



EMC TEST REPORT

Applicant NOKIA Shanghai Bell Co. Ltd.
FCC ID 2ADZRHA030WB
Product 7368 Intelligent Services Access Manager CPE
Brand NOKIA
Model HA-030W-B
Report No. R1901B0001-E2V1
Issue Date March 5, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC Code CFR47 Part15B (2017)/ ANSI C63.4 (2014)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Wei Liu

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Summary of measurement results

Number	Test Case	Clause in FCC Rules	Conclusion
1	Radiated Emission	15.109, ANSI C63.4-2014	PASS
2	Conducted Emission	15.107, ANSI C63.4-2014	PASS
Test Date: January 1, 2019 ~February 11, 2019			

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City: Shanghai
Post code: 201201
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Website: <http://www.ta-shanghai.com>
E-mail: xukai@ta-shanghai.com

2 General Description of Equipment under Test

2.1 Client Information

Applicant	NOKIA Shanghai Bell Co. Ltd.
Applicant address	No. 388, Ningqiao Rd. Pilot Free Trade Zone, Shanghai, China
Manufacturer	TAICANG T&W ELECTRONICS CO.,LTD
Manufacturer address	89# Jiang Nan RD, Lu Du, Taicang, Jiangsu, China

2.2 General information

EUT Description	
Device Type	Mobile Device
Application Purpose	Class II Permissive Change
Model Number	HA-030W-B
SN	/
HW Version	PEM2
SW Version	Null
Antenna Type	Internal Antenna
Test Mode	Transfer Data Mode
EUT Accessory	
Adapter	Manufacturer: Dongguan Shilong Fuhua Electronic Co., Ltd. Model: UES24WU-120200SPA
Auxiliary test equipment	
PC	PC Manufacturer: Dell Model: E5450 (SN : P48G001)
Remark: The information of the EUT is declared by the manufacturer.	

HA-030W-B (R1901B0001-E2V1) is a variant model of HA-030W-B (Y1804B0039-E1V1).
Test values all retested for variant in this report. The detailed product change description please refers to the FCC class II permissive change application letter.

**EUT Configuration**

No.	Name	Model/Code No.	Edition	Serial No. or Quantity
1	EMA-HA-030W-B	3FE47429AA	PEM2	PEM 1
2	Power adapter	UES24WU-120200SPA	A/0	UE181219GWAD2RI

ONT Mnemonic	Kit Code	EMA Code	Part Description	Power Adapter
HA-030W-B	3FE47357AA	3FE47429AA	Wi-Fi Access Point and range extender, 3xGE UNI, 3x3 11n+4x4 11ac, US plug	UES24WU-120200SPA
HA-030W-B	3FE47671AA	3FE47429AA	Wi-Fi Access Point and range extender, 3xGE UNI, 3x3 11n+4x4 11ac, US plug, 2 pack	UES24WU-120200SPA
HA-030W-B	3FE47672AA	3FE47429AA	Wi-Fi Access Point and range extender, 3xGE UNI, 3x3 11n+4x4 11ac, US plug, 3 pack	UES24WU-120200SPA

Auxiliary Equipment

No.	Name	Brand name	Model	ASB code	Valid Until
1	SmartBits 600B	Sprint	DE7853	-	No Cal. Required
2	PC	HP	N.A	-	No Cal. Required
3	PC	DELL	N.A	-	No Cal. Required
4	PC	Thinkpad	N.A	-	No Cal. Required

Ports

No.	Port name	Number	Shielded or unshielded	Cable type (optic, twisted pair, etc.)	Max. Cable length
1	AC port	1	Unshielded	--	--
2	GE	4	Unshielded	--	--



2.3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards

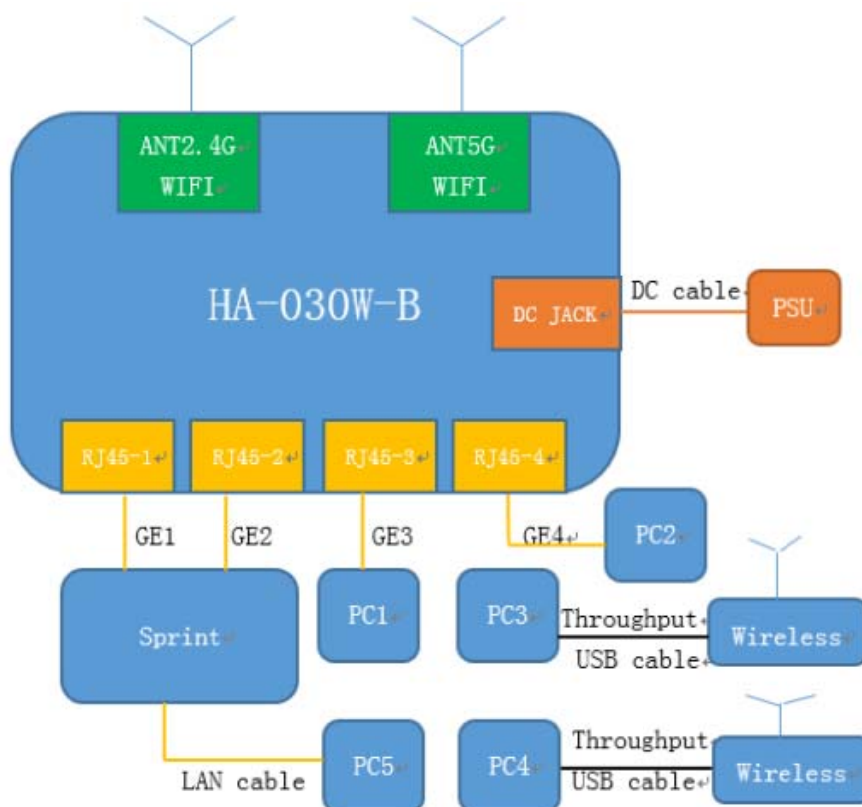
FCC Code CFR47 Part15B (2017)

ANSI C63.4 (2014)

2.4 Test configuration

Description: The HA-030W-B is a AP which has 3 GE LAN ports, and 1 GE WAN port.

The basic functional test in normal room conditions consists of the traffic test and WIFI throughput test. HA-030W-B runs 2traffics on each line with SMB600B, the each upstream of 2 GE is 1Gbps, and downstream is 1Gbps. Frame loss ratio less than 10e-7. The WIFI keep connecting.



Test configuration

3 Test Case Results

3.1 Radiated Emission

Ambient condition

Temperature	Relative humidity	Pressure
24°C~26°C	45%~50%	102.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The distance between EUT and receive antenna should be 3 meters. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier. During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum of radiated signal level.

The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. During the test, the EUT is worked at maximum output power.

Set the spectrum analyzer in the following:

Below 1GHz:

RBW=100 kHz / VBW=300 kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=1MHz / VBW=3MHz/ Sweep=AUTO

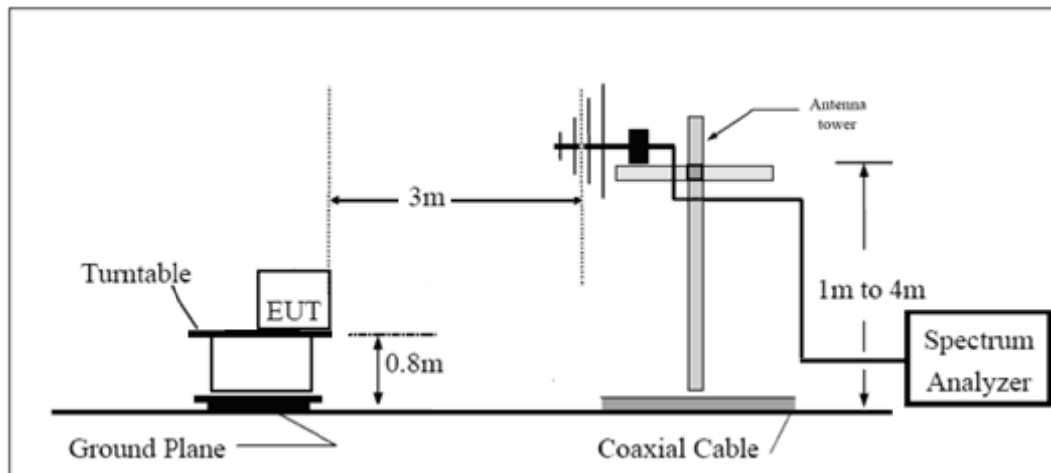
(b) AVERAGE: RBW=1MHz / VBW=1Hz / Sweep=AUTO

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

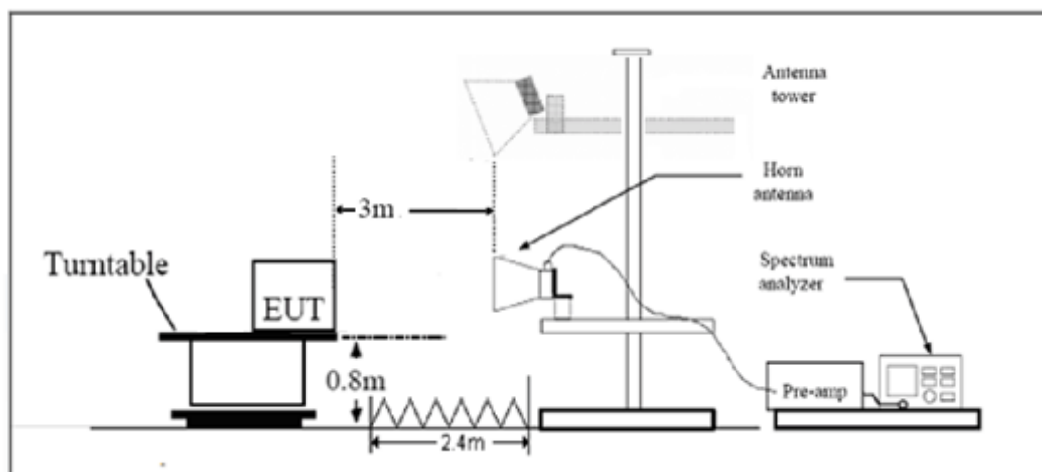
During the test, reference test configuration, EUT is connected to laptop via a cable in the case of Transfer Data mode.

Test Setup

Below 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Antenna Tower meets ANSI C63.4 requirements for measurements above 1 GHz by keeping the antenna aimed at the EUT during the antenna's ascent/ descent along the antenna mast.

Limits

Frequency (MHz)	Field Strength (dB μ V/m)	Detector
30 -88	40.0	Quasi-peak
88-216	43.5	Quasi-peak
216 – 960	46.0	Quasi-peak
960-1000	54.0	Quasi-peak
1000-5 th harmonic of the highest frequency or 40GHz, which is lower	54 74	Average Peak

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
30MHz~200MHz	4.02 dB
200MHz~1000MHz	3.28 dB
1GHz~18GHz	3.70 dB
18GHz~26.5GHz	5.78 dB
26.5GHz~40GHz	5.82 dB

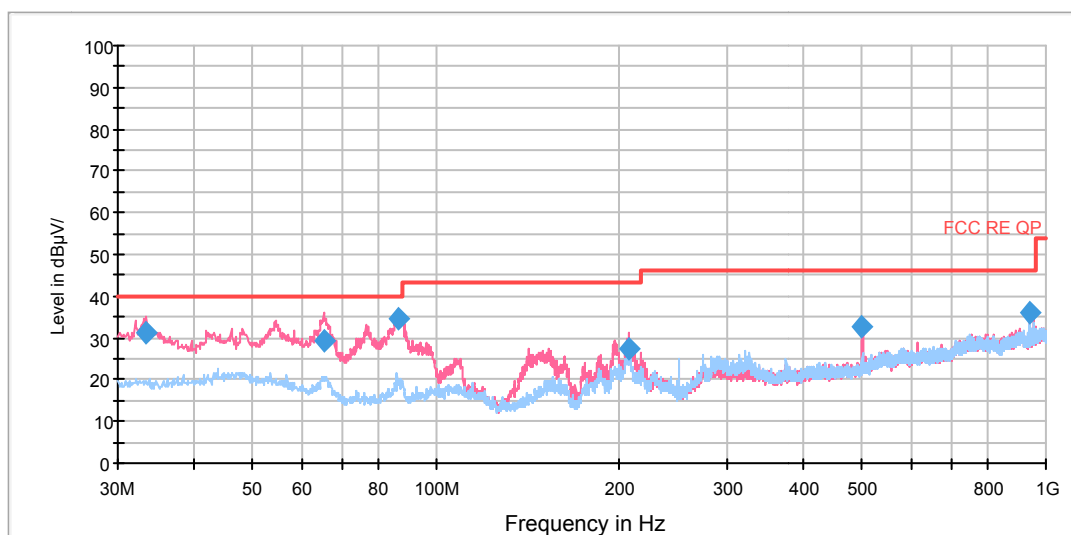
Test Results

Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier, the Emissions in the frequency band 18GHz- 26.5GHz is more than 20dB below the limit are not reported.

The following graphs display the maximum values of horizontal and vertical by software.

For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

RE 30M-1GHz QP



Radiated Emission from 30MHz to 1GHz

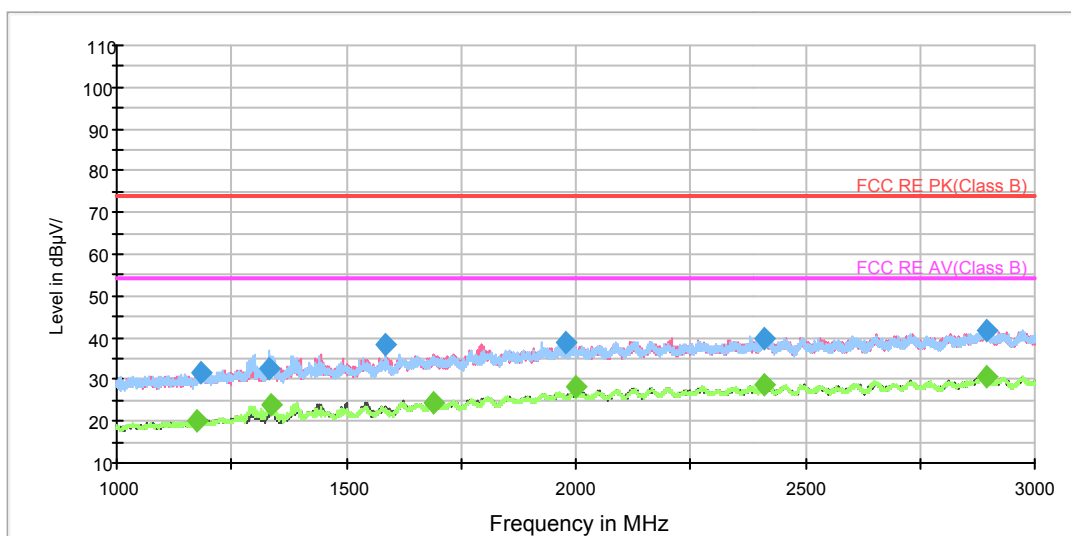
Frequency (MHz)	Quasi-Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
33.351512	31.5	17.0	100.0	V	279.0	14.5	8.5	40.0
65.446960	29.3	17.6	175.0	V	0.0	11.7	10.7	40.0
86.808138	34.4	23.3	125.0	V	178.0	11.1	5.6	40.0
206.944750	27.2	15.2	100.0	V	198.0	12.0	16.3	43.5
499.996250	32.8	14.0	100.0	V	158.0	18.8	13.2	46.0
938.218250	36.2	11.5	207.0	H	234.0	24.7	9.8	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

3. Margin = Limit – Quasi-Peak

RE 1G-3GHz PK+AV

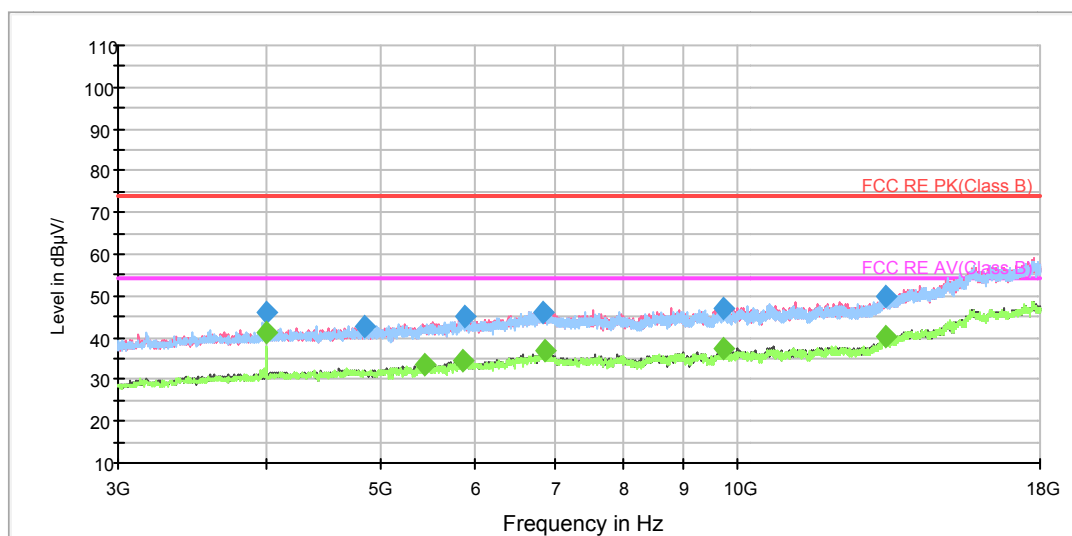


Radiated Emission from 1GHz to 3GHz

Frequency (MHz)	Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1182.788750	31.7	41.0	100.0	H	10.0	-9.3	42.3	74.0
1331.715000	32.5	41.0	100.0	H	149.0	-8.5	41.5	74.0
1586.110000	38.2	45.5	100.0	V	173.0	-7.3	35.8	74.0
1976.927500	39.0	43.1	100.0	V	198.0	-4.1	35.0	74.0
2410.937500	39.6	41.7	100.0	V	322.0	-2.1	34.4	74.0
2893.805000	41.9	42.1	100.0	V	327.0	-0.2	32.1	74.0

Frequency (MHz)	Average (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1176.760000	20.3	29.5	100.0	V	110.0	-9.2	33.7	54.0
1336.168750	23.7	32.3	200.0	H	280.0	-8.6	30.3	54.0
1689.707500	24.4	30.3	200.0	V	166.0	-5.9	29.6	54.0
1999.947500	28.0	31.8	200.0	V	181.0	-3.8	26.0	54.0
2412.065000	28.8	30.9	200.0	V	64.0	-2.1	25.2	54.0
2893.152500	30.8	30.9	100.0	H	15.0	-0.1	23.2	54.0

RE 3-18GHz PK+AV 15C



Radiated Emission from 3GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
4000.013750	46.0	46.3	100.0	V	154.0	-0.3	28.0	74.0
4852.448750	42.7	41.3	200.0	V	58.0	1.4	31.3	74.0
5890.003750	45.3	41.6	200.0	V	302.0	3.7	28.7	74.0
6862.243750	45.8	40.4	100.0	V	0.0	5.4	28.2	74.0
9715.938750	47.0	39.4	200.0	V	230.0	7.6	27.0	74.0
13345.182500	49.9	38.6	200.0	V	31.0	11.3	24.1	74.0

Frequency (MHz)	Average (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
4000.057500	41.4	41.7	100.0	H	167.0	-0.3	12.6	54.0
5440.255000	33.4	30.7	200.0	V	13.0	2.7	20.6	54.0
5868.756250	34.6	30.9	200.0	V	131.0	3.7	19.4	54.0
6869.328750	36.7	31.3	200.0	V	40.0	5.4	17.3	54.0
9711.100000	37.2	29.6	200.0	V	166.0	7.6	16.8	54.0
13354.455000	40.1	28.8	100.0	V	199.0	11.3	13.9	54.0

3.2 Conducted Emission

Ambient condition

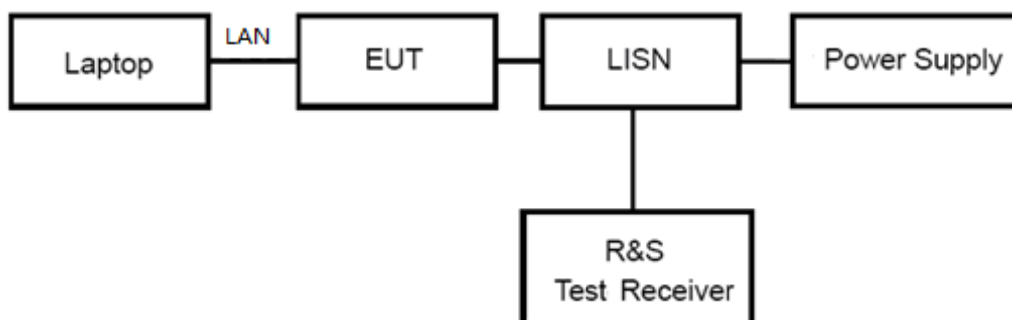
Temperature	Relative humidity	Pressure
24°C ~26°C	50%~55%	102.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

During the test, reference test configuration, EUT is connected to laptop via a cable in the case of Transfer Data mode.

Test Setup



Note: Power Supply is AC Power source and it is used to change the voltage 120V/60Hz.

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
*: Decreases with the logarithm of the frequency.		

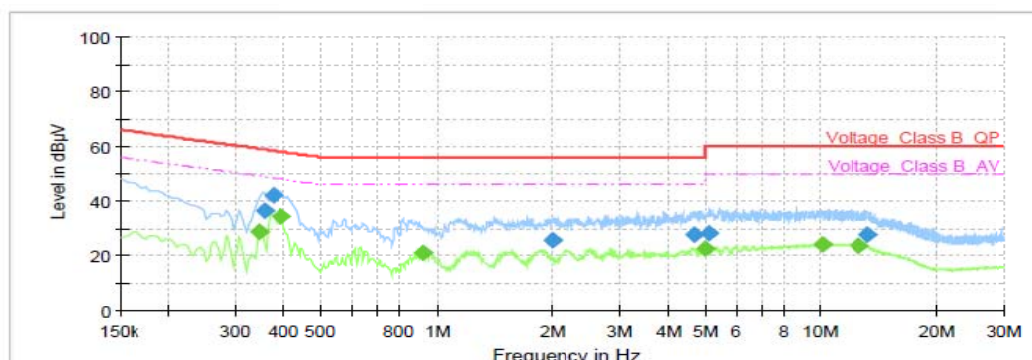
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is

with the coverage factor $k = 1.96$. $U = 2.57$ dB.

Test Results

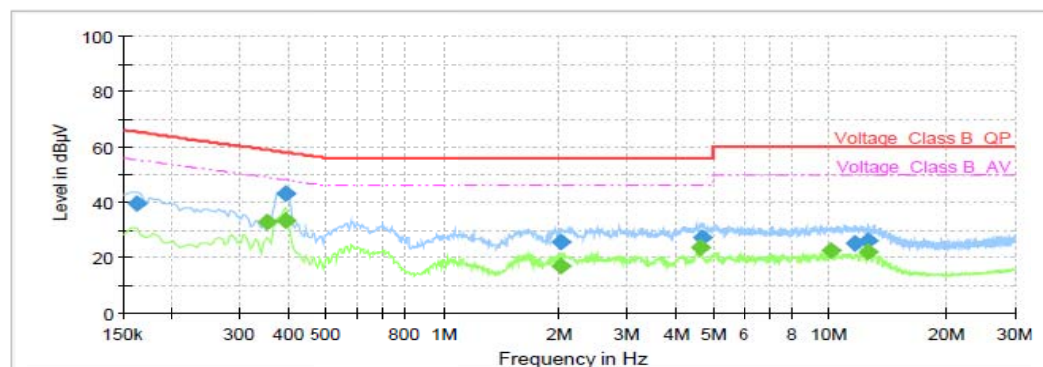
Following plots, Blue trace uses the peak detection; Green trace uses the average detection.



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.35	---	28.89	49.06	20.17	100.0	9.000	L1	ON	19.18
0.35	36.16	---	58.85	22.69	100.0	9.000	L1	ON	19.18
0.38	42.15	---	58.34	16.19	100.0	9.000	L1	ON	19.22
0.39	---	34.41	48.05	13.64	100.0	9.000	L1	ON	19.23
0.92	---	20.91	46.00	25.09	100.0	9.000	L1	ON	19.24
2.00	25.49	---	56.00	30.51	100.0	9.000	L1	ON	19.13
4.68	27.72	---	56.00	28.28	100.0	9.000	L1	ON	19.09
4.99	---	22.42	46.00	23.58	100.0	9.000	L1	ON	19.08
5.13	28.18	---	60.00	31.82	100.0	9.000	L1	ON	19.09
10.12	---	24.13	50.00	25.87	100.0	9.000	L1	ON	19.41
12.48	---	23.73	50.00	26.27	100.0	9.000	L1	ON	19.44
13.24	27.92	---	60.00	32.08	100.0	9.000	L1	ON	19.50

L line

Conducted Emission from 150 KHz to 30 MHz



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.16	39.34	---	65.40	26.06	100.0	9.000	N	ON	19.15
0.35	---	32.61	48.96	16.35	100.0	9.000	N	ON	19.17
0.39	---	33.47	48.05	14.57	100.0	9.000	N	ON	19.23
0.39	42.85	---	58.05	15.20	100.0	9.000	N	ON	19.23
2.02	25.39	---	56.00	30.61	100.0	9.000	N	ON	19.13
2.02	---	16.90	46.00	29.10	100.0	9.000	N	ON	19.13
4.64	---	23.41	46.00	22.59	100.0	9.000	N	ON	19.10
4.67	27.17	---	56.00	28.83	100.0	9.000	N	ON	19.09
10.02	---	22.36	50.00	27.64	100.0	9.000	N	ON	19.42
11.63	25.37	---	60.00	34.63	100.0	9.000	N	ON	19.38
12.51	---	22.08	50.00	27.92	100.0	9.000	N	ON	19.42
12.51	26.22	---	60.00	33.78	100.0	9.000	N	ON	19.42

N line

Conducted Emission from 150 KHz to 30 MHz

4 Main Test Instrument

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Time
Spectrum Analyzer	R&S	FSV40	15195-01-00	2018-05-20	2019-05-19
EMI Test Receiver	R&S	ESCI	100948	2018-05-20	2019-05-19
Trilog Antenna	SCHWARZBECK	VULB 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Standard Gain Horn	ETS-Lindgren	3160-09	00102643	2018-06-20	2019-06-19
Standard Gain Horn	STEATITE	QSH-SL-26-40-K-15	16779	2017-07-20	2019-07-19
EMI Test Receiver	R&S	ESR	101667	2018-05-20	2019-05-19
LISN	R&S	ENV216	101171	2016-12-16	2019-12-15
Bore Sight Antenna mast	ETS	2171B	00058752	/	/
Test software	EMC32	R&S	9.26.0	/	/

ANNEX A: The EUT Appearance and Test Configuration

A.1 EUT Appearance



Front Side



Back Side

a: EUT

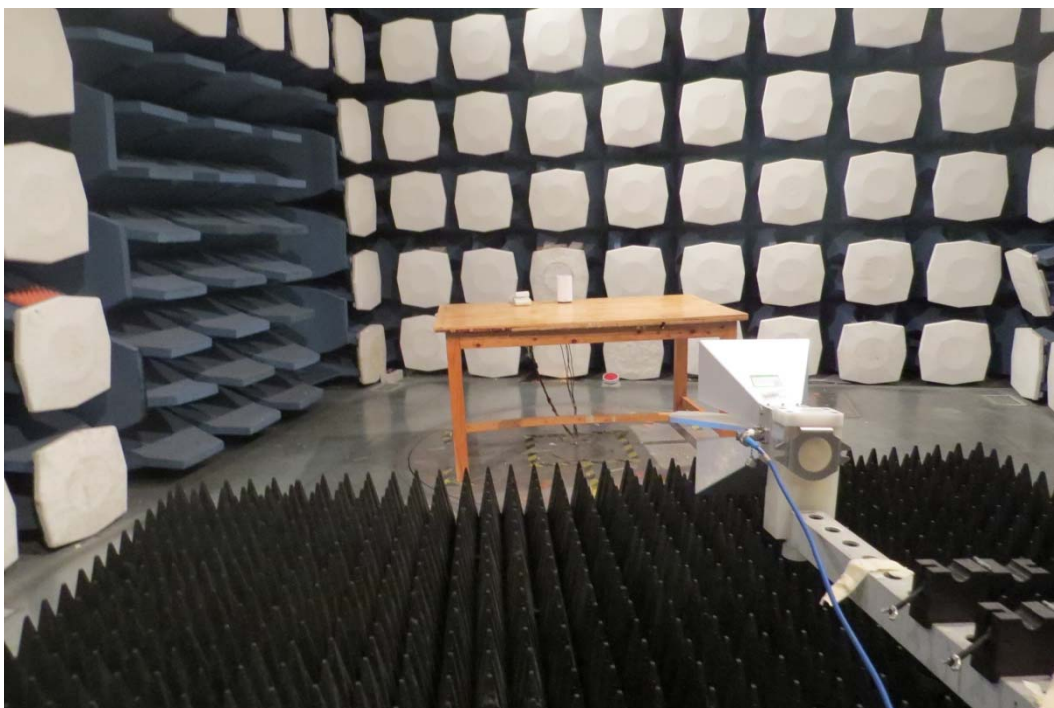


b: Adapter
Picture 1 EUT

A.2 Test Setup



a: Below 1GHz



b: Above 1GHz

Picture 2 Radiated Emission Test Setup



Picture 3 Conducted Emission Test Setup