RADIO COMMUNICATIONS AND EMC TESTING REPORT

Kenxen Electronic (SZ) Limited

W4R
IRIScan™ Book 5 WIFI, T4R, IRIScan™ Book 5

Scanner

2.4GHz Wi-Fi Transceiver

Test Report: 161027008SZN-001

Test Engineer :	Powell Bao Engineer	Sign On File
Report Approved By :	Hardy Suo Project Engineer	Digitally signed by Hardy Suo Location: Intertek Testing Services
Date :	17 October 2016	

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RADIO PERFORMANCE MEASUREMENTS
RESULT SUMMARY

Requirements	ETSI EN 300 328		Condition	Compliance
	Technical requirements	Test Specification		
	Clause Number			
RF Output Power	4.3.2.2	5.3.2		Complied
Power Spectral Density	4.3.2.3	5.3.3	Only for modulations other than FHSS	Complied
Duty cycle, Tx-Sequence, Tx-gap	4.3.2.4	5.3.2	Only for non-adaptive equipment and RF Output Power>10dBm	Complied
Medium Utilisation	4.3.2.5	5.3.2	Only for non-adaptive equipment and RF Output Power>10dBm	Complied
Adaptivity	4.3.2.6	5.3.7	Only for adaptive equipment and RF Output Power>10dBm	Complied
Occupied Channel Bandwidth	4.3.2.7	5.3.8		Complied
Transmitter unwanted emission in the OOB domain	4.3.2.8	5.3.9		Complied
Transmitter unwanted emission in the spurious domain	4.3.2.9	5.3.10		Complied
Receiver spurious emissions	4.3.2.10	5.3.11		Complied
Receiver Blocking	4.3.2.11	5.3.7	Only for adaptive equipment and RF Output Power>10dBm	Complied
Geo-location capability	4.3.2.12	N/A	Only applies to equipment with geo-location capability	N/A
Technical requirements for FHSS modulation	4.3.1	5.3	Only for FHSS	N/A
When determining the test conclusion, the Measurement Uncertainty of test has been considered. Note: N/A means Not applicable.				

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EMC COMPLIANCE MEASUREMENTS
RESULT SUMMARY

	ETSI EN 301 489-17	ETSI EN 301 489-1	Compliance
	Clause Number		
EMC Emission	7.1	8.2 8.4	Complied
Harmonic Current Emission (AC Mains Power Input Port)	7.1	8.5	Complied
Voltage Fluctuations and Flicker (AC Mains Power Input Port)	7.1	8.6	Complied
Electrostatic Discharge	7.2	9.3	Complied
Radio Frequency Electromagnetic Field (80MHz-1GHz & 1.4GHz-2.7GHz)	7.2	9.2	Complied
Fast Transients	7.2	9.4	Complied
Surges	7.2	9.8	Complied
Conducted RF Immunity	7.2	9.5	Complied
Voltage Dips & Interruptions	7.2	9.7	Complied
When determining the test conclusion, the Measurement Uncertainty of test has been considered.			

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EQUIPMENT UNDER TEST (EUT) INFORMATION

Applicant:	Kenxen Electronic (SZ) Limited building A13, Zone D, MinZhu, Western Industrial Area, ShaJing Town, Baoan District, ShenZhen, Guang Dong Province, China..
Description of EUT:	Scanner
Type Number (s):	W4R IRIScan™ Book 5 WIFI, T4R, IRIScan™ Book 5
Brand Name(s):	DIRECTSCAN, IRIScan™
Serial Number (s):	Not Labelled
Equipment Received:	28 July 2016
Test Date (s):	28 July 2016 to 17 October 2016
WiFi Version:	802.11b, 802.11g, 802.11n-HT20, 802.11n-HT40
Test Site and Location:	Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch 6/F., Block D, Huahan Building, Langshan Road, Nanshan District, Shenzhen, China EST Technology Co., Ltd. Santun Management Zone (Guantai Road), Houjie District,Dongguan,Guangdong, P. R. China
Test Specification (s):	ETSI EN 300 328 V1.9.1 (2015-02) ETSI EN 301 489-1 V1.9.2 (2011-09) ETSI EN 301 489-17 V2.2.1 (2012-09)

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EXHIBIT 1

GENERAL DESCRIPTION

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1 INTRODUCTION

Intertek Testing Services Shenzhen Limited Kejiyuan Branch has tested the Kenxen Electronic (SZ) Limited W4R Scanner. The sample was tested to the relevant performance specification published by the European Telecommunications Standards Institute. This report contains the results of these tests and is submitted to Kenxen Electronic (SZ) Limited as the final test results.

The Models: IRIScan™ Book 5 WIFI, T4R, IRIScan™ Book 5 are the same as the Model: W4R in hardware aspect and electrical aspect except the model T4R, IRIScan™ Book 5 without WiFi module. The difference in model number, appearance, brand name serves as marketing strategy.

The production units are required to conform to the initial sample as received when the units are placed on the market.

1.1 Product Information (Information as required by ETSI EN 300 328 V1.9.1 (2015-02), clause 5.3.1)

In accordance with ETSI EN 300 328 V1.9.1 (2015-02), clause 5.3.1, the following information is provided by the supplier.

a) The type of modulation used by the equipment:	☐ FHSS ☒ Other forms of modulation	
b) In case of FHSS modulation:	• In case of Non-Adaptive Frequency Hopping equipment: The number of Hopping Frequencies: _____	
	• In case of Adaptive Frequency Hopping Equipment: The maximum number of Hopping Frequencies:___ The minimum number of Hopping Frequencies:___	
	• The (average) Dwell Time: ms Maximum	
c) Adaptive / non-adaptive equipment:	☐ Non-adaptive Equipment	
	☒ Adaptive Equipment without the possibility to switch to a non-adaptive mode	
	☐ Adaptive Equipment which can also operate in a non-adaptive mode	
d) In case of adaptive equipment:	The maximum Channel Occupancy Time implemented by the equipment:___ ms	
	☒ The equipment has implemented an LBT based DAA mechanism	
	• In case of equipment using modulation different from FHSS:	☐ The equipment is Frame Based equipment
		☐ The equipment is Load Based equipment
		☐ The equipment can switch dynamically between Frame Based and Load Based equipment
	The CCA time implemented by the equipment:___µs	
	☐ The equipment has implemented an non-LBT based DAA mechanism	
	☐ The equipment can operate in more than one adaptive mode	
e) In case of non-adaptive equipment:	The maximum RF Output Power (e.i.r.p.): ____ dBm	
	The maximum (corresponding) Duty Cycle: ____ %	
	Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):_____	

f) The worst case operational mode for each of the following	• RF Output Power: 802.11b
	• Power Spectral Density: 802.11b
	• Duty cycle, Tx-Sequence, Tx-gap: N/A

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tests:	• Accumulated Transmit time, Frequency Occupation & Hopping Sequence (only for FHSS equipment): N/A	
	• Hopping Frequency Separation (only for FHSS equipment): N/A	
	• Medium Utilisation: N/A	
	• Adaptivity & Receiver Blocking: 802.11g	
	• Nominal Channel Bandwidth: 802.11n-HT40	
	• Transmitter unwanted emissions in the OOB domain: 802.11n-HT40	
	• Transmitter unwanted emissions in the spurious domain: 802.11b	
	• Receiver spurious emissions: 802.11n-HT40	
g) The different transmit operating modes (tick all that apply):	☒ Operating mode 1: Single Antenna Equipment	☒ Equipment with only one antenna
		☐ Equipment with two diversity antennas but only one antenna active at any moment in time
		☐ Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only one antenna is used. (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)
	☐ Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming	☐ Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)
		☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
		☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
	☐ Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming	☐ Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)
		☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
		☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
h) In case of Smart Antenna Systems:	• The number of Receive chains: 1	
	• The number of Transmit chains:__1__	☐ symmetrical power distribution
		☐ asymmetrical power distribution
		In case of beam forming, the maximum (additional) beam forming gain:___dB
i) Operating Frequency Range(s) of the equipment:	• Operating Frequency Range 1: 2412MHz to 2472 MHz	
	• Operating Frequency Range 2: 2422MHz to 2462MHz	
j) Nominal Channel Bandwidth(s):	• Nominal Channel Bandwidth 1: 18.823 MHz	
	• Nominal Channel Bandwidth 2: 36.195MHz	
k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):	☒ Stand-alone	
	☐ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)	
	☐ Plug-in radio device (Equipment intended for a variety of host systems)	
	☐ Other:_____	

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l) The extreme operating conditions that apply to the equipment:	Operating temperature range: 0 ° C to 35 ° C	
	Details provided are for the:	☒ stand-alone equipment ☐ combined (or host) equipment ☐ test jig
m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:	• Antenna Type:	
	☒ Integral Antenna	Antenna Gain: 2.2 dBi max If applicable, additional beamforming gain (excluding basic antenna gain):____dB ☐ Temporary RF connector provided ☐ No temporary RF connector provided
	☐ Dedicated Antennas (equipment with antenna connector)	☐ Single power level with corresponding antenna(s) ☐ Multiple power settings and corresponding antenna(s) Number of different Power Levels: ____ Power Level 1: ____ dBm Power Level 2: ____ dBm Power Level 3: ____ dBm Note: These power levels are conducted power levels (at antenna connector).
	• For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable	

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:

Power Level 1:____ dBm
Number of antenna assemblies provided for this power level: ____

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

Power Level 2: ____ dBm
Number of antenna assemblies provided for this power level: ____

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

Power Level 3: ____ dBm
Number of antenna assemblies provided for this power level: ____

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

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n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:	Details provided are for the:	☒ stand-alone equipment ☐ combined (or host) equipment ☐ test jig
	Supply Voltage	☐ AC mains State AC voltage 230 V ☐ DC State DC voltage 3.7V In case of DC, indicate the type of power source ☐ Internal Power Supply ☐ External Power Supply or AC/DC adapter ☒ Battery ☐ Other: ____
o) Describe the test modes available which can facilitate testing:	N/A	
p) The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], IEEE 802.15.4™ [i.4], proprietary, etc.):	802.11b, 802.11g, 802.11n-HT20, 802.11n-HT40	
q) If applicable, the statistical analysis referred to in clause 5.3.1 q)	N/A	
r) If applicable, the statistical analysis referred to in clause 5.3.1 r)	N/A	
s) Geo-location capability supported by the equipment:	☐ Yes	☐ The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user.
	☒ No	

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2 TEST SPECIFICATION

2.1 RELEVANT PERFORMANCE SPECIFICATION

The relevant performance specifications for Kenxen Electronic (SZ) Limited W4R Scanner are ETSI EN 300 328 V1.9.1 (2015-02) and ETSI EN 301 489-1 V1.9.2 (2011-09). The harmonised standards are ETSI EN 300 328 V1.9.1 (2015-02), ETSI EN 301 489-17 V2.2.1 (2012-09) and ETSI EN 301 489-1 V1.9.2 (2011-09).

The tests performed are those required to demonstrate compliance with the technical specifications and the essential requirements of Article 3.1(b) and 3.2 of the Radio Equipment and Telecommunications Terminal Equipment Directive (1999/5/EC) - R&TTE or Radio Equipment Directive (2014/53/EU) - RED for regulatory purposes.

2.2 TEST ENVIRONMENT

The tests were performed in the Radio communications and Electromagnetic Compatibility Test Facility at Intertek Testing Services Shenzhen Limited Kejiyuan Branch. The sample was subjected to the ambient conditions in the laboratory and indoor test site except during tests at extremes of temperatures and the Radiated Emissions Tests. The temperature and relative humidity recorded during the period of each test are given in the results.

2.3 CONFIGURATION OF TEST SAMPLE

The test sample consisted of one transceiver and under manufacturer's specified test mode, only the worst case data were reported.

2.4 TEST POWER SOURCES

The Scanner is intended to operate from operate from DC 3.7V Rechargeable battery or charged by Adapter AC 230V/50Hz. The test power sources were:

For DC input (supplied by battery):
Nominal test voltage DC 3.7V

For AC input (supplied by AC/DC adapter):
Nominal test voltage AC 230V

2.5 TEST FREQUENCIES

For 802.11b/g and n-HT20 the sample supplied operated on 13 channels, nominally at 2.412 - 2.472 GHz and for 802.11n-HT40 the sample supplied operated on 9 channels, nominally at 2.422 - 2.462 GHz for Transceiver. The channel is separated by 5 MHz channel spacing. The tests were carried out on channel 1, 7 and 13 channels of the frequency of the alignment range for 802.11b/g and n-HT20 and channel 3, 7 and 11 channels of the frequency of the alignment range for 802.11n-HT40.

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2.6 GENERAL REQUIREMENTS

2.6.1 MODULATION

1. Constant envelope digital frequency modulation is used with CCK / OFDM technique,
2. Manufacturer's declared operating temperature: 0°C to +35°C.
3. The product is a Scanner with WiFi IEEE 802.11b/g/n radio functions.

2.6.2 ANTENNA

The antenna used in Transceiver is permanent Integrate antenna.

2.7 MEASUREMENT UNCERTAINTY

All measurement uncertainties stated in this report are estimated to a 95% confidence level.

2.8 SUPPORT EQUIPMENT – RADIO PERFORMANCE MEASUREMENTS

Test Software (Provided by Client) was installed on the EUT

2.9 SUPPORT EQUIPMENT – EMC COMPLIANCE MEASUREMENTS

1. Laptop (DELL E6240) (Provided by EST)
2. USB Cabel (Detachable, Shielded with two ferrite cores, 120cm) (Provided by Customer)
3. Apple Adaptor (Model: A1357, Input: AC 100-240V, 0.45A, 50/60Hz; Output: DC 5V, 2.1A) (Provided by EST)

2.10 PERFORMANCE CRITERIA

2.10.1 PERFORMANCE CRITERIA FOR CONTINUOUS PHENOMENA (CT & CR)

At the conclusion of the test the EUT shall operated as intended with no loss of user control functions or stored data, the communication link shall have been maintained during the test.

Where the EUT is transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

2.10.2 PERFORMANCE CRITERIA FOR TRANSIENT PHENOMENA (TT & TR)

At the conclusion of each exposure the EUT shall operated with no user noticeable loss of communication link.

Where the EUT is transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

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EXHIBIT 2

TEST RESULT
OF
RADIO PERFORMANCE MEASUREMENTS

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3 RF Output Power

3.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 328 V1.9.1 (2015-02)
Clause :	5.3.2
Test method	Conducted measurements

3.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
101309	Open Switch and Control Unit	Rohde &Schwarz	OSP 120	25 June 16	25 June 17
103173	Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	25 June 16	25 June 17
108752	Signal Generator	Rohde &Schwarz	SMB100A	25 June 16	25 June 17
260753	Vector Signal Generator	Rohde &Schwarz	SMBV100A	25 June 16	25 June 17
120	Temperature controller	Terchy	MHQ	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

3.3 WORSE CASE TEST RESULT (DC Power Supply)

(802.11b)

Test Conditions			Measured Power (dBm)	Limit (dBm)	Margin (dB)
Temperature (°C) Humidity (%)	Voltage (VAC)	Channel			
Ambient	$V_{DC\ nom}$ 3.7V	Channel 1	17.2	20	-2.8
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		16.9	20	-3.1
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		17.0	20	-3.0
Ambient	$V_{DC\ nom}$ 3.7V	Channel 7	17.9	20	-2.1
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		17.7	20	-2.3
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		17.6	20	-2.4
Ambient	$V_{DC\ nom}$ 3.7V	Channel 13	18.2	20	-1.8
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		17.7	20	-2.3
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		17.8	20	-2.2

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(802.11g)

Test Conditions			Measured Power (dBm)	Limit (dBm)	Margin (dB)
Temperature (°C) Humidity (%)	Voltage (VAC)	Channel			
Ambient	$V_{DC\ nom}$ 3.7V	Channel 1	12.1	20	-7.9
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		11.4	20	-8.6
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		11.7	20	-8.3
Ambient	$V_{DC\ nom}$ 3.7V	Channel 7	13.0	20	-7.0
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		12.2	20	-8.8
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		12.3	20	-7.7
Ambient	$V_{DC\ nom}$ 3.7V	Channel 13	12.6	20	-7.4
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		12.5	20	-7.5
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		12.6	20	-7.4

(802.11n-HT20)

Test Conditions			Measured Power (dBm)	Limit (dBm)	Margin (dB)
Temperature (°C) Humidity (%)	Voltage (VAC)	Channel			
Ambient	$V_{DC\ nom}$ 3.7V	Channel 1	12.1	20	-7.9
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		11.6	20	-8.4
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		11.2	20	-8.8
Ambient	$V_{DC\ nom}$ 3.7V	Channel 7	12.3	20	-7.7
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		12.3	20	-7.7
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		11.7	20	-8.3
Ambient	$V_{DC\ nom}$ 3.7V	Channel 13	12.7	20	-7.3
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		12.6	20	-7.4
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		12.1	20	-7.9

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(802.11n-HT40)

Test Conditions			Measured Power (dBm)	Limit (dBm)	Margin (dB)
Temperature (°C) Humidity (%)	Voltage (VAC)	Channel			
Ambient	$V_{DC\ nom}$ 3.7V	Channel 1	11.2	20	-8.8
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		10.6	20	-9.4
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		11.1	20	-8.9
Ambient	$V_{DC\ nom}$ 3.7V	Channel 7	11.7	20	-8.3
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		11.4	20	-8.6
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		11.5	20	-8.5
Ambient	$V_{DC\ nom}$ 3.7V	Channel 13	12.1	20	-7.9
T_{min} 0°C H_{min} 0%	$V_{DC\ nom}$ 3.7V		11.4	20	-8.6
T_{max} 35°C H_{max} 50%	$V_{DC\ nom}$ 3.7V		11.6	20	-8.4

Notes:

1. Negative sign (-) in the margin column signify levels below the limit.
2. 20 dBm corresponds to 100mW.
3. Measurement Uncertainty: ±1.49B.
4. Remark: Power setting and Power level in the test software provided by the client.

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4 Power Spectral Density

4.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 328 V1.9.1 (2015-02)
Clause :	5.3.3
Test method	Conducted measurements

4.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
103173	Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

4.3 Limit for power spectrum density

For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

4.4 Measuring instrument setting

Spectrum analyzer settings	
Spectrum Analyzer function	**Setting**
Start Frequency	2400MHz
Stop Frequency	2483.5MHz
Detector	RMS
RBW	10 kHz
VBW	30 kHz
Sweep	Auto couple
Trace	Max hold
Sweep points	> 8350
Attenuation	Auto

4.5 Worse Case Test results- DC TEST VOLTAGE

(802.11b)

Channel	Frequency (MHz)	Measured Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Margin (dB)
Channel 1	2412	8.5	10	-1.5
Channel 7	2442	9.1	10	-0.8
Channel 13	2472	9.4	10	-0.6

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(802.11g)

Channel	Frequency (MHz)	Measured Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Margin (dB)
Channel 1	2412	0.5	10	-9.5
Channel 7	2442	1.4	10	-8.6
Channel 13	2472	0.9	10	-9.1

(802.11n-HT20)

Channel	Frequency (MHz)	Measured Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Margin (dB)
Channel 1	2412	0.1	10	-9.9
Channel 7	2442	0.3	10	-9.7
Channel 13	2472	0.6	10	-9.4

(802.11n-HT40)

Channel	Frequency (MHz)	Measured Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Margin (dB)
Channel 3	2422	-3.5	10	-13.5
Channel 7	2442	-3.0	10	-13.0
Channel 11	2462	-2.9	10	-12.9

Notes:

1. Negative sign (-) in the margin column signify levels below the limit.
2. Measurement Uncertainty: ±3.0dB.
3. Remark: Power setting and Power level in the test software provided by the client.

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5 Adaptivity

5.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 328 V1.9.1 (2015-02)
Clause :	5.3.7
Test method	Conducted measurements

5.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
101309	Open Switch and Control Unit	Rohde &Schwarz	OSP 120	25 June 16	25 June 17
103173	Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	25 June 16	25 June 17
108752	Signal Generator	Rohde &Schwarz	SMB100A	25 June 16	25 June 17
260753	Vector Signal Generator	Rohde &Schwarz	SMBV100A	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd.

5.3 Limit

5.3.1 Limit for Load Based Equipment

The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 18 µs.

If the equipment finds the channel occupied, it shall not transmit on this channel (see note 2). The equipment shall perform an Extended CCA check in which the channel is observed for a random duration in the range between 18 µs and at least 160 µs. If the extended CCA check has determined the channel to be no longer occupied, the equipment may resume transmissions on this channel. If the Extended CCA time has determined the channel still to be occupied, it shall perform new Extended CCA checks until the channel is no longer occupied.

The total time that an equipment makes use of a RF channel is defined as the Channel Occupancy Time. This Channel Occupancy Time shall be less than 13 ms, after which the device shall perform a new CCA as described in step 1) above.

The energy detection threshold for the CCA shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the CCA threshold level (TL) shall be equal or less than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). For power levels below 20 dBm e.i.r.p., the CCA threshold level may be relaxed to TL = -70 dBm/MHz + (20 dBm - Pout e.i.r.p.)/1 MHz (Pout in dBm).

5.3.2 Limit for Short Control Signalling Transmissions

If implemented, Short Control Signalling Transmissions of adaptive equipment using wide band modulations other than FHSS shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms.

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5.4 Test result

Mode	Channel	Adaptivity	Maximum Channel Occupancy Time(us)	COT limit(ms)	COT result	Short Control Signalling Transmissions	Short Control Signalling Transmissions Limit (within any observation period of 50 ms)	Duty cycle result
802.11b	1	Pass	240	13	Pass	0%	10 %	Pass
802.11b	13	Pass	2599	13	Pass	0%	10 %	Pass
802.11g	1	Pass	1163	13	Pass	5.4%	10 %	Pass
802.11g	13	Pass	4729	13	Pass	6.1%	10 %	Pass
802.11n (HT 20)	1	Pass	8153	13	Pass	2.6%	10 %	Pass
802.11n (HT 20)	13	Pass	4470	13	Pass	4.8%	10 %	Pass
802.11n (HT 40)	3	Pass	3351	13	Pass	4.2%	10 %	Pass
802.11n (HT 40)	11	Pass	6399	13	Pass	4.7%	10 %	Pass

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6 Occupied Channel Bandwidth

6.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 328 V1.9.1 (2015-02)
Clause :	5.3.8
Test method	Conducted measurements

6.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
103173	Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	25 June 16	25 June 17

Note: Measurement Uncertainty: ± 5%.
Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

6.3 Limit for occupied channel bandwidth

The Occupied Channel Bandwidth shall fall completely within the band given in 2.4 GHz to 2.4835 GHz.

For non-adaptive equipment using wide band modulations other than FHSS and with e.i.r.p greater than 10dBm, the Occupied Channel Bandwidth shall be less than 20MHz.

6.4 TEST RESULT

6.4.1 WORSE TEST RESULT - AC TEST VOLTAGE

(802.11b)

Frequency (MHz)	99% Bandwidth (MHz)	F_L at 99% BW (MHz)	F_H at 99% BW (MHz)	Result
2412	15.423072	2404.290964	2419.714036	Pass
2472	15.438070	2464.240970	2479.679040	Pass

(802.11g)

Frequency (MHz)	99% Bandwidth (MHz)	F_L at 99% BW (MHz)	F_H at 99% BW (MHz)	Result
2412	17.882765	2402.901137	2420.783902	Pass
2472	17.912761	2462.886139	2480.798900	Pass

(802.11n-HT20)

Frequency (MHz)	99% Bandwidth (MHz)	F_L at 99% BW (MHz)	F_H at 99% BW (MHz)	Result
2412	18.822647	2402.686164	2421.508811	Pass
2472	18.742657	2462.606174	2481.348831	Pass

(802.11n-HT40)

Frequency (MHz)	99% Bandwidth (MHz)	F_L at 99% BW (MHz)	F_H at 99% BW (MHz)	Result
2422	36.195476	2403.932259	2440.127734	Pass
2462	36.185477	2443.922260	2480.107737	Pass

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7 Transmitter unwanted emissions in the out-of-band domain

7.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 328 V1.9.1 (2015-02)
Clause :	5.3.9
Test method	Conducted measurements

7.2 EQUIPMENT LIST

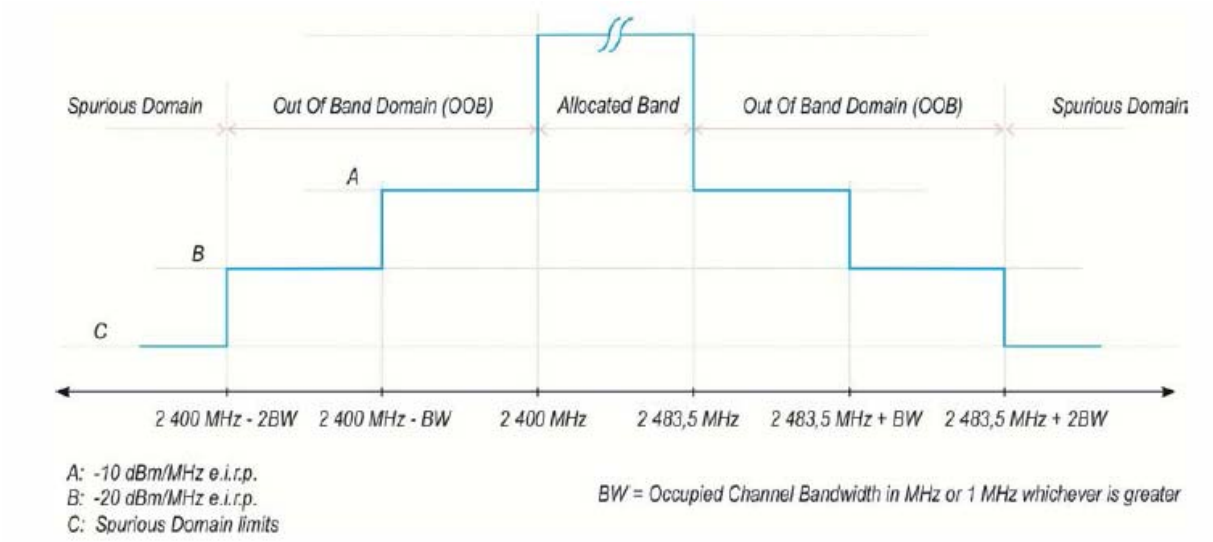
Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
103173	Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

7.3 Limit

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 3.

NOTE: Within the 2 400 MHz to 2 483.5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.2.7.



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7.4 Worse Case Test Result (DC Power Supply)

(802.11b)

Worst case test channel: Channel 13 (2472MHz)

Test Conditions			Measured Power (dBm)	Limit (dBm)	Margin (dB)
Temperature (°C) Humidity (%)	Voltage (VAC)	Test Segment (MHz)			
Ambient	V DC nom 3.7V	2400-2*BW to 2400-BW	-42.6	-20	-22.6
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-42.7	-20	-22.7
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-42.6	-20	-22.6
Ambient	V DC nom 3.7V	2400-BW to 2400	-42.4	-10	-32.4
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-42.5	-10	-32.5
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-42.5	-10	-32.5
Ambient	V DC nom 3.7V	2483.5 to 2483.5+BW	-37.4	-10	-27.4
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-39.4	-10	-29.4
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-40.6	-10	-30.6
Ambient	V DC nom 3.7V	2483.5+BW to 2483.5+2*BW	-41.1	-20	-21.1
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-41.2	-20	-21.1
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-41.2	-20	-21.1

Notes: 1. Negative sign (-) in the margin column signify levels below the limit.
2. Measurement Uncertainty: ±3.0dB.

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(802.11g)

Worst case test channel: Channel 13 (2472MHz)

Test Conditions			Measured Power (dBm)	Limit (dBm)	Margin (dB)
Temperature (°C) Humidity (%)	Voltage (VAC)	Test Segment (MHz)			
Ambient	V DC nom 3.7V	2400-2*BW to 2400-BW	-42.6	-20	-22.6
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-42.7	-20	-22.7
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-42.6	-20	-22.6
Ambient	V DC nom 3.7V	2400-BW to 2400	-42.3	-10	-32.3
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-42.4	-10	-32.4
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-42.4	-10	-32.4
Ambient	V DC nom 3.7V	2483.5 to 2483.5+BW	-33.5	-10	-23.5
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-37.0	-10	-27.0
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-36.9	-10	-26.9
Ambient	V DC nom 3.7V	2483.5+BW to 2483.5+2*BW	-41.2	-20	-21.2
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-41.2	-20	-21.2
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-41.2	-20	-21.2

Notes: 1. Negative sign (-) in the margin column signify levels below the limit.
2. Measurement Uncertainty: ±3.0dB.

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(802.11n-HT20)

Worst case test channel: Channel 13 (2472MHz)

Test Conditions			Measured Power (dBm)	Limit (dBm)	Margin (dB)
Temperature (°C) Humidity (%)	Voltage (VAC)	Test Segment (MHz)			
Ambient	V DC nom 3.7V	2400-2*BW to 2400-BW	-42.6	-20	-22.6
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-42.6	-20	-22.6
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-42.6	-20	-22.6
Ambient	V DC nom 3.7V	2400-BW to 2400	-42.3	-10	-32.3
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-42.3	-10	-32.3
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-42.3	-10	-32.3
Ambient	V DC nom 3.7V	2483.5 to 2483.5+BW	-32.7	-10	-22.7
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-36.3	-10	-26.3
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-36.3	-10	-26.3
Ambient	V DC nom 3.7V	2483.5+BW to 2483.5+2*BW	-41.2	-20	-21.2
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-41.2	-20	-21.2
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-41.2	-20	-21.2

Notes: 1. Negative sign (-) in the margin column signify levels below the limit.
2. Measurement Uncertainty: ±3.0dB.

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(802.11n-HT40)

Worst case test channel: Channel 11 (2462MHz)

Test Conditions			Measured Power (dBm)	Limit (dBm)	Margin (dB)
Temperature (°C) Humidity (%)	Voltage (VAC)	Test Segment (MHz)			
Ambient	V DC nom 3.7V	2400-2*BW to 2400-BW	-42.6	-20	-22.6
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-42.5	-20	-22.5
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-42.6	-20	-22.6
Ambient	V DC nom 3.7V	2400-BW to 2400	-40.3	-10	-30.3
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-42.4	-10	-32.4
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-41.7	-10	-31.7
Ambient	V DC nom 3.7V	2483.5 to 2483.5+BW	-26.9	-10	-16.9
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-37.9	-10	-27.9
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-30.0	-10	-20.0
Ambient	V DC nom 3.7V	2483.5+BW to 2483.5+2*BW	-39.8	-20	-19.8
T_{min} 0°C H_{min} 0%	V DC nom 3.7V		-41.9	-20	-21.9
T_{max} 35°C H_{max} 50%	V DC nom 3.7V		-41.2	-20	-21.2

Notes: 1. Negative sign (-) in the margin column signify levels below the limit.
2. Measurement Uncertainty: ±3.0dB.

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8 Transmitter unwanted emissions in the spurious domain

8.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 328 V1.9.1 (2015-02)
Clause :	5.3.10
Test method	Radiated measurements

8.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
100004	EMI Test Receiver	R & S	ESVS10	25 June 16	25 June 17
MY50140697	Spectrum Analyzer	Agilent	E4411B	25 June 16	25 June 17
25872	Bilog Antenna	Teseq	CBL 6111D	25 June 16	25 June 17
187037	Signal Amplifier	Agilent	310N	25 June 16	25 June 17
MY44211139	Spectrum Analyzer	Agilent	E4408B	25 June 16	25 June 17
BBHA9120D1002	Horn Antenna	SCHWARZBECK	BBHA 9120D	25 June 16	25 June 17
9718-212	Signal Amplifier	SCHWARZBECK	9718-212	25 June 16	25 June 17
MY44211139	Spectrum Analyzer	Agilent	E4408B	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

8.3 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values.

Frequency Range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

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8.4 Test Result

(802.11b)
Channel 1

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	105.660	-74.4	-54.0	-20.4
Vertical	487.840	-75.5	-54.0	-21.5
Horizontal	631.400	-70.3	-54.0	-16.3
Vertical	4824.000	-41.2	-30.0	-11.2
Horizontal	7236.000	-47.76	-30.0	-17.8
Horizontal	12691.250	-44.08	-30.0	-14.1

Channel 13

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Vertical	487.840	-75.8	-54.0	-21.8
Horizontal	600.360	-72.6	-54.0	-18.6
Horizontal	631.400	-72.8	-54.0	-18.8
Vertical	4944.000	-39.08	-30.0	-9.1
Horizontal	7416.000	-46.85	-30.0	-16.9
Vertical	12667.750	-44.38	-30.0	-14.4

(802.11g)

Channel 1

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	600.360	-70.9	-54.0	-16.9
Horizontal	623.640	-71.5	-54.0	-17.5
Horizontal	631.400	-70.1	-54.0	-16.1
Horizontal	4824.000	-40.34	-30.0	-10.3
Horizontal	7236.000	-48.2	-30.0	-18.2
Horizontal	12656.000	-44.6	-30.0	-14.6

Channel 13

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Vertical	209.450	-74.1	-54.0	-20.1
Horizontal	600.360	-72.4	-54.0	-18.4
Horizontal	631.400	-71.1	-54.0	-17.1
Horizontal	4944.000	-41	-30.0	-11.0
Horizontal	7416.000	-47.43	-30.0	-17.4
Horizontal	9589.250	-44.6	-30.0	-14.6

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(802.11n-HT20)
Channel 1

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Vertical	209.450	-73.4	-54.0	-19.4
Horizontal	623.640	-75.4	-54.0	-21.4
Horizontal	641.100	-74.8	-54.0	-20.8
Horizontal	4824.000	-41.9	-30.0	-11.9
Horizontal	7236.000	-47.6	-30.0	-17.6
Vertical	12691.250	-40.9	-30.0	-10.9

Channel 13

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	105.600	-73.7	-54.0	-19.7
Horizontal	600.360	-70.7	-54.0	-16.7
Horizontal	631.400	-70.2	-54.0	-16.2
Horizontal	4944.000	-39.78	-30.0	-9.8
Horizontal	7416.000	-46.88	-30.0	-16.9
Vertical	9601.000	-42.71	-30.0	-12.7

(802.11n-HT40)
Channel 3

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	105.660	-76.0	-54.0	-22.0
Horizontal	600.360	-75.3	-54.0	-21.3
Horizontal	641.100	-73.1	-54.0	-19.1
Horizontal	4844.000	-43.34	-30.0	-13.3
Horizontal	7266.000	-47.42	-30.0	-17.4
Horizontal	12691.250	-42.09	-30.0	-12.1

Channel 11

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	180.350	-76.5	-54.0	-22.5
Horizontal	631.400	-70.9	-54.0	-16.9
Horizontal	641.100	-70.2	-54.0	-16.2
Horizontal	4924.000	-43.46	-30.0	-13.5
Horizontal	7386.000	-46.6	-30.0	-16.6
Horizontal	9848.000	-44.32	-30.0	-14.3

Notes:

1. Negative sign (-) in the margin column signify levels below the limit.
2. The test frequency range is 30MHz to 12.75GHz.
3. Other emissions found were at least 10 dB below the limit.
4. Measurement Uncertainty: ±4.8dB for frequency range 30MHz to 1GHz and ±6.0dB for frequency range 1GHz to 12.75GHz.

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9 Receiver spurious emission

9.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 328 V1.9.1 (2015-02)
Clause :	5.3.11
Test method	Radiated measurements
Test Mode	Receive-only mode

9.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
100004	EMI Test Receiver	R & S	ESVS10	25 June 16	25 June 17
MY50140697	Spectrum Analyzer	Agilent	E4411B	25 June 16	25 June 17
25872	Bilog Antenna	Teseq	CBL 6111D	25 June 16	25 June 17
187037	Signal Amplifier	Agilent	310N	25 June 16	25 June 17
MY44211139	Spectrum Analyzer	Agilent	E4408B	25 June 16	25 June 17
BBHA9120D1002	Horn Antenna	SCHWARZBECK	BBHA 9120D	25 June 16	25 June 17
9718-212	Signal Amplifier	SCHWARZBECK	9718-212	25 June 16	25 June 17
MY44211139	Spectrum Analyzer	Agilent	E4408B	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

9.3 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values.

Frequency Range	Maximum power	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12.75 GHz	-47 dBm	1 MHz

9.4 Test Result

(802.11b)

Channel 1

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	30.000	-67.3	-57.0	-10.3
Horizontal	151.250	-71.7	-57.0	-14.7
Horizontal	641.100	-73.7	-57.0	-16.7
Horizontal	10917.000	-58.1	-47.0	-11.1
Horizontal	12609	-56.45	-47.0	-9.5
Vertical	12691.25	-57.1	-47.0	-10.1

☐ No emissions significantly above equipment noise floor.

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Channel 13

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	30.000	-68.5	-57.0	-11.5
Vertical	233.700	-75.3	-57.0	-18.3
Horizontal	641.100	-75.7	-57.0	-18.7
Horizontal	11081.500	-57.7	-47.0	-10.7
Vertical	12256.5	-55.39	-47.0	-8.4
Horizontal	12421	-56.09	-47.0	-9.1

☐ No emissions significantly above equipment noise floor.

(802.11g)

Channel 1

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	30.000	-67.4	-57.0	-10.4
Horizontal	151.250	-71.5	-57.0	-14.5
Horizontal	309.360	-74.5	-57.0	-17.5
Vertical	8731.500	-57.8	-47.0	-10.8
Horizontal	12221.25	-58.66	-47.0	-11.7
Vertical	12515	-58.37	-47.0	-11.4

☐ No emissions significantly above equipment noise floor.

Channel 13

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	30.000	-68.7	-57.0	-11.7
Horizontal	151.250	-71.6	-57.0	-14.6
Horizontal	631.400	-72.4	-57.0	-15.4
Horizontal	9601.000	-59.6	-47.0	-12.6
Horizontal	12503.25	-57.39	-47.0	-10.4
Vertical	12515	-58.1	-47.0	-11.1

☐ No emissions significantly above equipment noise floor.

(802.11n-HT20)

Channel 1

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	30.000	-67.9	-57.0	-10.9
Horizontal	600.360	-72.1	-57.0	-15.1
Horizontal	631.400	-71.7	-57.0	-14.7
Horizontal	8731.500	-59.8	-47.0	-12.8
Vertical	12338.750	-57.9	-47.0	-10.9

☐ No emissions significantly above equipment noise floor.

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Channel 13

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	30.000	-67.3	-57.0	-10.3
Horizontal	151.250	-71.7	-57.0	-14.7
Horizontal	631.400	-70.7	-57.0	-13.7
Horizontal	8778.500	-60.8	-47.0	-13.8
Horizontal	12256.5	-58.61	-47.0	-11.6
Vertical	12573.75	-55.51	-47.0	-8.5

☐ No emissions significantly above equipment noise floor.

(802.11n-HT40)

Channel 3

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	30.000	-68.1	-57.0	-11.1
Horizontal	105.660	-75.1	-57.0	-18.1
Horizontal	309.360	-74.4	-57.0	-17.4
Horizontal	10987.500	-57.8	-47.0	-10.8
Horizontal	12656.000	-55.43	-47.0	-8.4

☐ No emissions significantly above equipment noise floor.

Channel 11

Antenna Polarization	Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
Horizontal	30.000	-67.7	-57.0	-10.7
Horizontal	151.250	-71.8	-57.0	-14.8
Horizontal	641.100	-73.2	-57.0	-16.2
Horizontal	8778.500	-59.7	-47.0	-12.7
Horizontal	11657.250	-58.3	-47.0	-11.3
Vertical	12750.000	-54.8	-47.0	-7.8

☐ No emissions significantly above equipment noise floor.

Notes:
1. Negative sign (-) in the margin column signify levels below the limit.
2. The test frequency range is 30MHz to 12.75GHz.
3. Other emissions found were at least 10 dB below the limit.
4. Measurement Uncertainty: ±4.8dB for frequency range 30MHz to 1GHz and ±6.0dB for frequency range 1GHz to 12.75GHz.

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10 Receiver Blocking

10.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 328 V1.9.1 (2015-02)
Clause :	5.3.7
Test method	Conducted measurements

10.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
101309	Open Switch and Control Unit	Rohde &Schwarz	OSP 120	25 June 16	25 June 17
103173	Signal and Spectrum Analyzer	Rohde &Schwarz	FSV	25 June 16	25 June 17
108752	Signal Generator	Rohde &Schwarz	SMB100A	25 June 16	25 June 17
260753	Vector Signal Generator	Rohde &Schwarz	SMBV100A	25 June 16	25 June 17
120	Temperature controller	Terchy	MHQ	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co., Ltd.

10.3 Limit

Adaptive equipment using wide band modulations other than FHSS, shall comply with the requirements defined in clause 4.3.2.6.2 (non-LBT based DAA) or clause 4.3.2.6.3 (LBT based DAA) in the presence of a blocking signal with characteristics as provided in below table.

Equipment Type (LBT / non- LBT)	Wanted signal mean power from companion device	Blocking signal frequency [MHz]	Blocking signal power [dBm]	Type of interfering signal
LBT	sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35	CW
Non-LBT	-30 dBm			

NOTE 1: The highest blocking frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest blocking frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.3.7.1.

NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.

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10.4 Test result

802.11b Mode

Channel	Wanted signal mean power from companion device (dBm/MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Result
01	-50	2488.5	-35	Pass
13	-50	2395	-35	Pass

802.11g Mode

Channel	Wanted signal mean power from companion device (dBm/MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Result
01	-50	2488.5	-35	Pass
13	-50	2395	-35	Pass

802.11n HT20 Mode

Channel	Wanted signal mean power from companion device (dBm/MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Result
01	-50	2488.5	-35	Pass
13	-50	2395	-35	Pass

802.11n HT40 Mode

Channel	Wanted signal mean power from companion device (dBm/MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Result
03	-50	2488.5	-35	Pass
11	-50	2395	-35	Pass

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EXHIBIT 3

TEST RESULT
OF
EMC COMPLIANCE MEASUREMENTS

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11 EMC EMISSION TEST

11.1 TEST METHOD AND SUMMARY

Basic Standard :	EN55022: 2006 + A1: 2007	
Test :	Radiated Emission	Conducted Emission
Classification :	Class B	
Port :	Enclosure Port of Ancillary Equipment	AC Mains Power Port

11.2 RADIATED EMISSION TEST

11.2.1 TEST EQUIPMENT

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
100004	EMI Test Receiver	R & S	ESVS10	25 June 16	25 June 17
MY50140697	Spectrum Analyzer	Agilent	E4411B	25 June 16	25 June 17
25872	Bilog Antenna	Teseq	CBL 6111D	25 June 16	25 June 17
187037	Signal Amplifier	Agilent	310N	25 June 16	25 June 17
101985	EMI Test Receiver	R & S	ESPI3	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

11.2.2 TEST RESULT

Test mode: WiFi Mode

Test Frequency: 30MHz – 1GHz

Polarization	Frequency (MHz)	Net at 3m (dBμV/m)	Calculated Net at 10m (dBμV/m)	Limit at 10m (dBμV/m)	Margin (dB)
Horizontal	273.470	31.5	21.5	37.0	-15.5
Horizontal	405.390	34.6	24.6	37.0	-12.4
Horizontal	381.140	39.0	29.0	37.0	-8.0
Vertical	166.770	29.5	19.5	30.0	-10.5
Vertical	277.350	29.7	19.7	37.0	-17.3
Vertical	600.360	36.4	26.4	37.0	-10.6

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Test Frequency: 1GHz – 6GHz

Peak

Polarization	Frequency (MHz)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	2550.000	42.9	70.0	-27.2
Horizontal	2825.000	40.4	70.0	-29.6
Horizontal	5275.000	44.8	74.0	-29.2
Vertical	2550.000	41.2	70.0	-28.8
Vertical	4850.000	48.9	74.0	-25.1
Vertical	5975.000	46.2	74.0	-27.8

Average

Polarization	Frequency (MHz)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	2550.000	33.0	50.0	-17.0
Horizontal	2825.000	30.1	50.0	-19.9
Horizontal	5275.000	34.6	54.0	-19.5
Vertical	2550.000	29.4	50.0	-20.6
Vertical	4850.000	37.9	54.0	-16.1
Vertical	5975.000	32.5	54.0	-21.5

Notes:

1. Quasi-Peak Detector Data for 30M-1000MHz, Peak & Average Detector Data for 1000MHz-6000MHz.
2. Negative sign (-) in the margin column signify levels below the limit
3. Frequency range scanned: 30 MHz to 2000 MHz (The highest internal frequency is 2480MHz which was declared by applicant).
4. Only emissions significantly above equipment noise floor are reported.

11.2.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainties: ± 4.8dB. The measured result is above the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

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11.3 CONDUCTED EMISSION TEST

11.3.1 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
832354	EMI Test Receiver	R & S	ESHS30	25 June 16	25 June 17
101260	Artificial Mains Network	R & S	ENV216	25 June 16	25 June 17
101100	Pulse Limiter	R & S	ESH3-Z2	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

11.3.2 TEST RESULT

The emission results (AC mains power port, Telecommunication port) are attached in Appendix 1.

11.3.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainties: ± 3.6dB.

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12 HARMONIC EMISSION TEST

12.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-3-2: 2006 + A1: 2009 + A2: 2009
Classification :	Class A
Port :	AC Mains Input Port

12.2 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
663000002099	Power Analyzer	Chroma	6630	25 June 16	25 June 17
653000007115	Voltage Source	Chroma	6530	N/A	N/A

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

12.3 TEST RESULT

According to EN 61000-3-2: 2006 clause 7, equipment with a rated power less than or equal to 75W is deemed to fulfil all relevant requirements of this standard without testing.

12.4 MEASUREMENT UNCERTAINTY

Measurement Uncertainties: 0.03%.

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13 VOLTAGE FLUCTUATIONS AND FLICKER

13.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-3-3: 2008
Port :	AC Mains Input Port

13.2 TEST EQUIPMENT

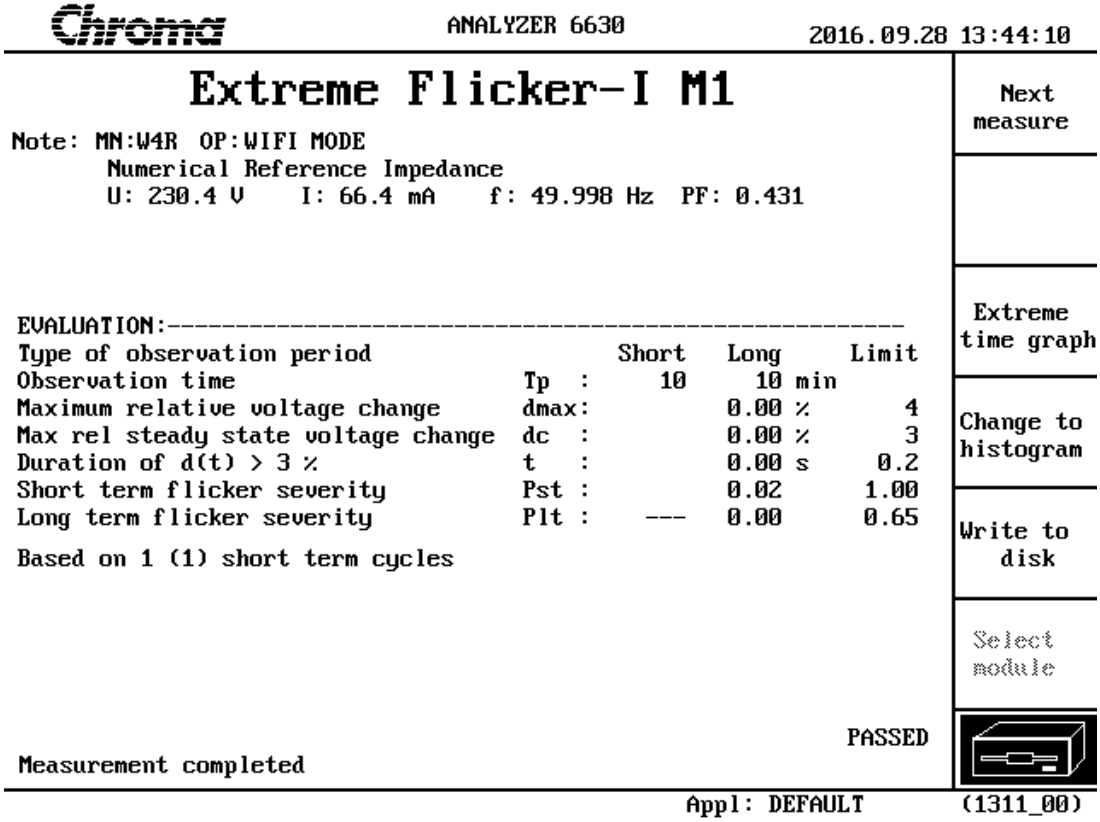
Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
663000002099	Power Analyzer	Chroma	6630	25 June 16	25 June 17
653000007115	Voltage Source	Chroma	6530	N/A	N/A

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

13.3 TEST RESULT

Flicker Test Summary per EN/IEC61000-3-3 (Run time)

Worst Case Test Mode: WiFi Mode
Test Result: Pass **Status: Test Completed**



13.4 MEASUREMENT UNCERTAINTY

Measurement Uncertainties: 0.25%.

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14 ELECTROSTATIC DISCHARGE

14.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-4-2: 2009
Port :	Endosure
Required Performance Criterion :	TT & TR
Level :	± 2.0, ± 4.0, ±8.0 kV (Air Discharge) ±4.0 kV (Contact Discharge) ±4.0 kV (Indirect Contact Discharge)
Temperature :	23.7 ^{0}C
Relative Humidity :	44.7 %
No. of Discharge(s) :	Minimum of 10 Discharges per Each Polarity
Time Between Each Discharge :	1 second
Test Mode :	WiFi Mode, WiFi Idle
Test Setup :	Table-top
Test of Post-installation :	N/A

14.2 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
174153	ESD Generator	HAEFELY	ONYX16	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

14.3 TEST RESULT

14.3.1 TEST RESULT

Discharge Type	Applied Voltage	Result (Pursuant to ETSI EN 301 489-17 Criterion TT & TR)
Contact Discharge	± 4kV	Complied
Air Discharge	± 2, ± 4, ± 8kV	Complied
Indirect HCP Discharge	± 4kV	Complied
Indirect VCP Discharge	± 4kV	Complied

14.3.2 ADDITIONAL RESULT INFORMATION

The communication link of EUT could not maintain during the test, pressing power button was needed to resume normal operation. After consider with client's confirmation that relevant instruction will be mentioned in the manual, so the test result was considered to be passed.

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15 RADIO FREQUENCY ELECTROMAGNETIC FIELD

15.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-4-3: 2006 + A1: 2008 + A2: 2010
Port :	Enclosure
Required Performance Criterion :	CT & CR
Level :	3.0 V/m (rms)
Test Modulation :	1kHz, 80% AM
Frequency :	80 MHz to 1000 MHz and 1400 MHz to 2000 MHz
Dwell Time :	1s
Frequency Step :	1%
Temperature :	25.3^{0}C
Relative Humidity :	54.4%
Test Facility :	Full Anechoic Chamber
Antenna Polarization :	Horizontal and Vertical
Type of Antenna :	Biconical / Log-periodic / Horn
Test Distance :	3m
Test Mode :	WiFi Mode, WiFi Idle
Test Setup :	Table-top

15.2 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	12-Oct-16	12-Oct-17
SZ180-01	Signal Generator	R&S	SML03	23-May-16	23-May-17
SZ181-01	Amplifier	PRANA	AP32 MT215	23-Jan-16	23-Jan-17
SZ181-07	Power Amplifier	MILMEGA	AS0827-110	23-Jan-16	23-Jan-17
SZ182-01	RF Power Meter	BOONTON	4232A	23-Jan-16	23-Jan-17
SZ188-02	Anechoic Chamber	ETS	RFD-F/A-100	08-Nov-14	08-Nov-16

* The Equipment would be verified together with the test system before testing.

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15.3 TEST RESULT

15.3.1 TEST RESULT

Frequency (MHz)	Exposed Side	Result (Pursuant to ETSI EN 301 489-17 Criterion CT & CR)
80 to 1000 1400 to 2700	Front	Complied
80 to 1000 1400 to 2700	Left	Complied
80 to 1000 1400 to 2700	Rear	Complied
80 to 1000 1400 to 2700	Right	Complied

15.3.2 ADDITIONAL RESULT INFORMATION

The EUT worked as intended during and after the test. No observable change occurred.

15.4 DECLARATION INFORMATION FROM APPLICANT

None.

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16 FAST TRANSIENTS

16.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-4-4: 2004 +A1: 2010	
Port :	A.C. Power Lines	Telecommunication Lines, D.C. Power Lines, Signal Lines and Control Lines
Required Performance Criterion :	TT & TR	
Level :	±1.0kV	±0.5kV
Temperature :	24.6 ^{0}C	
Relative Humidity :	52.1 %	
Test Duration	1 minute per each polarity	
Test Mode :	WiFi Mode, WiFi Idle	
Test Setup :	Table-top	
Generator Drive :	Internal	
Sequence of Application :	Each One	

16.2 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
173659	EFT Generator	HAEFELY	ECOMPACT 4	25 June 16	25 June 17
181035	Capacitive Coupling Clamp	HAEFELY	IP4A	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

16.3 TEST RESULT

16.3.1 TEST RESULT

Port	Level	Result (Pursuant to ETSI EN 301 489-17 Criterion TT & TR)
A.C. Power Lines	± 1kV	Complied

16.3.2 ADDITIONAL RESULT INFORMATION

The EUT worked as intended during and after the test. No observable change occurred.

16.4 DECLARATION INFORMATION FROM APPLICANT

None.

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17 SURGES

17.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-4-5 : 2006		
Port :	A.C. Power Lines		
	Phase And Neutral	Phase And Earth	Neutral And Earth
Level :	5 Positive And 5 Negative Surges		
	±1kV	N/A	N/A
Generator Impedance :	2 ohm	12 ohm	12 ohm
Required Performance Criterion :	TT & TR		
Temperature :	25.3 ^{0}C		
Relative Humidity :	54.4 %		
Repetition Rate :	1 minute		
Test Mode :	WiFi Mode, WiFi Idle		
Test Setup :	Table-top		
Surge Generator Trigger :	Internal		
Installation Condition :	Class 3: Electrical environment where cables run in parallel.		
Phase Angle :	0°, 90°, 180°, 270°		

17.2 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
174034	Surge Controller	HAEFELY	PSURGE8000	25 June 16	25 June 17
174125	Surge Impulse Module	HAEFELY	PIM100	25 June 16	25 June 17
174134	Surge Coupling Network	HAEFELY	PCD100	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

17.3 TEST RESULT

17.3.1 TEST RESULT

Level	Result (Pursuant to ETSI EN 301 489-17 Criterion TT & TR)
Between Phase And Neutral : ± 1kV	Complied

17.3.2 ADDITIONAL RESULT INFORMATION

The EUT worked as intended during and after the test. No observable change occurred.

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17.4 DECLARATION INFORMATION FROM APPLICANT

None.

18 CONDUCTED RF IMMUNITY

18.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-4-6: 2009
Port :	A.C. Power Lines, Telecommunication Lines, D.C. Power Lines, Signal Lines and Control Lines
Required Performance Criterion :	CT & CR
Level :	3.0V (rms)
Test Modulation :	1 kHz, 80% AM
Frequency :	0.15 MHz to 80 MHz
Dwell Time :	1s
Frequency Step :	1%
Temperature :	25.3^{0}C
Relative Humidity :	54.4%
Coupling Factor of CDN :	-1.0dB ~ –1.7dB
Test Mode :	WiFi Mode, WiFi Idle
Test Setup :	Table-top
Equipment Under Test (EUT):	Single Unit

18.2 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
126A1163	CS Test System	FRANKONIA	CIT-10	25 June 16	25 June 17
A2210150	CDN	FRANKONIA	CDN-M2+M3	25 June 16	25 June 17
132A1207	EM-Clamp	FRANKONIA	EMCL-20	25 June 16	25 June 17

Note: This test was witnessed in Dongguan EST Technology Co.,Ltd

* The Equipment would be verified together with the test system before testing.

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18.3 TEST RESULT

18.3.1 TEST RESULT

Port	Level	Result (Pursuant to ETSI EN 301 489-17 Criterion CT & CR)
A.C. Power Lines	3V (rms)	Complied

18.3.2 ADDITIONAL RESULT INFORMATION

The EUT worked as intended during and after the test. No observable change occurred.

18.4 DECLARATION INFORMATION FROM APPLICANT

None.

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19 VOLTAGE DIPS & INTERRUPTIONS

19.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-4-11: 2004			
Port :	A.C. Power Lines			
Level :	Test level in %U_T	Duration(s)	Required Performance Criterion	
			Transmitter	Receiver
	0	0.01	TT	TR
	0	0.02	TT	TR
	70	0.5	TT	TR
	0	5	TT	TR
No. of Dips/Interruptions :	3			
Temperature :	27.6 ^{0}C			
Relative Humidity :	52.1 %			
Test Mode :	WiFi Mode, WiFi Idle			
Test Setup :	Test generator causes the interference to the EUT AC mains			

U_T is the rated voltage for the equipment.

19.2 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
173659	DIPS Tester	HAEFELY	ECOMPACT 4	25 June 16	25 June 17

* The Equipment would be verified together with the test system before testing.

19.3 TEST RESULT

19.3.1 TEST RESULT FOR TRANSMITTER

Test Condition		Result (Pursuant to ETSI EN 301 489-17)	
Test Level in %U_T	**Duration(s)**	**Meet Criterion CT & CR**	**Meet Criterion TT & TR**
0	0.01	N/A	Complied
0	0.02	N/A	Complied
70	0.5	N/A	Complied
0	5	N/A	Complied

U_T is the rated voltage for the equipment.

19.3.3 ADDITIONAL RESULT INFORMATION

The communication link of EUT could not maintain during the test and could be reset by operator after the test at test level 0%UT, 5s of Interrupt.

19.4 DECLARATION INFORMATION FROM APPLICANT

None.

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EXHIBIT 4

PHOTOS OF EUT

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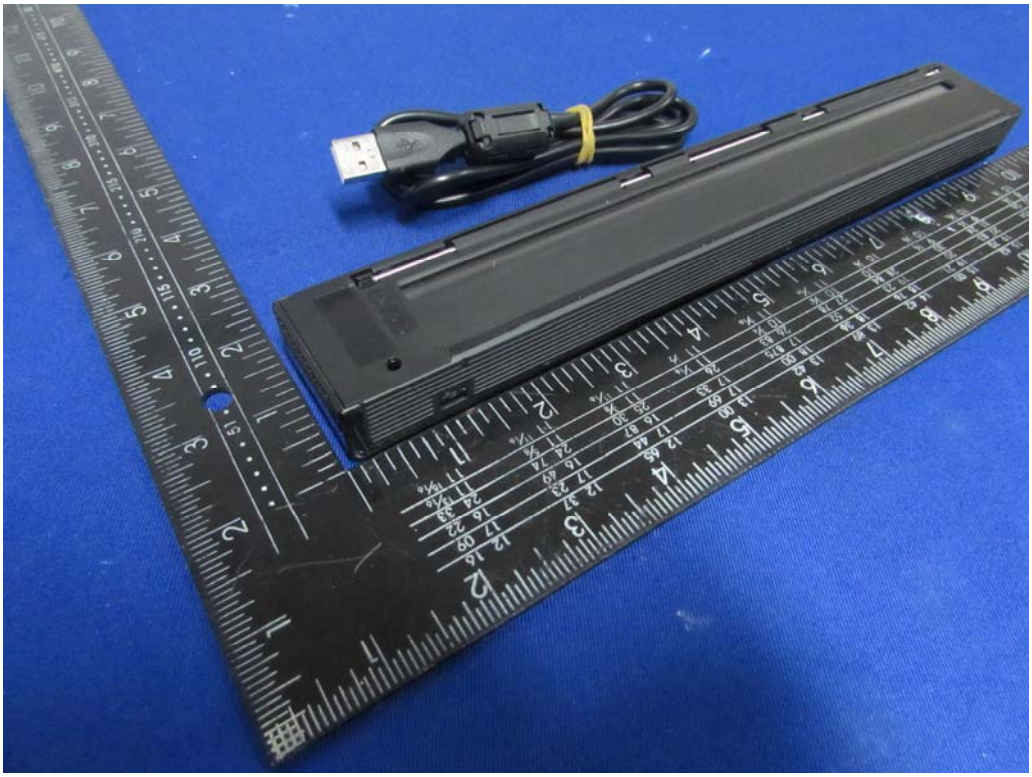
20. EUT PHOTOS

20.1 EXTERNAL PHOTOS

External Photo

External Photo



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External Photo

External Photo

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External Photo

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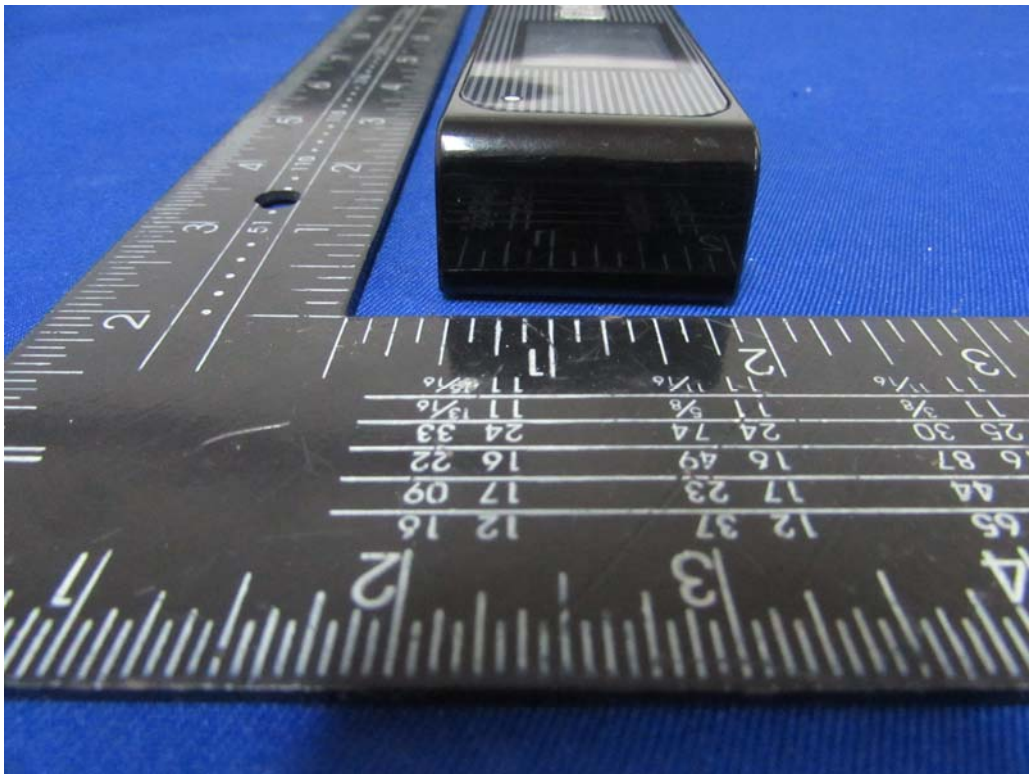

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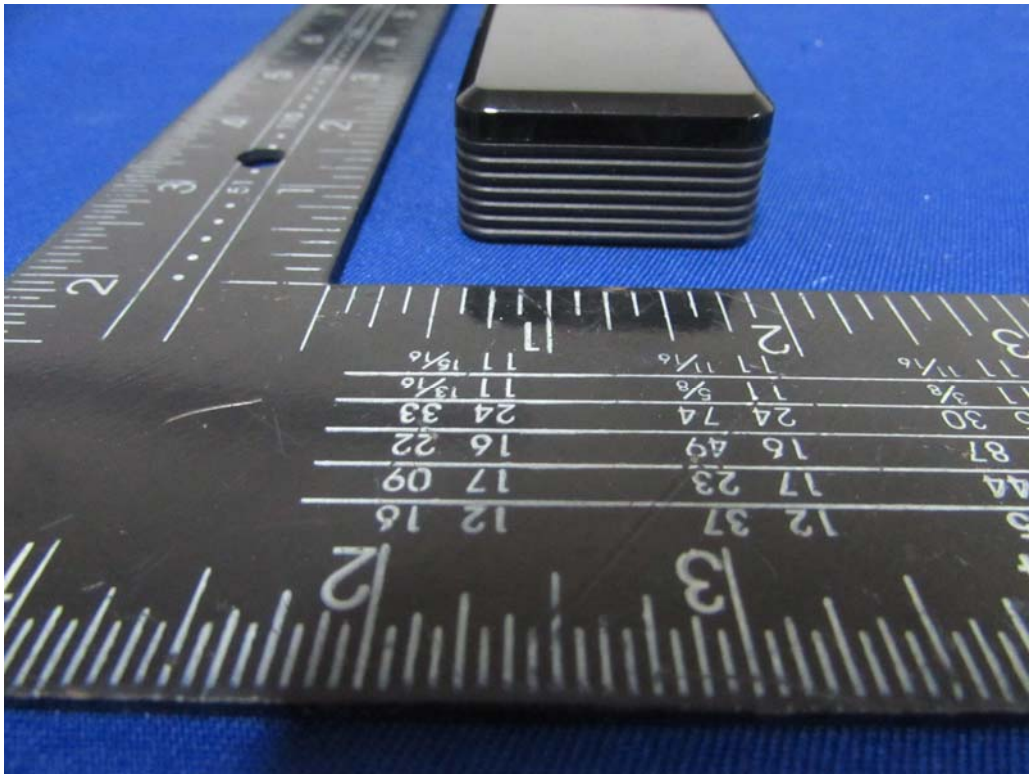

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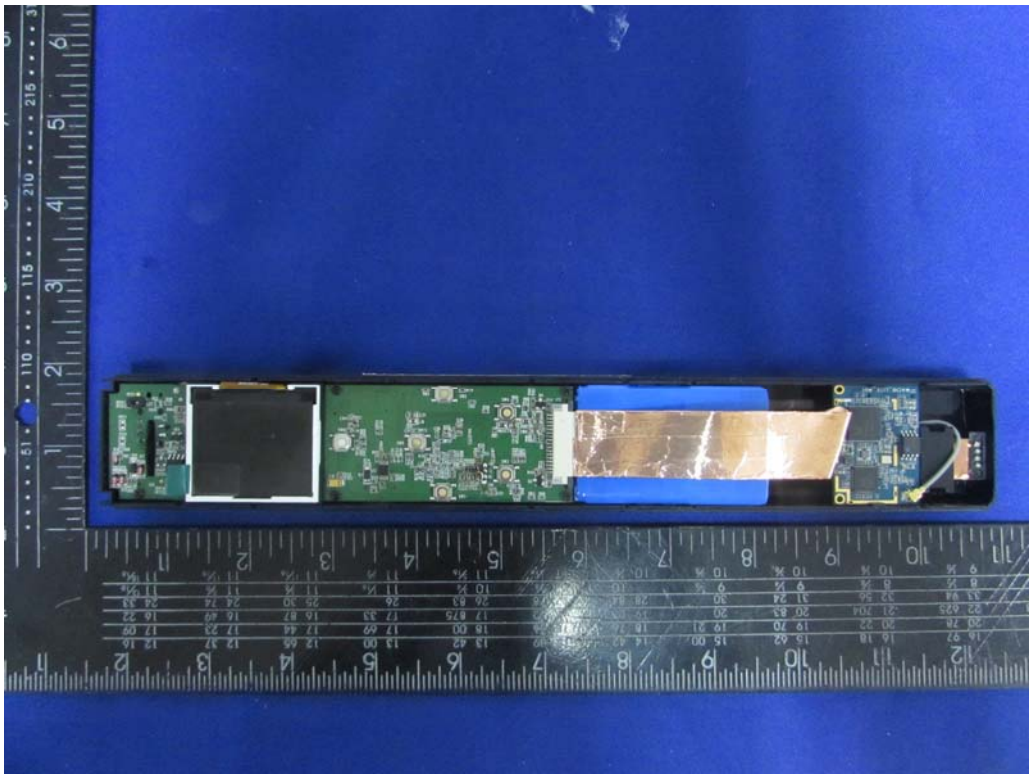
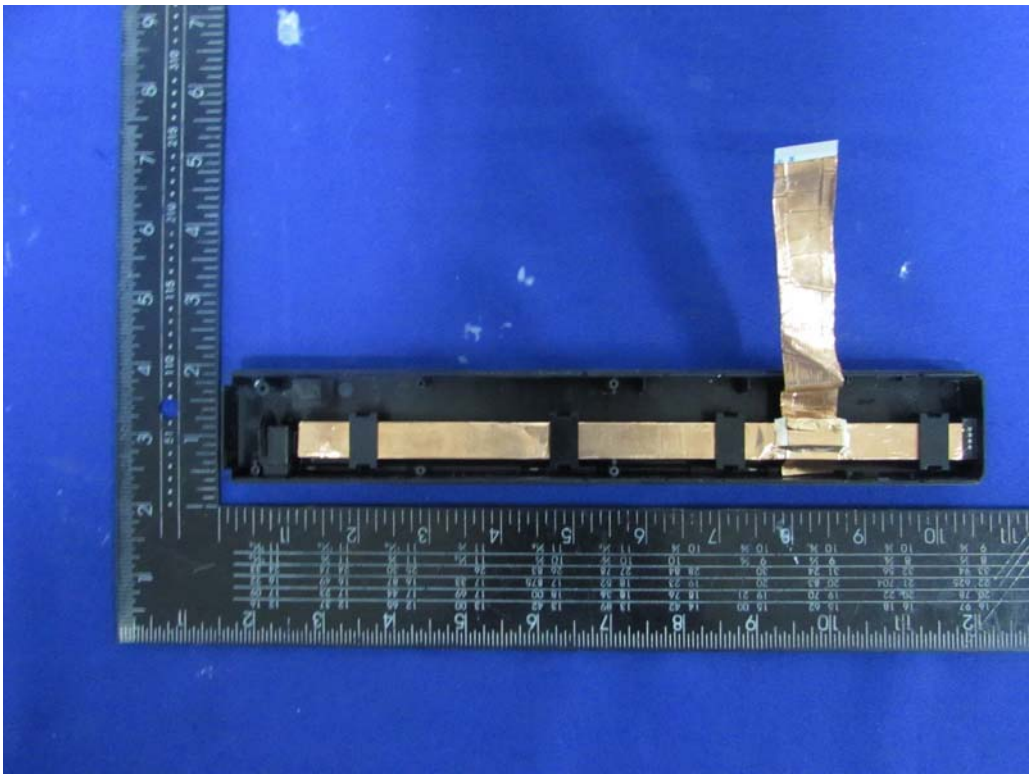
20.2 INTERNAL PHOTOS

Internal Photo



Internal Photo



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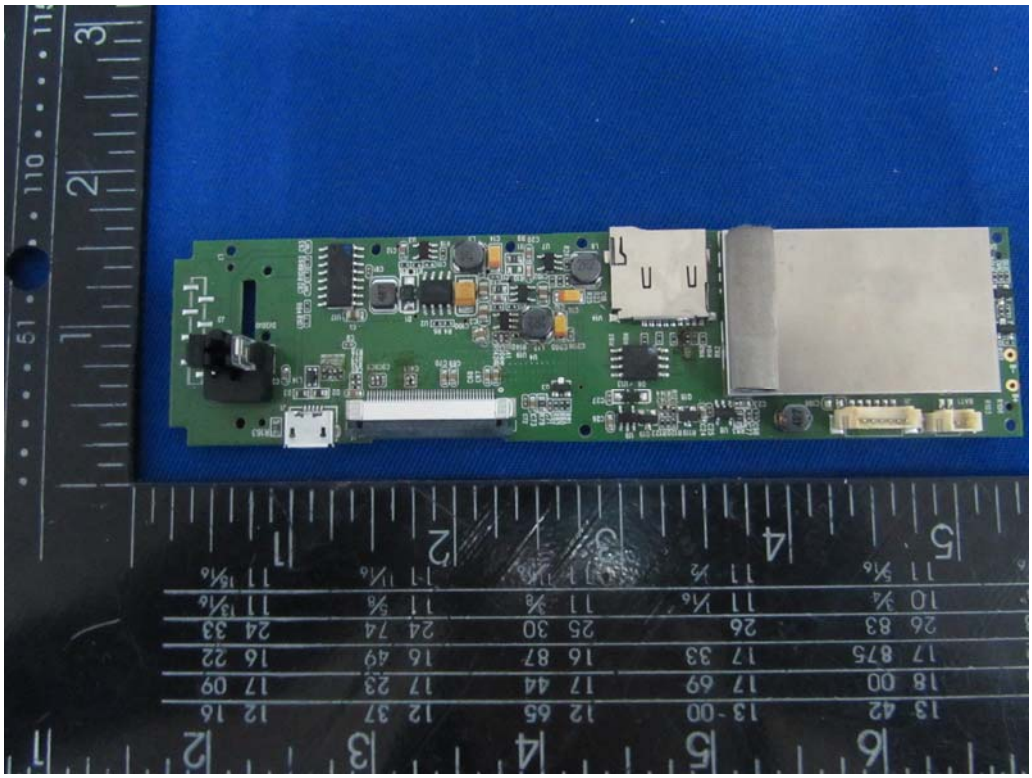
Internal Photo



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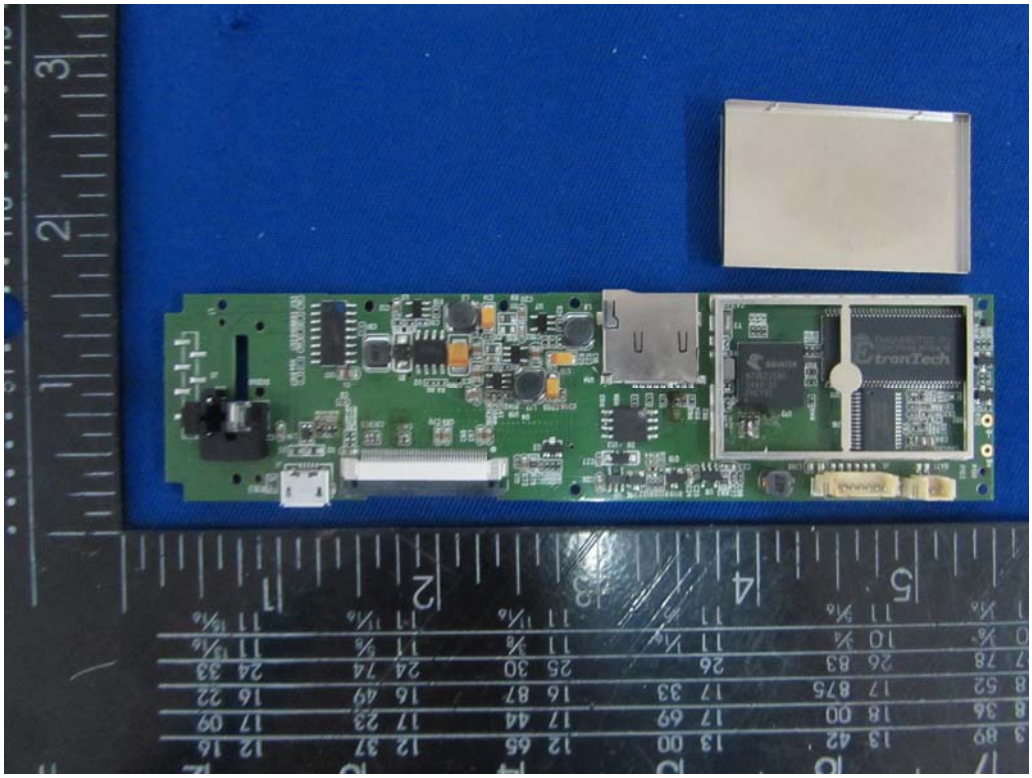

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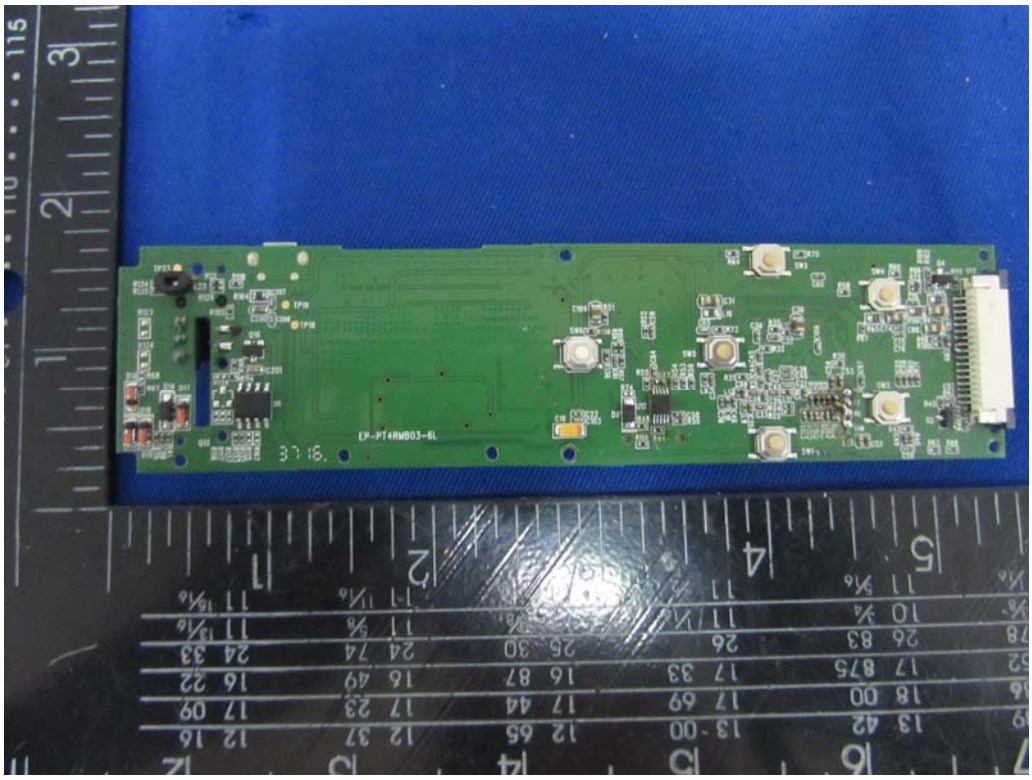

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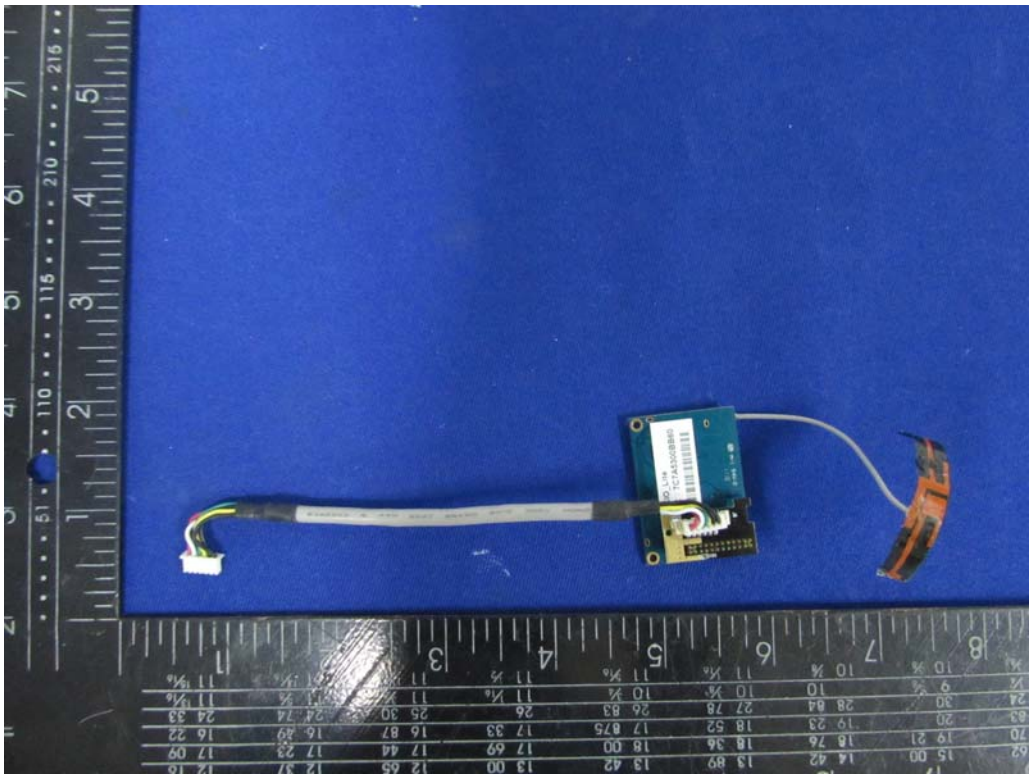

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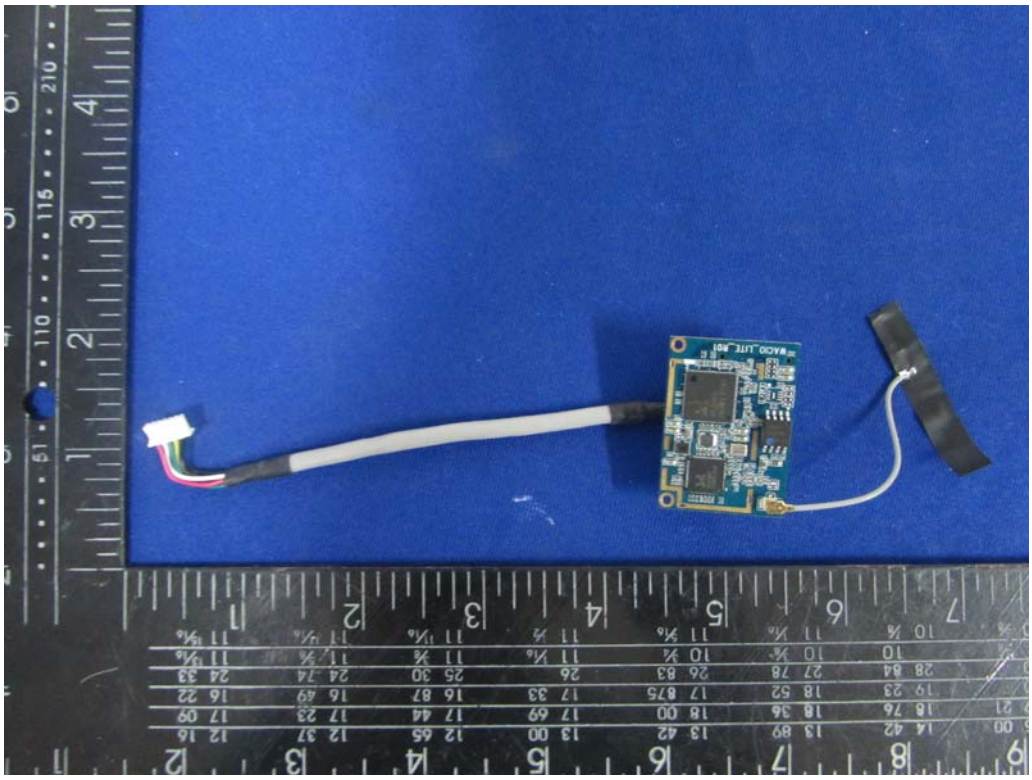
Internal Photo



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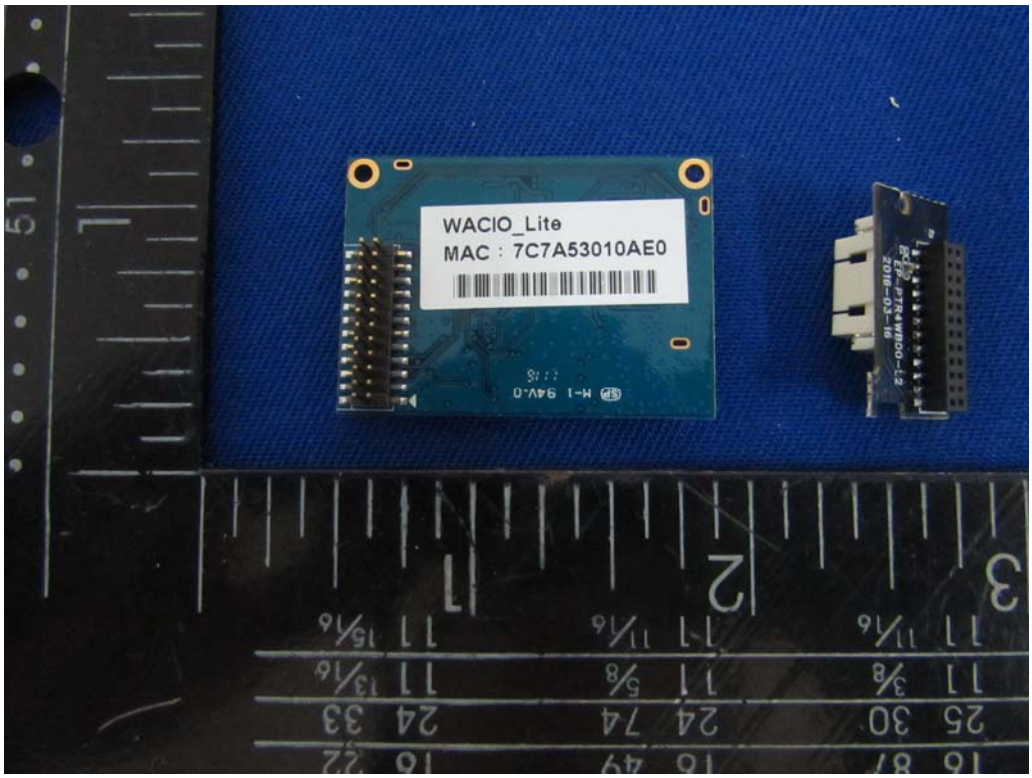

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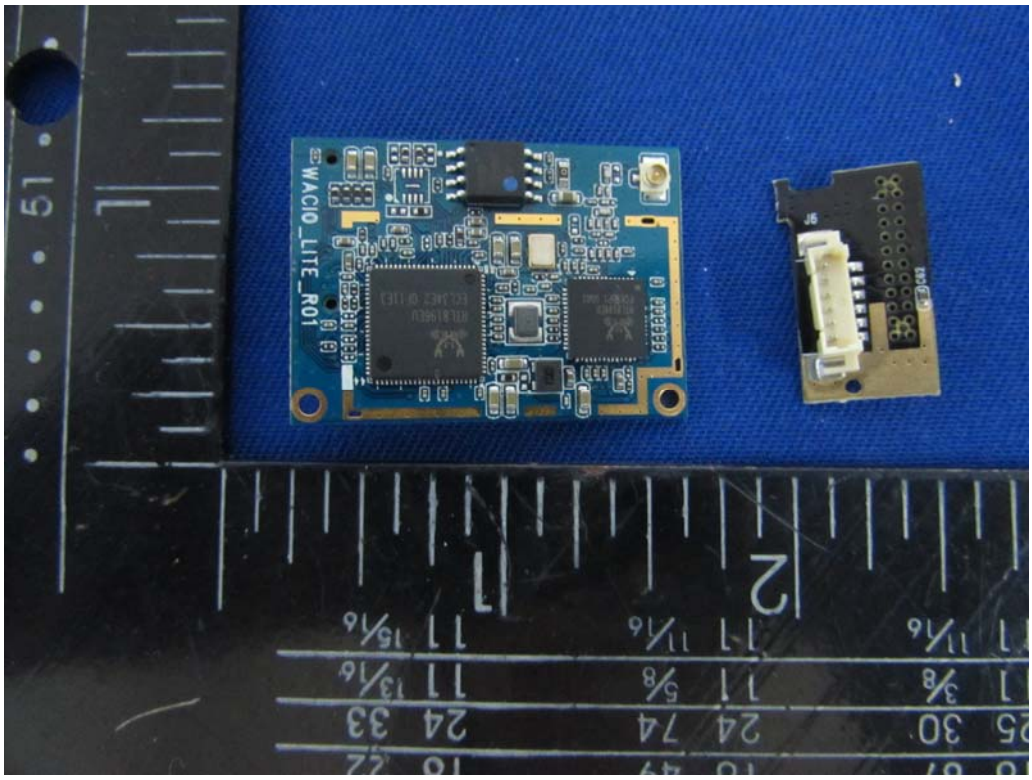
Internal Photo



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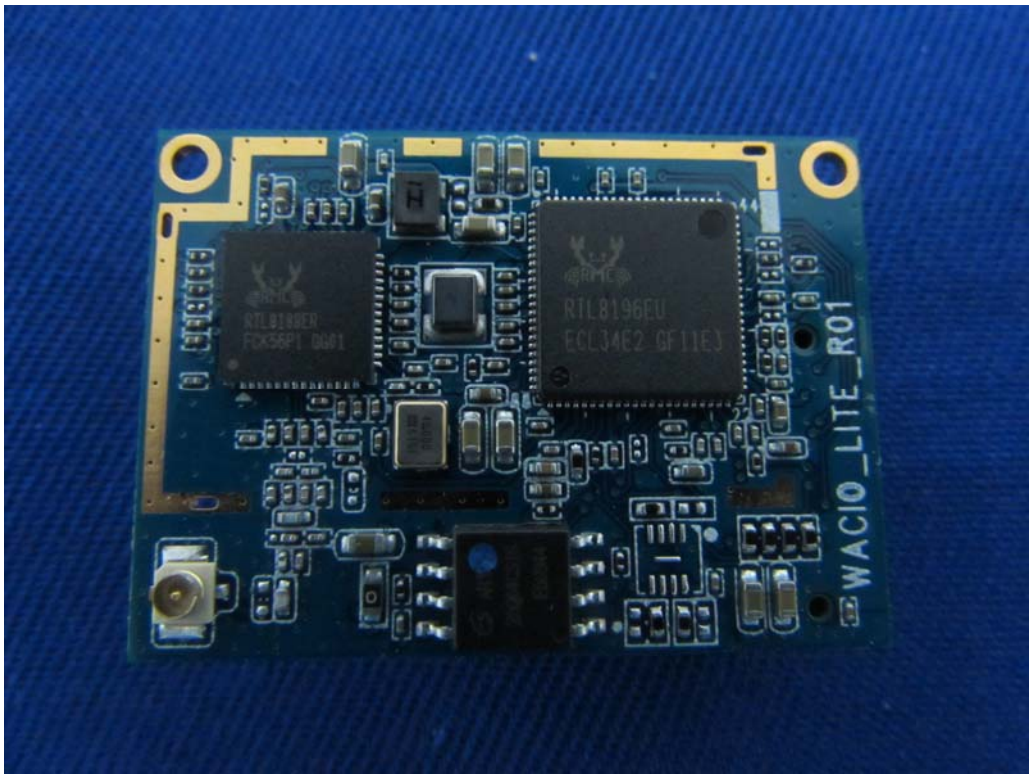

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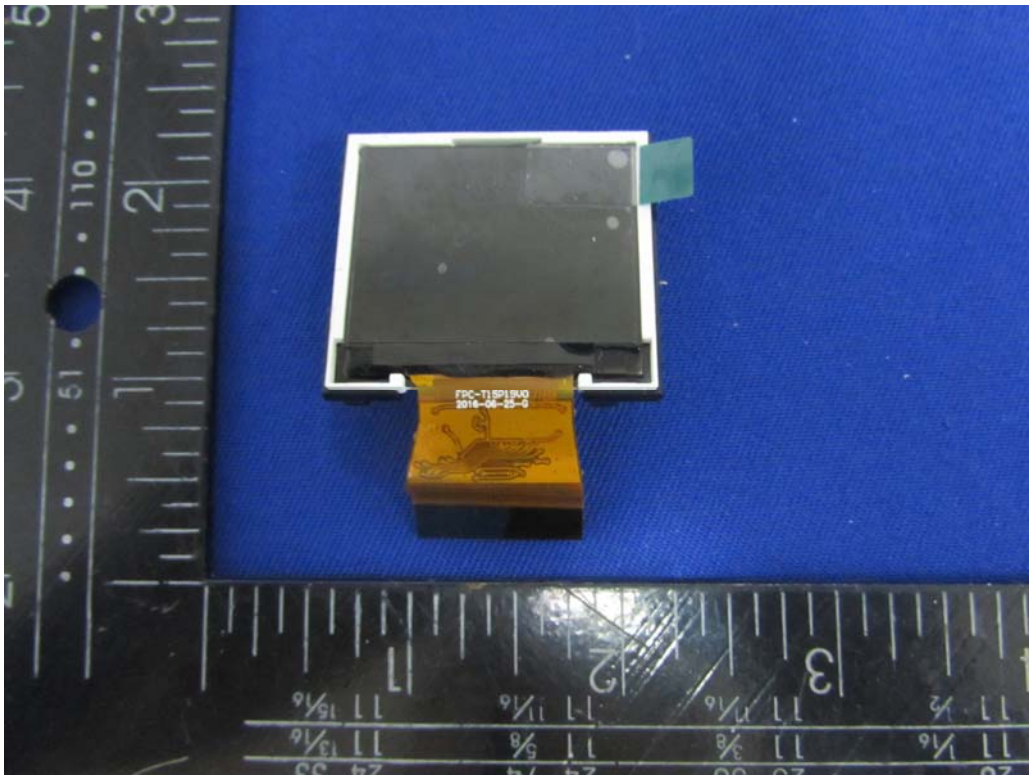

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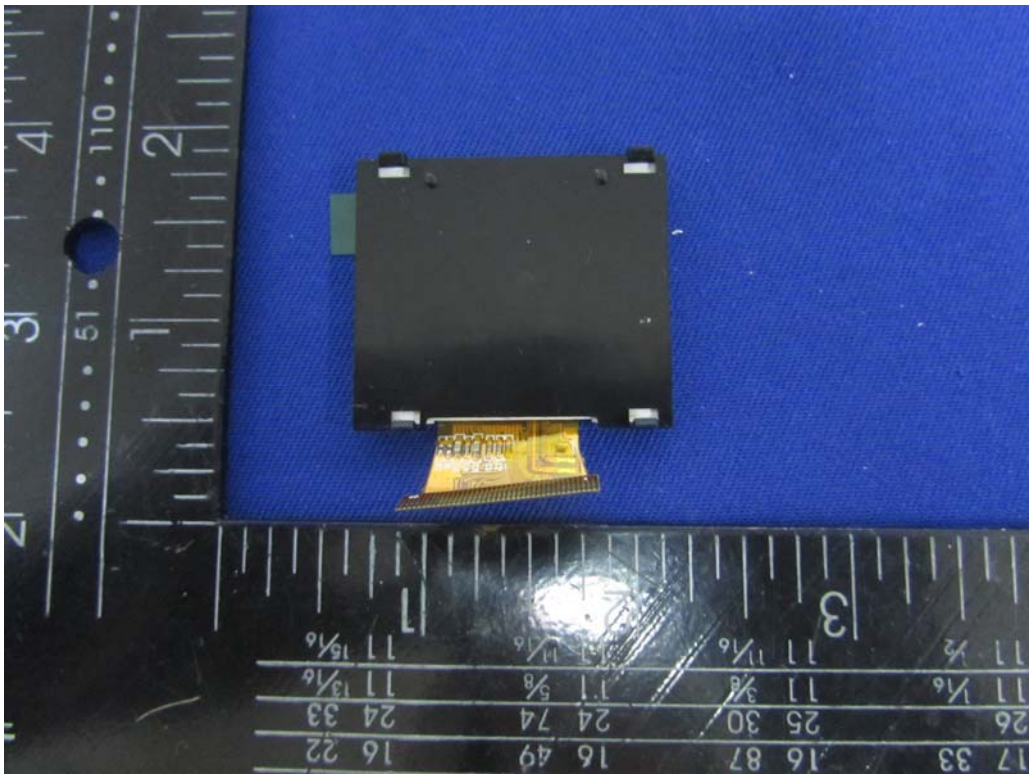

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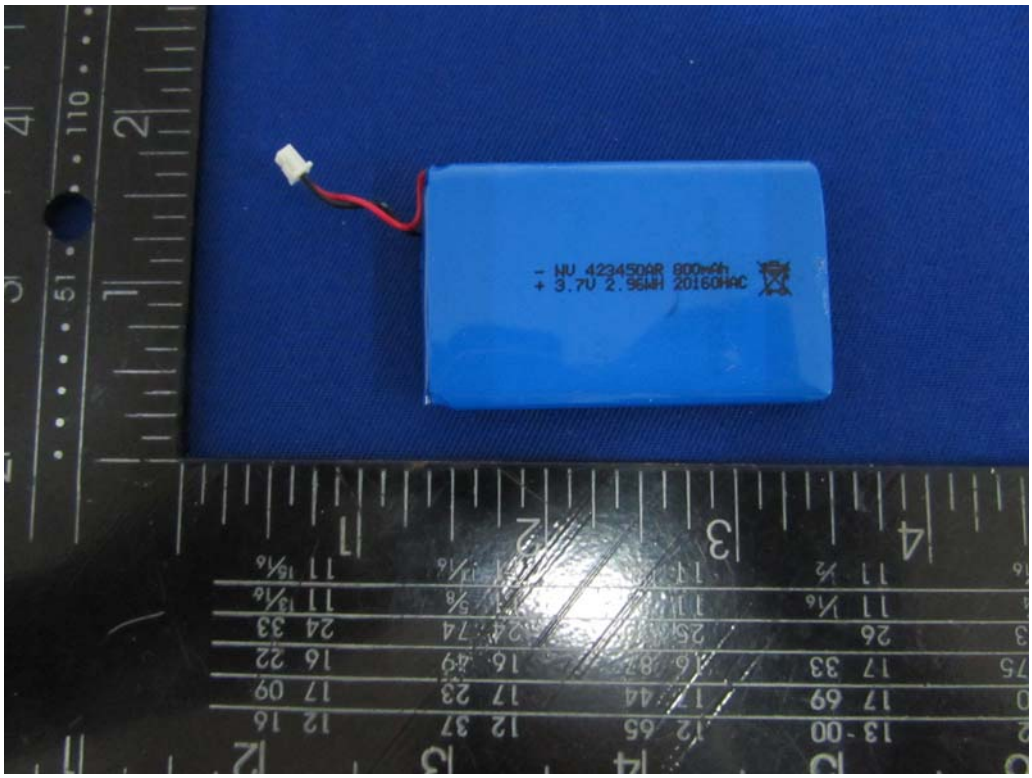
Internal Photo



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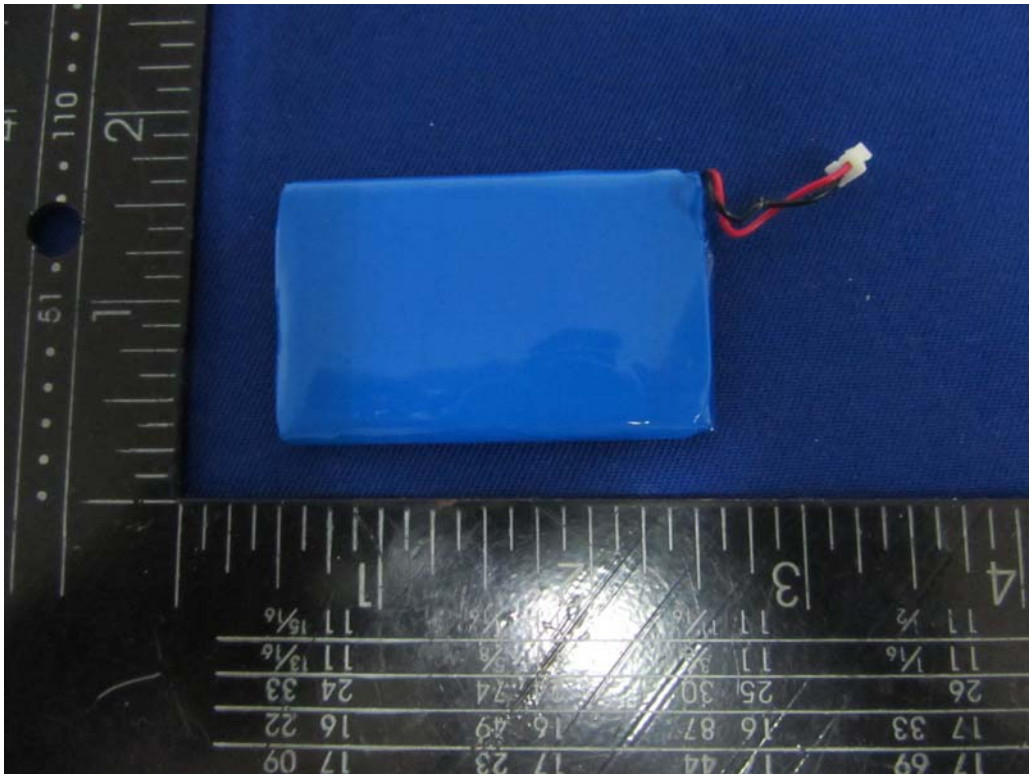

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EXHIBIT 5

APPENDIX

Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch
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APPENDIX 1 TEST RESULT ATTACHMENT

Test	Total Page(s)
Conducted Emission Test (Live Line)	1
-Graph and Table	
Conducted Emission Test (Neutral Line)	1
-Graph and Table	

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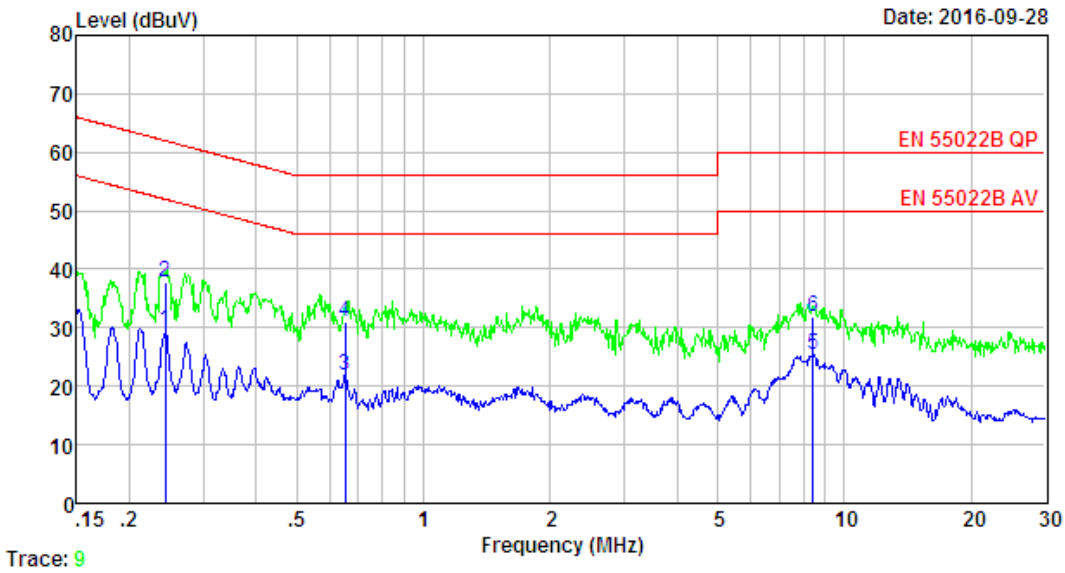
Worst Case Mode: WiFi Mode
AC mains 'Live'

Conducted Emission Test- EN55022



Result Table

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuv)	Limits (dBuv)	Margin (dB)	Remark
1	0.24	9.61	9.82	10.15	29.58	52.00	22.42	Average
2	0.24	9.61	9.82	18.24	37.67	62.00	24.33	QP
3	0.65	9.59	9.81	2.35	21.75	46.00	24.25	Average
4	0.65	9.59	9.81	11.48	30.88	56.00	25.12	QP
5	8.41	9.66	9.86	6.00	25.52	50.00	24.48	Average
6	8.41	9.66	9.86	12.33	31.85	60.00	28.15	QP

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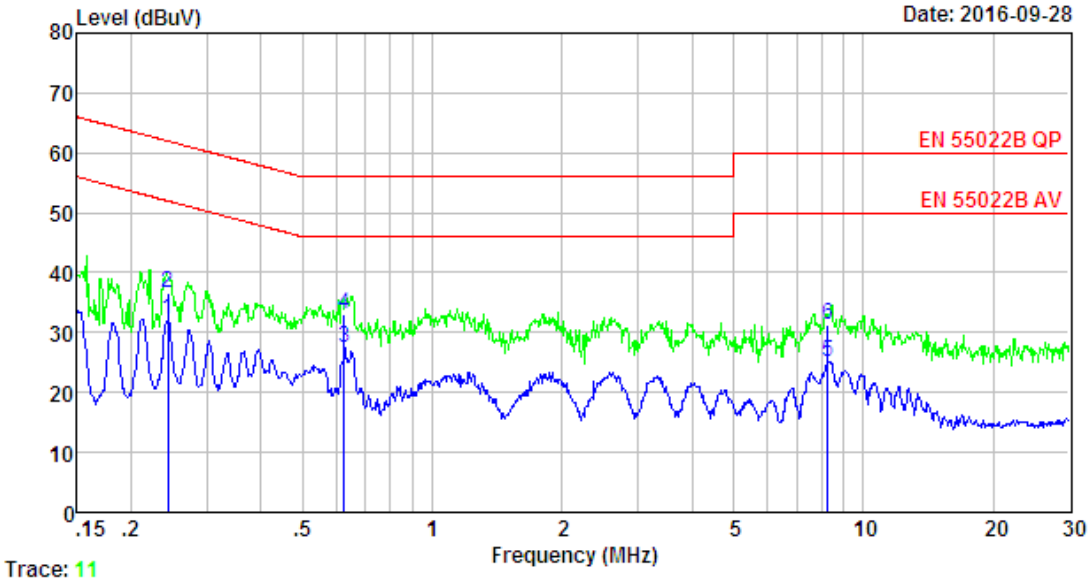
Worst Case Mode: WiFi Mode
AC mains 'Neutral'

Conducted Emission Test- EN55022



Result Table

	Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuv)	Limits (dBuv)	Margin (dB)	Remark
1	0.24	9.61	9.82	12.68	32.11	52.00	19.89	Average
2	0.24	9.61	9.82	17.25	36.68	62.00	25.32	QP
3	0.62	9.60	9.81	7.95	27.36	46.00	18.64	Average
4	0.62	9.60	9.81	13.68	33.09	56.00	22.91	QP
5	8.28	9.66	9.87	5.48	25.01	50.00	24.99	Average
6	8.28	9.66	9.87	11.64	31.17	60.00	28.83	QP

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