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TESTING
CNAS L9678

EMC Test Report

Product Name:	**LtAP mini LTE kit**
Model Number:	**RB912R-2nD-LTm&R11e-LTE**
Applicant:	**Mikrotikls SIA**

KeySense Testing & Certification International Co., Ltd.

1-3F, Lab Building, No.29 District, ZhongKai Hi-Tech Industrial Development Park, Huizhou, Guangdong, China

Test Report of EMC				
Test Product name	LtAP mini LTE kit M/N: RB912R-2nD-LTm&R11e-LTE			
Product Family models	LtAP mini M/N: RB912R-2nD-LTm; LtAP mini 4G kit M/N: RB912R-2nD-LTm&R11e-4G (Only the model and the product name are different)			
Applicant	Name	Mikrotikls SIA		
	Address	Brivibas gatve 214i,Riga,LV-1039,Latvia		
Manufacturer	Name	Mikrotikls SIA		
	Address	Brivibas gatve 214i,Riga,LV-1039,Latvia		
Factory	Name	Mikrotikls SIA		
	Address	Brivibas gatve 214i,Riga,LV-1039,Latvia		
Trade Name	MikroTik			
Receipt date	Sep 08, 2020	Quantity	1	
Standard	EN 50121-3-2:2016 EN 50155:2017 EN 61000-4-8:2010			
Test site	1F,Lab Building,No.29 District, ZhongKai Hi-Tech Industrial Development Park, Huizhou, Guangdong, China.			
Test period	Sep 08, 2020- Sep 18, 2020	Issue Date	Nov 23, 2020	
Test result	The equipment under test was found to be compliance with the requirements of the standards applied.			

Tested by: Bing. He	Sign: Bing. He	Date: 2020.11.23	(Stamp)
Reviewed by: Lake. Wang	Sign: Lake Wang	Date: 2020.11.23	
Approved by:Jack.Li (Supervisor)	Sign: Jack Li	Date: 2020.11.23	

KeySense Testing & Certification International Co., Ltd.

Contents

1 SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

EMISSION			
Description of Test Item	Standard	Test	Results
Conducted disturbance at mains terminals	EN 50121-3-2:2016	EN 50121-3-2:2016	PASS
Radiated Emission Test (30MHz~1000MHz)	EN 50121-3-2:2016	EN 50121-3-2:2016	PASS
Radiated Emission Test (above 1GHz)			
N/A is an abbreviation for Not Applicable.			

IMMUNITY				
Description of Test Item	Test Standard	Basic Standard	Observation Criteria	Results
Electrostatic discharge (ESD)	EN 50121-3-2:2016	EN 61000-4-2:2009	A	PASS
Radio frequency,Continuous radiated disturbance	EN 50121-3-2:2016	EN 61000-4-3:2006+A1: 2008+A2:2010	A	PASS
Electrical fast transient (EFT)	EN 50121-3-2:2016	EN 61000-4-4: 2012	A	PASS
Surge	EN 50121-3-2:2016	EN 61000-4-5:2006	A	PASS
Radio-frequency, Continuous conducted disturbance	EN 50121-3-2:2016	EN 61000-4-6:2009	A	PASS
Power frequency magnetic field	EN 61000-4-8:2010	EN 61000-4-8:2010	A	PASS
Voltage dips	EN 50155:2017	EN61000-4-11:2004	A	PASS
N/A is an abbreviation for Not Applicable.				

2 GENERAL INFORMATION

2.1 Description of Device(EUT)

Product name: LtAP mini LTE kit M/N: RB912R-2nD-LTm&R11e-LTE

Product Family models: LtAP mini M/N: RB912R-2nD-LTm;

LtAP mini 4G kit M/N: RB912R-2nD-LTm&R11e-4G
(Only the model and the product name are different)

Power Supply: Input 100-240V ;50/60Hz,0.8A

Output :24Vdc,1200mA

Test Voltage : AC 230V/50Hz

Note:

2.2 EUT operating mode(s)

To achieve compliance applied standard specification, the following mode(s) were made during compliance testing:

Operating mode 1	Normal working

2.3 Tested Supporting System Details

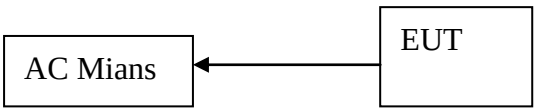
No.	Description	KST No.	Manufacturer	Model	Serial Number

☒ Cable Description

No.	From		To		Type of Cable		
	Device	I/O Port	Device	I/O Port	Length (m)	Shielded or Unshielded	Ferrite Core [Y/N]
1	EUT	DC Mains	EUT	DC Line	2.0	U	N

* Shielded or Unshielded : Unshielded=U, Shielded=S

2.4 Block Diagram of connection between EUT and simulators



2.5 Test Facility

Site Description: 1-3F, Lab Building, No.29 District, ZhongKai Hi-Tech Industrial Development Park, Huizhou, Guangdong, China

Name of Firm: KeySense Testing & Certification International Co., Ltd.

EMC Lab: Certificated by CNAS, CHINA

Registration No.:L9678

Date of registration: Feb 07, 2017

2.6 Measurement Uncertainty(95% confidence levels, k=2)

Test Item	Uncertainty
Uncertainty for Conduction emission test in shielding room	2.5dB(150kHz to 30MHz)
Uncertainty for Radiation Emission test in 3m chamber	4.14dB(30M~1GHz,Polarize:V)
	4.25dB(30M~1GHz,Polarize:H)

2.7 Test Equipments

2.7.1 For Conducted Emission at the Mains Terminals Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal .Interval
Receiver	R&S	ESR3	102054	2019.12. 25	1 year
LISN	AFJ	LS16	16011618383	2020.09.09	1 year

2.7.2 For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Receiver	R&S	ESR7	101661	2019.12. 25	1 year
Trilog-boardband antenna	SCHWARZBECK	VULB 9163D	9163961	2019.05.18	3 years
Pre-amplifier (Low Freq)	Claviio	BDLNA-0001-27 2007	1600015	2019.09.02	3 years

2.7.3 For Electrostatic discharge Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Electrostatic discharge generator	Noiseken	ESS-L1611	ESS1643151	2020.09.11	1 year

2.7.4 For Radio-frequency Continuous radiated disturbance Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Signal generator	R&S	SMC100A	105651	2019.12. 25	1 year
Power amplifier	PRANA	MT400	1507-1746	2019.12. 25	1 year
Trilog-boardband antenna	SCHWARZBECK	STLP 9128E	9128ES-136	2019.09.02	3years
Power amplifier	PRANA	SV70	1602-1820	2019.12.25	1 year
Horn antenna	Schwarzbeck	BBHA 9120E	BBHA9120E6 98	2017/10/25	3 years

2.7.5 For Electrical fast transient Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EFT generator	Noiseken	FNS-AX3-A16C	FNS1621762	2020.09.09	1 year
Coupling clamp	Noiseken	15-00009A	FNS15Y175	2020.09.09	1 year

2.7.6 For Surge Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Surge generator	Noiseken	LSS-6230A	LSS1634248	2020.09.09	1 year

2.7.7 For Radio-frequency Continuous conducted disturbance Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Signal generator	R&S	SMC100A	105651	2019.12. 25	1 year
Power amplifier	PRANA	DR220	1602-1819	2019.12. 25	1 year
CND	TESEQ	M016	43434	2020.09.09	1 year
Coupling clamp	TESEQ	KEMA 801A	43543	2019.12. 25	1 year

2.7.8 For Power magnetic field test

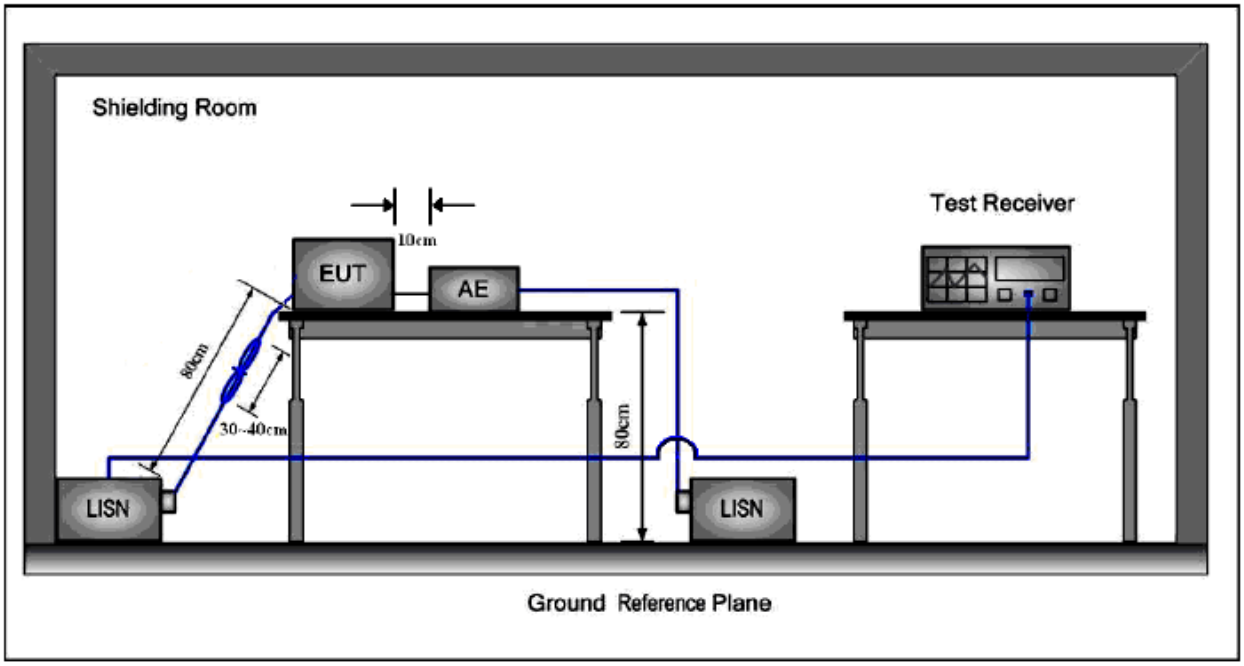
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Power magnetic field simulator	NARDA	PMM-1008	010WT60502	2020.09.09	1 year

2.7.9 For Voltage dips and interruptions Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Dips simulator	Noiseken	VDS-2002	VDS1510396	2020.09.09	1 year

3 CONDUCTED EMISSION AT THE MAINS TERMINALS TEST

3.1 Block Diagram of Test Setup



3.2 Test Standard

EN 50121-3-2: 2016

3.3 Limits of mains terminal disturbance voltage

Frequency (MHz)	EN 50121-3-2 (dBμV)		EN 55011 Class A (dBμV)	
	Q.P. (Quasi-Peak)	A.V. (Average)	Q.P. (Quasi-Peak)	A.V. (Average)
0.15~0.50	99	/	79	66
0.50~5.0	93	/	73	60
5.0~30	93	/	73	60

3.4 Operating Condition of EUT

Test date	Ambient temperature	Relative humidity	Atmospheric pressure
Sep 15, 2020	24°C	69%	100.4kPa

3.5 Test Procedure

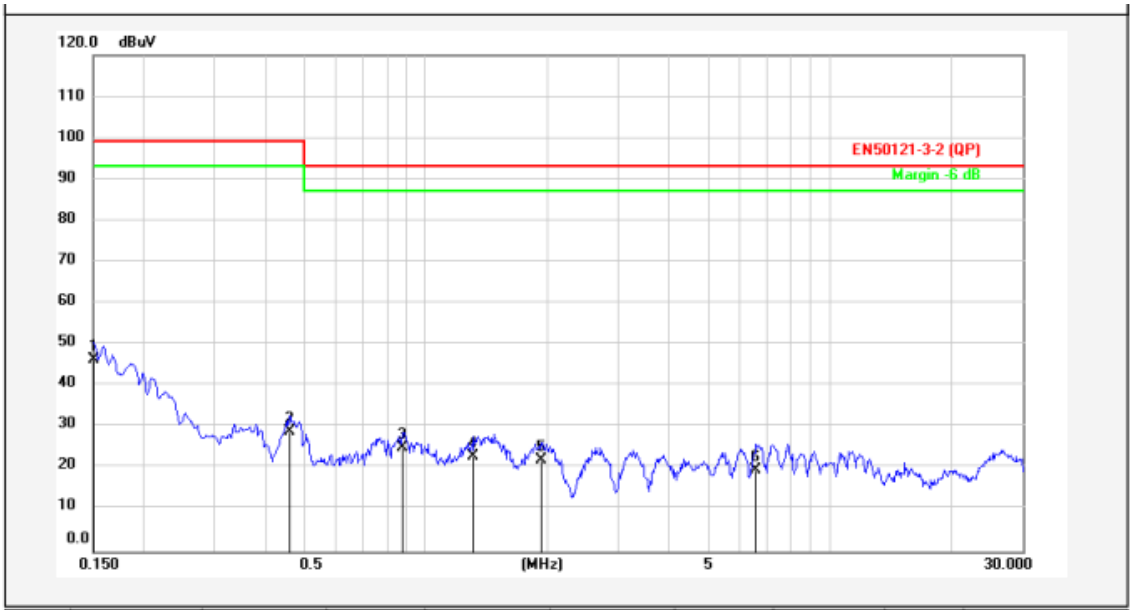
The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. #1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N.#2).This provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). The side of power line was checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to EN 50121-3-2 on conducted Disturbance test.

The bandwidth of the test receiver (R&S Test Receiver ESR) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

3.6 Test Data

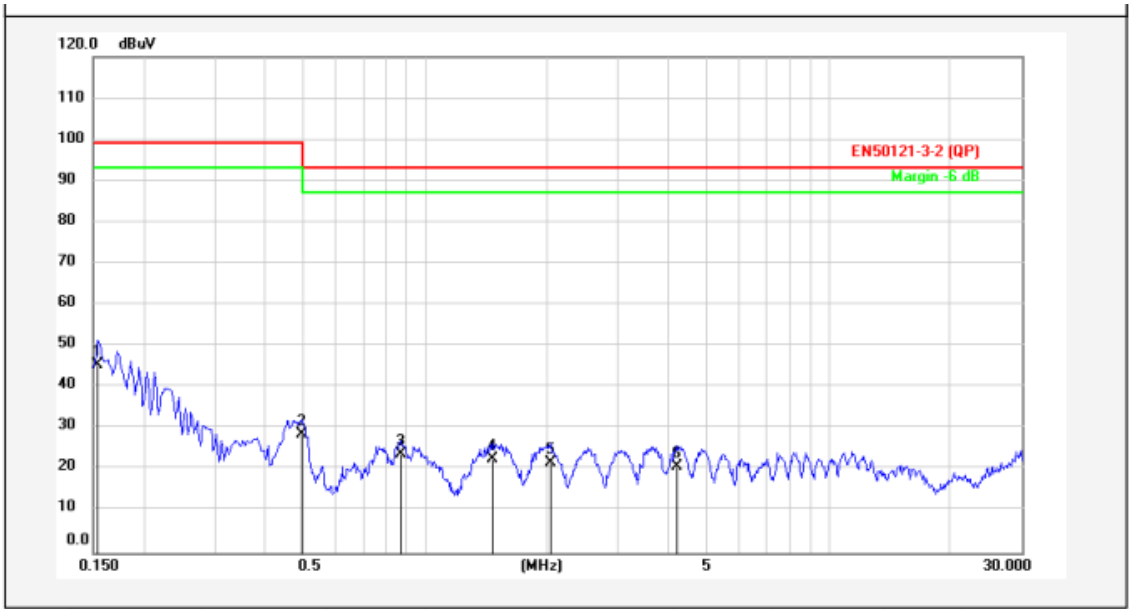
EUT:	LtAP mini LTE kit	Model Name:	RB912R-2nD-LTm&R11e-LTE
Test Mode:	Normal working	Test Date:	2020.09.15
Phase:	Live	Test Voltage:	AC 230V /50Hz
Operator:	Bing	Note:	



No.	Frequency (MHz)	Reading (dBuV)	Lisn/Isn (dB)	Cab_L (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	36.42	9.6	0.22	46.24	99.00	-52.76	QP	
2	0.4605	19.31	9.52	0.24	29.07	99.00	-69.93	QP	
3	0.8745	15.36	9.58	0.23	25.17	93.00	-67.83	QP	
4	1.3154	13.09	9.63	0.22	22.94	93.00	-70.06	QP	
5	1.9365	12.06	9.69	0.2	21.95	93.00	-71.05	QP	
6	6.5715	9.85	9.7	0.21	19.76	93.00	-73.24	QP	

Remarks: 1. Result=Reading+Lisn+Cab_L
2. If the average limit is met when using a quasi-peak detector.
the EUT shall be deemed to meet both limits and measurement
with average detctor is unnecessary.

EUT:	LtAP mini LTE kit	Model Name:	RB912R-2nD-LTm&R11e-LTE
Test Mode:	Normal working	Test Date:	2020.09.15
Phase:	Neutral	Test Voltage:	AC 230V /50Hz
Operator:	Bing	Note:	

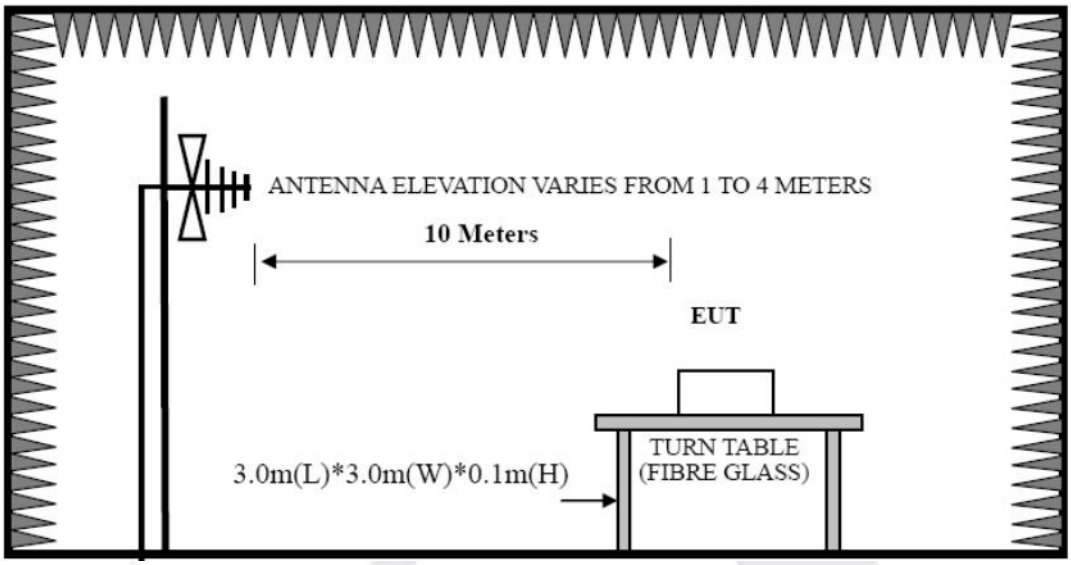


No.	Frequency (MHz)	Reading (dBuV)	Lisn/Isn (dB)	Cab_L (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1545	35.65	9.6	0.22	45.47	99.00	-53.53	QP	
2	0.4920	18.73	9.57	0.24	28.54	99.00	-70.46	QP	
3	0.8700	13.96	9.52	0.23	23.71	93.00	-69.29	QP	
4	1.4685	12.76	9.59	0.22	22.57	93.00	-70.43	QP	
5	2.0490	11.77	9.7	0.2	21.67	93.00	-71.33	QP	
6	4.2000	10.86	9.77	0.21	20.84	93.00	-72.16	QP	

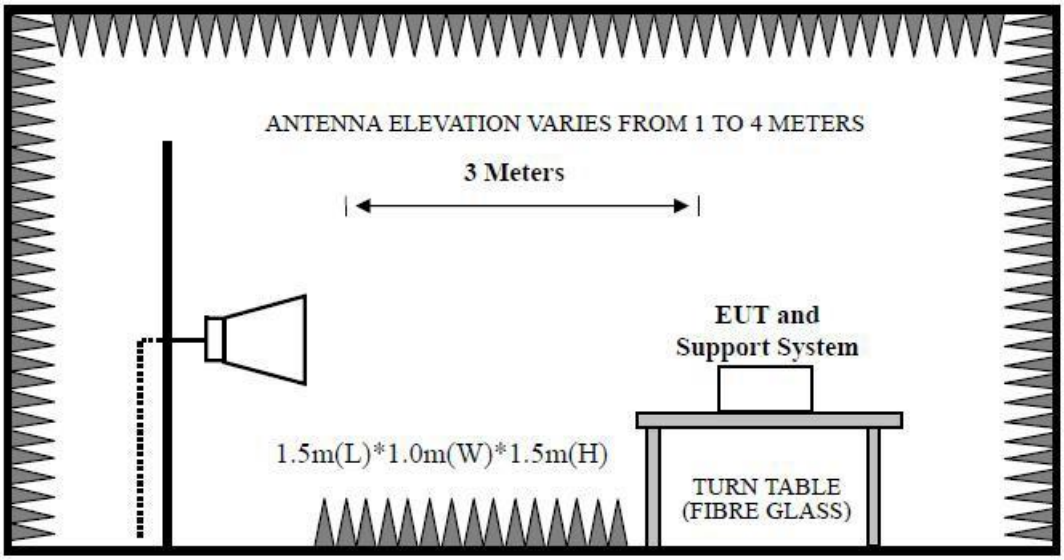
Remarks: 1. Result=Reading+Lisn+Cab_L
2. If the average limit is met when using a quasi-peak detector.
the EUT shall be deemed to meet both limits and measurement
with average detctor is unnecessary.

4 RADIATED EMISSION TEST

4.1 Block Diagram of Test Setup



Above 1GHz:



4.2 Test Standard

EN 50121-3-2:2016

EN 55011:2017

EN 61000-6-4:2007+A1:2011

4.3 Limits for radiated disturbance

Frequency(MHz)	EN 50121-3-2 (dBµV)	
	Q.P(Quasi-Peak)	A.V. (Average)
30~230	40	/
230~1000	47	/
1000~ 3000	76	56
3000~6000	80	60

4.4 Operating Condition of EUT

Test date	Ambient temperature	Relative humidity	Atmospheric pressure
Sep 11, 2020	24°C	67%	101.9kPa

4.5 Test Procedure

The EUT was placed on a turn table which was 0.8 m above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 10 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

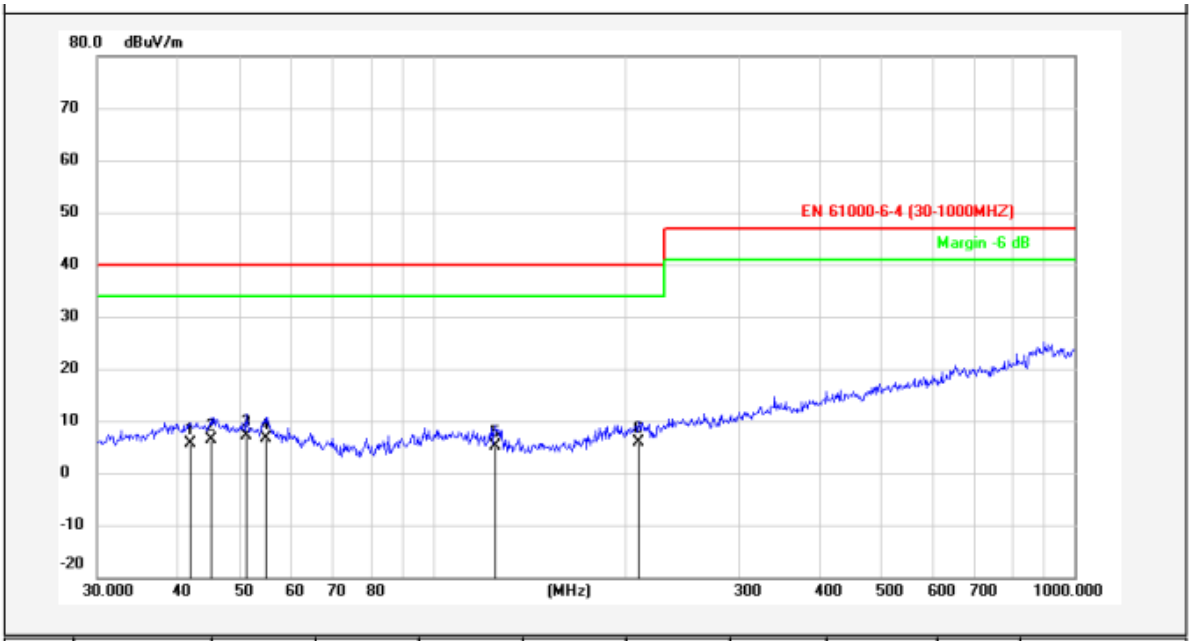
The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

The bandwidth setting on the test receiver was 120 kHz.

4.6 Test Data

(30Mhz-1000Mhz)

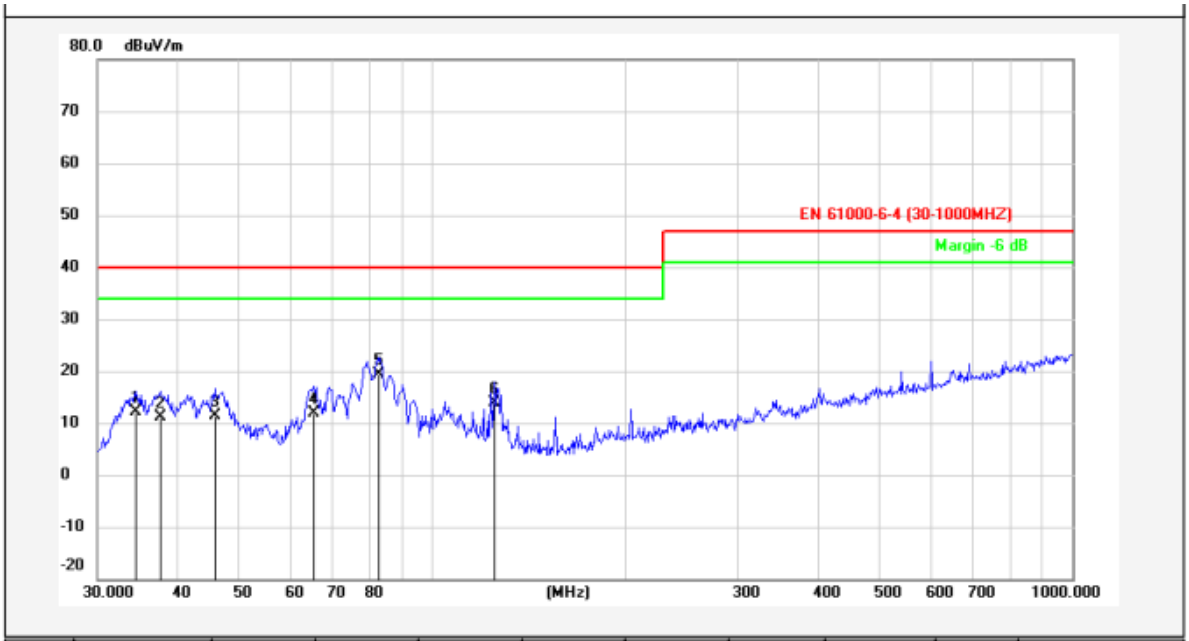
EUT:	LtAP mini LTE kit	Model Name:	RB912R-2nD-LTm&R11e-LTE
Test Mode:	Normal working	Test Date:	2020.09.11
Polarization:	Horizontal	Test Voltage:	AC 230V /50Hz
Operator:	Bing	Note:	



No.	Frequency (MHz)	Reading (dBuV/m)	Antenna. (dB/m)	Preamp. (dB)	Cable. (dB)	Result (dBuV/m)	Limit (dBuV/m	Margin (dB)	Detector	Remark
1	41.8596	21.34	13.52	30.54	1.38	5.70	40.00	-34.30	QP	
2	45.2165	21.46	13.96	30.52	1.4	6.30	40.00	-33.70	QP	
3	51.1208	22.29	13.96	30.48	1.43	7.20	40.00	-32.80	QP	
4	54.8348	22.02	13.69	30.45	1.44	6.70	40.00	-33.30	QP	
5	125.0066	23.40	9.9	29.99	1.79	5.10	40.00	-34.90	QP	
6	209.3129	21.91	11.56	29.75	2.08	5.80	40.00	-34.20	QP	

Remarks:1. Result=Reading+Antenna-Preamp+Cable
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

EUT:	LtAP mini LTE kit	Model Name:	RB912R-2nD-LTm&R11e-LTE
Test Mode:	Normal working(non-ground)	Test Date:	2020.09.11
Polarization:	Vertical	Test Voltage:	AC 230V /50Hz
Operator:	Bing	Note:	

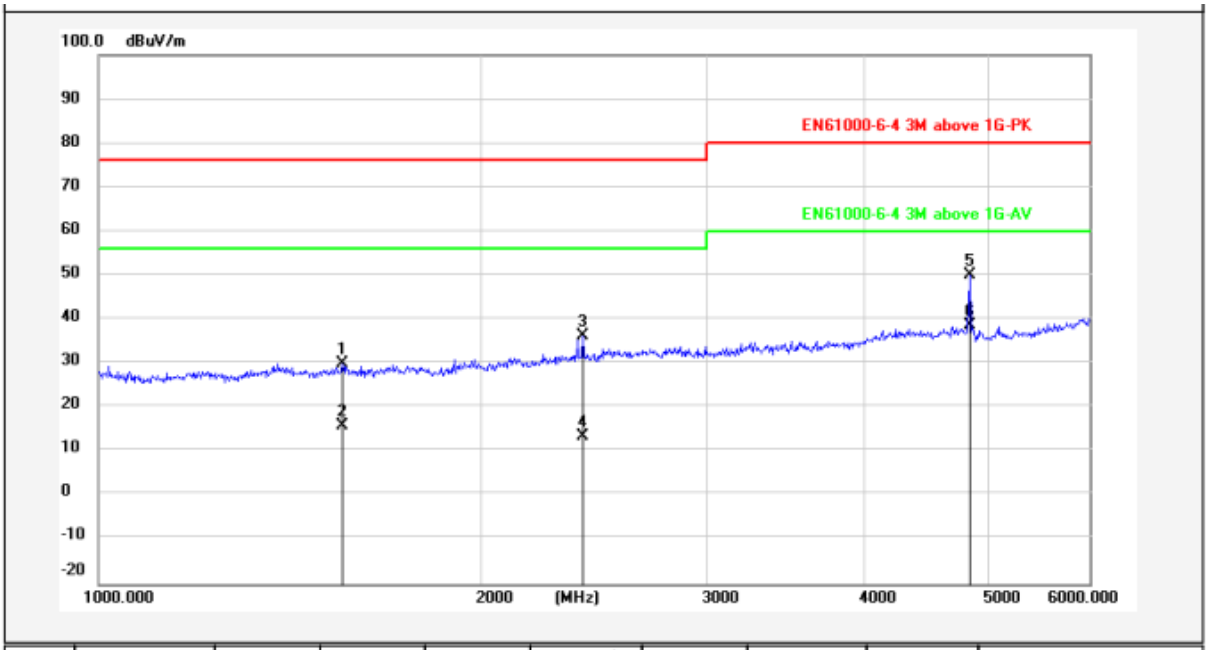


No.	Frequency (MHz)	Reading (dBuV/m)	Antenna. (dB/m)	Preamp. (dB)	Cable. (dB)	Result (dBuV/m)	Limit (dBuV/m	Margin (dB)	Detector	Remark
1	34.3962	29.80	11.64	30.6	1.26	12.10	40.00	-27.90	QP	
2	37.5478	27.45	12.9	30.57	1.32	11.10	40.00	-28.90	QP	
3	45.6948	26.65	13.86	30.51	1.4	11.40	40.00	-28.60	QP	
4	65.3431	30.30	10.63	30.39	1.46	12.00	40.00	-28.00	QP	
5	82.3588	39.47	8.88	30.3	1.45	19.50	40.00	-20.50	QP	
6	125.0066	32.20	9.9	29.99	1.79	13.90	40.00	-26.10	QP	

Remarks:1. Result=Reading+Antenna-Preamp+Cable
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

(1000Mhz-6000Mhz)

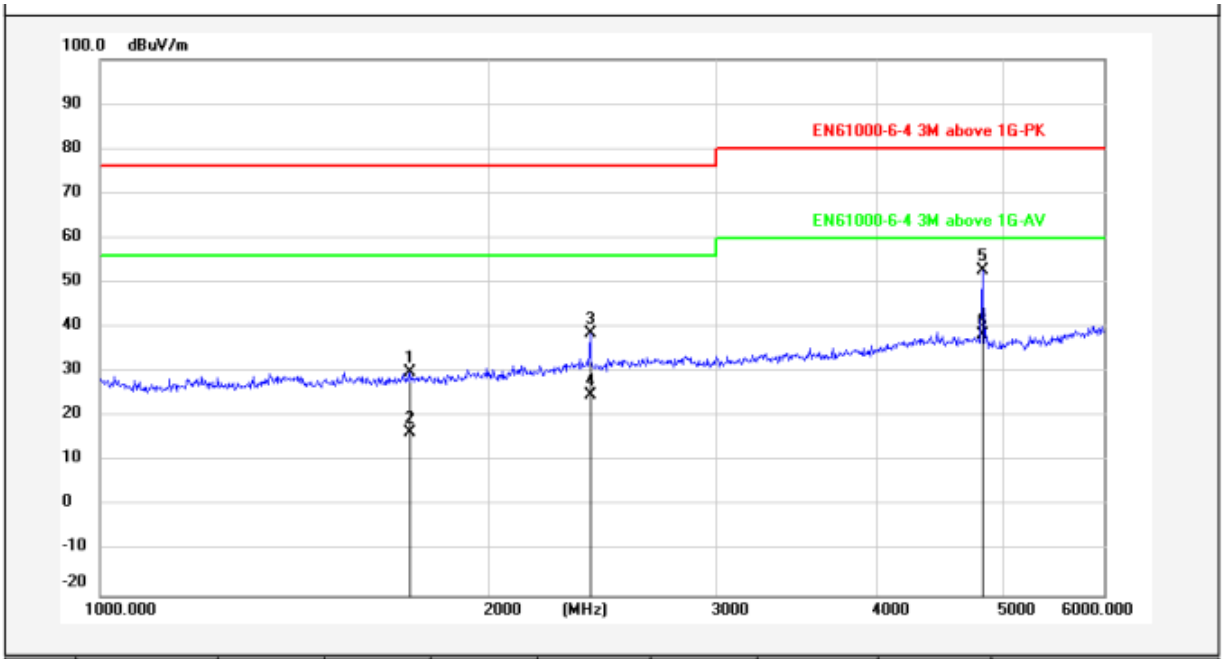
EUT:	LtAP mini LTE kit	Model Name:	RB912R-2nD-LTm&R11e-LTE
Test Mode:	Normal working	Test Date:	2020.09.11
Polarization:	Horizontal	Test Voltage:	AC 230V /50Hz
Operator:	Bing	Note:	



No.	Frequency (MHz)	Reading (dBuV/m)	Antenna. (dB/m)	Cable. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1553.908	39.13	24.95	-34.11	29.97	76.00	-46.03	peak	
2	1553.908	24.96	24.95	-34.11	15.80	56.00	-40.20	AVG	
3	2401.684	41.59	27.27	-32.5	36.36	76.00	-39.64	peak	
4	2401.684	18.63	27.27	-32.5	13.40	56.00	-42.60	AVG	
5	4830.532	48.73	31.26	-29.89	50.10	80.00	-29.90	peak	
6	4830.532	37.23	31.26	-29.89	38.60	60.00	-21.40	AVG	

Remarks:1. Result=Reading+Antenna+Cable

EUT:	LtAP mini LTE kit	Model Name:	RB912R-2nD-LTm&R11e-LTE
Test Mode:	Normal working(non-ground)	Test Date:	2020.09.11
Polarization:	Vertical	Test Voltage:	AC 230V /50Hz
Operator:	Bing	Note:	



No.	Frequency (MHz)	Reading (dBuV/m)	Antenna. (dB/m)	Cable. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1736.483	38.71	24.97	-33.7	29.98	76.00	-46.02	peak	
2	1736.483	25.23	24.97	-33.7	16.50	56.00	-39.50	AVG	
3	2397.385	44.03	27.25	-32.51	38.77	76.00	-37.23	peak	
4	2397.385	30.06	27.25	-32.51	24.80	56.00	-31.20	AVG	
5	4830.532	51.47	31.26	-29.89	52.84	80.00	-27.16	peak	
6	4830.532	36.83	31.26	-29.89	38.20	60.00	-21.80	AVG	

Remarks:1. Result=Reading+Antenna+Cable

5 IMMUNITY TEST RESULT

Description of Performance Criteria:

Performance criteria A

During and after the test the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criteria B

After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaces by a permissible loss of performance.

During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.

If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably except from the equipment if used as intended.

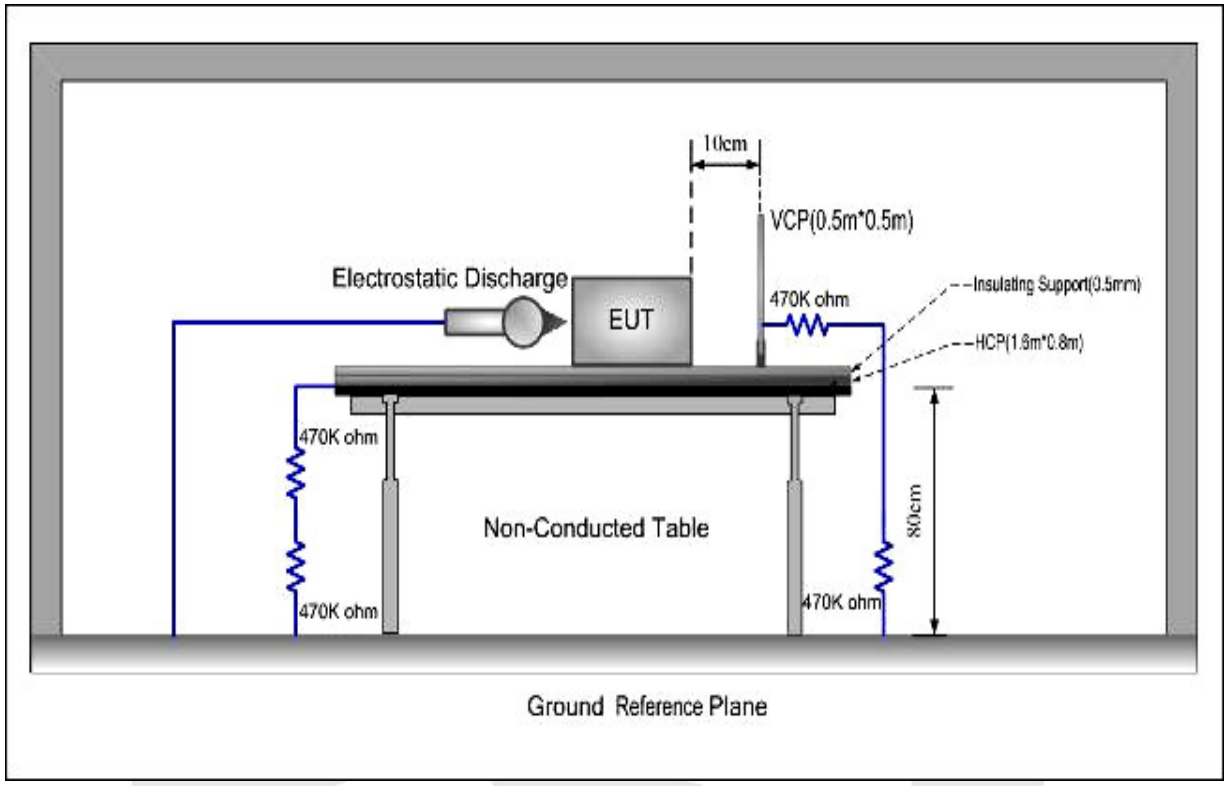
Performance criteria C

During and after testing, a temporary loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.

Functions, and/or information stored in non-volatile memory, or protected by a backup, shall not be lost.

6 ELECTROSTATIC DISCHARGE TEST

6.1 Block Diagram of Test Setup



6.2 Test Standard

EN 50121-3-2:2016 (EN 61000-4-2: 2009)

6.3 Severity Levels and Performance Criterion

Severity Levels	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)	Performance criterion
1.	2	2	A
2.	4	4	
3.	6	8	
4.	8	15	
x	Special	Special	

6.4 Operating Condition of EUT

Test date	Ambient temperature	Relative humidity	Atmospheric pressure
Sep 16, 2020	24°C	55%	100.7kPa

The details of test modes are as follows：

No.	Test Mode
1.	Normal working

6.5 Test Procedure

6.5.1 Air Discharge:

The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 20 times for each pre-selected test point. This procedure was repeated until all the air discharge completed.

6.5.2 Contact Discharge:

All the procedure was same as Section 8.5.1. except that the generator was re-triggered for a new single discharge and repearted 10 times for each pre-selected test point. The tip of the discharge electrode was touch the EUT before the discharge switch was operated.

6.5.3 Indirect discharge for horizontal coupling plane

At least 20 single discharges were applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

6.5.4 Indirect discharge for vertical coupling plane

At least 20 single discharge were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, was placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

6.6 Test Data

Electrostatic Discharge Test Results

Discharge Location		Type of discharge	Result
HCP	4 points	Contact	Pass
VCP	4 points	Contact	Pass
Crust	2 points	Contact	Pass
Screw	10 points	Contact	Pass
Ports	10 points	Contact	Pass
Gap	10 points	Air	Pass

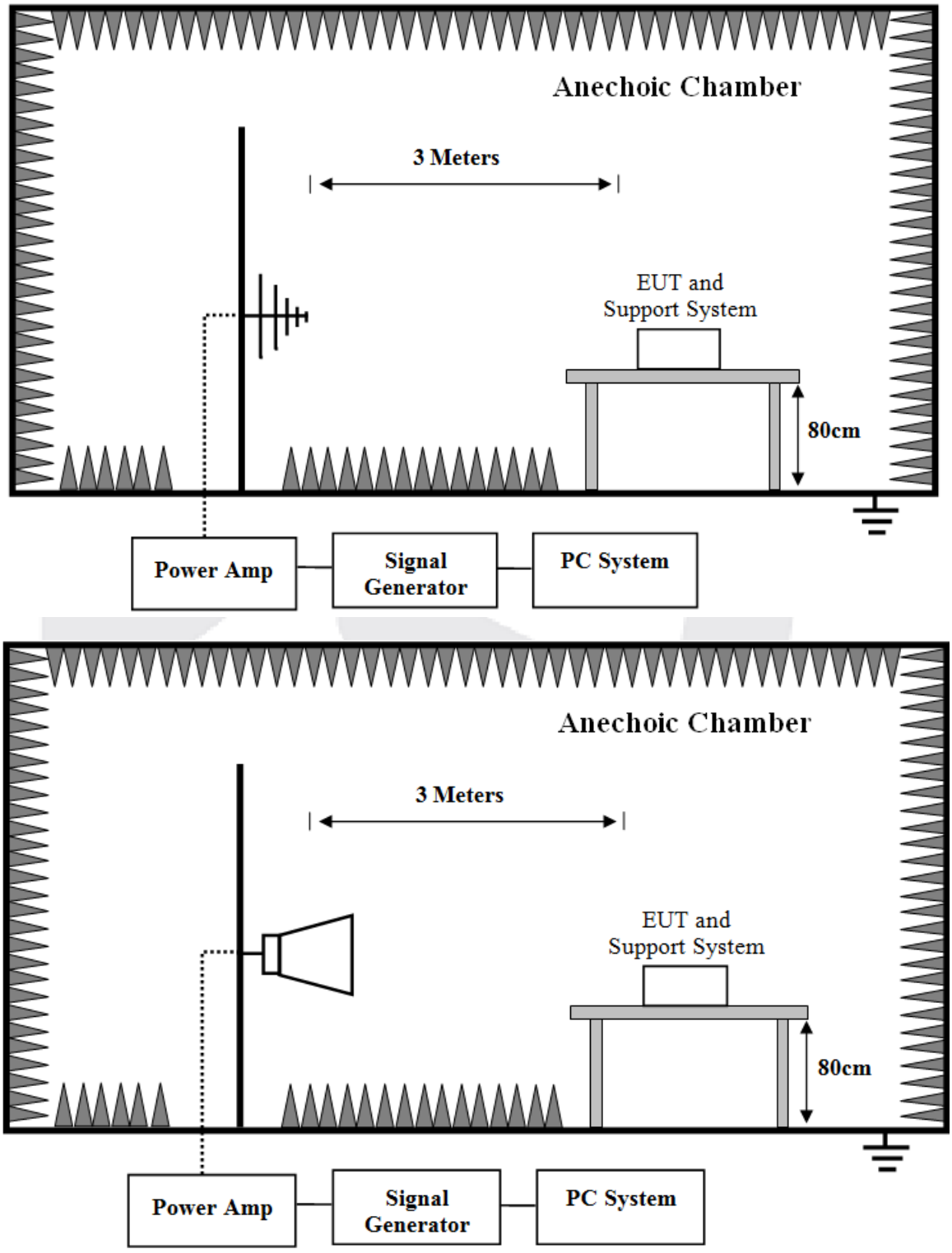
Remark: 1. There was no change compared with initial operation during the test.

2. Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

3. only test points accessible to passengers and staff (non-maintenance) are

7 Radio Frequency Electromagnetic Field Immunity Test

7.1 Block Diagram of Test Setup



7.2 Test Standard

EN 50121-3-2:2016 (EN 61000-4-3:2010),

Radio Frequency Electromagnetic Field Immunity Test levels

Level	Test field strength V/m
1	1
2	3
3	10
4	30
X	Special
Note: X is an opoen test level and the associated field strength may be any value. This level may be given in the product standard.	

7.3 Operating Condition of EUT

The details of test modes are as follows：

No.	Test Mode
1.	Normal working

7.4 Test Procedure

The field sensor is placed on the EUT table (0.8 meter above the ground) which is 3 meters away from the transmitting antenna. Through the signal generator, power amplifier and transmitting antenna to produce a uniformity field strength (3V/m measured by field sensor) around the EUT table from frequency range specified and records the signal generator‘s output level at the same time for whole measured frequency range. Then, put EUT and its simulators on the EUT turn table and keep them 3 meters away from the transmitting antenna which is mounted on an antenna tower and fixes at 1 meter height above the ground. Using the recorded signal generator’s output level to measure the EUT from frequency range specified and both horizontal & vertical polarization of antenna must be set and measured. Each of the four sides of EUT must be faced this transmitting antenna and measures individually.

7.5 Test Data

Radio-frequency Continuous radiated disturbance Test Results

EUT: LtAP mini LTE kit	Temperature: 24℃
M/N: RB912R-2nD-LTm&R11e-LTE	Humidity: 55%
Test Voltage: AC 230V/50Hz	Test Date: 2020.09.16
Test Engineer: BING	Pressure: 100.7KPa
Required Performance: A	Actual Performance: A
Test Level: 80-800MHz, 800-1000MHz :20V/m; 1400-2000MHz :10V/m; 2000-2700MHz :5V/m; 5100-6000MHz :3V/m	
Modulation: ☒ AM ☐ Pulse ☐ none 1 kHz 80%	

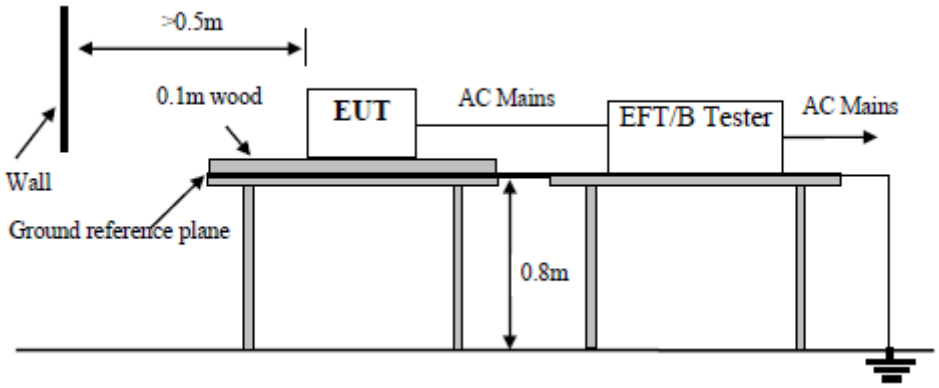
EUT Position	Frequency Rage:80-800MHz;800-1000MHz;1400-2000MHz;2000-2700MHz; 5100-6000MHz				
	Polarization: Horizontal		Polarization: Vertical		Result
	Required	Observation	Required	Observation	(Pass / Fail)
Front	A	A	A	A	Pass
Right	A	A	A	A	Pass
Rear	A	A	A	A	Pass
Left	A	A	A	A	Pass

Performance:

The EUT was no change compared with initial operation during the test.

8 ELECTRICAL FAST TRANSIENT/BURST TEST

8.1 . Block Diagram of Test Setup



8.2 Test Standard

EN 50121-3-2:2016 (EN 61000-4-4: 2012)

8.3 Severity Levels and Performance Criterion

Open Circuit Output Test Voltage ±10%			
Severity Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines	Performance criterion
1.	0.5KV	0.25KV	A
2.	1KV	0.5KV	
3.	2KV	1KV	
4.	4KV	2KV	
X	Special	Special	
The use of 5 kHz repetition frequency is traditional, however, 100 kHz is closer to reality. Product committees should determine which frequencies are relevant for specific products or product types. With some products, there may be no clear distinction between power ports and signal ports, in which case it is up to product committees to make this determination for test purposes.			
a "X" can be any level, above, below or in between the others. The level shall be specified in the dedicated equipment specification.			

8.4 Operating Condition of EUT

The details of test modes are as follows：

No.	Test Mode
1.	Normal working

8.5 Test Procedure

The EUT and its simulators were placed on a ground reference plane and were insulated from it by a wood support 0.1m + 0.01m thick. The ground reference plane was 1m*1m metallic sheet with 0.65mm minimum thickness. This reference ground plane was project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane was more than 0.5m. The length of signal and power cable between EUT and EFT generator was 0.5m. All cables to the EUT was placed on the wood support, cables not subject to EFT/B was routed as far as possible from the cable under test to minimize the coupling between the cables.

8.6 Test Data

Electrical fast transient Test Results

EUT	: LtAP mini LTE kit	Temperature	: 24℃
M/N	: RB912R-2nD-LTm&R11e-LTE	Humidity	: 55%
Test Voltage	: AC 230V/50Hz	Test Date	: 2020.09.16
Test Engineer	: BING	Pressure	: 100.7kPa
Required Performance	: A	Actual Performance	: A

Repetition Frequency : 5 kHz	Burst Duration : 15ms	Burst Period: 300ms
Inject Time(s): 120s	Inject Method: Direct	Inject Line: AC Mains

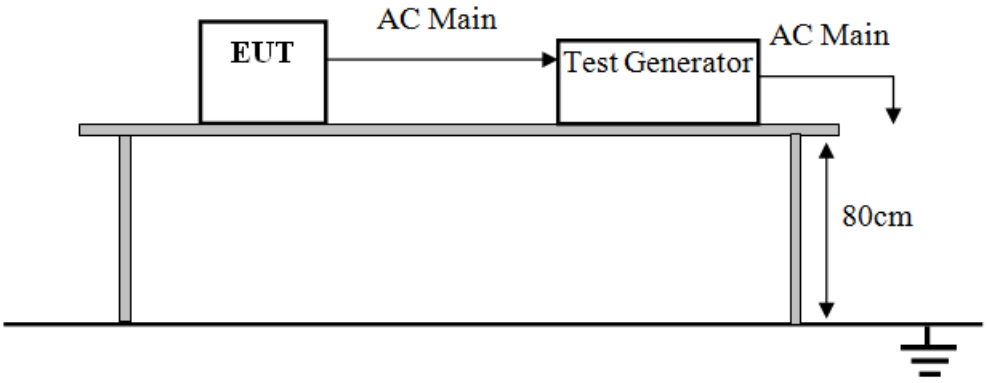
Line	Test Voltage	Performance		Result
		Required	Observation	(Pass/Fail)
L1	±2.0kV	A	A	Pass
N	±2.0kV	A	A	Pass
L1+N	±2.0kV	A	A	Pass
Signal Line	±2.0kV	A	A	Pass

Performance:

There was no change compared with initial operation during the test.

9 SURGE TEST

9.1 Block Diagram of Test Setup



9.2 Test Standard

EN 50121-3-2:2016 (EN 61000-4-5:2014/A1:2017)

9.3 Severity Levels and Performance Criterion

Severity Level	Lines- Lines	Lines-PE	Performance criterion
1.	--	--	A
2.	0.5	1	
3.	1	2	
4.	2	4	
X	Special	Special	

9.4 Operating Condition of EUT

The details of test modes are as follows：

No.	Test Mode
1.	Normal working

9.5 Test Data

Surge Immunity Test Results

EUT: LtAP mini LTE kit	Temperature: 24℃
M/N: RB912R-2nD-LTm&R11e-LTE	Humidity: 55%
Test Voltage: AC 230V/50Hz	Test Date: 2020.09.16
Test Engineer: BING	Pressure: 100.7KPa
Required Performance: A	Actual Performance: A
Counts of pulse: +5 times, -5 times	Interval: 60 Seconds
Line : ■ AC Mains □ DC Supply □ Signal :WAN & LAN Port	

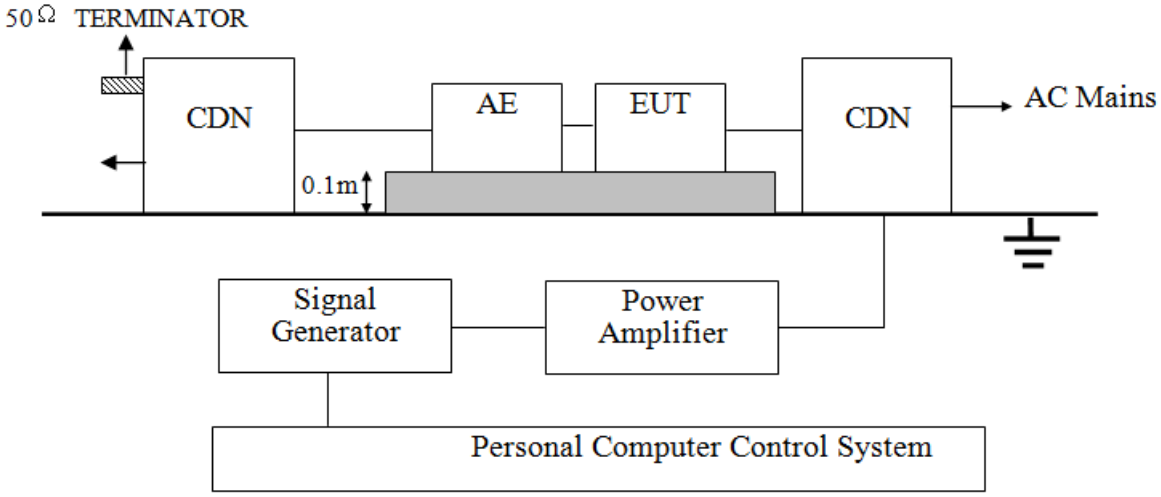
Location	Volt	500V			1kV			2kV			Result
	Phase	Performance			Performance			Performance			(Pass/Fail)
		Required	+	-	Required	+	-	Required	+	-	
L1-N	0°	/	/	/	A	A	A	/	/	/	Pass
L1-PE	/	/	/	/	/	/	/	/	/	/	/
N-PE	/	/	/	/	/	/	/	/	/	/	/

Performance:

There was no change compared with initial operation during the test.

10 Injected Currents Susceptibility TEST

10.1 Block Diagram of Test Setup



10.2 Test Standard

EN 50121-3-2:2016(EN 61000-4-6:2014/A1:2015)

10.3 Severity Levels and Performance Criterion

Severity Level	Open circuit test voltageCe.m.f.)		
	dBμV	V	Performance criterion
1.	120	1	A
2.	130	3	
3.	140	10	
X	Special	Special	

10.4 Operating Condition of EUT

The details of test modes are as follows：

No.	Test Mode
1.	Normal working

10.5 Test Procedure

The EUT were placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) was placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT were as short as possible, and their height above the ground reference plane were between 30 and 50 mm (where possible).

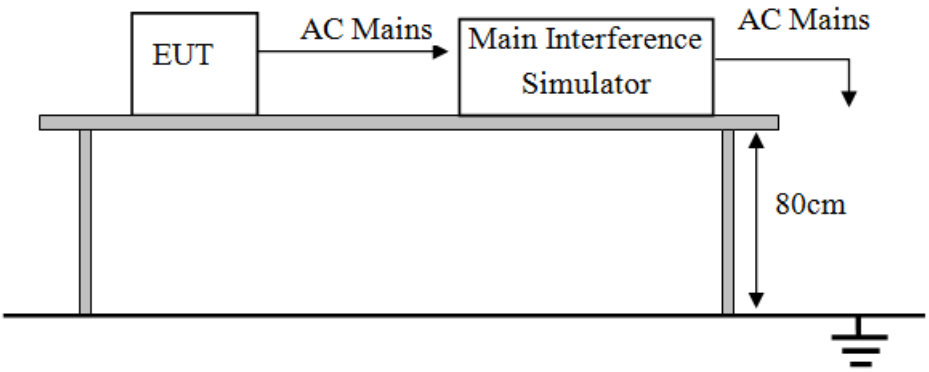
10.6 Test Data

Radio-frequency Continuous conducted disturbance Test Results

EUT: LtAP mini LTE kit			Temperature: 24℃		
M/N: RB912R-2nD-LTm&R11e-LTE			Humidity: 55%		
Test Voltage: AC 230V/50Hz			Test Date: 2020.09.16		
Test Engineer: BING			Pressure: 101.0KPa		
Required Performance: A			Actual Performance: A		
Modulation Signal: 1kHz, 80% AM					
Frequency Range	Injected Position	Voltage Level (r.m.s)	Required	Observation	Result (Pass / Fail)
0.15 - 80	AC mains	10V	A	A	PASS
0.15 - 80	Signal Line	10V	A	A	PASS
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
/	/	/	/	/	/
Performance: There was no change compared with initial operation during the test.					

11 VOLTAGE DIPS AND INTERRUPTIONS TEST

11.1 Block Diagram of Test Setup



11.2 Test Standard

EN 50155:2007

11.3 Severity Levels and Performance Criterion

Severity Level	Voltage fluctuation and short - term interruption test
0%Un	The input voltage is interrupted for 10ms
0.7Un	minimum voltage
1.25Un	max voltage
0.6~1.4Un	Voltagefluctuationnotexceeding0.1sshouldnot cause functional abnormalities
1.25~1.4Un	Voltage fluctuations up to 1s should not cause damage and allow for functional degradation

Overvoltage test			
Test Voltage	Up/down time (s)	Continuous time(s)	Series resistance CQ,tolerance± 10%)
1.4Un	0.1	1.0	1

11.4 Operating Condition of EUT

The details of test modes are as follows:

No.	Test Mode
1.	Normal working

11.5 Test Procedure

1) The interruptions are introduced at selected phase angles with specified duration.
2) Record any degradation of performance.

11.6 Test Data

Voltage Dips and Short Interruptions Immunity Test Result AC 230V/50Hz

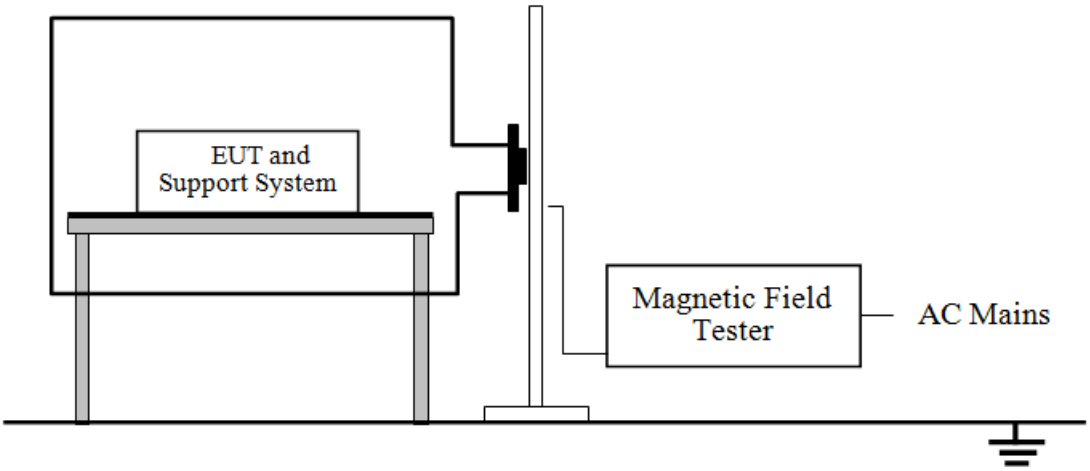
EUT	: LtAP mini LTE kit	Temperature	: 24℃
M/N	: RB912R-2nD-LTm&R11e-LTE	Humidity	: 55%
Test Voltage	: AC 230V	Test Date	: 2020.09.16
Test Engineer	: BING	Test Mode	: Normalworking

Test Items	Test results
Short-time interruption	No abnormality can be maintained in normal working state after testing and testing, which satisfies performance grade A
voltage fluctuation	No abnormality can be maintained in normal working state after testing and testing, which satisfies performance grade A
Overvoltage	No abnormality can be maintained in normal working state after testing and testing, which satisfies performance grade A

Remark: The EUT was Stopped during the test, but self-recoverable after the test

12 Power Frequency Magnetic Field Immunity Test

12.1 Block Diagram of Test Setup



12.2 Test Standard

EN 61000-4-8: 2010

12.3 Severity Levels and Performance Criterion

Severity Level	Magnetic field intensity A/m		Performance criterion
	Continuous magnetic field	1~3s Transient magnetic field	
1.	1	--	A
2.	3	--	
3.	10	--	
4.	30	100	
5.	100	1000	
X	Special	Special	

12.4 Operating Condition of EUT

The details of test modes are as follows：

No.	Test Mode
1.	Normal working

12.5 Test Procedure

The EUT was subjected to the test magnetic field by using the induction coil of standard dimensions (1m*1m). The induction coil then was rotated by 90°in order to expose the EUT to the test field with different orientations

12.6 Test Data

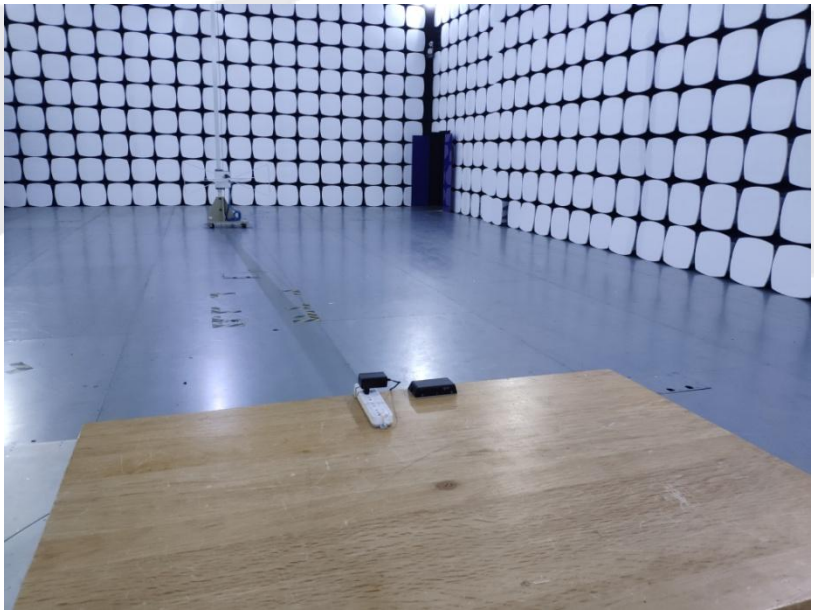
EUT : LtAP mini LTE kit				Temperature: : 24.4℃		
M/N : RB912R-2nD-LTm&R11e-LTE				Humidity: : 55%		
Test Voltage: : AC 230V/50Hz				Test Date: : 2020-09-16		
Test Engineer: : BING				Pressure: : 100.7 KPa		
Coil Orientation	Continuous magnetic field (A/m)	frequency (Hz)	Testing Duration	Performance		Result
				Required	Observation	(Pass / Fail)
X	30	50	30s	A	A	Pass
Y	30	50	30s	A	A	Pass
Z	30	50	30s	A	A	Pass
Coil Orientation	Transient magnetic field (A/m)	frequency (Hz)	Testing Duration	Performance		Result
				Required	Observation	(Pass / Fail)
X	300	50	3s	A	A	Pass
Y	300	50	3s	A	A	Pass
Z	300	50	3s	A	A	Pass

13 Test setup photo

Conducted disturbance at mains terminals Test

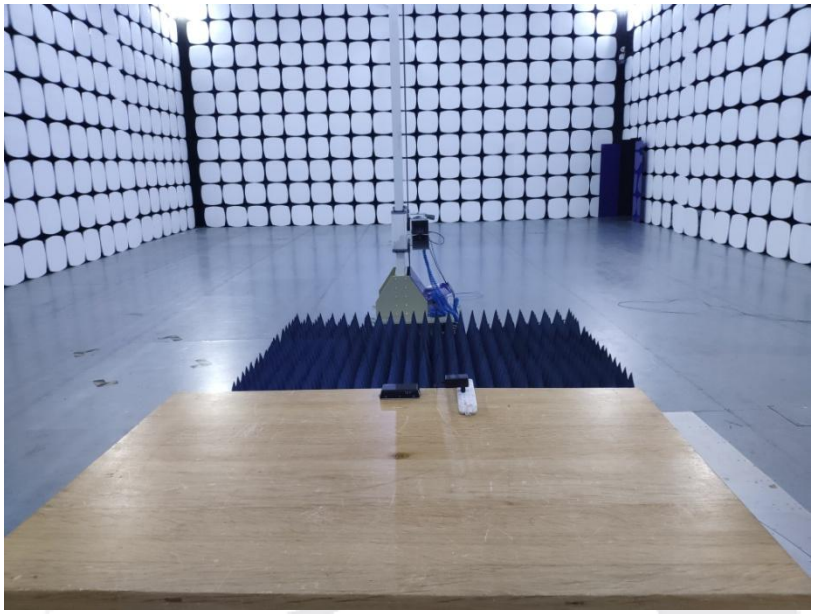
Radiated Disturbance Test

30-1000MHz



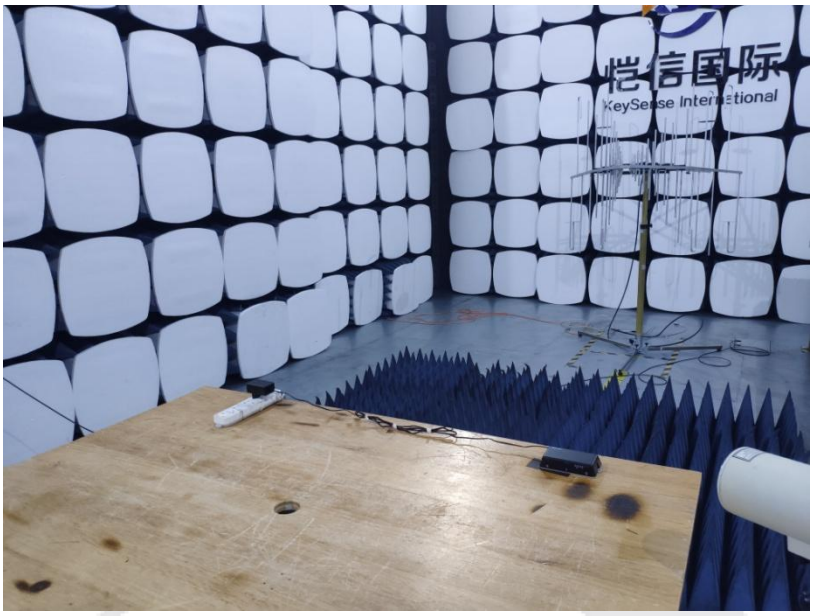
Radiated Disturbance Test

1000-6000MHz

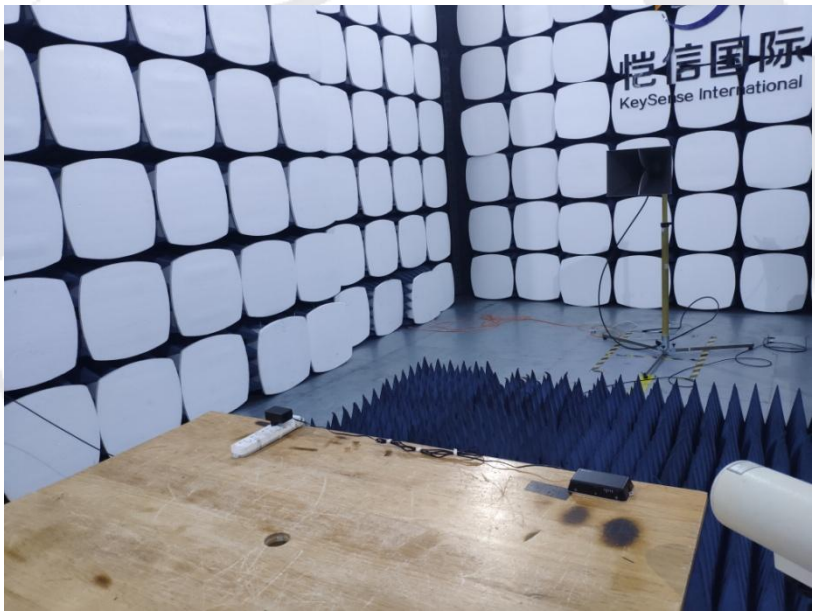


Electrostatic discharge Test

Radio-frequency Continuous radiated disturbance Test(80MHz-1000MHz)



Radio-frequency Continuous radiated disturbance Test(above 1000MHz)

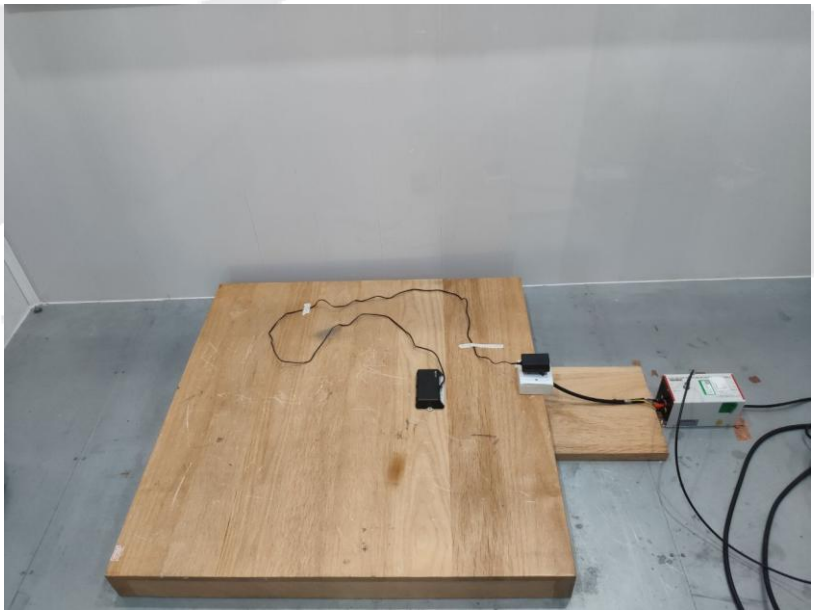


Electrical fast transient Test (Power terminal)

Electrical fast transient Test (Signal lines)

Surge Test

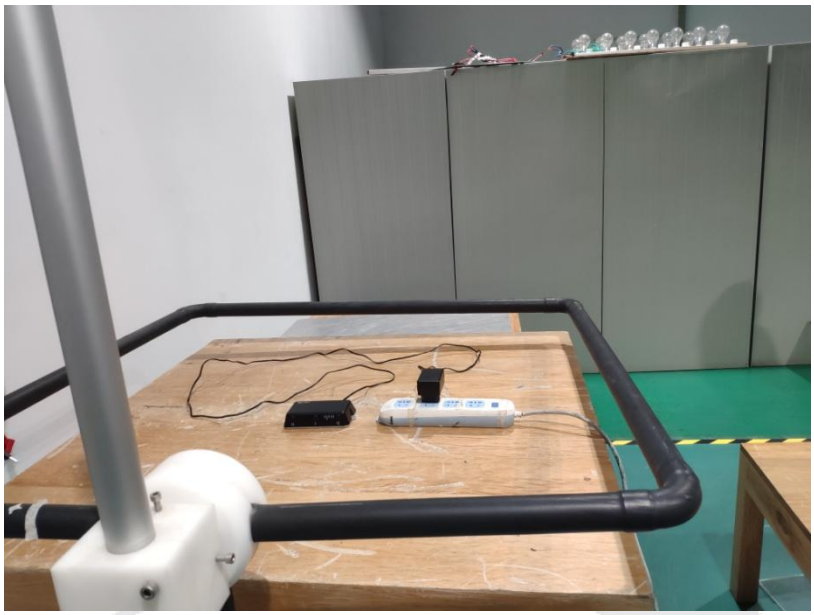
Radio-frequency Continuous conducted disturbance Test(Power terminal)



Radio-frequency Continuous conducted disturbance Test(Signal lines)

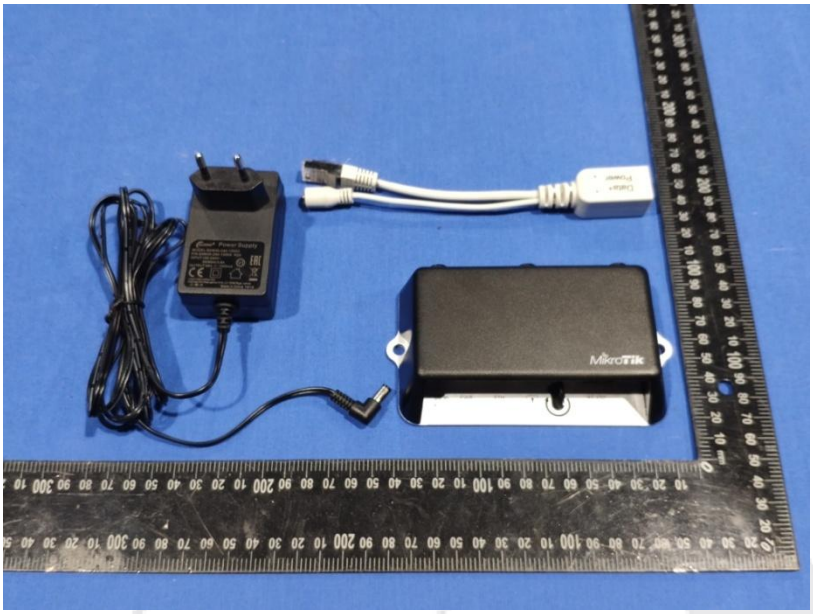
Voltage dips & interruption Test

Power frequency magnetic Test

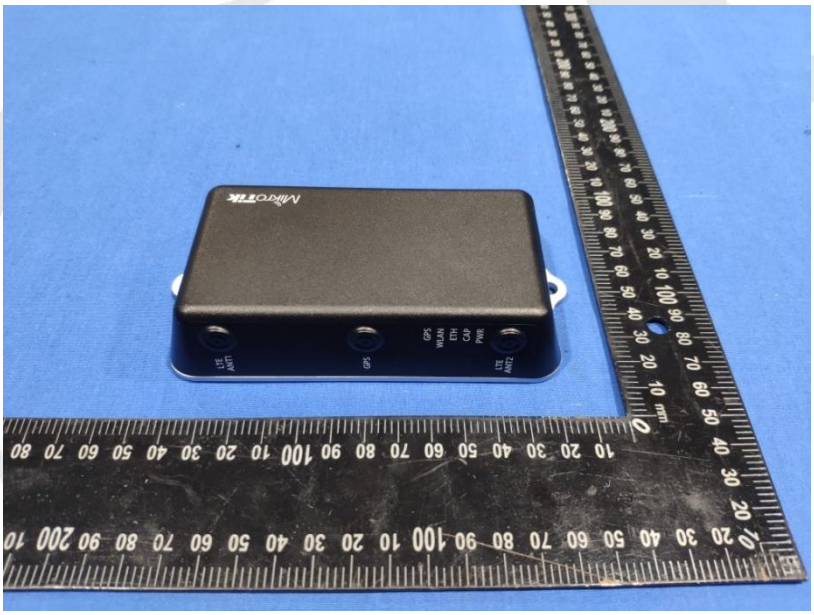


14 PHOTOS OF THE EUT

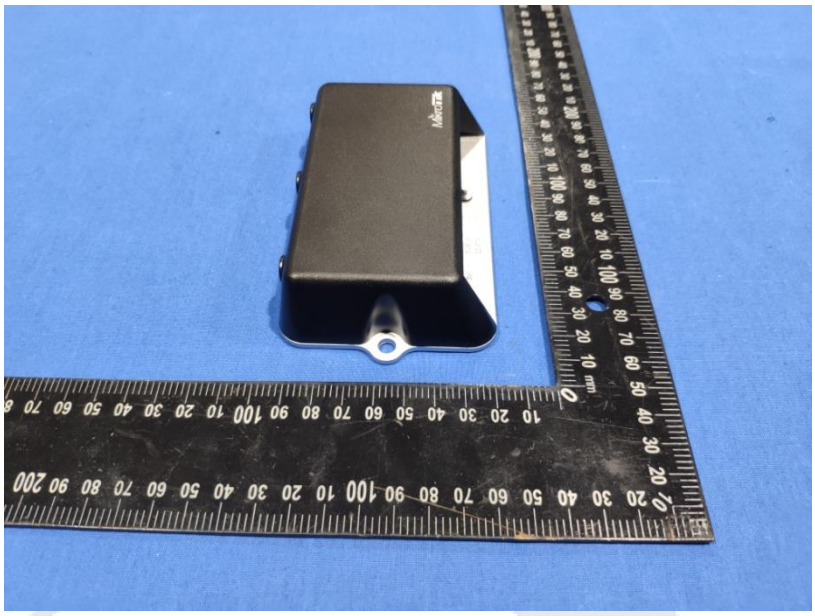
External photos

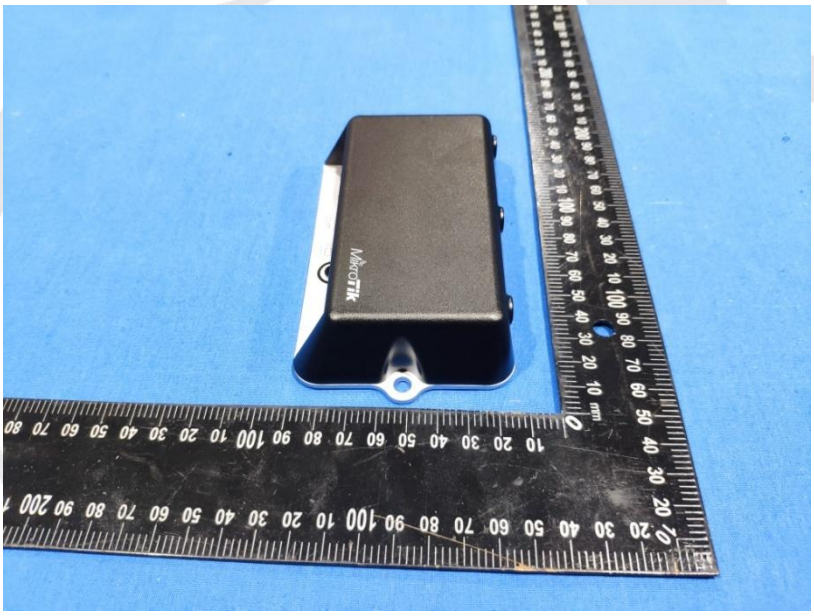


External photos



External photos





Adapter photos

End of Report

Statement

1. The calibration and measurement of test equipments used in our laboratory are traceable to National primary standard of measurement and BIPM.
2. The report is invalid without the special test seal of the company.
3. The test report is invalid without the signature of main tester,examiner and approver.
4. The report is invalid if altered and added or deleted.
5. The test results in this report only apply to the tested samples.
6. This test report shall not be reproduced except in full, without the written approval of our laboratory.
7. “☆”item cannot be Accredited by CNAS.
8. Any objections must be raised to KeySense within 15days since the date when report is received.

Test Laboratory: KeySense Testing & Certification International Co., Ltd.

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Postcode: 516006 Fax: 0752-3219929

Tel: 0752-3219929 E-mail: keysense@kst-cert.com