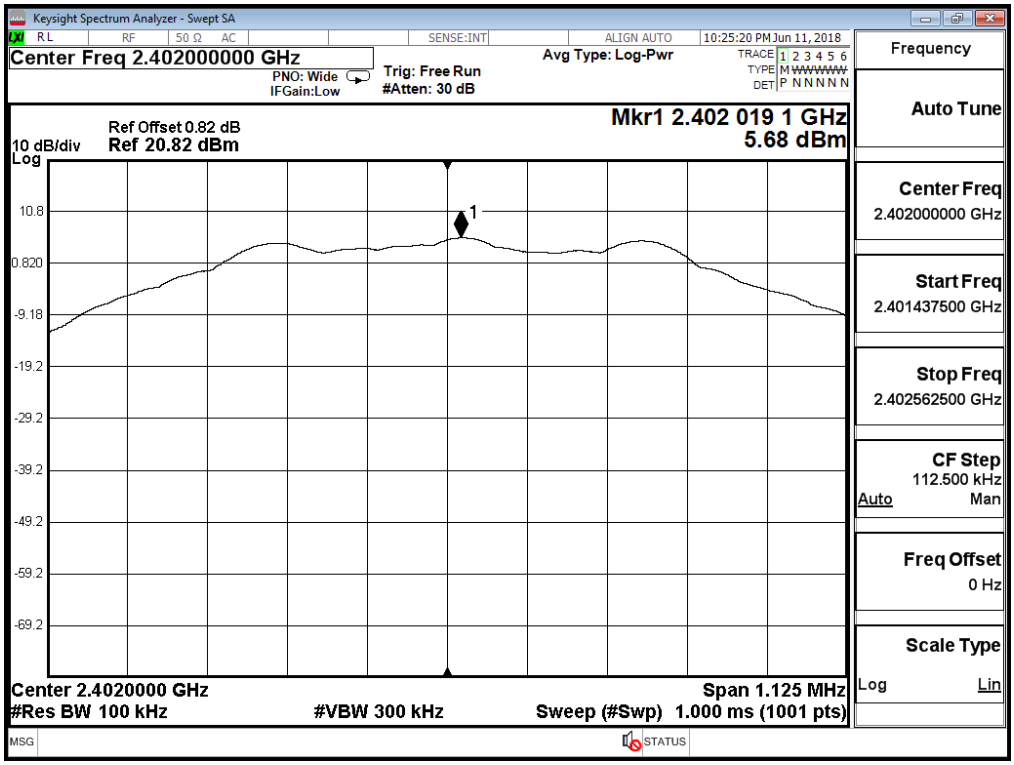
± 1.20 dB

8.5. Test Result of Power Density

Product : M2 Nurse Call Module
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	5.690	≦8dBm	Pass

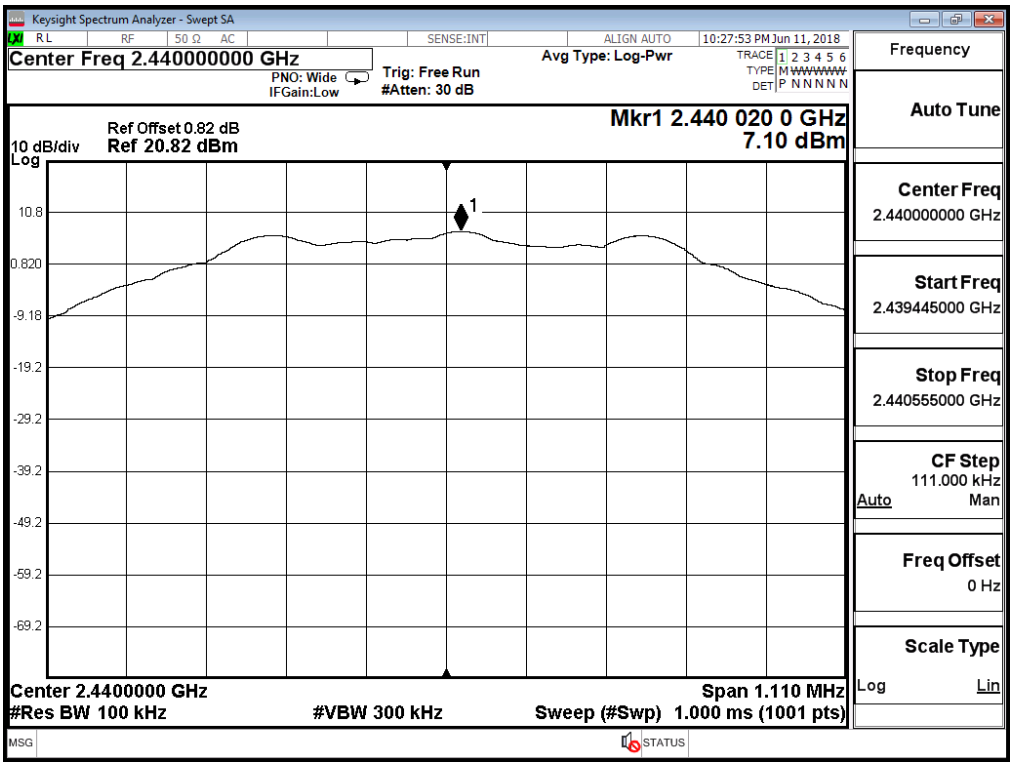
Figure Channel 00:



Product : M2 Nurse Call Module
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	7.100	≦8dBm	Pass

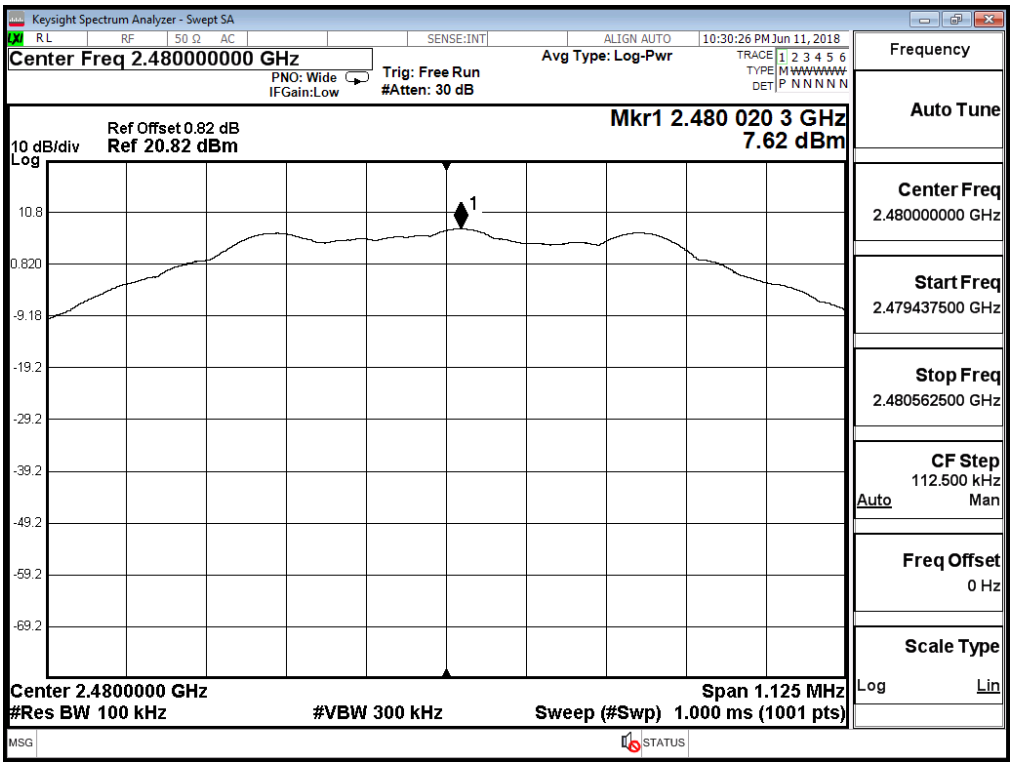
Figure Channel 19:



Product : M2 Nurse Call Module
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

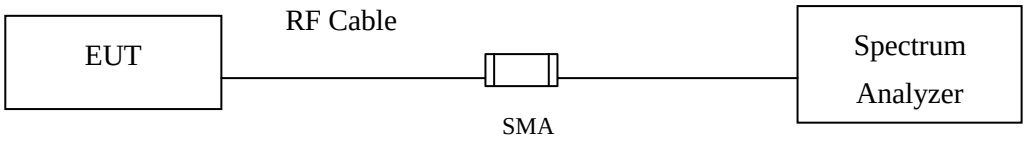
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	7.620	≦8dBm	Pass

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 : M2 Nurse Call Module
Test Item : Duty Cycle
Test Mode : Mode 1: Transmit - BLE (GFSK)

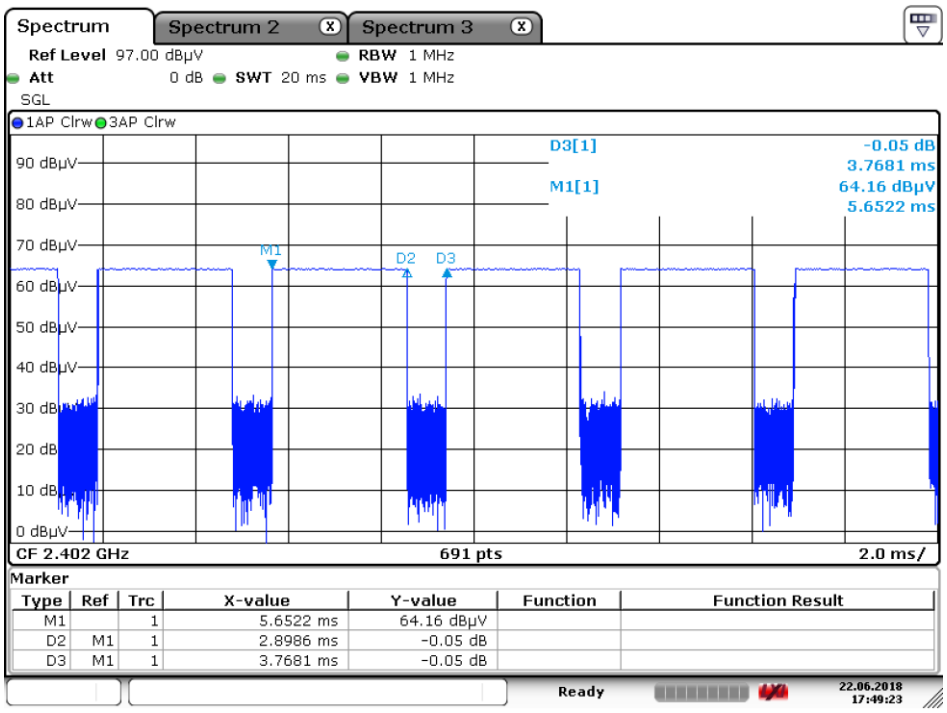
Duty Cycle Formula:

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	2.8986	3.7681	76.92	1.14



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10. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs