



中国认可
国际互认
检测
TESTING
CNAS L2264

EMC TEST REPORT

Applicant UAB TELTONIKA
FCC ID 2AJLOTM2500TLT
Brand TELTONIKA
Product GSM/GPRS/GNSS/BLEETOOTH module
Model TM2500
Report No. RXA1606-0123EMC01R1
Issue Date November 23, 2016

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC Code CFR47 Part15B (2015)/ 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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Guangchang Fan

Approved by: Guangchang Fan

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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: July 28, 2016 ~ August 22, 2016			

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. This report must not be used by the client to claim product certification, approval, or endorsement by CNAS or any government agencies.

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 (recognition number is 428261)

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-766)

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	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	
Product Name:	GSM/GPRS/GNSS/BLEETOOTH module
Model Number:	TM2500
IMEI:	357454070000011
HW Version:	TM2500_01
SW Version:	TM25_D_00.00.01.00
Antenna Type:	BT: Internal Antenna GSM/GPS: External Antenna
Used Host Product:	PC: Model: DELL E6430(SN : 32RKWW1)
Test Mode:	Transfer Data Mode
Remark: The information of the EUT is declared by the manufacturer. Please refer to the specifications or user manual for details.	



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 (2015)

ANSI C63.4 (2014)

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

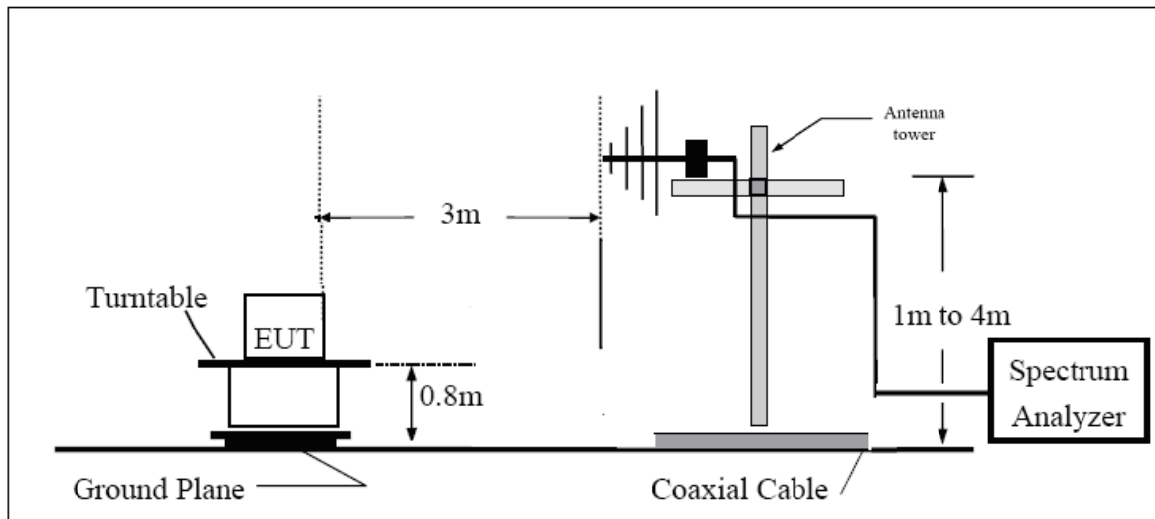
(b) AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

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.

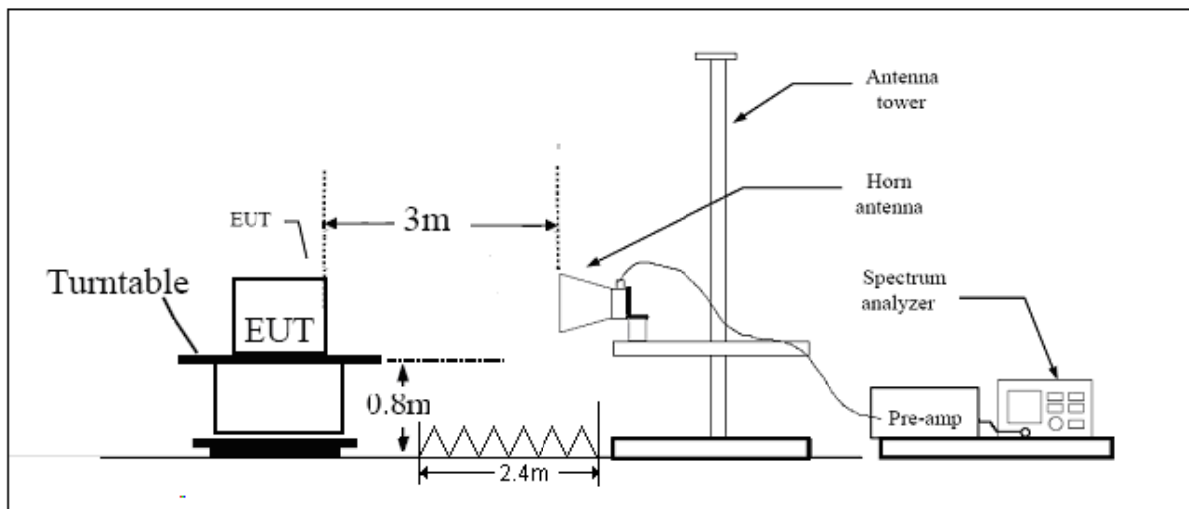
Test Setup

30MHz -1GHz

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 $k = 1.96$. $U = 3.92$ dB.

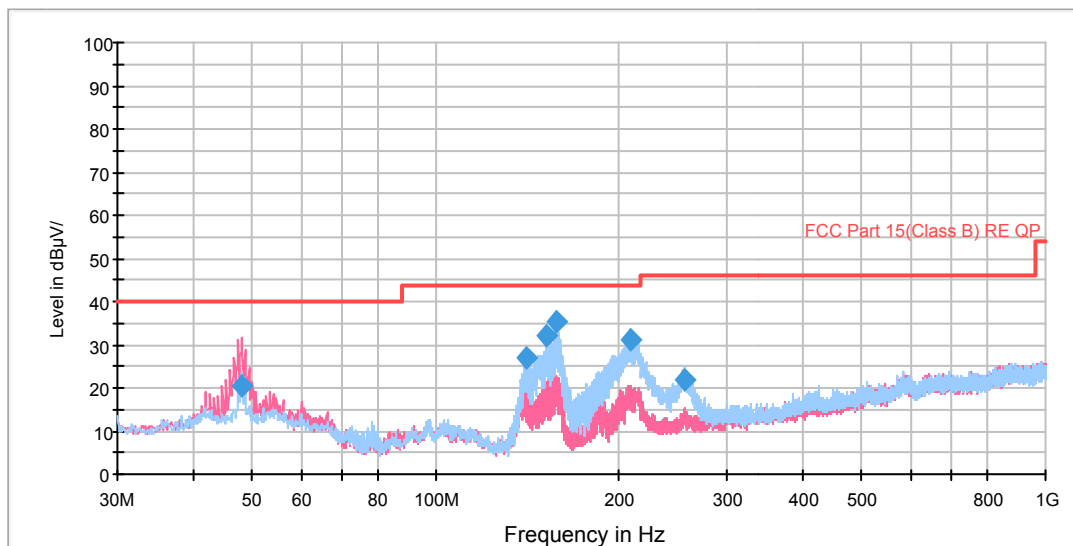
Test Results

Sweep from 9 kHz to 30MHz, and the emissions more than 20 dB below the permissible value 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

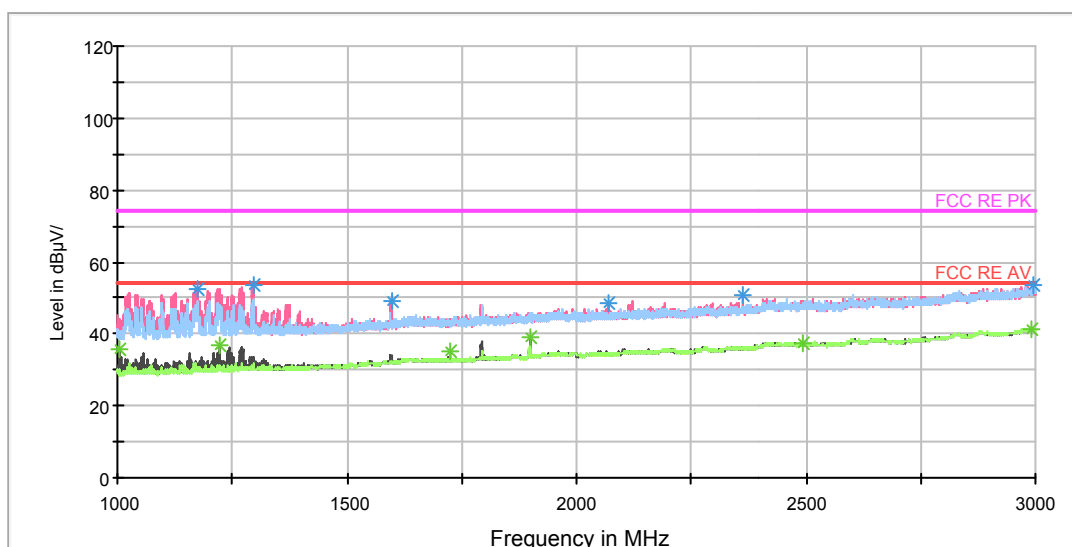
Frequency (MHz)	Quasi-Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
48.025138	20.6	40.8	121.0	V	6.0	-20.2	19.4	40.0
140.668550	27.1	56.7	126.0	H	316.0	-29.6	16.4	43.5
152.158503	32.1	61.3	126.0	H	113.0	-29.2	11.4	43.5
157.561112	35.3	64.2	126.0	H	106.0	-28.9	8.2	43.5
208.922500	31.3	57.3	127.0	H	293.0	-26.0	12.2	43.5
255.607250	22.0	46.7	101.0	H	7.0	-24.7	24.0	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

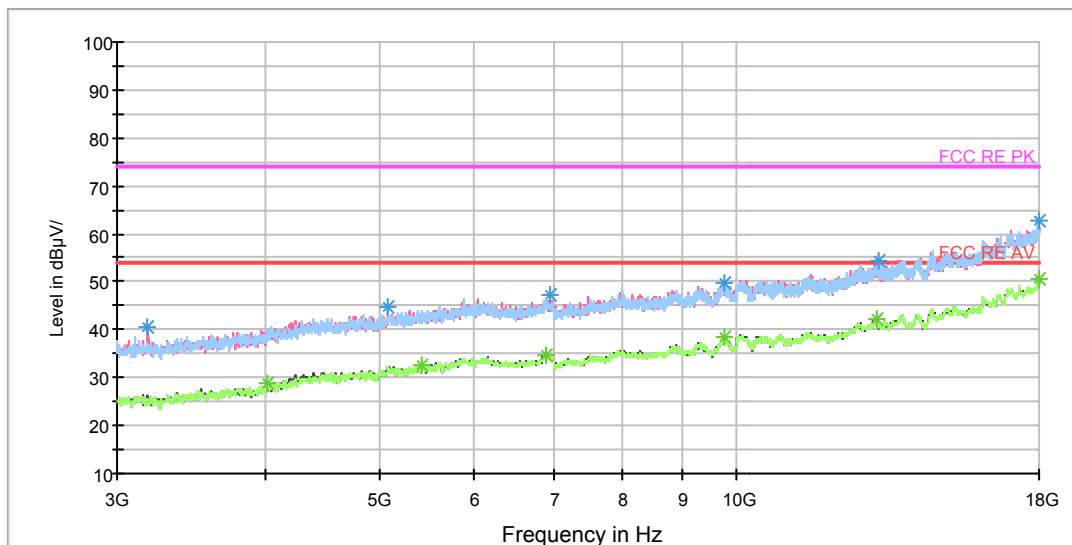


Radiated Emission from 1GHz to 3GHz

Frequency (MHz)	Peak (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1174.750000	52.7	60.7	101.0	V	107.0	-8.0	21.3	74
1296.500000	53.7	61.5	101.0	V	9.0	-7.8	20.3	74
1596.500000	48.9	55.3	101.0	V	175.0	-6.4	25.1	74
2071.500000	48.6	51.7	101.0	V	204.0	-3.1	25.4	74
2362.250000	51.0	52.4	101.0	V	0.0	-1.4	23.0	74
2994.750000	53.7	56.0	101.0	H	116.0	2.3	20.3	74

Frequency (MHz)	Average (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1005.250000	35.5	44.8	101.0	V	0.0	-9.3	18.5	54
1223.750000	36.6	44.4	101.0	V	0.0	-7.8	17.4	54
1724.750000	35.4	40.4	101.0	V	175.0	-5.0	18.6	54
1897.750000	39.0	42.8	101.0	V	157.0	-3.8	15.0	54
2495.000000	37.5	37.6	101.0	V	343.0	0.1	16.5	54
2992.250000	41.5	43.7	101.0	H	329.0	2.2	12.5	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)
3185.625000	40.7	42.4	201.0	V	32.0	-1.7	33.3	74
5070.000000	44.6	48.0	201.0	H	226.0	3.4	29.4	74
6961.875000	47.1	53.7	201.0	V	1.0	6.6	26.9	74
9768.750000	49.8	61.7	101.0	V	158.0	11.9	24.2	74
13162.500000	54.3	69.7	201.0	H	307.0	15.4	19.7	74
17992.500000	62.6	87.9	101.0	H	329.0	25.3	11.4	74

Frequency (MHz)	Average (dBuV/m)	Reading value (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
4023.750000	28.9	29.5	101.0	H	0.0	0.6	25.1	54
5431.875000	32.5	36.3	101.0	H	62.0	3.8	21.5	54
6900.000000	34.6	41.6	101.0	V	342.0	7.0	19.4	54
9757.500000	38.3	50.0	101.0	V	342.0	11.7	15.7	54
13153.125000	42.2	57.7	101.0	V	327.0	15.5	11.8	54
17996.250000	50.4	75.8	101.0	V	0.0	25.4	3.6	54

3.2 Conducted Emission

Ambient condition

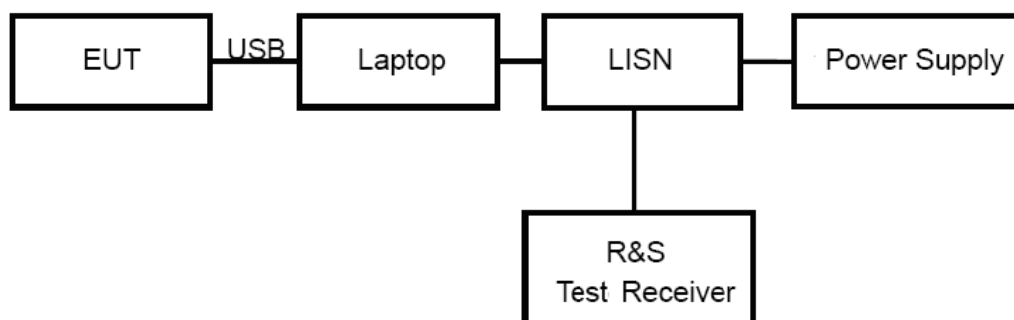
Temperature	Relative humidity	Pressure
24°C ~26°C	50%~55%	102.5kPa

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 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

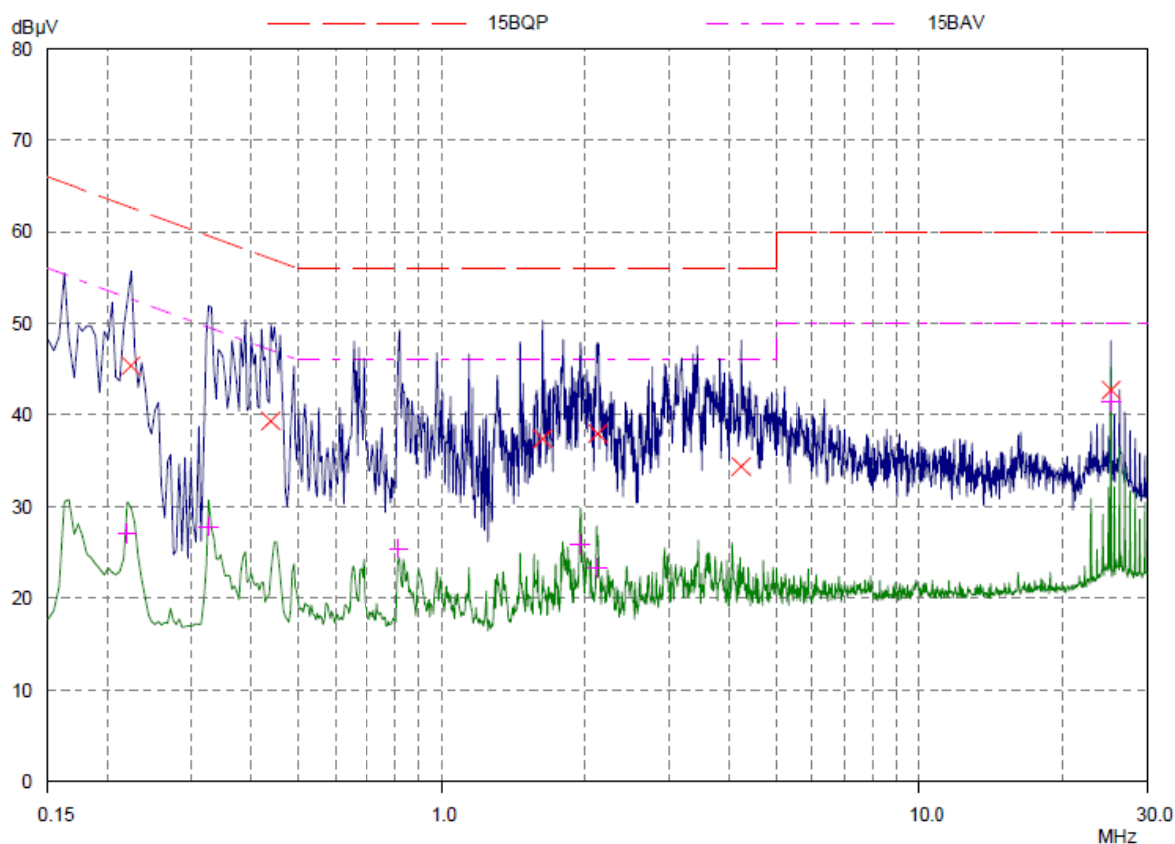
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 2.69$ dB.

Test Results

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



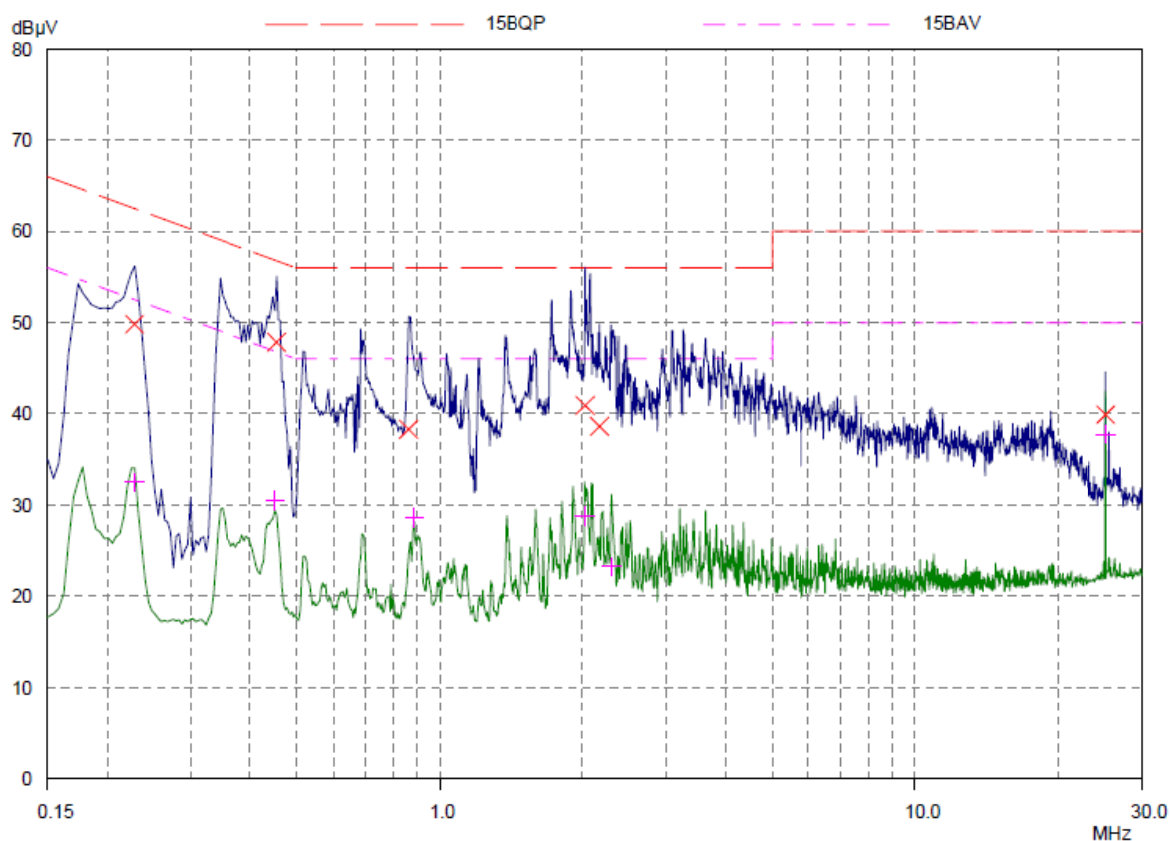
Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.22421	45.36	62.66	17.30	L1	gnd
0.43906	39.32	57.08	17.76	L1	gnd
1.62656	37.40	56.00	18.60	L1	gnd
2.12656	37.98	56.00	18.02	L1	gnd
4.23984	34.40	56.00	21.60	L1	gnd
25.22812	42.72	60.00	17.28	L1	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.22031	27.14	52.81	25.67	L1	gnd
0.32578	27.79	49.56	21.77	L1	gnd
0.81406	25.45	46.00	20.55	L1	gnd
1.95468	25.82	46.00	20.18	L1	gnd
2.12656	23.37	46.00	22.63	L1	gnd
25.22812	41.47	50.00	8.53	L1	gnd

L line

Conducted Emission from 150 KHz to 30 MHz



Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB	Phase -	PE -
0.22812	49.81	62.52	12.71	N	gnd
0.45468	47.84	56.79	8.95	N	gnd
0.86093	38.32	56.00	17.68	N	gnd
2.025	40.91	56.00	15.09	N	gnd
2.16953	38.62	56.00	17.38	N	gnd
25.22812	39.90	60.00	20.10	N	gnd

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB	Phase -	PE -
0.22812	32.52	52.52	20.00	N	gnd
0.45078	30.47	46.86	16.39	N	gnd
0.88437	28.62	46.00	17.38	N	gnd
2.02109	28.80	46.00	17.20	N	gnd
2.30234	23.28	46.00	22.72	N	gnd
25.22812	37.76	50.00	12.24	N	gnd

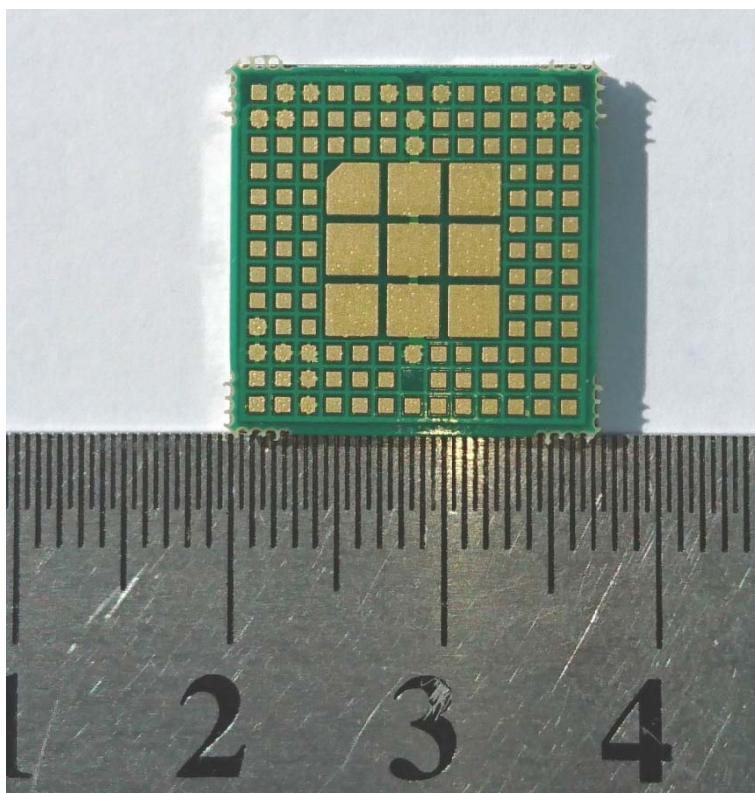
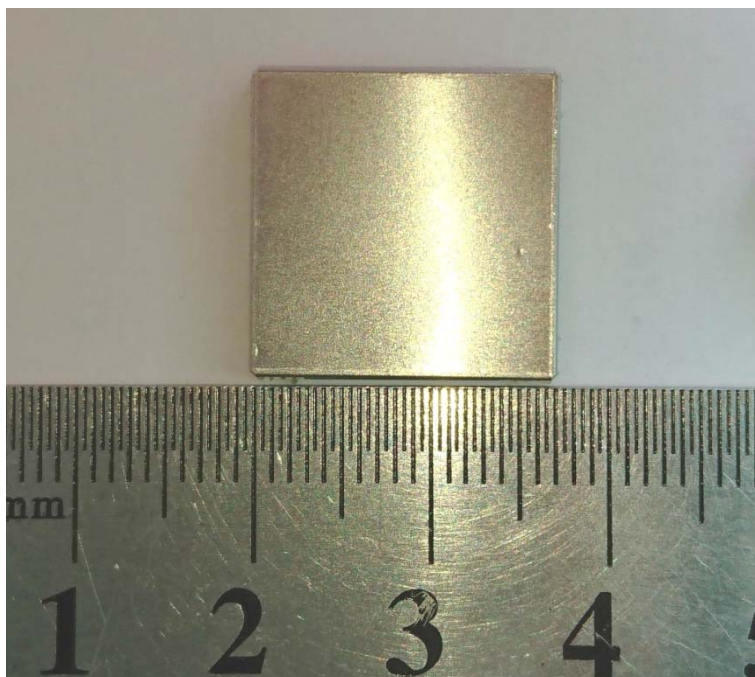
N line
Conducted Emission from 150 KHz to 30 MHz

4 Main Test Equipment

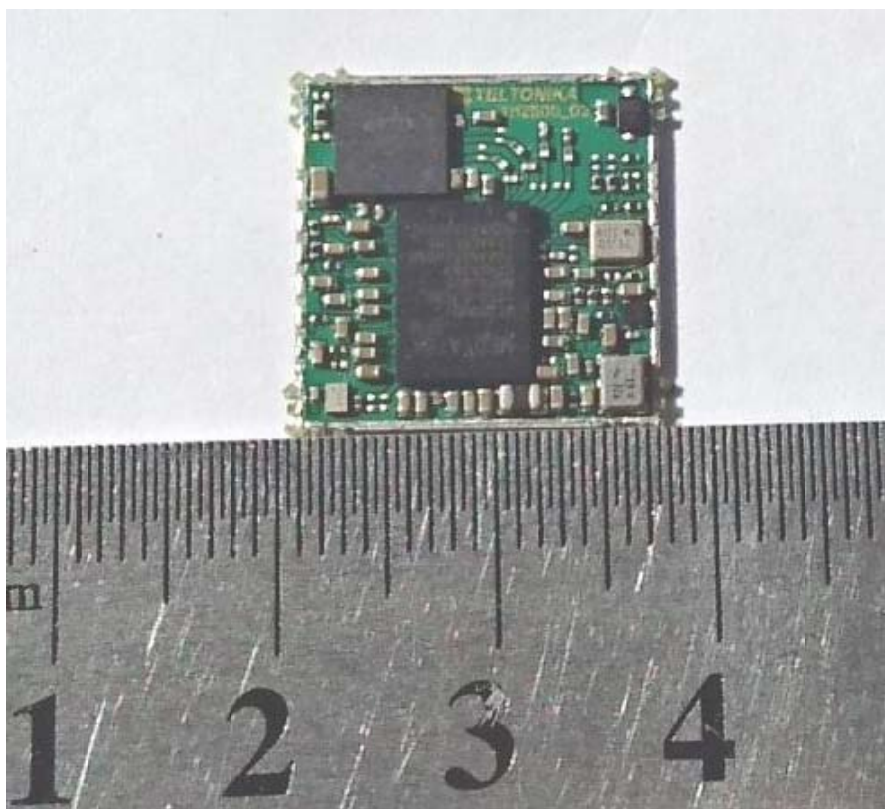
Name	Type	Manufacturer	Serial Number	Last Cal.	Cal. Due Date
EMI Test Receiver	ESCI3	R&S	100948	2016-06-01	2017-05-31
Signal Analyzer	FSV30	R&S	100815	2015-12-17	2016-12-16
Loop Antenna	FMZB1519	SCHWARZBECK	1519-047	2014-02-29	2017-02-28
Trilog Antenna	VULB 9163	SCHWARZBECK	9163-201	2014-12-06	2017-12-05
Horn Antenna	HF907	R&S	100126	2014-12-06	2017-12-05
Horn Antenna	3160-09	ETS-Lindgren	00102643	2015-01-30	2018-01-29
EMI Test Receiver	ESCS30	R&S	100138	2015-12-17	2016-12-16
LISN	ENV216	R&S	101171	2013-12-18	2016-12-17
Bore Sight Antenna mast	2171B	ETS	00058752	NA	NA

ANNEX A: The EUT Appearance and Test Configuration

A.1 EUT Appearance



Front Side

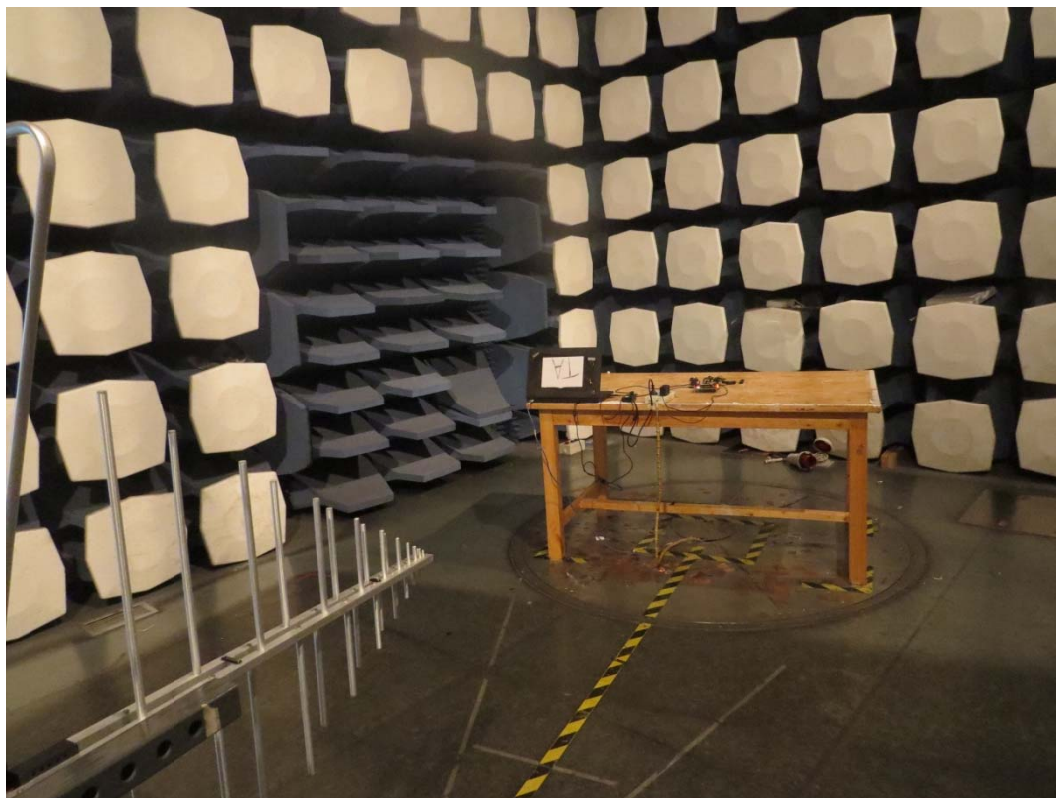


Back Side

a: EUT

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

A.3 Host Product

