

RF TEST REPORT

Test item : BLUETOOTH Mono Headset
Model No. : HBM-586
Order No. : 1101-00063
Date of receipt : 2011-01-14
Test duration : 2011-01-28 ~ 2011-02-10
Date of issue : 2011-03-23
Use of report : FCC Original Grant

Applicant : LG Electronics USA.
1000 Sylvan Avenue Englewood Cliffs, New Jersey, United States

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification : FCC Part 15.247 Subpart C
ANSI C63.4-2003

Test environment : See appended test report

Test result : ☒ Pass ☐ Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of Digital EMC Co., Ltd.

Tested by:



Engineer
D.C. Cha

Witnessed by:



N/A

Reviewed by:



Manager
W.J. Lee

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1. Equipment information

1.1 Equipment description

FCC Equipment Class	Part 15 Spread Spectrum Transmitter(DSS)
Equipment type	BLUETOOTH Mono Headset
Equipment model name	HBM-586
Equipment add model name	N/A
Equipment serial no.	Identical prototype
Frequency band	2402 ~ 2480 MHz
Spread Spectrum	Frequency Hopping
Modulation type	GFSK, $\pi/4$ -DQPSK
Transmission rate	1Mbps, 2Mbps
Channel Spacing	1.0 MHz
Power	Lithium Battery: DC 3.7V
Antenna type	Internal Type: FPCB Antenna (Max. Peak Gain: -0.9 dBi)

1.2 Ancillary equipment

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

2. Information about test items

2.1 Test mode & EUT Position

This Device was tested in maximum duty mode at maximum power of hopping enable / disable mode.

Test Case 1	-
Test Case 2	-
Test Case 3	-

EUT position: refer to Test photo file.

2.2 Auxiliary equipment

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

2.3 Tested frequency

- Hopping Function: Enable

	TX Frequency (MHz)	RX Frequency (MHz)
Hopping Band	2402 ~ 2480	2402 ~ 2480

- Hopping Function: Disable

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

2.4 Tested environment

Temperature	: 21 ~ 23 °C
Relative humidity content	: 42 ~ 55 % R.H.
Details of power supply	: DC 3.7 V

2.5 EMI Suppression Device(s)/Modifications

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

→ None

3. Test Report

3.1 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	>= 20dB BW or >= 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	=< 1Watt , if CHs >= 75 Others =<0.125W		C
15.247(d)	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	Radiated	C Note. 2
15.207	AC Conducted Emissions	FCC 15.207	AC Line Conducted	NA Note. 3
15.203	Antenna Requirements	FCC 15.203	-	C
Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable Note 2: This test item was performed in each axis. And the worst case data were reported. Note 3: When this device is in the charging mode, the Bluetooth function is disabled.				

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

3.2 Transmitter requirements

3.2.1 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	Test Mode	Peak of center channel (MHz)	Peak of adjacent Channel (MHz)	Test Result (MHz)
Enable	Data rate:1Mbps	2439.953	2440.973	1.020
	Data rate: 2Mbps	2440.124	2441.132	1.008

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

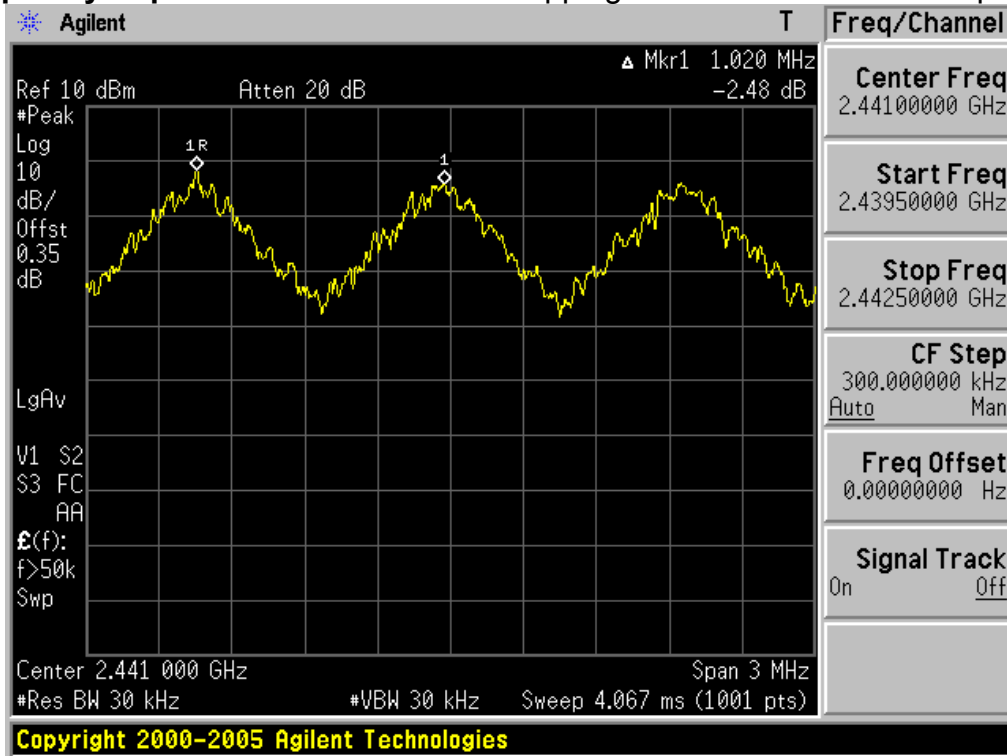
- Minimum Standard:

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

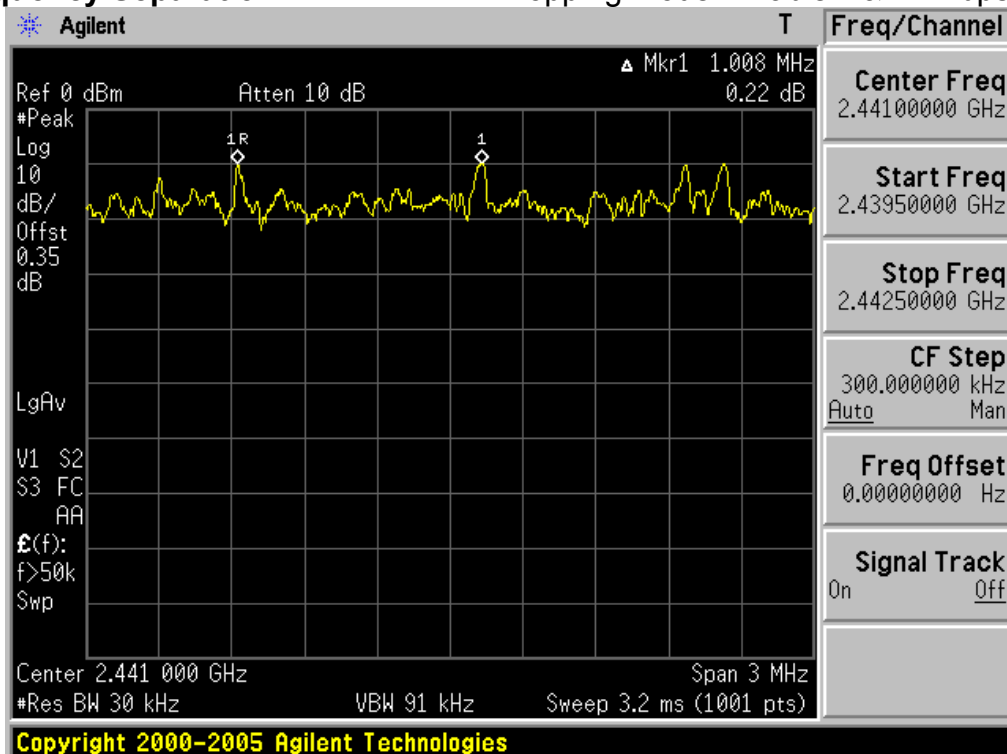
Carrier Frequency Separation

Hopping mode: Enable & 1Mbps



Carrier Frequency Separation

Hopping mode: Enable & 2Mbps



3.2.2 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	Test mode	Test Result (Total Hops)
Enable	Data rate: 1Mbps	79
	Data rate: 2Mbps	79

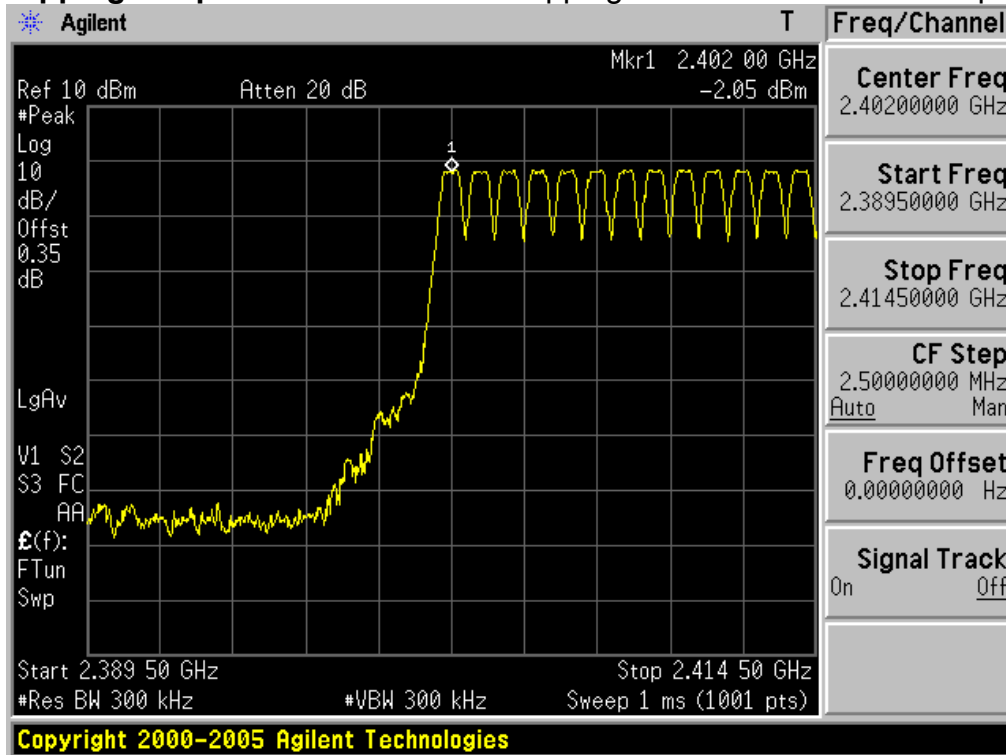
Note 1: See next pages for actual measured spectrum plots.

- Minimum Standard:

At least 15 hops

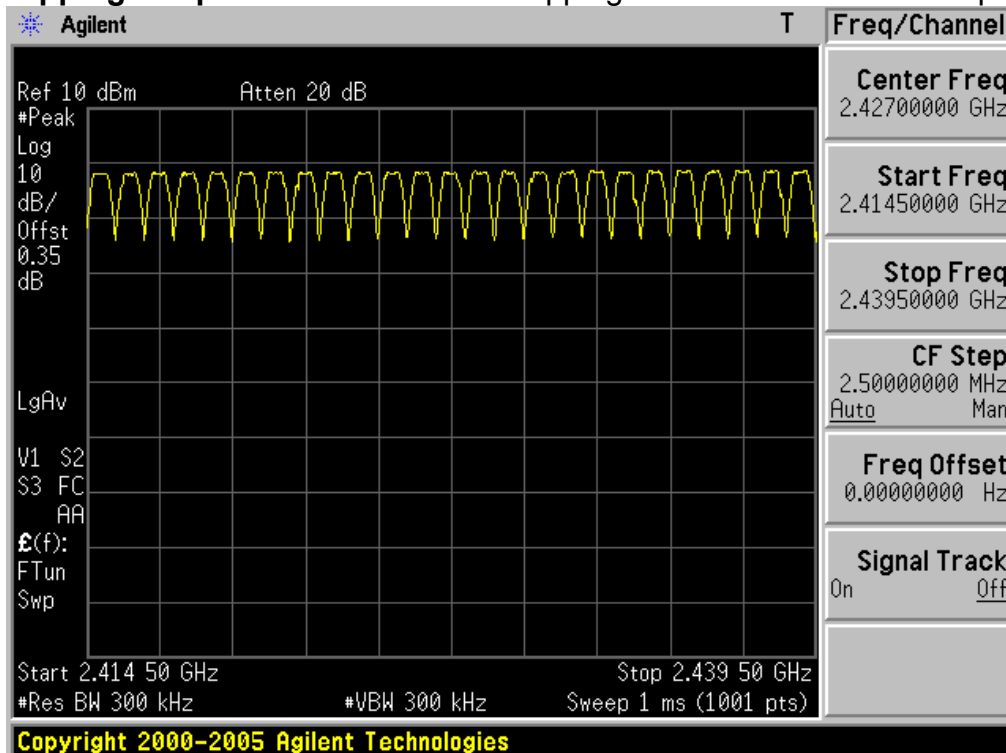
Number of Hopping Frequencies 1

Hopping mode: Enable & 1Mbps



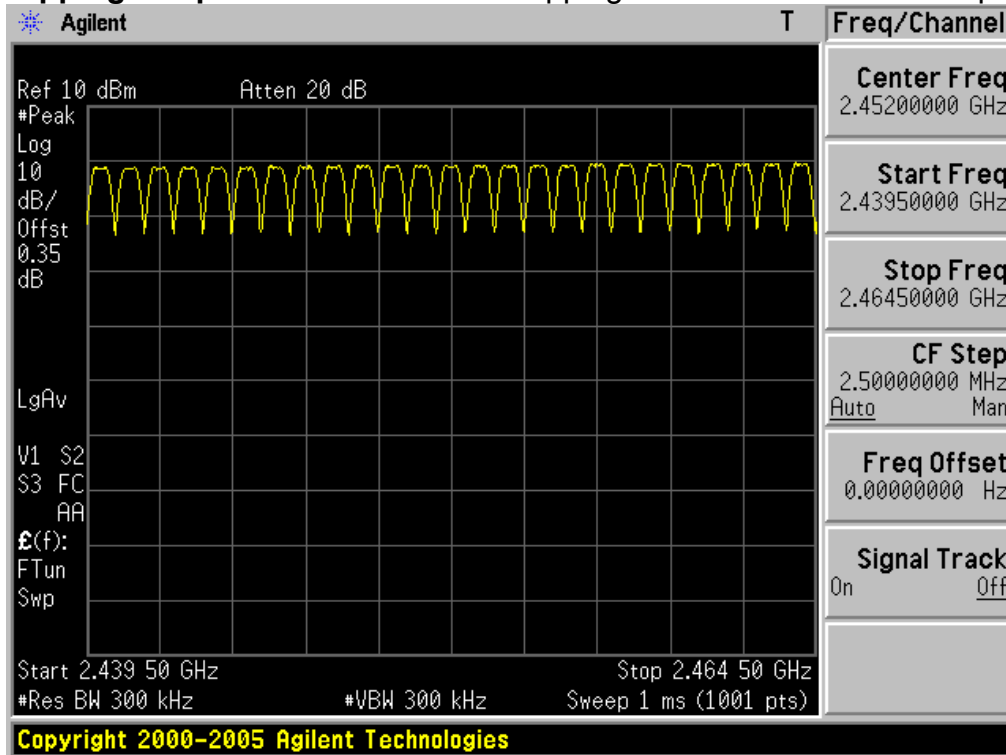
Number of Hopping Frequencies 2

Hopping mode: Enable & 1Mbps



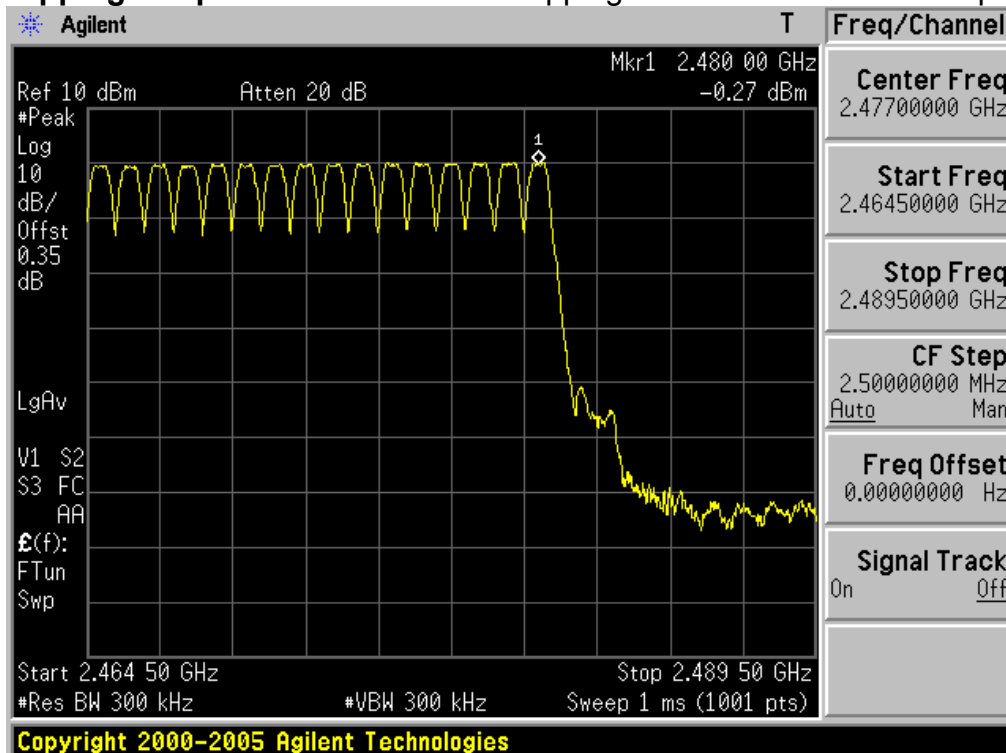
Number of Hopping Frequencies 3

Hopping mode: Enable & 1Mbps



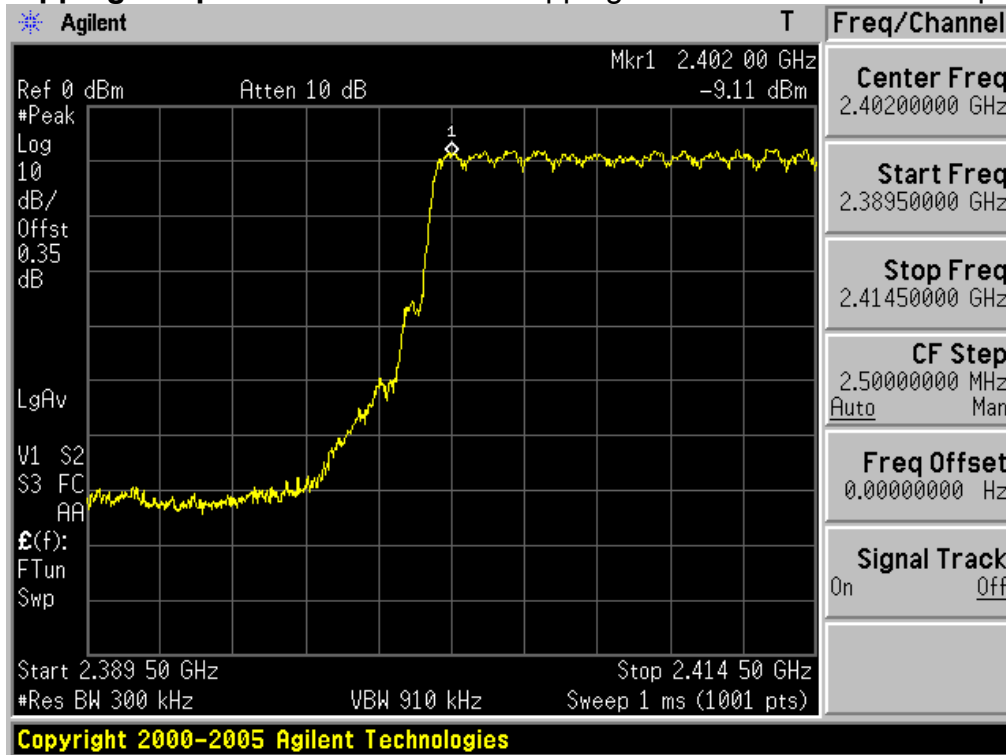
Number of Hopping Frequencies 4

Hopping mode: Enable & 1Mbps



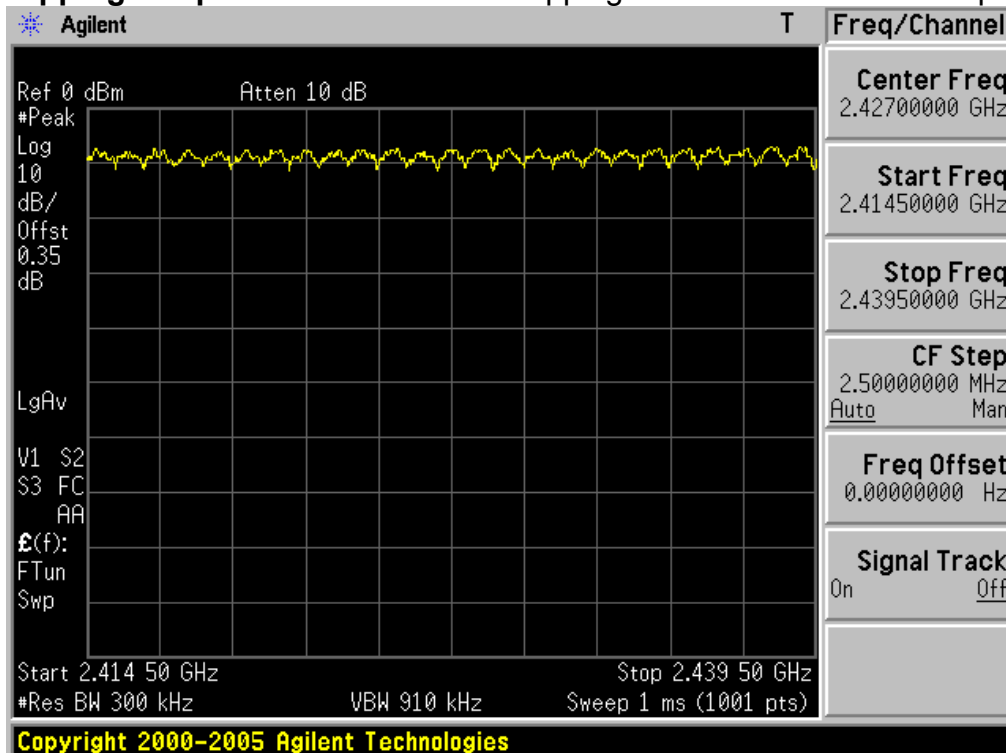
Number of Hopping Frequencies 1

Hopping mode: Enable & 2Mbps



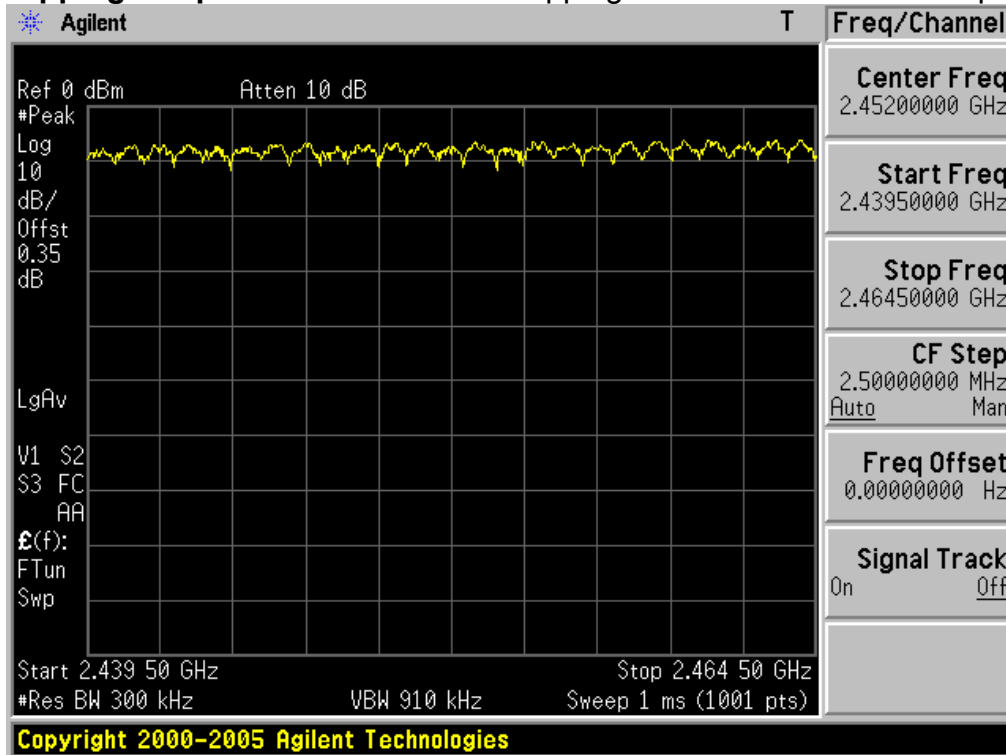
Number of Hopping Frequencies 2

Hopping mode: Enable & 2Mbps



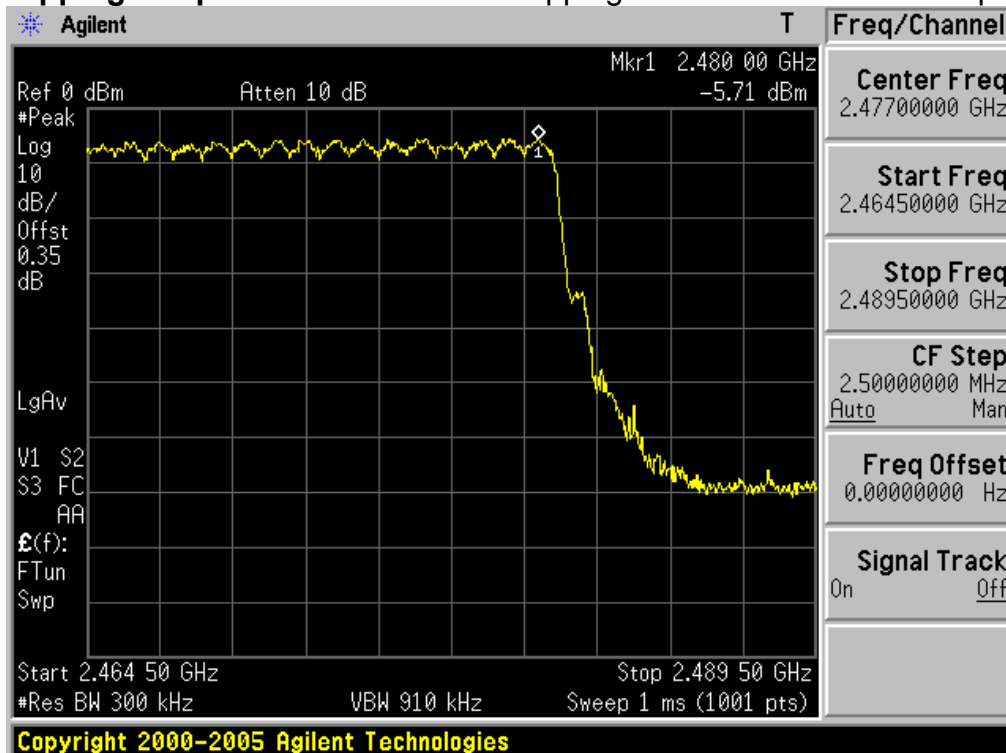
Number of Hopping Frequencies 3

Hopping mode: Enable & 2Mbps



Number of Hopping Frequencies 4

Hopping mode: Enable & 2Mbps



3.2.3 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	Test mode	Tested Channel	Test Results (MHz)
Disable	Date rate: 1Mbps	Lowest	0.935
		Middle	0.930
		Highest	0.940
	Date rate: 2Mbps	Lowest	1.285
		Middle	1.265
		Highest	1.270

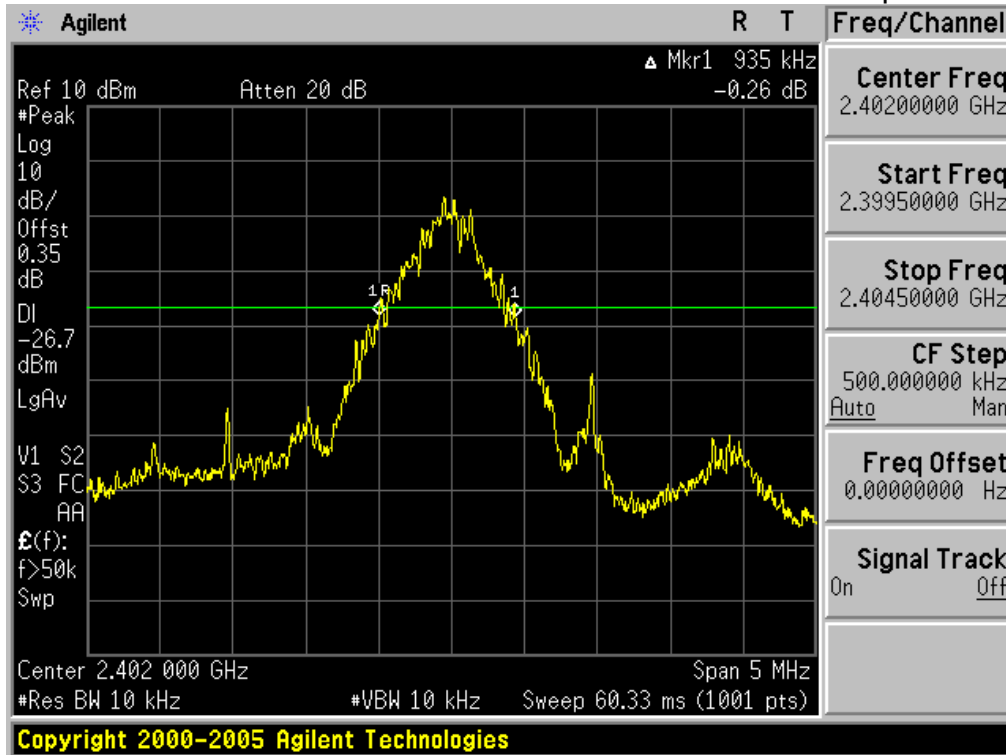
Note 1: See next pages for actual measured spectrum plots.

- Minimum Standard:

None

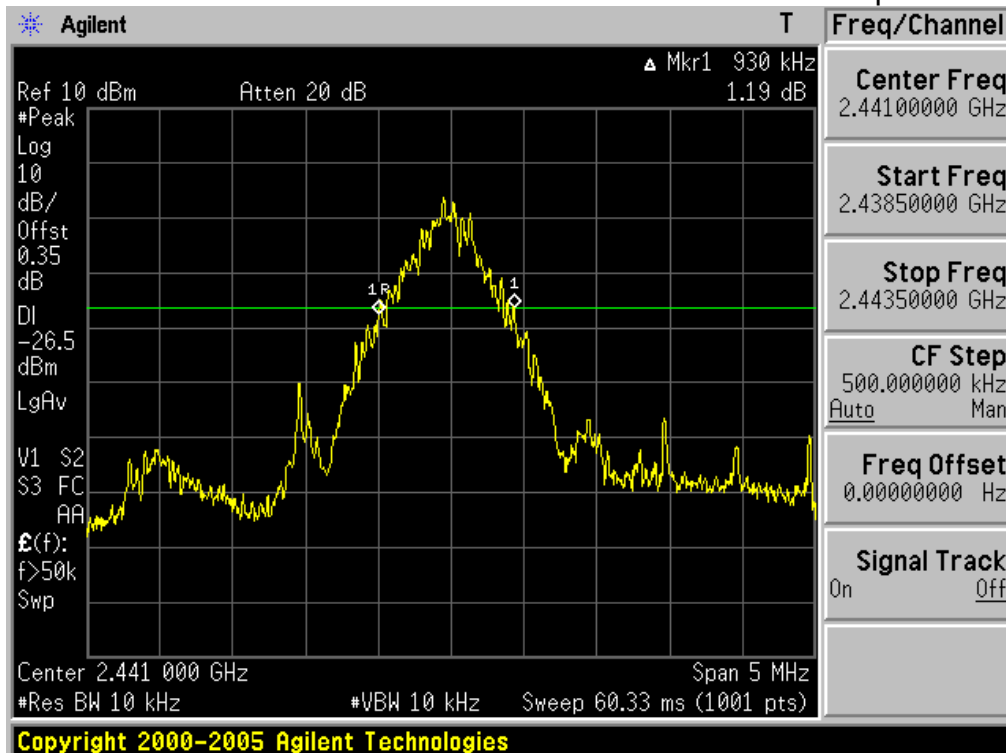
20dB Bandwidth

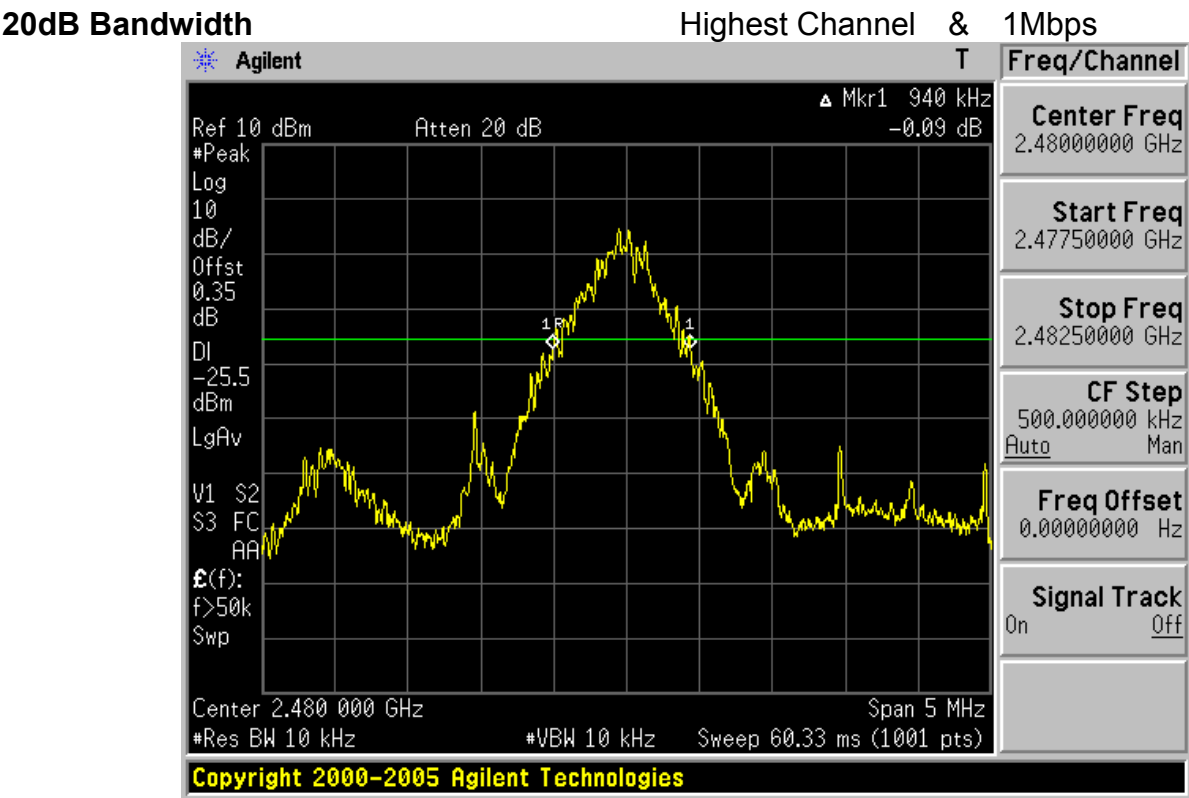
Lowest Channel & 1Mbps



20dB Bandwidth

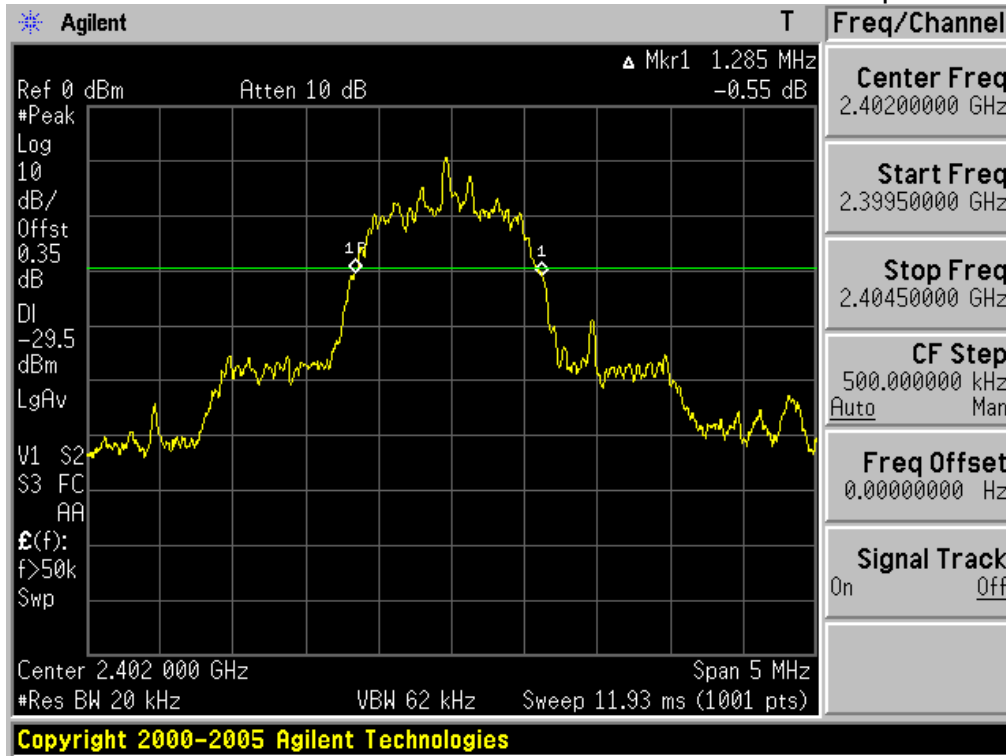
Middle Channel & 1Mbps





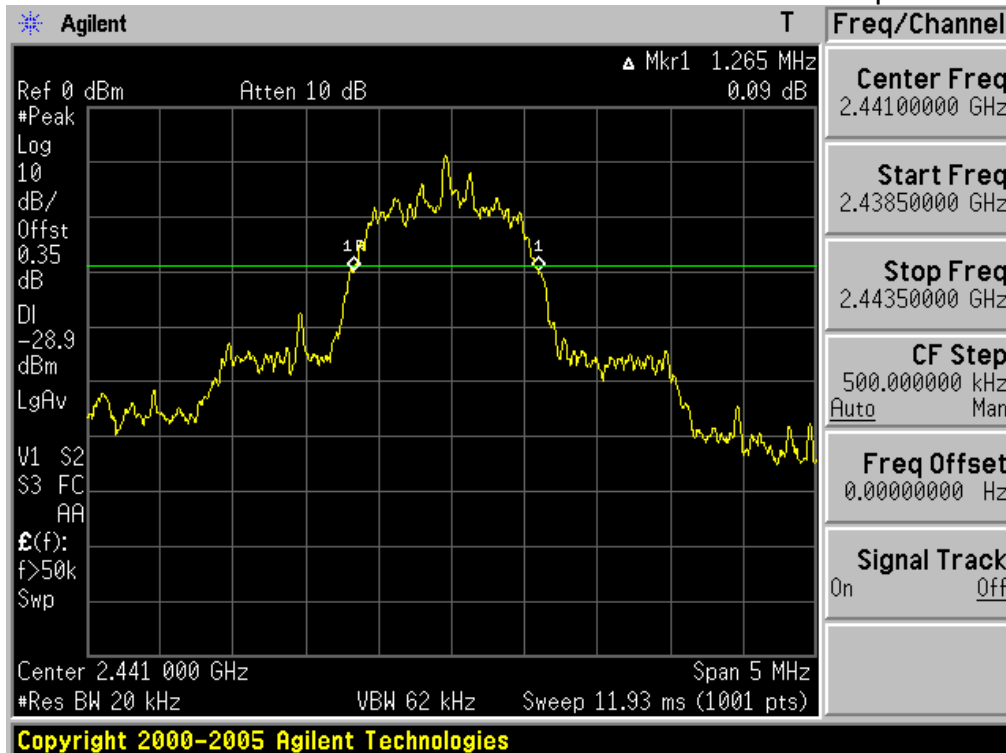
20dB Bandwidth

Lowest Channel & 2Mbps



20dB Bandwidth

Middle Channel & 2Mbps



20dB Bandwidth

Highest Channel & 2Mbps



3.2.4 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

RBW = 1 MHz

Trace = max hold

Span = zero

VBW = $\geq$ RBW

Detector function = peak

- Measurement Data: **Comply**

Hopping mode	Test mode	Packet Type	Burst On Time (ms)	Period (ms)	Number of hopping Channels	Test Result (s)
Enable	Data Rate: 1Mbps	DH 5	2.895	3.750	79	0.309
	Data Rate: 2Mbps	DH 5	2.910	3.750	79	0.310

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

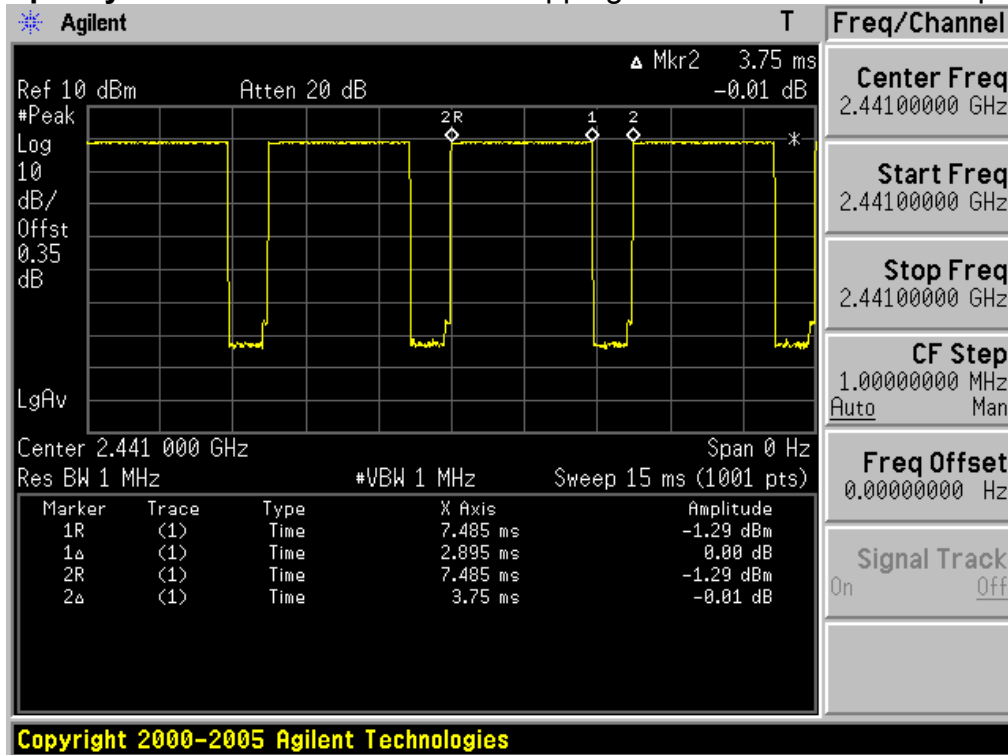
Note 2: See next pages for actual measured spectrum plots.

- Minimum Standard:

No greater than 0.4 seconds

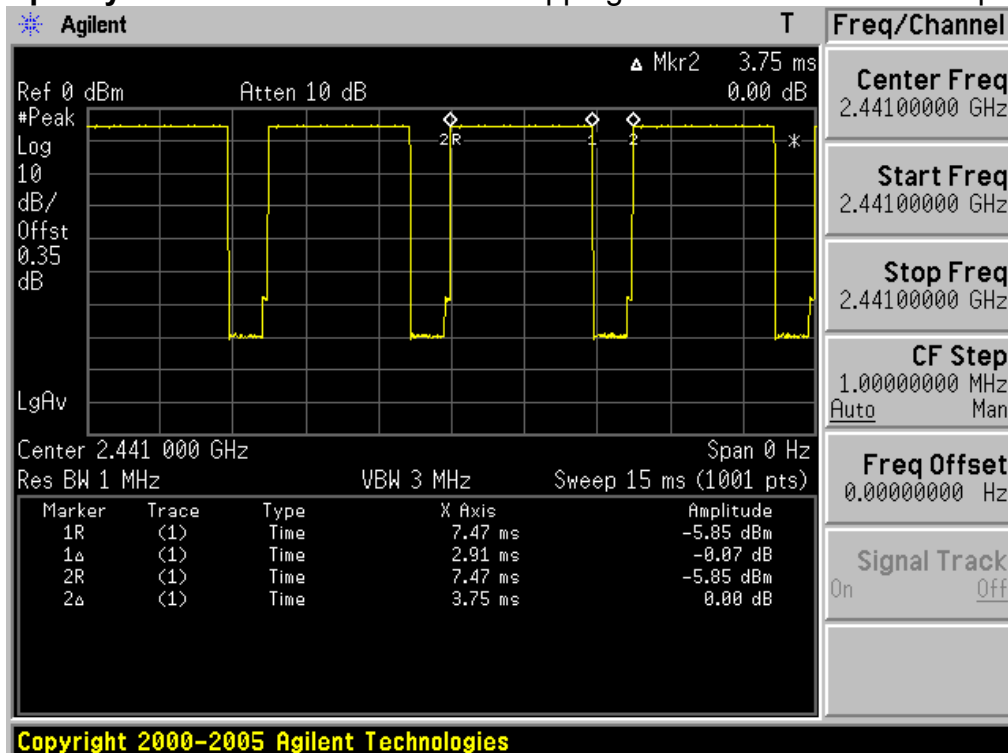
Time of Occupancy

Hopping mode: Enable & 1Mbps



Time of Occupancy

Hopping mode: Enable & 2Mbps



3.2.5 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	Test mode	Tested Channel	Test Results	
			dBm	mW
Disable	Data rate: 1Mbps	Lowest	-1.68	0.679
		Middle	-1.17	0.764
		Highest	0.07	1.016
	Data rate: 2Mbps	Lowest	-7.24	0.189
		Middle	-6.67	0.215
		Highest	-4.77	0.333

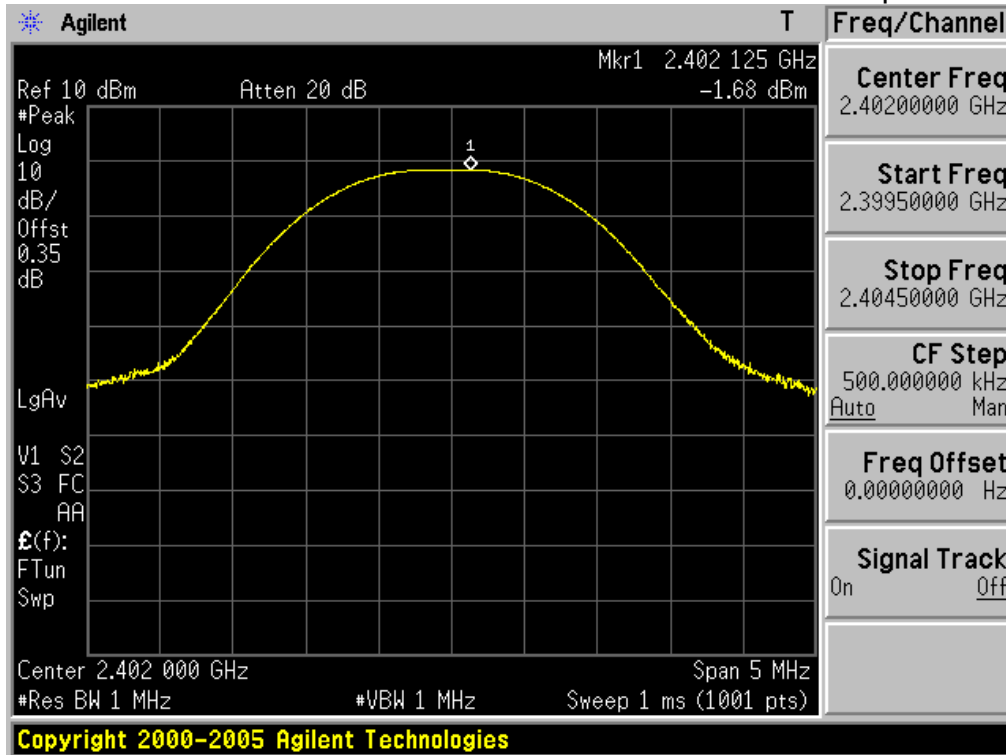
Note 1: See next pages for actual measured spectrum plots.

- 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**

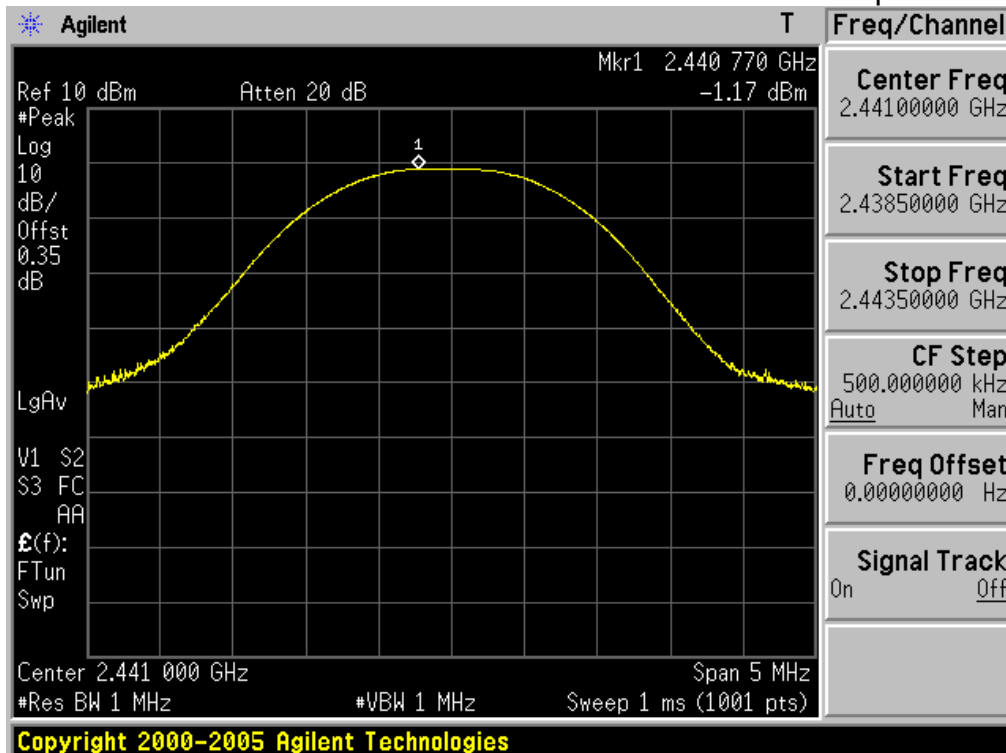
Peak Output Power

Lowest Channel & 1Mbps



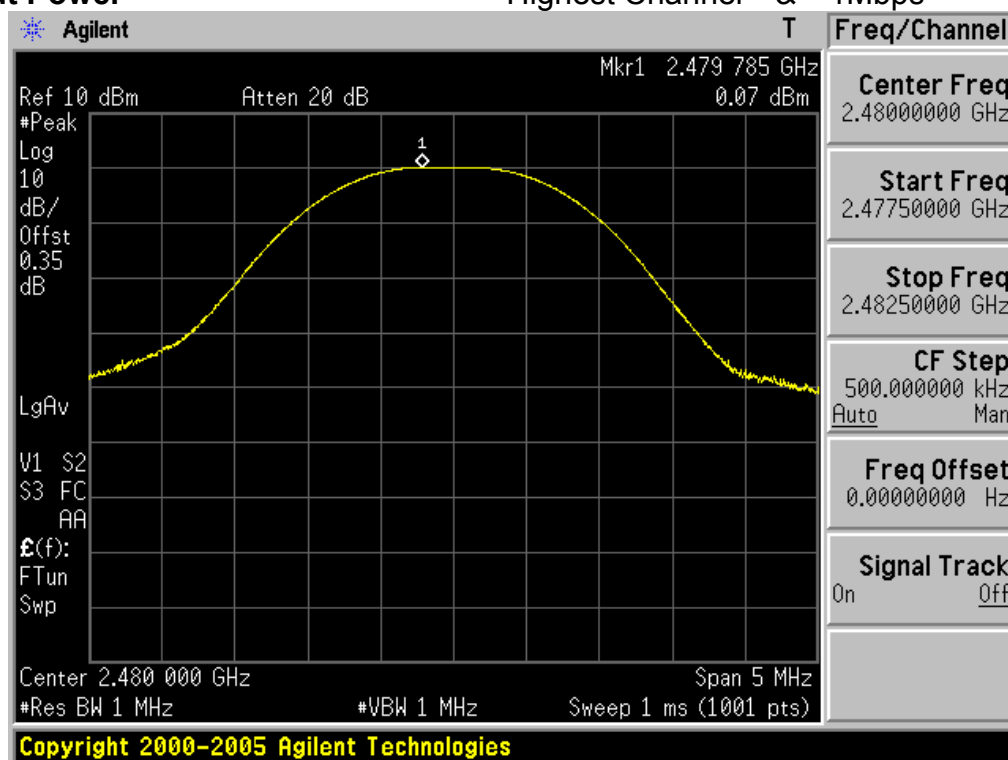
Peak Output Power

Middle Channel & 1Mbps



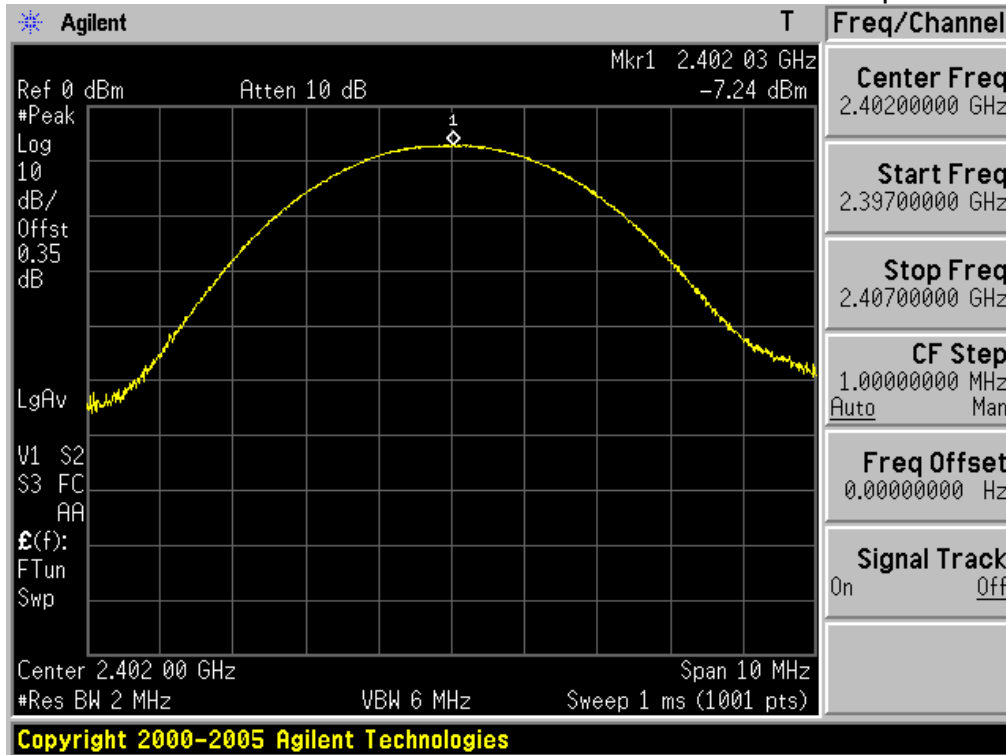
Peak Output Power

Highest Channel & 1Mbps



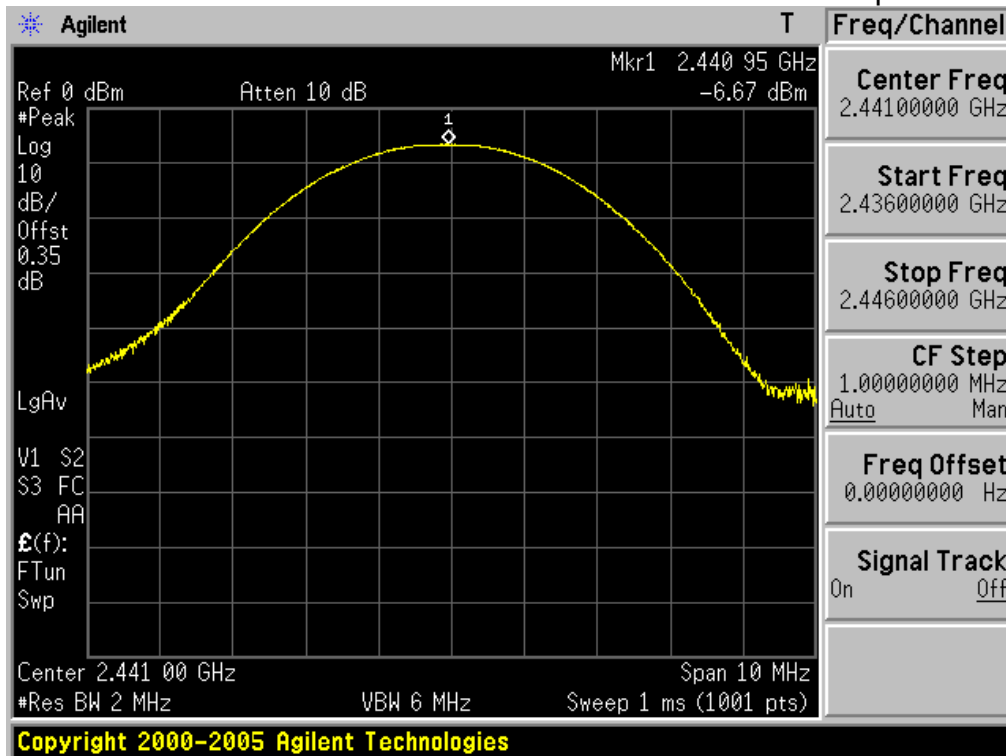
Peak Output Power

Lowest Channel & 2Mbps



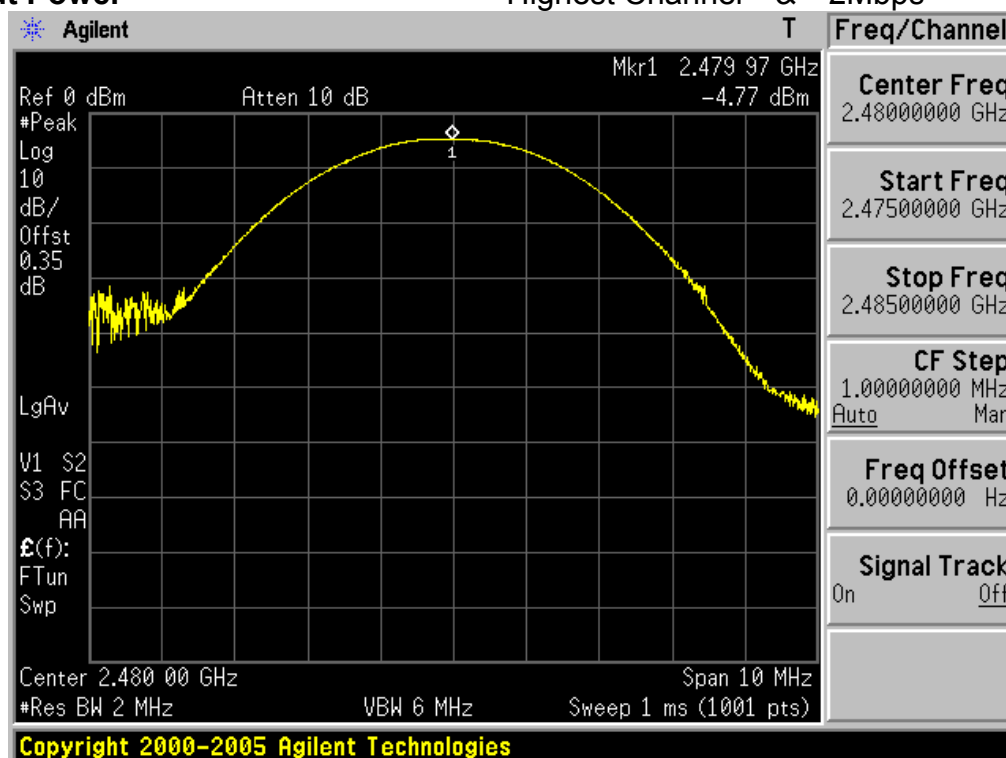
Peak Output Power

Middle Channel & 2Mbps



Peak Output Power

Highest Channel & 2Mbps



3.2.6 Conducted Spurious Emissions

- Procedure:

The bandwidth at 20dB down from the highest inband spectral density is 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 measure 20 dB down both sides of the intentional emission.

For Band-edge testing the spectrum analyzer is set to:

Tested frequency = the highest and the lowest Frequencies

Center frequency = 2400MHz, 2483.5MHz

Span = 10MHz

Detector function = peak

RBW = 1% of the span

VBW = $\geq$ RBW

Trace = max hold

Sweep = auto

For spurious testing the spectrum analyzer is set to:

Tested frequency = the highest, middle and the lowest Frequencies

RBW = 100 kHz

VBW = $\geq$ RBW

Detector function = peak

Sweep = auto

Trace = max hold

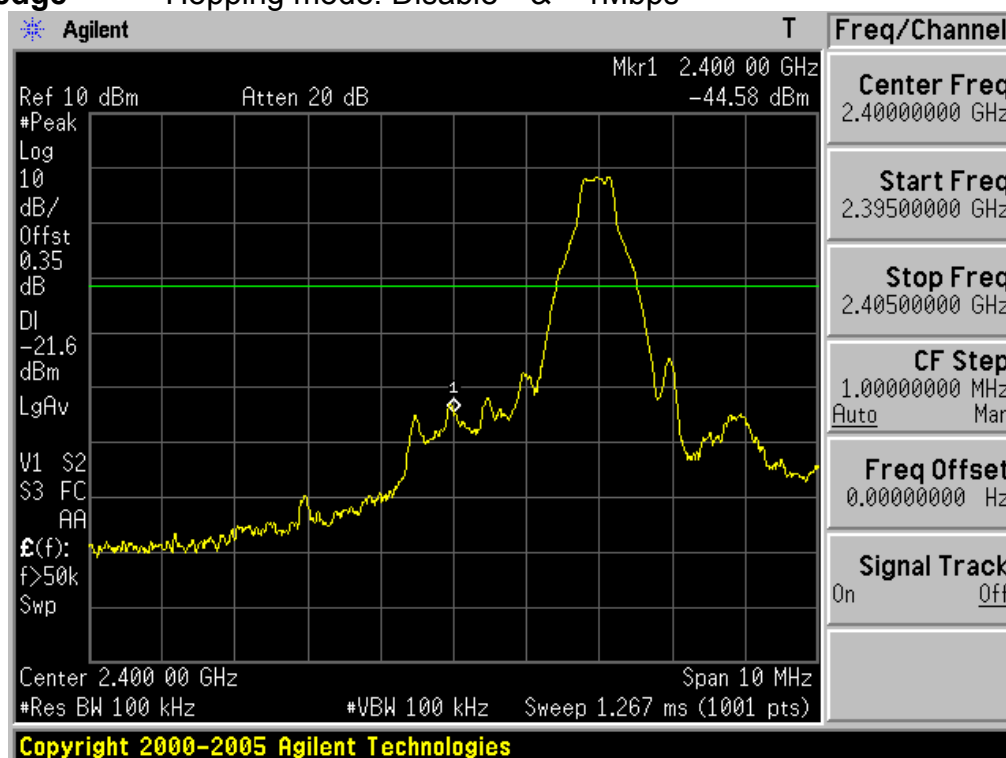
- Measurement Data: **Comply**

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

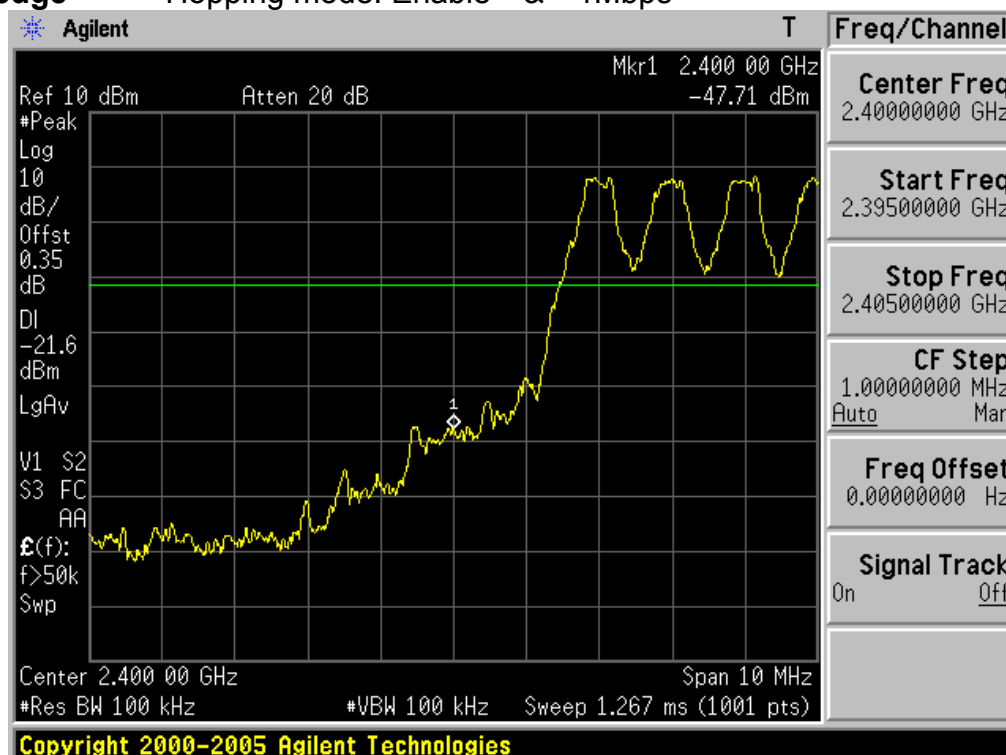
- Minimum Standard:

Minimum Standard:	> 20 dBc
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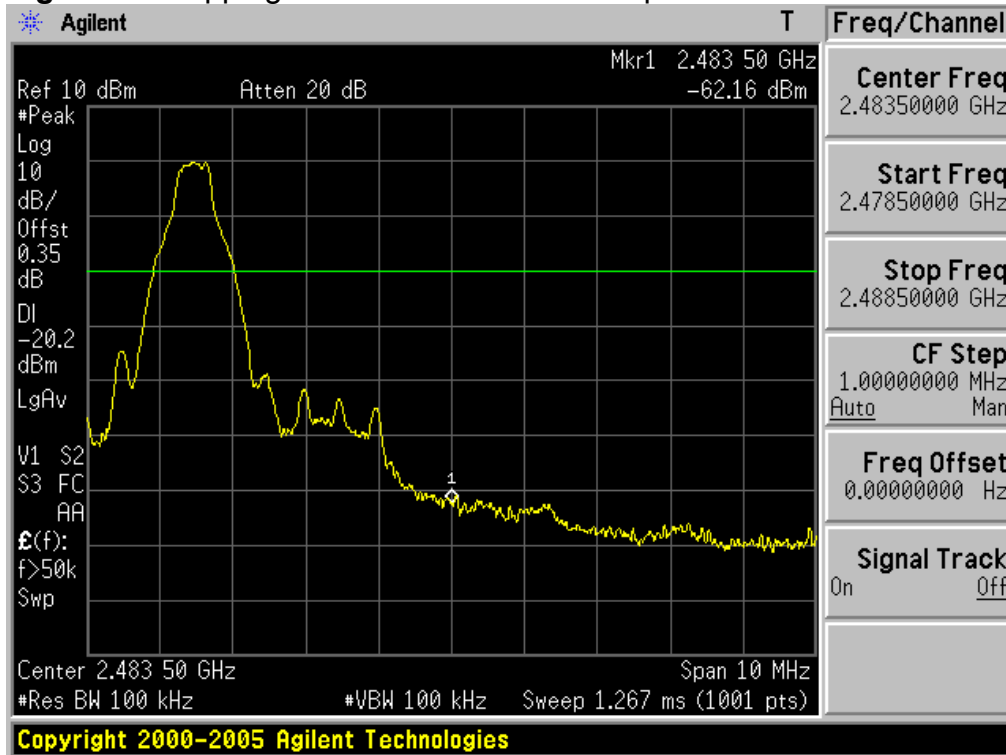
Low Band-edge Hopping mode: Disable & 1Mbps



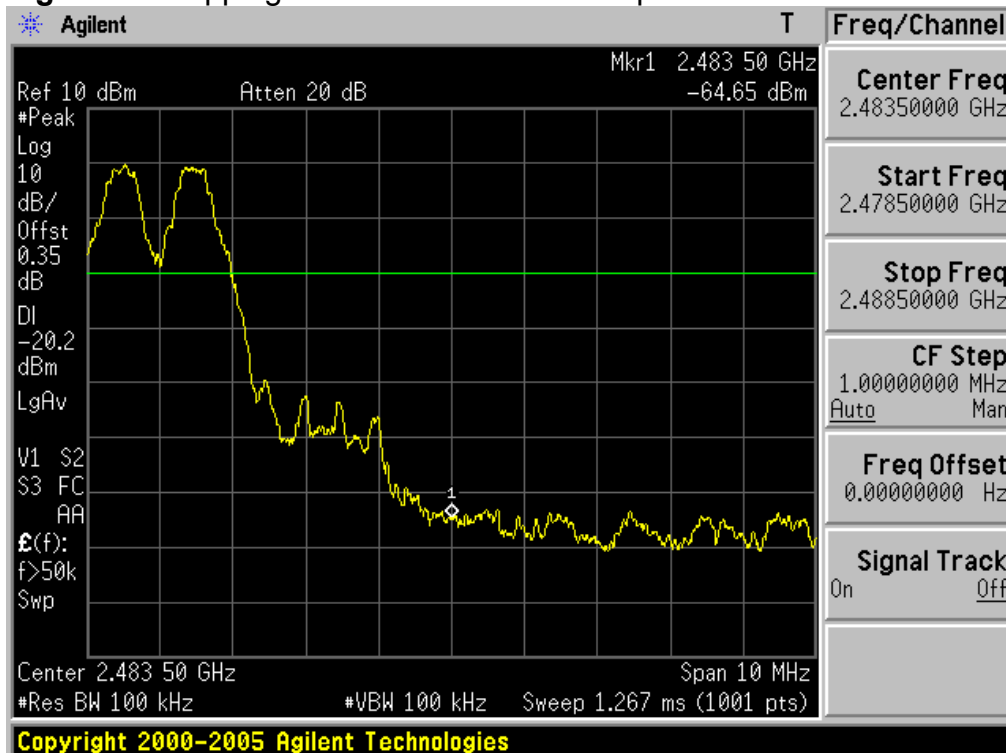
Low Band-edge Hopping mode: Enable & 1Mbps



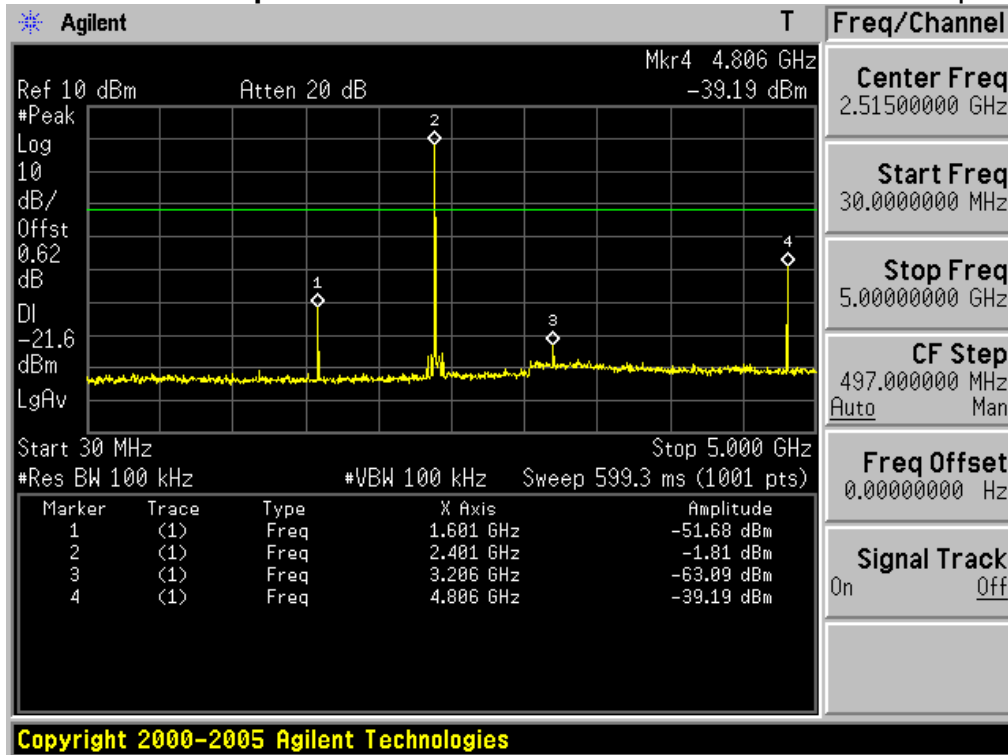
High Band-edge Hopping mode: Disable & 1Mbps



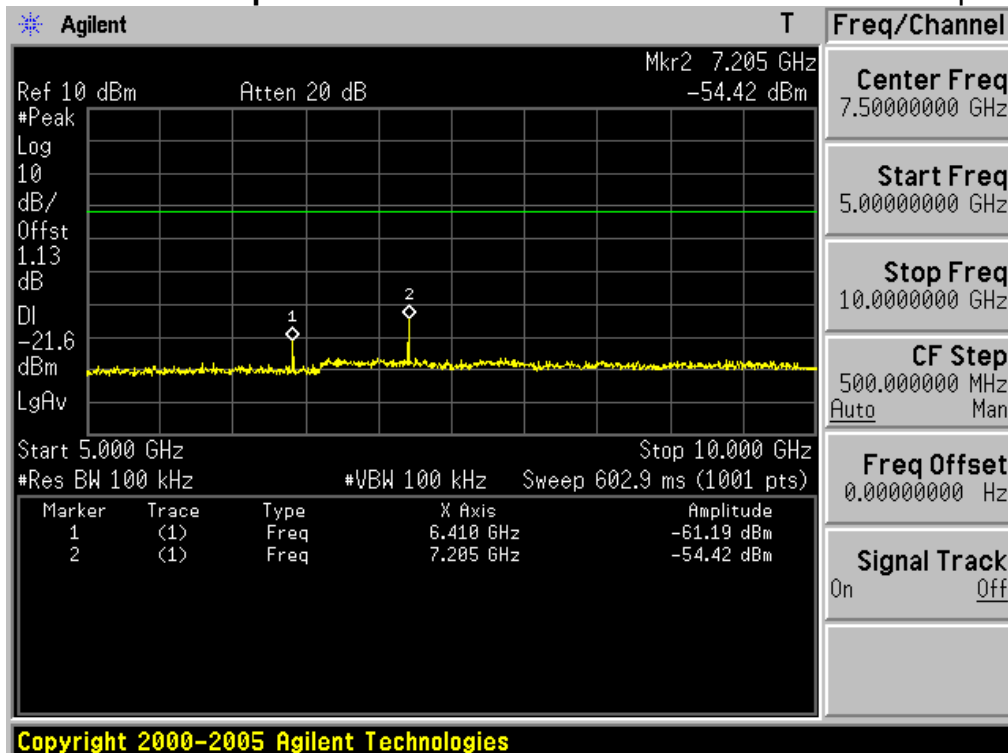
High Band-edge Hopping mode: Enable & 1Mbps



30MHz ~ 5GHz Conducted Spurious Emissions Lowest Channel & 1Mbps

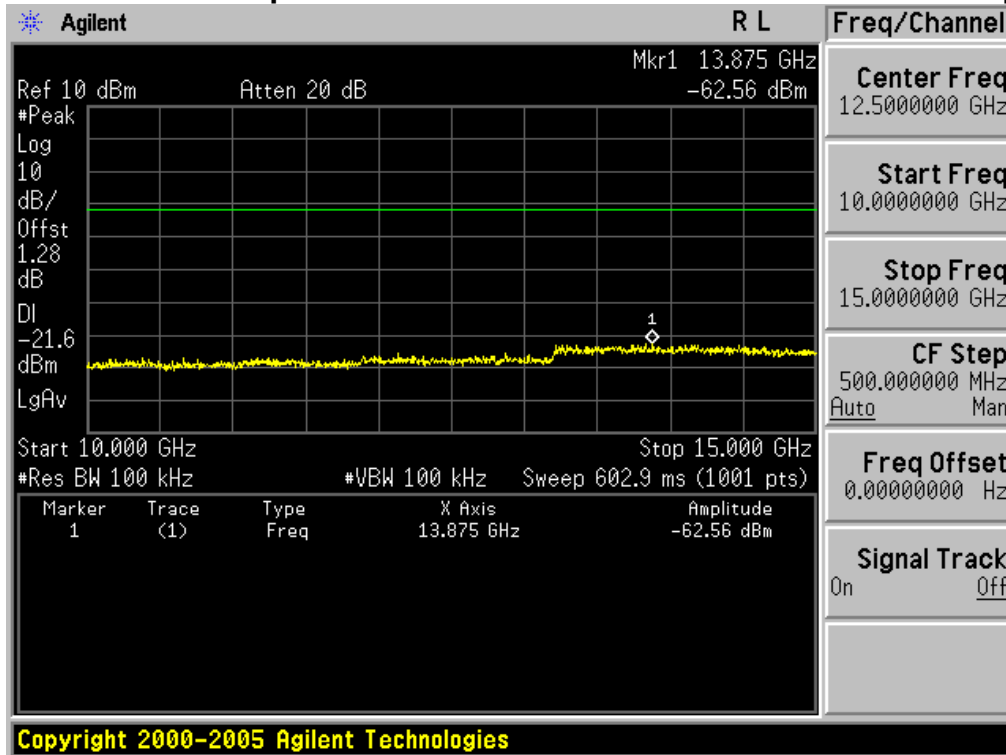


5GHz ~ 10GHz Conducted Spurious Emissions Lowest Channel & 1Mbps



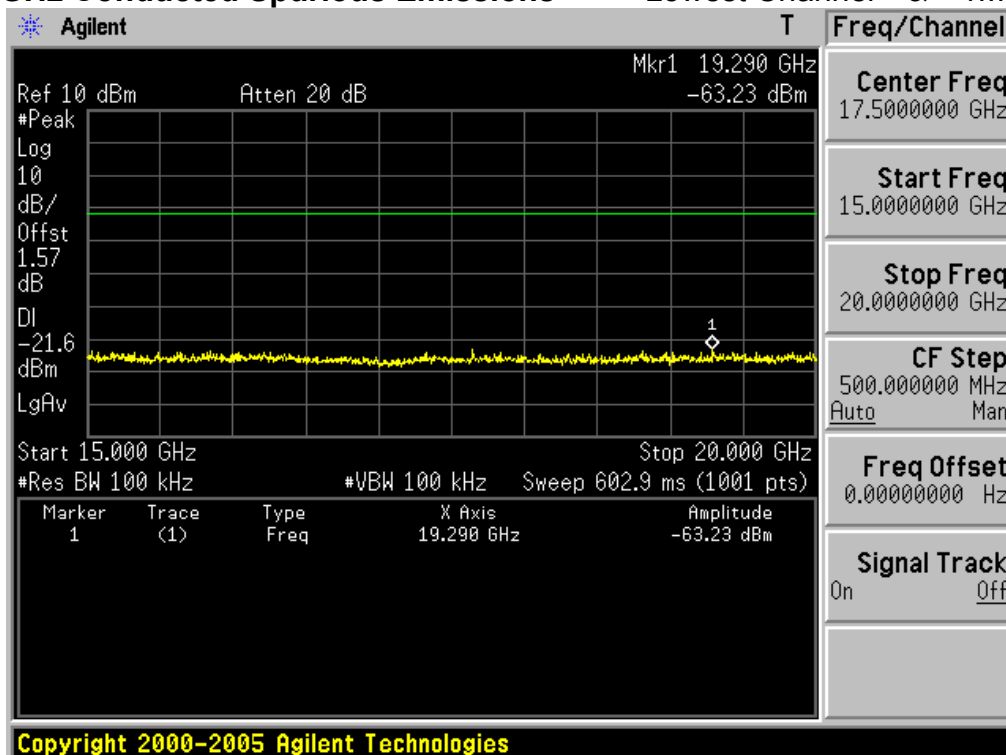
10GHz ~ 15GHz Conducted Spurious Emissions

Lowest Channel & 1Mbps



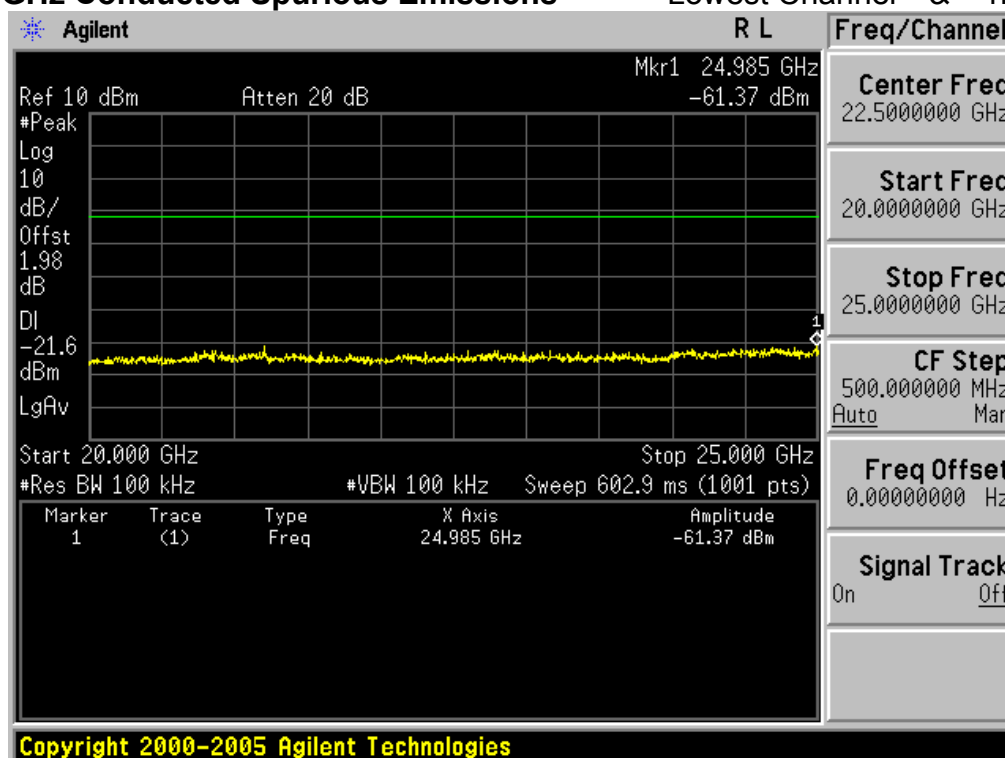
15GHz ~ 20GHz Conducted Spurious Emissions

Lowest Channel & 1Mbps



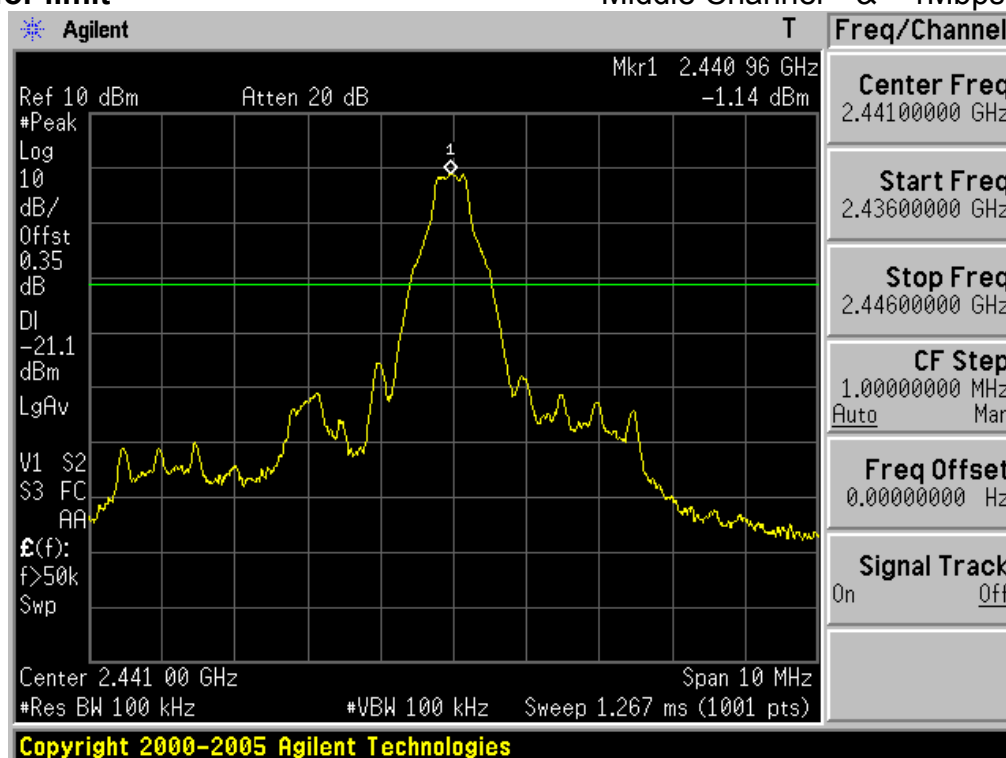
20GHz ~ 25GHz Conducted Spurious Emissions

Lowest Channel & 1Mbps



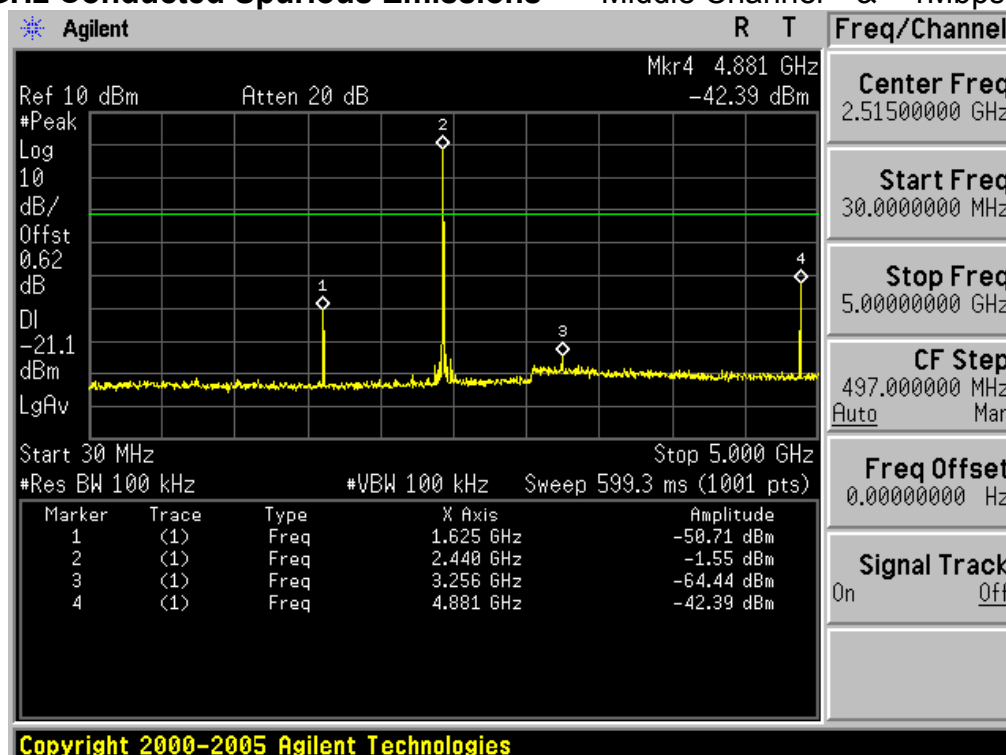
Reference for limit

Middle Channel & 1Mbps

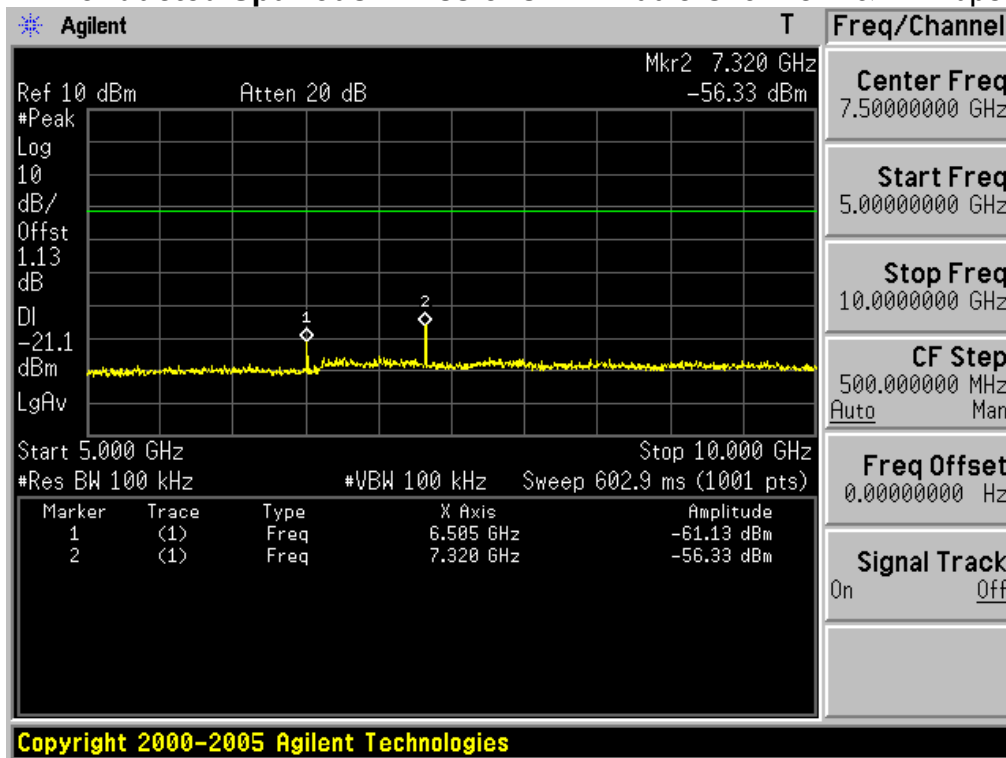


30MHz ~ 5GHz Conducted Spurious Emissions

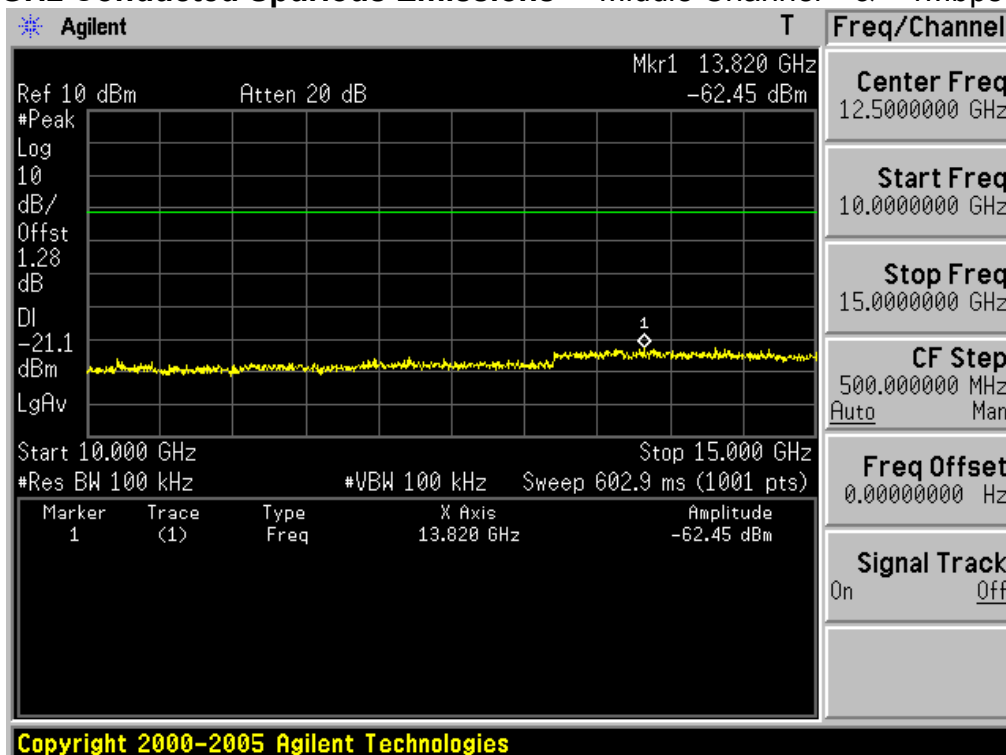
Middle Channel & 1Mbps



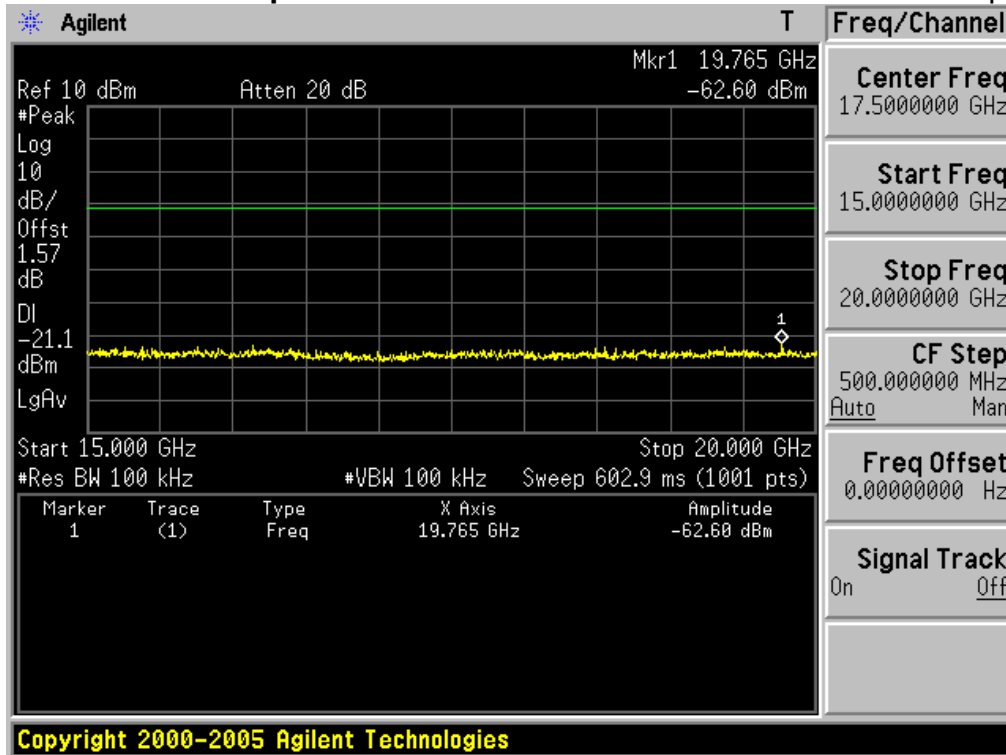
5GHz ~ 10GHz Conducted Spurious Emissions Middle Channel & 1Mbps



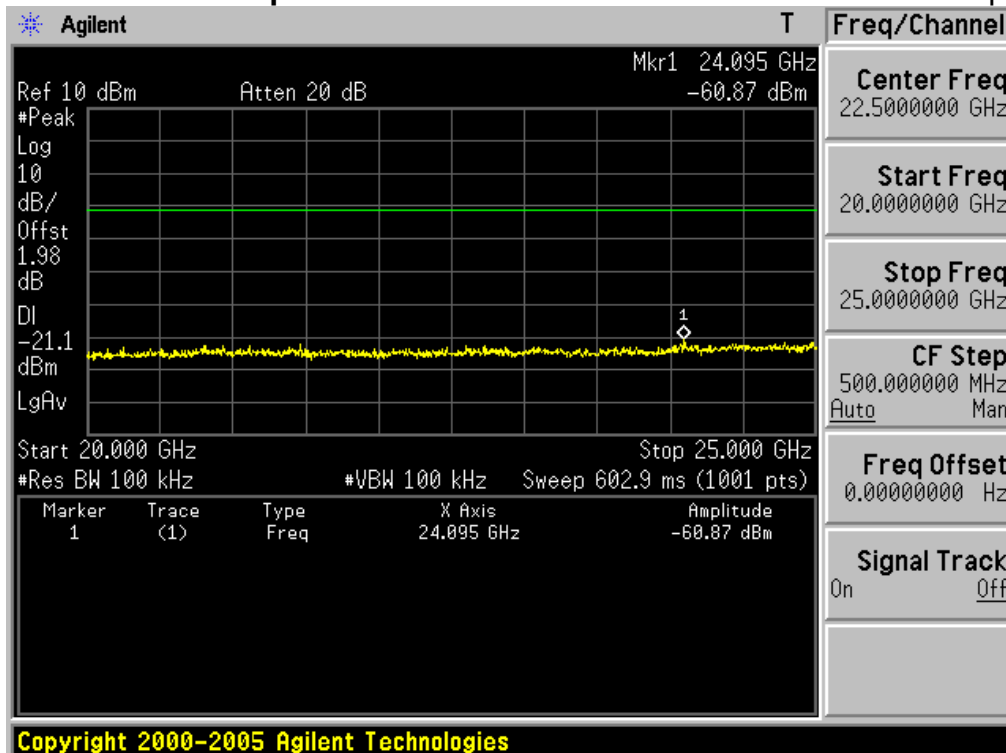
10GHz ~ 15GHz Conducted Spurious Emissions Middle Channel & 1Mbps



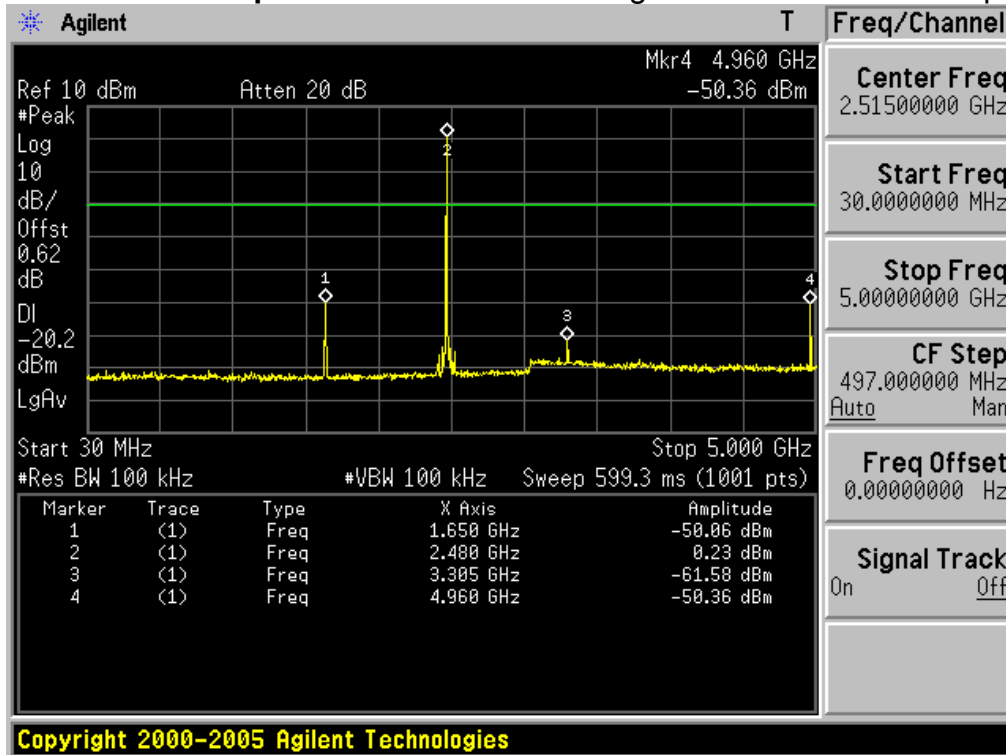
15GHz ~ 20GHz Conducted Spurious Emissions Middle Channel & 1Mbps



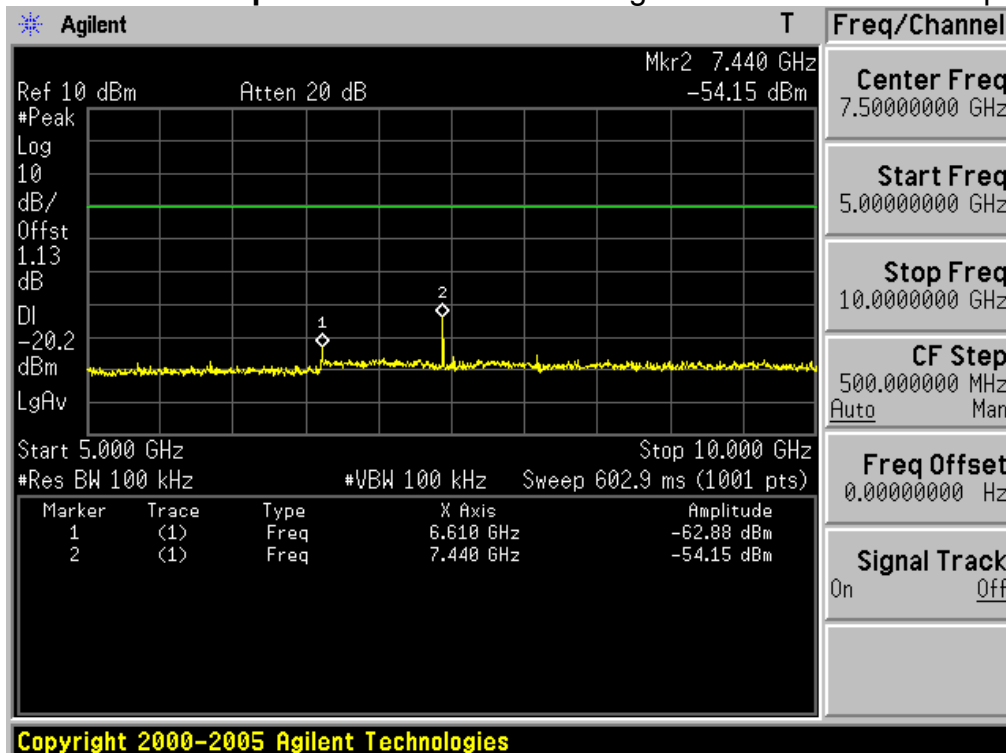
20GHz ~ 25GHz Conducted Spurious Emissions Middle Channel & 1Mbps



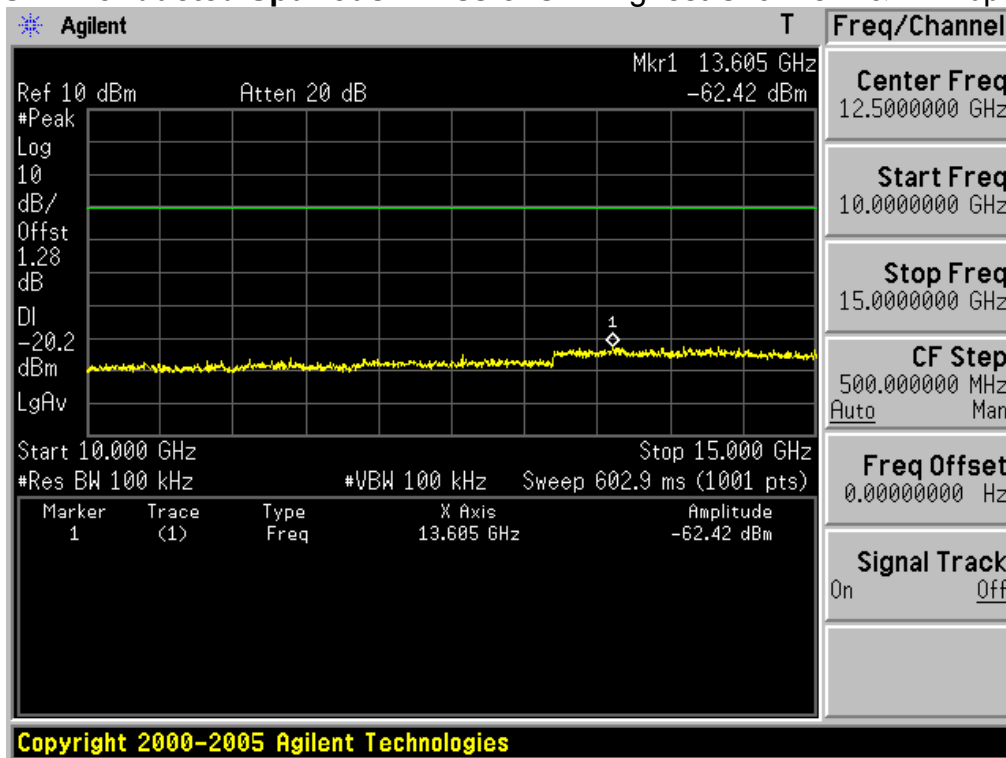
30MHz ~ 5GHz Conducted Spurious Emissions Highest Channel & 1Mbps



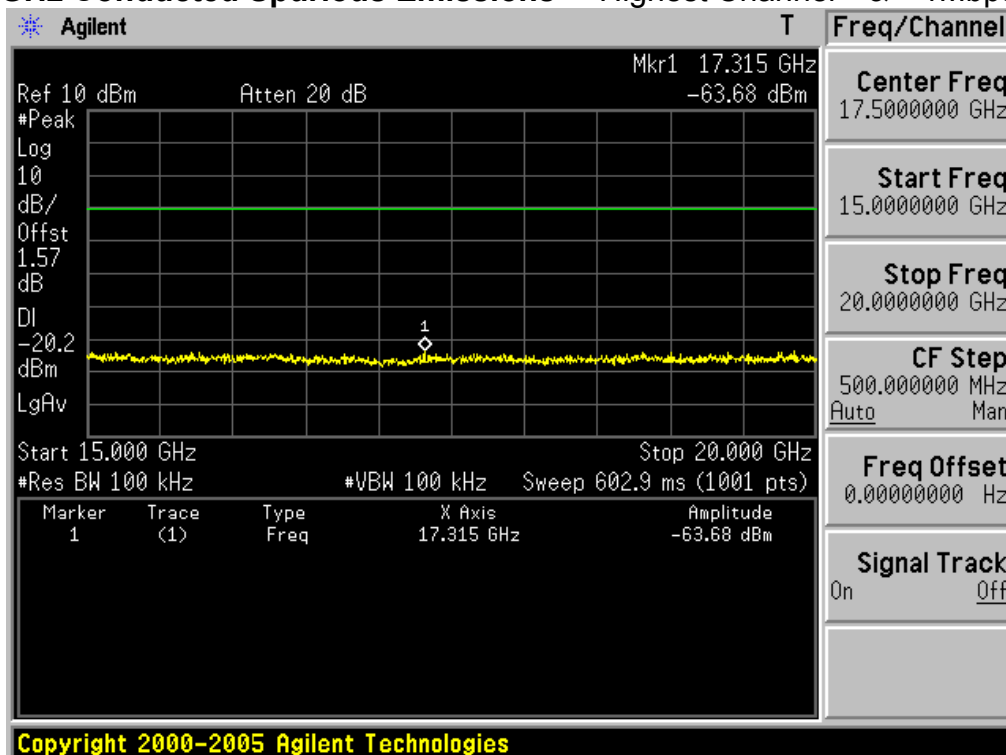
5GHz ~ 10GHz Conducted Spurious Emissions Highest Channel & 1Mbps



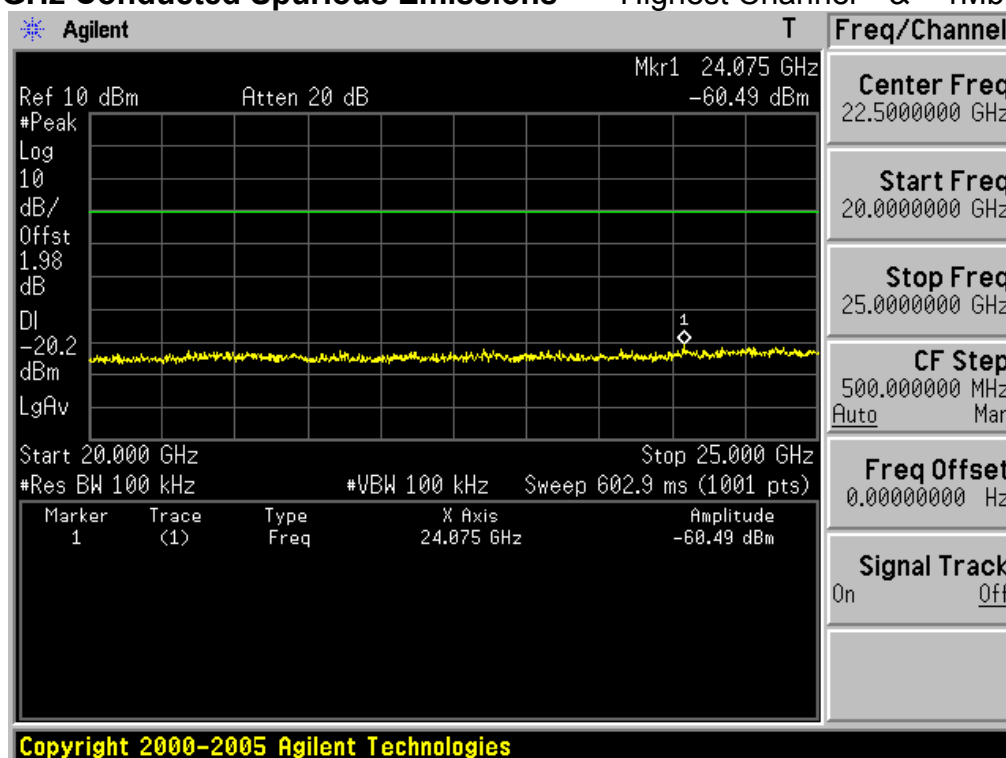
10GHz ~ 15GHz Conducted Spurious Emissions Highest Channel & 1Mbps



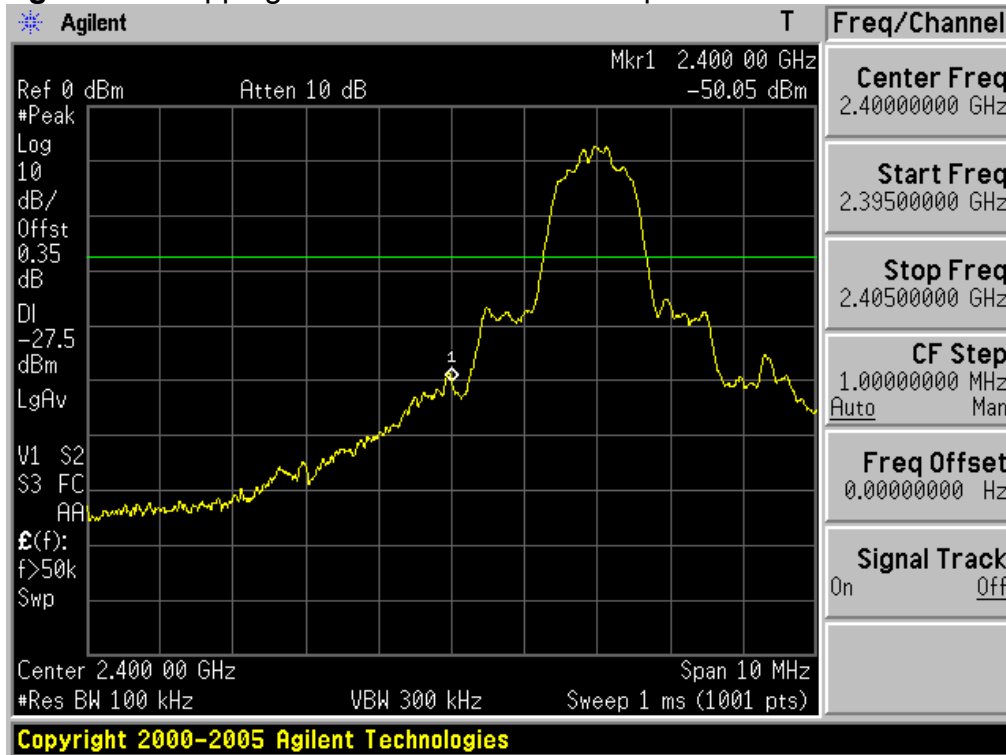
15GHz ~ 20GHz Conducted Spurious Emissions Highest Channel & 1Mbps



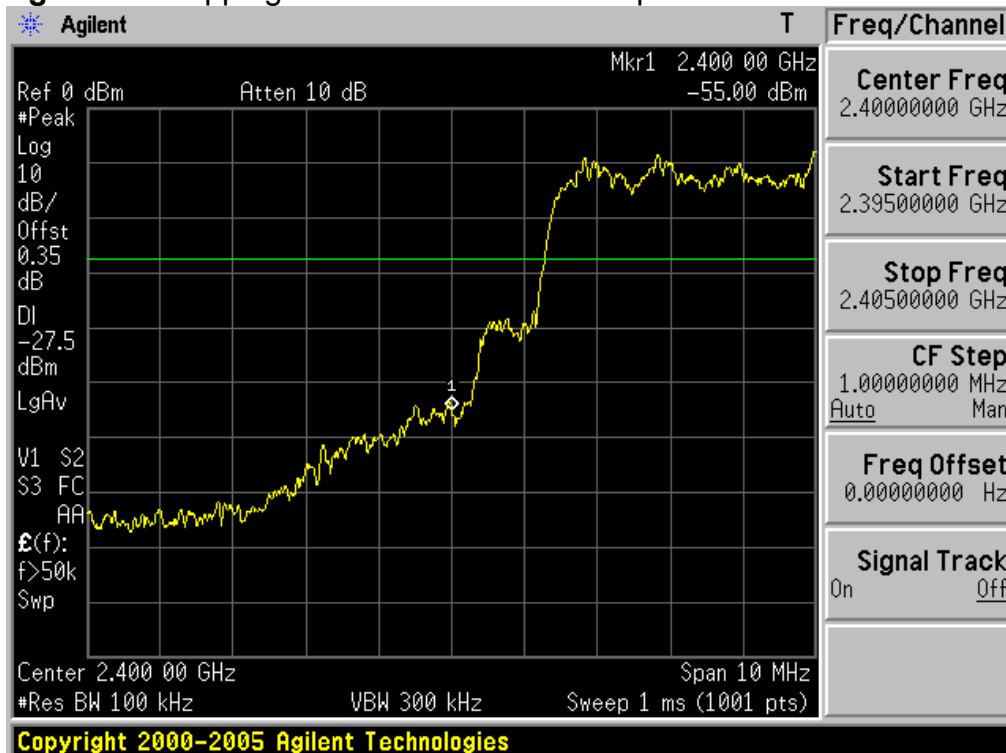
20GHz ~ 25GHz Conducted Spurious Emissions Highest Channel & 1Mbps



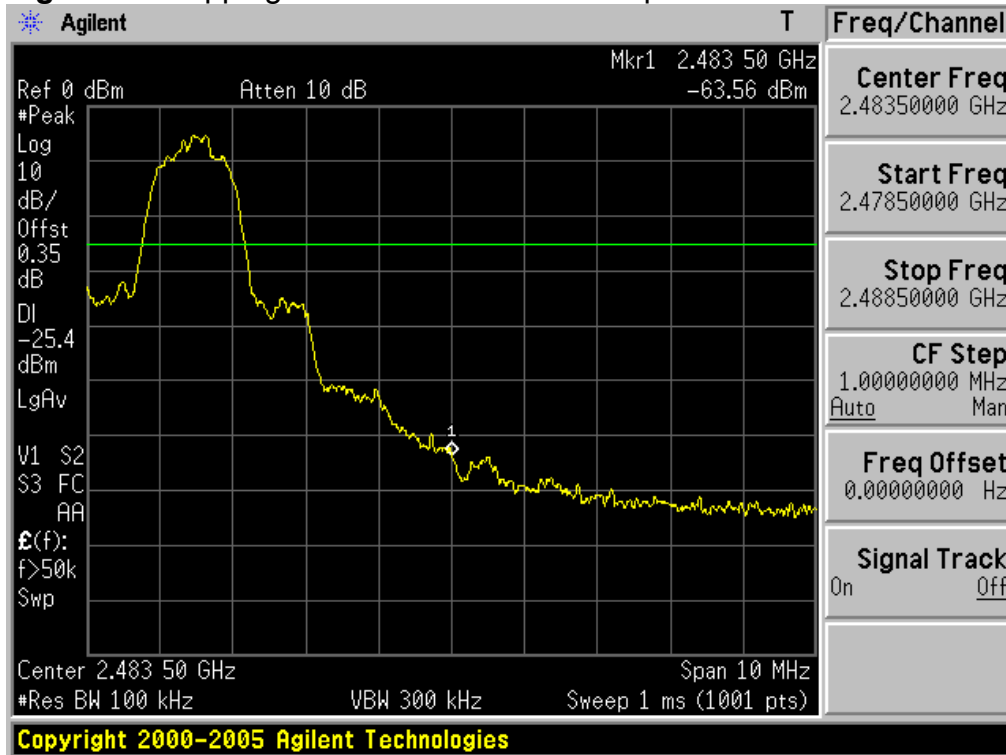
Low Band-edge Hopping mode: Disable & 2Mbps



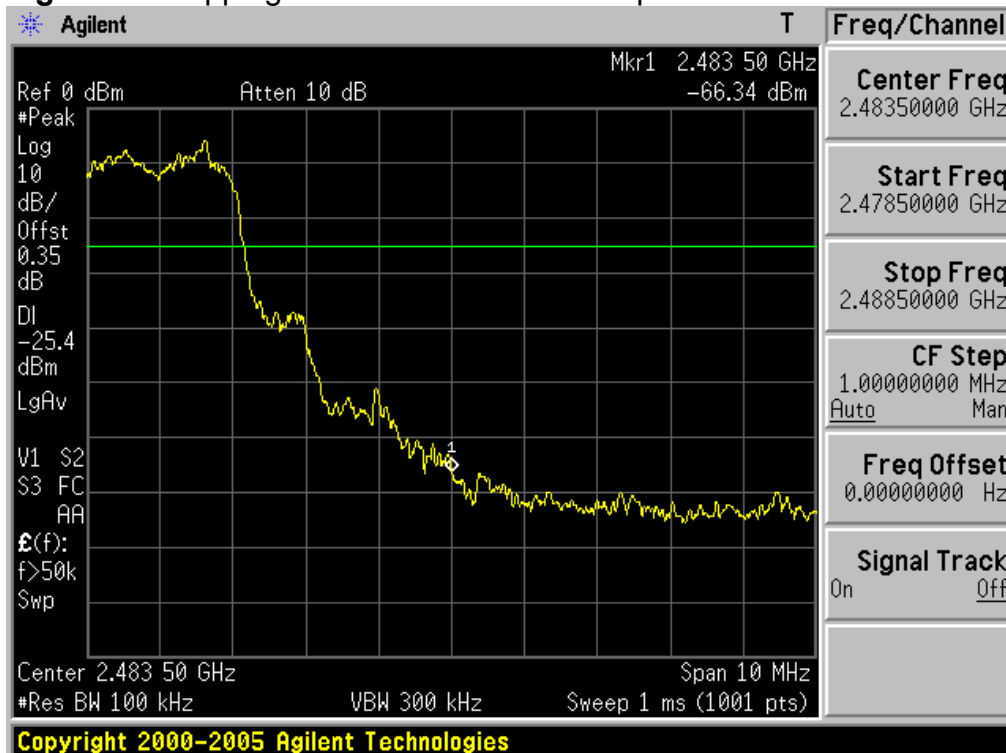
Low Band-edge Hopping mode: Enable & 2Mbps



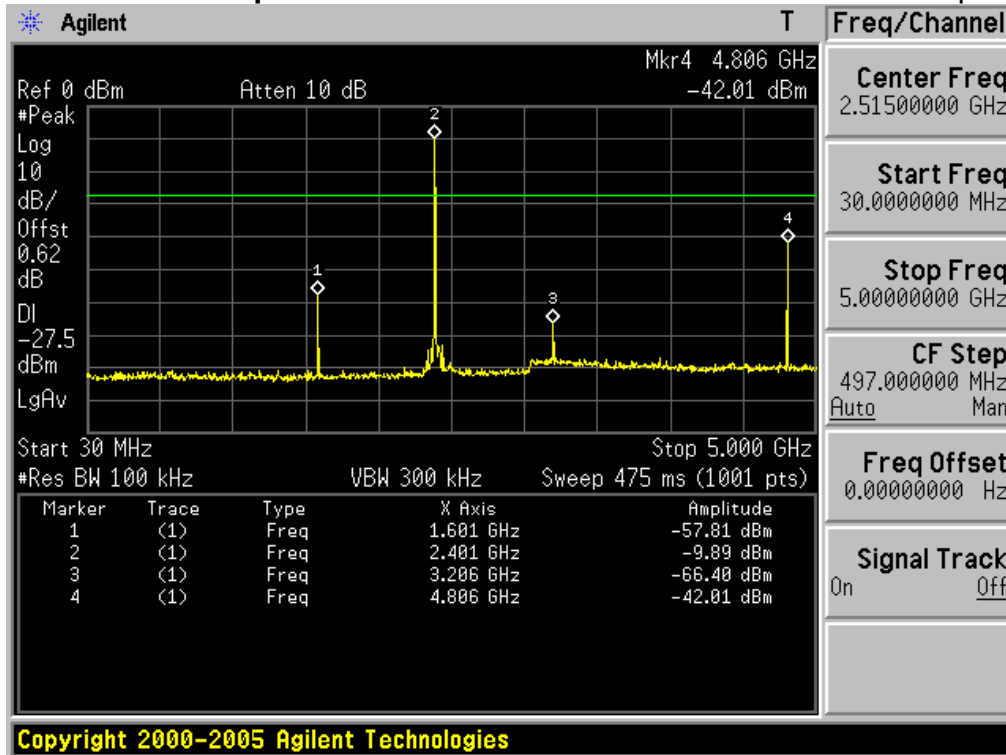
High Band-edge Hopping mode: Disable & 2Mbps



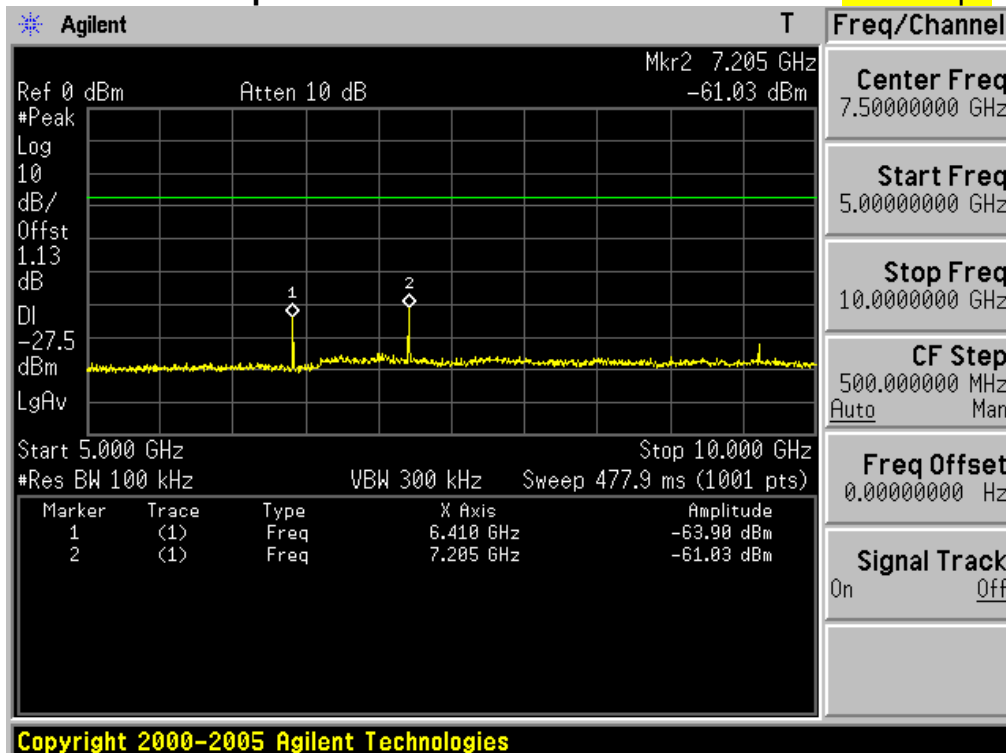
High Band-edge Hopping mode: Enable & 2Mbps



30MHz ~ 5GHz Conducted Spurious Emissions Lowest Channel & 2Mbps

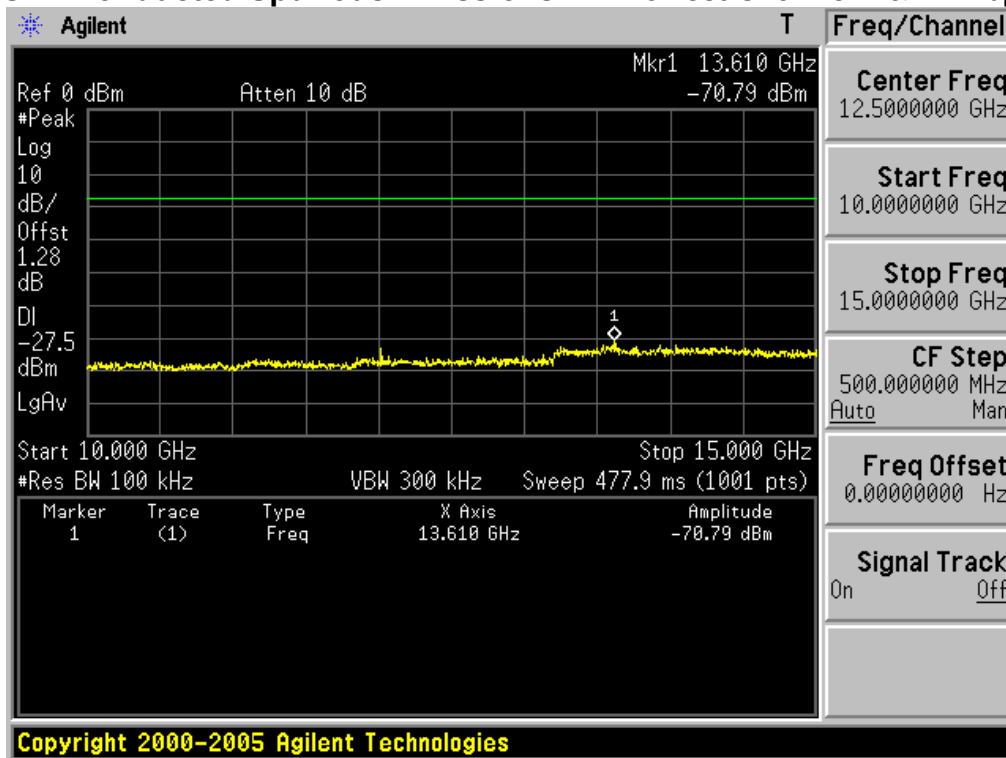


5GHz ~ 10GHz Conducted Spurious Emissions Lowest Channel & 2Mbps

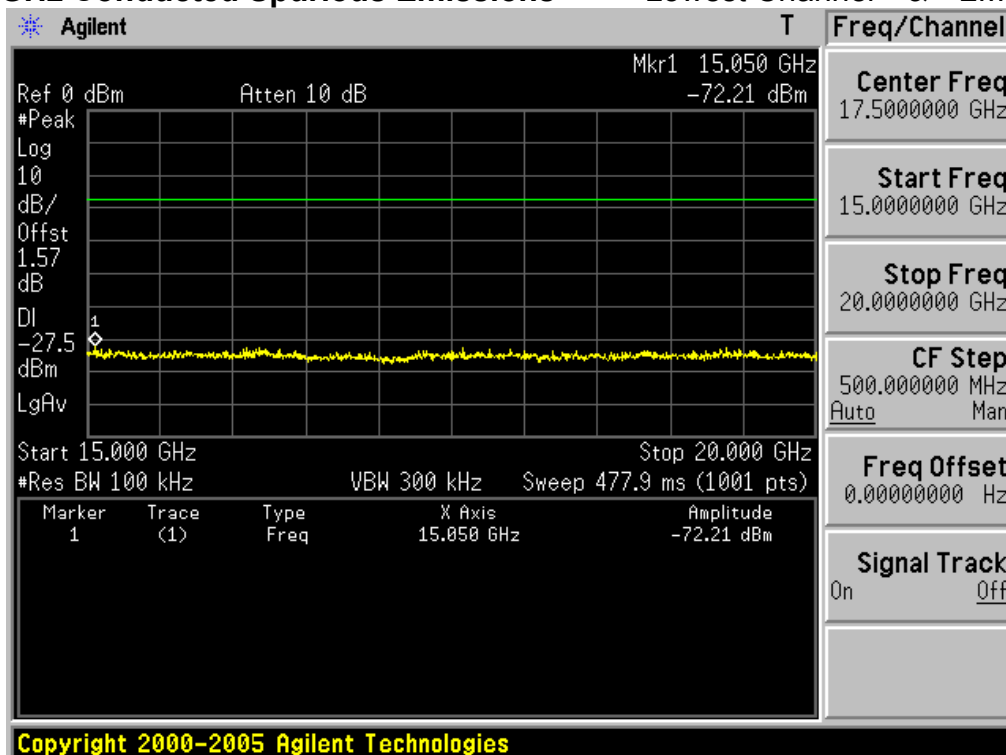


10GHz ~ 15GHz Conducted Spurious Emissions

Lowest Channel & 2Mbps

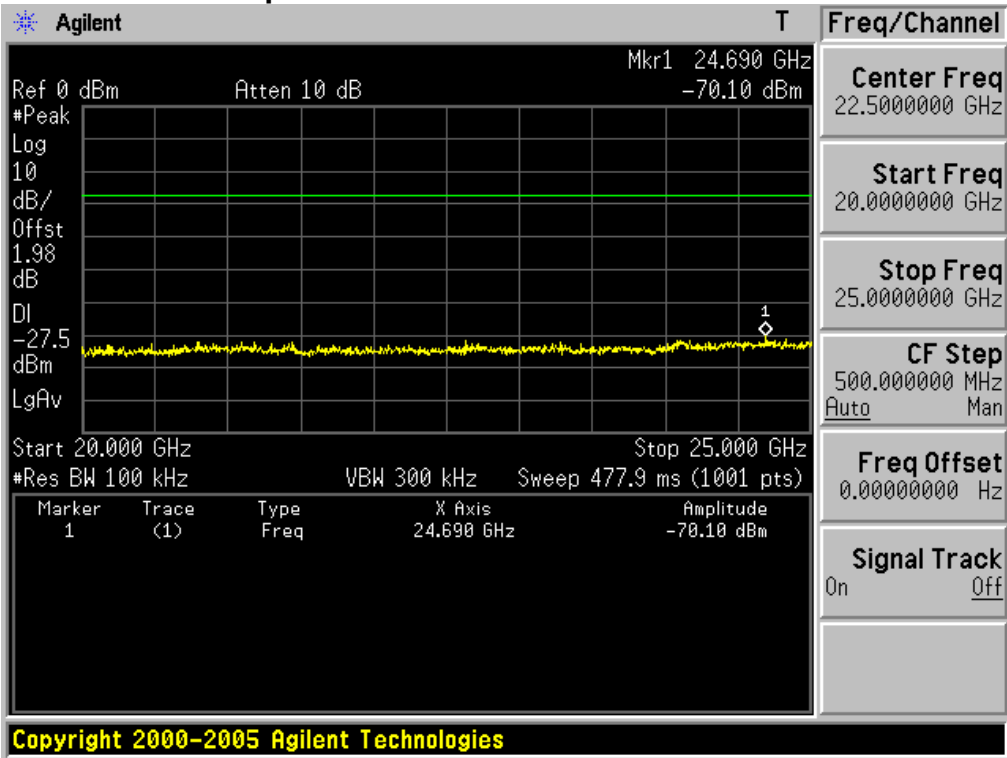
**15GHz ~ 20GHz Conducted Spurious Emissions**

Lowest Channel & 2Mbps



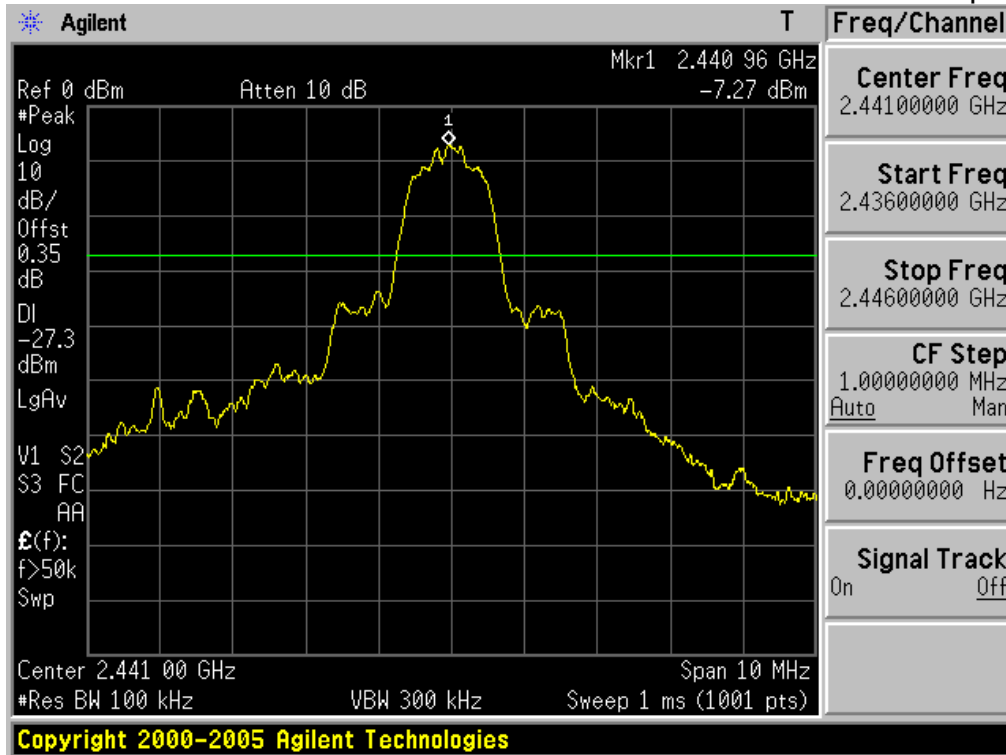
20GHz ~ 25GHz Conducted Spurious Emissions

Lowest Channel & 2Mbps



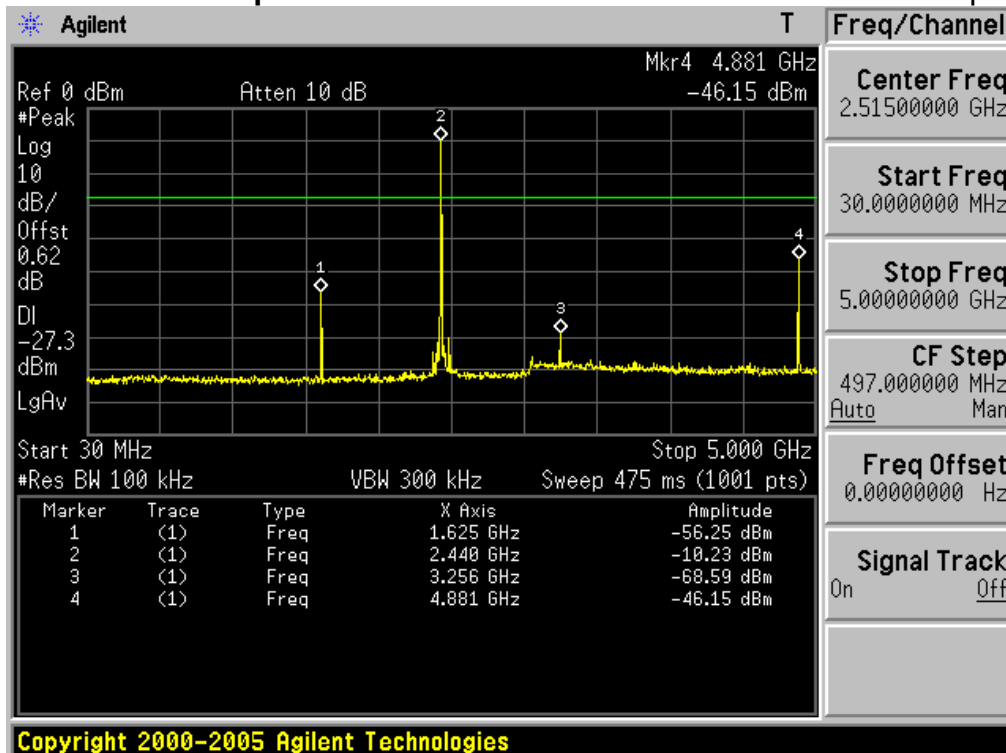
Reference for limit

Middle Channel & 2Mbps

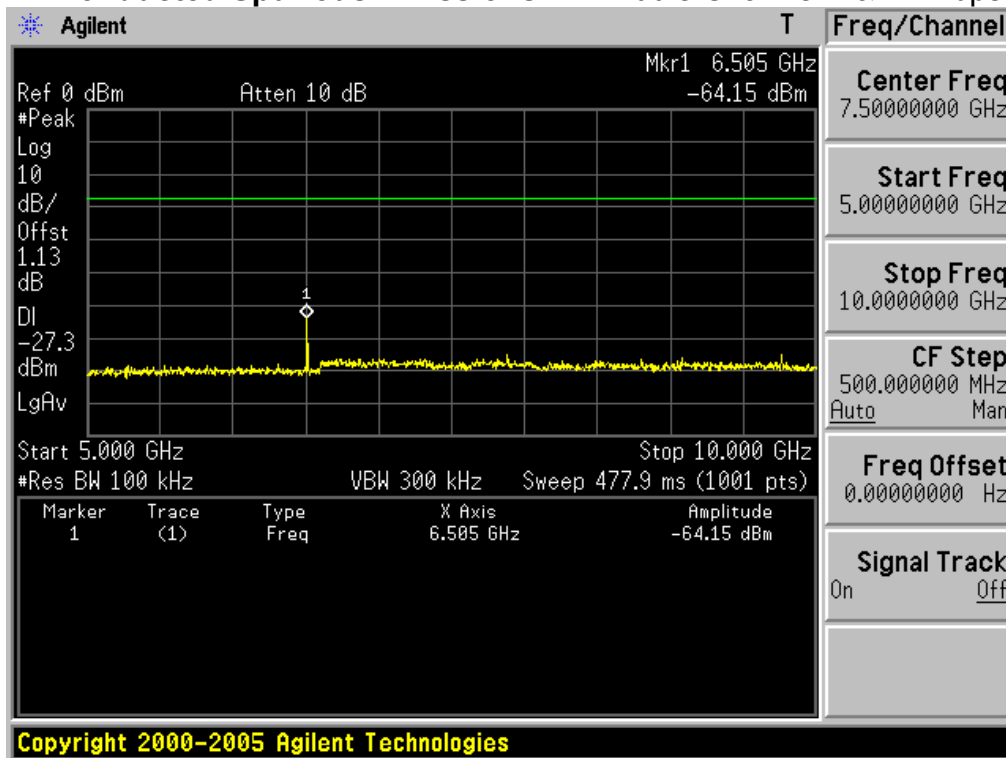


30MHz ~ 5GHz Conducted Spurious Emissions

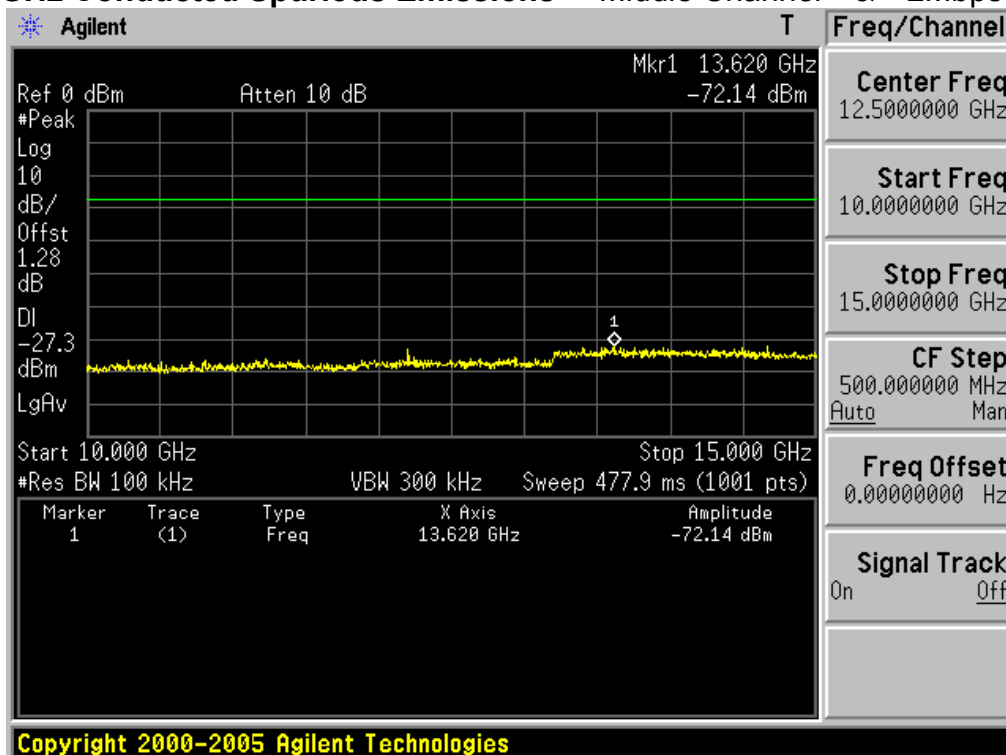
Middle Channel & 2Mbps



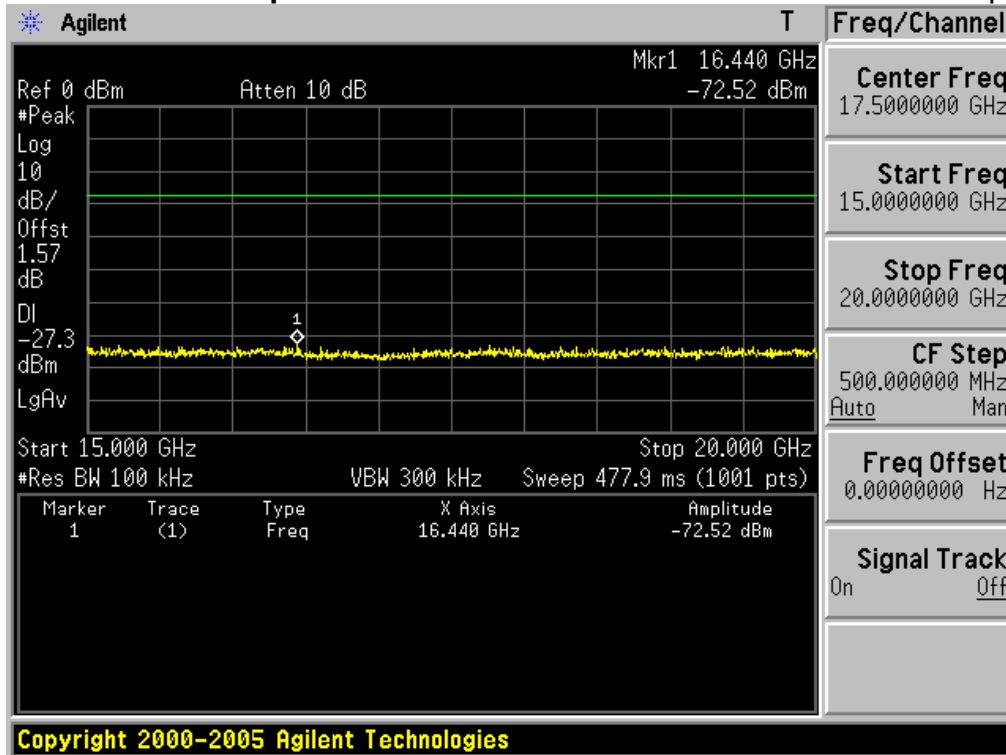
5GHz ~ 10GHz Conducted Spurious Emissions Middle Channel & 2Mbps



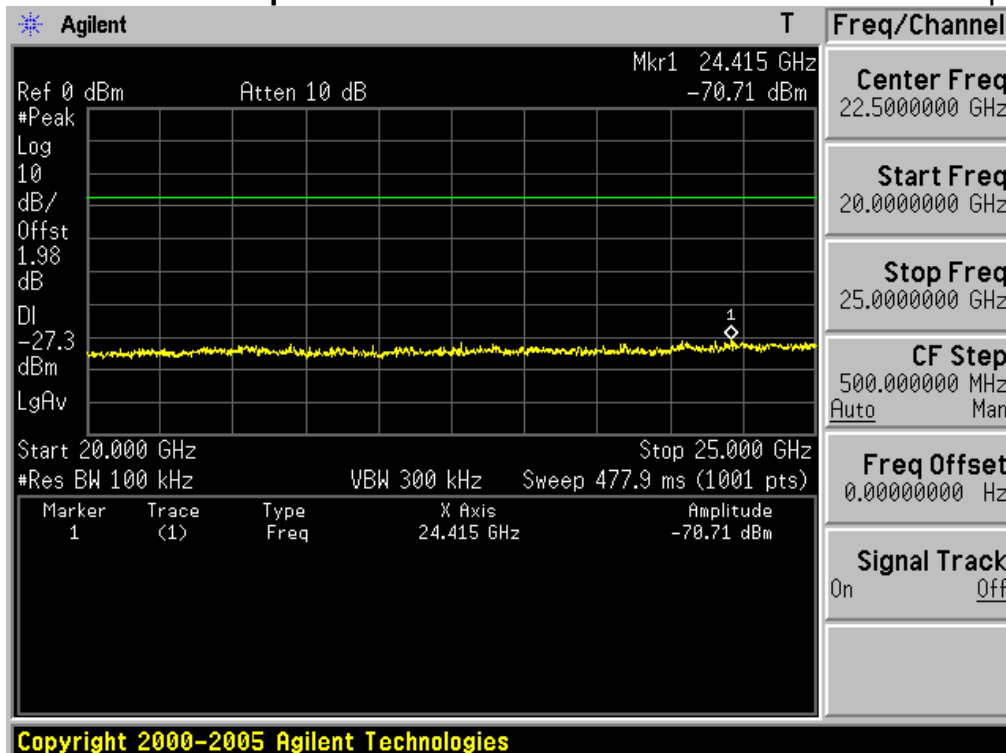
10GHz ~ 15GHz Conducted Spurious Emissions Middle Channel & 2Mbps



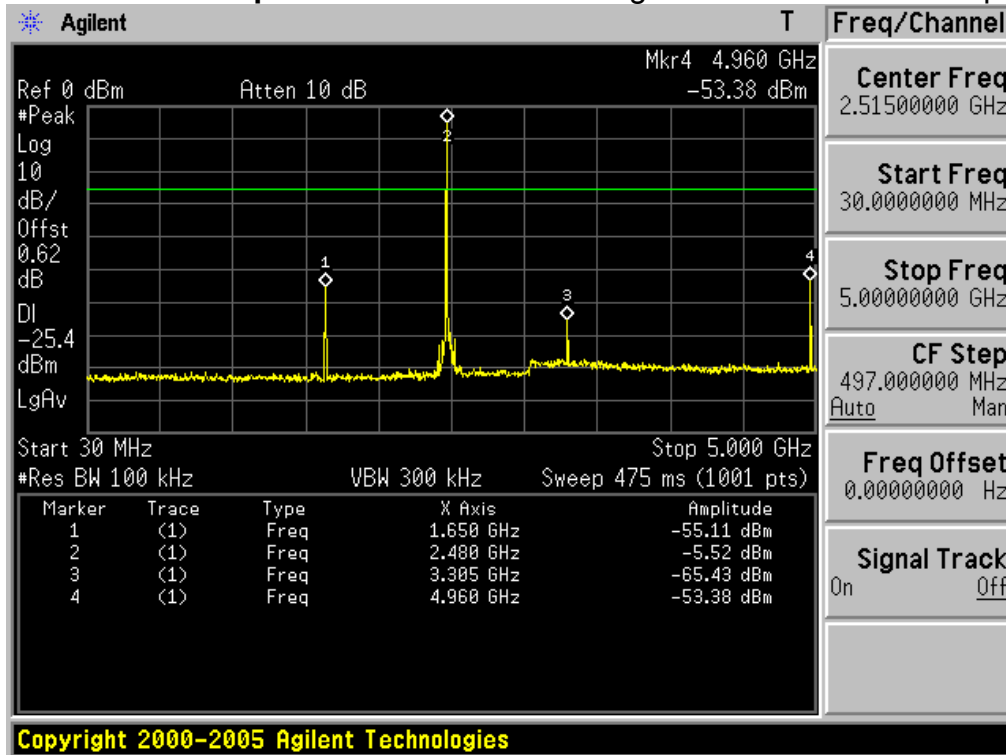
15GHz ~ 20GHz Conducted Spurious Emissions Middle Channel & 2Mbps



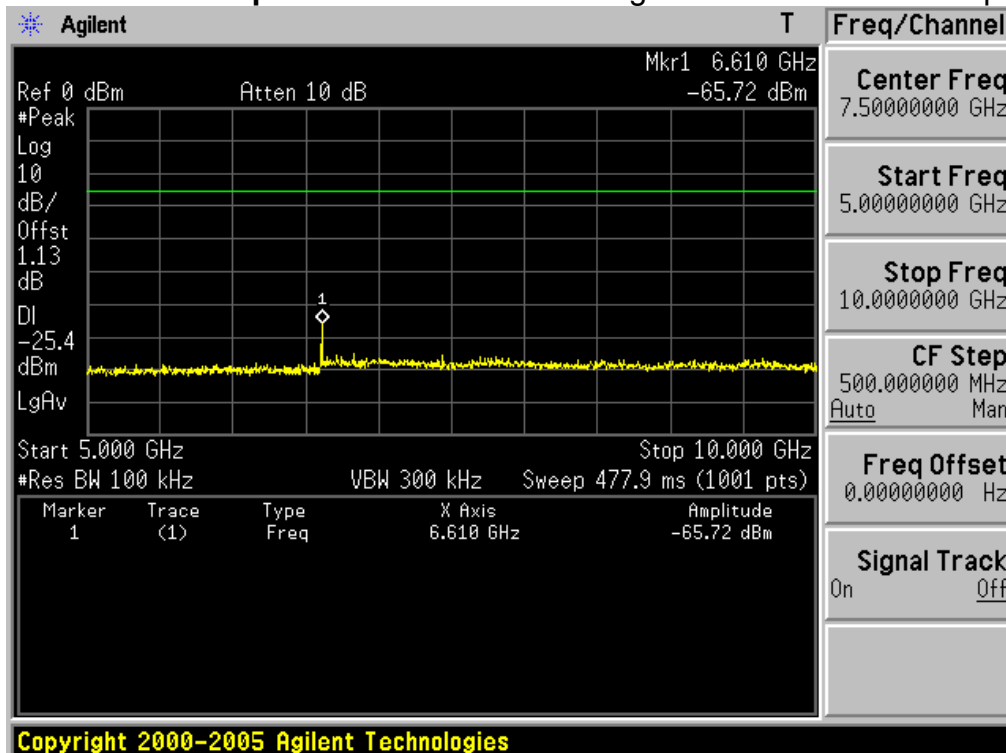
20GHz ~ 25GHz Conducted Spurious Emissions Middle Channel & 2Mbps



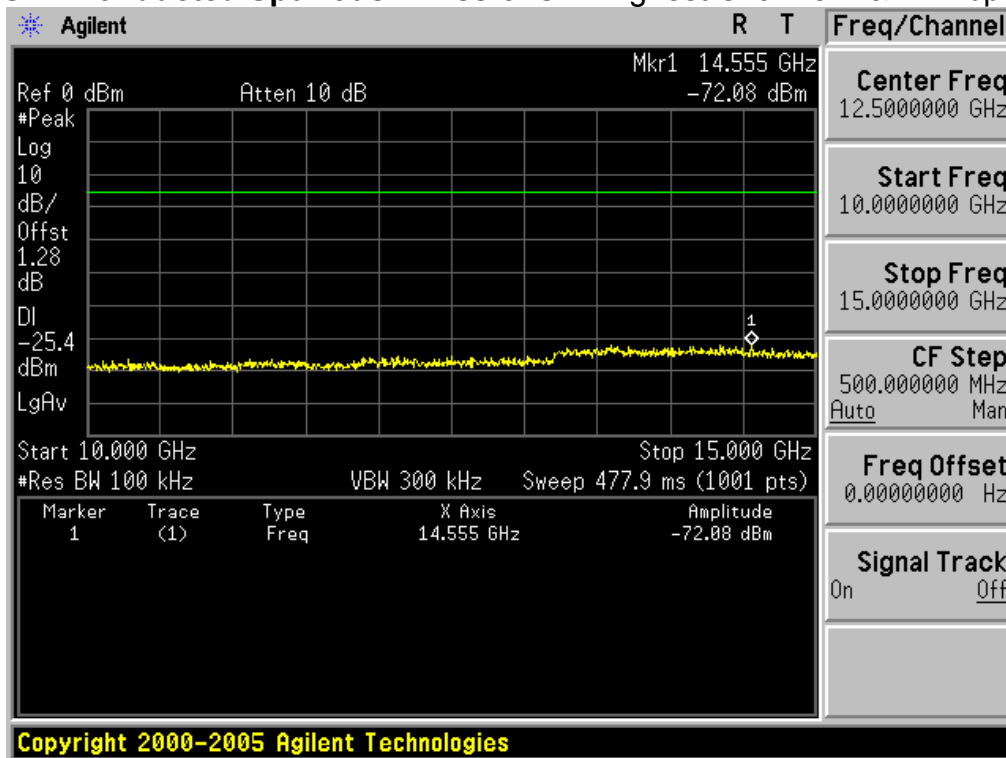
30MHz ~ 5GHz Conducted Spurious Emissions Highest Channel & 2Mbps



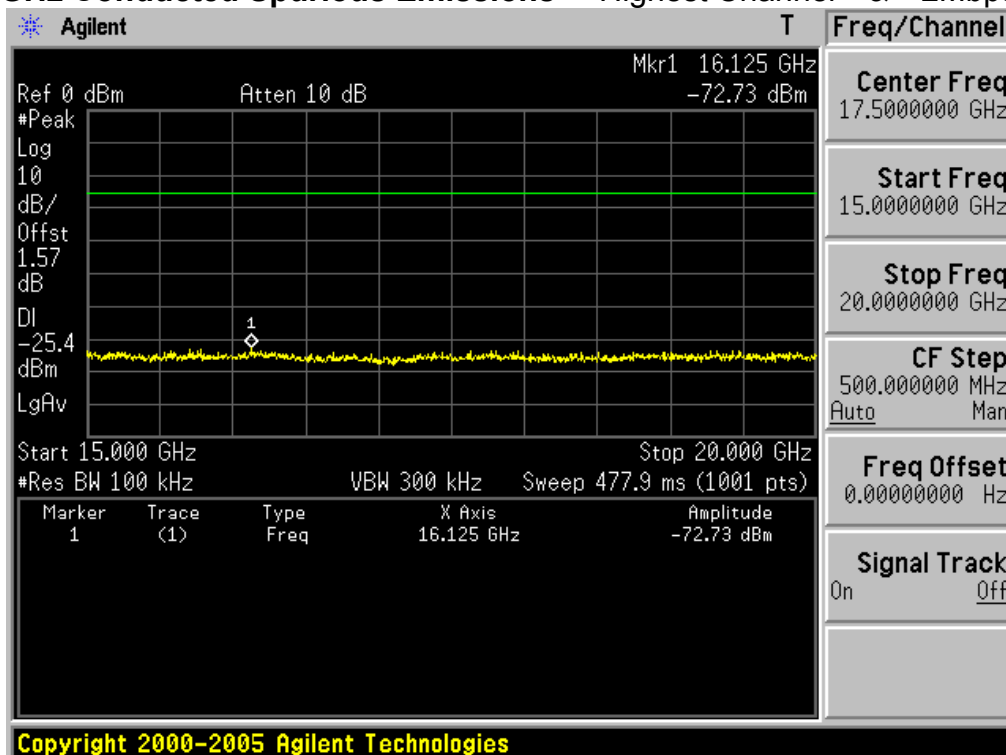
5GHz ~ 10GHz Conducted Spurious Emissions Highest Channel & 2Mbps



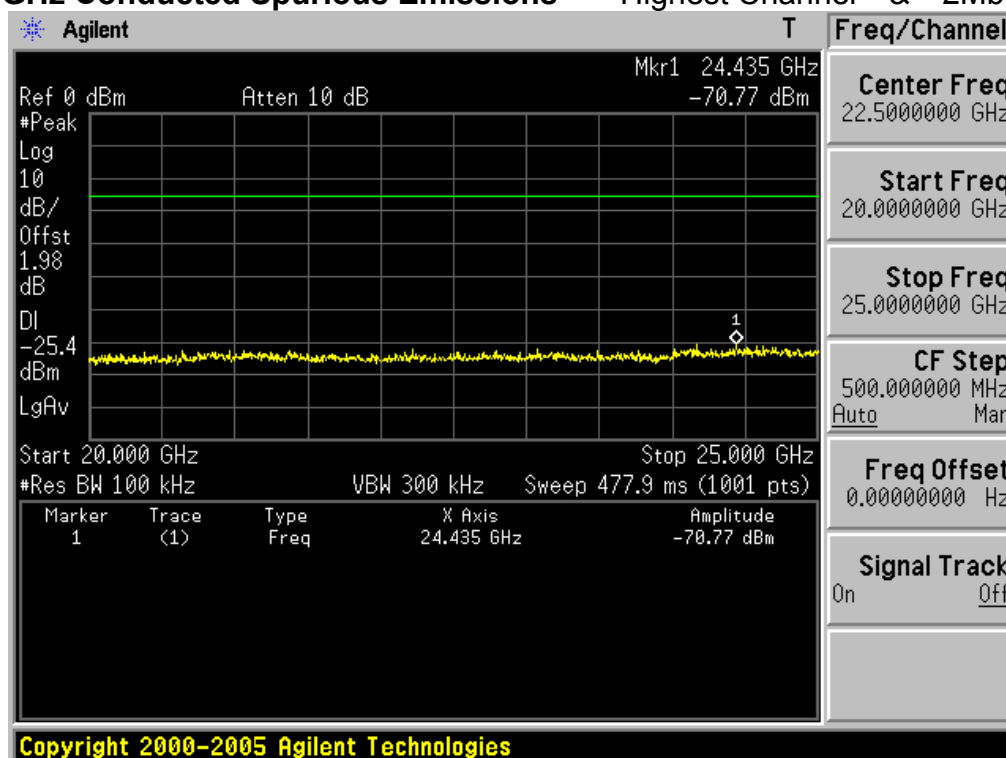
10GHz ~ 15GHz Conducted Spurious Emissions Highest Channel & 2Mbps



15GHz ~ 20GHz Conducted Spurious Emissions Highest Channel & 2Mbps



20GHz ~ 25GHz Conducted Spurious Emissions Highest Channel & 2Mbps



3.2.7 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

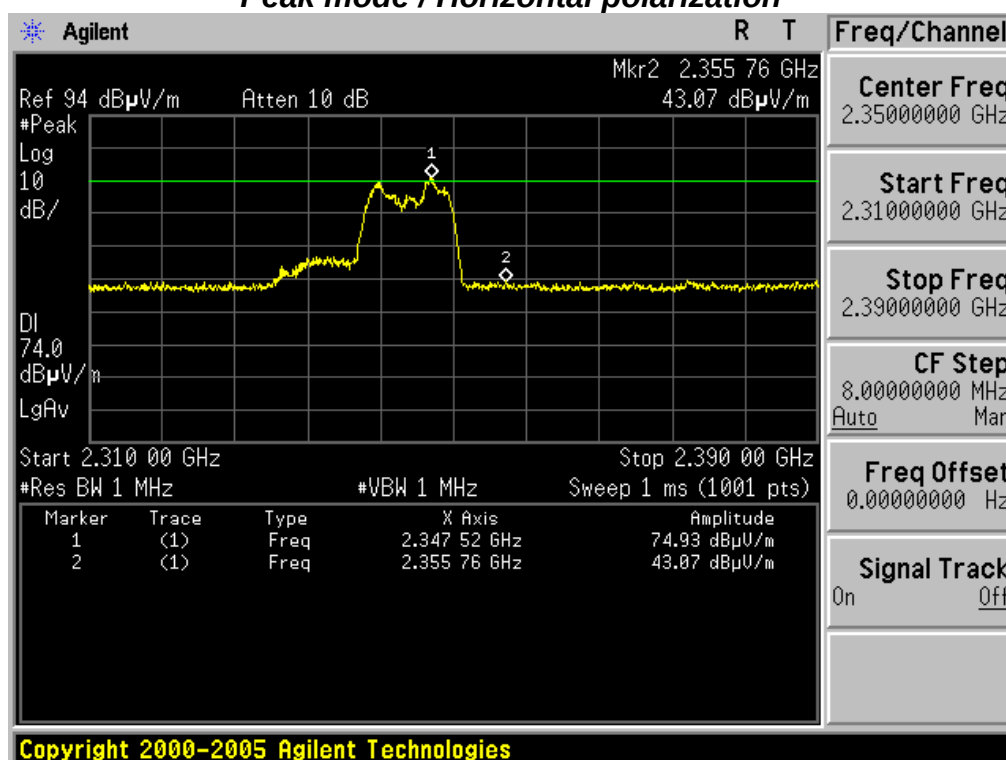
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part,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

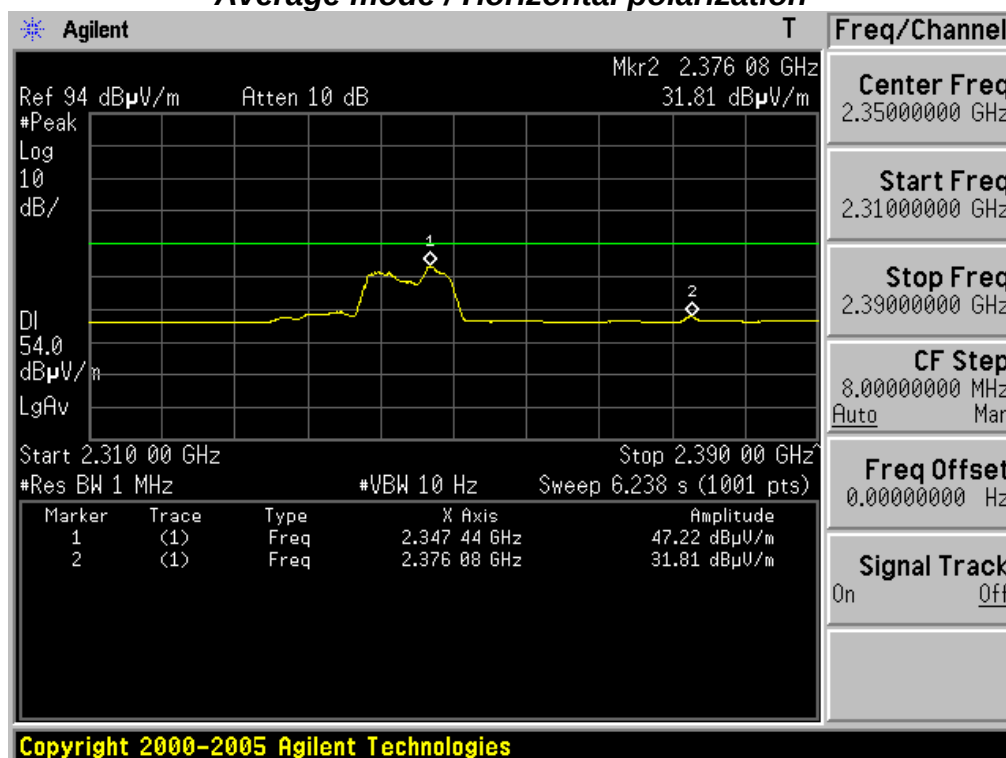
• **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR 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 Lowest Channel & 1Mbps & The worst case EUT Position: X-axis
Peak mode / Horizontal polarization



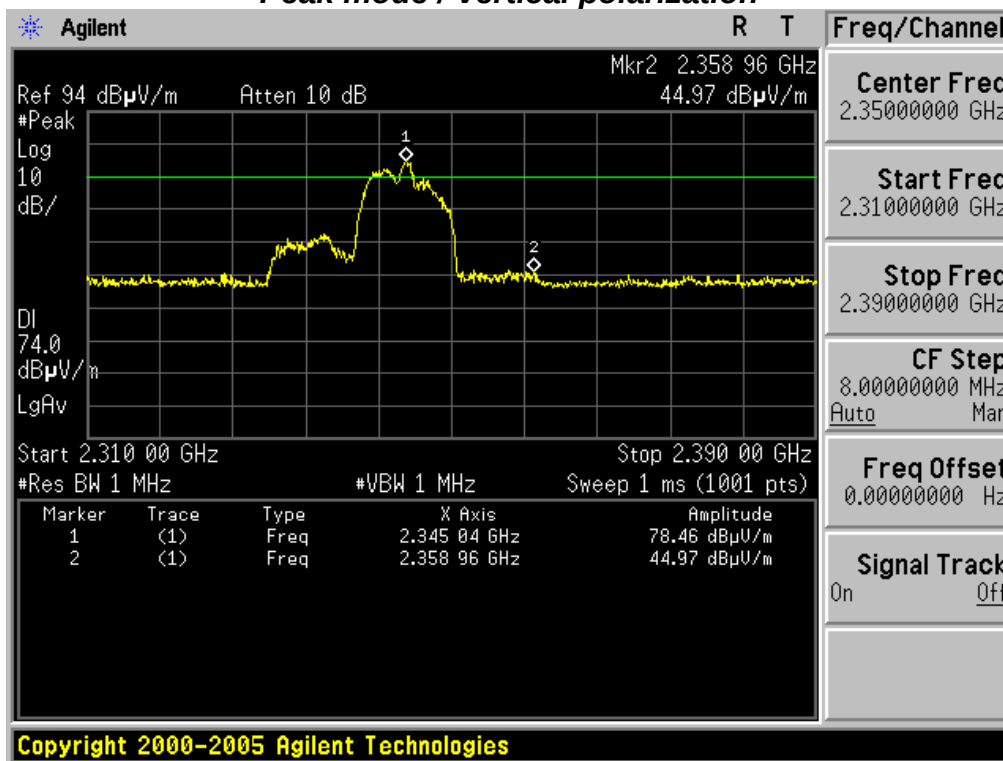
Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Lowest Channel & 1Mbps & The worst case EUT Position: X-axis
Average mode / Horizontal polarization



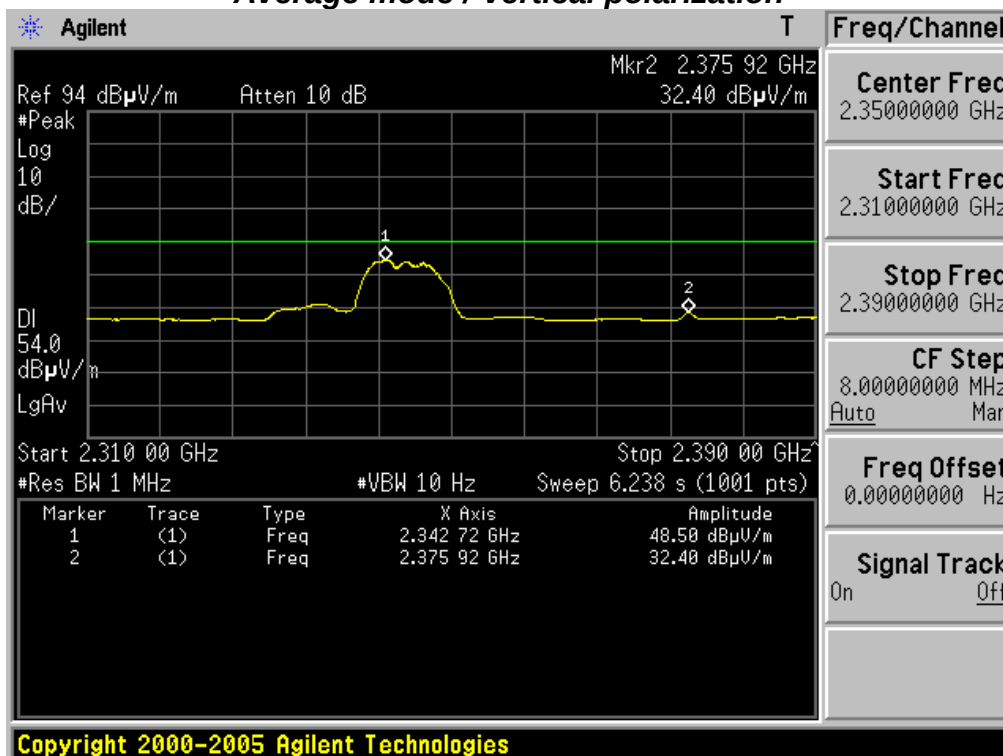
Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Lowest Channel & 1Mbps & The worst case EUT Position: Y-axis
Peak mode / Vertical polarization



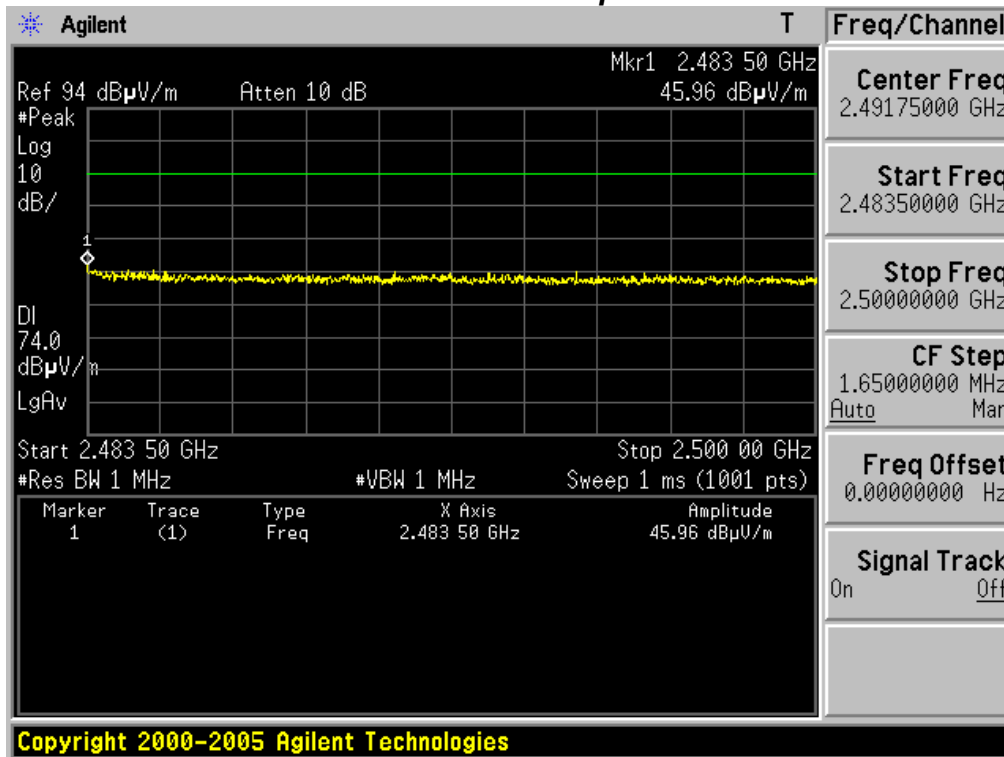
Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Lowest Channel & 1Mbps & The worst case EUT Position: Y-axis
Average mode / Vertical polarization

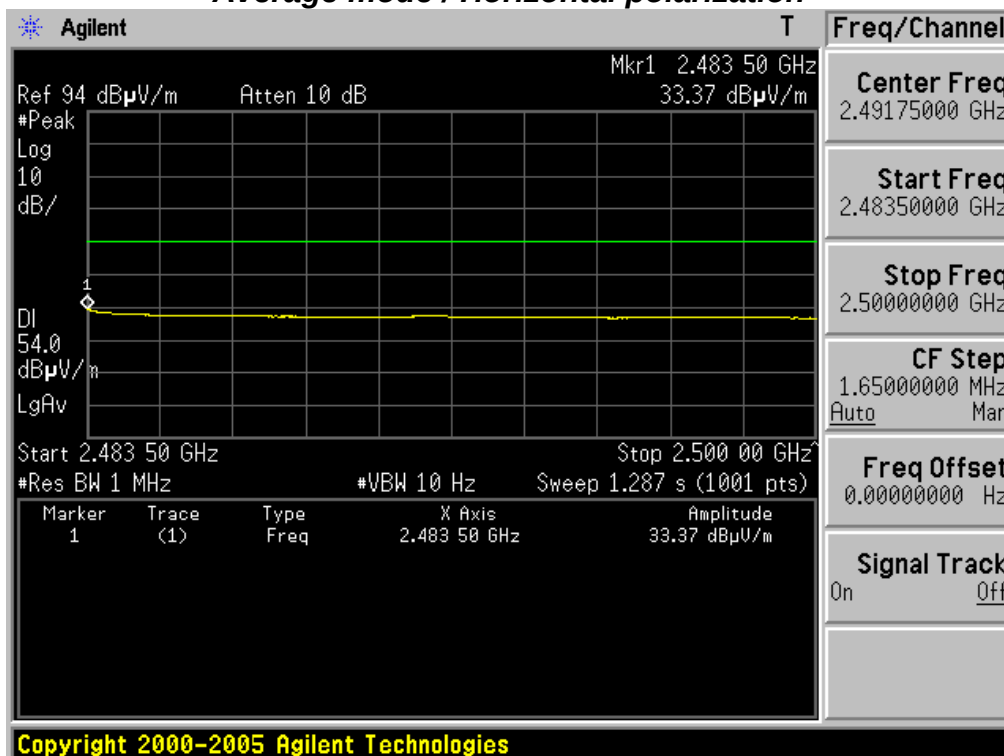


Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

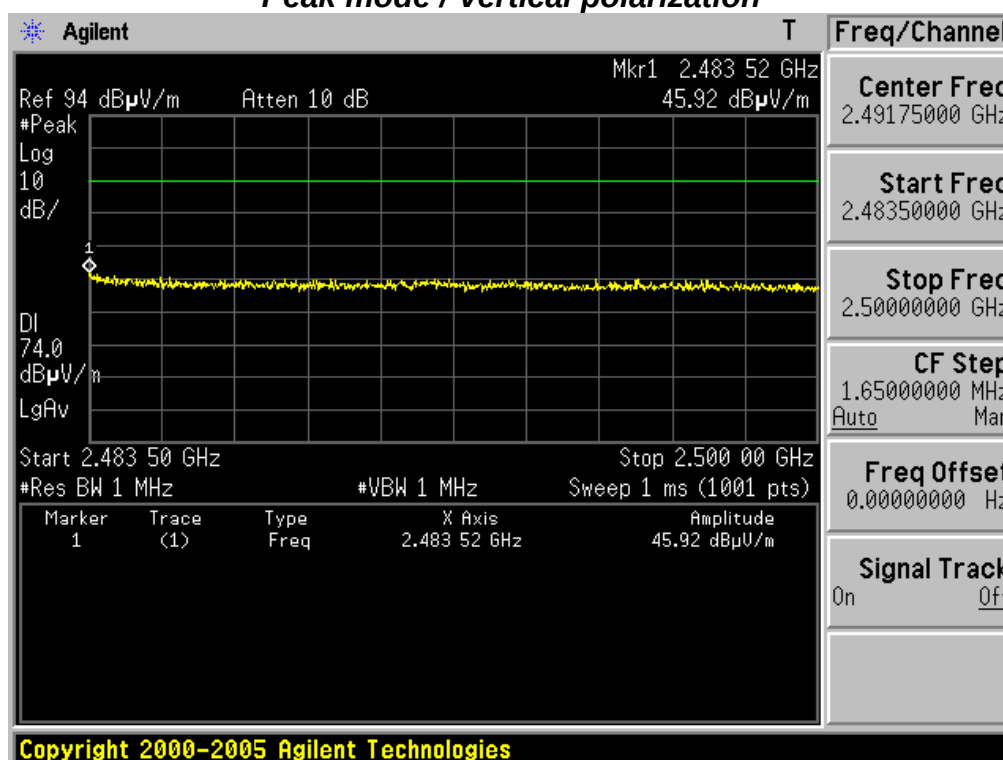
Restricted Band Edge Highest Channel & 1Mbps & The worst case EUT Position: X-axis
Peak mode / Horizontal polarization



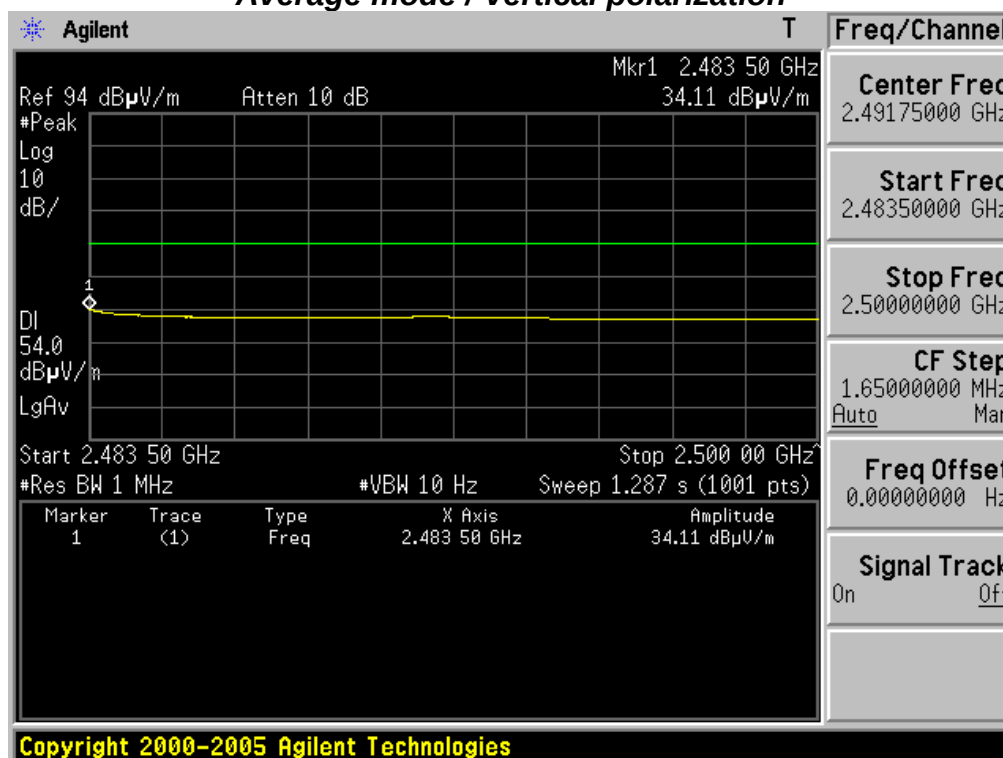
Restricted Band Edge Highest Channel & 1Mbps & The worst case EUT Position: X-axis
Average mode / Horizontal polarization



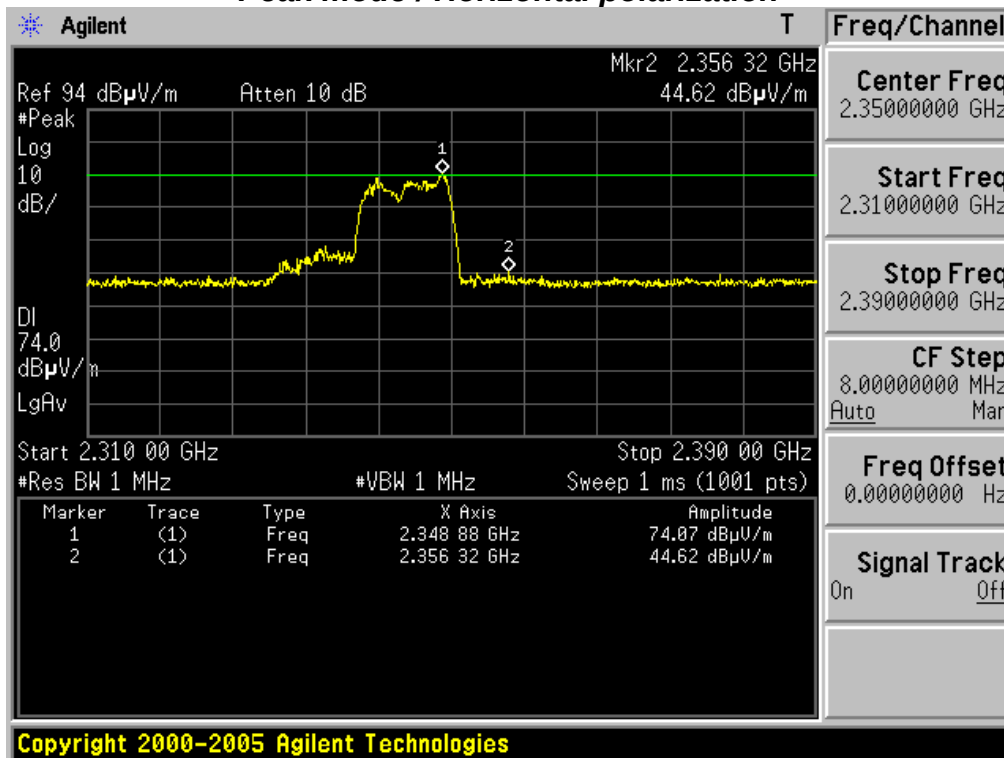
Restricted Band Edge Highest Channel & 1Mbps & The worst case EUT Position: Y-axis
Peak mode / Vertical polarization



Restricted Band Edge Highest Channel & 1Mbps & The worst case EUT Position: Y-axis
Average mode / Vertical polarization

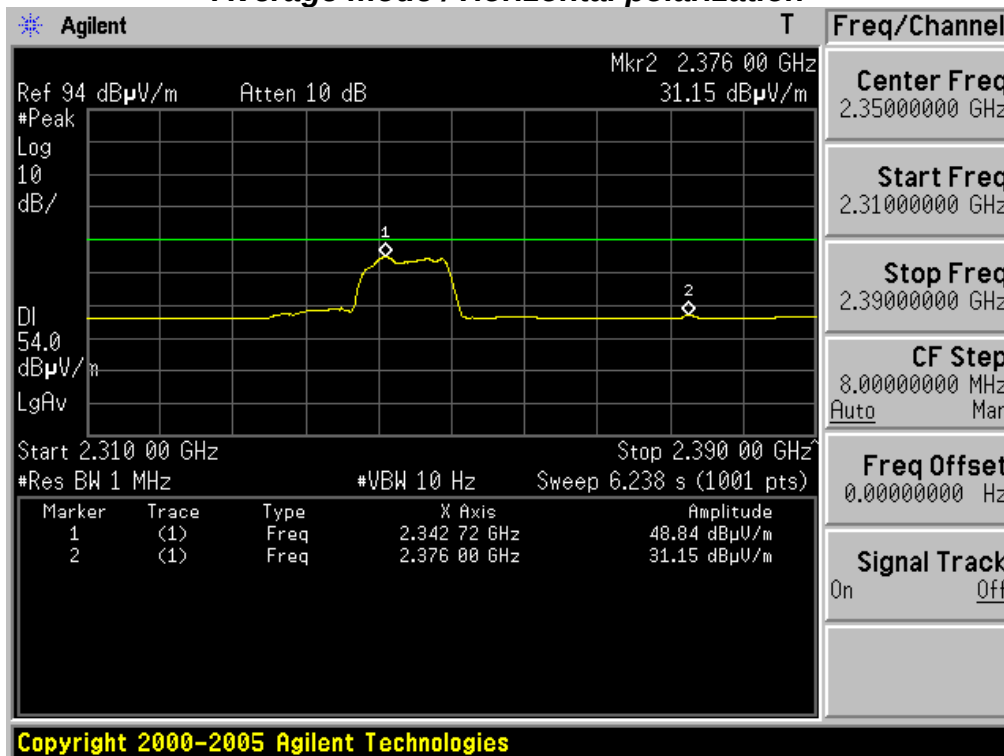


Restricted Band Edge Lowest Channel & 2Mbps & The worst case EUT Position: Z-axis
Peak mode / Horizontal polarization



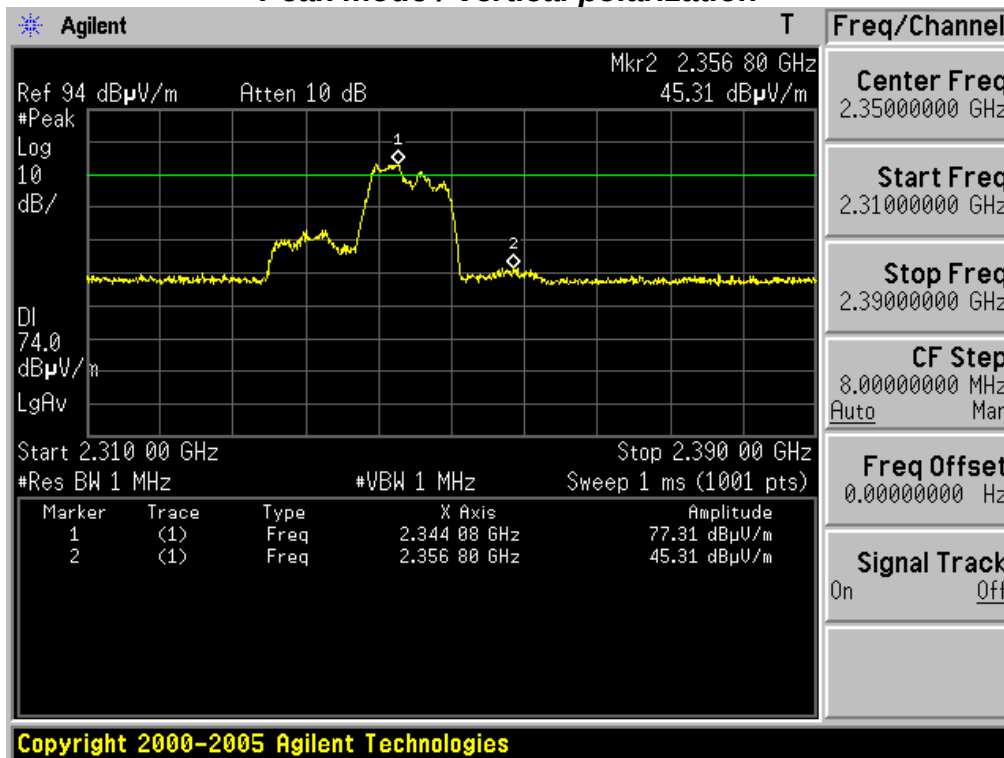
Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Lowest Channel & 2Mbps & The worst case EUT Position: Z-axis
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 Lowest Channel & 2Mbps & The worst case EUT Position: Z-axis
Peak mode / Vertical polarization



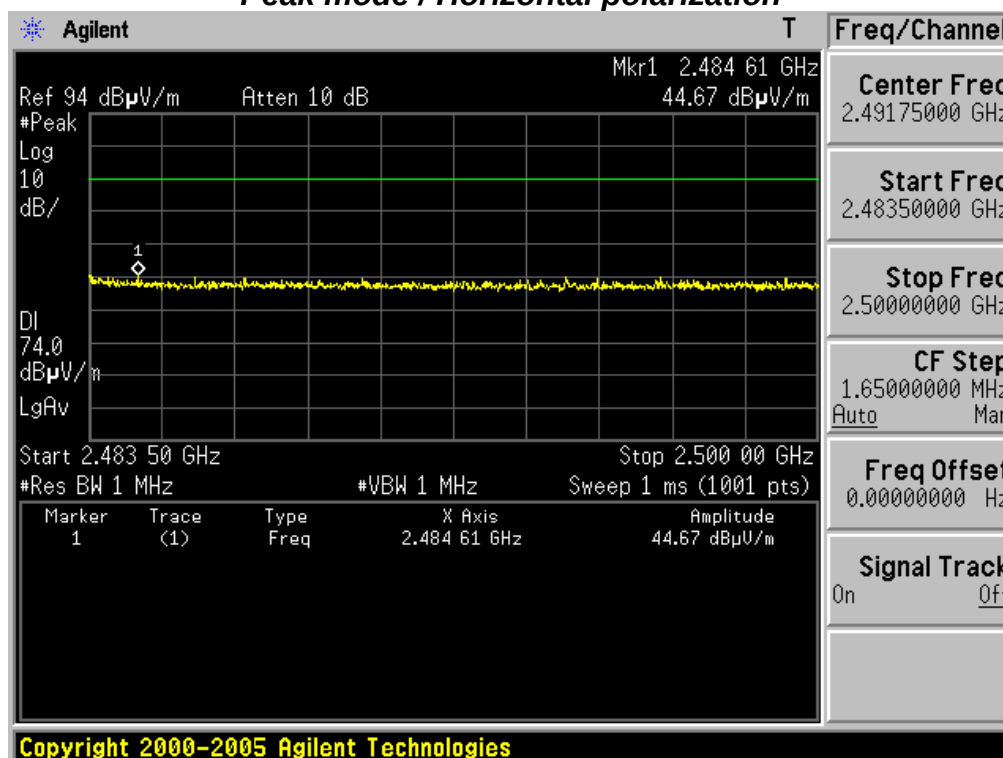
Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

Restricted Band Edge Lowest Channel & 2Mbps & The worst case EUT Position: Z-axis
Average mode / Vertical polarization

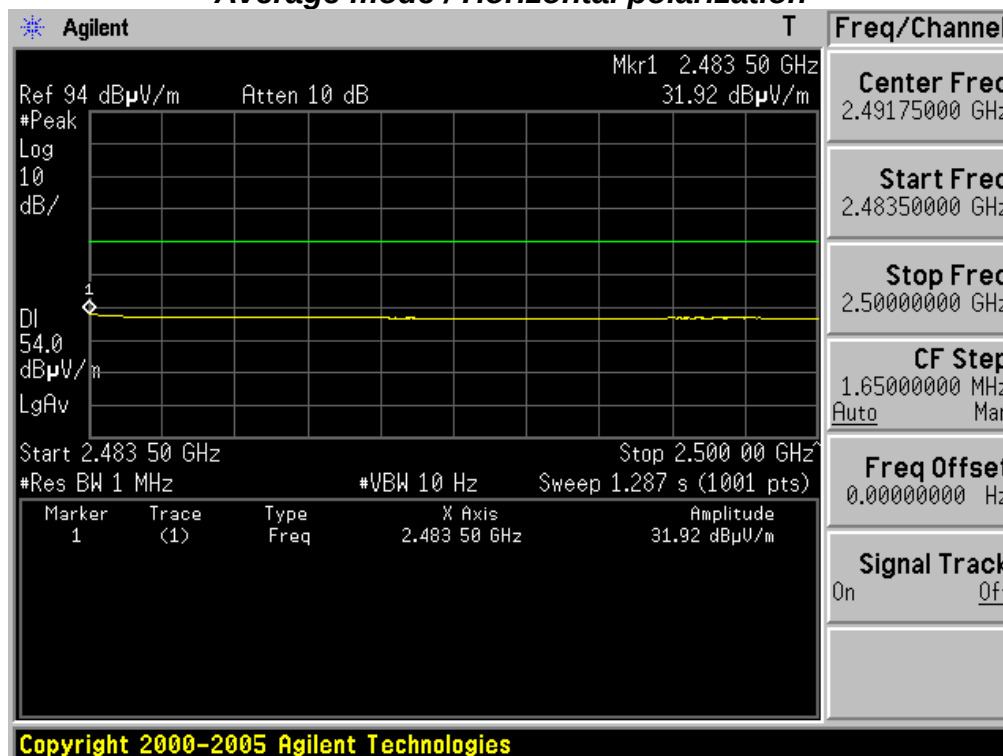


Marker 1's emissions of the low band edge test plots are emissions from WIMAX downlink signal in Korea.

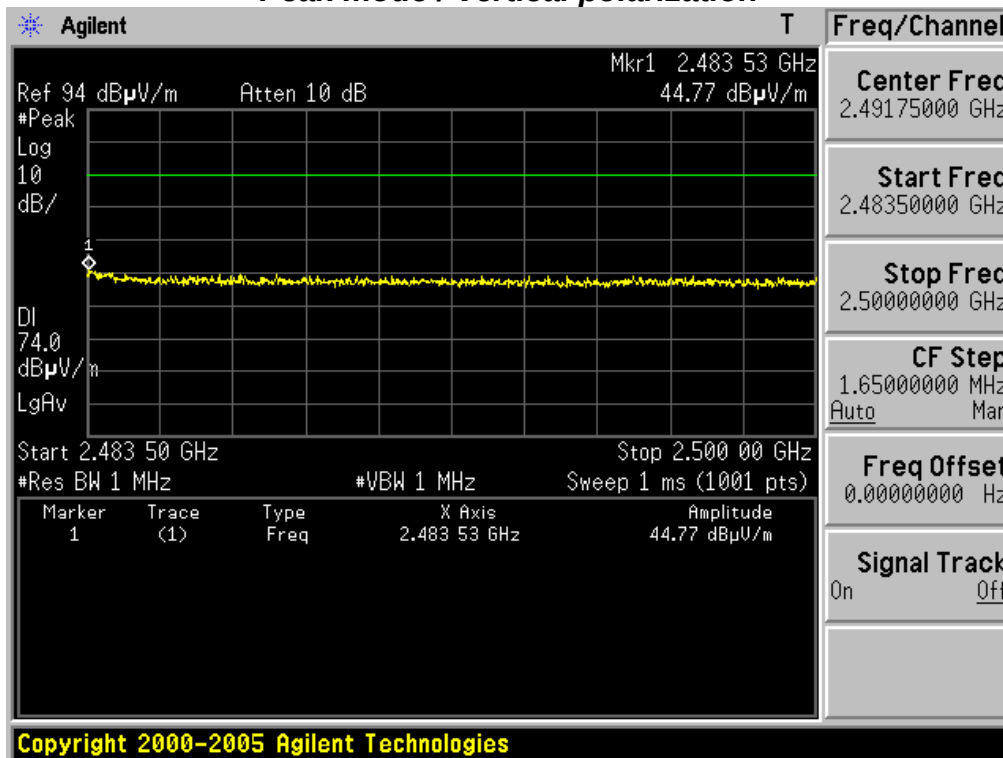
Restricted Band Edge Highest Channel & 2Mbps & The worst case EUT Position: Z-axis
Peak mode / Horizontal polarization



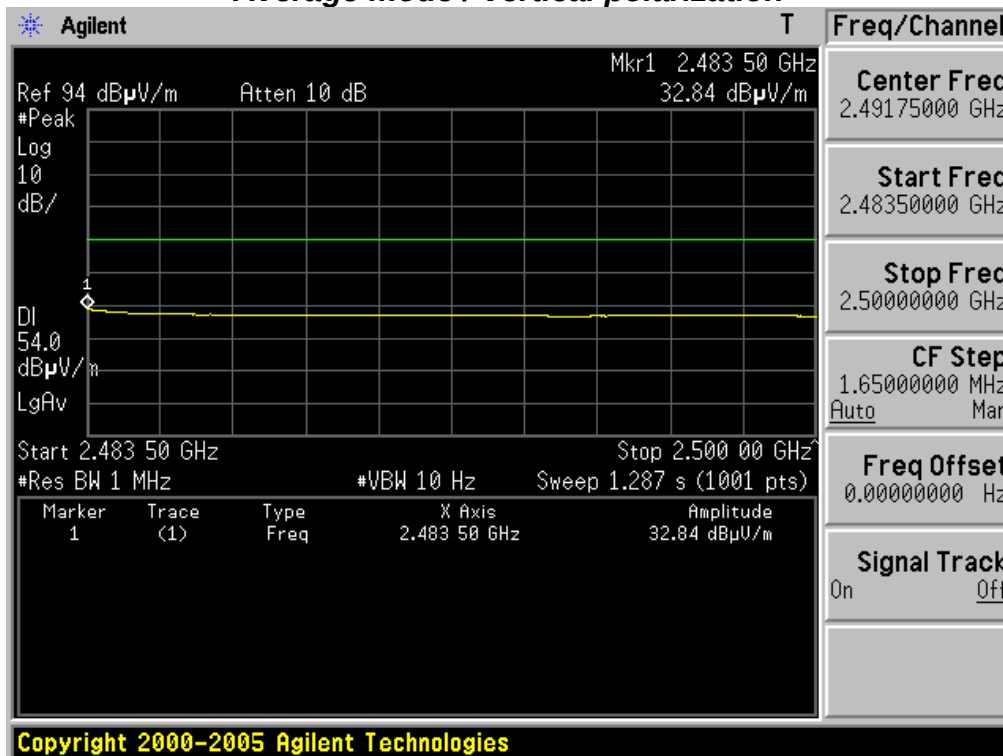
Restricted Band Edge Highest Channel & 2Mbps & The worst case EUT Position: Z-axis
Average mode / Horizontal polarization



Restricted Band Edge Highest Channel & 2Mbps & The worst case EUT Position: Y-axis
Peak mode / Vertical polarization



Restricted Band Edge Highest Channel & 2Mbps & The worst case EUT Position: Y-axis
Average mode / Vertical polarization



30MHz ~ 1GHz Radiated Spurious Emissions & 1Mbps

▪ Lowest Channel & 1Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	Reading(dBuV)	T.F (dB/m)	Result(dBuV/m)	Limit(dBuV/m)	Margin(dB)
			QP		QP		
908.736	V	Z axis	17.89	1.85	19.74	46.00	26.26
-	-	-	-	-	-	-	-

▪ Middle Channel & 1Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	Reading(dBuV)	T.F (dB/m)	Result(dBuV/m)	Limit(dBuV/m)	Margin(dB)
			QP		QP		
854.533	V	Z axis	18.44	1.08	19.52	46.00	26.48
-	-	-	-	-	-	-	-

▪ Highest Channel & 1Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	Reading(dBuV)	T.F (dB/m)	Result(dBuV/m)	Limit(dBuV/m)	Margin(dB)
			QP		QP		
908.815	V	Z axis	17.58	1.85	19.43	46.00	26.57
-	-	-	-	-	-	-	-

Note.

1. No other spurious emissions were detected greater than listed emissions on above table.

2. Sample Calculation.

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

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

1GHz ~ 25GHz Radiated Spurious Emissions & 1Mbps**▪ Lowest Channel & 1Mbps**

Frequency (MHz)	ANT Pol	The worst case EUT Position	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
4804.025	H	X axis	59.26	50.96	5.28	-30.77	33.77	25.47	74.00	54.00	40.23	28.53
4803.910	V	X axis	60.33	51.78	5.28	-30.77	34.84	26.29	74.00	54.00	39.16	27.71
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

▪ Middle Channel & 1Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	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
4881.935	H	Z axis	60.69	51.79	5.27	-30.77	35.19	26.29	74.00	54.00	38.81	27.71
4881.920	V	X axis	60.04	51.60	5.27	-30.77	34.54	26.10	74.00	54.00	39.46	27.90
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

▪ Highest Channel & 1Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	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
4959.755	H	X axis	57.74	49.00	5.64	-30.77	32.61	23.87	74.00	54.00	41.39	30.13
4959.920	V	X axis	58.77	50.10	5.64	-30.77	33.64	24.97	74.00	54.00	40.36	29.03
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were detected greater than listed emissions on above table.
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,
D.C.F (Duty Cycle Correction Factor) = $20\log(\text{The worst Case DWELL Time}/100\text{ms})$
= $20\log(2.895\text{ms} / 100\text{ms}) = -30.77 \text{ dB}$

30MHz ~ 1GHz Radiated Spurious Emissions & 2Mbps

▪ Lowest Channel & 2Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	Reading(dBuV)	T.F (dB/m)	Result(dBuV/m)	Limit(dBuV/m)	Margin(dB)
			QP		QP		
957.334	V	Z axis	17.99	2.42	20.41	46.00	25.59
-	-	-	-	-	-	-	-

▪ Middle Channel & 2Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	Reading(dBuV)	T.F (dB/m)	Result(dBuV/m)	Limit(dBuV/m)	Margin(dB)
			QP		QP		
957.377	V	Z axis	18.21	2.42	20.63	46.00	25.37
-	-	-	-	-	-	-	-

▪ Highest Channel & 2Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	Reading(dBuV)	T.F (dB/m)	Result(dBuV/m)	Limit(dBuV/m)	Margin(dB)
			QP		QP		
866.123	V	Z axis	18.76	1.25	20.01	46.00	25.99
-	-	-	-	-	-	-	-

Note.

1. No other spurious emissions were detected greater than listed emissions on above table.

2. Sample Calculation.

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

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

1GHz ~ 25GHz Radiated Spurious Emissions & 2Mbps**▪ Lowest Channel & 2Mbps**

Frequency (MHz)	ANT Pol	The worst case EUT Position	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
4803.975	H	X axis	56.40	46.02	5.28	-30.72	30.96	20.58	74.00	54.00	43.04	33.42
4804.010	V	X axis	56.60	46.08	5.28	-30.72	31.16	20.64	74.00	54.00	42.84	33.36
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

▪ Middle Channel & 2Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	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
4881.635	H	Z axis	56.66	46.00	5.27	-30.72	31.21	20.55	74.00	54.00	42.79	33.45
4882.245	V	X axis	57.36	46.66	5.27	-30.72	31.91	21.21	74.00	54.00	42.09	32.79
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

▪ Highest Channel & 2Mbps

Frequency (MHz)	ANT Pol	The worst case EUT Position	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
4960.005	H	Z axis	54.84	45.24	5.64	-30.72	29.76	20.16	74.00	54.00	44.24	33.84
4959.975	V	Z axis	55.86	48.62	5.64	-30.72	30.78	23.54	74.00	54.00	43.22	30.46
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were detected greater than listed emissions on above table.
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,
D.C.F (Duty Cycle Correction Factor) = $20\log(\text{The worst Case DWELL Time}/100\text{ms})$
= $20\log(2.91\text{ms} / 100\text{ms}) = -30.72 \text{ dB}$

3.2.8 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: When this device is in the charging mode, the Bluetooth function is disabled.

- Minimum Standard: FCC Part 15.207(a)

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

3.2.9 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 EUT antenna is connected to the main PCB using the spring contactor which is manufacture's unique method. (Refer to Internal Photo file.)

- 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 I

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.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
☒	Spectrum Analyzer	Agilent	E4440A	10/09/30	11/09/30	MY45304199
☐	Spectrum Analyzer	Rohde Schwarz	FSQ26	11/01/11	12/01/11	200445
☐	Spectrum analyzer	Agilent	E4404B	11/03/08	12/03/08	US41061134
☐	Spectrum Analyzer(RE)	H.P	8563E	10/10/04	11/10/04	3551A04634
☐	MXA Signal Analyzer	Agilent Technologies, Inc	N9020A	11/01/07	12/01/07	MY49100833
☐	Power Meter	H.P	EPM-442A	10/07/01	11/07/01	GB37170413
☐	Power Sensor	H.P	8481A	10/07/01	11/07/01	3318A96332
☐	Power Divider	Agilent	11636B	10/10/05	11/10/05	56471
☐	4-Way Power Divider	ET Industries	D-0526-4	10/12/24	11/12/24	210195001
☐	Power Splitter	Anritsu	K241B	10/10/05	11/10/05	020611
☐	Power Splitter	Anritsu	K241B	10/07/01	11/07/01	017060
☐	Power Splitters & Dividers	Aeroflex/Weinschel	1594	11/02/21	12/02/21	1177
☐	Frequency Counter	H.P	5342A	10/07/01	11/07/01	2119A04450
☐	TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	10/10/04	11/10/04	30604493/021031
☒	Digital Multimeter	H.P	34401A	11/03/07	12/03/07	3146A13475, US36122178
☐	Multifunction Synthesizer	HP	8904A	10/10/11	11/10/11	3633A08404
☒	Signal Generator	Rohde Schwarz	SMR20	11/03/08	12/03/08	101251
☐	Signal Generator	H.P	ESG-3000A	10/07/01	11/07/01	US37230529
☐	Vector Signal Generator	Rohde Schwarz	SMJ100A	11/01/11	12/01/11	100148
☐	Vector Signal Generator	Rohde Schwarz	SMBV100A	11/01/11	12/01/11	255571
☐	Audio Analyzer	H.P	8903B	10/07/02	11/07/02	3011A09448
☐	Modulation Analyzer	H.P	8901B	10/07/01	11/07/01	3028A03029
☐	8960 Series 10 Wireless Comms. Test Set	Agilent	E5515C	11/03/07	12/03/07	GB43461134
☐	Universal Radio communication Tester	Rohde Schwarz	CMU200	11/03/07	12/03/07	106760
☐	Bluetooth Tester	TESCOM	TC-3000B	10/07/01	11/07/01	3000B000268
☐	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-3
☒	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-2
☐	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-4
☐	AC Power supply	DAEKWANG	5KVA	11/03/08	12/03/08	20060321-1
☐	DC Power Supply	HP	6622A	11/03/07	12/03/07	3448A03760
☒	DC Power Supply	HP	6633A	11/03/07	12/03/07	3524A06634
☐	DC Power Supply	Protek	PWS-3010D	10/10/04	11/10/04	4072702
☐	BAND Reject Filter	Microwave Circuits	N0308372	10/10/05	11/10/05	3125-01DC0352
☐	BAND Reject Filter	Wainwright	WRCG1750	10/10/05	11/10/05	2
☐	High-Pass Filter	ANRITSU	MP526D	10/10/04	11/10/04	M27756
☐	High-pass filter	Wainwright	WHNX2.1	N/A	N/A	1
☒	High-pass filter	Wainwright	WHNX3.0	N/A	N/A	9
☐	High-pass filter	Wainwright	WHNX5.0	N/A	N/A	8

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
☐	High-Pass Filter	Wainwright	WHKX8.5	N/A	N/A	1
☐	High-Pass Filter	Wainwright	D82346	N/A	N/A	9
☐	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	10/10/04	11/10/04	21097
☒	HORN ANT	ETS	3115	10/07/14	11/07/14	6419
☐	HORN ANT	A.H.Systems	SAS-574	09/06/10	11/06/10	154
☐	HORN ANT	A.H.Systems	SAS-574	09/06/10	11/06/10	155
☐	HORN ANT	SCHWARZBECK	BBHA9120A	10/04/13	12/04/13	322
☐	Dipole Antenna	Schwarzbeck	VHA9103	10/11/29	11/11/29	2116
☐	Dipole Antenna	Schwarzbeck	VHA9103	10/11/29	11/11/29	2117
☐	Dipole Antenna	Schwarzbeck	UHA9105	10/11/29	11/11/29	2261
☐	Dipole Antenna	Schwarzbeck	UHA9105	10/11/29	11/11/29	2262
☐	LOOP Antenna	ETS	6502	10/11/29	11/11/29	3471
☐	Coaxial Fixed Attenuators	Agilent	8491B	10/07/01	11/07/01	MY39260700
☐	Attenuator (3dB)	WEINSCHTEL	56-3	10/10/05	11/10/05	Y2342
☐	Attenuator (3dB)	WEINSCHTEL	56-3	10/10/05	11/10/05	Y2370
☐	Attenuator (10dB)	WEINSCHTEL	23-10-34	10/10/01	11/10/01	BP4386
☐	Attenuator (10dB)	WEINSCHTEL	23-10-34	11/01/11	12/01/11	BP4387
☐	Attenuator (10dB)	WEINSCHTEL	86-10-11	10/10/05	11/10/05	446
☐	Attenuator (10dB)	WEINSCHTEL	86-10-11	10/10/05	11/10/05	408
☐	Attenuator (20dB)	WEINSCHTEL	86-20-11	10/10/05	11/10/05	432
☐	Attenuator (30dB)	JFW	50FH-030-300	11/03/07	12/03/07	060320-1
☐	Attenuator (40dB)	WEINSCHTEL	57-40-33	10/10/01	11/10/01	NN837
☐	Termination	H.P	HP-909D	10/07/02	11/07/02	02750
☐	Termination	H.P	HP-909D	10/07/02	11/07/02	02702
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0088CAN	10/07/01	11/07/01	788
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0185CAN	10/07/01	11/07/01	790
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0215CAN	10/07/01	11/07/01	112
☐	Amplifier (30dB)	Agilent	8449B	11/03/07	12/03/07	3008A01590
☒	Amplifier (30dB)	H.P	8449B	11/03/07	12/03/07	3008A00370
☐	Amplifier	EMPOWER	BBS3Q7ELU	10/10/04	11/10/04	1020
☐	RF Power Amplifier	OPHIRRF	5069F	10/07/01	11/07/01	1006
☒	EMI TEST RECEIVER	R&S	ESU	11/01/20	12/01/20	100014
☐	BILOG ANTENNA	SCHAFFNER	CBL6112B	10/07/14	11/07/14	2737
☐	Amplifier (22dB)	H.P	8447E	11/01/11	12/01/11	2945A02865
☐	EMI TEST RECEIVER	R&S	ESCI	11/03/08	12/03/08	100364

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
☒	BICONICAL ANT.	Schwarzbeck	VHA 9103	10/11/29	11/11/29	91032789
☒	LOG-PERIODIC ANT.	Schwarzbeck	UHALP9108A1	10/11/29	12/11/29	1098
☐	BICONICAL ANT.	Schwarzbeck	VHA 9103	10/12/21	12/12/21	91031946
☐	LOG-PERIODIC ANT.	Schwarzbeck	UHALP9108A1	10/07/07	11/07/07	0590
☒	Low Noise Pre Amplifier	TSJ	MLA-100K01-B01-2	11/03/07	12/03/07	1252741
☐	Low Noise Pre Amplifier	TSJ	MLA-00108-B02-36	11/01/11	12/01/11	1518831
☐	Amplifier (25dB)	Agilent	8447D	11/03/07	12/03/07	2944A10144
☐	Amplifier (25dB)	Agilent	8447D	10/07/01	11/07/01	2648A04922
☐	Spectrum Analyzer(CE)	H.P	8591E	11/03/07	12/03/07	3649A05889
☐	LISN	Kyoritsu	KNW-407	11/01/11	12/01/11	8-317-8
☐	LISN	Kyoritsu	KNW-242	10/07/02	11/07/02	8-654-15
☐	CVCF	NF Electronic	4420	11/03/08	12/03/08	304935/337980
☐	50 ohm Terminator	HME	CT-01	11/01/11	12/01/11	N/A
☐	RFI/FIELD Intensity Meter	Kyoritsu	KNM-2402	10/07/02	11/07/02	4N-170-3
☐	Wideband Radio Communication Tester	R&S	CMW500	10/10/21	11/10/21	100988