Radio Equipment Directive-Radio
For
High-Flying Electronics Technology Co., Ltd.

HF-A21
Model No.: HF-A21

Prepared for	:	High-Flying Electronics Technology Co., Ltd.
Address	:	Room 1002, Building 1, No.3000, Longdong Avenue, Pudong New Area, Shanghai, 201203, China

Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
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Report Number	:	R011611207T
Date of Test	:	Nov. 04~ 29, 2016
Date of Report	:	Nov. 30, 2016

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TEST REPORT

Applicant	:	High-Flying Electronics Technology Co., Ltd.
Manufacturer	:	High-Flying Electronics Technology Co., Ltd.
EUT	:	HF-A21
Model No.	:	HF-A21
Serial No.	:	N.A.
Trade Mark	:	High-Flying
Rating	:	DC 3.3V, 400mA max

Measurement Procedure Used:

ETSI EN 300 328 V1.9.1 (2015-02)

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 300 328 requirements.

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

Date of Test : Nov. 04~ 29, 2016

Prepared by : (Tested Engineer / Baron Wen)

Reviewer : (Project Manager / Amy Ding)

Approved & Authorized Signer : (Manager / Tom Chen)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	HF-A21
Model Number	:	HF-A21
Test Power Supply	:	AC 230V, 50Hz for adapter
Frequency	:	2412 ~ 2472MHz (13 channels)
Antenna Gain	:	2 dBi
Applicant	:	High-Flying Electronics Technology Co., Ltd.
Address	:	Room 1002, Building 1, No.3000, Longdong Avenue, Pudong New Area, Shanghai, 201203, China
Manufacturer	:	High-Flying Electronics Technology Co., Ltd.
Address	:	Room 1002, Building 1, No.3000, Longdong Avenue, Pudong New Area, Shanghai, 201203, China
Factory	:	High-Flying Electronics Technology Co., Ltd.
Address	:	Room 1002, Building 1, No.3000, Longdong Avenue, Pudong New Area, Shanghai, 201203, China
Date of receipt	:	Nov. 04, 2016
Date of Test	:	Nov. 04~ 29, 2016

1.2. Auxiliary Equipment Used during Test

N.A

1.3. Description of Test Facility

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

FCC-Registration No.: 752021
Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed 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 752021, July 06, 2016.

IC-Registration No.: 8058A-1
Shenzhen Anbotek Compliance Laboratory Limited., EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A, Jun. 13, 2016.

Test Location
All Emissions tests were performed at
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

1.4. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1 dB (Horizontal) Ur = 4.3 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4dB

1.5. Test Standards

ETSI EN 300 328 V1.9.1 (2015-02) Electromagnetic compatibility and Radio spectrum Matters (ERM); wideband transmission systems; Data transmission equipment operating in the 2,4GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

2. MEASURING DEVICE AND TEST EQUIPMENT

Test equipments list of Shenzhen Anbotek Compliance Laboratory Limited.

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analysis	Agilent	E4407B	US39390582	Jul. 12, 2016	1 Year
2.	Preamplifier	Instruments corporation	EMC011830	980100	Jun. 17, 2016	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Jun. 17, 2016	1 Year
4.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	May 06, 2016	1 Year
5.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 06, 2016	1 Year
6.	Pre-amplifier	SONOMA	310N	186860	Jun. 17, 2016	1 Year
7.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
8	Power Sensor	Agilent	KFSW150502	15I00041SN045	Jun. 17, 2016	1 Year
9	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Jun. 17, 2016	1 Year
10	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Jun. 17, 2016	1 Year
11	Signal Generator	Agilent	E4421B	MY41000743	Jun. 17, 2016	1 Year
12	DC Power supply	IV	IV-8080	YQSB0096	Jun. 17, 2016	1 Year
13	TEMP&HUMI PROGRAMMABLE CHAMBER	Bell Group	BE-THK-150M8	SE-0137	Jun. 17, 2016	1 Year

3. Technical Test

3.1. Summary of Test Results

No Deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (only “Passed” if all single measurements are “Passed”)	Passed

3.2. Test Report

Test Report Reference

List of Measurements		
Description of Test	Reference: Clause No.	Result
RF Output Power	4.3.2.1	Complies
Power Spectral Density	4.3.2.2	Complies
Duty Cycle, TX-Sequence, TX-gap	4.3.2.3	N/A
Medium Utilisation	4.3.2.4	N/A
Adaptivity	4.3.2.5	Complies
Occupied Channel Bandwidth	4.3.2.6	Complies
Transmitter Unwanted Emissions in Out-Of-Band Domain	4.3.2.7	Complies
Transmitter Unwanted Emissions in the Spurious Domain	4.3.2.8	Complies
Receiver Spurious Emissions	4.3.2.9	Complies
Receiver Blocking	4.3.2.10	Complies

3.3. Description of Test Modes

The EUT has been tested under operating condition.
Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

IEEE802.11b: Channel 1(2412MHz), Channel 7(2442MHz) and Channel 13(2472MHz) with 1Mbps Worst data rate (worst case) are chosen for the final testing.
IEEE802.11g: Channel 1(2412MHz), Channel 7(2442MHz) and Channel 13(2472MHz) with 6Mbps data rate (the worst case) are chosen for the final testing.
IEEE802.11n(HT20): Channel 1(2412MHz), Channel 7(2442MHz) and Channel 13(2472MHz) with 54Mbps Worst data rate (worst case) are chosen for the final testing.
IEEE802.11n(HT40): Channe3(2422MHz), Channel 7(2442MHz) and Channel 11 (2462MHz) with 108Mbps data rate (the worst case) are chosen for the final testing.

4. RF Output Power

Applicable Standard

According to ETSI EN 300 328 §4.3.2.1, For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20dBm.
The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20dBm. See clause 5.3.1m). For non-adaptive equipemt 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 Procedure

The measurement shall be performed using normal operation of the equipment with modulation, using the test data sequence, applied. The test procedure shall be as follows:

Step 1:
Use a fast power sensor suitable for 2,4 GHz and capable of 1 MS/s.
Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples must represent the power of the signal.
- Measurement duration: For non-adaptive equipment: equal to the observation period defined in clauses 4.3.1.2.1 or 4.3.2.3.1. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.
NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:
• For conducted measurements on devices with one transmit chain:
- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data. Use these stored samples in all following steps.
• For conducted measurements on devices with multiple transmit chains:
- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.
- Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than half the time between two samples.
- 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.
Step 3:
• Find the start and stop times of each burst in the stored measurement samples.
NOTE 2: The start and stop times are defined as the points where the power is at least 20 dB below the RMS burst power calculated in step 4.

Step 4:
• Between the start and stop times of each individual burst calculate the RMS power over the burst. Save these burst values, as well as the start and stop times for each burst.

Step 5:
• The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.
• If applicable, add the additional beamforming gain "Y" in dB.

Step 6:
• Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
• If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.
• The RF Output Power (P) shall be calculated using the formula below:
P = A + G + Y
• This value, which shall comply with the limit given in clauses 4.3.1.1.2 or 4.3.2.1.2, shall be recorded in the test report.

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.9 kPa

Antenna Assembly Gain G:	2 dBi
P=A+G	

The range of temperature is tested according to the applicant's requirement.

Test Mode: IEEE 802.11 b

Test Conditions			Low Freq. (2412MHz)	Mid Freq. (2442MHz)	High Freq. (2472MHz)
Tmin(-10)℃	Vmin(207V)	Measured Power	10.85	11.23	11.57
		EIRP	12.85	13.23	13.57
	Vmax(253V)	Measured Power	11.14	11.66	11.80
		EIRP	13.14	13.66	13.80
Tnom(+25)℃	Vnom(230V)	Measured Power	10.65	11.52	11.31
		EIRP	12.65	13.52	13.31
Tmax(+55)℃	Vmin(207V)	Measured Power	10.09	11.01	11.81
		EIRP	12.09	13.01	13.81
	Vmax(253V)	Measured Power	10.99	11.63	11.04
		EIRP	12.99	13.63	13.04
Limit		Average Limit = 20 dBm			

Test Mode: IEEE 802.11g

Test Conditions			Low Freq. (2412MHz)	Mid Freq. (2442MHz)	High Freq. (2472MHz)
Tmin(-10)℃	Vmin(207V)	Measured Power	16.87	17.28	17.35
		EIRP	18.87	19.28	19.35
	Vmax(253V)	Measured Power	16.94	17.29	17.07
		EIRP	18.94	19.29	19.07
Tnom(+25)℃	Vnom(230V)	Measured Power	16.62	16.56	16.80
		EIRP	18.62	18.56	18.80
Tmax(+55)℃	Vmin(207V)	Measured Power	16.95	17.05	17.84
		EIRP	18.95	19.05	**19.84**
	Vmax(253V)	Measured Power	16.81	17.00	17.48
		EIRP	18.81	19.00	19.48
Limit		Average Limit = 20 dBm			

Test Mode: IEEE 802.11 n(HT20)

Test Conditions			Low Freq. (2412MHz)	Mid Freq. (2442MHz)	High Freq. (2472MHz)
Tmin(-10)℃	Vmin(207V)	Measured Power	15.74	15.55	15.96
		EIRP	17.74	17.55	17.96
	Vmax(253V)	Measured Power	15.28	16.22	15.20
		EIRP	17.28	18.22	17.20
Tnom(+25)℃	Vnom(230V)	Measured Power	16.12	15.38	16.06
		EIRP	18.12	17.38	18.06
Tmax(+55)℃	Vmin(207V)	Measured Power	16.32	15.09	15.95
		EIRP	18.32	17.09	17.95
	Vmax(253V)	Measured Power	16.43	15.49	16.54
		EIRP	18.43	17.49	18.54
Limit		Average Limit = 20 dBm			

Test Mode: IEEE 802.11n (HT40)

Test Conditions			Low Freq. (2422MHz)	Mid Freq. (2442MHz)	High Freq. (2462MHz)
Tmin(-10)℃	Vmin(207V)	Measured Power	14.56	14.89	15.02
		EIRP	16.56	16.89	17.02
	Vmax(253V)	Measured Power	14.57	15.11	15.07
		EIRP	16.57	17.11	17.07
Tnom(+25)℃	Vnom(230V)	Measured Power	14.30	14.81	14.83
		EIRP	16.30	16.81	16.83
Tmax(+55)℃	Vmin(207V)	Measured Power	14.09	14.92	14.73
		EIRP	16.09	16.92	16.73
	Vmax(253V)	Measured Power	14.62	14.82	14.82
		EIRP	16.62	16.82	16.82
Limit		Average Limit = 20 dBm			

5. Power Spectral Density

Applicable Standard

According to ETSI EN **300 328** §4.3.2.2, for wide band modulations other then FHSS (e.g. DSSS, OFDM, etc.), the maximum power spectrum density is limited to 10 mW per MHz.

Test Procedure

Step 1
the measurement setup shall be calibrated with a CW signal from a calibrated source; the reference signal should have a strength of 10 dBm;
the settings of the spectrum analyzer shall be:
center frequency : equal to the signal source;
resolution BW: 100kHz for FHSS, 1 MHz for DSSS;
video BW: Same;
detector mode: positive peak;
averaging: off;
span: zero Hz;
amplitude: adjust for middle of the instrument's range.

Step 2
the calibrating signal power shall be reduced to 0 dBm and it shall be verified that the power meter reading also reduces by 10 dB.

Step 3
connect the equipment to be measured. Using the following settings of the spectrum analyzer in combination with "max hold" function, find the frequency of highest power output in the power envelope;
center Frequency: equal to operating frequency;
resolution BW: 100kHz for FHSS, 1 MHz for DSSS;
video BW: same;
detector mode: positive peak;
averaging: off;
Span: 3 times the spectrum width;
Amplitude: adjust for middle of the instrument's range.
the frequency found shall be recorded in the test report.

Step 4
set the center frequency of the spectrum analyzer to the found frequency and switch to zero span. The power meter indicates the measured power density. The power density e.i.r.p. is calculated from the measured power density and the declared antenna assembly gain(s).

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53 %
ATM Pressure:	100.9 kPa

Test Mode: Transmitting
Test Result: PASS
Test dates see the following pages

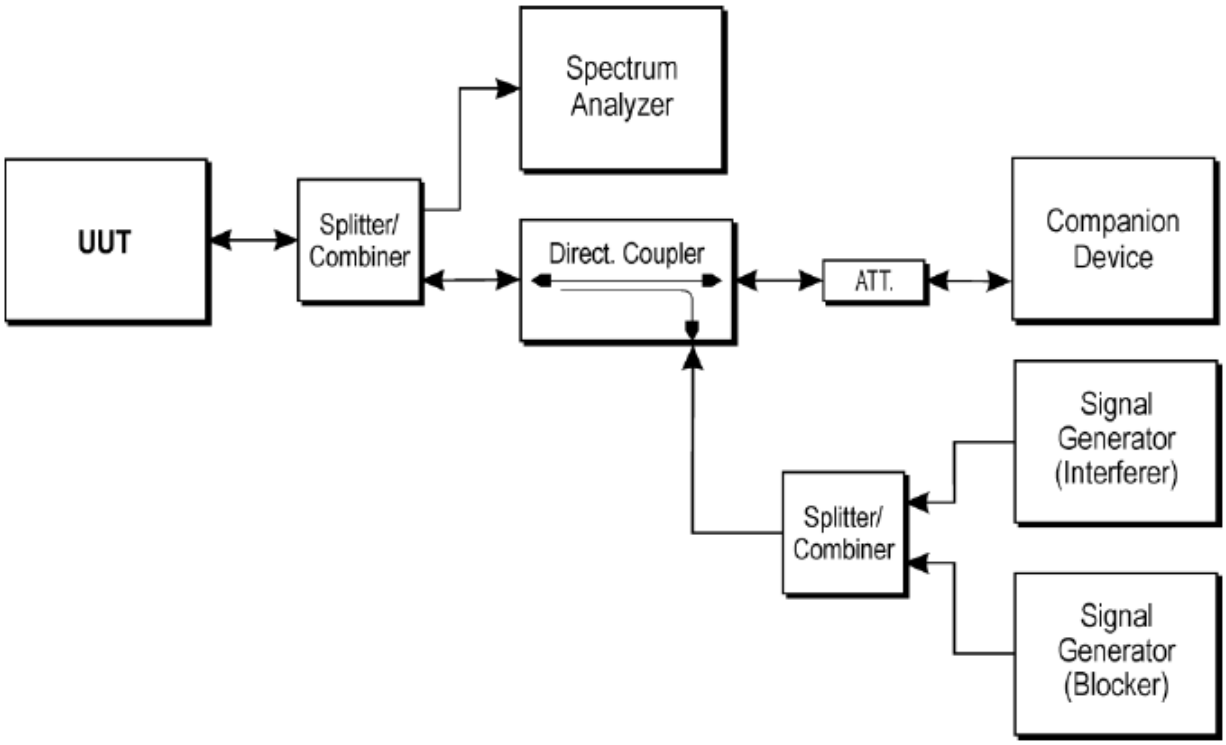
Test mode	Transmitting frequency	Measured (dBm/ MHz)	Limit (dBm/ MHz)	Test Result
802.11b	2412	0.327	10	Pass
	2442	1.428	10	Pass
	2472	0.304	10	Pass
802.11g	2412	1.153	10	Pass
	2442	2.070	10	Pass
	2472	2.136	10	Pass
802.11n(HT20)	2412	2.942	10	Pass
	2442	2.883	10	Pass
	2472	3.791	10	Pass
802.11n(HT40)	2422	0.800	10	Pass
	2442	1.224	10	Pass
	2462	0.935	10	Pass

6. Adaptivity

Applicable Standard

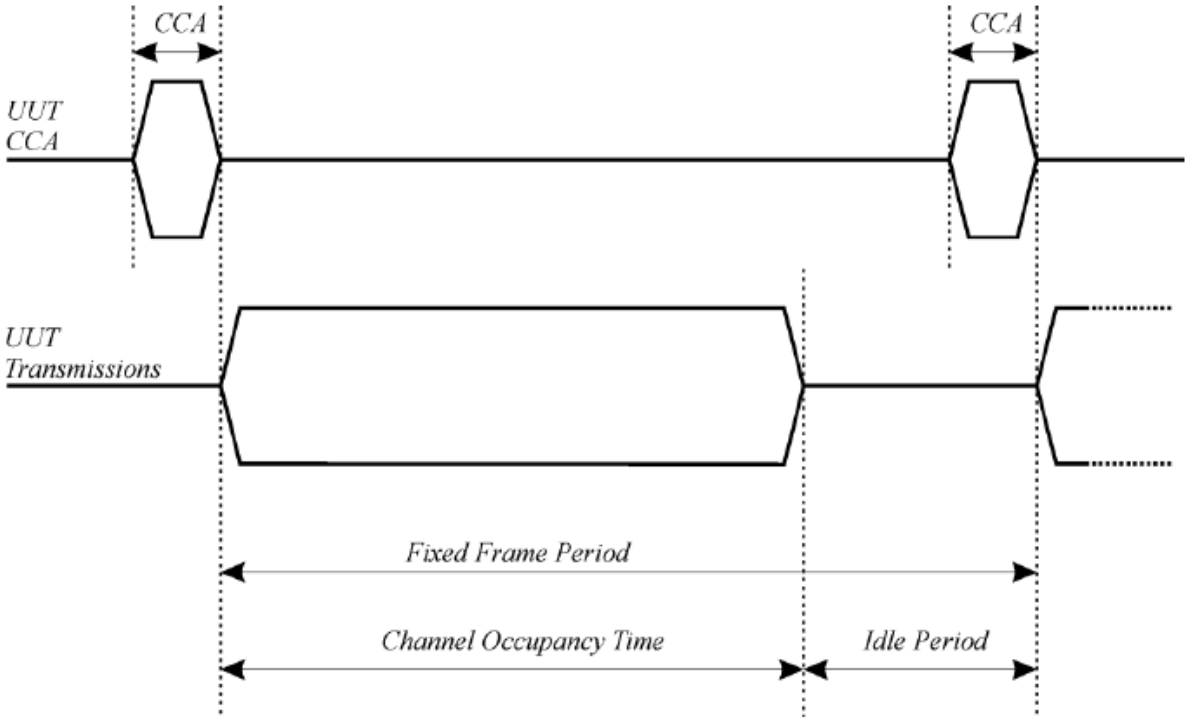
This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode providing the equipment complies with the requirements and/or restrictions applicable to non-adaptive equipment.
In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.
Adaptive equipment using modulations other than FHSS is allowed to operate in a non-adaptive mode providing it complies with the requirements applicable to non-adaptive equipment.
An adaptive equipment using modulations other than FHSS is equipment that uses a mechanism by which it can adapt to its environment by identifying other transmissions present within its Occupied Channel Bandwidth.
Adaptive equipment using modulations other than FHSS shall implement either of the Detect and Avoid mechanisms provided in clauses 4.3.2.5.1 or 4.3.2.5.2. Adaptive systems are allowed to switch dynamically between different adaptive modes.

Test Setup



Test Procedure

1) Before transmission, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The equipment shall observe the operating channel for the duration of the CCA observation time which shall be not less than 20 µs. The channel shall be considered occupied if the energy level in the channel exceeds the threshold given in step 5) below. If the equipment finds the channel to be clear, it may transmit immediately.
The CCA time used by the equipment shall be declared by the supplier.



2) If the equipment finds the channel occupied, it shall not transmit on this channel during the next Fixed Frame Period. NOTE 1: The equipment is allowed to switch to a non-adaptive mode and to continue transmissions on this channel providing it complies with the requirements applicable to non-adaptive systems. See clause 4.3.2.5. Alternatively, the equipment is also allowed to continue transmissions on this channel providing it complies with the requirements 4.3.2.5.3.

3) The total time during which an equipment has transmissions on a given channel without re-evaluating the availability of that channel, is defined as the Channel Occupancy Time.
The Channel Occupancy Time shall be in the range 1 ms to 10 ms followed by an Idle Period of at least 5 % of the Channel Occupancy Time used in the equipment for the current Fixed Frame Period.

4) An equipment, upon correct reception of a packet which was intended for this equipment can skip CCA and immediately (see note 2) proceed with the transmission of management and control frames (e.g. ACK and Block ACK frames are allowed but data frames are not allowed). A consecutive sequence of such transmissions by the equipment without a new CCA shall not exceed the maximum Channel Occupancy Time.
NOTE 2: For the purpose of multi-cast, the ACK transmissions (associated with the same data packet) of the individual devices are allowed to take place in a sequence.

5) 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 lower 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 - Pout e.i.r.p. (Pout in dBm).

If implemented, Short Control Signaling Transmissions of adaptive equipment using wide band modulations other than FHSS shall have a maximum duty cycle of 10% within an observation period of 50ms.

Test Results

Test Item	Limit	Measured Value	Result
Clear Channel Assessment(CCA)	20us	51us	PASS
Channel Occupancy Time (COT)	1ms~ 10ms	4.8ms	PASS
Idle Period	＞5%* COT	660us	PASS
No Transmission on “unavailable” Channels	Yes	Yes	PASS
Detection Threshold Level(TL)	-70dBm/MHz	-78.01dBm/MHz	PASS
Short Control Signaling Transmission	10%	1.3%	PASS

7. Occupied Channel Bandwidth

Definition and Requirement

The Occupied Channel Bandwidth shall fall completely within the band given in clause 1. In addition, for non-adaptive system 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.

Test Result

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53 %
ATM Pressure:	100.9 kPa

Test Mode: Transmitting
Test Result: PASS
Test dates see the following pages

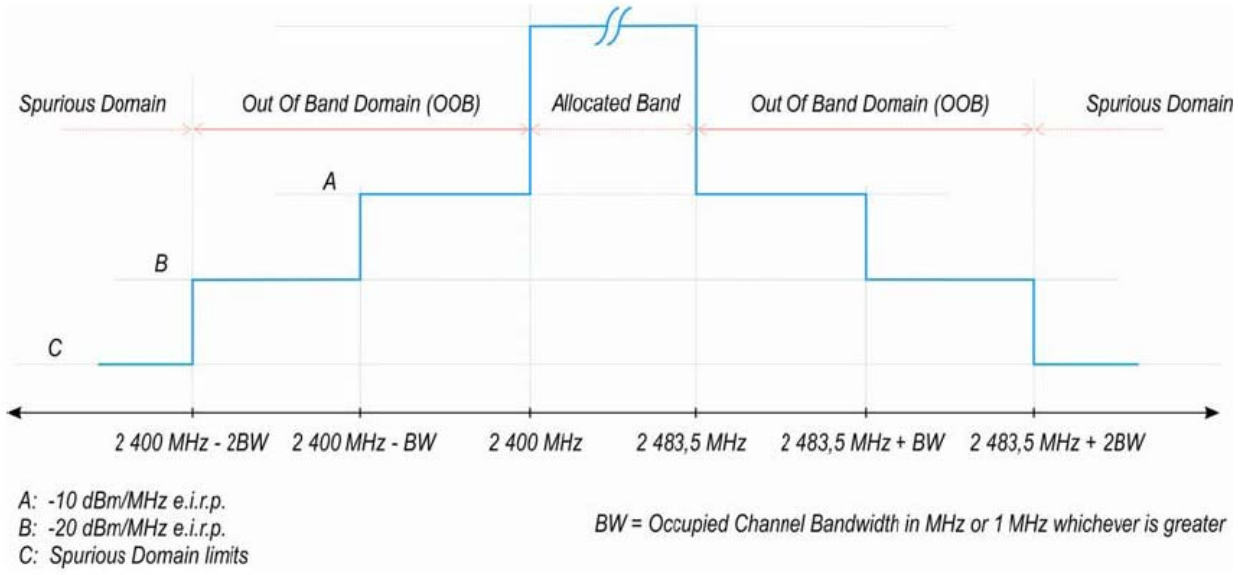
Test mode	Transmitting frequency	Measured (MHz)	Test Result
802.11b	2412	14.024	Pass
	2442	14.240	Pass
	2472	14.189	Pass
802.11g	2412	16.508	Pass
	2442	17.075	Pass
	2472	16.508	Pass
802.11n(HT20)	2412	17.495	Pass
	2442	17.613	Pass
	2472	17.618	Pass
802.11n(HT40)	2422	35.966	Pass
	2442	36.280	Pass
	2462	36.295	Pass

8. Transmitter Unwanted Emissions in the out-of-band Domain

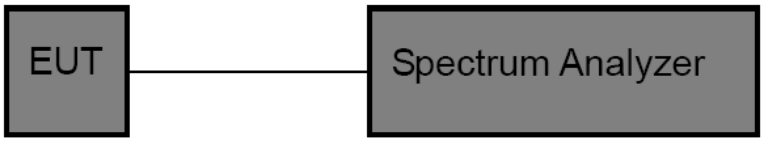
Test Limit

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 2400MHz to 2483.5MHz band, the Out-of band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.2.6.



Test Setup



Test Procedure

Step 1:
The transmitter output was connected to the spectrum analyzer.
Set the spectrum analyzer as following:
-Centre Frequency: 2484 MHz.
-Span: 0 Hz
-Resolution BW : 1 MHz
-Filter mode: Channel filter
-Video BW : 3 MHz
-Detector Mode: RMS
-Trace Mode : Clear / Write

-Sweep Mode: Continuous
-Sweep Points : 5000
-Trigger Mode: Video trigger
-Sweep Time: Suitable to capture one transmission burst

Step 2 (2483.5 MHz to 2483.5 MHz +BW):
Adjust trigger level to select the transmissions with the highest power level.
The highest power level shall be selected.
Set a window to match with the start and end of the burst and in which the RMS Power shall be measured using the Time Domain Power Function.
RMS Power within this 1 MHz segment (2483.5 MHz to 2484.5 MHz). Compare this value the applicable limit provided by the mask.
Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2483.5 MHz to 2483.5 MHz+BW. The centre frequency of the last 1 MHz segment within the range 2483.5 MHz to 2483.5 MHz +BW. The centre frequency of the last 1 MHz segment shall be set to 2483.5 MHz+BW-0.5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 3 (2483.5 MHz +BW to 2483.5 MHz +2BW):
Change the centre frequency of the analyzer to 2484MHz + BW and perform the measurement for the first 1MHz segment within range 2483.5MHz +BW to 2483.5 MHz +2BW. Increase the centre frequency in 1MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2483.5 MHz+ 2BW-0.5 MHz.

Step 4 (2400 MHz-BW to 2400 MHz):
Change the centre frequency of the analyzer to 2399.5MHz and perform the measurement for the first 1MHz segment within range 2400 MHz -BW to 2400 MHz Reduce the centre frequency in 1MHz steps and repeat the measurement to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2400 MHz -BW+ 0.5 MHz.

Step 5 (2400 MHz-BW to 2400 MHz):
Change the centre frequency of the analyzer to 2399.5MHz-BW and perform the measurement for the first 1MHz segment within range 2400 MHz -2BW to 2400 MHz –BW. Reduce the centre frequency in 1MHz steps and repeat the measurement to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2400 MHz -2BW+ 0.5 MHz.

Test Results

PASS. Please refer to the following data.

Test Item	:	Spurious Emissions	Test Mode	:	Transmitter Operating
Test Voltage	:	AC 230V, 50Hz for adapter	Temperature	:	25℃
Test Result	:	PASS	Humidity	:	54%RH

802.11b:

Frequency Band	Maximum Level	Limit	Result
[2483.5 MHz, 2483.5 MHz+ BW]	-22.40	-10 dBm/MHz	Pass
[2483.5 MHz+ BW, 2483.5 MHz+ 2BW]	-39.39	-20 dBm/MHz	Pass
[2400 MHz- BW, 2400 MHz]	-27.78	-10 dBm/MHz	Pass
[2400 MHz- 2BW, 2400 MHz- BW]	-35.99	-20 dBm/MHz	Pass

802.11g

[2483.5 MHz, 2483.5 MHz+ BW]	-32.78	-10 dBm/MHz	Pass
[2483.5 MHz+ BW, 2483.5 MHz+ 2BW]	-33.47	-20 dBm/MHz	Pass
[2400 MHz- BW, 2400 MHz]	-27.17	-10 dBm/MHz	Pass
[2400 MHz- 2BW, 2400 MHz- BW]	-35.48	-20 dBm/MHz	Pass

802.11n(HT20):

Frequency Band	Maximum Level	Limit	Result
[2483.5 MHz, 2483.5 MHz+ BW]	-26.79	-10 dBm/MHz	Pass
[2483.5 MHz+ BW, 2483.5 MHz+ 2BW]	-34.88	-20 dBm/MHz	Pass
[2400 MHz- BW, 2400 MHz]	-30.41	-10 dBm/MHz	Pass
[2400 MHz- 2BW, 2400 MHz- BW]	-39.01	-20 dBm/MHz	Pass

802.11n(HT40)

[2483.5 MHz, 2483.5 MHz+ BW]	-25.49	-10 dBm/MHz	Pass
[2483.5 MHz+ BW, 2483.5 MHz+ 2BW]	-38.40	-20 dBm/MHz	Pass
[2400 MHz- BW, 2400 MHz]	-24.45	-10 dBm/MHz	Pass
[2400 MHz- 2BW, 2400 MHz- BW]	-35.64	-20 dBm/MHz	Pass

9. Transmitter unwanted emissions in the spurious domain

Standard Application

According to ETSI EN 300 328 V1.9.1, spurious emissions are emissions outside the frequency range as defined in frequency range. The level of spurious emissions shall be measured as:

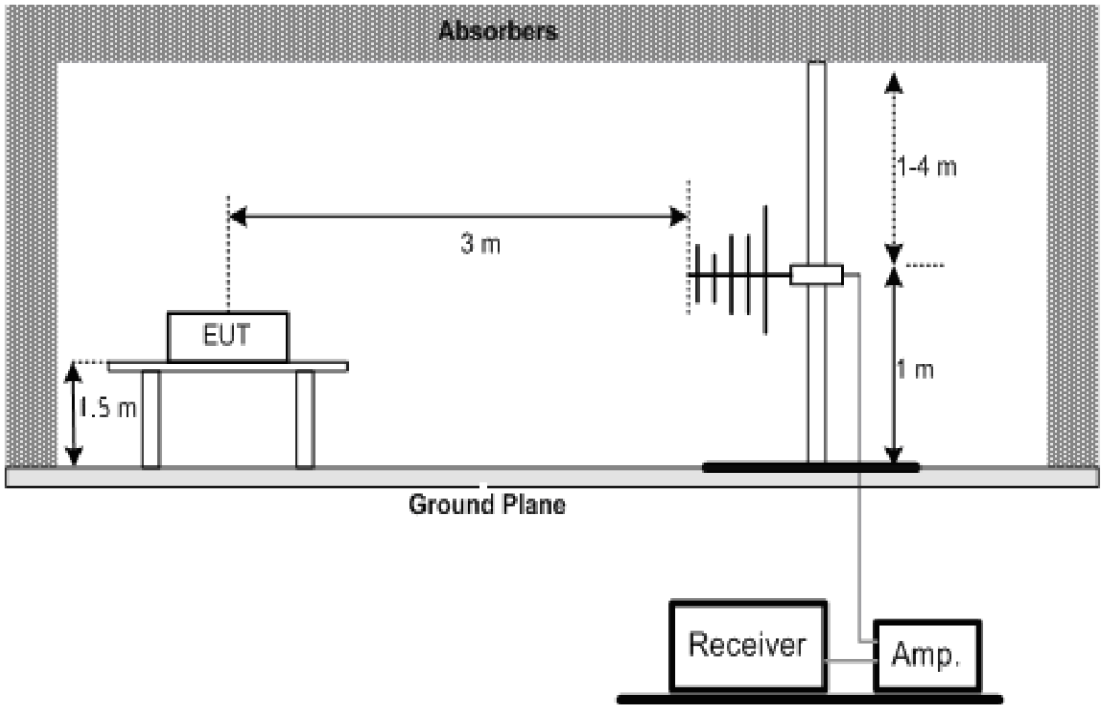
Either: a. Their power in a specified load (conducted spurious emissions);
and b. Their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation);
or c. Their effective radiated power when radiated by cabinet and antenna.

The spurious emissions of the transmitter shall not exceed the values in following tables

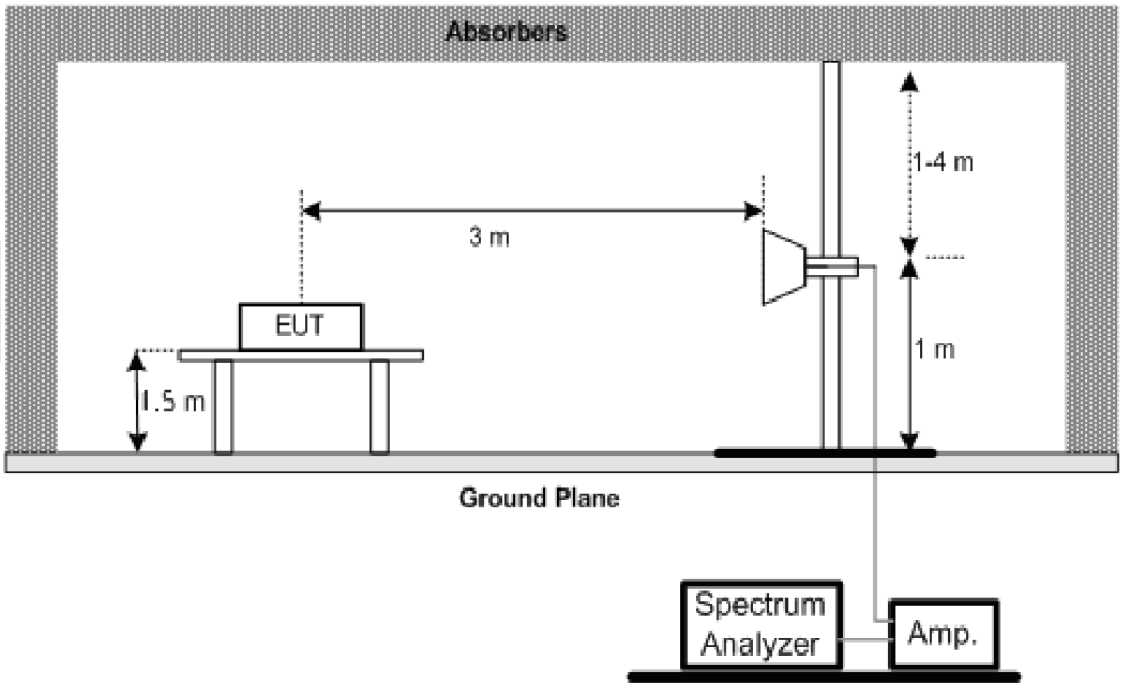
Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-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

Test Setup

(A) Radiated Emission Test Set-Up Frequency Bellow 1 GHz.



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz.



Test Procedure

The EUT was placed on the top of the turntable in chamber.
The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
Set the spectrum analyzer as follows to measure the emissions (Bellow 1 GHz):
-Resolution BW : 100 kHz.
-Resolution BW :300 kHz.
-Detector : RMS.
-Trace Mode : Max Hold.
-Sweep time : 1s.
-Span :100M.
-Amplitude :Adjust for middle of the instrument's range.

Set the spectrum analyzer as follows to measure the emissions (Above 1 GHz):
-Resolution BW : 1 MHz.
-Resolution BW :3 MHz.
-Detector : RMS.
-Trace Mode : Max Hold.
-Sweep time : 1s.
-Span :100M.
-Amplitude :Adjust for middle of the instrument's range.

For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable. .

The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).

Replace the EUT by standard antenna and feed the RF port by signal generator.
Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.

Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
The level of the spurious emission is the power level of (g) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.

If the measuring emissions that exceed the level of 6 dB below the applicable limit, the resolution bandwidth shall be switched to 30 kHz and the span shall be adjusted accordingly. If the level does not change by more than 2 dB, it is a narrowband emission; the observed value shall be recorded. If the level changes by more than 2 dB, the emission is a wideband emission and its level shall be measured and recorded.
The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

Test Results

PASS. Please refer to the following data.

Test Item	:	Spurious Emissions	Test Mode	:	Transmitter Operating
Test Voltage	:	AC 230V, 50Hz for adapter	Temperature	:	25℃
Test Result	:	PASS	Humidity	:	54%RH

Bellow 1GHz:

The worst case: 802.11b, 2412MHz

Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
138.892	V	TX	-60.02	-36.00	-24.02
673.746	V	TX	-65.84	-54.00	-11.84
---	V	TX	---	---	---
207.205	H	TX	-67.02	-54.00	-13.02
343.955	H	TX	-58.70	-36.00	-22.70
---	H	TX	---	---	---

The worst case: 802.11b, 2472MHz

Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
155.583	V	TX	-66.04	-36.00	-30.04
756.467	V	TX	-65.70	-54.00	-11.70
---	V	TX	---	---	---
162.831	H	TX	-65.79	-36.00	-29.79
773.294	H	TX	-68.06	-54.00	-14.06
---	H	TX	---	---	---

Above 1GHz:					
The worst case: 802.11b, 2412MHz					
Frequency	Ant	TX/RX	Measured	Limits	Margins
(MHz)	H / V		(dBm)	(dBm)	
4823.76	V	TX	-46.23	-30.00	-16.23
1505.15	V	TX	-49.76	-30.00	-19.76
---	V	TX	---	---	---
4823.62	H	TX	-44.44	-30.00	-14.44
1646.91	H	TX	-49.30	-30.00	-19.30
---	H	TX	---	---	---
The worst case: 802.11b, 2472MHz					
Frequency	Ant	TX/RX	Measured	Limits	Margins
(MHz)	H / V		(dBm)	(dBm)	
4945.70	V	TX	-39.32	-30.00	-9.32
1667.67	V	TX	-47.78	-30.00	-17.78
---	V	TX	---	---	---
4944.33	H	TX	-47.58	-30.00	-17.58
1734.69	H	TX	-44.98	-30.00	-14.98
---	H	TX	---	---	---

10. Receiver Spurious Emissions

Standard Application

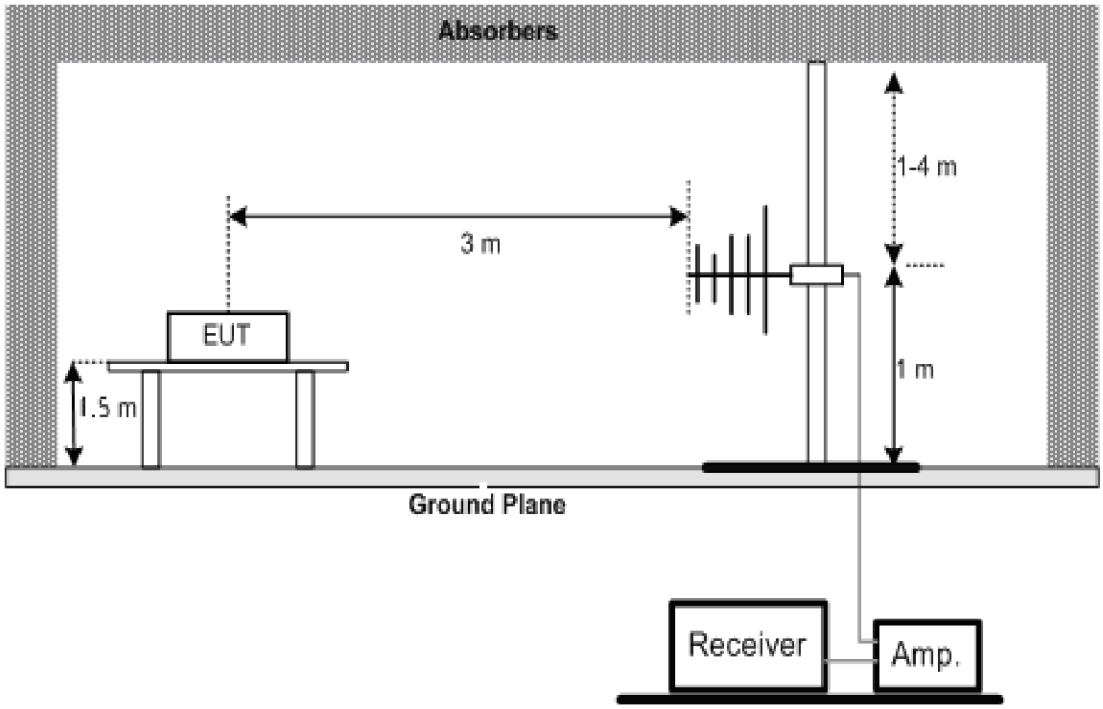
According to ETSI EN 300 328

The spurious emissions of the receiver shall not exceed the values in following tables

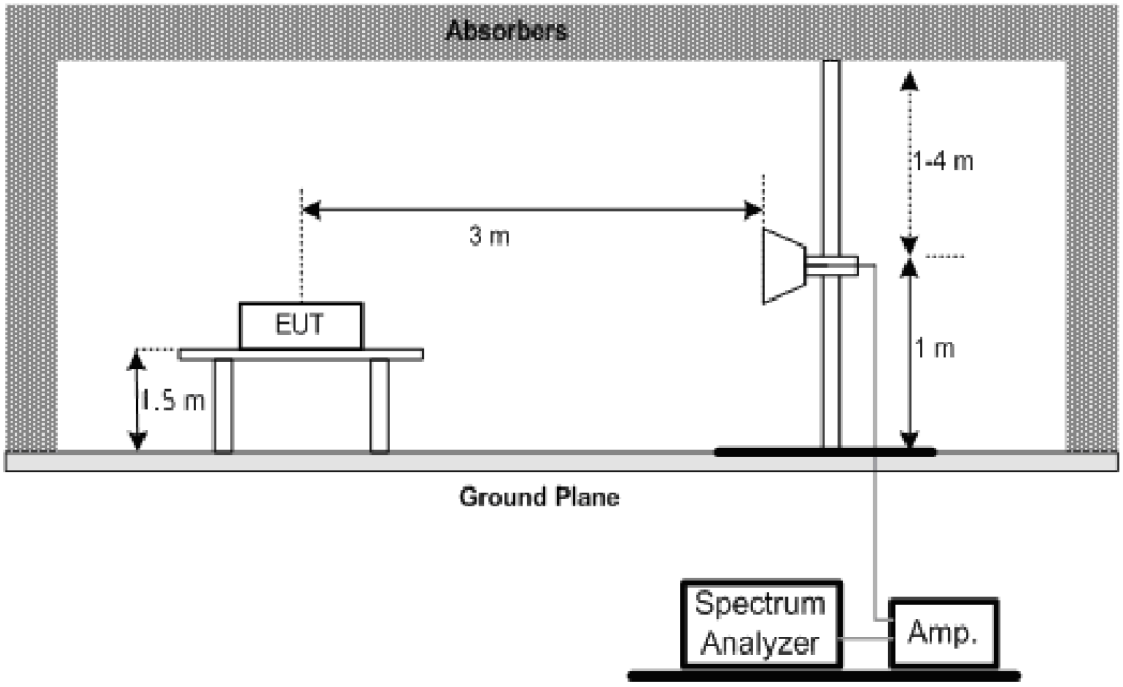
Frequency range	Maximum power, e.r.p.	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12.75 GHz	-47 dBm	1 MHz

Test Setup

(A) Radiated Emission Test Set-Up Frequency Bellow 1 GHz.



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz.



Test Procedure

The EUT was placed on the top of the turntable in chamber.
The test shall be made in the transmitting mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
Set the spectrum analyzer as follows to measure the emissions (Bellow 1 GHz):
-Resolution BW : 100 kHz.
-Resolution BW :300 kHz.
-Detector : RMS.
-Trace Mode : Max Hold.
-Sweep time : 1s.
-Span :100M.
-Amplitude :Adjust for middle of the instrument's range.

Set the spectrum analyzer as follows to measure the emissions (Above 1 GHz):
-Resolution BW : 1 MHz.
-Resolution BW :3 MHz.
-Detector : RMS.
-Trace Mode : Max Hold.
-Sweep time : 1s.
-Span :100M.

-Amplitude :Adjust for middle of the instrument's range.

For 30~1000MHz spurious emissions measurement, the broad band bi-log receiving antenna was placed 3 meters far away from the turntable. .

The broadband receiving antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization. Each recorded suspected value is indicated as Read Level (Raw).

Replace the EUT by standard antenna and feed the RF port by signal generator.
Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.

Adjust the power level of the signal generator to reach the same reading with Read Level (Raw). The level of the spurious emission is the power level of (g) plus the gain of the standard antenna in dBi and minus the loss of the cable used between the signal generator and the standard antenna.

If the measuring emissions that exceed the level of 6 dB below the applicable limit, the resolution bandwidth shall be switched to 30 kHz and the span shall be adjusted accordingly. If the level does not change by more than 2 dB, it is a narrowband emission; the observed value shall be recorded. If the level changes by more than 2 dB, the emission is a wideband emission and its level shall be measured and recorded.
The measurement shall be repeated at the lowest and the highest channel of the stated frequency range.

Test Results

PASS. Please refer to the following data.

Test Item	:	Spurious Emissions	Test Mode	:	RX
Test Voltage	:	AC 230V, 50Hz for adapter	Temperature	:	25℃
Test Result	:	PASS	Humidity	:	54%RH

Bellow 1GHz:

The worst case: 802.11b, 2412MHz

Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
423.531	V	RX	-70.45	-57.00	-13.45
---	V	RX	---	---	---
---	V	RX	---	---	---
216.016	H	RX	-71.08	-57.00	-14.08
---	H	RX	---	---	---
---	H	RX	---	---	---

The worst case: 802.11b, 2472MHz

Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
234.592	V	RX	-71.00	-57.00	-14.00
---	V	RX	---	---	---
---	V	RX	---	---	---
444.301	H	RX	-66.67	-57.00	-9.67
---	H	RX	---	---	---
---	H	RX	---	---	---

Above 1GHz:					
The worst case: 802.11b, 2412MHz					
Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
1503.48	V	RX	-58.80	-47.00	-11.80
---	V	RX	---	---	---
---	V	RX	---	---	---
1499.40	H	RX	-60.91	-47.00	-13.91
---	H	RX	---	---	---
---	H	RX	---	---	---
The worst case: 802.11b, 2472MHz					
Frequency (MHz)	Ant H / V	TX/RX	Measured (dBm)	Limits (dBm)	Margins
1930.00	V	RX	-56.19	-47.00	-9.19
---	V	RX	---	---	---
---	V	RX	---	---	---
2598.84	H	RX	-62.75	-47.00	-15.75
---	H	RX	---	---	---
---	H	RX	---	---	---

11. Receiver Blocking

Standard Application

This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode. See also clause 4.3.2.5.

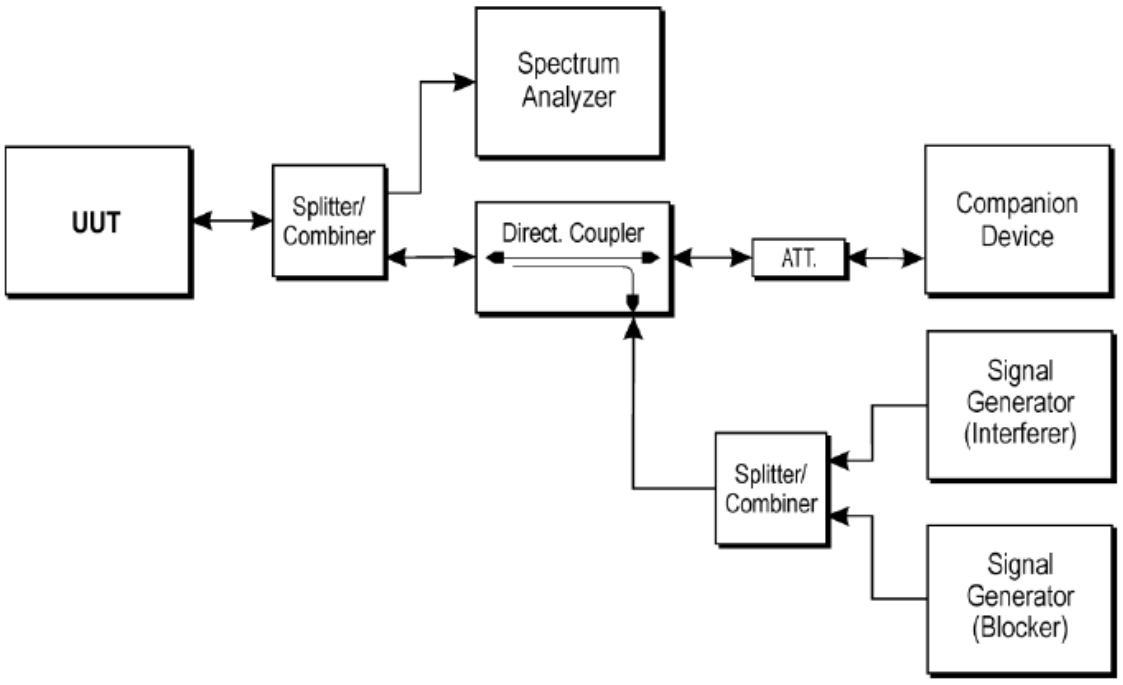
In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

Adaptive equipment using wide band modulations other than FHSS, shall comply with the requirements defined in clauses 4.3.2.5.1 (non-LBT based DAA) or 4.3.2.5.2 (LBT based DAA) in the presence of a blocking signal with characteristics as provided in table 6.

Table 6: Receiver Blocking parameters

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)	-30	CW
Non-LBT	-30 dBm			
NOTE 1: The highest blocking frequency shall be used for testing the lowest operating channel, while the lowest blocking frequency shall be used for testing the highest operating channel.				
NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.				

Test Setup



Test Results

Wanted Signal Mean Power from Companion Device (dBm)	Block Signal Frequency (MHz)	Limit (dBm)	Max. Block Signal Power (dBm)	Result
-50	2395	-30	-24.34	PASS
-50	2488.5	-30	-23.78	PASS

APPENDIX I (TEST PHOTOGRAPHS)

1. Photo of Emission Test