

FCC/IC - TEST REPORT

Report Number	:	68.950.12.114.01	Date of Iss	sue:	10 August 2012
Model	:	BSCBLE			
Product Type	:	Bluetooth Low Energy Co	mbo Senso	r	
Applicant	:	Dayton Industrial Co., Ltd	.		
Address	:	2-12 Kwai Fat Road, 11-A	A Kwai Chur	ng, Ne	w Territories, Hong Kong
Production Facility	:	Kendy Electronics Ltd.			
Address	:	2-12 Kwai Fat Road, 11-A	A Kwai Chur	ng, Ne	w Territories, Hong Kong
Test Result	:	■ Positive □ Negat	ive		
Total pages including					
Appendices	:.	39			

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1 Table of Contents

1	Table of Contents	2
2	Details about the Test Laboratory	3
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	Technical Requirements. 7.1 Conducted Peak Power. 7.2 Band edge compliance of RF emission. 7.3 Spurious RF Conducted emission. 7.4 Spurious radiated emissions for transmitter and receiver. 7.5 6dB Bandwidth & 99% bandwidth. 7.6 Power spectral density.	8 10 20 27 31
8	System Measurement Uncertainty	39



2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: Jiangsu TÜV Product Service Ltd. – Shenzhen Branch

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Century Craftwork Culture Square,

No. 4001, Fuqiang Road, Futian District 518048,

Shenzhen, P.R.C.

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

Test Site 2

Company name: Audix Technology (shenzhen) Co.,Ltd

Block Shenzhen, Science & Industry Park,

Nantou, Shenzhen,

Guangdong,

China

Telephone: 86 755 2663 9496 Fax: 86 755 2663 2877

Report Number: 68.950.12.114.01 Page 3 of 39



3 Description of the Equipment Under Test

Description of the Equipment Under Test

Product: Bluetooth Low Energy Combo Sensor

Model no.: BSCBLE

Brand Name: NIL

Options and accessories: NIL

Rating: DC 3V (Supplied by 1pcs 3VDC CR2032 Battery)

RF Transmission

Frequency: 2400MHz-2483.5MHz

Description of the EUT: NIL

Auxiliary Equipment Used during Test:

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



4 Summary of Test Standards

Test Standards				
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES			
10-1-2011 Edition	Subpart C - Intentional Radiators			
RSS-Gen Issue 3	General Requirements and Information for the Certification of			
December 2010	Radio Apparatus			
RSS-210 Issue 8	RSS-210 — Licence-exempt Radio Apparatus (All Frequency			
December 2010	Bands): Category I Equipment			



5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C, RSS-Gen, RSS-210						
Test Condition	Pages	Test	Te	st Resi	ult	
		Site	Pass	Fail	N/A	
15.207 & RSS-GEN A7.2.4 Conducted Emission AC		Site 2			\boxtimes	
Power Port						
15.247 (b) (1) & RSS-210 A8.4 Conducted peak	8	Site 2	\boxtimes			
output power						
15.247(d) & RSS-210 A8.5 Band edge compliance of	10	Site 2	\boxtimes			
RF emissions						
15.247(d) & RSS-210 A8.5 Spurious RF conducted	20	Site 2	\boxtimes			
emissions						
15.247(d) & 15.209 & RSS-210 2.5 & RSSGEN 7.2.5	27	Site 2	\boxtimes			
& RSSGEN 6.1 Spurious radiated emissions for						
transmitter and receiver						
15.247(a)(2) & RSS-210 A8.2(a) 6dB bandwidth	31	Site 2	\boxtimes			
RSSGEN 4.6.1 99% Occupied Bandwidth	31	Site 2	\boxtimes			
15.247(e) & RSS-210 A8.2(b) Power spectral density	35	Site 2	\boxtimes			
15.247(a)(1) & RSS-210 A8.1(a) 20dB bandwidth*		Site 2			\boxtimes	
15.247(a)(1) & RSS-210 A8.1(b) Carrier frequency		Site 2			\boxtimes	
separation*						
15.247(a)(1)(iii) & RSS-210 A8.1(d) Number of		Site 2			\boxtimes	
hopping frequencies*						
15.247(a)(1)(iii) & RSS-210 A8.1(c) Dwell Time*		Site 2			\boxtimes	

NOTE1 "*" The requirement is not applicable to Bluetooth Low Energy device.



6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: O4GBSCBLE & IC ID: 7666A-BSCBLE complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules; and RSS-210.

All the configurations of the product were tested and only the worst test results are listed in the report.

SUMMARY:

All tests according	to the	regulations	cited on	page 5	were
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- - Performed
- ☐ Not Performed

The Equipment Under Test

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

Sample Received Date: 19 May 2012

Testing Start Date: 20 May 2012

Testing End Date: 1 August 2012

- Jiangsu TÜV Product Service Ltd. - Shenzhen Branch -

Reviewed by:

Prepared by:

Tested by:

Phoebe Hu EMC Project Manager Felix Li EMC Project Engineer

-elis-h

Sunny Lu Test Engineer



7 Technical Requirement

7.1 Conducted peak output power

Test Method

The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the peak power detection.

Limits for conducted peak output power measurements

Frequency Range	Limit	Limit
MHz	W	dBm
2400-2483	≤1	≤30

Conducted peak output power

Т	est	Resul	t

Frequency MHz	Conducted Peak Output Power dBm	Result
2402	-2.68	Pass
2442	-1.80	Pass
2480	-1.39	Pass



Test Equipment

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL DUE DATE
Spectrum Analyzer	Agilent	E4446A	US44300459	May 07, 2013



Test Method

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW and VBW to 1MHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength.

The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW and VBW to 100kHz, to measure the conducted peak band edge.

Limits

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

Frequency	Limit Average	Limit Peak
MHz	dBuV/m	dBuV/m
Below 2390 Above 2483.5	54	74

Report Number: 68.950.12.114.01 Page 10 of 39

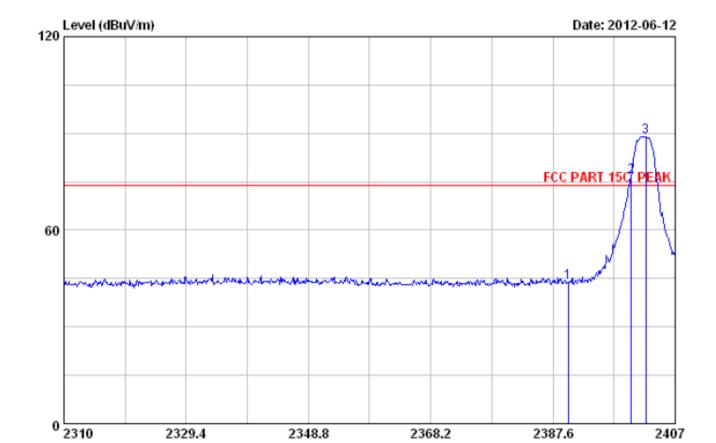


Lower edge Peak Plot:

EUT: Bluetooth Low Energy Combo Sensor

Operating Condition: Tx, 2402MHz

Ant. Polarity: Vertical



M/N: BSCBLE

	Freq.	Ant. Factor (dB/m)	Cable loss (dB)	-	Reading (dBuV)	Emission Level (dBuV/m)		_	Remark
2	2390.000 2400.000 2402.344	27.96	6.01	34.44 34.44 34.44	44.19 77.03 89.52	43.72 76.56 89.05	74.00 74.00 74.00	30.28 -2.56 -15.05	Peak Peak Peak

Remarks:

- 1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
- 2. The emission levels that are 20dB below the official limit are not reported.

Frequency (MHz)

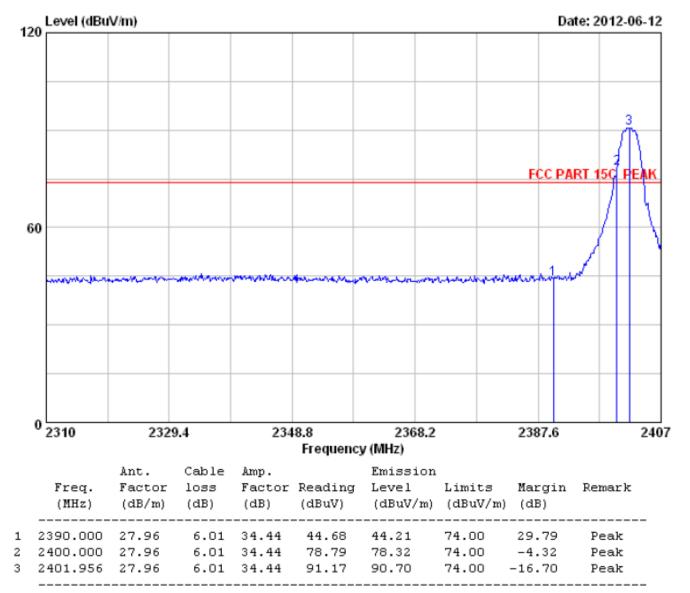


Lower edge Peak Plot:

EUT: Bluetooth Low Energy Combo Sensor M/N: BSCBLE

Operating Condition: Tx, 2402MHz

Ant. Polarity: Horizontal



Remarks:

- 1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
- 2. The emission levels that are 20dB below the official limit are not reported.

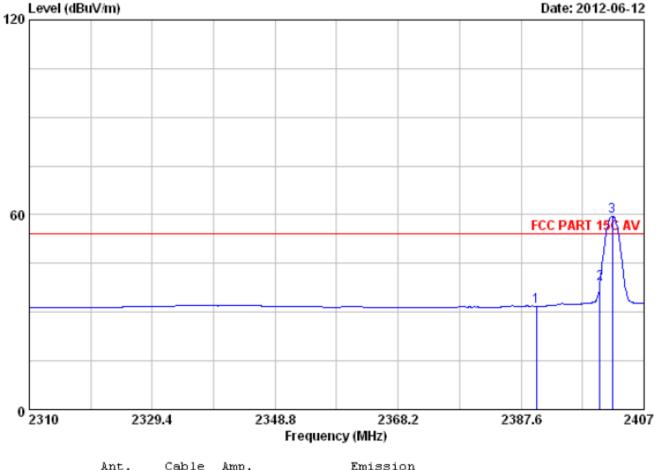


Lower edge AV Plot:

EUT: Bluetooth Low Energy Combo Sensor

Operating Condition: Tx, 2402MHz

Ant. Polarity: Vertical



M/N: BSCBLE

	Freq.	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)		Limits (dBuV/m)	Margin (dB)	Remark
2	2390.000 2400.000 2401.956	27.96 27.96 27.96	6.01	34.44 34.44 34.44	32.39 39.36 59.95	31.92 38.89 59.48	54.00 54.00 54.00	22.08 15.11 -5.48	Average Average Average

Remarks:

- 1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
- 2. The emission levels that are 20dB below the official limit are not reported.

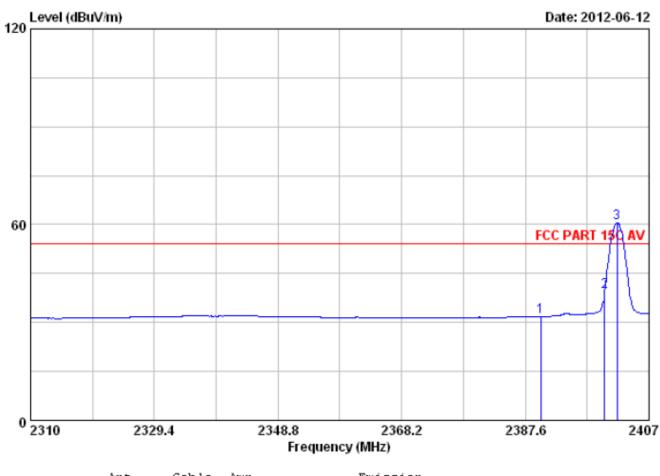


Lower edge AV Plot:

EUT: Bluetooth Low Energy Combo Sensor M/N: BSCBLE

Operating Condition: Tx, 2402MHz

Ant. Polarity: Horizontal



	Freq.	Ant. Factor (dB/m)	Cable loss (dB)	-	Reading (dBuV)		Limits	Margin (dB)	Remark
2	2390.000 2400.000 2401.956	27.96 27.96 27.96	6.01	34.44 34.44 34.44	32.36 39.99 60.89	31.89 39.52 60.42	54.00 54.00 54.00	22.11 14.48 -6.42	Average Average Average

Remarks:

- 1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
- 2. The emission levels that are 20dB below the official limit are not reported.

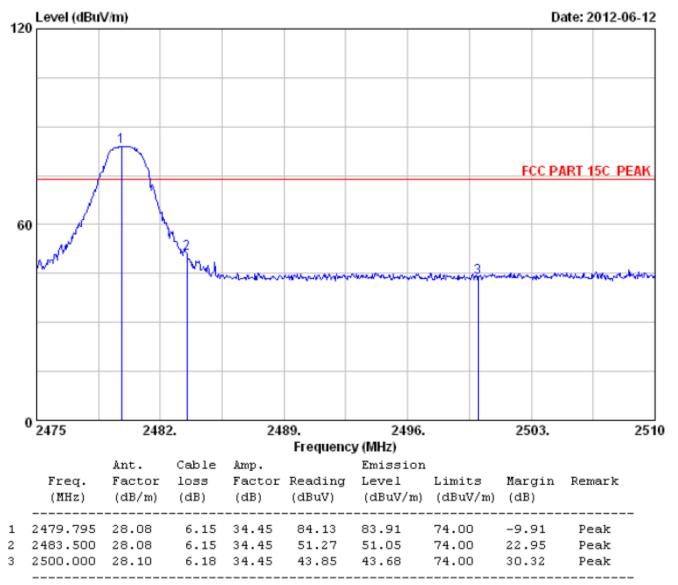


Upper edge Peak Plot:

EUT: Bluetooth Low Energy Combo Sensor M/N: BSCBLE

Operating Condition: Tx, 2480MHz

Ant. Polarity: Vertical



Remarks:

- 1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
- 2. The emission levels that are 20dB below the official limit are not reported.

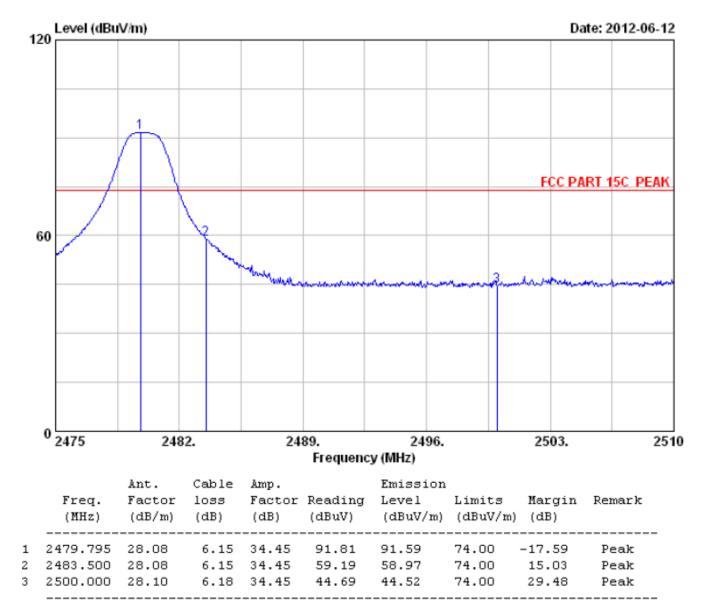


Upper edge Peak Plot:

EUT: Bluetooth Low Energy Combo Sensor M/N: BSCBLE

Operating Condition: Tx, 2480MHz

Ant. Polarity: Horizontal



Remarks:

- 1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
- 2. The emission levels that are 20dB below the official limit are not reported.

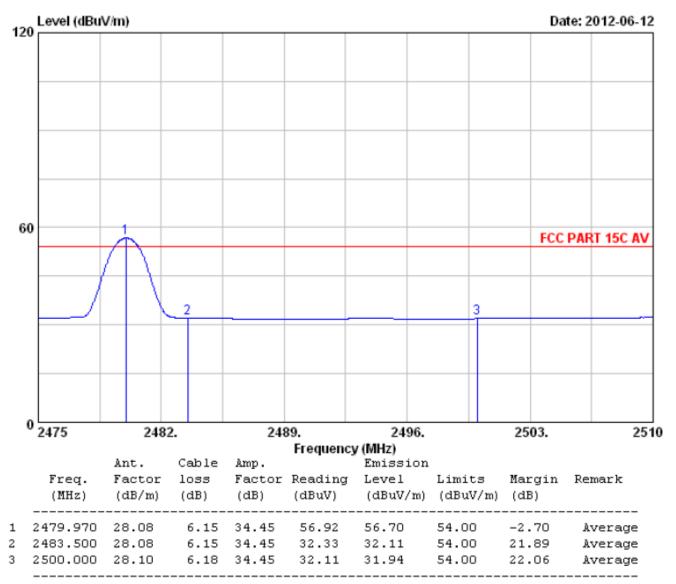


Upper edge AV Plot:

EUT: Bluetooth Low Energy Combo Sensor

Operating Condition: Tx, 2480MHz

Ant. Polarity: Vertical



M/N: BSCBLE

Remarks:

- 1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
- 2. The emission levels that are 20dB below the official limit are not reported.

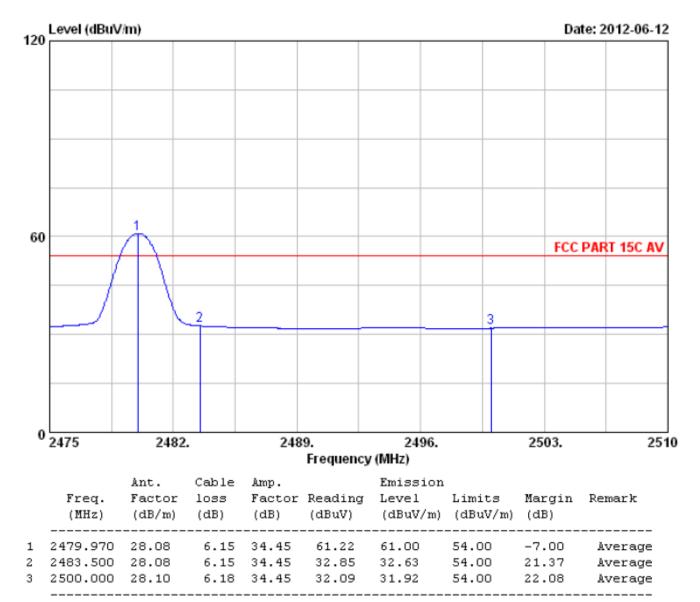


Upper edge AV Plot:

EUT: Bluetooth Low Energy Combo Sensor

Operating Condition: Tx, 2480MHz

Ant. Polarity: Horizontal



M/N: BSCBLE

Remarks:

- 1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
- 2. The emission levels that are 20dB below the official limit are not reported.



Test Equipment List

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL DUE DATE
Spectrum	Agilent	E4446A	US44300459	May 07, 2013
Amp HP		8449B	3008A02495	May 07, 2013
Antenna	EMCO	3115	9607-4877	May 16, 2013
Bilog Antenna	Schaffner	CBL6111C	2598	Dec.13, 2012
HF Cable	Hubersuhne	Sucoflex104		May 07, 2013



Test Method

The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the peak power detection.

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyzer were respectively set to 100 kHz and 100 kHz.

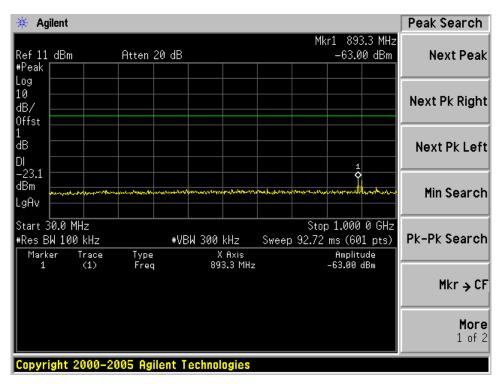
Limit

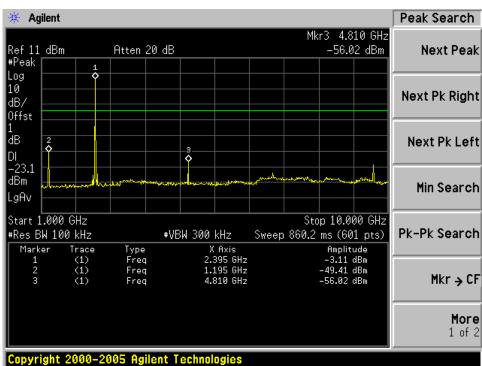
Frequency Range MHz	Limit (dBc)
1000-25000	-20

Report Number: 68.950.12.114.01 Page 20 of 39



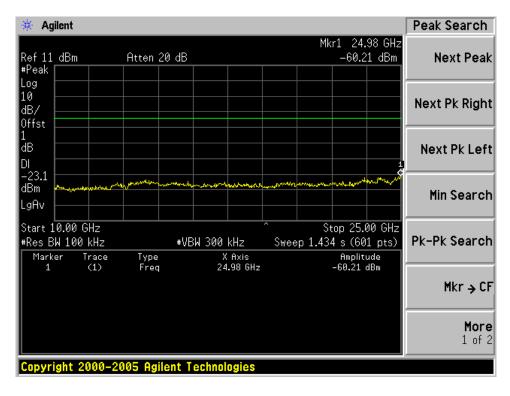
Test Result: 2402MHz

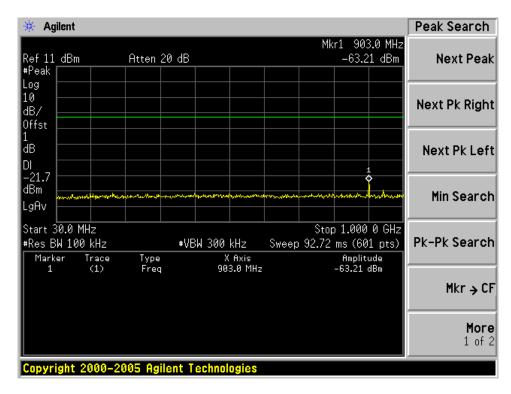






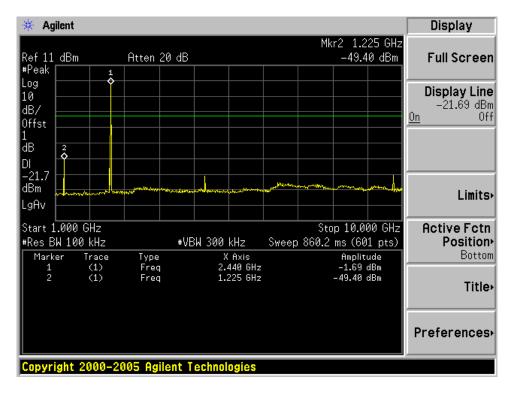
2402MHz

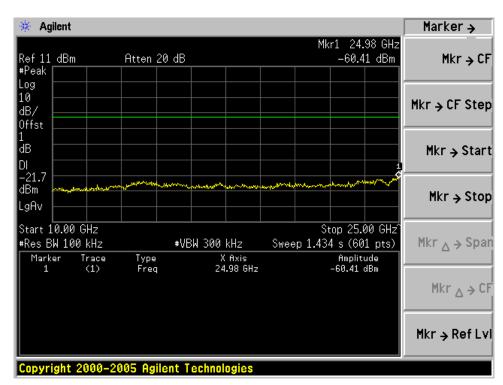






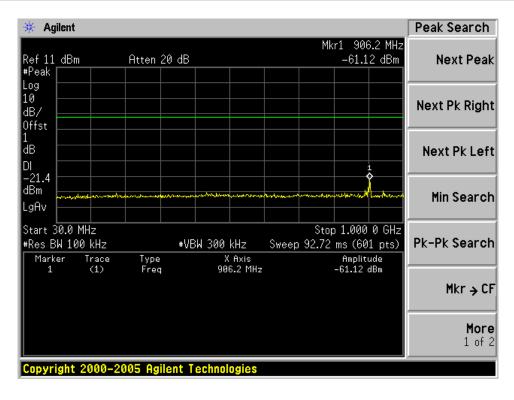
2442MHz

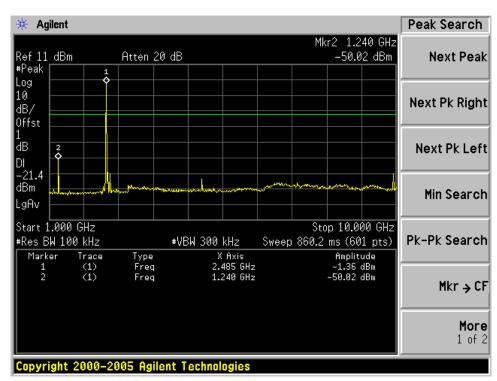




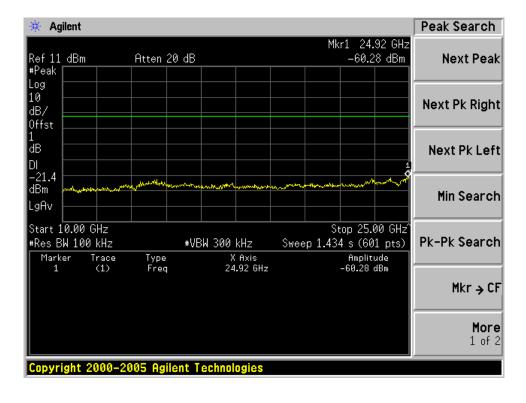


2480MHz











Test Equipment List

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL.DUE.DATE
Spectrum Analyzer	Agilent	E4446A	US44300459	May 07, 2013

Report Number: 68.950.12.114.01 Page 26 of 39



7.4 Spurious radiated emissions for transmitter and receiver

Test Method

- 1 The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2 The turntable shall be rotated for 360 degrees to determine the position of maximum emission level
- 3 EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 4 Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5 Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

Limit

Frequency	Field Strength	Field Strength	Detector
MHz	uV/m	dBμV/m	
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



Transmitter and receiver Spurious radiated emissions

Test Result 2402MHz

Frequency	Antenna Factor	Cable Loss	Amp. Factor	Reading	Emission Level	Polarization	Limit	Detector	Result
MHz	dB/m	dB	dB	dΒμV	dBμV/m		dΒμV/m		
below 1GHz *	-	-		-	-	-	-	-	Pass
4804.000	-	-		-	-	-	-	-	Pass
4804.000	-	-		-	-	-	-	-	Pass
7206.000	-	-		-	-	-	-	-	Pass
7206.000	-	-		-	-	-	-	-	Pass
9608.000	37.76	11.03	34.56	31.66	45.89	Vertical	54	AV	Pass
9608.000	37.76	11.03	34.56	43.91	58.14	Vertical	74	PK	Pass
9608.000	37.76	11.03	34.56	33.28	47.51	Horizontal	54	AV	Pass
9608.000	37.76	11.03	34.56	45.67	59.90	Horizontal	74	PK	Pass

Note "*":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.

2442MHz

Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Amp. Factor dB	Reading dBµV	Emission Level dBµV/m	Polarization	Limit dBµV/m	Detector	Result
below	-	-		-	-	-	-	_	Pass
1GHz * 4884.000	_	_		_	_	_	_	_	Pass
4884.000	-	- -		_	-	-	<u>-</u>	-	Pass
7326.000	36.05	10.48	34.73	33.47	45.27	Horizontal	54	AV	Pass
7326.000	36.05	10.38	34.73	46.72	58.52	Horizontal	74	PK	Pass
7326.000	36.05	10.48	34.73	33.74	45.54	Vertical	54	AV	Pass
7326.000	36.05	10.38	34.73	45.85	57.65	Vertical	74	PK	Pass
9768.000	-	-		-	-	-	-	-	Pass
9768.000	-	-		-	-	-	-	-	Pass

Note "*":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.



Transmitter and receiver Spurious radiated emissions

2480MHz

Frequency	Antenna Factor	Cable Loss	Amp. Factor	Reading	Emission Level	Polarization	Limit	Detector	Result
MHz	dB/m	dB	dB	dΒμV	dΒμV/m		dBμV/m		
below 1GHz *	-	-		-	-	-	-	-	Pass
4960.000	-	-		-	-	-	-	-	Pass
4960.000	-	-		-	-	-	-	-	Pass
7440.000	36.37	10.51	34.74	33.81	45.95	Vertical	54	AV	Pass
7440.000	36.37	10.51	34.74	46.07	58.21	Vertical	74	PK	Pass
7440.000	36.37	10.51	34.74	34.41	46.55	Horizontal	54	AV	Pass
7440.000	36.37	10.51	34.74	46.78	58.92	Horizontal	74	PK	Pass
9920.000	-	-		-	-	-	-	-	Pass
9920.000	-	-		-	-	-	-	-	Pass

Note "*": 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.

As the EUT don't have a receive mode, testing were applied on standby mode to instead: Standby mode:

Frequency	Antenna Factor	Cable Loss	Amp. Factor	Reading	Emission Level	Polarization	Limit	Detector	Result
MHz	dB/m	dB	dB	dΒμV	dBμV/m		dΒμV/m		
below 1GHz *	-	-		-	-	-	-	-	Pass
12050.000	39.45	7.00	34.91	34.16	45.70	Vertical	54	AV	Pass
12050.000	39.45	7.00	34.91	39.69	51.23	Vertical	74	PK	Pass
9619.000	37.77	7.20	34.56	33.05	43.46	Horizontal	54	AV	Pass
9619.000	37.77	7.20	34.56	38.51	48.92	Horizontal	74	PK	Pass

Note "*": 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.



Test Equipment List

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL DUE DATE
Spectrum	Agilent	E4446A	US44300459	May 07, 2013
Amp	Amp HP		3008A02495	May 07, 2013
Antenna	EMCO	3115	9607-4877	May 16, 2013
Bilog Antenna	Schaffner	CBL6111C	2598	Dec.13, 2012
HF Cable	Hubersuhne	Sucoflex104		May 07, 2013



7.5 6 dB bandwidth & 99% bandwidth

Test Method

- 1 Place the EUT on the table and set it in the transmitting mode.
- 2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3 Mark the peak frequency and -6dB (upper and lower) frequency.

Limit

Limit [kHz]	
 ≥ 500	

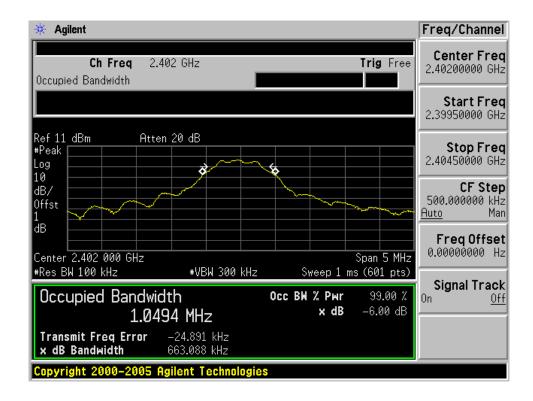
Report Number: 68.950.12.114.01 Page 31 of 39



20 dB bandwidth

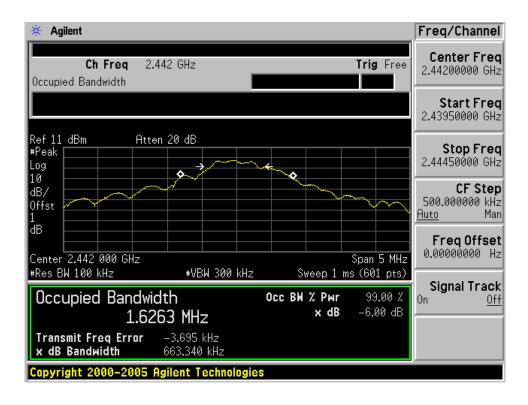
Test result

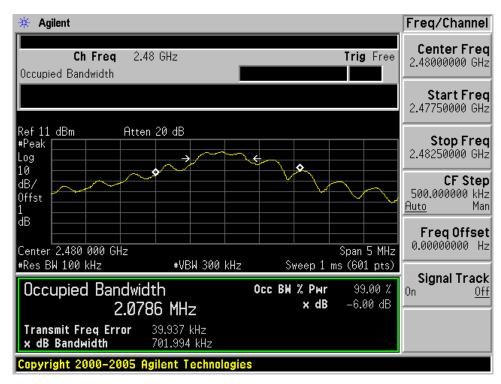
Frequency	6 dB Bandwidth	Limit	Result
MHz	kHz	kHz	
2402	663.088	≥ 500	Pass
2442	663.340	≥ 500	Pass
2480	701.994	≥ 500	Pass
Frequency	%99 Bandwidth	Limit	Result
 Frequency MHz	%99 Bandwidth MHz	Limit kHz	Result
 	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Result Pass
 MHz	MHz		
MHz 2402	MHz 1.049	kHz 	Pass





20 dB bandwidth







Test Equipment

20 dB bandwidth Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL.DUE.DATE
Spectrum Analyzer	Agilent	E4446A	US44300459	May 07, 2013



7.6 Power spectral density

Test Method

- 1 Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 2 Set the spectrum analyzer as RBW = 3 kHz, VBW = 10 kHz, Span = 300 kHz, Sweep = 100 s
- 3 Record the max reading.

Limit

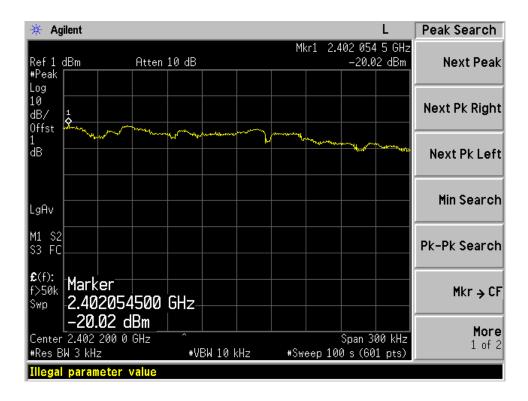
Limit		
dBm / 3 kHz		



Power spectral density

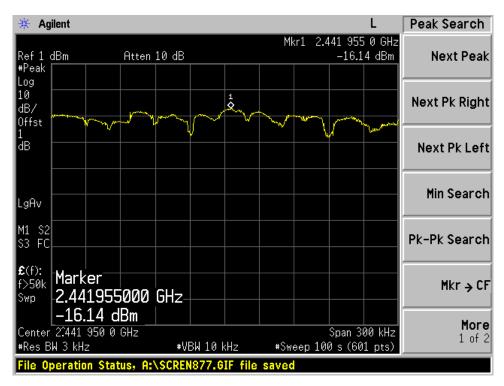
WIFI Mode IEEE 802.11b modulation (1Mbps) Test Result

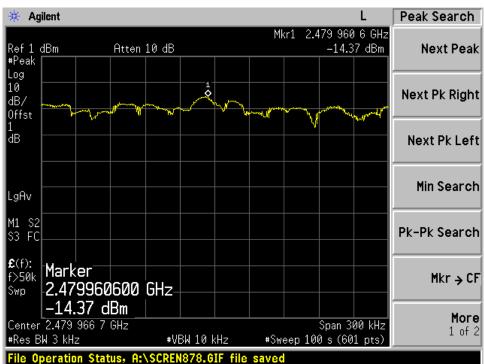
Frequency	Р	Result	
MHz	dBm		
2402	-20.02	Pass	
2442	-16.14	Pass	
2480	-14.37	Pass	





Power spectral density







Test Equipment

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL.DUE.DATE
Spectrum Analyzer	Agilent	E4446A	US44300459	May 07, 2013



8 System Measurement Uncertainty

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

System Measurement Uncertainty

Items		Extended Uncertainty	
RE	Field strength (dBμV/m)	U=4.32dB (30MHz-25GHz)	
CE	Disturbance Voltage (dBμV)	U=2.4dB	