

RED-EMC Test Report

For

MAXIIOT LTD

LoRaWAN

Model No.: DL7612-EX

Prepared For : MAXIIOT LTD

Address : No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680

Prepared By : Shenzhen Anbotech Compliance Laboratory Limited

Address : 1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

Tel: (86) 755-26066440 Fax: (86) 755-26014772

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TEST REPORT

Applicant : MAXIIOT LTD
Manufacturer : MAXIIOT LTD
Product Name : LoRaWAN
Model No. : DL7612-EX
Trade Mark : MAXIIOT
Rating(s) : Input: DC 3.3V, 1A

Test Standard(s) : **Draft ETSI EN 301 489-1 V2.2.0 (2017-03)**
EN 55032: 2015
EN 55035: 2017
Final draft ETSI EN 301 489-3 V2.1.1 (2017-03)

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 301 489-1, EN 301 489-3 & EN 55032 and EN 55035 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

Date of Test

Jun. 22~Nov. 06, 2018

Prepared By



(Engineer / Oliay Yang)

Reviewer

(Supervisor / Snowy Meng)

Approved & Authorized Signer

(Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680
Manufacturer	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680
Factory	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680

1.2. Description of Device (EUT)

Product Name	:	LoRaWAN
Model No.	:	DL7612-EX
Trade Mark	:	MAXIIOT
Test Power Supply	:	TX & RX: DC 3.3V
Test Sample No.	:	S1(Normal Sample), S2(Engineering Sample)
Product Description	Operation Frequency:	868-868.6MHz
	Number of Channel:	6 Channels
	Modulation Type:	OOK
	Software Version:	V1.0
	Hardware Version:	V1.0
	Antenna Type:	Cylindrical Antenna
	Antenna Gain(Peak):	5 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		

1.3. Auxiliary Equipment Used During Test

Notebook	:	Manufacturer: FUJITSU LIMITED M/N: LH531 S/N: 518127-01R2300775 DC Rating: DC 19V, 4.22A CE , FCC DOC, CCC
		Adapter: M/N: ADP-602HA Input: 100V-240V~ 50/60Hz, 1.5A Output: DC 19V, 3.16A

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode

For Conducted Emission	
Final Test Mode	Description
Mode 1	TX Mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX Mode

1.5. Test Equipment List

Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 17, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 17, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 17, 2017	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A

Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 17, 2017	1 Year
2.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 20, 2017	1 Year
3.	Pre-amplifier	SONOMA	310N	186860	Nov. 17, 2017	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A
5.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 17, 2017	1 Year
6.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 17, 2017	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2017	1 Year

Electrostatic Discharge Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Simulators	3Ctest	ESD-30T	ES0131505	Nov. 17, 2017	1 Year

R/S Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Signal Generator	Agilent	N5182A	MY48180656	Nov. 17, 2017	1 Year
2	Amplifier	Amplifier Research	150W1000M3	309410	N/A	N/A
3	Amplifier	Amplifier Research	60S1G3	309433	N/A	N/A
4	Log-Periodic Antenna	Schwarzbeck	VULP9118E	00992	Aug. 17, 2018	3 Year
5	Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 18, 2017	3 Year
6	Power Sensor	Agilent	E9301A	MY41498906	N/A	N/A
7	Power Sensor	Agilent	E9301A	MY41498088	N/A	N/A
8	Power Meter	Agilent	E4419B	GB40202909	N/A	N/A
9	Field Probe	ETS-Lindgren	HI-6006	00212747	Apr. 20, 2017	3 Year
10	software	EMtrace	EM 3	N/A	N/A	N/A

1.6. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

Shenzhen Anbotech Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

1.7. Performance Criteria

1.7.1. For EMS Test:

- ✓ A: Normal performance within the specification limits;
- ✓ B: Temporary degradation or loss of function or performance which is self-recoverable;
- ✓ C: Temporary degradation or loss of function or performance which requires operator intervention or system reset;
- ✓ D: Degradation or loss of function which is not recoverable due to damage of equipment (components) or software, or loss of data

Note: The manufacturer's specification may define effects on the EUT which may be considered insignificant, and therefore acceptable.

This classification may be used as a guide in formulating performance criteria, by committees responsible for generic, product and product-family standards, or as a framework for the agreement on performance criteria between the manufacturer and the purchaser, for example where no suitable generic, product or product-family standard exists.

1.7.2. For EN 301 489-3:

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

Table 1: Performance criteria

Criteria	During test	After test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).
<p>NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p>NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p>NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p>		

Performance criteria for Continuous phenomena applied to Transmitters (CT)

The performance criteria A shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Transmitters (TT)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Continuous phenomena applied to Receivers (CR)

The performance criteria A shall apply. Where the EUT is a transceiver, under no circumstances, shall the

transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Receivers (TR)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Continuous phenomena applied to Transmitters (CT)

A communication link shall be established at the start of the test, and maintained during the test, see clauses 4.2.3 and 4.2.4.

During the test, the uplink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high level background noise present the filter bandwidth can be reduced down to a minimum of 40 Hz.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained. In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.

Performance criteria for Transient phenomena applied to Transmitters (TT)

A communications link shall be established at the start of the test, see appropriate clauses 4.2 to 4.2.4.

At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link. At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained. In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.

Performance criteria for Continuous phenomena applied to Receivers (CR)

A communications link shall be established at the start of the test, see appropriate clauses 4.2 to 4.2.6.

During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence.

During the test, the downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high level background noise present the filter bandwidth can be reduced down to a minimum of 40 Hz. At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained.

Performance criteria for Transient phenomena applied to Receivers (TR)

A communications link shall be established at the start of the test, see appropriate clauses 4.2. to 4.2.6.

At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link. At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained.

2. Summary of Test Results

EMC Emission				
Test Items	Standard	Basic Standard	Limit	Results
Conducted Emission	ETSI EN 301 489-1 V2.2.0 Clause 8.3 & 8.4	EN 55032: 2015	Class B	PASS
Radiated Emission	ETSI EN 301 489-1 V2.2.0 Clause 8.2	EN 55032: 2015	Class B	PASS
Harmonic Current Emission	ETSI EN 301 489-1 V2.2.0 Clause 8.5	EN 61000-3-2: 2014	Class A	N/A
Voltage Fluctuations& Flicker	ETSI EN 301 489-1 V2.2.0 Clause 8.6	EN 61000-3-3: 2013	/	N/A
EMC Immunity				
Test Items	Standard	Basic Standard	Performance Criteria	Results
Electrostatic Discharge	ETSI EN 301 489-1 V2.2.0 Clause 9.3	EN 61000-4-2 :2009	B	PASS
RF Electromagnetic Field	ETSI EN 301 489-1 V2.2.0 Clause 9.2	EN 61000-4-3: 2006 +A1: 2008+A2: 2010	A	PASS
Fast transients, common mode	ETSI EN 301 489-1 V2.2.0 Clause 9.4	EN 61000-4-4: 2012	B	N/A
Surges	ETSI EN 301 489-1 V2.2.0 Clause 9.8	EN 61000-4-5: 2014+A1: 2017	B	N/A
Radio frequency, common mode	ETSI EN 301 489-1 V2.2.0 Clause 9.5	EN 61000-4-6: 2014	A	N/A
Volt. Interruptions Volt. Dips	ETSI EN 301 489-1 V2.2.0 Clause 9.7	EN 61000-4-11: 2004	B / C / C NOTE (3)	N/A
NOTE:				
	(1) " N/A" denotes test is not applicable in this Test Report			
	(2) Alternatively, for equipment intended to be used exclusively in an industrial environment or a telecommunicationcentre, the class A limits may be used.			
	(3) Voltage dip: 100% reduction – Performance Criteria B			
	Voltage dip: 100% reduction – Performance Criteria B			
	Voltage dip: 70% reduction – Performance Criteria C			
	Voltage Interruption: 0% Interruption – Performance Criteria C			

3. Emission Test

3.1. Conducted Emission Test at Main Ports

3.1.1. Test Standard and Limit

Test Standard	Draft ETSI EN 301 489-1 V2.2.0 Clause 8.3 & 8.4
Basic Standard	EN 55032: 2015

Limits for conducted emissions

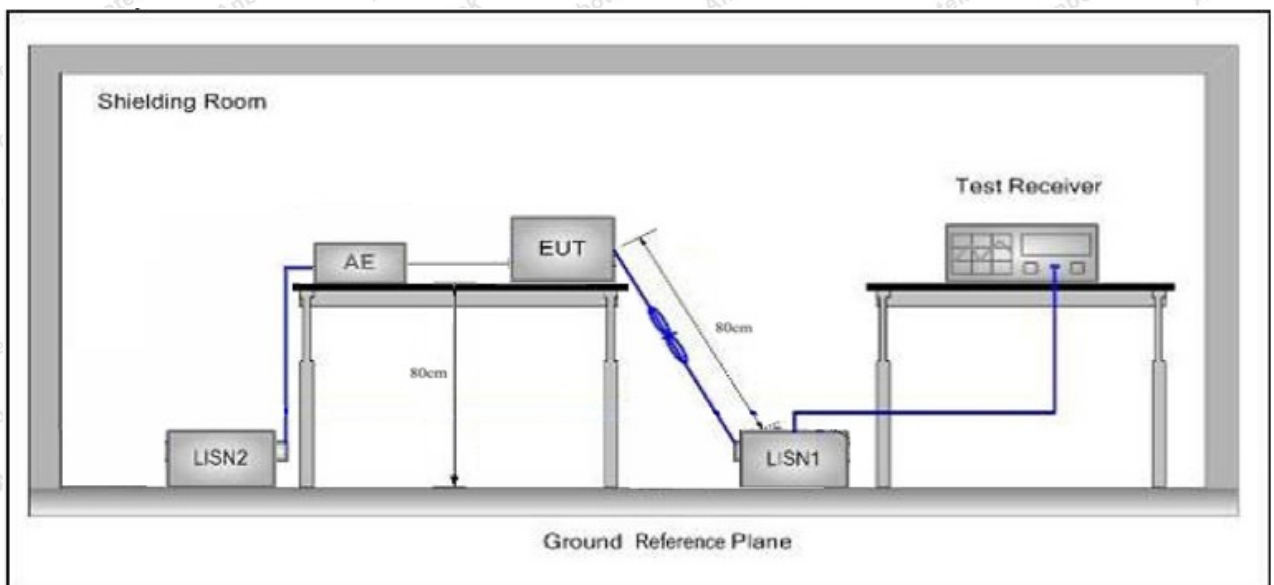
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50

Remark: *Decreasing linearly with logarithm of the frequency.

Limits for conducted emissions of equipment intended to be used in telecommunication centres and industrial environment

Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	79	66
	500kHz~30MHz	73	60

3.1.2. Test Setup



3.1.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ETSI EN 301 489-1 V2.2.0 & EN 55032: 2015 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

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

For the actual test configuration, please refer to the related Item EUT Test Photos.

3.1.4. Test Data

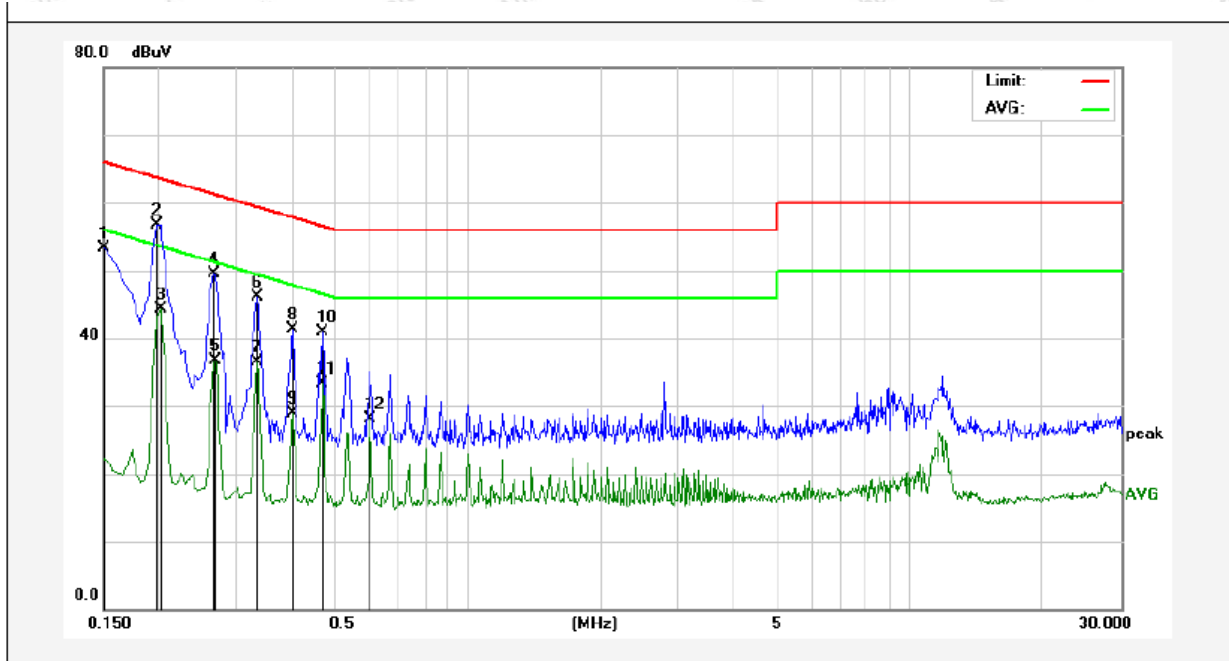
PASS

The EUT should be compliance to the limit of Class B

Only the worst case data was showed in the report, please to see the following pages

Conducted Emission Test Data

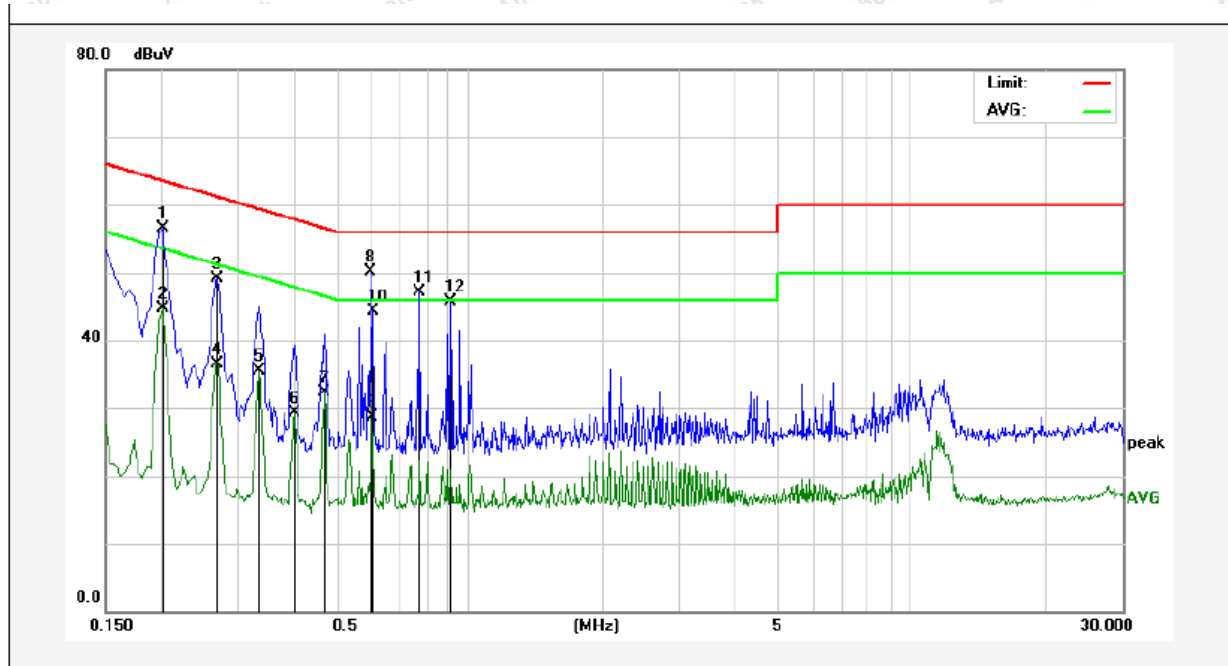
Test Site: 1# Shielded Room
Operating Condition: Mode 1
Test Specification: TX & RX: DC 3.3V
Comment: Live Line
Tem.: 22.2°C Hum.: 60%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1500	33.47	19.90	53.37	65.99	-12.62	QP	
2	0.1980	36.84	19.90	56.74	63.69	-6.95	QP	
3	0.2020	24.48	19.90	44.38	53.52	-9.14	AVG	
4	0.2660	29.69	19.89	49.58	61.24	-11.66	QP	
5	0.2700	16.86	19.89	36.75	51.12	-14.37	AVG	
6	0.3339	26.21	19.91	46.12	59.35	-13.23	QP	
7	0.3339	16.69	19.91	36.60	49.35	-12.75	AVG	
8	0.4020	21.32	19.94	41.26	57.81	-16.55	QP	
9	0.4020	8.93	19.94	28.87	47.81	-18.94	AVG	
10	0.4700	20.94	19.97	40.91	56.51	-15.60	QP	
11	0.4700	13.26	19.97	33.23	46.51	-13.28	AVG	
12	0.6020	8.04	20.01	28.05	46.00	-17.95	AVG	

Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: Mode 1
Test Specification: TX & RX: DC 3.3V
Comment: Neutral Line
Tem.: 22.2°C Hum.: 60%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.2020	36.59	19.90	56.49	63.52	-7.03	QP	
2	0.2020	24.80	19.90	44.70	53.52	-8.82	AVG	
3	0.2700	29.12	19.89	49.01	61.12	-12.11	QP	
4	0.2700	16.59	19.89	36.48	51.12	-14.64	AVG	
5	0.3339	15.63	19.91	35.54	49.35	-13.81	AVG	
6	0.4020	9.29	19.94	29.23	47.81	-18.58	AVG	
7	0.4700	12.43	19.97	32.40	46.51	-14.11	AVG	
8	0.5980	30.12	20.01	50.13	56.00	-5.87	QP	
9	0.6020	8.65	20.01	28.66	46.00	-17.34	AVG	
10	0.6060	24.38	20.01	44.39	56.00	-11.61	QP	
11	0.7740	27.13	20.06	47.19	56.00	-8.81	QP	
12	0.9060	25.53	20.09	45.62	56.00	-10.38	QP	

3.2. Radiated Emission Test

3.2.1. Test Standard and Limit

Test Standard	Draft ETSI EN 301 489-1 V2.2.0 Clause 8.2
Basic Standard	EN 55032: 2015

Radiated Emission Test Limit (Below 1000MHz)

Frequency (MHz)	Limit (dB μ V/m)	
	Quasi-peak Level	
	Class B	Class A
30MHz~230MHz	40	50
230MHz~1000MHz	47	57
Remark: 1. The lower limit shall apply at the transition frequency. 2. The test distance is 3m.		

Radiated Emission Test Limit (Above 1000MHz)

Frequency (MHz)	Limit (dB μ V/m)			
	Class B		Class A	
	Peak	Average	Peak	Average
1000 MHz -3000 MHz	70	50	76	56
3000 MHz -6000 MHz	74	54	80	60
Remark: 1. The lower limit applies at the transition frequency. 2. The test distance is 3m.				

Radiated Emission Test Limit for FM Receivers

Frequency (MHz)	Limit (dB μ V/m)	
	Quasi-peak Level	
	Fundamental	Harmonics
30MHz~230MHz	60	52
230MHz~300MHz	60	52
300MHz~1000MHz	60	56
Remark: 1. The lower limit shall apply at the transition frequency. 2. The test distance is 3m.		

Frequency Range of Radiated Measurement

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 6 GHz, whichever is lower

3.2.2. Test Setup

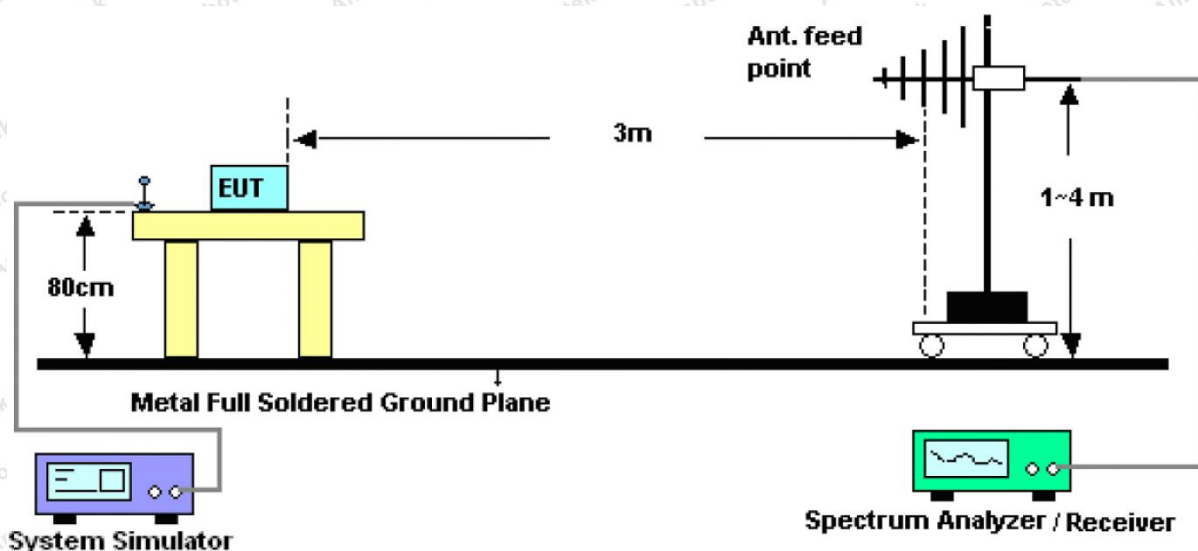


Figure 1. 30MHz to 1GHz

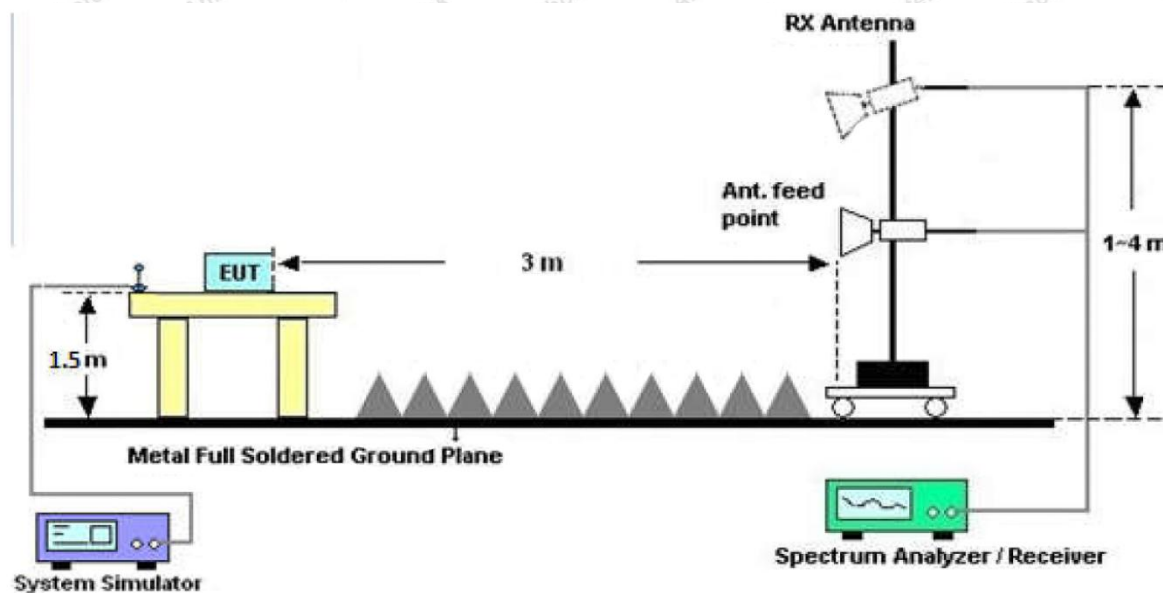


Figure 2. Above 1 GHz

3.2.3. Test Procedure

- 1) The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- 2) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- 3) The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4) The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- 5) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold

mode when the test frequency is below 1GHz.

The test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.

6) For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.

The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak/Average detection at frequency above 1GHz.

3.2.4. Test Data

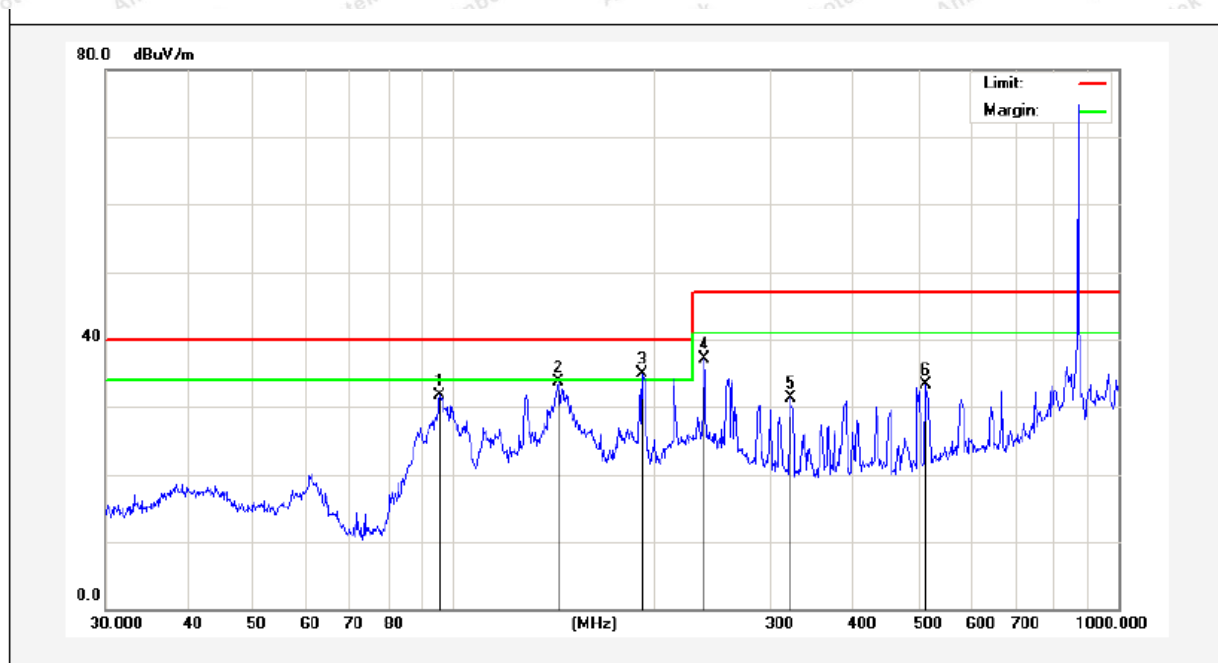
PASS

The EUT should be compliance to the limit of Class B

Only the worst case data was showed in the report, please to see the following pages

Test Results (30~1000MHz)

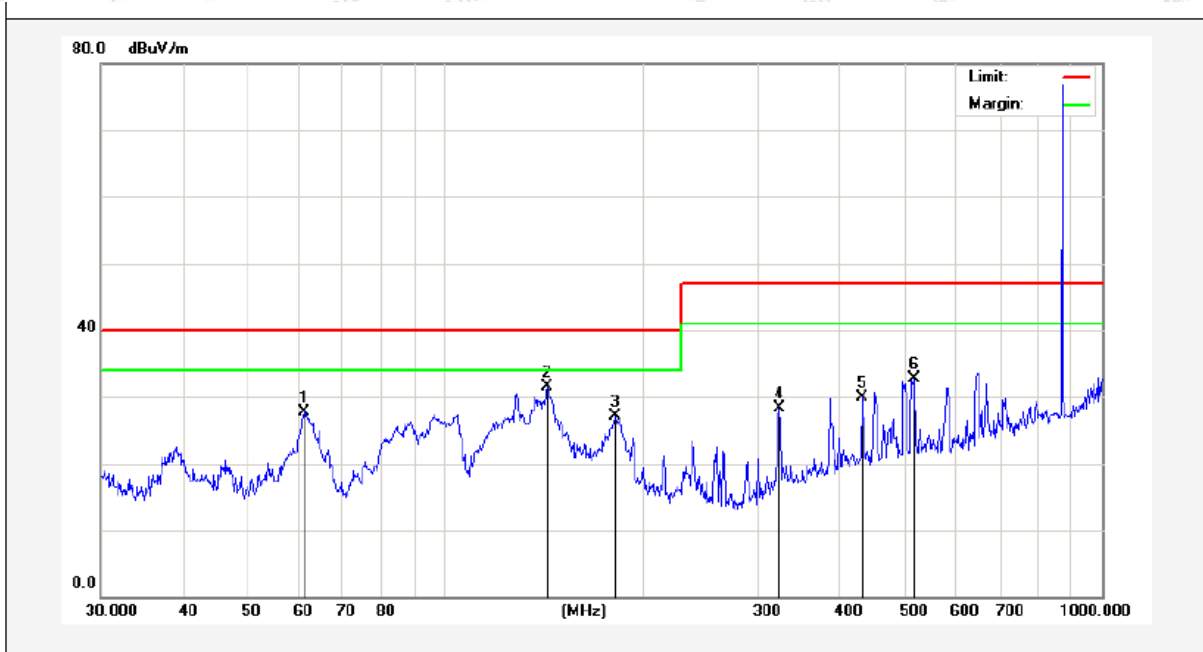
Job No.: SZAWW180622001-01E Temp.(°C)/Hum.(%RH): Tem.: 24.2°C Hum.: 56%
Standard: EN301489_Class B_3m Power Source: TX & RX: DC 3.3V
Test Mode: Mode 1 Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	95.4270	53.89	-22.18	31.71	40.00	-8.29	QP	300	65	
2	143.8295	56.06	-22.43	33.63	40.00	-6.37	QP	300	110	
3	192.4186	55.61	-20.67	34.94	40.00	-5.06	QP	300	175	
4	238.3102	55.69	-18.65	37.04	47.00	-9.96	QP	300	224	
5	321.0607	47.20	-15.99	31.21	47.00	-15.79	QP	300	312	
6	513.6331	44.23	-10.99	33.24	47.00	-13.76	QP	300	360	

Test Results (30~1000MHz)

Job No.: SZAWW180622001-01E Temp.(°C)/Hum.(%RH): Tem.: 24.2°C Hum.: 56%
Standard: EN301489_Class B_3m Power Source: TX & RX: DC 3.3V
Test Mode: Mode 1 Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	61.1316	45.19	-17.43	27.76	40.00	-12.24	QP	300	74	
2	143.3261	49.87	-18.44	31.43	40.00	-8.57	QP	300	123	
3	181.9202	43.77	-16.67	27.10	40.00	-12.90	QP	300	176	
4	323.3204	43.20	-14.86	28.34	47.00	-18.66	QP	300	224	
5	431.0316	41.20	-11.25	29.95	47.00	-17.05	QP	300	296	
6	519.0649	43.36	-10.62	32.74	47.00	-14.26	QP	300	330	

Test Results (1GHz~6GHz)

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Detector
1432.82	55.49	-2.81	52.67	70.00	-17.33	H	PEAK
2086.65	51.15	-2.82	48.33	70.00	-21.67	H	PEAK
2023.82	50.91	-4.19	46.72	70.00	-23.28	H	PEAK
4148.72	46.48	-4.78	41.70	74.00	-32.30	H	PEAK
4681.74	55.31	-5.29	50.02	74.00	-23.98	H	PEAK
4826.96	45.86	-5.37	40.49	74.00	-33.51	H	PEAK
1432.82	39.45	-2.81	36.64	50.00	-13.36	H	AVG
2086.65	42.89	-2.82	40.07	50.00	-9.93	H	AVG
2023.82	40.41	-4.19	36.21	50.00	-13.79	H	AVG
4148.72	46.39	-4.78	41.61	54.00	-12.39	H	AVG
4681.74	41.71	-5.29	36.42	54.00	-17.58	H	AVG
4826.96	38.51	-5.37	33.15	54.00	-20.85	H	AVG
1530.74	46.62	-2.77	43.85	70.00	-26.15	V	PEAK
1827.78	51.52	-2.55	48.98	70.00	-21.02	V	PEAK
2124.16	49.45	-3.86	45.59	70.00	-24.41	V	PEAK
4020.13	46.18	-4.78	41.40	74.00	-32.60	V	PEAK
4601.12	47.09	-4.75	42.35	74.00	-31.65	V	PEAK
4866.05	55.21	-5.47	49.75	74.00	-24.25	V	PEAK
1530.74	39.11	-2.77	36.33	50.00	-13.67	V	AVG
1827.78	41.95	-2.55	39.41	50.00	-10.59	V	AVG
2124.16	41.58	-3.86	37.72	50.00	-12.28	V	AVG
4020.13	40.70	-4.78	35.92	54.00	-18.08	V	AVG
4601.12	44.29	-4.75	39.54	54.00	-14.46	V	AVG
4866.05	42.18	-5.47	36.71	54.00	-17.29	V	AVG

Remark:

1. Level = Receiver Read level + Antenna Factor

4. Immunity Test

General Performance Criteria

◆ Performance criteria for continuous phenomena applied to transmitters and receivers (CT/CR)

During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.

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

◆ Performance criteria for transient phenomena applied to transmitters and receivers (TT/TR)

After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.

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

◆ Performance criteria for equipment which does not provide a continuous communication link

For radio equipment which does not provide a continuous communication link, the performance criteria described in CT/CR and TT/TR are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in CT/CR and TT/TR.

◆ Performance criteria for ancillary equipment tested on a stand alone basis

If ancillary equipment is intended to be tested on a stand alone basis, the performance criteria described in CT/CR and TT/TR are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests.

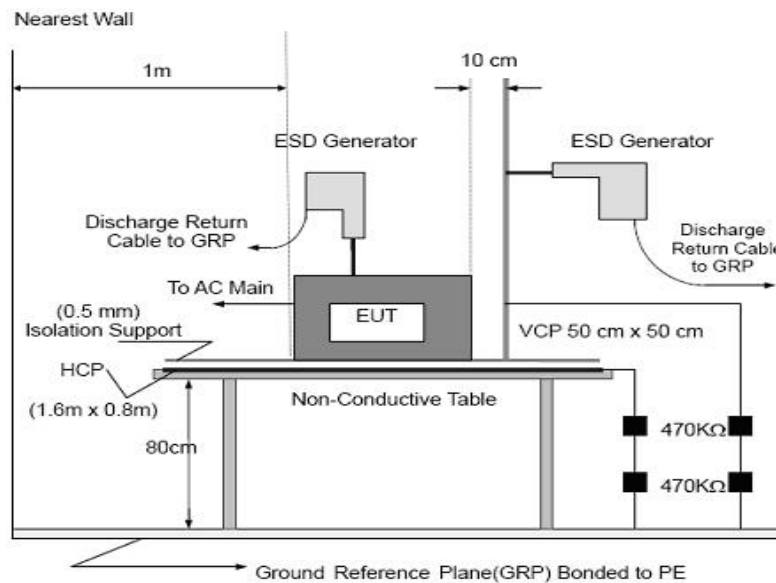
The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in CT/CR and TT/TR.

4.1. Electrostatic Discharge Test

4.1.1. Test Standard and Specification

Test Standard	Draft ETSI EN 301 489-1 V2.2.0 Clause 9.3/ EN 55035 Clause 4.2.1
Basic Standard	EN 61000-4-2: 2009
Discharge Impedance:	330 ohm / 150 pF
Performance Criterion:	CT/CR
Discharge Voltage:	Air Discharge: 2kV/4kV/8kV Contact Discharge: 2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

4.1.2. Test Setup



Note:

TABLE-TOP EQUIPMENT:

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940kohm total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT:

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

4.1.3. Test Procedure

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- 1) Contact discharge was applied to conductive surfaces and coupling planes of the EUT.

During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second.

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.

- 2) Air discharges at insulation surfaces of the EUT.

It was at least ten single discharges with positive and negative at the same selected point.

- 3) When applying direct discharges to a portable or handheld battery-powered EUT with a display screen, it may not be possible to observe the screen for a given EUT orientation. If observation of the screen is necessary during this test, the EUT may be mounted vertically using non-metallic supports.

- 4) For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.4. Test Data

Job No.: SZAWW180622001-01E Temp.(°C)/Hum.(%RH): 24.3°C/55%RH
Standard: EN 61000-4-2 Power Source: TX & RX: DC 3.3V
Test Mode: Mode 1

Item	Contact Discharge to conducted surfaces and to coupling planes		Air Discharge at insulating surfaces
	Direct Contact Discharge	Indirect Contact Discharge	
Test Voltage	Reaction of EUT / Result	Reaction of EUT / Result	Reaction of EUT / Result
+2kV	n.r.r. PASS	n.r.r. PASS	n.r.r. PASS
-2kV	n.r.r. PASS	n.r.r. PASS	n.r.r. PASS
+4kV	n.r.r. PASS	n.r.r. PASS	n.r.r. PASS
-4kV	n.r.r. PASS	n.r.r. PASS	n.r.r. PASS
+6kV	-	-	n.r.r. PASS
-6kV	-	-	n.r.r. PASS
+8kV	-	-	n.r.r. PASS
-8kV	-	-	n.r.r. PASS

Remarks: n.r.r. = no reaction recognized

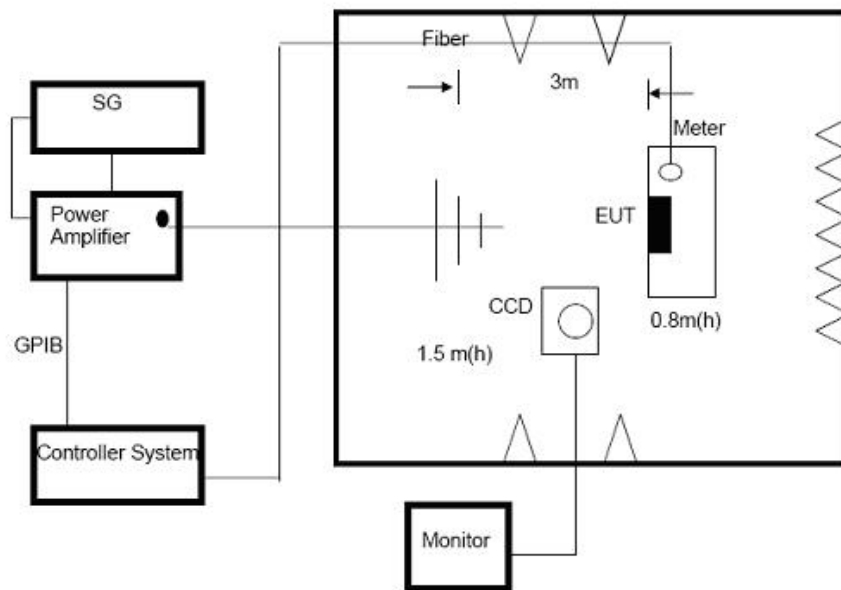
Performance Criteria A observed and No any function degraded during the tests.

4.2. Radiated, RF Electromagnetic Fields Test

4.2.1. Test Standard and Specification

Test Standard	Draft ETSI EN 301 489-1 V2.2.0 Clause 9.2/ EN 55035 Clause 5
Basic Standard	EN 61000-4-3: 2006+A1: 2008+A2: 2010
Required Performance	A
Frequency Range	80MHz to 6GHz
Field Strength	3 V/m
Modulation	1kHz Sine Wave, 80%, AM Modulation
Frequency Step	1 % of preceding frequency value
Polarity of Antenna	Horizontal and Vertical
Test Distance	3 m
Antenna Height	1.5 m
Dwell Time	at least 0.5 seconds

4.2.2. Test Setup



4.2.3. Test Procedure

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber. The testing distance from antenna to the EUT was 3 meters.

- 1) The field strength level was 3V/m
- 2) The frequency range is swept from 80 MHz to 6000 MHz with the signal 80%amplitude modulated with a 1kHz sine wave.
- 3) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond, but shall in no case be less than 0.5s.

4) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.2.4. Test Data

Job No.: SZAWW180622001-01E Temp.(°C)/Hum.(%RH): 21.1°C/54.7%RH
Standard: EN 61000-4-3 Power Source: TX & RX: DC 3.3V
Test Mode: Mode 1

Frequency Range (MHz)	Antenna Polarity	R.F. Field Strength	Azimuth	Result
80~6000	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
			Rear	
			Left	
			Right	

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Test

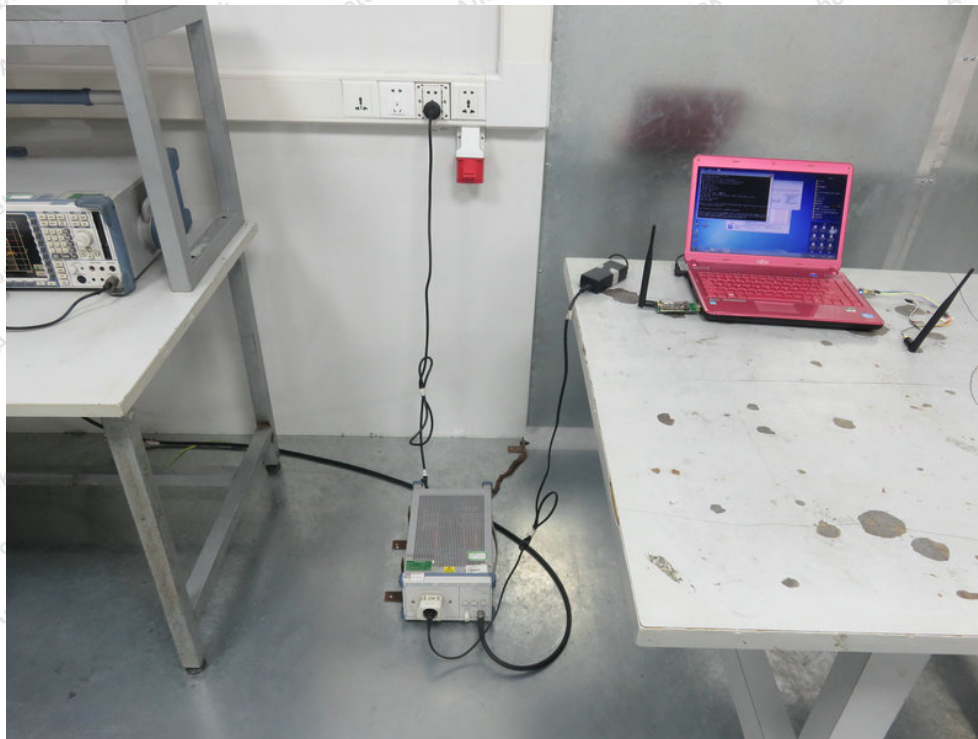
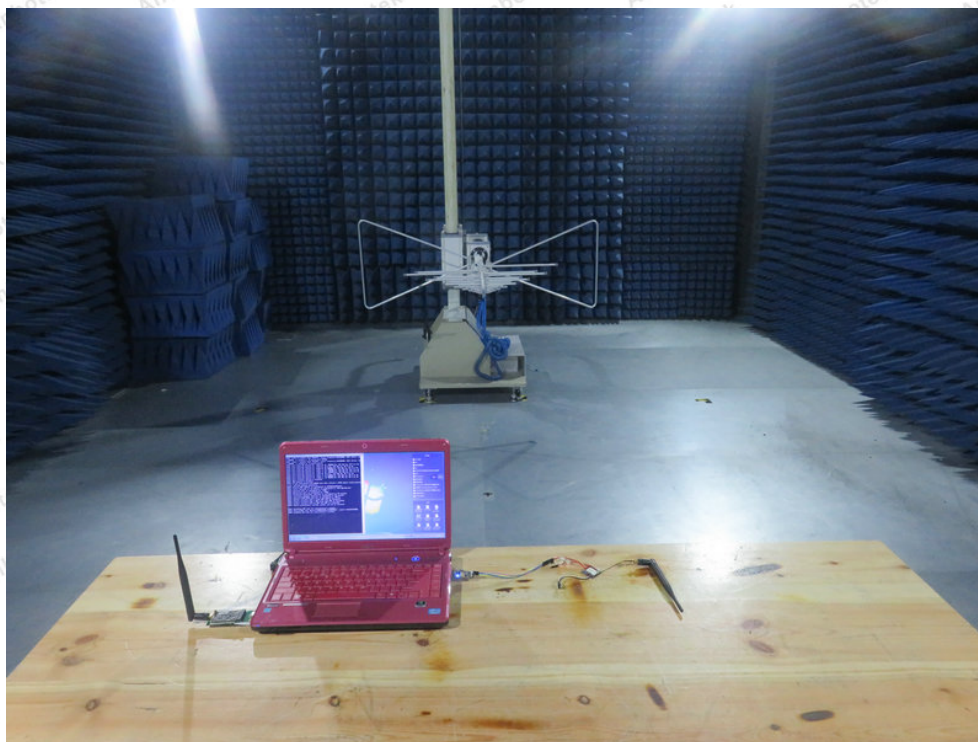


Photo of Radiation Emission Test



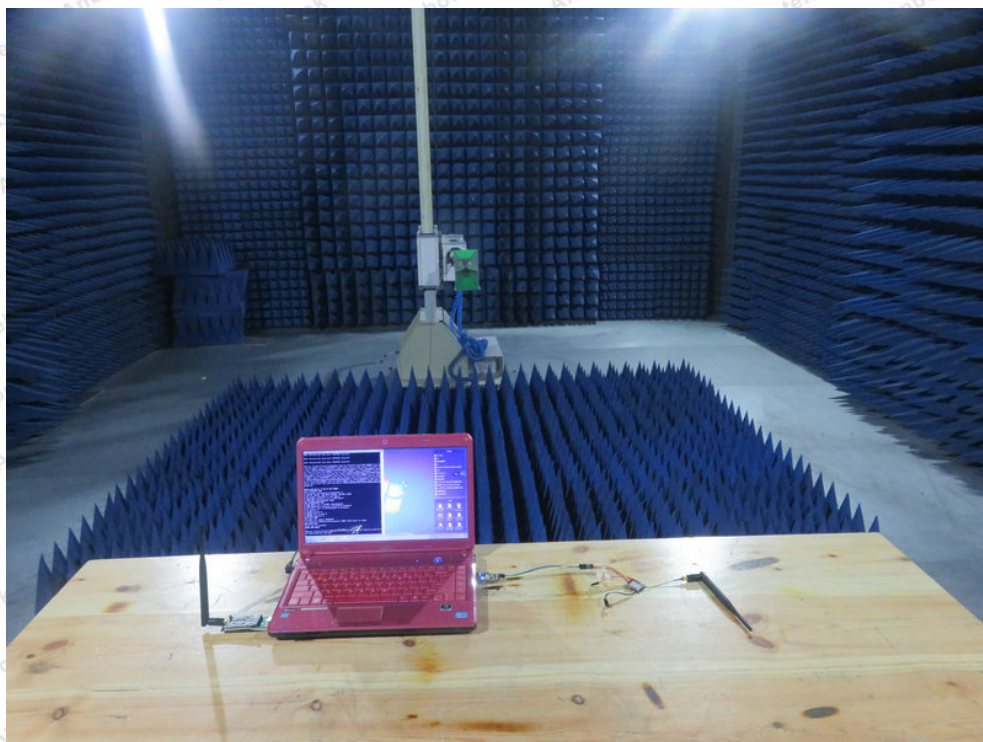
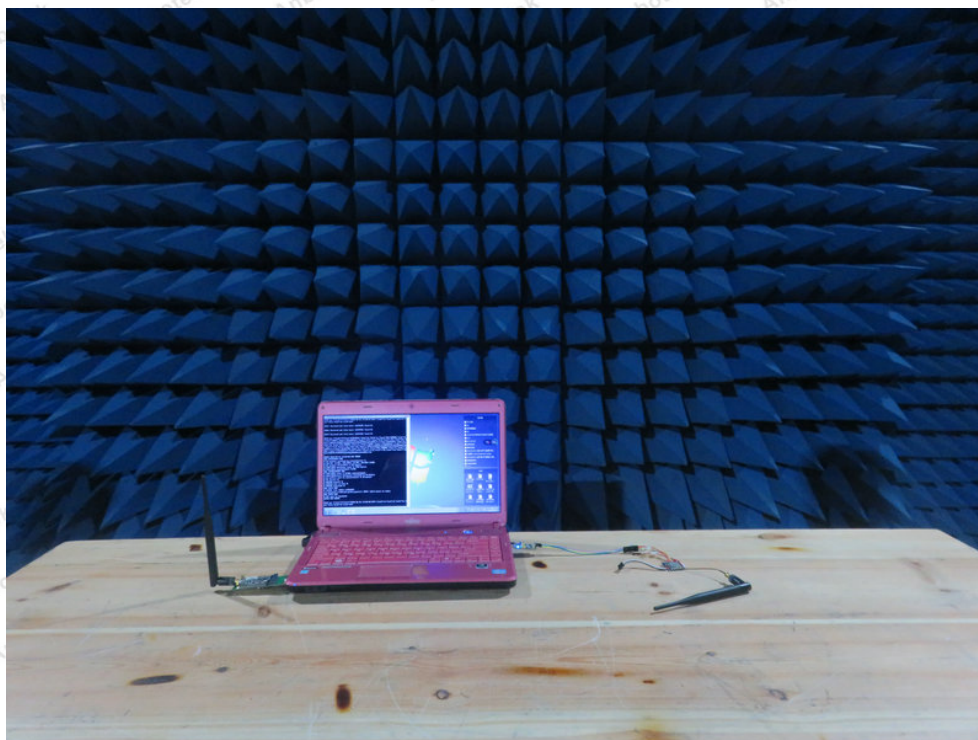


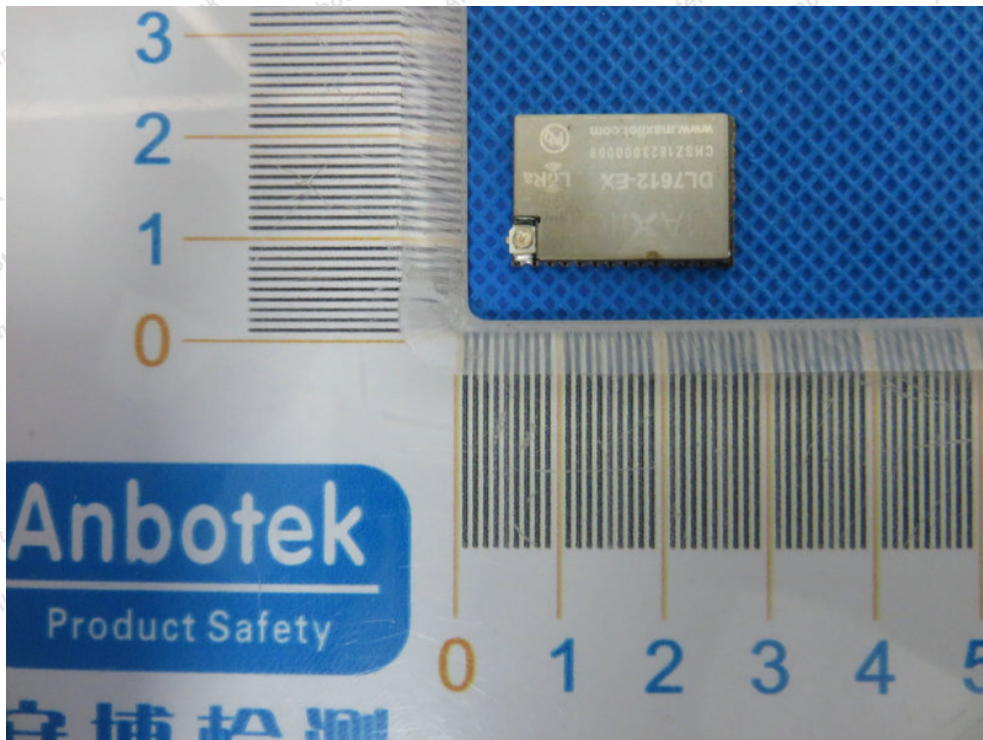
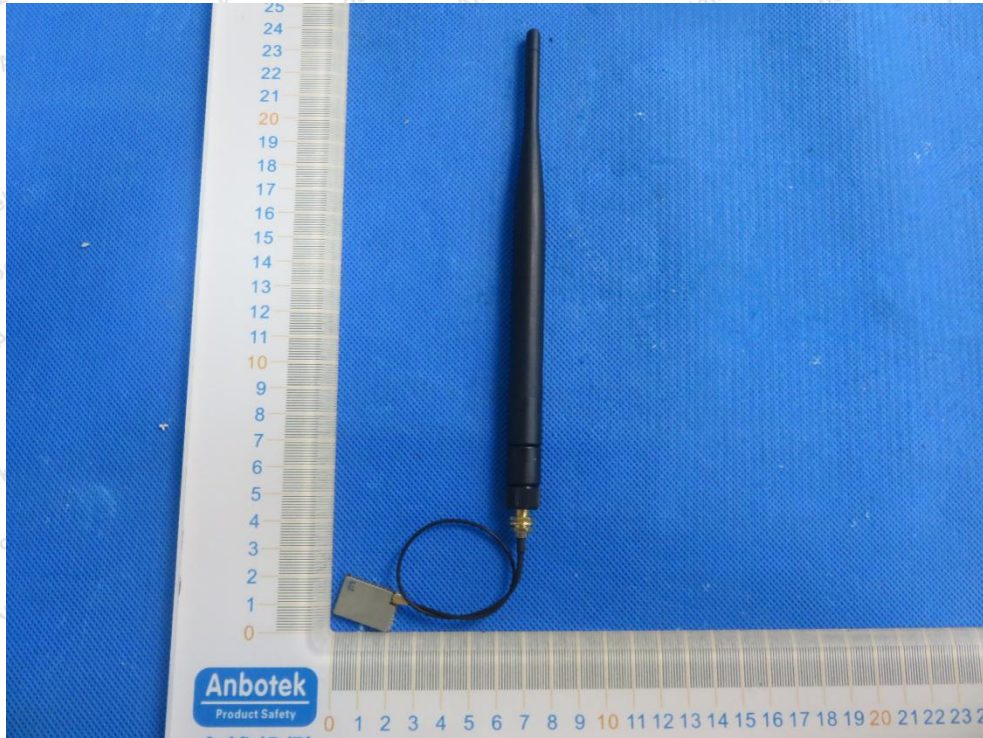
Photo of Electrostatic Discharge Test

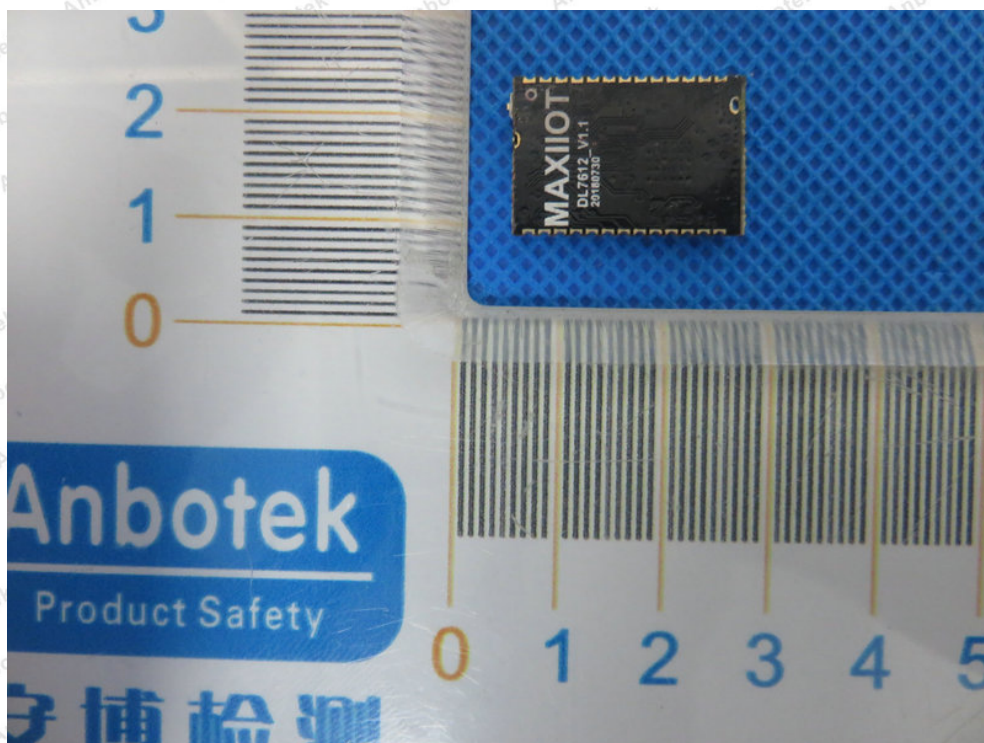


Photo of RF Field Strength Susceptibility Test

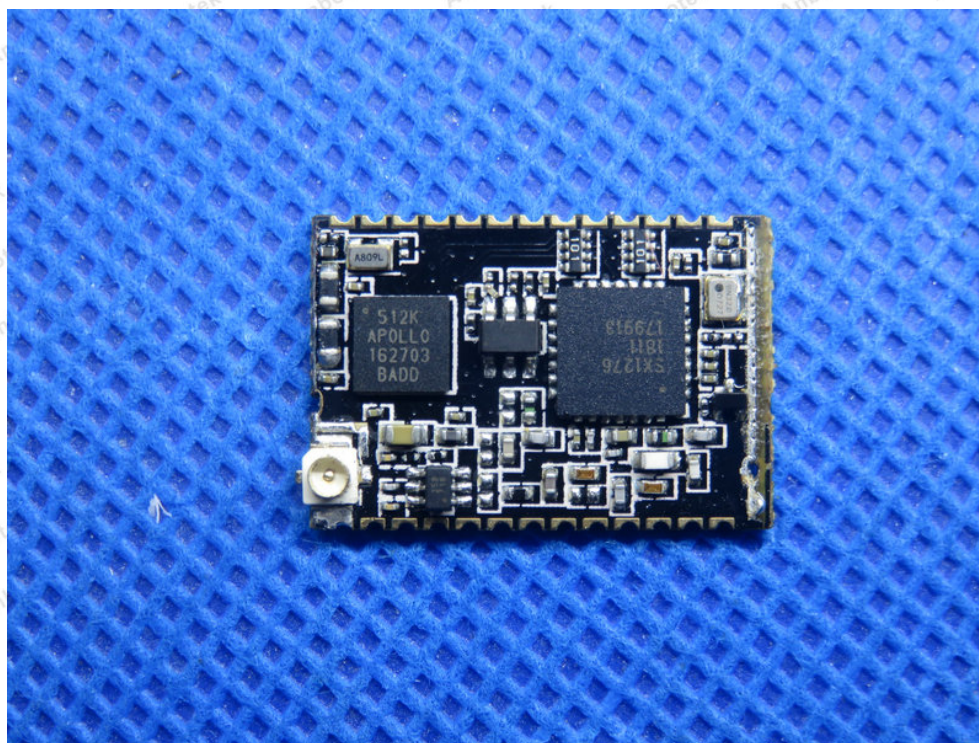
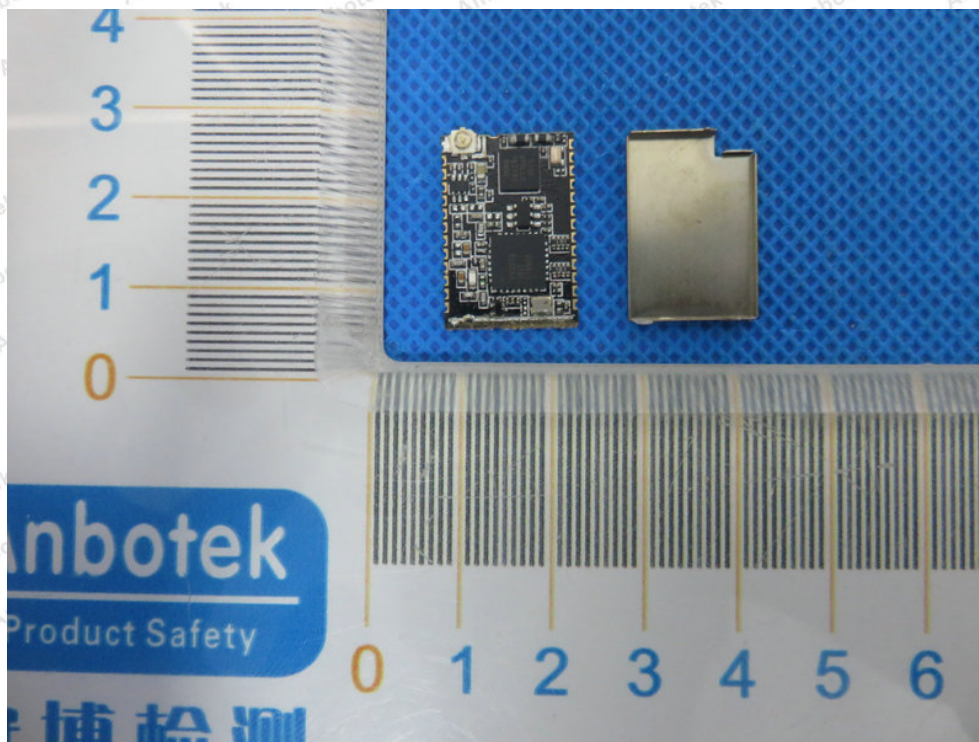


APPENDIX II -- EXTERNAL PHOTOGRAPH





APPENDIX III -- INTERNAL PHOTOGRAPH



----- End of Report -----