SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

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TEST REPORT

Application No.:	SZEM1707007845CR
Applicant:	Harman International Industries, Incorporated
Address of Applicant:	8500 Balboa Blvd, Northridge, CA 91329, UNITED STATES
Manufacturer:	Harman International Industries, Incorporated
Address of Manufacturer:	8500 Balboa Blvd, Northridge, CA 91329, UNITED STATES
Factory:	ANAM ELECTRONICS VIETNAM CO., LTD
Address of Factory:	Dong Van II Industrial Zone, Duy Tien District Ha Nam Province, Viet Nam
Equipment Under Test (EUT):	
EUT Name:	Portable Bluetooth Speaker
Model No.:	TRAVELER
Trade mark:	Harman Kardon
FCC ID:	APIHKTRAVELER
Standards:	47 CFR Part 15, Subpart C (2016)
Date of Receipt:	2017-07-26
Date of Test:	2017-07-28 to 2017-07-31
Date of Issue:	2017-08-01
Test Result :	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

.

Jack Zhang
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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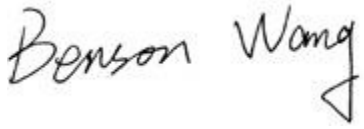
Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2017-08-01		Original

Authorized for issue by:				
				
		Benson Wang /Project Engineer		
		Eric Fu /Reviewer		

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.1.2	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

Model No.: TRAVELER

This test report SZEM170700784503 is only valid with the original test report SZEM170300192204. Review this report and the original report.

According to the applicant, the models in this report just changed the NTC protection circuit. Considering to the difference, pre-scan were performed on the sample in this report to find the items which can be influential to the result in the original test report for fully retest.

Therefore in this report Conducted Peak Output Power and Radiated Spurious Emissions was fully retested on model TRAVELER and shown the data in this report, other tests please refer to original report SZEM170300192204.

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4 General Information

4.1 Details of E.U.T.

Power supply:	Lithium Ion Battery: 3.8V, 2500mAh (Charge by adapter)
Cable:	Usb cable: 92cm unshielded
Frequency range:	2402MHz-2480MHz
Bluetooth version	BT 4.2 Dual mode
Modulation Type:	GFSK
Number of Channels:	40
Antenna type	Integral
Antenna gain	2.77dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	Apple	A1357 W010A051	REF. No.SEA0500

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25×10^{-8}
2	Duty cycle	0.37%
3	Occupied Bandwidth	3%
4	RF conducted power	0.75dB
5	RF power density	2.84dB
6	Conducted Spurious emissions	0.75dB
7	RF Radiated power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
8	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
9	Temperature test	1℃
10	Humidity test	3%
11	Supply voltages	1.5%
12	Time	3%

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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• Industry Canada (IC)

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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5 Equipment List

Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2017-04-14	2018-04-13
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

Radiated Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2017-05-10	2018-05-10
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2017-04-14	2018-04-13
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-02	2017-03-05	2020-03-05
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-14
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-14	2017-06-16	2020-06-15
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2016-10-09	2017-10-09
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2016-10-09	2017-10-09
Pre-amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-10	2016-10-17	2017-10-17
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2017-04-14	2018-04-13
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2015-08-14	2018-08-14
Band filter	N/A	N/A	SEM023-01	N/A	N/A

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RE in Chamber					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-05-10	2018-05-10
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2016-10-09	2017-10-09
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-02	2017-03-05	2020-03-05
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2017-04-14	2018-04-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2016-10-12	2017-10-12
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2017-04-18	2018-04-18

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(c)

6.1.2 Conclusion

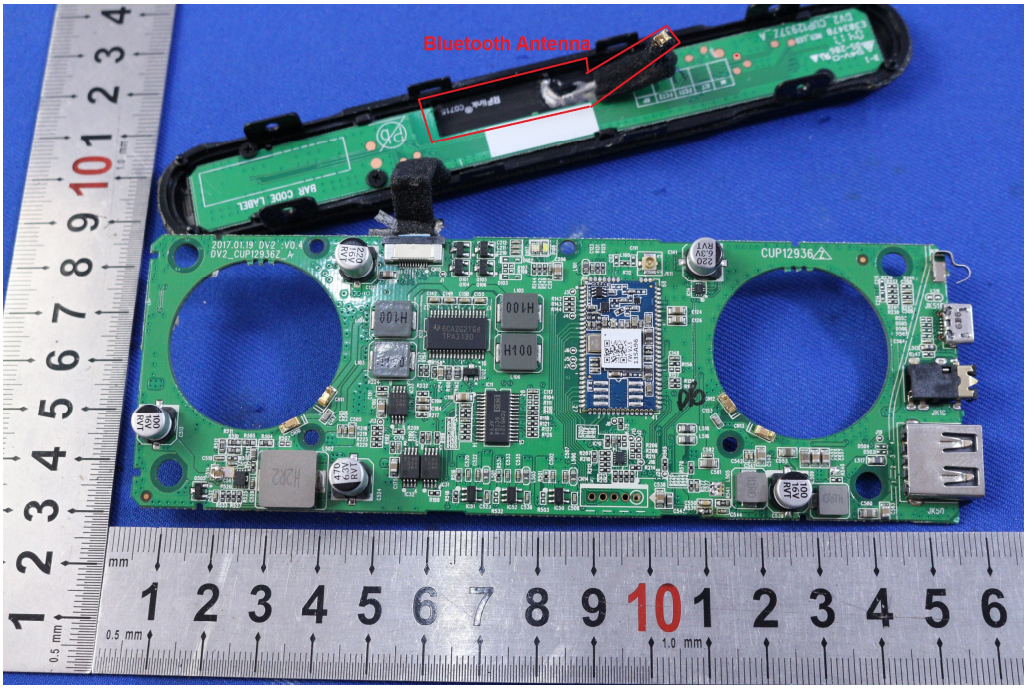
Standard Requirment:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:



The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.77dBi.

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7 Radio Spectrum Matter Test Results

7.1 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)
Test Method: ANSI C63.10 (2013) Section 11.9.1.2
Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

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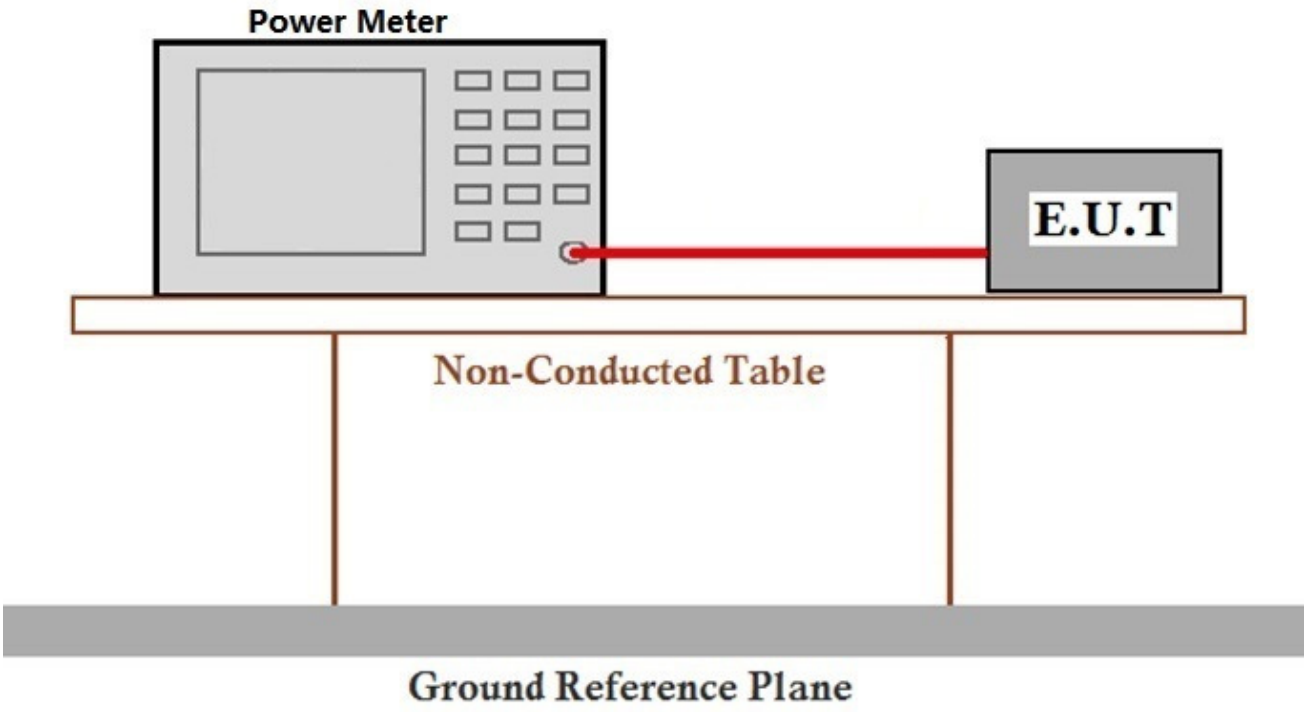
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar

Test mode e:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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7.2 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6
Measurement Distance: 3m
Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

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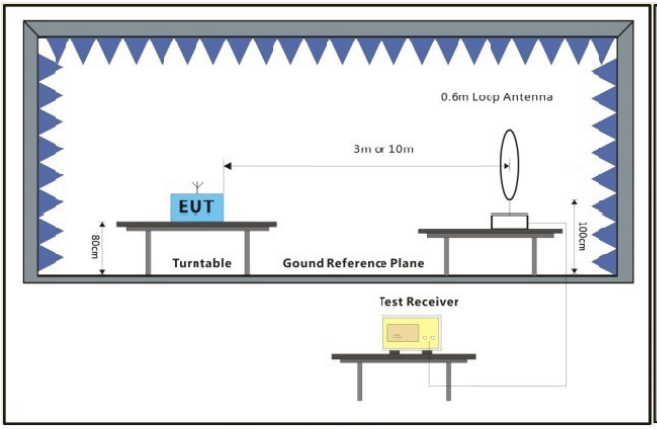
7.2.1 E.U.T. Operation

Operating Environment:

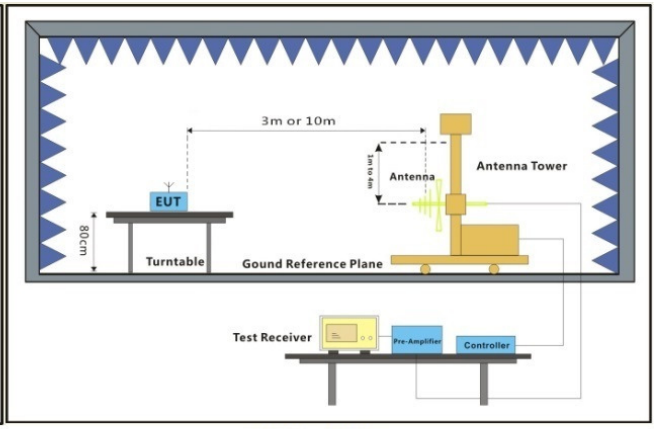
Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar

Test mode	d:TX mode+charge: Keep the EUT in continuously transmitting mode with GFSK modulation and being charged.
	e:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation
The worst case for final test:	d:TX mode+charge: Keep the EUT in continuously transmitting mode with GFSK modulation and being charged.

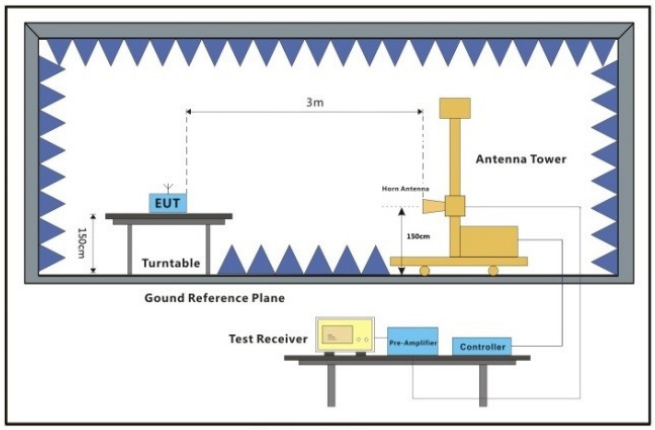
7.2.2 Test Setup Diagram



Below 30MHz



30MHz-1GHz



Above 1GHz

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7.2.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel,the middle channel,the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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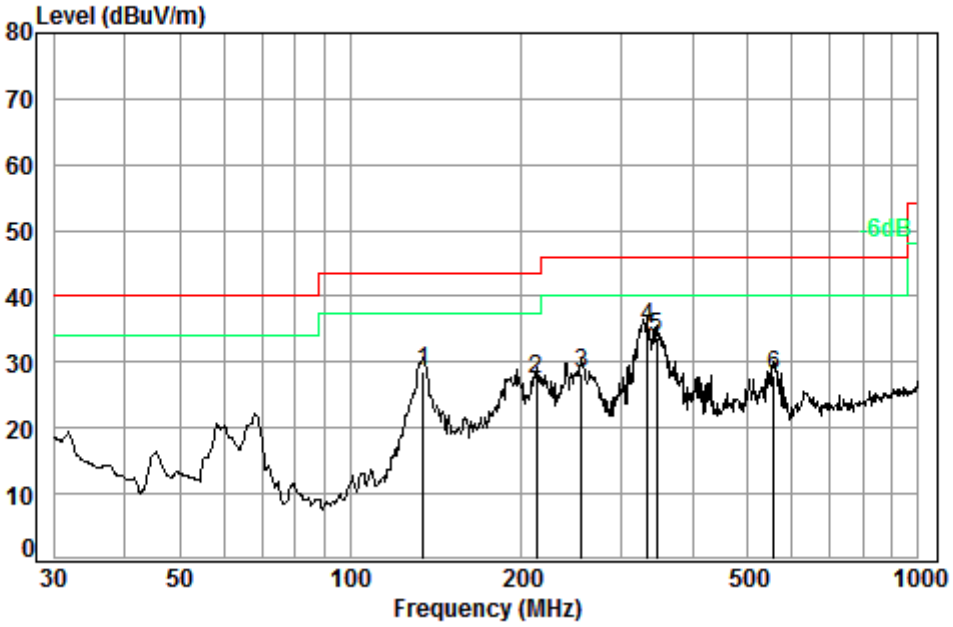
30MHz~1GHz

QP value:

Mode:d; Polarization:Horizontal;



Condition: 3m HORIZONTAL
Job No. : 07845CR
Test Mode: d

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	134.56	1.29	7.88	26.98	46.55	28.74	43.50	-14.76
2	212.27	1.47	10.84	26.65	41.65	27.31	43.50	-16.19
3	255.62	1.70	12.41	26.52	40.84	28.43	46.00	-17.57
4 pp	333.69	2.01	14.49	26.66	45.32	35.16	46.00	-10.84
5	345.60	2.05	14.06	26.77	44.33	33.67	46.00	-12.33
6	556.77	2.66	18.95	27.61	34.06	28.06	46.00	-17.94

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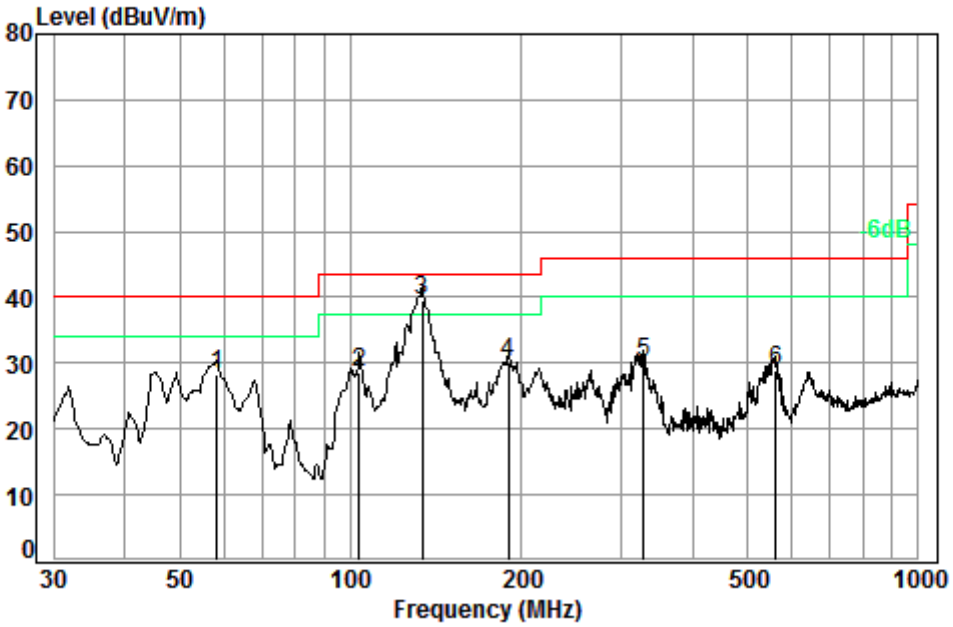
Mode:d; Polarization:Vertical



Condition: 3m VERTICAL
Job No. : 07845CR
Test Mode: d

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	58.20	0.80	7.47	27.27	47.35	28.35	40.00	-11.65
2	103.81	1.21	8.91	27.17	45.62	28.57	43.50	-14.93
3 pp	133.62	1.28	7.84	26.99	57.49	39.62	43.50	-3.88
4	189.74	1.38	10.09	26.74	45.24	29.97	43.50	-13.53
5	327.89	1.99	14.70	26.62	40.00	30.07	46.00	-15.93
6	560.69	2.66	18.99	27.60	35.00	29.05	46.00	-16.95

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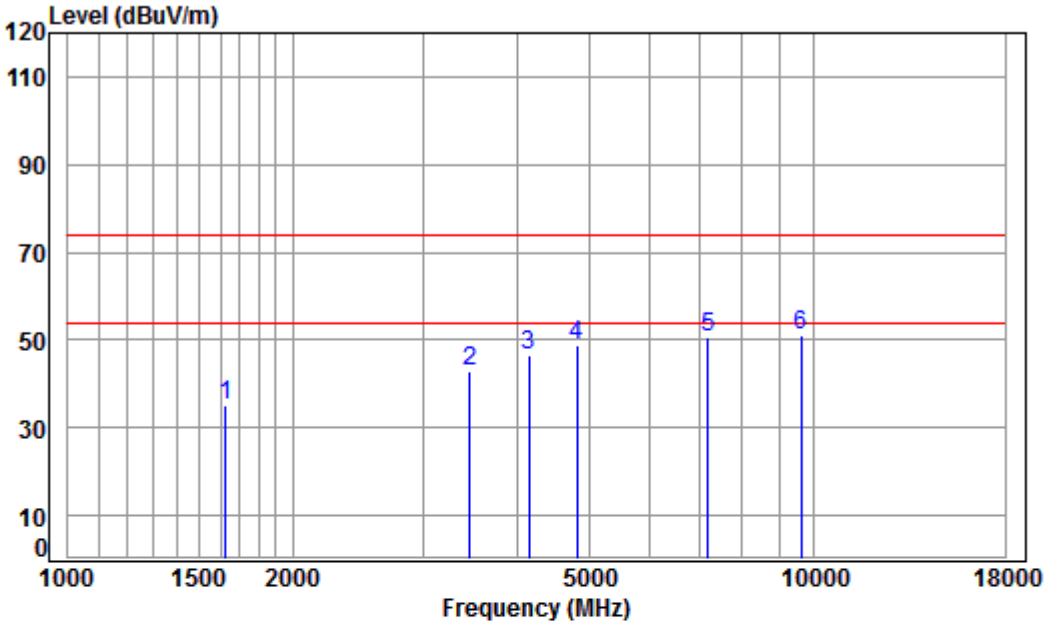
Above 1GHz

Mode:d; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:Low



Condition: 3m HORIZONTAL
Job No : 07845CR/07846CR
Mode : 2402 TX SE
Note : BLE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1625.121	4.62	26.36	38.03	41.55	35.00	74.00	-39.00	peak
2	3455.508	6.27	32.13	37.95	41.97	42.96	74.00	-31.04	Peak
3	4145.664	6.88	33.60	38.08	43.69	46.49	74.00	-27.51	peak
4	4804.000	7.73	34.16	38.41	44.88	48.75	74.00	-25.25	peak
5	7206.000	9.65	36.42	37.10	41.22	50.45	74.00	-23.55	peak
6 pp	9608.000	11.06	37.52	35.09	37.34	51.28	74.00	-22.72	peak

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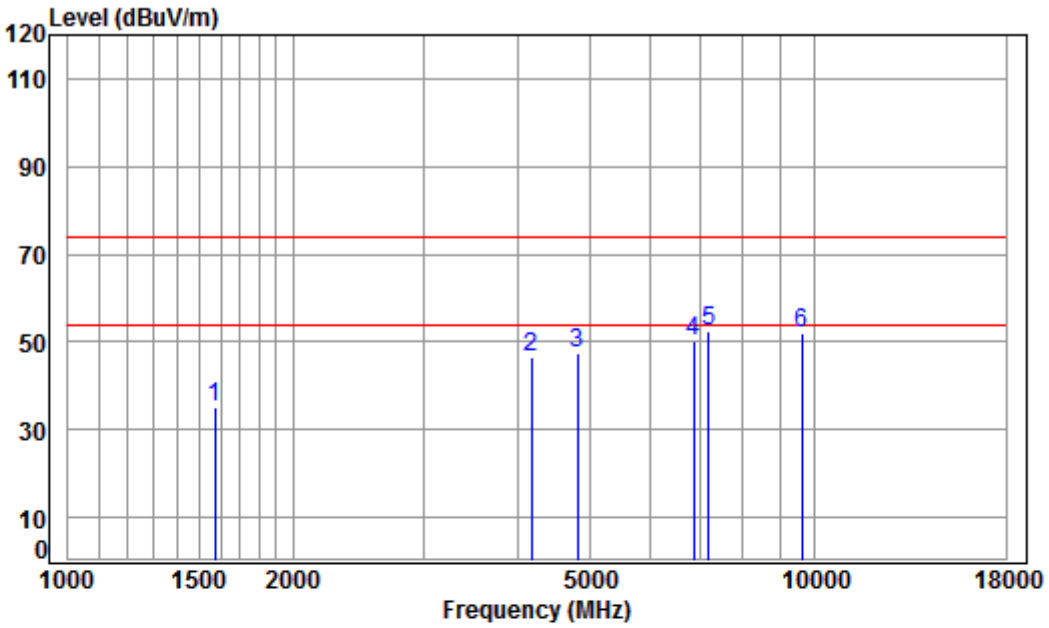
Mode:d; Polarization:Vertical; Modulation Type:GFSK; ; Channel:Low



Condition: 3m VERTICAL
Job No : 07845CR/07846CR
Mode : 2402 TX SE
Note : BLE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1574.265	4.56	26.14	38.03	42.05	35.21	74.00	-38.79	peak
2	4169.698	6.90	33.60	38.09	43.81	46.61	74.00	-27.39	peak
3	4804.000	7.73	34.16	38.41	43.36	47.23	74.00	-26.77	peak
4	6874.906	9.40	36.16	37.42	41.69	50.15	74.00	-23.85	peak
5 pp	7206.000	9.65	36.42	37.10	43.13	52.36	74.00	-21.64	peak
6	9608.000	11.06	37.52	35.09	38.04	51.98	74.00	-22.02	peak

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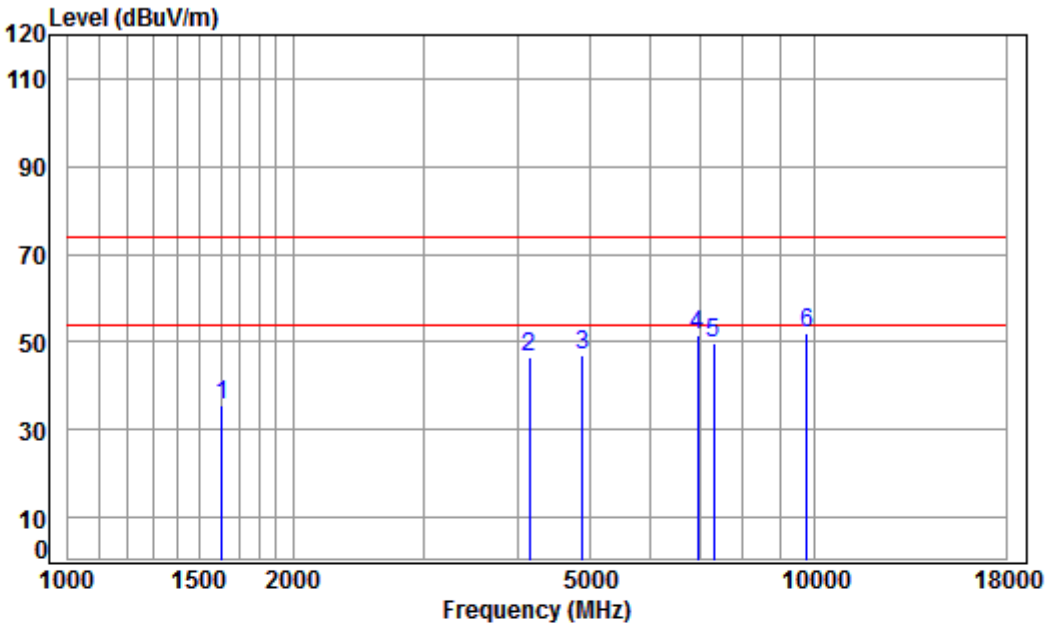
Mode:d; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:middle



Condition: 3m HORIZONTAL
Job No : 07845CR/07846CR
Mode : 2440 TX SE
Note : BLE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1606.441	4.60	26.28	38.03	42.32	35.66	74.00	-38.34	peak
2	4145.664	6.88	33.60	38.08	43.69	46.49	74.00	-27.51	peak
3	4880.000	7.83	34.29	38.45	42.77	46.85	74.00	-27.15	peak
4	6954.852	9.47	36.38	37.34	42.65	51.47	74.00	-22.53	peak
5	7320.000	9.73	36.37	37.00	40.56	49.90	74.00	-24.10	peak
6 pp	9760.000	11.21	37.55	35.02	37.90	52.10	74.00	-21.90	peak

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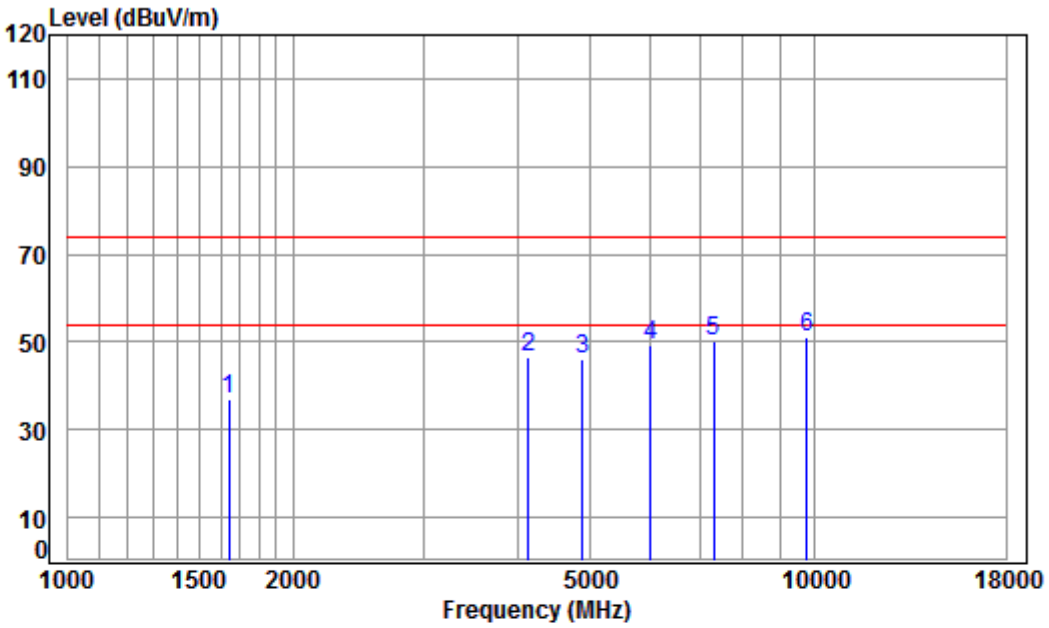
Mode:d; Polarization:Vertical; Modulation Type:GFSK; ; Channel:middle



Condition: 3m VERTICAL
Job No : 07845CR/07846CR
Mode : 2440 TX SE
Note : BLE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1644.019	4.64	26.44	38.03	43.30	36.87	74.00	-37.13	peak
2	4133.699	6.86	33.60	38.07	43.94	46.73	74.00	-27.27	peak
3	4880.000	7.83	34.29	38.45	41.85	45.93	74.00	-28.07	peak
4	6018.999	8.76	34.72	38.28	43.88	49.40	74.00	-24.60	Peak
5	7320.000	9.73	36.37	37.00	40.92	50.26	74.00	-23.74	peak
6 pp	9760.000	11.21	37.55	35.02	37.07	51.27	74.00	-22.73	peak

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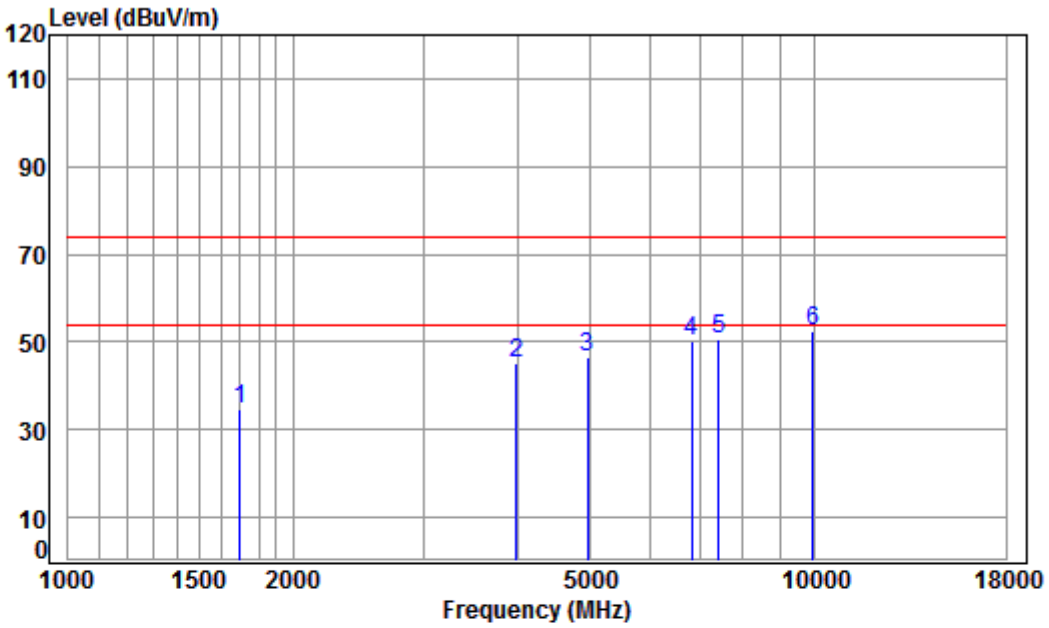
Mode:d; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:High



Condition: 3m HORIZONTAL
Job No : 07845CR/07846CR
Mode : 2480 TX SE
Note : BLE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1697.129	4.70	26.66	38.02	41.00	34.90	74.00	-39.10	peak
2	3981.257	6.69	33.55	38.00	42.69	45.38	74.00	-28.62	peak
3	4960.000	7.95	34.43	38.48	42.12	46.45	74.00	-27.55	peak
4	6835.278	9.37	36.05	37.45	41.91	50.21	74.00	-23.79	peak
5	7440.000	9.81	36.32	36.89	41.16	50.62	74.00	-23.38	peak
6 pp	9920.000	11.36	37.58	34.94	38.11	52.57	74.00	-21.43	peak

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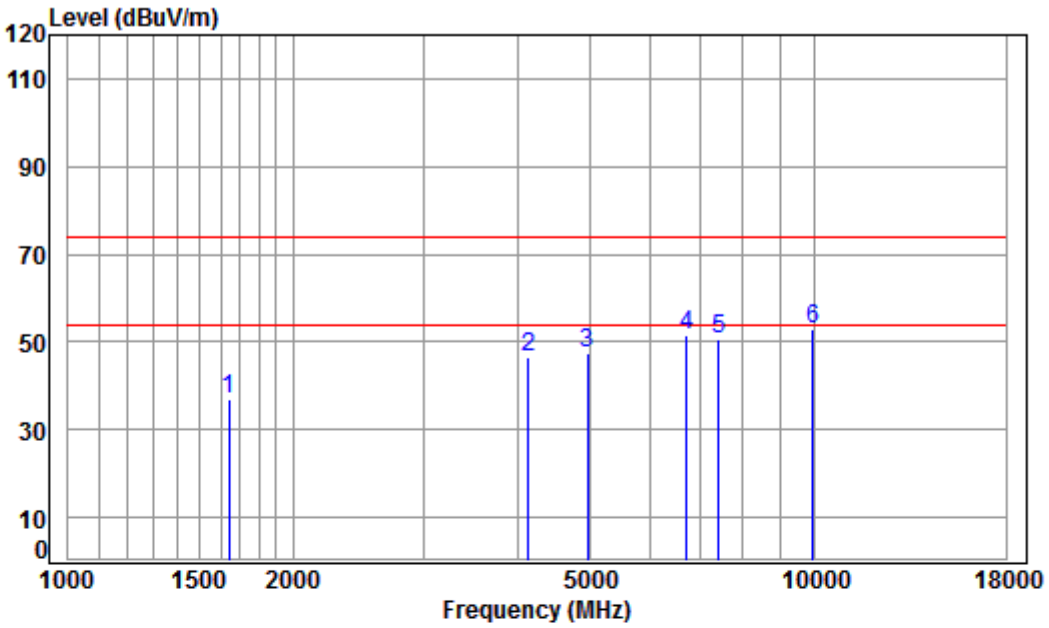
Mode:d; Polarization:Vertical; Modulation Type:GFSK; ; Channel:High



Condition: 3m VERTICAL
Job No : 07845CR/07846CR
Mode : 2480 TX SE
Note : BLE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1644.019	4.64	26.44	38.03	43.30	36.87	74.00	-37.13	peak
2	4133.699	6.86	33.60	38.07	43.94	46.73	74.00	-27.27	peak
3	4960.000	7.95	34.43	38.48	42.91	47.24	74.00	-26.76	peak
4	6737.207	9.28	35.78	37.55	43.53	51.39	74.00	-22.61	peak
5	7440.000	9.81	36.32	36.89	41.38	50.84	74.00	-23.16	peak
6 pp	9920.000	11.36	37.58	34.94	38.44	52.90	74.00	-21.10	peak

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Remark:
1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

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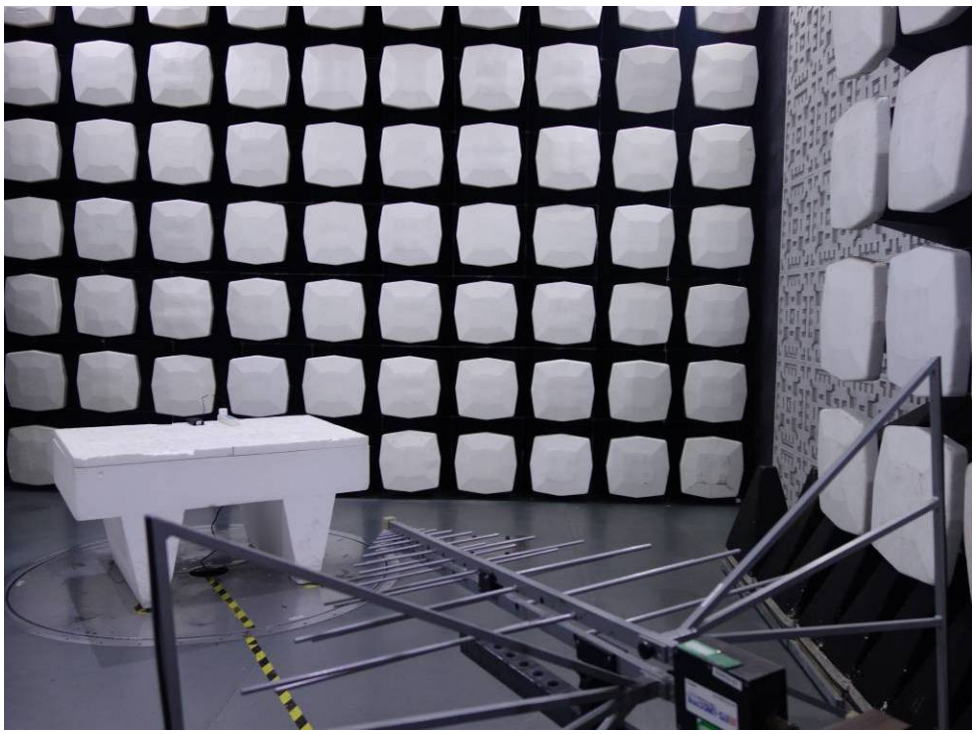
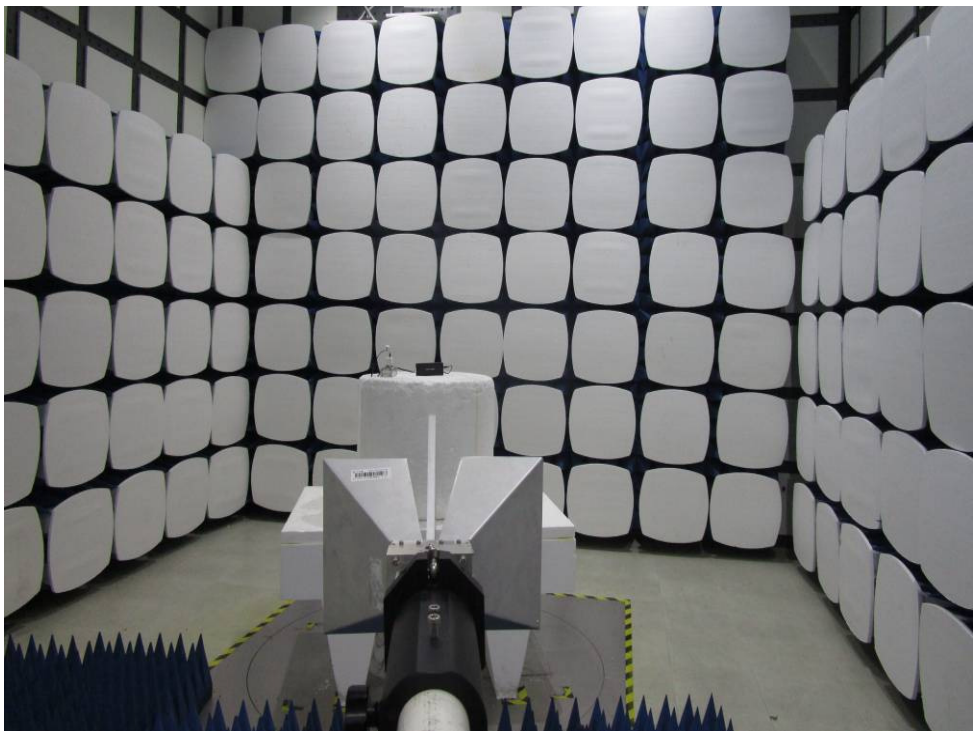
8 Photographs

8.1 Radiated Spurious Emissions Test Setup





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8.2 EUT Constructional Details

Refer to Appendix C - Photographs of EUT Constructional Details for SZEM1707007845CR.

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9 Appendix

9.1 Appendix 15.247

1. Conducted Peak Output Power

Test Mode	Test Channel	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	-1.67	<30	PASS
BLE	2440	-1.23	<30	PASS
BLE	2480	-1.48	<30	PASS

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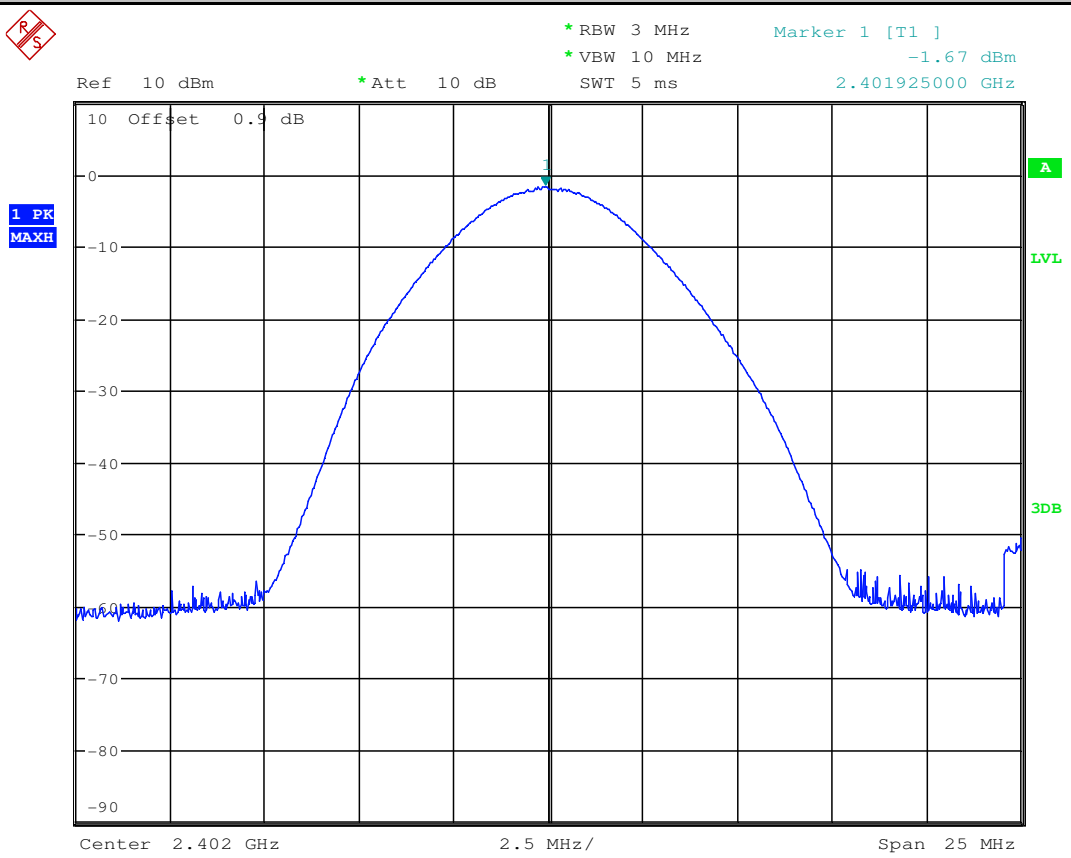
Conducted Peak Output Power_DH5_2402



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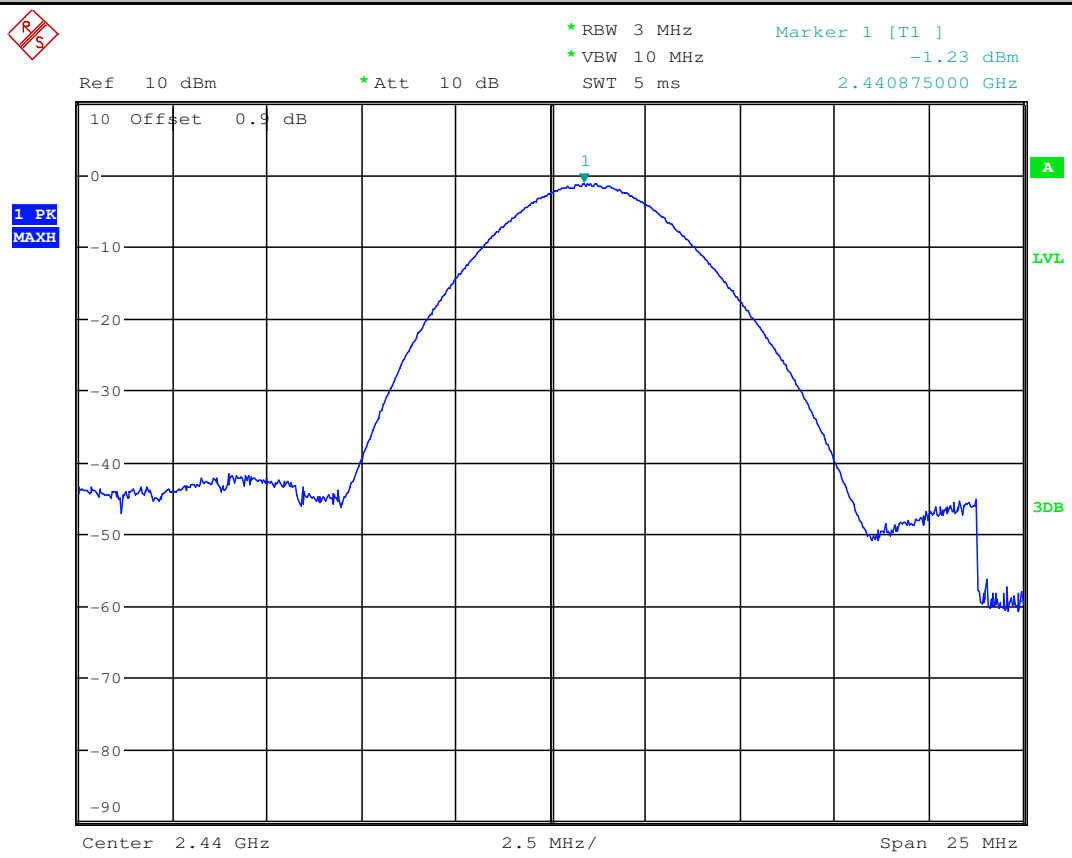
Conducted Peak Output Power_DH5_2440



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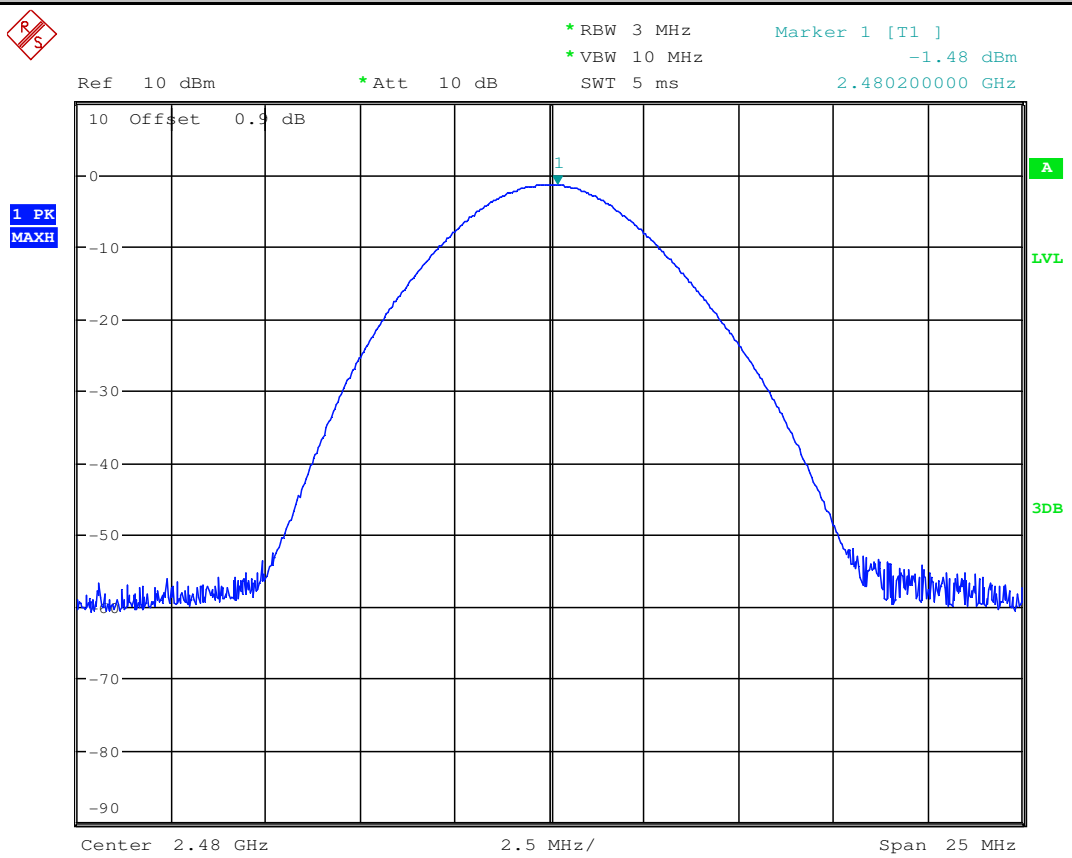
Conducted Peak Output Power_DH5_2480



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