

FCC PART 15B

TEST REPORT

For

Iconnect

No.9, Aly. 58, Ln. 112, Ruiguang Rd., Neihu Dist., Taipei City, Taiwan

FCC ID: 2AB87-OWL

Report Type: Original Report	Product Type: HAK5OWL
Report Number:	RDG181225002-00A
Report Date:	2019-11-21
Reviewed By:	Gavin Xu RF Engineer 
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

TABLE OF CONTENTS

General Information	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S)	3
TEST METHODOLOGY	3
MEASUREMENT UNCERTAINTY	4
TEST FACILITY	4
DECLARATIONS	4
System Test Configuration	5
DESCRIPTION OF TEST CONFIGURATION	5
EQUIPMENT MODIFICATIONS	5
EUT EXERCISE SOFTWARE	5
LOCAL SUPPORT EQUIPMENT LIST AND DETAILS	5
SUPPORT CABLE LIST AND DETAILS	5
BLOCK DIAGRAM OF TEST SETUP	6
TEST EQUIPMENT LIST	7
ENVIRONMENTAL CONDITIONS	7
Summary of Test Results	8
Conducted emissions	9
EUT SETUP	9
EMI TEST RECEIVER SETUP	9
TEST PROCEDURE	9
TEST DATA	11
Radiated emissions	13
EUT SETUP	13
EMI TEST RECEIVER SETUP	14
TEST PROCEDURE	14
CORRECTED AMPLITUDE & MARGIN CALCULATION	14
TEST DATA	15

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	HAK5OWL
EUT Model:	HAK5OWL
Highest Operation Frequency:	2462 MHz
Rated Input Voltage:	DC 5V from USB port
Serial Number:	181225002
EUT Received Date:	2018.12.26
EUT Status:	Good

Objective

This report is prepared on behalf of *Iconnect* in accordance with FCC Part 15B Part 2, subpart J, and Part 15, Subpart A and B of the Federal Communications Commission's rules.

The objective of the manufacturer is to determine the compliance of EUT with FCC Part 15 B Class B.

Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: 2AB87-OWL

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, 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.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB, 200M~1GHz: 5.92 dB, 1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB
Temperature	±1 °C
Humidity	±5%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “△”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

This report cannot be reproduced except in full, without prior written approval of the Company.

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA, or any agency of the U.S. Government.

This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in typical mode.

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

The software "TFGEN.EXE" was used during test.

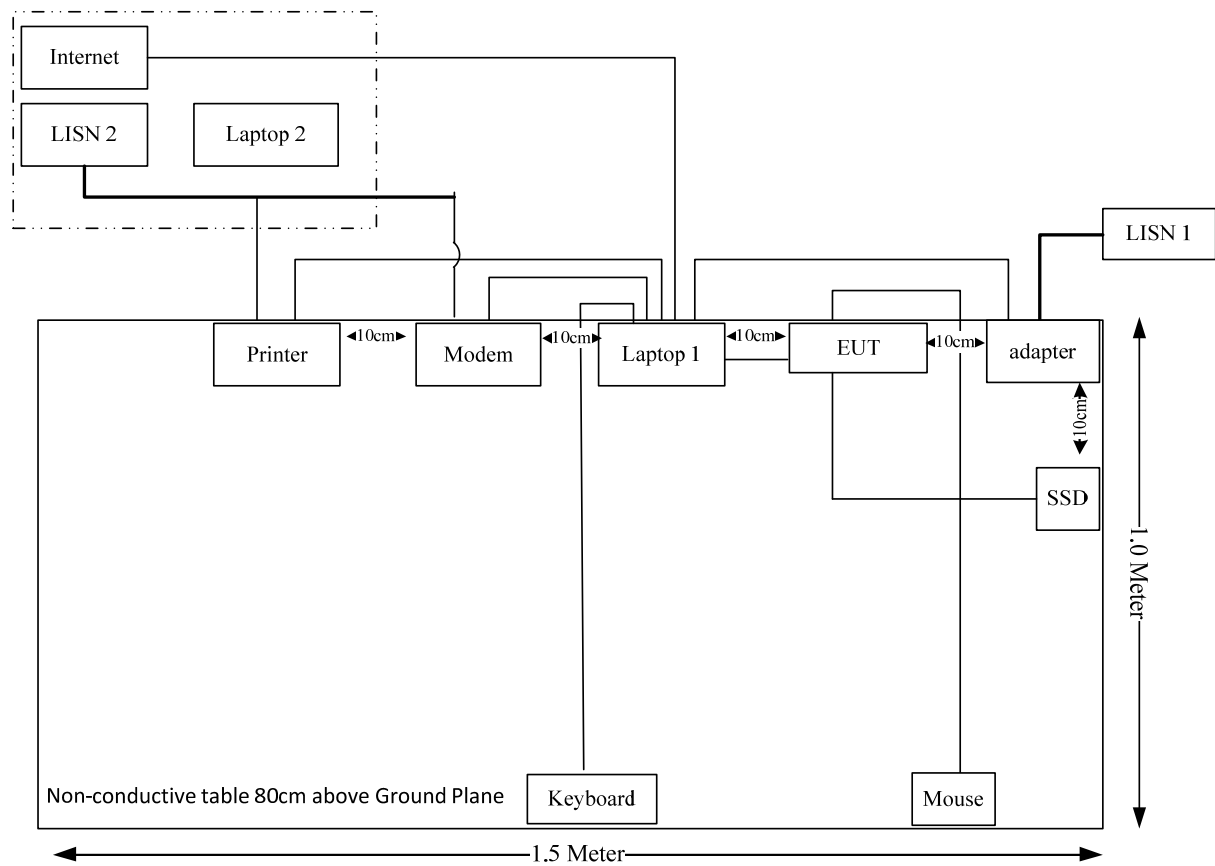
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop1	PP11L	QDS-BRCM1017
HP	Printer	C3941A	JPTVOB2337
DELL	Keyboard	L100	CNORH656658907BL05DC
SAST	Modem	AEM-2100	293
Seagate	SSD	STDR1000300	N/A
DELL	Mouse	MO56UOA	F0Y02P7Y
Lenovo	Laptop 2 (Link with Wi-Fi)	ThinkPad E450	PF-0MR8KV

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	Yes	No	0.1	EUT	Laptop1
USB Cable	Yes	No	0.3	EUT	SSD
Mouse Cable	Yes	No	1.2	EUT	Mouse
RJ45 Cable	Yes	No	10	Laptop1	Internet
Serial Cable	Yes	No	1.2	Serial Port of Laptop1	Modem
Keyboard Cable	Yes	No	1.5	Keyboard	USB Port of Laptop 1
Parallel Cable	Yes	No	1.2	Parallel Port of Laptop1	Printer

Block Diagram of Test Setup



Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted emissions					
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2018-09-05	2019-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2018-12-10	2019-12-10
R&S	EMI Test Receiver	ESPI	100120	2019-05-09	2020-05-09
Radiated emissions Below 1GHz					
R&S	EMI Test Receiver	ESR3	102453	2019-06-26	2020-06-26
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2019-05-06	2020-05-06
HP	Amplifier	8447D	2727A05902	2019-09-05	2020-09-05
Radiated emissions Above 1GHz					
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-05-09	2020-05-09
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2018-09-05	2019-09-05
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2018-09-05	2019-09-05
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2019/6/16	2020/6/16

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

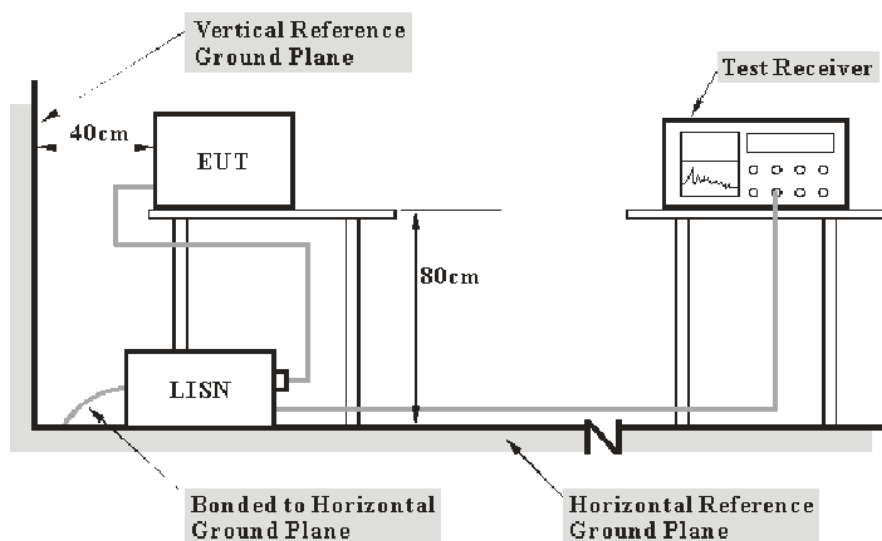
Test Item:	Conducted emissions	Radiated emissions Below 1GHz	Radiated emissions Above 1GHz
Test Date:	2019-07-15	2019-10-29	2019-07-15
Tester:	Lily Xie	Neil Liao	Lucy Lu
Temperature:	30.5°C	25.3 °C	28.9°C
Relative Humidity:	56%	40%	68%
ATM Pressure:	100.2kPa	100.1kPa	100.2kPa

SUMMARY OF TEST RESULTS

Rule and Clause	Description of Test	Test Result
FCC §15.107	Conducted emissions	Compliance
FCC §15.109	Radiated emissions	Compliance

CONDUCTED EMISSIONS

EUT Setup



Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15 B Class B limits.

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

The adapter was connected to the Main LISN with 120V/60Hz AC power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the Adapter of Laptop was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

V_C : corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

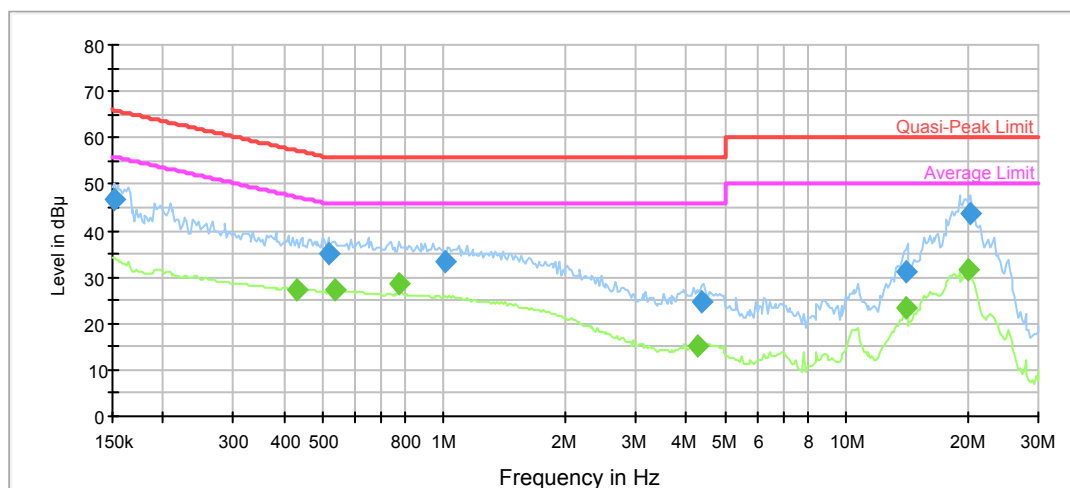
The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data

Please refer to following table and plots:

Port: L
 Test Mode: Operating
 Power Source: AC 120V/60Hz
 Note:



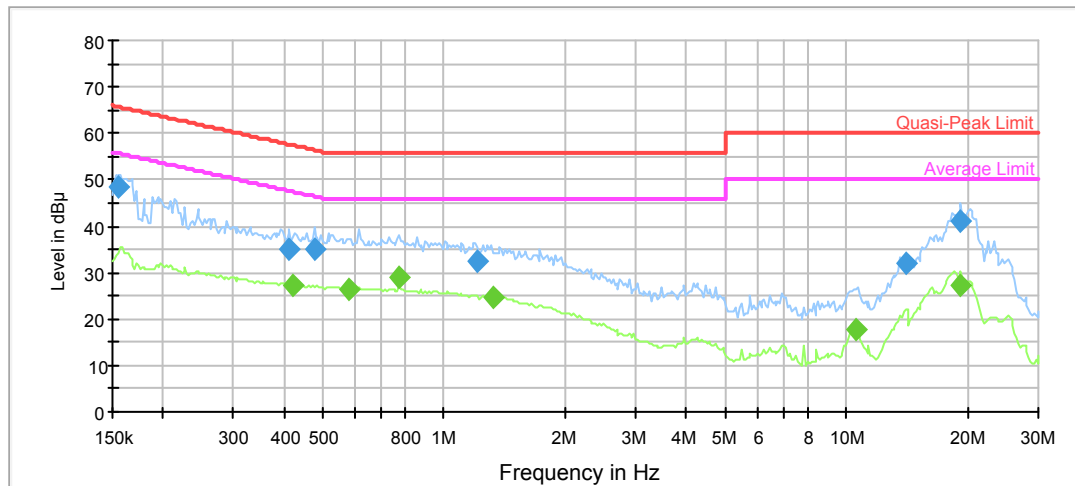
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.151500	46.8	9.000	L1	11.2	19.1	65.9
0.515160	35.0	9.000	L1	9.9	21.0	56.0
1.001244	33.4	9.000	L1	9.8	22.6	56.0
4.375514	24.5	9.000	L1	9.8	31.5	56.0
14.016240	31.3	9.000	L1	9.8	18.7	60.0
20.254840	43.8	9.000	L1	10.1	16.2	60.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.430682	27.4	9.000	L1	9.9	19.8	47.2
0.536077	27.1	9.000	L1	9.9	18.9	46.0
0.774673	28.7	9.000	L1	9.8	17.3	46.0
4.289574	15.3	9.000	L1	9.8	30.7	46.0
14.152410	23.3	9.000	L1	9.8	26.7	50.0
20.054297	31.4	9.000	L1	10.1	18.6	50.0

Port: N
Test Mode: Operating
Power Source: AC 120V/60Hz
Note:



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.156091	48.5	9.000	N	11.1	17.2	65.7
0.413877	35.2	9.000	N	9.9	22.4	57.6
0.475741	35.2	9.000	N	9.9	21.2	56.4
1.212214	32.6	9.000	N	9.8	23.4	56.0
14.016241	32.0	9.000	N	9.8	28.0	60.0
19.271786	41.2	9.000	N	10.0	18.8	60.0

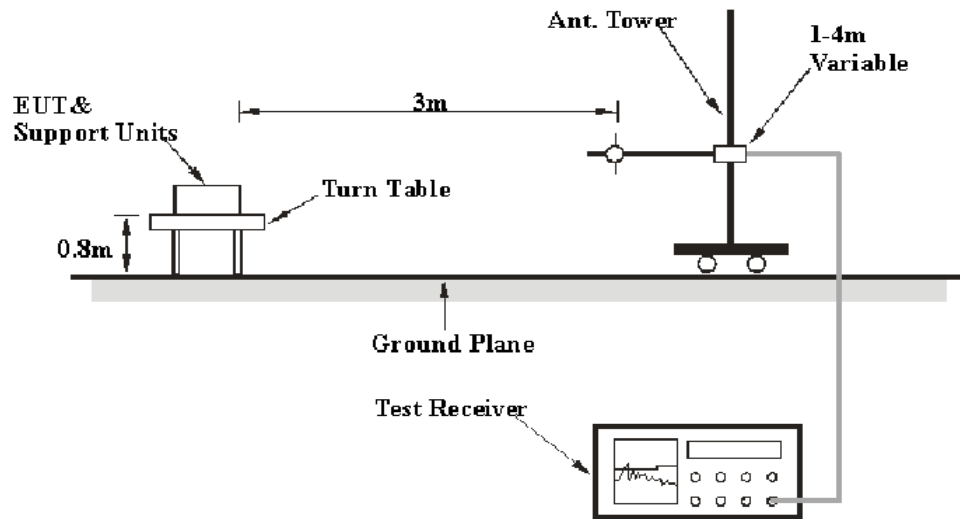
Final Result 2

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.422196	27.2	9.000	N	9.9	20.2	47.4
0.580495	26.6	9.000	N	9.8	19.4	46.0
0.774673	28.9	9.000	N	9.8	17.1	46.0
1.332444	24.9	9.000	N	9.8	21.1	46.0
10.624741	17.7	9.000	N	9.8	32.3	50.0
19.271786	27.3	9.000	N	10.0	22.7	50.0

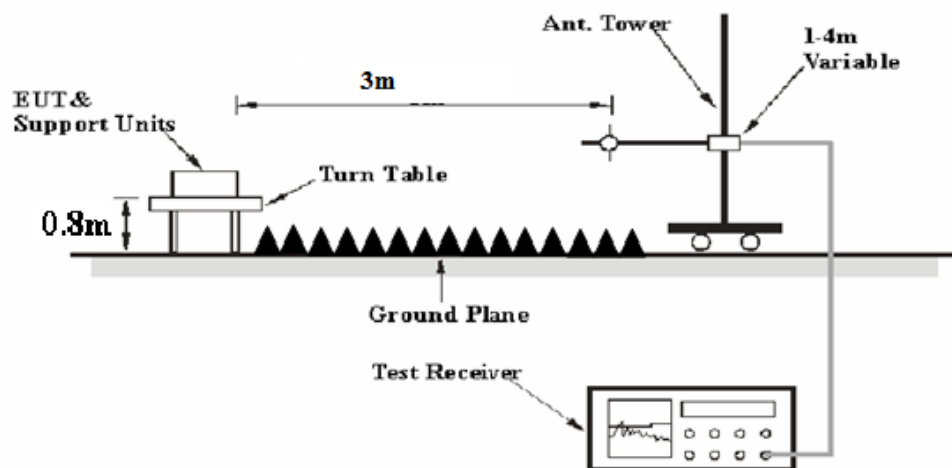
RADIATED EMISSIONS

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission below 1GHz tests were performed in the 10 meters chamber test site, above 1GHz tests were performed in the 3 meters chamber test site A, using the setup accordance with the ANSI C63.4-2014. The specification used was with the FCC Part 15 B Class B limits.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 13 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	Peak
	1 MHz	Reduced video bandwidth	/	AVG

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

During the radiated emissions, the adapter of laptop was connected to the first AC floor outlet and the other support equipments were connected to the second AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The data was recorded in the Quasi-peak detection mode for below 1 GHz, peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Meter Reading+ Corrected

Note:

Corrected = Antenna Factor + Cable Loss - Amplifier Gain

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

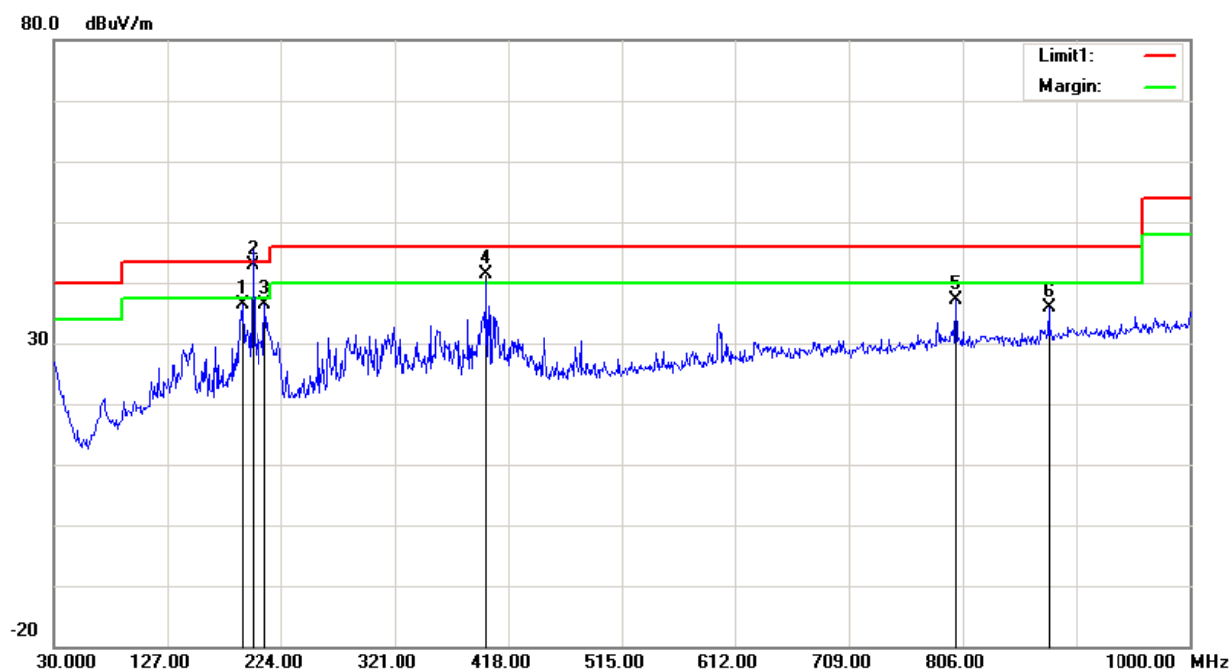
$$\text{Margin} = \text{Limit} - \text{Result}$$

Test Data

Please refer to following table and plots:

Condition: FCC Part 15B Class B
 EUT: HAK5OWL
 Model: HAK5OWL
 Test Mode: Operating
 Note:

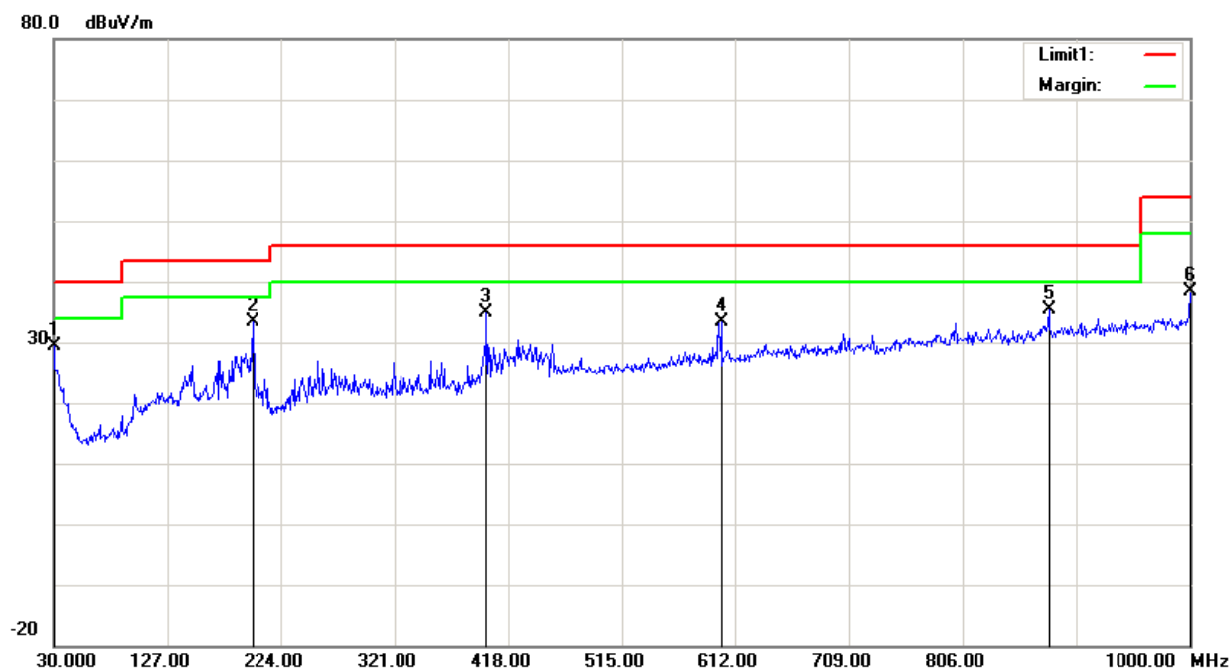
Polarization: Horizontal
 Power: AC 120V/60Hz
 Distance: 3m



Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
191.0200	43.48	peak	-7.07	36.41	43.50	7.09
199.7500	48.90	QP	-5.92	42.98	43.50	0.52
210.4200	43.80	peak	-7.37	36.43	43.50	7.07
399.5700	43.30	QP	-2.03	41.27	46.00	4.73
800.1800	32.59	peak	4.43	37.02	46.00	8.98
879.7200	36.24	peak	-0.47	35.77	46.00	10.23

Condition: FCC Part 15B Class B
EUT: HAK5OWL
Model: HAK5OWL
Test Mode: Operating
Note:

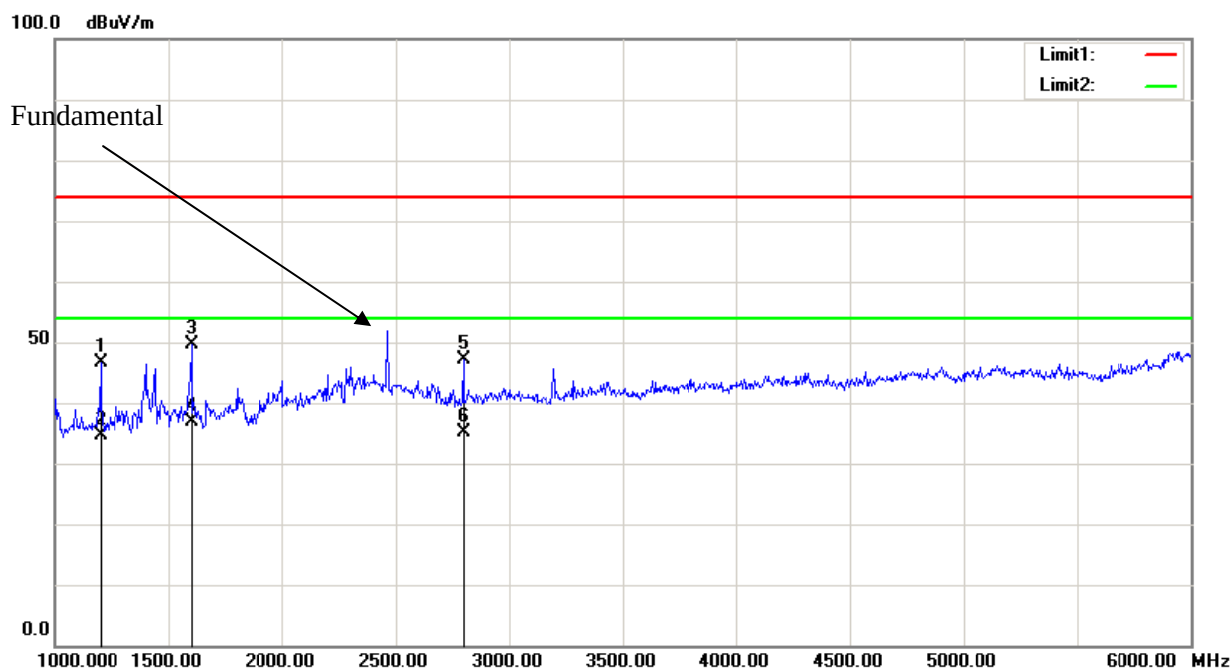
Polarization: Vertical
Power: AC 120V/60Hz
Distance: 3m



Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	27.59	peak	1.72	29.31	40.00	10.69
199.7500	39.32	peak	-5.92	33.40	43.50	10.10
399.5700	36.93	peak	-2.03	34.90	46.00	11.10
600.3600	32.27	peak	1.03	33.30	46.00	12.70
879.7200	35.86	peak	-0.47	35.39	46.00	10.61
1000.0000	36.53	peak	1.79	38.32	54.00	15.68

Condition: FCC Part 15B Class B
EUT: HAK5OWL
Model: HAK5OWL
Test Mode: Operating
Note:

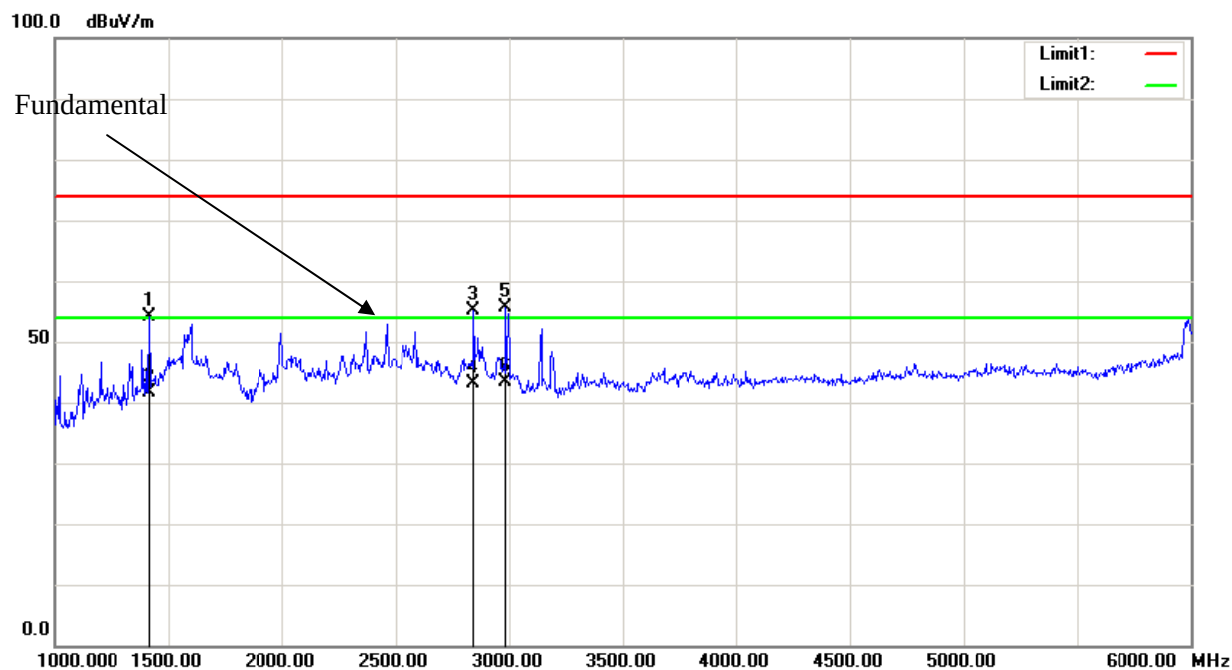
Polarization: Horizontal
Power: AC 120V/60Hz
Distance: 3m



Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1200.000	56.48	peak	-9.96	46.52	74.00	27.48
1200.000	44.56	AVG	-9.96	34.60	54.00	19.40
1600.000	58.43	peak	-8.72	49.71	74.00	24.29
1600.000	45.66	AVG	-8.72	36.94	54.00	17.06
2800.000	52.29	peak	-5.24	47.05	74.00	26.95
2800.000	40.25	AVG	-5.24	35.01	54.00	18.99

Condition: FCC Part 15B Class B
EUT: HAK5OWL
Model: HAK5OWL
Test Mode: Operating
Note:

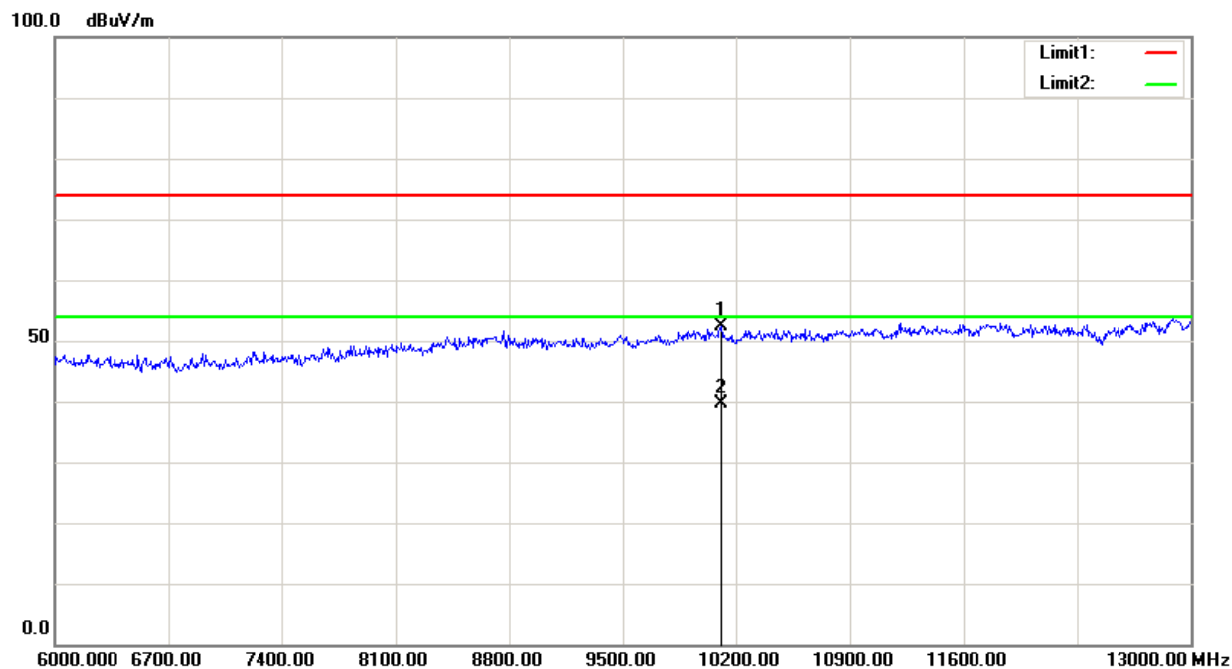
Polarization: Vertical
Power: AC 120V/60Hz
Distance: 3m



Frequency (MHz)	Reading (dB μ V)	Detector	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1417.500	63.52	peak	-9.46	54.06	74.00	19.94
1417.500	50.97	AVG	-9.46	41.51	54.00	12.49
2847.500	60.40	peak	-5.23	55.17	74.00	18.83
2847.500	48.36	AVG	-5.23	43.13	54.00	10.87
2987.500	60.42	peak	-4.88	55.54	74.00	18.46
2987.500	48.23	AVG	-4.88	43.35	54.00	10.65

Condition: FCC Part 15B Class B
 EUT: HAK5OWL
 Model: HAK5OWL
 Test Mode: Operating
 Note:

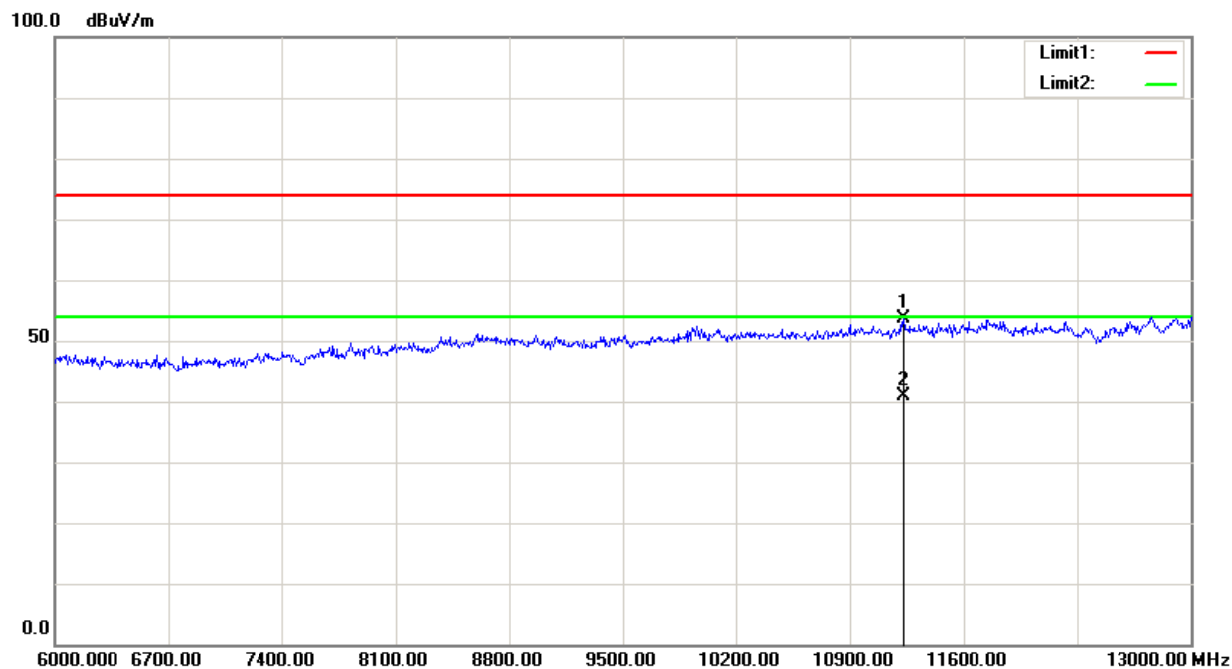
Polarization: Horizontal
 Power: AC 120V/60Hz
 Distance: 3m



Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10109.000	44.88	peak	7.47	52.35	74.00	21.65
10109.000	32.26	AVG	7.47	39.73	54.00	14.27

Condition: FCC Part 15B Class B
EUT: HAK5OWL
Model: HAK5OWL
Test Mode: Operating
Note:

Polarization: Vertical
Power: AC 120V/60Hz
Distance: 3m



Frequency (MHz)	Reading (dB μ V)	Detector	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
11229.000	45.59	peak	8.11	53.70	74.00	20.30
11229.000	32.66	AVG	8.11	40.77	54.00	13.23

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