

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....: A1207086022-RW

FCC ID.....: OYS-JR-01H

Compiled by

(position+printed name+signature)...: File administrators Tony Li

Supervised by

(position+printed name+signature)...: Technique principal Robin Fang

Approved by

(position+printed name+signature)...: Manager James Wu

Date of issue.....: Sep 07, 2012

Representative Laboratory Name ..: Shenzhen CTL Electron Technology Co., Ltd.

Address: Room 405, The 3# of 4th Building, Zhuguang No.2 Industrial District, Xili Town, Nanshan, Shenzhen, China

Testing Laboratory Name: Bontek Compliance Testing Laboratory Ltd

Address: 1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

Applicant's name: Zealous Audio

Address: 10708 Lora Street, Temple City, Ca 91780

Test specification:

Standard: **FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System**

TRF Originator.....: Shenzhen CTL Electron Technology Co., Ltd.

Master TRF.....: Dated 2012-06

Shenzhen CTL Electron Technology Co., Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen CTL Electron Technology Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen CTL Electron Technology Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test item description: HeadPhone

Trade Mark: /

Manufacturer: **Zealous Audio**

Model/Type reference.....: JR-01

Listed Models: /

Ratings: DC 3.7 V

Operation Frequency: From 2402MHz to 2480MHz

Modulation: FHSS(8DPSK&GFSK)

Result.....: **Positive**

TEST REPORT

Test Report No. : A1207086022-RW	Sep 07, 2012 Date of issue
---	-------------------------------

Equipment under Test : HeadPhone

Model /Type : JR-01

Listed Models : /

Applicant : **Zealous Audio**

Address : 10708 Lora Street, Temple City, Ca 91780

Manufacturer : **Zealous Audio**

Address : 10708 Lora Street, Temple City, Ca 91780

Test Result according to the standards on page 4:	Positive
--	-----------------

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1.	<u>TEST STANDARDS</u>	<u>4</u>
2.	<u>SUMMARY</u>	<u>5</u>
2.1.	General Remarks	5
2.2.	Equipment Under Test	5
2.3.	Short description of the Equipment under Test (EUT)	5
2.4.	EUT operation mode	5
2.5.	EUT configuration	5
2.6.	Related Submittal(s) / Grant (s)	6
2.7.	Modifications	6
2.8.	NOTE	6
3.	<u>TEST ENVIRONMENT</u>	<u>7</u>
3.1.	Address of the test laboratory	7
3.2.	Test Facility	7
3.3.	Environmental conditions	7
3.4.	Configuration of Tested System	7
3.5.	Test Description	8
3.6.	Statement of the measurement uncertainty	8
3.7.	Equipments Used during the Test	9
4.	<u>TEST CONDITIONS AND RESULTS</u>	<u>10</u>
4.1.	AC Power Conducted Emission(Not applicable to this device)	10
4.2.	Radiated Emission	11
4.3.	Maximum Peak Output Power	17
4.4.	20dB Bandwidth	21
4.5.	Band Edge	25
4.6.	Frequency Separation	27
4.7.	Number of hopping frequency	29
4.8.	Spurious RF Conducted Emission	32
4.9.	Time Of Occupancy(Dwell Time)	36
4.10.	Antenna Requirement	43
5.	<u>TEST SETUP PHOTOS OF THE EUT</u>	<u>44</u>
6.	<u>EXTERNAL AND INTERNAL PHOTOS OF THE EUT</u>	<u>45</u>

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	July 25, 2012
Testing commenced on	:	July 25, 2012
Testing concluded on	:	Sep 03, 2012

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/> 120V / 60 Hz	<input type="radio"/> 115V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 3.7V from battery

2.3. Short description of the Equipment under Test (EUT)

2.4GHz Bluetooth HeadPhone.

For more details, refer to the user's manual of the EUT.

Serial number: Prototype

2.4. EUT operation mode

The EUT has been tested under typical operating condition. There are EDR (Enhanced Data Rate) and BDR (Basic Data Rate) mode. The Applicant provides Bluetooth tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. There are 79 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel.

Frequency Range:	2402-2480MHz
Channel number:	79 channels
Modulation type:	Frequency Hopping Spread Spectrum
Antenna:	PCB Antenna

2.5. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- ☒ - supplied by the manufacturer
- ☐ - supplied by the lab

<input type="radio"/>	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
<input type="radio"/>	Multimeter	Manufacturer :	/
		Model No. :	/

2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: OYS-JR-01** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

2.8. NOTE

- The EUT is is a Bluetooth product, The functions of the EUT listed as below:

	Test Standards	Reference Report
Bluetooth	FCC Part 15 Subpart C (Section 15.247)	A1207086022-RW
MPE	OET 65 C	A1207086022-RM

- The frequency bands used in this EUT are listed as follows:

Frequency Band(MHz)	2400-2483.5	5150-5350	5470-5725	5725-5850
Bluetooth	√	—	—	—

- The EUT provides one completed transmitter and receiver.

Modulation Mode	TX Function
Bluetooth	1TX

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Bontek Compliance Testing Laboratory Ltd
1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 7631A

The 3m alternate test site of Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7631A on March, 2008.

FCC-Registration No.: 338263

Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 338263, March 24, 2008.

CNAS-Lab Code: L3923

Bontek Compliance Testing Laboratory Ltd has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: Mar 22, 2012. Valid time is until Mar 21, 2015.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	<u>15-35 ° C</u>
Humidity:	<u>30-60 %</u>
Atmospheric pressure:	<u>950-1050mbar</u>

3.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System



3.5. Test Description

FCC PART 15		
FCC Part 15.207	AC Power Conducted Emission	N/A
FCC Part 15.247(a)	20dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge Compliance of RF Emission	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(a)(1)	Frequency Separation	PASS
FCC Part 15.247(a)(1)(iii)	Number of hopping frequency	PASS
FCC Part 15.247(a)(1)(iii)	Time of Occupancy	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

Remark: The measurement uncertainty is not included in the test result.

3.6. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1" and TR-100028-02 "Electromagnetic compatibilityand Radio spectrum Matters (ERM);Uncertainties in the measurementof mobile radio equipment characteristics;Part 2 " and is documented in the Bontek Compliance Testing Laboratory Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Test Items	Measurement Uncertainty	Notes
Frequency stability	150 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-12.75 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-12.75 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	-----	(1)
Emission Mask	-----	(1)
Modulation Characteristic	-----	(1)
Transmitter Frequency Behavior	-----	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

3.7. Equipments Used during the Test

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ULTRA-BROADBAND ANTENNA	Rohde&Schwarz	HL562	100015	2012/4/23
2	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2012/4/23
3	RF TEST PANEL	Rohde&Schwarz	TS / RSP	335015/ 0017	2012/4/23
4	TURNTABLE	ETS	2088	2149	2012/4/23
5	ANTENNA MAST	ETS	2075	2346	2012/4/23
6	EMI TEST SOFTWARE	Rohde&Schwarz	ESK1	N/A	2012/4/23
7	HORN ANTENNA	Rohde&Schwarz	HF906	100039	2012/4/23
8	Amplifer	Sonoma	310N	E009-13	2012/4/23
9	JS amplifer	Rohde&Schwarz	JS4-00101800-28-5A	F201504	2012/4/23
10	High pass filter	Compliance Direction systems	BSU-6	34202	2012/4/23
11	Horn Antenna	SCHWARZBECK	BBHA9170	25841	2012/4/23
12	Amplifer	Compliance Direction systems	PAP-1G-26	48	2012/4/23
13	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2012/4/23

Maximum Peak Output Power / Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2012/4/23
2	Power Meter	Anritsu	ML2487A	6K00001568	2012/4/23
3	Power Meter Sensor	Anritsu	ML2491A	0630989	2012/4/23
4	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	2012/4/23

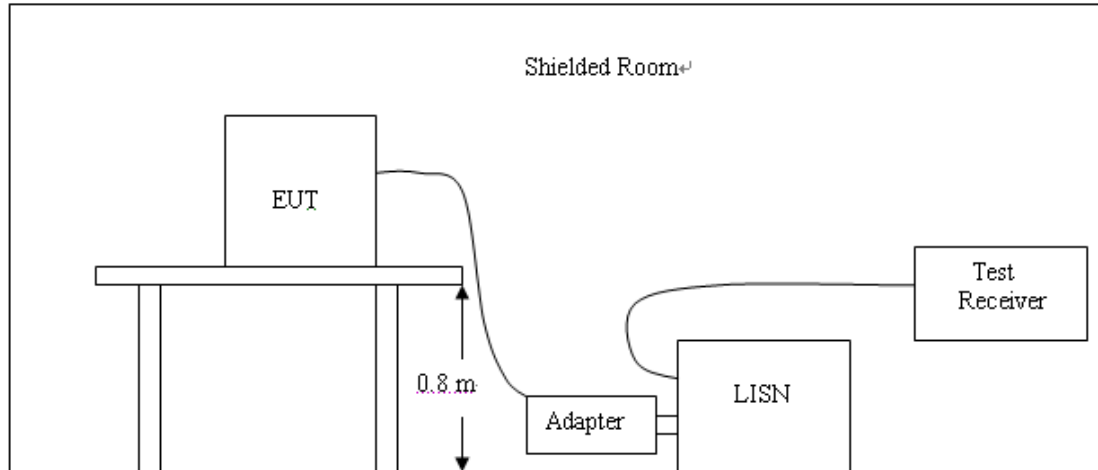
AC Power Conducted Emission

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	2012/4/23
2	EMI Test Receiver	Rohde&Schwarz	ESCS 30	100038	2012/4/23
3	Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2012/4/23
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	2012/4/23

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission(Not applicable to this device)

TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2009.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2009
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2009
- 4 The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency (MHz)	Maximum RF Line Voltage (dBµV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

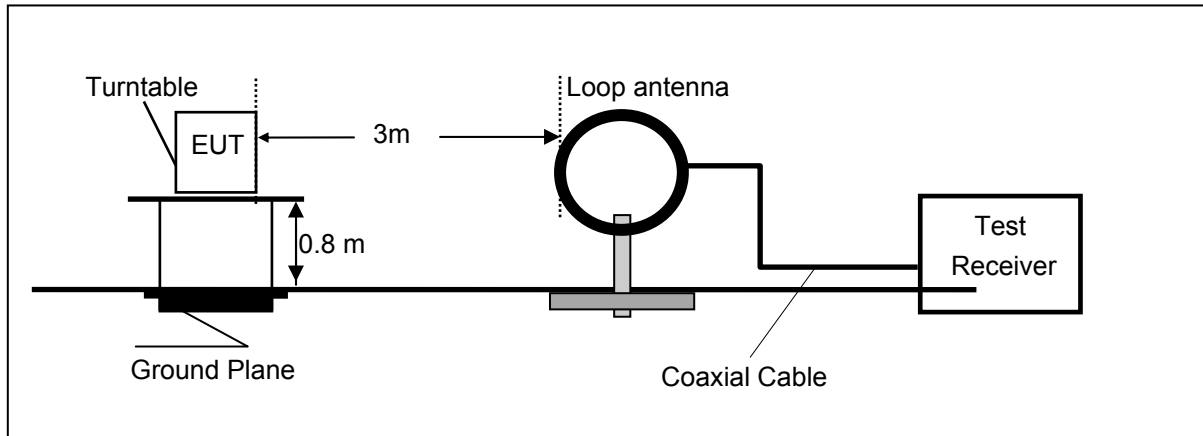
Not applicable to this device (because the equipment is powered by battery)

4.2. Radiated Emission

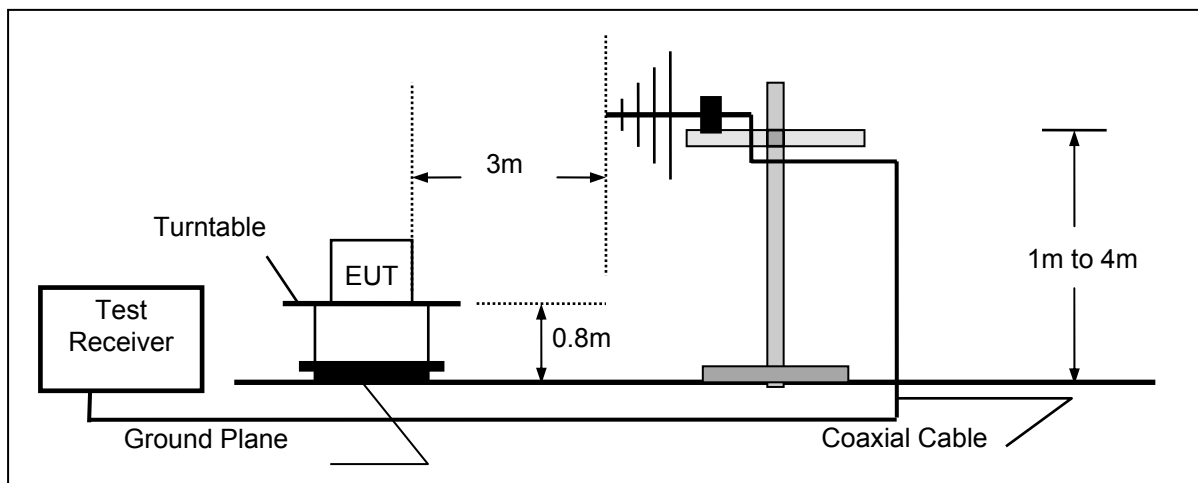
TEST CONFIGURATION

Radiated Emission Test Set-Up

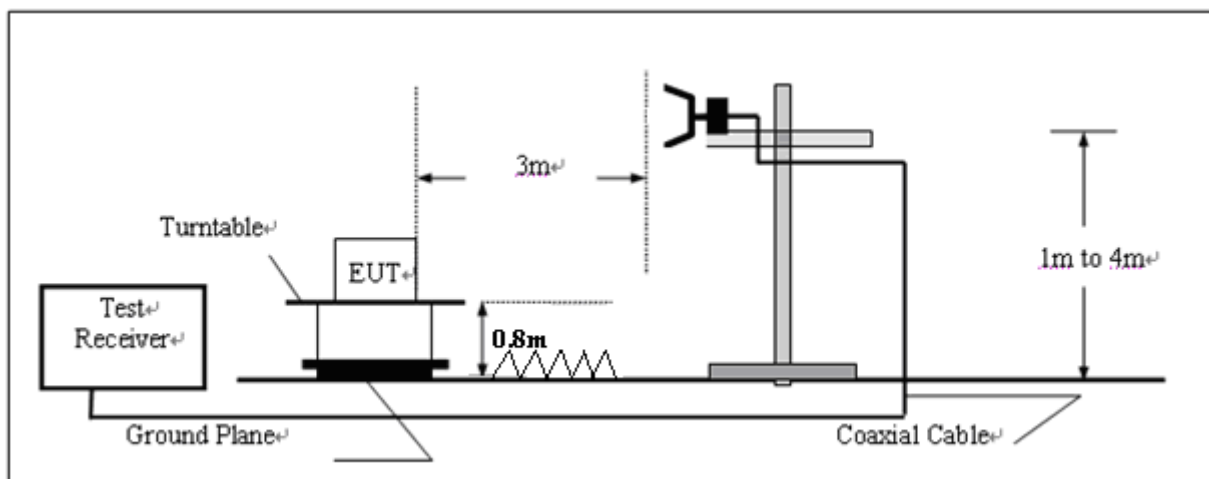
Frequency range 9KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

$$\text{Transd} = \text{AF} + \text{CL} - \text{AG}$$

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

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

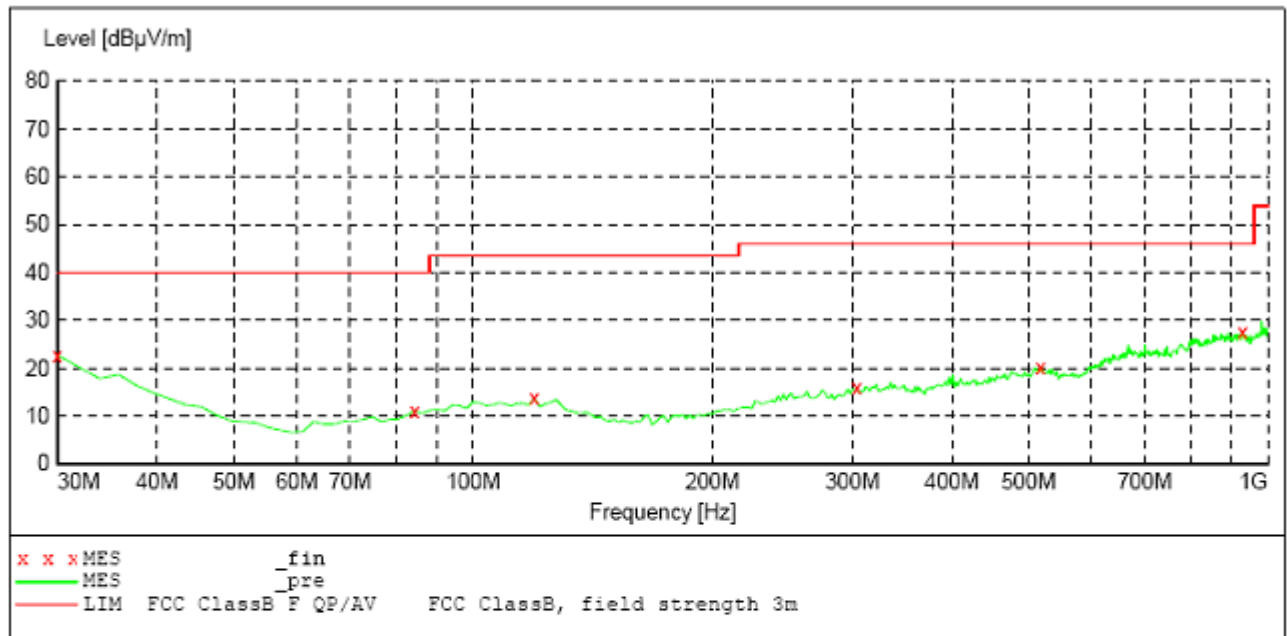
TEST RESULTS**Radiated emission in frequency band below 30MHz**

Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Margin (dB)	Detector	Polarization
24	31.56	49.54	17.98	QP	/

For 30MHz to 1000MHz**SCAN TABLE: "test Field(30M-1G)QP"**

Short Description: Field Strength(30M-1G)

Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
30.0 MHz	1.0 GHz	60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562

**MEASUREMENT RESULT :**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	22.80	-11.3	40.0	17.2	QP	100.0	331.00	VERTICAL
84.428858	11.10	-21.2	40.0	28.9	QP	100.0	75.00	VERTICAL
119.418838	13.70	-19.3	43.5	29.8	QP	100.0	306.00	VERTICAL
304.088176	16.00	-16.7	46.0	30.0	QP	100.0	212.00	VERTICAL
517.915832	20.20	-13.0	46.0	25.8	QP	100.0	95.00	VERTICAL
930.020040	27.50	-7.1	46.0	18.5	QP	100.0	210.00	VERTICAL

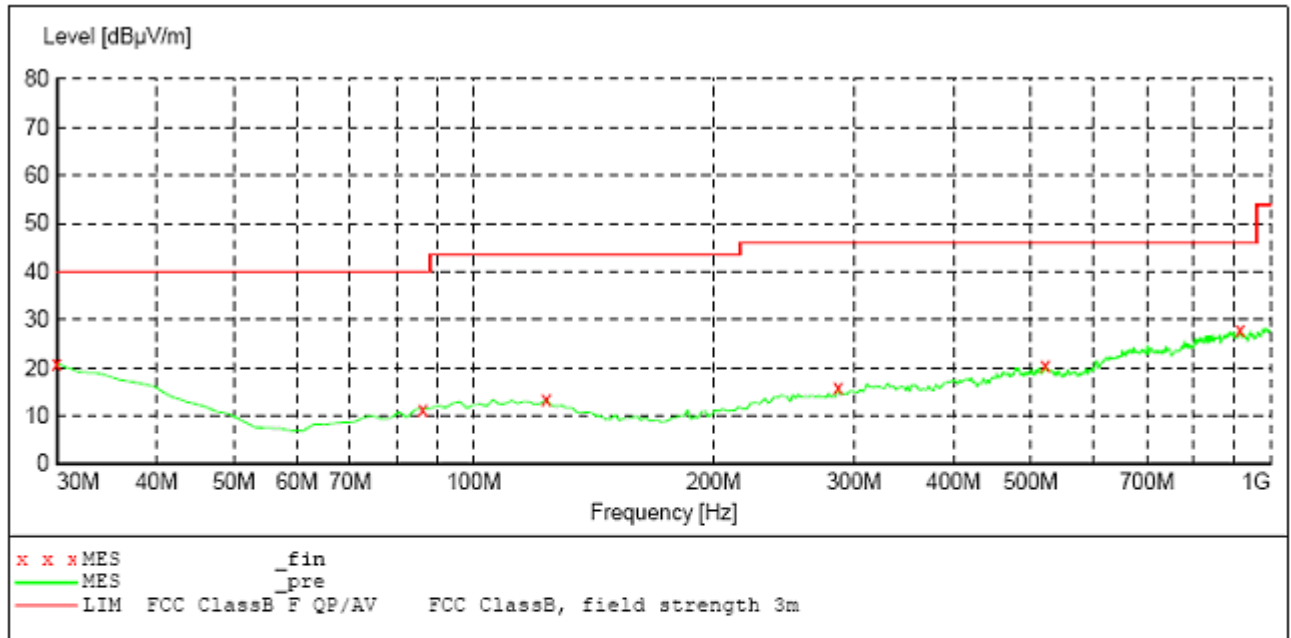
REMARKS :

- *Undetectable
- The IF bandwidth of EMI Test Receiver was 120KHz for measuring from 30 MHz to 1 GHz and 1 MHz for measuring above 1 GHz
- The Transd=Cabel loss +Antenna factor -pre-amplifier factor
- The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos. The worst case data is recorded in the report.

SCAN TABLE: "test Field(30M-1G)QP"

Short Description: Field Strength(30M-1G)

Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
Frequency 30.0 MHz	Frequency 1.0 GHz	Width 60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562

**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	20.80	-11.3	40.0	19.2	QP	300.0	269.00	HORIZONTAL
86.372745	11.40	-20.8	40.0	28.6	QP	300.0	71.00	HORIZONTAL
123.306613	13.40	-19.5	43.5	30.1	QP	100.0	175.00	HORIZONTAL
286.593186	15.80	-17.8	46.0	30.2	QP	100.0	355.00	HORIZONTAL
521.803607	20.70	-13.0	46.0	25.3	QP	300.0	343.00	HORIZONTAL
916.412826	27.90	-7.2	46.0	18.1	QP	300.0	215.00	HORIZONTAL

REMARKS :

- * Undetectable
- The IF bandwidth of EMI Test Receiver was 120KHz for measuring from 30 MHz to 1 GHz and 1 MHz for measuring above 1 GHz
- The Transd=Cabel loss +Antenna factor -pre-amplifier factor
- The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos. The worst case data is recorded in the report.

Above 1G

The frequency spectrum above 1 GHz for Transmitter was investigated. All emission not reported are much lower than the prescribed limits. Set the RBW=1MHz,VBW=3MHz for Peak Detector while the RBW=1MHz,VBW=10Hz for Average Detector,Readings are both peak and average values. The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Low channel**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	*2402.00	92.85	PK			1.00	175	96.25	28.3	4.90	36.6	-3.40
1	*2402.00	83.45	AV			1.00	175	86.85	28.3	4.90	36.6	-3.40
2	4804.00	40.84	PK	74.00	32.61	1.00	256	37.64	32.7	7.00	36.5	3.20
2	4804.00	--	AV	54.00	--	1.00	256	--	32.7	7.00	36.5	3.20
3	7206.00	46.62	PK	74.00	27.24	1.00	136	37.22	35.8	8.90	35.3	9.40
3	7206.00	--	AV	54.00	--	1.00	136	--	35.8	8.90	35.3	9.40
4	12020.41	53.74	PK	74.00	20.04	1.00	215	37.14	38.0	11.30	32.7	16.6
4	12020.41	--	AV	54.00	--	1.00	215	---	38.0	11.30	32.7	16.6

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	*2402.00	95.45	PK			1.00 V	124	98.85	28.3	4.90	36.6	-3.40
1	*2402.00	85.96	AV			1.00 V	124	89.36	28.3	4.90	36.6	-3.40
2	4804.00	43.63	PK	74.00	29.82	1.00 V	339	40.43	32.7	7.00	36.5	3.20
2	4804.00	--	AV	54.00	--	1.00 V	339	--	32.7	7.00	36.5	3.20
3	7206.00	45.48	PK	74.00	28.38	1.00 V	340	36.08	35.8	8.90	35.3	9.40
3	7206.00	--	AV	54.00	--	1.00 V	340	--	35.8	8.90	35.3	9.40
4	12020.41	49.53	PK	74.00	24.25	1.00	20	32.93	38.0	11.30	32.7	16.6
4	12020.41	--	AV	54.00	--	1.00 V	20	--	38.0	11.30	32.7	16.6

Middle channel**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	*2441.00	95.08	PK			1.00	153	98.28	28.3	5.10	36.6	-3.20
1	*2441.00	84.82	AV			1.00	153	88.02	28.3	5.10	36.6	-3.20
2	4882.00	46.45	PK	74.00	27.00	1.00	202	43.05	32.3	7.60	36.5	3.40
2	4882.00	--	AV	54.00	--	1.00	202	--	32.3	7.60	36.5	3.40
3	7323.00	47.41	PK	74.00	26.45	1.00	355	38.01	36.1	8.60	35.3	9.40
3	7323.00	--	AV	54.00	--	1.00	355	--	36.1	8.60	35.3	9.40
4	12020.41	49.62	PK	74.00	24.16	1.00	28	33.02	38.0	11.30	32.7	16.6
4	12020.41	--	AV	54.00	--	1.00	28	--	38.0	11.30	32.7	16.6

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	*2441.00	95.83	PK			1.00	121	99.03	28.3	5.10	36.6	-3.20
1	*2441.00	85.68	AV			1.00	121	88.88	28.3	5.10	36.6	-3.20
2	4882.00	43.74	PK	74.00	29.71	1.00	97	40.34	32.3	7.60	36.5	3.40
2	4882.00	--	AV	54.00	--	1.00	97	--	32.3	7.60	36.5	3.40
3	7323.00	45.41	PK	74.00	28.45	1.00	288	36.01	36.1	8.60	35.3	9.40
3	7323.00	--	AV	54.00	--	1.00	288	--	36.1	8.60	35.3	9.40
4	12020.41	50.52	PK	74.00	23.26	1.00	89	33.92	38.0	11.30	32.7	16.6
4	12020.41	--	AV	54.00	--	1.00	89	--	38.0	11.30	32.7	16.6

High channel**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	*2480.00	91.25	PK			1.00	156	94.55	28.2	5.10	36.6	-3.30
1	*2480.00	80.89	AV			1.00	156	84.19	28.2	5.10	36.6	-3.30
2	4960.00	43.68	PK	74.00	30.77	1.00	198	38.88	33.0	7.00	36.2	3.80
2	4960.00	--	AV	54.00	--	1.00	198	--	33.0	7.00	36.2	3.80
3	7340.00	43.66	PK	74.00	30.20	1.00	90	34.26	36.2	8.50	35.3	9.40
3	7340.00	--	AV	54.00	--	1.00	90	--	36.2	8.50	35.3	9.40
4	12020.41	49.86	PK	74.00	23.92	1.00	124	33.26	38.0	11.30	32.7	16.6
4	12020.41	--	AV	54.00	--	1.00	124	--	38.0	11.30	32.7	16.6

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

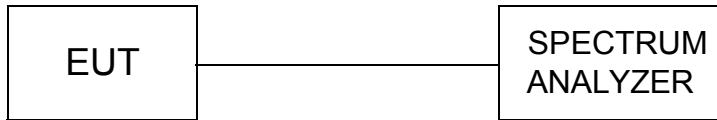
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	*2480.00	94.02	PK			1.000 V	125	97.32	28.2	5.10	36.6	-3.30
1	*2480.00	86.63	AV			1.00 V	125	89.93	28.2	5.10	36.6	-3.30
2	4960.00	49.13	PK	74.00	29.92	1.00 V	96	39.73	36.2	8.50	35.3	3.80
2	4960.00	--	AV	54.00	--	1.00 V	96	--	36.2	8.50	35.3	3.80
3	7340.00	49.58	PK	74.00	27.58	1.00 V	35	36.88	37.4	10.10	34.8	9.40
3	7340.00	--	AV	54.00	--	1.00 V	35	--	37.4	10.10	34.8	9.40
4	12020.41	50.84	PK	74.00	22.94	1.00 V	37	34.24	38.0	11.30	32.7	16.6
4	12020.41	--	AV	54.00	--	1.00 V	37	--	38.0	11.30	32.7	16.6

REMARKS:

1. The other emission levels were very low against the limit.
2. The limit value is defined as per 15.247
3. The worst test mode is BDR mode and the data is recorded. The average measurement was not performed when the peak measured data under the limit of average detection.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum. Set the RBW=1MHz VBW=3MHz.

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

TEST RESULTS

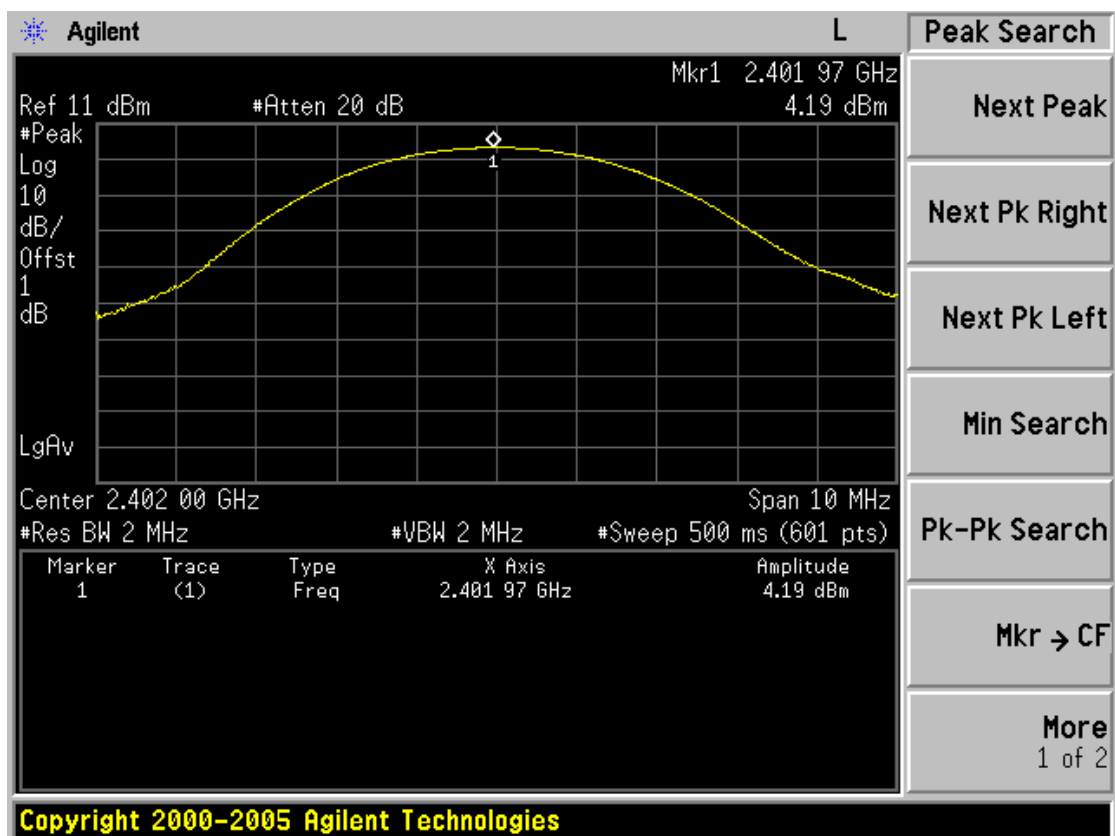
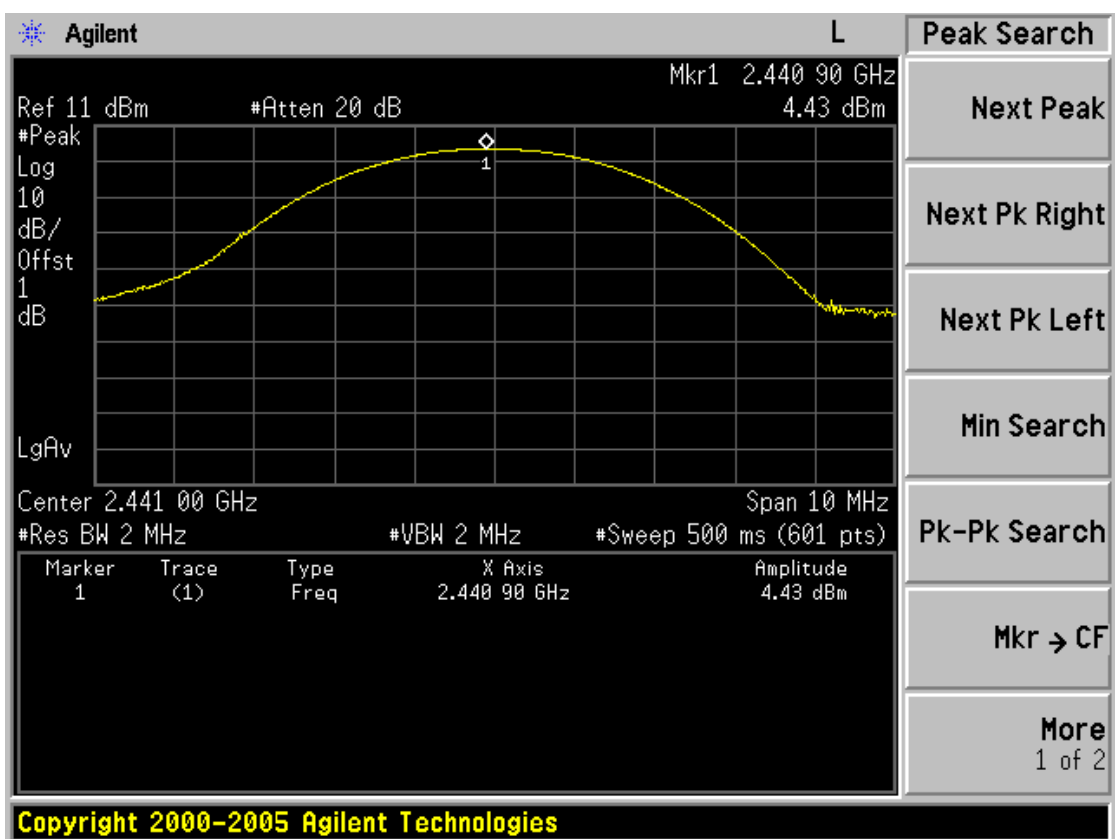
BDR Mode:

Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	4.19	30	PASS
2441	4.43	30	PASS
2480	3.77	30	PASS

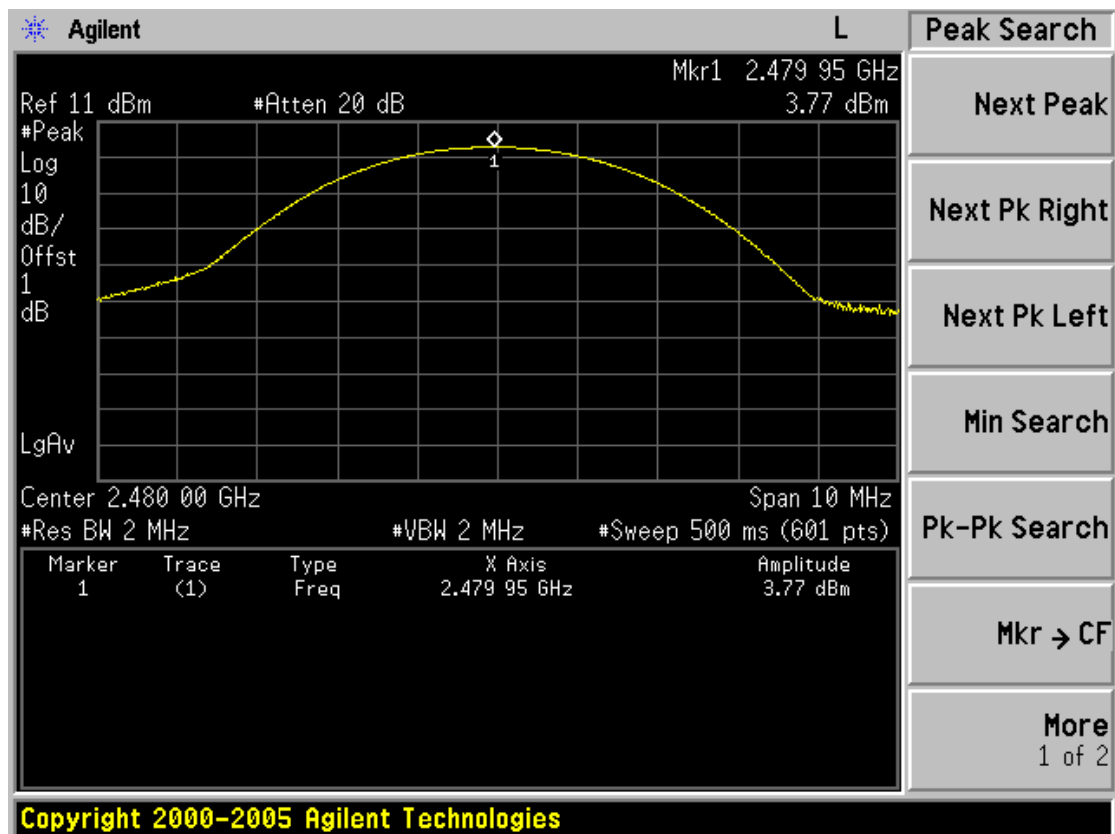
EDR Mode:

Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	4.63	30	PASS
2441	4.96	30	PASS
2480	4.65	30	PASS

Note: The test results including the cable lose.

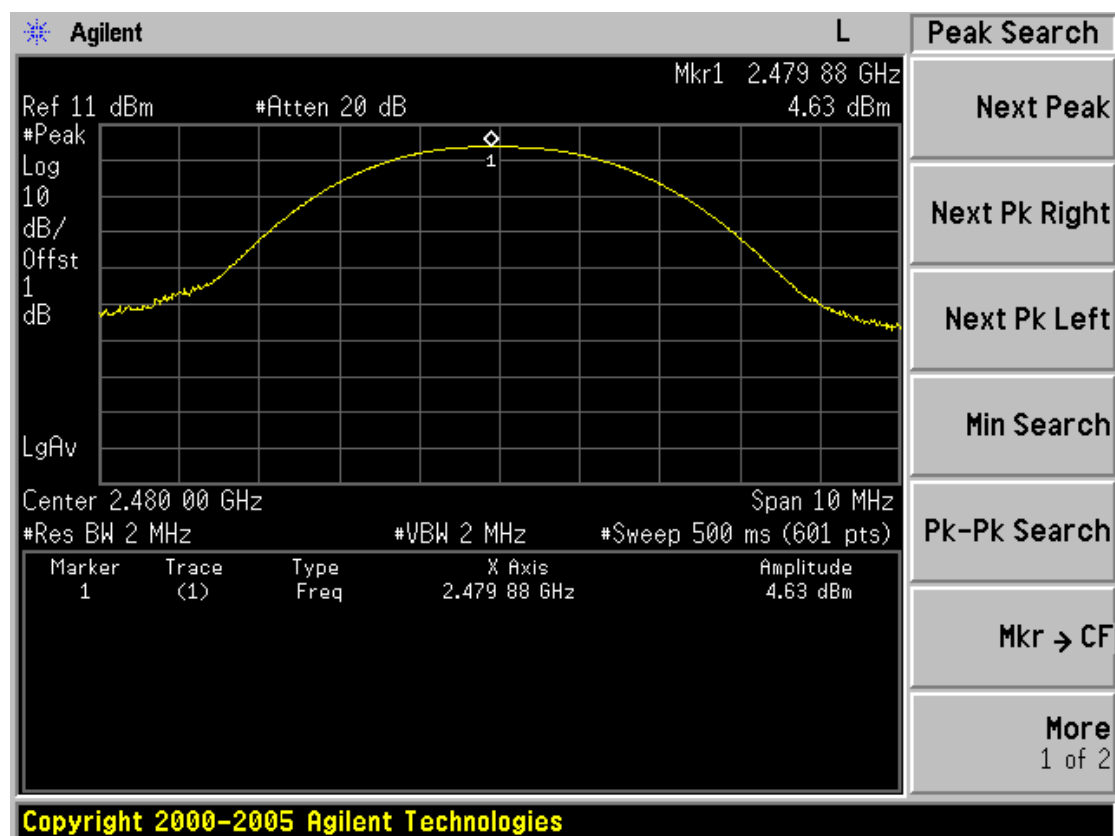
BDR Mode:**Low channel****Middle channel**

High channel

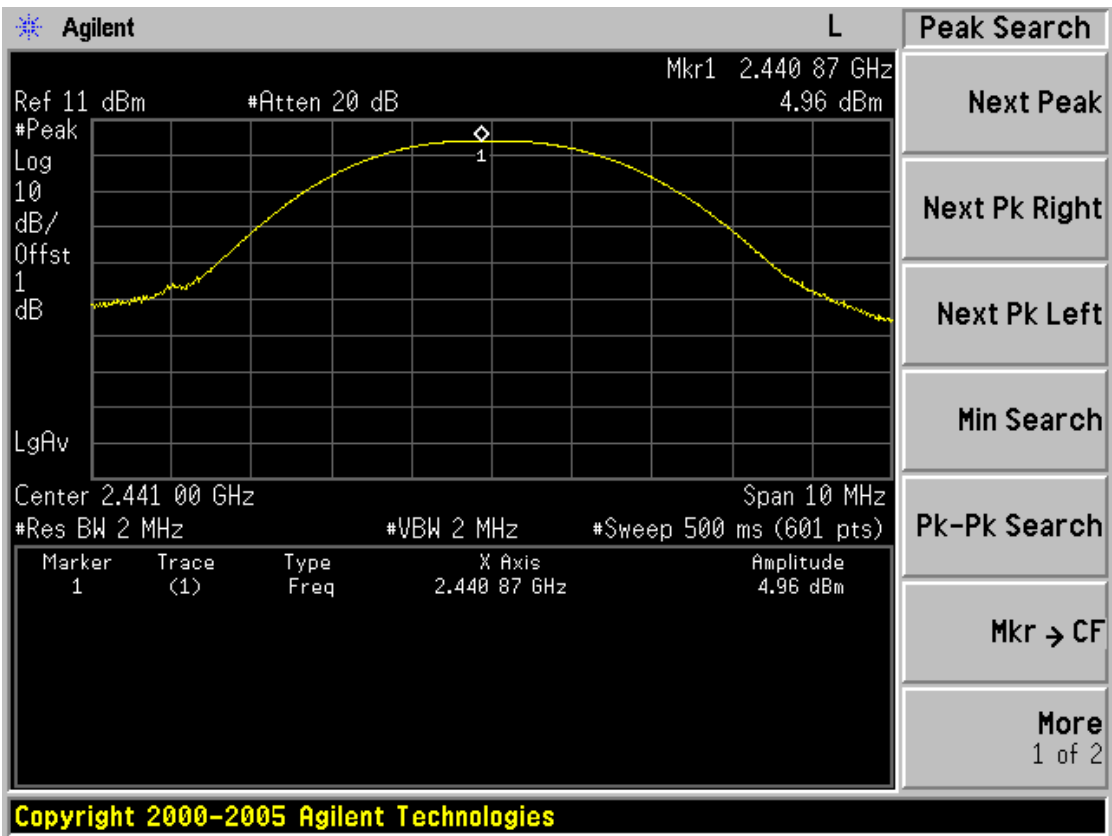


EDR Mode:

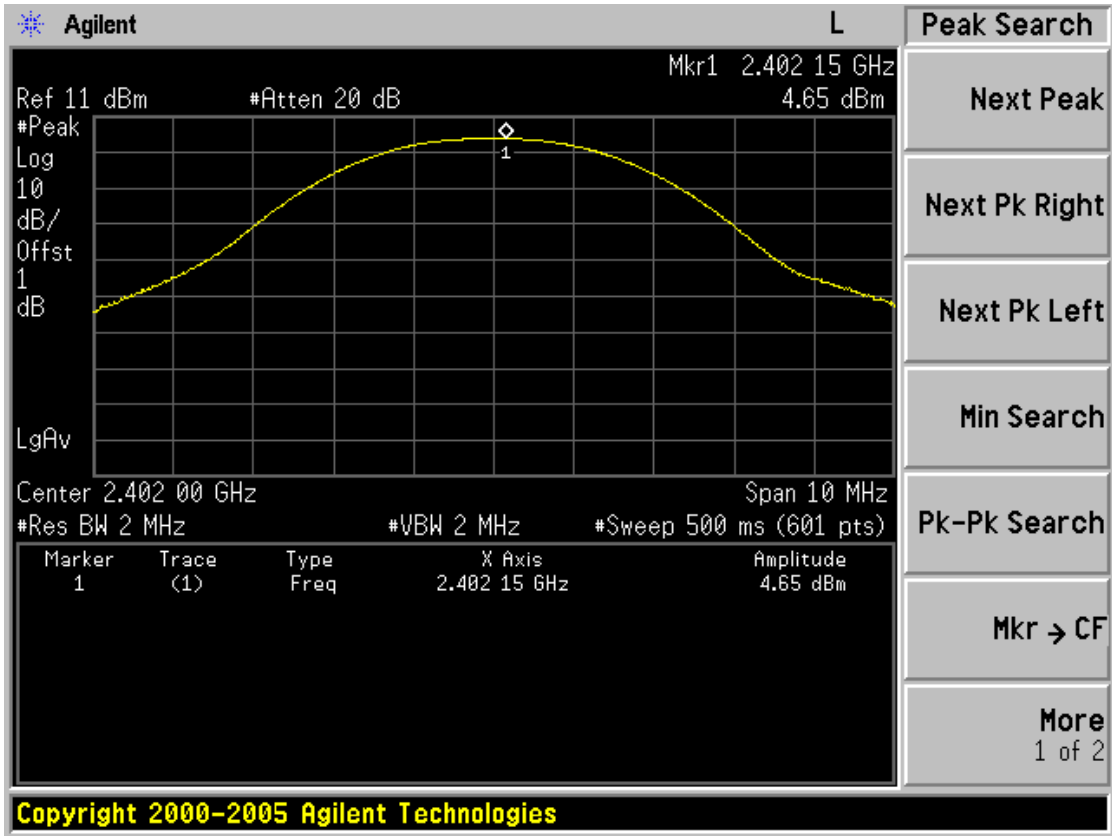
Low channel



Middle channel

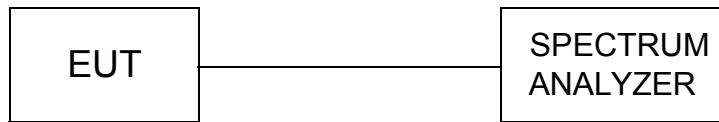


High channel



4.4. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

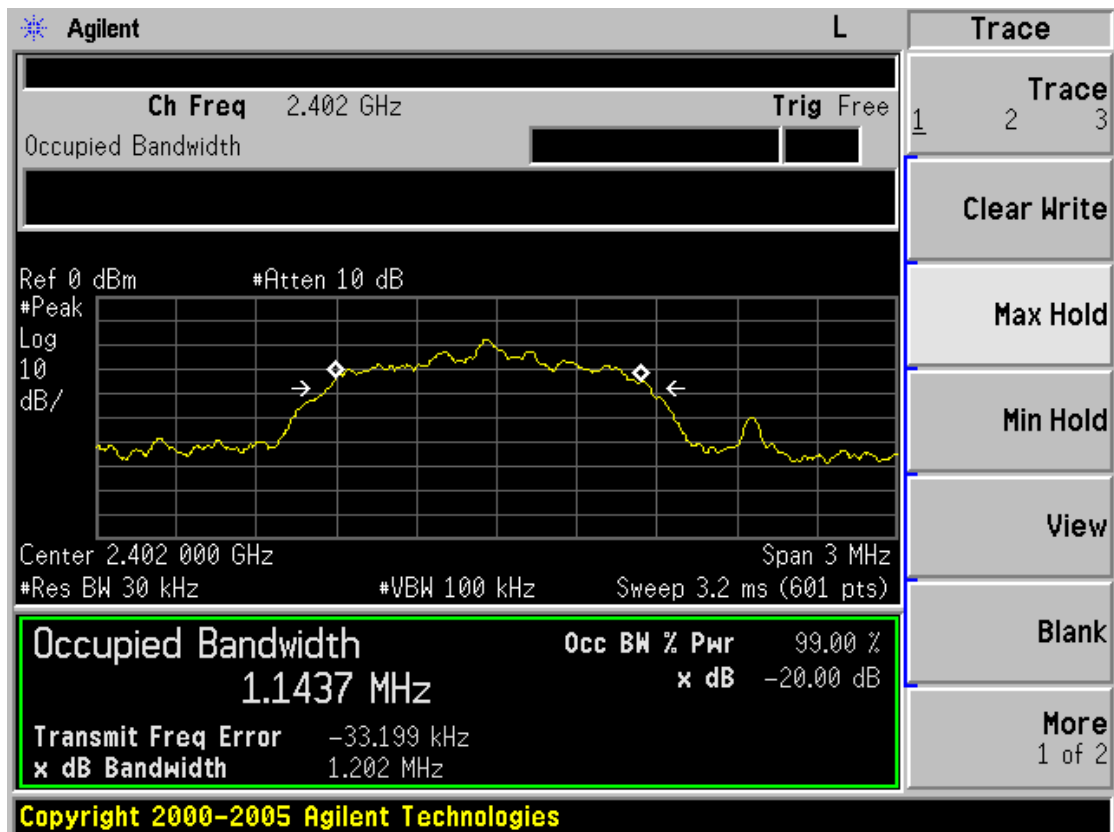
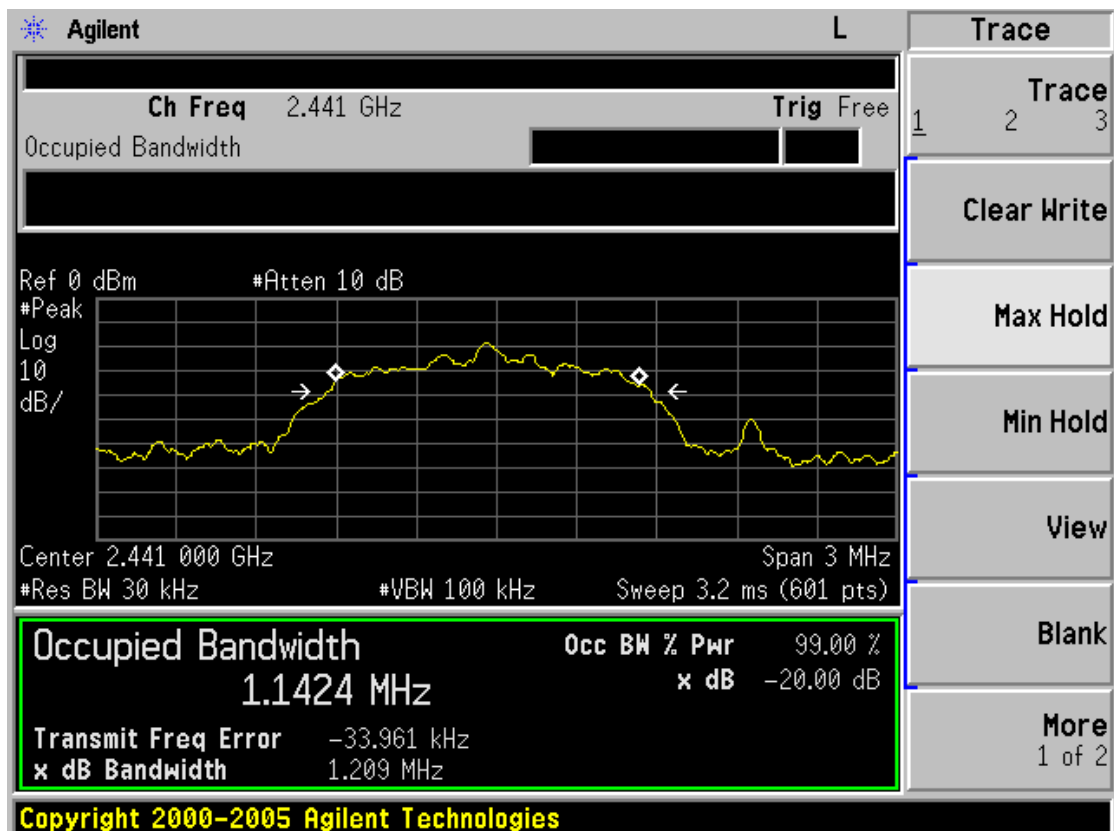
TEST RESULTS

EDR Mode:

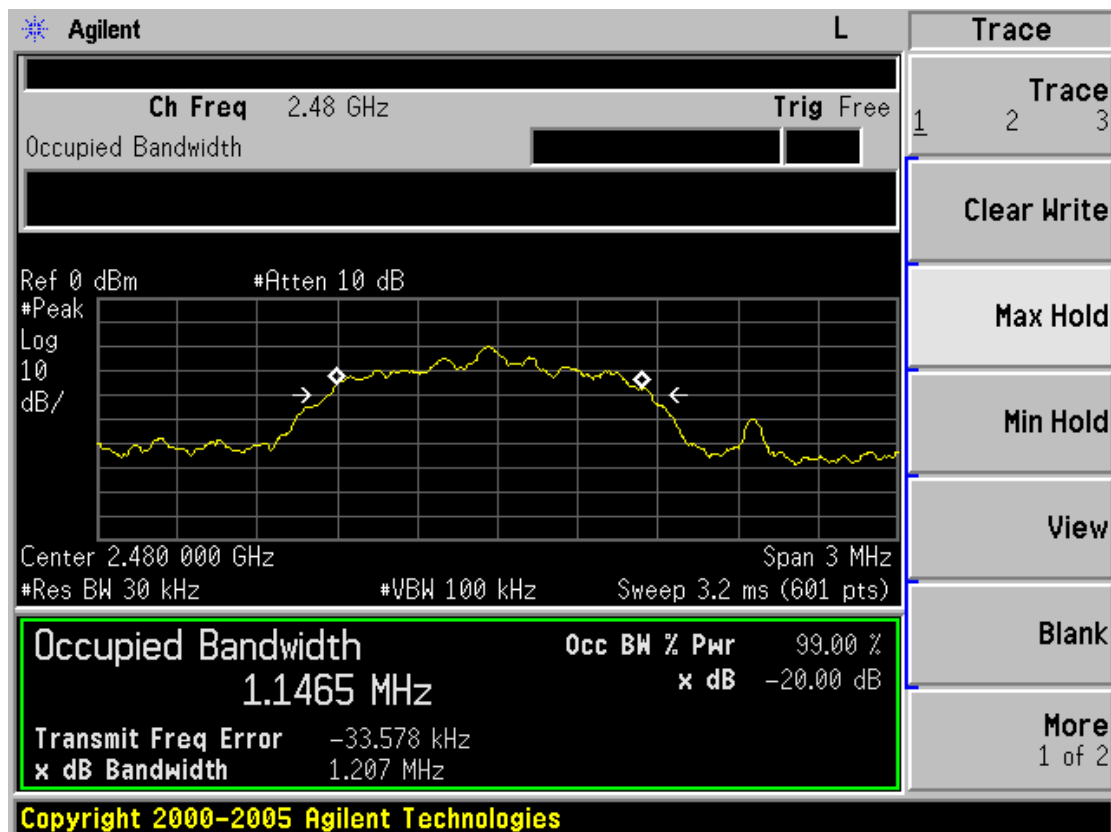
CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (KHz)	LIMIT (MHz)	PASS/FAIL
2402	1202.00	/	PASS
2441	1209.00	/	PASS
2480	1207.00	/	PASS

BDR Mode:

CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (KHz)	LIMIT (MHz)	PASS/FAIL
2402	854.262	/	PASS
2441	845.738	/	PASS
2480	846.124	/	PASS

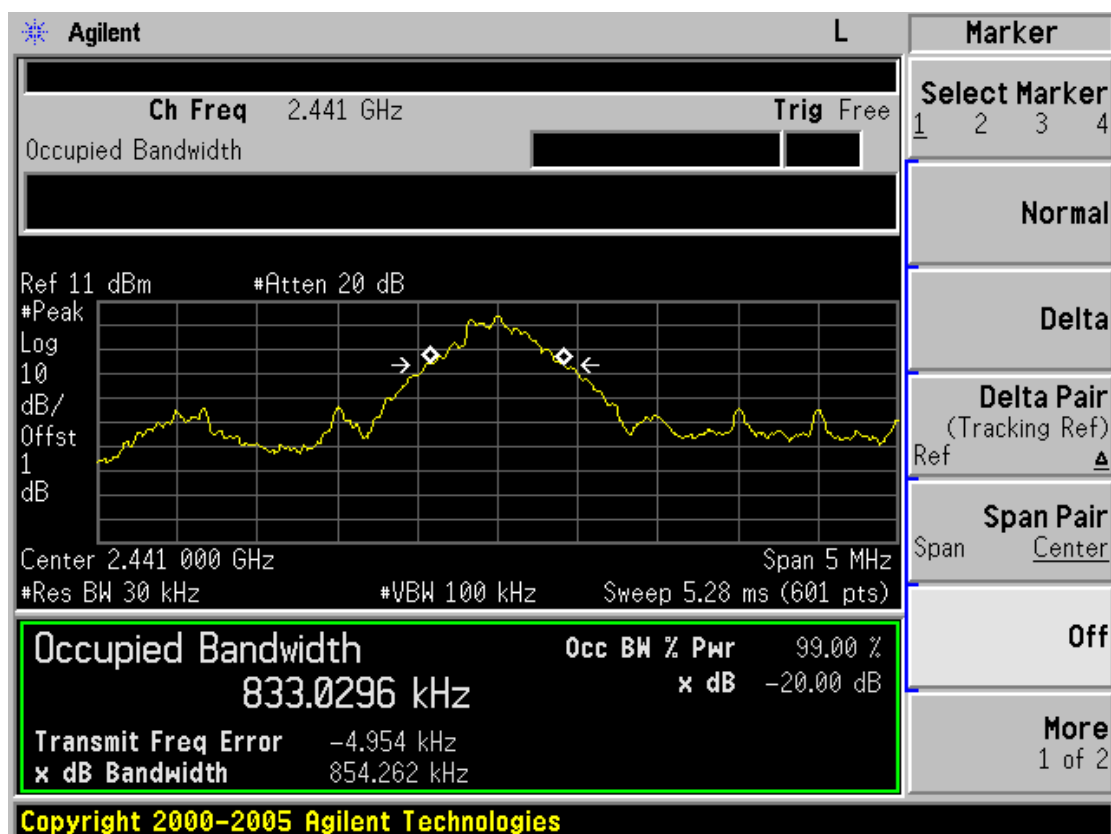
Photos of 20dB Bandwidth Measurement(EDR Mode)**Low Channel****Middle Channel**

High Channel

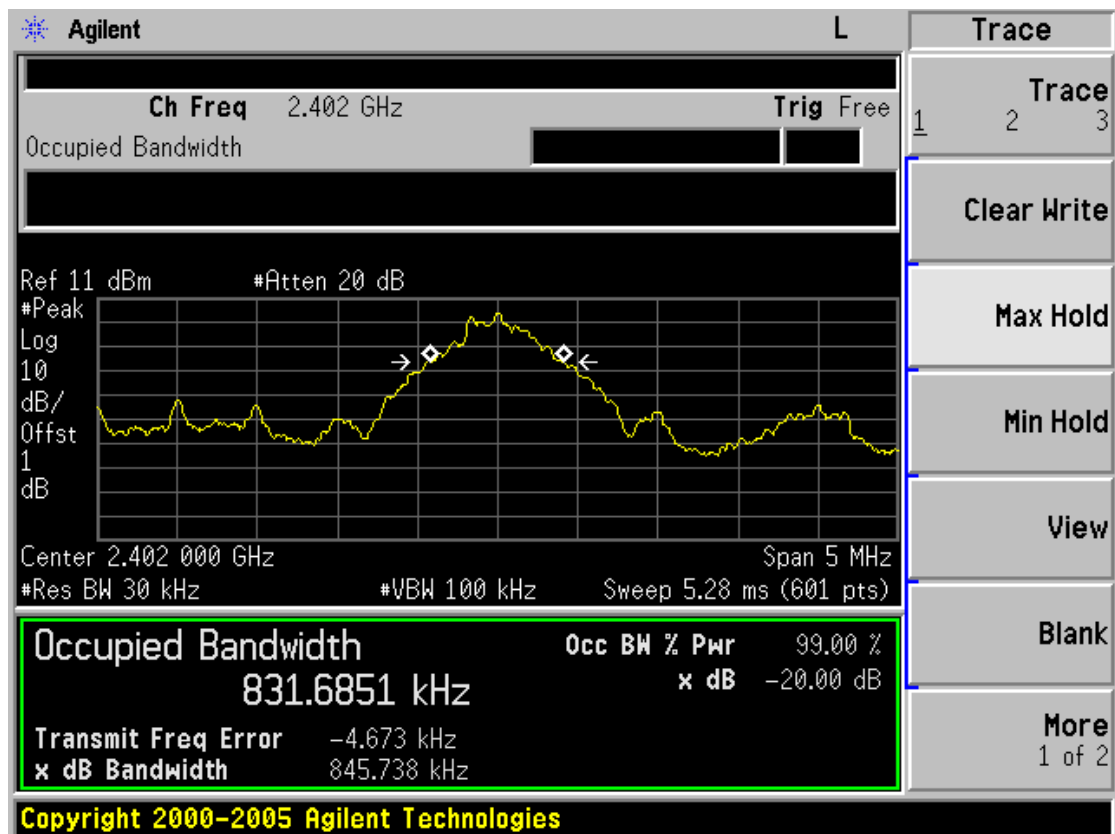


Photos of 20dB Bandwidth Measurement(BDR Mode)

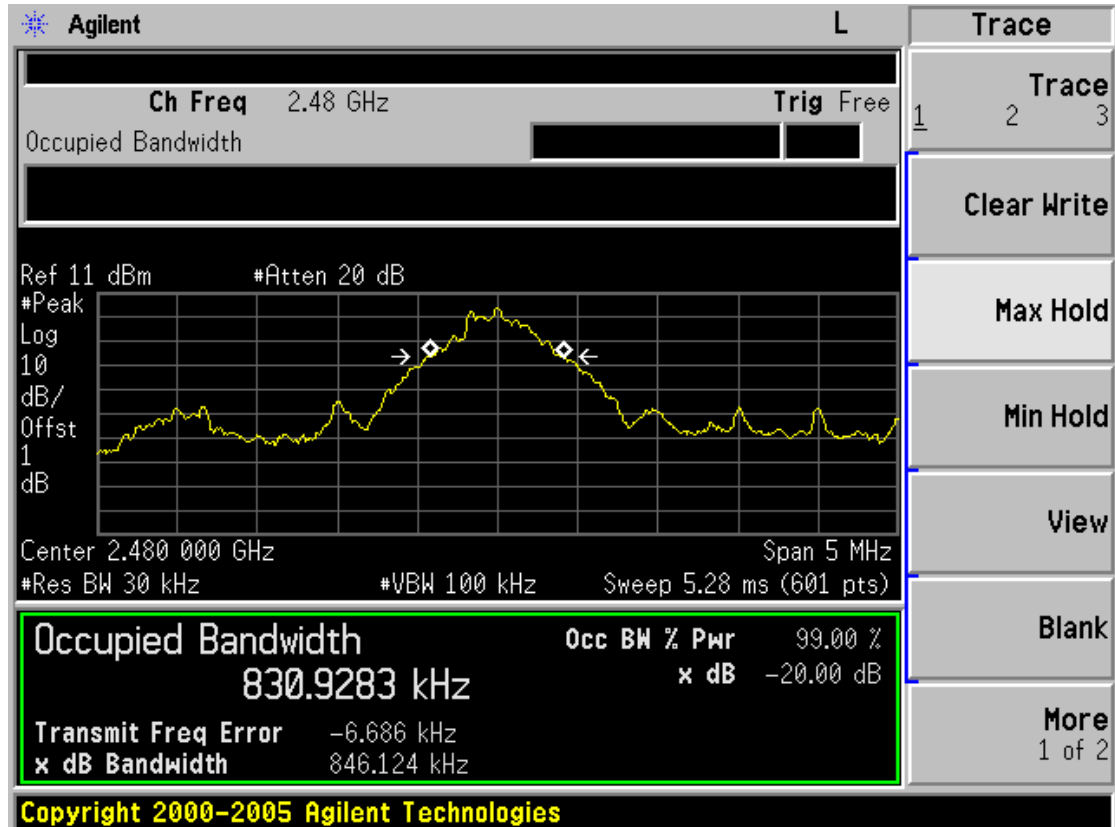
Low Channel



Middle Channel



High Channel



4.5. Band Edge

Applicable Standard

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 §15.209(a) is not required. 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 §15.205(c)).

TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

LIMIT

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)

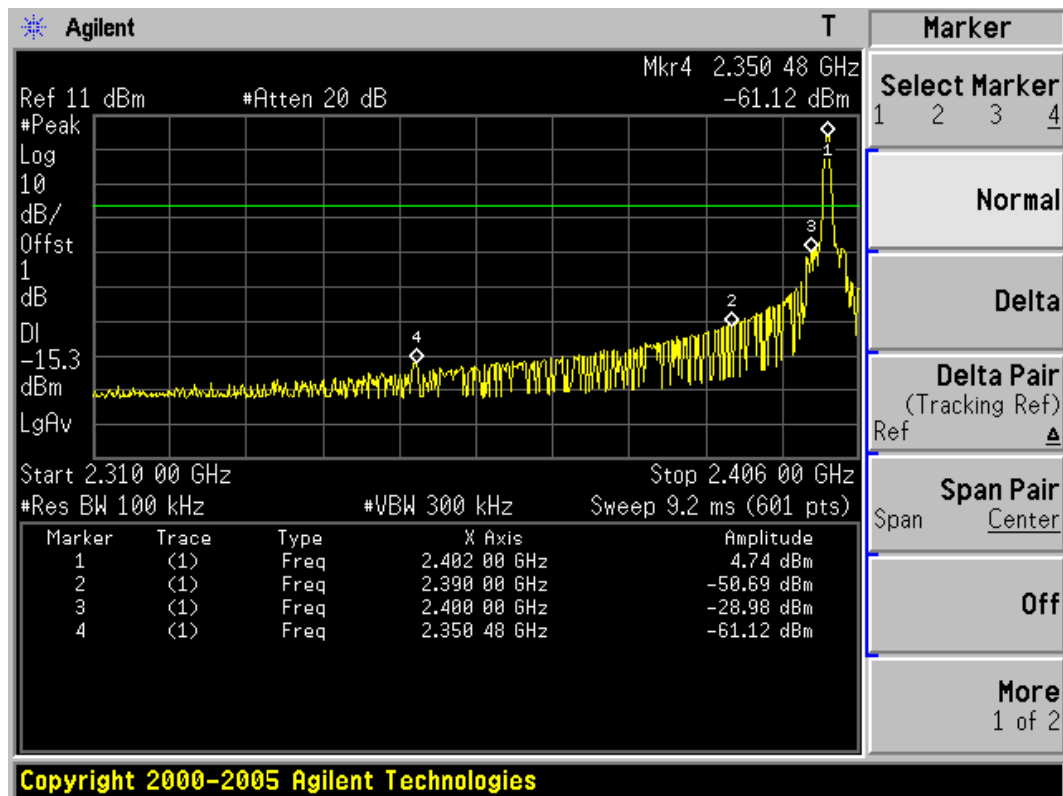
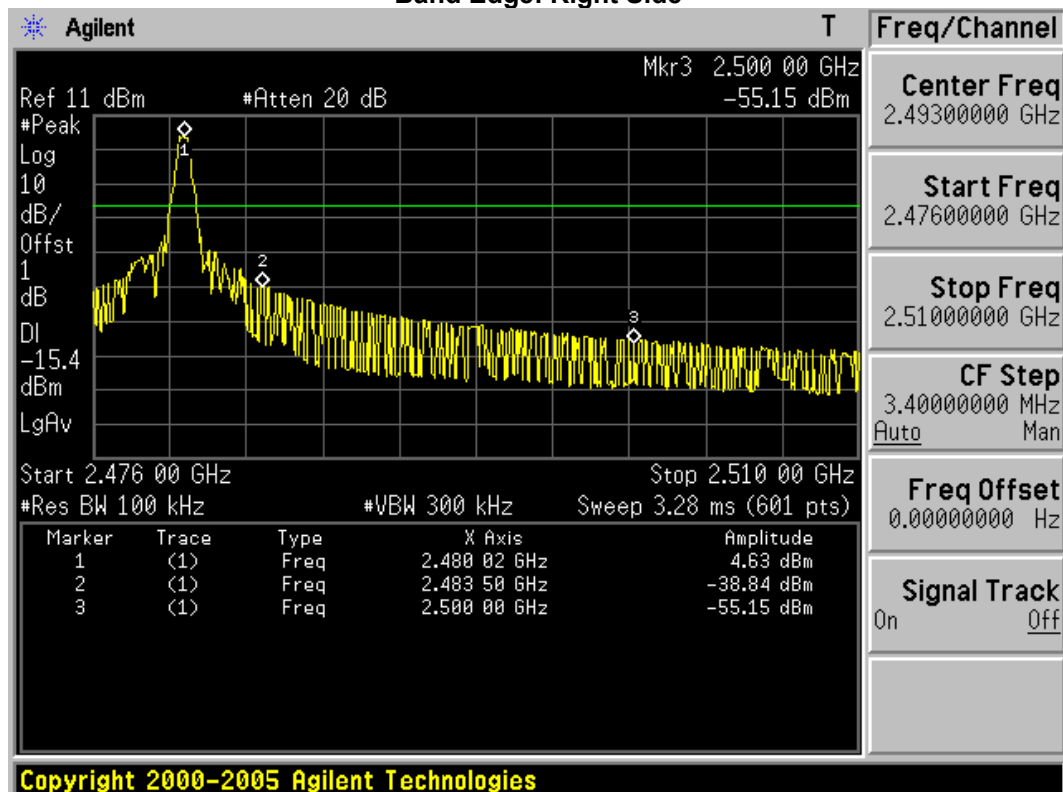
TEST RESULTS

Both radiated and conducted band edge were measurement BDR and EDR mode, recording worst case(BDR mode) in test report

Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Margin (dB)	Detector	Polarization
Out of left side band					
2390.00	58.69	74	15.31	PK	Horizontal
2390.00	46.64	54	7.36	AV	Horizontal
2390.00	58.11	74	15.89	PK	Vertical
2390.00	49.04	54	4.96	AV	Vertical
Out of right side band					
2483.50	56.26	74	17.74	PK	Horizontal
2483.50	46.66	54	7.34	AV	Horizontal
2483.50	57.74	74	16.26	PK	Vertical
2483.50	47.64	54	6.36	AV	Vertical

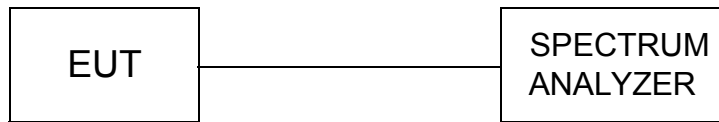
Photos of Conducted Band Edge Measurement (BDR Mode)

Frequency	Delta peak to band emission	Limit(dBc)
2400MHz	-50.69	20
2483.5MHz	-38.84	20

Band Edge: Left Side**Band Edge: Right Side**

4.6. Frequency Separation

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100KHz VBW.

LIMIT

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the $2/3 \times 20\text{dB}$ bandwidth of the hopping channel, whichever is greater.

TEST RESULTS

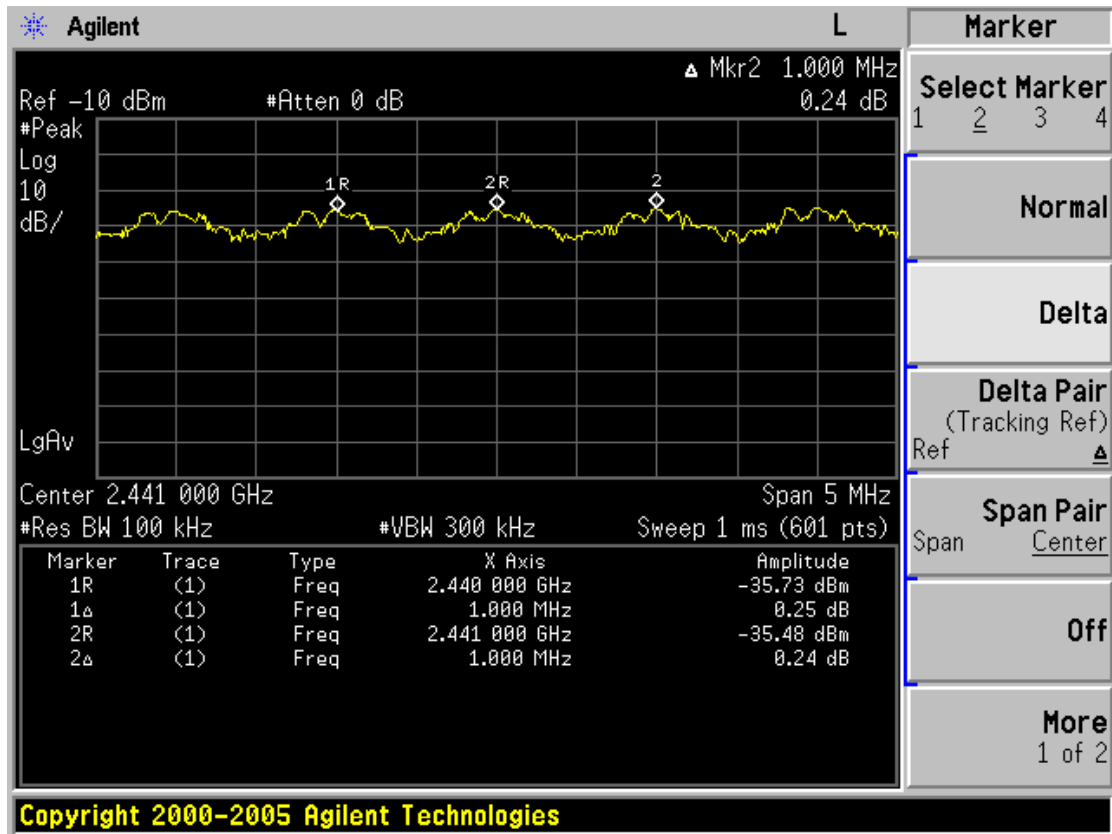
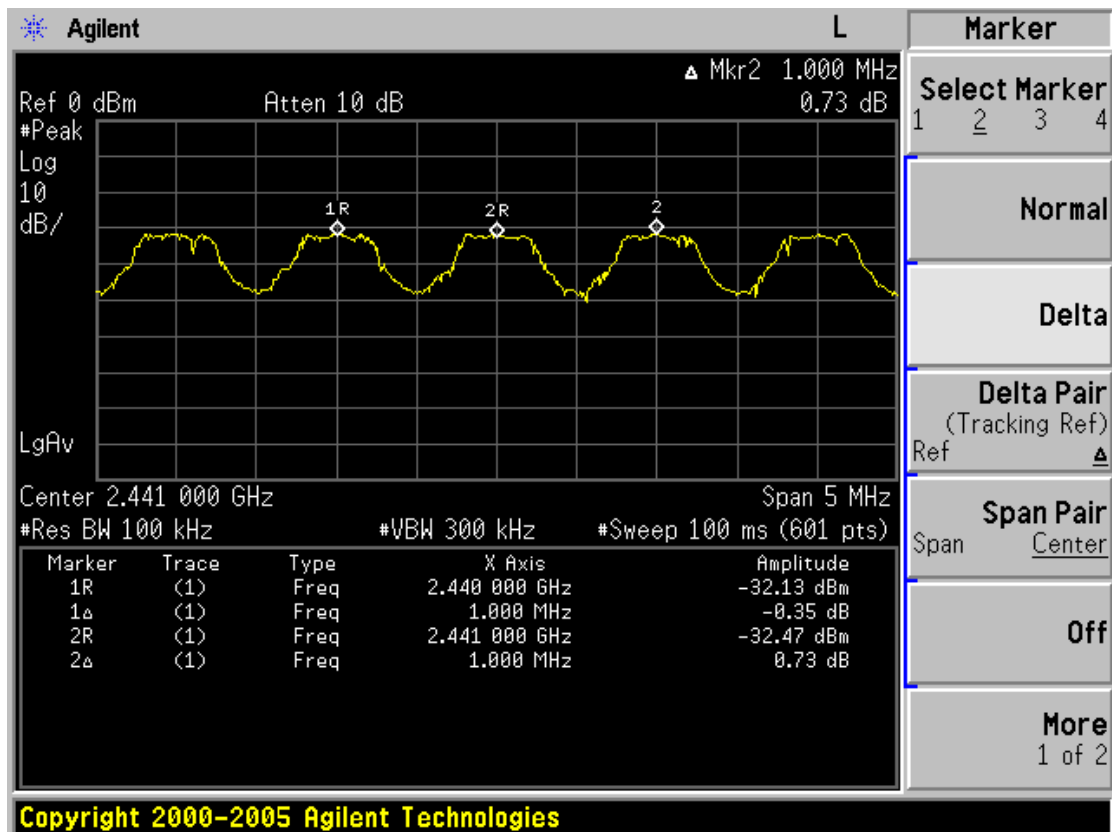
The channel separation were measurement three channels for both BDR and EDR mode, recording worst case of each channel for both BDR and EDR mode in test report

BDR Mode:

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Mid Channel	2441	1.000	25KHz or $2/3 \times 20\text{dB}$ bandwidth	Pass
Adjacency Channel	2440			

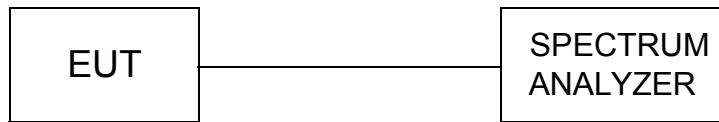
EDR Mode:

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Mid Channel	2441	1.000	25KHz or $2/3 \times 20\text{dB}$ bandwidth	Pass
Adjacency Channel	2440			

Photos of Frequency separation Measurement (BDR Mode)**Photos of Frequency separation Measurement(EDR Mode)**

4.7. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz with 100 KHz RBW and 300KHz VBW.

LIMIT

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

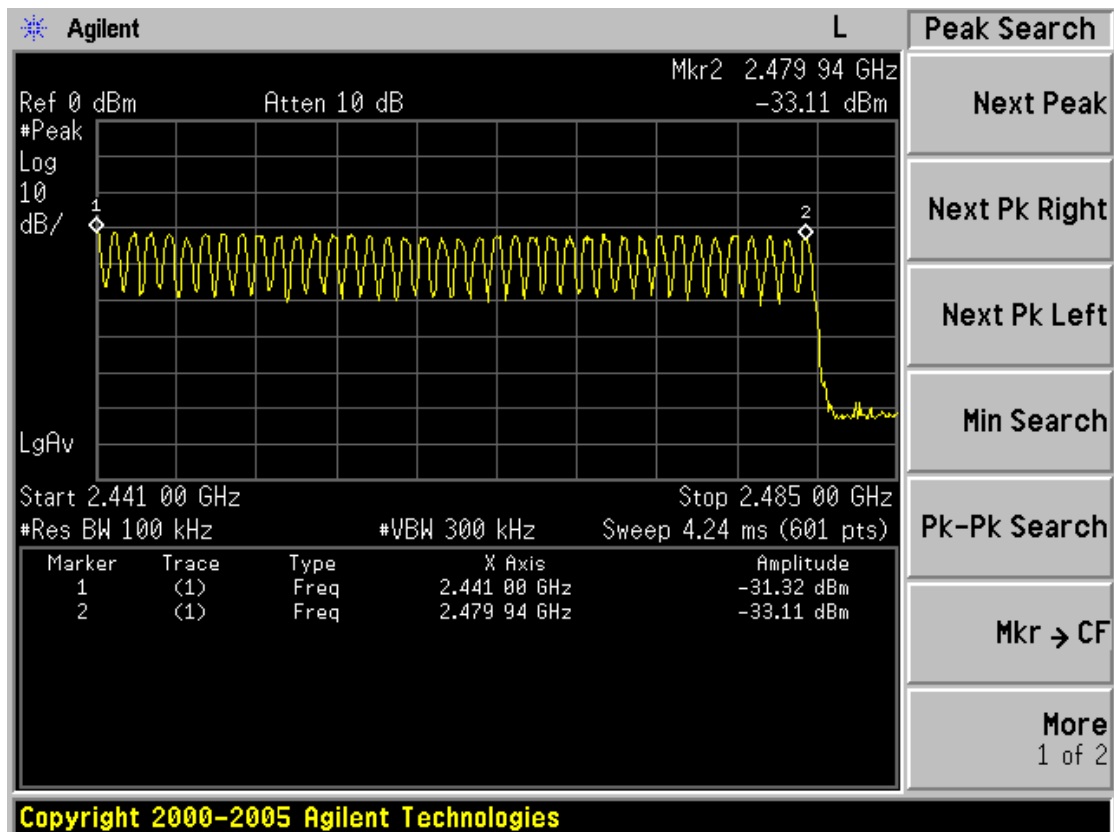
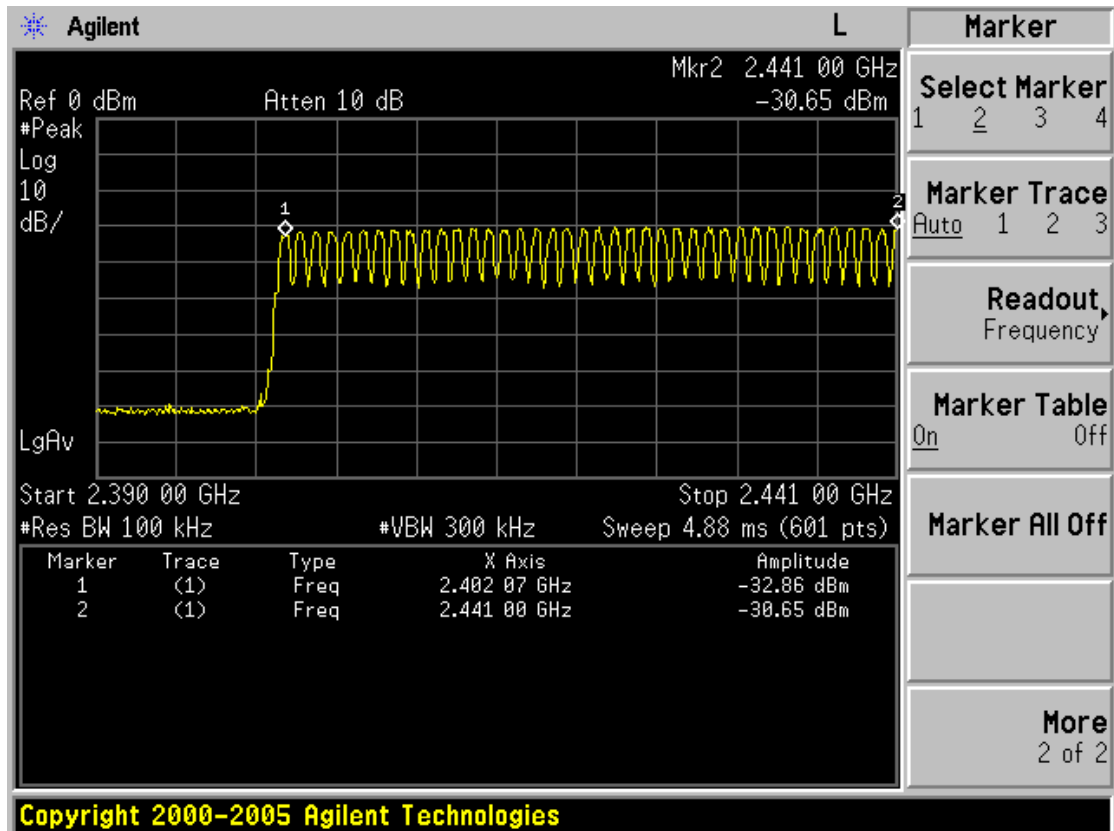
TEST RESULTS

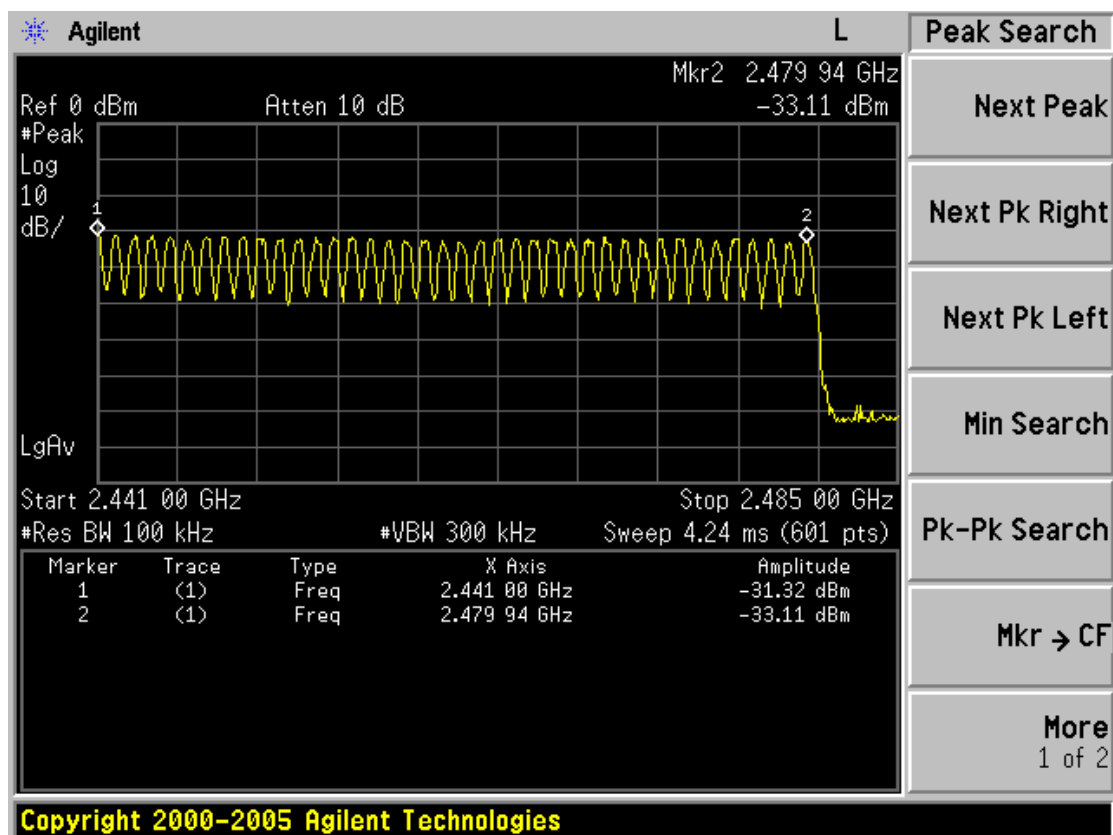
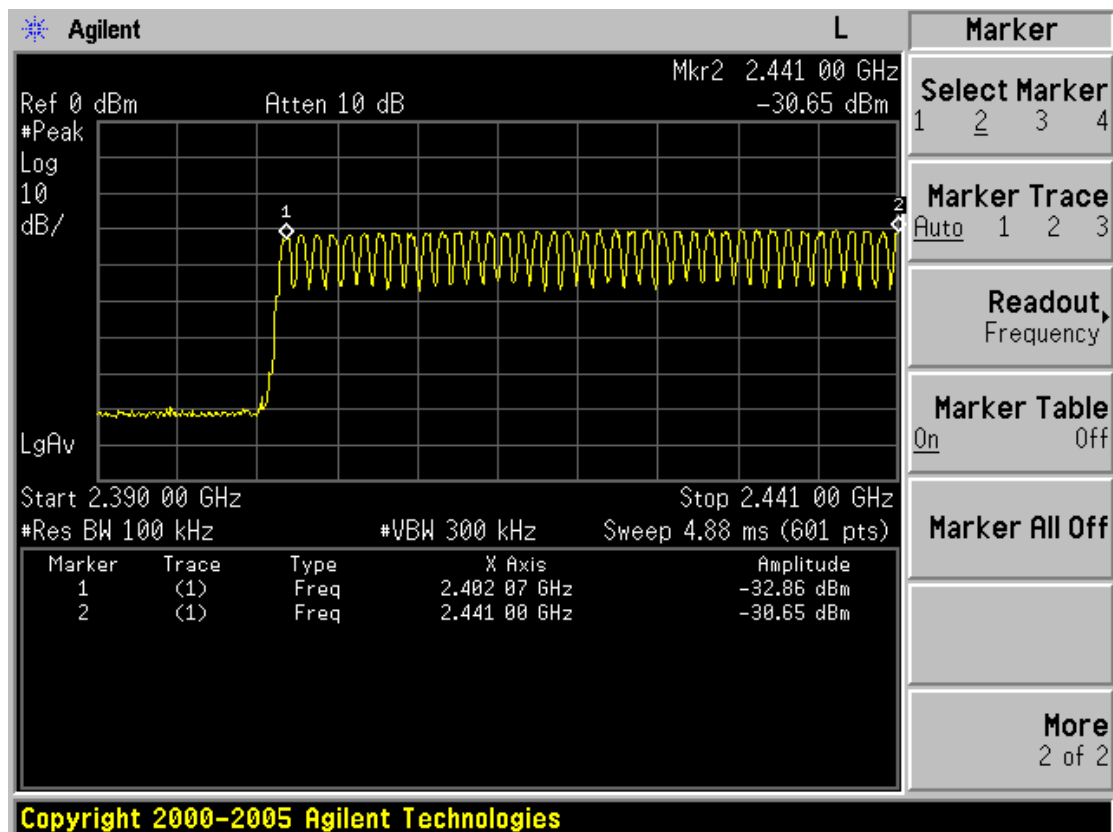
BDR Mode:

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

EDR Mode:

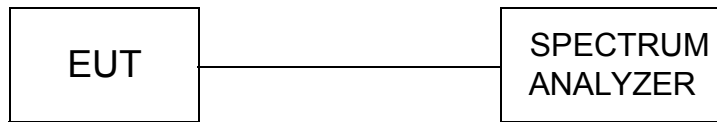
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Photos of Number of hopping channel Measurement (BDR Mode)

Photos of Number of hopping channel Measurement (BDR Mode)

4.8. Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2009 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=100kHz and VBM= 300KHz to measure the peak field strength , and measure frequency range from 30MHz to 26.5GHz.

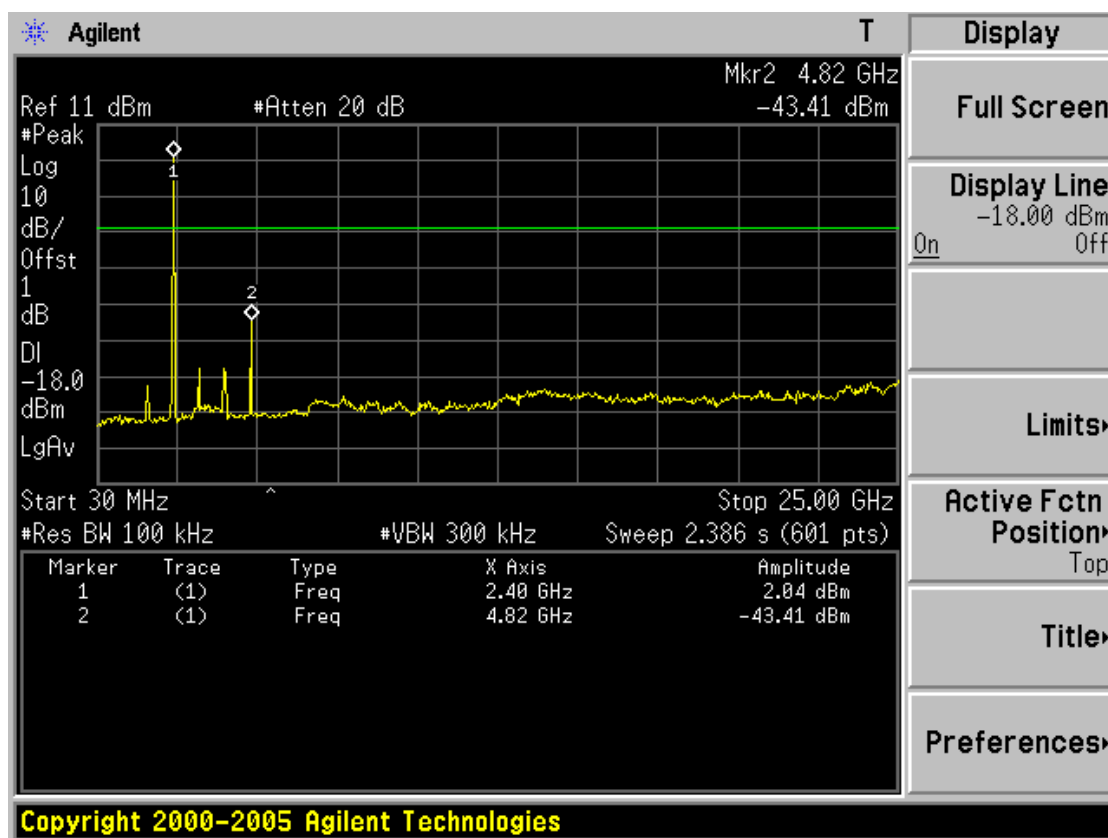
LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

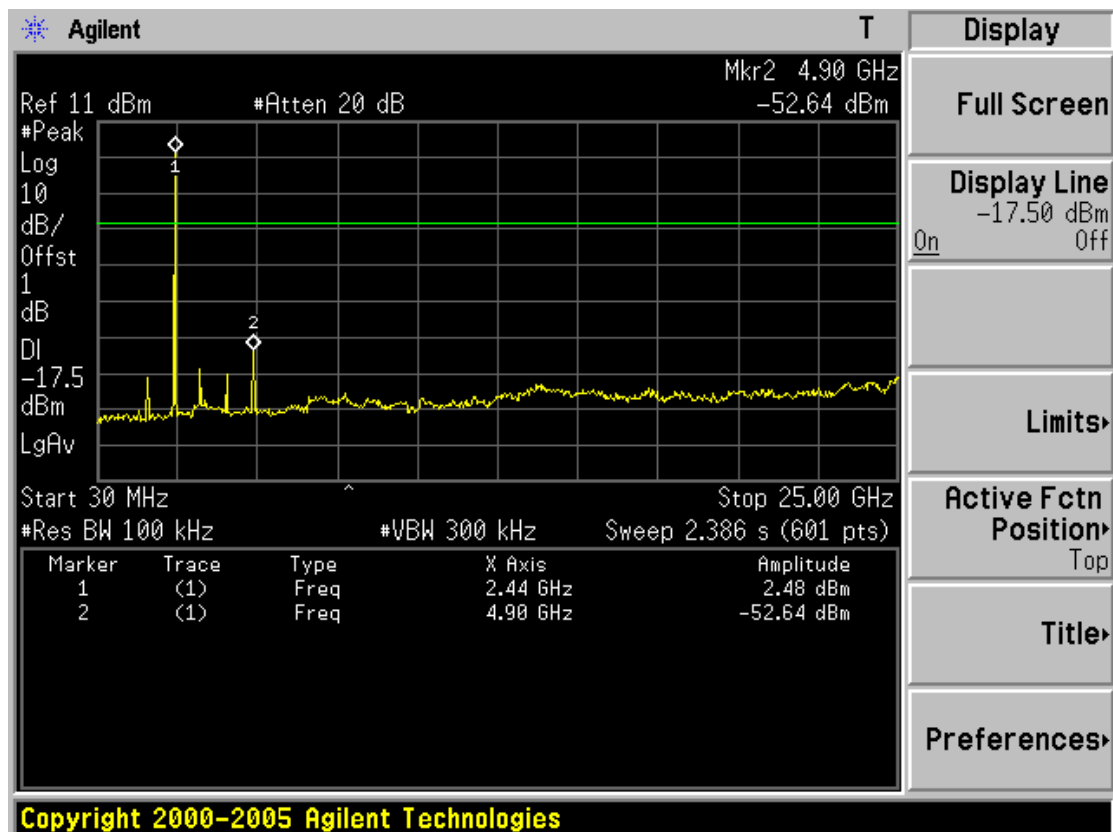
TEST RESULTS

Photos of Spurious RF Conducted Emission Measurement (BDR Mode)

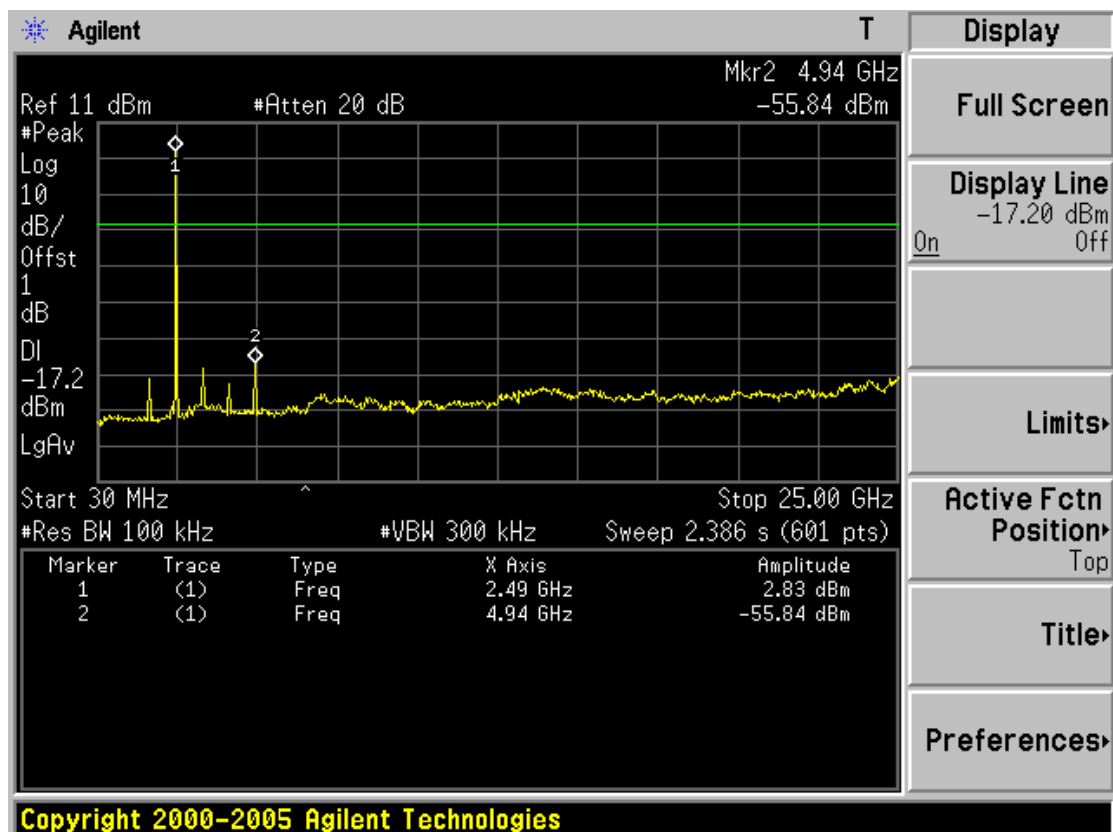
Low channel

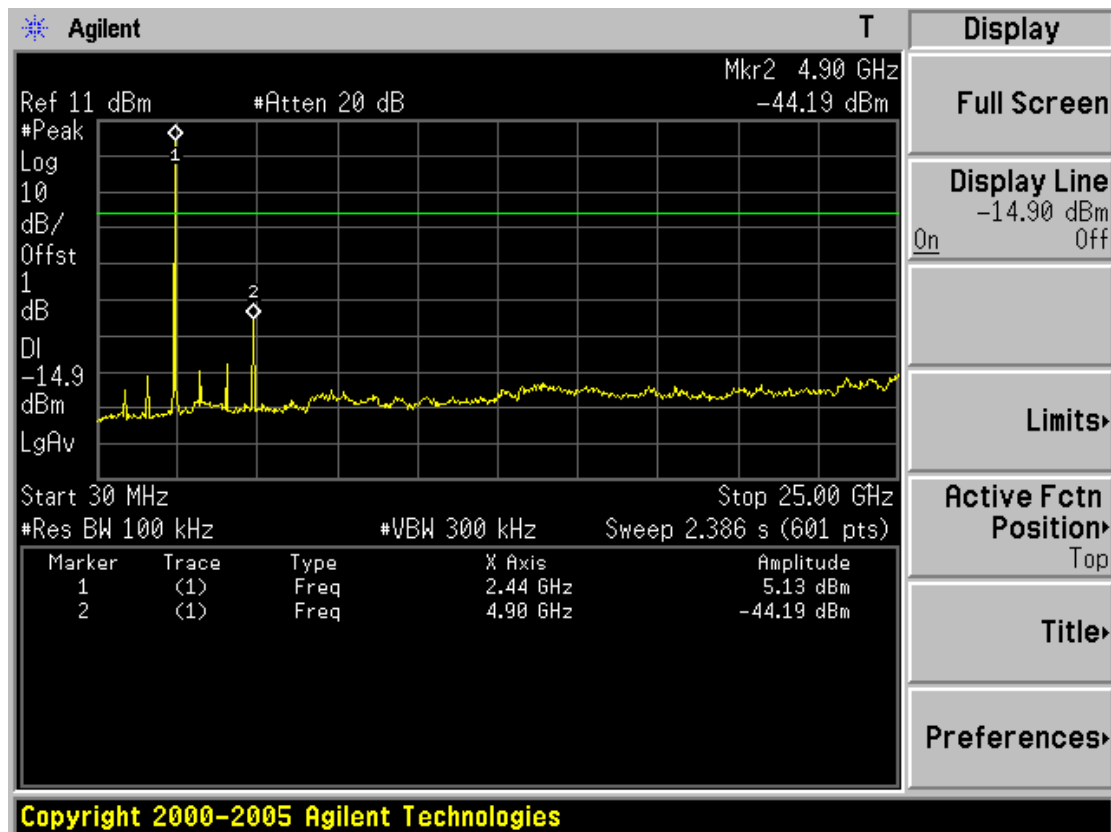
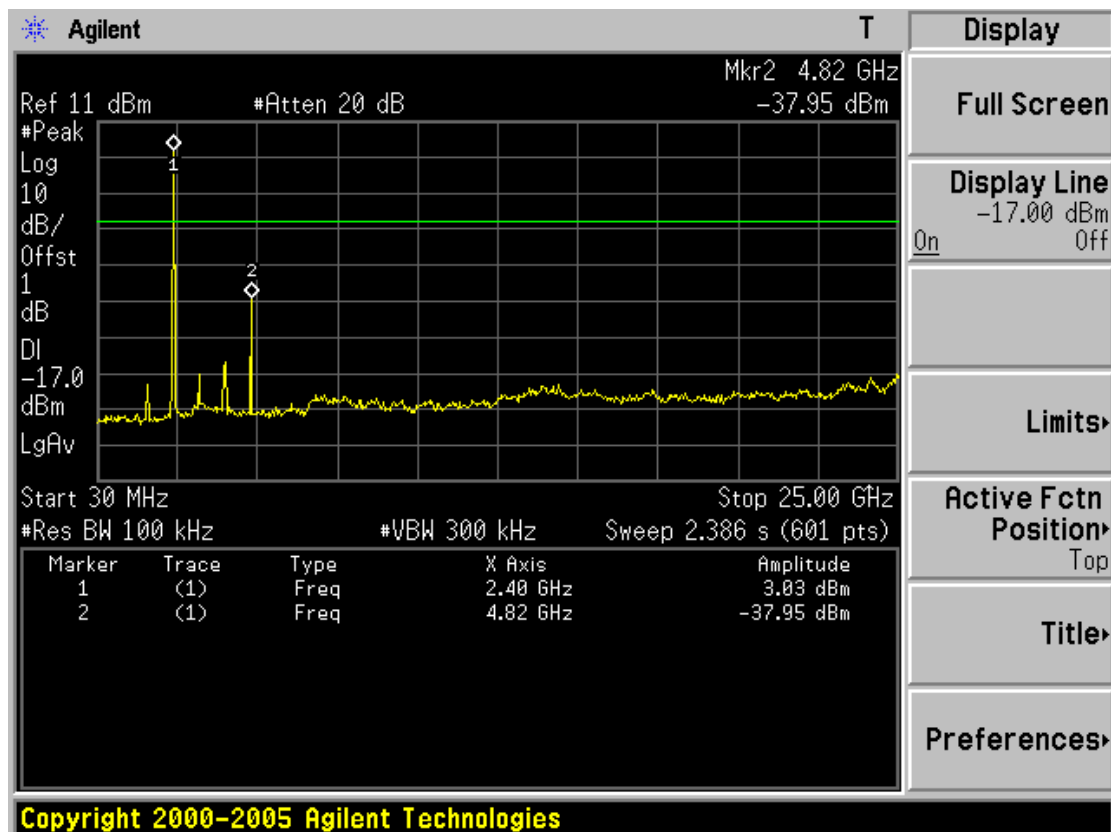


Middle channel

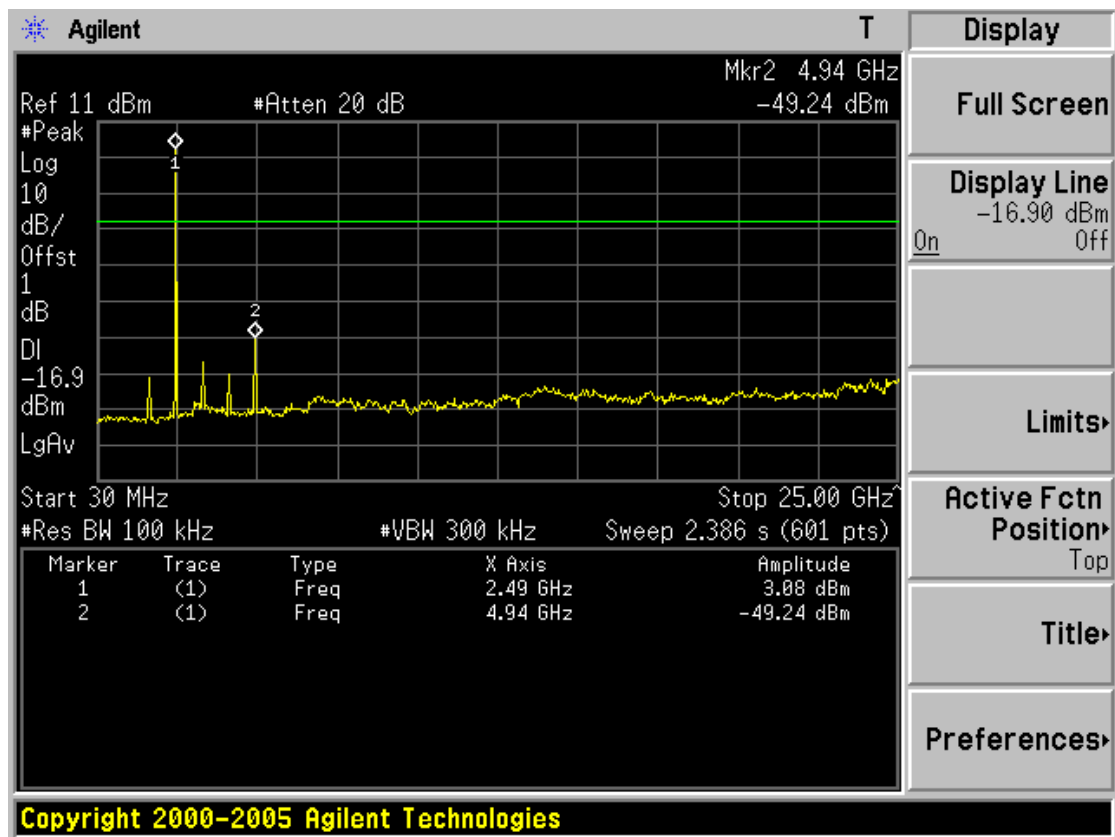


High channel



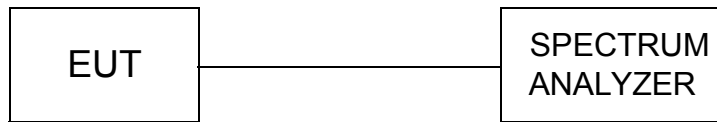
Photos of Spurious RF Conducted Emission Measurement (EDR Mode)**Low channel****Middle channel**

High channel



4.9. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 3MHz VBW, Span 0Hz.

LIMIT

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST RESULTS

The dell time were measurement three channels for both BDR and EDR mode,recording worst case of each channel for both BDR and EDR mode in test report

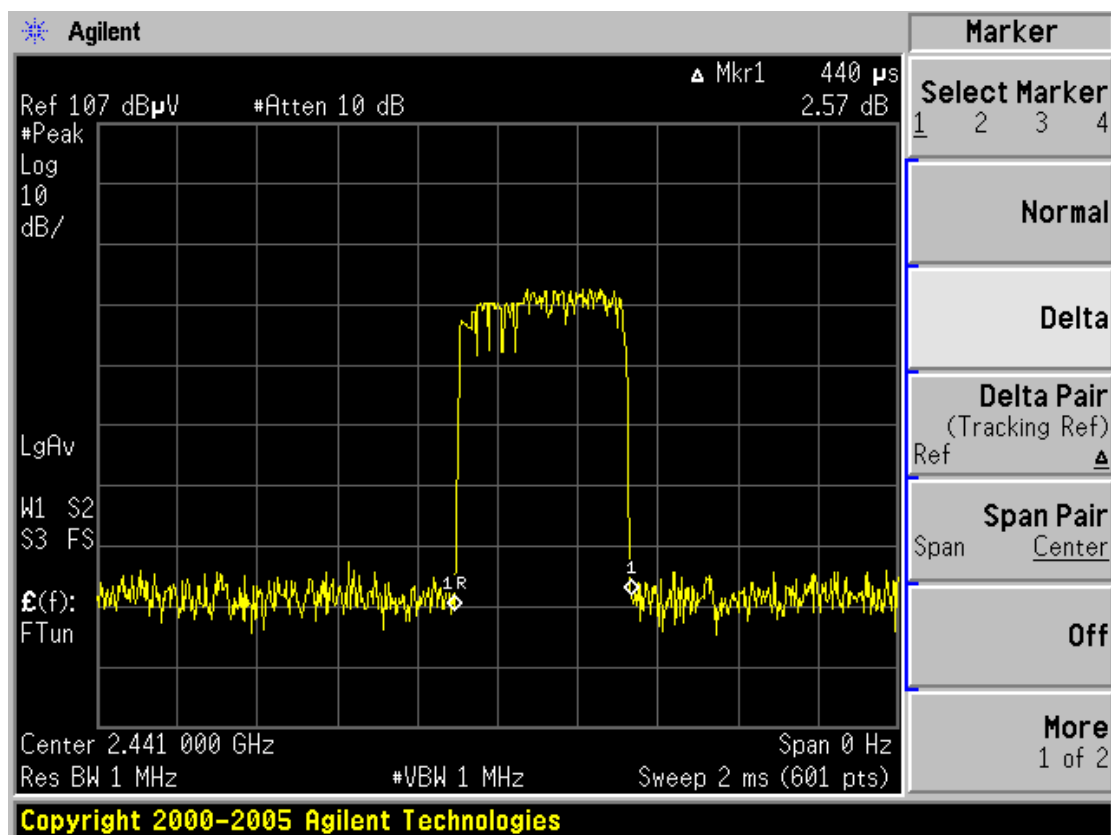
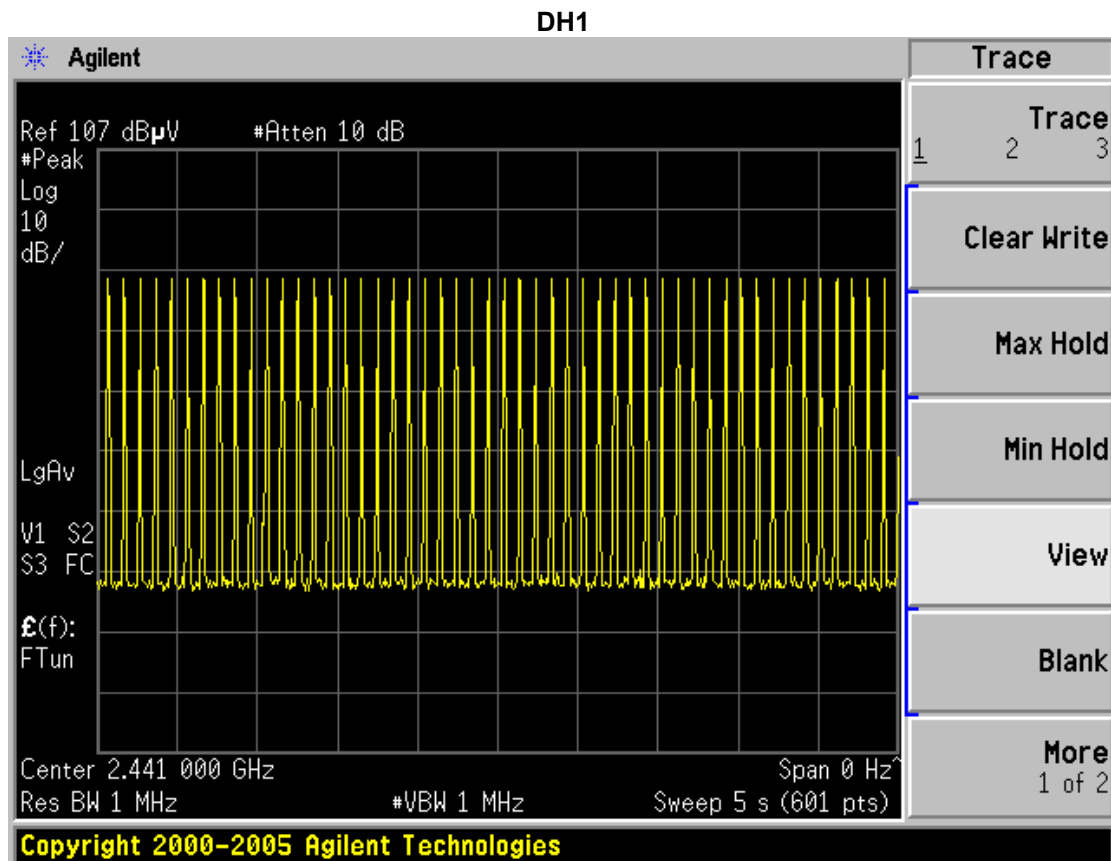
BDR Mode:

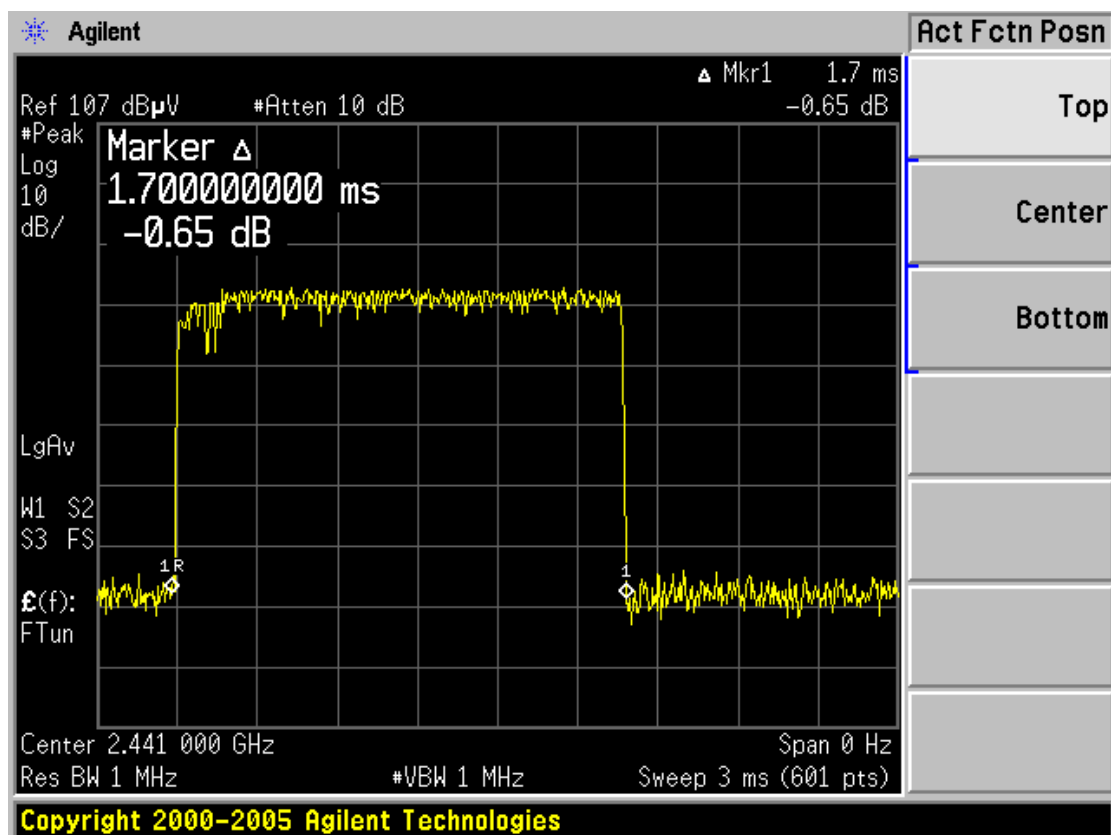
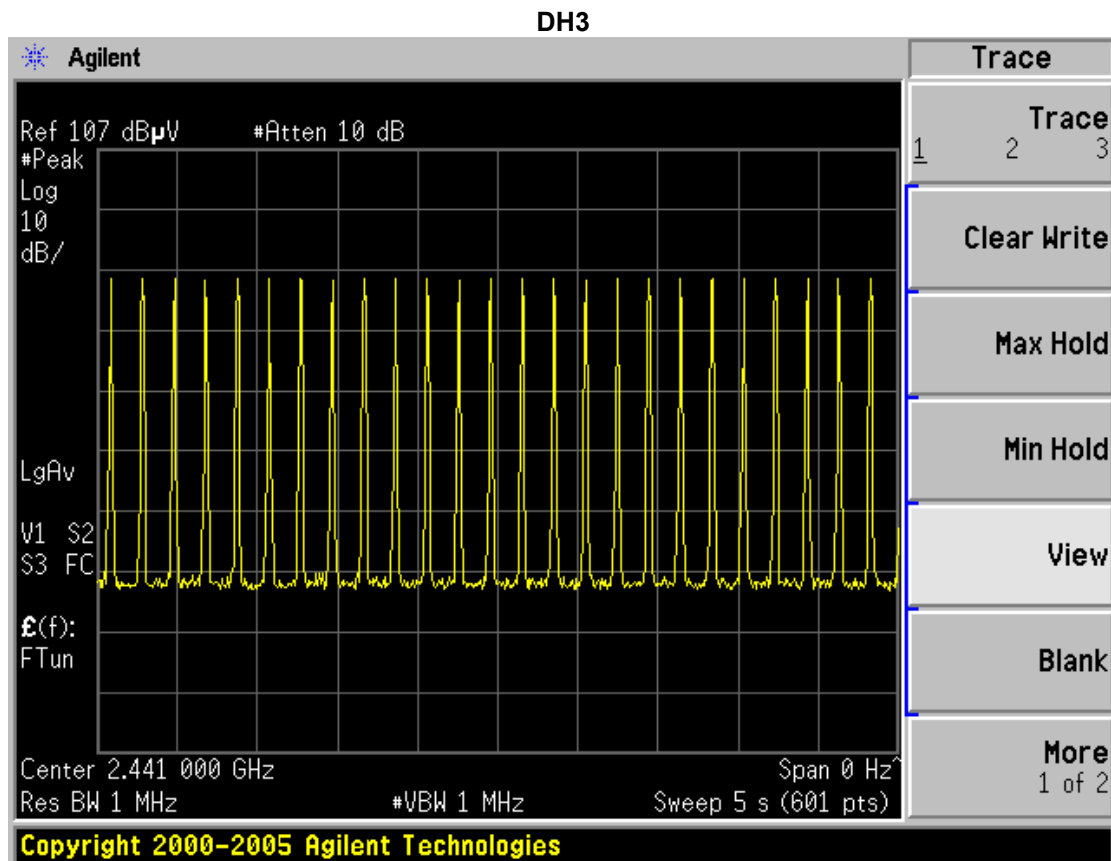
Mode	Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
DH 1	Middle	0.440	0.1408	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second				
DH 3	Middle	1.7000	0.2720	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second				
DH 5	Middle	3.0500	0.3253	0.4	Pass
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

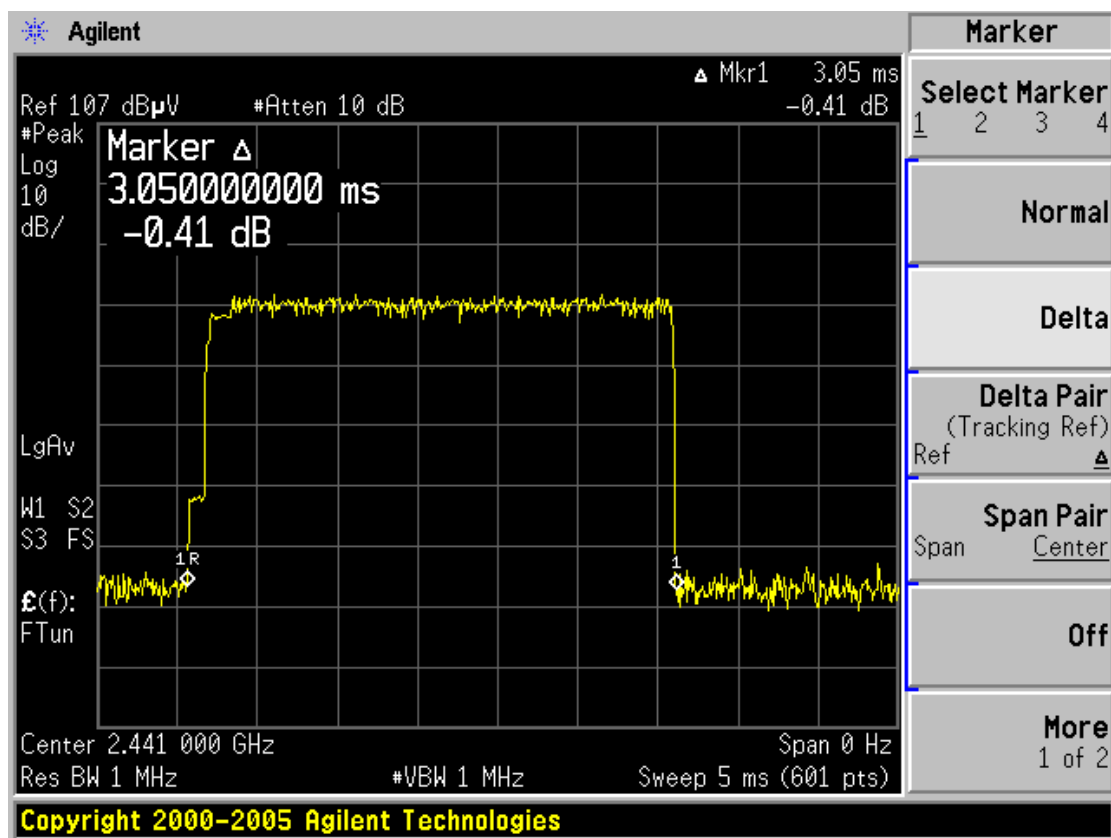
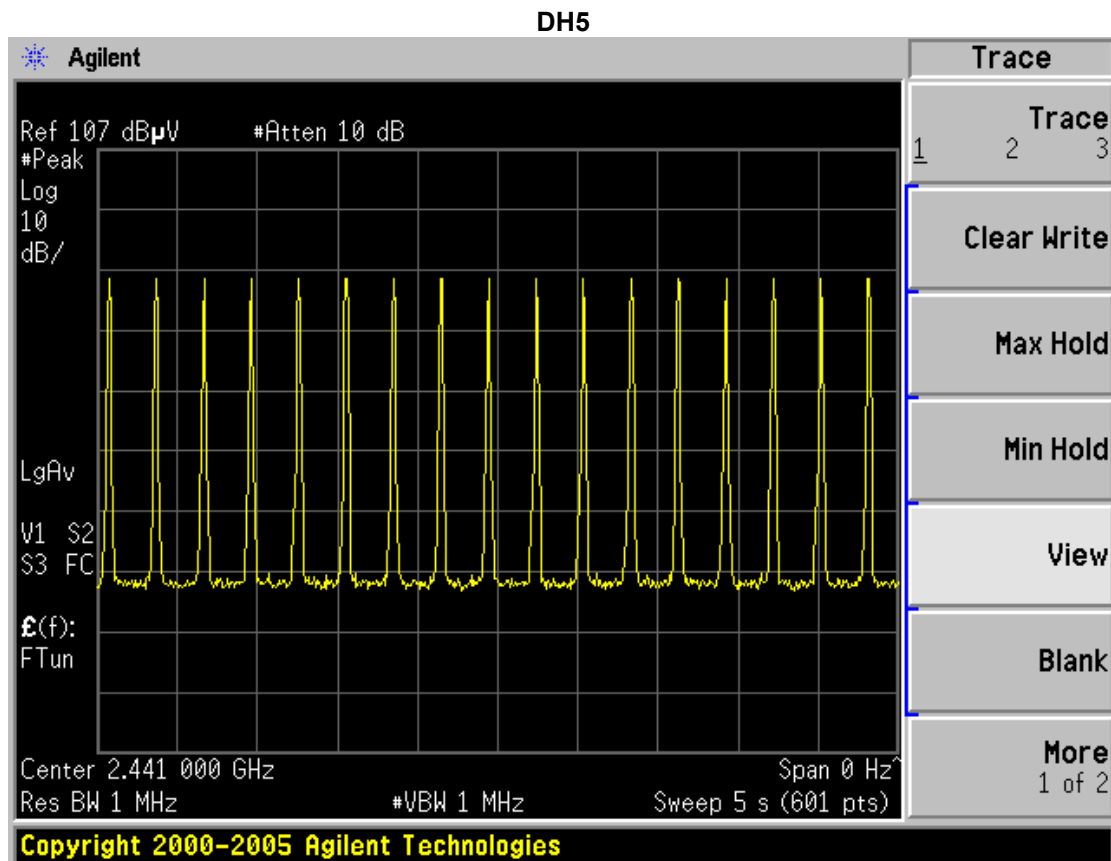
EDR Mode:

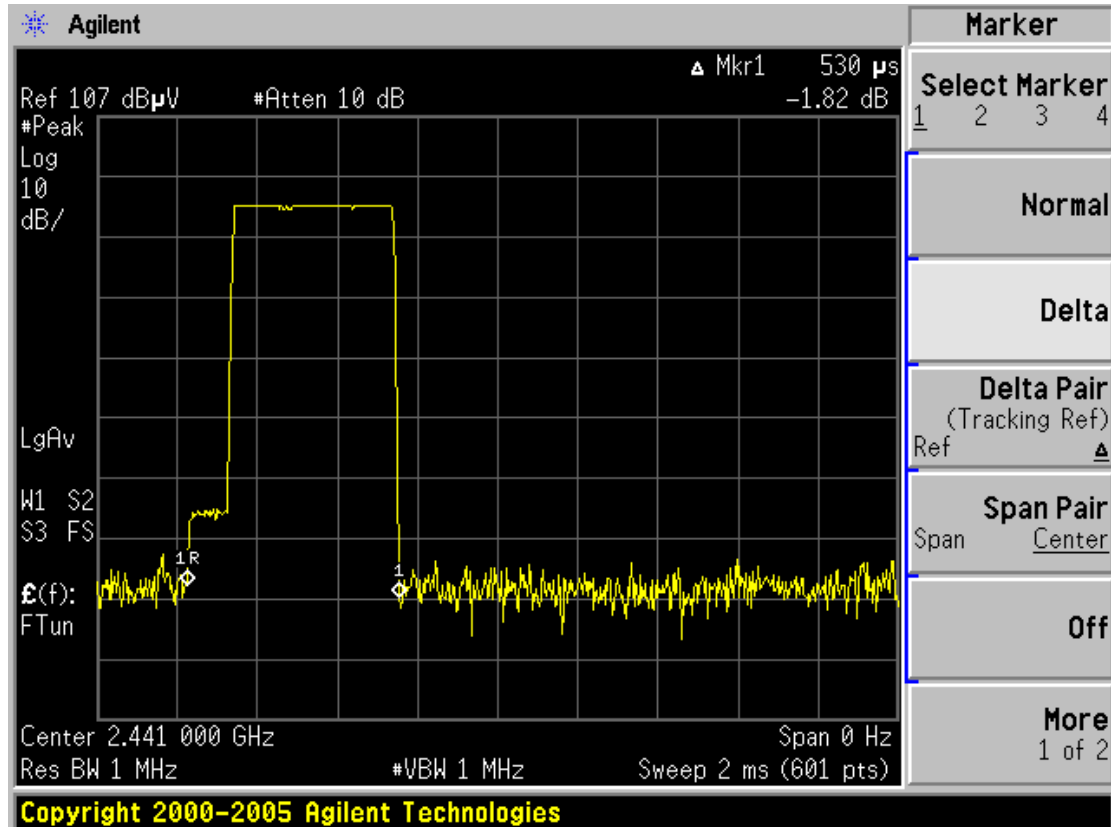
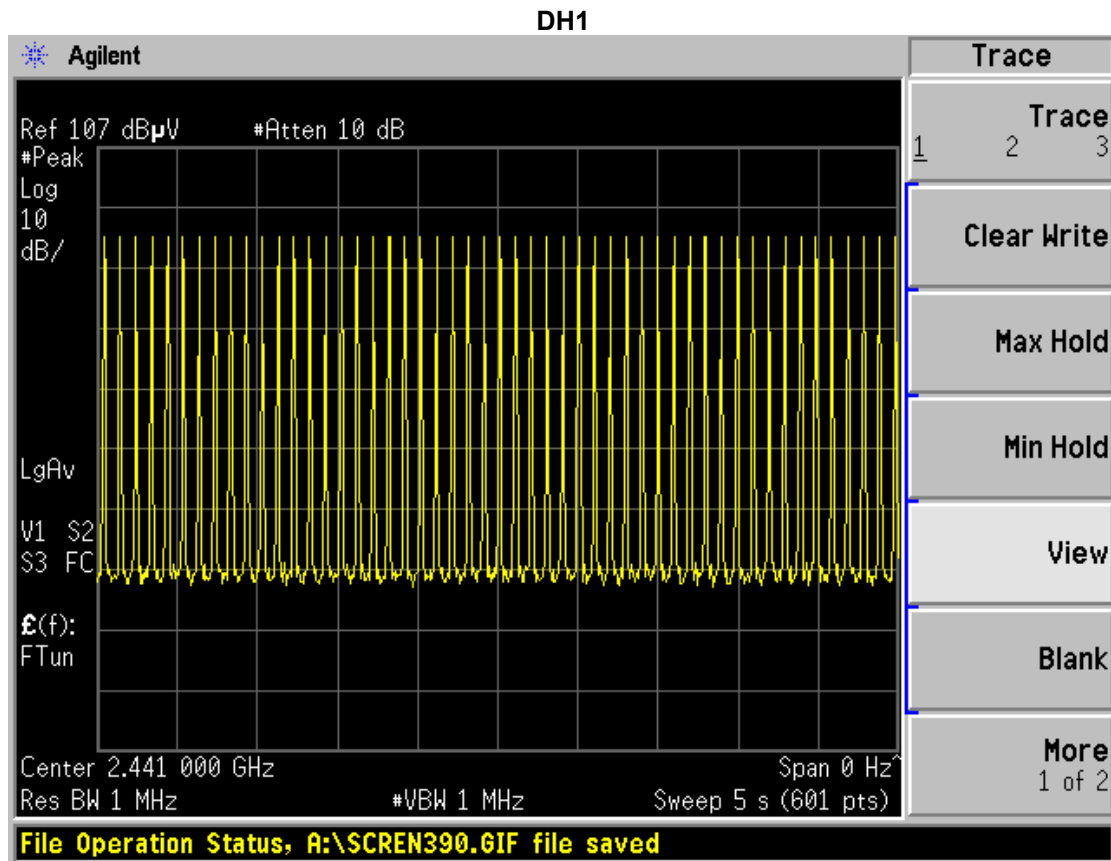
Mode	Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
DH 1	Middle	0.5300	0.1696	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second				
DH 3	Middle	1.7920	0.5734	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second				
DH 5	Middle	2.950	0.3147	0.4	Pass
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

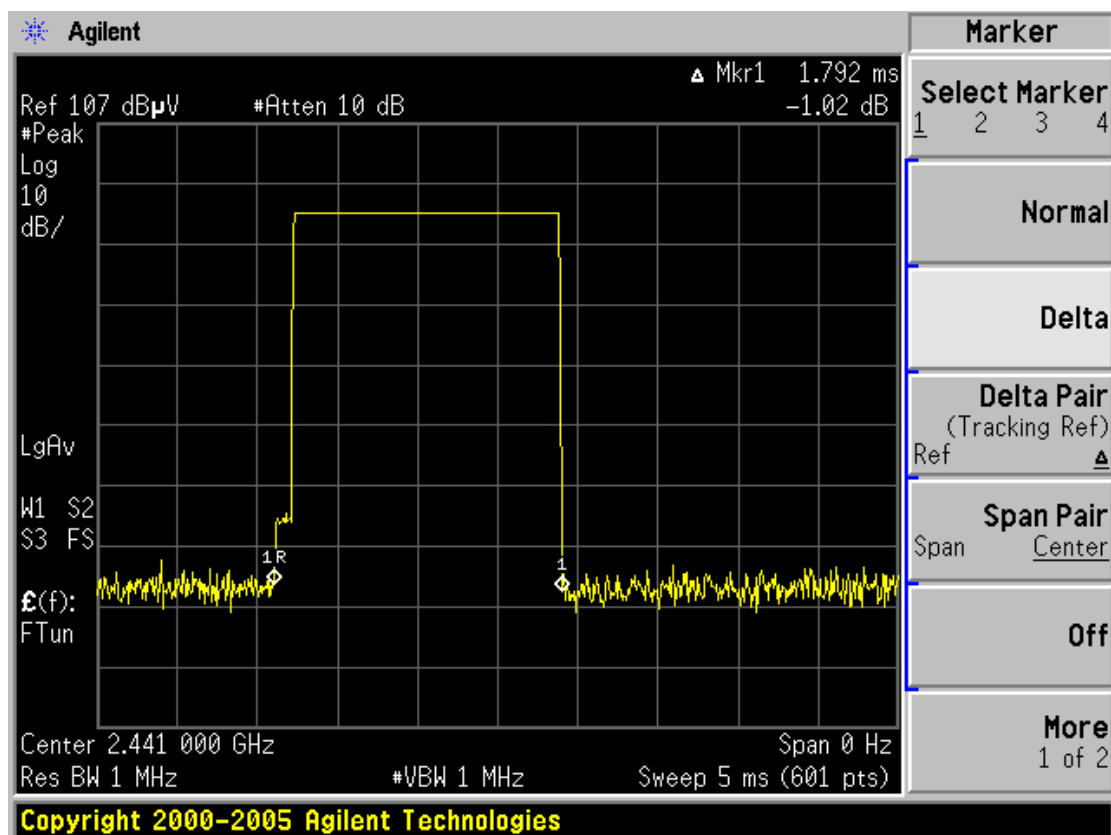
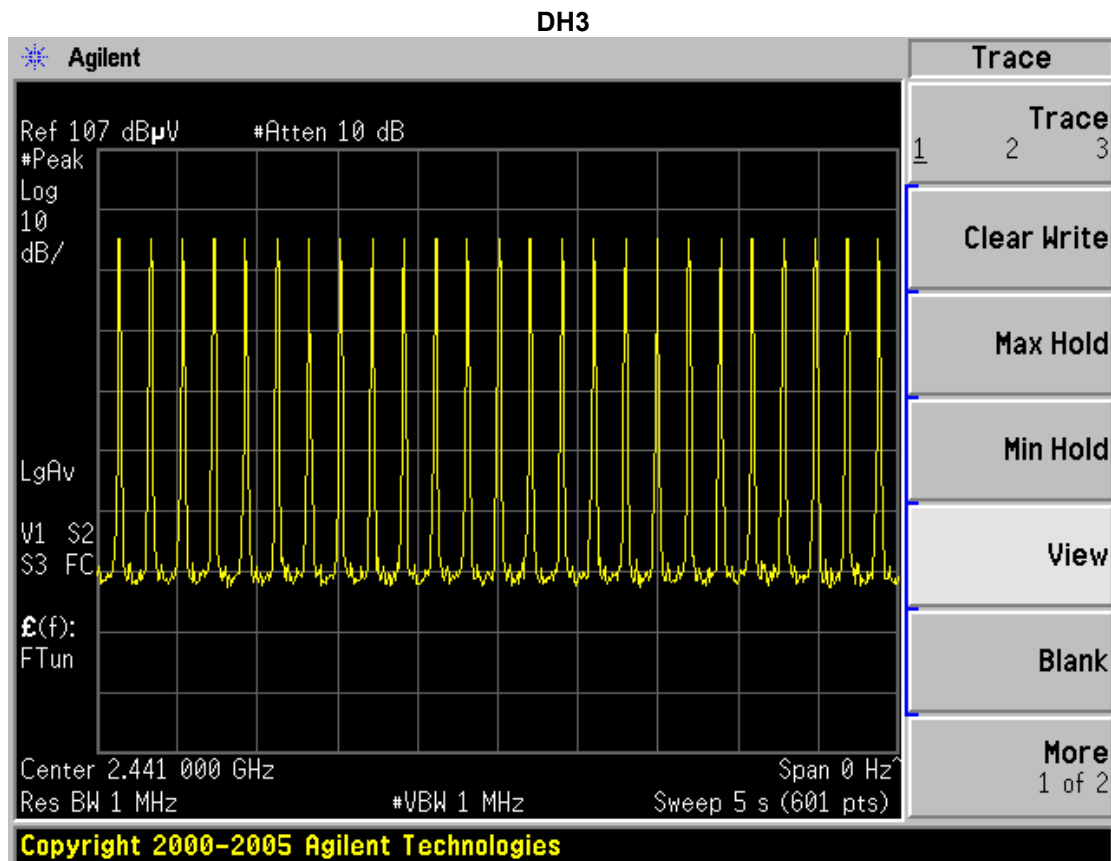
Photos of Dwell time Measurement (BDR)

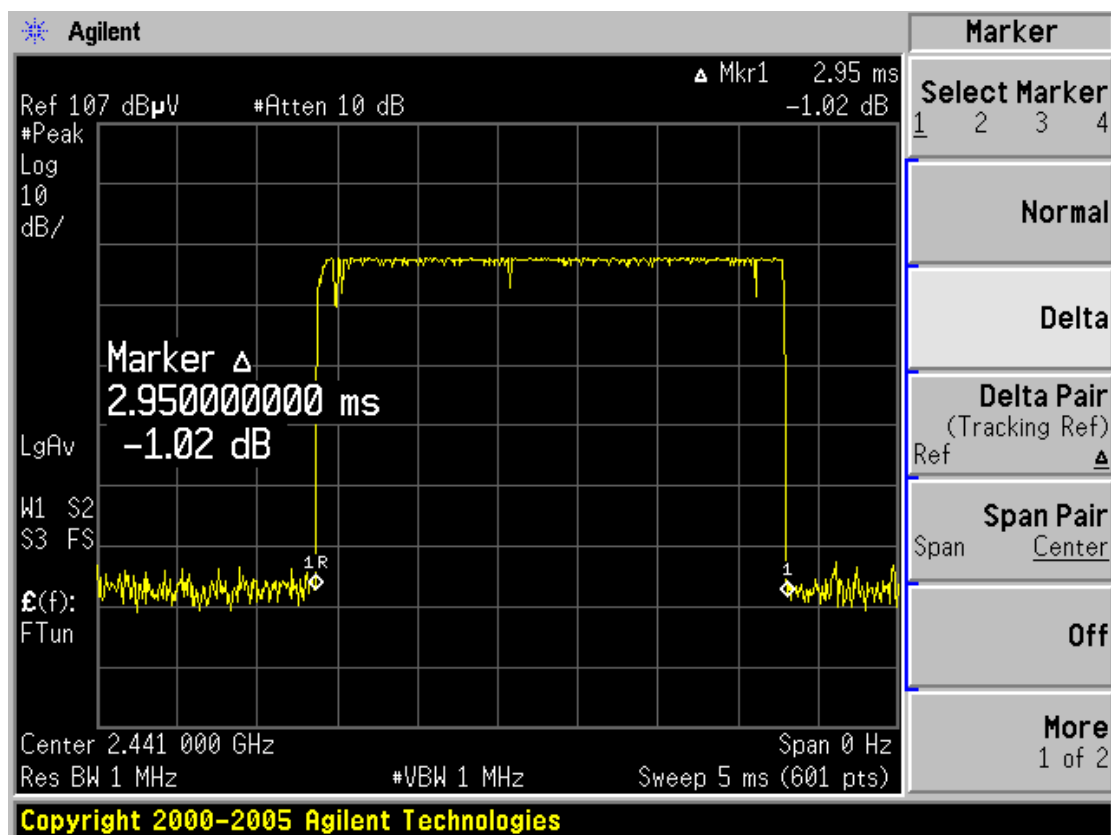
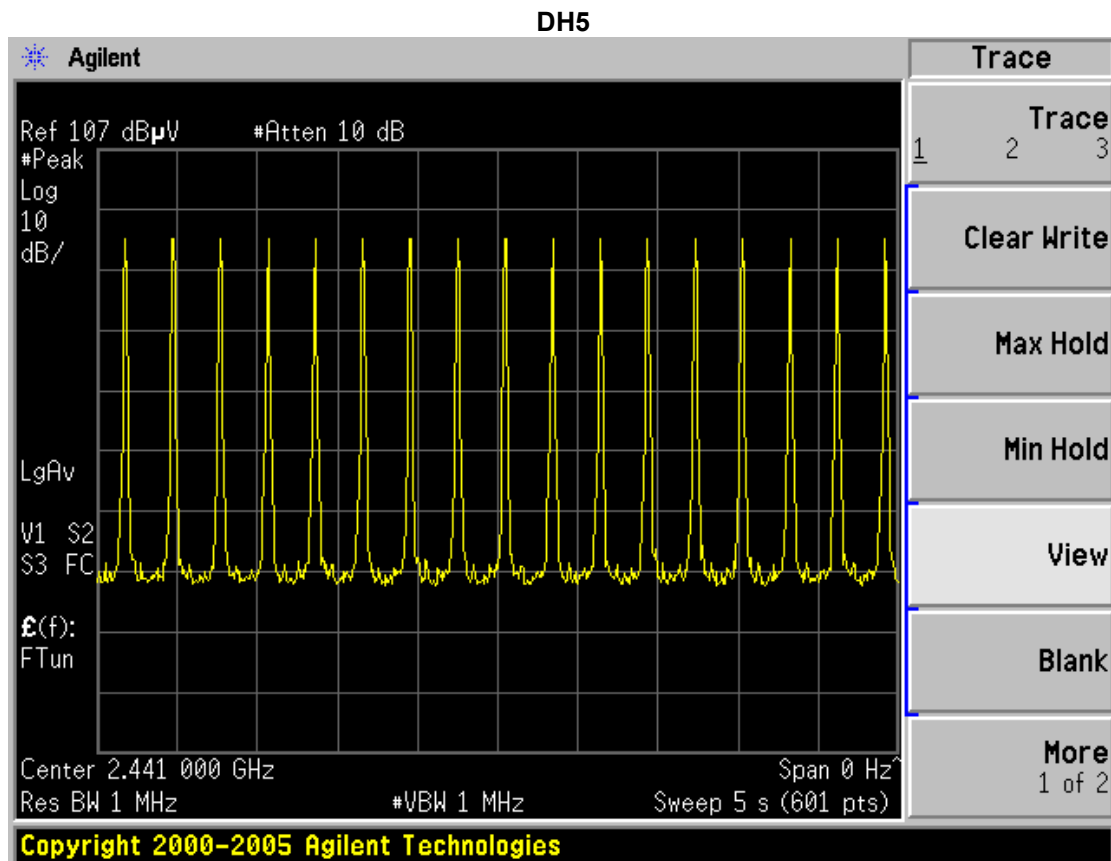






Photos of Dwell time Measurement(EDR)





4.10. Antenna Requirement

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.

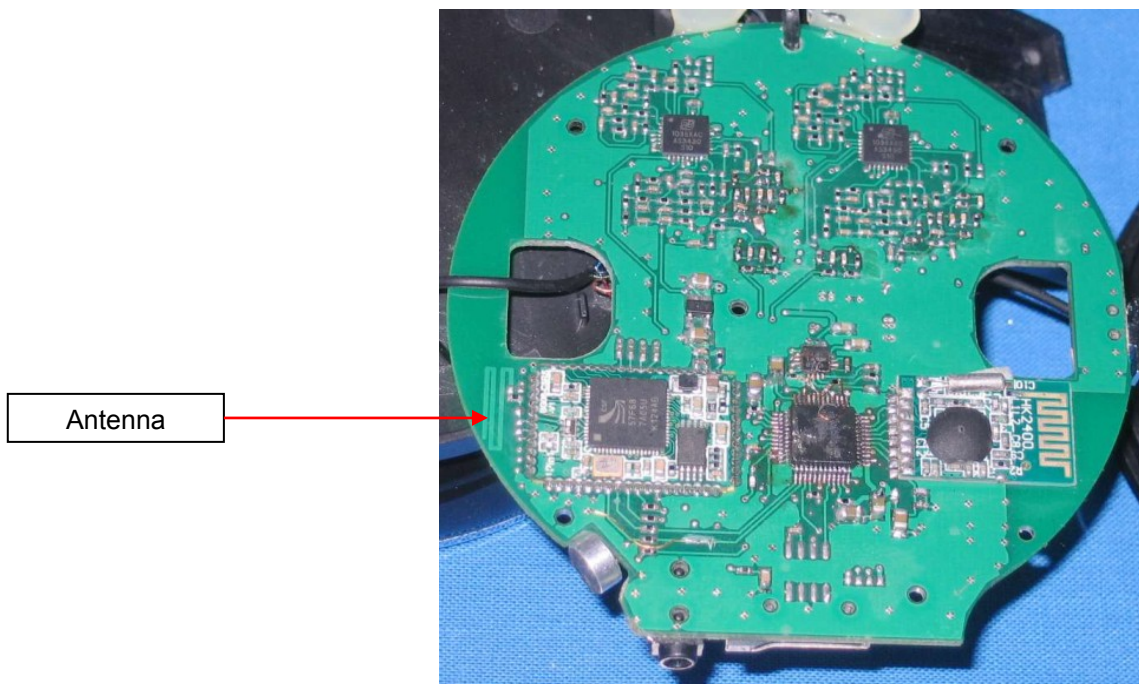
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.

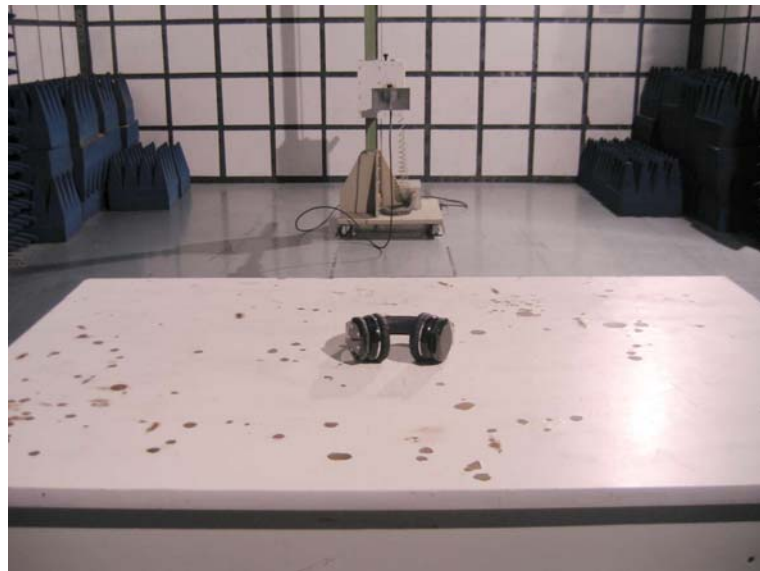
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a PCB Antenna .The maximum Gain of the antenna only 1.50 dBi. Detial please see the photos as following:



5. Test Setup Photos of the EUT



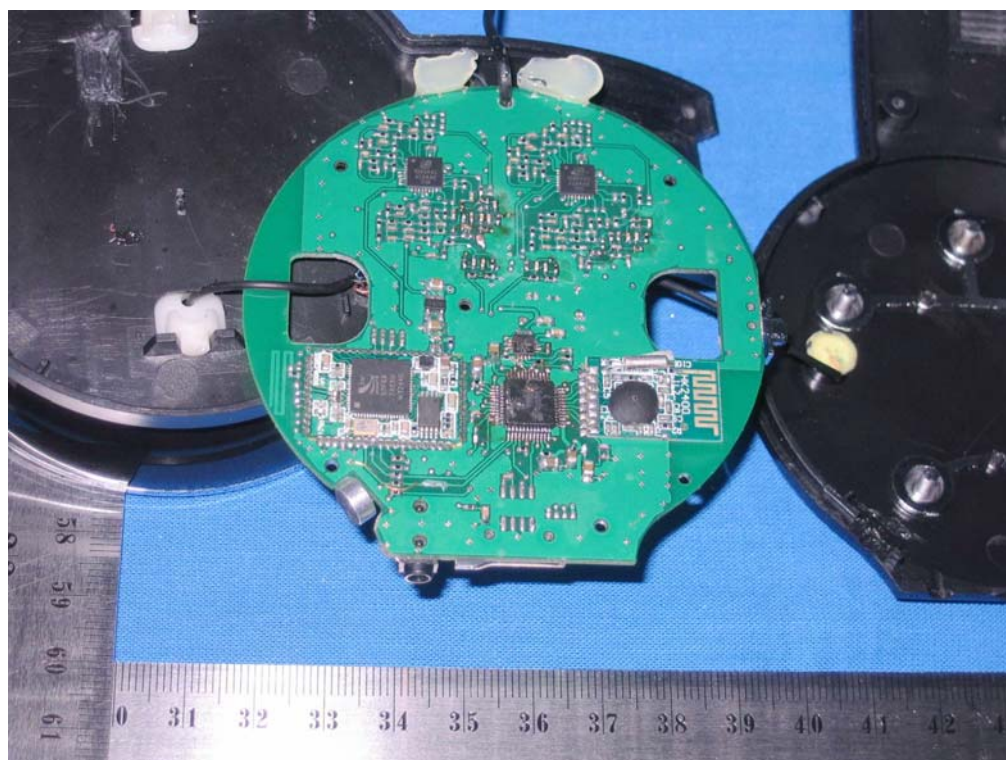
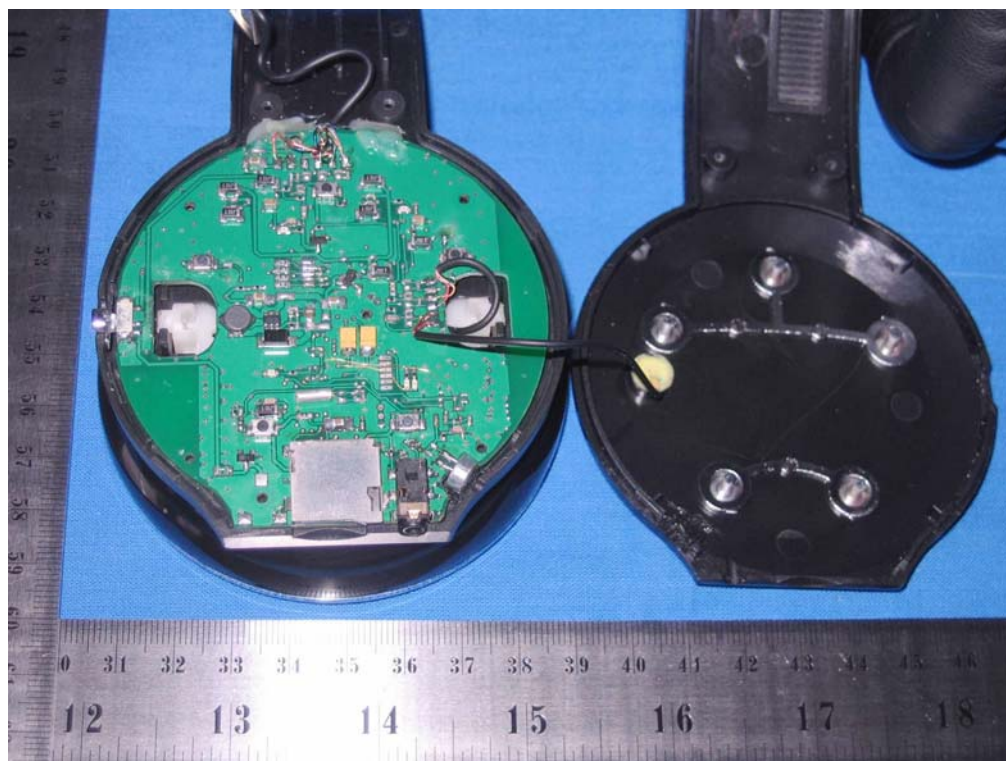
6. External and Internal Photos of the EUT

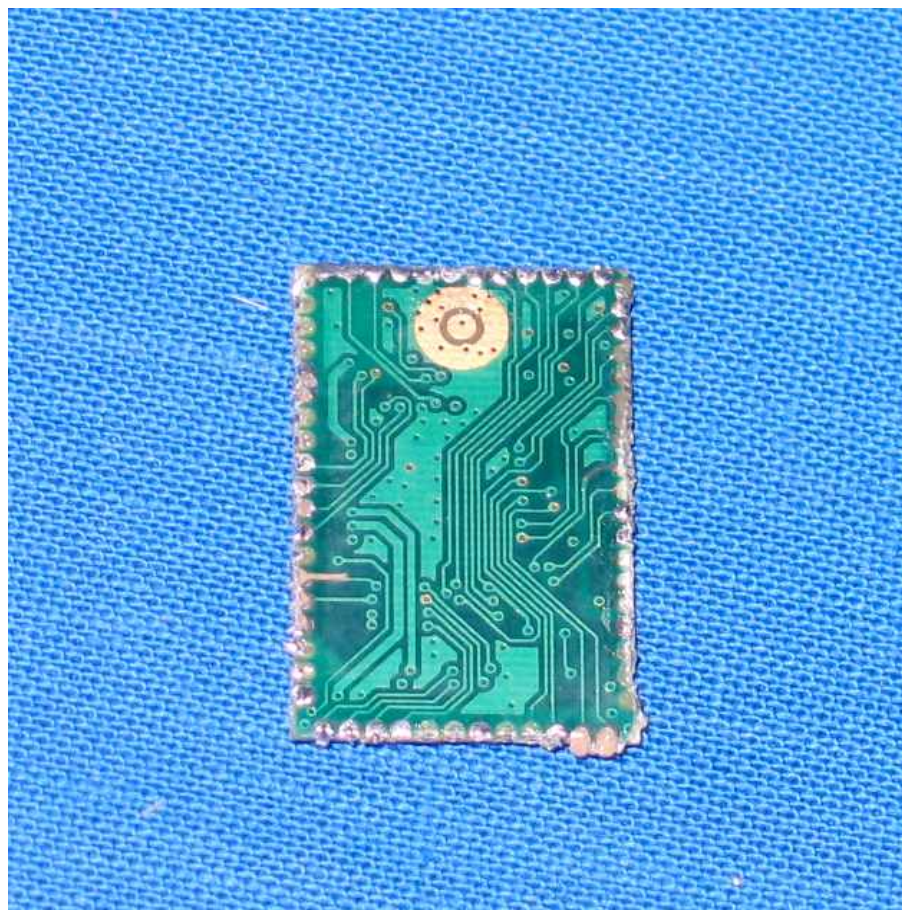
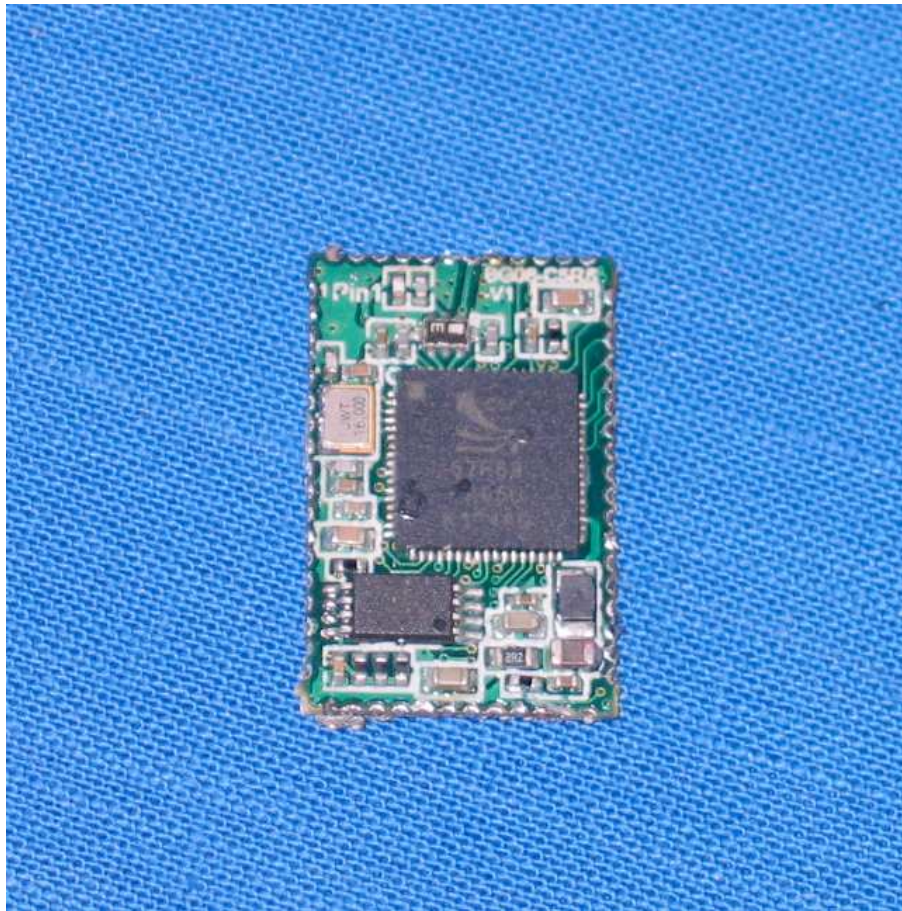
External Photos

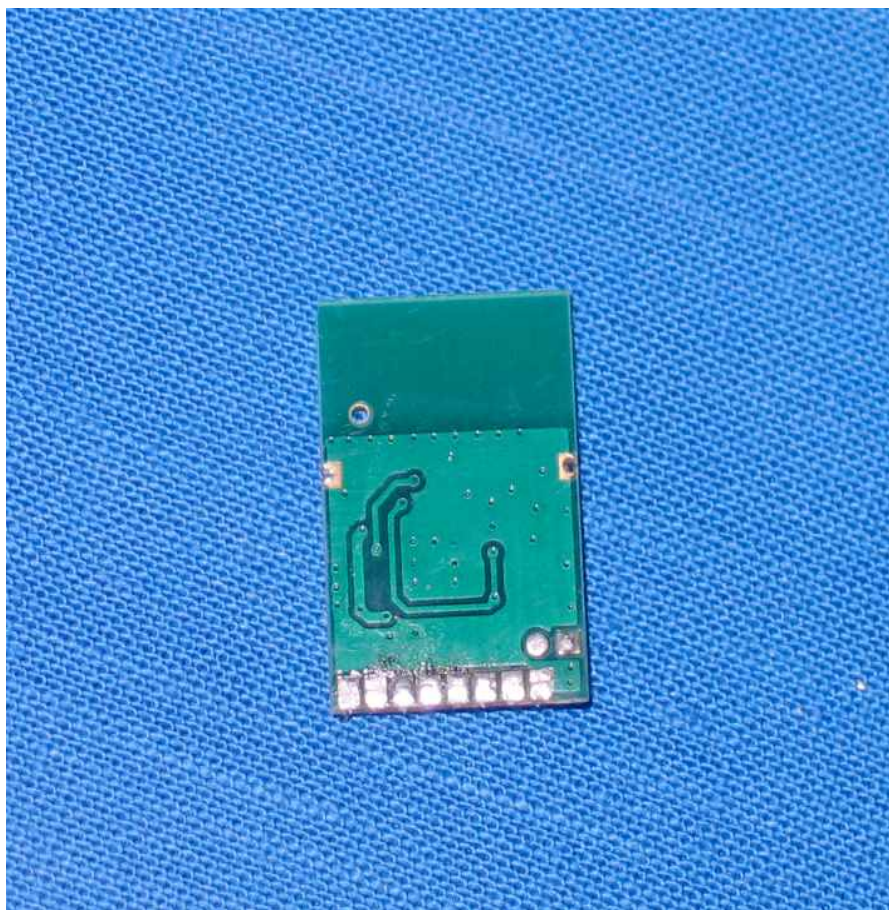
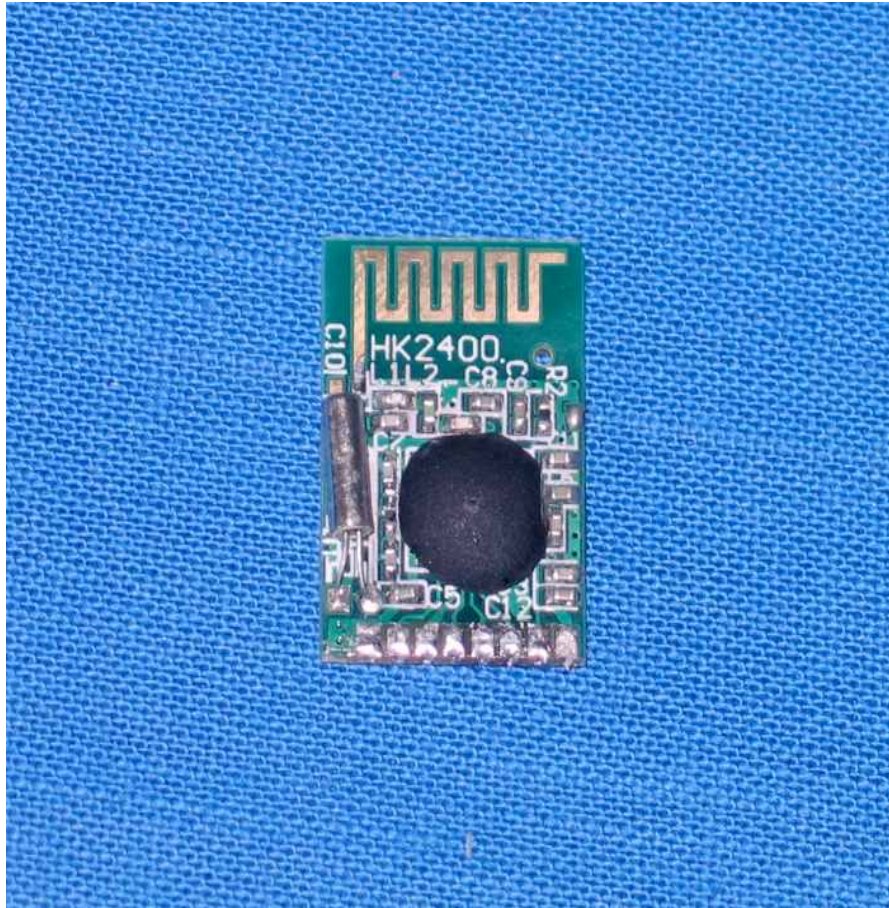




Internal Photos



BT Module

2.4G Module

.....End of Report.....