

RADIO TEST REPORT

No. 202259R1

EQUIPMENT UNDER TEST

Equipment: Bluetooth Headset HBH-60
Type / model: SonyEricsson 8505004
Manufacturer: SonyEricsson
Tested by request of: Ericsson Technology Licensing AB

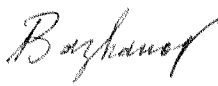
SUMMARY

The equipment complies with the requirements of the following standards:

FCC, Part 15, Subpart C (2001);
RSS-210, Issue 5 (November 2001)

Date of issue: October 15, 2002

Tested by:


Vladimir Bazhanov

Approved by:


Monica Roos

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company: Sony Ericsson Mobile Communications AB
Nya Vattentorget
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Name of contact: Håkan Sjöberg
Phone : + 46 46 193559
E-mail: hakan.sjoberg@sonyericsson.com

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment: Bluetooth Headset HBH-60
Type/Model: SonyEricsson 8505004
Serial Number: 391
FCC ID Number: PY78505004
Brand name: SonyEricsson
Manufacturer: SonyEricsson
Rating: 2,6 V DC (2,4 ... 2,8 V DC)
Rating RF output power: Power class 2
Operating temperature range: -10 to +55 °C
Frequency range: 2400 – 2483,5 MHz
Antenna gain: -3,5 dBi

2.2 Additional hardware information about the EUT

The EUT consists of the following unit:

Unit	Type and version	Serial number
Bluetooth Headset HBH-60	SonyEricsson 8505004	391

2.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software	Version	Comment
CAH 109 01 24	R1A	-

2.4 Peripheral equipment

Peripheral equipment is defined as equipment needed for correct operation of the EUT, but not included as a part of the testing and evaluation of the EUT.

Equipment	Manufacturer / Type	Serial number
Standard Charger CST-13	ERICSSON / 4020070-BV Input: 100-240 V, 150mA, 50-60 Hz; Output: 5,1 V DC, 450 mA	-
Serial Communication Card	Simba	-
Power Supply	OLTRONIX / B60-1T	2621
Laptop PC	IBM / 2645-450	55250AY

The EUT was tested using the following cables:

Cable	Type	Length
RF cable	Sucoflex 104	1,5 m
Serial cable	Standard	1,5 m

3. TEST SPECIFICATIONS

3.1 Standards

FCC (2001): Subpart C – Intentional Radiators; §15.247 for frequency hopping systems operating in the 2400 – 2483.5 MHz and 5725 – 5850 MHz; §15.205 for restricted bands; §15.109 and §15.209 for radiated limits.

RSS-210, Issue 5 (November 2001): Low Power Licence-Exempt Radiocommunication Devices.

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

3.3 Mode of operation during the test

The EUT was tested supplied by 2,6 V DC. Measurement set-ups for the out-of-band spurious emissions test are described in Section 12.4. During other tests the EUT was connected to the spectrum analyzer FSIQ 40 (SEMCO No. 9192) by the cable Sucoflex 104 (SEMCO No. 5186). Spectrum analyzer and the EUT settings are specified in the corresponding sections. The frequencies and hopping mode of the EUT were controlled by the PC, through the serial communication link. The software CAH 109 01 24, version R1A, was used.

3.4 Operating environment

Temperature: 21-22 °C
Relative Humidity: 21-26 %

4. TEST SUMMARY

The results in this report apply only to the sample tested:

	Test	Result	Note
15.247(b)	Peak output power	Pass	
15.247(a)	TX Output Spectrum – 20 dB Bandwidth	Pass	
15.247(a)	Carrier frequency separation	Pass	
15.247(a)	Number of hopping frequencies (channels)	Pass	
15.247(a)	Time of occupancy (dwell time)	Pass	
15.247(c)	Band edge compliance	Pass	
15.247 (d)	Peak power spectral density	Pass	
15.109 (a)	Out of band spurious emissions, radiated	Pass	
15.247(c)	Out of band spurious emissions, radiated	Pass	

5. PEAK OUTPUT POWER

5.1 Test protocol

Date of test: October 10, 2002

The EUT was set to the TX mode and hopping off.

Spectrum analyzer settings:

Span: 10 MHz

RBW: 3 MHz

VBW: 3 MHz

Sweep time: 1 s

Detector: Peak

Trace: Max Hold

Test conditions	Output power (dBm)			
	$F_{\min} = 2402 \text{ MHz}$	$F_{\text{mid}} = 2441 \text{ MHz}$	$F_{\max} = 2480 \text{ MHz}$	Limit (dBm)
$V_{\text{nom}} = 2,6 \text{ V}$	1,2	1,1	0,2	30

Measurement results were corrected for the cable loss and antenna gain declared by the manufacturer.

Measurement plots are given in Appendix I.

6. TX OUTPUT SPECTRUM – 20 dB BANDWIDTH

6.1 Test protocol

Date of test: October 10, 2002

The EUT was set to the TX mode and hopping off.

Spectrum analyzer settings:

Span: 1,5 MHz
 RBW: 30 kHz
 VBW: 30 kHz
 Sweep time: 5 ms
 Detector: Peak
 Trace: Max Hold

Test conditions	20 dB bandwidth (kHz)			
	$F_{\min} = 2402 \text{ MHz}$	$F_{\text{mid}} = 2441 \text{ MHz}$	$F_{\max} = 2480 \text{ MHz}$	Limit (kHz)
$V_{\text{nom}} = 2,6 \text{ V}$	980	974	959	<1000

Measurement plots are given in Appendix I.

7. CARRIER FREQUENCY SEPARATION

7.1 Test protocol

Date of test: October 10, 2002

The EUT was set to the TX mode and hopping on.

Spectrum analyzer settings:

Span: 4 MHz
 RBW: 100 kHz
 VBW: 100 kHz
 Sweep time: 5 ms
 Detector: Peak
 Trace: Max Hold

Test conditions	Frequency separation (kHz)			
	$F_{\min} = 2402 \text{ MHz}$	$F_{\text{mid}} = 2441 \text{ MHz}$	$F_{\max} = 2480 \text{ MHz}$	Limit (kHz)
$V_{\text{nom}} = 2,6 \text{ V}$	1002	1002	1010	> 980

Measurement plots are given in Appendix I.

8. NUMBER OF HOPPING CHANNELS**8.1 Test protocol**

Date of test: October 10, 2002

The EUT was set to the TX mode and hopping on.

Spectrum analyzer settings:

Span: 85 MHz

RBW: 100 kHz

VBW: 100 kHz

Sweep time: 21,5 ms

Detector: Peak

Trace: Max Hold

Test conditions	Frequency range	
	No. of channels	Limit (No. of channels)
$V_{nom} = 2,6 \text{ V}$	79	> 75

Measurement plots are given in Appendix I.

9. BAND EDGE COMPLIANCE**9.1 Test protocol**

Date of test: October 10, 2002

The EUT was set to TX mode and hopping off.

Spectrum analyzer settings:

Span: 7-9 MHz

RBW: 100 kHz

VBW: 100 kHz

Sweep time: 5 ms

Detector: Peak

Trace: Max Hold

Test conditions	Band edge compliance		
	$F_{\min} = 2400 \text{ MHz}$	$F_{\max} = 2483,5 \text{ MHz}$	Limit (dBc)
$V_{\text{nom}} = 2,6 \text{ V}$	-37,9 dBc	-41,1 dBc	< -20

Measurement plots are given in Appendix I.

10. TIME OF OCCUPANCY (DWEELL TIME)

10.1 Test protocol

Date of test: October 10, 2002

The EUT was set to the TX mode and hopping on.

Spectrum analyzer settings:

Determination of transmitting time T

Span: 0 Hz
 RBW: 1 MHz
 VBW: 1 MHz
 Sweep time: 1,05 ms
 Single sweep
 Detector: Peak
 Trace: Clear/Write
 Trigger: Video

Determination of the number of times n the channel was active in 30 s

RBW: 100 kHz
 VBW: 100 kHz
 Sweep time: 10 s

Time for the channel to be active in 30 s: $S = T * n$

Limit: < 0,4 s

Test conditions	Test parameters	Time of occupancy (dwell time)		
		$F_{min} = 2402 \text{ MHz}$	$F_{mid} = 2441 \text{ MHz}$	$F_{max} = 2480 \text{ MHz}$
$V_{nom} = 2,6 \text{ V}$	T (μs)	387,2	387,2	387,2
	n	$98*3=294$	$100*3=300$	$98*3=294$
	S (s)	0,11	0,12	0,11

Measurement plots are given in Appendix I.

11. PEAK POWER SPECTRAL DENSITY

11.1 Test protocol

Date of test: October 10, 2002

The EUT was set to the TX mode, hopping on and maximum data rate.

Spectrum analyzer settings:

Span: 1 MHz
 RBW: 3 kHz
 VBW: 10 kHz
 Sweep time: 280 ms
 Detector: Peak
 Trace: Max Hold

Test conditions	Power spectral density (dBm)			
	$F_{\min} = 2402 \text{ MHz}$	$F_{\text{mid}} = 2441 \text{ MHz}$	$F_{\max} = 2480 \text{ MHz}$	Limit (dBm)
$V_{\text{nom}} = 2,6 \text{ V}$	-16,8	-17,1	-17,0	< 8

Measurement results were corrected for the cable loss.

Measurement plots are given in Appendix I.

12. RADIATED SPURIOUS EMISSIONS

12.1 Operating environment

Temperature: 21 °C (15 - 35 °C)

Relative Humidity: 26 % (20 - 75 %)

12.2 Measurement uncertainty

Radiated disturbance electric field intensity, 30-1000 MHz: $\pm 4,6$ dB

Radiated disturbance electric field intensity, 1000-26000 MHz: $\pm 6,0$ dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.

The measurement uncertainty is given with a confidence of 95%.

12.3 Test equipment and software

Equipment	Manufacturer	Type	SEMKO No.
Software:	R&S	ES-K1, V1.60	
<i>Test site: Semi-anechoic shielded chamber, 10 x 20 x 8,5 m (W x L x H)</i>			
Spectrum analyser/ Measurement receiver:	R&S	ESAI	2973/2974
Antenna amplifier:	SEMKO		7992/7993
Antenna, bilog:	Chase	CBL6111A	971
<i>Test site: Bluetooth anechoic shielded chamber, 3,68 x 6,98 x 2,35 m (W x L x H)</i>			
Signal analyser:	R&S	FSIQ 40	9192
Preamplifier:	HP	8449B	6685
Antenna:			
Double Ridge Guide Horn:	EMCO	3115	4936
Horn antenna:	EMCO	3160-08	30099
Horn antenna:	EMCO	3160-09	30101

R&S = Rohde & Schwarz

HP = Hewlett Packard

12.4 Measurement set-up

12.4.1 Test site: Semi-anechoic shielded chamber (30 – 1000 MHz)

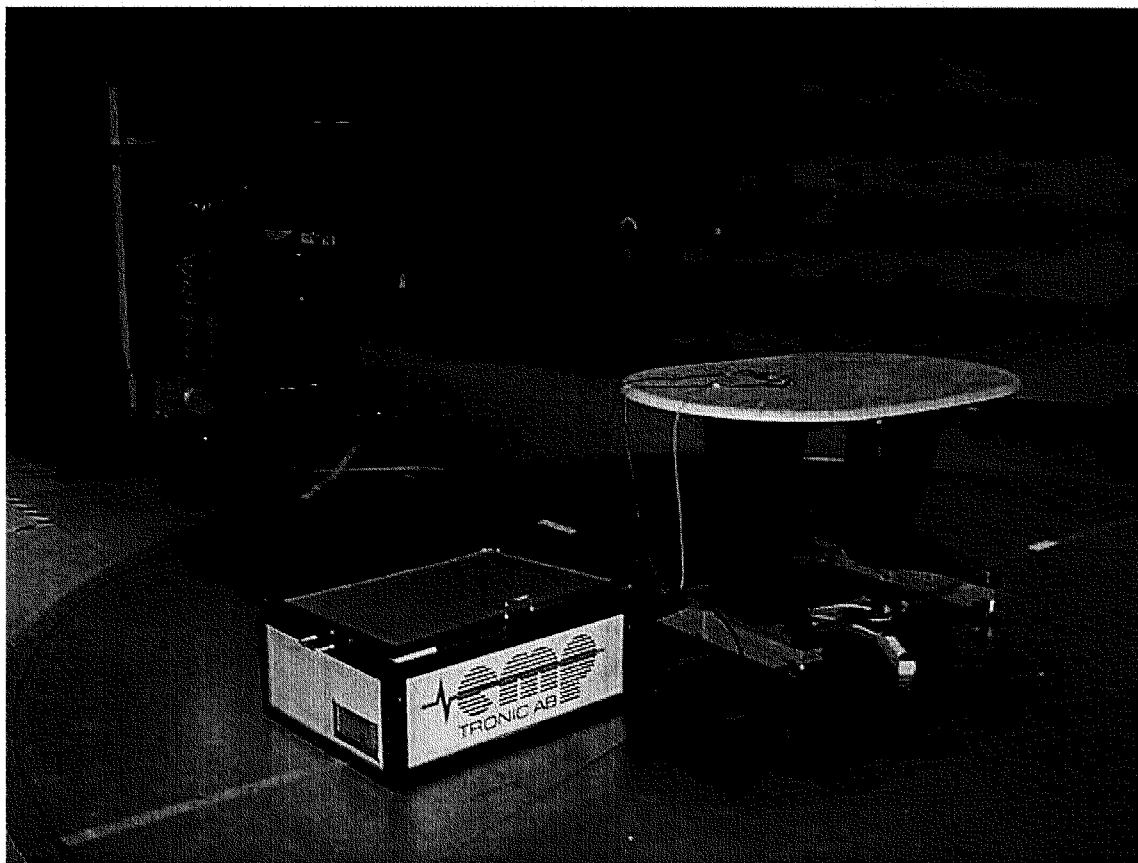
The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photos are given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m, 2,5 m and 3,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. The peak overview sweeps are found in section 12.5.

For frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration quasi-peak measurements were carried out.

Test set-up in the semi-anechoic shielded chamber





12.4.2 Test site: Bluetooth anechoic shielded chamber (1-26 GHz)

In the Bluetooth anechoic chamber the EUT was placed on a non-metallic table, 1,4 m above the floor. The radiated disturbance electric field intensity was measured at a distance of 3 m. The specified test mode was enabled.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,4 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. If necessary, the sweep was repeated with average detection.

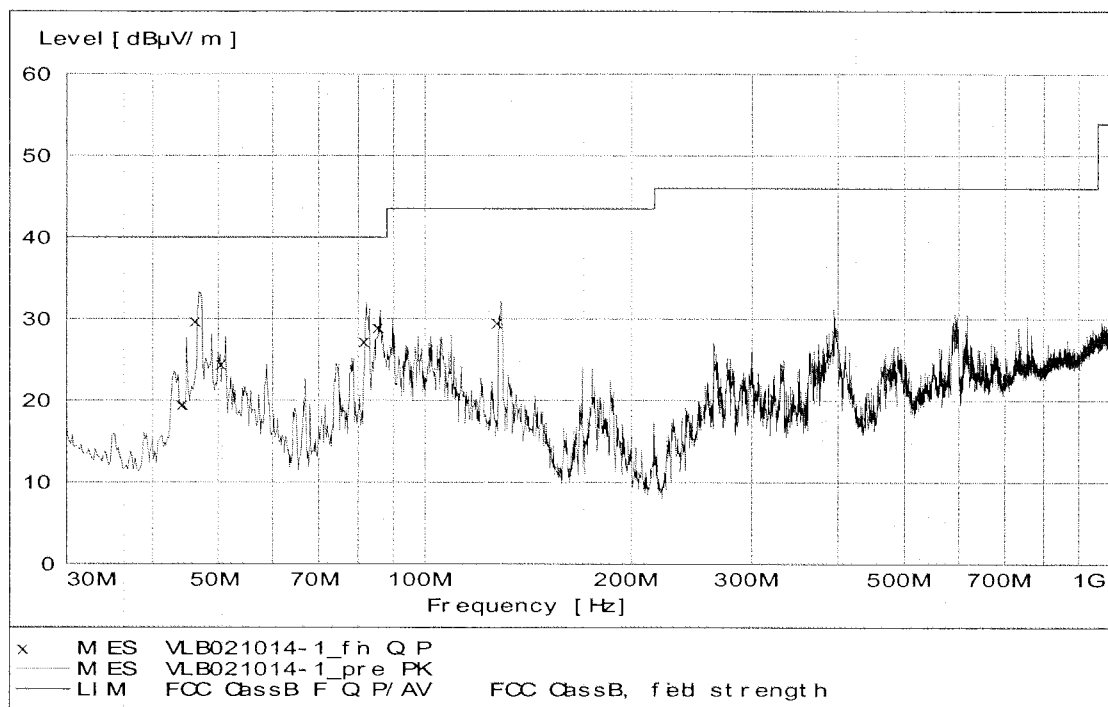
The peak overview sweeps are found in section 12.5.

12.5 Test protocol

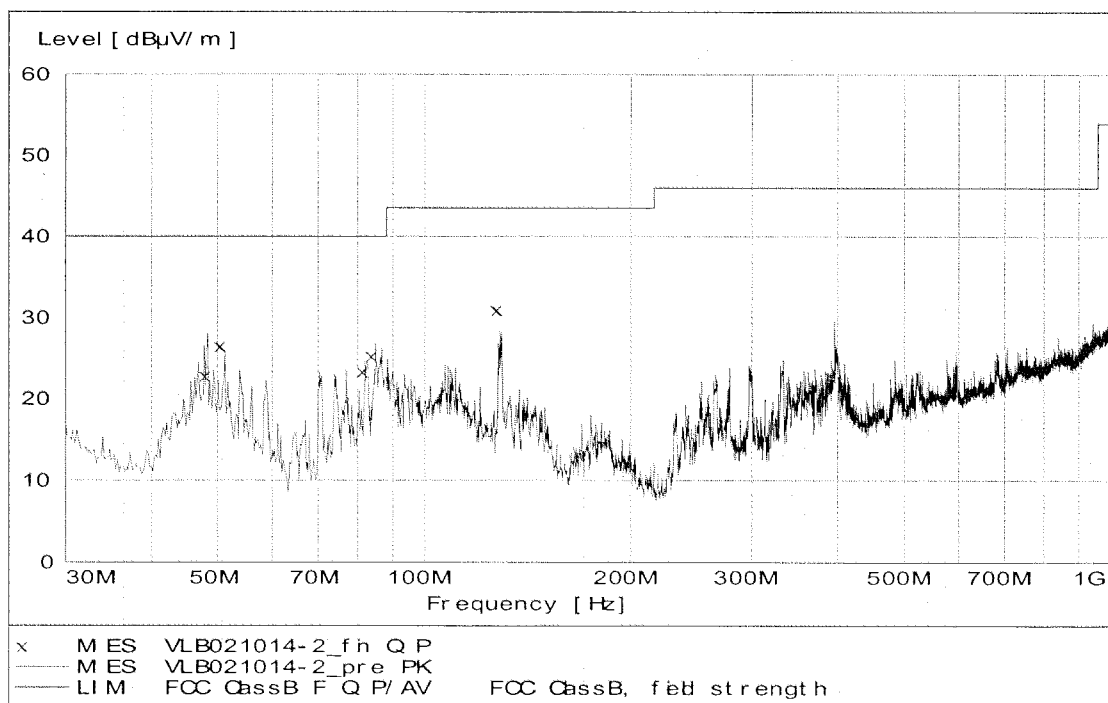
12.5.1 Semi-anechoic shielded chamber

Date of test: October 14, 2002

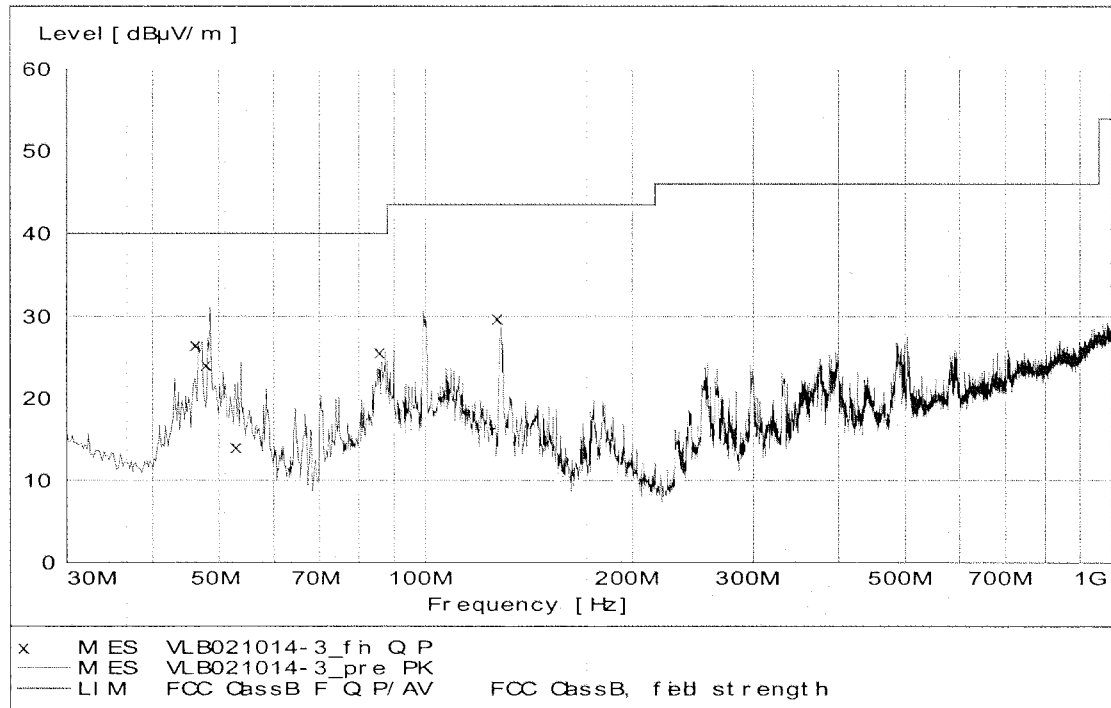
30 – 1000 MHz, max peak at a distance of 3 m on the lower TX channel



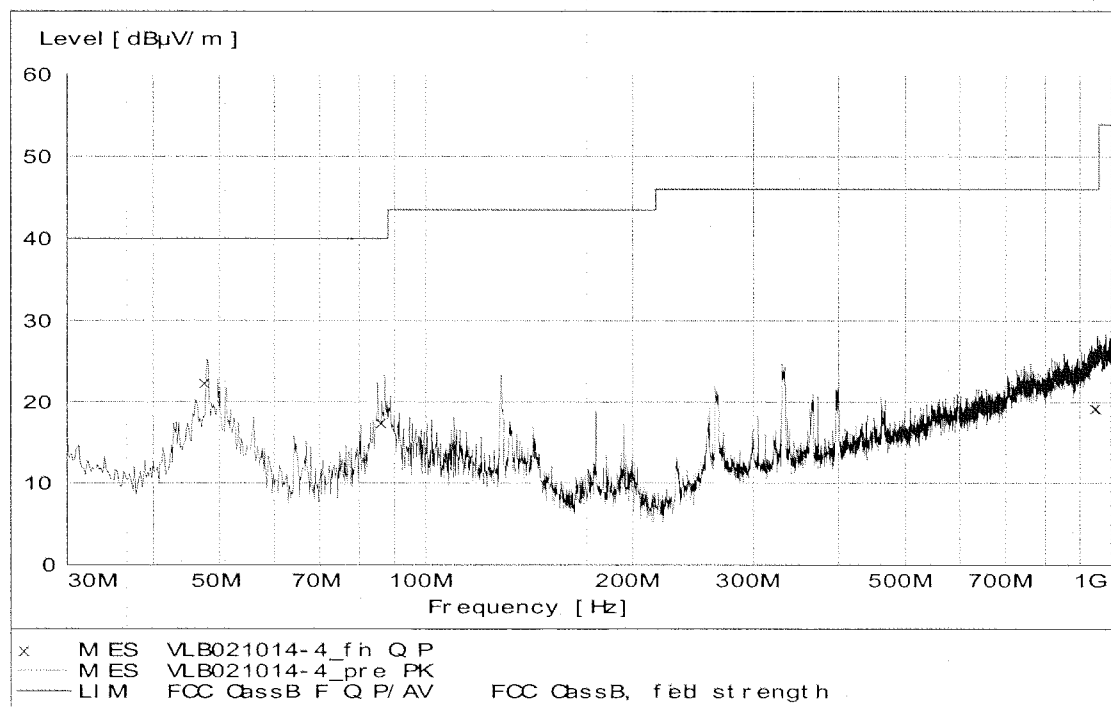
30 – 1000 MHz, max peak at a distance of 3 m on the middle TX channel



30 – 1000 MHz, max peak at a distance of 3 m on the upper TX channel



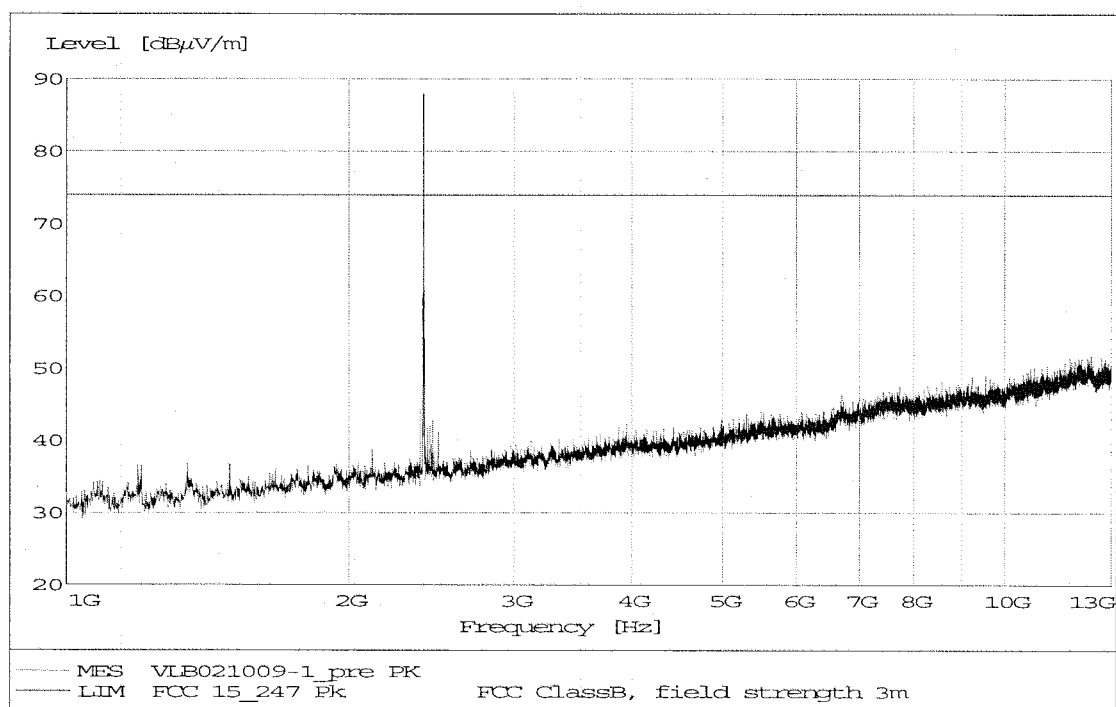
30 – 1000 MHz, max peak at a distance of 3 m in the stand-by mode



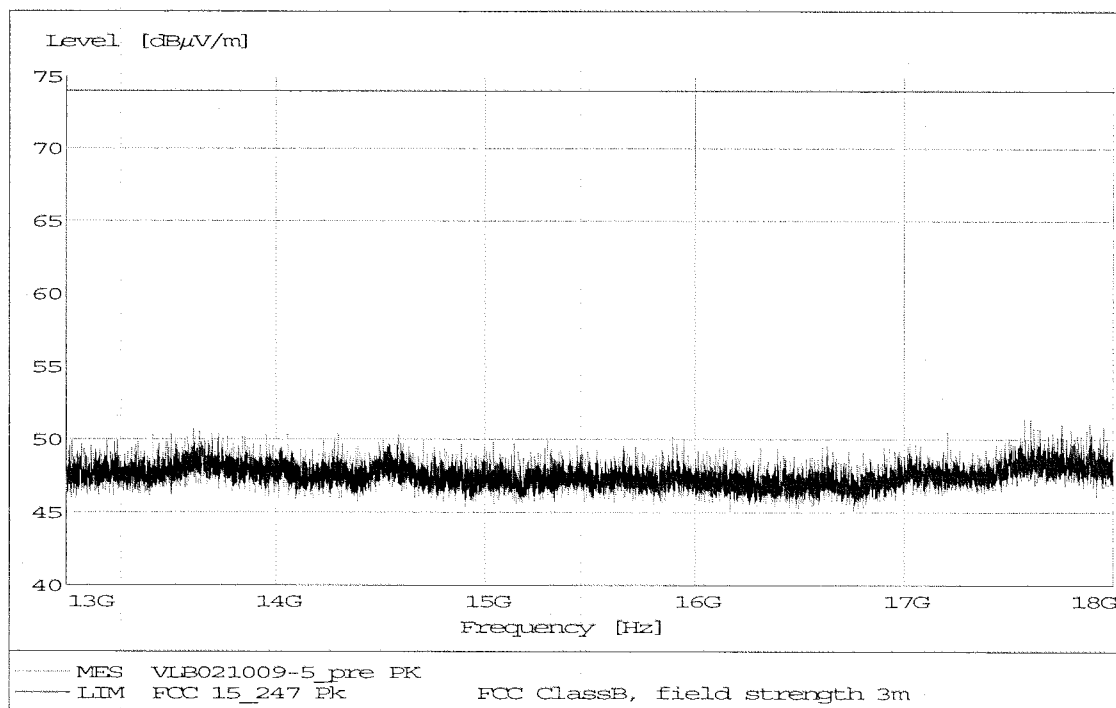
12.5.2 Bluetooth anechoic shielded chamber

Date of test: October 9, 2002

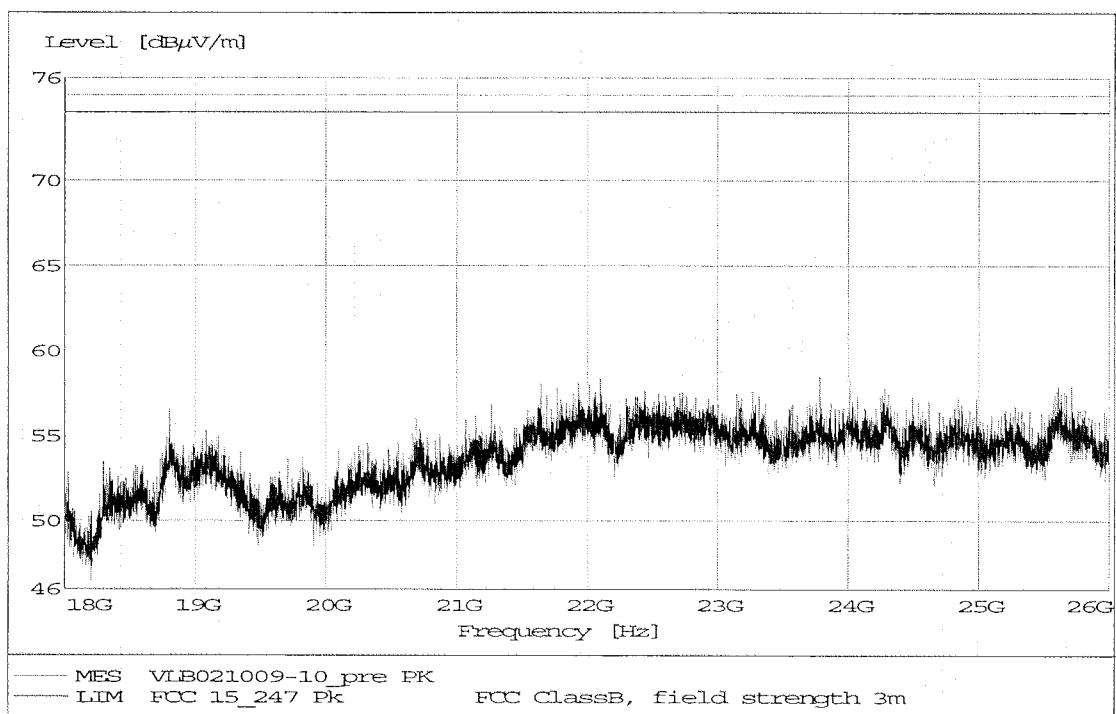
1 – 13 GHz, peak detection at a distance of 3 m; TX mode, lower channel



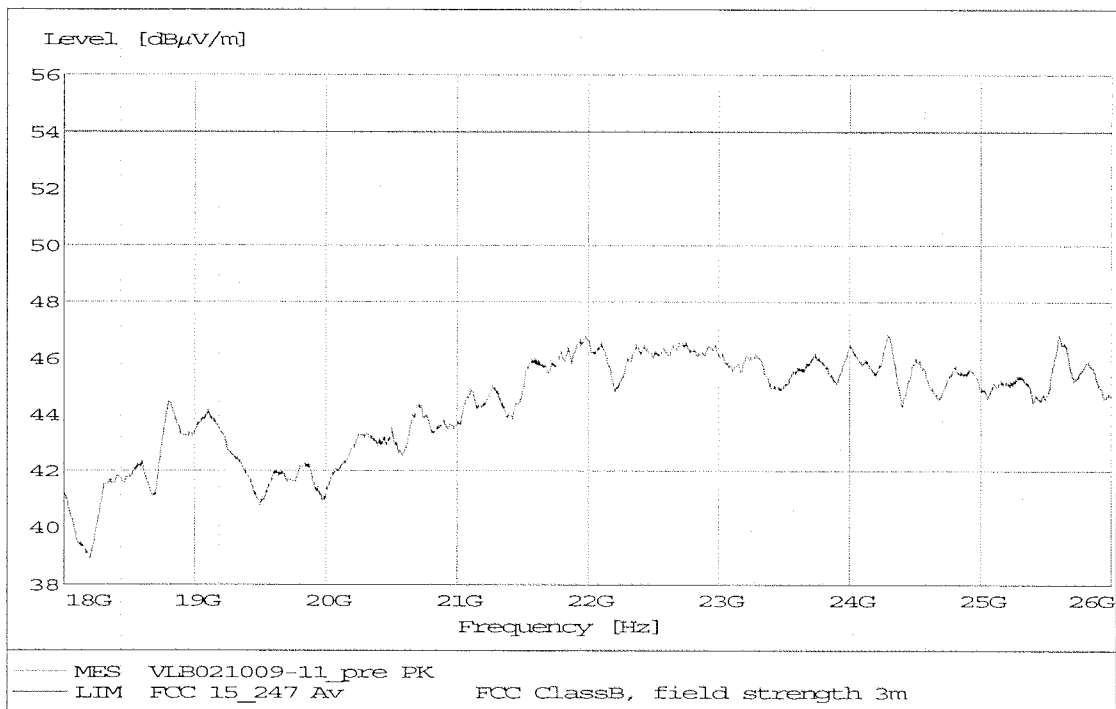
13 – 18 GHz, peak detection at a distance of 3 m; TX mode, lower channel



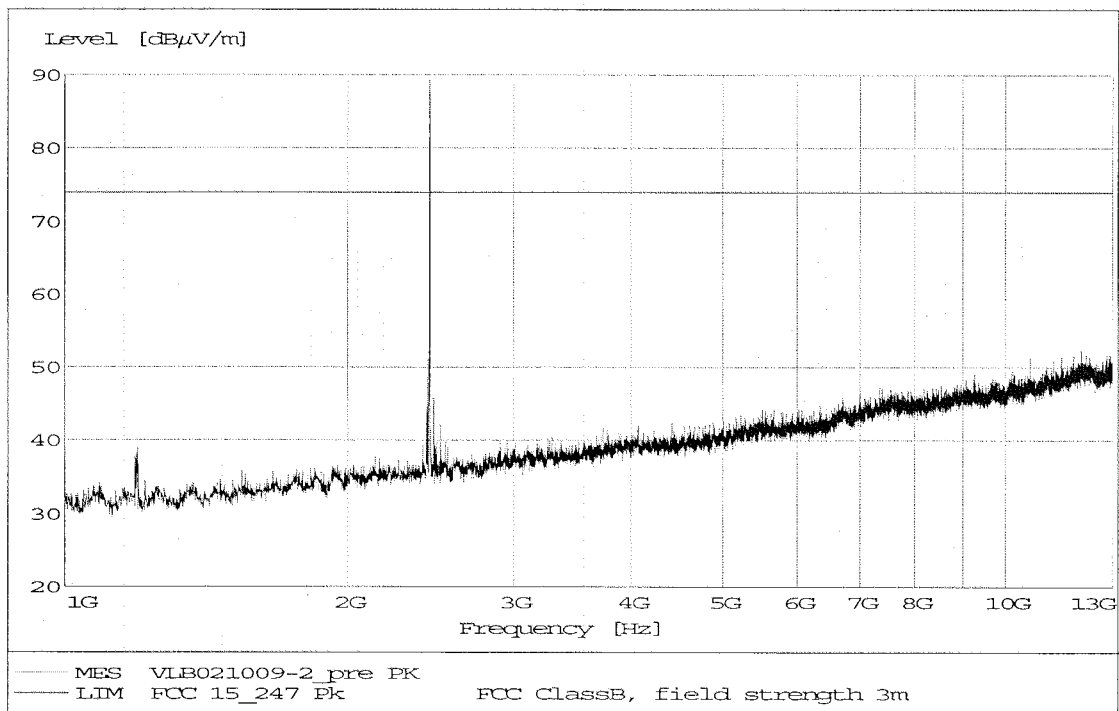
18 – 26 GHz, peak detection at a distance of 3 m; TX mode, lower channel



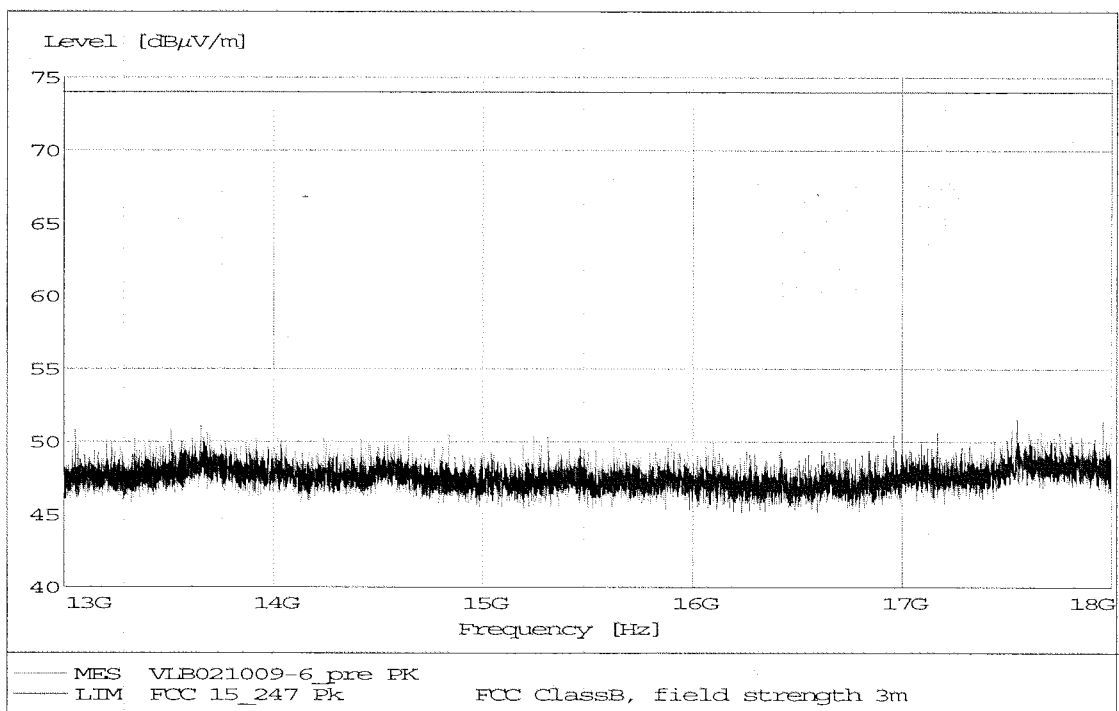
18 – 26 GHz, average detection at a distance of 3 m; TX mode, lower channel



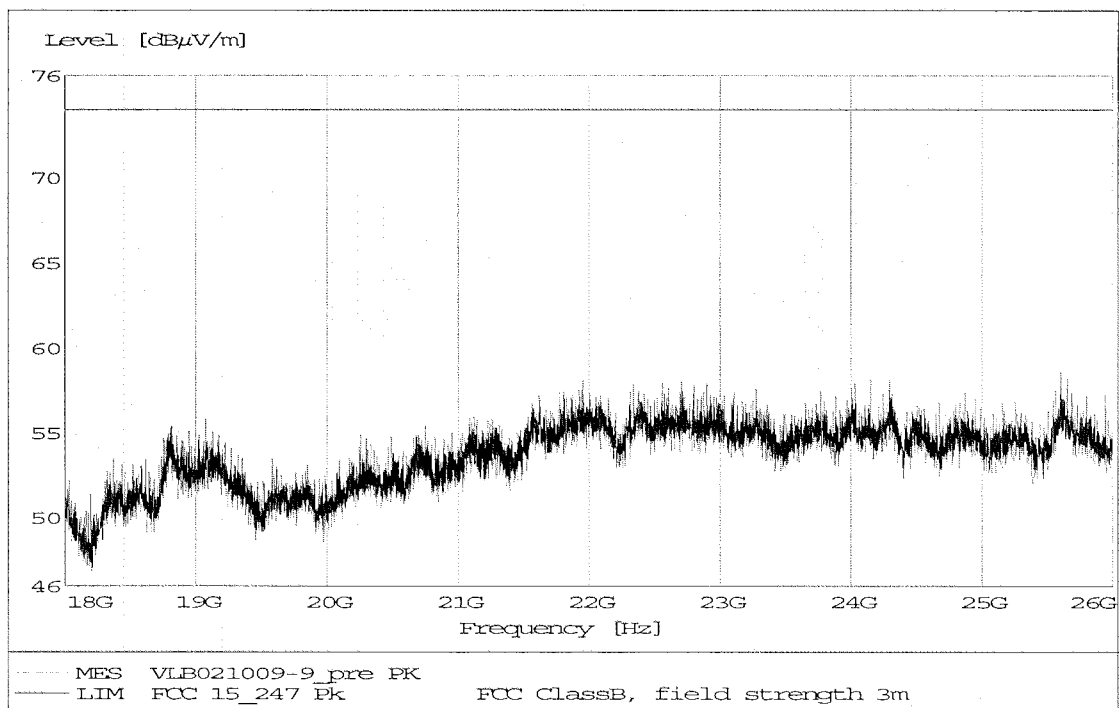
1 – 13 GHz, peak detection at a distance of 3 m; TX mode, middle channel



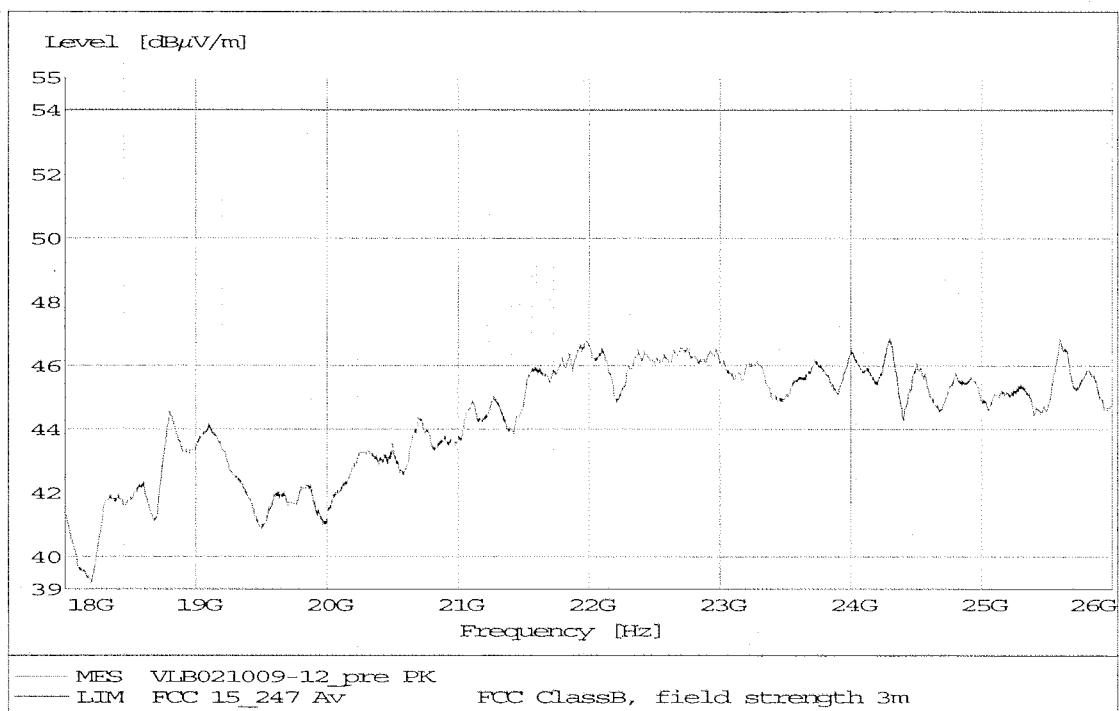
13 – 18 GHz, peak detection at a distance of 3 m; TX mode, middle channel



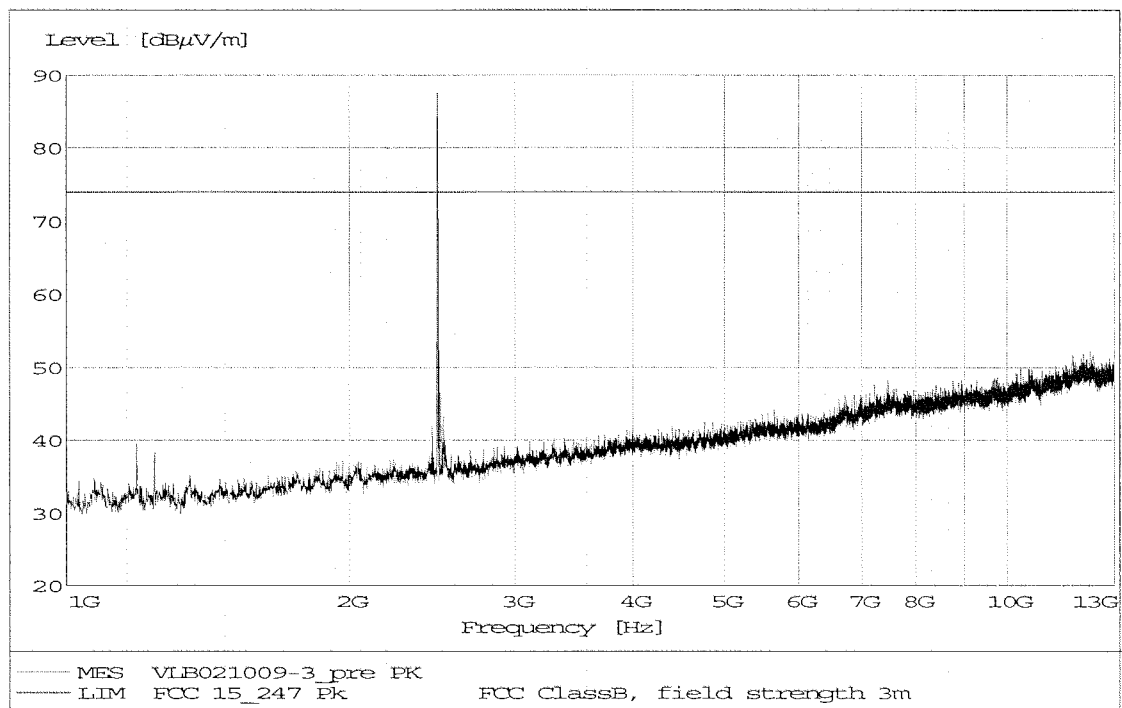
18 – 26 GHz, peak detection at a distance of 3 m; TX mode, middle channel



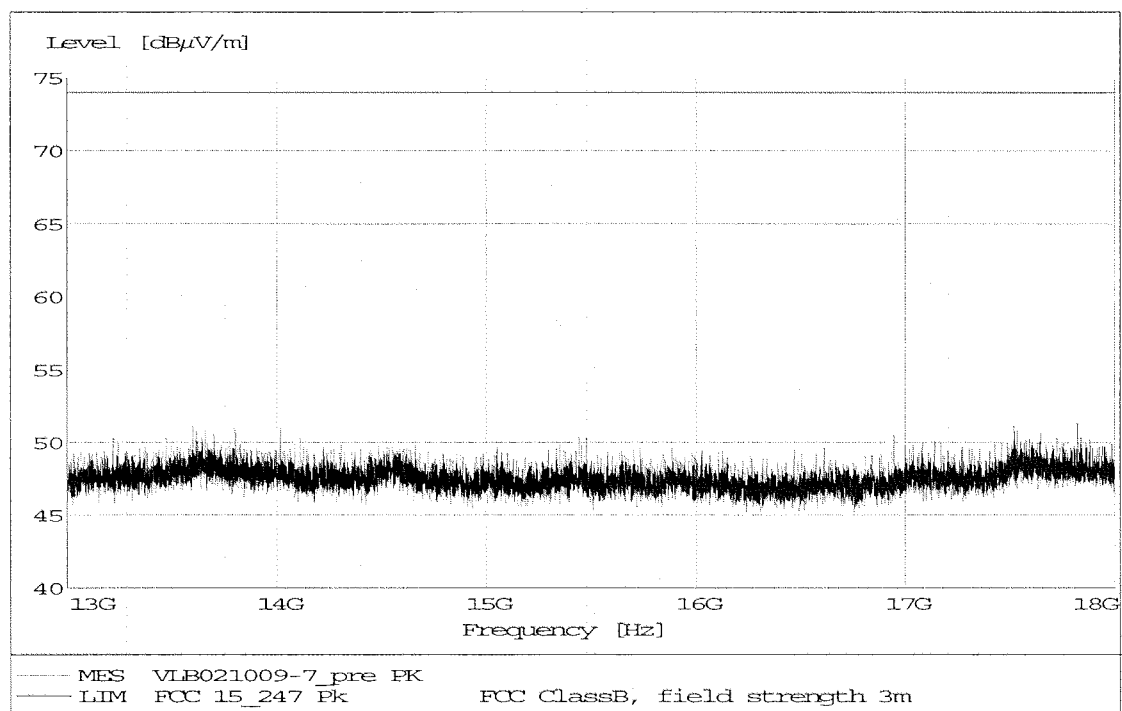
18 – 26 GHz, average detection at a distance of 3 m; TX mode, middle channel



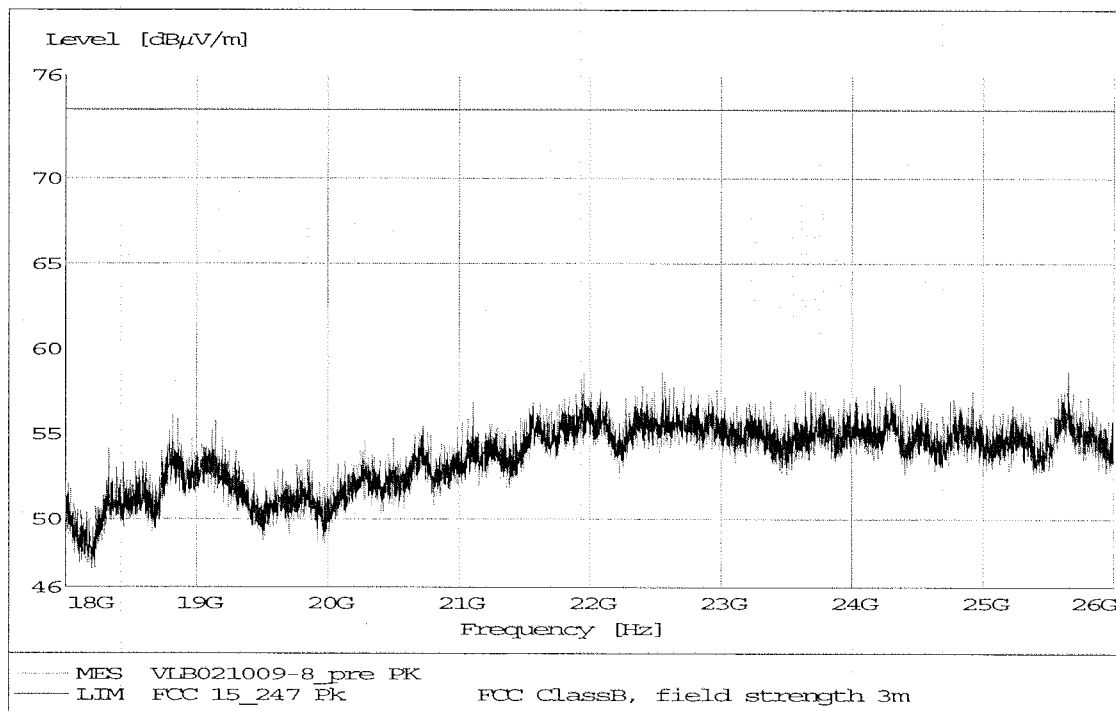
1 – 13 GHz, peak detection at a distance of 3 m; TX mode, upper channel



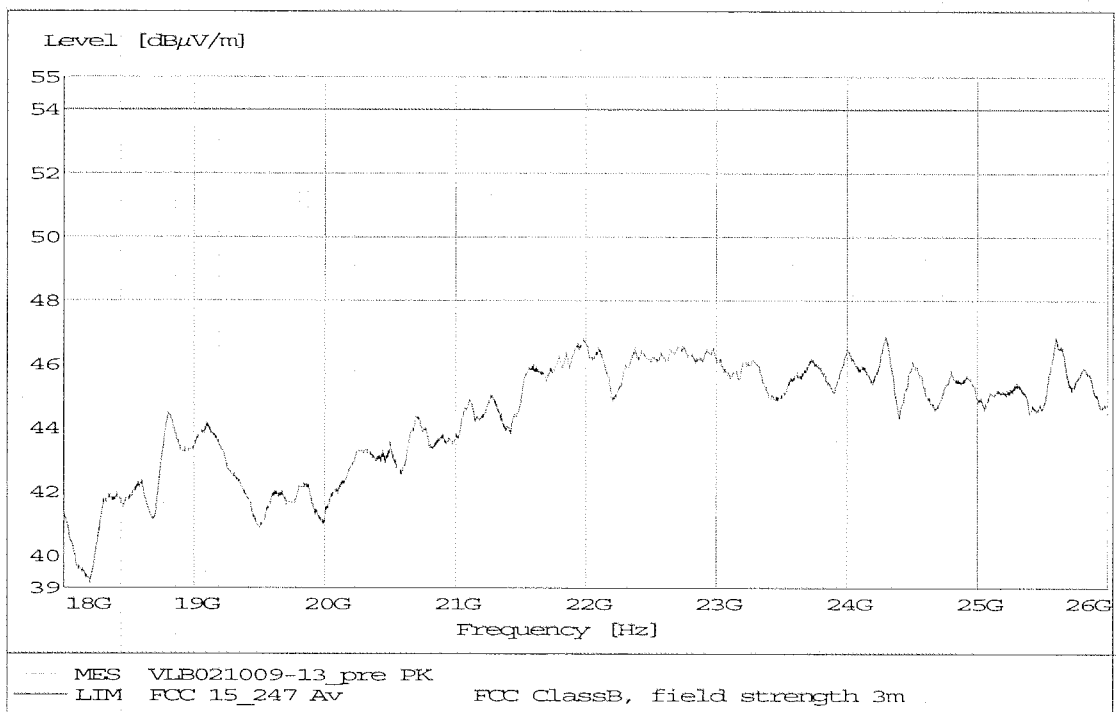
13 – 18 GHz, peak detection at a distance of 3 m; TX mode, upper channel



18 – 26 GHz, peak detection at a distance of 3 m; TX mode, upper channel

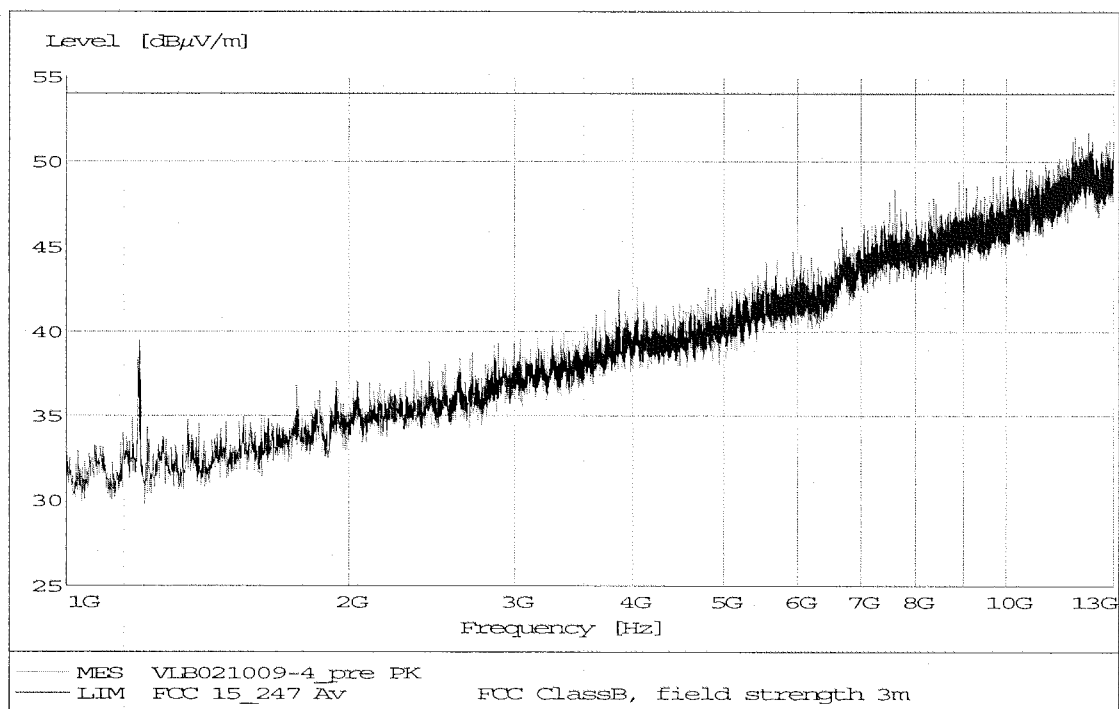


18 – 26 GHz, average detection at a distance of 3 m; TX mode, upper channel



Date of test: October 9, 2002

1 – 13 GHz, peak detection at a distance of 3 m; stand by mode

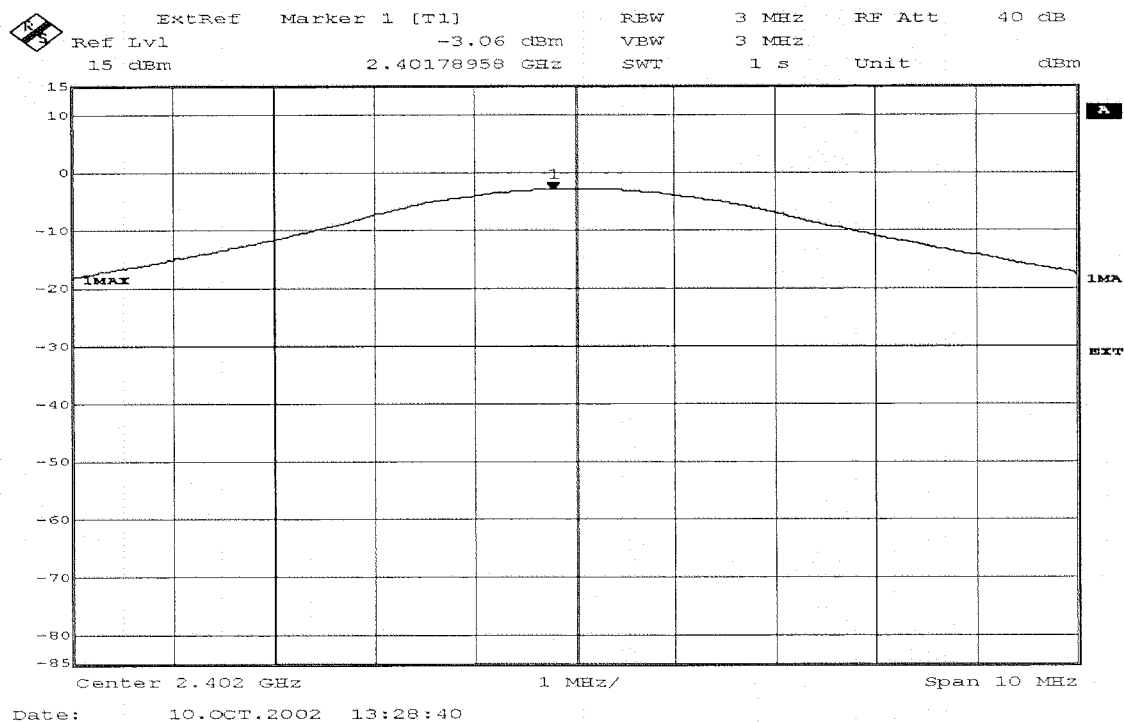


Field strength of spurious emissions						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Note
		Peak [dBμV/m]	QP/AV [dBμV/m]	Peak [dBμV/m]	QP/AV [dBμV/m]	
44,6	120	28	19,6	-	40	
46,6	120	33	29,8	-	40	
47,9	120	25	22,5	-	40	
48,3	120	32	24,2	-	40	
50,8	120	26	26,5	-	40	
53,4	120	24	14,2	-	40	
82,0	120	24	23,4	-	40	
82,3	120	32	27,3	-	40	
84,4	120	26	25,3	-	40	
86,2	120	31	29,0	-	40	
86,6	120	25	25,7	-	40	
86,9	120	23	17,6	-	40	
128,6	120	28	31,0	-	43,5	
395,4	120	30	22,8	-	46	
957,5	120	28	19,4	-	46	
1000 – 13000	1000	< 52	-	74	54	
13000 – 18000	1000	< 52	-	74	54	
18000 – 26000	1000	< 59	< 47	74	54	

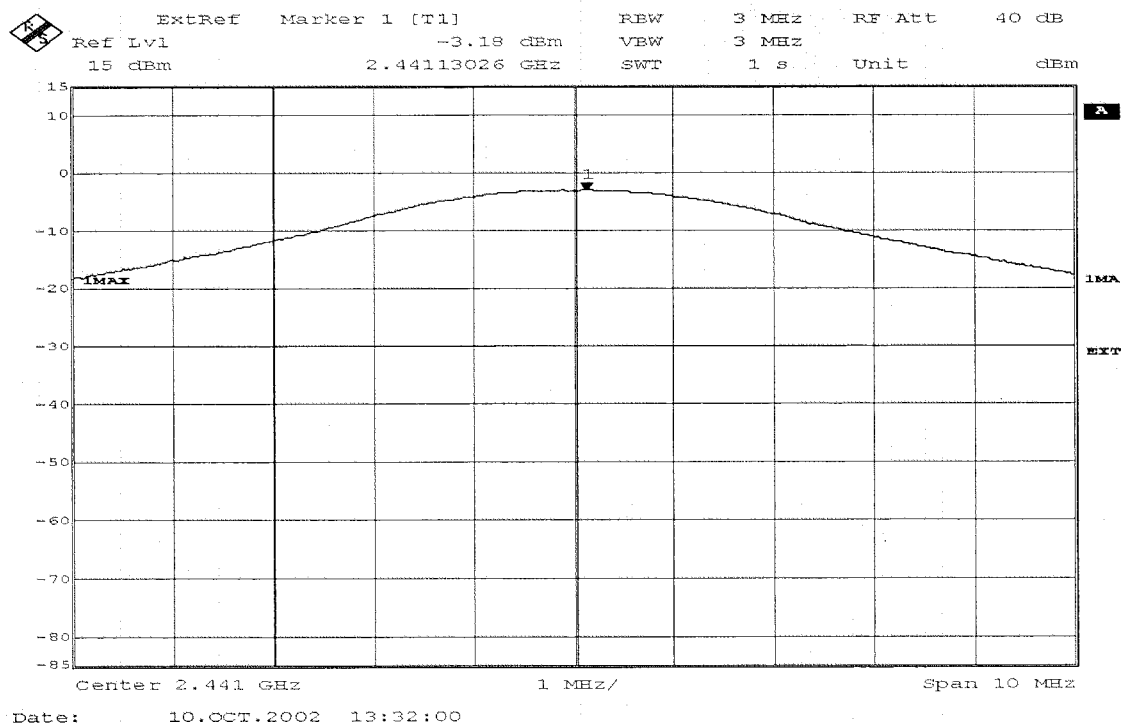
Fulfil requirements: Yes

APPENDIX I – MEASUREMENT PLOTS

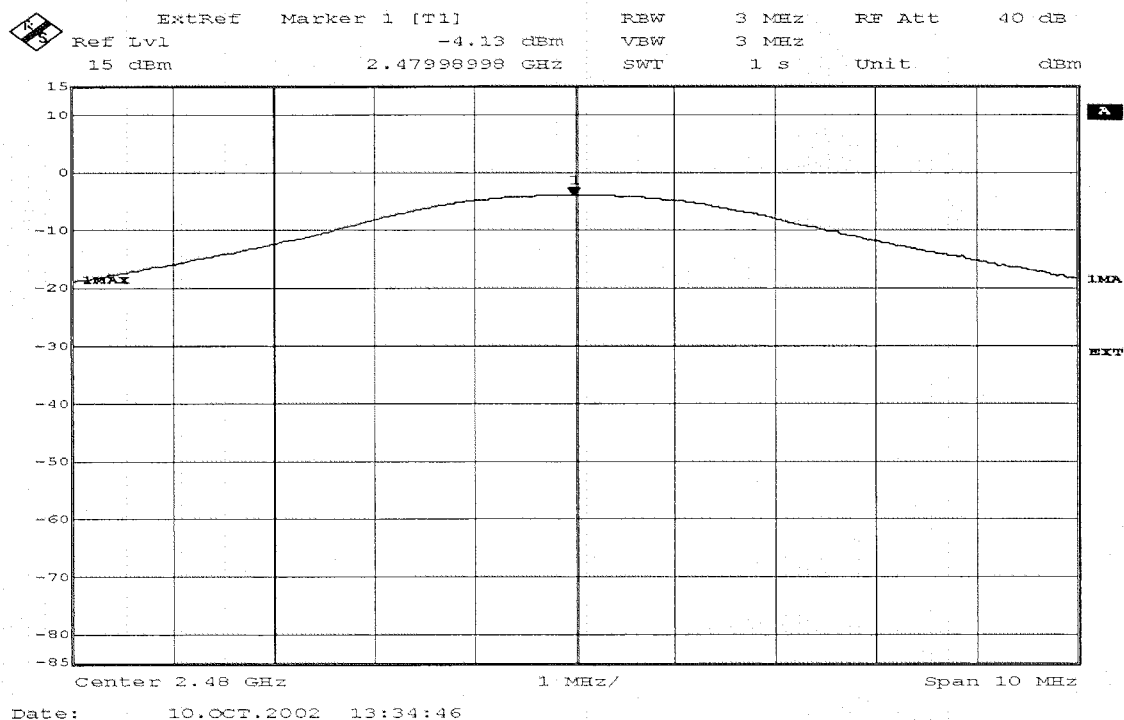
Peak Output Power, lower channel



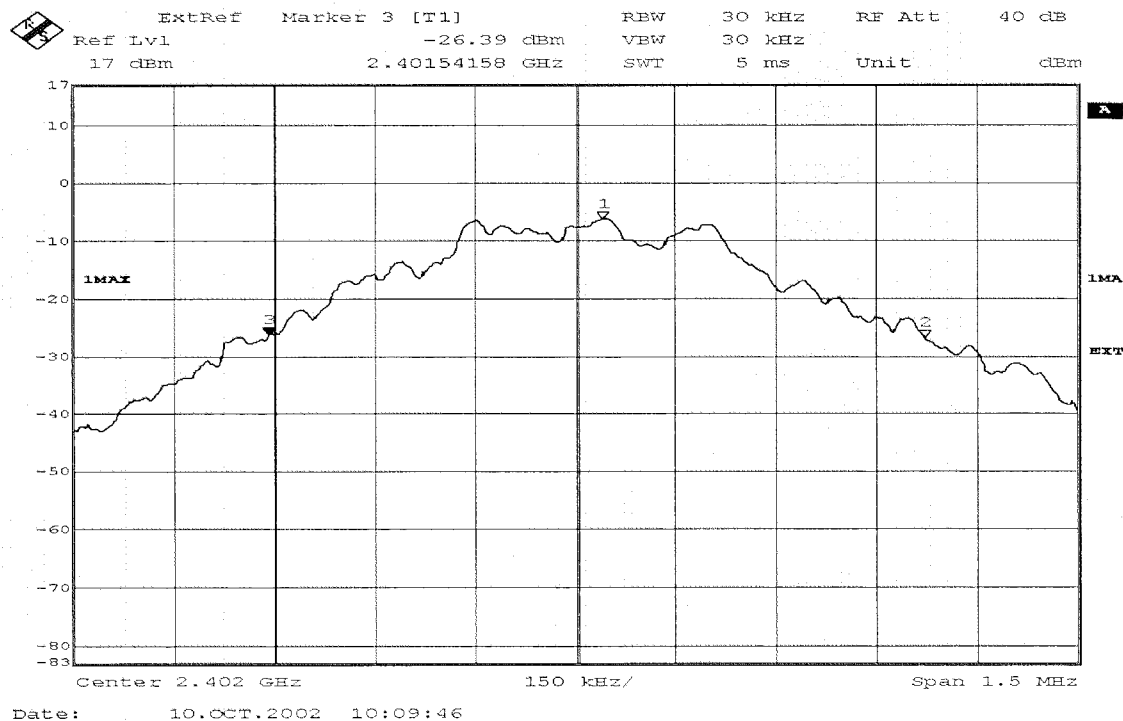
Peak Output Power, middle channel



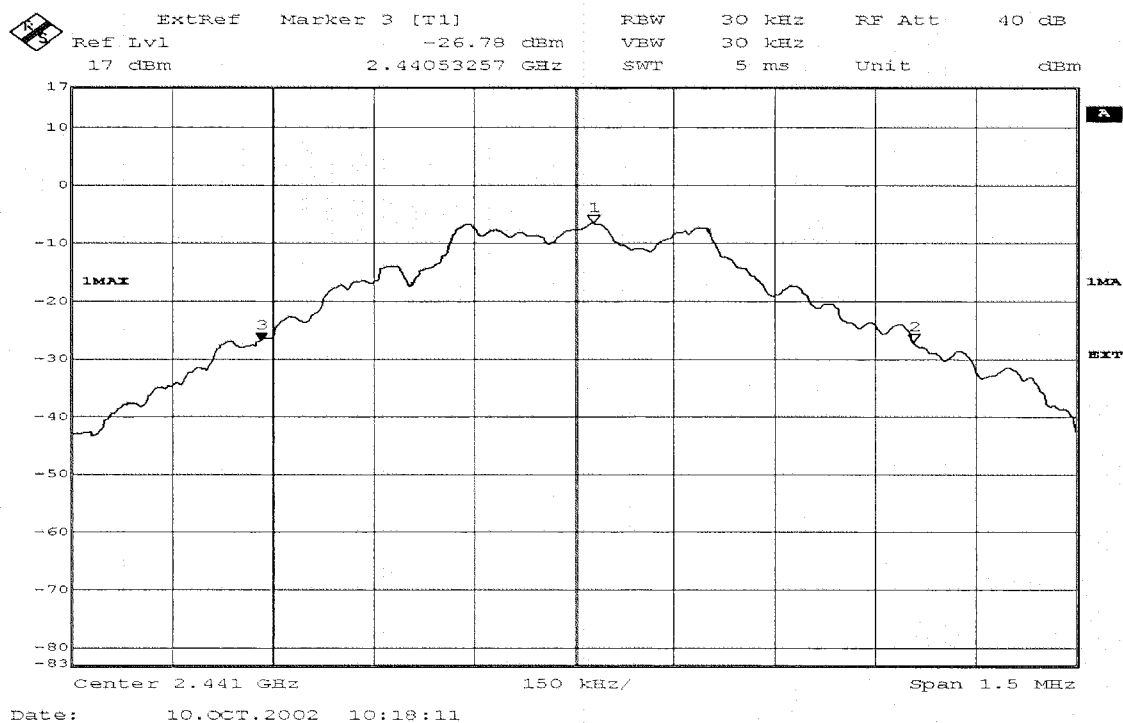
Peak Output Power, upper channel



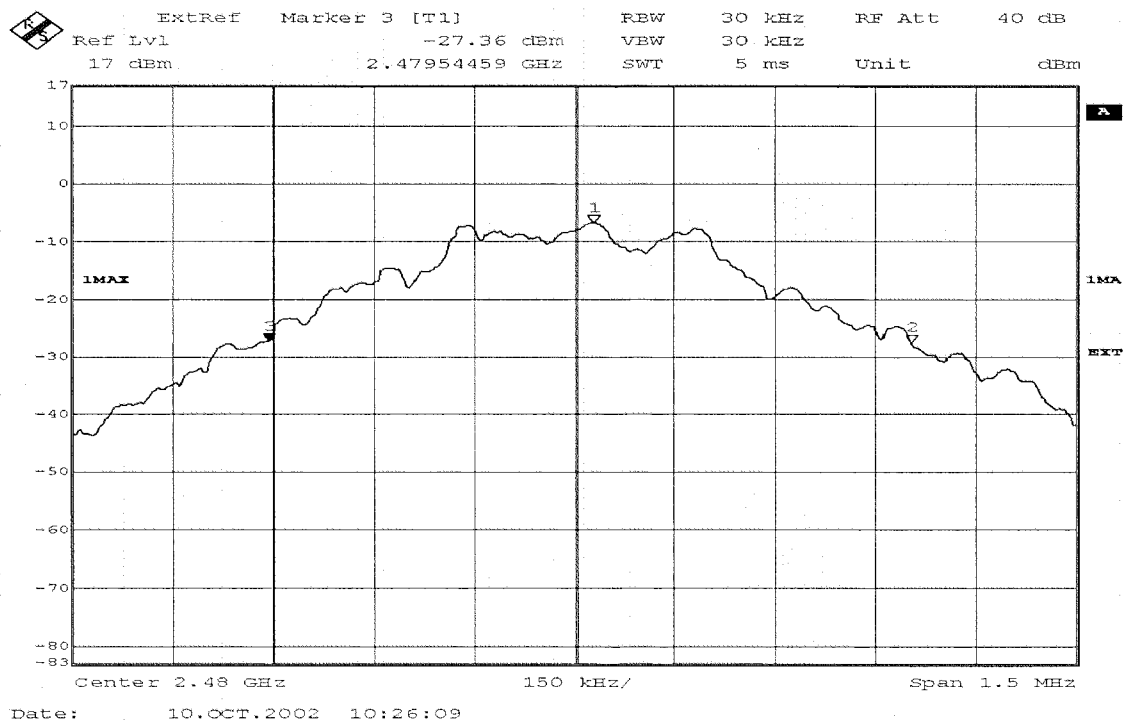
TX Output Spectrum -- 20 dB Bandwidth, lower channel



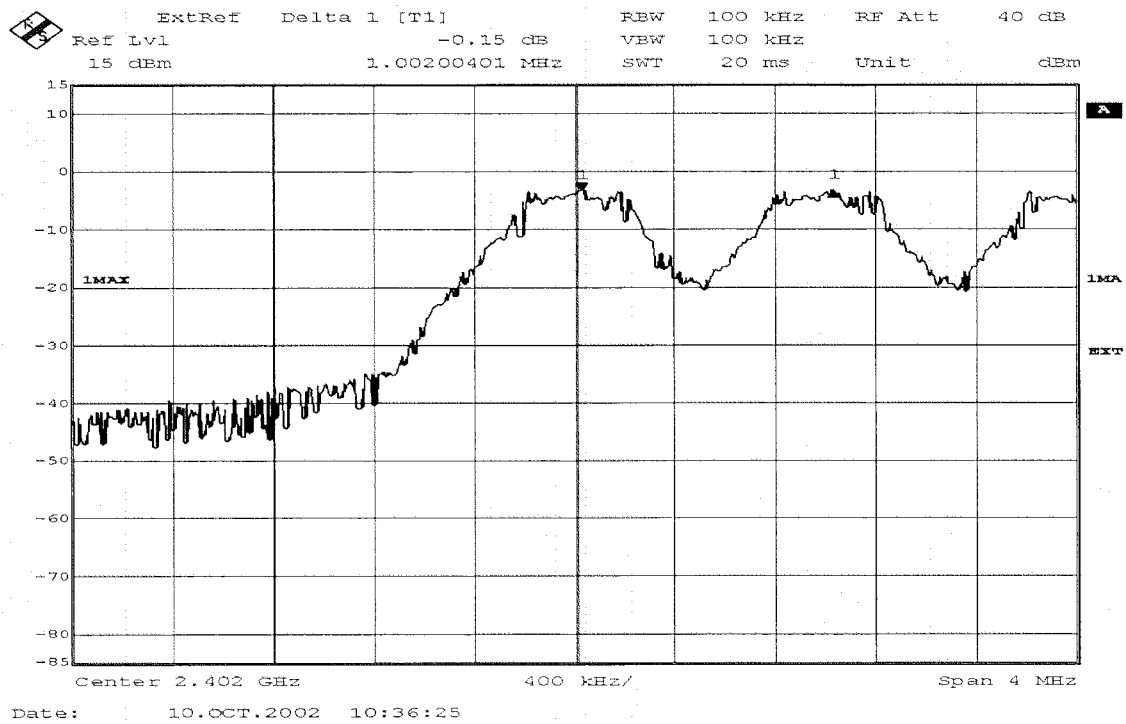
TX Output Spectrum – 20 dB Bandwidth, middle channel



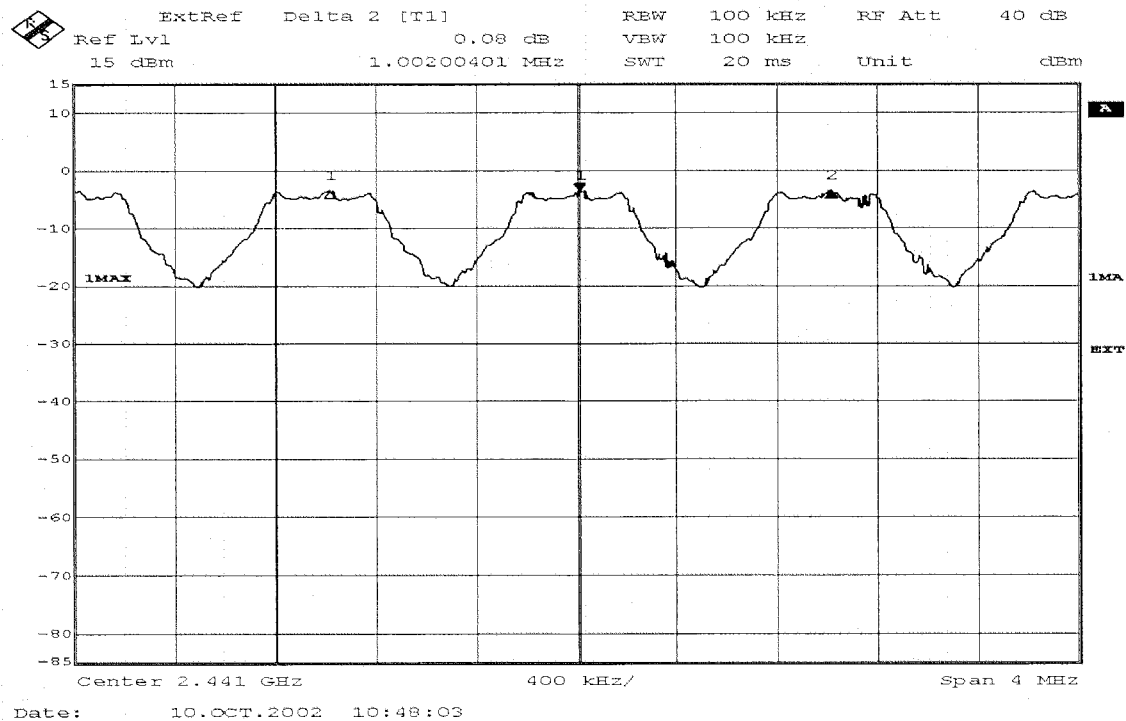
TX Output Spectrum – 20 dB Bandwidth, upper channel



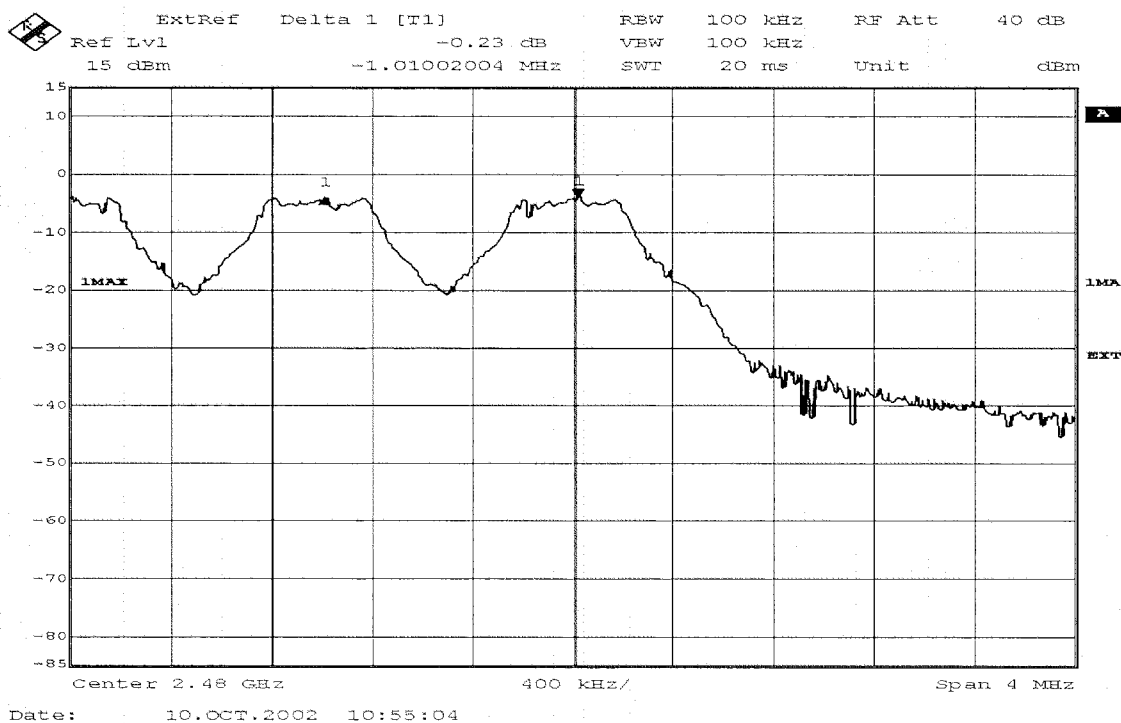
Carrier Frequency Separation, lower channel



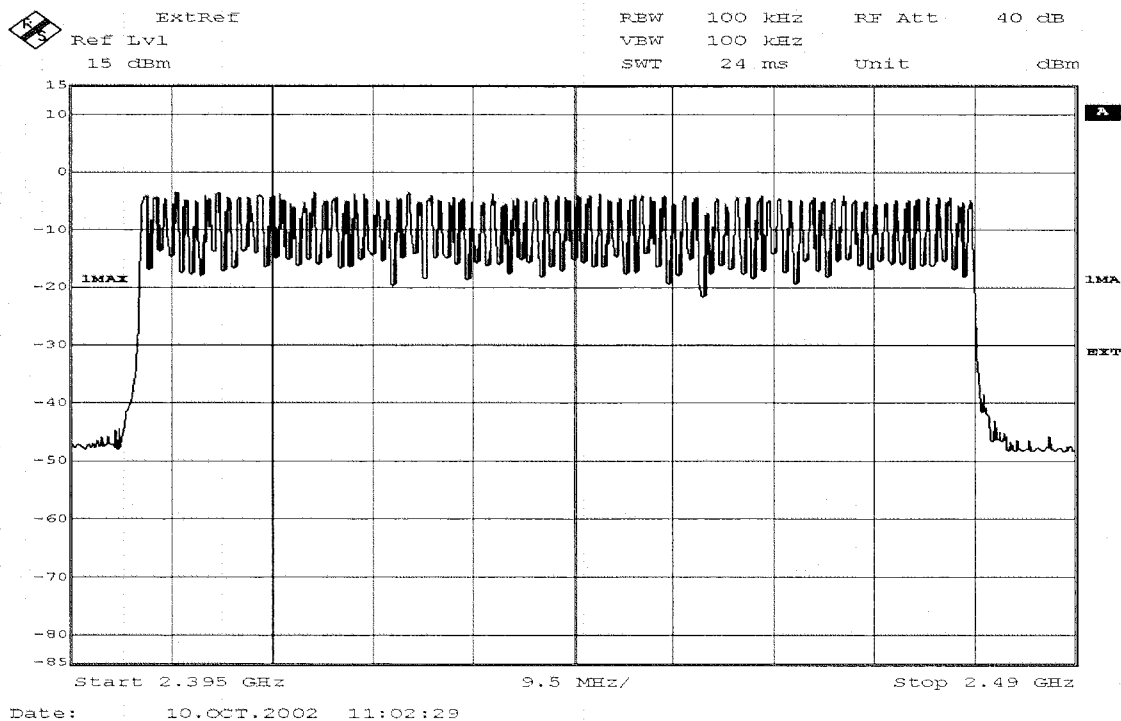
Carrier Frequency Separation, middle channel



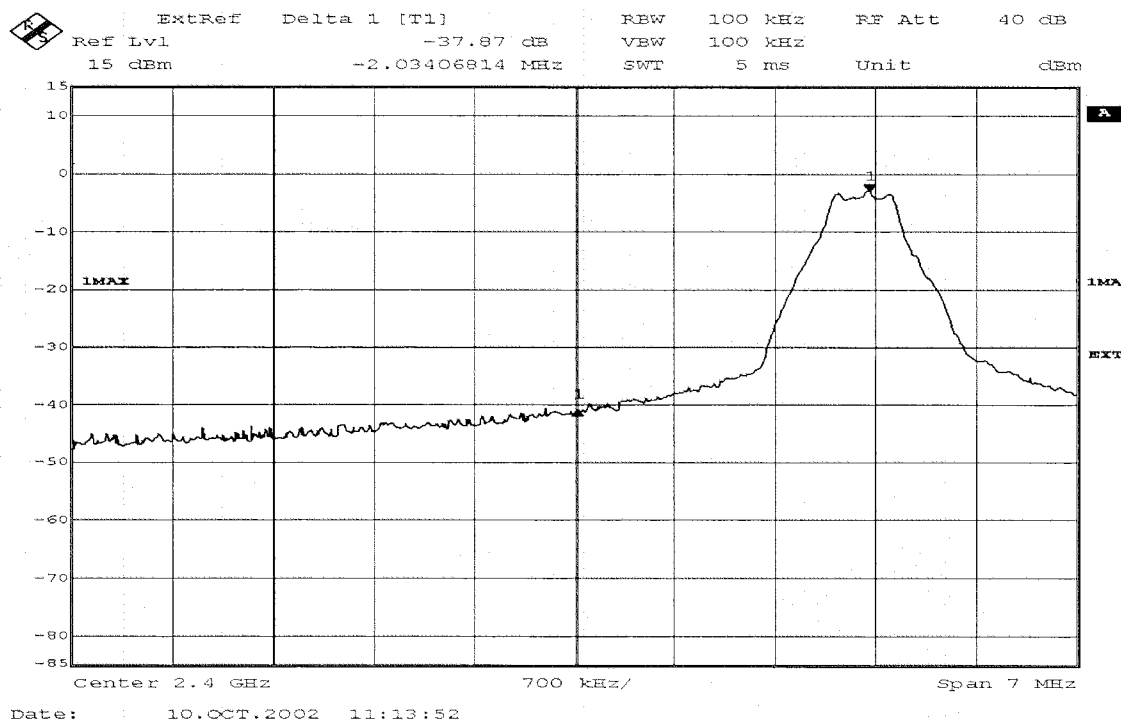
Carrier Frequency Separation, upper channel



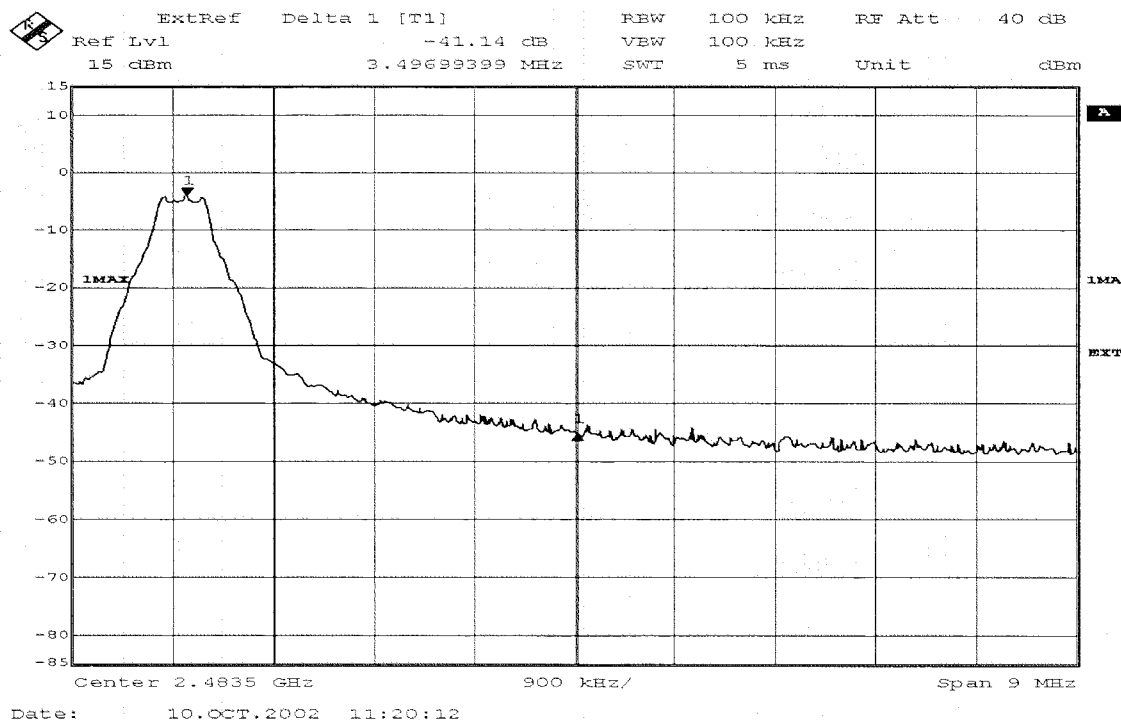
Number of Hopping Channels (79)



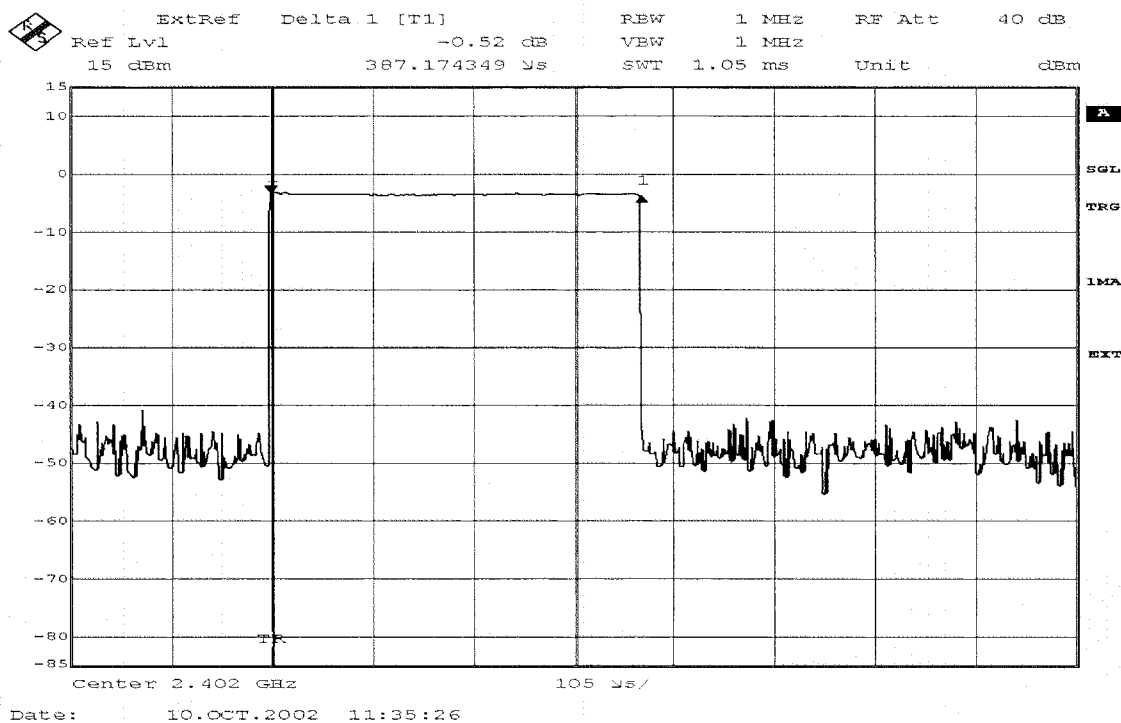
Band Edge Compliance at 2400 MHz



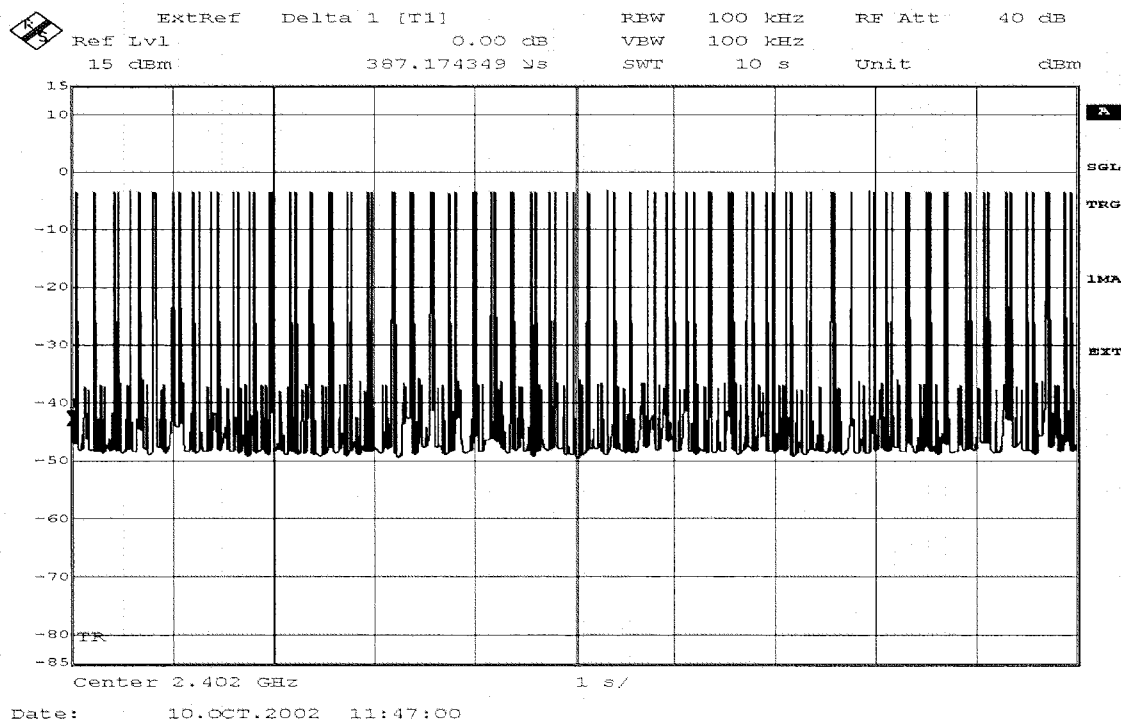
Band Edge Compliance at 2483,5 MHz



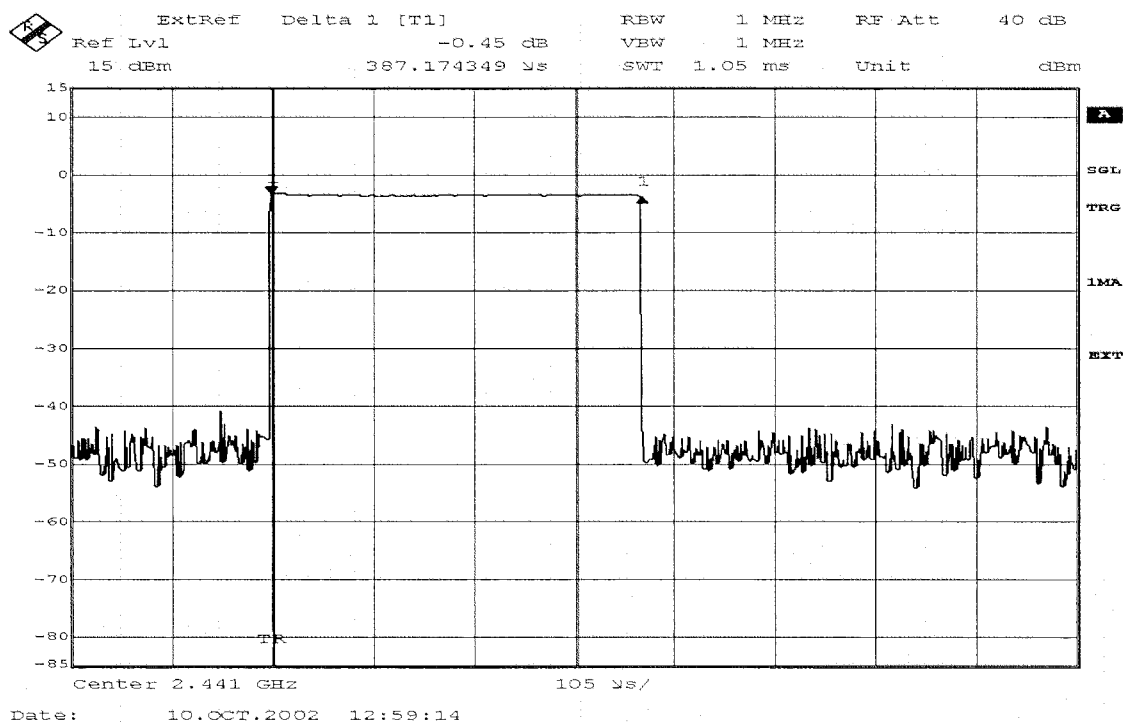
Time of Occupancy (dwell time), lower channel – determination of T



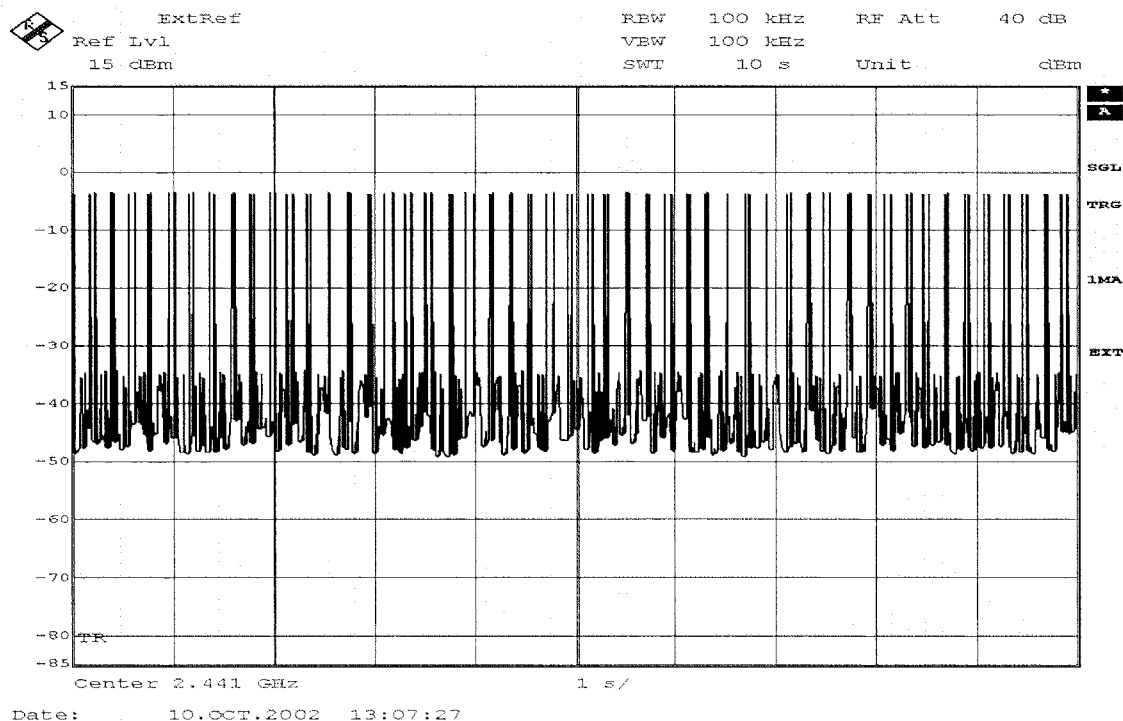
Time of Occupancy (dwell time), lower channel – determination of n



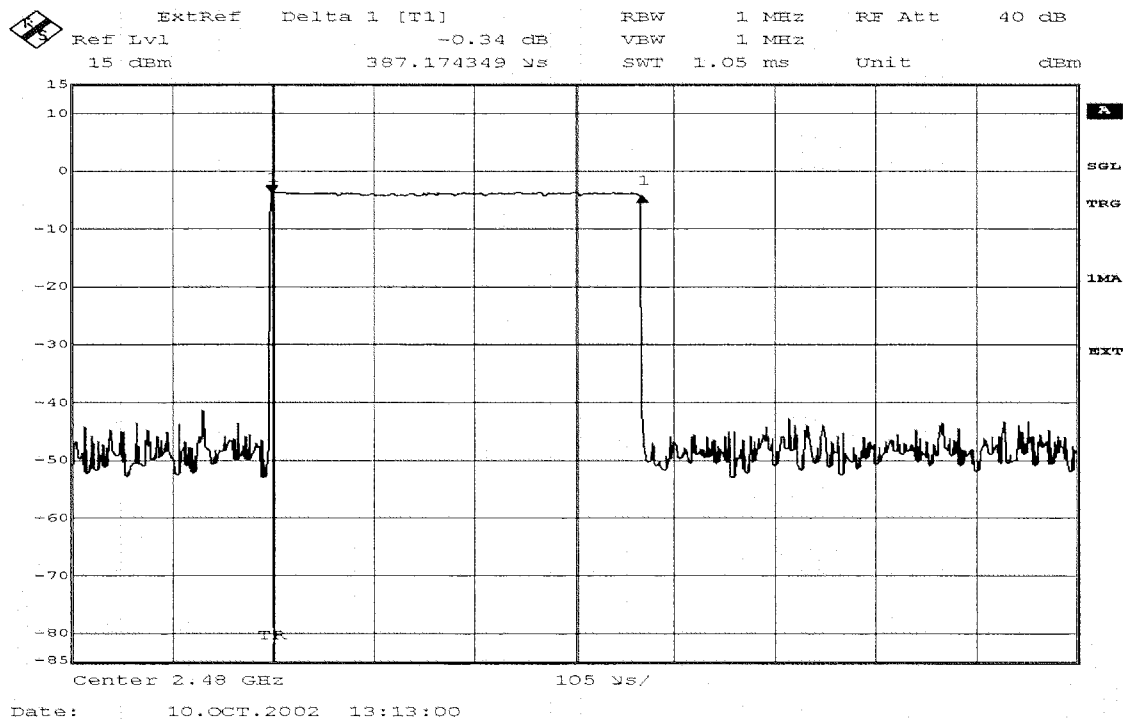
Time of Occupancy (dwell time), middle channel – determination of T



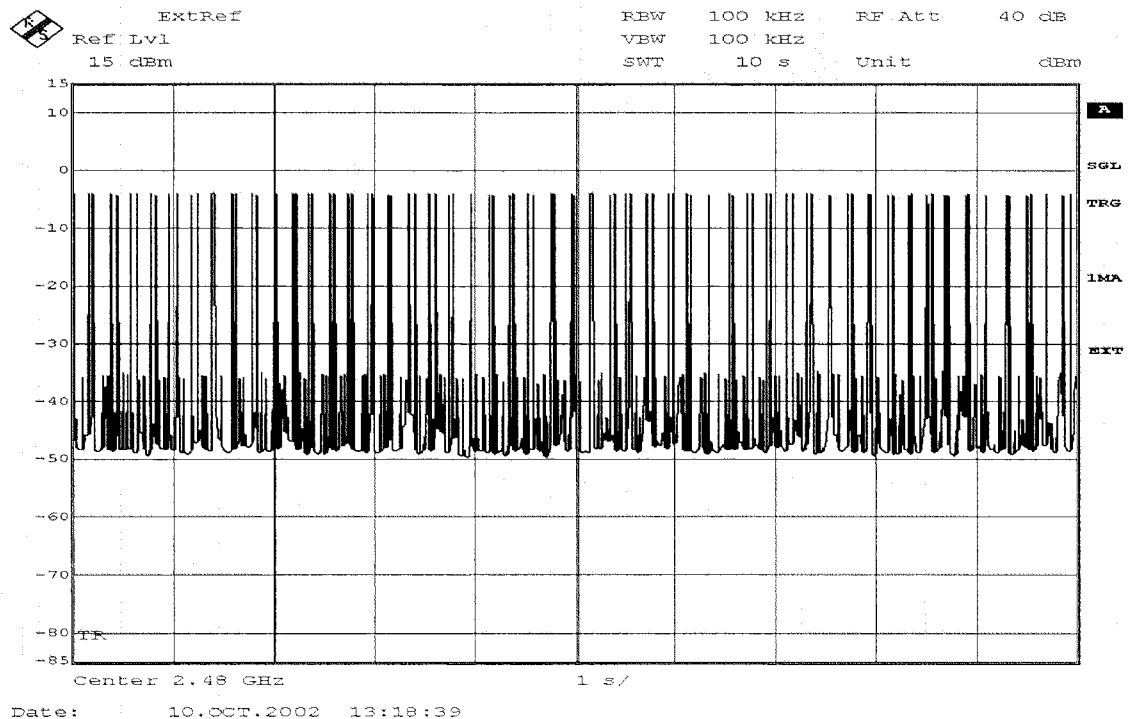
Time of Occupancy (dwell time), middle channel – determination of n



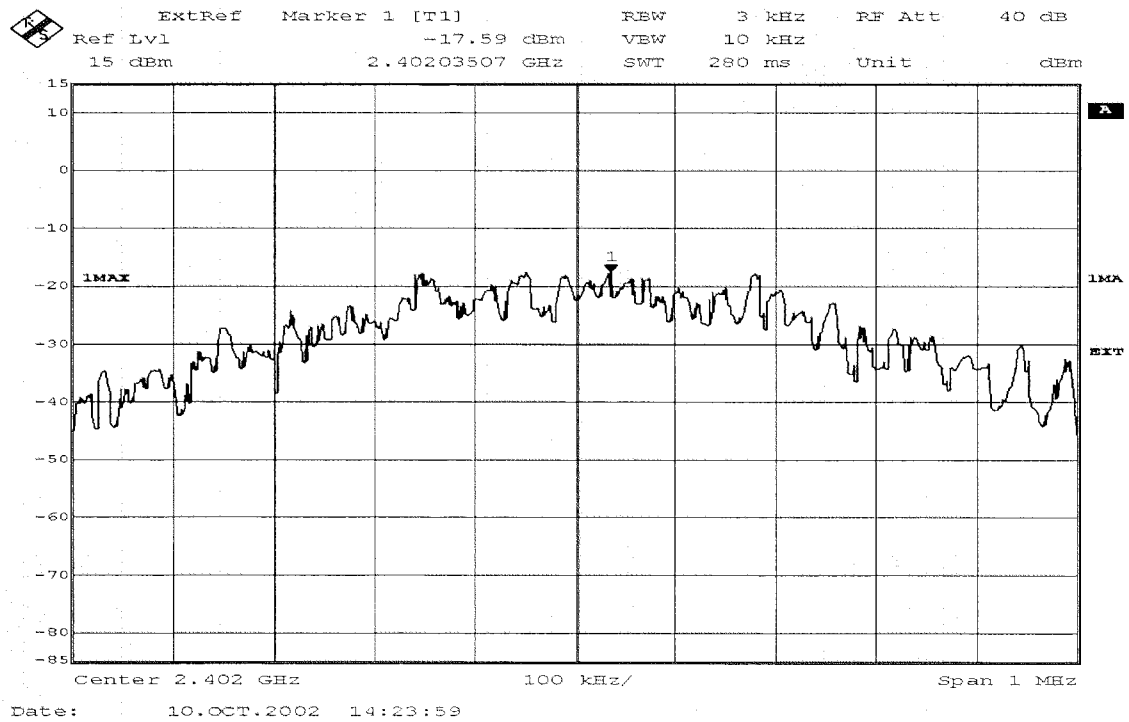
Time of Occupancy (dwell time), upper channel – determination of T



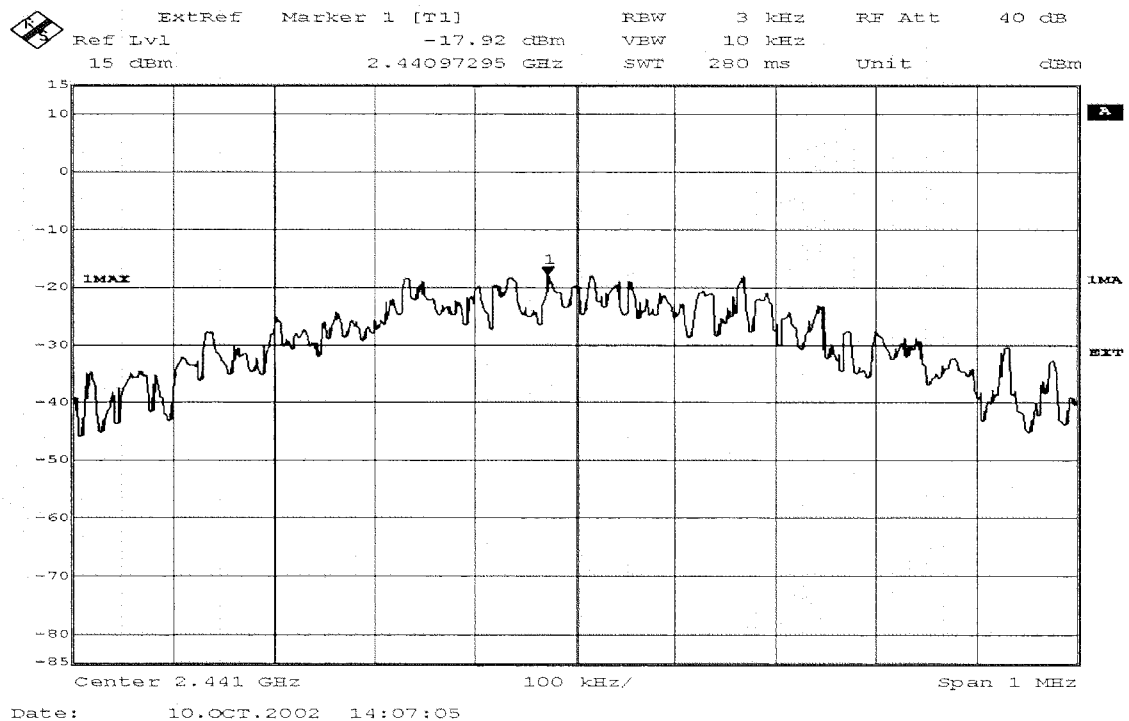
Time of Occupancy (dwell time), upper channel – determination of n



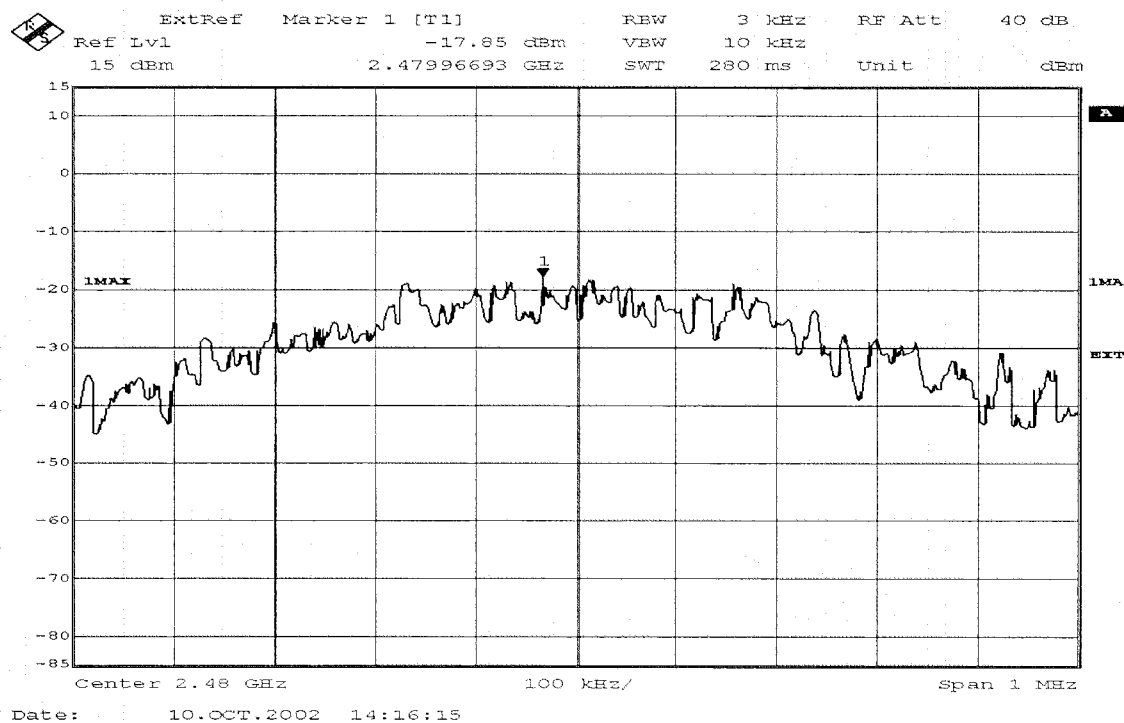
Power Spectral Density, lower channel



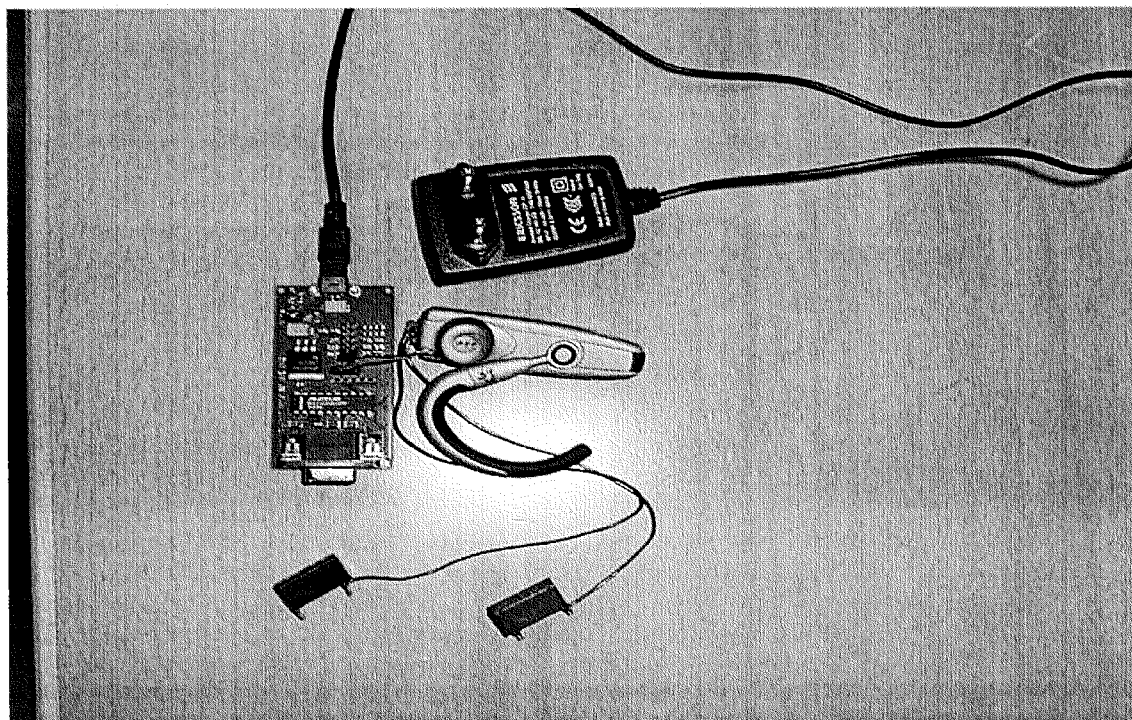
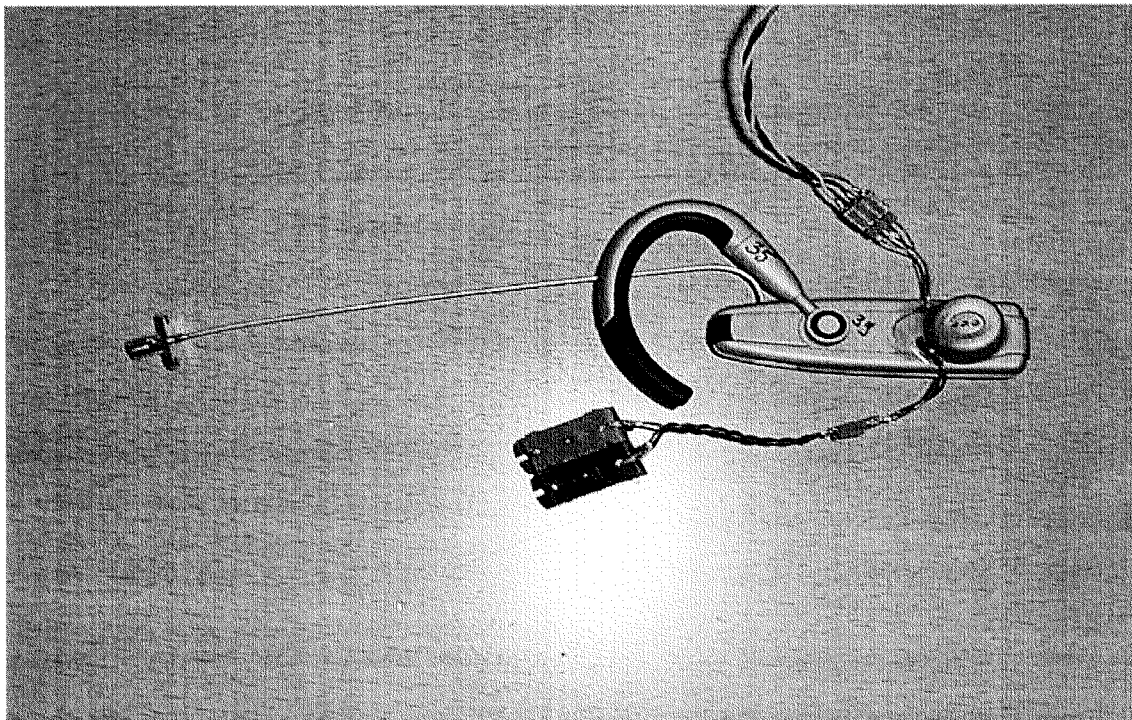
Power Spectral Density, middle channel



Power Spectral Density, upper channel



APPENDIX II – PHOTOS OF THE EUT



Identification photo

