CE-RF Test Report

Applicant:	_____
Product Description:	small action camera
Tested Model:	SDV121
Test Standards:	ETSI EN 300 328 V2.1.1 (2016-11) EN 62479: 2010
Report No.:	JQL170512936-2E
Date of Test:	2017-05-03 to 2017-05-12
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Tested By:	_____ (Andy Yang / Test Engineer)
Reviewed By:	_____ (RC Peng / Manager)

Prepared By:

Shenzhen Jialian Testing Consulting Co., Ltd.

5/F, 7 Building, XinYuan Industrial Park, Xili Town, NanShan District, ShenZhen City, China

Tel.: +86-755-26994385 Fax.: +86-755-86108753 Website: www.test-jql.com

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:

Address of applicant:

Manufacturer:

Address of manufacturer:

General Description of EUT	
Product Name:	small action camera
Trade Name:	--
Model No.:	SDV121
Adding Model(s):	SDV100, SDV101, SVD102, SDVX(X=103-120), SDVY(Y=122-200)
Rated Voltage:	Battery 3.7V, Charging: USB 5V
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Frequency Range:	2412-2472MHz for 802.11b,g,n-HT20 2422-2462MHz for 802.11n-HT40
RF Output Power:	12.78 dBm (EIRP)
Type of Modulation:	CCK, PBCC, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels	13 for 802.11b,g,n-HT20 9 for 802.11n-HT40
Channel Separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	0 dBi

1.2 Test Standards

The following report is prepared on behalf of the Deeray Global Co., Ltd in accordance with ETSI EN 300328, Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the RED Directive.

The objective of the manufacturer is to demonstrate compliance with ETSI EN 300328.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the emission/immunity should be checked to ensure compliance has been maintained

1.3 Test Methodology

All measurements contained in this report were conducted with ETSI EN 300328, Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the RED Directive.

1.4 Test Facility

CNAS Registration No.: L0579

Shenzhen Academy of Metrology and Quality Inspection is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L0579. All measurement facilities used to collect the measurement data are located at Metrology and Quality Inspection Building,Central Section of LongZhu Road, Nanshan District, Shenzhen (518055)

1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission/immunity level. The test modes were adapted according to the operation manual for use, the EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements, more detailed description as follows:

Test Mode List:

Test Mode	Description	Remark
TM1	802.11b	2412MHz, 2442MHz, 2472MHz
TM2	802.11g	2412MHz, 2442MHz, 2472MHz
TM3	802.11n-HT20	2412MHz, 2442MHz, 2472MHz
TM4	802.11n-HT40	2422MHz, 2442MHz, 2462MHz

Test Conditions					
	Normal	LTLV	LTHV	HTHV	HTLV
Temperature (℃)	20	-20	-20	55	55
Voltage (V)	3.7	3.3	4.2	4.2	3.3

EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
/	/	/	/

Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	---	±1×10-7
Power Spectral Density	Conducted	±0.70dB
Transmitter Spurious Emissions	Radiated	±5.2dB
Receiver Spurious Emissions	Radiated	±5.2dB

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Spectrum Analyzer	Agilent	N9020A	US47140102	2016-07-01	2017-06-30
Signal Generator	Agilent	83752A	3610A01453	2016-07-01	2017-06-30
Vector Signal Generator	Agilent	N5182A	MY47070202	2016-07-01	2017-06-30
Power Sensor	Agilent	U2021XA	MY54250019	2016-07-01	2017-06-30
Power Sensor	Agilent	U2021XA	MY54250021	2016-07-01	2017-06-30
Power Sensor	Agilent	U2021XA	MY54210040	2016-07-01	2017-06-30
Power Sensor	Agilent	U2021XA	MY54260021	2016-07-01	2017-06-30
Simultaneous Sampling	Agilent	U2531A	TW54243509	2016-07-01	2017-06-30
Power Splitter	Mini-Circuits	Z4PD-642W-S+	N846501416	2016-07-01	2017-06-30
Spectrum Analyzer	R&S	FSP	836079/035	2016-07-01	2017-06-30
Pre-amplifier	Agilent	8447F	3113A06717	2016-07-01	2017-06-30
Pre-amplifier	Compliance Direction	PAP-0118	24002	2016-07-01	2017-06-30
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2016-07-01	2017-06-30
Horn Antenna	ETS	3117	00086197	2016-07-01	2017-06-30
Spectrum Analyzer	Agilent	E4407B	MY41440400	2016-07-01	2017-06-30
Horn Antenna	Schwarz beck	BBHA9170	BBHA9170582	2016-07-01	2017-06-30
Temperature& Humidity Chamber	GONGWEN	GDJS-800	/	2016-07-01	2017-06-30

2. SUMMARY OF TEST RESULTS

Standards	Reference	Description of Test Item	Result
EN 300328 V2.1.1 (2016-11)	4.3.2.2	RF Output Power	Passed
	4.3.2.3	Power Spectral Density	Passed
	4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	N/A
	4.3.2.5	Medium Utilisation (MU) Factor	N/A
	4.3.2.6	Adaptivity (adaptive equipment using modulations other than FHSS)	Passed
	4.3.2.7	Occupied Channel Bandwidth	Passed
	4.3.2.8	Transmitter Unwanted Emissions in the Out-of-band Domain	Passed
	4.3.2.9	Transmitter Unwanted Emissions in the Spurious Domain	Passed
	4.3.2.10	Receiver Spurious Emissions	Passed
	4.3.2.11	Receiver Blocking	Passed
Passed: The EUT complies with the essential requirements in the standard Failed: The EUT does not comply with the essential requirements in the standard N/A: not applicable			

3. RF Output Power

3.1 Standard Applicable

According to Section 4.3.1.2.3, The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20 dBm. The maximum RF output power for non-adaptive Frequency Hopping equipment, shall be declared by the supplier. The maximum RF output power for this equipment shall be equal to or less than the value declared by the supplier. This declared value shall be equal to or less than 20 dBm.

According to Section 4.3.2.2.3, For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm. The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.

3.2 Test Procedure

According to section 5.3.2.2.1.2 of the standard EN 300328, 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 individual sampling point (time domain), sum the coincident power samples of all ports and store them. Use these summed samples in all following steps..

Step 3:

• Find the start and stop times of each burst in the stored measurement samples.

The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.

NOTE 2: In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.

Step 4:

• Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these Pburst values, as well as the start and stop times for each burst.

$$P_{burst} = \frac{1}{k} \sum_{n=1}^{k} P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number

Step 5:

• The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

Step 6:

• Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.

• If applicable, add the additional beamforming gain "Y" in dB.

•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 clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.

3.3 Summary of Test Results

Test Conditions	EIRP (dBm)			Limit
	Lowest CH	Middle CH	Highest CH	dBm
802.11b				
Normal	12.74	12.78	12.74	20
LTLV	12.59	12.71	12.63	20
LTHV	12.55	12.68	12.61	20
HTHV	12.69	12.65	12.59	20
HTLV	12.71	12.72	12.65	20
802.11g				
Normal	11.52	11.55	11.18	20
LTLV	11.44	11.47	11.10	20
LTHV	11.62	11.65	11.28	20
HTHV	11.41	11.44	11.07	20
HTLV	11.39	11.42	11.05	20
802.11n HT20				
Normal	10.40	10.61	10.43	20
LTLV	10.31	10.52	10.34	20
LTHV	10.35	10.56	10.38	20
HTHV	10.55	10.76	10.58	20
HTLV	10.30	10.51	10.33	20
802.11n HT40				
Normal	10.83	10.11	10.96	20
LTLV	10.79	10.07	10.92	20
LTHV	10.89	10.17	10.02	20
HTHV	10.70	10.98	10.83	20
HTLV	10.78	10.06	10.91	20

4. Power Spectral Density

4.1 Standard Applicable

According to Section 4.3.2.3.3, For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to10 dBm per MHz.

4.2 Test Procedure

According to section 5.3.3.2.1 of the standard EN 300328, the test procedure shall be as follows:

Step 1:
Connect the UUT to the spectrum analyser and use the following settings:
- Start Frequency: 2 400 MHz
- Stop Frequency: 2 483,5 MHz
- Resolution BW: 10 kHz
- Video BW: 30 kHz
- Sweep Points: > 8 350

NOTE: For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.
- Detector: RMS
- Trace Mode: Max Hold
- Sweep time: Auto

For non-continuous signals, wait for the trace to be completed. Save the (trace) data set to a file.

Step 2:
For conducted measurements on smart antenna systems using either operating mode 2 or 3 (see clause 5.1.3.2), repeat the measurement for each of the transmit ports. For each frequency point, add up the amplitude (power) values for the different transmit chains and use this as the new data set.

Step 3:
Add up the values for amplitude (power) for all the samples in the file.

Step 4:
Normalize the individual values for amplitude so that the sum is equal to the RF Output Power (e.i.r.p.) measured inclause 5.3.2.

Step 5:
Starting from the first sample in the file (lowest frequency), add up the power of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.

Step 6:
Shift the start point of the samples added up in step 5 by 1 sample and repeat the procedure in step 5 (i.e. sample #2 to#101).

Step 7:
Repeat step 6 until the end of the data set and record the radiated Power Spectral Density values for each of the 1 MHz segments.

From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, whichshall comply with the limit given in clause 4.3.2.3.3, shall be recorded in the test report.

RBW/VBW=10/30 kHz

4.3 Summary of Test Results

Test Mode	Test Frequency	Spectral Density	Limit
	MHz	dBm/MHz	dBm/MHz
802.11b	2412	2.59	10
	2442	2.65	10
	2472	2.32	10
802.11g	2412	1.33	10
	2442	1.31	10
	2472	1.32	10
802.11n (HT20)	2412	0.74	10
	2442	0.68	10
	2472	0.72	10
802.11n (HT40)	2422	-3.27	10
	2442	-3.27	10
	2462	-3.43	10

5. Adaptivity (Adaptive Equipment Using Modulations Other Than FHSS)

5.1 Standard Application

According to section 4.3.2.6.2.2.2, Load Based Equipment shall comply with the following requirements:
Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect, as described in IEEE Std. 802.11™-2007 [i.4] clauses 9, 15, 18 or 19, in IEEE Std. 802.11n™-2009 [i.4], clauses 9, 11 and 20 or in IEEE Std. 802.15.4™-2011 [i.5], clauses 4 and 5 providing they comply with the conformance requirements referred to in clause 4.3.2.6.3.2.

Equipment using a modulation other than FHSS and using the non-LBT based Detect and Avoid mechanism, shall comply with the following minimum set of requirements:
1) During normal operation, the equipment shall evaluate the presence of a signal on its current operating channel. If it is determined that a signal is present with a level above the detection threshold defined in step 5) the channel shall be marked as 'unavailable'.
2) 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.
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.
4) The Channel Occupancy Time shall be less than 40 ms. Each such transmission sequence shall be followed by an Idle Period (no transmissions) of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs. After this, the procedure as in step 1) needs to be repeated.
5) The detection threshold shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the detection threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). For power levels less than 20 dBm e.i.r.p., the detection threshold level may be relaxed to: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.)
6) The equipment shall comply with the requirements defined in step 1) to step 4) of the present clause in the presence of an unwanted CW signal as defined in table 9.

Non-LBT based Detect and Avoid:

Table 9: Unwanted Signal parameters

Wanted signal mean power from companion device (dBm)	Unwanted signal frequency (MHz)	Unwanted CW signal power (dBm)
-30	2 395 or 2 488,5 (see note 1)	-35 (see note 2)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.		
NOTE 2: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

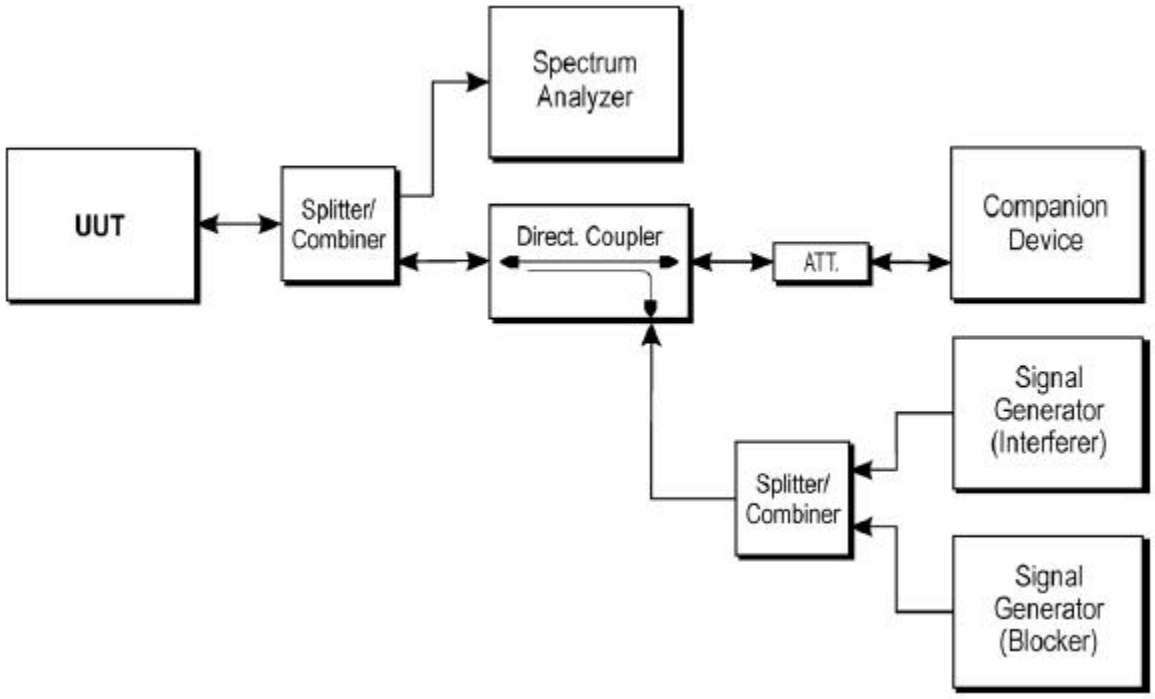
LBT based Detect and Avoid:

Table 10: Unwanted Signal parameters

Wanted signal mean power from companion device	Unwanted signal frequency (MHz)	Unwanted signal power (dBm)
sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35 (see note 3)
NOTE 1: The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1.		
NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.		
NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.		

5.2 Test procedure

According to the section 5.3.7.2.1, the test block diagram shall be used.



All test procedure is carried to the section 5.3.7.2.1

RBW/VBW=8MHz/30MHz

5.3 Summary of Test Results/Plots

802.11b Lowest Channel (2412MHz)	
AWGN Interference Level (dBm)	-63.00
Block Signal Level (dBm)	-35.00
Max COT Time (ms)	0.12
Interference Start Time (ms)	10000
Minimum COT Time (ms)	1.12
Duty Cycle (%)	0
Pulse Width (ms)	0.00
Block Signal Inject time(ms)	70000
802.11b Highest Channel (2472MHz)	
AWGN Interference Level (dBm)	-63.00
Block Signal Level (dBm)	-35.00
Max COT Time (ms)	0.21
Interference Start Time (ms)	10000
Minimum COT Time (ms)	-1.06
Duty Cycle (%)	0
Pulse Width (ms)	0.00
Block Signal Inject time(ms)	70000
802.11g Lowest Channel (2412MHz)	
AWGN Interference Level (dBm)	-63.00
Block Signal Level (dBm)	-35.00
Max COT Time (ms)	0.12
Interference Start Time (ms)	10000
Minimum COT Time (ms)	1.12
Duty Cycle (%)	0
Pulse Width (ms)	0.00
Block Signal Inject time(ms)	70000
802.11g Highest Channel (2472MHz)	
AWGN Interference Level (dBm)	-63.00
Block Signal Level (dBm)	-35.00
Max COT Time (ms)	0.21
Interference Start Time (ms)	10000
Minimum Idle Time (ms)	-1.06
Duty Cycle (%)	0
Pulse Width (ms)	0.00
Block Signal Inject time(ms)	70000

802.1n-HT20 Lowest Channel (2412MHz)	
AWGN Interference Level (dBm)	-63.00
Block Signal Level (dBm)	-35.00
Max COT Time (ms)	0.16
Interference Start Time (ms)	10000
Minimum COT Time (ms)	1.01
Duty Cycle (%)	0
Pulse Width (ms)	0.00
Block Signal Inject time(ms)	70000
802.11n-HT20 highest Channel (2472MHz)	
AWGN Interference Level (dBm)	-63.00
Block Signal Level (dBm)	-35.00
Max COT Time (ms)	0.21
Interference Start Time (ms)	10000
Minimum COT Time (ms)	0.99
Duty Cycle (%)	0
Pulse Width (ms)	0.00
Block Signal Inject time(ms)	70000
802.11n-HT40 Lowest Channel (2422MHz)	
AWGN Interference Level (dBm)	-63.00
Block Signal Level (dBm)	-35.00
Max COT Time (ms)	0.22
Interference Start Time (ms)	10000
Minimum COT Time (ms)	1.25
Duty Cycle (%)	0
Pulse Width (ms)	0.00
Block Signal Inject time(ms)	70000
802.11n-HT40 Highest Channel (2462MHz)	
AWGN Interference Level (dBm)	-63.00
Block Signal Level (dBm)	-35.00
Max COT Time (ms)	0.21
Interference Start Time (ms)	10000
Minimum COT Time (ms)	0.99
Duty Cycle (%)	0
Pulse Width (ms)	0.00
Block Signal Inject time(ms)	70000

6. Occupied Channel Bandwidth

6.1 Standard Application

According to section 4.3.2.7.3. The Occupied Channel Bandwidth shall fall completely within the band given in clause 1. In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

6.2 Test procedure

According to the section 5.3.8.2.1, the measurement procedure shall be as follows:
Step 1:
Connect the UUT to the spectrum analyser and use the following settings:
• Centre Frequency: The centre frequency of the channel under test
• Resolution BW: ~ 1 % of the span without going below 1 %
• Video BW: 3 × RBW
• Frequency Span: 2 × Occupied Channel Bandwidth
• Detector Mode: RMS
• Trace Mode: Max Hold
Step 2:
Wait until the trace is completed.
Find the peak value of the trace and place the analyser marker on this peak.
Step 3:
Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.

6.3 Summary of Test Results/Plots

RBW/VBW=430/1200kHz For 802.11b,g,n-HT20
RBW/VBW=820/2400kHz For 802.11n-HT40

Test Mode	Test Channel	Measured Value
	MHz	MHz
802.11b	2412	12.60
	2472	12.65
802.11g	2412	17.13
	2472	16.84
802.11n HT20	2412	17.77
	2472	17.68
802.11n HT40	2422	36.13
	2462	35.94

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

7.1 Standard Application

According to section 4.3.2.8.3. 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.

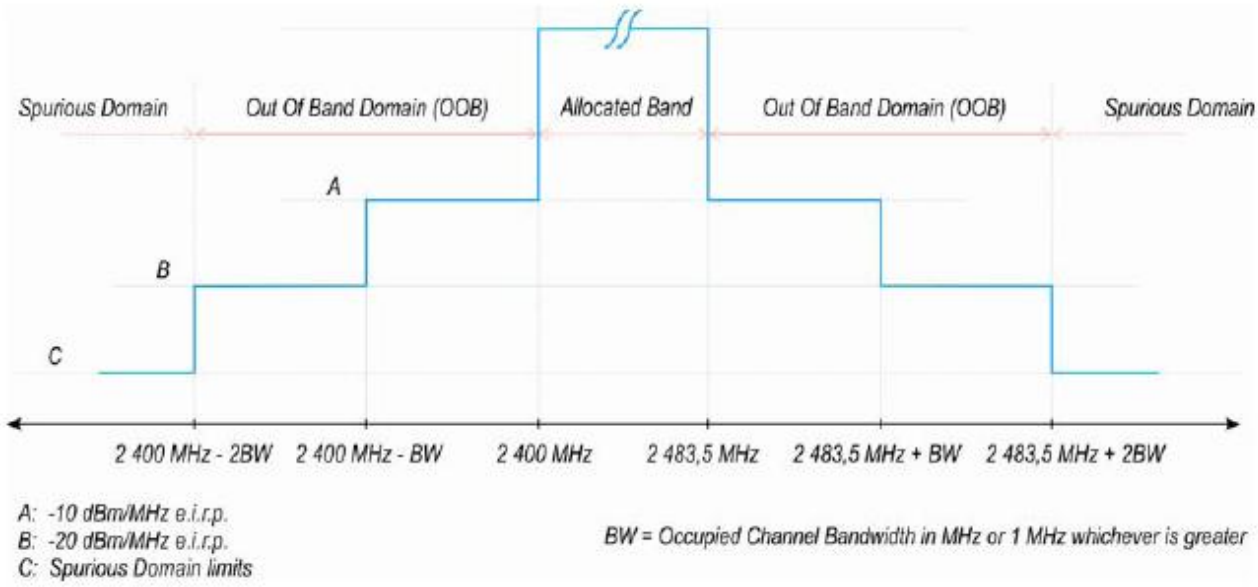


Figure 3: Transmit mask

7.2 Test procedure

According to the section 5.3.9.2.1, the measurement procedure shall be as follows:
The Out-of-band emissions within the different horizontal segments of the mask provided in figures 1 and 3 shall be measured using the steps below. This method assumes the spectrum analyser is equipped with the Time Domain Poweroption.

Step 1:
• Connect the UUT to the spectrum analyser and use the following settings:
- Centre Frequency: 2 484 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: 5 000
- Trigger Mode: Video trigger

- Sweep Time: Suitable to capture one transmission burst

Step 2: (segment 2 483,5 MHz to 2 483,5 MHz + BW)
• Adjust the trigger level to select the transmissions with the highest power level.
• For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.
• Set a window (start and stop lines) 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.
• Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with 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 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 3: (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW)
• Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz.

Step 4: (segment 2 400 MHz - BW to 2 400 MHz)
• Change the centre frequency of the analyser to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz.

Step 5: (segment 2 400 MHz - 2BW to 2 400 MHz - BW)
• Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz.

Step 6:
• In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain "G" in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits provided by the mask given in figures 1 or 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.
These measurements have to be performed at normal environmental conditions and shall be repeated at the extremes of the operating temperature range.

RBW/VBW=1MHz/3MHz

7.3 Summary of Test Results/Plots

Test CH.	Test Segment	Max. Emissions Reading (dBm)					Limit
	MHz	Normal	LTLV	LTHV	HTHV	HTLV	dBm
Test Mode: 802.11b							
Lowest	2400-BW to 2400	-31.78	-31.90	-31.86	-31.70	-31.64	-10
	2400-2BW to 2400-BW	-50.52	-50.54	-50.37	-50.54	-50.56	-20
Highest	2483.5 to 2483.5+BW	-37.12	-37.07	-37.07	-36.92	-36.93	-10
	2483.5+BW to 2483.5+2BW	-56.14	-55.94	-56.10	-56.09	-56.20	-20
Test Mode: 802.11g							
Lowest	2400-BW to 2400	-29.13	-29.09	-29.14	-29.14	-28.97	-10
	2400-2BW to 2400-BW	-48.21	-48.12	-48.31	-48.17	-48.03	-20
Highest	2483.5 to 2483.5+BW	-30.08	-29.95	-30.07	-29.89	-30.25	-10
	2483.5+BW to 2483.5+2BW	-52.52	-52.70	-52.42	-52.69	-52.77	-20
Test Mode: 802.11n-HT20							
Lowest	2400-BW to 2400	-30.31	-30.25	-30.29	-30.34	-30.20	-10
	2400-2BW to 2400-BW	-49.98	-49.89	-49.95	-49.88	-49.79	-20
Highest	2483.5 to 2483.5+BW	-33.78	-34.00	-33.98	-33.65	-33.82	-10
	2483.5+BW to 2483.5+2BW	-53.35	-53.44	-53.29	-53.27	-53.27	-20
Test Mode: 802.11n-HT40							
Lowest	2400-BW to 2400	-35.68	-35.67	-35.45	-35.74	-35.62	-10
	2400-2BW to 2400-BW	-54.06	-54.29	-54.17	-53.83	-53.92	-20
Highest	2483.5 to 2483.5+BW	-35.58	-35.44	-35.38	-35.51	-35.36	-10
	2483.5+BW to 2483.5+2BW	-57.89	-58.08	-57.65	-57.68	-57.75	-20
Note 1: BW please refer to section 6.3. Note 2: the data just list the worst cases.							

8. Transmitter Unwanted Emissions in the Spurious Domain

8.1 Standard Applicable

According to section 4.3.2.9.3. The transmitter unwanted emissions in the spurious domain shall not exceed the values given in the following table.

Transmitter limit for spurious emissions

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

8.2 Test Procedure

See clause 5.1 for the test conditions. These measurements shall only be performed at normal test conditions.
The level of spurious emissions shall be measured as, either:
a) their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or
b) their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no temporary antenna connectors

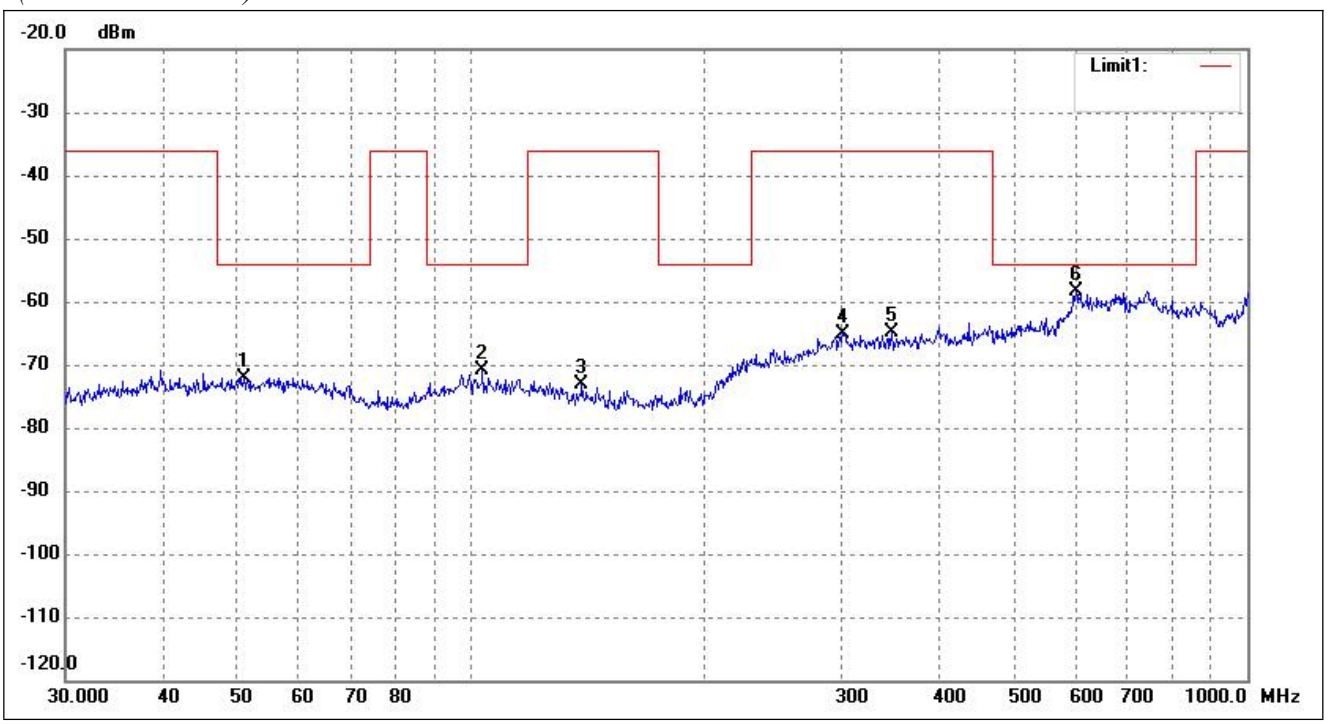
The device under test has an integral antenna and the radiated measurement shall apply to the device, using the method of measurement as described in the EN300328 section 5.3.10.2.

RBW=100kHz VBW=300kHz 30MHz-1GHz
RBW=1MHz VBW=3MHz 1GHz-12.75GHz

8.3 Summary of Test Results/Plots

According to the data, the EUT complied with the EN 300328 standards, and had the worst cases:

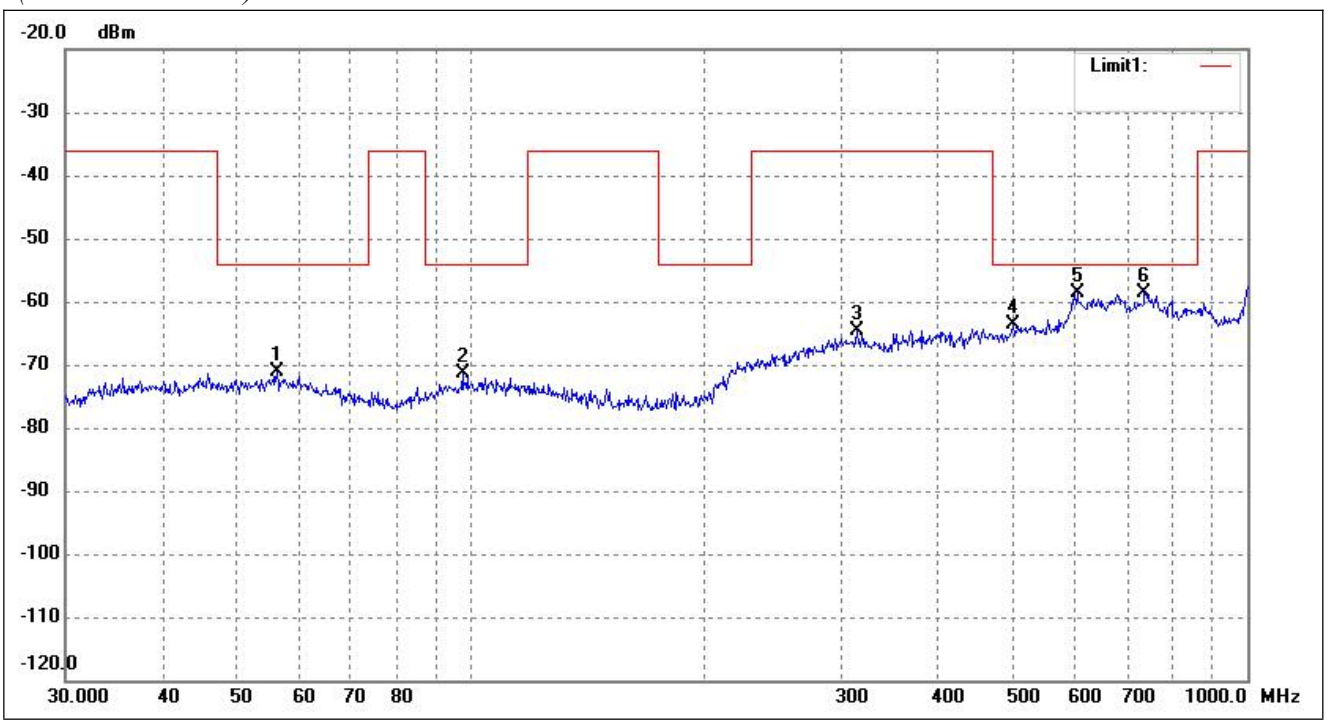
Spurious Emission from 30MHz to 1GHz
Lowest channel
Horizontal:
(802.11b-worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	50.9420	-88.51	16.47	-72.04	-54.00	-18.04	ERP
2	103.4421	-87.08	16.31	-70.77	-54.00	-16.77	ERP
3	138.8735	-87.84	14.63	-73.21	-36.00	-37.21	ERP
4	301.4224	-87.83	22.83	-65.00	-36.00	-29.00	ERP
5	348.0274	-87.31	22.53	-64.78	-36.00	-28.78	ERP
6	601.4265	-87.59	29.27	-58.32	-54.00	-4.32	ERP

Vertical:

(802.11b-worst case)

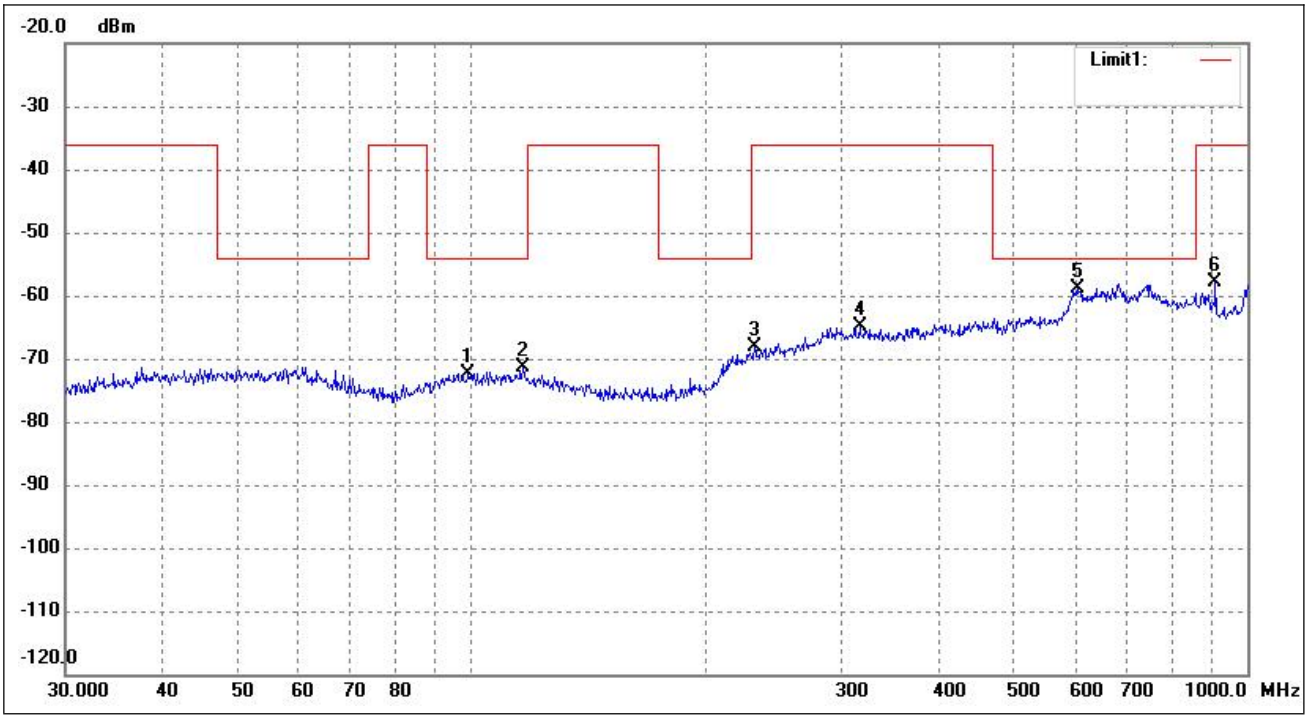


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	56.1974	-87.72	16.53	-71.19	-54.00	-17.19	ERP
2	97.4560	-87.44	15.95	-71.49	-54.00	-17.49	ERP
3	314.3765	-87.56	22.90	-64.66	-36.00	-28.66	ERP
4	499.4247	-87.85	24.13	-63.72	-54.00	-9.72	ERP
5	603.5392	-87.84	29.11	-58.73	-54.00	-4.73	ERP
6	737.0714	-87.89	29.27	-58.62	-54.00	-4.62	ERP

Highest channel

Horizontal:

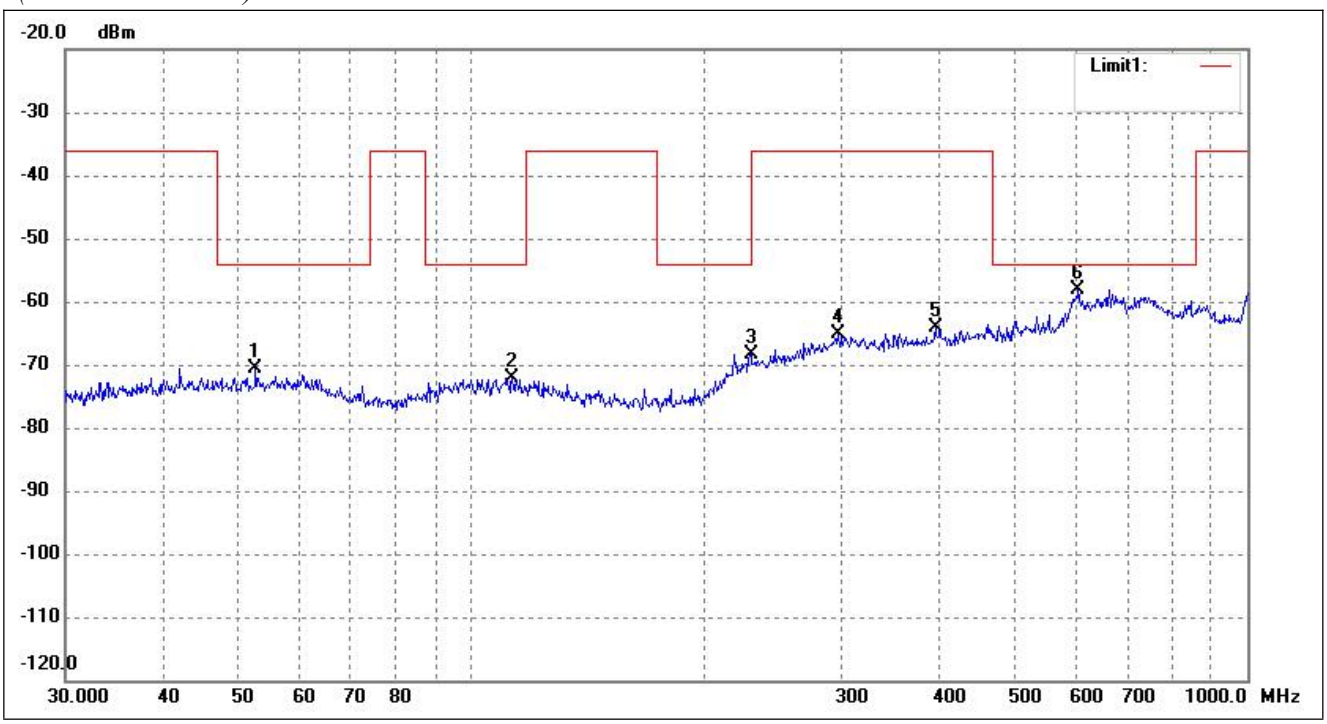
(802.11b-worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	99.1797	-88.47	16.21	-72.26	-54.00	-18.26	ERP
2	116.5401	-87.55	16.20	-71.35	-54.00	-17.35	ERP
3	231.7179	-87.83	19.59	-68.24	-36.00	-32.24	ERP
4	316.5890	-87.79	22.91	-64.88	-36.00	-28.88	ERP
5	603.5392	-88.02	29.11	-58.91	-54.00	-4.91	ERP
6	909.6667	-83.54	25.77	-57.77	-36.00	-21.77	ERP

Vertical:

(802.11b-worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	52.7600	-87.19	16.50	-70.69	-54.00	-16.69	ERP
2	112.9196	-88.25	16.23	-72.02	-54.00	-18.02	ERP
3	229.2931	-87.73	19.46	-68.27	-54.00	-14.27	ERP
4	297.2241	-87.90	22.71	-65.19	-36.00	-29.19	ERP
5	396.2415	-87.60	23.46	-64.14	-36.00	-28.14	ERP
6	605.6592	-86.97	28.96	-58.01	-54.00	-4.01	ERP

Spurious Emission above 1GHz

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Lowest Channel-2412MHz *(802.11b-worst case)*						
4824	-56.02	7.92	-48.10	-30	-18.10	H
7236	-56.14	12.94	-43.20	-30	-13.20	H
4824	-56.13	7.92	-48.21	-30	-18.21	V
7236	-56.11	12.98	-43.13	-30	-13.13	V
Highest Channel-2472MHz *(802.11b-worst case)*						
4944	-56.88	8.27	-48.61	-30	-18.61	H
7416	-59.85	13.73	-46.12	-30	-16.12	H
4944	-57.99	8.27	-49.72	-30	-19.72	V
7416	-61.16	13.73	-47.43	-30	-17.43	V

Note 1: Testing is carried out with frequency rang 30MHz to 12.75GHz, which above 3th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Note 2: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

9. Receiver Spurious Emissions

9.1 Standard Applicable

According to section 4.3.2.10.3, The spurious emissions of the receiver shall not exceed the values given in the following table .

Spurious emission limits for receivers

Frequency range	Maximum power e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

9.2 Test Procedure

See clause 5.1 for the test conditions. These measurements shall only be performed at normal test conditions.
The level of spurious emissions shall be measured as, either:
a) their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or
b) their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no temporary antenna connectors

The device under test has an integral antenna and the radiated measurement shall apply to the device, using the method of measurement as described in the EN300328 section 5.3.11.2.

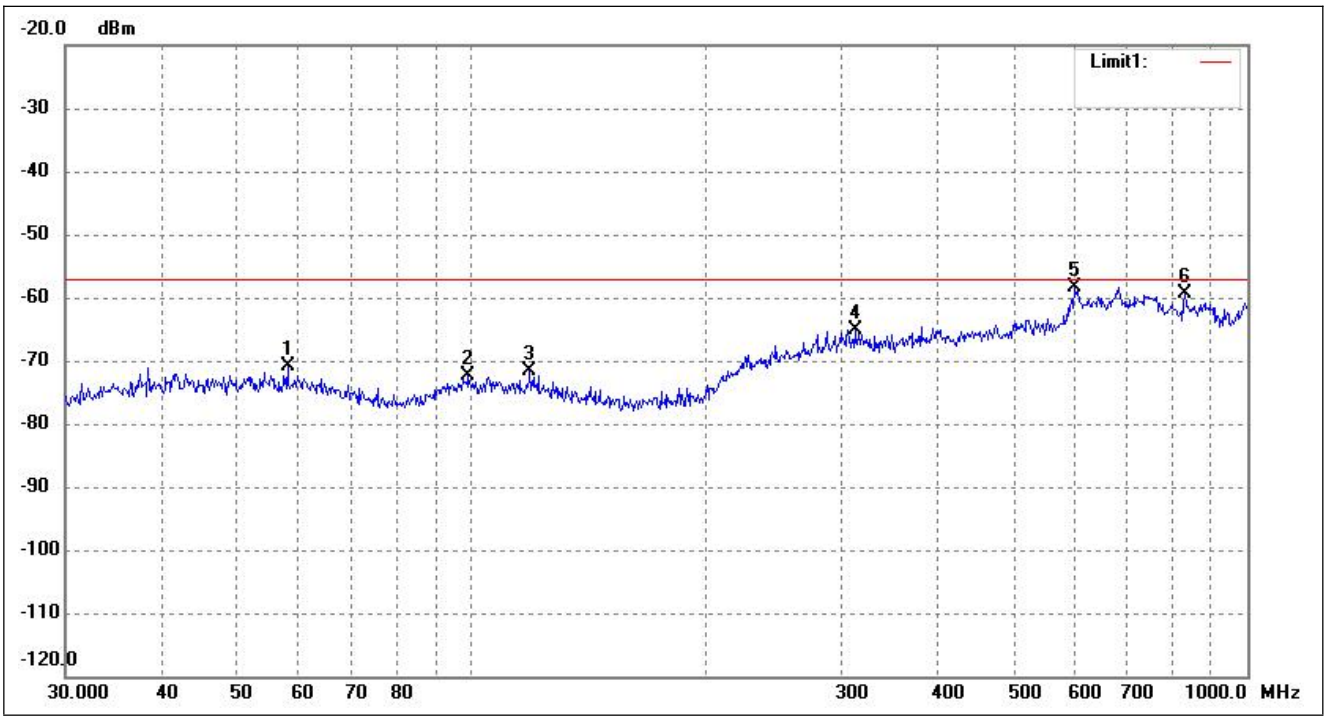
RBW=100kHz VBW=300kHz 30MHz-1GHz
RBW=1MHz VBW=3MHz 1GHz-12.75GHz

9.3 Summary of Test Results/Plots

According to the data, the EUT complied with the EN 300328 standards, and had the worst cases:

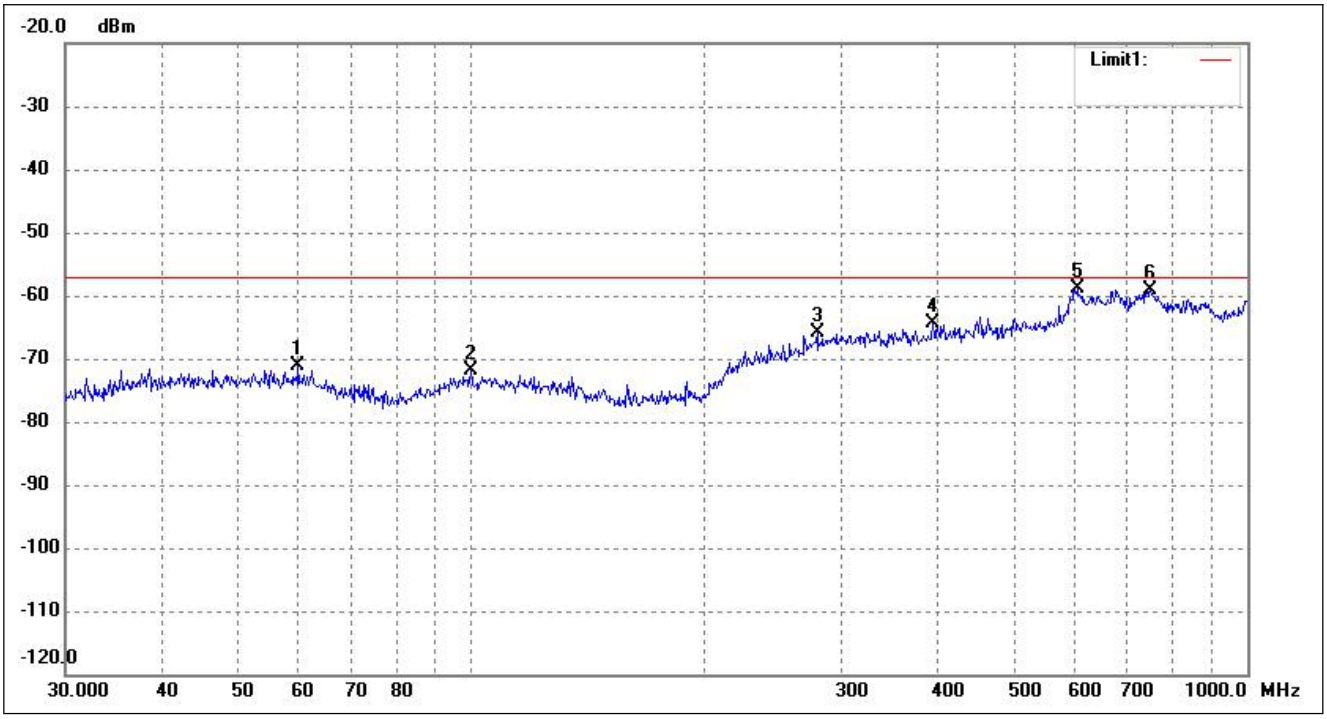
Test Mode: Receiving

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	57.9993	-87.52	16.55	-70.97	-57.00	-13.97	ERP
2	99.1797	-88.54	16.21	-72.33	-57.00	-15.33	ERP
3	119.0180	-87.92	16.19	-71.73	-57.00	-14.73	ERP
4	312.1794	-87.99	22.88	-65.11	-57.00	-8.11	ERP
5	599.3213	-87.58	29.24	-58.34	-57.00	-1.34	ERP
6	830.4002	-86.38	27.00	-59.38	-57.00	-2.38	ERP

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	59.8588	-87.82	16.58	-71.24	-57.00	-14.24	ERP
2	99.8777	-88.30	16.31	-71.99	-57.00	-14.99	ERP
3	279.0436	-87.87	22.01	-65.86	-57.00	-8.86	ERP
4	393.4724	-87.76	23.34	-64.42	-57.00	-7.42	ERP
5	603.5392	-87.96	29.11	-58.85	-57.00	-1.85	ERP
6	750.1083	-88.22	28.99	-59.23	-57.00	-2.23	ERP

Note: Testing is carried out with frequency rang 30MHz to 12.75GHz, which above 1GHz are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

10. Receiver Blocking

10.1 Standard Application

According to section 4.3.2.11.2, Receiver blocking is a measure of the ability of the equipment to receive a wanted signal on its operating channel without exceeding a given degradation in the presence of an unwanted signal (blocking signal) at frequencies other than those of the operating band.

Load Based Equipment not using any of the mechanisms referenced above shall comply with the following minimum set of requirements :

The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).

While maintaining the minimum performance criteria as defined in clause 4.3.2.11.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category 1, 2 and 3 provided in table 14, table 15 or table 16.

4.2.3.2.1 Receiver category 1

Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment.

4.2.3.2.2 Receiver category 2

Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment.

4.2.3.2.3 Receiver category 3

Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment.

Table 14: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking signal
P_{min} + 6 dB	2 380 2 503,5	-53	CW
P_{min} + 6 dB	2 300 2 330 2 360	-47	CW
P_{min} + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW
NOTE: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.			

Table 15: Receiver Blocking parameters receiver category 2 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking signal
P_{min} + 6 dB	2 380 2 503,5	-57	CW
P_{min} + 6 dB	2 300 2 583,5	-47	CW
NOTE: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.			

Table 16: Receiver Blocking parameters receiver category 3 equipment

Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	Type of blocking signal
P_{min} + 12 dB	2 380 2 503,5	-57	CW
P_{min} + 12 dB	2 300 2 583,5	-47	CW
NOTE: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.			

10.2 Test Procedure

Step 1: • For non-frequency hopping equipment, the UUT shall be set to the lowest operating channel.
Step 2: • The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.
Step 3: • With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in figure 6. The variable attenuator is set to a value that achieves the minimum performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 with a resolution of at least 1 dB. The resulting level for the wanted signal at the input of the UUT is Pmin. This value shall be measured and recorded in the test report.
• The signal level is increased by the value provided in the table corresponding to the receiver category and type of equipment.
Step 4: • The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment. It shall be verified and recorded in the test report that the performance criteria as specified in clause 4.3.1.12.3 or clause 4.3.2.11.3 is met.
Step 5: • Repeat step 4 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.
Step 6: • For non-frequency hopping equipment, repeat step 2 to step 5 with the UUT operating at the highest operating channel.

10.3 Test procedure

According to the section 5.4.11.2.1, the test block diagram shall be used.

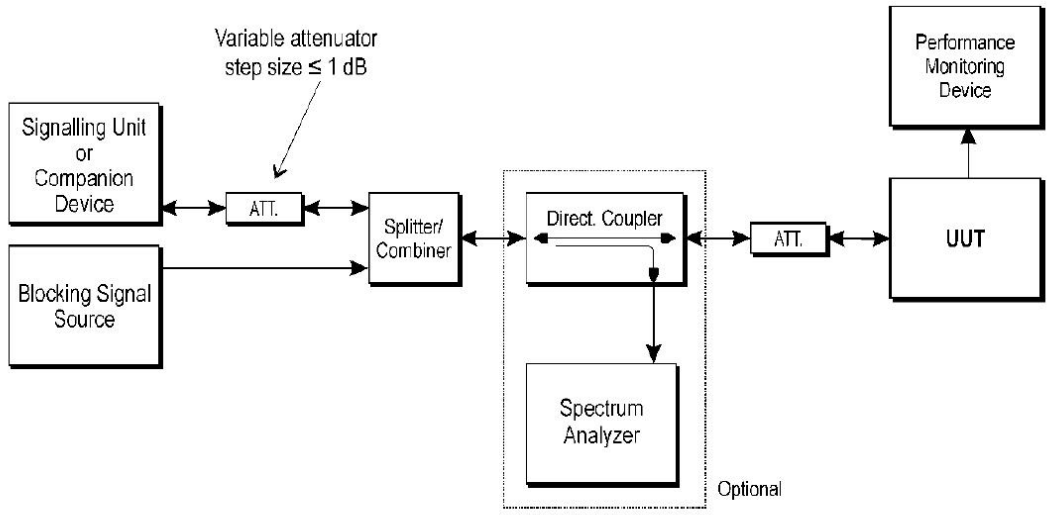


Figure 6: Test Set-up for receiver blocking

All test procedure is carried to the section 5.4.11.2.1

10.4 Summary of Test Results/Plots

802.11b Lowest Channel (2412MHz)	
Minimum Performance Criteria (@10% PER) (dBm)	-90.00
P_{min}+6dB(dBm)	-84.00
①Blocking Signal Frequency(MHz)	2380, 2503.5
①Block Signal Level (dBm)	-45.00
②Blocking Signal Frequency(MHz)	2300, 2330, 2360, 2523.5, 2553.5, 2583.5, 2613.5, 2643.5, 2673.5
②Block Signal Level (dBm)	-40.00
Test Result(Max. PER):	PER: 2.8(Limit:<10%)
802.11b Highest Channel (2472MHz)	
Minimum Performance Criteria (@10% PER) (dBm)	-90.00
P_{min}+6dB(dBm)	-84.00
①Blocking Signal Frequency(MHz)	2380, 2503.5
①Block Signal Level (dBm)	-45.00
②Blocking Signal Frequency(MHz)	2300, 2330, 2360, 2523.5, 2553.5, 2583.5, 2613.5, 2643.5, 2673.5
②Block Signal Level (dBm)	-40.00
Test Result(Max. PER):	PER: 2.7(Limit:<10%)
802.11g Lowest Channel (2412MHz)	
Minimum Performance Criteria (@10% PER) (dBm)	-86.00
P_{min}+6dB(dBm)	-80.00
①Blocking Signal Frequency(MHz)	2380, 2503.5
①Block Signal Level (dBm)	-45.00
②Blocking Signal Frequency(MHz)	2300, 2330, 2360, 2523.5, 2553.5, 2583.5, 2613.5, 2643.5, 2673.5
②Block Signal Level (dBm)	-40.00
Test Result(Max. PER):	PER: 2.5(Limit:<10%)
802.11g Highest Channel (2472MHz)	
Minimum Performance Criteria (@10% PER) (dBm)	-86.00
P_{min}+6dB(dBm)	-80.00
①Blocking Signal Frequency(MHz)	2380, 2503.5
①Block Signal Level (dBm)	-45.00
②Blocking Signal Frequency(MHz)	2300, 2330, 2360, 2523.5, 2553.5, 2583.5, 2613.5, 2643.5, 2673.5
②Block Signal Level (dBm)	-40.00
Test Result(Max. PER):	PER:2.8(Limit:<10%)

802.1n-HT20 Lowest Channel (2412MHz)	
Minimum Performance Criteria (@10% PER) (dBm)	-85.00
P_{min}+6dB(dBm)	-79.00
①Blocking Signal Frequency(MHz)	2380, 2503.5
①Block Signal Level (dBm)	-45.00
②Blocking Signal Frequency(MHz)	2300, 2330, 2360, 2523.5, 2553.5, 2583.5, 2613.5, 2643.5, 2673.5
②Block Signal Level (dBm)	-40.00
Test Result(Max. PER):	PER: 2.1(Limit:<10%)
802.11n-HT20 highest Channel (2472MHz)	
Minimum Performance Criteria (@10% PER) (dBm)	-85.00
P_{min}+6dB(dBm)	-79.00
①Blocking Signal Frequency(MHz)	2380, 2503.5
①Block Signal Level (dBm)	-45.00
②Blocking Signal Frequency(MHz)	2300, 2330, 2360, 2523.5, 2553.5, 2583.5, 2613.5, 2643.5, 2673.5
②Block Signal Level (dBm)	-40.00
Test Result(Max. PER):	PER: 2.5(Limit:<10%)

Remark: the smallest channel bandwidth shall be used together with the lowest data rate for this channel bandwidth. This mode of operation are aligned with the performance criteria defined in clause 4.3.1.12.3 or clause 4.3.2.11.3 as declared by the manufacturer (see clause 5.4.1)

11. RF EXPOSURE BASIC RESTRICTIONS

11.1 Standard Applicable

According to EN 62479:2010, Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz).

Low-power exclusion level P_{max} based on considerations of SAR

When SAR is the basic restriction, a conservative minimum value for P_{max} can be derived, equal to the localized SAR limit (SAR_{max}) multiplied by the averaging mass (m):

$$P_{max} = SAR_{max}\, m \qquad (A.1)$$

Example values of P_{max} according to Equation (A.1) are provided in Table A.1 for cases described by the ICNIRP guidelines [1], IEEE Std C95.1-1999 [2] and IEEE Std C95.1-2005 [3] where SAR limits are defined. Other exposure guidelines or standards may be applicable depending on national regulations.

Table A.1 – Example values of SAR-based P_{max} for some cases described by ICNIRP, IEEE Std C95.1-1999 and IEEE Std C95.1-2005

Guideline / Standard	SAR limit, SAR_{max} W/kg	Averaging mass, m g	P_{max} mW	Exposure tier[a]	Region of body[a]
ICNIRP [1]	2	10	20	General public	Head and trunk
	4	10	40	General public	Limbs
	10	10	100	Occupational	Head and trunk
	20	10	200	Occupational	Limbs
IEEE Std C95.1-1999 [2]	1,6	1	1,6	Uncontrolled environment	Head, trunk, arms, legs
	4	10	40	Uncontrolled environment	Hands, wrists, feet and ankles
	8	1	8	Controlled environment	Head, trunk, arms, legs
	20	10	200	Controlled environment	Hands, wrists, feet and ankles
IEEE Std C95.1-2005 [3]	2	10	20	Action level	Body except extremities and pinnae
	4	10	40	Action level	Extremities and pinnae
	10	10	100	Controlled environment	Body except extremities and pinnae
	20	10	200	Controlled environment	Extremities and pinnae
[a] Consult the appropriate standard for more information and definitions of terms.					

11.2 Evaluation Methods

Based on the above standard limit, the basic restriction at frequency between 10MHz to 300GHz is on localized SAR in the head. Any device with output power below 20mW cannot produce an exposure exceeding this restriction under the most pessimistic exposure conditions.

The basic restriction is 2W/Kg for general public device, so any unit which supplies less than 20mW from it's antenna port, averaged over 6 minutes, will meet the basic restriction.

11.3 Evaluation Results

Maximum EIRP Power

Frequency	EPR/EIRP	ERP/EIRP	Limit	Result
MHz	dBm	mW	mW	Pass/Fail
2442	12.78	18.97	20	Pass

Since Max. EIRP of the product at worse case is: 18.97 mW which cannot exceed the exempt condition, 20mW specified in EN 62479. It is deemed to full fit the requirement of RF exposure basic restriction specified in EC Council Recommendation (1999/519/EC).

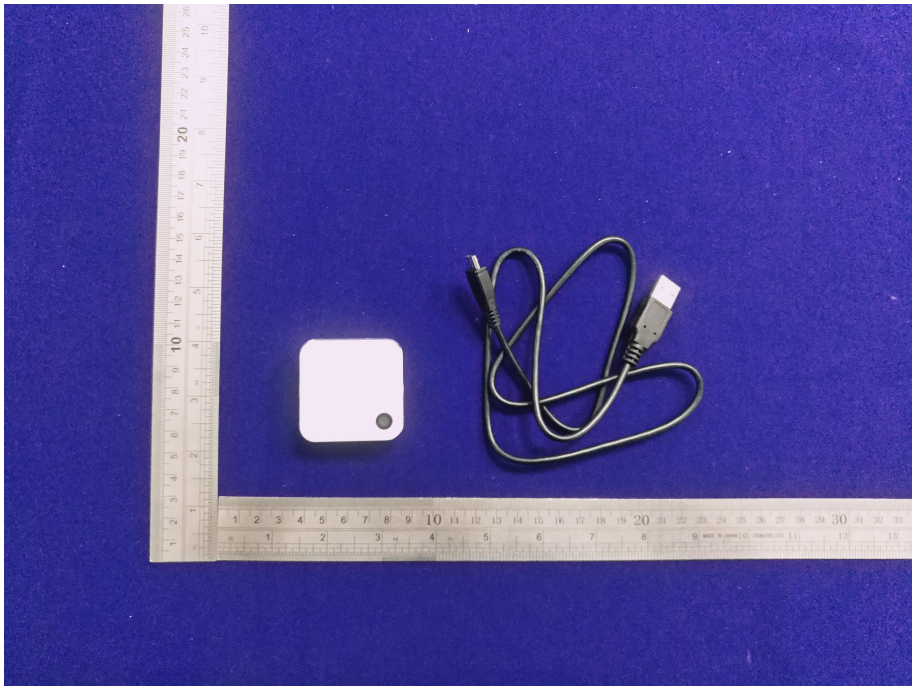
EXHIBIT A - LABEL

Label Information

Remark: Text is Black in color and is justified. Labels are printed in indelible ink on permanent adhesive backing or silk-screened onto the EUT or shall be affixed at a conspicuous location on the EUT. The 'CE' marking must be affixed to the EUT or to its data plate. Where this is not possible or not warranted on account of the nature of the apparatus, it must be affixed to the packaging, if any, and to the accompanying documents. The 'CE' marking must have a height of at least 5 mm. If the 'CE' marking is reduced or enlarged the proportions given in the above graduated drawing must be respected.

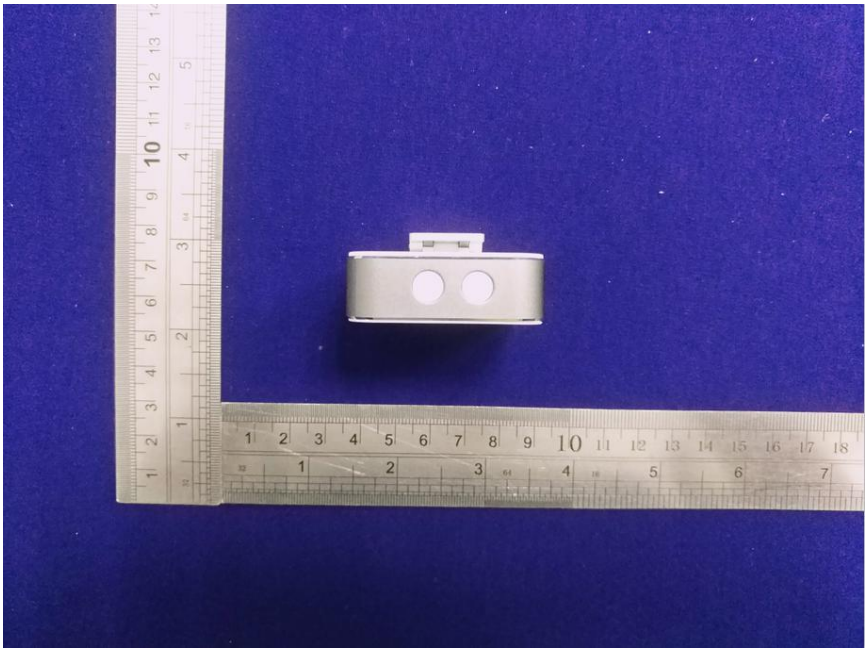
EXHIBIT B - EUT PHOTOS

EUT View 1



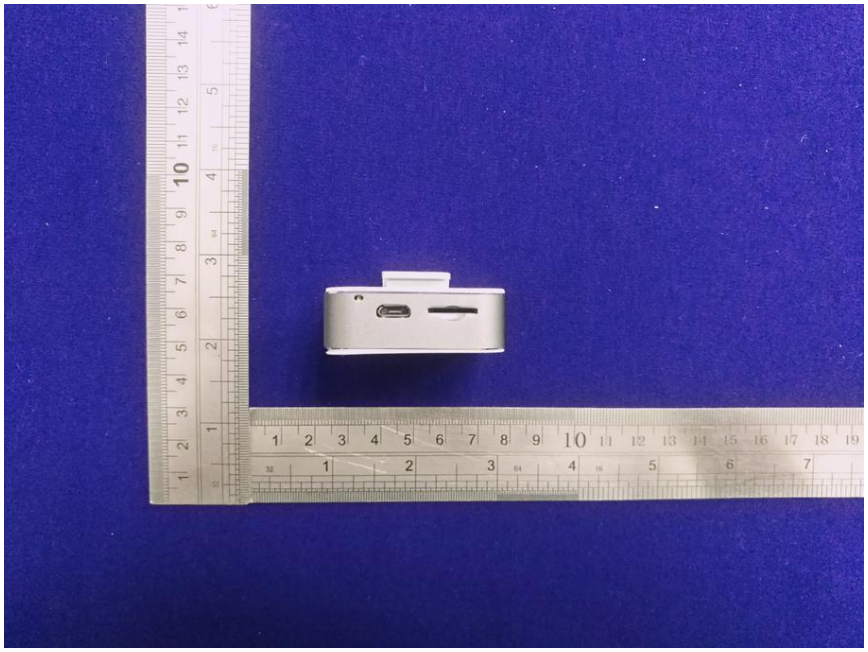
EUT View 2

EUT View 3



EUT View 4

EUT View 5



******* END OF REPORT *******