EMC Test Report

Product Name: LTE CPE

Product Model: B311-521

Report Number: SYBH(Z-EMC)20191011017001-2

FCC ID: QISB311-521

Reliability Laboratory of Huawei Technologies Co., Ltd.

(Global Compliance and Testing Center of Huawei Technologies Co., Ltd)

No.2, New City Avenue, Songshan Lake Sci. & Tech. Industry Park, Dongguan, 523808, P.R.C

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Notice

1. **The laboratory has passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.**
2. **The laboratory has passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01**
3. **The laboratory has been recognized by the Innovation, Science and Economic Development Canada (ISED) to test to Canadian radio equipment requirements. The CAB identifier is CN0003, and the ISED# is 21741.**
4. **The laboratory (Reliability Lab of Huawei Technologies Co., Ltd.) is also named "Global Compliance and Testing Center of Huawei Technologies Co., Ltd.", the both names have coexisted since 2009.**
5. **The laboratory has been recognized by the US Federal Communications Commission (FCC) to perform compliance testing subject to the Commission's Certification rules. The Designation Number is CN1173, and the Test Firm Registration Number is 294140.**
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7. **The test report is invalid if there is any evidence of erasure and/or falsification.**
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9. **Normally, the test report is only responsible for the samples that have undergone the test.**
10. **Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.**
11. **If any question about this report, please contact the laboratory (PublicGCTC@huawei.com).**

Applicant:	Huawei Technologies Co., Ltd.
Address:	No.2 New City Avenue Songshan Lake Sci. &Tech. Industry Park, Dongguan, Guangdong, P.R.C
Date of Receipt Test Item:	2019-11-10
Start Date of Test:	2019-11-12
End Date of Test:	2019-11-23
Test Result:	Pass

Operator (Test Engineer)	**2019-11-24**	**FuLiangliang**	Fu Liang liang
	Date	**Name**	**Signature**
Approved By (Lab Manager)	**2019-11-25**	**HeHao**	He Hao
	Date	**Name**	**Signature**

Modification Record

No.	Last Report Version	Modification Description
1	V1.0	First report

TABLE OF CONTENT

1 General Information

1.1 EUT Description

EUT Description	
Product Name	LTE CPE
Model Number	B311-521
Input voltage	Vnom 12V
TX Frequency	WCDMA Band II: 1850MHz To 1910MHz WCDMA Band IV: 1710MHz To 1755MHz WCDMA Band V: 824MHz To 849MHz LTE BAND 2:1850MHz to 1910MHz LTE BAND 4:1710MHz to 1755MHz LTE BAND 5:824MHz to 849MHz LTE BAND 7:2500MHz to 2570MHz LTE BAND66:1710MHz to 1780MHz WIFI 2.4G: 2412MHz – 2462MHz
RX Frequency	WCDMA Band II: 1930MHz To 1990MHz WCDMA Band IV: 2110MHz To 2155MHz WCDMA Band V: 869MHz To 894MHz LTE BAND 2:1930MHz to 1990MHz LTE BAND 4: 2110MHz To 2155MHz LTE BAND 5: 869MHz To 894MHz LTE BAND 7:2620MHz to 2690MHz LTE BAND 66:2110MHz to 2180MHz WIFI 2.4G: 2412MHz – 2462MHz
HW Version	WL4B311SW
SW Version	10.0.2.1(H190SP8C00)
EUT Accessory	
External Antenna	Manufacturer: Huawei Technologies Co.,Ltd. antenna gain: 1dBi
External Antenna	Manufacturer: Huawei Technologies Co.,Ltd. antenna gain: 3dBi
LAN cable	Outsourcing Cable, Straight Through Cable,1.5m,RJ45,CAT5e,RJ45,8P8C,CCS,Gold-Plated 3u",Yellow(114C),Transparent Connector, Yellow Rubber Head, Different Cable OD, Used in 100M,Terminal Dedicated
Tel cable	Outsourcing Cable,RJ11 Cable,1.5m,RJ11,2 core Wire,RJ11,6P2C,CCA,Gold-Plated 3u",CoolGray 3U,Transparent Connector, Terminal Dedicated
Adapter	Manufacturer: Huawei Technologies Co.,Ltd. Model: HW-120100E01 Input voltage: 100V-240V~50-60Hz，0.5A Output voltage: +12V ⎓ 1A SN: A9442BK6M09992 SN: U94404K5D01651
Adapter	Manufacturer: Huawei Technologies Co.,Ltd. Model: HW-120100B01 Input voltage: 100V-240V~50-60Hz，0.5A Output voltage: +12V ⎓ 1A SN: A9432BK7200680 SN: U94303K7405768

Adapter	Manufacturer: Huawei Technologies Co.,Ltd. Model: HW-120100U01 Input voltage: 100V-240V~50-60Hz，0.5A Output voltage: +12V ⎓ 1A SN: A9662BK7LO1953 SN: U96604J8Z00720

Remark: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed information.

1.2 Test Site Information

Test Site 1:	Reliability Laboratory of Huawei Technologies Co., Ltd. Global Compliance and Testing Center of Huawei Technologies Co., Ltd.
Test Site Location:	No.2, New City Avenue, Songshan Lake Sci. & Tech. Industry Park, Dongguan, 523808, P.R.C

1.3 Applied Standards

APPLIED STANDARD

47 CFR FCC Part 15, Subpart B
ICES-003 Issue 6

2 Summary of Results

Summary of Results				
Test Items	**Test Mode**	**Performance Class & Required Performance Criteria**	**Result**	**Site**
Radiated Emissions Enclosure Port	Mode1	CLASS B	Pass	Site1
Conducted Emissions ☐DC Power Port ☒AC Power Port ☐Telecommunication Ports	Mode1 Mode2	CLASS B	Pass	Site1
Note: 1, Measurement taken is within the uncertainty of test system. 2, ☒ The item has been tested; ☐ The item has not been tested.				

During the measurement, the environmental conditions complied with the range listed as below.

Item	**Required**
Ambient temperature	15°C～35°C
Relative humidity	25%～75%
Atmospheric pressure	86kPa～106kPa

3 System Configuration during EMC Test

3.1 Test Mode

The EUT was configured, installed, arranged and operated in a manner consistent with typical application. The following mode(s) were applied during the compliance test.

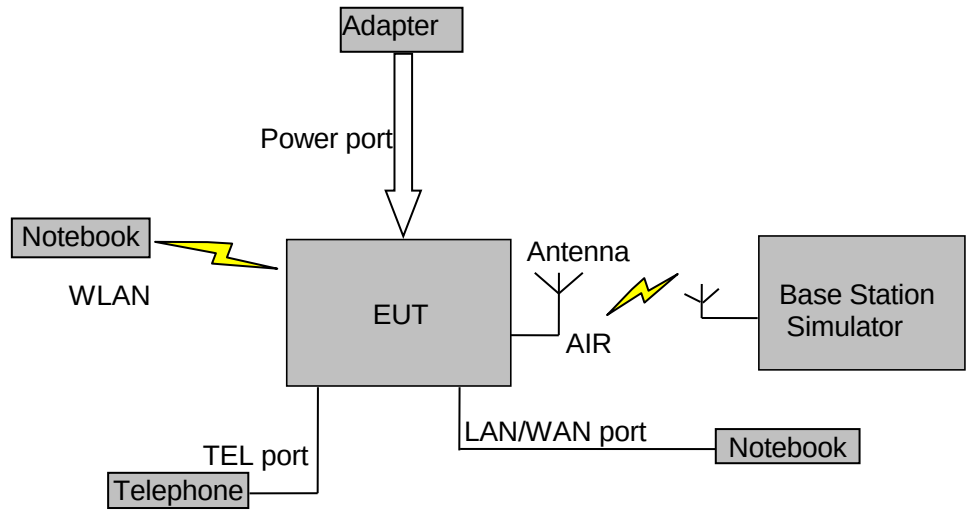
Test Mode	
Mode 1:	EUT with Adapter + USB + TEL + LAN/WAN + Wireless Service Idle Mode
Mode 2:	EUT with Adapter + USB + TEL + LAN/WAN + Wireless Service Traffic Mode

Remark:

1) If there is one kind of accessories with different models, each one should be applied throughout the compliance test respectively, however, only the worst case will be recorded in this report.
2) If EUT has more than one typical operation, only the worst test mode will be recorded in this report.

3.2 Test System Configuration

Connection Diagram (Mode 1~Mode 2)



3.3 Associated Equipment Used during Test

Name	Model	Manufacturer	S/N	Calibrated Deadline
Radio Communication tester	CMU200	R&S	3607033573	2020-01-14
Radio Communication tester	MT8820C	Anritsu	A110518805	2020-02-29
Notebook	X230	Lenovo	A130911985	N/A
Notebook	X230	Lenovo	A130911986	N/A
Telephone	HCD8166TSD	HUAWEI	N/A	N/A

4 Electromagnetic Interference (EMI)

4.1 Radiated Disturbance 30MHz to 18GHz

4.1.1 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4-2014. The test distance was 3m.The set-up and test methods were according to ANSI C63.4-2014.
A preliminary scan and a final scan of the emissions were made from 30 MHz to18 GHz by using test script of software; The emissions were measured using Quasi-Peak Detector (30MHz~1GHz) and AV/PK detector (above 1GHz). The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1m to 4m. The azimuth range of turntable was 0°to 360°. The receiving antenna has two polarizations V and H.
Measurement bandwidth (RBW) for 30MHz to 1000 MHz: 120 kHz;
Measurement bandwidth (RBW) for 1000MHz to 18000 MHz: 1MHz;
EUT was configured in idle mode and the test performed at worst emission state.

4.1.2 Test setup

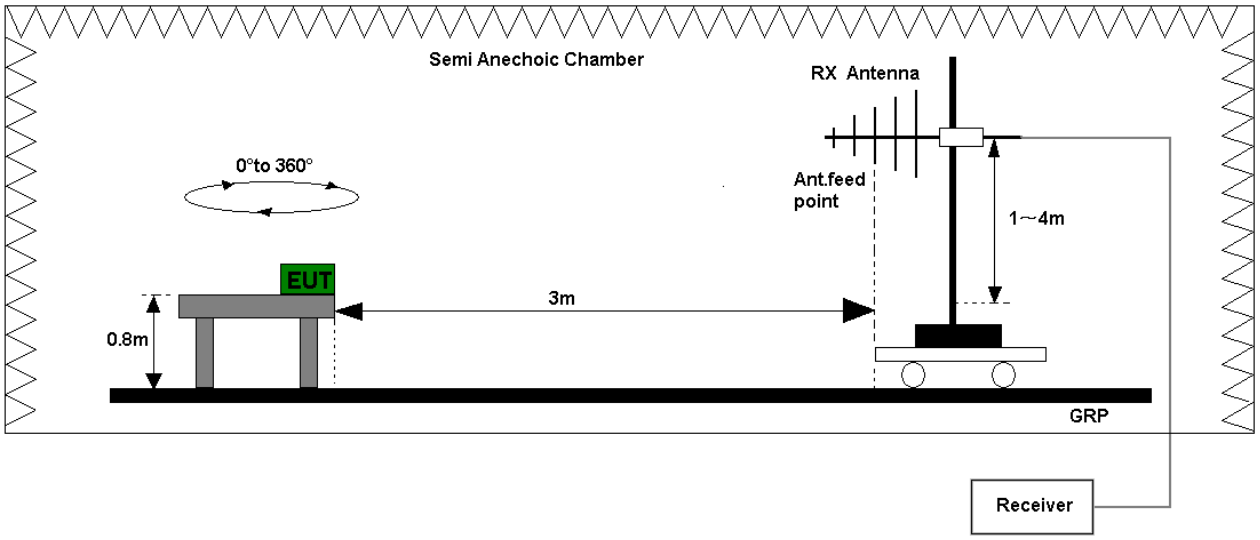


Figure 1.Test set-up of radiated disturbance(30MHz-1GHz)

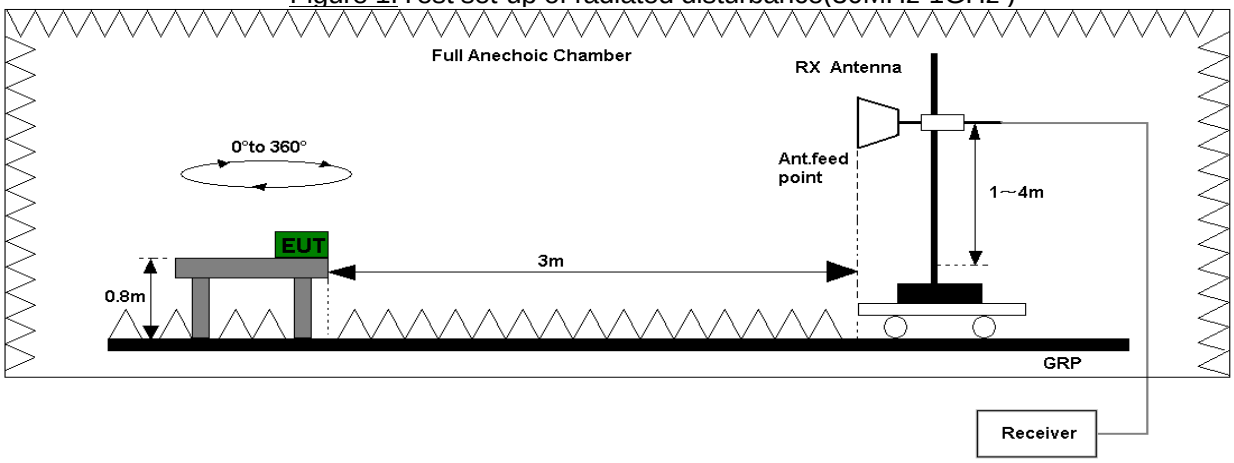


Figure 2.Test set-up of radiated disturbance(above 1GHz)

4.1.3 Test Results

The EUT has met the requirements for Radiated Emission of enclosure port.

Refer to the section 7.1 of this report for test data.

Test Limits (Class B)				
Frequency of Emission (MHz)	Radiated Limit			
	Unit(μV/m)		Unit(dBμV/m)	
30-88	100		40	
88-216	150		43.5	
216-960	200		46	
Above 960	500		54	
Above 1000	AV	PK	AV	PK
	500	5000	54	74

4.2 Conducted Disturbance 0.15 MHz to 30MHz

4.2.1 Test Procedure

The Table-top EUT was placed upon a non-metallic table 0.8 m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm away from LISN. The set-up and test methods were according to ANSI C63.4-2014. Conducted Disturbance at AC Port measurements were undertaken on the L and N Lines. The emissions were measured using a Quasi-Peak Detector and Average Detector.
EUT was communicated with the simulator through Air interface, the simulator controls the EUT to transmitter the maximum power which defined in specification of product. The EUT operated on the typical channel.
Measurement bandwidth (RBW) for 150 kHz to 30 MHz: 9 kHz;
The EUT was set in the shielded chamber and operated under nominal conditions.

4.2.2 Test Setup

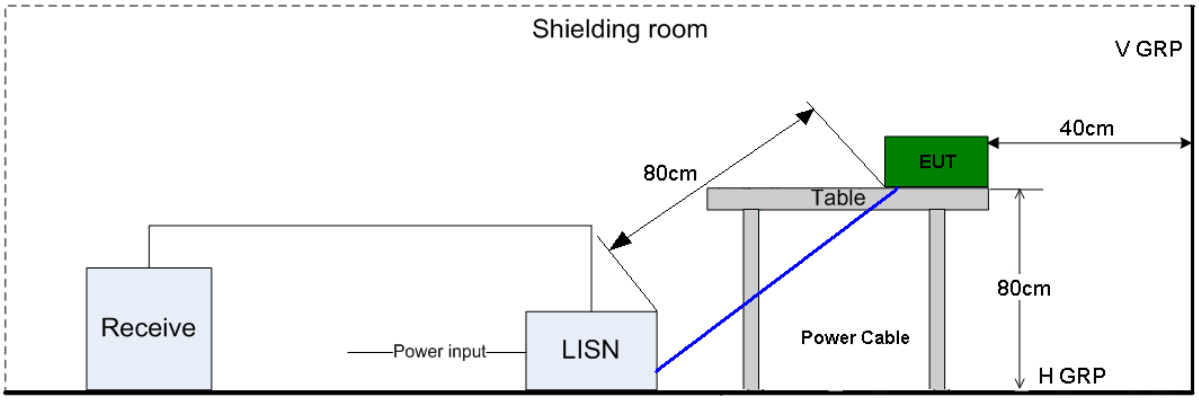


Figure 3. Test Set-up of conducted disturbance

4.2.3 Test Results

The EUT has met requirements for Conducted disturbance of power lines.
Refer to the section 7.2 of this report for test data.

Test Limit of AC Power Port		
Frequency range	150kHz ~ 30MHz	
Frequency	Voltage limits	
	QP (dBμV)	AV (dBμV)
0.15MHz~0.5MHz	66-56	56-46
0.5MHz-5MHz	56	46
5MHz~30MHz	60	50

5 Main Test Instruments

Main Test Equipments						
Test item	**Test Instrument**	**Model**	**S/N**	**Manufacturer**	**Calibrated Deadline**	**Cal interval**
RE	EMI Test receiver	ESU26	100150	R&S	Jan. 14, 2020	12
	Broadband Antenna	VULB 9163	9163-491	SCHWARZBECK	Feb. 22, 2021	24
	Horn Antenna	HF906	100683	R&S	Mar. 15, 2021	24
CE	EMI Test receiver	ESU26	101163	R&S	Jan. 14, 2020	12
	Artificial Mains Network	ENV216	100382	R&S	Feb. 29, 2020	12
Software Information						
Test Item	Software Name	Manufacturer	Version			
RE	EMC32	R&S	V9.25.0			
CE	EMC32	R&S	V9.25.0			

6 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

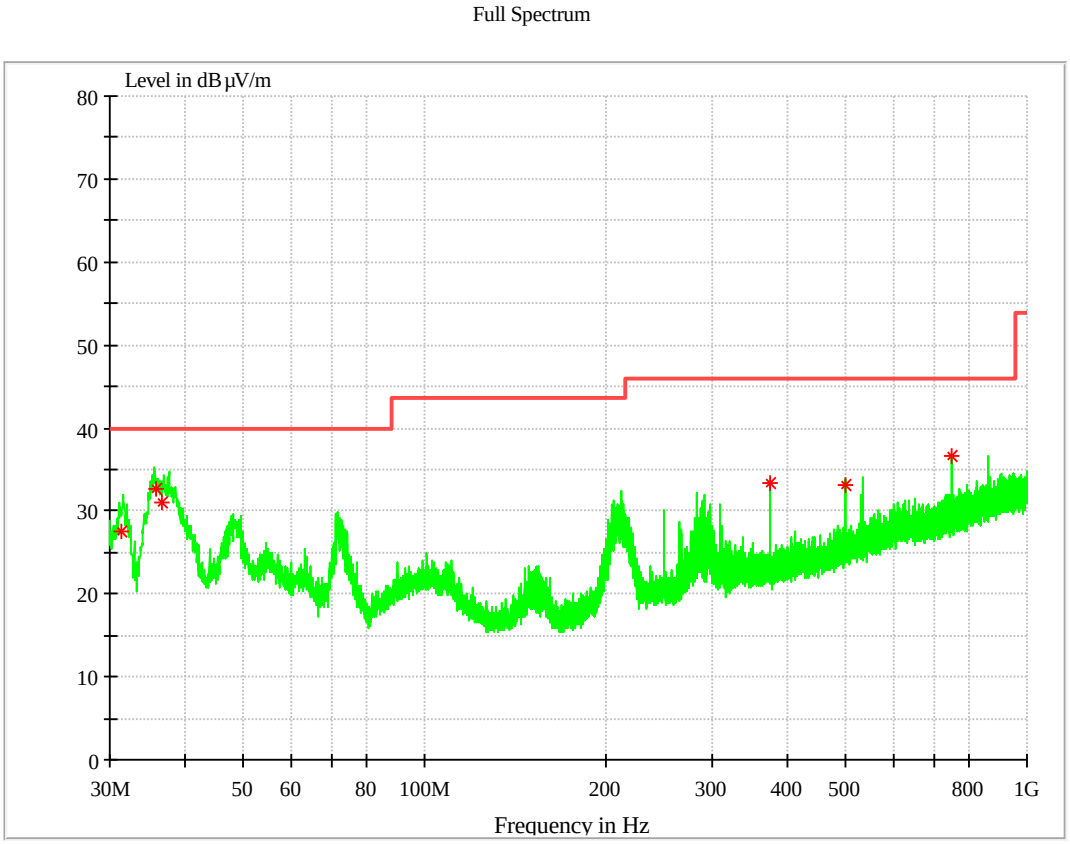
System Measurement Uncertainty		
Items		**Extended Uncertainty**
RE(30MHz-1GHz)	Field strength (dBμV/m)	U=5.24dB; k=2
RE(1GHz-18GHz)	Field strength (dBμV/m)	U=4.84 dB; k=2
CE	Disturbance Voltage (dBμV)	U=2.3 dB; k=2

7 Test Data and Graph

7.1 Radiated Disturbance

7.1.1 30MHz~1GHz

Test Mode1: EUT with Adapter + USB + TEL + LAN/WAN + Wireless Service Idle Mode



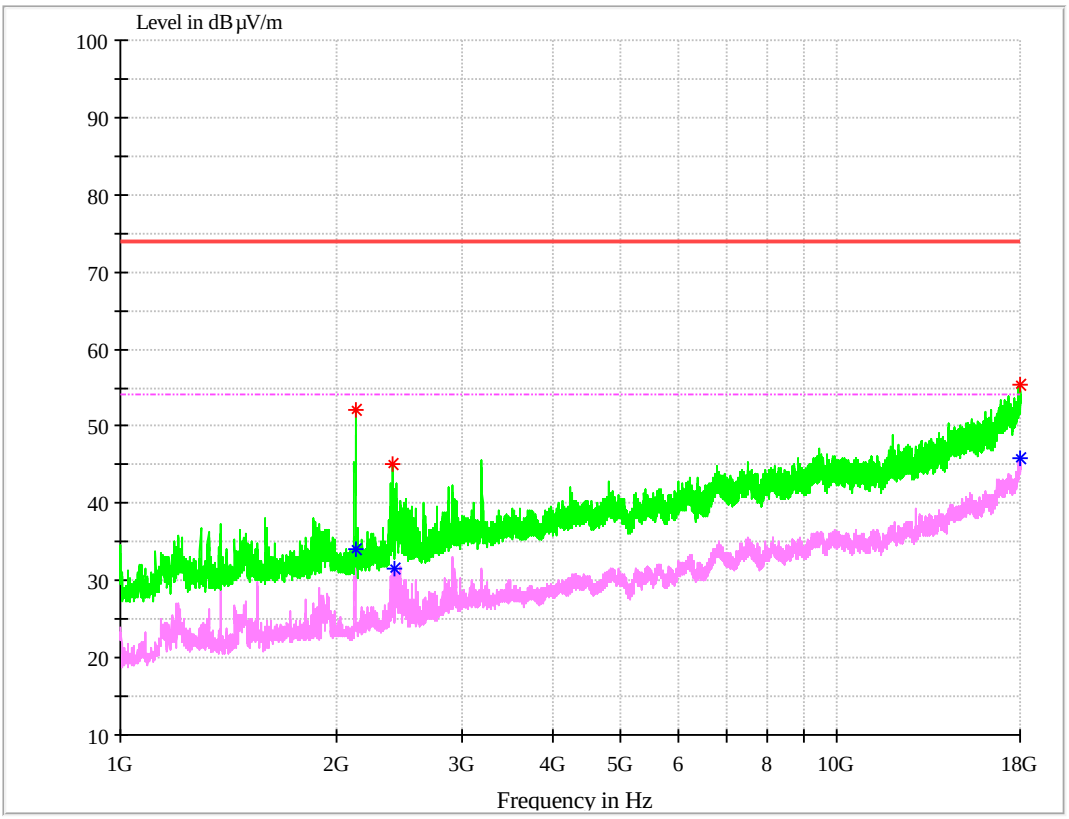
MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
31.323180	27.44	12.8	40.00	12.56	102.0	9.0	V
35.824220	32.59	13.0	40.00	7.41	100.0	89.0	V
36.707060	30.98	13.2	40.00	9.02	100.0	123.0	V
375.023220	33.43	16.3	46.00	12.57	101.0	47.0	H
500.056820	33.14	18.7	46.00	12.86	190.0	341.0	V
749.970040	36.55	22.1	46.00	9.45	100.0	62.0	V

Note:
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
The reading level is calculated by software which is not shown in the sheet.

7.1.2 1GHz~18GHz

Test Mode1: EUT with Adapter + USB + TEL + LAN/WAN + Wireless Service Idle Mode



MEASUREMENT RESULT: PK Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
2127.6667	52.04	-11.9	74.0	21.96	100	206	V
2394.0000	44.97	-10.9	74.0	29.03	100	345	V
17948.4333	55.29	15.6	74.0	18.71	100	17	V

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
2125.4000	33.99	-11.9	54.0	20.01	100.0	98	V
2412.1333	31.67	-10.9	54.0	22.33	100.0	129	V
17988.6666	45.73	16	54.0	8.27	100.0	358	H

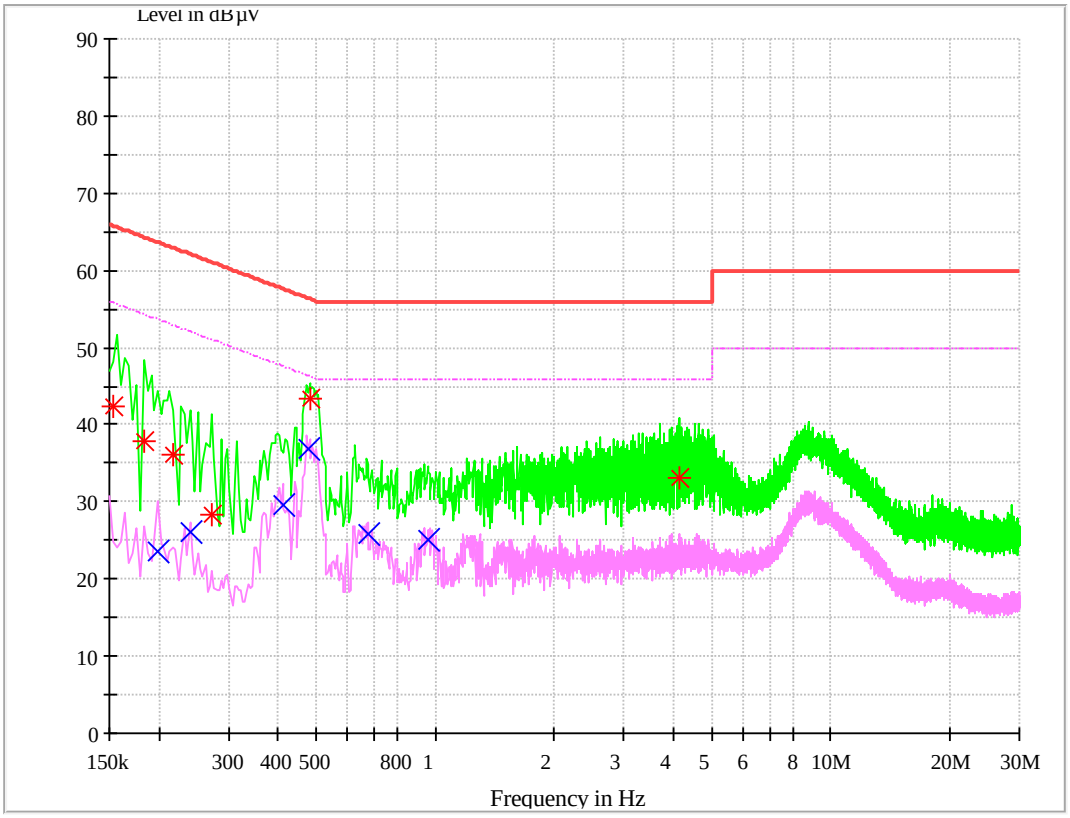
Note:
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
The reading level is calculated by software which is not shown in the sheet.

7.2 Conducted Disturbance

Only the worst test results were shown.

7.2.1 AC Port Test Data

Test Mode2: EUT with Adapter + USB + TEL + LAN/WAN + Wireless Service Traffic Mode



MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV	Line	Transd dB	Margin dB	Limit dBµV	PE
0.153538	42.36	L1	9.7	23.45	65.81	FLO
0.184426	37.79	N	9.7	26.49	64.28	FLO
0.2175	36.18	L1	9.7	26.73	62.91	FLO
0.273175	28.24	L1	9.7	32.78	61.02	FLO
0.485074	43.31	L1	9.7	12.94	56.25	FLO
4.144645	33.08	N	9.8	22.92	56.00	FLO

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV	Line	Transd dB	Margin dB	Limit dBµV	PE
0.198182	23.54	L1	9.7	30.15	53.69	FLO
0.240225	26.19	N	9.7	25.90	52.09	FLO
0.411621	29.51	L1	9.7	18.11	47.62	FLO
0.47729	36.79	L1	9.7	9.60	46.39	FLO
0.674579	25.9	L1	9.7	20.10	46.00	FLO
0.962794	25.18	L1	9.7	20.82	46.00	FLO

Note:
Level= Reading level+ Transd (cable loss + correction factor)
The reading level is calculated by software which is not shown in the sheet.

----------END----------