



**CTS (NINGBO) TESTING SERVICE TECHNOLOGY
INTERNATIONAL**

OPERATE ACCORDING TO ISO/IEC 17025

EMC TEST REPORT

TEST REPORT NUMBER : CGZ3170314-00331-EE



CTS (Ningbo) Testing Service Technology Co., Ltd.

Fl.1 & 8 West, Bldg. B, No. 66, Qingyi Rd., Hi-Tech Zone, Ningbo, Zhejiang, China

EMC TEST REPORT

Report Reference No. CGZ3170314-00331-EE

Date of issue 28 March 2017

Testing Laboratory Name **CTS (Ningbo) Testing Service Technology Co., Ltd.**

Address GZ test site: A101, No.65, Zhuji Road, Tianhe District, Guangzhou, Guangdong, China.

Testing location/ procedure Full application of Harmonised standards ☒
 Partial application of Harmonised standards ☐
 Other standard testing method ☐

Applicant's name Rigado, Inc.

Address 3950 Fariview Industrial Dr SE, Suite 100, Salem, OR USA, 97302

Test specification:

Standard **ETSI EN 301 489-1 V2.1.1, ETSI EN 301 489-17 V3.1.1**

Test Report Form No. CTSEMC-1.0

TRF Originator CTS (Ningbo) Testing Service Technology Co., Ltd.

Master TRF Dated 2009-01

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Test item description. BMD-301

Trade Mark Rigado

Manufacturer Rigado, Inc.

Model/Type reference BMD-301

Ratings DC 3.6V

Result **PASSED**

Compiled by:



Kate zhang / File administrators

Supervised by:



Duke yang / Technique principal

Approved by:



Vincent yao / Manager



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EMC -- T E S T R E P O R T**Test Report No. : CGZ3170314-00331-EE**28 March 2017
Date of issue

Type / Model.....	BMD-301
EUT.....	BMD-301
Applicant	Rigado, Inc.
Address.....	3950 Fariview Industrial Dr SE, Suite 100, Salem, OR USA, 97302
Telephone.....	+1-971-208-9857
Fax.....	+1-971-208-9869
Contact.....	Cam Nichols
Manufacturer	Rigado, Inc.
Address.....	3950 Fariview Industrial Dr SE, Suite 100, Salem, OR USA, 97302
Telephone.....	+1-971-208-9857
Fax.....	+1-971-208-9869
Contact.....	Cam Nichols
Factory	Rigado, Inc.
Address.....	3950 Fariview Industrial Dr SE, Suite 100, Salem, OR USA, 97302
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

ETSI EN 301 489-1 V2.1.1
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
ETSI EN 301 489-17 V3.1.1
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

2 SUMMARY

2.1 GENERAL REMARKS

Date of receipt of test sample	14 March 2017
Testing commenced on	14~28 March 2017
Testing concluded on	28 March 2017

2.2 FINAL ASSESSMENT

The EMC requirements pertaining to the technical standards and tested operation modes are

☒ - fulfilled.

☐ - **not** fulfilled.

The equipment under test

☒ - fulfils the EMC requirements cited on page 1.

☐ - **does not** fulfil the EMC requirements cited on page 1.

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage: ☒ DC 3.3V by Jig
☐ Others

3.2 Short description of the Equipment under Test (EUT)

Number of tested samples: 1
Serial number: Prototype

3.3 EUT operation mode

The equipment under test was operated during the measurement under the following conditions:

☒ – TX and RX

Operating Mode: TX and RX

Note: 5.0dBi antenna of EUT is the radiated test worst case; so only these test results be recorded in the test report.

Emissions tests.....: According to ETSI EN 301 489-1 V2.1.1 and ETSI EN 301 489-17 V3.1.1, searching for the highest disturbance.

Immunity tests: According to ETSI EN 301 489-1 V2.1.1 and ETSI EN 301 489-17 V3.1.1, searching for the highest susceptibility.

3.4 EUT configuration

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurement:

Not Applicable

3.5 Performance level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product.

3.6 Definition related to the performance level

Performance table for ETSI EN 301 489-17 V3.1.1		
Criteria	During test	After test
A	Shall operate as intended. May show degradation of performance (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 2) 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 1). No unintentional transmissions.	Functions shall be self-recoverable . Shall operate as intended after recovering . Shall be no degradation of performance (see note 2). 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 2).

NOTE 1: 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.

NOTE 2: 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.

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

GZ test site: A101, No.65, Zhuji Road, Tianhe District, Guangzhou, Guangdong, China

Tel: +86-20-85543113 (32 lines)

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4.2 Test facility

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

CNAS-Lab Code: L3394

CTS (Ningbo) Testing Service Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01: 2006 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

IC-Registration No.: 8374A

The 3m Alternate Test Site of CTS (Ningbo) Testing Service Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 8374A on May 22, 2014.

FCC-Registration No.: 971995

CTS (Ningbo) Testing Service Technology Co., Ltd., 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.971995, July 13, 2012.

4.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35 ° C
Humidity:	25~75 %
Atmospheric pressure:	86~106 kPa

4.4 Definitions of symbols used in this test report

- - The black square indicates that the listed condition, standard or equipment is applicable for this report.
- - The empty square indicates that the listed condition, standard or equipment is **not** applicable for this report.

4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the CTS quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

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4.6 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Conduction disturbance	150kHz~30MHz	$\pm 1.22\text{dB}$	(1)
Power disturbance	30MHz~300MHz	$\pm 1.38\text{dB}$	(1)
Radiation emission (3m)	30MHz~300MHz	$\pm 3.14\text{dB}$	(1)
	300MHz~1000MHz	$\pm 3.18\text{dB}$	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.
- (2) The actual EUT tested items in this test report, only applies to this "measurement uncertainty" in part / all of the corresponding data.

4.7 Test Description

4.7.1 Description of Standards and Results

EMISSION(ETSI EN 301 489-1 V2.1.1 and ETSI EN 301 489-17 V3.1.1)			
Description of Test Item	Standard	Limits	Results
Conducted disturbance at mains terminals	EN 55032:2015	Class B	N/A
Radiated disturbance	EN 55032:2015	Class B	PASS
Harmonic current emissions	EN 61000-3-2:2014	Class A	N/A
Voltage fluctuations & flicker	EN 61000-3-3:2013	-----	N/A
IMMUNITY (ETSI EN 301 489-1 V2.1.1 and ETSI EN 301 489-17 V3.1.1)			
Description of Test Item	Basic Standard	Performance Criteria	Results
Electrostatic discharge (ESD)	EN 61000-4-2:2009	B	PASS
Radio-frequency, Continuous radiated disturbance	EN 61000-4-3: 2006+A1:2008+A2:2010	A	PASS
Electrical fast transient (EFT)	EN 61000-4-4:2012	B	N/A
Surge (Input a.c. power ports)	EN 61000-4-5:2006	B	N/A
Surge (Telecommunication ports)		B	N/A
Radio-frequency, Continuous conducted disturbance	EN 61000-4-6:2009	A	N/A
Voltage dips, >95% reduction	EN 61000-4-11:2004	B	N/A
Voltage dips, 30% reduction		B	N/A
Voltage interruptions		C	N/A
N/A is an abbreviation for Not Applicable.			

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5 TEST CONDITIONS AND RESULTS

5.1 Radiated disturbance (electric field)

For test instruments and accessories used see section 6 part 6.1.

5.1.1 Description of the test location

Test location : Semi-Anechoic chamber

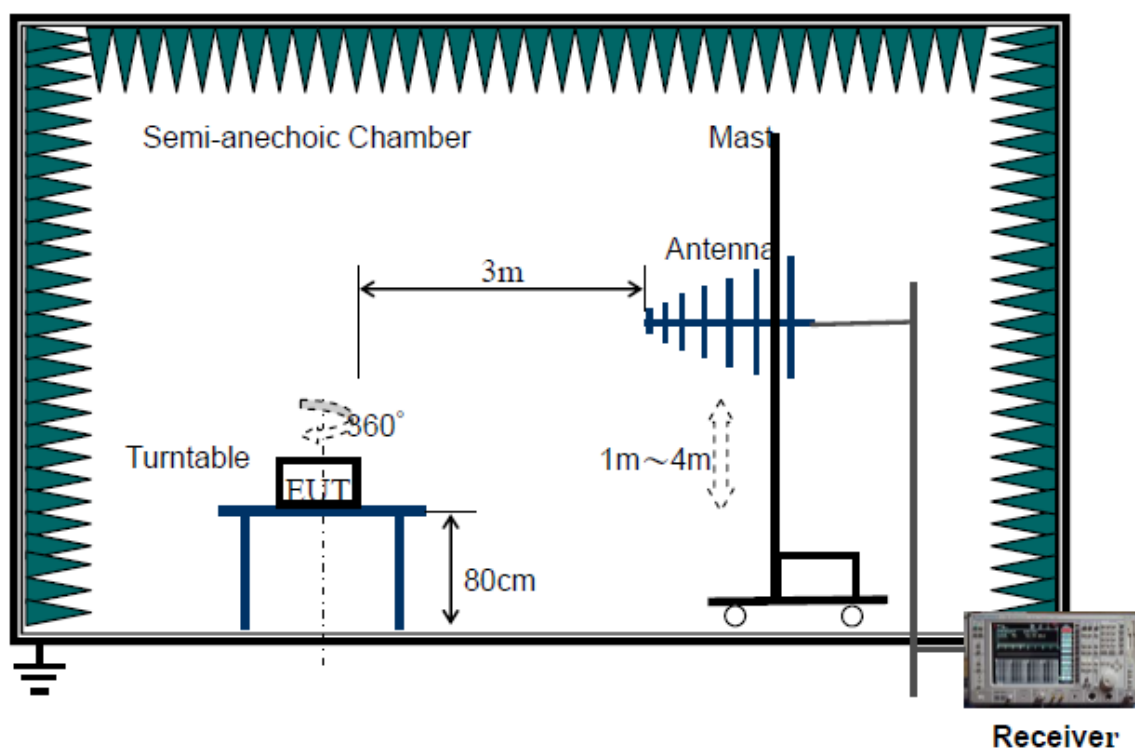
Test disturbance: 3 Meter

5.1.2 Description of the test set-up

5.1.2.1 Operating Condition

The EUT is normal during the test, and the results of the maximum emanation are recorded

5.1.2.2 Block Diagram of Test Setup



Radiated Disturbance Below 1GHz

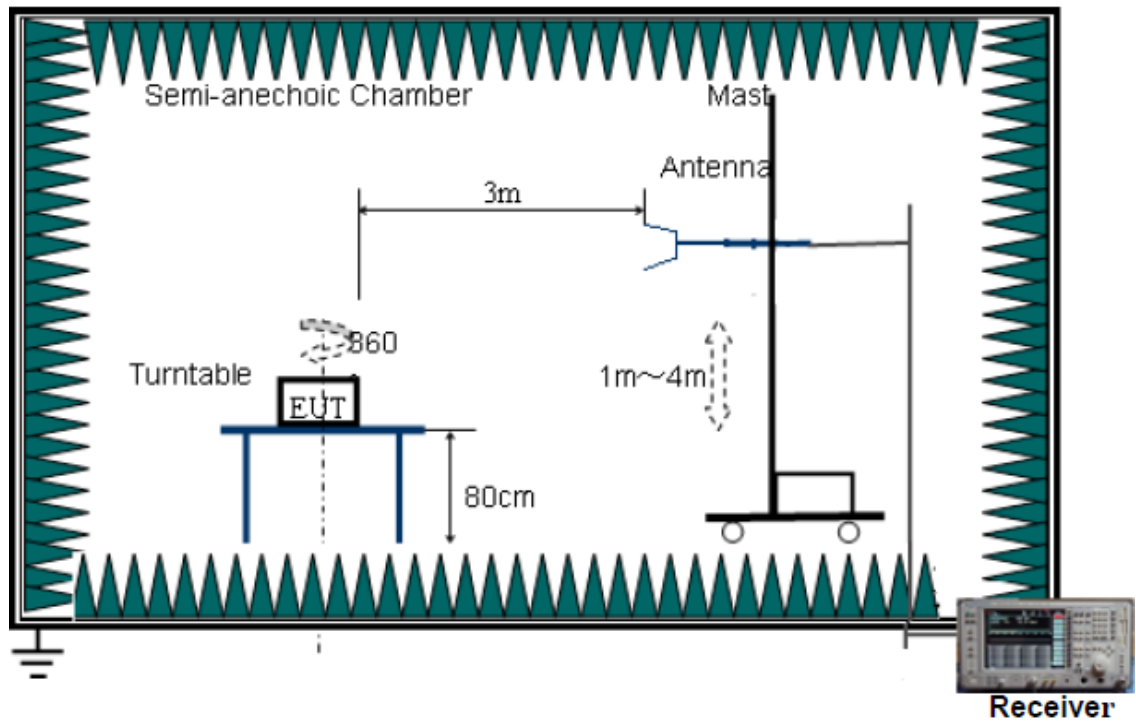
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Radiated Disturbance Above 1GHz

5.1.3 Limits of disturbance (Class B)

Frequency (MHz)	Distance (Meters)	Field Strengths Limits (dBμV/m)		
		Peak	QP	Average
30 ~ 230	3	----	40	----
230 ~ 1000	3	----	47	----
1000~3000	3	70	----	50
3000~6000	3	74	----	54

Note: (1) The tighter limit shall apply at the edge between two frequency bands.
(2) Distance refers to the distance in meters between the test instrument antenna and the closest point of any part of the E.U.T.

5.1.4 Test result

The requirements are	Fulfilled
Test Condition	Ambient Temperature: 24°C Humidity: 56%
Band width	120kHz for below 1GHz, 1MHz for above 1GHz
Frequency range	30 MHz - 6000 MHz
Min. limit margin	>15.30 dB at 30 - 6000 MHz
Operator	Duke

Remarks: The limits are kept. For detailed results, please see the following page(s).

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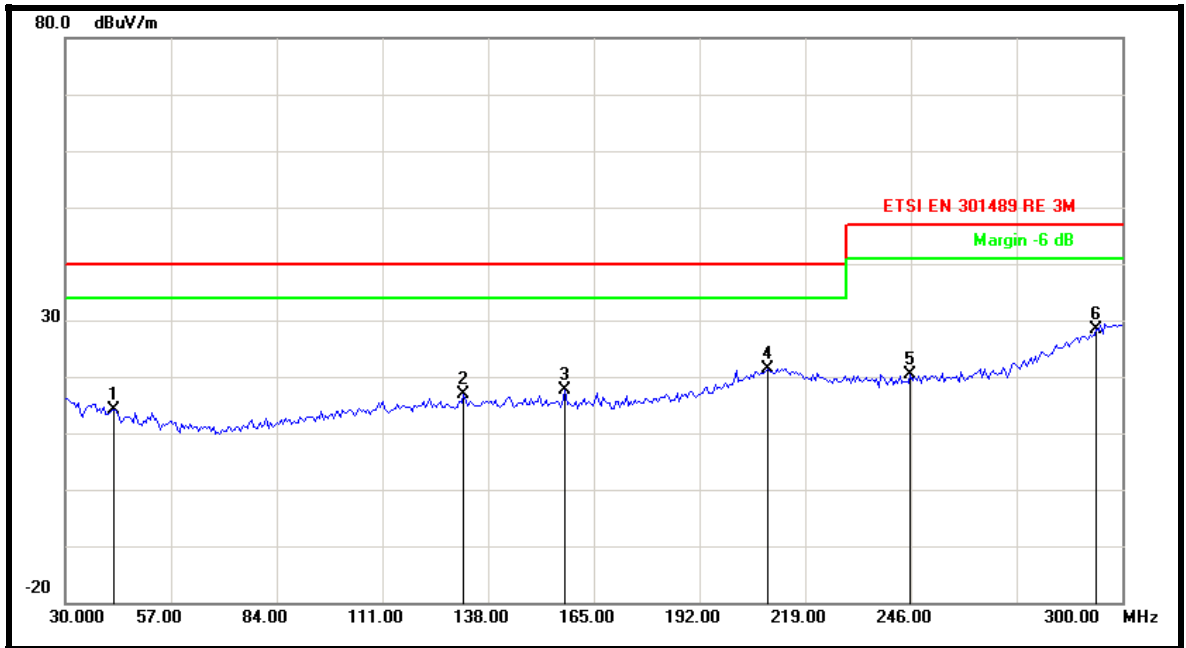
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5.1.5 Test protocol

Test point:	Horizontal	Result:	<input checked="" type="checkbox"/> - passed
Operation mode	TX and RX		<input type="checkbox"/> - not passed
Remarks:			



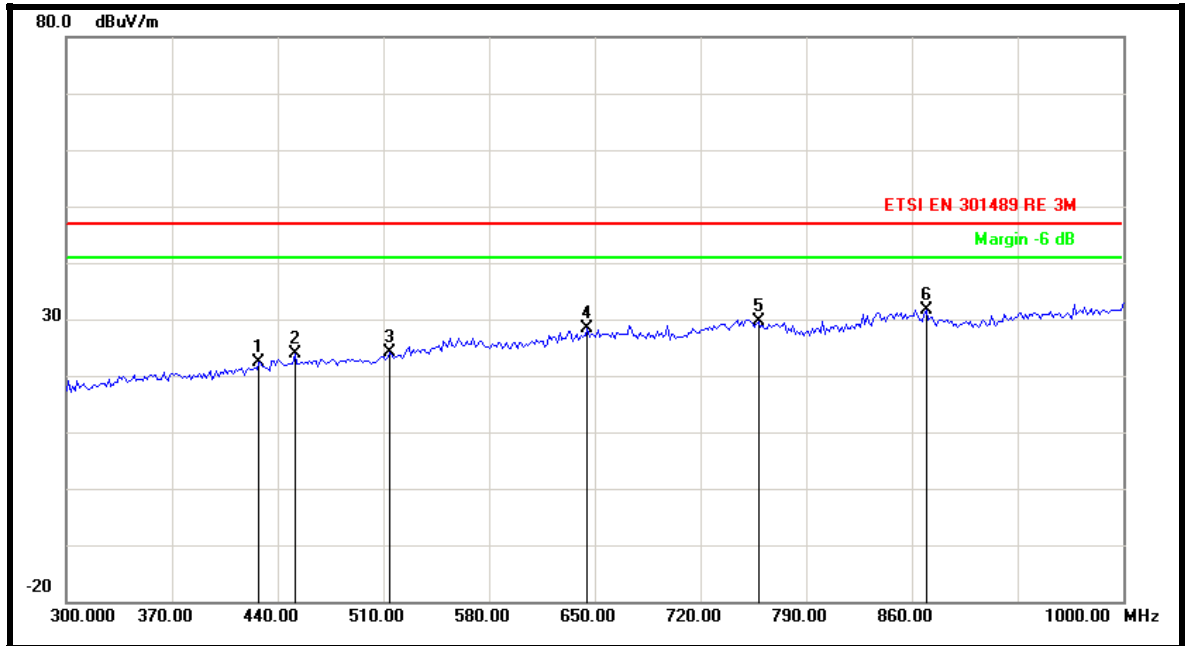
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	42.4449	-16.78	31.01	14.23	40.00	-25.77	QP
2	131.7234	-15.52	32.48	16.96	40.00	-23.04	QP
3	157.6954	-15.34	33.04	17.70	40.00	-22.30	QP
4	209.6393	-9.66	31.16	21.50	40.00	-18.50	QP
5	245.8918	-11.06	31.54	20.48	47.00	-26.52	QP
6	293.5070	-2.84	31.22	28.38	47.00	-18.62	QP

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No.	Frequency (MHz)	Factor (dB/m)	Reading (dBμV)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.
1	427.6553	-9.14	31.50	22.36	47.00	-24.64	QP
2	451.5030	-8.19	32.11	23.92	47.00	-23.08	QP
3	514.6293	-7.04	31.06	24.02	47.00	-22.98	QP
4	645.0902	-3.37	31.78	28.41	47.00	-18.59	QP
5	758.7174	-1.61	31.29	29.68	47.00	-17.32	QP
6	869.5391	-0.66	32.36	31.70	47.00	-15.30	QP

Above 1GHz							
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBμV)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.
1	1801.603	-8.20	40.87	32.67	70.00	-37.33	peak
2	1801.603	-8.20	25.79	17.59	50.00	-32.41	AVG
3	4847.695	5.02	39.65	44.67	74.00	-29.33	peak
4	4847.695	5.02	25.51	30.53	54.00	-23.47	AVG

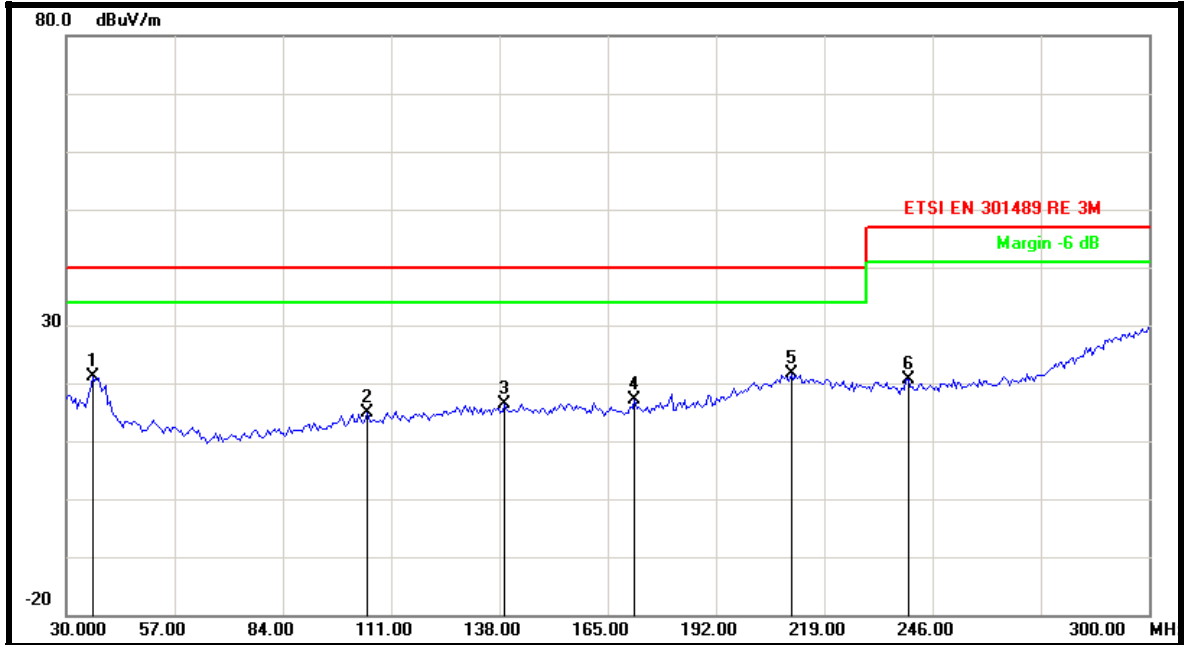
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Test point:	Vertical	Result:	<input checked="" type="checkbox"/> - passed
Operation mode	TX and RX		<input type="checkbox"/> - not passed
Remarks:			



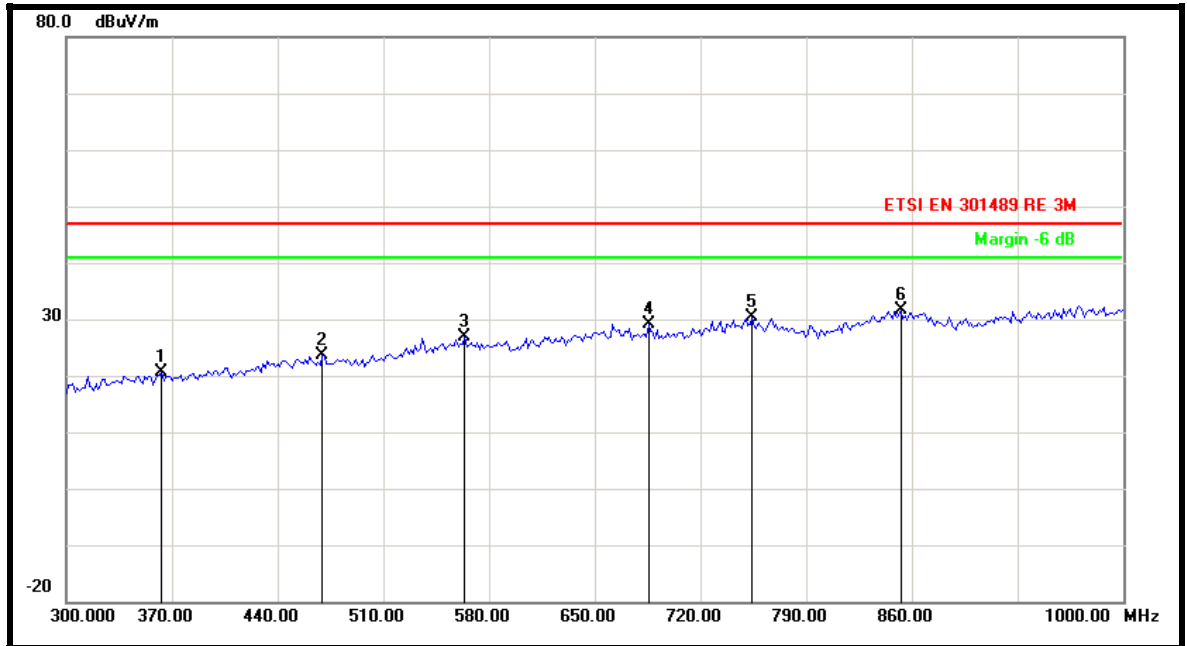
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBμV)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.
1	36.4930	-16.01	37.07	21.06	40.00	-18.94	QP
2	105.2104	-17.09	31.85	14.76	40.00	-25.24	QP
3	139.2986	-15.42	31.78	16.36	40.00	-23.64	QP
4	171.7635	-15.28	32.33	17.05	40.00	-22.95	QP
5	210.7214	-9.64	31.18	21.54	40.00	-18.46	QP
6	239.9399	-11.14	31.84	20.70	47.00	-26.30	QP

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No.	Frequency (MHz)	Factor (dB/m)	Reading (dBμV)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.
1	363.1263	-10.84	31.56	20.72	47.00	-26.28	QP
2	469.7395	-8.00	31.73	23.73	47.00	-23.27	QP
3	563.7275	-5.48	32.37	26.89	47.00	-20.11	QP
4	685.7715	-3.22	32.43	29.21	47.00	-17.79	QP
5	754.5090	-1.48	31.79	30.31	47.00	-16.69	QP
6	852.7054	-0.20	31.84	31.64	47.00	-15.36	QP

Above 1GHz							
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBμV)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.
1	1521.042	-9.99	40.78	30.79	70.00	-39.21	peak
2	1521.042	-9.99	25.35	15.36	50.00	-34.64	AVG
3	4066.132	2.50	38.50	41.00	74.00	-33.00	peak
4	4066.132	2.50	24.48	26.98	54.00	-27.02	AVG

Note: Level=Reading+Factor. Margin= Level—Limit

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5.2 Electrostatic discharge

For test instruments and accessories used see section 6 part 6.2.

5.2.1 Description of the test location

Test location :	Test location no. 2
Power supply:	DC 3.3V by Jig
Test condition:	Ambient Temperature: 24℃, Humidity:56%
Date of test :	14~28 March 2017
Operator :	Duke

5.2.2 Severity of levels electrostatic discharge

5.2.1.1 Severity level: Contact discharge at $\pm 4\text{KV}$ air discharge at $\pm 8\text{KV}$

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1	2	2
2	4	4
3	6	8
4	8	15
X	Special	Special

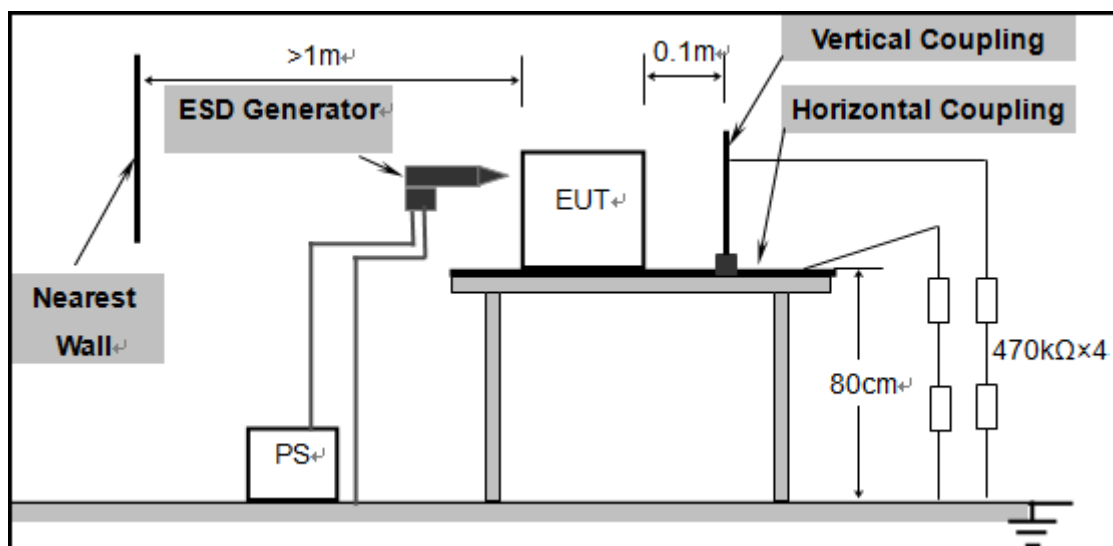
5.2.1.2 Performance criterion: B

5.2.3 Description of the test set-up

5.2.3.1 Operating Condition

The EUT is normal during the test, and the results of the maximum emanation are recorded

5.2.3.2 Block Diagram of Test Setup



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5.2.4 Test specification:

Contact discharge voltage:	<input type="checkbox"/> 2 kV	<input type="checkbox"/> 4 kV
Air discharge voltage:	<input type="checkbox"/> 2 kV	<input type="checkbox"/> 4 kV <input type="checkbox"/> 8 kV
Discharge impedance:	<input type="checkbox"/> 330 Ω / 150 pF	
Discharge factor:	<input type="checkbox"/> ≥ 1 sec.	
Number of discharges:	<input type="checkbox"/> ≥ 10	
Type of discharge:	Direct discharge	<input type="checkbox"/> Air discharge
		<input type="checkbox"/> Contact discharge
	Indirect discharge	<input type="checkbox"/> Contact discharge
Polarity:	<input type="checkbox"/> Positive	<input type="checkbox"/> Negative
Discharge location:	<input type="checkbox"/> see photo documentation of the test set-up	
	<input type="checkbox"/> all external locations accessible by hand	
	<input type="checkbox"/> horizontal plate (HCP)	
	<input type="checkbox"/> vertical coupling plate (VCP)	

5.2.5 Test resultThe requirements are **Fulfilled**Performance Criterion: **B****Remarks:** During the test no deviation was detected to the selected operation mode(s).

5.3 Radiated, radio-frequency, electromagnetic field

For test instruments and accessories used see section 6 part 6.3.

5.3.1 Description of the test location

Test location :	GTEM chamber
Power supply:	DC 3.3V by Jig
Test condition:	Ambient Temperature: 24℃, Humidity:56%
Date of test :	14~28 March 2017
Operator :	Duke

5.3.2 Severity levels of radiated, Radio-frequency, electromagnetic field

5.3.2.1 Severity level: 3V/m

Level	Field strenght(V/m)
1	1
2	3
3	10
X	Special

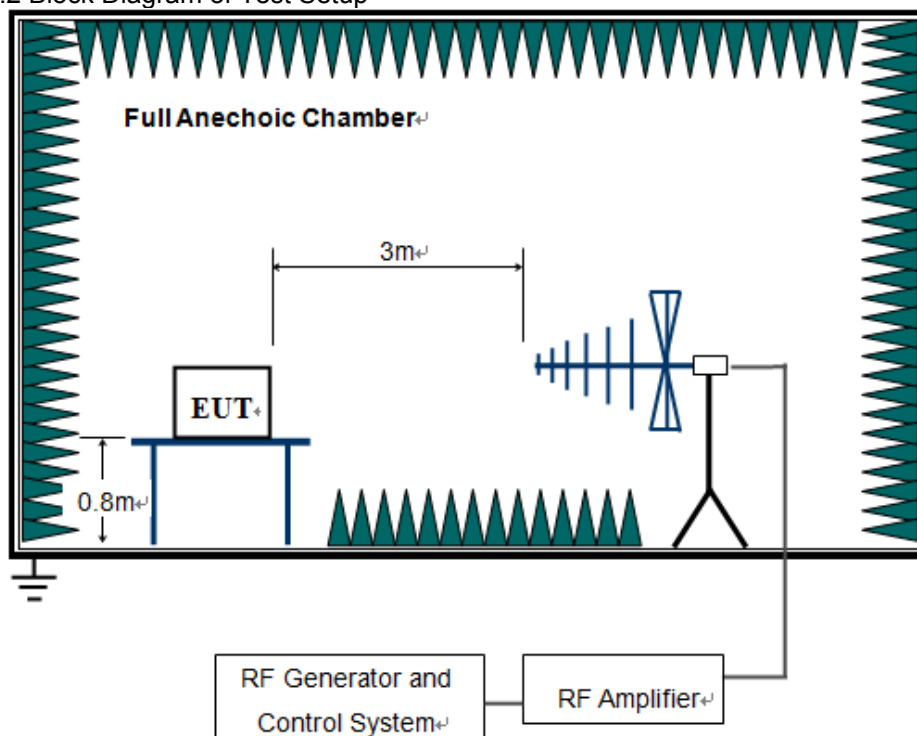
5.3.2.2 Performance criterion: A

5.3.3 Description of the test set-up

5.3.3.1 Operating Condition

The EUT is normal during the test, and the results of the maximum emanation are recorded

5.3.3.2 Block Diagram of Test Setup



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5.3.4 Test specification:

Frequency range:	■ 80 MHz to 6000 MHz
Field strength:	■ 3 V/m
EUT - antenna separation:	■ 3 m
Modulation:	■ AM: 80 % ■ sinusoidal 1000Hz
Frequency step:	■ 1 % with 3 s dwell time
Antenna polarisation:	■ horizontal ■ vertical

5.3.5 Test resultThe requirements are **Fulfilled**Performance Criterion: **A****Remarks:** During the test no deviation was detected to the selected operation mode(s).

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6 USED TEST EQUIPMENT

6.1					
Radiated disturbance (Electric field)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Signal analyzer	ROHDE & SCHWARZ	FSIQ26	100311	2016/03/24
2	EMI Test Receiver	ROHDE & SCHWARZ	ESVS 10	842885/001	2016/10/24
3	Biconical Antenna	ROHDE & SCHWARZ	HK116	100221	2016/03/26
4	Log per Antenna	ROHDE & SCHWARZ	HL223	100226	2016/03/26
5	Log per Antenna	ROHDE & SCHWARZ	HL050	100186	2016/03/26
6	Pre-Amplifier	EMC	EMC330	980113	2016/03/24
7	Pre-Amplifier	EMC	EMC012645	980114	2016/03/24
8	EMI Test Software	Farad	EZ-EMC	N/A	N/A
6.2					
Electrostatic Discharge					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ESD Simulator	Schlöder	SESD 200	0302016	2016/03/28
6.3					
RF Field Strength Susceptibility					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Signal Generator	ROHDE & SCHWARZ	SMY 01	843215/014	2016/10/24
2	Signal Generator	ROHDE & SCHWARZ	SML03	102986	2016/10/24
3	Amplifier	KALMUS	713FC	7385-1	2016/10/24
4	Power Meter	ROHDE & SCHWARZ	NRVS	842856/049	2016/10/24
5	Field Probe	ETS	HI-6005	00075047	2016/10/24
6	RS Test Software	Farad	EZ-RS	N/A	N/A

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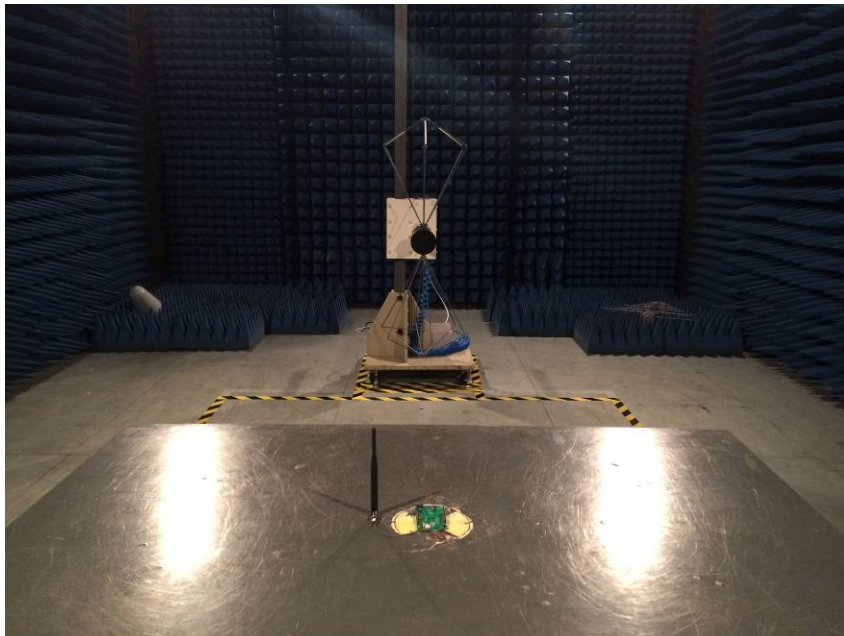
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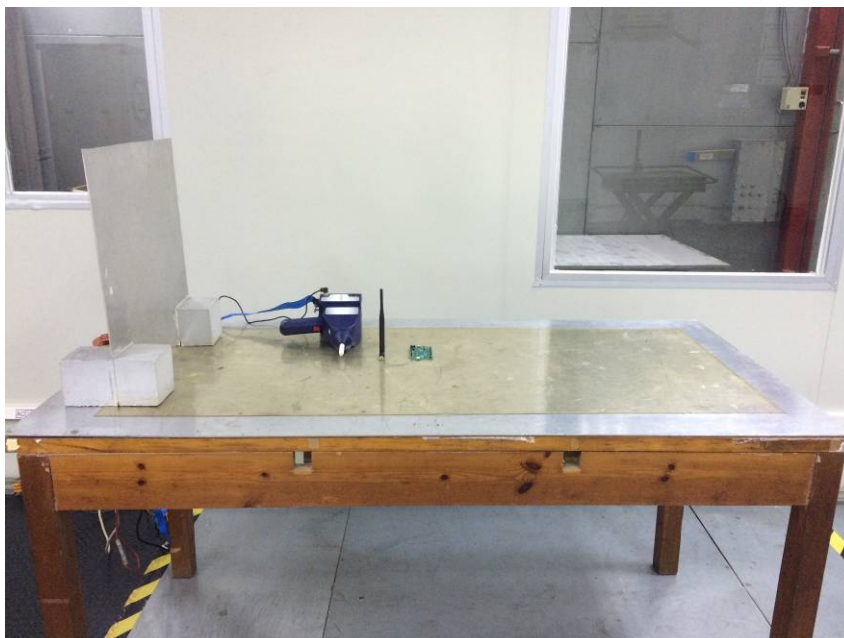
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7 TEST PHOTOGRAPHS

7.1. Photo of radiated emission measurement (R.E. Electric field)



7.2. Photo of electrostatic discharge Immunity measurement (E.S.D.)



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7.3. Photo of RF field strength Immunity measurement (R.S.)



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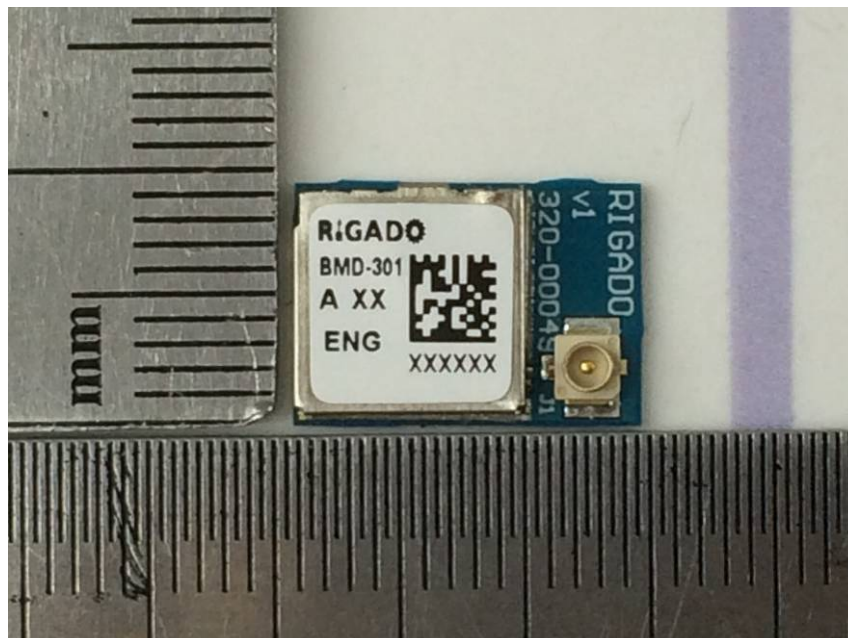
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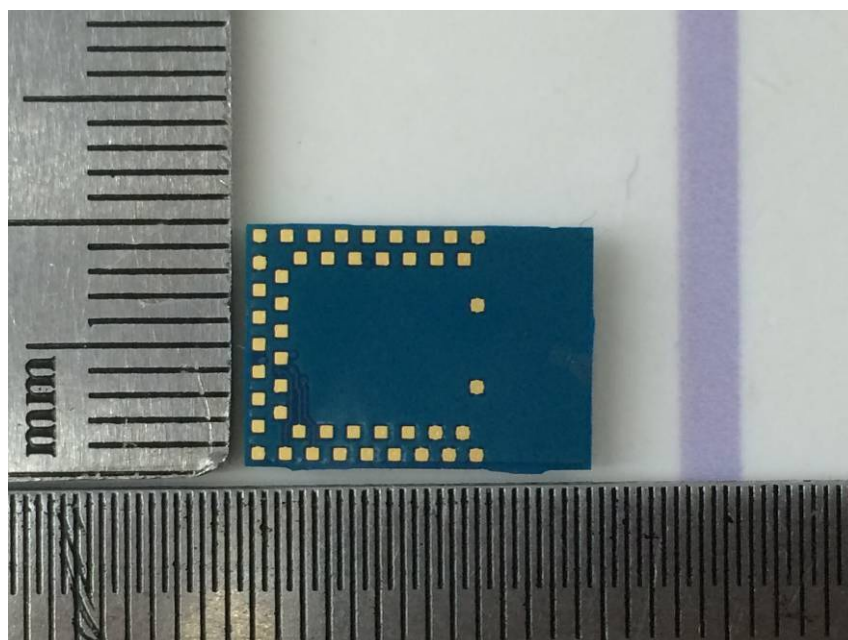
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8 External and Internal Photos of the EUT



External view 1



External view 2

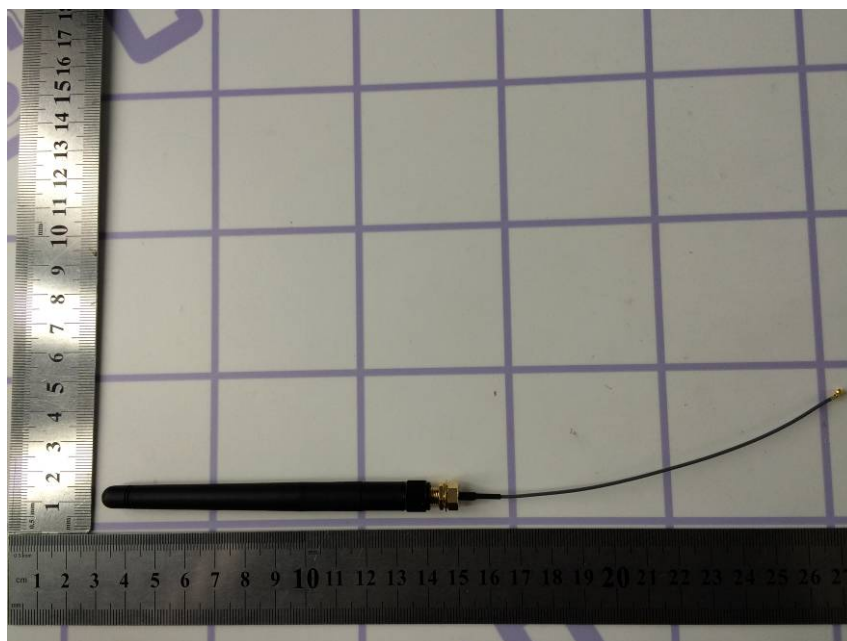
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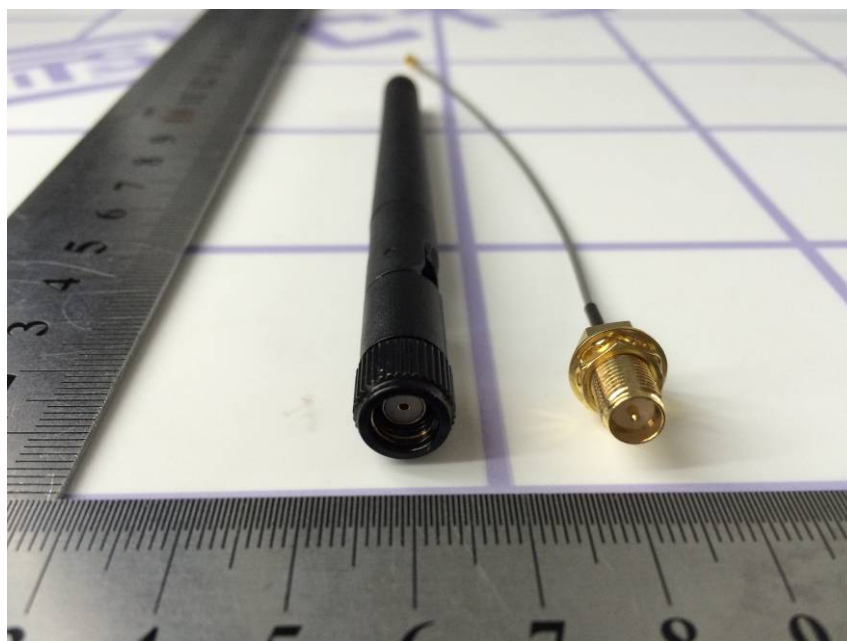
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External antenna 1 Pulse- W1030 (Gain 2.0dBi) view



External antenna 1 Pulse- W1030 (Gain 2.0dBi) antenna port view

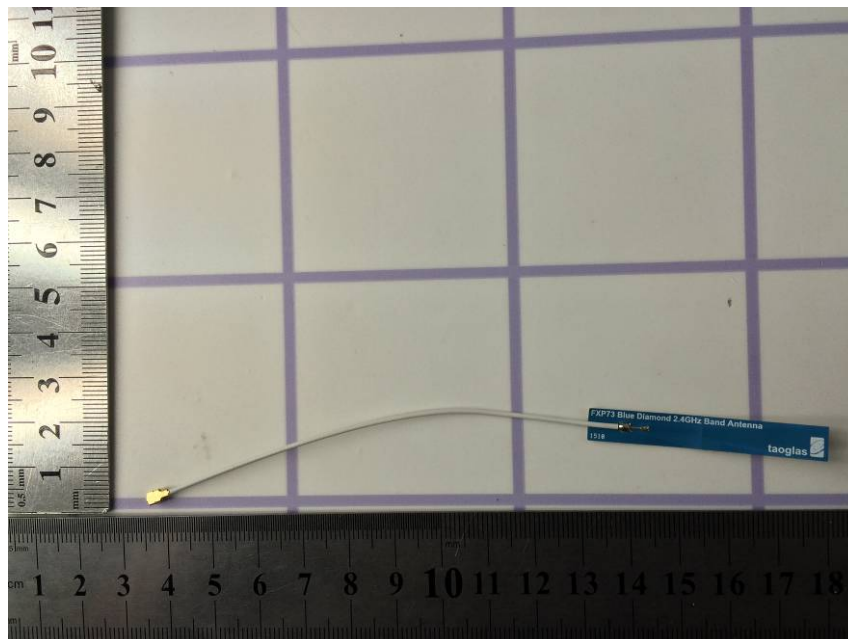
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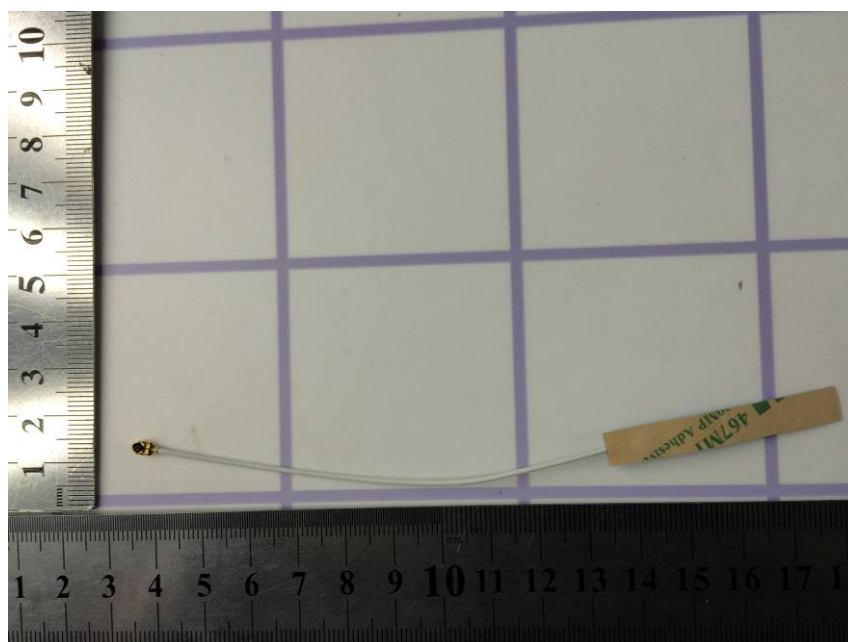
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External antenna 2 Taoglas-FXP73.07.0100A (Gain 2.5dBi) side 1 view



External antenna 2 Taoglas-FXP73.07.0100A (Gain 2.5dBi) side 2 view

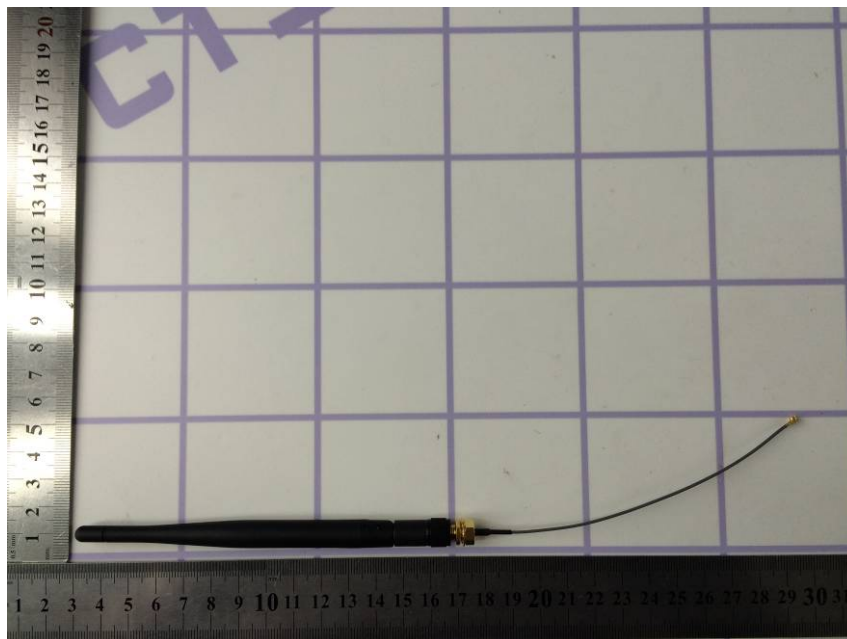
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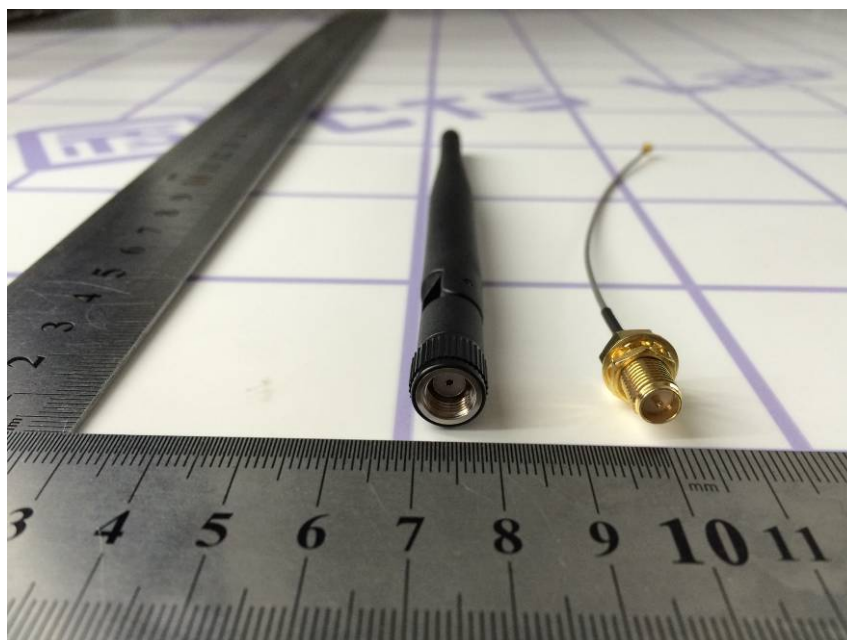
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External antenna 3 Pulse-W1027 (Gain 3.2dBi) view



External antenna 3 Pulse-W1027 (Gain 3.2dBi) antenna port view

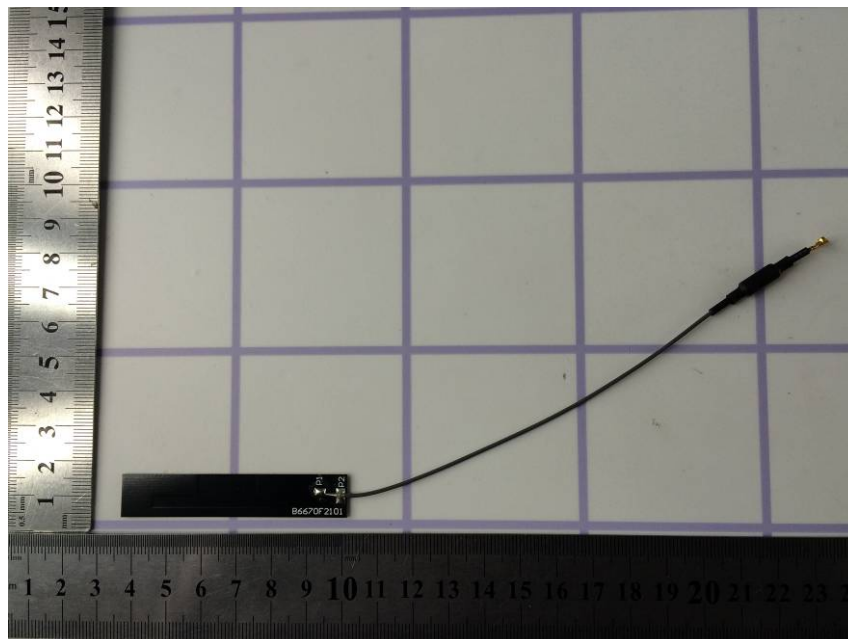
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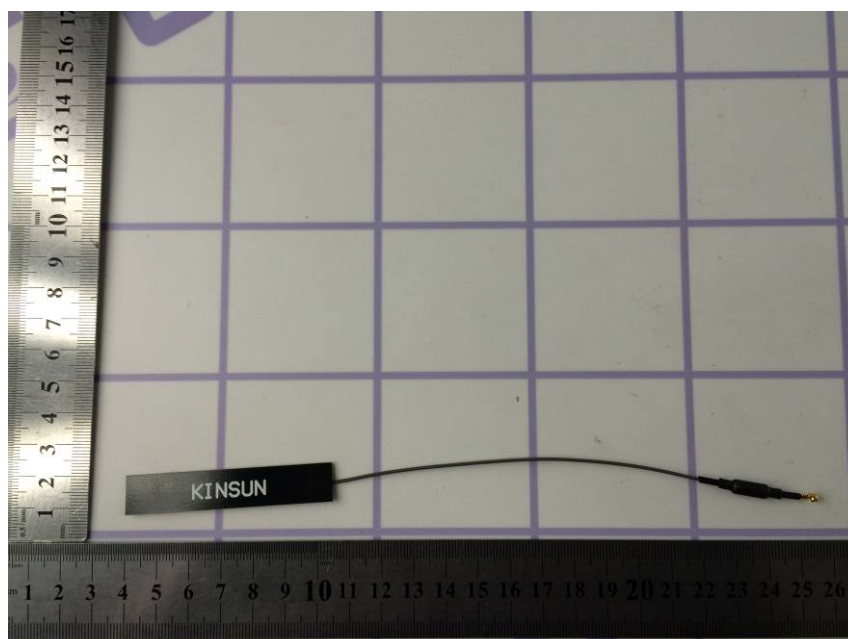
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External antenna 4 Kinsun-6670113050-145 (Gain 2.0dBi) side 1 view



External antenna 4 Kinsun-6670113050-145 (Gain 2.0dBi) side 2 view

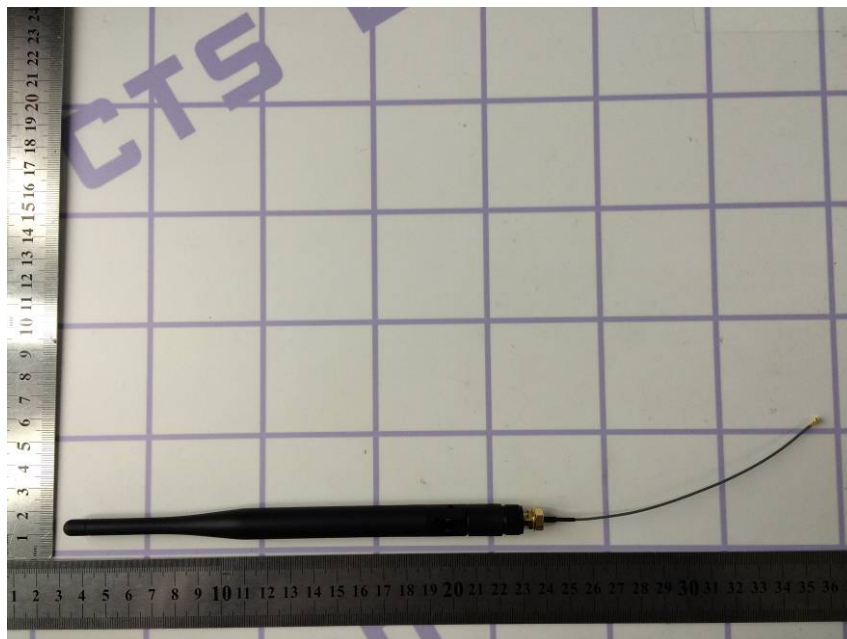
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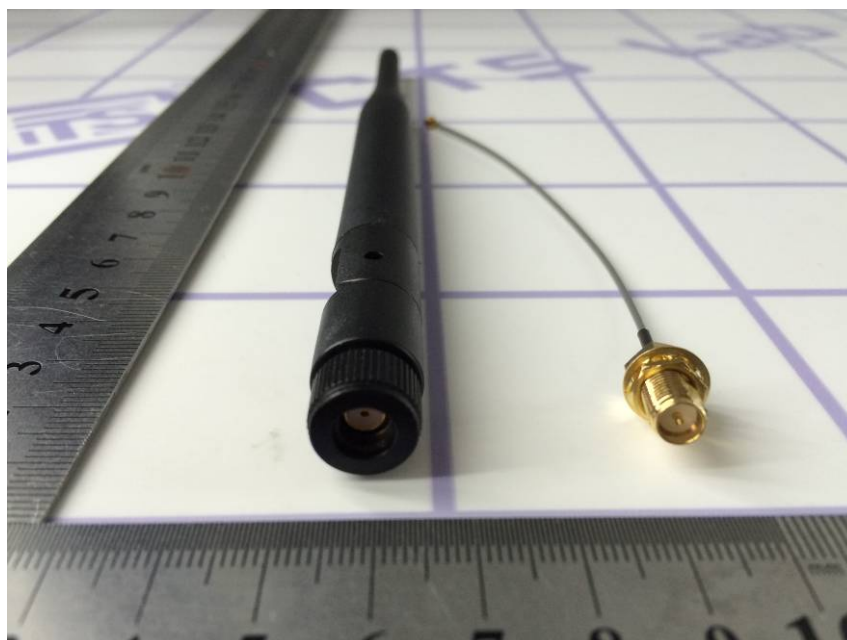
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External antenna 5 Kinsun- 6610103081 (Gain 5 dBi) view



External antenna 5 Kinsun- 6610103081 (Gain 5 dBi) antenna port view

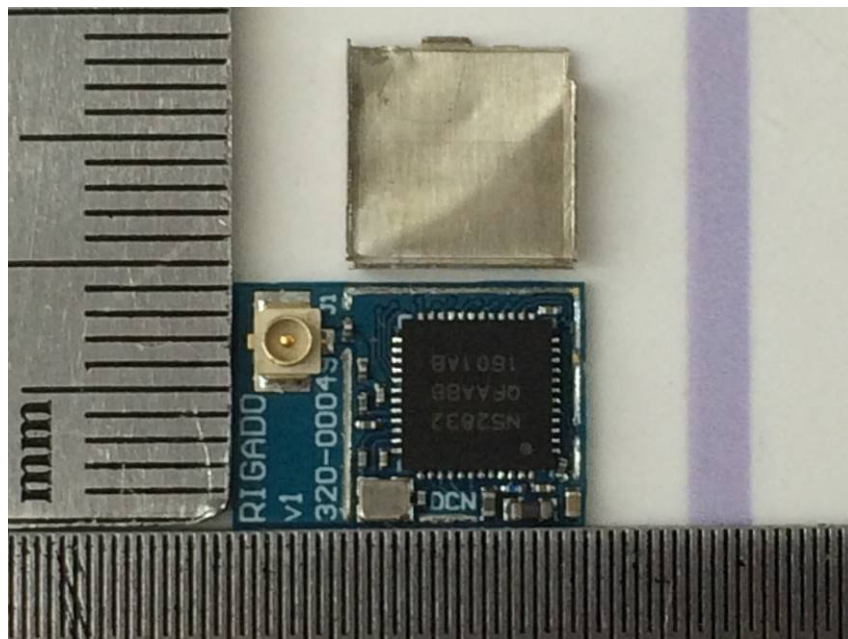
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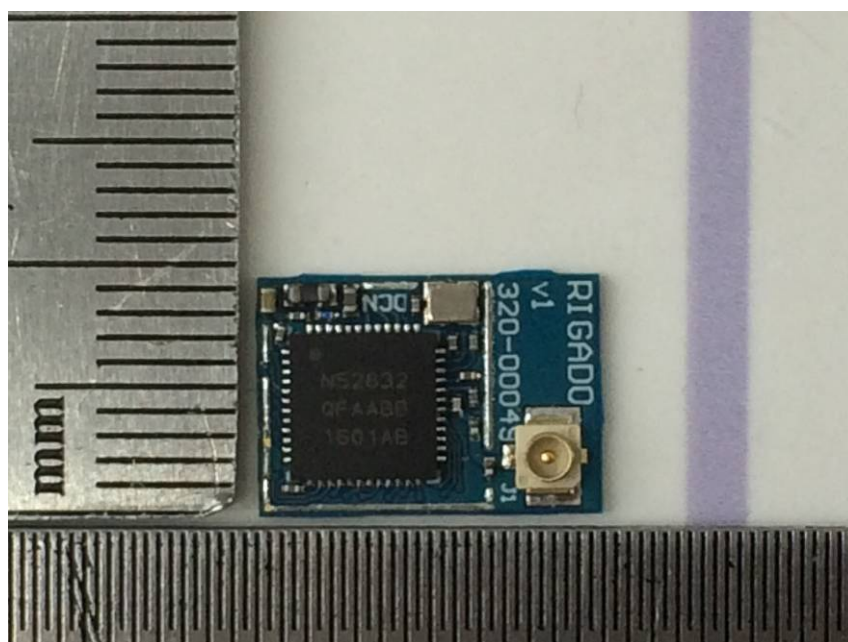
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Internal view



PCB side 1 view

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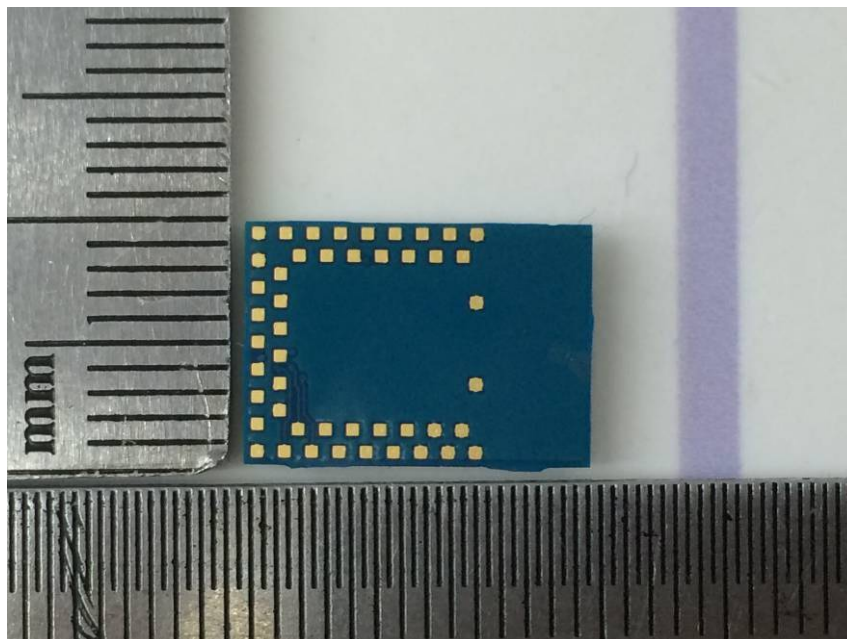
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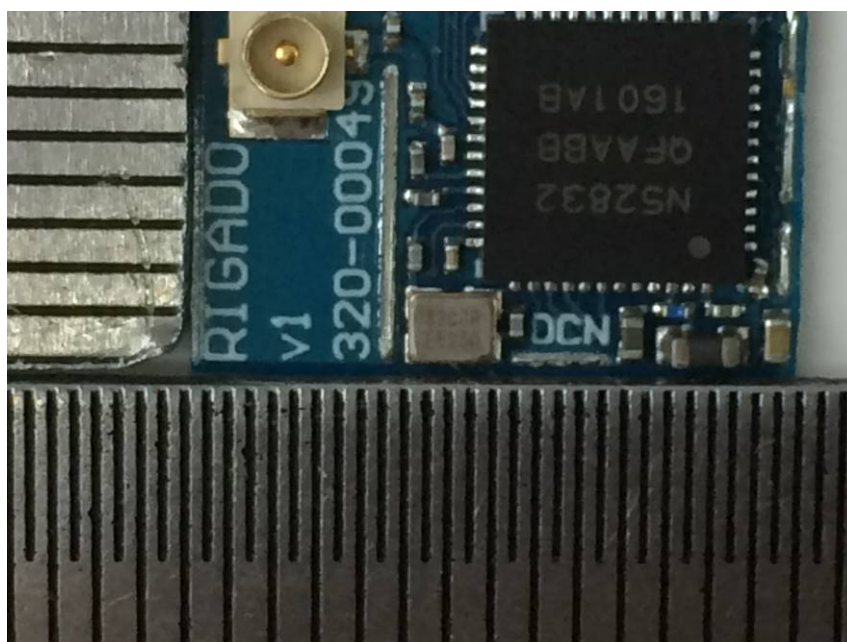
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PCB side 2 view



Oscillator view

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9 Manufacturer/ Approval holder Declaration

The following identical model(s):

N/A

Belong to the tested device:

Product description: **BMD-301**
Model name: **BMD-301**

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