



FCC TEST REPORT

Test report

On Behalf of

SHENZHEN TOP FAME ELECTRONICS LTD

For

Digital wireless rear view system

**Model No.: DW-7016, DW-4300WS, DW-4301WS, DW-4302WS, DW-4303WS,
DW-4304WS, DW-4305WS, CA431, DW-5000WS, DW-5001WS, DW-5002WS,
DW5003WS, DW-5004WS, DW-5005WS, DW-5400WS, CA531, DW-7010WS,
DW-7016WS, DW-9016WS, CA731, RX-C73/DIG/CL, WS-2C**

FCC ID: 2AR9W-DW-7016

**Prepared for : SHENZHEN TOP FAME ELECTRONICS LTD
5/F,6Bldg., the 2nd of Zhugushi industrial area, Longgang district, Shenzhen,
China**

**Prepared By : Shenzhen HUAKE Testing Technology Co., Ltd.
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Bao'an District, Shenzhen City, China**



TEST REPORT

Applicant's name.....: **SHENZHEN TOP FAME ELECTRONICS LTD**
Address: 5/F,6Bldg,the 2nd of Zhugushi industrial area,Longgang district,
Shenzhen,China
Manufacture's Name: **SHENZHEN TOP FAME ELECTRONICS LTD**
Address: 5/F,6Bldg., the 2nd of Zhugushi industrial area, Longgang district,
Shenzhen, China

Product description

Trade Mark: N/A
Product name.....: Digital wireless rear view system
Model and/or type reference .: DW-7016, DW-4300WS, DW-4301WS, DW-4302WS, DW-4303WS, DW-4304WS, DW-4305WS, CA431, DW-5000WS, DW-5001WS, DW-5002WS, DW5003WS, DW-5004WS, DW-5005WS, DW-5400WS, CA531, DW-7010WS, DW-7016WS, DW-9016WS, CA731, RX-C73/DIG/CL, WS-2C
Standards.....: FCC Rules and Regulations Part PART 15.249
ANSI C63.10: 2013

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Date of Test.....:
Date (s) of performance of tests.....: Dec. 01, 2018 ~. Dec. 17, 2018
Date of Issue: Dec. 17, 2018
Test Result: **Pass**

Testing Engineer : 
(Gary Qian)

Technical Manager : 
(Eden Hu)

Authorized Signatory : 
(Jason Zhou)



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1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.249: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

ANSI C63.10:2013 : American National Standard for Testing Unlicensed Wireless Devices

ANSI C63.4: 2014: –American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz
Range of 9 kHz to 40GHz



2. SUMMARY

2.1. Product Description

Name of EUT	Digital wireless rear view system
Trade Mark:	N/A
Model Number	DW-7016
List Model:	DW-4300WS, DW-4301WS, DW-4302WS, DW-4303WS, DW-4304WS, DW-4305WS, CA431, DW-5000WS, DW-5001WS, DW-5002WS, DW5003WS, DW-5004WS, DW-5005WS, DW-5400WS, CA531, DW-7010WS, DW-7016WS, DW-9016WS, CA731, RX-C73/DIG/CL, WS-2C
Power Rating	DC 12V
FCC ID	2AR9W-DW-7016
FCC Operation frequency	2409MHz-2476MHz
Modulation	GFSK
Antenna Type	External antenna
Antenna gain	2.0dBi

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage	:	☐ 230V / 50 Hz	☐ 120V / 60Hz
		☒ 12 V DC	☐ 24 V DC
		☐ Other (specified in blank below)	

DC 12V

2.3. Short description of the Equipment under Test (EUT)

This is a Digital wireless rear view system.

For more details, refer to the user's manual of the EUT.

2.4. EUT operation mode

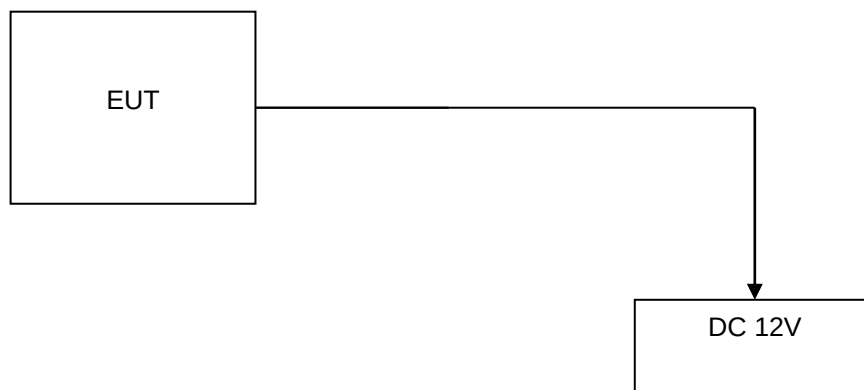
The Applicant provides test software to control the EUT for staying in continuous transmitting and receiving mode for testing .There are 68 channels provided to the EUT. Channel 00/33/67 was selected to test.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
00	2409	34	2443
01	2410	35	2444
02	2411	36	2445
03	2412	37	2446
04	2413	38	2447
05	2414	39	2448
06	2415	40	2449
07	2416	41	2450
08	2417	42	2451
09	2418	43	2452
10	2419	44	2453
11	2420	45	2454



12	2421	46	2455
13	2422	47	2456
14	2423	48	2457
15	2424	49	2458
16	2425	50	2459
17	2426	51	2460
18	2427	52	2461
19	2428	53	2462
20	2429	54	2463
21	2430	55	2464
22	2431	56	2465
23	2432	57	2466
24	2433	58	2467
25	2434	59	2468
26	2435	60	2469
27	2436	61	2470
28	2437	62	2471
29	2438	63	2472
30	2439	64	2473
31	2440	65	2474
32	2441	66	2475
33	2442	67	2476

2.5. Block Diagram of Test Setup



2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AR9W-DW-7016** filing to comply with Section 15.247 of the FCC Part 15.249

2.7. Modifications

No modifications were implemented to meet testing criteria.



3. TEST ENVIRONMENT

3.1. TEST FACILITY

Test Firm : Shenzhen HUAK Testing Technology Co., Ltd.

Address 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

3.2. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.3. Summary of measurement results

FCC PART 15.249		
FCC Part 15.249(a)	Field Strength of Fundamental	PASS
FCC Part 15.209	Spurious Emission	PASS
FCC Part 15.209	Band edge	PASS
FCC Part 15.215(c)	20dB bandwidth	PASS
FCC Part 15.207	Conducted Emission	N/A
FCC Part 15.203	Antenna Requirement	PASS

Remark:

1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed
3. We tested all test mode and recorded worst case in report

3.4. Statement of the measurement uncertainty

Measurement Uncertainty

Conducted Emission Expanded Uncertainty	= 2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	= 3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	= 4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	= 4.06dB, k=2



3.5. Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 28, 2017	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 28, 2017	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 28, 2017	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 28, 2017	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2017	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 28, 2017	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 28, 2017	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 28, 2017	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 28, 2017	1 Year
10.	Horn Antenna	Schwarzbeck	9120D	HKE-013	Dec. 28, 2017	1 Year
11.	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	HKE-017	Dec. 28, 2017	1 Year
12.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 28, 2017	1 Year
13.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 28, 2017	1 Year
14.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 28, 2017	N/A
15.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 28, 2017	1 Year
16.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2017	1 Year
17.	Signal generator	Agilent	N5182A	HKE-029	Dec. 28, 2017	1 Year
18.	Signal Generator	Agilent	83630A	HKE-028	Dec. 28, 2017	1 Year
19.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 28, 2017	3 Year
20.	RF Cable(below 1GHz)	HUBER+SUHNER	RG214	HKE-055	Dec. 28, 2017	1 Year
21.	RF Cable(above 1GHz)	HUBER+SUHNER	RG214	HKE-056	Dec. 28, 2017	1 Year

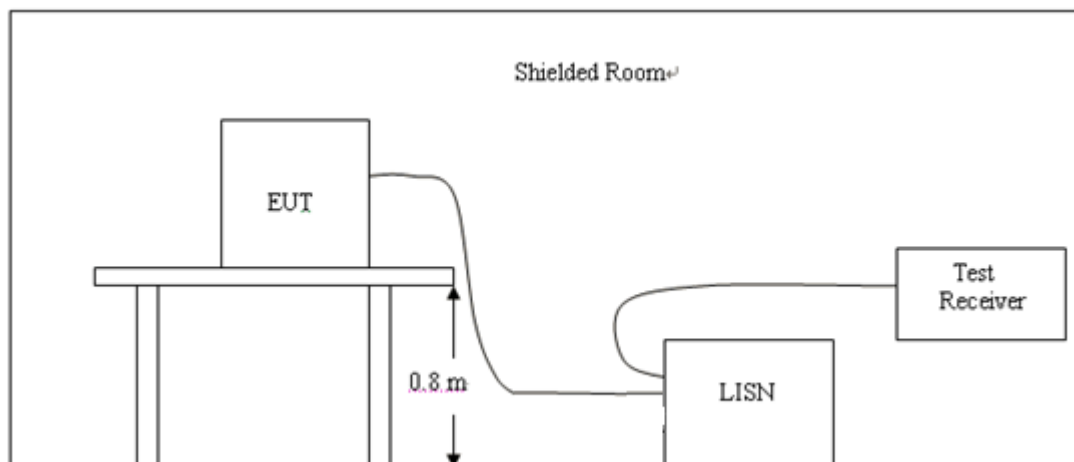
Note: 1. The Cal.Interval was one year.



4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

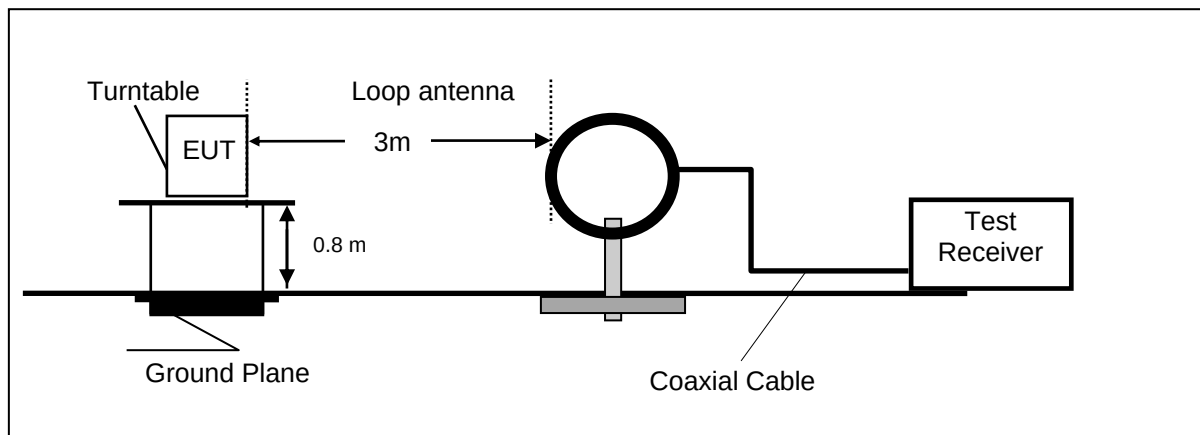
TEST RESULTS

Note applicable to this device.

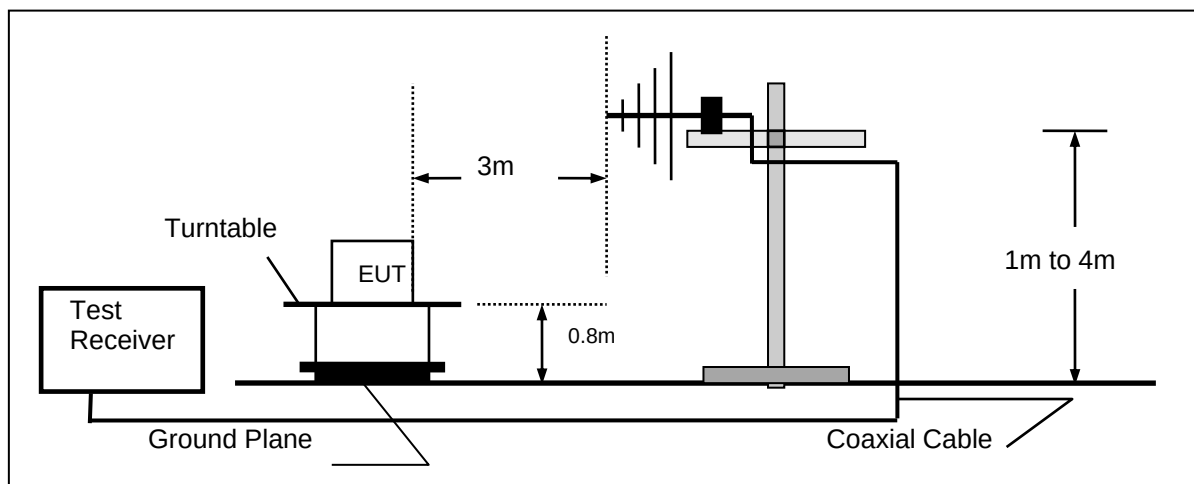
4.2. Radiated Emission and Band Edges

TEST CONFIGURATION

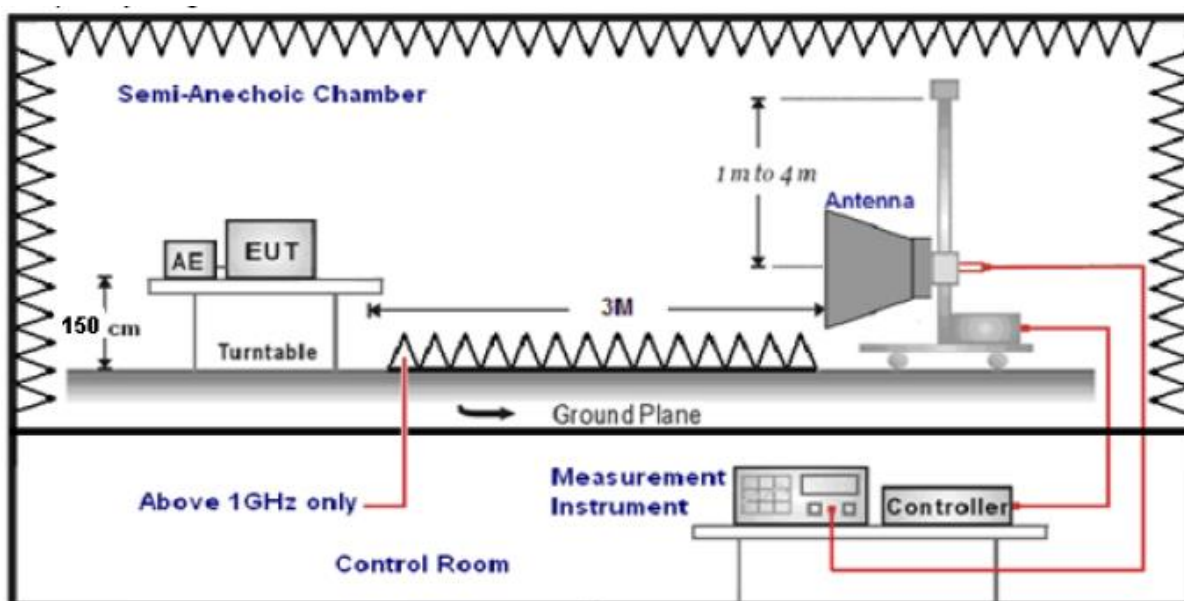
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



**Test Procedure**

- Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
- Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until all frequency measurements have been completed.
- Radiated emission test frequency band from 9KHz to 25GHz.
- The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

- Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz, Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz, Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz, Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

TEST RESULTS

Remark: we test at Low, Middle, and High channel; only the worst result of Middle Channel was reported as below:

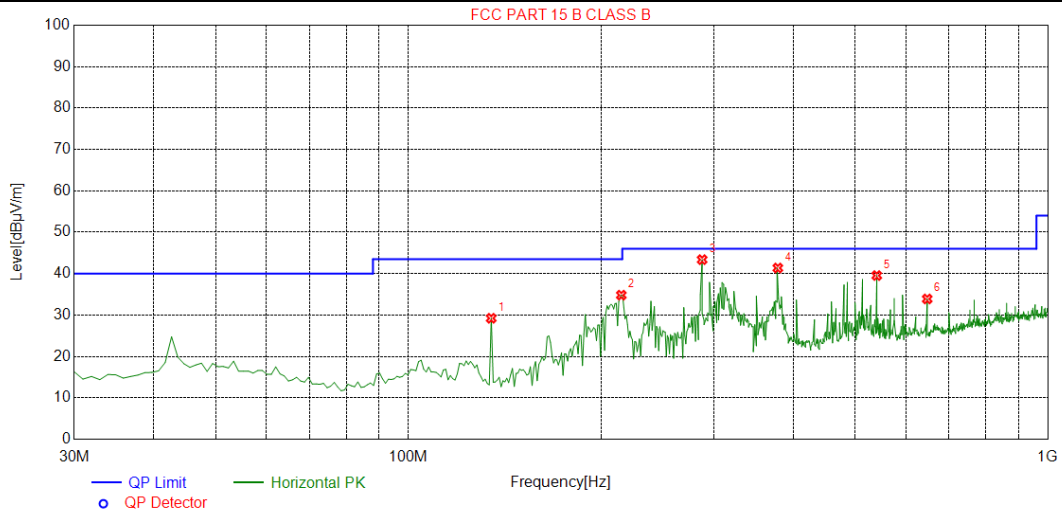
For 9 KHz-30MHz

Frequency (MHz)	Corrected Reading (dBuV/m)@3m	FCC Limit (dBuV/m) @3m	Margin (dB)	Detector	Result
0.38	46.62	96.01	49.39	QP	PASS
1.55	51.72	63.80	12.08	QP	PASS
19.68	56.69	69.54	12.85	QP	PASS
24.62	40.75	69.54	28.79	QP	PASS



For 30MHz-1GHz

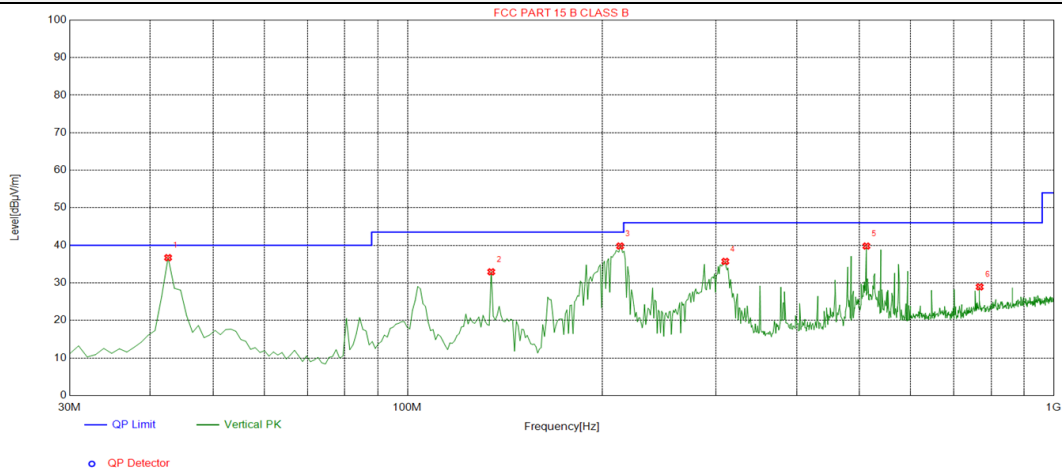
Horizontal



Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	134.760	29.22	-18.86	43.50	14.28	100	133	Horizontal
2	215.270	34.81	-14.67	43.50	8.69	100	95	Horizontal
3	288.020	43.38	-12.92	46.00	2.62	100	66	Horizontal
4	378.230	41.37	-10.86	46.00	4.63	100	266	Horizontal
5	540.220	39.54	-7.20	46.00	6.46	100	152	Horizontal
6	647.890	33.89	-5.78	46.00	12.11	100	215	Horizontal

Vertical



Suspected List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	42.6100	36.71	-14.08	40.00	3.29	100	117	Vertical
2	134.760	32.93	-18.86	43.50	10.57	100	98	Vertical
3	213.330	39.81	-14.72	43.50	3.69	100	117	Vertical
4	310.330	35.71	-12.59	46.00	10.29	100	226	Vertical
5	513.060	39.80	-7.92	46.00	6.20	100	27	Vertical
6	768.170	28.92	-3.29	46.00	17.08	100	37	Vertical



For 1GHz to 25GHz

CH Low (2409MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2409	110.5	-5.75	104.75	114	-9.25	peak
2409	91.01	-5.75	85.26	94	-8.74	AVG
4818	60.47	-3.64	56.83	74	-17.17	peak
4818	46.82	-3.64	43.18	54	-10.82	AVG
7227	56.32	-0.95	55.37	74	-18.63	peak
7227	42.49	-0.95	41.54	54	-12.46	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2409	111.01	-5.75	105.26	114	-8.74	peak
2409	92.73	-5.75	86.98	94	-7.02	AVG
4818	61.58	-3.64	57.94	74	-16.06	peak
4818	44.72	-3.64	41.08	54	-12.92	AVG
7227	55.77	-0.95	54.82	74	-19.18	peak
7227	42.69	-0.95	41.74	54	-12.26	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



CH Middle (2442MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2442	108.72	-5.50	103.22	114	-10.78	peak
2442	90.09	-5.50	84.59	94	-9.41	AVG
4884	61.73	-3.51	58.22	74	-15.78	peak
4884	44.86	-3.51	41.35	54	-12.65	AVG
7326	56.69	-0.82	55.87	74	-18.13	peak
7326	41.73	-0.82	40.91	54	-13.09	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2442	110.25	-5.50	104.75	114	-9.25	peak
2442	91.46	-5.50	85.96	94	-8.04	AVG
4884	59.87	-3.51	56.36	74	-17.64	peak
4884	45.69	-3.51	42.18	54	-11.82	AVG
7326	56.51	-0.82	55.69	74	-18.31	peak
7326	41.79	-0.82	40.97	54	-13.03	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



CH High (2476MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2476	109.71	-5.15	104.56	114	-9.44	peak
2476	90.59	-5.15	85.44	94	-8.56	AVG
4952	59.88	-3.43	56.45	74	-17.55	peak
4952	45.76	-3.43	42.33	54	-11.67	AVG
7428	55.39	-0.75	54.64	74	-19.36	peak
7428	41.53	-0.75	40.78	54	-13.22	AVG
---	---	---	---	---	---	---

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2476	110.73	-5.15	105.58	114	-8.42	peak
2476	91.89	-5.15	86.74	94	-7.26	AVG
4952	60.12	-3.43	56.69	74	-17.31	peak
4952	46.39	-3.43	42.96	54	-11.04	AVG
7428	56.46	-0.75	55.71	74	-18.29	peak
7428	41.90	-0.75	41.15	54	-12.85	AVG
---	---	---	---	---	---	---

Remark:

(1) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(2) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed.



Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.50	55.88	-5.65	50.23	74	-23.77	peak
2483.50	--	--	--	54	--	AVG
2485.75	53.91	-5.69	48.22	74	-25.78	peak
2485.75	--	--	--	54	--	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



CH High (2476MHz)

Vertical

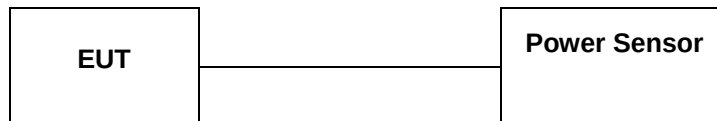
Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.50	56.91	-5.65	51.26	74	-22.74	peak
2483.50	--	--	--	54	--	AVG
2485.75	55.06	-5.69	49.37	74	-24.63	peak
2485.75	--	--	--	54	--	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



4.3. Occupied Bandwidth Measurement

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

N/A

TEST RESULTS

Modulation	Channel	99% OBW (MHz)	20dB bandwidth (MHz)	Result
GFSK	CH00	0.902	0.964	Pass
	CH33	0.905	0.966	
	CH67	0.904	0.962	

Note: 1.The test results including the cable lose.



GFSK Modulation



CH00



CH33



CH67



4.4. Antenna Requirement

Standard Applicable

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.

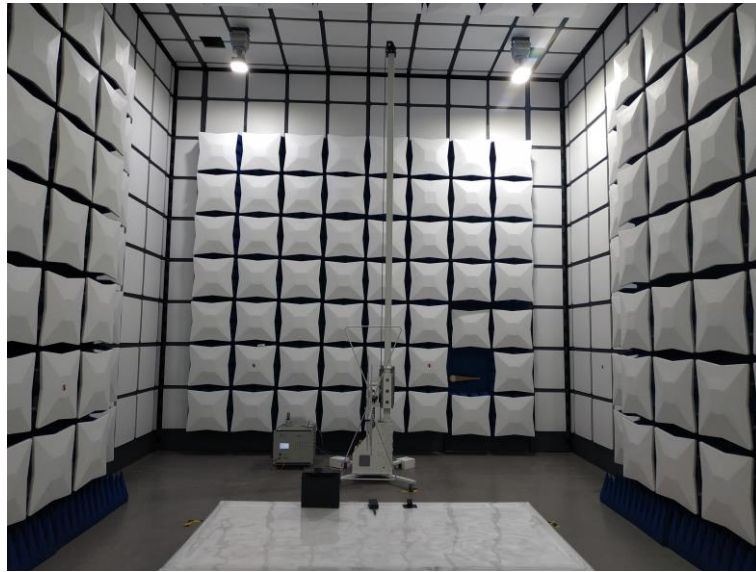
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Antenna Information

The directional gains of antenna used for transmitting is 2.00 dBi.



5. Test Setup Photos of the EUT



.....End of Report.....