



FCC ID: 2AGBW-NARF
Report No.: TMWK2110000821KR

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RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

(Class II Permissive Change)

Test Standard	FCC Part 15.247
Product name	North American RF Module
Brand Name	PHILIPS
Model No.	NARF
Test Result	Pass
Statements of Conformity	Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)

Approved by:

Sehni, Hu

Sehni Hu
Supervisor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	December 17, 2021	Initial Issue	ALL	Allison Chen



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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Signify (China) Investment Co., Ltd Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai 200233, China
Manufacturer	Signify (China) Investment Co., Ltd Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai 200233, China
Equipment	North American RF Module
Model Name	NARF
Model Discrepancy	N/A
Received Date	October 19, 2021
Date of Test	November 12 ~ 23, 2021
Power Operation	Power from power supply. (DC 24V)
Class II Permissive Change	1. Part substitution. The previous DC-DC converter is replaced by a new one to cause the correlation components around DC-DC converter and PCB layout make minor change to fit on the new DC supply solution. The key relative to RF chip and correlation component doesn't have any change. 2. We verified radiated emission below 1GHz and AC-line conducted emission test data in this test report.

Remark:

1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

1.2 EUT CHANNEL INFORMATION

Frequency Range	906.0MHz ~ 924.0MHz
Modulation Type	OQPSK
Number of channel	180 Channels

Remark:

Refer as ANSI 63.10:2013 clause 5.6.1 Table 4

Number of frequencies to be tested		
Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Type	☒ PIFA ☐ PCB ☐ Dipole ☐ RFID Antenna
Antenna Gain	Gain: -2.0 dBi
Antenna Connector	N/A

Remark:

1.The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203.



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1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 0.0014
RF output power, conducted	+/- 1.14
Power density, conducted	+/- 1.40
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87

Remark:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.)

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Jack Chen	-
Radiation	Ray Li	-
RF Conducted	N/A	-

Remark: The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC public Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

1.6 INSTRUMENT CALIBRATION

AC Power line Conducted Emission Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
CABLE	EMCI	CFD300-NL	CERF	06/28/2021	06/27/2022
EMI Test Receiver	R&S	ESCI	100064	07/05/2021	07/04/2022
LISN	SCHAFFNER	NNB 41	03/10013	02/02/2021	02/01/2022
DC Power Supplies	GW Instek	SPS-3610	GPE880163	01/04/2021	01/03/2022
Software	EZ-EMC(CCS-3A1-CE-Wugu)				

3M 966A Chamber Test Site (LF)					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Bilog Antenna	Sunol Sciences	JB3	A030105	07/19/2021	07/18/2022
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/24/2021	02/23/2022
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/06/2021	01/05/2022
Pre-Amplifier	EMEC	EM330	060609	02/24/2021	02/23/2022
Spectrum Analyzer	Agilent	E4446A	US42510268	09/23/2021	09/22/2022
Digital Multimeters	FLUKE	87V	24860499	12/14/2020	12/13/2021
DC Power Source	Motech	PPS1208	120033120005	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
North American RF Module	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 6.11-20180419c				

Remark: Each piece of equipment is scheduled for calibration once a year.



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1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
	N/A				

Support Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	NB(J)	TOSHIBA	PT345T-00L002	N/A	PD97260H

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247.



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2. TEST SUMMARY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	Pass
15.247(d)	4.2	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Test Channel Frequencies	906.0MHz ~ 924.0MHz																											
Channel List	<table><tr><th>Channel No.</th><th>Frequency (MHz)</th><th>Channel No.</th><th>Frequency (MHz)</th></tr><tr><td>1</td><td>906.0</td><td>91</td><td>915.1</td></tr><tr><td>2</td><td>906.1</td><td>...</td><td>...</td></tr><tr><td>...</td><td>...</td><td>...</td><td>...</td></tr><tr><td>...</td><td>...</td><td>179</td><td>923.9</td></tr><tr><td>90</td><td>915.0</td><td>180</td><td>924.0</td></tr></table>				Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	1	906.0	91	915.1	2	906.1	...	...	...	...	...	...	...	...	179	923.9	90	915.0	180	924.0
	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)																								
	1	906.0	91	915.1																								
	2	906.1	...	...																								
	...	...	...	...																								
	...	...	179	923.9																								
	90	915.0	180	924.0																								

3.2 THE WORST MODE OF MEASUREMENT

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1: EUT power by Power supply
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Power supply Mode	Mode 1: EUT power by AC Power
Worst Mode	☒ Mode 1

Remark:

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report
3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a),

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

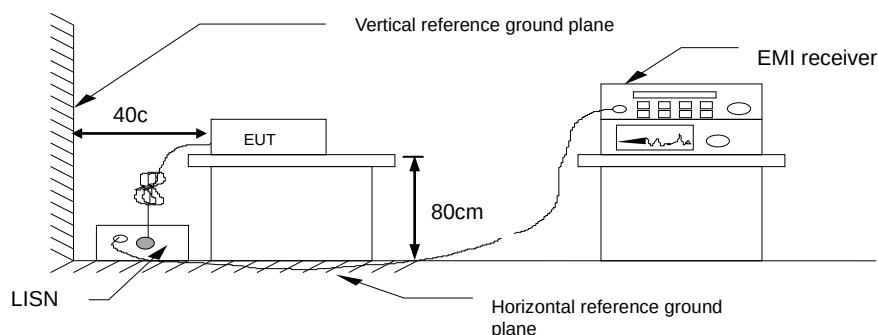
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

4.1.3 Test Setup

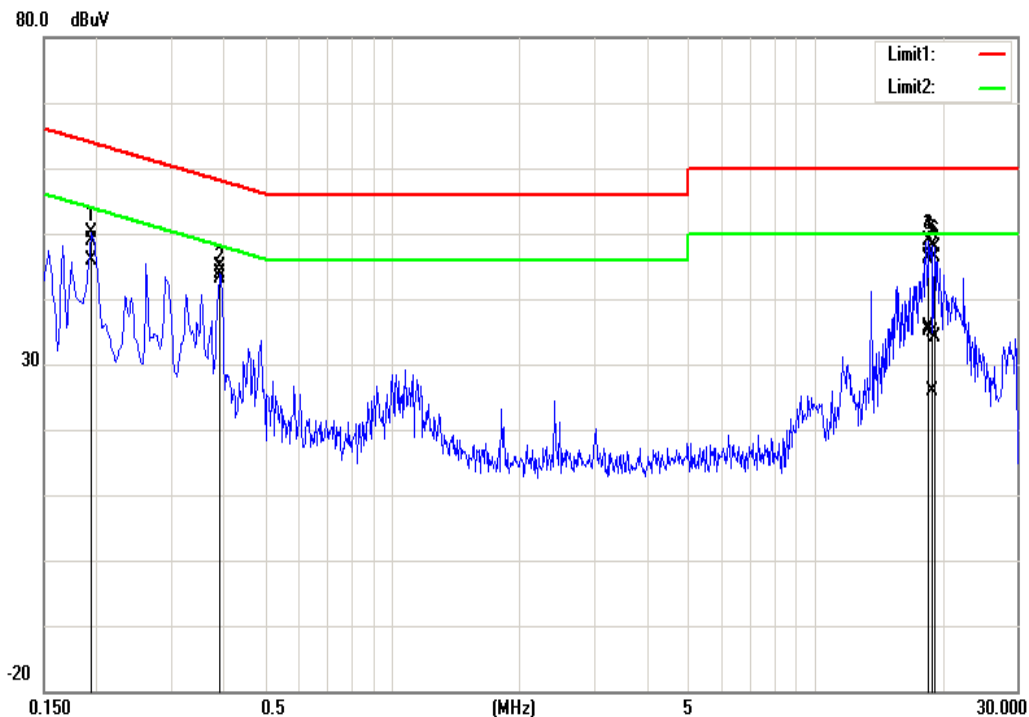


4.1.4 Test Result

PASS.

Test Data

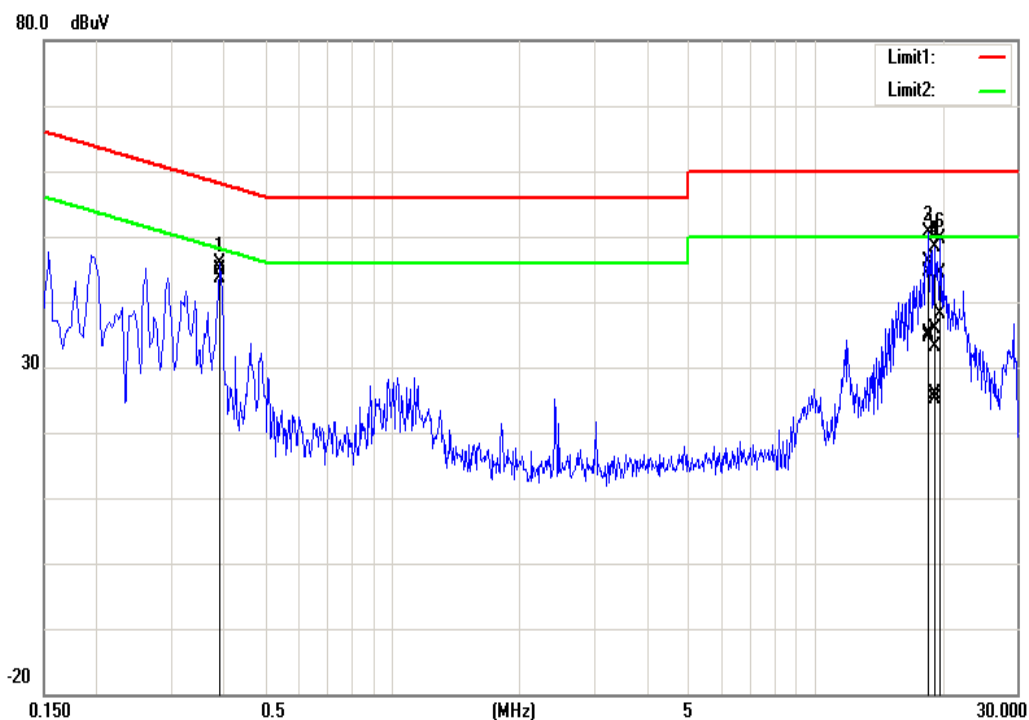
Test Mode:	Mode 1	Temp/Hum	22.9(°C)/ 48%RH
Phase:	Line	Test Date	November 12, 2021
		Test Engineer	Jack Chen



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.1940	38.57	35.47	10.29	48.86	45.76	63.86	53.86	-15.00	-8.10	Pass
0.3900	34.58	32.93	10.29	44.87	43.22	58.06	48.06	-13.19	-4.84	Pass
18.2900	35.73	25.23	10.46	46.19	35.69	60.00	50.00	-13.81	-14.31	Pass
18.5460	36.02	24.59	10.46	46.48	35.05	60.00	50.00	-13.52	-14.95	Pass
18.8900	24.52	15.39	10.46	34.98	25.85	60.00	50.00	-25.02	-24.15	Pass
19.1420	35.80	23.73	10.46	46.26	34.19	60.00	50.00	-13.74	-15.81	Pass

Note: Correction factor = LISN loss + Cable loss.

Test Mode:	Mode 1	Temp/Hum	22.9(°C)/ 48%RH
Phase:	Neutral	Test Date	November 12, 2021
		Test Engineer	Jack Chen



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.3900	34.68	33.30	10.29	44.97	43.59	58.06	48.06	-13.09	-4.47	Pass
18.2900	34.17	24.27	10.46	44.63	34.73	60.00	50.00	-15.37	-15.27	Pass
18.5460	35.72	24.63	10.46	46.18	35.09	60.00	50.00	-13.82	-14.91	Pass
18.8900	22.73	14.75	10.46	33.19	25.21	60.00	50.00	-26.81	-24.79	Pass
19.1420	25.40	15.47	10.46	35.86	25.93	60.00	50.00	-24.14	-24.07	Pass
19.7420	33.82	27.79	10.46	44.28	38.25	60.00	50.00	-15.72	-11.75	Pass

Note: Correction factor = LISN loss + Cable loss.

4.2 RADIATION SPURIOUS EMISSION

4.2.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

4.2.2 Test Procedure

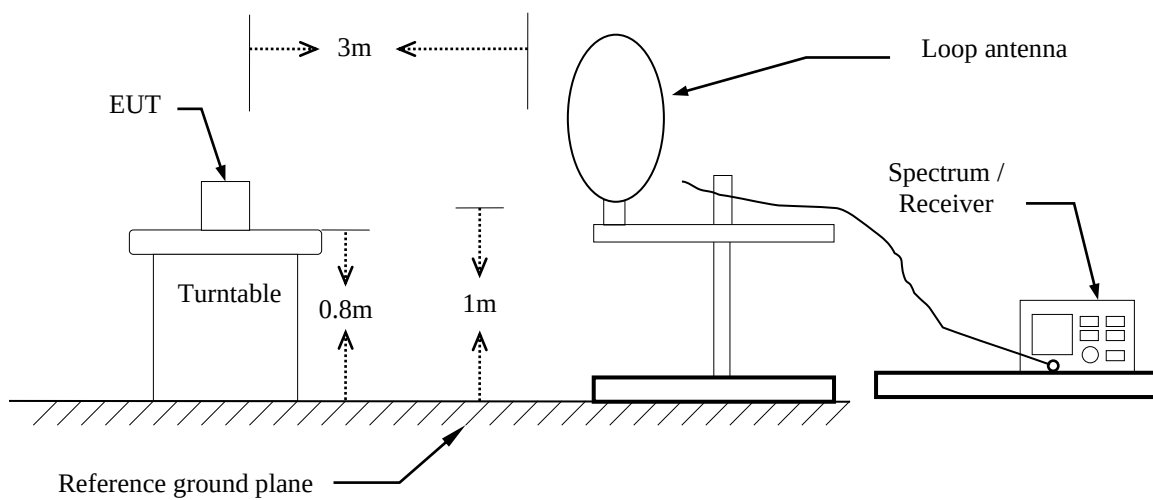
Test method Refer as ANSI C63.10:2013.

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10, and the EUT set in a continuous mode.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.
3. Span shall wide enough to full capture the emission measured. The SA from 30MHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.
4. For harmonic, the worst case of output power was BR-1Mbps. Therefore only BR-1Mbps record in the report.
5. The SA setting following :
 - (1) Below 1G : RBW = 100kHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
 - (2) Above 1G :
 - (2.1) For Peak measurement : RBW = 1MHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
 - (2.2) For Average measurement : RBW = 1MHz, VBW
 - 'If Duty Cycle $\geq$ 98%, VBW=10Hz.
 - 'If Duty Cycle <98%, VBW=1/T.

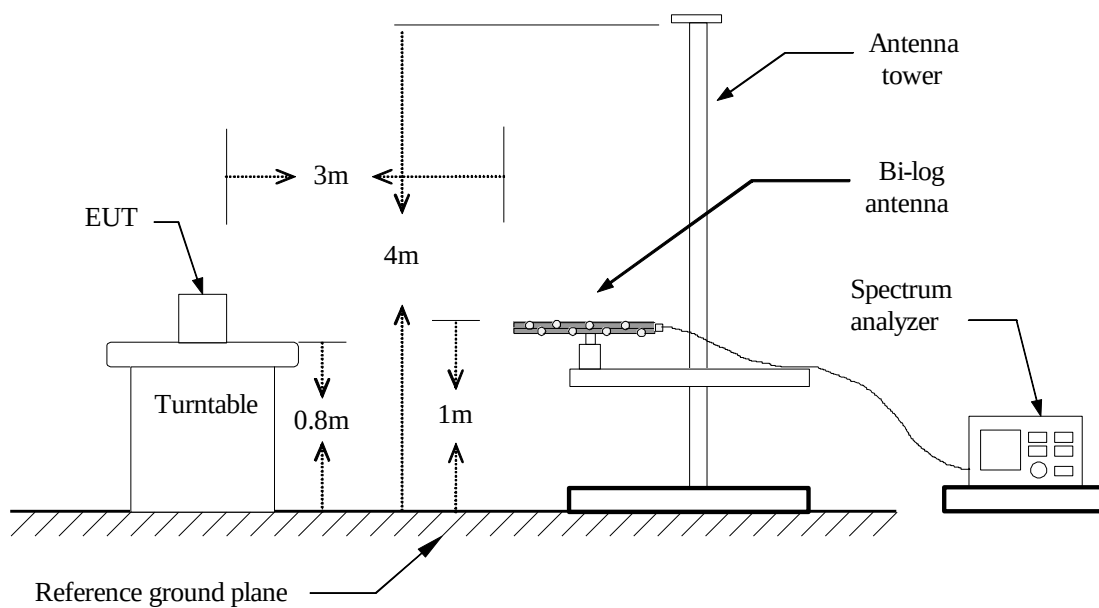
Note: No emission found between lowest internal used/generated frequency to 30MHz (9KHz~30MHz)

4.2.3 Test Setup

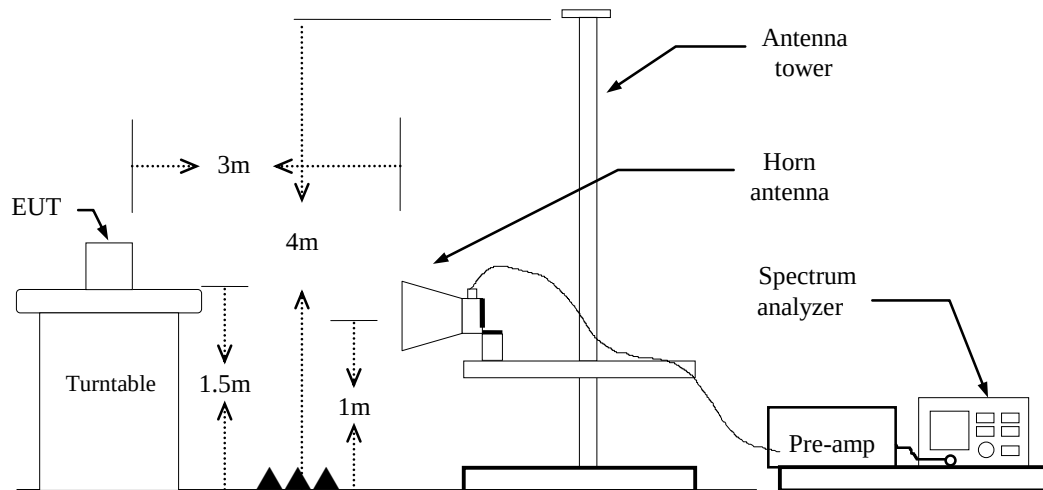
9kHz ~ 30MHz



30MHz ~ 1GHz



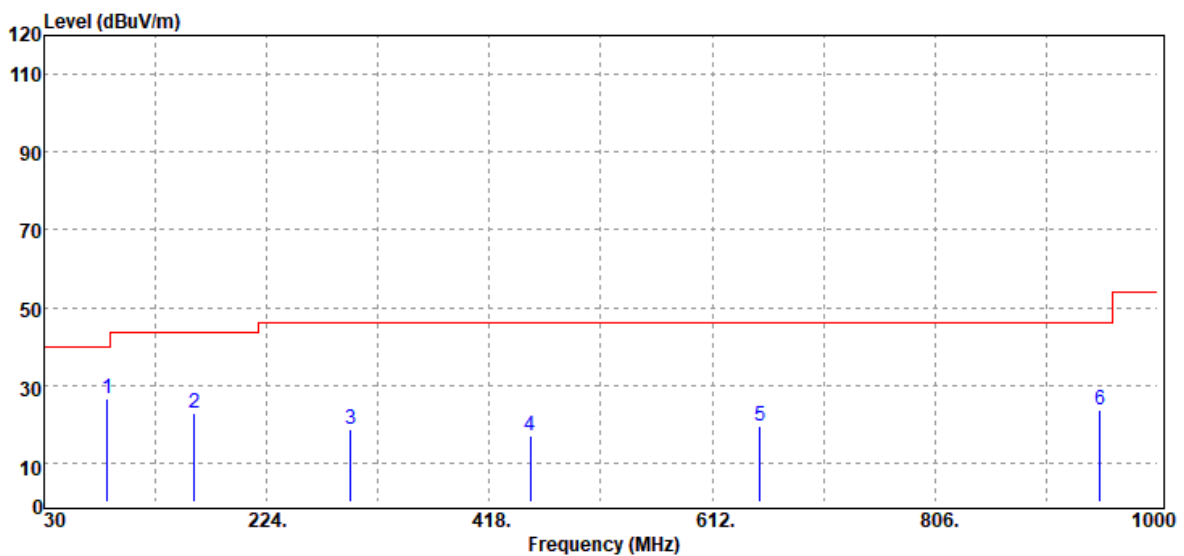
Above 1 GHz



4.2.4 Test Result

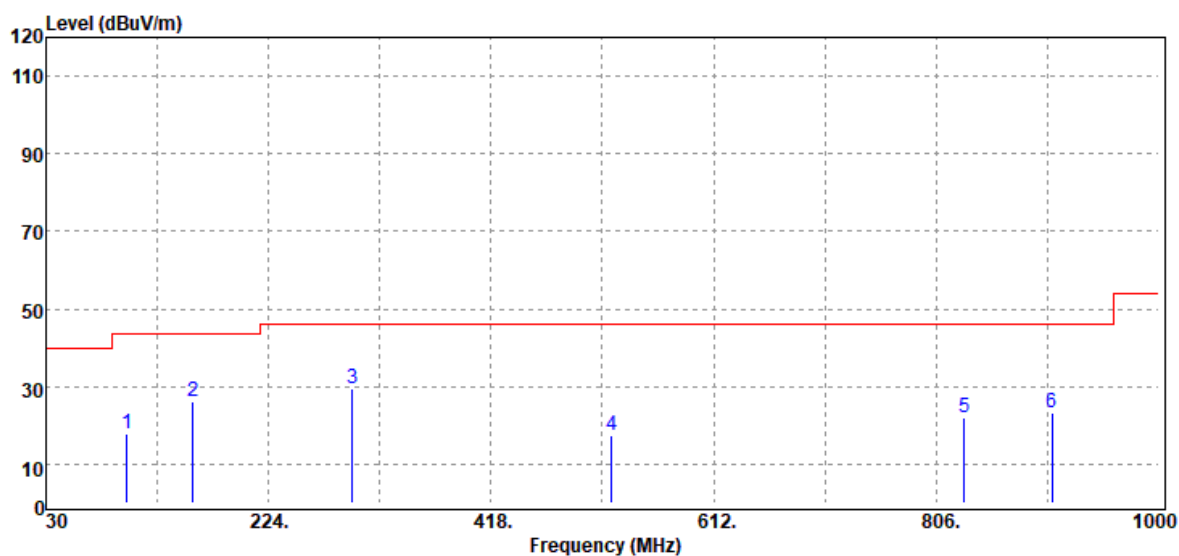
Below 1G Test Data

Test Mode:	CH Low	Temp/Hum	23.9(°C)/ 60%RH
Test Item	30MHz-1GHz	Test Date	November 23, 2021
Polarize	Vertical	Test Engineer	Ray Li
Detector	QP		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
85.29	QP	42.51	-15.87	26.64	40.00	-13.36
160.95	QP	33.31	-10.61	22.70	43.50	-20.80
296.75	QP	27.30	-8.78	18.52	46.00	-27.48
453.89	QP	21.29	-4.32	16.97	46.00	-29.03
653.71	QP	20.40	-0.70	19.70	46.00	-26.30
949.56	QP	20.00	3.68	23.68	46.00	-22.32

Test Mode:	CH Low	Temp/Hum	23.9(°C)/ 60%RH
Test Item	30MHz-1GHz	Test Date	November 23, 2021
Polarize	Horizontal	Test Engineer	Ray Li
Detector	QP		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
100.81	QP	30.41	-12.50	17.91	43.50	-25.59
158.04	QP	36.60	-10.51	26.09	43.50	-17.41
296.75	QP	38.40	-8.78	29.62	46.00	-16.38
522.76	QP	20.61	-3.15	17.46	46.00	-28.54
830.25	QP	20.10	1.99	22.09	46.00	-23.91
906.88	QP	20.19	3.18	23.37	46.00	-22.63

- End of Test Report -