



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

OPERATE ACCORDING TO ISO/IEC 17025

RF TEST REPORT

TEST REPORT NUMBER : CGZ3160202-00111-E



CTS (Ningbo) Testing Service Technology Co., Ltd.
2/F., South Tower, Huojia Building, No.181, Canghai Road,
Jiangdong Science and Technology Park, Ningbo, Zhejiang, China



TEST REPORT

AS/NZS 4268:2012+AMDT 1:2013

Radio equipment and systems—Short range devices—Limits and methods of measurement

Report Reference No.: CGZ3160202-00111-E

Date of issue: 03 February 2016

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, LLC

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

Test specification:

Standard: AS/NZS 4268:2012+AMDT 1:2013

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-300

Trade Mark: Rigado

Manufacturer: Rigado, LLC

Model/Type reference: BMD-300

Ratings/Frequency: 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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RF -- TEST REPORT

Test Report No. : CGZ3160202-00111-E	<u>03 February 2016</u> Date of issue
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Type / Model.....	BMD-300
EUT.....	BMD-300
Applicant	Rigado, LLC
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, LLC
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, LLC
Address.....	3950 Fariview Industrial Dr SE, Suite 100, Salem, OR USA, 97302
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Contact.....	Cam Nichols

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:

AS/NZS 4268:2012+AMDT 1:2013

Radio equipment and systems—Short range devices—Limits and methods of measurement

2 SUMMARY

2.1 GENERAL REMARKS

Date of receipt of test sample	02 February 2016
Testing commenced on	02~03 February 2016
Testing concluded on	03 February 2016

2.2 FINAL ASSESSMENT

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

☒ - fulfilled.

☐ - **not** fulfilled.

The equipment under test

☒ - fulfils the RF requirements cited on page 1.

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

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage: ☒ DC 3.6V
☐ Other (Specified blank below)

3.2 Short description of the Equipment under Test (EUT)

Description	:	BMD-300
Model Number	:	BMD-300
Operation frequency	:	2402MHz~2480MHz ISM Band Low Channel:2402MHz, Middle Channel:2440MHz High Channel : 2480MHz
Transmit Modulation	:	GFSK
Date Rate	:	1, 2 Mbps
Max output Power	:	-4.38 dBm
Antenna	:	PCB Antenna
Antenna Assembly Gain:	:	0dBi (maximum)
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 (1 Mbps)
☒ – TX (2 Mbps) and RX

Operating Mode: TX (2 Mbps) and RX

Note:TX (2 Mbps Rate) of EUT is the radiated test worst case; so only these test results be recorded in the test report.

Emissions tests.....: According to **AS-NZS 4268** searching for the highest disturbance.

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

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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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Parameter	Uncertainty
Total RF Power	$\pm 1.914\text{dB}$
RF Power density, Conducted	$\pm 1.5\text{dB}$
Frequency Range	$\pm 0.227\text{KHz}$
All emissions, Radiated	$\pm 4.04\text{dB}$
Temperature	$\pm 0.3^{\circ}\text{C}$
Humidity	$\pm 2.0\% \text{ RH}$
Voltage(DC)	± 0.223
Voltage(AC, <10KHz)	± 0.262

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4.6 Test Description and Results

Test case	Subclause	Results
<i>TRANSMITTER PARAMETERS</i>		
Maximum EIRP	8.1	PASS
Transmitter Spurious Emissions	8.2	PASS
Peak Power Spectral Density	Table 1	PASS
6 dB Bandwidth Measurement	Table 1	PASS
<i>RECEIVER PARAMETERS</i>		
Receiver spurious radiations	9.1	PASS
Note: N/A= Not applicable		

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5 TEST CONDITIONS AND RESULTS

5.1 Maximum EIRP

For test instruments and accessories used see section 6 part 6.1

5.1.1 Limit

The limit refer to Table 1 45A of AS/NZS 4268

Permitted operating frequency band (MHz)	Limit	
	Limit for mW	Limit for dBm
2400 to 2483.5	4000	36

5.1.2 Test Procedure reference clause 8.1 of AS/NZS 4268

5.1.3 Test Results for normal test conditions

The measurements for RF output power was performed at both normal environmental conditions and at the extremes of the operating temperature and voltage range. Controlling software has been activated to set the EUT on hopping channel and maximum power level.

The power was measured with an modulated carrier.

TEST CONDITION			EIRP POWER (dBm)			LIMIT (dBm)
			(Low CH) 2402 MHz	(Middle CH) 2440 MHz	(High CH) 2480 MHz	
$T_{nom}(^{\circ}C)$	+25	$V_{nom}(V)$	-4.49	-5.09	-6.15	36
$T_{min}(^{\circ}C)$	-10	$V_{min}(V)$	-4.48	-4.89	-6.33	36
		$V_{max}(V)$	*-4.38	-4.89	-5.87	36
$T_{max}(^{\circ}C)$	+50	$V_{min}(V)$	-4.71	-4.81	-6.14	36
		$V_{max}(V)$	-4.70	-4.80	-6.42	36

5.2 Transmitter Spurious Emissions

For test instruments and accessories used see section 6 part 6.1

5.2.1 Limit

The limit refer to Table 1 45A of AS/NZS 4268

In any 100 kHz bandwidth outside the frequency band in which the transmitter is operating, the power shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

5.2.2 Test Procedure reference clause 8.2.2 of AS/NZS 4268

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz
VBW = RBW
Sweep = auto
Detector function = peak
Trace = max hold.
4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

5.2.3 Test result

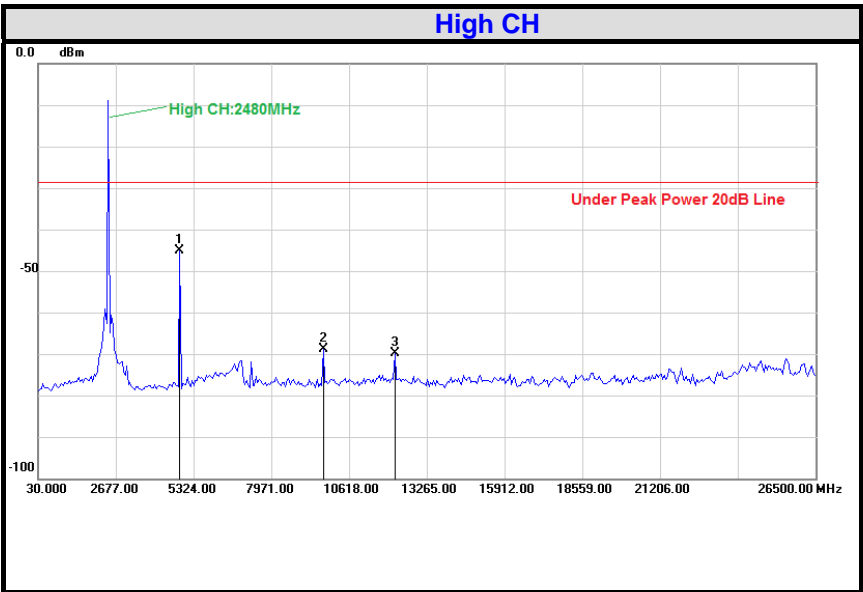
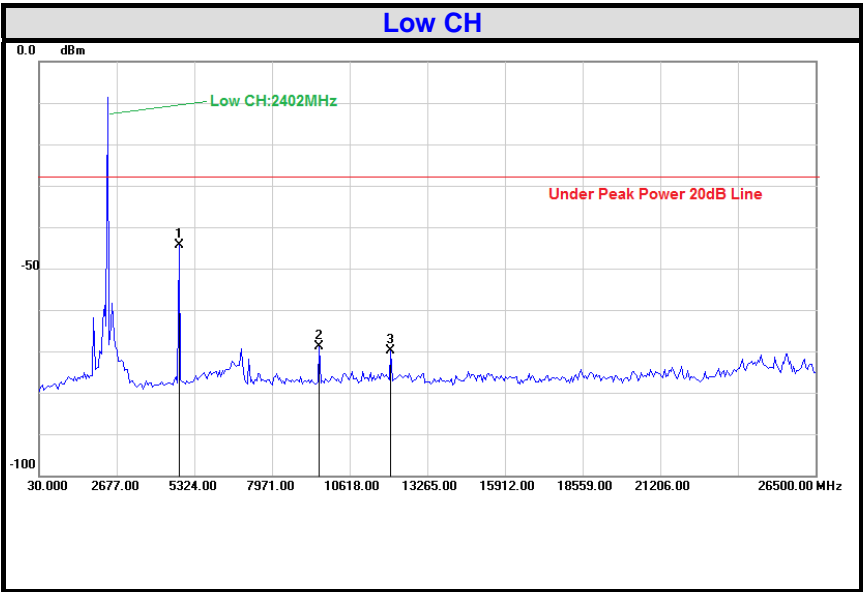
Low Channel:

30MHz to 26.6 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

High Channel:

30MHz to 26.6 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

Test Plot



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5.3 Peak Power Spectral Density

For test instruments and accessories used see section 6 part 6.1

5.3.1 Limits

The limit refer to Table 1 45A of AS/NZS 4268

CONDITION	FREQUENCY BAND	LIMIT (e.i.r.p.)
Under normal conditions	2400 ~ 2483.5 MHz	25mW / 3KHz (14dBm/3KHz)

5.3.2 Test Procedure

The test setup has been constructed as the normal test condition. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. The peak power density as defined in AS/NZS 4268 shall be measured and recorded. Controlling software (Art.exe) has been activated to set the EUT on specific status.

5.3.3 Test Result

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER DENSITY (dBm/3KHz) (E.I.R.P)	LIMIT (dBm/3KHz) (E.I.R.P)	PASS/FAIL
Low CH	2402.00	-20.08	14	PASS
Middle CH	2440.00	-20.61	14	PASS
High CH	2480.00	-21.76	14	PASS

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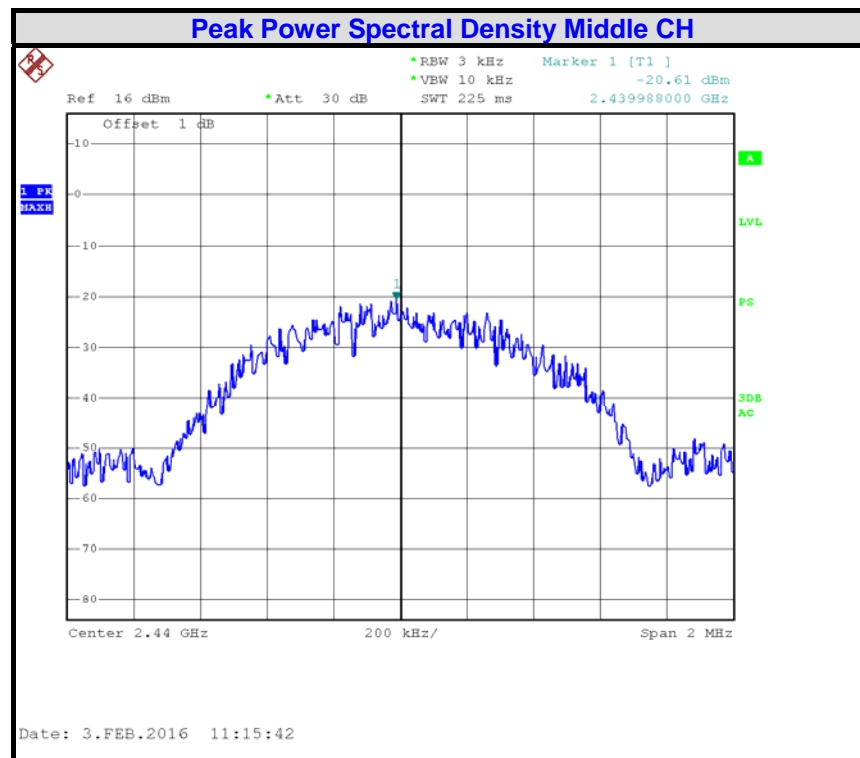
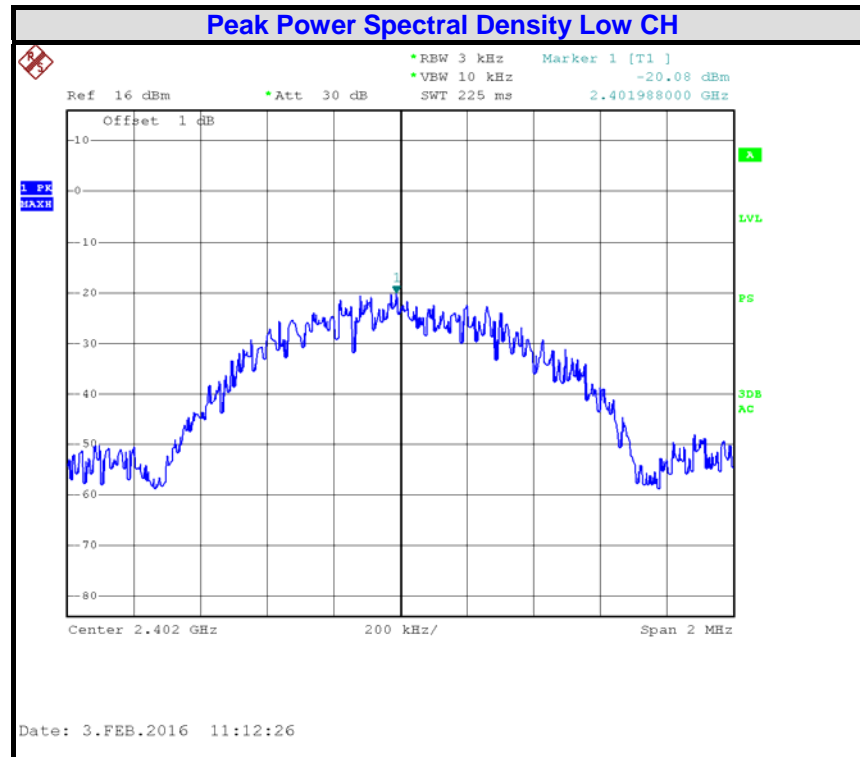
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Test Plot



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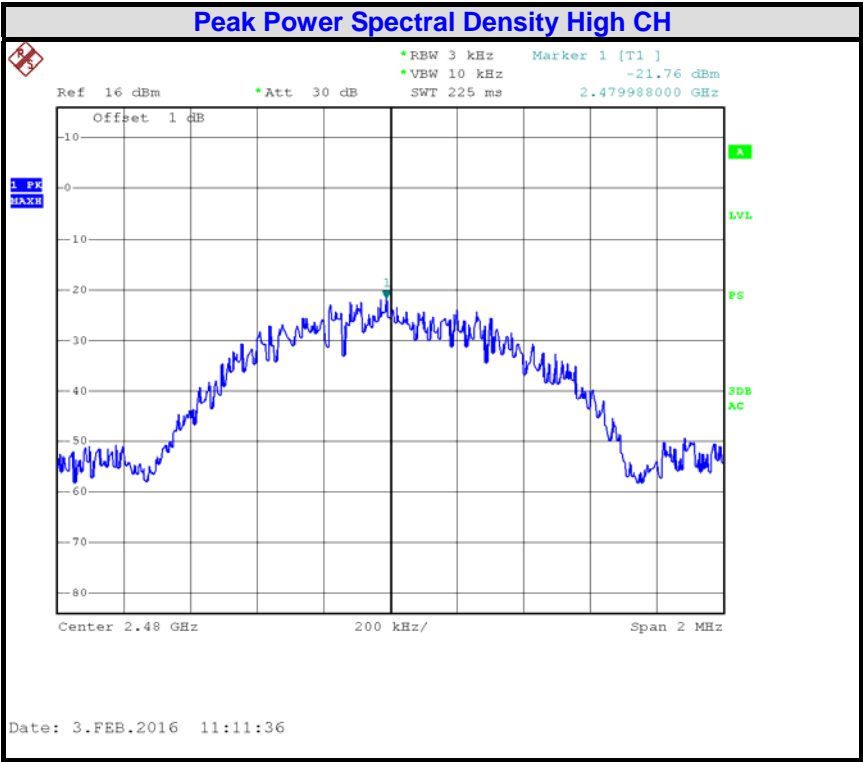
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5.4 6 dB Bandwidth Measurement

For test instruments and accessories used see section 6 part 6.1

5.4.1 Limits

The limit refer to Table 1 45A of AS/NZS 4268

CONDITION	FREQUENCY BAND	LIMIT
Under normal conditions	2400 ~ 2483.5 MHz	500KHz

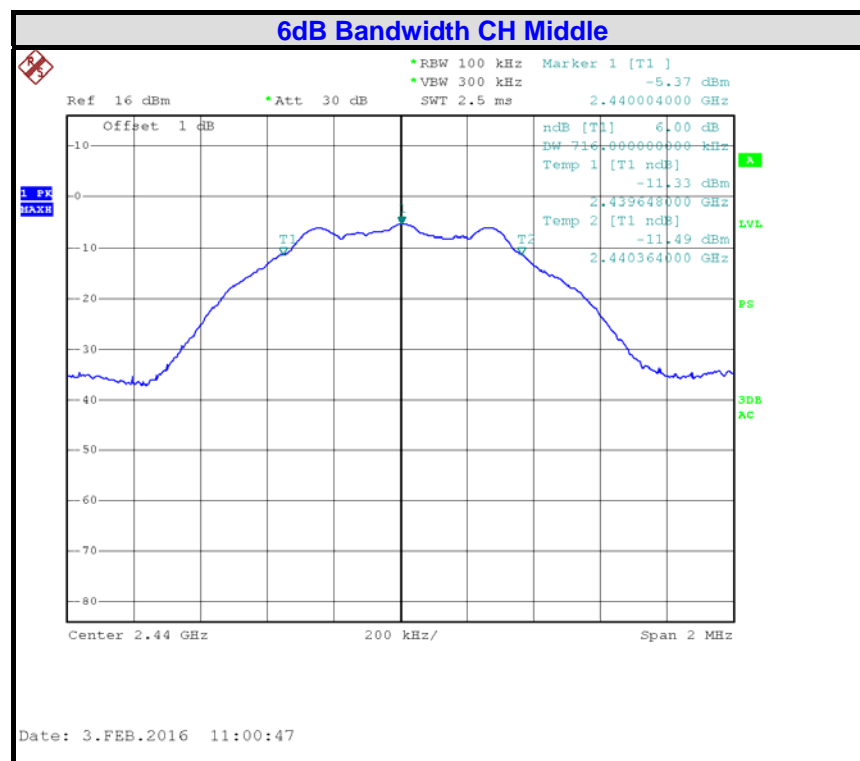
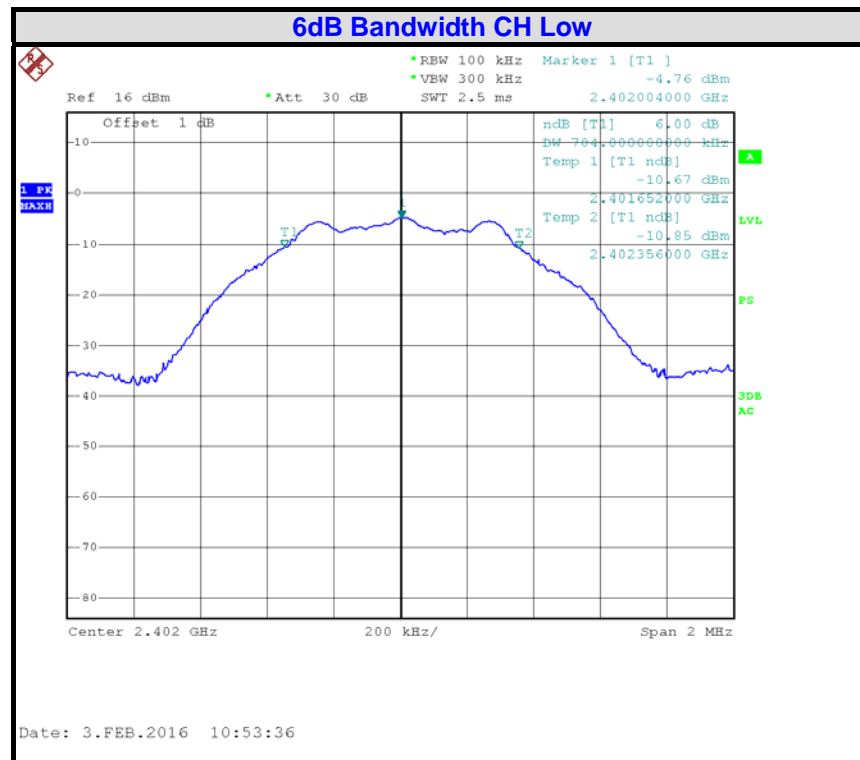
5.4.2 Test Procedure reference clause 8.3.2 of AS/NZS 4268

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = 300kHz, Span = 3MHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated

5.4.3 Test Results

Channel	Frequency (MHz)	Bandwidth (KHz)	Limit (KHz)	Result (KHz)
Low	2402	704.0	>500	PASSED
Middle	2440	716.0		PASSED
High	2480	732.0		PASSED

Test Plot



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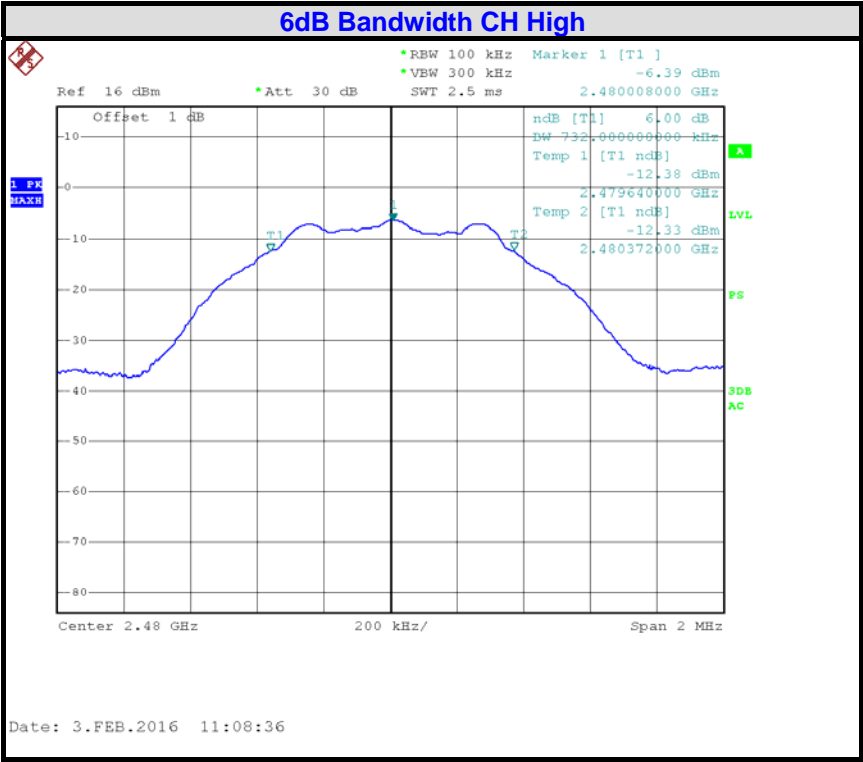
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5.5 Receiver Spurious Emission

For test instruments and accessories used see section 6 part 6.1

5.5.1 Limits

The limit refer to 9.1 of AS/NZS 4268

FREQUENCY MHz	DISTANCE Meters	E.i.r.p LIMIT	
		nW	dBm
30 ~ 1000	3	3.3	-57
Above 1000	3	32.8	-47

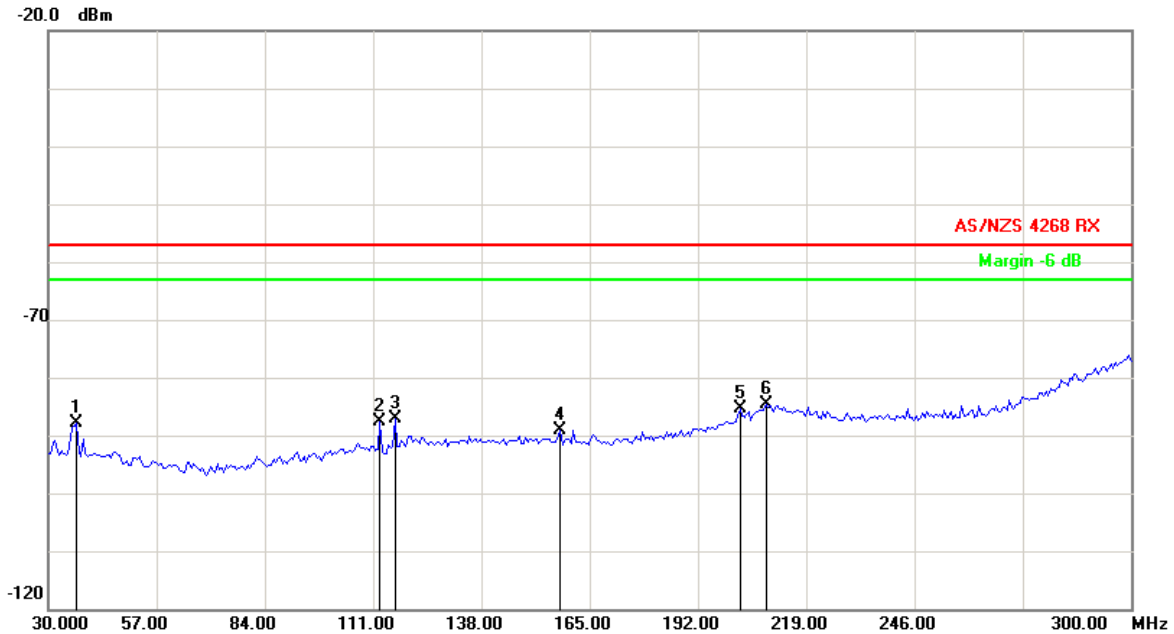
5.5.2 Test Procedure reference clause 9.1 of AS/NZS 4268

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

5.5.3 Test Results

The frequency range from 30MHz to 230MHz, 230MHz to 1000MHz and above 1GHz. is investigated. Please see the following pages.

Channel:	RX	Result:	<input checked="" type="checkbox"/> - passed
Test point:	Horizontal		<input type="checkbox"/> - not passed
Frequency range:	30MHz-1GHz		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	37.0341	-16.95	-70.90	-87.85	-57.00	-30.85	peak
2	112.7856	-17.14	-70.57	-87.71	-57.00	-30.71	peak
3	116.5731	-16.92	-70.09	-87.01	-57.00	-30.01	peak
4	157.6954	-15.97	-73.14	-89.11	-57.00	-32.11	peak
5	202.6052	-11.74	-73.69	-85.43	-57.00	-28.43	peak
6	209.0982	-10.38	-74.17	-84.55	-57.00	-27.55	peak
Remark: Other frequency mini margin all >6 dB of Limit							

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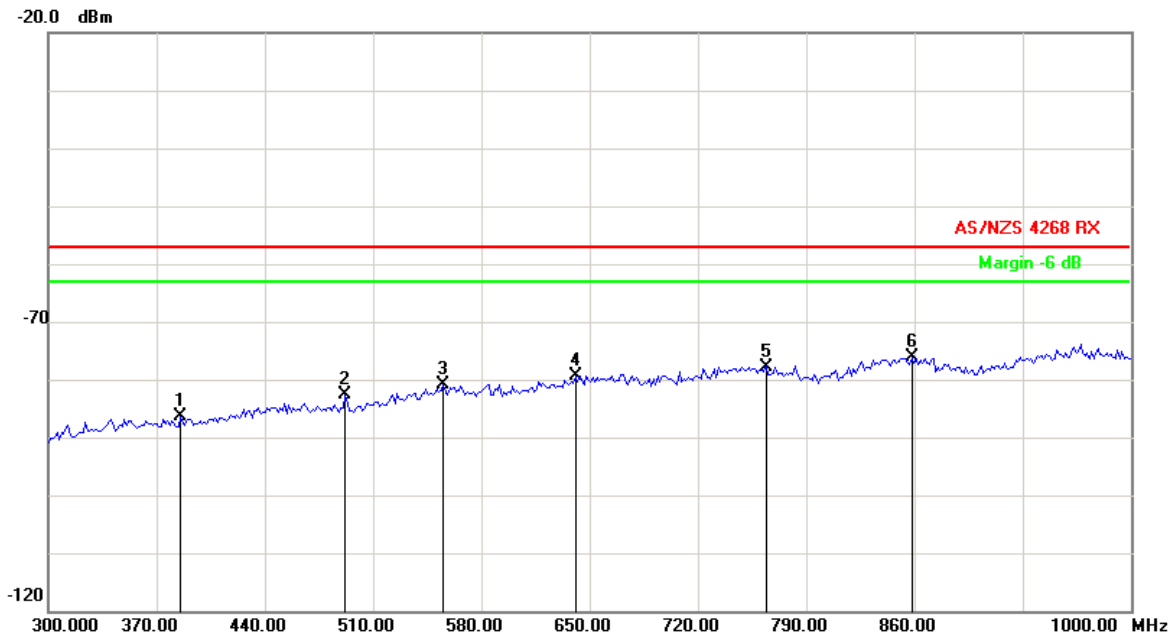
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No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	385.5711	-10.75	-75.66	-86.41	-57.00	-29.41	peak
2	492.1844	-8.17	-74.48	-82.65	-57.00	-25.65	peak
3	555.3106	-5.67	-75.17	-80.84	-57.00	-23.84	peak
4	640.8818	-3.65	-75.77	-79.42	-57.00	-22.42	peak
5	764.3287	-2.08	-75.67	-77.75	-57.00	-20.75	peak
6	858.3166	-0.54	-75.60	-76.14	-57.00	-19.14	peak
Remark: Other frequency mini margin all >6 dB of Limit							

Channel:	RX	Result:	<input checked="" type="checkbox"/> - passed
Test point:	Horizontal		<input type="checkbox"/> - not passed
Frequency range:	Above 1GHz		

No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	1824.148	-10.39	-67.05	-77.44	-47.00	-30.44	peak
2	5426.854	4.53	-69.83	-65.30	-47.00	-18.30	peak
Remark: Other frequency mini margin all >6 dB of Limit							

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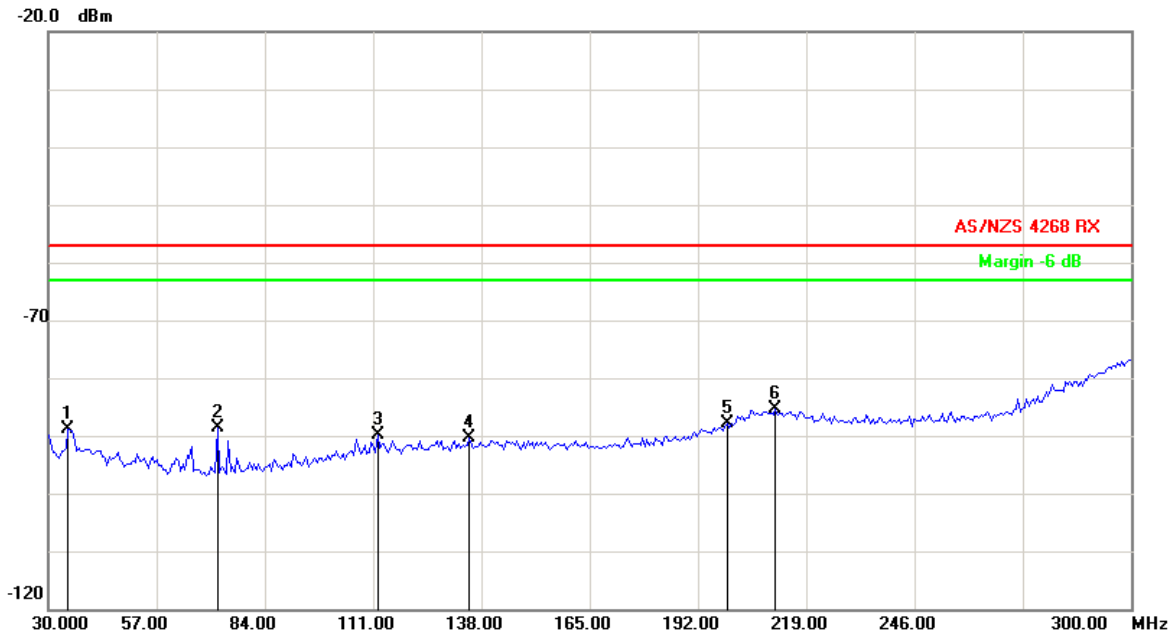
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Channel:	RX	Result:	■ - passed
Test point:	Vertical		□ - not passed
Frequency range:	30MHz-1GHz		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	34.8697	-16.67	-72.25	-88.92	-57.00	-31.92	peak
2	72.2044	-20.58	-67.97	-88.55	-57.00	-31.55	peak
3	112.2445	-17.17	-72.76	-89.93	-57.00	-32.93	peak
4	134.9699	-16.10	-74.22	-90.32	-57.00	-33.32	peak
5	199.3587	-12.42	-75.36	-87.78	-57.00	-30.78	peak
6	211.2625	-10.28	-75.12	-85.40	-57.00	-28.40	peak
Remark: Other frequency mini margin all >6 dB of Limit							

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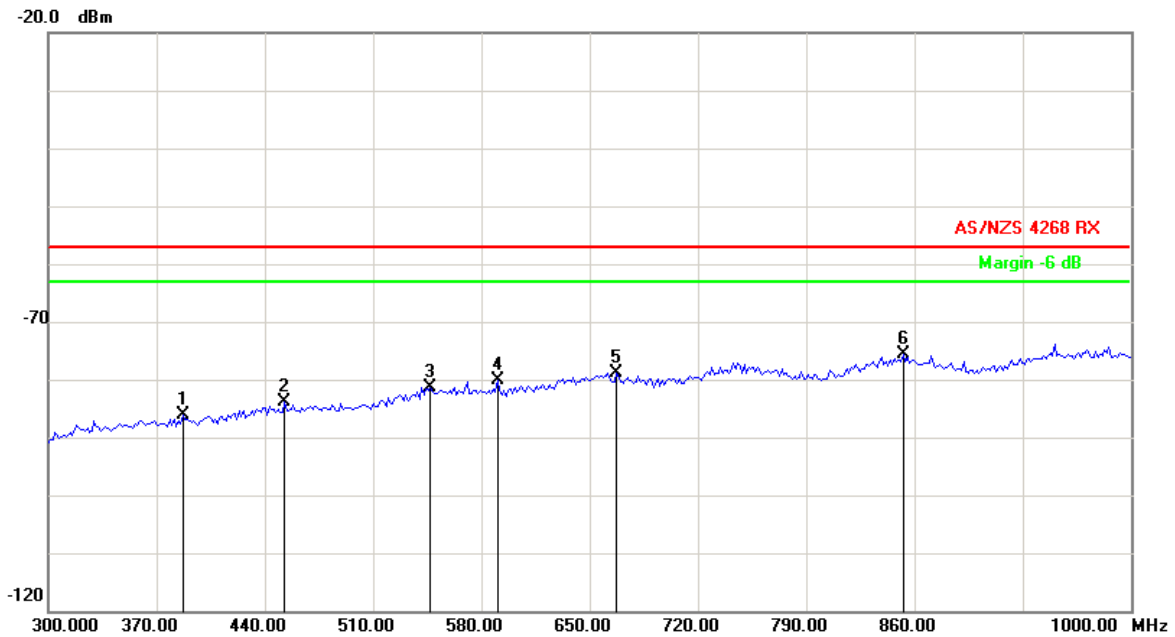
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No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	386.9739	-10.73	-75.33	-86.06	-57.00	-29.06	peak
2	452.9058	-8.44	-75.43	-83.87	-57.00	-26.87	peak
3	546.8938	-5.83	-75.43	-81.26	-57.00	-24.26	peak
4	590.3808	-5.58	-74.56	-80.14	-57.00	-23.14	peak
5	667.5351	-3.40	-75.36	-78.76	-57.00	-21.76	peak
6	852.7054	-0.37	-75.19	-75.56	-57.00	-18.56	peak
Remark: Other frequency mini margin all >6 dB of Limit							

Channel:	RX	Result:	<input checked="" type="checkbox"/> - passed
Test point:	Vertical		<input type="checkbox"/> - not passed
Frequency range:	Above 1GHz		

No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	1518.036	-12.41	-67.23	-79.64	-47.00	-32.64	peak
2	5403.307	4.46	-69.21	-64.75	-47.00	-17.75	peak
Remark: Other frequency mini margin all >6 dB of Limit							

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

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6 USED TEST EQUIPMENT

6.1

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100868	2015/10/29
2	Signal analyzer	ROHDE & SCHWARZ	FSIQ26	102986	2015/03/24
3	Biconical Antenna	ROHDE & SCHWARZ	HK116	100221	2015/03/24
4	Log per Antenna	ROHDE & SCHWARZ	HL223	100226	2015/03/24
5	Log per Antenna	ROHDE & SCHWARZ	HL050	100186	2015/03/24
6	Temperature Chamber	GW	GDS-150	1016	2015/10/29
7	Oscilloscope	Agilent	DSO6104A	MY40009313	2015/10/29
8	Power meter	ROHDE & SCHWARZ	NRVS	842856/049	2015/10/29
9	Temperature Chamber	GW	GDS-150	1016	2015/10/29

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7 TEST PHOTOGRAPHS

7.1. Photo of radiated emission measurement



Below 1GHz



Above 1GHz

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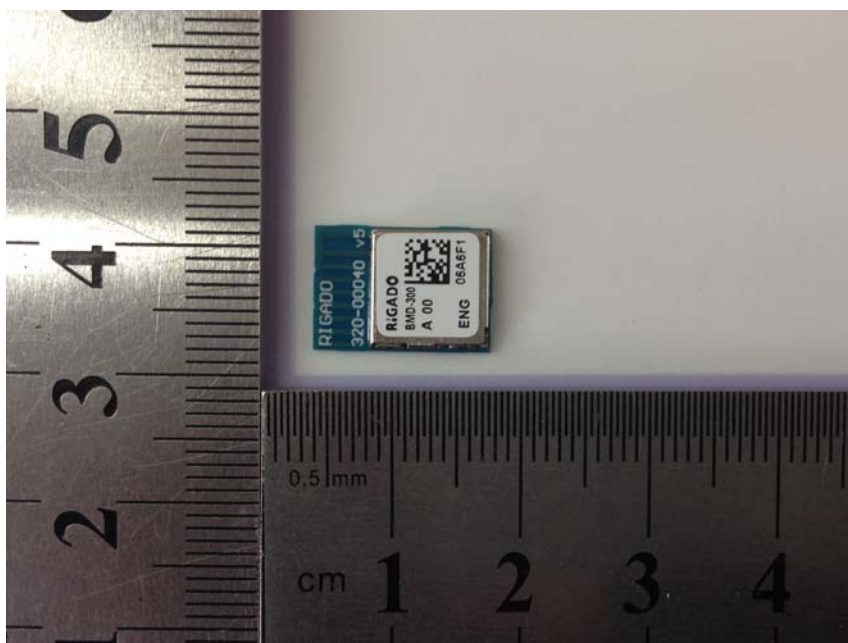
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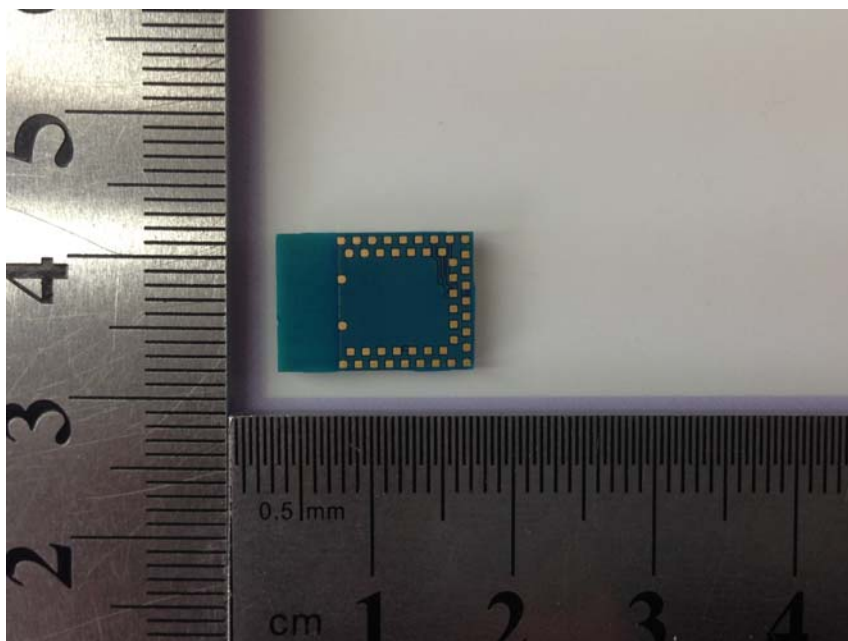
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8 External Photos of the EUT



External view side 1



External view side 2

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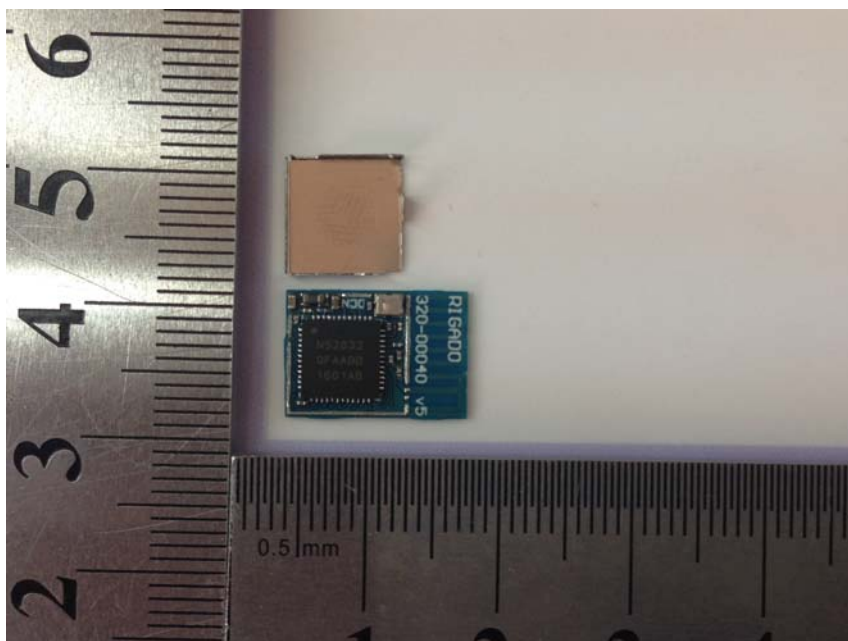
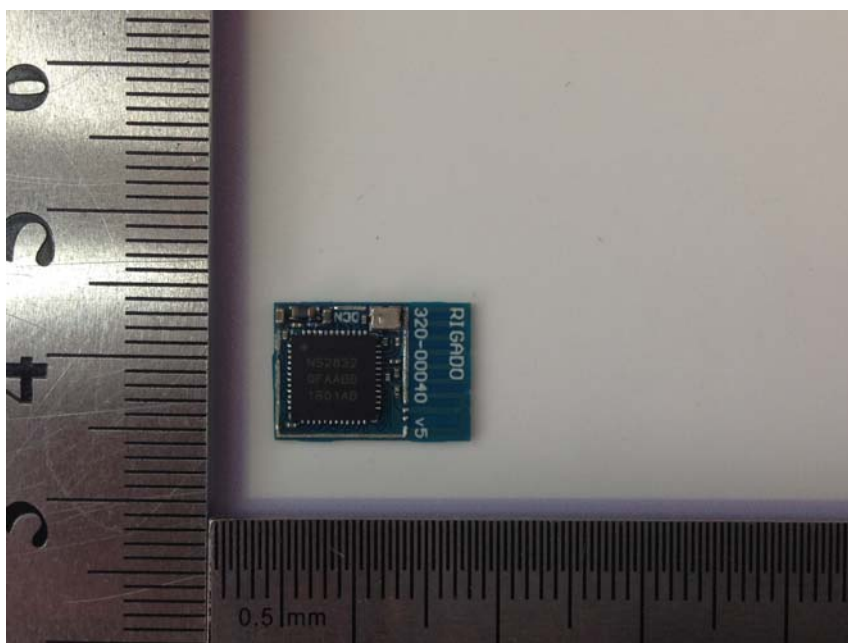
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**Internal view****PCB side 1 view**

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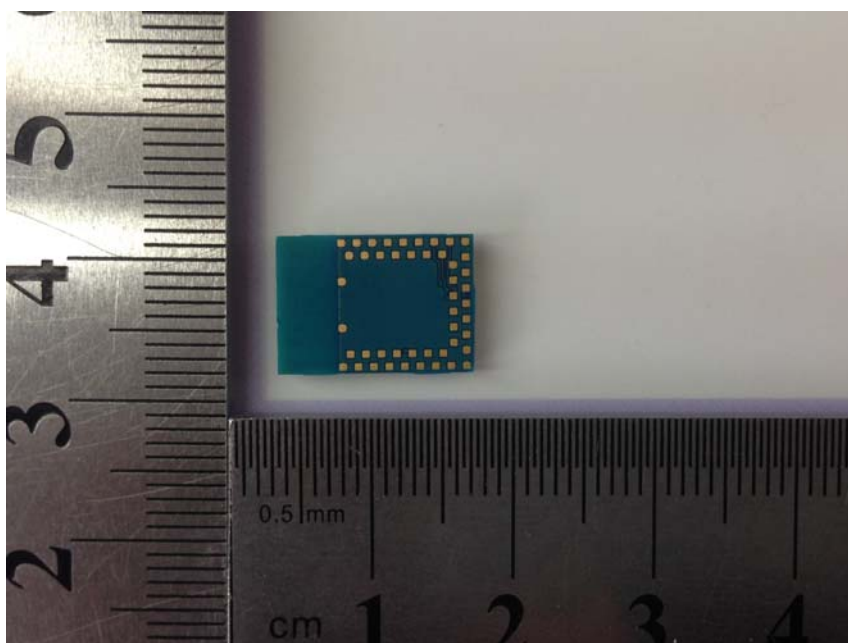
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**PCB side 2 view****Oscillator view**

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9 Manufacturer/ Approval holder Declaration

The following identical model(s):

N/A

Belong to the tested device:

Product description: **BMD-300**
Model name: **BMD-300**

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