



EMC TEST REPORT

Applicant UAB Teltonika
FCC ID 2AET4RUT240V
Product LTE Router
Brand Teltonika
Model RUT240
Report No. RXA1708-0301EMC01R1
Issue Date December 20, 2017

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

Guangchang Fan

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Approved by: Guangchang Fan/ Director

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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
Date of Testing: November 5, 2017 ~ December 19, 2017			

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
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2 General Description of Equipment under Test

2.1 Client Information

Applicant	UAB TELTONIKA
Applicant address	Saltoniskiu st. 10c, Vilnius, Lithuania
Manufacturer	UAB TELTONIKA
Manufacturer address	Saltoniskiu st. 10c, Vilnius, Lithuania

2.2 General information

EUT Description			
Device Type:	Portable Device		
Product Name:	LTE Router		
Model Number:	RUT240		
IMEI:	861107031948582		
HW Version:	5		
SW Version:	RUT2XX_R_00.00.284		
Antenna Type:	Sub or Retractable Antenna		
Test Mode:	Transfer Data Mode		
Frequency:		TX:	RX:
	LTE Band 4	1710 ~ 1755	2110 ~ 2155
	LTE Band 13	777 ~ 787	746 ~ 756
	WIFI 2.4G:	2400 ~ 2483.5	2400 ~ 2483.5
Modulation:	LTE: QPSK; 16QAM; 64QAM; WLAN 802.11b: DSSS WLAN 802.11g/n: OFDM		
EUT Accessory			
Adapter	Manufacturer: Shenzhen Shengji Mains CO., LTD Model: SJ-09010033		
LTE antenna	Manufacturer: Beyonddoor Model: BY-LTE-03-03-Silkscreen-LTE		
WiFi antenna	Manufacturer: Beyonddoor Model: BY-2400-05-05-01-Silkscreen-WiFi		
Auxiliary test equipment			
PC	PC Manufacturer: Dell Model: E5430 (SN : R98M9 A02)		
Remark: The information of the EUT is declared by the manufacturer.			



2.3 Applied Standards

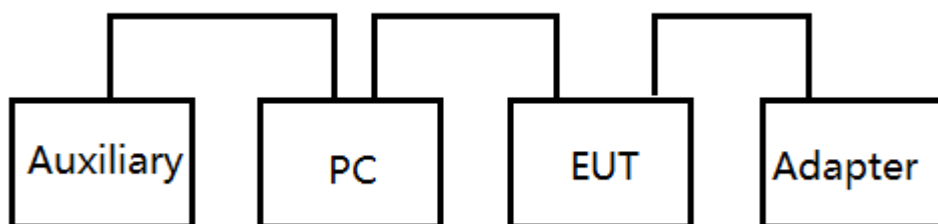
According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards

FCC Code CFR47 Part15B (2017)

ANSI C63.4 (2014)

2.4 Test Configuration



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

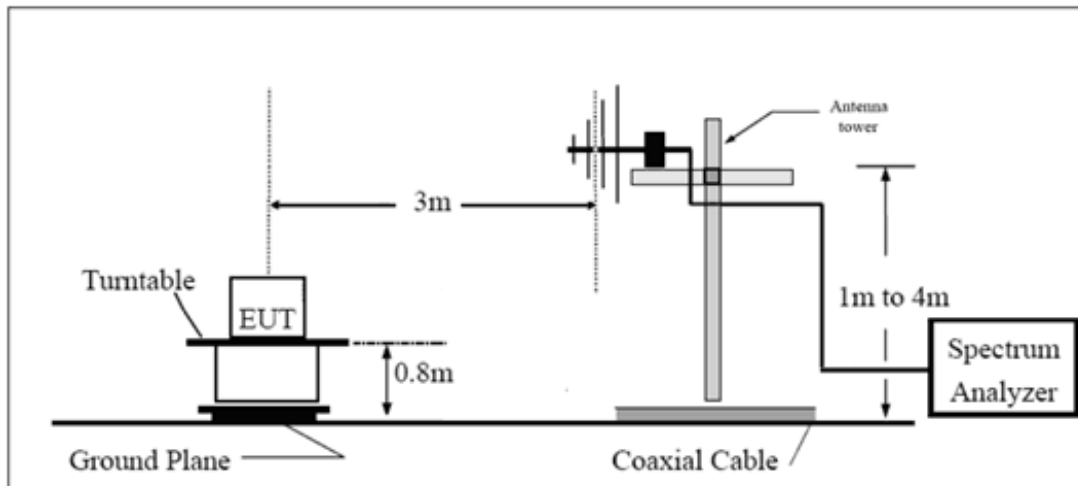
(b) AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

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 stand-up position (Z axis) and the worst case was recorded.

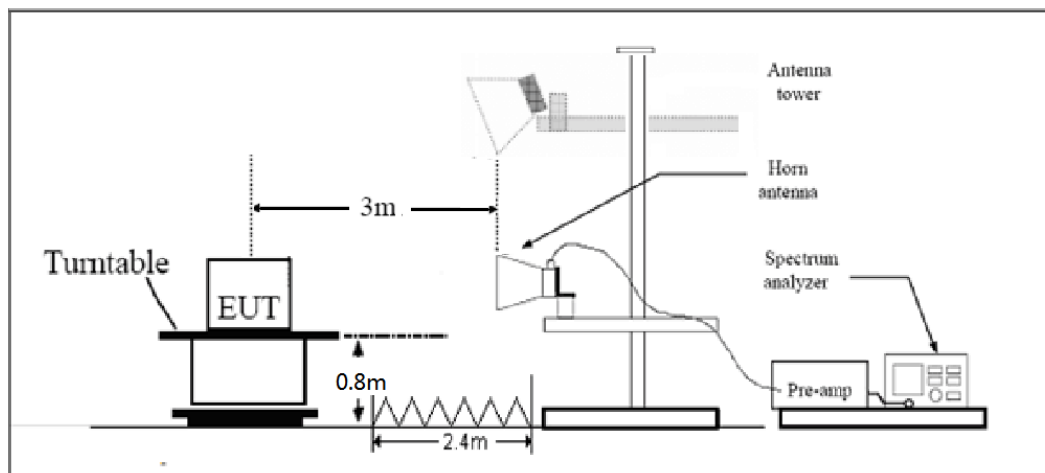
During the test, EUT connected power supply, and EUT is connected to a laptop via a network cable in the case of communication.

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

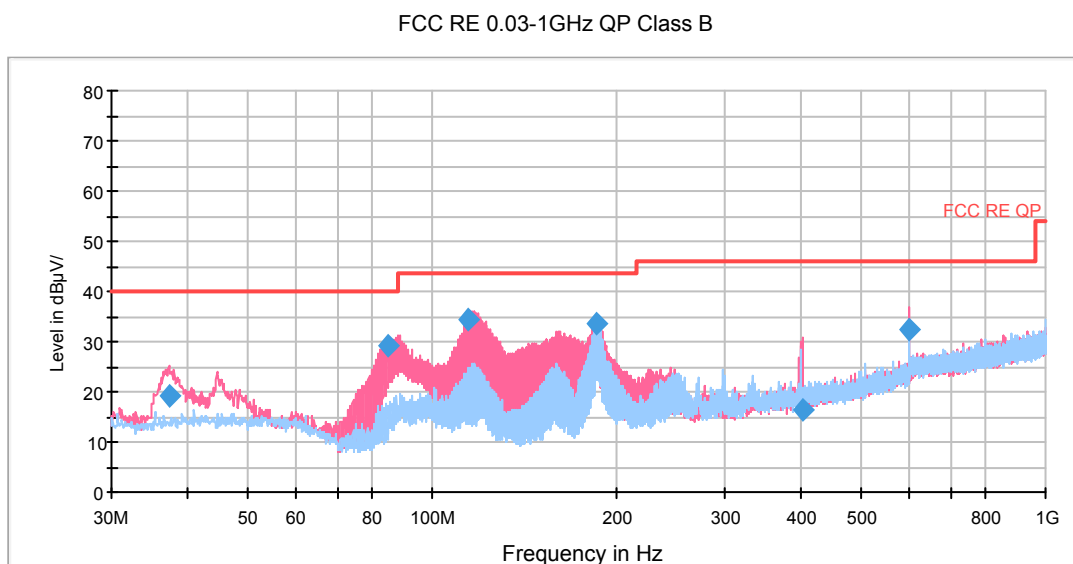
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 3.704$ dB.

Test Results

During the test, the preliminary test was performed in all frequency bands, WIFI 2.4G 802.11b CH1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

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.

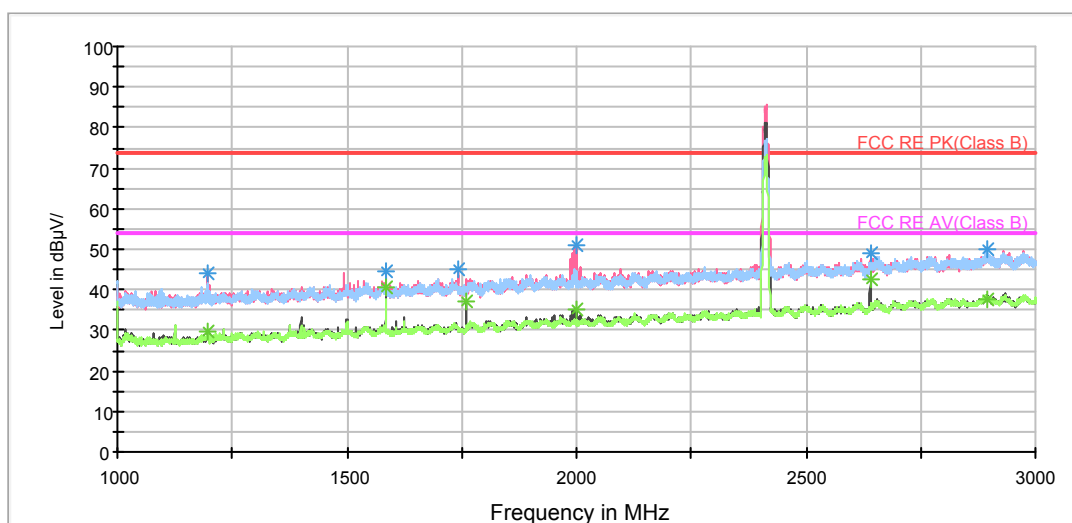


Radiated Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
37.178000	19.1	6.5	100.0	V	314.0	12.6	20.9	40.0
84.982000	29.1	18.9	114.0	V	0.0	10.2	10.9	40.0
114.857000	34.5	23.0	100.0	V	337.0	11.5	9.0	43.5
185.901000	33.6	22.3	114.0	V	159.0	11.3	9.9	43.5
401.779000	16.3	-1.7	125.0	V	0.0	18.0	29.7	46.0
599.972000	32.5	9.6	100.0	V	277.0	22.9	13.5	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

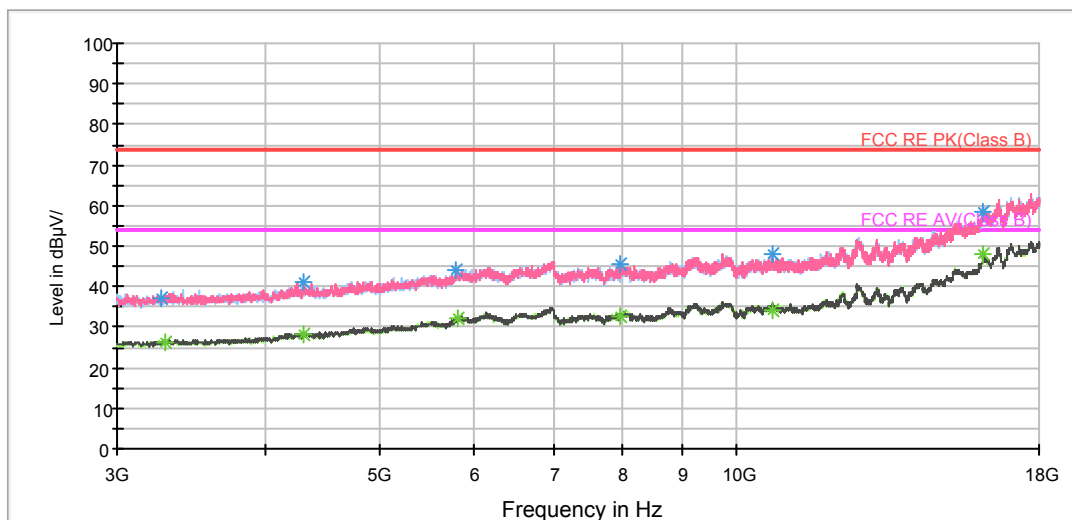


Radiated Emission from 1GHz to 3GHz

Frequency (MHz)	Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1195.750000	43.9	52.1	200.0	V	137.0	-8.2	30.1	74
1584.000000	44.6	50.9	200.0	V	190.0	-6.3	29.4	74
1743.500000	45.1	50.0	100.0	V	98.0	-4.9	28.9	74
1999.250000	50.9	54.3	300.0	V	174.0	-3.4	23.1	74
2640.250000	48.9	48.7	100.0	V	107.0	0.2	25.1	74
2895.750000	50.1	48.0	199.0	H	241.0	2.1	23.9	74

Frequency (MHz)	Average (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1195.750000	29.6	37.8	200.0	V	137.0	-8.2	24.4	54
1584.000000	40.7	47.0	200.0	V	190.0	-6.3	13.3	54
1760.000000	36.9	41.7	200.0	V	111.0	-4.8	17.1	54
1999.500000	35.3	38.7	300.0	V	174.0	-3.4	18.7	54
2640.000000	42.7	42.5	100.0	V	107.0	0.2	11.3	54
2895.750000	37.6	35.5	199.0	H	241.0	2.1	16.4	54

RE 3-18GHz PK+AV



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)
3270.000000	37.3	39.6	100.0	H	0.0	-2.3	36.7	74
4306.875000	41.0	40.3	100.0	V	3.0	0.7	33.0	74
5793.750000	44.1	40.0	100.0	H	236.0	4.1	29.9	74
7981.875000	45.4	38.0	100.0	H	89.0	7.4	28.6	74
10702.500000	48.0	37.5	100.0	H	77.0	10.5	26.0	74
16160.625000	58.2	36.7	100.0	H	164.0	21.5	15.8	74

Frequency (MHz)	Average (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
3298.125000	26.1	28.3	100.0	H	236.0	-2.2	27.9	54
4306.875000	28.3	27.6	100.0	V	3.0	0.7	25.7	54
5820.000000	31.9	27.4	100.0	V	39.0	4.5	22.1	54
7981.875000	32.7	25.3	100.0	H	89.0	7.4	21.3	54
10702.500000	34.3	23.8	100.0	H	77.0	10.5	19.7	54
16160.625000	48.0	26.5	100.0	H	164.0	21.5	6.0	54

3.2 Conducted Emission

Ambient condition

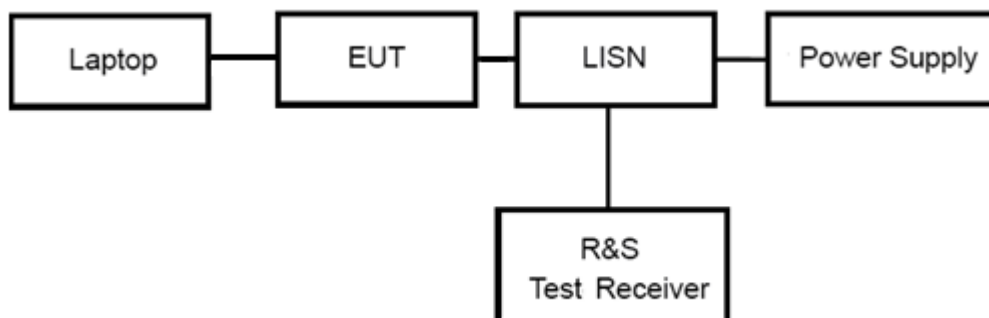
Temperature	Relative humidity	Pressure
24°C ~26°C	50%~55%	102.5kPa

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 connected power supply, and EUT is connected to a laptop via a network cable in the case of communication.

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.		

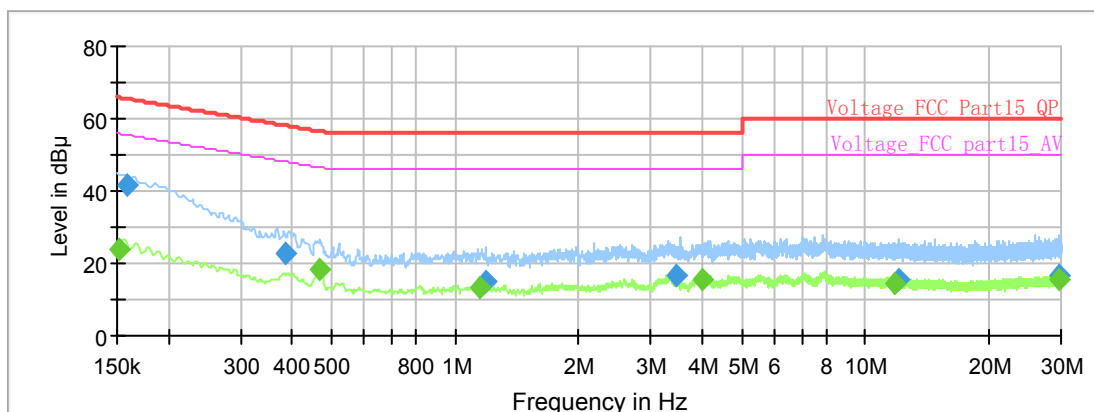
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 2.57\text{dB}$.

Test Results

During the test, the preliminary test was performed in all frequency bands, WIFI 2.4G 802.11b CH1 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

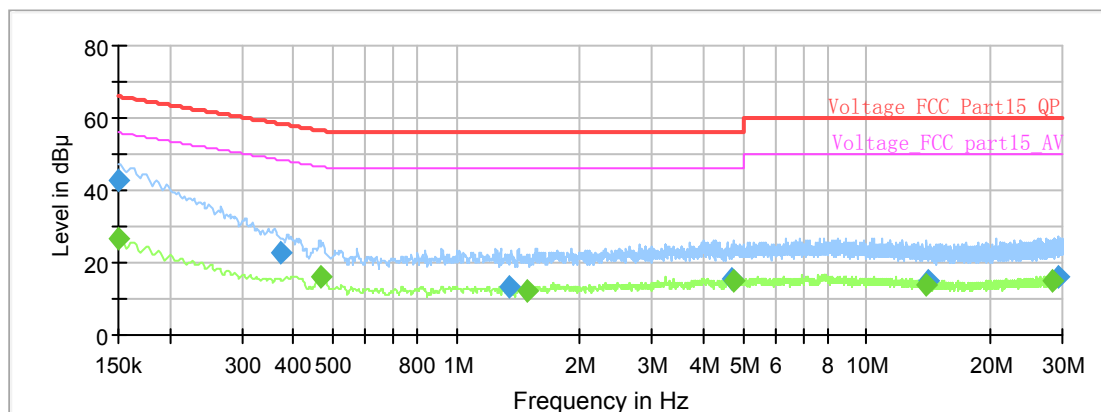
Following plots, Blue trace uses the peak detection; Green trace uses the average detection.



Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.152250	---	23.68	55.88	32.20	1000.0	9.000	L1	ON	19.6
0.159000	41.72	---	65.52	23.80	1000.0	9.000	L1	ON	19.6
0.386250	22.64	---	58.14	35.51	1000.0	9.000	L1	ON	19.6
0.467250	---	18.26	46.56	28.31	1000.0	9.000	L1	ON	19.6
1.146750	---	13.09	46.00	32.91	1000.0	9.000	L1	ON	19.6
1.191750	14.90	---	56.00	41.10	1000.0	9.000	L1	ON	19.6
3.459750	16.60	---	56.00	39.40	1000.0	9.000	L1	ON	19.6
4.013250	---	15.47	46.00	30.53	1000.0	9.000	L1	ON	19.6
11.823000	---	14.45	50.00	35.55	1000.0	9.000	L1	ON	19.9
12.070500	15.56	---	60.00	44.44	1000.0	9.000	L1	ON	19.9
29.584500	---	15.42	50.00	34.58	1000.0	9.000	L1	ON	20.1
29.661000	16.68	---	60.00	43.32	1000.0	9.000	L1	ON	20.1

L line

Conducted Emission from 150 KHz to 30 MHz



Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	26.54	56.00	29.46	1000.0	9.000	N	ON	19.7
0.150000	42.93	---	66.00	23.07	1000.0	9.000	N	ON	19.7
0.372750	22.95	---	58.44	35.49	1000.0	9.000	N	ON	19.6
0.469500	---	16.39	46.52	30.14	1000.0	9.000	N	ON	19.6
1.340250	13.49	---	56.00	42.51	1000.0	9.000	N	ON	19.6
1.482000	---	12.48	46.00	33.52	1000.0	9.000	N	ON	19.6
4.670250	15.81	---	56.00	40.19	1000.0	9.000	N	ON	19.7
4.728750	---	14.75	46.00	31.25	1000.0	9.000	N	ON	19.7
14.003250	---	14.03	50.00	35.97	1000.0	9.000	N	ON	19.9
14.068500	15.16	---	60.00	44.84	1000.0	9.000	N	ON	19.9
28.475250	---	14.97	50.00	35.03	1000.0	9.000	N	ON	19.9
29.258250	16.29	---	60.00	43.71	1000.0	9.000	N	ON	19.9

N line

Conducted Emission from 150 KHz to 30 MHz

4 Main Test Instrument

Name	Manufacturer	Type	Serial Number	Last Cal.	Cal. Due Date
Signal Analyzer	R&S	FSV30	100815	2016-12-16	2017-12-15
Signal Analyzer	R&S	FSV30	100815	2017-12-15	2018-12-14
EMI Test Receiver	R&S	ESCI	100948	2017-05-20	2018-05-19
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-02-18	2019-02-17
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-201	2014-12-06	2017-12-05
TRILOG Broadband Antenna	SCHWARZBECK	VUBL 9163	9163-201	2017-11-18	2020-11-17
Horn Antenna	R&S	HF907	100126	2014-12-06	2019-12-05
Horn Antenna	ETS-Lindgren	3160-09	00102643	2015-01-30	2018-01-29
EMI Test Receiver	R&S	ESCS30	100138	2016-12-16	2017-12-15
EMI Test Receiver	R&S	ESCS30	100138	2017-12-15	2018-12-14
LISN	R&S	ENV216	101171	2016-12-16	2019-12-15
Bore Sight Antenna mast	ETS	2171B	00058752	NA	NA
Test software	EMC32	R&S	V9.26.0	NA	NA