



FCC EMC Test Report

Product Name: LTE Multi-mode USB Rotator

Model Number: E397u-53

Report No: SYBH(Z-EMC)062052011-2

FCC ID: QISE397U-53

Reliability Laboratory of Huawei Technologies Co., Ltd.

Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China

Tel: +86 755 28780808 Fax: +86 755 89652518



Notice 1

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Notice 2

Modification Information:

Modification Information

Modification Information	1	
	2	
	3	<i>Not Applicable!</i>
	4	
	5	
	6	
	7	



REPORT ON	LTE Multi-mode USB Rotator
	M/N: E397u-53
REGULATION	FCC CFR47 Part 15: Subpart B;
START OF TEST	May.01,2011
END OF TEST	May.04,2011
Final Judgement:	Pass

Approved By

2011-05-08
Date

Liuchunlin
Name

Signature

Reviewed By

2011-05-08
Date

Dailinjun
Name

Signature

Operator

2011-05-08
Date

daniel
Name

Signature



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1 Status

1.1 Product Information

CLIENT:	Huawei Technologies Co., Ltd.
ADDRESS:	Bantian Longgang District Shenzhen, P.R. China
MANUFACTURING DESCRIPTION	LTE Multi-mode USB Rotator
MANUFACTURERS MODEL NUMBER	E397u-53

1.2 Test Site

Site 1:

EMC LABORATORY OF RELIABILITY LABORATORY OF HUAWEI TECHNOLOGIES CO., LTD

1.3 Test environment condition

Ambient temperature	20~25°C
Relative humidity	40%~52%
Atmospheric pressure	101kPa



2 Summary of Results

Table below shows a brief summary of the results obtained.

Summary of results

EUT Classification: Wireless Terminal				
Test Items	Test Configuration & Test Mode	Required Performance Criteria	Result	Site
<u>Radiated Emissions</u> Enclosure Port	TC1 (TM11-TM20)	N/A	Pass	Site1
<u>Conducted Emissions</u>	TC1 (TM1-TM20)	N/A	Pass	Site1
Note: 1, Measurement taken is within the measurement uncertainty of measurement system. 2, TC = Test configuration				



3 Equipment Specification

3.1 General Description

E397u-53 LTE/CDMA dual mode USB Rotator is subscriber equipment in the LTE/CDMA system. E397u-53 implement such functions as RF signal receiving/transmitting, LTE, CDMA2000 1x and the CDMA2000 1x EV-DO Rev.A/Rev.0 protocol processing, data service etc. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface and Micro SD card interface. E397u-53 has three internal antennas as default.

3.1.1 Main Equipment Technical Data

Description:	LTE Multi-mode USB Rotator
Models:	E397u-53
Input Rated Voltage:	5V
Rated Consumption Power:	Max 3.5 W
Rated Power:	Max 30dBm
Dimensions:	93 (length) × 35 (width) × 15 (height) (mm3)
Weight:	50g

Sub-Assembly Identity

Mode		Work Frequency	
		Transmitt Frequency (MHz)	Receive Frequency (MHz)
CDMA	CDMA/EVDO 1900(BC1)	1850-1910	1930-1990
	CDMA/EVDO 1700(BC15)	1710-1755	2110-2155
LTE	Band IV(1700M)1.4MHz	1710-1755	2110-2155
	Band IV(1700M)3MHz		
	Band IV(1700M)5MHz		
	Band IV(1700M)10MHz		

Sub-Assembly Identity

Board			
Model Name	Qty.	IMEI	Description
E397u-53	1	357149040014254	Main Board



4 System Configuration during EMC Test

The Equipment under Test (EUT) was functioning correctly during all tests. The EUT was installed within the test site and was configured to simulate a typical user installation.

4.1 Cables Used during Test

Cable Used during Test

Cable	Quantity	Type of Cable
N/A	N/A	N/A

4.2 Associated Equipment Used during Test

Associated Equipment Used during Test

Associated Equipment Used during Test					
Name	Model	Manufacturer	S/N	Cal Date	Cal Interval (month)
Radio Communication Tester	CMU200	R&S	3607033573	2011-03-17	CMU200
Radio Communication Analyzer	MT8820C	ANRITSU	6200930909	2010-12-1	12
Notebook	T61	ThinkPad	3108052581	NA	NA
Notebook	D620	DELL	3106085412	NA	NA

4.3 Test Configurations and Test Mode

4.3.1 Test Configuration.

The EUT will be connected to test system (Base Station Simulator) in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).

TC1:EUT powered with an adapter and connected to the test system (Base Station Simulator).

Configuration table

TC1	TM1~TM20
-----	----------

4.3.2 Test Mode

There were 20 test Modes. TM1 to TM20 were shown in the diagrams below:

TM1	operate in traffic mode CDMA1700;
TM2	operate in traffic mode EVDO1700 Rev 0;
TM3	operate in traffic mode EVDO1700 Rev A;
TM4	operate in traffic mode CDMA1900;
TM5	operate in traffic mode EVDO1900 Rev 0;
TM6	operate in traffic mode EVDO1900 Rev A;
TM7	operate in traffic mode LTE band IV (CB=1.4MHz)
TM8	operate in traffic mode LTE band IV (CB=3MHz)
TM9	operate in traffic mode LTE band IV (CB=5MHz)
TM10	operate in traffic mode LTE band IV (CB=10MHz)
TM11	operate in idle mode CDMA1700;
TM12	operate in idle mode EVDO1700 Rev 0;
TM13	operate in idle mode EVDO1700 Rev A;

TM14	operate in idle mode CDMA1900;
TM15	operate in idle mode EVDO1900 Rev 0;
TM16	operate in idle mode EVDO1900 Rev A;
TM17	operate in idle mode LTE band IV (CB=1.4MHz)
TM18	operate in idle mode LTE band IV (CB=3MHz)
TM19	operate in idle mode LTE band IV (CB=5MHz)
TM20	operate in idle mode LTE band IV (CB=10MHz)

The EUT will be connected to test system (Base Station Simulator) in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).

4.4 Test conditions and test Connections

4.4.1 Test Conditions

The EUT will be connected to test system (Base Station Simulator) in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).

4.4.2 Test connections

Traffic Mode:

The EUT is required to be in the traffic mode, a call is set up according to the generic call set up procedure and enter the EUT into loop back test mode.

For CDMA, the following conditions shall also be met:

- The EUT shall be commanded to operate at maximum transmit power;

For LTE,

Assign channel frequency to an appropriate channel number. Set the ARFCN channel number to 1732.5MHz for LTE Band IV.

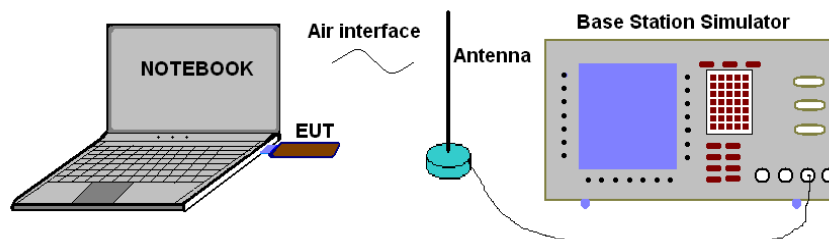


Figure 1.: TC1 (TM1-TM10)

Idle Mode:

The EUT will be connected to test system (Base Station Simulator) in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).

The EUT is required to be in the idle mode.

For CDMA/LTE, the following conditions shall be met:

- UE shall be camped on a cell;
- UE shall perform Location Registration (LR) before the test, but not during the test;
- UE's neighbour cell list shall be empty;

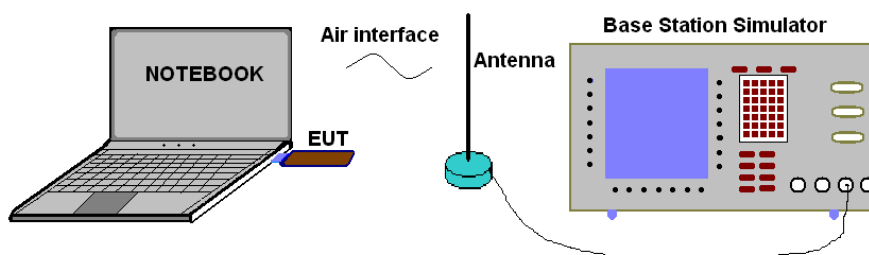


Figure 2.: TC2 (TM11-TM20)

5 Electromagnetic Interference (EMI)

5.1 Radiated Disturbance 30MHz to 18GHz

5.1.1 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4. The test distance was 3m. The set-up and test methods were according to ANSI C63.4.

A preliminary scan and a final scan of the emissions were made from 30 MHz to 18 GHz by using test script of software; the emissions were measured using Quasi-Peak Detector (30MHz~1GHz) and AV 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 receive antenna has two polarizations V and H.

EUT was configured in idle mode and the test performed at worst emission state.

Measurement bandwidth: 30 MHz – 1000 MHz: 120 k Hz

Measurement bandwidth: 1GHz – 18GHz: 1MHz

Test set up figure:

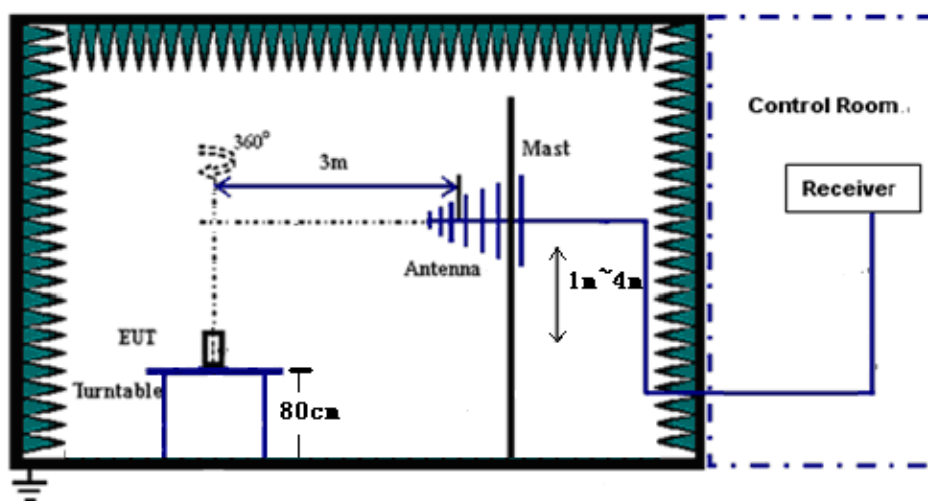


Figure 3. Test set-up

5.1.2 Test Results

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

Test Limits

Frequency of Emission (MHz)	Radiated Limit	
	Unit($\mu\text{V}/\text{m}$)	Unit($\text{dB}\mu\text{V}/\text{m}$)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

5.2 Conducted Disturbance 0.15 MHz to 30MHz

5.2.1 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 from LISN. The set-up and test methods were according to ANSI C63.4.

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.

Huawei Mobile Station was communicated with the BTS simulator through Air interface, the BTS simulator controls the Mobile Station to transmitter the maximum power which defined in specification of product. The Mobile Station operated on the typical channel.

Measurement bandwidth (RBW) for 150kHz to 30 MHz: 9 kHz;

Test Set-up figure:

The Mobile Station was setup in the screened chamber and operated under nominal conditions.

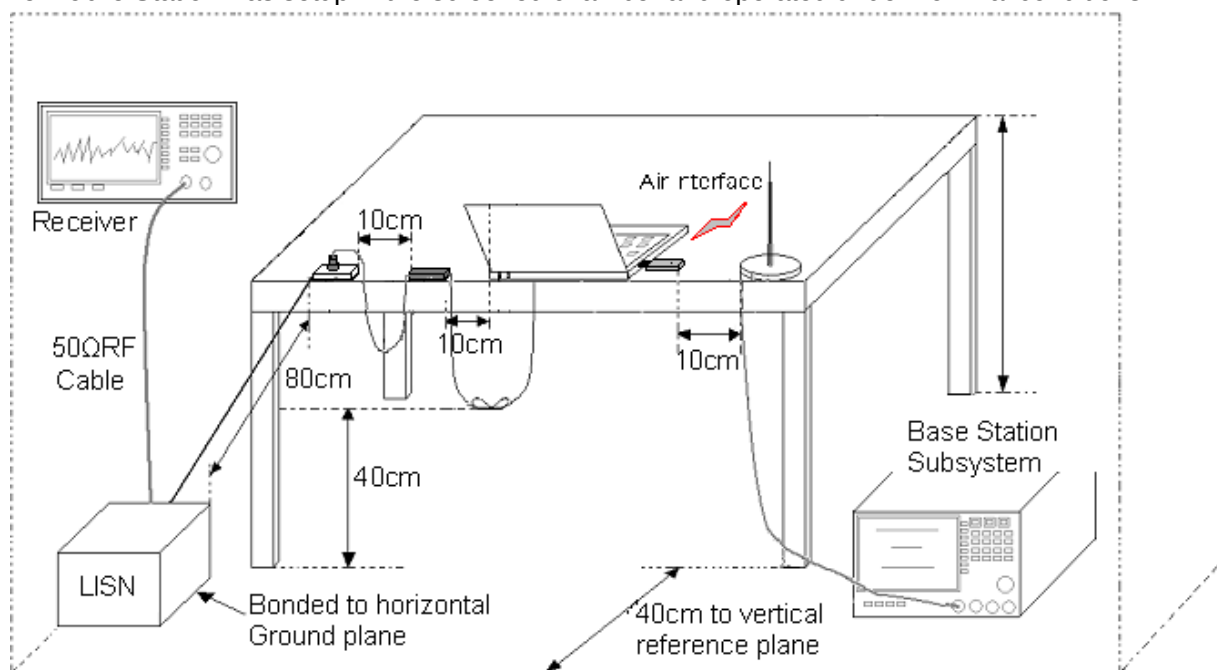


Figure 4. Test Set-up

5.2.2 Test Results

The EUT has met requirements for Conducted disturbance of power lines.

Test Limit of DC&AC Power Port

Frequency range	150kHz~ 30MHz	
Classification	Class B	
Limit(Class B)	Voltage limits	
	QP	AV
0.15MHz~0.5MHz	66~56 dB μ V	56~46 dB μ V
0.5MHz~5MHz	56 dB μ V	46 dB μ V
5MHz~30MHz	60 dB μ V	50 dB μ V



6 Main Test Instruments

Main Test Equipments

Test item	Test Instrument	Model	Manufacturer	Cal-Date	Cal Interval (month)
RE&CE	EMI Test receiver	ESU26	R&S	Jun.25, 2010	12
	Broadband Antenna	VULB 9163	SCHWARZBECK	May.15, 2010	12
	Horn Antenna	HF906	R&S	May.15, 2010	12
	LISN	ENV216	R&S	Jun.25.2010	12
Software Information					
Test Item	Software Name	Manufacturer		Version	
RE/CE	ES-K1	R&S		1.7.1	



7 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

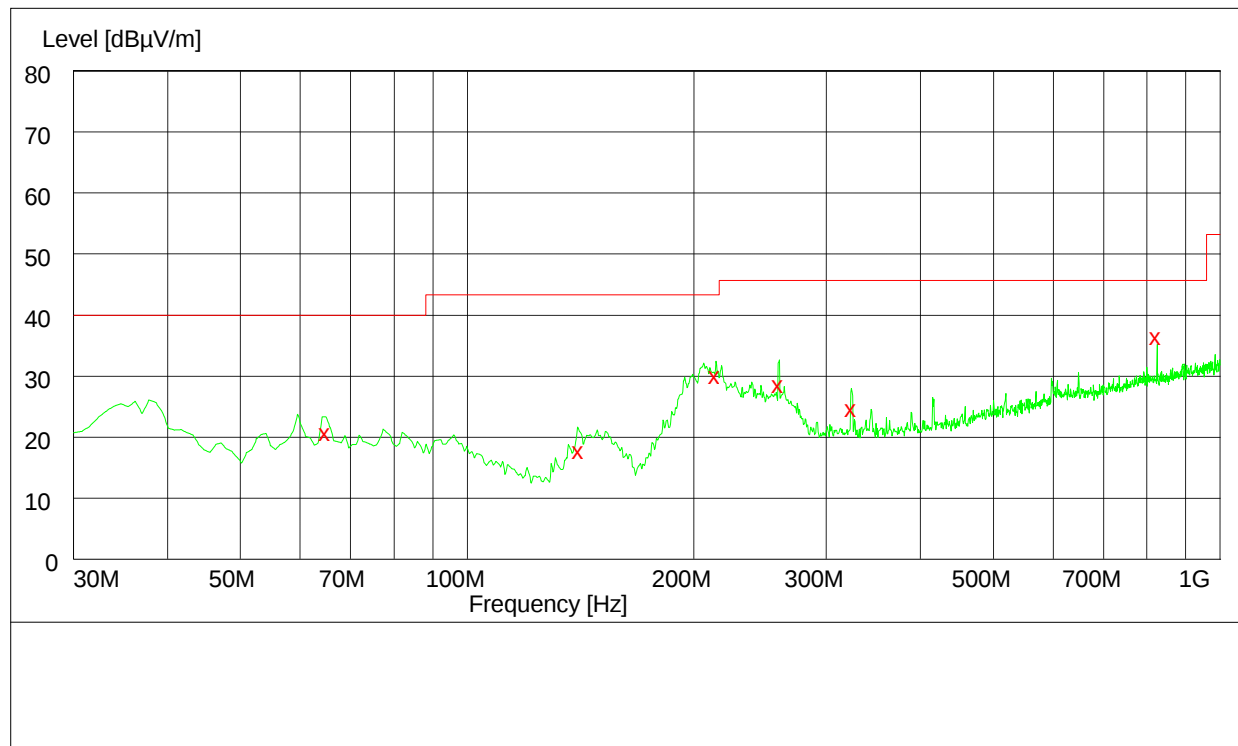
Items		Extended Uncertainty
RE	Field strength (dB μ V/m)	U=4.1dB; k=2(30MHz-1GHz)
RE	Field strength (dB μ V/m)	U=4.1dB; k=2(1GHz-18GHz)
CE	Disturbance Voltage (dB μ V)	U=3.4dB; k=2

8 Graph and Data of Emission Test

8.1 Radiated Disturbance

This test was carried out in all the test modes, here only the worst test result was shown.

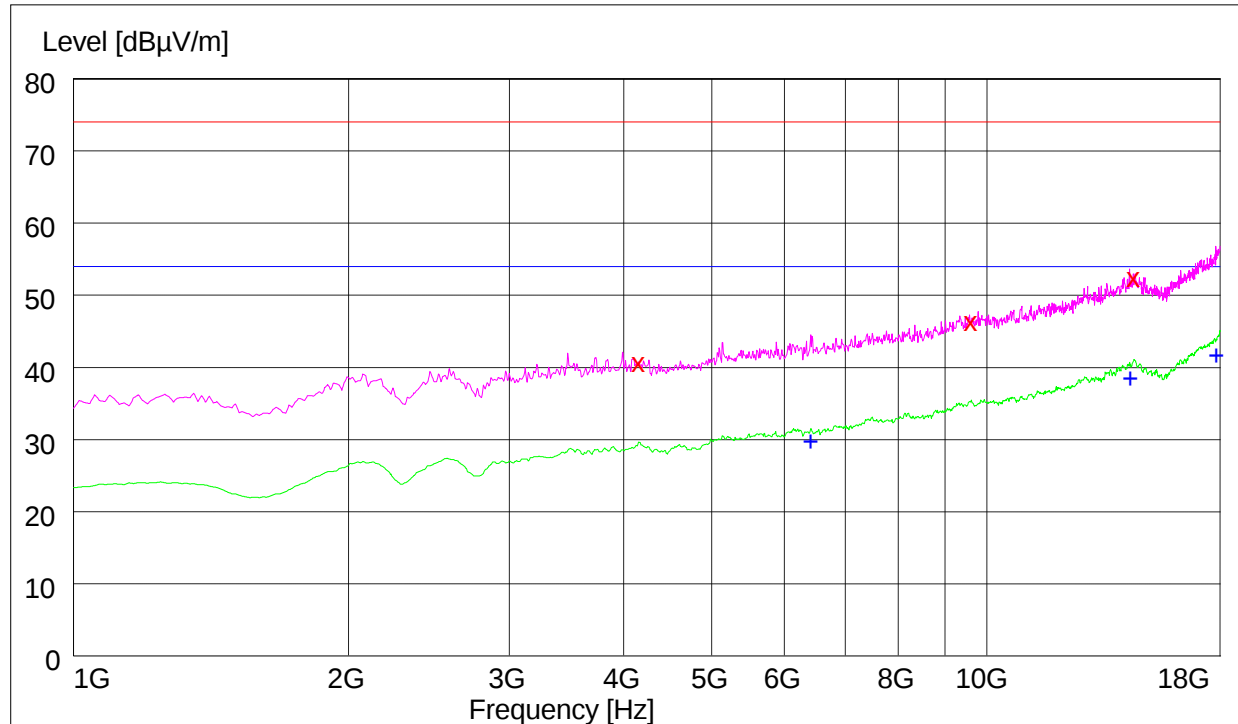
30MHz-1GHz



MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarisation
64.860000	21.30	10.5	40.0	18.7	102.0	159.00	VERTICAL
141.000000	18.30	8.7	43.5	25.2	102.0	114.00	VERTICAL
213.840000	30.70	12.7	43.5	12.8	147.0	98.00	HORIZONTAL
259.380000	29.20	14.2	46.0	16.8	134.0	121.00	HORIZONTAL
324.360000	25.20	16.2	46.0	20.8	102.0	87.00	HORIZONTAL
824.220000	37.00	25.2	46.0	9.0	200.0	105.00	VERTICAL

1GHz-18GHz



MEASUREMENT RESULT: PK Detector

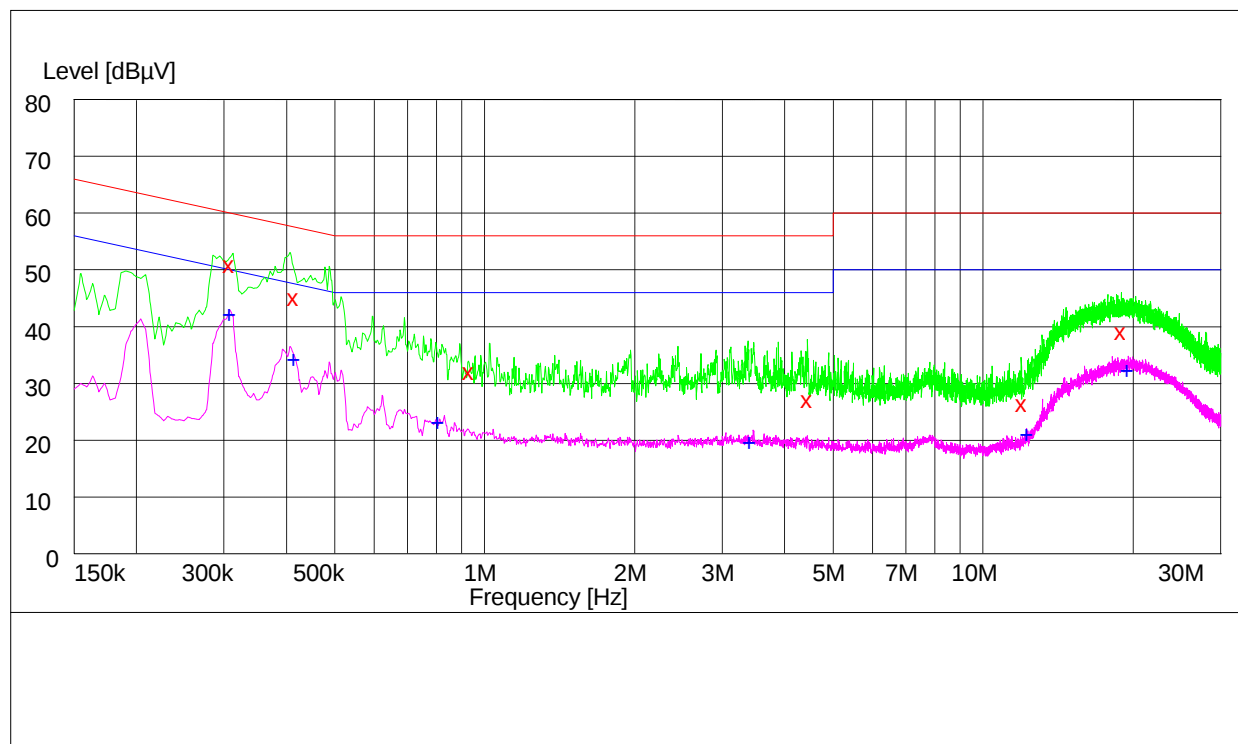
Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBμV/m	dB	dBμV/m	dB	cm	deg	
4158.000000	41.40	5.8	74.0	32.6	100.0	200.00	VERTICAL
9620.500000	47.00	15.9	74.0	27.0	100.0	350.00	VERTICAL
14497.000000	53.20	22.7	74.0	20.8	150.0	338.00	VERTICAL

MEASUREMENT RESULT: AV Detector

Frequency	Level	Transd	Limit	Margin	Height	Azimuth	Polarisation
MHz	dBμV/m	dB	dBμV/m	dB	cm	deg	
6408.500000	30.30	9.4	54.0	23.7	128.0	69.00	VERTICAL
14331.000000	39.10	22.0	54.0	14.9	146.0	47.00	VERTICAL
17810.500000	42.30	26.8	54.0	11.7	111.0	154.00	VERTICAL

8.2 Conducted Disturbance

This test was carried out in all the test modes, here only the worst test result was shown.



MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.308000	51.70	10.0	60	8.3	L1	FLO
0.414000	45.80	10.0	58	12.2	L1	FLO
0.934000	32.90	10.1	56	23.1	L1	FLO
4.456000	27.80	10.2	56	28.2	L1	FLO
11.994000	27.20	10.3	60	32.8	L1	FLO
18.946000	40.00	10.3	60	20	N	FLO

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.308000	42.90	10.0	50	7.1	N	FLO
0.414000	34.90	10.0	48	13.1	L1	FLO
0.806000	23.90	10.1	46	22.1	L1	FLO
3.412000	20.30	10.2	46	25.7	N	FLO
12.268000	21.70	10.3	50	28.3	L1	FLO
19.520000	33.00	10.3	50	17	L1	FLO

-----END-----