FCC Test Report

APPLICANT	:	GigaDevice Semiconductor Inc.
EQUIPMENT	:	802.11bgn wlan module
BRAND NAME	:	GigaDevice
MODEL NAME	:	GD32W515_MD1
FCC ID	:	2A3BS-GD32W515MD1
STANDARD	:	47 CFR Part 15 Subpart B
CLASSIFICATION	:	Certification
TEST DATE(S)	:	Sep. 29, 2021 ~ Oct. 21, 2021

We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2014 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager

ACCREDITED Cert #5145.02

Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC191334	Rev. 01	Initial issue of report	Oct. 22, 2021

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.107	AC Conducted Emission	< 15.107 limits	PASS	Under limit 15.65 dB at 0.150 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 12.82 dB at 32.910 MHz

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1. General Description

1.1. Applicant

GigaDevice Semiconductor Inc.
Building No. 8, IC Park, No. 9 Fenghao East Road, Haidian District, Beijing 100094, China

1.2. Manufacturer

GigaDevice Semiconductor Inc.
Building No. 8, IC Park, No. 9 Fenghao East Road, Haidian District, Beijing 100094, China

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	802.11bgn wlan module
Brand Name	GigaDevice
Model Name	GD32W515_MD1
FCC ID	2A3BS-GD32W515MD1
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20/HT40
HW Version	GD32W515_MD1_SP_2V1
SW Version	KEIL-image-all-rf-test-1.0.3.bin
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4. Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	802.11b/g/n: 2400 MHz ~ 2483.5 MHz
Rx Frequency	802.11b/g/n: 2400 MHz ~ 2483.5 MHz
Antenna Type	WLAN : PCB Antenna & Dipole Antenna
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM)

Note: The device supports two types of antenna which can't use simultaneously.

1.5. Modification of EUT

No modifications are made to the EUT during all test items.

1.6. Test Location

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH02-KS	CN1257	314309

1.7. Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH02-KS	AUDIX	E3	6.2009-8-24a
2.	CO01-KS	AUDIX	E3	6.2009-8-24

1.8. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart B
- ANSI C63.4-2014

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2. Test Configuration of Equipment Under Test

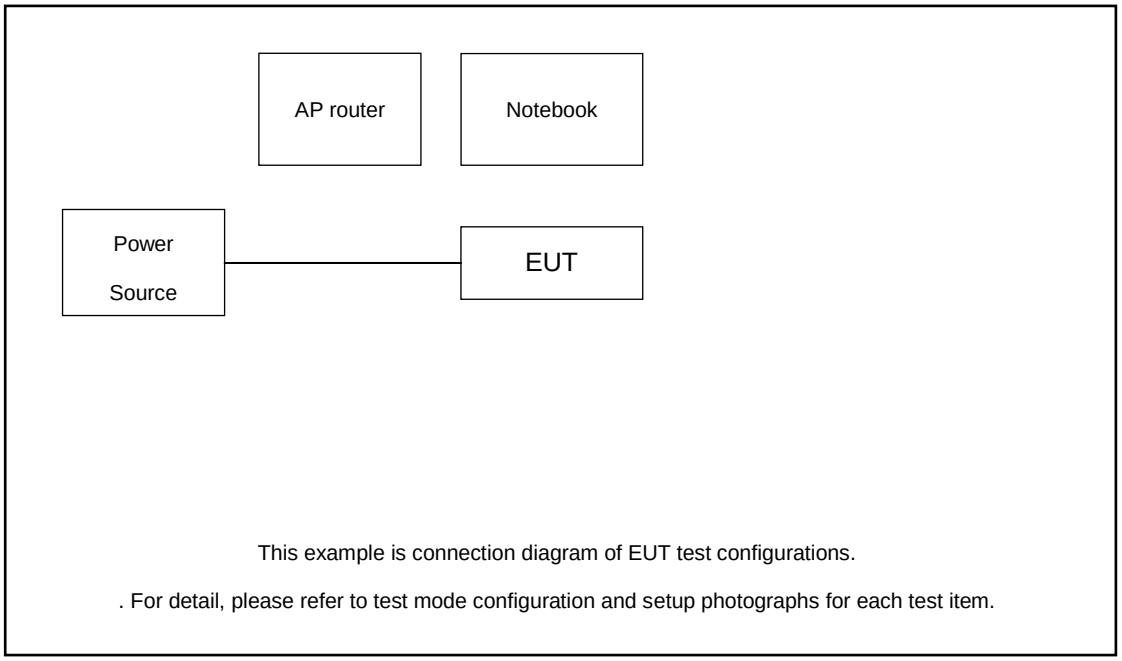
2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (30MHz to the 5th harmonic of the highest frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
AC Conducted Emission	Mode 1: WLAN (2.4G) Idle+ Power from Adapter + PCB Antenna Mode 2: WLAN (2.4G) Idle+ Power from Adapter + Dipole Antenna
Radiated Emissions	Mode 1: WLAN (2.4G) Idle+ Power from Adapter + PCB Antenna Mode 2: WLAN (2.4G) Idle+ Power from Adapter + Dipole Antenna
Remark: **1.** The worst case of AC is mode 2; only the test data of this mode is reported. **2.** The worst case of RE is mode 2; only the test data of this mode is reported.	

2.2. Connection Diagram of Test System



The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application

2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Adapter	N/A	N/A	N/A	N/A	N/A
2.	USB Cable	N/A	N/A	N/A	Unshielded,1.2m	N/A
3.	WLAN AP	TP-Link	TL-WDR5600	N/A	N/A	Unshielded,1.8m
4.	WLAN AP	D-Link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
5.	Notebook	Lenovo	V130-15IKB005	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
6.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
7.	Test Jig	N/A	N/A	N/A	N/A	N/A
8.	Adapter	Moto	C-P56	N/A	N/A	N/A

2.4. EUT Operation Test Setup

At the same time, the EUT was attached to the WLAN AP, and the following programs installed in the EUT were programmed during the test.

3. Test Result

3.1. Test of AC Conducted Emission Measurement

3.1.1 Limits of AC Conducted Emission

For equipment 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 or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

<Class B Limit>

Frequency of emission (MHz)	Conducted 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.

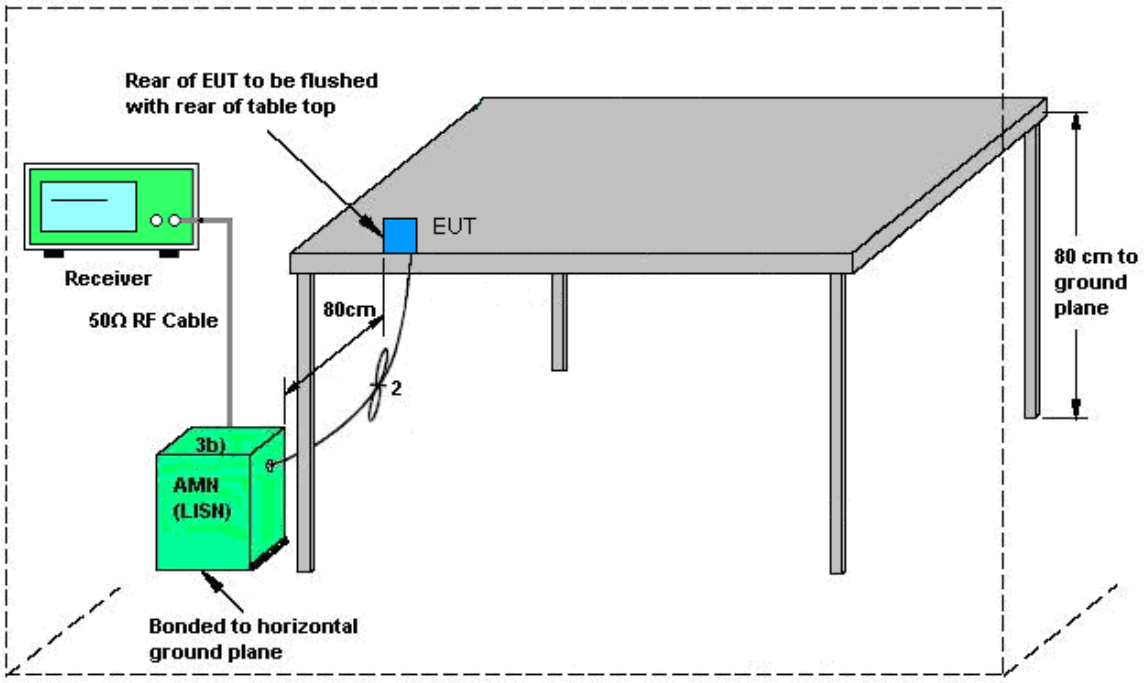
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedure

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

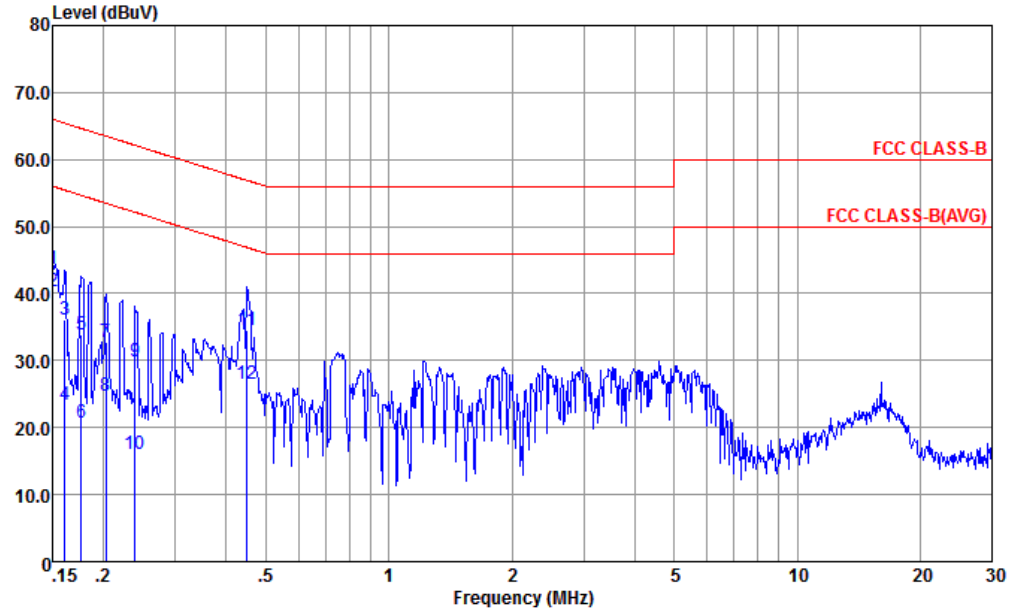
3.1.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.1.5 Test Result of AC Conducted Emission

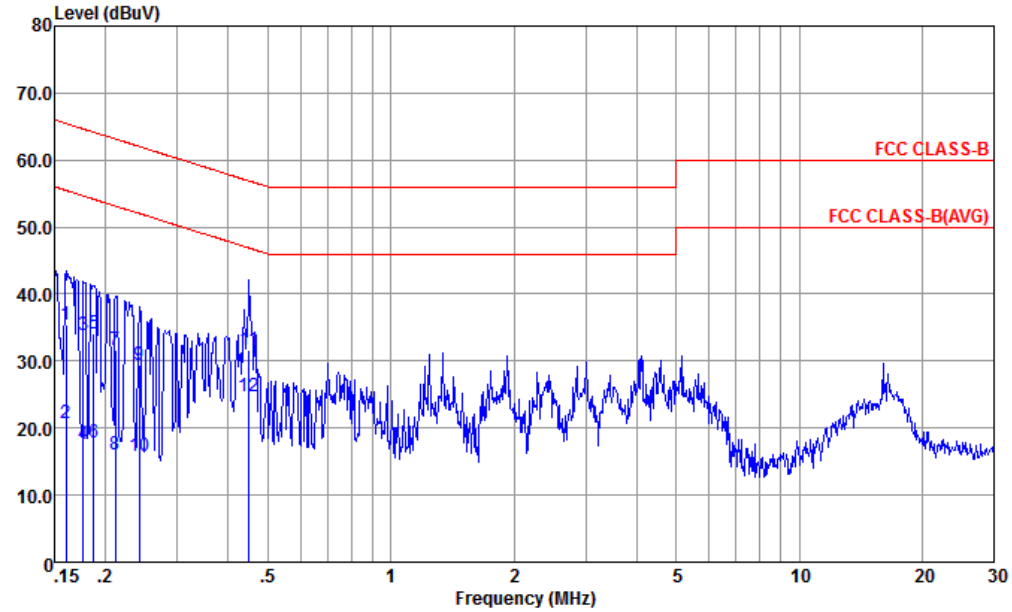
Test Engineer :	Amos Zhang	Temperature :	26.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	Phase :	Line



Site : CO01-KS
Condition : FCC CLASS-B LISN-L-060105-CN02 LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.150	43.65	-22.35	66.00	33.10	0.07	10.48	QP
2	*	0.150	40.35	-15.65	56.00	29.80	0.07	10.48	Average
3		0.161	36.03	-29.40	65.43	25.51	0.07	10.45	QP
4		0.161	23.33	-32.10	55.43	12.81	0.07	10.45	Average
5		0.177	33.79	-30.85	64.64	23.30	0.08	10.41	QP
6		0.177	20.69	-33.95	54.64	10.20	0.08	10.41	Average
7		0.203	32.65	-30.84	63.49	22.20	0.09	10.36	QP
8		0.203	24.75	-28.74	53.49	14.30	0.09	10.36	Average
9		0.239	29.94	-32.19	62.13	19.50	0.10	10.34	QP
10		0.239	16.04	-36.09	52.13	5.60	0.10	10.34	Average
11		0.449	34.57	-22.32	56.89	24.19	0.13	10.25	QP
12		0.449	26.57	-20.32	46.89	16.19	0.13	10.25	Average

Test Engineer :	Amos Zhang	Temperature :	26.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Site : CO01-KS
Condition : FCC CLASS-B LISN-N-060105-CN02 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.160	35.51	-29.96	65.47	24.91	0.15	10.45	QP
2	0.160	20.81	-34.66	55.47	10.21	0.15	10.45	Average
3	0.177	33.87	-30.77	64.64	23.30	0.16	10.41	QP
4	0.177	17.67	-36.97	54.64	7.10	0.16	10.41	Average
5	0.187	34.15	-30.00	64.15	23.60	0.16	10.39	QP
6	0.187	17.75	-36.40	54.15	7.20	0.16	10.39	Average
7	0.212	31.73	-31.41	63.14	21.20	0.17	10.36	QP
8	0.212	16.03	-37.11	53.14	5.50	0.17	10.36	Average
9	0.242	29.32	-32.72	62.04	18.80	0.18	10.34	QP
10	0.242	15.72	-36.32	52.04	5.20	0.18	10.34	Average
11	0.449	31.57	-25.32	56.89	21.10	0.22	10.25	QP
12 *	0.449	24.77	-22.12	46.89	14.30	0.22	10.25	Average

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

<Class B Limit>

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2. Measuring Instruments

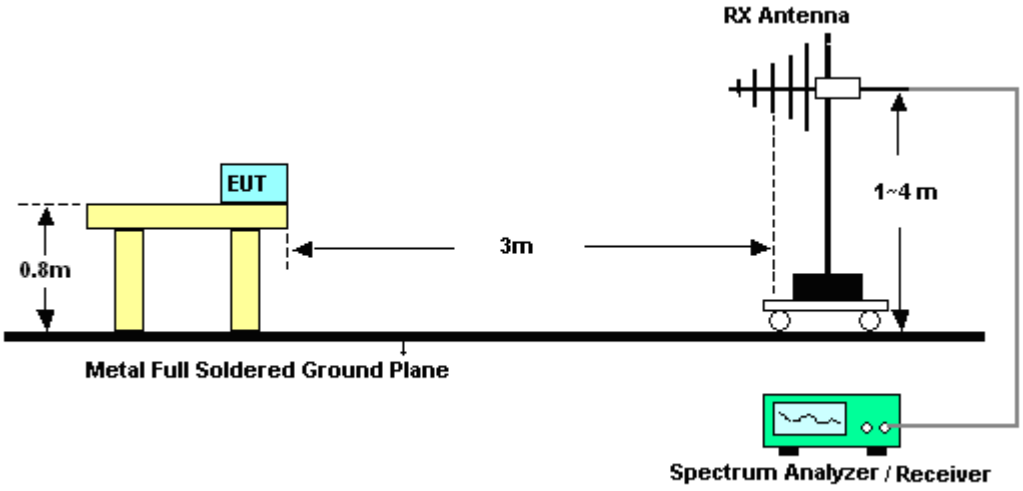
The measuring equipment is listed in the section 4 of this test report.

3.2.3. Test Procedures

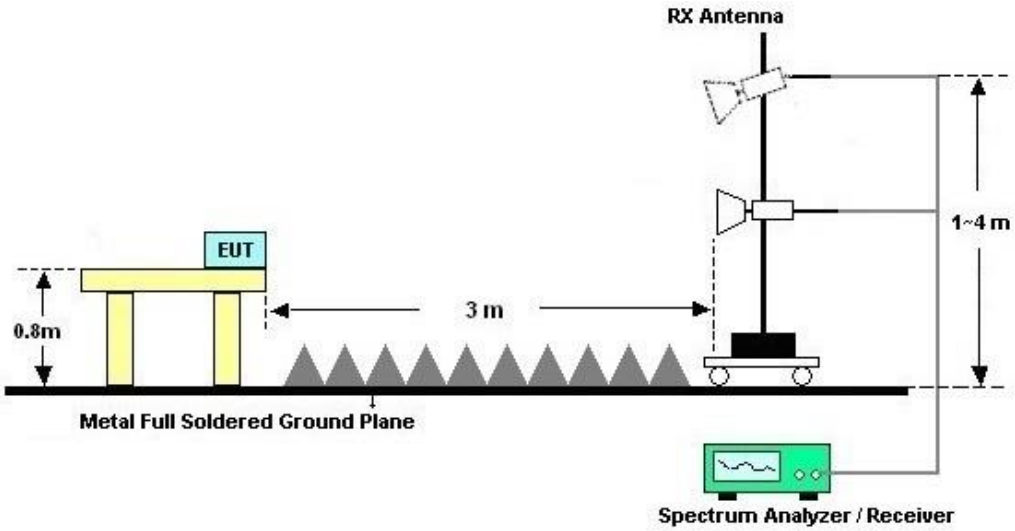
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBμV/m) = 20 log Emission level (μV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
10. Exploratory radiated emissions testing of handheld and/or body-worn devices shall include rotation of the EUT through three orthogonal axes (X/Y/Z Plane) to determine the orientation (attitude) that maximizes the emissions.

3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz

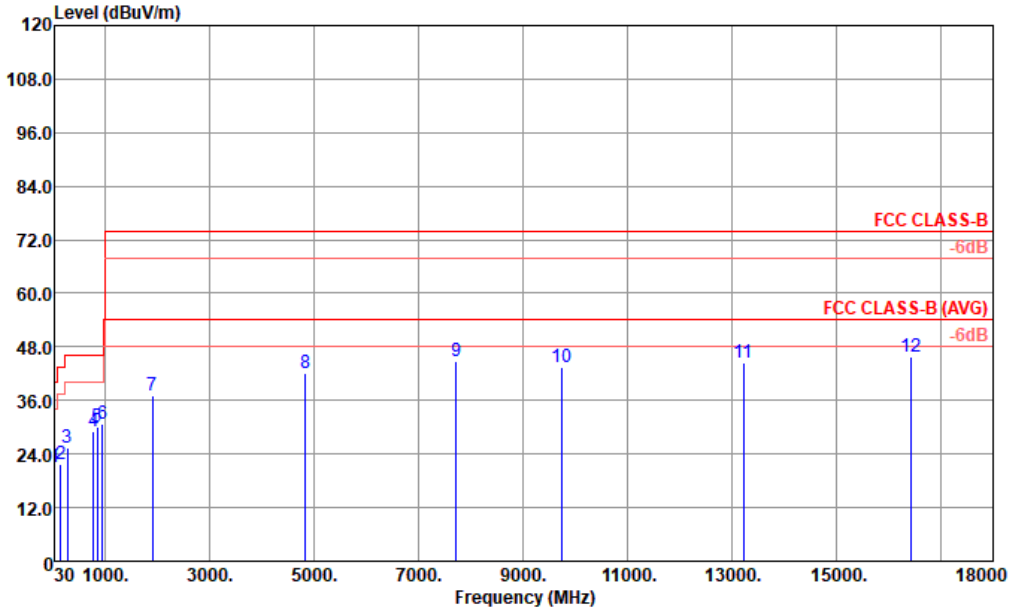


For radiated emissions above 1GHz



3.2.5. Test Result of Radiated Emission

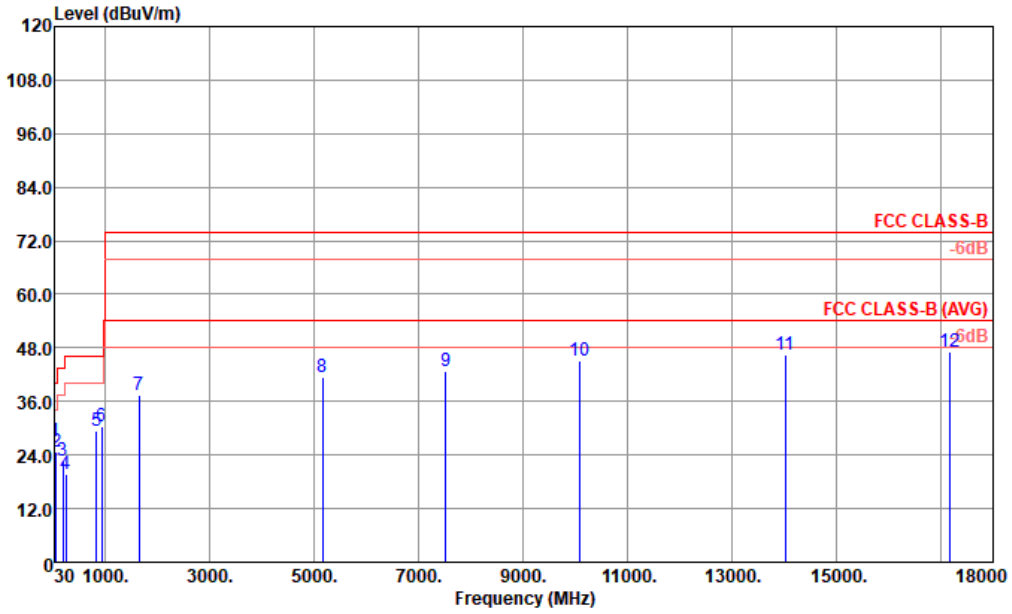
Test Engineer :	Fang Peng	Temperature :	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Horizontal



Site : 03CH02-KS
Condition : FCC CLASS-B 3m LF 6111D SN44483 HORIZONTAL

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	31.940	21.14	-18.86	40.00	28.73	24.04	0.57	32.20	---	---	Peak
2	157.070	21.68	-21.82	43.50	35.07	16.68	2.03	32.10	---	---	Peak
3	282.200	25.47	-20.53	46.00	35.83	19.04	2.74	32.14	---	---	Peak
4	782.720	29.09	-16.91	46.00	28.62	28.20	4.57	32.30	---	---	Peak
5	856.440	29.94	-16.06	46.00	28.27	29.27	4.78	32.38	---	---	Peak
6	949.560	30.62	-15.38	46.00	26.79	31.00	5.03	32.20	---	---	Peak
7	1904.000	37.14	-36.86	74.00	63.55	28.47	7.16	62.04	---	---	Peak
8	4840.000	41.97	-32.03	74.00	57.51	34.83	11.60	61.97	---	---	Peak
9	7720.000	44.71	-29.29	74.00	55.18	36.63	14.72	61.82	---	---	Peak
10	9756.000	43.37	-30.63	74.00	51.24	37.50	16.66	62.03	---	---	Peak
11	13221.000	44.52	-29.48	74.00	47.94	38.55	19.64	61.61	---	---	Peak
12	16425.000	45.88	-28.12	74.00	45.67	40.24	22.06	62.09	---	---	Peak

Test Engineer :	Fang Peng	Temperature :	21~22°C
		Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Vertical



Site : 03CH02-KS
Condition : FCC CLASS-B 3m LF 6111D SN44483 VERTICAL

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	32.910	27.18	-12.82	40.00	35.28	23.51	0.59	32.20	---	---	Peak
2	61.040	24.60	-15.40	40.00	43.72	11.96	1.02	32.10	---	---	Peak
3	199.750	22.83	-20.67	43.50	37.51	15.10	2.32	32.10	---	---	Peak
4	255.040	19.59	-26.41	46.00	29.46	19.71	2.61	32.19	---	---	Peak
5	837.040	29.57	-16.43	46.00	28.20	29.02	4.72	32.37	---	---	Peak
6	936.950	30.52	-15.48	46.00	27.20	30.52	5.00	32.20	---	---	Peak
7	1656.000	37.29	-36.71	74.00	64.14	28.10	6.70	61.65	---	---	Peak
8	5160.000	41.57	-32.43	74.00	56.31	34.95	12.00	61.69	---	---	Peak
9	7520.000	42.82	-31.18	74.00	53.57	36.52	14.58	61.85	---	---	Peak
10	10080.000	45.22	-28.78	74.00	52.56	37.56	17.14	62.04	---	---	Peak
11	14022.000	46.50	-27.50	74.00	49.37	38.61	20.13	61.61	---	---	Peak
12	17163.000	46.97	-27.03	74.00	45.11	40.50	22.86	61.50	---	---	Peak

Note:

1. Level(dBμV/m) = Read Level(dBμV) + Antenna Factor(dB/m) + Cable Loss(dB) - Preamp Factor(dB)
2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 21, 2021	Oct. 21, 2021	Apr. 20, 2022	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 17, 2021	Oct. 21, 2021	Oct. 16, 2022	Conduction (CO01-KS)
AC LISN	R&S	ENV216	100334	9kHz~30MHz	Oct. 17, 2021	Oct. 21, 2021	Oct. 16, 2022	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 17, 2021	Oct. 21, 2021	Oct. 16, 2022	Conduction (CO01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Oct. 17, 2020	Sep. 29, 2021	Oct. 16, 2021	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz-44G,MAX 30dB	Oct. 17, 2020	Sep. 29, 2021	Oct. 16, 2021	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Jan. 26, 2021	Sep. 29, 2021	Jan. 25, 2022	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 01, 2020	Sep. 29, 2021	Oct. 31, 2021	Radiation (03CH02-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 06, 2020	Sep. 29, 2021	Nov. 05, 2021	Radiation (03CH02-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 06, 2021	Sep. 29, 2021	Jan. 05, 2022	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Apr. 12, 2021	Sep. 29, 2021	Apr. 11, 2022	Radiation (03CH02-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5GHz	Oct. 17, 2020	Sep. 29, 2021	Oct. 16, 2021	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	6160100024733	N/A	NCR	Sep. 29, 2021	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Sep. 29, 2021	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Sep. 29, 2021	NCR	Radiation (03CH02-KS)

NCR: No Calibration Required

5. Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.9dB**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.9dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**