FCC RADIO TEST REPORT

FCC ID: 2A376-HL100

Sample： Light Hotspot Miner

Trade Name： Smart Harvest Instruments

Main Model： HL100

Additional Model： N/A

Report No.： UNIA21122119ER-63

Prepared for

Smart Harvest Instruments Inc.

180 Northfield Drive West, Unit 4, Waterloo, N2L 0C7, Canada

Prepared by

Shenzhen United Testing Technology Co., Ltd.

2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, XixiangStr, Bao'an District, Shenzhen, China

TEST RESULTCERTIFICATION

Applicant.....:	Smart Harvest Instruments Inc.
Address.....:	180 Northfield Drive West, Unit 4, Waterloo, N2L 0C7, Canada
Manufacturer .....:	Smart Harvest Instruments Inc.
Address.....:	180 Northfield Drive West, Unit 4, Waterloo, N2L 0C7, Canada
Product description	
Product ..... :	Light Hotspot Miner
Trade Name .....:	Smart Harvest Instruments
Model Name.....:	HL100
Test Methods .....:	FCC Rules and Regulations Part 15 Subpart C Section 15.247 ANSI C63.10: 2013

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., 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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Date (s) of performance of tests ..... :	Dec. 21, 2021 ~ Feb. 22, 2022
Date of Issue ..... :	Feb. 24, 2022
Test Result ..... :	Pass

Prepared by: kahn.yang

Kahn yang/Editor

Reviewer: Sky dong

Sky dong/Supervisor

Approved & Authorized Signer: liuze

Liuze/Manager

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1. GENERAL INFORMATION

1.1. GENERAL DESCRIPTION OF EUT

Product:	Light Hotspot Miner
Trade Name:	Smart Harvest Instruments
Main Model:	HL100
Additional Model:	N/A
Model Difference:	N/A
FCC ID:	2A376-HL100
Antenna Type:	Connector RP-SMA + External antenna
Antenna Gain:	5dBi
Frequency Range:	923.3MHz~927.5MHz
Number of Channels:	8CH
Modulation Type:	LoRa (Chirp spread spectrum)
Battery:	N/A
Adapter:	N/A
Power Source:	DC 5.0V from adapter with AC 120(240)V/60Hz

1.2. CARRIER FREQUENCY OF CHANNELS

Frequency Band	Hopping Channel	Frequency (MHz)
923.3~927.5MHz	01	923.3
	02	923.9
	03	924.5
	04	925.1
	05	925.7
	06	926.3
	07	926.9
	08	927.5

1.3. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

1.4. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013).
Radiated testing was performed at an antenna to EUT distance 3 meters.

2. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI	ANSI	9kHz ~ 150kHz	2.96	
		150kHz ~ 30MHz	2.44	

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI	ANSI	9kHz ~ 30MHz	2.50	
		30MHz ~ 1000MHz	4.80	
		1000MHz ~ 18000MHz	4.13	

3. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel (923.3MHz)
2	Middle channel (925.1MHz)
3	High channel (927.5MHz)

Note:

1.Only the result of the worst case was recorded in the report, if no other cases.

2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

3. ForConductedTestmethod,atemporaryantennaconnectorisprovidedbythemanufacture.

4. SYSTEM TEST CONFIGURATION

4.1. CONFIGURATION OF EUT SYSTEM

Operation of EUT during Conducted and Radiation testing:

4.2. EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Note
E-1	Light Hotspot Miner	Smart Harvest Instruments	HL100	N/A
E-2	Adapter	XIAOMI	MDY-08-EF	AE

4.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247	Peak Output Power	Compliant
15.247	Occupied Bandwidth	Compliant
15.247	Band Edge	Compliant
15.247	Power Spectral Density	Compliant
15.209	Radiated Emission	Compliant
15.207	Conducted Emission	Compliant

5. TEST FACILITY

Test Laboratory : Shenzhen United Testing Technology Co., Ltd.
Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd,Tiegang Community, XixiangStr, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.The testing quality system of our laboratory meets with ISO/IEC-17025 requirements. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:
A2LA Certificate Number: 4747.01
The EMC Laboratory has been accredited by A2LA, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

FCC Registration Number: 674885
The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission.

IC Registration Number: 21947
The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada.

6. TEST EQUIPMENT OF RADIATED EMISSION TEST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Conduction Emissions Measurement					
1	Conducted Emission Test Software	EZ-EMC	Ver.CCS-3A1-CE	N/A	N/A
2	AMN	Schwarzbeck	NNLK8121	8121370	2022.09.22
3	AAN	TESEQ	T8-Cat6	38888	2022.09.22
4	Pulse Limiter	CYBRTEK	EM5010	E115010056	2022.05.17
5	EMI Test Receiver	Rohde&Schwarz	ESCI	101210	2022.09.22
Radiated Emissions Measurement					
1	Radiated Emission Test Software	EZ-EMC	Ver.CCS-03A1	N/A	N/A
2	Horn Antenna	Sunol	DRH-118	A101415	2022.09.27
3	Broadband Hybrid Antenna	Sunol	JB1	A090215	2022.03.01
4	PREAMP	HP	8449B	3008A00160	2022.09.22
5	PREAMP	HP	8447D	2944A07999	2022.05.17
6	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2022.09.22
7	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2022.09.22
8	Signal Generator	Agilent	E4421B	MY4335105	2022.09.22
9	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2022.09.22
10	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2022.09.22
11	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2022.05.17
12	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2022.05.17
13	RF power divider	Anritsu	K241B	992289	2022.09.22
14	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2022.09.22
15	Active Loop Antenna	Com-Power	AL-130R	10160009	2022.07.25
16	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2022.09.22
17	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2022.05.23
18	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2022.09.27
19	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2022.09.22
20	Signal Generator	Agilent	N5183A	MY47420153	2022.09.22
21	Spctrum Analyzer	Rohde&Schwarz	FSP 40	100501	2022.09.22
22	Power Meter	KEYSIGHT	N1911A	MY50520168	2022.09.22

23	Frequency Meter	VICTOR	VC2000	997406086	2022.09.22
24	DC Power Source	HYELEC	HY5020E	055161818	2022.09.22

7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

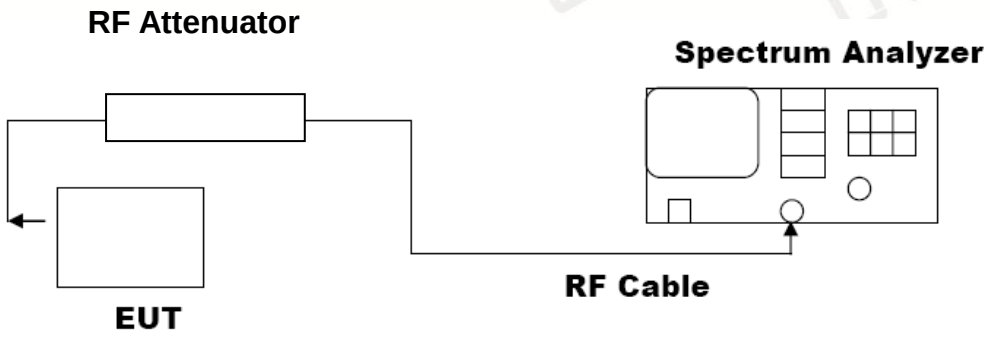
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
3. RBW > 20 dB bandwidth of the emission being measured.
4. VBW ≥RBW.
5. Sweep: Auto.
6. Detector function: Peak.
7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

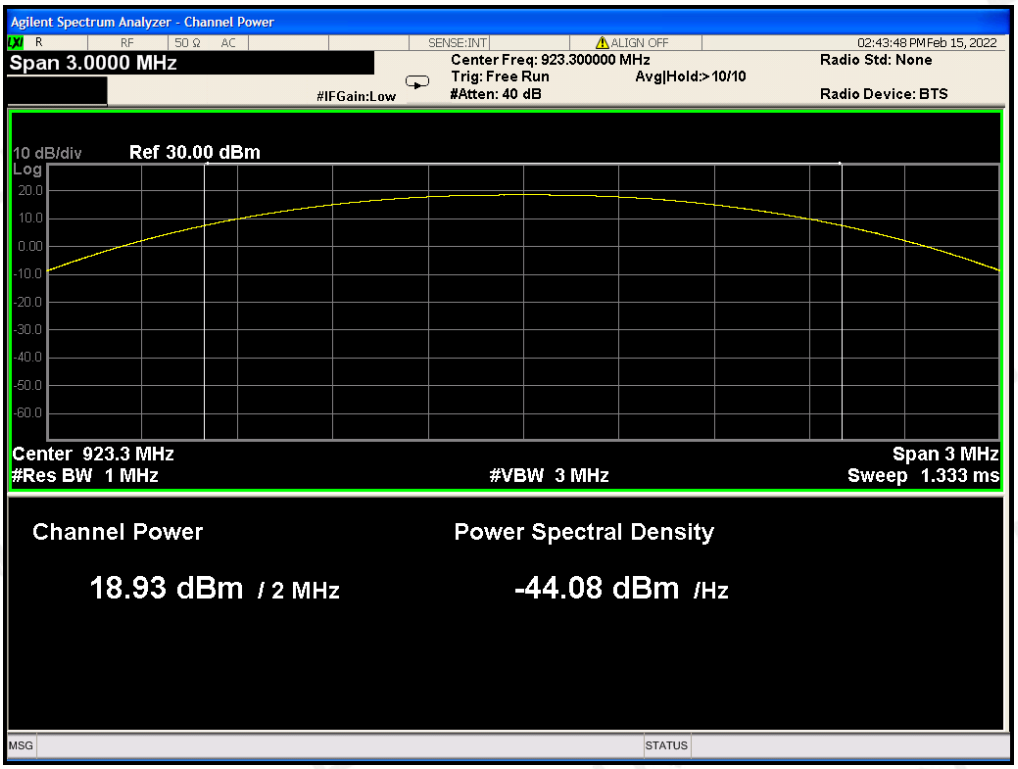
PEAK POWER TEST SETUP



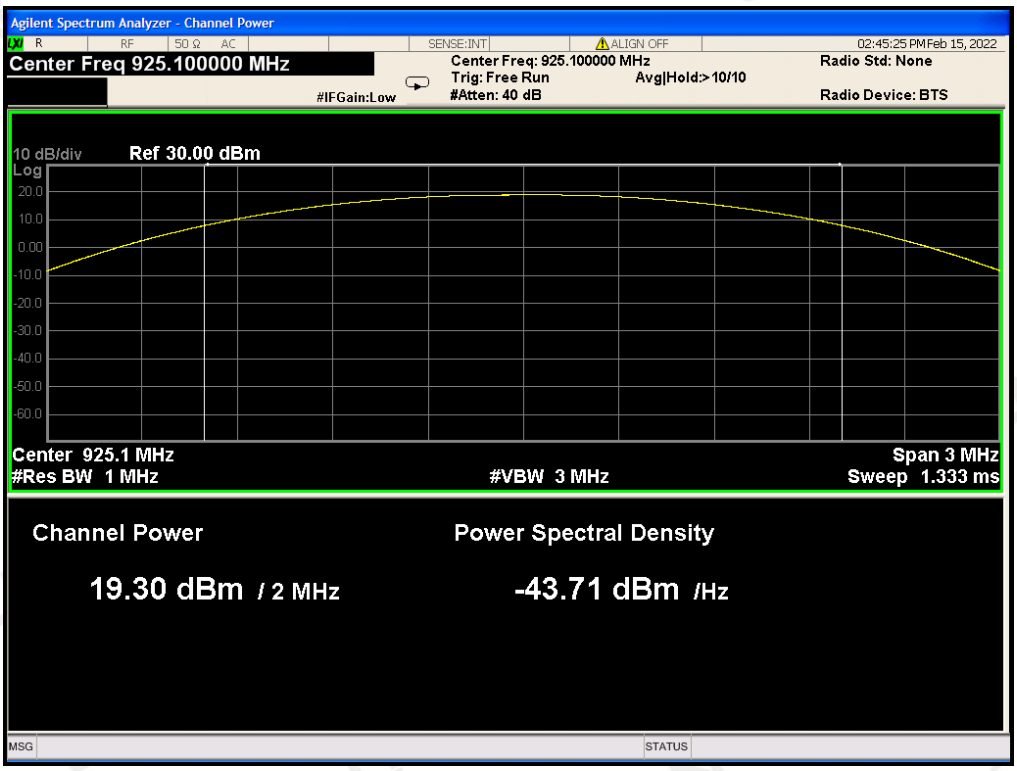
7.3. LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (MHz)	**Peak Power (dBm)**	**Applicable Limits (dBm)**	**Result**
923.3	18.93	21	Pass
925.1	19.30	21	Pass
927.5	18.86	21	Pass

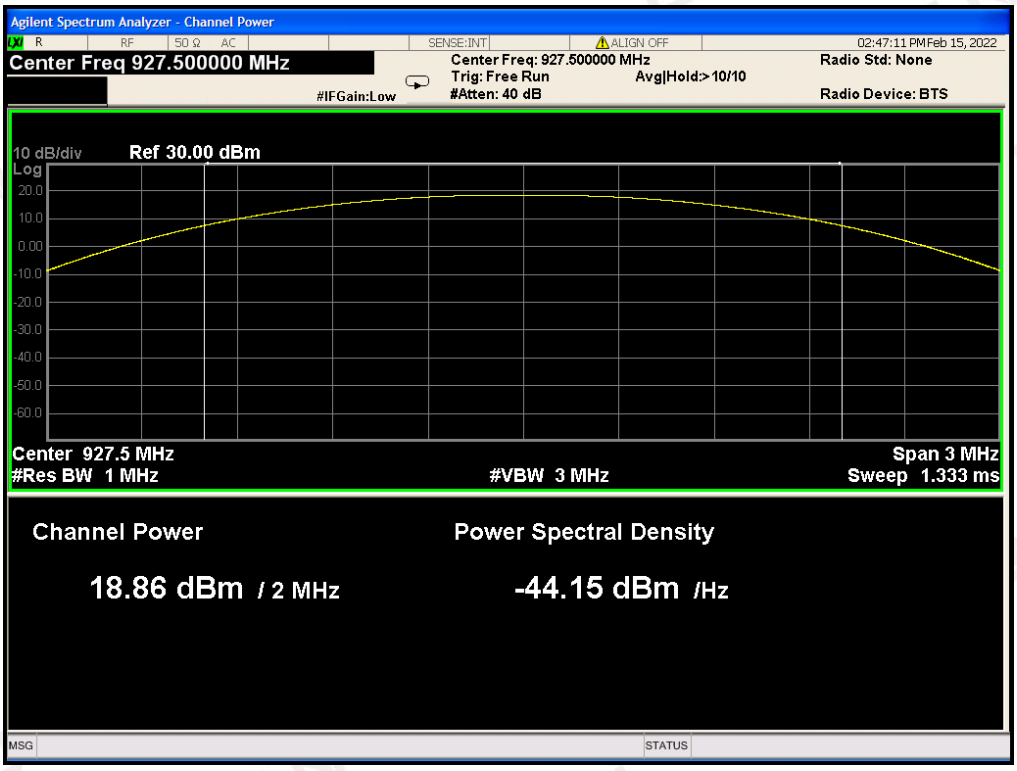
CH01



CH04


Agilent Spectrum Analyzer - Channel Power
Center Freq 925.100000 MHz
Center Freq: 925.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
02:45:25 PM Feb 15, 2022
10 dB/div
Log
Ref 30.00 dBm
Center 925.1 MHz
#Res BW 1 MHz
#VBW 3 MHz
Span 3 MHz
Sweep 1.333 ms
Channel Power
19.30 dBm / 2 MHz
Power Spectral Density
-43.71 dBm /Hz
MSG
STATUS

CH08


Agilent Spectrum Analyzer - Channel Power
Center Freq 927.500000 MHz
Center Freq: 927.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
02:47:11 PM Feb 15, 2022
10 dB/div
Log
Ref 30.00 dBm
Center 927.5 MHz
#Res BW 1 MHz
#VBW 3 MHz
Span 3 MHz
Sweep 1.333 ms
Channel Power
18.86 dBm / 2 MHz
Power Spectral Density
-44.15 dBm /Hz
MSG
STATUS

8. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

8.1. MEASUREMENT PROCEDURE

(1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
(2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
(3). Set the SPA Trace 1 Max hold, then View.
Note: The method of PKPSD in the KDB 558074 item 8.4 was used in this testing.

8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 7.2.

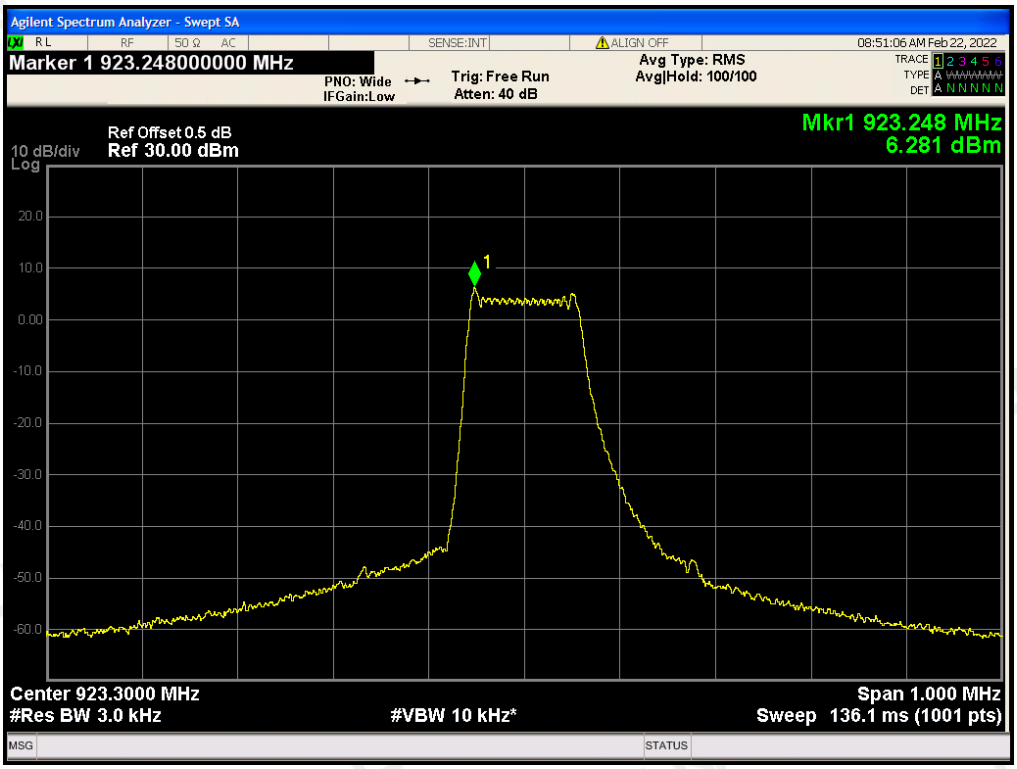
8.3. MEASUREMENT EQUIPMENT USED

Refer to Section 6.

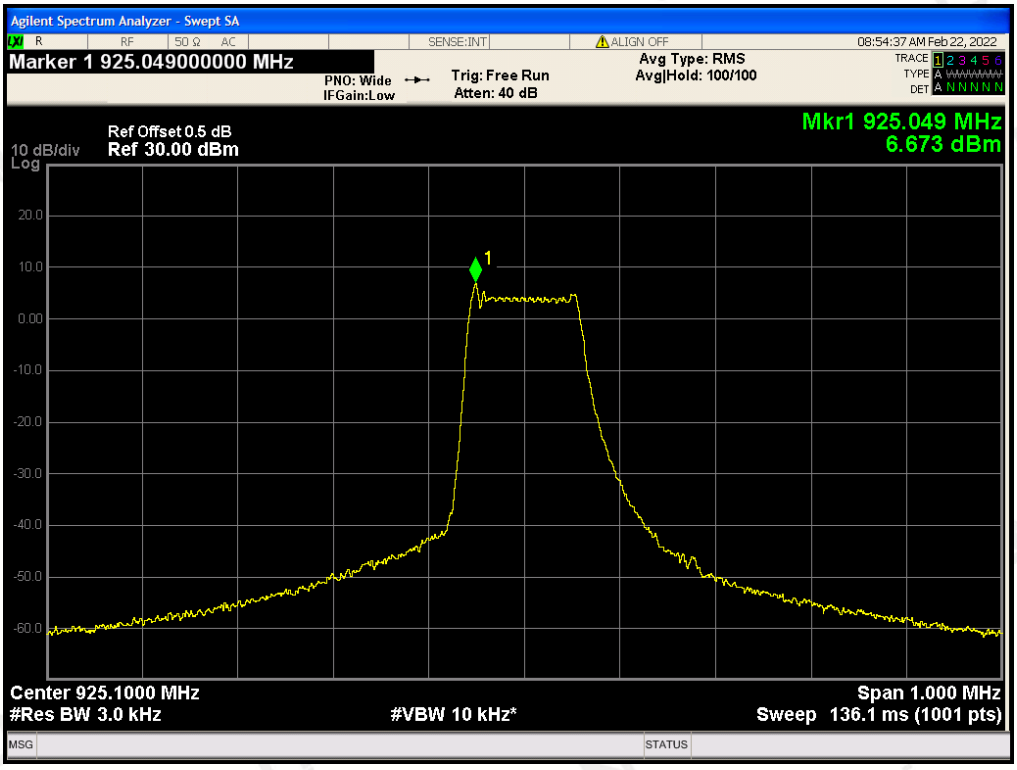
8.4. LIMITS AND MEASUREMENT RESULT

Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
923.3	6.281	8	Pass
925.1	6.673	8	Pass
927.5	5.620	8	Pass

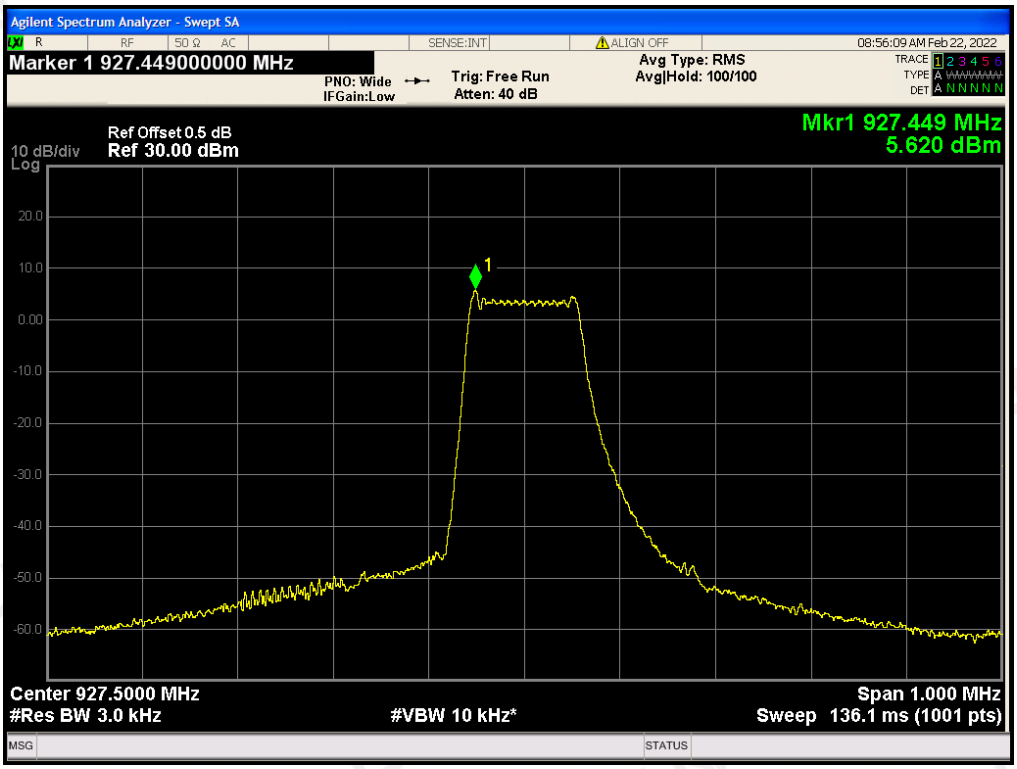
CH01


Agilent Spectrum Analyzer - Swept SA
Marker 1 923.248000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: RMS
Avg|Hold: 100/100
08:51:06 AM Feb 22, 2022
Ref Offset 0.5 dB
10 dB/div
Log
Ref 30.00 dBm
Mkr1 923.248 MHz
6.281 dBm
Center 923.3000 MHz
#Res BW 3.0 kHz
#VBW 10 kHz*
Span 1.000 MHz
Sweep 136.1 ms (1001 pts)

CH04


Agilent Spectrum Analyzer - Swept SA
Marker 1 925.049000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: RMS
Avg|Hold: 100/100
08:54:37 AM Feb 22, 2022
Ref Offset 0.5 dB
10 dB/div
Log
Ref 30.00 dBm
Mkr1 925.049 MHz
6.673 dBm
Center 925.1000 MHz
#Res BW 3.0 kHz
#VBW 10 kHz*
Span 1.000 MHz
Sweep 136.1 ms (1001 pts)

CH08

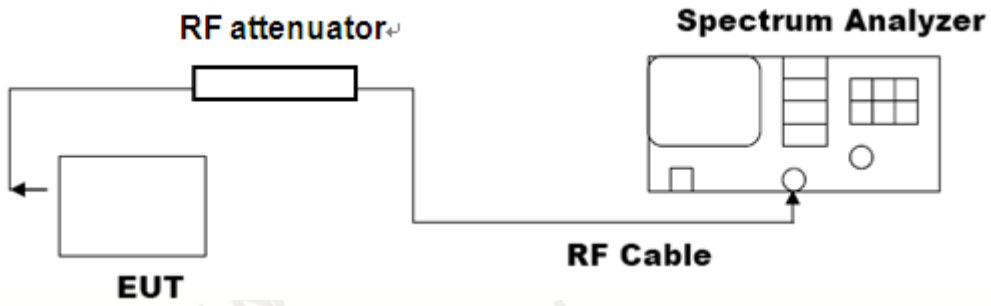

Agilent Spectrum Analyzer - Swept SA
Marker 1 927.449000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: RMS
Avg|Hold: 100/100
08:56:09 AM Feb 22, 2022
Ref Offset 0.5 dB
10 dB/div
Log
Ref 30.00 dBm
Mkr1 927.449 MHz
5.620 dBm
Center 927.5000 MHz
#Res BW 3.0 kHz
#VBW 10 kHz*
Span 1.000 MHz
Sweep 136.1 ms (1001 pts)

9. OCCUPIED BANDWIDTH

9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel
   The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

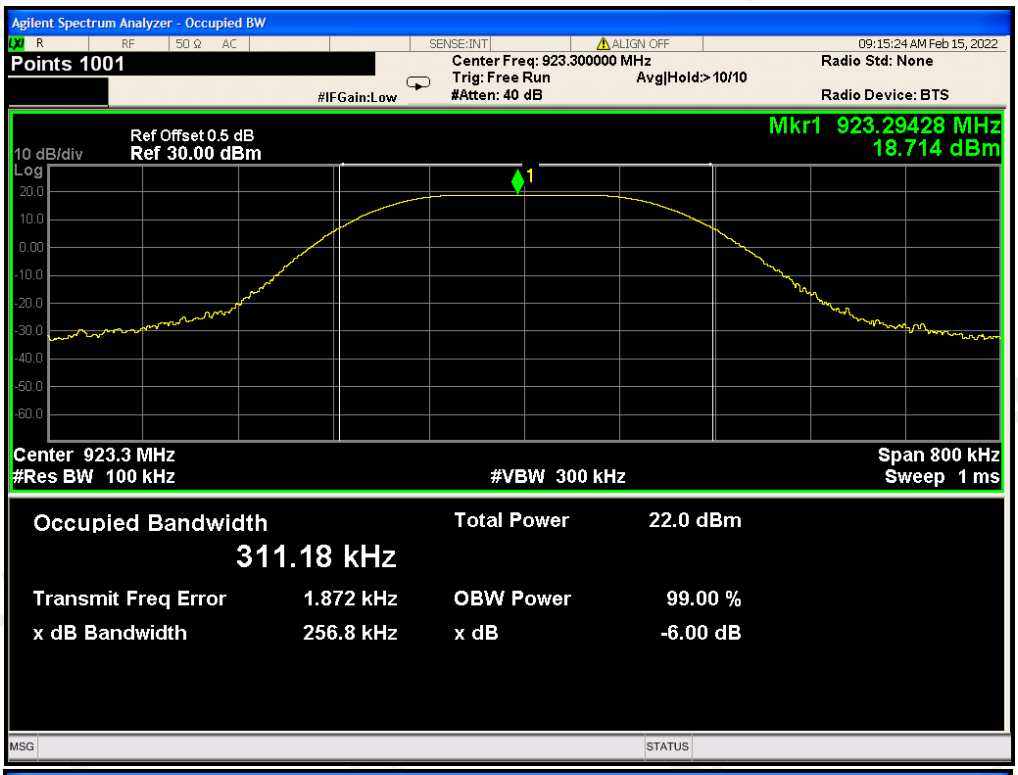
9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

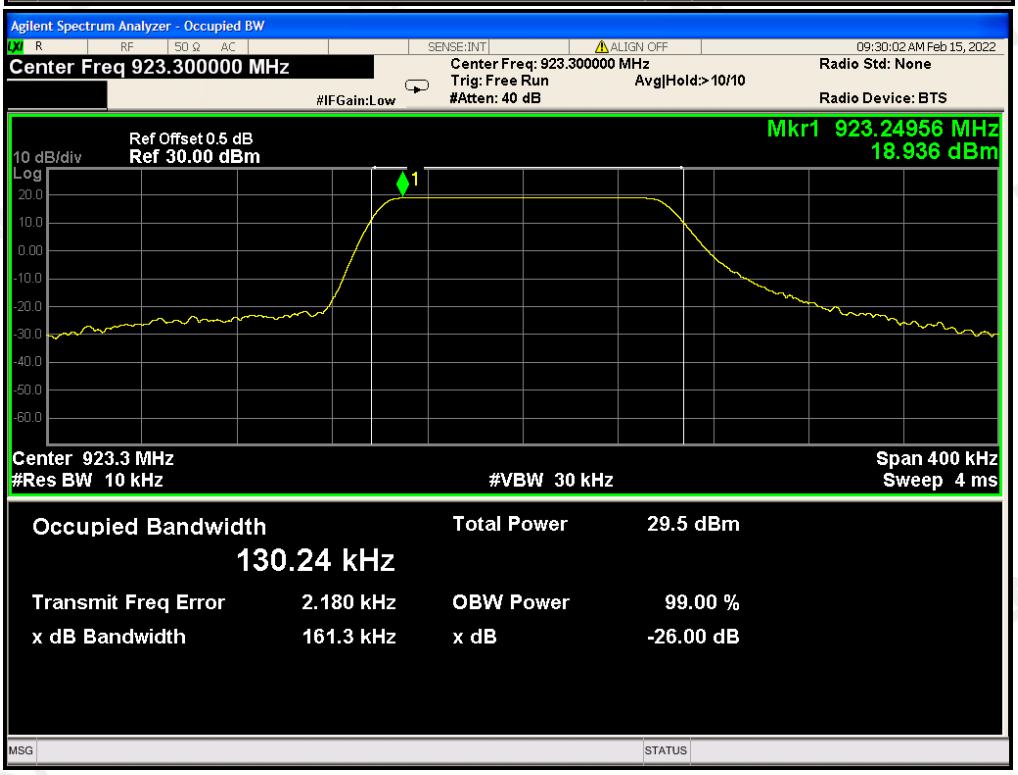


9.3. LIMITS AND MEASUREMENT RESULTS

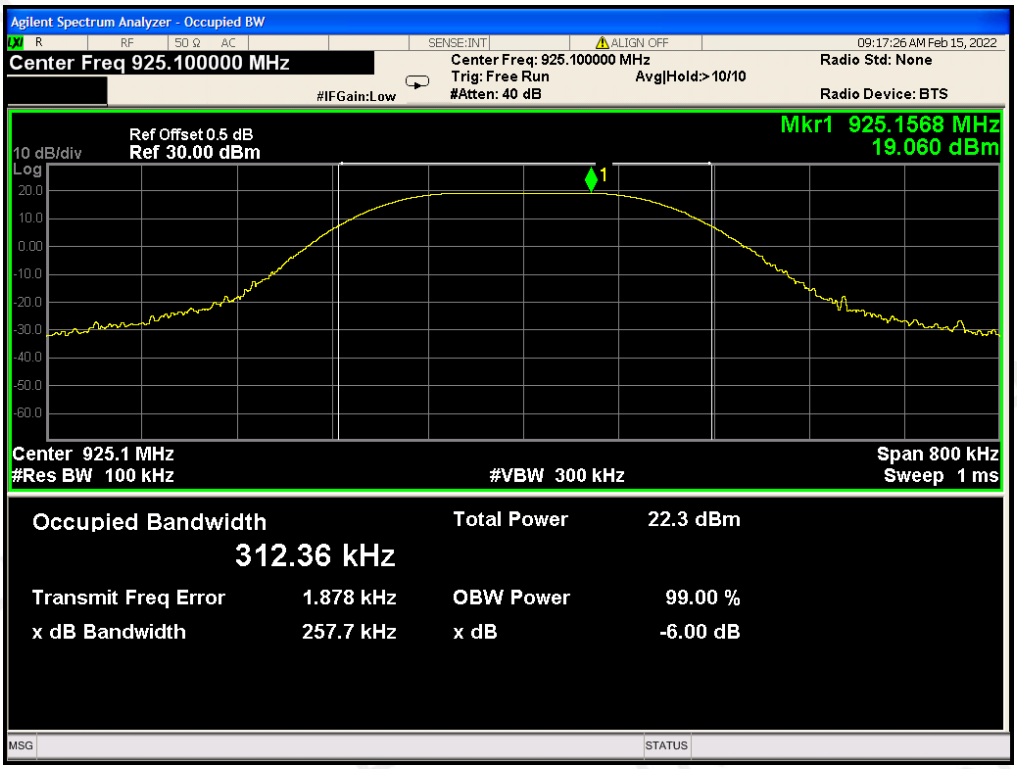
Applicable Limits	Measurement Result			
	Test Data (kHz)			Result
	Frequency (MHz)	6dB Bandwidth	99% Occupied Bandwidth	
>500kHz	923.3	256.8	130.24	Pass
	925.1	257.7	130.31	Pass
	927.5	257.5	130.56	Pass

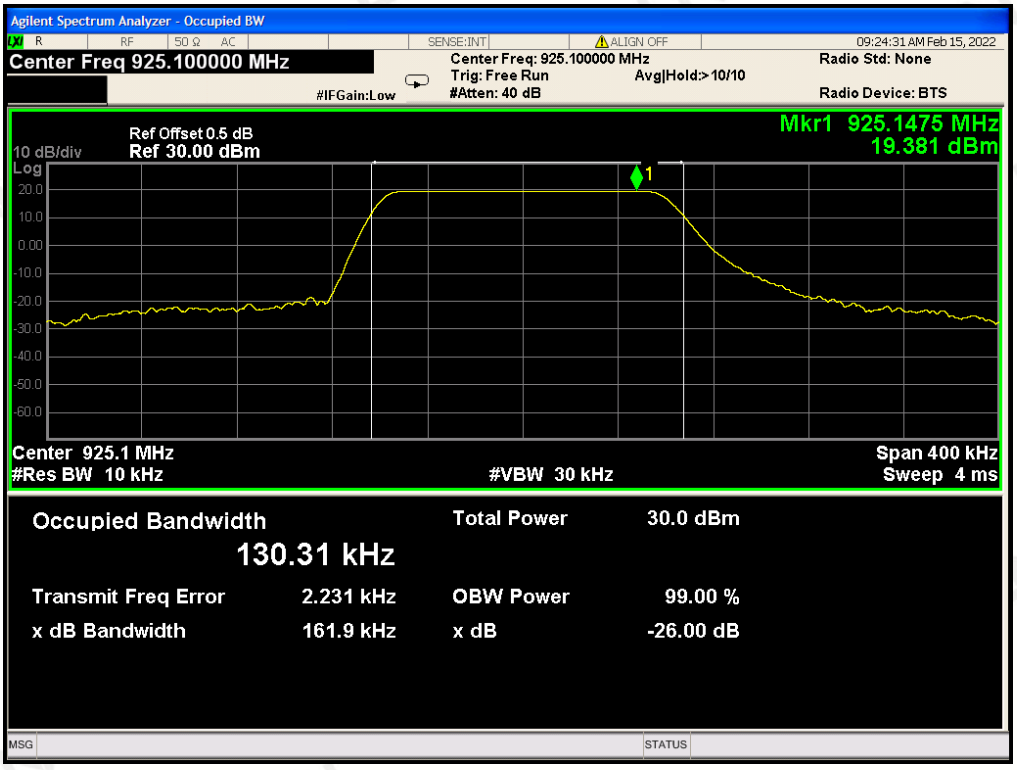
CH01


Agilent Spectrum Analyzer - Occupied BW
09:15:24 AM Feb 15, 2022
Points 1001
Center Freq: 923.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Ref Offset 0.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 923.29428 MHz
18.714 dBm
Center 923.3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Span 800 kHz
Sweep 1 ms
Occupied Bandwidth
311.18 kHz
Total Power 22.0 dBm
Transmit Freq Error 1.872 kHz
OBW Power 99.00 %
x dB Bandwidth 256.8 kHz
x dB -6.00 dB
MSG
STATUS

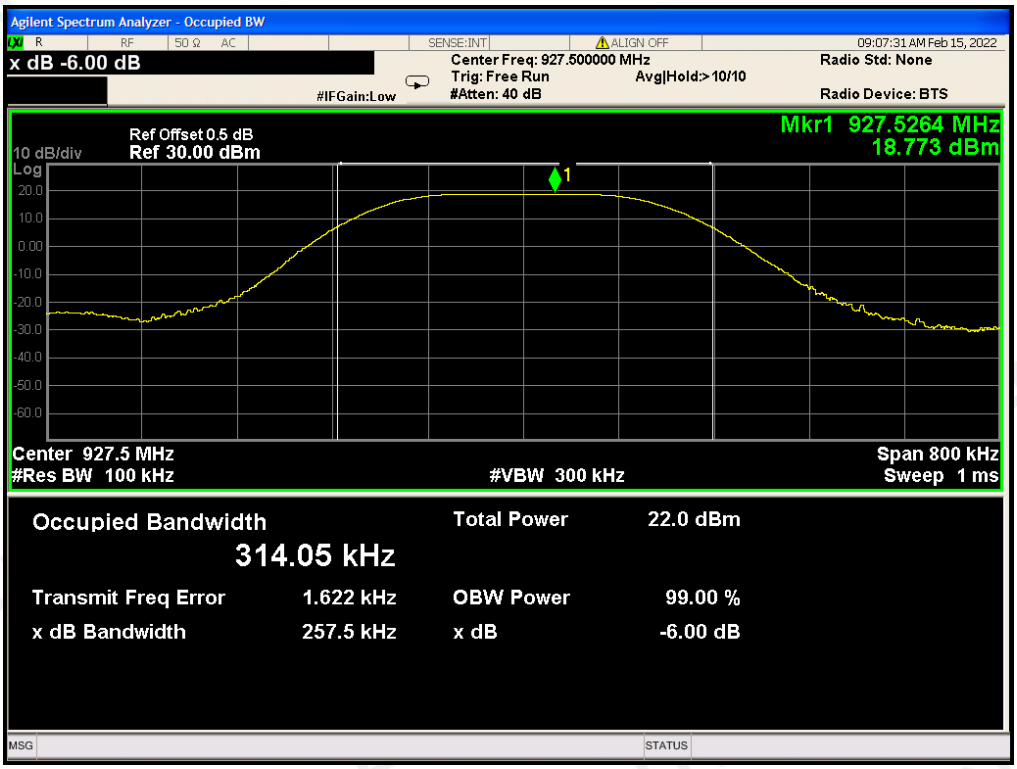

Agilent Spectrum Analyzer - Occupied BW
09:30:02 AM Feb 15, 2022
Center Freq 923.300000 MHz
Center Freq: 923.300000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
Ref Offset 0.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 923.24956 MHz
18.936 dBm
Center 923.3 MHz
#Res BW 10 kHz
#VBW 30 kHz
Span 400 kHz
Sweep 4 ms
Occupied Bandwidth
130.24 kHz
Total Power 29.5 dBm
Transmit Freq Error 2.180 kHz
OBW Power 99.00 %
x dB Bandwidth 161.3 kHz
x dB -26.00 dB
MSG
STATUS

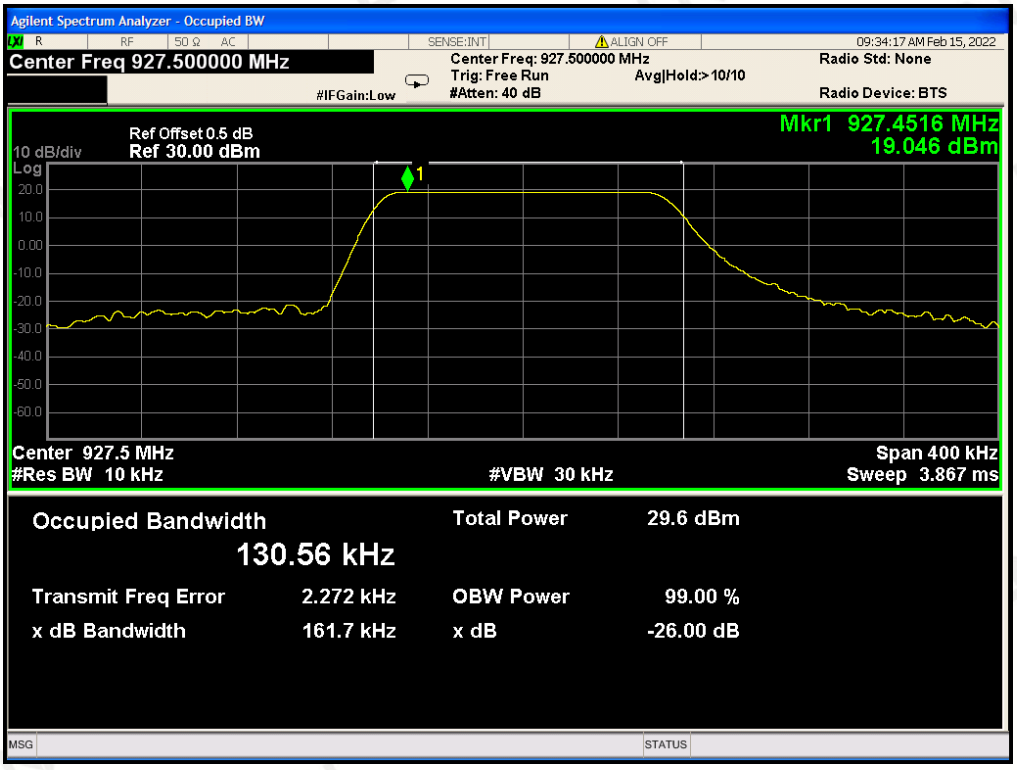
CH04


Agilent Spectrum Analyzer - Occupied BW
Center Freq 925.100000 MHz
Center Freq: 925.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
09:17:26 AM Feb 15, 2022
Radio Std: None
Radio Device: BTS
Ref Offset 0.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 925.1568 MHz
19.060 dBm
Center 925.1 MHz
#Res BW 100 kHz
#VBW 300 kHz
Span 800 kHz
Sweep 1 ms
Occupied Bandwidth
312.36 kHz
Total Power 22.3 dBm
Transmit Freq Error 1.878 kHz
OBW Power 99.00 %
x dB Bandwidth 257.7 kHz
x dB -6.00 dB
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
Center Freq 925.100000 MHz
Center Freq: 925.100000 MHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 40 dB
09:24:31 AM Feb 15, 2022
Radio Std: None
Radio Device: BTS
Ref Offset 0.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 925.1475 MHz
19.381 dBm
Center 925.1 MHz
#Res BW 10 kHz
#VBW 30 kHz
Span 400 kHz
Sweep 4 ms
Occupied Bandwidth
130.31 kHz
Total Power 30.0 dBm
Transmit Freq Error 2.231 kHz
OBW Power 99.00 %
x dB Bandwidth 161.9 kHz
x dB -26.00 dB
MSG
STATUS

CH08


Agilent Spectrum Analyzer - Occupied BW
x dB -6.00 dB
Center Freq: 927.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
09:07:31 AM Feb 15, 2022
Ref Offset 0.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 927.5264 MHz
18.773 dBm
Center 927.5 MHz
#Res BW 100 kHz
#VBW 300 kHz
Span 800 kHz
Sweep 1 ms
Occupied Bandwidth
314.05 kHz
Total Power 22.0 dBm
Transmit Freq Error 1.622 kHz
OBW Power 99.00 %
x dB Bandwidth 257.5 kHz
x dB -6.00 dB
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
Center Freq 927.500000 MHz
Center Freq: 927.500000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
09:34:17 AM Feb 15, 2022
Ref Offset 0.5 dB
10 dB/div
Ref 30.00 dBm
Log
Mkr1 927.4516 MHz
19.046 dBm
Center 927.5 MHz
#Res BW 10 kHz
#VBW 30 kHz
Span 400 kHz
Sweep 3.867 ms
Occupied Bandwidth
130.56 kHz
Total Power 29.6 dBm
Transmit Freq Error 2.272 kHz
OBW Power 99.00 %
x dB Bandwidth 161.7 kHz
x dB -26.00 dB
MSG
STATUS

10. BAND EDGE

10.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
   RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
4. Set SPA Trace 1 Max hold, then View.

10.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2

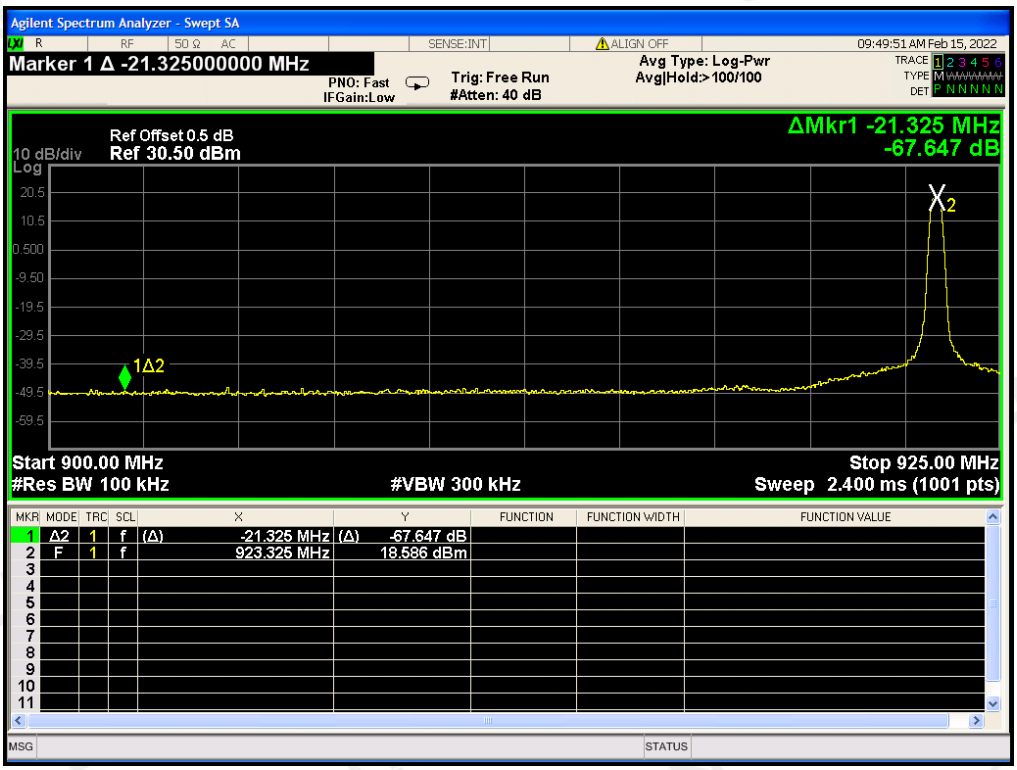
10.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

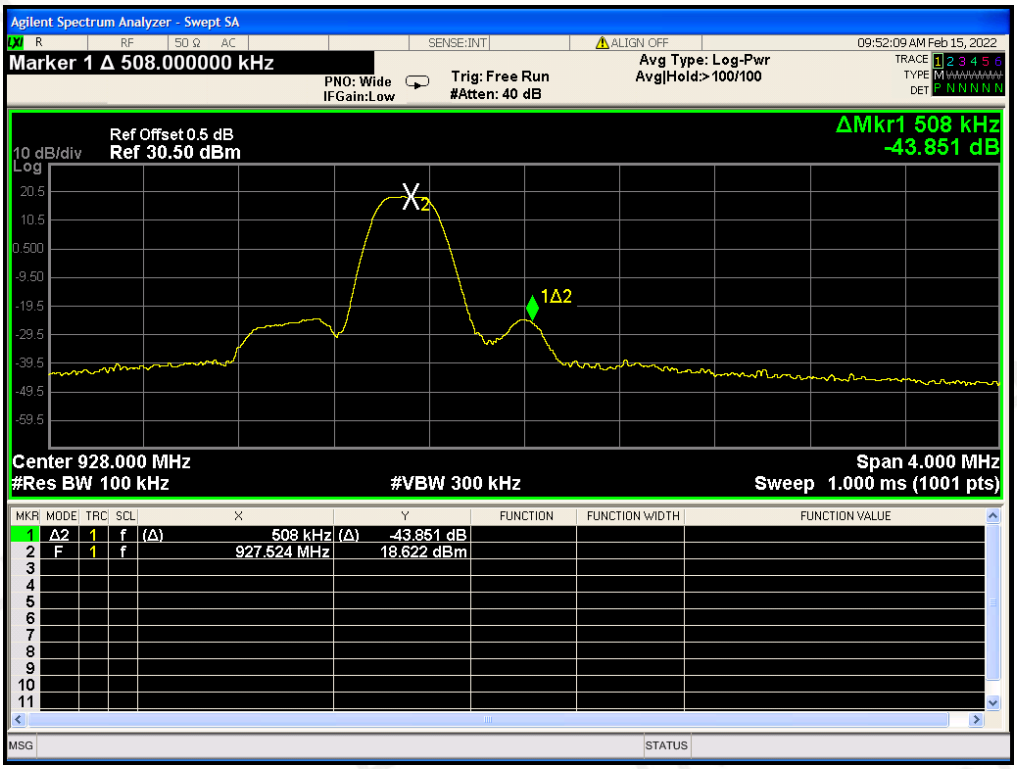
10.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	**Measurement Result**	
	Test Data	**Result**
In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the BOTTOM Channel	Pass
	At least -20dBc than the limit Specified on the TOP Channel	Pass

CH01


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ -21.325000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
09:49:51 AM Feb 15, 2022
Ref Offset 0.5 dB
10 dB/div
Log
Ref 30.50 dBm
ΔMkr1 -21.325 MHz
-67.647 dB
Start 900.00 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 925.00 MHz
Sweep 2.400 ms (1001 pts)
1 Δ2 1 f (Δ) -21.325 MHz (Δ) -67.647 dB
2 F 1 f 923.325 MHz 18.586 dBm

CH08


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 508.000000 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
09:52:09 AM Feb 15, 2022
Ref Offset 0.5 dB
10 dB/div
Ref 30.50 dBm
ΔMkr1 508 kHz
-43.851 dB
Center 928.000 MHz
#Res BW 100 kHz
#VBW 300 kHz
Span 4.000 MHz
Sweep 1.000 ms (1001 pts)
1 Δ2 1 f (Δ) 508 kHz (Δ) -43.851 dB
2 F 1 f 927.524 MHz 18.622 dBm

11. RADIATED EMISSION

11.1. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

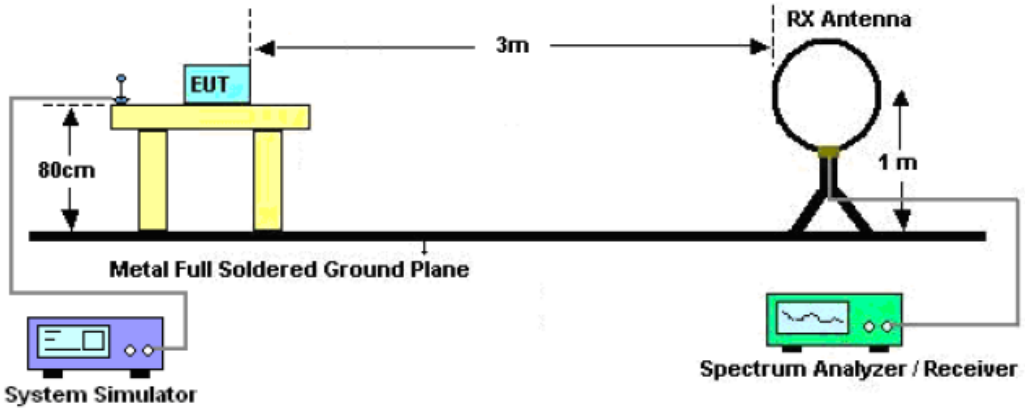
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
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
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/3MHz for Peak, 1MHz/3MHz for Average

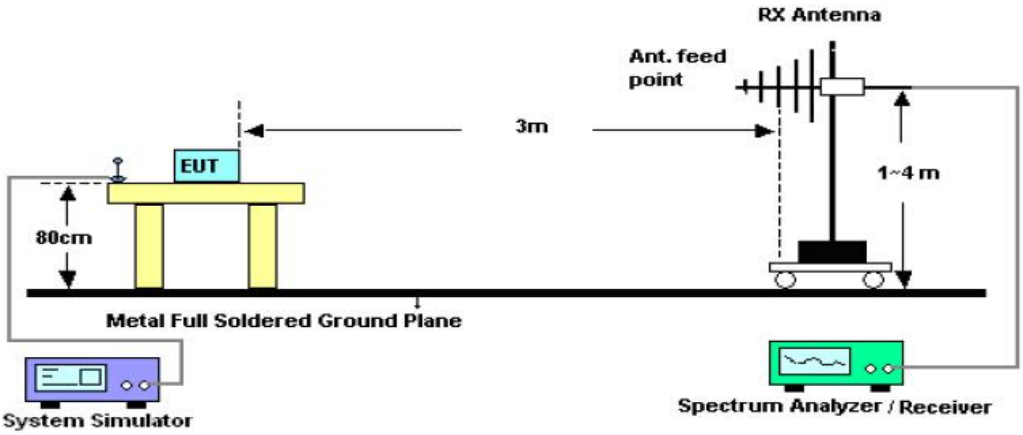
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

11.2. TEST SETUP

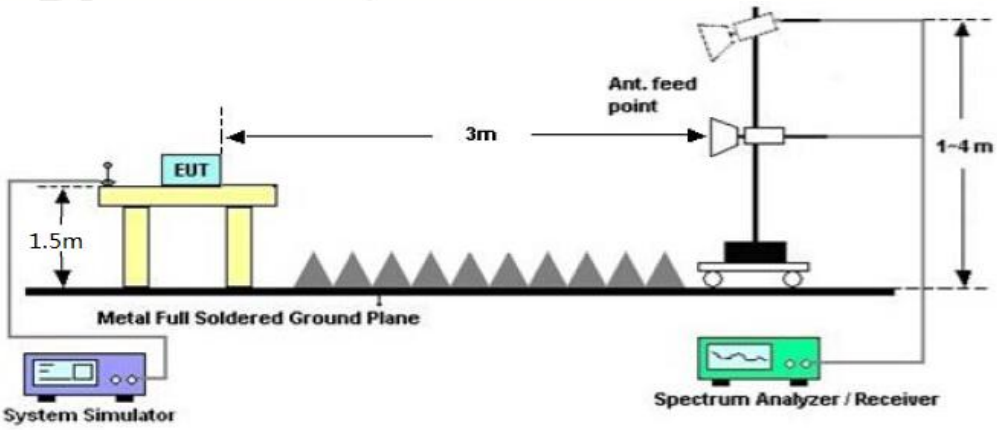
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



11.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

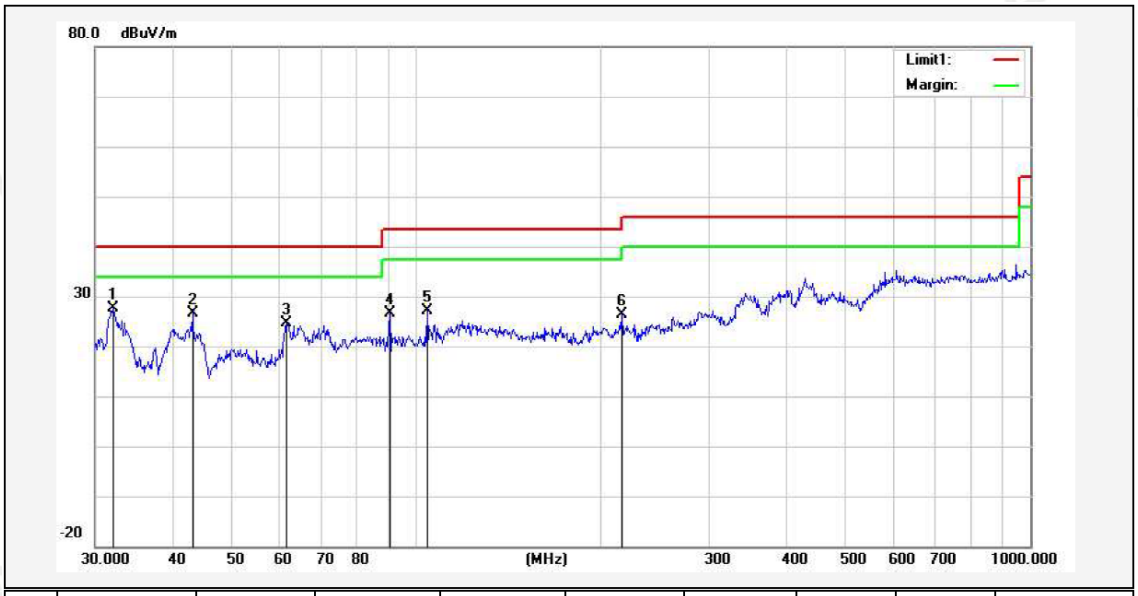
11.4. TEST RESULT

RADIATED EMISSION BELOW 30MHz

The amplitude of spurious emissions from 9kHzto30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

Below 1GHz Test Results:

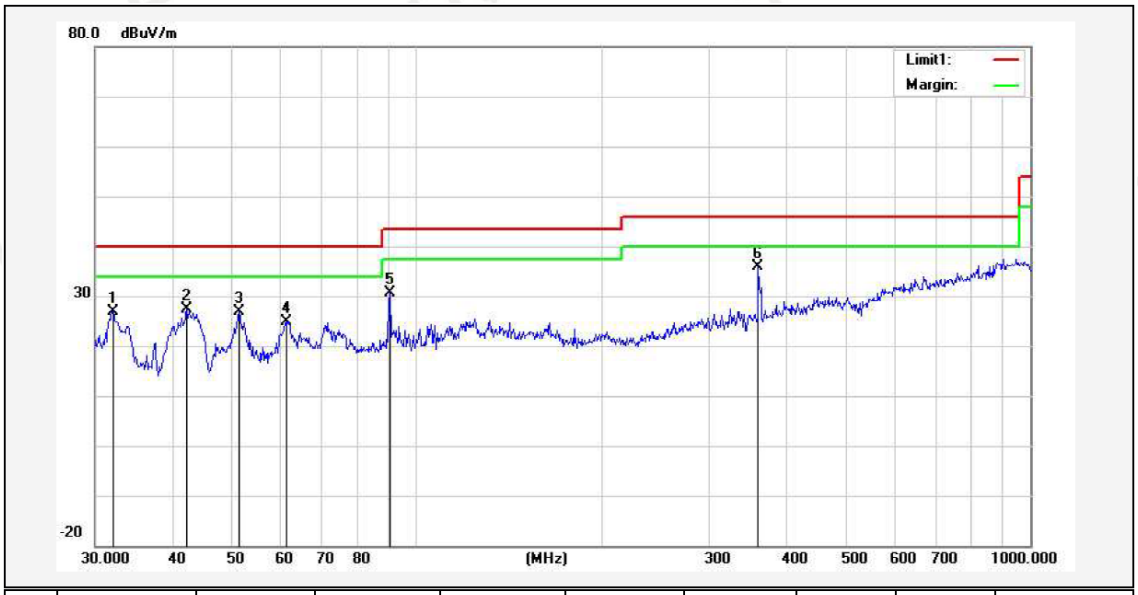
Temperature:	24℃	Relative Humidity:	48%
Test Date:	Jan. 17, 2022	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Horizontal
Test Mode:	Transmitting mode of 923.3MHz		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1*	32.0667	36.23	-8.66	27.57	40.00	-12.43	70	100	peak
2	43.2017	43.76	-17.01	26.75	40.00	-13.25	90	100	peak
3	61.5617	46.42	-21.72	24.70	40.00	-15.30	100	100	peak
4	90.5374	47.20	-20.66	26.54	43.50	-16.96	120	100	peak
5	104.1701	45.59	-18.37	27.22	43.50	-16.28	150	100	peak
6	216.0240	43.59	-17.28	26.31	46.00	-19.69	180	100	peak

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	24℃	Relative Humidity:	48%
Test Date:	Jan. 17, 2022	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Vertical
Test Mode:	Transmitting mode of 923.3MHz		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	32.0667	35.64	-8.66	26.98	40.00	-13.02	80	100	peak
2	42.3022	43.88	-16.46	27.42	40.00	-12.58	100	100	peak
3	51.4806	47.39	-20.52	26.87	40.00	-13.13	120	100	peak
4	61.5618	46.70	-21.72	24.98	40.00	-15.02	150	100	peak
5	90.5374	51.21	-20.66	30.55	43.50	-12.95	180	100	peak
6*	360.4476	49.88	-13.92	35.96	46.00	-10.04	200	100	peak

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Remark：

1. Radiated emission test from 9KHz to 10th harmonic of fundamental was verified, emission from 9kHz to 30MHz are more than 20dB below the limit, so it was not recorded in this report.
2. * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
3. The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120kHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10kHz.

Above 1 GHz Test Results:

CH01 (923.3MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1846.6	70.17	-6.55	63.62	74	-10.38	PK
1846.6	53.95	-6.55	47.40	54	-6.60	AV
2769.9	69.87	-5.72	64.15	74	-9.85	PK
2769.9	54.03	-5.72	48.31	54	-5.69	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1846.6	70.32	-6.55	63.77	74	-10.23	PK
1846.6	53.79	-6.55	47.24	54	-6.76	AV
2769.9	69.88	-5.72	64.16	74	-9.84	PK
2769.9	54.06	-5.72	48.34	54	-5.66	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

CH04 (925.1MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1850.2	70.20	-6.55	63.65	74	-10.35	PK
1850.2	54.13	-6.55	47.58	54	-6.42	AV
2775.3	69.82	-5.72	64.10	74	-9.90	PK
2775.3	54.07	-5.72	48.35	54	-5.65	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1850.2	70.37	-6.55	63.82	74	-10.18	PK
1850.2	54.16	-6.55	47.61	54	-6.39	AV
2775.3	69.90	-5.72	64.18	74	-9.82	PK
2775.3	54.10	-5.72	48.38	54	-5.62	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

CH08 (927.5MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1855	70.35	-6.55	63.80	74	-10.20	PK
1855	54.27	-6.55	47.72	54	-6.28	AV
2782.5	70.05	-5.72	64.33	74	-9.67	PK
2782.5	54.11	-5.72	48.39	54	-5.61	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
1855	70.29	-6.55	63.74	74	-10.26	PK
1855	54.20	-6.55	47.65	54	-6.35	AV
2782.5	70.12	-5.72	64.40	74	-9.60	PK
2782.5	53.90	-5.72	48.18	54	-5.82	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Remark:
1. Measuring frequencies from 1 GHz to the 10 GHz.
2. “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
3. * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
4. 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.
5. The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120kHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10kHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
6. When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
7. For fundamental frequency, RBW>20dB Bandwidth, VBW>=3*RBW, Peak detector for PK value, RMS detector for AV value.

12. FCC LINE CONDUCTED EMISSION TEST

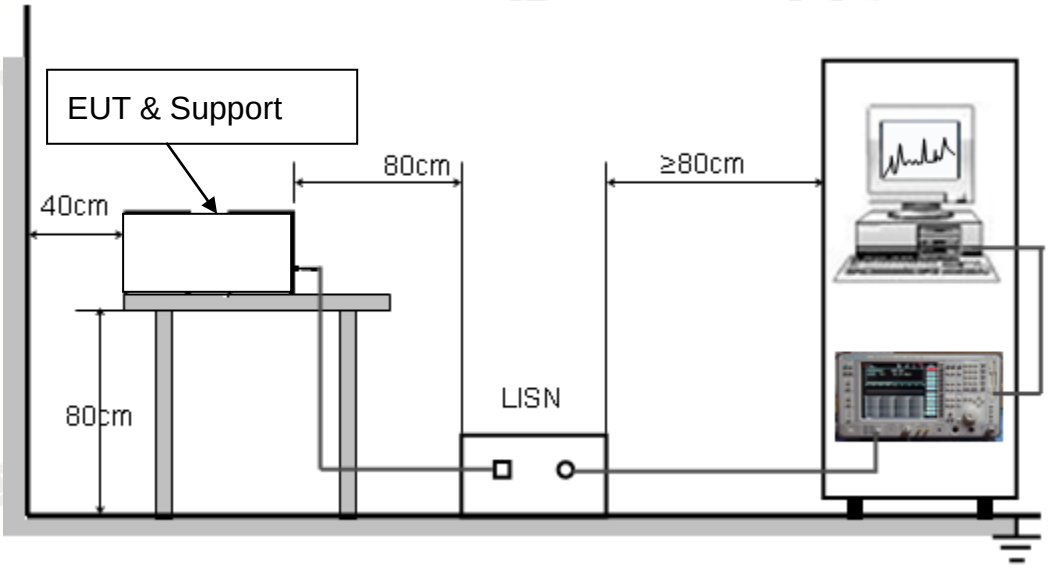
12.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P. (dBμV)	Average (dBμV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note: 1. The lower limit shall apply at the transition frequency.

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipment received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

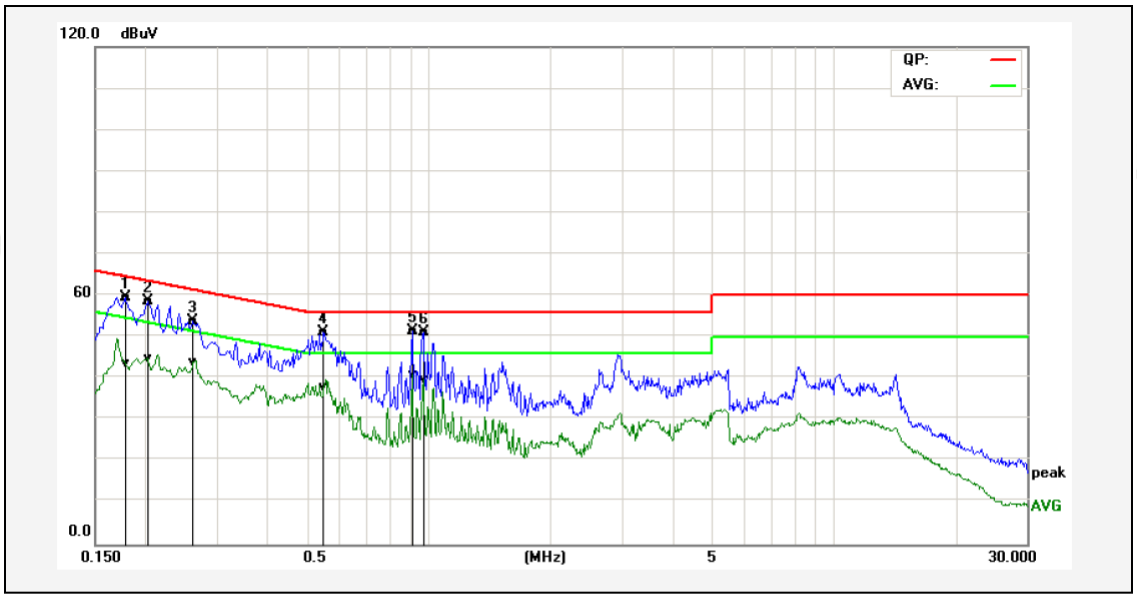
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

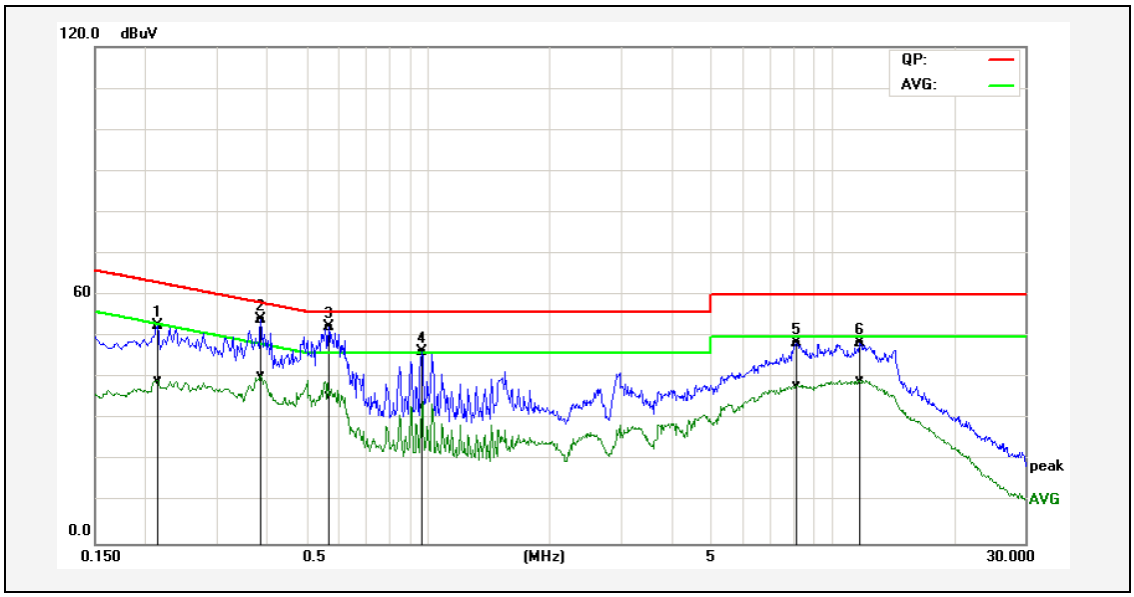
Temperature:	24℃	Relative Humidity:	48%
Test Date:	Jan. 13, 2022	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Line
Test Mode:	Transmitting mode of 923.3MHz		



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1P	0.1780	49.57	33.71	10.02	59.59	43.73	64.58	54.58	-4.99	-10.85	Pass
2P	0.2020	48.50	34.77	10.03	58.53	44.80	63.53	53.53	-5.00	-8.73	Pass
3P	0.2620	43.75	34.09	10.00	53.75	44.09	61.37	51.37	-7.62	-7.28	Pass
4P	0.5500	41.25	27.93	10.00	51.25	37.93	56.00	46.00	-4.75	-8.07	Pass
5*	0.9100	41.30	30.88	10.01	51.31	40.89	56.00	46.00	-4.69	-5.11	Pass
6P	0.9700	41.25	29.59	10.02	51.27	39.61	56.00	46.00	-4.73	-6.39	Pass

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

Temperature:	24℃	Relative Humidity:	48%
Test Date:	Jan. 13, 2022	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Neutral
Test Mode:	Transmitting mode of 923.3MHz		



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1P	0.2140	42.77	29.49	10.03	52.80	39.52	63.05	53.05	-10.25	-13.53	Pass
2P	0.3860	44.12	30.71	10.00	54.12	40.71	58.15	48.15	-4.03	-7.44	Pass
3*	0.5700	42.23	25.86	9.99	52.22	35.85	56.00	46.00	-3.78	-10.15	Pass
4P	0.9660	36.32	23.29	10.02	46.34	33.31	56.00	46.00	-9.66	-12.69	Pass
5P	8.1660	38.45	28.08	10.08	48.53	38.16	60.00	50.00	-11.47	-11.84	Pass
6P	11.7380	38.36	29.28	10.16	48.52	39.44	60.00	50.00	-11.48	-10.56	Pass

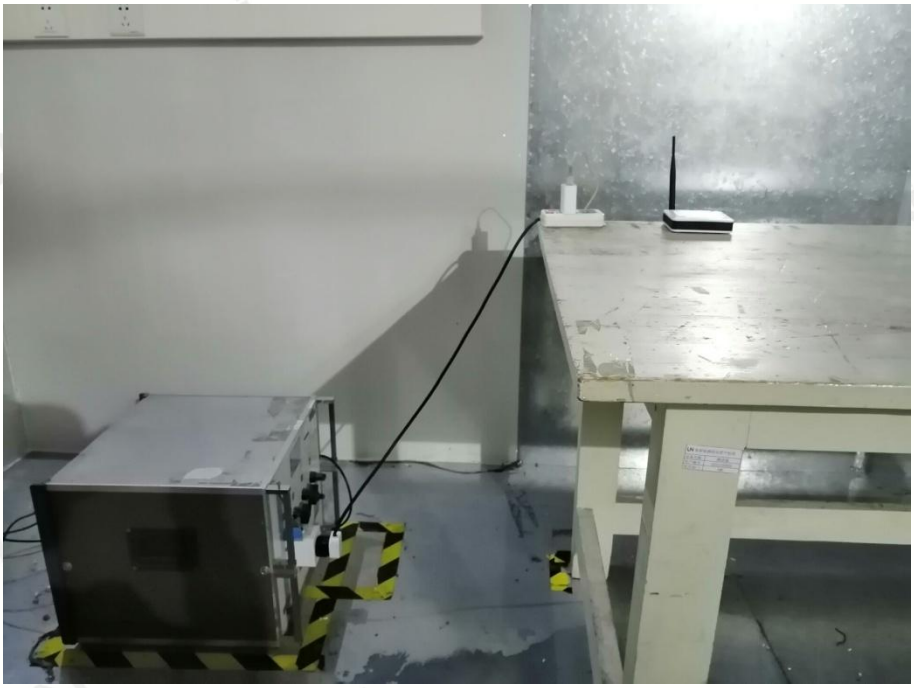
Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC RADIATED EMISSION TEST SETUP BELOW 1GHZ

FCC RADIATED EMISSION TEST SETUP ABOVE 1GHZ

FCC LINE CONDUCTED EMISSION TEST SETUP



----END OF REPORT----