TEST REPORT

Reference No.	:	WTS17S0270212E
Applicant	:	Zhejiang Mylinks intelligence Technology Co., Ltd.
Address	:	2410. Building 2, YaZhong Road, Nanhu District, Jiaxing City, Zhejiang Province, China
Manufacturer	:	The same as above
Address	:	The same as above
Product Name	:	Wi-Fi Module
Model No.	:	M0E10XPX
Standards	:	EN 300 328 V1.9.1: 2015 EN 301 489-1 V1.9.2: 2011 EN 301 489-17 V2.2.1: 2012 EN 62311:2008
Date of Receipt sample	:	Feb. 08, 2017
Date of Test	:	Feb. 09 – Mar. 17, 2017
Date of Issue	:	Mar. 20, 2017
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
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Tested by:

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2 Laboratories Introduction

Waltek Services Test Group Ltd is a professional third-party testing and certification organization with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by CNAS (China National Accreditation Service for Conformity Assessment) AQSIQ, CMA and IECEE for CBTL. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CPSC(Consumer Product Safety Commission), CEC(California energy efficiency), IC(Industry Canada) and ELI(Efficient Lighting Initiative). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as UL, Intertek(ETL-SEMKO), CSA, TÜV Rheinland, TÜV SÜD, etc.

Waltek Services Test Group Ltd. is one of the largest and the most comprehensive third party testing organizations in China, our headquarter located in Shenzhen and have branches in Foshan, Dongguan, Zhongshan, Suzhou,Ningbo and Hong Kong, Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), reliablity and energy performance, Chemical test. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

3 Contents

4 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS17S0270212E	Feb. 08, 2017	Feb. 09 – Mar. 17, 2017	Mar. 20, 2017	original	-	Valid

5 General Information

5.1 General Description of E.U.T.

Product Name:	Wi-Fi Module
Model No.:	M0E10XPX
Model Description:	N/A
Wi-Fi:	2.4G-802.11b/g/n HT20
Hardware Version:	V1.0.1
Software Version:	V2.0.018

5.2 Details of E.U.T.

Operation Frequency:	802.11b/g/n HT20: 2412-2472MHz
Max. RF output power:	9.37dBm
Type of Modulation:	DSSS, OFDM
Antenna installation:	PCB printed antenna
Antenna Gain:	2.0dBi
Technical Data:	PCB Power: DC 3.3V

5.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462	12	2467
13	2472	14	-	15	-	16	-

5.4 Additional Information

a) The type of modulation used by the equipment:
☐FHSS (for Basic Bluetooth) ☒other forms of modulation
b) In case of FHSS modulation:
☐In case of non-Adaptive Frequency Hopping equipment:
The number of Hopping Frequencies:
☐In case of Adaptive Frequency Hopping Equipment:
The maximum number of Hopping Frequencies: *The minimum number of Hopping Frequencies:*
☐*The (average) Dwell Time: ___maximum*
c) Adaptive / non-adaptive equipment:
☐non-adaptive Equipment ☒adaptive Equipment without the possibility to switch to a non-adaptive mode ☐adaptive Equipment which can also operate in a non-adaptive mode
d) In case of adaptive equipment:
The Channel Occupancy Time implemented by the equipment:
☐The equipment has implemented an LBT based DAA mechanism
☐In case of equipment using modulation different from FHSS:
☐The equipment is Frame Based equipment ☒The equipment is Load Based equipment ☐The equipment can switch dynamically between Frame Based and Load Based equipment
The CCA time implemented by the equipment: ..... µs
☐The equipment has implemented an non-LBT based DAA mechanism
☐The equipment can operate in more than one adaptive mode
e) In case of non-adaptive Equipment:
The maximum RF Output Power (e.i.r.p.):
The maximum (corresponding) Duty Cycle:
Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared): ……
f) The worst case operational mode for each of the following tests:
☒RF Output Power: 802.11b
☒Power Spectral Density: 802.11b
☐Duty cycle, Tx-Sequence, Tx-gap
☐Accumulated Transmit time, Frequency Occupation & Hopping Sequence (only for FHSS equipment):
☐Hopping Frequency Separation (only for FHSS equipment):
☐Medium Utilization:
☐Adaptivity & Receiver Blocking:
☒Transmitter unwanted emissions in the OOB domain: 802.11n (HT20)
☒Transmitter unwanted emissions in the spurious domain: 802.11g
☒Receiver spurious emissions : 802.11b
g) The different transmit operating modes (tick all that apply):
☒Operating mode 1: Single Antenna Equipment
☒Equipment with only one antenna
☐Equipment with two diversity antennas but only one antenna active at any moment in time
☐Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only One antenna is used (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)
☐Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming
☐Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)
☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
NOTE 1: Add more lines if more channel bandwidths are supported.

☐Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming
☐Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)
☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
☐High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
NOTE 2: Add more lines if more channel bandwidths are supported.
h) In case of Smart Antenna Systems:
The number of Receive chains:
The number of Transmit chains:
☐symmetrical power distribution
☐asymmetrical power distribution
In case of beam forming, the maximum (additional) beam forming gain:
NOTE: The additional beam forming gain does not include the basic gain of a single antenna.
i) Operating Frequency Range(s) of the equipment:
Operating Frequency Range 1: *2412 MHz to 2472 MHz*
Operating Frequency Range 2:
NOTE: Add more lines if more Frequency Ranges are supported.
j) Nominal Channel Bandwidth(s):
Nominal Channel Bandwidth 1: *19.77MHz(802.11n20) Max.*
Nominal Channel Bandwidth 2:
NOTE: Add more lines if more channel bandwidths are supported.
k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):
☒Stand-alone
☐Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)
☐Plug-in radio device (Equipment intended for a variety of host systems)
☐Other
l) The normal and the extreme operating conditions that apply to the equipment:
Refer to section 8
m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p. levels:
Antenna Type:
☒Integral Antenna (information to be provided in case of conducted measurements)
Antenna Gain: 2.0 dBi
If applicable, additional beamforming gain (excluding basic antenna gain):
☐Temporary RF connector provided
☐No temporary RF connector provided
☐Dedicated Antennas (equipment with antenna connector)
☐Single power level with corresponding antenna(s)
☐Multiple power settings and corresponding antenna(s)
Number of different Power Levels:
Power Level 1:
Power Level 2:
Power Level 3:
NOTE 1: Add more lines in case the equipment has more power levels.
NOTE 2: These power levels are conducted power levels (at antenna connector).
For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable
Power Level 1:
Number of antenna assemblies provided for this power level:

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

NOTE 3: Add more rows in case more antenna assemblies are supported for this power level.
Power Level 2:

Number of antenna assemblies provided for this power level:

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

NOTE 4: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 3:

Number of antenna assemblies provided for this power level:

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

NOTE 5: Add more rows in case more antenna assemblies are supported for this power level.

n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:

Refer to section 8.

o) Describe the test modes available which can facilitate testing:

……

p) The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], IEEE 802.15.4™ [i.4], proprietary, etc.):……

q) If applicable, the statistical analysis referred to in clause 5.4.1 q)

(to be provided as separate attachment)

r) If applicable, the statistical analysis referred to in clause 5.4.1 r)

(to be provided as separate attachment)

s) Geo-location capability supported by the equipment:

☐Yes

☐The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user

☒No

t) Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or clause 4.3.2.11.3):

……...

5.5 Test Facility

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

- **IC – Registration No.: 7760A**

  Waltek Services (Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A, October 15, 2015

- **FCC Test Site 1# – Registration No.: 880581**

  Waltek Services (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, April 29, 2014.

- **FCC Test Site 2# – Registration No.: 328995**

  Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 328995, December 3, 2014.

6 Test Summary

R&TTE RF PART		
Test	**Applicable Standard**	**Result**
RF output power	EN 300 328	PASS
Duty Cycle, Tx-sequence, Tx-gap	EN 300 328	N/A
Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	EN 300 328	N/A
Hopping Frequency Separation	EN 300 328	N/A
Medium Utilisation (MU) factor	EN 300 328	N/A
Adaptivity (Adaptive Frequency Hopping)	EN 300 328	N/A
Receiver Blocking	EN 300 328	N/A
Occupied Channel Bandwidth	EN 300 328	PASS
Maximum power spectral density	EN 300 328	PASS
Transmitter unwanted emissions in the out-of-band domain	EN 300 328	PASS
Transmitter unwanted emissions in the spurious domain	EN 300 328	PASS
Receiver spurious emissions	EN 300 328	PASS
Geo-location capability	EN 300 328	N/A
R&TTE HEALTH PART		
Test	**Applicable Standard**	**Result**
RF Exposure	EN 62311	PASS
R&TTE EMC PART		
Test	**Applicable Standard**	**Result**
Conducted Emissions	EN 301 489-1/17	PASS
Radiated Emissions	EN 301 489-1/17	PASS
Harmonic Current Emissions	EN 301 489-1/17	N/A
Voltage Fluctuations and Flicker	EN 301 489-1/17	PASS
Electrostatic Discharge(ESD)	EN 301 489-1/17	PASS
Radiated Immunity (R/S)	EN 301 489-1/17	PASS

Electrical Fast Transients (EFT)	EN 301 489-1/17	PASS
Surge Immunity	EN 301 489-1/17	PASS
Conducted Immunity (C/S)	EN 301 489-1/17	PASS
Voltage Dips and Interruptions	EN 301 489-1/17	PASS
Remark: PASS: Test item meets the requirement N/A: Not Applicable		

7 Equipment Used during Test

7.1 Equipments List

RF Part						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 22,2016	Sep.21.,2017
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	Sep. 12,2016	Sep.11.,2017
3.	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	Aug. 14,2016	Aug. 13,2017
4.	EXA Signal Analyzer	Keysight	N9010A	MY50520207 526B25MPB W7X	Apr. 29,2016	Apr. 28,2017
5.	ESG VECTOR SIGNAL GENERATOR	Keysight	4438C	MY45092536 005506601U NJ	Apr. 13,2016	Apr. 12,2017
6.	EXG Analog Signal Generator	Keysight	N5171B	MY53050845 503	Sep. 12,2016	Sep.11.,2017
7.	USB Wideband Power Sensor	Keysight	U2021XA	SG5440003	Apr. 29,2016	Apr. 28,2017
8.	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.09,2016	Apr.08,2017
9.	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep. 12,2016	Sep.11.,2017
10.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.09,2016	Apr.08,2017
11.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	669	Apr.09,2016	Apr.08,2017
12.	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr. 13,2016	Apr. 12,2017
13.	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	Apr. 13,2016	Apr. 12,2017
14.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Sep.15,2016	Sep.14,2017
ETSI Test software: Software name: ETSI family Software version: V1.9.1						

EMC Part						
Conducted Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	EMI Test Receiver	R&S	ESCI	101155	Sep. 12,2016	Sep. 11,2017
2	LISN	SCHWARZBECK	NSLK 8128	8128-289	Sep. 12,2016	Sep. 11,2017
3	Limiter	York	MTS-IMP-136	261115-001-0024	Sep. 12,2016	Sep. 11,2017
4	Cable	LARGE	RF300	-	Sep. 12,2016	Sep. 11,2017
3m Semi-anechoic Chamber for Radiation Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP	100091	Apr.29,2016	Apr.28,2017
2	Amplifier	Agilent	8447D	2944A10178	Jan.12, 2017	Jan.11, 2018
3	Active Loop Antenna	Beijing Dazhi	ZN30900A	0703	Oct.17,2016	Oct.16,2017
4	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.09,2016	Apr.09,2017
5	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep. 12,2016	Sep. 11,2017
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.09,2016	Apr.09,2017
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr.13,2016	Apr.12,2017
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	Apr.13,2016	Apr.12,2017
Harmonic/ Flicker						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Digital Power Analyzer	SCHAFFNER	CCN 1000-1	72625	Apr.13,2016	Apr.12,2017
2	Power Source	SCHAFFNER	NSG 1007	58477	Apr.13,2016	Apr.12,2017
Electrostatic Discharge						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Electrostatic Discharge Simulator	HAEFELY	PESD 1610	20011086	May 31,2016	May 30,2017
Conducted Immunity						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	RF Generator	TESEQ	NSG4070	25781	Sep. 12,2016	Sep. 11,2017
2	CDN M-Type	TESEQ	CDN M016	25112	Sep. 12,2016	Sep. 11,2017
3	EM-Clamp	TESEQ	KEMZ 801	25453	Sep. 12,2016	Sep. 11,2017
4	Attenuator 6dB	TESEQ	ATN6050	25365	Sep. 12,2016	Sep. 11,2017
Surge, EFT, Voltage dips and Interruption						

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	All Modules Generator	SCHAFFNER	6150	34579	Sep. 22,2016	Sep. 21,2017
2	EMS Modules Generator	EMC PARTNER TRANSIENT	2000	494	Sep. 22,2016	Sep. 21,2017
3	Capacitive Coupling Clamp	SCHAFFNER	CDN 8014	25311	Sep. 22,2016	Sep. 21,2017
4	Signal and Data Line Coupling Network	SCHAFFNER	CDN 117	25627	Sep. 22,2016	Sep. 21,2017
Radio-frequency electromagnetic fields						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Signal Generater	R&S	SMB100A	105942	Sep. 12,2016	Sep. 11,2017
2	RF Power Amplifier	BONN Elektronik	BLWA0830-160/100/40D	128740	Sep. 12,2016	Sep. 11,2017
3	Gestockte Breitband (S tacked) Log.-per.Antenna	SCHWARZBECK	STLP9128D	043	Sep. 12,2016	Sep. 11,2017
4	Power Meter	R&S	NRP2	102031	Sep. 12,2016	Sep. 11,2017
3m Semi-anechoic Chamber for Radiation(TDK)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	Apr.13,2016	Apr.12,2017
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Apr.09,2016	Apr.08,2017
3	Amplifier	ANRITSU	MH648A	M43381	Apr.13,2016	Apr.12,2017
4	Cable	HUBER+SUHNER	CBL2	525178	Apr.13,2016	Apr.12,2017

7.2 Description of Support Units

Equipment	Description	Model No.	Series No.
LED DOWN LIGHT	Zhejiang Mylinks intelligence Technology Co., Ltd.	JDL012-BLE01-F	/

7.3 Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5dB
Power Spectral Density, conducted	±3dB
Unwanted Emissions, conducted	±3dB
All emissions, radiated	±6dB
Time	±5%
Duty Cycle	±5%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conduction disturbance(150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~6GHz)	±5.47dB

7.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

8 RF Requirements

1. Normal Test Conditions:

Temperature: +15 °C to +35 °C

Relative humidity: 20 % to 75 %

2. Extreme Test Conditions:

Extreme Temperature:

For tests at extreme temperatures, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.

Test Conditions	Normal	Lower	Upper
Temperature (℃)	20	-20	70

3. Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting(802.11b/g/n20)	2412MHz	2442MHz	2472MHz
Receiving(802.11b/g/n20)	2412MHz	2442MHz	2472MHz

8.1 RF Output power

8.1.1 Definition

The RF output power is defined as the mean equivalent isotropically radiated power (e.i.r.p.) of the equipment during a transmission burst.

8.1.2 Limit

The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20dBm.
The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. See clause 5.3.1 m). For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.
This limit shall apply for any combination of power level and intended antenna assembly.

8.1.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.1.4 Test Procedure

Step 1:
• Use a fast power sensor suitable for 2.4 GHz and capable of minimum 1 MS/s.
• Use the following settings:
- Sample speed 1 MS/s or faster.
- The samples shall represent the RMS power of the signal.
- Measurement duration: For non-adaptive equipment: equal to the observation period defined in clause 4.3.1.3.2 or clause 4.3.2.4.2. 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 500 ns.
- 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

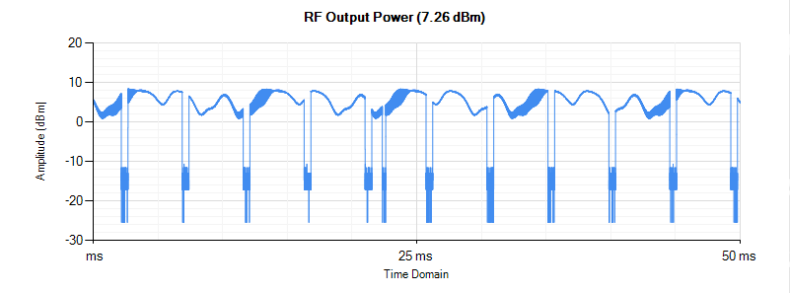
• This value, which shall comply with the limit given in clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.

8.1.5 Measurement Record

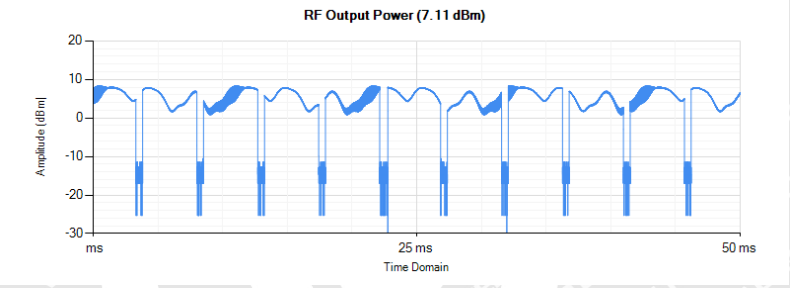
Modulation	Test conditions Temperatures	EIRP (dBm)		
		Low Channel	Middle Channel	High Channel
802.11b	Normal	9.22	9.09	9.19
	Lower	9.24	9.10	9.21
	Upper	9.26	9.11	9.23
802.11g	Normal	9.06	9.14	9.14
	Lower	9.09	9.15	9.16
	Upper	9.12	9.17	9.19
802.11n(HT20)	Normal	9.27	9.32	9.24
	Lower	9.29	9.34	9.25
	Upper	9.31	**9.37**	9.28
Limit		≤100mW (20dBm)		
Remark: P = A + G + Y,G=2dBi,x=100%				

Test Plots

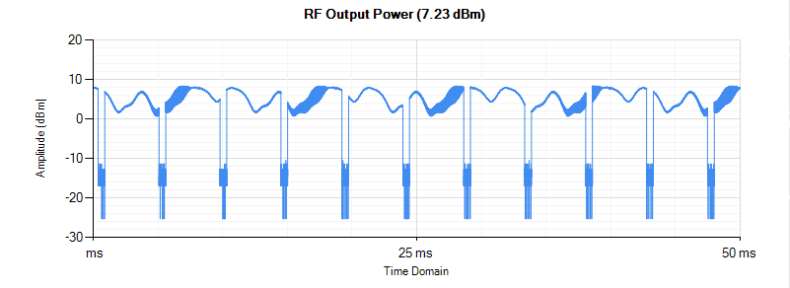
802.11b Low Channel



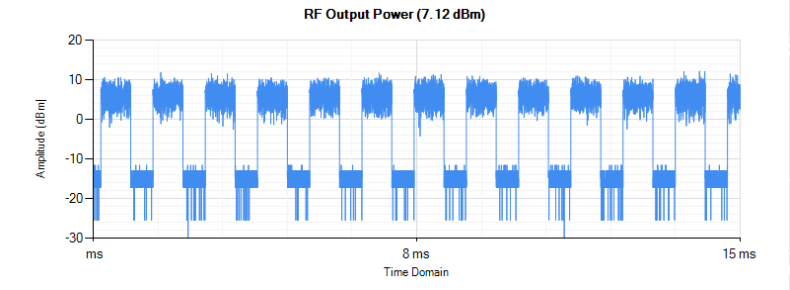
802.11b Middle Channel



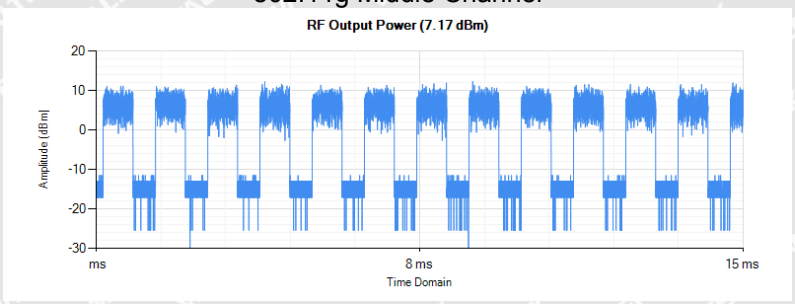
802.11b High Channel



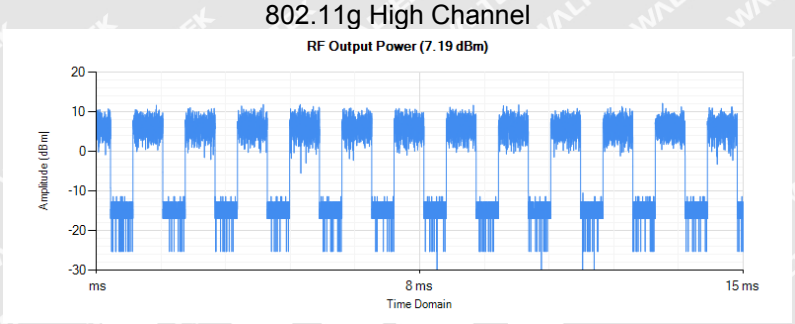
802.11g Low Channel



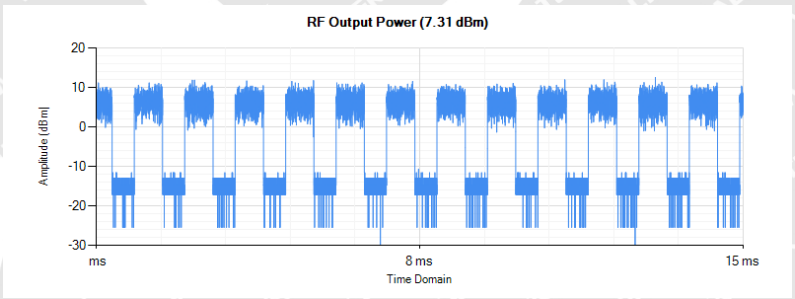
802.11g Middle Channel



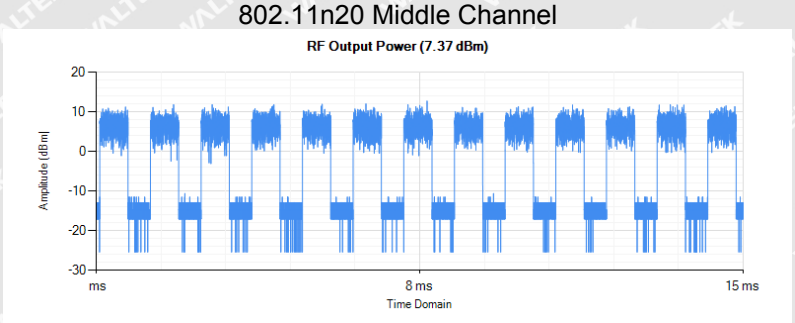
802.11g High Channel



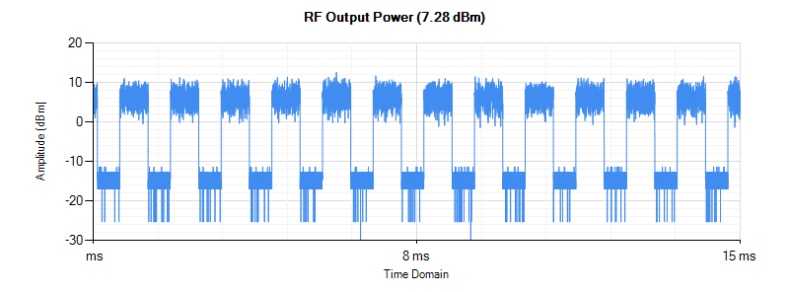
802.11n20 Low Channel



802.11n20 Middle Channel



802.11n20 High Channel



8.2 Power Spectral Density

8.2.1 Definition

The Power Spectral Density is the mean equivalent isotropically radiated power (e.i.r.p.) spectral density in a 1 MHz bandwidth during a transmission burst.

8.2.2 Limit

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

8.2.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.2.4 Test Procedure

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: 10 s; the sweep time may be increased further until a value where the sweep time has no impact on the RMS value of the signal

For non-continuous signals, wait for the trace to stabilize.

Save the data (trace data) set to a file.

Step 2:

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

Step 3:

Add up the values for power for all the samples in the file using the formula below.

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

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

Step 4:

Normalize the individual values for power (in dBm) so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.3.2 and save the corrected data. The following formulas can be used:

$$C_{Corr} = P_{Sum} - P_{e.i.r.p.}$$

$$P_{Samplecorr}(n) = P_{Sample}(n) - C_{Corr}$$

with 'n' being the actual sample number

Step 5:

Starting from the first sample *PSamplecorr(n)* (lowest frequency), add up the power (in mW) of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to sample #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 one sample and repeat the procedure in step 5 (i.e. sample #2 to sample #101).

Step 7:

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

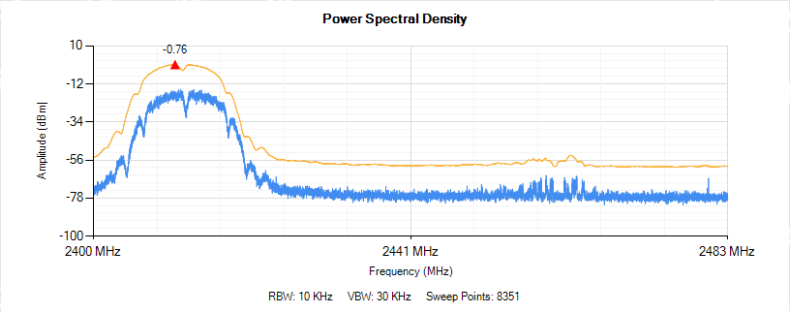
From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.3.3, shall be recorded in the test report.

8.2.5 Measurement Record

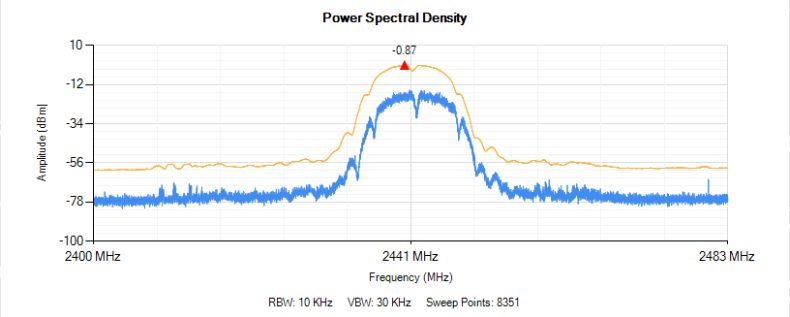
Modulation	Test conditions	Maximum e.i.r.p. Spectral Density (dBm/MHz)		
		Low Channel	Middle Channel	High Channel
802.11b	Normal	-0.76	-0.87	-0.72
802.11g	Normal	-4.42	-4.27	-4.48
802.11n20	Normal	-4.43	-4.33	-4.86
Limit		≤10dBm/MHz		

Test Plots

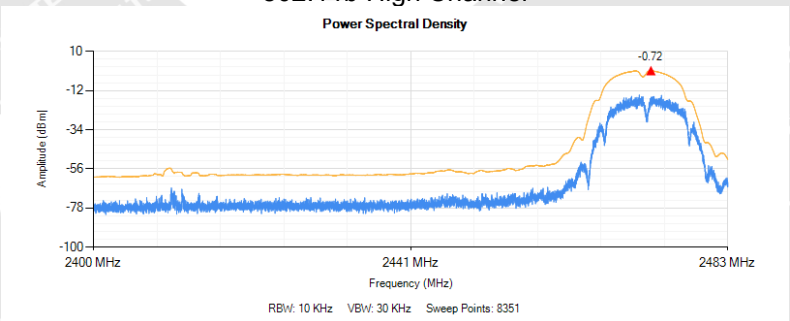
802.11b Low Channel



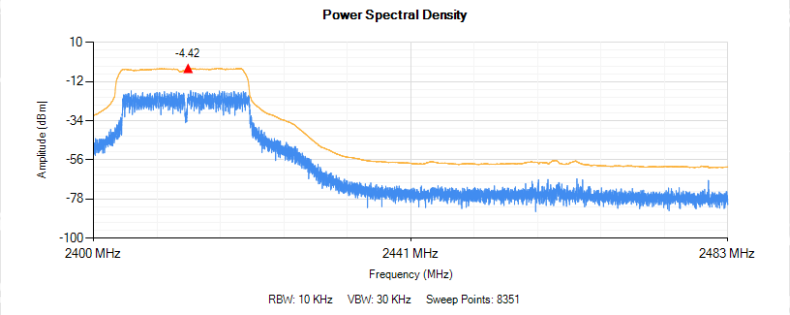
802.11b Middle Channel



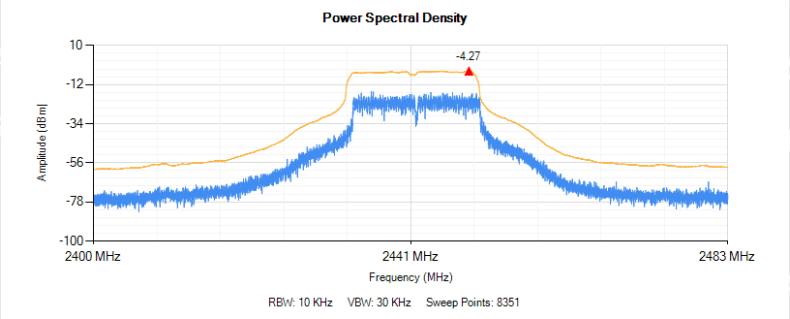
802.11b High Channel



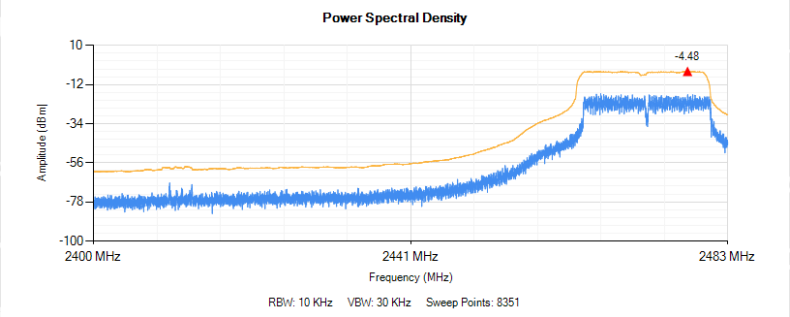
802.11g Low Channel



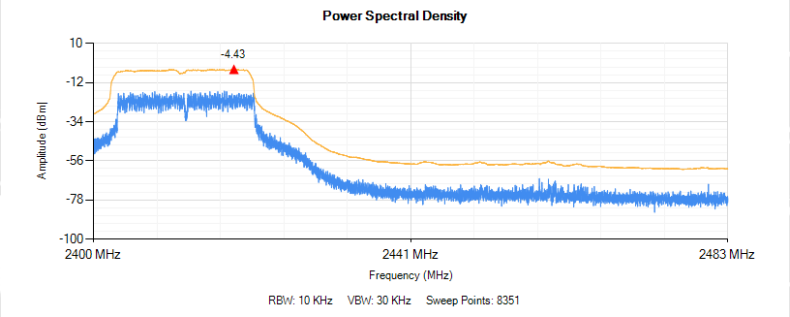
802.11g Middle Channel



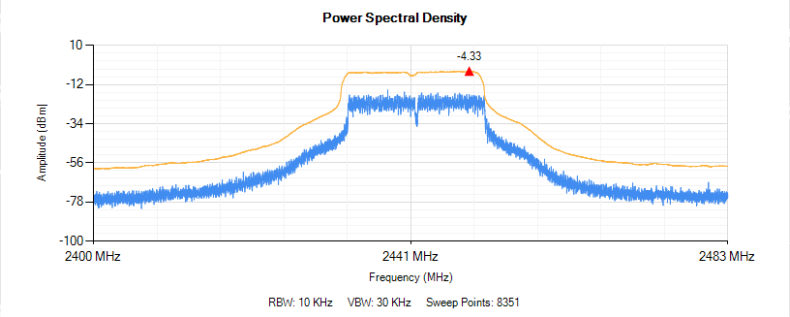
802.11g High Channel



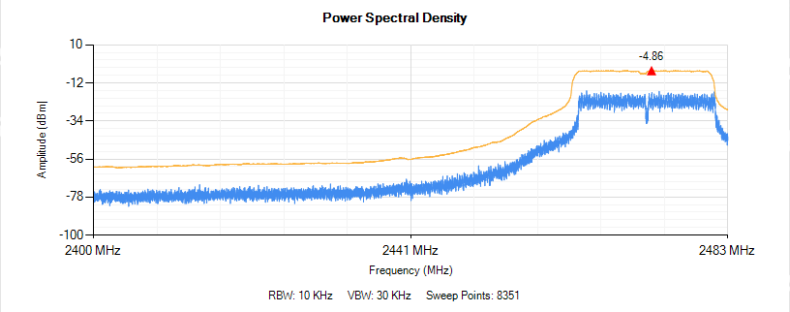
802.11n20 Low Channel



802.11n20 Middle Channel



802.11n20 High Channel



8.3 Adaptivity(adaptive equipment using modulations other than FHSS)and Receiver Blocking

8.3.1 Adaptivity Definition

LBT based Detect and Avoid is a mechanism by which equipment using wide band modulations other than FHSS,avoids transmissions in a channel in the presence of other transmissions in that channel.

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].

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.

8.3.2 Adaptivity Limit

Refer to section 4.3.2.6.3.2 of EN 300 328 V1.9.1

8.3.3 Receiver Blocking Definition

Receiver blocking is a measure of the capability of the adaptivity mechanism to operate as intended (see clause 4.3.2.6) in the presence of an unwanted signal (blocking signal) on frequencies other than those of the operating channel and the adjacent channels.

8.3.4 Receiver Blocking Limit

Adaptive equipment using wide band modulations other than FHSS, shall comply with the requirements defined in clause 4.3.2.6.2 (non-LBT based DAA) or clause 4.3.2.6.3 (LBT based DAA) in the presence of a blocking signal with characteristics as provided in table 6..

Table 6: Receiver Blocking parameters

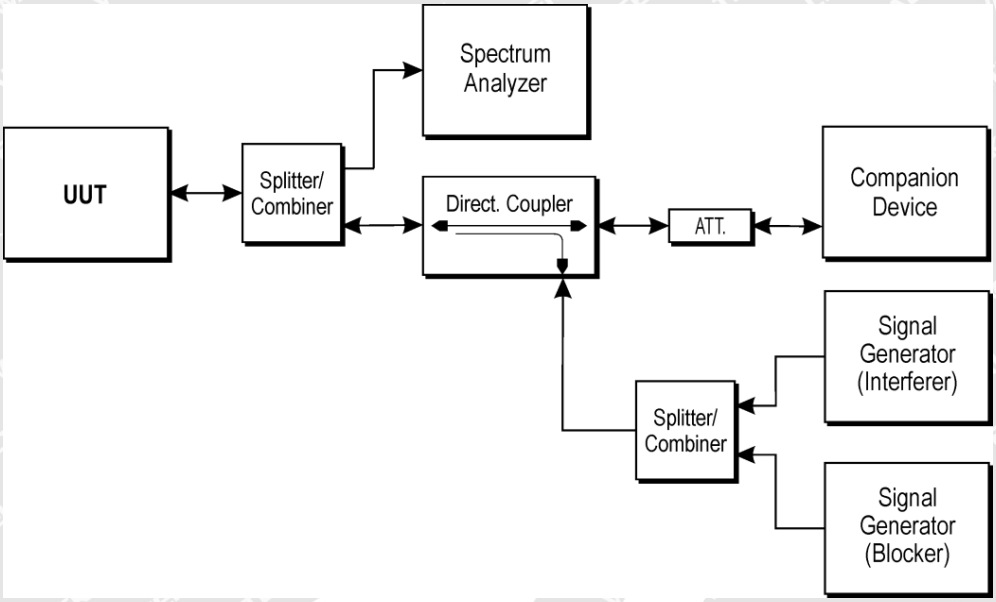
Equipment Type (LBT / non- LBT)	Wanted signal mean power from companion device	Blocking signal frequency [MHz]	Blocking signal power [dBm]	Type of interfering signal
LBT	sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35	CW
Non-LBT	-30 dBm			
NOTE 1: The highest blocking frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest blocking frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.3.7.1.				
NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.				

The conformance tests for this requirement are part of the conformance tests defined for adaptivity in clause 5.3.7 and more specifically clause 5.3.7.2.1.2 or clause 5.3.7.2.1.3.

8.3.5 EUT Operation Condition

The EUT was programmed to be in transmitting mode.

8.3.6 Test Procedure



8.3.7 Measurement Record

The EIRP is less than 10dBm, so the test not applicable.

8.4 Occupied Channel Bandwidth

8.4.1 Definition

The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal.

8.4.2 Limit

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

8.4.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.4.4 Test Procedure

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 for frequency hopping equipment: Lowest frequency separation that is used within the hopping sequence
- Frequency Span for other types of equipment: 2 × Nominal Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep time: 1 s

Step 2:

Wait for the trace to stabilize.

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 EUT.

This value shall be recorded.

NOTE: Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement.

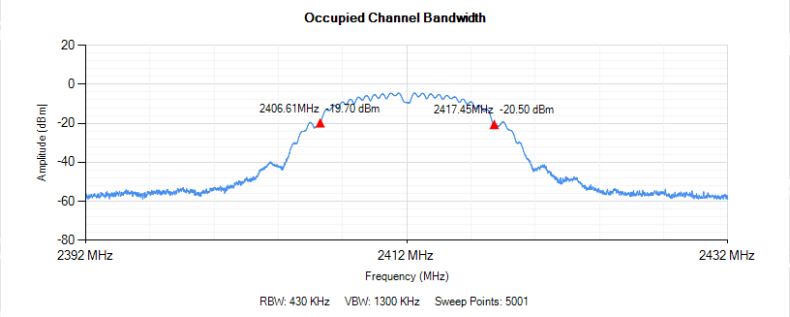
8.4.5 Measurement Record

Modulation	Frequency (MHz)	Frequency Range (MHz)		Occupied Channel (MHz)
802.11b	Low	2406.610	/	10.84
	High	/	2477.430	10.86
802.11g	Low	2402.895	/	18.25
	High	/	2481.270	18.64
802.11n20	Low	2402.345	/	19.43
	High	/	2481.875	19.77

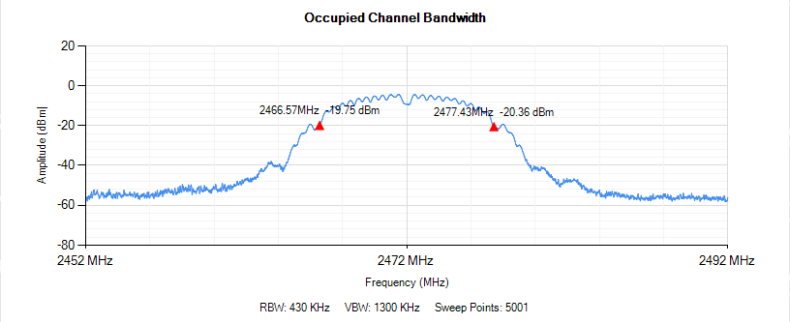
Test Plot

802.11b:

Low Channel

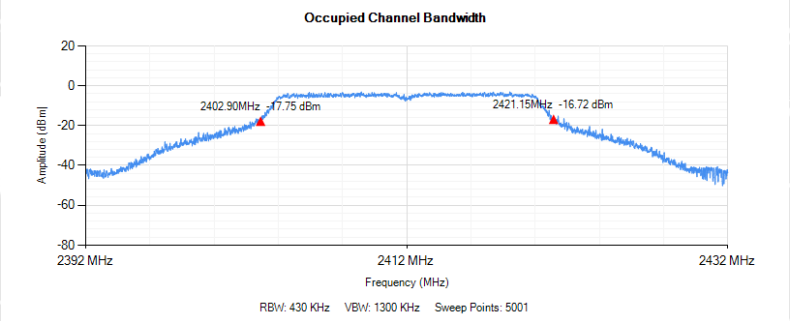


High Channel

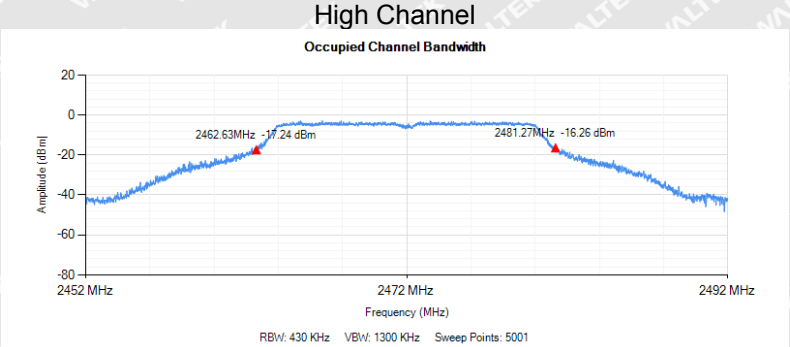


802.11g:

Low Channel

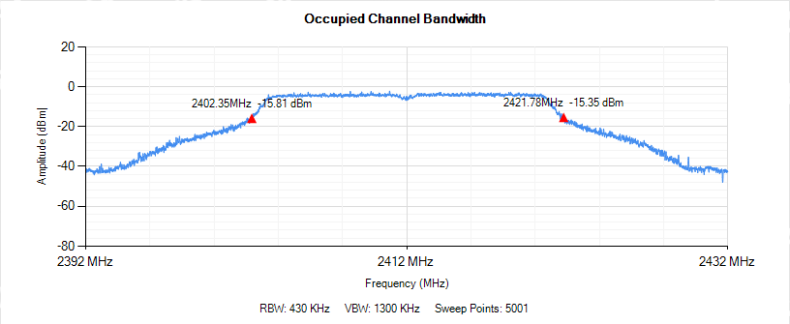


High Channel

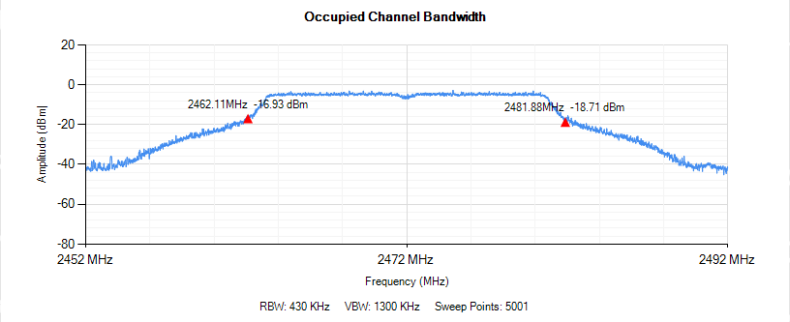


802.11n20:

Low Channel



High Channel



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

8.5.1 Definition

Transmitter unwanted emissions in the out-of-band domain are emissions when the equipment is in Transmit mode, on frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious.

8.5.2 Limit

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

NOTE: Within the 2 400 MHz to 2 483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.2.7.

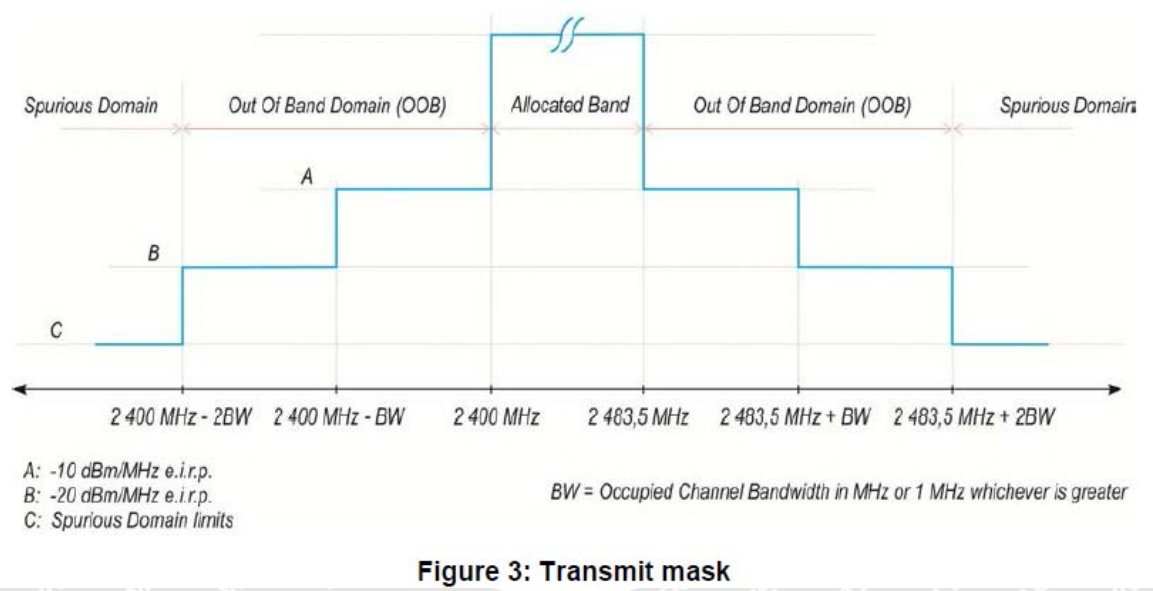


Figure 3: Transmit mask

8.5.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.5.4 Test Procedure

The applicable mask is defined by the measurement results from the tests performed under clause 5.3.8 (Occupied Channel Bandwidth).

The test procedure is further as described under clause 5.3.9.2.1.

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 Power option.

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: Max Hold

- Sweep Mode: Continuous

- Sweep Points: Sweep Time [s] / (1 µs) or 5 000 whichever is greater

- Trigger Mode: Video trigger

NOTE 1: In case video triggering is not possible, an external trigger source may be used.

- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

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 (which means this may partly overlap with the previous 1 MHz segment).

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 - BW + 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

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 (which means this may partly overlap with the previous 1 MHz segment).

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 figure 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.

• In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains.

The declared antenna assembly gain "G" in dBi for a single antenna shall be added to these results. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. Comparison with the applicable limits shall be done using any of the options given below:

- Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added. The additional beamforming gain "Y" in dB shall be added as well and the resulting values compared with the limits provided by the mask given in figure 1 or figure 3.

- Option 2: the limits provided by the mask given in figure 1 or figure 3 shall be reduced by

10 × log10(Ach) and the additional beamforming gain "Y" in dB. The results for each of the transmit chains shall be individually compared with these reduced limits.

NOTE 2: Ach refers to the number of active transmit chains.

It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.

8.5.5 Measurement Record

Condition: Normal

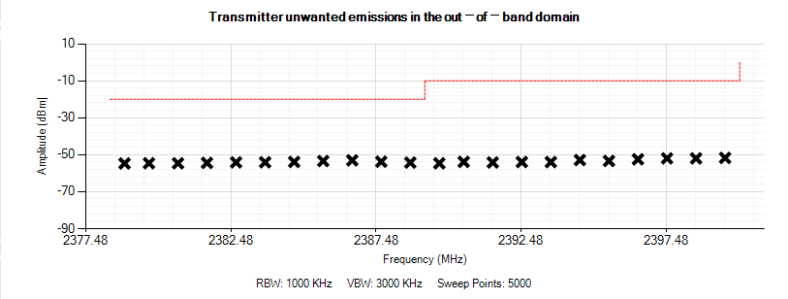
Mode	802.11b Low channel		Mode	802.11b High channel	
Frequency (MHz)	Level (dBm)	Limit (dBm)	Frequency (MHz)	Level (dBm)	Limit (dBm)
2399.5	-51.709	-10	2484	-53.34	-10
2398.5	-51.969	-10	2485	-54.13	-10
2397.5	-51.959	-10	2486	-55.6	-10
2396.5	-52.469	-10	2487	-55.89	-10
2395.5	-53.349	-10	2488	-55.6	-10
2394.5	-52.859	-10	2489	-55.54	-10
2393.5	-53.979	-10	2490	-55.93	-10
2392.5	-53.949	-10	2491	-56.21	-10
2391.5	-54.169	-10	2492	-56.51	-10
2390.5	-53.839	-10	2493	-56.34	-10
2389.5	-54.619	-10	2494	-56.85	-10
2388.5	-54.249	-10	2495	-57.19	-10
2387.5	-53.739	-10	2496	-56.7	-10
2386.5	-53.019	-10	2497	-56.43	-10
2386.17	-53.399	-10	2497.23	-56.56	-10
2385.17	-53.889	-20	2498.23	-57.1	-20
2384.17	-54.079	-20	2499.23	-57.45	-20
2383.17	-54.129	-20	2500.23	-57.5	-20
2382.17	-54.389	-20	2501.23	-57.55	-20
2381.17	-54.619	-20	2502.23	-57.6	-20
2380.17	-54.579	-20	2503.23	-57.57	-20
2379.17	-54.709	-20	2504.23	-57.59	-20

Mode	802.11g Low channel		Mode	802.11g High channel	
Frequency (MHz)	Level (dBm)	Limit (dBm)	Frequency (MHz)	Level (dBm)	Limit (dBm)
2399.5	-24.799	-10	2484	-27.21	-10
2398.5	-25.989	-10	2485	-28.49	-10
2397.5	-28.269	-10	2486	-30.28	-10
2396.5	-30.919	-10	2487	-32.98	-10
2395.5	-34.909	-10	2488	-36.24	-10
2394.5	-37.729	-10	2489	-40.33	-10
2393.5	-39.919	-10	2490	-43.04	-10
2392.5	-41.399	-10	2491	-45.22	-10
2391.5	-42.819	-10	2492	-46.57	-10
2390.5	-43.989	-10	2493	-47.84	-10
2389.5	-45.399	-10	2494	-48.7	-10
2388.5	-46.889	-10	2495	-49.58	-10
2387.5	-47.779	-10	2496	-50.26	-10
2386.5	-48.409	-10	2497	-50.86	-10
2385.5	-48.949	-10	2498	-51.62	-10
2384.5	-49.449	-10	2499	-52.32	-10
2383.5	-49.869	-10	2500	-52.75	-10
2382.5	-50.169	-10	2501	-53.18	-10
2382.25	-50.159	-10	2501.64	-53.66	-10
2381.25	-50.479	-20	2502.64	-53.93	-20
2380.25	-50.169	-20	2503.64	-53.62	-20
2379.25	-50.219	-20	2504.64	-53.51	-20
2378.25	-50.819	-20	2505.64	-54.23	-20
2377.25	-51.469	-20	2506.64	-54.63	-20
2376.25	-51.839	-20	2507.64	-54.91	-20
2375.25	-52.009	-20	2508.64	-55.04	-20
2374.25	-52.169	-20	2509.64	-55.09	-20
2373.25	-52.299	-20	2510.64	-55.11	-20
2372.25	-52.369	-20	2511.64	-55.2	-20
2371.25	-52.459	-20	2512.64	-55.17	-20
2370.25	-52.539	-20	2513.64	-55.2	-20
2369.25	-52.639	-20	2514.64	-55.23	-20
2368.25	-52.779	-20	2515.64	-55.21	-20
2367.25	-52.789	-20	2516.64	-55.21	-20
2366.25	-52.809	-20	2517.64	-55.23	-20
2365.25	-52.859	-20	2518.64	-55.3	-20
2364.25	-52.949	-20	2519.64	-55.19	-20
2364	-52.969	-20	2520.28	-55.19	-20

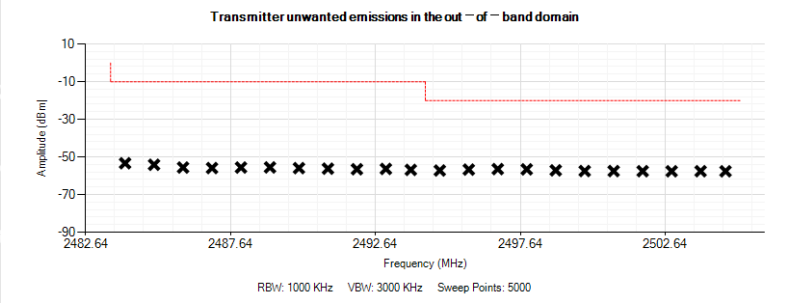
Mode	802.11n20 Low channel		Mode	802.11n20 High channel	
Frequency (MHz)	Level (dBm)	Limit (dBm)	Frequency (MHz)	Level (dBm)	Limit (dBm)
2399.5	-23.949	-10	2484	-25.72	-10
2398.5	-25.839	-10	2485	-27.97	-10
2397.5	-27.409	-10	2486	-29.8	-10
2396.5	-29.809	-10	2487	-32.47	-10
2395.5	-33.709	-10	2488	-35.76	-10
2394.5	-36.679	-10	2489	-39.6	-10
2393.5	-38.819	-10	2490	-42.69	-10
2392.5	-40.309	-10	2491	-44.72	-10
2391.5	-41.239	-10	2492	-46.17	-10
2390.5	-42.279	-10	2493	-47.12	-10
2389.5	-43.449	-10	2494	-48.27	-10
2388.5	-44.659	-10	2495	-48.75	-10
2387.5	-45.729	-10	2496	-49.66	-10
2386.5	-46.619	-10	2497	-50.26	-10
2385.5	-47.599	-10	2498	-50.84	-10
2384.5	-48.109	-10	2499	-51.32	-10
2383.5	-48.549	-10	2500	-51.97	-10
2382.5	-49.039	-10	2501	-52.49	-10
2381.5	-49.339	-10	2502	-52.94	-10
2381.07	-49.169	-10	2502.77	-53.05	-10
2380.07	-48.989	-20	2503.77	-52.67	-20
2379.07	-49.719	-20	2504.77	-53.29	-20
2378.07	-50.299	-20	2505.77	-53.99	-20
2377.07	-50.889	-20	2506.77	-54.36	-20
2376.07	-51.449	-20	2507.77	-54.77	-20
2375.07	-51.749	-20	2508.77	-54.93	-20
2374.07	-51.869	-20	2509.77	-55.02	-20
2373.07	-52.109	-20	2510.77	-55.15	-20
2372.07	-52.319	-20	2511.77	-55.14	-20
2371.07	-52.379	-20	2512.77	-55.18	-20
2370.07	-52.409	-20	2513.77	-55.16	-20
2369.07	-52.479	-20	2514.77	-55.26	-20
2368.07	-52.589	-20	2515.77	-55.25	-20
2367.07	-52.669	-20	2516.77	-55.26	-20
2366.07	-52.649	-20	2517.77	-55.24	-20
2365.07	-52.749	-20	2518.77	-55.18	-20
2364.07	-52.839	-20	2519.77	-55.18	-20
2363.07	-52.949	-20	2520.77	-55.22	-20
2362.07	-52.859	-20	2521.77	-55.25	-20
2361.64	-52.969	-20	2522.54	-55.32	-20

Test Plots

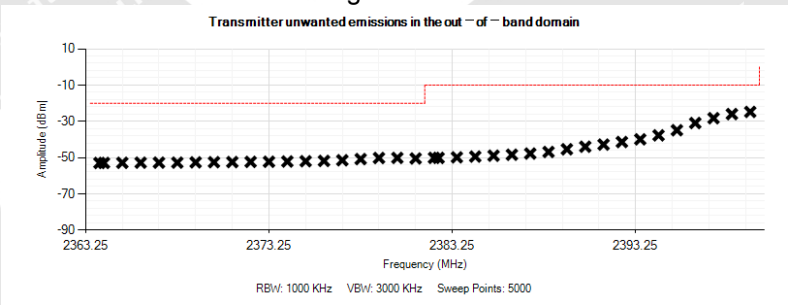
802.11b Low Channel



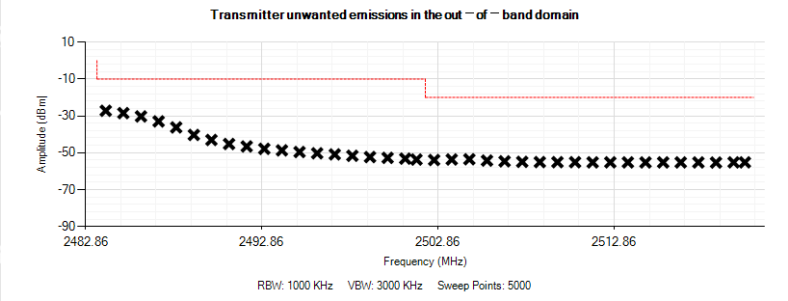
802.11b High Channel



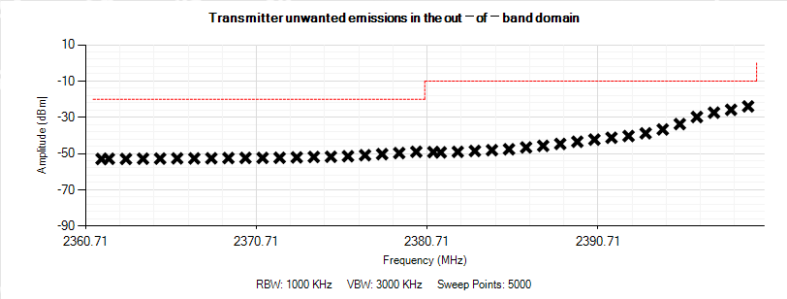
802.11g Low Channel



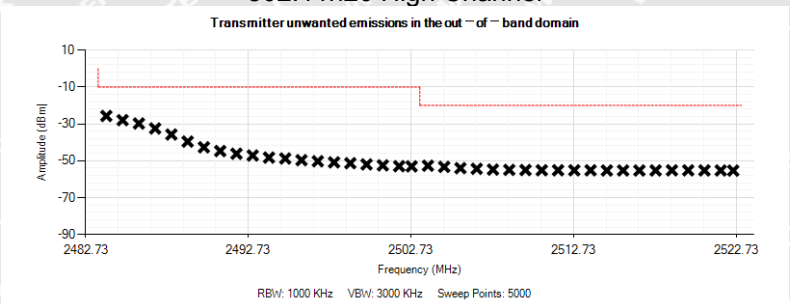
802.11g High Channel



802.11n20 Low Channel



802.11n20 High Channel



8.6 Transmitter unwanted emissions in the spurious domain

8.6.1 Definition

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

8.6.2 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 4.

NOTE: In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted) and to the emissions radiated by the cabinet. In case of integral antenna equipment (without temporary antenna connectors), these limits apply to emissions radiated by the equipment.

Table 4: Transmitter limits 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

8.6.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.6.4 Test Procedure

The test site as described in annex B and applicable measurement procedures as described in annex C shall be used.

The test procedure is further as described under clause 5.3.10.2.1

8.6.5 Measurement Record

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level	Result	
			Height	Polar	SG Level	Cable	Antenna Gain		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
802.11b low channel										
524.37	34.06	139	1.4	H	-63.29	0.16	0.00	-63.45	-54	-9.45
524.37	33.26	158	1.2	V	-65.24	0.16	0.00	-65.40	-54	-11.40
4824.00	50.26	239	1.8	H	-59.20	2.64	12.70	-49.14	-30	-19.14
4824.00	47.06	317	1.5	V	-61.13	2.64	12.70	-51.07	-30	-21.07
7236.00	45.09	182	1.0	H	-62.55	3.22	11.70	-54.07	-30	-24.07
7236.00	43.50	185	1.8	V	-64.02	3.22	11.70	-55.54	-30	-25.54
802.11b High channel										
524.37	33.35	242	1.5	H	-64.00	0.16	0.00	-64.16	-54	-10.16
524.37	33.33	254	1.7	V	-65.17	0.16	0.00	-65.33	-54	-11.33
4944.00	50.20	71	1.0	H	-58.83	2.40	11.60	-49.63	-30	-19.63
4944.00	47.35	11	1.5	V	-61.21	2.40	11.60	-52.01	-30	-22.01
7416.00	44.05	243	1.7	H	-62.49	3.28	11.90	-53.87	-30	-23.87
7416.00	43.18	75	1.6	V	-63.53	3.28	11.90	-54.91	-30	-24.91

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level	Result	
			Height	Polar	SG Level	Cable	Antenna Gain		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
802.11g low channel										
524.37	33.12	164	1.5	H	-64.23	0.16	0.00	-64.39	-54	-10.39
524.37	32.32	261	1.8	V	-66.18	0.16	0.00	-66.34	-54	-12.34
4824.00	50.29	169	1.9	H	-59.17	2.64	12.70	-49.11	-30	-19.11
4824.00	47.97	234	1.7	V	-60.22	2.64	12.70	-50.16	-30	-20.16
7236.00	46.53	346	1.2	H	-61.11	3.22	11.70	-52.63	-30	-22.63
7236.00	44.81	82	1.8	V	-62.71	3.22	11.70	-54.23	-30	-24.23
802.11g High channel										
524.37	32.68	66	1.8	H	-64.67	0.16	0.00	-64.83	-54	-10.83
524.37	34.22	274	1.5	V	-64.28	0.16	0.00	-64.44	-54	-10.44
4944.00	49.56	269	1.7	H	-59.47	2.40	11.60	-50.27	-30	-20.27
4944.00	46.93	246	1.0	V	-61.63	2.40	11.60	-52.43	-30	-22.43
7416.00	44.60	324	1.6	H	-61.94	3.28	11.90	-53.32	-30	-23.32
7416.00	43.73	44	1.4	V	-62.98	3.28	11.90	-54.36	-30	-24.36

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level	EN 300 328	
			Height	Polar	SG Level	Cable	Antenna Gain		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
802.11n20 low channel										
524.37	35.43	167	1.7	H	-61.92	0.16	0.00	-62.08	-54	-8.08
524.37	32.20	168	1.6	V	-66.30	0.16	0.00	-66.46	-54	-12.46
4824.00	50.11	225	2.0	H	-59.35	2.64	12.70	-49.29	-30	-19.29
4824.00	47.70	334	1.9	V	-60.49	2.64	12.70	-50.43	-30	-20.43
7236.00	43.88	15	1.2	H	-63.76	3.22	11.70	-55.28	-30	-25.28
7236.00	44.90	149	1.3	V	-62.62	3.22	11.70	-54.14	-30	-24.14
802.11n20 High channel										
524.37	34.60	98	1.4	H	-62.75	0.16	0.00	-62.91	-54	-8.91
524.37	34.32	129	1.1	V	-64.18	0.16	0.00	-64.34	-54	-10.34
4944.00	50.92	83	1.2	H	-58.11	2.40	11.60	-48.91	-30	-18.91
4944.00	45.90	293	1.9	V	-62.66	2.40	11.60	-53.46	-30	-23.46
7416.00	44.46	243	1.3	H	-62.08	3.28	11.90	-53.46	-30	-23.46
7416.00	44.35	214	1.6	V	-62.36	3.28	11.90	-53.74	-30	-23.74

8.7 Receiver spurious emissions

8.7.1 Definition

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode.

8.7.2 Limit

The spurious emissions of the receiver shall not exceed the values given in table 5.
NOTE: In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted) and to the emissions radiated by the cabinet. In case of integral antenna equipment (without temporary antenna connectors), these limits apply to emissions radiated by the equipment.

Table 5: 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

8.7.3 EUT Operation Condition

The EUT was programmed to be in continuously transmitting mode.

8.7.4 Test Procedure

The test site as described in annex B and applicable measurement procedures as described in annex C shall be used.
The test procedure is further as described under clause 5.3.11.2.1.

8.7.5 Measurement Record

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level	Result	
			Height	Polar	SG Level	Cable	Antenna Gain		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
802.11b low channel										
245.26	42.01	315	1.9	H	-67.70	0.15	0.00	-67.85	-57	-10.85
245.09	42.23	163	1.9	V	-64.76	0.15	0.00	-64.91	-57	-7.91
2334.06	39.41	261	1.7	H	-73.97	0.34	10.50	-63.81	-47	-16.81
2334.35	46.55	79	1.5	V	-66.08	0.34	10.50	-55.92	-47	-8.92
802.11b High channel										
245.26	41.48	34	1.3	H	-68.23	0.15	0.00	-68.38	-57	-11.38
245.09	41.20	352	1.9	V	-65.79	0.15	0.00	-65.94	-57	-8.94
2334.06	40.14	319	1.7	H	-73.24	0.34	10.50	-63.08	-47	-16.08
2334.35	47.35	167	1.8	V	-65.28	0.34	10.50	-55.12	-47	-8.12

Remark: only the worst case 802.11b mode is recorded.

9 Health Requirements

9.1 Limits

According to Council Recommendation: the criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation.

Reference levels for electric, magnetic and electromagnetic fields (0Hz to 300GHz, unperturbed RMS values)

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density Seq (W/m2)
0-1 Hz	-	3.2×10^{4}	4×10^{4}	-
1-8 Hz	10000	$3.2\times10^{4}/f^{2}$	$4\times10^{4}/f^{2}$	-
8-25 Hz	10000	4000/f	5000/f	-
0.025-0.8 kHz	250/f	4/f	5/f	-
0.8-3 kHz	250/f	5	6.25	-
3-150 kHz	87	5	6.25	-
0.15-1 MHz	87	0.73/f	0.92/f	-
1-10 MHz	$87/f^{1/2}$	0.73/f	0.92/f	-
10-400 MHz	28	0.073	0.095	2
400-2000 MHz	$1.375\ f^{1/2}$	$0.0037\ f^{1/2}$	$0.0046\ f^{1/2}$	f/200
2-300 GHz	61	0.16	0.2	10

Note:

1. f as indicated in the frequency range column.
2. For frequencies between 100 kHz and 10 GHz, Seq, E^2, H^2 and B^2 are to be averaged over any six-minute period.
3. For frequencies exceeding 10 GHz, Seq, E^2, H^2 and B^2 are to be averaged over any $68 / f^{1.05}$ minute period (f in GHz).

9.2 RF Exposure Evaluations

From Council Recommendation 1999/519/EC table 2, the maximum power density is 10 W/m^2.
Power density (S) is calculated by the following formula:
S =PG* Duty factor / 4πR²
P = Peak Power Input to antenna (Watts)
G =Antenna Gain (numeric)
R = distance to the center of radiation of antenna (in meter) = 0.20 m
Note:
1) P (Watts)=(10 ^ (dBm /10))/1000
2) G (Antenna gain in numeric) = 10^ (Antenna gain in dBi /10)
3) Duty factor

Mode	Duty factor
transmitting	1.0

4) π=3.142

9.3 RF Exposure test procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.
The temperature and related humidity: 21°C and 55% RH.

9.4 Test Result of RF Exposure Evaluation

Mode	Antenna Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (W)	Duty factor	Calculated RF Exposure (W/ m²)	Limit (W/ m²)
802.11n	1.585	9.37	0.009	1.00	0.0273	10

10 EMC Requirements

1. Test Conditions:

Temperature: +15 °C to +35 °C

Relative humidity: 20 % to 75 %

Power Supply	Test Voltage
PCB	DC 3.3V

2. Performance Criteria Description

EN 301 489-1V1.9.2 Clause 6 requirements:
The performance criteria are used to take a decision on whether a radio equipment passes or fails immunity tests. For the purpose of the present document four categories of performance criteria apply: • performance criteria for continuous phenomena applied to transmitters(CT); • performance criteria for transient phenomena applied to transmitters(TT); • performance criteria for continuous phenomena applied to receivers(CR); • performance criteria for transient phenomena applied to receivers(TR). Normally, the performance criteria depend on the type of radio equipment. Thus, the present document only contains general performance criteria commonly used for the assessment of radio equipment. More specific and product-related performance criteria for a dedicated type of radio equipment may be found in the part of EN 301 489 series [i.13] dealing with the particular type of radio equipment.

Performance Criteria	Description
CT,CR	If no further details are given in the relevant part of EN 301 489 series [i.13] dealing with the particular type of radio equipment, the following general performance criteria for continuous phenomena shall apply. During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance. During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the

	product description and documentation and what the user may reasonably expect from the apparatus if used as intended.
TT,TR	If no further details are given in the relevant part of EN 301 489 series [i.13] dealing with the particular type of radio equipment, the following general performance criteria for transient phenomena shall apply.After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended.In some cases this permissible performance level may be replaced by a permissible loss of performance. During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

EN 301 489-17 V2.2.1 Clause 6 requirements:
The performance criteria are: • performance criteria A for immunity tests with phenomena of a continuous nature; • performance criteria B for immunity tests with phenomena of a transient nature; • performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

Criteria	During test	After test
A	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after

		recovering. Shall be no degradation of performance (see note 2).

NOTE 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.
NOTE 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Performance Criteria	Description
CT	The performance criteria A shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.
TT	The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test

	is correctly interpreted.
CR	The performance criteria A shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.
TR	The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Emission
1. General EN 301 489-1 [1], table 2 contains the applicability of EMC emission measurements to the relevant ports of radio equipment. 2. Special conditions No special conditions shall apply to radio equipment in the scope of the present document.

Immunity
1. General EN 301 489-1 [1], table 2, contains the applicability of EMC immunity measurements to the relevant ports of radio equipment. 2. Special conditions No special conditions are relevant for products covered in the present document

3. Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Conducted Emissions	
TM1*	WiFi continuous communication link
Radiated Emissions	
TM1*	WiFi continuous communication link
Harmonic Current Emissions and Voltage Fluctuations and Flicker	
TM1*	WiFi continuous communication link
Electrostatic Discharge(ESD)	
TM1*	WiFi continuous communication link
Radiated Immunity(R/S)	
TM1*	WiFi continuous communication link
TM2	WiFi continuous communication link (PCB operation)
Electrical Fast Transients (EFT)\ Surge Immunity\ Voltage Dips and Interruptions \Conducted Immunity(C/S)	
TM1*	WiFi continuous communication link
All test mode were tested and passed, only Conducted Emissions, Radiated Emissions Harmonic Current Emissions and Voltage Fluctuations and Flicker shows the worst case mode which were recorded in this report.	

10.1 Conducted Emissions

Test Method	:	EN 301 489-1, EN 55022
Frequency Range	:	150kHz to 30MHz
Class/Severity	:	Class B/ Table 2 of EN 55022
Detector	:	Peak for pre-scan (9kHz Resolution Bandwidth)

10.1.1 E.U.T. Operation

Operating Environment :

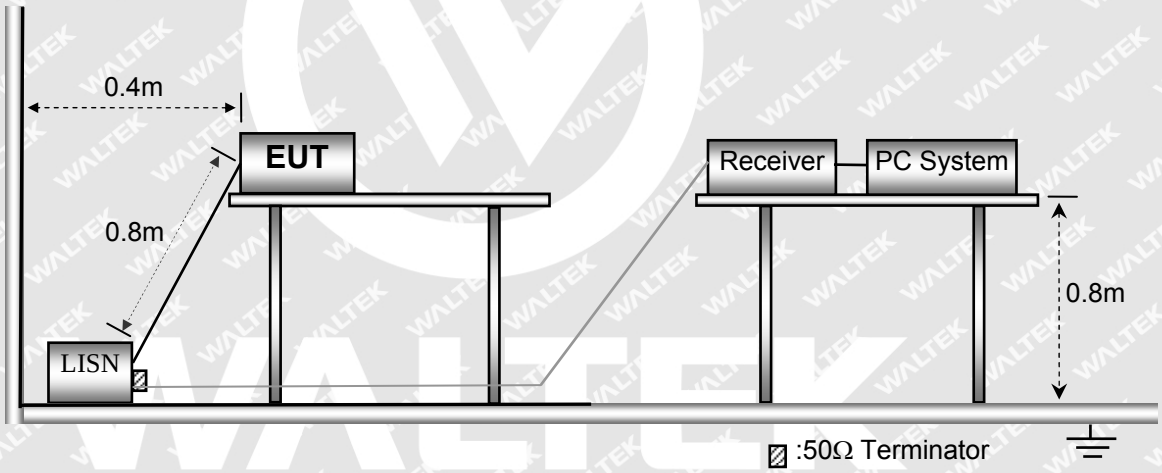
Temperature	:	21.5°C
Humidity	:	52.1 % RH
Atmospheric Pressure	:	101.3kPa

EUT Operation :

Refer to section 10(3).

10.1.2 Test Setup

The conducted emission tests were performed using the setup accordance with the EN 55022.



10.1.3 Measurement Description

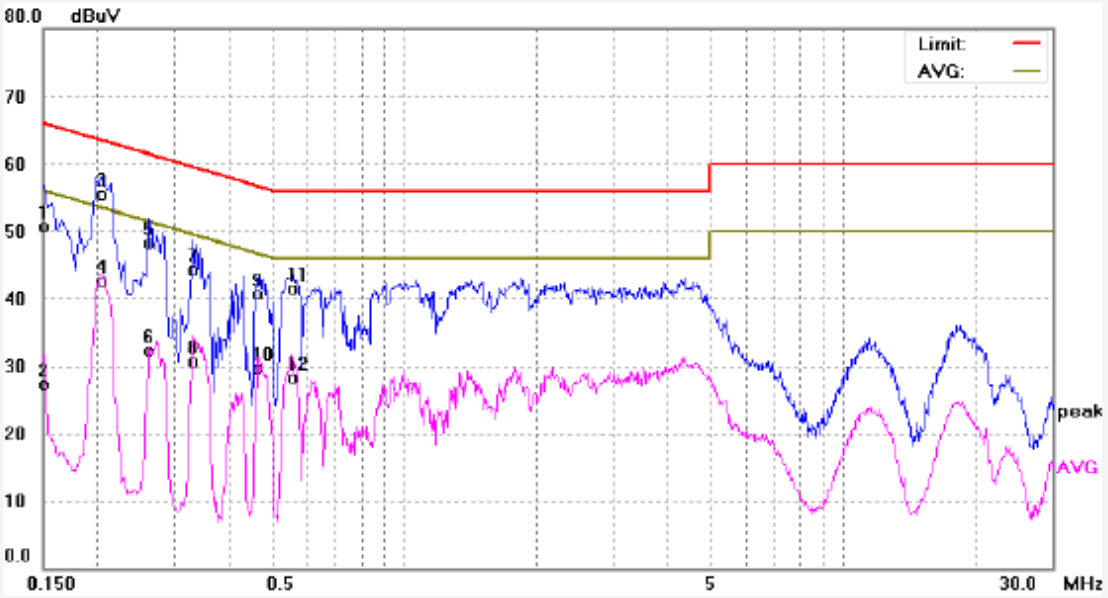
An initial pre-scan was performed on the live and neutral lines.

No futher quasi-peak or average measurements were performed since no peak emissions were detected within 10dB line below the average limit.

Please refer to the following peak scan graph for reference.

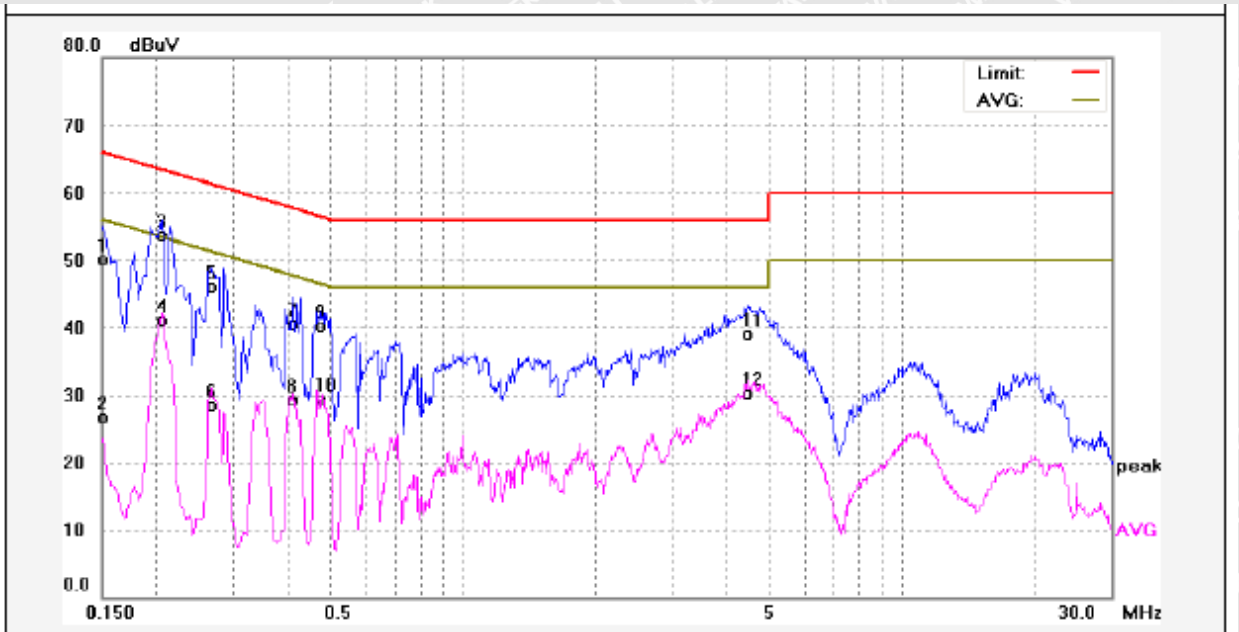
10.1.4 Test Results

Live Line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	41.11	9.64	50.75	65.99	-15.24	QP	
2	0.1500	17.62	9.64	27.26	55.99	-28.73	AVG	
3	0.2060	45.93	9.62	55.55	63.36	-7.81	QP	
4	0.2060	33.15	9.62	42.77	53.36	-10.59	AVG	
5	0.2644	38.76	9.64	48.40	61.29	-12.89	QP	
6	0.2644	22.68	9.64	32.32	51.29	-18.97	AVG	
7	0.3300	34.75	9.63	44.38	59.45	-15.07	QP	
8	0.3300	21.06	9.63	30.69	49.45	-18.76	AVG	
9	0.4700	31.12	9.65	40.77	56.51	-15.74	QP	
10	0.4700	20.01	9.65	29.66	46.51	-16.85	AVG	
11	0.5620	31.86	9.69	41.55	56.00	-14.45	QP	
12	0.5620	18.68	9.69	28.37	46.00	-17.63	AVG	

Neutral Line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	40.43	9.64	50.07	65.99	-15.92	QP	
2	0.1500	17.13	9.64	26.77	55.99	-29.22	AVG	
3	0.2060	44.01	9.62	53.63	63.36	-9.73	QP	
4	0.2060	31.46	9.62	41.08	53.36	-12.28	AVG	
5	0.2660	36.41	9.64	46.05	61.24	-15.19	QP	
6	0.2660	18.92	9.64	28.56	51.24	-22.68	AVG	
7	0.4100	30.77	9.64	40.41	57.65	-17.24	QP	
8	0.4100	19.60	9.64	29.24	47.65	-18.41	AVG	
9	0.4740	30.59	9.65	40.24	56.44	-16.20	QP	
10	0.4740	19.92	9.65	29.57	46.44	-16.87	AVG	
11	4.4699	29.05	9.99	39.04	56.00	-16.96	QP	
12	4.4699	20.34	9.99	30.33	46.00	-15.67	AVG	

10.2 Radiated Emissions

Test Method	:	EN 301 489-1, EN 55022
Frequency Range	:	30MHz to 1GHz, 1GHz to 6GHz
Class/Severity	:	Class B/ Table 6 of EN 55022 (30MHz to 1GHz) Class B/ Table 8 of EN 55022 (1GHz to 6GHz)
Detector	:	Peak for pre-scan (120kHz Resolution Bandwidth Below 1GHz; 1MHz Resolution Bandwidth Above 1GHz)

10.2.1 EUT Operation:

Operating Environment :

Temperature	:	22.5°C
Humidity	:	52.1 % RH
Atmospheric Pressure	:	101.2kPa

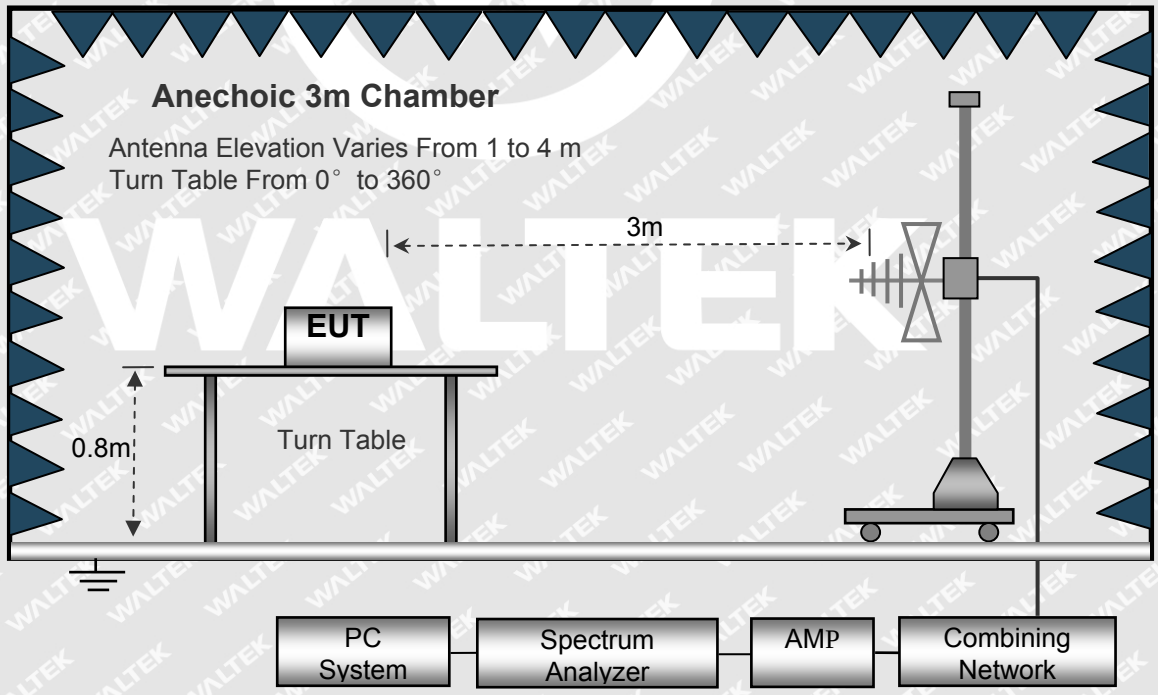
EUT Operation :

Refer to section 10(3).

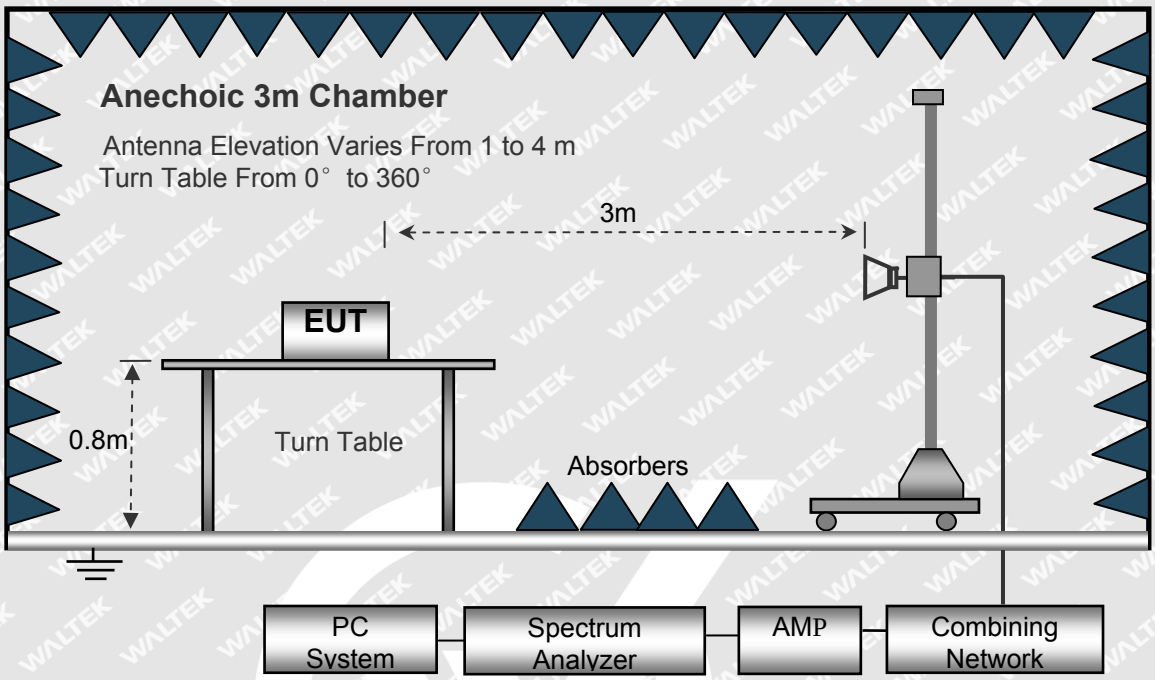
10.2.2 Test Setup

The radiated emission tests were performed using the setup accordance with the EN 55022.

Frequency Range: Below 1 GHz



Frequency Range: Above 1 GHz



10.2.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

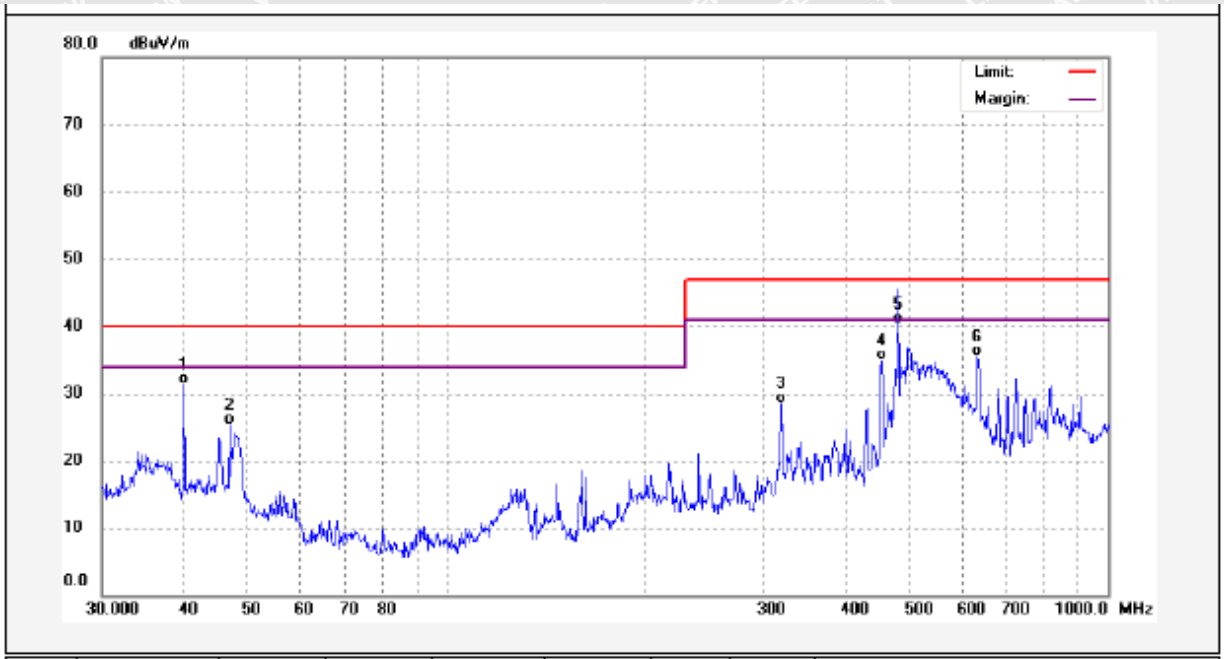
Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

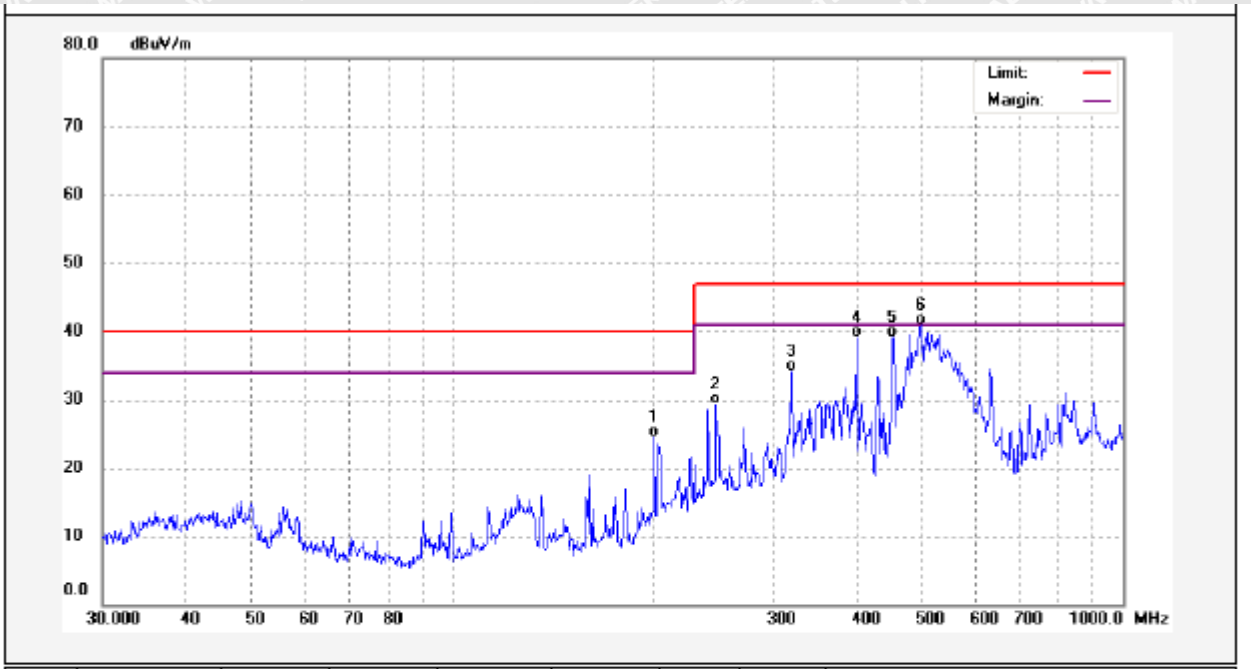
10.2.4 Test Result

Frequency Range: 30MHz ~ 1000MHz
Antenna Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	39.9942	46.49	-15.19	31.30	40.00	-8.70	QP	
2	46.8303	40.82	-15.58	25.24	40.00	-14.76	QP	
3	319.9370	42.28	-13.77	28.51	47.00	-18.49	QP	
4	454.3100	46.66	-11.69	34.97	47.00	-12.03	QP	
5	480.5276	50.27	-9.87	40.40	47.00	-6.60	QP	
6	633.9073	44.87	-9.43	35.44	47.00	-11.56	QP	

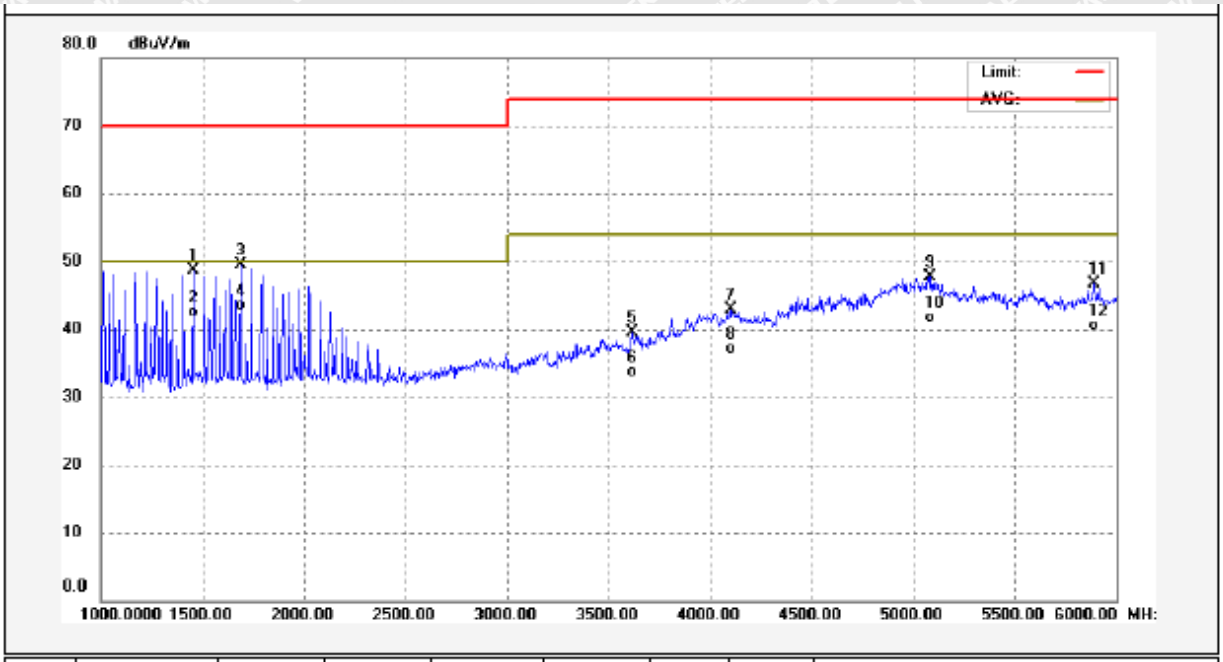
Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	199.9856	41.88	-17.38	24.50	40.00	-15.50	QP	
2	246.8149	45.63	-16.40	29.23	47.00	-17.77	QP	
3	319.9370	47.85	-13.77	34.08	47.00	-12.92	QP	
4	400.4319	51.65	-12.57	39.08	47.00	-7.92	QP	
5	452.7197	50.90	-11.74	39.16	47.00	-7.84	QP	
6	499.4247	50.01	-9.19	40.82	47.00	-6.18	QP	

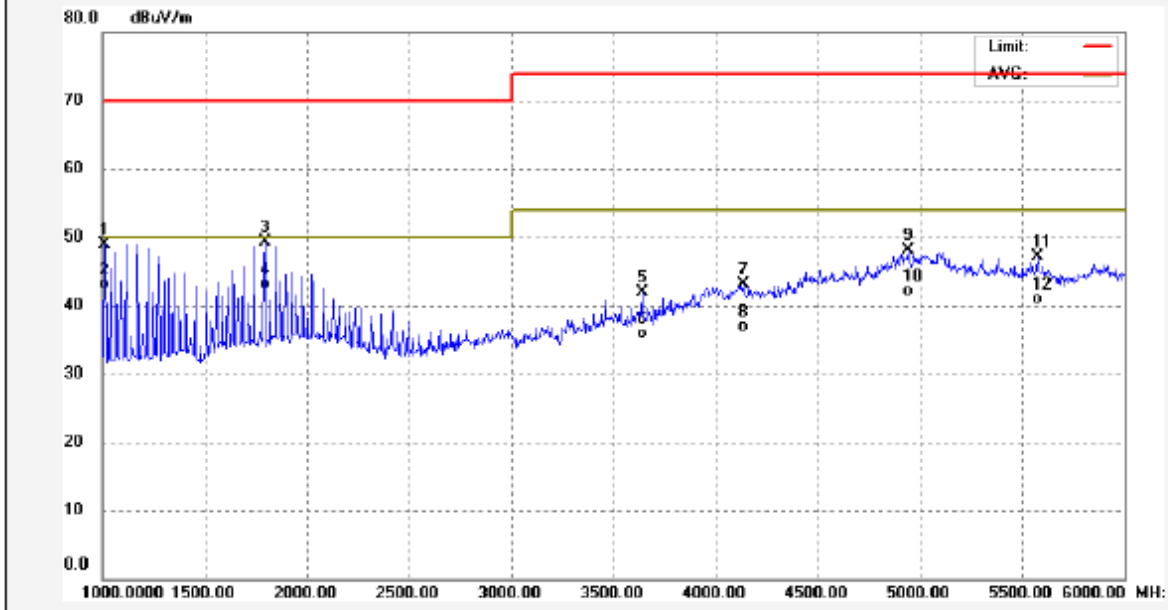
Frequency Range: 1000MHz ~ 6000MHz

Antenna Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1455.000	65.40	-16.75	48.65	70.00	-21.35	peak	
2	1455.000	59.26	-16.75	42.51	50.00	-7.49	AVG	
3	1690.000	65.21	-15.80	49.41	70.00	-20.59	peak	
4	1690.000	59.36	-15.80	43.56	50.00	-6.44	AVG	
5	3615.000	49.30	-9.72	39.58	74.00	-34.42	peak	
6	3615.000	43.44	-9.72	33.72	54.00	-20.28	AVG	
7	4100.000	49.22	-6.34	42.88	74.00	-31.12	peak	
8	4100.000	43.37	-6.34	37.03	54.00	-16.97	AVG	
9	5085.000	48.91	-1.15	47.76	74.00	-26.24	peak	
10	5085.000	42.77	-1.15	41.62	54.00	-12.38	AVG	
11	5890.000	48.67	-2.02	46.65	74.00	-27.35	peak	
12	5890.000	42.52	-2.02	40.50	54.00	-13.50	AVG	

Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1010.000	67.28	-18.31	48.97	70.00	-21.03	peak	
2	1010.000	61.42	-18.31	43.11	50.00	-6.89	AVG	
3	1795.000	64.72	-15.37	49.35	70.00	-20.65	peak	
4	1795.000	58.57	-15.37	43.20	50.00	-6.80	AVG	
5	3640.000	51.52	-9.52	42.00	74.00	-32.00	peak	
6	3640.000	45.37	-9.52	35.85	54.00	-18.15	AVG	
7	4135.000	49.22	-6.20	43.02	74.00	-30.98	peak	
8	4135.000	43.07	-6.20	36.87	54.00	-17.13	AVG	
9	4940.000	49.33	-1.32	48.01	74.00	-25.99	peak	
10	4940.000	43.48	-1.32	42.16	54.00	-11.84	AVG	
11	5575.000	49.57	-2.52	47.05	74.00	-26.95	peak	
12	5575.000	43.41	-2.52	40.89	54.00	-13.11	AVG	

10.3 Harmonic Current Emissions

Test Method	:	EN 301 489-1, EN 61000-3-2
Class/Severity	:	Class A
Evaluate Result	:	N/A
Remark	:	This equipment uses symmetrical control method and the rated power is less than 75W. According to section 7 of EN 61000-3-2, tests need not be made on equipment.

10.4 Voltage Fluctuation and Flicker

Test Method : EN 301 489-1, EN 61000-3-3

Test Result : PASS

10.4.1 EUT Operation:

Operating Environment :

Temperature : 21.5°C

Humidity : 52.2 % RH

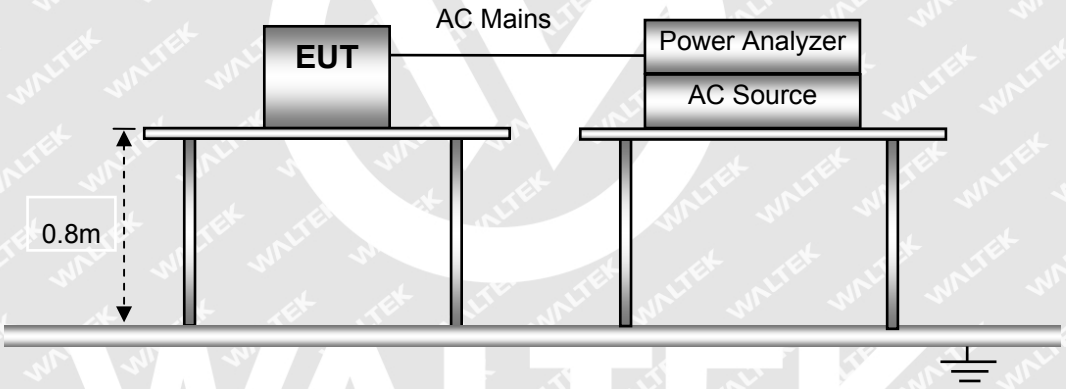
Atmospheric Pressure : 101.2kPa

EUT Operation :

Refer to section 10(3).

10.4.2 Test Setup

The Voltage Fluctuation and Flicker test was performed in accordance with the EN 61000-3-3.



10.4.3 Test Result

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

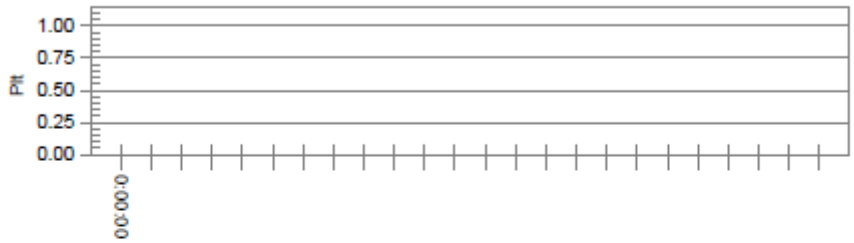
EUT: WiFi Module
Test category: All parameters (European limits)
Test date: 2017-2-22
Test duration (min): 10
Comment: Transmitting
Customer: M0E10XPX

Tested by: Liulelin
Test Margin: 100
Start time: 13:51:39
End time: 14:02:06
Data file name: F-000057.cts_data

Test Result: Pass
Status: Test Completed

Pst, and limit line
European Limits

Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	229.83			
Highest dt (%):	0.00	Test limit (%):	N/A	N/A
T-max (mS):	0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.00	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.028	Test limit:	0.650	Pass

10.5 Electrostatic Discharge(ESD)

Test Method	:	EN 301 489-1, EN 61000-4-2
Discharge Impedance	:	330 Ω / 150 pF
Discharge Voltage	:	Air Discharge: +/-2,4,8 KV Contact Discharge:+/-2,4 kV HCP & VCP: +/-2,4 kV
Polarity	:	Positive & Negative
Discharge Repeat Times	:	At Least 20 times at each test point
Discharge Mode	:	Single Discharge
Discharge Period	:	1 second minimum

10.5.1 E.U.T. Operation

Operating Environment：

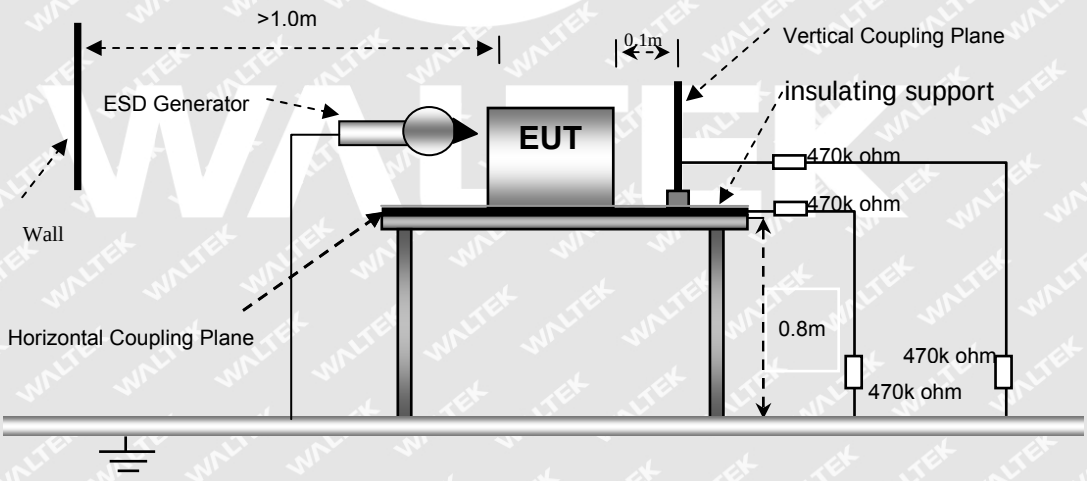
Temperature	:	21.5°C
Humidity	:	52.0 % RH
Barometric Pressure	:	101.3kPa

EUT Operation：

Refer to section 10(3).

10.5.2 Block Diagram of Setup

The ESD test was performed in accordance with the EN 61000-4-2.



10.5.3 Test Results

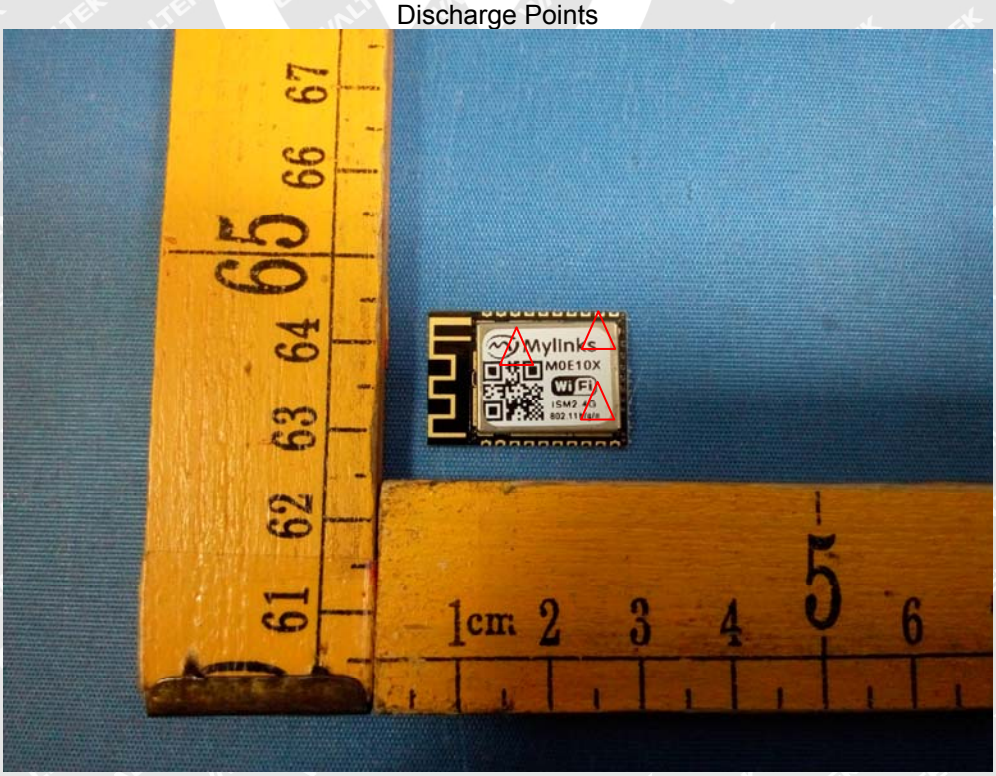
Indirect Application			Performance Criteria	
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling
2,4	+/-	1	TT/TR	TT/TR
Remark: Test points : 1. All sides(Front/Top/ Back/ Left/Right Sides).				

Direct Application			Performance Criteria	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
2,4,8	+/-	1	N/A	N/A
2,4	+/-	2	TT/TR	N/A
Remark: Test points : 1. All Exposed Surface & Seams; 2. All metallic part N/A: Not applicable.				

Air discharge ⬭

Contact discharge △

Discharge Points



10.6 Radiated Immunity(R/S)

Test Method	:	EN 301 489-1, EN 61000-4-3
Face Under Test	:	Three Mutually Orthogonal Faces
Severity	:	3V/m, 1kHz, 80% Amp. Mod. from 80MHz to 1GHz, 1.4GHz to 2.7GHz
Test Result	:	PASS

10.6.1 E.U.T. Operation

Operating Environment:

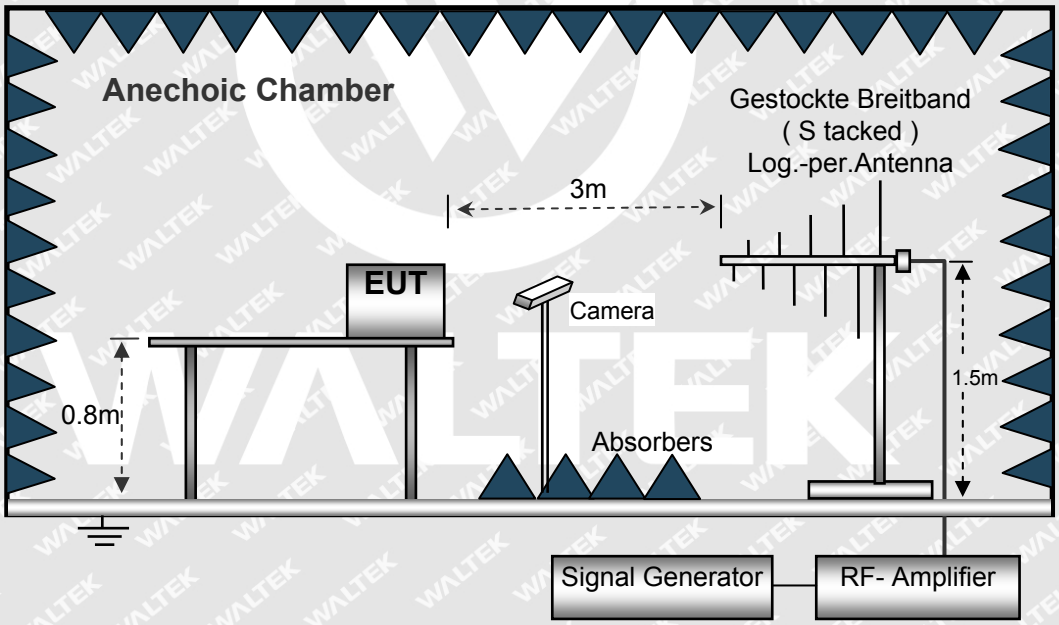
Temperature	:	21.4°C
Humidity	:	52.1 % RH
Barometric Pressure	:	101.2kPa

EUT Operation :

Refer to section 10(3).

10.6.2 Block Diagram of Setup

The Radiated Immunity test was performed in accordance with the EN 61000-4-3.



10.6.3 Test Results

Frequency	Level	Modulation	EUT Face	Performance Criteria
80MHz -1GHz,	3V/m	1kHz, 80%, Amp. Mod.	Front, Back Left, Right	CT/CR
1.4GHz - 2.7GHz	3V/m	1kHz, 80%, Amp. Mod.	Front, Back Left, Right	CT/CR

10.7 Electrical Fast Transients (EFT)

Test Method	:	EN 301 489-1, EN 61000-4-4
Polarity	:	Positive & Negative
Repetition Frequency	:	5kHz
Burst Duration	:	300ms
Test Duration	:	2 minutes per level & polarity

10.7.1 E.U.T. Operation

Operating Environment：

Temperature	:	21.5°C
Humidity	:	52.2 % RH
Barometric Pressure	:	101.2kPa

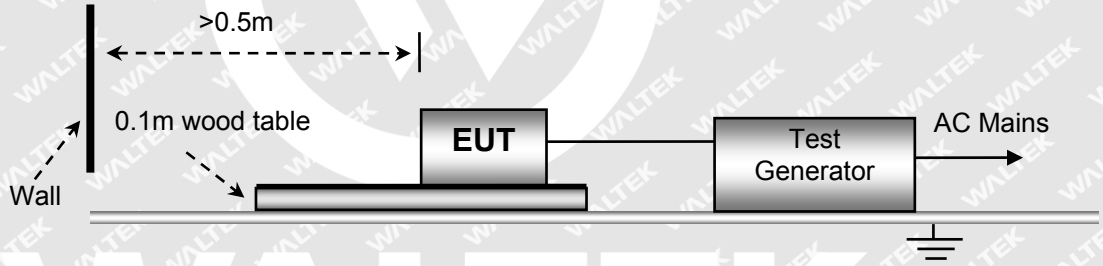
EUT Operation：

Refer to section 10(3).

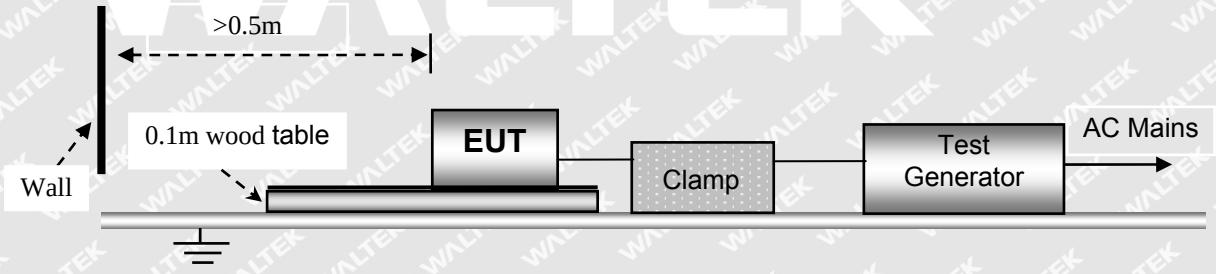
10.7.2 Block Diagram of Test Setup

The Electrical Fast Transients Immunity test was performed in accordance with the EN 61000-4-4.

For AC Mains or DC Ports:



For Signal, Telecommunication or Control Ports:



10.7.3 Test Results

Lead under Test	Test Level	Test Voltage	Performance Criteria
AC Mains	2	±1.0 kV	TT/TR

10.8 Surges

Test Method	:	EN 301 489-1, EN 61000-4-5
Interval	:	60s between each surge
No. of surges	:	5 positive, 5 negative at 0°, 90°, 180°, 270°.

10.8.1 E.U.T. Operation

Operating Environment:

Temperature	:	21.6°C
Humidity	:	52.1 % RH
Barometric Pressure	:	101.2kPa

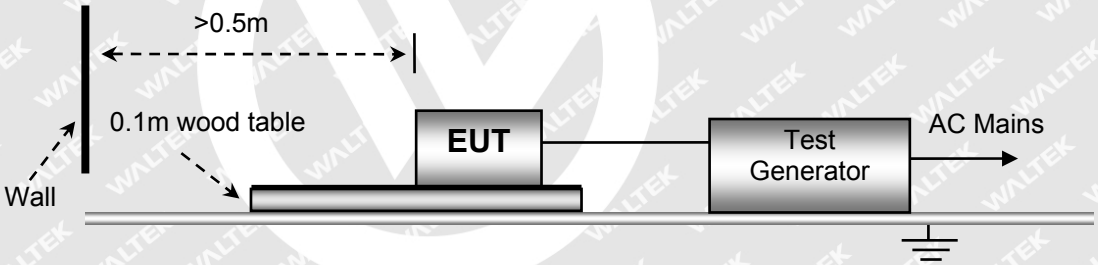
EUT Operation:

Refer to section 10(3).

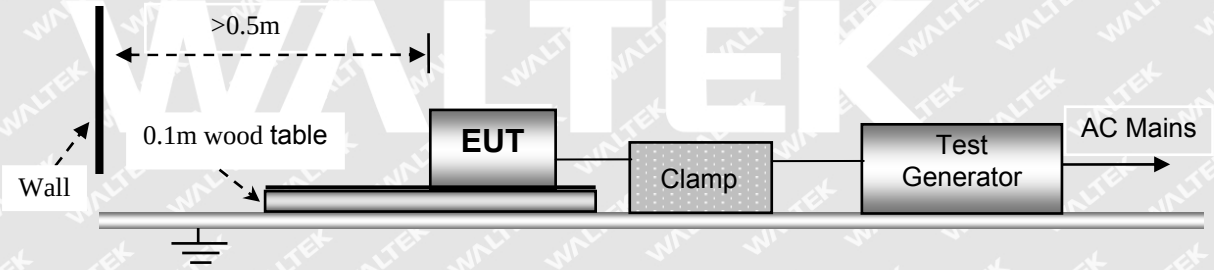
10.8.2 Block Diagram of Test Setup

The Surges Immunity test was performed in accordance with the EN 61000-4-5.

For AC Mains or DC Ports:



For Telecommunication Port:



10.8.3 Test Results

Lead under Test	Test Level	Test Voltage	Path	Performance Criteria
AC Mains	2	±1kV	L-N	TT/TR

10.9 Conducted Immunity 0.15MHz to 80MHz

Test Method : EN 301 489-1, EN 61000-4-6

Test level : 3V rms (unmodulated emf into 150 Ω)

Modulation : 80%, 1kHz Amplitude Modulation.

10.9.1 E.U.T. Operation

Operating Environment :

Temperature : 21.5°C

Humidity : 52.1 % RH

Barometric Pressure : 101.3kPa

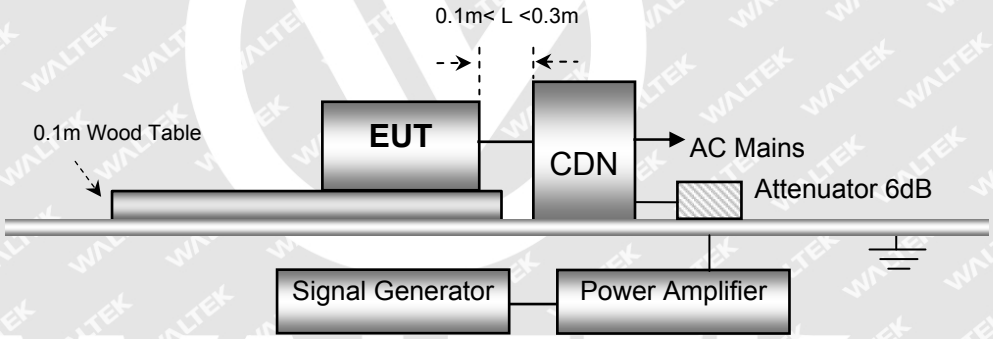
EUT Operation :

Refer to section 10(3).

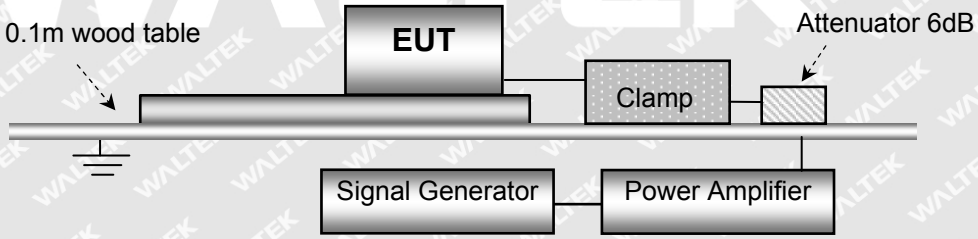
10.9.2 Block Diagram of Test Setup

The Injected Currents Immunity test was performed in accordance with the EN 61000-4-6.

For AC Mains or DC Ports:



For Signal, Telecommunication or Control Ports:



10.9.3 Test Results

Line	Frequency	Test Level	Voltage Level	Modulation	Step Size	Dwell Time	Performance Criteria
AC Mains	0.15MHz to 80MHz	2	3Vrms	80%, 1kHz Amp. Mod.	1%	1s	CT/CR

10.10 Voltage Dips and Interruptions

Test Method : EN 301 489-1, EN 61000-4-11

No. of Dips / Interruptions : 3 per Level at 10ms intervals

10.10.1 E.U.T. Operation

Operating Environment：

Temperature : 21.5°C

Humidity : 52.1 % RH

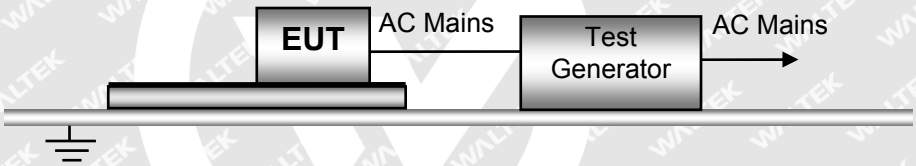
Barometric Pressure : 101.2kPa

EUT Operation：

Refer to section 10(3).

10.10.2 Block Diagram of Setup

The Voltage Dips and Interruptions Immunity test was performed in accordance with the EN 61000-4-11.



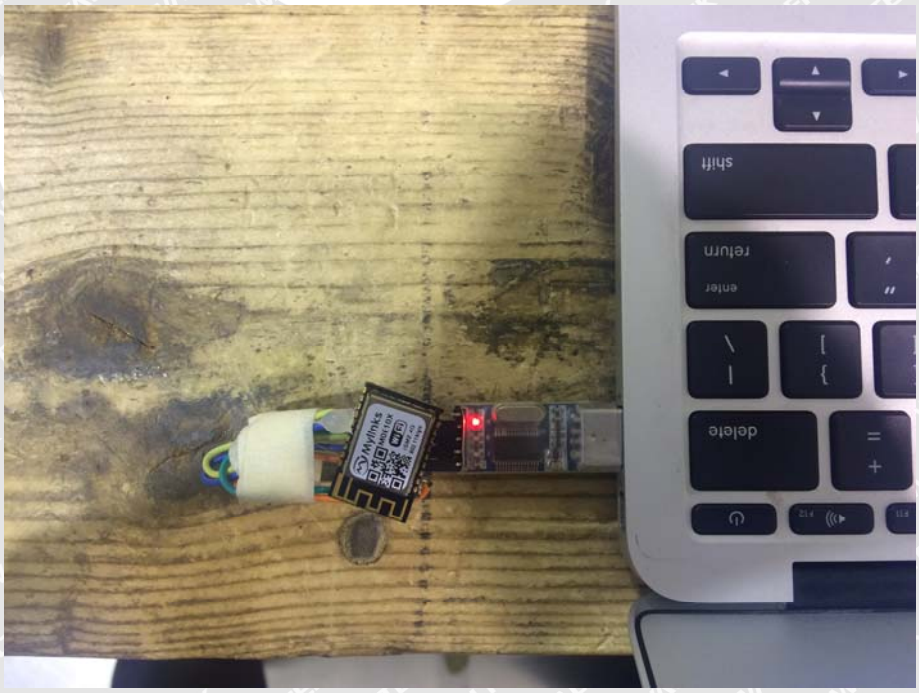
10.10.3 Test Results

Type	Residual Voltage (%)	Phase	Cycle	No of dropout	Performance Criteria
Voltage Dips	0	0°	0.5	3	TT/TR
	0	0°	1	3	TT/TR
	70	0°	25	3	TT/TR
Voltage Interruption	0	0°	250	3	TT/TR

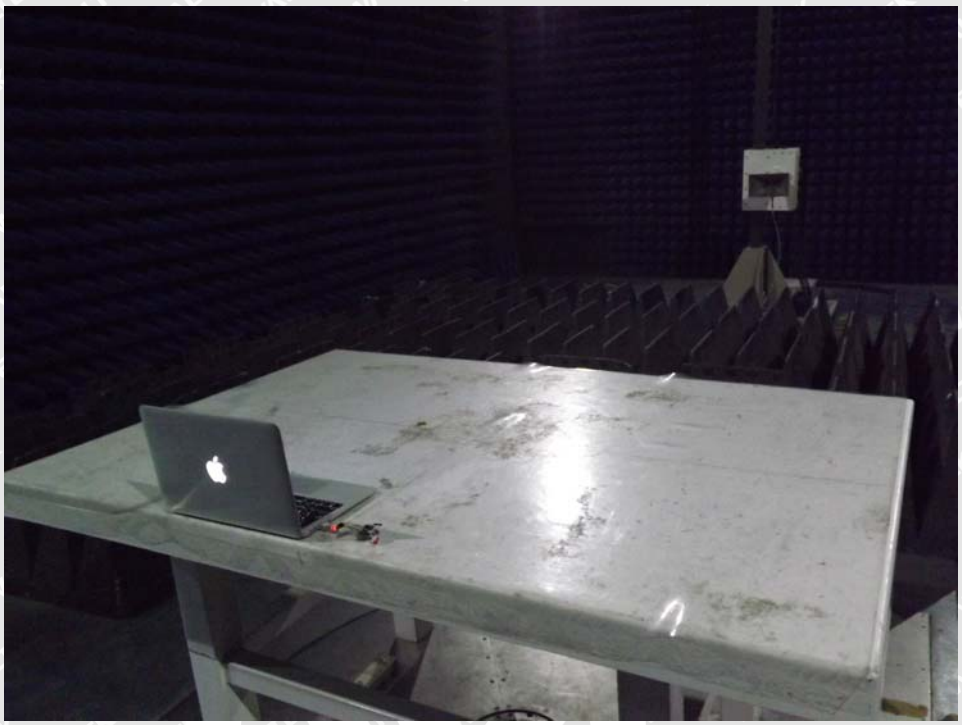
11 Photographs of test setup and EUT.

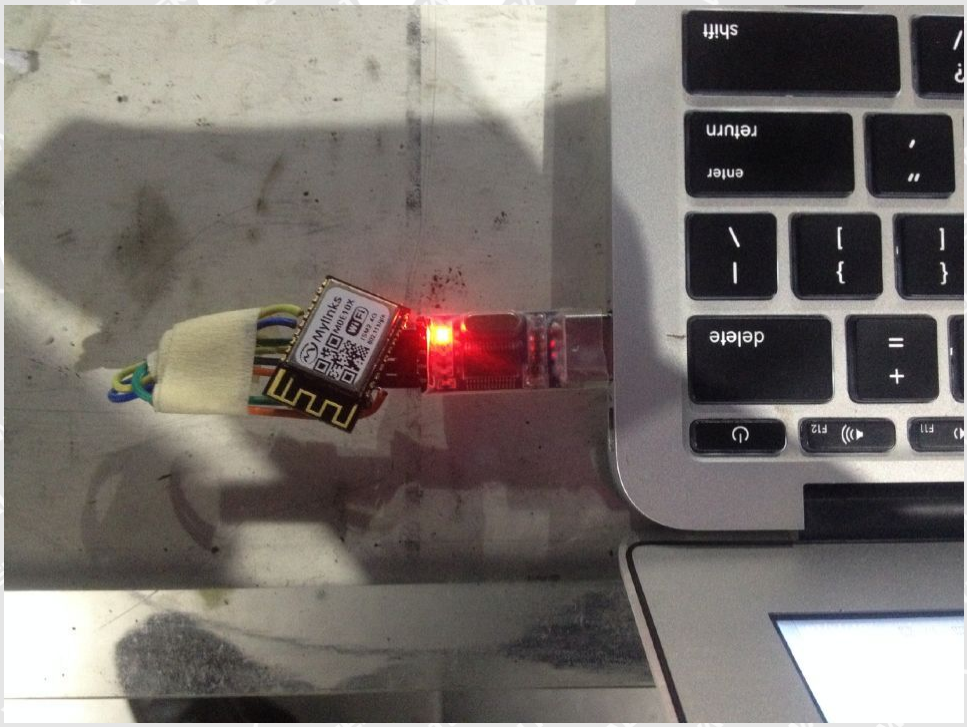
11.1 Photograph - Radiated Emissions Test Setup

For 30MHz-1000MHz

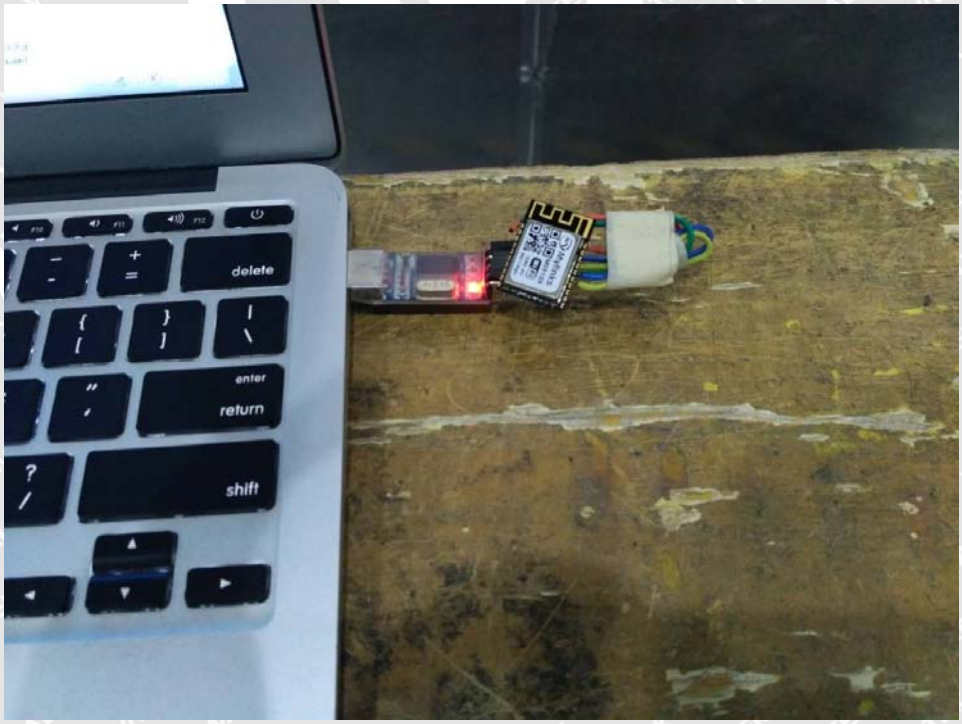


For Above 1GHz





11.2 Photograph - Conducted Emissions Test Setup



11.3 Photographs - Flicker Test Setup

11.4 Photograph - Radiated immunity Test Setup

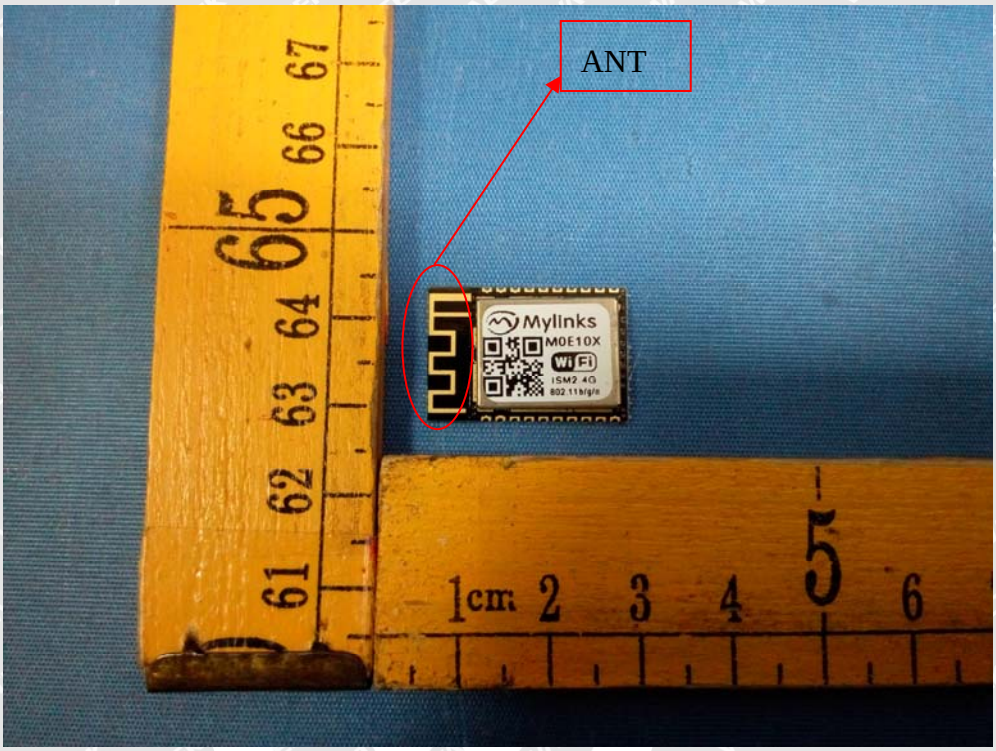
11.5 Photograph - ESD Test Setup

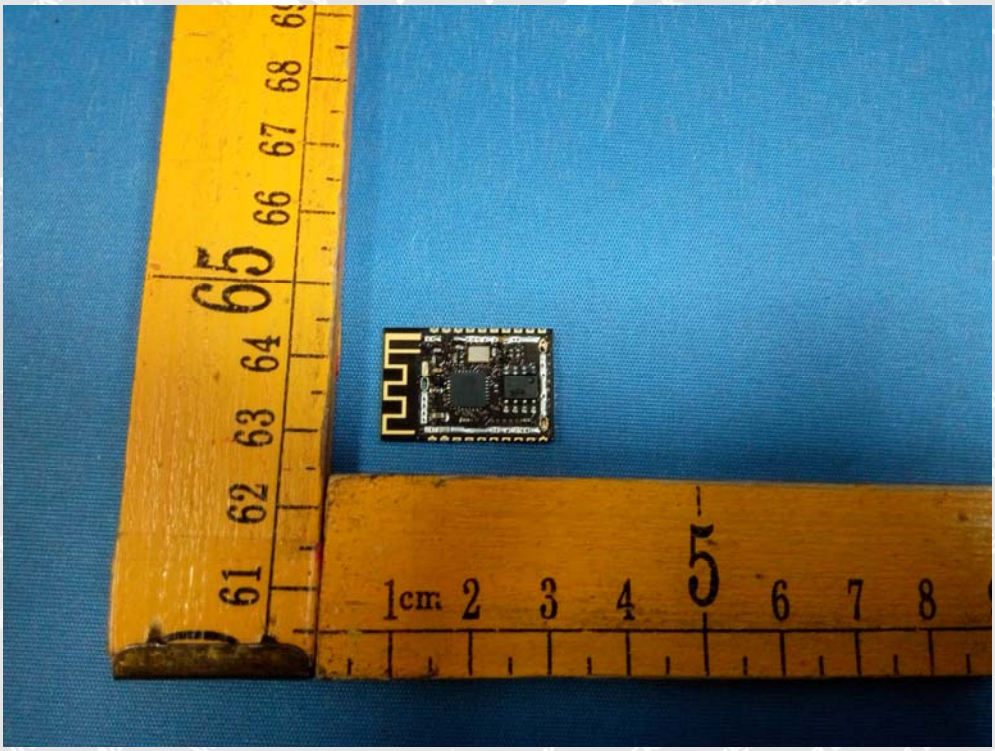
11.6 Photographs – Surge & EFT & Dips Test Setup

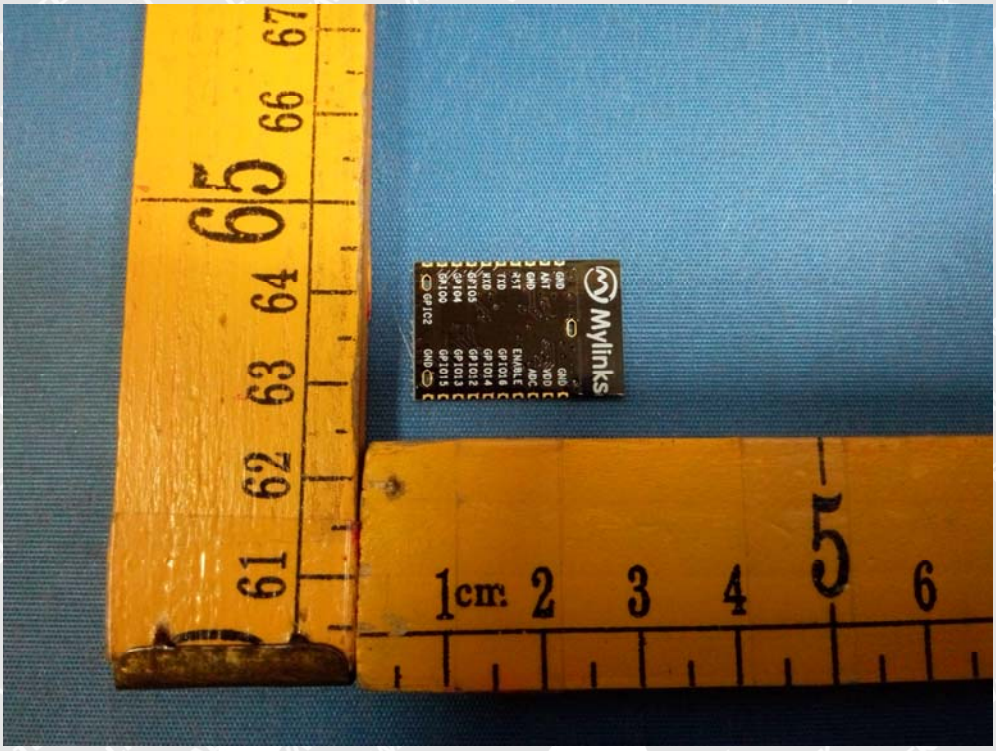
11.7 Photographs – Conducted Immunity Test Setup

12 Photographs - Constructional Details

12.1 EUT –M0E10XPX Photos







======End of Report======