CERT # 5473.03

Test Report No.:
FCCSZ2024-0003-RF2

RF Test Report

FCC ID	:	**2AYHY-CT10X**
EUT	:	**Smart Current Transformer**
MODEL	:	**See Section 2.2**
BRAND NAME	:	**Milesight**
APPLICANT	:	**Xiamen Milesight IoT Co., Ltd.**
Classification of Test	:	**N/A**

CVC Testing Technology (Shenzhen) 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: Smart Current Transformer** **Model/Type: See Section 2.2** **Brand: Milesight** **Serial No.: N/A** **Sampe No.: 2-1,2-2**

Date of Receipt.	**2024.01.10**	Date of Testing	**2024.01.10～2024.02.22**

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. Seal of CVC **Issue Date: 2024.02.23**

Tested by:	Reviewed by:	Approved by:
Cai Jianyu	Huang Meng	Dong Sanbi
Name Signature	Name Signature	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
FCCSZ2024-0003-RF2	Original release	2024.02.23

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted Output power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Meet the requirement of limit.

1.1 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial Number	Cal. interval	Cal. Due
WIFI & Bluetooth Test System					/
Signal&Spectrum Analyzer	Rohde&Schwarz	FSV 30	104408	1 year	2024.5.21
#3Shielding room	MORI	443	N/A	3 year	2026.5.16
Wideband radio communication tester	Rohde&Schwarz	CMW 500	168778	1 year	2024.5.25
Analog signal Generator (100kHz ~ 40GHz)	Rohde&Schwarz	SMB 100A	181934	1 year	2024.5.21
Vector signal Generator (9kHz ~ 6GHz)	Keysight	N5182B	MY57301451	1 year	2024.4.25
Vector signal Generator (9kHz ~ 6GHz)	Rohde&Schwarz	SGT 100A	111724	1 year	2024.5.21
RF control unit(BT/WiFi)	Tonscend	JS0806-2-8CH	20E8060261	1 year	2024.5.21
Radiation Spurious(Above 1GHz)					/
Signal&Spectrum Analyzer	Rohde&Schwarz	FSV 40	101898	1 year	2024.5.21
EMI Test Receiver	Rohde&Schwarz	ESR3	102693	1 year	2024.5.25
Antenna(30MHz~1001MHz)	SCHWARZBECK	VULB 9168	1133	1 year	2025.2.4
Horn antenna(1GHz-18GHz)	ETS	3117	227611	1 year	2024.3.25
Horn antenna(18GHz-40GHz)	QMS	QMS-00880	22051	1 year	2024.3.25
3m anechoic chamber	MORI	966	CS0300011	3 year	2026.5.18
Filter group(RSE-BT/WiFi)	Rohde&Schwarz	WiFi /BT Variant 1	100820	1 year	2024.5.21
Filter group(RSE-Cellular)	Rohde&Schwarz	Cellular Variant 1	100768	1 year	2024.5.21
Preamplifier(10kHz-1GHz)	Rohde&Schwarz	SCU-01F	100299	1 year	2024.5.21
Preamplifier(1GHz-18GHz)	Rohde&Schwarz	SCU-18F	100799	1 year	2024.5.21
Preamplifier(1GHz-18GHz)	Rohde&Schwarz	SCU-18F	100801	1 year	2024.5.21
Preamplifier(18Gz-40GHz)	Rohde&Schwarz	SCU-40A	101209	1 year	2024.5.21
#2 control room	MORI	433	CS0300028	3 year	2024.5.21
Temperature and humidity meter	/	C193561517	C193561517	1 year	2024.5.21
Radiation Spurious(Below 1GHz)					/
EMI Test Receiver	Rohde&Schwarz	ESR 26	101718	1 year	2024.5.25
Loop antenna（8.3k~30MHz）	Rohde&Schwarz	HFH2-Z2E	100951	1 year	2024.5.26
Antenna(30MHz~1000MHz)	SCHWARZBECK	VULB 9168	1132	1 year	2025.2.27
3m anechoic chamber	MORI	966	CS0200019	3 year	2026.5.18
Attenuator	/	SJ-5dB	607684	1 year	2025.2.4
#1 control room	MORI	433	CS0300028	3 year	2026.5.16
Temperature and humidity meter	/	C193561473	CS0200071	1 year	2024.5.21
Conducted emission					/
EMI Test Receiver	Rohde&Schwarz	ESR3	102694	1 year	2024.5.25
limiter（10 dB）	Rohde&Schwarz	ESH3-Z2	102824	1 year	2024.5.16
Voltage probe	Rohde&Schwarz	CVP9222C	28	1 year	2024.5.16
Current probe	Rohde&Schwarz	EZ-17	101442	1 year	2024.5.21
ISN network	Rohde&Schwarz	ENV 81	100401	1 year	2024.5.16
ISN network	Rohde&Schwarz	ENV 81 Cat6	101896	1 year	2024.5.16
LISN（single-phase ）	Rohde&Schwarz	ENV216	102569	1 year	2024.4.11
#1Shielding room	MORI	854	N/A	3 year	2026.5.16

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	Measurement Uncertainty
1	Conducted emission test	+/-2.7 dB
2	Radiated emission 9kHz-30MHz	+/-5.6 dB
3	Radiated emission 30MHz-1GHz	+/-4.6 dB
4	Radiated emission 1GHz-18GHz	+/-4.4 dB
5	Radiated emission 18GHz-40GHz	+/-5.1 dB
6	RF power	+/-0.9 dB
7	Power Spectral Density	+/-0.8 dB
8	Conducted spurious emissions	+/-2.7 dB
9	Transmission Time	+/-0.27%
10	Occupied Bandwidth	+/-1.86%
Remark: 95% Confidence Levels, k=2.		

1.3 TEST LOCATION

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

CABID:CN0137
Lab Address: No. 1301, Guanguang Road, Xinlan Community, Guanlan Street, Longhua District, Shenzhen City, Guangdong Province 518110 P.R.China
Post Code：518110 Tel：0755-23763060-8805
Fax：0755-23763060 E-mail：sz-kf@cvc.org.cn
FCC(Test firm designation number：CN1363)
IC(Test firm CAB identifier number：CN0137)
CNAS(Test firm designation number：L16091)

2 GENERAL INFORMATION

2.1 GENERAL PRODUCT INFORMATION

PRODUCT	Smart Current Transformer
BRAND	Milesight
MODEL	CT103-915M
ADDITIONAL MODEL	See Section 2.2
POWER SUPPLY	AC 120V/60Hz
MODULATION TYPE	Chirp Spread Spectrum
OPERATING FREQUENCY	DTS 500kHz, 903MHz~927.5MHz
NUMBER OF CHANNEL	16
PEAK OUTPUT POWER	20.73dBm (Maximum)
ANTENNA TYPE (Remark 3)	External Antenna, 3.73dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

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. Please refer to the antenna report.
4. EUT photo refer to the report (Report NO.: FCCSZ2024-0003-EUT).
5. The EUT have SISO function, provides 1 completed transmitter and 1 receiver.

2.2 Additional Model/Type

Main Model No.	Serial Model No.	Difference
CT103-915M	NO103-915M, CT103-9M,NO103-9M	only differences are the model no and appearance silkprint.
	CT101-915M,NO101-915M, CT101-9M,NO101-9M	1.Main Model No and Serial Model No only differences are the external Current Transformer. 2.Serial Model only differences are the model no and appearance silkprint.
	CT105-915M,NO105-915M, CT107-915M,NO107-915M, CT109-915M,NO109-915M, CT110-915M,NO110-915M, CT301-915M,NO301-915M, CT303-915M,NO303-915M, CT305-915M,NO305-915M, CT310-915M,NO310-915M,	1.Main Model No and Serial Model No. only differences are the external Current Transformer. 2.Serial Model only differences are the model no and appearance silkprint.

	CT315-915M,NO315-915M, CT320-915M,NO320-915M, CT325-915M,NO325-915M, CT330-915M,NO330-915M, CT335-915M,NO335-915M, CT340-915M,NO340-915M, CT105-9M,NO105-9M, CT107-9M,NO107-9M, CT109-9M,NO109-9M, CT110-9M,NO110-9M, CT301-9M,NO301-9M, CT303-9M,NO303-9M, CT305-9M,NO305-9M, CT310-9M,NO310-9M, CT315-9M,NO315-9M, CT320-9M,NO320-9M, CT325-9M,NO325-9M, CT330-9M,NO330-9M, CT335-9M,NO335-9M, CT340-9M,NO340-9M	

2.3 OTHER INFORMATION

Operating frequency of each channel

LORA DR8					
CHANNEL	**FREQ. (MHz)**	**CHANNEL**	**FREQ. (MHz)**	**CHANNEL**	**FREQ. (MHz)**
0	**903**	6	912.6	12	925.7
1	904.6	**7**	**914.2**	13	926.3
2	906.2	8	923.3	14	926.9
3	907.8	9	923.9	**15**	**927.5**
4	909.4	10	924.5	--	--
5	911.0	11	925.1	**--**	**--**

Note: The channels which were indicated in bold type of the above channel list were selected as representative test channel. Therefor only the data of the test channels were recorded in this report.

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

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

Where **RE<1G:** Radiated Emission below 1GHz **RE≥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.

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE
A	0 to 15	0	FHSS	DR8

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.

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE
A	0 to 15	0,7,15	FHSS	DR8

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	DATA RATE
A	0 to 15	0,7,15	FHSS	DR8

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RE<1G	24.5deg. C, 54%RH	AC 120V/60Hz	Wang Zhiming
RE≥1G	24.5deg. C, 54%RH	AC 120V/60Hz	Wang Zhiming
PLC	25.2deg. C, 55%RH	AC 120V/60Hz	Zhou Ye
APCM	25.2deg. C, 55%RH	AC 120V/60Hz	Cai Jianyu

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	N/A	N/A	N/A	N/A	N/A

Support Cable							
NO	Description	Quantity (Number)	Length (cm)	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

3.1.1 Limits

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.		

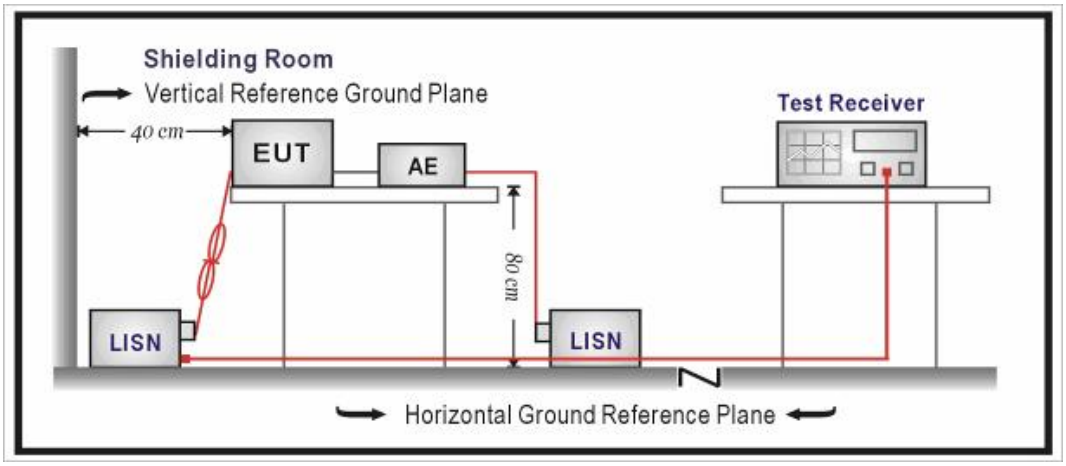
3.1.2 Test Procedures

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.

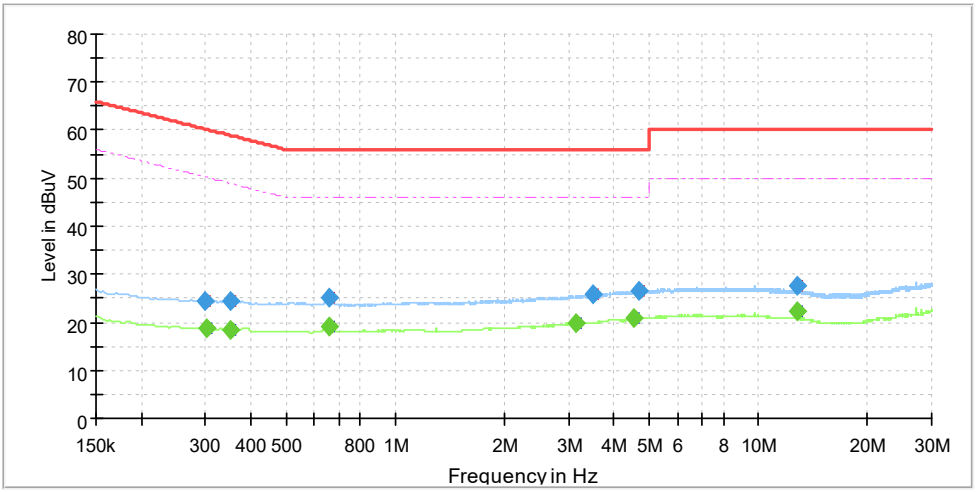
3.1.3 Test setup



3.1.4 Test Results

CONDUCTED WORST-CASE DATA:
MODEL:CT101-915M

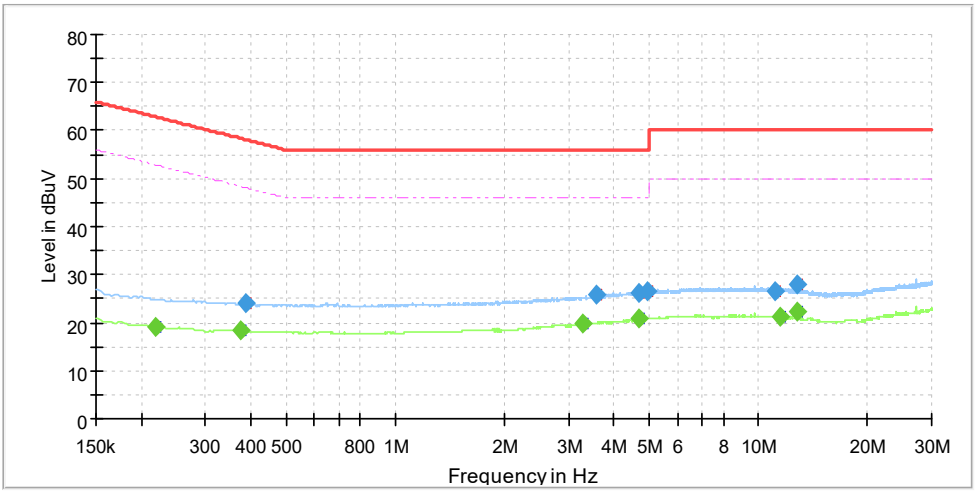
Test Mode	LORA Link	Frequency Range	150KHz ~ 30MHz
Test Voltage	AC 120V/60Hz	PHASE	Line (L)
Environmental Conditions	25.2deg. C, 55%RH	Tested By	Zhou Ye



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.299	24.4	---	60.3	35.9	L1	19.7
2	0.303	---	18.7	50.2	31.4	L1	19.7
3	0.350	---	18.5	49.0	30.5	L1	19.7
4	0.353	24.3	---	58.9	34.6	L1	19.7
5	0.659	---	19.0	46.0	27.0	L1	19.7
6	0.661	25.3	---	56.0	30.7	L1	19.7
7	3.158	---	20.0	46.0	26.0	L1	20.0
8	3.505	25.7	---	56.0	30.3	L1	20.0
9	4.562	---	20.9	46.0	25.1	L1	20.2
10	4.682	26.5	---	56.0	29.5	L1	20.2
11	12.800	---	22.2	50.0	27.8	L1	20.4
12	12.802	27.7	---	60.0	32.3	L1	20.4

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

Test Mode	LORA Link	**Frequency Range**	150KHz ~ 30MHz
Test Voltage	AC 120V/60Hz	**PHASE**	Line (N)
Environmental Conditions	25.2deg. C, 55%RH	**Tested By**	Zhou Ye

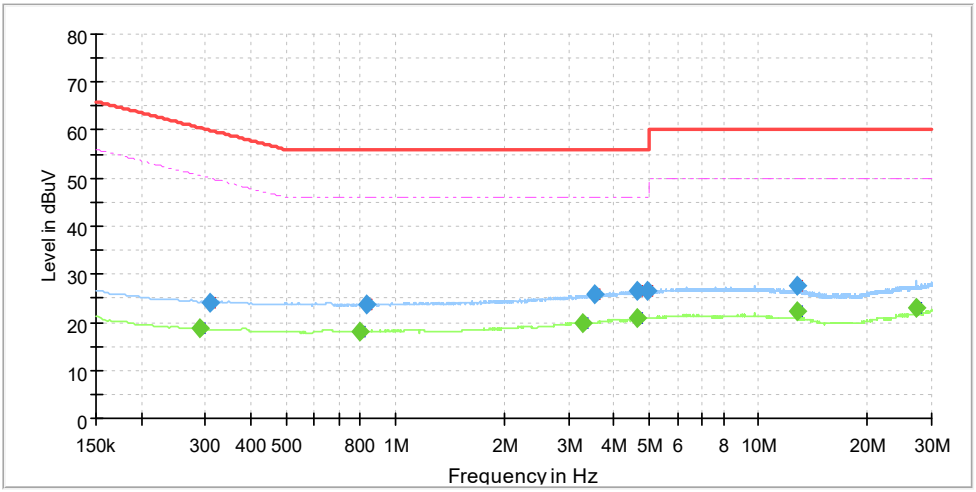


NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.220	---	19.0	52.8	33.9	N	19.5
2	0.377	---	18.4	48.3	29.9	N	19.5
3	0.386	24.0	---	58.1	34.1	N	19.5
4	3.273	---	19.8	46.0	26.2	N	19.9
5	3.566	25.7	---	56.0	30.3	N	19.9
6	4.670	---	20.8	46.0	25.2	N	20.1
7	4.679	26.3	---	56.0	29.7	N	20.1
8	4.965	26.4	---	56.0	29.6	N	20.1
9	11.175	26.6	---	60.0	33.4	N	20.7
10	11.542	---	21.2	50.0	28.8	N	20.6
11	12.800	---	22.4	50.0	27.6	N	20.6
12	12.800	27.9	---	60.0	32.1	N	20.6

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

CONDUCTED WORST-CASE DATA:
MODEL:CT103-915M

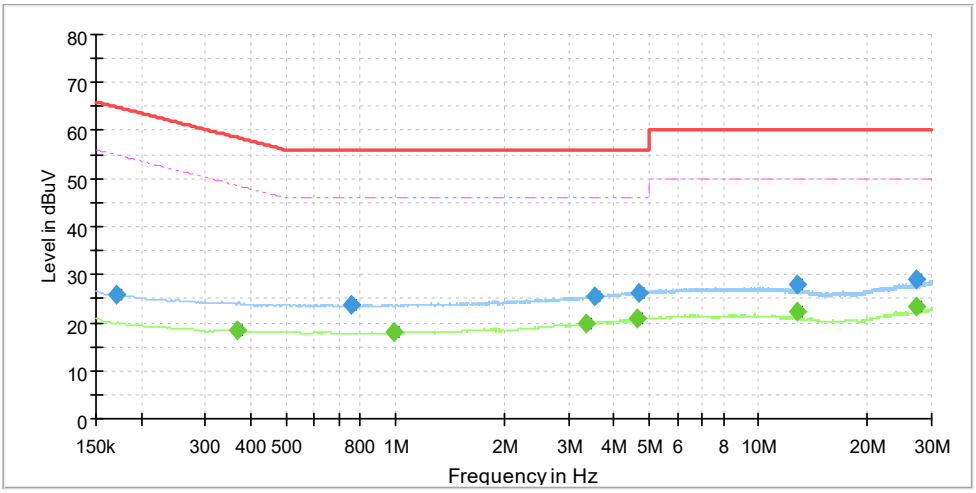
Test Mode	LORA Link	**Frequency Range**	150KHz ~ 30MHz
Test Voltage	AC 120V/60Hz	**PHASE**	Line (L)
Environmental Conditions	25.2deg. C, 55%RH	**Tested By**	Zhou Ye



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.290	---	18.7	50.5	31.9	L1	19.7
2	0.308	24.2	---	60.0	35.9	L1	19.6
3	0.800	---	17.9	46.0	28.1	L1	19.7
4	0.839	23.8	---	56.0	32.2	L1	19.7
5	3.282	---	20.0	46.0	26.0	L1	20.0
6	3.548	25.7	---	56.0	30.3	L1	20.0
7	4.643	---	20.9	46.0	25.1	L1	20.2
8	4.652	26.5	---	56.0	29.5	L1	20.2
9	4.943	26.6	---	56.0	29.4	L1	20.2
10	12.800	---	22.2	50.0	27.8	L1	20.4
11	12.800	27.7	---	60.0	32.3	L1	20.4
12	27.137	---	22.9	50.0	27.1	L1	20.9

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

Test Mode	LORA Link	Frequency Range	150KHz ~ 30MHz
Test Voltage	AC 120V/60Hz	PHASE	Line (N)
Environmental Conditions	25.2deg. C, 55%RH	Tested By	Zhou Ye



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.170	25.7	---	64.9	39.2	N	19.6
2	0.366	---	18.4	48.6	30.2	N	19.5
3	0.755	23.6	---	56.0	32.4	N	19.6
4	0.994	---	18.2	46.0	27.8	N	19.6
5	3.363	---	19.8	46.0	26.2	N	19.9
6	3.534	25.6	---	56.0	30.4	N	19.9
7	4.619	---	20.8	46.0	25.2	N	20.1
8	4.691	26.2	---	56.0	29.8	N	20.1
9	12.800	---	22.4	50.0	27.6	N	20.6
10	12.800	28.0	---	60.0	32.0	N	20.6
11	27.137	---	23.4	50.0	26.6	N	21.4
12	27.137	29.0	---	60.0	31.0	N	21.4

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

3.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT

3.2.1 Limit

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).

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

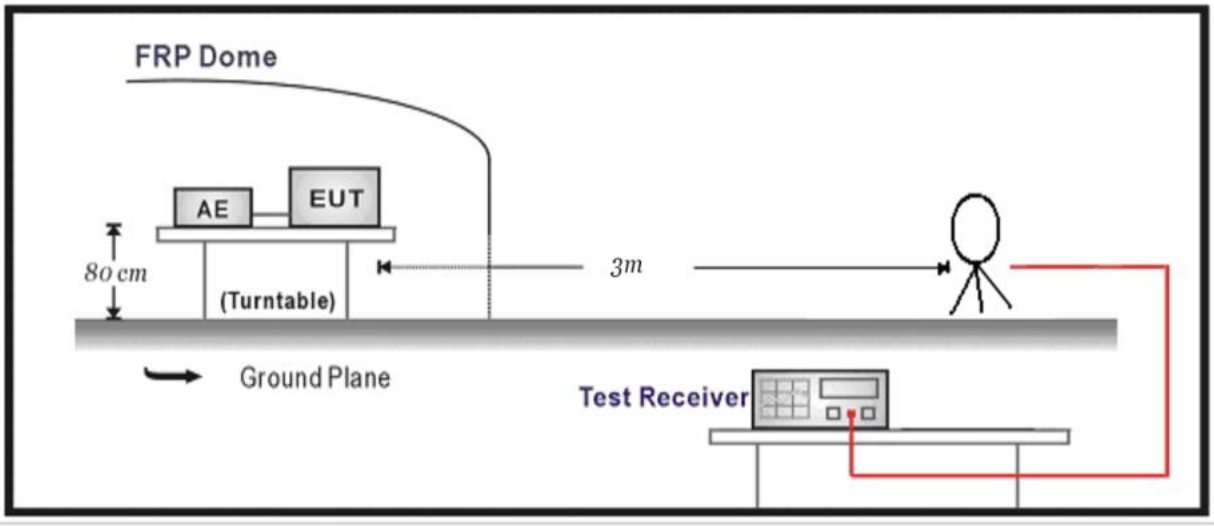
a. The EUT was placed on the top of a rotating table 1.5 meters(above 1GHz) and 0.8 meters(below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving 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:

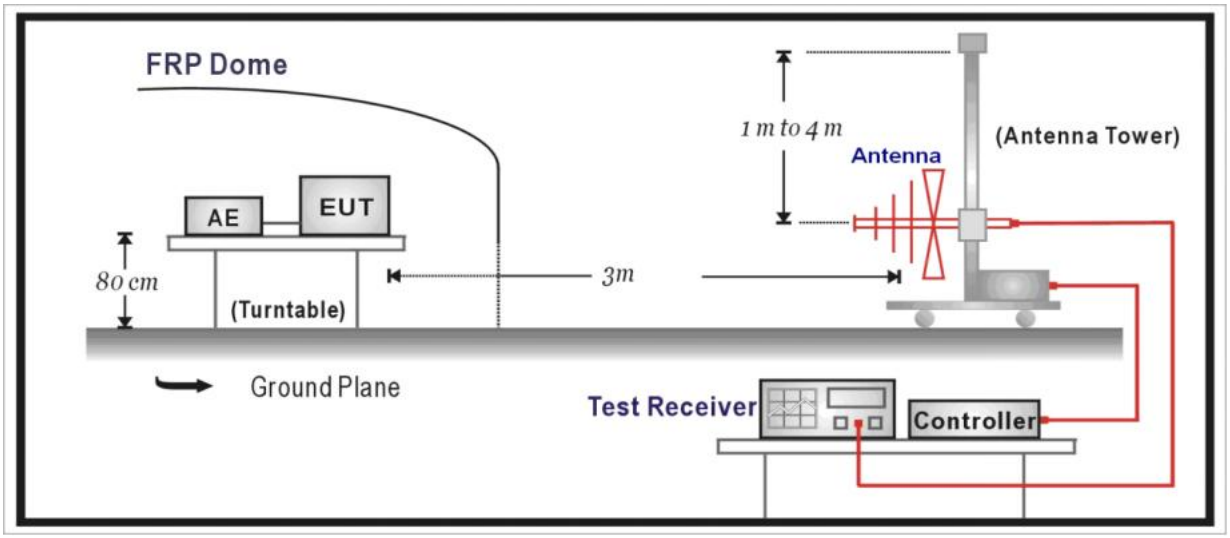
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution 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

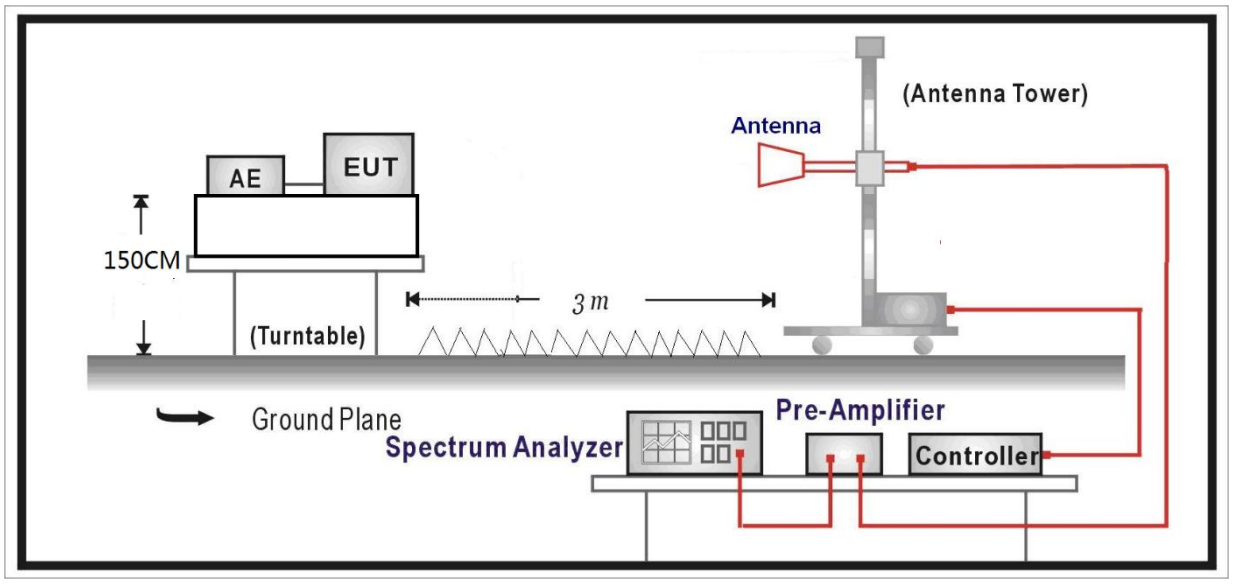
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:

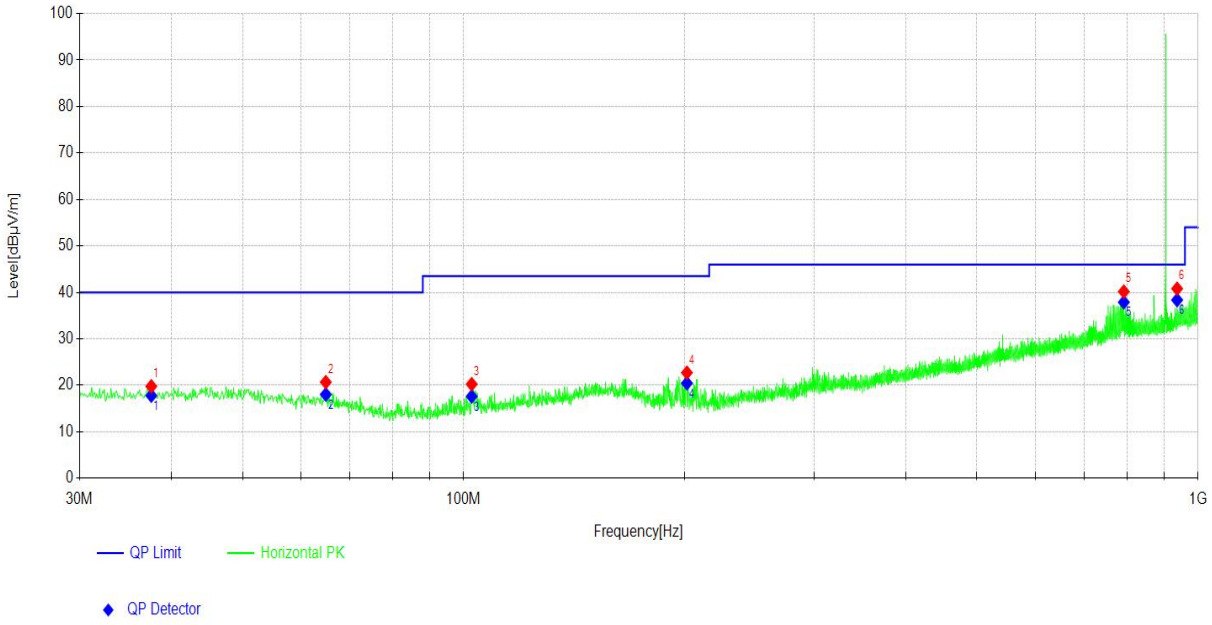


3.2.4 Test results

BELOW 1GHz WORST-CASE DATA:
MODEL:CT103-915M

Worst Test Mode	LORA Link	Channel	CH 0
Frequency Range	9KHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Horizontal

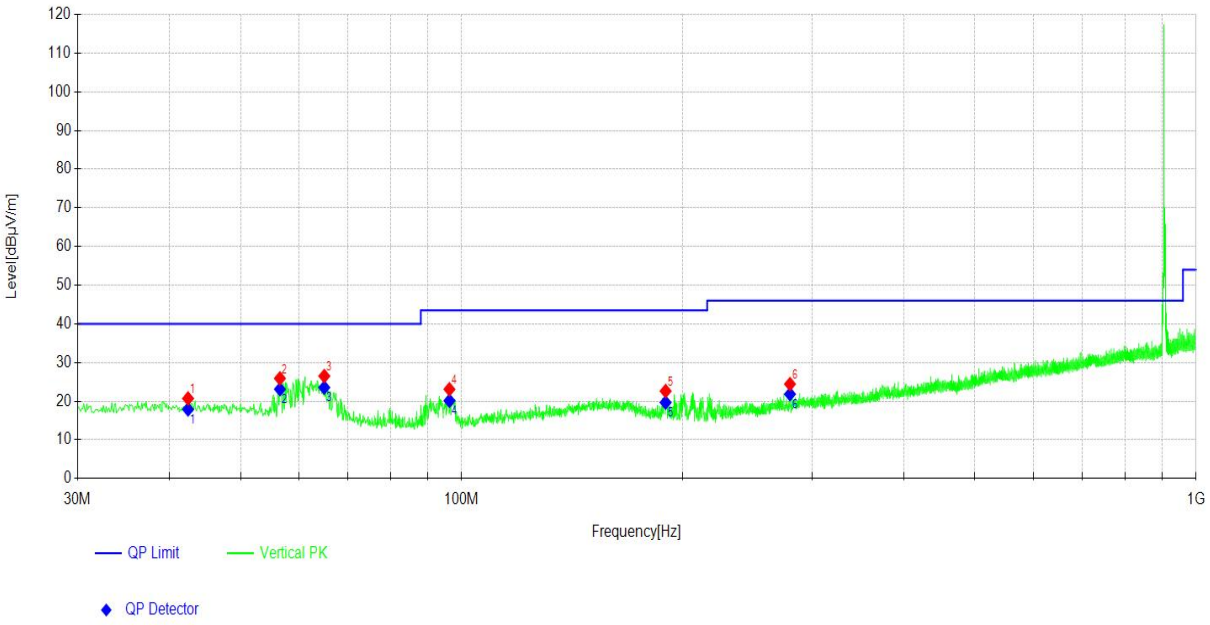


NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]
1	37.567	-0.7	18.50	17.80	40.00	22.20	100	323
2	64.923	1.1	16.94	18.04	40.00	21.96	100	44
3	102.563	2.42	15.19	17.61	43.50	25.89	100	97
4	201.416	4.46	15.99	20.45	43.50	23.05	100	76
5	792.399	7.71	30.18	37.89	46.00	8.11	100	94
6	**936.556**	**6.5**	**31.87**	**38.37**	**46.00**	**7.63**	**100**	**94**

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	LORA Link	**Channel**	CH 0
Frequency Range	9KHz ~ 1GHz	**Detector Function**	Quasi-Peak (QP)

Vertical



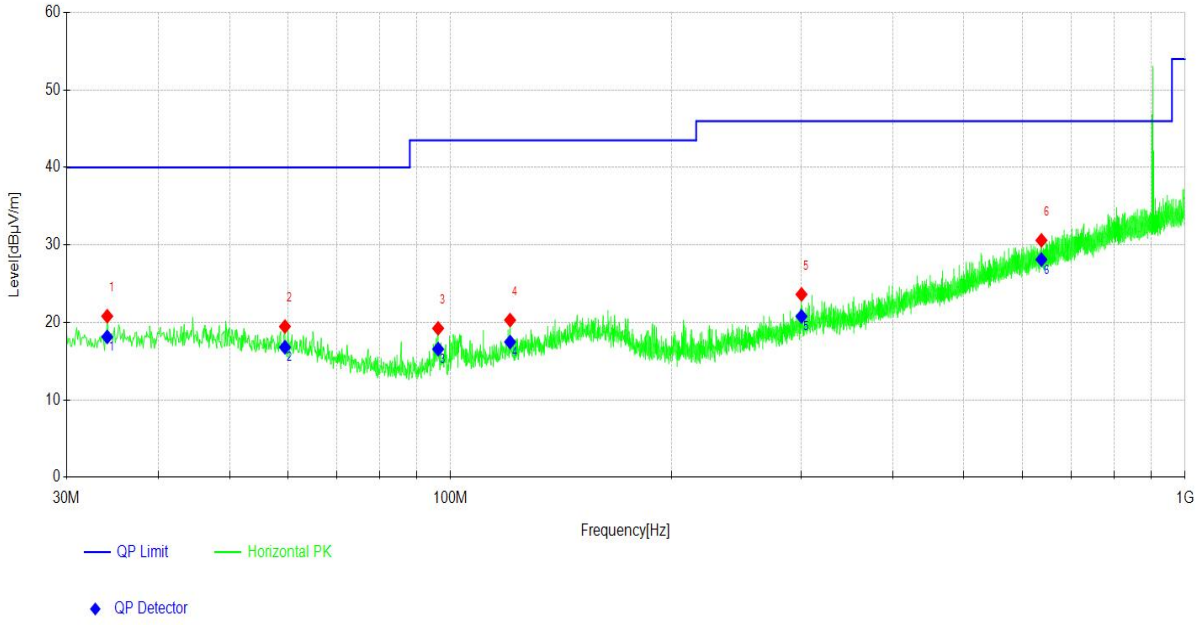
NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]
1	42.417	-0.91	18.81	17.90	40.00	22.10	100	0
2	56.581	5.06	18.04	23.10	40.00	16.90	100	192
3	65.021	6.61	16.93	23.54	40.00	16.46	100	238
4	96.258	5.33	14.79	20.12	43.50	23.38	100	76
5	189.581	3.31	16.35	19.66	43.50	23.84	100	241
6	279.994	3.8	18.02	21.82	46.00	24.18	100	58

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]

BELOW 1GHz WORST-CASE DATA:
MODEL:CT101-915M

Worst Test Mode	LORA Link	**Channel**	CH 0
Frequency Range	9KHz ~ 1GHz	**Detector Function**	Quasi-Peak (QP)

Horizontal

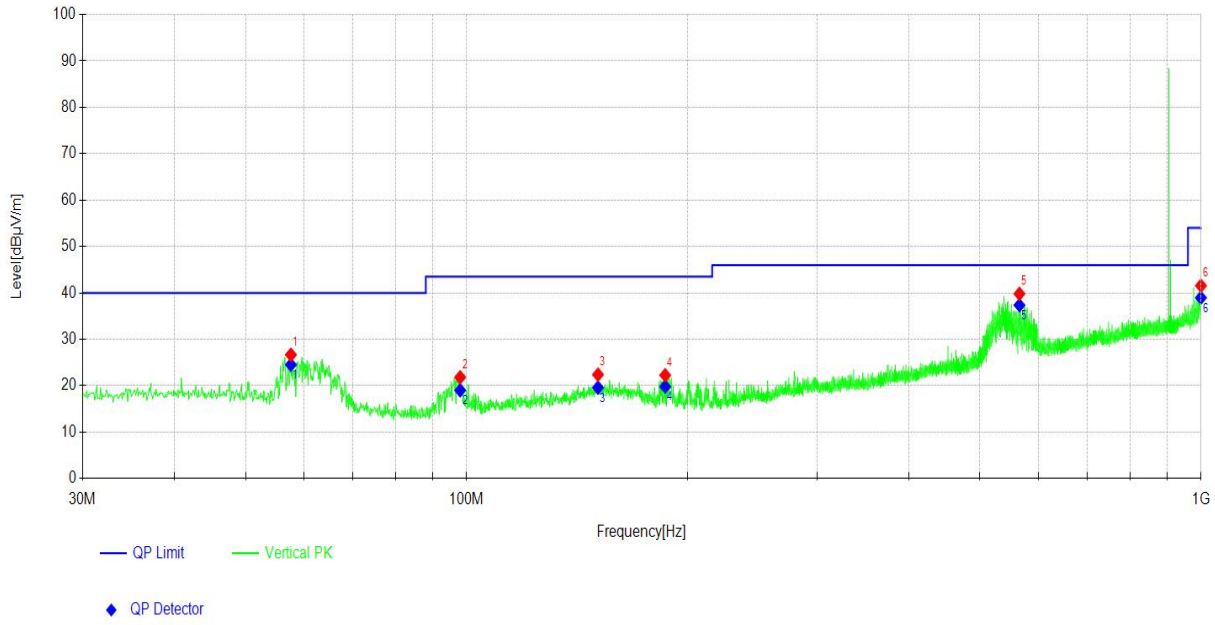


NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]
1	34.074	-0.12	18.24	18.12	40.00	21.88	100	269
2	59.491	-0.98	17.77	16.79	40.00	23.21	100	166
3	96.161	1.76	14.79	16.55	43.50	26.95	100	205
4	120.510	0.6	16.86	17.46	43.50	26.04	100	130
5	300.463	1.38	19.40	20.78	46.00	25.22	100	71
6	637.475	0.96	27.15	28.11	46.00	17.89	100	290

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	LORA Link	**Channel**	CH 0
Frequency Range	9KHz ~ 1GHz	**Detector Function**	Quasi-Peak (QP)

Vertical



NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]
1	57.648	6.57	17.95	24.52	40.00	15.48	100	326
2	98.004	4.15	14.87	19.02	43.50	24.48	100	160
3	150.971	0.2	19.39	19.59	43.50	23.91	100	326
4	186.380	3.28	16.54	19.82	43.50	23.68	100	326
5	565.882	11.73	25.64	37.37	46.00	8.63	100	209
6	999.709	6.51	32.45	38.96	54.00	15.04	100	92

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 0	Frequency	903MHz
Frequency Range	1GHz~9.3G	Detector Function	PK/AV

Horizontal

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector
1	1806.00	45.30	7.74	53.04	74.00	20.96	PK
2	1806.00	37.55	7.74	45.29	54.00	8.71	RMS
3	2709.00	36.13	11.22	47.35	54.00	6.65	RMS
4	2709.00	43.41	11.22	54.63	74.00	19.37	PK
5	3612.00	44.95	14.87	59.82	74.00	14.18	PK
6	3612.00	36.57	14.87	51.44	54.00	2.56	RMS

Vertical

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector
1	1806.00	45.96	7.74	53.70	74.00	20.30	PK
2	1806.00	36.88	7.74	44.62	54.00	9.38	RMS
3	2709.00	36.80	11.22	48.02	54.00	5.98	RMS
4	2709.00	43.82	11.22	55.04	74.00	18.96	PK
5	3612.00	43.60	14.87	58.47	74.00	15.53	PK
6	3612.00	36.41	14.87	51.28	54.00	2.72	RMS

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 7	**Frequency**	914.2MHz
Frequency Range	1GHz~9.3G	**Detector Function**	PK/AV

Horizontal

NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector
1	1828.40	37.04	7.85	44.89	54.00	9.11	RMS
2	1828.40	43.45	7.85	51.30	74.00	22.70	PK
3	2742.60	36.82	12.13	48.95	54.00	5.05	RMS
4	2742.60	43.36	12.13	55.49	74.00	18.51	PK
5	3656.80	36.30	15.14	51.44	54.00	2.56	RMS
6	3656.80	43.73	15.14	58.87	74.00	15.13	PK

Vertical

NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector
1	1828.40	44.25	7.85	52.10	74.00	21.90	PK
2	1828.40	36.94	7.85	44.79	54.00	9.21	RMS
3	2742.60	43.78	12.13	55.91	74.00	18.09	PK
4	2742.60	36.23	12.13	48.36	54.00	5.64	RMS
5	3656.80	42.56	15.14	57.70	74.00	16.30	PK
6	3656.80	35.65	15.14	50.79	54.00	3.21	RMS

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 15	**Frequency**	927.5MHz
Frequency Range	1GHz~9.3G	**Detector Function**	PK/AV

Horizontal

NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector
1	1855.00	44.69	8.06	52.75	74.00	21.25	PK
2	1855.00	37.05	8.06	45.11	54.00	8.89	RMS
3	2782.50	43.59	11.23	54.82	74.00	19.18	PK
4	2782.50	36.74	11.23	47.97	54.00	6.03	RMS
5	3710.00	43.02	15.34	58.36	74.00	15.64	PK
6	3710.00	36.00	15.34	51.34	54.00	2.66	RMS

Vertical

NO.	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector
1	1855.00	36.69	8.06	44.75	54.00	9.25	RMS
2	1855.00	43.98	8.06	52.04	74.00	21.96	PK
3	2782.50	37.38	11.23	48.61	54.00	5.39	RMS
4	2782.50	44.50	11.23	55.73	74.00	18.27	PK
5	3710.00	36.64	15.34	51.98	54.00	2.02	RMS
6	3710.00	43.34	15.34	58.68	74.00	15.32	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 6dB BANDWIDTH MEASUREMENT

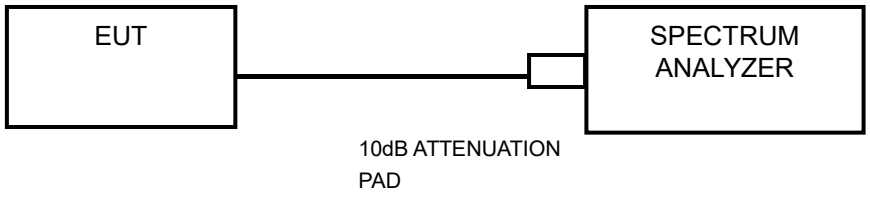
3.3.1 Limits

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

3.3.2 Measurement procedure

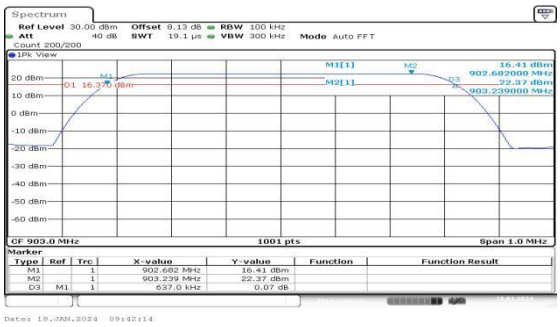
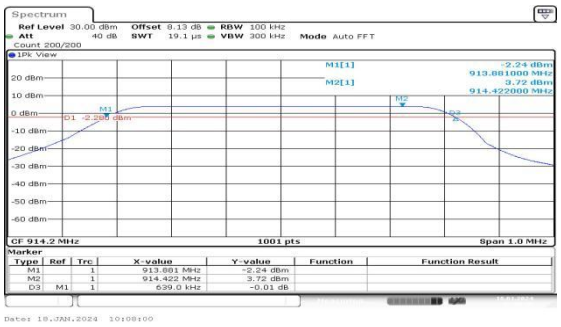
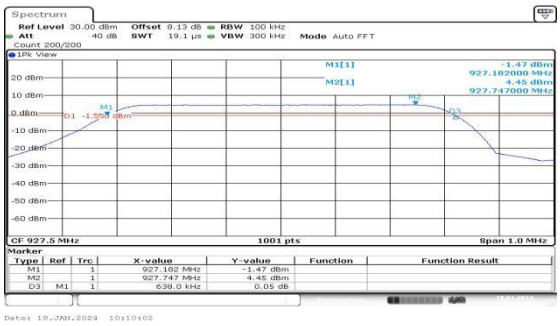
a. Set resolution bandwidth (RBW) = 100KHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associatedwith the two amplitude points (upper and lower) that are attenuated by 6 dB relative to themaximum level measured in the fundamental emission.

3.3.3 Test setup



3.3.4 Test result

Mode	Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)
DR8	0	903.0	637	≥500
	7	914.2	639	≥500
	15	927.5	638	≥500

CH0	CH7
	
CH15	
	

3.4 CONDUCTED OUTPUT POWER

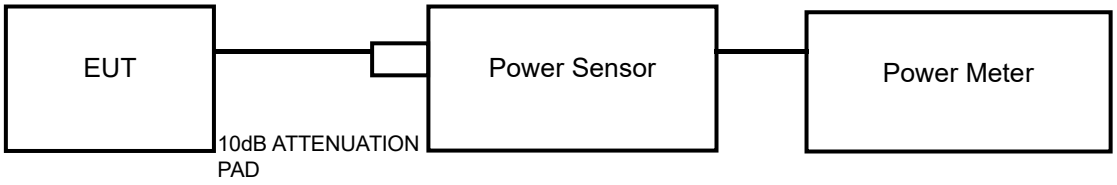
3.4.1 Limits

Forsystems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm).

3.4.2 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.

3.4.3 Test setup



3.4.4 Test result

PEAK OUTPUT POWER

GFSK

CHANNEL	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)	Peak Power Limit (mW)	Verdict
0	903.0	19.75	94.41	1000	PASS
7	914.2	20.02	100.46	1000	PASS
15	927.5	20.73	118.30	1000	PASS

AVERAGE OUTPUT POWER (For reference)

CHANNEL	Channel Frequency (MHz)	Average Power (dBm)	Average Power (mW)	Average Power Limit (mW)	Verdict
0	903.0	2.29	1.69	1000	PASS
7	914.2	2.98	1.99	1000	PASS
15	927.5	3.53	2.25	1000	PASS

3.5 POWER SPECTRAL DENSITY MEASUREMENT

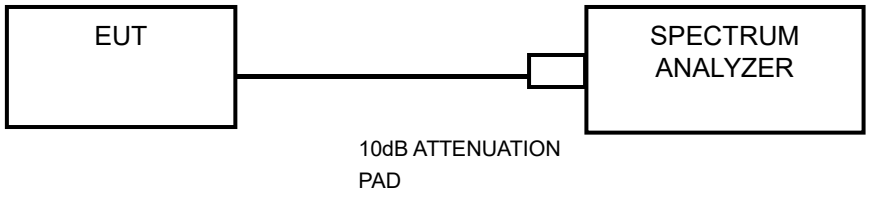
3.5.1 Limits

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

3.5.2 Measurement procedure

a. Set instrument center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set RBW to: 3KHz
d. Set VBW ≥3 x RBW.
e. Detector = peak
f. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g. Sweep time = auto couple.
h. Use the peak marker function to determine the maximum amplitude level.

3.5.3 Test setup



3.5.4 Test result

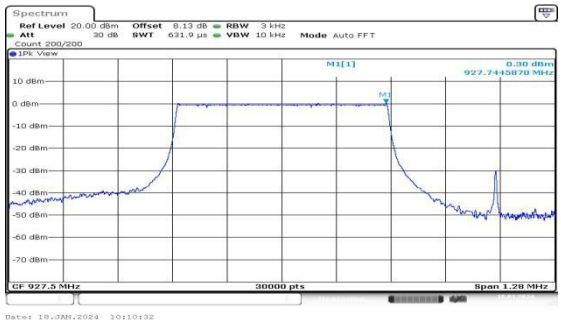
CHANNEL	CHANNEL FREQUENCY (MHz)	PSD(dBm/3kHz)	Limit (dBm/3kHz)	PASS / FAIL
0	903.0	-0.74	8	PASS
7	914.2	-0.42	8	PASS
15	927.5	0.30	8	PASS

Test Plot:

CH0

CH7

CH15



3.6 OUT OF BAND EMISSION MEASUREMENT

3.6.1 Limits

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

3.6.2 Measurement procedure

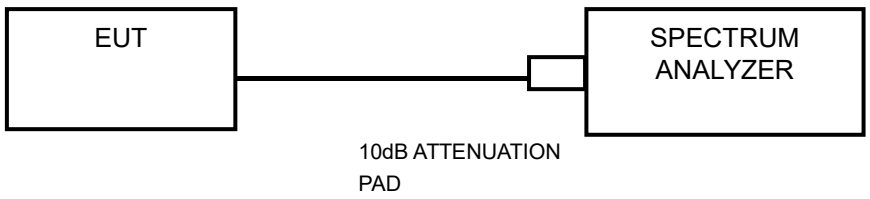
Measurement Procedure -Reference Level

a. Set the RBW = 100 kHz.
b. Set the VBW ≥ 300 kHz.
c. Detector = peak.
d. Sweep time = auto couple.
e. Trace mode = max hold.
f. Allow trace to fully stabilize.
g. Use the peak marker function to determine the maximum power level in any 100 kHzband segment within the fundamental EBW.

Measurement Procedure –Unwanted Emission Level

a. Set RBW = 100 kHz.
b. Set VBW ≥ 300 kHz.
c. Set span to encompass the spectrum to be examined
d. Detector = peak.
e. Trace Mode = max hold.
f. Sweep = auto couple.

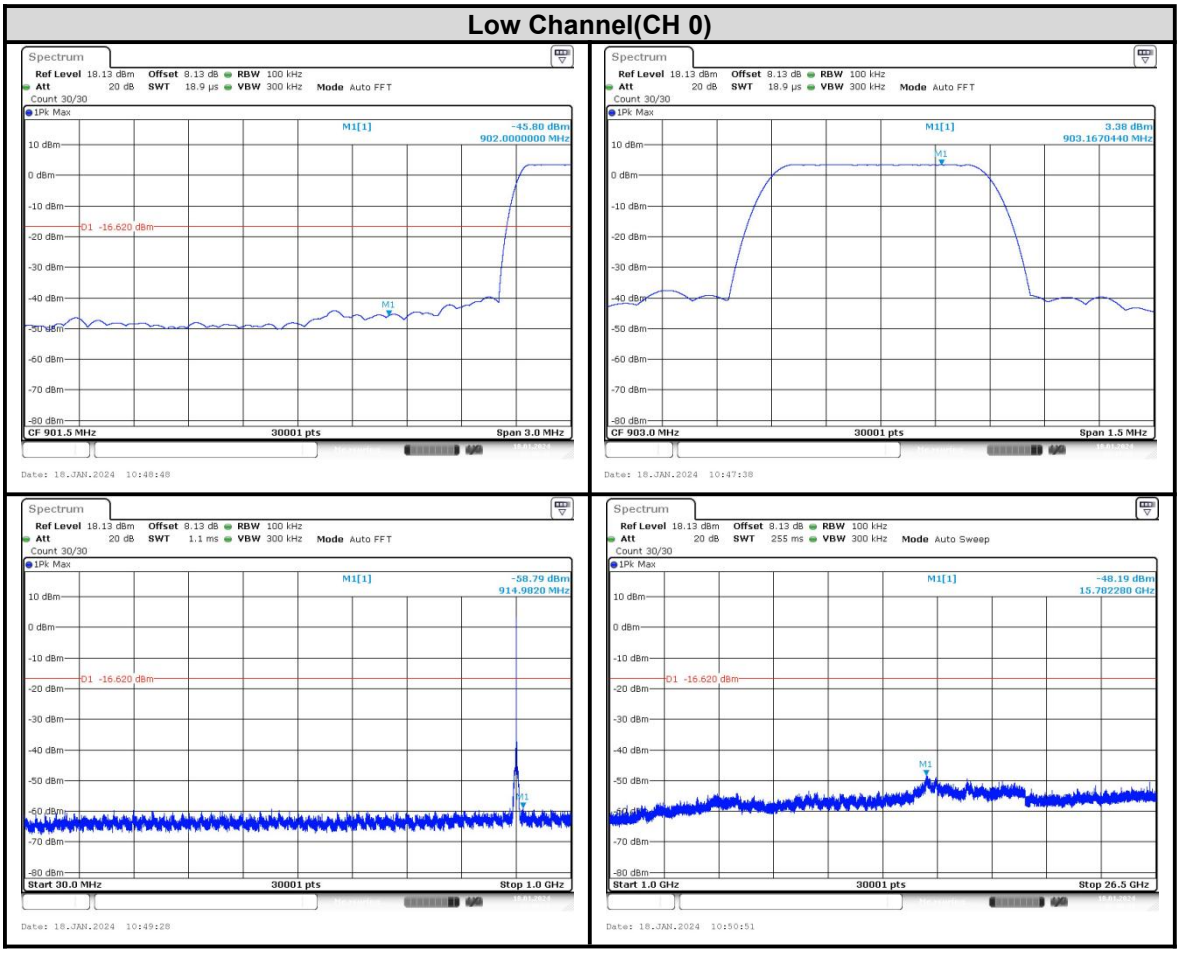
3.6.3 Test setup



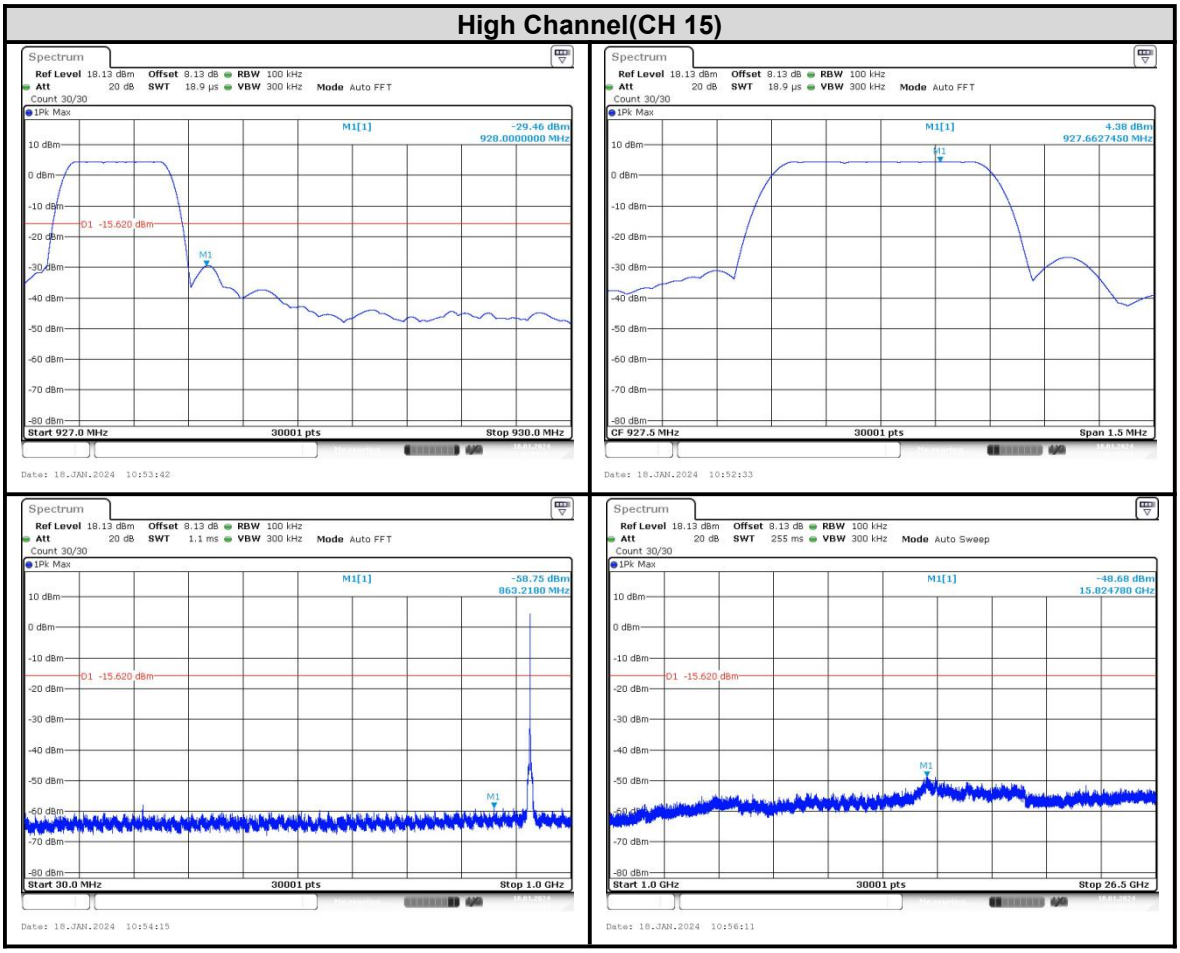
3.6.4 Test result

The spectrum plots are attached on the following images.

Low Channel(CH 0)



High Channel(CH 15)



4 PHOTOGRAPHS OF TEST SETUP

Please refer to the attached file (Test Setup Photo).

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

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Important

(1) The test report is invalid without the official stamp of CVC;

(2) Any part photocopies of the test report are forbidden without the written permission from CVC;

(3) The test report is invalid without the signatures of Approval and Reviewer;

(4) The test report is invalid if altered;

(5) Objections to the test report must be submitted to CVC within 15 days.

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

(7) As for the test result “-” or “N” means “not applicable”, “/” means “not test”, “P” means “pass” and “F” means “fail”

The test data and test results given in this test report should only be used for purposes of scientific research, teaching and internal quality control when the CMA symbol is not presented.

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