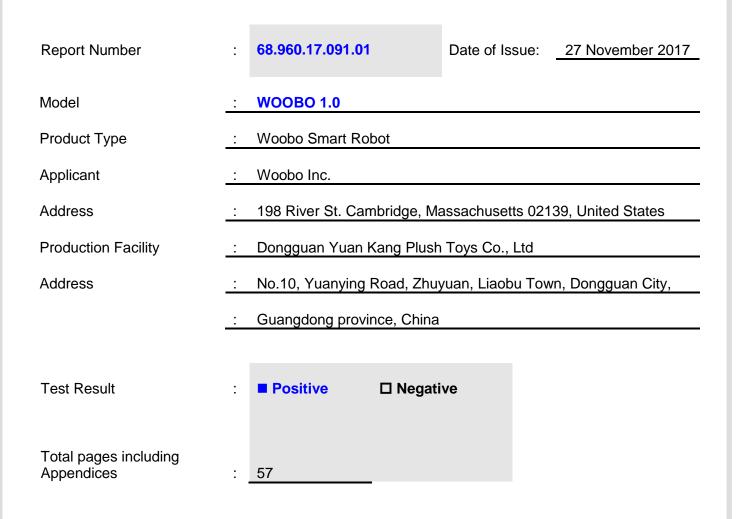


# **FCC- TEST REPORT**



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TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Branch issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.



# **1** Table of Contents

1	Table of Contents				
2	Details about the Test Laboratory				
3	Description of the Equipment under Test	.4			
4	Summary of Test Standards	.5			
5	Summary of Test Results	.6			
6	General Remarks	.7			
7	Test Setups	.8			
8	Systems test configuration	.9			
9	Technical Requirement	10			
9.	1 Conducted Emission	10			
9.	2 Conducted peak output power	13			
9.	3 6dB bandwidth	14			
9.	4 Power spectral density	21			
9.	9.5 Spurious RF conducted emissions				
9.	9.6 Band edge				
9.	9.7 Spurious radiated emissions for transmitter				
10	Test Equipment List	56			
11	System Measurement Uncertainty				



# 2 Details about the Test Laboratory

# **Details about the Test Laboratory**

Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
	Building 12&13, Zhiheng Wisdomland Business Park,
	Nantou Checkpoint Road 2, Nanshan District,
	Shenzhen City, 518052,
	P. R. China

FCC Registration 514049 Number:

Telephone:	86 755 8828 6998
Fax:	86 755 8828 5299



# **3** Description of the Equipment under Test

# **Description of the Equipment Under Test**

Product:	Woobo Smart Robot
Model no.:	WOOBO 1.0
FCC ID:	2ANIX-0001
Options and accessories:	Power Adapter (USB Cable: 1.0m, Unshielded, Detachable)
Rating:	5.0VDC, 1.8A Max or DC 3.7V, 6000mAh (Built-in rechargeable Li- ion battery) (For Woobo Smart Robot) Power Adapter (M/N: NB-A520A USBA-Z, manufactured by Ruide) with following ratings: Input: 100-240VAC, 50/60Hz, 300mA Output: 5.0VDC, 2000mA
RF Transmission Frequency:	2412-2462MHz (for 802.11b, 802.11g, 802.11n-HT20) 2422-2452MHz (for 802.11n-HT40)
No. of Operated Channel:	11
Modulation:	CCK, DQPSK, DBPSK for 802.11b QPSK, BPSK, 64QAM, 16QAM for 802.11g/n
Duty Cycle:	100%
Antenna Type:	Integral Antenna
Antenna Gain:	3.3dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Woobo Smart Robot with WIFI function operating at 2.4GHz



# **4** Summary of Test Standards

	Test Standards
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES
10-1-2016 Edition	Subpart C - Intentional Radiators

All the test methods were according to KDB558074 D01 v04 DTS Measurement Guidance and ANSI C63.10 (2013).

# 5 Summary of Test Results

	Technical Requirements				
FCC Part 15 Subpart C/RSS	6-247 Issue 2/RSS-Gen Issue 4				
Test Condition		Pages	Test Result	Test Site	
§15.207	Conducted emission AC power port	10	Pass	Site 1	
§15.247(b)(1)	Conducted peak output power	13	Pass	Site 1	
§15.247(e)	Power spectral density	21	Pass	Site 1	
§15.247(a)(2)	6dB bandwidth	14	Pass	Site 1	
§15.247(a)(1)	20dB bandwidth		N/A		
§15.247(a)(1)	Carrier frequency separation		N/A		
§15.247(a)(1)(iii)	a)(1)(iii) Number of hopping frequencies		N/A		
§15.247(a)(1)(iii)	Dwell Time		N/A		
§15.247(d)	Spurious RF conducted emissions	29	Pass	Site 1	
§15.247(d)	Band edge	42	Pass	Site 1	
§15.247(d) & §15.209	Spurious radiated emissions for transmitter and receiver	47	Pass	Site 1	
§15.203	Antenna requirement	See note 1	Pass		

Remark: N/A – Not Applicable.

Note 1: The EUT uses an Integrated Antenna, which gain is 3.3dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

# 6 General Remarks

## Remarks

Model WOOBO 1.0 have three color of appearance: Pink, Purple, Green.

This submittal(s) (test report) is intended for FCC ID: 2ANIX-0001 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C.

## SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed
- I Not Performed

The Equipment under Test

- - Fulfills the general approval requirements.
- □ **Does not** fulfill the general approval requirements.

Sample Received Date: October 19, 2017

Testing Start Date:

October 19, 2017 November 17, 2017

Testing End Date:

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:

revor

Trevor You EMC Senior Project Engineer

Reviewed by:

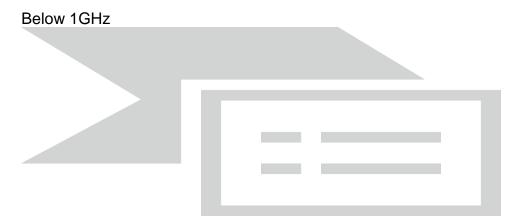
Nick theory

Nick Huang EMC Project Engineer

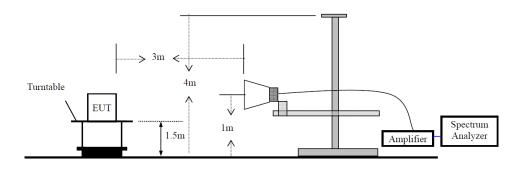


# 7 Test Setups

# 7.1 Radiated test setups



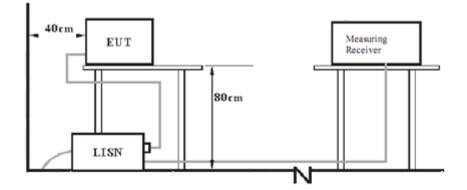
Above 1GHz



# 7.2 Conducted RF test setups



# 7.3 AC Power Line Conducted Emission test setups



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Page 8 of 57



# 8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION MANUFACTURER		MODEL NO.(SHIELD)	S/N(LENGTH)	

Test software: RF test tool

The system was configured to channel 1, 6 and 11 for 802.11b/g/nHT20 test and configured to channel 3, 6 and 9 for 802.11nHT40 test.



# 9.1 Conducted Emission

# **Test Method**

- 1. The EUT was placed on a table, which is 0.8m above ground plane
- 2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
- 3. Maximum procedure was performed to ensure EUT compliance
- 4. A EMI test receiver is used to test the emissions from both sides of AC line

# Limit

Frequency	QP Limit	AV Limit
MHz	dBµV	dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

\*Decreasing linear

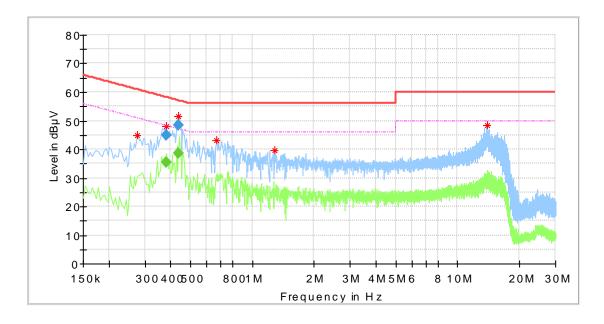




#### Conducted Emission Test 150kHz – 30MHz

M/N:	WOOBO 1.0
Op Cond.:	Charging + Media Playing + WiFi Connect
Test Spec.:	Power Line, Live
Comment:	AC 120V/60Hz

Temperature (°C): 23.1 Relative Humidity (%): 58.0 Atmospheric Pressure(mbar) : 1012



# **Critical\_Freqs**

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr.* (dB)
0.274000	45.09		61.00	15.91	L1	10.2
0.381500	48.10		58.32	10.23	L1	11.0
0.437500	51.46		57.02	5.56	L1	11.1
0.670000	43.26		56.00	12.74	L1	10.2
1.286000	39.58		56.00	16.42	L1	10.2
14.022000	48.46		60.00	11.54	L1	10.7

# Final\_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr.* (dB)
0.381500		35.52	48.25	12.73	L1	11.1
0.381500	44.95		58.25	13.30	L1	11.1
0.437500		38.48	47.11	8.63	L1	11.1
0.437500	48.29		57.11	8.82	L1	11.1

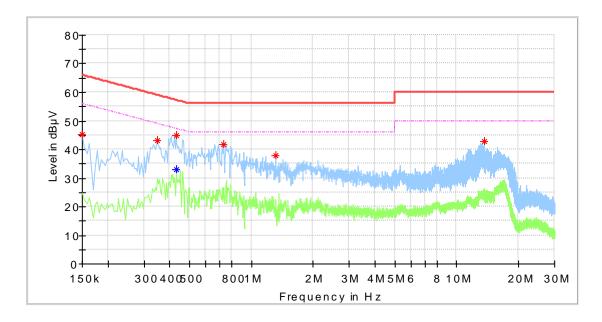
Remark: "\*" Correct factor=cable loss + LISN factor



#### Conducted Emission Test 150kHz – 30MHz

M/N:	WOOBO 1.0
Op Cond.:	Charging + Media Playing + WiFi Connect
Test Spec.:	Power Line, Neutral
Comment:	AC 120V/60Hz

Temperature (°C): 23.1 Relative Humidity (%): 58.0 Atmospheric Pressure(mbar) : 1012



Critical_Freqs						
Frequency	MaxPeak	Average	Limit	Margin	Line	Corr.*
(MHz)	(dBµV)	(dBµV)	(dBµV)	(dB)		(dB)
0.150000	45.12		66.00	20.88	Ν	10.3
0.350000	43.30		58.96	15.67	Ν	10.3
0.430000		33.09	47.25	14.17	Ν	10.3
0.430000	44.76		57.25	12.49	Ν	10.3
0.734000	41.81		56.00	14.19	Ν	10.4
1.314000	37.79		56.00	18.21	Ν	10.4
13.646000	42.85		60.00	17.15	Ν	11.0

# Final\_Result

Frequency	QuasiPe	Average	Limit	Margin	Line	Corr.*
(MHz)	ak	(dBµV)	(dBµV)	(dB)		(dB)

Remark: "\*" Correct factor=cable loss + LISN factor

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Page 12 of 57



# 9.2 Conducted peak output power

#### **Test Method**

- Use the following spectrum analyzer settings: RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW Sweep = auto, Detector function = peak, Trace = max hold.
- 2. Add a correction factor to the display.
- 3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

### Limits

According to §15.247 (b) (1), conducted peak output power limit as below:

Frequency Range	Limit	Limit
MHz	W	dBm
2400-2483.5	≤1	≤30

**Conducted Peak** 

Test result as below table

802.11b

802.11

802.11

802.11

	Frequency	Output Power	Result	
_	MHz	dBm		
_	Top channel 2412MHz	13.9	Pass	
	Middle channel 2437MHz	14.1	Pass	
	Bottom channel 2462MHz	14.3	Pass	
1g				
ig		Conducted Peak		
	Frequency	Output Power	Result	
	MHz	dBm	rtoodit	
-	Top channel 2412MHz	11.7	Pass	
	Middle channel 2437MHz	12.0	Pass	
	Bottom channel 2462MHz	11.7	Pass	
1nHT2	20			
1111112		Conducted Peak		
	Frequency	Output Power	Result	
	MHz		Result	
-		dBm 10.1	Pass	
	Top channel 2412MHz Middle channel 2437MHz	10.0	Pass	
	Bottom channel 2462MHz	10.6	Pass	
		10.0	F 855	
1nHT4	0			
		Conducted Peak		
	Frequency	Output Power	Result	
	MHz	dBm		
-	Top channel 2422MHz	8.8	Pass	
	Middle channel 2437MHz	8.9	Pass	
	Bottom channel 2452MHz	9.4	Pass	

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# 9.3 6dB bandwidth

#### **Test Method**

- Use the following spectrum analyzer settings: RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be  $\geq$  6 dB.
- 3. Allow the trace to stabilize, record the X dB Bandwidth value.

## Limit

#### Limit [kHz]

≥500

#### Test result

#### 802.11b

Frequency MHz	6dB bandwidth KHz	Result
Bottom channel 2412MHz	10120	Pass
Middle channel 2437MHz	10120	Pass
Top channel 2462MHz	10120	Pass

#### 802.11g

Frequency MHz	6dB bandwidth KHz	Result
Bottom channel 2412MHz	16540	Pass
Middle channel 2437MHz	16540	Pass
Top channel 2462MHz	16580	Pass

# 802.11nHT20

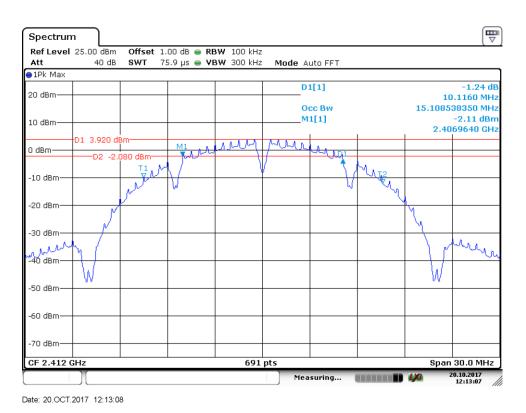
Frequency MHz	6dB bandwidth KHz	Result
Bottom channel 2412MHz	17840	Pass
Middle channel 2437MHz	17800	Pass
Top channel 2462MHz	17840	Pass

#### 802.11nHT40

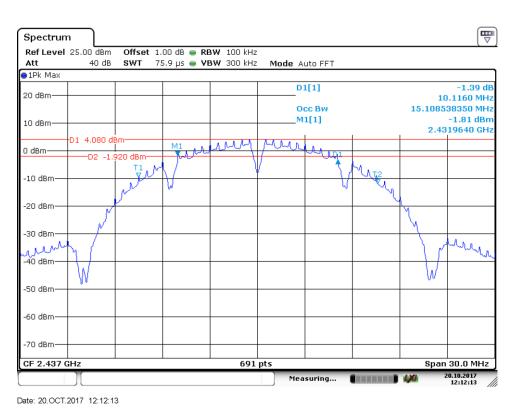
Frequency MHz	6dB bandwidth KHz	Result
Bottom channel 2422MHz	36560	Pass
Middle channel 2437MHz	36470	Pass
Top channel 2452MHz	36470	Pass

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#### 802.11b







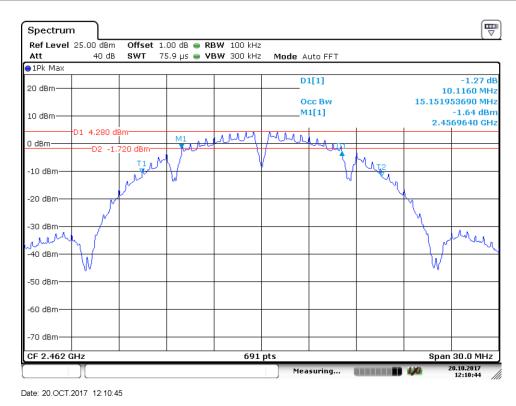
# 2437MHz

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Page 15 of 57









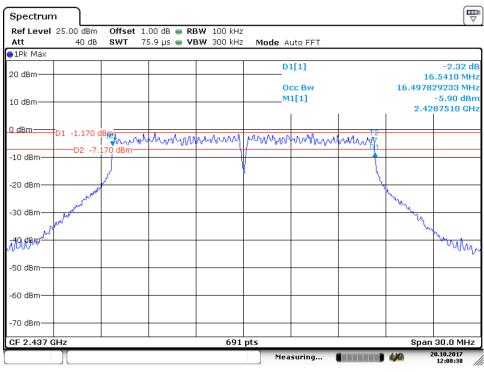
#### 802.11g Spectrum Ref Level 25.00 dBm Offset 1.00 dB 👄 RBW 100 kHz Att 40 dB S₩T 75.9 µs 👄 **VBW** 300 kHz Mode Auto FFT ∋1Pk Max D1[1] -2.16 dE 20 dBm 16.5410 MHz Occ Bw 16.497829233 MHz M1[1] -6.47 dBm 10 dBm-2.4037510 GHz 0 dBm D1 -1.690 dBm D2 -7.690 dBm www.www.w MM -10 dBm -20 dBm -30 dBm -49 dBW MM -50 dBm -60 dBm--70 dBm Span 30.0 MHz CF 2.412 GHz 691 pts 20.10.2017 12:05:22 Measuring... Date: 20.OCT.2017 12:05:22

# 2412MHz

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Page 16 of 57





Date: 20.OCT.2017 12:08:37



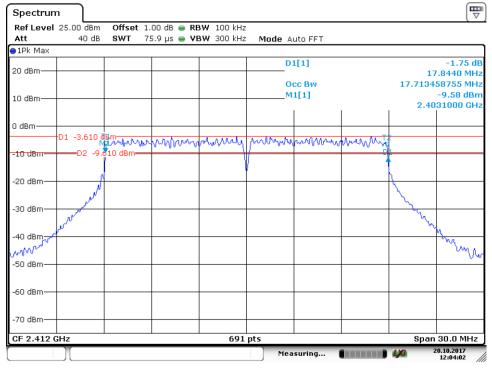
[₩] Spectrum Ref Level 25.00 dBm Offset 1.00 dB 👄 RBW 100 kHz Att 40 dB S₩T 75.9 µs 👄 **VBW** 300 kHz Mode Auto FFT ⊖1Pk Max D1[1] -1.31 dE 20 dBm-16.5850 MHz Occ Bw 16.497829233 MHz M1[1] -8.11 dBm 10 dBm-2.4537080 GHz 0 dBm-monorman -10 dBm -20 dBm--30 dBm -40 dBm WW -50 dBm -60 dBm--70 dBm Span 30.0 MHz CF 2.462 GHz 691 pts 23.10.2017 14:08:36 Measuring... 1 11 Date: 23.OCT.2017 14:08:36

# 2462MHz

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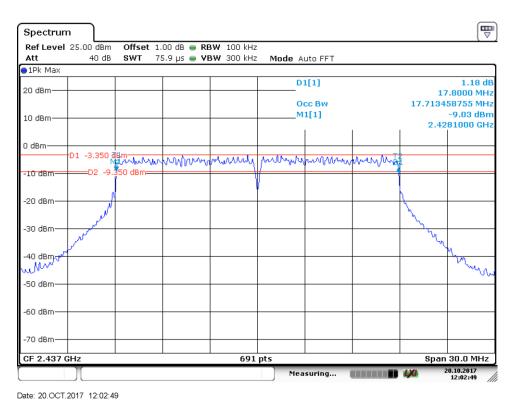
Page 17 of 57

#### 802.11nHT20



Date: 20.OCT.2017 12:04:02



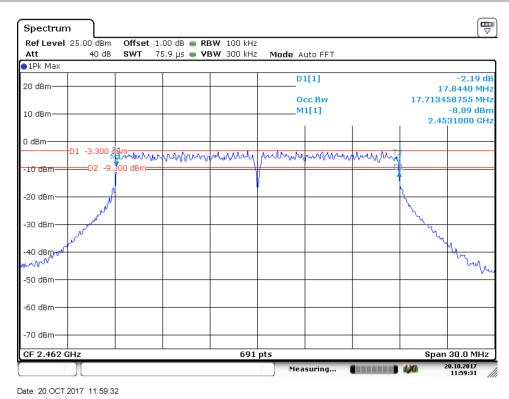


# 2437MHz

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#### 2462MHz

## 802.11 HT40

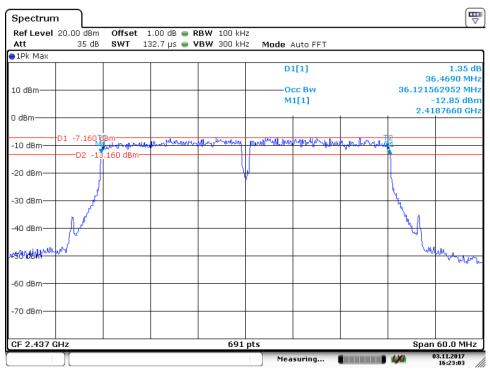
₩ Spectrum Ref Level 20.00 dBm Offset 1.00 dB 🖷 RBW 100 kHz Att 35 dB SWT 132.7 µs 👄 **VBW** 300 kHz Mode Auto FFT ⊖1Pk Ma× D1[1] -2.54 dE 36.5560 MH 10 dBm-Occ Bw 36.121562952 MH: -12.93 dBm 2.4037660 GHz M1[1] 0 dBm 01 -7.180 de and Million Many Maril Jana. -10 dBm--D2 -13.180 dBm -20 dBm--30 dBm 40 dBm -southin 1ML -60 dBm -70 dBm-CF 2.422 GHz 691 pts Span 60.0 MHz )3.11.2017 16:21:09 Measuring... Date: 3.NOV.2017 16:21:09

## 2422MHz

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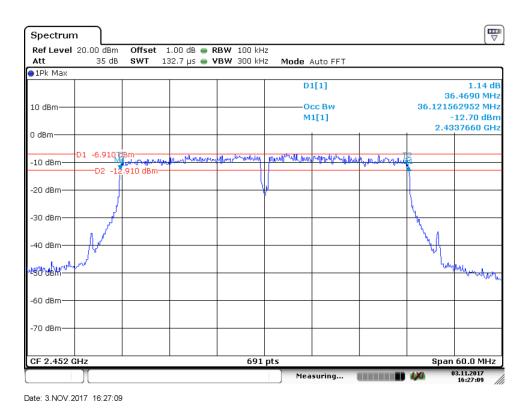
Page 19 of 57





Date: 3.NOV.2017 16:23:03





# 2452MHz

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Page 20 of 57



#### **Test Method**

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

- Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
- 2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
- 3. Repeat above procedures until other frequencies measured were completed.

# Limit

Limit [dBm]

≤8

# Test result

802.11b

Frequency MHz	Power spectral density dBm	Result
Top channel 2412MHz	-16.80	Pass
Middle channel 2437MHz	-16.69	Pass
Bottom channel 2462MHz	-16.47	Pass

802.11g

Power spectral density dBm	Result
-15.83	Pass
-15.54	Pass
-15.39	Pass
	<b>dBm</b> -15.83 -15.54

# 802.11nHT20

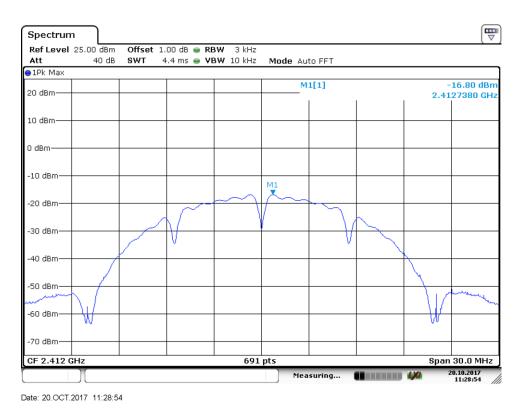
Power spectral density	Result
dBm	
-17.71	Pass
-17.37	Pass
-17.27	Pass
	density <u>dBm</u> -17.71 -17.37



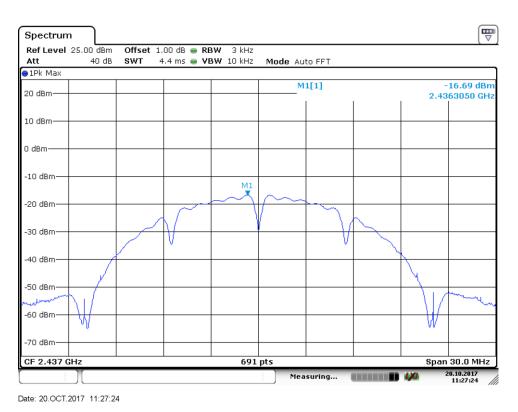
# 802.11nHT40

	Power spectral	
Frequency	density	Result
MHz	dBm	
Top channel 2412MHz	-19.97	Pass
Middle channel 2437MHz	-19.87	Pass
Bottom channel 2462MHz	-19.71	Pass

## 802.11b







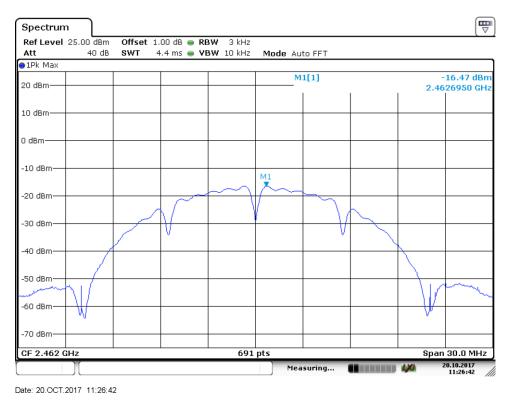
# 2437MHz

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Page 23 of 57









#### ₹ Spectrum Offset 1.00 dB 👄 RBW 3 kHz Ref Level 25.00 dBm 40 dB 4.4 ms 🖷 VBW 10 kHz Att SWT Mode Auto FFT 🔵 1 Pk Max M1[1] 15.83 dBn 20 dBm 2.4116960 GH 10 dBm 0 dBm· -10 dBm <u>un Muri</u> JARY AN ANALASIN AMANM изкил -20 dBm -30 dBm MUU VINA -40 dBm Well -50 dBm Anulup -60 dBm--70 dBm Span 30.0 MHz CF 2.412 GHz 691 pts Measuring... 20.10.2017 11:24:14 Date: 20.OCT.2017 11:24:14

# 2412MHz

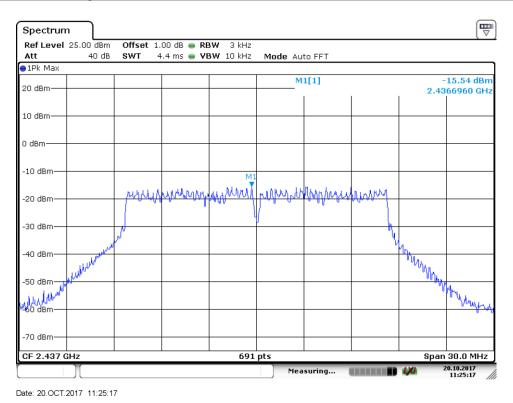
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802.11g

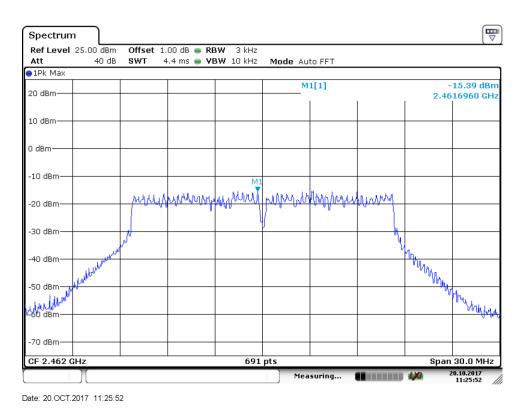
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Page 24 of 57





#### 2437MHz

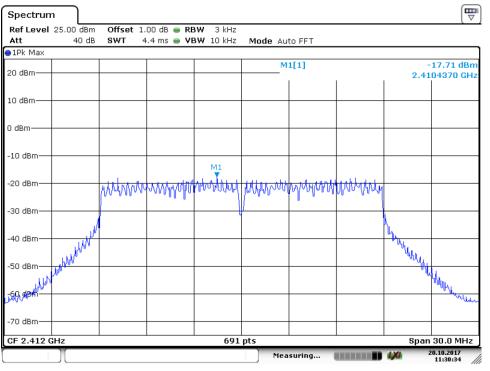


# 2462MHz

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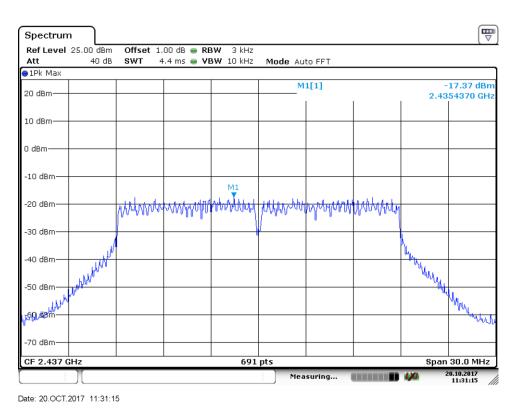
Page 25 of 57

# 802.11nHT20



Date: 20.OCT.2017 11:30:34

### 2412MHz



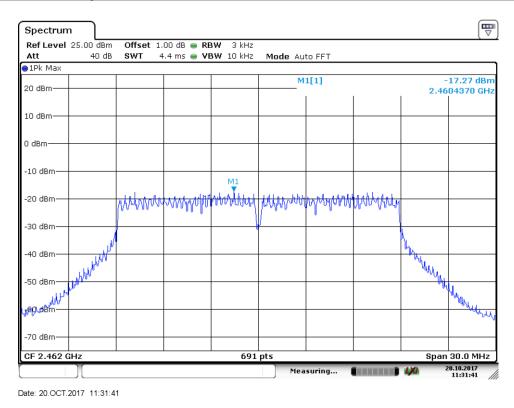
# 2437MHz

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Page 26 of 57







#### 2462MHz

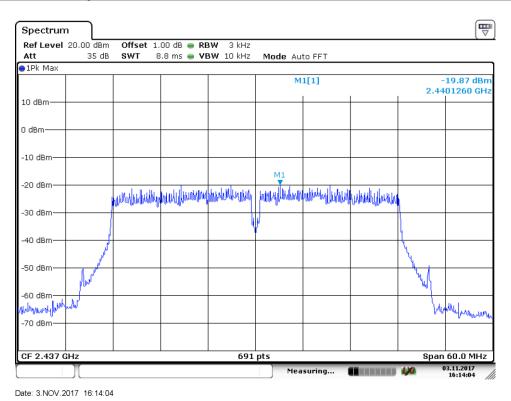
#### 802.11nHT40 ₩ Spectrum Ref Level 20.00 dBm Offset 1.00 dB 👄 RBW 3 kHz 8.8 ms 👄 **VBW** 10 kHz Att 35 dB S₩T Mode Auto FFT ∋1Pk Max M1[1] 19.97 dBn 2.4251260 GH 10 dBm-0 dBm -10 dBm M1 -20 dBm way while the part of the second states and the second -30 dBm -40 dBm -50 dBm -60 dBm paramont with your ungahilipun du -70 dBm CF 2.422 GHz 691 pts Span 60.0 MHz 03.11.2017 16:15:01 Measuring... **1** Date: 3.NOV.2017 16:15:01

# 2422MHz

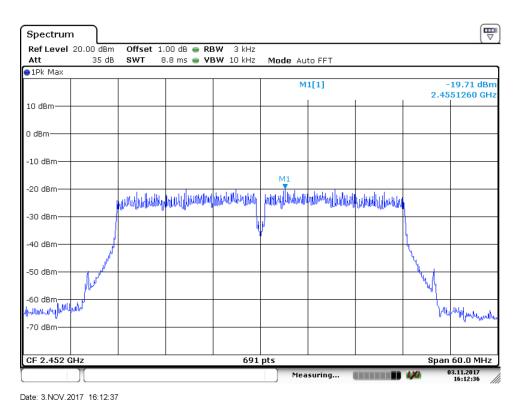
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Page 27 of 57





### 2437MHz



# 2452MHz

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Page 28 of 57



### **Test Method**

- 1. Establish a reference level by using the following procedure:
  - a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
  - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
- 2. Use the maximum PSD level to establish the reference level.
  - a. Set the center frequency and span to encompass frequency range to be measured.
  - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
- 3. Repeat above procedures until other frequencies measured were completed.

## Limit

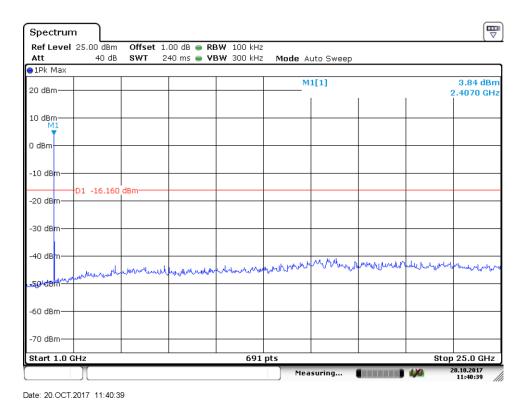
Frequency Range MHz	Limit (dBc)				
30-25000	-20				



#### 802.11b

Spectrum									
	25.00 dBm		1.00 dB 😑 R						
Att	40 dB	SWT	9.7 ms 😑 V	<b>BW</b> 300 kHz	Mode A	uto Sweep			
⊖1Pk Max									
20 dBm					M	1[1]	I		46.84 dBm 02.40 MHz
10 dBm									
0 dBm									
-10 dBm—									
-20 dBm—	-D1 -16.160	dBm							
-30 dBm									
-40 dBm								м	1
୵ <del></del> ୕ୠୄୠଢ଼ୄୠ <del>୶</del> ୄୄୄୄୄ	poples ware	weth month	antwowww.	www.whenter	نىساللىتىيەدارل <sub>ىرى</sub> لىر <sub>لىرى</sub>	who was	tollade the the second	hourstoneord	Ulwhuh-Usyun
-60 dBm—									
-70 dBm—									
Start 30.0	MHz			691	pts			Sto	p 1.0 GHz
					Mea	suring		<b>4/0</b> 2	0.10.2017 11:41:07

Date: 20.OCT.2017 11:41:07

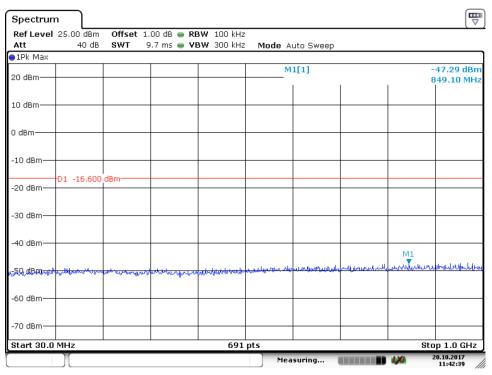


# 2412MHz

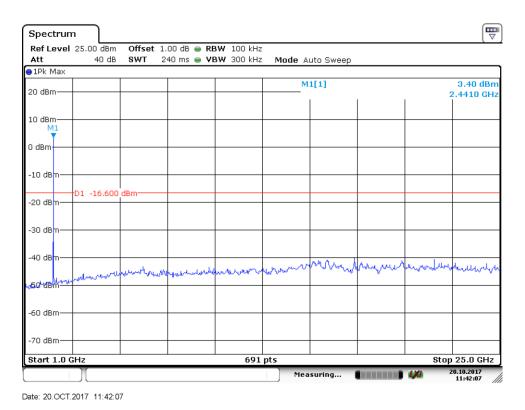
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Page 30 of 57





Date: 20.OCT.2017 11:42:39

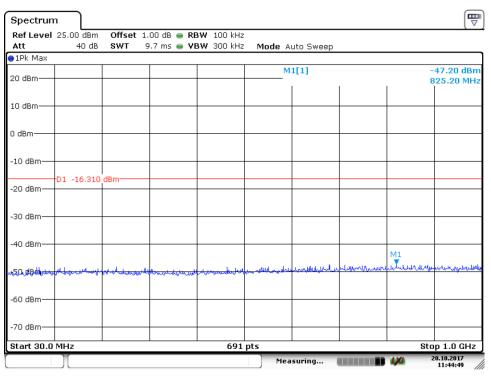


2437MHz

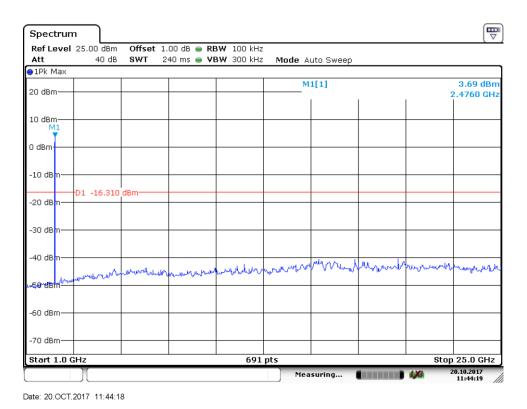
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Page 31 of 57





Date: 20.OCT.2017 11:44:49



2462MHz

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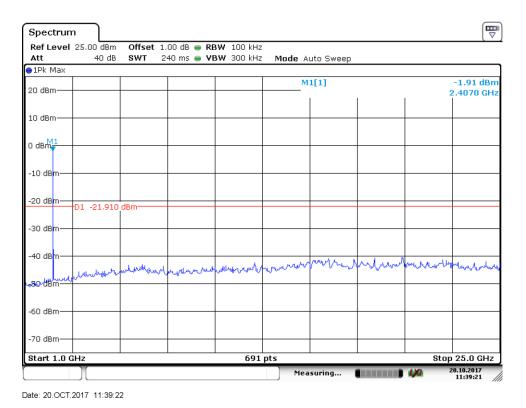
Page 32 of 57



#### 802.11g

Spectrun	n								
	25.00 dBm		1.00 dB 😑 RE						
Att	40 dB	S₩T	9.7 ms 👄 ۷	<b>BW</b> 300 kHz	Mode A	uto Sweep			
⊖1Pk Max									
20 dBm					M	1[1]	I		47.38 dBm 364.50 MHz
10 dBm									
0 dBm									
-10 dBm—									
-20 dBm—	D1 -21.910	dBm							
-30 dBm—									
-40 dBm—								M1	
1,5A-grant	t-mature	pp <sup>re</sup> -cottoneo	A rollowing the line of the li	wether the	n <del>dd llonwy</del> n Macane	Man Mark Miles	Usunahusu	-	MMunhawan
-60 dBm—									
-70 dBm—									
Start 30.0 MHz 691 pts Stop 1.0 GHz									
					Mea	suring		4/0	20.10.2017 11:39:46

Date: 20.OCT.2017 11:39:46

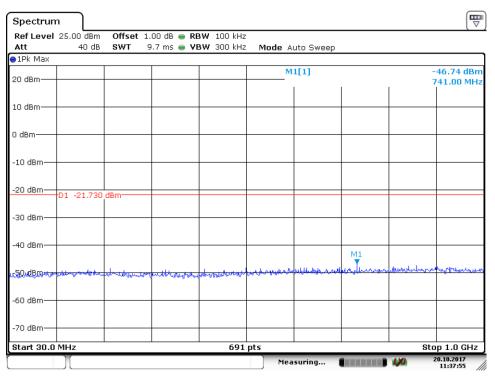


# 2412MHz

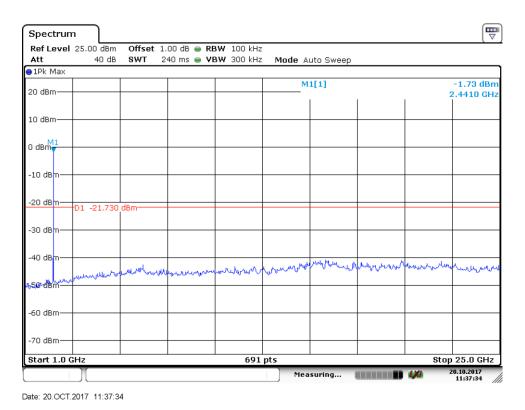
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Page 33 of 57





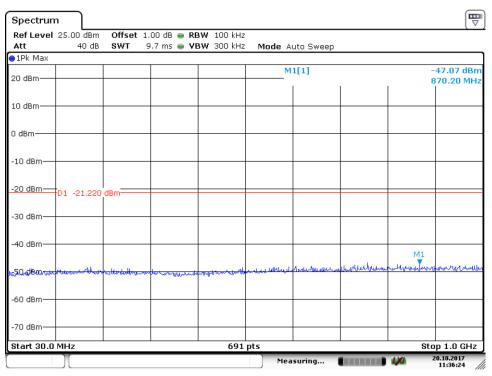
Date: 20.OCT.2017 11:37:56



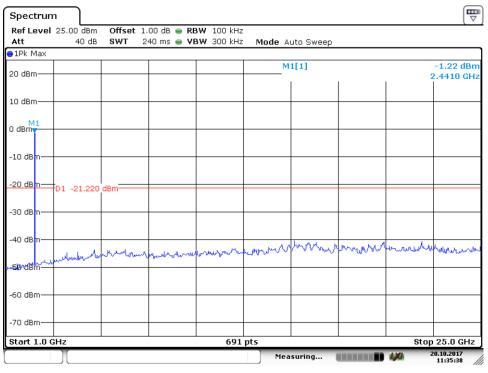
2437MHz

EMC\_SZ\_FR\_21.00 FCC Release 2017-05-17





Date: 20.OCT.2017 11:36:24



Date: 20.OCT.2017 11:35:39

## 2462MHz

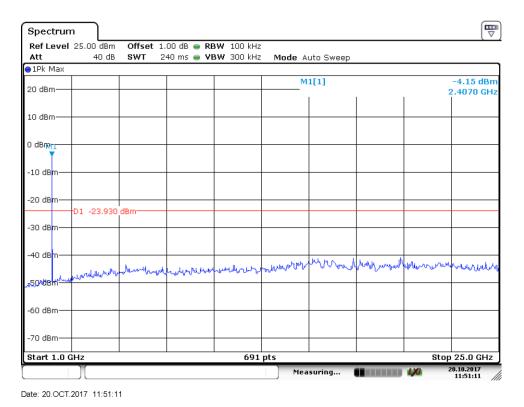
EMC\_SZ\_FR\_21.00 FCC Release 2017-05-17



# 802.11nHT20

Spectrum									
Ref Level	25.00 dBm	Offset	1.00 dB 👄 R	<b>BW</b> 100 kHz					
Att	40 dB	SWT	9.7 ms 👄 🛛	BW 300 kHz	Mode A	uto Sweep			
⊖1Pk Max									
20 dBm					M	1[1]			-47.67 dBm 829.40 MHz
10 dBm									
0 dBm									
-10 dBm									
-20 dBm	D1 00 000	-10							
-30 dBm	-D1 -23.930	asm-							
-40 dBm									
	derter politica po	anger anger	Mandinghitter		<del>hered</del> iana	kan ang pangang dan kang dan kang dan kang bang bang bang bang bang bang bang b	on and alable of the	M1 when and	Maynown
-60 dBm—									
-70 dBm									
Start 30.0	MHz			691	pts			Sto	op 1.0 GHz
						suring			20.10.2017 11:51:33

Date: 20.OCT.2017 11:51:32

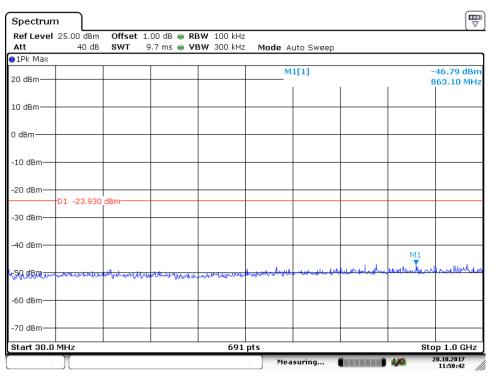


# 2412MHz

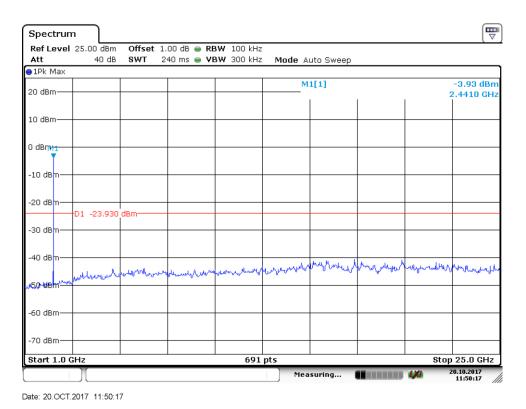
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Page 36 of 57





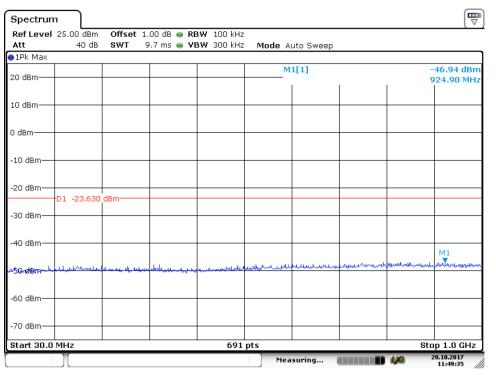
Date: 20.OCT.2017 11:50:42



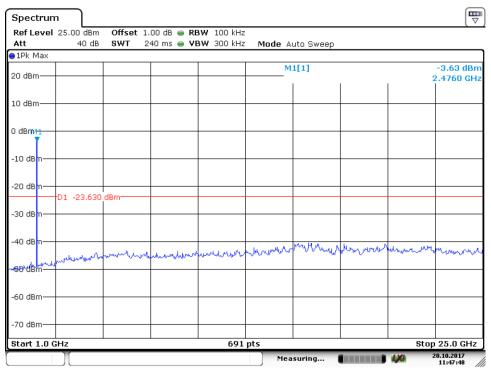
2437MHz

EMC\_SZ\_FR\_21.00 FCC Release 2017-05-17





Date: 20.OCT.2017 11:49:35



Date: 20.OCT.2017 11:47:48

## 2462MHz

EMC\_SZ\_FR\_21.00 FCC Release 2017-05-17

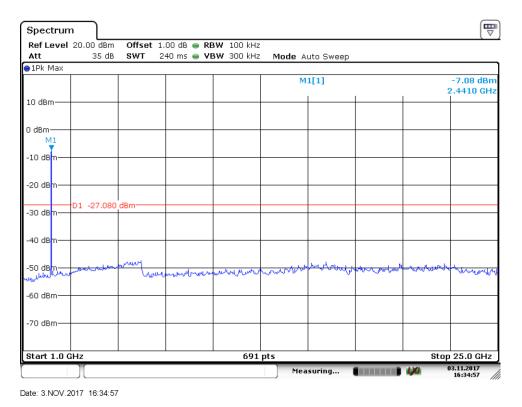




# 802.11nHT40

Spectrun	n								
Ref Level	20.00 dBm	Offset 1	.00 dB 🔵 RE	3W 100 kHz					
Att	35 dB	SWT	9.7 ms 👄 ۷	3W 300 kHz	Mode A	uto Sweep			
⊖1Pk Max		_							
					м	1[1]			51.44 dBm 701.70 MHz
10 dBm									
0 dBm									
-10 dBm									
-20 dBm—									
-30 dBm—	D1 -27.080	dBm							
-40 dBm—									
-50 dBm						M:	Linung - Linu		and a look holds
Whomstreen	Low with white	unnum	manualandugan	www.www.	Name	and the character	en de la companya		
-60 dBm									
-70 dBm									
Start 30.0	MHz			691	pts			Sto	p 1.0 GHz
					Mea	suring		4/0	03.11.2017 16:35:55

Date: 3.NOV.2017 16:35:55



# 2422MHz

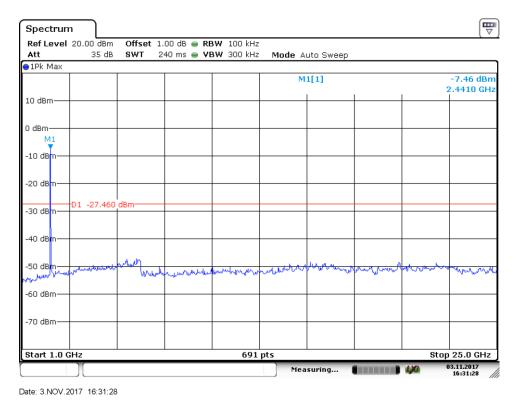
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Page 39 of 57



Spectrun	n								
Ref Level Att	20.00 dBm 35 dB		00 dB 👄 RE .7 ms 👄 VE		Mode A	uto Sweep			
⊖1Pk Max									
					М	1[1]			51.63 dBm 70.20 MHz
10 dBm									
0 dBm									
-10 dBm—									
-20 dBm—									
-30 dBm—	D1 -27.460	dBm							
-40 dBm									
-50 dBm								M1	
ellour contro	undebour	amanahaman	Mulman	ronderteamer	drawne who	handle and a start of the second s	www.walal.co.lbr.sb	multim	whentrogene
-60 dBm									
-70 dBm—									
Start 30.0	MHz			691	pts	1	1	Sto	p 1.0 GHz
	][				Mea	suring		4/0	3.11.2017 16:31:58

Date: 3.NOV.2017 16:31:59



# 2437MHz

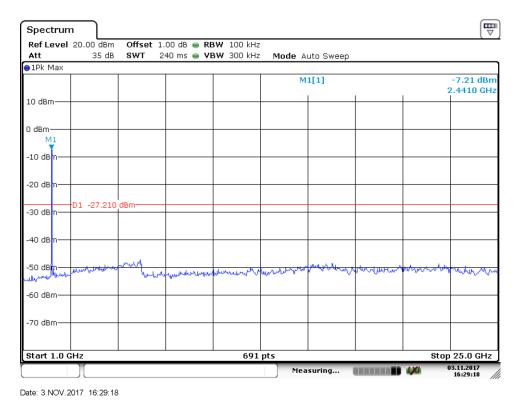
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Page 40 of 57



Spectrun	n								
Ref Level Att	20.00 dBm 35 dB	Offset 1 SWT	00 dB 👄 RE 9.7 ms 👄 VI	3W 100 kHz 3W 300 kHz	Mode A	uto Sweep			
⊖1Pk Max									
					М	1[1]			51.26 dBm 328.00 MHz
10 dBm									
0 dBm									
-10 dBm—									
-20 dBm—									
-30 dBm—	D1 -27.210	dBm							
-40 dBm									
-50 dBm								M1	
	ununun	mandertran	unununu	pulanoutheriters	haddedtarbard	wenter	hollowhere	untrucher	and and states and
-60 dBm									
-70 dBm—									
Start 30.0	MHz			691	pts			Sto	p 1.0 GHz
					Mea	suring		1/0	03.11.2017 16:30:07

Date: 3.NOV.2017 16:30:07



## 2452MHz

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Page 41 of 57



# 9.6 Band edge

## **Test Method**

1 Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 kHz, VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold.

- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

# Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

# Test result

## 802.11b

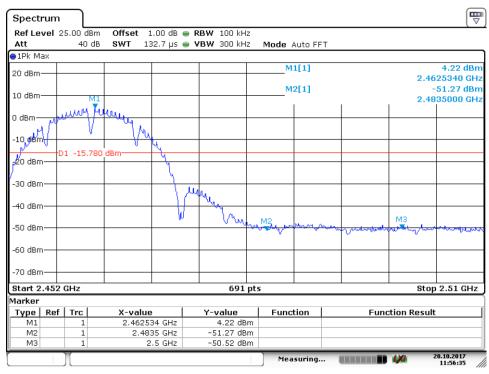
	vel 2	5.00 dBr			RBW 100 ki							
Att		40 d	B <b>SWT</b> 28	4.4 µs (	VBW 300 kł	Ηz	Mode /	Auto FF	Т			
-			1				M	1[1]				3.77 d
20 dBm	-					+		-[-]			2	2.411430
							M	2[1]				-33.84 d
10 dBm											M1 2	2.400000
0 dBm—											WW PAR	
о авт–											he l'ad	
-10 dBm										U.	U I	iA.
-10 000										(I		° h
-20 dBr		1 -16.23	30 dBm							/		_
20 320										1		
-30 dBm	)									-M2		
										J.		بالجر (
-40 dBm	n											
								MB	14 8	V I		
-50-pdBb	more	mbrun	mound	Jana	my second for	uw	mount	forment	. W.			_
					I .							
-60 dBrr	۱ <u> </u>					+						_
-70 dBr	) <u> </u>					1						-
Start 2	.31 G	Hz	I		691	pts					Sto	p 2.432 G
Marker												
Туре	Ref	Trc	X-value		Y-value		Func	tion		Fund	tion Res	ult
M1		1	2.4114		3.77 d							
M2 M3		1		4 GHz	-33.84 d -49.91 d							

Date: 20.OCT.2017 11:55:36

# 2412MHz

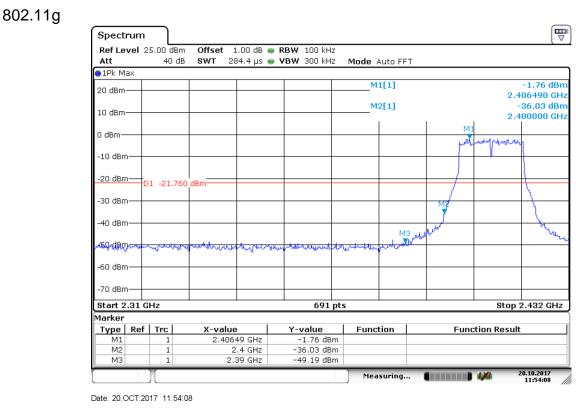
EMC\_SZ\_FR\_21.00 FCC Release 2017-05-17

## **Band edge**



Date: 20.0CT.2017 11:56:35

# 2462MHz



# 2412MHz

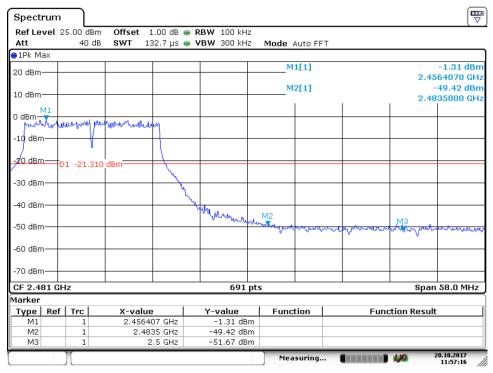
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Page 43 of 57



#### Report Number: 68.960.17.091.01

### **Band edge**



Date: 20.OCT.2017 11:57:17

## 2462MHz

# 802.11nHT20

₩ Spectrum Ref Level 25.00 dBm Offset 1.00 dB 🖷 RBW 100 kHz Att 40 dB S₩T 284.4 µs 👄 **VBW** 300 kHz Mode Auto FFT ∋1Pk Max M1[1] 3.63 dBn 20 dBm-2.411430 GH M2[1] -38.40 dBm 10 dBm-2.400000 GH 0 dBm -10 dBm -20 dBm-D1 -23.630.dBm--30 dBm мţ 40 dBm мз 450,dBm -60 dBm -70 dBm Stop 2.432 GHz Start 2.31 GHz 691 pts Marker Function Function Result Type | Ref | Trc | X-value Y-value M1 2.41143 GHz -3.63 dBm 1 2.4 GHz 2.39 GHz M2 -38.40 dBm 1 МЗ -48.22 dBm 1 20.10.2017 Measuring...

Date: 20.OCT.2017 11:53:13

# 2412MHz

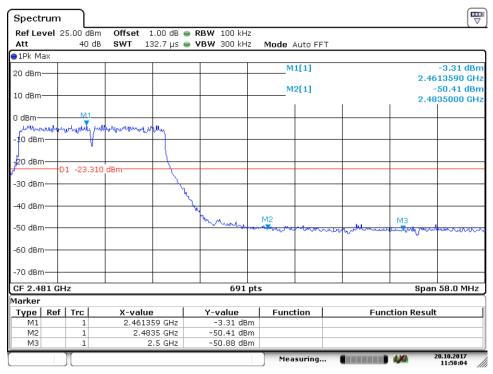
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Page 44 of 57



#### Report Number: 68.960.17.091.01

### **Band edge**



Date: 20.OCT.2017 11:58:04

## 2462MHz

### 802.11nHT40

[₩] Spectrum Ref Level 20.00 dBm Offset 1.00 dB 🖷 RBW 100 kHz Att 35 dB S₩T 322.4 µs 👄 **VBW** 300 kHz Mode Auto FFT ∋1Pk Max M3[1] 52.14 dBn 2.390000 GHz 10 dBm M1[1] -7.31 dBm 2.424770 GH 0 dBm--10 dBm -20 dBm-27.31 -30 dBm Mé 40 dBm -50 dBm underforment hand whenow 44 when -60 dBm--70 dBm Start 2.31 GHz 691 pts Stop 2.452 GHz Marker Function Function Result Type | Ref | Trc | X-value Y-value M1 2.42477 GHz -7.31 dBm 1 2.4 GHz 2.39 GHz M2 -40.39 dBm 1 МЗ 1 -52.14 dBm )3.11.2017 16:55:20 4,70 Measuring...

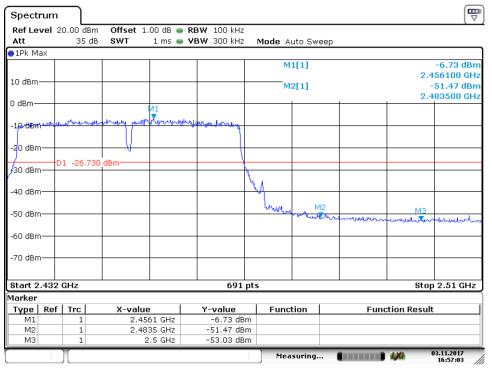
Date: 3.NOV.2017 16:55:20

# 2422MHz

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## **Band edge**



Date: 3.NOV.2017 16:57:03

#### 2452MHz





# **Test Method**

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.

3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz,  $VBW \ge RBW$  for peak measurement and VBW = 10Hz for average

measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz, VBW  $\ge$  RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

### Note:

1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.

2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.

3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).

4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.



# Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK



Correct

factor

(dB/m)

-23.7

-23.2

Result

Pass

Pass

## Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

## Transmitting spurious emission test result as below:

### 802.11b

2412MHz	(30MHz -	1GHz)				
F	requency	Emission Level	Polarization	Limit	Detector	Margin
	MHz	dBuV/m		dBµV/m		dBuV/m
39	96.013333	36.99	Horizontal	46.00	QP	9.01
39	96.013333	36.68	Vertical	46.00	QP	9.32

### 2412MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
2772.188 *	46.21	Horizontal	<b>dBμV/m</b> 74.00	PK	27.79	( <b>uB/III)</b> -4.7	Pass
2772.188 *	46.27	Vertical	74.00	PK	27.73	-4.6	Pass

#### Remark:

(1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

(2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

(3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss



2437MHz (30MHz Frequency MHz	– 1GHz) Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
		Horizontal		QP			Pass
		Vertical		QP			Pass
2437MHz (Above	1GHz) Emission	Polarization	Limit	Detector	Margin	Correct	Result

Frequency	Level	Polarization	Limit	Detector	Margin	factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
2772.188 *	45.45	Horizontal	74.00	PK	28.55	-4.7	Pass
4874.063 *	44.71	Vertical	74.00	PK	29.29	2.6	Pass

#### Remark:

- (1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

### 2462MHz (30MHz - 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
		Horizontal		QP			Pass
		Vertical		QP			Pass

### 2462MHz (Above 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
2772.188 *	46.13	Horizontal	74.00	PK	27.87	-4.7	Pass
1188.00 *	44.00	Vertical	74.00	PK	30.00	-12.6	Pass

- (1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss



# 802.11g

2412MHz	(30MHz -	1GHz)
		10112)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result	
		Horizontal		QP			Pass	
		Vertical		QP			Pass	

### 2412MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
2772.125 *	46.45	Horizontal	74.00	PK	27.55	-4.7	Pass
2772.250 *	44.34	Vertical	74.00	PK	29.66	-4.6	Pass

#### Remark:

- (1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

### 2437MHz (30MHz - 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
		Horizontal		QP			Pass
		Vertical		QP			Pass

#### 2437MHz (Above 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
2772.00 *	45.28	Horizontal	74.00	PK	28.72	-4.7	Pass
12796.41 *	44.60	Vertical	74.00	PK	29.40	13.0	Pass

- (1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss



2462MHz (30MHz Frequency MHz	– 1GHz) Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
		Horizontal		QP			Pass
		Vertical		QP			Pass
2462MHz (Above	1GHz) Emission	<b>_</b> <i>.</i> .			<b>.</b> .	Correct	<b>-</b>

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
2772.00 *	45.50	Horizontal	74.00	PK	28.50	-4.7	Pass
1188.063 *	42.41	Vertical	74.00	PK	31.59	-12.6	Pass

#### Remark:

- (1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

### 802.11nHT20

2412MHz (	30MHz –	1GHz)
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Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
		Horizontal		QP			Pass
		Vertical		QP			Pass

#### 2412MHz (Above 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
15068.91 *	46.53	Horizontal	74.00	PK	27.47	18.5	Pass
4356.094 *	49.47	Vertical	74.00	PK	24.53	1.0	Pass

- (1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss



#### 802.11nHT40

# 2422MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
		Horizontal		QP			Pass
		Vertical		QP			Pass

#### 2422MHz (Above 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
15735.47 *	47.03	Horizontal	74.00	PK	26.97	19.2	Pass
12500.63 *	44.61	Vertical	74.00	PK	29.39	12.7	Pass

#### Remark:

- (4) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (5) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (6) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

### 2437MHz (30MHz - 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
		Horizontal		QP			Pass
		Vertical		QP			Pass

#### 2437MHz (Above 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
2772.13 *	45.76	Horizontal	74.00	PK	28.24	-4.7	Pass
17787.66 *	50.32	Vertical	74.00	PK	23.68	22.9	Pass

- (1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss



# 2452MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
		Horizontal		QP			Pass
		Vertical		QP			Pass

## 2452MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
15051.56 *	47.32	Horizontal	74.00	PK	26.68	18.6	Pass
9808.13 *	42.95	Vertical	74.00	PK	31.05	9.1	Pass

#### Remark:

(1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

(2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

(3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss



2437MHz (30MHz – 1GHz)
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Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
		Horizontal		QP			Pass
		Vertical		QP			Pass

#### 2437MHz (Above 1GHz)

Frequency MHz	Emíssion Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBuV/m	Correct factor (dB/m)	Result
2772.00 *	47.42	Horizontal	74.00	PK	26.58	-4.7	Pass
1187.938 *	45.27	Vertical	74.00	PK	28.73	-12.6	Pass

#### Remark:

- (1) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (2) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

#### 2462MHz (30MHz - 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
		Horizontal		QP			Pass
		Vertical		QP			Pass

### 2462MHz (Above 1GHz)

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
MHz	dBuV/m		dBµV/m		dBuV/m	(dB/m)	
2772.00 *	45.50	Horizontal	74.00	PK	28.50	-4.7	Pass
14782.50 *	47.57	Vertical	74.00	PK	26.43	17.7	Pass

- (4) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (5) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (6) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss



# **10 Test Equipment List**

# List of Test Instruments

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2018-7-7
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-7
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-7-7
Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-7
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2018-7-7
3m Semi-anechoic chamber	TDK	9X6X6		2019-5-29
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-7
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-7-7
Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-14
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2018-7-14
LISN	Rohde & Schwarz	ENV4200	100249	2018-7-14
LISN	Rohde & Schwarz	ENV216	100326	2018-7-14
ISN	Rohde & Schwarz	ENY81	100177	2018-7-14
ISN	Rohde & Schwarz	ENY81-CA6	101664	2018-7-14
High Voltage Probe	Rohde & Schwarz	TK9420(VT94 20)	9420-58	2018-7-14
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2018-7-14

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- Power spectral density\*
- Spurious RF conducted emissions
- Band edge



For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

#### System Measurement Uncertainty

System Measurement Uncertainty							
Test Items	Extended Uncertainty						
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.98dB; Vertical: 5.06dB;						
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.95dB; Vertical: 4.94dB;						
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 5.14dB; Vertical: 5.12dB;						
Uncertainty for Conducted RF test with TS 8997	Power level test involved: 2.06dB Frequency test involved: 1.16×10 <sup>-7</sup>						

