

Test Report No.8212308340 Rev.1

For Alvarion (formerly Breezecom & Floware) Ltd.

Equipment Under Test:

***BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system***

***From The Standards Institution
Of Israel
Industry Division
Telematics Laboratory
EMC Section***



Certificate No.1487-01

Test Report No.: 8212308340 Rev.1

Page 1 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Order placed by:	Alvarion (formerly Breezecom & Floware) Ltd.
Address:	P.O. Box 13139 Tel Aviv 61131 Israel
Sample for test selected by:	The orderer
The date of test:	09/04/2002.

Description of Equipment

Under Test (EUT): BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system of the BreezeAccess V family

Manufactured by: Alvarion (formerly Breezecom & Floware) Ltd.

Reference Documents:

- ❖ CFR 47 FCC: "Rules and Regulations";
Part 15. "Radio frequency devices";
Subpart C: "Intentional radiators"

Test Results: The EUT was found to be in compliance with the requirements of FCC Rules Part 15 Subpart C Sec.15.205, 15.207, 15.209, 15.247 (c).

This Test Report contains 73 pages
and may be used only in full.

This Test Report applies only to the specimen tested and may not
be applied to other specimens of the same product.

Test Report No.: 8212308340 Rev.1

Page 2 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

Table of Contents

1. General	3
1.1 BreezeACCESS 5.7GHz GFSK system description:	3
1.2 Scope:	7
2. Test specification, Methods and Procedures	8
3. Measurements, examinations and derived results	8
3.1 Location of the Test Site:	8
3.2 Test condition:	8
3.3 Conducted emission test:	9
3.4 Radiated emission test:	15
3.5 Restricted bands:	19
3.6 Spurious Emission, Antenna conducted:	35
4. Compliance with specification	59
5. Appendix 1: Test equipment used	60
6. Appendix 2: Antenna Factor and Cable Loss	61
7. Appendix 3: Test configuration illustration	63

1 General

1.1 BreezeACCESS 5.7GHz GFSK system description:

Description of Equipment Under Test (EUT): BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Manufactured by: Alvarion (formerly Breezecom & Floware) Ltd.

The BreezeAccess 5.7GHz (BreezeAccess V) GFSK frequency hopping spread spectrum (FHSS) system is a modification of the BreeAccess 2.4GHz GFSK (FCC ID: LKT-IF-24) frequency hopping spread spectrum (FHSS) transceiver used for WLANs and similar applications. This system is designed to support the 5725-5850MHz band and is a two box system containing an outdoor unit and an indoor unit. The indoor unit is the same unit for all BreezeAccess products. In order to change the system frequency band some modifications are done in the radio section of the outdoor unit.

The modification is the high frequency radio part changed to support the 5.7GHz band instead of the 2.4GHz band. The changes include the LNA, front-end filter and mixer in the receive part of the system. Mixer, pre-amplifier, power amplifier and filters in the transmit part of the system. The TX/RX switch was changed to a switch that can support the band. The PLL was upgraded by adding a frequency doubler to support the 5.7GHz band the PLL component was not changed. All other parts of the system: modem, CPU, IF section, power supply, internal clocks and control were not changed and are similar to the 2.4GHz system.

The 5.7GHz band operates in the same frequency regime as the 2.4GHz system. There was no change in the modem software or hardware. The RF PLL setting to 5.7GHz band instead of the 2.4GHz band does the frequency shift.

The modulation is done in the indoor unit that is common to all BreezeAccess products and therefore all modulation characteristics are kept and are identical to the 2.4GHz band.

The tests done on the 5.7GHz system cover all the radio changes and include antenna port test, harmonic radiation test, restricted band test and output power test.

All other characteristic and description are identical to the LKT-IF-24 and can be taken from there.

The block diagram of IF 5.7 GHz outdoor unit RF section is shown in Figure 1. Items marked in red are replaced from the original 2.4 GHz system for the 5.7GHz system.

The block diagram of IF 5.7 GHz indoor unit is shown in Figure 2.

The EUT was tested with two antennas:

1. Sector antenna:
Manufacture: European antenna
Model No: SA17-55V/450
Gain: 17dBi
2. Integrated antenna:
Manufacture: MARS antenna & RF systems
Model: ANT.MA575820V
Gain: 20 dBi

The EUTs internal view is shown in Figure 3.

Test Report No.: 8212308340 Rev.1

Page 4 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

IF 5.7GHz OUTDOOR UNIT RF SECTION Block Diagram

Items marked in **RED** are replaced from the original 2.4GHz system for the 5.7GHz system

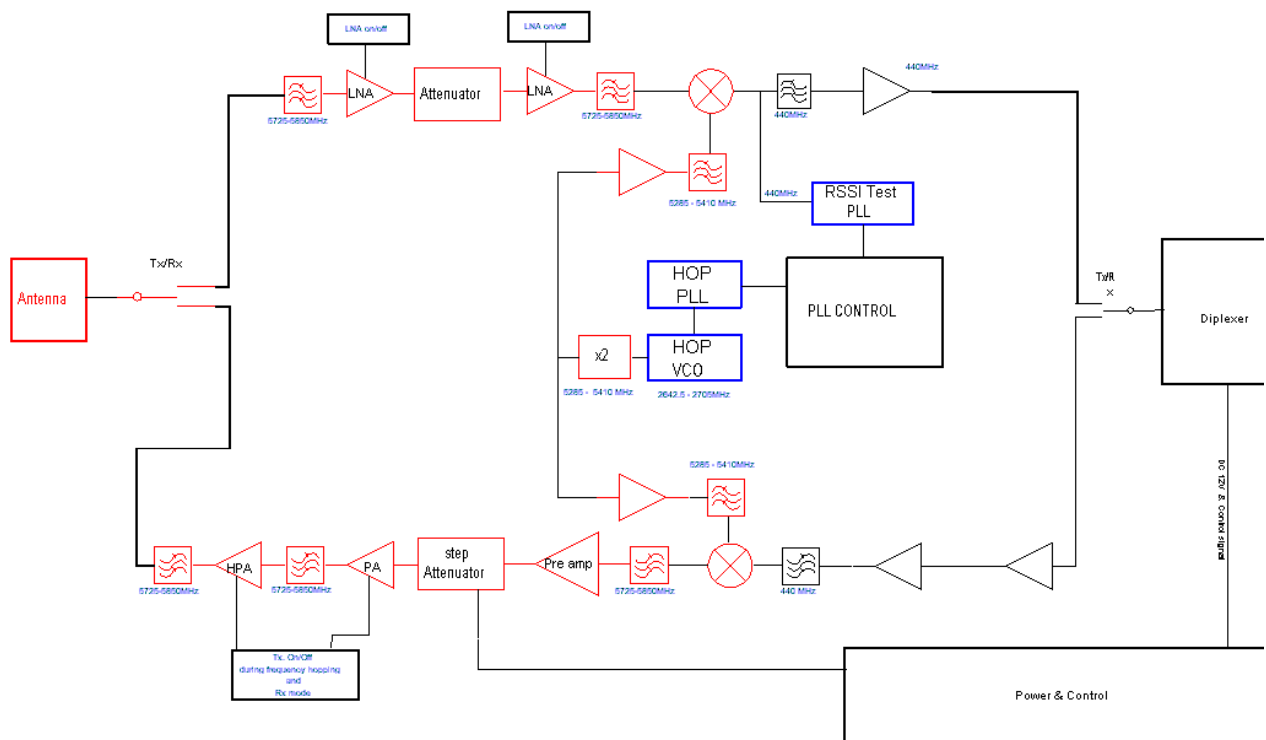


Figure 1

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Test Report No.: 8212308340 Rev.1

Page 6 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

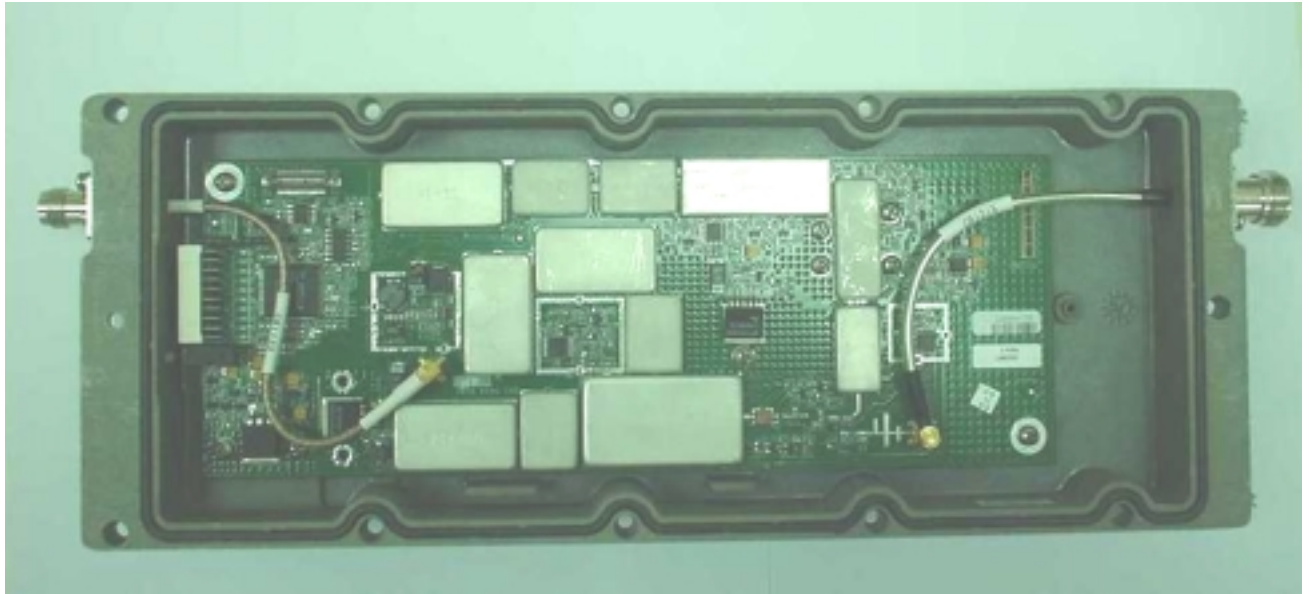


Figure 3 EUTs internal view.

Test Report No.: 8212308340 Rev.1

Page 7 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

1.2 Scope:

This test report contains results of the tests, performed on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system according to the following requirements of CFR 47 FCC Part 15 Subpart C:

1. Conducted emission measurements per Sec. 15.207;
2. Spurious emission measurements up to 7th harmonic for low, middle and high channels per C Sec.15.209;
3. Radiated emission measurements in two restricted bands 5.35-5.46 GHz and 10.6-12.7 GHz per Sec.15.205, 15.35.
4. Spurious emission. Antenna conducted per Sec.15.247 (c).

Only the tests related to performed changes were made.

Test Report No.: 8212308340 Rev.1

Page 8 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

2 Test specification, Methods and Procedures

Test Specification:

- ❖ CFR 47 FCC: "Rules and Regulations";
Part 15. "Radio frequency devices";
Subpart C: "Intentional radiators".

Methods and Procedures:

- ❖ ANSI C63/4/1992: "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz".

3 Measurements, examinations and derived results

3.1 Location of the Test Site:

EMC laboratory of the Standards Institution of Israel in Tel-Aviv.

3.2 Test condition:

Temperature: 22 °C
Humidity: 60 %

Test Report No.: 8212308340 Rev.1

Page 9 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

3.3 Conducted emission test:

3.3.1 Requirements:

EUTs conducted emission within the band 450 kHz to 30 MHz shall not exceed value required in section 15.207.

3.3.2 Test configuration:

The measurements were performed on the 110 VAC mains input of the EUT power adapter. The EUT was placed on a non-metallic table in a shielded chamber at a height of 80 cm from the floor of the shielded chamber and 40 cm from the wall of the shielded chamber.

3.3.3 Test procedure:

The EUT was operated to transmitting through the customer software. First, initial scans were performed. Final measurements were performed at the frequencies where emission exceeded the tolerance limit.

Test equipment (EMI receiver) setup was as follow:

Initial scan:

Detector type	Peak
Mode	Max hold
Bandwidth	9 kHz
Step size	Continuous sweep
Sweep time	>100 msec

Measurements

Detector type	Quasi-peak, Avg (CISPR)
Bandwidth	9 kHz
Measurement time	200 seconds/MHz
Observation	>15 seconds

3.3.4 Test results:

The conducted emissions from the EUT were found below specified limit. Test results are shown in Table 1 and Plots #1 - #4.

Test Report No.: 8212308340 Rev.1

Page 10 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

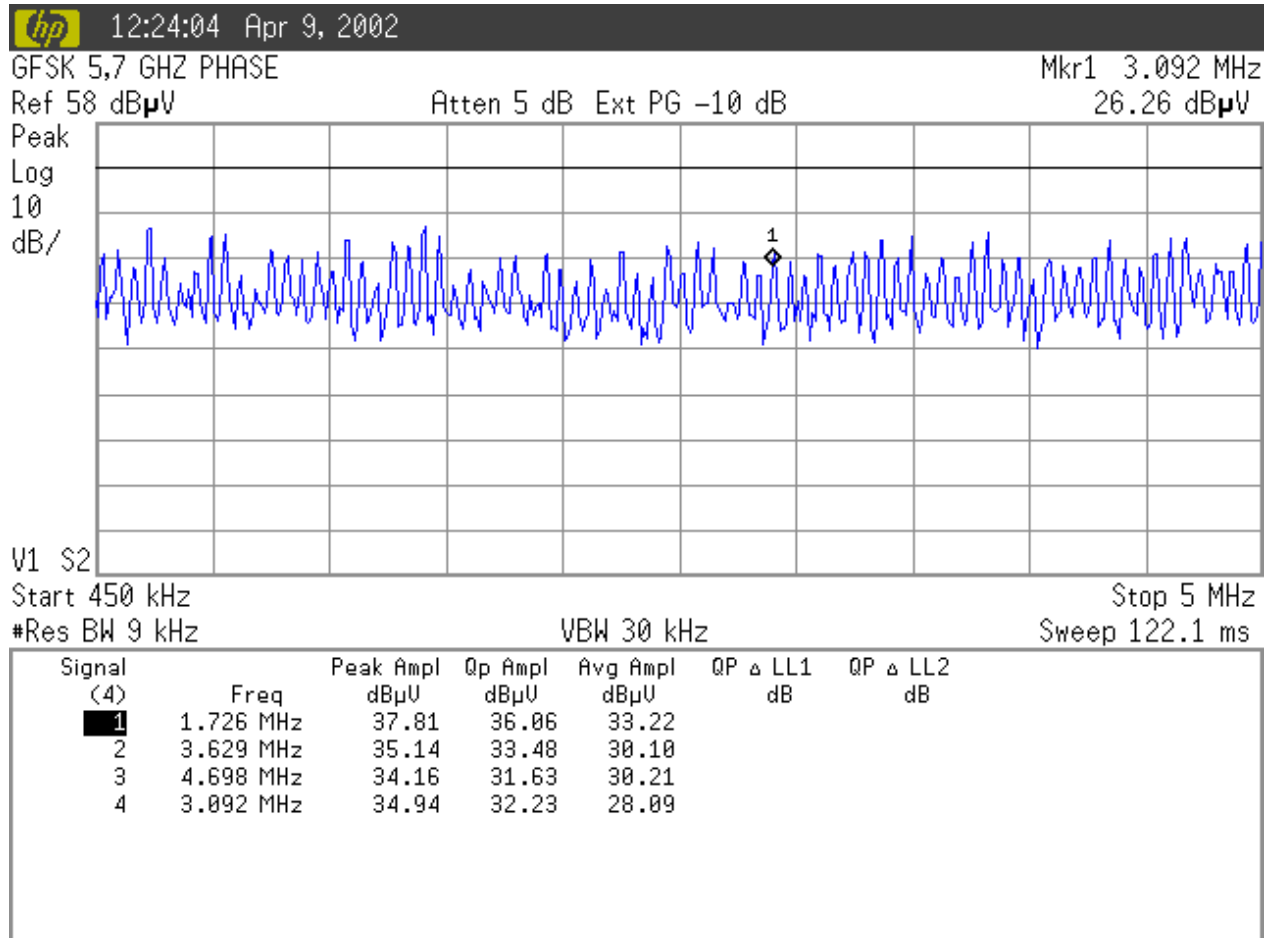
**Table 1. Conducted emission test results
on 110 VAC input of the EUT power adapter**

Frequency (MHz)	Tested line	Detector type	Emissions (dBμV)	Limit (dBμV)	Margin (dB)	Results
1.726	Phase	Peak	37.8	-	-	Complies
		QP	36.0	48	12.0	
		AVG	33.2	-	-	
3.092	Phase	Peak	34.9	-	-	Complies
		QP	32.2	48	15.8	
		AVG	28.1	-	-	
3.629	Phase	Peak	35.1	-	-	Complies
		QP	33.5	48	14.5	
		AVG	30.1	-	-	
4.698	Phase	Peak	34.2	-	-	Complies
		QP	31.6	48	16.4	
		AVG	30.2	-	-	
6.951	Phase	Peak	34.4	-	-	Complies
		QP	31.9	48	16.1	
		AVG	28.2	-	-	
25.9	Phase	Peak	32.4	-	-	Complies
		QP	28.9	48	19.1	
		AVG	24.5	-	-	
0.537	Neutral	Peak	36.2	-	-	Complies
		QP	34.3	48	13.7	
		AVG	30.6	-	-	
1.739	Neutral	Peak	33.5	-	-	Complies
		QP	29.7	48	18.3	
		AVG	25.6	-	-	
2.695	Neutral	Peak	28.3	-	-	Complies
		QP	23.6	48	24.4	
		AVG	19	-	-	
4.665	Neutral	Peak	33.7	-	-	Complies
		QP	31.4	48	16.6	
		AVG	27.9	-	-	
7.088	Neutral	Peak	33.5	-	-	Complies
		QP	31.4	48	16.6	
		AVG	26.9	-	-	
27.48	Neutral	Peak	32.3	-	-	Complies
		QP	28.7	48	19.3	
		AVG	23.7	-	-	

Test Report No.: 8212308340 Rev.1

Page 11 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system



Plot 1. Conducted emissions measurement result

Reference standard: FCC Part 15 Subpart C sec.15.207

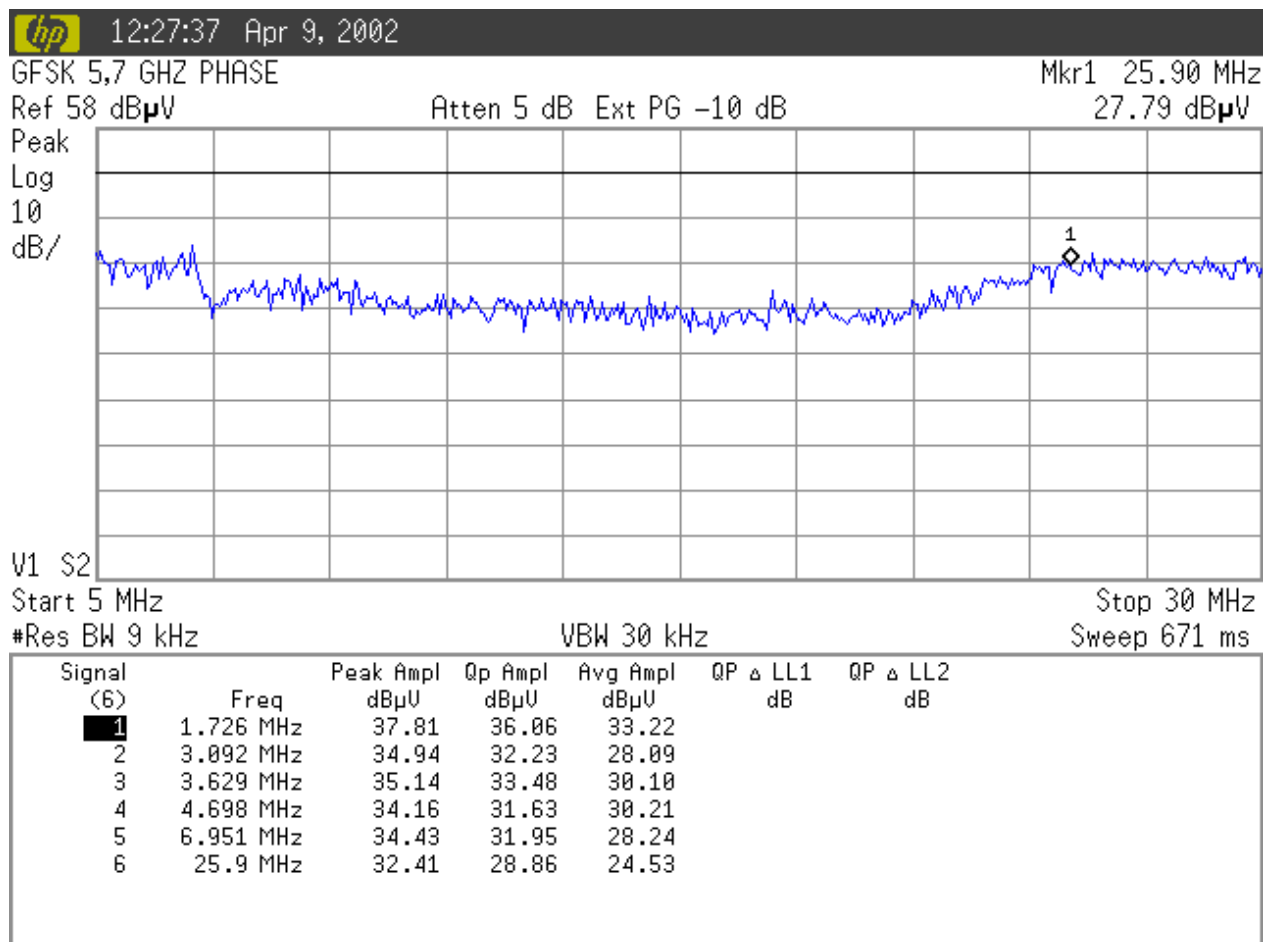
Frequency range: 450 kHz-5 MHz

line: phase

Test Report No.: 8212308340 Rev.1

Page 12 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system



Plot 2.

Conducted emissions measurement result

Reference standard: FCC Part 15 Subpart C sec.15.207

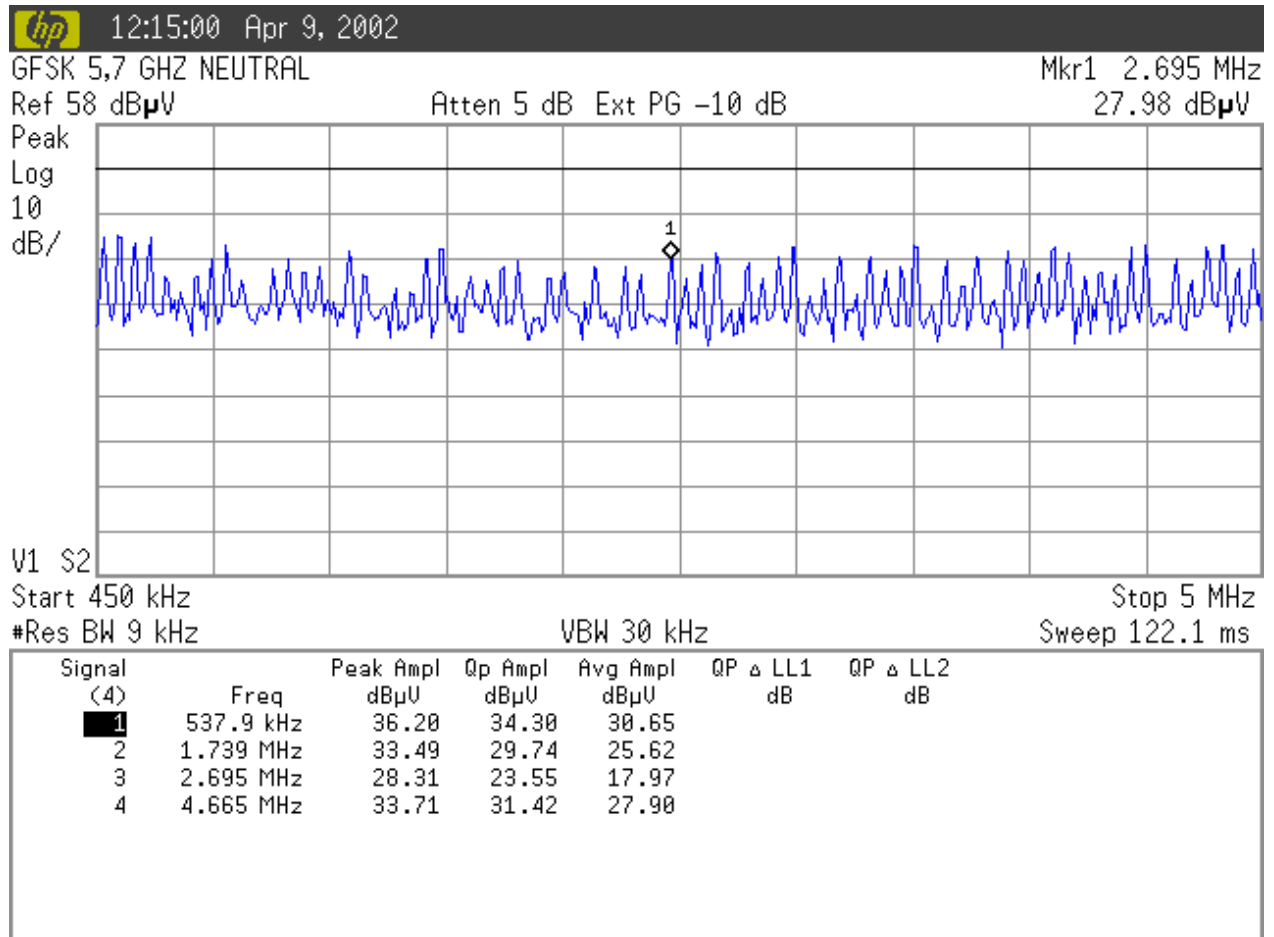
Frequency range: 5-30 MHz

line: phase

Test Report No.: 8212308340 Rev.1

Page 13 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system



Plot 3. Conducted emissions measurement result

Reference standard: FCC Part 15 Subpart C sec.15.207

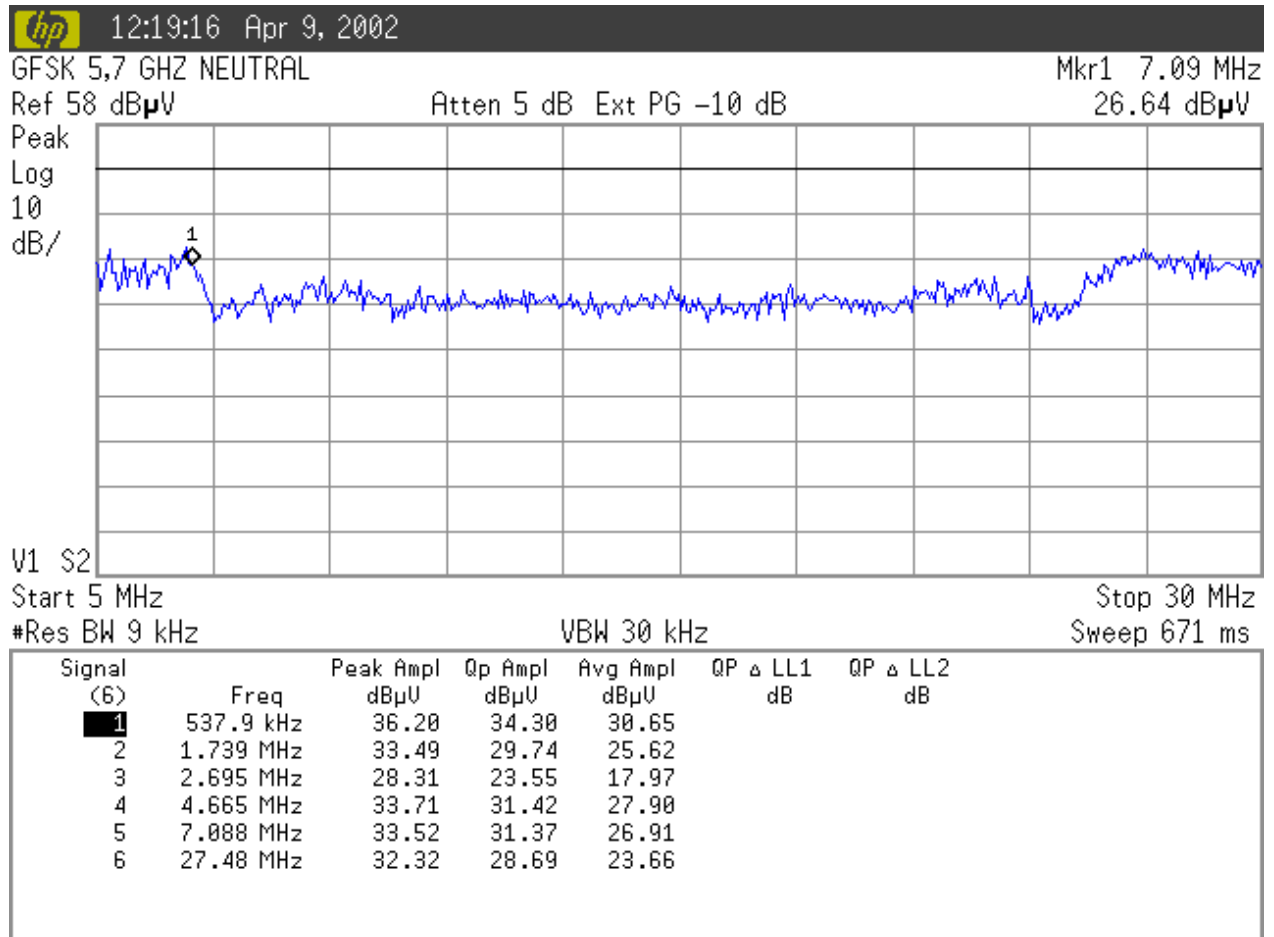
Frequency range: 450 kHz-5 MHz

line: neutral

Test Report No.: 8212308340 Rev.1

Page 14 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system



Plot 4 Conducted emissions measurement result

Reference standard: FCC Part 15 Subpart C sec.15.207

Frequency range: 5-30 MHz

line: neutral

3.4 Radiated emission test:

3.4.1 Requirements:

EUTs radiated emission shall not exceed value required in section 15.209.

3.4.2 Test procedure:

The EUT was tested with two different antennas - sector and integrated.

The measurements were performed in the anechoic chamber.

The EUT was arranged on a non-metallic table 0.8 m placed on the turntable.

Measuring antennas used: Up to 22 GHz - Double Ridge **EMCO** model 3115
above 22 GHz - Alpha TRG model A361

Antenna height = 1 m.

Polarization: Vertical/Horizontal

Measurement distance = 1m.

The frequency range was investigated up to 40516 MHz.

The measurements were performed in vertical and horizontal polarization, the maximum reading recorded.

Measuring detector function and bandwidths:

Detector type	Peak
Resolution bandwidth	1MHz
Video bandwidth	1 MHz

Detector type	Average
Resolution bandwidth	1MHz
Video bandwidth	3 kHz*

3.4.3 Radiated emission test results and calculation ratio:

The test results with sector antenna are shown in table #1 to #3.

The test results with integrated antenna are shown in table #4 to #6.

Note 1:

Up to 22000 MHz the emission level was calculated as:

E Reading (dB μ V) + measuring cable loss (dB) + measuring antenna factor (dB/m) +
Distance correction factor

For measuring cable loss and measuring antenna factor refer to Appendix 2.

Distance correction factor = -9.5 dB (correction to extrapolation reading from 1 m to 3m
specified distance)

Above 22000 MHz the emission level was calculated as

E Reading (dB μ V) + measuring antenna factor (dB/m) + Distance correction factor. The
measuring antenna was directly connected to the spectrum analyzer.

Test Report No.: 8212308340 Rev.1

Page 16 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Table 1. Spurious emissions test results

Antenna: sector
Frequency: Low operating frequency 5727 MHz

Frequency (GHz)	Emission Level (dB μ V/m)		Limit @ 3m (dB μ V/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
11.454	47	47	54	74	7.0	27.0	Complies
17.181	37	37			17.0	37.0	Complies
22.908	40	40			14.0	34.0	Complies
28.635	27.5	27.5			26.5	46.5	Complies
34.362	34.3	34.3			19.7	39.7	Complies
40.089	43.2	43.2			10.8	30.8	Complies

Table 2. Spurious emissions test results

Antenna: sector
Frequency: Middle operating frequency 5788 MHz

Frequency (GHz)	Emission Level (dB μ V/m)		Limit @ 3m (dB μ V/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
11.576	51	51	54	74	3.0	23.0	Complies
17.364	44	44			10.0	30.0	Complies
23.152	47	47			7.0	27.0	Complies
28.94	29.8	29.8			24.2	44.2	Complies
34.720	39.5	39.5			14.5	34.5	Complies
40.516	44.2	44.2			9.8	29.8	Complies

Test Report No.: 8212308340 Rev.1

Page 17 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Table 3. Spurious emissions test results

Antenna: sector

Frequency: High operating frequency 5848 MHz

Frequency (GHz)	Emission Level (dB μ V/m)		Limit @ 3m (dB μ V/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
11.696	51.3	51.2	54	74	2.7	22.8	Complies
17.544	53	53			1.0	21.0	Complies
23.392	50.1	50.1			3.9	23.9	Complies
29.24	31.7	31.7			22.3	42.3	Complies
35.088	38.1	38.1			15.9	35.9	Complies
40.936	41.9	41.9			12.1	32.1	Complies

Table 4. Spurious emissions test results

Antenna: Integrated

Frequency: Low operating frequency 5727 MHz

Frequency (GHz)	Emission Level (dB μ V/m)		Limit @ 3m (dB μ V/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
11.454	52.3	52.3	54	74	1.7	21.7	Complies
17.181	53	53			1.0	21.0	Complies
22.908	51	51			3.0	23.0	Complies
28.635	36.3	36.3			17.7	37.7	Complies
34.362	42.9	42.9			11.1	31.1	Complies
40.089	44.3	44.3			9.7	29.7	Complies

Test Report No.: 8212308340 Rev.1

Page 18 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Table 5. Spurious emissions test results

Antenna: Integrated
Frequency: Middle operating frequency 5788 MHz

Frequency (GHz)	Emission Level (dB μ V/m)		Limit @ 3m (dB μ V/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
11.576	51.8	51.8	54	74	2.2	22.2	Complies
17.364	53	53			1.0	21.0	Complies
23.152	52.1	52.1			1.9	21.9	Complies
28.940	41.3	41.3			12.7	32.7	Complies
34.720	45	45			9.0	29.0	Complies
40.516	44.7	44.7			9.3	29.3	Complies

Table 6. Spurious emissions test results

Antenna: Integrated
Frequency: High operating frequency 5848 MHz

Frequency (GHz)	Emission Level (dB μ V/m)		Limit @ 3m (dB μ V/m)		Margin (dB)		Results
	Average	Peak	Average	Peak	Average	Peak	
11.696	52.1	52.1	54	74	1.9	21.9	Complies
17.544	53	53			1.0	21.0	Complies
23.392	52.6	52.6			1.4	21.4	Complies
29.240	42	42			12.0	32	Complies
35.088	38.8	38.8			15.2	35.2	Complies
40.936	42.3	42.3			11.7	31.7	Complies

Test Report No.: 8212308340 Rev.1

Page 19 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

3.5 Restricted bands:

3.5.1 Requirements:

Radiated emission in restricted bands should meet the requirements of section 15.205.

3.5.2 Test procedure:

The EUT was tested with two different antennas - sector and integrated.

The measurements were performed in the anechoic chamber.

The EUT was arranged on a non-metallic table 0.8 m placed on the turntable.

Measuring antennas used: Double Ridge **EMCO** model 3115

Antenna height = 1 m.

Measurement distance = 1m.

Measuring detector function and bandwidths:

Detector type	Peak
Resolution bandwidth	1MHz
Video bandwidth	1 MHz
Detector type	Average
Resolution bandwidth	1MHz
Video bandwidth	3 kHz*

3.5.3 Test results and calculation ratio:

EUT with sector antenna

The spurious emissions were found in two restricted bands: 5.35-5.46 GHz and 10.6-12.7 GHz.

The test results are shown in Plots #5 to # 16.

EUT with integrated antenna

The spurious emissions were found in three restricted bands: 5.35-5.46 GHz, 10.6-12.7 GHz and 22.01 – 23.12 GHz.

The test results are shown in Plots #17 to #34.

Note 2:

The measurements in restricted bands were performed at 1 m distance instead of 3 m, thus the specified limit line in the plots 54 dB μ V/m (for Average detector) and 74 dB μ V/m (for Peak detector) was raised to 10 dB.

Test Report No.: 8212308340 Rev.1

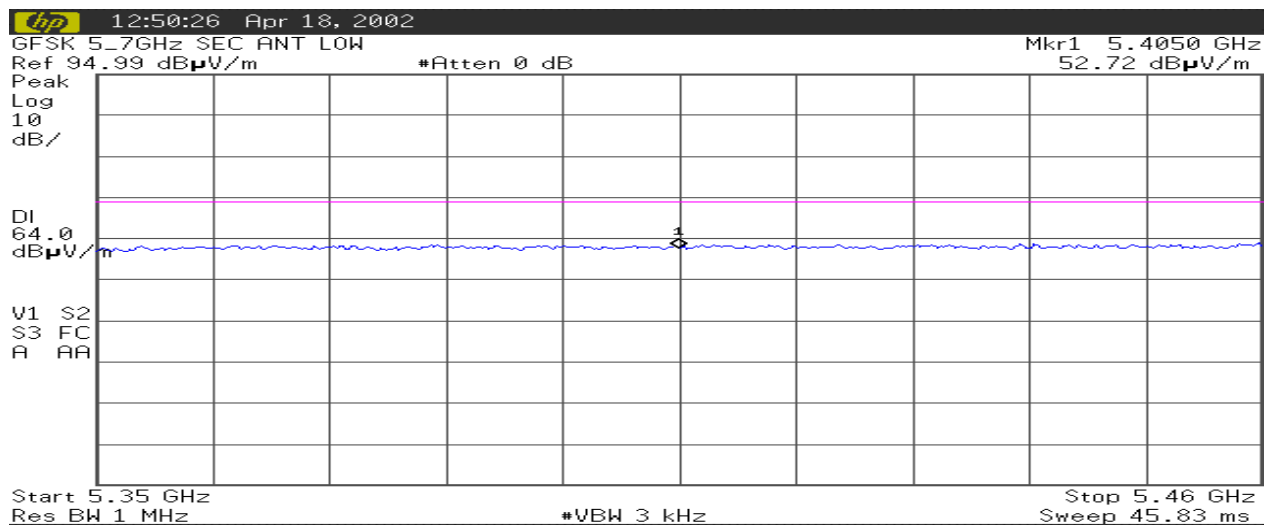
Page 20 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 5

Radiated emissions measured in restricted band 5.35 –5.46 GHz

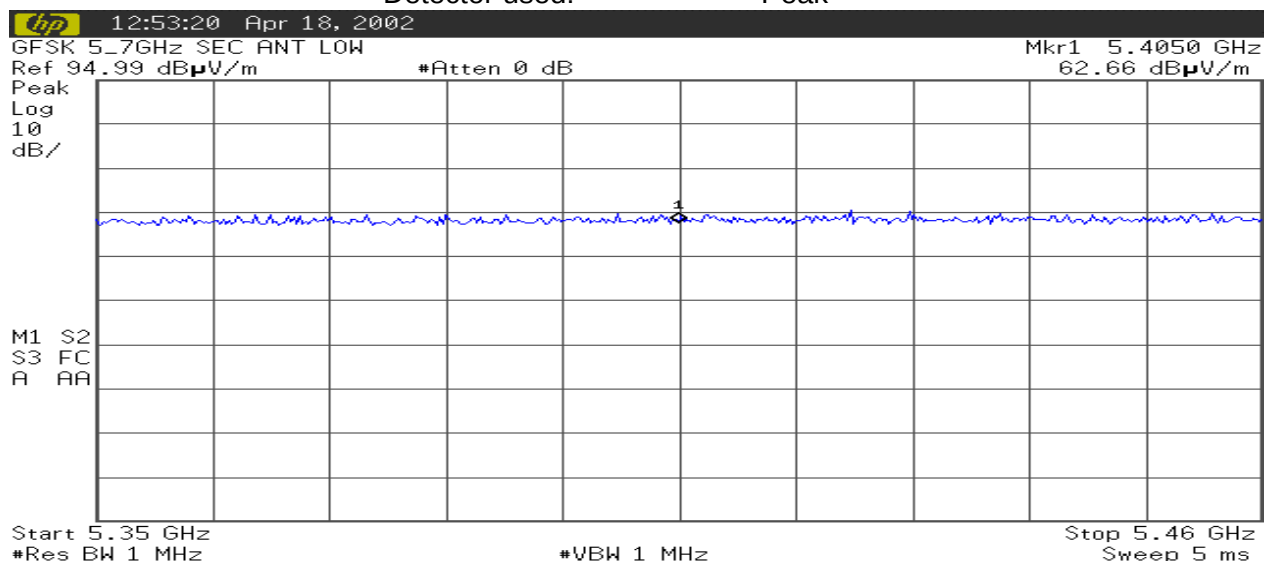
Antenna: Sector
operating frequency: Low
Detector used: Average



Plot # 6

Radiated emissions measured in restricted band 5.35 –5.46 GHz

Antenna: Sector
operating frequency: Low
Detector used: Peak



Test Report No.: 8212308340 Rev.1

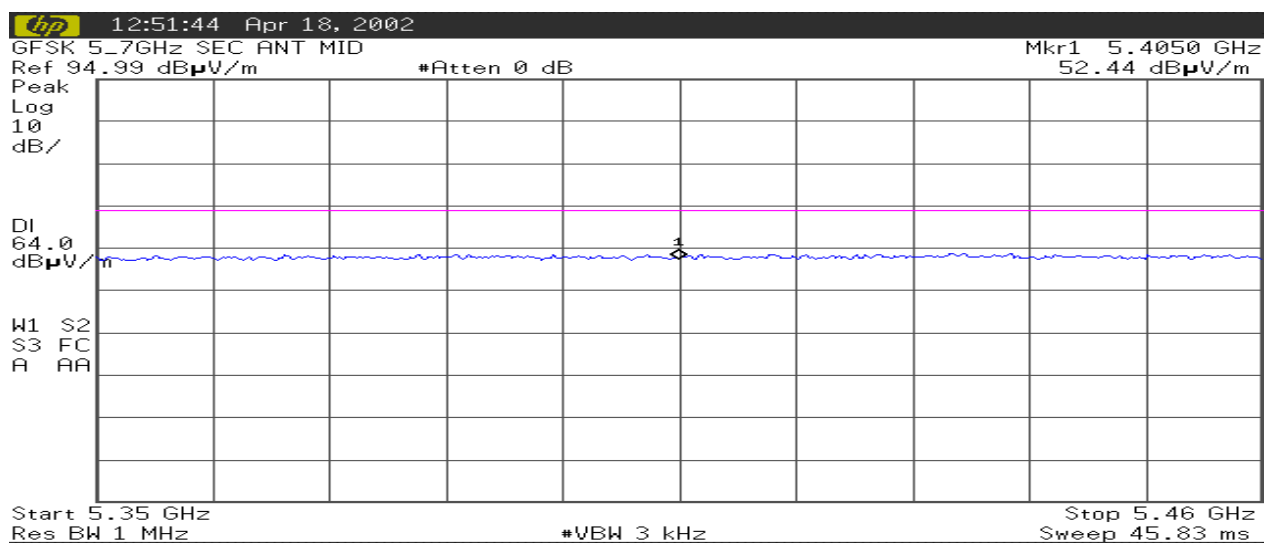
Page 21 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 7

Radiated emissions measured in restricted band 5.35 –5.46 GHz

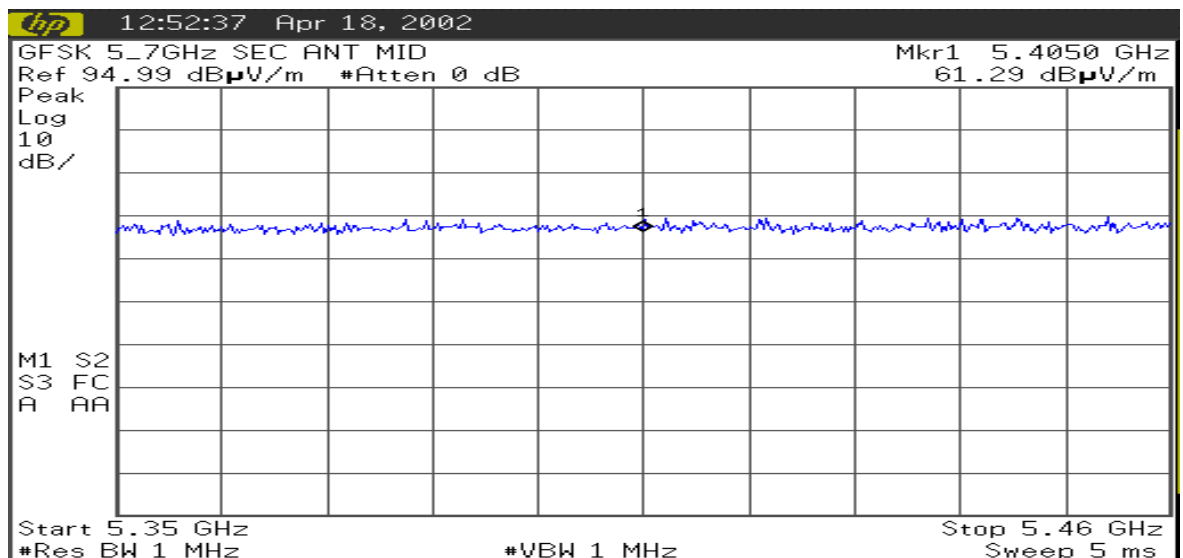
Antenna: Sector
operating frequency: Middle
Detector used: Average



Plot # 8

Radiated emissions measured in restricted band 5.35 –5.46 GHz

Antenna: Sector
operating frequency: Middle
Detector used: Peak



Test Report No.: 8212308340 Rev.1

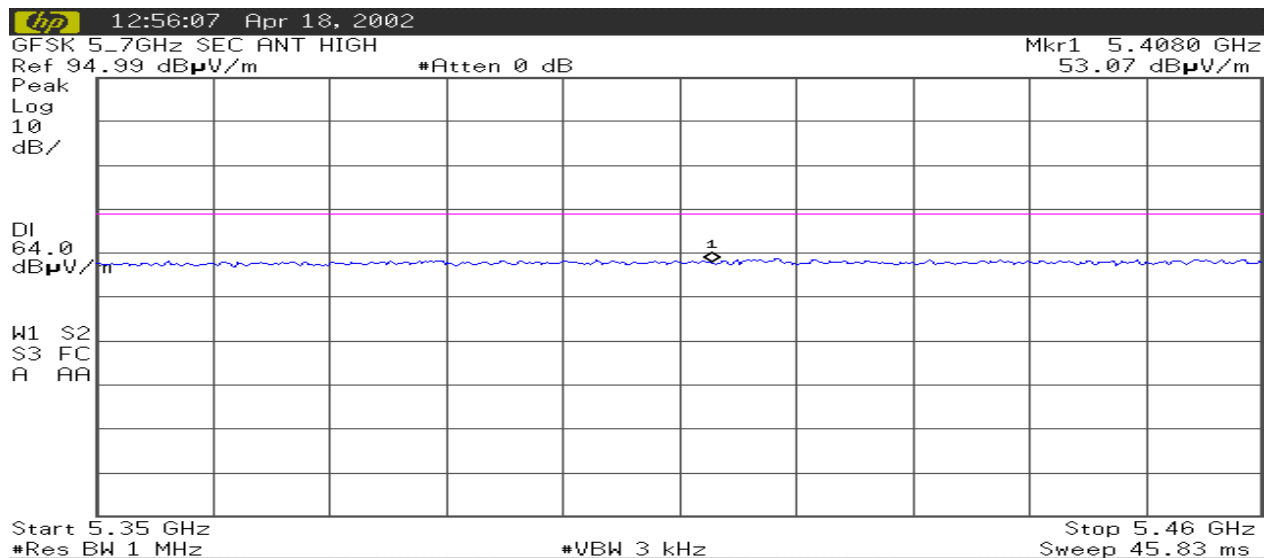
Page 22 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 9

Radiated emissions measured in restricted band 5.35 –5.46 GHz

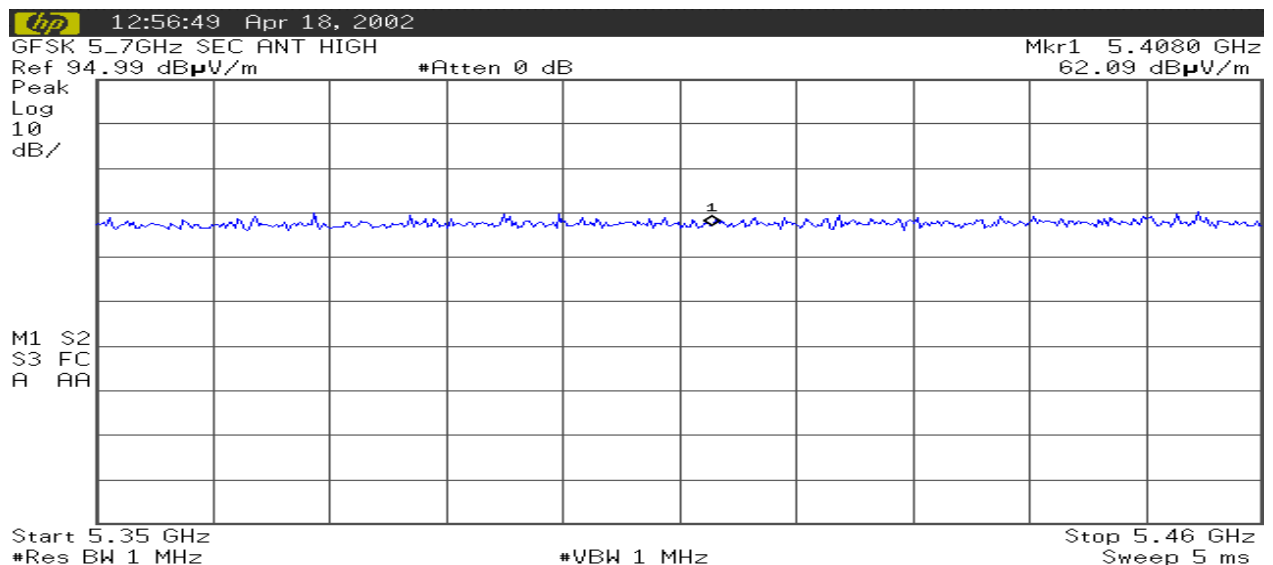
Antenna: Sector
operating frequency: High
Detector used: Average



Plot # 10

Radiated emissions measured in restricted band 5.35 –5.46 GHz

Antenna: Sector
operating frequency: High
Detector used: Peak



Test Report No.: 8212308340 Rev.1

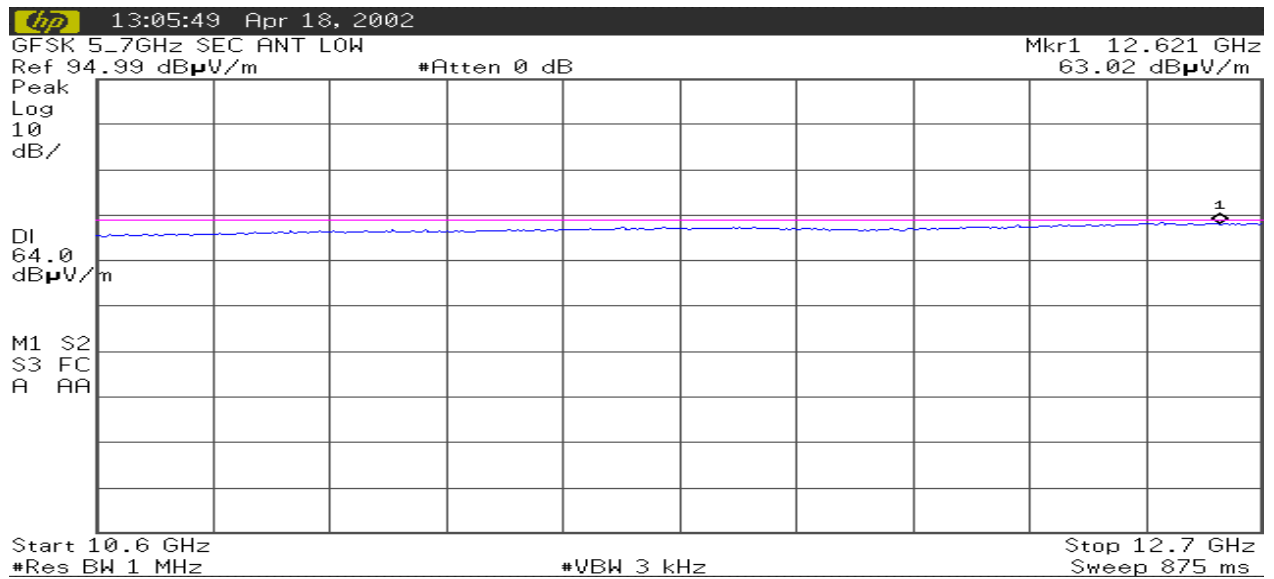
Page 23 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 11

Radiated emissions measured in restricted band 10.6 –12.7GHz

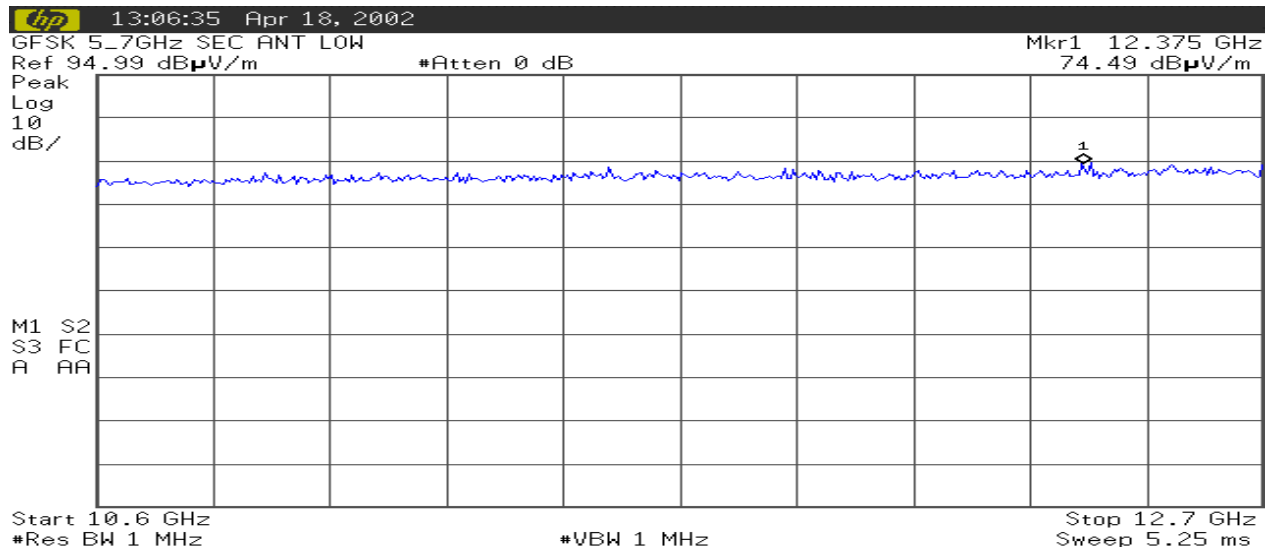
Antenna: Sector
operating frequency: Low
Detector used: Average



Plot # 12

Radiated emissions measured in restricted band 10.6 –12.7GHz

Antenna: Sector
operating frequency: Low
Detector used: Peak



Test Report No.: 8212308340 Rev.1

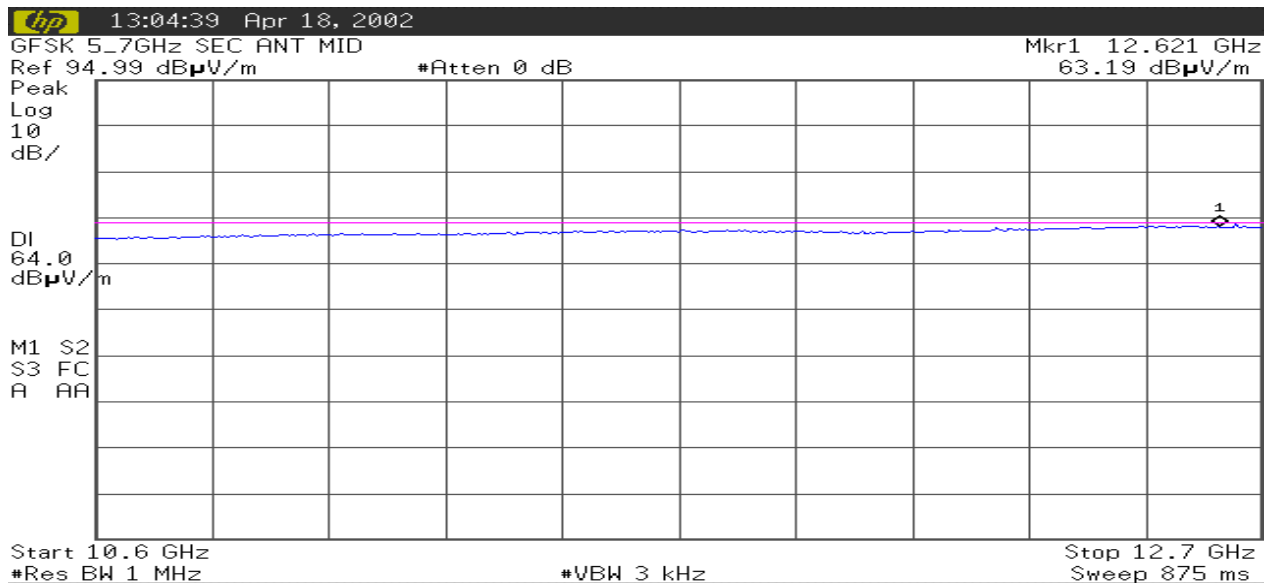
Page 24 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 13

Radiated emissions measured in restricted band 10.6 –12.7GHz

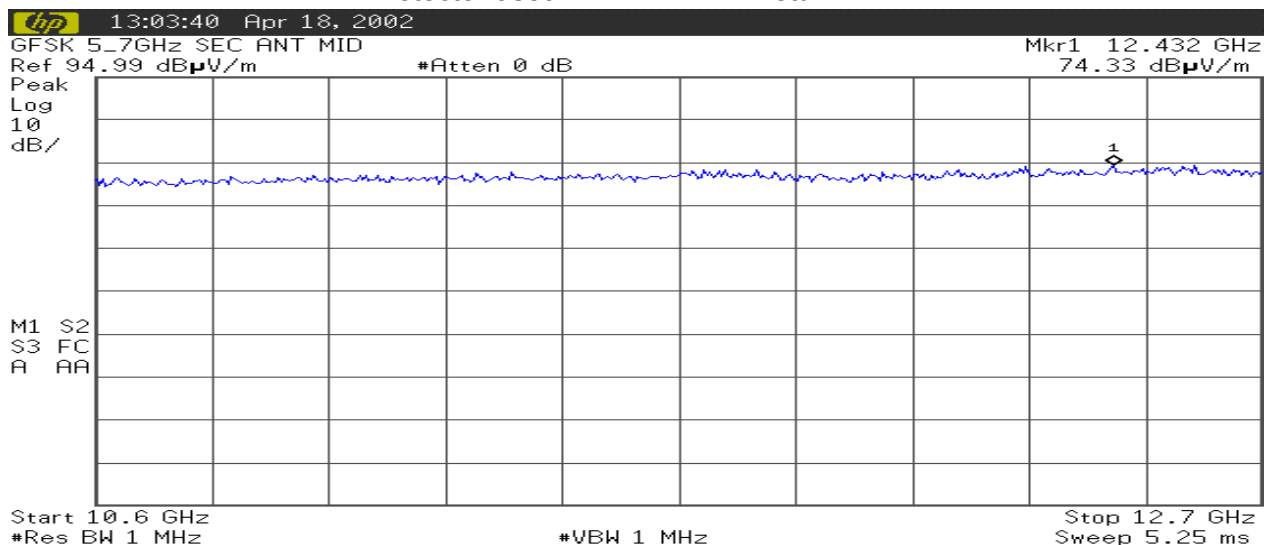
Antenna: Sector
operating frequency: Middle
Detector used: Average



Plot # 14

Radiated emissions measured in restricted band 10.6 –12.7GHz

Antenna: Sector
operating frequency: Middle
Detector used: Peak



Test Report No.: 8212308340 Rev.1

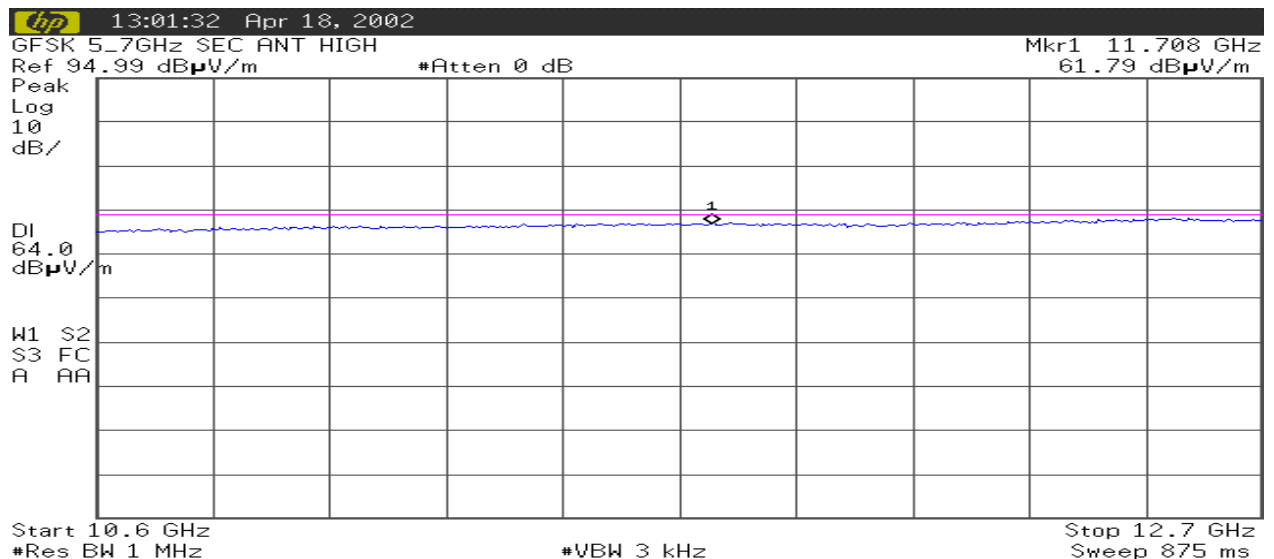
Page 25 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 15

Radiated emissions measured in restricted band 10.6 –12.7GHz

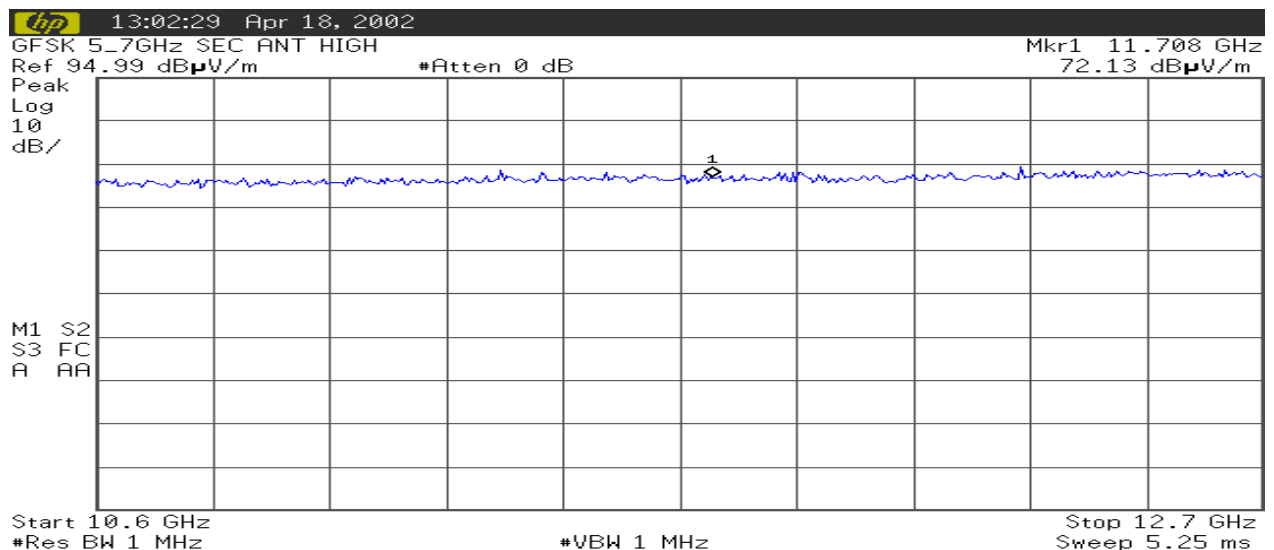
Antenna: Sector
operating frequency: High
Detector used: Average



Plot # 16

Radiated emissions measured in restricted band 10.6 –12.7GHz

Antenna: Sector
operating frequency: High
Detector used: Peak



Test Report No.: 8212308340 Rev.1

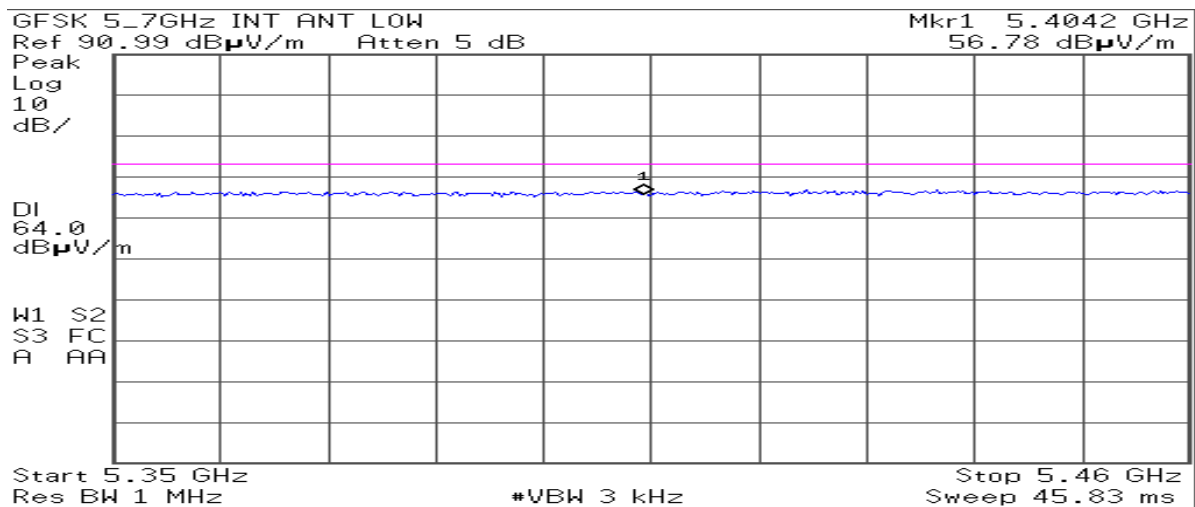
Page 26 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 17

Radiated emissions measured in restricted band 5.35 –5.46 GHz

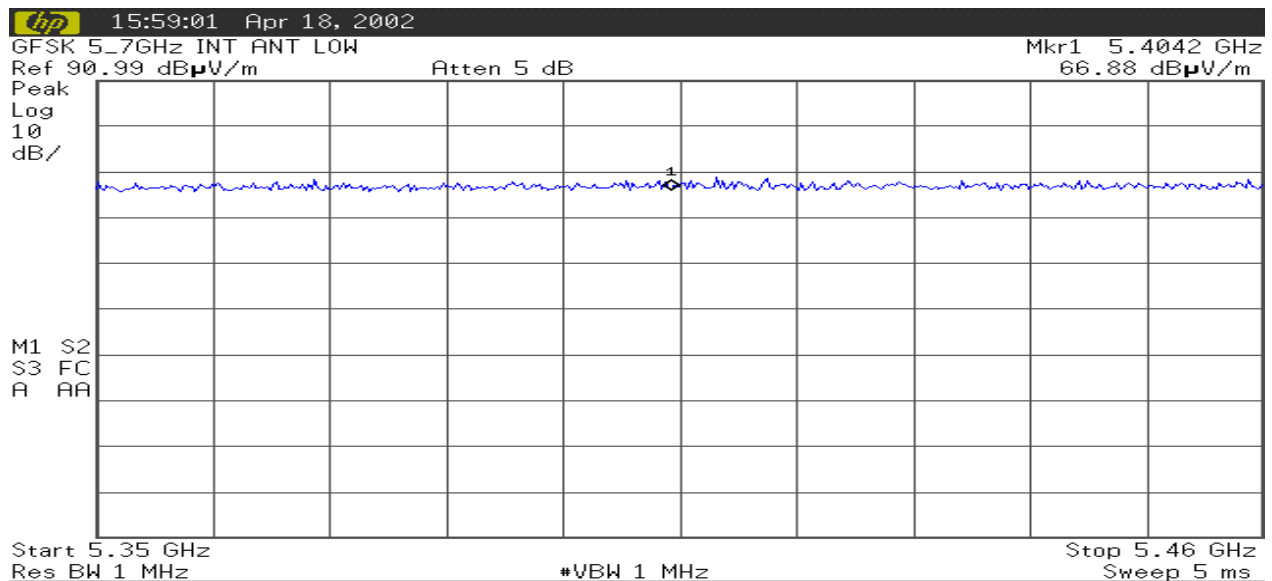
Antenna: INTEGRATED
operating frequency: Low
Detector used: Average



Plot # 18

Radiated emissions measured in restricted band 5.35 –5.46 GHz

Antenna: INTEGRATED
operating frequency: Low
Detector used: Peak



Test Report No.: 8212308340 Rev.1

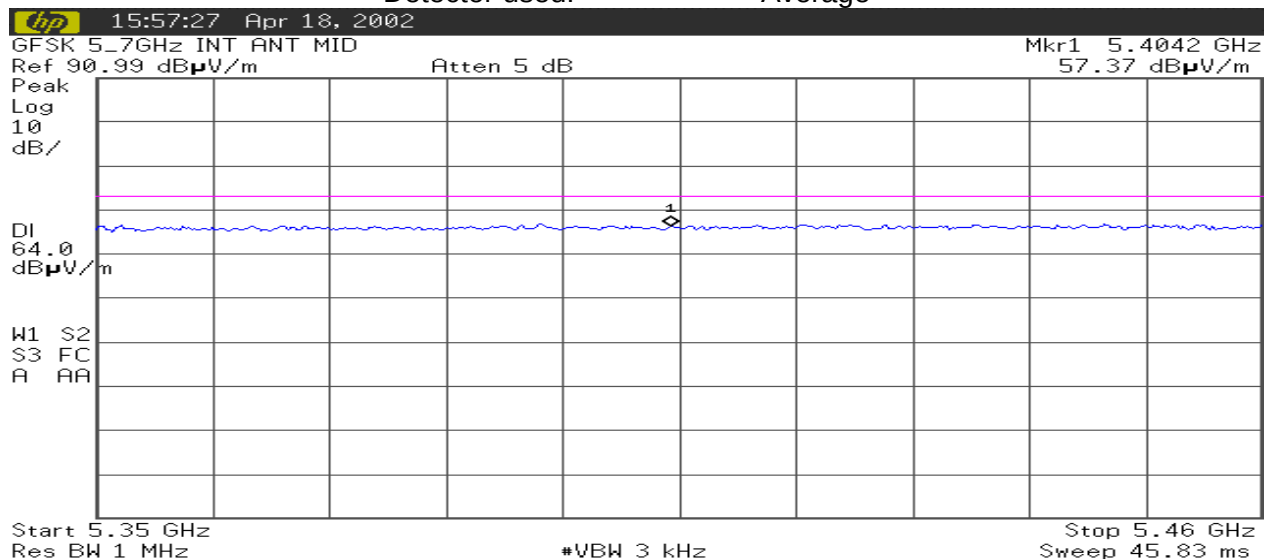
Page 27 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 19

Radiated emissions measured in restricted band 5.35 –5.46 GHz

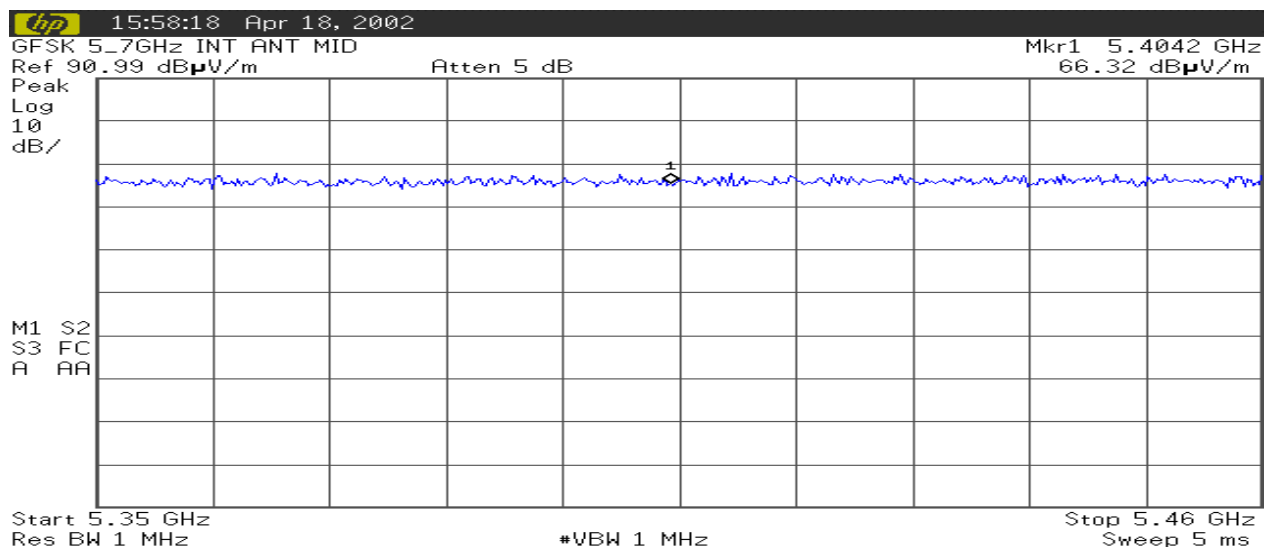
Antenna: INTEGRATED
operating frequency: MID
Detector used: Average



Plot # 20

Radiated emissions measured in restricted band 5.35 –5.46 GHz

Antenna: INTEGRATED
operating frequency: MID
Detector used: Peak



Test Report No.: 8212308340 Rev.1

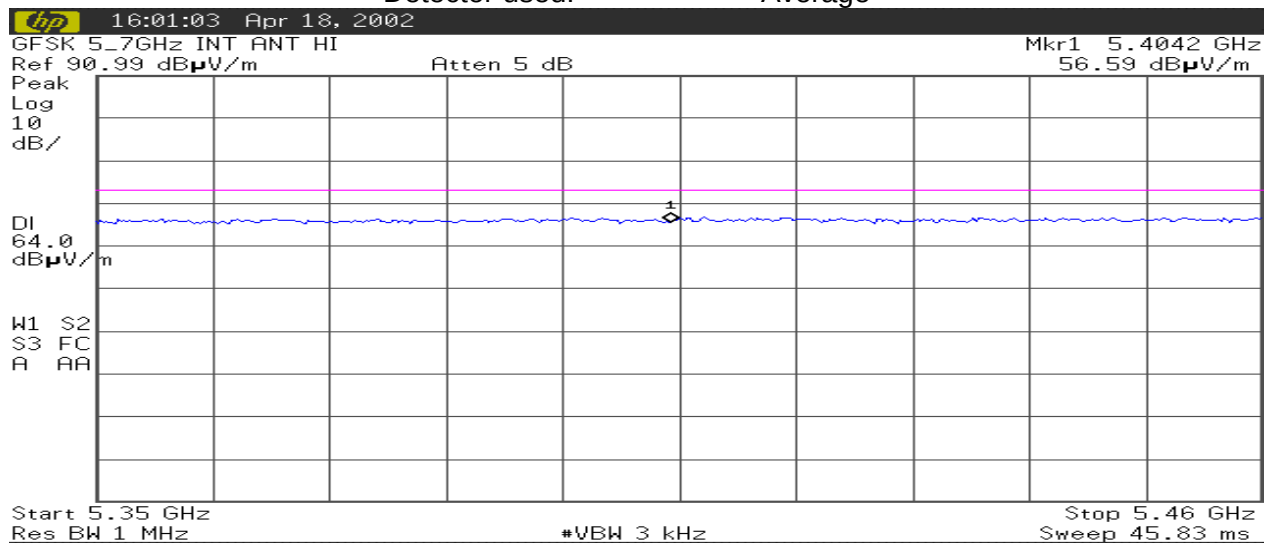
Page 28 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 21

Radiated emissions measured in restricted band 5.35 –5.46 GHz

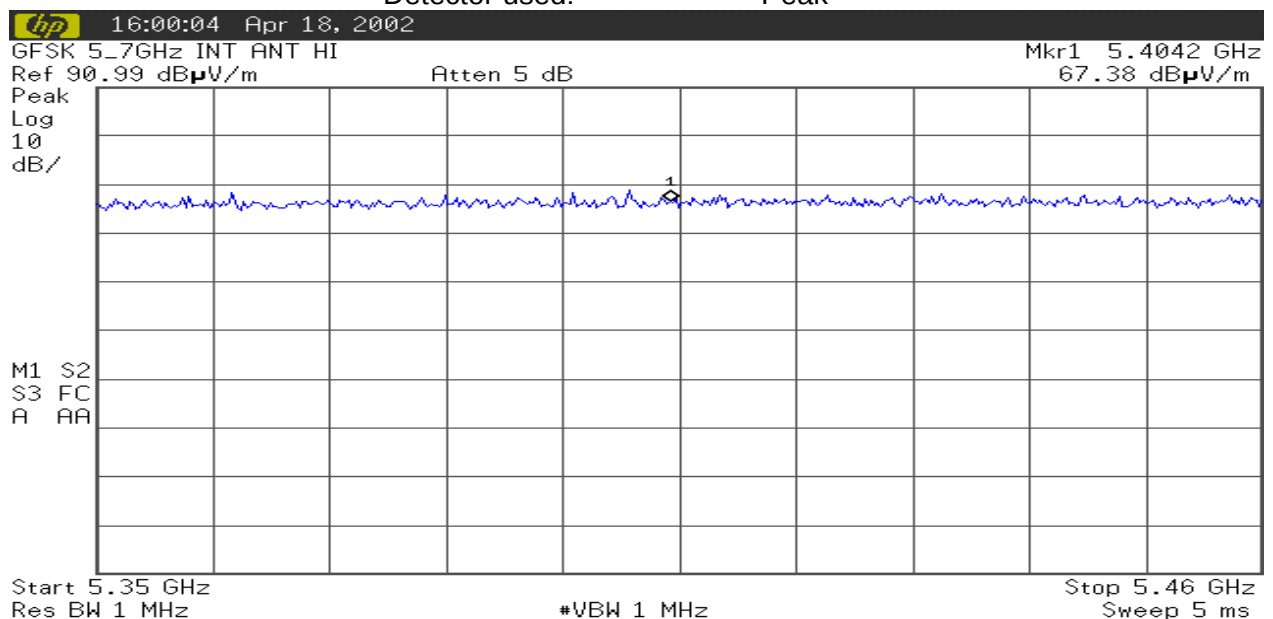
Antenna: INTEGRATED
operating frequency: High
Detector used: Average



Plot # 22

Radiated emissions measured in restricted band 5.35 –5.46 GHz

Antenna: INTEGRATED
operating frequency: High
Detector used: Peak



Test Report No.: 8212308340 Rev.1

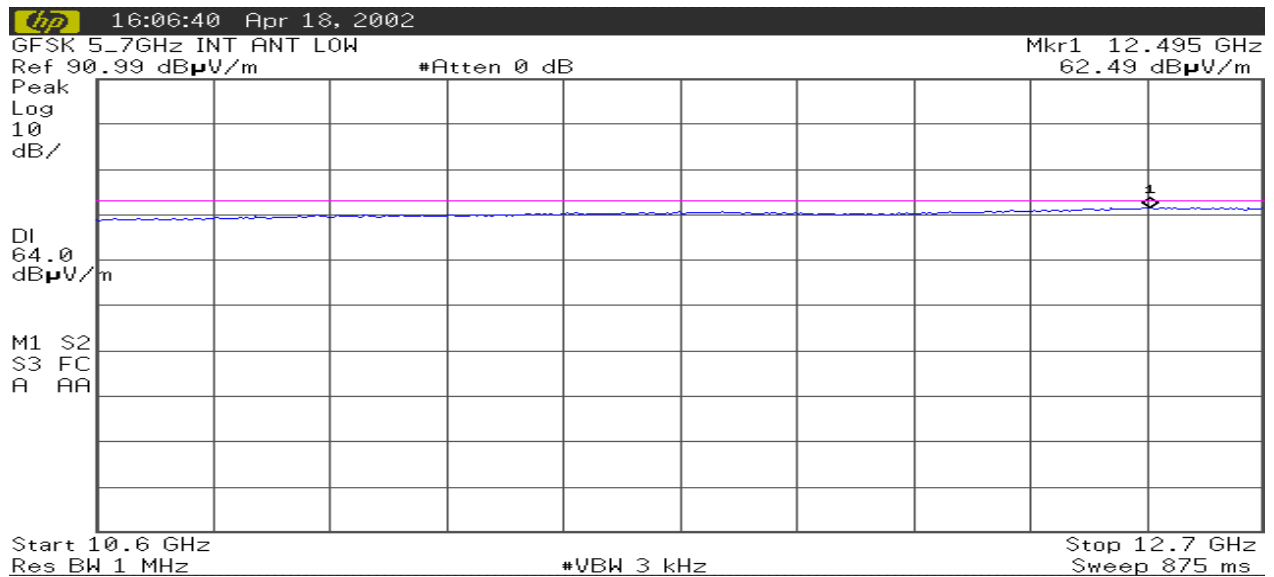
Page 29 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 23

Radiated emissions measured in restricted band 10.6 –12.7 GHz

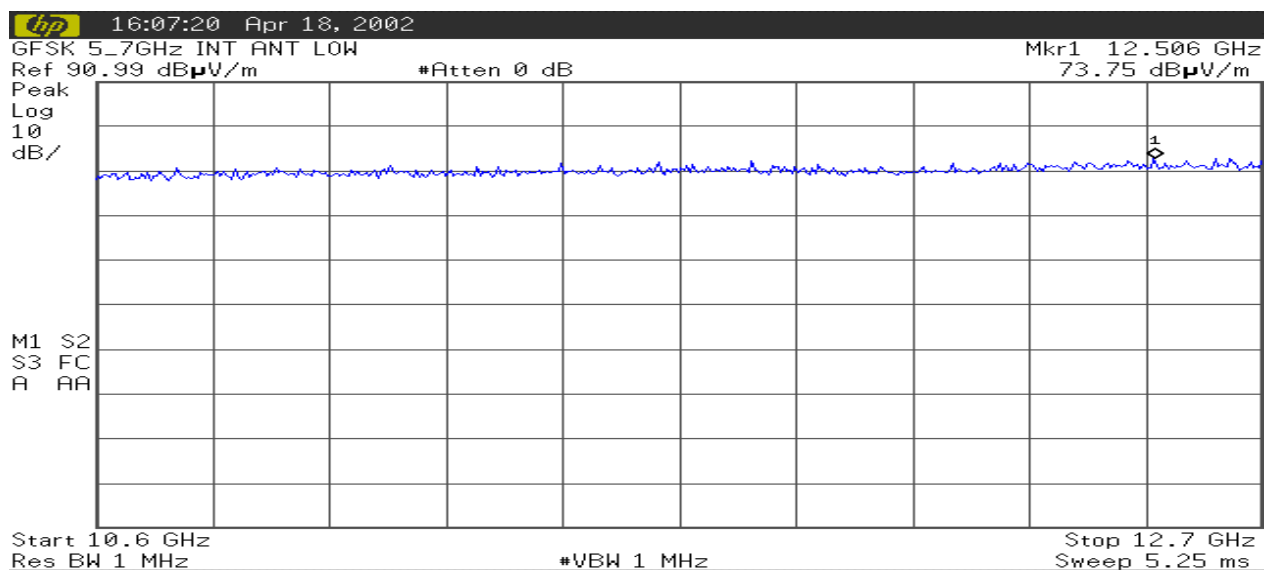
Antenna: INTEGRATED
operating frequency: Low
Detector used: Average



Plot # 24

Radiated emissions measured in restricted band 10.6 –12.7 GHz

Antenna: INTEGRATED
operating frequency: Low
Detector used: Peak





Test Report No.: 8212308340 Rev.1

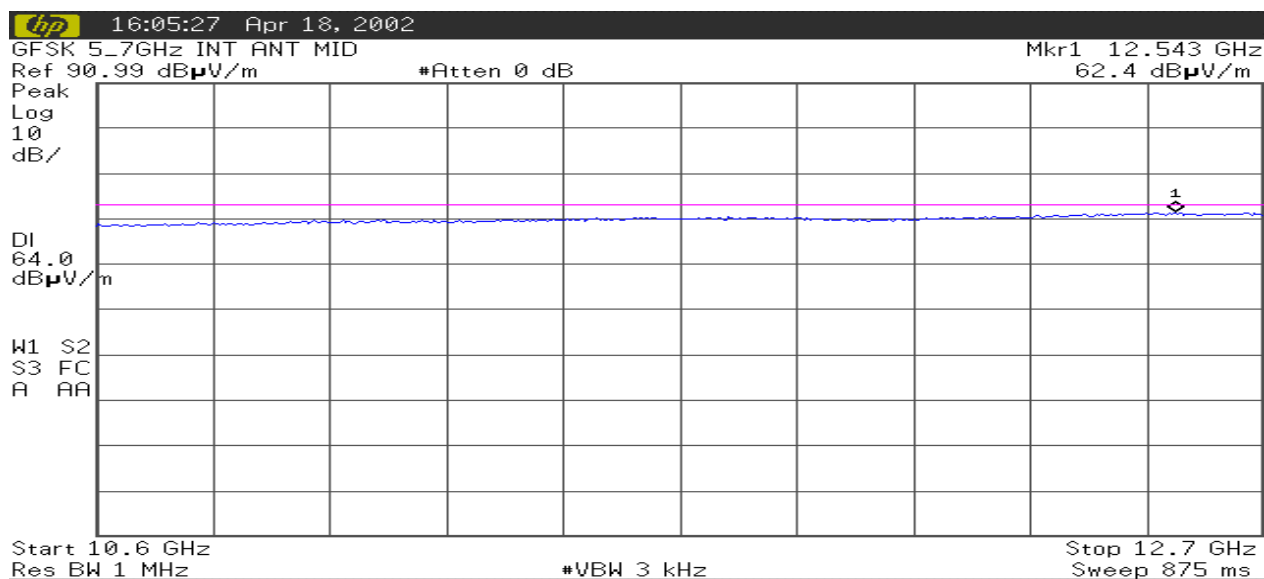
Page 30 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

Plot # 25

Radiated emissions measured in restricted band 10.6 –12.7 GHz

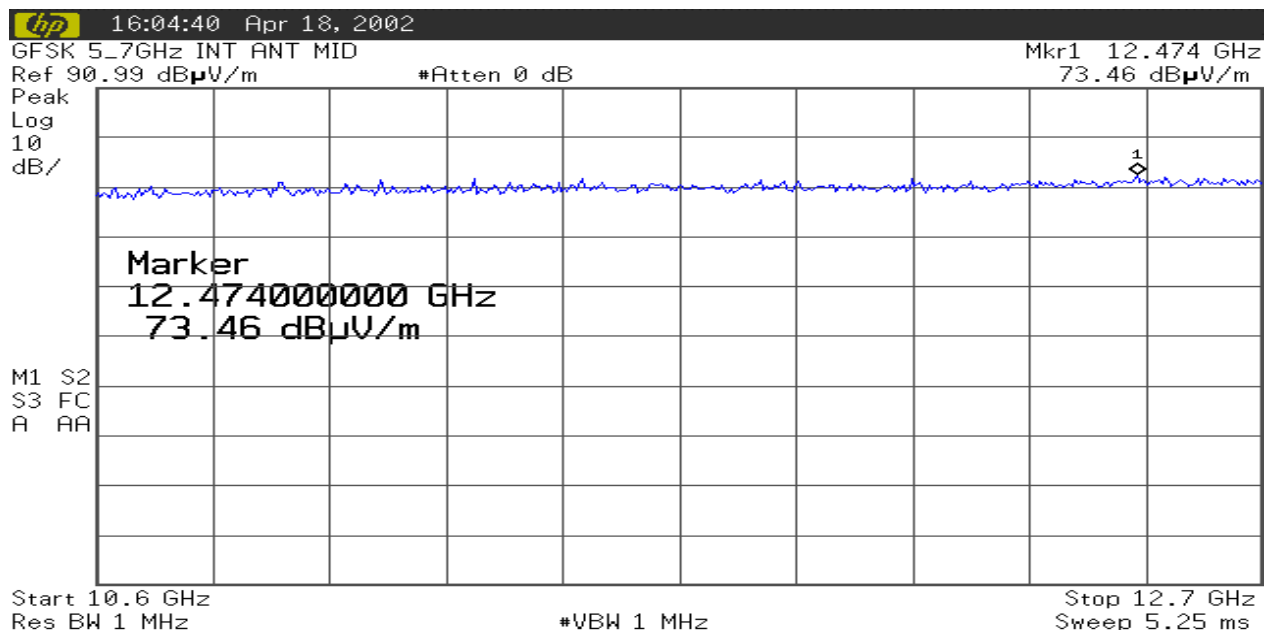
Antenna: INTEGRATED
operating frequency: MID
Detector used: Average



Plot # 26

Radiated emissions measured in restricted band 10.6 –12.7 GHz

Antenna: INTEGRATED
operating frequency: MID
Detector used: Peak



Test Report No.: 8212308340 Rev.1

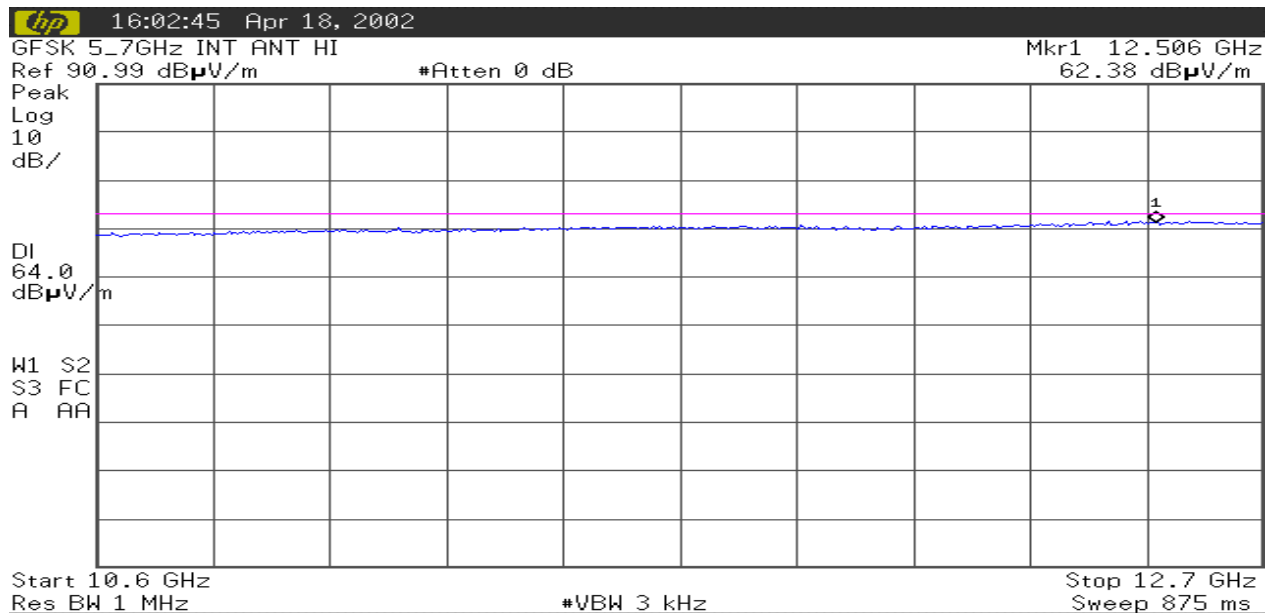
Page 31 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 27

Radiated emissions measured in restricted band 10.6 –12.7 GHz

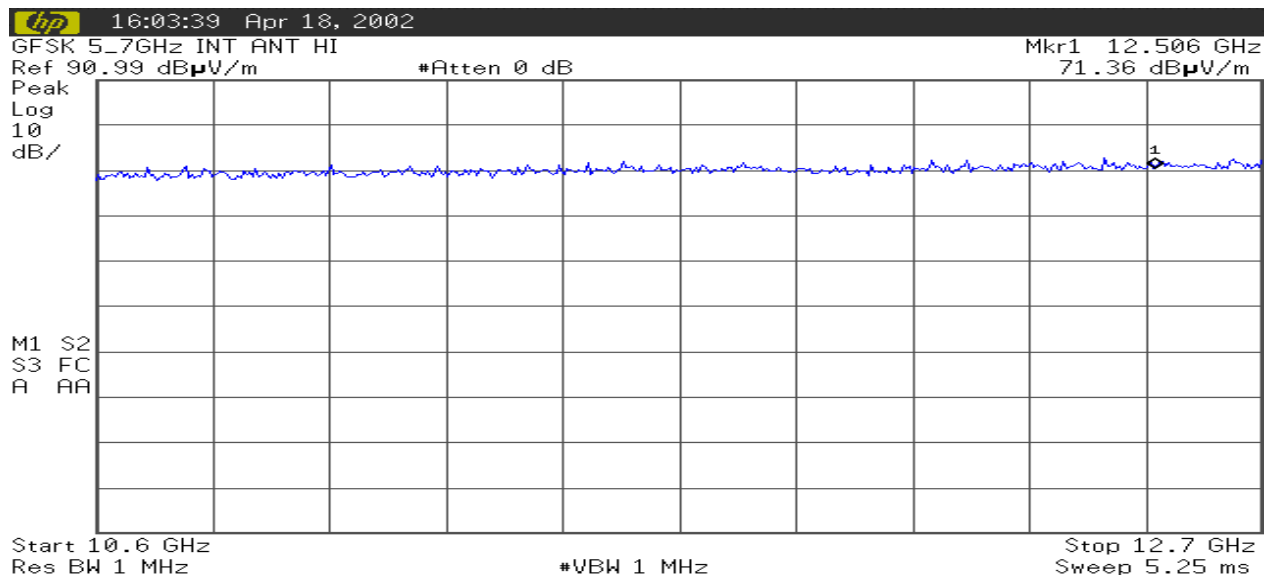
Antenna: INTEGRATED
operating frequency: High
Detector used: Average



Plot # 28

Radiated emissions measured in restricted band 10.6 –12.7 GHz

Antenna: INTEGRATED
operating frequency: High
Detector used: Peak



Test Report No.: 8212308340 Rev.1

Page 32 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

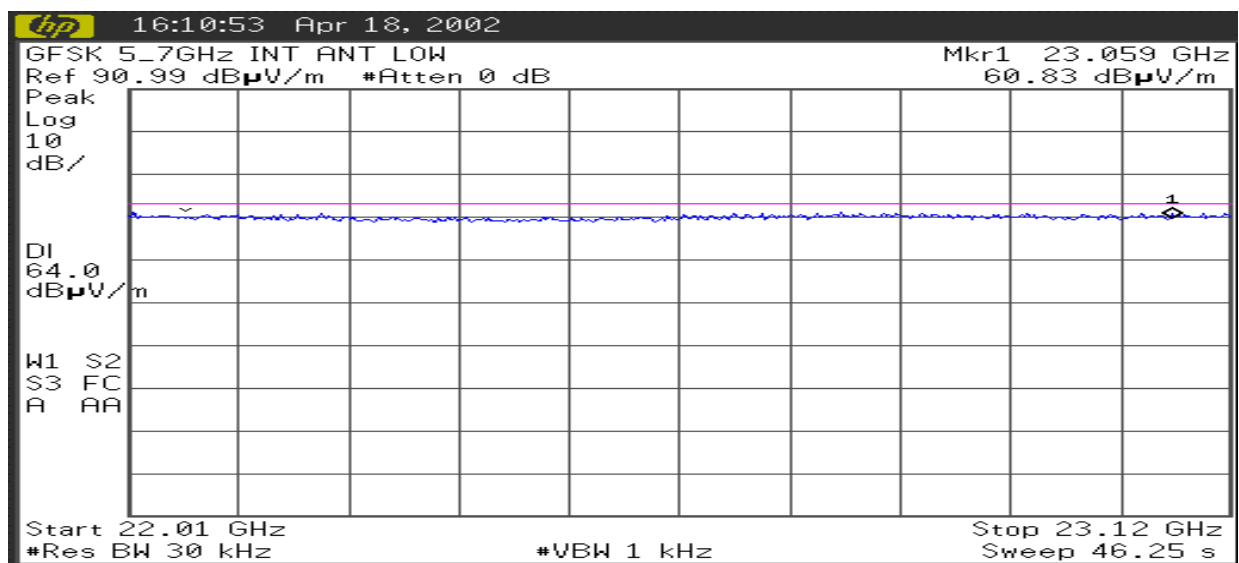
Plot # 29

Radiated emissions measured in restricted band 22.01 –23.12 GHz

Antenna: INTEGRATED

Operating frequency: Low

Detector used: Average



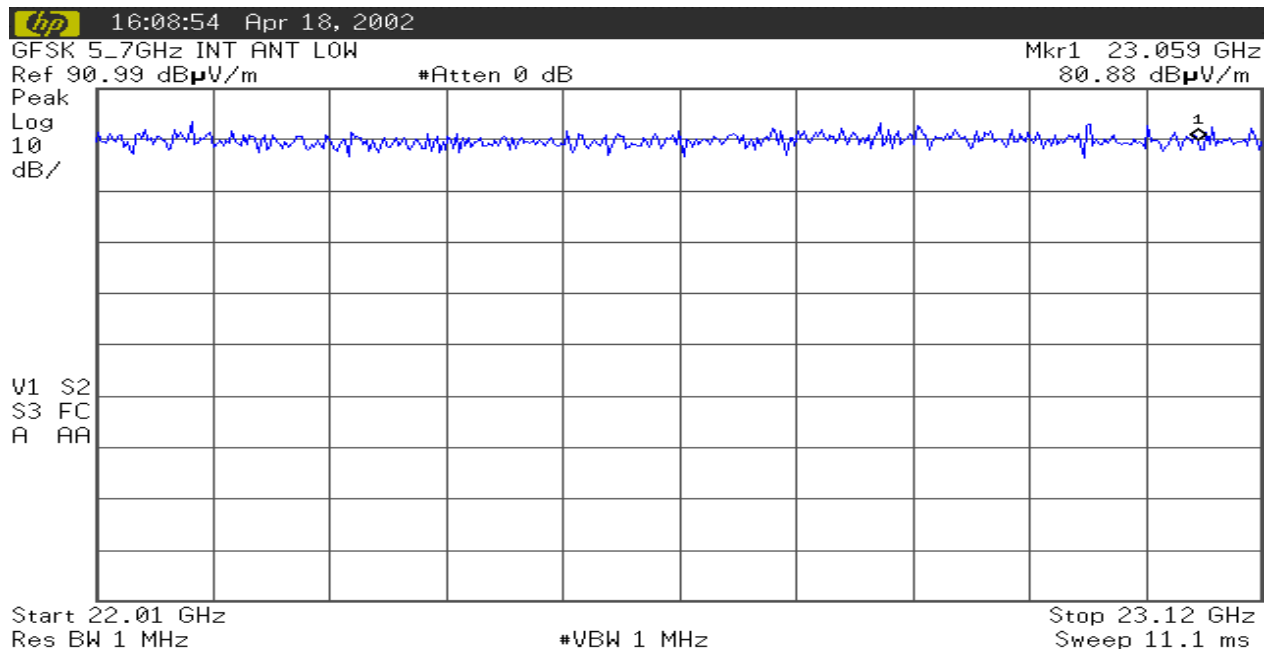
Plot # 30

Radiated emissions measured in restricted band 22.01 –23.12 GHz

Antenna: INTEGRATED

Operating frequency: Low

Detector used: Peak



Test Report No.: 8212308340 Rev.1

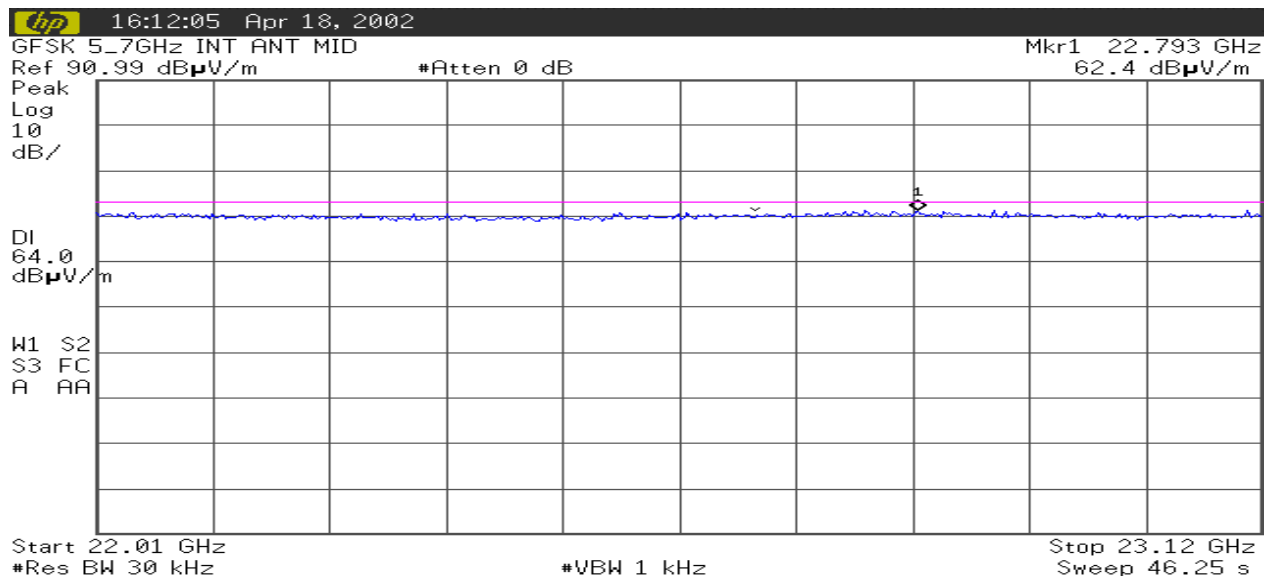
Page 33 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 31

Radiated emissions measured in restricted band 22.01 –23.12 GHz

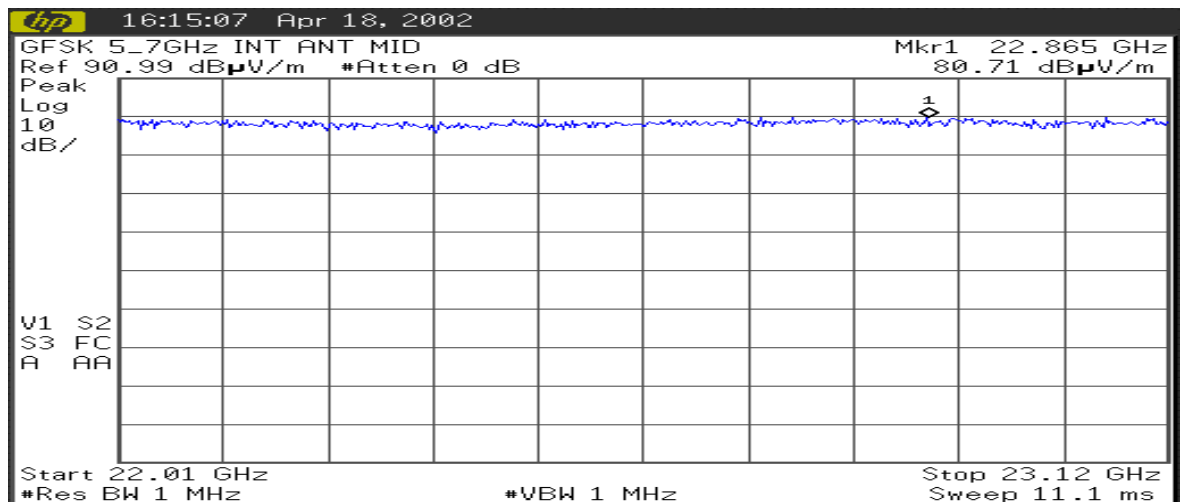
Antenna: INTEGRATED
Operating frequency: MID
Detector used: Average



Plot # 32

Radiated emissions measured in restricted band 22.01 –23.12 GHz

Antenna: INTEGRATED
Operating frequency: MID
Detector used: Peak





Test Report No.: 8212308340 Rev.1

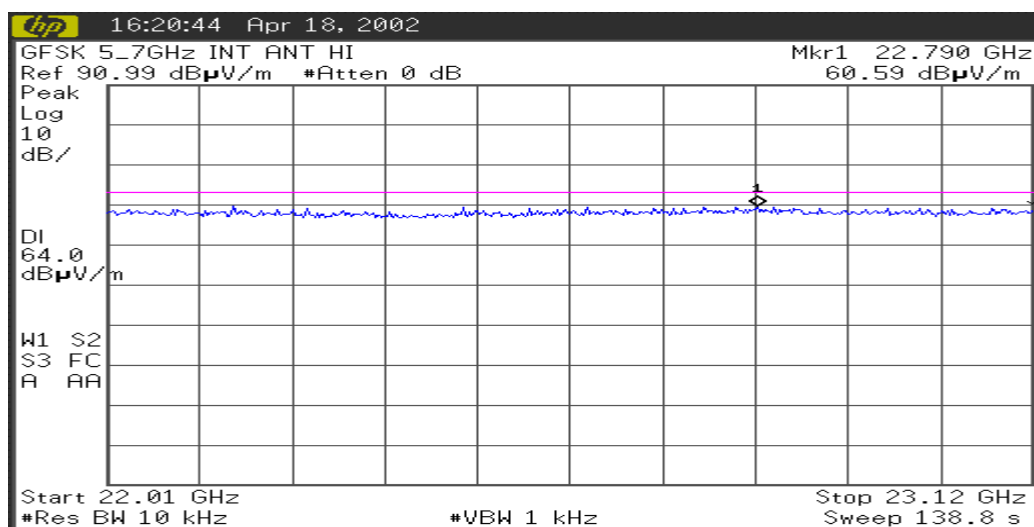
Page 34 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

Plot # 33

Radiated emissions measured in restricted band 22.01 –23.12 GHz

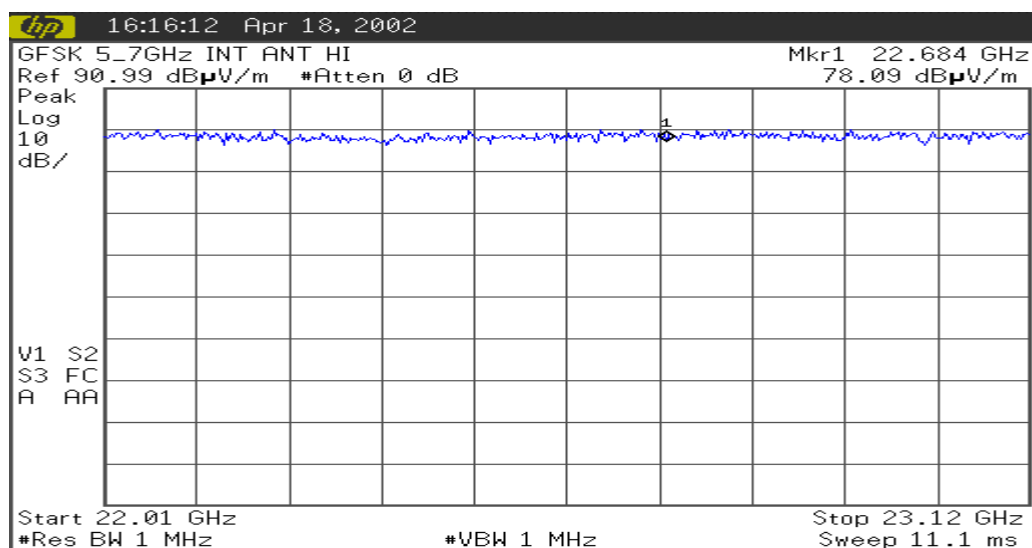
Antenna: INTEGRATED
Operating frequency: High
Detector used: Average



Plot # 34

Radiated emissions measured in restricted band 22.01 –23.12 GHz

Antenna: INTEGRATED
operating frequency: High
Detector used: Peak



Test Report No.: 8212308340 Rev.1

Page 35 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

3.6 Spurious Emission, Antenna conducted:

3.6.1 Requirements:

RF conducted spurious emissions shall not exceed value required in sections 15.247 (c).

3.6.2 Test procedure:

The EUTs antenna connector was connected to the spectrum analyzer input via 20 dB attenuator.

The measurements were performed from 30 MHz to 40 GHz for low, middle and high channels were the unit was set to packetized transmission.

3.6.3 Test results:

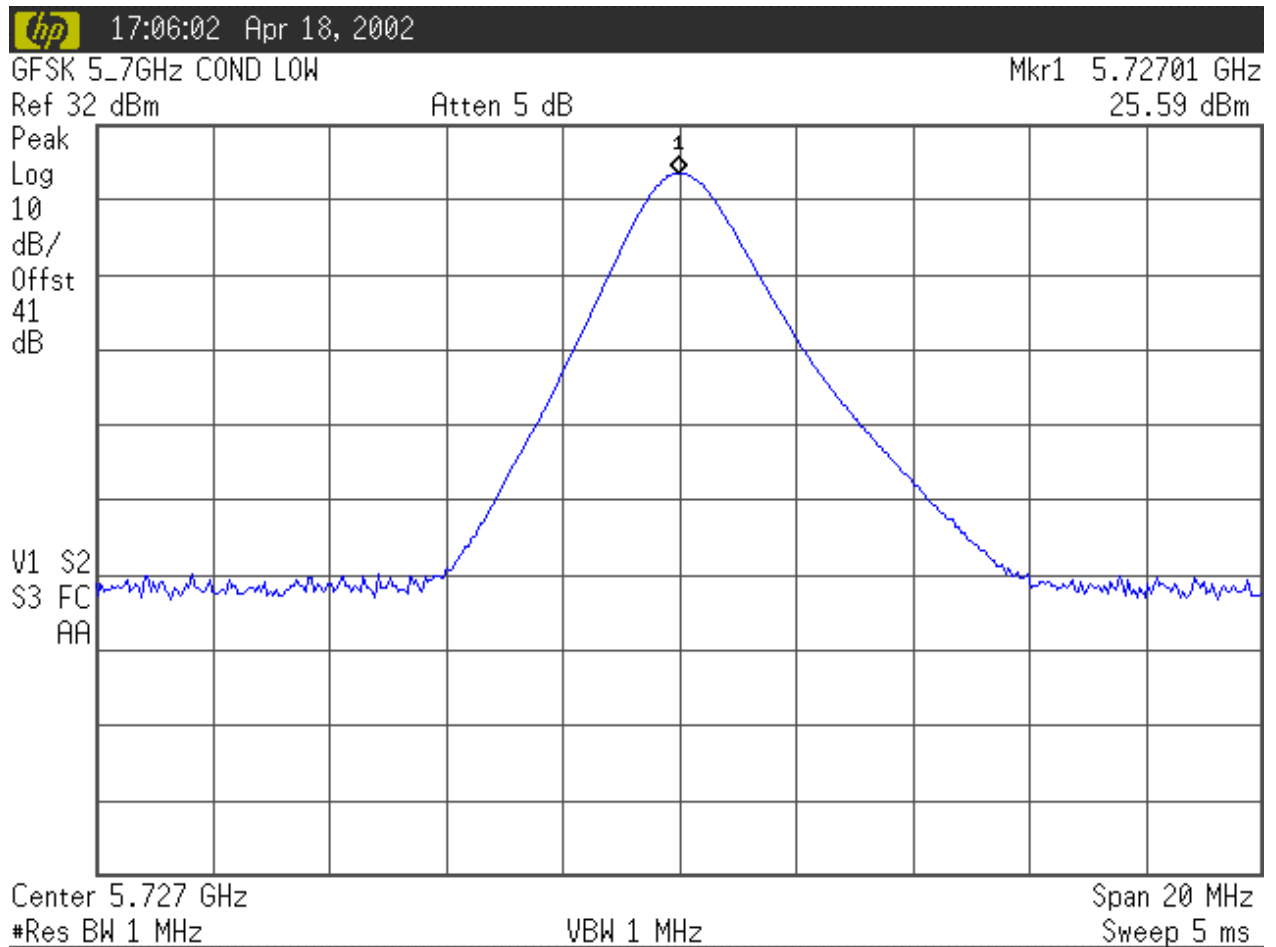
Test results are shown in Plots #35 to # 99.

Test Report No.: 8212308340 Rev.1

Page 36 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 35
Antenna conducted, Output power, Low operating frequency

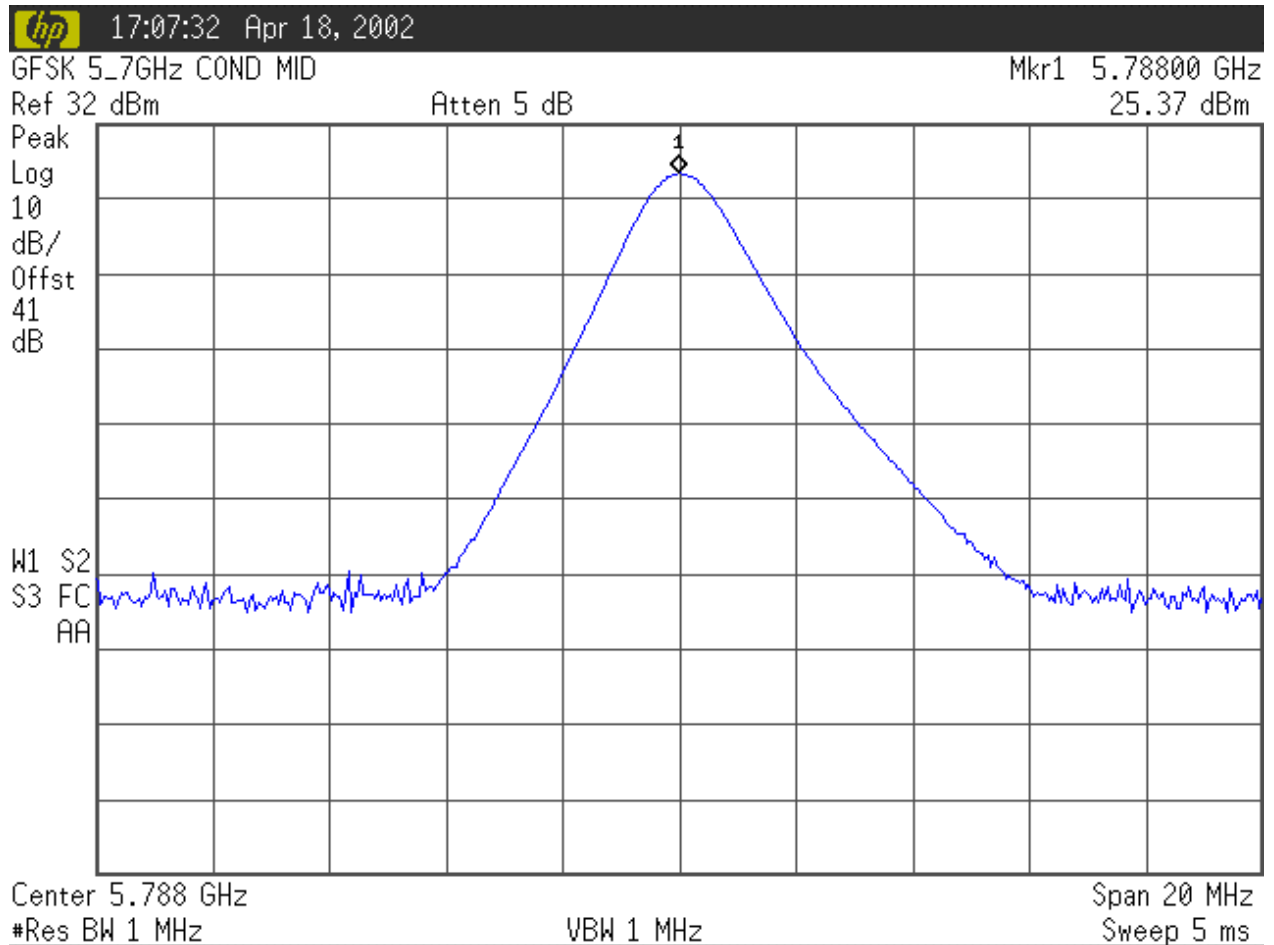


Test Report No.: 8212308340 Rev.1

Page 37 of 73 Pages

**Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system**

Plot # 36
Antenna conducted, Output power, MID operating frequency

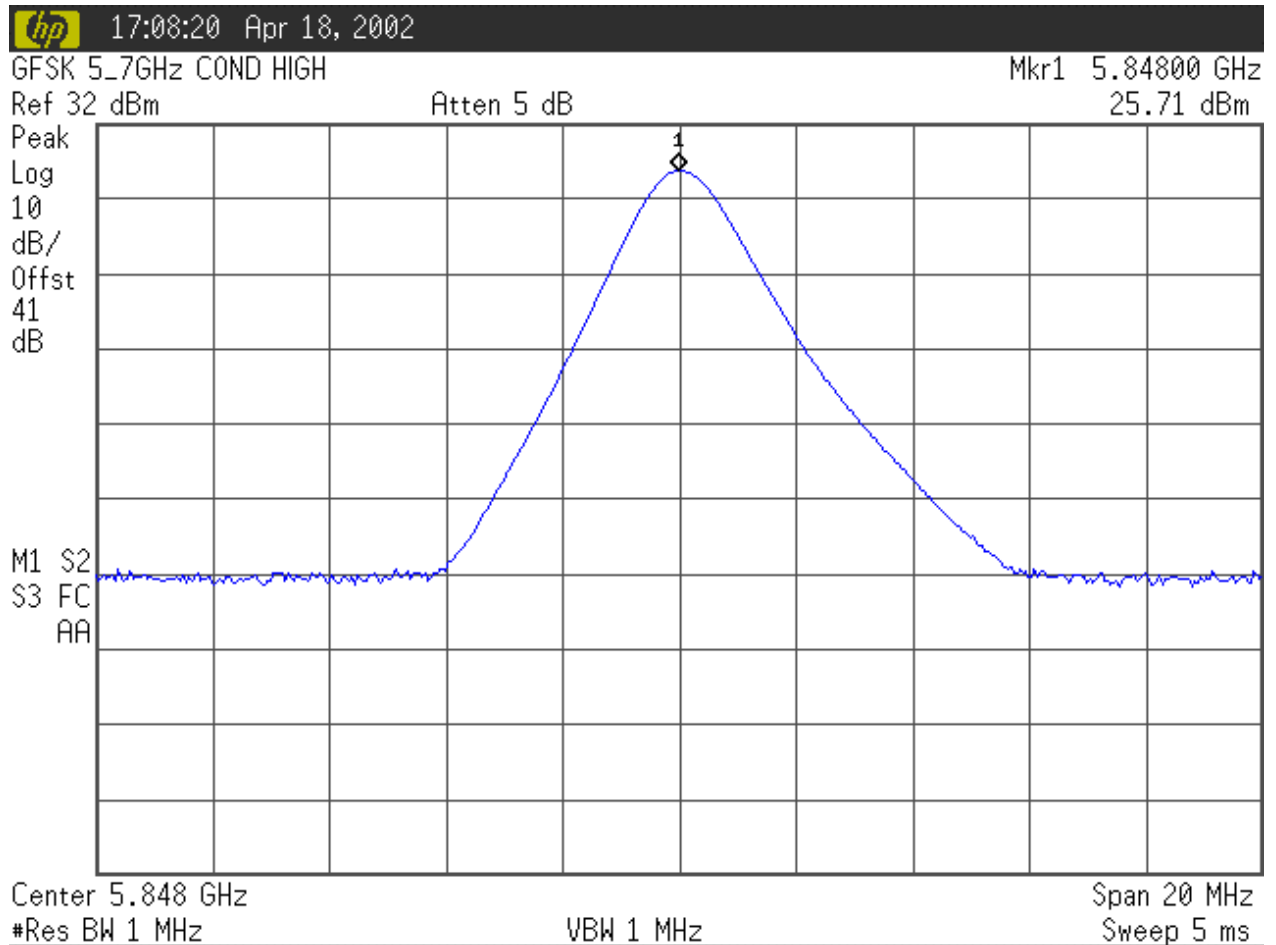


Test Report No.: 8212308340 Rev.1

Page 38 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 37
Antenna conducted, Output power, HIGH operating frequency



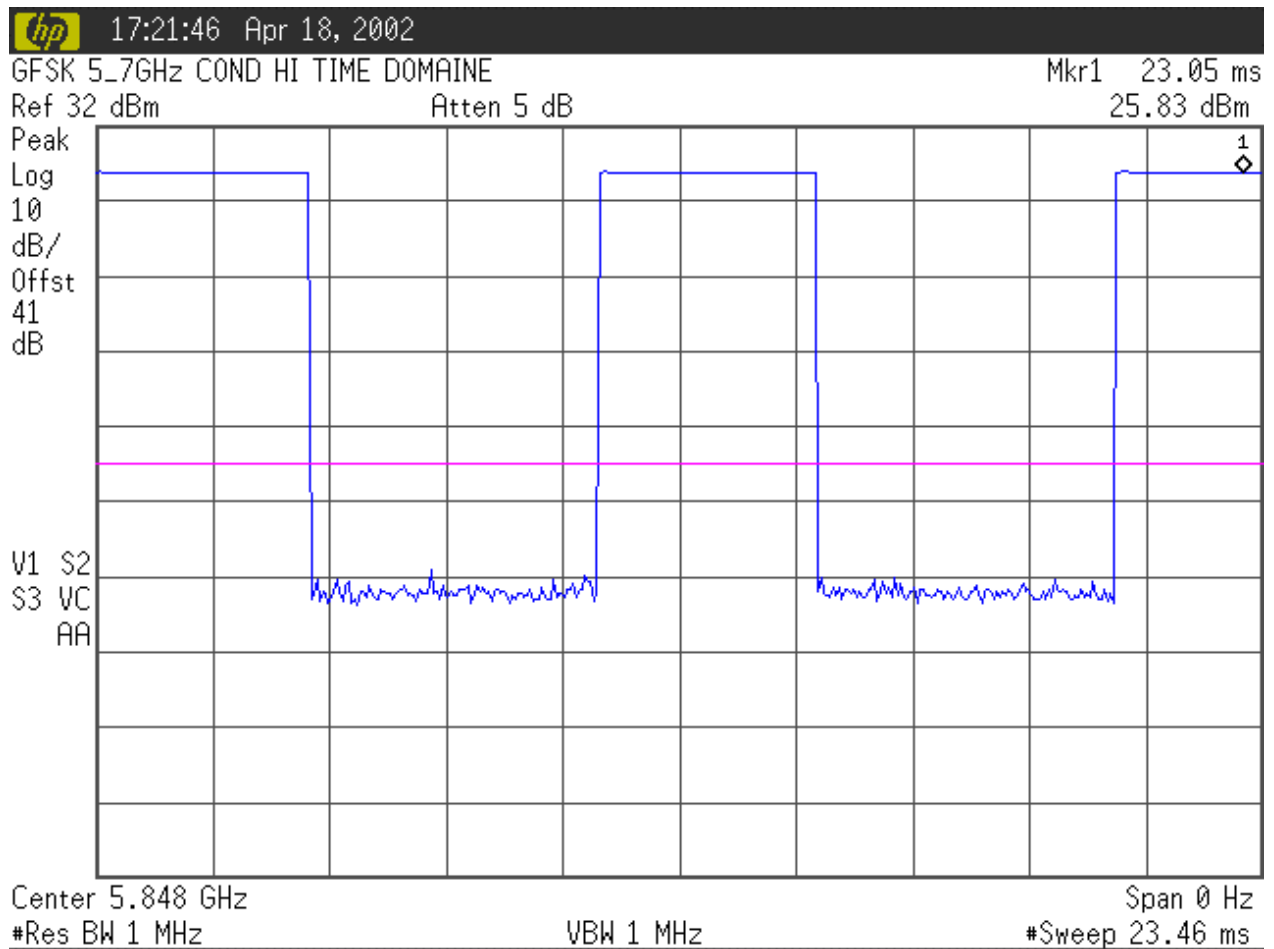
Test Report No.: 8212308340 Rev.1

Page 39 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 38

High operating frequency Time domain, single channel

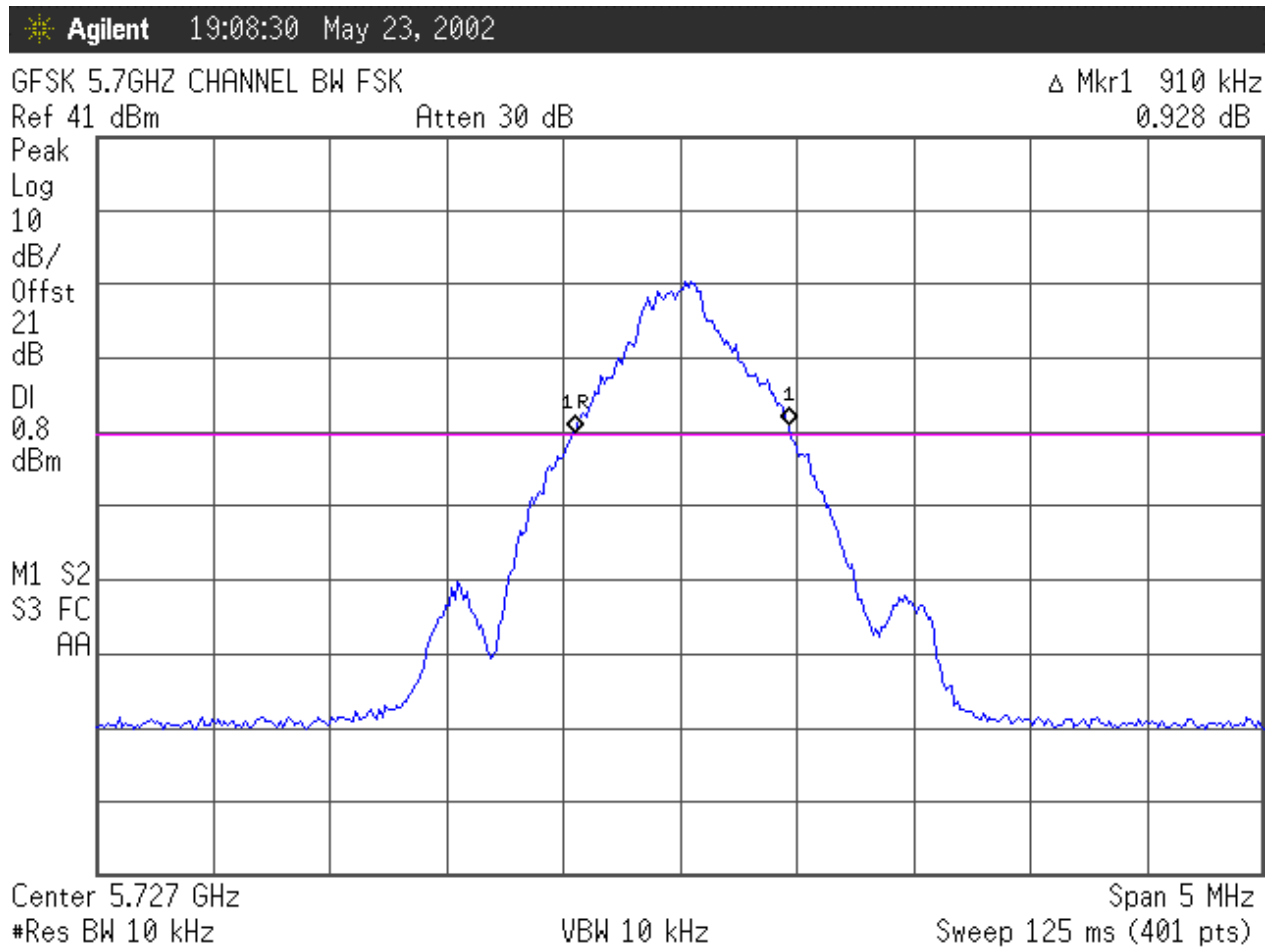


Test Report No.: 8212308340 Rev.1

Page 40 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 86
20 dB channel bandwidth, FSK Low

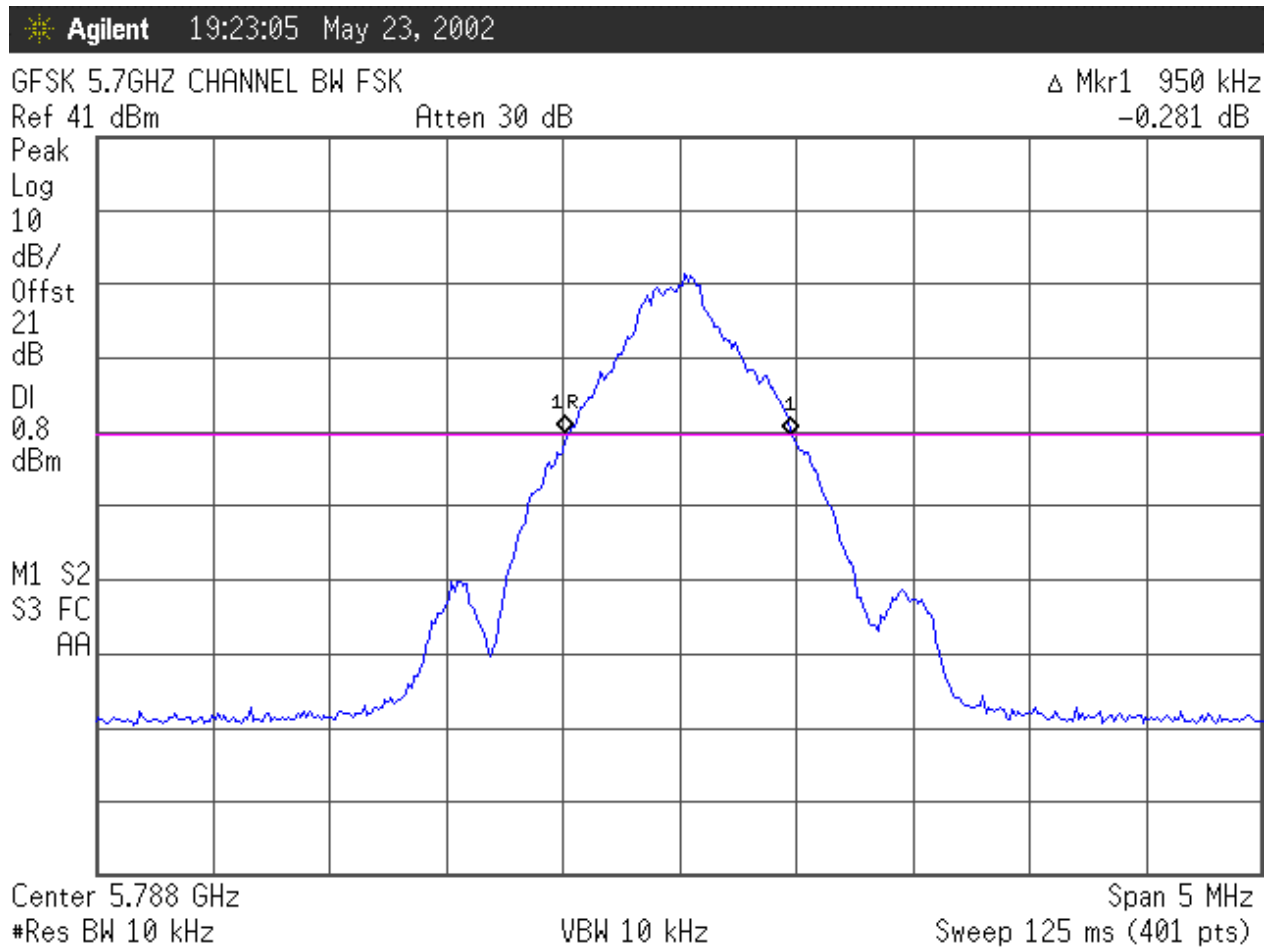


Test Report No.: 8212308340 Rev.1

Page 41 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 87
20 dB channel bandwidth, FSK Middle

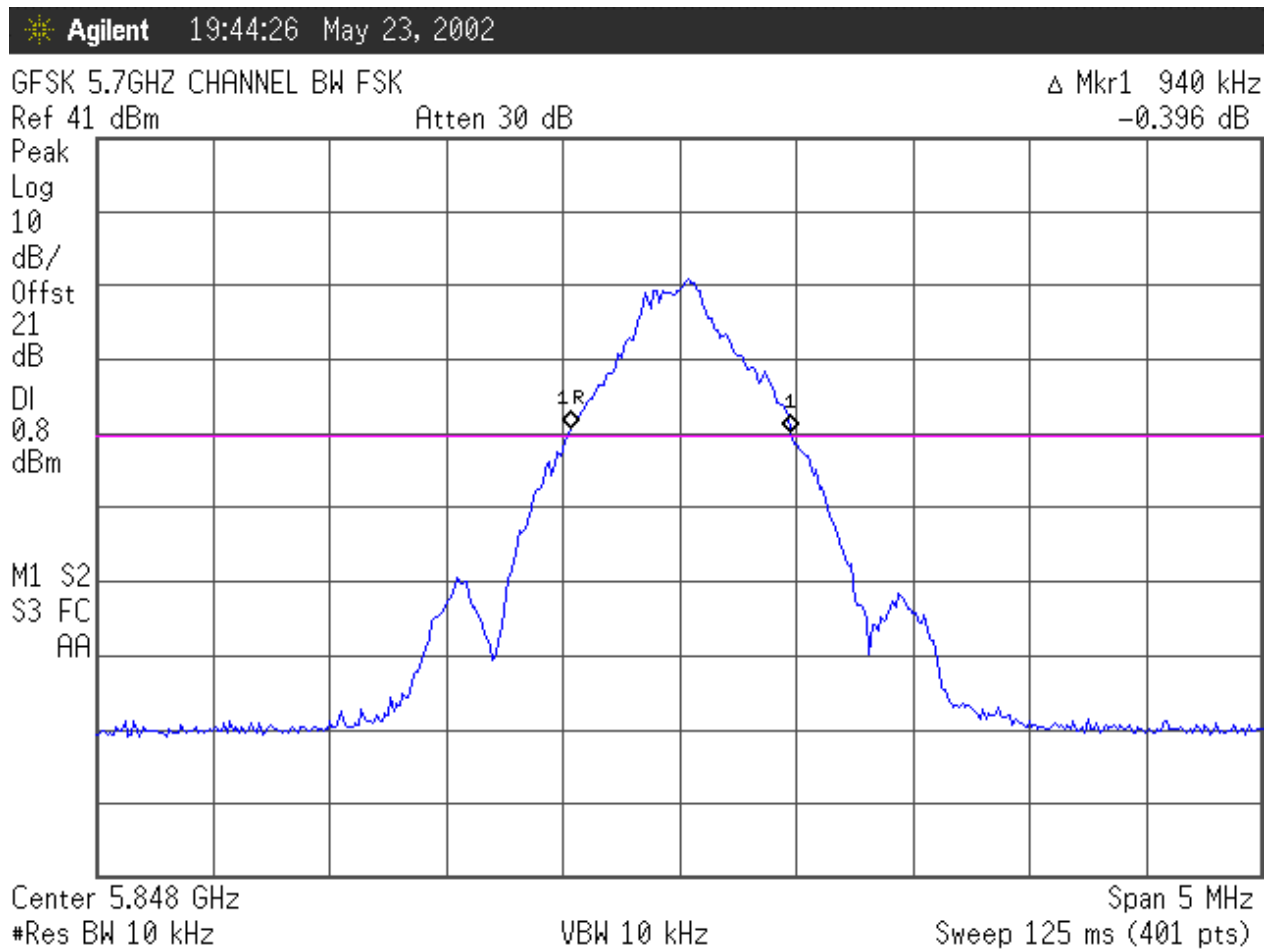


Test Report No.: 8212308340 Rev.1

Page 42 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 93
20 dB channel bandwidth, FSK High

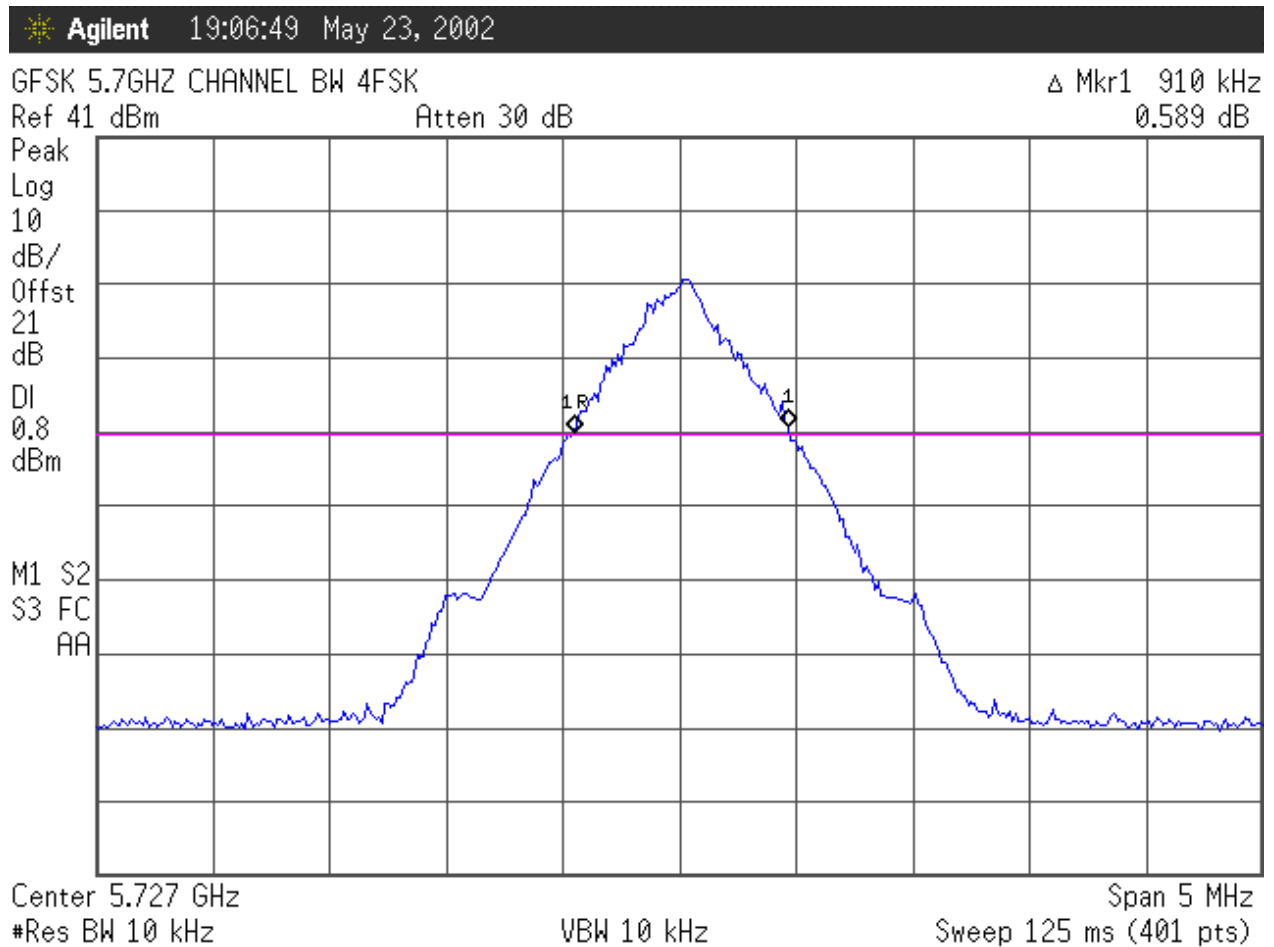


Test Report No.: 8212308340 Rev.1

Page 43 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

Plot # 85
20 dB channel bandwidth, 4FSK Low

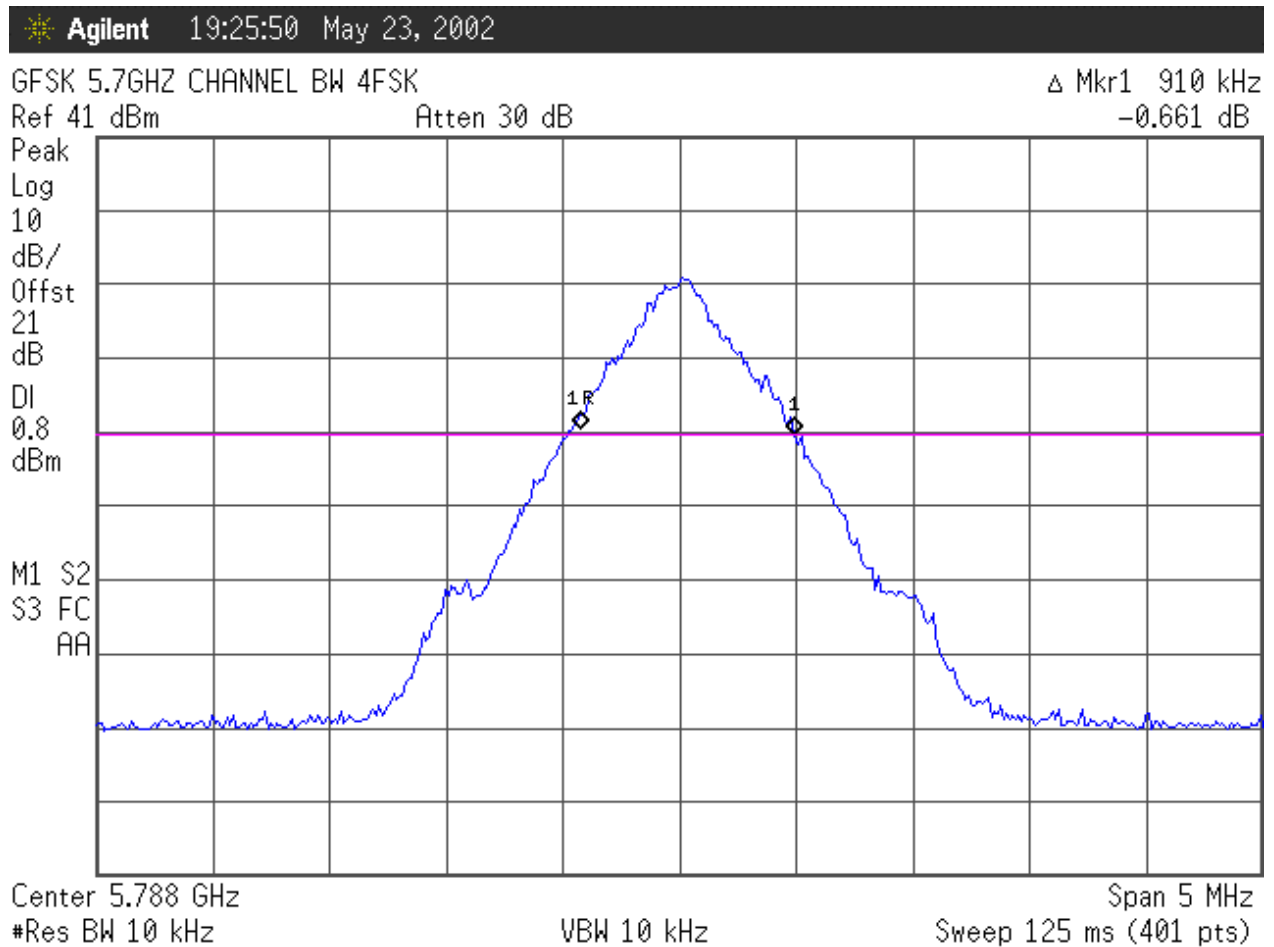


Test Report No.: 8212308340 Rev.1

Page 44 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 88
20 dB channel bandwidth, 4FSK Middle

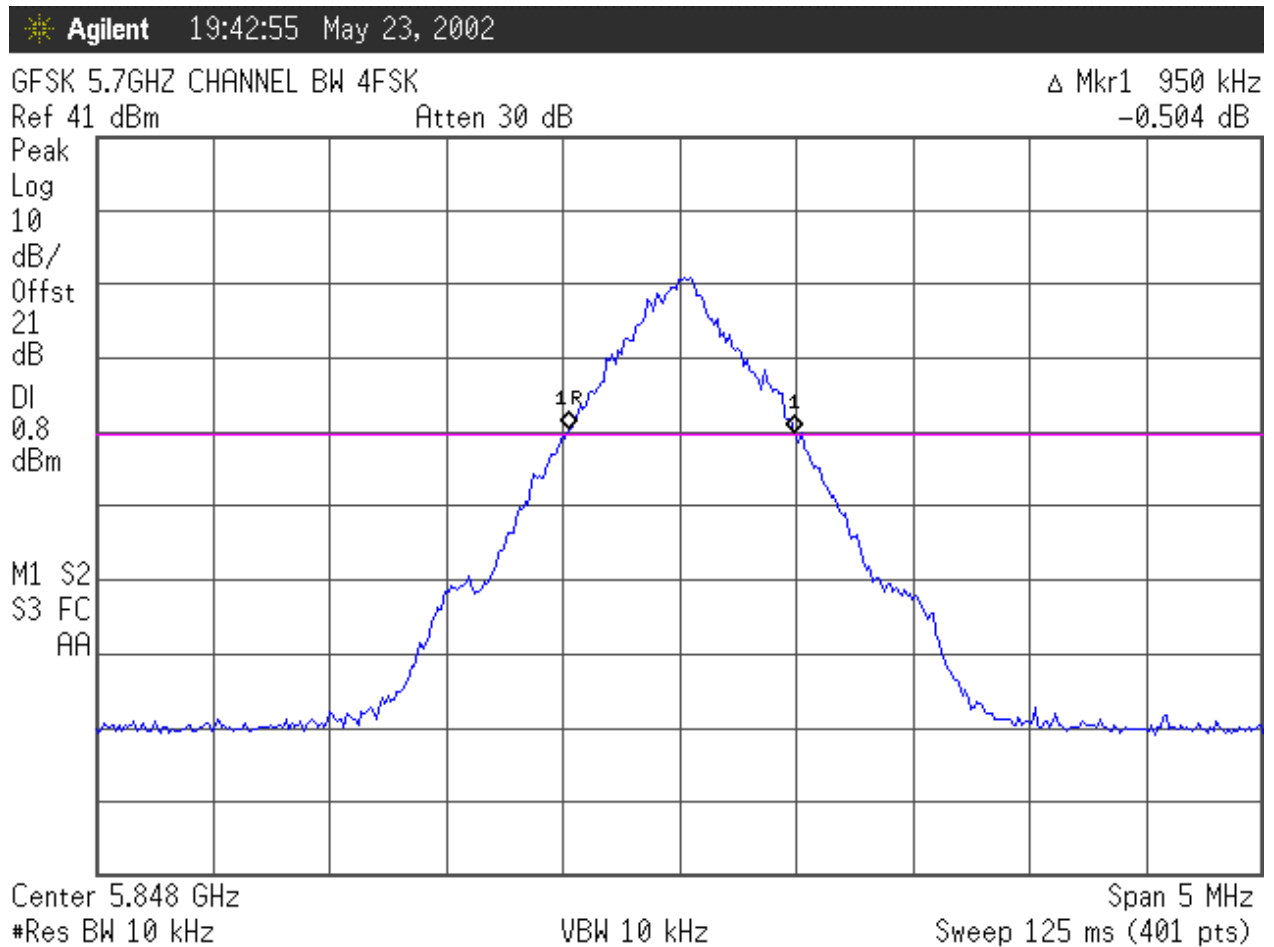


Test Report No.: 8212308340 Rev.1

Page 45 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 92
20 dB channel bandwidth, 4FSK High

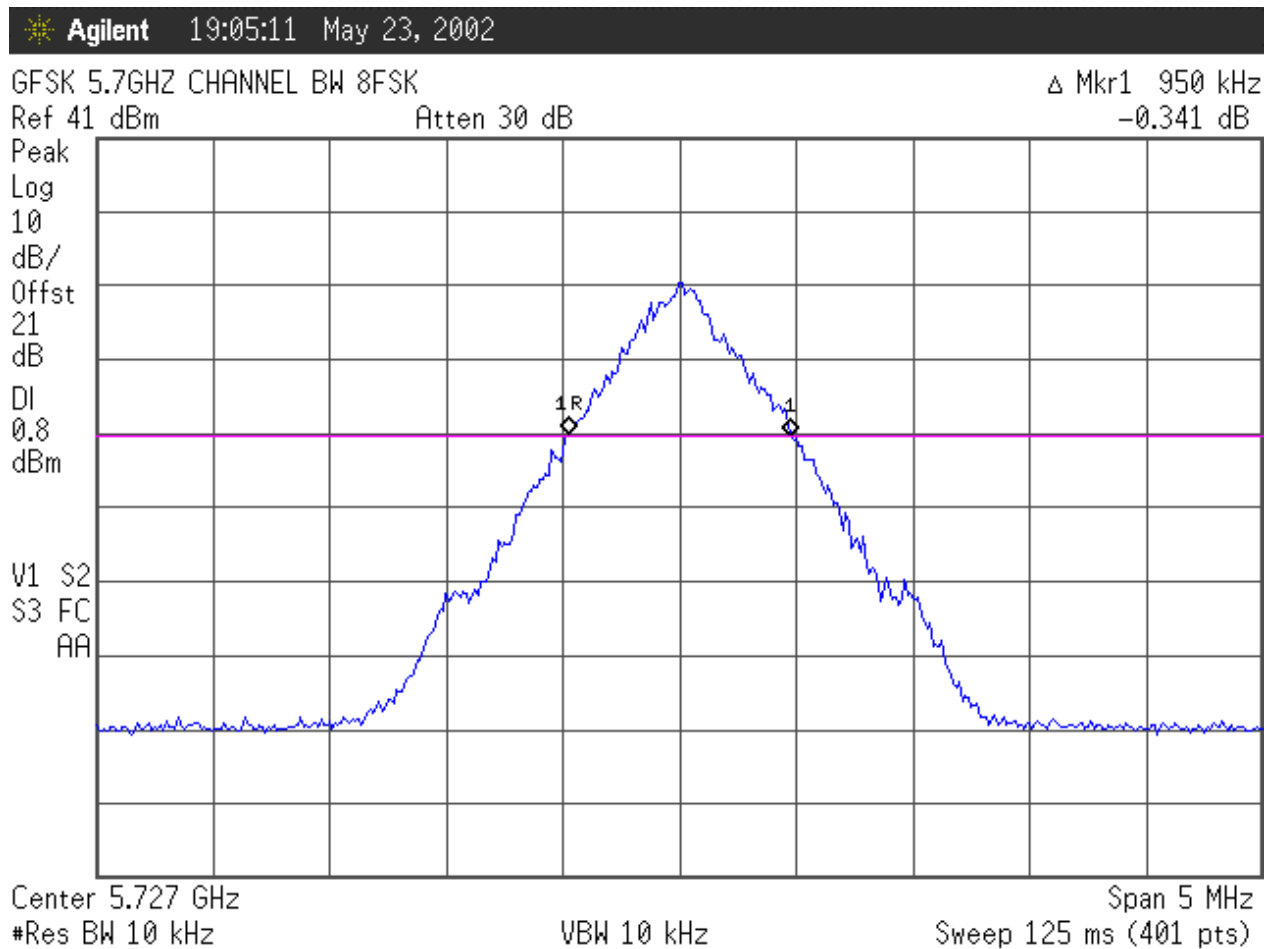


Test Report No.: 8212308340 Rev.1

Page 46 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

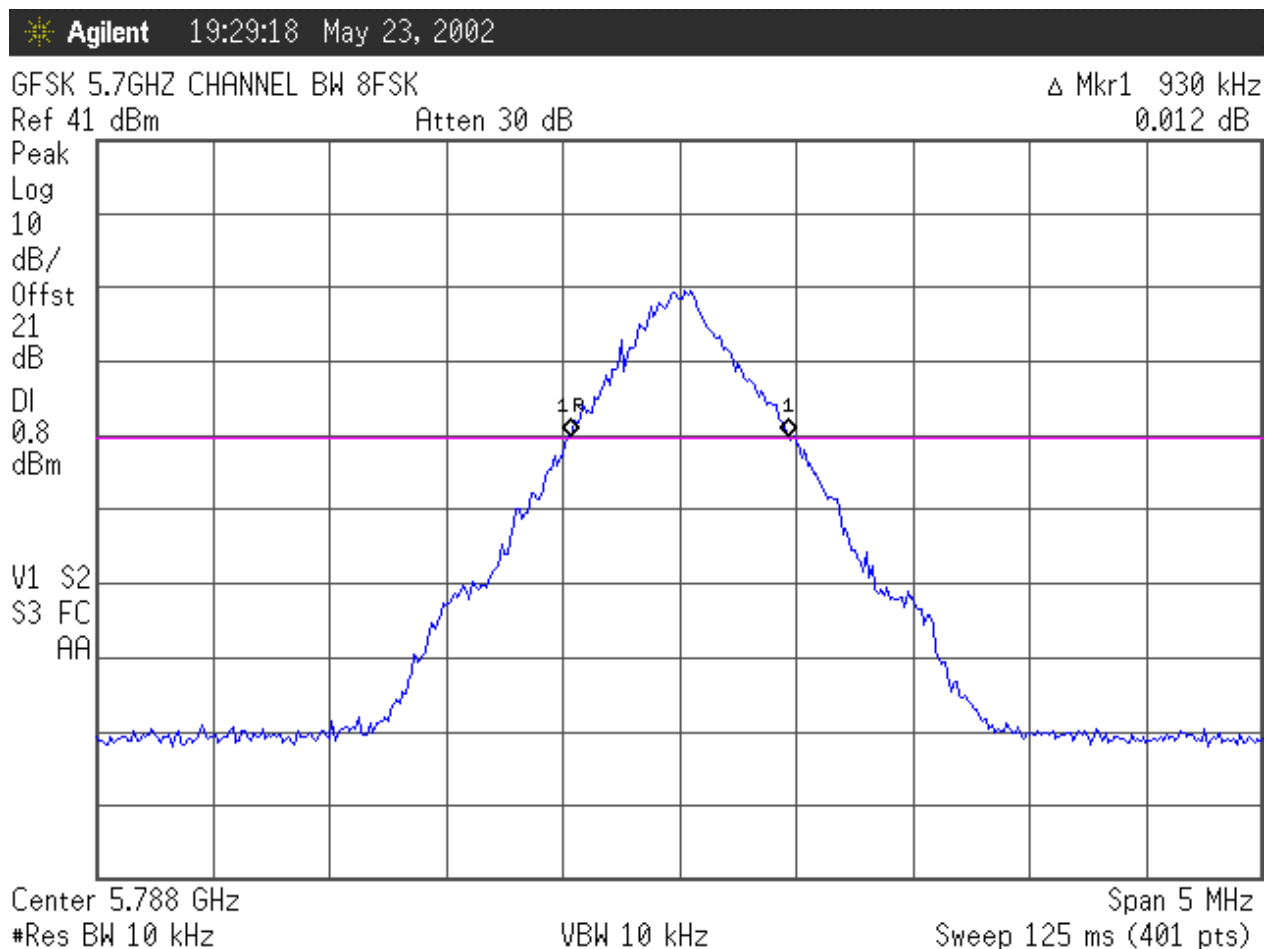
Plot # 84
20 dB channel bandwidth, 8FSK Low





Test Report No.: 8212308340 Rev.1

Page 47 of 73 Pages

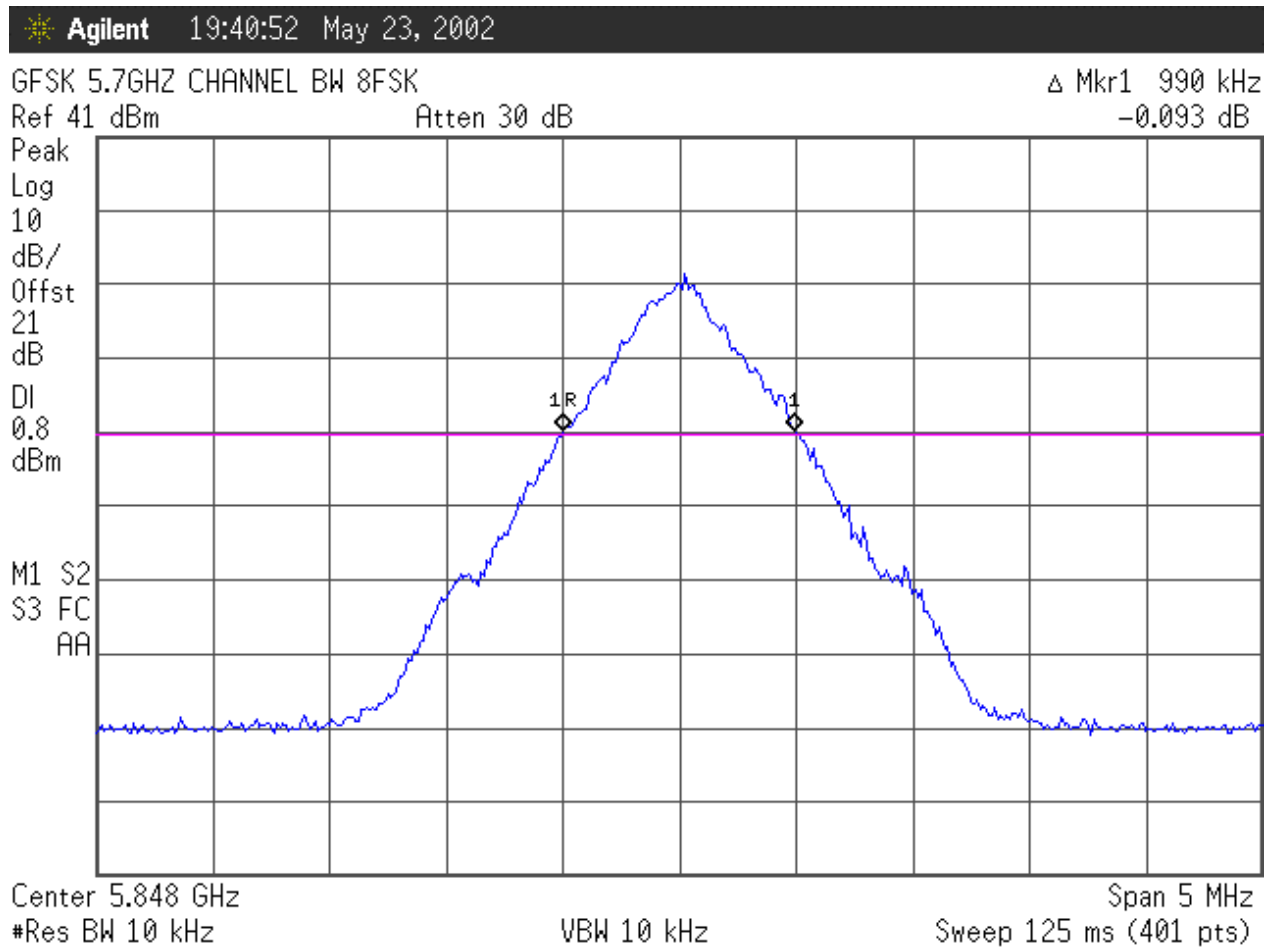
Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system**Plot # 90**
20 dB channel bandwidth, 8FSK Middle

Test Report No.: 8212308340 Rev.1

Page 48 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 91
20 dB channel bandwidth, 8FSK High

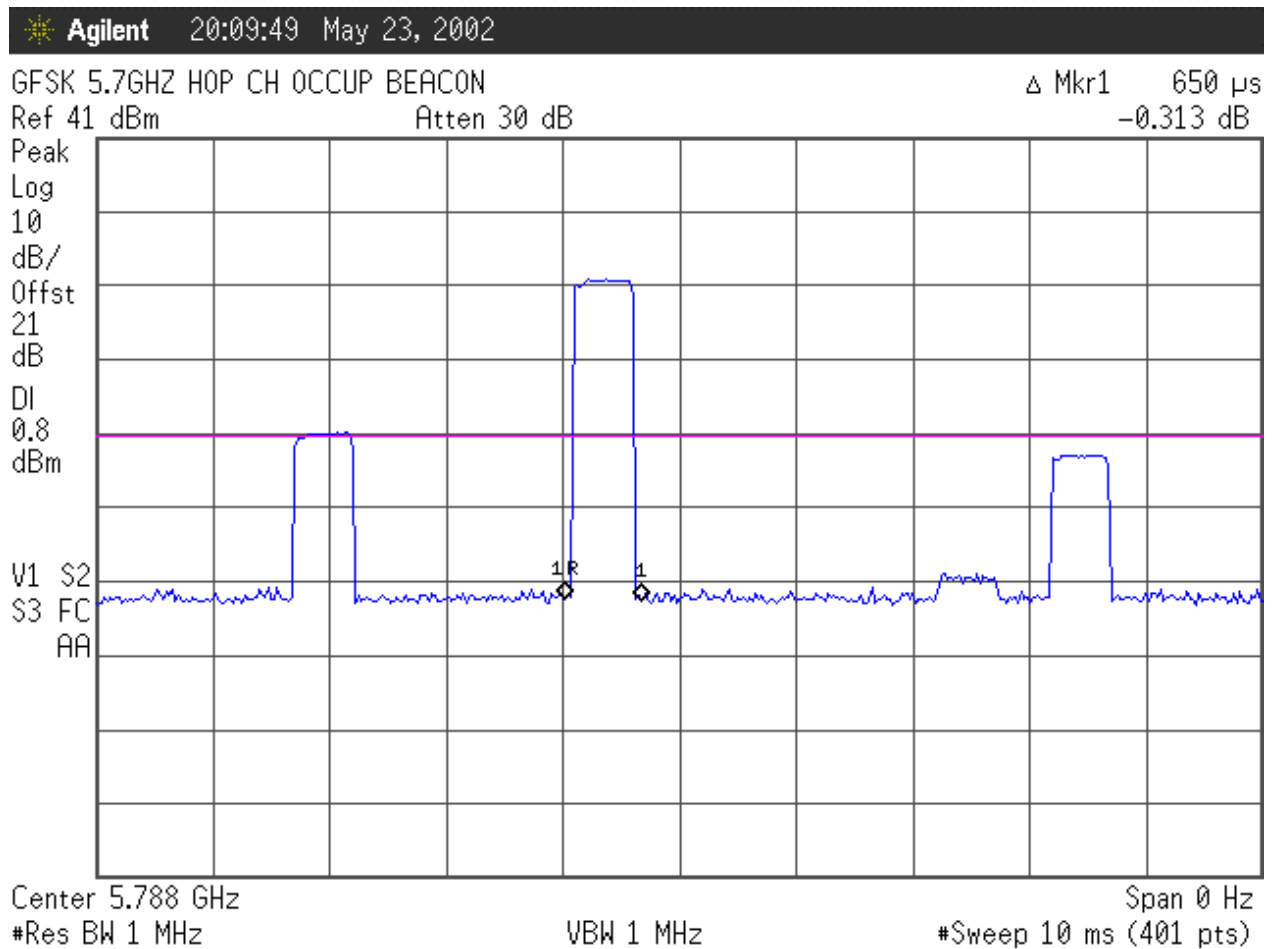


Test Report No.: 8212308340 Rev.1

Page 49 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 94
Time domain, FSK Beacon

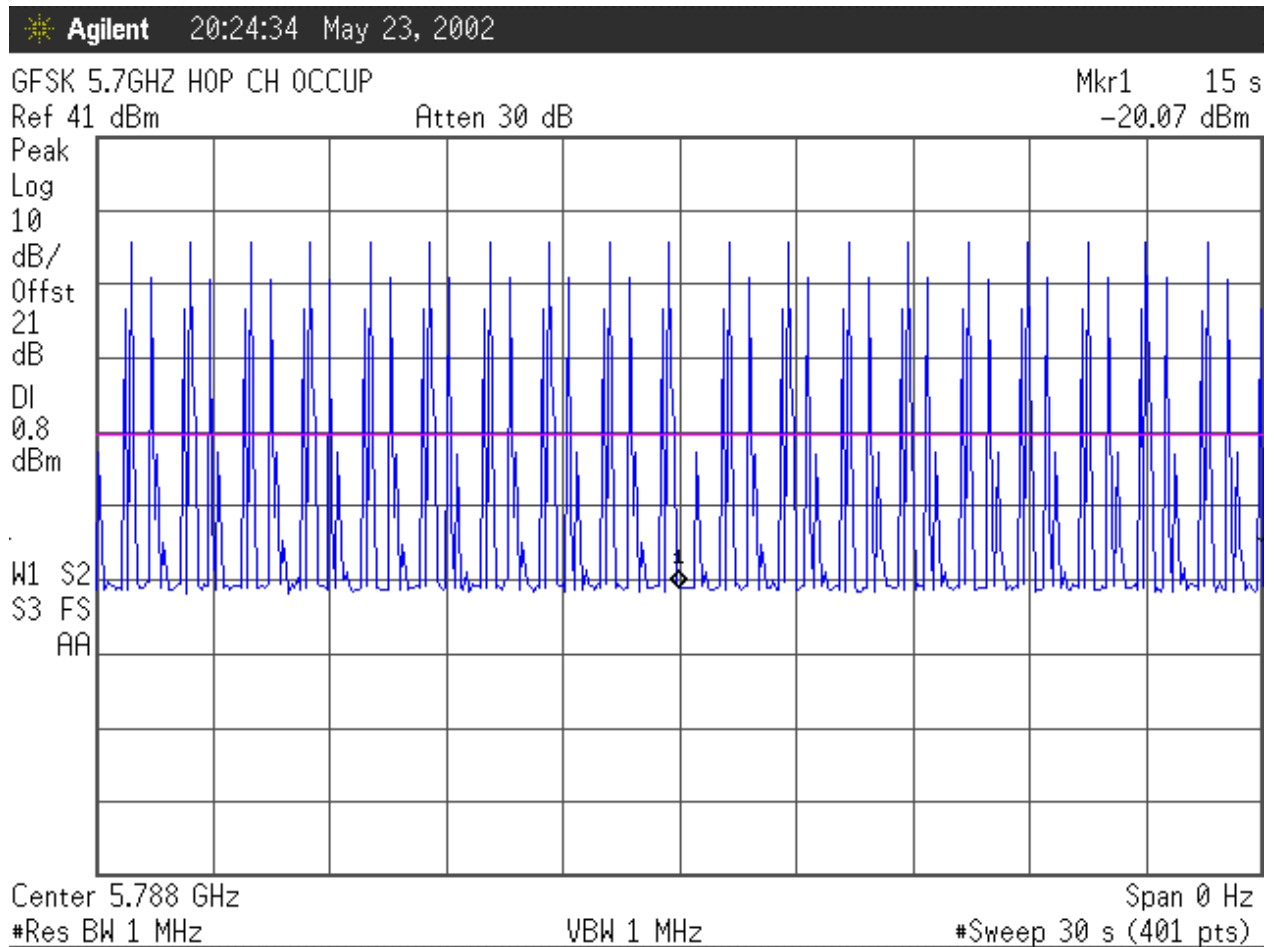


Test Report No.: 8212308340 Rev.1

Page 50 of 73 Pages

**Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system**

Plot # 96
Channel dwell time plot for 30 second period

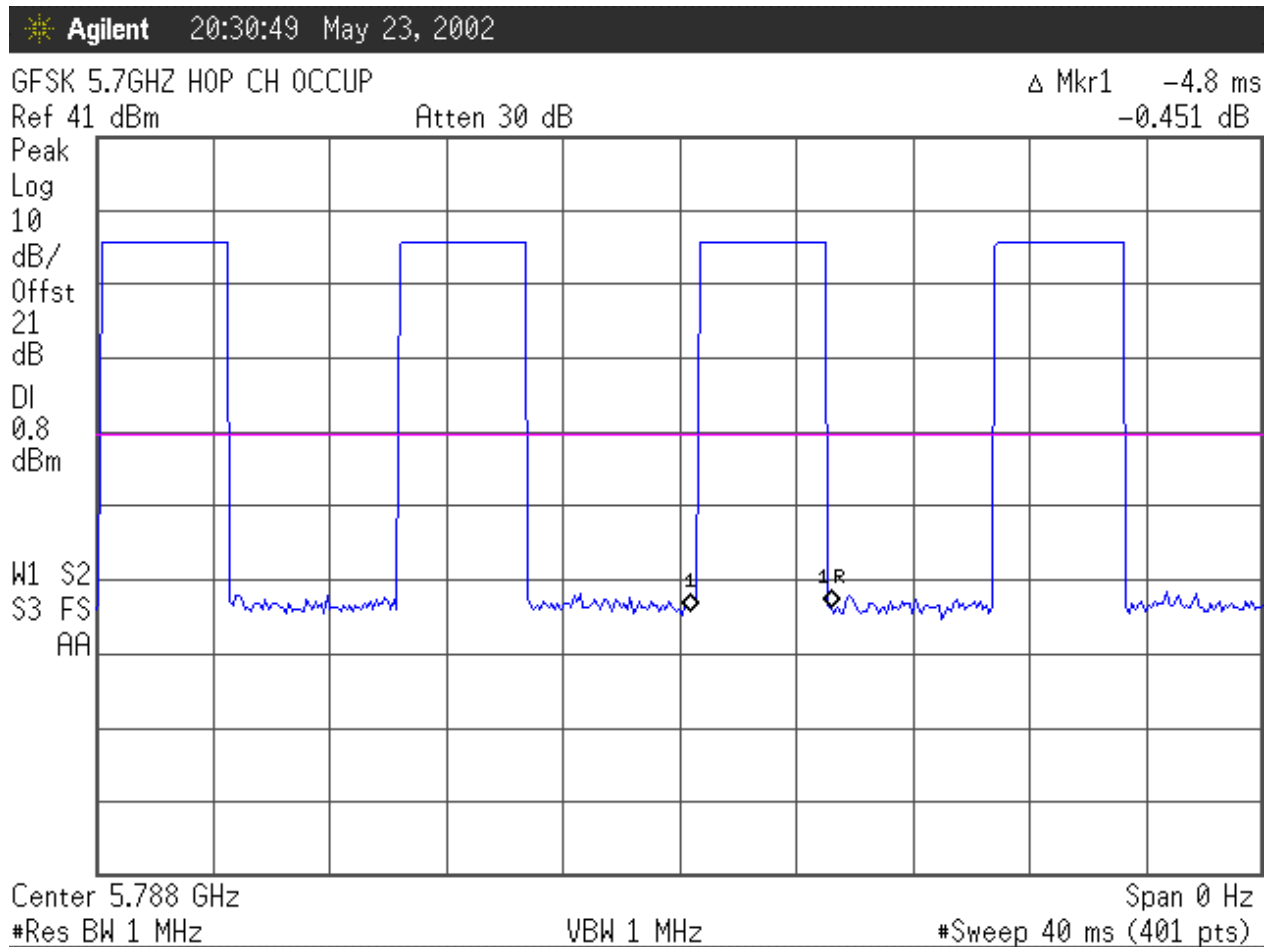


Test Report No.: 8212308340 Rev.1

Page 51 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 98
Time Domain

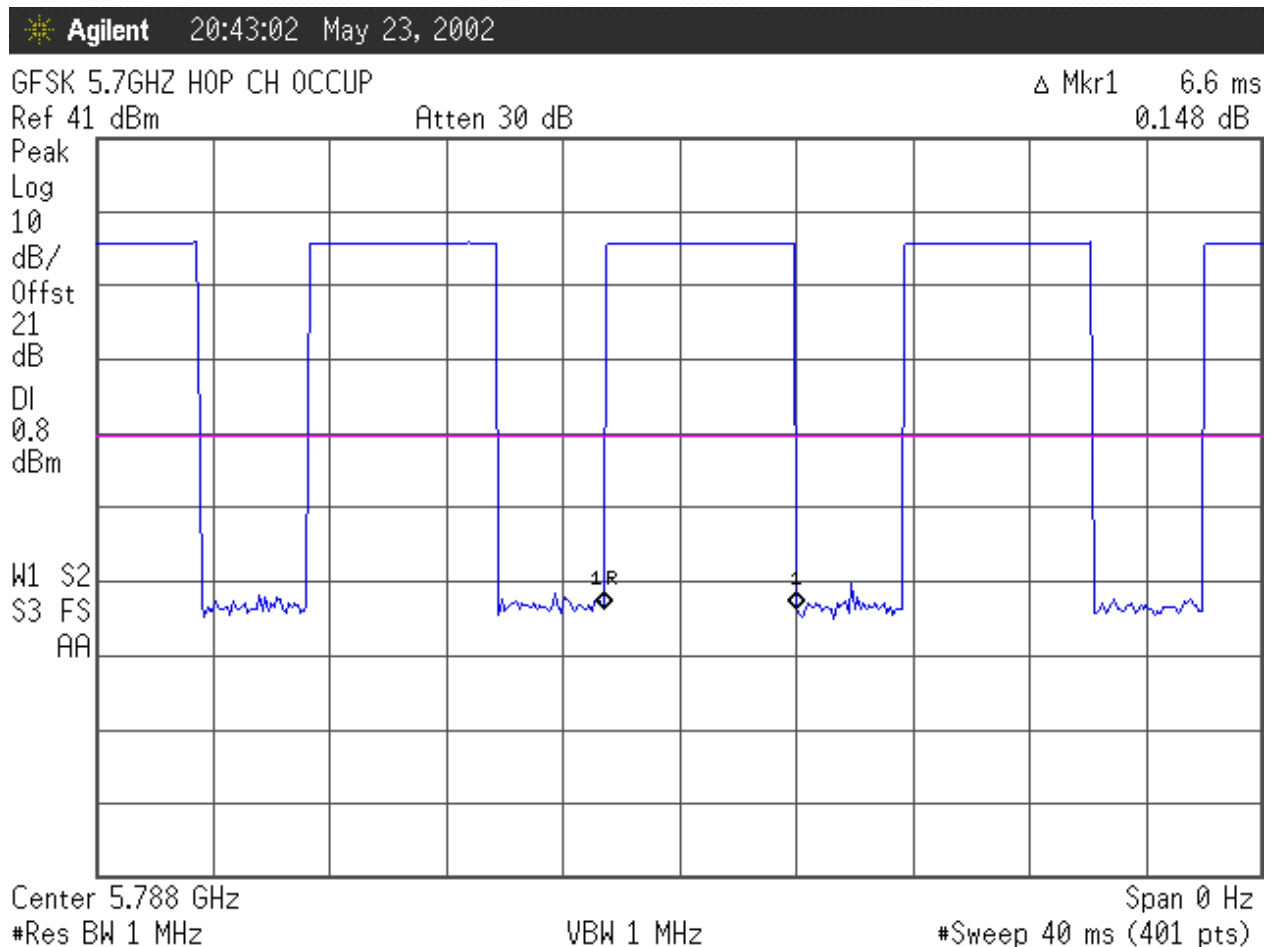


Test Report No.: 8212308340 Rev.1

Page 52 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 99
Time Domain



Test Report No.: 8212308340 Rev.1

Page 53 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 39

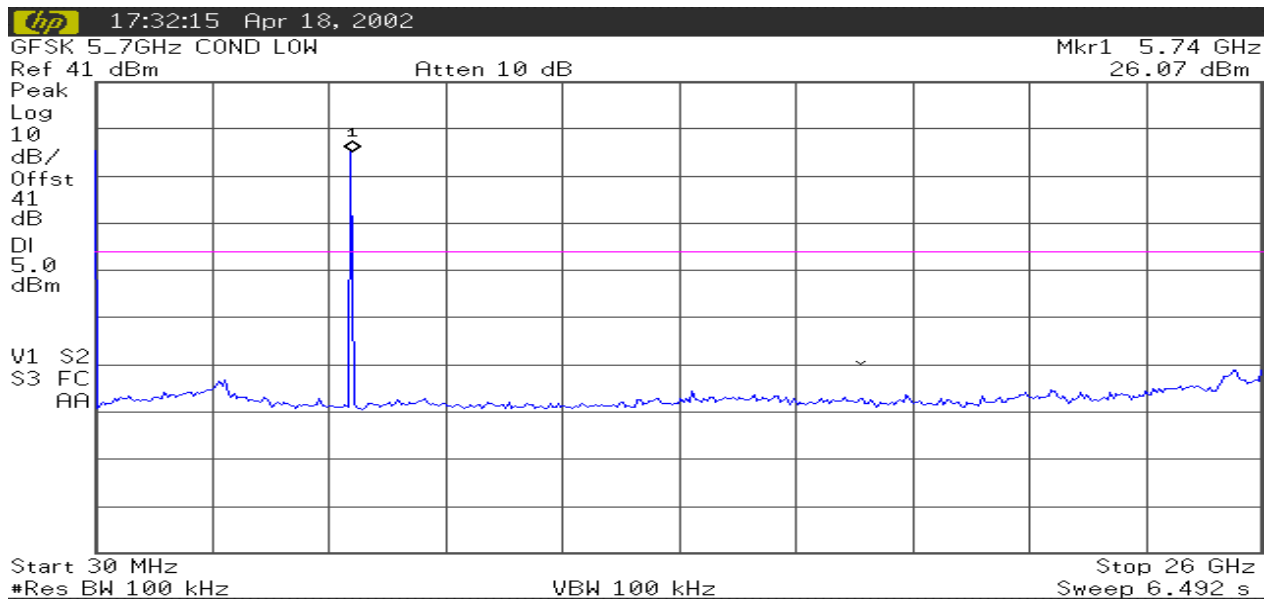
Antenna conducted spurious emissions

operating frequency:

Low

Frequency range

30 MHz- 26 GHz



Plot # 40

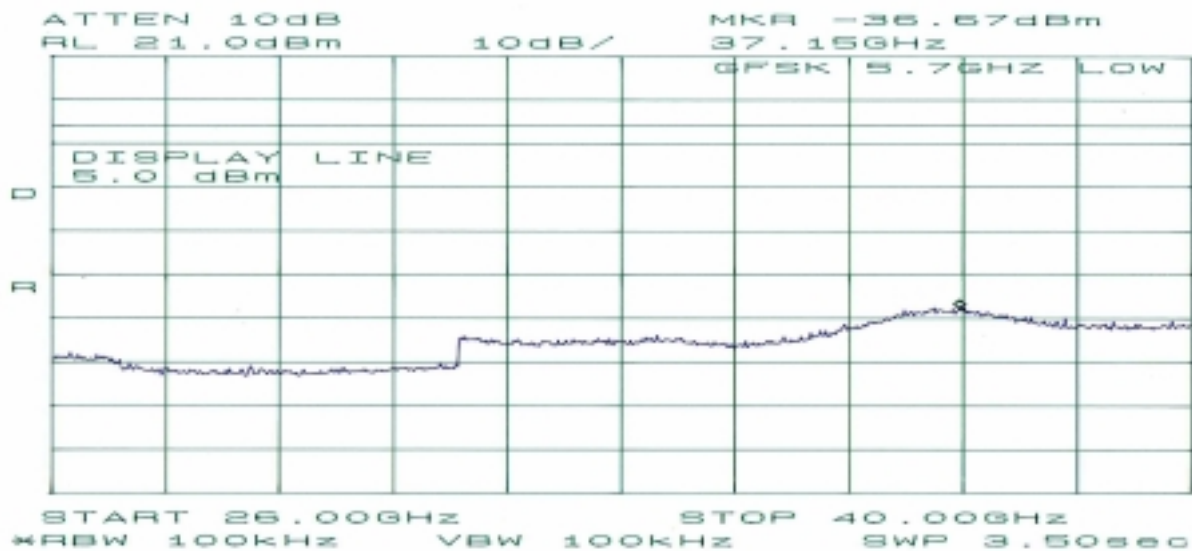
Antenna conducted spurious emissions

operating frequency:

Low

Frequency range

26 - 40 GHz



Test Report No.: 8212308340 Rev.1

Page 54 of 73 Pages

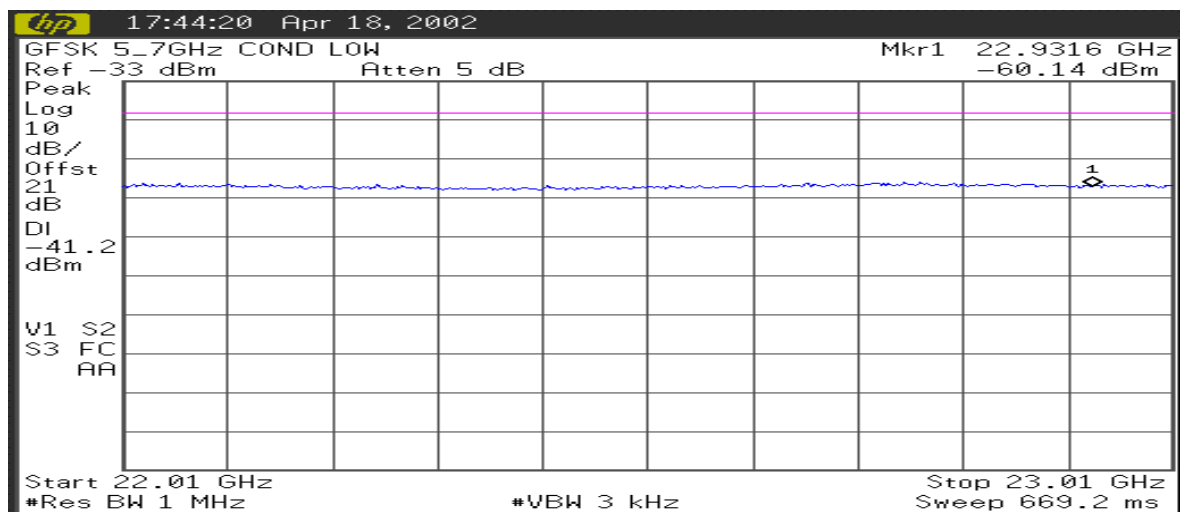
Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 41

Antenna conducted spurious emissions in restricted band 22.01-23.12

operating frequency: Low

Detector: Average

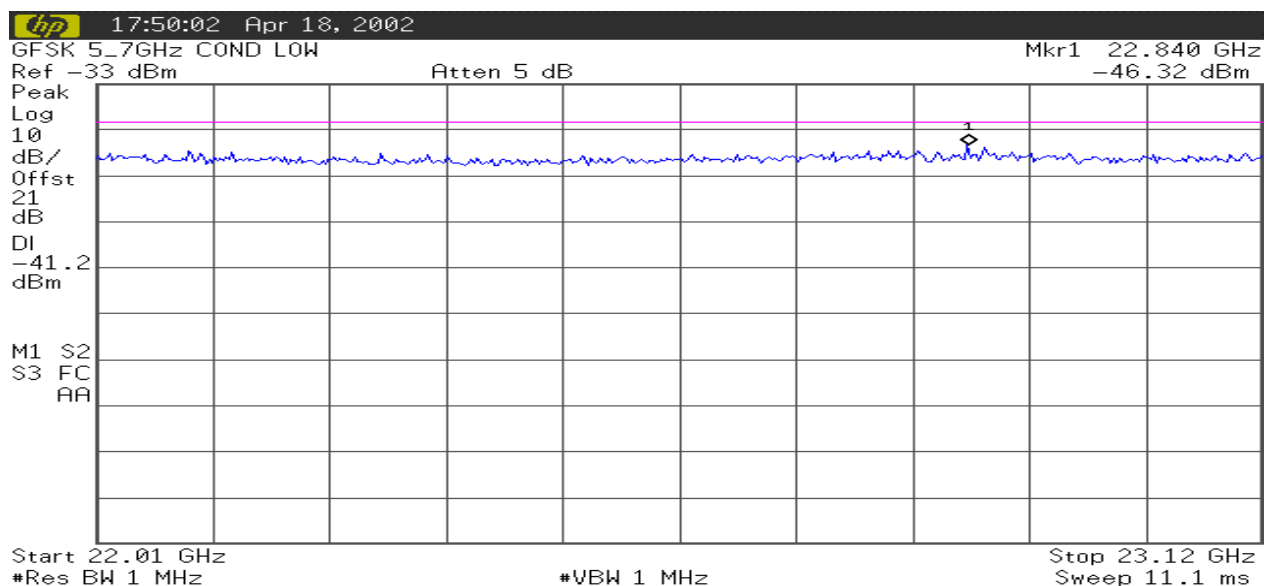


Plot # 42

Antenna conducted spurious emissions in restricted band 22.01-23.12

operating frequency: Low

Detector: Peak



Test Report No.: 8212308340 Rev.1

Page 55 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 43

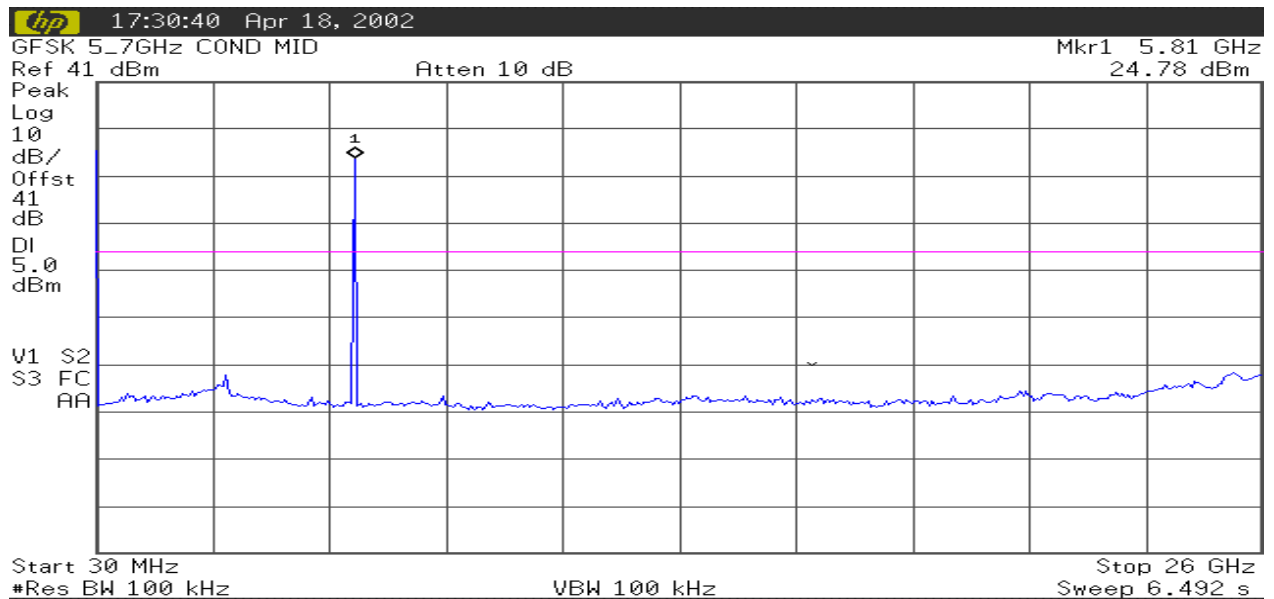
Antenna conducted spurious emissions

operating frequency:

MID

Frequency range

30 MHz - 26 GHz



Plot # 44

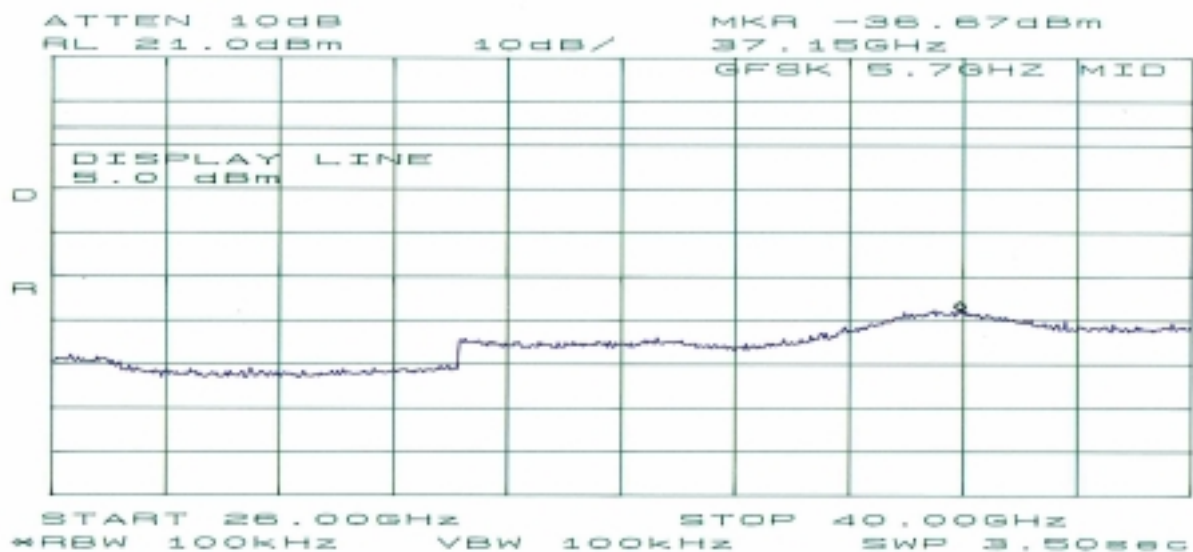
Antenna conducted spurious emissions

operating frequency:

MID

Frequency range

26 - 40 GHz



Test Report No.: 8212308340 Rev.1

Page 56 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 45

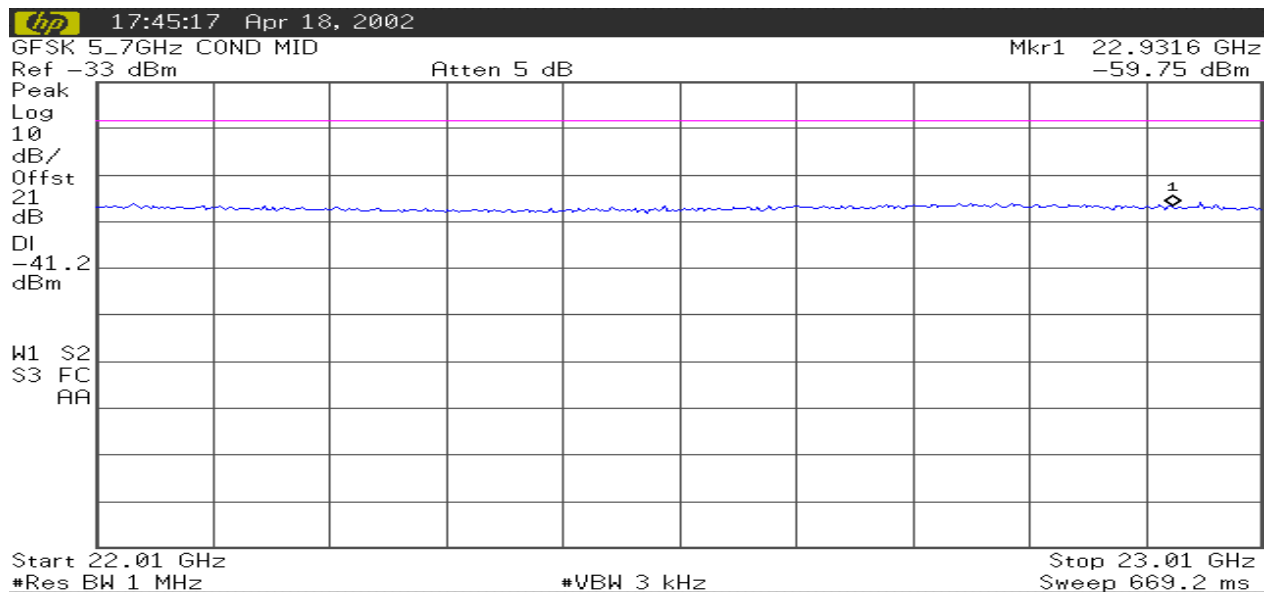
Antenna conducted spurious emissions in restricted band 22.01-23.12

operating frequency:

MID

Detector:

Average



Plot # 46

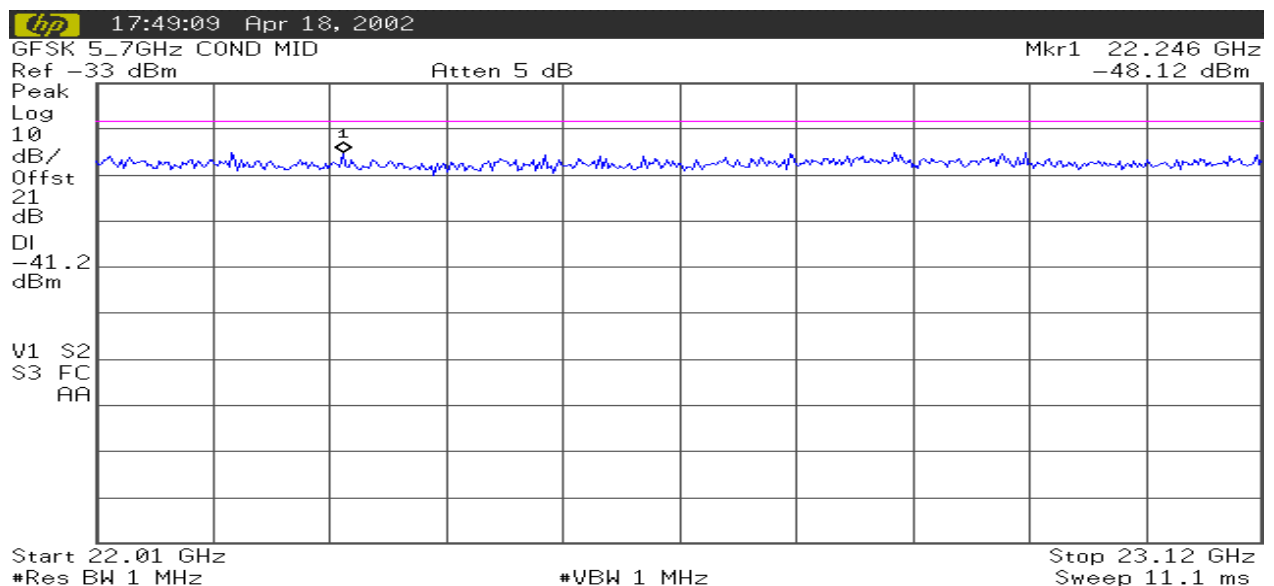
Antenna conducted spurious emissions in restricted band 22.01-23.12

operating frequency:

MID

Detector:

Peak



Test Report No.: 8212308340 Rev.1

Page 57 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

Plot # 47

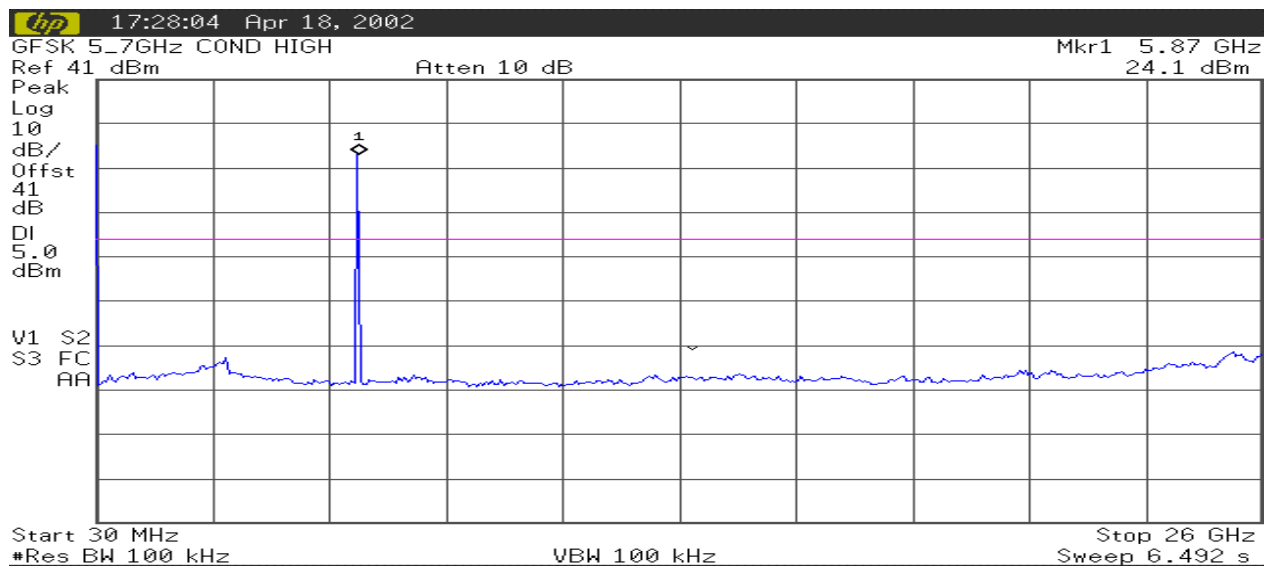
Antenna conducted spurious emissions

operating frequency:

High

Frequency range

30 - 26 GHz



Plot # 48

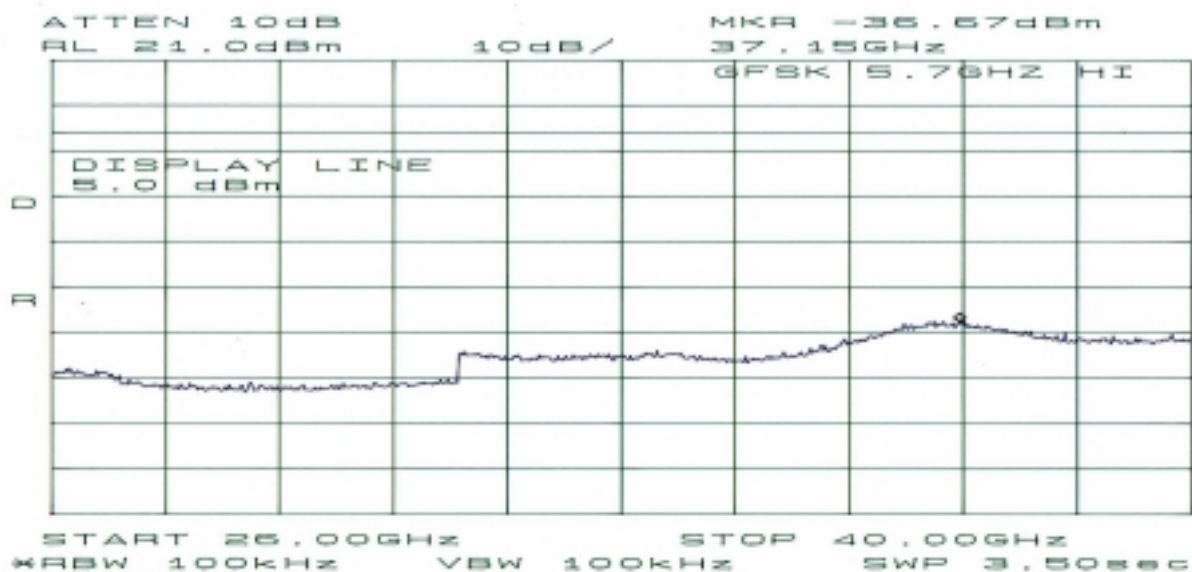
Antenna conducted spurious emissions

operating frequency:

High

Frequency range

26 - 40 GHz





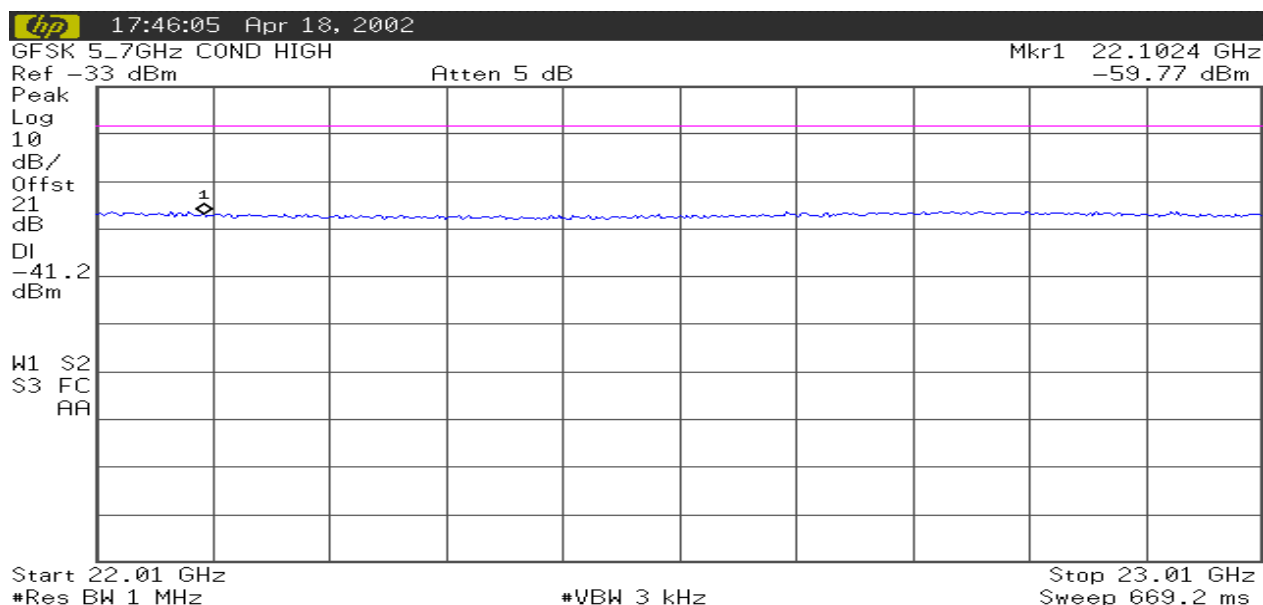
Test Report No.: 8212308340 Rev.1

Page 58 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

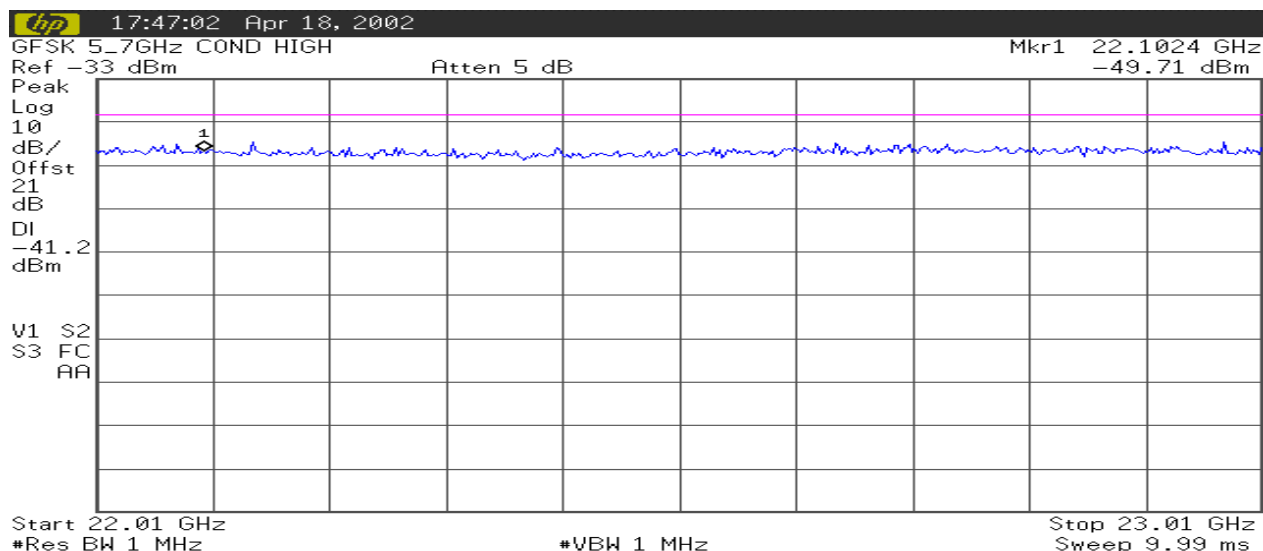
Plot # 49

Antenna conducted spurious emissions in restricted band 22.01-23.12

operating frequency: High
Detector Average

Plot # 50

Antenna conducted spurious emissions in restricted band 22.01-23.12

operating frequency: High
Detector Peak

Test Report No.: 8212308340 Rev.1

Page 59 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

4 Compliance with specification

Test	FCC Part 15 Subpart C Sec #	Test result
Conducted emission	Sec.15.207	Complies
Spurious radiated emission	Sec.15.209	Complies
Radiated emissions in restricted bands	Sec.15.205	Complies
Spurious emissions antenna conducted	Sec.15.247 (c)	Complies

Telematics Laboratory
29 May, 2002

Name: Eng. Yuri Rozenberg
Position: Head of EMC Branch

Name Maxim Reizin
Position: Testing Technician

Test Report No.: 8212308340 Rev.1

Page 60 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

5 Appendix 1: Test equipment used

All measurements equipment is on SII calibration schedule with a recalibration interval not exceeding once a year.

Instrument	Manufacturer	Model	Serial No.	Last calibration date	Next calibration date
Spectrum analyzer 10 KHz-26.5 GHz	HP	E7405a	SII 4944	04/02	04/03
Spectrum analyzer 9 KHz-50 GHz	HP	8565E	3517A00347	07/01	07/02
Antenna Double Ridge 1-18 GHz	EMCO	3115	SII4873	03/02	03/03
Antenna Standard Gain Horn 26.5-40 GHz	WILTRON	Alpha TRG A361	861A/590	01/02	01/03
LISN 9 kHz – 30 MHz	FCC	LISN- 50/250-32-4- 16	SII 5023	05/02	05/03
Transient limiter 0.009-200 MHz	HP	11947A	31074A3105	05/02	05/03
Attenuator 20 dB	HP	8491B	3929M5039 4	05/02	05/03

Test Report No.: 8212308340 Rev.1

Page 61 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency hopping spread spectrum (FHSS) system

6 Appendix 2: Antenna Factor and Cable Loss

Cable Loss

Type: Sucoflex 104PE; Ser.No.21324/4PE; 4 m length

Point	Frequency (GHz)	Cable Loss (dB)
0	0.0-1.8	1.67
1	1.8 – 3.6	2.39
2	3.6 – 5.4	3.04
3	5.4-7.2	3.58
4	7.2-9.0	4.06
5	9.0-10.8	4.49
6	10.8-12.6	4.91
7	12.6-14.4	5.31
8	14.4-16.2	5.66
9	16.2-18.00	6.01

Antenna Factor

Double Ridged Guide Antenna mfr EMCO model 3115

Point	Frequency (MHz)	Antenna Factor (dB/m)
1	2000	27.4
2	2500	28.9
3	3000	31.0
4	4000	33.1
5	4500	32.5
6	5000	32.4
7	6000	53.7
8	6500	35.6
9	7000	36.4
10	7500	36.9
11	8000	37.0
12	8500	38.0
13	9000	38.6
14	9500	38.4
15	10000	38.4
16	10500	38.4
17	11000	38.9
18	11500	39.6
19	12000	39.4
20	12500	39.2
21	13000	40.3
22	13500	41.0
23	14000	41.2
24	14500	41.3
25	15000	40.0
26	15500	38.0
27	16000	38.1
28	16500	40.3
29	17000	42.2
30	17500	44.6
31	18000	46.2

Test Report No.: 8212308340 Rev.1

Page 62 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

Antenna Factor
Standard Gain Horn 2600 – 4000 MHz Alpha TRG Model A361

Point	Frequency (MHz)	Antenna Factor (dB/m)
1	26000	35.22
2	27000	35.40
3	28000	35.52
4	29000	35.64
5	30000	35.76
6	31000	35.90
7	32000	36.07
8	33000	36.16
9	34000	36.31
10	35000	36.46
11	36000	36.60
12	37000	36.74
13	38000	36.93
14	39000	37.21
15	40000	37.28

Test Report No.: 8212308340 Rev.1

Page 63 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

7 Appendix 3: Test configuration illustration

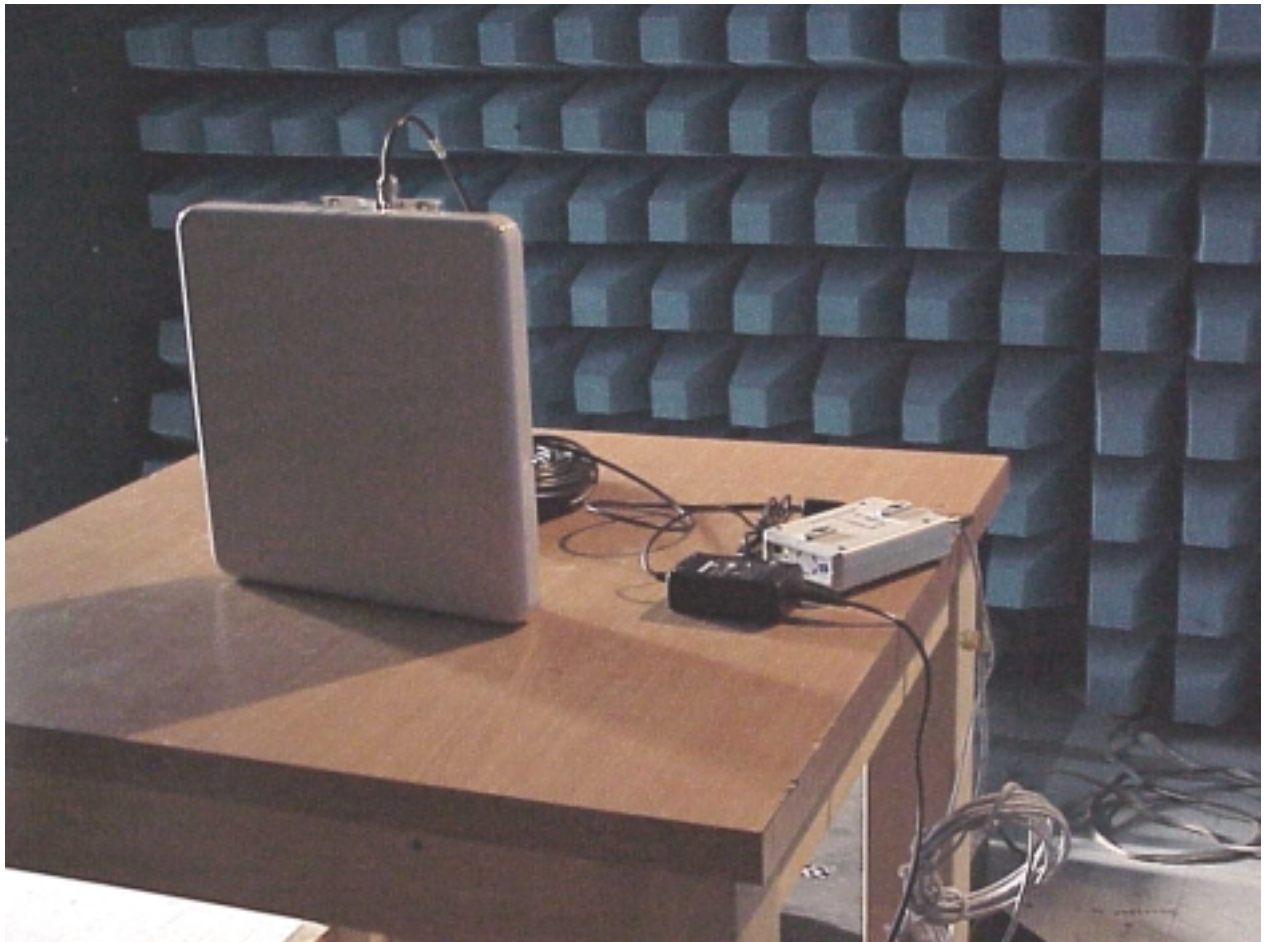


Photo #1.
EUT with integral antenna

Test Report No.: 8212308340 Rev.1

Page 64 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

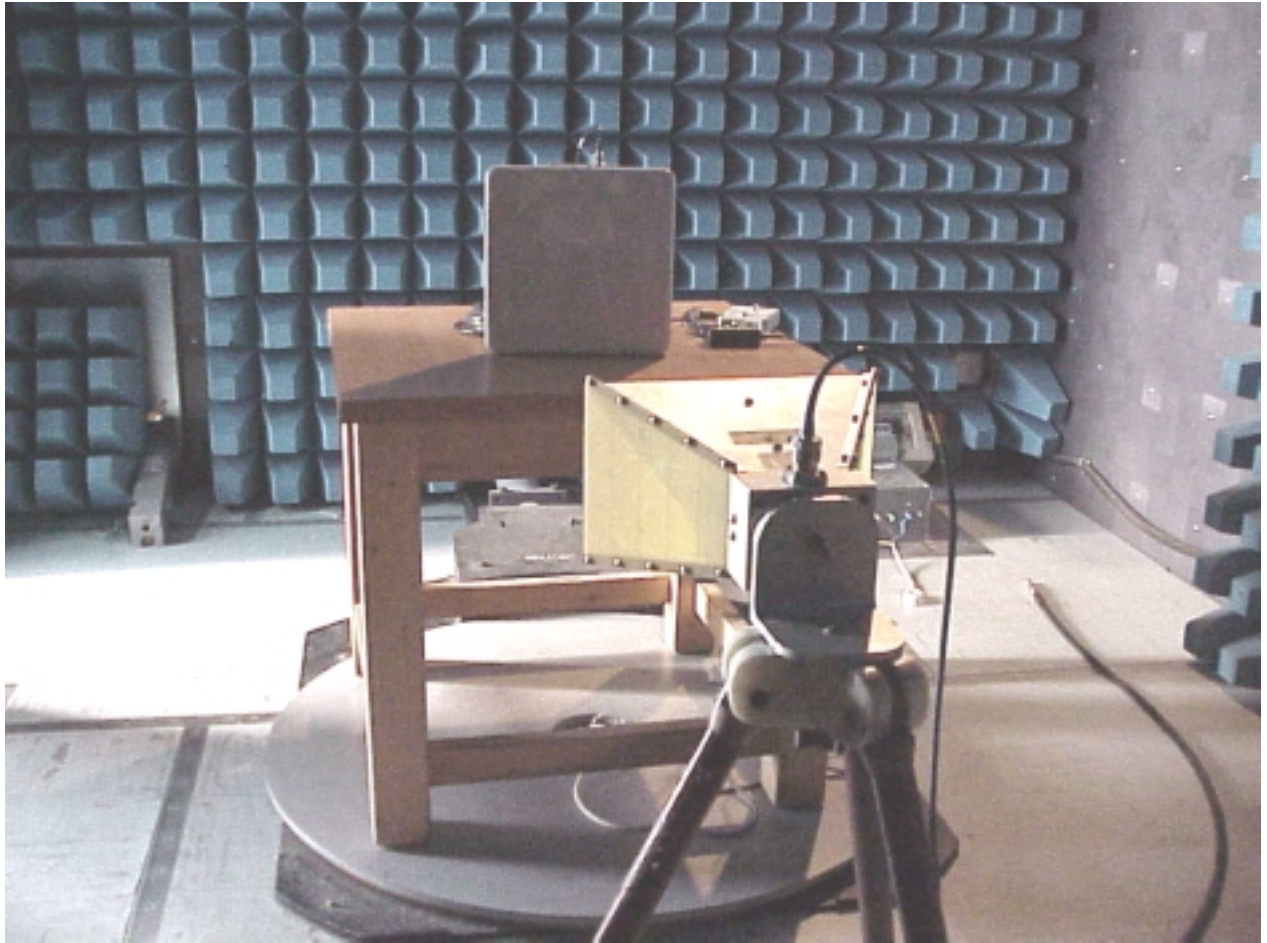


Photo #2.
EUT with integral antenna.
Radiated emission test

Test Report No.: 8212308340 Rev.1

Page 65 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system



Photo #3
EUT with integral antenna.
Radiated emission test

Test Report No.: 8212308340 Rev.1

Page 66 of 73 Pages

**Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system**

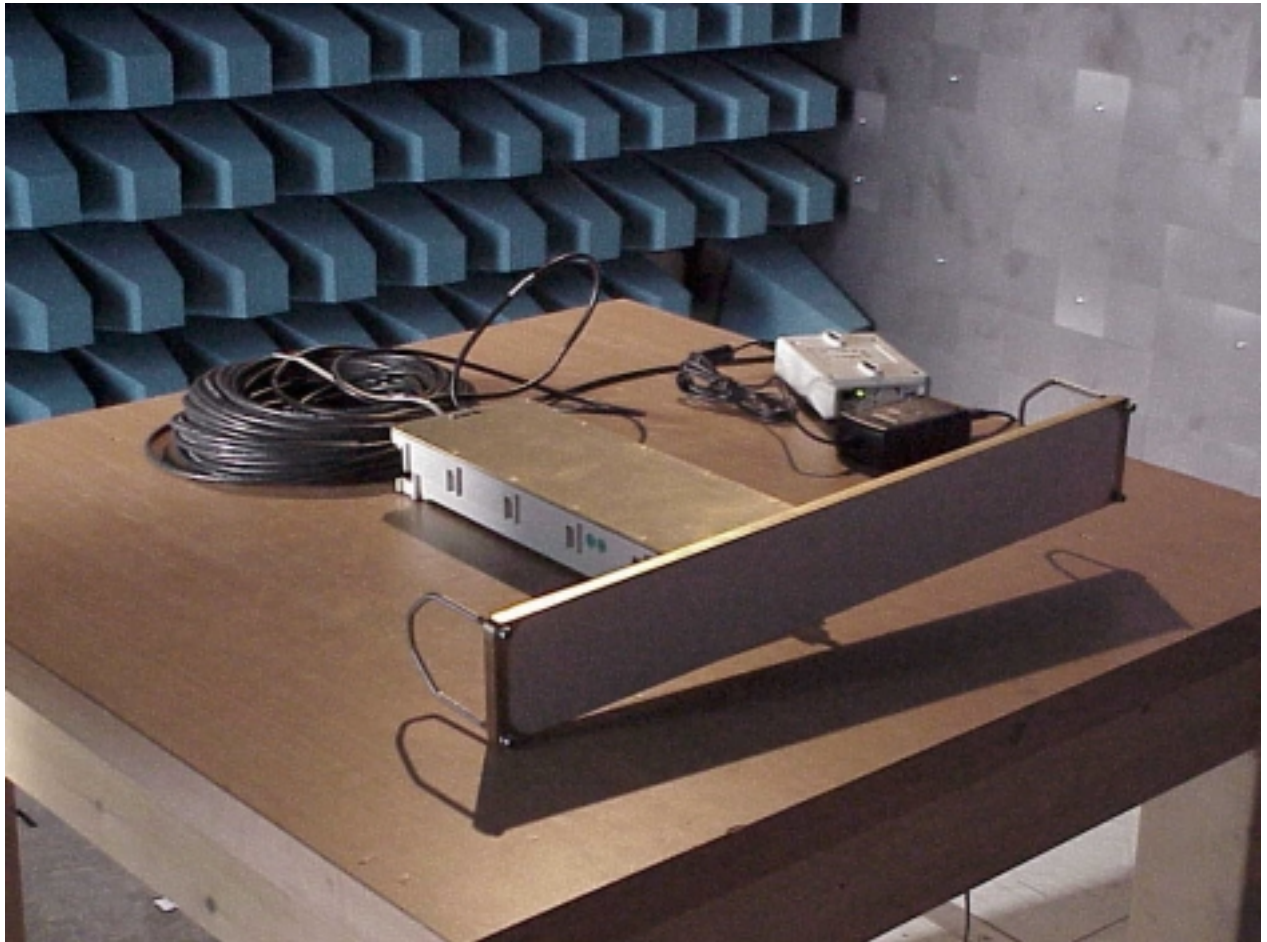


Photo #4
EUT with sector antenna

Test Report No.: 8212308340 Rev.1

Page 67 of 73 Pages

**Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system**

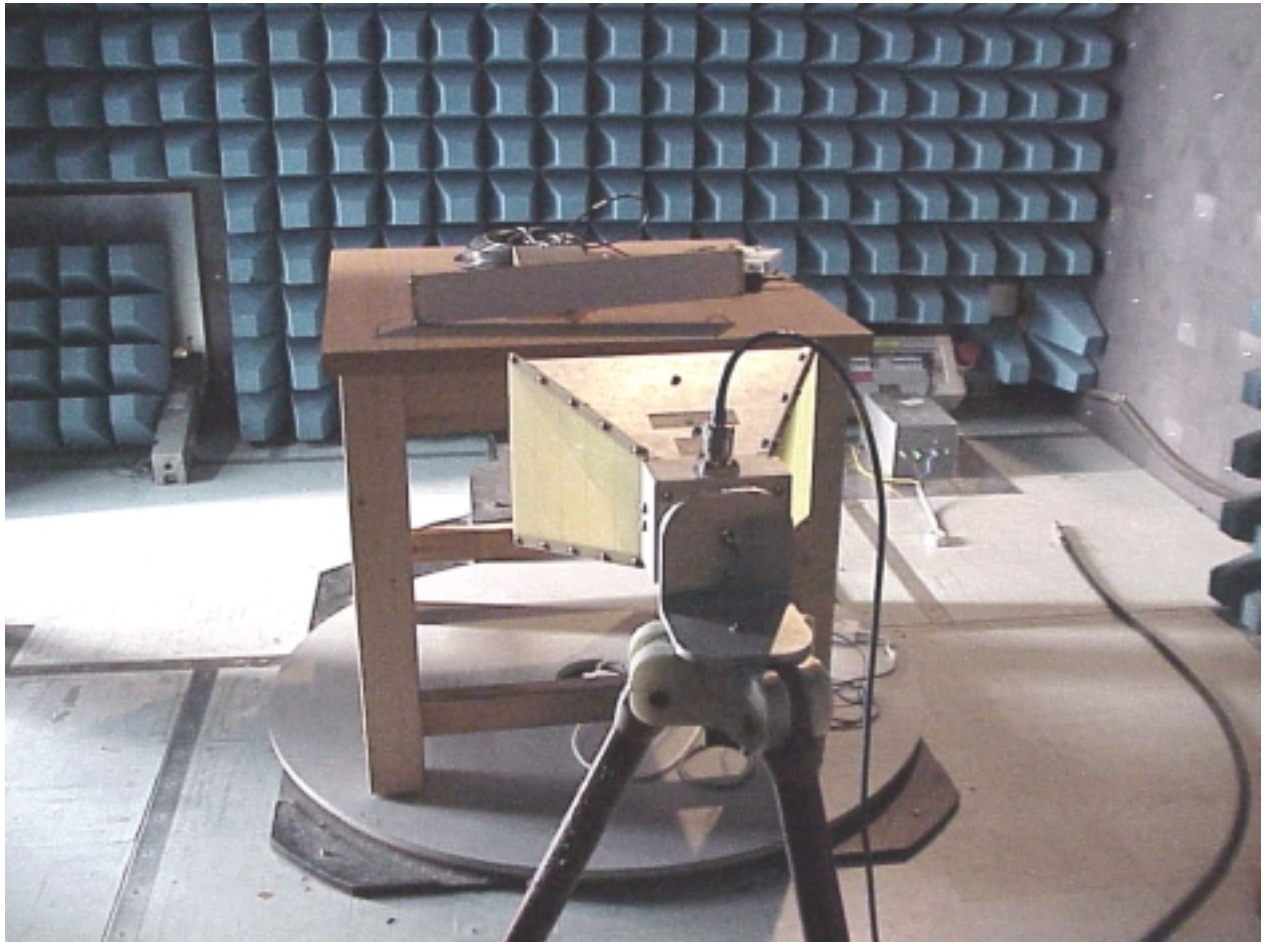


Photo #5
EUT with sector antenna.
Radiated emission test

Test Report No.: 8212308340 Rev.1

Page 68 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system



Photo #6
EUT with sector antenna.
Radiated emission test

Test Report No.: 8212308340 Rev.1

Page 69 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system



Photo #7
antenna marking label

Test Report No.: 8212308340 Rev.1

Page 70 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system

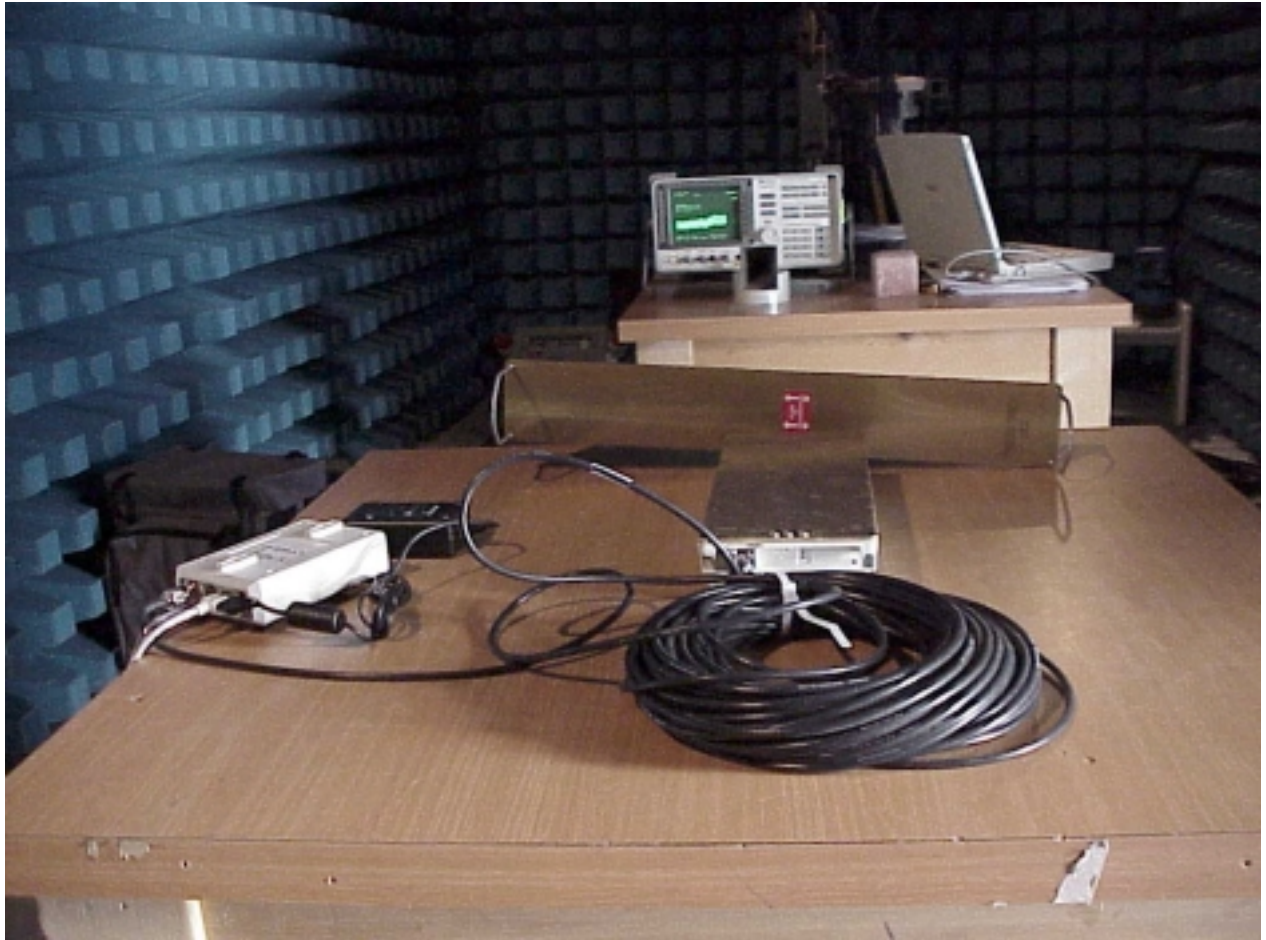


Photo #8
EUT with sector antenna. Radiated emission test

Test Report No.: 8212308340 Rev.1

Page 71 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system



Photo #9
Radiated emission test

Test Report No.: 8212308340 Rev.1

Page 72 of 73 Pages

**Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system**



Photo #10
Spurious conducted antenna test. Measuring equipment

Test Report No.: 8212308340 Rev.1

Page 73 of 73 Pages

Title: Test on BreezeAccess 5.7GHz GFSK frequency
hopping spread spectrum (FHSS) system



Photo #11
Spurious conducted antenna test. Measuring equipment