



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

OPERATE ACCORDING TO ISO/IEC 17025

RF TEST REPORT

TEST REPORT NUMBER : CGZ3170314-00331-ER



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

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

RF TEST REPORT

Report Reference No.: CGZ3170314-00331-ER

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 300 328 V2.1.1**

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/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. : CGZ3170314-00331-ER	<u>28 March 2017</u> 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
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Factory.....	Rigado, Inc.
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Fax.....	+1-971-208-9869
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:

ETSI EN 300 328 V2.1.1

Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 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 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 3.3V by Jig
☐ Other (Specified blank below)

3.2 Short description of the Equipment under Test (EUT)

Description	:	BMD-301
Model Number	:	BMD-301
Operation frequency	:	2402MHz~2480MHz ISM Band
		Low Channel:2402MHz, Middle Channel:2440MHz High Channel : 2480MHz
Transmit Modulation	:	GFSK
Max output Power	:	-0.24dBm
Date Rate	:	1, 2 Mbps
Antenna	:	External antenna (Pulse-W1030), 2.0dBi
	:	External antenna (Taoglas-FXP73.07.0100A), 2.5dBi
	:	External antenna (Pulse-W1027), 3.2dBi
	:	External antenna (Kinsun-6670113050-145), 2.0dBi
	:	External antenna (Kinsun-6610103081), 5.0dBi
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: Low Channel (2402MHz), Middle channel(2440MHz) ,
High Channel(2480MHz)

Operating Mode RX: Normal

Note:TX (2 Mbps Rate, 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 300 328 V2.1.1** searching for the highest disturbance.

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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:



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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)

Fax: +86-20-38780406

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 June 06, 2011 .

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 %
AtmosphDuke 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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Measurement Uncertainty	
RF Frequency	$\pm 1 \times 10^{-8}$
RF Power, Conducted	$\pm 0.55\text{dB}$
Maximum Frequency Deviation: _ Within 300Hz and 6KHz of Audio Frequency _ Within 6KHz and 25KHz of Audio Frequency	$\pm 3\%$ $\pm 2\text{dB}$
Adjacent channel power	$\pm 2\text{dB}$
Conducted Emission of Transmitter, Valid Up to 12.75GHz	$\pm 3\text{dB}$
Conducted Emissions of Receivers	$\pm 2\text{dB}$
Radiated Emission of Transmitter, Valid Up to 12.75GHz	$\pm 4\text{dB}$
Radiated Emissions of Receivers	$\pm 4\text{dB}$

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.

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4.6 Test Description and Results

No.	Basic Standard	Test Type	Result
1	ETSI EN 300 328 4.3.2.2	RF Output Power	Pass
2	ETSI EN 300 328 4.3.2.3	Power Spectral Density	Pass
3	ETSI EN 300 328 4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	N/A
4	ETSI EN 300 328 4.3.2.5	Medium Utilisation(MU) factor	N/A
5	ETSI EN 300 328 4.3.2.6	Adaptivity	N/A
6	ETSI EN 300 328 4.3.2.7	Occupied Channel Bandwidth	Pass
7	ETSI EN 300 328 4.3.2.8	Transmitter unwanted emissions in the out-of-band domain	Pass
8	ETSI EN 300 328 4.3.2.9	Transmitter unwanted emissions in the spurious domain	Pass
9	ETSI EN 300 328 4.3.2.10	Receiver spurious emissions	Pass
10	ETSI EN 300 328 4.3.2.11	Receiver Blocking	Pass
Note: 1. N/A means it's not applicable to this item. 2. Owing to the maximum declared RF Output power (e.i.r.p.) less than 10 dBm, so the item 3, 4, 5 are not applicable.			

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5 TEST CONDITIONS AND RESULTS

5.1 RF Output Power

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

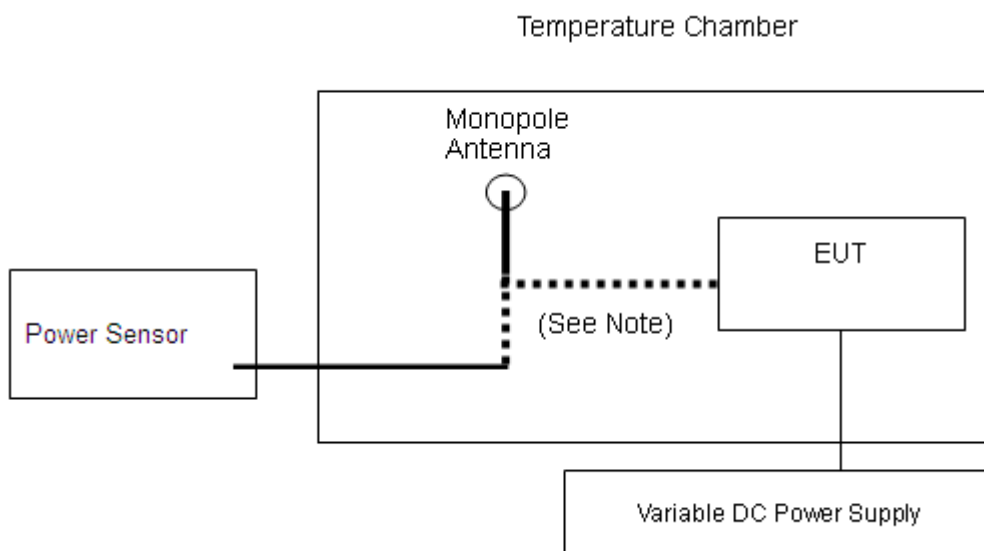
EN 300 328 Clause 4.3.2.2

For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm.

The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.3.1 m). For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.

This limit shall apply for any combination of power level and intended antenna assembly.

Test Configuration



Test Procedure

- 1) Use a fast power sensor and set the samples speed 1MS/s or faster.
- 2) Connect one power sensor to each transmit port, Trigger the power sensors so that they start sampling at the same time. For each instant in time, sum the power of the individual samples of all ports and store them. Use these stored samples in all following steps.
- 3) Find the start and stop times of each burst in the stored measurement samples.
- 4) Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these Pburst values, as well as the start and stop times for each burst.
- 5) The highest of all Pburst values (Value "A" in dBm) will be used for maximum e.i.r.p calculations.
- 6) The cable loss and attenuator factor shall be considered to the value "A".

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- 7) Add the (stated) antenna assembly gain “G” in dBi of the individual antenna. If applicable, add the additional beamforming gain “Y” in dB.
- 8) The RF output power (P) shall be calculated using the formula: $P=A+G+Y$

Test Results

EXTERNAL ANTENNA 1 (PULSE-W1030) 2.0dBi				
TEST CONDITIONS		RF OUTPUT POWER (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
Low Channel	EIRP	6.21	6.24	6.18
Middle Channel	EIRP	6.31	6.07	6.24
High Channel	EIRP	6.15	6.17	6.08
Limit		20dBm		
Number of Burst		10		
Measurement Time		45.53ms		
Measurement uncertainty		+ 0.28dB / - 0.30dB		
Note		1. Result=Reading+ Ant. Gain 2. The reading value included cable loss.		

EXTERNAL ANTENNA 2 (TAOGLAS-FXP73.07.0100A) 2.5dBi				
TEST CONDITIONS		RF OUTPUT POWER (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
Low Channel	EIRP	6.71	6.74	6.68
Middle Channel	EIRP	6.81	6.57	6.74
High Channel	EIRP	6.65	6.67	6.58
Limit		20dBm		
Number of Burst		10		
Measurement Time		45.53ms		
Measurement uncertainty		+ 0.28dB / - 0.30dB		
Note		1. Result=Reading+ Ant. Gain 2. The reading value included cable loss.		

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EXTERNAL ANTENNA 3 (PULSE-W1027) 3.2dBi				
TEST CONDITIONS		RF OUTPUT POWER (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
Low Channel	EIRP	7.41	7.44	7.38
Middle Channel	EIRP	7.51	7.27	7.44
High Channel	EIRP	7.35	7.37	7.28
Limit		20dBm		
Number of Burst		10		
Measurement Time		45.53ms		
Measurement uncertainty		+ 0.28dB / - 0.30dB		
Note		1. Result=Reading+ Ant. Gain 2. The reading value included cable loss.		

EXTERNAL ANTENNA 4 (KINSUN-6670113050-145) 2.0dBi				
TEST CONDITIONS		RF OUTPUT POWER (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
Low Channel	EIRP	6.21	6.24	6.18
Middle Channel	EIRP	6.31	6.07	6.24
High Channel	EIRP	6.15	6.17	6.08
Limit		20dBm		
Number of Burst		10		
Measurement Time		45.53ms		
Measurement uncertainty		+ 0.28dB / - 0.30dB		
Note		1. Result=Reading+ Ant. Gain 2. The reading value included cable loss.		

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EXTERNAL ANTENNA 5 (KINSUN-6610103081) 5.0dBi				
TEST CONDITIONS		RF OUTPUT POWER (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
Low Channel	EIRP	9.21	9.24	9.18
Middle Channel	EIRP	9.31	9.07	9.24
High Channel	EIRP	9.15	9.17	9.08
Limit		20dBm		
Number of Burst		10		
Measurement Time		45.53ms		
Measurement uncertainty		+ 0.28dB / - 0.30dB		
Note		1. Result=Reading+ Ant. Gain 2. The reading value included cable loss.		

Conclusion: PASS

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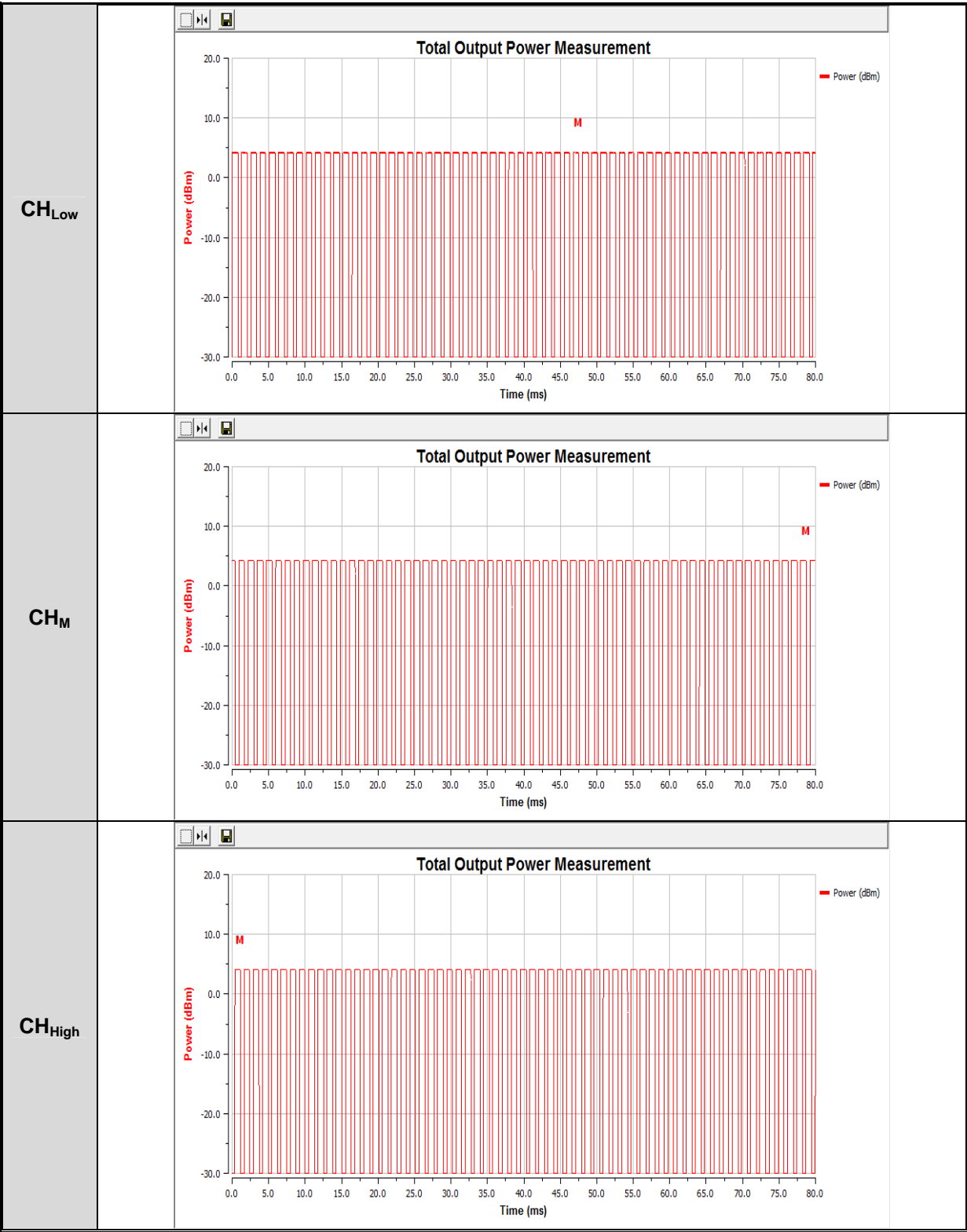
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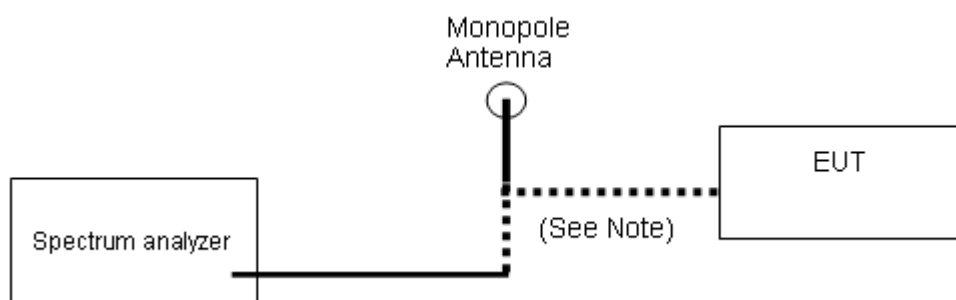
5.2 Power Spectral Density

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

EN 300 328 Clause 4.3.2.3

For wide band modulations other than the FHSS, The maximum E.I.R.P Power density is limited to 10mW Per MHz.

Test Configuration



Test Procedure

- 1) Set the frequency from 2400MHz to 2483.5MHz, use 10kHz RBW and 30kHz VBW for pre-scan. The number of sweep points shall be more than 8350. Wait for the trace to be completed and save the (trace) data set to a file.
- 2) Add up the values for amplitude (power) for all the samples in the file.
- 3) Normalize the individual values for amplitude so that the sum is equal to the RF Output Power(e.i.r.p) measured in 5.1.
- 4) Starting from the first sample in the file (lowest frequency), add up the power of the following samples representing a 1MHz segment and record the results for power and position (i.e. sample #1 to #100). This is the Power Spectral Density (e.i.r.p) for the first 1MHz segment which shall be recorded.
- 5) Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step 4(i.e. sample #2 to #101).
- 6) Repeat step 5 until the end of the data set and record the radiated power spectral Density values for each of the 1MHz segments.
- 7) The cable loss and attenuator factor shall be considered to the test result.
- 8) The highest value shall be recorded in the test report

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Test Results

EXTERNAL ANTENNA 1 (PULSE-W1030) 2.0dBi			
PEAK POWER DENSITY			
Channel Tested	Power Density (dBm/MHz)	Test Limit (dBm/MHz)	Pass / Fail
Low Channel TX	6.09	10	Pass
Middle Channel TX	6.08	10	Pass
High Channel TX	6.08	10	Pass

EXTERNAL ANTENNA 2 (TAOGLAS-FXP73.07.0100A) 2.5dBi			
PEAK POWER DENSITY			
Channel Tested	Power Density (dBm/MHz)	Test Limit (dBm/MHz)	Pass / Fail
Low Channel TX	6.59	10	Pass
Middle Channel TX	6.58	10	Pass
High Channel TX	6.58	10	Pass

EXTERNAL ANTENNA 3 (PULSE-W1027) 3.2dBi			
PEAK POWER DENSITY			
Channel Tested	Power Density (dBm/MHz)	Test Limit (dBm/MHz)	Pass / Fail
Low Channel TX	7.29	10	Pass
Middle Channel TX	7.28	10	Pass
High Channel TX	7.28	10	Pass

EXTERNAL ANTENNA 4 (KINSUN-6670113050-145) 2.0dBi			
PEAK POWER DENSITY			
Channel Tested	Power Density (dBm/MHz)	Test Limit (dBm/MHz)	Pass / Fail
Low Channel TX	6.09	10	Pass
Middle Channel TX	6.08	10	Pass
High Channel TX	6.08	10	Pass

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EXTERNAL ANTENNA 5 (KINSUN-6610103081) 5.0dBi			
PEAK POWER DENSITY			
Channel Tested	Power Density (dBm/MHz)	Test Limit (dBm/MHz)	Pass / Fail
Low Channel TX	9.09	10	Pass
Middle Channel TX	9.08	10	Pass
High Channel TX	9.08	10	Pass

Note: Result=Reading+ Ant. Gain
The reading value included cable loss.

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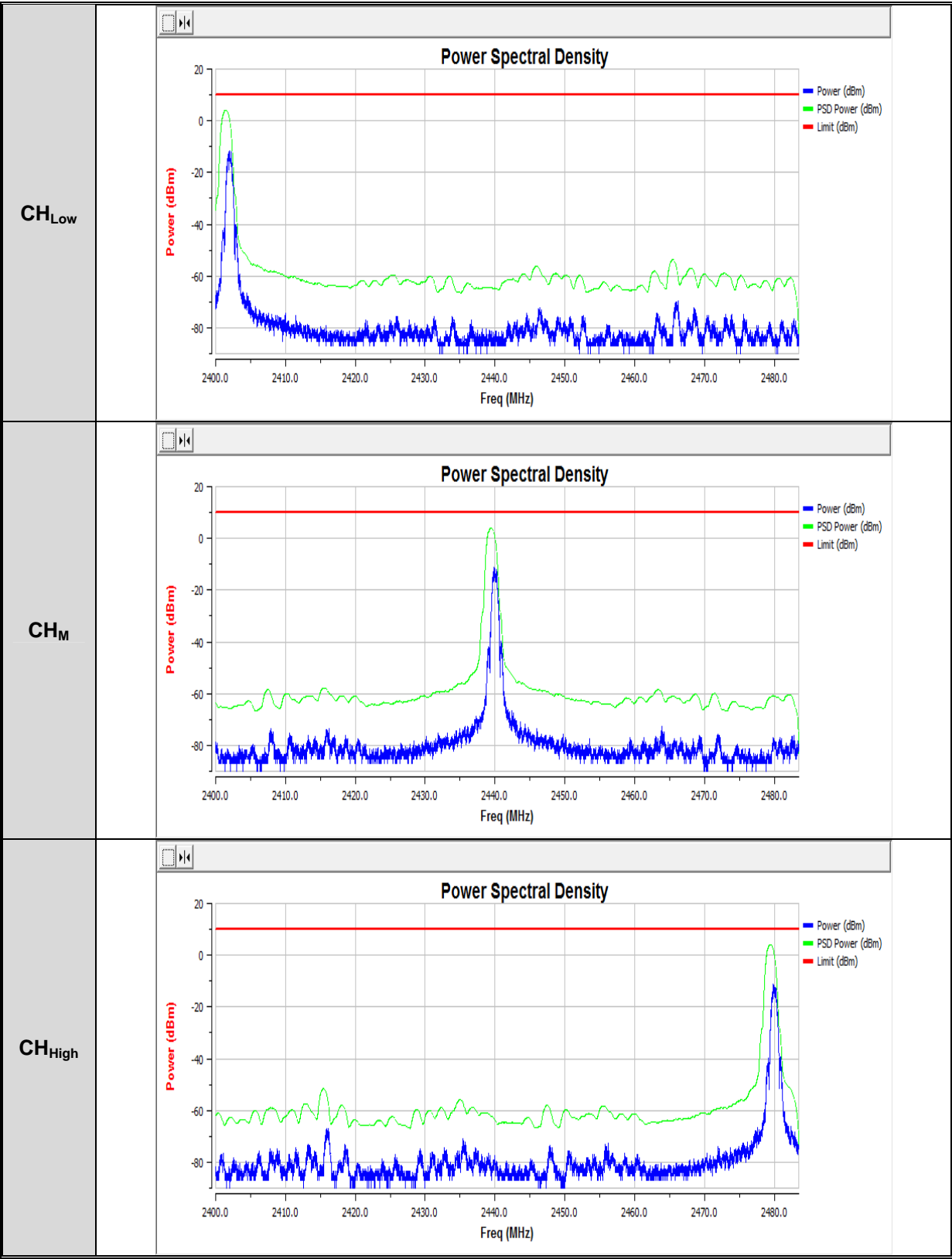
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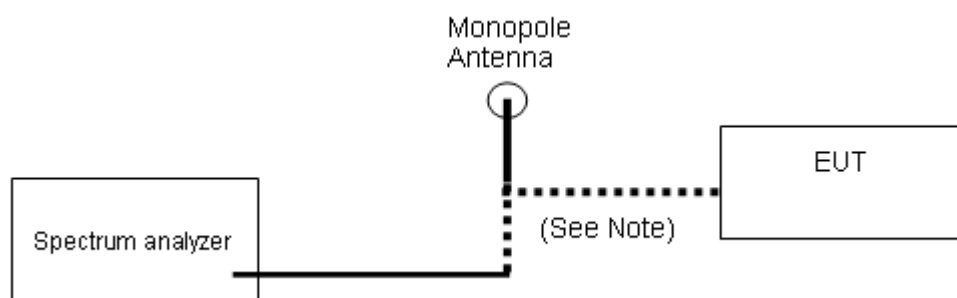
5.3 Occupied Channel Bandwidth

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

ETSI EN 300328 SUBCLAUSE 4.3.2.7

The Occupied Channel Bandwidth shall fall completely within the band given in clause 1.
In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

Test Configuration



Test Procedure

- 1) The spectrum analyser shall be used the following settings:
Centre Frequency: The centre frequency of the channel under test
Resolution BW: ~1% of the span without going below 1%
Video BW: $3 \times \text{RBW}$
Span: $2 \times \text{OBW}$
Detector: RMS
Trace mode: Max Hold
- 2) Wait until the trace is completed, find the peak value of the trace and place the analyser marker on this peak.
- 3) Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.

Test Results

OCCUPIED CHANNEL BANDWIDTH		
Channel Tested	Test Data (MHz)	Criteria
Low Channel TX	1.0454	PASS
High Channel TX	1.0520	PASS

Conclusion: PASS

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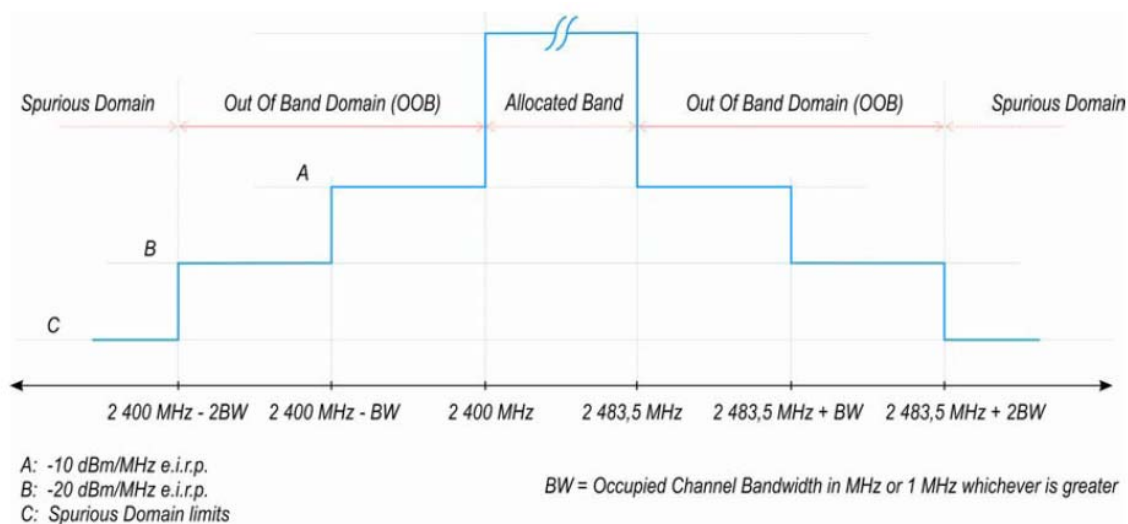
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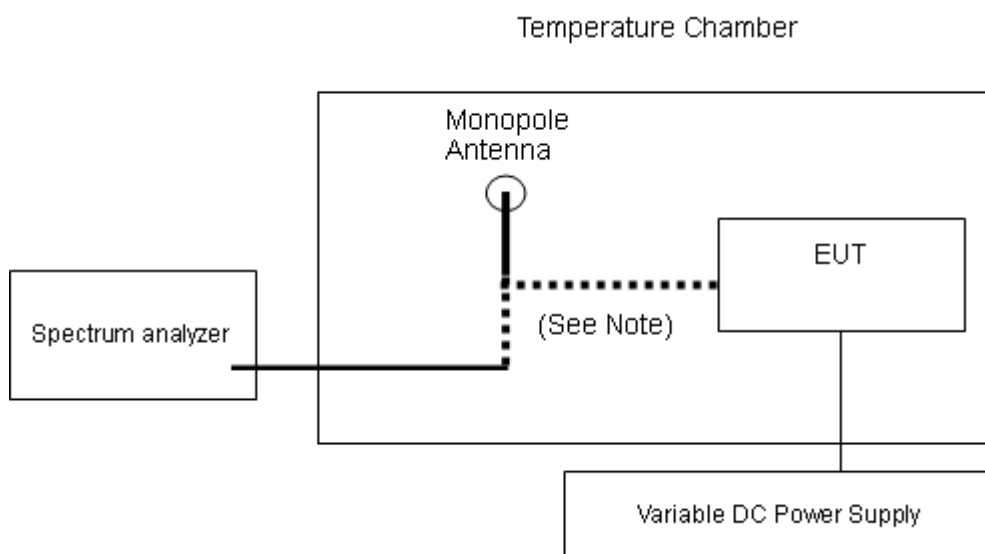
5.4 Transmitter Unwanted Emissions In The Out Of Band Domain

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

ETSI EN300328 SUBCLAUSE 4.3.2.8



Test Configuration



For have temporary antenna connector product

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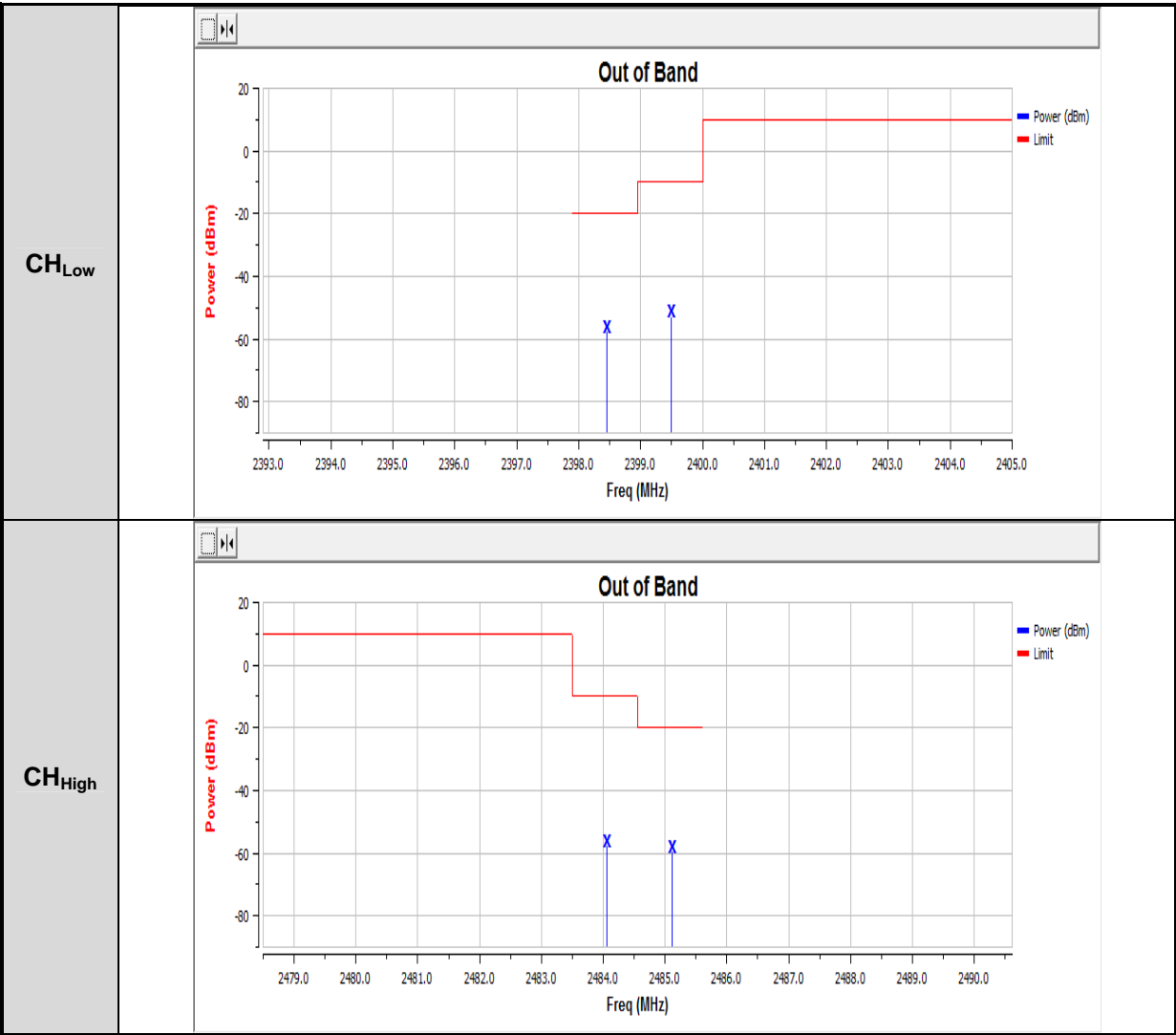
Test Procedure

- 1) The spectrum analyser shall be used the following settings:
 Centre Frequency: 2484MHz
 Resolution BW: 1MHz; Video BW: 3MHz; Span: 0Hz; Detector: RMS
 Trace mode: Max Hold; Sweep Points: 5000
- 2) (segment 2 483.5 MHz to 2 483.5 MHz + BW)
 Adjust the trigger level to select the transmissions with the highest power level.
 Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483.5 MHz to 2 483.5 MHz + BW.
- 3) Segment 2 483.5 MHz + BW to 2 483.5 MHz + 2BW
 Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483.5 MHz + BW to 2 483.5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW – 0.5 MHz.
- 4) Segment 2 400 MHz - BW to 2 400 MHz
 Change the centre frequency of the analyser to 2 399.5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0.5 MHz.
- 5) Segment 2 400 MHz - 2BW to 2 400 MHz - BW
 Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0.5 MHz.
- 6) The cable loss and attenuator factor shall be considered to the test result.

Test Results

TRANSMITTER UNWANTED EMISSIONS IN THE OUT OF BAND DOMAIN			
Channel Tested	Temp (25)°C	Temp (-20)°C	Temp (55)°C
Low Channel TX	PASS	PASS	PASS
High Channel TX	PASS	PASS	PASS
Note	All the modes had been tested, but only the worst data recorded in the report.		

Conclusion: PASS



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5.5 Transmitter Spurious Emissions

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

ETSI EN300328 SUBCLAUSE 4.3.2.9

Spurious emissions are emissions outside the frequency range(s) of the equipment as defined in Clause 4.3.1.9.

Transmitter unwanted emissions in the spurious domain are emissions outside the allocated band and outside the out-of-band domain as indicated in figure 1 when the equipment is in Transmit mode.

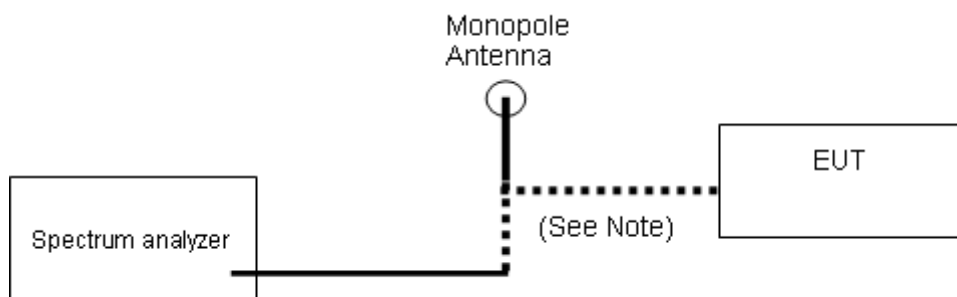
The spurious emissions of the transmitter shall not exceed the values in tables in the indicated bands:

5.5.1 Test Limit

Frequency Range	Maximum Power e.r.p(<=1GHz)/e.i.r.p(>1GHz)	Bandwidth
30MHZ to 47MHZ	-36dBm	100kHz
47MHZ to 74MHZ	-54dBm	100kHz
74MHZ to 87.5MHZ	-36dBm	100kHz
87.5MHZ to 118MHZ	-54dBm	100kHz
118MHZ to 174MHZ	-36dBm	100kHz
174 MHZ to 230MHZ	-54dBm	100kHz
230 MHZ to 470MHZ	-36dBm	100kHz
470 MHZ to 862MHZ	-54dBm	100kHz
862 MHZ to 1GHZ	-36dBm	100kHz
1 GHZ to 12.75GHZ	-30dBm	1MHz

Test Configuration

Conducted Method



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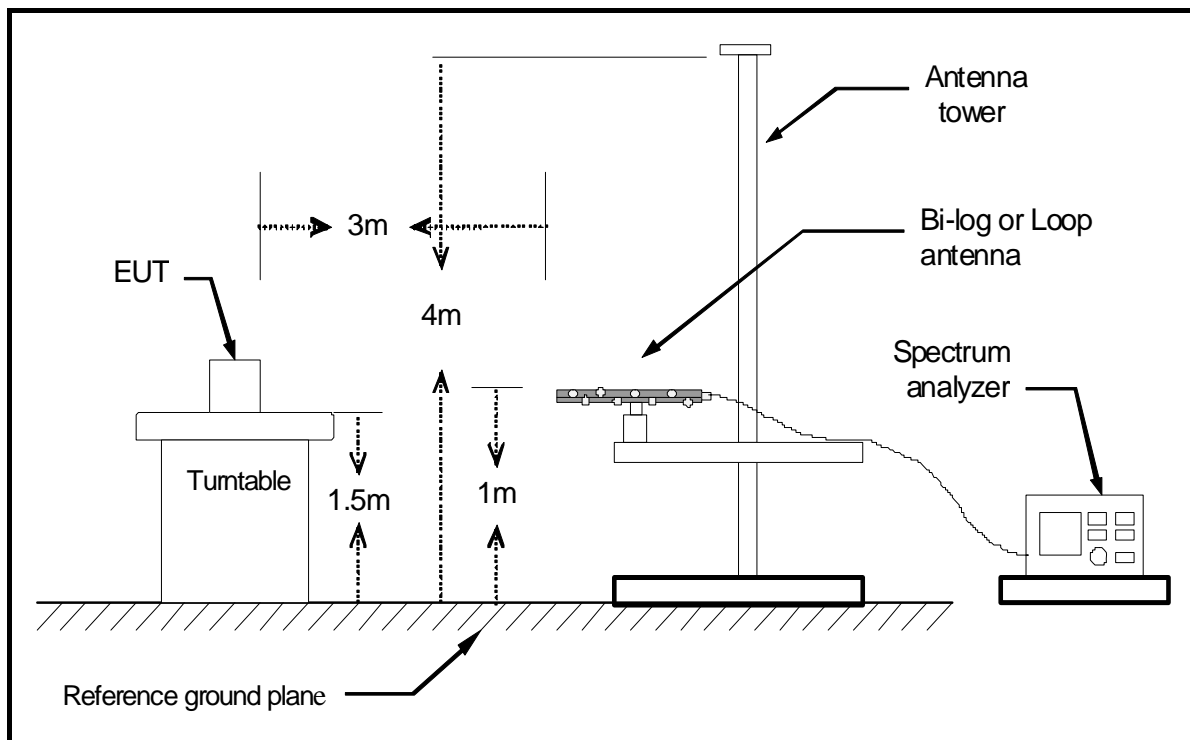
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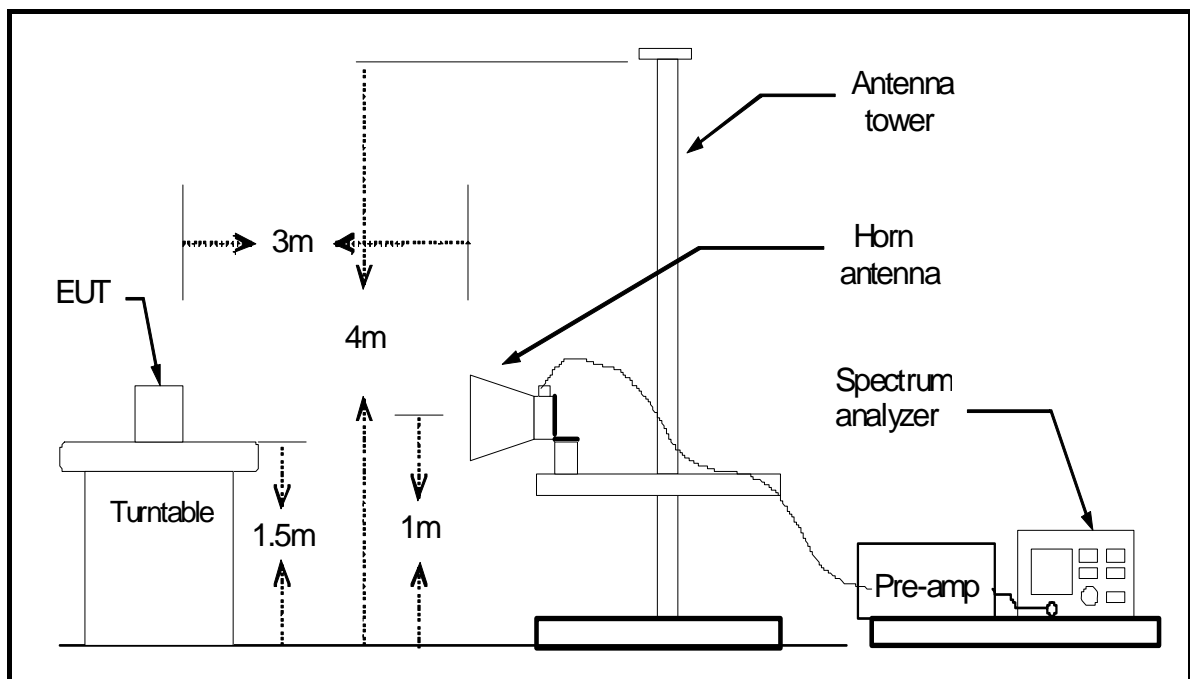
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Radiated Mode



Below 1GHz



Above 1GHz

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Test Procedure

- 1) The emissions over the range 30 MHz to 1 000 MHz shall be identified.
- 2) Spectrum analyzer settings:
 - Resolution bandwidth: 100 kHz
 - Video bandwidth: 300 kHz
 - Detector mode: Peak
 - Sweep Points: $\geq 19\,400$
 - Trace Mode: Max Hold
- 3) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits.
- 4) The emissions over the range 1 GHz to 12.75 GHz shall be identified.
- 5) Resolution bandwidth: 1 MHz
 - Video bandwidth: 3 MHz
 - Detector mode: Peak
 - Trace Mode: Max Hold
 - Sweep Points: $\geq 23\,200$
- 6) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits.

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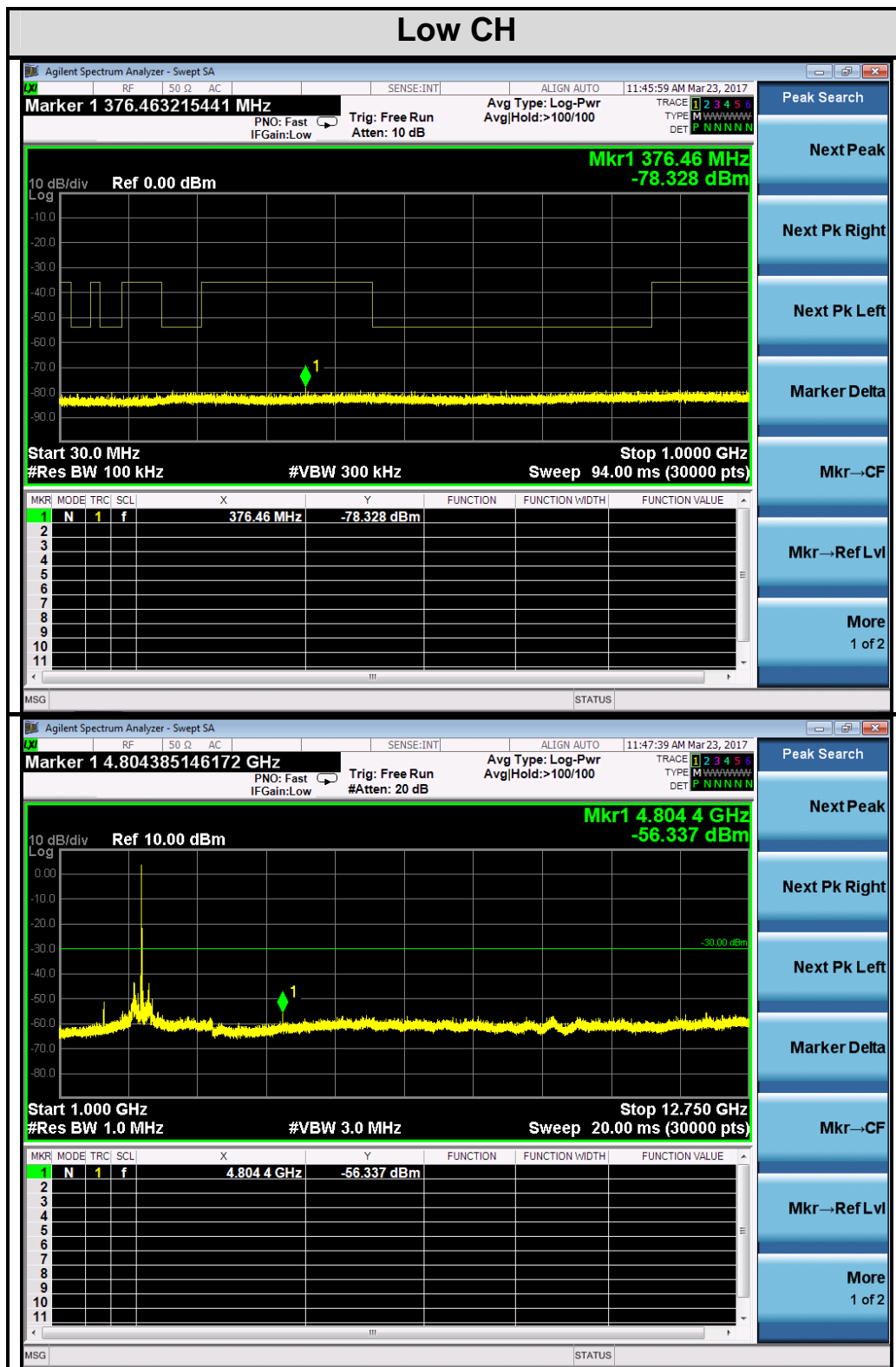
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Conducted Mode Test result



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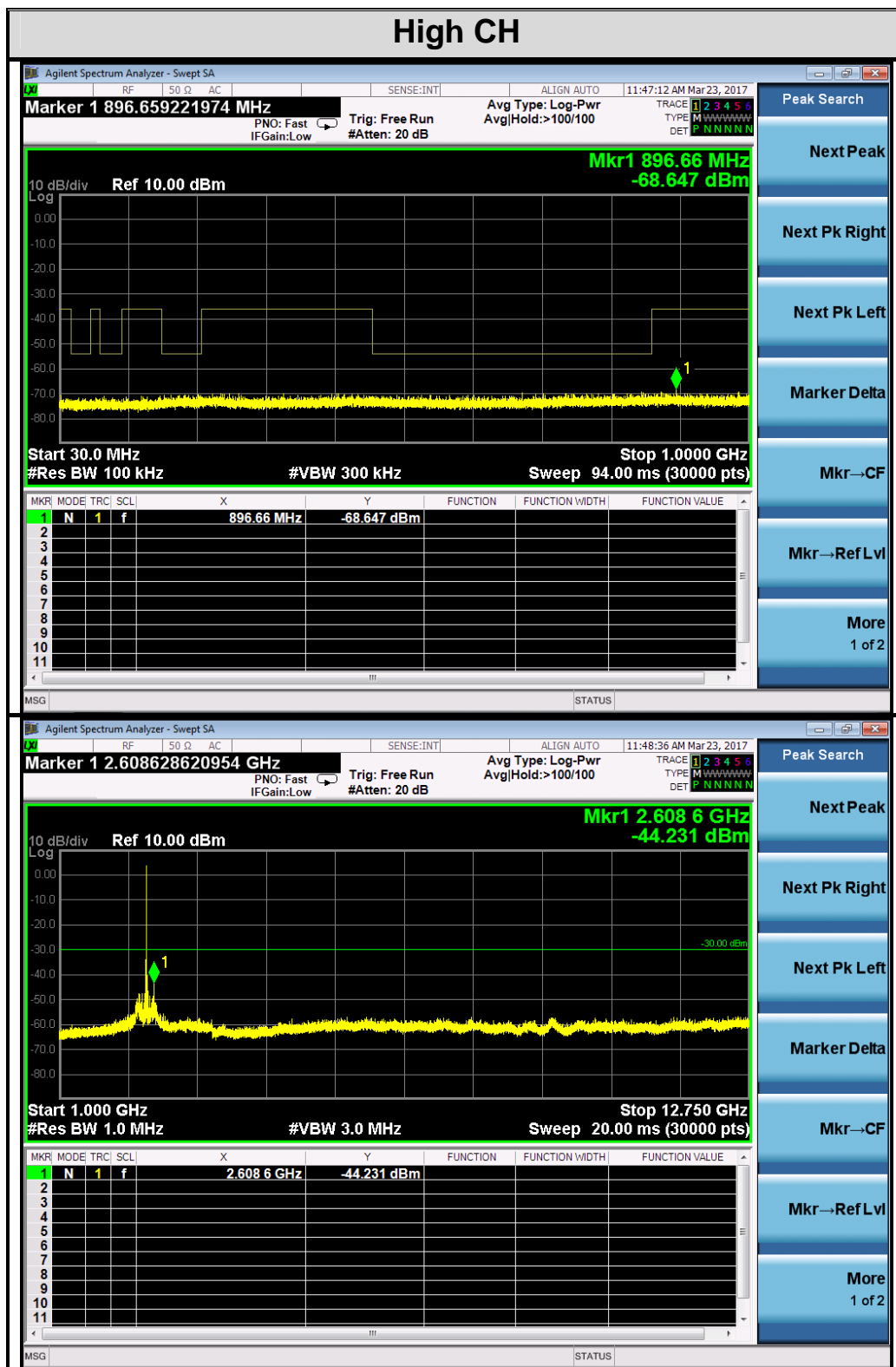
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Note: 1. All the modes had been test but only the worst data record in the report.

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Radiated Method Test Method Test Result:

TRANSMITTER SPURIOUS EMISSION BELOW 1GHZ (30~1000MHZ)-LOW CHANNEL								
Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
85.26	29.38	V	-63.79	0.04	0.70	-63.13	-36.00	27.13
251.84	31.32	V	-69.23	0.13	7.14	-62.22	-36.00	26.22
354.53	30.41	V	-68.66	0.25	6.02	-62.89	-36.00	26.89
467.52	29.15	V	-70.83	0.38	6.77	-64.45	-36.00	28.45
512.11	31.77	V	-68.39	0.43	6.66	-62.16	-54.00	8.16
632.53	29.57	V	-69.83	0.52	7.26	-63.09	-54.00	9.09
Other(30-1000)	--	V	--	--	--	--	-36.00/-54.00	--
137.57	30.07	H	-63.80	0.05	0.00	-63.85	-36.00	27.85
287.45	30.72	H	-68.23	0.17	6.52	-61.88	-36.00	25.88
351.42	28.41	H	-70.17	0.25	5.63	-64.79	-36.00	28.79
617.51	32.12	H	-66.73	0.51	6.78	-60.46	-54.00	6.46
712.67	32.18	H	-66.19	0.58	5.66	-61.10	-54.00	7.10
854.18	30.42	H	-68.27	0.68	6.52	-62.42	-54.00	8.42
Other(30-1000)	--	H	--	--	--	--	-36.00/-54.00	--

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TRANSMITTER SPURIOUS EMISSION ABOVE 1GHZ (1~12.75GHZ) -LOW CHANNEL								
Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4804	45.12	V	-55.30	2.64	9.30	-48.64	-30.00	18.64
7206	41.28	V	-60.54	3.14	11.28	-52.39	-30.00	22.39
--	--	--	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-30.00	--
4804	44.33	H	-55.89	2.64	9.30	-49.23	-30.00	19.23
7206	42.01	H	-60.02	3.14	11.28	-51.88	-30.00	21.88
--	--	--	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-36.00/-54.00	--

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TRANSMITTER SPURIOUS EMISSION BELOW 1GHZ (30~1000MHZ)-HIGH CHANNEL								
Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
84.86	29.81	V	-63.73	0.04	0.54	-63.23	-36.00	27.23
251.15	30.56	V	-68.70	0.13	7.14	-61.69	-36.00	25.69
348.53	30.75	V	-67.41	0.24	5.54	-62.11	-36.00	26.11
467.29	29.69	V	-68.97	0.38	6.77	-62.59	-36.00	26.59
512.37	31.42	V	-68.54	0.43	6.66	-62.31	-54.00	8.31
631.52	29.16	V	-70.50	0.52	7.28	-63.73	-54.00	9.73
Other(30-1000)	--	V	--	--	--	--	-36.00/-54.00	--
137.86	30.38	H	-63.27	0.05	0.00	-63.32	-36.00	27.32
287.17	30.45	H	-69.94	0.17	6.52	-63.59	-36.00	27.59
350.63	28.72	H	-70.10	0.25	5.50	-64.85	-36.00	28.85
617.04	32.51	H	-67.62	0.51	6.78	-61.35	-54.00	7.35
711.59	32.49	H	-65.44	0.57	5.58	-60.44	-54.00	6.44
853.72	30.08	H	-69.42	0.67	6.64	-63.46	-54.00	9.46
Other(30-1000)	--	H	--	--	--	--	-36.00/-54.00	--

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TRANSMITTER SPURIOUS EMISSION ABOVE 1GHZ (1~12.75GHZ) -HIGH CHANNEL								
Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4960	46.25	V	-53.11	2.75	9.62	-46.24	-30.00	16.24
7440	42.38	V	-59.52	3.09	11.62	-50.99	-30.00	20.99
--	--	--	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-30.00	--
4960	47.13	H	-52.62	2.75	9.62	-45.75	-30.00	15.75
7440	43.68	H	-57.14	3.09	11.62	-48.61	-30.00	18.61
--	--	--	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-36.00/-54.00	--

Note:

1. The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "--" remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

Conclusion: PASS

5.6 Receiver Spurious Emission

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

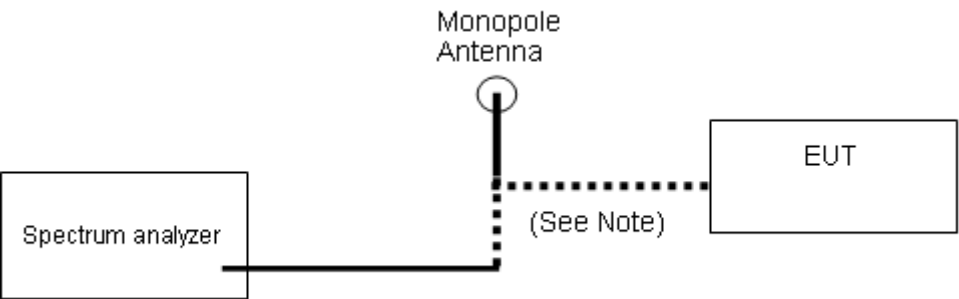
ETSI EN300328 SUBCLAUSE 4.3.2.10

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode. The spurious emissions of the receiver shall not exceed the values given in table

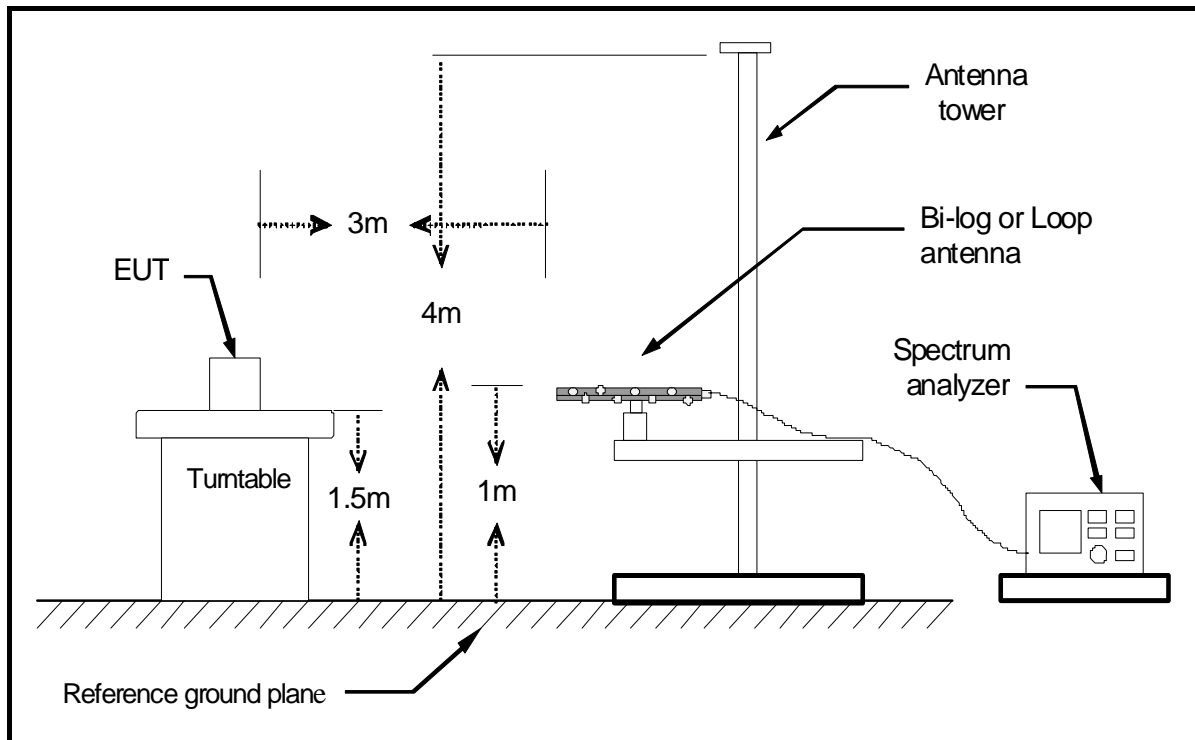
Frequency Range	Maximum Power, e.r.p.	Measurement Bandwidth
30MHz to 1GHz	-57dBm	100KHz
1GHz to 12.75GHz	-47dBm	1MHz

Test Configuration

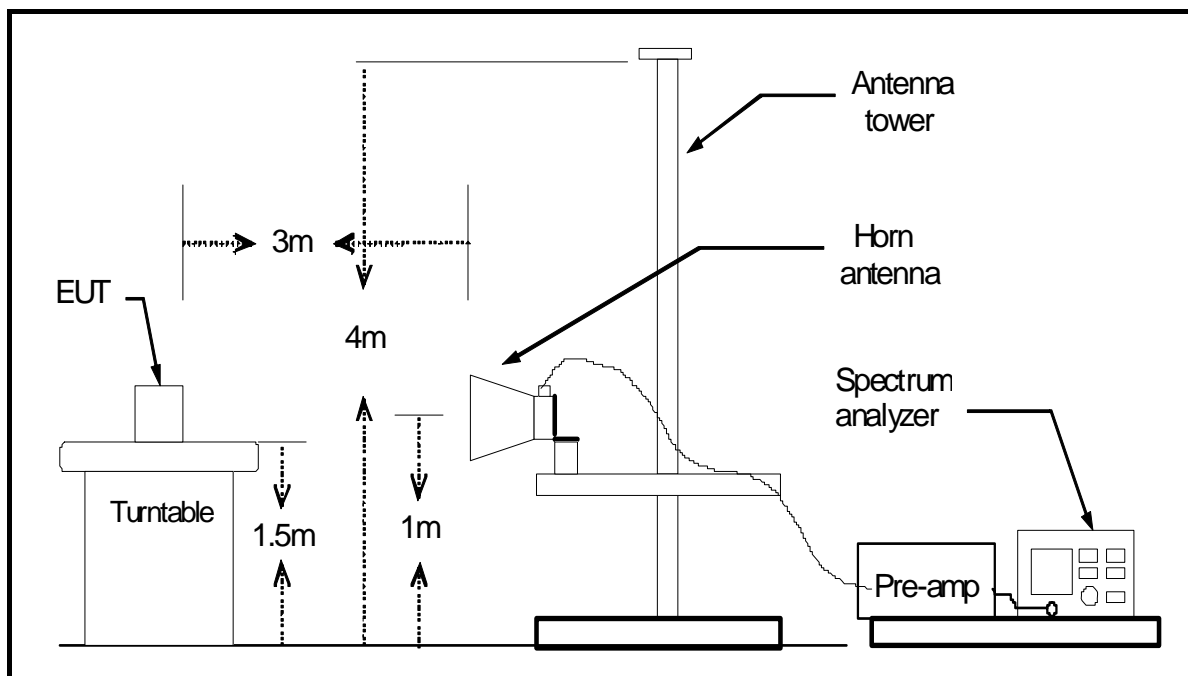
Conducted Method



Radiated Mode



Below 1GHz



Above 1GHz

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Test Procedure

- 1) The emissions over the range 30 MHz to 1 000 MHz shall be identified.
- 2) Spectrum analyzer settings:
 - Resolution bandwidth: 100 kHz
 - Video bandwidth: 300 kHz
 - Detector mode: Peak
 - Sweep Points: $\geq 19\,400$
 - Trace Mode: Max Hold
- 3) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits.
- 4) The emissions over the range 1 GHz to 12.75 GHz shall be identified.
- 5) Resolution bandwidth: 1 MHz
 - Video bandwidth: 3 MHz
 - Detector mode: Peak
 - Trace Mode: Max Hold
 - Sweep Points: $\geq 23\,200$
- 6) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits.

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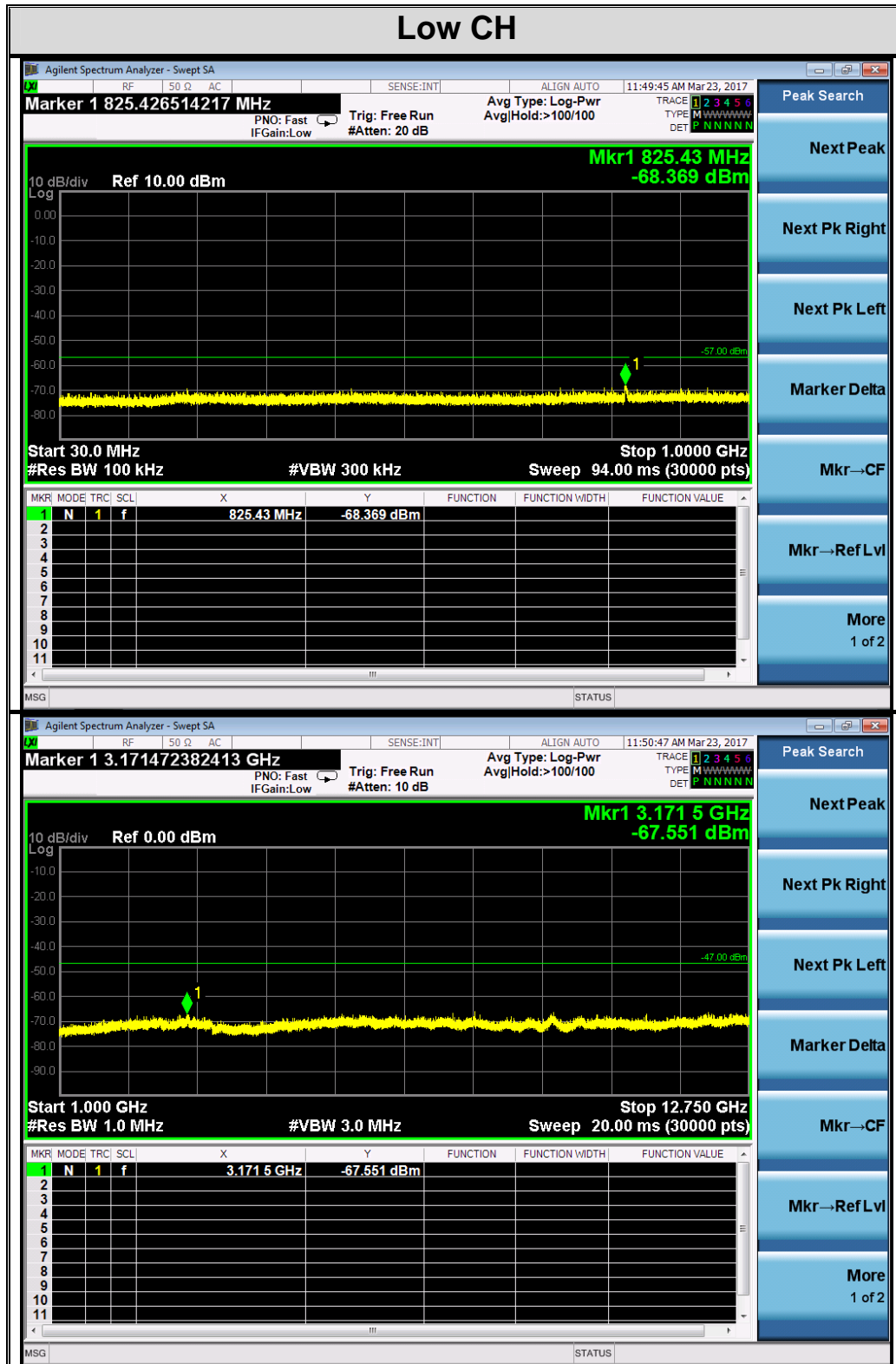
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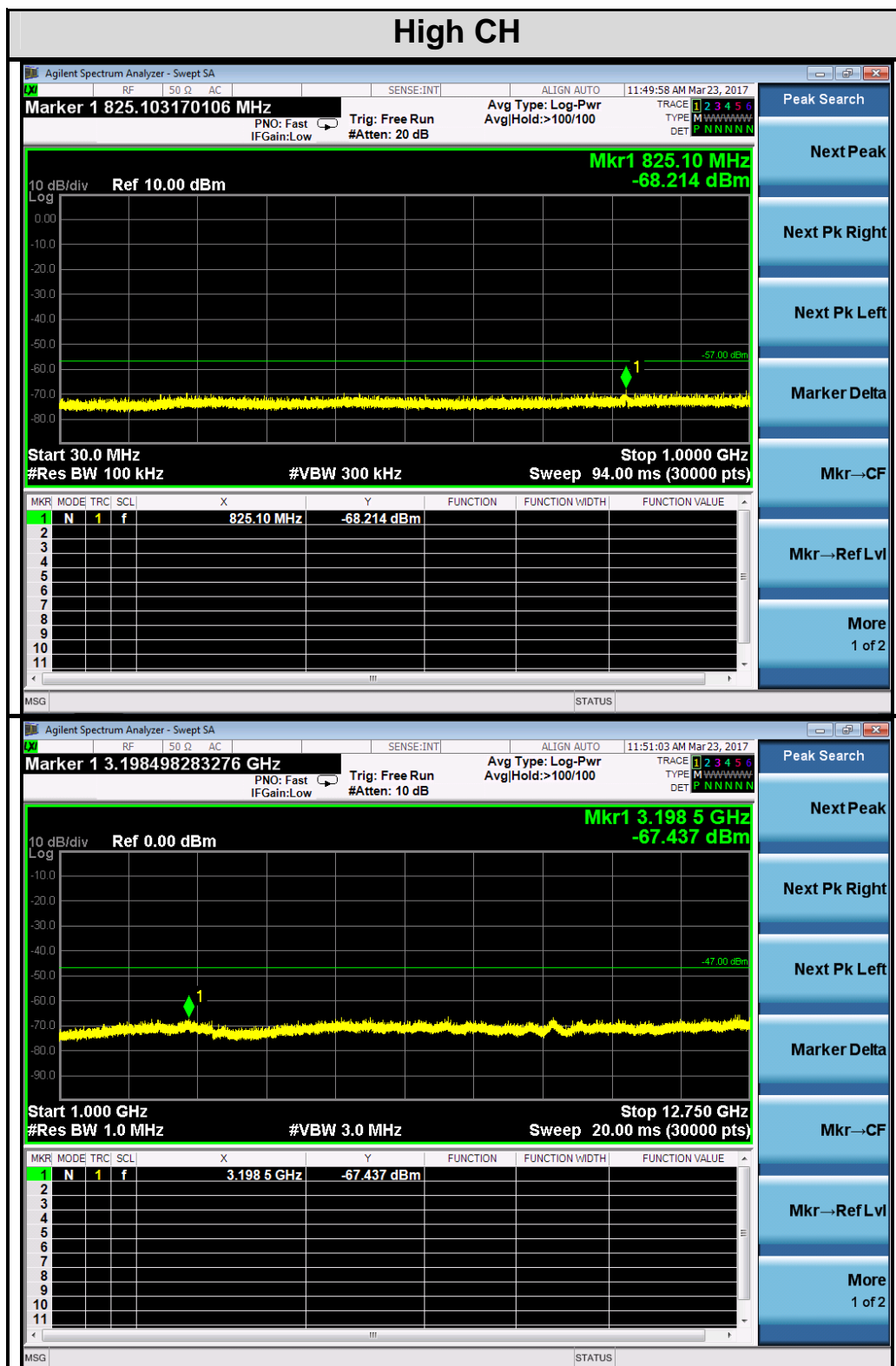
Conducted Mode Test result



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Note: 1. All the modes had been test but only the worst data record in the report.

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Radiated Method Test Method Test Result:

RECEIVER SPURIOUS EMISSION BELOW 1GHZ (30~1000MHZ)-LOW CHANNEL								
Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
88.25	31.71	V	-63.22	0.04	1.12	-62.14	-57.00	5.14
228.47	31.45	V	-69.12	0.10	7.08	-62.15	-57.00	5.15
354.33	30.08	V	-69.88	0.25	6.02	-64.11	-57.00	7.11
417.18	31.43	V	-68.29	0.32	7.01	-61.60	-57.00	4.60
535.15	29.51	V	-70.90	0.45	6.90	-64.44	-57.00	7.44
617.28	30.25	V	-69.67	0.51	6.78	-63.39	-57.00	6.39
Other(30-1000)	--	V	--	--	--	--	-57.00	--
88.25	31.71	V	-63.22	0.04	1.12	-62.14	-57.00	5.14
228.47	31.45	V	-69.12	0.10	7.08	-62.15	-57.00	5.15
354.33	30.08	V	-69.88	0.25	6.02	-64.11	-57.00	7.11
417.18	31.43	V	-68.29	0.32	7.01	-61.60	-57.00	4.60
535.15	29.51	V	-70.90	0.45	6.90	-64.44	-57.00	7.44
617.28	30.25	V	-69.67	0.51	6.78	-63.39	-57.00	6.39
Other(30-1000)	--	H	--	--	--	--	-57.00	--

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RECEIVER SPURIOUS EMISSION ABOVE 1GHZ (1~12.75GHZ) -LOW CHANNEL								
Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuV/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
1575.38	34.58	V	-63.99	1.11	6.01	-59.09	-47.00	12.09
--	--	--	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
1665.36	35.81	H	-61.74	1.16	6.40	-56.49	-47.00	9.49
--	--	--	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-47.00	--

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RECEIVER SPURIOUS EMISSION BELOW 1GHZ (30~1000MHZ)-HIGH CHANNEL								
Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
88.18	31.25	V	-62.13	0.04	1.12	-61.05	-57.00	4.05
228.27	31.78	V	-68.24	0.10	7.08	-61.27	-57.00	4.27
353.56	30.43	V	-68.36	0.25	5.89	-62.72	-57.00	5.72
415.81	31.05	V	-69.45	0.32	6.95	-62.82	-57.00	5.82
534.36	29.96	V	-69.54	0.44	6.84	-63.14	-57.00	6.14
617.78	30.47	V	-68.55	0.51	6.78	-62.28	-57.00	5.28
Other(30-1000)	--	V	--	--	--	--	-57.00	--
107.24	29.52	H	-63.95	0.04	1.04	-62.95	-57.00	5.95
317.51	31.47	H	-66.78	0.21	6.19	-60.80	-57.00	3.80
374.55	29.43	H	-70.94	0.27	6.56	-64.65	-57.00	7.65
394.38	32.19	H	-67.13	0.30	6.48	-60.94	-57.00	3.94
717.51	31.38	H	-67.24	0.58	6.06	-61.76	-57.00	4.76
784.26	31.15	H	-67.97	0.63	6.58	-62.01	-57.00	5.01
Other(30-1000)	--	H	--	--	--	--	-57.00	--

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RECEIVER SPURIOUS EMISSION ABOVE 1GHZ (1~12.75GHZ) -HIGH CHANNEL								
Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
1576.82	35.12	V	-63.23	1.11	6.01	-58.33	-47.00	11.33
--	--	--	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
1664.53	36.25	H	-61.88	1.16	6.40	-56.63	-47.00	9.63
--	--	--	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-47.00	--

Note:

1. The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "--" remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

Conclusion: PASS

5.7 Receiver Blocking

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

Receiver Blocking Parameters For Receiver Category 1 Equipment			
Wanted Signal Mean Power From Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 2)	Type of Blocking Signal
Pmin + 6 dB	2 380 2 503,5	-53	CW
Pmin + 6 dB	2 300 2 330 2 360	-47	CW
Pmin + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW

Receiver Blocking Parameters For Receiver Category 2 Equipment			
Wanted Signal Mean Power From Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 2)	Type of Blocking Signal
Pmin + 6 dB	2 380 2 503,5	-57	CW
Pmin + 6 dB	2 300 2 583.5	-47	CW

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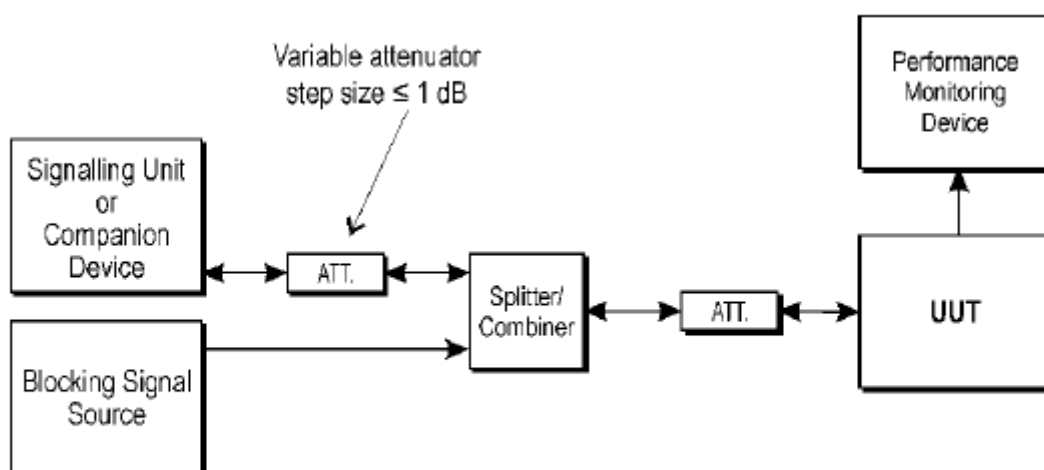
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Receiver Blocking Parameters For Receiver Category 3 Equipment			
Wanted Signal Mean Power From Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 2)	Type of Blocking Signal
Pmin + 12 dB	2 380 2 503,5	-57	CW
Pmin + 12 dB	2 300 2 583.5	-47	CW

NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in EN 300 328 V2.1.1 clause 4.3.2.11.3 in the absence of any blocking signal.

NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

Test Configuration



Test Set-up for receiver blocking

Test Procedure

- 1) The UUT shall be set to the lowest operating channel.
- 2) The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.
- 3) With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in the Test Set-up. The attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum

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performance criteria is still met. The resulting level for the wanted signal at the input of the UUT is P_{min} .

This signal level (P_{min}) is increased by the value provided in the table corresponding to the receiver category and type of equipment.

- 4) The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment. It shall be verified and recorded in the test report that the performance criteria is met.
- 5) Repeat step 4 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.
- 6) Repeat step 2 to step 5 with the UUT operating at the highest operating channel.

Test Result

Wanted Signal Power (MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result (PER)	Limit (PER)	Result
$P_{min}+12\text{dB}$	2380	-57	0.56%	10%	Pass
$P_{min}+12\text{dB}$	2503.5	-57	0.63%	10%	Pass
$P_{min}+12\text{dB}$	2300	-47	0.72%	10%	Pass
$P_{min}+12\text{dB}$	2583.5	-47	0.25%	10%	Pass

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6 USED TEST EQUIPMENT

6.1					
Item	Test Equipment	Manufacturer	Model No.	Cal. Validity	Cal. Period
1	MXG X-Series Vector Signal Generator	Agilent	N5182B	2016.10.10	1 Year
2	RF Analog Signal Generator	Agilent	N5171B	2016.10.10	1 Year
3	EXA Signal Analyzer	Agilent	N9010A	2016.10.10	1 Year
4	USB Wideband Power Sensor	Agilent	U2021XA	2016.10.10	1 Year
5	USB Wideband Power Sensor	Agilent	U2021XA	2016.10.10	1 Year
6	USB Wideband Power Sensor	Agilent	U2021XA	2016.10.10	1 Year
7	USB Wideband Power Sensor	Agilent	U2021XA	2016.10.10	1 Year
8	2.4G Band Fliter	MICRO TRONICS	BRM50702	2016.10.10	1 Year
9	H & T Chamber	EXPERY	TN-400	2016.07.14	1 Year
10	AMPLIFIER	EM	EM30180	2016.07.14	1 Year
11	ANTENNA	A.H.	SAS-521-4	2016.03.01	1 Year
12	ANTENNA	Schwarzbeck	9168	2016.03.01	1 Year
13	HORN ANTENNA	E.M.	EM-AH-10180	2016.03.01	1 Year
14	HORN ANTENNA	ETS	3117	2016.03.01	1 Year

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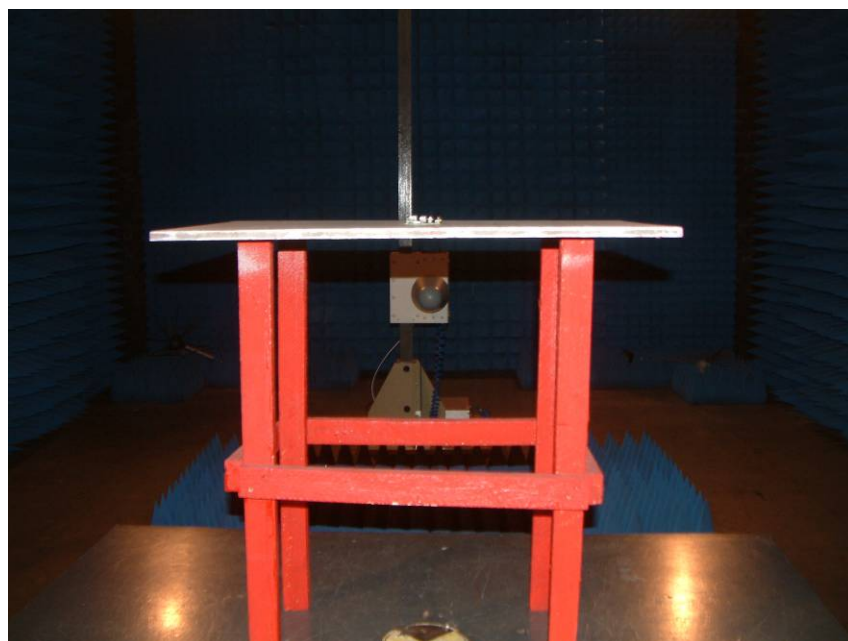
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7 TEST PHOTOGRAPHS

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



Below 1GHz



Above 1GHz

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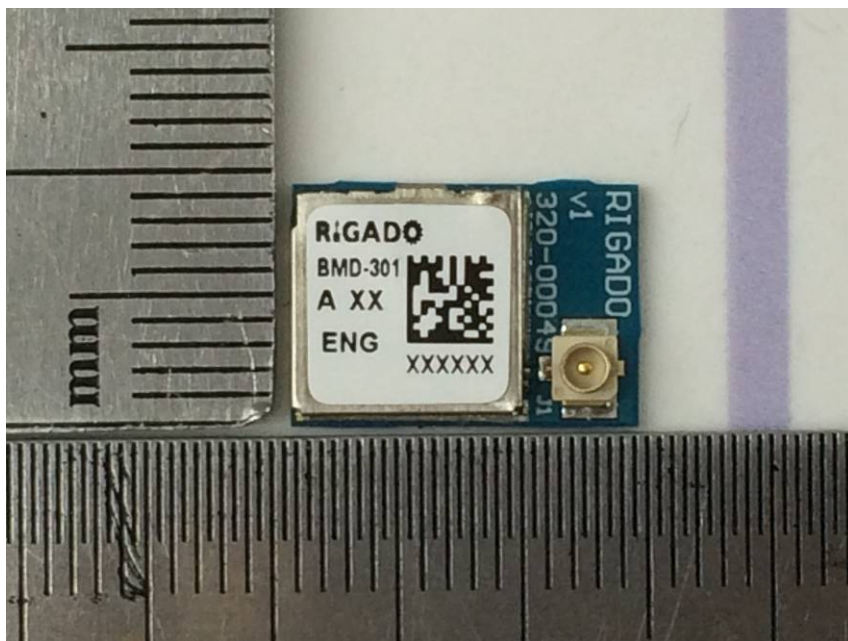
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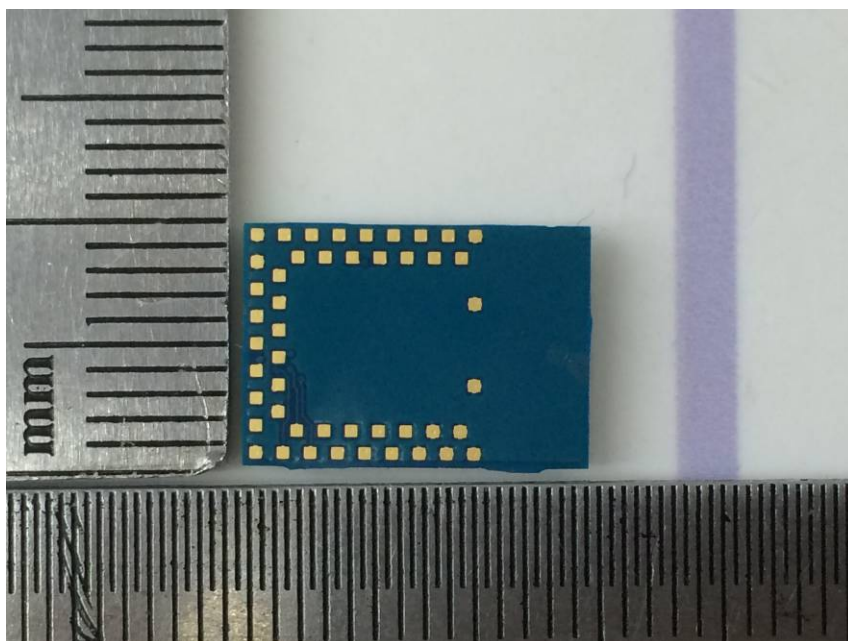
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8 External Photos of the EUT



External view 1



External view 2

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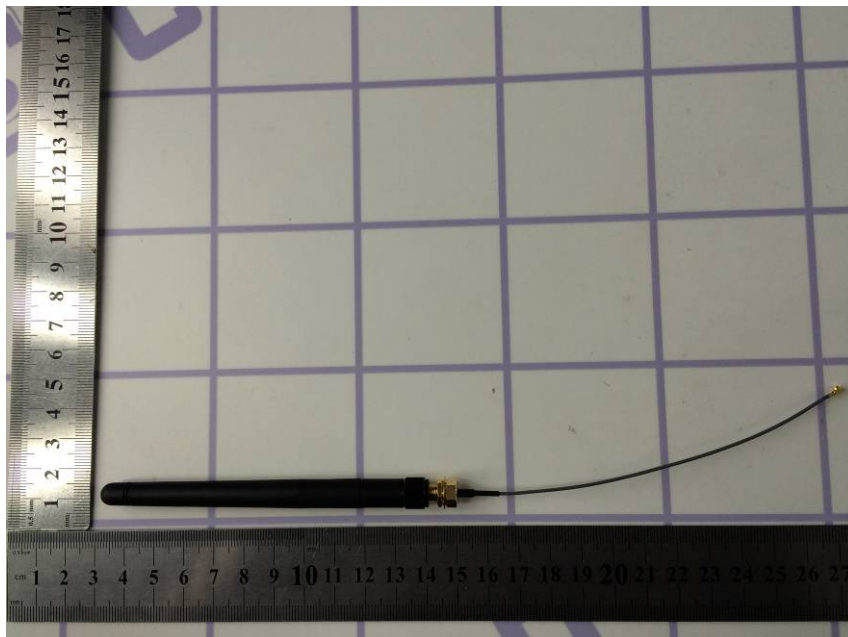
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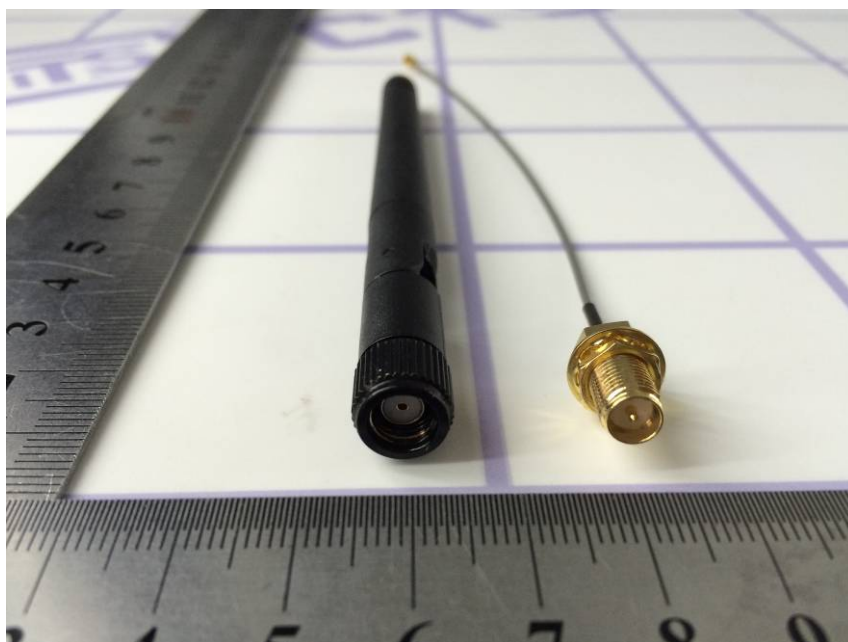
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External antenna 1 Pulse- W1030 (Gain 2.0dBi) view



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

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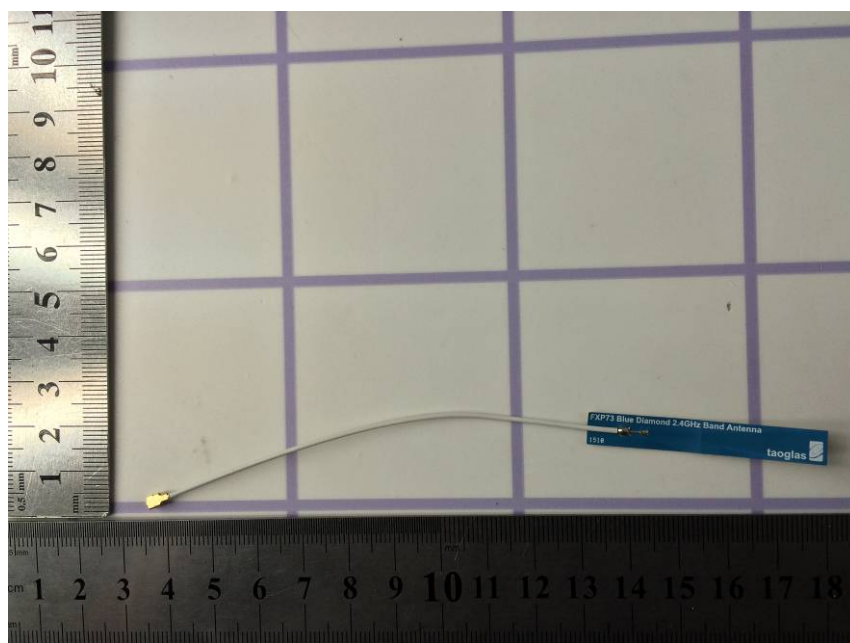
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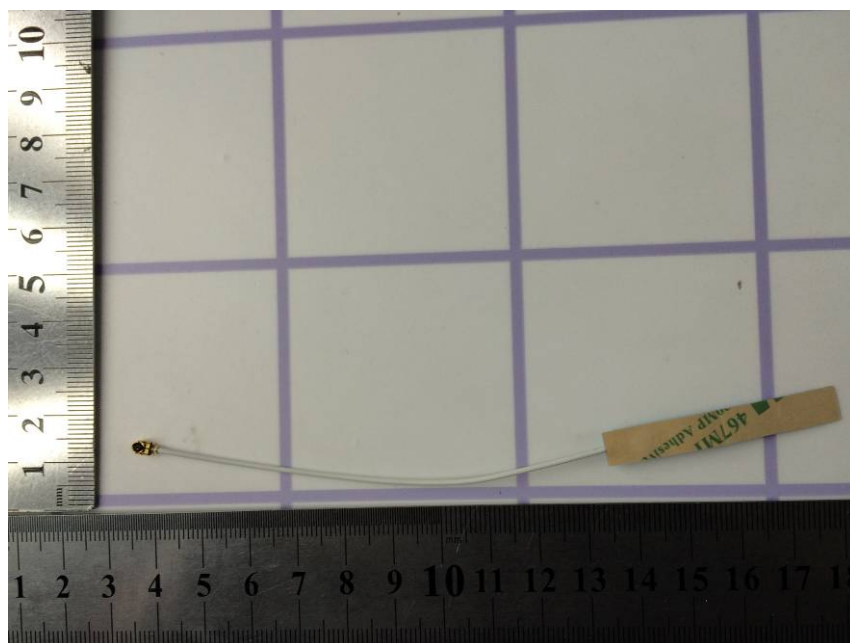
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External antenna 2 Taoglas-FXP73.07.0100A (Gain 2.5dBi) side 1 view



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

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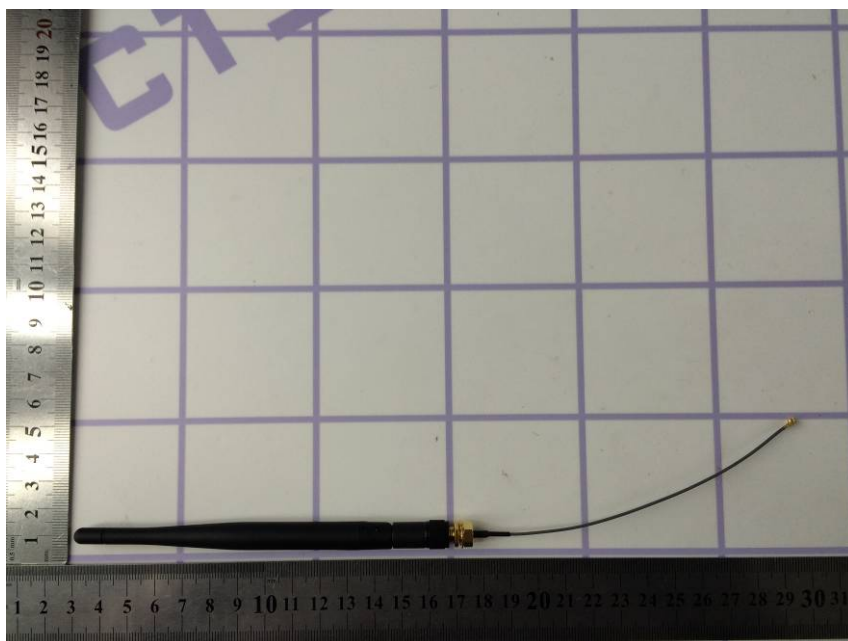
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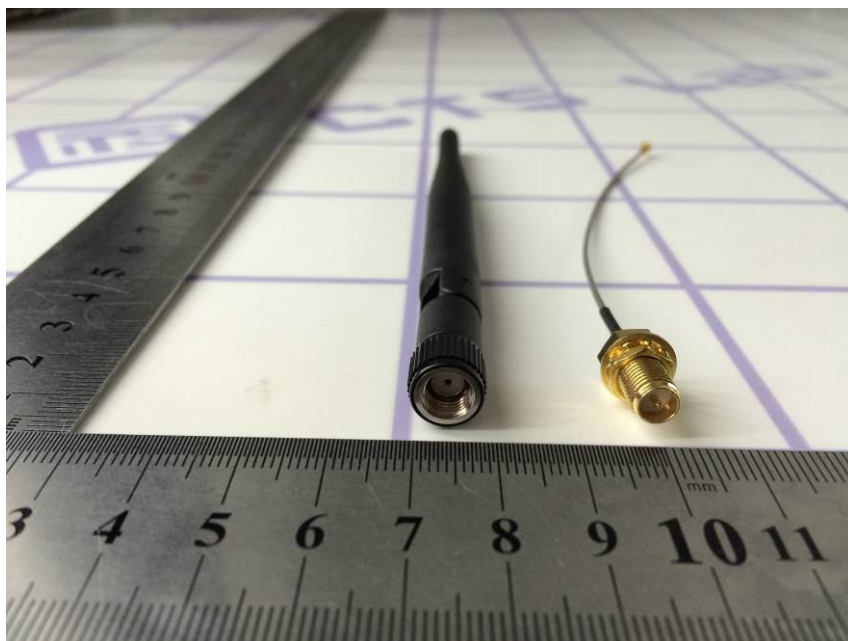
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External antenna 3 Pulse-W1027 (Gain 3.2dBi) view



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

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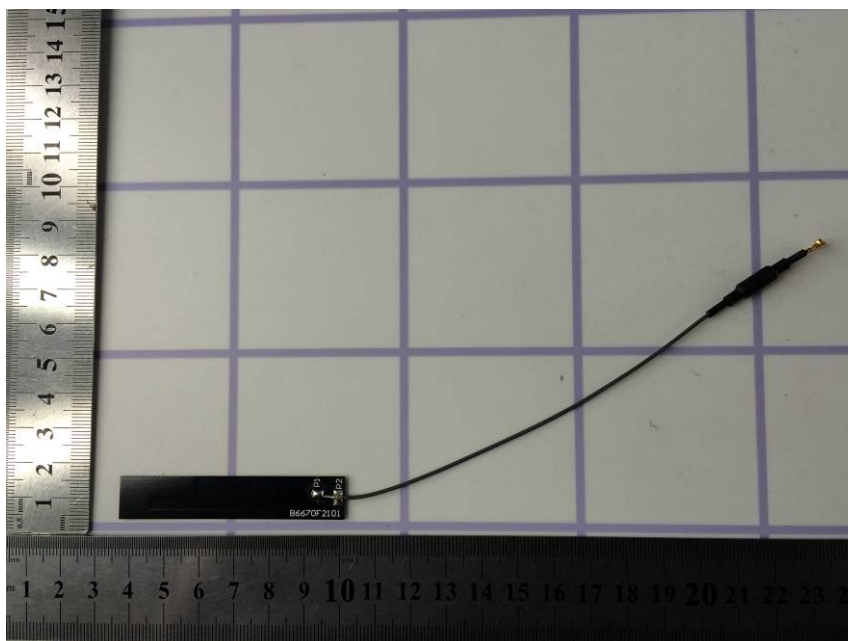
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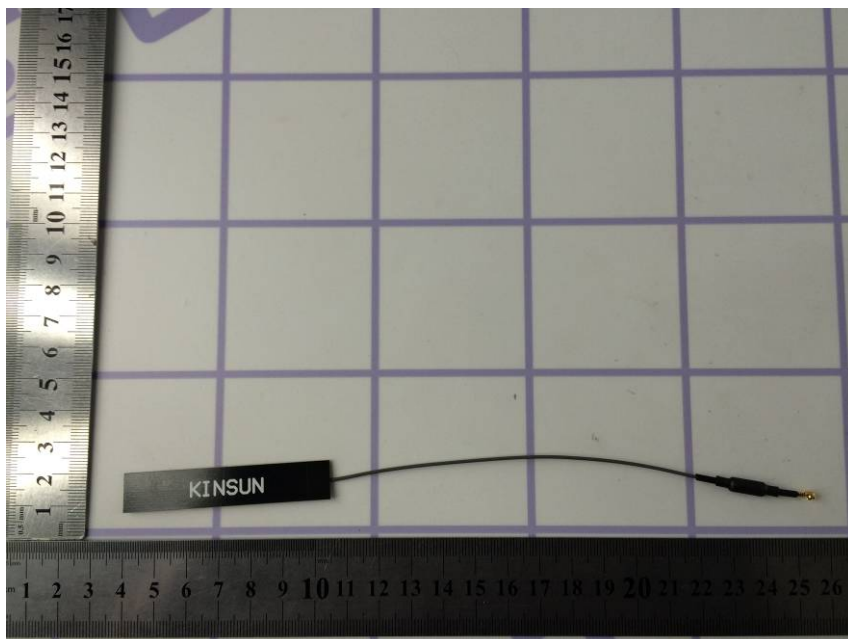
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External antenna 4 Kinsun-6670113050-145 (Gain 2.0dBi) side 1 view



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

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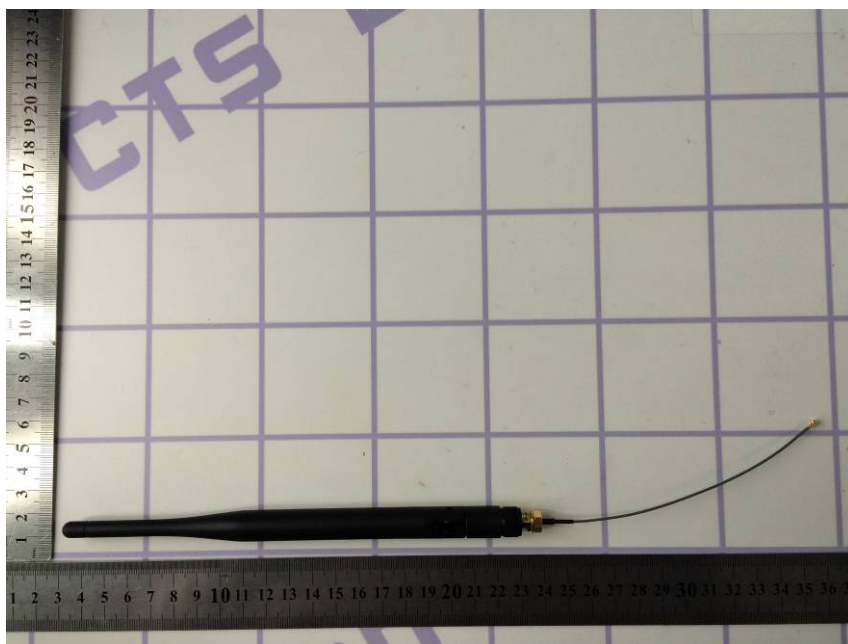
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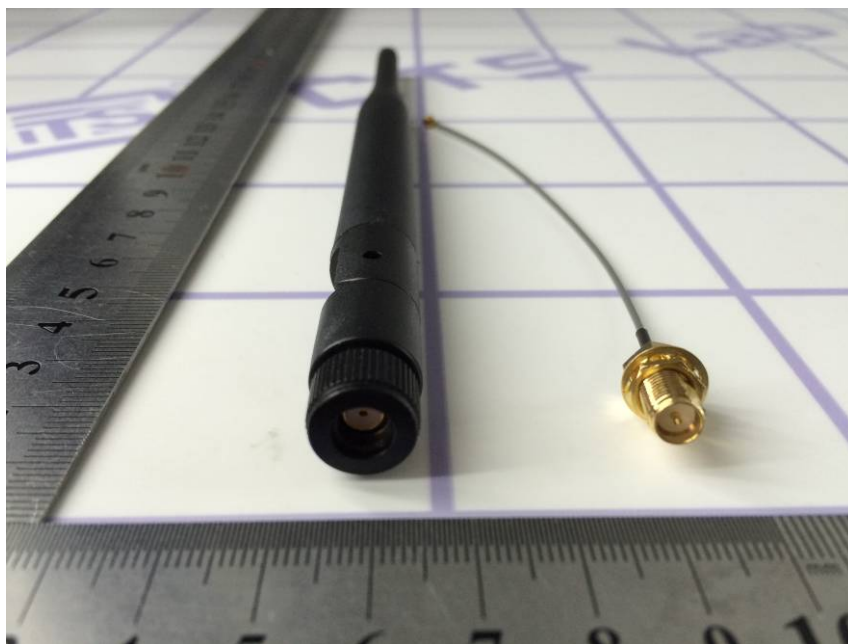
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External antenna 5 Kinsun- 6610103081 (Gain 5 dBi) view

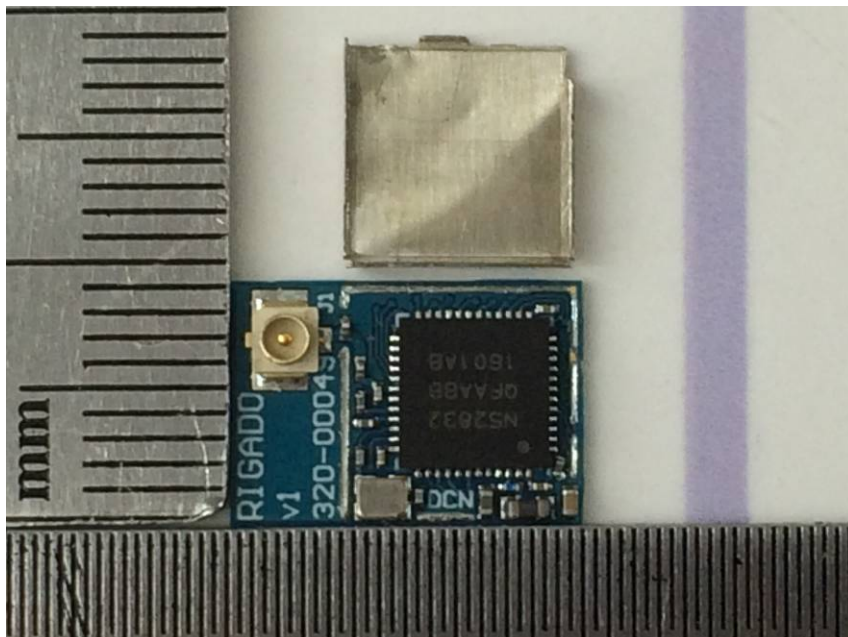


External antenna 5 Kinsun- 6610103081 (Gain 5 dBi) antenna port view

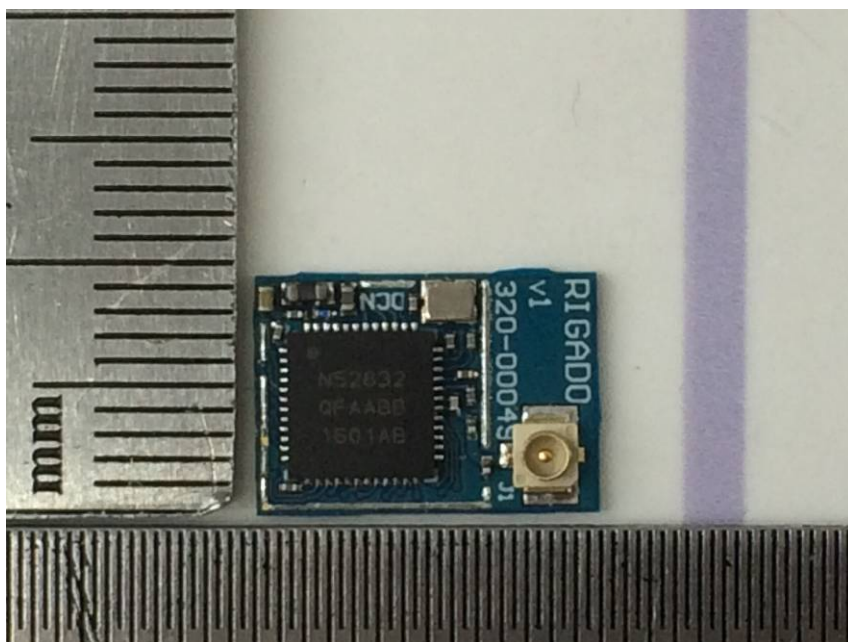
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Internal view



PCB side 1 view

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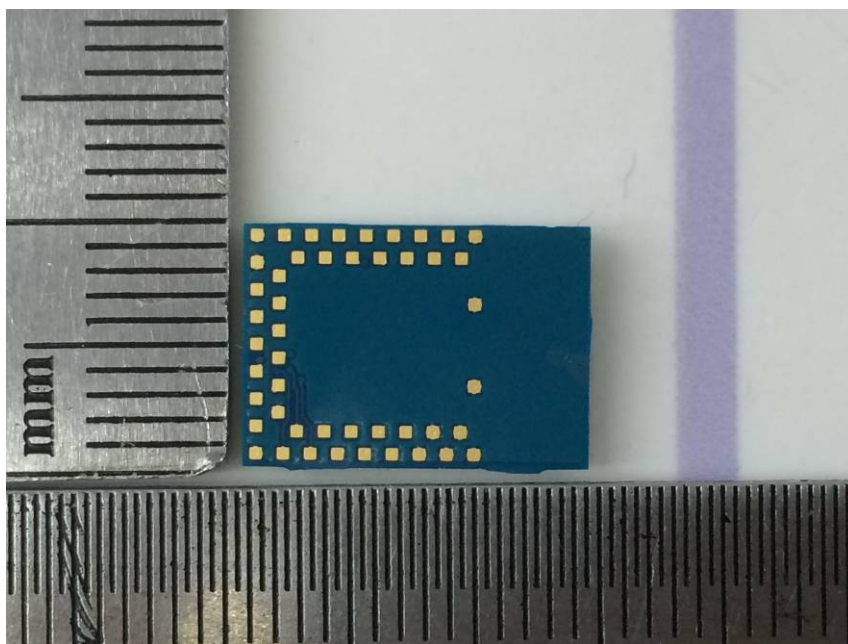
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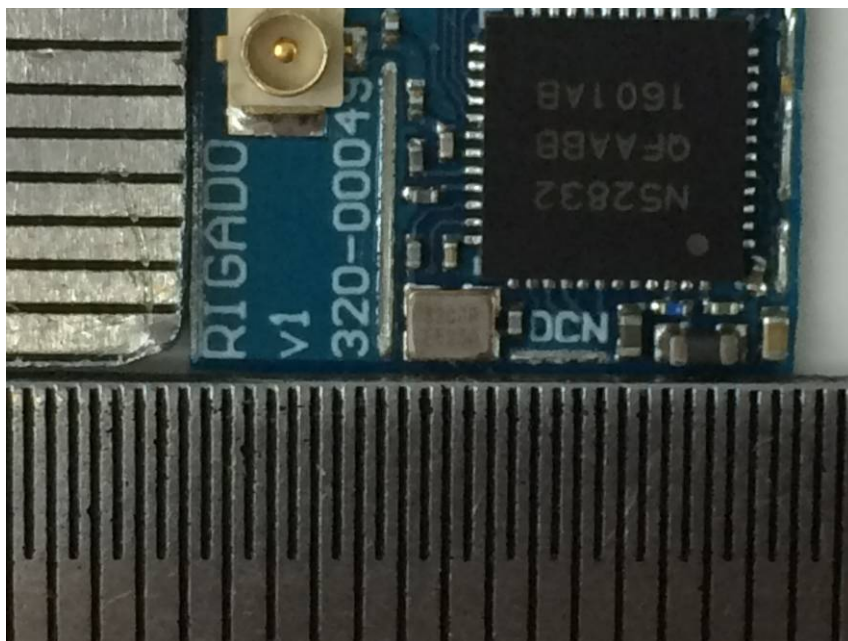
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PCB side 2 view



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**