



Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15 C (15.225)

Report Reference No. : GTS20181224005-1-21

FCC ID. : 2AU3C-B1

Compiled by

(position+printed name+signature) .: File administrators Tracy Hu

Tracy Hu

Supervised by

(position+printed name+signature) .: Test Engineer Moon Tan



Moon Tan

Approved by

(position+printed name+signature) .: Manager Simon Hu

Simon Hu

Date of issue : Nov.21,2019

Representative Laboratory Name.: Shenzhen Global Test Service Co.,Ltd.

Address : No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong, China

Applicant's name..... : RFinder.LLC

Address : 455 sunrise highway West Islip New York 11795 USA.

Test specification

Standard : FCC Part 15 C (15.225)

TRF Originator..... : Shenzhen Global Test Service Co.,Ltd.

Master TRF : Dated 2014-12

Shenzhen Global Test Service Co.,Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen Global Test Service Co.,Ltd. is acknowledged as copyright owner and source of the material. Shenzhen Global Test Service Co.,Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test item description RFinder B1

Trade Mark : N/A

Manufacturer : Shenzhen Tinfull Technology Co.,Ltd.

Model/Type reference : B1

List Model : N/A

Modulation Type..... : ASK

Operation Frequency : 13.56 MHz

Hardware Version : DT863-MB-V0.4

Software Version..... : N/A

Rating : DC 7.6V by Battery

Recharged by DC 8.7V/1.8A Adapter

Result : **PASS**

TEST REPORT

Test Report No. :	GTS20181224005-1-21	Nov.21,2019
		Date of issue

Equipment under Test : RFinder B1

Model /Type : B1

List Model : N/A

Applicant : **RFinder.LLC**

Address : 455 sunrise highway West Islip New York 11795 USA.

Manufacturer : **Shenzhen Tinfull Technology Co.,Ltd.**

Address : Floor 6&8, C1 Plant, changfang Industrial Park, julong mountain No.3 road, dagongyeyuan, longtian street, Pingshan District, Shenzhen, China.

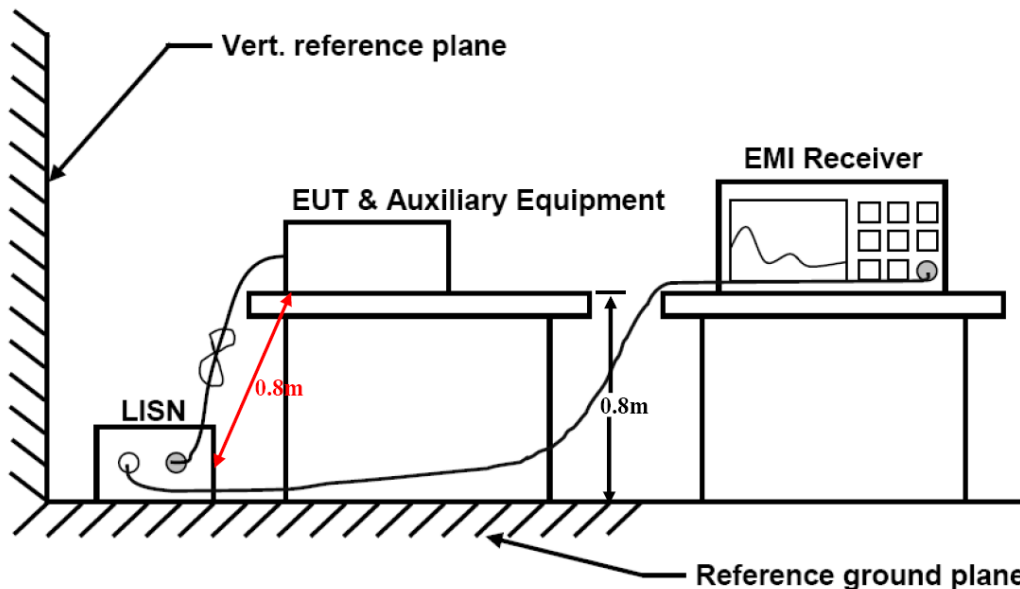
Test Result:	PASS
---------------------	-------------

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS	5
2. SUMMARY	6
2.1. General Remarks	6
2.2. Product Description	6
2.3. Equipment Under Test	8
2.4. Short description of the Equipment under Test (EUT)	8
2.5. Block Diagram of Test Setup.....	8
2.6. Related Submittal(s) / Grant (s).....	8
2.7. Special Accessories.....	8
2.8. Modifications	8
3. TEST ENVIRONMENT	9
3.1. Address of the test laboratory	9
3.2. Test Facility	9
3.3. Environmental conditions	9
3.4. Summary of measurement results	9
3.5. Statement of the measurement uncertainty	10
3.6. Equipments Used during the Test	11
4. RADIATED MEASUREMENT	12
4.1. Standard Applicable.....	12
4.2. Measuring Instruments and Setting	12
4.3. Test Procedures	13
4.4. Test Setup Layout	17
4.5. Test Results	18
5. FIELD STRENGTH OF FUNDAMENTAL EMISSIONS AND MASK MEASUREMENT	20
5.1. Block Diagram of Test Setup.....	20
5.2. Field strength of fundamental emissions limit and Mask limit.....	20
5.3. Test Results	20
6. BANDWIDTH OF THE OPERATING FREQUENCY.....	22
6.1. Standard Applicable.....	22
6.2. Test Result	22
7. FREQUENCY STABILITY MEASUREMENT	23
7.1. Standard Applicable.....	23
7.2. Test Result	23
8. LINE CONDUCTED EMISSIONS.....	24
8.1. Standard Applicable.....	24
8.2. Block Diagram of Test Setup.....	24



8.3. Test Results	24
9. ANTENNA REQUIREMENTS	26
9.1. Standard Applicable.....	26
9.2. Antenna Connected Construction	26
9.2.1. Standard Applicable	26
9.2.2. Antenna Connector Construction.....	26
9.2.3. Results: Compliance.	26
10. TEST SETUP PHOTOS OF THE EUT	27
11. EXTERNAL AND INTERNAL PHOTOS OF THE EUT	27

1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.225](#): RADIO FREQUENCY DEVICES.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Oct. 28, 2019
Testing commenced on	:	Nov.01,2019
Testing concluded on	:	Nov.21,2019

2.2. Product Description

Product Name	RFinder B1
Trade Mark	N/A
Model/Type reference	B1
List Model	N/A
Model Declaration	N/A
Power supply:	DC 7.6V by Battery Recharged by DC 8.7V/1.8A Adapter
2G	
Support Band	GSM850/PCS1900/GPRS850/GPRS1900/EDGE850/EDGE1900
Release Version	R99
GPRS Class	Class 12
EGPRS Class	Class 12
GSM/EDGE/GPRS Power Class	GSM850:Power Class 4/ PCS1900:Power Class 1
GPRS/EDGE Multislot Class	GPRS/EDGE: Multi-slot Class 12
Type Of Modulation	GMSK for GSM/GPRS; GMSK/8PSK for EGPRS
Antenna Description	PIFA Antenna; -5.0dBi (max.) For GSM 850; -3.0dBi (max.) For DCS 1900;
3G	
UMTS Operation Frequency Band	UMTS FDD Band II/V
WCDMA Release Version	R6
HSDPA Release Version	Release 6
HSUPA Release Version	Release 6
Modulation Type	QPSK for UMTS
Antenna Description	PIFA Antenna; -3.0dBi (max.) For WCDMA Band II; -5.0dBi (max.) For WCDMA Band V
LTE	
LTE Operation Frequency Band	LTE Band 2, 4, 5, 7,12,17, 26, 38, 41
LTE Release Version	R9
Type Of Modulation	QPSK/16QAM
Antenna Description	PIFA Antenna; -3.0dBi (max.) For Band 2;-3.0dBi (max.) For Band 4; -5.0dBi (max.) For Band 5;-3.0dBi (max.) For Band 7;

	-5.0dBi (max.) For Band 12;-5.0dBi (max.) For Band 17; -3.0dBi (max.) For Band 26;-3.0dBi (max.) For Band 38 -3.0dBi (max.) For Band 41
Bluetooth	
Frequency Range	2402MHz ~ 2480MHz
Channel Number	79 channels for Bluetooth V4.0 (BDR/EDR) 40 channels for Bluetooth V4.0 (BT LE)
Channel Spacing	1MHz for Bluetooth V4.0 (BDR/EDR) 2MHz for Bluetooth V4.0 (BT LE)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8-DPSK for Bluetooth V4.0 (BDR/EDR) GFSK for Bluetooth V4.0 (BT LE)
Bluetooth Version	V4.0
Antenna Description	PIFA Antenna, -1.2dBi (Max.)
WIFI(2.4G Band)	
Frequency Range	2412MHz ~ 2462MHz
Channel Spacing	5MHz
Channel Number	11 Channel for 20MHz bandwidth(2412~2462MHz) 7 channels for 40MHz bandwidth(2422~2452MHz)
Modulation Type	802.11b: DSSS; 802.11g/n: OFDM
Antenna Description	PIFA Antenna, -1.2dBi (Max.)
WIFI(5.2G Band)	
Frequency Range	5180MHz ~ 5240MHz
Channel Number	4 channels for 20MHz bandwidth(5180-5240MHz) 2 channels for 40MHz bandwidth(5190~5230MHz)
Modulation Type	802.11a/n/ac: OFDM
Antenna Description	PIFA Antenna, -1.4dBi (Max.)
WIFI (5.8G Band)	
Frequency Range	5745MHz ~ 5825MHz
Channel Number	5 channels for 20MHz bandwidth(5745-5825MHz) 2 channels for 40MHz bandwidth(5755~5795MHz)
Modulation Type	802.11a/n/ac: OFDM
Antenna Description	PIFA Antenna, -1.4dBi (Max.)
PMR	
Frequency Range	VHF:136MHz to 174 MHz;UHF:400MHz to 470MHz
Channel Separation	Analog Voice 12.5KHz Digital Voice 12.5KHz
Modulation Type	FM for Analog Voice FSK for Digital Voice
Channel Bandwidth	12.5 KHz
Rate Power	4W/2W
Antenna Description	External Antenna, 1.8dBi (Max.)
RFID(13.56MHz)	
Frequency Range	13.56MHz
Channel Number	1
Modulation Type	ASK
Antenna Description	PIFA Antenna, -1.20dBi (Max.)

GPS Receiver	Support and only RX
--------------	---------------------

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	☐ 230V / 50 Hz	☐ 120V / 60Hz
		☐ 12 V DC	☐ 24 V DC
		☒ Other (specified in blank below)	

DC 7.6V form battery

2.4. Short description of the Equipment under Test (EUT)

This is a RFinder B1

For more details, refer to the user's manual of the EUT.

2.5. Block Diagram of Test Setup



2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AU3C-B1** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
ShenZhen Tinfull Technology Co.,Ltd	Adapter	STK018-08718T	--	SDOC

2.8. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong, China, China.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS (No. CNAS L8169)

Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)

Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Summary of measurement results

Applied Standard: FCC Part 15 Subpart C		
Test Items	FCC Rules	Result
Line Conducted Emissions	§15.207(a)	PASS
Field Strength of Fundamental Emissions	§15.225(a)(b)(c)	PASS
Radiated Emissions	§15.225(d) & §15.209	PASS
20dB Bandwidth	§ 15.215	PASS
Frequency Stability	§15.225(e)	PASS
Antenna Requirement	§15.203	PASS

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Global Test Service Co.,Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

3.6. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2019/09/20	2020/09/19
LISN	R&S	ESH2-Z5	893606/008	2019/09/20	2020/09/19
EMI Test Receiver	R&S	ESPI3	101841-cd	2019/09/20	2020/09/19
EMI Test Receiver	R&S	ESCI7	101102	2019/09/20	2020/09/19
Spectrum Analyzer	Agilent	N9020A	MY48010425	2019/09/20	2020/09/19
Spectrum Analyzer	R&S	FSV40	100019	2019/09/20	2020/09/19
Vector Signal generator	Agilent	N5181A	MY49060502	2019/09/20	2020/09/19
Signal generator	Agilent	E4421B	3610AO1069	2019/09/20	2020/09/19
Climate Chamber	ESPEC	EL-10KA	A20120523	2019/09/20	2020/09/19
Controller	EM Electronics	Controller EM 1000	N/A	N/A	N/A
Horn Antenna	Schwarzbeck	BBHA 9120D	01622	2019/09/23	2020/09/22
Active Loop Antenna	Beijing Da Ze Technology Co.,Ltd.	ZN30900C	15006	2019/10/12	2020/10/11
Bilog Antenna	Schwarzbeck	VULB9163	000976	2019/05/26	2020/05/25
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2019/09/20	2020/09/19
Amplifier	Schwarzbeck	BBV 9743	#202	2019/09/20	2020/09/19
Amplifier	Schwarzbeck	BBV9179	9719-025	2019/09/20	2020/09/19
Amplifier	EMCI	EMC051845B	980355	2019/09/20	2020/09/19
Temperature/Humidity Meter	Gangxing	CTH-608	02	2019/09/20	2020/09/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	KL142031	2019/09/20	2020/09/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	KL142032	2019/09/20	2020/09/19
RF Cable(below 1GHz)	HUBER+SUHNER	RG214	RE01	2019/09/20	2020/09/19
RF Cable(above 1GHz)	HUBER+SUHNER	RG214	RE02	2019/09/20	2020/09/19
Data acquisition card	Agilent	U2531A	TW53323507	2019/09/20	2020/09/19
Power Sensor	Agilent	U2021XA	MY5365004	2019/09/20	2020/09/19
Test Control Unit	Tonscend	JS0806-1	178060067	2019/06/20	2020/06/19
Automated filter bank	Tonscend	JS0806-F	19F8060177	2019/06/20	2020/06/19
EMI Test Software	Tonscend	JS1120-1	Ver 2.6.8.0518	/	/
EMI Test Software	Tonscend	JS1120-3	Ver 2.5.77.0418	/	/
EMI Test Software	Tonscend	JS32-CE	Ver 2.5	/	/
EMI Test Software	Tonscend	JS32-RE	Ver 2.5.1.8	/	/

Note: The Cal.Interval was one year.

4. Radiated Measurement

4.1. Standard Applicable

According to §15.209/ §15.205

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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

4.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10 th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

4.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 0.8 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 2.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

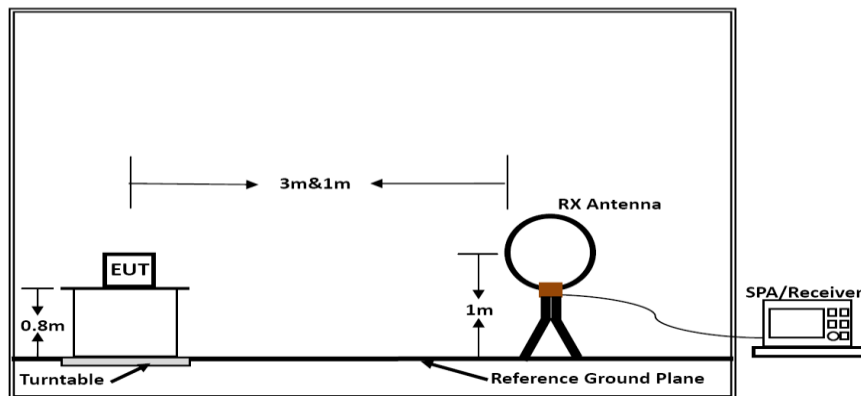
Premeasurement:

- The antenna is moved spherical over the EUT in different polarizations of the antenna.

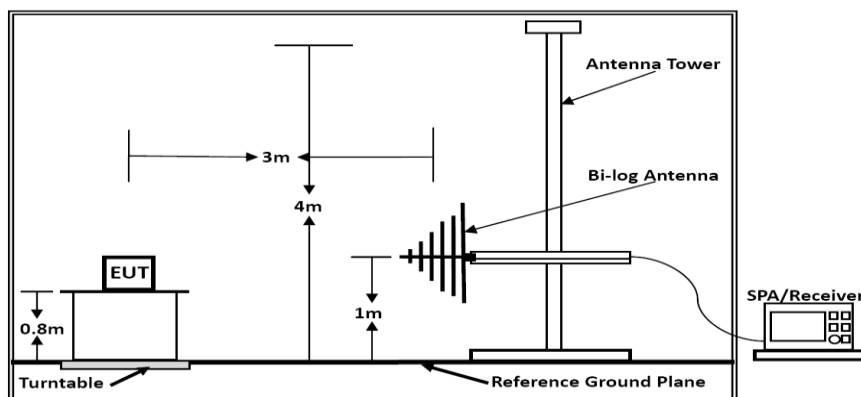
Final measurement:

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

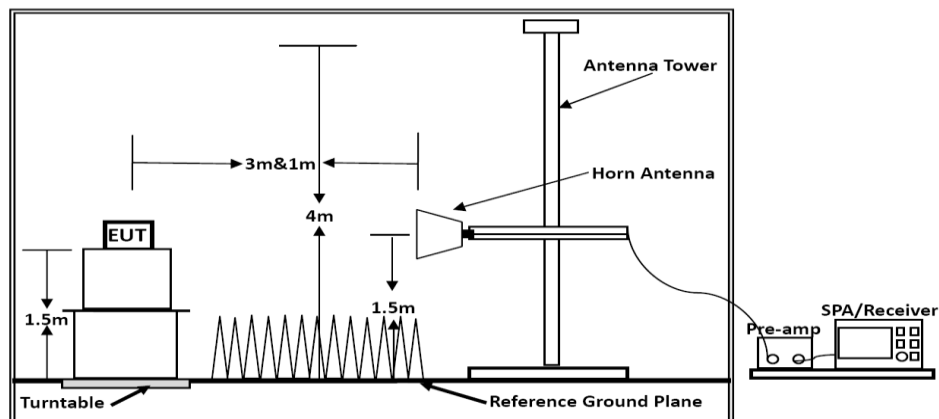
4.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);
 Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

4.5. Test Results

PASS.

The test data please refer to following page:

9 KHz~30MHz

Note: Only recorded the worst test result.

Freq. MHz	Reading dBuV	Factor dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark
0.52	--	--	--	92.64	--	--
1.62	--	--	--	63.58	--	--
2.64	23.31	20.76	44.07	69.5	-25.43	QP
6.32	27.43	20.78	48.21	69.5	-21.29	QP
13.56	34.17	20.64	54.81	124	-57.69	QP
21.15	26.00	20.78	46.78	69.5	-22.72	QP
20.77	27.54	20.40	47.94	69.5	-21.56	QP
25.91	29.53	20.41	49.94	69.5	-19.56	QP

*Note: Emission Level= Reading Level + Antenna Factor + Cable Loss

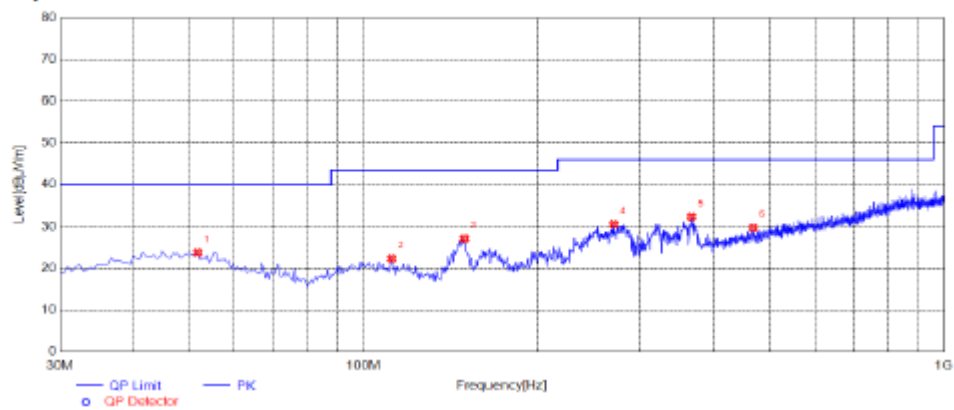
Margin = Emission Limit – Emission Values

“--” means noise floor.

30MHz ~ 1GHz

Horizontal

Test Graph



Suspected List

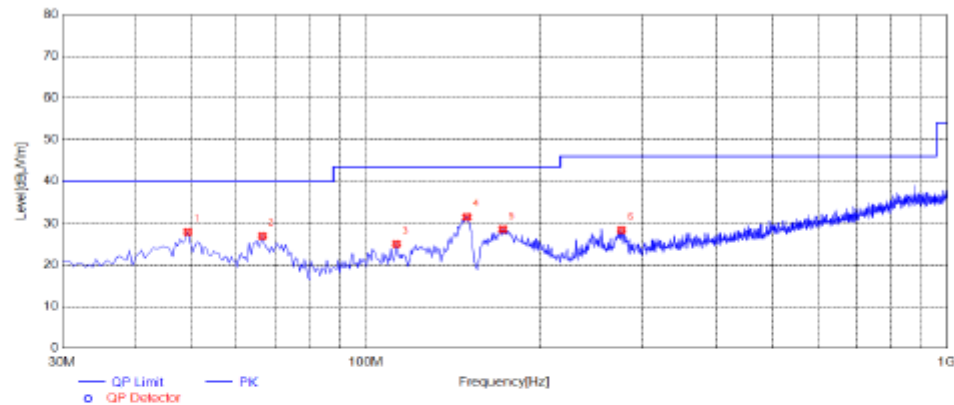
NO.	Frequency [MHz]	Reading [dBμV/m]	Factor [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity	Remark
1	51.8250	38.97	-15.20	23.77	40.00	16.23	100	50	PK	Horizontal	PASS
2	111.9650	39.63	-17.31	22.32	43.50	21.18	100	300	PK	Horizontal	PASS
3	149.3100	46.84	-19.72	27.12	43.50	16.38	100	260	PK	Horizontal	PASS
4	270.0750	45.04	-14.49	30.55	46.00	15.45	100	340	PK	Horizontal	PASS
5	367.5600	44.70	-12.42	32.28	46.00	13.72	100	30	PK	Horizontal	PASS
6	469.4100	40.05	-10.36	29.69	46.00	16.31	100	290	PK	Horizontal	PASS

Note:1. Result (dBμV/m) = Reading(dBμV/m) + Factor (dB) .

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

Vertical

Test Graph



Suspected List

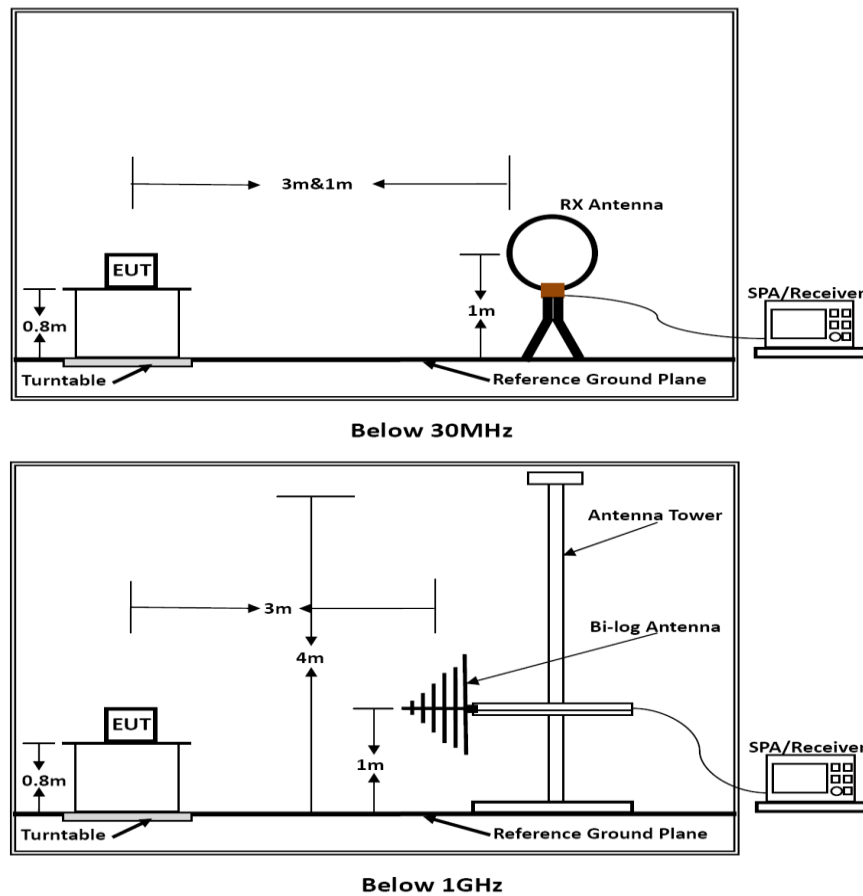
NO.	Frequency [MHz]	Reading [dBμV/m]	Factor [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity	Remark
1	49.4000	42.71	-14.84	27.87	40.00	12.13	100	290	PK	Vertical	PASS
2	66.3750	45.38	-18.44	26.94	40.00	13.06	100	350	PK	Vertical	PASS
3	112.9350	42.47	-17.46	25.01	43.50	18.49	100	40	PK	Vertical	PASS
4	149.3100	51.24	-19.72	31.52	43.50	11.98	100	300	PK	Vertical	PASS
5	172.1050	47.44	-18.88	28.56	43.50	14.94	100	340	PK	Vertical	PASS
6	275.4100	42.85	-14.49	28.36	46.00	17.64	100	260	PK	Vertical	PASS

Note:1. Result (dBμV/m) = Reading(dBμV/m) + Factor (dB) .

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

5. Field Strength of Fundamental Emissions and Mask Measurement

5.1. Block Diagram of Test Setup



5.2. Field strength of fundamental emissions limit and Mask limit

The field strength of fundamental emissions shall not exceed 15848 microvolts/meter at 30 meters. The emissions limit in this paragraph is based on measurement instrumentation employing a QP detector.

Frequencies (MHz)	Field Strength (microvolts/meter)	Field Strength (dBμV/m) at 10m	Field Strength (dBμV/m) at 3m
13.553 ~ 13.567MHz	15848 at 30m	103.08 (QP)	124 (QP)

Mask Limit:

Frequency (MHz)	Limit (dBuV/m)	Distance (m)
1.705-13.110	69.5	3
13.110-13.410	80.5	3
13.410-13.553	90.5	3
13.553-13.567	124.0	3
13.567-13.710	90.5	3
13.710-14.010	80.5	3
14.010-30.000	69.5	3

5.3. Test Results

PASS.

The test data please refer to following page:

	Freq.(MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Pol.	Remark
1	13.56	54.35	20.64	74.99	124.0	H	QP
2	13.43	45.36	20.64	66	90.5	H	QP
3	13.37	39.58	20.64	60.22	80.5	H	QP
4	13.64	44.61	20.64	65.25	90.5	H	QP
5	13.85	38.69	20.64	59.33	80.5	H	QP

*Note: Factor= Antenna Factor + Cable Loss

Emission level (dB μ V/m) = 20 log Emission level (μ V/m).

Measured distance is 3m.

All emissions emit from non-NFC function of digital unintentional emissions. All NFC's spurious emissions are below 20dB of limits.

6. Bandwidth of the operating frequency

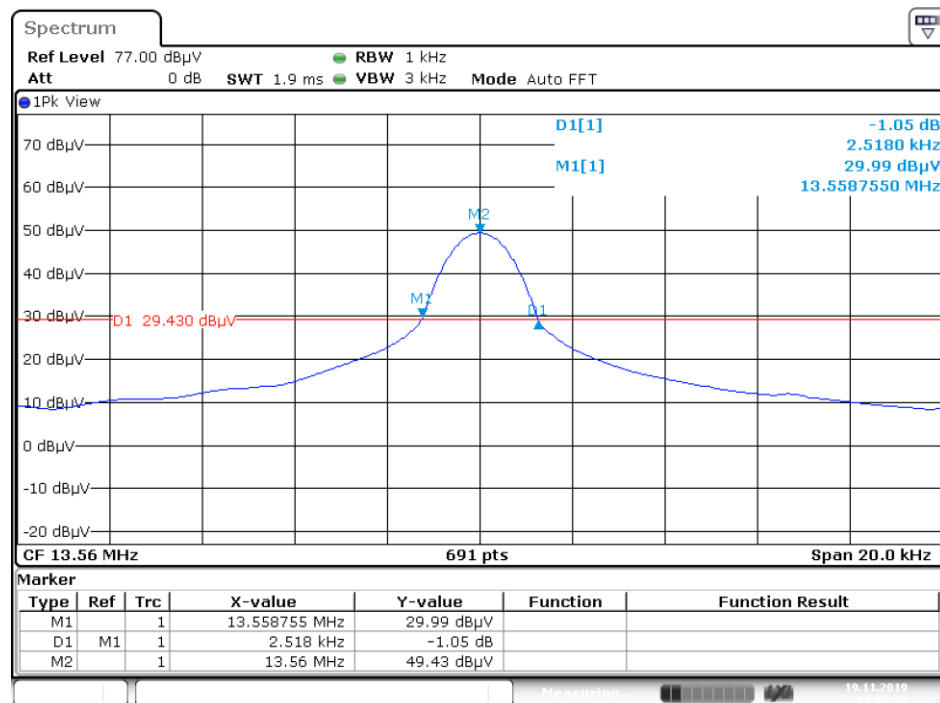
6.1. Standard Applicable

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (13.553 ~ 13.567MHz).

6.2. Test Result

Carrier Frequency (MHz)	20dB Bandwidth (KHz)	F _L (MHz)	F _H (MHz)
13.56	2.5	13.558755	13.561273

Please refer to the test plot:



Date: 19.NOV.2019 13:57:31

7. Frequency Stability Measurement

7.1. Standard Applicable

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% (100ppm) of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a full charged battery.

7.2. Test Result

Voltage vs. Frequency Stability

Voltage(V)	Measurement Frequency (MHz)	Deviation (KHz)	Deviation (ppm)	Limit (ppm)
DC 6.70V	13.56044	0.44	32.45	100
DC 7.60V	13.56013	0.13	9.59	100
DC 8.40V	13.56031	0.31	22.86	100

Temperature vs. Frequency Stability

Temperature (°C)	Measurement Frequency (MHz)	Deviation (KHz)	Deviation (ppm)	Limit (ppm)
-20	13.56007	0.07	5.16	100
-10	13.56013	0.13	9.59	100
0	13.56021	0.21	15.49	100
10	13.56026	0.26	19.17	100
20	13.56044	0.44	32.45	100
30	13.56018	0.18	13.27	100
40	13.56039	0.39	28.76	100
50	13.56044	0.44	32.45	100

8. line conducted emissions

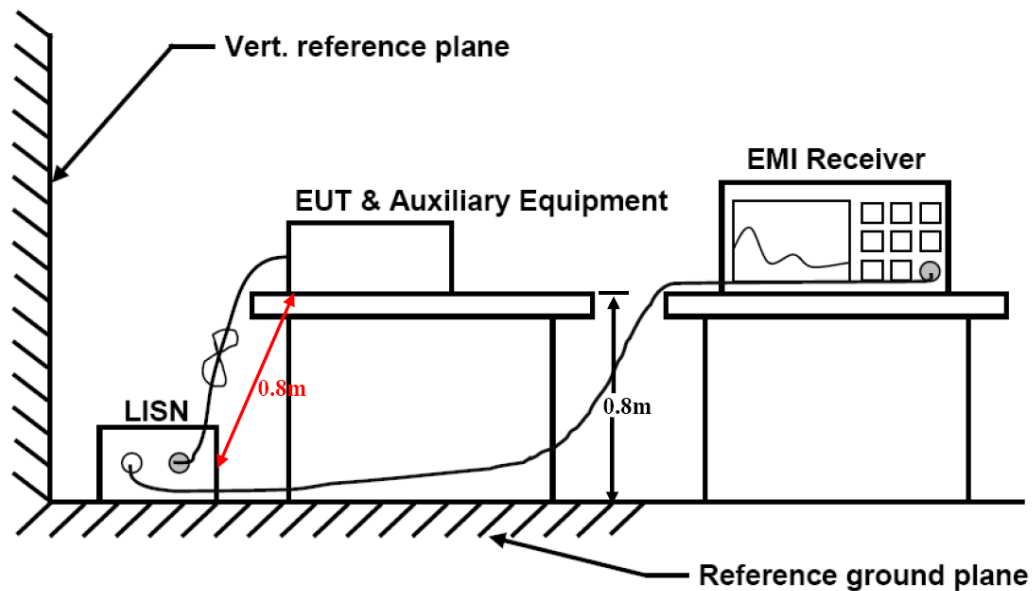
8.1. Standard Applicable

According to §15.207(a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Limits (dB μ V)	
	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

* Decreasing linearly with the logarithm of the frequency

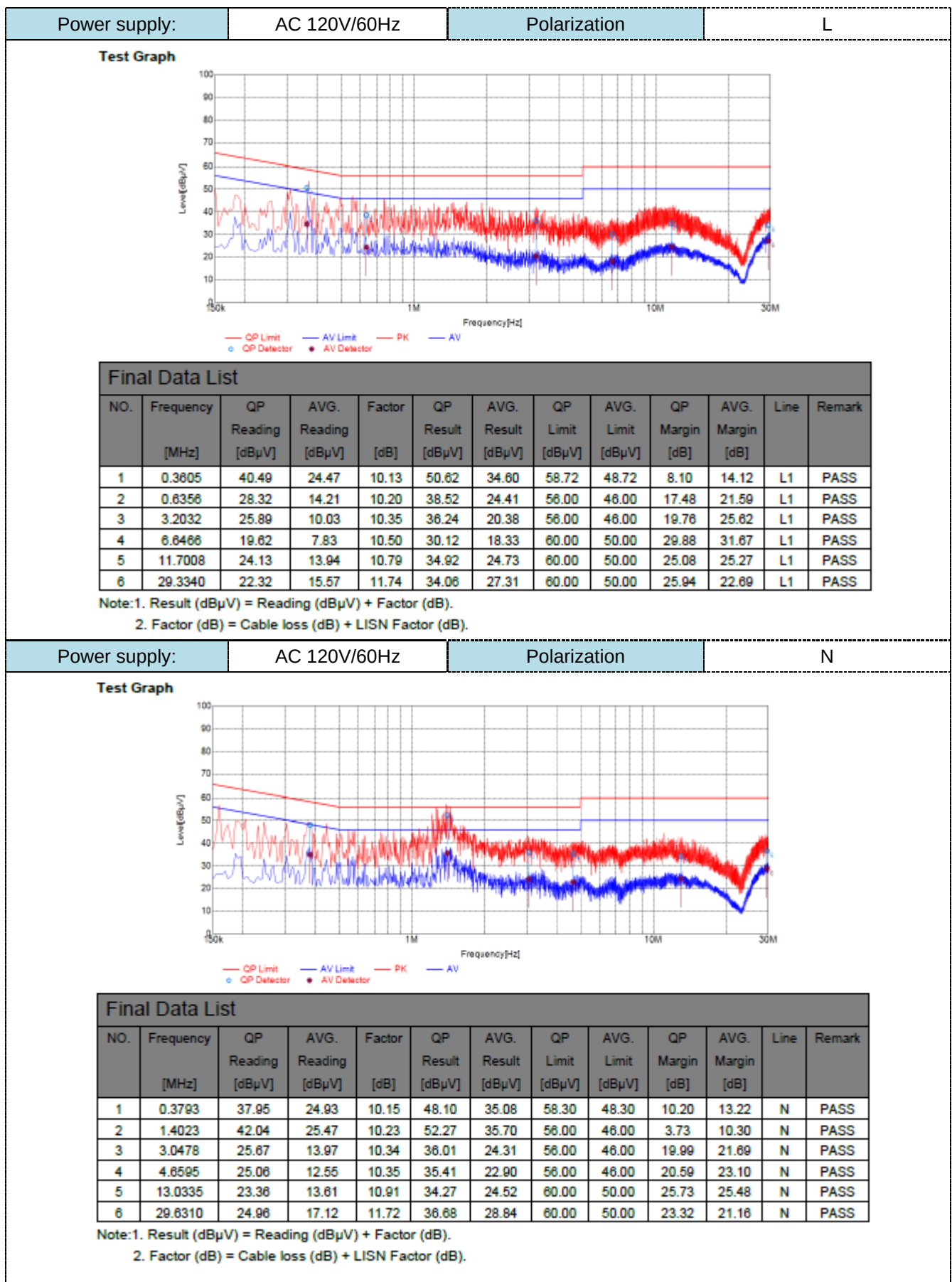
8.2. Block Diagram of Test Setup



8.3. Test Results

PASS.

The test data please refer to following page.

AC Conducted Emission of charge from adapter mode @ AC 120V/60Hz (worst case)

9. Antenna Requirements

9.1. Standard Applicable

According to antenna requirement of §15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

9.2. Antenna Connected Construction

9.2.1. Standard Applicable

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

9.2.2. Antenna Connector Construction

The gains of antenna used for transmitting is -1.2dBi, and the antenna is a Loop antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

9.2.3. Results: Compliance.

10. Test Setup Photos of the EUT

Reference to the TEST SETUP PHOTOS

11. External and Internal Photos of the EUT

Reference to the EXTERNAL AND INTERNAL PHOTOS

.....End of Report.....