Test Report No.:
FCC2021-0025-RF1

RF Test Report

EUT	:	**AI Vision Sensor**
MODEL	:	**VS121-915M**
BRAND NAME	:	**Milesight**
APPLICANT	:	**Xiamen Milesight IoT Co., Ltd.**
Classification Of Test	:	**N/A**

CVC Testing Technology Co., Ltd.

Client	**Name : Xiamen Milesight IoT Co., Ltd.** **Address : Building C09, Software Park Phase III, Xiamen 361024, Fujian, China**
Manufacturer	**Name : Xiamen Milesight IoT Co., Ltd.** **Address : Building C09, Software Park Phase III, Xiamen 361024, Fujian, China**
Equipment Under Test	**Name : AI Vision Sensor** **Model/Type: VS121-915M** **Trade mark : Milesight** **Serial NO.:N/A** **Sample NO.:6-1**

Date of Receipt.	**2021.09.08**	Date of Testing	**2021.09.08～2022.04.14**

Test Specification	**Test Result**
FCC Part 15, Subpart C, Section 15.247	PASS

Evaluation of Test Result	The equipment under test was found to comply with the requirements of the standards applied. **Issue Date: 2022.04.14**

Tested by:	Reviewed by:	Approved by:
Xu ZhenFei Name Signature	**Liu YongHai** Name Signature	**Chen HuaWen** Name Signature

Other Aspects: NONE.

Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FCC2021-0025-RF1	Original release	2022.04.14

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
FCC STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.247(a)(1) (i)	Number of Hopping Frequency Used	PASS	Meet the requirement of limit.
15.247(a)(1)	Hopping Channel Separation	PASS	Meet the requirement of limit.
15.247(a)(1) (i)	20dB EMISSION BANDWIDTH	PASS	Meet the requirement of limit.
15.247(f)	Average time of Occupancy for hybrid System	PASS	Meet the requirement of limit.
15.247(b)	Conducted Output Power	PASS	Meet the requirement of limit.
15.247(e)(f)	Power Spectral Density	PASS	Meet the requirement of limit.
15.247(d), 15.209,15.205	Radiated Emissions	PASS	Meet the requirement of limit.
15.247(d)	Out of band Emission Measurement	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

1.1 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. Due
WIFI & Bluetooth Test System 1					/
Communication Shielded Room 1	4m*3m*3m	CRTDSWKSR44301	VGDS-0699	CRT	2024/04/24
Spectrum Analyzer	FSV30	104337	DZ-000235	R&S	2022/11/03
Comprehensive Test Instrument	CMW500	137779	DZ-000220	R&S	2022/06/30
Comprehensive Test Instrument	CMW500	169888	DZ-000342	R&S	2022/12/01
LTE Comprehensive Test Instrument	E7515A	MY58010639	DZ-000173	KEYSIGHT	2022/04/14
Analog Signal Generator	SMA100B	103663	DZ-000239-2	R&S	2022/06/30
Vector Signal Generator	SMBV100B	101757	DZ-000239-1	R&S	2022/06/30
Programmable DC Power Supply	E3642A	MY59108106	DZ-000242-2	KEYSIGHT	2022/08/05
Radiation SpuriousTest System					/
3m Semi-Anechoic Chamber	FACT-4	ST08035	WKNA-0024	ETS	2024/12/12
Spectrum Analyzer	N9010B	MY57470323	DZ-000174	KEYSIGHT	2023/03/02
EMI Test Receiver	N9038A-508	MY532290079	EM-000397	Agilent	2023/03/02
Broadband Antenna	VULB 9163	9163-530	EM-000342	SCHWARZBECK	2022/06/26
Waveguide Horn Antenna	HF906	360306/008	WKNA-0024-8	R&S	2023/03/04
Waveguide Horn Antenna	BBHA9170	00949	DZ-000209-2	SCHWARZBECK	2022/08/27
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWARZBECK	2022/06/30
5G Bandstop Filters	WRCJV12-4900-5100-5900-6100-50EE	1	DZ-000186	WI	2022/12/20
Comprehensive tester	CMW500	159000	DZ-000240-2	R&S	2022/12/20

1.2 MEASUREMENT UNCERTAINTY

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

No.	ITEM	FREQUENCY	UNCERTAINTY
1	Conducted Emissions	9kHz~30MHz	2.7dB
2	Radiated Spurious Emissions	9KHz ~ 30MHz	5.6dB
		30MHz ~ 1GMHz	4.6dB
		1GHz ~ 18GHz	4.4dB
		18GHz ~ 40GHz	4.6dB

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

1.3 TEST LOCATION

The tests and measurements refer to this report were performed by EMC testing Lab. of CVC Testing Technology Co., Ltd.

Address: No.3,TiantaiyiRoad,KaitaiAvenue,ScienceCity,Guangzhou,China
Post Code：510663 Tel：020-32293888
FAX：020-32293889 E-mail：office@cvc.org.cn

2 GENERAL INFORMATION

2.1 GENERAL PRODUCT INFORMATION

PRODUCT	AI Vision Sensor
BRAND	Milesight
MODEL	VS121-915M
ADDITIONAL MODEL	N/A
FCC ID	2AYHY-VS121
POWER SUPPLY	DC 5V From Adapter
MODULATION TYPE	Chirp Spread Spectrum
OPERATING FREQUENCY	Hybrid 125kHz, 902.3MHz~927.6MHz
NUMBER OF CHANNEL	122
PEAK OUTPUT POWER	17.69dBm (Max. Measured)
ANTENNA TYPE	Spring Antenna, 1dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB Line: Unshielded Detachable 1.0m

Remark:

1. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. EUT photo refer to the report (Report NO.: FCC2021-0025-E).
4. The EUT have SISO function, provides 1 completed transmitter and 1 receiver.

2.2 Description of Accessories

Adapter	
BRAND	CWT
Model No.:	2AEA010BC3D
Input:	100-240 V~50/60 Hz 0.35 A Max
Output:	5.0 V ⎓ 2 A
AC Cable:	N/A
DC Cable:	N/A

2.3 OTHER INFORMATION

Operation Frequency Each of Channel							
CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
1	**902.3**	37	909.5	73	916.8	109	925
2	902.5	38	909.7	74	917	110	925.2
3	902.7	39	909.9	75	917.2	111	925.4
4	902.9	40	910.1	76	917.4	112	925.6
5	903.1	41	910.3	77	917.6	113	925.8
6	903.3	42	910.5	78	917.8	114	926
7	903.5	43	910.7	79	918	115	926.2
8	903.7	44	910.9	80	918.2	116	926.4
9	903.9	45	911.1	81	918.4	117	926.6
10	904.1	46	911.3	82	918.6	118	926.8
11	904.3	47	911.5	83	918.8	119	927
12	904.5	48	911.7	84	919	120	927.2
13	904.7	49	911.9	85	919.2	121	927.4
14	904.9	50	912.1	86	919.4	**122**	**927.6**
15	905.1	51	912.3	87	919.6		
16	905.3	52	912.5	88	919.8		
17	905.5	53	912.7	89	920		
18	905.7	54	912.9	90	920.2		
19	905.9	55	913.1	91	920.4		
20	906.1	56	913.3	92	920.6		
21	906.3	57	913.5	93	920.8		
22	906.5	58	913.7	94	921		
23	906.7	59	913.9	95	921.2		
24	906.9	60	914.1	96	921.4		
25	907.1	61	914.3	97	921.6		
26	907.3	62	914.5	98	921.8		
27	907.5	63	914.7	99	922		
28	907.7	**64**	**914.9**	100	922.2		
29	907.9	65	915.2	101	922.4		
30	908.1	66	915.4	102	922.6		
31	908.3	67	915.6	103	922.8		
32	908.5	68	915.8	104	923		
33	908.7	69	916	105	923.2		
34	908.9	70	916.2	106	923.4		
35	909.1	71	916.4	107	923.6		
36	909.3	72	916.6	108	923.8		

2.4 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, xyz axis and antenna ports

The worst case was found when positioned on xaxis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	APPLICABLE TEST ITEMS				DESCRIPTION
	RSE<1G	RSE≥1G	PLC	APCM	
A	√	√	√	√	LORA link

Where **RSE<1G:** Radiated Emission below 1GHz. **RSE≥1G:** Radiated Emission above 1GHz.
PLC: Power Line Conducted Emission. **APCM:** Antenna Port Conducted Measurement.

RADIATED EMISSION TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	PACKET TYPE
A	1 to 122	1	Chirp Spread Spectrum	DR0

For the test results, only the worst case was shown in test report.

RADIATED EMISSION TEST (ABOVE 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	PACKET TYPE
A	1 to 122	1,64,122	Chirp Spread Spectrum	DR0

ANTENNA PORT CONDUCTED MEASUREMENT:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	PACKET TYPE
A	1 to 122	1,64,122	Chirp Spread Spectrum	DR0

POWER LINE CONDUCTED EMISSION TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	TESTED CONDITION
-	LORA Link

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RSE<1G	24deg. C, 55%RH	AC 120V/60Hz	Liu ShiWei
RSE≥1G	24deg. C, 55%RH	AC 120V/60Hz	Liu ShiWei
PLC	24deg. C, 55%RH	AC 120V/60Hz	Liu ShiWei
APCM	25deg. C, 58%RH	AC 120V/60Hz	Liu ShiWei

2.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC PART 15, Subpart C. Section 15.247
KDB 558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10-2020

All test items have been performed and recorded as per the above standards

2.6 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.

Support Equipment					
NO	**Description**	**Brand**	**Model No.**	**Serial Number**	**Supplied by**
1	Latop	Lenovo	V14	PFNXB1628023	Lab

Support Cable							
NO	**Description**	**Quantity (Number)**	**Length (m)**	**Detachable (Yes/ No)**	**Shielded (Yes/ No)**	**Cores (Number)**	**Supplied by**
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3 TEST TYPES AND RESULTS

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 Limit

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
NOTE: 1. The lower limit shall apply at the transition frequencies. NOTE: 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.		

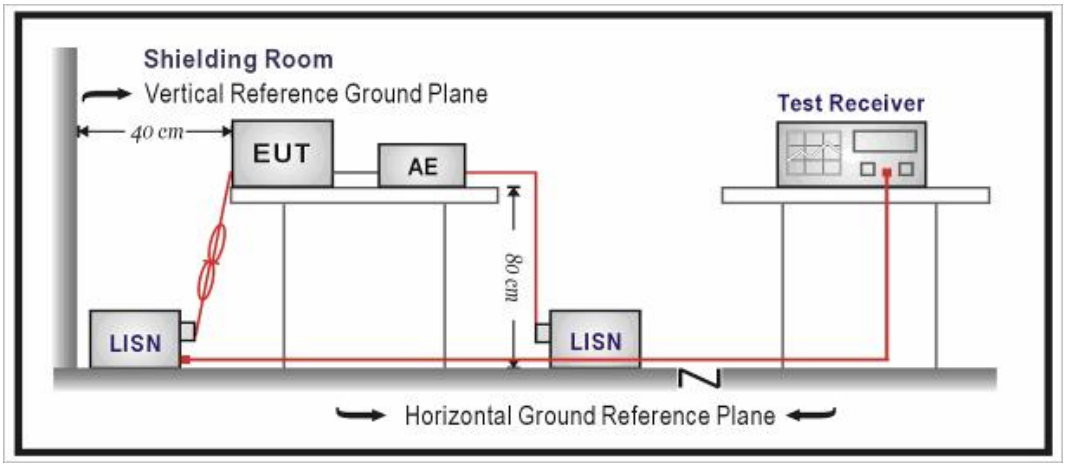
3.1.2 Measurement procedure

a. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the Test photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.The equipment under test shall be placed on a support of non-metallic material, the height of which shall be1.5m above the ground,

b. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

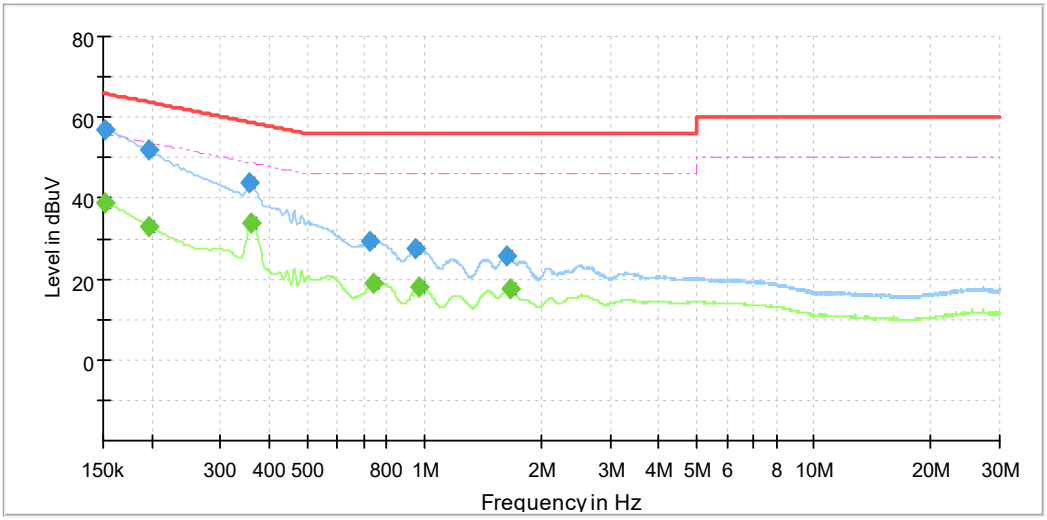
c. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

3.1.3 Test setup



3.1.4 Test results

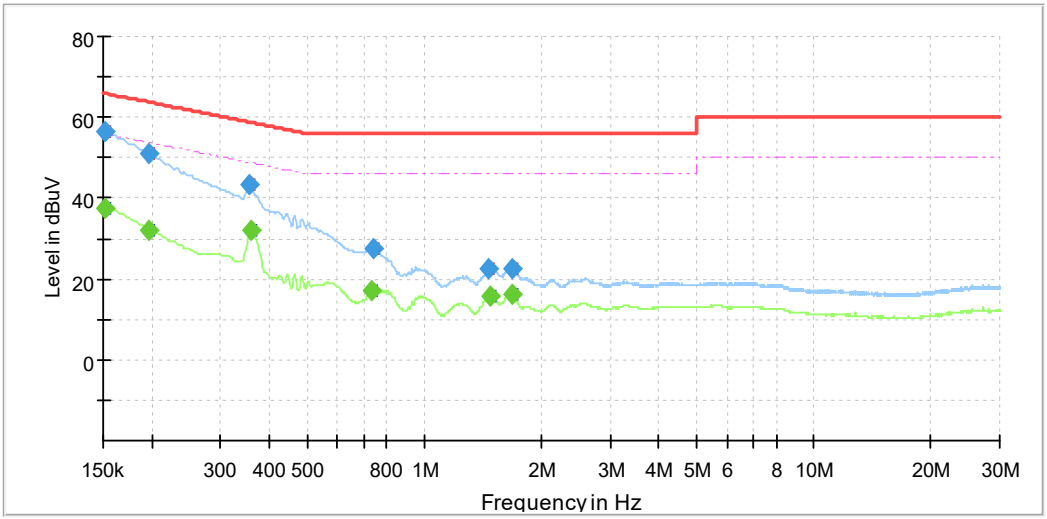
Test Mode	LORA Link	Frequency Range	150KHz ~ 30MHz
PHASE	Line (L)		



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	**0.152**	**57.1**	**---**	**65.9**	**8.8**	**L1**	**19.5**
2	0.152	---	38.6	55.9	17.2	L1	19.5
3	0.197	51.8	---	63.7	11.9	L1	19.5
4	0.197	---	33.2	53.7	20.6	L1	19.5
5	0.357	43.6	---	58.8	15.2	L1	19.5
6	0.359	---	33.9	48.7	14.8	L1	19.5
7	0.728	29.5	---	56.0	26.5	L1	19.6
8	0.737	---	18.7	46.0	27.3	L1	19.6
9	0.949	27.6	---	56.0	28.4	L1	19.6
10	0.969	---	17.9	46.0	28.1	L1	19.6
11	1.624	25.8	---	56.0	30.2	L1	19.6
12	1.662	---	17.7	46.0	28.3	L1	19.6

Remark: The emission levels of other frequencies were very low against the limit.

Test Mode	LORA Link	**Frequency Range**	150KHz ~ 30MHz
PHASE	Line (N)		



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.152	56.3	---	65.9	9.6	N	19.5
2	0.152	---	37.7	55.9	18.2	N	19.5
3	0.197	50.9	---	63.7	12.8	N	19.5
4	0.197	---	32.3	53.7	21.5	N	19.5
5	0.357	43.5	---	58.8	15.3	N	19.6
6	0.359	---	32.0	48.7	16.7	N	19.6
7	0.733	---	16.9	46.0	29.1	N	19.6
8	0.737	27.5	---	56.0	28.5	N	19.6
9	1.464	22.4	---	56.0	33.6	N	19.6
10	1.482	---	15.6	46.0	30.4	N	19.6
11	1.680	---	16.0	46.0	30.0	N	19.6
12	1.687	22.4	---	56.0	33.6	N	19.6

Remark: The emission levels of other frequencies were very low against the limit.

3.2 RADIATED EMISSIONS

3.2.1 Limits

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). Other emissions shall be at least 20dB below the highest level of the desired power.

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: 1. The lower limit shall apply at the transition frequencies.
NOTE: 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
NOTE: 3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

3.2.2 Measurement procedure

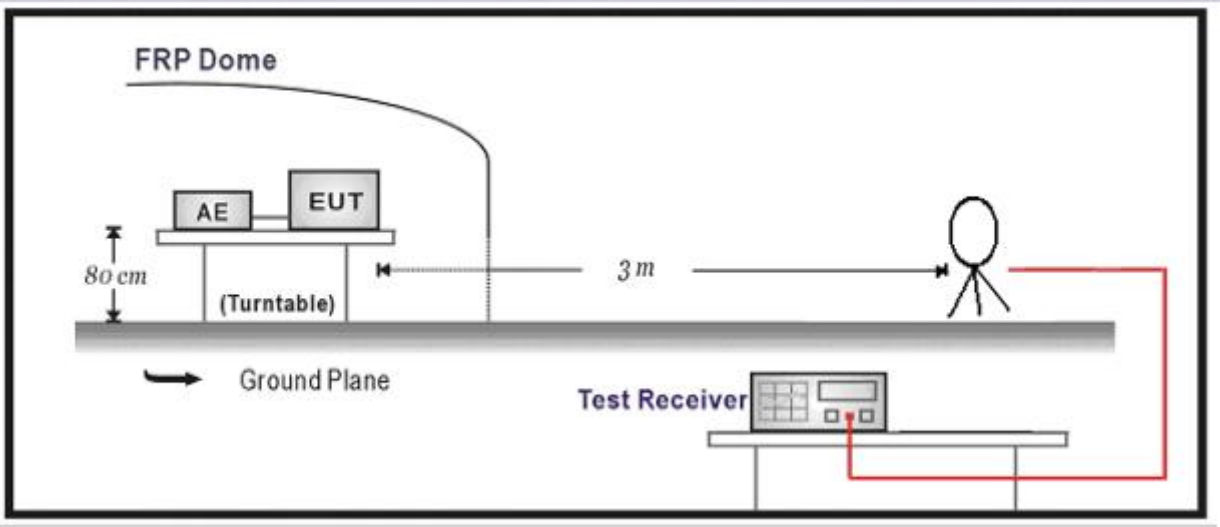
a. The EUT was placed on the top of a rotating table 1.5 meters(above 1GHz) and 0.8 meters(below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. For below 1GHz was used bilog antenna, and above 1GHz was used horn antenna, and its 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.
d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

NOTE:

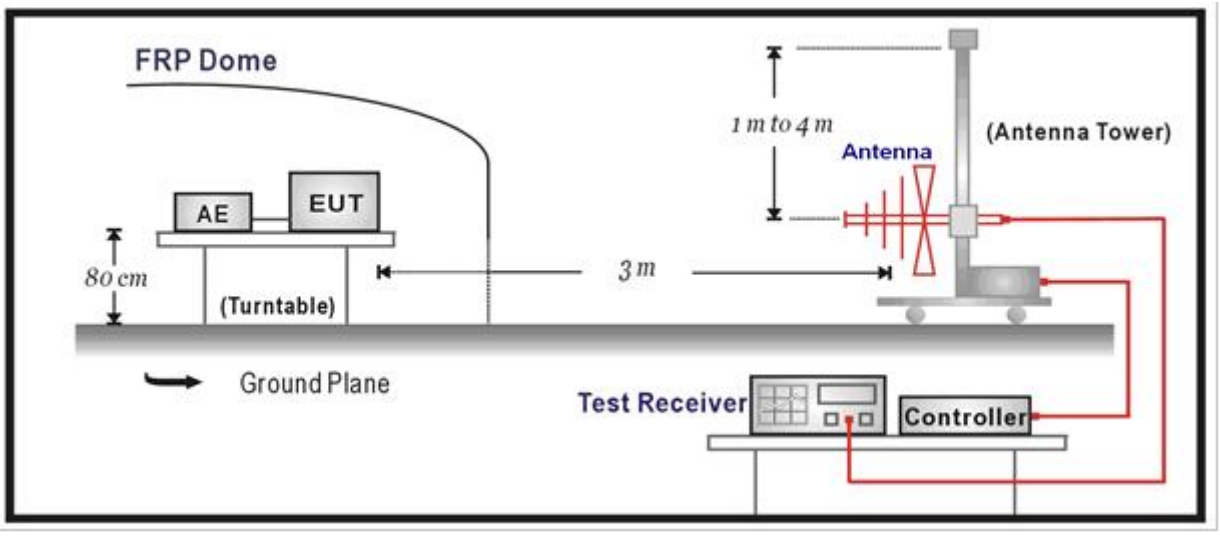
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ⩾ 1/T (Duty cycle < 98%) or 10Hz(Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

3.2.3 Test setup

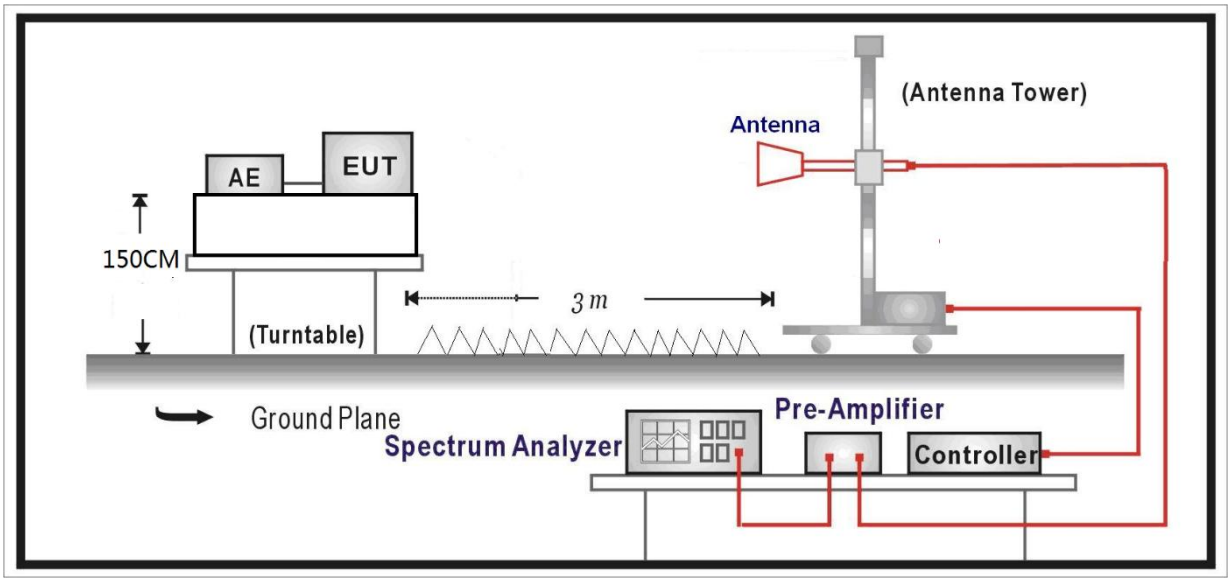
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:

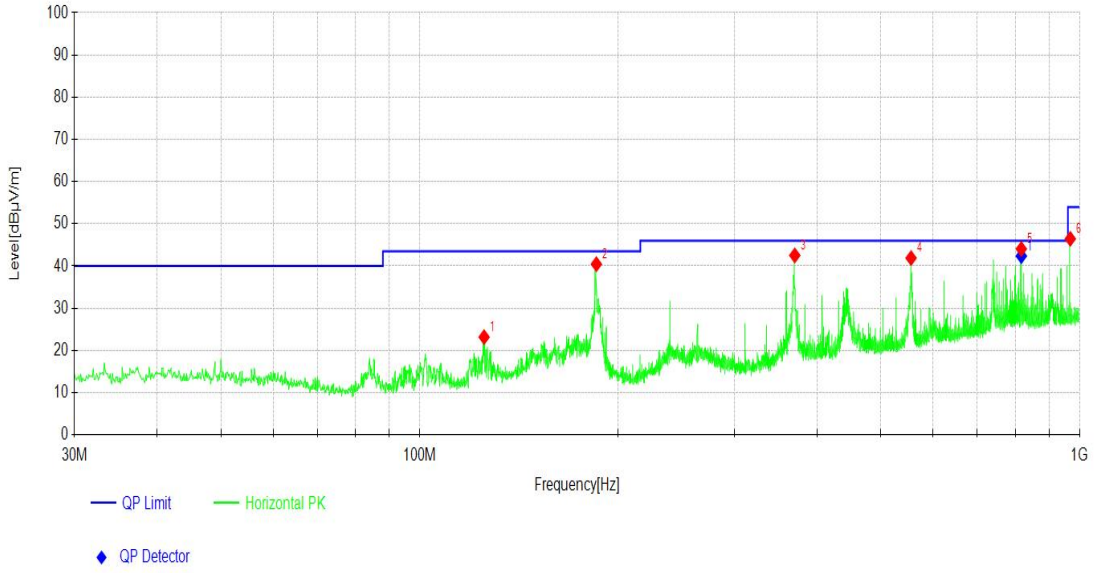


3.2.4 Test results

BELOW 1GHz WORST-CASE DATA:

Worst Test Mode	DR0	**Channel**	CH 1
Frequency Range	9KHz ~ 1GHz	**Detector Function**	Quasi-Peak (QP)

Horizontal

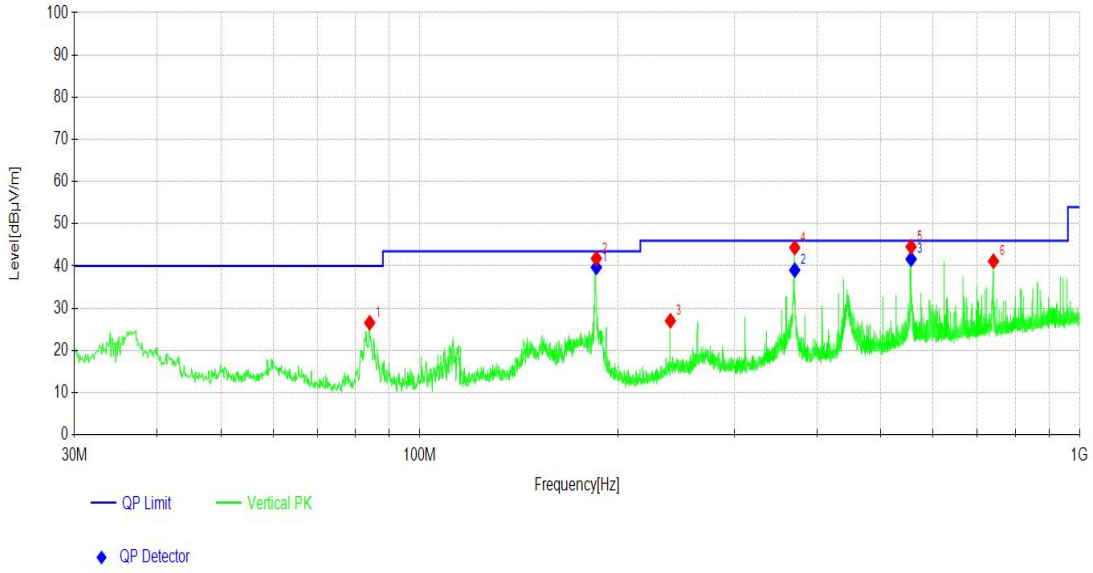


NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]
1	125.2635	9.95	23.17	13.22	43.50	20.33	200	174
2	**185.3125**	**27.74**	**40.45**	**12.71**	**43.50**	**3.05**	**100**	**27**
3	370.3100	26.19	42.52	16.33	46.00	3.48	100	148
4	555.5016	21.79	41.89	20.10	46.00	4.11	200	16
5	816.0696	18.13	42.37	24.24	46.00	3.63	100	75
6	968.0838	20.87	46.44	25.57	54.00	7.56	100	196

Remark: 1. 9KHz~30MHz have been test and test data more than 20dB margin.
2. The emission levels of other frequencies were greater than 20dB margin.
3. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB).
4. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
5. Margin(dB) = Limit[dBµV/m] - Level [dBµV/m]

Worst Test Mode	DR0	**Channel**	CH 1
Frequency Range	9KHz ~ 1GHz	**Detector Function**	Quasi-Peak (QP)

Vertical



NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]
1	84.0344	16.16	26.55	10.39	40.00	13.45	100	122
2	185.3125	26.98	39.69	12.71	43.50	3.81	100	35
3	239.9290	13.58	27.02	13.44	46.00	18.98	200	99
4	370.2130	22.69	39.02	16.33	46.00	6.98	100	165
5	555.5986	21.56	41.66	20.10	46.00	4.34	200	62
6	740.4991	17.78	41.15	23.37	46.00	4.85	100	195

Remark: 1. 9KHz~30MHz have been test and test data more than 20dB margin.
2. The emission levels of other frequencies were greater than 20dB margin.
3. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB).
4. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
5. Margin(dB) = Limit[dBµV/m] - Level [dBµV/m]

ABOVE 1GHz DATA

Channel	CH 1	**Frequency**	902.3MHz
Frequency Range	1GHz~9.3G	**Detector Function**	PK/AV

Horizontal

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	1804.6	49.26	7.73	56.99	74.00	17.01	130	156	PK
2	1804.6	43.91	7.73	51.64	54.00	2.36	130	156	AV
3	2706.9	41.32	10.79	52.11	54.00	1.89	214	182	AV
4	2706.9	47.38	10.84	58.22	74.00	15.78	214	110	PK
5	3609.2	35.26	14.86	50.12	54.00	3.88	130	17	AV
6	3609.2	43.89	14.86	58.75	74.00	15.25	130	17	PK

Vertical

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	1804.6	41.27	7.73	49.00	54.00	5.00	134	48	AV
2	1804.6	47.43	7.73	55.16	74.00	18.84	134	48	PK
3	2706.9	35.92	11.20	47.12	54.00	6.88	277	48	AV
4	2706.9	46.70	11.65	58.35	74.00	15.65	277	314	PK
5	3609.2	45.25	14.80	60.05	74.00	13.95	131	227	PK
6	3609.2	35.82	14.86	50.68	54.00	3.32	131	301	AV

Remark: 1. The emission levels of other frequencies were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]

Channel	CH 64	**Frequency**	914.9MHz
Frequency Range	1GHz~9.3G	**Detector Function**	PK/AV

Horizontal

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	1829.8	48.04	7.73	55.77	74.00	18.23	205	150	PK
2	1829.8	42.75	7.73	50.48	54.00	3.52	205	150	AV
3	2744.7	36.35	11.20	47.55	54.00	6.45	258	268	AV
4	2744.7	43.63	11.20	54.83	74.00	19.17	258	52	PK
5	3659.6	36.17	14.80	50.97	54.00	3.03	170	359	AV
6	3659.6	46.15	14.80	60.95	74.00	13.05	170	357	PK

Vertical

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	1829.8	44.30	7.86	52.16	74.00	21.84	217	262	PK
2	1829.8	36.91	7.86	44.77	54.00	9.23	217	262	AV
3	2744.7	36.07	11.20	47.27	54.00	6.73	190	5	AV
4	2744.7	43.95	11.20	55.15	74.00	18.85	190	30	PK
5	3659.6	44.01	14.86	58.87	74.00	15.13	169	136	PK
6	3659.6	35.31	14.86	50.17	54.00	3.83	169	294	AV

Remark: 1. The emission levels of other frequencies were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]

Channel	CH 122	**Frequency**	926.6MHz
Frequency Range	1GHz~9.3G	**Detector Function**	PK/AV

Horizontal

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	1853.2	45.08	8.05	53.13	74.00	20.87	143	175	PK
2	1853.2	36.47	8.05	44.52	54.00	9.48	143	275	AV
3	2779.8	36.23	11.24	47.47	54.00	6.53	187	301	AV
4	2779.8	44.26	11.24	55.50	74.00	18.50	187	334	PK
5	3706.4	42.94	15.34	58.28	74.00	15.72	151	262	PK
6	3706.4	35.30	15.34	50.64	54.00	3.36	151	288	AV

Vertical

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	1853.2	36.98	8.05	45.03	54.00	8.97	104	115	AV
2	1853.2	44.44	8.05	52.49	74.00	21.51	104	62	PK
3	2779.8	44.19	11.24	55.43	74.00	18.57	101	95	PK
4	2779.8	36.62	11.24	47.86	54.00	6.14	101	95	AV
5	3706.4	35.62	15.34	50.96	54.00	3.04	205	209	AV
6	3706.4	44.02	15.34	59.36	74.00	14.64	205	209	PK

Remark: 1. The emission levels of other frequencies were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]

3.3 NUMBER OF HOPPING FREQUENCY USED

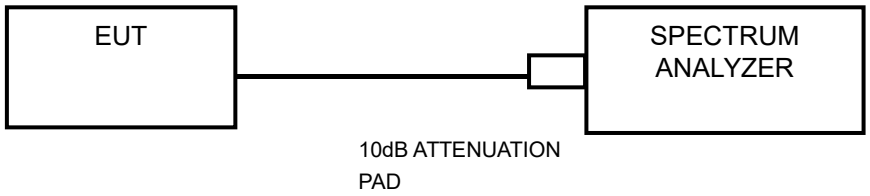
3.3.1 Limits

At least 50 channels frequencies, and should be equally spaced.

3.3.2 Measurement procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
d. Set the SA on View mode and then plot the result on SA screen.
e. Repeat above procedures until all frequencies measured were completed.

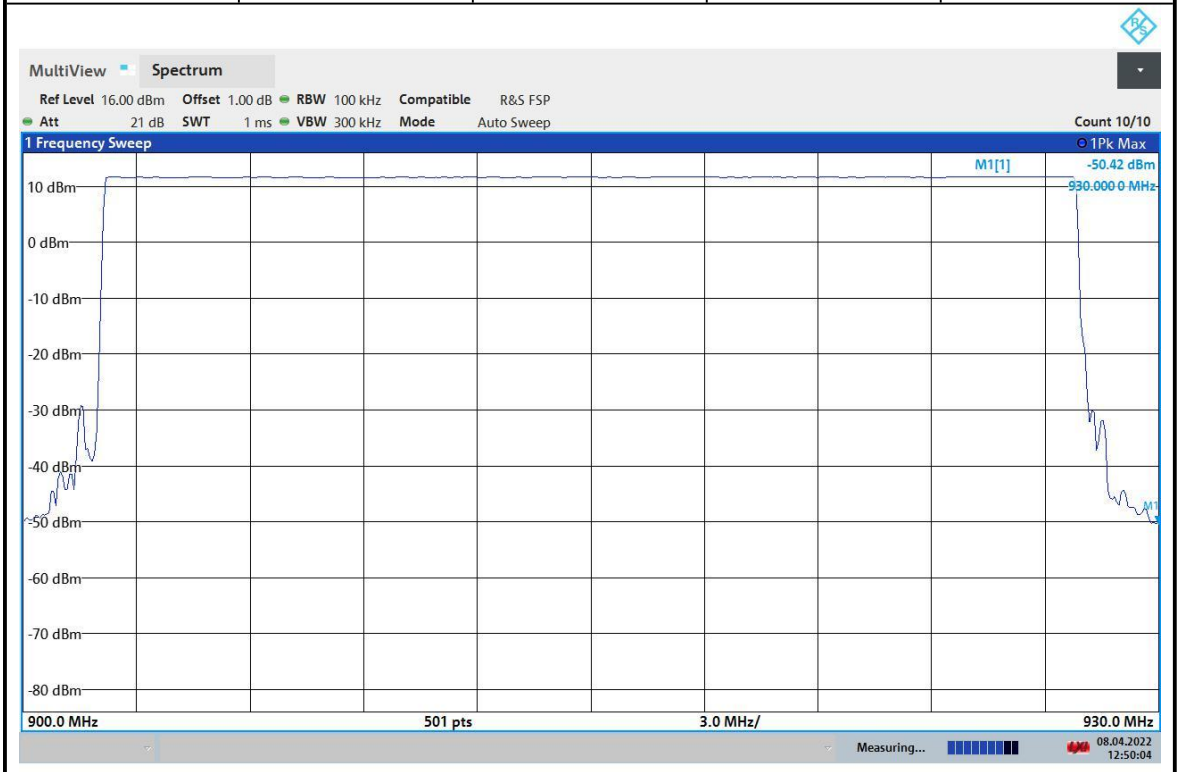
3.3.3 Test setup



3.3.4 Test result

There are 122 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

Mode	Channel	Result[Num]	Limit[Num]	Verdict
DR0	Hop	122	≥50	PASS



3.4 DWELL TIME ON EACH CHANNEL

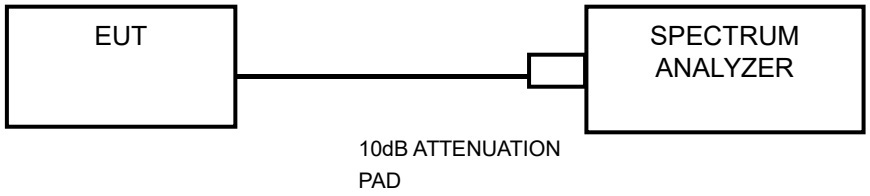
3.4.1 Limits

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

3.4.2 Measurement procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

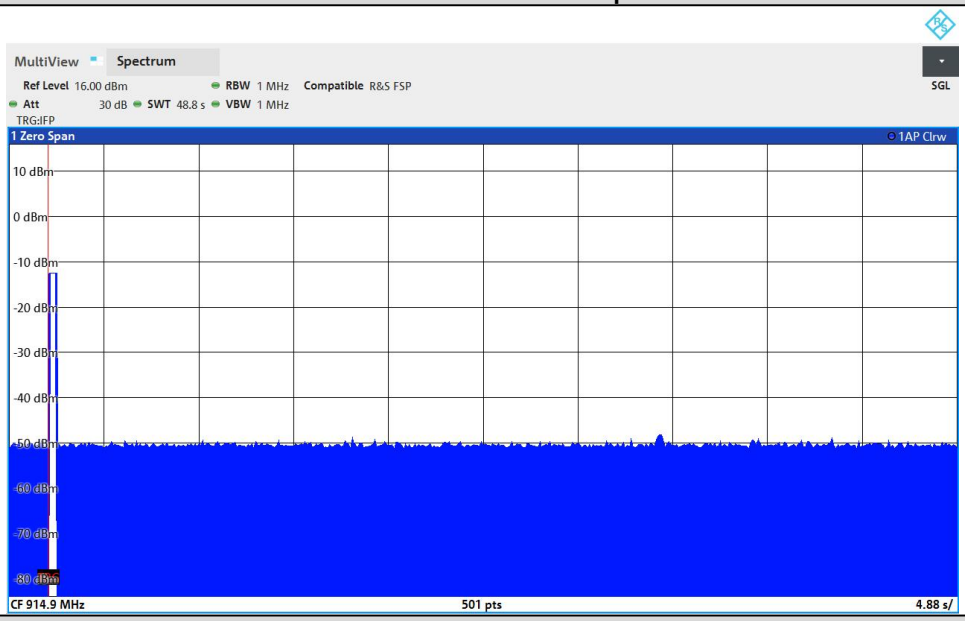
3.4.3 Test setup



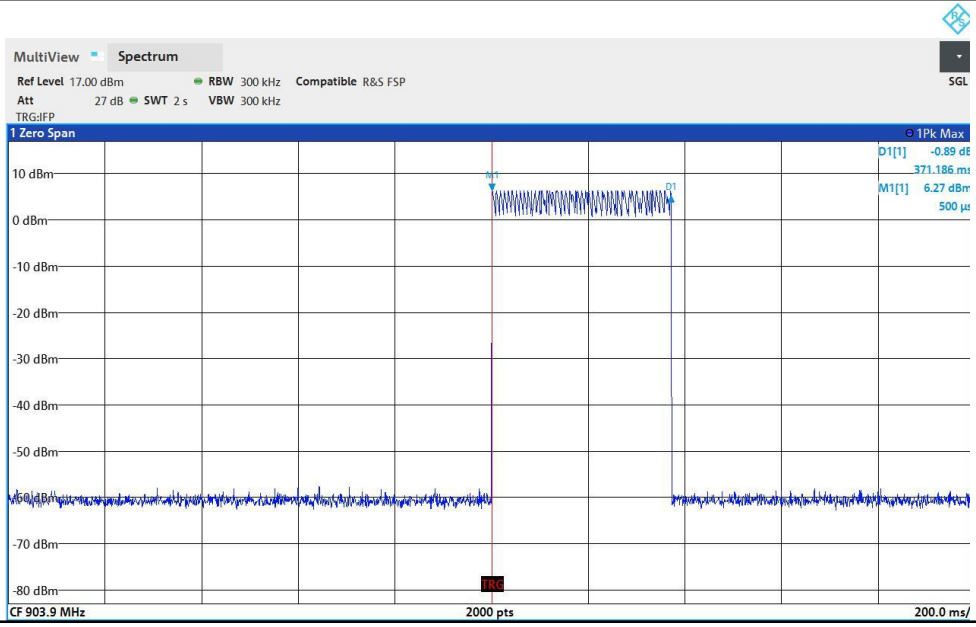
3.4.4 Test result

Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)	Length of transmission time (sec)	Result (sec)	Limit (sec)	Verdict
DR0	122	48.8	0.371	0.371	⩽0.4	PASS

Number of transmission in a period



Length of transmission time



3.5 20dB EMISSION BANDWIDTH

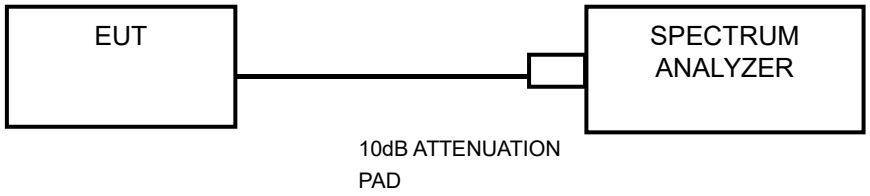
3.5.1 Limits

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz

3.5.2 Measurement procedure

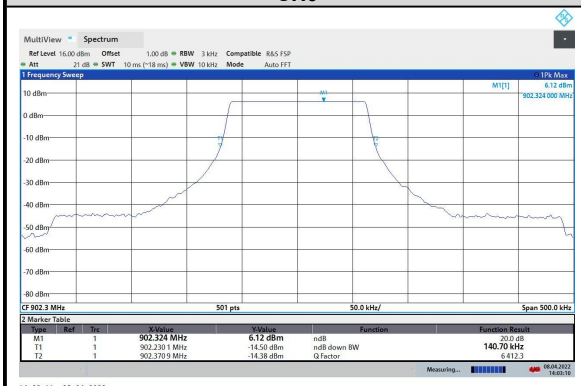
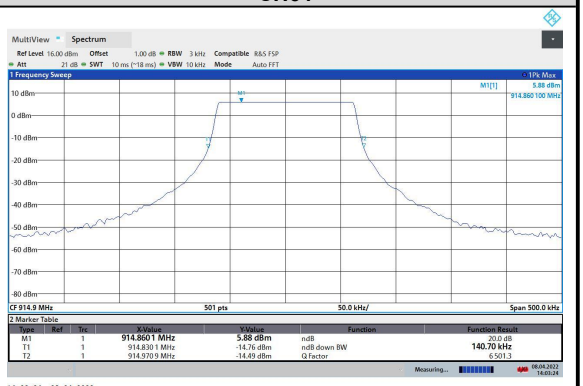
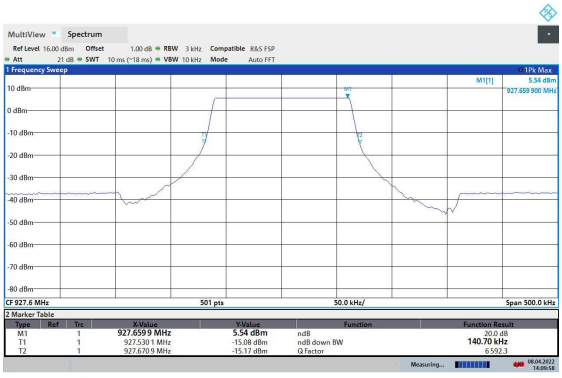
a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
d. Repeat above procedures until all frequencies measured were complete.

3.5.3 Test setup



3.5.4 Test result

Mode	Channel	Channel Frequency (MHz)	20dB Emission Bandwidth(kHz)	Limit (kHz)
DH0	1	902.3	140.70	≤250
	64	914.9	140.70	≤250
	122	927.6	140.70	≤250

CH0	CH64
	
CH122	
	

3.6 HOPPING CHANNEL SEPARATION

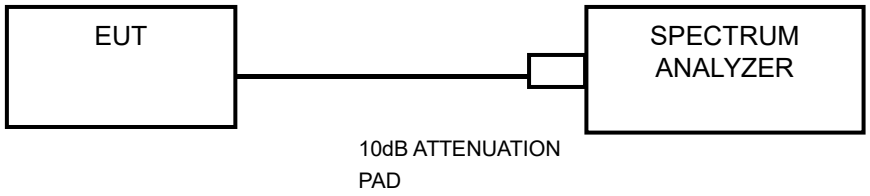
3.6.1 Limits

At least 25kHz or two-third of 20dB hopping channel bandwidth (whichever is greater).

3.6.2 Measurement procedure

a. Span: Wide enough to capture the peaks of two adjacent channels.
b. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
c. Video (or average) bandwidth (VBW) ⩾ RBW.
d. Sweep: Auto.
e. Detector function: Peak.
f. Trace: Max hold.
g. Allow the trace to stabilize.

3.6.3 Test setup

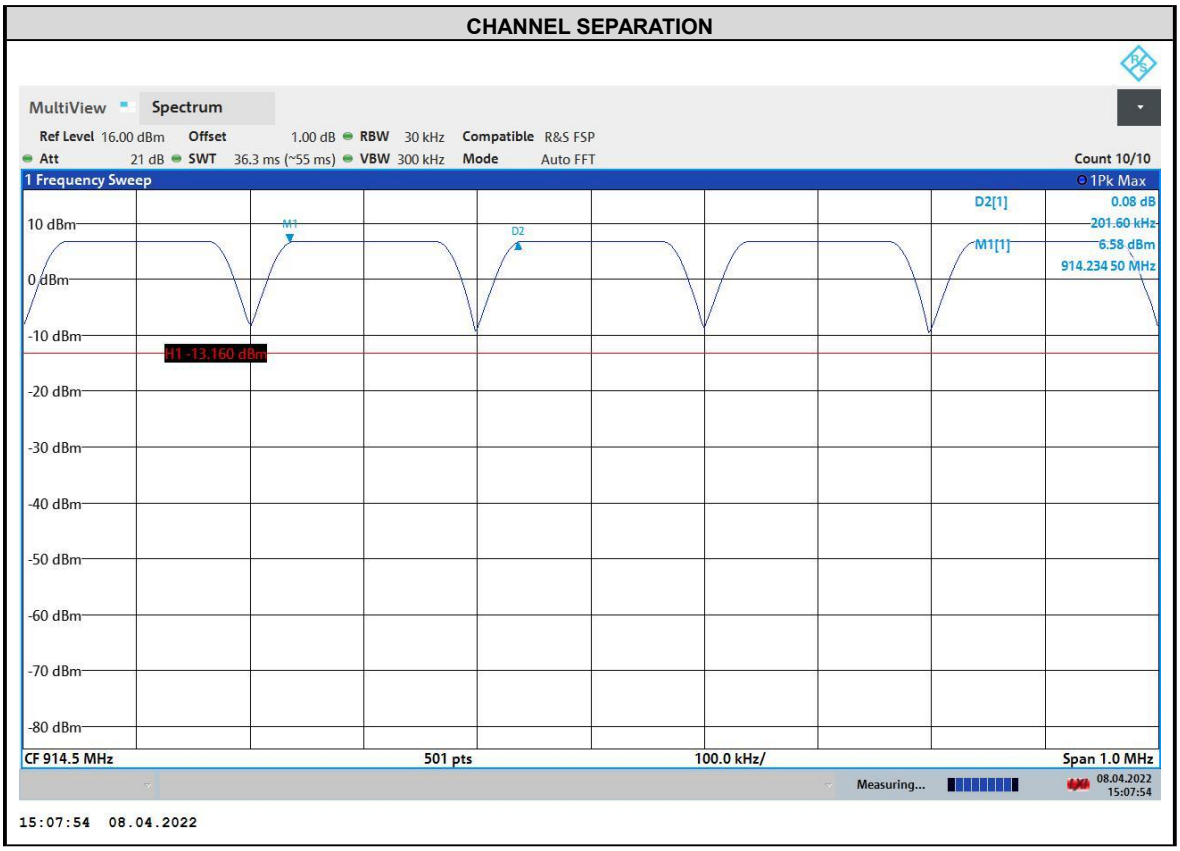


3.6.4 Test result

Mode	Adjacent Channel Separation (kHz)	Minimum Limit 20dB Bandwidth (kHz)	Verdict
DR0	201.60	140.70	PASS

Test Plot:

CHANNEL SEPARATION



3.7 CONDUCTED OUTPUT POWER

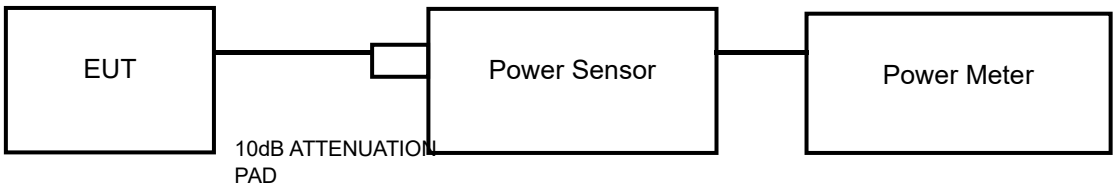
3.7.1 Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

3.7.2 Measurement procedure

a. A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor and set the detector to PEAK. Record the power level.
b. Anaverage power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power senso and set the detector to AVERAGE. Record the power level.

3.7.3 Test setup



3.7.4 Test result

PEAK OUTPUT POWER

GFSK

CHANNEL	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)	Peak Power Limit (mW)	Verdict
1	902.3	17.69	58.749	1000	PASS
64	914.9	17.45	55.590	1000	PASS
122	927.6	17.14	51.761	1000	PASS

AVERAGE OUTPUT POWER(For reference)

Mode	Channel Frequency (MHz)	Average Power (dBm)	Average Power (mW)	Average Power Limit (mW)	Verdict
1	902.3	6.22	4.188	1000	PASS
64	914.9	5.96	3.945	1000	PASS
122	927.6	5.62	3.648	1000	PASS

3.8 POWER SPECTRAL DENSITY MEASUREMENT

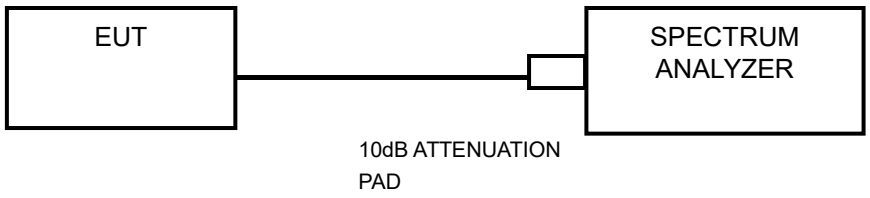
3.8.1 Limits

The Maximum of Power Spectral Density Measurement is 8dBm/3KHz.

3.8.2 Measurement procedure

1. Set instrument center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set RBW to: 3KHz
4. Set VBW ≥3 x RBW.
5. Detector = peak
6. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
7. Sweep time = auto couple.
8 .Use the peak marker function to determine the maximum amplitude level.

3.8.3 Test setup

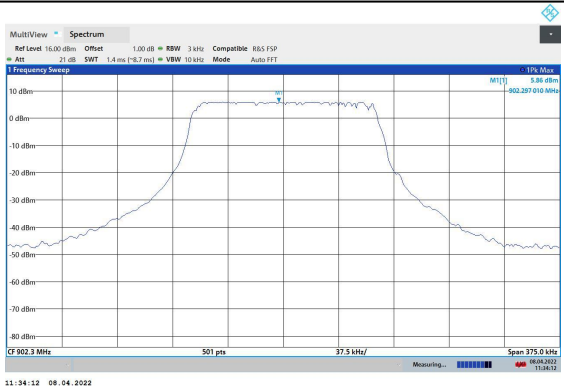


3.8.4 Test result

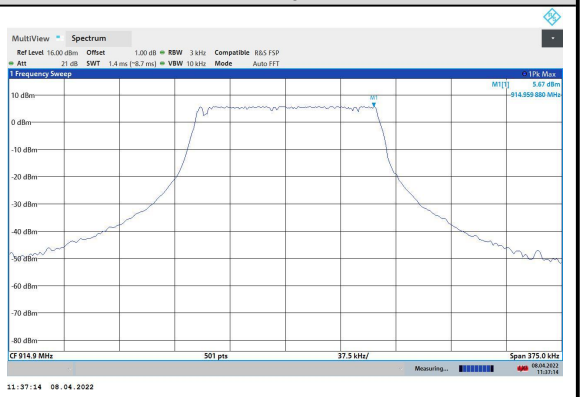
CHANNEL	CHANNEL FREQUENCY (MHz)	PSD(dBm/3kHz)	Limit (dBm/3kHz)	PASS / FAIL
1	902.3	5.86	8	PASS
64	914.9	5.67	8	PASS
122	927.6	5.55	8	PASS

Test Plot:

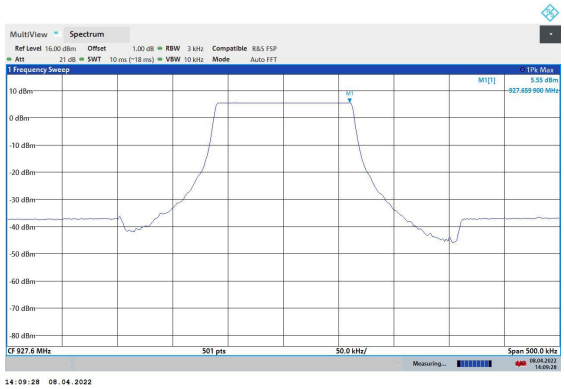
CH1



CH64



CH122



3.9 OUT OF BAND EMISSION MEASUREMENT

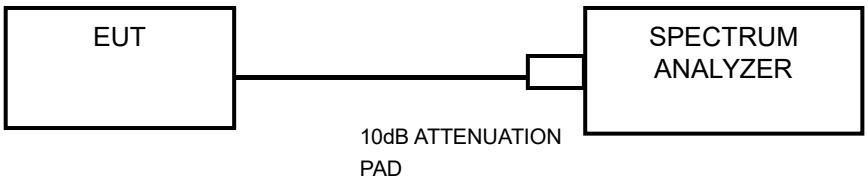
3.9.1 Limits

Below –20dB of the highest emission level of operating band (in 100KHz RBW).

3.9.2 Measurement procedure

The transmitter output was connected to the spectrum analyzer via a low loss cable. of Spectrum Analyzer was set RBW to 100 kHz and VBW to 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. Detector = PEAK and Trace mode = Max Hold. The band edges was measured and recorded.

3.9.3 Test setup

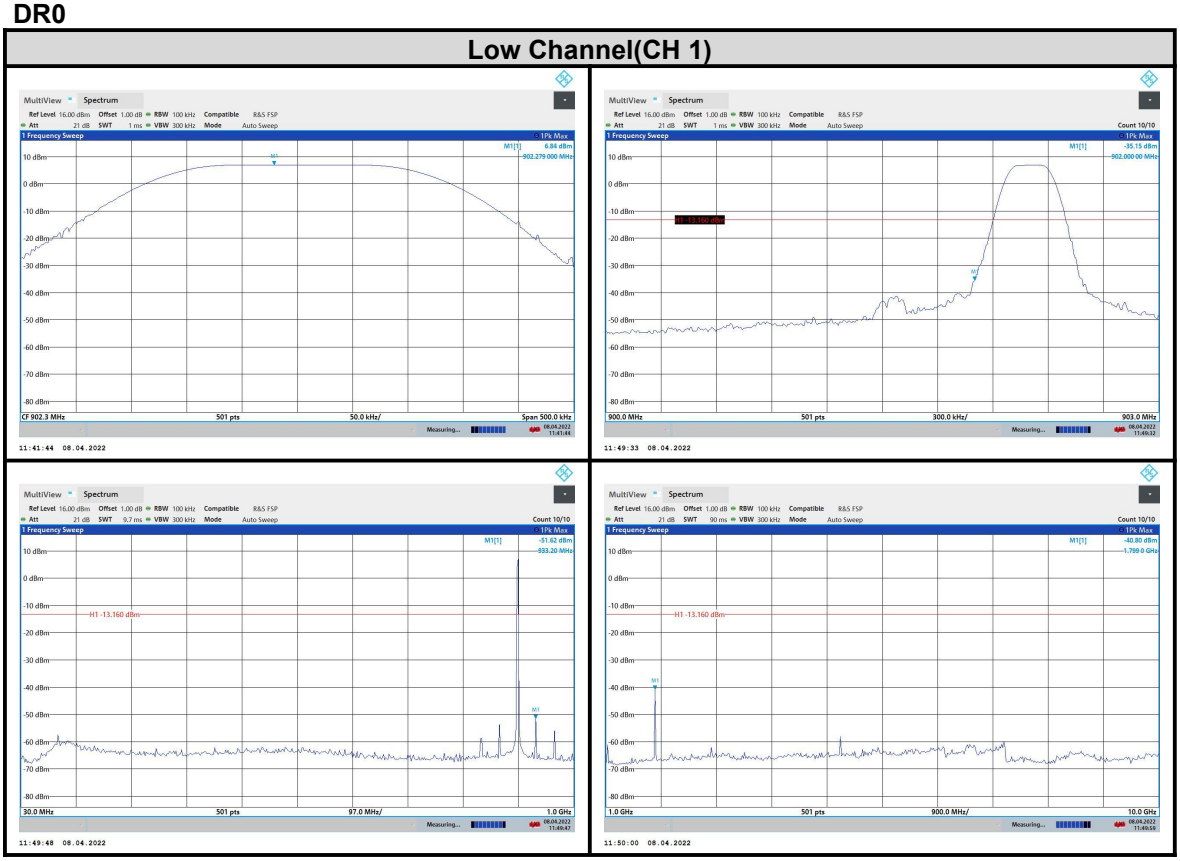


3.9.4 Test result

The spectrum plots are attached on the following images.

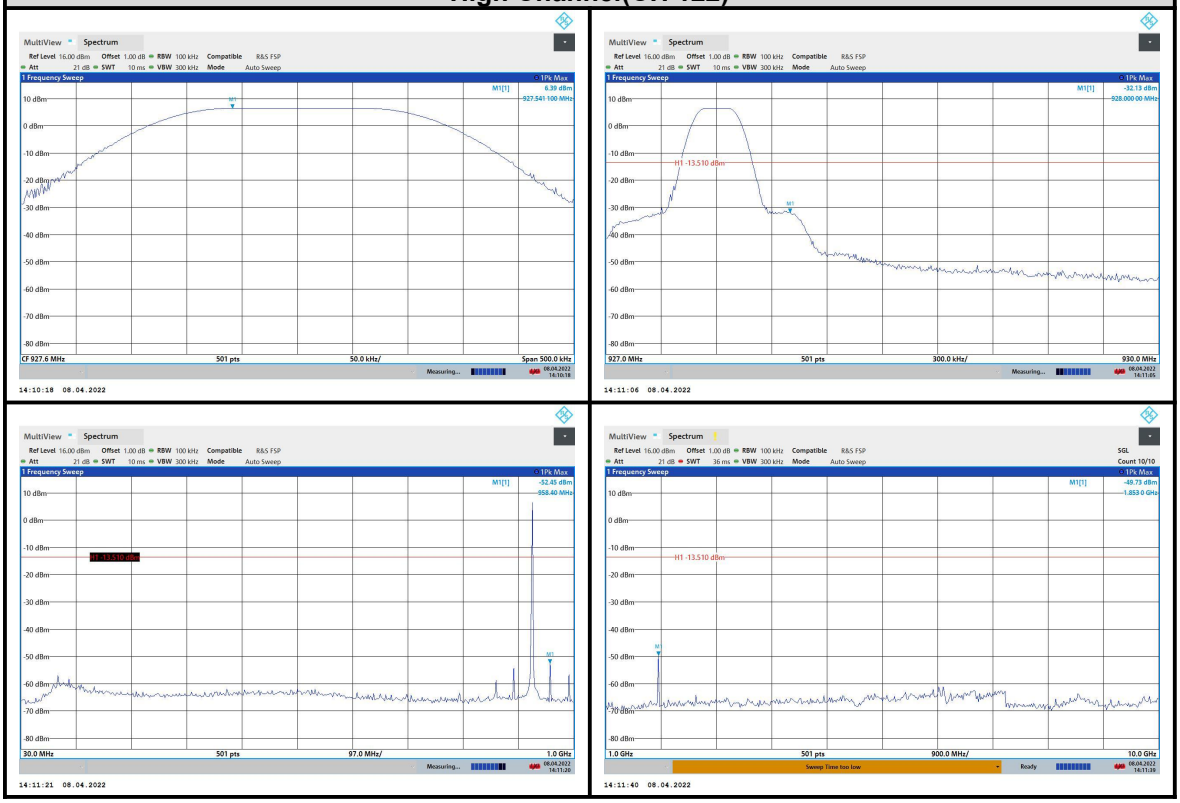
DR0

Low Channel(CH 1)



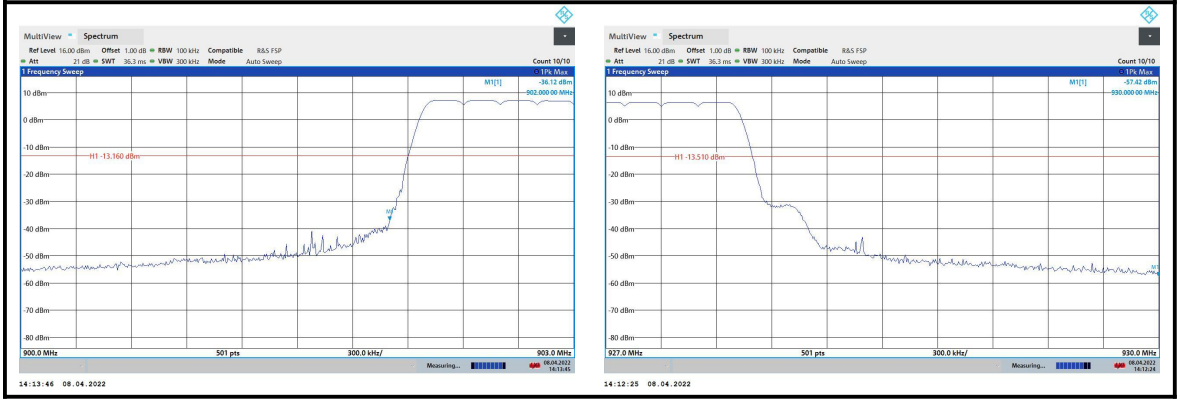
DR0

High Channel(CH 122)



DR0-HOPPING

Hopping



4 PHOTOGRAPHS OF TEST SETUP

Please refer to the attached file (Test Photos).

5 PHOTOGRAPHS OF THE EUT

Please refer to the attached file (External Photos report and Internal Photos).

Important

(1) The test report is valid with the official seal of the laboratory and the signatures of Test engineer, Author and Reviewer simultaneously.

(2) The test report is invalid if altered.

(3) Any photocopies or part photocopies in the test report are forbidden without the written permission from the laboratory.

(4) Objections to the test report must be submitted to the laboratory within 15 days.

(5) Generally, commission test is responsible for the tested samples only.

Address of the laboratory:
CVC Testing Technology Co., Ltd.
Address: No.3,TiantaiyiRoad,KaitaiAvenue,ScienceCity,Guangzhou,China
Post Code：510663 Tel：020-32293888
FAX：020-32293889 E-mail：office@cvc.org.cn