

# FCC Part 15C TEST REPORT

## FCC ID: 2BKB3-D51WD71W

Product : D51W, D71W  
Model Name : D51W, D71W  
Brand : Hiwill  
Report No. : NCT24035598-2

Prepared for

**Hiwill Intelligent Technology (Dongguan) Co., Ltd**  
603, No. 5 Lucheng West Road, Qingxi Town, Dongguan City, Guangdong Province,  
China.

Prepared by

**Shenzhen NCT Testing Technology Co., Ltd.**  
A101&2F B2, Fuqiao 6th Area, Xintian Community, Fuhai Street, Baoan District,  
Shenzhen, People's Republic of China

**TEL: 400-8868-419**

**FAX: 86-755-27790922**

## 1 TEST RESULT CERTIFICATION

Applicant's name : Hiwill Intelligent Technology (Dongguan) Co., Ltd  
Address : 603, No. 5 Lucheng West Road, Qingxi Town, Dongguan City, Guangdong Province, China.  
Manufacture's name : Hiwill Intelligent Technology (Dongguan) Co., Ltd  
Address : 603, No. 5 Lucheng West Road, Qingxi Town, Dongguan City, Guangdong Province, China.  
Product name : D51W, D71W  
Model name : D51W, D71W  
Additional model : N/A  
Standards : FCC CFR Title 47 Part 15 Subpart C Section 15.407  
Test procedure : ANSI C63.10:2013  
Test Date : Aug. 08, 2024 to Nov. 05, 2024  
Date of Issue : Nov. 05, 2024  
Test Result : Pass

This device described above has been tested by NCT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

*Keven Wu*

Keven Wu / Engineer

Technical Manager:

*Henry Wang*

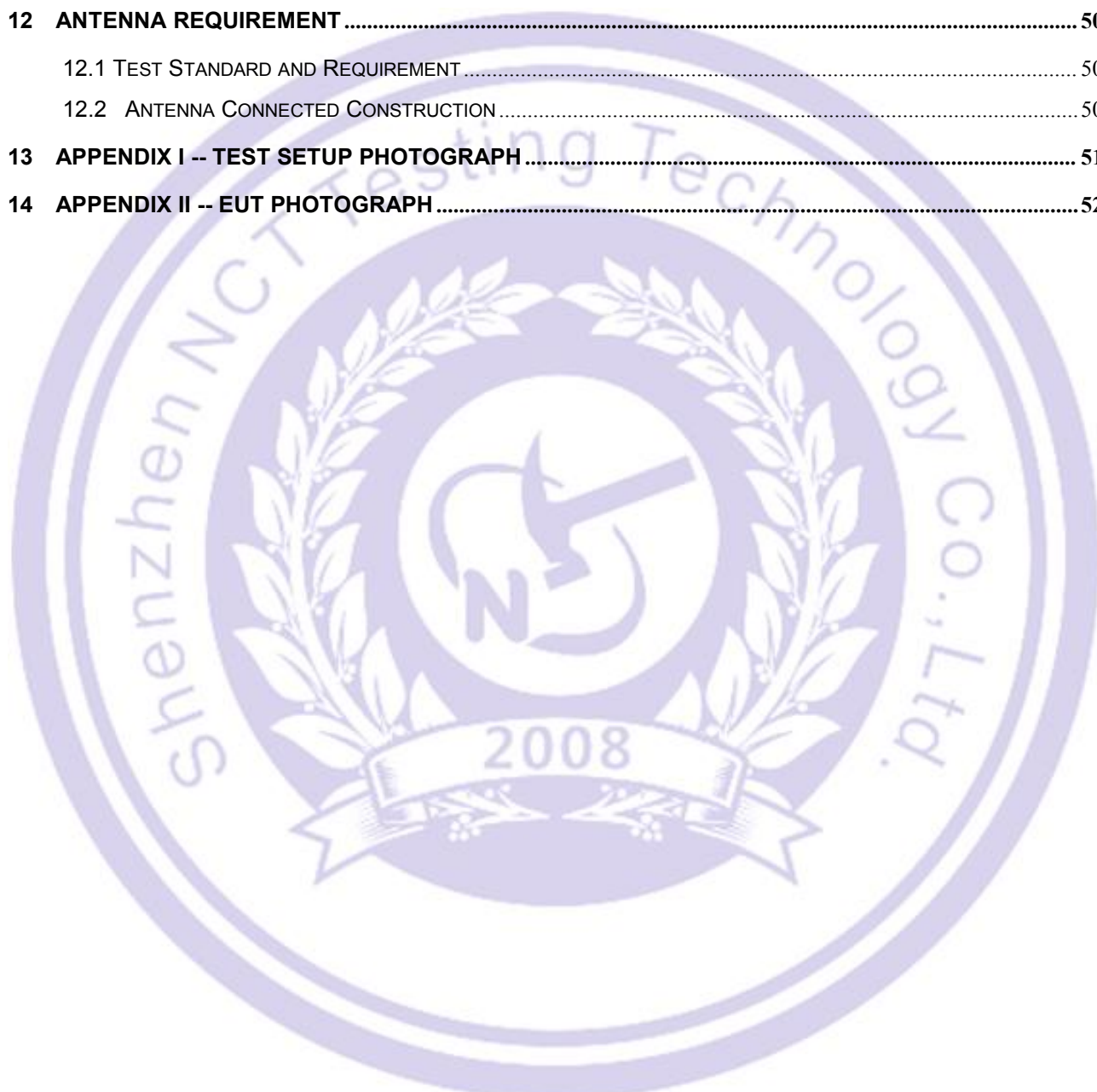
Henry Wang / Manager



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## 2 Test Summary

Test Items	Test Requirement	Result
FCC part 15.203	Antenna requirement	PASS
FCC part 15.207	AC Power Line Conducted Emission	PASS
FCC part 15.407 (a)	Conducted Peak Output Power	PASS
FCC part 15.407 (e)	6dB Bandwidth& 99% OCB	PASS
FCC part 15.407 (a)	Power Spectral Density	PASS
FCC part 15.407(b)	Conducted Bandedge	PASS
FCC part 15.407(b)/15.209	Radiated Emission and Restricted Bands	PASS

Remark:

1. "N/A" denotes test is not applicable in this Test Report.

## 3 TEST FACILITY

### Site Description

EMC Lab. : Accredited by CNAS, 2022-09-27

The certificate is valid until 2028.01.07

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2017)

The Certificate Registration Number is L8251

Designation Number: CN1347

Test Firm Registration Number: 894804

Accredited by A2LA, June 14, 2023

The Certificate Registration Number is 6837.01

Accredited by Industry Canada, November 09, 2018

The Conformity Assessment Body Identifier is CN0150

Company Number: 30806

Name of Firm : Shenzhen NCT Testing Technology Co., Ltd.

Site Location : A101&2F B2, Fuqiao 6th Area, Xintian Community, Fuhai Street, Baoan District, Shenzhen, People's Republic of China

## 4 General Information

### 4.1 General Description of E.U.T.

Product Name	:	D51W, D71W
Model Name	:	D51W, D71W
Sample ID	:	240831001, 240831002
Sample(s) Status:	:	Engineer sample
Additional model	:	N/A
Model difference	:	The only difference between models is that the size of the outer box is different, and the electronic part is the same.
Operating frequency	:	5726-5850MHz
Numbers of Channel	:	32 channels
Antenna Type	:	PCB Antenna
Antenna Gain	:	4.24dBi
Type of Modulation	:	FSK
Power supply	:	DC 24V/2.85A from Adapter
Hardware Version	:	JY-SPA100-MAIN-V3.1
Software Version	:	DSP:DB-D51W_SPA100_V07 BT:LingYang-ATMOS-TWS-M_IIS-V1.29-(Hiwill D51W)-Dobly-MUSIC-0814-0x72D7.MVA LingYang-ATMOS-TWS-M_IIS-V1.29-(Hiwill D71W)-Dobly-MUSIC-0814-0x7E51.MVA
Adapter Information	:	Manufacturer:Guangdong Tiantongjiuheng Technology Co.,Ltd Model:TJ07201W2402850US Input:100-240V ~ 50/60Hz 1.5A MAX Output:DC 24V/2850mA
<p>Remark: the Antenna gain is provided by customer from Antenna spec. and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.</p>		

## 4.2 Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5726	9	5758	17	5790	25	5822
2	5730	10	5762	18	5794	26	5826
3	5734	11	5766	19	5798	27	5830
4	5738	12	5770	20	5802	28	5834
5	5742	13	5774	21	5806	29	5838
6	5746	14	5778	22	5810	30	5842
7	5750	15	5782	23	5814	31	5846
8	5754	16	5786	24	5818	32	5850





## 4.3 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description	
Mode 1	CH01	FSK
Mode 2	CH16	
Mode 3	CH32	
For Conducted & Radiated Emission		
Final Test Mode	Description	
Mode 1	CH01	FSK
Mode 2	CH16	
Mode 3	CH32	

Note:

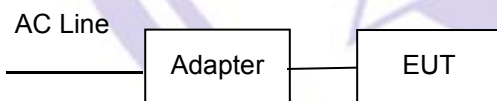
- (1) The measurements are performed at the highest, middle, lowest available channels.

## 4.4 Test Setup Configuration

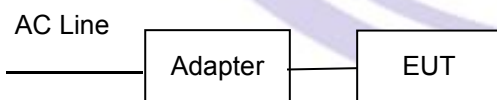
Conducted Emission



Radiated Emission



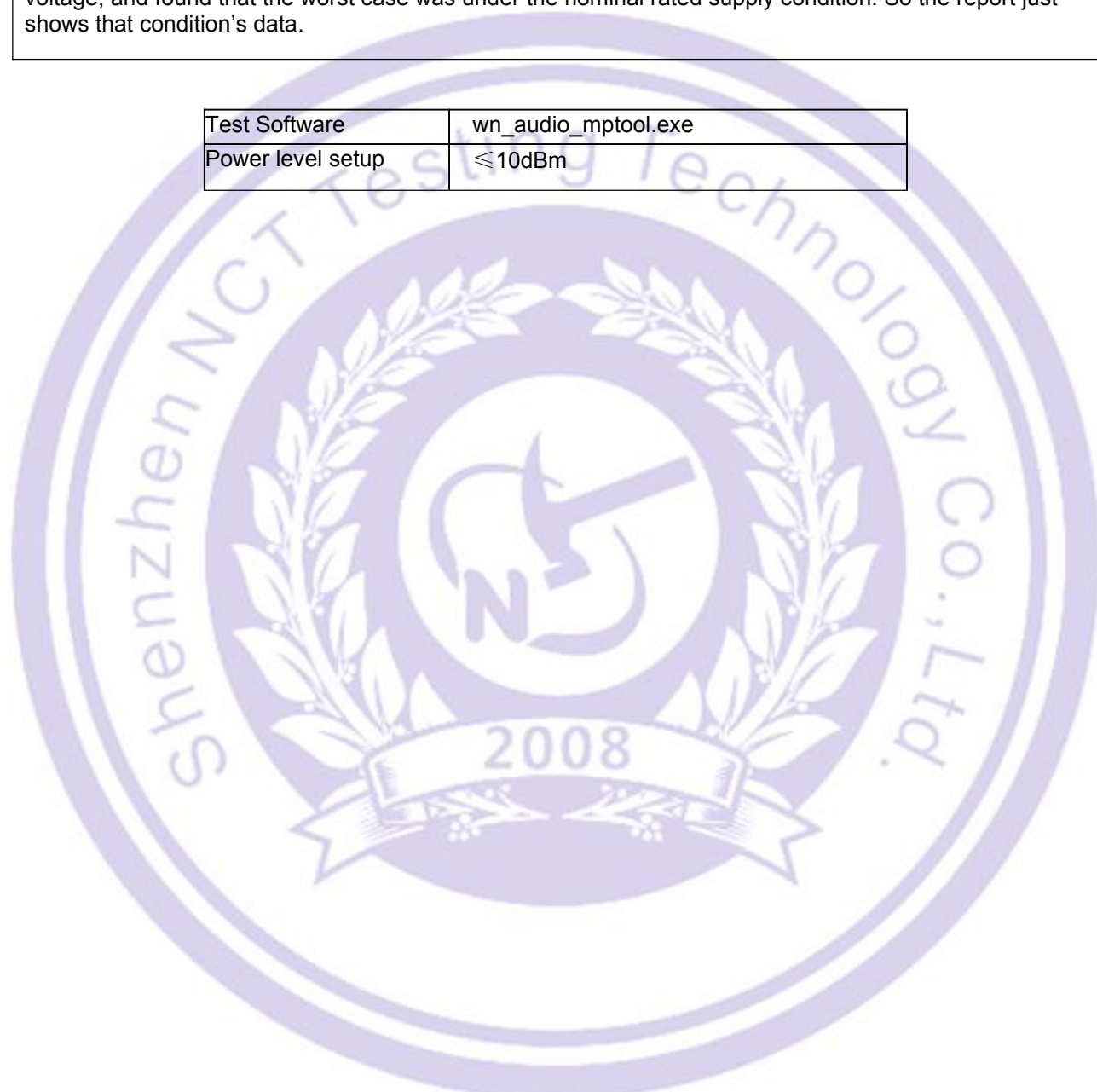
Conducted Spurious



## 4.5 Test Mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

Test Software	wn_audio_mptool.exe
Power level setup	≤ 10dBm



## 5 Equipment During Test

### 5.1 Equipments List

Conducted emission Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
944 Shielded Room	944 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESPI	101604	Rohde & Schwarz	2024/6/17	2025/6/16
LISN	ENV 216	102796	Rohde & Schwarz	2024/6/17	2025/6/16
LISN	VN1-13S	004023	CRANAGE	2024/6/17	2025/6/16
Cable	RG223-1500MM	NA	RG	2024/6/17	2025/6/16

Radiated emission & Radio Frequency Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
966 Shielded Room	966 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESCI	101178	Rohde & Schwarz	2024/6/17	2025/6/16
Spectrum Analyze (10Hz-26.5GHz)	N9020A	MY50510202	Agilent	2024/6/17	2025/6/16
Amplifi (30MHz-1GHz)	BBV 9743 B	00374	SCHNARZBECK	2024/6/17	2025/6/16
Bilog Antenna (30MHz-1GHz)	VULB9162	00473	SCHNARZBECK	2023/3/19	2025/3/18
Horn antenna (1GHz-18GHz)	BBHA 9120 D	02622	SCHNARZBECK	2023/3/19	2025/3/18
Pream plifier (1GHz-18GHz)	BBV 9718D	0024	SCHNARZBECK	2024/6/17	2025/6/16
Spectrum Analyze (1GHz-40GHz)	FSV 40	100952	Rohde & Schwarz	2024/6/17	2025/6/16
Pream plifier (15GHz-40GHz)	BBV 9718D	0024	SCHNARZBECK	2024/6/17	2025/6/16
Broadband Antenna (15GHz-40GHz)	SAS-574	588	A.H.System	2023/3/19	2025/3/18
Loop Antenna (9KHz-30MHz)	FMZB1519B	014	SCHNARZBECK	2024/6/20	2025/6/19

Amplifier (9KHz-30MHz)	CVP 9222 C	00109	SCHNARZBECK	2024/6/18	2025/6/17
MXG Signal Analyzer	N9020A	101178	RS	2024/6/17	2025/6/16
MXG Vector Signal Generator	N5182A	MY50510202	Agilent	2024/6/17	2025/6/16
MXG Analog Signal Generator	N5181A	00374	SCHWARZBECK	2024/6/17	2025/6/16
Power Sensor	TR1029-2	00473	SCHNARZBECK	2024/6/17	2025/6/16
RF Swith	TR1029-1	02622	SCHNARZBECK	2024/6/17	2025/6/16
Cable	DA800- 4000MM	NA	DA	2024/6/17	2025/6/16
Cable	DA800- 11000MM	NA	DA	2024/6/17	2025/6/16

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	AUDIX	e3	6.120718
2	EMC radiation test system	AUDIX	e3	6.120718
3	RF test system	TACHOY	RFTest	V1.0.0
4	RF communication test system	TACHOY	RFTest	V1.0.0

## 5.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10 <sup>-6</sup>
Bandwidth	± 1.5 x 10 <sup>-6</sup>
Conducted spurious emission	±2.76dB
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB

## 5.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	D51W, D71W	Hiwill	D51W, D71W	N/A	EUT
E-2	Notebook	lenovo	B40-80	MP07F6JD	Auxiliary

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

## 6 Conducted Emission

Test Requirement: : FCC CFR 47 Part 15 Section 15.207  
Test Method: : ANSI C63.10:2013  
Test Result: : PASS  
Frequency Range: : 150kHz to 30MHz  
Class/Severity: : Class B  
Detector: : Peak for pre-scan (9kHz Resolution Bandwidth)

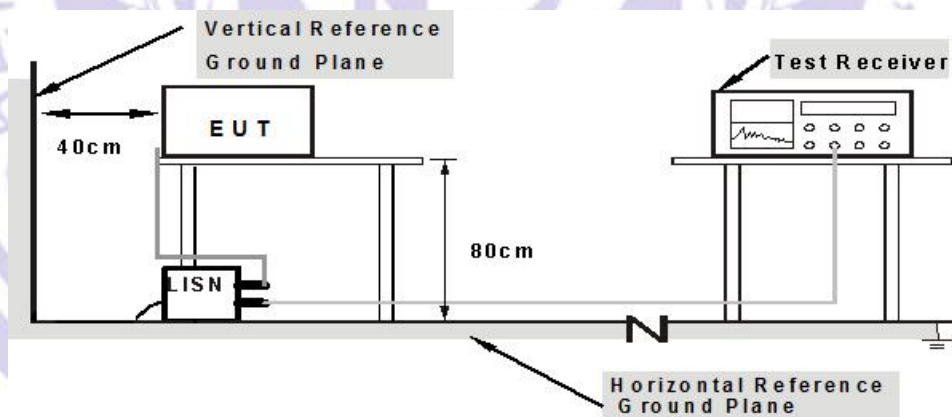
### 6.1 E.U.T. Operation

Operating Environment :

Temperature: : 23.2°C  
Humidity: : 51 % RH  
Atmospheric Pressure: : 101.12 kPa  
Test Voltage : AC 120V/60Hz

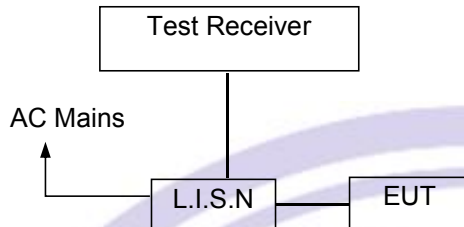
### 6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013



**Note: 1.Support units were connected to second LISN.  
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

## 6.3 Test SET-UP (Block Diagram of Configuration)



## 6.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

## 6.5 Conducted Emission Limit

### Conducted Emission

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.

## 6.6 Measurement Description

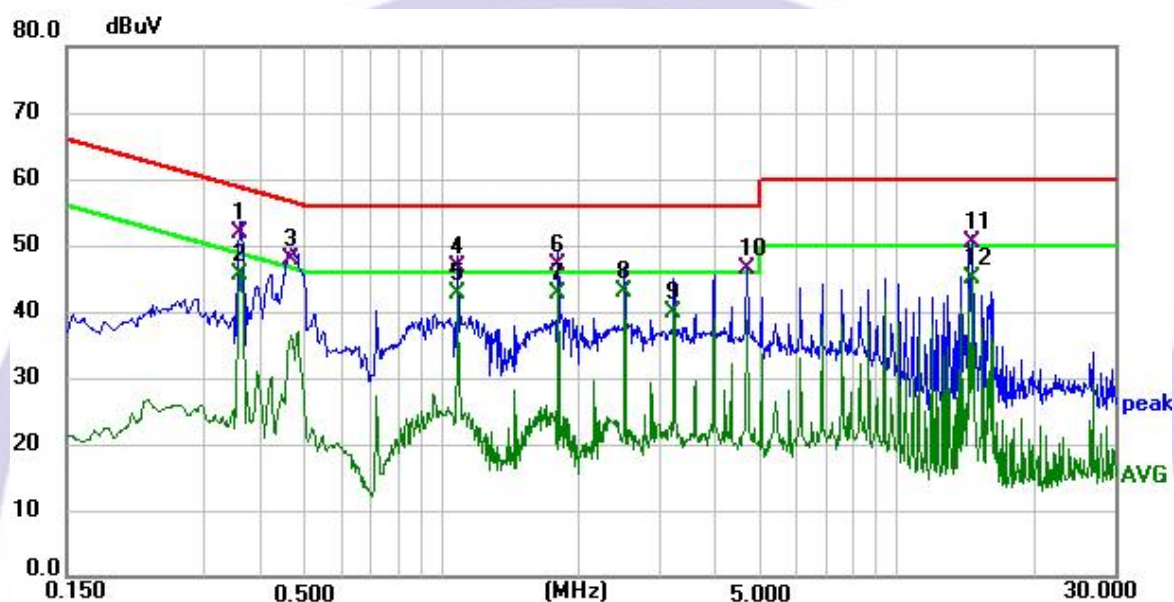
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

## 6.7 Conducted Emission Test Result

Pass

Conducted emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (FSK) are recorded in the following pages and the others modulation methods do not exceed the limits.

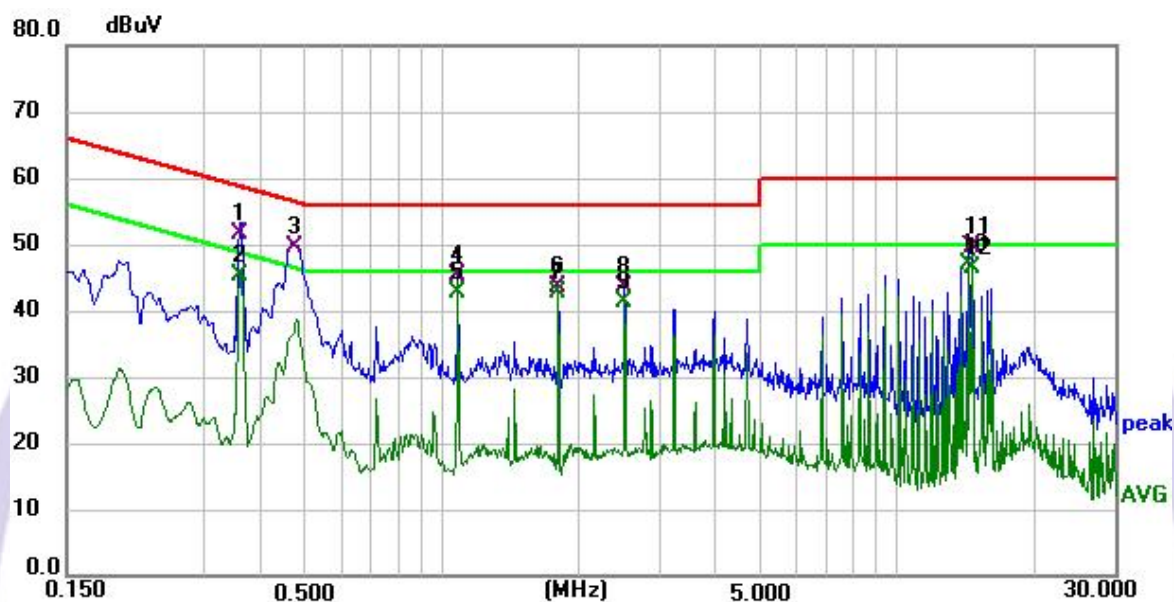
Channel:	Low	Phase :	L
Model:	D71W		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.361	41.98	9.87	51.85	58.71	-6.86	QP	P
2	0.361	35.66	9.87	45.53	48.71	-3.18	AVG	P
3	0.465	37.97	9.99	47.96	56.60	-8.64	QP	P
4	1.081	37.02	9.81	46.83	56.00	-9.17	QP	P
5	1.081	32.84	9.81	42.65	46.00	-3.35	AVG	P
6	1.801	36.65	10.24	46.89	56.00	-9.11	QP	P
7	1.801	32.45	10.24	42.69	46.00	-3.31	AVG	P
8 *	2.521	32.75	10.12	42.87	46.00	-3.13	AVG	P
9	3.241	30.14	9.81	39.95	46.00	-6.05	AVG	P
10	4.690	36.46	9.86	46.32	56.00	-9.68	QP	P
11	14.600	39.97	10.32	50.29	60.00	-9.71	QP	P
12	14.600	34.80	10.32	45.12	50.00	-4.88	AVG	P



Channel:	High	Phase :	N
Model:	D71W		

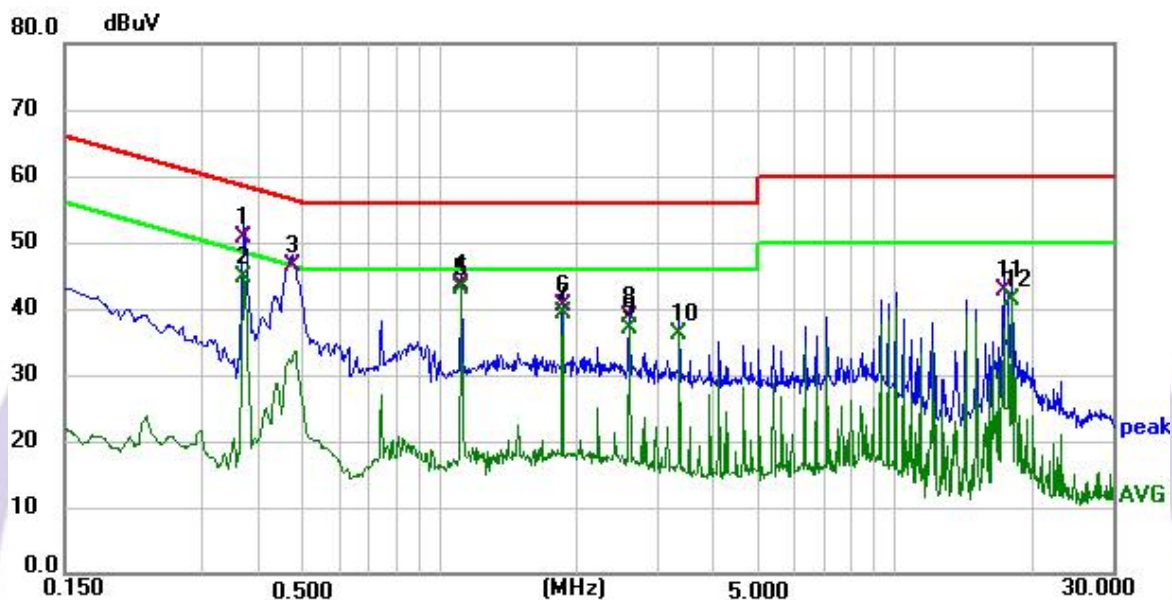


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.361	41.64	9.99	51.63	58.71	-7.08	QP	P
2	0.361	35.42	9.99	45.41	48.71	-3.30	AVG	P
3	0.474	39.59	10.04	49.63	56.44	-6.81	QP	P
4	1.081	35.43	9.93	45.36	56.00	-10.64	QP	P
5	1.081	32.70	9.93	42.63	46.00	-3.37	AVG	P
6	1.801	33.68	9.94	43.62	56.00	-12.38	QP	P
7	1.801	32.71	9.94	42.65	46.00	-3.35	AVG	P
8	2.521	33.77	9.80	43.57	56.00	-12.43	QP	P
9	2.521	31.36	9.80	41.16	46.00	-4.84	AVG	P
10 *	14.425	36.96	10.00	46.96	50.00	-3.04	AVG	P
11	14.600	39.57	10.00	49.57	60.00	-10.43	QP	P
12	14.600	36.42	10.00	46.42	50.00	-3.58	AVG	P

Notes:

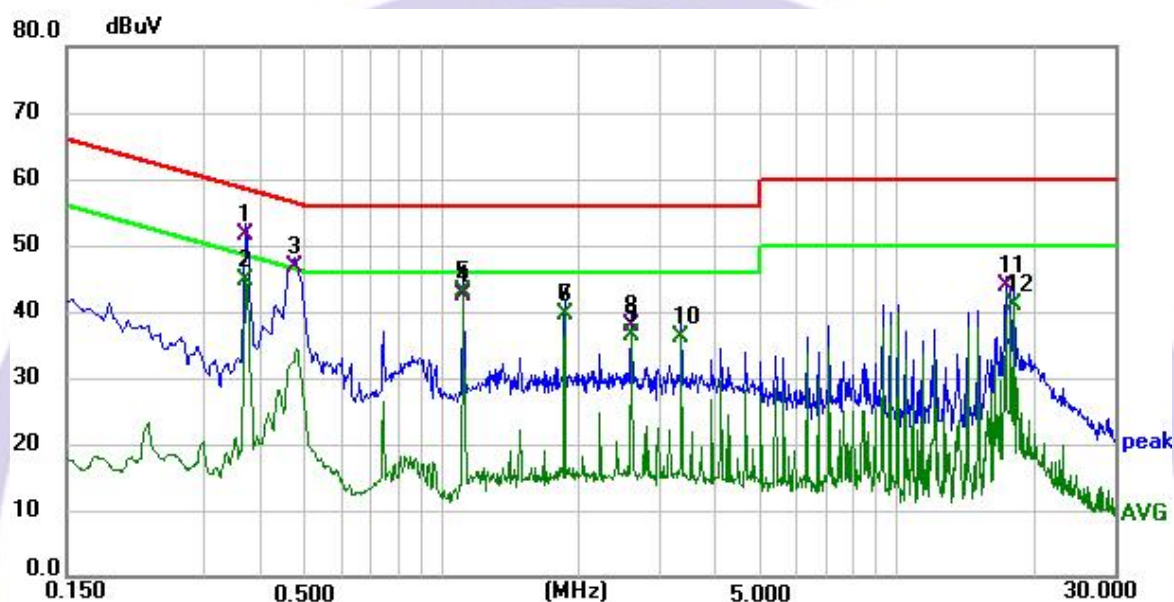
1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Measurement Level = Reading level + Correct Factor

Channel:	Low	Phase :	L
Model:	D51W		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.370	40.80	9.94	50.74	58.50	-7.76	QP	P
2	0.370	34.84	9.94	44.78	48.50	-3.72	AVG	P
3	0.474	36.39	9.96	46.35	56.44	-10.09	QP	P
4	1.117	33.78	9.83	43.61	56.00	-12.39	QP	P
5 *	1.117	33.04	9.83	42.87	46.00	-3.13	AVG	P
6	1.864	30.22	10.29	40.51	56.00	-15.49	QP	P
7	1.864	29.10	10.29	39.39	46.00	-6.61	AVG	P
8	2.602	28.51	10.08	38.59	56.00	-17.41	QP	P
9	2.602	26.98	10.08	37.06	46.00	-8.94	AVG	P
10	3.349	26.42	9.79	36.21	46.00	-9.79	AVG	P
11	17.300	32.31	10.43	42.74	60.00	-17.26	QP	P
12	18.050	30.71	10.46	41.17	50.00	-8.83	AVG	P

Channel:	Low	Phase :	N
Model:	D51W		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.370	41.70	9.99	51.69	58.50	-6.81	QP	P
2	0.370	34.86	9.99	44.85	48.50	-3.65	AVG	P
3	0.474	36.68	10.04	46.72	56.44	-9.72	QP	P
4	1.117	32.44	9.93	42.37	56.00	-13.63	QP	P
5 *	1.117	32.95	9.93	42.88	46.00	-3.12	AVG	P
6	1.864	29.72	9.95	39.67	56.00	-16.33	QP	P
7	1.864	29.62	9.95	39.57	46.00	-6.43	AVG	P
8	2.602	28.07	9.78	37.85	56.00	-18.15	QP	P
9	2.602	26.78	9.78	36.56	46.00	-9.44	AVG	P
10	3.349	26.38	9.82	36.20	46.00	-9.80	AVG	P
11	17.300	33.92	10.04	43.96	60.00	-16.04	QP	P
12	18.050	30.96	10.04	41.00	50.00	-9.00	AVG	P

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Measurement Level = Reading level + Correct Factor

## 7 Radiated Spurious Emissions

Test Requirement : FCC part 15.407(b)/15.209  
 Test Method : ANSI C63.10:2013  
 Test Result : PASS  
 Measurement Distance : 3m  
 Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	20log <sup>(2400/F(kHz))</sup> + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log <sup>(24000/F(kHz))</sup> + 40
1.705 ~ 30	30	30	100 * 30	20log <sup>(30)</sup> + 40
30 ~ 88	100	3	100	20log <sup>(100)</sup>
88 ~ 216	150	3	150	20log <sup>(150)</sup>
216 ~ 960	200	3	200	20log <sup>(200)</sup>
Above 960	500	3	500	20log <sup>(500)</sup>

### 7.1 EUT Operation

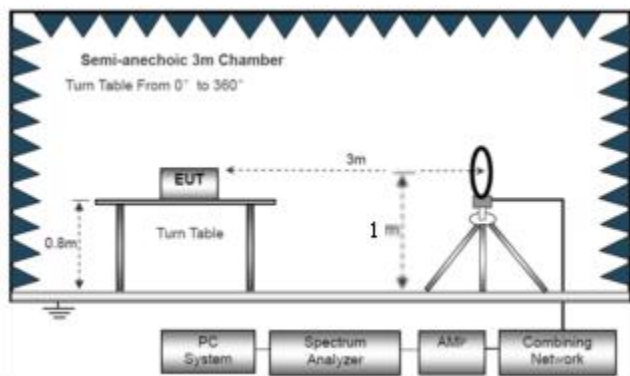
Operating Environment :

Temperature : 24.5 °C  
 Humidity : 55.5% RH  
 Atmospheric Pressure : 101.3kPa  
 Test Voltage : AC 120V60Hz

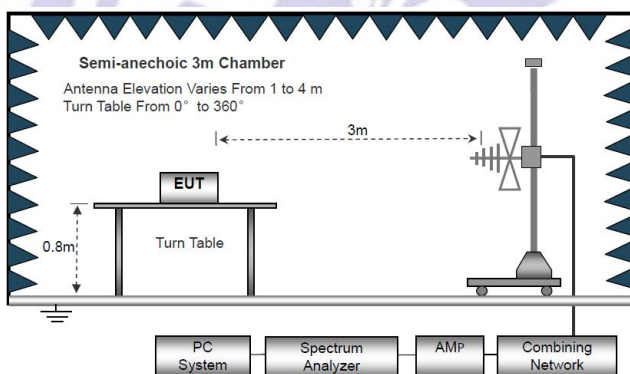
## 7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

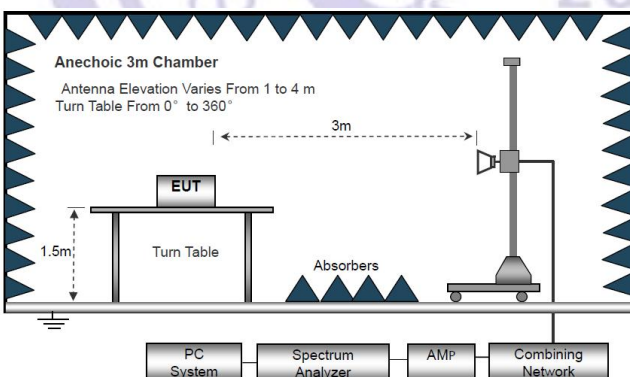
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



**7.3 Spectrum Analyzer Setup**

<b>Spectrum Parameter</b>	<b>Setting</b>
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

<b>Receiver Parameter</b>	<b>Setting</b>
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

## 7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
7. Test Procedure of measurement (For Above 1GHz):
  - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
  - 2) Change the antenna polarization and repeat 1) with vertical polarization.
  - 3) Make a hardcopy of the spectrum.
  - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
  - 5) Change the analyser mode to Clear/ Write and found the cone of emission.
  - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
  - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
  - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

## 7.5 Summary of Test Results

### Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =  $40 \log(\text{Specific distance} / \text{test distance})$  (dB);  
Limit line = Specific limits (dBuV) + distance extrapolation factor.

### Test Frequency: 30MHz ~ 1GHz

Please refer to the following test plots, Low Channel (5726MHz) Worst case FSK for record:



Model:	D71W
--------	------

Test plot for Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 !	43.966	24.24	12.29	36.53	40.00	-3.47	QP
2 *	130.379	26.81	13.51	40.32	43.50	-3.18	QP
3 !	159.784	26.60	13.56	40.16	43.50	-3.34	QP
4 !	162.611	26.92	13.31	40.23	43.50	-3.27	QP
5 !	184.490	28.79	11.36	40.15	43.50	-3.35	QP
6 !	208.580	29.56	10.67	40.23	43.50	-3.27	QP

Remark: Emission Level = Reading + Factor

Model:	D71W
--------	------

Test plot for Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	34.396	24.14	12.75	36.89	40.00	-3.11	QP
2 !	37.680	23.89	12.89	36.78	40.00	-3.22	QP
3 !	45.375	23.32	13.22	36.54	40.00	-3.46	QP
4 !	48.672	23.06	13.37	36.43	40.00	-3.57	QP
5 !	68.872	20.50	15.89	36.39	40.00	-3.61	QP
6 !	159.784	26.68	13.53	40.21	43.50	-3.29	QP

Remark: Emission Level = Reading + Factor

Model:	D51W
--------	------

Test plot for Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 !	42.007	24.22	12.31	36.53	40.00	-3.47	QP
2 !	110.569	27.28	12.58	39.86	43.50	-3.64	QP
3 !	135.032	26.66	13.30	39.96	43.50	-3.54	QP
4 !	159.784	26.70	13.56	40.26	43.50	-3.24	QP
5 *	184.490	29.00	11.36	40.36	43.50	-3.14	QP
6 !	208.580	29.61	10.67	40.28	43.50	-3.22	QP

Remark: Emission Level = Reading + Factor

Model:	D51W
--------	------

Test plot for Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 !	33.917	23.13	12.73	35.86	40.00	-4.14	QP
2 !	37.416	23.86	12.88	36.74	40.00	-3.26	QP
3 !	39.715	23.63	12.96	36.59	40.00	-3.41	QP
4 *	72.084	20.85	16.10	36.95	40.00	-3.05	QP
5 !	79.800	20.16	16.68	36.84	40.00	-3.16	QP
6 !	110.569	27.08	12.57	39.65	43.50	-3.85	QP

Remark: Emission Level = Reading + Factor

### Test Frequency 1GHz-25GHz

FSK mode have been tested, and the worst result(FSK) was report as below

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:5726									
V	11452.00	56.31	30.55	5.77	24.66	56.19	74.00	-17.81	PK
V	11452.00	46.23	30.55	5.77	24.66	46.11	54.00	-7.89	AV
V	17178.00	54.63	30.33	6.32	24.55	55.17	74.00	-18.83	PK
V	17178.00	44.61	30.33	6.32	24.55	45.15	54.00	-8.85	AV
V	22904.00	50.33	30.85	7.45	24.69	51.62	74.00	-22.38	PK
H	11452.00	56.34	30.55	5.77	24.66	56.22	74.00	-17.78	PK
H	11452.00	46.29	30.55	5.77	24.66	46.17	54.00	-7.83	AV
H	17178.00	54.06	30.33	6.32	24.55	54.6	74.00	-19.4	PK
H	17178.00	44.13	30.33	6.32	24.55	44.67	54.00	-9.33	AV
H	22904.00	51.02	30.85	7.45	24.69	52.31	74.00	-21.69	PK
operation frequency:5786									
V	11572.00	56.38	30.55	5.77	24.66	56.26	74.00	-17.74	PK
V	11572.00	46.41	30.55	5.77	24.66	46.29	54.00	-7.71	AV
V	17358.00	54.13	30.33	6.32	24.55	54.67	74.00	-19.33	PK
V	17358.00	44.59	30.33	6.32	24.55	45.13	54.00	-8.87	AV
V	23144.00	50.39	30.85	7.45	24.69	51.68	74.00	-22.32	PK
H	17358.00	56.37	30.55	5.77	24.66	56.25	74.00	-17.75	PK
H	17358.00	46.17	30.55	5.77	24.66	46.05	54.00	-7.95	AV
H	17358.00	54.32	30.33	6.32	24.55	54.86	74.00	-19.14	PK

H	17358.00	44.27	30.33	6.32	24.55	44.81	54.00	-9.19	AV
H	17358.00	50.47	30.85	7.45	24.69	51.76	74.00	-22.24	PK
operation frequency:5850									
V	11700.00	55.39	30.55	5.77	24.66	55.27	74.00	-18.73	PK
V	11700.00	45.82	30.55	5.77	24.66	45.7	54.00	-8.3	AV
V	17550.00	54.36	30.33	6.32	24.55	54.9	74.00	-19.1	PK
V	17550.00	44.28	30.33	6.32	24.55	44.82	54.00	-9.18	AV
V	23400.00	51.03	30.85	7.45	24.69	52.32	74.00	-21.68	PK
H	11700.00	56.27	30.55	5.77	24.66	56.15	74.00	-17.85	PK
H	11700.00	46.31	30.55	5.77	24.66	46.19	54.00	-7.81	AV
H	17550.00	54.41	30.33	6.32	24.55	54.95	74.00	-19.05	PK
H	17550.00	44.51	30.33	6.32	24.55	45.05	54.00	-8.95	AV
H	23400.00	50.39	30.85	7.45	24.69	51.68	74.00	-22.32	PK

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,

Margin= Emission Level - Limit

2. If peak below the average limit, the average emission was no test.

3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

### Spurious Emission in Restricted Band

FSK mode have been tested, and the worst result(FSK) was report as below

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Emission Level	Limits	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB/m)	(dBuV/m)	(dBm)	(dBm)	
V	5650.00	55.36	30.09	4.80	23.90	53.97	-41.23	-27	PK
V	5700.00	55.31	30.18	4.82	23.94	53.89	-41.31	10	PK
V	5720.00	56.18	30.20	4.85	23.98	54.81	-40.39	15.6	PK
V	5725.00	56.06	30.22	4.85	23.98	54.67	-40.53	27	PK
V	5850.00	55.32	30.22	4.85	23.98	53.93	-41.27	27	PK
V	5855.00	55.04	30.22	4.85	23.98	53.65	-41.55	15.6	PK
V	5875.00	55.38	30.24	4.86	24.01	54.01	-41.19	10	PK
V	5925.00	55.49	30.28	4.88	24.09	54.18	-41.02	-27	PK
H	5650.00	55.36	30.09	4.80	23.90	53.97	-41.23	-27	PK
H	5700.00	55.31	30.18	4.82	23.94	53.89	-41.31	10	PK
H	5720.00	56.18	30.20	4.85	23.98	54.81	-40.39	15.6	PK
H	5725.00	56.06	30.22	4.85	23.98	54.67	-40.53	27	PK
H	5850.00	55.32	30.22	4.85	23.98	53.93	-41.27	27	PK
H	5855.00	55.04	30.22	4.85	23.98	53.65	-41.55	15.6	PK
H	5875.00	55.38	30.24	4.86	24.01	54.01	-41.19	10	PK
H	5925.00	55.49	30.28	4.88	24.09	54.18	-41.02	-27	PK

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,

Margin= Emission Level - Limit

2. If peak below the average limit, the average emission was no test.

3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

## 8 PEAK OUTPUT POWER TEST

Test Requirement:	FCC Part15 C Section 15.407(a)
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01

### 8.1.1 Applied procedures / limit

FCC Part15 (15.407) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.407(a)	Peak Output Power	1 watt or 30dBm	5725-5850	PASS

### 8.1.2 TEST PROCEDURE

- a. The EUT was directly connected to the Power meter.

### 8.1.3 DEVIATION FROM STANDARD

No deviation.

### 8.1.4 TEST SETUP



### 8.1.5 EUT OPERATION CONDITIONS

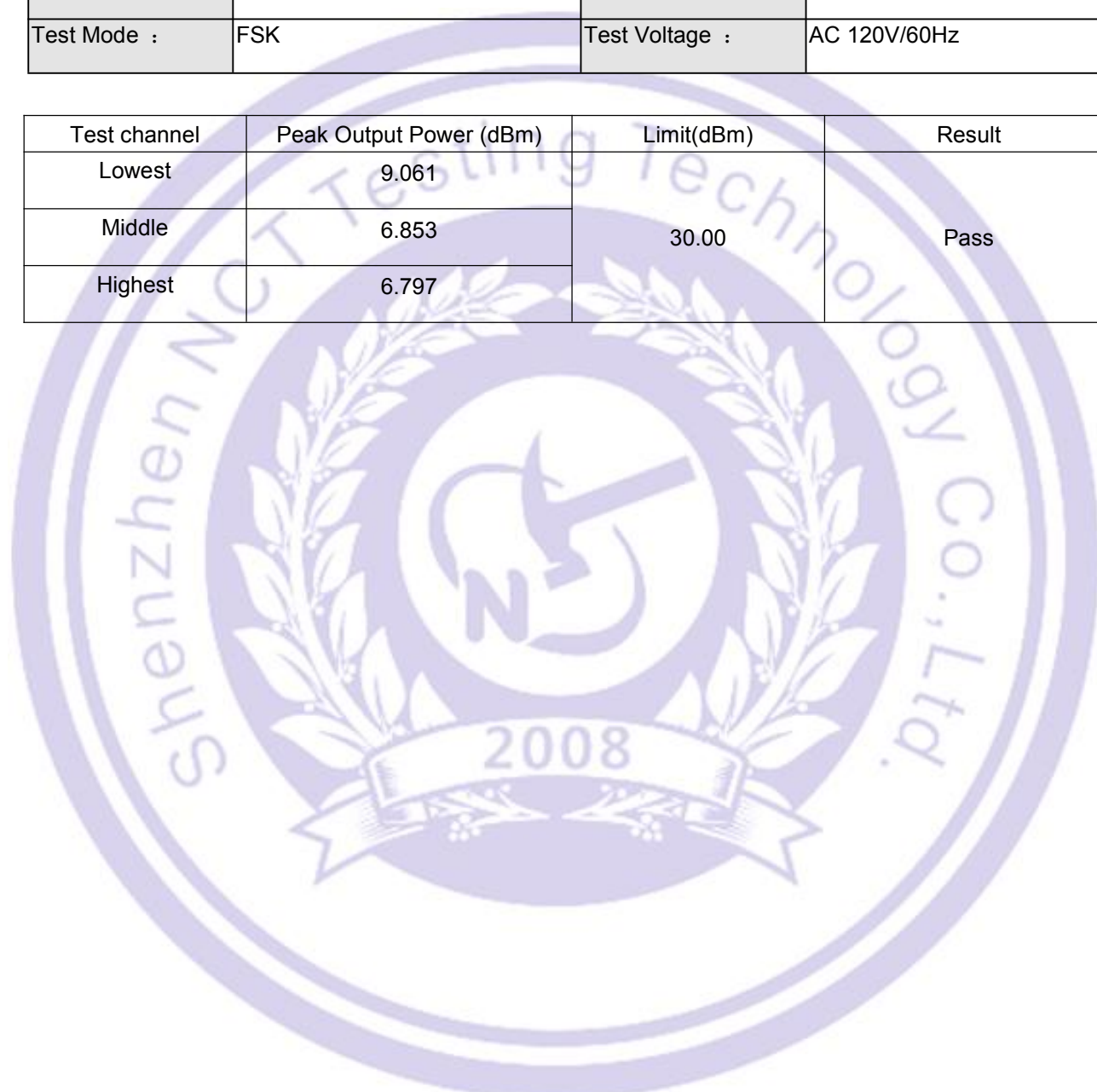
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



## 8.1.6 test results

Temperature:	26°C	Relative Humidity:	54%
Test Mode :	FSK	Test Voltage :	AC 120V/60Hz

Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	9.061	30.00	Pass
Middle	6.853		
Highest	6.797		



## 9 Channel Bandwidth

### 9.1.1 Applied procedures / limit

The bandwidth at 6 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum power control level, as defined in KDB 789033, at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26 dB bandwidth. The 26 dB bandwidth is used to determine the conducted power limits. The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

### 9.1.2 TEST PROCEDURE

#### 1. Emission Bandwidth (EBW)

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission.

Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

#### 2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) 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 6 dB relative to the maximum level measured in the fundamental emission.

### 9.1.3 DEVIATION FROM STANDARD

No deviation.

### 9.1.4 TEST SETUP



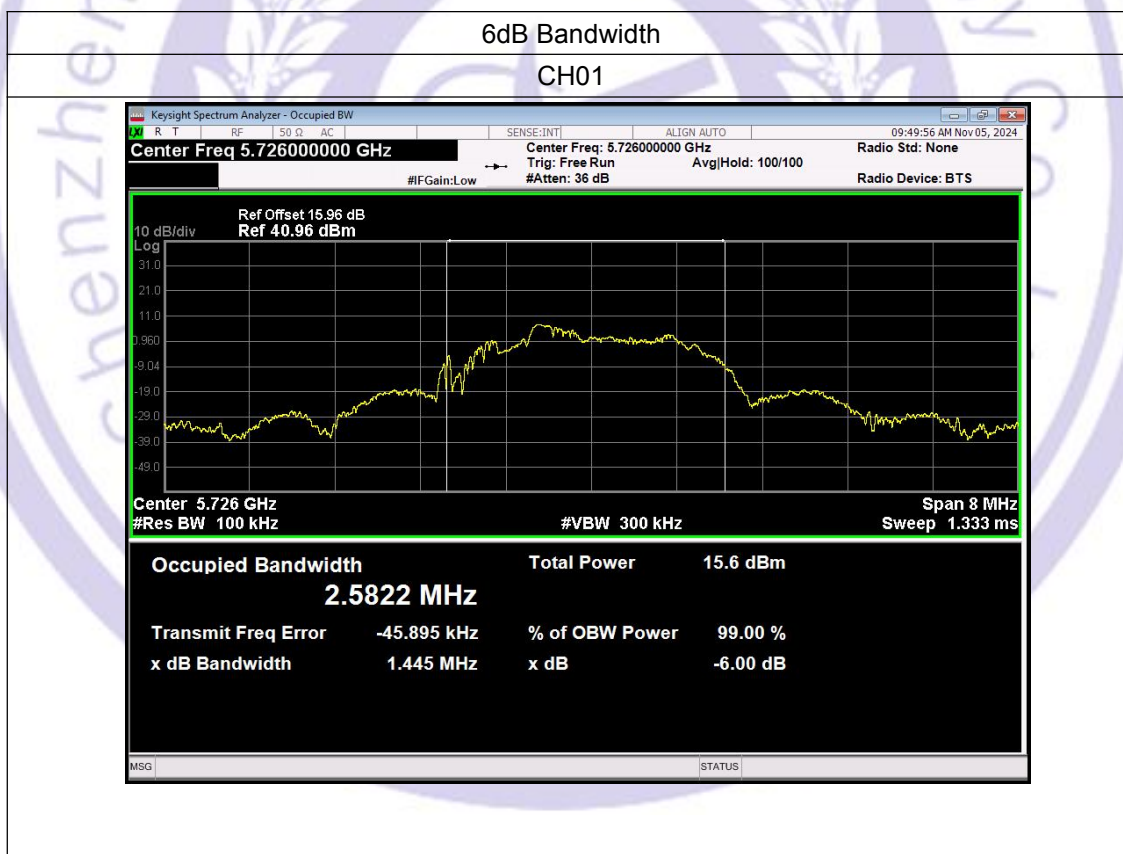
### 9.1.5 EUT OPERATION CONDITIONS

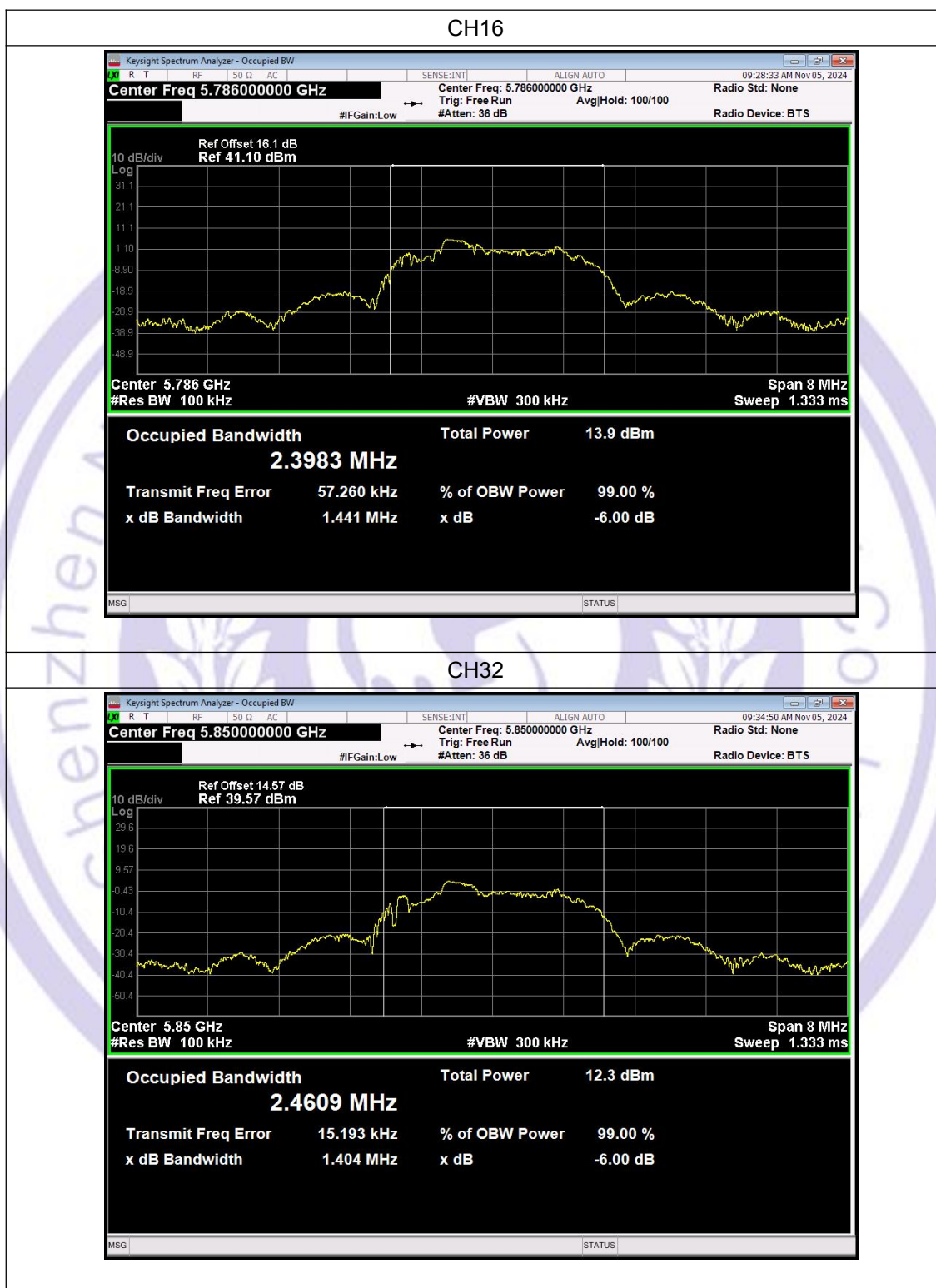
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

## 9.1.6 test results

Temperature:	26°C	Relative Humidity:	54%
Test Mode :	FSK	Test Voltage :	AC 120V/60Hz

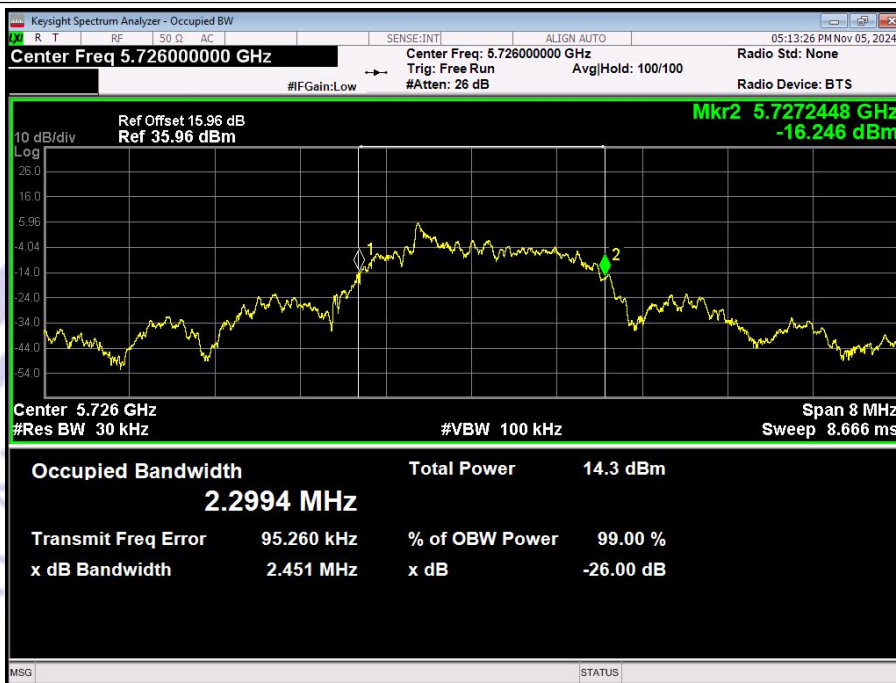
Test channel	6dB Bandwidth (MHz)	99% Occupied bandwidth(MHz)	Limit(KHz)	Result
Lowest	1.445	2.2994	>500	Pass
Middle	1.441	2.3657		
Highest	1.404	2.3863		



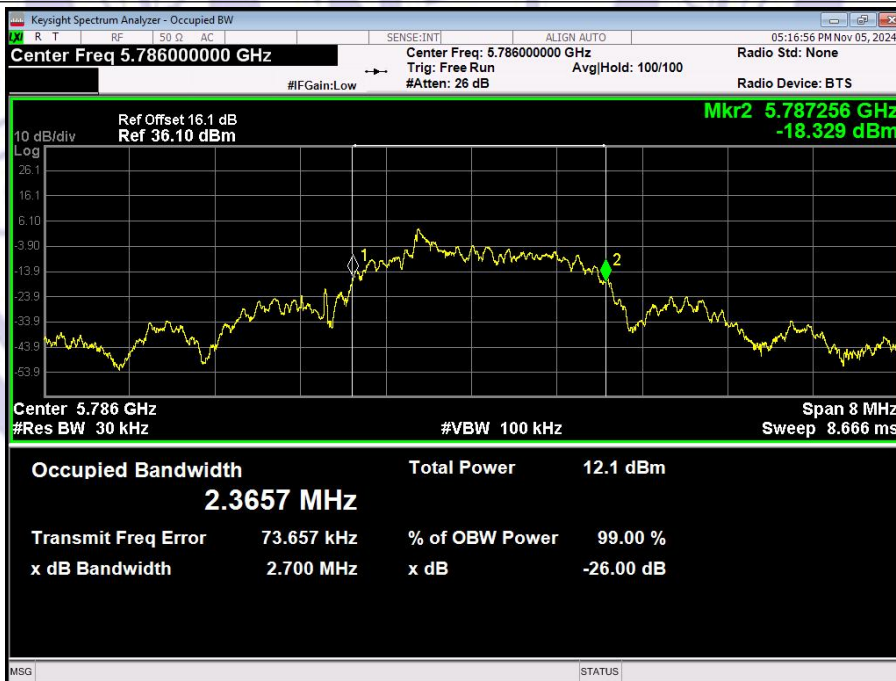


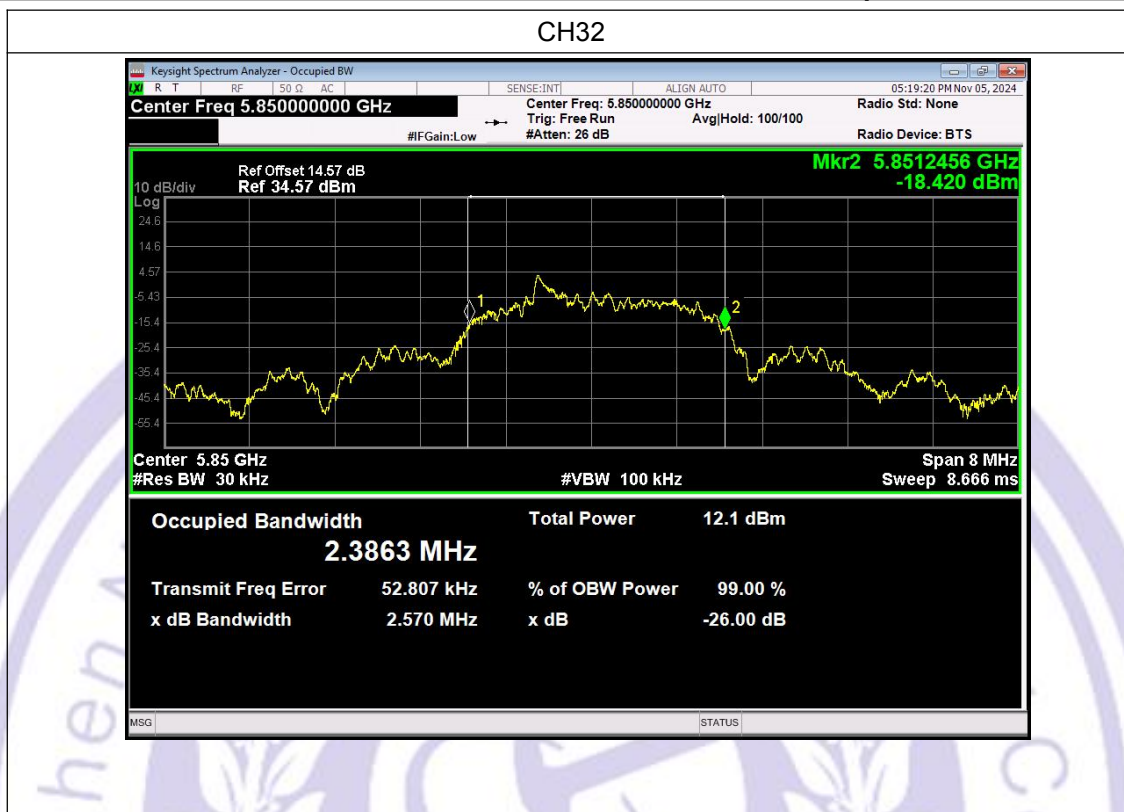
99% Bandwidth

CH01



CH16





## 10 On Time and Duty Cycle

### 10.1.1 Standard Applicable

None; for reporting purpose only

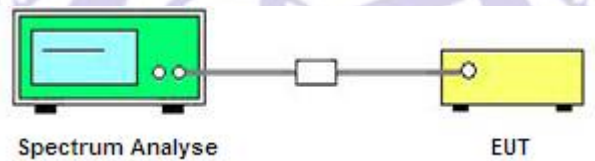
### 10.1.2 Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of the spectrum analyzer.

### 10.1.3 Test Procedures

- 1). Set the Centre frequency of the spectrum analyzer to the transmitting frequency;
- 2). Set the span=0MHz, RBW=8MHz, VBW=8MHz, Sweep time=10001pts;
- 3). Detector = peak;
- 4). Trace mode = Single hold.

### 10.1.4 Test Setup Layout



### 10.1.5 EUT Operation during Test

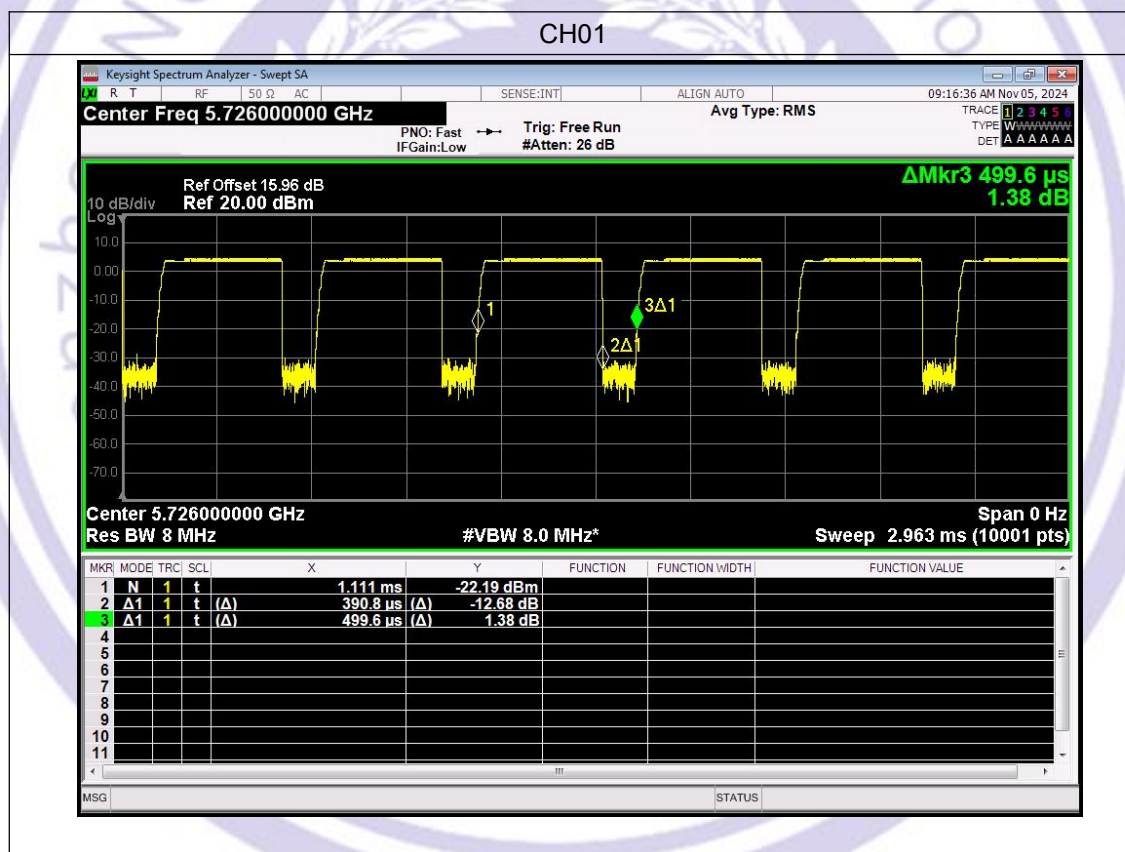
The EUT was programmed to be in continuously transmitting mode.

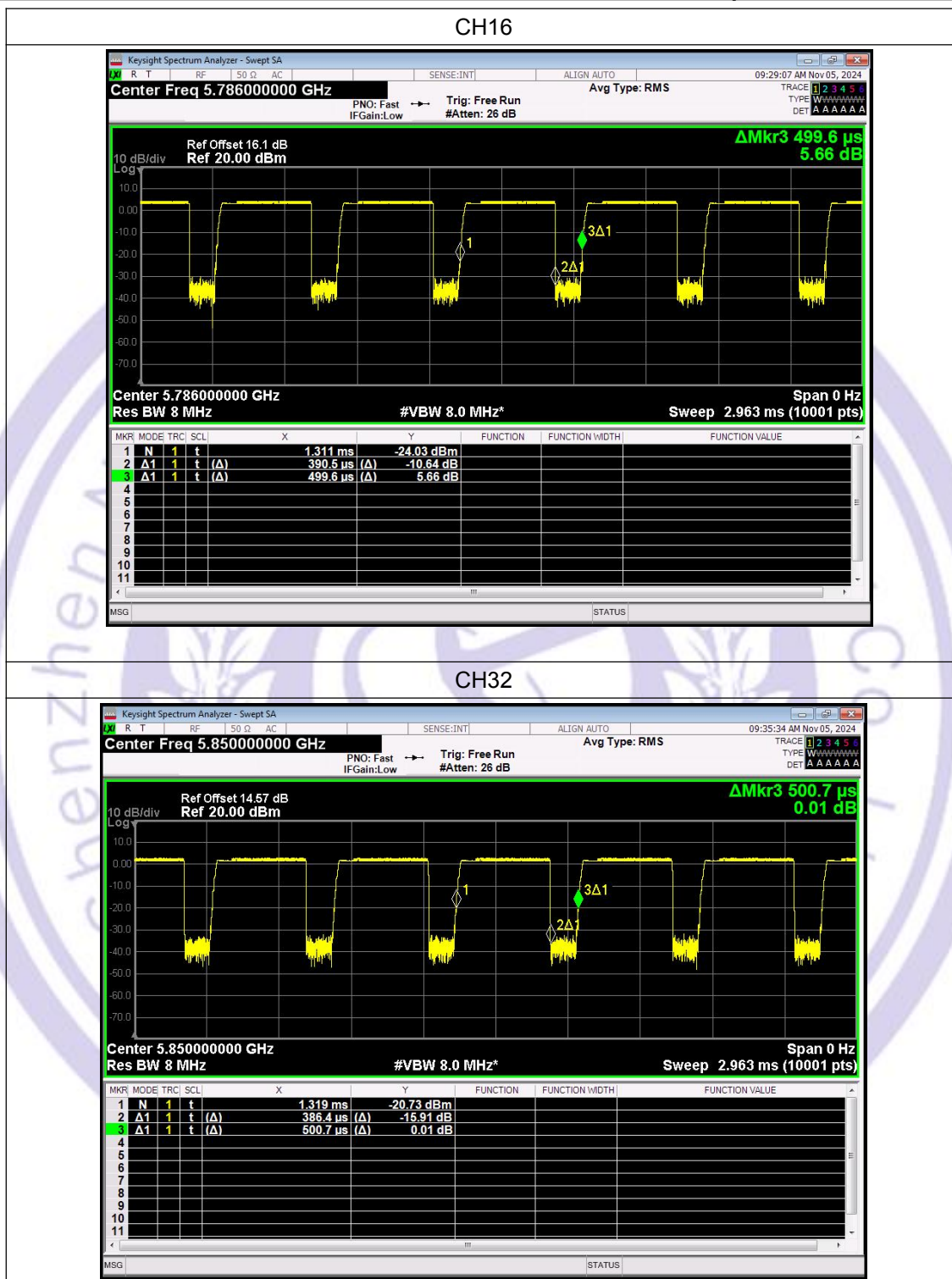


## 10.1.6 Test result

Mode	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)
FSK	01	0.391	0.500	78.23	0.7823	1.0663
	16	0.391	0.500	78.17	0.7817	1.0696
	32	0.386	0.501	77.16	0.7716	1.1261

## Test Graphs





## 11 POWER SPECTRAL DENSITY TEST

Test Requirement:	FCC Part15 C Section 15.407 (e)
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v02r01

### 11.1.1 Applied procedures / limit

FCC Part15 (15.407) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.407 (e)	Power Spectral Density	30dBm/500kHz	5725-5850	PASS

### 11.1.2 TEST PROCEDURE

Methods refer to FCC KDB 789033

- a) Set RBW  $\geq 1/T$ , where T is defined in II.B.I.a).
- b) Set VBW  $\geq 3$  RBW.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10 \log(500 \text{ kHz}/\text{RBW})$  to the measured result, whereas RBW ( $< 500 \text{ kHz}$ ) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10 \log(1\text{MHz}/\text{RBW})$  to the measured result, whereas RBW( $< 1 \text{ MHz}$ ) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

### 11.1.3 DEVIATION FROM STANDARD

No deviation.

## 11.1.4 TEST SETUP



## 11.1.5 EUT OPERATION CONDITIONS

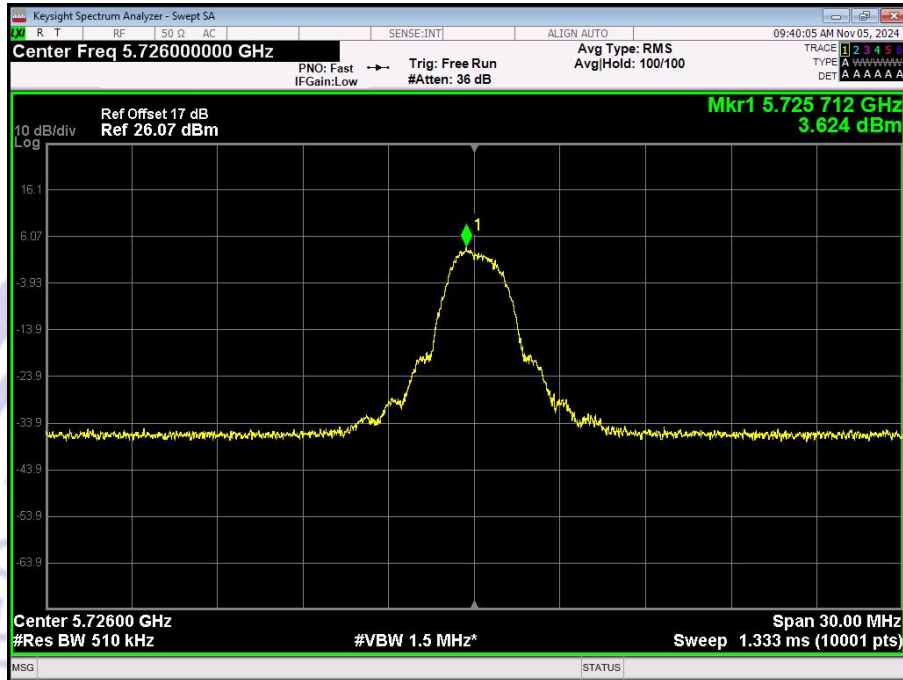
The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

## 11.1.6 test results

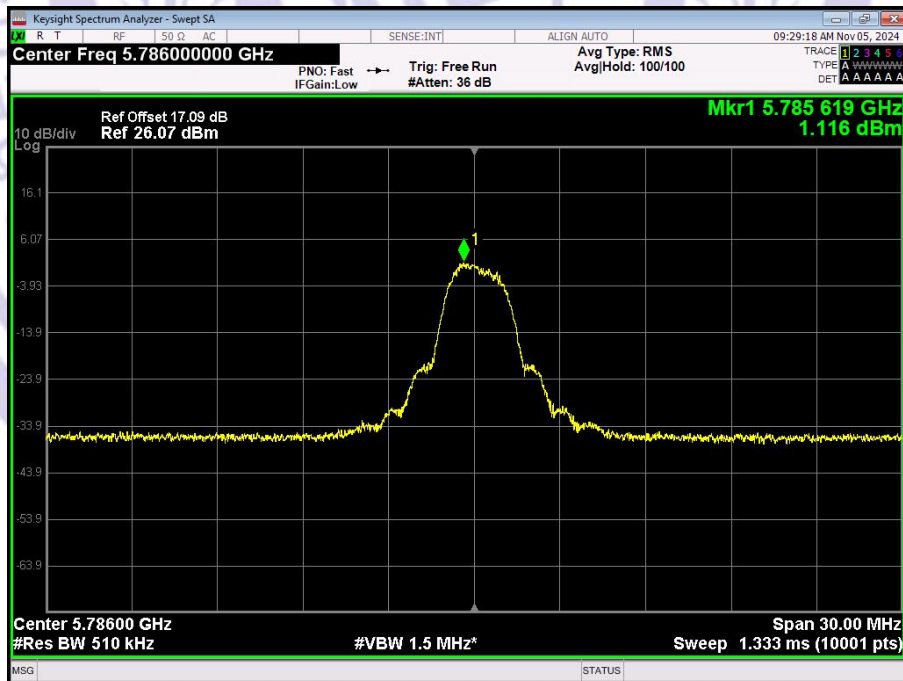
Temperature:	26°C	Relative Humidity:	54%
Test Mode :	FSK	Test Voltage :	AC 120V/60Hz

Frequency	Power Spectral Density (dBm/500kHz)	Duty Cycle Factor (db)	Report Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)	Result
5726 MHz	3.624	1.07	4.694	30.00	PASS
5786 MHz	1.116	1.07	2.086	30.00	PASS
5850 MHz	0.627	1.13	1.757	30.00	PASS

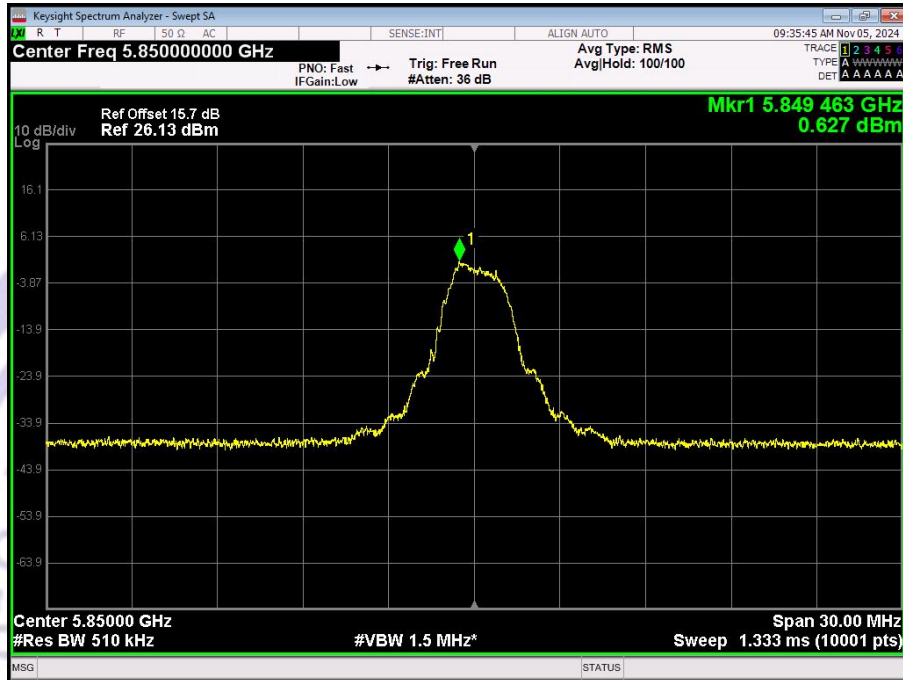
CH01



CH16



CH32



## 12 Conducted BAND EDGE

### 12.1.1 Applicable Standard

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.

provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.

FCC: For the band 5725-5825 MHz, 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.

### 12.1.2 Test Procedure

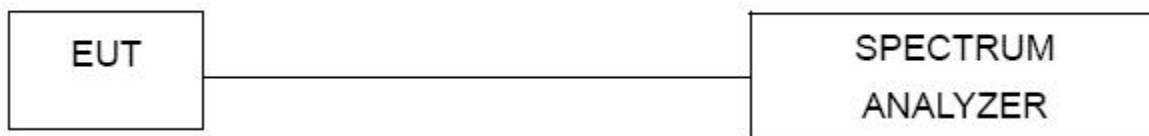
Using the following spectrum analyzer setting:

- A) Set the RBW = 1MHz.
- B) Set the VBW = 3MHz.
- C) Sweep time = auto couple.
- D) Detector function = peak.
- E) Trace mode = max hold.
- F) Allow trace to fully stabilize.
- G) Note: Antenna gain was considered during the test.

### 12.1.3 DEVIATION FROM STANDARD

No deviation.

## 12.1.4 TEST SETUP



## 12.1.5 EUT OPERATION CONDITIONS

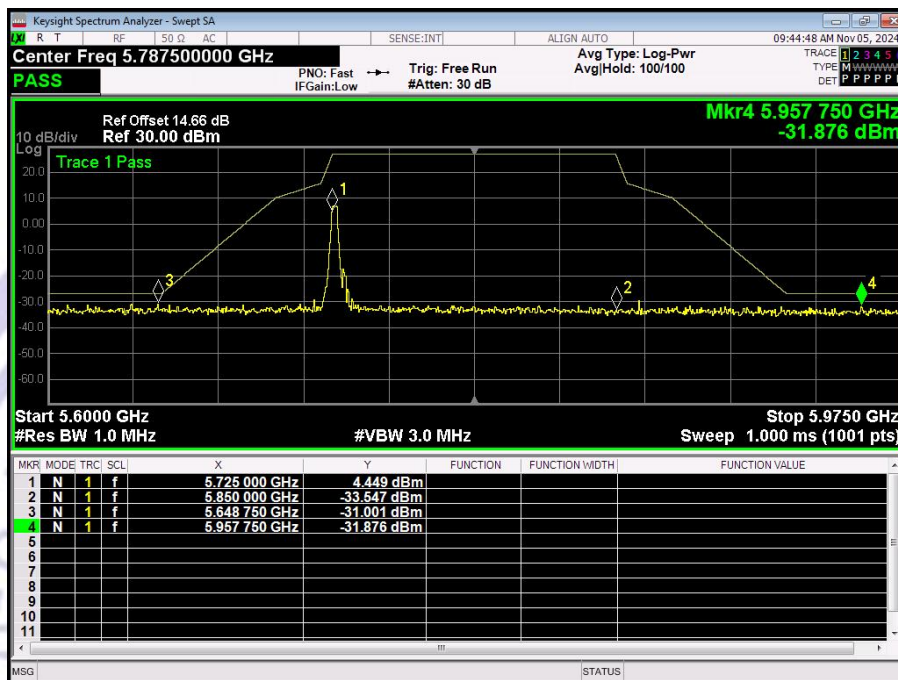
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



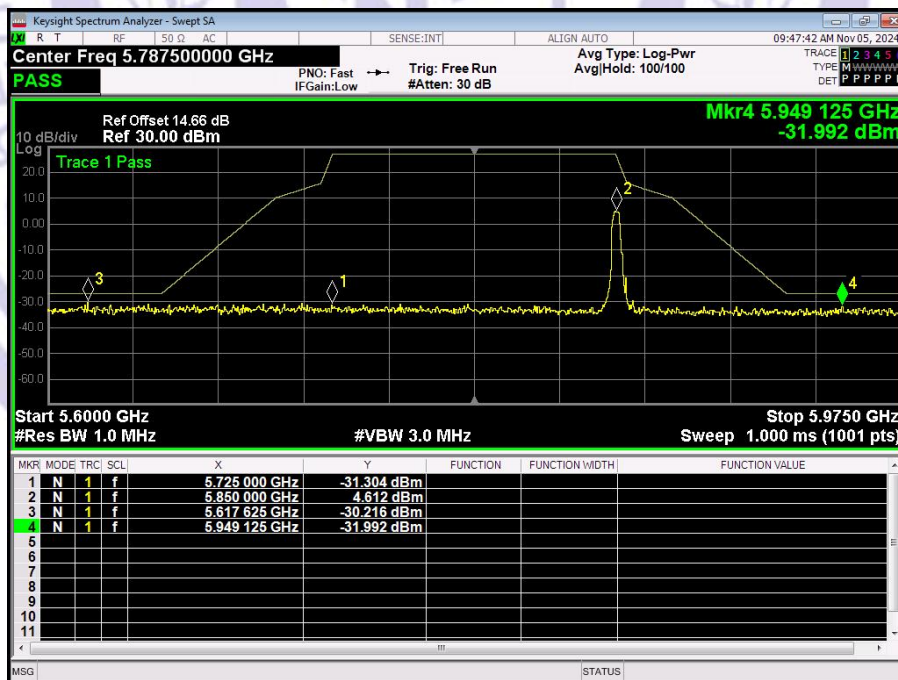


## 12.1.6 TEST RESULTS

5726MHz



5850MHz



## 12 Antenna Requirement

### 12.1 Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203
Requirement	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.

### 12.2 Antenna Connected Construction

The antenna is PCB Antenna which permanently attached, and the best case gain of the antenna is 4.24dBi. It complies with the standard requirement.

## 13 APPENDIX I -- TEST SETUP PHOTOGRAPH

Please see the attachment for details.



## 14 APPENDIX II -- EUT PHOTOGRAPH

Please see the attachment for details.

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

