EMC Test Report

Applicant	：	HIVOX BIOTEK INC.
Product Type	：	RF MODULE
Trade Name	：	HIVOX BIOTEK INC.
Model Number	：	RFM-001
Applicable Standard	：	FCC 47 CFR PART 15 SUBPART B ANSI C63.4: 2014
Received Date	：	Dec. 20, 2021
Test Period	：	Dec. 29, 2021 ~ Jan. 03, 2022
Issued Date	：	Mar. 31, 2022

Issued by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
Taoyuan City 334025, Taiwan (R.O.C.)
Tel：+886-3-2710188 / Fax：+886-3-2710190

Taiwan Accreditation Foundation accreditation number: 1330
Test Firm MRA designation number: TW1062
Certified Scope: 9 kHz ~ 40 GHz

Note:

1. The test results are valid only for samples provided by customers and under the test conditions described in this report.
2. This report shall not be reproduced except in full, without the written approval of A Test Lab Technology Corporation.
3. The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.

Revision History

Rev.	Issued Date	Revisions	Revised By
00	Mar. 31, 2022	Initial Issue	Emma Chao

Verification of Compliance

Applicant	:	HIVOX BIOTEK INC.
Product Type	:	RF MODULE
Trade Name	:	HIVOX BIOTEK INC.
Model Number	:	RFM-001
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART B ANSI C63.4: 2014
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan (R.O.C.) Tel：+886-3-2710188 / Fax：+886-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330

Testing Laboratory
1330

The above equipment has been tested by A Test Lab Techno Corp., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved By : Terry Liao

(Terry Liao)

TABLE OF CONTENTS

1 General Information

1.1. Summary of Test Result

Emission			
Standard	Item	Verdict	Remark
FCC 47 CFR PART 15 SUBPART B ANSI C63.4	Conducted Emission	PASS	Meet Class B limit Minimum margin is -13.02 dB at 6.2980 MHz
	Radiated Emission below 1 GHz	PASS	Meet Class B limit Minimum margin is -3.10 dB at 99.1797 MHz
	Radiated Emission above 1 GHz	PASS	Meet Class B limit Minimum margin is -12.54 dB at 17864.000 MHz

Decision Rule

■ Uncertainty is not included.

□ Uncertainty is included.

1.2. Testing Location

Site Name: A Test Lab Techno Corp.

Site Address: No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan (R.O.C.)

Tel： +886-3-2710188

Fax： +886-3-2710190

1.3. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty (dB)
Conducted Emission	DC Power Port	9 kHz ~ 150 kHz	± 2.7
		150 kHz ~ 30 MHz	± 2.7

Test Item	Test Site	Frequency Range		Uncertainty (dB)
Radiated Emission	TE06	30 MHz ~ 1000 MHz	Horizontal	± 4.3
			Vertical	± 4.9
	TE01	30 MHz ~ 1000 MHz		± 4.8
		1000 MHz ~ 6000 MHz		± 5.7
		6000 MHz ~ 18000 MHz		± 5.7
		18000 MHz ~ 26500 MHz		± 5.0
		26500 MHz ~ 40000 MHz		± 4.9
	TE09	30 MHz ~ 1000 MHz		± 4.9
		1000 MHz ~ 6000 MHz		± 5.2
		6000 MHz ~ 18000 MHz		± 5.3
		18000 MHz ~ 26500 MHz		± 4.6
		26500 MHz ~ 40000 MHz		± 4.8
Note: The Vertical and Horizontal measurement uncertainty of 1 GHz to 40 GHz is evaluated and choose which polarity is worst value.				

1.4. Test Site Environment

Test Item	Items	Required (IEC 60068-1)	Actual
Conducted Emission	Temperature (°C)	15-35	15-30
	Humidity (%RH)	25-75	45-75
	Barometric pressure (mbar)	860-1060	990-1005
Radiated Emission	Temperature (°C)	15-35	15-30
	Humidity (%RH)	25-75	45-75
	Barometric pressure (mbar)	860-1060	990-1005

2 EUT Description

Applicant	HIVOX BIOTEK INC. 5F., No.123, Xingde Rd., Sanchong Dist., New Taipei City 241, Taiwan, R.O.C.
Product Type	RF MODULE
Trade Name	HIVOX BIOTEK INC.
Model Number	RFM-001
I/O Ports	Refer to the user manual provided by clients.
Highest Operating Frequency	2430 MHz
EUT Power Rating	DC 2.7 V ~ DC 3.3 V

3 Test Methodology

3.1. Decision of Test Mode

3.1.1. The following test mode(s) were scanned during the preliminary test:

Pre-Test Mode
Mode 1: SRD 2430 MHz Rx

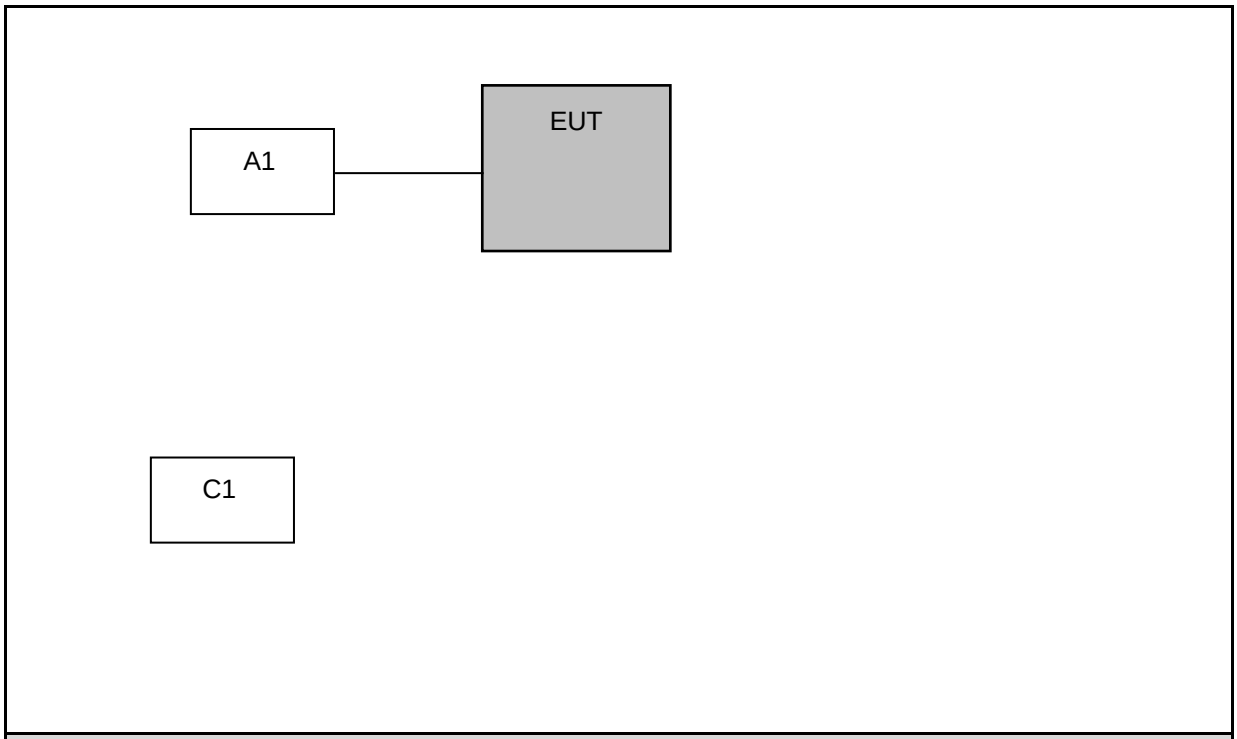
3.1.2. After the preliminary scan, the following test mode was final mode and found to produce the highest emission level.

Final Test Mode			
EMI	Conducted Emission		Mode 1
	Radiated Emission	Below 1 GHz	Mode 1
		Above 1 GHz	Mode 1

3.2. EUT Test Step

1.Setup the EUT and simulators as shown on 3.3.
2.Turn on the power all equipment.
3.Turn on Bluetooth receiver.
4.Start to test till get the worst reading.

3.3. Configuration of Test System Details



Test Setup			
No.	Setup Peripherals	Connection type	Test Mode
			1
A1	DC Power Supply	DC Power Cable	V

Support Unit used in test configuration and system						
Product		Manufacturer	Model Number	Serial Number	Data Cable	Power Cord
(1)	DC Power Supply	HILA	DP-30032	N/A	Non-Shielded, 1 m	Non-Shielded, 1.8 m

3.4. Test Instruments

Test Period: Dec. 29, 2021

Testing Engineer: Yaofong Huang

Conducted Emission test site					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Test Receiver	R&S	ESCI	100367	May 21, 2021	1 year
LISN	R&S	ENV216	101041	Apr. 8, 2021	1 year
Cable	Woken	00100D1380194M	TE-02-03 (CB-098)	May 28, 2021	1 year
Software	EZ EMC	1.1.4.3	-----	-----	-----
Test Site	ATL	TE02	TE02	N.C.R.	-----

Test Period: Dec. 31, 2021

Testing Engineer: Chichang Lin

Radiated Emission - 10 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Amplifier	EMCI	EMC9135	980298	Oct. 26, 2021	1 year
Amplifier	EMCI	EMC9135	980299	Nov. 28, 2021	1 year
Test Receiver	R&S	ESCI	100722	Nov. 01, 2021	1 year
Test Receiver	R&S	ESCI	101000	Nov. 25, 2021	1 year
Broadband Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	670	Nov. 14, 2021	1 year
Broadband Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	671	Nov. 30, 2021	1 year
RF Cable	EMC	EMC102-N-N-6000	TE06-H-1	Feb. 15, 2021	1 year
RF Cable	EMC	EMC102-N-N-7000	TE06-H-2	Feb. 15, 2021	1 year
RF Cable	EMC	EMC102-N-N-3000	TE06-H-3	Feb. 15, 2021	1 year
RF Cable	EMC	EMC102-N-N-1000	TE06-H-4	Feb. 15, 2021	1 year
RF Cable	EMC	EMC102-N-N-7000	TE06-V-2	Feb. 15, 2021	1 year
RF Cable	EMC	EMC102-N-N-3000	TE06-V-3	Feb. 15, 2021	1 year
RF Cable	EMC	EMC102-N-N-1000	TE06-V-4	Feb. 15, 2021	1 year
RF Cable	EMC	EMC104-N-N-6000	TE06-V-5	Feb. 15, 2021	1 year
Software	EZ_EMC	1.1.4.2	----	----	----
Test Site	ATL	TE06	TE06	Oct. 17, 2021	1 year

Note: N.C.R. = No Calibration Request.

Test Period: Jan. 03, 2022

Testing Engineer: Dean Ho

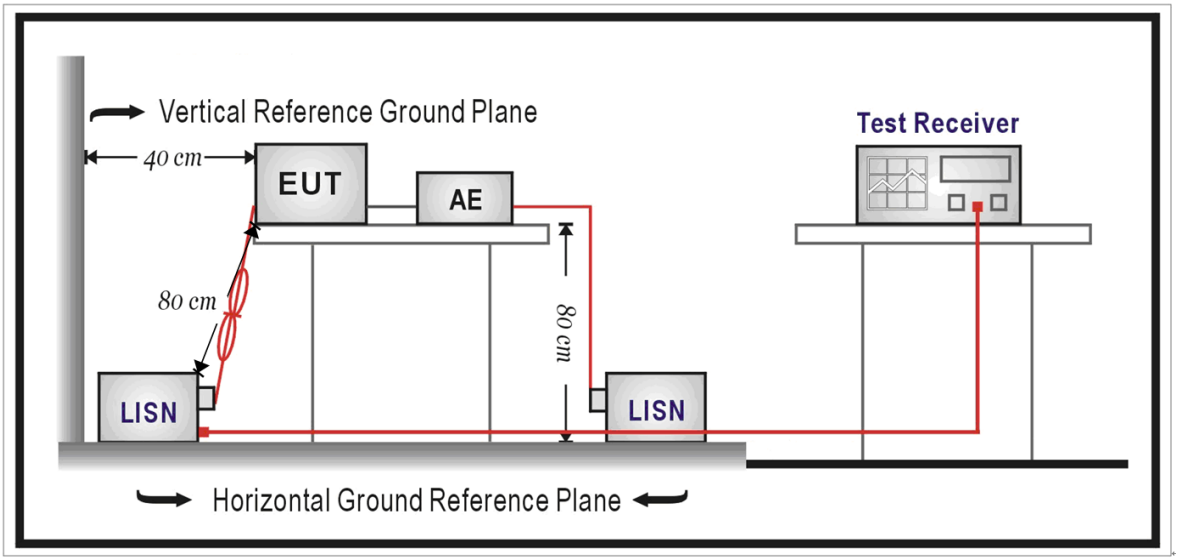
Radiated Emission - 3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Receiver	R & S	ESR26	101752	May 27, 2021	1 year
Amplifier (1-26.5 GHz)	Agilent	8449B	3008A02456	Mar. 30, 2021	1 year
Double Ridged Horn Antenna (1-18 GHz)	ETS	3117	00128055	Sep. 08, 2021	1 year
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	Feb. 17, 2021	1 year
Microwave Cable	EMCI	EMC104-SM-SM-13000	150503	Feb. 17, 2021	1 year
Software	EZ EMC	1.1.4.4	-----	-----	-----
Test Site(VSWR)	ATL	TE09	TE09	Apr. 10, 2021	1 year

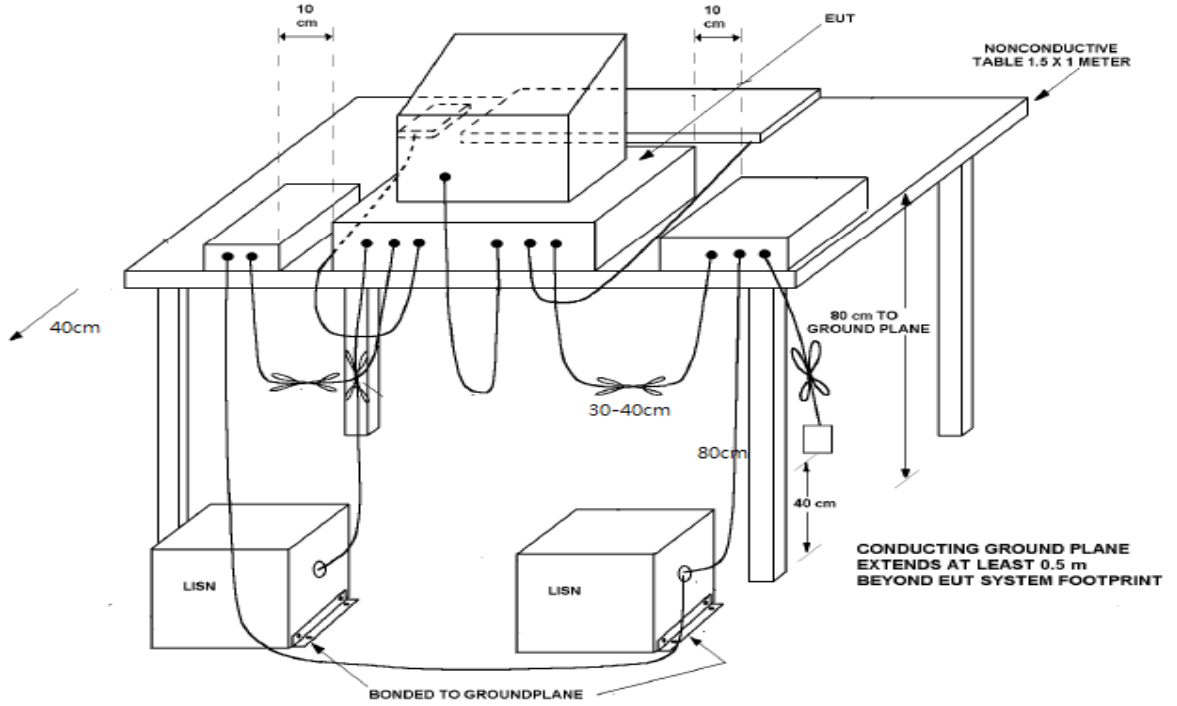
Note: N.C.R. = No Calibration Request.

4 Measurement Procedure

4.1. Conducted Emission

■ **Test Setup**





Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 Ω// 50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 Ω// 50 uH coupling impedance with 50ohm termination.

Tabletop device shall be placed on a non-conducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The wall of screened room shall be located 40cm to the rear of the EUT. Other surfaces of tabletop or floor standing EUT shall be at least 80cm from any other ground conducting surface including one or more LISNs. For floor-standing device shall be placed under the EUT with a 12 mm insulating material.

Conducted emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a resolution bandwidth of 9 kHz. The equipment under test (EUT) shall be meet the limits in section 4.1.1, as applicable, including the average limit and the quasi-peak limit when using respectively, an average detector and quasi-peak detector measured in accordance with the methods described of related standard. When all of peak value were complied with quasi-peak and average limit from 150 kHz to 30 MHz then quasi-peak and average measurement was unnecessary.

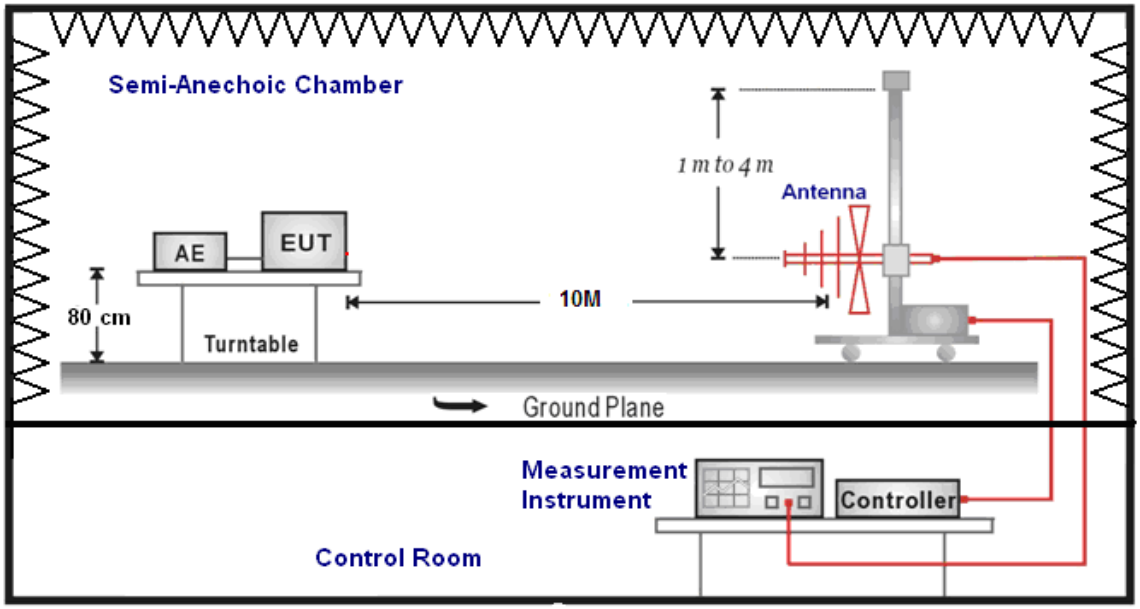
The AMN shall be placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for AMNs mounted on top of the ground reference plane. This distance is between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment shall be at least 0,8 m from the AMN. If the mains power cable is longer than 1m then the cable shall be folded back and forth at the centre of the lead to form a bundle no longer than 0.4 m. All of interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long. All of EUT and AE shall be separate place more than 0.1 m. All 50 Ω ports of the LISN shall be resistively terminated into 50 Ω loads when not connected to the measuring instrument.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

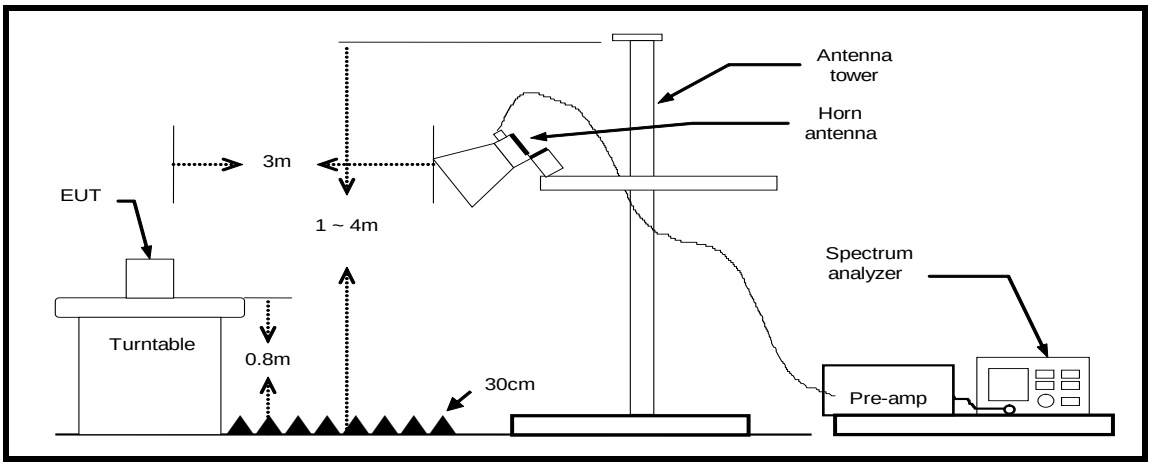
4.2. Radiated Emission

■ Test Setup

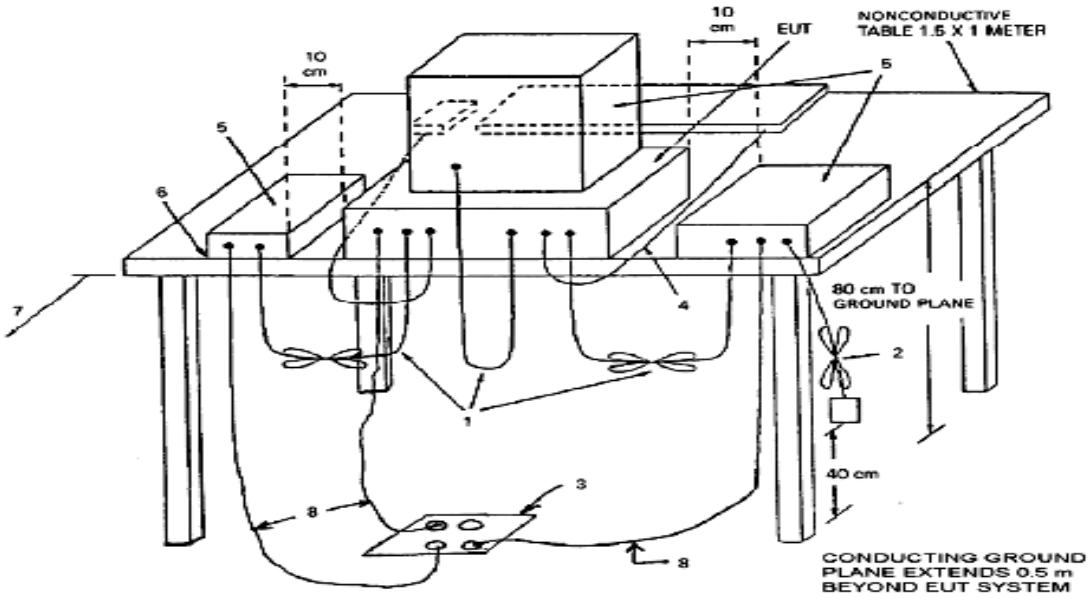
Below 1 GHz



Above 1 GHz



Test arrangement for radiated emissions of tabletop equipment.



■ Test Procedure

Below 1 GHz

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. When the EUT is floor-standing equipment, it is placed on the ground plane which has a 12 mm non-conductive covering to insulate the EUT from the ground plane.

The turn table is 0.8 m height and 2.0 m wide x 1.0 m deep size. It can rotate 360 degrees to determine the position of the maximum emission level. The spcing between the each equipment was 10 cm. The mains cables are dropped to floor and are round to recepatacle. Interconnecting cables of table top equipment that hang closer than 0.4 m to the ground plane are folded back and forth forming a bundle 0.3 m to 0.4 m long, hanging approximately in the middle between ground plane and table. The EUT was positioned such that the distance from antenna to the EUT was 10 meters and the receive antenna was moved from 1 m to 4 m to investigate maximum highest emission at least 6 points over the frequency range from 30 MHz to1 GHz using a resolution bandwidth of 120 kHz and measured by the quasi-peak detector.

According to this standard paragraph 15.109, as an alternative to the radiated emission limits, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, “Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement”.

Above 1 GHz

The Setup is same as Below 1 GHz placement. The turn table is 0.8 m height and 1.8 m wide x 1.0 m deep size. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meter for above 1 GHz, the highest frequency performed according to internal source frequency of the EUT, the specification was below:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 - 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Absorber shall be spread between floor of a turn table and a receive antenna shown in 4.2.3. The antenna used boresight antenna master from 1 meter and 4 meters to find out the maximum emission level and find the highest emission at least 6 points. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated on radiated measurement.

Radiated emissions were applied to above 1 GHz using a resolution bandwidth of 1 MHz and measured by the peak and average detector which antenna to the EUT distance was 3 meters. If the EUT was meet both limits and measurement with the average detector receiver is unnecessary.

5 Requirements and Performance Criteria

5.1. Conducted Emission

■ **Limit**

Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Note: (1) The lower limit shall apply at the transition frequencies.
(2) The limit decreases in line with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

5.2. Radiated Emission

■ Limit

Under 1 GHz test shall not exceed following value

FCC 47 CFR PART 15 SUBPART B				
Frequency range (MHz)	Class A		Class B	
	Distance (m)	dBuV/m	Distance (m)	dBuV/m
30 to 88	10	39	3	40
88 to 216	10	43.5	3	43.5
216 to 960	10	46.4	3	46
Above 960	10	49.5	3	54

CISPR 22				
Frequency range (MHz)	Class A		Class B	
	Distance (m)	dBuV/m	Distance (m)	dBuV/m
30 to 230	10	40	10	30
230 to 1000	10	47	10	37

Above 1 GHz test shall not exceed following value

Frequency (MHz)	dBuV/m (Distance 3 m)			
	Class A		Class B	
	Average	Peak	Average	Peak
1000 ~ 40000	60	80	54	74

Remark: 1. The tighter limit shall apply at the edge between two frequency bands.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)
4. Peak detector limit is corresponding to 20 dB above the maximum permitted average limit.

According to FCC Part 15.33 (b), for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

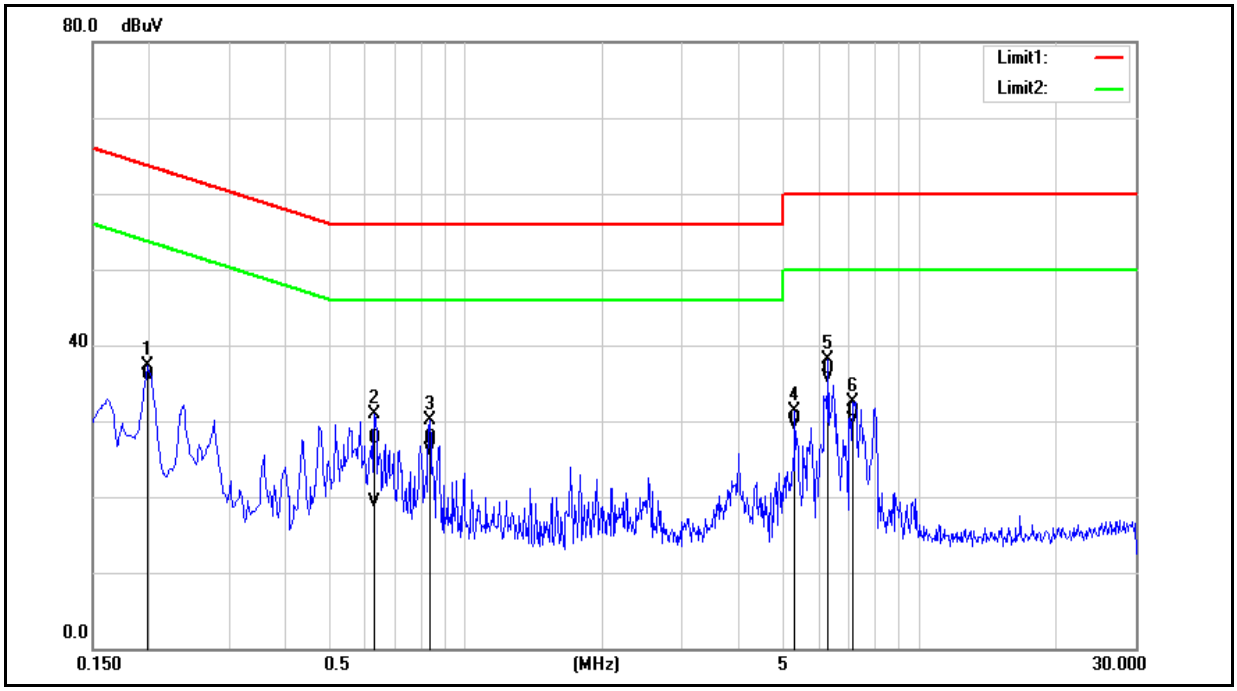
Highest frequency generated or used in the device or in which the device operated or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

6 Test Result

6.1. Conducted Emission

■ **Test Result**

Test Standard:	FCC Part 15B	Power Line:	L1
Test Mode:	Mode 1	Test Power:	DC 3.3 V
Description:			

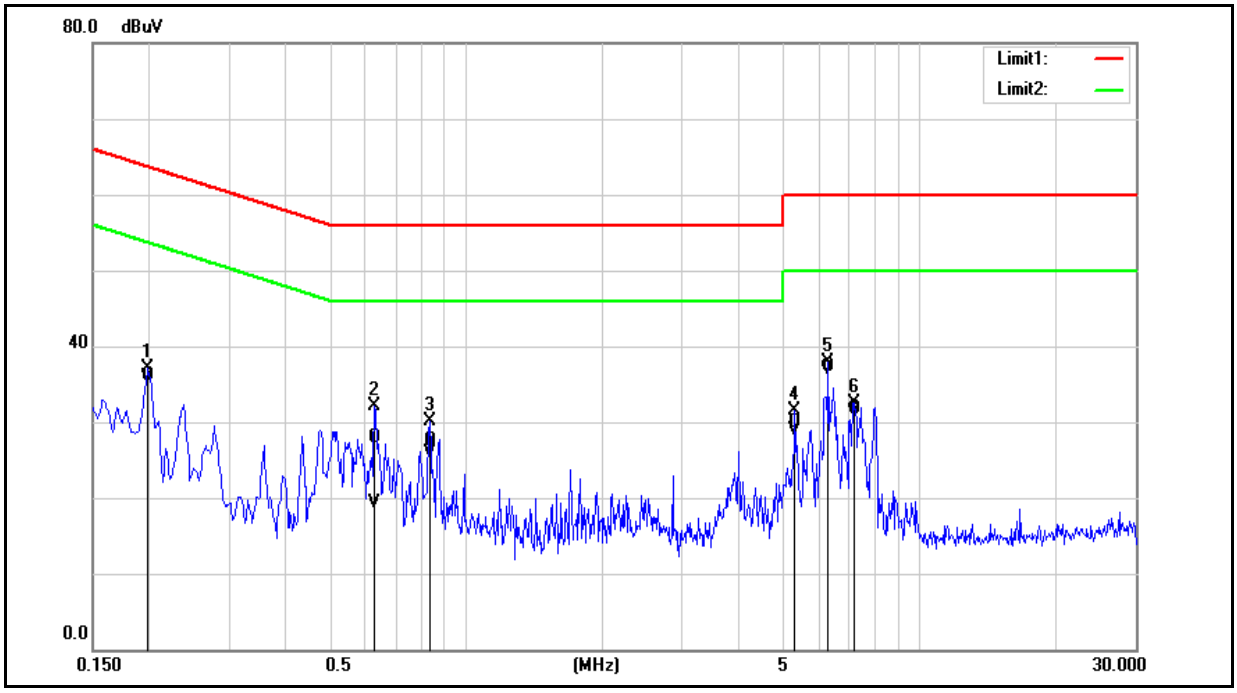


No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1980	26.38	26.22	9.74	36.12	35.96	63.69	53.69	-27.57	-17.73	Pass
2	0.6300	17.88	9.48	9.75	27.63	19.23	56.00	46.00	-28.37	-26.77	Pass
3	0.8340	17.95	16.42	9.75	27.70	26.17	56.00	46.00	-28.30	-19.83	Pass
4	5.3100	20.38	19.63	9.87	30.25	29.50	60.00	50.00	-29.75	-20.50	Pass
5	6.3020	27.04	25.76	9.89	36.93	35.65	60.00	50.00	-23.07	-14.35	Pass
6	7.1340	21.31	20.10	9.91	31.22	30.01	60.00	50.00	-28.78	-19.99	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Test Standard:	FCC Part 15B	Power Line:	N
Test Mode:	Mode 1	Test Power:	DC 3.3 V
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1980	26.45	26.26	9.73	36.18	35.99	63.69	53.69	-27.51	-17.70	Pass
2	0.6300	18.15	9.51	9.74	27.89	19.25	56.00	46.00	-28.11	-26.75	Pass
3	0.8340	17.72	16.15	9.75	27.47	25.90	56.00	46.00	-28.53	-20.10	Pass
4	5.3100	20.01	18.95	9.89	29.90	28.84	60.00	50.00	-30.10	-21.16	Pass
5	6.2980	27.35	27.07	9.91	37.26	36.98	60.00	50.00	-22.74	-13.02	Pass
6	7.2100	21.79	21.35	9.93	31.72	31.28	60.00	50.00	-28.28	-18.72	Pass

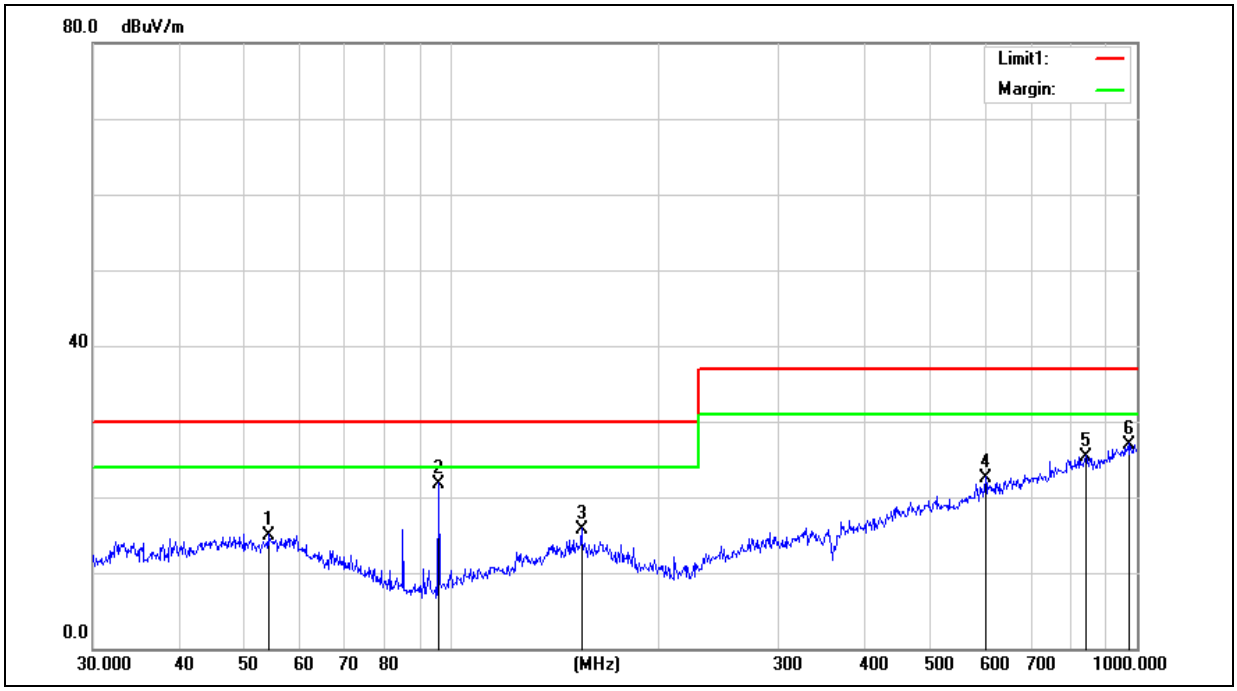
Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

6.2. Radiated Emission

■ **Test Result**

Test Standard:	FCC Part 15B (limit use CISPR 22)	Test Distance:	10 m
Test Mode:	Mode 1	Test Power:	DC 3.3 V
Measurement Range:	30 MHz~1 GHz	Ant.Polar.:	Horizontal

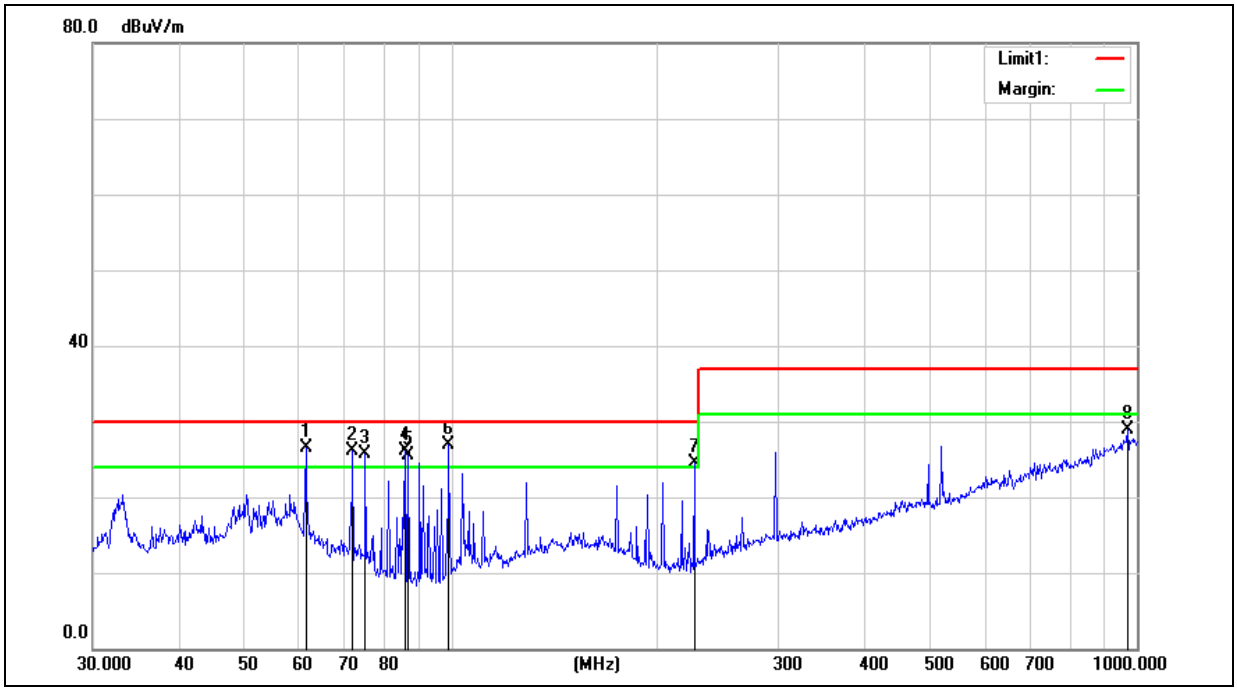


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	54.0711	32.01	-17.01	15.00	30.00	-15.00	300	360	QP
2	95.7622	44.05	-22.25	21.80	30.00	-8.20	200	335	QP
3	154.8204	32.18	-16.38	15.80	30.00	-14.20	374	360	QP
4	601.4265	31.65	-9.05	22.60	37.00	-14.40	191	360	QP
5	842.1296	31.57	-6.17	25.40	37.00	-11.60	100	359	QP
6	972.3374	31.30	-4.30	27.00	37.00	-10.00	300	359	QP

Note: 1. Result (dBuV/m) = Correction factor (dB/m) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Test Standard:	FCC Part 15B (limit use CISPR 22)	Test Distance:	10 m
Test Mode:	Mode 1	Test Power:	DC 3.3 V
Measurement Range:	30 MHz~1 GHz	Ant.Polar.:	Vertical

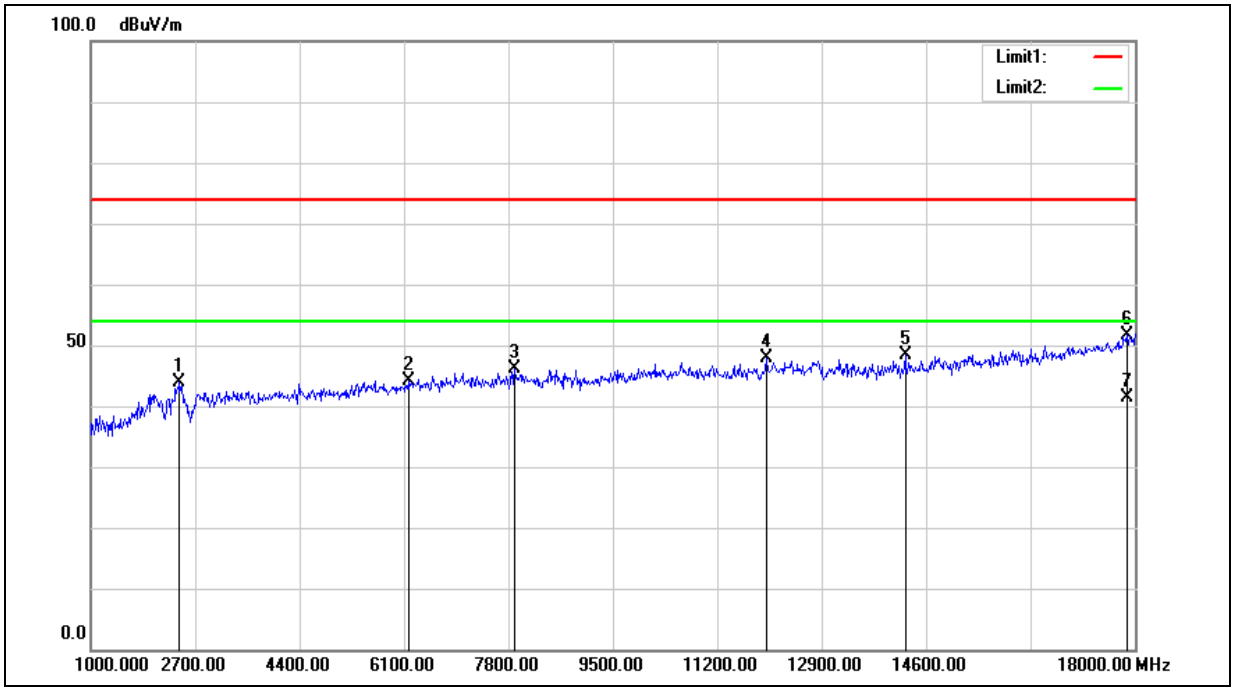


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	61.3463	43.56	-17.06	26.50	30.00	-3.50	299	224	QP
2	71.8320	44.76	-18.66	26.10	30.00	-3.90	299	224	QP
3	74.9191	45.07	-19.37	25.70	30.00	-4.30	299	224	QP
4	85.5977	47.70	-21.60	26.10	30.00	-3.90	299	224	QP
5	86.5030	47.23	-21.73	25.50	30.00	-4.50	199	146	QP
6	99.1797	47.58	-20.68	26.90	30.00	-3.10	299	197	QP
7	226.0994	42.43	-17.93	24.50	30.00	-5.50	299	342	QP
8	968.9338	30.26	-1.36	28.90	37.00	-8.10	399	23	QP

Note: 1. Result (dBuV/m) = Correction factor (dB/m) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Test Standard:	FCC Part 15B	Test Distance:	3 m
Test Mode:	Mode 1	Test Power:	DC 3.3 V
Measurement Range:	1 GHz~30 GHz	Ant.Polar.:	Horizontal

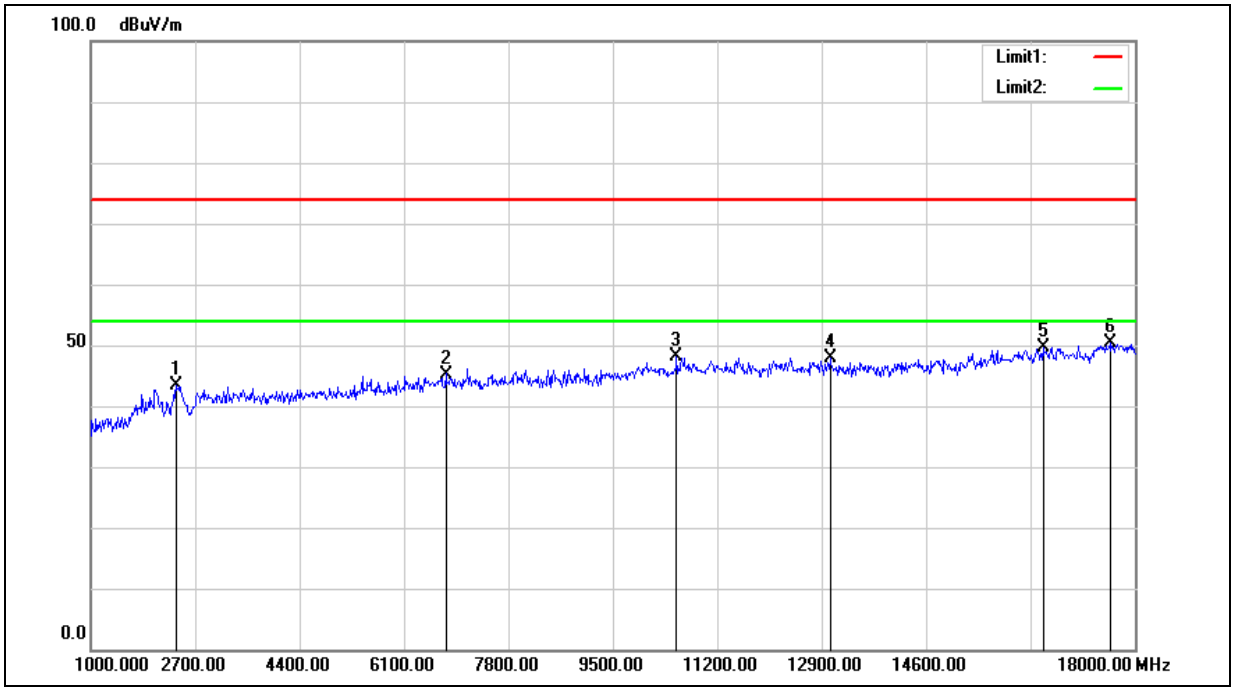


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2445.000	41.53	2.44	43.97	74.00	-30.03	100	5	peak
2	6168.000	34.98	9.12	44.10	74.00	-29.90	100	342	peak
3	7902.000	35.71	10.35	46.06	74.00	-27.94	100	169	peak
4	11999.000	32.02	15.96	47.98	74.00	-26.02	100	260	peak
5	14260.000	30.14	18.36	48.50	74.00	-25.50	100	0	peak
6	17864.000	28.86	22.89	51.75	74.00	-22.25	100	330	peak
7	17864.000	18.57	22.89	41.46	54.00	-12.54	100	330	AVG

Note: 1. Result (dBuV/m) = Correction factor (dB/m) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Test Standard:	FCC Part 15B	Test Distance:	3 m
Test Mode:	Mode 1	Test Power:	DC 3.3 V
Measurement Range:	1 GHz~30 GHz	Ant.Polar.:	Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	2394.000	40.96	2.31	43.27	74.00	-30.73	100	77	peak
2	6780.000	35.39	9.86	45.25	74.00	-28.75	100	121	peak
3	10537.000	34.13	14.00	48.13	74.00	-25.87	100	290	peak
4	13036.000	29.55	18.28	47.83	74.00	-26.17	100	360	peak
5	16504.000	28.94	20.80	49.74	74.00	-24.26	100	48	peak
6	17592.000	27.92	22.37	50.29	74.00	-23.71	100	144	peak

Note: 1. Result (dBuV/m) = Correction factor (dB/m) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

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