

RADIO TEST REPORT

No. 312797R2

EQUIPMENT UNDER TEST

Equipment: Remote control
Type / model: RCS-HTC/US
Manufacturer: HTC Sweden AB
Tested by request of: Syncore Technologies AB

SUMMARY

The equipment complies with the requirements of the following standards:

FCC, Part 15, Subpart B (2002) and Subpart C (2002);

This report replaces earlier issued report dated: December 19, 2003.



Date of issue: January 30, 2004

Tested by: *Linda Heikurainen* Approved by:

Linda Heikurainen

Björn Rosenqvist
Björn Rosenqvist

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company: Syncore Technologies AB
Teknikringen 1B, Mjördevi Science Park
583 30 Linköping
SWEDEN

Name of contact: Mattias Engström

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment: Remote control
Type/Model: RCS-HTC/US
FCC ID Number: RP9 RCS-HTC-US
Manufaktur: HTC Sweden AB
P.O. Box 69
614 22 Söderköping
SWEDEN

Rating/Supplying voltage: 24 V DC
Rating RF output power: <10 dBm
External antenna connector: NO
Frequency range: 910-920 MHz
Number of channels: 50
Modulation characteristics: FSK
Stand by mode supported: Yes

2.2 Additional hardware information about the EUT

The EUT consists of the following unit:

Unit	Type and version
Handheld control unit	Transceiver-card: V3 Signal adaptation-card: V3

2.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software	Version	Comment
WDAQ	1.24	



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2.4 Modifications during the test

No modifications have been made during the tests.



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3. TEST SPECIFICATIONS

3.1 Standards

FCC part 15 (2002): Subpart B – Unintentional radiators and Subpart C – Intentional Radiators; §15.247 for frequency hopping systems operating in the 902 – 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz.

3.2 Additions, deviations and exclusions from standards

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

3.3 Operating environment

If not additionally specified, the tests were performed under the following environmental conditions:

Air temperature: 20 – 24 °C

Relative humidity: 15 - 30 %



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4. TEST SUMMARY

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

FCC reference	Test	Result	Note
15.247	Output power	Pass	
15.247	TX Output Spectrum – 20 dB Bandwidth	Pass	
15.247	Carrier frequency separation	Pass	
15.247	Number of hopping frequencies (channels)	Pass	
15.247	Time of occupancy (dwell time)	Pass	
15.247	Band edge compliance	Pass	
15.109	Out of band spurious emissions, radiated	Pass	
15.209	Out of band spurious emissions, radiated	Pass	



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5. PEAK OUTPUT POWER**5.1 Test protocol**

Date of test: December 9, 2003

EUT mode of operation: TX and hopping off.

Spectrum analyzer settings:

Span: 27 MHz

RBW: 100 kHz

VBW: 100 kHz

Sweep time: 7 ms

Detector: Peak

Trace: Max Hold

Channel (MHz)	Measured field strength (dBμV/m)	Peak Output Power (dBm)	Limit value (dBm)
910	98,0	5,8*	< 30
915	93,7	1,5*	
920	99,3	7,1*	

Measurement results are corrected for attenuation in the test set-up configuration.

Peak output power is calculated according to the following formula:

$$P = (E \cdot D)^2 / 30$$

Where: E=Field strength in V/m
D=distance in m

Example: $E = 10^{(98,0 / 20)} / 1000000 = 0,0794328 \text{ V/m}$
 $P = (E \cdot 3)^2 / 30 = 0,00189 \text{ W} = 2,8 \text{ dBm}$

*The above measured values are performed at 100 kHz RBW and VBW, 3 dB has been added to the values to show worst case scenario if the tests had been performed at 200 kHz RBW and VBW.



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6. TX OUTPUT SPECTRUM – 20 dB BANDWIDTH**6.1 Test protocol**

Date of test: December 12, 2003

EUT mode of operation: TX and hopping off.

Spectrum analyzer settings:

Span: 1,0 MHz

RBW: 30 kHz

VBW: 30 kHz

Sweep time: 20 ms

Detector: Peak

Trace: Max Hold

Channel (MHz)	20 dB Bandwidth (kHz)	Limit value (kHz)
910	183	< 250
915	180	
920	183	



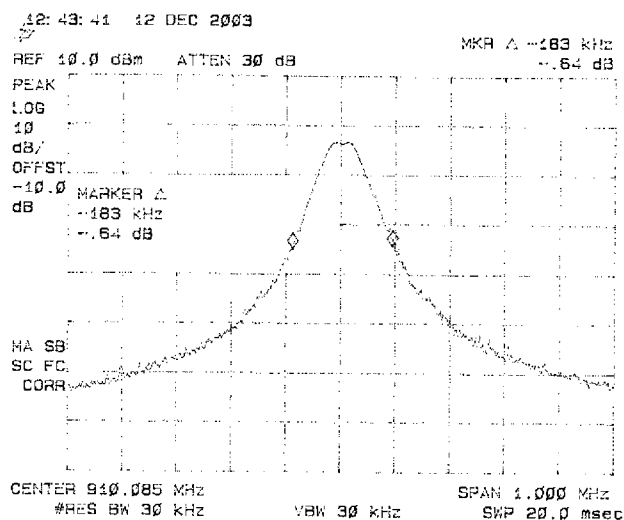
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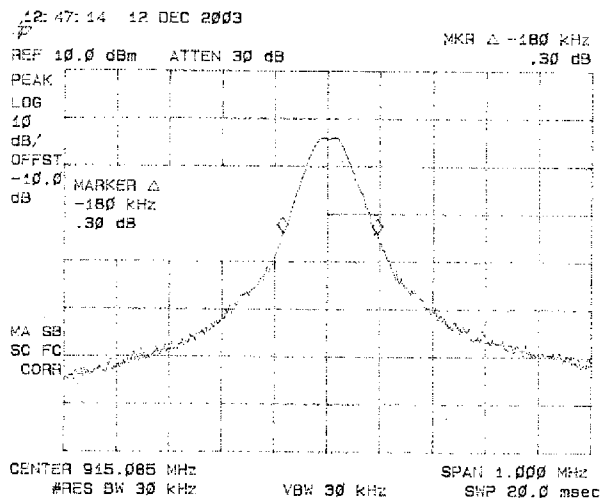
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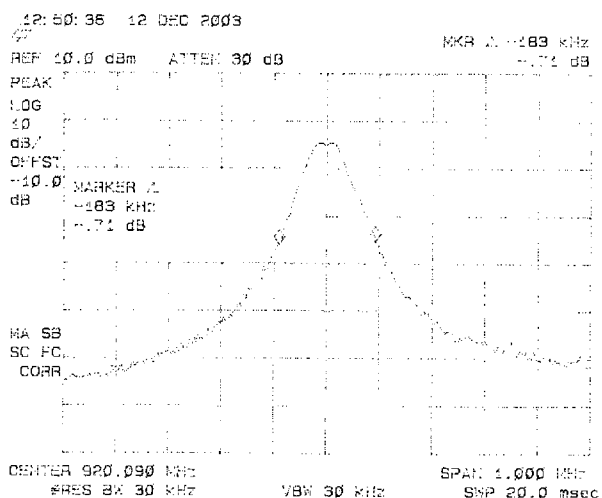
910 MHz



915 MHz



920 MHz



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7. CARRIER FREQUENCY SEPARATION**7.1 Test protocol**

Date of test: December 12, 2003

EUT mode of operation: TX and hopping on.

Spectrum analyzer settings:

Span: 500 - 600 kHz

RBW: 10 kHz

VBW: 10 kHz

Sweep time: Auto

Detector: Peak

Trace: Max Hold

Channel (MHz)	Carrier frequency separation from the next channel		Limit value (kHz)
	To the right (kHz)	To the left (kHz)	
910	203	-	> 183
915	201	201	> 183
920	-	203	> 183



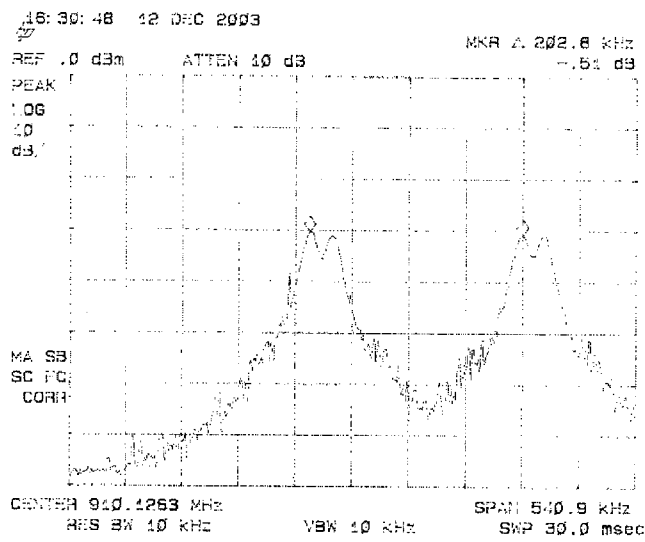
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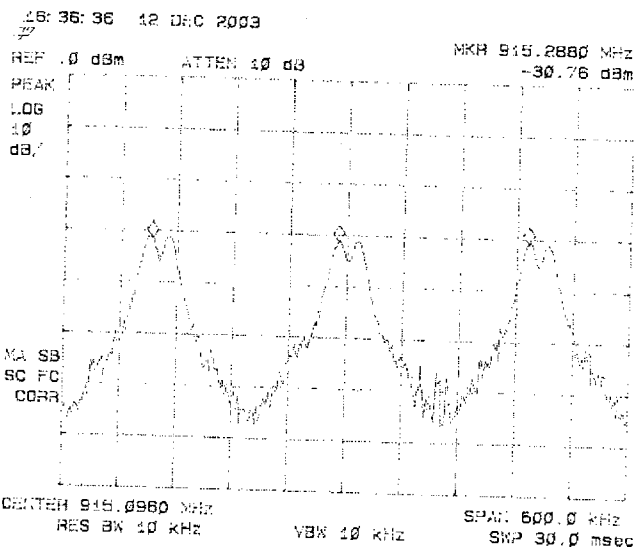
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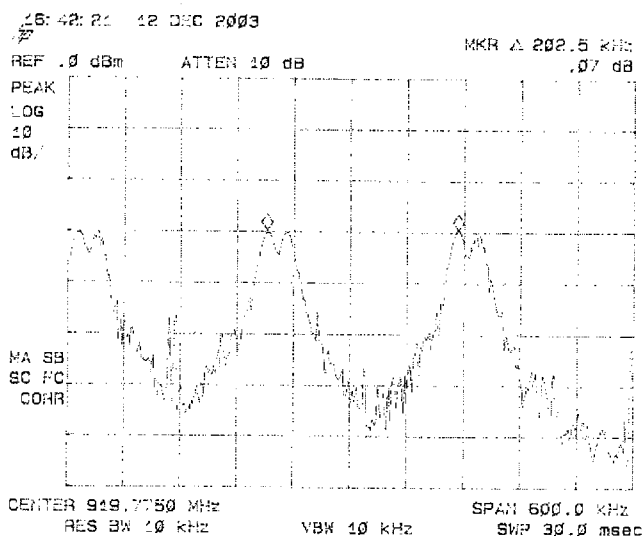
910 MHz



915 MHz



920 MHz



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8. NUMBER OF HOPPING CHANNELS

8.1 Test protocol

Date of test: December 12, 2003

EUT mode of operation: TX and hopping on.

Spectrum analyzer settings:

Start frequency: 909 MHz

Stop frequency: 921 MHz

RBW: 30 kHz

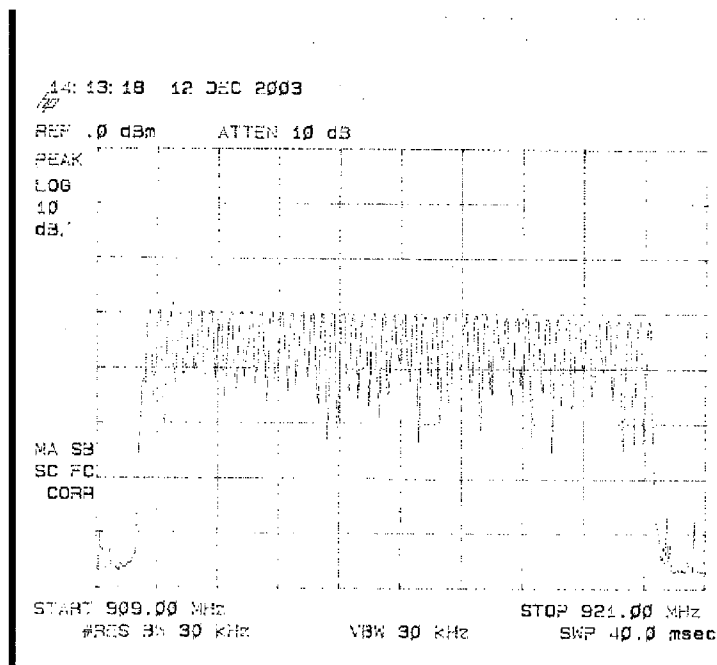
VBW: 30 kHz

Sweep time: Auto

Detector: Peak

Trace: Max Hold

Number of hopping channels	Limit value
50	≥ 50



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9. TIME OF OCCUPANCY (DWELL TIME)

9.1 Test protocol

Date of test: December 12, 2003

EUT mode of operation: TX and hopping on.

Spectrum analyzer settings:

Determination of transmitting time T

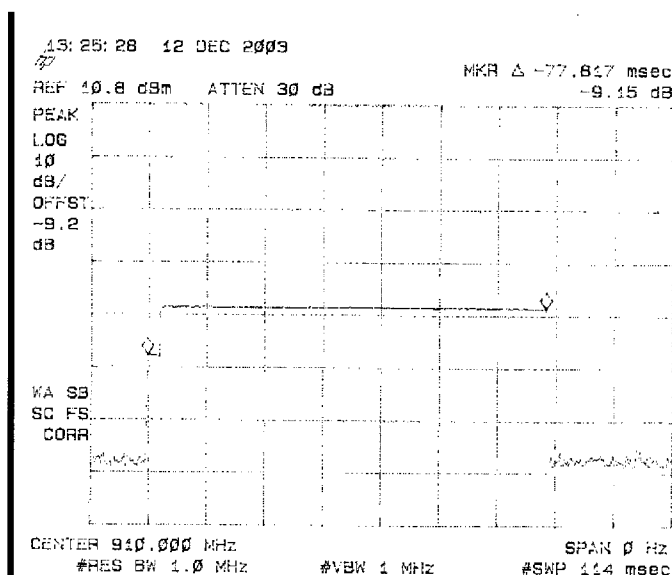
Span: 0 Hz
 RBW: 1 MHz
 VBW: 1 MHz
 Sweep time: 114 ms
 Single sweep
 Detector: Peak
 Trace: Clear/Write
 Trigger: Manual

Determination of the number of times n the channel is active during the sweep time of 20 s

RBW: 10 kHz
 VBW: 10 kHz
 Sweep time: 20 s

Test parameters	910 MHz	Limit value (s)
T (ms)	77,8	-
n	3	-
Dwell time (s) = $T \cdot 10^{-3} \times n$	0,23	< 0,4

Transmitting time:



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Dwell time:

13:59:47 12 DEC 2003

REF -19.3 dBm #ATTEN 30 dB

PEAK

LOG

10

dB

OFFST

-9.2

dB

WA SB

SC FS

COHR

CENTER 910.0000 MHz

#RES BW 10 kHz

#VBW 10 kHz

SPAN 0 Hz

#SWP 20.0 sec



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10. BAND EDGE COMPLIANCE

10.1 Test protocol

Date of test: December 9, 2003

EUT mode of operation: TX and hopping off.

Parameter settings

Start frequency (MHz): 901,5
 Stop frequency (MHz): 928,5
 RBW (kHz): 100
 VBW (kHz): 100
 Sweep time (ms): 7
 Detector: Peak
 Trace: Max Hold

Data summary

Frequency 910 MHz

Frequency	RBW	Measured Level	Limit	Note
[MHz]	[kHz]	Peak [$\mu\text{V/m}$]	Peak [$\mu\text{V/m}$]	
902	100	< 200	500	
928	100	< 200	500	

Frequency 915 MHz

Frequency	RBW	Measured Level	Limit	Note
[MHz]	[kHz]	Peak [$\mu\text{V/m}$]	Peak [$\mu\text{V/m}$]	
902	100	< 220	500	
928	100	< 220	500	

Frequency 920 MHz

Frequency	RBW	Measured Level	Limit	Note
[MHz]	[kHz]	Peak [$\mu\text{V/m}$]	Peak [$\mu\text{V/m}$]	
902	100	< 200	500	
928	100	< 200	500	

This measurement does not include the field strength of fundamental, see section 5 (Peak output power).



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11. RADIATED SPURIOUS EMISSIONS

11.1 Operating environment

Temperature: 20 - 24°C (15 - 35 °C)
 Relative Humidity: 20 - 30 % (20 - 75 %)

11.2 Measurement uncertainty

Radiated disturbance electric field intensity, 30 – 1000 MHz: $\pm 4,6$ dB
 Radiated disturbance electric field intensity, 1000 – 18000 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%.

11.3 Test equipment

Equipment	Manufacturer	Type	SEMKO No.
<i>Test site: Semi-anechoic shielded chamber, 10 x 20 x 8,5 m (W x L x H)</i>			30300
Software:	Rohde & Schwarz	ES-K1, V1.60	
Measurement receiver:	Rohde & Schwarz	ESAI	2973/2974
Antenna amplifier:	SEMKO	Miteq	7992/7993
Antenna, bilog:	Chase	CBL6111A	1555
<i>Test site: Bluetooth anechoic shielded chamber, 3,7 x 7,0 x 2,4 m (W x L x H)</i>			12285
Software:	Rohde & Schwarz	ES-K1, V1.60	
Signal analyser:	Rohde & Schwarz	FSIQ 40	9192
Preamplifier:	MITEQ	AFS6/AFS44	12335
Preamplifier:	Hewlett & Packard	8447D	7061
Antennas:			
Log periodic	Rhode & Schwarz	HUF-Z3	3132
Double Ridge Guide Horn:	EMCO	3115	4936



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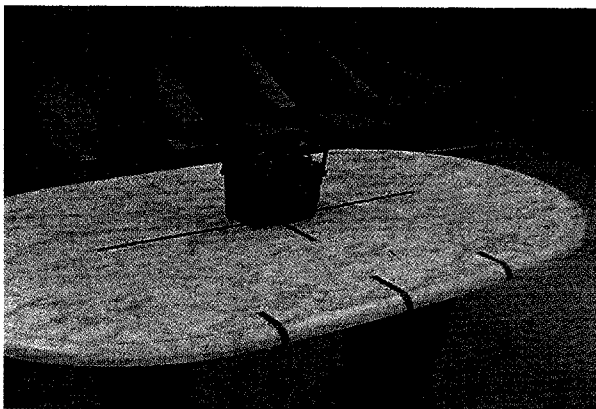
11.4 Measurement set-up

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 10 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 photo is 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.

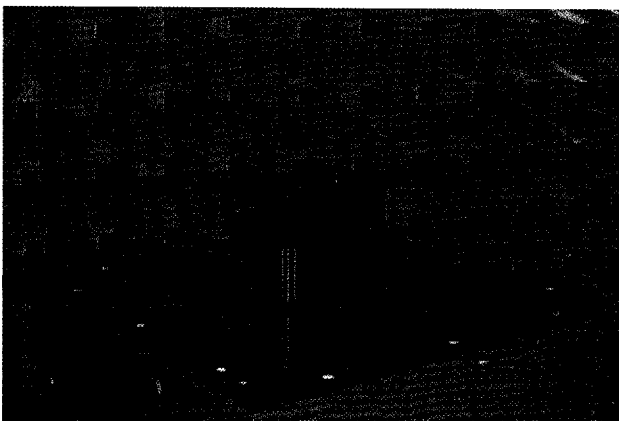
At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements were carried out. Test set-up photo:



Test site: Bluetooth anechoic shielded chamber (500 – 10 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 spectrum analyser 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. Test set-up photo is shown below.



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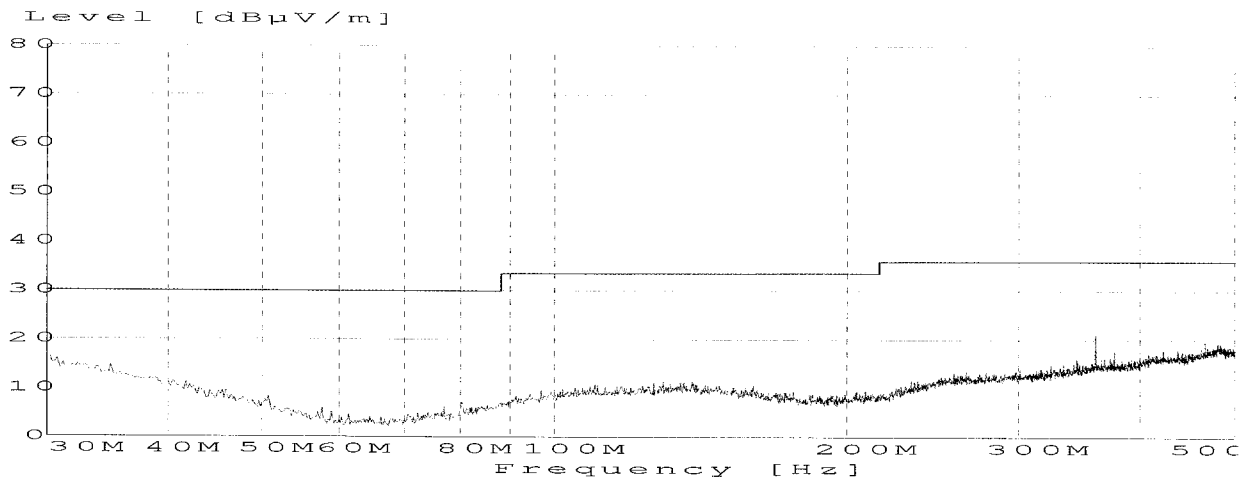
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11.5 Test protocol

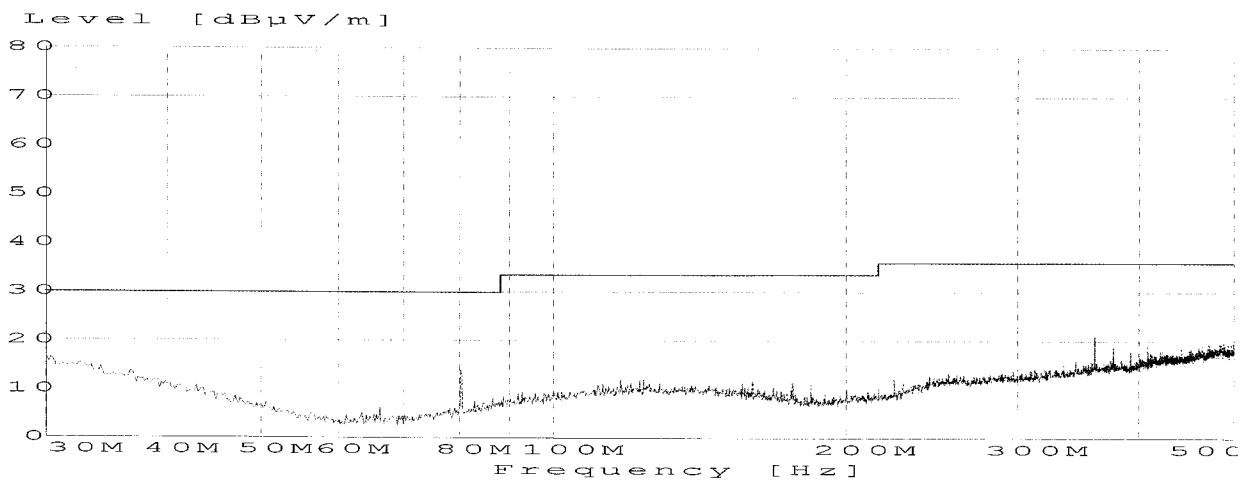
Semi-anechoic shielded chamber

Date of test: December 9 and December 12, 2003

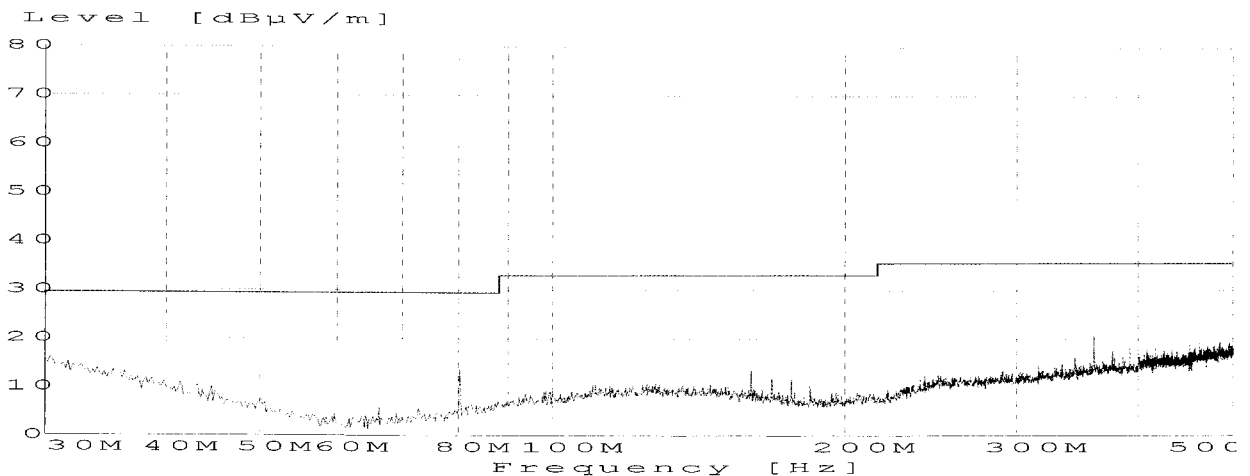
30 – 500 MHz, max peak at a distance of 10 m on the lower TX channel



30 – 500 MHz, max peak at a distance of 10 m on the middle TX channel



30 – 500 MHz, max peak at a distance of 10 m on the upper TX channel



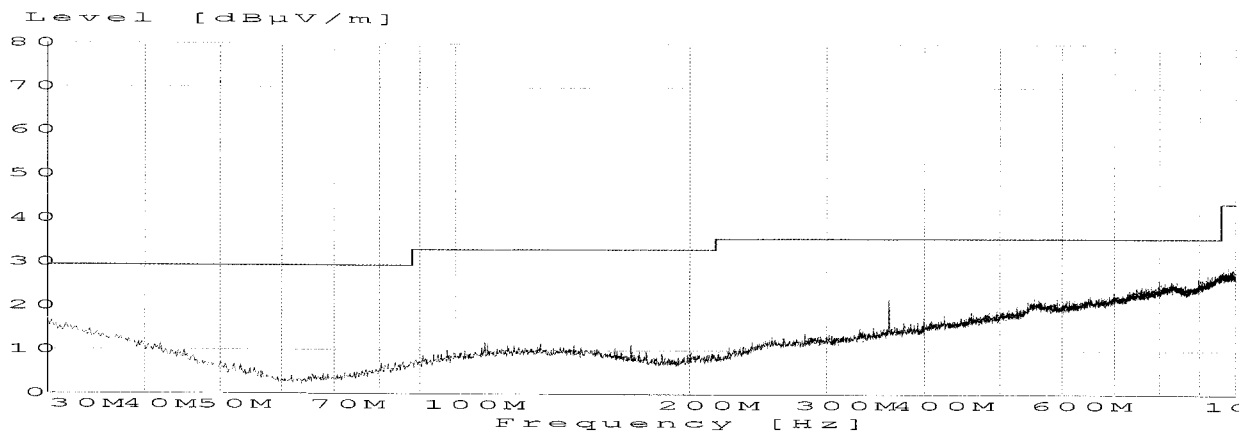
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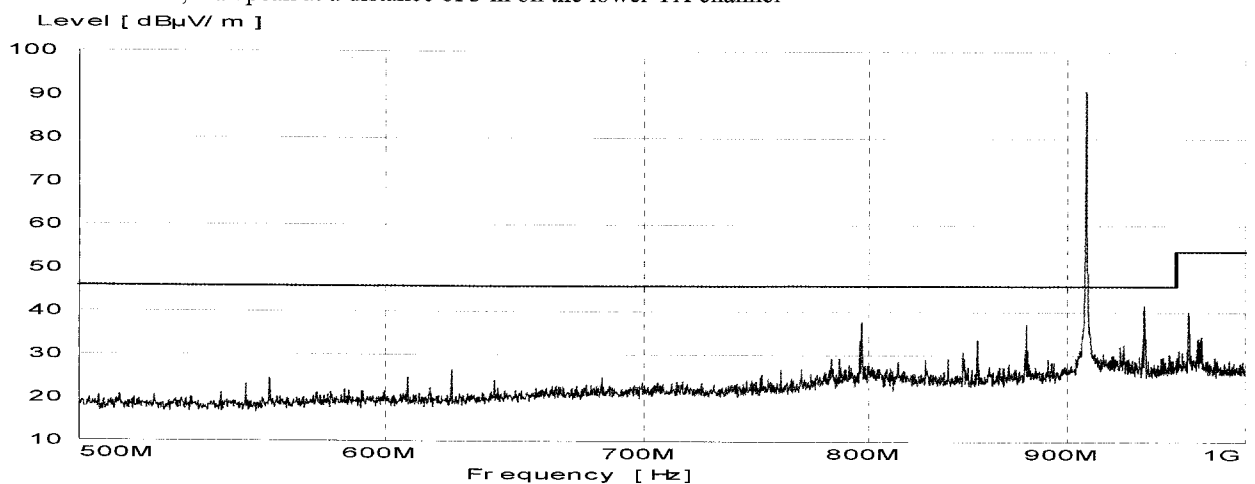
30 – 1000 MHz, max peak at a distance of 10 m in the stand by mode



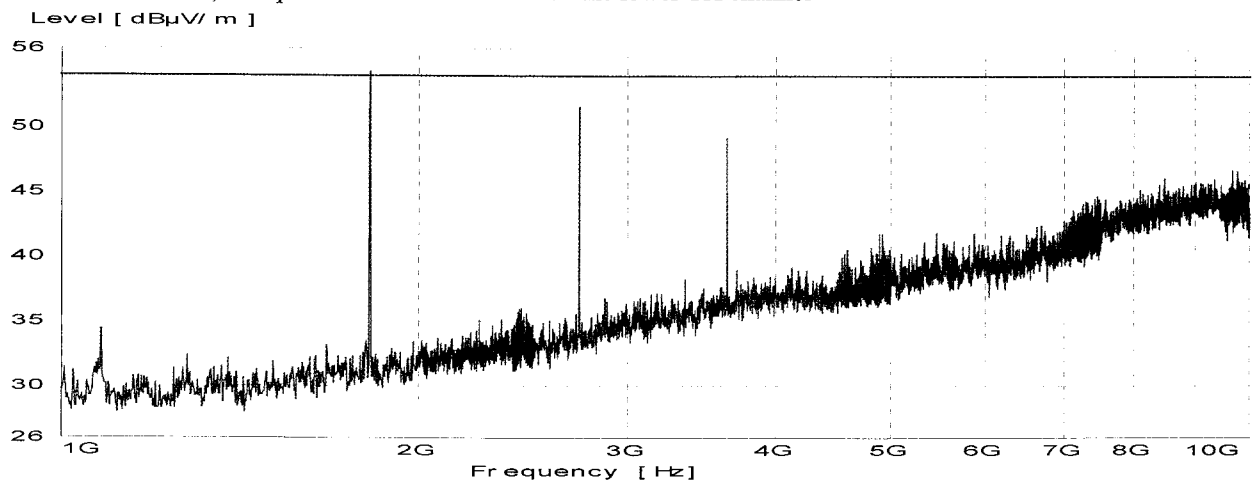
Bluetooth anechoic shielded chamber

Date of test: December 9, 2003

500 – 1000 MHz, max peak at a distance of 3 m on the lower TX channel



1000 – 10000 MHz, max peak at a distance of 3 m on the lower TX channel



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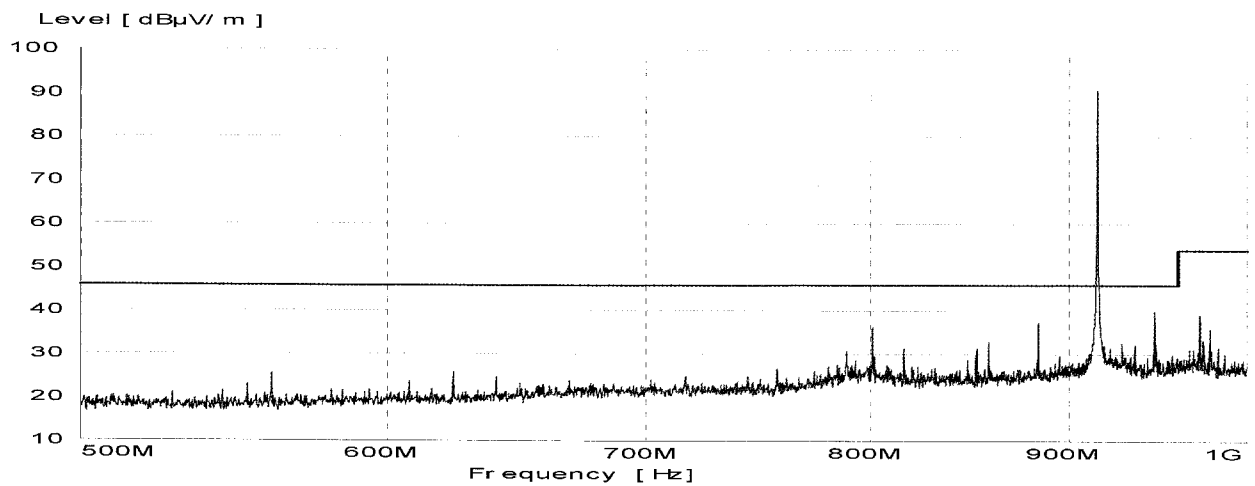
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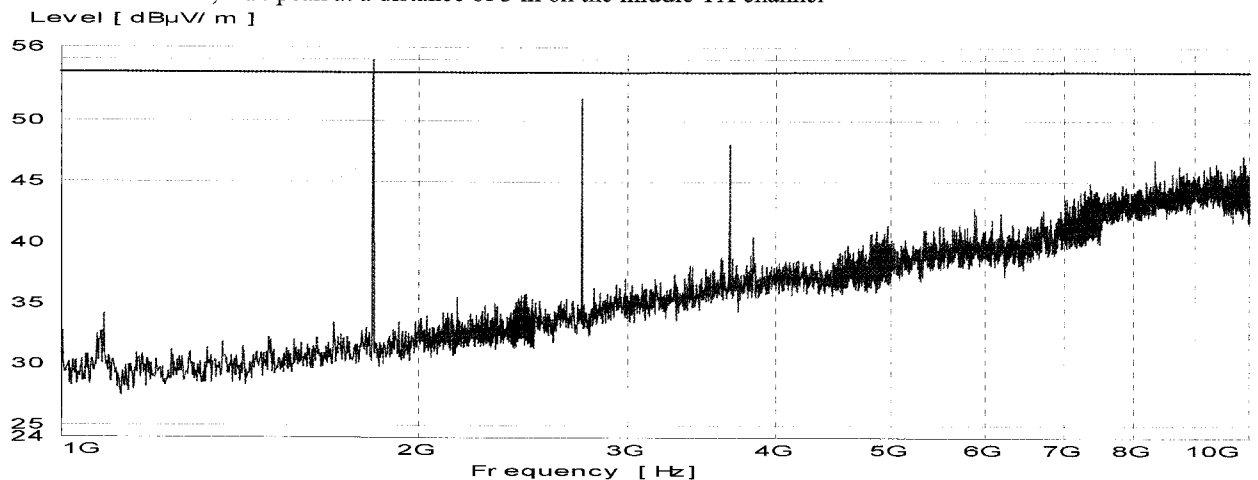
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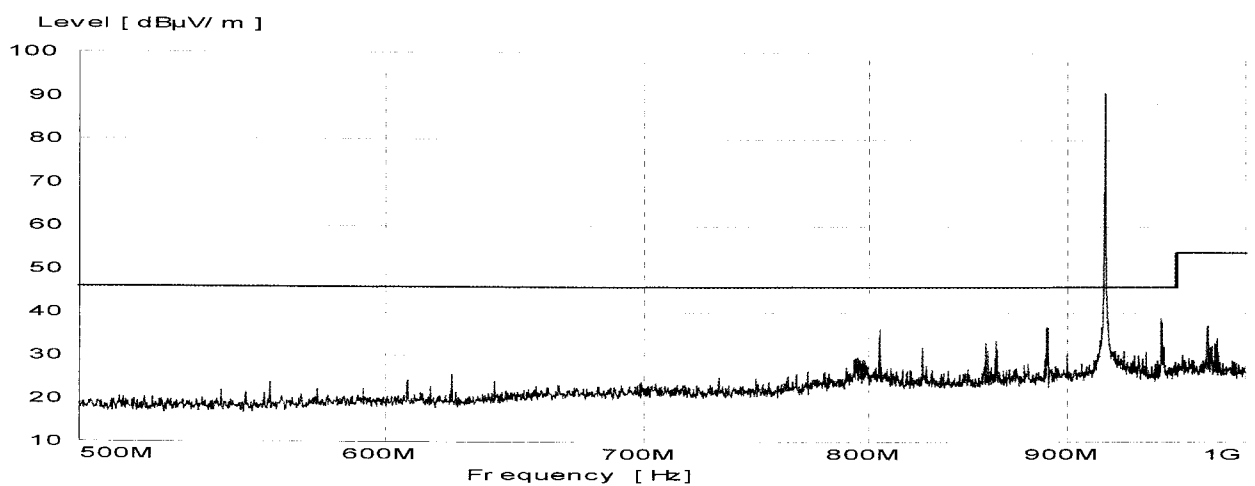
500 – 1000 MHz, max peak at a distance of 3 m on the middle TX channel



1000 – 10000 MHz, max peak at a distance of 3 m on the middle TX channel



500 – 1000 MHz, max peak at a distance of 3 m on the upper TX channel



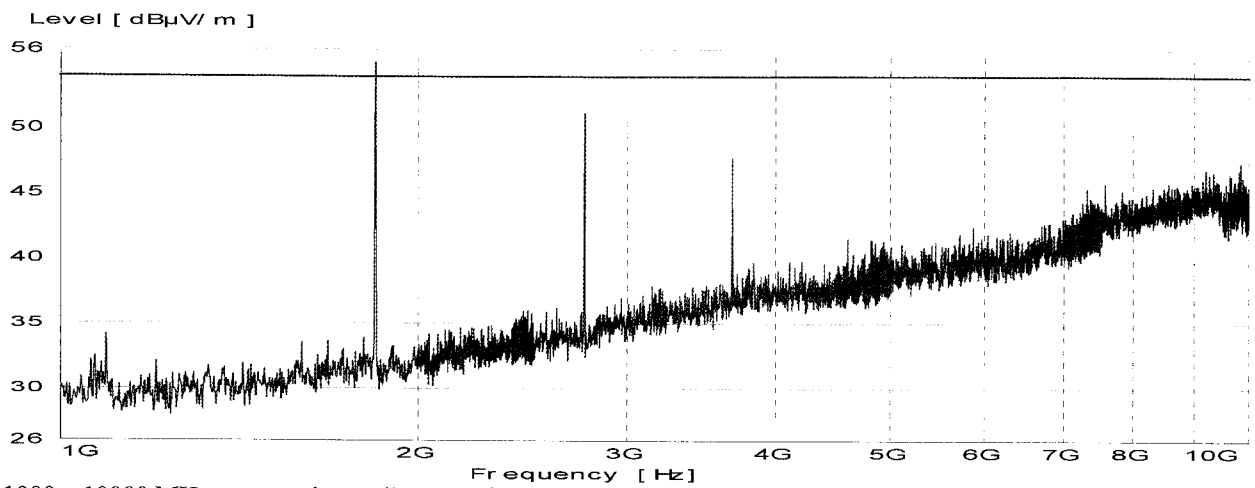
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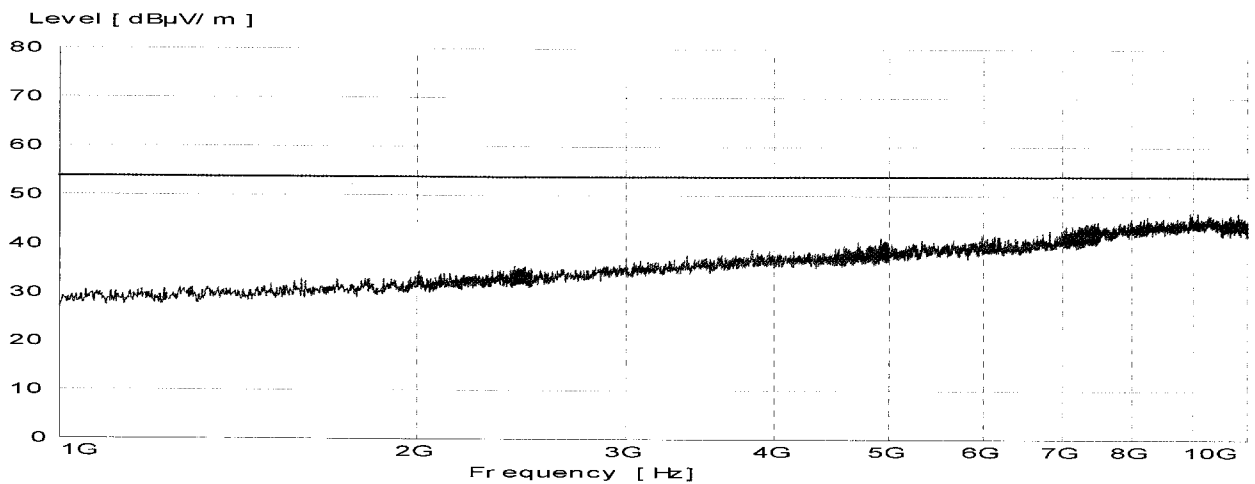
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1000 – 10000 MHz, max peak at a distance of 3 m on the upper TX channel



1000 – 10000 MHz, max peak at a distance of 3 m in the stand by mode



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Data summary

Frequency 910 MHz

Field strength of spurious emissions						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Note
		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	
30 – 88	120	< 18	-	-	29,5	10 m distance
88 – 216	120	< 11	-	-	33	“
216 – 500	120	< 21	-	-	35,6	“
796,6	100	38	-	-	46	3 m distance
878,6	100	37	-	-	46	“
1821,6	1000	54	45,4	74	54	“
2730,5	1000	52	-	74	54	“

Frequency 915 MHz

Field strength of spurious emissions						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Note
		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	
30 – 88	120	< 18	-	-	29,5	10 m distance
88 – 216	120	< 11	-	-	33	“
216 – 500	120	< 21	-	-	35,6	“
800,8	100	36,3	-	-	46	3 m distance
883,8	100	37,3	-	-	46	“
946,7	100	40,0	-	-	46	“
1831,7	1000	55,1	45,8	74	54	“
2744,5	1000	51,9	-	74	54	“

Frequency 920 MHz

Field strength of spurious emissions						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Note
		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	
30 – 88	120	< 18	-	-	29,5	10 m distance
88 – 216	120	< 11	-	-	33	“
216 – 500	120	< 21	-	-	35,6	“
888,8	100	36,7	-	-	46	3 m distance
950,9	100	38,9	-	-	46	“
951,5	100	37,7	-	-	46	“
1841,7	1000	55,1	47,5	74	54	“
2760,5	1000	51,2	-	74	54	“



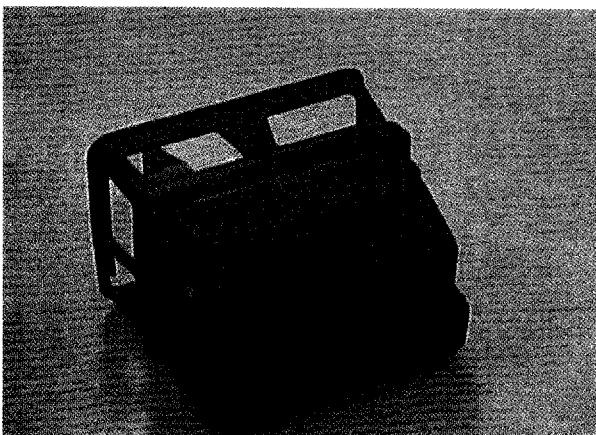
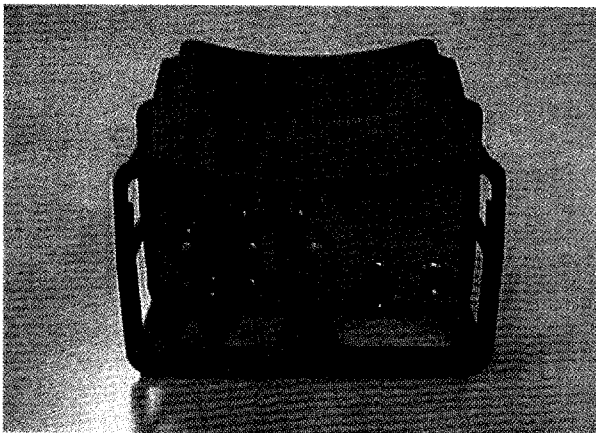
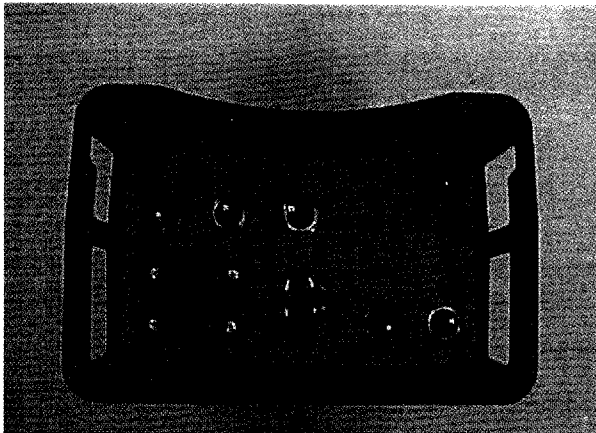
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APPENDIX – PHOTOS OF THE EUT



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