

RED-Radio Test Report

For

High-Flying Electronics Technology Co., Ltd.

WIFI Module

Model No.: HF-A11

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

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Contents

1. General Information.....	5
1.1. Client Information.....	5
1.2. Description of Device (EUT).....	5
1.3. Auxiliary Equipment Used During Test.....	6
1.4. Description of Test Modes.....	7
1.5. List of channels.....	9
1.6. Test Conditions.....	9
1.7. Test Equipment List.....	10
1.8. Measurement Uncertainty.....	11
1.9. Description of Test Facility.....	11
2. Summary of Test Results.....	12
3. RF Output Power.....	13
3.1. RF Output Power Limit.....	13
3.2. Test Setup.....	13
3.3. Test Procedure.....	13
3.4. Test Data.....	13
4. Power Spectral Density.....	16
4.1. Test Limit.....	16
4.2. Test Setup.....	16
4.3. Test Procedure.....	16
4.4. Test Data.....	17
5. Adaptivity.....	18
5.1. Test Limit.....	18
5.2. Test Setup.....	19
5.3. Test Procedure.....	19
5.4. Test Data.....	19
6. Occupied Channel Bandwidth.....	20
6.1. Test Limit.....	20
6.2. Test Setup.....	20
6.3. Test Procedure.....	20
6.4. Test Data.....	20
7. Transmitter Unwanted Emissions in the out-of-band Domain.....	22
7.1. Test Limit.....	22
7.2. Test Setup.....	22
7.3. Test Procedure.....	22
7.4. Test Data.....	23
8. Transmitter Unwanted Emissions in the Spurious Domain.....	25
8.1. Test Limit.....	25
8.2. Test Setup.....	25
8.3. Test Procedure.....	25
8.4. Test Data.....	26
9. Receiver Spurious Emissions.....	28

9.1. Test Limit.....	28
9.2. Test Setup.....	28
9.3. Test Procedure.....	28
9.4. Test Data.....	29
10. Receiver Blocking.....	30
10.1. Test Limit.....	30
10.2. Test Setup.....	31
10.3. Test Procedure.....	31
10.4. Minimum Performance Declaration.....	31
10.5. Test Data.....	32
APPENDIX I -- TEST SETUP PHOTOGRAPH.....	33

TEST REPORT

Applicant : High-Flying Electronics Technology Co., Ltd.
Manufacturer : High-Flying Electronics Technology Co., Ltd.
Product Name : WIFI Module
Model No. : HF-A11
Trade Mark : Hi-Flying
Rating(s) : DC 3.3V, 170~300mA

Test Standard(s) : ETSI EN 300 328 V2.1.1 (2016-11)

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 ETSI EN 300 328 V2.1.1 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 : May 27~Jun. 13, 2017

Prepared By :



Winkey Wang

(Tested Engineer / Winkey Wang)

Reviewer :

Amy Ding

(Project Manager / Amy Ding)

Approved & Authorized Signer :

Tom Chen

(Manager / Tom Chen)

1. General Information

1.1. Client Information

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

1.2. Description of Device (EUT)

Product Name	:	WIFI Module	
Model No.	:	HF-A11	
Trade Mark	:	Hi-Flying	
Test Power Supply	:	AC 230V, 50Hz for adapter	
Product Description	:	Operation Frequency:	2412MHz ~ 2472MHz
	:	Transfer Rate:	802.11b:11/5.5/2/1Mbps 802.11g:54/48/36/24/18/12/9/6 Mbps 802.11n: up to 150Mbps
	:	Number of Channel:	13 Channels for 20MHz bandwidth(2412~2472MHz) 9 Channels for 40MHz bandwidth(2422~2462MHz)
	:	Modulation Type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
	:	Antenna Type:	Chip Antenna
	:	Antenna Gain(Peak):	0.8 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

1.3. Auxiliary Equipment Used During Test

Adapter	:	Manufacturer: Shanghai jun peng electronics co., LTD Model No.: JP-015 Input: AC 100-265V, 50/60Hz, 0.4A Output: DC 5V, 1A
PC	:	Manufacturer: DELL M/N: Optiplex 3020 MT S/N: CN-079V51-70163-4AD-089K-A00 Input Rating: AC 100-240V, 50-60Hz 5.4A CE , FCC DOC, CCC
MONITOR	:	Manufacturer: DELL M/N: UZ2215Hf S/N: CN-035VN6-72872-45A-A3AB Input Rating: AC 100-240V, 50-60Hz, 1.5A Output Rating: DC 19.5V, 4.62A TUV-GS FCC CE KCC VCCI
KEYBOARD	:	Manufacturer: DELL M/N: SK-8120 S/N: CN-0DJ365-71616-49J-0MVR-A00 Input Rating: DC 5V,0.05A CE FCC VCCI KCC TUV-GS Cable: 1.8m, unshielded
MOUSE	:	Manufacturer: DELL M/N: MS111-T S/N: CN-0KW2YH-71616-488-1CBJ Input Rating: DC 5V,0.1A Cable: 1.8m, unshielded CE FCC VCCI KCC TUV-GS
Power Line	:	Non-Shielded, 1.5m
VGA Cable	:	Non-Shielded, 1.5m

1.4. Description of Test Modes

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

RF Output Power Test

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 13	1, 7, 13	DSSS	DBPSK	1.0
802.11g	1 to 13	1, 7, 13	OFDM	BPSK	6.0
802.11n (HT20)	1 to 13	1, 7, 13	OFDM	BPSK	6.5
802.11n (HT40)	3 to 11	3, 7, 11	OFDM	BPSK	13.5

Power Spectral Density Test

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 13	1, 7, 13	DSSS	DBPSK	1.0
802.11g	1 to 13	1, 7, 13	OFDM	BPSK	6.0
802.11n (HT20)	1 to 13	1, 7, 13	OFDM	BPSK	6.5
802.11n (HT40)	3 to 11	3, 7, 11	OFDM	BPSK	13.5

Adaptivity Test:

Mode	Available Channel	Tested Channel	Modulation Technology
802.11b	1 to 13	1, 13	DSSS
802.11g	1 to 13	1, 13	OFDM
802.11n (HT20)	1 to 13	1, 13	OFDM
802.11n (HT40)	3 to 11	3, 11	OFDM

Occupied Channel Bandwidth Test

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 13	1, 13	DSSS	DBPSK	1.0
802.11g	1 to 13	1, 13	OFDM	BPSK	6.0
802.11n (HT20)	1 to 13	1, 13	OFDM	BPSK	6.5
802.11n (HT40)	3 to 11	3, 11	OFDM	BPSK	13.5

Transmitter unwanted emission in the out-of-band domain Test

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 13	1, 13	DSSS	DBPSK	1.0
802.11g	1 to 13	1, 13	OFDM	BPSK	6.0
802.11n (HT20)	1 to 13	1, 13	OFDM	BPSK	6.5
802.11n (HT40)	3 to 11	3, 11	OFDM	BPSK	13.5

Spurious Emissions Test

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 13	13	DSSS	DBPSK	1

Receiver Blocking Test

Mode	Available Channel	Tested Channel	Modulation Technology
802.11b	1 to 13	1, 13	DSSS
802.11g	1 to 13	1, 13	OFDM
802.11n (HT20)	1 to 13	1, 13	OFDM
802.11n (HT40)	3 to 11	3, 11	OFDM

1.5. List of channels

Thirteen channels are provided for 802.11b, 802.11g, 802.11n(HT20):

Channel	Frequency	Channel	Frequency
1	2412 MHz	8	2447 MHz
2	2417 MHz	9	2452 MHz
3	2422 MHz	10	2457 MHz
4	2427 MHz	11	2462 MHz
5	2432 MHz	12	2467 MHz
6	2437 MHz	13	2472 MHz
7	2442 MHz		

1.6. Test Conditions

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	-20°C ~ 55°C Note: (1)
Relative Humidity	20% - 75%	N/A
Supply Voltage	AC 230V, 50Hz for adapter	N/A

Note: (1) The HT 55°C and LT -20°C was declared by manufacturer, The EUT couldn't be operate normally with higher or lower temperature.

1.7. Test Equipment List

Radiated:						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analysis	Agilent	E4407B	US39390582	Jul. 12, 2016	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Jun. 17, 2016	1 Year
3.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	May 06, 2017	1 Year
4.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 06, 2017	1 Year
5.	Preamplifier	Instruments corporation	EMC011830	980100	Jun. 17, 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	DC Power supply	IV	IV-8080	YQSB0096	Jun. 17, 2016	1 Year
9	TEMP&HUMI PROGRAMMABLE CHAMBER	Bell Group	BE-THK-15 0M8	SE-0137	Jun. 17, 2016	1 Year
10	Band filter	Amindeon	COM-MW	SE-330	Jun. 17, 2016	1 Year
Conducted:						
1	Directional Coupler	Agilent	87300C	MY44300299	Jun. 17, 2016	1 Year
2	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Jun. 17, 2016	1 Year
3	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Jun. 17, 2016	1 Year
4	Signal Generator	Agilent	E4421B	MY41000743	Jun. 17, 2016	1 Year
5	Power Sensor	Agilent	KFSW15050 2	15I00041SN048	Jun. 17, 2016	1 Year
6	Power Sensor	Agilent	KFSW15050 2	15I00041SN045	Jun. 17, 2016	
7	4 Ch. Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	TW54063507	Jun. 17, 2016	1 Year
8	4 Ch. Simultaneous Sampling 14 Bits 2 MS/s	Agilent	U2531A	TW54063513	Jun. 17, 2016	1 Year
9	splitter	Mini	PS3-7	4463	Jun. 17, 2016	1 Year
10	CBT32 BLUETOOTH TESTER 4HU	Rohde&Schwarz	CBT32	101176	Jun. 29,2016	1 Year
11	Constant temperature and humidity box	Oregon Scientific	BA-888	SE-1111	Jun. 17, 2016	1 Year

1.8. Measurement Uncertainty

For the test methods, according to ETSI EN 300 328 standard, the measurement uncertainty figures shall be calculated in accordance with ETR 100 028-1 [4] and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Maximum measurement uncertainty	
Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1,5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 1 \text{ }^{\circ}\text{C}$
Humidity	$\pm 5 \%$
DC and low frequency voltages	$\pm 3 \%$
Time	$\pm 5 \%$
Duty Cycle	$\pm 5 \%$

1.9. 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 registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 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, June 13, 2016.

Test Location

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited.

1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

2. Summary of Test Results

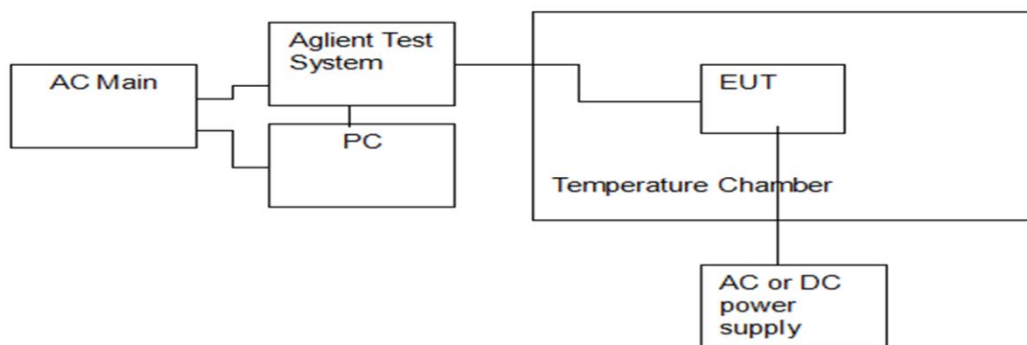
List of Measurements			
No	Test Items	Clause No.	Results
Transmitter Items			
1	RF Output Power	4.3.2.2	Complies
2	Power Spectral Density	4.3.2.3	Complies
3	Duty Cycle, TX-Sequence, TX-gap	4.3.2.4	N/A Note (2)(3)
4	Medium Utilization (MU) factor	4.3.2.5	N/A Note (2)(3)
5	Adaptivity	4.3.2.6	Complies
6	Occupied Channel Bandwidth	4.3.2.7	Complies
7	Transmitter Unwanted Emissions in the Out-Of-Band Domain	4.3.2.8	Complies
8	Transmitter Unwanted Emissions in the Spurious Domain	4.3.2.9	Complies
9	RF Output Power	4.3.2.2	Complies
Receiver Items			
10	Receiver spurious emissions	4.3.1.11	Complies
11	Receiver Blocking	4.3.2.12	Complies
Note: (1) "N/A": indicates test is not applicable in this Test Report. (2) This requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p. (3) This requirement applies to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode. (4) This requirement does not apply to adaptive equipment unless operating in non-adaptive mode.			

3. RF Output Power

3.1. RF Output Power Limit

Condition	Limit
☐ Non-adaptive frequency hopping systems	Equal to or less than the value declared by the manufacturer. This declared value shall be equal to or less than 20 dBm.
☒ Adaptive frequency hopping systems	20dBm

3.2. Test Setup



3.3. Test Procedure

Refer to chapter 5.4.2.2.1 of EN 300 328 V2.1.1.

1. Run a test program to control EUT transmitting at specific channel
2. Connect the power sensor to the transmit port
3. Power Meter was setting as below:
Sample speed: 1 MS/s
Number of bursts: at least 10bursts
Detector: RMS
4. A power meter was used to read the response of the power sensor
5. Define Start time and Stop time of a burst by 30dB below the highest value of the stores samples.
6. Find the highest burst value
7. Record the power level
8. EIRP = antenna gain + power level of step 7.

3.4. Test Data

Please to see the following pages

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V

Test Mode:		TX(CH01/CH07/CH13)-802.11b				
TEST CONDITIONS				Total e.i.r.p (dBm)		
				CH00	CH07	CH13
T nom (°C)	20.00	V nom (V)	230	15.85	16.09	16.45
T min (°C)	-20.00	V nom (V)	230	16.20	16.41	16.56
T max (°C)	55.00	V nom (V)	230	16.10	16.23	16.80
Max RF Power				16.80		
Limits				20dBm		
Result				Complies		
Note: Power measurement, actual measurement for 16 Burst power.						

Test Mode:		TX(CH01/CH07/CH13)-802.11g				
TEST CONDITIONS				Total e.i.r.p (dBm)		
				CH00	CH07	CH13
T nom (°C)	20.00	V nom (V)	230	14.39	14.88	15.08
T min (°C)	-20.00	V nom (V)	230	13.54	14.87	15.20
T max (°C)	55.00	V nom (V)	230	14.70	14.97	15.37
Max RF Power				15.37		
Limits				20dBm		
Result				Complies		
Note: Power measurement, actual measurement for 16 Burst power.						

Test Mode:		TX(CH01/CH7/CH13)-802.11n(HT20)				
TEST CONDITIONS				Total e.i.r.p (dBm)		
				CH00	CH07	CH13
T nom (°C)	20.00	V nom (V)	230	12.74	13.05	13.25
T min (°C)	-20.00	V nom (V)	230	12.97	13.74	13.29
T max (°C)	55.00	V nom (V)	230	12.63	13.33	13.27
Max RF Power				13.74		
Limits				20dBm		
Result				Complies		
Note: Power measurement, actual measurement for 16 Burst power.						

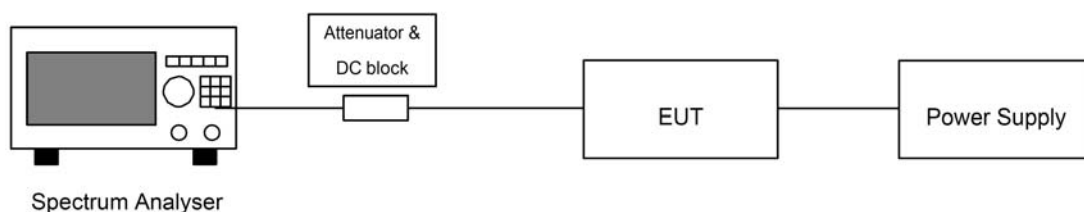
Test Mode:		TX(CH01/CH7/CH13)-802.11n(HT40)				
TEST CONDITIONS				Total e.i.r.p (dBm)		
				CH00	CH07	CH13
T nom (°C)	20.00	V nom (V)	230	12.15	12.43	12.59
T min (°C)	-20.00	V nom (V)	230	12.19	12.13	12.31
T max (°C)	55.00	V nom (V)	230	12.87	11.60	12.17
Max RF Power				12.87		
Limits				20dBm		
Result				Complies		
Note: Power measurement, actual measurement for 16 Burst power.						

4. Power Spectral Density

4.1. Test Limit

Condition	Frequency BAND	Limit (e.i.r.p.)
Under normal conditions	2400 ~ 2483.5 MHz	10dBm / 1MHz

4.2. Test Setup



4.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.3.

Connect the UUT to the spectrum analyzer and use the following settings:

Frequency range	2400MHz-2483.5MHz
RBW/VBW	10kHz/30kHz
Sweep points/time	>8350 / 10S
Detector	RMS
Trace	Max hold

4.4. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V

Channel	Channel Frequency (MHz)	Power Density (dBm/1MHz) (E.I.R.P)	Limit (dBm/1MHz) (E.I.R.P)	Test Result
802.11b				
01	2412.00	4.67	10	PASS
07	2442.00	4.66	10	PASS
13	2472.00	4.45	10	PASS
802.11g				
01	2412.00	2.58	10	PASS
07	2442.00	2.56	10	PASS
13	2472.00	2.67	10	PASS

Channel	Channel Frequency (MHz)	Power Density (dBm/1MHz) (E.I.R.P)	Limit (dBm/1MHz) (E.I.R.P)	Test Result
802.11n(HT20)				
01	2412.00	2.33	10	PASS
07	2442.00	2.42	10	PASS
13	2472.00	2.49	10	PASS
802.11n(HT40)				
03	2422.00	-1.09	10	PASS
07	2442.00	-1.05	10	PASS
11	2462.00	-1.05	10	PASS

5. Adaptivity

5.1. Test Limit

See clause 5.1 of ETSI EN 300 328 V2.1.1(2016-11) for the test conditions. These measurements shall only be performed at normal test conditions.

When supported by the operating frequency range of the equipment, this test shall be performed on two operating (hopping) frequencies randomly selected from the operating frequencies used by the equipment. The first (lower) frequency shall be randomly selected within the range 2 400 MHz to 2 442 MHz while the second (higher) frequency shall be randomly selected within the range 2 442 MHz to 2 483,5 MHz. The equipment shall be in a normal operating (hopping) mode.

For equipment which can operate in an adaptive and a non-adaptive mode, it shall be verified that prior to the test, the equipment is operating in the adaptive mode.

The equipment shall be configured in a mode that results in the longest Channel Occupancy Time.

Non-LBT based Detect and Avoid:

- 1 The channel shall remain unavailable for a minimum time equal to 1 s after which the channel may be considered again as an 'available' channel;
- 2 $COT \leq 40 \text{ ms}$;
- 3 Idle Period shall be minimum 5% of COT with a minimum of 100us;
- 4 Detection threshold level = $-70\text{dBm/MHz} + 10 \cdot \log(100\text{mW}/P_{\text{out}})$ (P_{out} in mW E.I.R.P)

LBT based Detect and Avoid (Frame Based Equipment):

- 1 The CCA observation time shall be not less than 18 us;
- 2 CCA observation time declared by the supplier;
- 3 $COT = 1 \sim 10 \text{ ms}$;
- 4 Idle Period $\geq 5\%$ of COT;
- 5 Detection threshold level = $-70\text{dBm/MHz} + 10 \cdot \log(100\text{mW}/P_{\text{out}})$ (P_{out} in mW E.I.R.P)

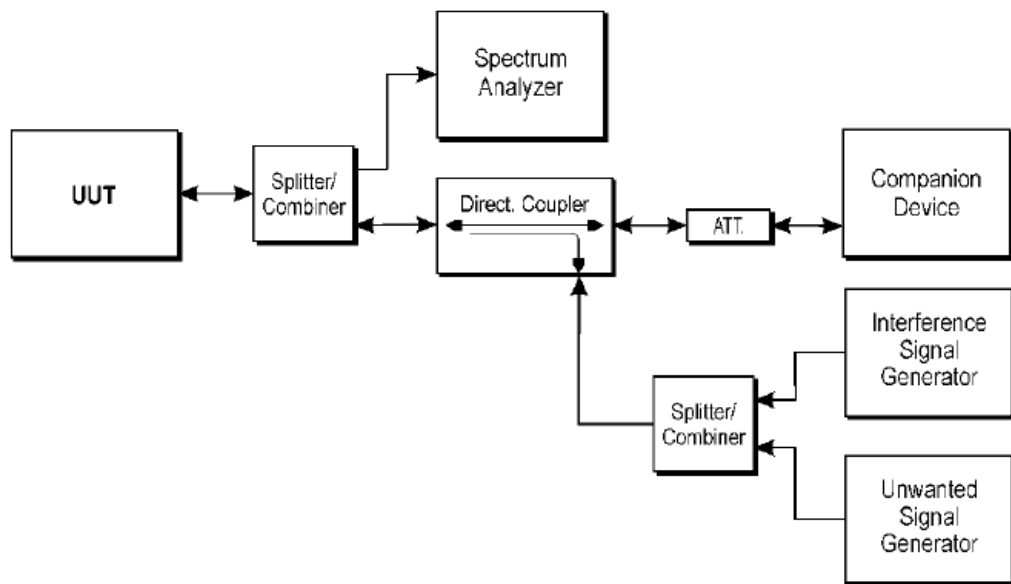
LBT based Detect and Avoid (Load Based Equipment):

- 1 The CCA observation time shall be not less than 18 us;
- 2 CCA declared by the manufacturer;
- 3 $COT \leq 13 \text{ ms}$;
- 4 Detection threshold level = $-70\text{dBm/MHz} + 10 \cdot \log(100\text{mW}/P_{\text{out}})$ (P_{out} in mW E.I.R.P)

Short Control Signalling Transmissions:

Short Control Signalling Transmissions shall have a maximum TxOn / (TxOn + TxOff) ratio of 10 % within any observation period of 50 ms or within an observation period equal to the dwell time, whichever is less.

5.2. Test Setup



5.3. Test Procedure

Refer to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.6

5.4. Test Data

Note: The EUT is a Load Based Equipment.

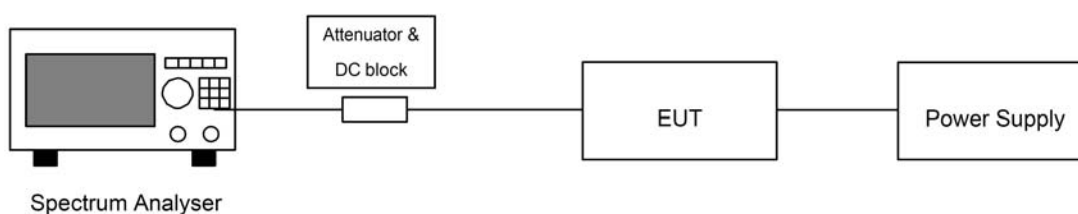
Test Mode	Test Channel	Interference Signal Level(dBm)	Unwanted Signal Level(dBm)	Max. COT (ms)	Conclusion
802.11b	Lowest	-66.80	-35	3.13	Pass
	Highest	-66.80	-35	3.24	Pass
802.11g	Lowest	-65.37	-35	2.74	Pass
	Highest	-65.37	-35	2.96	Pass
802.11n(HT20)	Lowest	-63.74	-35	2.31	Pass
	Highest	-63.74	-35	2.85	Pass
802.11n(HT40)	Lowest	-62.87	-35	2.17	Pass
	Highest	-62.87	-35	2.66	Pass

6. Occupied Channel Bandwidth

6.1. Test Limit

Condition		Limit
All types of equipment		Shall fall completely within the band 2400 to 2483.5 MHz.
Additional requirement	For non-adaptive using wide band modulations other than FHSS system and e.i.r.p >10dBm.	Less than 20MHz
	For non-adaptive Frequency Hopping system and e.i.r.p >10dBm.	Less than 5MHz

6.2. Test Setup



6.3. Test Procedure

Refer to EN 300 328, clause 5.4.7 for the test conditions and the measurement method.

The setting of the Spectrum Analyzer

Center Frequency	The centre frequency of the channel under test
Frequency Span	2 × Nominal Channel Bandwidth (e.g. 2MHz for BT)
Detector	RMS
RBW	~ 1 % of the span without going below 1 % (62KHz)
VBW	3 × RBW (180KHz)
Trace	Max hold
Sweep time	1S

6.4. Test Data

EUT:		Model Name:	
Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V

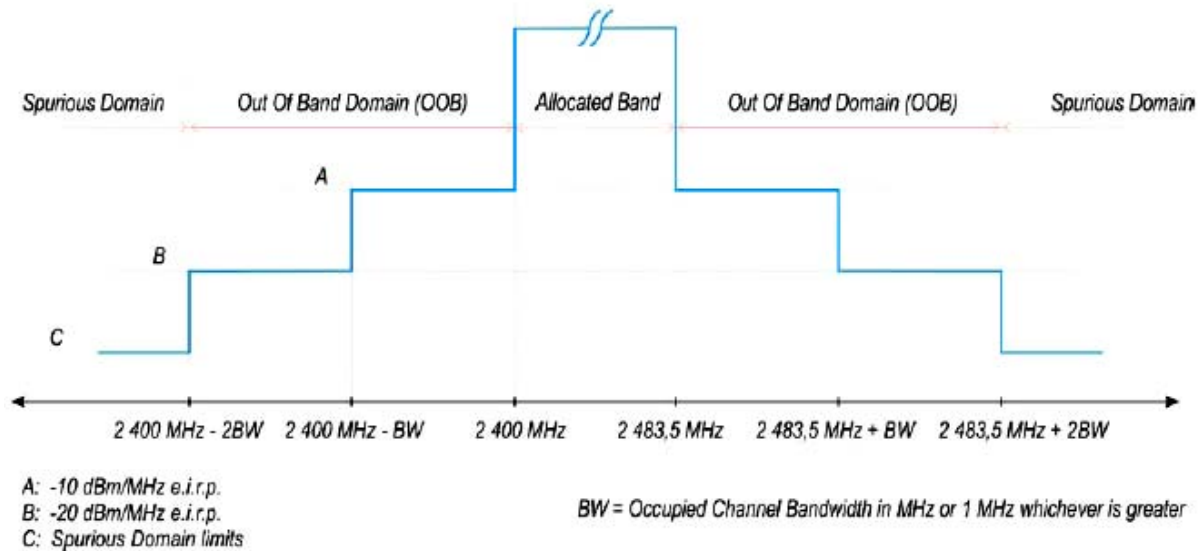
Test Channel	99% Bandwidth (MHz)	FL/FH (MHz)	Limit	Result
802.11b				
Lowest	13.636	2405.20	2400MHz ~	PASS
Highest	13.923	2479.02	2483.5MHz	PASS
802.11g				
Lowest	16.489	2403.74	2400MHz ~	PASS
Highest	16.545	2480.25	2483.5MHz	PASS
802.11n(HT20)				
Lowest	17.678	2403.16	2400MHz ~	PASS
Highest	17.698	2480.83	2483.5MHz	PASS
802.11n(HT40)				
Lowest	36.055	2403.92	2400MHz ~	PASS
Highest	36.040	2480.01	2483.5MHz	PASS

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

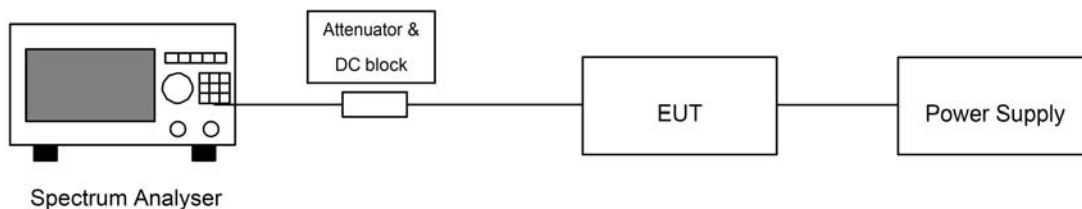
7.1. Test Limit

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 as below.

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.



7.2. Test Setup



7.3. Test Procedure

Refer as EN 300 328, clause 5.4.8 for the test conditions and the measurement method.

The setting of the Spectrum Analyzer

RBW/ VBW	1MHz/3MHz
Span	0Hz
Filter mode	Channel filter
Sweep mode	Continuous
Sweep Points	Sweep Time[s]/(1us) or 5000 points, whichever is greater
Detector	RMS
Trace mode	Max Hold
Trigger Mode	Video trigger

7.4. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V

Mode: 802.11b

Channel frequency		2412MHz		2472MHz	
Test condition		OOB Emission(MHz)		OOB Emission(MHz)	
		2400-BW ~2400	2400-2BW ~2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
		Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)
V nom (V)	AC 230V	-36.36	-56.98	-35.88	-54.27
Limits		-10.00	-20.00	-10.00	-20.00
PASS/FAIL		PASS	PASS	PASS	PASS

Mode: 802.11g

Channel frequency		2412MHz		2472MHz	
Test condition		OOB Emission(MHz)		OOB Emission(MHz)	
		2400-BW ~2400	2400-2BW ~2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
		Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)
V nom (V)	AC 230V	-57.02	-61.23	-48.87	-56.39
Limits		-10.00	-20.00	-10.00	-20.00
PASS/FAIL		PASS	PASS	PASS	PASS

Mode: 802.11n(HT20)

Channel frequency		2412MHz		2472MHz	
Test condition		OOB Emission(MHz)		OOB Emission(MHz)	
		2400-BW ~2400	2400-2BW ~2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
		Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)
V nom (V)	AC 230V	-56.39	-66.74	-46.31	-57.90
Limits		-10.00	-20.00	-10.00	-20.00
PASS/FAIL		PASS	PASS	PASS	PASS

Mode: 802.11n(HT40)

Channel frequency		2422MHz		2462MHz	
Test condition		OOB Emission(MHz)		OOB Emission(MHz)	
		2400-BW ~2400	2400-2BW ~2400-BW	2483.5 ~ 2483.5+BW	2483.5+BW ~ 2483.5+2BW
		Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)	Maximum power (dBm)
V nom (V)	AC 230V	-58.74	-69.52	-52.23	-63.37
Limits		-10.00	-20.00	-10.00	-20.00
PASS/FAIL		PASS	PASS	PASS	PASS

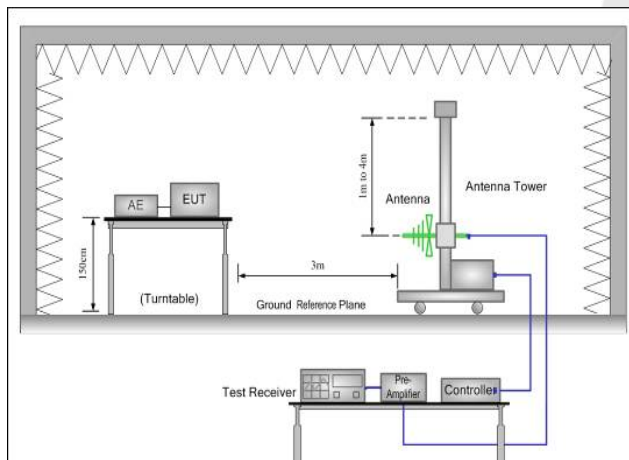
8. Transmitter Unwanted Emissions in the Spurious Domain

8.1. Test Limit

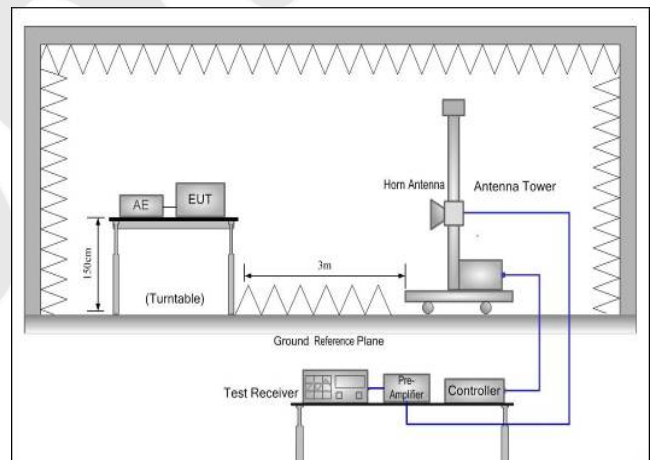
Frequency Range	Maximum Power	Bandwidth
30 MHz to 47 MHz	-36dBm	100kHz
47 MHz to 74 MHz	-54dBm	100kHz
74 MHz to 87,5 MHz	-36dBm	100kHz
87,5 MHz to 118 MHz	-54dBm	100kHz
118 MHz to 174 MHz	-36dBm	100kHz
174 MHz to 230 MHz	-54dBm	100kHz
230 MHz to 470 MHz	-36dBm	100kHz
470 MHz to 862 MHz	-54dBm	100kHz
862 MHz to 1 GHz	-36dBm	100kHz
1GHz ~ 12.75GHz	-30dBm	1MHz

8.2. Test Setup

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



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



8.3. Test Procedure

Refer to chapter 5.4.9.2.2 of EN 300 328 V2.1.1 for radiated measurement.

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.
3. The equipment was configured to operate under its worst case situation with respect to output power.
4. The test setup has been constructed as the normal use condition. Controlling software has been activated to set the EUT on specific status.

8.4. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V

Test Result: 30-1000MHz

Test Mode: TX Mode			Test Channel: 802.11b		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
55.57	-65.54	-54.00	-11.54	H	PASS
144.93	-65.63	-36.00	-29.63	H	
345.27	-70.42	-36.00	-34.42	H	
617.84	-70.54	-54.00	-16.54	H	
765.15	-74.86	-54.00	-20.86	H	
977.81	-68.25	-36.00	-32.25	H	
69.09	-71.12	-54.00	-17.12	V	
141.47	-68.50	-36.00	-32.50	V	
404.36	-67.69	-36.00	-31.69	V	
670.97	-69.50	-54.00	-15.50	V	
739.92	-69.60	-54.00	-15.60	V	
882.55	-73.63	-36.00	-37.63	V	

Test Result: above 1000MHz

Test Mode: TX Mode			Test Channel: 802.11b CH01		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4824.00	-48.80	-30.00	-18.80	H	PASS
7236.00	-48.49	-30.00	-18.49	H	
9648.00	-46.21	-30.00	-16.21	H	
4824.00	-48.50	-30.00	-18.50	V	
7236.00	-45.98	-30.00	-15.98	V	
9648.00	-46.71	-30.00	-16.71	V	

Test Mode: TX Mode			Test Channel: 802.11b CH13		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4944.00	-45.86	-30.00	-15.86	H	PASS
7416.00	-46.73	-30.00	-16.73	H	
9888.00	-44.95	-30.00	-14.95	H	
4944.00	-51.37	-30.00	-21.37	V	
7416.00	-46.41	-30.00	-16.41	V	
9888.00	-43.84	-30.00	-13.84	V	

Test Mode: TX Mode			Test Channel: 802.11n40 CH03		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4844.00	-45.70	-30.00	-15.70	H	PASS
7266.00	-45.23	-30.00	-15.23	H	
9688.00	-44.73	-30.00	-14.73	H	
4844.00	-49.93	-30.00	-19.93	V	
7266.00	-46.02	-30.00	-16.02	V	
9688.00	-46.82	-30.00	-16.82	V	

Test Mode: TX Mode			Test Channel: 802.11n40 CH11		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4924.00	-46.80	-30.00	-16.80	H	PASS
7386.00	-44.52	-30.00	-14.52	H	
9848.00	-46.86	-30.00	-16.86	H	
4924.00	-45.70	-30.00	-15.70	V	
7386.00	-51.68	-30.00	-21.68	V	
9848.00	-45.85	-30.00	-15.85	V	

9. Receiver Spurious Emissions

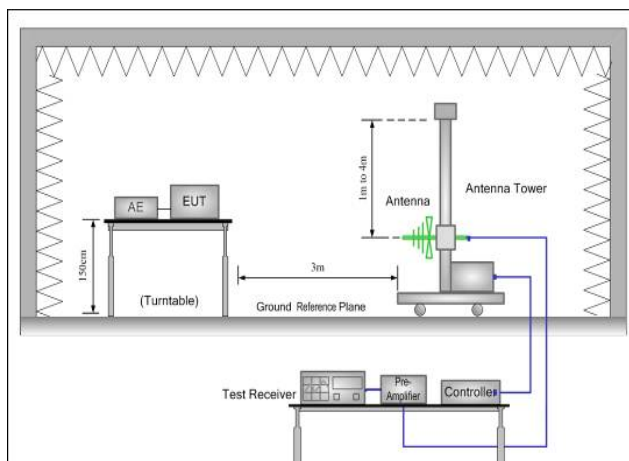
9.1. Test Limit

The spurious emissions of the receiver shall not exceed the values given in table.

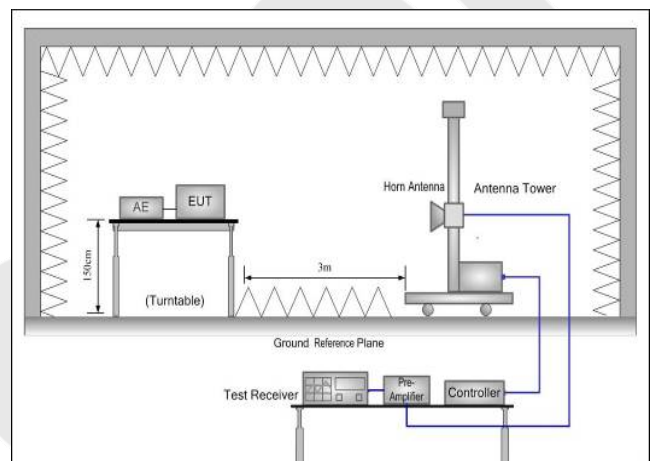
Frequency Range	Maximum Power
30MHz ~ 1GHz	-57dBm
1GHz ~ 12.75GHz	-47dBm

9.2. Test Setup

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



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



9.3. Test Procedure

Refer as EN 300 328, Refer to chapter 5.4.10.2.2 for radiated measurement.

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. Testing was performed when the equipment was in a receive-only mode.
3. The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.
4. The test setup has been constructed as the normal use condition. Controlling software has been activated to set the EUT on specific status.

9.4. Test Data

Temperature:	25 ° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V

Test Result: 30-1000MHz

Test Mode: RX Mode			Test Channel: 802.11 b		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
71.13	-65.53	-57.00	-8.53	H	PASS
102.93	-69.26	-57.00	-12.26	H	
170.69	-63.68	-57.00	-6.68	H	
191.91	-72.86	-57.00	-15.86	H	
384.28	-67.21	-57.00	-10.21	H	
718.04	-66.45	-57.00	-9.45	H	
70.94	-70.09	-57.00	-13.09	V	
89.62	-66.56	-57.00	-9.56	V	
156.48	-67.10	-57.00	-10.10	V	
197.11	-70.09	-57.00	-13.09	V	
285.83	-71.68	-57.00	-14.68	V	
770.03	-69.58	-57.00	-12.58	V	

Test Result: above 1000MHz

Test Mode: RX Mode			Test Channel: 802.11b CH01		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4824.00	-62.37	-47.00	-15.37	H	PASS
7236.00	-64.22	-47.00	-17.22	H	
9648.00	-65.85	-47.00	-18.85	H	
4824.00	-67.41	-47.00	-20.41	V	
7236.00	-70.61	-47.00	-23.61	V	
9648.00	-66.31	-47.00	-19.31	V	

Test Mode: RX Mode			Test Channel: 802.11b CH13		
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
4944.00	-63.24	-47.00	-16.24	H	PASS
7416.00	-66.25	-47.00	-19.25	H	
9888.00	-67.06	-47.00	-20.06	H	
4944.00	-66.76	-47.00	-19.76	V	
7416.00	-67.20	-47.00	-20.20	V	
9888.00	-70.70	-47.00	-23.70	V	

10. Receiver Blocking

10.1. Test Limit

This requirement applies to all receiver categories.

RECEIVER CATEGORY		
☒ Category 1	Category 2 ☐	Category 3 ☐
Minimum performance criterion	PER $\leq 10\%$ ☒	
	Alternative performance criteria	

Receiver Category 1 Equipment			
Wanted Signal Mean Power From Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Type of Blocking Signal
Pmin + 6 dB	2380 2503.5	-53	CW
Pmin + 6 dB	2300 2330 2360	-47	CW
Pmin + 6 dB	2523.5 2553.5 2583.5 2613.5 2643.5 2673.5	-47	CW

NOTE: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria.

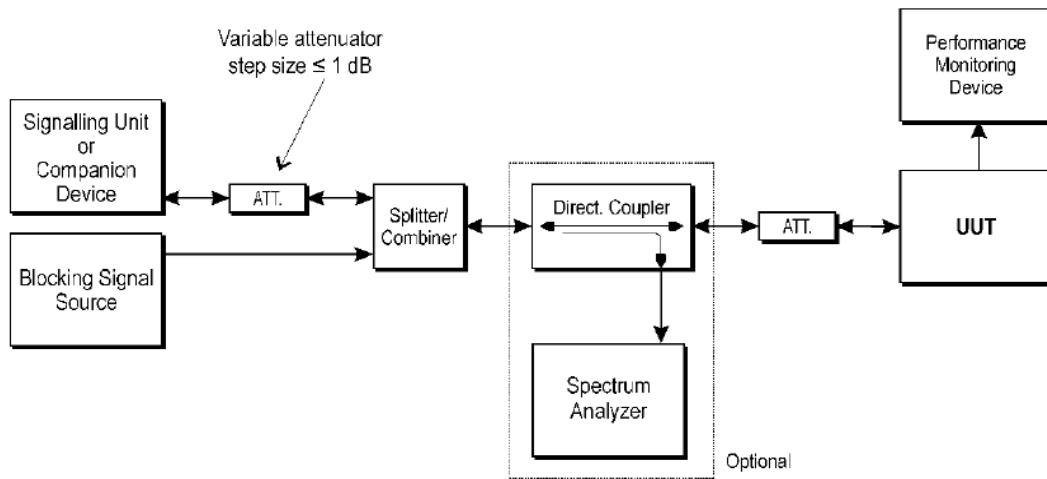
Receiver Category 2 Equipment			
Wanted Signal Mean Power From Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Type of Blocking Signal
Pmin + 6 dB	2380 2503.5	-57	CW
Pmin + 6 dB	2300 2583.5	-47	CW

NOTE: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria.

Receiver Category 3 Equipment			
Wanted Signal Mean Power From Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Type of Blocking Signal
Pmin + 12 dB	2380 2503.5	-57	CW
Pmin + 12 dB	2300 2583.5	-47	CW

NOTE: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria.

10.2. Test Setup



10.3. Test Procedure

Refer to chapter 5.4.11.2.1 of EN 300 328 V2.1.1

10.4. Minimum Performance Declaration

	CH	Pmin (dBm)	PER ($\leq 10\%$)
802.11b	01	-91	Pass
	13	-91	Pass
802.11g	01	-91	Pass
	13	-91	Pass
802.11n(HT20)	01	-91	Pass
	13	-91	Pass
802.11n(HT40)	03	-91	Pass
	11	-91	Pass

Note: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria.

10.5. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V

Wanted Signal Mean Power from Companion Device (dBm/MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Type of Blocking Signal	Pass / Fail
-85	2380	-57	CW	PASS
	2503.5			PASS
-85	2300	-47	CW	PASS
	2330			PASS
	2360			PASS
-85	2523.5	-47	CW	PASS
	2553.5			PASS
	2583.5			PASS
	2613.5			PASS
	2643.5			PASS
	2673.5			PASS

APPENDIX I -- TEST SETUP PHOTOGRAPH

