TE ST REPORT

of

FCC Part 15 Subpart C §15.247
FCC ID: W7LTD9J

Equipment Under Test	:	2.4 GHz Radio Control
Model Name	:	RP24TD9J
Serial No.	:	N/A
Applicant	:	Radio Post Company LTD
Manufacturer	:	Radio Post Company LTD
Date of Test(s)	:	2009-04-10 ~ 2009-04-28
Date of Issue	:	2009-05-14

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

Tested By: **Date** **2009-05-14**

Geoffrey Do

Approved By **Date** **2009-05-14**

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
www.electrolab.kr.sgs.com
Telephone : +82 +31 428 5700
FAX : +82 +31 427 2371

1.2. Details of applicant

Applicant : Radio Post Company LTD
Address : 510, Jungang Induspia 2, 144-5, Sangdaewon-1 dong, Jungwon-gu, Sungnam-si, Kyunggi-do, Korea
Contact Person : Yoo-seok Jeong
Phone No. : +32 +31 776 3131
Fax No. : +32 +31 776 3132

1.3. Description of EUT

Kind of Product	2.4 GHz Radio Control
Model Name	RP24TD9J
Serial Number	N/A
Power Supply	DC 9.6 V
Frequency Range	2405 MHz ~ 2480 MHz
Modulation Technique	DSSS
Number of Channels	76
Antenna Type	-10 ~ 50℃
Antenna Gain	Connecter type (Patch antenna)

1.4 Declarations by the manufacturer

- N/A

1.5. Test equipment list

Equipment	Manufacturer	Model	Cal Due.
Signal Generator	Agilent	E4438C	Apr. 01, 2010
Spectrum Analyzer	Agilent	E4440A	Apr. 01, 2010
High Pass Filter	Wainwright Instrument GmbH	WHK3.0/18G-11SS	Oct. 01, 2009
Attenuator	Agilent	8494B	Jan. 06, 2010
DC Power Supply	Agilent	6674A	Apr. 02, 2010
Preamplifier	Agilent	8449B	Apr. 01, 2010
Test Receiver	R & S	ESVS10	Jan. 17, 2010
Ultra Boradband Antenna	R & S	HL562	Oct. 02, 2009
Horn Antenna	R & S	HF906	Nov. 13, 2009
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 3.5 m × 3.5 m)	Jan. 31, 2010

▶ **Support equipment**

Description	Manufacturer	Model	Serial Number
Transmitter	JAPAN REMOTE CONTROL CO.,LTD.	PCM9X II LIMITED	N/A

1.6. Summary of test result

The EUT has been tested according to the following specifications:

Applied standard : FCC Part15 subpart C		
Standard section	**Test Item**	**Result**
15.205(a) 15.209(a) 15.247(d)	Transmitter radiated spurious emissions and conducted spurious emission	Complied
15.247(a)(2)	6 dB Bandwidth and 99 % BW	Complied
15.247(b)(3)	Maximum peak output power	Complied
15.247(e)	Power spectral density	Complied
15.247(i) 1.1307(b)(1)	RF exposure evaluation	Complied

1.7. Test report revision

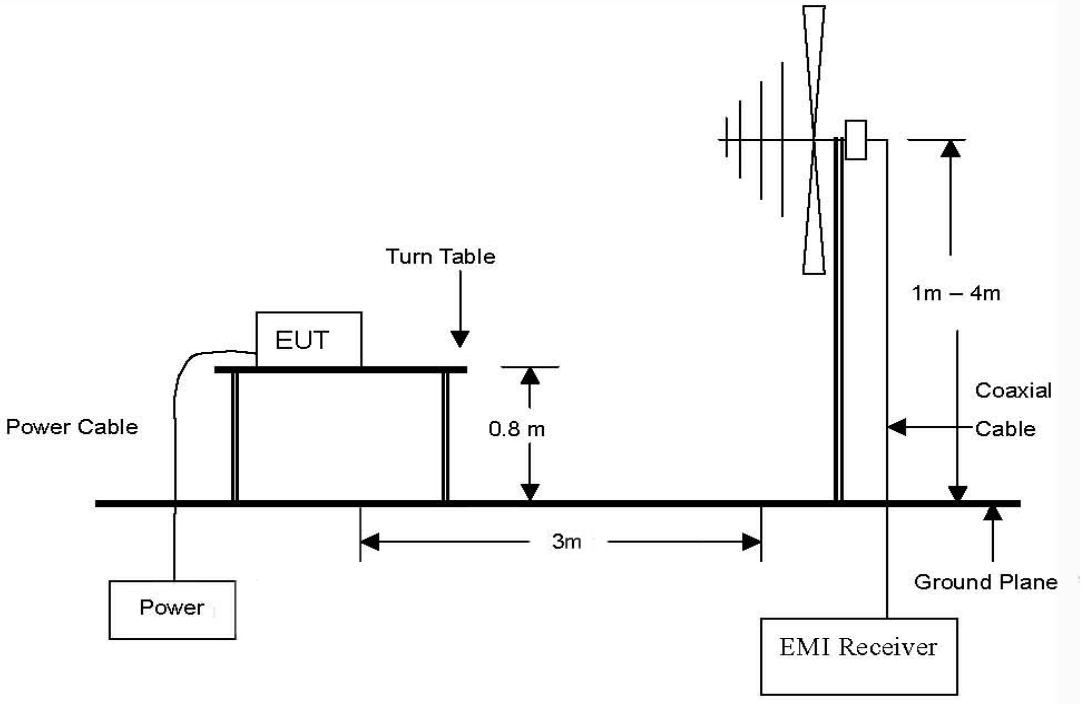
Revision	Report number	Description
0	F690501/RF-RTL003088	Initial

2. Transmitter radiated spurious emissions and conducted spurious emission

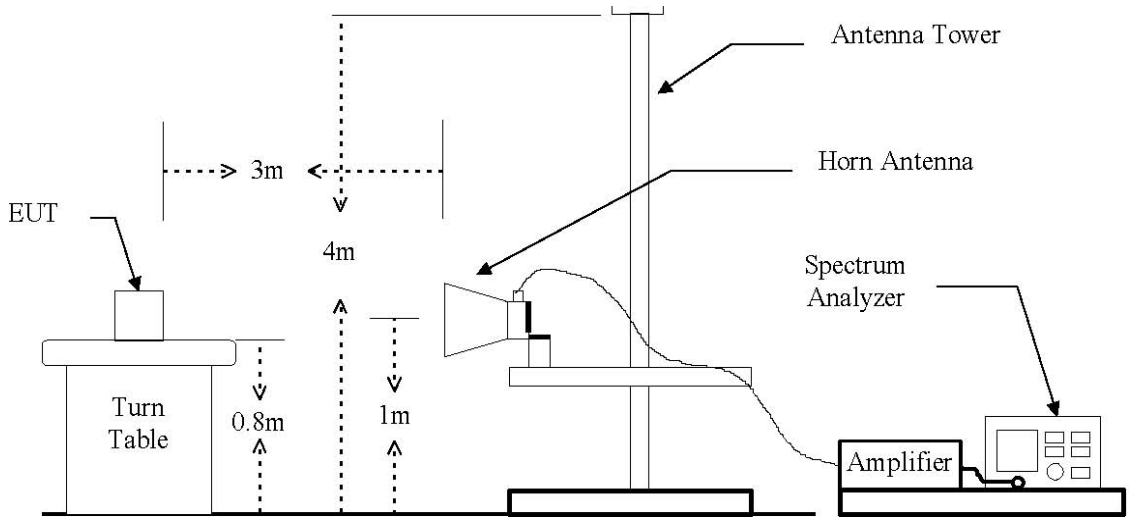
2.1. Test setup

2.1.1. 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.



2.1.2. Conducted spurious emissions

2.2. Limit

According to §15.247(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 §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))
According to § 15.109(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 (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

2.3. Test procedures

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

2.3.1. 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.*

2.3.2. 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=100 kHz, VBW=100 kHz.

2.4.1. Test result

Ambient temperature : 22 ℃
Relative humidity : 47 % R.H.

2.4.4.1. 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)	CL (dB)	Actual (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
153.63	23.30	Q.P.	H	7.67	1.39	32.36	43.50	11.14
155.90	32.20	Q.P.	V	7.57	1.40	41.17	43.50	2.33
271.95	18.60	Q.P.	H	10.12	1.85	30.57	46.00	15.43
Above 280.00	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.*

2.4.4.2. Spurious radiated emission for above 1 GHz

A. Low Channel (2405 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)
2390.00*	41.86	Peak	H	28.05	-31.28	38.63	74.00	35.37
4810.74	56.47	Peak	H	32.97	-28.49	60.95	74.00	13.05
4810.74	39.55	AV	H	32.97	-28.49	44.03	54.00	9.97
7216.37	55.19	Peak	H	35.76	-25.56	65.39	74.00	8.61
7216.37	37.41	AV	H	35.76	-25.26	47.91	54.00	6.09
Above 7300.00	Not Detected							

B. Middle Channel (2445 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)
4891.31	50.47	Peak	H	33.19	-28.41	55.25	74.00	18.75
4891.31	36.11	AV	H	33.19	-28.41	40.89	54.00	13.11
7335.81	51.35	Peak	H	35.90	-25.52	61.73	74.00	12.27
7335.81	37.36	AV	H	35.90	-25.52	47.74	54.00	6.26
Above 7400.00	Not Detected							

C. High Channel (2480 MHz)

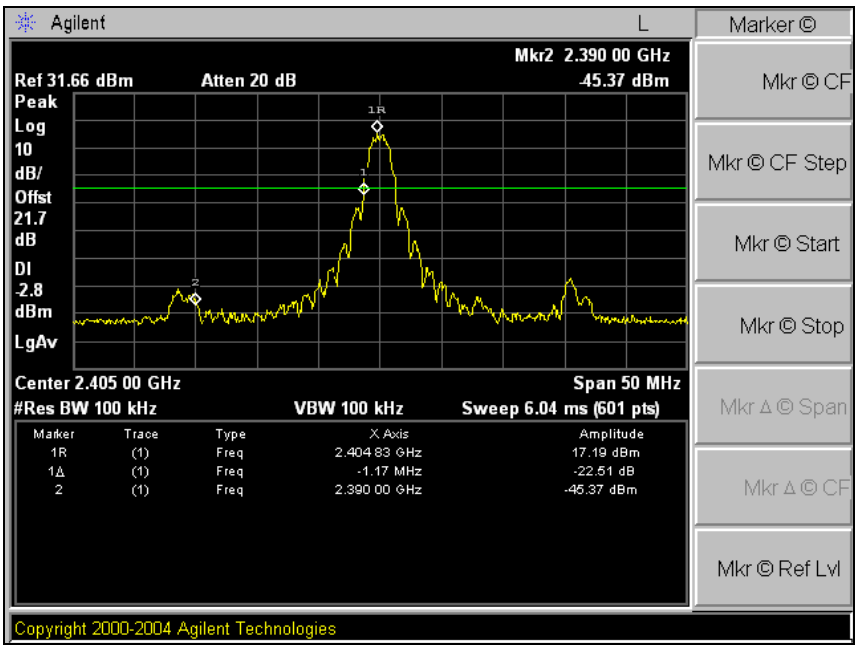
Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.50*	51.14	Peak	H	28.18	-31.20	48.12	74.00	25.88
4961.27	49.94	Peak	H	33.39	-28.34	54.99	74.00	19.01
4961.27	34.57	AV	H	33.39	-28.34	39.62	54.00	14.38
Above 5000.00	Not Detected							

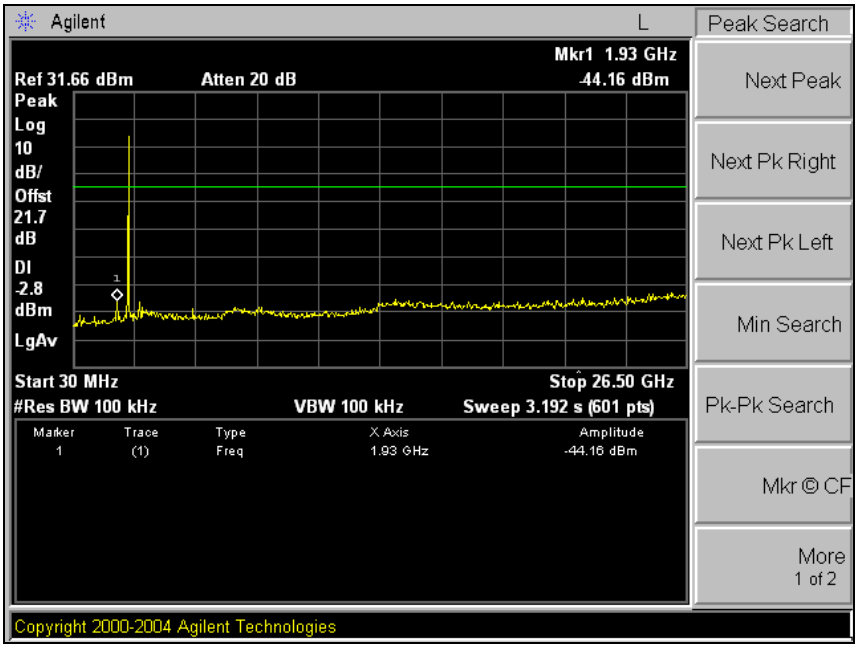
▣ *Remarks*

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.*

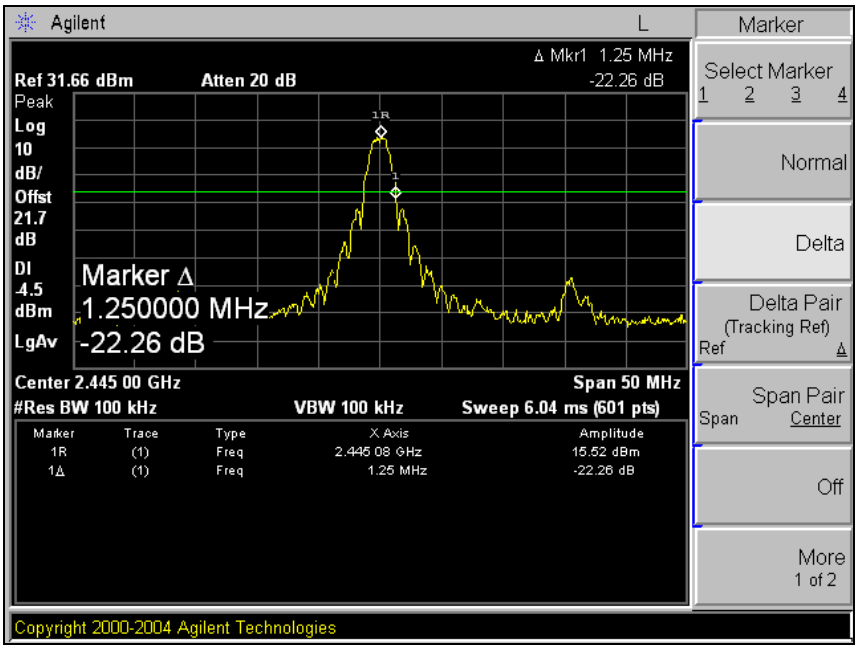
2.4.3. Spurious RF Conducted Emissions: Plot of Spurious RF Conducted Emission

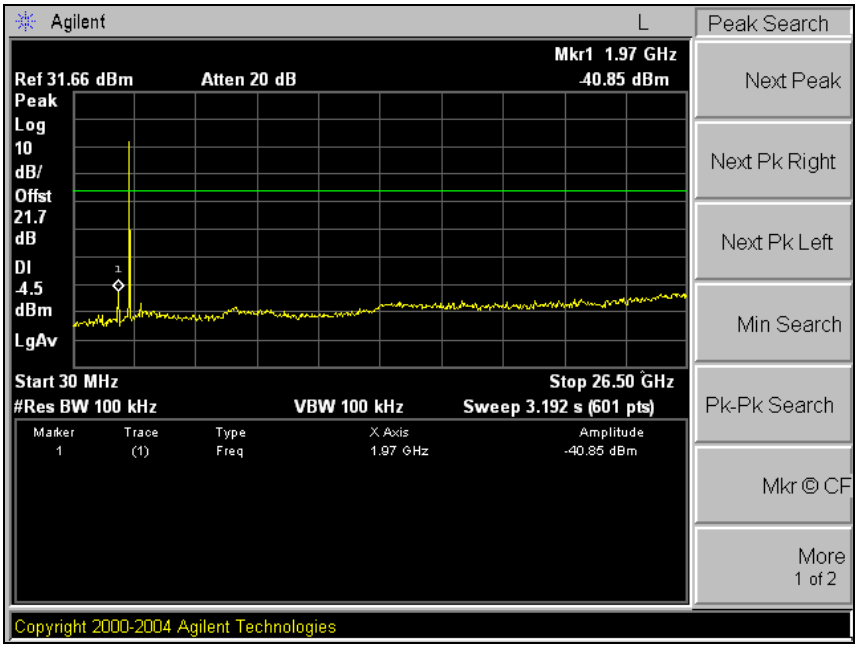
Low Channel



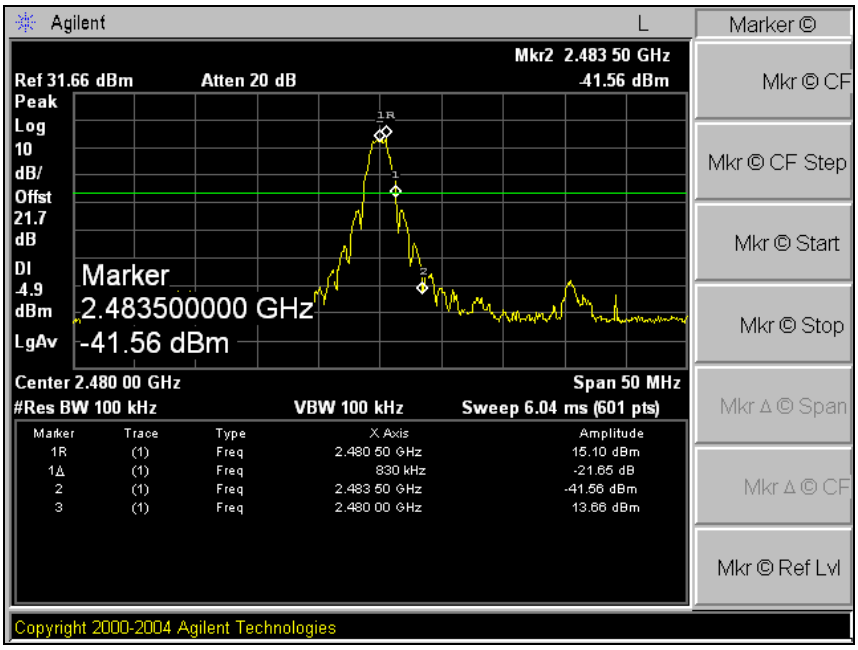


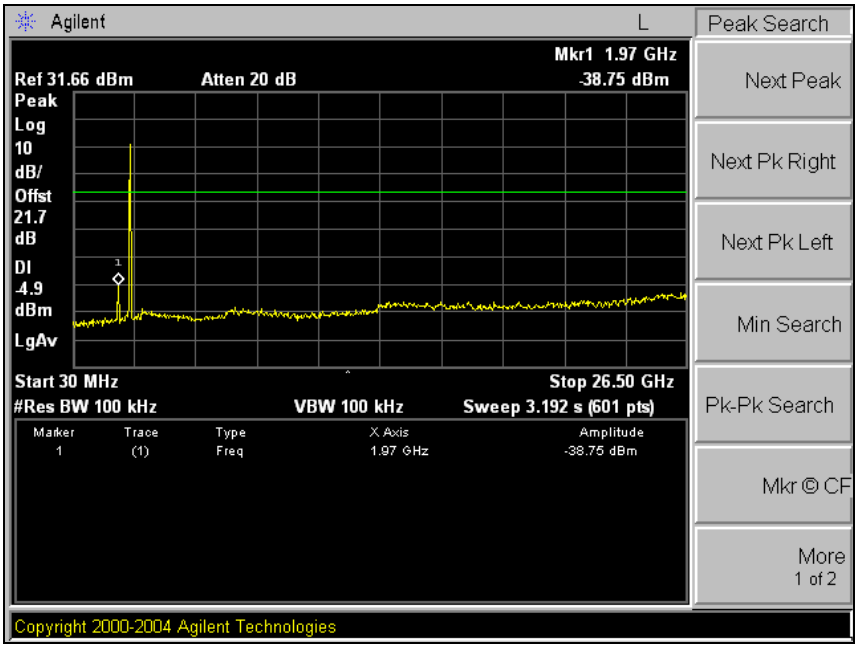
Middle Channel





High Channel





3. 6 dB Bandwidth measurement and 99 % BW

3.1. Test setup

3.2. Limit

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 ~928 MHz , 2400 ~ 2483.5 MHz, and 5725 ~ 5825 MHz bands. The minimum of 6 dB Bandwidth shall be at least 500 kHz

3.3. Test procedure

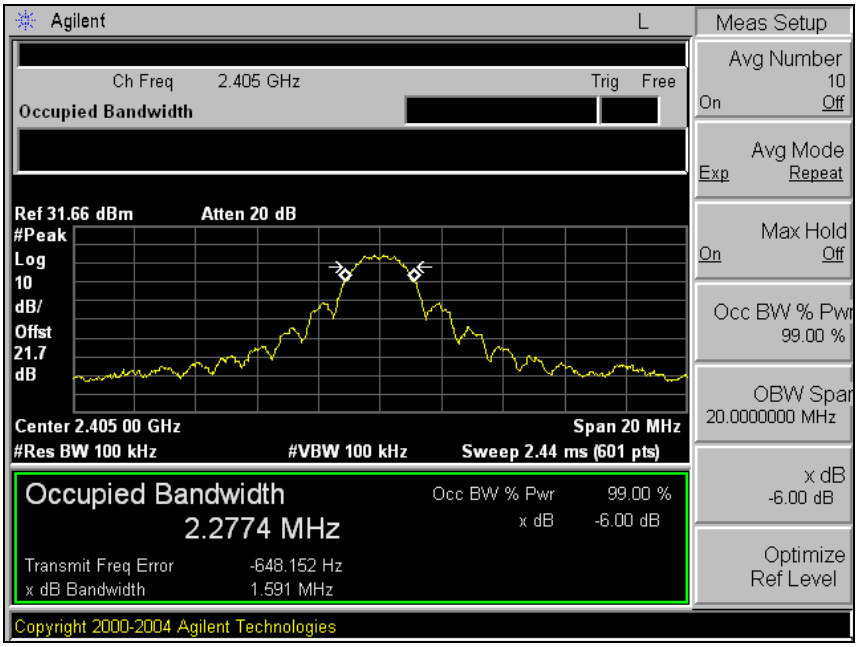
1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100 kHz, VBW = RBW, Span = 20 MHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

3.4. Test result

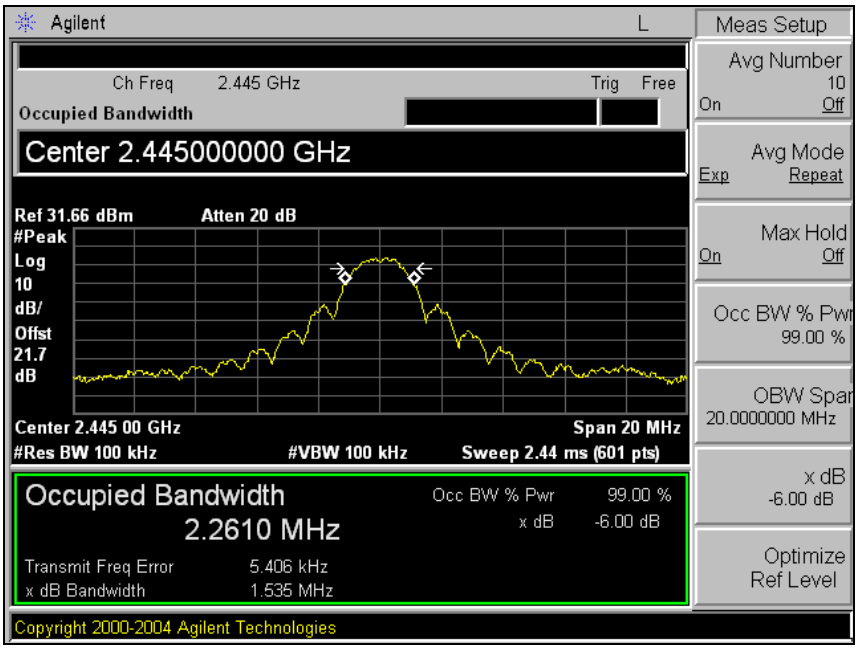
Ambient temperature : 21 ℃
Relative humidity : 46 % R.H.

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
2405	1.59	2.277
2445	1.54	2.261
2480	1.65	2.245

Low channel



Middle channel



High channel

4. Maximum peak output power measurement

4.1. Test setup

4.2. Limit

According to §15.247(b)(3), for systems using digital modulation in the 902 ~ 928 MHz, 2400 ~2483.5 MHz, and 5725 ~ 5850 MHz band: 1 Watt. As an alternative to a peak power measurement, compliance with the one watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antenna elements. The average must not include any intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
According to §15.247(b)(4), the conducted output power limit specified in paragraph(b) of this section is based on the use of antenna with directional gains that do not exceed 6 dBi. Except as shown in paragraph(c) of this section, if transmitting antenna of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2), and (b)(3) of this section , as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.3. Test procedure

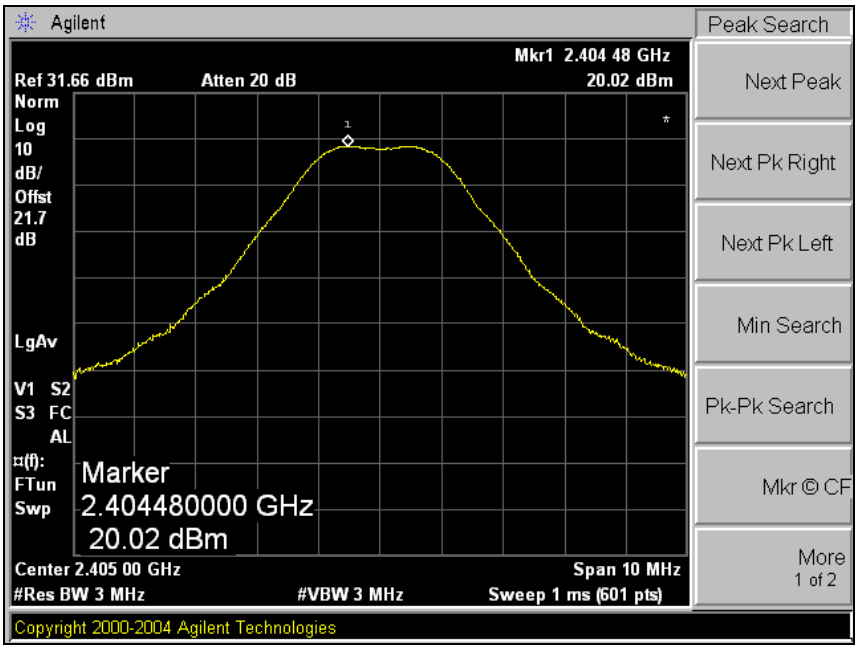
1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the Spectrum analyzer as RBW = 3 MHz, VBW = 3 MHz, Span = Auto.

4.4. Test result

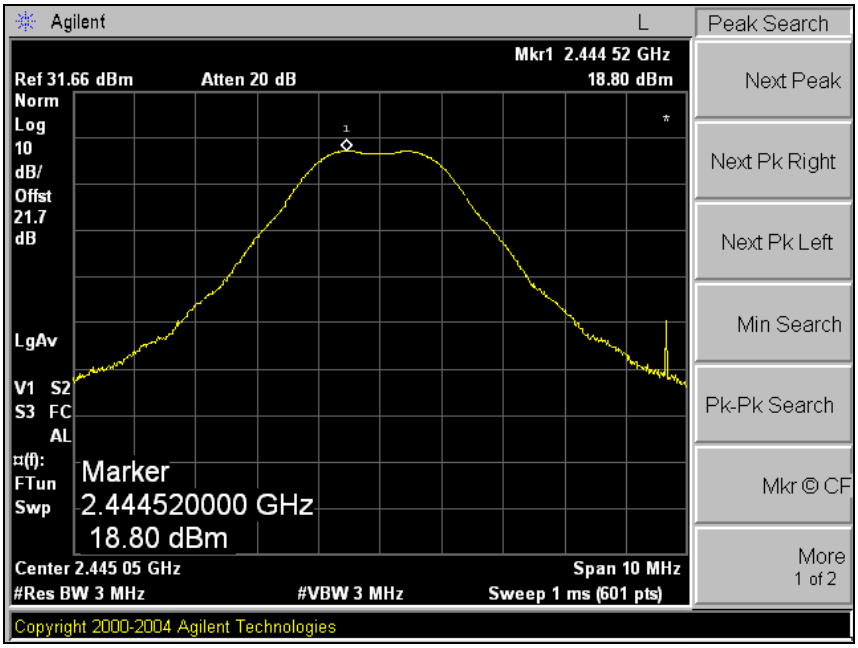
Ambient temperature : 21 ℃
Relative humidity : 46 % R.H.

Frequency (MHz)	Output power (dBm)	Limit (dBm)	Margin (dB)
2405	20.02	30	9.98
2445	18.80		11.20
2480	17.83		12.17

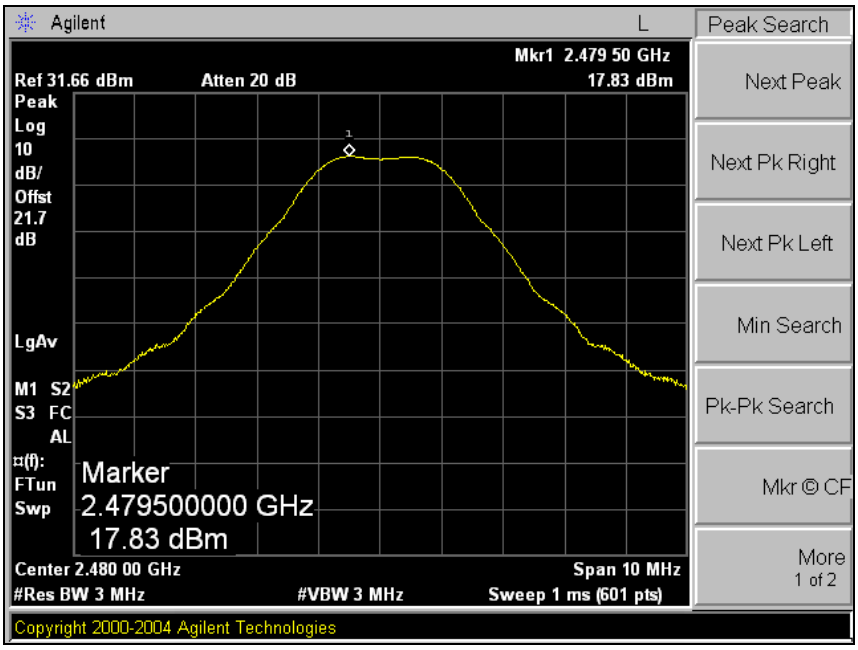
Low channel



Middle channel



High channel



5. Power spectral density measurement

5.1. Test setup

5.2. Limit

According to §15.247(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

5.3. Test procedure

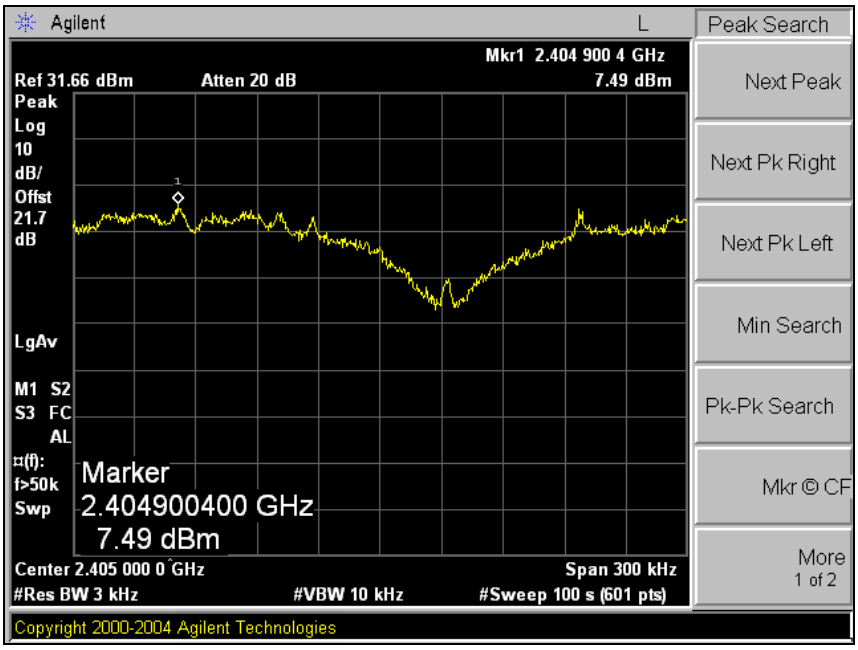
1. Place the EUT on the table and set it in transmitting mode
   Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3 kHz, VBW = 10 kHz, Span = 300 kHz, Sweep = 100 s
3. Record the max reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

5.4. Test result

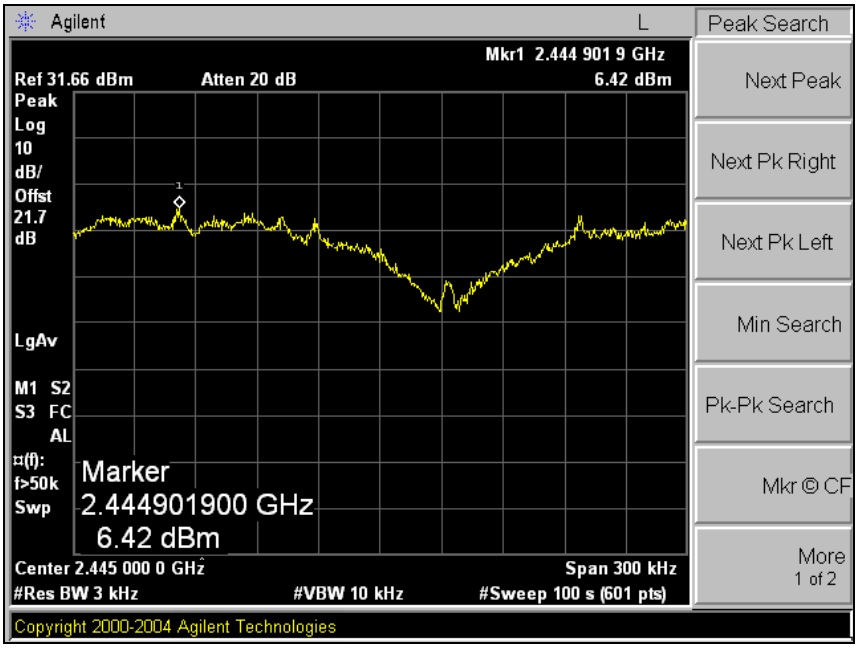
Ambient temperature : 21 ℃
Relative humidity : 46 % R.H.

Frequency (MHz)	Final RF Power Level in 3 kHz BW (dBm)	Limit (dBm)	Margin (dB)
2405	7.49	8	0.51
2445	6.42		1.58
2480	6.01		1.99

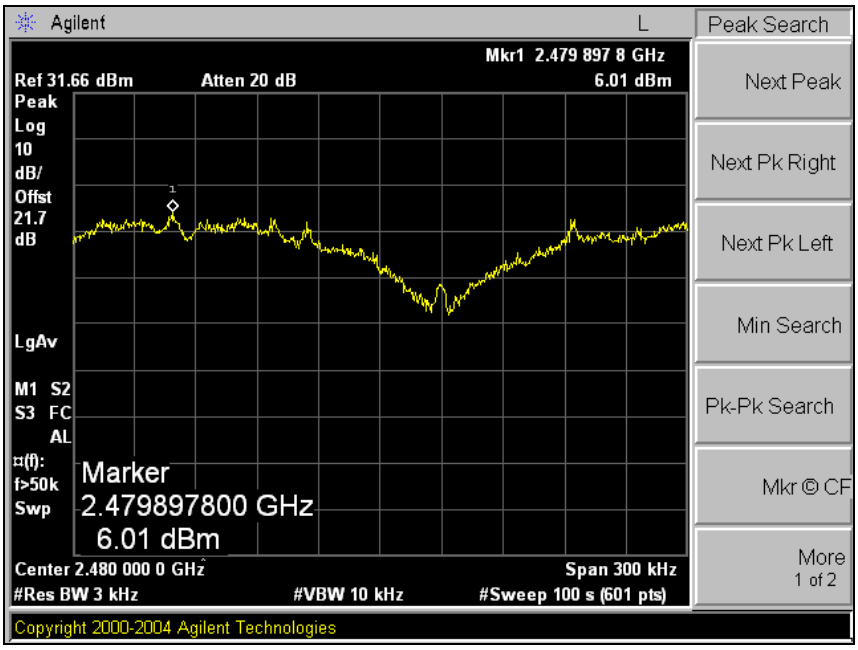
Low channel



Middle channel



High channel



6. Antenna Requirement

6.1. 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 6 dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.

6.2. Antenna Connected Construction

The antenna used of this product is Patch antenna.
The peak max gain of this antenna is 2.31 dBi(2.4 GHz)

7. 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

7.1 Friis transmission formula : Pd = (Pout*G)/(4*pi*R^2)

Where
Pd = power density in mW/cm^2
Pout = output power to antenna in mW
G = gain of antenna in linear scale
Pi = 3.1416
R = distance between observation point and center of the radiator in cm
Pd the limit of MPE, 1 mW/cm^2. 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.

7.2 Test result of RF exposure evaluation

Test Item : RF Exposure Evaluation Data
Test Mode : Normal Operation

7.1.1 Output power into antenna & RF exposure evaluation distance

Frequency (MHz)	Peak output power (dBm)	Antenna Gain (dBi)	Power density at 20 cm (mW/cm^2)	Limit (mW/cm^2)
2405	20.02	2.31	0.03402	1
2445	18.80	2.31	0.02569	
2480	17.83	2.31	0.02055	

■Note
The power density Pd (4th column) at a distance of 20cm calculated from the friis transmission formula is far below the limit of 1 mW/ cm^2.