

# Global United Technology Services Co., Ltd.

Report No.: GTS2023090223F02

# **TEST REPORT**

Applicant: Feit Electric Company

Address of Applicant: 4901 Gregg Road, Pico Rivera, California 90660, United

States

Manufacturer: SIGNCOMPLEX LIMITED

Address of No.70 Hexiang West Road, Heshan Industrial Park, Heshan,

Manufacturer: Guangdong, China

**Equipment Under Test (EUT)** 

Product Name: CBU Module

Model No.: PLRGBMOD

Trade Mark: Feit Electric

FCC ID: SYW-PLRGBSCAG

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: September 21, 2023

Date of Test: September 22-27, 2023

Date of report issued: September 27, 2023

Test Result: PASS \*

Authorized Signature:

Robinson Luo Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

<sup>\*</sup> In the configuration tested, the EUT complied with the standards specified above.



# 2 Version

Version No.	Date	Description
00	September 27, 2023	Original

Prepared By:	Joseph Ou	Date:	September 27, 2023
	Project Engineer		
Check By:	Johnson lun	Date:	September 27, 2023
	Reviewer		

# **GTS**

Report No.: GTS2023090223F02

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# 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	N/A
Conducted Output Power	15.247 (b)(3)	Pass
Channel Bandwidth	15.247 (a)(2)	Pass
Power Spectral Density	15.247 (e)	Pass
Band Edge	15.247(d)	Pass
Spurious Emission	15.205/15.209	Pass

#### Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.

2. Test according to ANSI C63.10:2013

## **Measurement Uncertainty**

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz-30MHz	3.1dB	(1)
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted 0.15MHz ~ 30MHz 3.44dB		(1)	
Note (1): The measurement unce	ertainty is for coverage factor of k	=2 and a level of confidence of 9	95%.



# 5 General Information

# 5.1 General Description of EUT

Product Name:	CBU Module
Model No.:	PLRGBMOD
Test sample(s) ID:	GTS2023090223-1
Sample(s) Status:	Engineer sample
Serial No.:	300007000039A
Operation Frequency:	2402MHz~2480MHz
Channel Numbers:	40
Channel Separation:	2MHz
Modulation Type:	GFSK
Data Rate:	LE 1M PHY: 1 Mb/s
Antenna Type:	PCB Antenna
Antenna Gain:	2.21dBi(declare by applicant)
Power Supply:	DC 3.0V-3.6V

#### Remark:

- 1. Antenna gain information provided by the customer
- 2. The relevant information of the sample is provided by the entrusting company, and the laboratory is not responsible for its authenticity.



Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402 MHz	11	2422 MHz	21	2442 MHz	31	2462 MHz
2	2404 MHz	12	2424 MHz	22	2444 MHz	32	2464 MHz
3	2406 MHz	13	2426 MHz	23	2446 MHz	33	2466 MHz
4	2408 MHz	14	2428 MHz	24	2448 MHz	34	2468 MHz
5	2410 MHz	15	2430 MHz	25	2450 MHz	35	2470 MHz
6	2412 MHz	16	2432 MHz	26	2452 MHz	36	2472 MHz
7	2414 MHz	17	2434 MHz	27	2454 MHz	37	2474 MHz
8	2416 MHz	18	2436 MHz	28	2456 MHz	38	2476 MHz
9	2418 MHz	19	2438 MHz	29	2458 MHz	39	2478 MHz
10	2420 MHz	20	2440 MHz	30	2460 MHz	40	2480 MHz

#### Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2440MHz
The Highest channel	2480MHz



#### 5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
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#### 5.3 Description of Support Units

Manufacturer	Description	Model	Serial Number
IBM Thinkpad	Notebook PC	2374	L3-G0686

#### 5.4 Deviation from Standards

None.

#### 5.5 Abnormalities from Standard Conditions

None.

#### 5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• FCC—Registration No.: 381383

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

• ISED—Registration No.: 9079A

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of ISED for radio equipment testing

NVLAP (LAB CODE:600179-0)

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

#### 5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480 Fax: 0755-27798960

#### 5.8 Additional Instructions

Test Software	Special test software provided by manufacturer	
Power level setup	Default	



# 6 Test Instruments list

Radia	Radiated Emission:							
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)		
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	June 23, 2021	June 22, 2024		
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A		
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 14, 2023	April 13, 2024		
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 19, 2023	March 18, 2025		
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	April 17, 2023	April 16, 2025		
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A		
7	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 14, 2023	April 13, 2024		
8	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 29, 2022	Nov. 28, 2023		
9	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 14, 2023	April 13, 2024		
10	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 14, 2023	April 13, 2024		
11	Horn Antenna (18- 26.5GHz)	1	UG-598A/U	GTS664	Oct. 30, 2022	Oct. 29, 2023		
12	Horn Antenna (26.5-40GHz)	A.H Systems	SAS-573	GTS665	Oct. 30, 2022	Oct. 29, 2023		
13	FSV·Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	March 13, 2023	March 12, 2024		
14	Amplifier		LNA-1000-30S	GTS650	April 14, 2023	April 13, 2024		
15	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS668	Dec. 20, 2022	Dec.19, 2023		
16	Wideband Amplifier	1	WDA-01004000-15P35	GTS602	April 14, 2023	April 13, 2024		
17	Thermo meter	JINCHUANG	GSP-8A	GTS643	April 19, 2023	April 18, 2024		
18	RE cable 1	GTS	N/A	GTS675	July 31. 2023	July 30. 2024		
19	RE cable 2	GTS	N/A	GTS676	July 31. 2023	July 30. 2024		
20	RE cable 3	GTS	N/A	GTS677	July 31. 2023	July 30. 2024		
21	RE cable 4	GTS	N/A	GTS678	July 31. 2023	July 30. 2024		
22	RE cable 5	GTS	N/A	GTS679	July 31. 2023	July 30. 2024		
23	RE cable 6	GTS	N/A	GTS680	July 31. 2023	July 30. 2024		
24	RE cable 7	GTS	N/A	GTS681	July 31. 2023	July 30. 2024		
25	RE cable 8	GTS	N/A	GTS682	July 31. 2023	July 30. 2024		



RF C	RF Conducted Test:					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 14, 2023	April 13, 2024
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	April 14, 2023	April 13, 2024
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 14, 2023	April 13, 2024
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 14, 2023	April 13, 2024
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 14, 2023	April 13, 2024
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 14, 2023	April 13, 2024
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 14, 2023	April 13, 2024
9	Thermo meter	JINCHUANG	GSP-8A	GTS641	April 19, 2023	April 18, 2024
10	EXA Signal Analyzer	Keysight	N9010B	MY60241168	Nov. 04, 2022	Nov. 03, 2023

Gen	General used equipment:					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	KUMAO	SF132	GTS647	April 19, 2023	April 18, 2024



#### 7 Test results and Measurement Data

#### 7.1 Antenna requirement

**Standard requirement:** FCC Part15 C Section 15.203 /247(c)

#### 15.203 requirement:

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, 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.

#### 15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

#### **E.U.T Antenna:**

The antenna is PCB antenna, reference to the appendix II for details

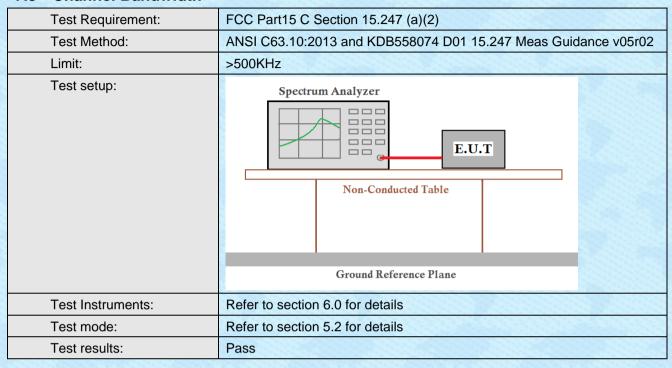


# 7.2 Conducted Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)			
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02			
Limit:	30dBm			
Test setup:	Spectrum Analyzer  E.U.T  Non-Conducted Table  Ground Reference Plane			
Test Instruments:	Refer to section 6.0 for details			
Test mode:	Refer to section 5.2 for details			
Test results:	Pass			



#### 7.3 Channel Bandwidth





# 7.4 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)			
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02			
Limit:	8dBm/3kHz			
Test setup:	Spectrum Analyzer  E.U.T  Non-Conducted Table  Ground Reference Plane			
Test Instruments:	Refer to section 6.0 for details			
Test mode:	Refer to section 5.2 for details			
Test results:	Pass			



# 7.5 Spurious Emission in Non-restricted & restricted Bands

#### 7.5.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)				
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02				
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.				
Test setup:	Spectrum Analyzer  E.U.T  Non-Conducted Table  Ground Reference Plane				
Test Instruments:	Refer to section 6.0 for details				
Test mode:	Refer to section 5.2 for details				
Test results:	Pass				

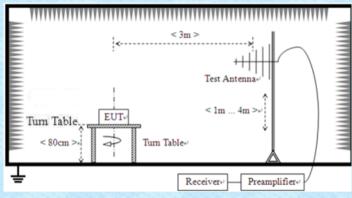


#### 7.5.2 Radiated Emission Method

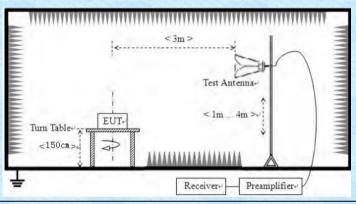
7.5.2 Radiated Emission Weti						
Test Requirement:	FCC Part15 C Section	on 15.209				
Test Method:	ANSI C63.10:2013					
Test Frequency Range:	9kHz to 25GHz					
Test site:	Measurement Distar	nce: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value	
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak	
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak	
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak	
	Above 1GHz	Peak	1MHz	3MHz	Peak	
	Above IGHZ	Peak	1MHz	10Hz	Average	
	Note: For Duty cyc cycle < 98%, average					
Limit:	Frequency	Limit (u'	V/m)	Value	Measurement Distance	
	0.009MHz-0.490M	IHz 2400/F(	KHz) Q	P/PK/AV	300m	
	0.490MHz-1.705M	Hz 24000/F	(KHz)	QP	30m	
	1.705MHz-30MH	z 30		QP	30m	
	30MHz-88MHz	100		QP		
	88MHz-216MHz	150		QP		
	216MHz-960MH	z 200		QP	3m	
	960MHz-1GHz	500	500		SIII	
	Above 1GHz	500	F	Average		
	Above 1G112	5000	)	Peak		
Test setup:	For radiated emiss	sions from 9kH	z to 30MF	lz		
	Turn Table EUT Im Table Im Receiver					



For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



#### Test Procedure:

- 1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Instruments:

Refer to section 6.0 for details

Global United Technology Services Co., Ltd.

No. 123- 128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102



Report No.: GTS2023090223F02					3090223F02	
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V,	AC 120V, 60Hz				
Test results:	Pass	Pass				

#### Measurement data:

Remark:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

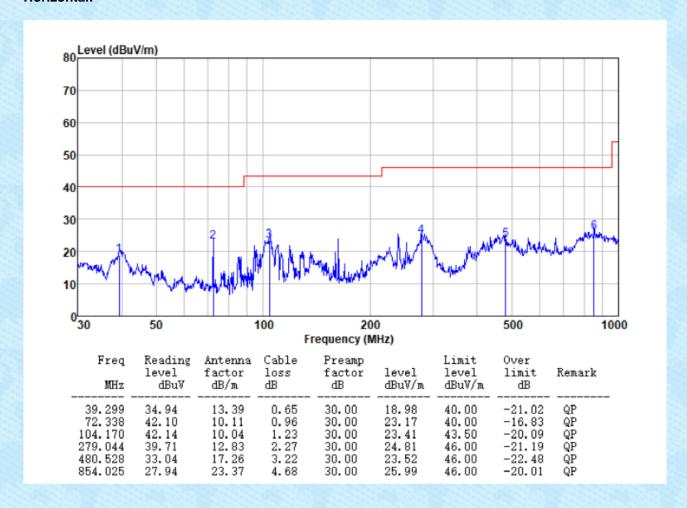
#### ■ 9kHz~30MHz

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



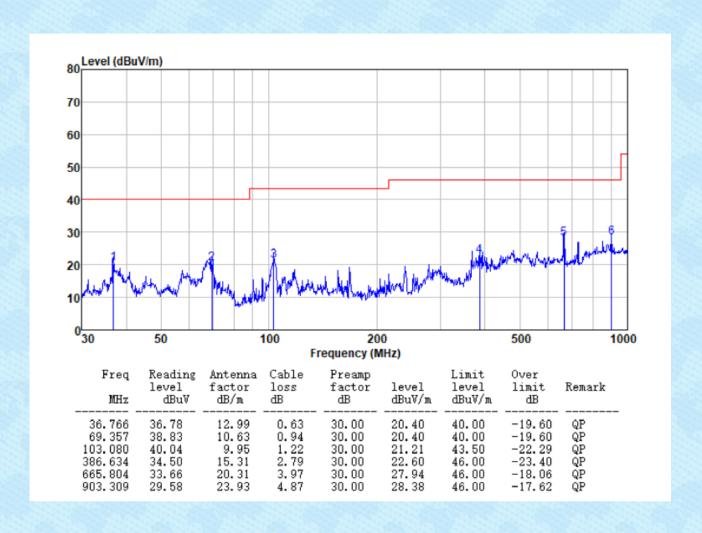
#### ■ Below 1GHz

Pre-scan all test modes, found worst case at 2480MHz, and so only show the test result of 2480MHz **Horizontal:** 





#### Vertical:

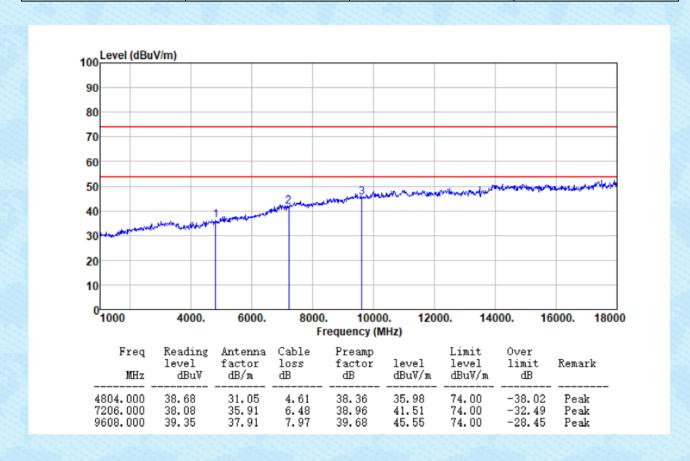




#### Above 1GHz

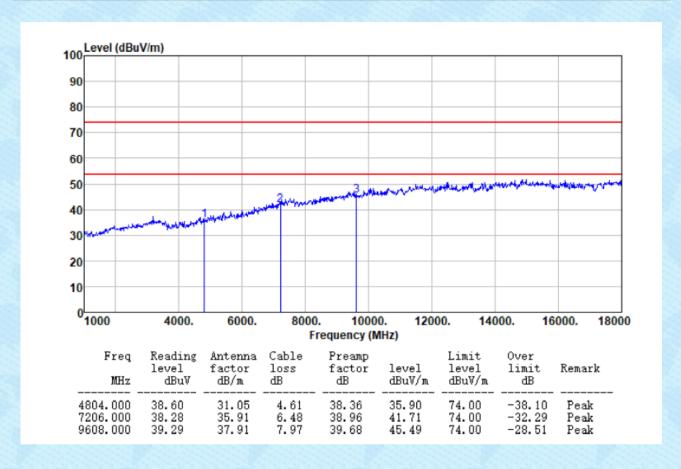
#### ■ Unwanted Emissions in Non-restricted Frequency Bands

est channel: Lowest Polari	tion: Horizontal
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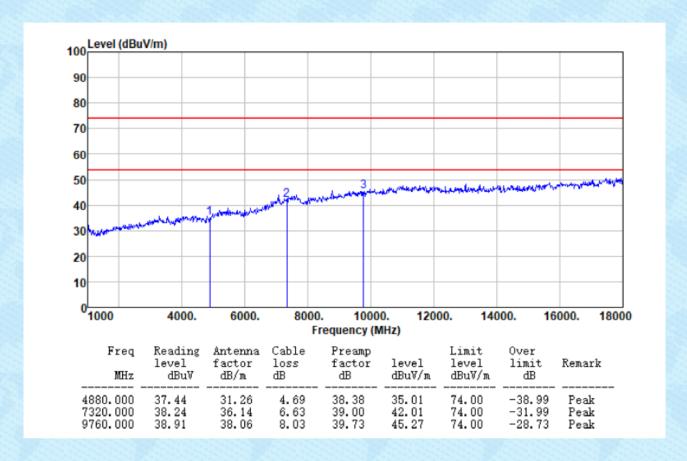


Test channel: Lowest	Polarization:	Vertical
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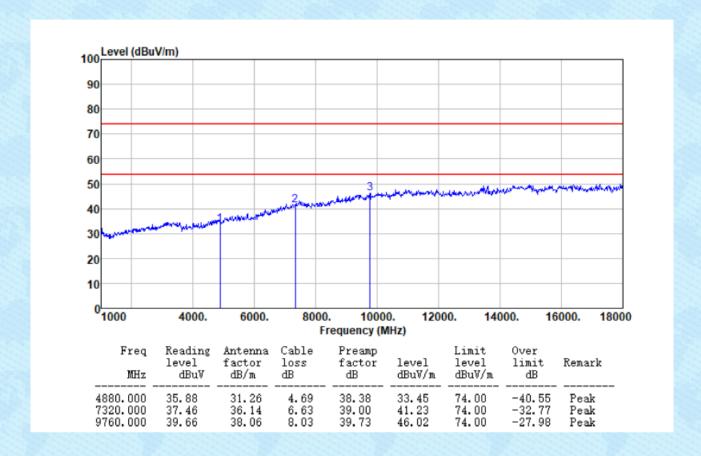


Test channel: Middle	Polarization:	Horizontal
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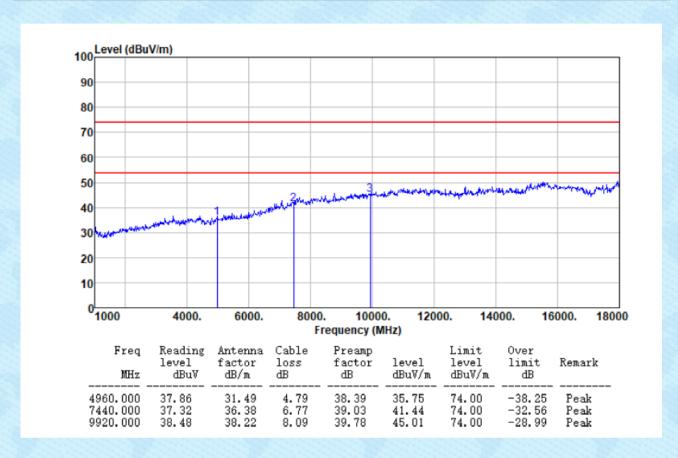


Test channel: Mide	e Polarizati	on: Vertical
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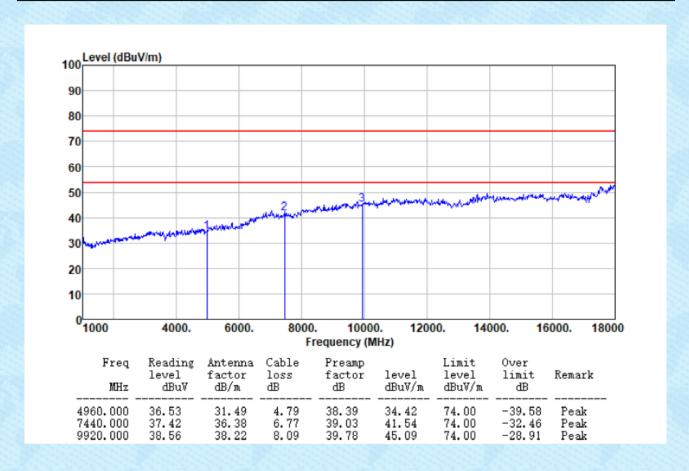


Test channel:	Highest	Polarization:	Horizontal
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		Test channel:	Highest	Polarization:	Vertical
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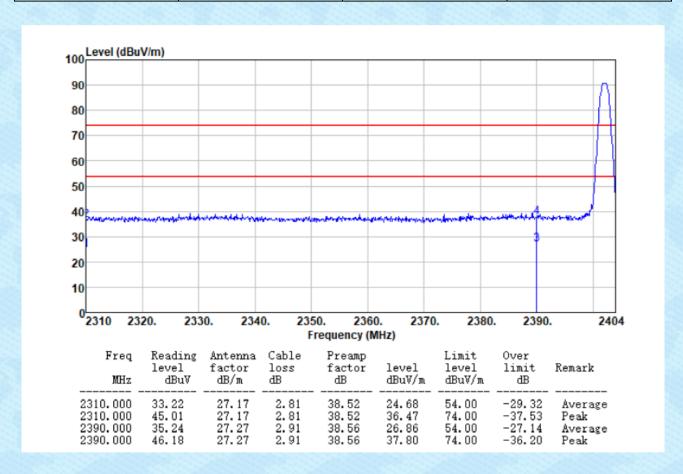
#### Remarks:

- 1. Final Level =Receiver Read level + Antenna Factor + Cable Loss Preamplifier Factor
- 2. The emission levels of frequencies range from 18GHz-25GHz are very lower than the limit and not show in test report.



#### Unwanted Emissions in Restricted Frequency Bands

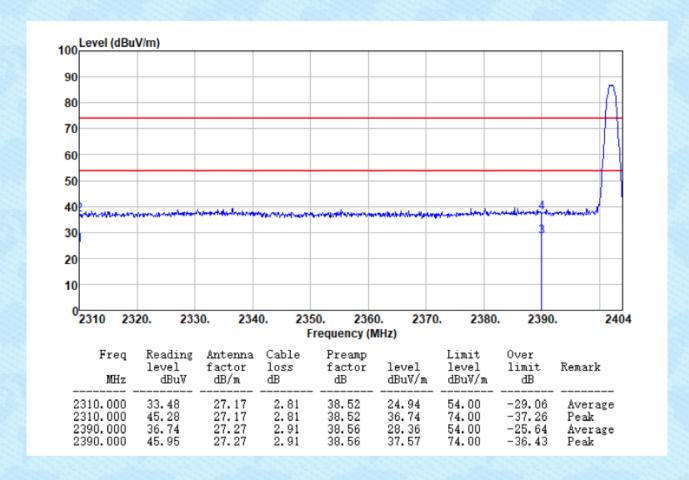
Test channel:	Lowest	Polarization:	Horizontal	
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No. 123- 128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone,

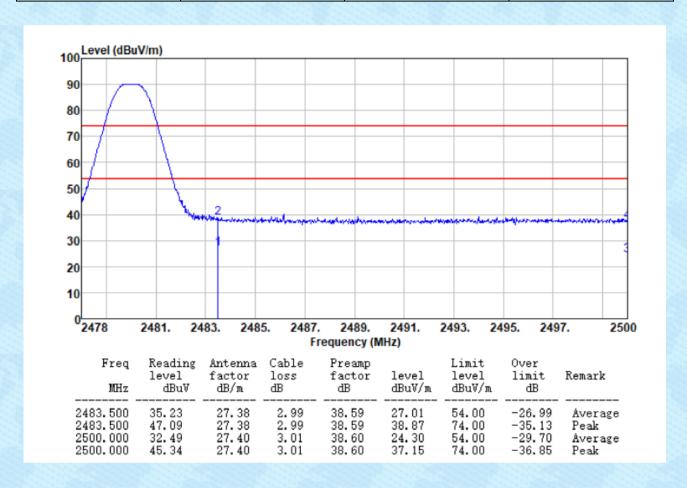


Polarization: Vertical	Test channel: Lowest
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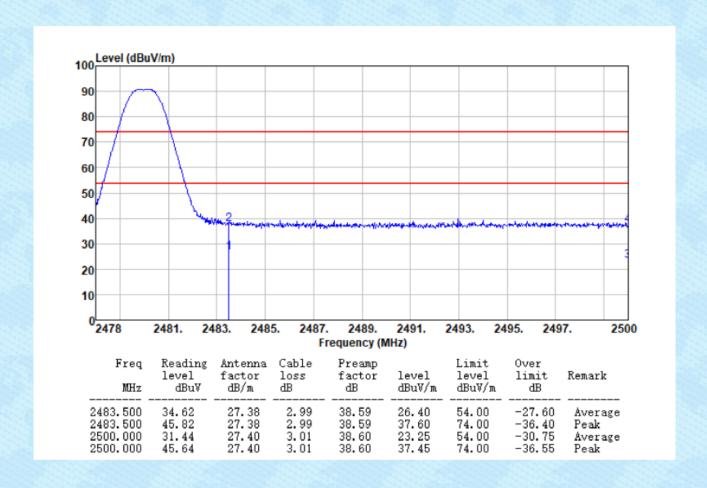


Test channel:	Highest	Polarization:	Horizontal	
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Test channel:   Highest   Polarization:   Vertical
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#### Remarks:

- 1. Final Level =Receiver Read level + Antenna Factor + Cable Loss Preamplifier Factor
- 2. The emission levels of other frequencies are very lower than the limit and not show in test report.
- 3. "\*", means this data is the too weak instrument of signal is unable to test.



# 8 Test Setup Photo

Reference to the appendix I for details.

# 9 EUT Constructional Details

Reference to the appendix II for details.

-----End-----