Test Report

Verified code: 725603

Report No.: E202307262325-15

Customer:	BYD Auto Industry Company Limited
Address:	No.3001,3007,HengPing Road, Pingshan, Shenzhen,P.R.China
Sample Name:	DiLink, BYD Di3.0F
Sample Model:	DiLink 3.0F, MTCF03
Receive Sample Date:	Jul.28,2023
Test Date:	Oct.25,2023 ~ Oct.26,2023
Reference Document:	CFR 47, FCC Parts 15 Subpart E Unlicensed National Information Infrastructure Devices
Test Result:	Pass

Prepared by: Huang Lifang

Reviewed by: Peng Huarui

Approved by: Zhao Zetian

GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2023-11-08

GRG METROLOGY & TEST GROUP CO., LTD.
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Statement

1. The report is invalid without "special seal for inspection and testing"; some copies are invalid; The report is invalid if it is altered or missing; The report is invalid without the signature of the person who prepared, reviewed and approved it.

2. The sample information is provided by the client and responsible for its authenticity; The content of the report is only valid for the samples sent this time.

3. When there are reports in both Chinese and English, the Chinese version will prevail when the language problems are inconsistent.

4. If there is any objection concerning the report, please inform us within 15 days from the date of receiving the report.

5. Without the agreement of the laboratory, the client is not authorized to use the test results for unapproved propaganda.

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E202307262325-15	Original Issue	2023-10-27

Note:

1. Based on the report number E20211217696105-5, E20211217696105-5& E202307262325-15 are the following changes:

Report No.	Product Name:	Adding Product Name:	Model No.:	Adding Model:	Note:
E20211217696105-5	DiLink	/	DiLink 3.0F	/	/
E202307262325-15	DiLink	BYD Di3.0F	DiLink 3.0F	MTCF03	Adding the product name BYD Di3.0F and the model MTCF03

1) Both models DiLink 3.0F and MTCF03 are identical except model number.The difference between the two versions of DiLink 3.0F is the broadcasting(AM/FM/DAB) chip only. in this report adding the product name BYD Di3.0F and the model MTCF03.
2) Except for the above changes, there are no other differences.

2. After evaluation, this report does not need to be retested, in this report we only updates the section 2.2, adding the product name BYD Di3.0F and the model MTCF03, except for Radiated Spurious Emission below 1GHz, all test datas come from E20211217696105-5(FCC ID: SD4-DILINK6125F, Issued Date: 2022-06-09).

1. TEST RESULT SUMMARY

Standard	Item	Limit / Severity	Result
CFR 47, FCC Parts 15 Subpart E (§15.407)	6dB Bandwidth &26dB Bandwidth & 99% Occupied Bandwidth	15.407(a) 15.407(e)	PASS
	AC Power Line Conducted Emissions	15.207 15.407(b)(9)	Not Applicable[1)]
	Unwanted Emissions and Band Edge	15.205 15.209 15.407(b)	PASS
	Output Power	15.407(a)	PASS
	Peak Power Spectral Density	15.407(a)	PASS
	Frequency Stability	15.407(g)	PASS
	Antenna Requirement	15.203	PASS

Note: 1) Not Applicable, the EUT is powered by DC 12V.
2) The antenna is External antenna. The max gain of antenna is -3.81dBi, which accordance 15.203 is considered sufficient to comply with the provisions of this section.
3) Except for Radiated Spurious Emission below 1GHz, the test results of others please refer to the E20211217696105-5 report.

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2. GENERAL DESCRIPTION OF EUT

2.1 APPLICANT

Name:	BYD Auto Industry Company Limited
Address:	No. 3001, 3007, Hengping Road, Pingshan, Shenzhen, P. R. China

2.2 MANUFACTURER

Name:	BYD Auto Industry Company Limited
Address:	No. 3001, 3007, Hengping Road, Pingshan, Shenzhen, P. R. China

2.3 FACTORY

Name:	Huizhou BYD Electronics Co., Ltd.
Address:	Xiangshui River, Economic Development Zone, Daya Bay, Huizhou, Guangdong, P. R. China

2.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Product Name:	DiLink
Adding Product Name:	BYD Di3.0F
Product Model:	DiLink 3.0F
Adding Model:	MTCF03
Models discrepancy:	Both models DiLink 3.0F and MTCF03 are identical except model number. The difference between the two versions of DiLink 3.0F is the broadcasting (AM/FM/DAB) chip only.
FCC ID:	SD4-DILINK6125F
Trade Name:	BYD
Power Supply:	DC12V
Frequency Band:	U-NII-1: 5180 MHz-5240 MHz U-NII-2A: 5260 MHz-5320 MHz U-NII-2C: 5500 MHz-5700 MHz U-NII-3: 5745 MHz-5825 MHz
Modulation Type:	OFDM
Antenna Specification:	U-NII-1: External antenna with -3.81dBi gain (Max.) U-NII-2A: External antenna with -4.34dBi gain (Max.) U-NII-2C: External antenna with -4.34dBi gain (Max.) U-NII-3: External antenna with -4.39dBi gain (Max.)

Number Of Channel	U-NII-1: IEEE 802.11a / n HT20 / ac VHT20: 4 Channels IEEE 802.11n HT40 / ac VHT40: 2 Channels IEEE 802.11ac VHT80: 1 Channel U-NII-2A: IEEE 802.11a / n HT20 / ac VHT20: 4 Channels IEEE 802.11n HT40 / ac VHT40: 2 Channels IEEE 802.11ac VHT80: 1 Channel U-NII-2C: IEEE 802.11a / n HT20 / ac VHT20: 11 Channels IEEE 802.11n HT40 / ac VHT40: 5 Channels IEEE 802.11ac VHT80: 2 Channel U-NII-3: IEEE 802.11a / n HT20 / ac VHT20: 5 Channels IEEE 802.11n HT40 / ac VHT40: 2 Channels IEEE 802.11ac VHT80: 1 Channel
Channels Spacing:	IEEE 802.11a: 20MHz IEEE 802.11n HT20: 20MHz IEEE 802.11n HT40: 40MHz IEEE 802.11ac VHT20: 20MHz IEEE 802.11ac VHT40: 40MHz IEEE 802.11ac VHT80: 80MHz
Transmit Power:	U-NII-1: 14.67dBm for IEEE 802.11a 14.47dBm for IEEE 802.11n HT20 14.46dBm for IEEE 802.11ac VHT20 13.52dBm for IEEE 802.11n HT40 13.51dBm for IEEE 802.11ac VHT40 12.22dBm for IEEE 802.11ac VHT80 U-NII-2A: 15.88dBm for IEEE 802.11a 15.74dBm for IEEE 802.11n HT20 15.75dBm for IEEE 802.11ac VHT20 14.68dBm for IEEE 802.11n HT40 14.71dBm for IEEE 802.11ac VHT40 13.17dBm for IEEE 802.11ac VHT80 U-NII-2C: 16.14dBm for IEEE 802.11a 16.02dBm for IEEE 802.11n HT20 15.97dBm for IEEE 802.11ac VHT20 15.18dBm for IEEE 802.11n HT40 15.15dBm for IEEE 802.11ac VHT40 13.67dBm for IEEE 802.11ac VHT80 U-NII-3: 16.22dBm for IEEE 802.11a 16.10dBm for IEEE 802.11n HT20 16.04dBm for IEEE 802.11ac VHT20

	15.05dBm for IEEE 802.11n HT40 15.02dBm for IEEE 802.11ac VHT40 13.72dBm for IEEE 802.11ac VHT80
Temperature Range:	-30℃~70℃
Hardware Version:	DiLink HW 6125F
Software Version:	DiLink SW 4.0F
Sample submitting way:	■Provided by customer □Sampling
Sample No:	E202307262325-0001
Note:	The EUT antenna gain is provided by the applicant. This report is made solely on the basis of such data and/or information. We accept no responsibility for the authenticity and completeness of the above data and information and the validity of the results and/or conclusions.

2.5 TEST OPERATION MODE

Mode No.	Description of the modes
1	5G Wi-Fi TX mode

Note: The items of radiated emission just record the worst case of 20MHz/40MHz/80MHz bandwith.

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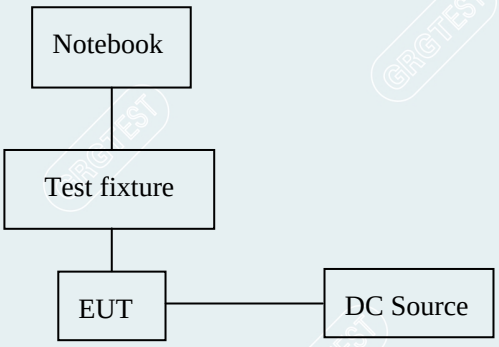
2.6 LOCAL SUPPORTIVEINSTRUMENTS

Name of equipment	Manufacturer	Model	Serial number	Note
Notebook	LENOVO	TianYi 310-14ISK	MP18DLC6	/
Adapter(Notebook)	LENOVO	ADLX65NVV3A	SA10M42747	Unshielded, 1m (AC Cable) Shielded, 1.8m (DC Cable)
DC Source	LW	PS-305DM	/	/
Test fixture	/	/	/	/
Cable				
Test fixture cable	/	/	/	Unshielded 0.15m
USB cable	/	/	/	Unshielded 1.0m
DC cable	/	/	/	Unshielded 0.8m

2.7 CONFIGURATION OF SYSTEM UNDER TEST



Test software:

Software version
QRCT

Power Setting:

Mode	Frequecy (MHz)	Power Setting	Frequecy (MHz)	Power Setting
IEEE 802.11a	5180	13	5500	13
	5200	13	5580	13
	5240	13	5700	13
	5260	13	5745	13
	5280	13	5785	13
	5320	13	5825	13

Mode	Frequecy (MHz)	Power Setting	Mode	Frequecy (MHz)	Power Setting
IEEE 802.11n HT20	5180	13	IEEE 802.11ac VHT20	5180	13
	5200	13		5200	13
	5240	13		5240	13
	5260	13		5260	13
	5280	13		5280	13
	5320	13		5320	13
	5500	13		5500	13
	5580	13		5580	13
	5700	13		5700	13
	5745	13		5745	13
	5785	13		5785	13
	5825	13		5825	13

Mode	Frequecy (MHz)	Power Setting	Mode	Frequecy (MHz)	Power Setting
IEEE 802.11n HT40	5190	12	IEEE 802.11ac VHT40	5190	12
	5230	12		5230	12
	5270	12		5270	12
	5310	12		5310	12
	5510	12		5510	12
	5550	12		5550	12
	5670	12		5670	12
	5755	12		5755	12
	5795	12		5795	12

Mode	Frequecy (MHz)	Power Setting	Frequecy (MHz)	Power Setting
IEEE 802.11ac VHT80	5210	11	5610	11
	5290	11	5775	11
	5530	11	/	/

3. LABORATORY AND ACCREDITATIONS AND MEASUREMENT UNCERTAINTY

3.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of GRG METROLOGY & TEST GROUP CO., LTD.

Add.:	No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District Shenzhen, 518110, People's Republic of China
P.C.:	518110
Tel :	0755-61180008
Fax:	0755-61180008

3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to GB/T 27025(ISO/IEC 17025:2017).

USA	A2LA(Certificate #2861.01)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	ISED (Company Number: 24897, CAB identifier:CN0069)
USA	FCC (Registration Number: 759402, Designation Number:CN1198)

Copies of granted accreditation certificates are available for downloading from our web site, http://www.grgtest.com

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3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty
Radiated Emission	Coplanar	9kHz～30MHz	4.40dB[1)]
	Coaxial	9kHz～30MHz	4.40dB[1)]
	Horizontal	30MHz～200MHz	4.60dB[1)]
		200MHz～1000MHz	4.80dB[1)]
		1GHz～18GHz	5.00dB[1)]
		18GHz～40GHz	5.20dB[1)]
	Vertical	30MHz～200MHz	4.70dB[1)]
		200MHz～1000MHz	4.70dB[1)]
		1GHz～18GHz	5.10dB[1)]
		18GHz～40GHz	5.40dB[1)]

Note:

[1)] This uncertainty represents an expanded uncertainty expressed at approximately the 95%.
This uncertainty represents an expanded uncertainty factor of *k*=2.

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4. LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Radiated Spurious Emission (Below 1GHz)				
Test software	Tonscend	JS32-RE		
Bi-log Antenna	Schwarzbeck	VULB 9160	VULB9160-3402	2024-09-24
Test Receiver	R&S	ESR26	101758	2024-09-22
Preamplifier	SHIRONG ELECTRONIC	DLNA-30M1G-G41	20200928003	2023-12-19

Note: The calibration interval of the above test instruments is 12 months.

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5. RADIATED SPURIOUS EMISSIONS

5.1 LIMITS

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

The unwanted emissions which fall in Restricted bands shall not exceed the field strength levels specified in the following table:

15.209 Radiated emission limits

Frequency (MHz)	Field Strength(μV/m)	Distance(m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

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5.2 TEST PROCEDURES

a. EUT was placed on a turn table, which is 0.8 meter high above ground for below 1GHz test, and which is 1.5 meter high above ground for above 1GHz test.
b. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower.
c. Set the EUT transmit continuously with maximum output power.
d. The turn table can rotate 360 degrees to determine the position of the maximum emission level.
e. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.
f. Spectrum analyzer setting parameters please see the below table.
g. Repeat above procedures until all channels were measured.
h. Record the results in the test report.

For 9kHz-150kHz

Spectrum Parameters	Setting
RBW	300Hz(for Peak&AVG)/CISPR 200Hz(for QP)
VBW	300Hz(for Peak&AVG)/CISPR 200Hz(for QP)
Start frequency	9kHz
Stop frequency	150kHz
Sweep Time	Auto
Detector	PEAK/QP/AVG
Trace Mode	Max Hold

Note : For 9kHz-90kHz&110kHz-150kHz,the detector is average,other frequency is CISPR QP detector.

For 150kHz-30MHz

Spectrum Parameters	Setting
RBW	9kHz
VBW	9kHz
Start frequency	150kHz
Stop frequency	30MHz
Sweep Time	Auto
Detector	QP
Trace Mode	Max Hold

Note : For 150kHz-490kHz,the detector is average,other frequency is CISPR QP detector.

For 30MHz-1GHz

Spectrum Parameters	Setting
RBW	120kHz
VBW	300kHz
Start frequency	30MHz
Stop frequency	1GHz
Sweep Time	Auto
Detector	QP
Trace Mode	Max Hold

For Above 1GHz

Spectrum Parameters	Setting	
RBW	1MHz	
VBW	PEAK Measurement	AVG Measurement
	3MHz	Duty cycle≥98%,VBW=10Hz Duty cycle＜98%,VBW≥1/T Video bandwidth mode=RMS (power averaging)
Start frequency	1GHz	
Stop frequency	40GHz	
Sweep Time	Auto	
Detector	PEAK	
Trace Mode	Max Hold	

Note :

(1) T is the on-time time of the duty cycle,when EUT transmit continuously with maximum output power,unit is seconds. reference section 2.8 for the on-time time.

(2) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

E = EIRP – 20log D + 104.8

where:

E = electric field strength in dBμV/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

So: E= -27 – 20log 3 + 104.8=68.3 (dBμV/m).

(3) The unwanted emissions which fall in Restricted bands shall not exceed the field strength ,Above 18G test distance is 1m, so the Peak Limit=74+20*log(3/1)=83.54 (dBμV/m).

The Avg Limit=54+20*log(3/1)=63.54 (dBμV/m).

(4) The maximum emissions of the operation frequency bands ,Above 18G test distance is 1m, so the Peak Limit=68.3+20*log(3/1)=77.84 (dBμV/m).

5.3 TEST SETUP

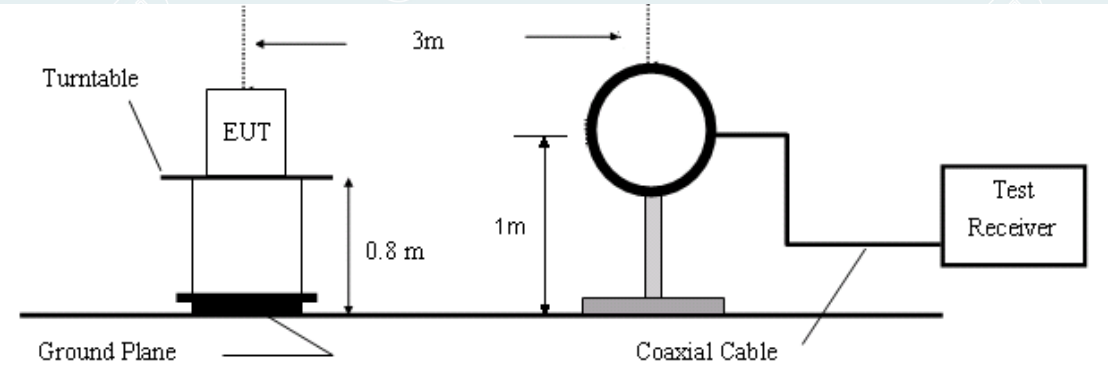


Figure 1. 9kHz to 30MHz radiated emissions test configuration

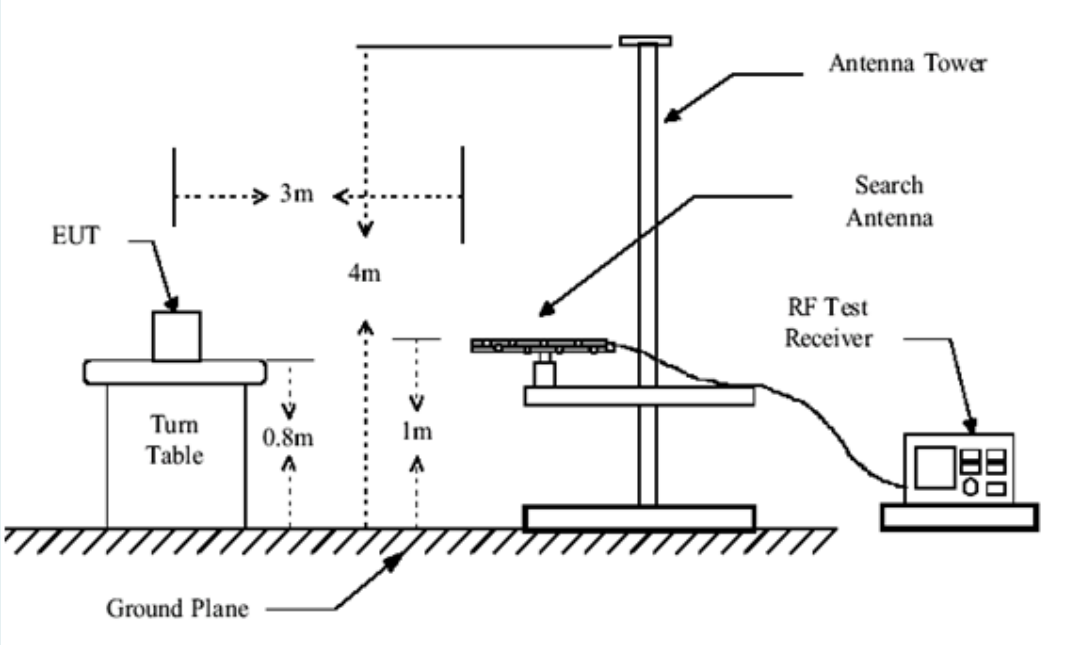


Figure 2. 30MHz to 1GHz radiated emissions test configuration

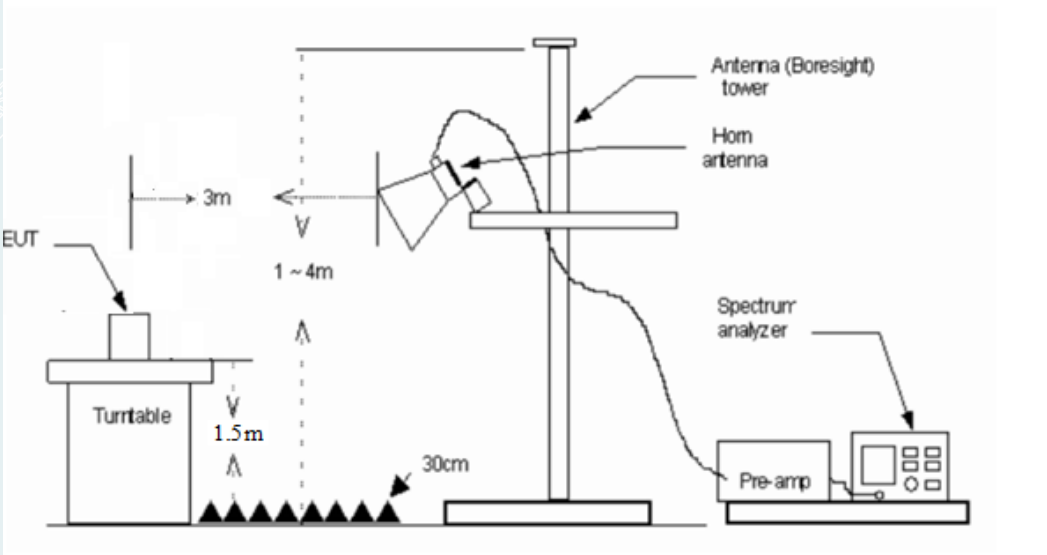


Figure 3. 1GHz to 18GHz radiated emissions test configuration

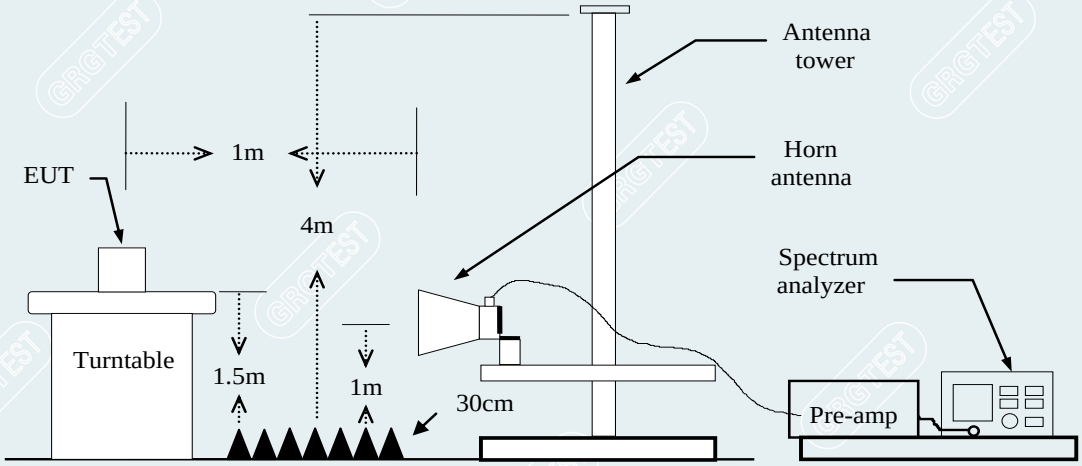


Figure 4. Above 18GHz radiated emissions test configuration

5.4 DATA SAMPLE

30MHz to 1GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	37.06	-15.48	21.58	40.00	-18.42	PK	Vertical

1GHz to 18GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Level (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	49.66	53.43	3.77	74.00	20.57	peak	Vertical
xxx	xxx	34.98	38.75	3.77	54.00	15.25	AVG	Vertical

Above 18GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Level (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	59.22	58.58	-0.64	83.54	24.96	peak	Vertical
xxx	xxx	53.01	52.37	-0.64	63.54	11.17	AVG	Vertical

Frequency (MHz) = Emission frequency in MHz

Ant.Pol. (H/V) = Antenna polarization

Reading (dBuV) = Uncorrected Analyzer / Receiver reading

Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)

Limit (dBuV/m) = Limit stated in standard

Margin (dB) = Remark Result (dBuV/m) – Limit (dBuV/m)

PK & Peak = Peak Reading

QP = Quasi-peak Reading

AVG = Average Reading

5.5 TEST RESULTS

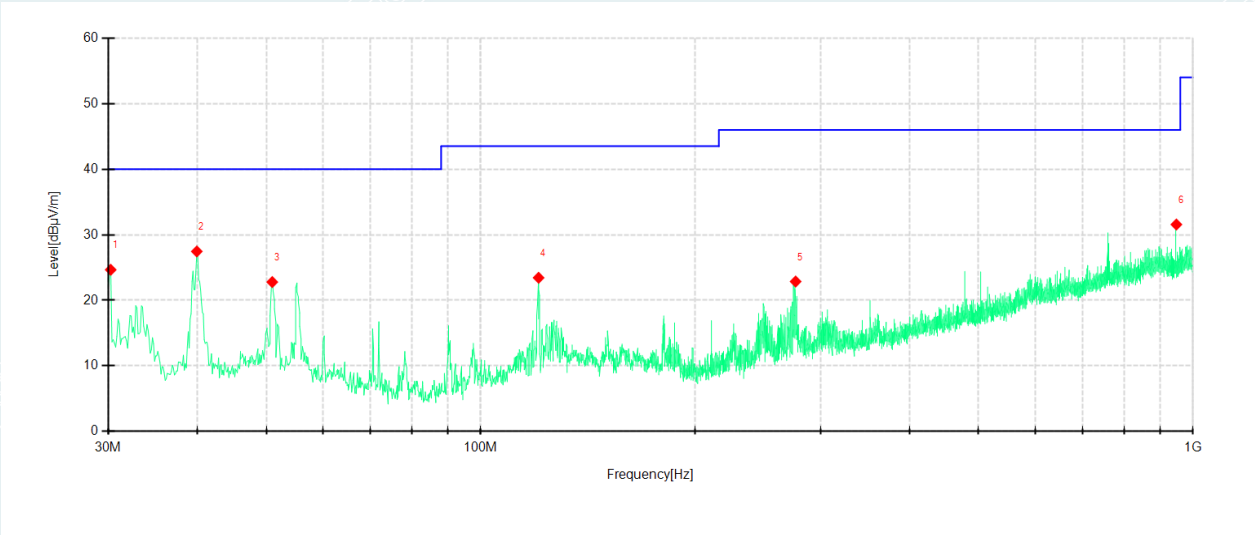
Below 1GHz

All models were pretested and only the worst modes and channels were recorded in this report. (IEEE 802.11a 5825MHz)

Mode: Mode 1/ IEEE 802.11a Channel :5825MHz

Test Environment: 25.0℃/54%RH/101.0kPa Test Voltage: DC 12V

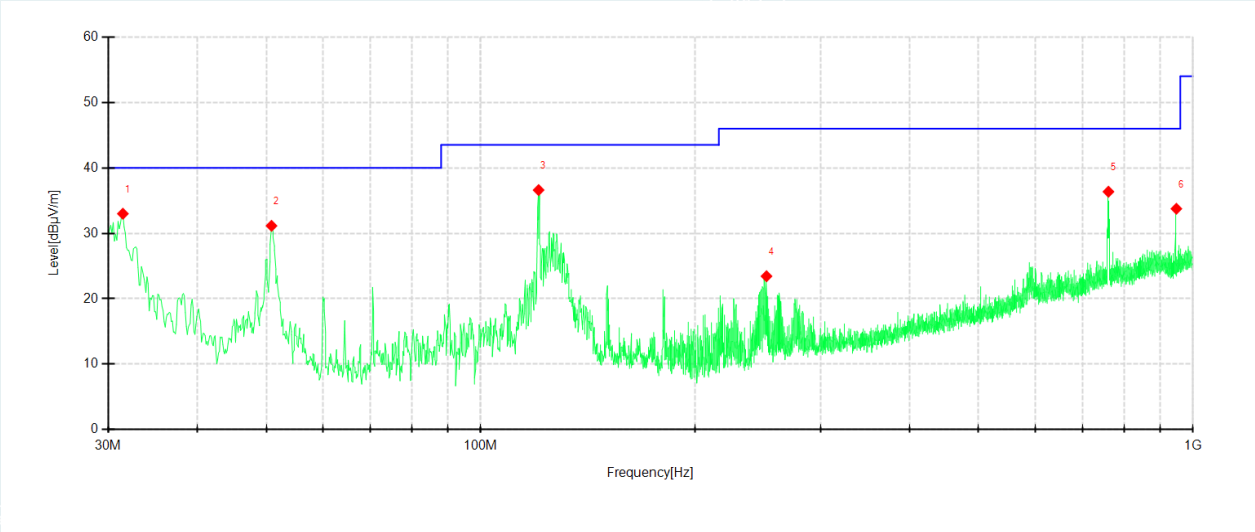
Test Engineer: Zhang Zishan Test Date: 2023-10-26



Suspected Data List											
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity	Verdict
1	30.2425	53.89	24.66	-29.23	40.00	15.34	PK	100	81	Horizontal	PASS
2	39.9437	56.12	27.46	-28.66	40.00	12.54	PK	100	81	Horizontal	PASS
3	50.9789	51.36	22.79	-28.57	40.00	17.21	PK	200	20	Horizontal	PASS
4	120.5851	53.39	23.44	-29.95	43.50	20.06	PK	100	55	Horizontal	PASS
5	276.7746	51.22	22.87	-28.35	46.00	23.13	PK	100	236	Horizontal	PASS
6	947.7347	46.97	31.56	-15.41	46.00	14.44	PK	200	59	Horizontal	PASS

Mode: Mode 1/ IEEE 802.11a
Test Environment: 25.0℃/54%RH/101.0kPa
Test Engineer: Zhang Zishan

Channel :5825MHz
Test Voltage: DC 12V
Test Date: 2023-10-26



Suspected Data List											
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity	Verdict
1	31.4552	62.16	33.00	-29.16	40.00	7.00	PK	100	357	Vertical	PASS
2	50.8576	59.71	31.15	-28.56	40.00	8.85	PK	100	174	Vertical	PASS
3	120.5851	66.56	36.61	-29.95	43.50	6.89	PK	100	98	Vertical	PASS
4	251.9152	52.72	23.45	-29.27	46.00	22.55	PK	100	345	Vertical	PASS
5	760.8651	53.09	36.36	-16.73	46.00	9.64	PK	100	150	Vertical	PASS
6	947.7347	49.17	33.76	-15.41	46.00	12.24	PK	200	262	Vertical	PASS

Remark:

1 No emission found between lowest internal used/generated frequency to 30MHz.
2 Radiated emissions measured in frequency range from 9 kHz to 1GHz were made with an instrument using Quasi-peak detector mode.
3 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.
4 The IF bandwidth of Receiver between 30MHz to 1GHz was 120 kHz.

APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM

Please refer to the attached document E202307262325-20 Test photo.

APPENDIX B. PHOTOGRAPH OF THE EUT

Please refer to the attached document E202307262325-21 EUT photo.

---------- End of Report ----------