

TEST REPORT

FCC RULES Part 15 Subpart C

Report File No. : STROR-06-002
Date of Issue : 2006-01-04
Kind of Product : Bluetooth PC Dongle
Model Name : SBD100PBE
FCC ID : A3LSBD100PBE
Manufacturer : Samsung Electronics Co., Ltd.
Serial No. : _____
Test Result : Complied

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VERIFICATION OF COMPLIANCE

Applicant : Samsung Electronic Co., Ltd.
Kind of Product : Bluetooth PC Dongle
Brand Name : -
Model Name : SBD100PBE
Model Difference : -
Report File No. : STROR-06-002
Date of test : Dec. 07, 2005 ~ Jan. 04, 2006
Receiver EUT : -

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
Part 15, Subpart B and Subpart C §15.247	Complied

The above equipment was tested by SGS Testing Korea Co., Ltd. for compliance with the requirements set forth in the FCC RULES Part 15, Subpart B and Subpart C §15.247. The results of testing in this report apply to the product system that was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



Date

Jan. 04, 2006

Feel Jeong

Approved By



Date

Jan. 04, 2006

Albert Lim

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1. GENERAL INFORMATION

1.1 General Description of EUT & Power

Kind of Product	Bluetooth PC Dongle
Model Name	SBD100PBE
Power Supply	DC 5 V (DC 4.5 ~ 5.5 V : Operating Power Range stated by Manufacturer)
Frequency Range	2402~2480 MHz(FHSS)
Transmit Power	1.31 dBm (FHSS)
Modulation Technique	FHSS
Number of Channels	79 ch (FHSS)
Test Modulation	Continuous RF
Operating Conditions	-20 ~ + 60
Antenna Type	Chip Antenna
Antenna Gain	-0.03 dBi

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1.2 Summary of Test Results

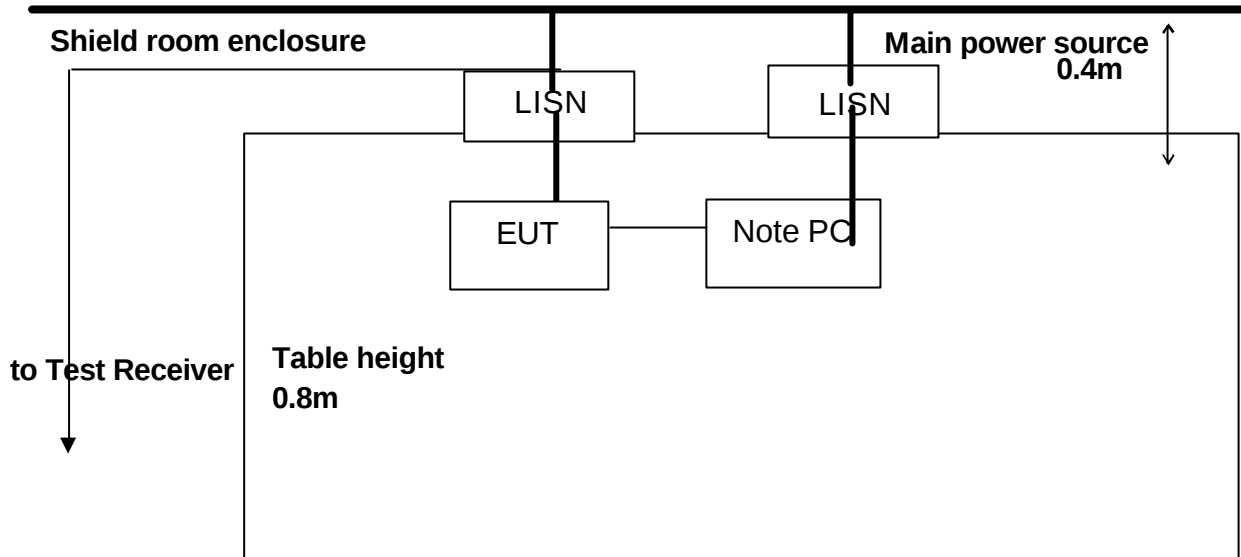
The EUT has been tested according to the following specifications:

APPLIED STANDARD:FCC 47 C.F.R. Part15, Subpart B and Subpart C		
Standard Section	Test Item	Result
15.107 15.207	AC Power Conducted Emission	PASS
15.247(a)(1)	20 dB Bandwidth	PASS
15.247(b)(1)	Maximum Peak Output Power	PASS
15.205(a) 15.209(a) 15.247(d)	Spurious Emission, Band Edge, and Restricted Bands	PASS
15.247(a)(1)	Frequency Separation	PASS
15.247(a)(1)(iii)	Number of Hopping Frequency	PASS
15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	PASS
15.247(e)	Power Spectral Density	PASS
15.247(i) 1.1307(b)(1)	RF Exposure	PASS

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2. CONDUCTED POWERLINE TEST

2.1 Test Setup



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2.2 Limit

According to §15.107(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/50ohm 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 (dBμ V)	
	Qausi-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 Procedure

1. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
2. Record the 6 or 8 highest emissions relative to the limit.
3. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
4. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
5. Repeat all above procedures on measuring each operation mode of EUT.

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2.4 Test Result

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

Humidity Level	52 %	Temperature	22 ?
----------------	------	-------------	------

Frequency range : 0.15 MHz – 30 MHz

Measured Bandwidth : 9 kHz

FREQ. (MHz)	LEVEL(dB μ V)		LINE	LIMIT(dB μ V)		MARGIN(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.165	36.4	27.1	H	65.2	55.2	28.84	28.09
0.195	33.1	24.8	H	63.8	53.8	30.71	29.01
0.225	30.2	22.6	H	62.6	52.6	32.45	30.08
0.285	38.2	37.5	H	60.7	50.7	22.50	13.21
11.055	23.7	21.0	H	60.0	50.0	36.35	28.99
15.970	29.0	27.6	H	60.0	50.0	31.00	22.36
0.165	36.3	26.7	N	65.2	55.2	28.91	28.54
0.195	31.6	22.4	N	63.8	53.8	32.22	31.38
0.225	29.0	22.1	N	62.6	52.6	33.66	30.51
0.285	36.8	36.7	N	60.7	50.7	23.91	13.96
11.055	24.1	22.9	N	60.0	50.0	35.92	27.10
15.970	27.0	26.8	N	60.0	50.0	32.96	23.18

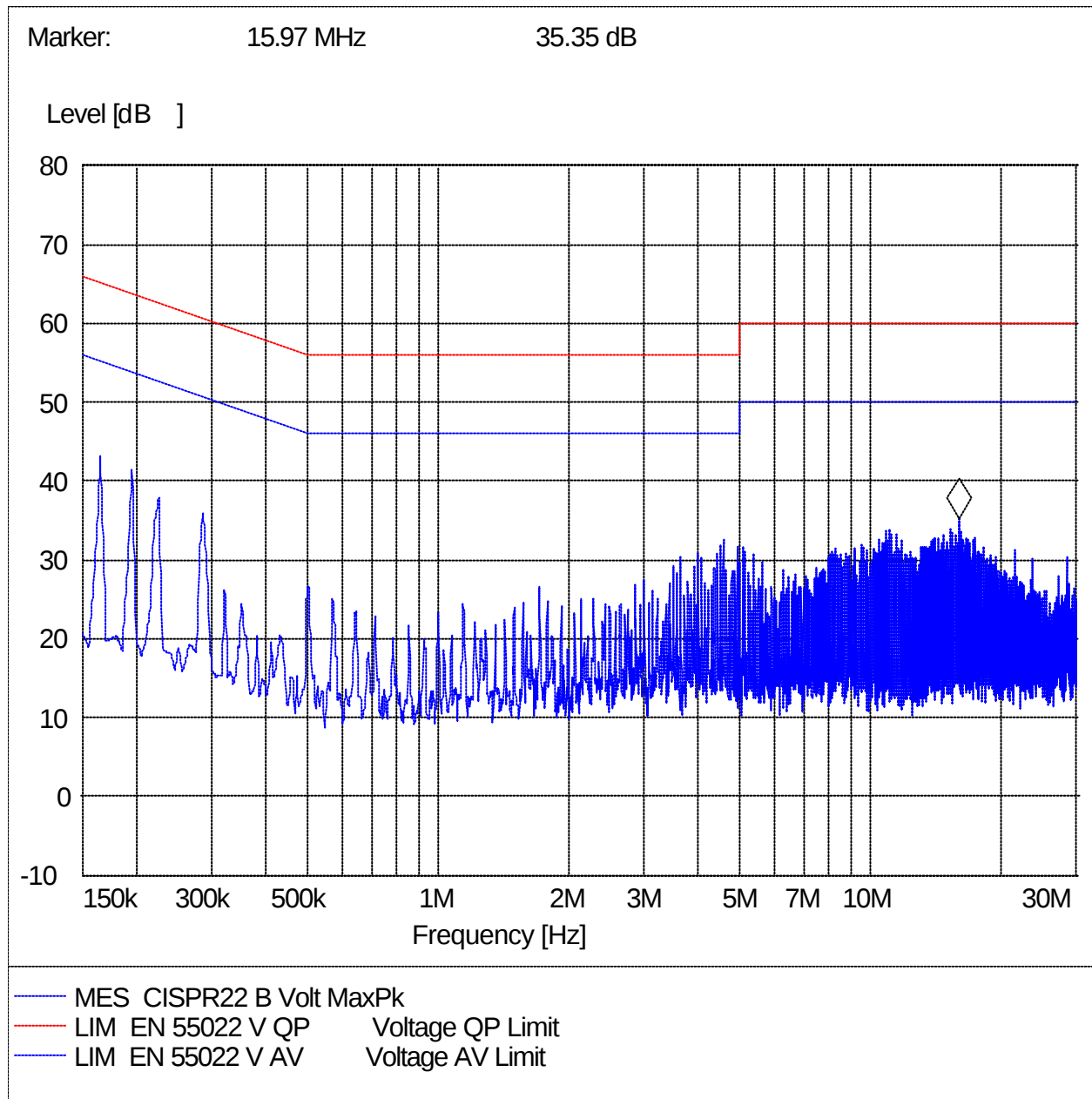
REMARKS :

- Note : • Line (H) :Hot , • Line (N) :Neutral

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Plot of Conducted Powerline

Test mode: (Hot)



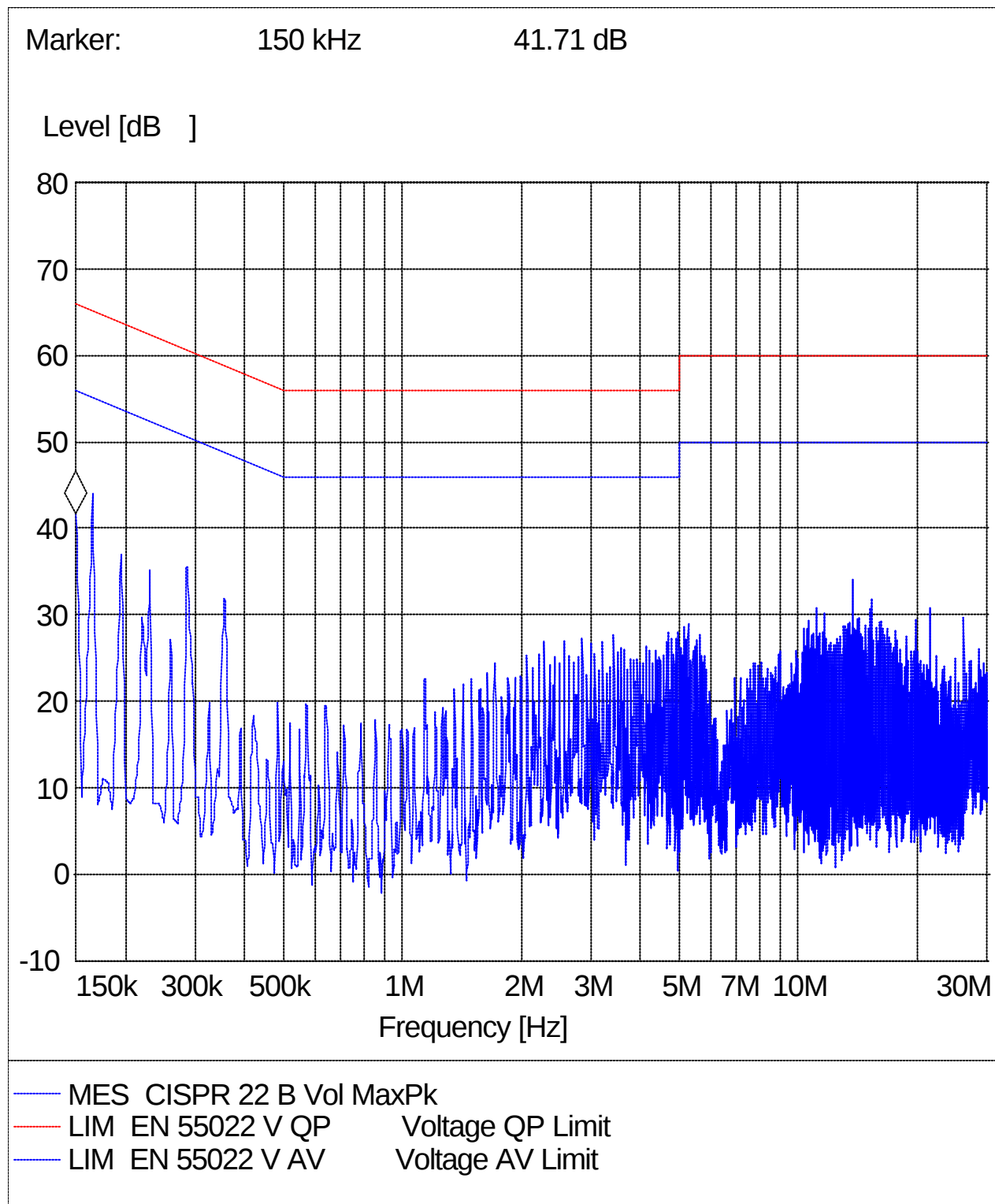
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Test mode: (Neutral)



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Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
LISN	3825/2	EMCO	Dec. 2006
Two-Line V-Network	NNB 41	Schaffner	Sep. 2006
Shielded Room	N/A	-	-
Test Receiver	Rohde & Schwarz	ESIB 26	Mar. 2006

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3. SPURIOUS EMISSION, BAND EDGE, and RESTRICTED BANDS TEST

3.1 Test Setup

1) Spurious Radiated Emissions

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 40 GHz.

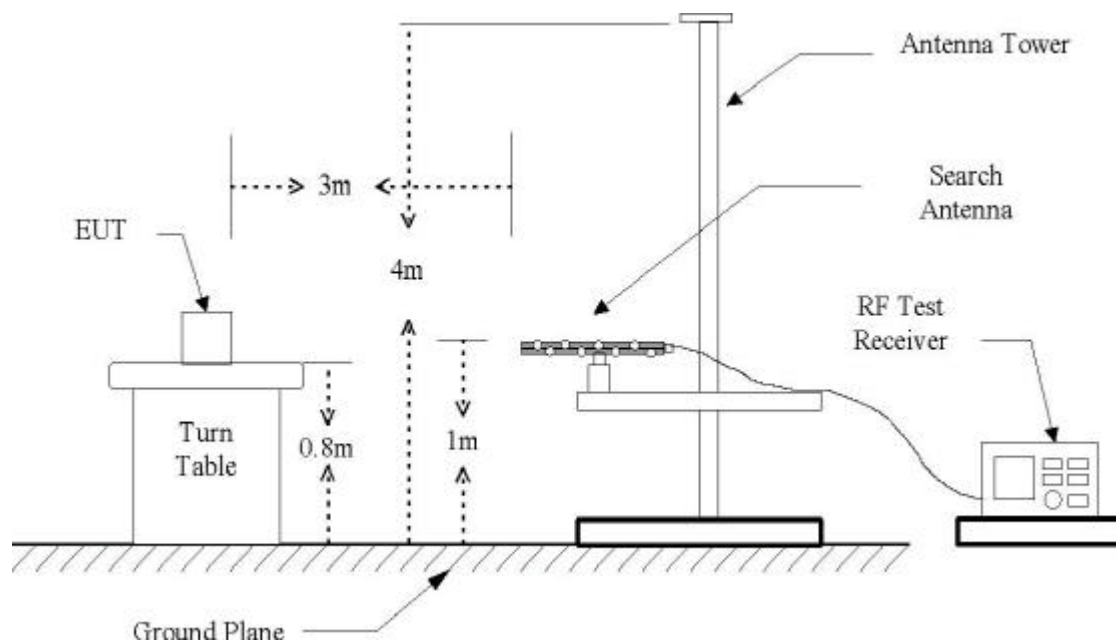


Figure 1 : Frequencies measured below 1 GHz configuration

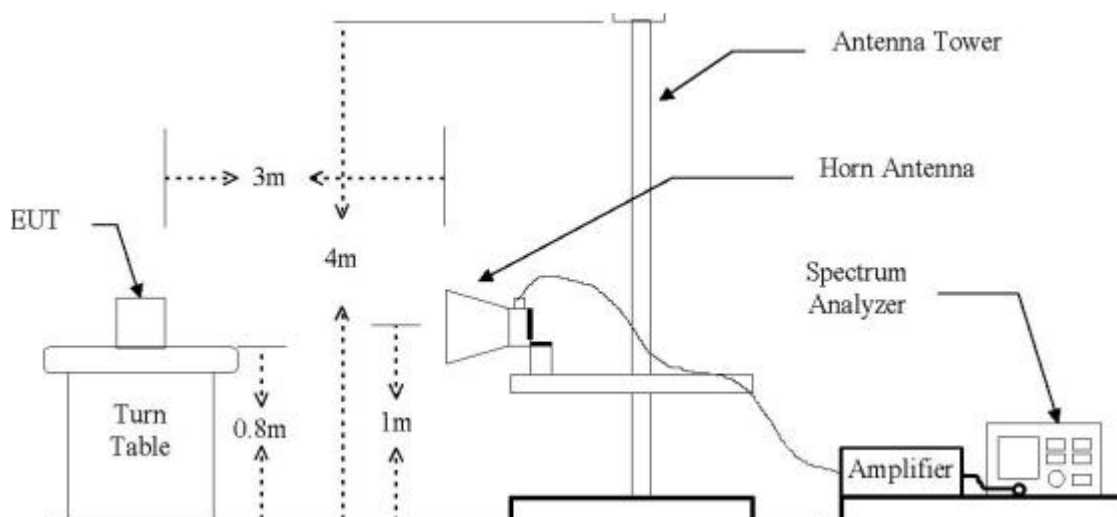
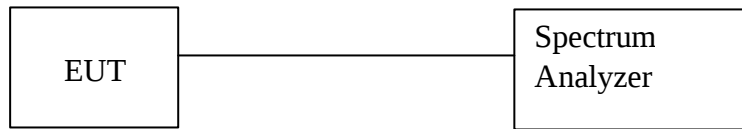


Figure 2 : Frequencies measured below 1 GHz configuration

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2) Spurious RF Conducted Emissions

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3.2 Limit

According to §5.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section §5.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §5.205(a), must also comply the radiated emission limits specified in section §5.209(a) (see section §5.205(c))

According to §15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/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

According to §5.109(a), for an unintentional device, except for Class A digital devices, the field strength of radiated emission from unintentional radiators at a distance of 3 meters shall not exceed the above table.

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3.3 Test Procedures

1) Spurious Radiated Emissions

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10meter open area 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 1 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 polarization 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. 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) and 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.

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2) Spurious RF Conducted Emissions

The transmitter output was connected to the spectrum analyzer via a low loss cable. Set both RBW and VBW of spectrum analyzer with suitable frequency span including 100 kHz bandwidth from band edge. The band edges was measured and recorded.

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3.4 Test Result**1) Spurious Radiated Emissions**

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.

Humidity Level	54 %	Temperature	23 ?
----------------	------	-------------	------

Radiated Spurious Emission 30 MHz ~1000 MHz Test Data (Worst-Case Configuration)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
215.050	10.2	Q.P.	H	16.34	1.51	28.05	43.52	15.47
307.973	5.0	Q.P.	H	15.89	1.84	22.69	46.00	23.31
351.999	14.1	Q.P.	H	16.14	1.94	32.21	46.00	13.79
431.864	15.8	Q.P.	H	17.48	2.16	35.44	46.00	10.56
440.281	9.5	Q.P.	H	17.71	2.18	29.39	46.00	16.61
796.593	10.1	Q.P.	H	23.32	3.00	36.42	46.00	9.58

REMARKS :

1. All spurious emission at channels are almost the same below 1 GHz, so that the channel was chosen at representative in final test
2. "*" means the restricted band.
3. Actual = Reading + AF + CL.

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The frequency spectrum above 1000 MHz was investigated. All emissions are not reported much lower than the prescribed limits. Reading values are both peak and average values.

Humidity Level	54%	Temperature	23?
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Antenna : Chip Antenna
Radiated Emission Test Data (Above 1 GHz)

1. Low Channel (2402 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF/CL (dB/m)/(dB)	Amp Gain (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4804.00	48.96	Peak	H	32.90/8.27	36.37	53.76	74.00	20.24
4804.00	35.33	Average	H	32.90/8.27	36.37	40.13	54.00	13.87
N/A								

2. Middle Channel (2441 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF/CL (dB/m)/(dB)	Amp Gain (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4882.00	48.27	Peak	H	32.93/8.30	36.35	54.15	74.00	19.85
4882.00	35.41	Average	H	32.93/8.30	36.35	41.29	54.00	12.71
N/A								

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3. High Channel (2480 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF/CL (dB/m)/(dB)	Amp Gain (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4960.00	48.77	Peak	H	32.97/8.32	36.34	53.72	74.00	20.28
4960.00	35.11	Average	H	32.97/8.32	36.34	40.06	54.00	13.94
N/A								

REMARKS :

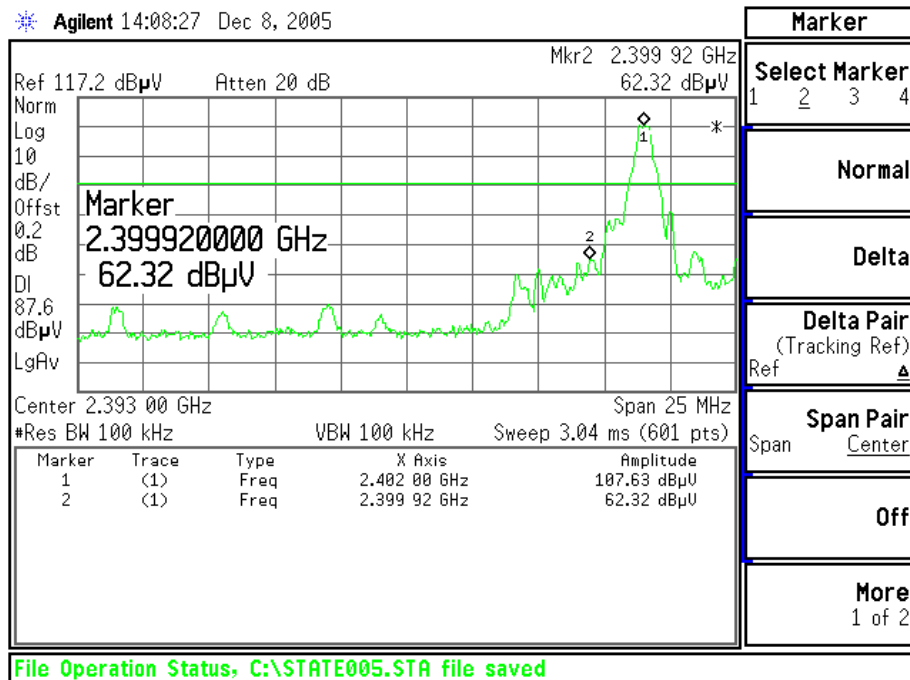
1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency
2. Measurements above only up to 6 maximum emission noted, or would be lesser if No specific emission from the EUT are recorded (ie: margin>20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emission measured in frequency above 1000 MHz were made with an Instrument using Peak detector mode and average detector mode of the emission Shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1 GHz to 10th harmonics of fundamental, RBW=1 MHz, VBW=1 MHz, Sweep time : Auto
 - b. Average Setting 1 GHz to 10th harmonics of fundamental, RBW=1 MHz, VBW=10 Hz, Sweep time : Auto

Test Equipment Used

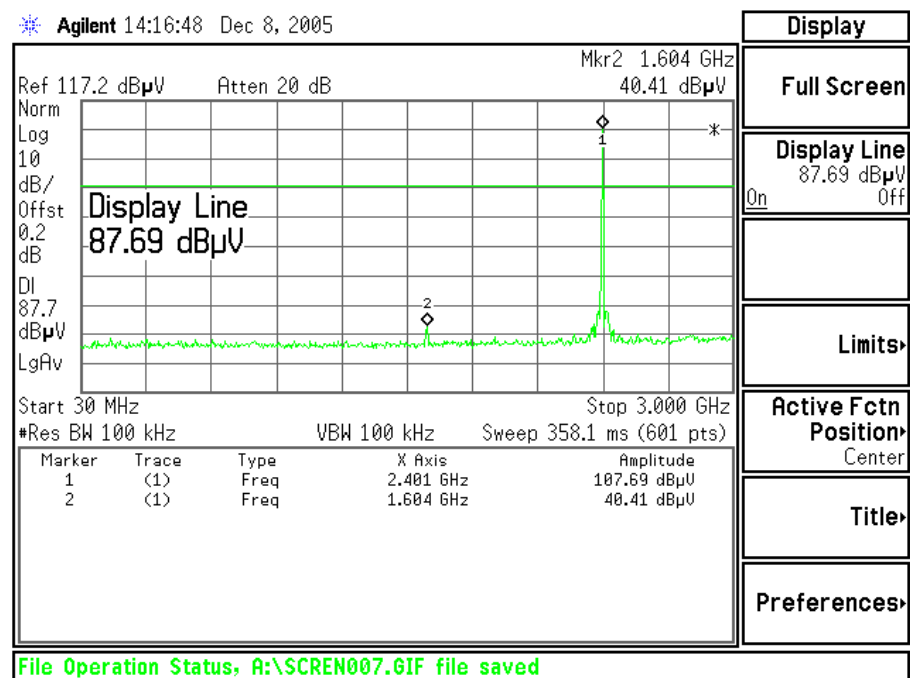
EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
EMI Test Receiver	R&S	ESIB26	Mar. 2006
Test Receiver	Rohde & Schwarz	ESIB 26	Mar. 2006
Preamplifier	Agilent	8449B	May 2006
Log-periodic	Rohde & Schwarz	UHALP9107	Jan. 2006
Biconical Antenna	Schwarzbeck	VHA9103	Mar. 2006
Horn Antenna	Schwarzbeck	BBHA9120D(0600)	Jul. 2006
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA9170223	Nov. 2007

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2) Spurious RF Conducted Emissions : Plot of Spurious RF Conducted Emissions



Low Channel



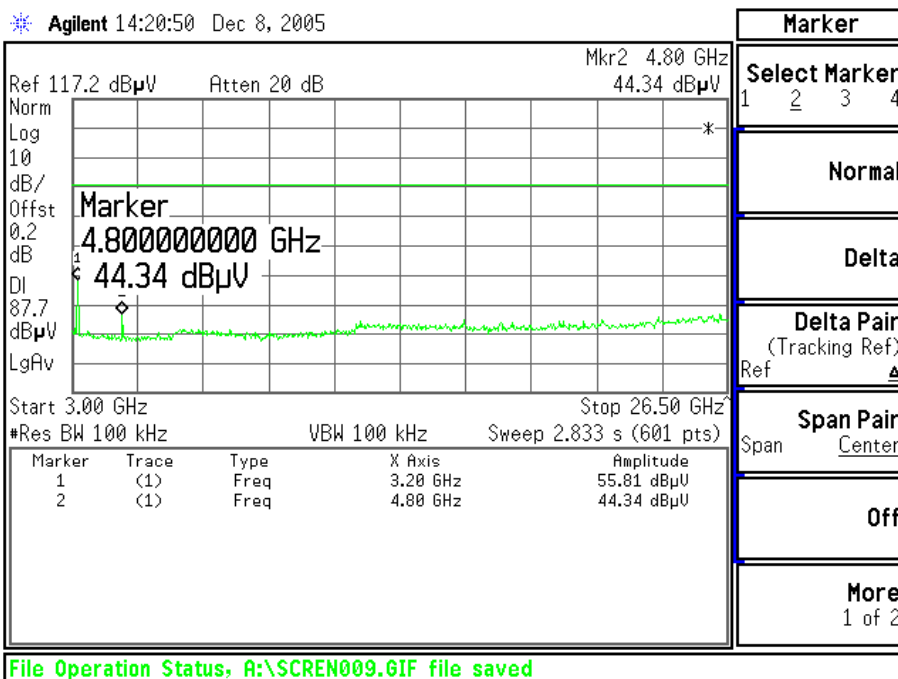
Low Channel

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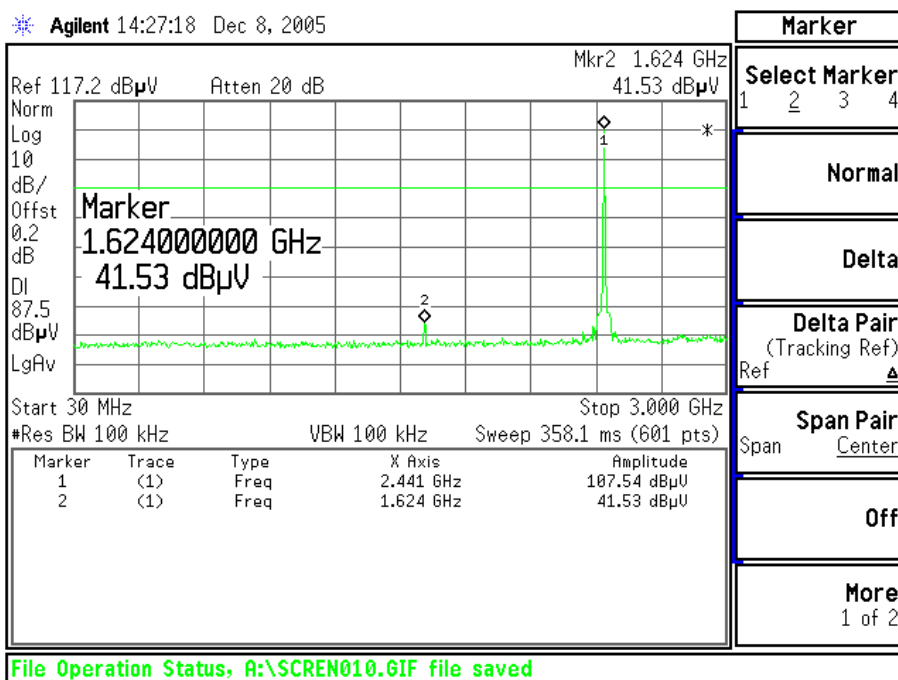
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Low Channel



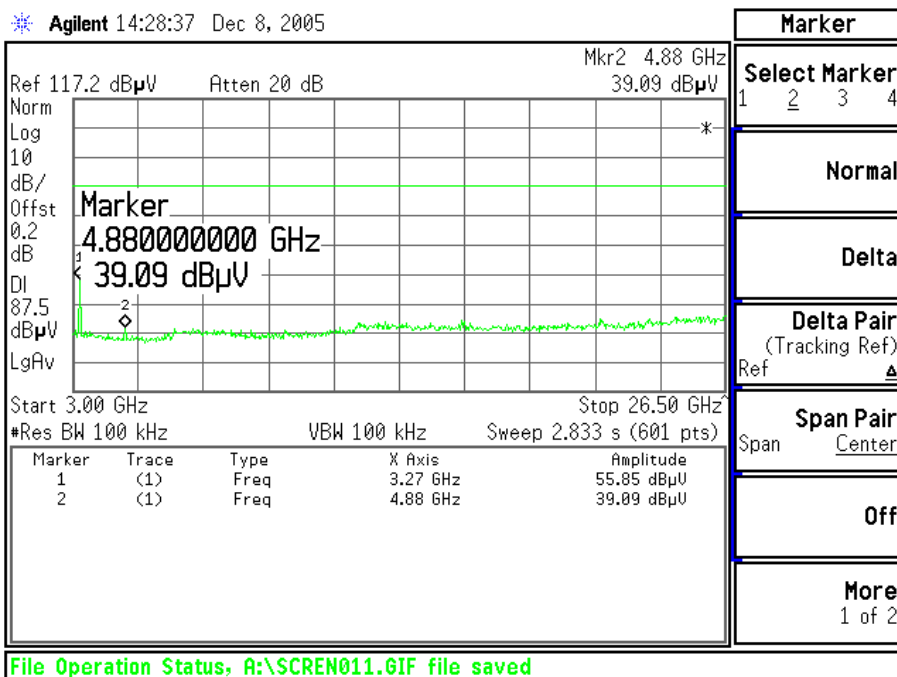
Middle Channel

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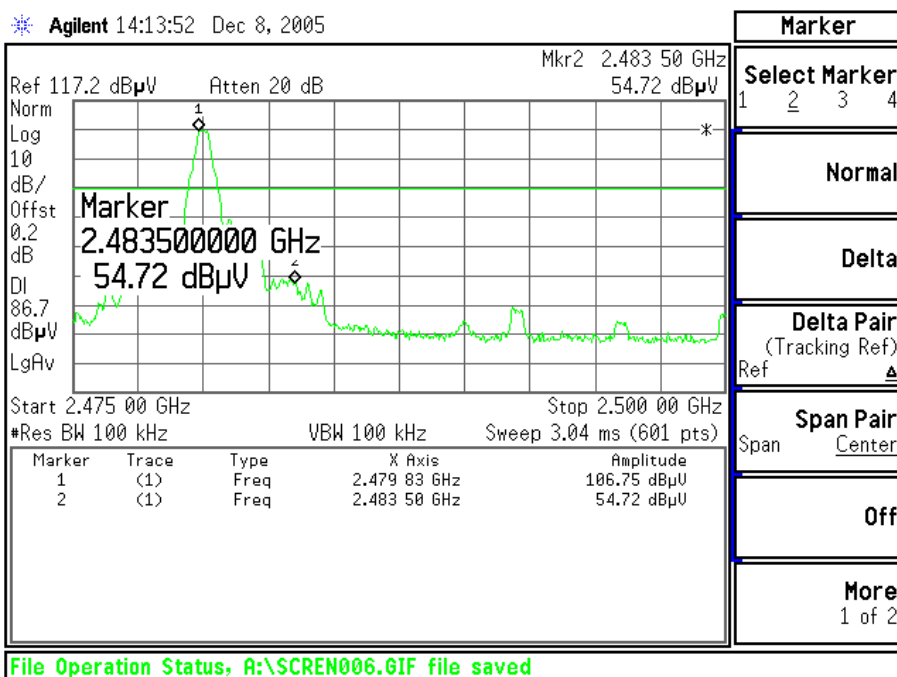
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Middle Channel



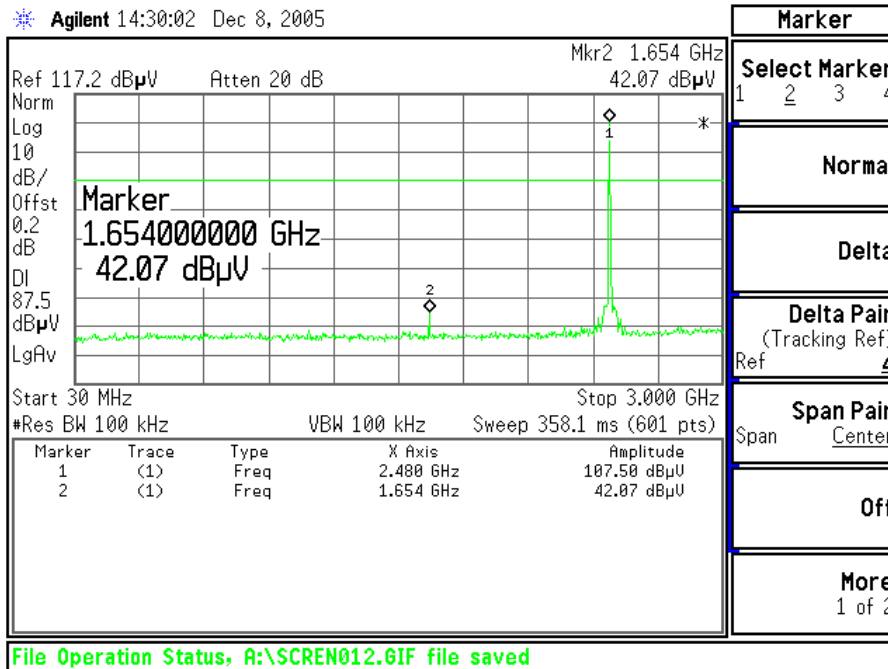
High Channel

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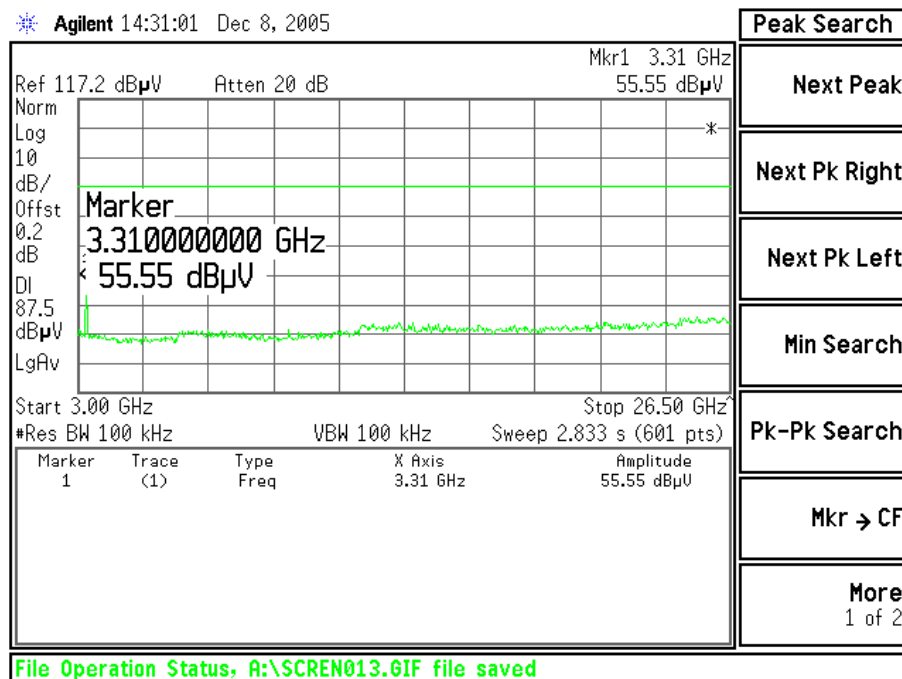
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High Channel



High Channel

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum analyzer	Agilent	E4440A	May 2006

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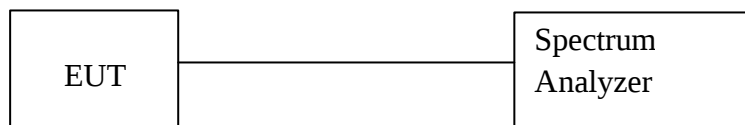
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4. 20 dB BANDWIDTH MEASUREMENT

4.1 Test Setup



4.2 Limits

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequency separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

4.3 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=10 kHz and VBW=10 kHz.
3. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

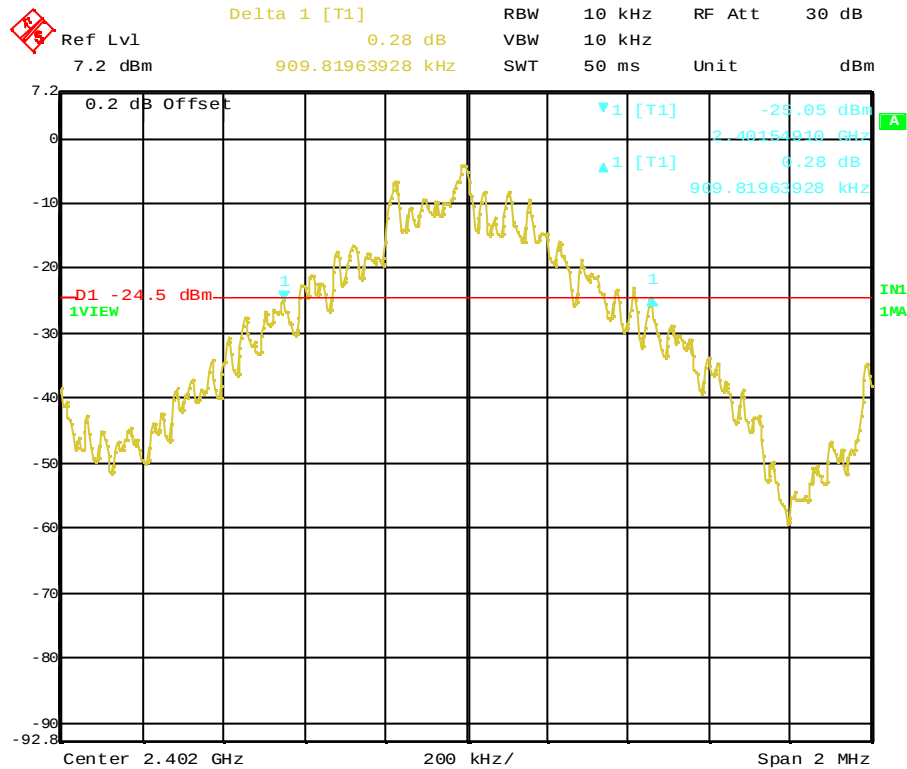
4.4 Test Result

Humidity Level	55 %	Temperature	25 ?
----------------	------	-------------	------

Channel	Channel Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2402	0.910
Middle	2441	0.914
High	2480	0.826

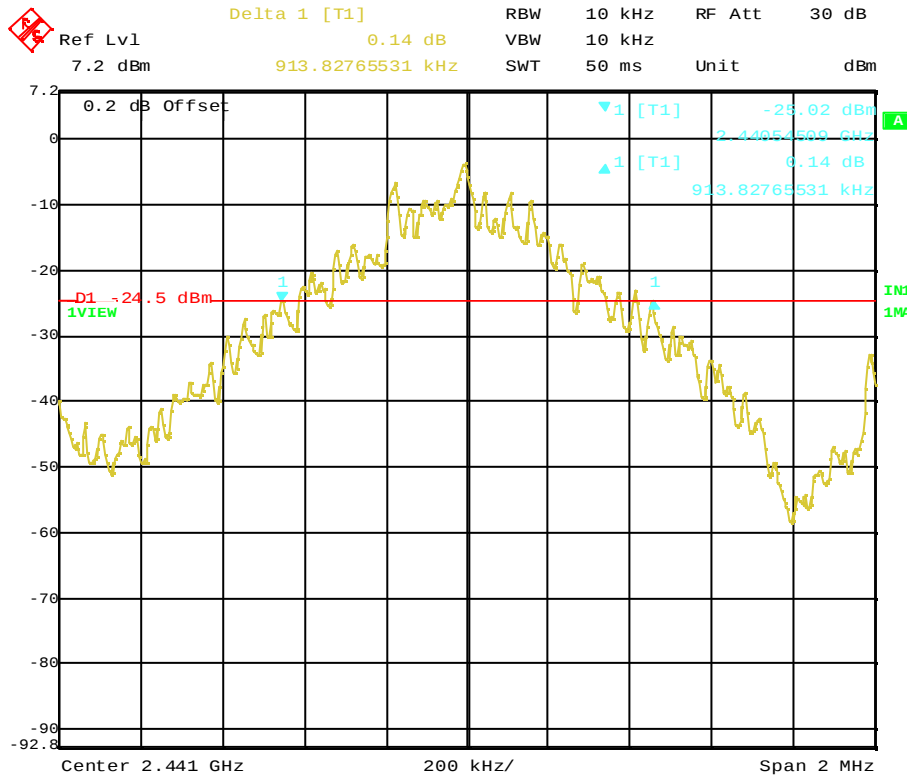
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Plot of 20dB Bandwidth



Date: 7.DEC.2005 14:31:11

Low Channel



Date: 7.DEC.2005 14:27:20

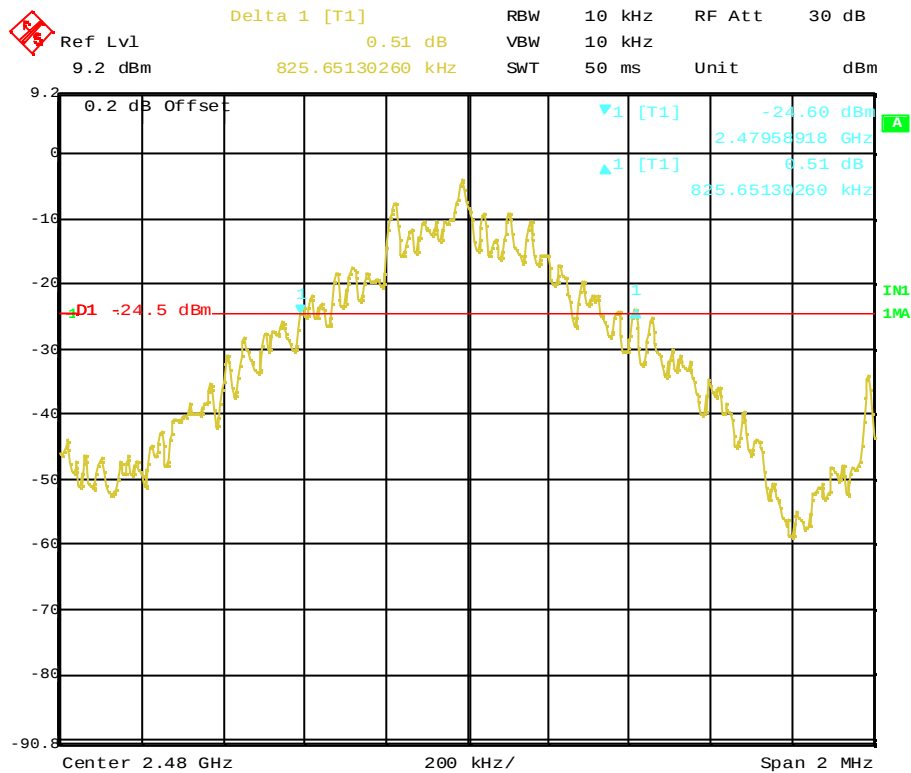
Middle Channel

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Date: 7. DEC. 2005 14:22:26

High Channel

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
EMI Test Receiver	R&S	ESIB26	Mar. 2006

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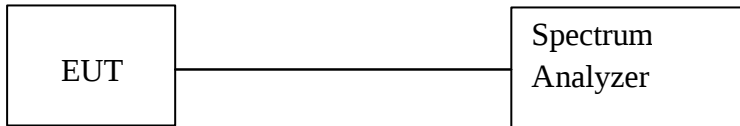
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5. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

5.1 Test Setup



5.2 Limit

According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

5.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Use the following spectrum analyzer settings:
Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
RBW > the 20 dB bandwidth of the emission being measured
VBW $\geq$ RBW
Sweep = auto
Detector function = peak
Trace = max hold
4. 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. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all frequencies measured were complete.

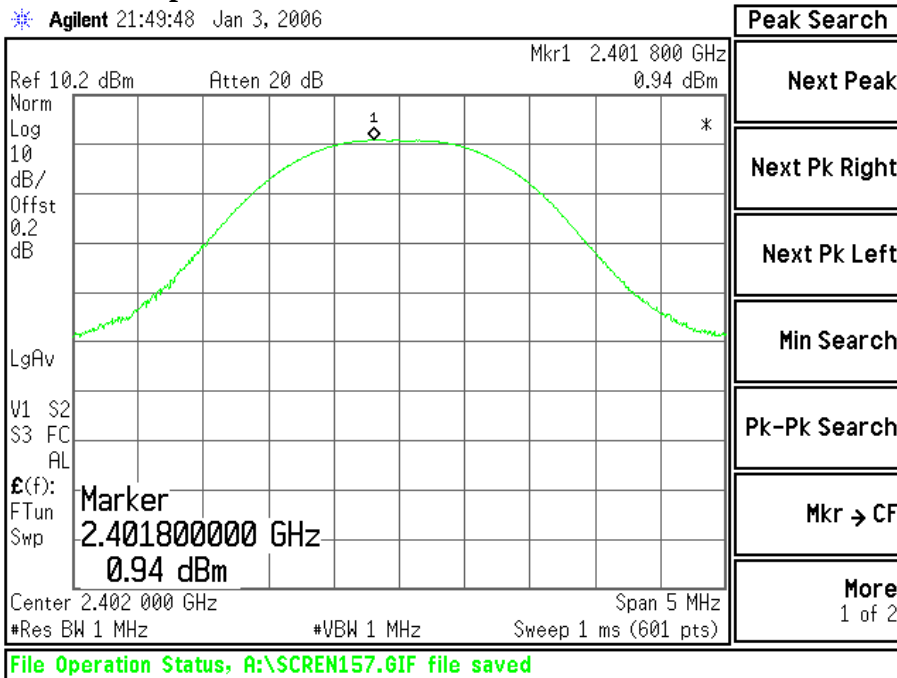
5.4 Test Result

Humidity Level	55 %	Temperature	25 ?
----------------	------	-------------	------

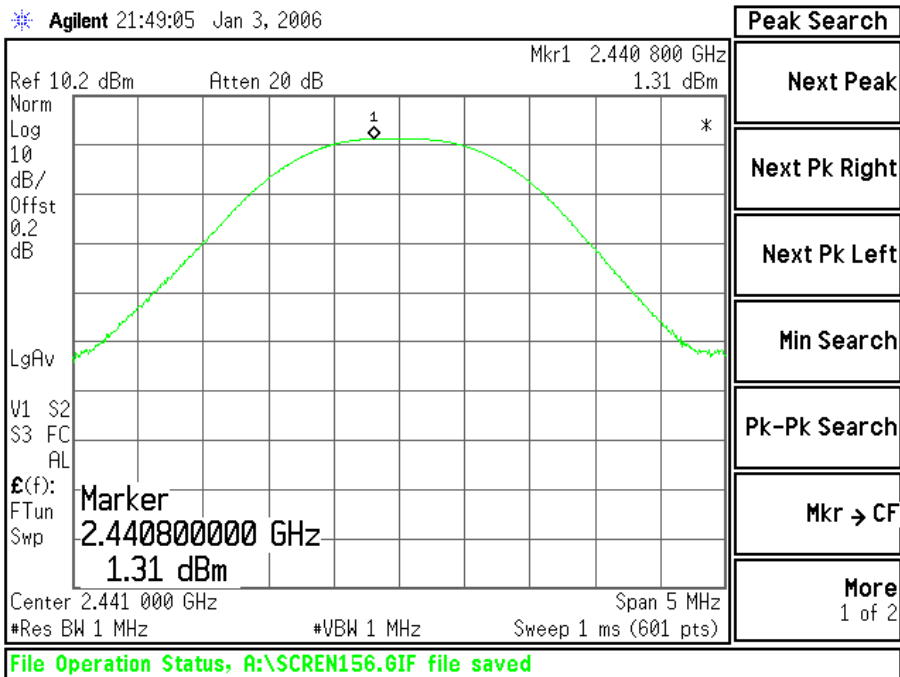
Channel	Channel Frequency (MHz)	Reading Power (dBm)	Cable Loss (dB)	Output Power (mW)	Limit (W)
Low	2402	0.94	0.2	1.24	0.125
Middle	2441	1.31	0.2	1.35	0.125
High	2480	1.11	0.2	1.29	0.125

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Plot of Maximum Pak Output Power

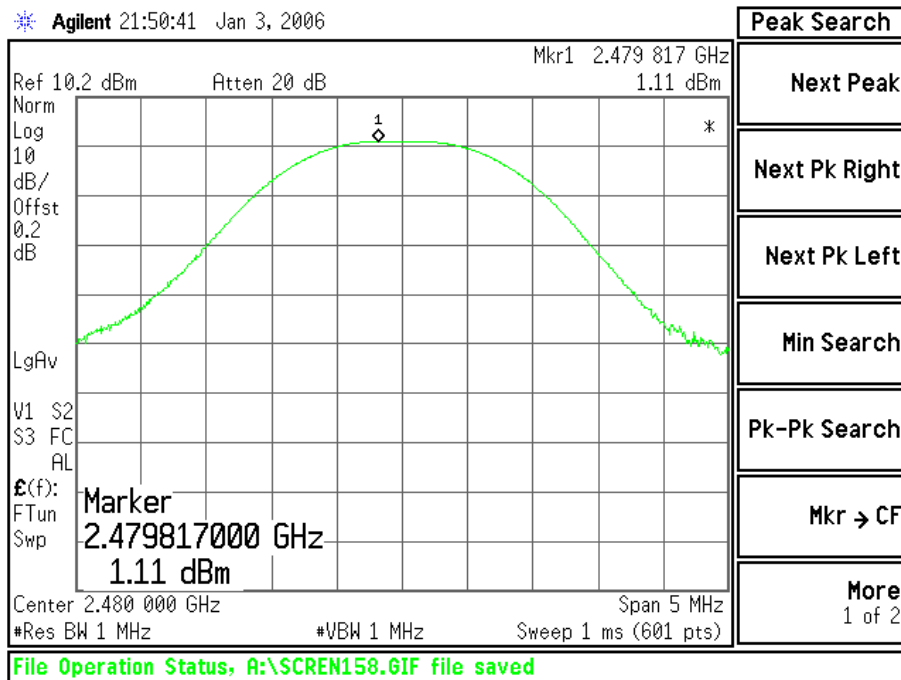


Low Channel



Middle Channel

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High Channel

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum analyzer	Agilent	E4440A	May 2006

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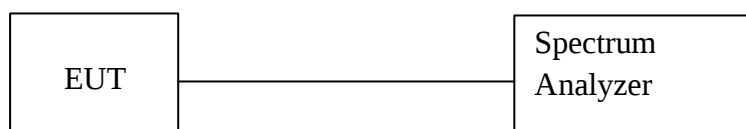
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6. FREQUENCY SEPARATION

6.1 Test Setup



6.2 Limits

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequency separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

6.3 Test Procedure

1. Place the EUT on the table and set it in 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 center frequency of spectrum analyzer = middle of hopping channel .
4. Set the spectrum analyzer as
RBW,VBW=100 kHz, Adjust Span to 5 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

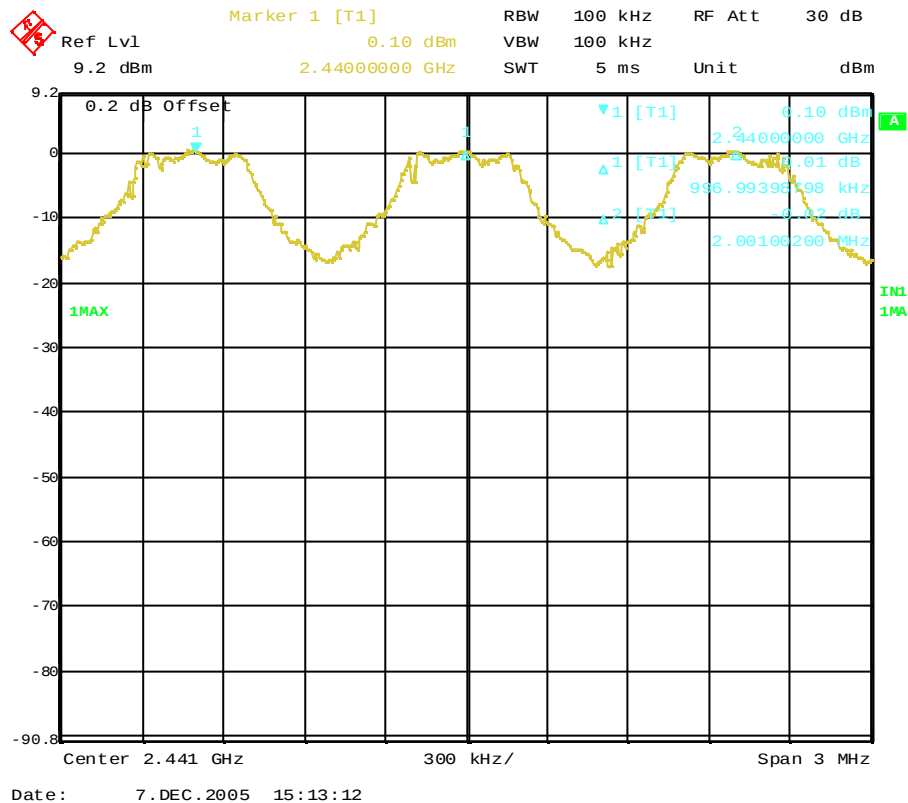
6.4 Test Result

Humidity Level	55 %	Temperature	25 ?
----------------	------	-------------	------

Channel Separation (MHz)	Limit (kHz)	Result
1	≥ 25 kHz/20 dB Bandwidth	Pass

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Plot of Frequency Separation



Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
EMI Test Receiver	R&S	ESIB26	Mar. 2006

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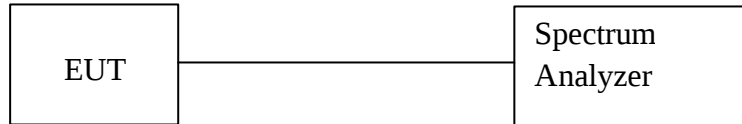
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7. NUMBER OF HOPPING FREQUENCY

7.1 Test Set up



7.2 Limit

According to §5.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

7.3 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as
Start=2400 MHz, Stop=2483.5 MHz
RBW, VBW=100 kHz, Sweep = auto
4. Max hold, view and count how many channel in the band.

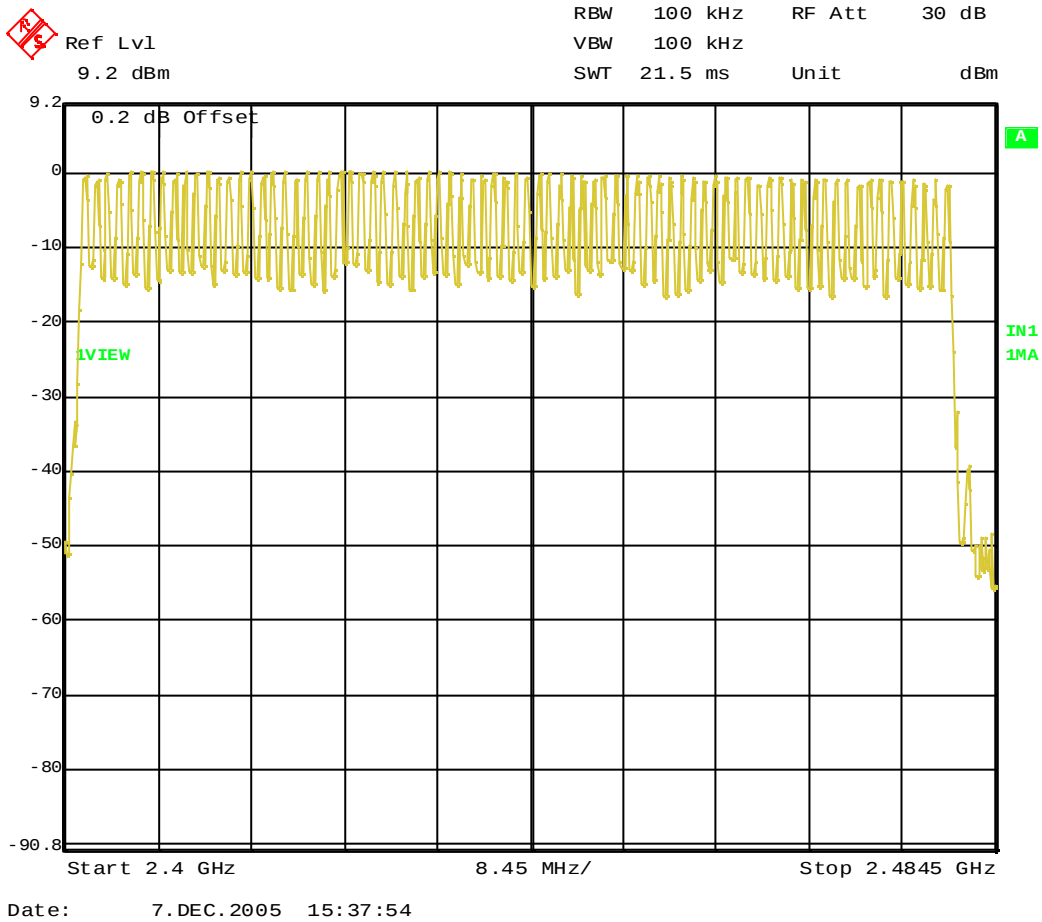
7.4 Test Result

Humidity Level	55 %	Temperature	25 ?
----------------	------	-------------	------

Result(No.of CH)	Limit (No.of CH)	Result
79	>= 15	Pass

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Plot of Number of hopping Frequency



Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
EMI Test Receiver	R&S	ESIB26	Mar. 2006

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8. TIME OF OCCUPANCY (DWELL TIME)

8.1 Test Set up



8.2 Limit

According to §5.247(a)(1)(iii), Frequency hopping systems operating in the 2400-2483.5 MHz, the average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4seconds multiplied by the number of hopping channel employed.

8.3 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from antenna port to the spectrum analyzer.
3. Set center frequency of the spectrum analyzer= operating frequency
RBW, VBW=1 MHz, Span=0 Hz, Sweep = auto
4. Repeat above procedures until all frequency were measured complete.

8.4 Test Result

Humidity Level	55 %	Temperature	25 ?
----------------	------	-------------	------

A period time=0.4(ms)*79=31.6(s)

DH1

Low Channel : $0.426(\text{ms}) \times (1600 / (2 \times 79)) \times 31.6(\text{s}) = 136.32(\text{ms})$

Middle Channel : $0.416(\text{ms}) \times (1600 / (2 \times 79)) \times 31.6(\text{s}) = 133.12(\text{ms})$

high Channel : $0.421(\text{ms}) \times (1600 / (2 \times 79)) \times 31.6(\text{s}) = 134.72(\text{ms})$

Channel	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	0.426	136.32	31.6	400	PASS
Middle	0.416	133.12	31.6	400	PASS
High	0.421	134.72	31.6	400	PASS

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DH3

Low Channel : $1.683(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6(\text{s}) = 269.28(\text{ms})$

Middle Channel : $1.671(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6(\text{s}) = 267.36(\text{ms})$

high Channel : $1.685(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6(\text{s}) = (\text{ms})$

Channel	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	1.683	269.28	31.6	400	PASS
Middle	1.671	267.36	31.6	400	PASS
High	1.685	269.60	31.6	400	PASS

DH5

Low Channel : $2.918(\text{ms}) \times (1600 / (6 \times 79)) \times 31.6(\text{s}) = 311.25(\text{ms})$

Middle Channel : $2.921(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6(\text{s}) = 311.57(\text{ms})$

high Channel : $2.919(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6(\text{s}) = 311.36(\text{ms})$

Channel	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
Low	2.918	311.25	31.6	400	PASS
Middle	2.921	311.57	31.6	400	PASS
High	2.919	311.36	31.6	400	PASS

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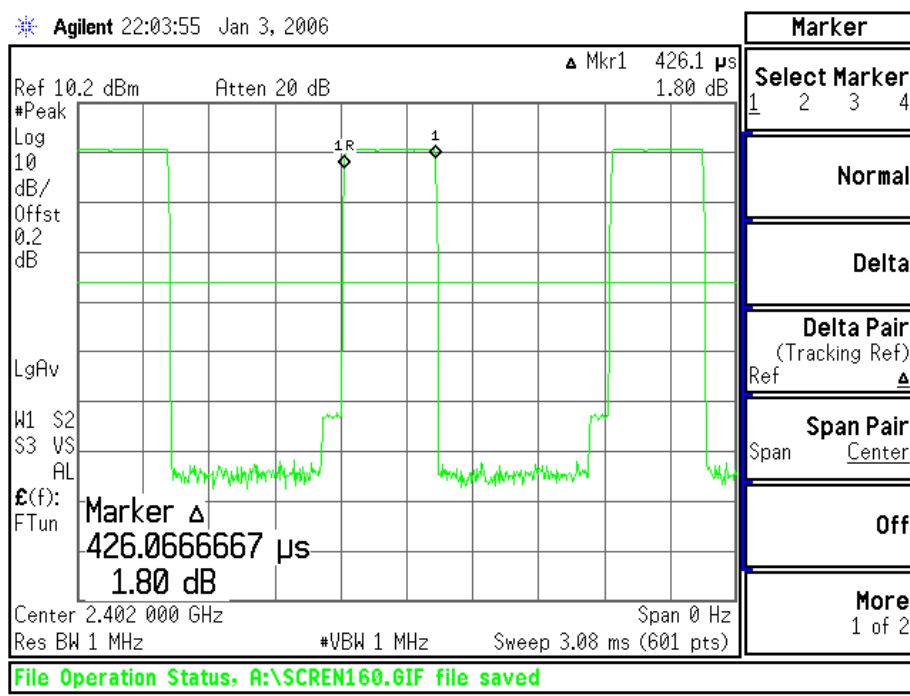
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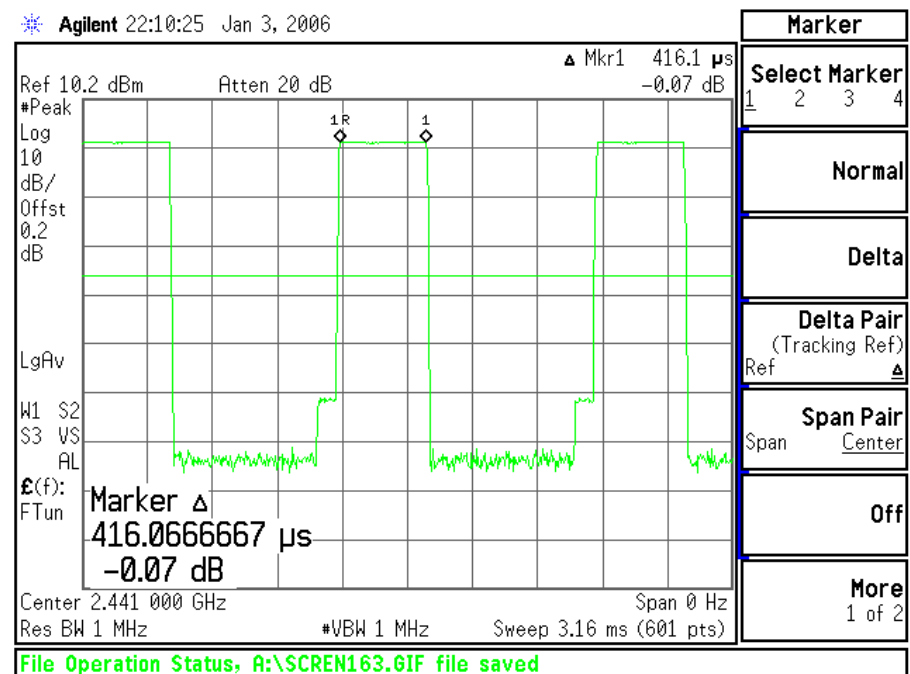
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Plot of Time of Occupancy (Dwell Time)

DH1



Low Channel



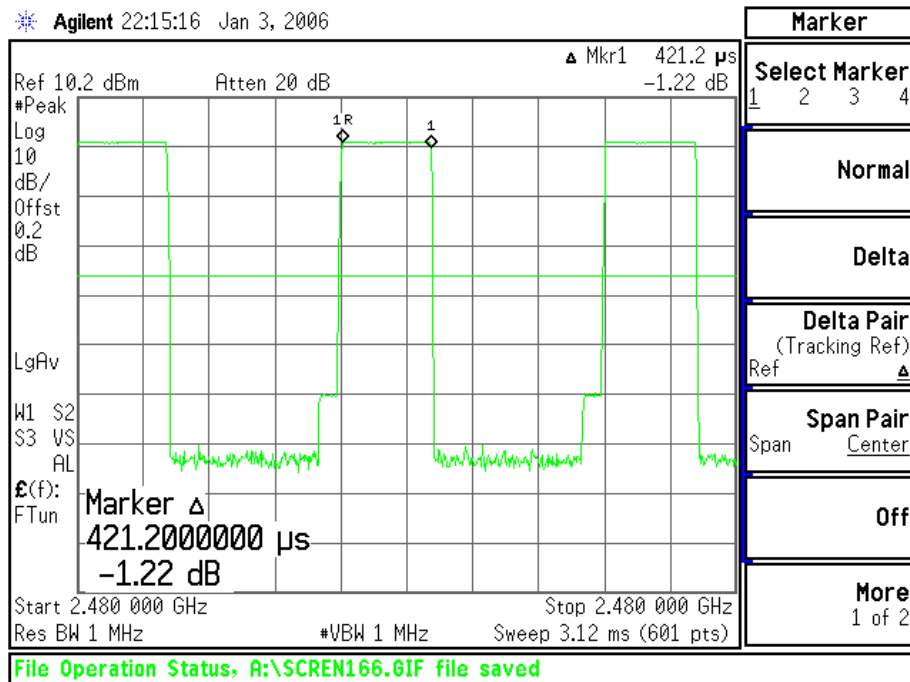
Middle Channel

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High Channel

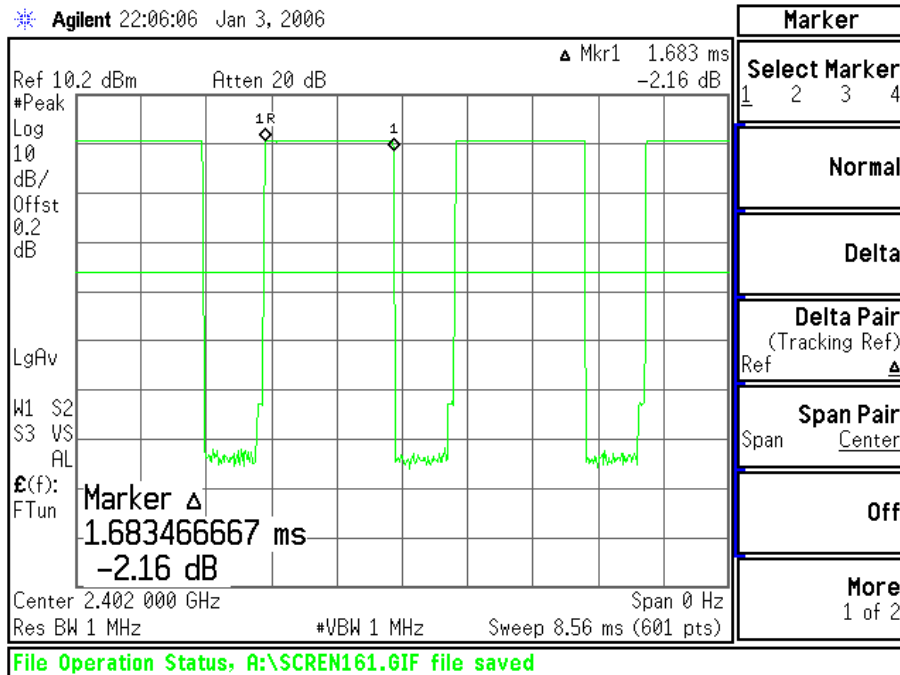
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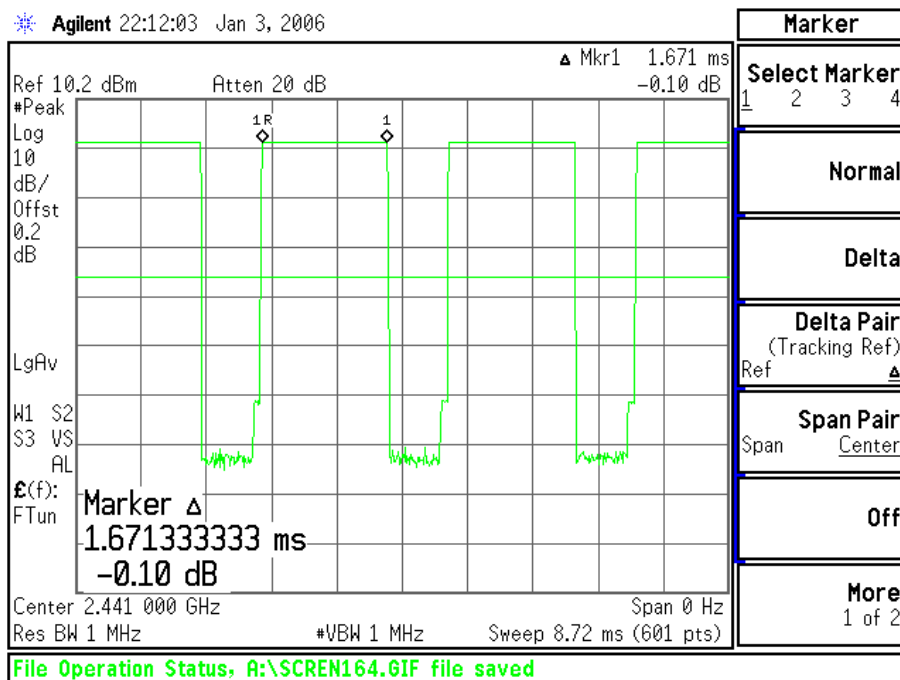
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DH3



Low Channel



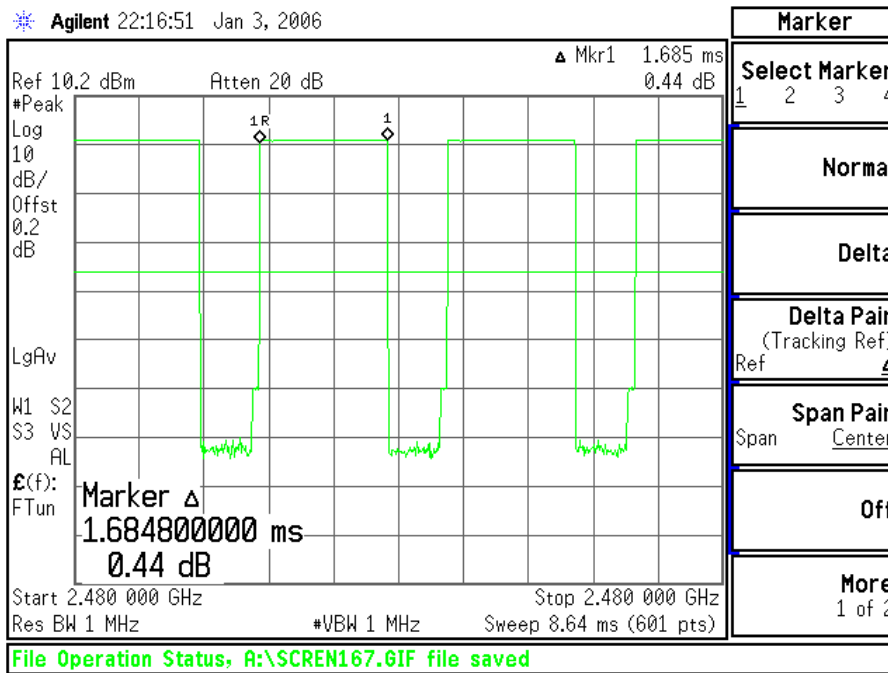
Middle Channel

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High Channel

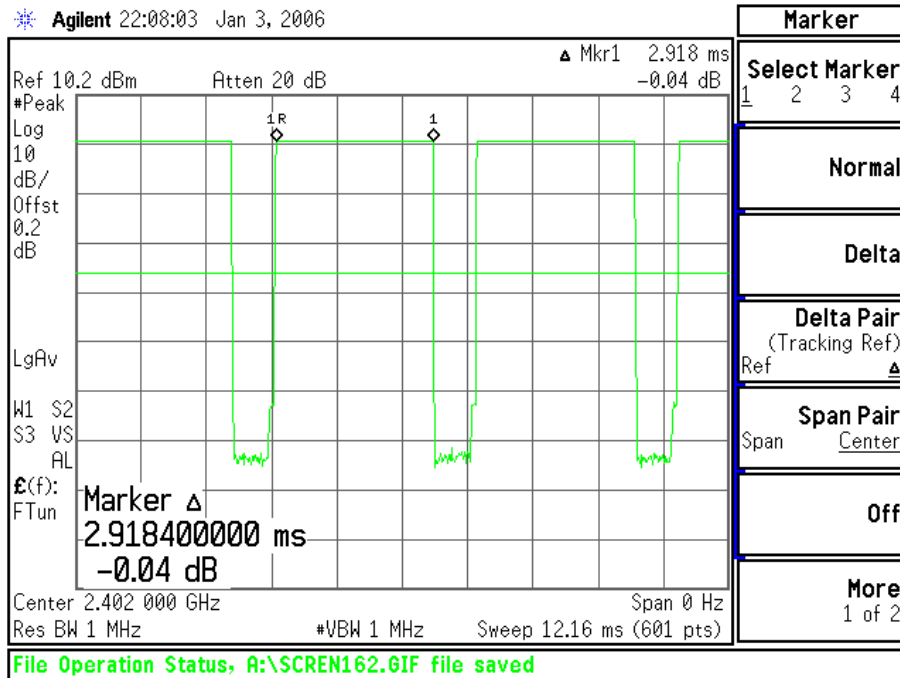
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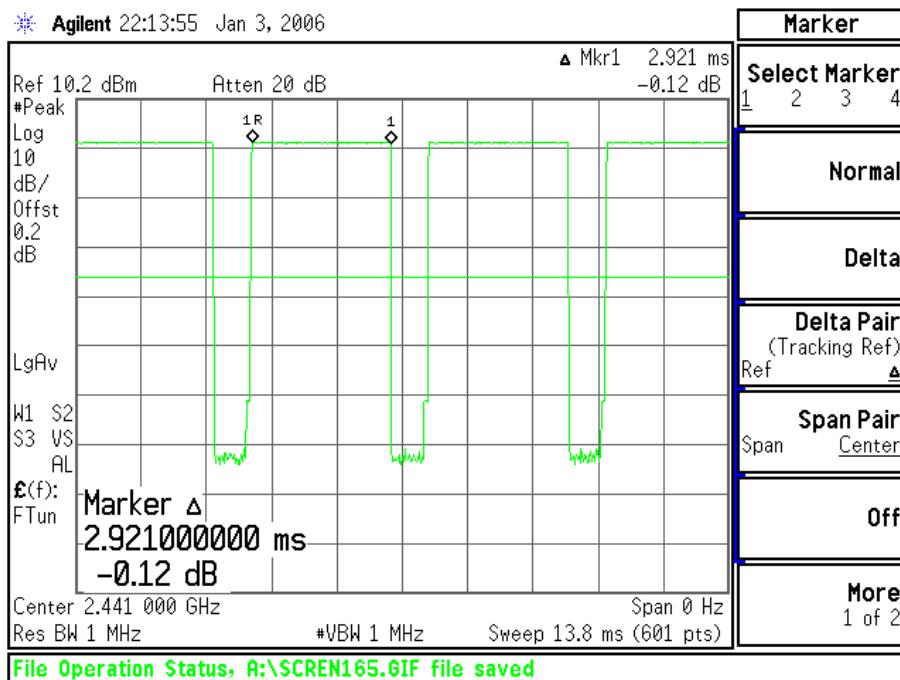
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DH5



Low Channel



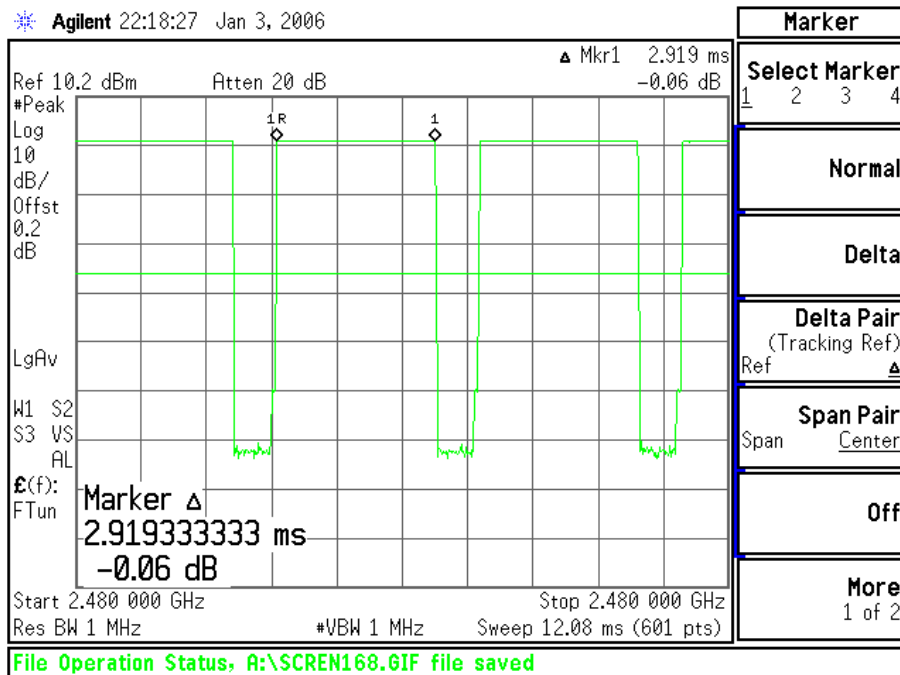
Middle Channel

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High Channel

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum analyzer	Agilent	E4440A	May 2006

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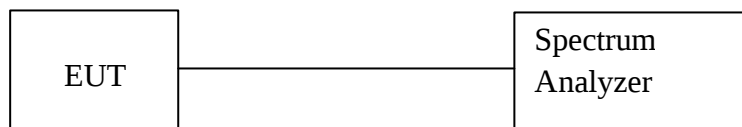
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9. POWER SPECTRAL DENSITY MEASUREMENT

9.1 Test Setup



9.2 Limit

According to §5.247(e), For digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph(b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density

9.3 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
3. Set the spectrum analyzer as RBW=3 kHz, VBW=10 kHz, Span=300 kHz, Sweep=100s
4. Record the max. reading
5. Repeat above procedures until all frequency measured were complete.

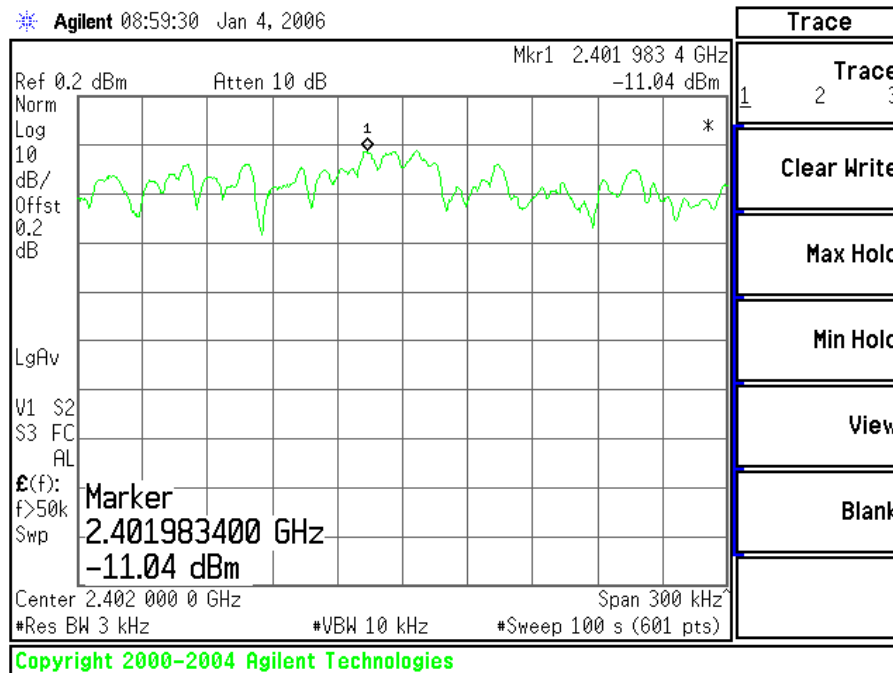
9.4 Test Result

Humidity Level	55 %	Temperature	25 ?
----------------	------	-------------	------

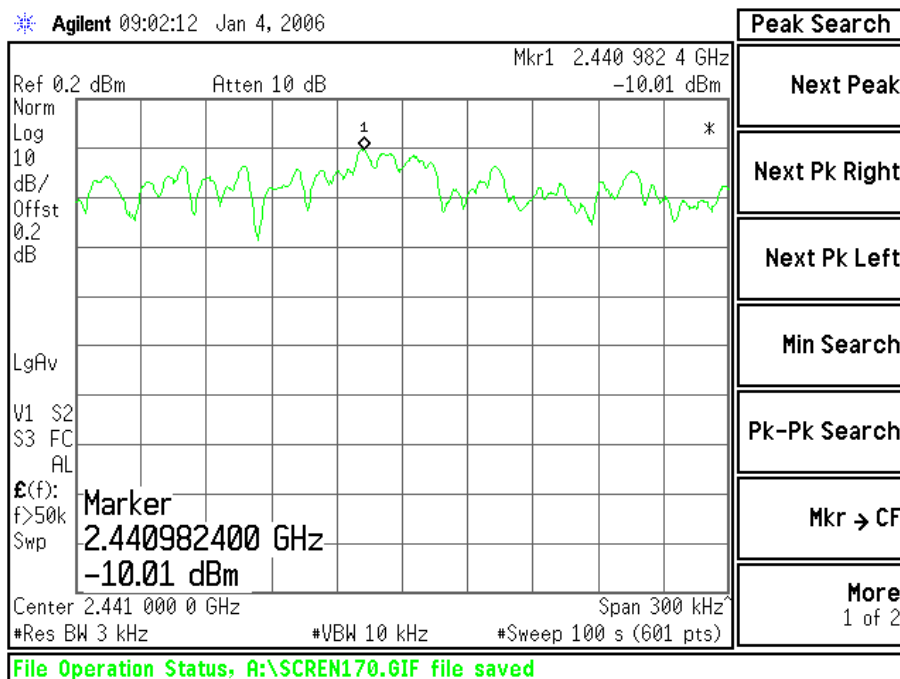
Channel	Channel Frequency (MHz)	Final RF Power Level in 3 kHz BW (dBm)	Maximum Limit (dBm)	Margin (dB)
Low	2402	-11.04	8	19.04
Middle	2441	-10.01	8	18.01
High	2480	-9.62	8	17.62

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Plot of Power Spectral Density



Low Channel



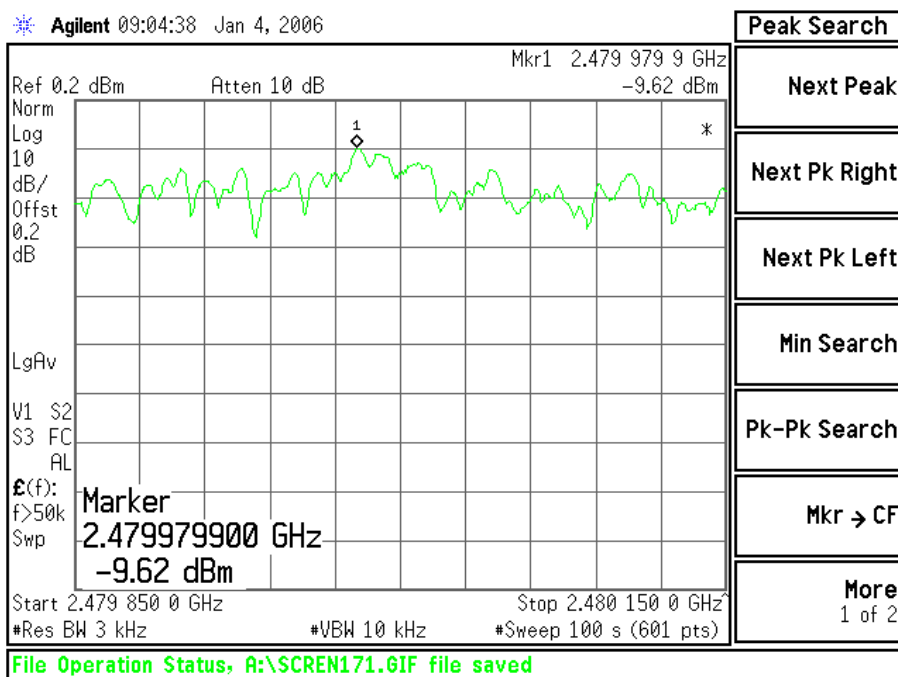
Middle Channel

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High Channel

Test Equipment Used

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Spectrum analyzer	Agilent	E4440A	May 2006

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10. ANTENNA REQUIREMENT

10.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section § 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6dBi.

10.2 Antenna Connected Construction

Antenna used in this product is connected with Chip antenna gain of -0.03 dBi

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11. RF EXPOSURE EVALUATION

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in § 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1500	--	--	F/300	6
1500 - 100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300 – 1500	--	--	F/1500	6
1500 - 100000	--	--	1	30

11.1 Friis transmission formula : $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1 mW/ cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

11.2 EUT Operating Condition

A software provided by client enabled the EUT to transmit and receive data at low, middle and high channel individually.

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11.3 Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

11.3.1 Output Peak Power & RF Exposure Evaluation Distance

Chip Antenna gain : -0.03 dBi

Channel	Channel Frequency (MHz)	Output Peak Power (dBm)	Antenna Gain (dBi)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
Low	2402	0.94	-0.03	0.00025	1
Middle	2441	1.31	-0.03	0.00027	1
High	2480	1.11	-0.03	0.00026	1

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12. Attachment A-1 Photos of the test set up



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Attachment A-2 Photos of the test set up

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