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Appendices -

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Tested by:



T017 (EN ISO/IEC 17025)

Pekka Kälviäinen, Test Engineer

Reviewed by:

Jyrki Leino, Market Access Manager

SORT OF EQUIPMENT:

Triple band (900/1800/1900) GPRS GSM Mobile Phone with BT

MARKETING NAME:

TYPE:

MANUFACTURER:

RM-25

EMC

Nokia Corporation

CLIENT:

Nokia Corporation

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Frederikskaj, DK-1790 Copenhagen, Denmark

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TEST LABORATORY:

Nemko Oy

FCC REG. NO.

91087 August 27, 2001

IC FILE NO.

IC 4627 July 2, 2003

SUMMARY:

In regard to the performed tests the equipment under test fulfils the requirements defined in the test specifications, see page 2 for details

The test results are valid for the tested unit only. Without a written permission of Nemko Oy it is allowed to copy this report as a whole, but not partially.

Summary of performed tests and test results

<i>Section in CFR 47</i>	<i>Section in ICES-003</i>		<i>Result</i>
15.107, a	5.3	AC power line conducted emissions	PASS
15.109, a	5.5	Radiated emissions	PASS

Explanations:

PASS The EUT passed that particular test.
FAIL The EUT failed that particular test.

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1. EUT and Accessory Information

1.1 EUT description

The EUT is a triple band (900/1800/1900MHz) GPRS GSM mobile phone with bluetooth. The highest internal frequency of the EUT was 3920.0 MHz.

1.2 EUT and accessories

	<i>unit</i>	<i>type</i>	<i>S/N</i>
<i>EUT</i>	GSM Phone	RM-25	004400/48/160974/9
<i>Accessories</i>	Battery	BL-4C	0670386363807
	Memory Card	MC12UO64DACA-0QA00	-
	AC Charger	ACP-12E	0675294 394349J093110013379
	Data cable	DKU-2	CK12083821
	Laptop PC	DELL PP01X	381S30J
	Mouse	Compaq M S34	4862A011
	Power Supply	DELL AA20031	3882A522
	Printter (Ink jet)	HP C2145A	SG57K150F5
	Digital Chamera	Apple M2613	TL 42702X250
	Printer AC Cable	-	-
	Printer Data Cable	-	-
	Camera Serial Cable	-	-

2. Standards and measurement methods

The test were performed in guidance of the CFR 47 Part 15, Subpart B, Class B, ICES-003, ANSI C63.4 and EN 55022.

3. Test results

3.1 AC power line conducted emissions

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	Nemko / Perkkaa
<i>Date of testing</i>	09.06.2004
<i>Test equipment</i>	5, 168, 348, 184, 545
<i>Test conditions</i>	22 °C, 35 % RH
<i>Test result</i>	PASS

3.1.1 Test method and limit

The test was performed inside a shielded room where the floor of the test site comprised the reference ground plane (RGP). For the duration of the test the EUT was placed on a non-conductive table 0.8 m high standing on the reference ground plane (see photograph 1). The excess length of the cables of the EUT were made into bundles 30-40 cm in length. The power input cable of the EUT was connected to an artificial mains network. The test was performed separately on the phase and also on the neutral wire.

The disturbances were first examined by performing a spectrum scan by using a peak detector. The general procedure in the conducted disturbance emission test is that no further measurements are necessary if the disturbance levels measured by using the peak detector are below the limit value defined for the measurement performed by using an average detector.

If not, then at the test frequencies concerned the measurement is performed also by using a quasi-peak detector. If the disturbance levels measured by using the quasi-peak detector are below the limit value defined for the measurement performed by using an average detector, then measurements by using the average detector are not necessary.

<i>Frequency band MHz</i>	<i>Quasi-peak dB(μV)</i>	<i>Average limit dB(μV)</i>
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5	56	46
5 - 30	60	50

3.1.2 EUT operation mode

<i>EUT operation mode</i>	GSM 1900 Idle
<i>EUT operation voltage</i>	115 V / 60 Hz

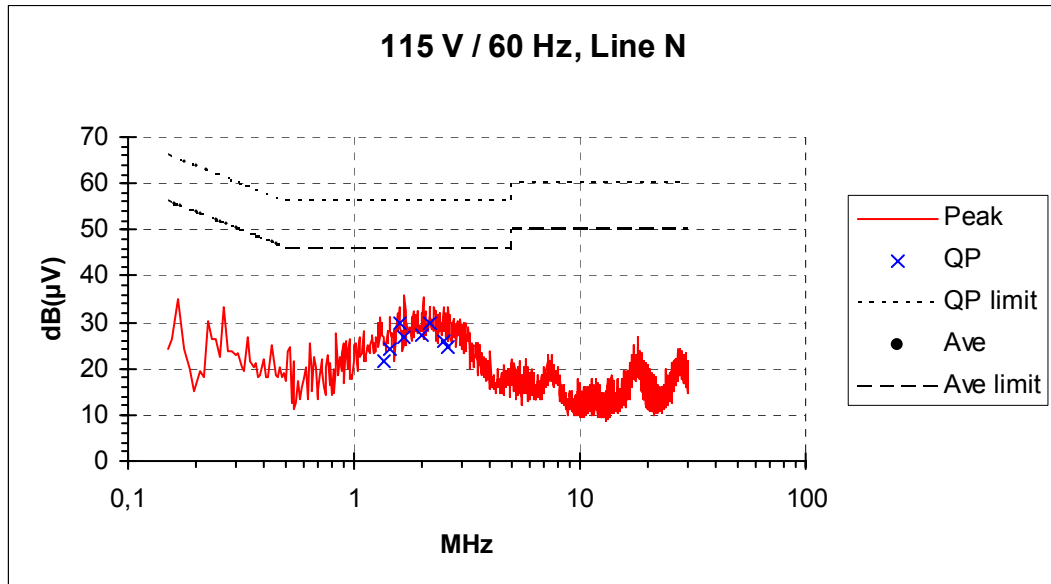
3.1.3 EUT test setup



Photograph 1. AC power line conducted emissions test setup

3.1.4 Test data

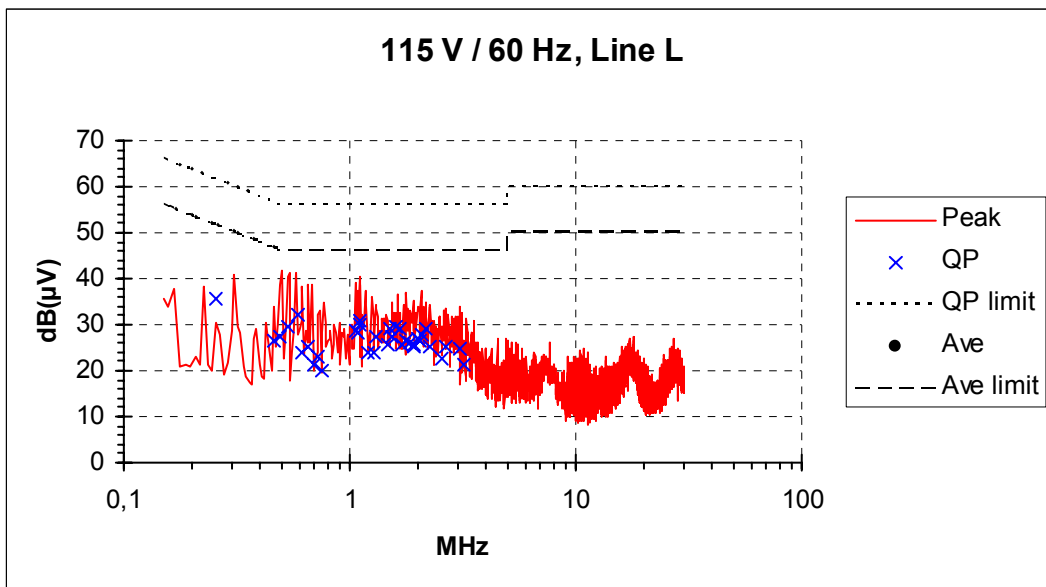
Idle, line N



Highest emissions:

Frequency MHz	Result Quasi-peak dB(μV)	Limit value Quasi-peak dB(μV)	Margin Quasi-peak dB	Result Average dB(μV)	Limit value Average dB(μV)	Margin Average dB
1.348	21.5	56.0	34.5	-	46.0	-
1.458	24.0	56.0	32.0	-	46.0	-
1.613	29.7	56.0	26.3	-	46.0	-
1.650	26.6	56.0	29.4	-	46.0	-
2.013	27.2	56.0	28.8	-	46.0	-
2.153	29.7	56.0	26.3	-	46.0	-
2.518	25.8	56.0	30.2	-	46.0	-
2.598	24.6	56.0	31.4	-	46.0	-

Idle. line L



Highest emissions:

Frequency MHz	Result Quasi-peak dB(μV)	Limit value Quasi-peak dB(μV)	Margin Quasi-peak dB	Result Average dB(μV)	Limit value Average dB(μV)	Margin Average dB
0.258	35.5	61.5	26.0	-	51.5	-
0.528	29.4	56.0	26.6	-	46.0	-
0.593	32.0	56.0	24.0	-	46.0	-
1.058	28.5	56.0	27.5	-	46.0	-
1.078	28.4	56.0	27.6	-	46.0	-
1.108	30.7	56.0	25.3	-	46.0	-
1.118	30.1	56.0	25.9	-	46.0	-
1.301	27.3	56.0	28.7	-	46.0	-
1.508	29.1	56.0	26.9	-	46.0	-
1.548	27.3	56.0	28.7	-	46.0	-
1.588	29.5	56.0	26.5	-	46.0	-
1.658	29.3	56.0	26.7	-	46.0	-
2.070	27.9	56.0	28.1	-	46.0	-
2.174	29.1	56.0	26.9	-	46.0	-

3.2 Radiated emissions

<i>Site name</i>	Nemko / Perkkaa
<i>Date of testing</i>	11. and 14.06.2004
<i>Test equipment</i>	350, 338, 42, 543, 544, 319, 525, 545, 184
<i>Test conditions</i>	22 °C. 35 % RH
<i>Test result</i>	PASS

3.2.1 Test method and limit

The test was performed in a semi-anechoic shielded room. The EUT was placed on a non-conductive 0.8 m high table standing on the turntable (photographs 2 and 3). During the test in the frequency range 30-2000 MHz the distance from the EUT to the measuring antenna was 3 m. During the test in the frequency range 2000-8000 MHz the distance from the EUT to the measuring antenna was 1.5 m. The excess length of the cables of the EUT were made into bundles 30-40 cm in length. In order to find the maximum levels of the disturbance radiation the angle of the turntable. The height of the measuring antenna and the lay-out of the EUT cables were varied during the tests. The test was performed with the measuring antenna being both in horizontal and vertical polarizations.

Vertical and horizontal polarizations in the frequency range 30 – 1000 MHz was measured by using the peak detector. During the peak detector scan. the turntable was rotated from 0° to 360° with 30° step with the antenna heights 1.0 m and 3.0 m. The highest levels of the radiated interference field strength measured by using the quasi-peak detector were recorded.

Vertical and horizontal polarizations in the frequency range 1000 – 8000 MHz was measured by using the peak detector. During the measurement the turntable was rotated from 0° to 360° and the antenna was raised from 1.0 m and 4.0 m.

The CFR 47 Part 15. Subpart B. Class B limit of 500 $\mu\text{V/m}$ has been calculated to correspond 54 $\text{dB}(\mu\text{V/m})$ as follows: $[\text{dB}(\mu\text{V/m})]=20\log[\mu\text{V/m}]$.

EN 55022 Class B limit (3m measuring distance)

<i>Frequency band MHz</i>	<i>Quasi-peak $\text{dB}(\mu\text{V/m})$</i>
30 - 230	40
230 - 1000	47

Class B limit (3m measuring distance)

<i>Frequency band MHz</i>	<i>Average limit $\text{dB}(\mu\text{V/m})$</i>	<i>Peak limit $\text{dB}(\mu\text{V/m})$</i>
1000 - 8000	54	74

3.2.2 EUT operation mode

<i>EUT operation mode</i>	GSM 1900 Idle
<i>EUT operation voltage</i>	115 V / 60 Hz

3.2.3 EUT test setup



Photograph 2. Radiated emissions test setup

3.2.4 Test data

The measurement results were obtained as described below.

$$E [\mu\text{V/m}] = U_{RX} + A_{CABLE} + AF - G_{PREAMP}$$

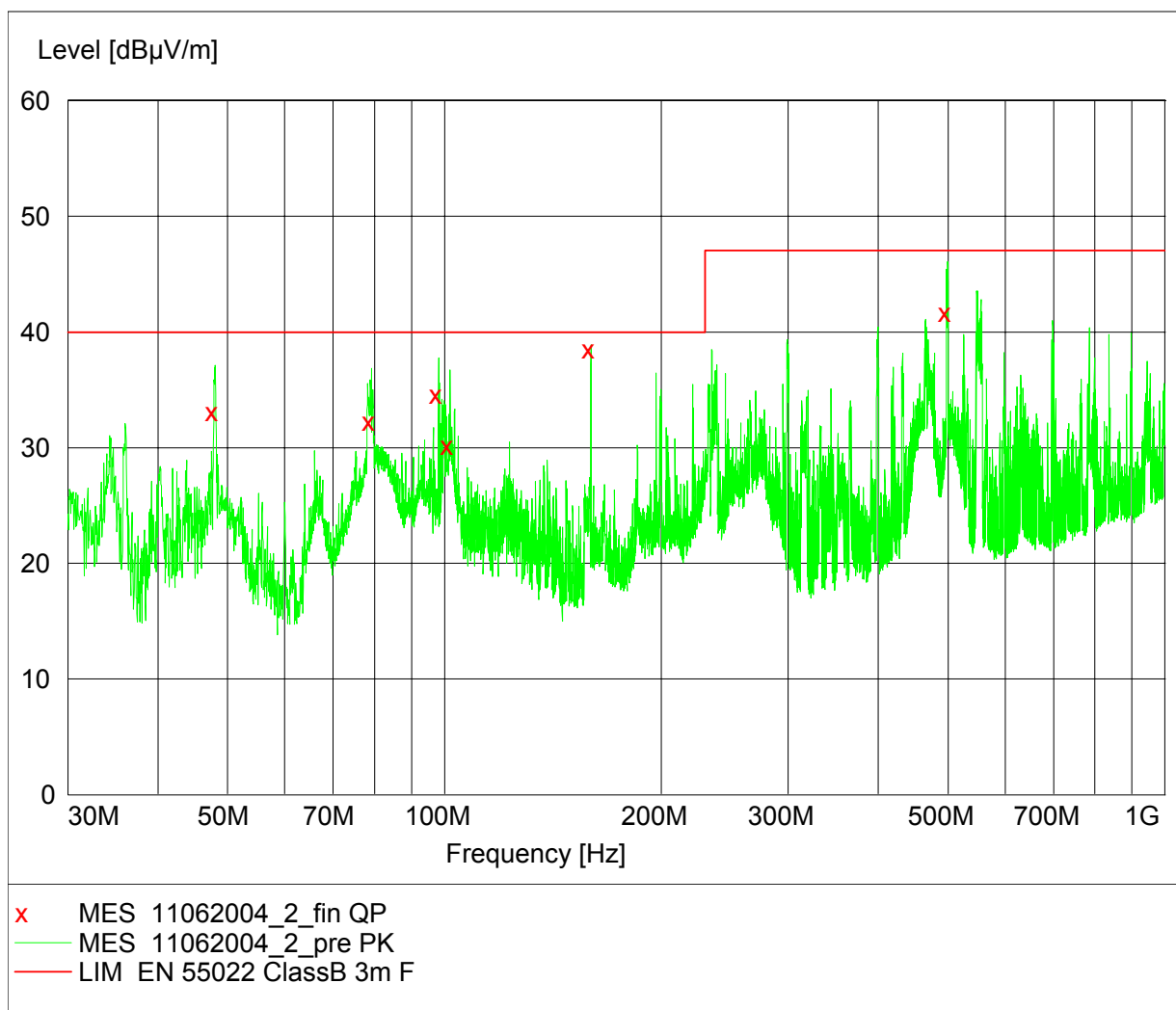
Where

U_{RX} receiver reading

A_{CABLE} attenuation of the cable

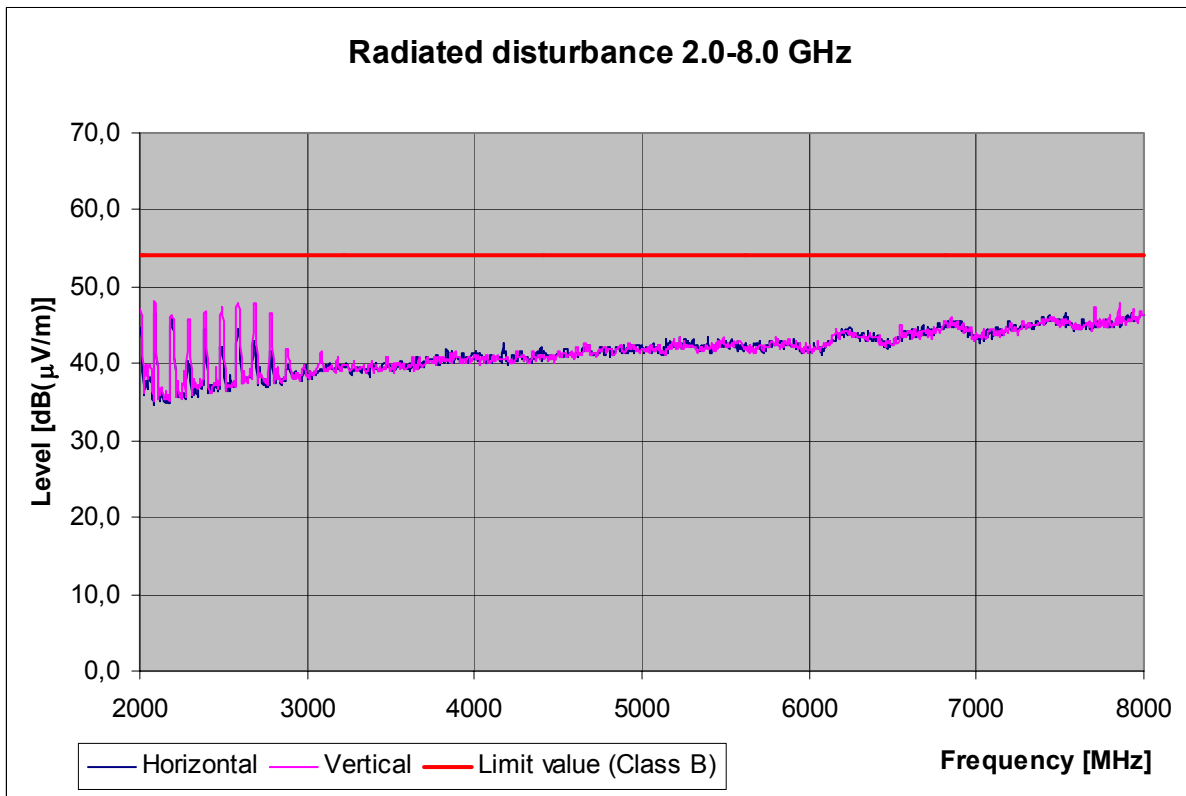
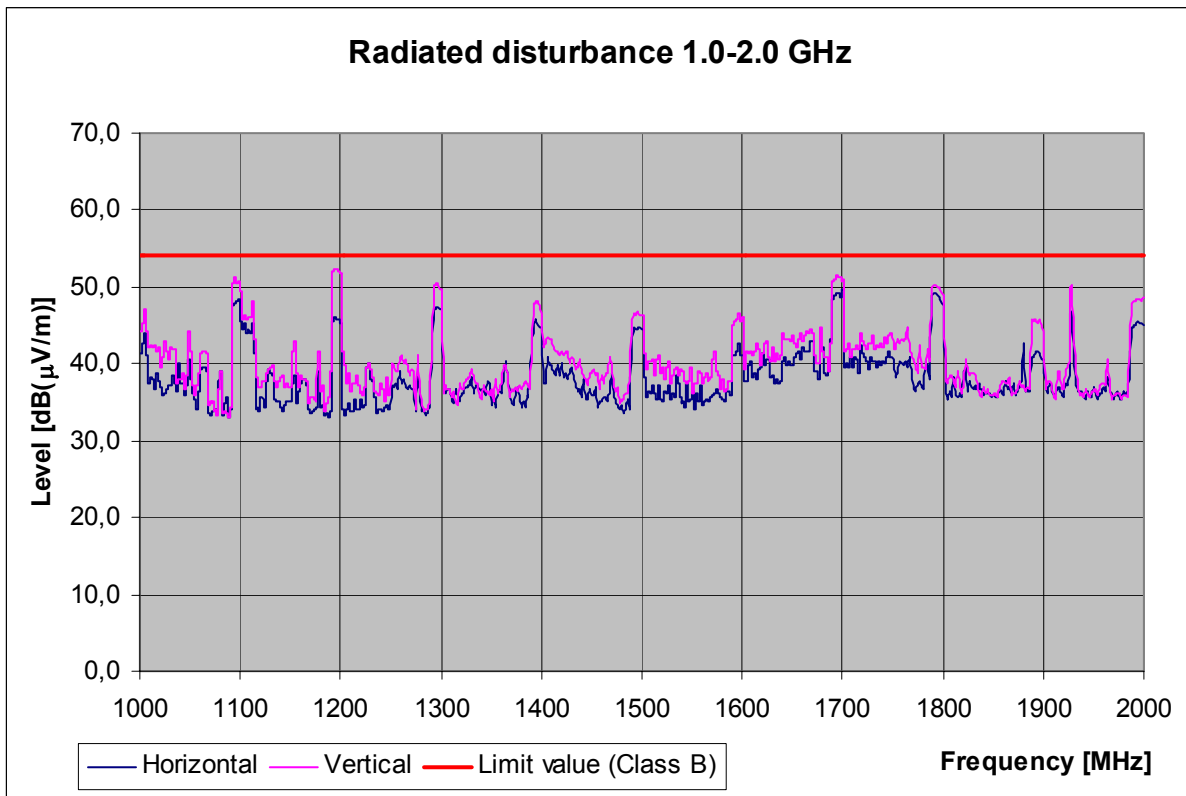
AF antenna factor

G_{PREAMP} gain of the preamplifier



Highest emissions:

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Height cm	Azimuth deg	Polarisation
48.04	33.1	-17.4	40	6.9	102.0	101.00	VERTICAL
79.20	32.3	-17.2	40	7.7	141.0	164.00	VERTICAL
98.28	34.6	-14.1	40	5.4	102.0	242.00	VERTICAL
101.72	30.2	-13.7	40	9.8	131.0	288.00	VERTICAL
159.76	38.5	-14.3	40	1.5	100.0	4.00	VERTICAL
498.96	41.7	-5.9	47	5.3	102.0	170.00	HORIZONTAL



4. List of test equipment

Each active test equipment is calibrated once a year, antennas every 18 months and other passive equipments every 24 months.

Nr.	Equipment	Type	Manufacturer	Serial number
5	Test receiver	ESH-3	Rohde & Schwarz	894718/015
338	Test receiver	ESS	Rohde & Schwarz	847151/009
42	Spectrum analyzer	8566B	Hewlett Packard	2637A04102
543	RF-amplifier	JCA018-501	JCA Technologies	103
544	RF-amplifier	ZFL-2000VH2	Mini-Circuits	D01080
168	Artificial Mains	NSLK 8127	Schwartzbeck	8127162
343	Artificial Mains	NSLK8128	Schwartzbeck	-
319	Antenna	CBL6112	Chase	2018
525	Double-Ridged Horn	3115	Emco	6691
545	GSM MS Test System	CMU	Rohde & Schwarz	836536/049
184	Temp. & humidity meter	H MI 32	Vaisala	63837
348	Shielded room	RFSD-100	Euroshield Oy	1320
350	Semianechoic shielded room	RFD-F-100	Euroshield Oy	1327