TEST REPORT

APPLICANT	:	Golden Mark (HK) Limited
PRODUCT NAME	:	Plug-In Dimmer
MODEL NAME	:	PD800
BRAND NAME	:	N/A
FCC ID	:	2AMY9PD800
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2022-08-08
TEST DATE	:	2022-08-15 to 2022-08-17
ISSUE DATE	:	2022-09-29

Edited by: Zeng Xiaoying (Rapporteur)

Approved by: Shen Junsheng (Supervisor)

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MORLAB
Shenzhen Morlab Communications Technology Co., Ltd.
FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road,
Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China
Tel: 86-755-36698555 Fax: 86-755-36698525
Http://www.morlab.cn E-mail: service@morlab.cn

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Change History		
Version	Date	Reason for change
1.0	2022-09-29	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Golden Mark (HK) Limited
Applicant Address:	6/F, Kimberley Plaza, 45-47 Kimberley Road, Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer:	Golden Mark (HK) Limited
Manufacturer Address:	6/F, Kimberley Plaza, 45-47 Kimberley Road, Tsim Sha Tsui, Kowloon, Hong Kong

1.2. Equipment Under Test (EUT) Description

Product Name:	Plug-In Dimmer
Sample No.:	2#
Hardware Version:	N/A
Software Version:	N/A
Equipment Type:	Z-Wave
Operating Frequency Range:	908.4MHz, 916.0MHz
Channel Number:	2
Antenna Type:	Monopole Antenna
Antenna Gain:	2.0dBi

Note 1: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. The Channel Number and Frequency

Channel	Frequency (MHz)
1	908.4
2	916.0

1.4. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result	Method Determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	No deviation
2	15.215	Bandwidth	Aug. 17, 2022	Su Xiaoxian	PASS	No deviation
3	15.207	Conducted Emission	Aug. 15, 2022	Wu Zhaoling	PASS	No deviation
4	15.249	Field strength	Aug. 16, 2022	Su Zhan	PASS	No deviation
5	15.209, 15.249	Radiated Emission and field strength of harmonics	Aug. 17, 2022	Su Zhan	PASS	No deviation

Note 1: The tests were performed according to the method of measurements prescribed in ANSIC63.10-2013.

Note 2: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 3: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

1.5. Environmental Conditions

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

Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106

2. 47 CFR Part 15C Requirements

2.1. Antenna Requirement

2.1.1. Applicable Standard

According to FCC 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.

2.1.2. Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

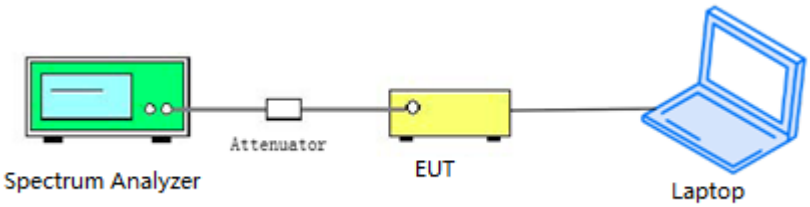
2.2. Bandwidth

2.2.1. Requirement

Refer to FCC 15.215

2.2.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) in the range of 1% to 5% of the measured bandwidth and video bandwidth (VBW) shall be approximately three times RBW.

2.2.3. Test Result

A.Test Verdict:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	Result
1	908.4	87.07	PASS
2	916.0	121.50	PASS

B.Test Plot:

(Channel 1, 908.4MHz)

(Channel 2, 916.0MHz)

2.3. Conducted Emission

2.3.1. Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

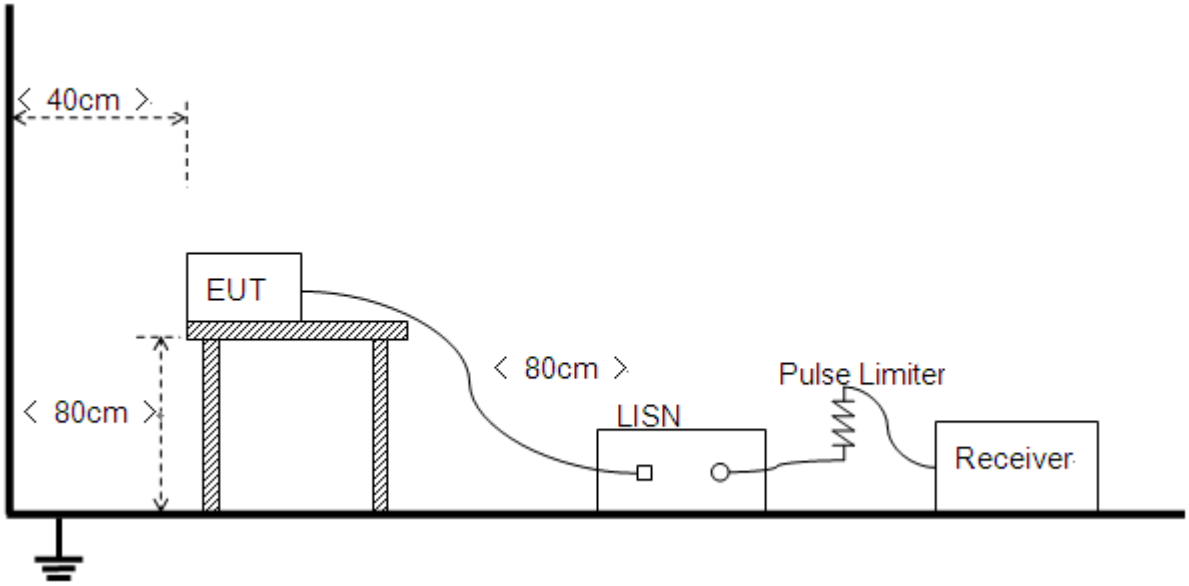
Note:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.3.2. Test Description

Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

2.3.1. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A.Test Setup:

Test Mode: EUT+Z-Wave TX

Test voltage: AC 120V/60Hz

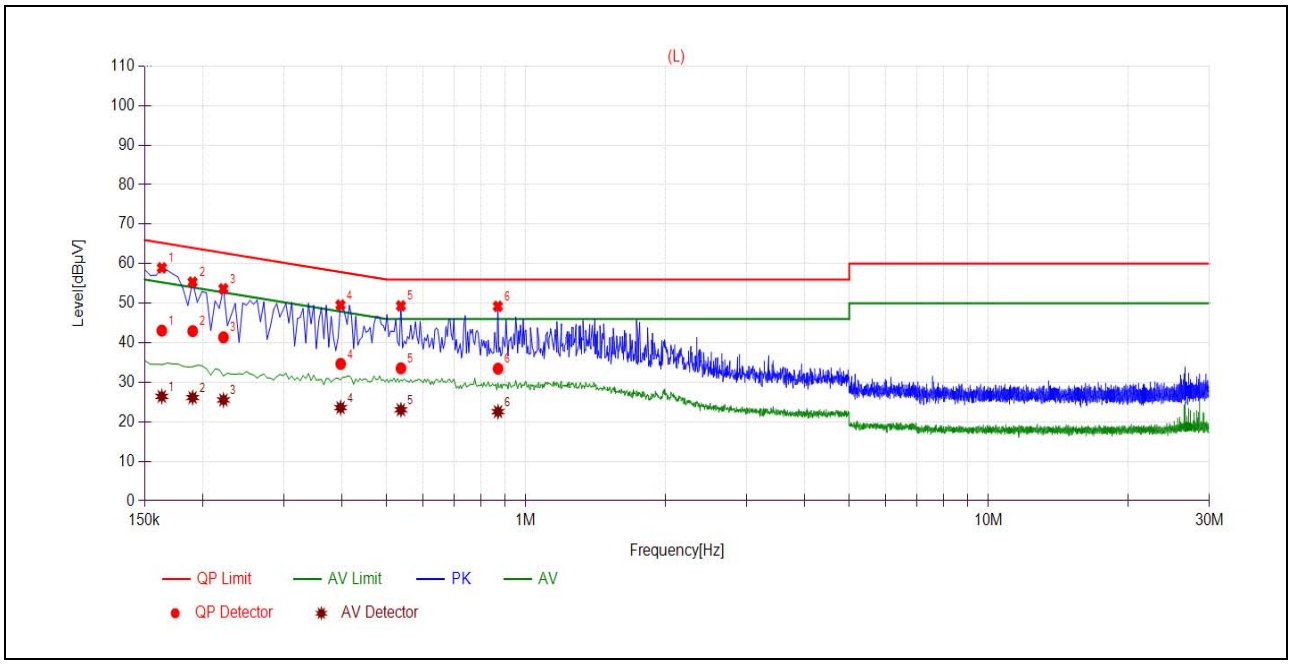
The measurement results are obtained as below:

E [dBμV] $=U_R + L_{Cable\ loss}$ [dB] + A_{Factor}

U_R: Receiver Reading

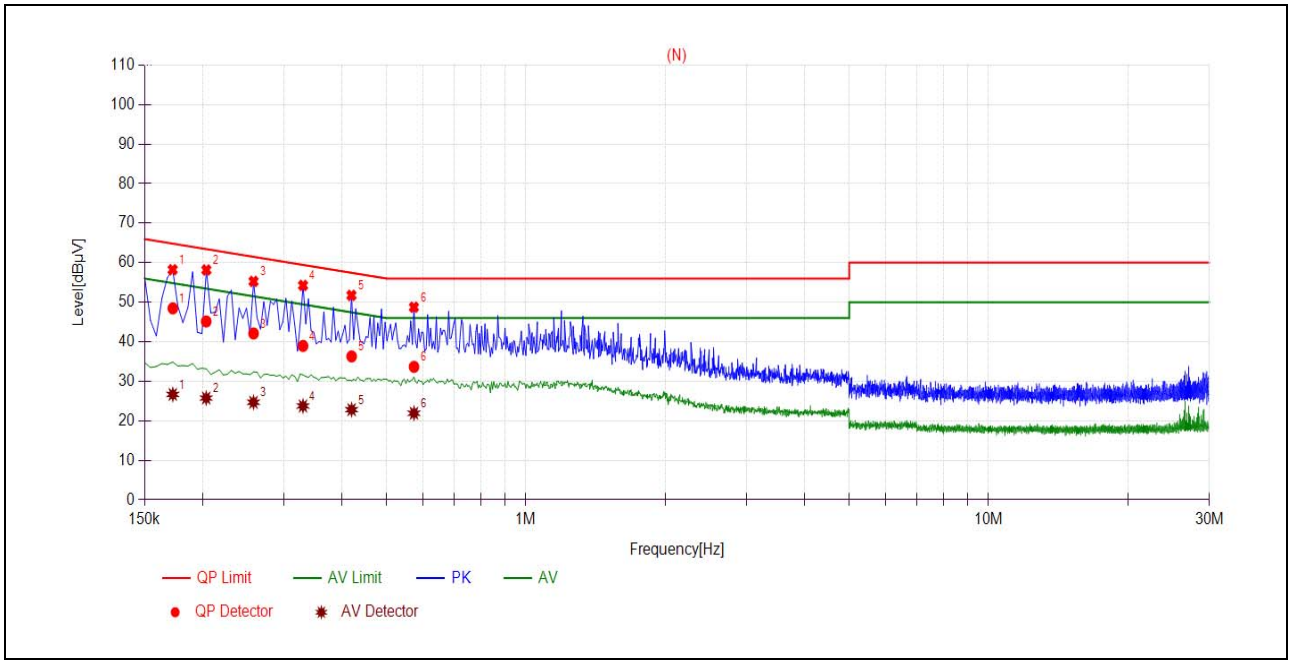
A_{Factor}: Voltage division factor of LISN

B.Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1634	43.08	26.42	65.29	55.29	Line	PASS
2	0.1905	42.96	26.13	64.01	54.01		PASS
3	0.2221	41.38	25.51	62.74	52.74		PASS
4	0.3978	34.66	23.57	57.90	47.90		PASS
5	0.5371	33.54	23.03	56.00	46.00		PASS
6	0.8707	33.45	22.55	56.00	46.00		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1726	48.46	26.67	64.84	54.84	Neutral	PASS
2	0.2038	45.15	25.75	63.45	53.45		PASS
3	0.2579	42.11	24.68	61.50	51.50		PASS
4	0.3299	38.95	23.74	59.45	49.45		PASS
5	0.4202	36.30	22.81	57.44	47.44		PASS
6	0.5732	33.66	21.91	56.00	46.00		PASS

2.4. Field Strength of Fundamental

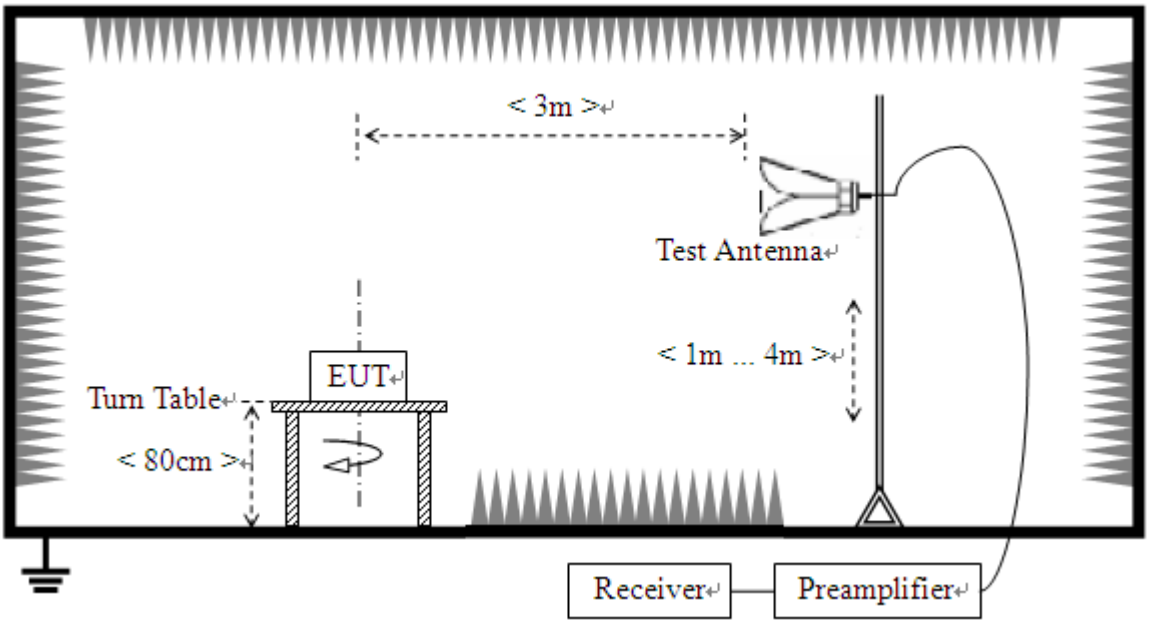
2.4.1. Requirement

According to FCC section 15.249(a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

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

2.4.2. Test Description

Test Setup:



The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

2.4.3. Test Procedure

Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured
RBW = 120 kHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

2.4.4. Test Result

The measurement results are obtained as below:
E [dBμV/m] $=U_R + A_T + A_{Factor}$ [dB]; $A_T = L_{Cable\ loss}$ [dB]-G_{preamp} [dB]
A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier Gain
A_{Factor}: Antenna Factor at 3m
During the test, the total correction Factor AT and A_{Factor} were built in test software.
Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report

A.Test Verdict:

Frequency (MHz)	Detector	ANT	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	AV Limit (dBμV/m)	Verdict
908.4	QP	H	62.40	6.75	22.20	91.35	93.97	PASS
	QP	V	62.33	6.75	22.20	91.28	93.97	PASS
916.0	QP	H	63.10	6.75	22.20	92.05	93.97	PASS
	QP	V	62.05	6.75	22.20	91.00	93.97	PASS

2.5. Radiated Emission and Field Strength of Harmonics

2.5.1. Requirement

According to section 15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

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

According to section 15.249(d), Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)	Field Strength Limitation at 3m Measurement Distance	
			(uV/m)	(dBuV/m)
0.009 - 0.490	2400/F(kHz)	300	10000* 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 - 1.705	24000/F(kHz)	30	100* 2400/F(KHz)	20log 2400/F(KHz) + 40
1.705 - 30.0	30	30	100*30	20log 30 + 40
30 - 88	100	3	100	20log 100
88 - 216	150	3	150	20log 150
216 - 960	200	3	200	20log 200
Above 960	500	3	500	20log 500

According to section 15.249(e), for frequencies above 1000MHz, the above field strength limits are based on average limits. The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

Note:

1) The tighter limit shall apply at the boundary between two frequency range.

2) Limitation expressed in dBuV/m is calculated by 20log Emission Level(uV/m).

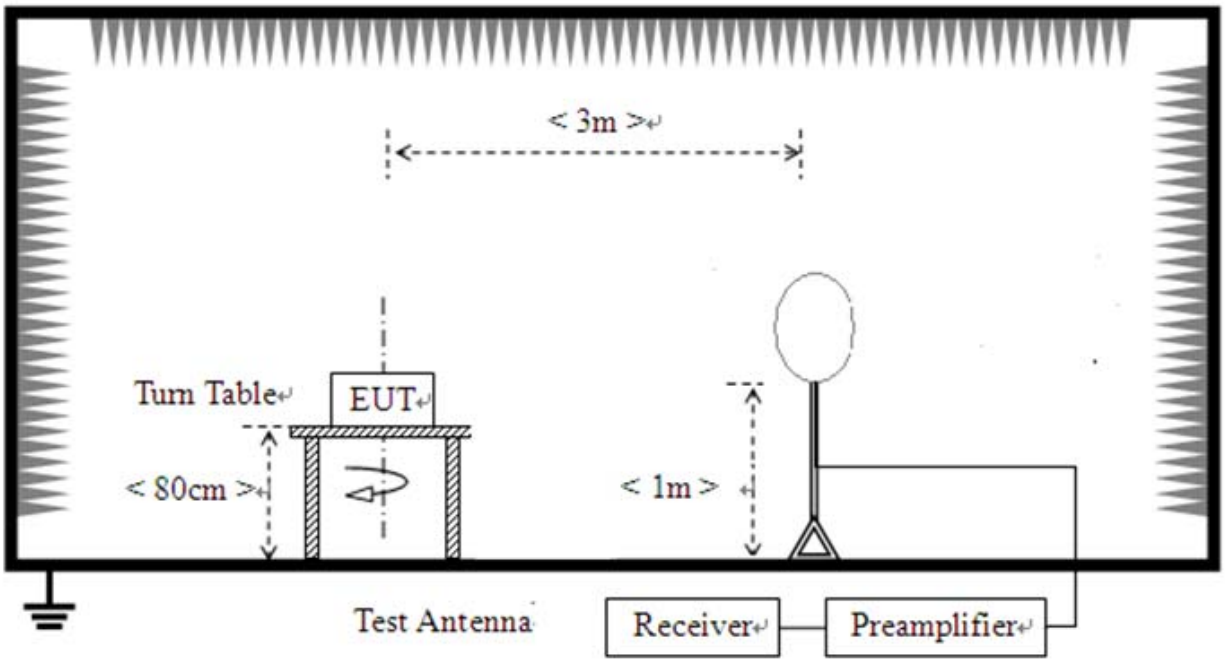
3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^2$.

Example: F.S Limit at 30m distance is 30uV/m, then F.S Limitation at 3m distance is adjusted as $Ld1 = L1 = 30uV/m * (10)^2 = 100 * 30uV/m$

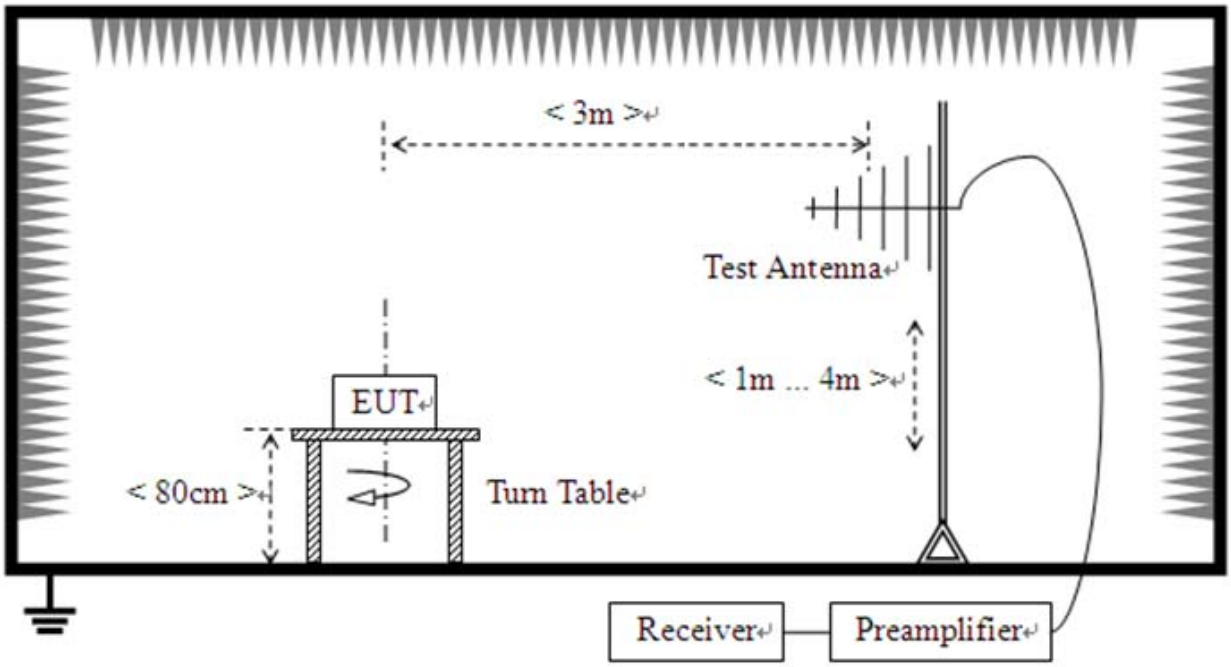
2.5.2. Test Description

A.Test Setup:

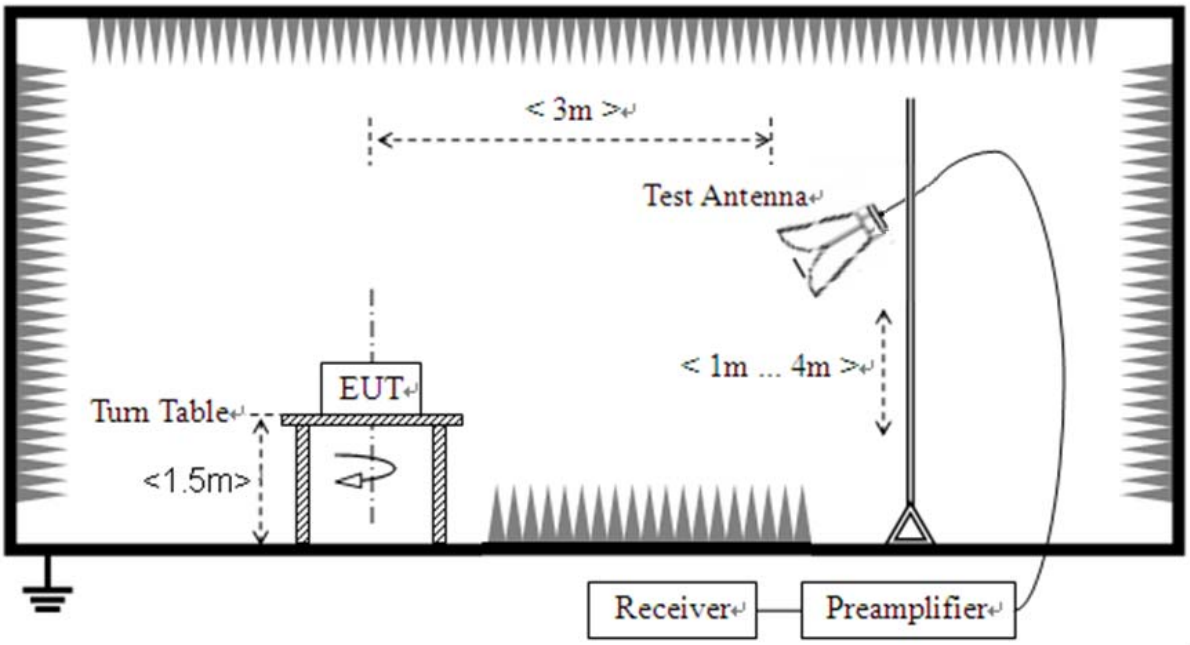
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz.The antenna to EUT distance is 3meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions. For measurements above 1 GHz, keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

2.5.3. Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

E [dBμV/m] $=U_R + A_T + A_{Factor}$ [dB]; $A_T = L_{Cable\ loss}$ [dB]$-G_{preamp}$ [dB]

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

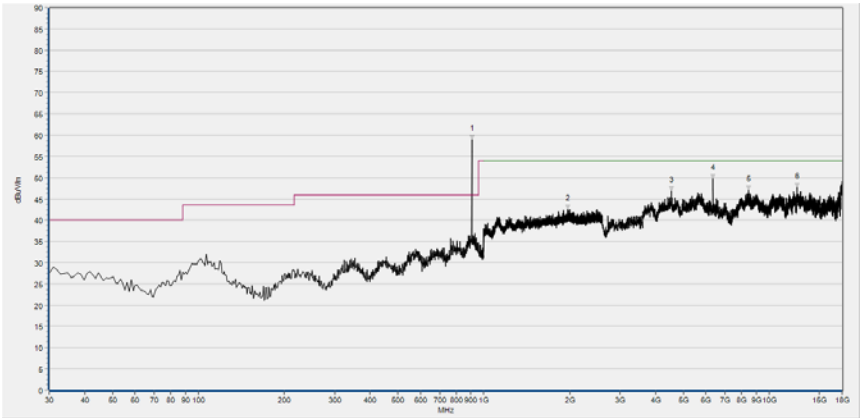
During the test, the total correction Factor A_T and A_{Factor} were built in test software.

Note 1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note 2: The low frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

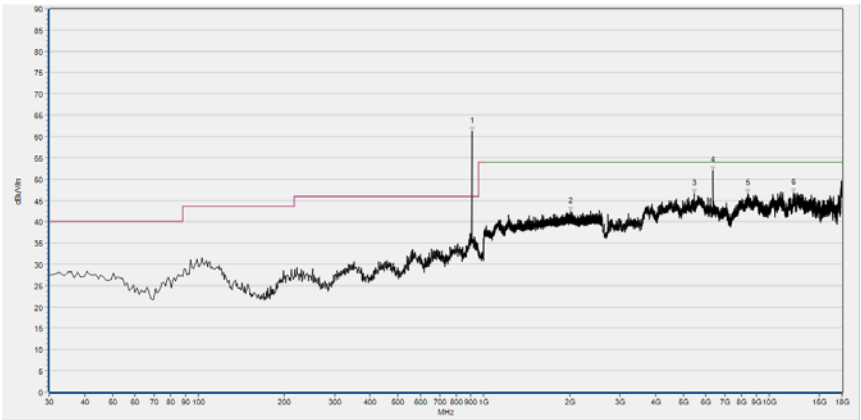
Note 3: For the frequency, which started from 18GHz to 10th harmonic of the highest frequency, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Plot for 908.4MHz



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
908.820	58.96	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1971.733	42.60	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4546.560	46.94	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6357.600	49.86	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8448.920	47.05	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12496.040	47.84	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

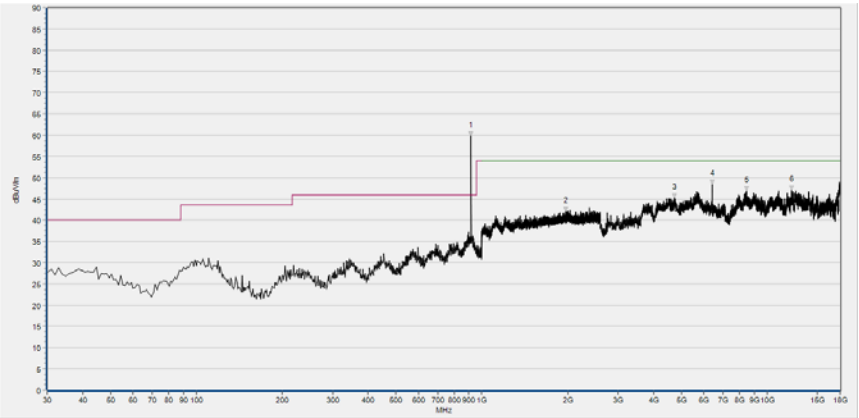
(Antenna Horizontal, 30MHz to 10GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
908.820	61.20	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
2010.667	42.33	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5449.000	46.54	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6359.000	51.93	N/A	49.66	74.00	N/A	54.00	Horizontal	PASS
8415.040	46.51	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12197.280	46.76	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

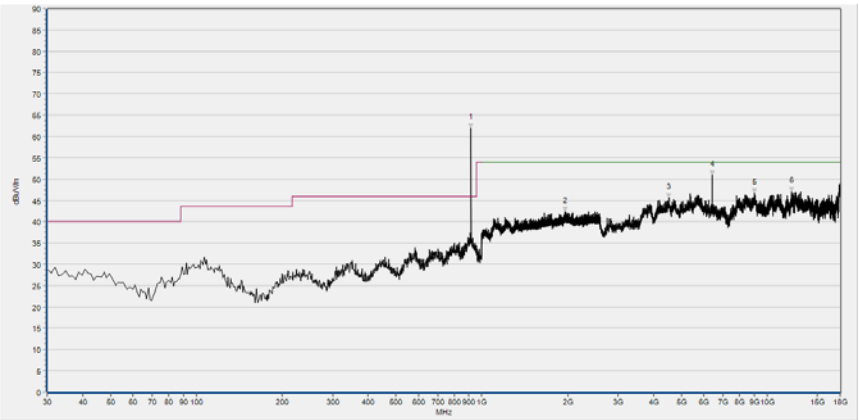
(Antenna Vertical, 30MHz to 10GHz)

Plot for 916.0MHz



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
915.610	59.85	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1965.333	42.10	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4737.520	45.19	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6413.040	48.37	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8464.320	46.97	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12141.840	47.01	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 10GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
915.610	62.00	N/A	N/A	N/A	46.00	N/A	Horizontal	N/A
1953.067	42.42	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4525.000	45.52	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
6411.800	51.09	N/A	48.87	74.00	N/A	54.00	Horizontal	PASS
9003.320	46.81	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12172.640	47.10	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Vertical, 30MHz to 10GHz)

Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test Items	Uncertainty
Bandwidth	±5%
Radiated Emission	±2.95dB

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

Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

4. Test Equipments Utilized

4.1 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2022.07.06	2023.07.05
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2022.05.25	2025.05.24
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2022.02.11	2025.02.10
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2022.07.13	2025.07.12
Coaxial Cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
1-18GHz pre-Amplifier	61171/61172	S020180L3203	Tonscend	2022.07.08	2023.07.07
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2022.03.03	2023.03.02
LISN	812744	NSLK 8127	Schwarzbeck	2022.03.03	2023.03.02
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2022.07.06	2023.07.05
Coaxial Cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

END OF REPORT