

# FCC Part 15B Measurement and Test Report

For

**Compex Systems Pte Ltd**

**135 Joo Seng Road, #08-01 PM Industrial Building Singapore**

**FCC ID: TK4WPE72NX**

<b>Report Concerns:</b> Original Report	<b>Equipment Type:</b> WIRELESS 11N INDOOR ACCESS POINT
<b>Model:</b>	<u>WPE72NX</u>
<b>Report No.:</b>	<u>STR11118272I</u>
<b>Test Date:</b>	<u>2011-12-01 to 2011-12-17</u>
<b>Issue Date:</b>	<u>2011-12-29</u>
<b>Tested By:</b>	<u>Seven Song / Engineer</u> <span style="float: right;"><i>Seven Song</i></span>
<b>Reviewed By:</b>	<u>Lahm Peng / EMC Manager</u> <span style="float: right;"><i>Lahm peng</i></span>
<b>Approved &amp; Authorized By:</b>	<u>Jandy so / PSQ Manager</u> <span style="float: right;"><i>Jandyso</i></span>
<b>Prepared By:</b>	
<p><b>SEM.Test Compliance Service Co., Ltd</b>                  3/F, Jinbao Commerce Building, Xin'an Fanshen Road,                  Bao'an District, Shenzhen, P.R.C. (518101)                  Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn</p>	

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd.

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## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: Compex Systems Pte Ltd  
 Address of applicant: 135 Joo Seng Road, #08-01 PM Industrial Building  
 Singapore

Manufacturer: Compex Systems Pte Ltd  
 Address of manufacturer: 135 Joo Seng Road, #08-01 PM Industrial Building  
 Singapore

#### General Description of E.U.T

Items	Description
EUT Description:	WIRELSS ACCESS POINT
Trade Name:	COMPEX
Model No.:	WPE72NX
Frequency range:	802.11b/g/n: 2412-2462MHz 802.11a/n: 5180-5240MHz, 5745-5825MHz
Antenna Gain:	2dBi
Antenna Type:	Detachable or Undetachable
Rated Voltage:	DC 24V by power adapter
Power Adapter:	Model 1: ILP50-2400500U Model 2: SAW-2400500 Model 3: YHSW-240050U
Rated Current:	/

*The test data is gathered from a production sample, provided by the manufacturer.*

### 1.2 Test Standards

The following report is prepared on behalf of the Compex Systems Pte Ltd in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart B, and section 15.205, 15.107, and 15.109 rules.

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

### 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in

the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible susceptibility against the tested phenomena. The test modes were adapted accordingly in reference to the Operating Instructions.

### 1.4 Test Facility

- **FCC – Registration No.: 994117**

SEM.Test Compliance Services 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 and the Registration is 994117.

- **Industry Canada (IC) Registration No.: 7673A**

The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

- **CNAS Registration No.: L4062**

Shenzhen SEM.Test Electronics Service Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 3/F, Jinbao Commerce Building, Xin'an Fanshen Road, Bao'an District, Shenzhen, P.R.C (518101)

### 1.5 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components.

### 1.6 Accessories Equipment List and Details

Description	Manufacturer	Model	Serial Number
Notebook	SAMSUNG	NP-R20	124V93FP30082V

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
RJ 45	1.8	Unshielded	Without Core

### 1.7 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
DC Power Cable	1.2	Unshielded	Without Core

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## 2. SUMMARY OF TEST RESULTS

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<b>Description of Test</b>	<b>Result</b>
§15.107 (a) Conducted Emission	Compliant
§15.109(a) Radiated Emission	Compliant

### 3. §15.107 (a) CONDUCTED EMISSIONS

#### 3.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is  $\pm 2.88$  dB.

#### 3.2 Test Equipment List and Details

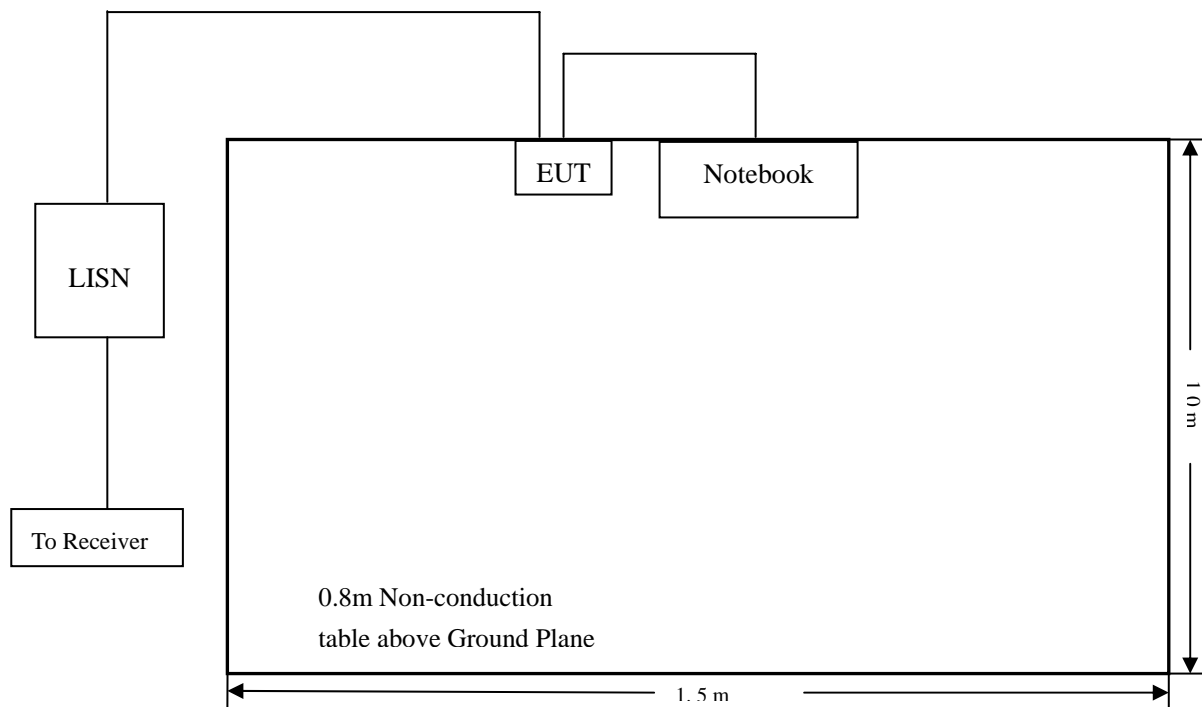
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2011-12-20	2012-12-19
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2011-12-20	2012-12-19
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2011-12-20	2012-12-19

**Statement of Traceability:** All calibrations have been performed per the NVLAP requirements traceable to the NIST.

#### 3.3 Test Procedure

Test is conducting under the description of ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

#### 3.4 Basic Test Setup Block Diagram



### 3.5 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

### 3.6 Summary of Test Results/Plots

According to the data in section 3.7, the EUT complied with the FCC Part 15.107 Conducted margin for a Class B device, with the *worst* margin reading of:

- 3.21 dB $\mu$ V at 0.734 MHz in the **Line** mode, **QP** detector (adapter Model: ILP50-2400500U), **0.15-30MHz**
- 14.37 dB $\mu$ V at 0.398 MHz in the **Line** mode, **Average** detector (adapter Model: SAW-2400500), **0.15-30MHz**
- 3.39 dB $\mu$ V at 0.170 MHz in the **Line** mode, **Peak** detector (adapter Model: YHSW-240050U), **0.15-30MHz**

### 3.7 Conducted Emissions Test Data

**Plot of Conducted Emissions Test Data**

*Conducted Disturbance*

*EUT: WIRELESS IIN INDOOR ACCESS POINT*

*M/N: WPE72*

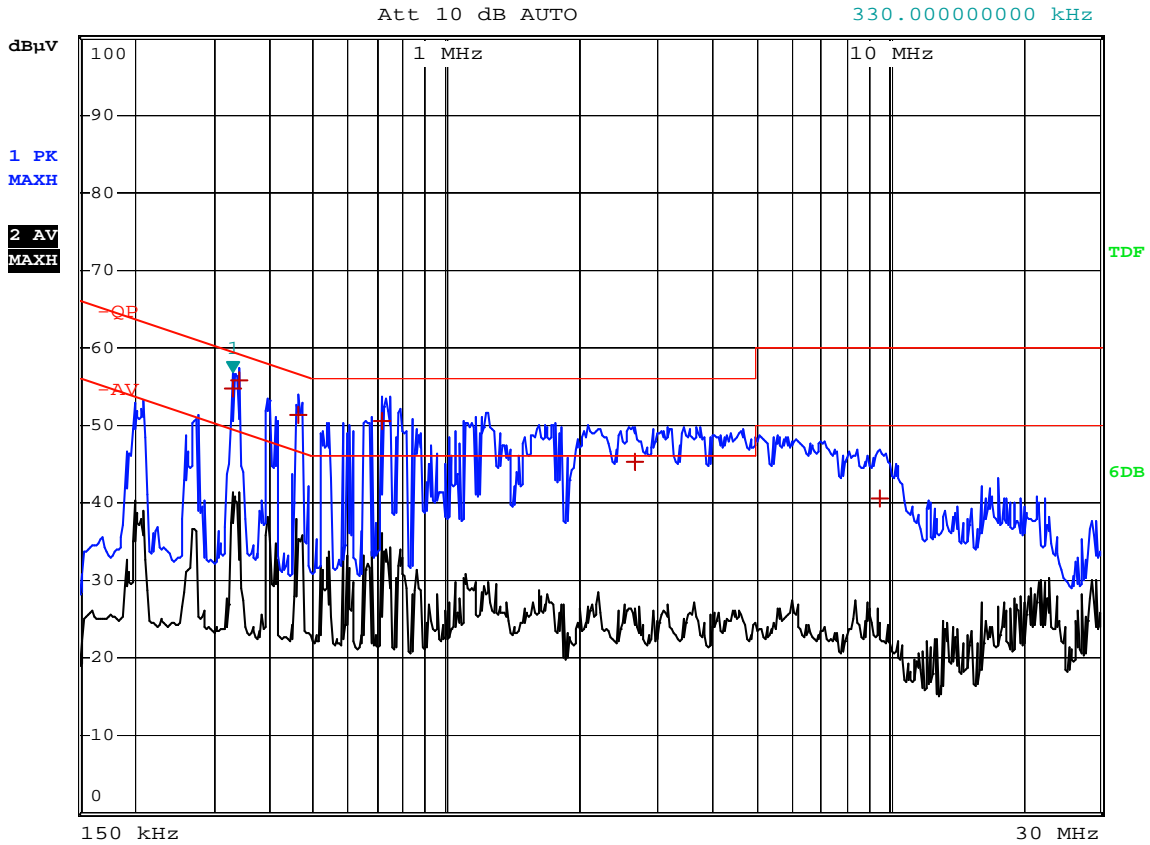
*Operating Condition: Operating*

*Test Specification: N*

*Comment: Adapter Model: ILP50-2400500U*



RBW 9 kHz Marker 1 [T1 ]  
 MT 5 s 56.73 dBµV  
 330.00000000 kHz



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Quasi Peak	330 kHz	54.83	-4.61
1 Quasi Peak	338 kHz	55.67	-3.57
1 Quasi Peak	462 kHz	51.42	-5.22
1 Quasi Peak	714 kHz	50.64	-5.36
1 Quasi Peak	2.662 MHz	45.35	-10.64
1 Quasi Peak	9.514 MHz	40.42	-19.57



**Plot of Conducted Emissions Test Data**

Conducted Disturbance

EUT: WIRELESS IIN INDOOR ACCESS POINT

M/N: WPE72

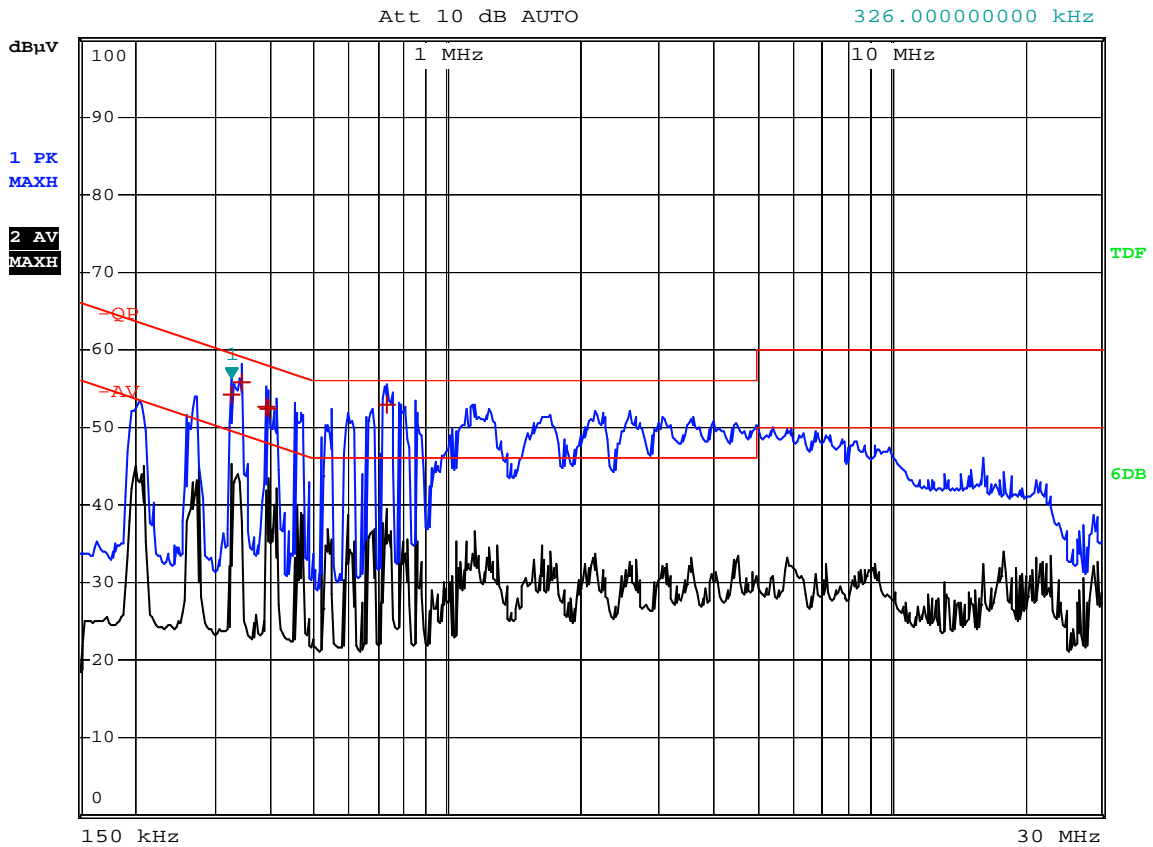
Operating Condition: Operating

Test Specification: L

Comment: Adapter Model: ILP50-2400500U



RBW 9 kHz Marker 1 [T1 ]  
 MT 5 s 56.40 dBµV  
 326.00000000 kHz



EDIT PEAK LIST (Final Measurement Results)			
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
1	Quasi Peak 326 kHz	54.22	-5.33
1	Quasi Peak 342 kHz	55.76	-3.38
1	Quasi Peak 390 kHz	52.57	-5.48
1	Quasi Peak 394 kHz	52.36	-5.61
1	Quasi Peak 734 kHz	52.78	-3.21

**Plot of Conducted Emissions Test Data**

*Conducted Disturbance*

*EUT: WIRELESS IIN INDOOR ACCESS POINT*

*M/N: WPE72*

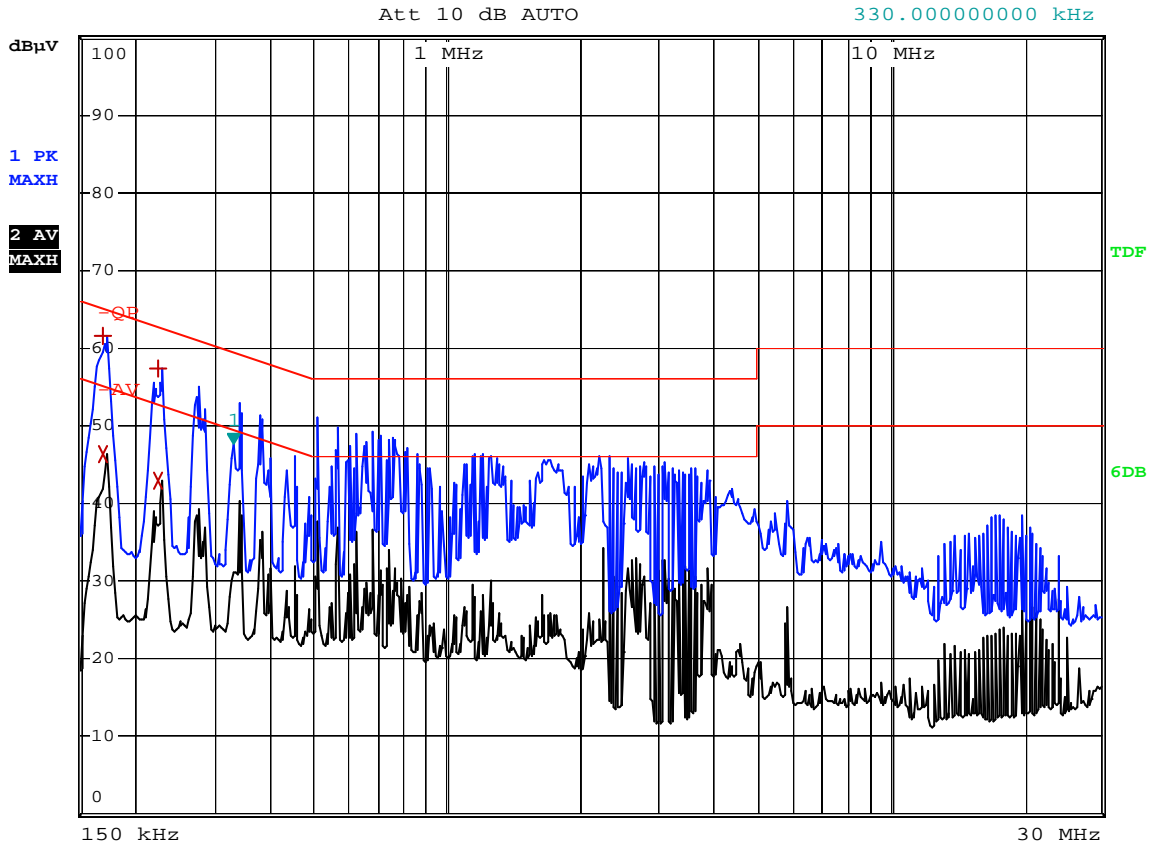
*Operating Condition: Operating*

*Test Specification: N*

*Comment: Adapter Model: YHSW-240050U*



RBW 9 kHz Marker 1 [T1 ]  
 MT 10 ms 47.75 dBµV  
 330.00000000 kHz



EDIT PEAK LIST (Prescan Results)				
Trace1:		-QP		
Trace2:		-AV		
Trace3:		---		
TRACE		FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Max Peak	170 kHz	61.57	-3.39
2	Average	170 kHz	46.37	-8.58
1	Max Peak	226 kHz	57.47	-5.12
2	Average	226 kHz	42.92	-9.66

**Plot of Conducted Emissions Test Data**

Conducted Disturbance

EUT: WIRELESS IIN INDOOR ACCESS POINT

M/N: WPE72

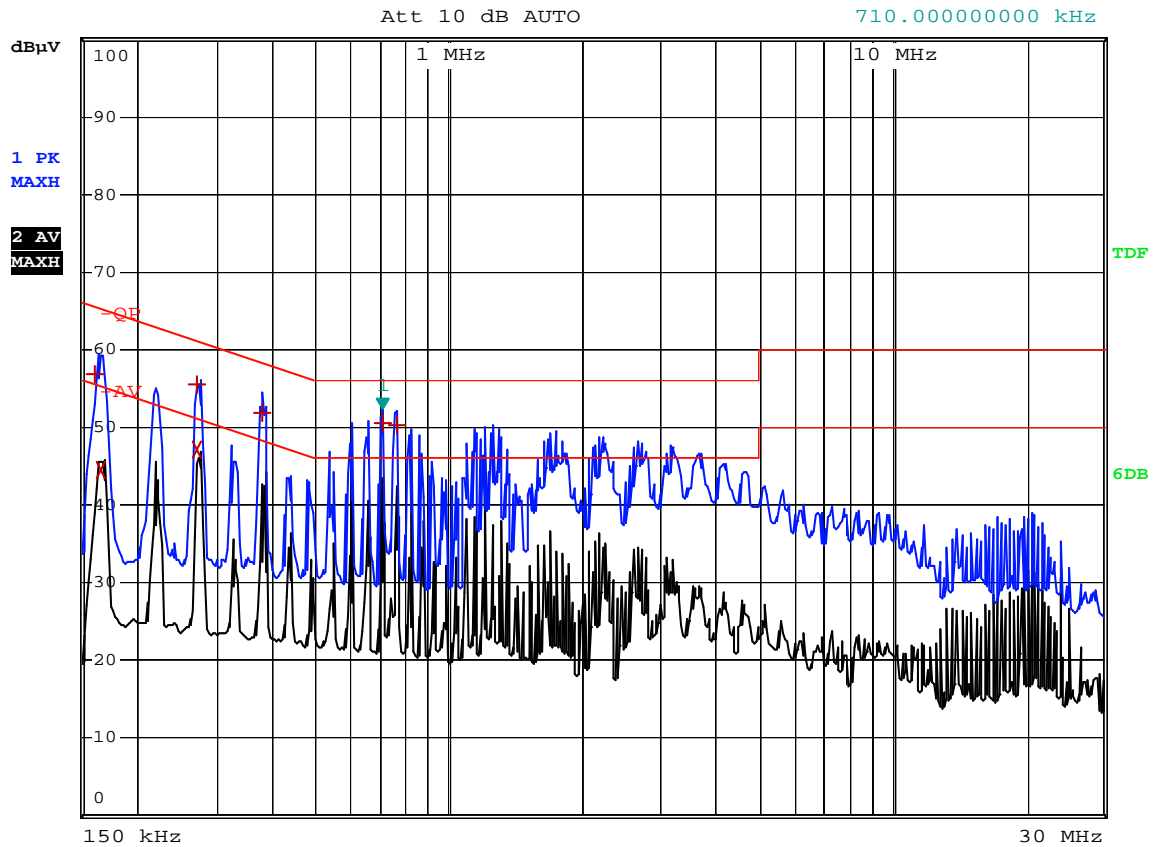
Operating Condition: Operating

Test Specification: L

Comment: Adapter Model: YHSW-240050U



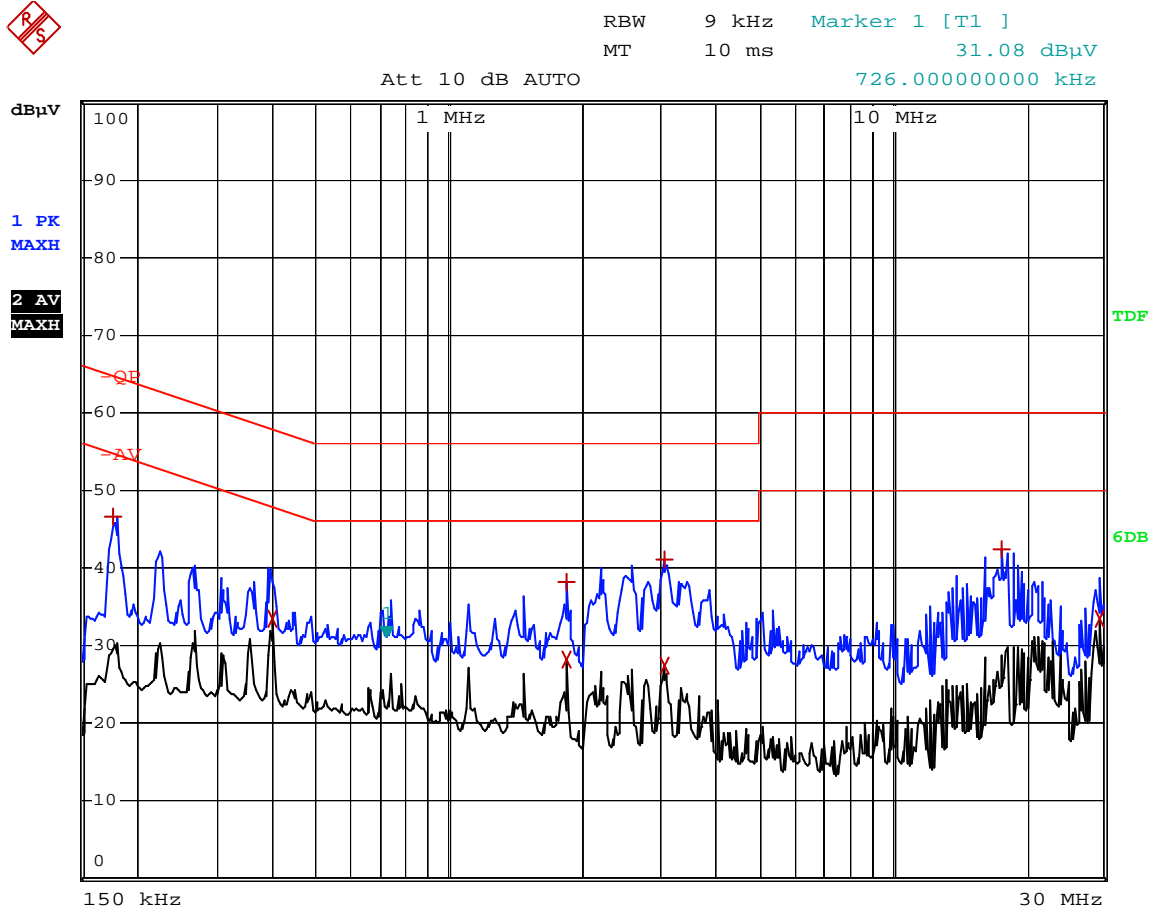
RBW 9 kHz Marker 1 [T1 ]  
 MT 5 s 52.27 dBµV  
 710.00000000 kHz



EDIT PEAK LIST (Final Measurement Results)			
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
1 Quasi Peak	162 kHz	56.89	-8.46
2 Average	166 kHz	44.56	-10.59
1 Quasi Peak	274 kHz	55.49	-5.50
2 Average	274 kHz	47.05	-3.94
1 Quasi Peak	378 kHz	51.92	-6.40
1 Quasi Peak	710 kHz	50.62	-5.37
1 Quasi Peak	762 kHz	50.31	-5.68

**Plot of Conducted Emissions Test Data**

Conducted Disturbance  
 EUT: WIRELESS IIN INDOOR ACCESS POINT  
 M/N: WPE72  
 Operating Condition: Operating  
 Test Specification: N  
 Comment: Adapter Model: SAW-2400500



EDIT PEAK LIST (Prescan Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Max Peak	178 kHz	46.55	-18.02
2 Average	398 kHz	33.51	-14.37
1 Max Peak	1.846 MHz	38.13	-17.86
2 Average	1.846 MHz	28.19	-17.80
2 Average	3.062 MHz	27.54	-18.45
1 Max Peak	3.07 MHz	41.14	-14.85
1 Max Peak	17.694 MHz	42.40	-17.59
2 Average	29.234 MHz	33.54	-16.45

**Plot of Conducted Emissions Test Data**

*Conducted Disturbance*

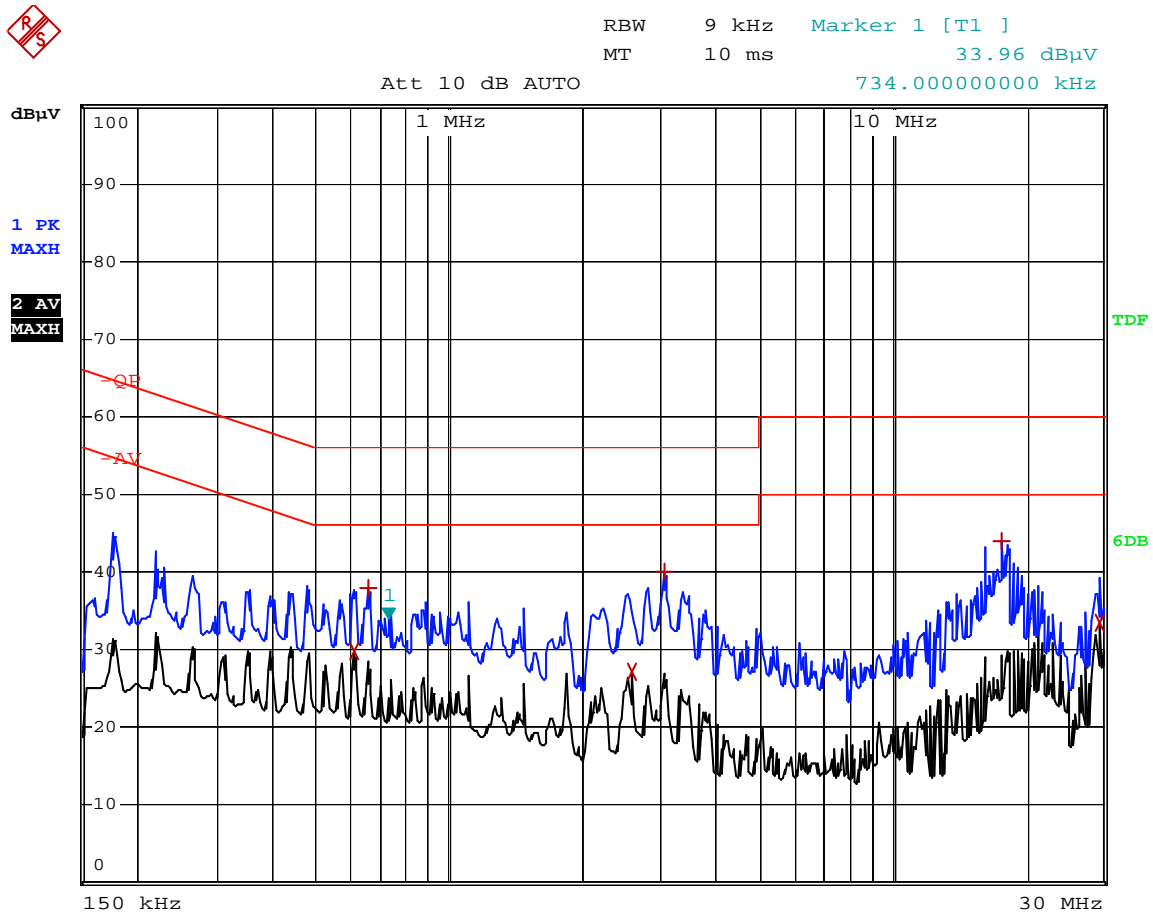
*EUT: WIRELESS 11N INDOOR ACCESS POINT*

*M/N: WPE72*

*Operating Condition: Operating*

*Test Specification: L*

*Comment: Adapter Model: SAW-2400500*



EDIT PEAK LIST (Prescan Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2 Average	610 kHz	29.76	-16.23
1 Max Peak	654 kHz	38.00	-18.00
2 Average	2.582 MHz	27.28	-18.71
1 Max Peak	3.062 MHz	40.01	-15.99
1 Max Peak	17.69 MHz	43.85	-16.14
2 Average	29.234 MHz	33.45	-16.54

## 4. §15.109(a)- RADIATED EMISSION

### 4.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any radiation emissions measurement is  $\pm 5.10$  dB.

### 4.2 Test Equipment List and Details

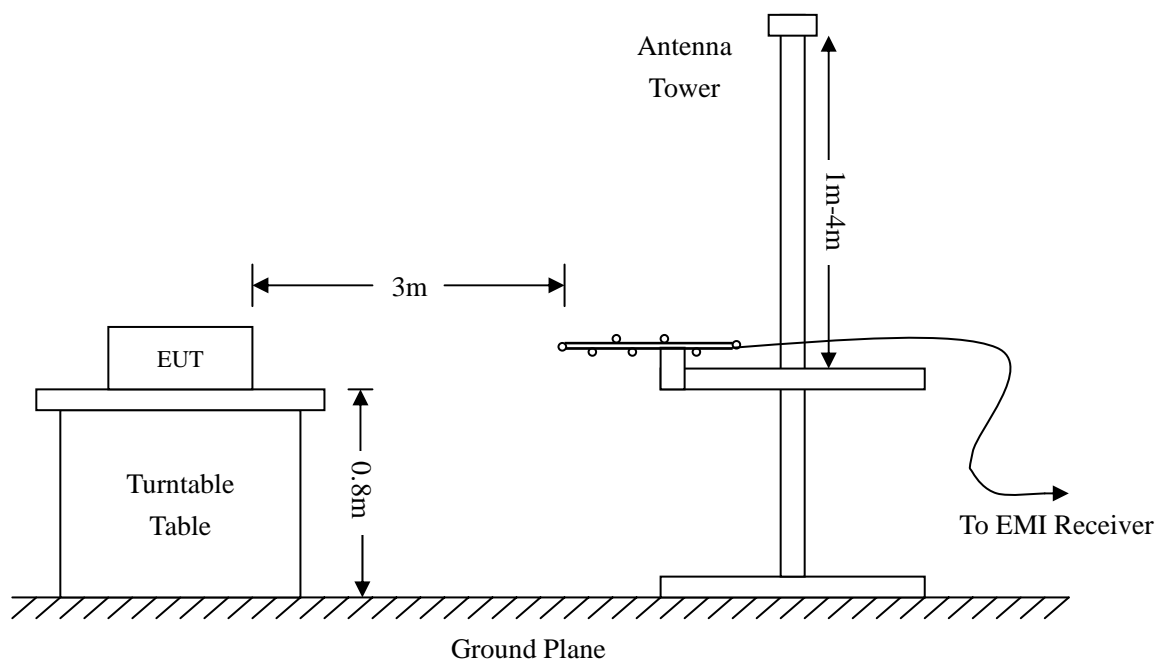
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2011-12-20	2012-12-19
EMI Test Receiver	R&S	ESVB	825471/005	2011-12-20	2012-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2011-12-20	2012-12-19
RF Switch	EM	EMSW18	SW060023	2011-12-20	2012-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2011-12-20	2012-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2011-12-20	2012-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08

### 4.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.109 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



#### 4.4 Test Receiver Setup

During the radiated emission test for above 1GHz, the test receiver was set with the following configurations:

For peak detector:

RBW = 1000kHz, VBW = 3000kHz, Sweep Time = Auto

For average detector:

RBW = 1000kHz, VBW = 10Hz, Sweep Time = Auto

#### 4.5 Corrected Amplitude & Margin Calculation

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

$$\text{Corr. Ampl.} = \text{Indicated Reading} - \text{Corr. Factor}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB $\mu$ V means the emission is 6dB $\mu$ V below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15B Limit}$$

#### 4.6 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	55 %
ATM Pressure:	1011 mbar

#### 4.7 Summary of Test Results/Plots

According to the data, the EUT complied with the FCC Part 15B Class B standards, and had the worst margin of:

**-1.23 dB $\mu$ V at 33.0949 MHz in the Vertical polarization adapter model ILP50-2400500U, 30 MHz to 1 GHz, 3Meters**

**-2.40 dB $\mu$ V at 804.6028 MHz in the Vertical polarization adapter model YHSW-240050U, 30 MHz to 1 GHz, 3Meters**

**-1.56 dB $\mu$ V at 804.6028 MHz in the Vertical polarization adapter model SAW2400500, 30 MHz to 1 GHz, 3Meters**

**Plot of Radiation Emissions Test**

*Radiated Disturbance*

*EUT: WIRELESS 11N INDOOR ACCESS POINT*

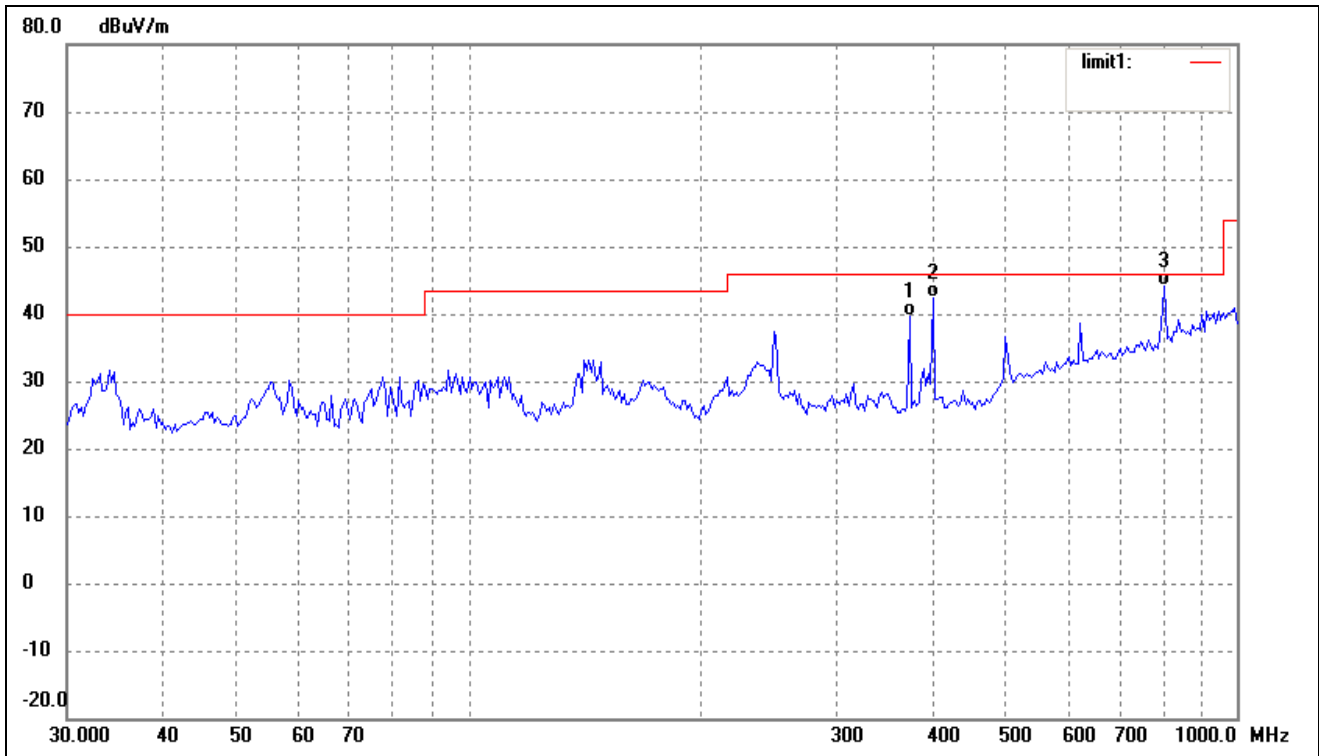
*M/N: WPE72NX*

*Operating Condition: Operating*

*Test Specification: Horizontal & Vertical*

*Comment: adapter model ILP50-2400500U*

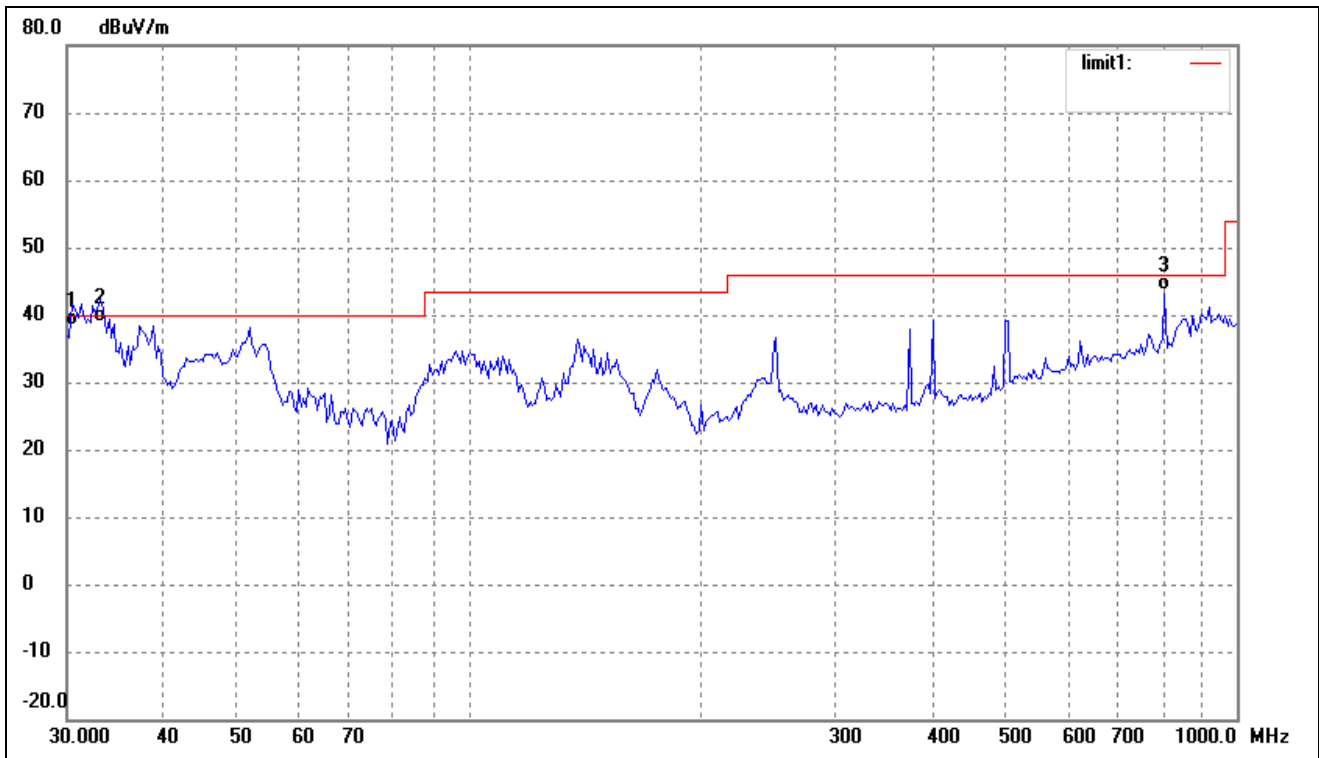
*Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	374.6225	28.44	11.11	39.55	46.00	-6.45	210	100	QP
2	401.8385	30.95	11.40	42.35	46.00	-3.65	113	100	QP
3	804.6028	24.91	19.10	44.01	46.00	-1.99	230	100	QP



Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.6190	31.63	6.77	38.40	40.00	-1.60	360	100	QP
2	33.0949	32.00	6.77	38.77	40.00	-1.23	250	100	QP
3	804.6028	24.42	19.10	43.52	46.00	-2.48	180	100	QP

*Radiated Disturbance*

*EUT: WIRELESS IIN INDOOR ACCESS POINT*

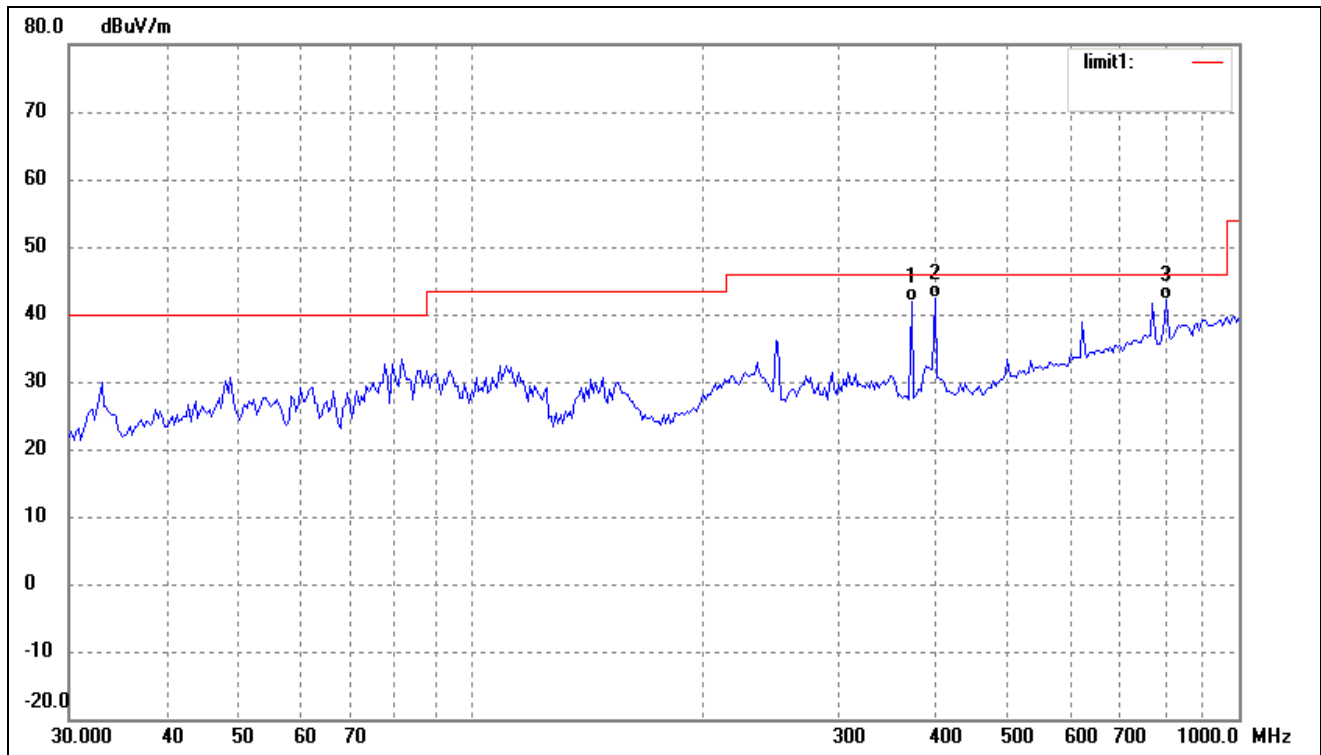
*M/N: WPE72NX*

*Operating Condition: Operating*

*Test Specification: Horizontal & Vertical*

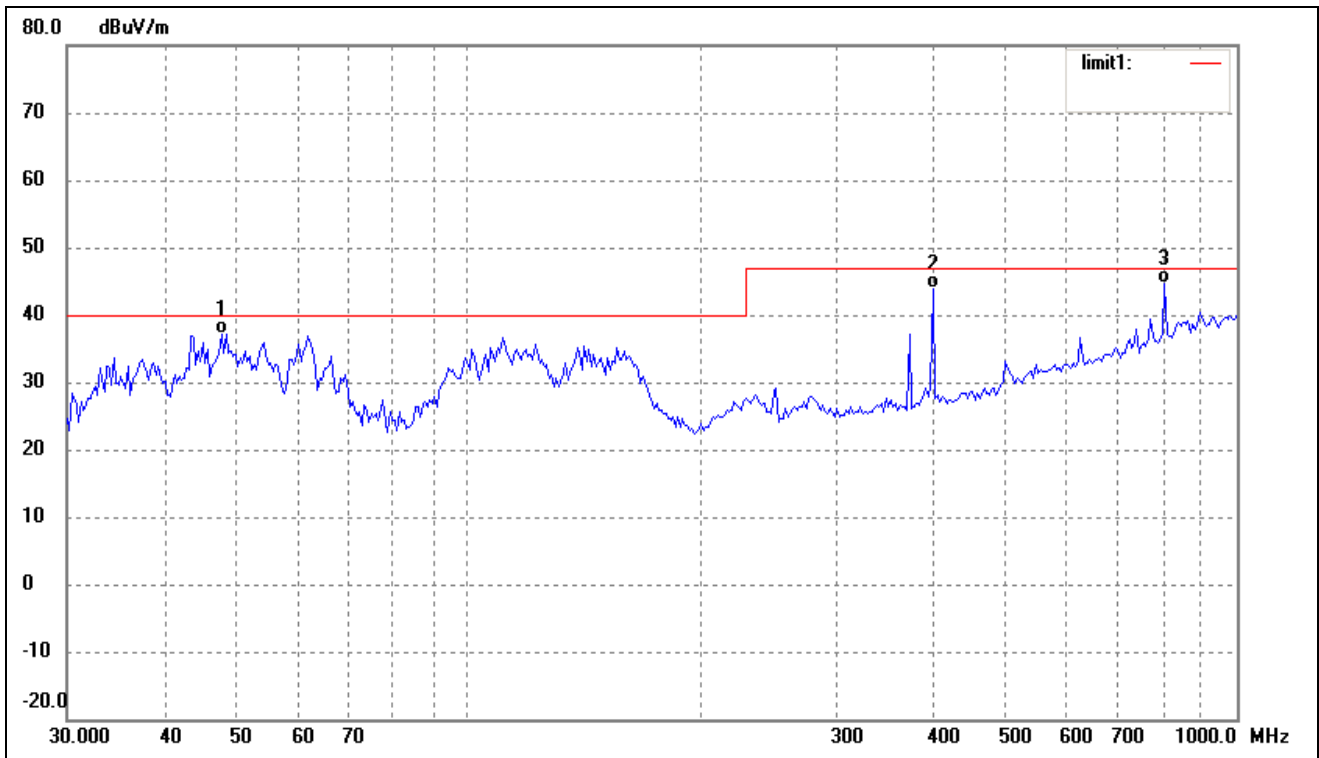
*Comment: adapter model YHSW-240050U*

*Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( ° )	Height (cm)	Remark
1	374.6225	30.76	11.11	41.87	46.00	-4.13	214	100	QP
2	401.8385	30.87	11.40	42.27	46.00	-3.73	200	100	QP
3	804.6028	23.01	19.10	42.11	46.00	-3.89	195	100	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( ° )	Height (cm)	Remark
1	47.6585	29.14	8.09	37.23	40.00	-2.77	204	100	QP
2	401.8385	32.37	11.40	43.77	47.00	-3.23	107	100	QP
3	804.6028	25.50	19.10	44.60	47.00	-2.40	100	100	QP

*Radiated Disturbance*

*EUT: WIRELESS IIN INDOOR ACCESS POINT*

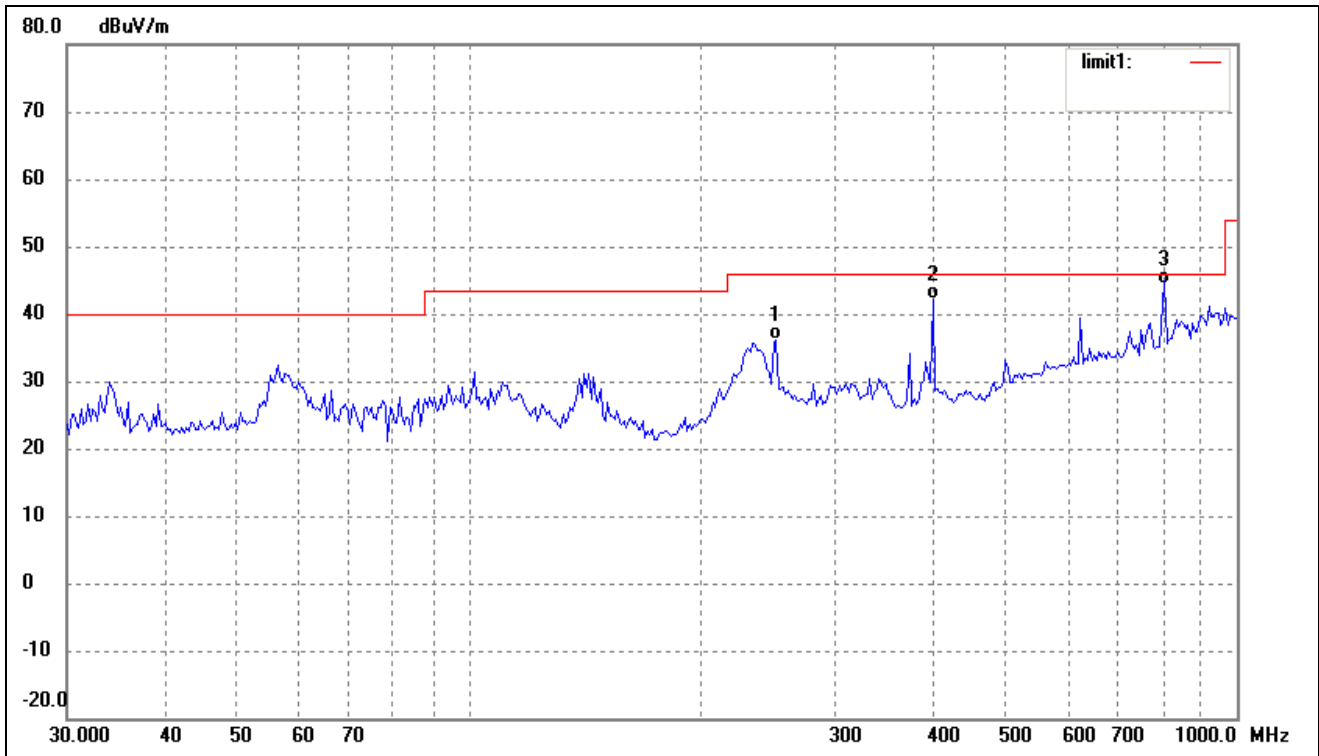
*M/N: WPE72NX*

*Operating Condition: Operating*

*Test Specification: Horizontal & Vertical*

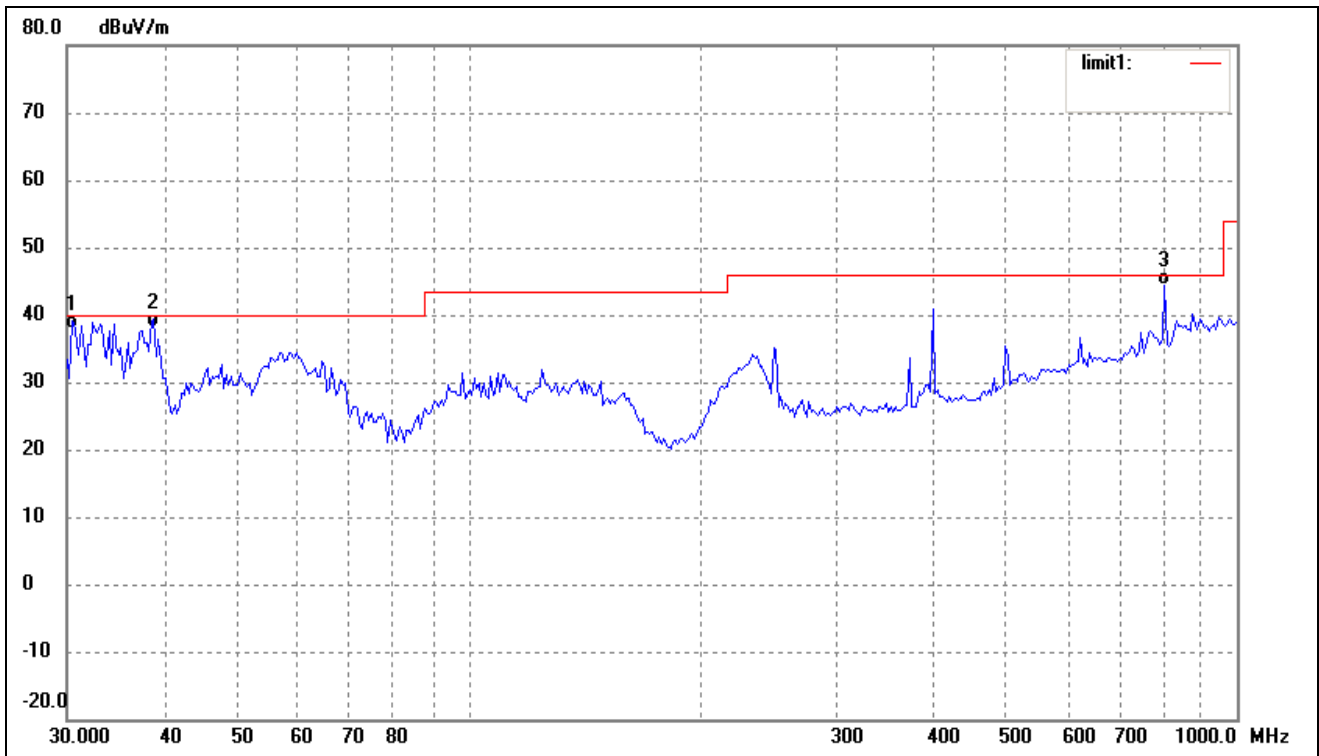
*Comment: adapter model SAW-2400500*

*Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	251.1804	27.41	8.72	36.13	46.00	-9.87	314	100	QP
2	401.8385	30.81	11.40	42.21	46.00	-3.79	221	100	QP
3	804.6028	25.34	19.10	44.44	46.00	-1.56	140	100	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( ° )	Height (cm)	Remark
1	30.6058	31.03	6.77	37.80	40.00	-2.20	359	100	QP
2	38.8878	30.21	7.84	38.05	40.00	-1.95	210	100	QP
3	804.6028	25.24	19.10	44.34	46.00	-1.66	138	100	QP

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics, the measurements greater than 20dB below the limit from 30MHz to 2GHz..