FCC PART 15C TEST REPORT FOR CERTIFICATION
On Behalf of

Dongguan Southstar Electronics Limited

Diaper Wetting Alarm Plus; Diaper Wetting Alarm Pro

Model Number: DIA21B

Additional Model: DIA11B

FCC ID:X8CDIA21B

Prepared for:	Dongguan Southstar Electronics Limited
	F Building, 3 Chengtian Rd., Mintian, Shatian Town, Dongguan,
	Guangdong, China
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

Report Number:	ESTE-R1808016
Date of Test:	Jul. 18 ~ Aug. 07, 2018
Date of Report:	Aug. 10, 2018

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Description Page

EST Technology Co., Ltd.

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 Wetting Alarm Plus; Diaper Wetting Alarm Pro
Model Number:	DIA21B
Additional Model:	DIA11B Note: These models have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, except the different model number、product function and product name. The "DIA21B" has the function of gas and humidity detection, with product name is "Diaper Wetting Alarm Plus"; The "DIA11B" only has the function of humidity detection, with product name is "Diaper Wetting Alarm Pro".
Power Supply:	DC 5V From Adapter DC 3.7V From internal battery
Test Voltage:	DC 5V From Adapter Input AC 120V/60Hz DC 5V From Adapter Input AC 240V/60Hz DC 3.7V
Trade Name:	Abellstar Serial No.: ------
Date of Receipt:	Jul. 17, 2018 Date of Test: Jul. 18 ~ Aug. 07, 2018
Test Specification:	FCC Rules and Regulations Part 15 Subpart C:2017 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:** Aug. 10, 2018

Prepared by:	Reviewed by:	Approved by:
Ring / Assistant	Tony / Engineer	Iceman Hu / 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 Wetting Alarm Plus
FCC ID	:	X8CDIA21B
Model Number	:	DIA21B
Operation frequency	:	2402MHz~2480MHz
Number of channel	:	40
Antenna	:	Internal antenna,2.5dBi Gain
Modulation	:	BLE: 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	PASS
Radiated Emission	FCC Part 15: 15.209 ANSI C63.10:2013 KDB 558074	PASS
Band Edge Compliance	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
6dB Bandwidth	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Peak Output Power	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Power Spectral Density	FCC Part 15: 15.247 ANSI C63.10:2013 KDB 558074	PASS
Antenna requirement	FCC Part 15: 15.203	PASS
Note: KDB 558074 D01 DTS Meas Guidance v04		

2.2. Test Facilities

EMC Lab	:	Certificated by CNAS, CHINA Registration No.: L5288 Date of registration: November 13, 2017 Certificated by A2LA, USA Registration No.: 4366.01 Date of registration: November 07, 2017 Certificated by FCC, USA Designation Number: CN1215 Registration No.: 722932 Date of registration: November 21, 2017 Certificated by Industry Canada Registration No.: 9405A Date of registration: December 03, 2015 Certificated by VCCI, Japan Registration No.: R-13663; C-14103 Date of registration: July 25, 2017 This Certificate is valid until: July 24, 2020 Certificated by TUV Rheinland, Germany Registration No.: UA 50195514 0001 Date of registration: February 07, 2015 Certificated by TUV/PS, Shenzhen Registration No.: SCN1017 Date of registration: January 27, 2011 Certificated by Intertek ETL SEMKO Registration No.: 2011-RTL-L2-64 Date of registration: April 28, 2011 Certificated by Nemko, Hong Kong Registration No.: 175193 Date of registration: May 4, 2011
Name of Firm	:	EST Technology Co., Ltd.
Site Location	:	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China

2.3. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	±3.48dB
Uncertainty for spurious emissions test (30MHz-1GHz)	±4.60 dB(Polarize: H)
	±4.68 dB(Polarize: V)
Uncertainty for spurious emissions test (1GHz to 18GHz)	±4.96dB
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.

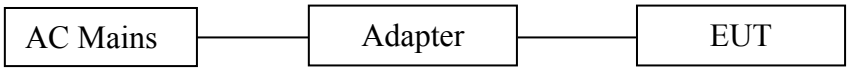
2.4. Assistant equipment used for test

2.4.1. Adapter

M/N	:	TEKA012-0502000UK
Input	:	AC 100-240V, 50/60Hz, 0.35AMAX
Output	:	DC 5V/2A
Note: Don’t configuration adapter when it sales on the market, The adapter provided by the laboratory.		

2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 (or 1.5) meter high above ground. EUT was beset into Bluetooth test mode by software before test.



(EUT: Diaper Wetting Alarm Plus)

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

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.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESHS30	832354	CEPREI	June 15,18	1 Year
Artificial Mains Network	Rohde & Schwarz	ENV216	101260	CEPREI	June 15,18	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101100	CEPREI	June 15,18	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

2.8.2. For radiated emission test(9 kHz-30MHz)

Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	101780	CEPREI	June 15,18	1 Year
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-038	CEPREI	October 08,17	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

2.8.3. For radiated emissions test (30-1000MHz)

Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	101780	CEPREI	June 15,18	1 Year
Bilog Antenna	Teseq	CBL 6111D	27090	CEPREI	June 15,18	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

2.8.4. For radiated emission test(above 1GHz)

Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA9120D1002	CEPREI	June 18,18	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170242	CEPREI	June 18,18	1Year
Signal Amplifier	SCHWARZBECK	BBV9718	9718-212	CEPREI	June 15,18	1 Year
Spectrum Analyzer	Rohde &Schwarz	FSV	103173	CEPREI	June 15,18	1 Year
PSA Series Spertrum Analyzer	Agilent	E4447A	MY50180031	CEPREI	June 15,18	1Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

2.8.5. For connect EUT antenna terminal test

Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Spectrum Analyzer	Rohde &Schwarz	FSV	103173	CEPREI	June 15,18	1 Year

Spectrum Analyzer	Agilent	E4408B	MY44211139	CEPREI	June 15,18	1 Year

3 POWER LINE CONDUCTED EMISSION TEST

3.1Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

3.2 Test Procedure

The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provides a 50 ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs). The AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Test.

The bandwidth of test receiver (R & S ESHS30) is set at 10kHz.

The frequency range from 150kHz to 30MHz is checked.

3.3. Test Result

PASS. **(**All emissions not reported below are too low against the prescribed limits.)

3.4. Test data

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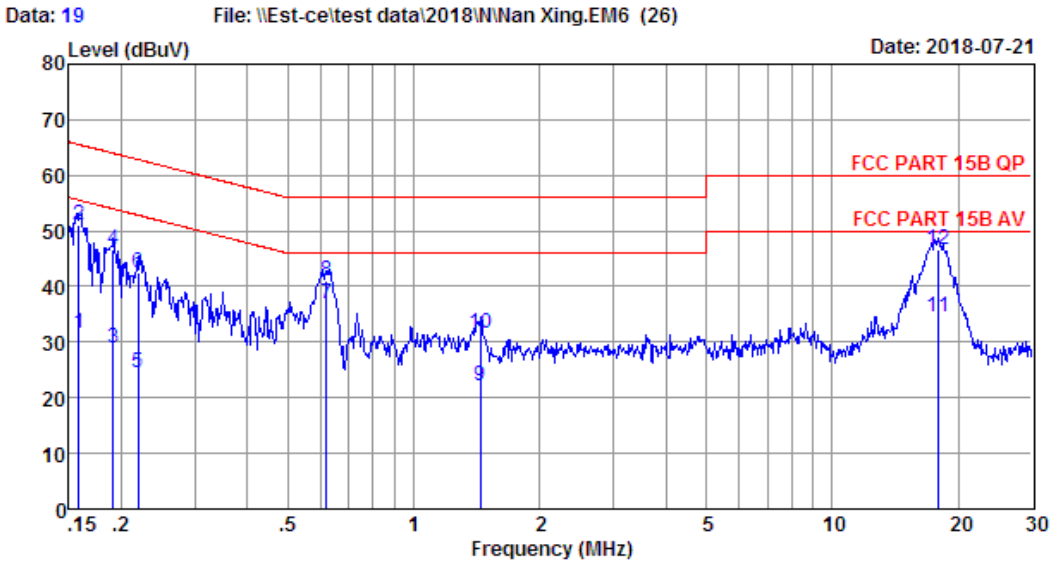

Site no. : 844 Shield Room
Limit : FCC PART 15B QP
Env. / Ins. : Temp:22.3'C Humi:48% Press:101.50kPa
Engineer : Viking
EUT : Diaper Wetting Alarm Plus
Power : DC 5V From Adapter Input AC 120V/60Hz
M/N : DIA21B
Test Mode : TX Mode

Data no. : 19
LINE Phase: LINE

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuv)	Limits (dBuv)	Margin (dB)	Remark
1	0.16	9.59	9.69	12.20	31.48	55.56	24.08	Average
2	0.16	9.59	9.69	31.93	51.21	65.56	14.35	QP
3	0.19	9.60	9.77	9.43	28.80	53.98	25.18	Average
4	0.19	9.60	9.77	27.22	46.59	63.98	17.39	QP
5	0.22	9.61	9.84	5.17	24.62	52.83	28.21	Average
6	0.22	9.61	9.84	23.10	42.55	62.83	20.28	QP
7	0.62	9.63	9.92	17.30	36.85	46.00	9.15	Average
8	0.62	9.63	9.92	21.40	40.95	56.00	15.05	QP
9	1.44	9.64	9.95	2.55	22.14	46.00	23.86	Average
10	1.44	9.64	9.95	11.91	31.50	56.00	24.50	QP
11	17.85	9.74	10.14	14.67	34.55	50.00	15.45	Average
12	17.85	9.74	10.14	26.76	46.64	60.00	13.36	QP

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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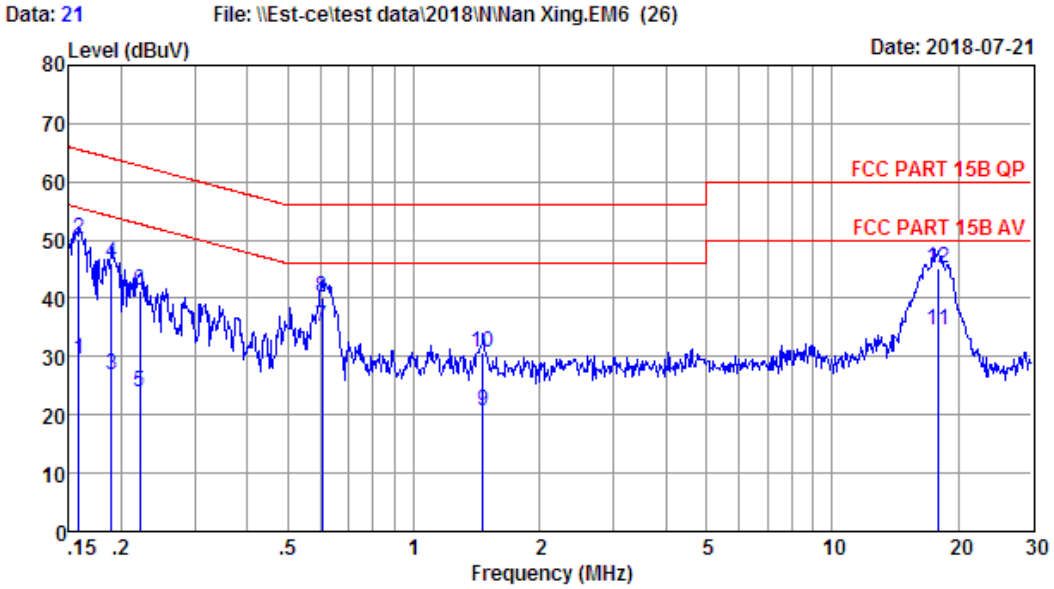

Site no. : 844 Shield Room
Data no. : 21
Limit : FCC PART 15B QP
LINE Phase: NEUTRAL
Env. / Ins. : Temp:22.3'C Humi:48% Press:101.50kPa
Engineer : Viking
EUT : Diaper Wetting Alarm Plus
Power : DC 5V From Adapter Input AC 120V/60Hz
M/N : DIA21B
Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuv)	Limits (dBuv)	Margin (dB)	Remark
1	0.16	9.50	9.69	10.20	29.39	55.56	26.17	Average
2	0.16	9.50	9.69	31.00	50.19	65.56	15.37	QP
3	0.19	9.53	9.77	7.43	26.73	54.06	27.33	Average
4	0.19	9.53	9.77	26.63	45.93	64.06	18.13	QP
5	0.22	9.53	9.84	4.42	23.79	52.74	28.95	Average
6	0.22	9.53	9.84	21.96	41.33	62.74	21.41	QP
7	0.60	9.56	9.92	15.72	35.20	46.00	10.80	Average
8	0.60	9.56	9.92	20.63	40.11	56.00	15.89	QP
9	1.46	9.56	9.95	1.18	20.69	46.00	25.31	Average
10	1.46	9.56	9.95	11.30	30.81	56.00	25.19	QP
11	17.85	9.90	10.14	14.51	34.55	50.00	15.45	Average
12	17.85	9.90	10.14	25.06	45.10	60.00	14.90	QP

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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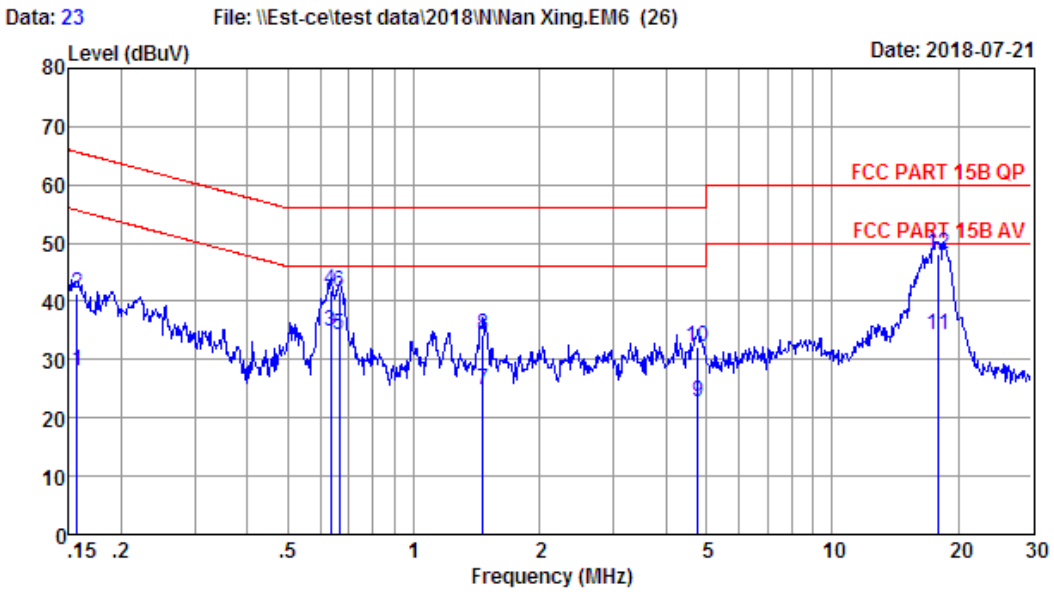

Site no. : 844 Shield Room
Data no. : 23
Limit : FCC PART 15B QP
LINE Phase: NEUTRAL
Env. / Ins. : Temp:22.3'C Humi:48% Press:101.50kPa
Engineer : Viking
EUT : Diaper Wetting Alarm Plus
Power : DC 5V From Adapter Input AC 240V/60Hz
M/N : DIA21B
Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuv)	Limits (dBuv)	Margin (dB)	Remark
1	0.16	9.50	9.69	9.00	28.19	55.65	27.46	Average
2	0.16	9.50	9.69	22.22	41.41	65.65	24.24	QP
3	0.63	9.56	9.92	15.23	34.71	46.00	11.29	Average
4	0.63	9.56	9.92	22.39	41.87	56.00	14.13	QP
5	0.66	9.56	9.92	14.74	34.22	46.00	11.78	Average
6	0.66	9.56	9.92	22.05	41.53	56.00	14.47	QP
7	1.46	9.56	9.95	5.18	24.69	46.00	21.31	Average
8	1.46	9.56	9.95	14.66	34.17	56.00	21.83	QP
9	4.77	9.61	10.00	3.06	22.67	46.00	23.33	Average
10	4.77	9.61	10.00	12.46	32.07	56.00	23.93	QP
11	17.94	9.90	10.14	14.13	34.17	50.00	15.83	Average
12	17.94	9.90	10.14	28.20	48.24	60.00	11.76	QP

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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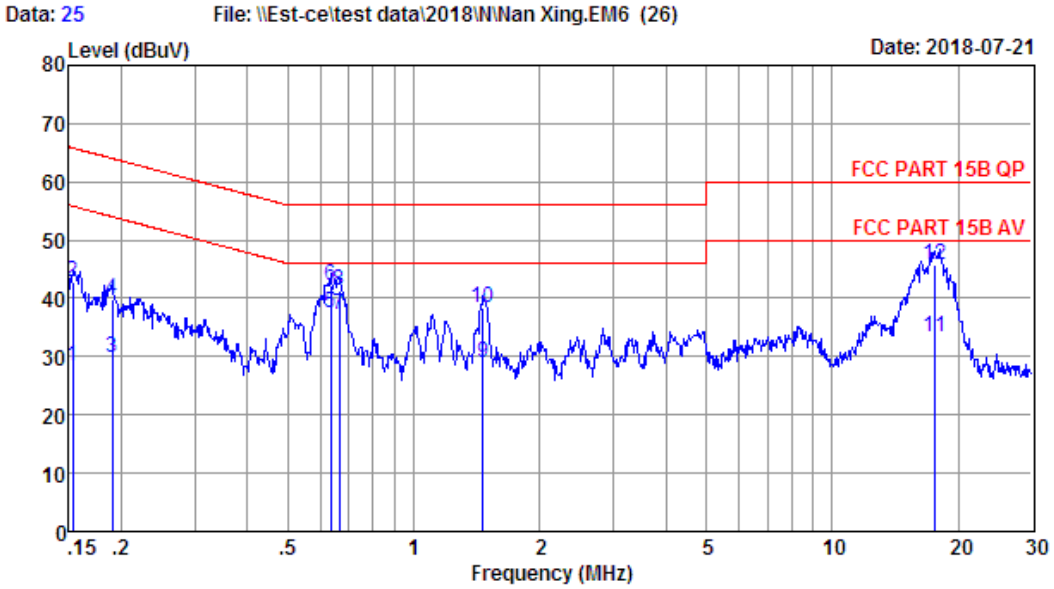


Site no. : 844 Shield Room
Data no. : 25
Limit : FCC PART 15B QP
LINE Phase: LINE
Env. / Ins. : Temp:22.3'C Humi:48% Press:101.50kPa
Engineer : Viking
EUT : Diaper Wetting Alarm Plus
Power : DC 5V From Adapter Input AC 240V/60Hz
M/N : DIA21B
Test Mode : TX Mode

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuv)	Limits (dBuv)	Margin (dB)	Remark
1	0.15	9.59	9.69	9.20	28.48	55.82	27.34	Average
2	0.15	9.59	9.69	23.57	42.85	65.82	22.97	QP
3	0.19	9.60	9.77	10.43	29.80	54.02	24.22	Average
4	0.19	9.60	9.77	20.38	39.75	64.02	24.27	QP
5	0.63	9.63	9.92	17.95	37.50	46.00	8.50	Average
6	0.63	9.63	9.92	22.60	42.15	56.00	13.85	QP
7	0.66	9.63	9.92	17.60	37.15	46.00	8.85	Average
8	0.66	9.63	9.92	21.80	41.35	56.00	14.65	QP
9	1.46	9.64	9.95	9.22	28.81	46.00	17.19	Average
10	1.46	9.64	9.95	18.82	38.41	56.00	17.59	QP
11	17.66	9.75	10.14	13.36	33.25	50.00	16.75	Average
12	17.66	9.75	10.14	25.94	45.83	60.00	14.17	QP

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

4 RADIATED EMISSION TEST

4.1 Limit

4.1.1 15.209 limits

Frequency (MHz)	Field Strength(μV/m)	Distance(m)
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

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.

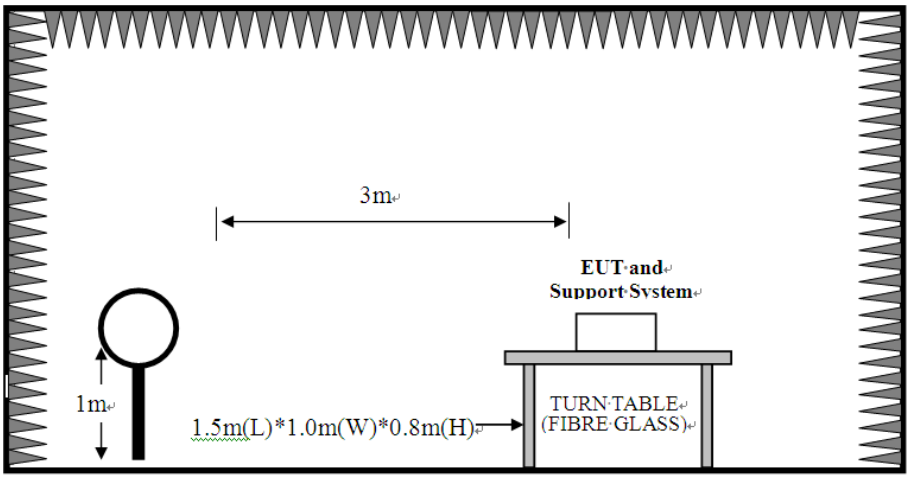
4.1.2 15.205 Restricted bands of operation

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])

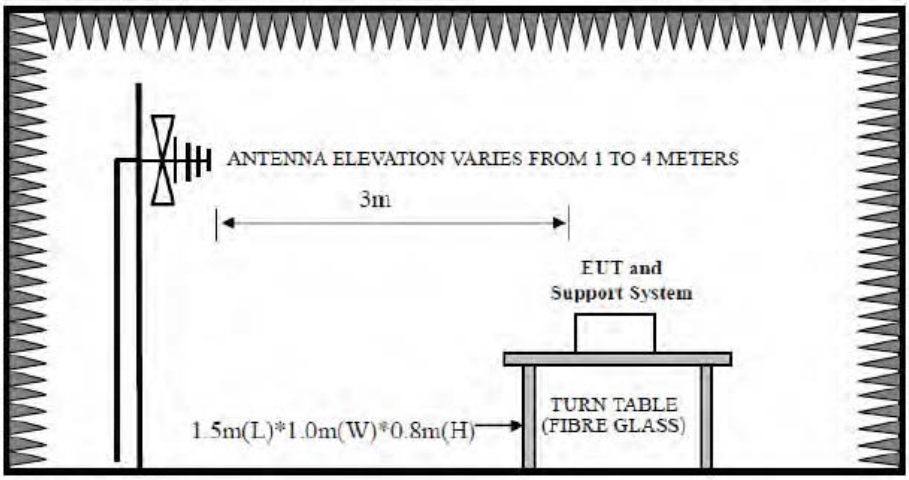
All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

4.2. Block Diagram of Test setup

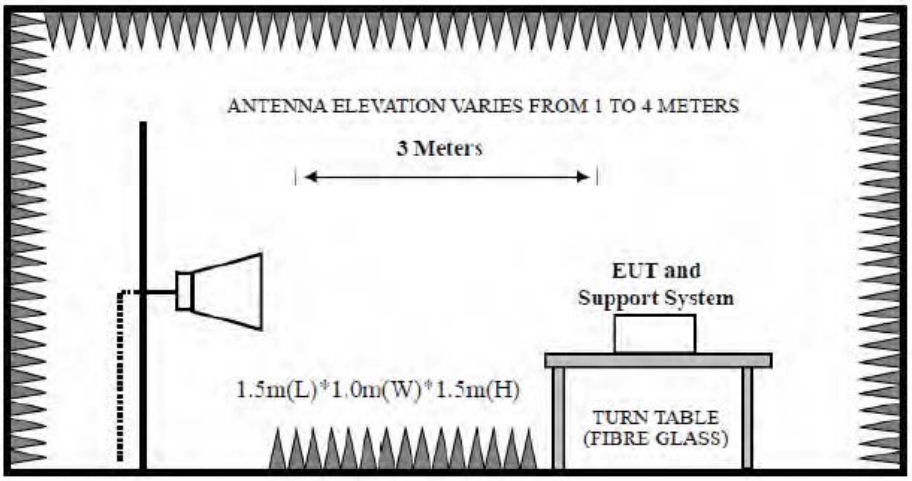
9kHz~30MHz



30~1000MHz



Above 1GHz



4.3. Test Procedure

EUT was placed on a turn table, which is 0.8 meter high above ground for 9kHz~1000MHz test, and which is 1.5 meter high above ground for above 1GHz test. 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. Both horizontal and vertical polarization of the antenna are set on test.

The test frequency analyzer system was set to Peak Detect (300Hz RBW in 9kHz to 150kHz and 10kHz RBW in 150kHz to 30MHz) Function and Specified Bandwidth with Maximum Hold Mode.

The bandwidth of the EMI test receiver (R&S ESVS10) is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 1MHz 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.

4.4. 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.

4.5. Test Data

9 kHz – 30 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.

30-1000 MHz

EST Technology

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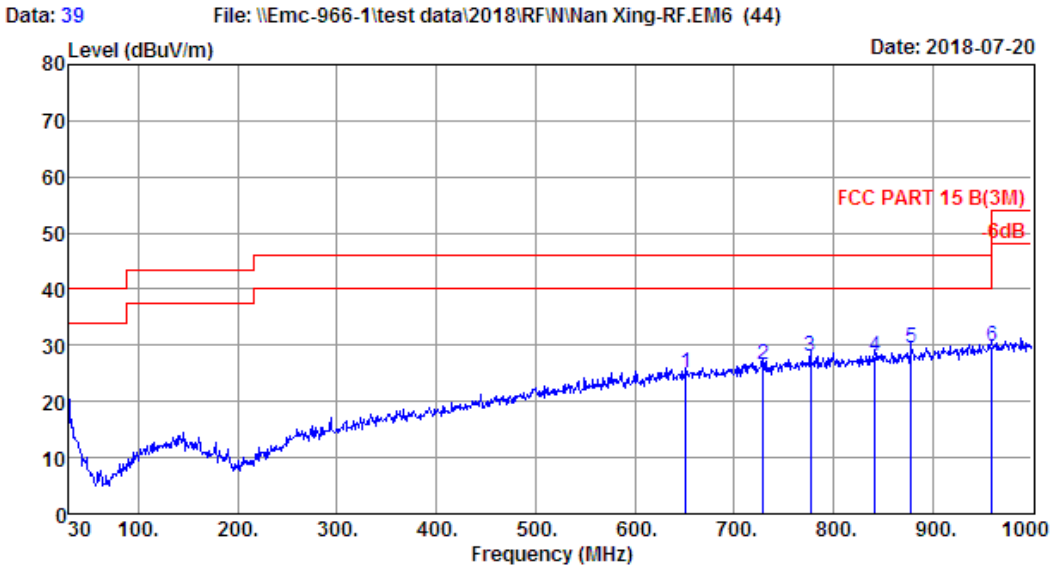


```
Site no.      : 1# 966 Chamber              Data no.  : 39
Dis. / Ant.   : 3m   37062                  Ant. pol. : VERTICAL
Limit         : FCC PART 15 B(3M)
Env. / Ins.   : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer      : Viking
EUT           : Diaper Wetting Alarm Plus
Power         : DC 3.7V
M/N           : DIA21B
Test Mode     : TX Mode
```

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	651.77	20.94	3.40	0.75	25.09	46.00	20.91	QP
2	729.37	21.68	3.69	1.31	26.68	46.00	19.32	QP
3	776.90	22.64	3.67	1.59	27.90	46.00	18.10	QP
4	841.89	23.20	3.89	1.01	28.10	46.00	17.90	QP
5	878.75	23.49	4.05	1.87	29.41	46.00	16.59	QP
6	960.23	24.50	4.81	0.43	29.74	54.00	24.26	QP

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

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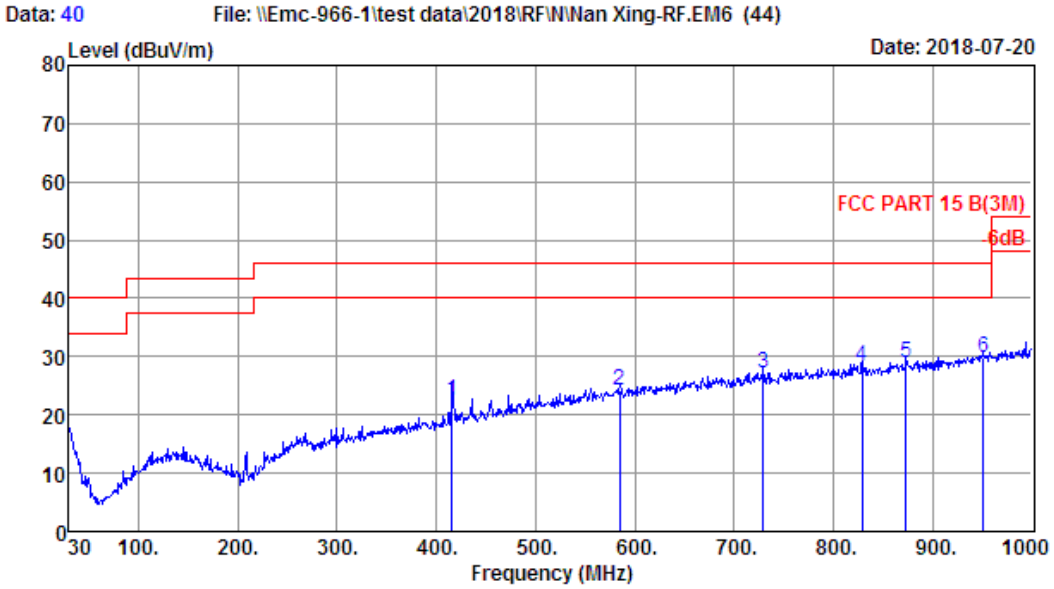

Site no. : 1# 966 Chamber Data no. : 40
Dis. / Ant. : 3m 37062 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Viking
EUT : Diaper Wetting Alarm Plus
Power : DC 3.7V
M/N : DIA21B
Test Mode : TX Mode

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	416.06	16.42	2.41	3.63	22.46	46.00	23.54	QP
2	584.84	19.80	3.15	1.20	24.15	46.00	21.85	QP
3	729.37	21.68	3.69	1.79	27.16	46.00	18.84	QP
4	829.28	23.00	3.90	1.33	28.23	46.00	17.77	QP
5	872.93	23.43	4.04	1.50	28.97	46.00	17.03	QP
6	951.50	24.42	4.65	0.76	29.83	46.00	16.17	QP

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

1000-18000MHz

EST Technology

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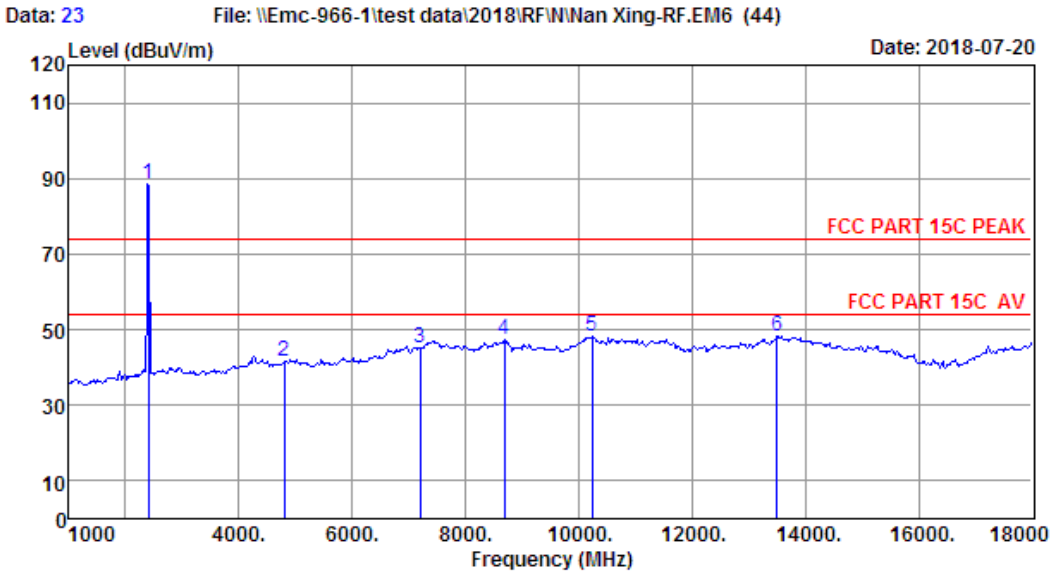


```
Site no.      : 1# 966 Chamber              Data no.  : 23
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer      : Viking
EUT           : Diaper Wetting Alarm Plus
Power         : DC 3.7V
M/N           : DIA21B
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	27.35	3.21	34.94	93.02	88.64	74.00	-14.64	Peak
2	4804.00	32.06	4.67	35.06	39.79	41.46	74.00	32.54	Peak
3	7206.00	36.56	5.99	33.45	36.28	45.38	74.00	28.62	Peak
4	8684.00	37.46	6.90	33.06	36.13	47.43	74.00	26.57	Peak
5	10231.00	39.19	9.84	34.41	33.54	48.16	74.00	25.84	Peak
6	13495.00	41.30	9.66	32.56	30.06	48.46	74.00	25.54	Peak

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

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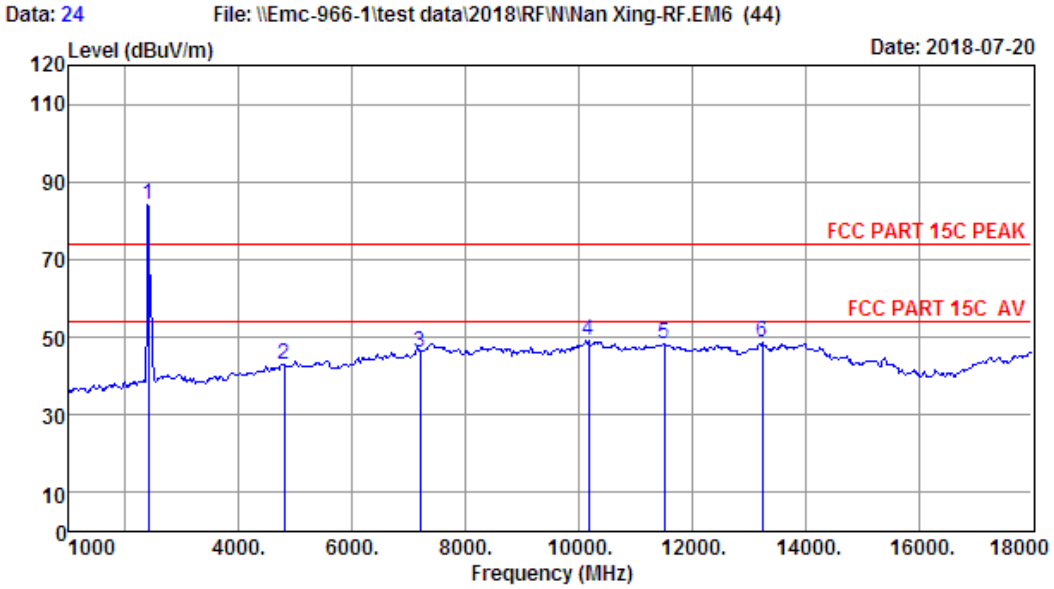


```
Site no.      : 1# 966 Chamber              Data no.  : 24
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer      : Viking
EUT           : Diaper Wetting Alarm Plus
Power         : DC 3.7V
M/N           : DIA21B
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	27.35	3.21	34.94	88.57	84.19	74.00	-10.19	Peak
2	4804.00	32.06	4.67	35.06	41.12	42.79	74.00	31.21	Peak
3	7206.00	36.56	5.99	33.45	37.13	46.23	74.00	27.77	Peak
4	10180.00	39.17	9.62	34.47	34.88	49.20	74.00	24.80	Peak
5	11506.00	40.10	8.28	32.55	32.45	48.28	74.00	25.72	Peak
6	13240.00	40.68	9.32	32.68	31.26	48.58	74.00	25.42	Peak

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

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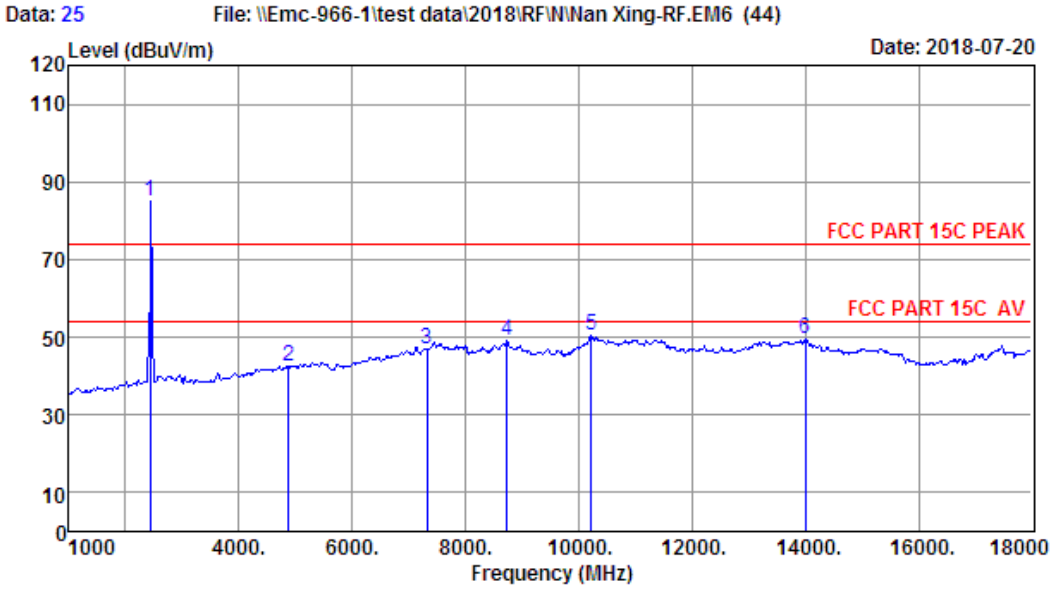


```
Site no.      : 1# 966 Chamber              Data no.  : 25
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer      : Viking
EUT           : Diaper Wetting Alarm Plus
Power         : DC 3.7V
M/N           : DIA21B
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	27.48	3.26	35.07	89.15	84.82	74.00	-10.82	Peak
2	4880.00	32.18	4.73	35.14	40.80	42.57	74.00	31.43	Peak
3	7320.00	36.82	6.10	33.28	37.19	46.83	74.00	27.17	Peak
4	8735.00	37.53	6.90	32.88	37.63	49.18	74.00	24.82	Peak
5	10214.00	39.19	9.77	34.43	35.77	50.30	74.00	23.70	Peak
6	14005.00	41.70	10.13	32.88	30.45	49.40	74.00	24.60	Peak

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

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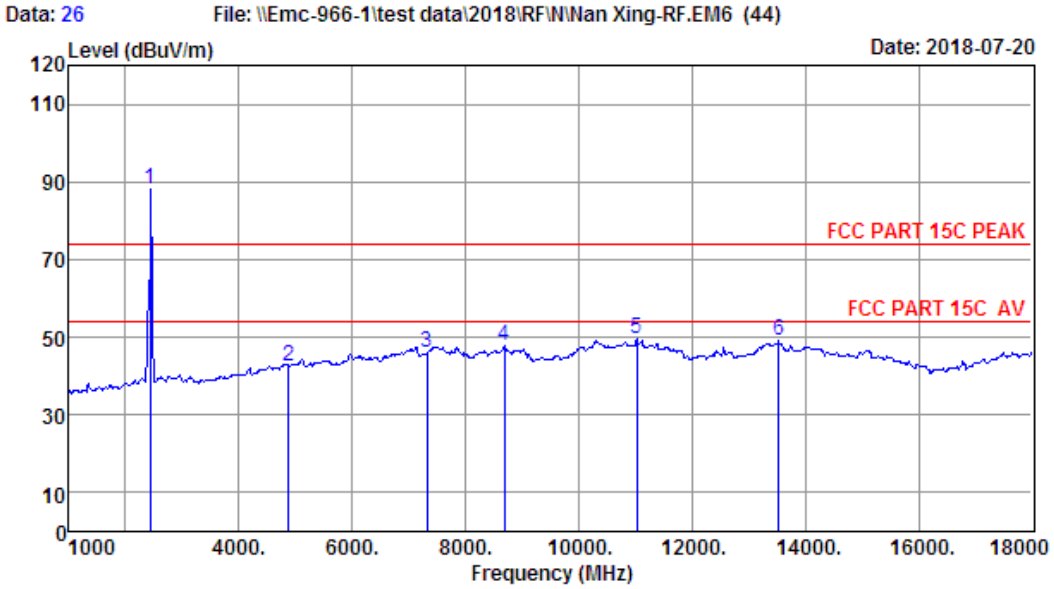

Site no. : 1# 966 Chamber Data no. : 26
Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Viking
EUT : Diaper Wetting Alarm Plus
Power : DC 3.7V
M/N : DIA21B
Test Mode : GFSK TX 2440MHz

	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	27.48	3.26	35.07	92.53	88.20	74.00	-14.20	Peak
2	4880.00	32.18	4.73	35.14	40.77	42.54	74.00	31.46	Peak
3	7320.00	36.82	6.10	33.28	36.44	46.08	74.00	27.92	Peak
4	8684.00	37.46	6.90	33.06	36.41	47.71	74.00	26.29	Peak
5	11030.00	39.91	8.55	33.39	34.69	49.76	74.00	24.24	Peak
6	13529.00	41.33	9.71	32.55	30.45	48.94	74.00	25.06	Peak

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

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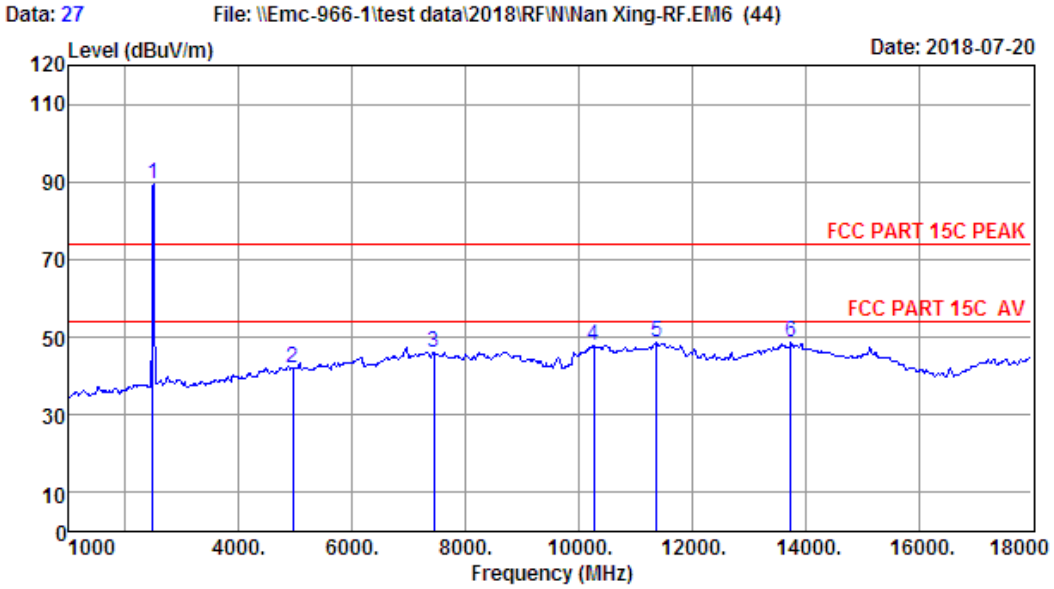

Site no. : 1# 966 Chamber Data no. : 27
Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Viking
EUT : Diaper Wetting Alarm Plus
Power : DC 3.7V
M/N : DIA21B
Test Mode : GFSK TX 2480MHz

	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	27.56	3.29	35.21	93.63	89.27	74.00	-15.27	Peak
2	4960.00	32.34	4.80	35.24	40.24	42.14	74.00	31.86	Peak
3	7440.00	37.09	6.13	33.08	35.96	46.10	74.00	27.90	Peak
4	10265.00	39.21	9.98	34.39	33.03	47.83	74.00	26.17	Peak
5	11370.00	40.05	8.30	32.78	32.93	48.50	74.00	25.50	Peak
6	13750.00	41.50	10.01	32.69	29.87	48.69	74.00	25.31	Peak

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

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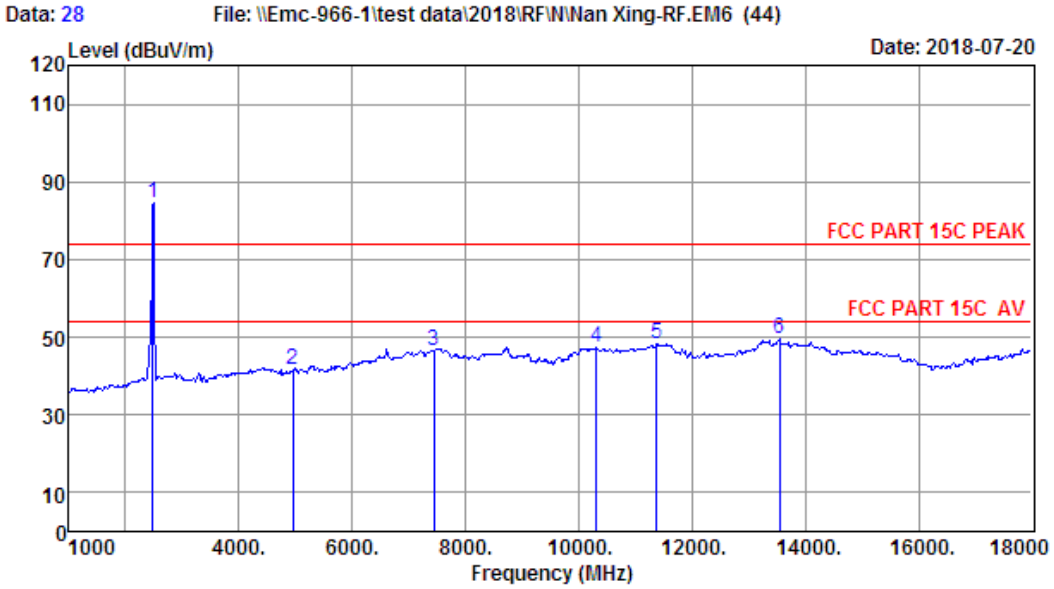



```
Site no.      : 1# 966 Chamber              Data no.  : 28
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer      : Viking
EUT           : Diaper Wetting Alarm Plus
Power         : DC 3.7V
M/N           : DIA21B
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	27.56	3.29	35.21	89.15	84.79	74.00	-10.79	Peak
2	4960.00	32.34	4.80	35.24	39.62	41.52	74.00	32.48	Peak
3	7440.00	37.09	6.13	33.08	36.39	46.53	74.00	27.47	Peak
4	10316.00	39.23	10.20	34.34	32.25	47.34	74.00	26.66	Peak
5	11370.00	40.05	8.30	32.78	32.68	48.25	74.00	25.75	Peak
6	13546.00	41.34	9.73	32.54	31.11	49.64	74.00	24.36	Peak

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

18000MHz – 25000MHz

Pass

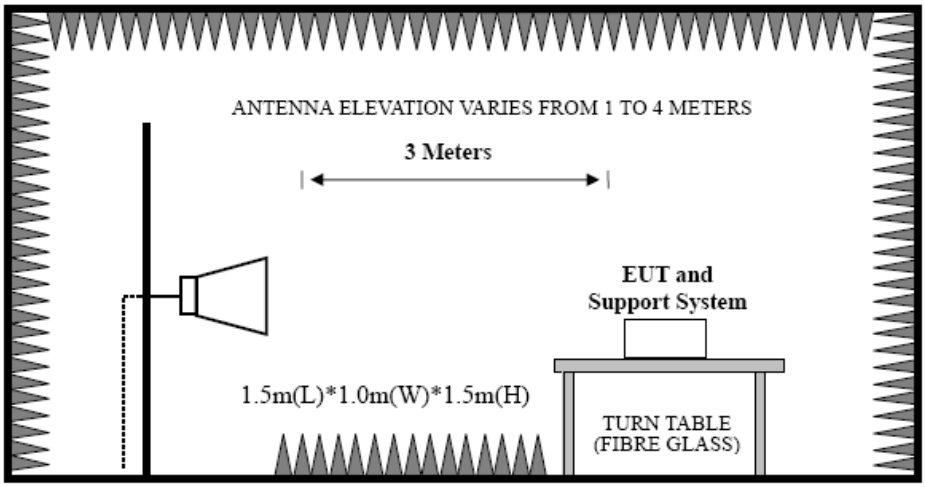
Note: The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

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.

5.5 Test Data

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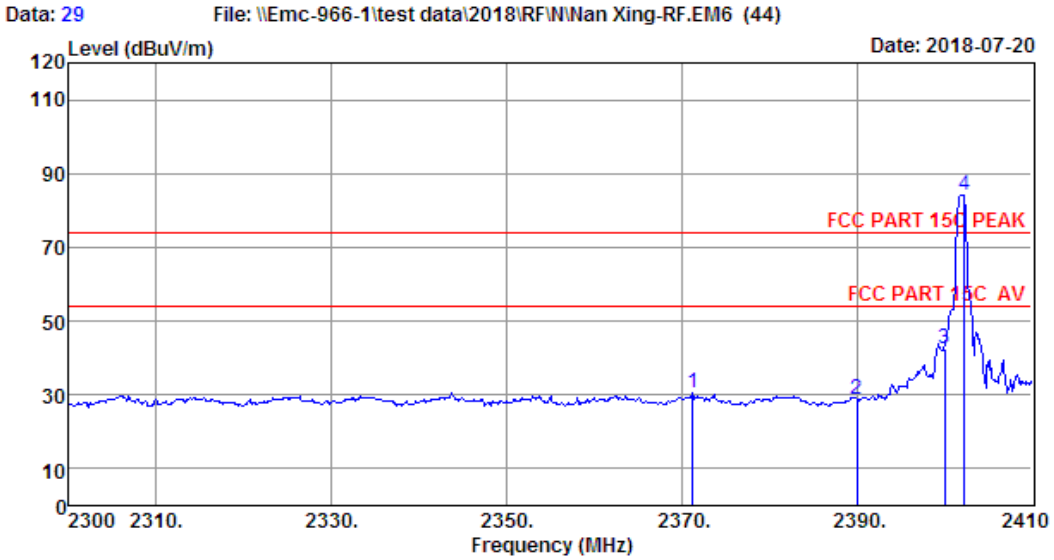

Site no. : 1# 966 Chamber Data no. : 29
Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Viking
EUT : Diaper Wetting Alarm Plus
Power : DC 3.7V
M/N : DIA21B
Test Mode : GFSK TX 2402MHz

	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	2371.28	27.31	3.20	34.80	35.05	30.76	74.00	43.24	Peak
2	2390.00	27.35	3.21	34.87	33.31	29.00	74.00	45.00	Peak
3	2400.00	27.35	3.21	34.94	46.78	42.40	74.00	31.60	Peak
4	2402.30	27.35	3.21	34.94	88.70	84.32	74.00	-10.32	Peak

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

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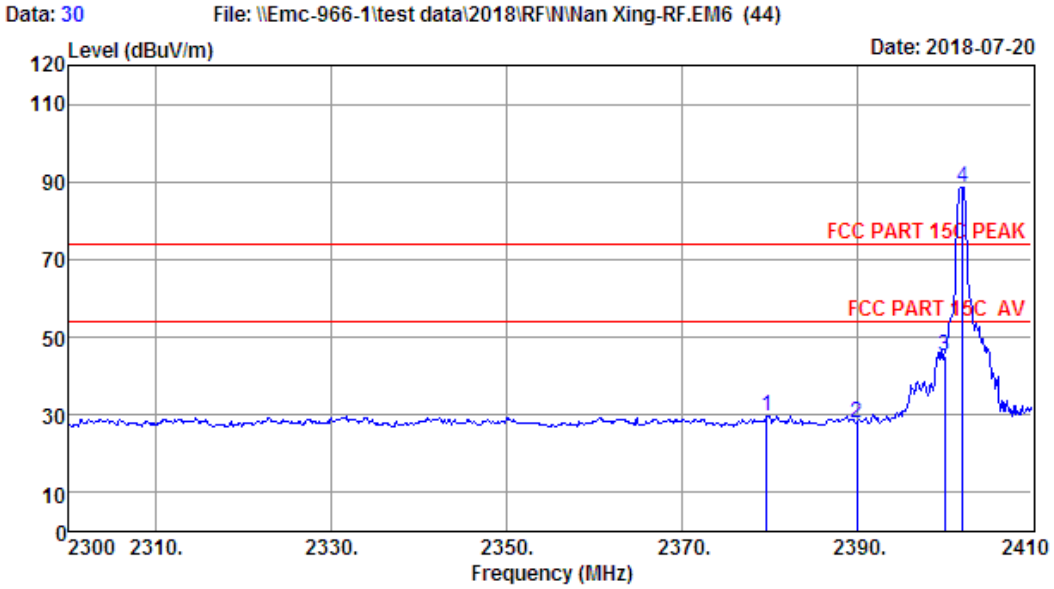


```
Site no.      : 1# 966 Chamber              Data no.  : 30
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer      : Viking
EUT           : Diaper Wetting Alarm Plus
Power         : DC 3.7V
M/N           : DIA21B
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	2379.75	27.31	3.20	34.80	33.97	29.68	74.00	44.32	Peak
2	2390.00	27.35	3.21	34.87	32.17	27.86	74.00	46.14	Peak
3	2400.00	27.35	3.21	34.94	49.57	45.19	74.00	28.81	Peak
4	2402.08	27.35	3.21	34.94	93.15	88.77	74.00	-14.77	Peak

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

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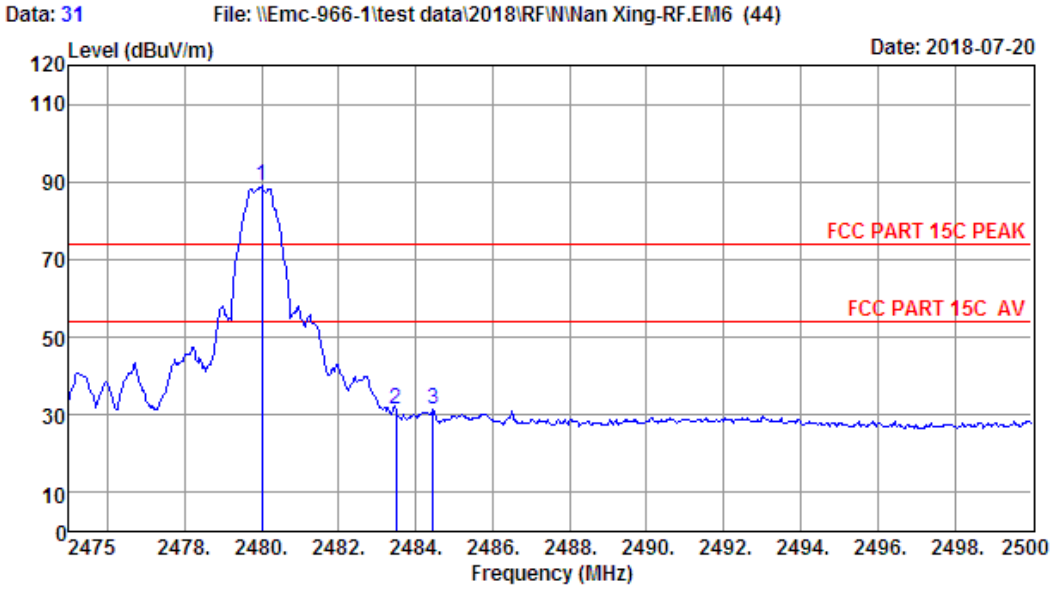


```
Site no.      : 1# 966 Chamber              Data no.  : 31
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer      : Viking
EUT           : Diaper Wetting Alarm Plus
Power         : DC 3.7V
M/N           : DIA21B
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	27.56	3.29	35.21	93.35	88.99	74.00	-14.99	Peak
2	2483.50	27.56	3.29	35.21	35.60	31.24	74.00	42.76	Peak
3	2484.45	27.56	3.29	35.21	35.72	31.36	74.00	42.64	Peak

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

EST Technology

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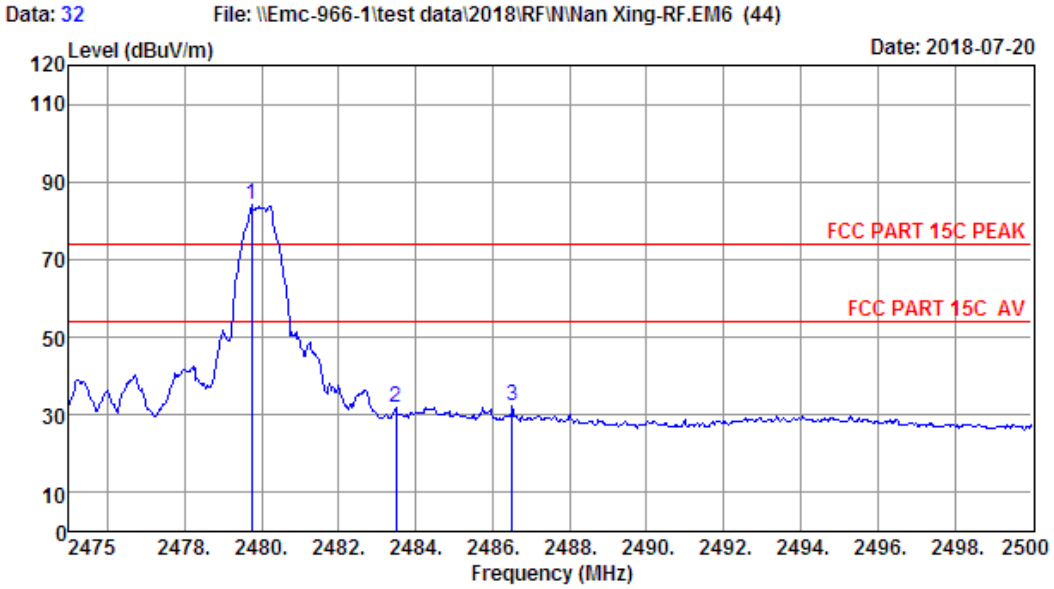


Site no. : 1# 966 Chamber Data no. : 32
Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Viking
EUT : Diaper Wetting Alarm Plus
Power : DC 3.7V
M/N : DIA21B
Test Mode : GFSK TX 2480MHz

	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	27.56	3.29	35.21	88.45	84.09	74.00	-10.09	Peak
2	2483.50	27.56	3.29	35.21	36.06	31.70	74.00	42.30	Peak
3	2486.50	27.56	3.29	35.21	36.48	32.12	74.00	41.88	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. 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, The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.

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.

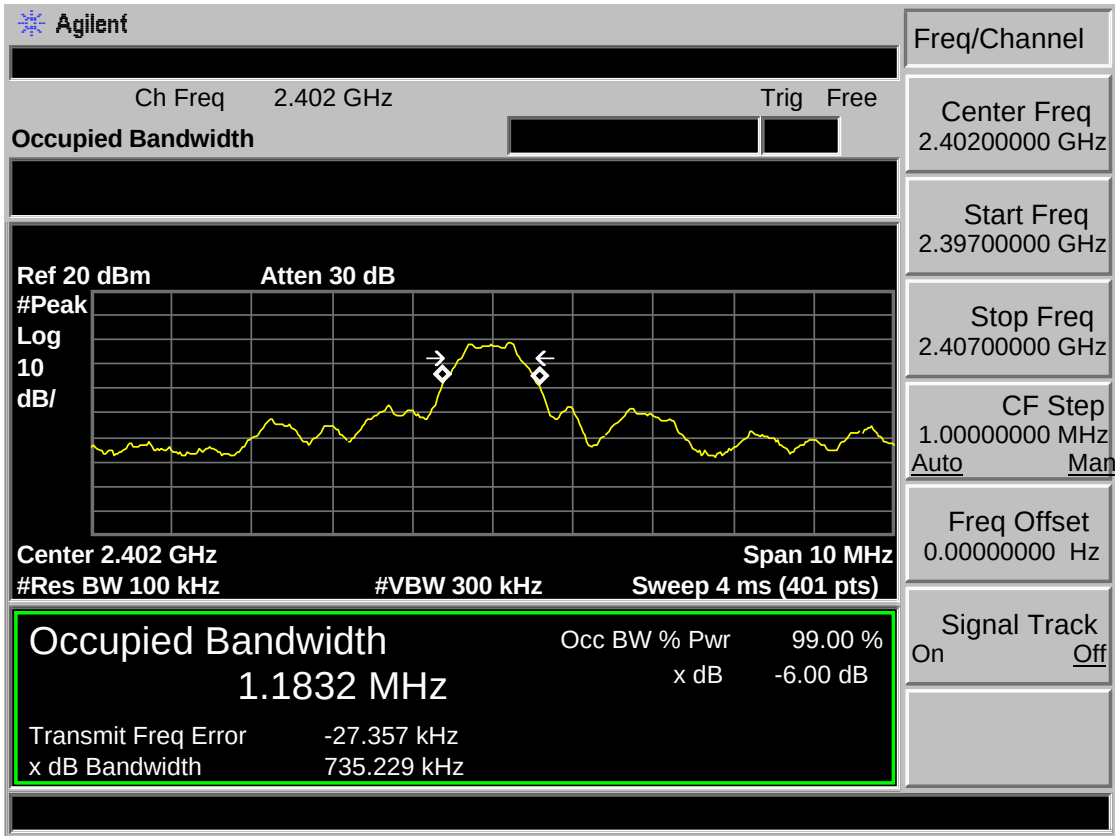
(7). Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3 Test Result

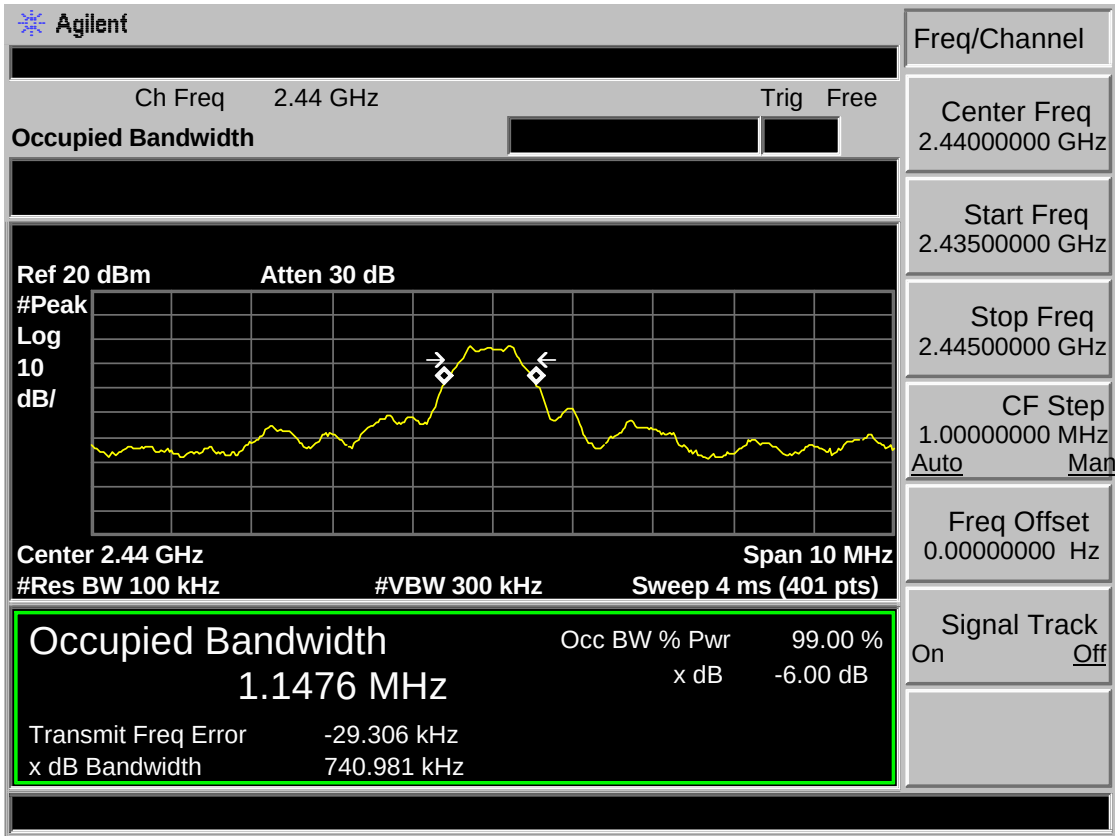
EUT: Diaper Wetting Alarm Plus			
M/N: DIA21B			
Test date: 2018-07-30		Test site: RF Site	Tested by: Viking
Test Mode	CH	6dB bandwidth（MHz）	Limit (KHz)
BT 4.0-BLE GFSK	CH1	0.735	>500
	CH20	0.741	>500
	CH40	0.733	>500
Conclusion：PASS			

6.4 Test Data

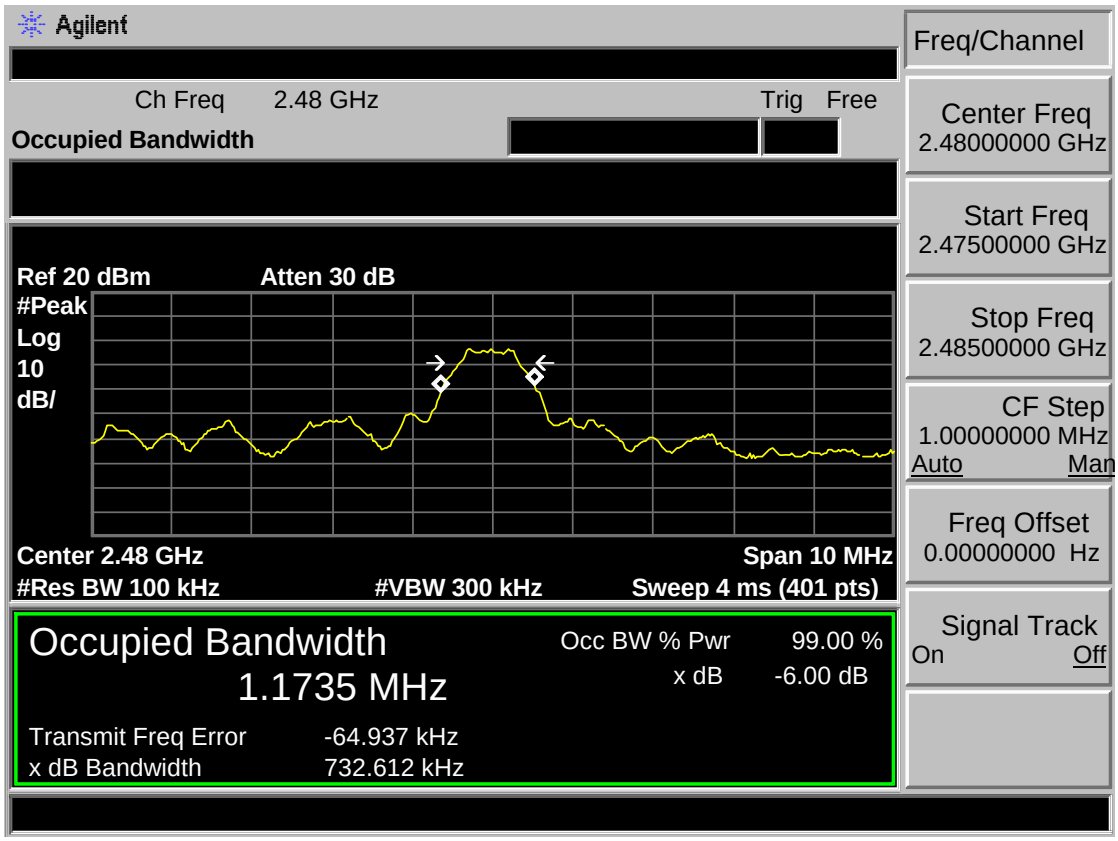
Test Mode: BT 4.0-BLE GFSK 2402MHz



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

1, The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.

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.

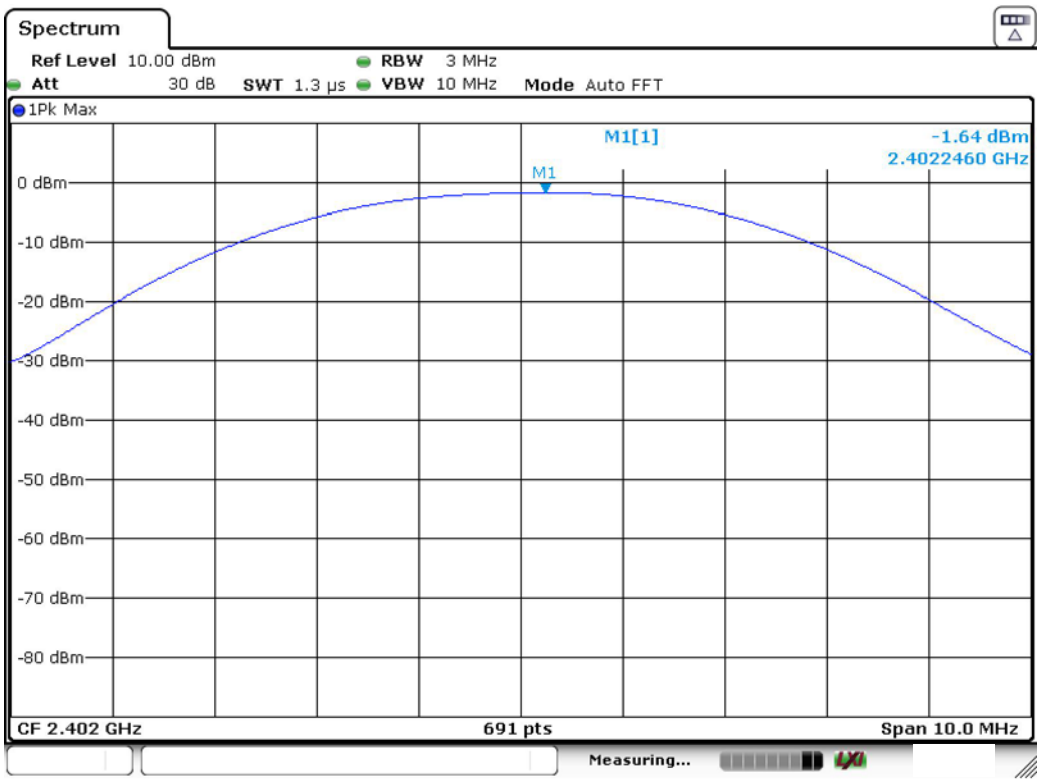
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

7.3 Test Result

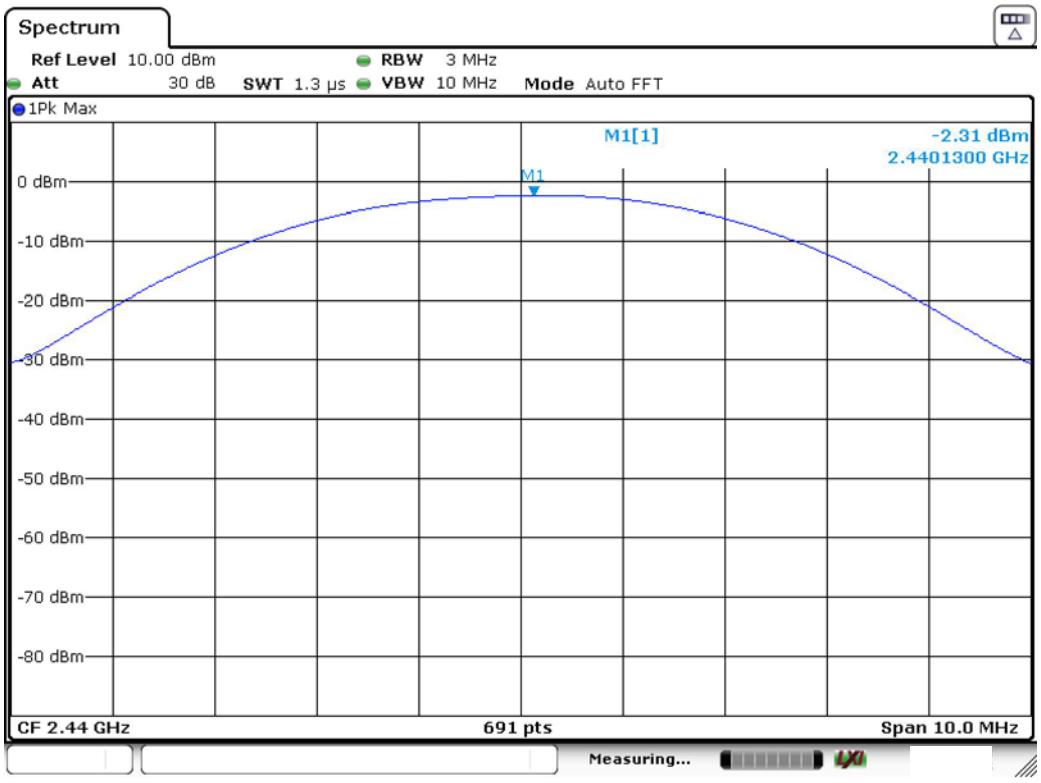
EUT: Diaper Wetting Alarm Plus			
M/N: DIA21B			
Test date: 2018-08-02		Test site: RF Site	Tested by: Viking
Pass			
Test Mode	CH	Peak output Power（dBm）	Limit (dBm)
BT 4.0-BLE GFSK	CH1	-1.64	30
	CH20	-2.31	30
	CH40	-2.81	30
Conclusion：PASS			

7.4 Test Data

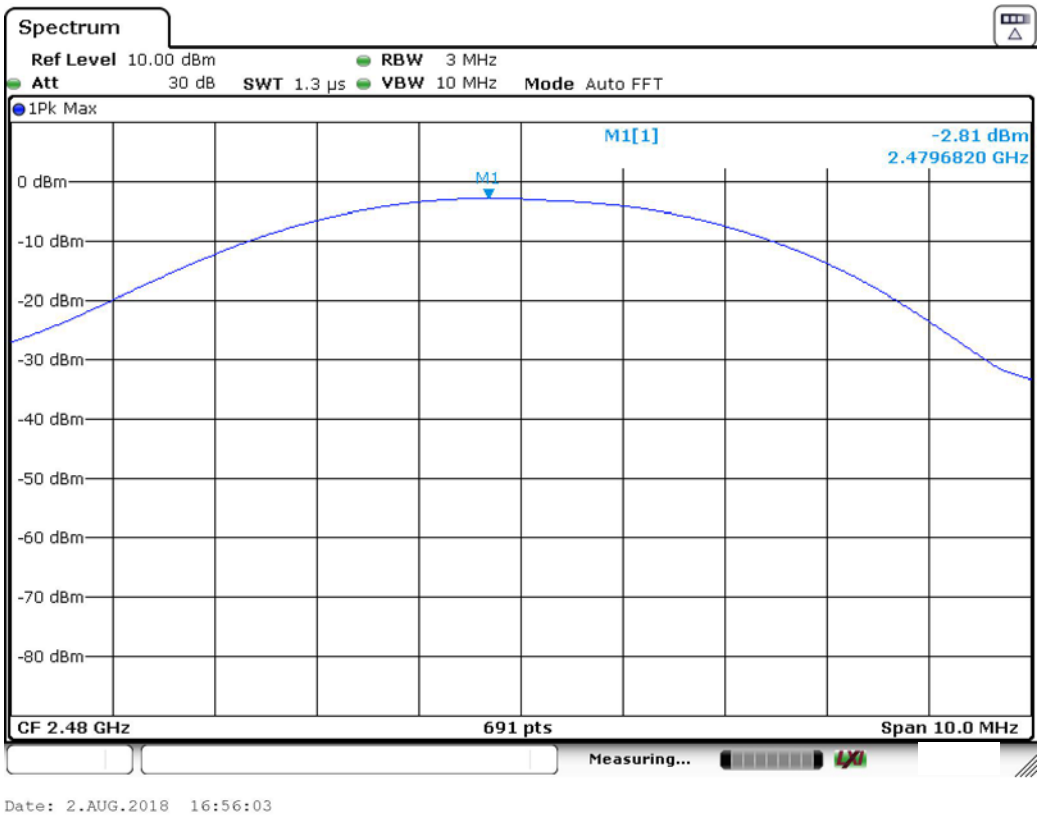
Test Mode: BT 4.0-BLE GFSK 2402MHz



Test Mode: BT 4.0-BLE GFSK 2440MHz



Test Mode: BT 4.0-BLE GFSK 2480MHz



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, The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.

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.

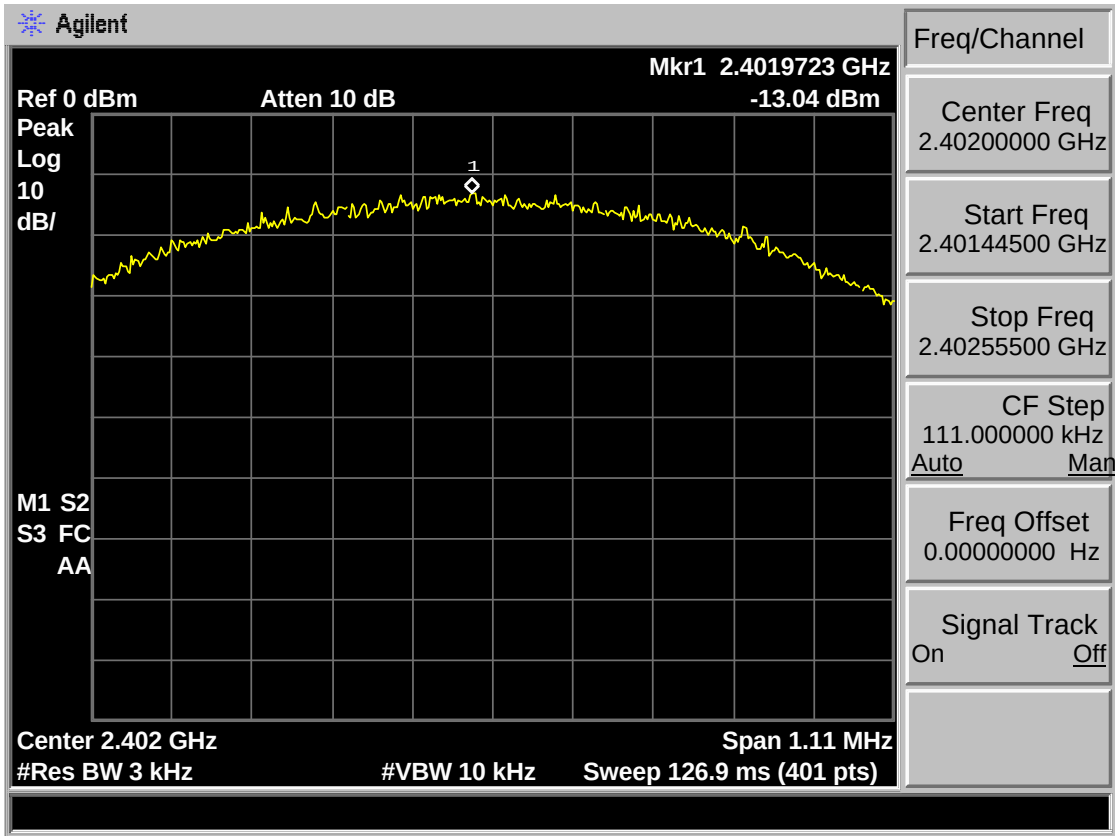
(10). If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

8.3 Test Result

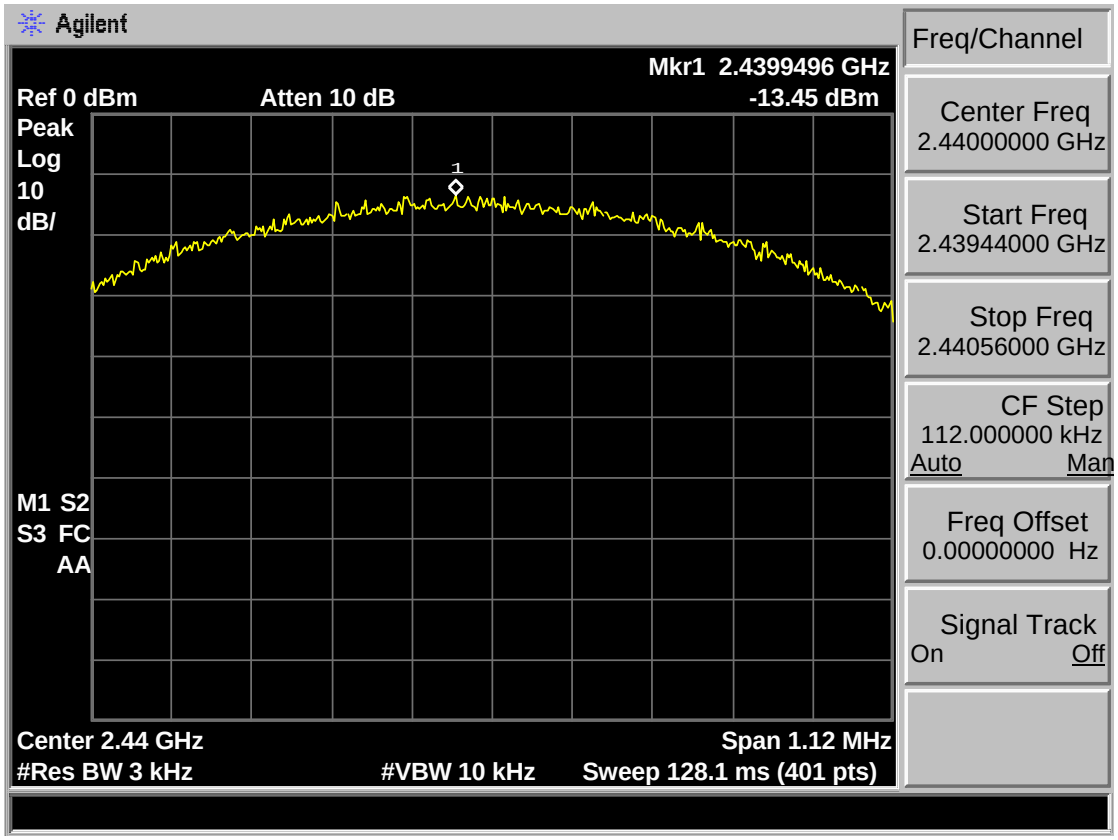
EUT: Diaper Wetting Alarm Plus			
M/N: DIA21B			
Test date: 2018-07-30		Test site: RF Site	Tested by: Viking
Pass			
Test Mode	CH	Power density (dBm/3kHz）	Limit (dBm/3kHz)
BT 4.0-BLE GFSK	CH1	-13.04	8
	CH20	-13.45	8
	CH40	-13.77	8
Conclusion：PASS			

8.4 Test Data

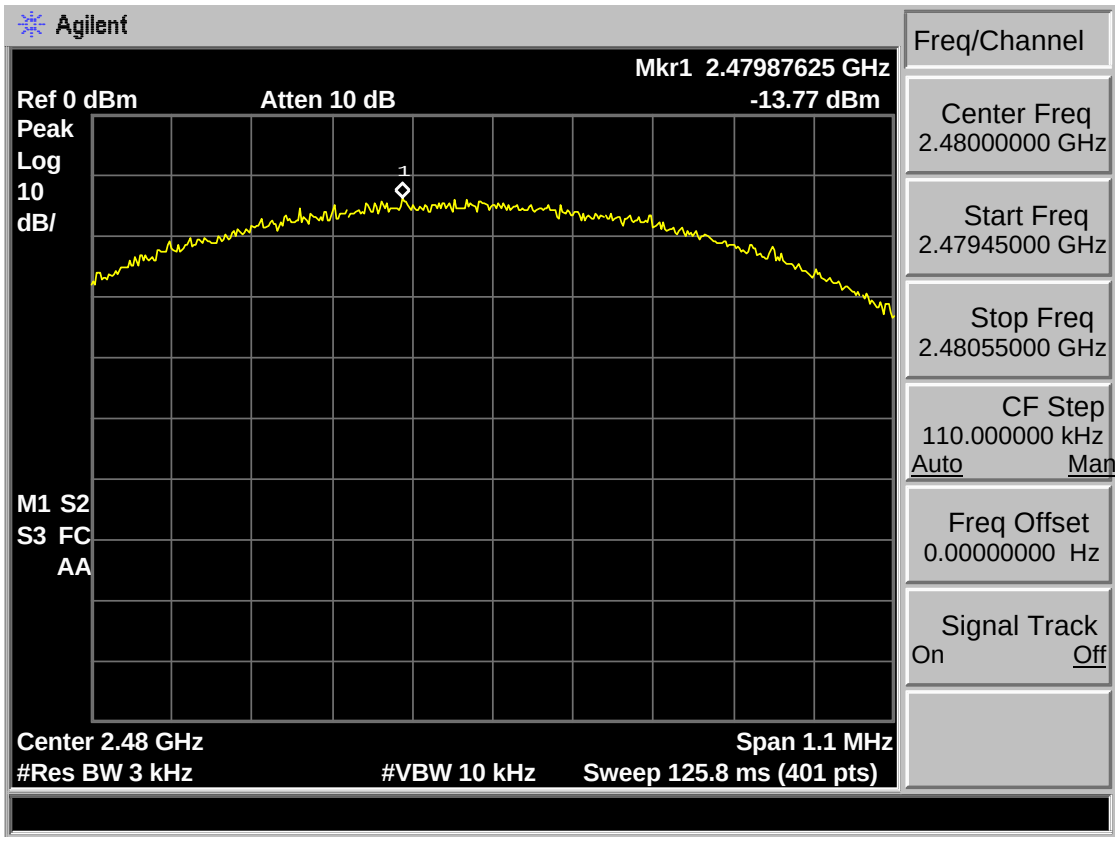
Test Mode: BT 4.0-BLE GFSK 2402MHz



Test Mode: BT 4.0-BLE GFSK 2440MHz



Test Mode: BT 4.0-BLE GFSK 2480MHz



9 ANTENNA REQUIREMENTS

9.1 Limit

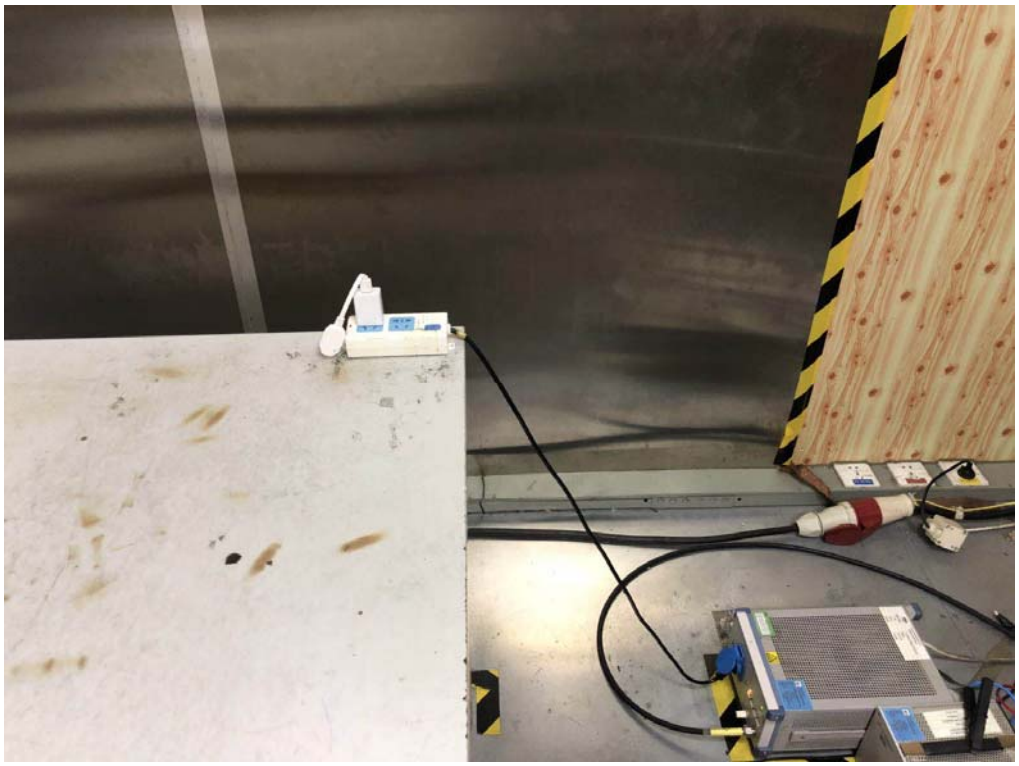
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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.

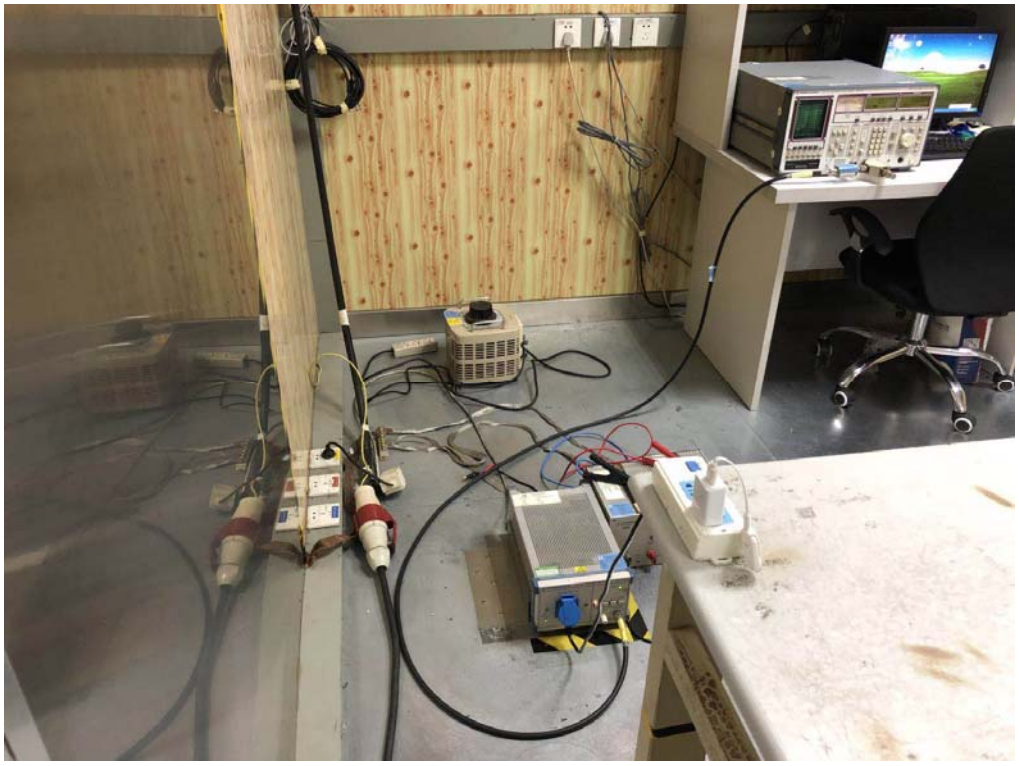
9.2 Result

The antennas used for this product are Internal 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 2.5 dBi.

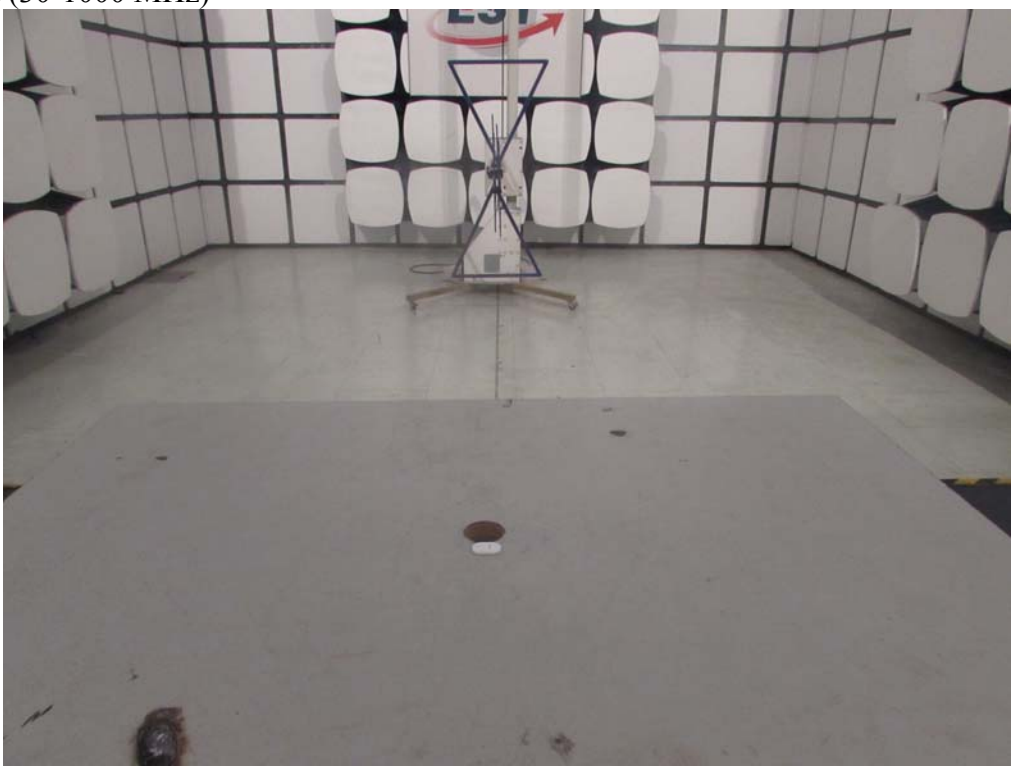
10 TEST SETUP PHOTO

Conducted Test





Radiated Test (30-1000 MHz)

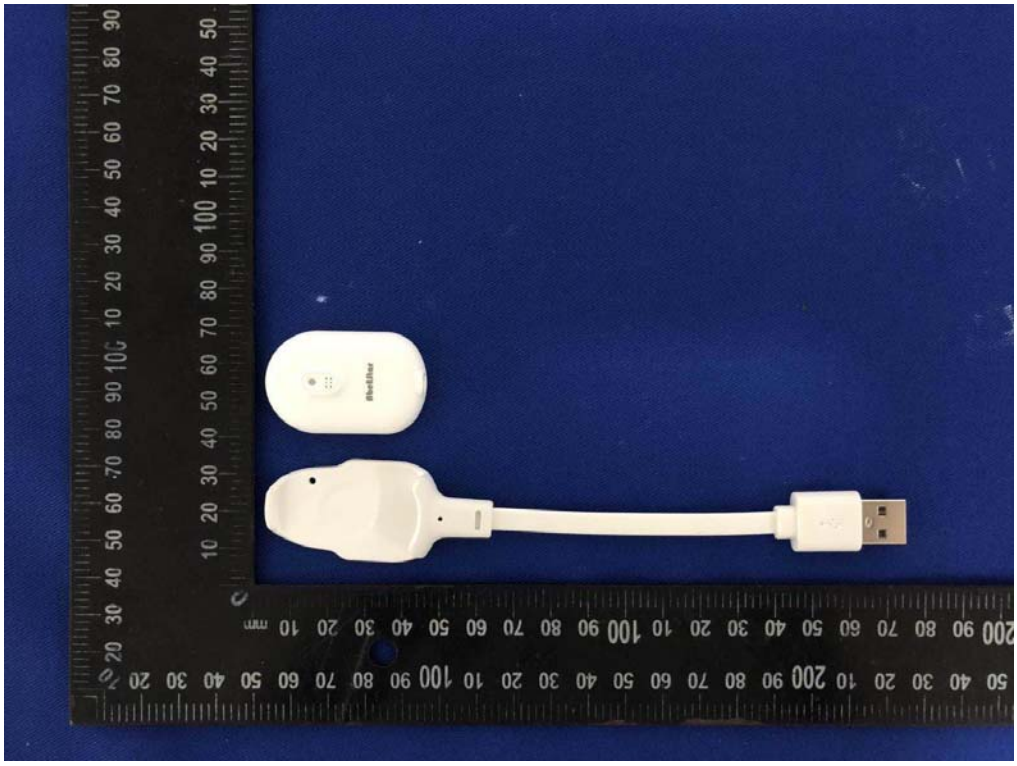


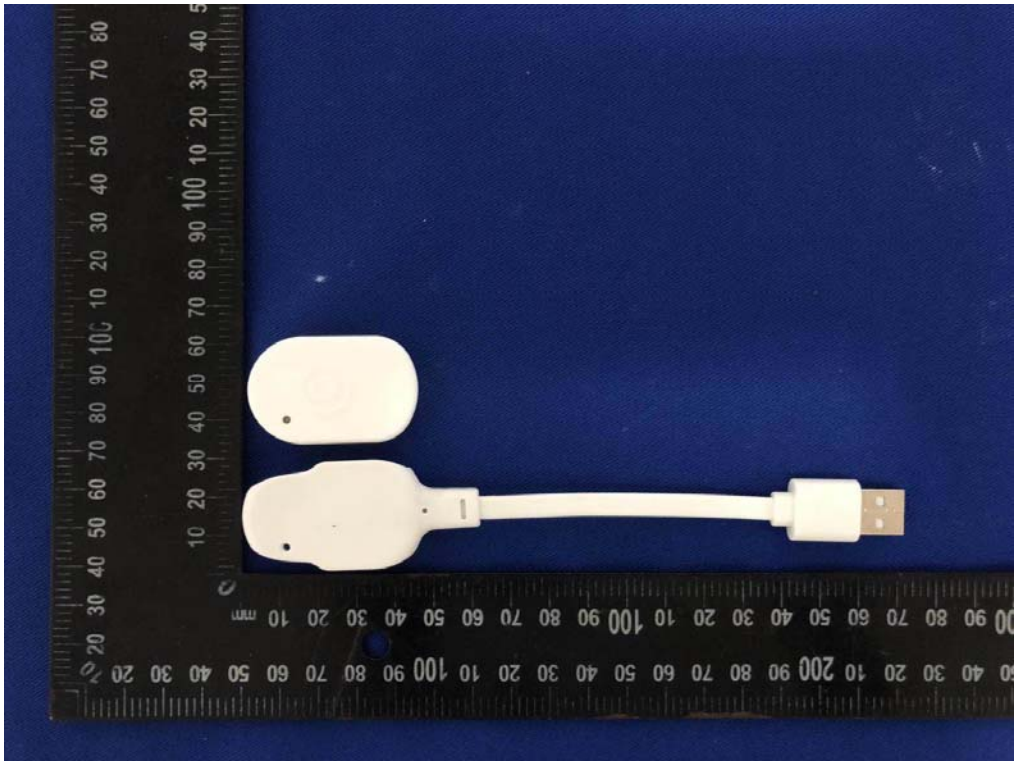
Radiated Test (Above 1GHz)

11 PHOTO EUT

External Photos

M/N: DIA21B





External Photos

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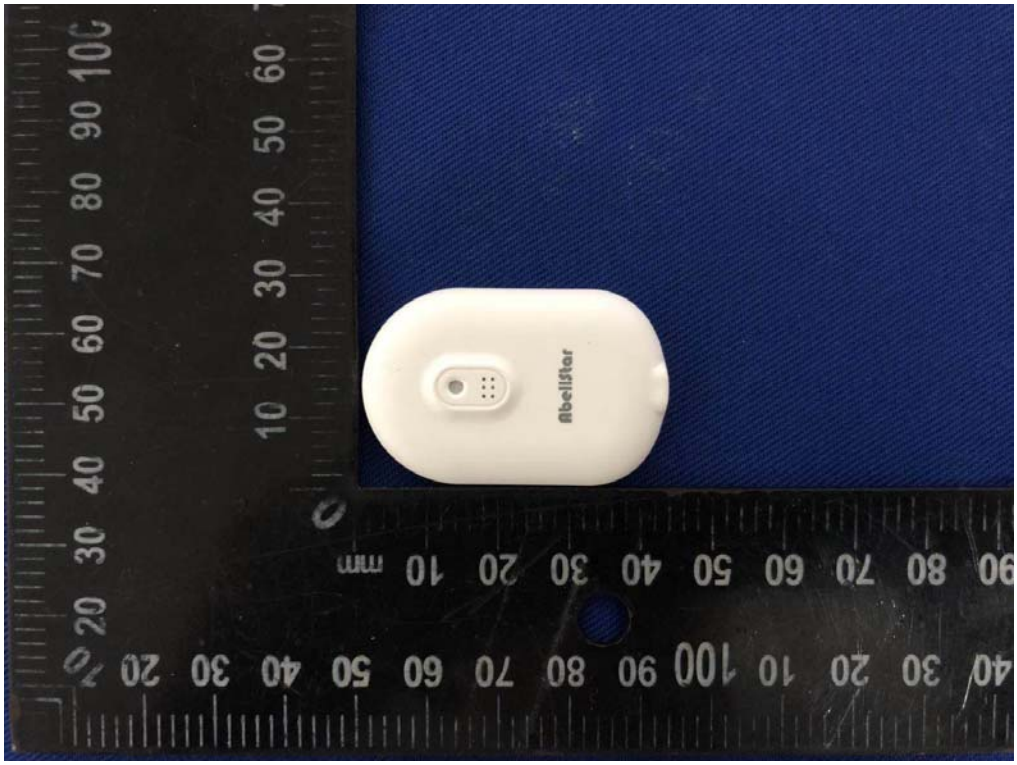

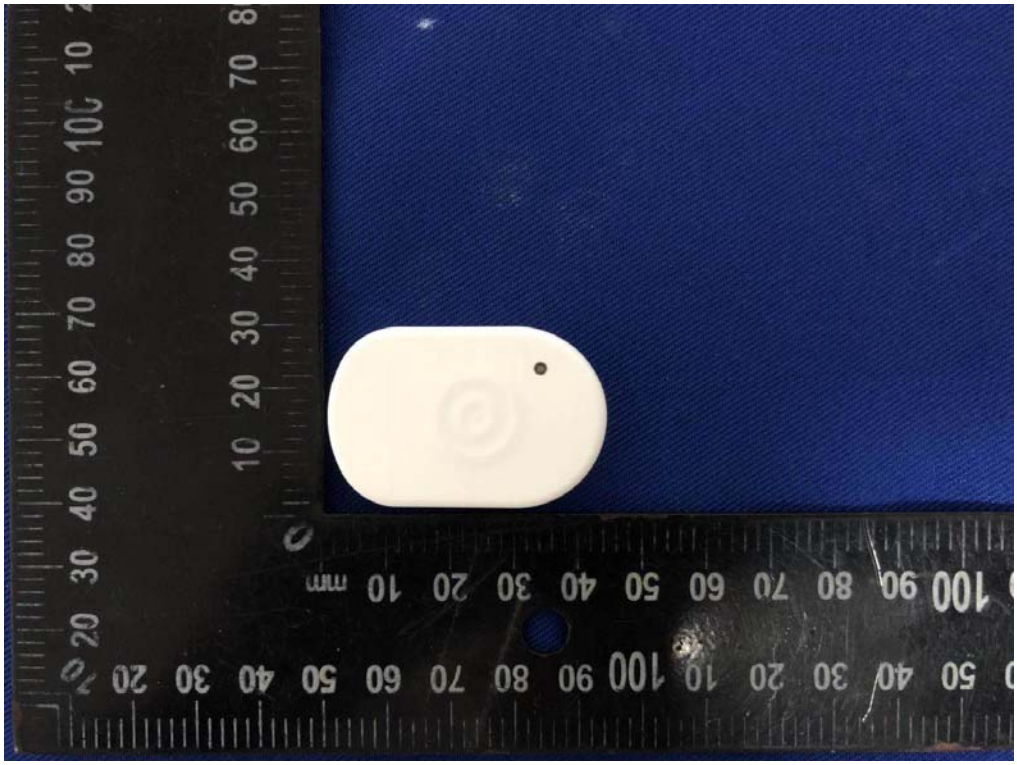

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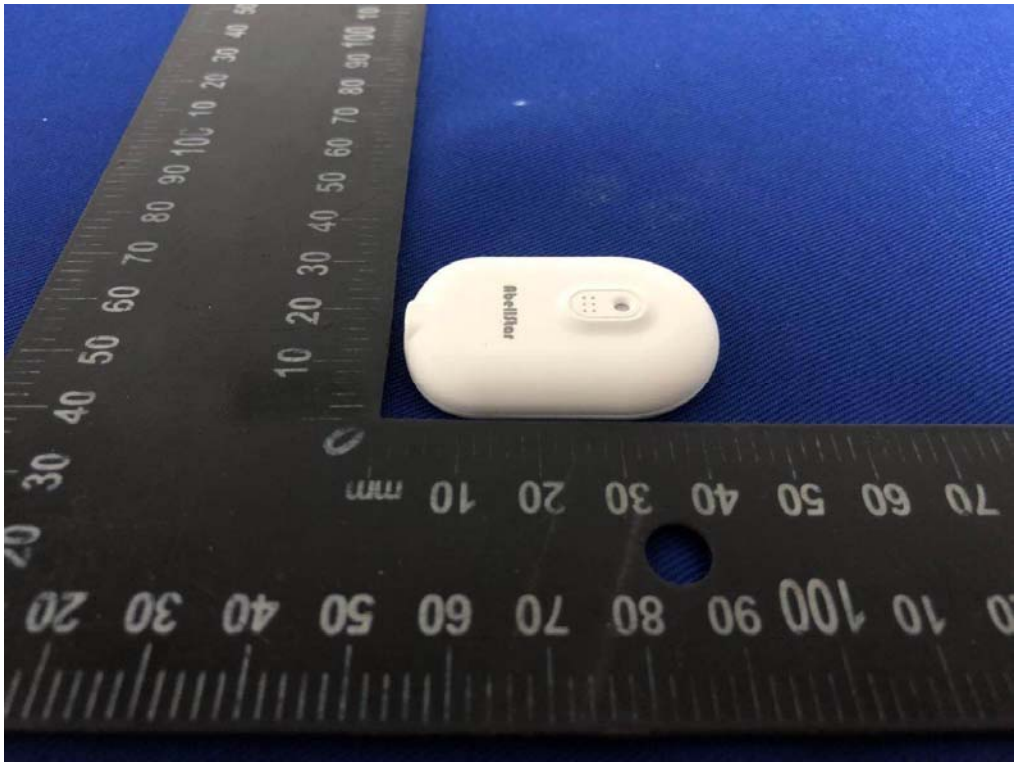

Internal Photos

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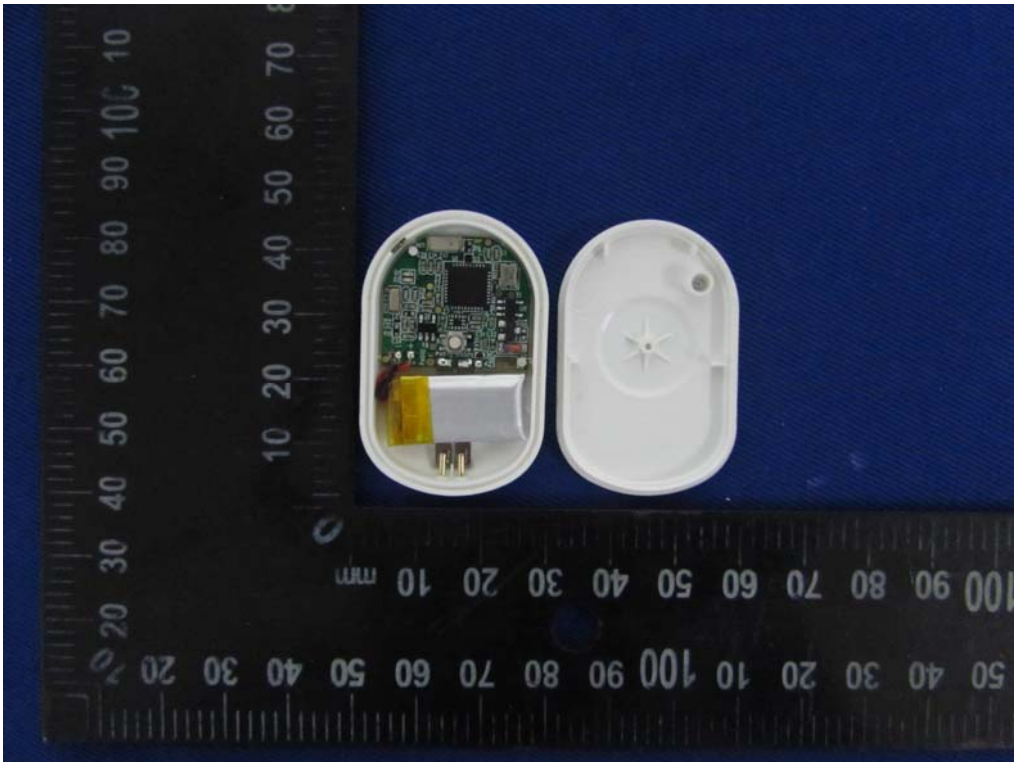

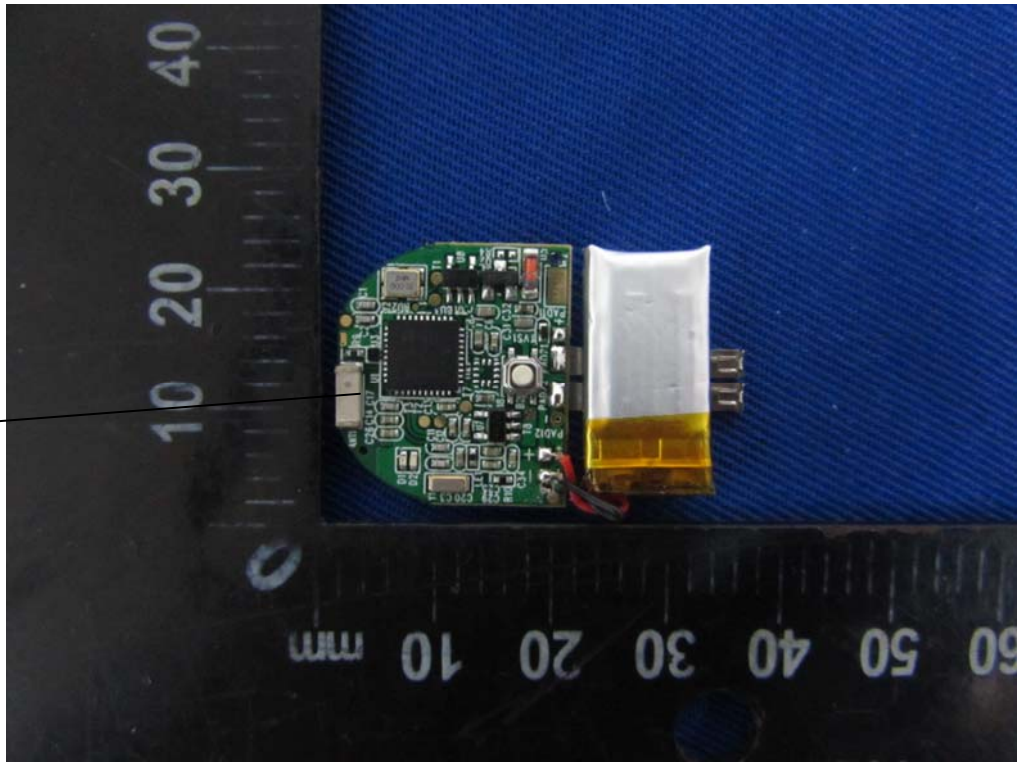

Internal Photos

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