TEST REPORT

of

FCC Part 15 Subpart B&E §15.407/ RSS-210 Issue 7, RSS-Gen Issue 2
FCC ID /IC ID: SQMSQ-3500 / 6303A-SQ3500

Equipment Under Test	:	VoIP Phone
Model Name	:	SQ-3500 (the addition of model name : SQ-3300)
Serial No.	:	N/A
Applicant	:	UniData Communication Systems, INC.
Manufacturer	:	UniData Communication Systems, INC.
Date of Test(s)	:	2009-10-01 ~ 2009-11-16
Date of Issue	:	2009-12-09

In the configuration tested, the EUT complied with the standards specified above.

Tested By: **Date** **2009-12.09**

Grant Lee

Approved By **Date** **2009-12.09**

Charles Kim

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1. General information

1.1. Testing laboratory

SGS Testing Korea Co., Ltd.
- Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040
- 705, Dongcheon-dong Suji-gu, Yongin-si, Gyeonggi-do, Korea.
www.electrolab.kr.sgs.com
Phone No. : +82 +31 428 5700
Fax No. : +82 +31 427 2371

1.2 Details of applicant

Applicant : UniData Communication System, INC.
Address : 3F, BuLim-Bldg, 837-6, Bangbae 4-dong, Seocho-gu, Seoul-si, Korea
Contact Person : Byeong-Gil Park
Phone No. : +82 +2 3443 3390
Fax No. : -

1.3 Description of EUT

Kind of Product	VoIP Phone
Model Name	SQ-3500 (the addition of model name : SQ-3300)
Serial Number	N/A
Power Supply	DC 3.7 V
Frequency Range	2412 MHz ~ 2462 MHz (11b/g) 5745 MHz ~ 5825 MHz (11a) 5180 MHz ~ 5240 MHz (11a – Non DFS)
Modulation Technique	DSSS, OFDM
Number of Channels	11 channel(11b/g), 5 channel(11a), 4 channel(11a – Non DFS)
Operating Conditions	-20 ~ 60℃
Antenna Type	Fixed type
Antenna Gain	2.85 dBi(11b/g), 1.78 dBi(11a), 1.85 dBi(11a – Non DFS)

The antenna used of this product is inverter F type antenna.
The peak max gain of this antenna is 1.85 dBi(5.1 GHz)

1.4 Details of added model

Model	information
SQ-3500	Basic
SQ-3300	Only apply FCC It's the same as basic model, except for camera that is not existence.

1.5. Description of test mode

IEEE 802.11a(Non-DFS) mode:
We found out the test mode with the highest power level after we analyze all the data rates. So we choose 6 Mbps data rate (worst case) as a representative.

1.6. Test equipment list

Equipment	Manufacturer	Model	Cal Due.
Signal Generator	R&S	SMR40	Jan. 21, 2010
Spectrum Analyzer	Agilent	E4440A	Apr. 01, 2010
Spectrum Analyzer	R&S	FSP40	Sep. 25, 2010
High Pass Filter	Wainwright Instrument GmbH	WHK6.0/18G-11SS	Sep. 29, 2010
Attenuator	Agilent	8494B	Apr. 01, 2010
DC Power Supply	Agilent	6674A	Apr. 02, 2010
Two-Lie V-network	R & S	ENV326	Jan. 01. 2010
Test Receiver	R & S	ESS	Jul. 03, 2010
Test Receiver	R & S	ESU26	Apr. 21, 2010
Preamplifier	H.P	8447F	Jul. 02, 2010
Preamplifier	H.P	8449B	Apr. 01, 2010
Bilog Antenna	VULB9163	SCHWARZBECK MESSELEKTRONIK	Jul. 22. 2010
Horn Antenna	Schwarzbeck	BBHA 9170	Jun. 16, 2010
Horn Antenna	R&S	HF906	Jan. 10, 2010
Anechoic Chamber	SY Corporation	L x W x H (6.5 m x 3.5 m x 3.5 m)	N.C.R.
Anechoic Chamber	SY Corporation	L x W x H (9.6 m x 6.4 m x 6.6 m)	Jan. 31, 2010

▶ Support equipment

Description	Manufacturer	Model	Serial Number
Notebook Computer	Sony Corporation	PCG-3AHP	28272287 7000053
Wireless Router	D-Link System	DIR-655	F3R3291000460

1.7. Summary of test result

The EUT has been tested according to the following specifications:

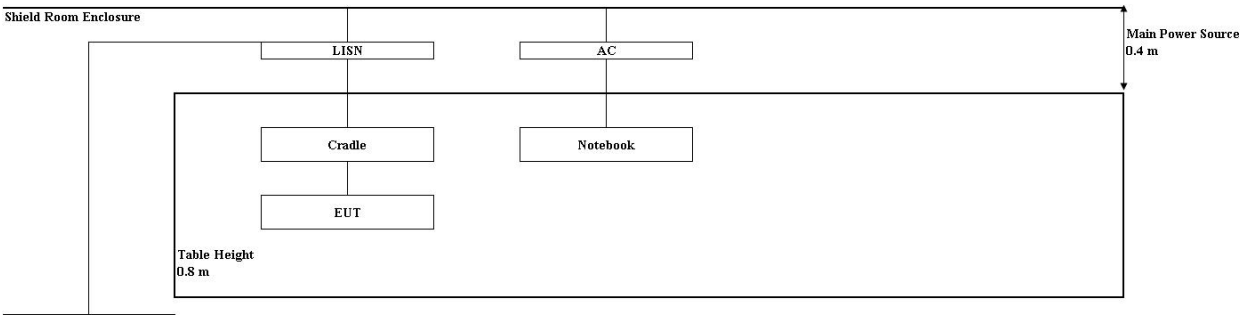
Applied standard : FCC Part15 subpart B&E, RSS-210, RSS-Gen			
Standard section		**Test Item**	**Result**
15.207	RSS-Gen 7.2.2	Transmitter AC power line conducted emission	Complied
15.107	RSS-Gen 7.2.2	Receiver AC power line conducted emission	Complied
15.205(a) 15.209(a) 15.407(b)(1)	A8.5	Transmitter radiated spurious emissions and Conducted spurious emission	Complied
15.109(a)	RSS-Gen 6	Receiver Radiated Spurious Emission	Complied
15.407(a)(1)	A 9.2(1)	Output power	Complied
15.407(a)(1)	A 9.2(1)	Peak power spectral density	Complied
15.407(a)(1)	-	Peak excursion	Complied

1.8. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL003439	Initial
1	F690501/RF-RTL003439-1	1. Spurious emission recorded only peak value 2. Output power is measured with 26dB EBW

2. Transmitter AC power line conducted emission

2.1. Test setup



2.2. Limit

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network(LISN).
Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.50	66-56*	56-46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

▣ *Decreases with the logarithm of the frequency.*

2.3. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

1. The test procedure is performed in a 6.5 m × 3.6 m× 3.6 m (L×W×H) shielded room. The EUT along with its peripherals were placed on a 1.0 m(W)× 1.5 m(L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

2.4. Test result (Worst case configuration_IEEE 802.11b & Cradle included)

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Ambient temperature : 22 ℃
Relative humidity : 49 % R.H.

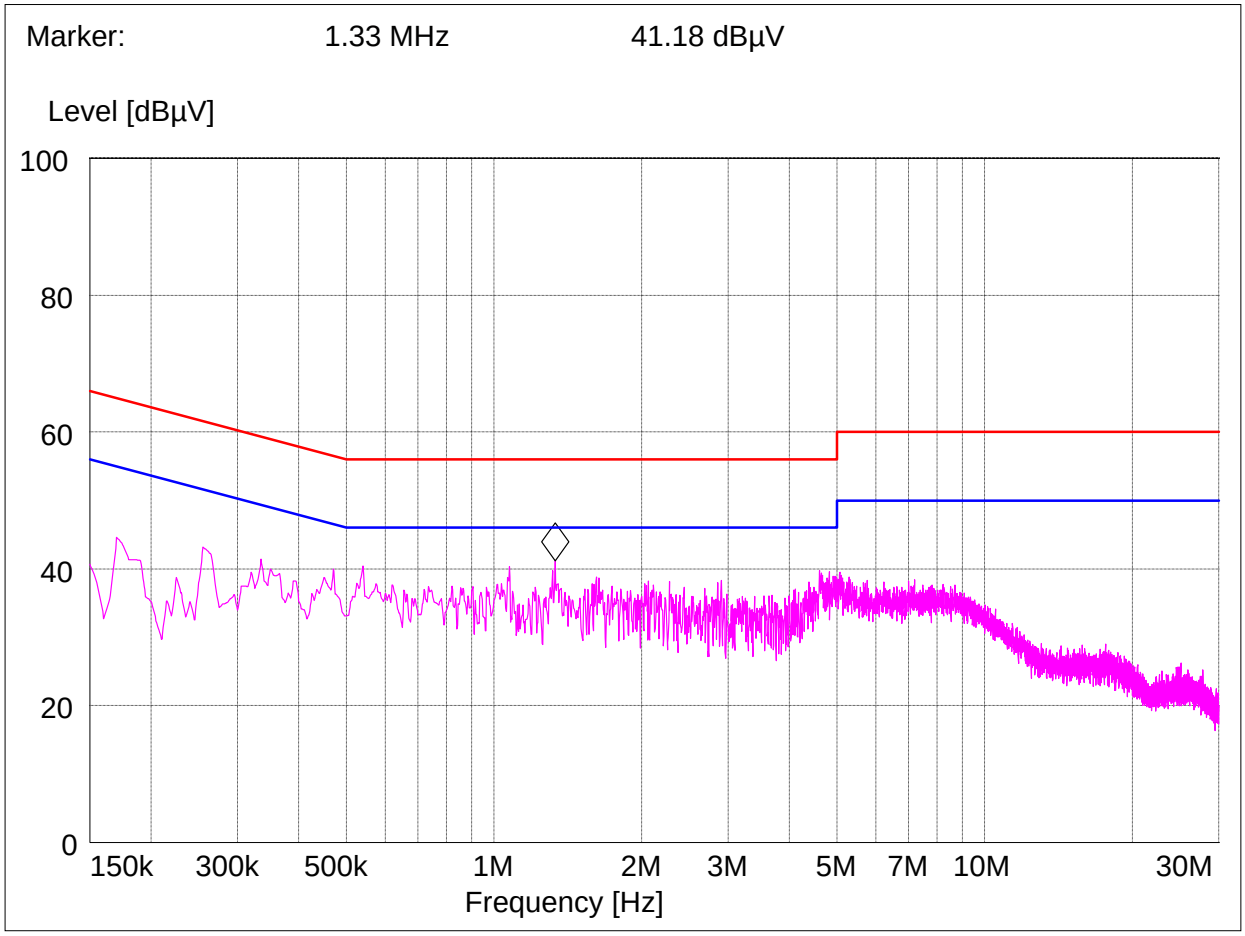
Frequency range : 0.15 MHz – 30 MHz
Measured Bandwidth : 9 kHz

Freq.	Level (dBuV)		Line	Limit (dBuV)		Margin (dB)	
(MHz)	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.17	40.60	26.90	H	64.96	54.96	24.36	28.06
0.26	40.60	30.10	H	61.43	51.43	20.83	21.33
0.34	34.90	25.60	H	59.20	49.20	24.30	23.60
0.47	35.20	24.70	H	56.51	46.51	21.31	21.81
1.08	32.30	21.80	H	56.00	46.00	23.70	24.20
1.33	33.40	22.90	H	56.00	46.00	22.60	23.10
0.18	35.50	20.00	N	64.49	54.49	28.99	34.49
0.26	39.70	27.40	N	61.43	51.43	21.73	24.03
0.47	34.10	22.90	N	56.51	46.51	22.41	23.61
0.75	30.50	20.80	N	56.00	46.00	25.50	25.20
1.02	31.70	22.90	N	56.00	46.00	24.30	23.10
5.14	28.90	22.50	N	60.00	50.00	31.10	27.50

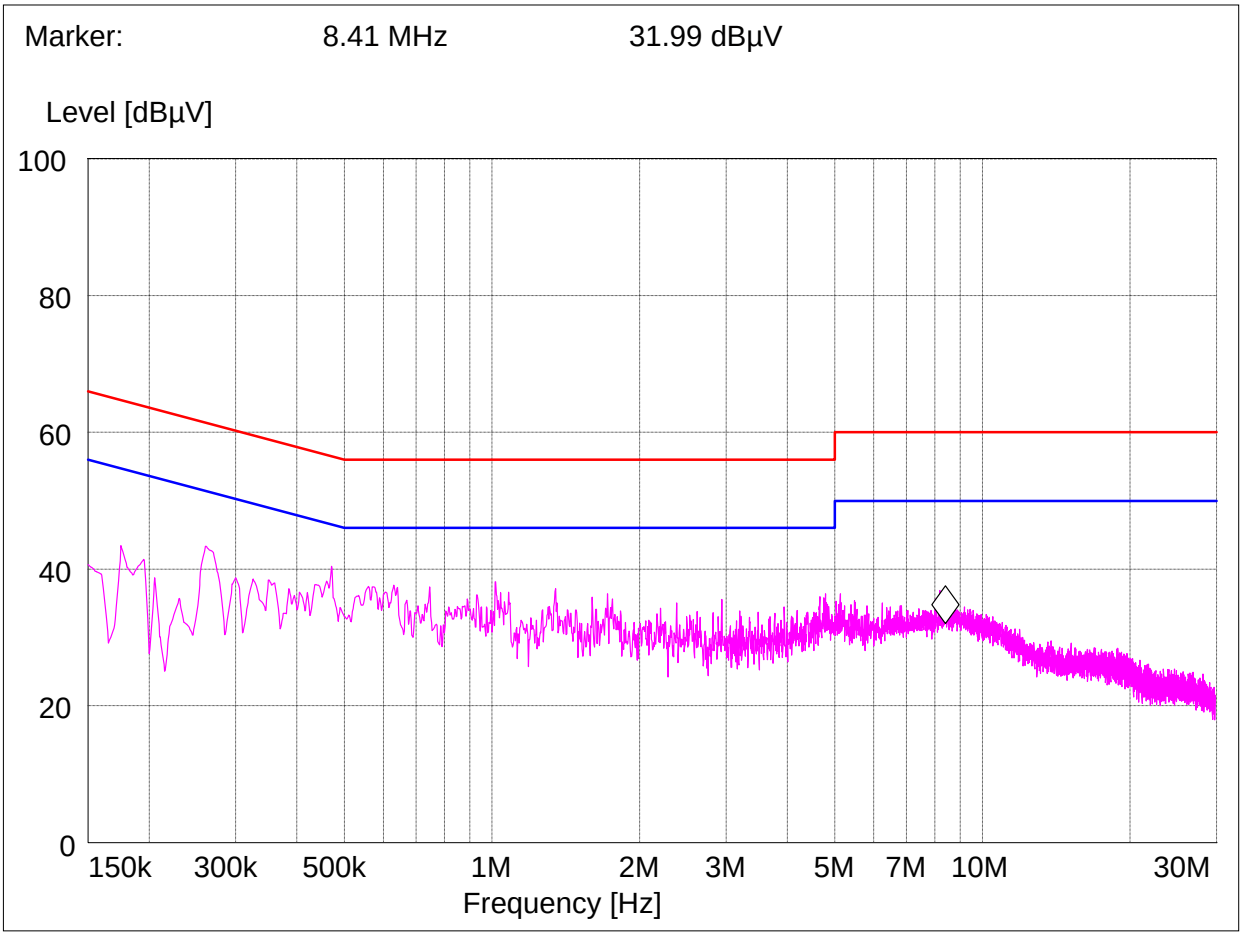
▣ Note
Line (H) : Hot
Line (N) : Neutral

Plot of conducted power line

Test mode: (Hot)

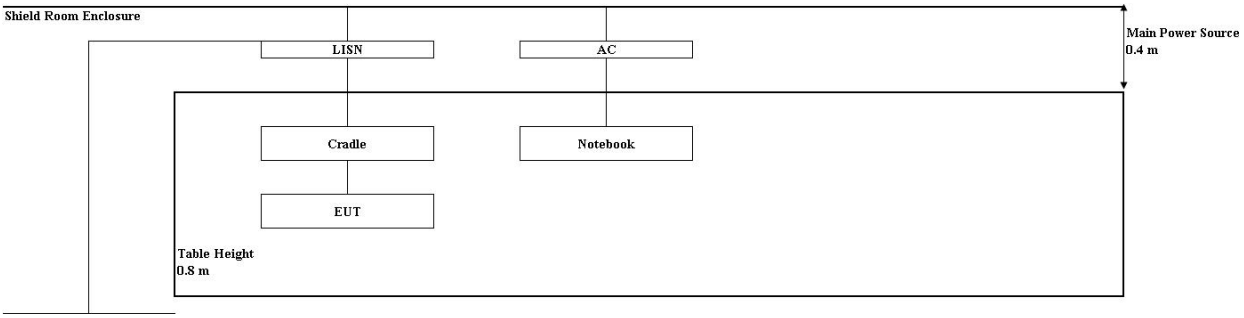


Test mode: (Neutral)



3. Receiver AC power line conducted emission

3.1. Test setup



3.2. Limit

According to §15.107(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of Emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.50	66-56*	56-46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

▣ *Decreases with the logarithm of the frequency.*

3.3. Test procedures

Same as clause 2.3.

3.4. Test result (Worst case configuration_IEEE 802.11b & Cradle included)

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Ambient temperature : 22 ℃
Relative humidity : 49 % R.H.

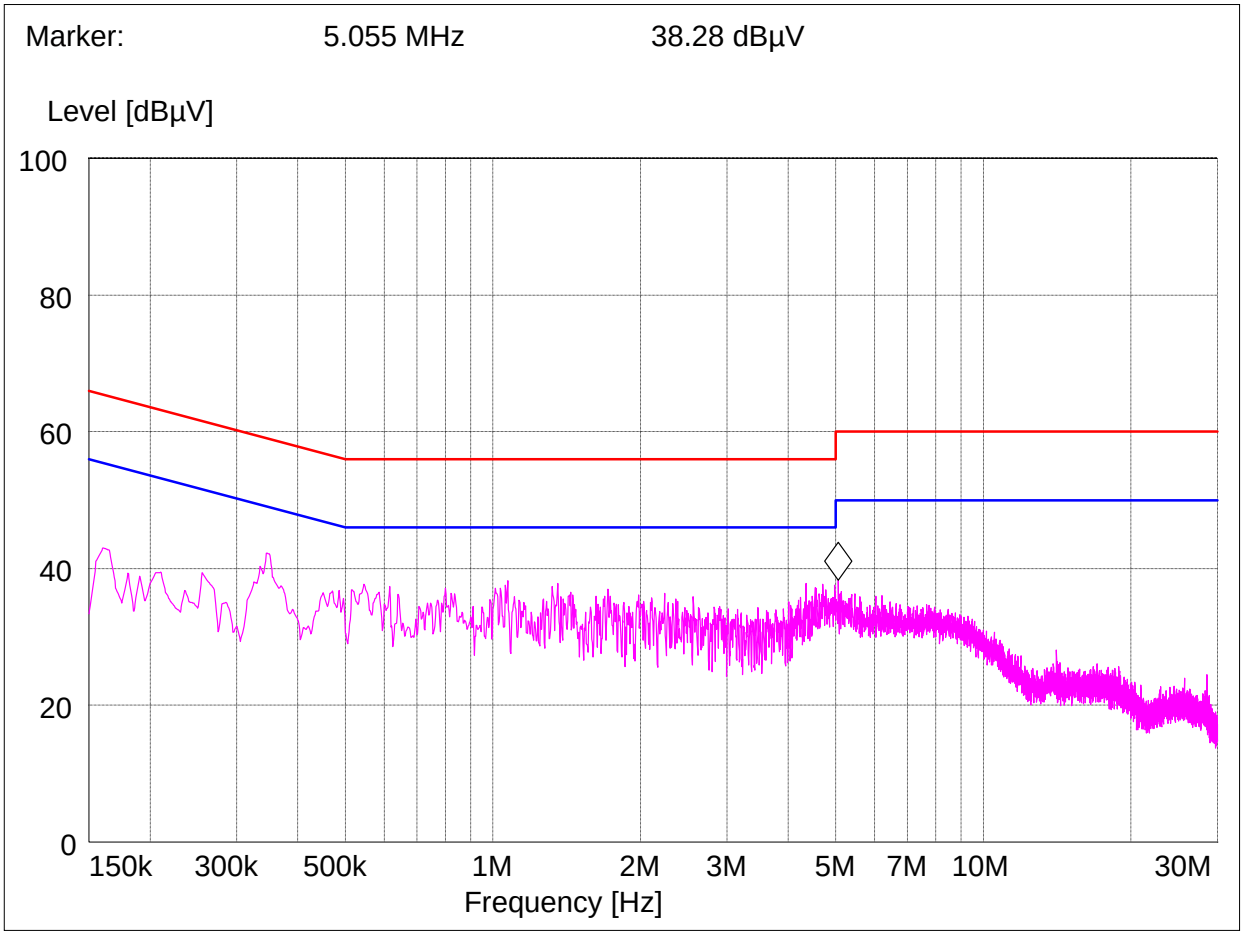
Frequency range : 0.15 MHz – 30 MHz
Measured Bandwidth : 9 kHz

Freq.	Level (dBuV)		Line	Limit (dBuV)		Margin (dB)	
(MHz)	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.16	36.50	20.80	H	65.46	55.46	28.96	34.66
0.35	40.00	29.80	H	58.96	48.96	18.96	19.16
0.55	30.40	20.20	H	56.00	46.00	25.60	25.80
1.07	31.30	19.90	H	56.00	46.00	24.70	26.10
1.34	31.10	18.80	H	56.00	46.00	24.90	27.20
5.06	29.70	22.00	H	60.00	50.00	30.30	28.00
0.17	35.10	19.20	N	64.96	54.96	29.86	35.76
0.20	31.60	16.90	N	63.61	53.61	32.01	36.71
0.27	34.00	20.90	N	61.12	51.12	27.12	30.22
0.40	33.00	19.90	N	57.85	47.85	24.85	27.95
1.47	26.00	17.70	N	56.00	46.00	30.00	28.30
2.15	25.10	17.20	N	56.00	46.00	30.90	28.80

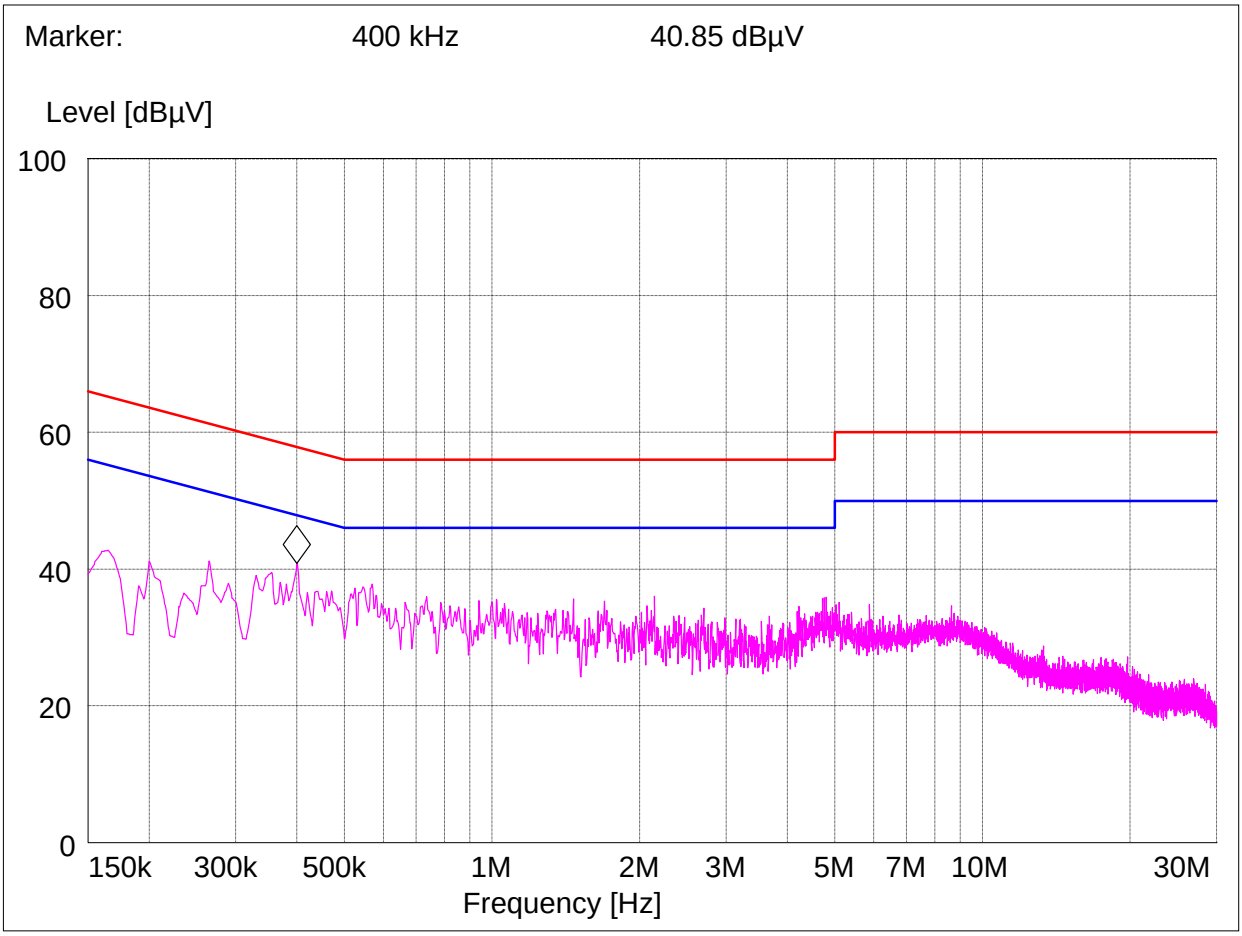
▣ Note
Line (H) : Hot
Line (N) : Neutral

Plot of conducted power line

Test mode : (Hot)



Test mode : (Neutral)

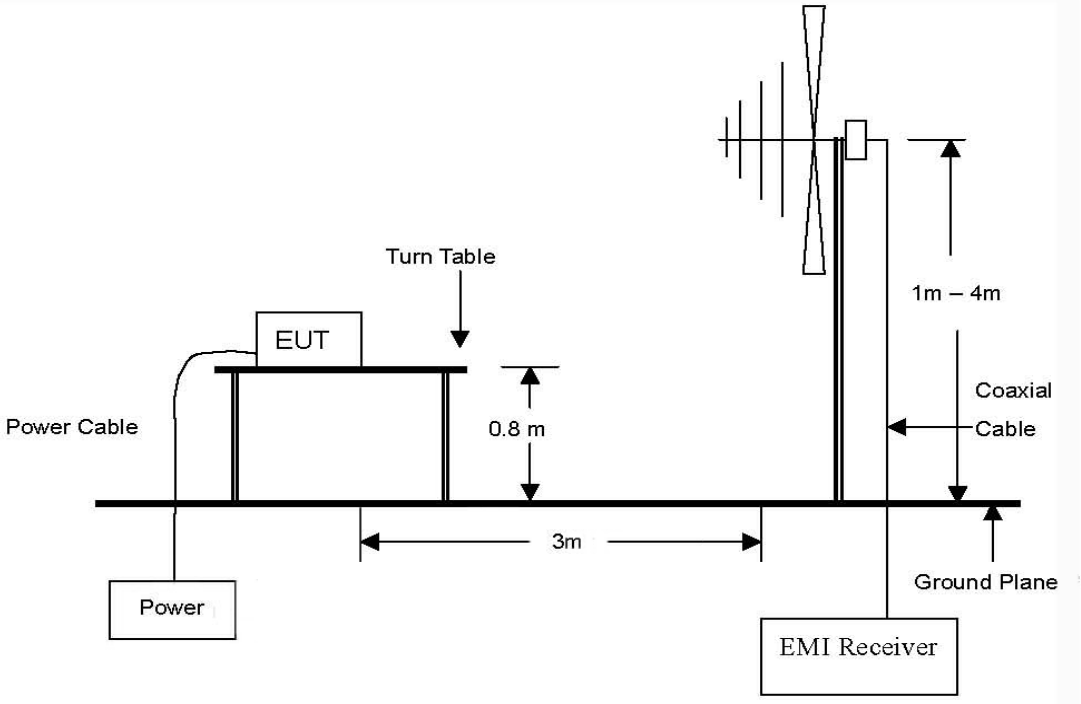


4. Transmitter radiated spurious emissions and conducted spurious emission

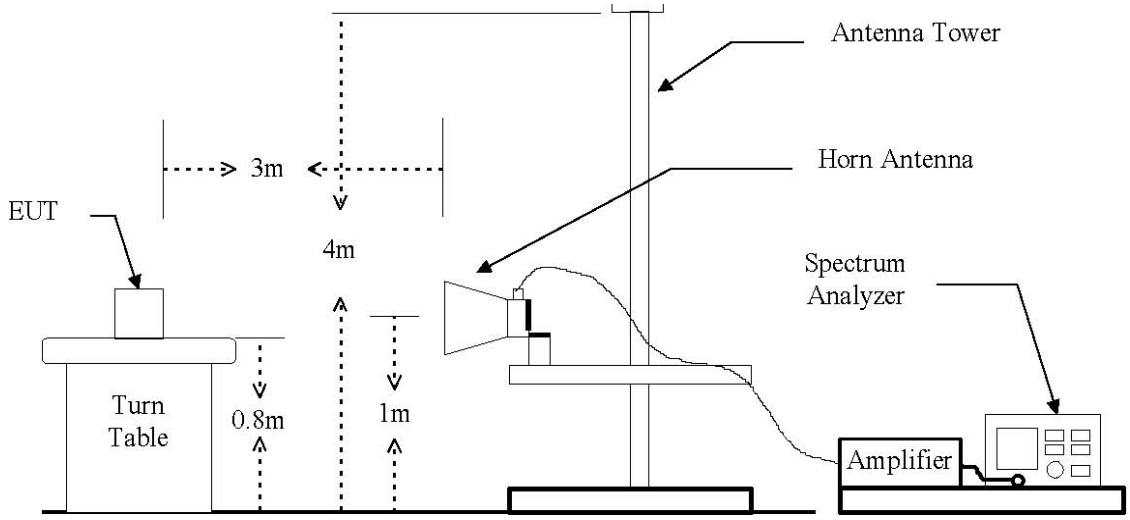
4.1. Test setup

4.1.1. Transmitter radiated spurious emissions

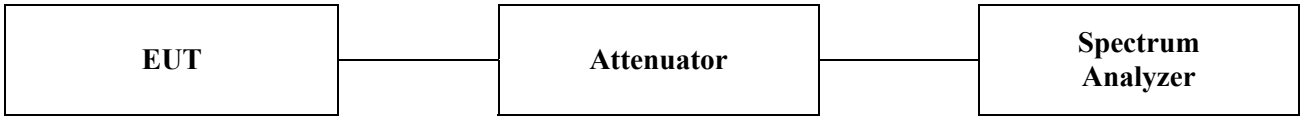
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 24 GHz Emissions.



4.1.2. Conducted spurious emissions



4.2. Limit

For transmitters operating in the 5.15 ~ 5.25 GHz band : all emissions outside of the 5.15 ~ 5.35 GHz band Shall not exceed an EIRP of -27 dBm

4.3. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

4.3.1. Test procedures for radiated spurious emissions

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height 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 table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

▣ *Note*

1. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 GHz.*
2. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz for Peak detection and frequency above 1 GHz.*
3. *The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.*

4.3.2. Test procedures for conducted spurious emissions

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=1 MHz, VBW=1 MHz.

4.4. Test result

Ambient temperature : 22 ℃
Relative humidity : 49 % R.H.

4.4.1. Spurious radiated emission for below 1GHz

The frequency spectrum from 30 MHz to 1000 MHz was investigated. All emissions are not reported much lower than the prescribed limits. All reading values are quasi-peak values.

Radiated emissions			Ant	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect mode	Pol.	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
398.980	29.30	Q.P.	H	13.30	-25.56	17.04	46.00	28.96
664.940	42.34	Q.P.	H	18.10	-25.59	34.85	46.00	11.15
766.633	30.47	Q.P.	H	19.46	-25.20	24.73	46.00	21.27
797.915	33.20	Q.P.	H	19.59	-25.05	27.74	46.00	18.26
Above 800.00	Not Detected							

▣ *Remark:*

1. *Measuring frequencies from 30 MHz to the 1 GHz.*
2. *All spurious emission at low, middle and high channel are almost the same below 1 GHz, so the spurious emission test result of the low channel was chosen as representative in finial test.*
3. *Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made an instrument Using peak/quasi-peak detector mode.*
4. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
5. *To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. The worst case is XZ.*

4.4.2. Spurious radiated emission for above 1 GHz

IEEE 802.11a (Non-DFS)

A. Low Channel (5180 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5150.00*	29.60	P	H	33.65	-28.05	35.20	74.00	38.80
5150.00*	29.66	P	V	33.65	-28.05	35.26	74.00	38.74
10300.00	45.64	P	H	37.70	-22.76	60.58	74.00	13.42
Above 10400.00	Not Detected							

B. Middle Channel (5200 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10386.00	46.50	P	V	37.70	-22.66	61.54	74.00	12.46
Above 10400.00	Not Detected							

C. High Channel (5240 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5350.00*	29.02	P	H	33.85	-27.73	35.14	74.00	38.86
5350.00*	29.05	P	V	33.85	-27.73	35.17	74.00	38.83
Above 5400.00	Not Detected							

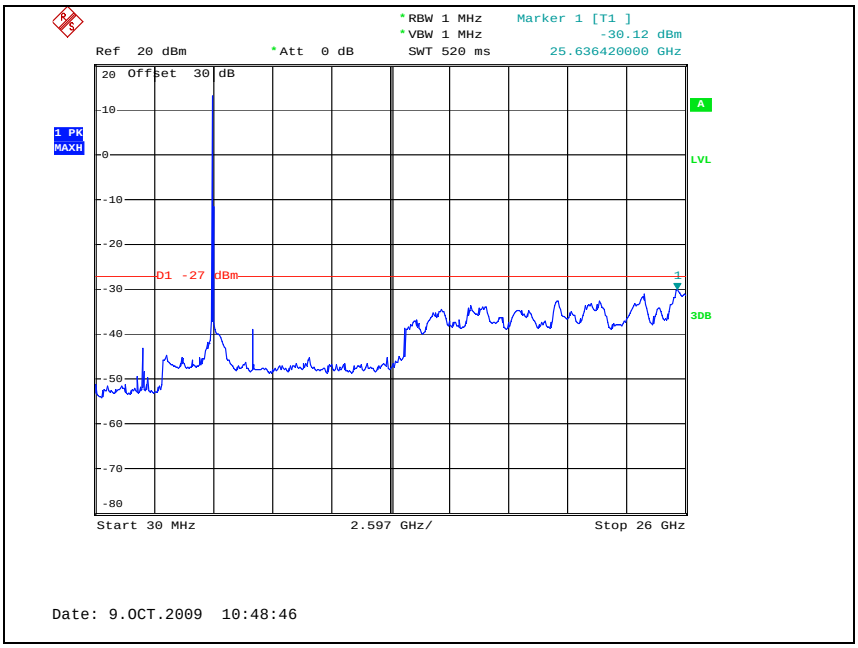
▣ *Remarks*

1. *"*" means the restricted band.*
2. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.*
3. *Radiated emissions measured in frequency above 1000 MHz were made with an instrument using peak/average detector mode.*
4. *Average test would be performed if the peak result were greater than the average limit.*
5. *To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. The worst case is XZ.*

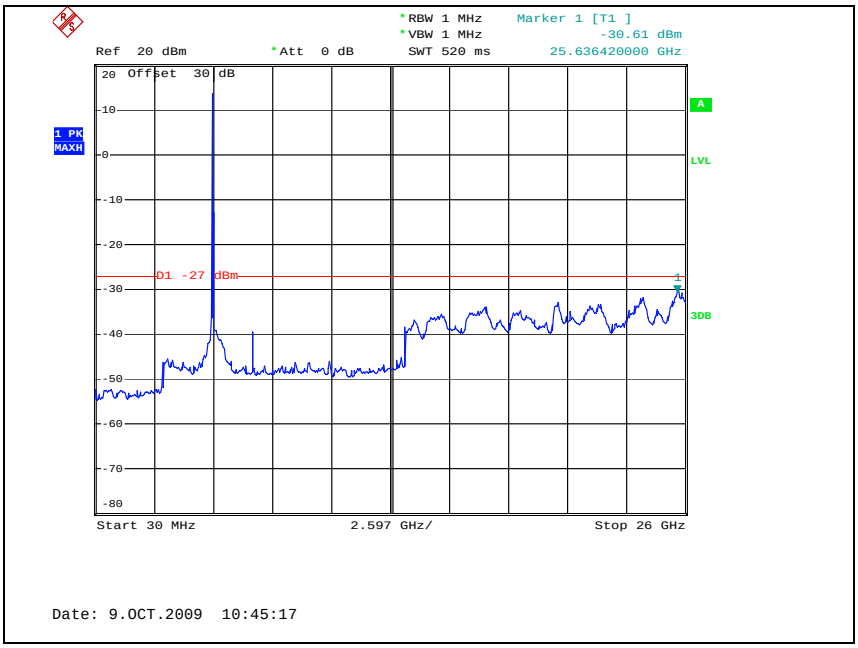
4.4.3. Spurious RF Conducted Emissions: Plot of Spurious RF Conducted Emission

IEEE 802.11a (Non-DFS)

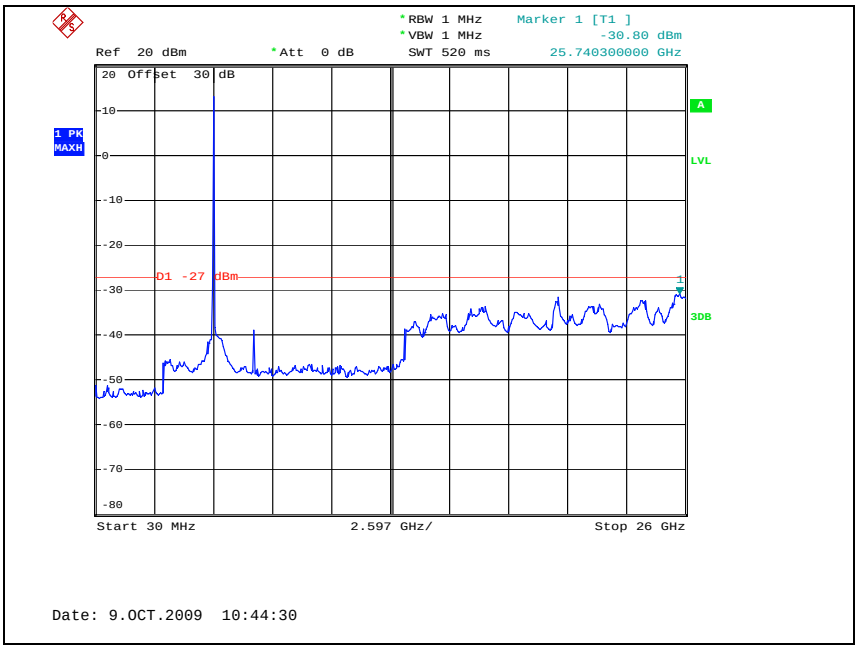
Low Channel



Middle Channel



High Channel



5. Receiver radiated spurious emissions

5.1. Test setup

Same as clause 4.1.

5.1.1. Receiver radiated spurious emissions

Same as clause 4.1.1.

5.2. Limit

According to §15.109(a), Except for Class A digital devices, the field strength of radiated emission from unintentional radiator at a distance of 3 m shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
30 - 88	3	40.0	100
88 – 216	3	43.5	150
216 – 960	3	46.0	200
Above 960	3	54.0	500

5.3. Test procedures

Same as clause 4.3.

5.3.1. Test procedures for radiated spurious emissions

Same as clause 4.3.1.

5.4. Test result

Ambient temperature : 22 ℃
Relative humidity : 49 % R.H.

5.4.1. Spurious radiated emission

All emissions are not reported much lower than the prescribed limits. All reading values are quasi-peak values.

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
398.980	31.26	Q.P.	H	13.30	-25.56	19.00	46.00	27.00
664.940	41.65	Q.P.	H	18.10	-25.59	34.16	46.00	11.84
766.633	31.22	Q.P.	H	19.46	-25.20	25.48	46.00	20.52
797.915	34.92	Q.P.	H	19.59	-25.05	29.46	46.00	16.54
Above 800.00	Not Detected							

▣ *Remark:*

1. *All spurious emission at low, middle and high channel are almost the same below 1 GHz, so the spurious emission test result of the low channel was chosen as representative in finial test.*
2. *"*" means the restricted band.*
3. *To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.*

6. 26dB bandwidth & 99% bandwidth

6.1. Test setup

6.2. Limit

None; for reporting purpose only

6.3. Test procedure

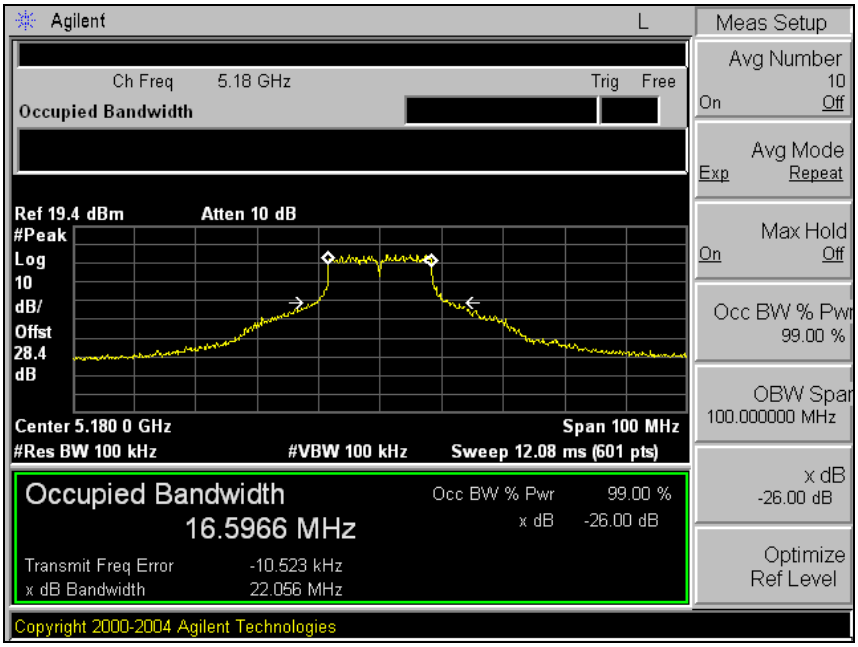
1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100 kHz, VBW = RBW, Span = 100 MHz, Sweep = auto.
4. Repeat until all the rest channels are investigated.

6.4. Test result

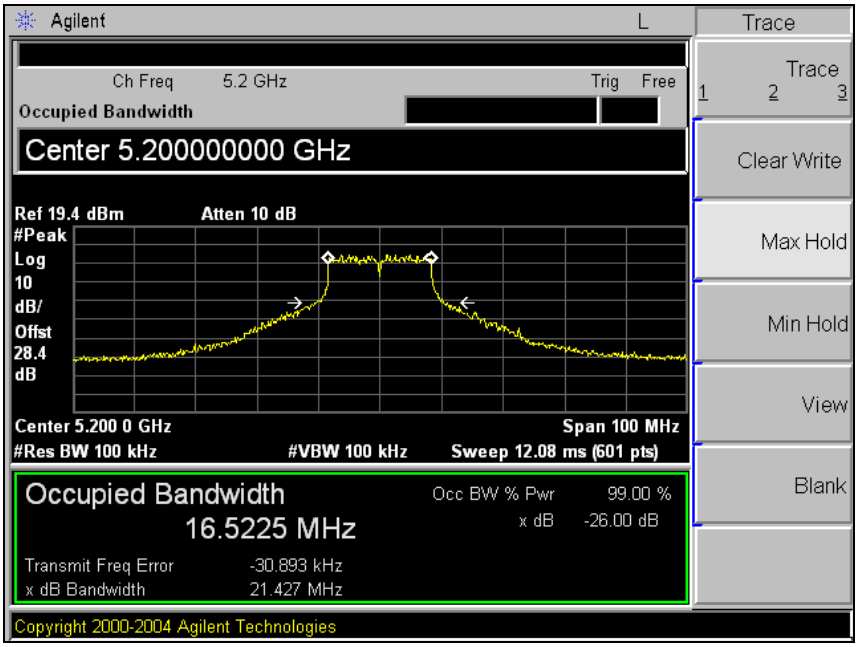
Ambient temperature : 22 ℃
Relative humidity : 49 % R.H.

Frequency (MHz)	26dB bandwidth (MHz)	99% bandwidth (MHz)
5180	22.06	16.60
5200	21.43	16.52
5240	21.41	16.51

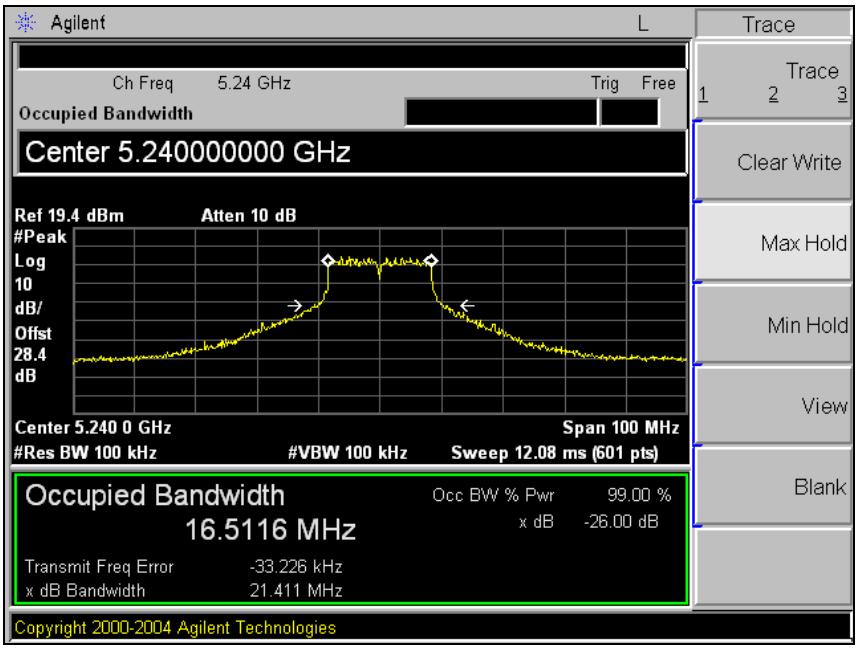
Low channel



Middle channel



High channel



7. Output power

7.1. Test setup

7.2. Limit

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.3. Test procedure

-

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. Set the Spectrum analyzer as RBW = 1 MHz, VBW = 3 MHz, Span = Auto, Channel BW = 26dB bandwidth

7.4. Test result

Ambient temperature : 22 ℃
Relative humidity : 49 % R.H.

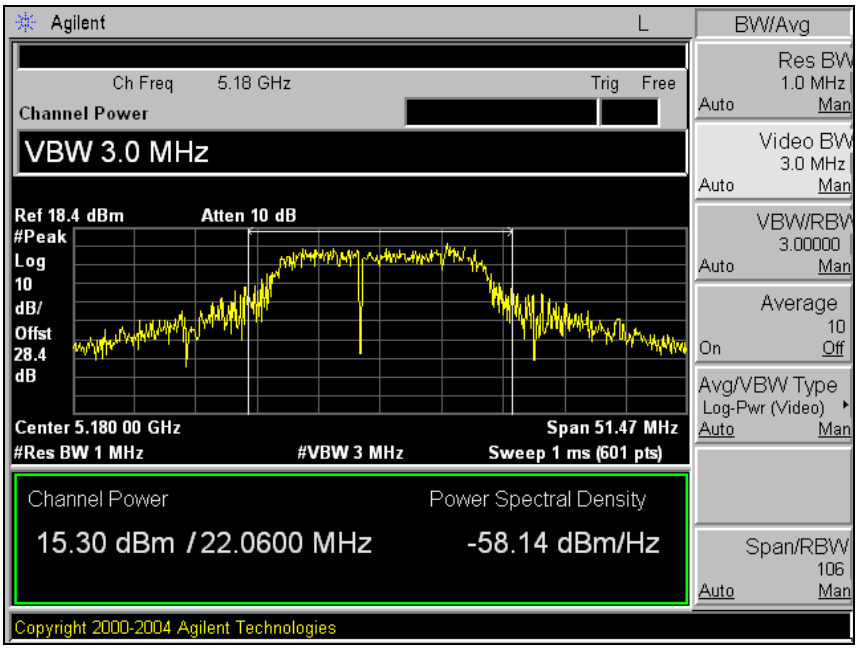
Limit

Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4+10LogB (dBm)	Antenna gain (dBi)	Limit (dB)
5180	17	22.06	17.44	1.85	17
5200	17	21.43	17.31	1.85	17
5240	17	21.41	17.31	1.85	17

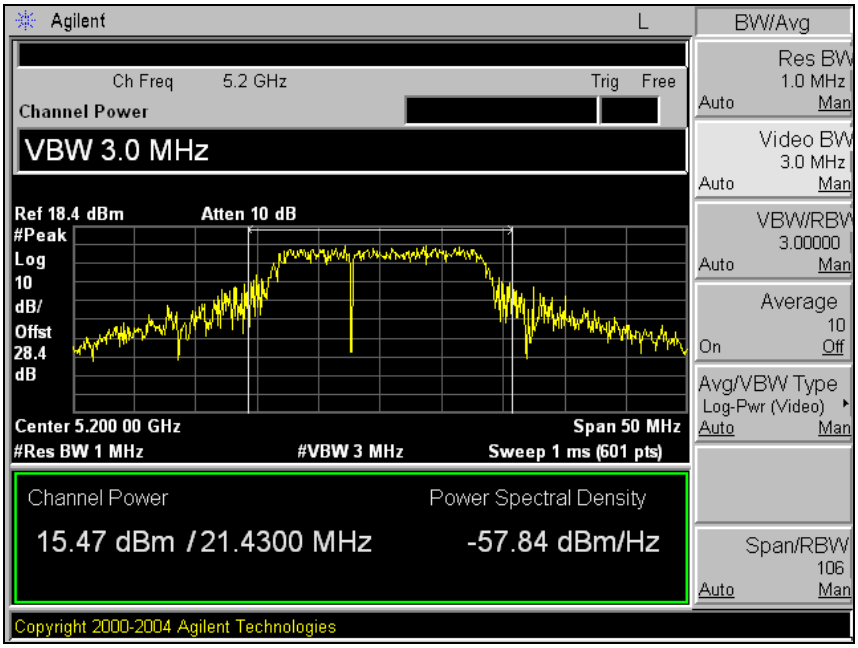
Results

Frequency (MHz)	Output power (dBm)	Limit (dBm)	Margin (dB)
5180	15.30	17	1.75
5200	15.47		1.37
5240	14.76		2.24

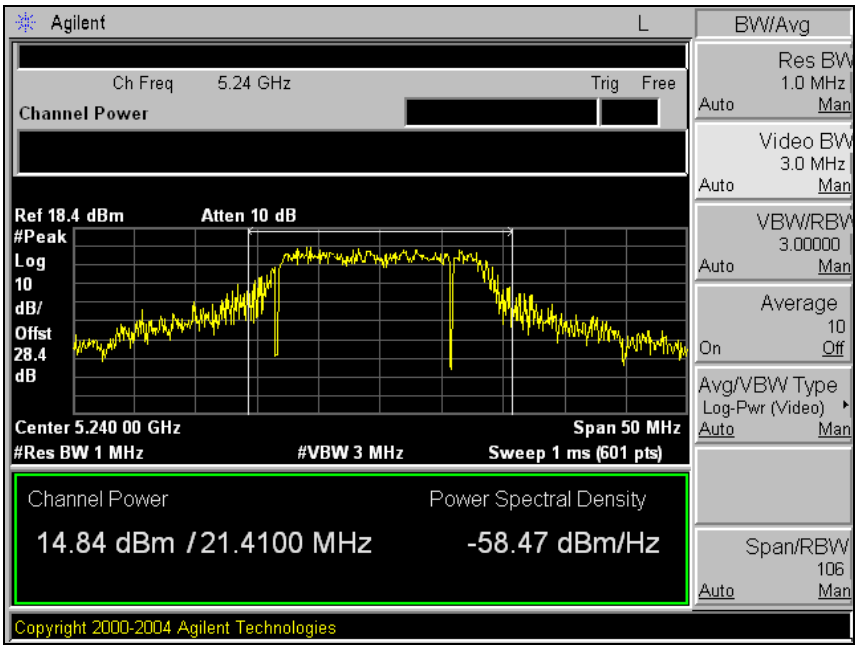
Low channel



Middle channel



High channel



8. Peak power spectral density

8.1. Test setup

8.2. Limit

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band.
If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 4 dBm.

8.3. Test procedure

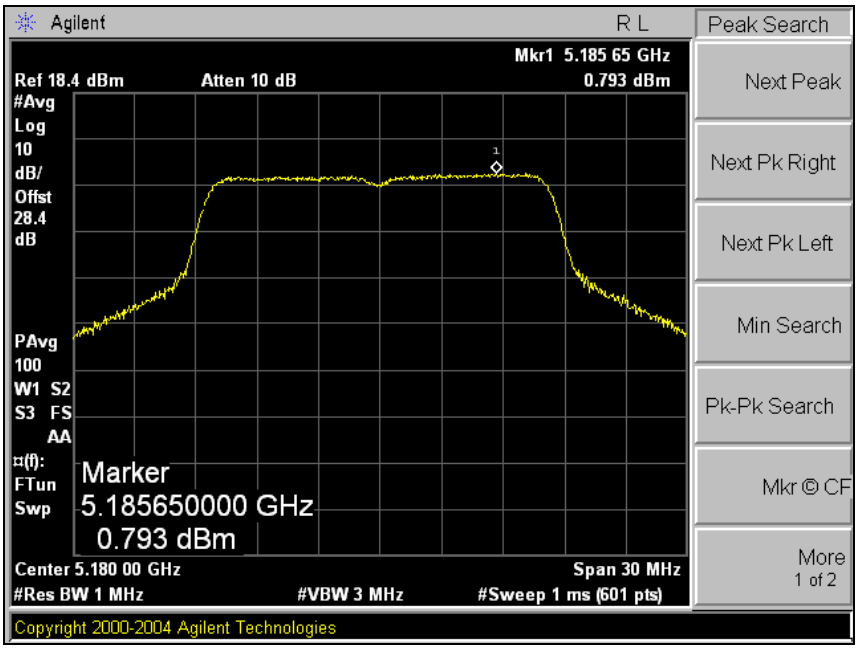
1. Place the EUT on the table and set it in transmitting mode
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 1 MHz, VBW = 3 MHz, Span = 30 MHz.
3. Record the max reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

8.4. Test result

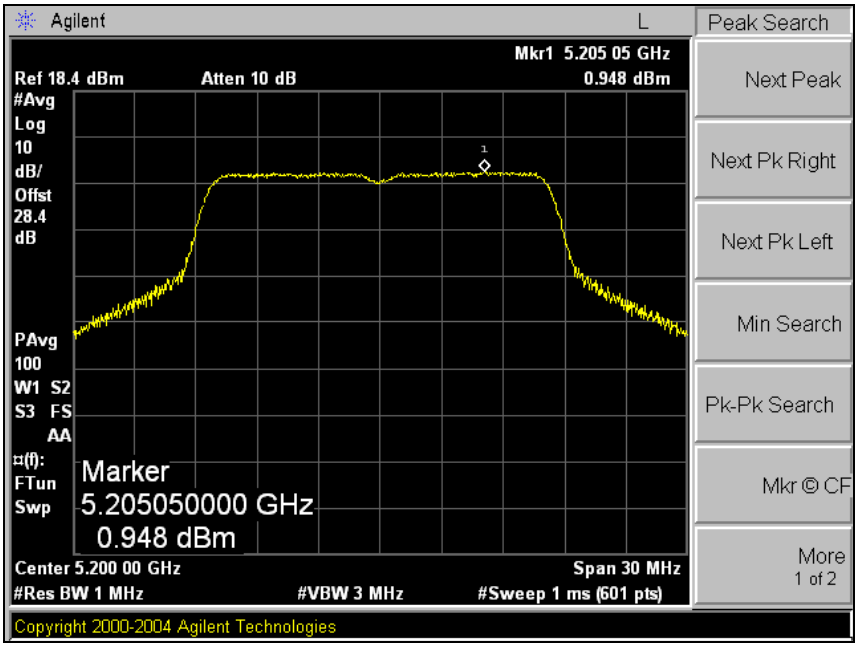
Ambient temperature : 22 ℃
Relative humidity : 49 % R.H.

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5180	0.793	4	3.207
5200	0.948		3.052
5240	0.201		3.799

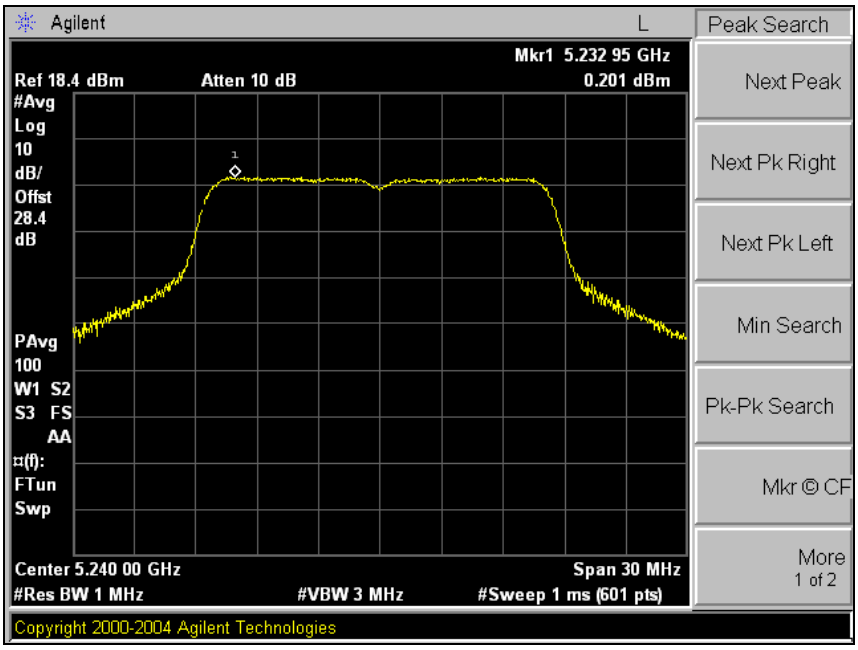
Low channel



Middle channel



High channel



9. Peak excursion

9.1. Test setup

9.2. Limit

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.The maximum antenna

9.3. Test procedure

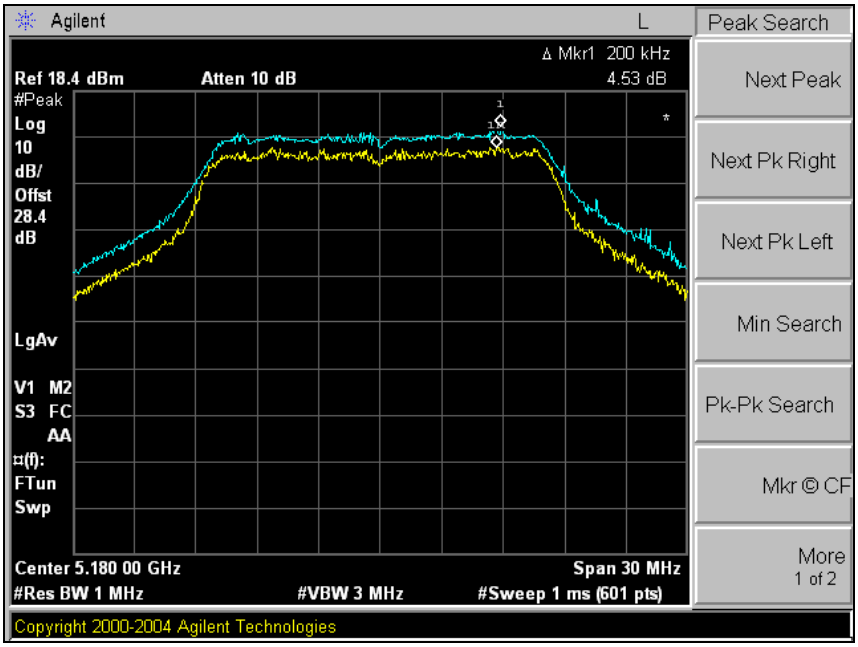
1. Place the EUT on the table and set it in transmitting mode
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as ;
   RBW = 1 MHz, VBW = 3 MHz, Span = 30 MHz, Detector mode: average, Trace 1: Max hold & View
3. Set the spectrum analyzer as ;
   RBW = 1 MHz, VBW = 3 MHz, Span = 30 MHz, Detector mode: peak , Trace 2: Max hold
4. Record the max reading.
5. Repeat the above procedure until the measurements for all frequencies are completed.

9.4. Test result

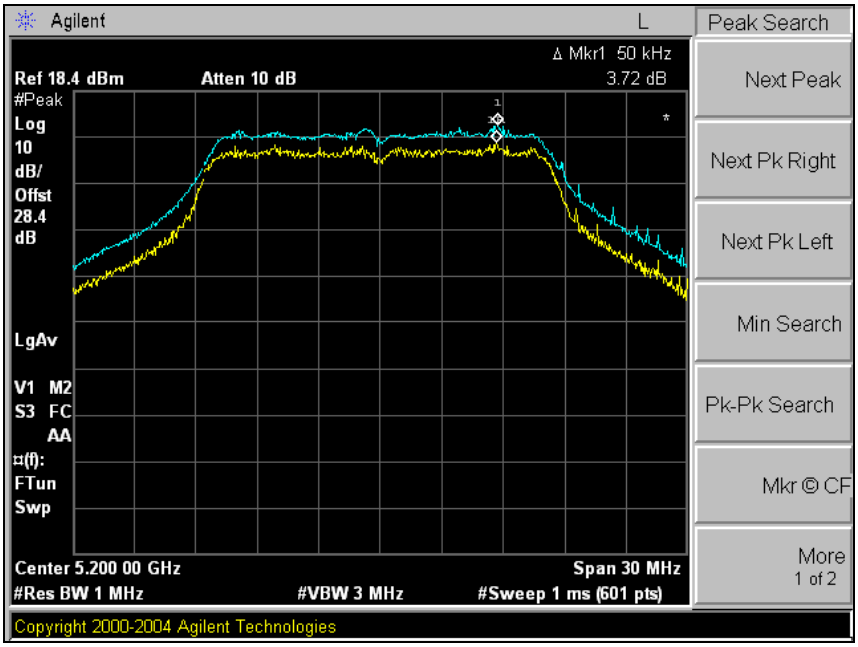
Ambient temperature : 22 ℃
Relative humidity : 49 % R.H.

Frequency (MHz)	Peak excursion (dB)	Limit (dB)	Margin (dB)
5180	4.53	13	8.47
5200	3.72		9.28
5240	3.66		9.34

Low channel



Middle channel



High channel