FCC PART 15C TEST REPORT FOR CERTIFICATION
On Behalf of

Dongguan Southstar Electronics Limited

Diaper Sensor

Model Number: DIA01B

FCC ID: X8CDIA01B

Prepared for : Dongguan Southstar Electronics Limited
F Building, 3 Chengtian Rd., Mintian Shatian Town,
Dongguan Guangdong China

Prepared By : EST Technology Co., Ltd.
Santun(guantai Road), Houjie Town, DongGuan City,
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Report Number: ESTE-R1703060
Date of Test : March 22, 2017~ March 29, 2017
Date of Report : April 01, 2017

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Test Report Verification

Applicant: **Address:**	Dongguan Southstar Electronics Limited F Building, 3 Chengtian Rd., Mintian Shatian Town, Dongguan Guangdong China
Manufacturer **Address:**	Dongguan Southstar Electronics Limited F Building, 3 Chengtian Rd., Mintian Shatian Town, Dongguan Guangdong China
E.U.T:	Diaper Sensor
Model Number:	DIA01B
Power Supply:	DC 3V
Test Voltage:	DC 3V
Trade Name:	Abellstar Serial No.: ------
Date of Receipt:	March 22, 2017 Date of Test: March 22, 2017~ March 29, 2017
Test Specification:	FCC Rules and Regulations Part 15 Subpart C:2016 ANSI C63.10:2013
Test Result:	The device described above is tested by EST Technology Co., Ltd.. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC Rules and Regulations Part 15 Subpart C requirements. This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd. Date: April 01, 2017
Prepared by:	Tested by:	Approved by:
Ada / Assistant	Tony.Tang/ Engineer	IcemanHu / Manager

Other Aspects:

None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Product Name	:	Diaper Sensor
Model Number	:	DIA01B
FCC ID	:	X8CDIA01B
Operation frequency	:	2402MHz~2480MHz
Number of channel	:	40
Antenna	:	Internal antenna, 2.5 dBi gain
Modulation	:	V4.0-BLE(Single-mode): GFSK
	:	
Sample Type	:	Prototype production

2. SUMMARY OF TEST

2.1. Summary of test result

Description of Test Item	Standard	Results
Power Line Conducted Emission	FCC Part 15: 15.207 ANSI C63.10: 2013 KDB 558074	N/A
Radiated Emissions	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10: 2013 KDB 558074	PASS
Band Edge Compliance	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10: 2013 KDB 558074	PASS
Conducted spurious emissions	FCC Part 15: 15.247(d) ANSI C63.10: 2013 KDB 558074	PASS
6dB Bandwidth	FCC Part 15: 15.247 (a)(2) ANSI C63.10: 2013 KDB 558074	PASS
Peak Output Power	FCC Part 15: 15.247 (b) ANSI C63.10: 2013 KDB 558074	PASS
Power Spectral Density	FCC Part 15: 15.247 (e) ANSI C63.10: 2013 KDB 558074	PASS
Antenna requirement	FCC Part 15: 15.203	PASS
Note: 15.207 only signals conducted onto the AC power lines are required to be measured. The equipment is only DC power supply, so “Power Line Conducted Emissions” is not required. 558074 D01 DTS Meas Guidance v04		

2.2. Test Facilities

EMC Lab	:	Certificated by CNAL, CHINA Registration No.: L5288 Date of registration: December 07, 2015 Certificated by FCC, USA Registration No.: 989591 Date of registration: November 20, 2013 Certificated by Industry Canada Registration No.: 9405A-1 Date of registration: December 30, 2015 Certificated by VCCI, Japan Registration No.: R-3663 & C-4103 Date of registration: July 25, 2011 Certificated by TUV Rheinland, Germany Registration No.: UA 50195514 0001 Date of registration: January 07, 2011 Certificated by TUV/PS, Shenzhen Registration No.: SCN1017 Date of registration: January 27, 2011 Certificated by Intertek ETL SEMKO Registration No.: 2011-RTL-L1-18 Date of registration: April 28, 2011 Certificated by Siemic, Inc. Registration No.: SLCN021 Date of registration: November 8, 2011 Certificated by Nemko, Hong Kong Registration No.: 175193 Date of registration: May 4, 2011
Name of Firm	:	EST Technology Co., Ltd.
Site Location	:	San Tun Management Zone, Houjie Town, Dongguan, Guangdong, China

2.3. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.54dB
Uncertainty for Radiation Emission test (30MHz-1GHz)	3.62 dB
Uncertainty for Radiation Emission test (1GHz to 18GHz)	4.86 dB
Uncertainty for radio frequency	7×10-8
Uncertainty for conducted RF Power	0.20dB
Uncertainty for Power density test	0.26dB

Note：This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.4. Assistant equipment used for test

N/A

2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 meter high above ground.EUT was be set into BT test mode by Bluesuite software before test.

EUT

(EUT: Diaper Sensor)

2.6. Test mode

A special test software was used to control EUT work in Continuous TX mode(100% duty cycle), and select test channel, wireless mode and data rate.

Mode	Channel	Frequency
BT 4.0-BLE GFSK	Low	2402MHz
	Middle	2440MHz
	High	2480MHz

2.7. Channel List for Bluetooth

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	2	2404
3	2406	4	2408
5	2410	6	2412
7	2414	8	2416
9	2418	10	2420
11	2422	12	2424
13	2426	14	2428
15	2430	16	2432
17	2434	18	2436
19	2438	20	2440
21	2442	22	2444
23	2446	24	2448
25	2450	26	2452
27	2454	28	2456
29	2458	30	2460
31	2462	32	2464
33	2466	34	2468
35	2470	36	2472
37	2474	38	2476
39	2478	40	2480

2.8. Test Equipment

2.8.1. For conducted emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESHS30	832354	June,28,16	1 Year
Artificial Mains Networ	Rohde & Schwarz	ENV216	101260	June,28,16	1 Year
Pulse Limiter	Rohde & Schwarz	ESSP-920BT-Z2	101100	June,28,16	1 Year

2.8.2. For radiated emission test(30-1000MHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESVS10	100004	June,28,16	1 Year
Spectrum Analyzer	Agilent	E4411B	MY50140697	June,28,16	1 Year
Bilog Antenna	Teseq	CBL 6111D	27090	June,28,16	1 Year
Signal Amplifier	Agilent	310N	187037	June,28,16	1 Year
RF Cable	Hubersuhner	W10.02	534123	June,28,16	1 Year

2.8.3. For Radio & radiated emission test(above 1GHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA9120D1002	June,28,16	1 Year
Signal Amplifier	SCHWARZBECK	BBV9718	9718-212	June,28,16	1 Year
Spectrum Analyzer	Agilent	E4408B	MY44211139	June,28,16	1 Year
RF Cable	Hubersuhner	RG 214/U	513423	June,28,16	1 Year
Spectrum Analyzer	Rohde &Schwarz	FSV	103173	June,28,16	1 Year

3. RADIATED EMISSION TEST

3.1. Limit

3.1.1. 15.209 limits

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Remark：(1) Emission level dBμV = 20 log Emission level μV/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

3.1.2. 15.205 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

3.2. Test Procedure

EUT and its simulators are placed on a turn table, which is 0.8 meter high above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

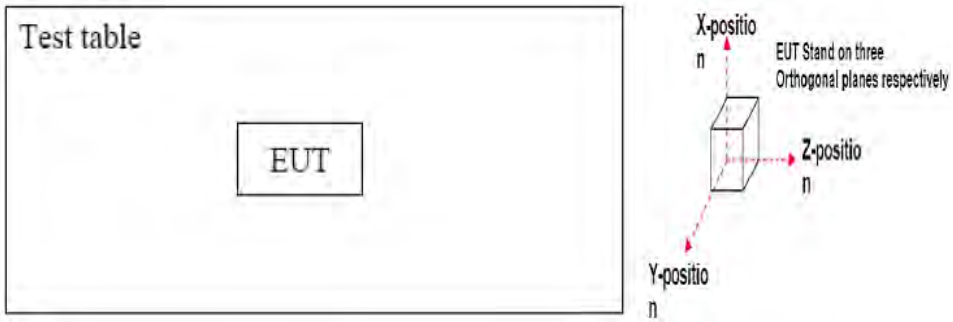
The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz

PEAK detector, 1MHz/1MHz for PAEK measurement,

PEAK detector, 1MHz/10Hz for Average measurement

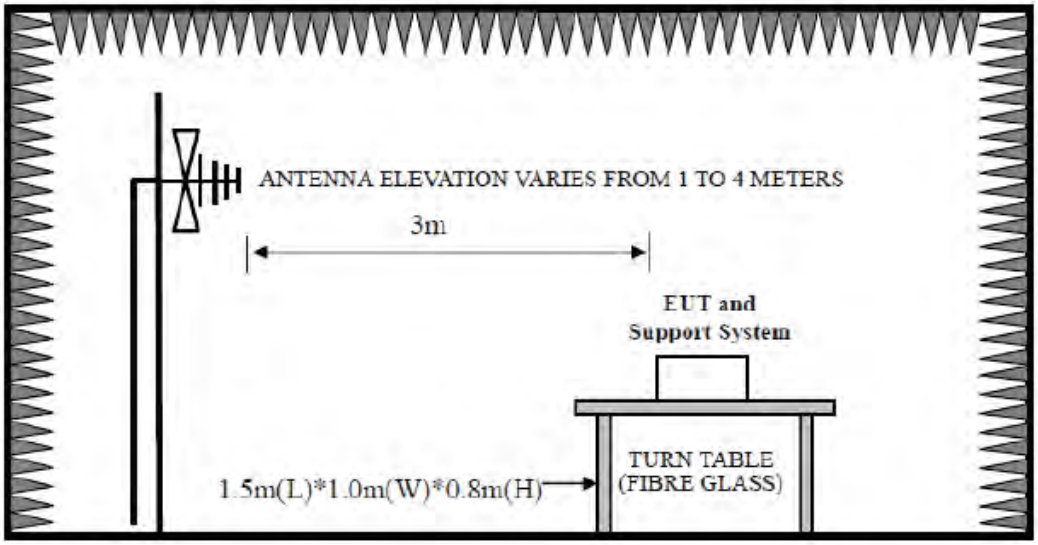
The frequency range from 30MHz to 10th harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

We test X-axis, Y-axis, and Z-axis,. The **Y-axis** is the worst mode, so only the worst mode test data was included in the report.

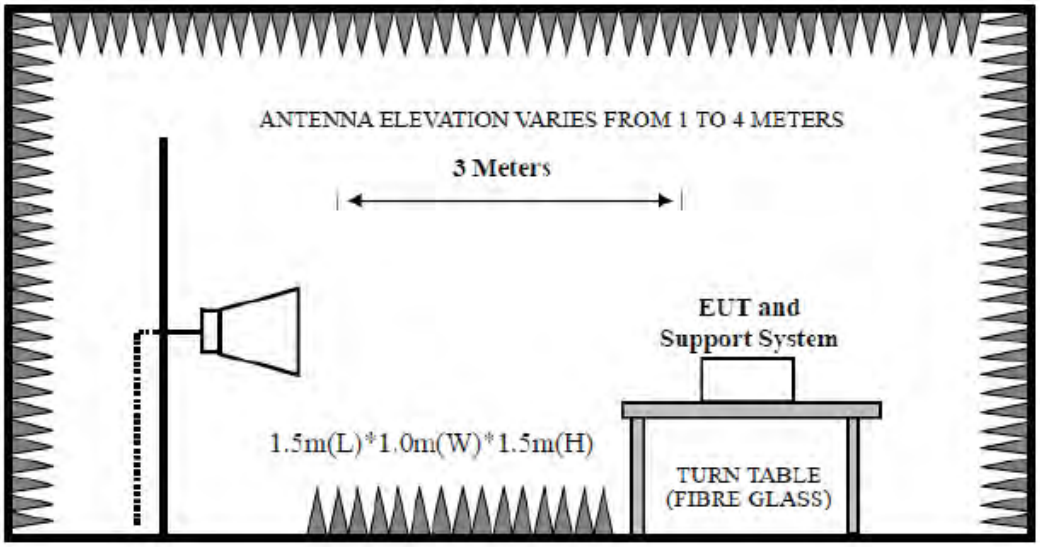


3.3. Block Diagram of Test setup

30~1000MHz



Above 1GHz



3.4. Test Result

PASS.

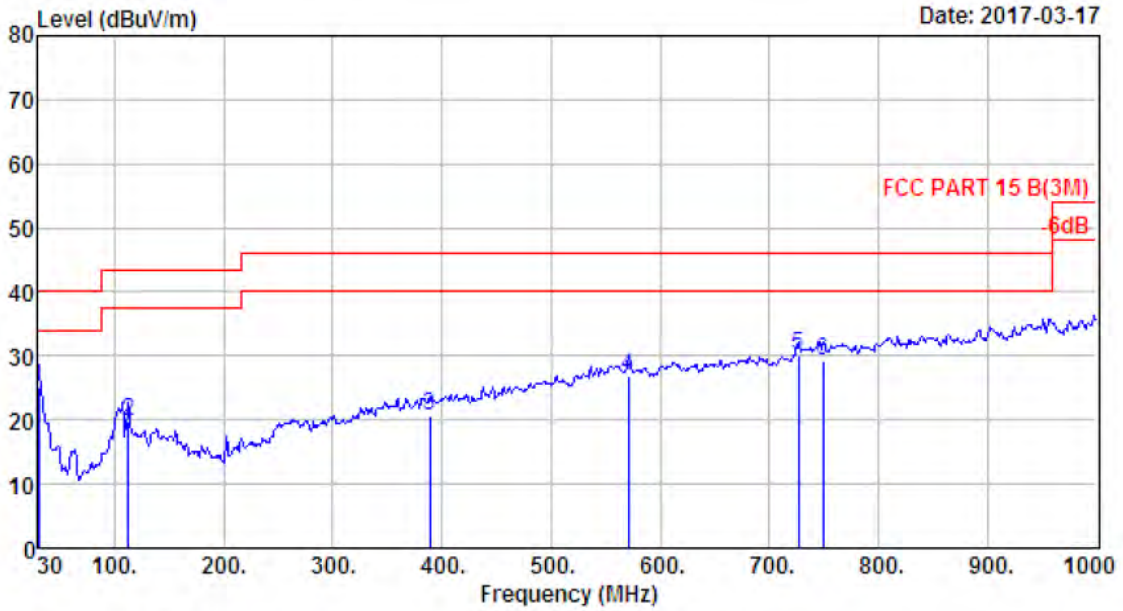
All the emissions from 30MHz to 25 GHz were comply with 15.209 limits.

Note: 1、For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

2、The frequency 2402MHz 、2440MHz and 2480 MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

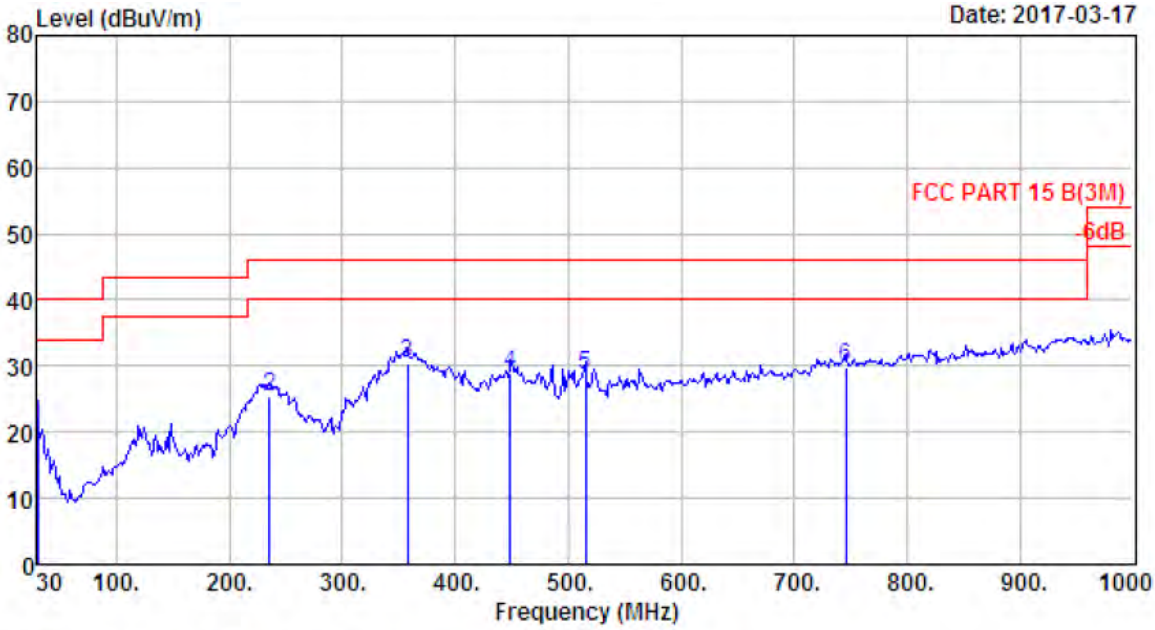
3.5. Test Data

30-1000 MHz



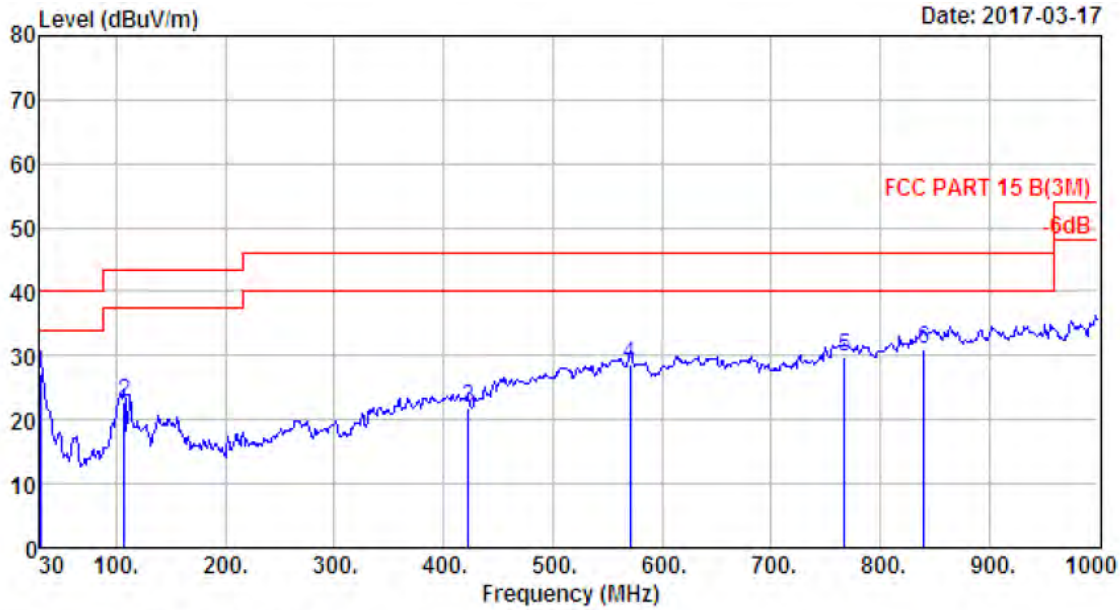

```
Site no.       : 1# 966 Chamber              Data no.   : 1
Dis. / Ant.    : 3m   27137                  Ant. pol.  : VERTICAL
Limit          : FCC PART 15 B(3M)
Env. / Ins.    : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer       : Tony
EUT            : Diaper Sensor
Power          : DC 3V
M/N            : DIA01B
Test Mode      : GFSK TX 2402MHz
```

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.00	18.51	0.65	5.87	25.03	40.00	14.97	QP
2	112.45	10.68	1.43	7.73	19.84	43.50	23.66	QP
3	388.90	15.54	2.65	2.38	20.57	46.00	25.43	QP
4	571.26	19.59	3.35	3.78	26.72	46.00	19.28	QP
5	726.46	21.91	3.74	4.53	30.18	46.00	15.82	QP
6	749.74	22.19	3.81	3.31	29.31	46.00	16.69	QP



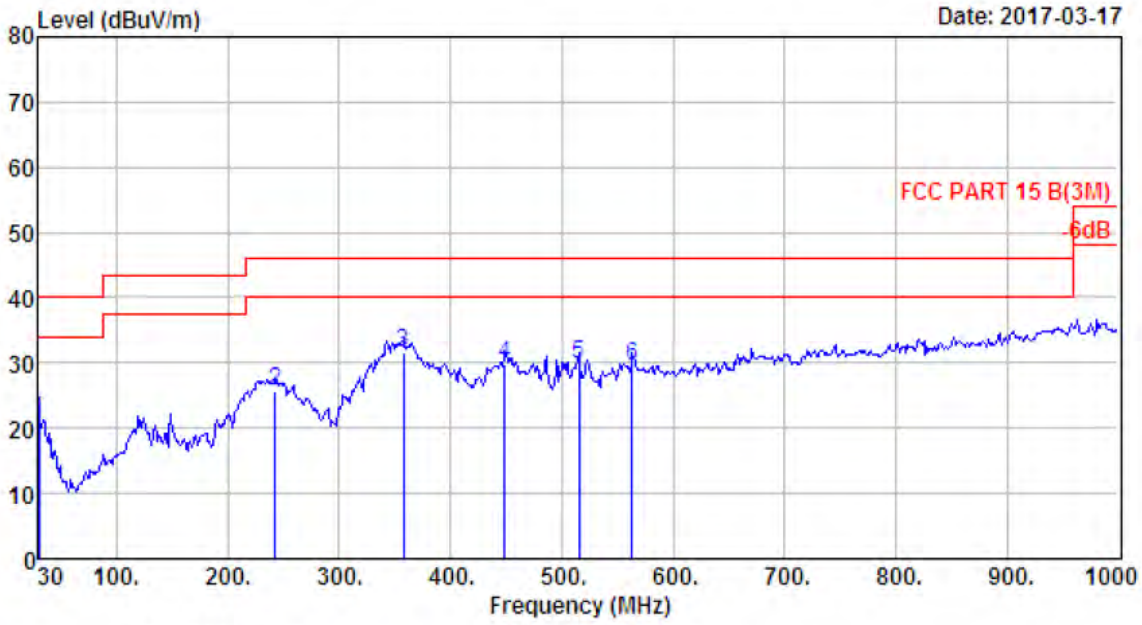
Site no. : 1# 966 Chamber Data no. : 2
Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.00	18.51	0.65	2.04	21.20	40.00	18.80	QP
2	235.64	9.80	2.09	13.42	25.31	46.00	20.69	QP
3	357.86	14.45	2.56	13.53	30.54	46.00	15.46	QP
4	449.04	16.45	2.95	9.50	28.90	46.00	17.10	QP
5	515.00	17.95	3.17	7.55	28.67	46.00	17.33	QP
6	745.86	22.26	3.90	3.75	29.91	46.00	16.09	QP



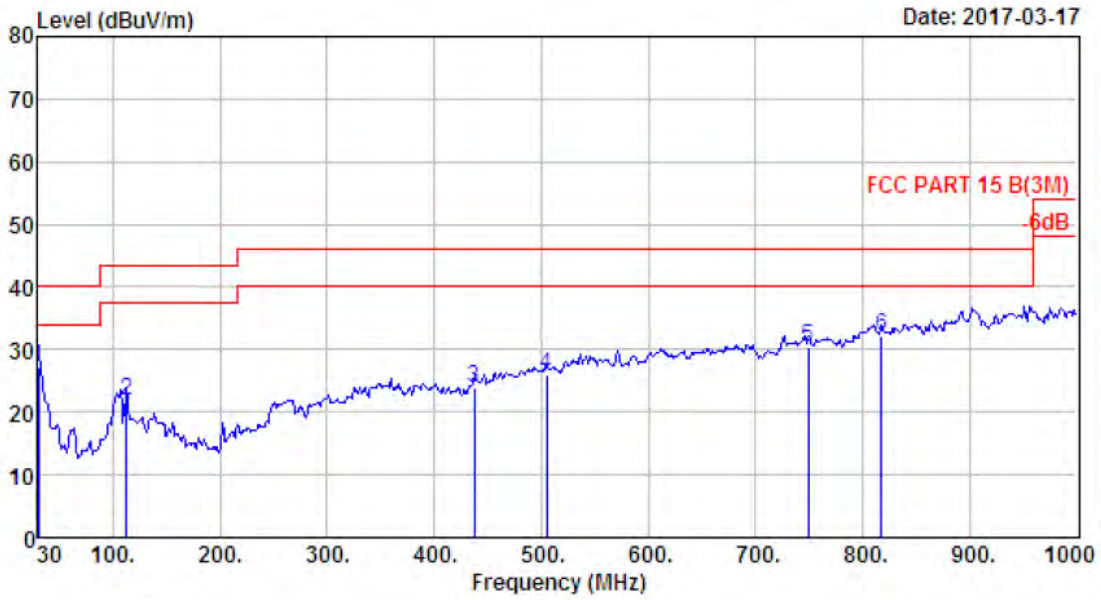
Site no. : 1# 966 Chamber Data no. : 3
Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2440MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.00	18.51	0.65	7.87	27.03	40.00	12.97	QP
2	107.60	10.24	1.39	11.09	22.72	43.50	20.78	QP
3	422.85	16.23	2.75	2.91	21.89	46.00	24.11	QP
4	571.26	19.59	3.35	5.78	28.72	46.00	17.28	QP
5	767.20	22.04	3.87	3.83	29.74	46.00	16.26	QP
6	839.95	22.60	3.76	4.70	31.06	46.00	14.94	QP



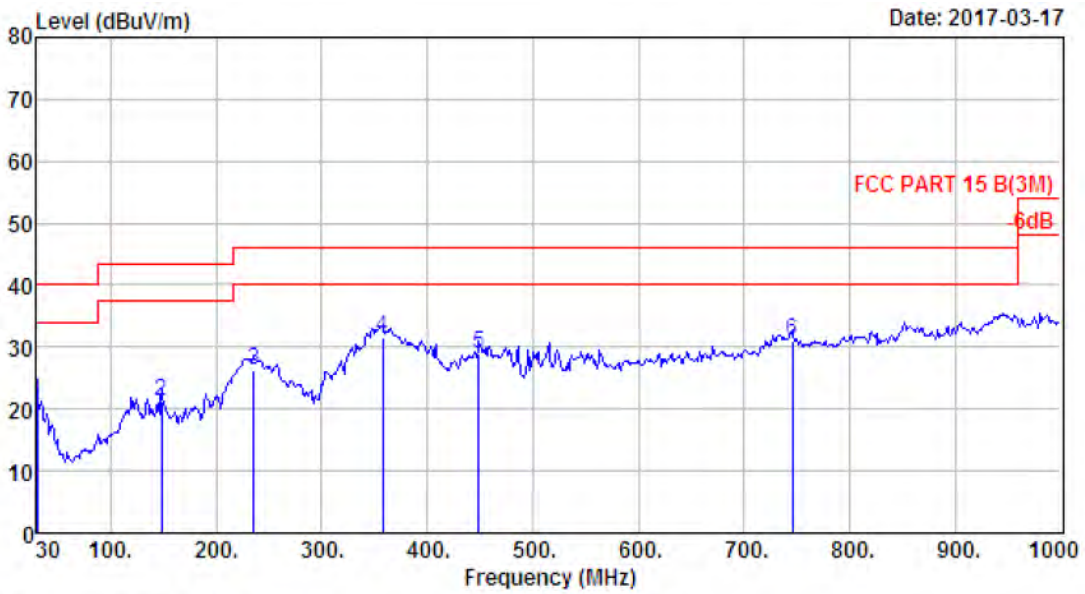
Site no. : 1# 966 Chamber Data no. : 4
Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2440MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.00	18.51	0.65	2.04	21.20	40.00	18.80	QP
2	242.43	10.64	2.16	12.87	25.67	46.00	20.33	QP
3	357.86	14.45	2.56	14.53	31.54	46.00	14.46	QP
4	449.04	16.45	2.95	10.50	29.90	46.00	16.10	QP
5	515.00	17.95	3.17	8.55	29.67	46.00	16.33	QP
6	563.50	19.67	3.28	6.50	29.45	46.00	16.55	QP



Site no. : 1# 966 Chamber Data no. : 5
Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.00	18.51	0.65	7.87	27.03	40.00	12.97	QP
2	112.45	10.68	1.43	9.73	21.84	43.50	21.66	QP
3	437.40	16.20	2.85	4.95	24.00	46.00	22.00	QP
4	505.30	17.91	3.16	4.76	25.83	46.00	20.17	QP
5	749.74	22.19	3.81	4.31	30.31	46.00	15.69	QP
6	817.64	22.35	3.81	5.88	32.04	46.00	13.96	QP



Site no. : 1# 966 Chamber Data no. : 6
Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.00	18.51	0.65	2.04	21.20	40.00	18.80	QP
2	148.34	11.00	1.69	8.52	21.21	43.50	22.29	QP
3	235.64	9.80	2.09	14.42	26.31	46.00	19.69	QP
4	357.86	14.45	2.56	14.53	31.54	46.00	14.46	QP
5	449.04	16.45	2.95	9.50	28.90	46.00	17.10	QP
6	745.86	22.26	3.90	4.75	30.91	46.00	15.09	QP

1000-18000 MHz

Site no. : 1# 966 Chamber Data no. : 11
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.61	6.62	34.64	80.14	79.73	74.00	-5.73	Peak
2	4804.00	31.25	11.77	35.64	33.09	40.47	74.00	33.53	Peak
3	7206.00	36.52	11.54	33.95	28.94	43.05	74.00	30.95	Peak
4	10180.00	38.42	11.49	34.53	29.95	45.33	74.00	28.67	Peak
5	11200.00	39.39	11.14	33.24	27.41	44.70	74.00	29.30	Peak
6	14175.00	41.61	10.91	33.35	27.35	46.52	74.00	27.48	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 12
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.61	6.62	34.64	87.65	87.24	74.00	-13.24	Peak
2	4804.00	31.25	11.77	35.64	37.73	45.11	74.00	28.89	Peak
3	7206.00	36.52	11.54	33.95	29.86	43.97	74.00	30.03	Peak
4	8735.00	37.40	11.45	33.76	30.45	45.54	74.00	28.46	Peak
5	10826.00	39.33	11.30	34.00	30.25	46.88	74.00	27.12	Peak
6	14124.00	41.57	10.91	33.22	28.11	47.37	74.00	26.63	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Site no. : site Data no. : 13
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2440MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.00	27.60	6.67	34.85	78.90	78.32	74.00	-4.32	Peak
2	4880.00	31.37	12.07	35.76	33.01	40.69	74.00	33.31	Peak
3	7320.00	36.55	11.57	34.14	29.37	43.35	74.00	30.65	Peak
4	8684.00	37.32	11.45	33.66	30.25	45.36	74.00	28.64	Peak
5	11234.00	39.37	11.12	33.25	27.87	45.11	74.00	28.89	Peak
6	14005.00	41.46	10.90	33.01	27.52	46.87	74.00	27.13	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 14
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2440MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2440.00	27.60	6.67	34.85	88.90	88.32	74.00	-14.32	Peak
2	4880.00	31.37	12.07	35.76	42.30	49.98	74.00	24.02	Peak
3	7320.00	36.55	11.57	34.14	31.45	45.43	74.00	28.57	Peak
4	8701.00	37.35	11.45	33.65	30.99	46.14	74.00	27.86	Peak
5	11200.00	39.39	11.14	33.24	30.45	47.74	74.00	26.26	Peak
6	13954.00	41.35	10.96	32.99	29.01	48.33	74.00	25.67	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 15
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.58	6.71	35.11	92.83	92.01	74.00	-18.01	Peak
2	4960.00	31.49	12.44	36.01	38.77	46.69	74.00	27.31	Peak
3	7440.00	36.54	11.61	34.22	32.39	46.32	74.00	27.68	Peak
4	8684.00	37.32	11.45	33.66	30.44	45.55	74.00	28.45	Peak
5	11166.00	39.41	11.17	33.31	28.87	46.14	74.00	27.86	Peak
6	14090.00	41.54	10.91	33.13	29.27	48.59	74.00	25.41	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 16
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.58	6.71	35.11	79.37	78.55	74.00	-4.55	Peak
2	4960.00	31.49	12.44	36.01	34.39	42.31	74.00	31.69	Peak
3	7440.00	36.54	11.61	34.22	31.31	45.24	74.00	28.76	Peak
4	8684.00	37.32	11.45	33.66	31.99	47.10	74.00	26.90	Peak
5	11234.00	39.37	11.12	33.25	29.54	46.78	74.00	27.22	Peak
6	14396.00	41.79	10.92	33.39	29.27	48.59	74.00	25.41	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

18000-25000 MHz
Pass
Note: The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

4. CONDUCTED SPURIOUS EMISSION

4.1. Limit

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

4.2. Test Procedure

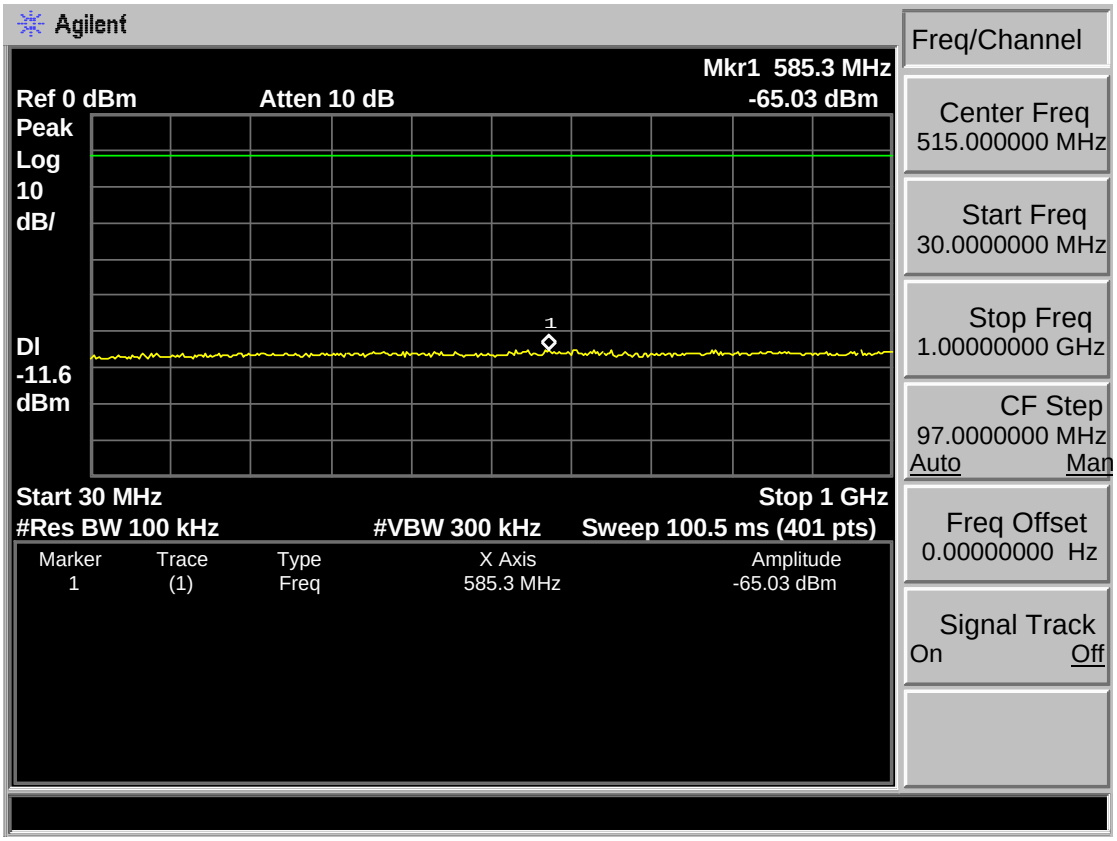
The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz for frequency range from 30MHz to 1000 MHz; The resolution bandwidth is set to 1 MHz, The video bandwidth is set to 3 MHz for frequency range from 1000MHz to 25000 MHz.

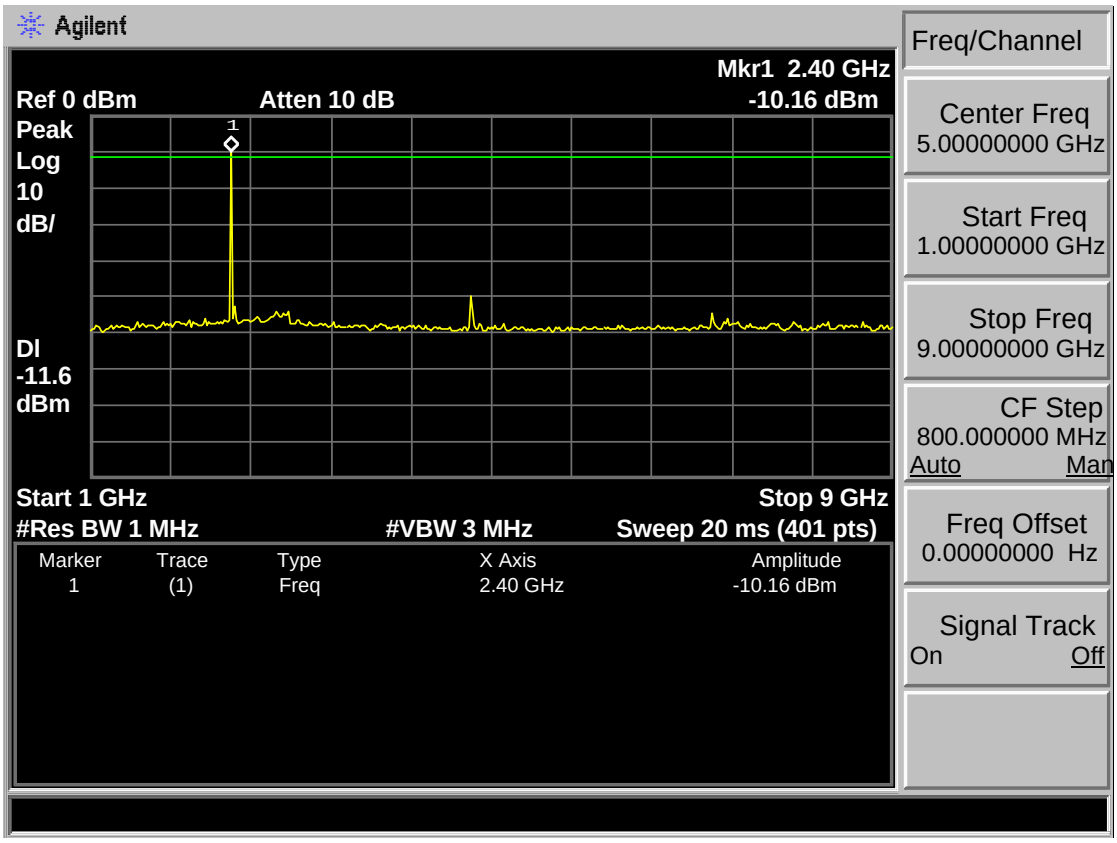
4.3. Test Result

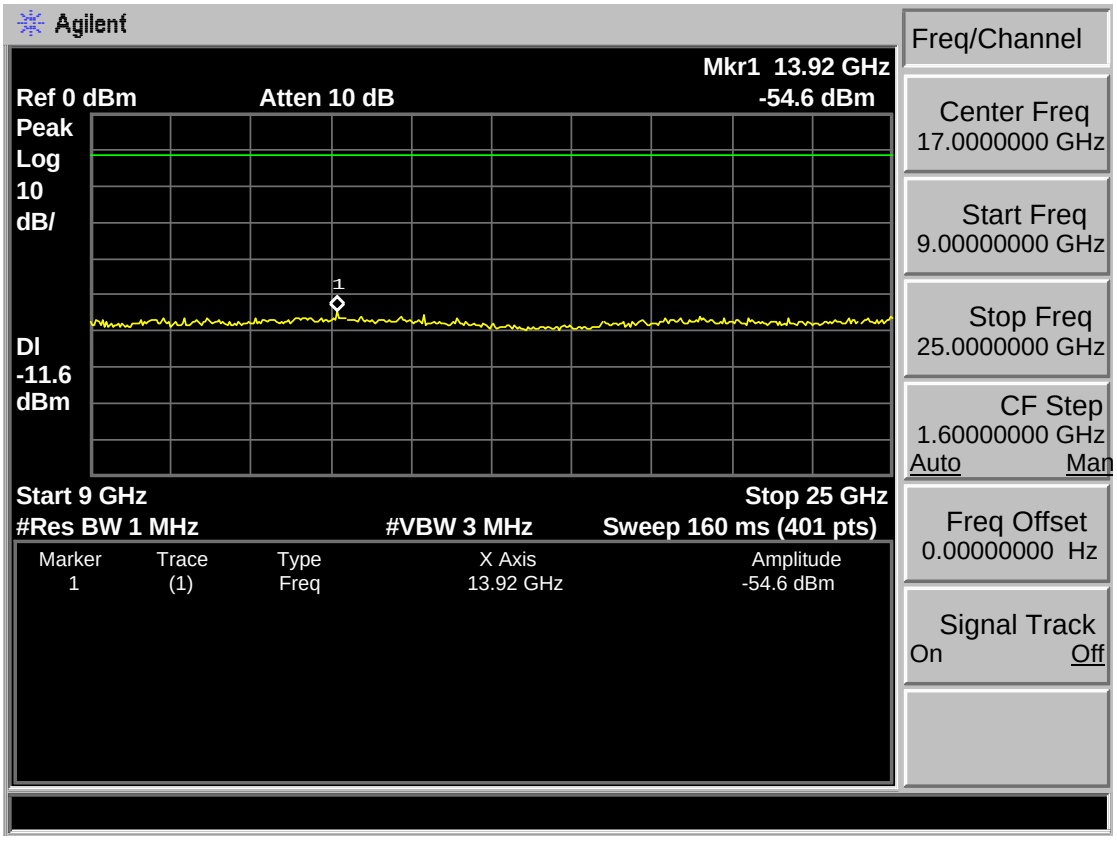
PASS (The testing data was attached in the next pages.)

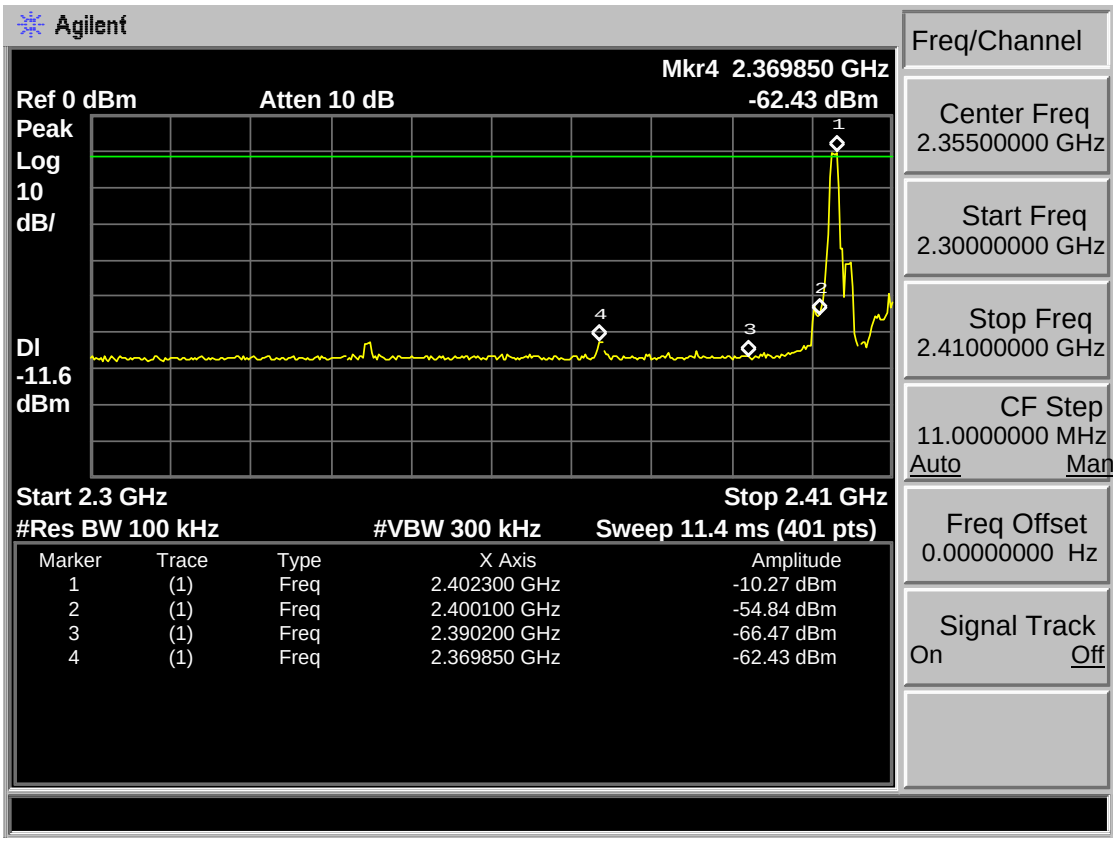
4.4. Test Data

Test Mode: BT 4.0-BLE GFSK 2402MHz

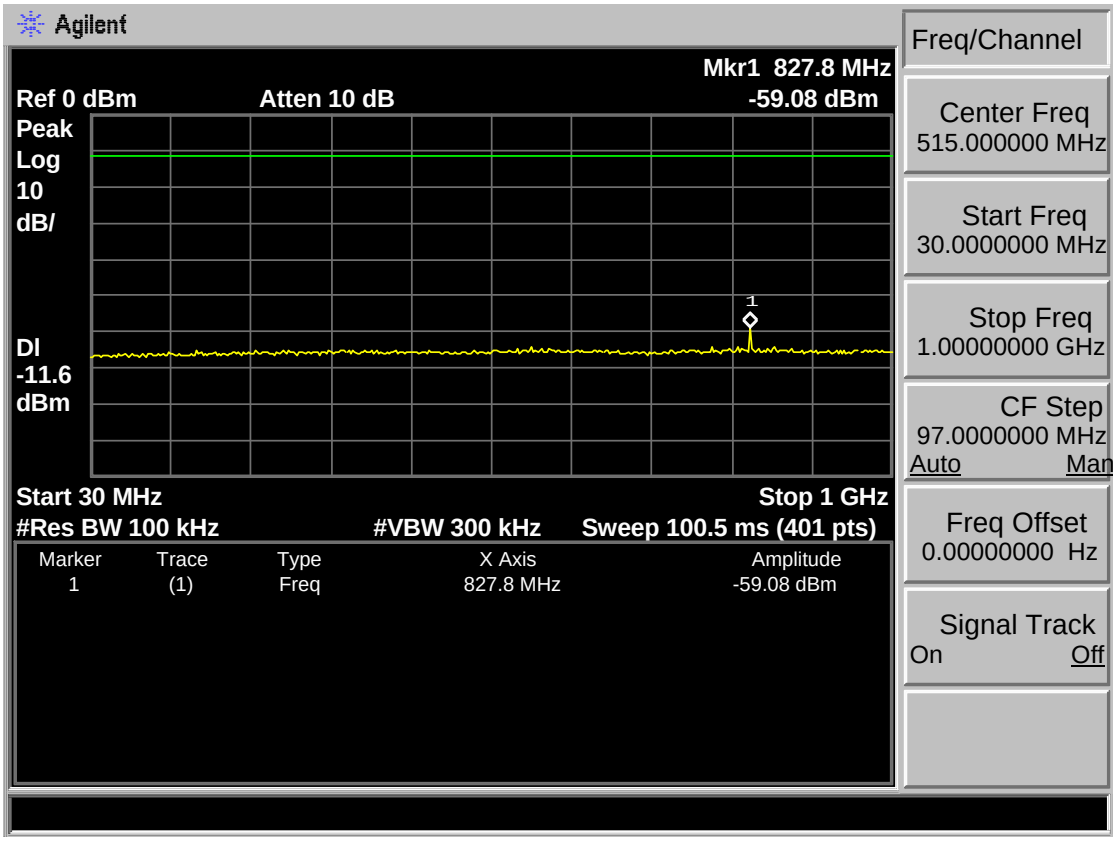


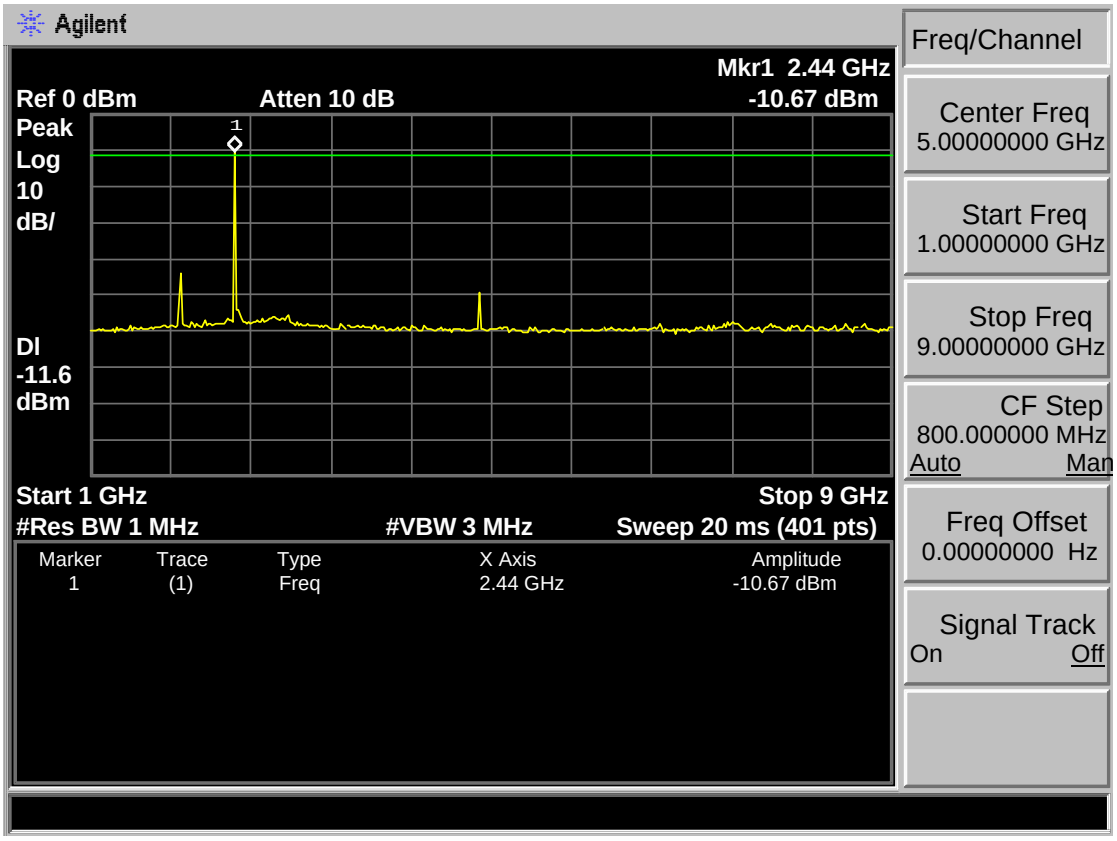


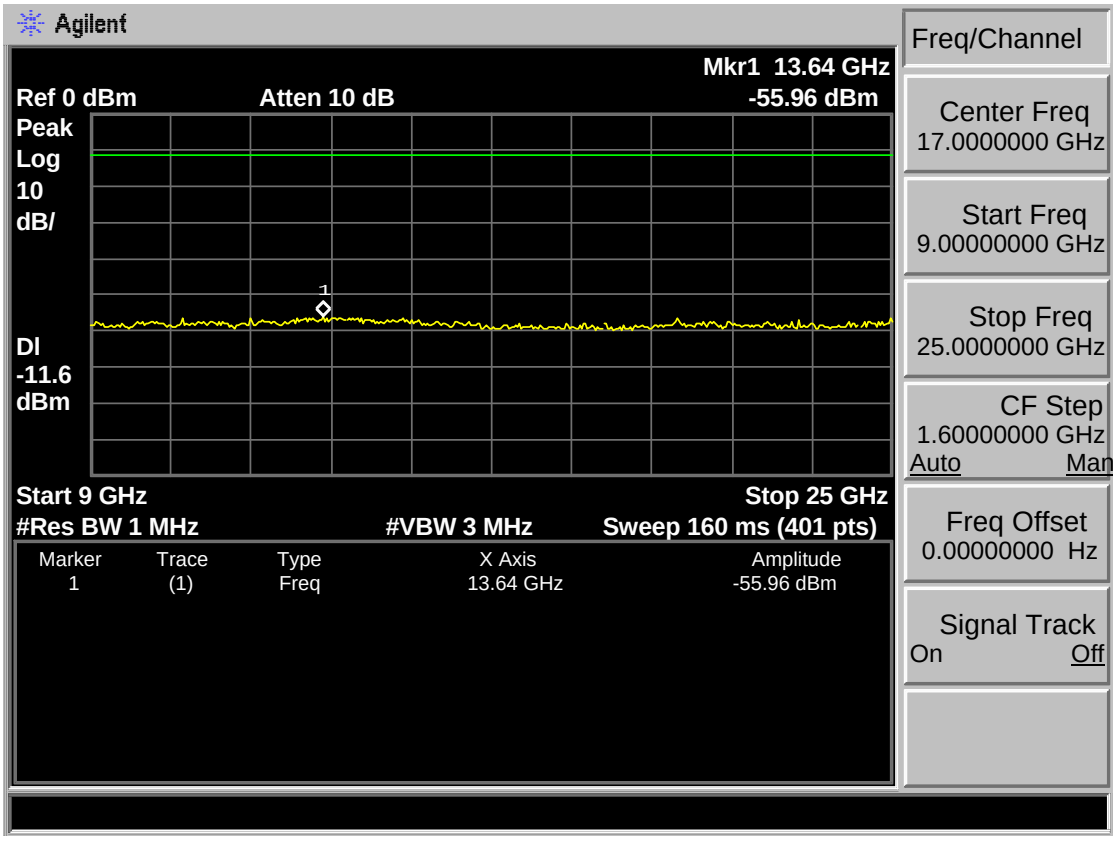

Agilent
Mkr1 13.92 GHz
Ref 0 dBm
Atten 10 dB
-54.6 dBm
Peak
Log
10
dB/
Dl
-11.6
dBm
Start 9 GHz
Stop 25 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 160 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 13.92 GHz -54.6 dBm
Freq/Channel
Center Freq
17.0000000 GHz
Start Freq
9.00000000 GHz
Stop Freq
25.0000000 GHz
CF Step
1.60000000 GHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off


Agilent
Mkr4 2.369850 GHz
Ref 0 dBm
Atten 10 dB
-62.43 dBm
Peak
Log
10
dB/
Dl
-11.6
dBm
Start 2.3 GHz
Stop 2.41 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 11.4 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.402300 GHz -10.27 dBm
2 (1) Freq 2.400100 GHz -54.84 dBm
3 (1) Freq 2.390200 GHz -66.47 dBm
4 (1) Freq 2.369850 GHz -62.43 dBm
Freq/Channel
Center Freq
2.35500000 GHz
Start Freq
2.30000000 GHz
Stop Freq
2.41000000 GHz
CF Step
11.0000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off

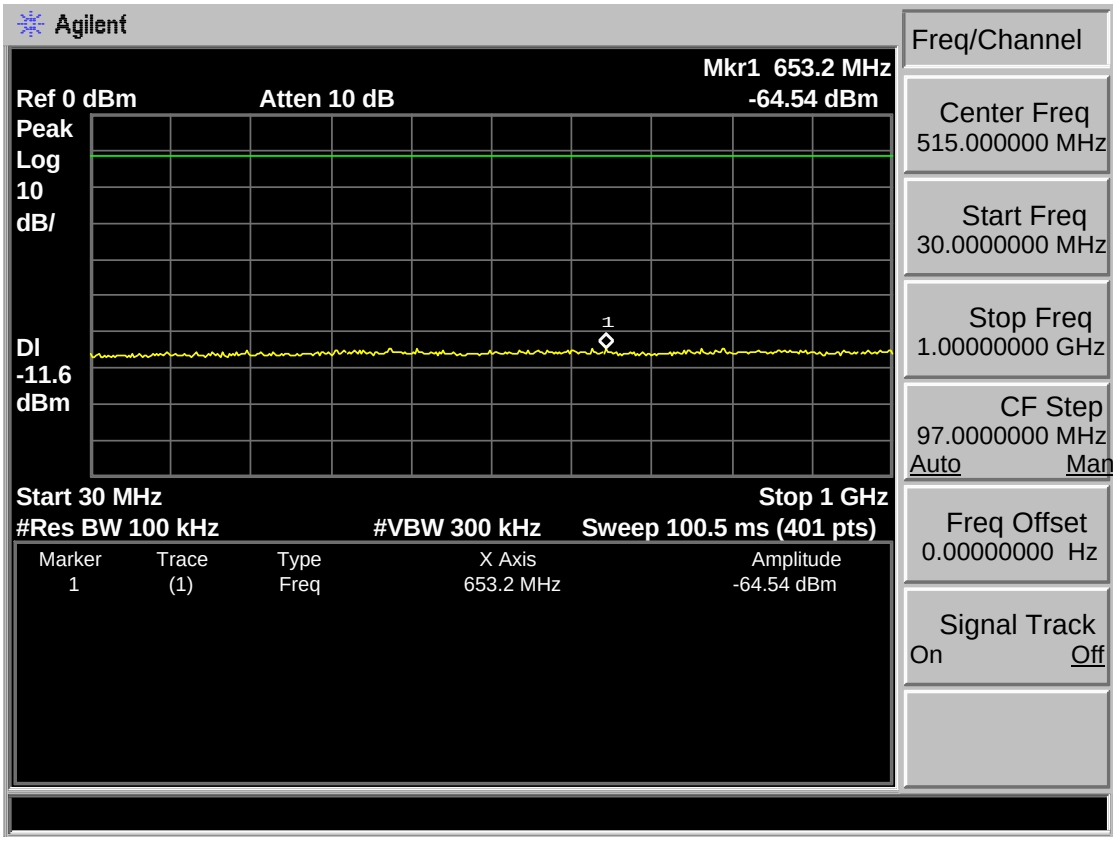
Test Mode: BT 4.0-BLE GFSK 2440MHz

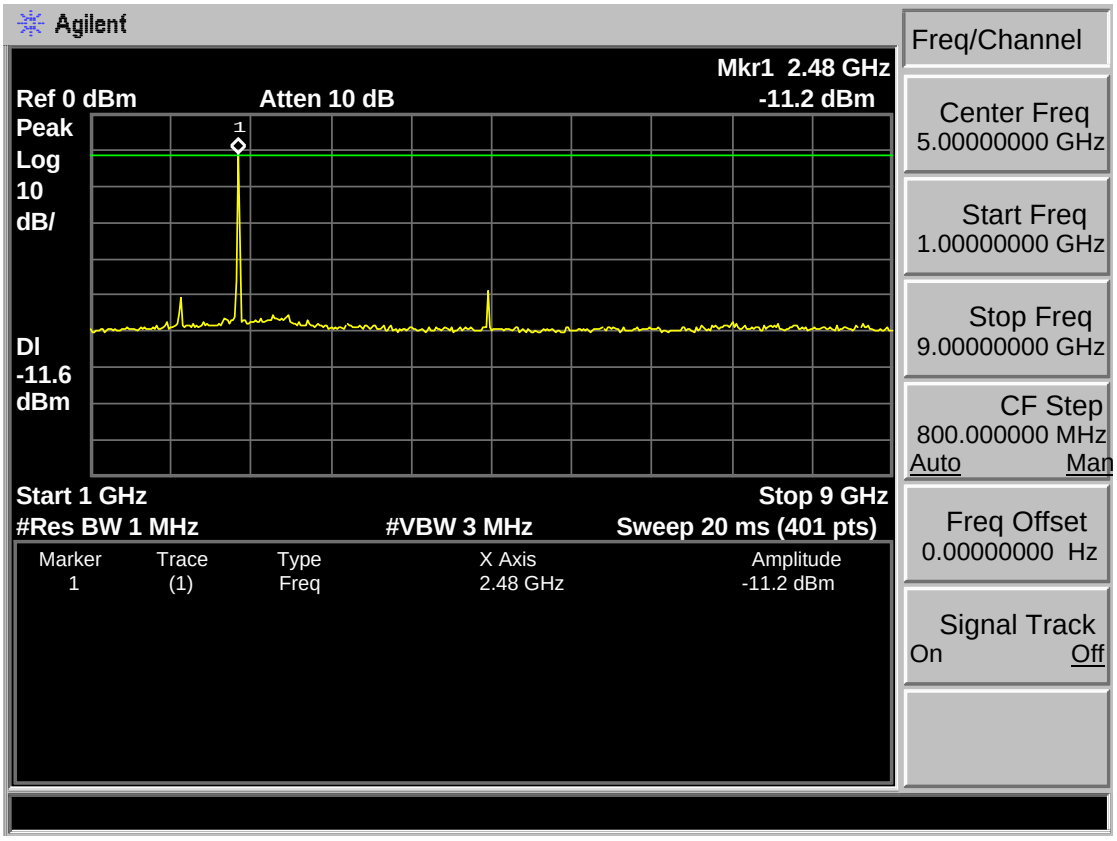


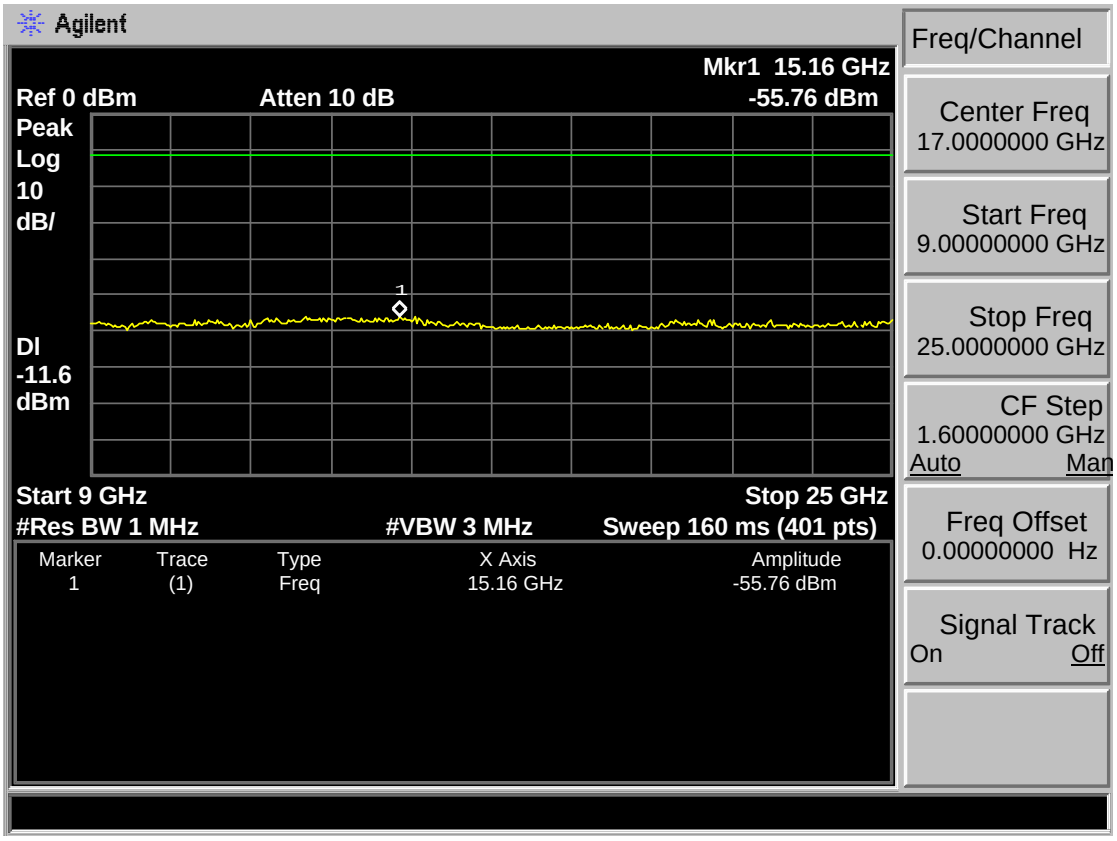


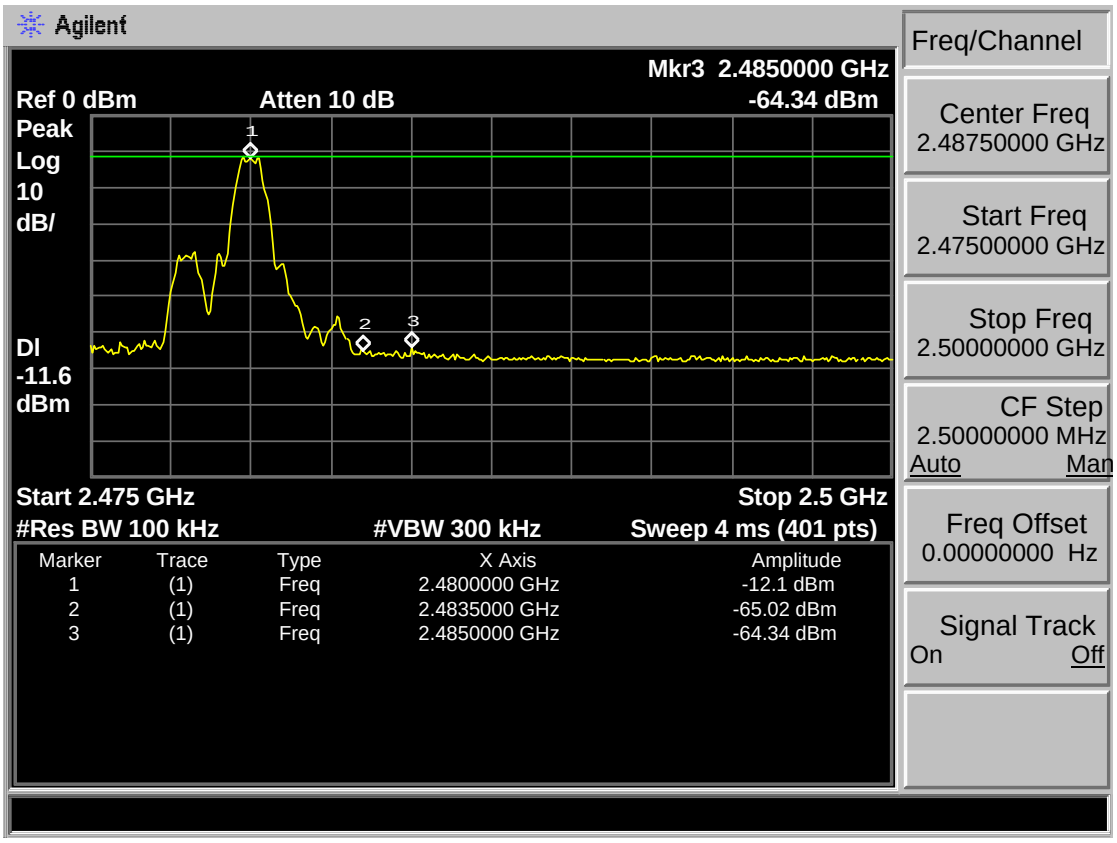

Agilent
Mkr1 13.64 GHz
Ref 0 dBm
Atten 10 dB
-55.96 dBm
Peak
Log
10
dB/
Dl
-11.6
dBm
Start 9 GHz
Stop 25 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 160 ms (401 pts)
Marker 1
Trace (1)
Type Freq
X Axis 13.64 GHz
Amplitude -55.96 dBm
Freq/Channel
Center Freq 17.0000000 GHz
Start Freq 9.00000000 GHz
Stop Freq 25.0000000 GHz
CF Step 1.60000000 GHz
Auto
Man
Freq Offset 0.00000000 Hz
Signal Track
On
Off

Test Mode: BT 4.0-BLE GFSK 2480MHz






Agilent
Mkr1 15.16 GHz
Ref 0 dBm
Atten 10 dB
-55.76 dBm
Peak
Log
10
dB/
Dl
-11.6
dBm
Start 9 GHz
Stop 25 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 160 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 15.16 GHz -55.76 dBm
Freq/Channel
Center Freq
17.0000000 GHz
Start Freq
9.00000000 GHz
Stop Freq
25.0000000 GHz
CF Step
1.60000000 GHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off

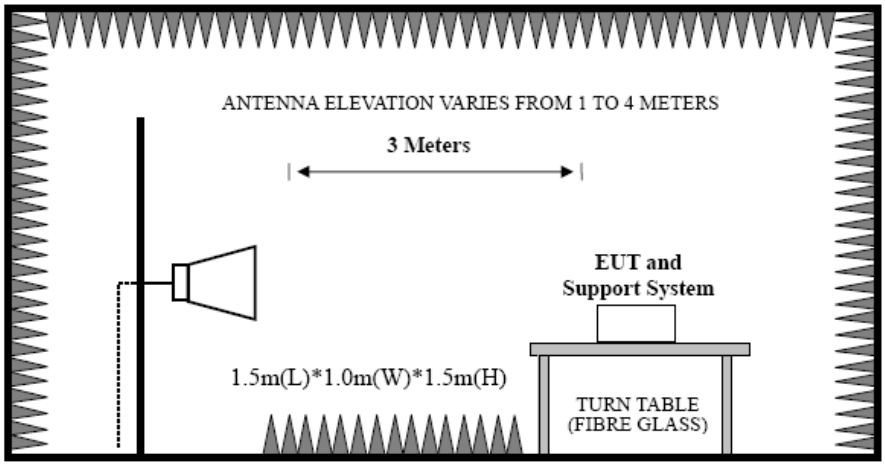

Agilent
Mkr3 2.4850000 GHz
Ref 0 dBm
Atten 10 dB
-64.34 dBm
Peak
Log
10
dB/
Dl
-11.6
dBm
Start 2.475 GHz
Stop 2.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 4 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.4800000 GHz -12.1 dBm
2 (1) Freq 2.4835000 GHz -65.02 dBm
3 (1) Freq 2.4850000 GHz -64.34 dBm
Freq/Channel
Center Freq
2.48750000 GHz
Start Freq
2.47500000 GHz
Stop Freq
2.50000000 GHz
CF Step
2.50000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off

5. BAND EDGE COMPLIANCE TEST

5.1 Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits

5.2 Block Diagram of Test setup



5.3 Test Procedure

1. The EUT is placed on a turntable, which is 1.5m above the ground plane and worked at highest radiated power.

2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.

3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

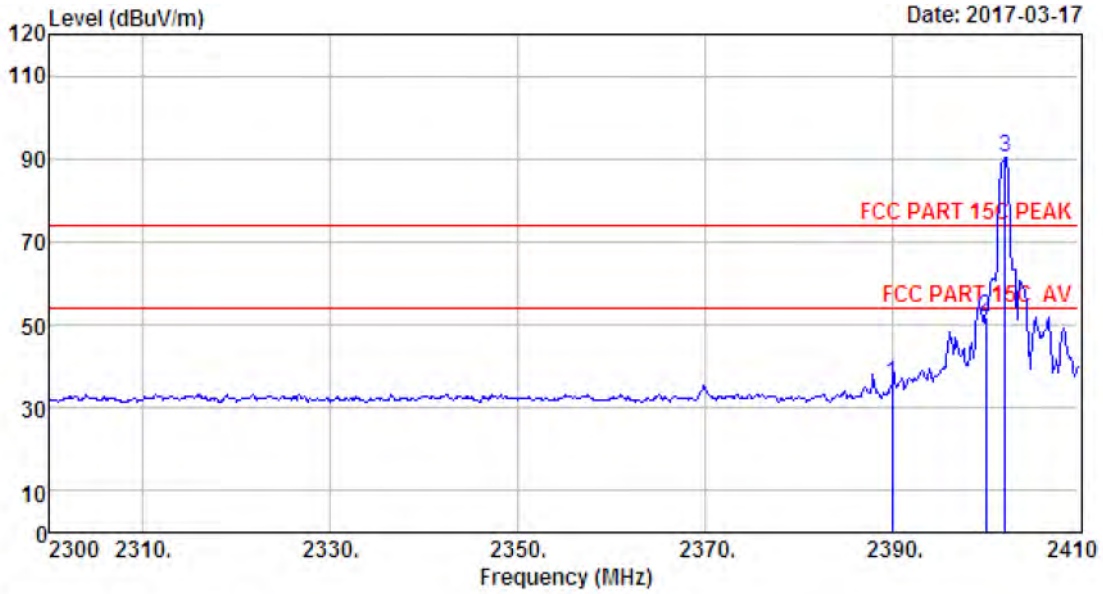
Peak : RBW = 1MHz, VBW = 1MHz, Detector=PEAK detector, Sweep time = auto.
AV : RBW = 1MHz, VBW = 10Hz, Detector=PEAK detector, Sweep time = auto.

5.4 Test Result

Pass (The testing data was attached in the next pages.)

Note: 1、For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.
2、The frequency 2402MHz and 2480 MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

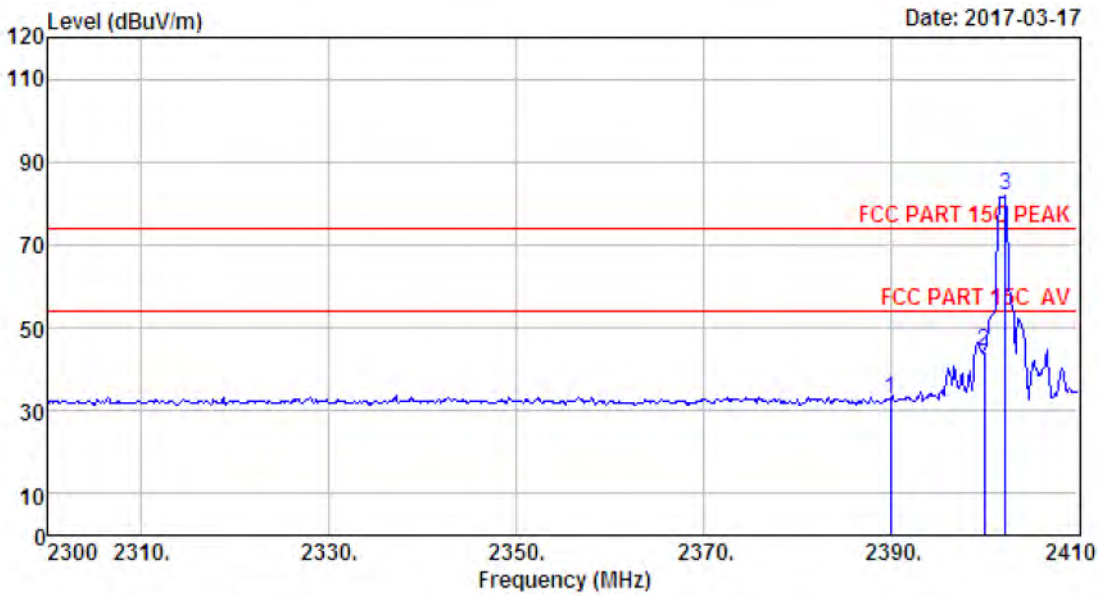
Test Data



Site no. : 1# 966 Chamber Data no. : 17
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.64	6.62	34.62	36.05	35.69	74.00	38.31	Peak
2	2400.00	27.61	6.62	34.64	52.05	51.64	74.00	22.36	Peak
3	2402.08	27.61	6.62	34.64	90.88	90.47	74.00	-16.47	Peak

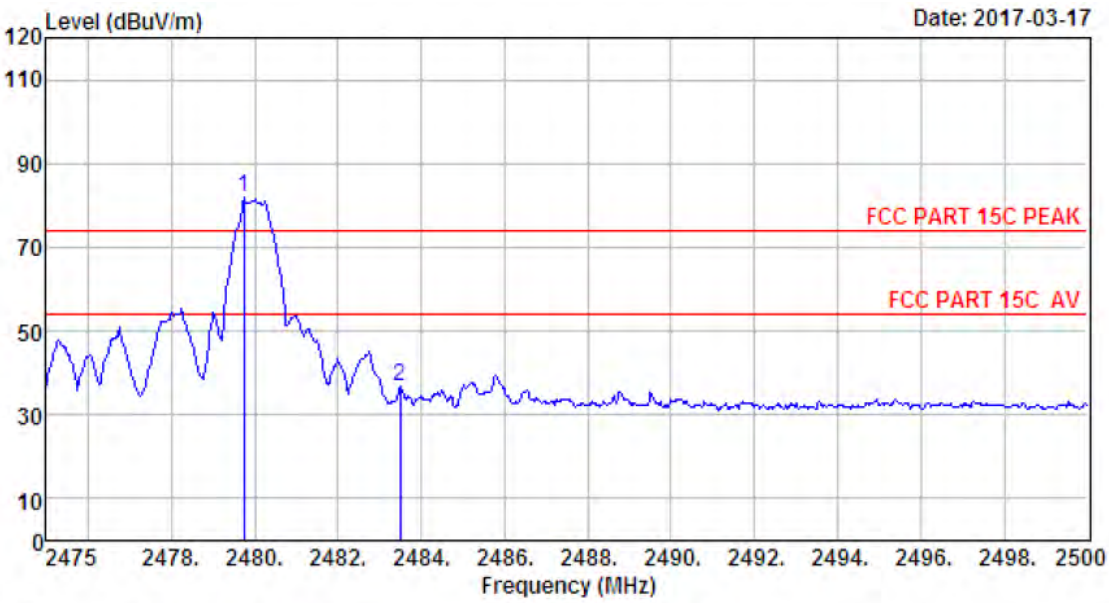
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 18
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.64	6.62	34.62	33.01	32.65	74.00	41.35	Peak
2	2400.00	27.61	6.62	34.64	44.67	44.26	74.00	29.74	Peak
3	2402.30	27.61	6.62	34.64	82.13	81.72	74.00	-7.72	Peak

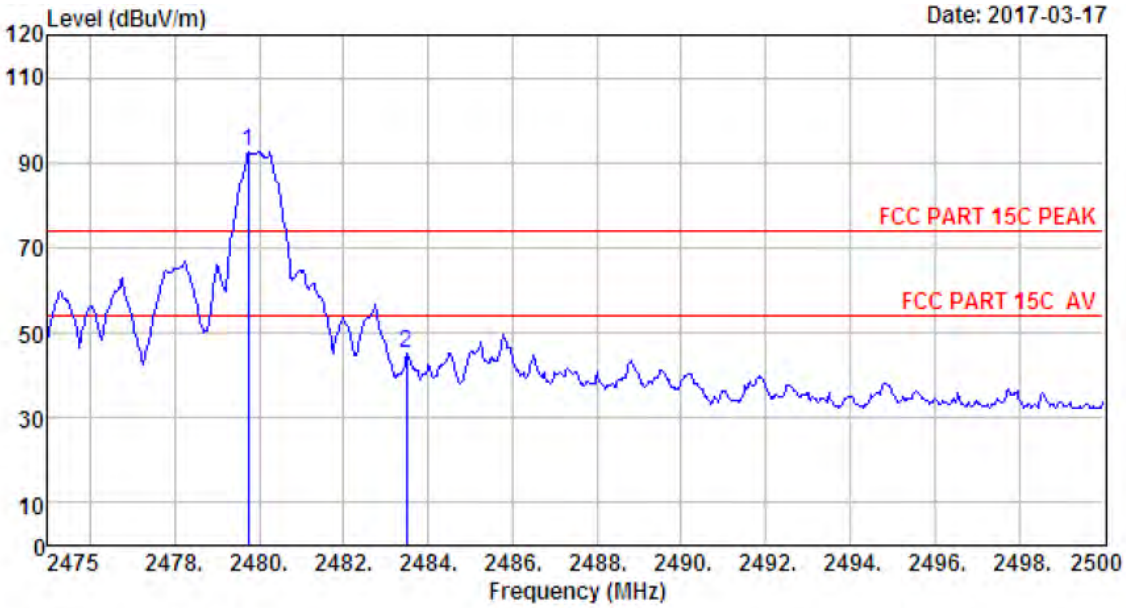
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 19
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.75	27.58	6.71	35.11	82.63	81.81	74.00	-7.81	Peak
2	2483.50	27.58	6.71	35.11	37.57	36.75	74.00	37.25	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 20
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Diaper Sensor
Power : DC 3V
M/N : DIA01B
Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.75	27.58	6.71	35.11	93.47	92.65	74.00	-18.65	Peak
2	2483.50	27.58	6.71	35.11	45.92	45.10	74.00	28.90	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

6 6dB Bandwidth Test

6.1 Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

6.2 Test Procedure

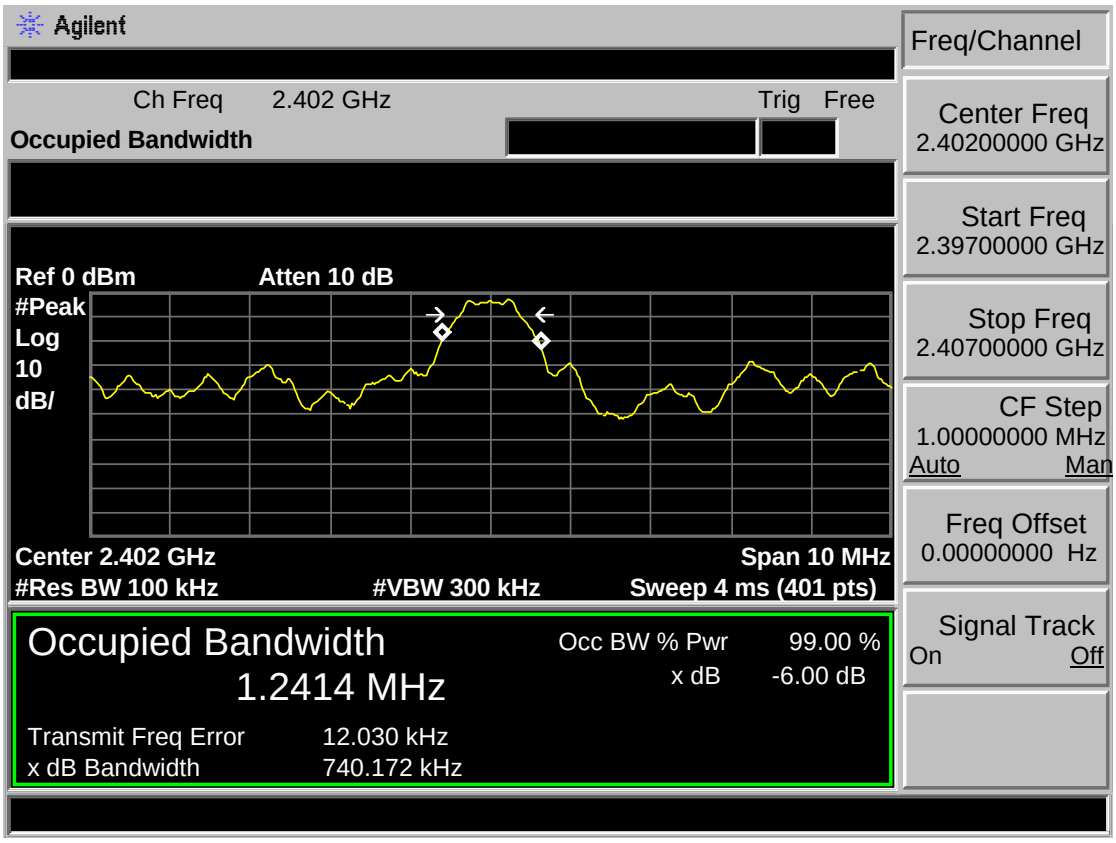
1, Connected the EUT's antenna port to spectrum analyzer device.
2, Follow the test procedure as described in KDB 558074
(1). Set resolution bandwidth (RBW) = 100 kHz.
(2). Set the video bandwidth (VBW) ≥ 3 x RBW.
(3). Detector = Peak.
(4). Trace mode = max hold.
(5). Sweep = auto couple.
(6). Allow the trace to stabilize.
(7). Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3 Test Result

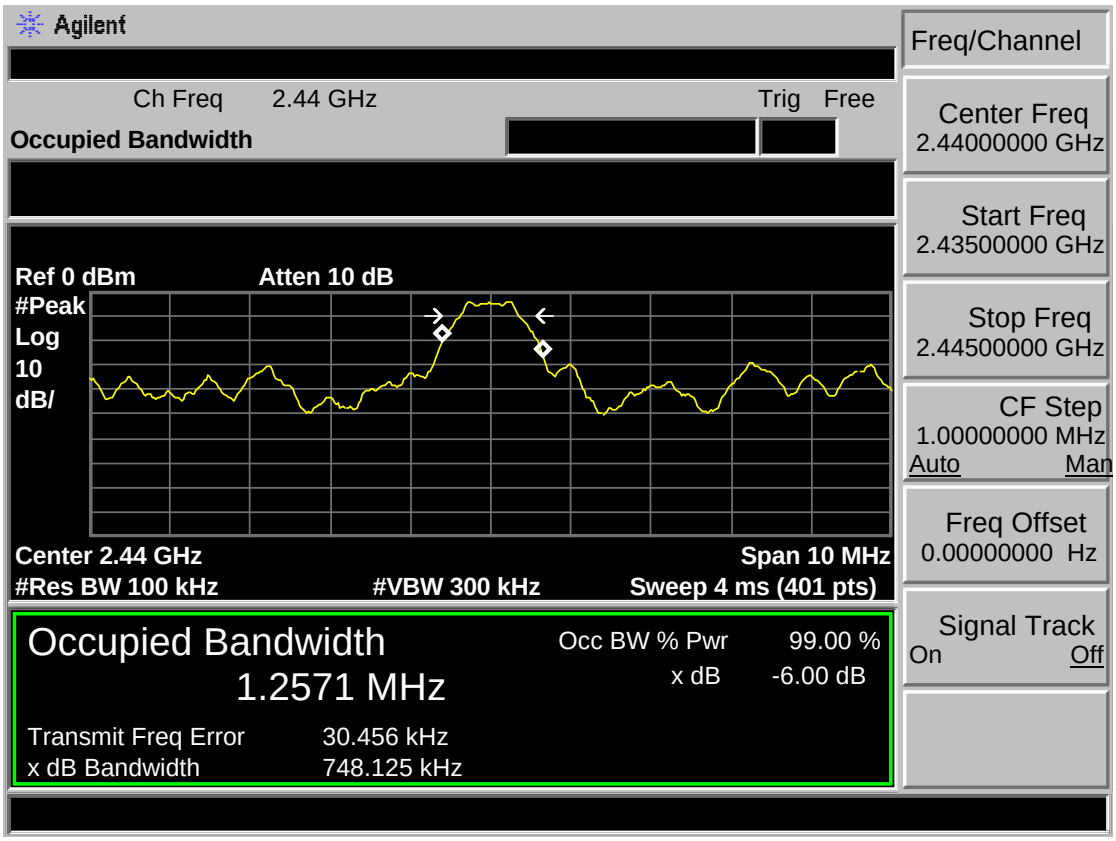
EUT: Diaper Sensor			
M/N: DIA01B			
Test date: 2017-03-26		Tested by: Tony.Tang	Test site: RF Site
Test Mode	CH	6dB bandwidth （MHz）	Limit (KHz)
BT 4.0-BLE GFSK	CH1	0.740	>500
	CH20	0.748	>500
	CH40	0.737	>500
Conclusion：PASS			

6.4 Test Data

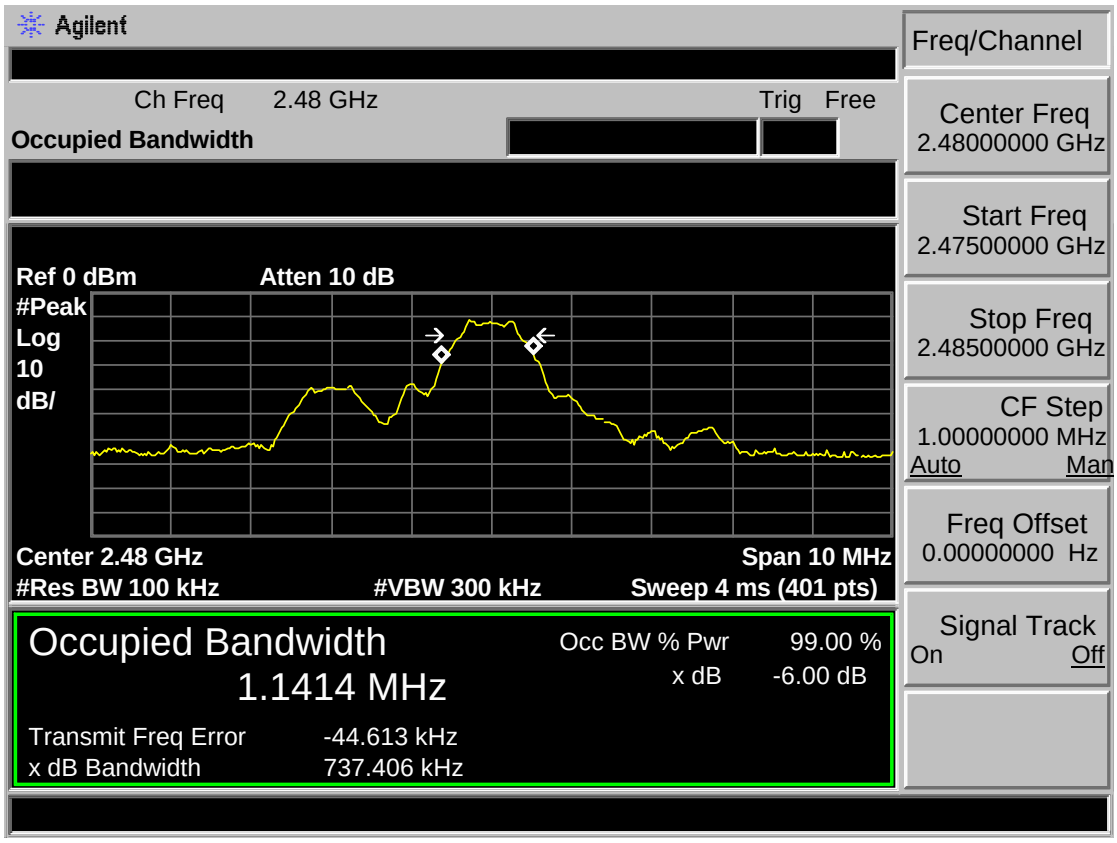
Test Mode: BT 4.0-BLE GFSK 2402MHz



Test Mode: BT 4.0-BLE GFSK 2440MHz



Test Mode: BT 4.0-BLE GFSK 2480MHz



7 OUTPUT POWER TEST

7.1 Limit

For systems using digital modulation in the 2400—2483.5MHz, The Peak out put Power shall not exceed 1W(30dBm)

7.2 Test Procedure

7.3Test Procedure

1, Connected the EUT's antenna port to spectrum analyzer device.
2, Follow the test procedure as described in KDB 558074
(1). Set the RBW ≥ DTS bandwidth.
(2). Set VBW ≥ 3 x RBW.
(3). Set span ≥ 3 x RBW.
(4). Sweep time = auto couple.
(5). Detector = peak.
(6). Trace mode = max hold.
(7). Allow trace to fully stabilize.
(8). Use peak marker function to determine the peak amplitude level.

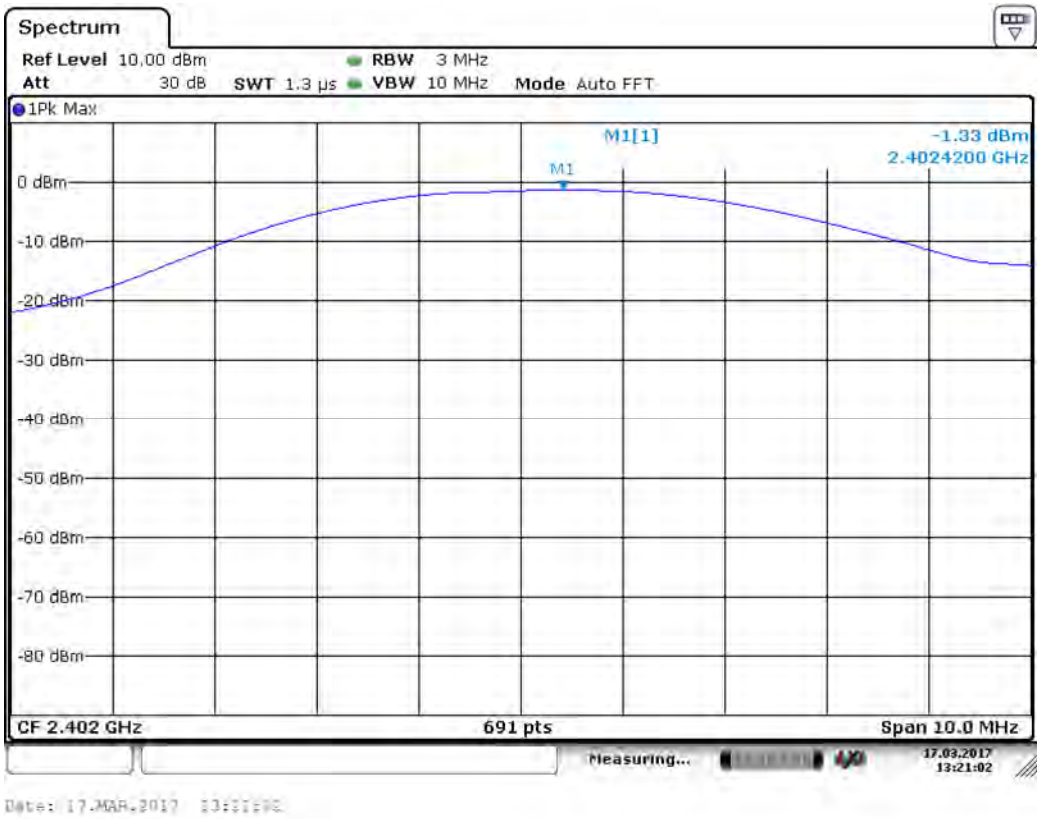
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offs

7.4 Test Result

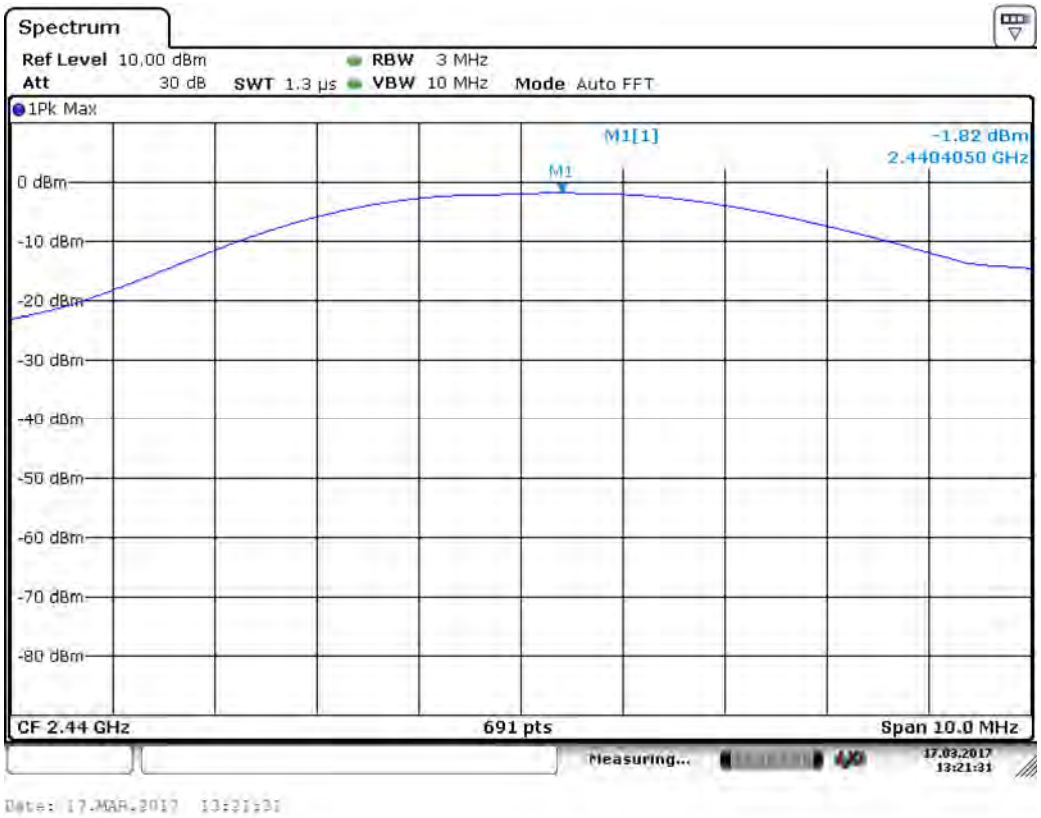
EUT: Diaper Sensor			
M/N:DIA01B			
Test date: 2017-03-26		Test site: 3m Chamber	Tested by: Tony Tang
Pass			
Test Mode	CH	Peak output Power （dBm）	Limit (dBm)
BT 4.0-BLE GFSK	CH1	-1.33	30
	CH20	-1.82	30
	CH40	-2.30	30
Conclusion：PASS			

7.5 Test Data

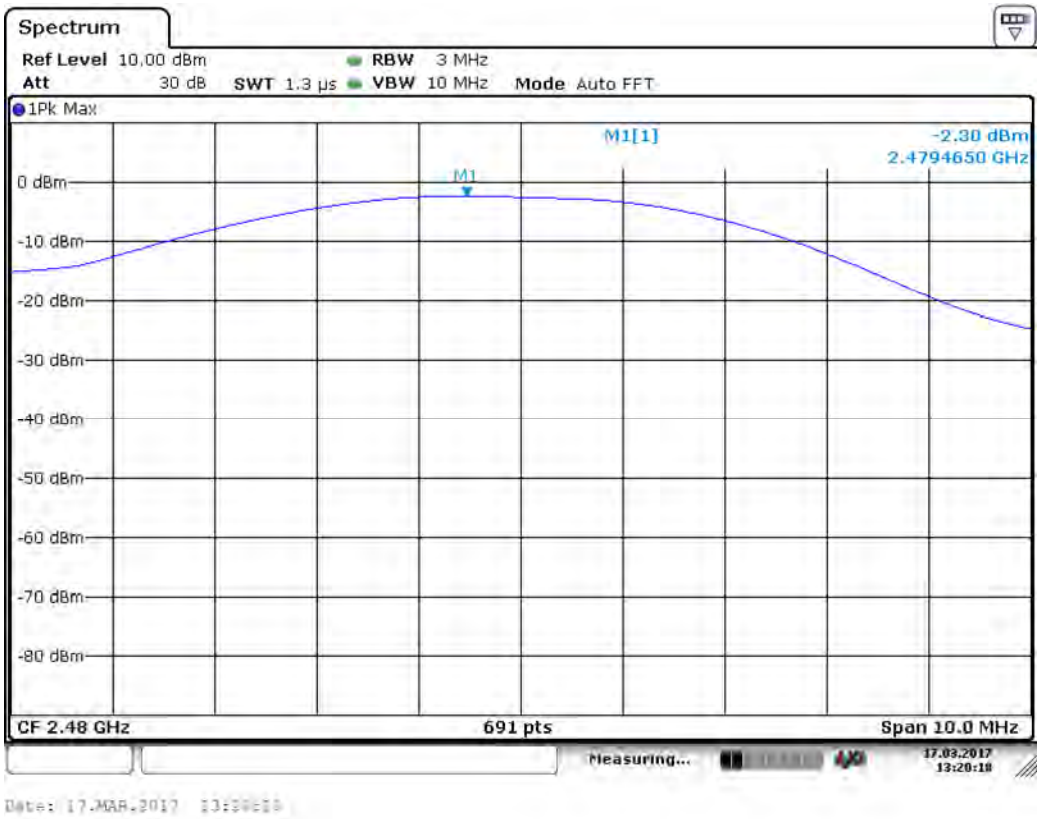
Test Mode: BT 4.0-BLE GFSK 2402MHz



Test Mode: BT 4.0-BLE GFSK 2440MHz



Test Mode: BT 4.0-BLE GFSK 2480MHz



8 POWER SPECTRAL DENSITY TEST

8.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

8.2 Test Procedure

1, Connected the EUT's antenna port to spectrum analyzer device.

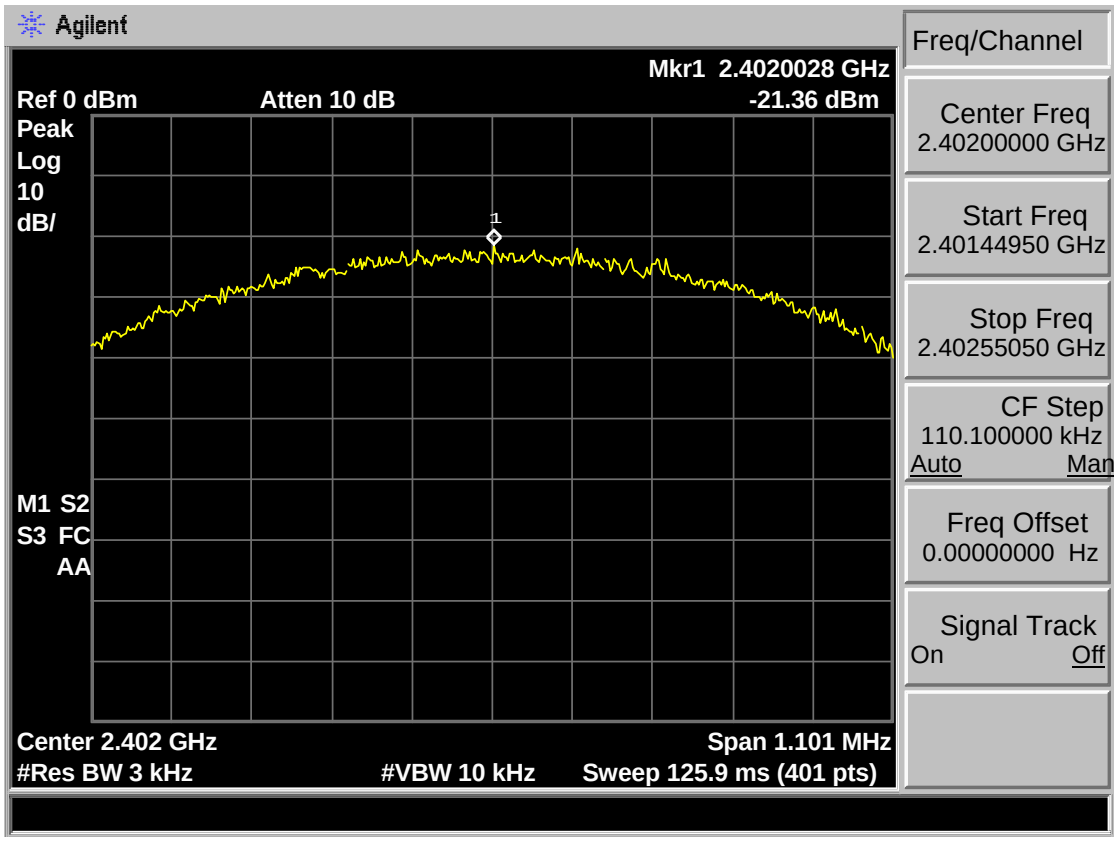
2, Follow the test procedure as described in KDB 558074
(1). Set analyzer center frequency to DTS channel center frequency.
(2). Set the span to 1.5 times the DTS bandwidth.
(3). Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
(4). Set the VBW ≥ 3 RBW.
(5). Detector = peak.
(6). Sweep time = auto couple.
(7). Trace mode = max hold.
(8). Allow trace to fully stabilize.
(9). Use the peak marker function to determine the maximum amplitude level.
(10). If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

8.3 Test Result

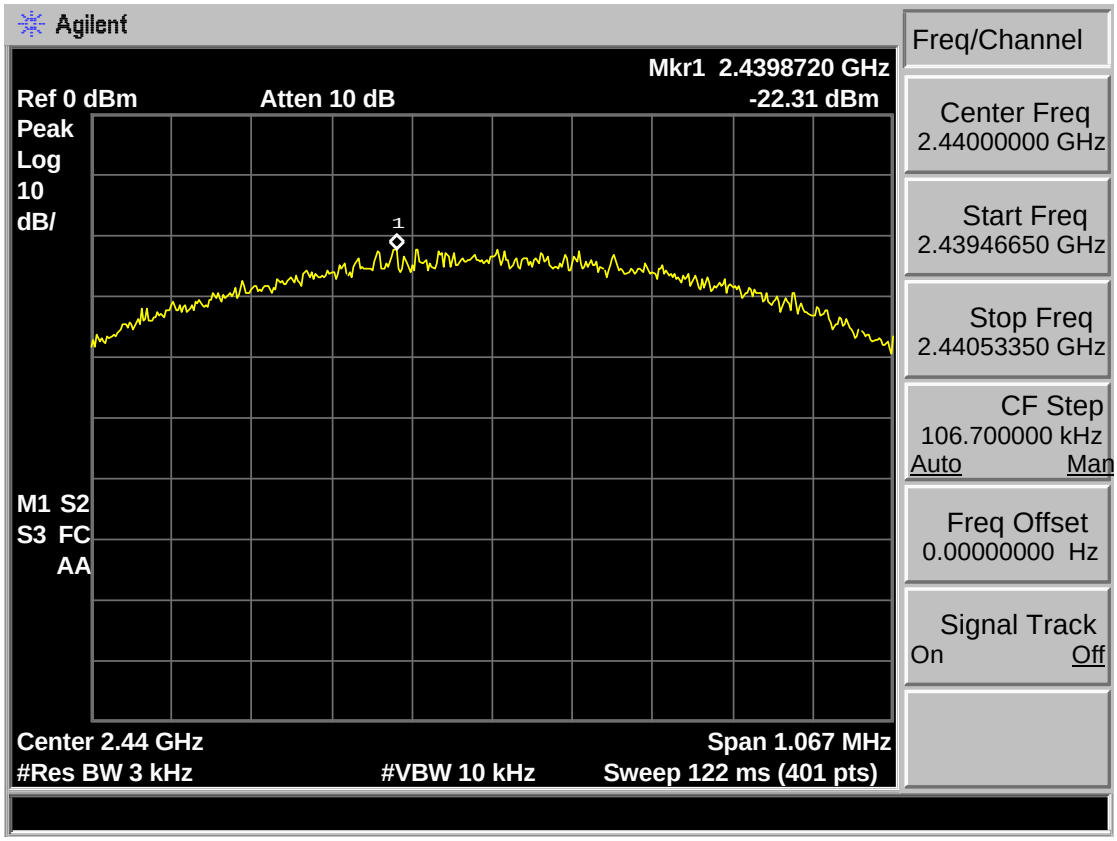
EUT: Diaper Sensor			
M/N: DIA01B			
Test date: 2017-03-26		Test site: 3m Chamber	Tested by: Tony Tang
Pass			
Test Mode	CH	Power density (dBm/3kHz）	Limit (dBm/3kHz)
BT 4.0-BLE GFSK	CH1	-21.36	8
	CH20	-22.31	8
	CH40	-22.56	8
Conclusion：PASS			

8.4 Test Data

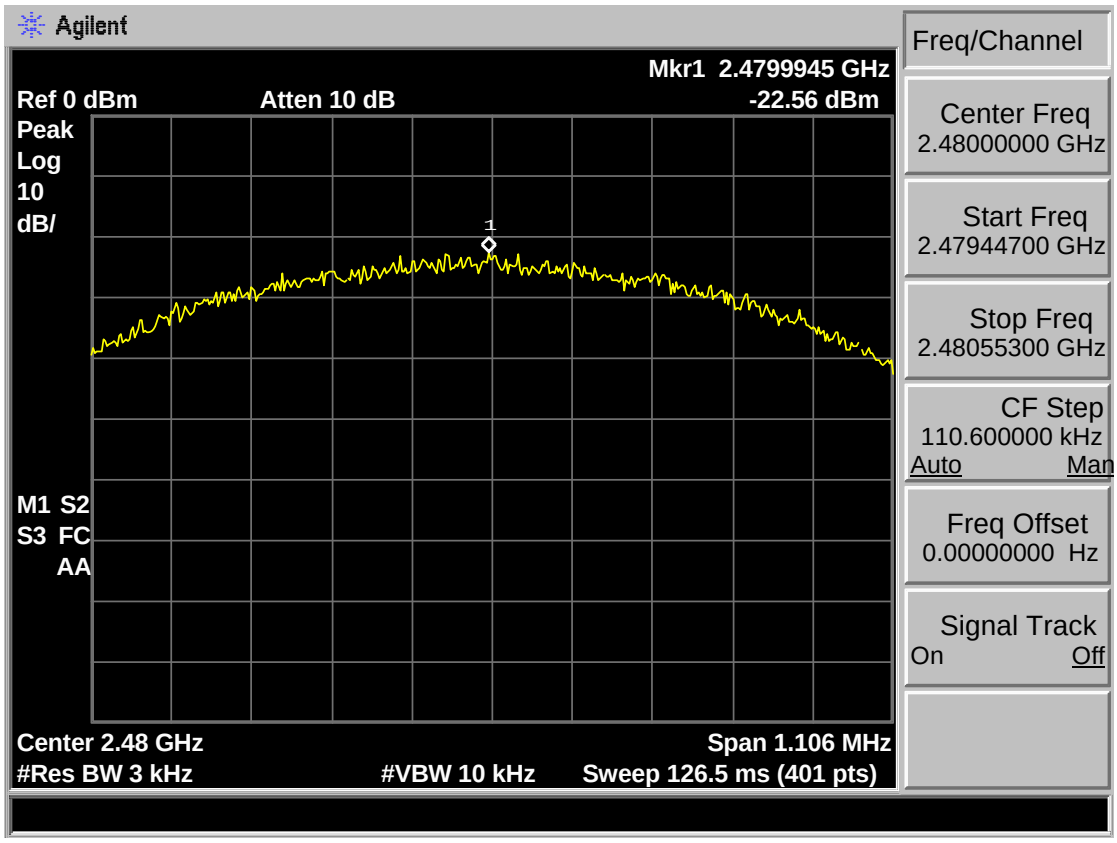
Test Mode: BT 4.0-BLE GFSK 2402MHz



Test Mode: BT 4.0-BLE GFSK 2440MHz



Test Mode: BT 4.0-BLE GFSK 2480MHz



9 ANTENNA REQUIREMENTS

9.1 Limit

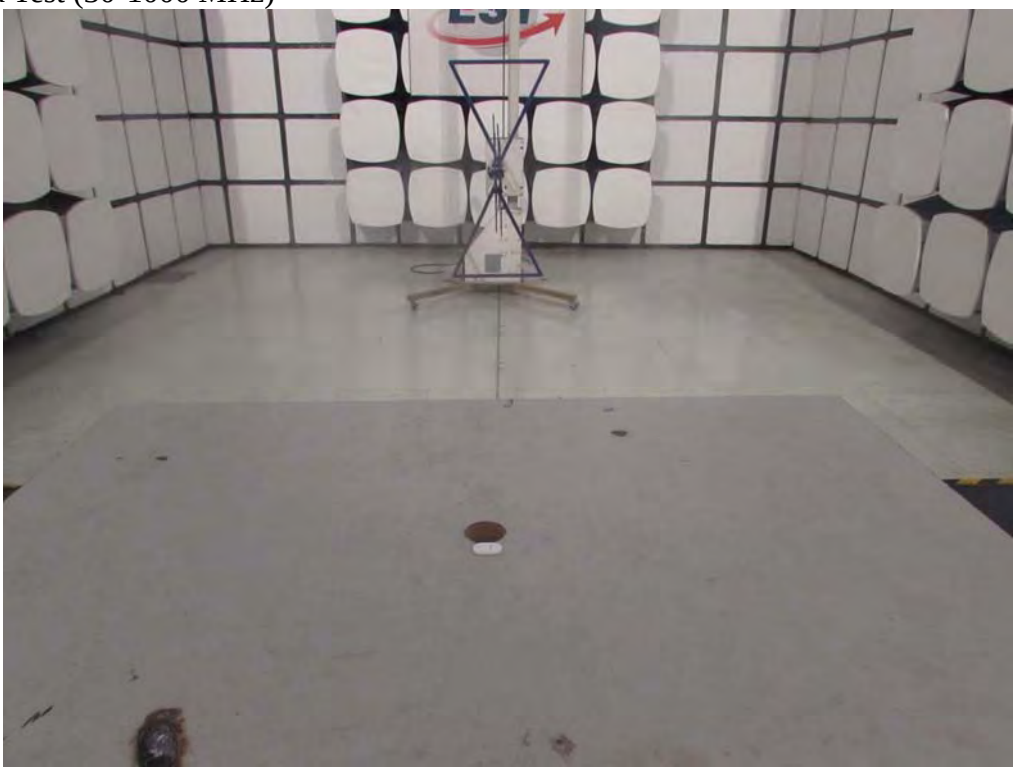
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2 Result

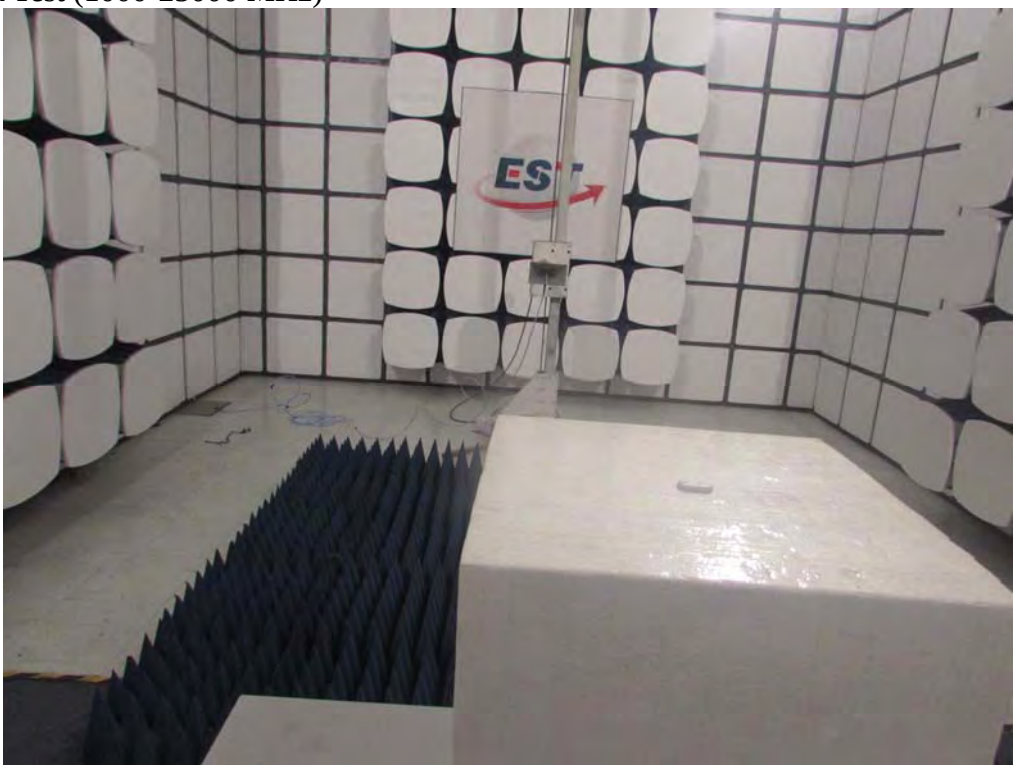
The antennas used for this product are integral Patch Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 2.5dBi.

10 TEST SETUP PHOTO

Radiated Test (30-1000 MHz)



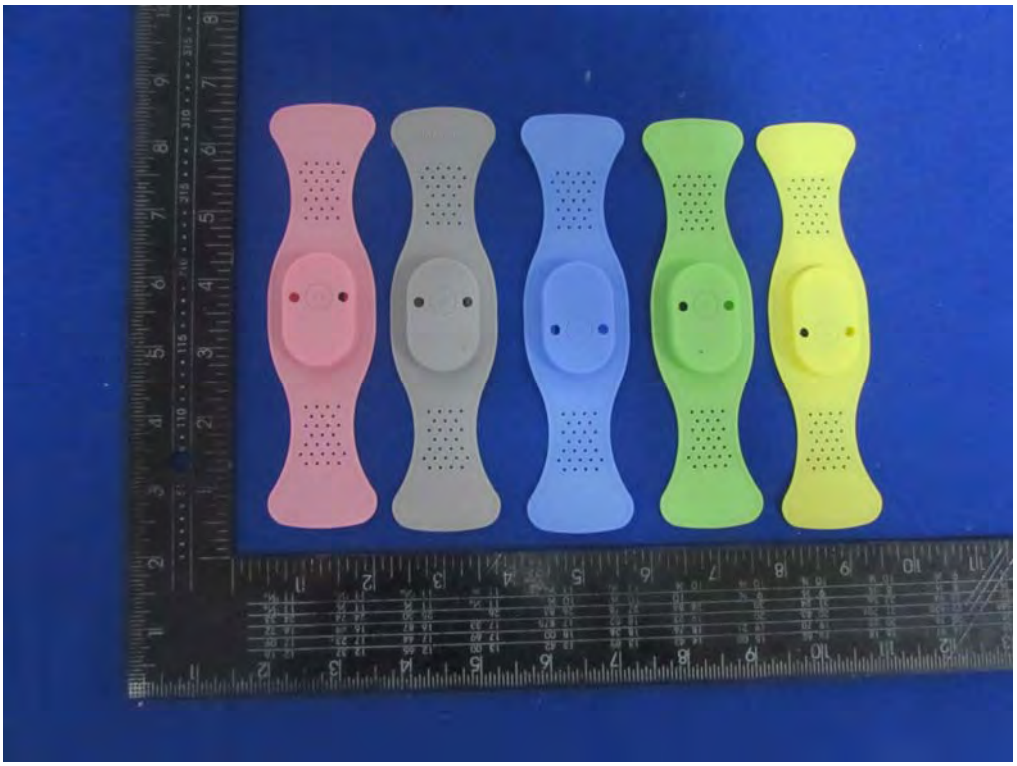
Radiated Test (1000-25000 MHz)



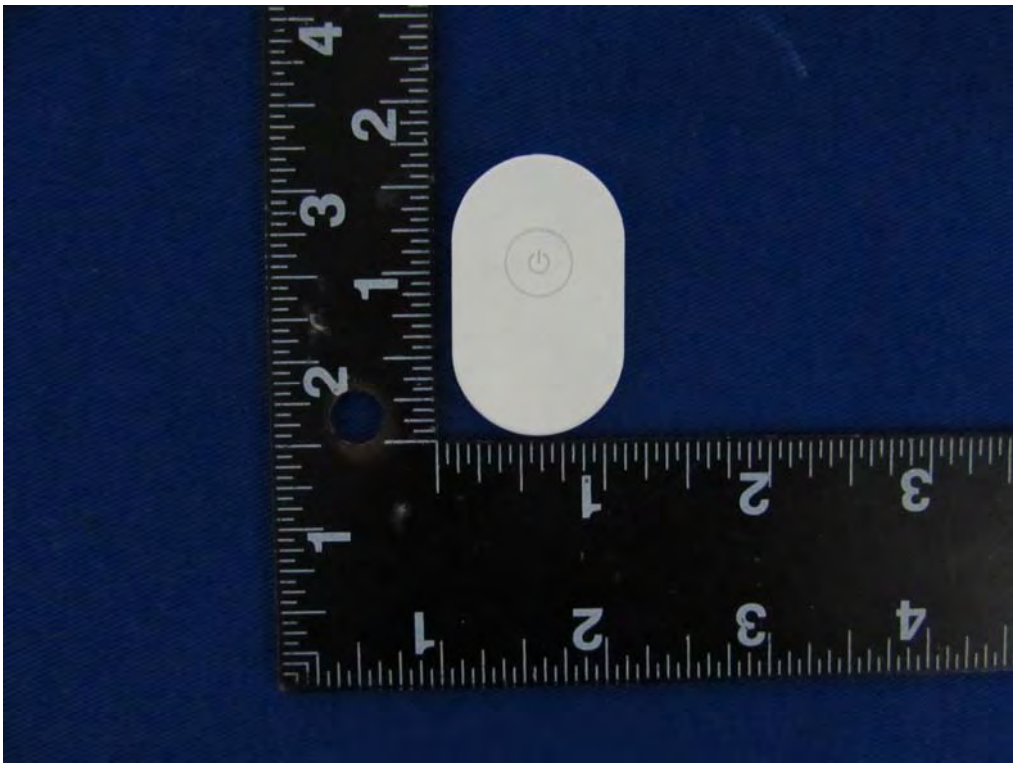
11 PHOTOS OF EUT

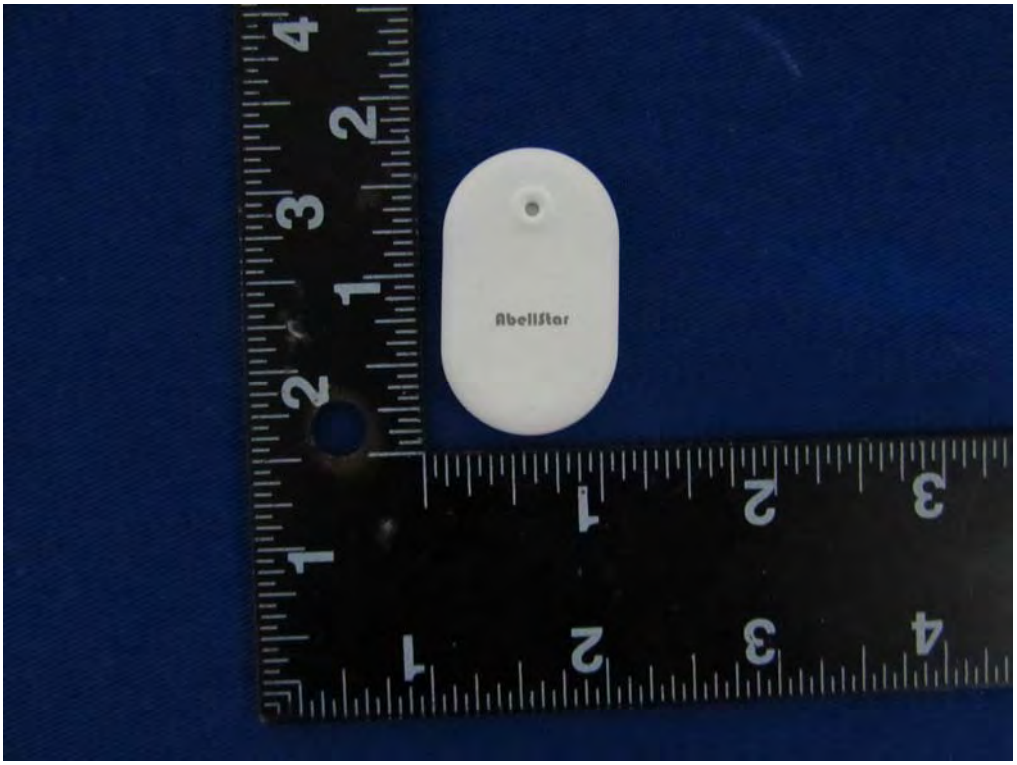
External Photos

M/N: DIA01B



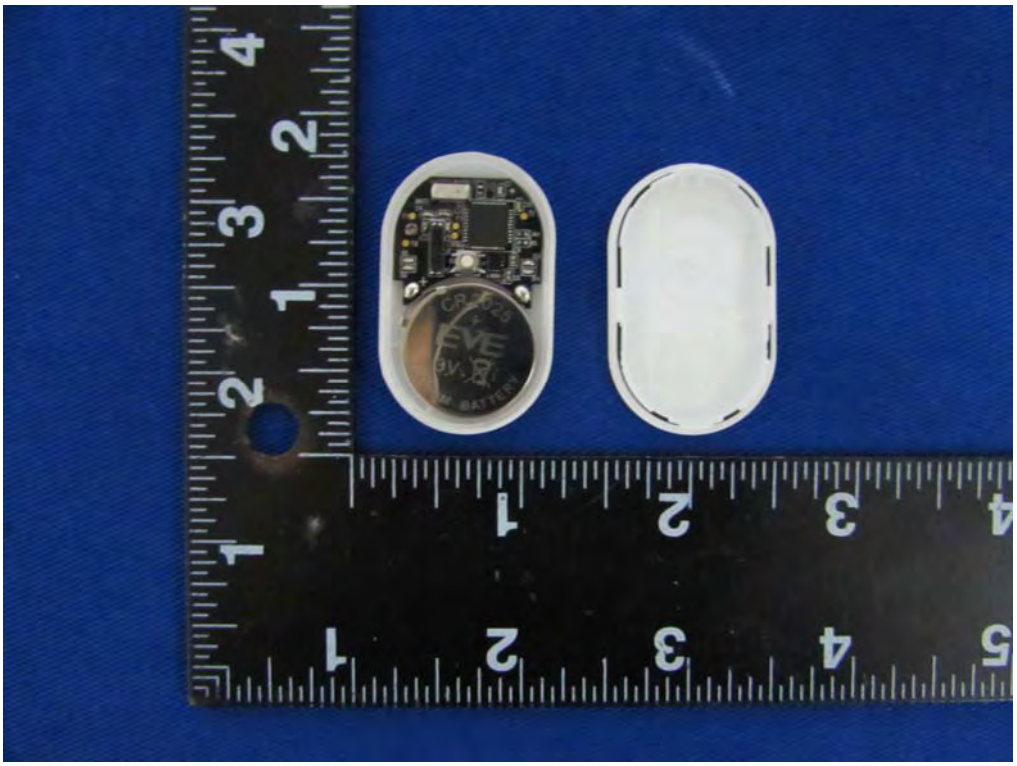
External Photos
M/N: DIA01B

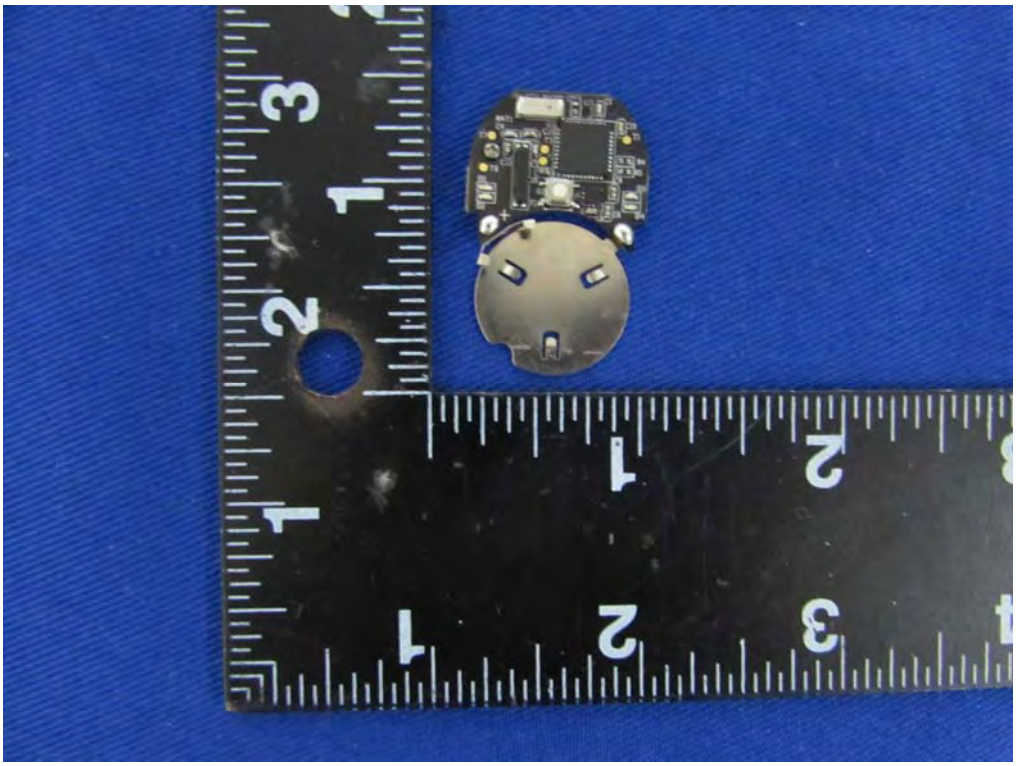


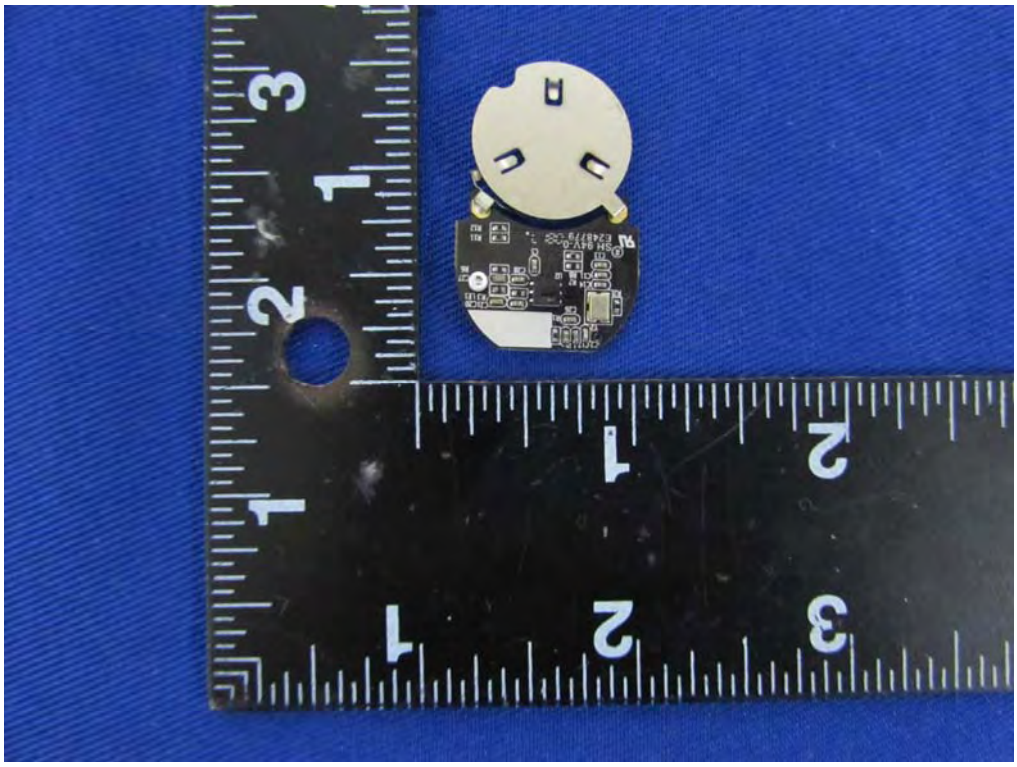
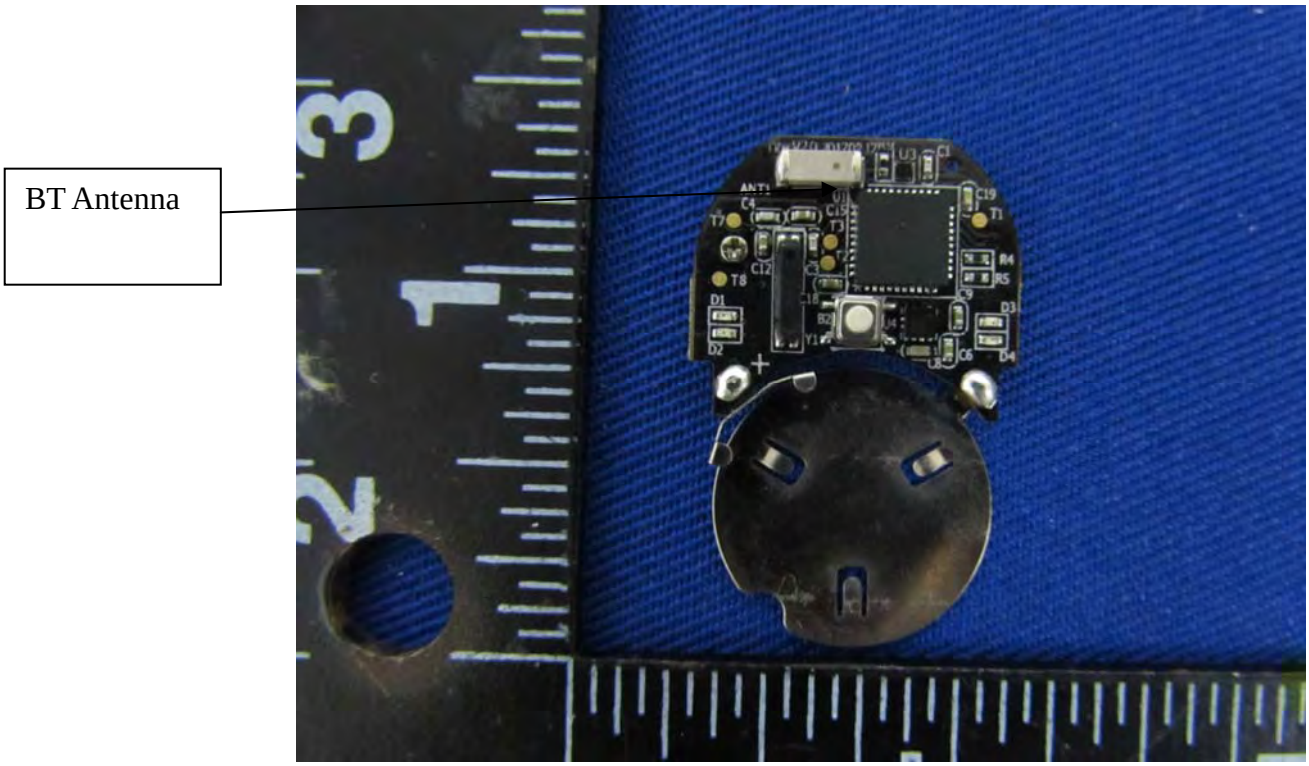


Internal Photos

M/N: DIA01B





Internal Photos

M/N: DIA01B