

**DIGITAL EMC CO., LTD.**

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<http://www.digitalemcc.com>**CERTIFICATION OF COMPLIANCE****LG Electronics USA.**

1000 Sylvan Avenue Englewood Cliffs New Jersey United States

Dates of Tests: March 15 ~ 17, 2010

Test Report S/N: DR50111003U

Test Site : DIGITAL EMC CO., LTD.

FCC ID

BEJHFB320

APPLICANT

LG Electronics USA.

Purpose	:	Original Grant
FCC Equipment Class	:	Part 15 Spread Spectrum Transmitter(DSS)
Device name	:	Bluetooth Hands-free Car Kit
Manufacturer	:	LG Electronics Inc.
FCC ID	:	BEJHFB320
Model name	:	HFB-320
Test Device Serial number	:	Identical prototype
FCC Rule Part(s)	:	FCC Part 15.247 Subpart C ANSI C63.4-2003
Frequency Range	:	2402 ~ 2480 MHz
Max. Output power	:	2.90 dBm Conducted
Data of issue	:	March 23, 2010

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1. General information

This report contains the result of tests performed by:

DIGITAL EMC CO., LTD.

Address: 683-3, Yubang-Dong, Yongin-Si, Kyunggi-Do, Korea. 449-080

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Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competent of calibration and testing laboratory".

Tested by: *Engineer*

March 23, 2010

D.C. Cha



Date

Name

Signature

Reviewed by: *Manager*

March 23, 2010

W.J. Lee



Date

Name

Signature

Applicant:

Company name : LG Electronics USA.

Address : 1000 Sylvan Avenue Englewood Cliffs, New Jersey, United States

Date of order : February 26, 2010

2. Equipment information

BEJHFB320

2.1 Equipment description

Equipment model no.	HFB-320
Equipment serial no.	Identical prototype
Type of equipment	Bluetooth Hands-free Car Kit
Frequency band	2402 ~ 2480 MHz
Type of Modulation	☒ GFSK for 1Mbps(BDR mode) ☐ $\pi/4$ -DQPSK for 2Mbps(EDR mode) ☐ 8DPSK for 3Mbps(EDR mode)
Spread Spectrum	Frequency Hopping
Channel Spacing	1.0 MHz
Power	Battery: DC 3.7V
Type of antenna	☒ Internal Type: PIFA Antenna (Max. Peak Gain: 3.5 dBi) ☐ External Type:



2.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
Cigarette Lighter Adapter	CLA-305	CB0BPE00156	LG Electronics Inc.	-
-	-	-	-	-

3. Information about test items

BEJHFB320

3.1 Tested frequency

- Hopping Function: Enable

Frequency	TX	RX
Frequency band of operation	2402MHz ~ 2480MHz	2402MHz ~ 2480MHz

- Hopping Function: Disable

Frequency	TX	RX
Lowest Channel	2402MHz	2402MHz
Middle Channel	2441MHz	2441MHz
Highest Channel	2480MHz	2480MHz

3.2 Tested environment

Temperature	:	22~23 °C
Relative humidity content	:	34~44 % R.H.
Details of power supply	:	DC 3.7V for Conducted & Radiated test items DC 12.0V for Radiated test items

3.3 Test mode

Test Case 1	EUT
Test Case 2	EUT + Cigarette Lighter Adapter

3.4 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

3.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing

→ None

4. Test Report

4.1 Summary of tests

FCC Part Section(s)	Parameter	Limit (Using in 2400 ~ 2483.5MHz)	Test Condition	Status Note 1
I. Test Items				
15.247(a)	Carrier Frequency Separation	$\geq 20\text{dB BW}$ or $\geq$ Two-Thirds of the 20dB BW	Conducted	C
	Number of Hopping Frequencies	≥ 15 hops		C
	20 dB Bandwidth	None		C
	Dwell Time	≤ 0.4 seconds		C
15.247(b)	Transmitter Output Power	$\leq 1\text{Watt}$, if CHs ≥ 75 Others $\leq 0.125\text{W}$		C
15.247(c)	Band-edge /Conducted	The radiated emission to any 100 kHz of out-band shall be at least 20dB below the highest in-band spectral density.		C
	Conducted Spurious Emissions		C	
15.205 15.209	Radiated Spurious Emissions	FCC 15.209 Limits	Radiated	C
15.207	AC Conducted Emissions	EN 55022	AC Line Conducted	NA Note 2
15.203	Antenna Requirements	FCC 15.203	-	C
Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable				
Note 2: Conducted emission test is not applicable. Because the power of the EUT is supplied from a car battery.				

The sample was tested according to the following specification:
ANSI C-63.4-2003, DA00-705

4.2 Transmitter requirements

4.2.1 Carrier Frequency Separation

- Procedure:

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to:

Span = wide enough to capture the peaks of two adjacent channels

RBW = 1% of the span

Sweep = auto

VBW = $\geq$ RBW

Detector function = peak

Trace = max hold

- Measurement Data: **Comply**

Hopping Mode	Data rate	Peak of center channel (MHz)	Peak of adjacent Channel (MHz)	Test Result (MHz)
Enable	1Mbps	2441.000	2442.017	1.017

See next page for actual measured spectrum plot.

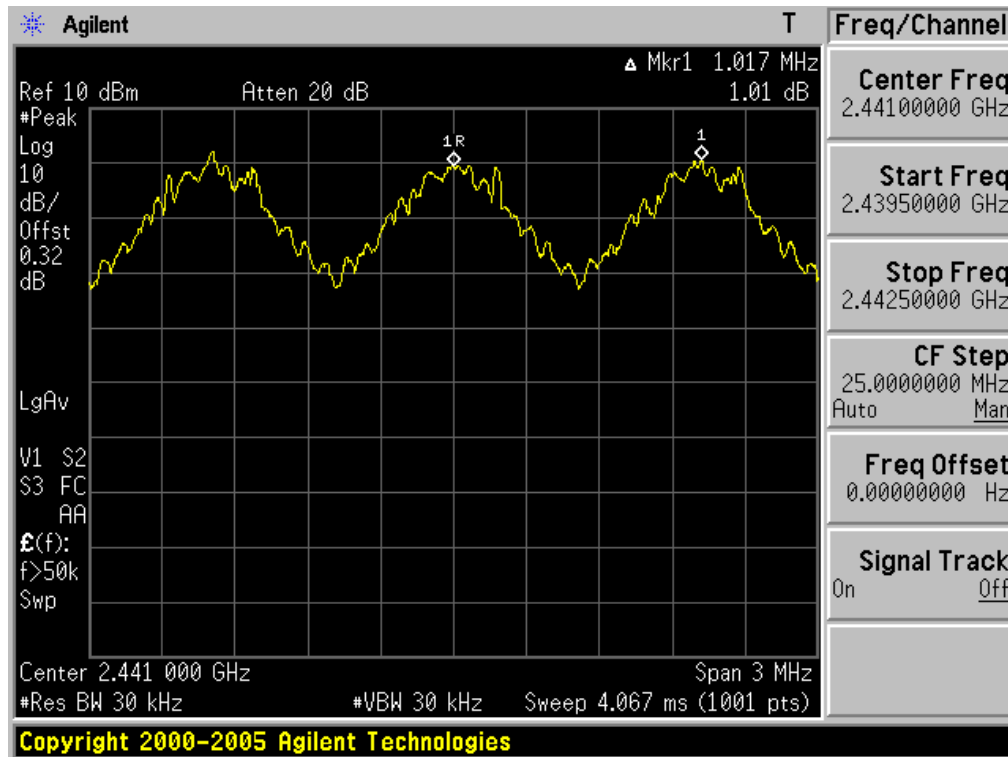
- Minimum Standard:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

Carrier Frequency Separation

Hopping mode: Enable



4.2.2 Number of Hopping Frequencies

- Procedure:

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

To get higher resolution, four frequency ranges within the 2400 ~ 2483.5 MHz FH band were examined.

The spectrum analyzer is set to:

Span = 25MHz Plot 1: Start Frequency = 2389.5MHz, Stop Frequency = 2414.5 MHz

Plot 2: Start Frequency = 2414.5MHz, Stop Frequency = 2439.5 MHz

Plot 3: Start Frequency = 2439.5MHz, Stop Frequency = 2464.5 MHz

Plot 4: Start Frequency = 2464.5MHz, Stop Frequency = 2489.5 MHz

RBW = 1% of the span or more

Sweep = auto

VBW = $\geq$ RBW

Detector function = peak

Trace = max hold

- Measurement Data: **Comply**

Hopping mode	Data rate	Test Result (Total Hops)
Enable	1Mbps	79

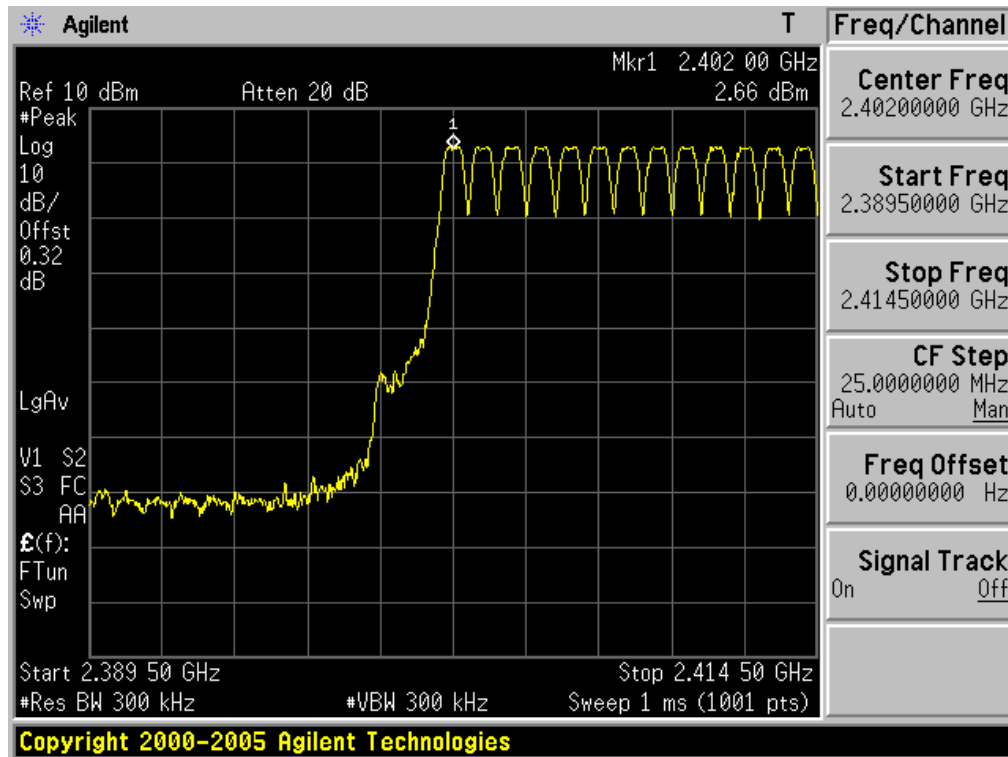
Note 1: See next pages for actual measured spectrum plots.

- Minimum Standard:

At least 15 hops

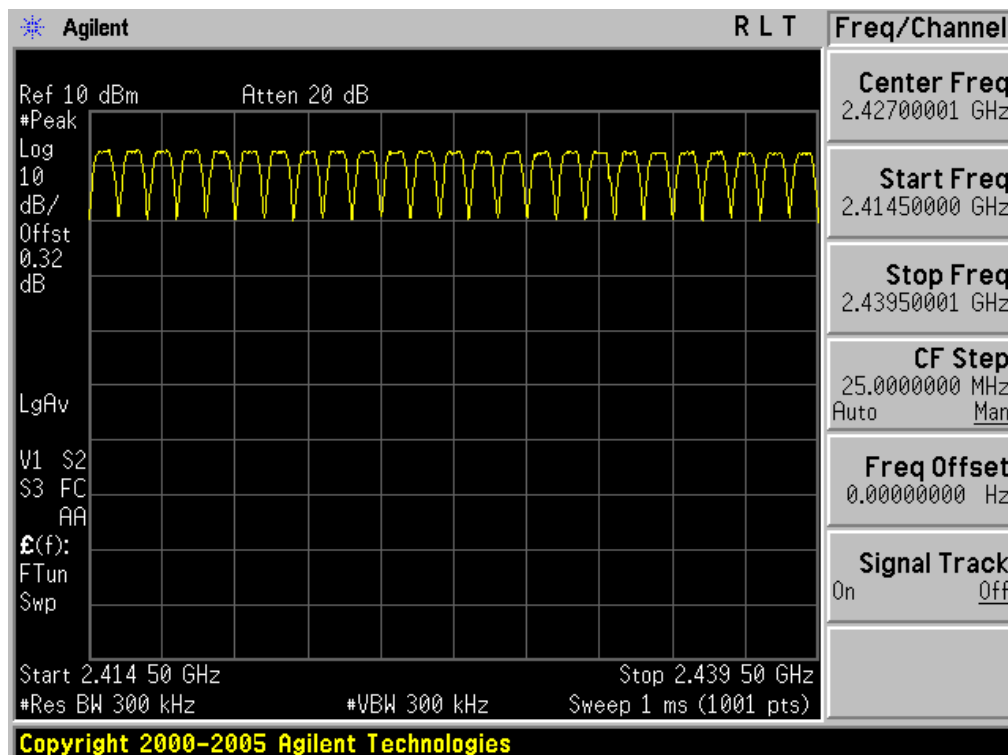
Number of Hopping Frequencies 1

Hopping mode: Enable



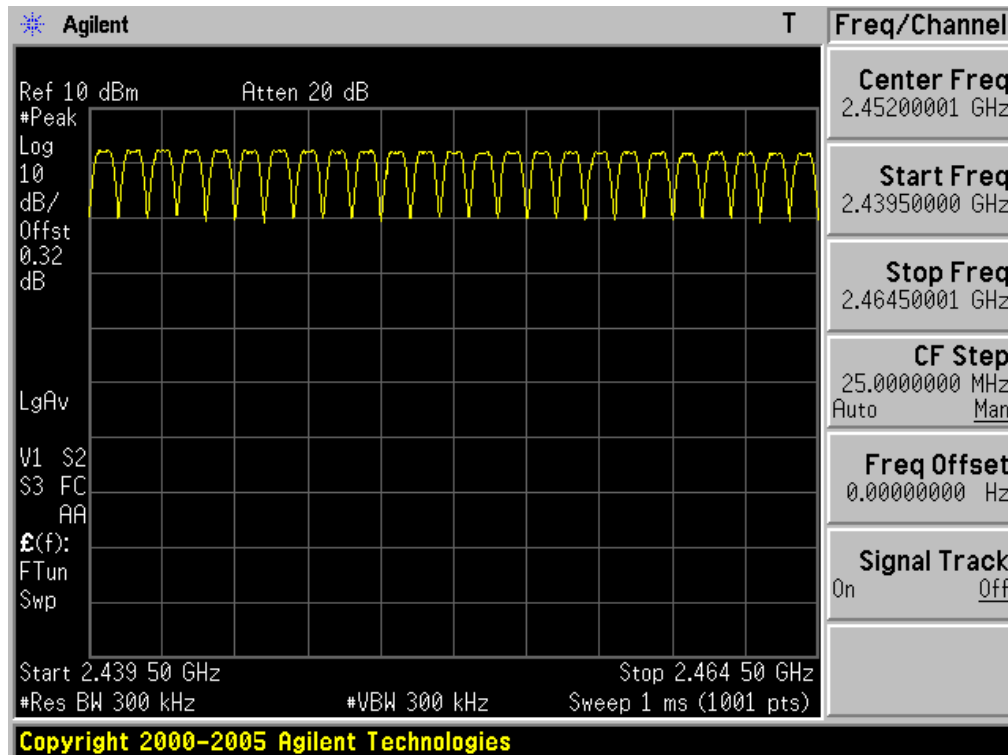
Number of Hopping Frequencies 2

Hopping mode: Enable



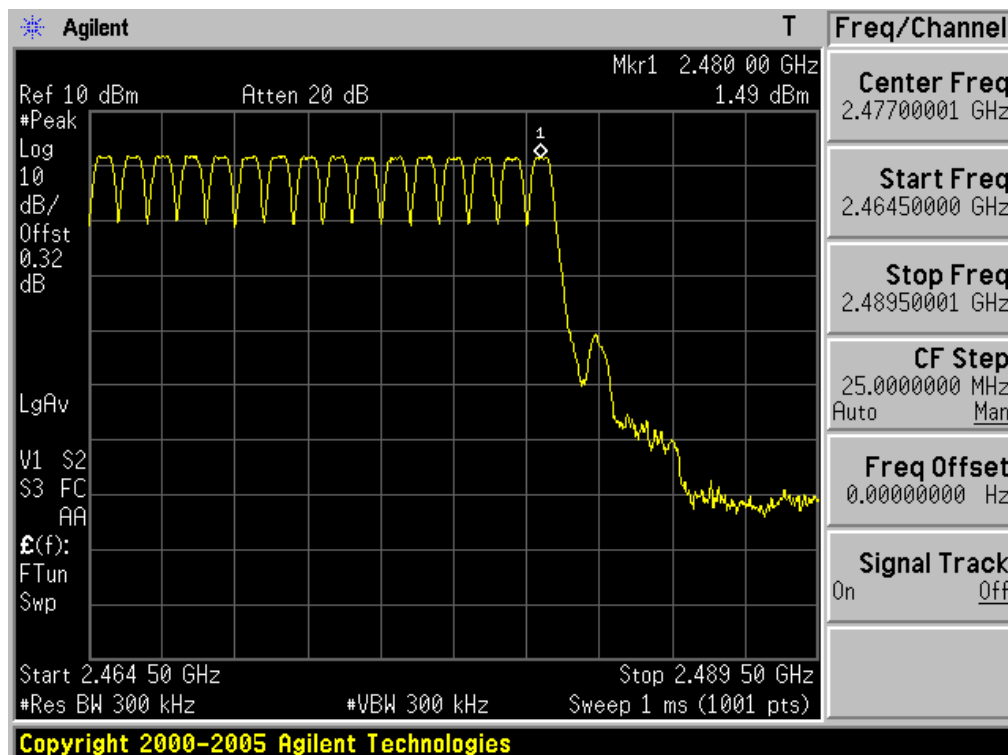
Number of Hopping Frequencies 3

Hopping mode: Enable



Number of Hopping Frequencies 4

Hopping mode: Enable



4.2.3 20 dB Bandwidth

- Procedure:

The bandwidth at 20 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest Frequencies

Span = approximately 2 or 3 times of the 20 dB bandwidth

RBW = 1% of the 20dB bandwidth or more

Sweep = auto

VBW = $\geq$ RBW

Detector function = peak

Trace = max hold

- Measurement Data: **Comply**

Hopping mode	Date rate	Tested Channel	Test Results (MHz)
Disable	1Mbps	Lowest	0.935
		Middle	0.935
		Highest	0.935

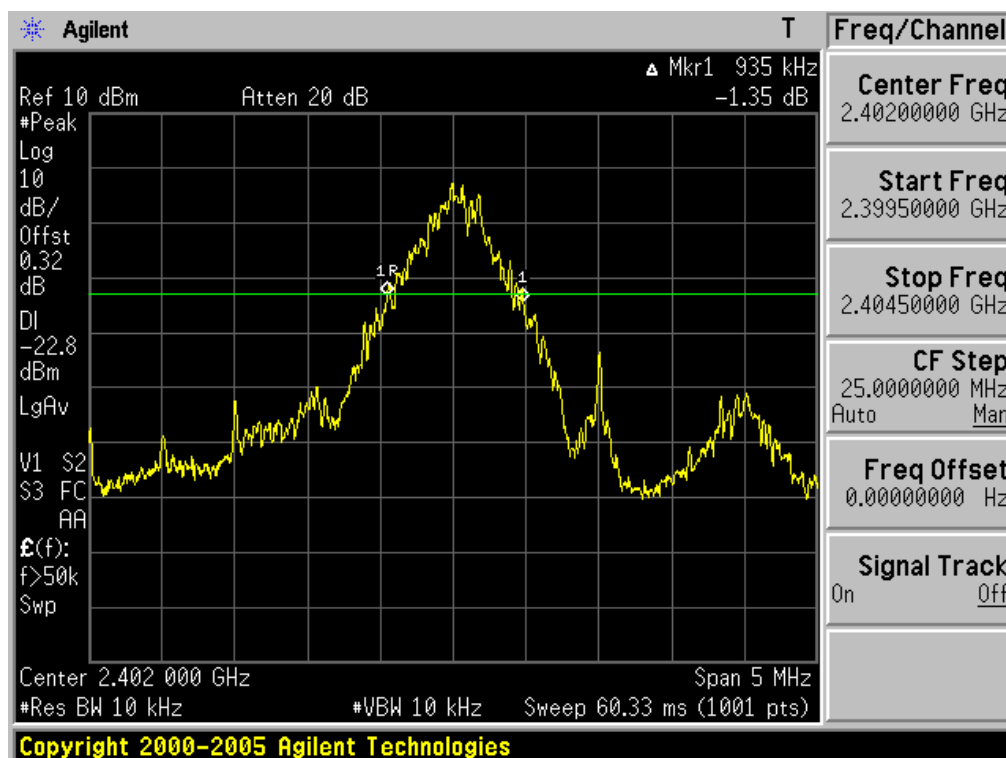
Note 1: See next pages for actual measured spectrum plots.

- Minimum Standard:

None

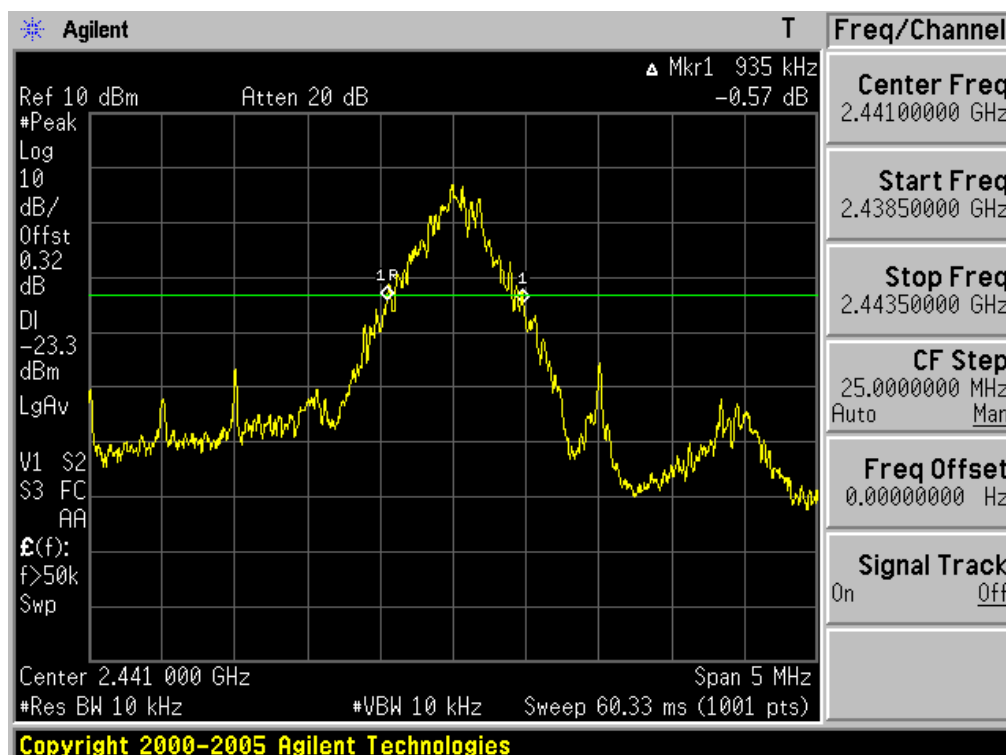
20dB Bandwidth

Lowest Channel



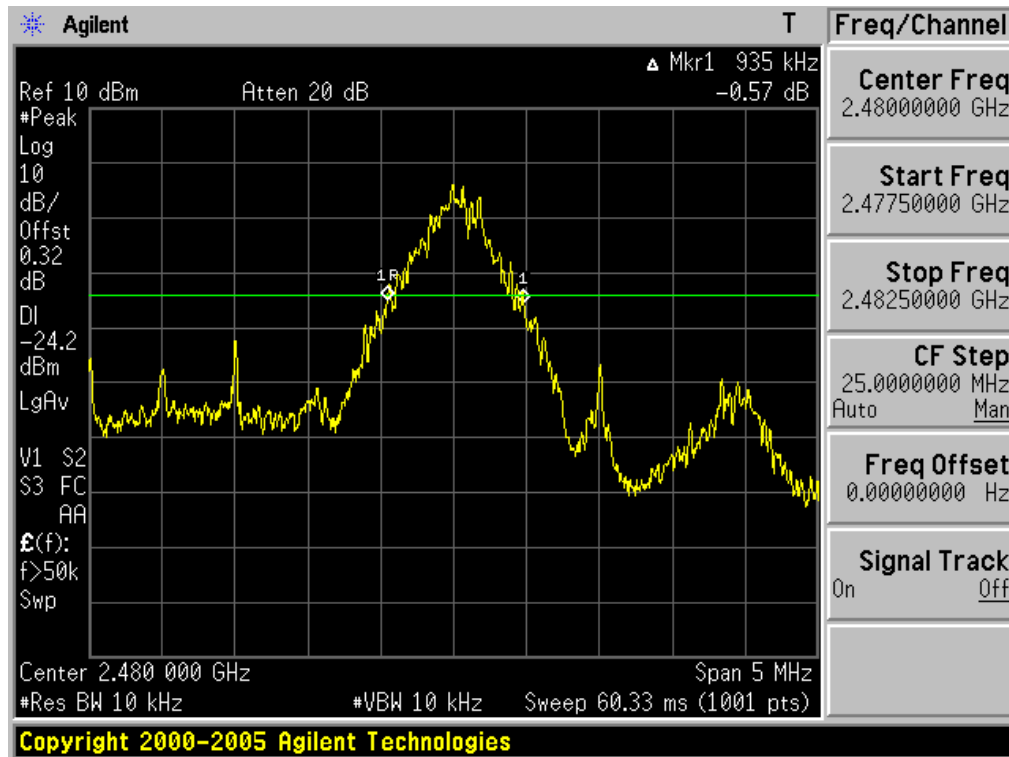
20dB Bandwidth

Middle Channel



20dB Bandwidth

Highest Channel



4.2.4 Time of Occupancy (Dwell Time)

- Procedure:

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to:

Center frequency = 2441 MHz

Span = zero

RBW = 1 MHz

VBW = $\geq$ RBW

Trace = max hold

Detector function = peak

- Measurement Data: **Comply**

Hopping mode	Data Rate	Packet Type	Burst On Time (ms)	Period (ms)	Number of hopping Channels	Test Result (s)
Enable	1Mbps	DH 5	2.895	3.75	79	0.309

Note 1: Each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event.

DWELL TIME = $(0.4 \times \text{Number of hopping Channels}) \times \text{Burst On time} / (\text{period} \times \text{Number of hopping Channels})$

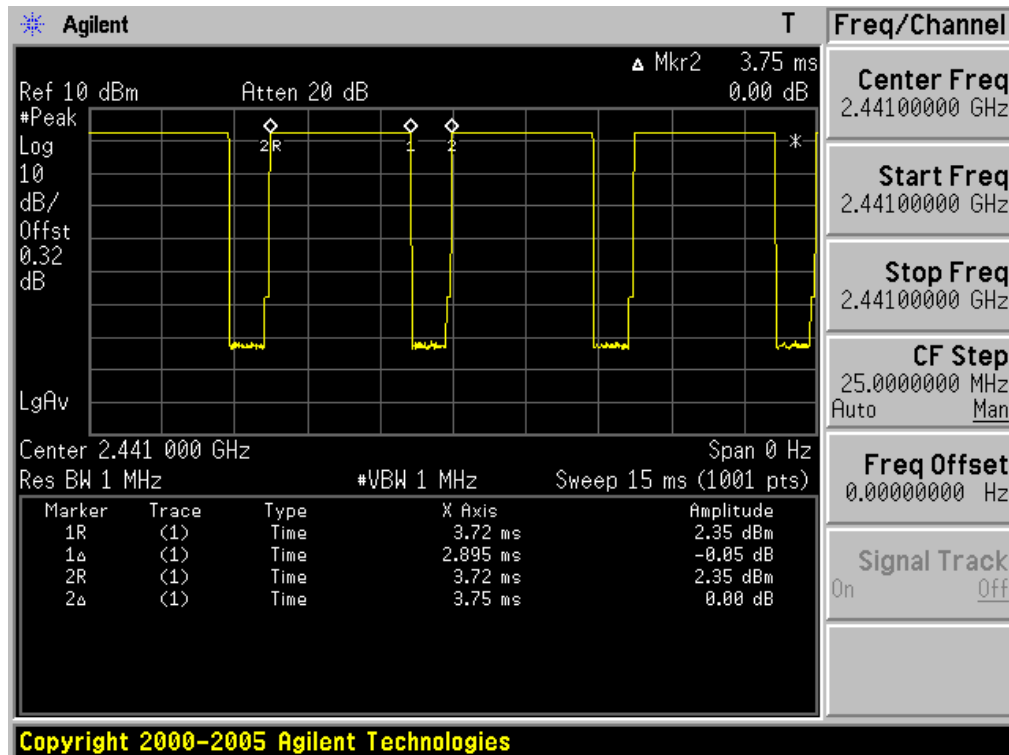
Note 2: See next pages for actual measured spectrum plots.

- Minimum Standard:

No greater than 0.4 seconds

Time of Occupancy

Hopping mode: Enable



4.2.5 Peak Output Power

- Procedure:

The peak output power was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest Frequencies

Span = approximately 5 times of the 20 dB bandwidth

RBW = greater than the 20dB bandwidth of the emission being measured

VBW = $\geq$ RBW

Detector function = peak

Trace = max hold

Sweep = auto

- Measurement Data: **Comply**

Hopping mode	Data rate	Tested Channel	Test Results	
			dBm	mW
Disable	1Mbps	Lowest	2.90	1.950
		Middle	2.38	1.730
		Highest	1.52	1.419

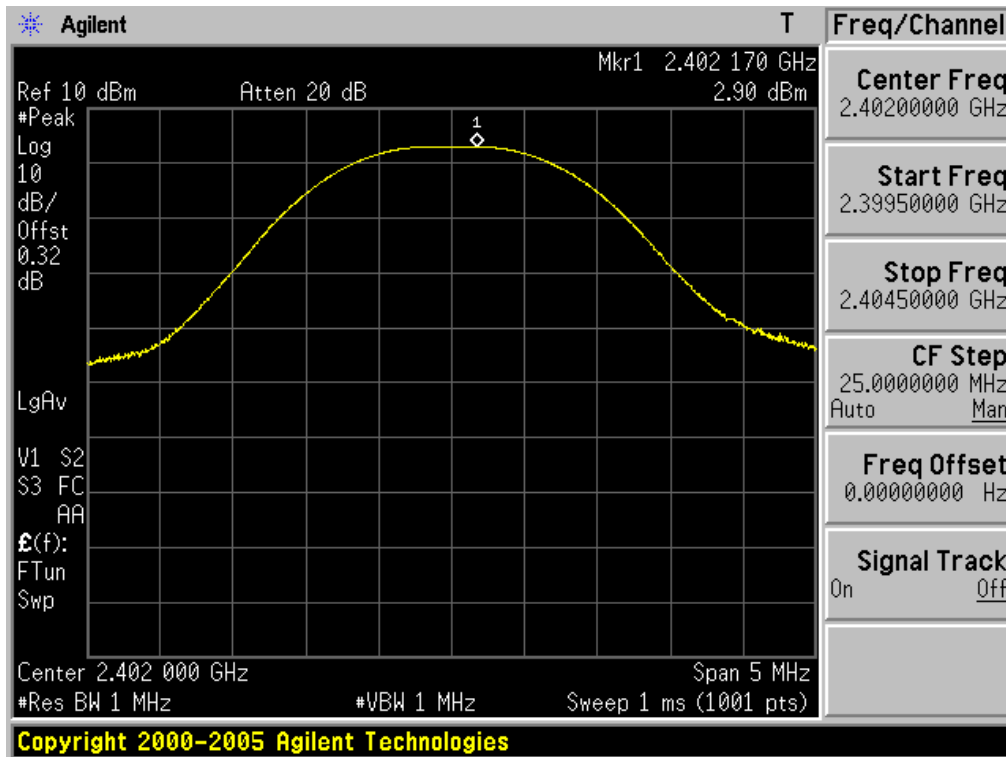
Note 1: See next pages for actual measured spectrum plots.

- Minimum Standard:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping 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**

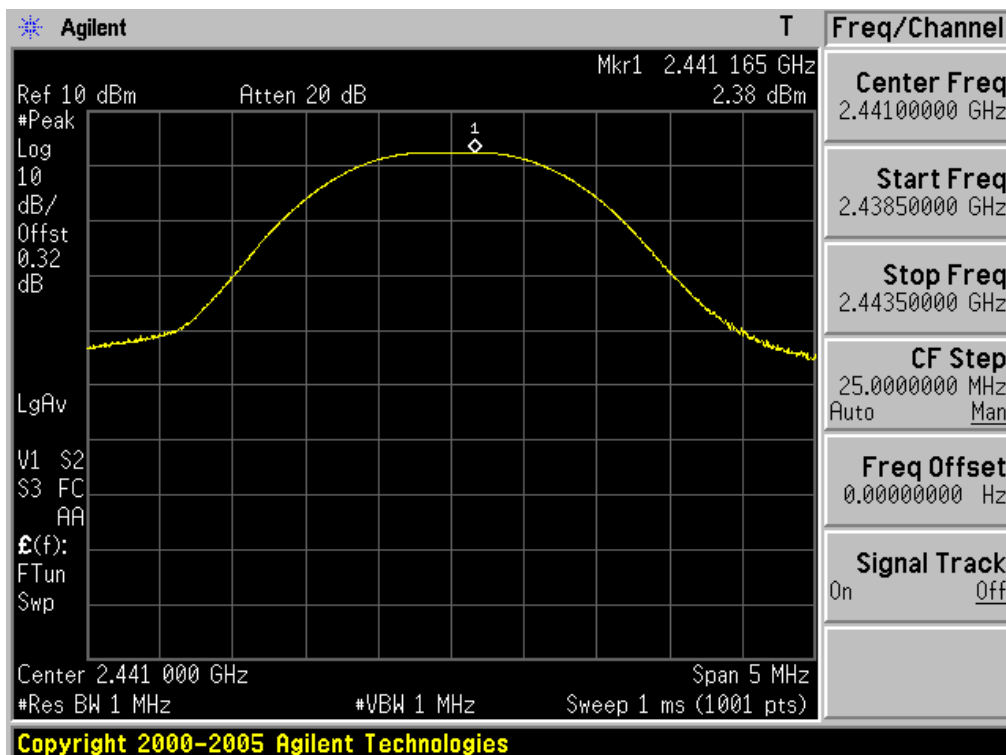
Peak Output Power

Lowest Channel



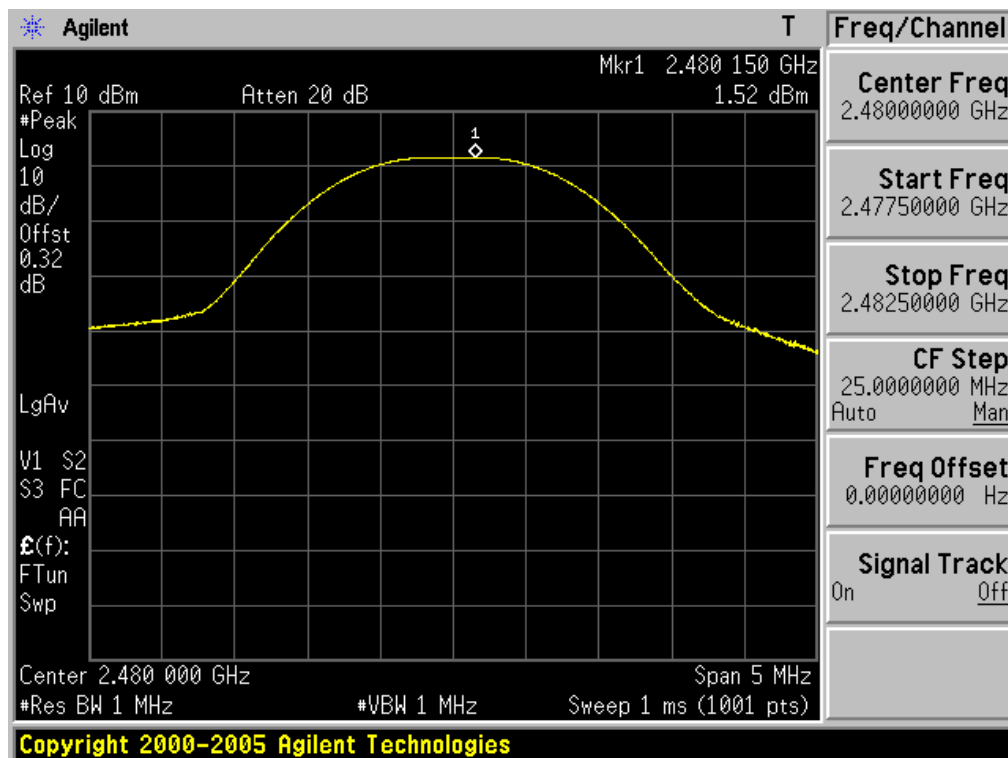
Peak Output Power

Middle Channel

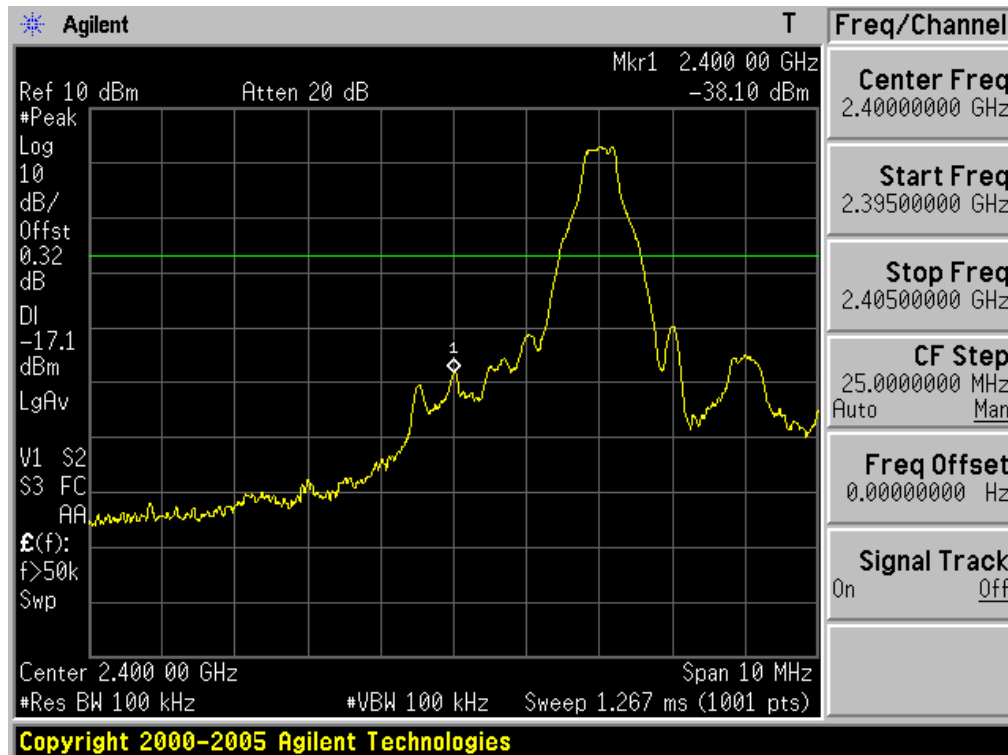


Peak Output Power

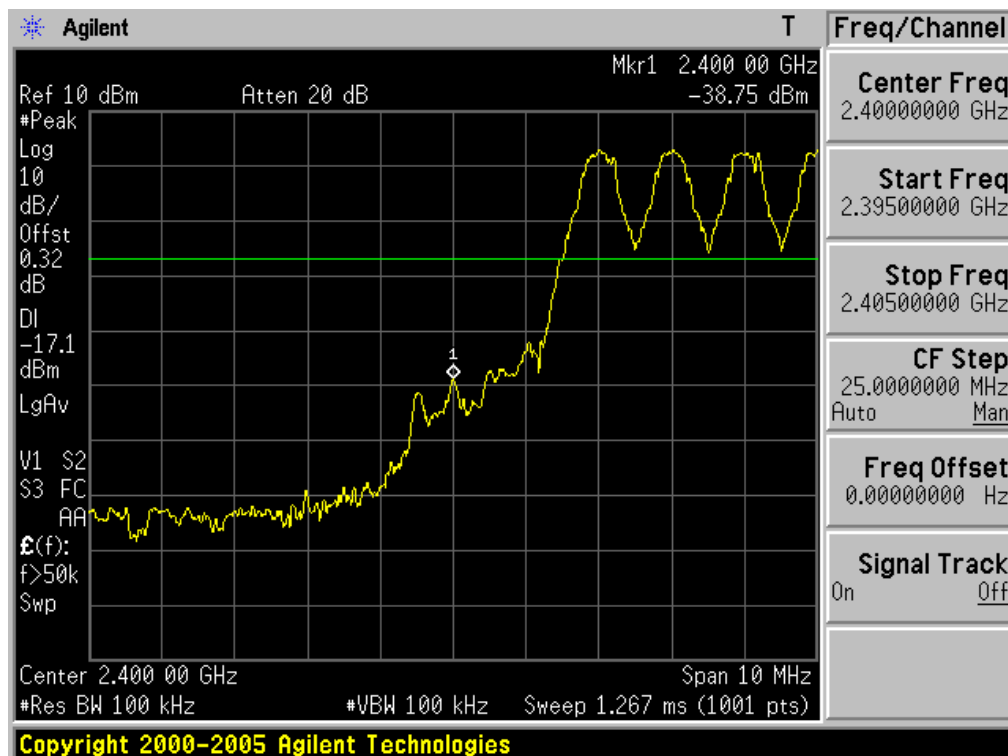
Highest Channel



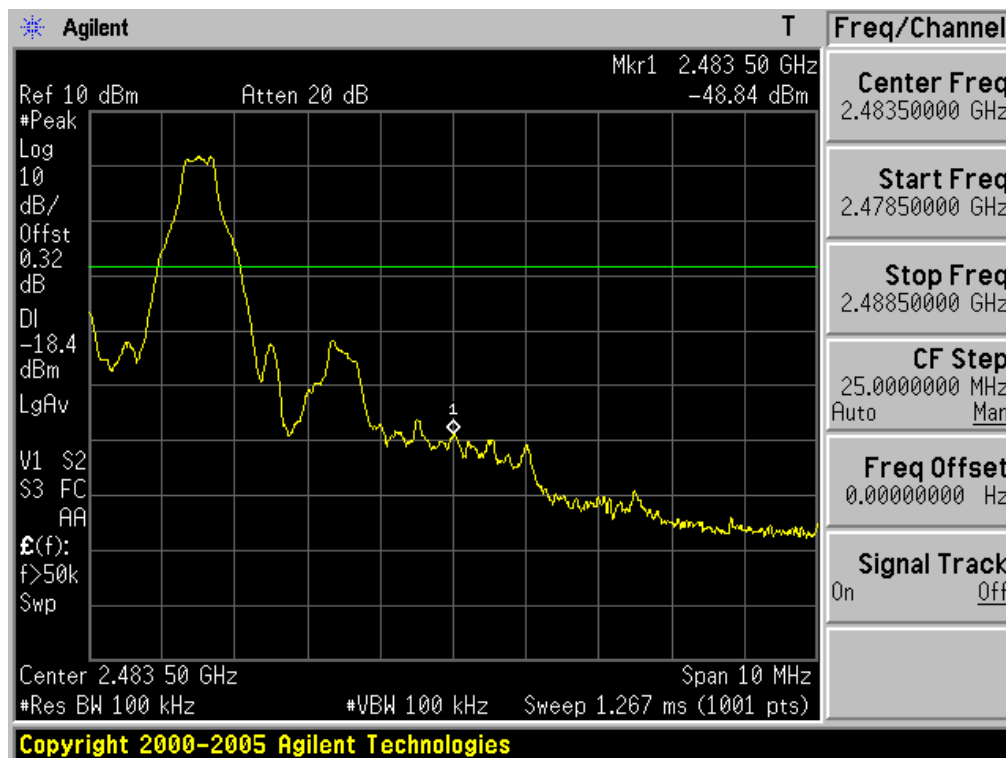
Low Band-edge Hopping mode: Disable & Lowest Channel



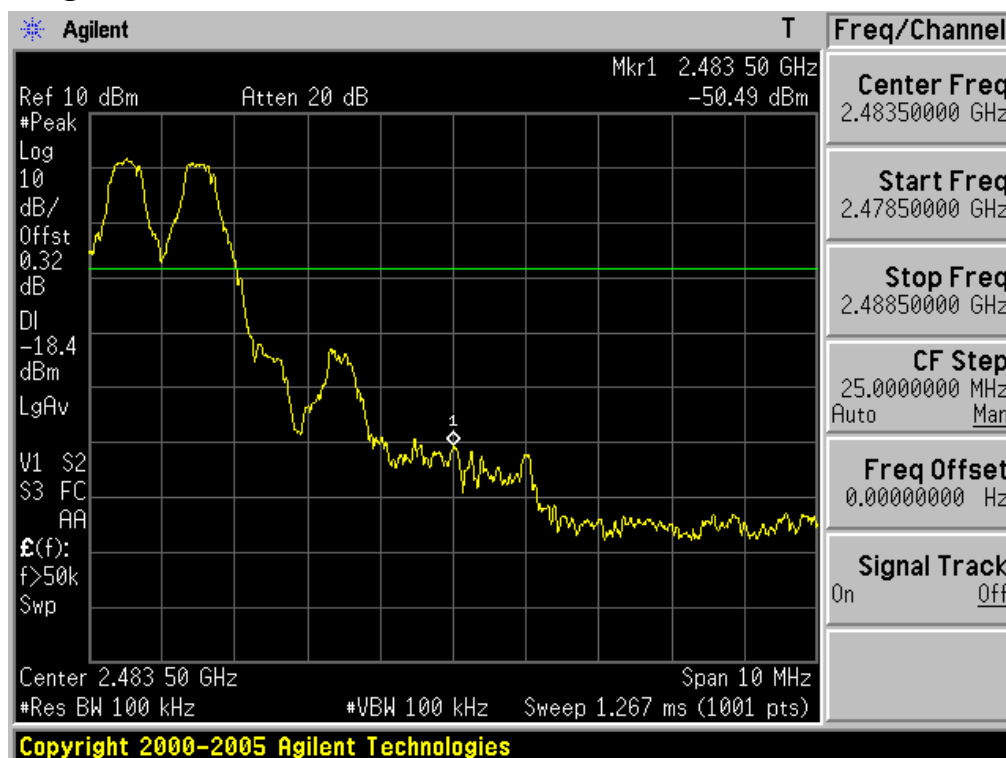
Low Band-edge Hopping mode: Enable



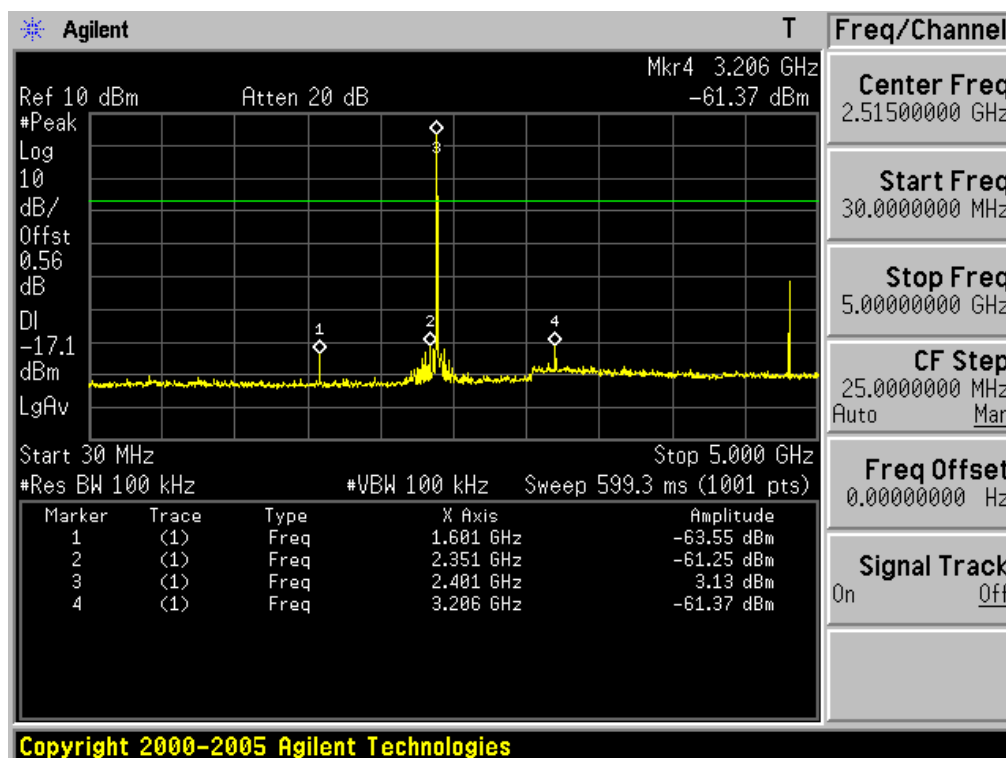
High Band-edge Hopping mode: Disable & Highest Channel



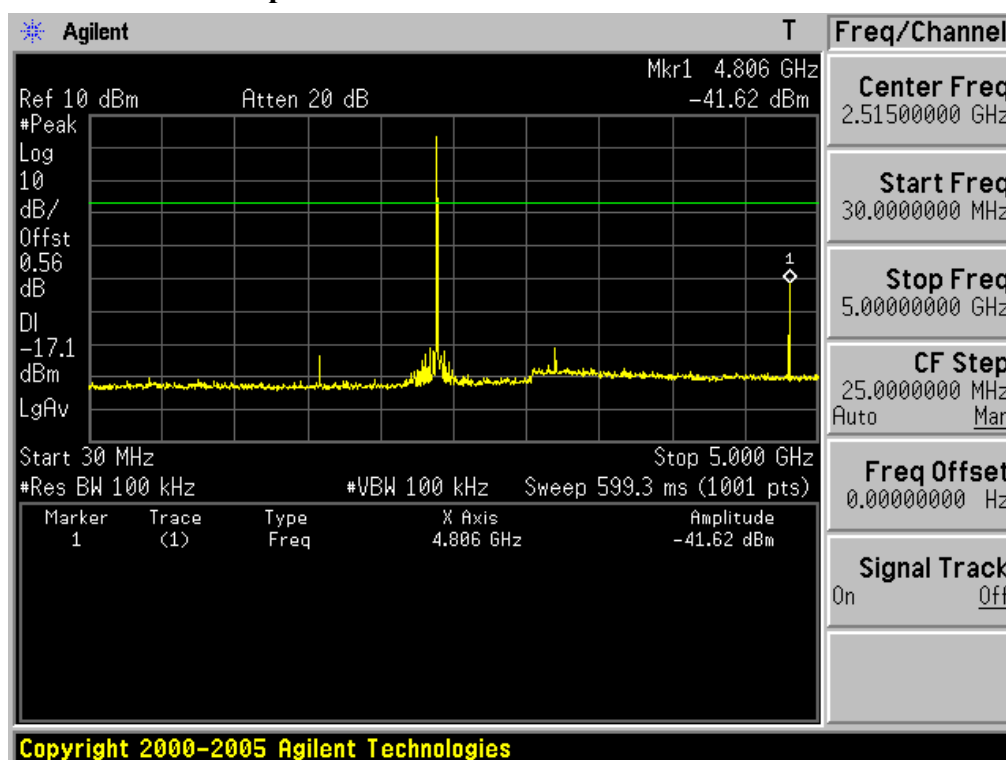
High Band-edge Hopping mode: Enable



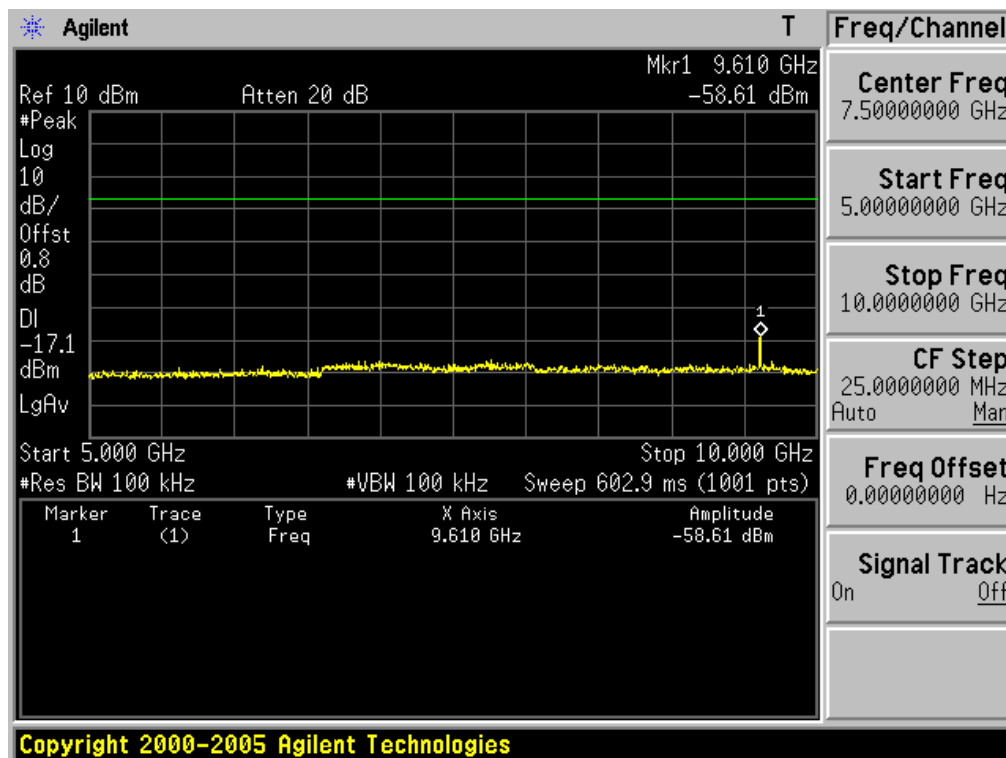
30MHz ~ 5GHz Conducted Spurious Emissions Lowest Channel



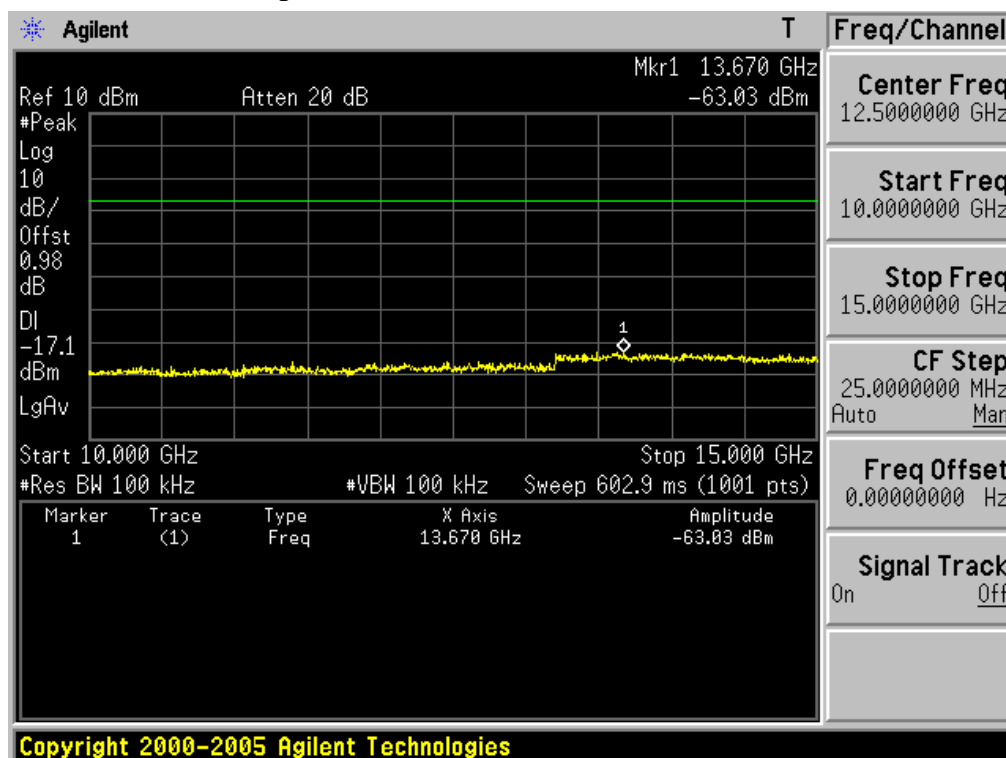
30MHz ~ 5GHz Conducted Spurious Emissions Lowest Channel



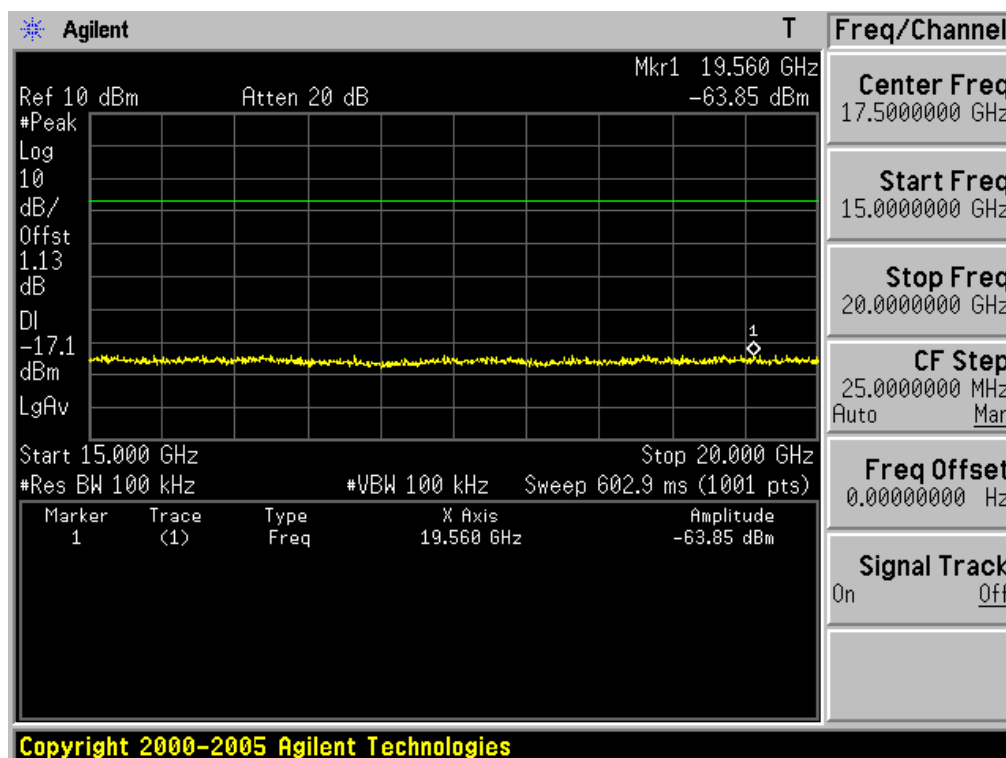
5GHz ~ 10GHz Conducted Spurious Emissions Lowest Channel



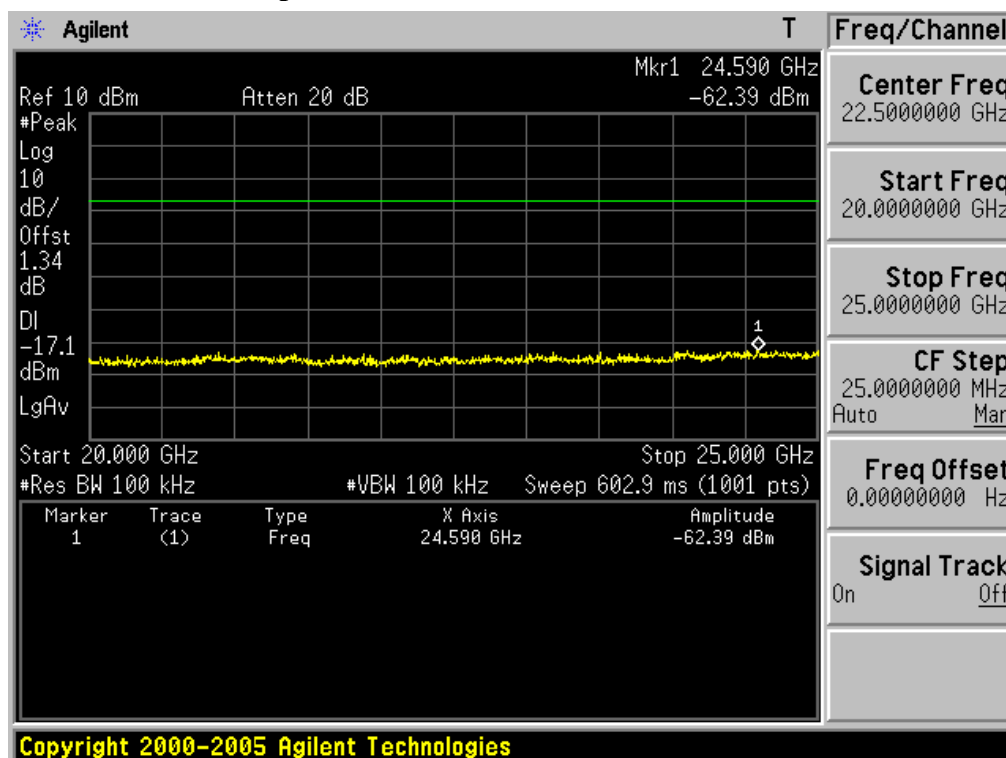
10GHz ~ 15GHz Conducted Spurious Emissions Lowest Channel



15GHz ~ 20GHz Conducted Spurious Emissions Lowest Channel

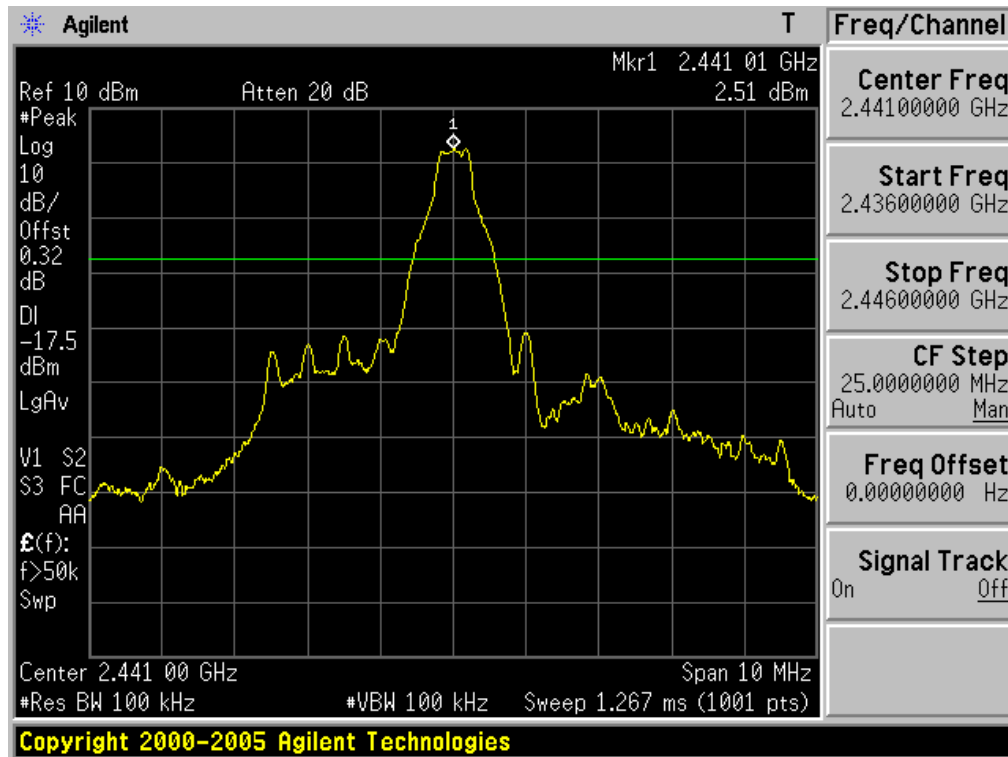


20GHz ~ 25GHz Conducted Spurious Emissions Lowest Channel



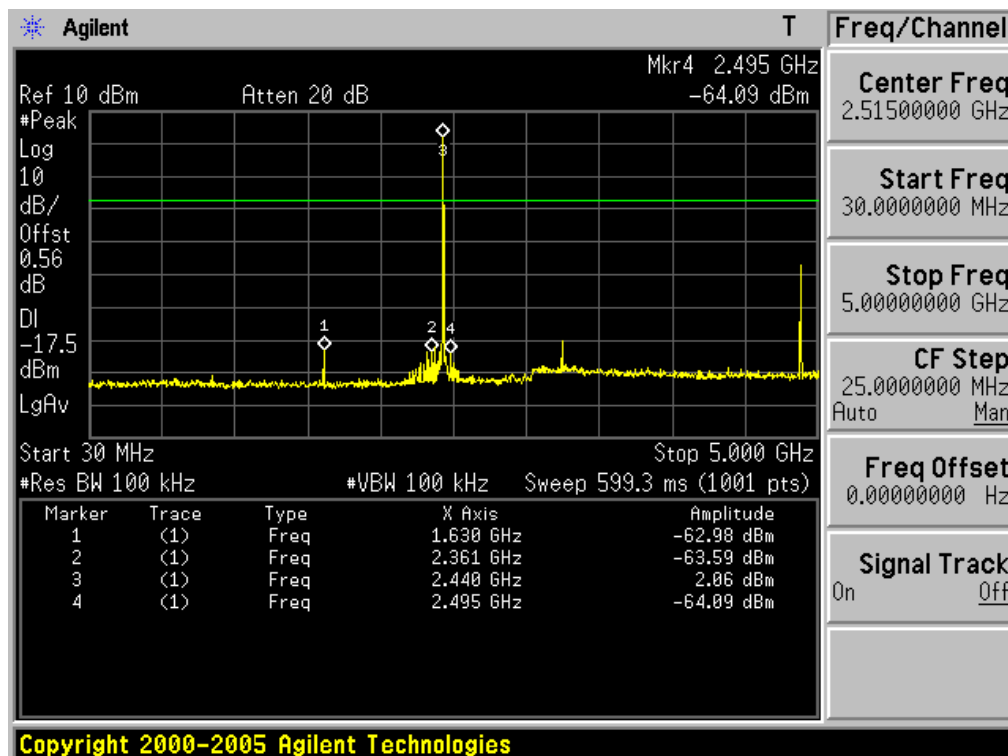
Reference for limit

Middle Channel

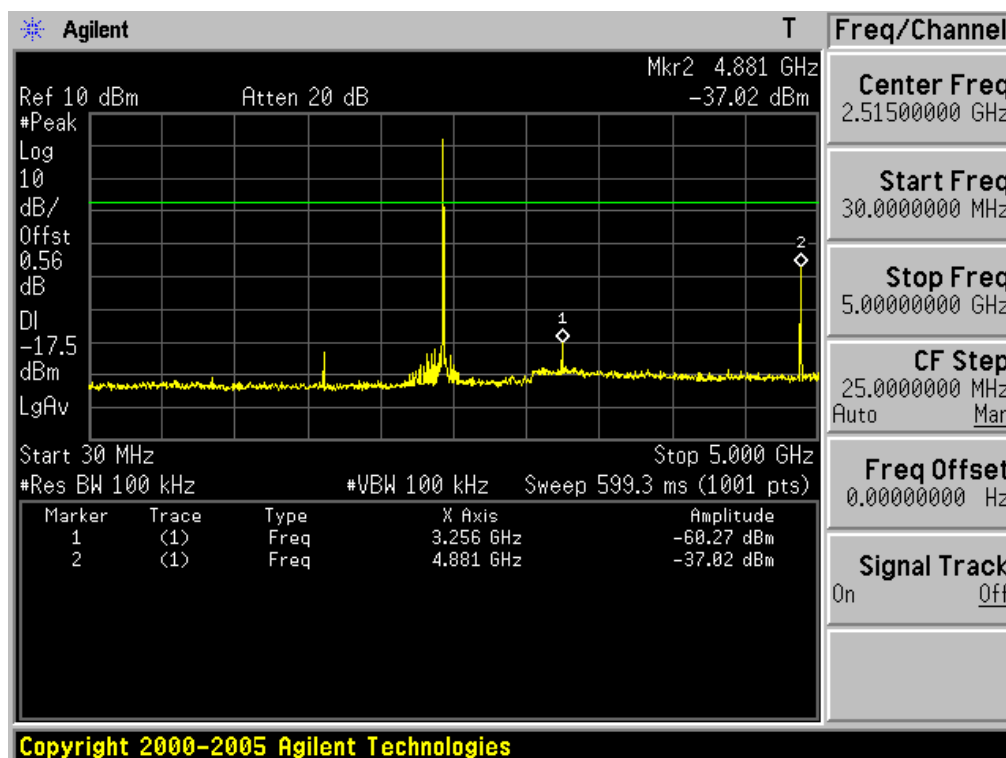


30MHz ~ 5GHz Conducted Spurious Emissions

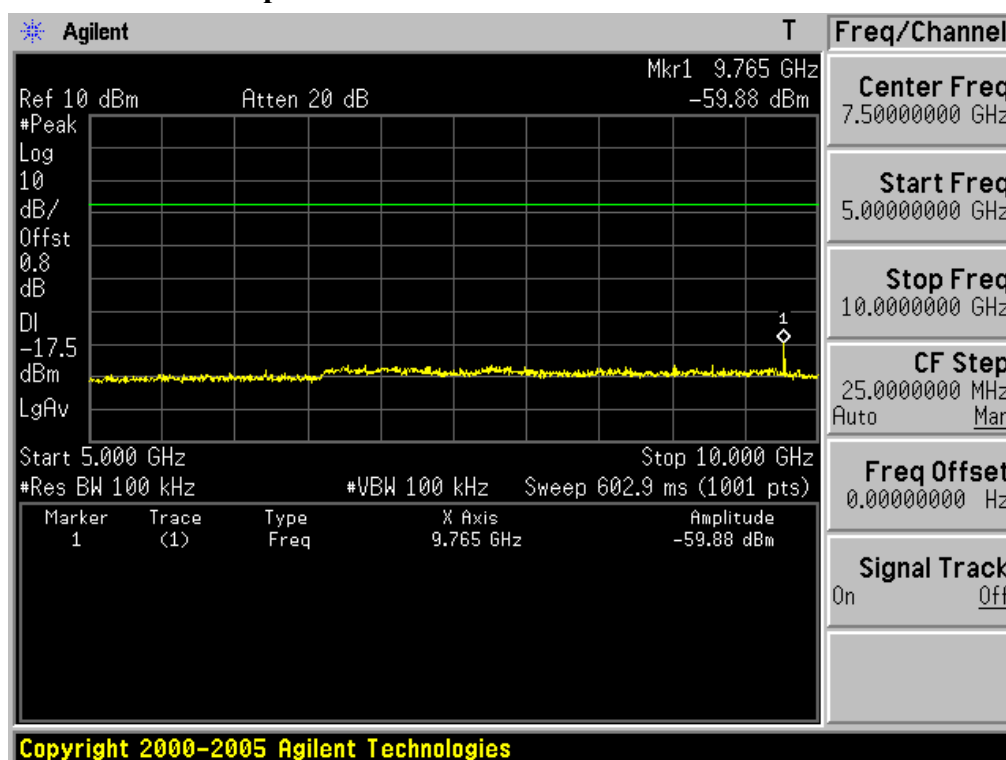
Middle Channel



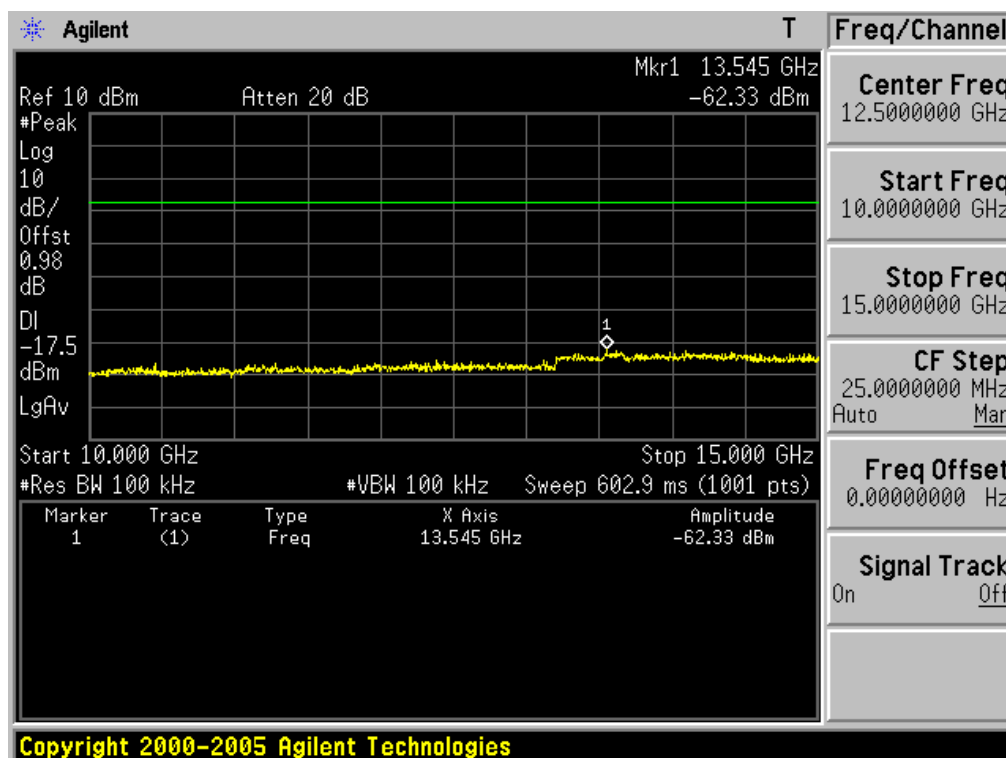
30MHz ~ 5GHz Conducted Spurious Emissions Middle Channel



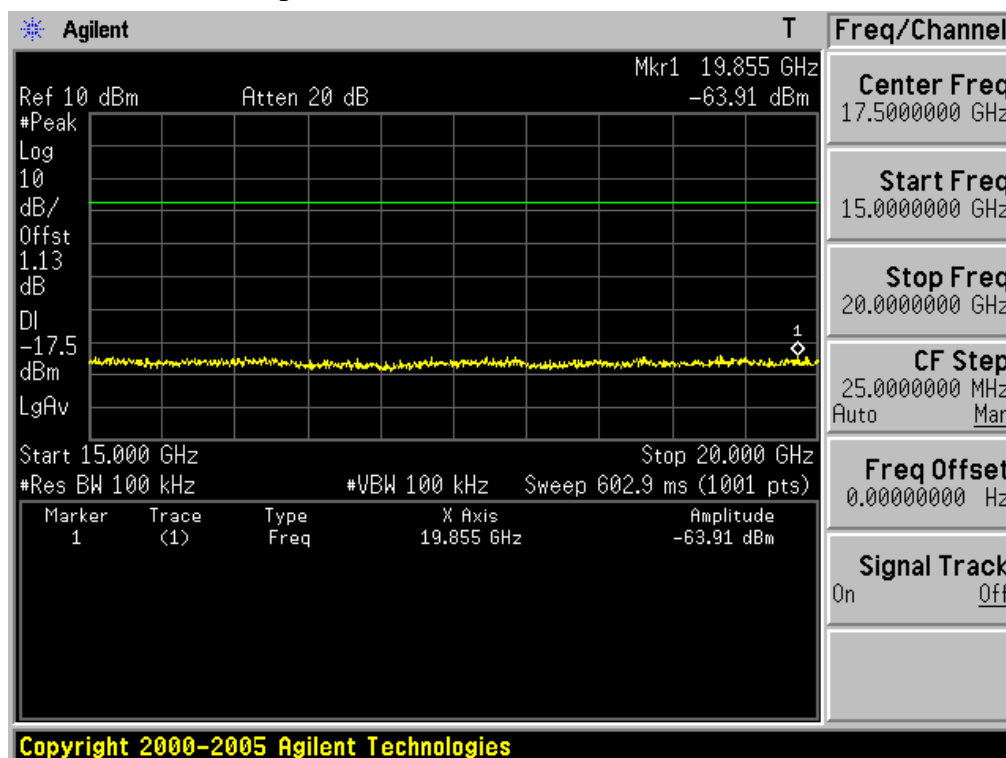
5GHz ~ 10GHz Conducted Spurious Emissions Middle Channel



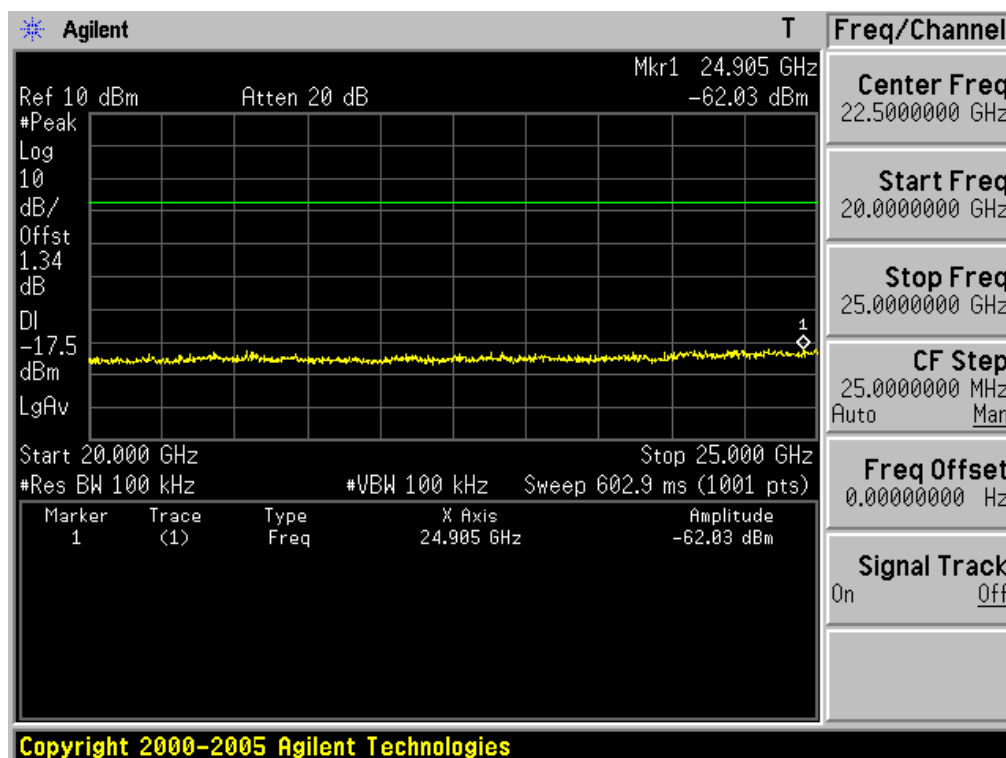
10GHz ~ 15GHz Conducted Spurious Emissions Middle Channel



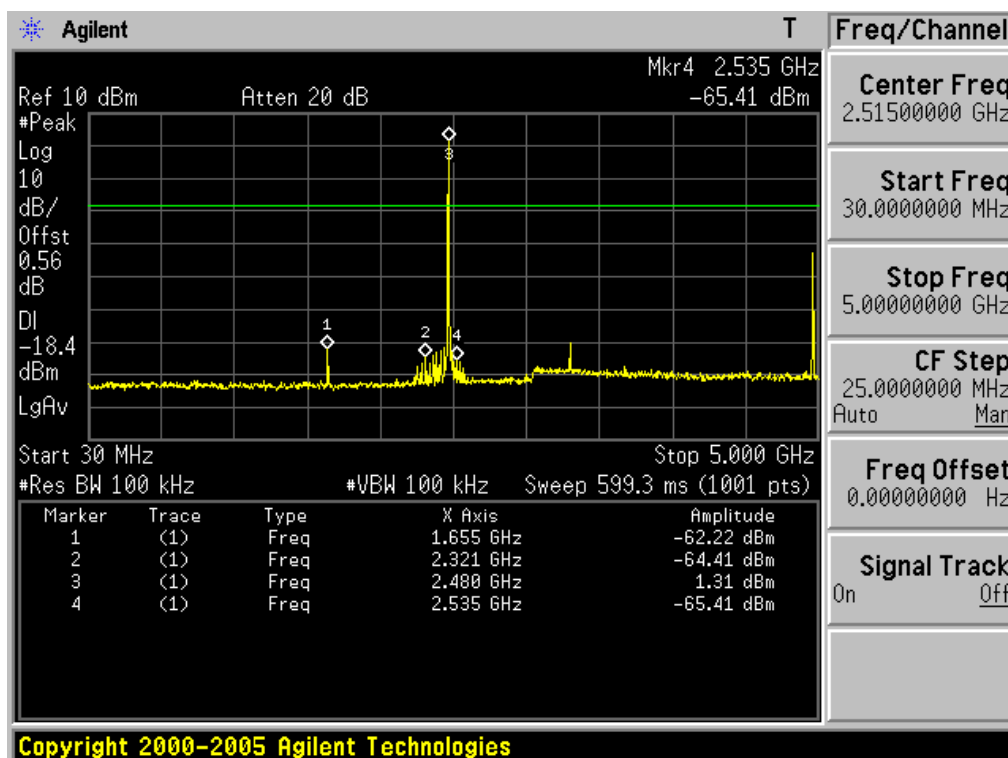
15GHz ~ 20GHz Conducted Spurious Emissions Middle Channel



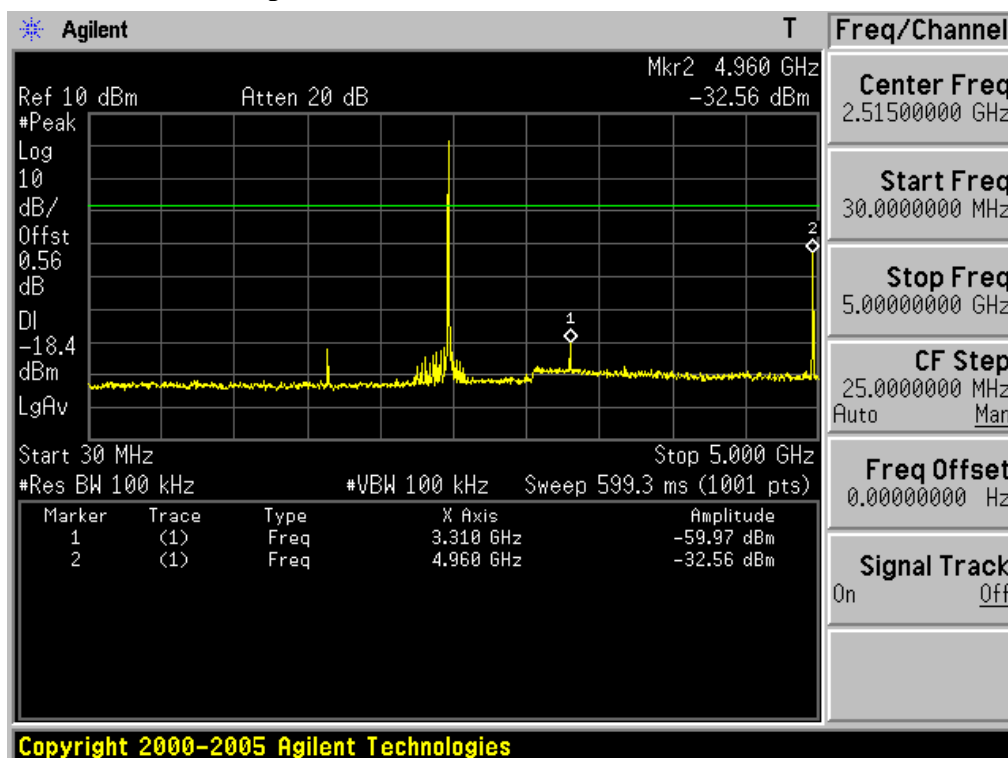
20GHz ~ 25GHz Conducted Spurious Emissions Middle Channel



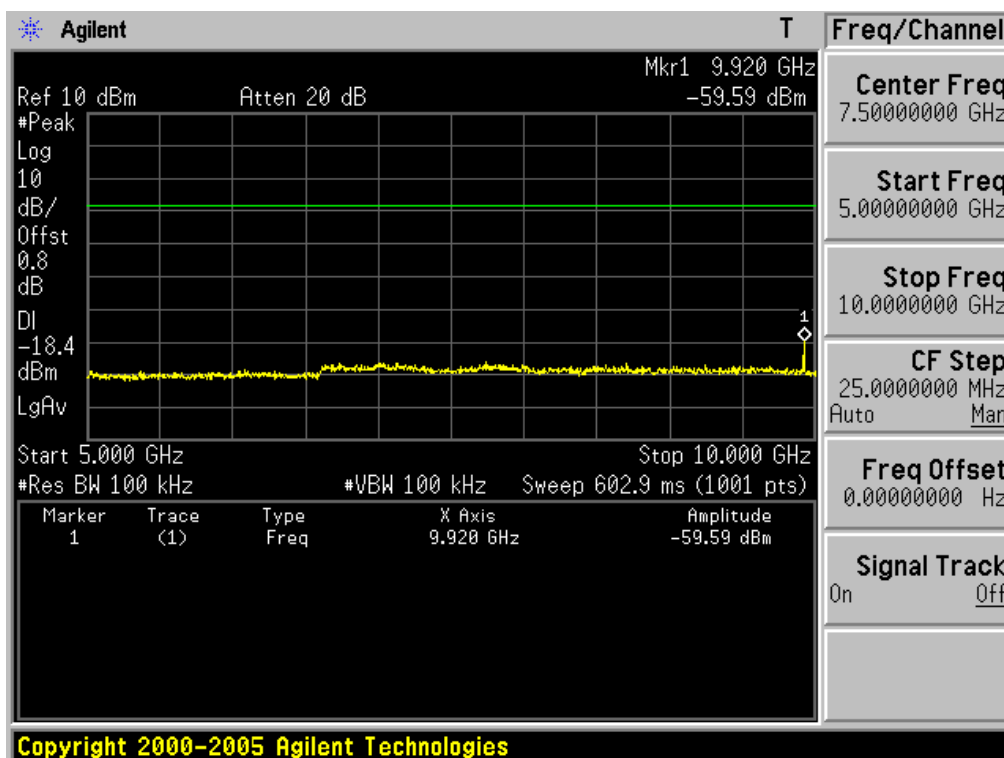
30MHz ~ 5GHz Conducted Spurious Emissions Highest Channel



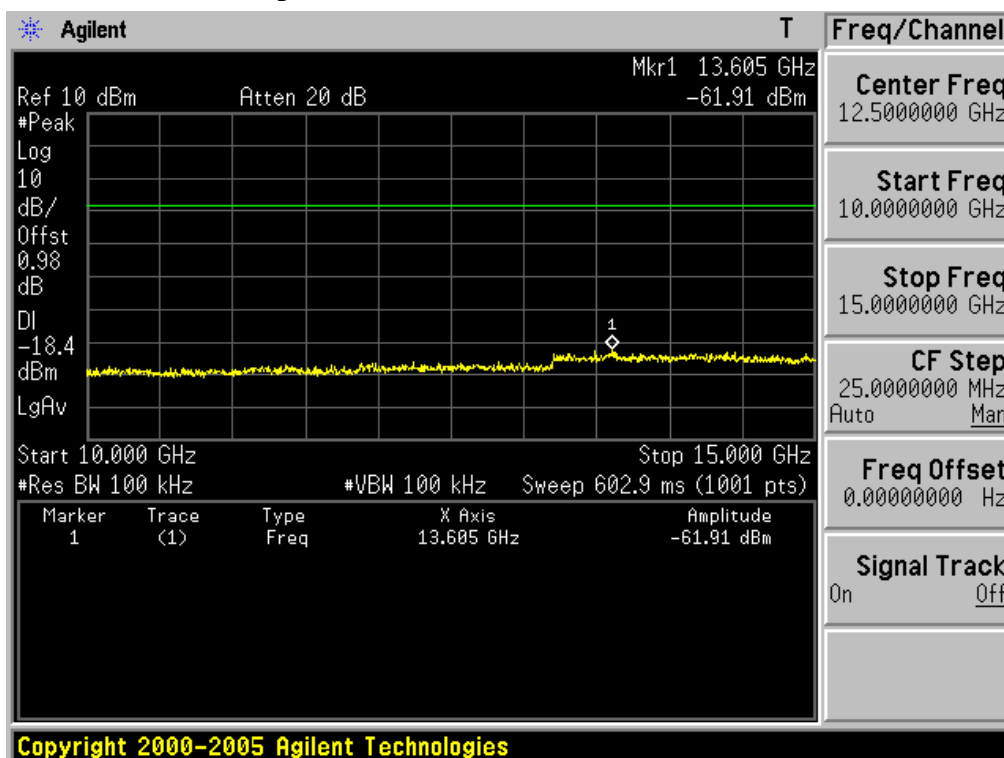
30MHz ~ 5GHz Conducted Spurious Emissions Highest Channel



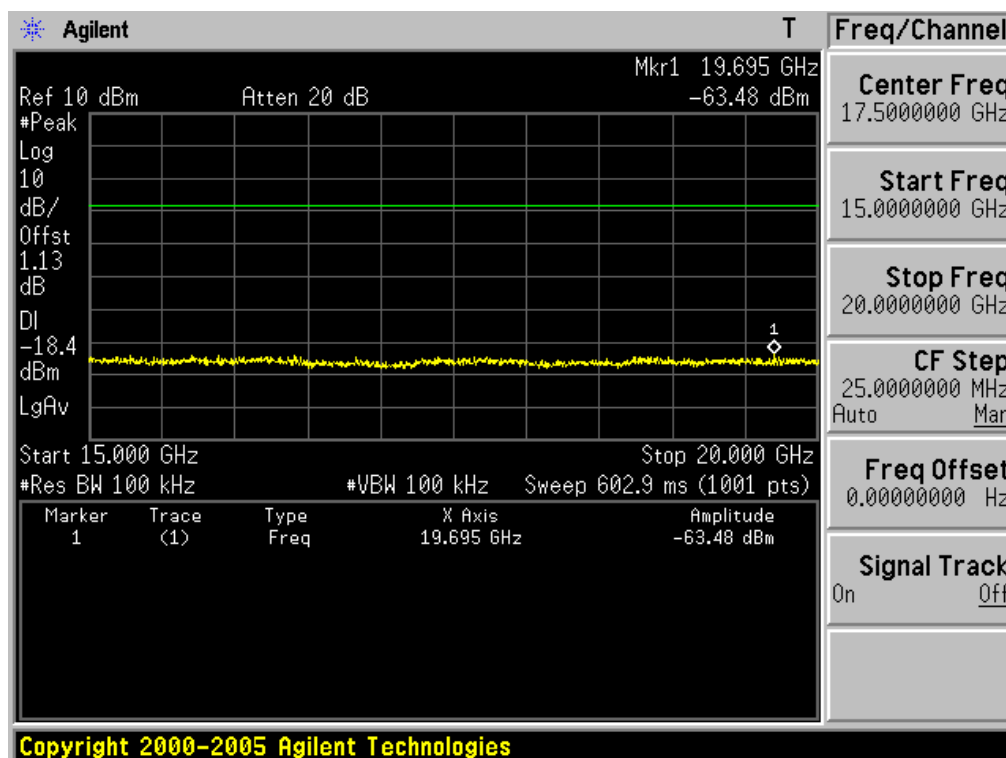
5GHz ~ 10GHz Conducted Spurious Emissions Highest Channel



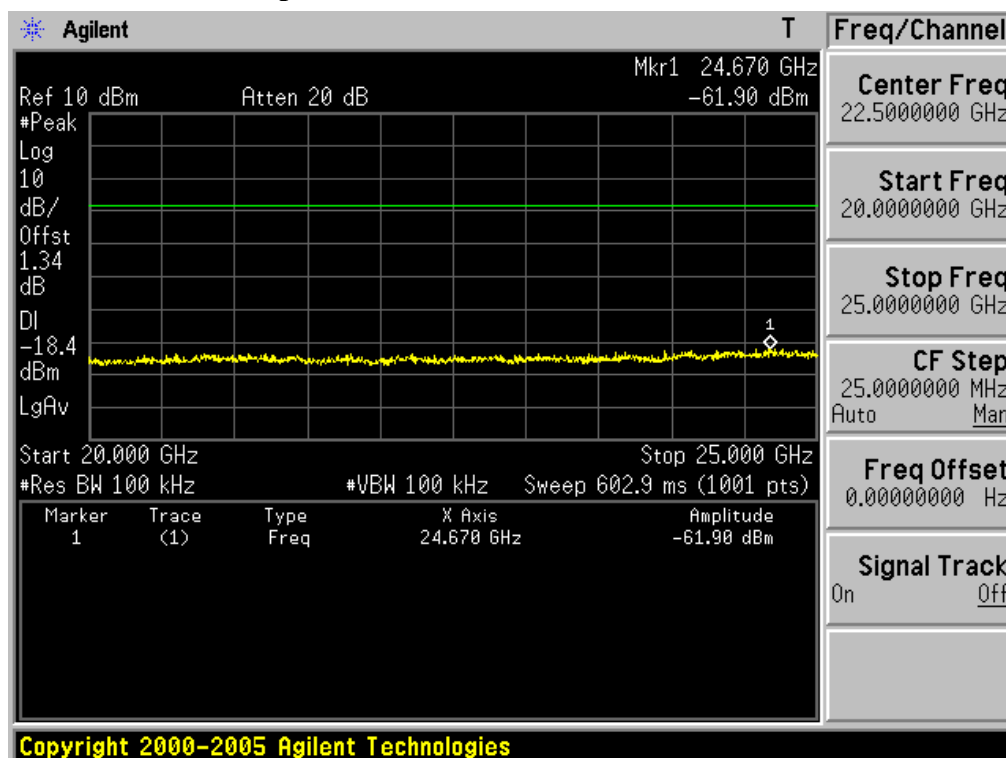
10GHz ~ 15GHz Conducted Spurious Emissions Highest Channel



15GHz ~ 20GHz Conducted Spurious Emissions Highest Channel



20GHz ~ 25GHz Conducted Spurious Emissions Highest Channel



4.2.7 Radiated Spurious Emissions

- Procedure:

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:

Tested frequency = Low, Middle, High Frequencies

Frequency Range = 30 MHz ~ 10th harmonic.

RBW and VBW = 1. Frequency range: 30MHz ~ 1GHz

RBW = 120KHz / VBW = $\geq$ RBW

2. Frequency range: 1GHz ~ 10th harmonics

Peak mode: RBW = 1MHz / VBW = $\geq$ RBW

Average mode: RBW = 1MHz / VBW = 10Hz

Detector function = Peak

Sweep = auto

Trace = max hold

- Measurement Data: **Comply**

Note 1: See next pages for actual measured spectrum plots and data.

- Minimum Standard:

▪ FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

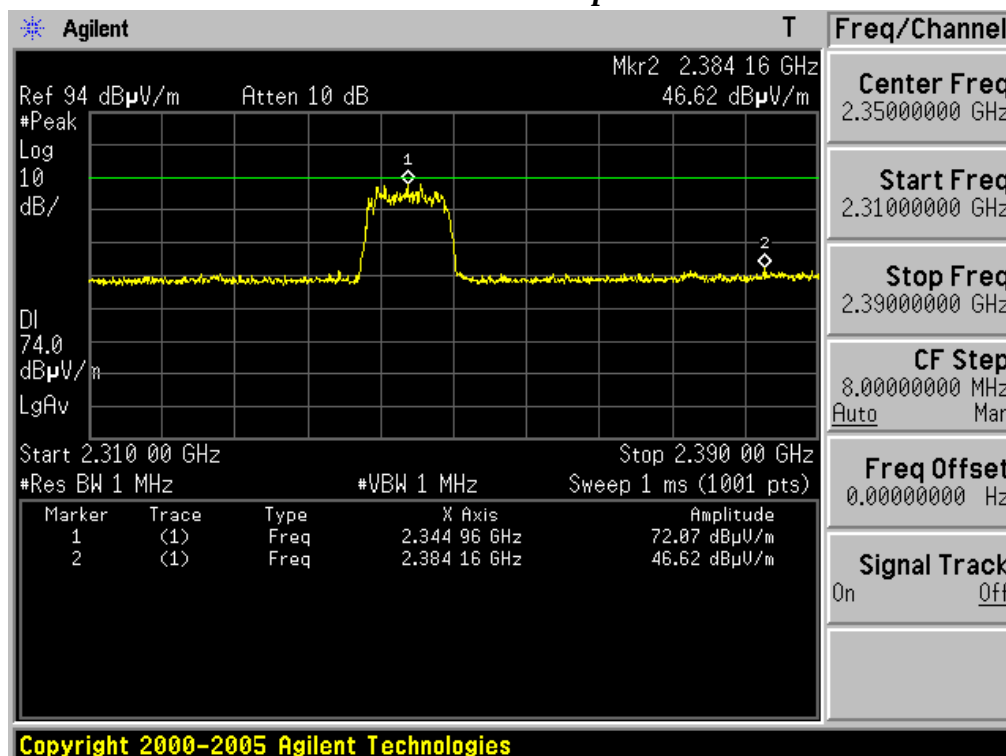
▪ FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	3600 ~ 4400	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	4.5 ~ 5.15	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~ 156.52525	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.7 ~ 156.9	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	162.0125 ~ 167.17	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	167.72 ~ 173.2	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	240 ~ 285	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	322 ~ 335.4	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	960 ~ 1240	3345.8 ~ 3358		

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

Restricted Band Edge Test Case 1 & Lowest Channel

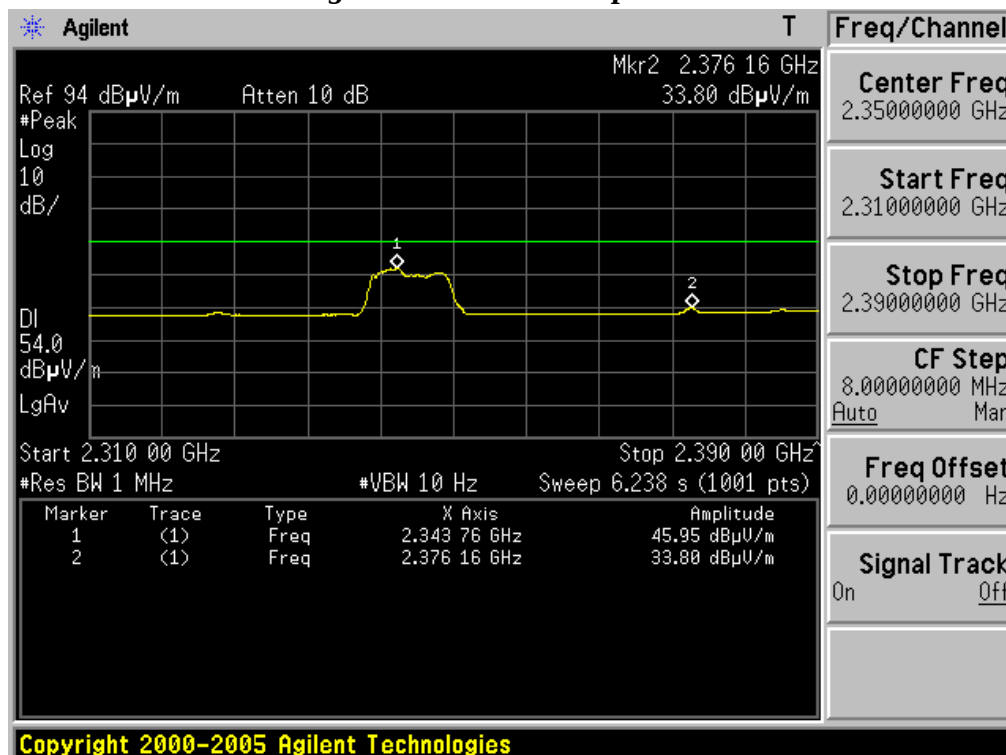
Peak mode / Horizontal polarization



Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Test Case 1 & Lowest Channel

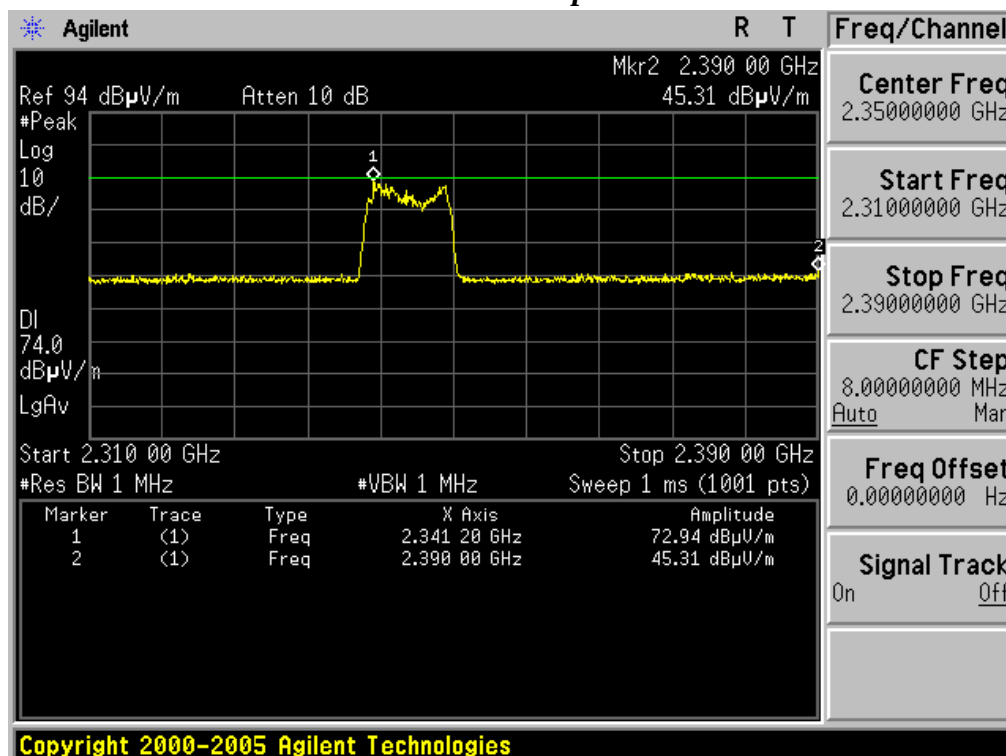
Average mode / Horizontal polarization



Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Test Case 1 & Lowest Channel

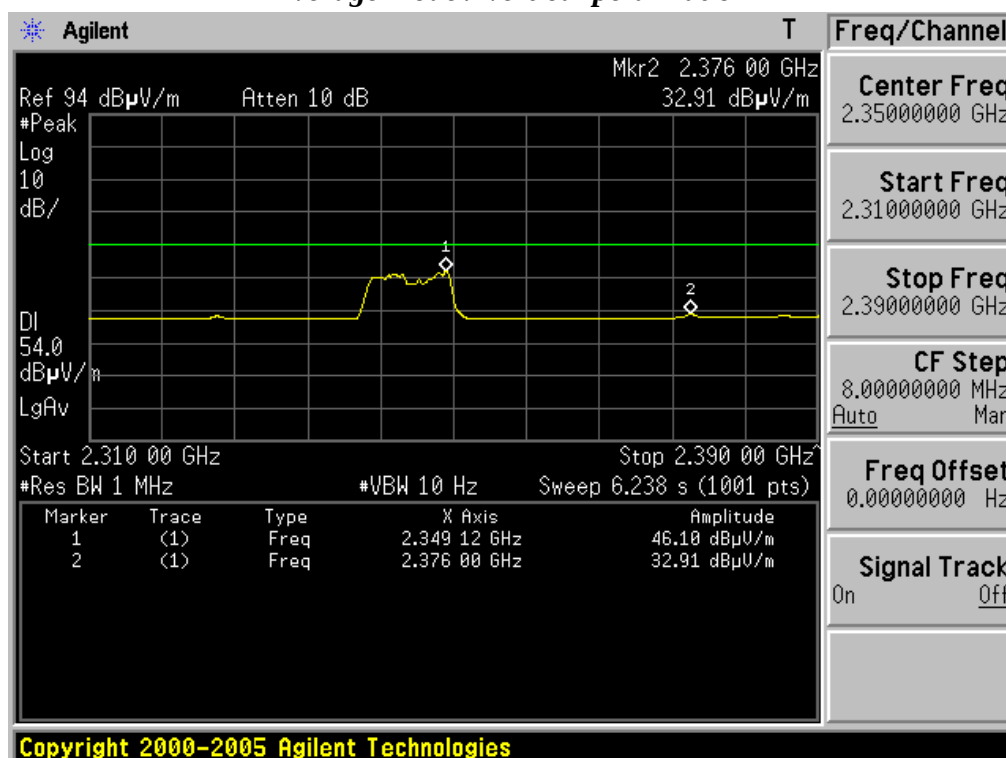
Peak mode / Vertical polarization



Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Test Case 1 & Lowest Channel

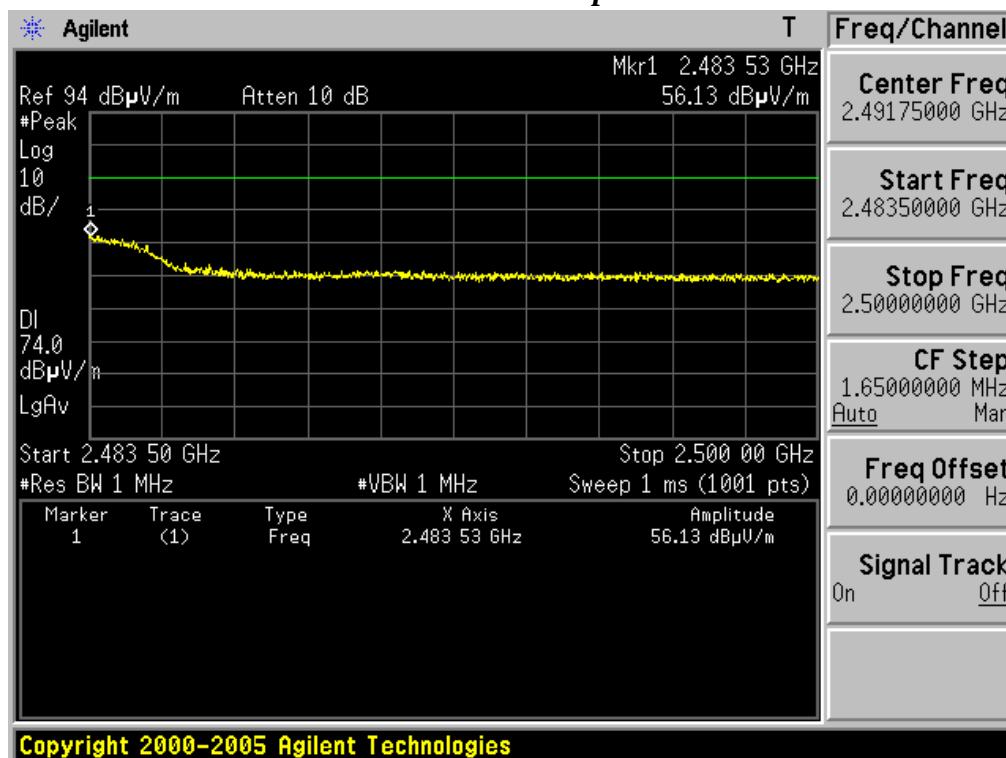
Average mode / Vertical polarization



Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

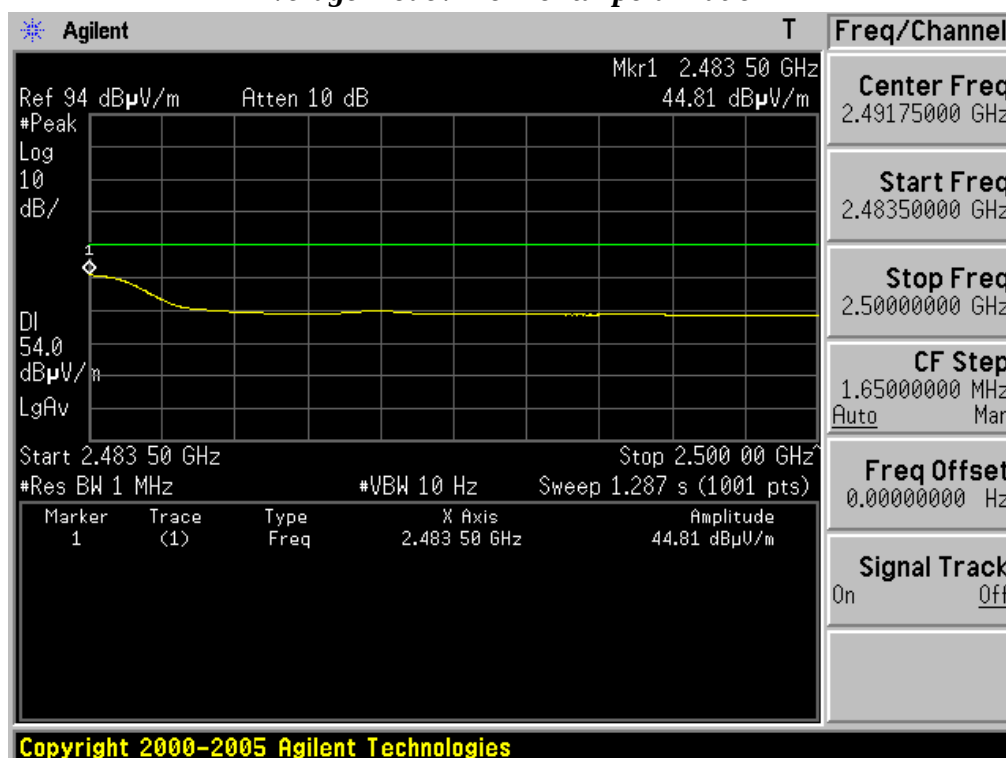
Restricted Band Edge Test Case 1 & Highest Channel

Peak mode / Horizontal polarization



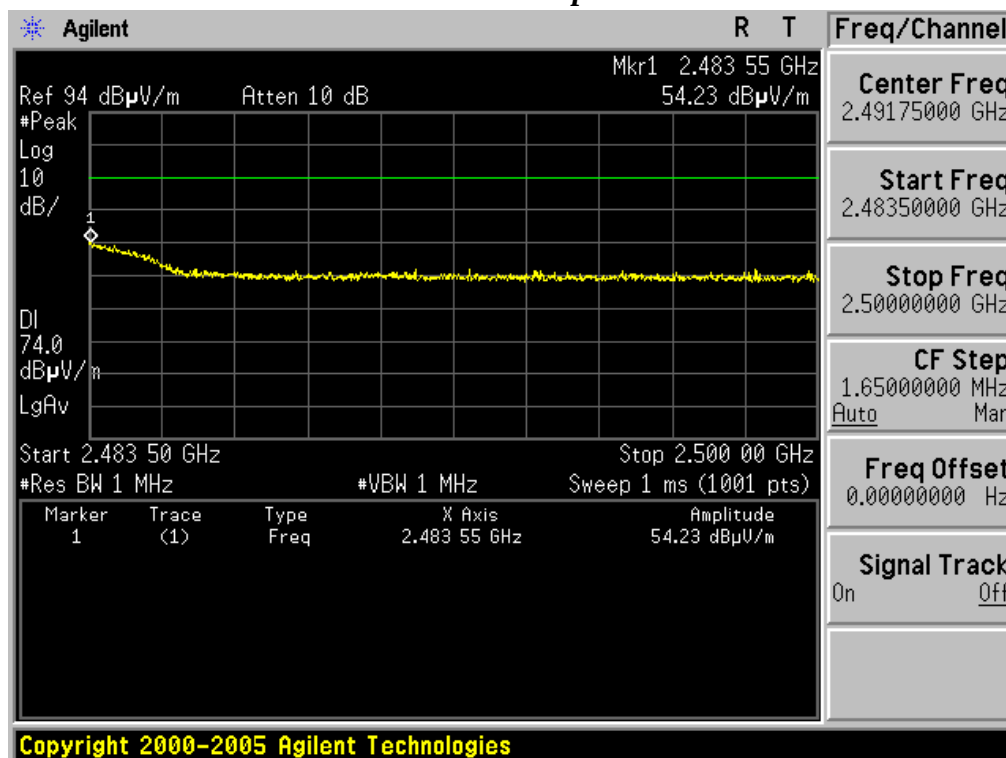
Restricted Band Edge Test Case 1 & Highest Channel

Average mode / Horizontal polarization



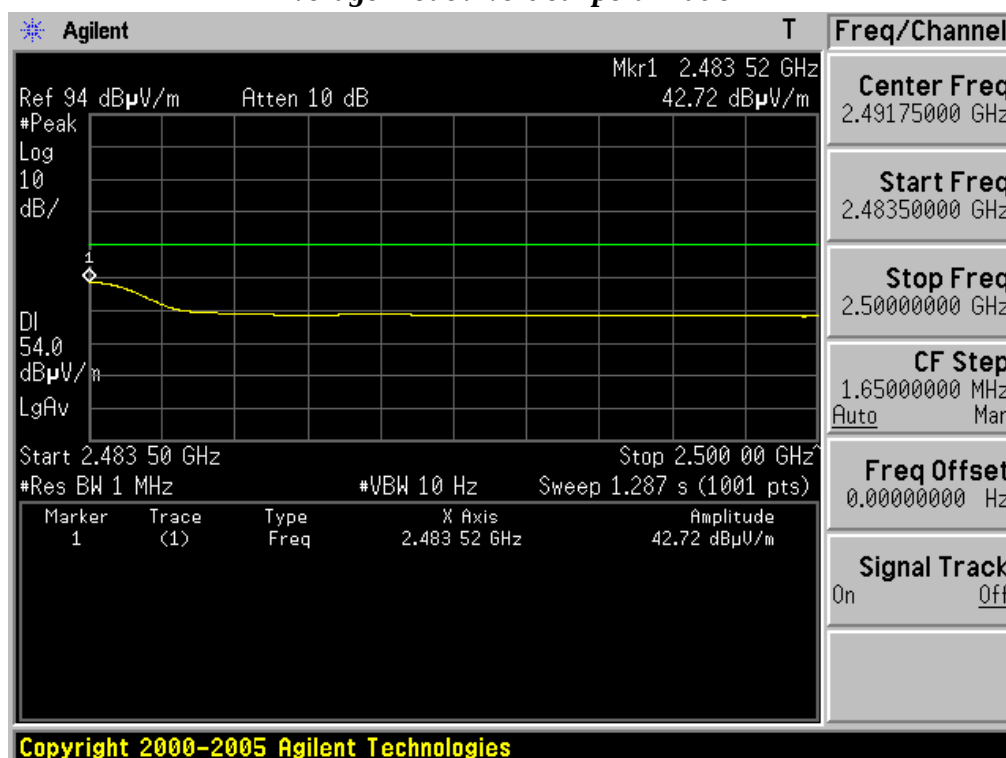
Restricted Band Edge Test Case 1 & Highest Channel

Peak mode / Vertical polarization



Restricted Band Edge Test Case 1 & Highest Channel

Average mode / Vertical polarization



30MHz ~ 1GHz Radiated Spurious Emissions Test Case 1 & Lowest Channel



RADIATED EMISSION

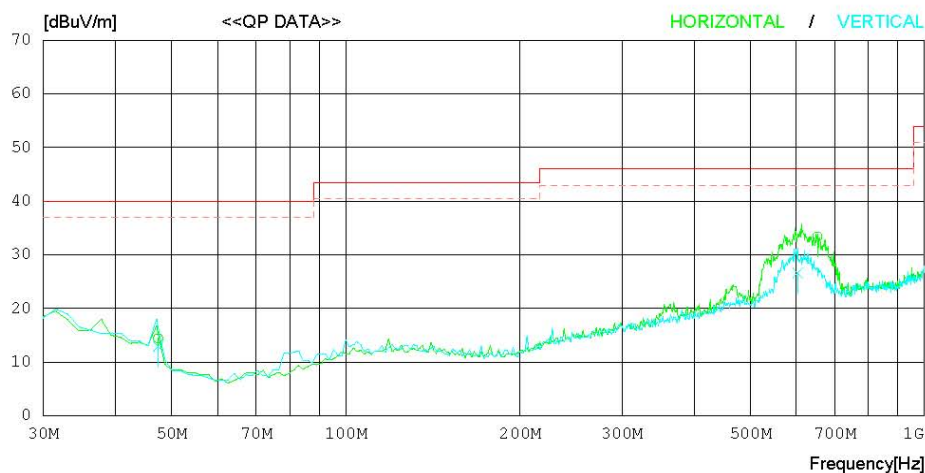
Date : 2010-03-17

Model Name : HFB-320
 Model No. :
 Serial No. : Identical prototype
 Test Condition : TX : 2402 MHz

Reference No. :
 Power Supply : DC 3.7 V
 Temp/Humi : 22 'c 44 % R.H.
 Operator : D.C.CHA

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
 MARGIN: 3 dB



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	47.371	25.7	10.4	1.0	22.7	14.4	40.0	25.6	201	358
2	652.884	34.6	19.0	4.1	24.3	33.4	46.0	12.6	301	1
----- Vertical -----										
3	47.393	24.2	10.4	1.0	22.7	12.9	40.0	27.1	400	197
4	604.487	27.8	19.2	4.0	24.4	26.6	46.0	19.4	100	358

30MHz ~ 1GHz Radiated Spurious Emissions

Test Case 1 & Middle Channel



RADIATED EMISSION

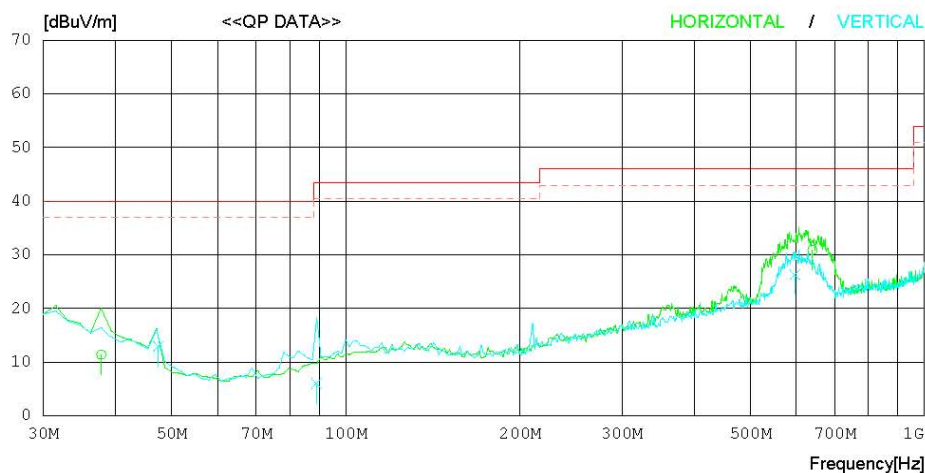
Date : 2010-03-17

Model Name : HFB-320
Model No. :
Serial No. : Identical prototype
Test Condition : TX : 2441 MHz

Reference No. :
Power Supply : DC 3.7 V
Temp/Humi : 22 'c 44 % R.H.
Operator : D.C.CHA

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
MARGIN: 3 dB



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	37.780	18.5	14.6	0.9	22.6	11.4	40.0	28.6	400	1
2	640.064	32.1	19.0	4.1	24.3	30.9	46.0	15.1	301	269
----- Vertical -----										
3	47.387	24.2	10.4	1.0	22.7	12.9	40.0	27.1	400	358
4	89.074	18.5	8.9	1.3	22.7	6.0	43.5	37.5	199	241
5	597.275	27.6	19.1	4.0	24.4	26.3	46.0	19.7	100	1

30MHz ~ 1GHz Radiated Spurious Emissions Test Case 1 & Highest Channel



RADIATED EMISSION

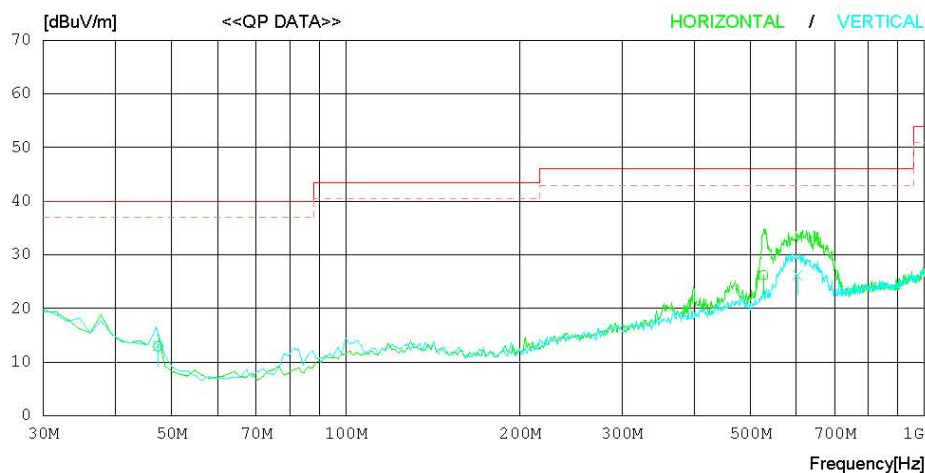
Date : 2010-03-17

Model Name : HFB-320
 Model No. :
 Serial No. : Identical prototype
 Test Condition : TX : 2480 MHz

Reference No. :
 Power Supply : DC 3.7 V
 Temp/Humi : 22 'c 44 % R.H.
 Operator : D.C.CHA

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
 MARGIN: 3 dB



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	47.371	24.2	10.4	1.0	22.7	12.9	40.0	27.1	199	358
2	527.205	28.8	18.3	3.6	24.5	26.2	46.0	19.8	199	209
----- Vertical -----										
3	47.386	24.4	10.4	1.0	22.7	13.1	40.0	26.9	400	46
4	603.846	27.4	19.2	4.0	24.4	26.2	46.0	19.8	100	1

1GHz ~ 25GHz Radiated Spurious Emissions

▪ Test Case 1 & Lowest Channel

Frequency (MHz)	ANT Pol	Reading(dBuV)		T.F (dB/m)	D.C.F	Result(dBuV/m)		Limit(dBuV/m)		Margin(dB)	
		PK	AV			PK	AV	PK	AV	PK	AV
4804.330	H	54.39	47.51	7.27	-30.77	30.89	24.01	74.00	54.00	43.11	29.99
4804.210	V	54.85	47.14	7.27	-30.77	31.35	23.64	74.00	54.00	42.65	30.36
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

▪ Test Case 1 & Middle Channel

Frequency (MHz)	ANT Pol	Reading(dBuV)		T.F (dB/m)	D.C.F	Result(dBuV/m)		Limit(dBuV/m)		Margin(dB)	
		PK	AV			PK	AV	PK	AV	PK	AV
4877.230	H	58.16	50.80	7.65	-30.77	35.04	27.68	74.00	54.00	38.96	26.32
4882.540	V	57.30	50.28	7.65	-30.77	34.18	27.16	74.00	54.00	39.82	26.84
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

▪ Test Case 1 & Highest Channel

Frequency (MHz)	ANT Pol	Reading(dBuV)		T.F (dB/m)	D.C.F	Result(dBuV/m)		Limit(dBuV/m)		Margin(dB)	
		PK	AV			PK	AV	PK	AV	PK	AV
4959.015	H	60.86	53.68	7.96	-30.77	38.05	30.87	74.00	54.00	35.95	23.13
4958.775	V	61.05	53.49	7.96	-30.77	38.24	30.68	74.00	54.00	35.76	23.32
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were detected at a level greater than 20dB below limit.
2. Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} + \text{D.C.F} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

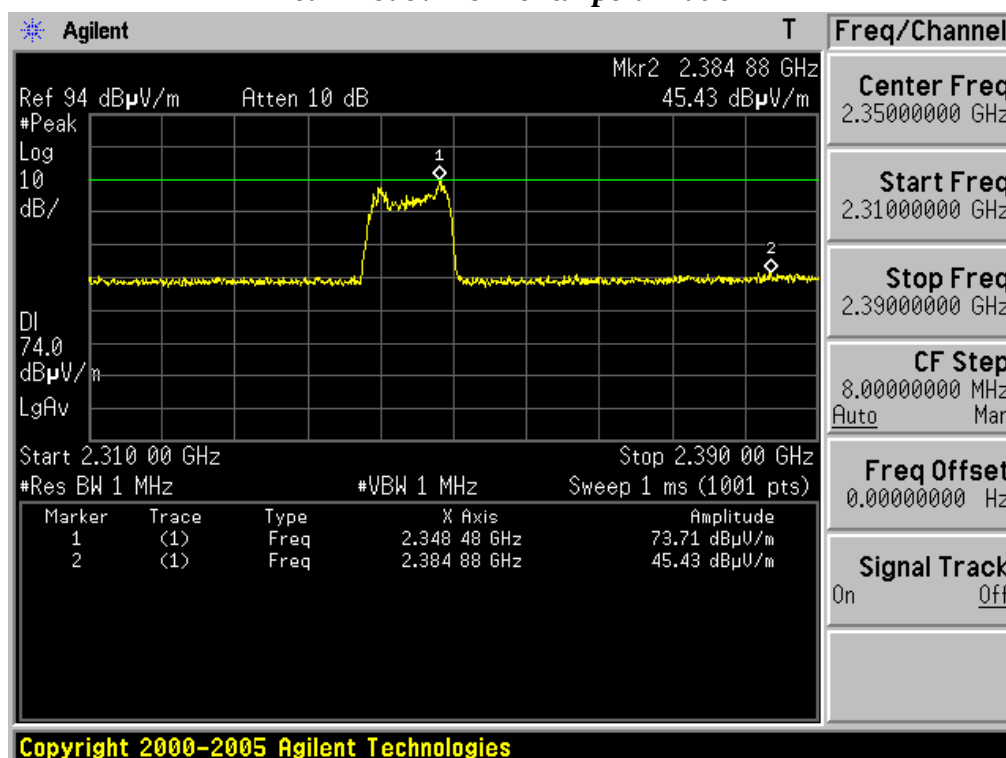
Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

$$\text{D.C.F (Duty Cycle Correction Factor)} = 20\log(\text{The worst Case DWELL Time}/100\text{ms})$$

$$= 20\log(2.895\text{ms} / 100\text{ms}) = -30.77\text{dB}$$

Restricted Band Edge Test Case 2 & Lowest Channel

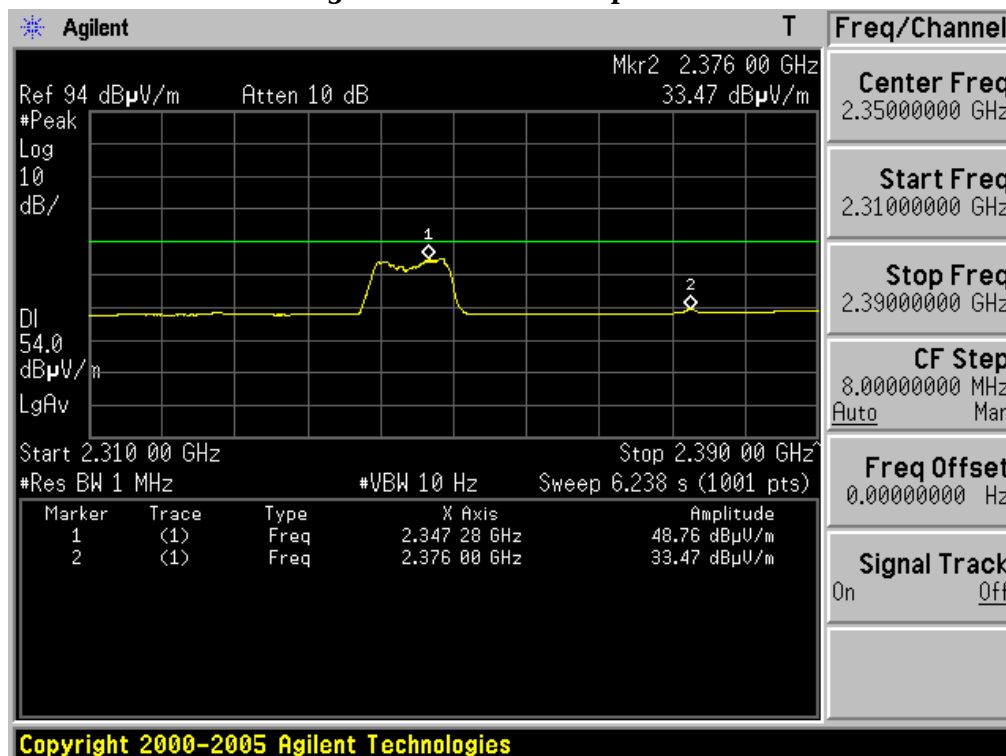
Peak mode / Horizontal polarization



Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Test Case 2 & Lowest Channel

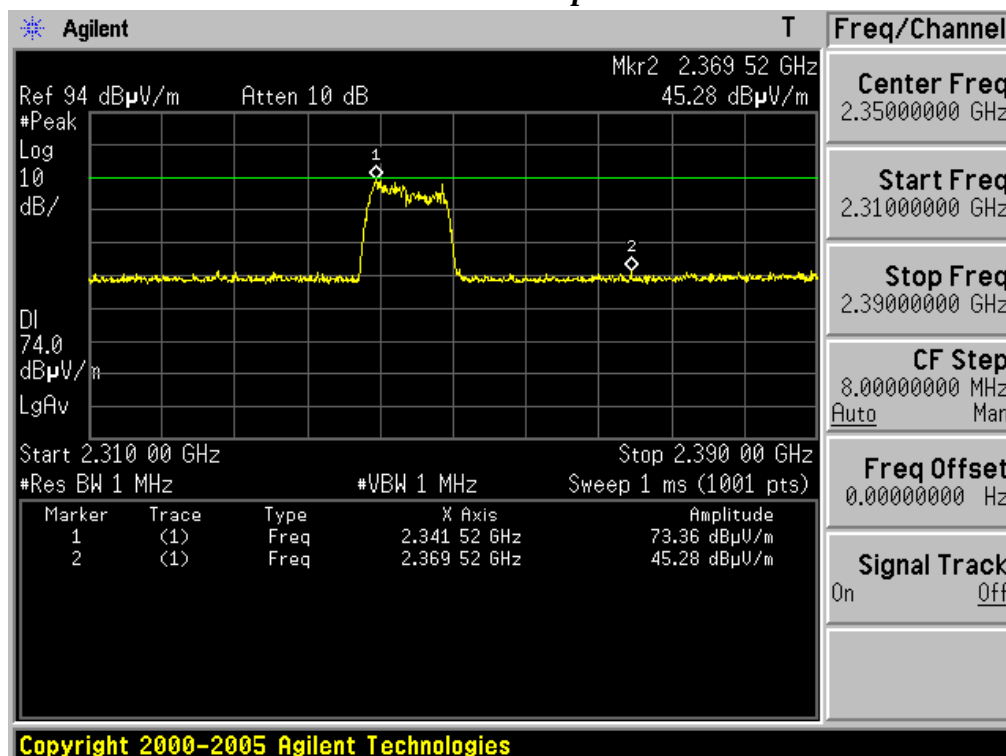
Average mode / Horizontal polarization



Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Test Case 2 & Lowest Channel

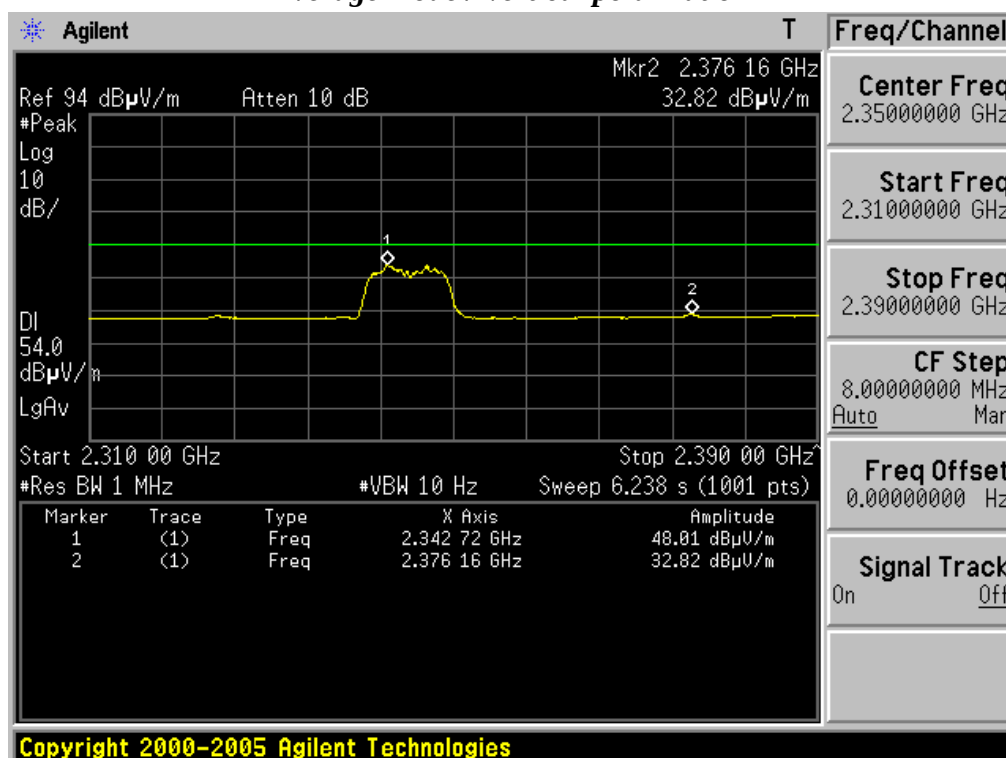
Peak mode / Vertical polarization



Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Test Case 2 & Lowest Channel

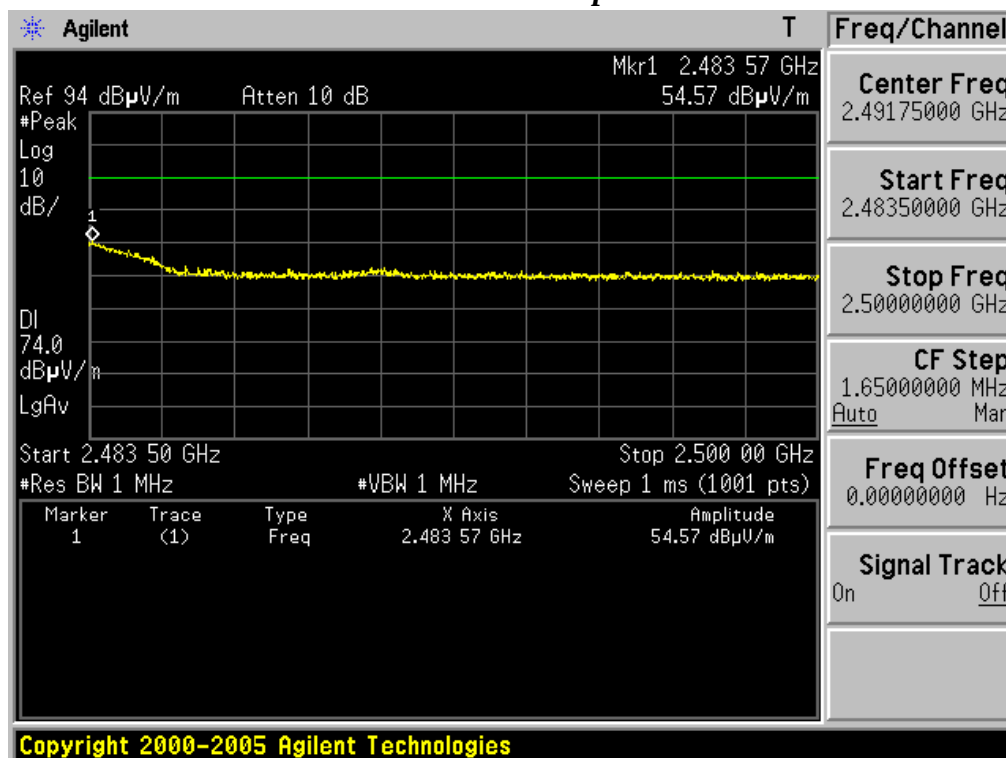
Average mode / Vertical polarization



Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

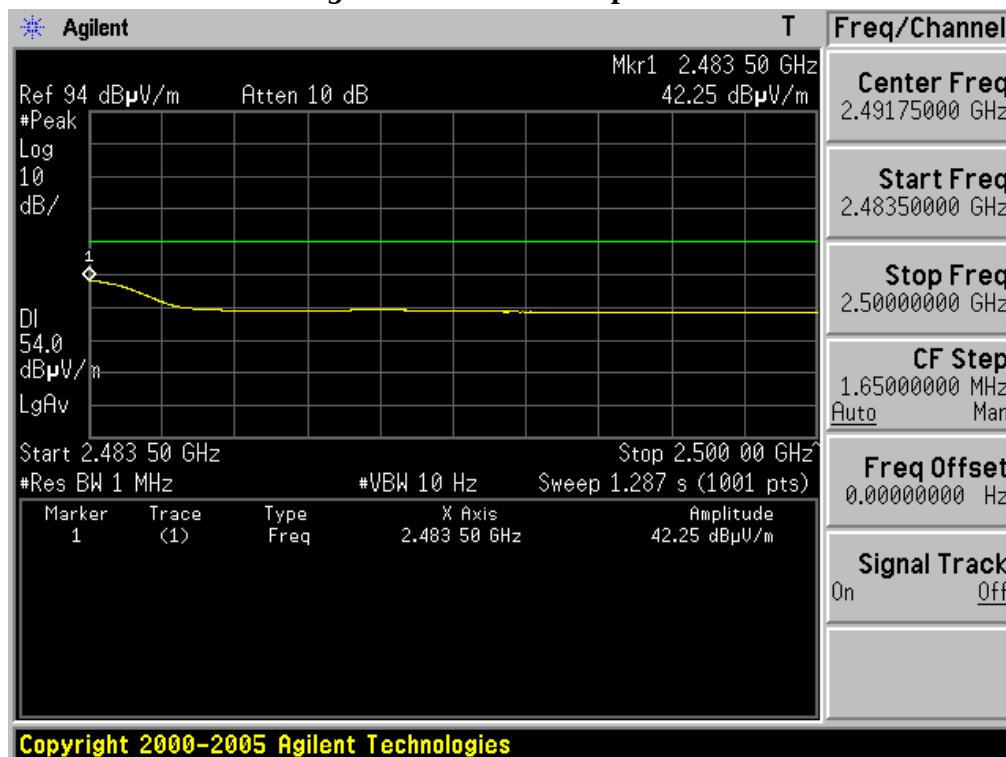
Restricted Band Edge Test Case 2 & & Highest Channel

Peak mode / Horizontal polarization



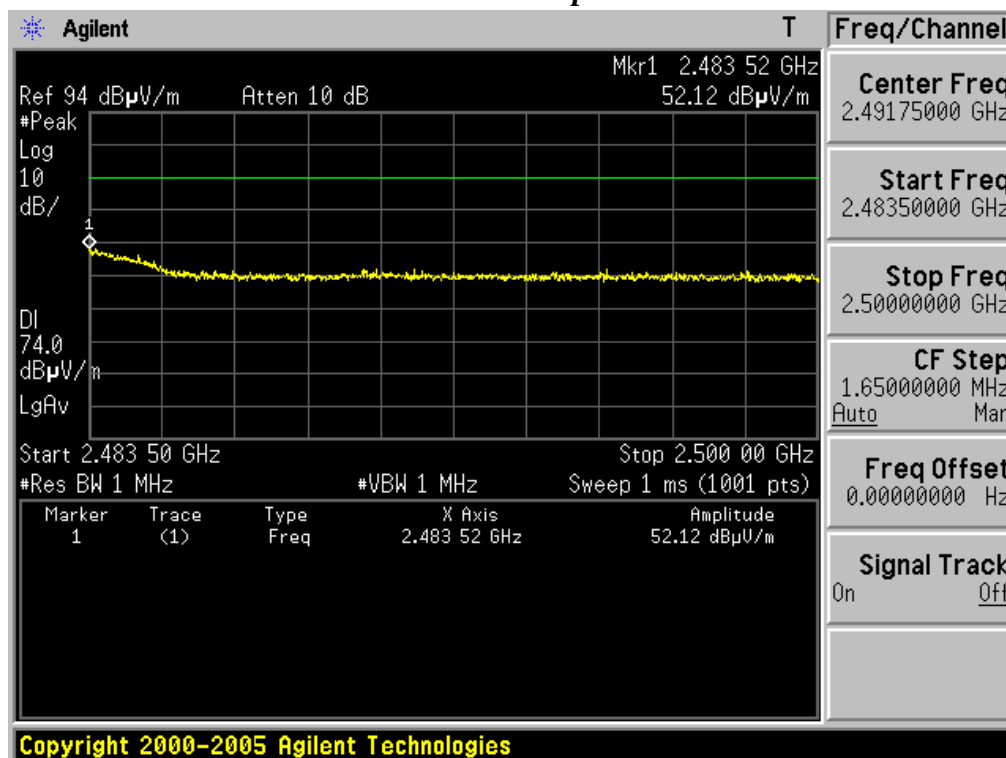
Restricted Band Edge Test Case 2 & & Highest Channel

Average mode / Horizontal polarization



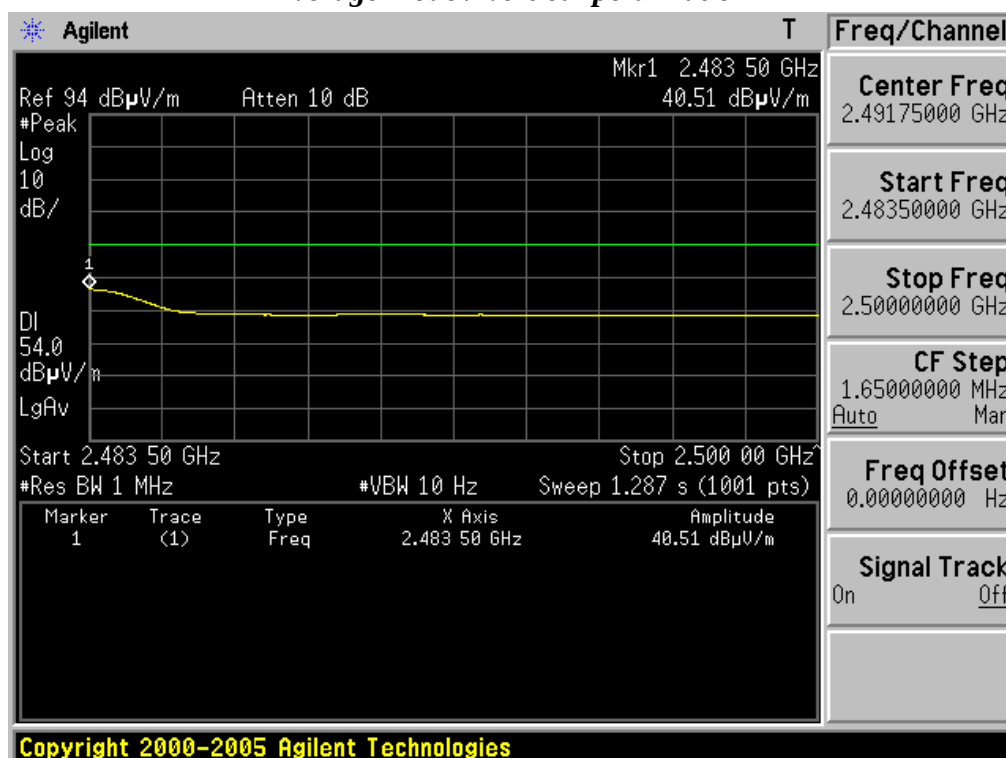
Restricted Band Edge Test Case 2 & Highest Channel

Peak mode / Vertical polarization



Restricted Band Edge Test Case 2 & Highest Channel

Average mode / Vertical polarization



30MHz ~ 1GHz Radiated Spurious Emissions Test Case 2 & Lowest Channel



RADIATED EMISSION

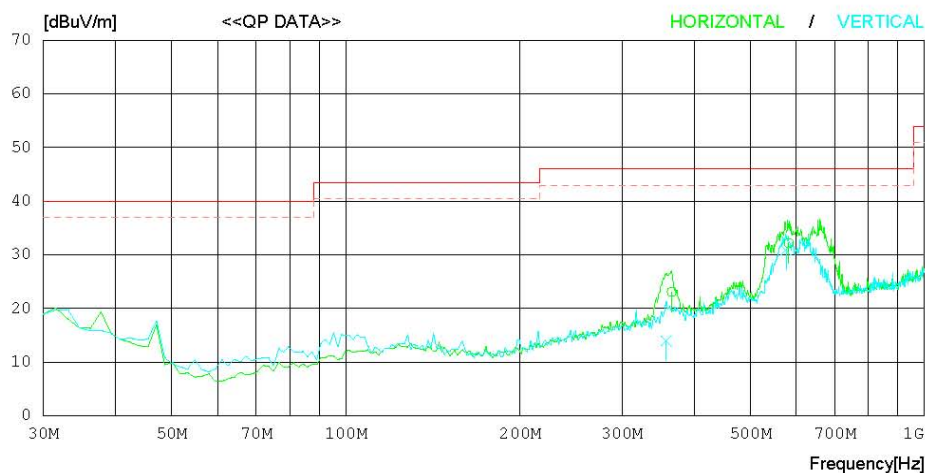
Date : 2010-03-17

Model Name : HFB-320
Model No. :
Serial No. : Identical prototype
Test Condition : TX : 2402 MHz

Reference No. :
Power Supply : DC 12 V
Temp/Humi : 22 'c 44 % R.H.
Operator : D.C.CHA

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
MARGIN: 3 dB



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	365.774	28.5	15.8	2.9	24.1	23.1	46.0	22.9	100	1
2	583.124	33.7	19.0	3.9	24.4	32.2	46.0	13.8	200	358
----- Vertical -----										
3	357.810	19.7	15.6	2.8	24.1	14.0	46.0	32.0	299	358
4	576.713	32.5	18.9	3.9	24.4	30.9	46.0	15.1	100	358

30MHz ~ 1GHz Radiated Spurious Emissions

Test Case 2 & Middle Channel



RADIATED EMISSION

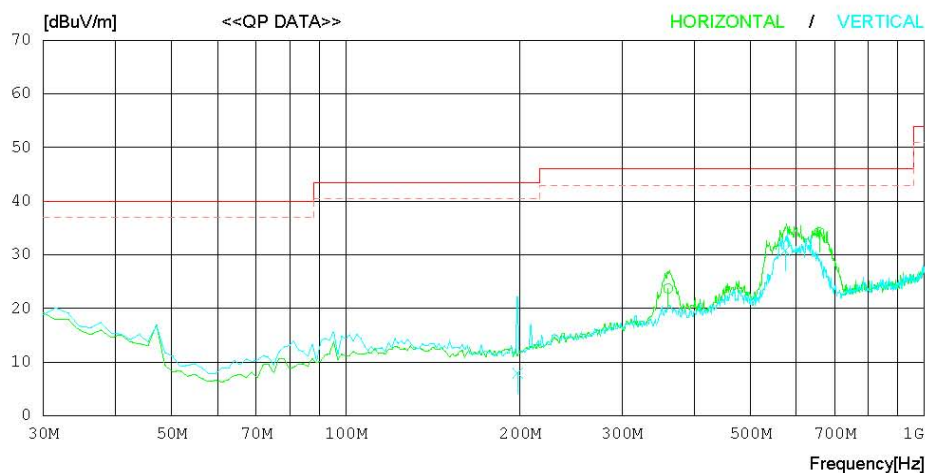
Date : 2010-03-17

Model Name : HFB-320
Model No. :
Serial No. : Identical prototype
Test Condition : TX : 2441 MHz

Reference No. :
Power Supply : DC 12 V
Temp/Humi : 22 'c 44 % R.H.
Operator : D.C.CHA

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
MARGIN: 3 dB



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	360.416	29.3	15.7	2.8	24.1	23.7	46.0	22.3	100	1
2	658.107	35.4	18.9	4.1	24.2	34.2	46.0	11.8	200	358
----- Vertical -----										
3	198.120	18.4	10.8	2.0	23.3	7.9	43.5	35.6	100	1
4	574.517	32.4	18.9	3.9	24.4	30.8	46.0	15.2	100	1

30MHz ~ 1GHz Radiated Spurious Emissions Test Case 2 & Highest Channel



RADIATED EMISSION

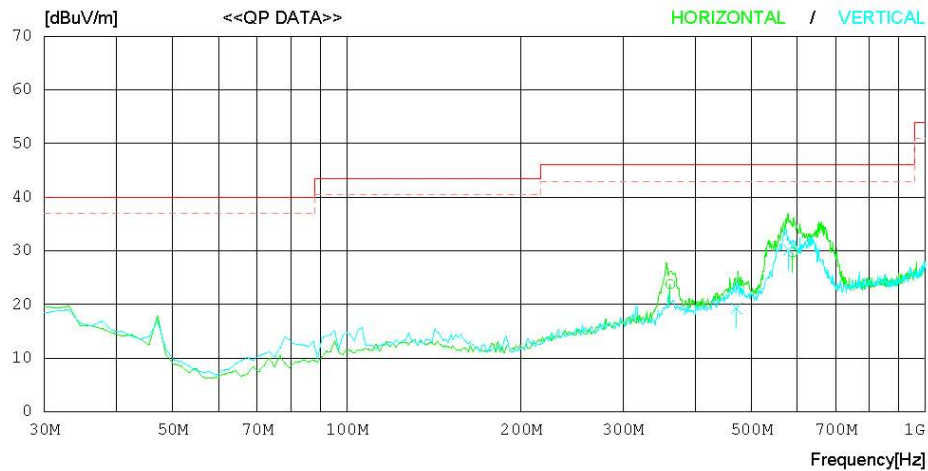
Date : 2010-03-17

Model Name : HFB-320
 Model No. :
 Serial No. : Identical prototype
 Test Condition : TX : 2480 MHz

Reference No. :
 Power Supply : DC 12 V
 Temp/Humi : 22 'c 44 % R.H.
 Operator : D.C.CHA

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
 MARGIN: 3 dB



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	361.993	29.4	15.7	2.8	24.1	23.8	46.0	22.2	100	217
2	589.600	31.1	19.0	4.0	24.4	29.7	46.0	16.3	201	0
----- Vertical -----										
3	471.500	22.8	17.6	3.4	24.5	19.3	46.0	26.7	199	111
4	580.289	31.8	18.9	3.9	24.4	30.2	46.0	15.8	100	83

1GHz ~ 25GHz Radiated Spurious Emissions

▪ Test Case 2 & Lowest Channel

Frequency (MHz)	ANT Pol	Reading(dBuV)		T.F (dB/m)	D.C.F	Result(dBuV/m)		Limit(dBuV/m)		Margin(dB)	
		PK	AV			PK	AV	PK	AV	PK	AV
4804.420	H	55.02	47.81	7.27	-30.77	31.52	24.31	74	54	42.48	29.69
4804.320	V	56.72	49.53	7.27	-30.77	33.22	26.03	74	54	40.75	27.97
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

▪ Test Case 2 & Middle Channel

Frequency (MHz)	ANT Pol	Reading(dBuV)		T.F (dB/m)	D.C.F	Result(dBuV/m)		Limit(dBuV/m)		Margin(dB)	
		PK	AV			PK	AV	PK	AV	PK	AV
4822.075	H	58.72	51.65	7.65	-30.77	35.60	28.53	74.00	54.00	38.40	25.47
4882.345	V	59.81	52.69	7.65	-30.77	36.69	29.57	74.00	54.00	37.31	24.43
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

▪ Test Case 2 & Highest Channel

Frequency (MHz)	ANT Pol	Reading(dBuV)		T.F (dB/m)	D.C.F	Result(dBuV/m)		Limit(dBuV/m)		Margin(dB)	
		PK	AV			PK	AV	PK	AV	PK	AV
4960.385	H	58.37	51.16	7.96	-30.77	35.56	28.35	74.00	54.00	38.44	25.65
4960.380	V	62.43	55.00	7.96	-30.77	39.62	32.19	74.00	54.00	34.38	21.81
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were detected at a level greater than 20dB below limit.
2. Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} + \text{DF} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

$$\text{D.C.F (Duty Cycle Correction Factor)} = 20\log(\text{The worst Case DWELL Time}/100\text{ms})$$

$$= 20\log(2.895\text{ms} / 100\text{ms}) = -30.77\text{dB}$$

4.2.8 AC Line Conducted Emissions

- Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak and average detector mode with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

- Measurement Data: **NA**

Note 1: Conducted emission test is not applicable. Because the power of the EUT is supplied from a car battery.

- Minimum Standard: FCC Part 15.207(a)/EN 55022

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

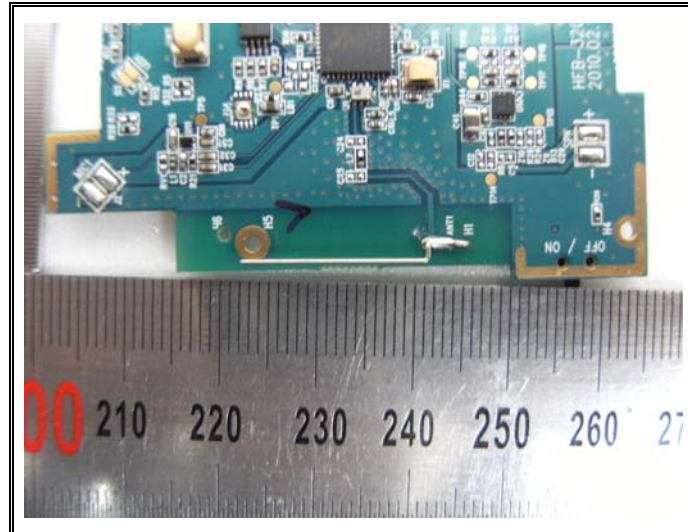
* Decreases with the logarithm of the frequency

4.2.9 Antenna Requirements

- Procedure:

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

- **Conclusion:** **Comply** (The antenna is permanently attached by soldering.)



- Minimum Standard:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions.

APPENDIX

TEST EQUIPMENT FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	Next.Due.Date (dd/mm/yy)	S/N
☒	Spectrum Analyzer	Agilent	E4440A	25/09/09	25/09/10	MY45304199
☐	Spectrum Analyzer	Rohde Schwarz	FSQ26	25/02/10	25/02/11	200347
☐	Spectrum Analyzer(RE)	H.P	8563E	13/10/09	13/10/10	3551A04634
☐	Power Meter	H.P	EMP-442A	02/07/09	02/07/10	GB37170413
☐	Power Sensor	H.P	8481A	02/07/09	02/07/10	3318A96332
☐	Power Divider	Agilent	11636B	13/10/09	13/10/10	56471
☐	Power Splitter	Anritsu	K241B	13/10/09	13/10/10	20611
☐	Power Splitter	Anritsu	K241B	02/07/09	02/07/10	017060
☐	Frequency Counter	H.P	5342A	13/07/09	13/07/10	2119A04450
☐	TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	10/10/09	10/10/10	30604493/021031
☒	Digital Multimeter	H.P	34401A	12/03/10	12/03/11	3146A13475, US36122178
☐	Multifunction Synthesizer	HP	8904A	06/10/09	06/10/10	3633A08404
☒	Signal Generator	Rohde Schwarz	SMR20	12/03/10	12/03/11	101251
☒	Signal Generator	H.P	ESG-3000A	02/07/09	02/07/10	US37230529
☐	Vector Signal Generator	Rohde Schwarz	SMJ100A	11/01/10	11/01/11	100148
☐	Vector Signal Generator	Rohde Schwarz	SMBV100A	23/02/10	23/02/11	255571
☐	Audio Analyzer	H.P	8903B	02/07/09	02/07/10	3011A09448
☐	Modulation Analyzer	H.P	8901B	02/07/09	02/07/10	3028A03029
☐	8960 Series 10 Wireless Comms. Test Set	Agilent	E5515C	02/07/09	02/07/10	GB43461134
☐	Universal Radio communication Tester	Rohde Schwarz	CMU 200	19/05/09	19/05/10	106760
☐	Bluetooth Tester	TESCOM	TC-3000B	02/07/09	02/07/10	3000B000268
☐	Thermo hygrometer	BODYCOM	BJ5478	28/01/10	28/01/11	090205-3
☒	Thermo hygrometer	BODYCOM	BJ5478	28/01/10	28/01/11	090205-2
☐	Thermo hygrometer	BODYCOM	BJ5478	28/01/10	28/01/11	090205-4
☐	AC Power supply	DAEKWANG	5KVA	12/03/10	12/03/11	20060321-1
☐	DC Power Supply	HP	6622A	12/03/10	12/03/11	3448A03760
☒	DC Power Supply	HP	6633A	12/03/10	12/03/11	3524A06634
☐	BAND Reject Filter	Microwave Circuits	N0308372	06/10/09	06/10/10	3125-01DC0352
☐	BAND Reject Filter	Wainwright	WRCG1750	06/10/09	06/10/10	2
☐	High-Pass Filter	ANRITSU	MP526D	06/10/09	06/10/10	M27756
☐	High-pass filter	Wainwright	WHKX2.1	N/A	N/A	1
☒	High-Pass Filter	Wainwright	WHKX3.0	N/A	N/A	9
☐	High-Pass Filter	Wainwright	WHNX5.0	N/A	N/A	8
☐	High-Pass Filter	Wainwright	WHNX8.5	N/A	N/A	1
☐	Tunable Notch Filter	Wainwright	WRCT800.0 /960.0-0.2/40-8SSK	N/A	N/A	32
☐	Tunable Notch Filter	Wainwright	WRCD1700.0 /2000.0-0.2/40-10SSK	N/A	N/A	53
☐	Tunable Notch Filter	Wainwright	WRCT1900.0 /2200.0-5/40-10SSK	N/A	N/A	30
☐	HORN ANT	ETS	3115	17/06/09	17/06/10	6419
☒	HORN ANT	ETS	3115	23/09/09	23/09/10	21097
☐	HORN ANT	A.H.Systems	SAS-574	10/06/09	10/06/10	154
☐	HORN ANT	A.H.Systems	SAS-574	10/06/09	10/06/10	155

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	Next.Due.Date (dd/mm/yy)	S/N
☐	Dipole Antenna	Schwarzbeck	VHA9103	06/10/09	06/10/10	2116
☐	Dipole Antenna	Schwarzbeck	VHA9103	06/10/09	06/10/10	2117
☐	Dipole Antenna	Schwarzbeck	UHA9105	05/10/09	05/10/10	2261
☐	Dipole Antenna	Schwarzbeck	UHA9105	05/10/09	05/10/10	2262
☐	LOOP Antenna	ETS	6502	14/09/09	14/09/10	3471
☐	Coaxial Fixed Attenuators	Agilent	8491B	02/07/09	02/07/10	MY39260700
☐	Attenuator (3dB)	WEINSCHEL	56-3	16/12/09	16/12/10	Y2342
☐	Attenuator (3dB)	WEINSCHEL	56-3	16/12/09	16/12/10	Y2370
☐	Attenuator (10dB)	WEINSCHEL	23-10-34	01/10/09	01/10/10	BP4386
☐	Attenuator (10dB)	WEINSCHEL	23-10-34	11/01/10	11/01/11	BP4387
☐	Attenuator (20dB)	WEINSCHEL	86-20-11	06/10/09	06/10/10	432
☐	Attenuator (10dB)	WEINSCHEL	31696	06/10/09	06/10/10	446
☐	Attenuator (10dB)	WEINSCHEL	31696	06/10/09	06/10/10	408
☐	Attenuator (40dB)	WEINSCHEL	57-40-33	01/10/09	01/10/10	NN837
☐	Attenuator (30dB)	JFW	50FH-030-300	12/03/10	12/03/11	060320-1
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0088CAN	02/07/09	02/07/10	788
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0185CAN	02/07/09	02/07/10	790
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0215CAN	02/07/09	02/07/10	112
☒	Amplifier (30dB)	Agilent	8449B	10/10/09	10/10/10	3008A01590
☐	Amplifier	EMPOWER	BBS3Q7ELU	02/11/09	02/11/10	1020
☐	RF Power Amplifier	OPHIRRF	5069F	02/07/09	02/07/10	1006
☒	EMI TEST RECEIVER	R&S	ESU	29/01/10	29/01/11	100014
☒	BILOG ANTENNA	SCHAFFNER	CBL6112B	02/06/09	02/06/10	2737
☒	Amplifier (22dB)	H.P	8447E	29/01/10	29/01/11	2945A02865
☐	EMI TEST RECEIVER	R&S	ESCI	12/05/09	12/05/10	100364
☐	LOG-PERIODIC ANT.	Schwarzbeck	UHALP9108A	30/05/09	30/05/10	590
☐	BICONICAL ANT.	Schwarzbeck	VHA 9103	02/06/09	02/06/10	2233
☐	LOG-PERIODIC ANT.	Schwarzbeck	UHALP 9108 A-1	07/10/09	07/10/10	1098
☐	BICONICAL ANT.	Schwarzbeck	VHA 9103	06/10/09	06/10/10	91031946
☐	Low Noise Pre Amplifier	TSJ	MLA-100K01-B01-2	12/03/10	12/03/11	1252741
☐	Amplifier (25dB)	Agilent	8447D	12/05/09	12/05/10	2944A10144
☐	Amplifier (25dB)	Agilent	8447D	03/07/09	03/07/10	2648A04922
☐	Spectrum Analyzer(CE)	H.P	8591E	12/03/10	12/03/11	3649A05889
☐	LISN	Kyoritsu	KNW-407	29/01/10	29/01/11	8-317-8
☐	LISN	Kyoritsu	KNW-242	29/01/10	29/01/11	8-654-15
☐	CVCF	NF Electronic	4420	12/03/10	12/03/11	304935/337980
☐	50 ohm Terminator	HME	CT-01	12/01/10	12/01/11	N/A
☐	RFI/FIELD Intensity Meter	Kyoritsu	KNM-2402	03/07/09	03/07/10	4N-170-3