



EMC TEST REPORT

Applicant Nokia Shanghai Bell Co.Ltd.
FCC ID 2ADZRHA140WB
Product 7368 Intelligent Services Access Manager CPE
Brand Nokia
Model HA-140W-B
Report No. R1910B0142-E1V2
Issue Date February 21, 2020

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC Code CFR47 Part15B (2019)/ 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

Guangchang Fan

Performed by: Wei Liu/ Manager

Approved by: Guangchang Fan/ Director

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000



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Summary of measurement results

Number	Test Case	Clause in FCC Rules	Conclusion
1	Radiated Emission	FCC Part15.109, ANSI C63.4-2014	PASS
2	Conducted Emission	FCC Part15.107, ANSI C63.4-2014	PASS
Test Date: October 15, 2019 and December 12, 2019			
Note: All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			

Note: This revised report (Report No.: R1910B0142-E1V2) supersedes and replaces the previously issued report (Report No.: R1910B0142-E1V1). Please discard or destroy the previously issued report and dispose of it accordingly.

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

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.

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
Country: P. R. China
Contact: Xu Kai
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: xukai@ta-shanghai.com

2 General Description of Equipment under Test

2.1 Applicant and Manufacturer Information

Applicant	Nokia Shanghai Bell Co.Ltd.
Applicant address	No. 388, Ningqiao Rd. Pilot Free Trade Zone, Shanghai, China
Manufacturer	SHENZHEN TWOWING TECHNOLOGIES CO.,LTD.
Manufacturer address	Nangang Industrial Building, Tangtou Industrial Park,Shiyan, Baoan, Shenzhen, Guangdong China

2.2 General information

EUT Description			
Device Type:	Movable device		
Model:	HA-140W-B		
SN	1#		
HW Version:	PEM2		
SW Version:	3FE48210FGCB55		
Antenna Type:	Internal Antenna		
Frequency:	Band	Tx (MHz)	Rx (MHz)
	WIFI 2.4G:	2412 ~ 2462	2412 ~ 2462
	WIFI 5G(U-NII-1):	5150 ~ 5250	5150 ~ 5250
	WIFI 5G(U-NII-2A):	5250 ~ 5350	5250 ~ 5350
	WIFI 5G(U-NII-2C):	5470 ~ 5725	5470 ~ 5725
	WIFI 5G(U-NII-3):	5725 ~ 5850	5725 ~ 5850
Modulation:	WLAN 802.11b: DSSS WLAN 802.11a/g/n/ac: OFDM		
EUT Accessory			
Adapter 1	Manufacturer: FUHUA ELECTRONIC CO., LTD. Model:UES36WU-120250SPA		
Adapter 2	Manufacturer: SHENZHEN SOY TECHNOLOGY CO., LTD. Model: SUV-1200300		
Auxiliary test equipment			
PC	PC Manufacturer: Dell Model: E5450 (SN : P48G001)		
Note: The EUT is sent from the applicant to TA and the information of the EUT is declared by the			



applicant.

Information of Configuration:

No.	Name	Model/Code No.	Edition	Serial No. or Quantity
1.1	HA-140W-B	3FE48130AA	PEM2	1
2.2	Power adapter	UES36WU-120250SPA	A/0	1
2.3	Power adapter	SUV-1200300	A/0	1

	Kit Code	EMA	Part Description	Power Adaptor
HA-140W-B	3FE48111AA	3FE 48130AA	7368CPE,AC2800,1xPO TS,4xG UNI,US plug	UES36WU-120250SPA SUV-1200300

	Name	RCR	KIT code	EMA code	PBA code	PB code	Part Description
HA-140W-B	US	ALU02561014	3FE48111AAAA	3FE48130AAAA	3FE48132AAAA	3FE48133AAAA	7368CPE,AC2800,1xPOTS,4xGE UNI,US plug

Auxiliary equipment details

No.	Name	Brand name	Model	NSB code	Valid Until
1	BigTao220	XINERTEL	DE8709	-	No Cal. Required
2	PC	Thinkpad	T470	-	No Cal. Required
3	Phone	NA	NA	-	No Cal. Required
4	USB	Sandisk	CZ73-16	-	No Cal. Required
5	2.4G WIFI Card	Asus	PCE-AC88	-	No Cal. Required
6	5G WIFI Card	Asus	PCE-AC88	-	No Cal. Required

Information of Ports

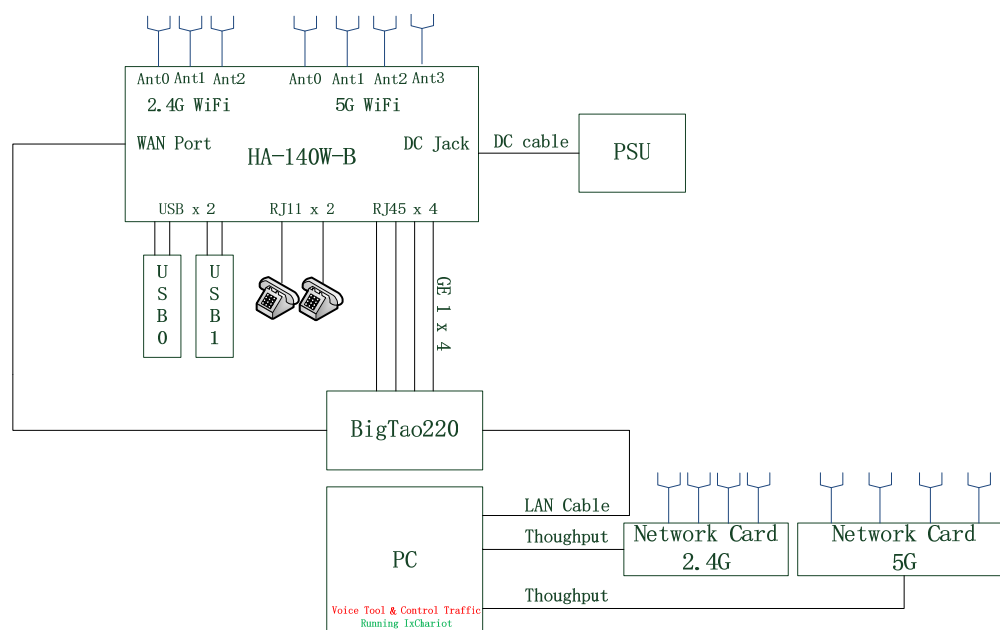
No.	Port name	Number	Shielded or unshielded	Cable type (optic, twisted pair, etc.)	Max. Cable length
1	Power	1	unshielded	-	-
2	GE	4	unshielded	-	-
3	POTS	1	unshielded	-	-
4	USB	2	shielded	-	-
5	WAN	1	unshielded	-	-

Test Configuration

Description: The HA-140W-B is an ethernet gateway which has 1 POT, 4 GE ports, 1 ethernet WAN port, 2 USB ports, 2.4G wi-fi and 5G wi-fi.

Function test should be done during the test for EUT operating status, and or should be done after the test for EUT power off status.

The basic functional test consists of the traffic test, POTs connection test and WIFI connection test, which establishes the communication traffic generator and HA-140W-B (EUT). The POTs keep connecting though OFLT program. The 2.4G wi-fi and 5G wi-fi keep connecting. The USB ports run read/write script though program. The EUT runs 4 traffics on each line with BigTao, the each upstream of 3 GE is 300Mbps, and downstream is 900Mbps.





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 (2019)

ANSI C63.4 (2014)



2.4 Test Mode

The test mode please refer to the 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 Detector: RBW=1MHz / VBW=3MHz/ Sweep=AUTO

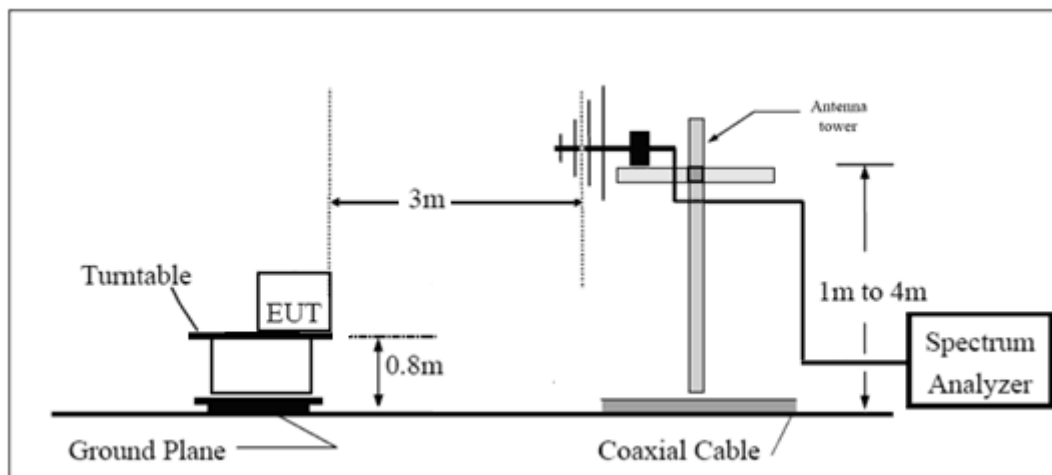
(b) AVERAGE Detector: RBW=1MHz / VBW=3MHz / Sweep=AUTO

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 lie-down position (X axis) and the worst case was recorded.

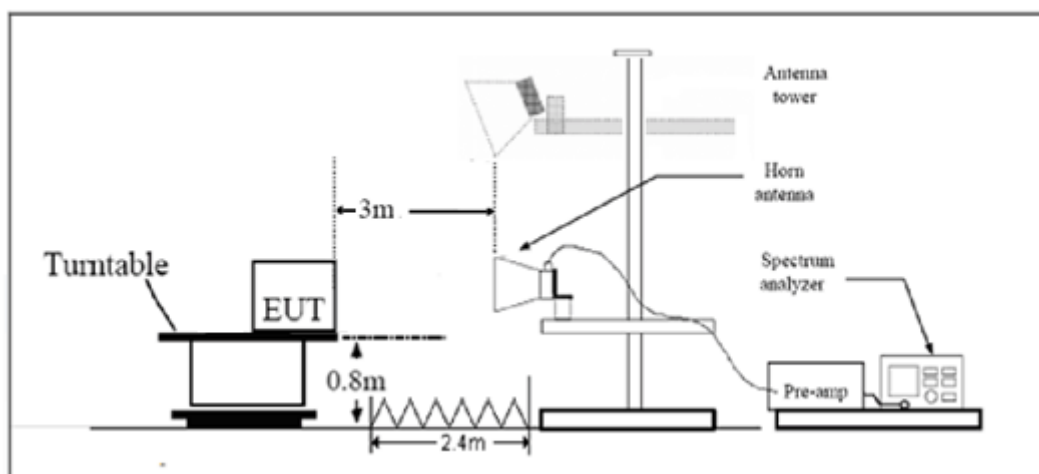
During the test, EUT is connected to a laptop via a USB cable in the case of Transfer Data mode. The EUT is used as the peripheral equipment of the PC. The data is transferred from EUT to PC; PC is connected to server via a long LAN cable.

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

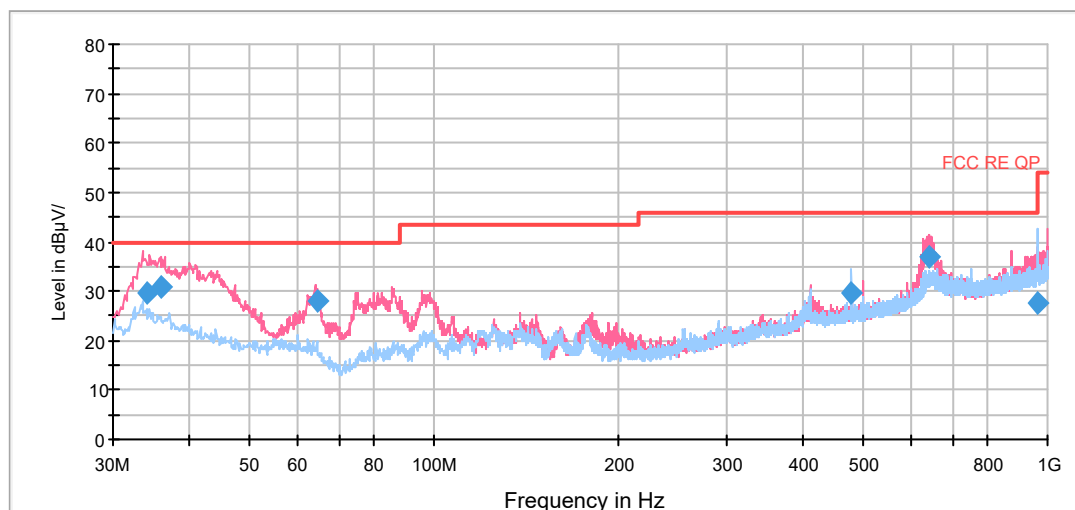
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

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- 26.5 GHz 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.

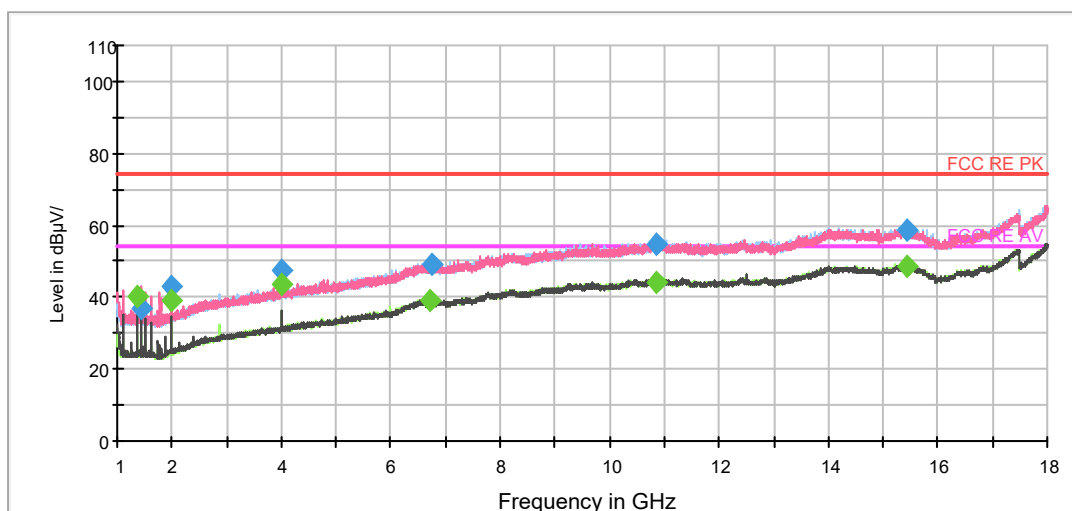


Radiated Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
33.996250	29.7	100.0	V	126.0	15.9	10.3	40.0
36.020000	30.7	125.0	V	109.0	16.5	9.3	40.0
64.432500	27.9	100.0	V	133.0	12.1	12.1	40.0
480.040000	29.5	203.0	H	161.0	20.8	16.5	46.0
642.276250	36.8	100.0	V	0.0	23.4	9.2	46.0
959.988750	27.7	114.0	H	225.0	27.1	18.3	46.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

2. Margin = Limit – Quasi-Peak



Radiated Emission from 1GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1438.265000	37.0	100.0	V	326.0	-10.6	37.0	74.0
1999.972500	43.1	100.0	H	199.0	-8.9	30.9	74.0
4000.002500	47.3	100.0	V	343.0	-2.7	26.7	74.0
6768.321250	48.9	400.0	V	216.0	5.1	25.1	74.0
10873.466250	54.7	100.0	H	186.0	13.5	19.3	74.0
15435.843750	58.7	300.0	V	107.0	17.4	15.3	74.0

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1374.912500	40.5	200.0	V	194.0	-10.8	13.5	54.0
2000.051250	39.2	100.0	H	199.0	-8.9	14.8	54.0
4000.013750	43.4	100.0	V	343.0	-2.7	10.6	54.0
6710.502500	38.9	400.0	V	0.0	5.0	15.1	54.0
10854.278750	44.2	400.0	H	194.0	13.5	9.8	54.0
15451.560000	48.8	200.0	H	6.0	17.4	5.2	54.0

3.2 Conducted Emission

Ambient condition

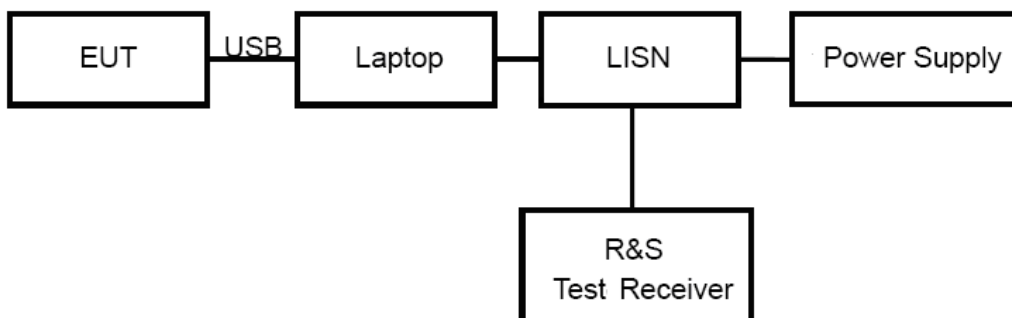
Temperature	Relative humidity	Pressure
24°C ~26°C	50%~55%	102.5kPa

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, EUT is connected to a laptop via a USB cable in the case of Transfer Data mode. The EUT is used as the peripheral equipment of the PC. The data is transferred from EUT to PC; PC is connected to server via a long LAN cable.

Test Setup



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

Limits

Frequency (MHz)	Conducted Limits(dB μ V)	
	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.

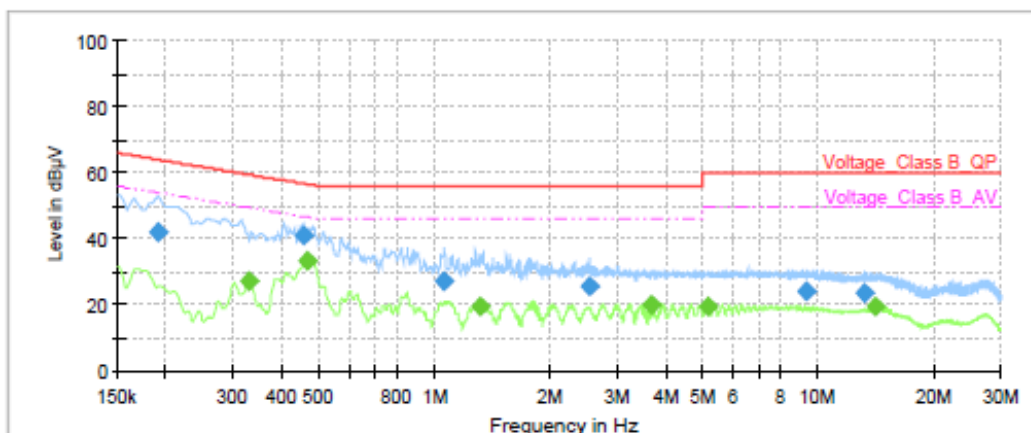
Measurement Uncertainty



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.

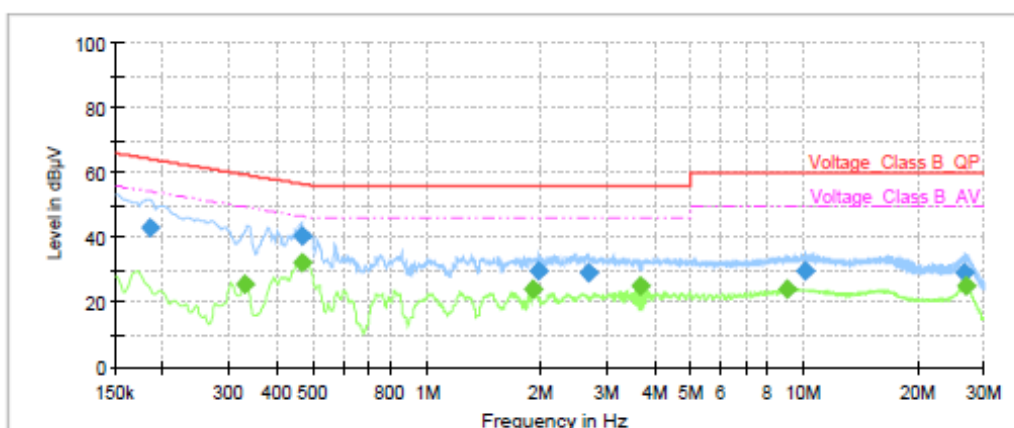


Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.19	41.84	---	64.02	22.18	1000.0	9.000	L1	ON	19
0.33	---	27.02	49.45	22.43	1000.0	9.000	L1	ON	19
0.46	40.98	---	56.77	15.79	1000.0	9.000	L1	ON	19
0.47	---	33.13	46.56	13.43	1000.0	9.000	L1	ON	19
1.06	27.20	---	56.00	28.80	1000.0	9.000	L1	ON	19
1.32	---	19.53	46.00	26.47	1000.0	9.000	L1	ON	19
2.54	25.55	---	56.00	30.45	1000.0	9.000	L1	ON	19
3.69	---	20.07	46.00	25.93	1000.0	9.000	L1	ON	19
5.15	---	19.46	50.00	30.54	1000.0	9.000	L1	ON	19
9.34	24.23	---	60.00	35.77	1000.0	9.000	L1	ON	19
13.21	23.67	---	60.00	36.33	1000.0	9.000	L1	ON	19
14.18	---	19.58	50.00	30.42	1000.0	9.000	L1	ON	19

Remark: Correct factor=cable loss + LISN factor

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)
0.18	42.90	---	64.31	21.41	1000.0	9.000	N	ON	19
0.33	---	25.61	49.45	23.84	1000.0	9.000	N	ON	19
0.47	---	32.24	46.60	14.36	1000.0	9.000	N	ON	19
0.47	40.37	---	56.60	16.23	1000.0	9.000	N	ON	19
1.91	---	23.90	46.00	22.10	1000.0	9.000	N	ON	19
1.99	29.80	---	56.00	26.20	1000.0	9.000	N	ON	19
2.67	29.31	---	56.00	26.69	1000.0	9.000	N	ON	19
3.67	---	25.27	46.00	20.73	1000.0	9.000	N	ON	19
9.00	---	23.91	50.00	26.09	1000.0	9.000	N	ON	19
10.06	29.54	---	60.00	30.46	1000.0	9.000	N	ON	19
26.46	29.37	---	60.00	30.63	1000.0	9.000	N	ON	20
26.76	---	24.93	50.00	25.07	1000.0	9.000	N	ON	20

Remark: Correct factor=cable loss + LISN factor

N line

Conducted Emission from 150 KHz to 30 MHz

4 Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Time
Spectrum Analyzer	R&S	FSV40	15195-01-00	2019-05-19	2020-05-18
EMI Test Receiver	R&S	ESCI	100948	2019-05-19	2020-05-18
Trilog Antenna	SCHWARZBECK	VULB 9163	9163-201	2017-11-18	2020-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Standard Gain Horn	ETS-Lindgren	3160-09	00102643	2018-06-20	2020-06-19
EMI Test Receiver	R&S	ESR	101667	2019-05-19	2020-05-18
LISN	R&S	ENV216	101171	2018-12-15	2021-12-14
Bore Sight Antenna mast	ETS	2171B	00058752	/	/
Test software	EMC32	R&S	9.26.0	/	/

*****END OF REPORT *****