



# TEST REPORT

<b>Applicant:</b>	DARKFLASH GUANGZHOU CO.,LTD		
<b>Address:</b>	ROOM 316,E-COMMERCE BUILDING,MEIDONG INDUSTRIAL PARK,NO.14 TIESHANHE ROAD,HUADU DISTRICT,GUANGZHOU		
<b>Manufacturer:</b>	Huaxiang(Guangzhou)Technology Co.,Ltd.		
<b>Address:</b>	Floor 2,Building A,Second Industrial Park,TuanjieRoad,Xinya Street,Huadu District,GuangzhouCity,Guangdong Province		
<b>Factory:</b>	Huaxiang(Guangzhou)Technology Co.,Ltd.		
<b>Address:</b>	Floor 2,Building A,Second Industrial Park,TuanjieRoad,Xinya Street,Huadu District,GuangzhouCity,Guangdong Province		
<b>E.U.T.:</b>	Mechanical Keyboard		
<b>Model Number:</b>	DF98 Lightless, GK104, GK108, GK106, CK106, CK108, CK104, CK100, GK100, DF98, DF87, DF108, DF68, DF75, DF18, DF22, DFS99, DFS108, DFS68,DFS75, DFS18,DFS22, DFS87, DFS104, CK87, CK68, CK75, GK87, GK68, GK75, AigoWQ5102, AigoVK001, AigoK100, AigoK120, AigoV200		
<b>Trade mark:</b>	darkFlash, Aigo		
<b>FCC ID:</b>	2BEA7-DF98		
<b>Date of Receipt:</b>	Mar 12, 2024	<b>Date of Test:</b>	Mar 12, 2024- Mar 25, 2024
<b>Test Specification:</b>	FCC 47 CFR Part 15, Subpart C		
<b>Test Result:</b>	The equipment under test was found to be compliance with the requirements of the standards applied.		
<b>Prepared by:</b>	<b>Approved &amp; Authorized Signer:</b>		
			
_____	_____		
Jerry Hu/ Engineer	Frank Shen/ Manager		
	Issue Date: April 2, 2024		
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 Dongguan Lepont Service Co., Ltd.			

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## 1. GENERAL PRODUCT INFORMATION

### 1.1. PRODUCT FUNCTION

Refer to Technical Construction Form and User Manual.

### 1.2. EUT TECHNICAL DESCRIPTION

Product Name:	Mechanical Keyboard
Model No.:	DF98 Lightless, GK104, GK108, GK106, CK106, CK108, CK104, CK100, GK100, DF98, DF87, DF108, DF68, DF75, DF18, DF22, DFS99, DFS108, DFS68, DFS75, DFS18, DFS22, DFS87, DFS104, CK87, CK68, CK75, GK87, GK68, GK75, AigoWQ5102, AigoVK001, AigoK100, AigoK120, AigoV200
Test Model No:	DF98 Lightless
Model Differences:	Only the model and color are different. Everything else is the same.
Test sample(s) ID:	LP23080282C01-S026
Sample(s) Status	Engineer sample
Hardware:	N/A
Software:	N/A
Operation Frequency:	2403.85 ~ 2479.85 MHz
Channel numbers:	16
Modulation type:	GFSK
Antenna Type:	PCB Antenna
Antenna gain:	2.34dBi
Power supply:	DC 3.7V From Battery

### 1.3. INDEPENDENT OPERATION MODES

The EUT has been tested under its typical operating condition.

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

#### Frequency and Channel list for GFSK

Channel No .	Frequency (MHz)	Channel No .	Frequency (MHz)
1	2403.85	2	2407.85
3	2414.85	4	2419.85
5	2422.85	6	2426.85
7	2436.85	8	2439.85
9	2441.85	10	2445.85
11	2453.85	12	2459.85
13	2463.85	14	2466.85
15	2473.85	16	2479.85

## 2. TEST STANDARDS AND SITES

### 2.1. DESCRIPTION OF STANDARDS AND RESULTS

The EUT have been tested according to the applicable standards as referenced below.

FCC Part Clause	Test Parameter	Verdict	Remark
15.207	Conducted Emission	PASS	
15.209	Radiated Emission	PASS	
15.249	Radiated Spurious Emission	PASS	
15.249	Band edge test	PASS	
15.215	20dB Bandwidth	PASS	
15.203	Antenna Requirement	PASS	

NOTE1: N/A (Not Applicable)

NOTE2: The report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2BEA7-DF98 filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

## 2.2. LIST OF TEST AND MEASUREMENT INSTRUMENTS

For radiated(9K-30M) emission test(966 Chamber 1)							
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	Lab No.	Remark
EMI Test Receiver	Rohde & Schwarz	ESR 3	101849	Feb. 14, 2024	1 Year	LEP-E006	<input type="checkbox"/>
Loop Antenna	Schwarzbeck	FMZB1519B	1519B-036	Feb. 14, 2024	3 Year	LEP-E068	<input type="checkbox"/>
966 Chamber 1	MR	MR-L02	LEP-E051	Nov. 17, 2022	3 Year	LEP-E051	<input type="checkbox"/>
Test software	EZ-EMC	Fala	EMEC-3A1	N/A	N/A	N/A	<input type="checkbox"/>
For radiated(30M-1G) emission test(966 Chamber 1)							
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	Lab No.	Remark
EMI Test Receiver	Rohde & Schwarz	ESR 3	101849	Feb. 14, 2024	1 Year	LEP-E006	<input checked="" type="checkbox"/>
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	743	Nov. 20, 2022	3 Year	LEP-E005	<input checked="" type="checkbox"/>
Signal Amplifier	HP	8447D	1726A01222	Feb. 14, 2024	1 Year	LEP-E007	<input checked="" type="checkbox"/>
6dB Attenuator	RswTech	5W 6dB	LEP-E084	Feb. 14, 2024	1 Year	LEP-E084	<input checked="" type="checkbox"/>
966 Chamber 1	MR	MR-L02	LEP-E051	Nov. 17, 2022	3 Year	LEP-E051	<input checked="" type="checkbox"/>
Test software	EZ-EMC	Fala	EMEC-3A1	N/A	N/A	N/A	<input checked="" type="checkbox"/>
For radiated(1-18G) emission test(966 Chamber 1)							
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	Lab No.	Remark
Spectrum analyzer	Rohde & Schwarz	FSV40	101412	Feb. 14, 2024	1 Year	LEP-E076	<input checked="" type="checkbox"/>
Spectrum analyzer	Agilent	N9020A	MY49100060	Feb. 14, 2024	1 Year	LEP-E020	<input checked="" type="checkbox"/>
Horn antenna	Schwarzbeck	BBHA 9120D	01875	Nov. 20, 2022	3 Year	LEP-E024	<input checked="" type="checkbox"/>
Preamplifier	Schwarzbeck	BBN 9718B	00010	Mar. 06, 2024	1 Year	LEP-E025	<input checked="" type="checkbox"/>
966 Chamber 1	MR	MR-L02	LEP-E051	Nov. 17, 2022	3 Year	LEP-E051	<input checked="" type="checkbox"/>
Test software	EZ-EMC	Fala	EMEC-3A1	N/A	N/A	N/A	<input checked="" type="checkbox"/>
For radiated(18-40G) emission test(966 Chamber 1)							
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	Lab No.	Remark
Spectrum analyzer	Rohde & Schwarz	FSV40	101412	Feb. 14, 2024	1 Year	LEP-E076	<input checked="" type="checkbox"/>
Horn antenna+Preamplifier	COM-POWER	AH840	10100020	Sep. 05, 2022	3 Year	LEP-E075	<input checked="" type="checkbox"/>
966 Chamber 1	MR	MR-L02	LEP-E051	Nov. 17, 2022	3 Year	LEP-E051	<input checked="" type="checkbox"/>
Test software	EZ-EMC	Fala	EMEC-3A1	N/A	N/A	N/A	<input checked="" type="checkbox"/>
For radiated(30M-1G) emission test(966 Chamber 2)							
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	Lab No.	Remark
EMI Test Receiver	Rohde & Schwarz	ESPI 3	101059	Feb. 14, 2024	1 Year	LEP-E054	<input type="checkbox"/>
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	743	Nov. 20, 2022	3 Year	LEP-E049	<input type="checkbox"/>
966 Chamber 2	MR	MR-L06	LEP-E052	Nov. 17, 2022	3 Year	LEP-E052	<input type="checkbox"/>
Test software	EZ-EMC	Fala	EMEC-3A1	N/A	N/A	N/A	<input type="checkbox"/>
For RF test							
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	Lab No.	Remark
Spectrum analyzer	Rohde & Schwarz	FSV40	101412	Feb. 14, 2024	1 Year	LEP-E076	<input checked="" type="checkbox"/>
Spectrum analyzer	Agilent	N9020A	MY49100060	Feb. 14, 2024	1 Year	LEP-E020	<input checked="" type="checkbox"/>
Vector source	Agilent	N5182A	MY47420382	Feb. 14, 2024	1 Year	LEP-E021	<input checked="" type="checkbox"/>
Analog signal source	Agilent	N5171B	MY51350292	Feb. 14, 2024	1 Year	LEP-E022	<input checked="" type="checkbox"/>
All instrument	Rohde & Schwarz	CMW 500	1201.002K50	Feb. 14, 2024	1 Year	LEP-E019	<input checked="" type="checkbox"/>
High and low temperature chamber	Math-mart	MT-1202-40	LEP-E041	Feb. 14, 2024	1 Year	LEP-E041	<input checked="" type="checkbox"/>
control unit	Tonscend	JS0806-2	10165	Feb. 14, 2024	1 Year	LEP-E034	<input checked="" type="checkbox"/>
Testing software	Tonscend	JSTS1120-3	Ver 2.6.77.0518	N/A	N/A	N/A	<input checked="" type="checkbox"/>

### 2.3. MEASUREMENT UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\%$
Conducted Emissions Test	$\pm 3.08\text{dB}$
Radiated Emission Test	$\pm 4.60\text{dB}$
Power Density	$\pm 0.9\%$
Occupied Bandwidth Test	$\pm 2.3\%$
Band Edge Test	$\pm 1.2\%$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 3.2\%$
Humidity	$\pm 2.5\%$
Measurement Uncertainty for a level of Confidence of 95%	



## 2.4. TEST FACILITY

EMC Lab. : The Laboratory has been assessed and proved to be in compliance with CNAS/CL01  
The Certificate Registration Number is L10100.  
The Laboratory has been assessed and proved to be in compliance with A2LA  
The Certificate Registration Number is 6901.01  
FCC Designation No.: CN1351  
Test Firm Registration No.: 397428  
ISED CAB identifier: CN0151  
Test Firm Registration No.: 20133

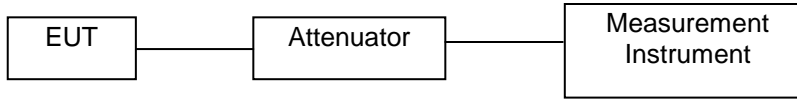
Test Location : Dongguan Lepont Testing Service Co., Ltd.

Address : Room 102, Building 11, No.7, Houjie Science And Technology Avenue, Houjie, Dongguan, Guangdong, China

### 3. SETUP OF EQUIPMENT UNDER TEST

#### 3.1. RADIO FREQUENCY TEST SETUP 1

The Bluetooth V5.1 component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



#### 3.2. RADIO FREQUENCY TEST SETUP 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 32.

Below 30MHz:

The EUT is placed on a turntable 0.8meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

Above 30MHz:

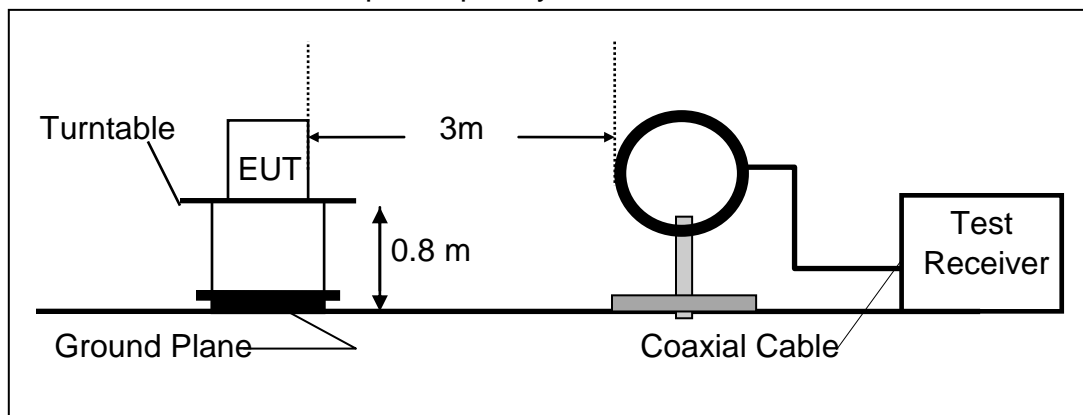
The EUT is placed on a turntable 0.8meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Above 1GHz:

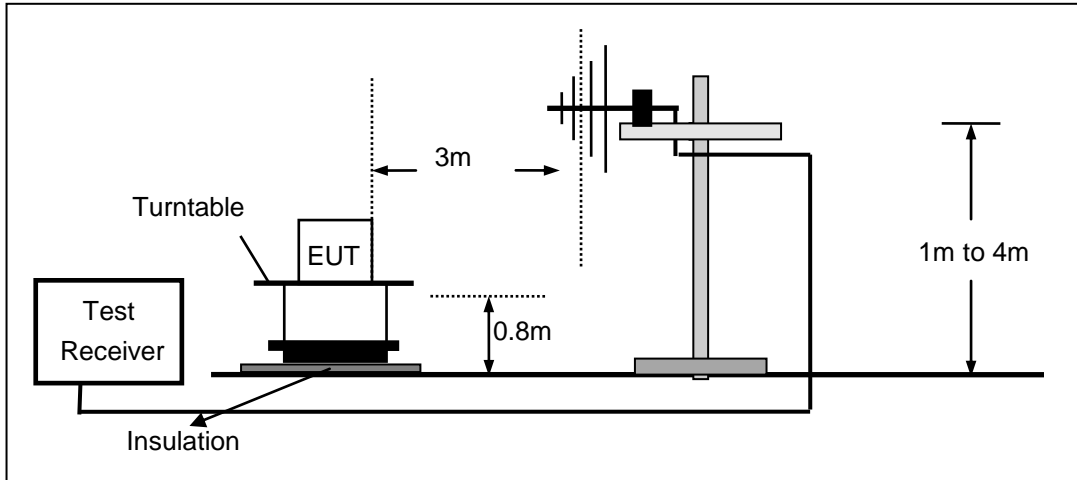
(Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.)

The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

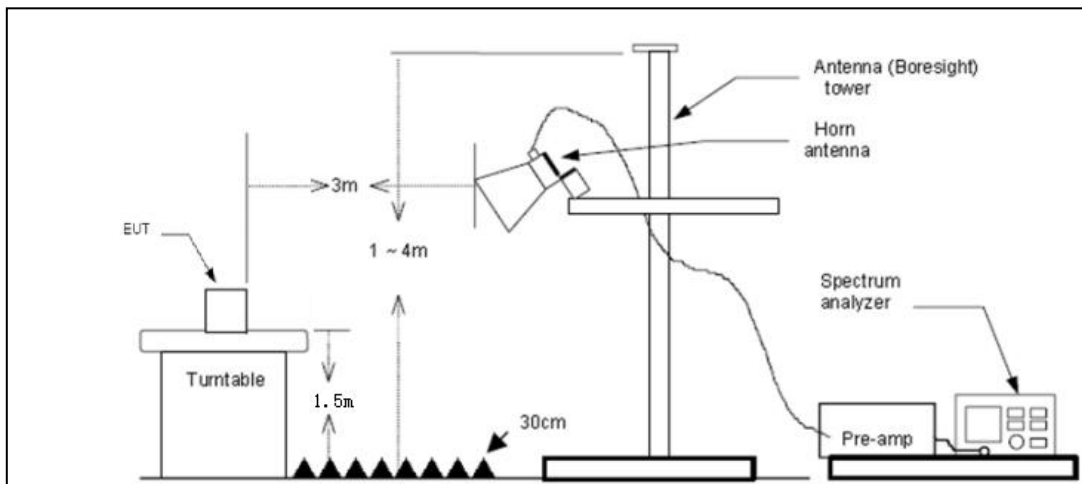
#### (a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

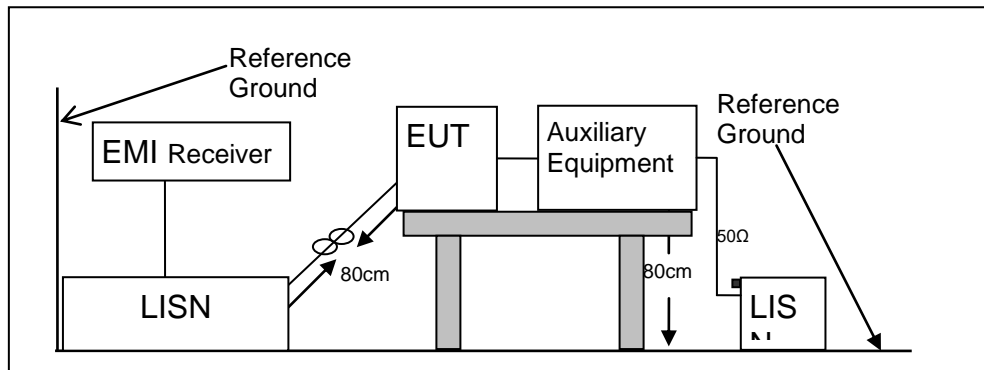


### 3.3. CONDUCTED EMISSION TEST SETUP

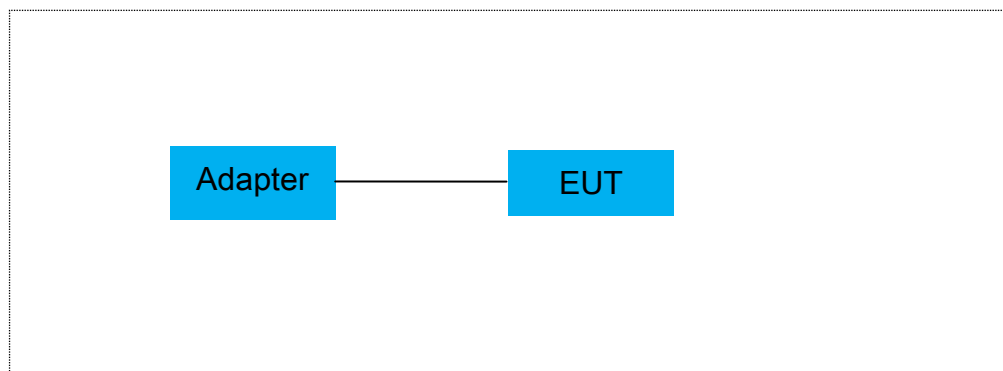
The mains cable of the EUT (Perfect Share Mini) must be connected to LISN. The LISN shall be placed 0.8m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.8m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



### 3.4. BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



## 4. TEST RESULTS AND MEASUREMENT DATA

### 4.1. BANDWIDTH TEST

#### 4.1.1. Applicable Standard

According to FCC Part 15.215

#### 4.1.2. Conformance Limit

No limit requirement.

#### 4.1.3. Test Configuration

Test according to clause 3.1 radio frequency test setup 1

#### 4.1.4. Test Procedure

The EUT was operating in controlled its channel. Printed out the test result from the spectrum by hard copy function.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW  $\geq$  1% of the 20 dB bandwidth(30KHz)

Set the video bandwidth (VBW)  $\geq$  RBW(100KHz).

Set Span= approximately 2 to 3 times the 20 dB bandwidth

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

Measure and record the results in the test report.

**Test Results:**

Modulation Mode	Channel Number	Channel Frequency (MHz)	Measurement Bandwidth (MHz)	Limit(MHz)	Verdict
GFSK	1	2403.85	1.994	N/A	PASS
GFSK	9	2441.85	2.017	N/A	PASS
GFSK	16	2479.85	2.027	N/A	PASS

Note: N/A (Not Applicable)

Test Model Channel 1: 2403.85MHz 20dB Bandwidth



Test Model Channel 9: 2441.85MHz 20dB Bandwidth



Test Model Channel 16: 2479.85MHz 20dB Bandwidth





## 4.2. RADIATED SPURIOUS EMISSION

### 4.2.1. Applicable Standard

According to FCC Part 15.249 and 15.209

### 4.2.2. Conformance Limit

According to FCC Part 15.249: radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to FCC Part 15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	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	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)
13.36-13.41			

According to FCC Part 15.205, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	24000/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remark :1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. Distance extrapolation factor =40log(Specific distance/ test distance)( dB);

Limit line=Specific limits(dBuV) + distance extrapolation factor.

for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10\*Ig(100 [kHz]/narrower RBW [kHz]). , the narrower RBW is 1 kHz and RBWCF is 20 dB for the

frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

Field strength of fundamental and Field strength of harmonics Limit:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50(94 dBV/m)	500(54 dBV/m)
2400-2483.5 MHz	50(94 dBV/m)	500(54 dBV/m)
5725-5875 MHz	50(94 dBV/m)	500(54 dBV/m)
24.0-24.25 GHz	250(108 dBV/m)	2500(68 dBV/m)

As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section 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

#### 4.2.3. Test Configuration

Test according to clause 6.2 radio frequency test setup 2

#### 4.2.4. Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for  $f \geq 1$  GHz(1GHz to 25GHz), 100 kHz for  $f < 1$  GHz(30MHz to 1GHz)

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from  $20\log(\text{dwell time}/100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Repeat above procedures until all frequency measured was complete.

**Test Results:**

■ **Field Strength of the fundamental signal**

Frequency	Factor	Meter Reading	Emission Level	Limits	Margin	Detector Type	Ant. Pol.
(MHz)	(dB)	(dB $\mu$ V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)		H/V
2403.85	13.75	76.22	89.97	114	-24.03	peak	V
	13.75	55.63	69.38	94	-24.62	AVG	V
	13.75	73.69	87.44	114	-26.56	peak	H
	13.75	51.03	64.78	94	-29.22	AVG	H
2441.85	14.01	67.36	81.37	114	-32.63	peak	V
	14.01	49.10	63.11	94	-30.89	AVG	V
	14.01	64.52	78.53	114	-35.47	peak	H
	14.01	45.69	59.70	94	-34.30	AVG	H
2479.85	14.32	68.60	82.92	114	-31.08	peak	V
	14.32	50.54	64.86	94	-59.14	AVG	V
	14.32	67.02	81.34	114	-32.66	peak	H
	14.32	47.11	61.43	94	-32.57	AVG	H

Note: (1) Correct Factor= Antenna Factor +Cable Loss- Amplifier Gain  
(2) Emission Level= Reading Level+Probe Factor +Cable Loss

■ Spurious Emission Above 1GHz (1GHz to 25GHz)

Worse case mode:		2403.85MHz		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)		H/V
4807.70	51.63	-4.11	47.52	74	-26.48	Peak	H
7291.20	48.54	1.51	50.05	74	-23.95	Peak	H
4807.70	51.87	-4.11	47.76	74	-26.24	Peak	V
7291.20	48.09	1.51	49.60	74	-24.40	Peak	V

Worse case mode:		2441.85MHz		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)		H/V
4883.70	50.22	-4.04	46.18	74	-27.82	peak	H
7325.55	47.69	1.57	49.26	74	-24.74	peak	H
4883.70	50.60	-4.04	46.56	74	-27.44	peak	V
7325.55	47.57	1.57	49.14	74	-24.86	peak	V

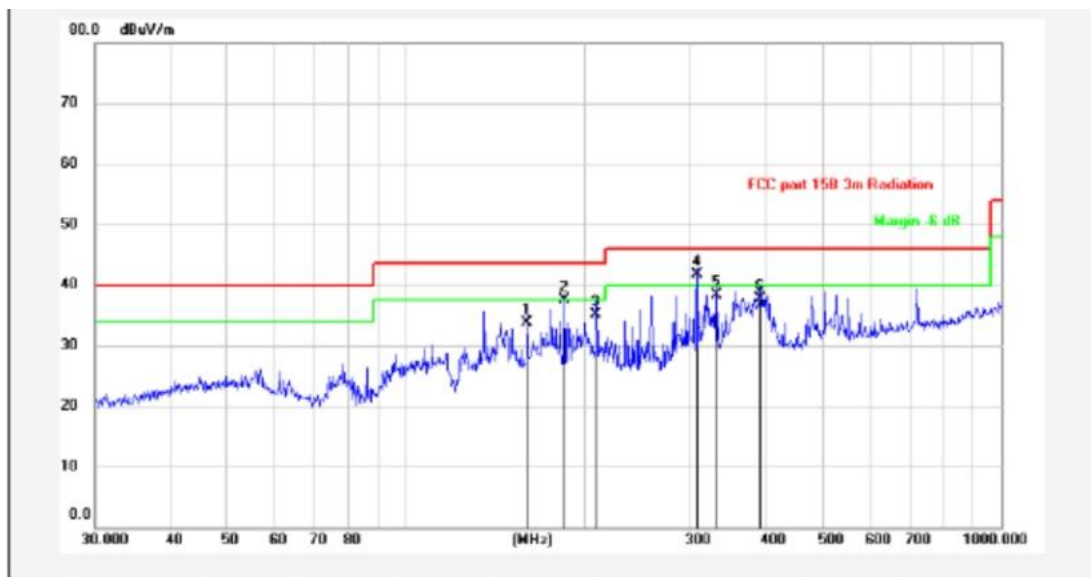
Worse case mode:		2479.85MHz		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)		H/V
4959.70	54.21	-4.33	49.88	74	-24.12	Peak	H
7439.55	48.77	1.01	49.78	74	-24.22	Peak	H
4959.70	53.05	-4.33	48.72	74	-25.28	Peak	V
7439.55	48.56	1.01	49.57	74	-24.43	Peak	V

- Note:** (1) All Readings are Peak Value (VBW=3MHz) and Peak Value(VBW=10Hz).  
 (2) Emission Level= Reading Level+Correct Factor +Cable Loss.  
 (3) Correct Factor= Ant\_F + Cab\_L - Preamp  
 (4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Spurious Emission below 1GHz (30MHz to 1GHz)

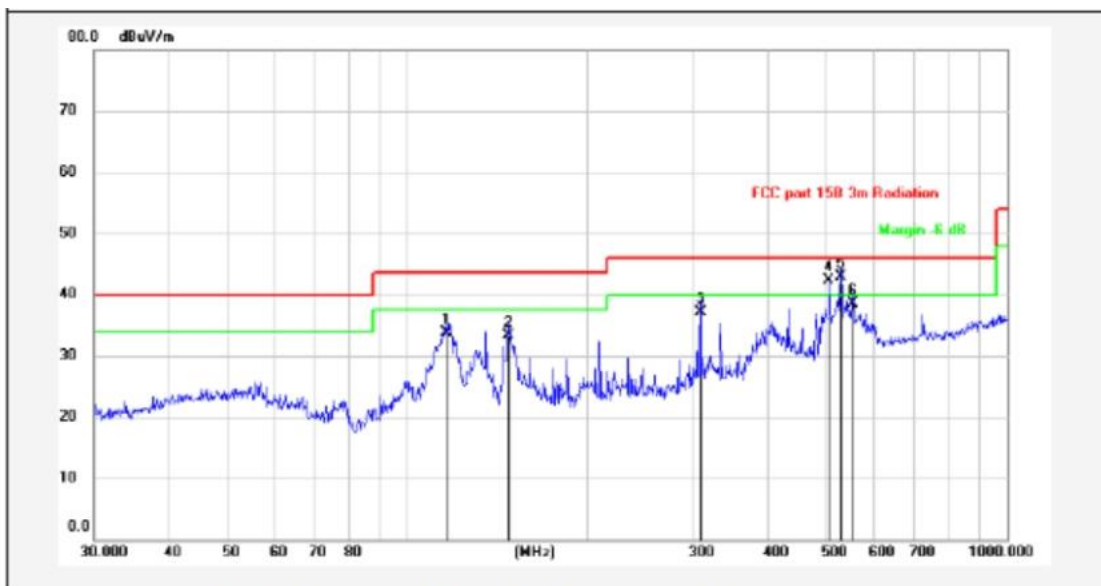
All modes have been tested, and the worst result recorded was report as below:

Test Mode:	TX 2403.85MHz	Test Voltage:	DC 3.7V
Temperature:	24.3°C	Phase:	Vertical
Relative Humidity:	53%	Pressure:	101.4KPa



No.	Frequency (MHz)	Reading (dBuV/m)	Antenna. (dB/m)	Cable. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	159.7844	23.02	8.82	1.96	33.80	43.50	-9.70	QP	
2	184.4898	25.44	9.98	2.08	37.50	43.50	-6.00	QP	
3	208.5801	22.05	11.03	2.12	35.20	43.50	-8.30	QP	
4	307.8313	26.13	13.16	2.41	41.70	46.00	-4.30	QP	
5	332.5187	22.08	13.85	2.47	38.40	46.00	-7.60	QP	
6	393.4723	20.30	14.82	2.68	37.80	46.00	-8.20	QP	

Test Mode:	TX 2403.85MHz	Test Voltage:	DC 3.7V
Temperature:	24.4°C	Phase:	Horizontal
Relative Humidity:	49%	Pressure:	101.5KPa



No.	Frequency (MHz)	Reading (dBuV/m)	Antenna. (dB/m)	Cable. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	116.1320	21.00	11.14	1.66	33.80	43.50	-9.70	QP	
2	147.4036	23.15	8.38	1.87	33.40	43.50	-10.10	QP	
3	307.8312	21.53	13.16	2.41	37.10	46.00	-8.90	QP	
4	504.7062	22.80	16.45	3.15	42.40	46.00	-3.60	QP	
5	528.2458	22.91	16.8	3.19	42.90	46.00	-3.10	QP	
6	552.8831	18.28	17.07	3.25	38.60	46.00	-7.40	QP	

### **4.3. BAND EDGES REQUIREMENT**

#### **4.3.1. Applicable Standard**

According to FCC Part 15.249(d)

#### **4.3.2. Test Configuration**

Test according to clause 3.2 radio frequency test setup 2

#### **4.3.3. Test Procedure**

Follow the guidelines in ANSI C63.10: Clause 6.10

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports(if EUT with antenna diversity architecture). The lowest, middle and highest channels were selected for the final test as listed below.

■ BAND EDGES REQUIREMENT DATA

Worse case mode:		GFSK		Test channel:		2403.85MHz	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector	Ant. Pol.
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	Type	H/V
2390.000	66.98	-9.2	57.78	74	-16.22	peak	H
2390.000	53.87	-9.2	44.67	54	-9.33	AVG	H
2400.000	70.12	-9.3	60.82	74	-13.18	peak	H
2400.000	57.10	-9.3	47.80	54	-6.20	AVG	H
2390.000	61.36	-9.2	52.16	74	-21.84	peak	V
2390.000	46.21	-9.2	37.01	54	-16.99	AVG	V
2400.000	63.69	-9.3	54.39	74	-19.61	peak	V
2400.000	48.10	-9.3	38.80	54	-15.20	AVG	V

Worse case mode:		GFSK		Test channel:		2479.85MHz	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector	Ant. Pol.
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	Type	H/V
2483.500	60.41	-9.2	51.21	74	-22.79	peak	H
2483.500	48.22	-9.2	39.02	54	-14.98	AVG	H
2483.500	61.25	-9.3	51.95	74	-22.05	peak	V
2483.500	51.69	-9.3	42.39	54	-11.61	AVG	V



#### 4.4. CONDUCTED EMISSION TEST

##### 4.4.1. Applicable Standard

According to FCC Part 15.207(a)

##### 4.4.2. Conformance Limit

Conducted Emission Limit		
Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies  
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Remark: Test results were obtained from the following equation:

$$\text{Measurement (dB}\mu\text{V)} = \text{LISN Factor (dB)} + \text{Cable Loss (dB)} + \text{Reading (dB}\mu\text{V)}$$

$$\text{Margin (dB)} = \text{Measurement (dB}\mu\text{V)} - \text{Limit (dB}\mu\text{V)}$$

##### 4.4.3. Test Configuration

Test according to clause 6.3 conducted emission test setup

##### 4.4.4. Test Procedure

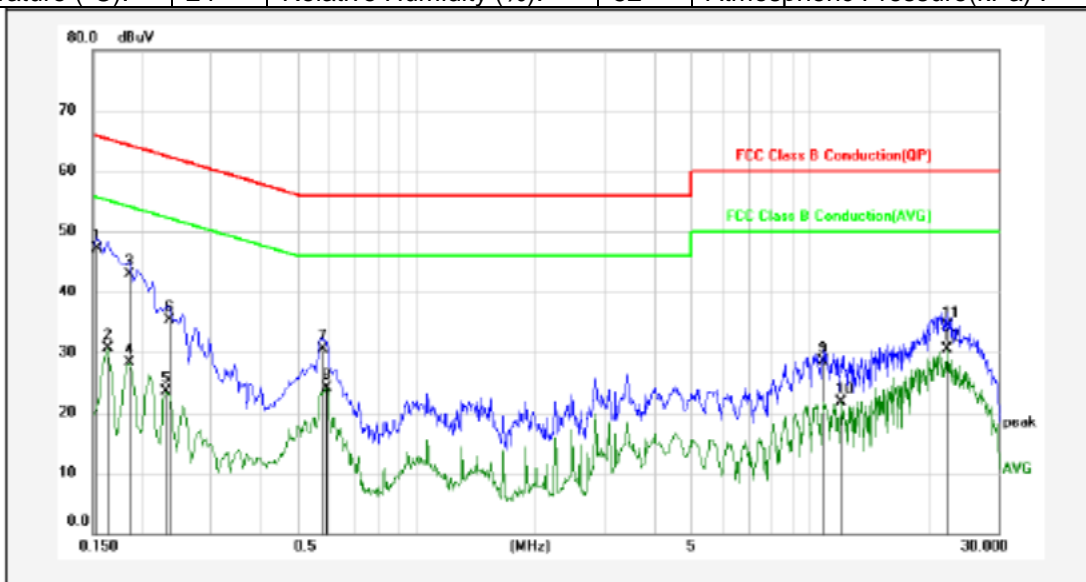
The EUT was placed on a table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Repeat above procedures until all frequency measured were complete.

**Test Results :**

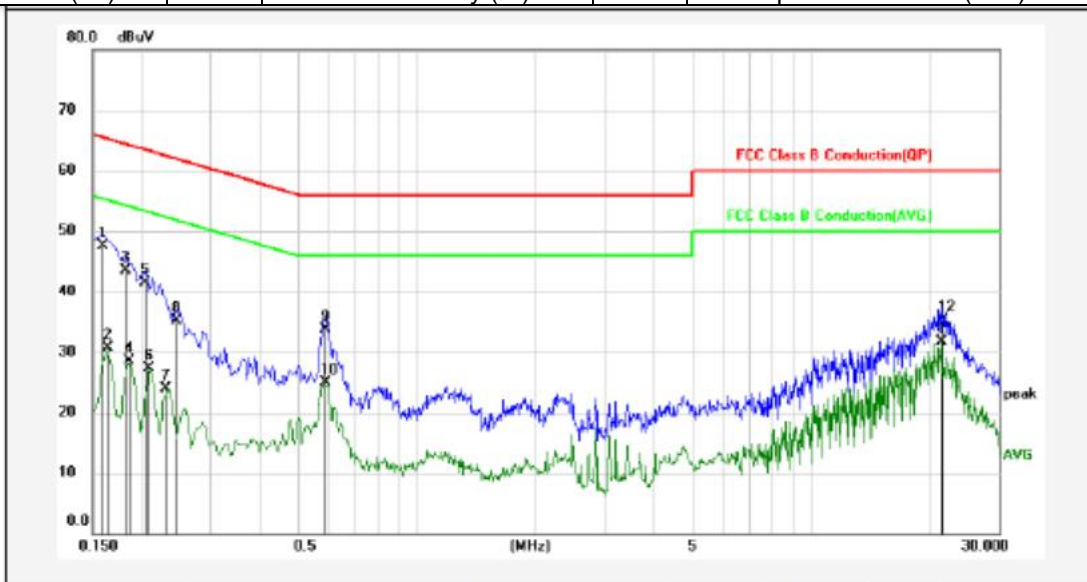
M/N	:	DF98 Lightless			
Test Mode	:	Charging			
Test Phase	:	Power Line; Live			
Test Voltage	:	DC 5V From PC Input AC 120V/60Hz (worse data)			
Temperature (°C):	24	Relative Humidity (%):	52	Atmospheric Pressure(kPa) :	101.7



No.	Frequency (MHz)	Reading (dBuV)	Lisn/Isn (dB)	Cab_L (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1545	36.53	10.45	0.22	47.20	65.75	-18.55	QP	
2	0.1635	20.04	10.45	0.22	30.71	55.28	-24.57	AVG	
3	0.1860	32.32	10.46	0.22	43.00	64.21	-21.21	QP	
4	0.1860	17.57	10.46	0.22	28.25	54.21	-25.96	AVG	
5	0.2310	12.87	10.47	0.23	23.57	52.41	-28.84	AVG	
6	0.2355	24.60	10.47	0.23	35.30	62.25	-26.95	QP	
7	0.5775	19.77	10.49	0.24	30.50	56.00	-25.50	QP	
8	0.5910	13.37	10.49	0.24	24.10	46.00	-21.90	AVG	
9	10.7610	17.78	10.5	0.22	28.50	60.00	-31.50	QP	
10	11.9445	10.98	10.51	0.22	21.71	50.00	-28.29	AVG	
11	22.2314	23.62	10.58	0.2	34.40	60.00	-25.60	QP	
12	22.2314	19.67	10.58	0.2	30.45	50.00	-19.55	AVG	

Remarks: 1. Result=Reading+Lisn+Cab\_L 2. If the average limit is met when using a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

M/N	:	DF98 Lightless			
Test Mode	:	Charging			
Test Phase	:	Power Line; Neutral			
Test Voltage	:	DC 5V From PC Input AC 120V/60Hz (worse data)			
Temperature (°C):	24	Relative Humidity (%):	52	Atmospheric Pressure(kPa):	101.7



No.	Frequency (MHz)	Reading (dBuV)	Lisn/Isn (dB)	Cab_L (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1590	36.83	10.45	0.22	47.50	65.52	-18.02	QP	
2	0.1635	20.01	10.45	0.22	30.68	55.28	-24.60	AVG	
3	0.1825	32.92	10.46	0.22	43.60	64.37	-20.77	QP	
4	0.1860	17.89	10.46	0.22	28.57	54.21	-25.64	AVG	
5	0.2040	30.81	10.46	0.23	41.50	63.45	-21.95	QP	
6	0.2085	16.59	10.46	0.23	27.28	53.26	-25.98	AVG	
7	0.2310	13.14	10.47	0.23	23.84	52.41	-28.57	AVG	
8	0.2455	24.40	10.47	0.23	35.10	61.91	-26.81	QP	
9	0.5865	22.97	10.49	0.24	33.70	56.00	-22.30	QP	
10	0.5865	14.25	10.49	0.24	24.98	46.00	-21.02	AVG	
11	21.4080	20.84	10.57	0.2	31.61	50.00	-18.39	AVG	
12	21.6420	24.63	10.57	0.2	35.40	60.00	-24.60	QP	

Remarks: 1. Result=Reading+Lisn+Cab\_L 2. If the average limit is met when using a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

#### 4.5. ANTENNA APPLICATION

##### 4.5.1. Antenna Requirement

Standard	Requirement
FCC CRF Part 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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.

##### 4.5.2.Result:PASS.

The EUT has 1 antennas: antenna has a gain of 2.34dBi;

- Antenna use a permanently attached antenna which is not replaceable.
- Not using a standard antenna jack or electrical connector for antenna replacement
- The antenna has to be professionally installed (please provide method of installation)

Note:which in accordance to section 15.203, please refer to the internal photos.

----- **END OF REPORT** -----