RF TEST REPORT

Test item	:	Cellular/PCS GSM/GPRS Phone with Bluetooth
Model No.	:	LG-A225, LGA225, A225
Order No.	:	1105-00605
Date of receipt	:	2011-05-11
Test duration	:	2011-05-12 ~ 2011-06-01
Date of issue	:	2011-06-03
Use of report	:	FCC Original Grant

Applicant : LG Electronics, Inc.
60-39, Gasan-dong, Gumchon-gu, Seoul, 153-023, Korea

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

Test specification	:	FCC Part 15 Subpart C 247
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:	Witnessed by:	Reviewed by:
Engineer S.K.Ryu	N/A	Manager W.J. Lee

Table of Contents

Copyright © 2010, Digital EMC Co., Ltd.

1. General Information

1.1 Testing Laboratory

Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea
www.digitalemc.com
Telephone : + 82-31-321-2664
FAX : + 82-31-321-1664

1.2 Details of Applicant

Applicant : LG Electronics Inc.
Address : 60-39, Gasan-dong, Gumchon-gu, Seoul, 153-023, Korea
Contact person : Hyeon Kyun, Kim
Phone No. : +82-2-2033-1107

1.3 Description of EUT

Product	Cellular/PCS GSM/GPRS Phone with Bluetooth
Model Name	LG-A225, LGA225, A225
Serial Number	Identical prototype
Power Supply	Lithium Ion Battery: DC 3.7V
Frequency Range	2402 ~ 2480MHz
Modulation Technique	GFSK, π/4-DQPSK, 8DPSK
Number of Channels	79
Antenna Type	Internal Antenna
Antenna Gain	PK -2.3dBi

1.4. Declaration by the manufacturer

- N/A

Copyright © 2010, Digital EMC Co., Ltd.

1.5. Information about the FHSS characteristics:

1.5.1. Pseudorandom Frequency Hopping Sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1 600 hops/s.

1.5.2. Equal Hopping Frequency Use

All Bluetooth units participating in the piconet are time and hop-synchronized to the channel.

1.5.3. System Receiver Input Bandwidth

Each channel bandwidth is 1㎒

Copyright ⓒ 2010, Digital EMC Co., Ltd.

1.6. Test Equipment List

Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	Next.Due.Date (dd/mm/yy)	S/N
Spectrum Analyzer	Agilent	E4440A	30/09/10	30/09/11	MY45304199
Spectrum Analyzer	Rohde Schwarz	FSQ26	11/01/11	11/01/12	200445
Spectrum Analyzer	Agilent	N9020A	07/01/11	07/01/12	MY49100833
Power Splitter	Anritsu	K241B	05/10/10	05/10/11	020611
Digital Multimeter	H.P	34401A	07/03/11	07/03/12	3146A13475, US36122178
Signal Generator	Rohde Schwarz	SMR20	08/03/11	08/03/12	101251
Vector Signal Generator	Rohde Schwarz	SMJ100A	11/01/11	11/01/12	100148
Bluetooth Tester	TESCOM	TC-3000B	01/07/10	01/07/11	3000B000268
Thermo hygrometer	BODYCOM	BJ5478	13/01/11	13/01/12	090205-2
DC Power Supply	HP	6622A	07/03/11	07/03/12	3448A03760
High-pass filter	Wainwright	WHNX3.0	N/A	N/A	9
BICONICAL ANT.	Schwarzbeck	VHA 9103	21/12/10	21/12/12	91031946
LOG-PERIODIC ANT.	Schwarzbeck	UHALP9108A	07/07/10	07/07/12	590
HORN ANT	ETS	3115	22/03/11	22/03/12	6419
HORN ANT	A.H.Systems	SAS-574	25/03/11	25/03/13	154
Amplifier (25dB)	Agilent	8447D	07/03/11	07/03/12	2944A10144
Amplifier (30dB)	Agilent	8449B	07/03/11	07/03/12	3008A01590
EMI TEST RECEIVER	R&S	ESU	20/01/11	20/01/12	100014
Spectrum Analyzer(CE)	H.P	8591E	07/03/11	07/03/12	3649A05889
LISN	Kyoritsu	KNW-407	11/01/11	11/01/12	8-317-8
LISN	Kyoritsu	KNW-242	02/07/10	02/07/11	8-654-15
CVCF	NF Electronic	4420	08/03/11	08/03/12	304935/337980
50 ohm Terminator	HME	CT-01	11/01/11	11/01/12	N/A
RFI/FIELD Intensity Meter	Kyoritsu	KNM-2402	02/07/10	02/07/11	4N-170-3

Copyright © 2010, Digital EMC Co., Ltd.

1.7. Summary of Test Results

FCC Part Section(s)	Parameter	Limit (Using in 2400 ~ 2483.5MHz)	Test Condition	Status Note 1
15.247(a)	99% & 20 dB Bandwidth	None	Conducted	C
15.247(b)	Transmitter Output Power	=< 1Watt , if CHs >= 75 Others =<0.125W		C
15.247(d)	Band-edge	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 Emissions	FCC 15.209 Limits	Radiated	C
15.207	AC Conducted Emissions	FCC 15.207 Limits	AC Line Conducted	C
15.203	Antenna Requirements	FCC 15.203	-	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: The sample was tested according to the following specification:
ANSI C-63.4-2003, DA00-705

Copyright © 2010, Digital EMC Co., Ltd.

1.8 Conclusion of worst-case and operation mode

The EUT has three type of modulation (GFSK, π/4DQPSK and 8DPSK).

Therefore all applicable requirements were tested all the modulation.

The field strength of spurious emission was measured in three orthogonal EUT positions(X-axis, Y-axis and Z-axis).

Tested frequency information,

- 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

1.9 Test report revision

Test Report No.	Date	Description
DRTFCC1106-0219	June. 03, 2011	Final version for approval

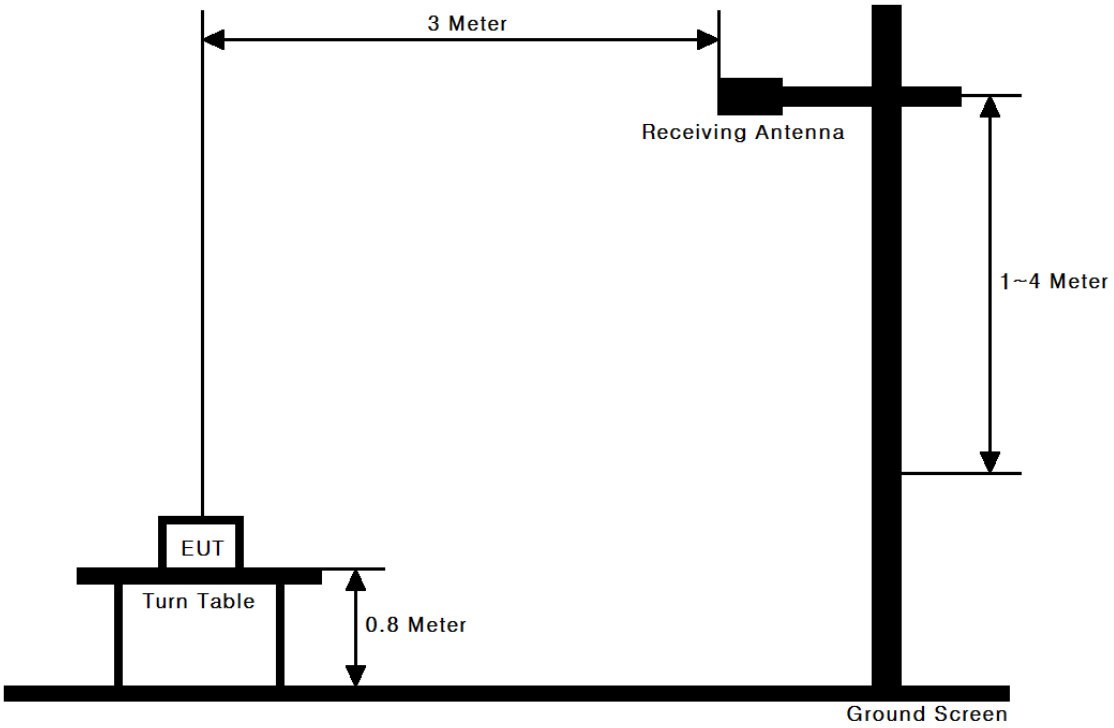
Copyright © 2010, Digital EMC Co., Ltd.

2. Transmitter Radiated Spurious Emissions and Conducted Spurious Emission

2.1. Test Setup

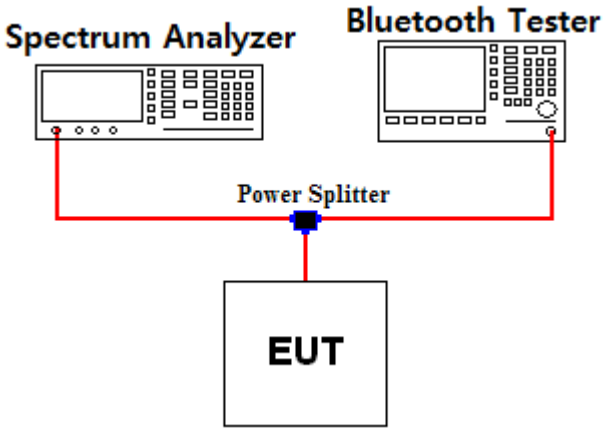
2.1.1. Transmitter Radiated Spurious Emissions

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 25 ㎓ Emissions.



Refer to test setup photo.

2.1.2. Conducted Spurious Emissions



Copyright © 2010, Digital EMC Co., Ltd.

2.2. Limit

According to §15.247(d), in any 100 ㎑ 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 ㏈ below that in the 100 ㎑ 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 ㏈ instead of 20 ㏈. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

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.

According to § 15.205(a) and (b), 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 ~	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~ 167.17	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.72 ~ 173.2	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	240 ~ 285	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	37.5 ~ 38.25	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	608 ~ 614	3345.8 ~ 3358		
		960 ~ 1240			

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.

Copyright © 2010, Digital EMC Co., Ltd.

2.3. Test Procedures

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

2.3.1. Test Procedures for Radiated Spurious Emissions

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈ margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE ;
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 ㎑ for Quasi-peak detection (QP) at frequency below 1 ㎓.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1㎒ for Peak detection and frequency above 1 ㎓.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 ㎒ and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 ㎓.

2.3.2. Test Procedures for Conducted Spurious Emissions

1. The transmitter output was connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=100 ㎑, VBW=100 ㎑.

Copyright © 2010, Digital EMC Co., Ltd.

2.4. Test Results

Ambient temperature : 21 ~ 24 °C
Relative humidity : 40 ~ 45%

2.4.1. Radiated Emission

30MHz ~ 25GHz Data(Modulation: *GFSK*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
47.408	V	X Axis	QP	32.00	-9.80	22.20	40.00	17.80
2388.960	H	X Axis	PK	50.44	-9.18	41.26	74.00	32.74
2388.960	H	X Axis	AV	39.32	-9.18	30.14	54.00	23.86
4804.250	H	X Axis	PK	47.93	-0.35	47.58	74.00	26.42
4804.000	H	X Axis	AV	37.61	-0.35	37.26	54.00	16.74

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
47.486	V	X Axis	QP	31.80	-9.90	21.90	40.00	18.10
4882.150	H	X Axis	PK	48.03	-0.06	47.97	74.00	26.03
4882.000	H	X Axis	AV	37.71	-0.06	37.65	54.00	16.35

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
47.209	V	Z Axis	QP	31.50	-9.60	21.90	40.00	18.10
2483.680	H	X Axis	PK	54.70	-8.59	46.11	74.00	27.89
2493.020	H	X Axis	AV	43.97	-8.56	35.41	54.00	18.59
4959.660	H	X Axis	PK	47.84	0.21	48.05	74.00	25.95
4959.990	H	X Axis	AV	36.33	0.21	36.54	54.00	17.46

Note.
1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

Copyright © 2010, Digital EMC Co., Ltd.

30MHz ~ 25GHz Data(Modulation: π/4 DQPSK)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
47.431	V	X Axis	QP	31.30	-9.80	21.50	40.00	18.50
2389.680	H	X Axis	PK	49.23	-9.18	40.05	74.00	33.95
2388.880	H	X Axis	AV	37.59	-9.18	28.41	54.00	25.59
4804.250	H	X Axis	PK	47.19	-0.35	46.84	74.00	27.16
4804.020	H	X Axis	AV	35.75	-0.35	35.40	54.00	18.60

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
31.551	H	X Axis	QP	18.00	-4.70	13.30	40.00	26.70
4882.150	H	X Axis	PK	47.98	-0.06	47.92	74.00	26.08
4882.000	H	X Axis	AV	35.73	-0.06	35.67	54.00	18.33

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
47.262	V	X Axis	QP	31.70	-9.70	22.00	40.00	18.00
2483.680	H	X Axis	PK	54.47	-8.59	45.88	74.00	28.12
2493.040	H	X Axis	AV	42.49	-8.56	33.93	54.00	20.07
4959.830	H	X Axis	PK	47.82	0.21	48.03	74.00	25.97
4959.990	H	X Axis	AV	34.57	0.21	34.78	54.00	19.22

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

Copyright © 2010, Digital EMC Co., Ltd.

30MHz ~ 25GHz Data(Modulation: π8DPSK)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
47.384	V	X Axis	QP	32.20	-9.80	22.40	40.00	17.60
2388.960	H	X Axis	PK	48.77	-9.18	39.59	74.00	34.41
2388.960	H	X Axis	AV	37.54	-9.18	28.36	54.00	25.64
4804.000	H	X Axis	PK	47.19	-0.35	46.84	74.00	27.16
4803.960	H	X Axis	AV	35.00	-0.35	34.65	54.00	19.35

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
47.437	V	X Axis	QP	30.80	-9.90	20.90	40.00	19.10
4881.650	H	X Axis	PK	47.24	-0.06	47.18	74.00	26.82
4881.950	H	X Axis	AV	35.47	-0.06	35.41	54.00	18.59

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
47.362	V	X Axis	QP	30.90	-9.80	21.10	40.00	18.90
2483.530	H	X Axis	PK	56.73	-8.59	48.14	74.00	25.86
2493.070	H	X Axis	AV	42.47	-8.56	33.91	54.00	20.09
4960.000	H	X Axis	PK	46.52	0.21	46.73	74.00	27.27
4960.030	H	X Axis	AV	34.61	0.21	34.82	54.00	19.18

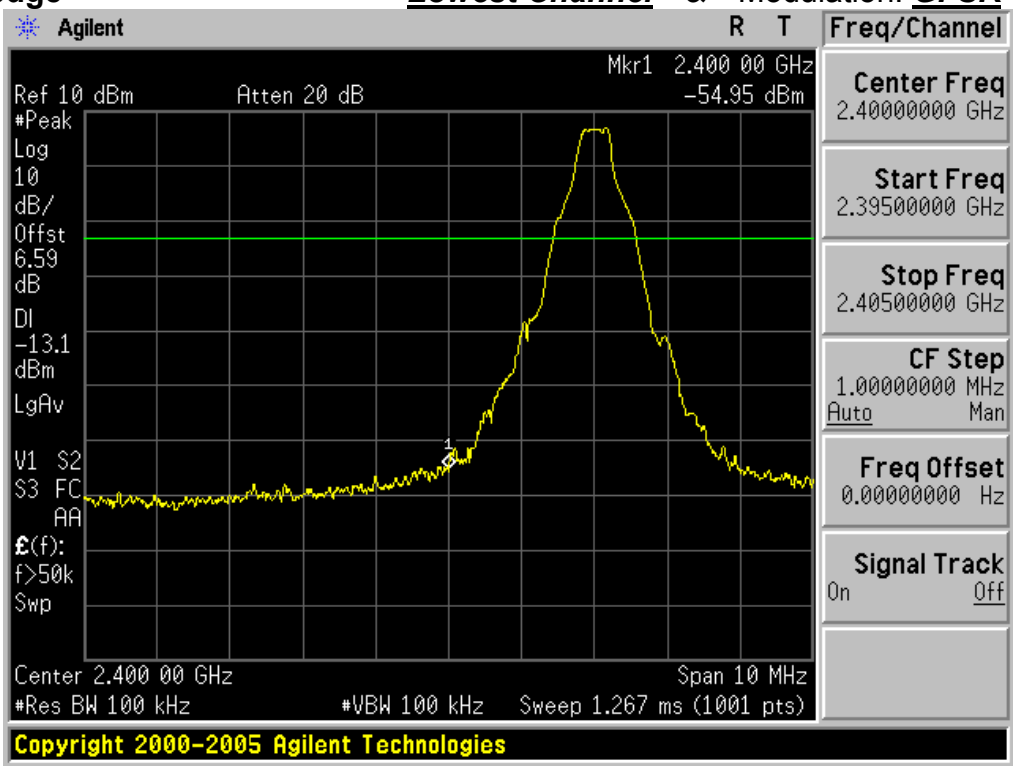
Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

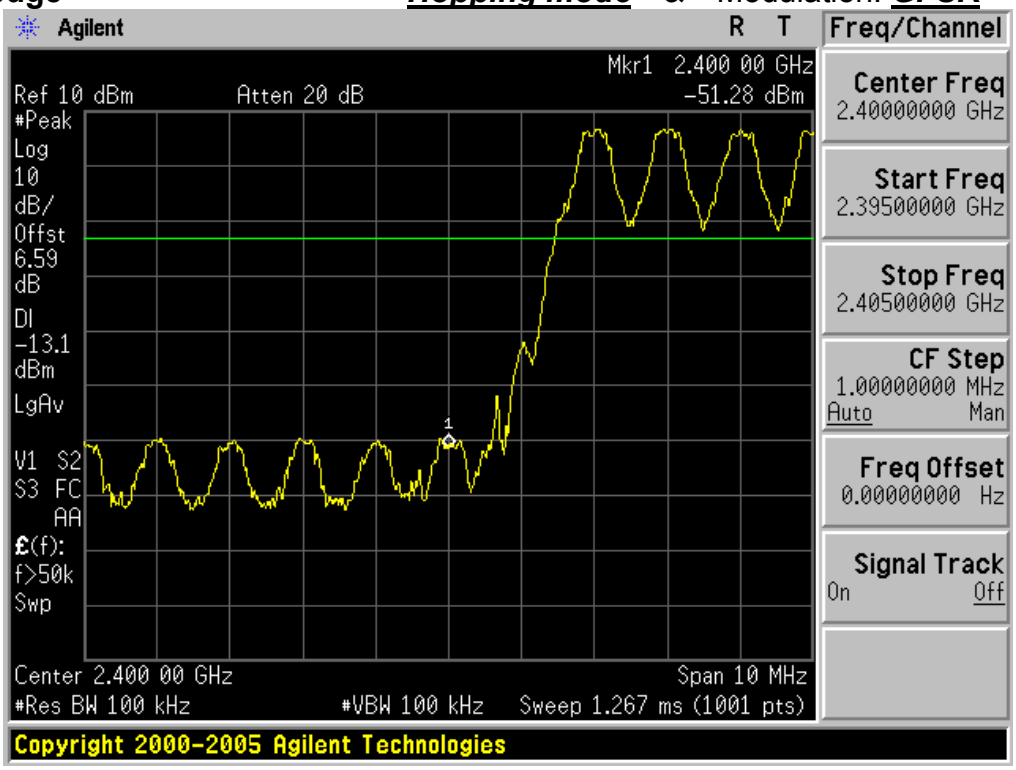
Copyright © 2010, Digital EMC Co., Ltd.

2.4.2. Conducted Spurious Emissions

Low Band-edge ***Lowest Channel*** & Modulation: ***GFSK***

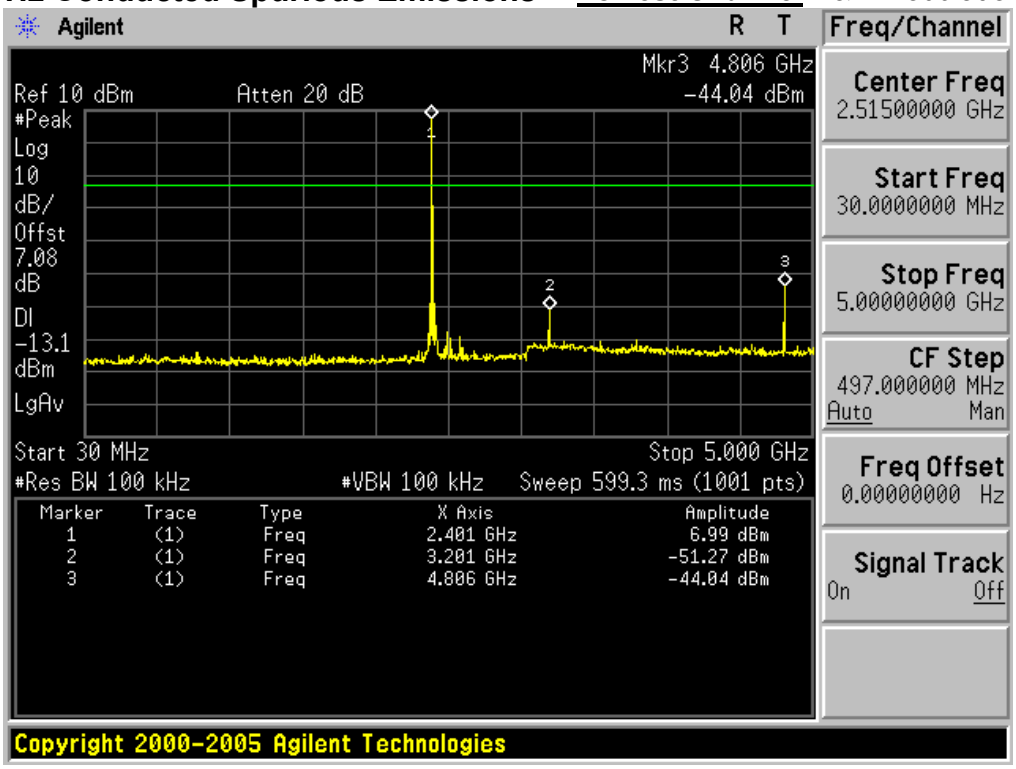


Low Band-edge ***Hopping mode*** & Modulation: ***GFSK***

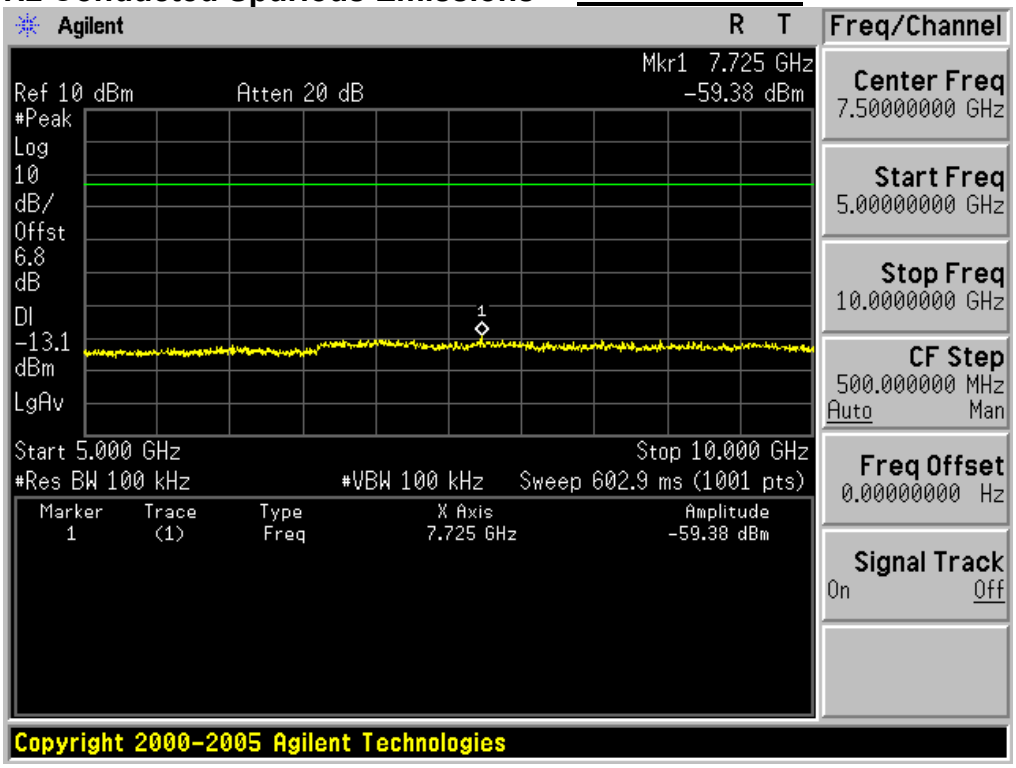


Copyright © 2010, Digital EMC Co., Ltd.

30MHz ~ 5GHz Conducted Spurious Emissions ***Lowest Channel*** & Modulation: ***GFSK***

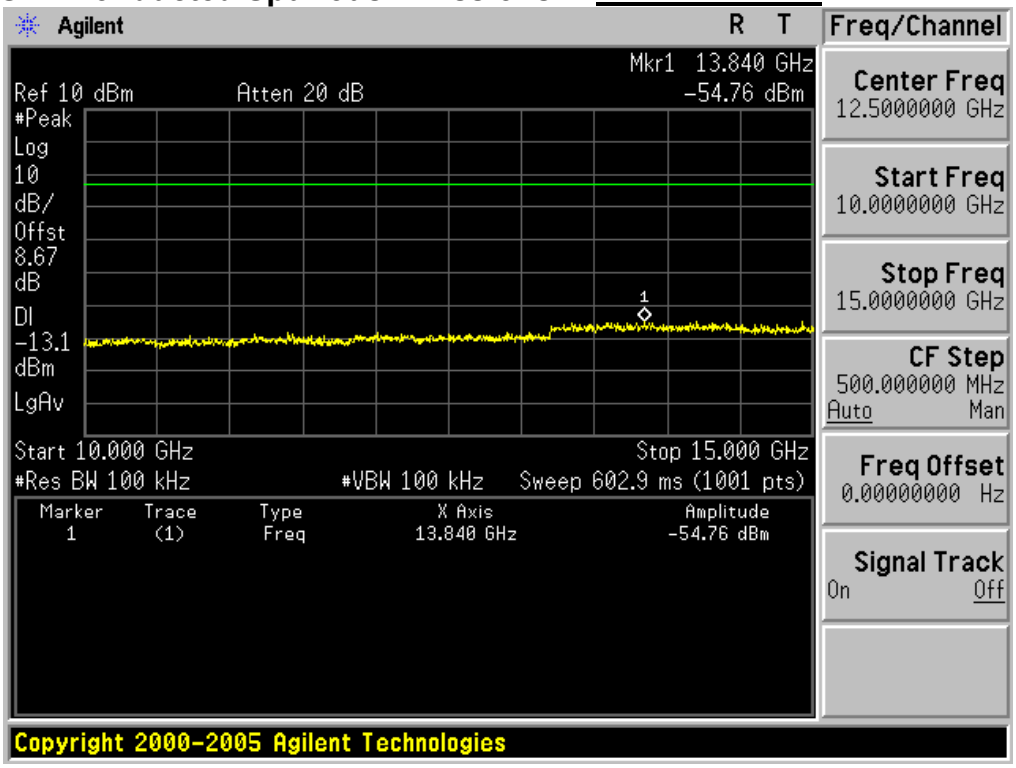


5GHz ~ 10GHz Conducted Spurious Emissions ***Lowest Channel*** & Modulation: ***GFSK***

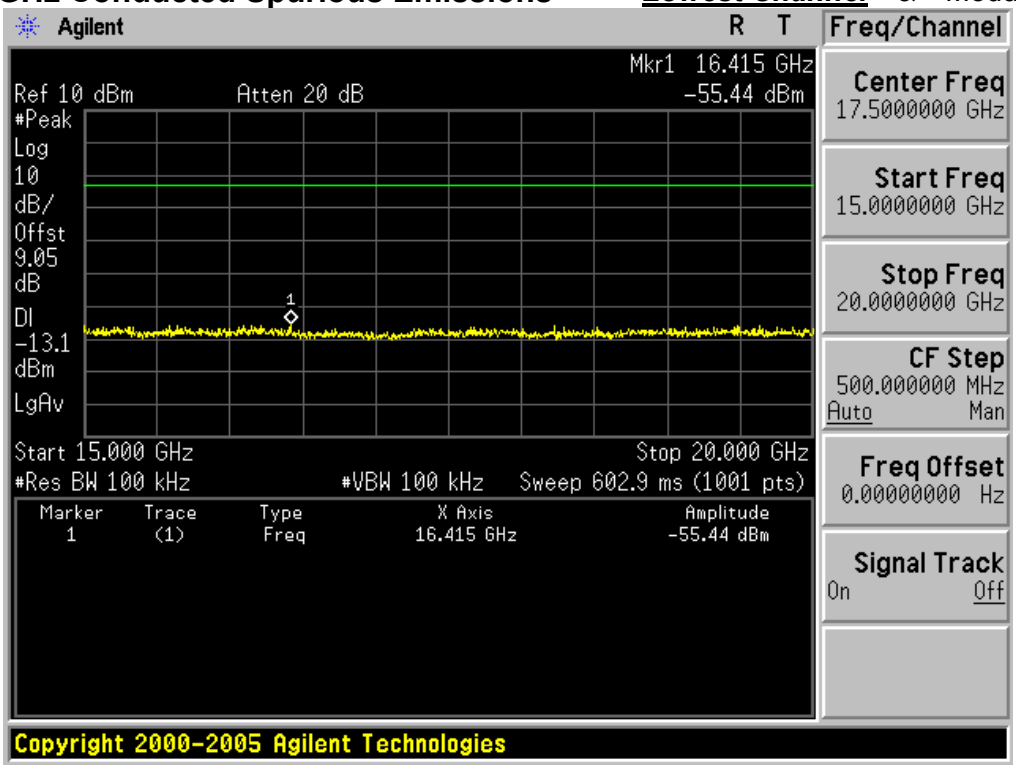


Copyright © 2010, Digital EMC Co., Ltd.

10GHz ~ 15GHz Conducted Spurious Emissions ***Lowest Channel*** & Modulation: ***GFSK***

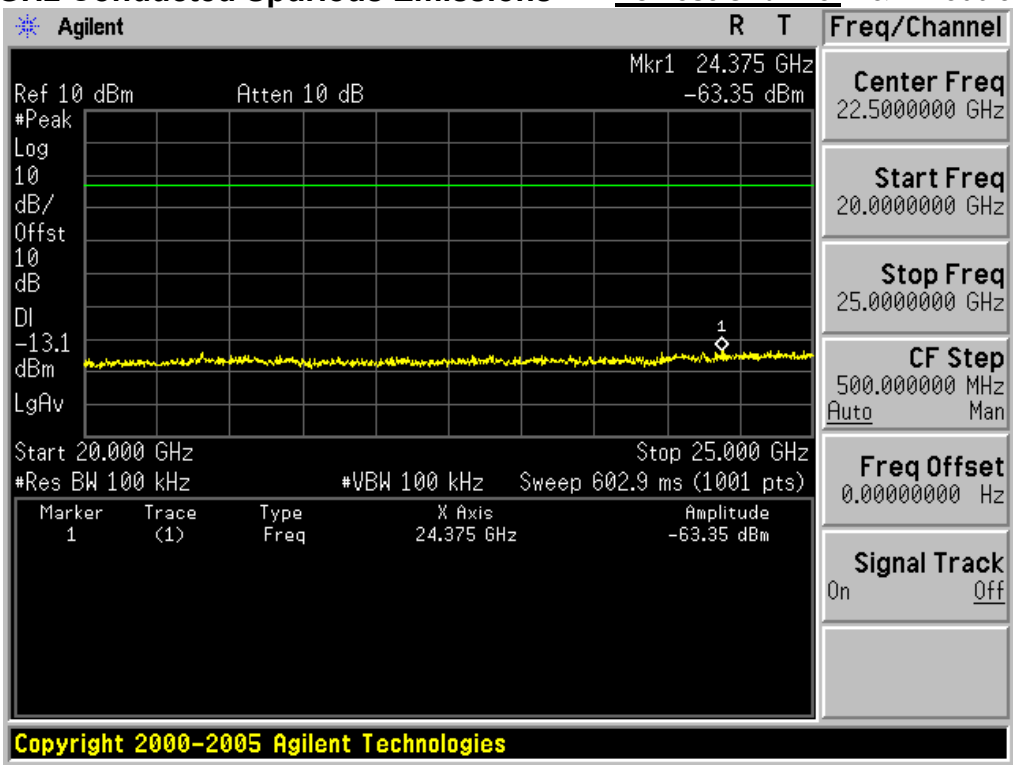


15GHz ~ 20GHz Conducted Spurious Emissions ***Lowest Channel*** & Modulation: ***GFSK***



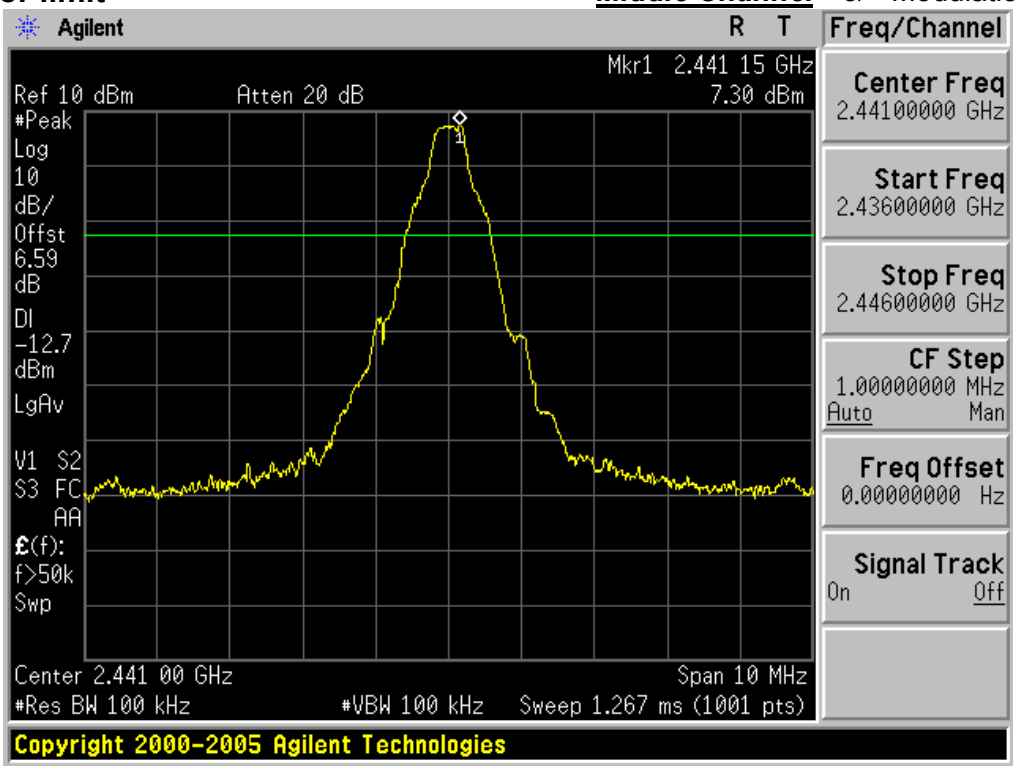
Copyright © 2010, Digital EMC Co., Ltd.

20GHz ~ 25GHz Conducted Spurious Emissions ***Lowest Channel*** & Modulation: ***GFSK***

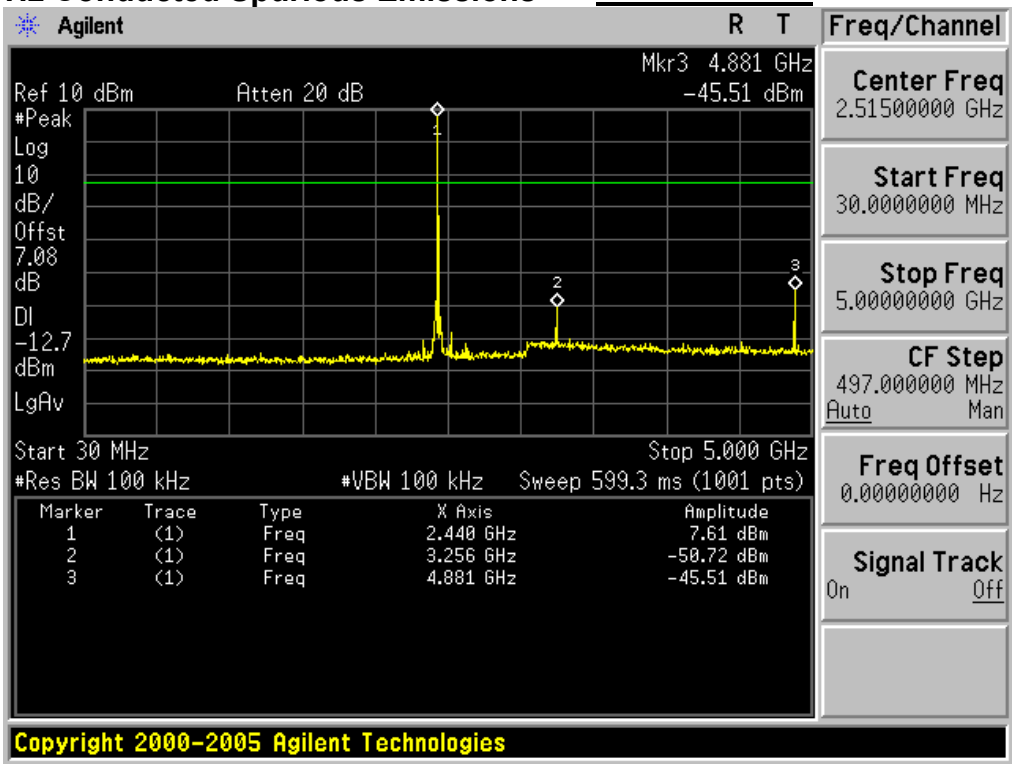


Copyright © 2010, Digital EMC Co., Ltd.

Reference for limit ***Middle Channel*** & Modulation: ***GFSK***

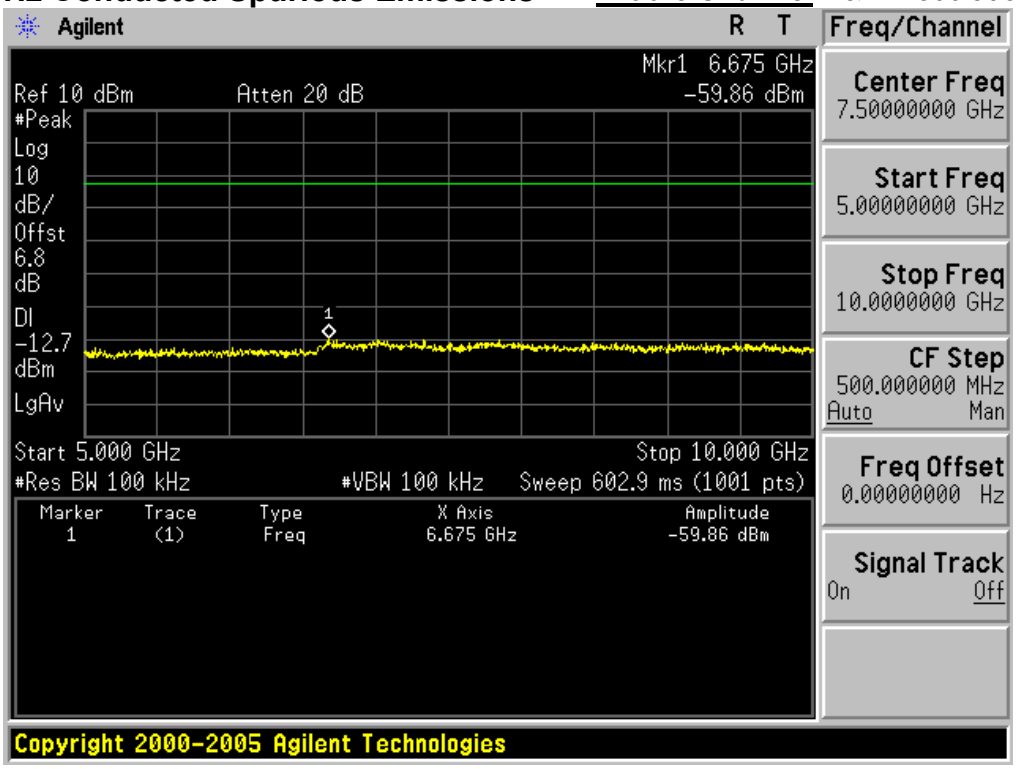


30MHz ~ 5GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***GFSK***

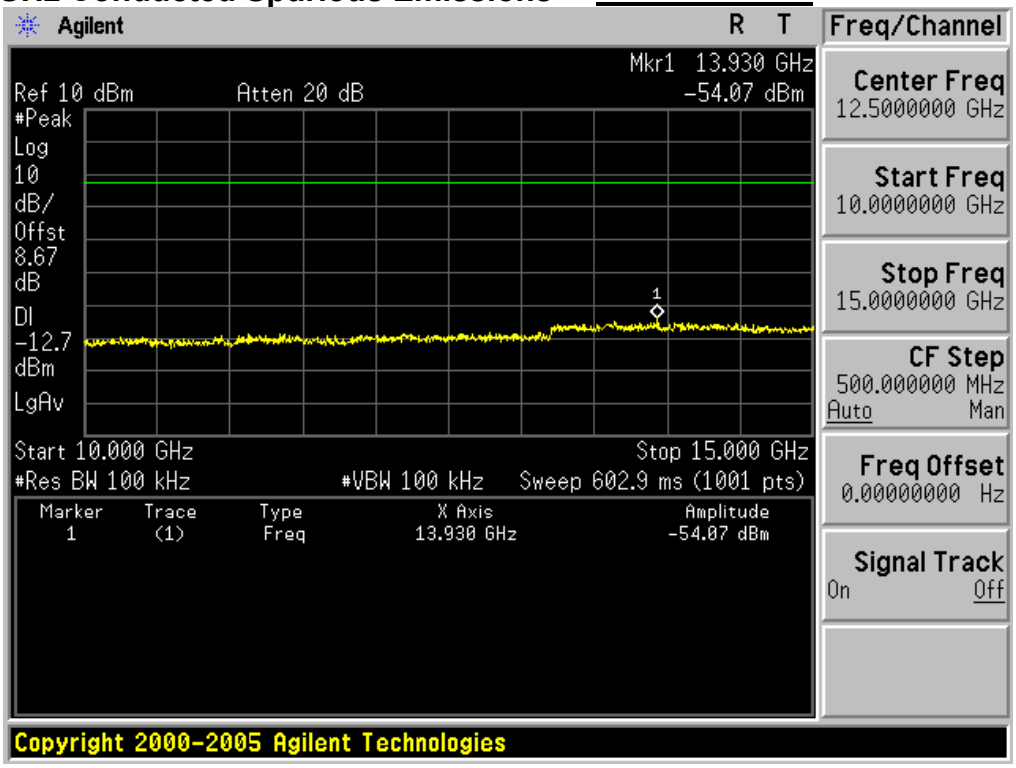


Copyright © 2010, Digital EMC Co., Ltd.

5GHz ~ 10GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***GFSK***

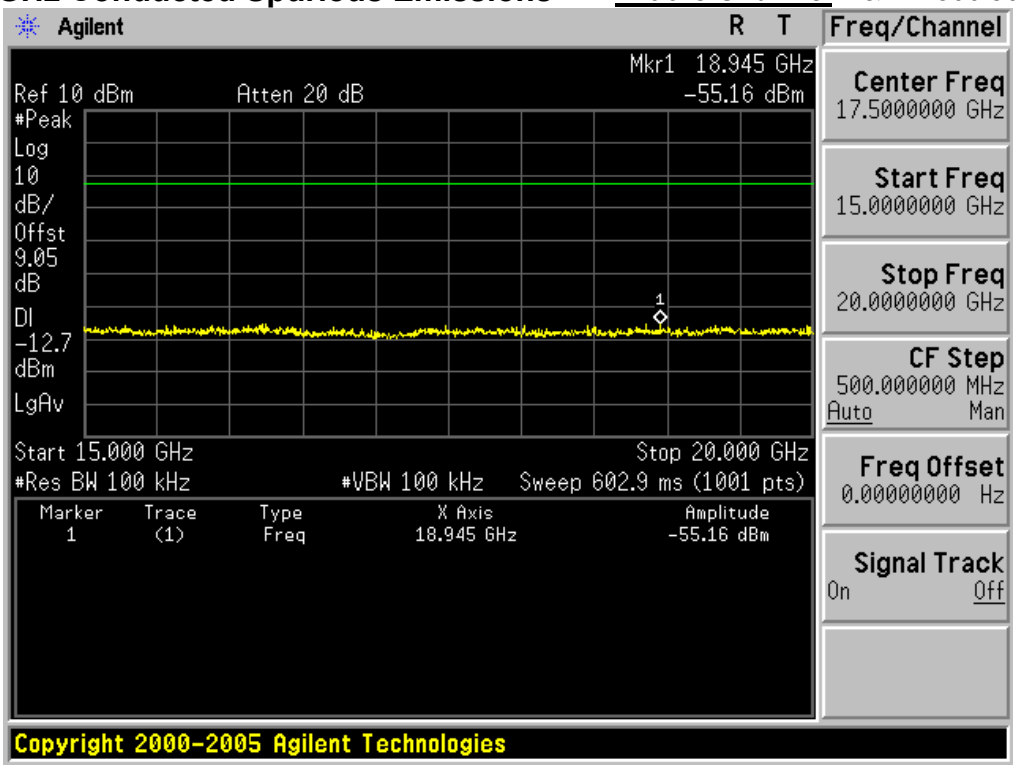


10GHz ~ 15GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***GFSK***

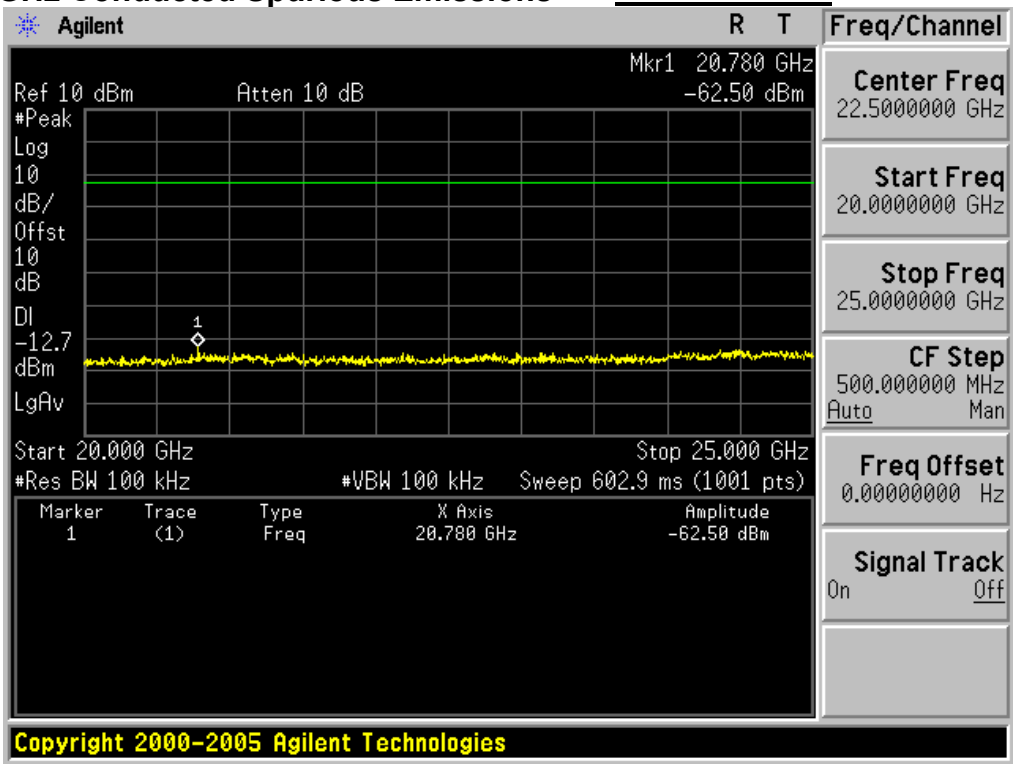


Copyright © 2010, Digital EMC Co., Ltd.

15GHz ~ 20GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***GFSK***

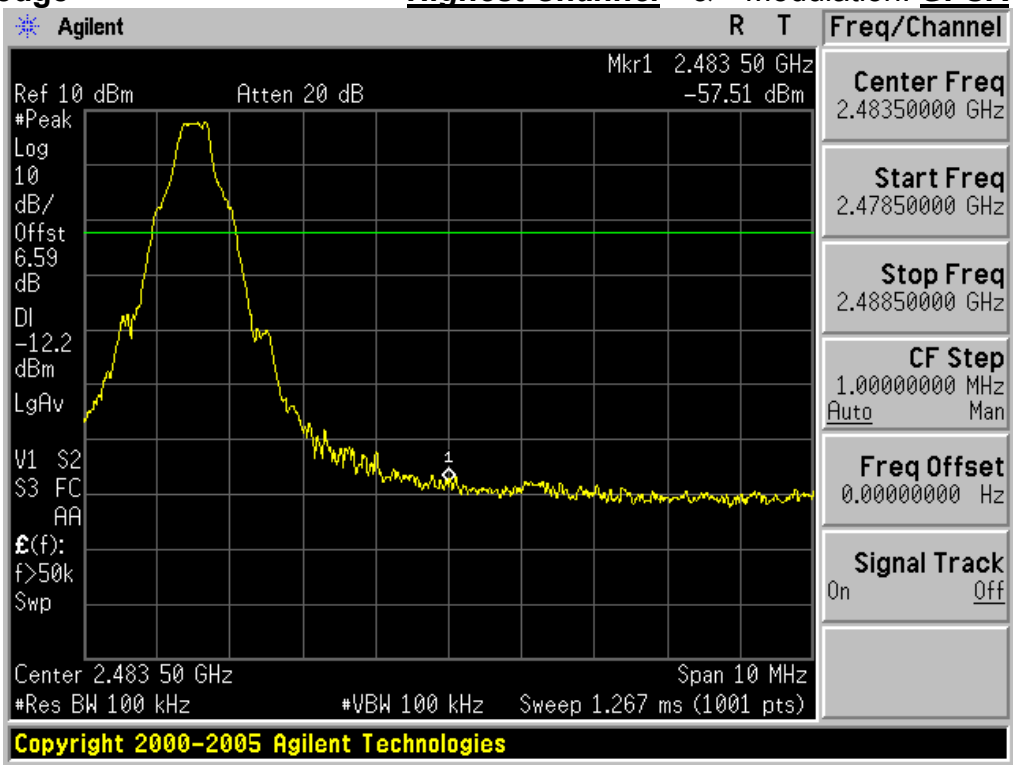


20GHz ~ 25GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***GFSK***

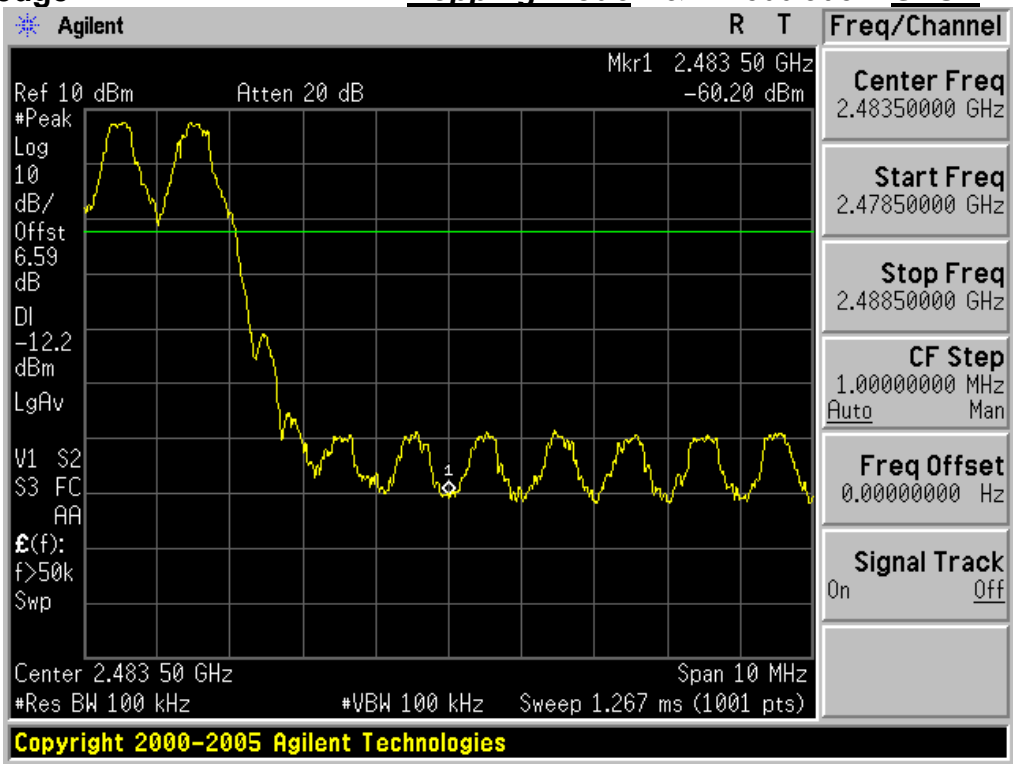


Copyright © 2010, Digital EMC Co., Ltd.

High Band-edge ***Highest Channel*** & Modulation: ***GFSK***

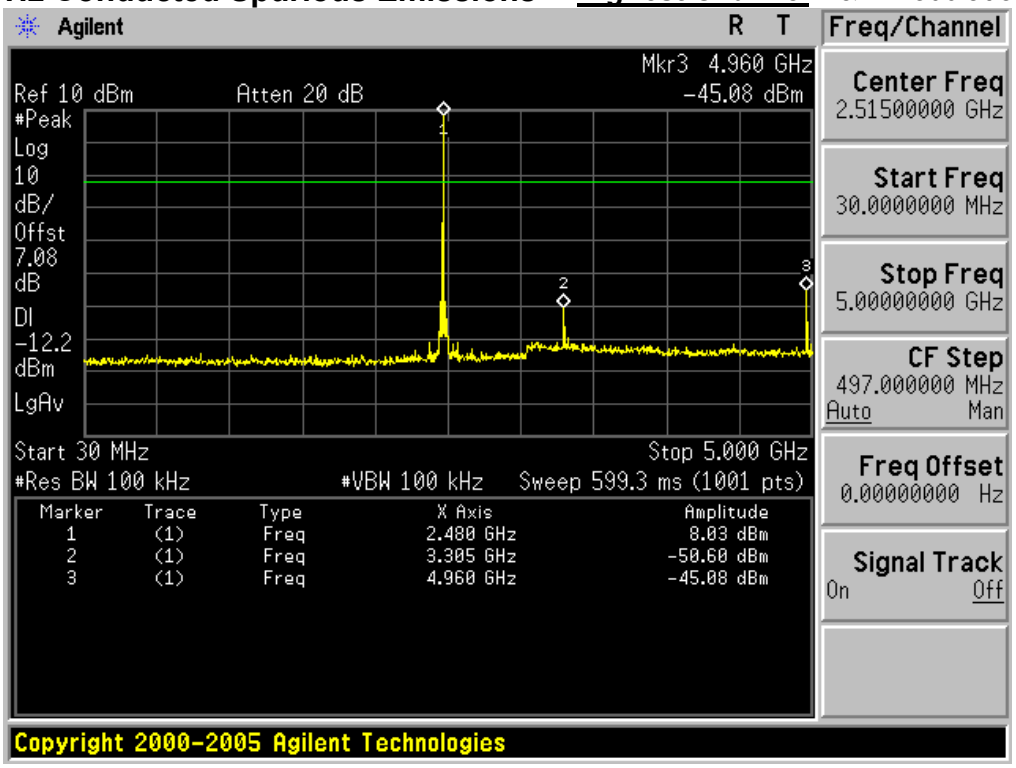


High Band-edge ***Hopping mode*** & Modulation: ***GFSK***

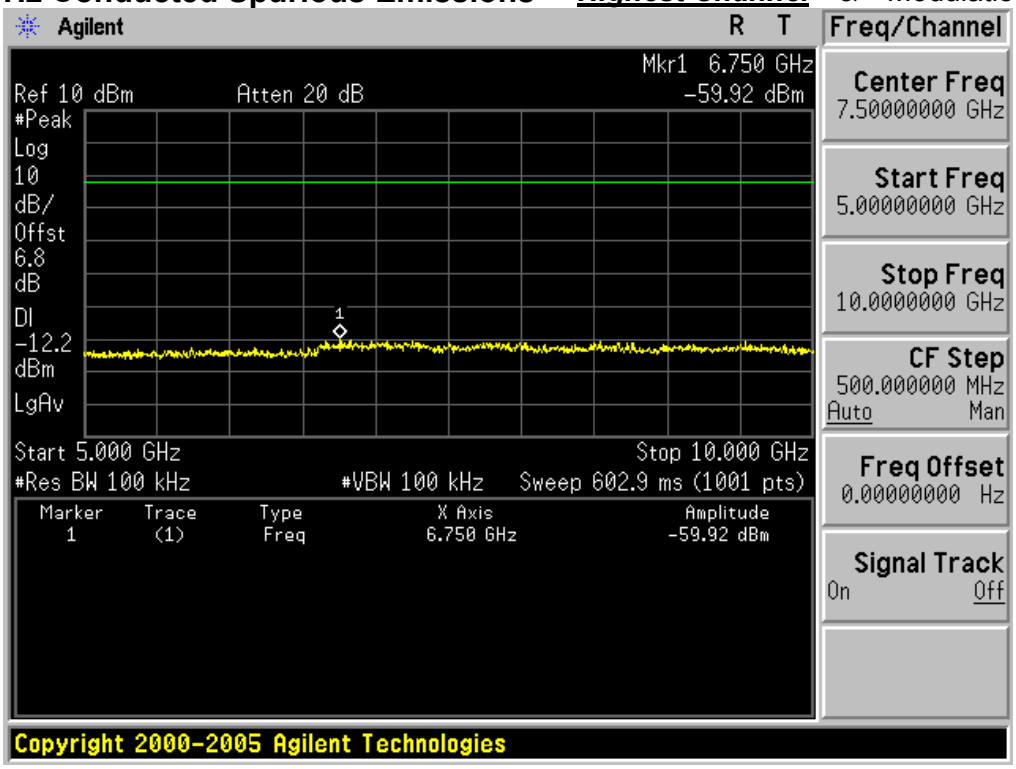


Copyright © 2010, Digital EMC Co., Ltd.

30MHz ~ 5GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***GFSK***

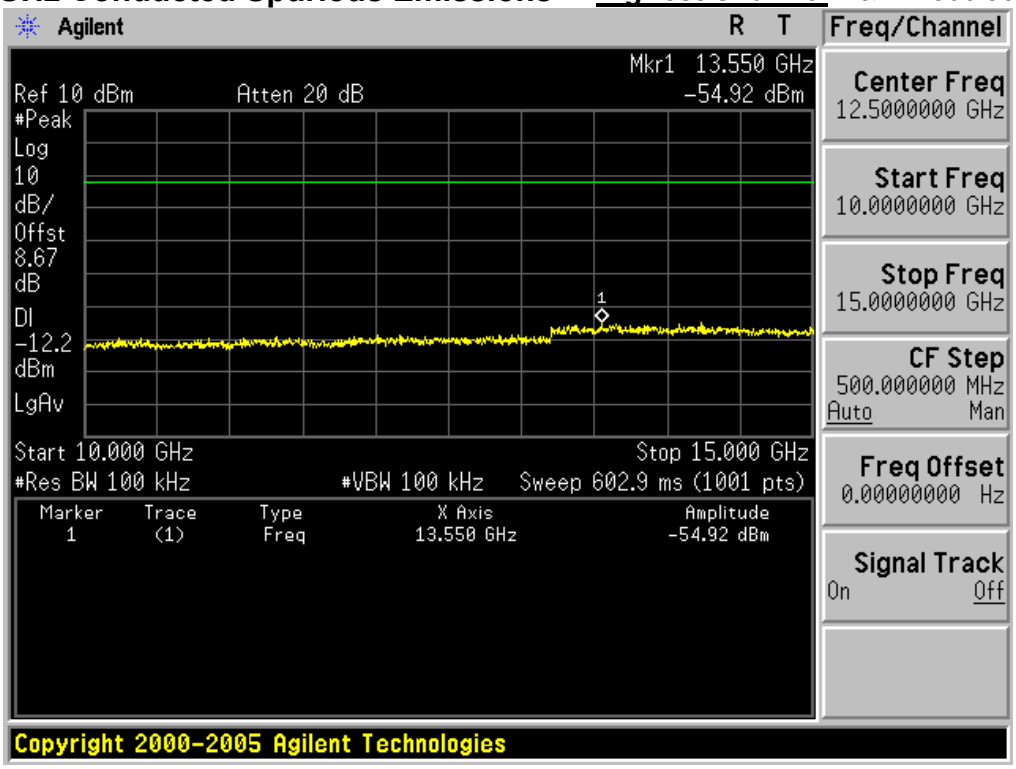


5GHz ~ 10GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***GFSK***

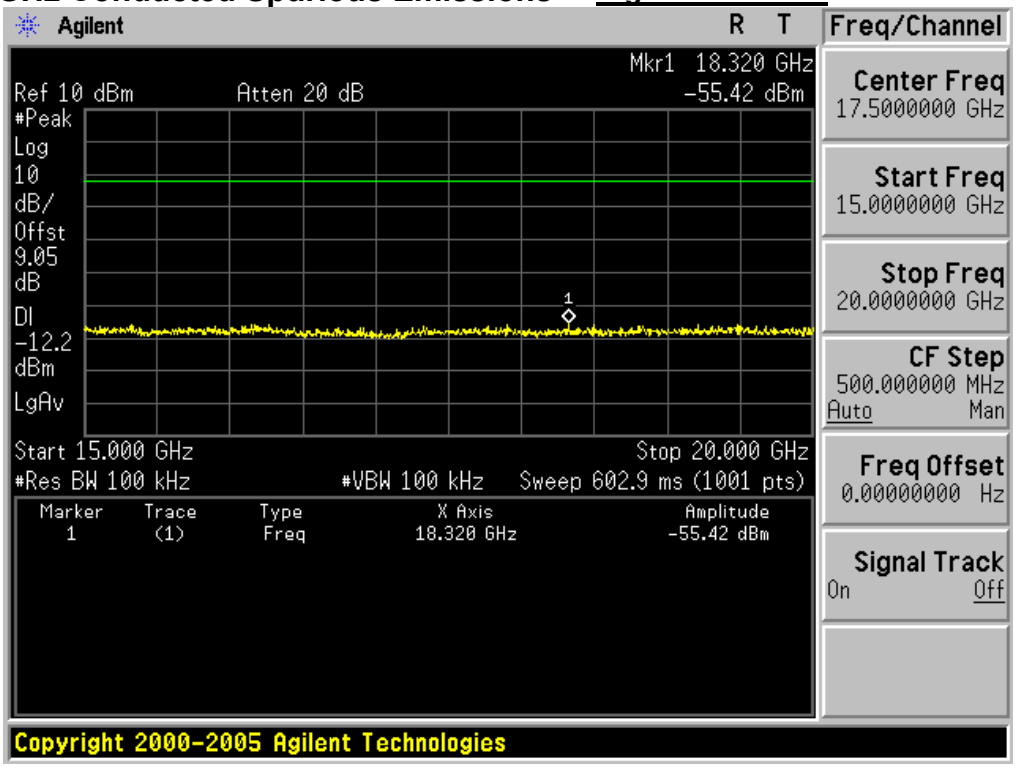


Copyright © 2010, Digital EMC Co., Ltd.

10GHz ~ 15GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***GFSK***

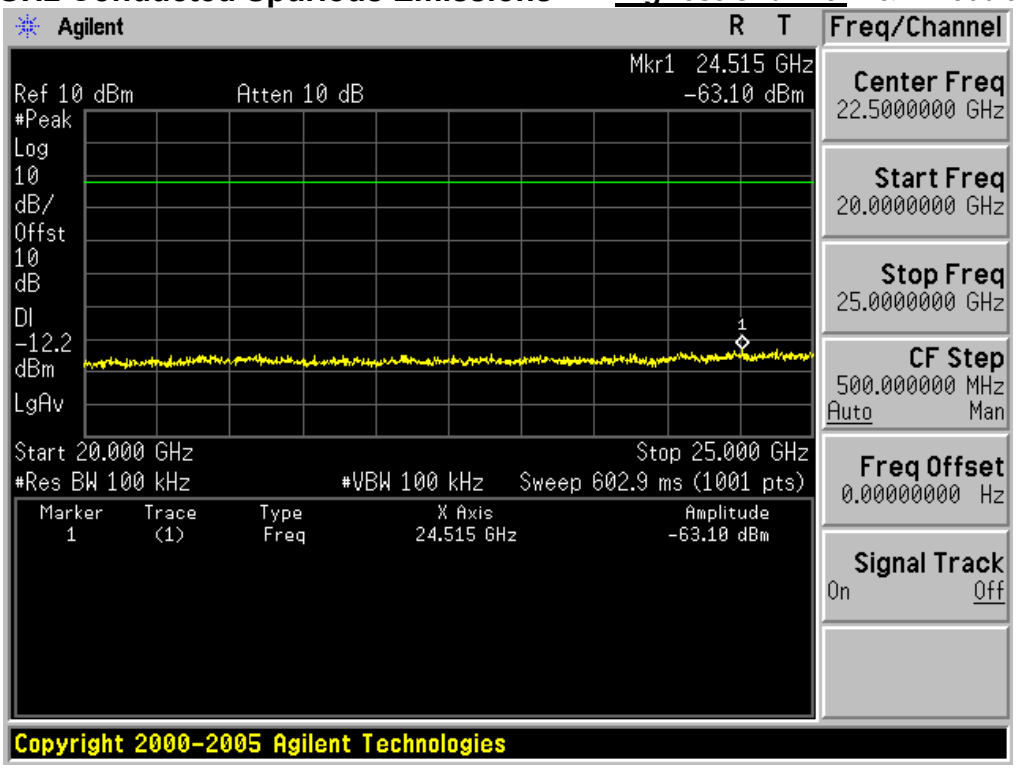


15GHz ~ 20GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***GFSK***



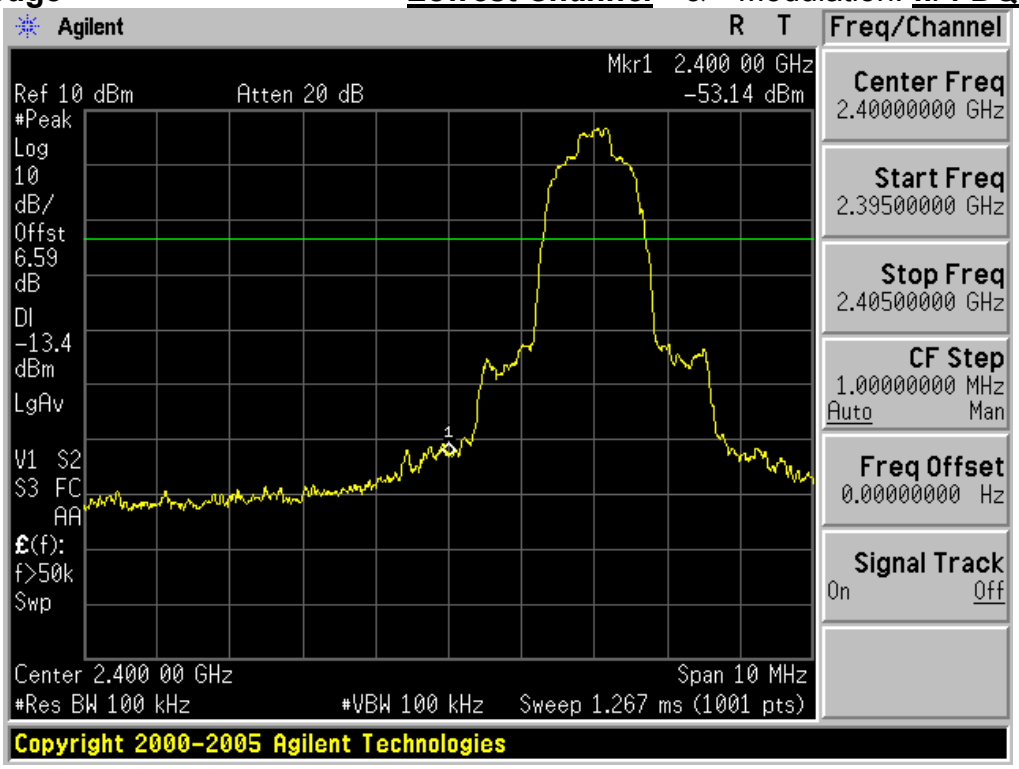
Copyright © 2010, Digital EMC Co., Ltd.

20GHz ~ 25GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***GFSK***

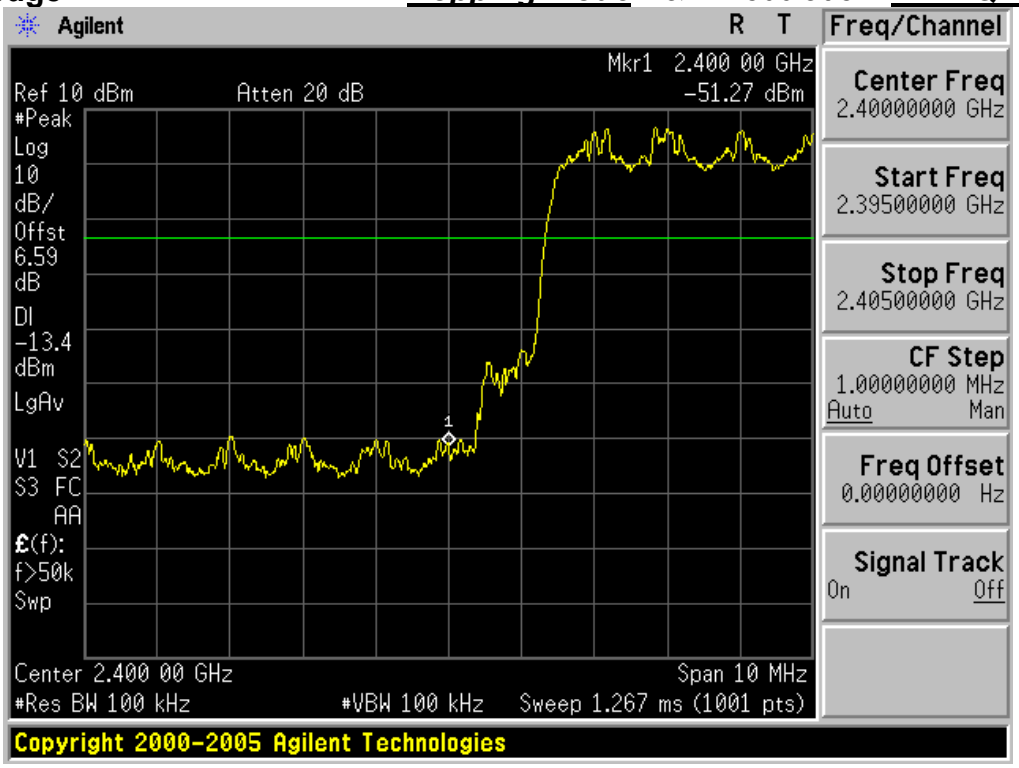


Copyright © 2010, Digital EMC Co., Ltd.

Low Band-edge ***Lowest Channel*** & Modulation: ***π/4 DQPSK***

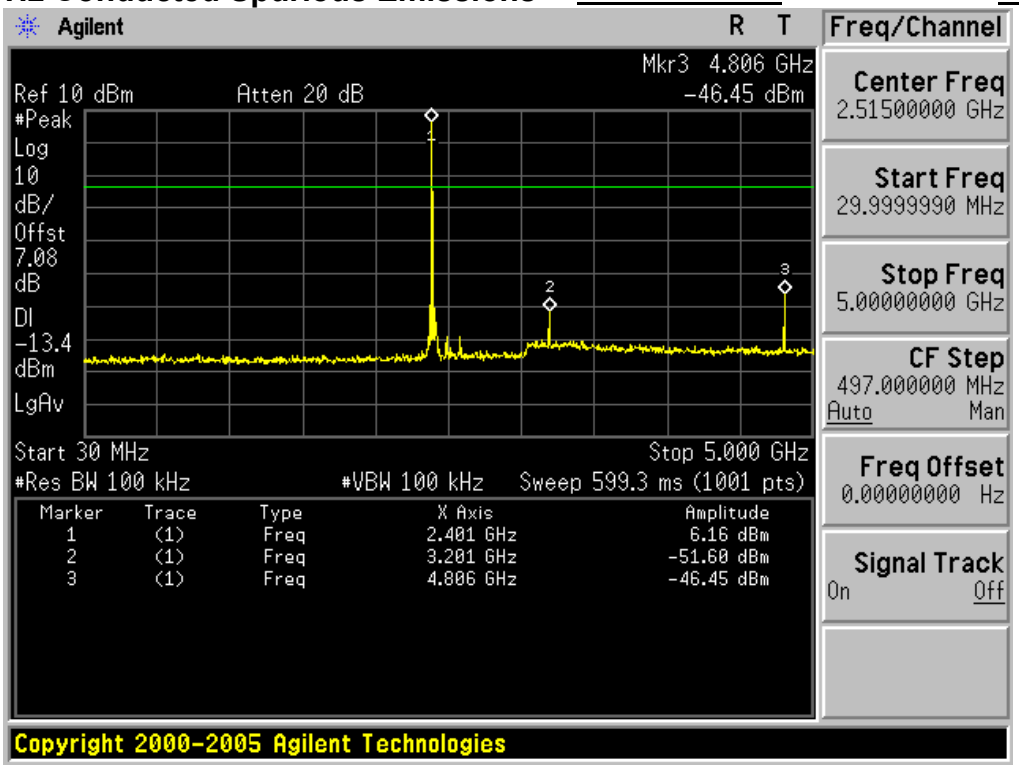


Low Band-edge ***Hopping mode*** & Modulation: ***π/4 DQPSK***

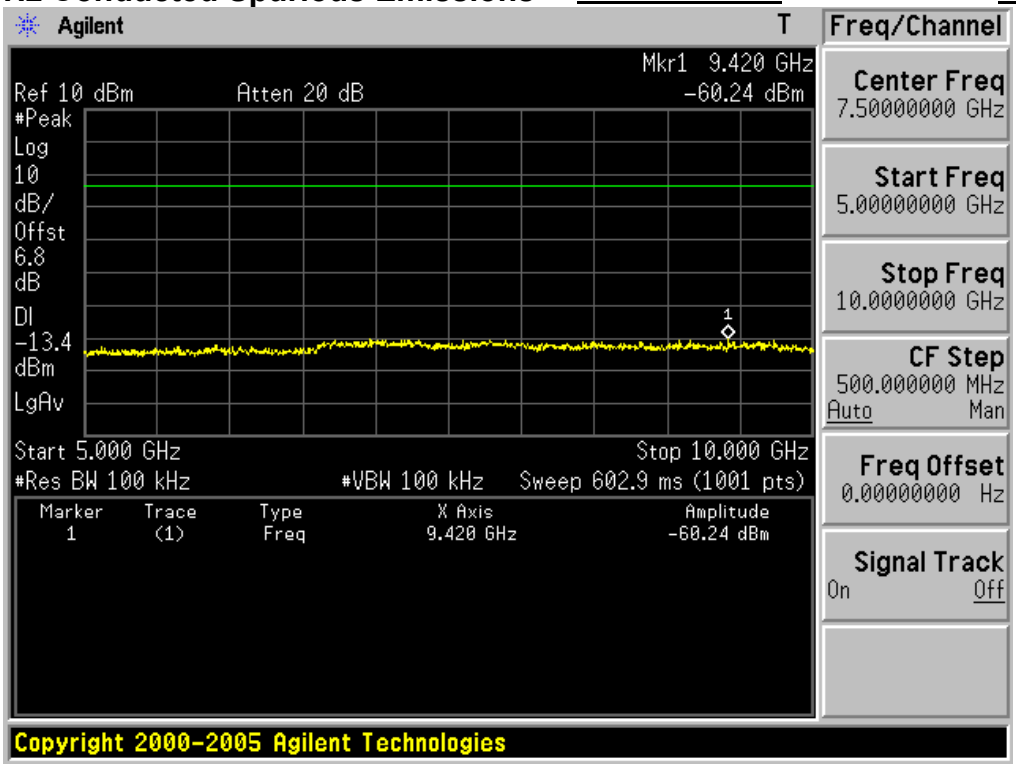


Copyright © 2010, Digital EMC Co., Ltd.

30MHz ~ 5GHz Conducted Spurious Emissions *Lowest Channel* & Modulation: *π/4 DQPSK*

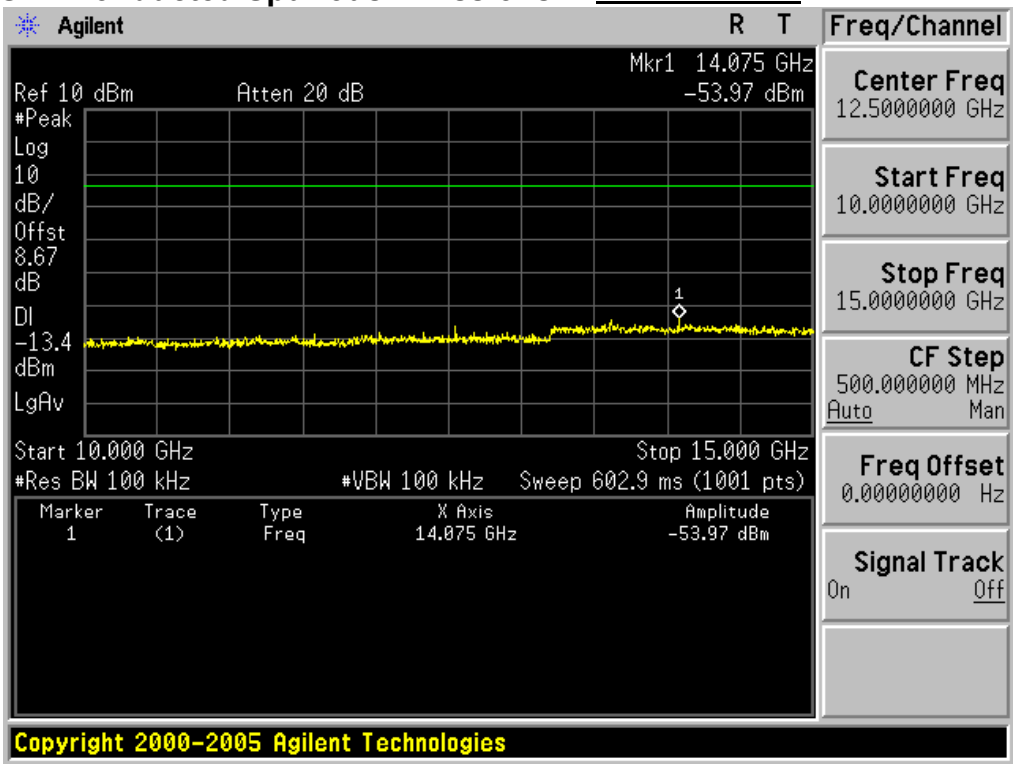


5GHz ~ 10GHz Conducted Spurious Emissions *Lowest Channel* & Modulation: *π/4 DQPSK*

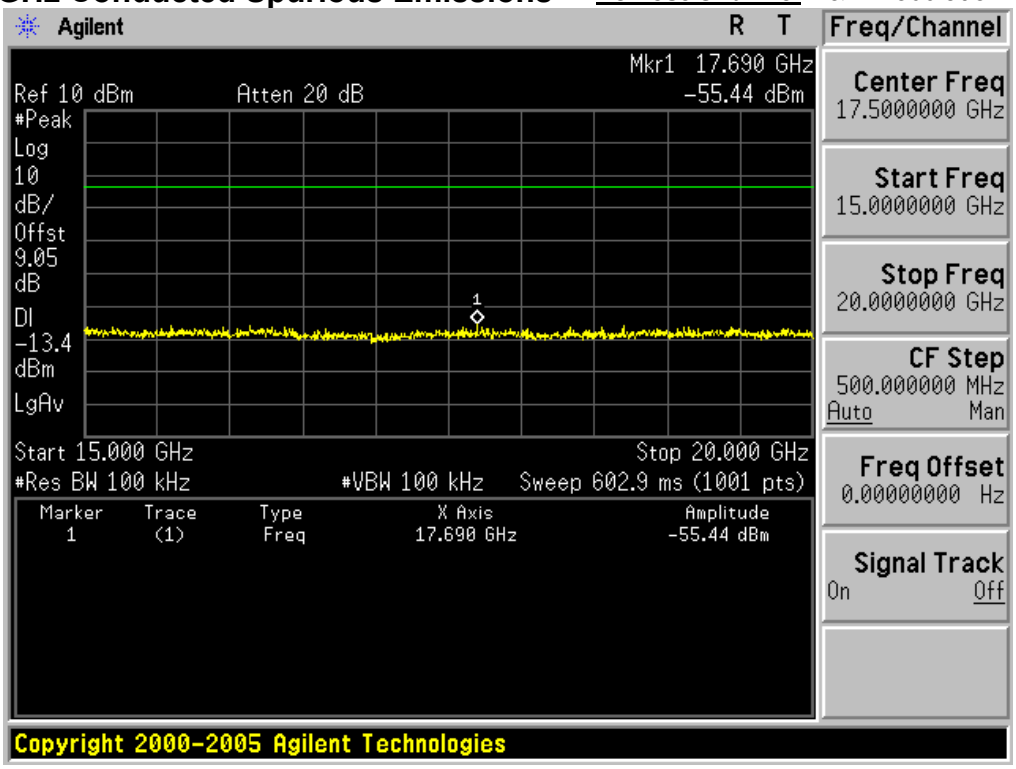


Copyright © 2010, Digital EMC Co., Ltd.

10GHz ~ 15GHz Conducted Spurious Emissions *Lowest Channel* & Modulation: *π/4 DQPSK*

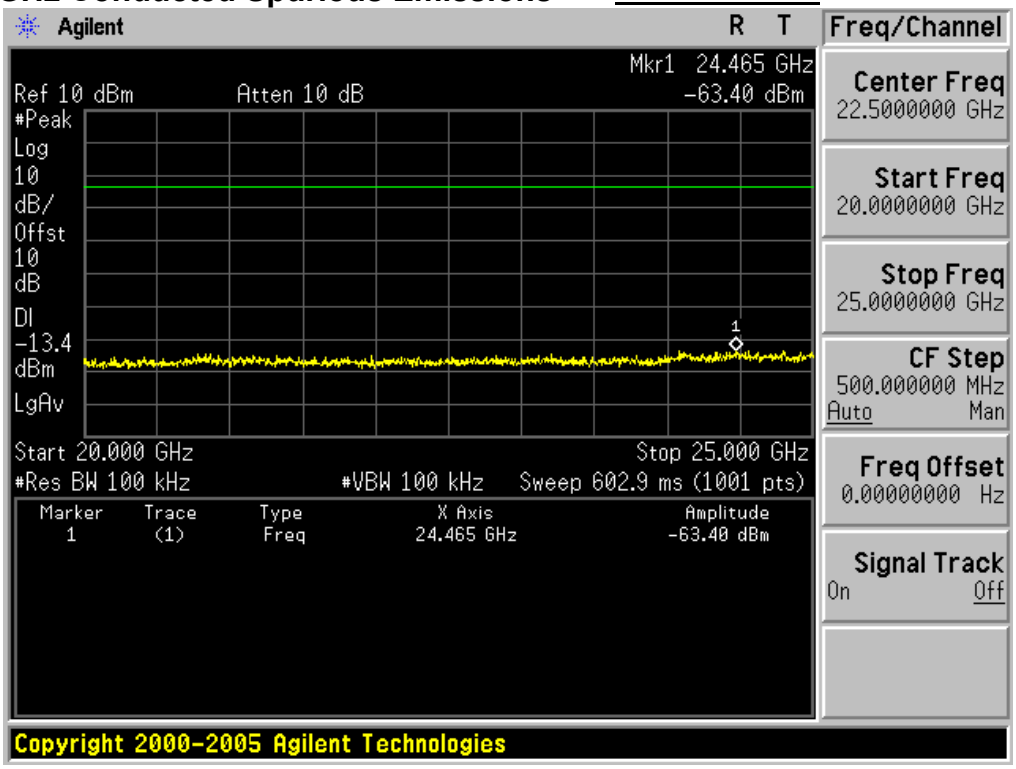


15GHz ~ 20GHz Conducted Spurious Emissions *Lowest Channel* & Modulation: *π/4 DQPSK*



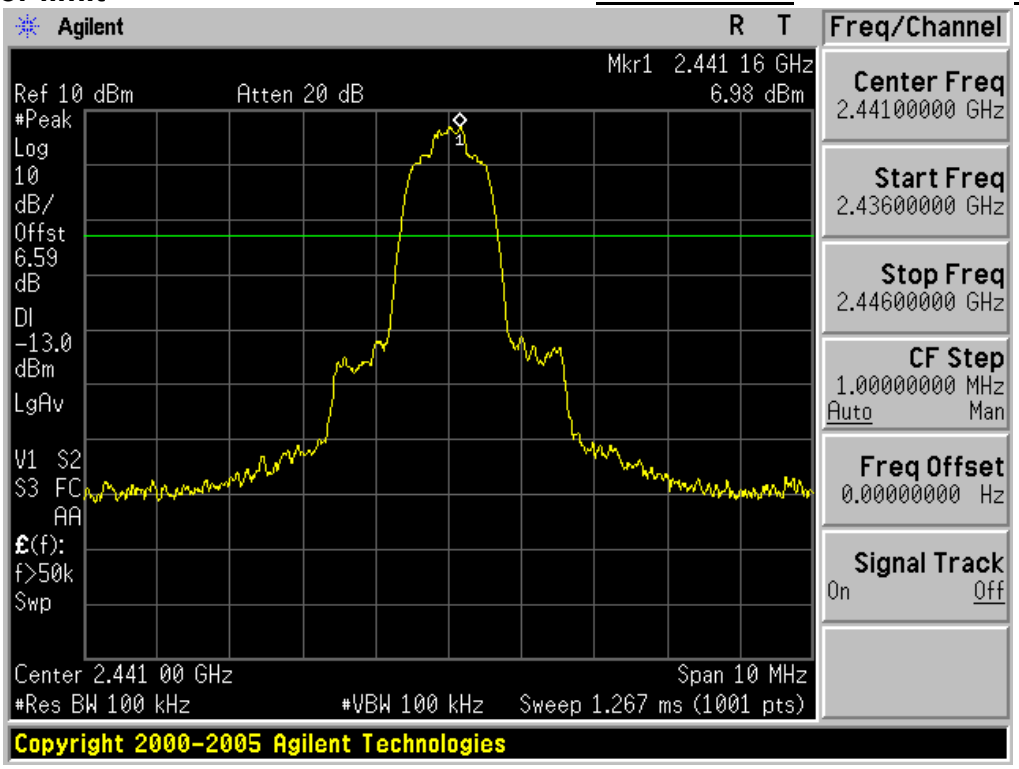
Copyright © 2010, Digital EMC Co., Ltd.

20GHz ~ 25GHz Conducted Spurious Emissions ***Lowest Channel*** & Modulation: ***π/4 DQPSK***

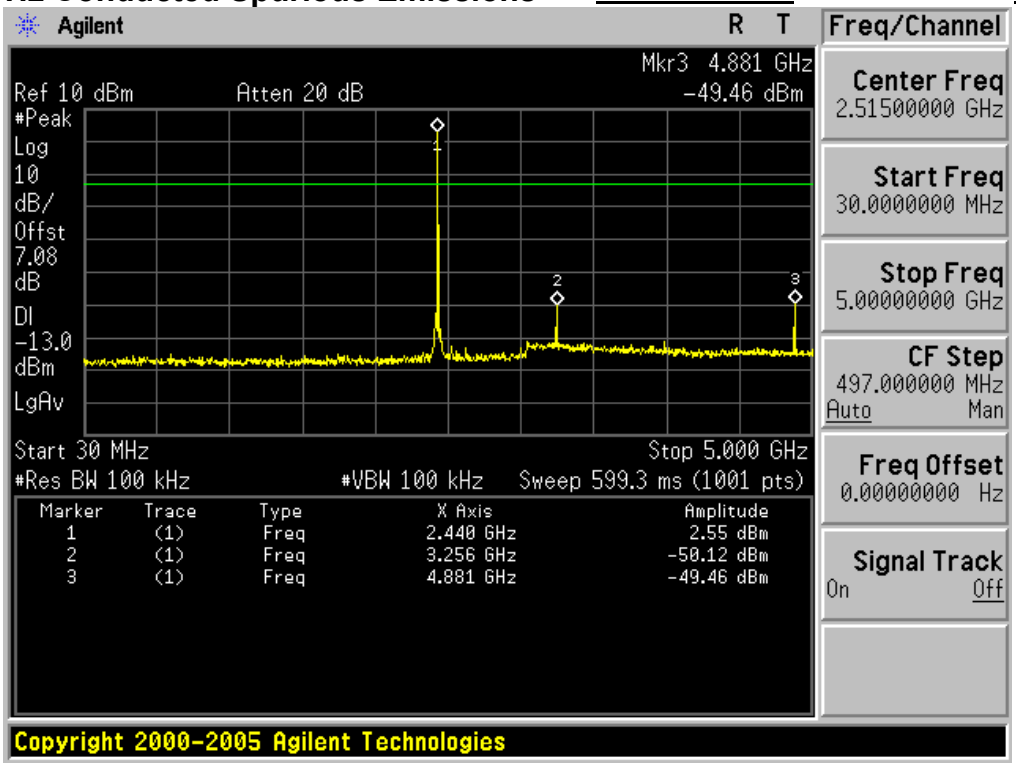


Copyright © 2010, Digital EMC Co., Ltd.

Reference for limit ***Middle Channel*** & Modulation: ***π/4 DQPSK***

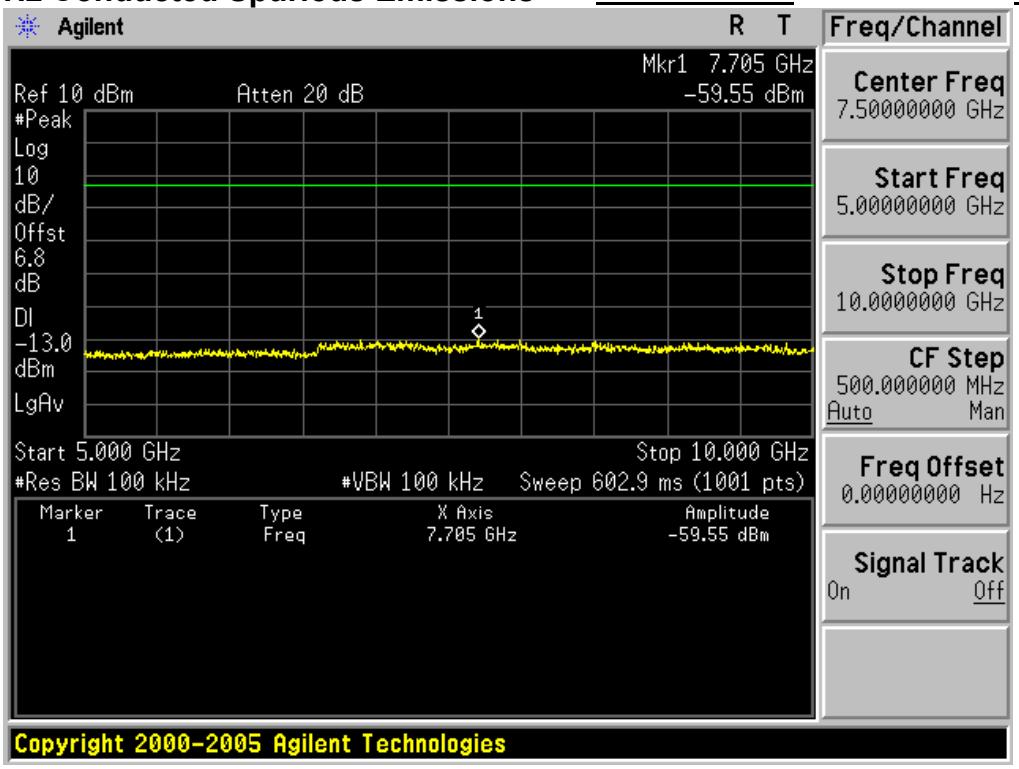


30MHz ~ 5GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***π/4 DQPSK***

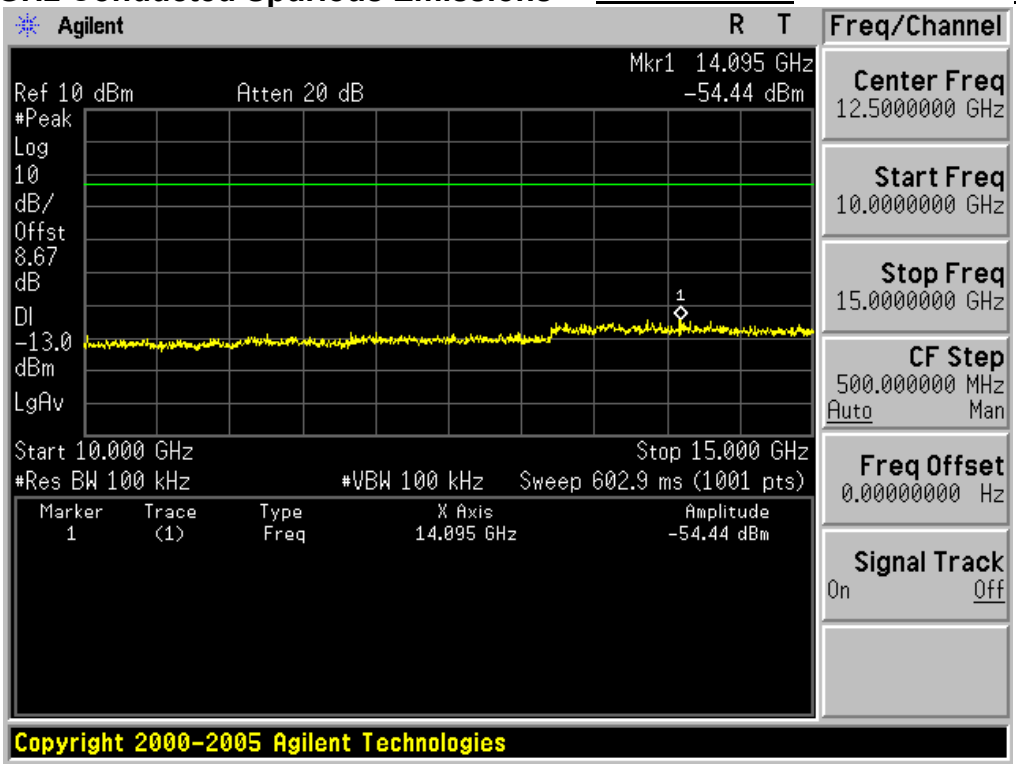


Copyright © 2010, Digital EMC Co., Ltd.

5GHz ~ 10GHz Conducted Spurious Emissions *Middle Channel* & Modulation: *π/4 DQPSK*

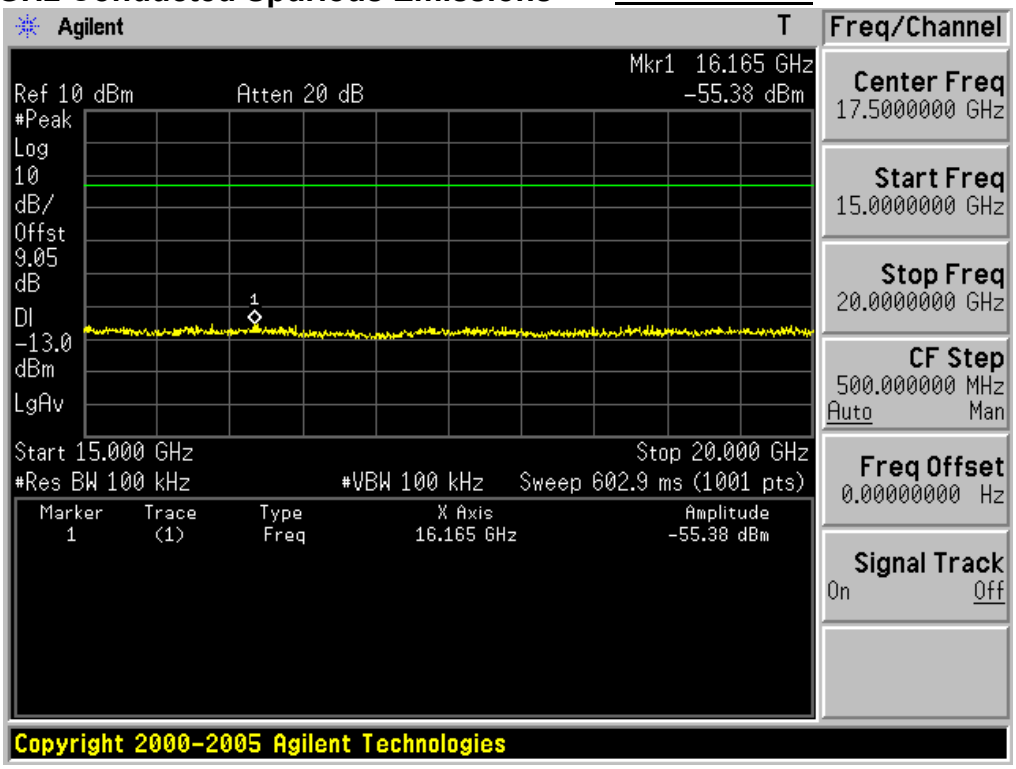


10GHz ~ 15GHz Conducted Spurious Emissions *Middle Channel* & Modulation: *π/4 DQPSK*

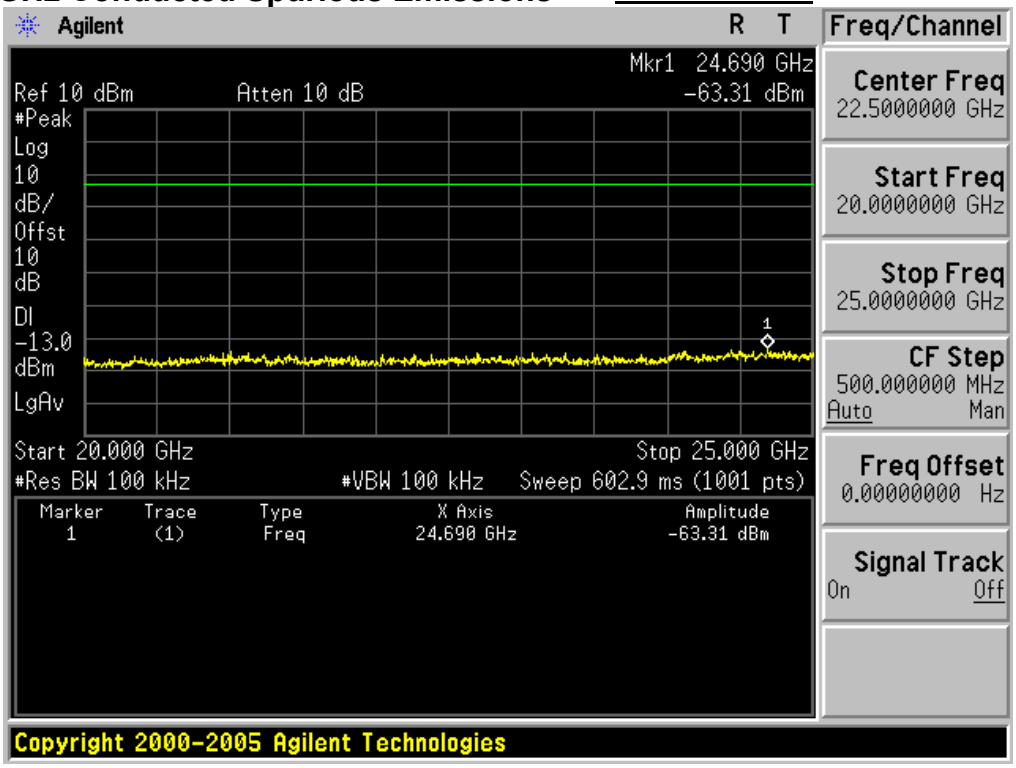


Copyright © 2010, Digital EMC Co., Ltd.

15GHz ~ 20GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***π/4 DQPSK***

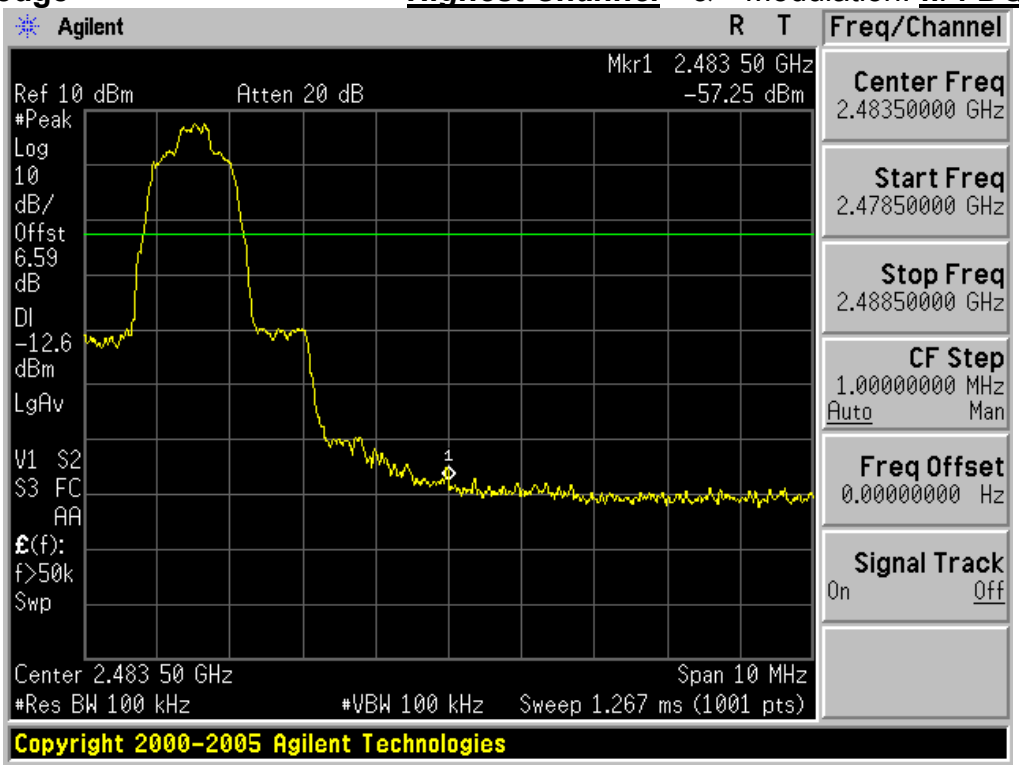


20GHz ~ 25GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***π/4 DQPSK***

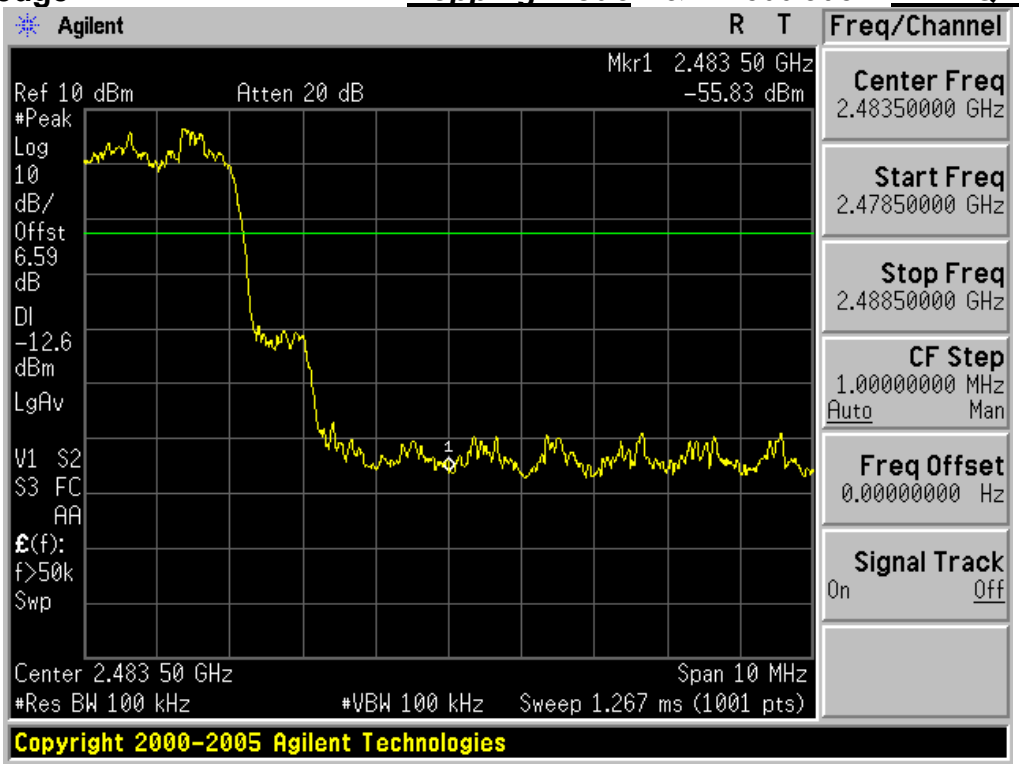


Copyright © 2010, Digital EMC Co., Ltd.

High Band-edge ***Highest Channel*** & Modulation: ***π/4 DQPSK***

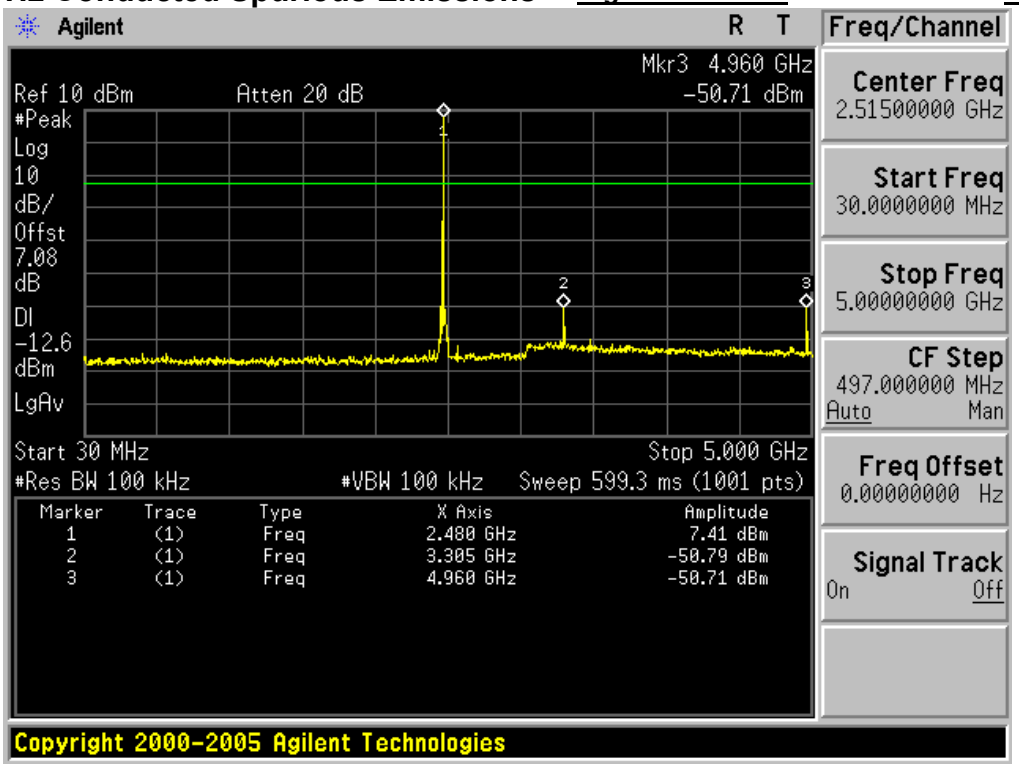


High Band-edge ***Hopping mode*** & Modulation: ***π/4 DQPSK***

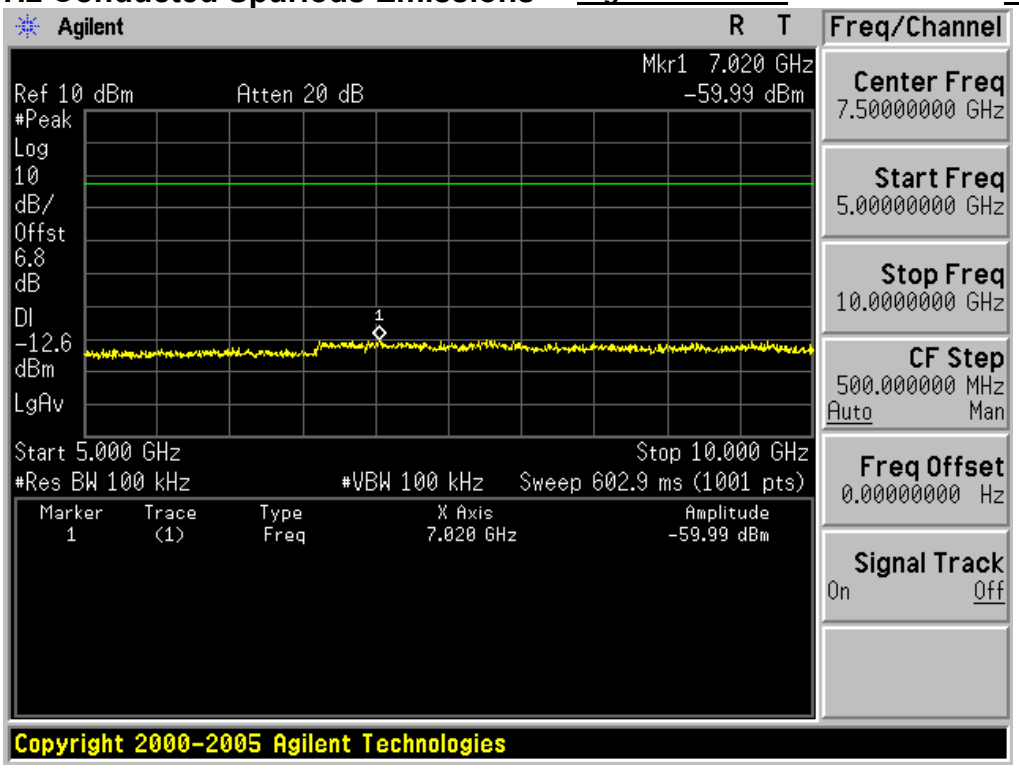


Copyright © 2010, Digital EMC Co., Ltd.

30MHz ~ 5GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***π/4 DQPSK***

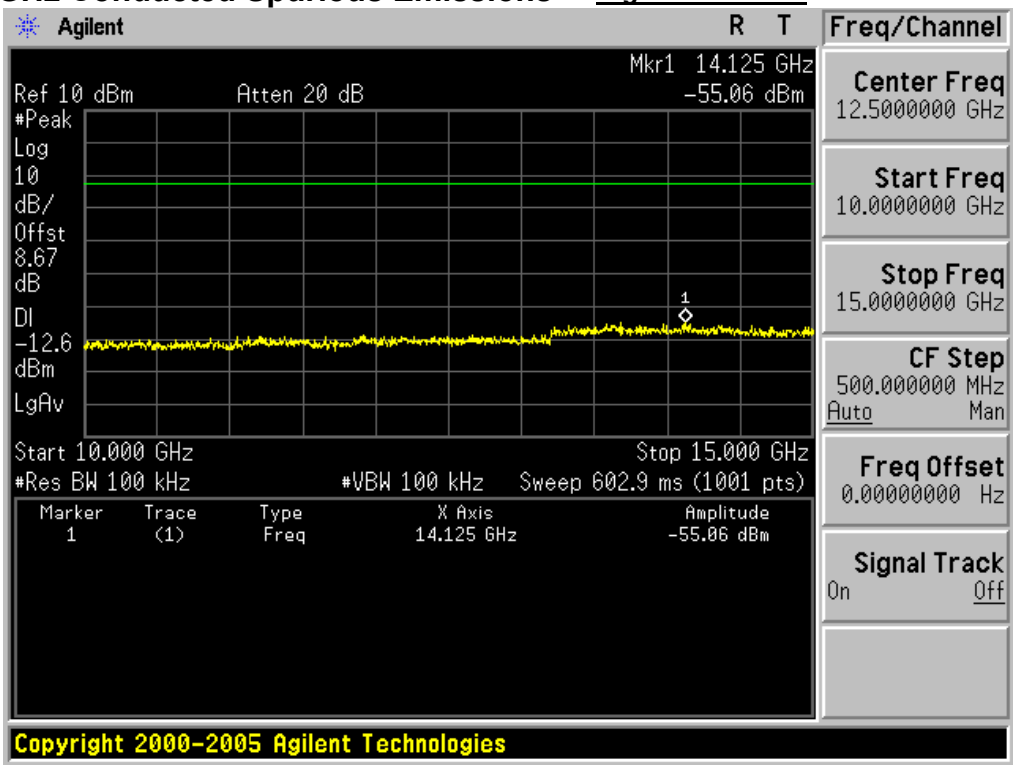


5GHz ~ 10GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***π/4 DQPSK***

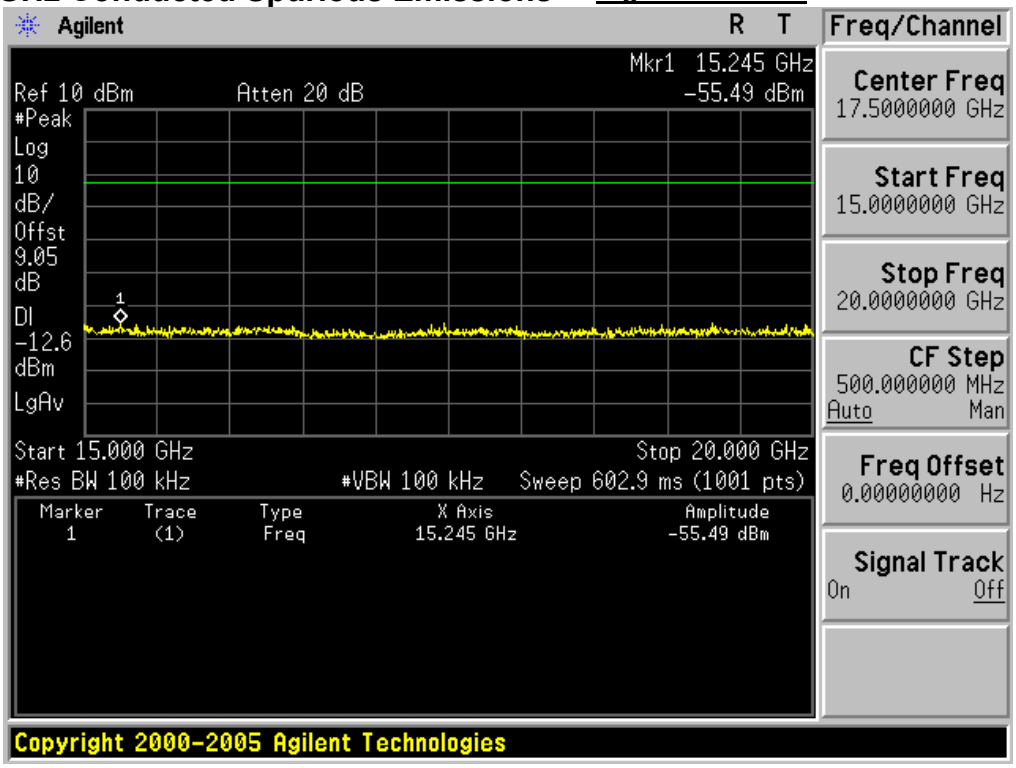


Copyright © 2010, Digital EMC Co., Ltd.

10GHz ~ 15GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***π/4 DQPSK***

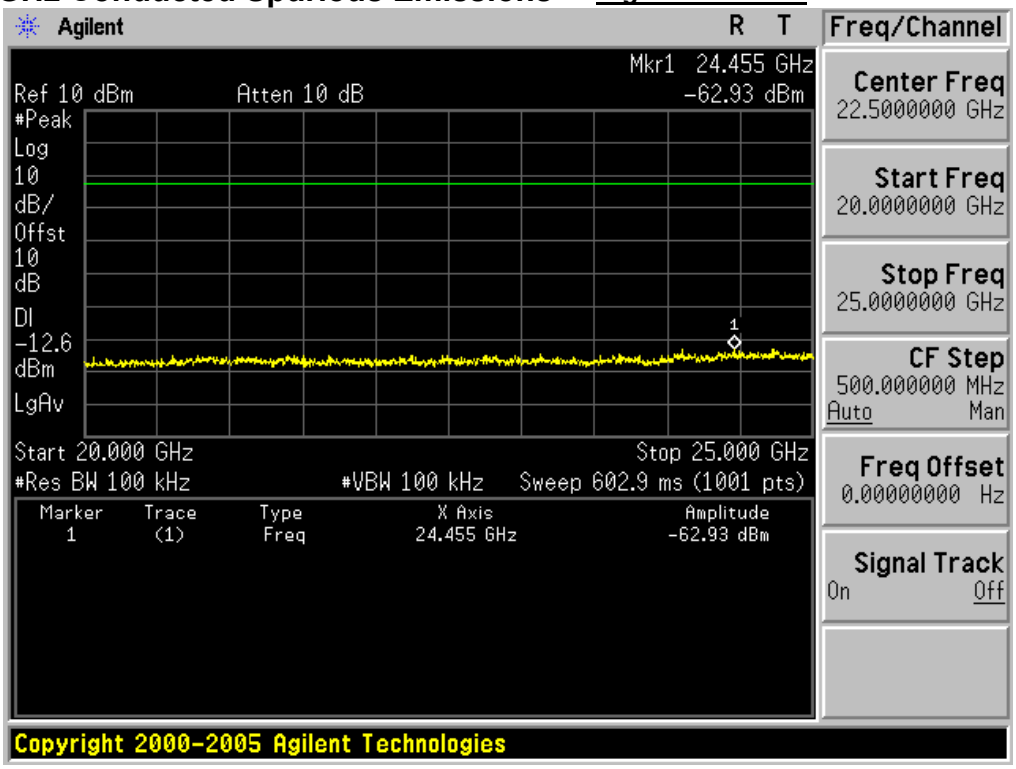


15GHz ~ 20GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***π/4 DQPSK***



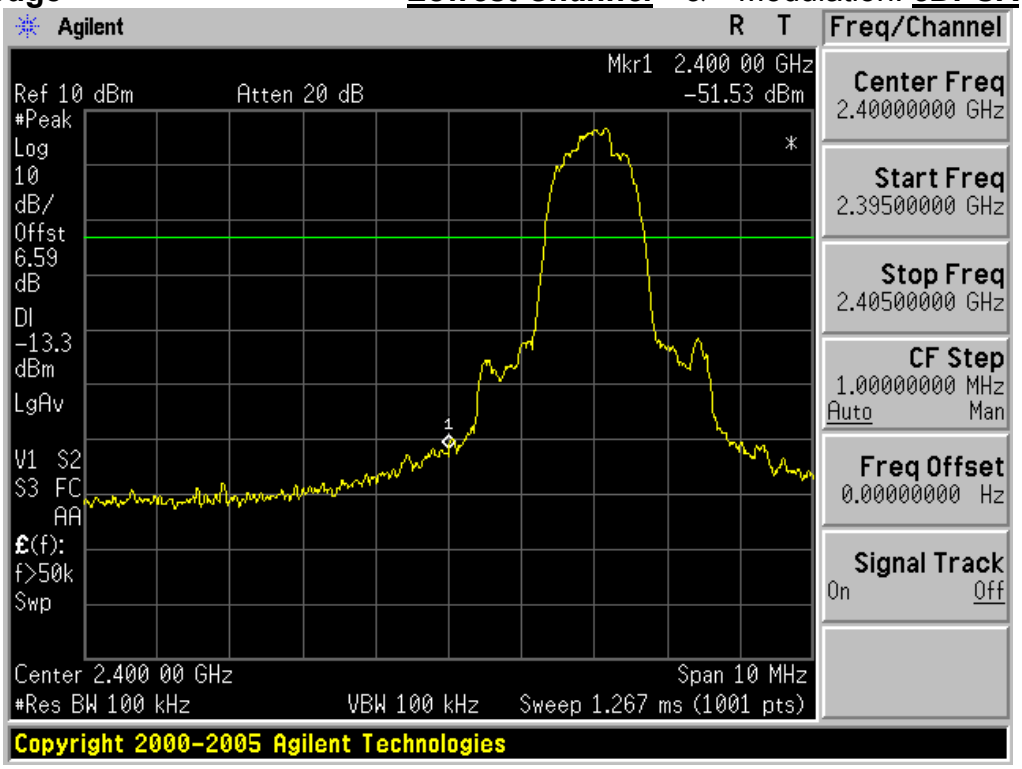
Copyright © 2010, Digital EMC Co., Ltd.

20GHz ~ 25GHz Conducted Spurious Emissions *Highest Channel* & Modulation: *π/4 DQPSK*

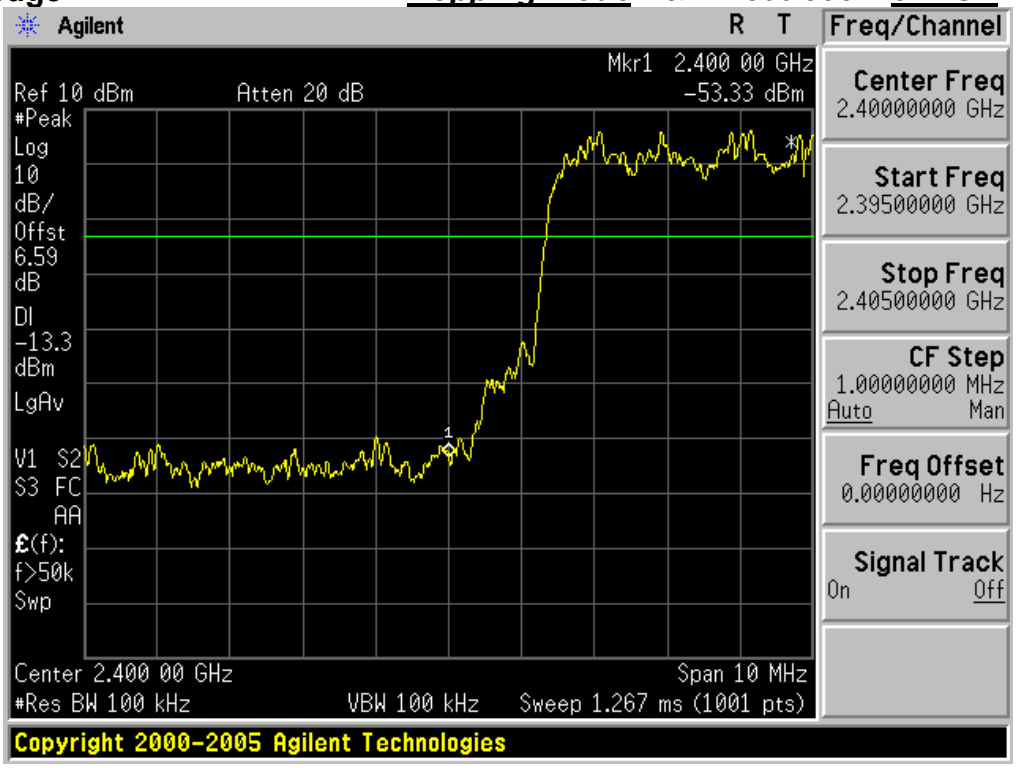


Copyright © 2010, Digital EMC Co., Ltd.

Low Band-edge ***Lowest Channel*** & Modulation: ***8DPSK***

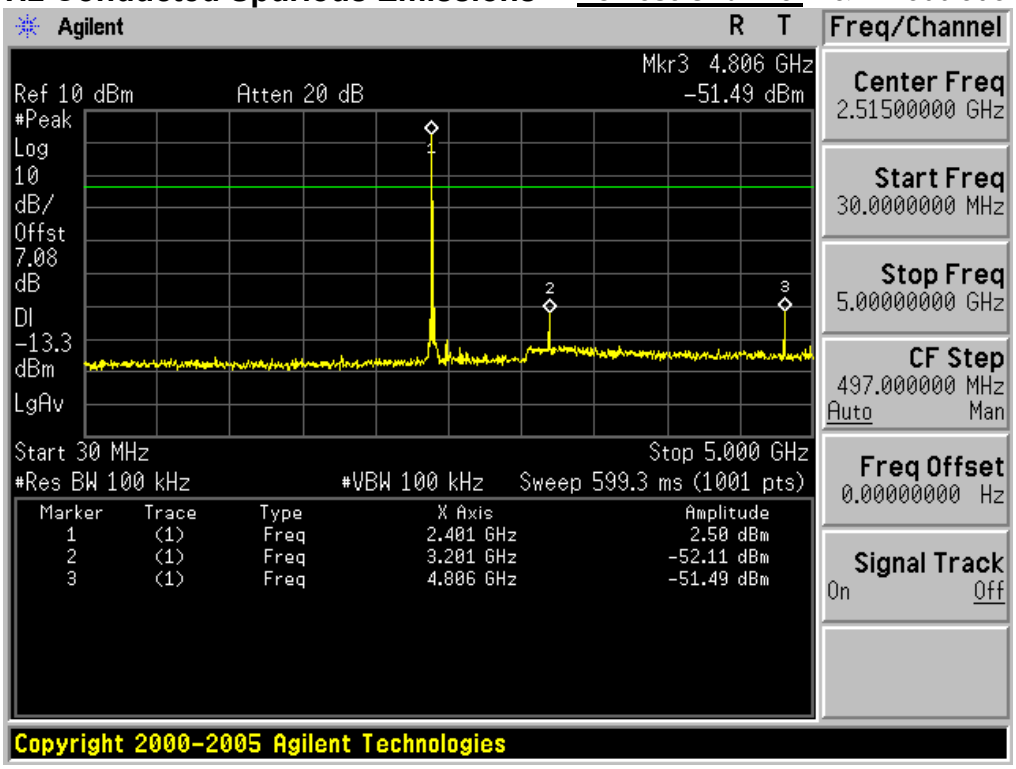


Low Band-edge ***Hopping mode*** & Modulation: ***8DPSK***

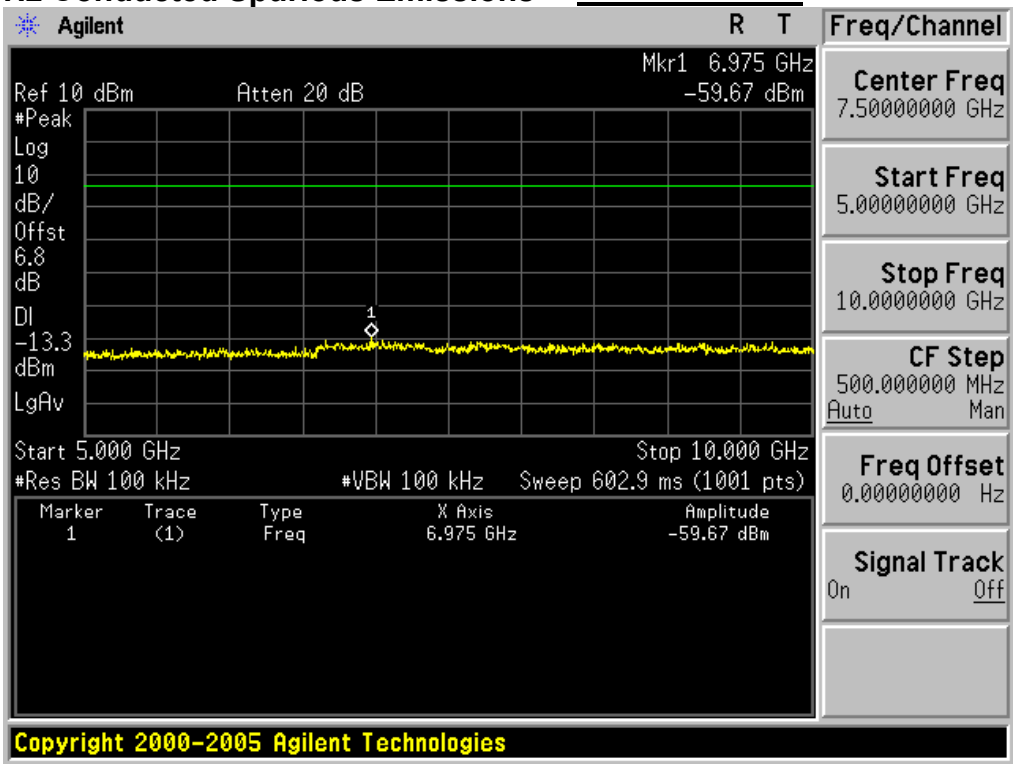


Copyright © 2010, Digital EMC Co., Ltd.

30MHz ~ 5GHz Conducted Spurious Emissions ***Lowest Channel*** & Modulation: ***8DPSK***

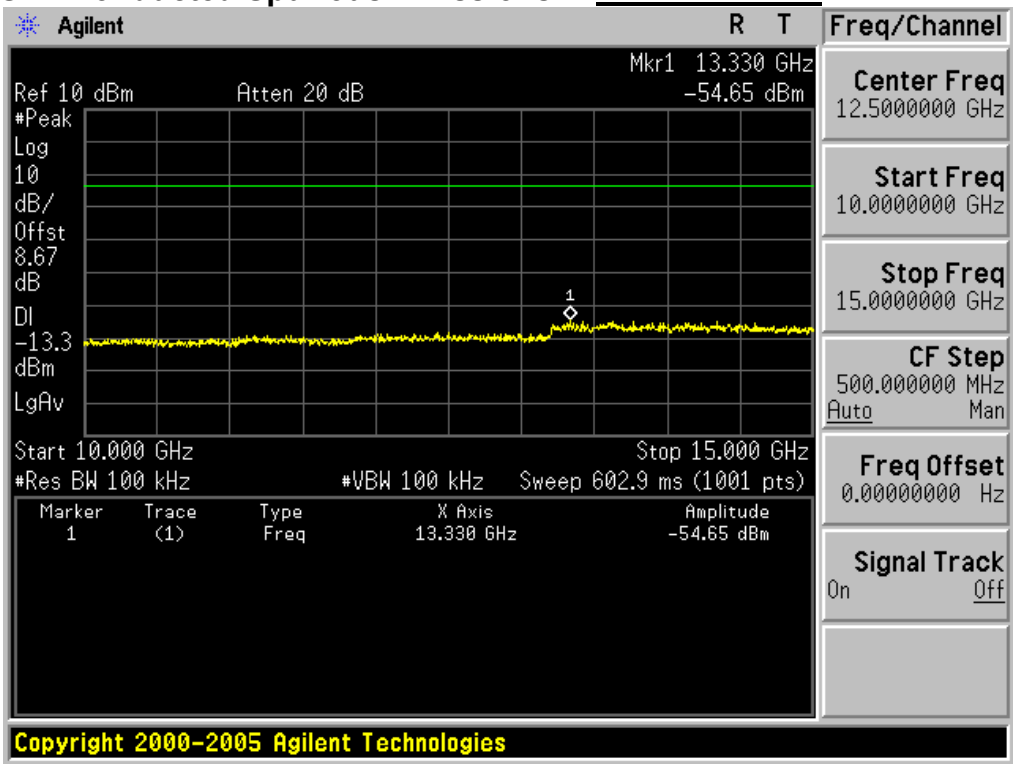


5GHz ~ 10GHz Conducted Spurious Emissions ***Lowest Channel*** & Modulation: ***8DPSK***

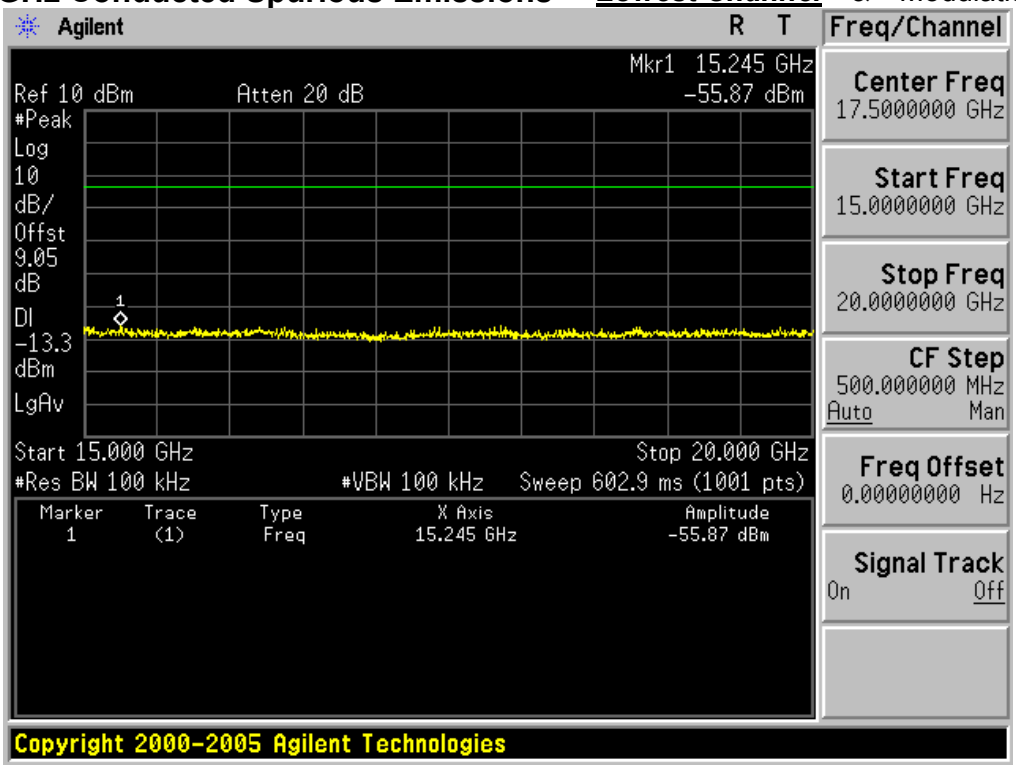


Copyright © 2010, Digital EMC Co., Ltd.

10GHz ~ 15GHz Conducted Spurious Emissions *Lowest Channel* & Modulation: *8DPSK*

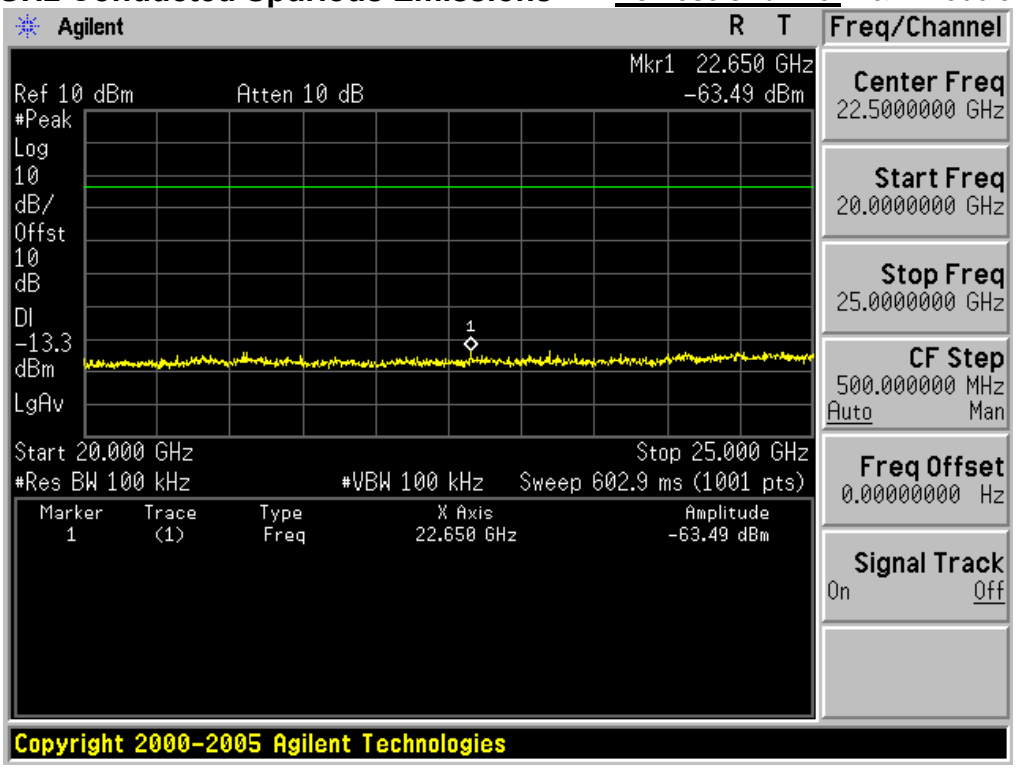


15GHz ~ 20GHz Conducted Spurious Emissions *Lowest Channel* & Modulation: *8DPSK*



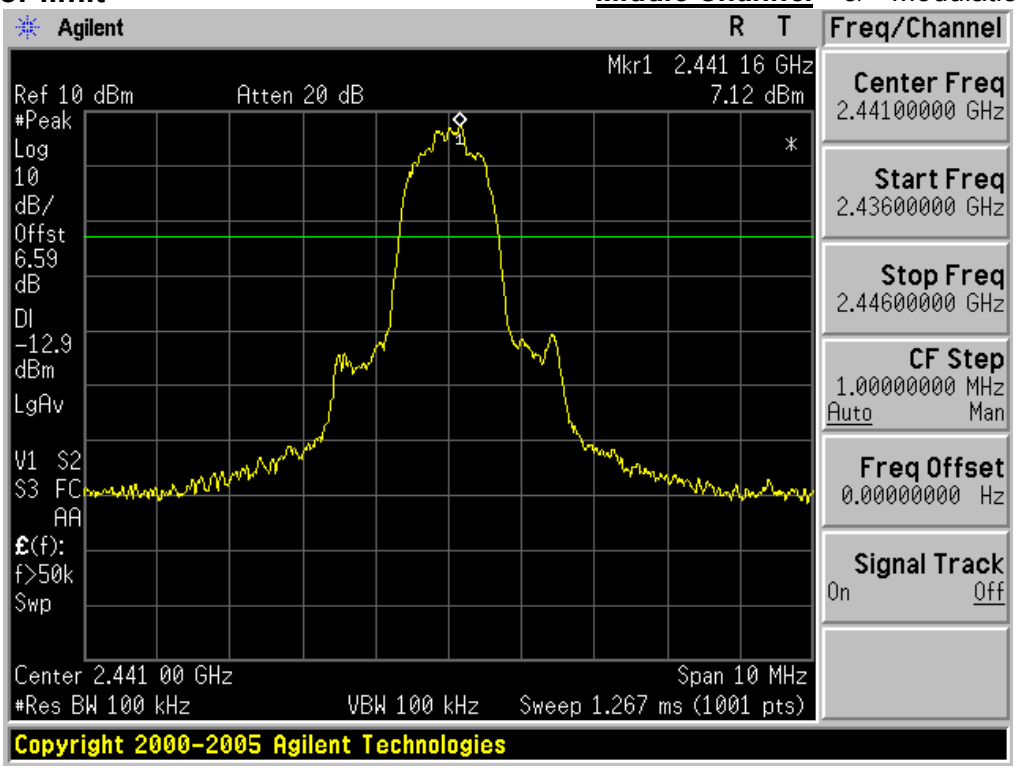
Copyright © 2010, Digital EMC Co., Ltd.

20GHz ~ 25GHz Conducted Spurious Emissions ***Lowest Channel*** & Modulation: ***8DPSK***

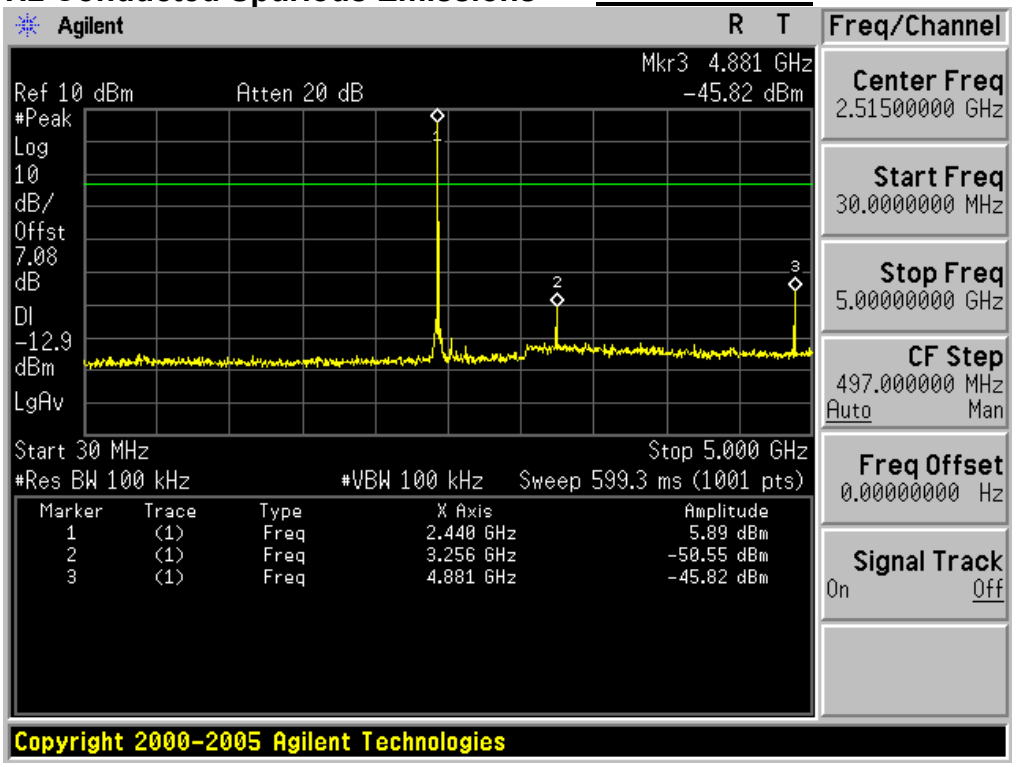


Copyright © 2010, Digital EMC Co., Ltd.

Reference for limit ***Middle Channel*** & Modulation: ***8DPSK***

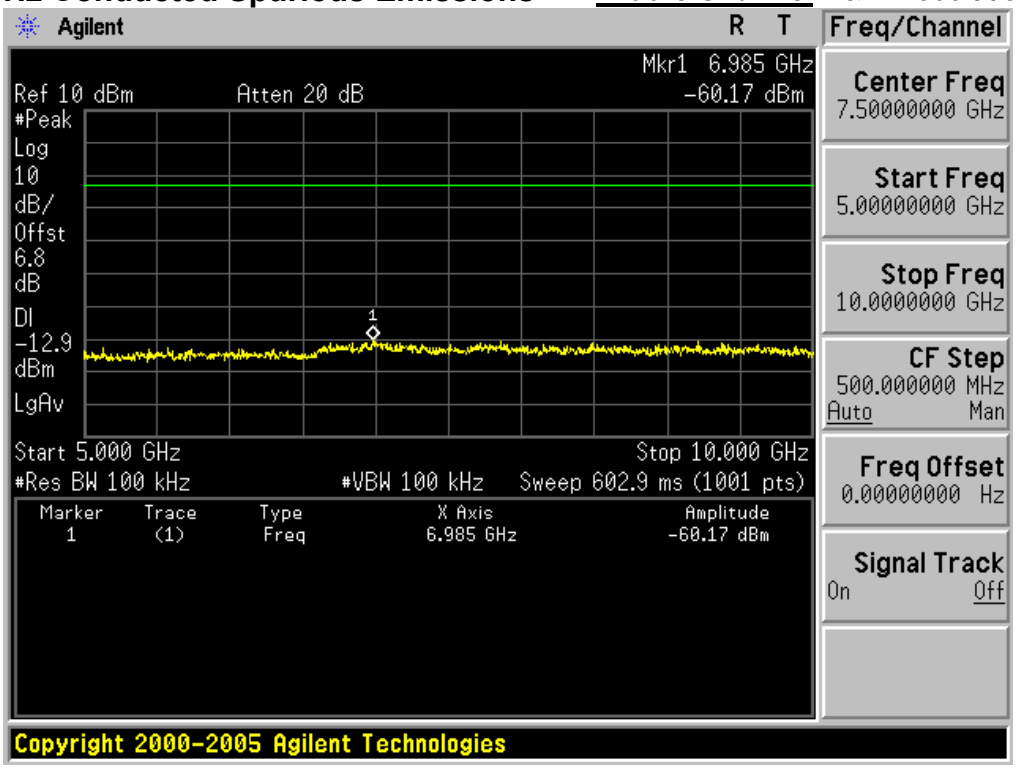


30MHz ~ 5GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***8DPSK***

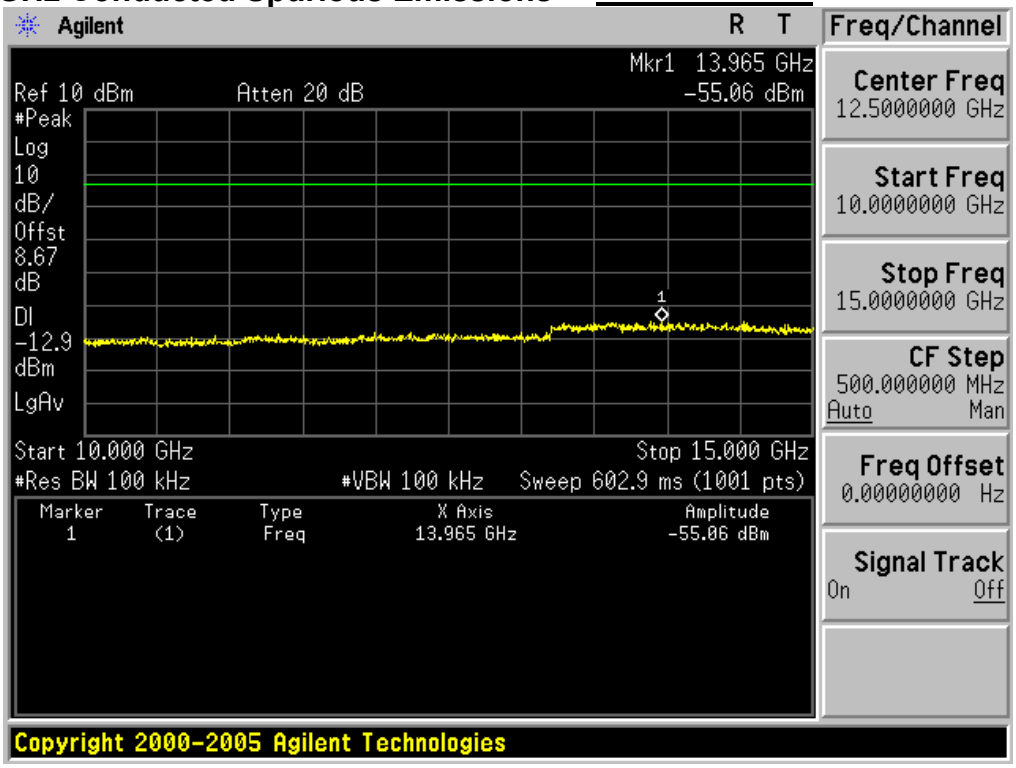


Copyright © 2010, Digital EMC Co., Ltd.

5GHz ~ 10GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***8DPSK***

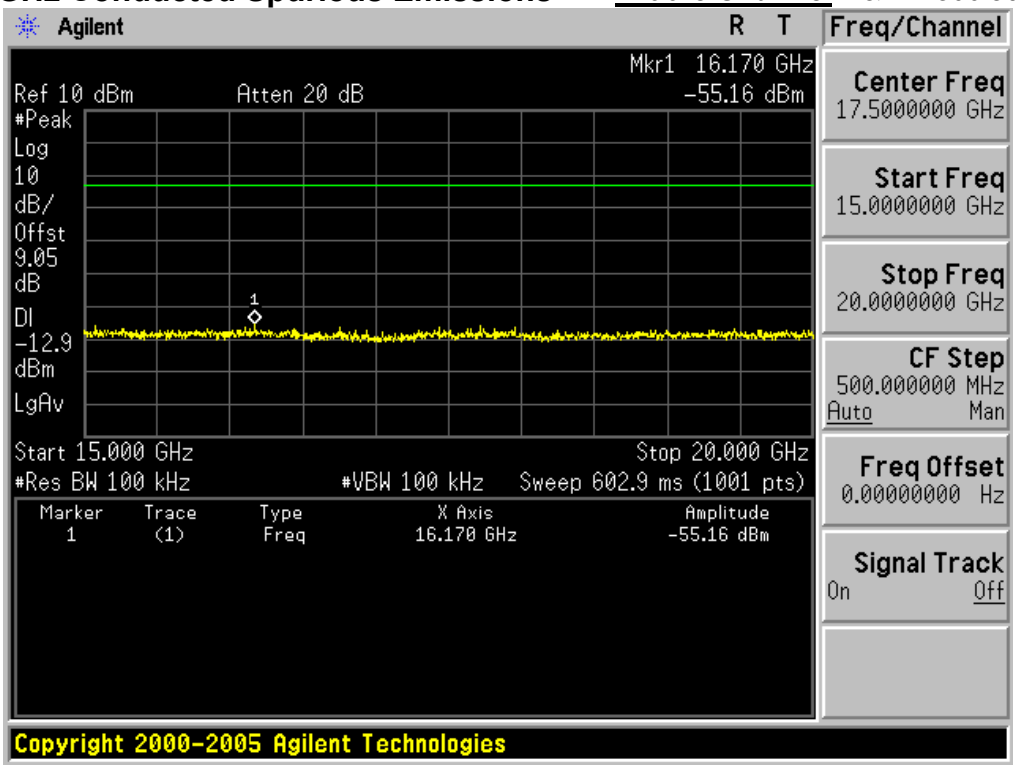


10GHz ~ 15GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***8DPSK***

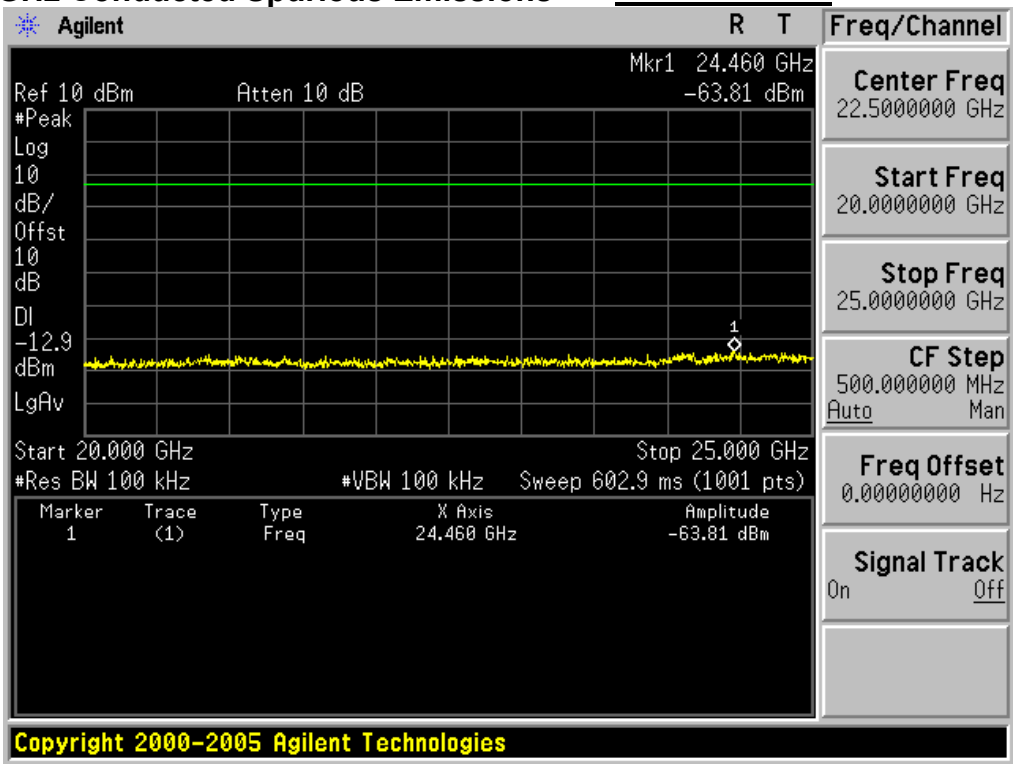


Copyright © 2010, Digital EMC Co., Ltd.

15GHz ~ 20GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***8DPSK***

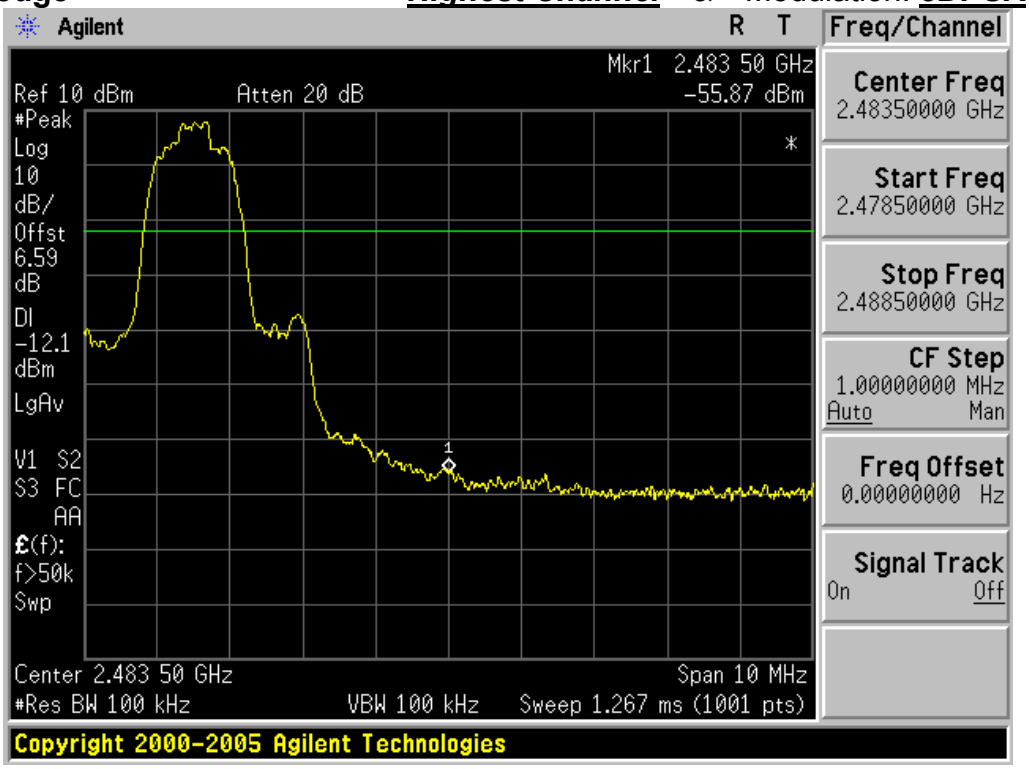


20GHz ~ 25GHz Conducted Spurious Emissions ***Middle Channel*** & Modulation: ***8DPSK***

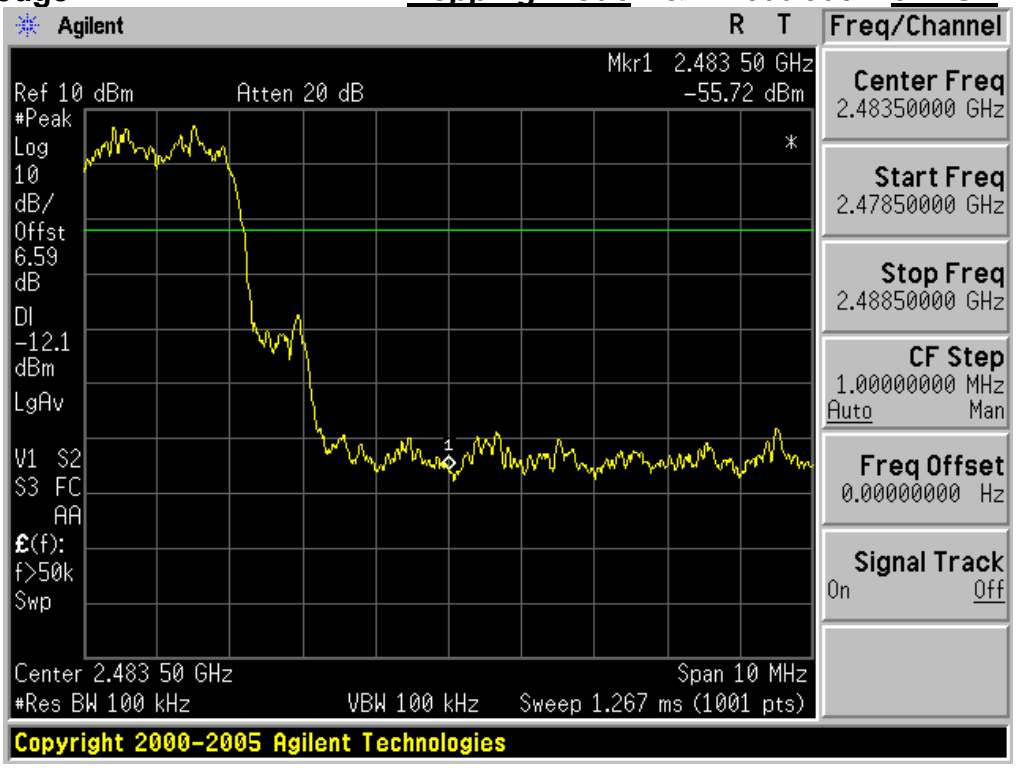


Copyright © 2010, Digital EMC Co., Ltd.

High Band-edge ***Highest Channel*** & Modulation: ***8DPSK***

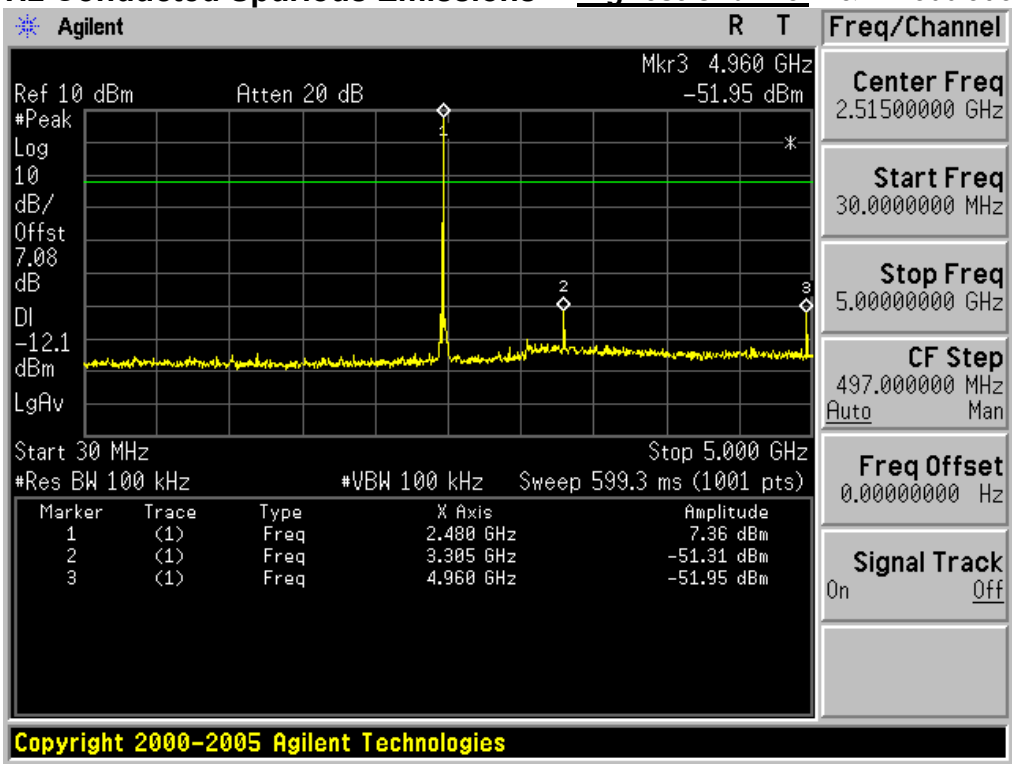


High Band-edge ***Hopping mode*** & Modulation: ***8DPSK***

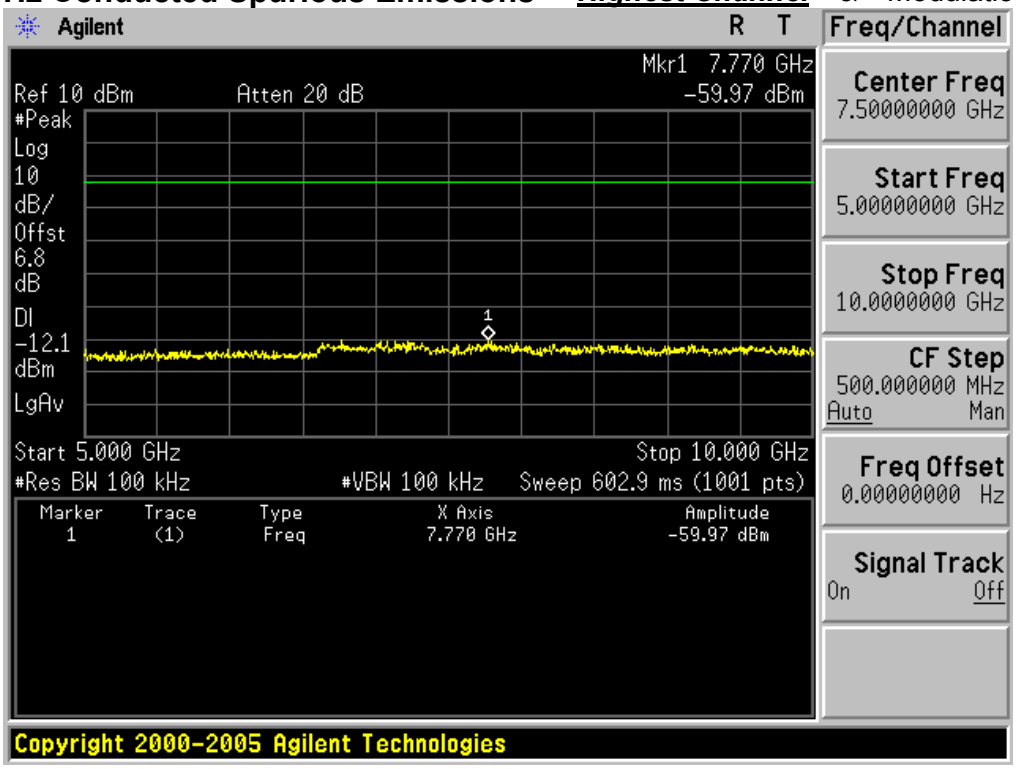


Copyright © 2010, Digital EMC Co., Ltd.

30MHz ~ 5GHz Conducted Spurious Emissions *Highest Channel* & Modulation: *8DPSK*

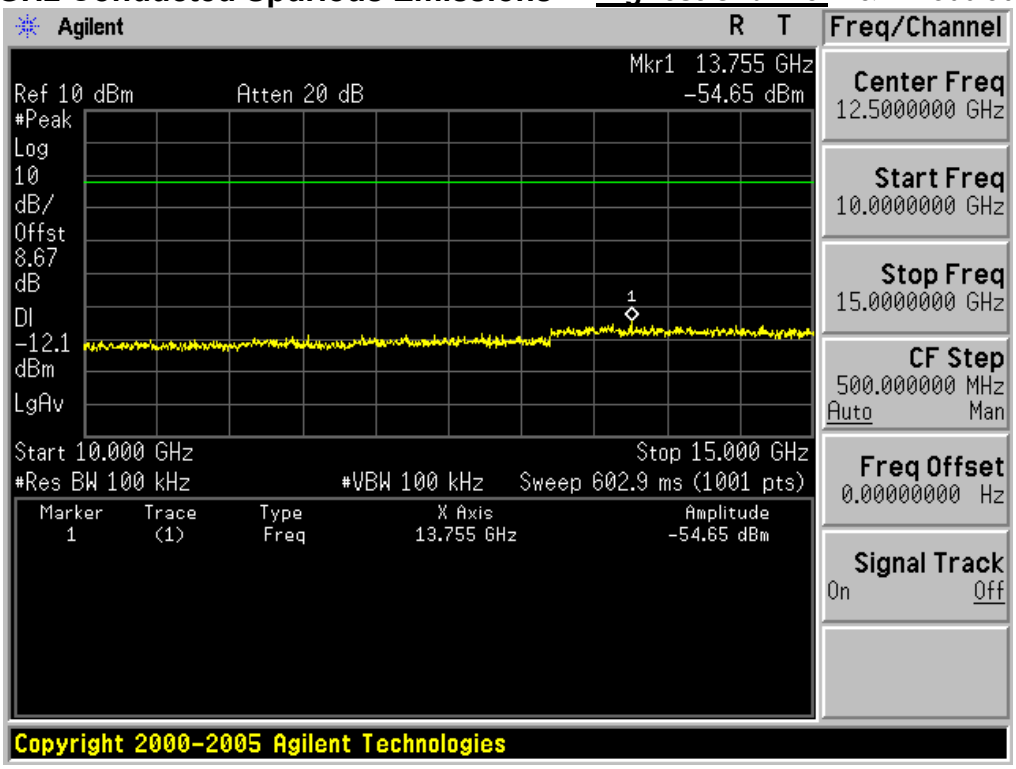


5GHz ~ 10GHz Conducted Spurious Emissions *Highest Channel* & Modulation: *8DPSK*

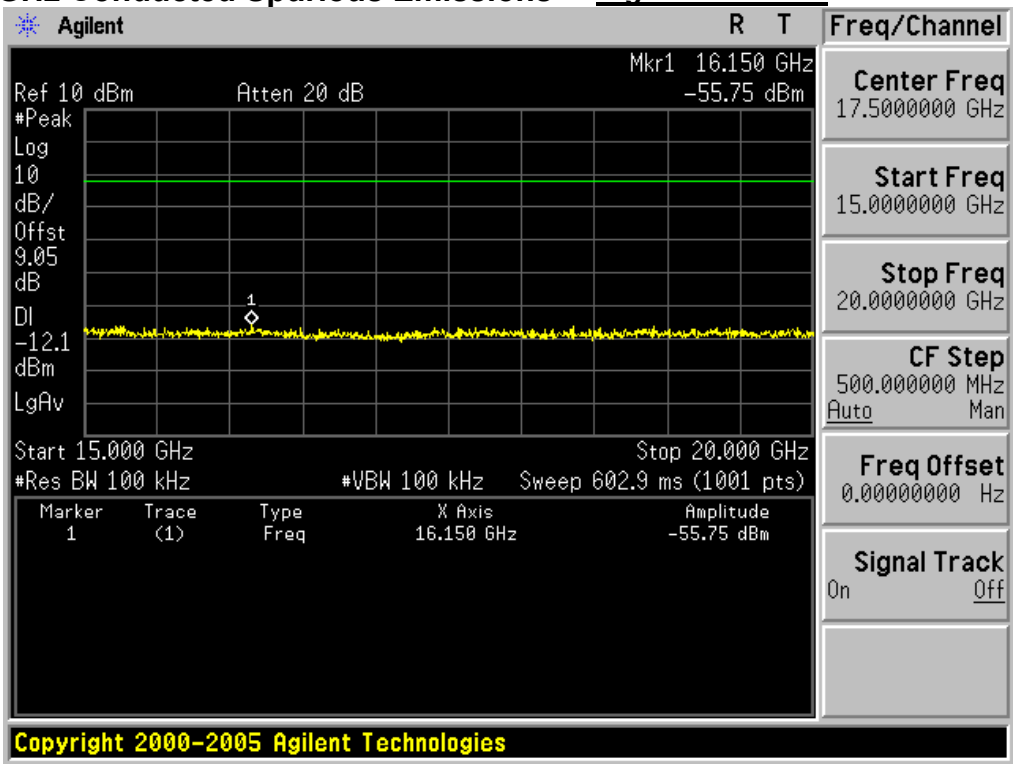


Copyright © 2010, Digital EMC Co., Ltd.

10GHz ~ 15GHz Conducted Spurious Emissions *Highest Channel* & Modulation: *8DPSK*

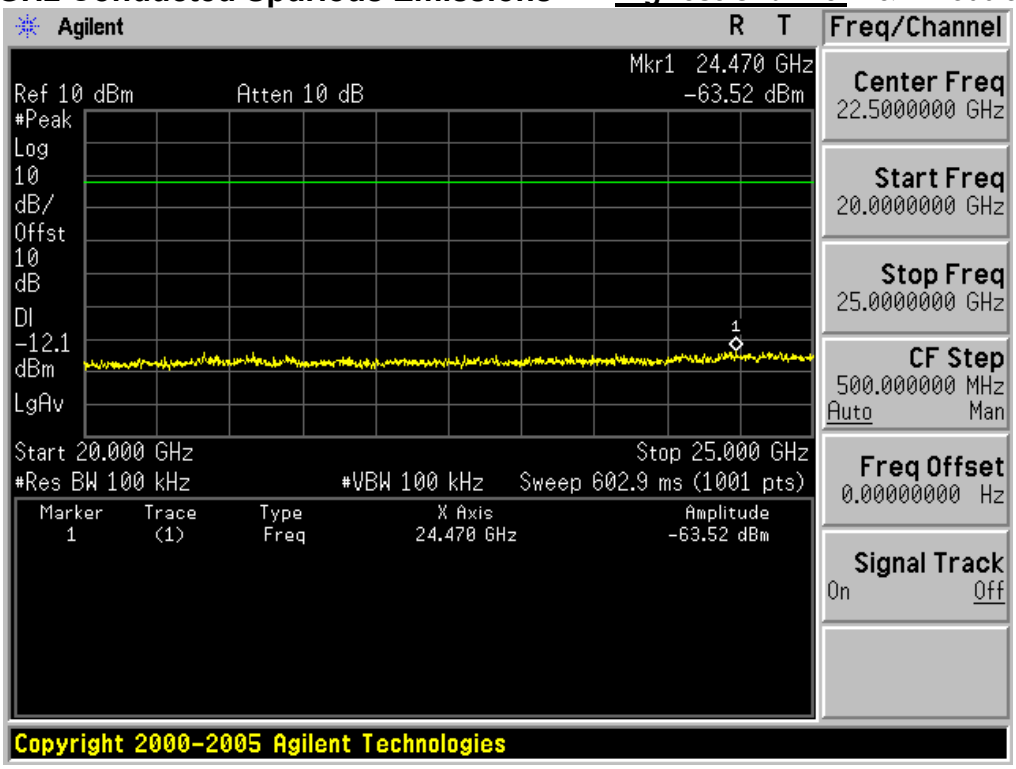


15GHz ~ 20GHz Conducted Spurious Emissions *Highest Channel* & Modulation: *8DPSK*



Copyright © 2010, Digital EMC Co., Ltd.

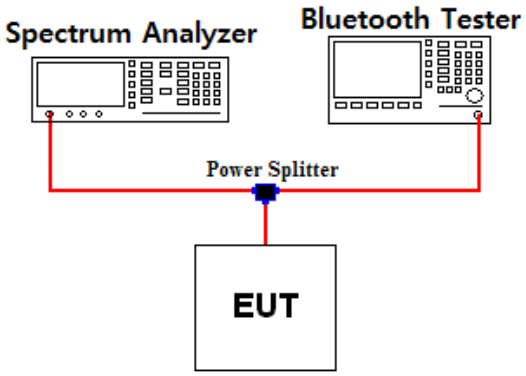
20GHz ~ 25GHz Conducted Spurious Emissions ***Highest Channel*** & Modulation: ***8DPSK***



Copyright © 2010, Digital EMC Co., Ltd.

3. 99 % & 20dBc BW

3.1. Test Setup



3.2. Limit

Limit: Not Applicable

3.3. Test Procedure

1. The 99% and 20dBc bandwidth were measured with a spectrum analyzer connected to RF antenna connector(conducted measurement) while EUT was operating in transmit mode. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer.

2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW = 10 ㎑, VBW = 100 ㎑, Span = 5 ㎒.

3.4. Test Results

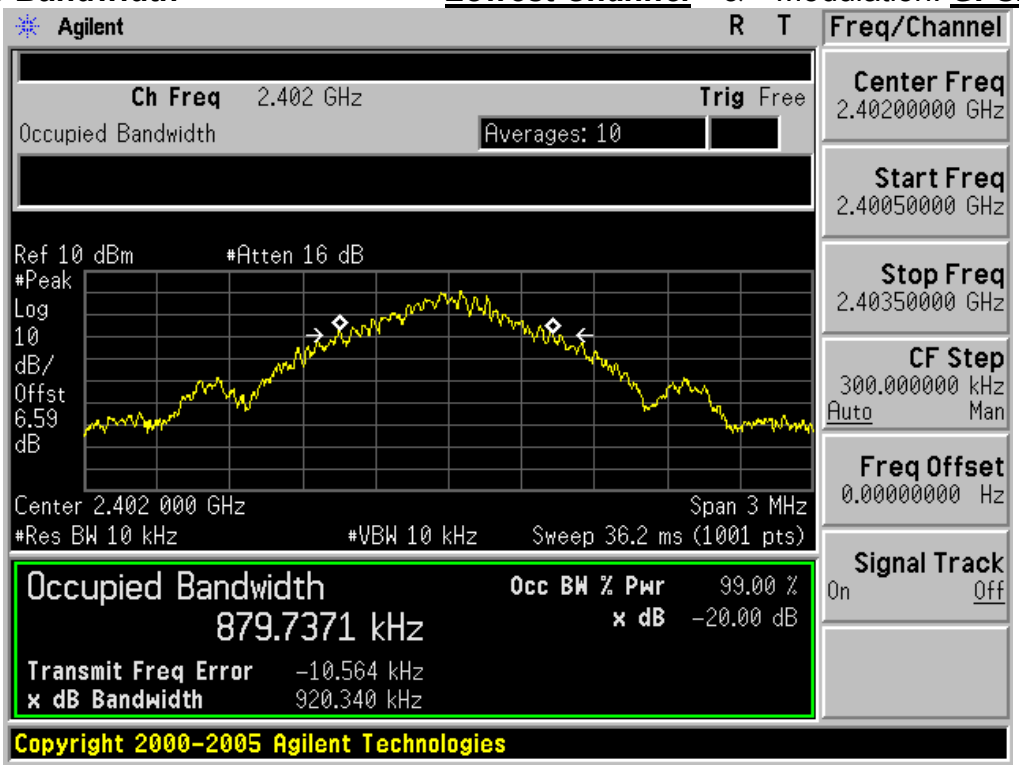
Ambient temperature : 23 °C
Relative humidity : 45%

Modulation	Tested Channel	20dBc BW (MHz)	99% BW (MHz)
GFSK	Lowest	0.920	0.880
	Middle	0.924	0.883
	Highest	0.922	0.884
π/4 DQPSK	Lowest	1.287	1.170
	Middle	1.311	1.176
	Highest	1.282	1.165
8DPSK	Lowest	1.300	1.167
	Middle	1.306	1.182
	Highest	1.302	1.182

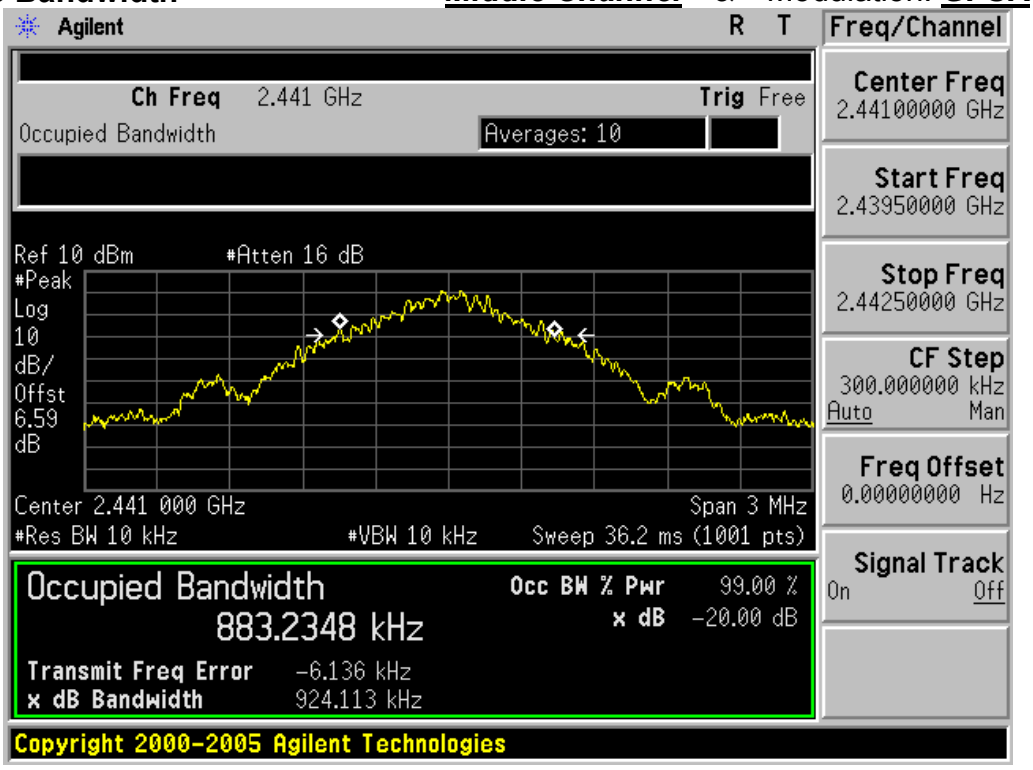
Note 1: See next pages for actual measured spectrum plots.

Copyright © 2010, Digital EMC Co., Ltd.

99% & 20dB Bandwidth ***Lowest Channel*** & Modulation: ***GFSK***

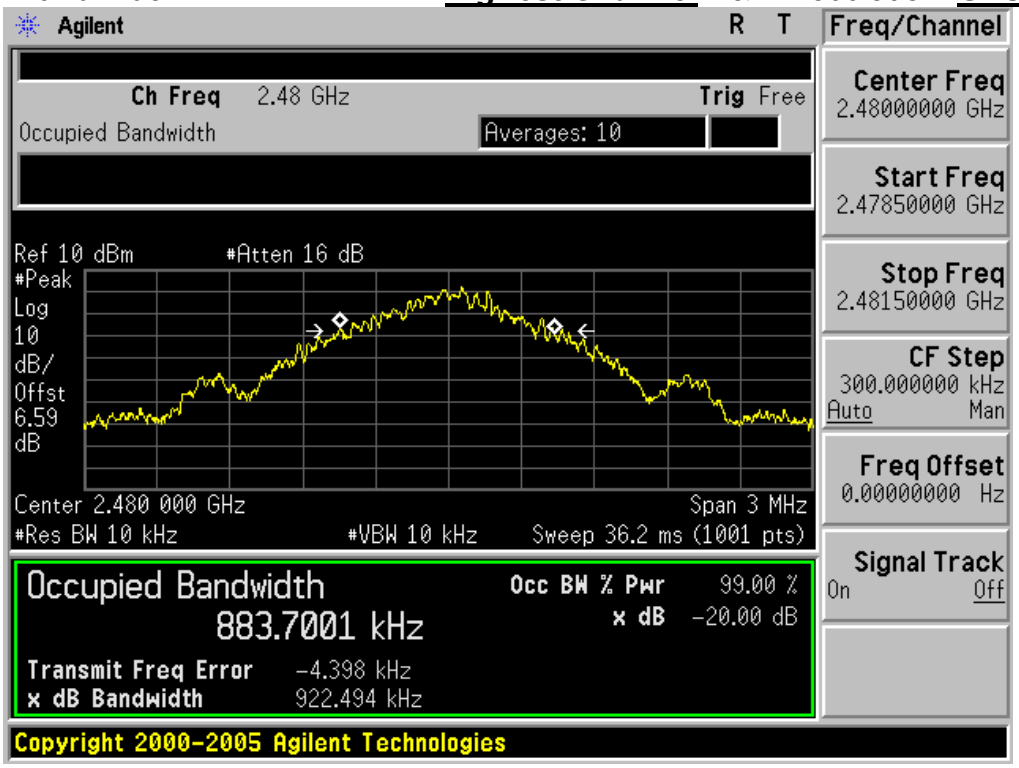


99% & 20dB Bandwidth ***Middle Channel*** & Modulation: ***GFSK***

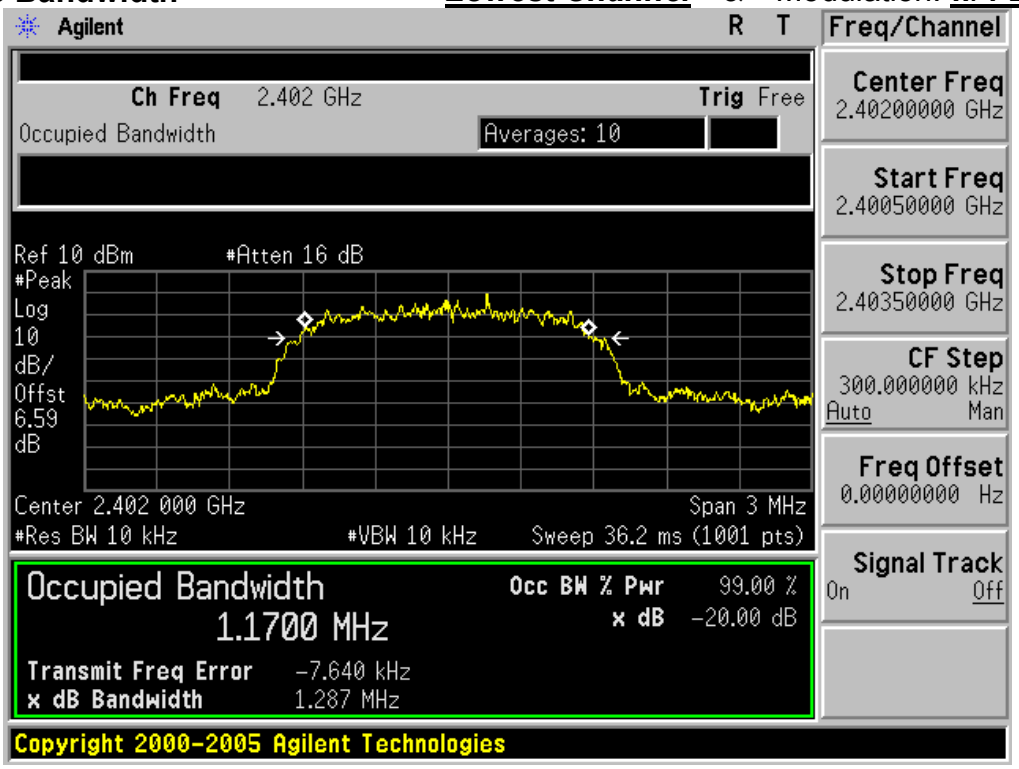


Copyright © 2010, Digital EMC Co., Ltd.

99% & 20dB Bandwidth ***Highest Channel*** & Modulation: ***GFSK***

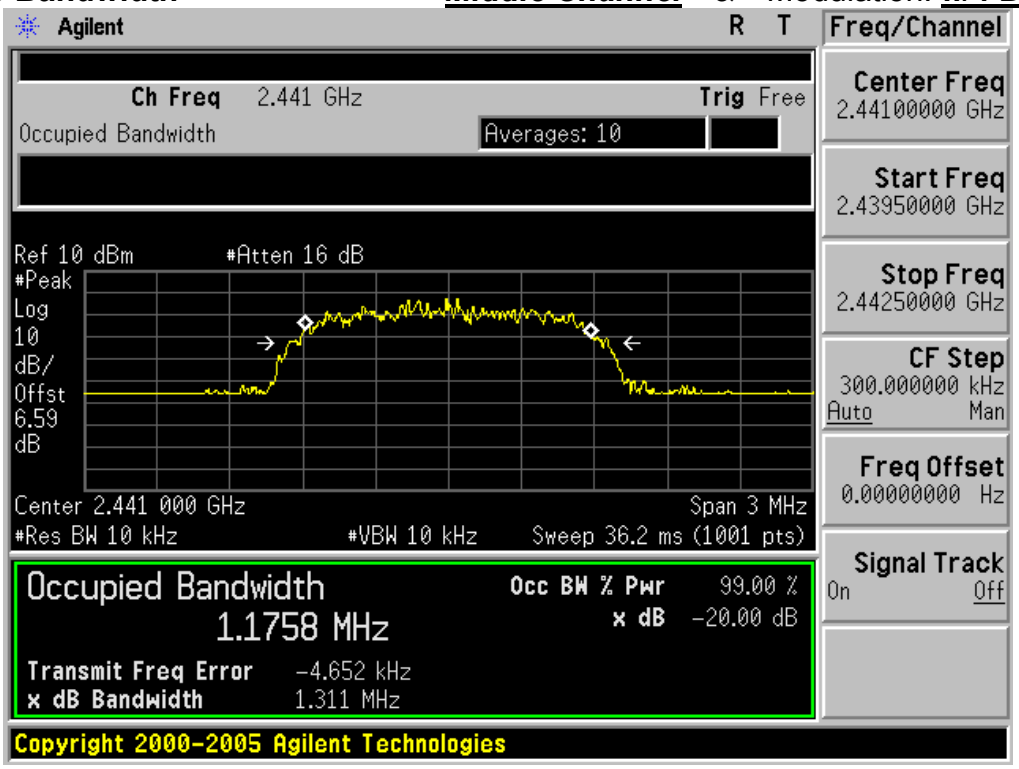


99% & 20dB Bandwidth ***Lowest Channel*** & Modulation: ***π/4 DQPSK***

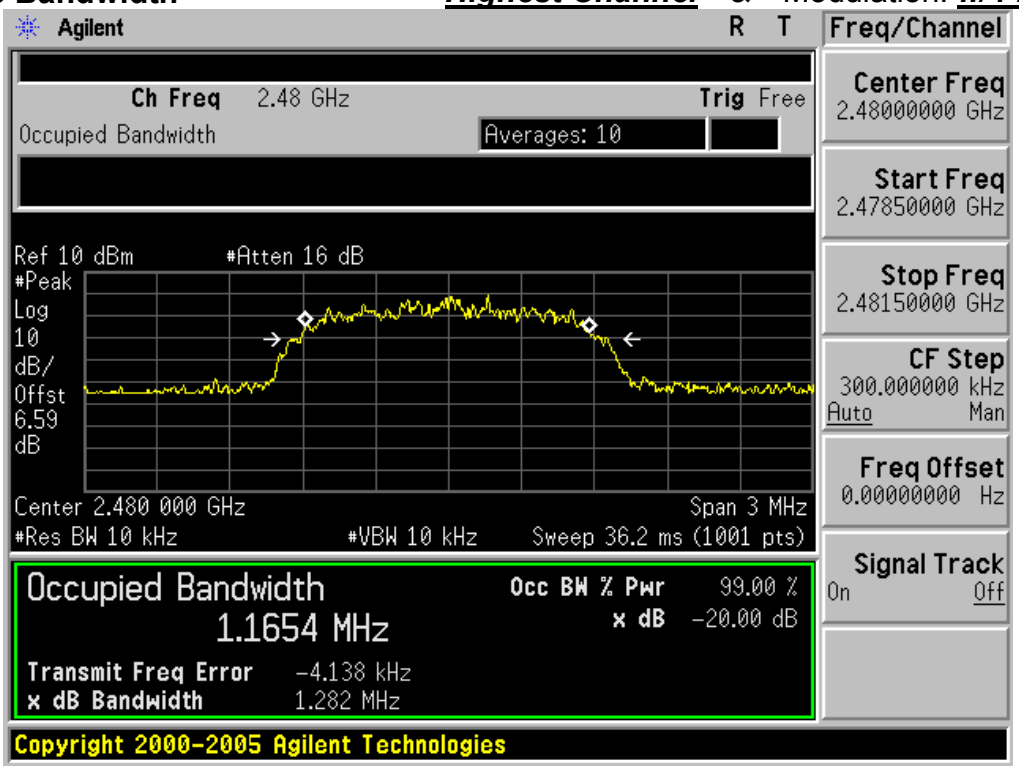


Copyright © 2010, Digital EMC Co., Ltd.

99% & 20dB Bandwidth ***Middle Channel*** & Modulation: ***π/4 DQPSK***

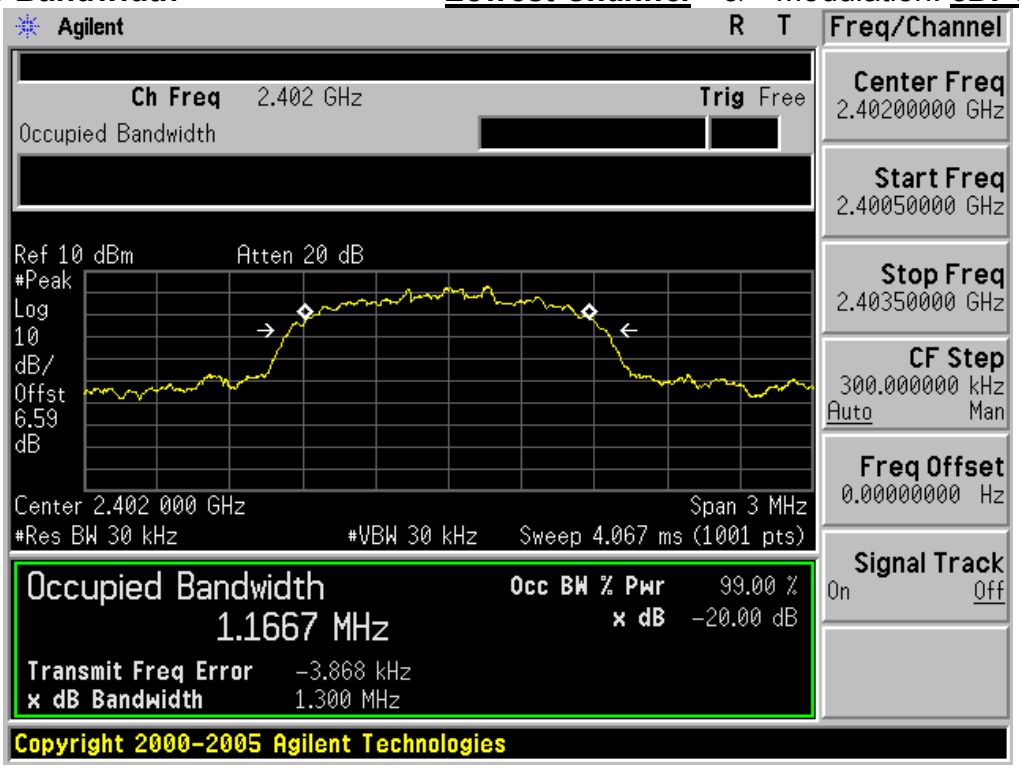


99% & 20dB Bandwidth ***Highest Channel*** & Modulation: ***π/4 DQPSK***

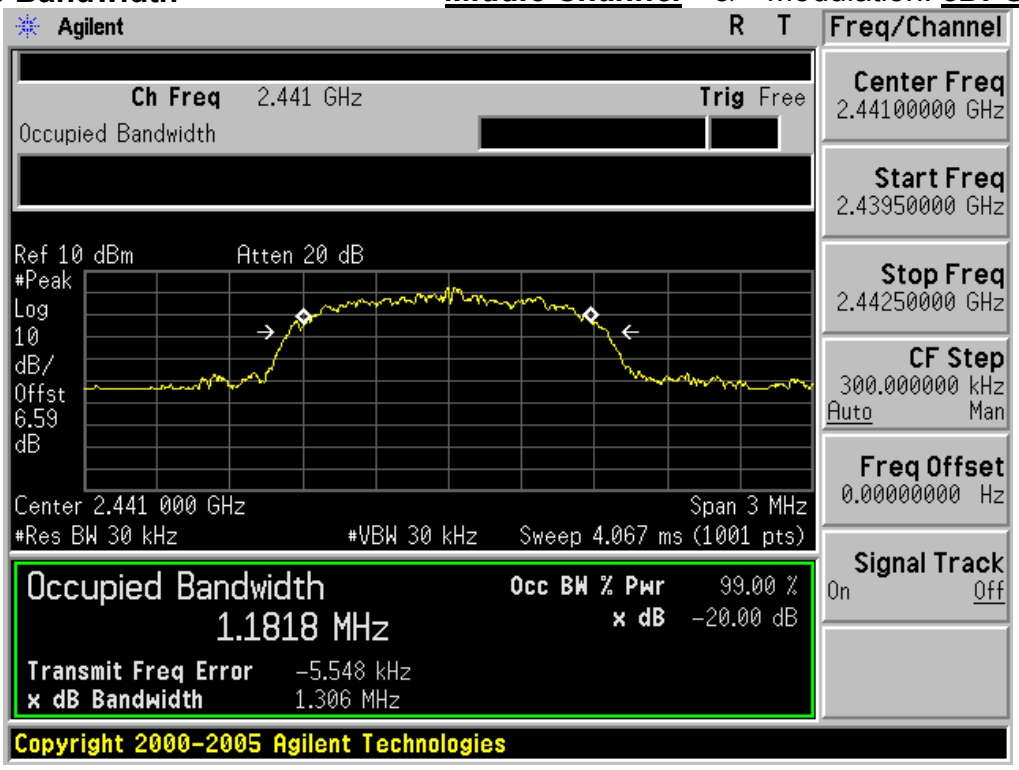


Copyright © 2010, Digital EMC Co., Ltd.

99% & 20dB Bandwidth ***Lowest Channel*** & Modulation: ***8DPSK***

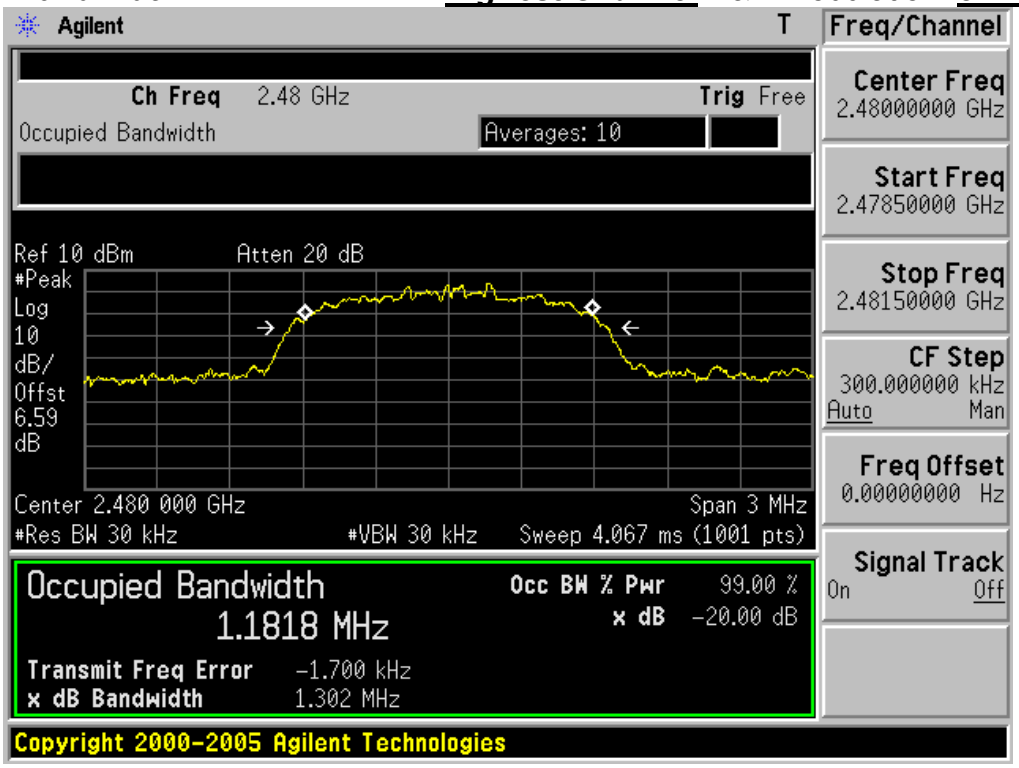


99% & 20dB Bandwidth ***Middle Channel*** & Modulation: ***8DPSK***



Copyright © 2010, Digital EMC Co., Ltd.

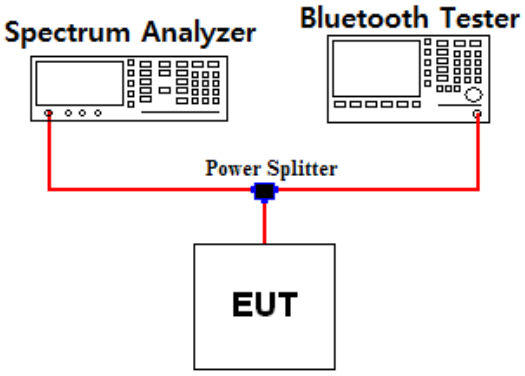
99% & 20dB Bandwidth ***Highest Channel*** & Modulation: ***8DPSK***



Copyright © 2010, Digital EMC Co., Ltd.

5. Maximum Peak Output Power Measurement

5.1. Test Setup



5.2. Limit

The maximum peak output power of the intentional radiator shall not exceed the following :

1. §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 ㎑ or the 20 ㏈ bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 ㎽.

2. §15.247(b)(1), For frequency hopping systems operating in the 2 400 – 2 483.5 ㎒ employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5 725 – 5 805 ㎒ band: 1 Watt.

5.3. Test Procedure

1. The RF power output was measured with a Spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A spectrum analyzer was used to record the shape of the transmit signal.

2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using ;
   Span = approximately 5 times the 20 ㏈ bandwidth, centered on a hopping channel
   RBW ≥ 20㏈ BW
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

Copyright © 2010, Digital EMC Co., Ltd.

5.4. Test Results

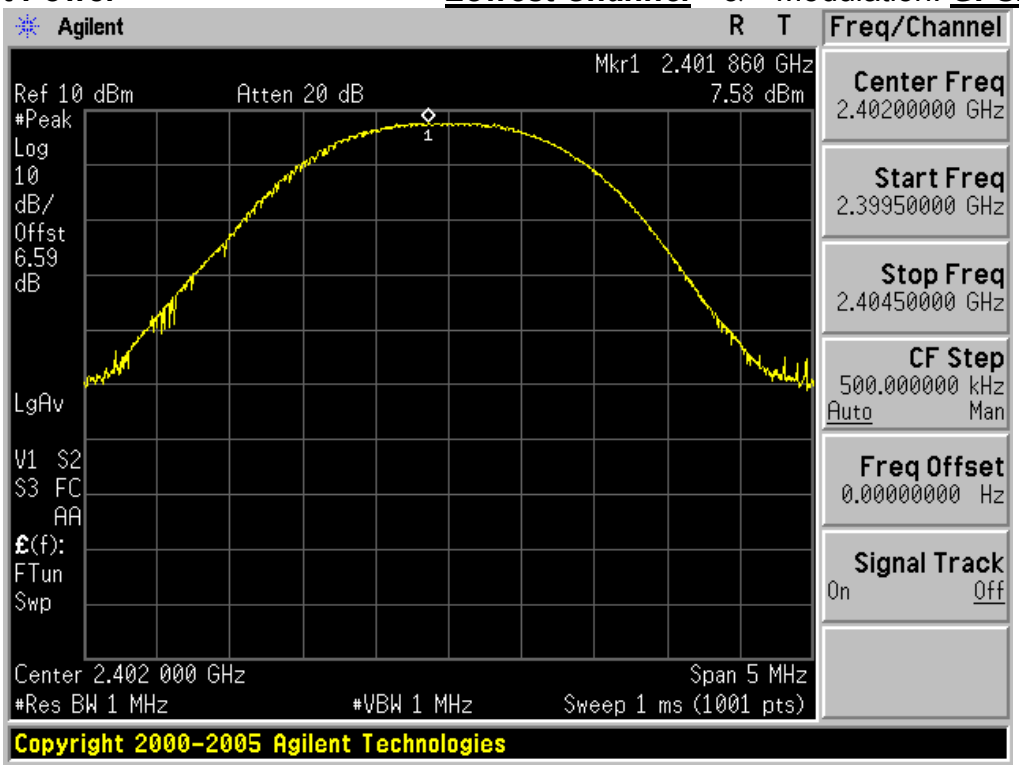
Ambient temperature : 23 °C
Relative humidity : 45%

Modulation	Tested Channel	Peak Output Power	
		dBm	mW
GFSK	**Lowest**	7.58	5.728
	Middle	7.80	6.026
	Highest	8.32	6.792
π/4 DQPSK	**Lowest**	6.93	4.932
	Middle	7.44	5.546
	Highest	7.79	6.012
8DPSK	**Lowest**	6.97	4.977
	Middle	7.36	5.445
	Highest	8.12	6.486

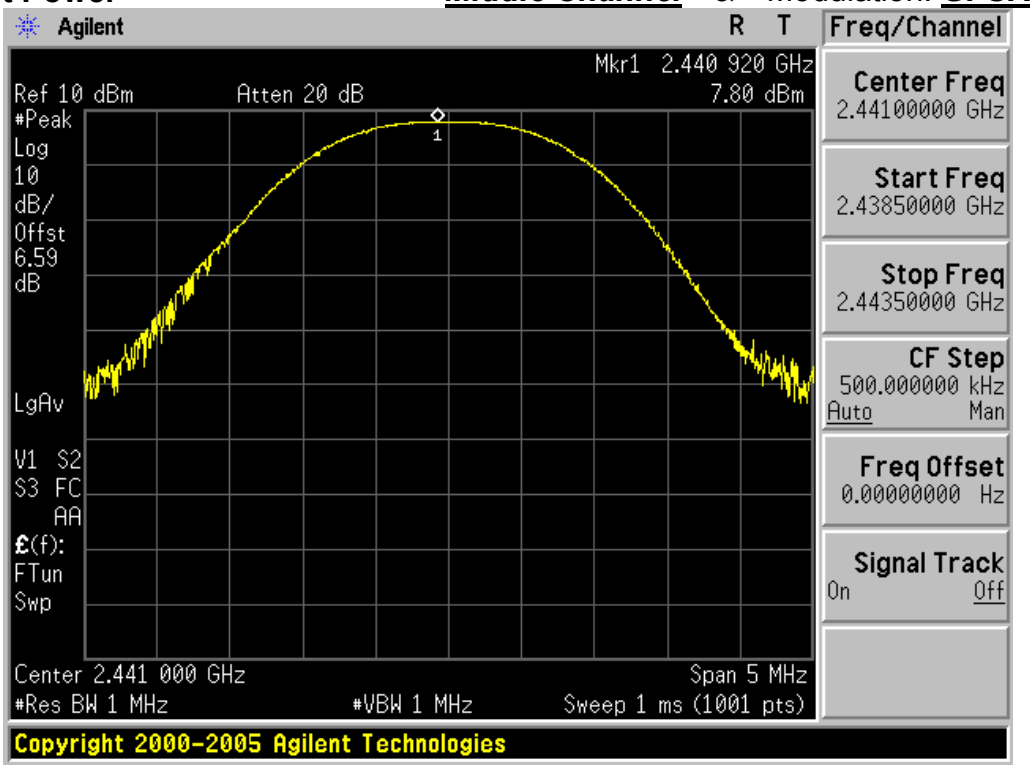
Note 1: See next pages for actual measured spectrum plots.

Copyright © 2010, Digital EMC Co., Ltd.

Peak Output Power ***Lowest Channel*** & Modulation: ***GFSK***

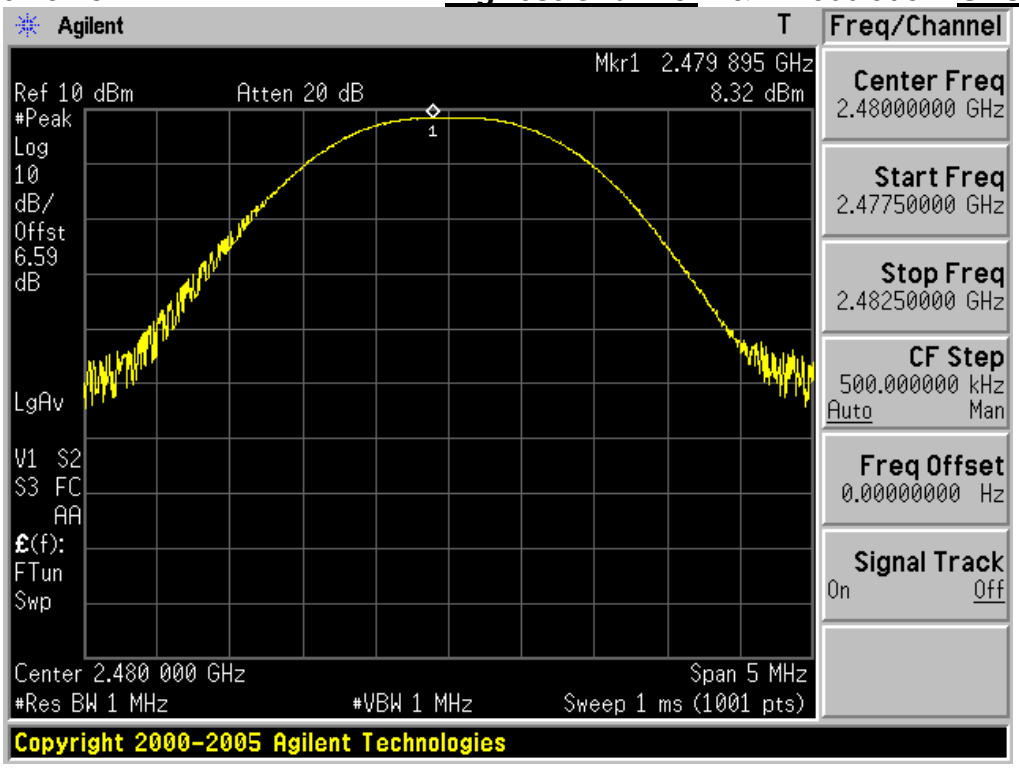


Peak Output Power ***Middle Channel*** & Modulation: ***GFSK***

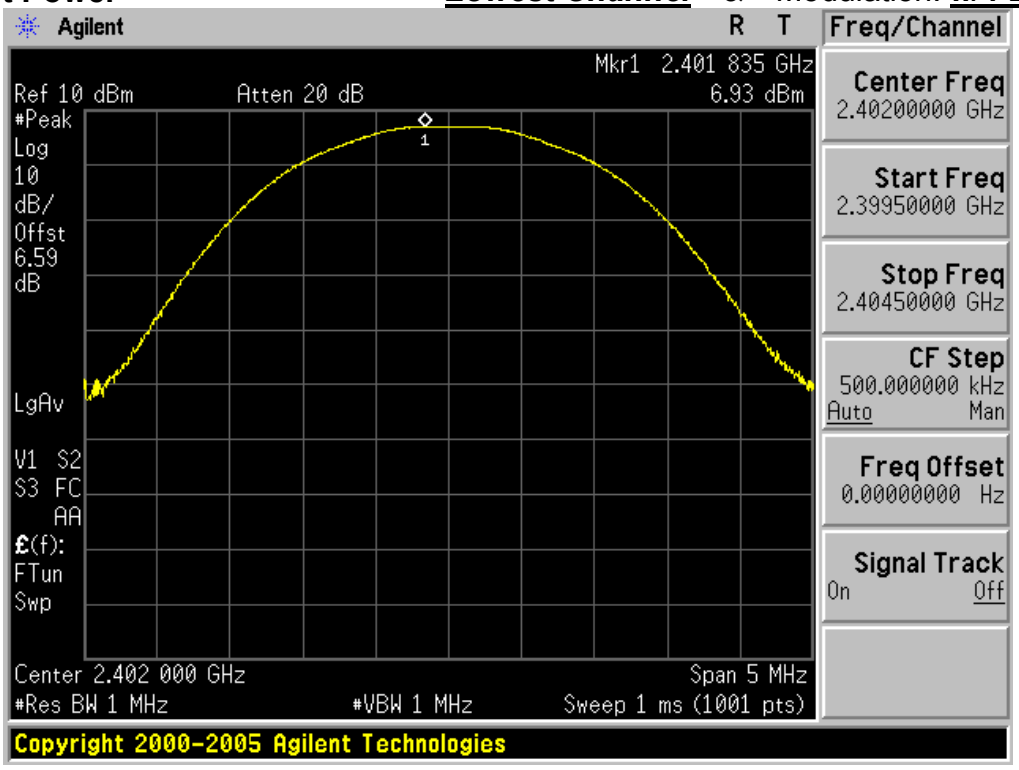


Copyright © 2010, Digital EMC Co., Ltd.

Peak Output Power ***Highest Channel*** & Modulation: ***GFSK***

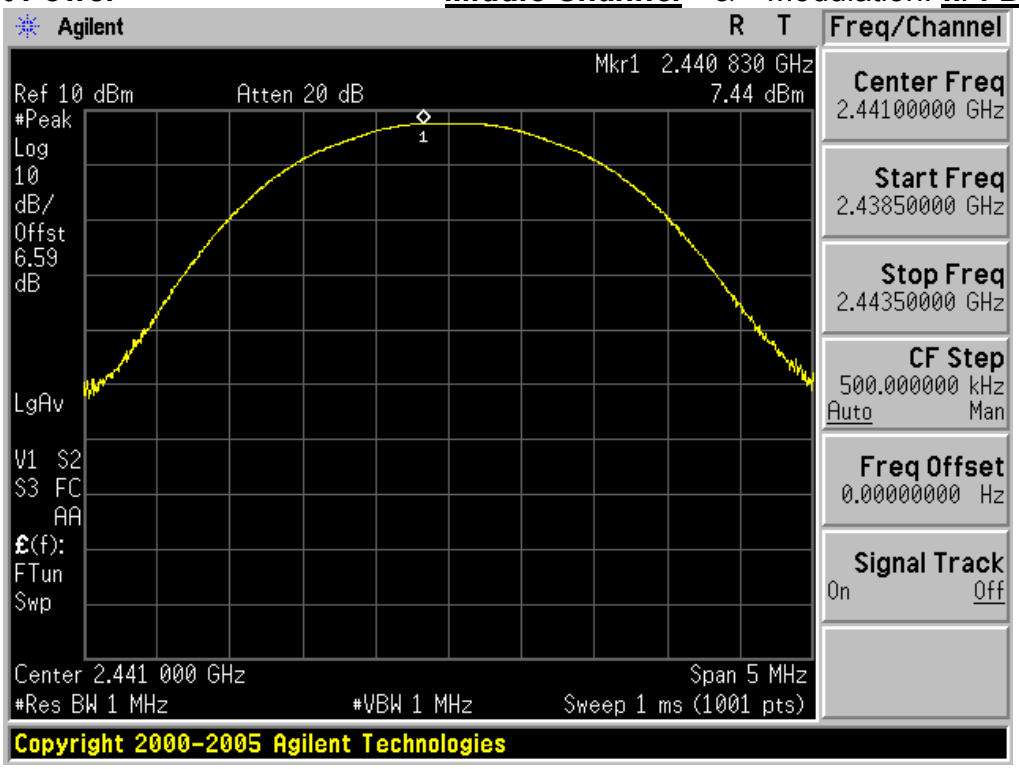


Peak Output Power ***Lowest Channel*** & Modulation: ***π/4 DQPSK***

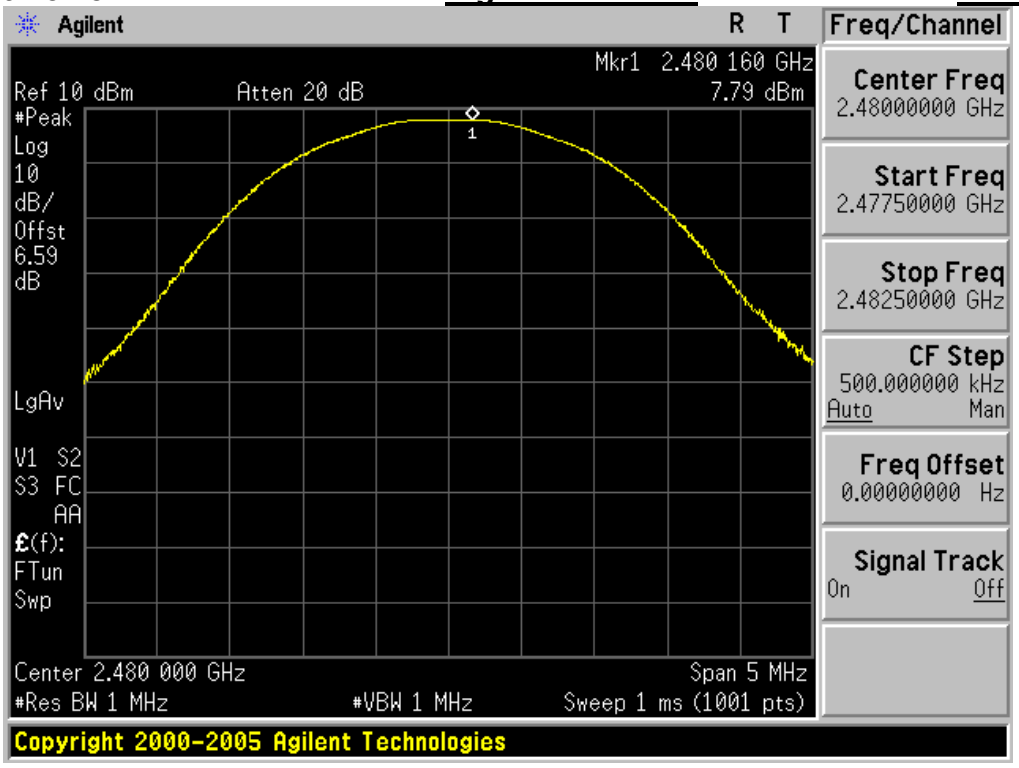


Copyright © 2010, Digital EMC Co., Ltd.

Peak Output Power ***Middle Channel*** & Modulation: ***π/4 DQPSK***

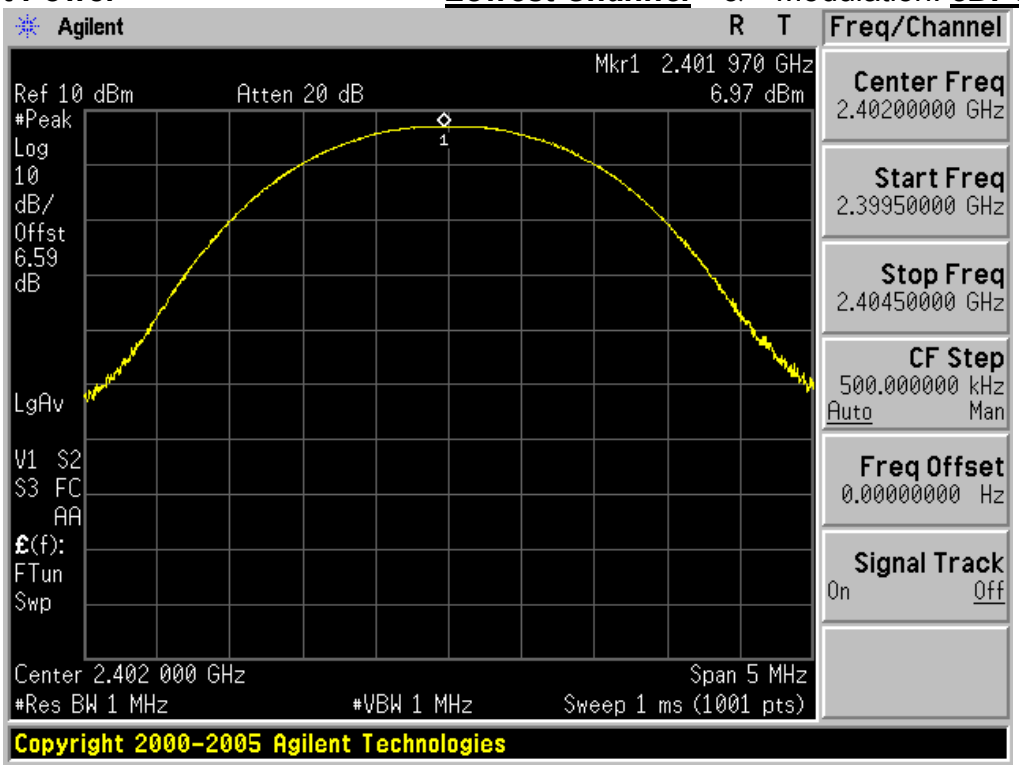


Peak Output Power ***Highest Channel*** & Modulation: ***π/4 DQPSK***

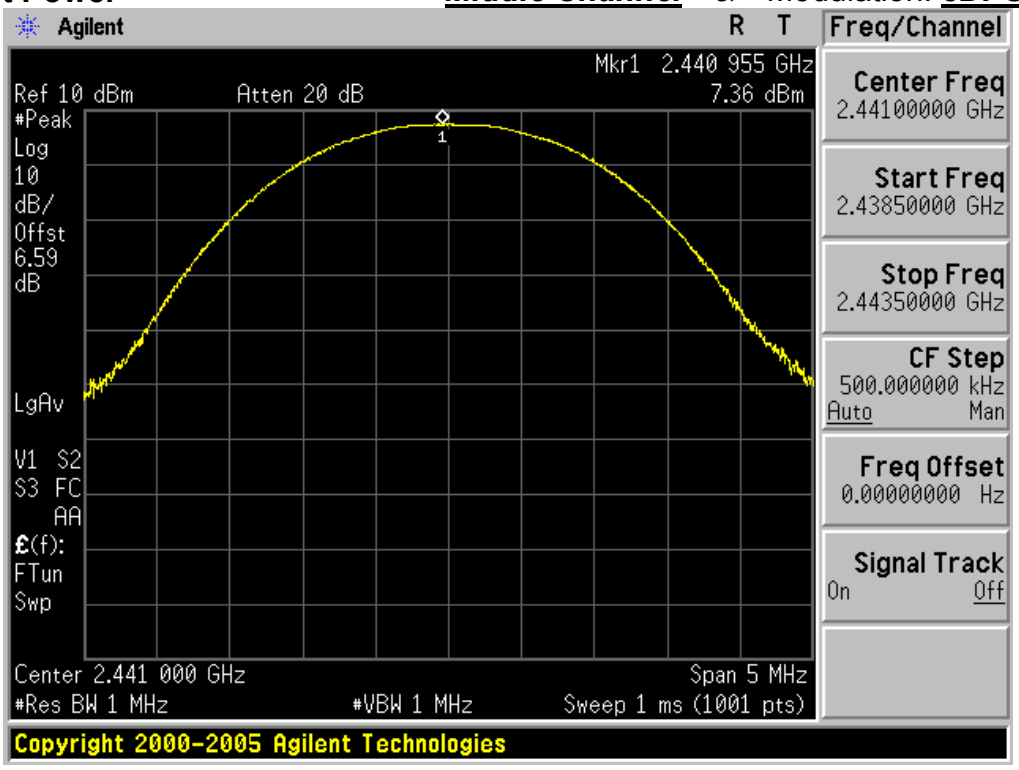


Copyright © 2010, Digital EMC Co., Ltd.

Peak Output Power ***Lowest Channel*** & Modulation: ***8DPSK***

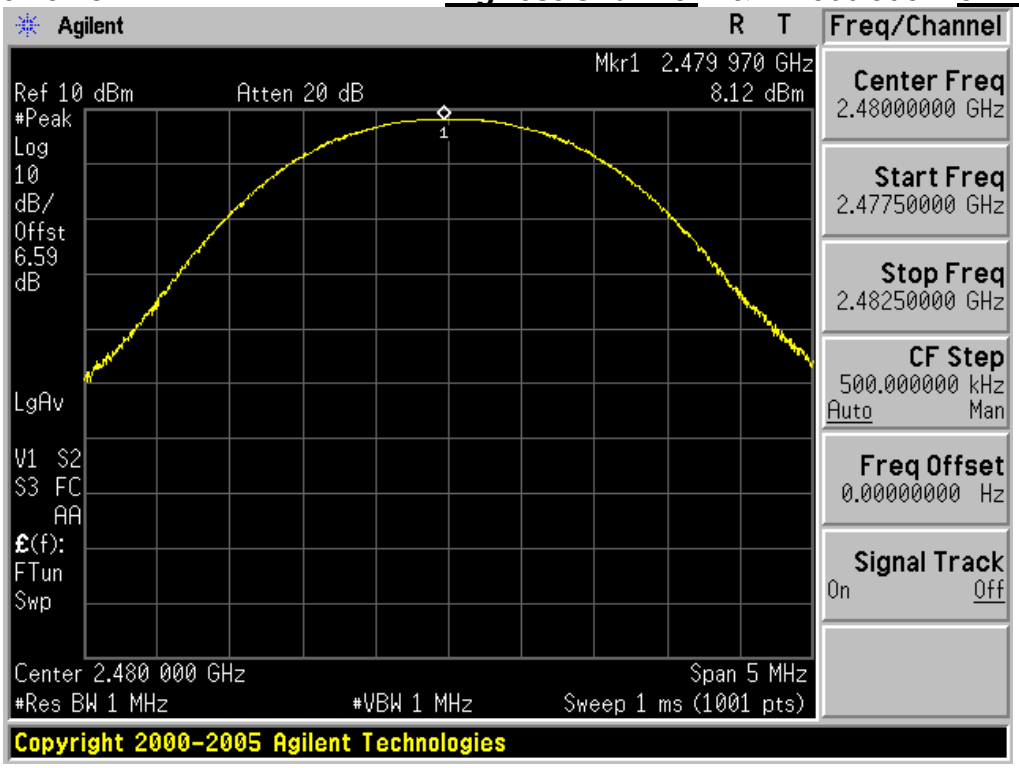


Peak Output Power ***Middle Channel*** & Modulation: ***8DPSK***



Copyright © 2010, Digital EMC Co., Ltd.

Peak Output Power ***Highest Channel*** & Modulation: ***8DPSK***



Copyright © 2010, Digital EMC Co., Ltd.

6. Transmitter AC Power Line Conducted Emission

6.1. Test Setup

Refer to test setup photo.

6.2. Limit

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network(LISN).
Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency 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

6.3. Test Procedures

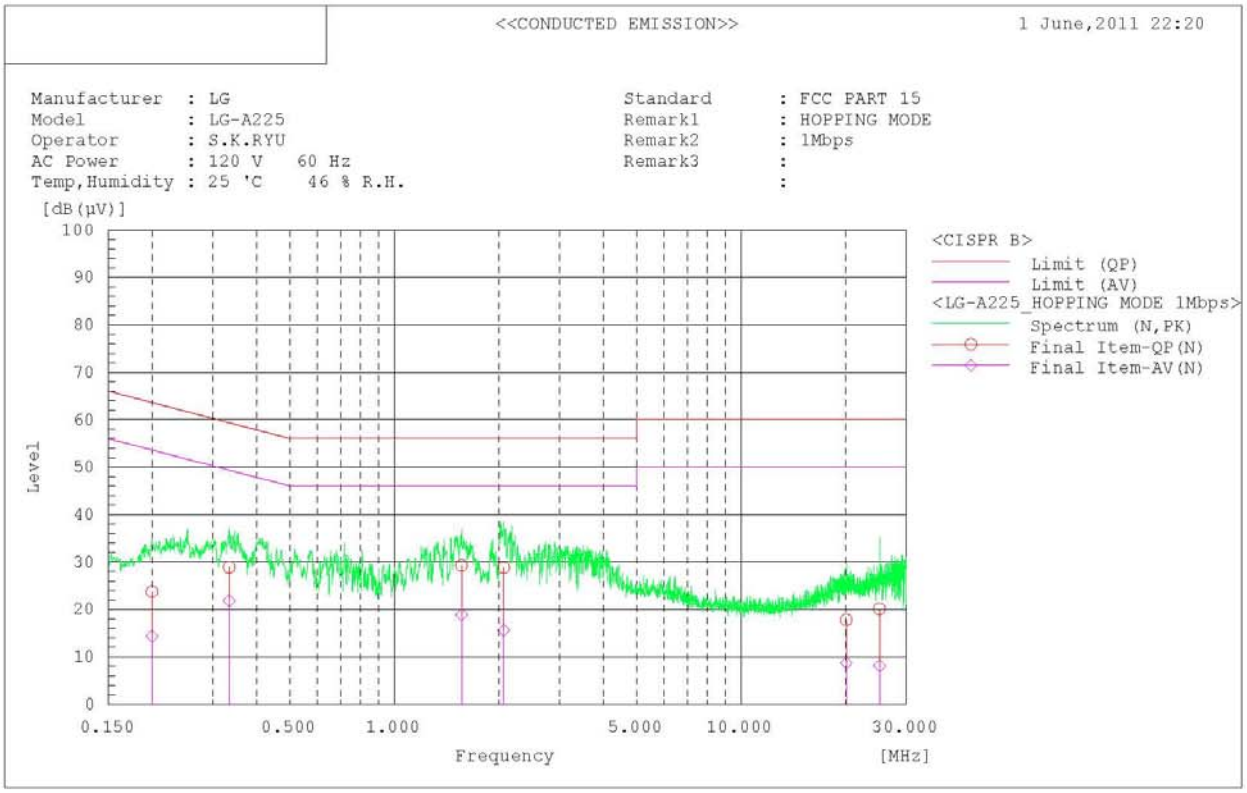
Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

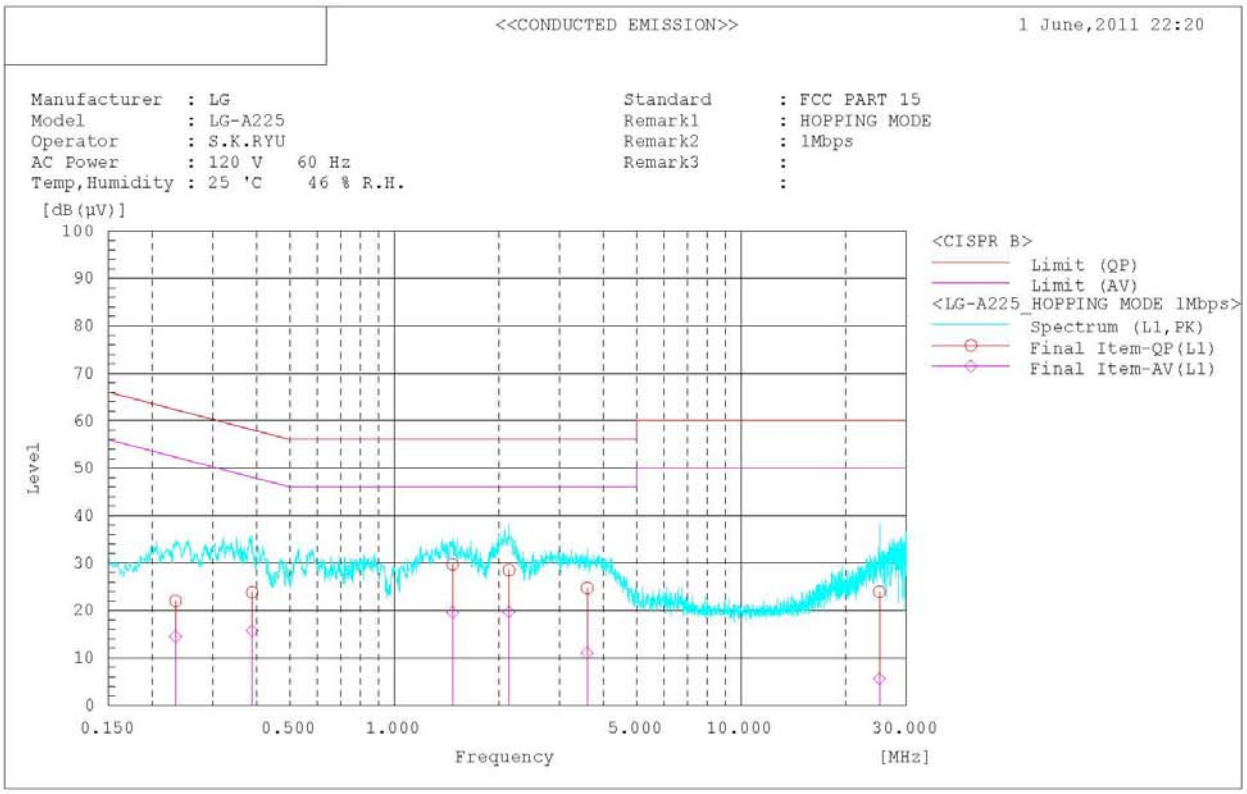
1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

Copyright © 2010, Digital EMC Co., Ltd.

6.4. Test Results

AC Line Conducted Emissions (Graph) & Modulation: ***GFSK***





Copyright © 2010, Digital EMC Co., Ltd.

AC Line Conducted Emissions (List) & Modulation: ***GFSK***

<<CONDUCTED EMISSION>>

1 June,2011 22:20

Standard : FCC PART 15
Manufacturer : LG
Model : LG-A225
Operator : S.K.RYU
AC Power : 120 V 60 Hz
Temp,Humidity : 25 'C 46 % R.H.
Remark1 : HOPPING MODE
Remark2 : 1Mbps
Remark3 :

Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c.f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]	Remark
1	0.200	23.6	14.2	0.1	23.7	14.3	63.6	53.6	39.9	39.3	
2	0.334	28.8	21.7	0.1	28.9	21.8	59.4	49.4	30.5	27.6	
3	1.563	29.1	18.7	0.2	29.3	18.9	56.0	46.0	26.7	27.1	
4	2.065	28.6	15.4	0.2	28.8	15.6	56.0	46.0	27.2	30.4	
5	20.105	16.6	7.5	1.2	17.8	8.7	60.0	50.0	42.2	41.3	
6	25.048	18.6	6.6	1.5	20.1	8.1	60.0	50.0	39.9	41.9	

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c.f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]	Remark
1	0.234	21.7	14.2	0.3	22.0	14.5	62.3	52.3	40.3	37.8	
2	0.389	23.5	15.4	0.3	23.8	15.7	58.1	48.1	34.3	32.4	
3	1.472	29.4	19.3	0.3	29.7	19.6	56.0	46.0	26.3	26.4	
4	2.140	28.2	19.4	0.3	28.5	19.7	56.0	46.0	27.5	26.3	
5	3.600	24.3	10.6	0.4	24.7	11.0	56.0	46.0	31.3	35.0	
6	25.048	22.5	4.2	1.4	23.9	5.6	60.0	50.0	36.1	44.4	

Copyright © 2010, Digital EMC Co., Ltd.