

TEST REPORT
of the accredited test laboratory

TÜV Nr.:M/EMV-05/141

about
the following EMC - test/- research

Division Medical
Technology/
Communication
Technology/ EMC

Testing Body for
Communication
Technology/ EMC

Prüfzentrum Wien
A-1230 Wien
Deutschstraße 10

Tel.: +43 1 / 610 91
Fax: Ext. 6505
Mail: office@tuev.or.at

Applicant: FREQUENTIS Ges.m.b.H
Spittelbreitengasse 34
1120 Wien

Product: VCS 3020 X Rel. 4.1
+ Operator Positions : EPOSA 04.00; EPOSA 04.10; C-POS 01

Accredited Testing
Laboratory,
Inspection Body,
Certification Body,
Calibration Body

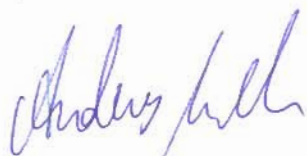
Serial Number: ---

Notified Body 0408

Standard: EN 55022:1998+ A1:2000+ A2:2003;
IEC/CISPR 22:1997+ A1:2000+ A2:2002;
FCC Part 15 10-1-2004 Edition; ICES-003 Issue 4 Feb. 2004
EN 55024:1998+ A1:2001+ A2:2003;
EN 61000-6-2:2001; EN 61000-6-3:2001

TÜV Österreich
Test laboratory for EMC

Supervisor of EMC-laboratory



Ing. Andreas Malek



31.05.2005

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Checked by



Ing. Michael Benninger

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The results of this test report only refer to the provided equipment.

Contents

	Designation	page
1.	Applicant	3
2.	Description of EUT	4
3.	Standards / Final result	5
4.	Test results	6-47
Appendix	Designation	pages
1	Test equipment used	3
2	Photodocumentation	36
3	Measurement diagrams	16
4	Test setup specifications	7

1. Applicant

Company	FREQUENTIS Ges.m.b.H
Department	
Address	1120 Wien; Spittelbreitengasse 34
Contact person	Dipl.-Ing. FH Gerald Herndl

EUT received on	16.3.2005
Tests were performed on	31.3., 1., 14, and 15. 4. 2005

2. Description of EUT

EUT	VCS 3020 X Rel. 4.1 + Operator Positions : EPOSA 04.00; EPOSA 04.10; C-POS 01
Serial Number	---
Manufacturer	FREQUENTIS Ges.m.b.H 1120 Wien; Spittelbreitengasse 34
Description	<p>FREQUENTIS Ges.m.b.H provided the following configuration for the measurements:</p> <p>Voice communication system built into a 42HE 19" cabinet For a detailed description see Appendix 4</p>
Operating mode	<p>The measurements were carried out at the following running states:</p> <p>Normal operation with the following connections made: ERIF – ERIF GPIF – GPIF ERIF – Radio Simulator LB – LB T0 – T0 BCA – BCB TMCS – PC 2 Operator positions</p>

During testing active connections were established and monitored.

For radiated measurements: The first six connections were looped inside the 19" cabinet, with no cable leaving the cabinet. The PC and the two Operator Positions were placed outside the test chamber.

For conducted measurements all above stated lines were leaving the cabinet.

The three operator positions were tested separately for radiated emissions with the 19" Cabinet placed outside the test chamber.

3. Standards / Final result

Name	Title	Deviation	Result
EN 55022:1998 + A1:2000 + A2:2003	Information technology equipment Radio disturbance characteristics Limits and methods of measurement	none	OK
IEC/CISPR 22:1997 + A1:2000 + A2:2002	Information technology equipment Radio disturbance characteristics Limits and methods of measurement	none	OK
FCC Part 15 10-1-2004 Edition	Radio Frequency Devices	none	OK
ICES-003 Issue 4 Feb. 2004	Digital Apparatus	none	OK
EN 55024:1998 + A1:2001 + A2:2003	Information technology equipment Immunity characteristics Limits and methods of measurement	Some tests were performed with higher levels, so that the equipment shows a better immunity level.	OK
EN 61000-6-2:2001	Electromagnetic compatibility (EMC) Part 6-2: Generic Standards Immunity for industrial environments	The radiated immunity tests were only made at 3 V/m for the operator positions. Otherwise they would fail.	OK
EN 61000-6-3:2001	Electromagnetic compatibility (EMC) Part 6-3: Generic Standards Emission standard for residential, commercial and light-industrial environments	none	OK
OK EUT passed NOK EUT failed			

4. Test results

4. 1.) Conducted emission on the power-supply-line

Because both the 19" cabinet electronic and the operator positions are DC powered, no conducted emission measurement was performed.

4. 2.) Telecom-Port Conducted Emissions

Limits

Frequency range	Limit Class B	
Detector	Quasi Peak	Average
0,150 - 0,5 MHz	40 - 30 dB μ A decreasing with the logarithm of frequency	30 - 20 dB μ A decreasing with the logarithm of frequency
0,5 - 30 MHz	30 dB μ A	20 dB μ A
Remark: Quasi Peak and Average limits must be both met		

Measuring apparatus parameters

Parameter	Preview measurement	Final measurement	Parameter	Preview measurement	Final measurement
Start frequency	150 kHz	150 kHz	Detector	MP/AV	QP/AV
Stop frequency	30 MHz	30 MHz	Measuring time	10 ms	1 s
Stepsize	5 kHz	5 kHz	RF-attenuation	0dB	0dB
IF- Bandwidth	9 kHz	9 kHz	Preamplifier	0 dB	0 dB

Operating mode	Measuring result
Normal operation with looping of signals Measurement on ERIF 03.00 line Measurement on GPIF 03.01 line Measurement on T0 03.00 line Measurement on BCB 03.00 line	Measurement diagram 1 Measurement diagram 2 Measurement diagram 3 Measurement diagram 4

The lines LB03.00 and BCA 03.00 were not measured because they will not be connected to a network as defined in CISPR 22 (EN 55022).

Test result

4. 2.1.) Measurement with QP-Detector on ERIF line

Frequency MHz	Level dBμA	Limit dBμA	Margin dB	Exceed- Mark
0,560	28,8	30,0	1,2	
0,600	24,6	30,0	5,4	
0,690	26,7	30,0	3,3	
0,735	29,1	30,0	0,9	
0,780	29,9	30,0	0,1	
0,825	28,0	30,0	2,0	
1,045	24,1	30,0	5,9	
1,115	27,3	30,0	2,7	
1,135	23,4	30,0	6,6	
3,295	21,9	30,0	8,1	

4. 2.2.) Measurement with QP-Detector on GPIF line

Frequency MHz	Level dBμA	Limit dBμA	Margin dB	Exceed- Mark
0,560	29,6	30,0	0,4	
0,600	24,3	30,0	5,7	
0,690	26,7	30,0	3,3	
0,735	29,7	30,0	0,3	
0,780	30,0	30,0	0,0	
0,825	28,3	30,0	1,7	
0,870	25,1	30,0	4,9	
1,050	23,6	30,0	6,4	
1,115	27,0	30,0	3,0	
3,340	22,7	30,0	7,3	

4. 2.3.) Measurement with QP-Detector on T0 line

Frequency MHz	Level dBµA	Limit dBµA	Margin dB	Exceed- Mark
0,560	28,8	30	1,2	
0,600	24,5	30	5,5	
0,690	26,7	30	3,3	
0,735	28,8	30	1,2	
0,780	30,0	30	0,0	
0,825	28,0	30	2,0	
1,050	23,6	30	6,4	
1,115	27,3	30	2,7	
3,340	22,5	30	7,5	
3,890	16,1	30	13,9	

4. 2.4.) Measurement with QP-Detector on BCB line

Frequency MHz	Level dBµA	Limit dBµA	Margin dB	Exceed- Mark
0,560	28,0	30	2,0	
0,600	24,5	30	5,5	
0,690	26,6	30	3,4	
0,735	28,6	30	1,4	
0,780	29,9	30	0,1	
0,825	27,7	30	2,3	
0,870	25,0	30	5,0	
1,050	23,4	30	6,6	
1,115	27,4	30	2,6	
3,390	24,1	30	5,9	

4. 2.5.) Measurement with AV-Detector on ERIF line

Frequency MHz	Level dBµA	Limit dBµA	Margin dB	Exceed- Mark
0,555	16,5	20,0	3,5	
0,600	13,8	20,0	6,2	
0,690	16,9	20,0	3,1	
0,735	16,4	20,0	3,6	
0,780	19,9	20,0	0,1	
0,820	13,7	20,0	6,3	
0,870	15,0	20,0	5,0	
1,070	12,3	20,0	7,7	
1,115	14,1	20,0	5,9	
12,290	14,4	20,0	5,6	

4. 2.6.) Measurement with AV-Detector on GPIF line

Frequency MHz	Level dBµA	Limit dBµA	Margin dB	Exceed- Mark
0,280	17,8	24,8	7,0	
0,555	16,4	20,0	3,6	
0,600	14,0	20,0	6,0	
0,690	16,6	20,0	3,4	
0,735	16,8	20,0	3,2	
0,780	19,6	20,0	0,4	
0,825	18,1	20,0	1,9	
0,870	14,9	20,0	5,1	
1,115	13,8	20,0	6,2	
12,290	15,4	20,0	4,6	

4. 2.7.) Measurement with AV-Detector on T0 line

Frequency MHz	Level dBµA	Limit dBµA	Margin dB	Exceed- Mark
0,280	18,5	24,8	6,3	
0,555	16,3	20	3,7	
0,600	14,0	20	6,0	
0,690	16,9	20	3,1	
0,735	17,0	20	3,0	
0,780	19,6	20	0,4	
0,825	17,8	20	2,2	
0,870	14,9	20	5,1	
1,095	13,2	20	6,8	
12,290	15,7	20	4,3	

4. 2.8.) Measurement with AV-Detector on BCB line

Frequency MHz	Level dBµA	Limit dBµA	Margin dB	Exceed- Mark
0,280	18,5	24,8	6,3	
0,560	15,3	20	4,7	
0,600	13,8	20	6,2	
0,690	17,0	20	3,0	
0,735	16,3	20	3,7	
0,780	19,9	20	0,1	
0,825	17,8	20	2,2	
0,870	15,0	20	5,0	
1,115	14,2	20	5,8	
12,290	15,3	20	4,7	

4. 3.) Radiated emission

Limits

Frequency range	Limit (quasi peak) *
30 - 230 MHz	39,6 dBµV/m
230 - 1000 MHz	46,6 dBµV/m

* Because the measurements were done at a measurement distance of 3m the limit was increased by a factor of 9,6 dB. This is still class B limit.

Measuring apparatus parameters

Parameter	Preview measurement	Final measurement	Parameter	Preview measurement	Final measurement
Start frequency	30 MHz	30 MHz	Detector	Max Peak	Quasi Peak
Stop frequency	1000 MHz	1000 MHz	Measuring time	10 ms	1 s
Stepsize	50 kHz	50 kHz	RF-attenuation	0dB	0dB
IF- Bandwidth	120 kHz	120 kHz	Preamplifier	20 dB	20 dB

Operating mode	Measuring result
Normal operation with looping of signals; 19" cabinet doors closed	Measurement diagram 5 – 7
Normal operation * EPOSA 04.00 placed in the test chamber	Measurement diagram 8 – 10
Normal operation * EPOSA 04.10 placed in the test chamber	Measurement diagram 11 – 13
Normal operation * C-POS 01 placed in the test chamber	Measurement diagram 14 – 16

* The three operator positions need a ferrite bead on the DC Cable to meet the limit (see Photodocumentation).

Test result

4. 3.1.) Measurement with QP-Detector (30 MHz – 200 MHz) on the 19" Cabinet

Frequency MHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
36,85	32,0	39,6	7,6		106	357	VERTICAL
44,55	30,3	39,6	9,3		104	266	VERTICAL
48,30	37,3	39,6	2,3		103	344	VERTICAL
56,30	27,4	39,6	12,2		179	177	VERTICAL
73,75	29,4	39,6	10,2		250	165	HORIZONTAL
147,45	37,7	39,6	1,9		136	51	HORIZONTAL
175,00	28,6	39,6	11,0		225	85	HORIZONTAL
200,00	29,5	39,6	10,1		100	49	HORIZONTAL

4. 3.2.) Measurement with QP-Detector (200 MHz – 1000 MHz) on the 19" Cabinet

Frequency MHz	Level dBµV/m	Limit dBµV/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
233,30	37,0	39,6	9,6		239	91	HORIZONTAL
266,70	39,0	46,6	7,6		138	138	HORIZONTAL
369,35	39,1	46,6	7,5		111	100	HORIZONTAL
373,60	36,2	46,6	10,4		100	97	HORIZONTAL
375,85	36,8	46,6	9,8		100	84	HORIZONTAL
400,00	37,9	46,6	8,7		100	91	HORIZONTAL
466,65	39,3	46,6	7,3		100	72	HORIZONTAL
997,90	38,4	46,6	8,2		100	102	VERTICAL

4. 3.3.) Measurement with QP- and AV-Detector (1000 MHz – 2000 MHz) on the 19" Cabinet

Due to the large margin of the premeasurements to the limit, no final assessment was made.

4. 3.4.) Measurement with QP-Detector (30 MHz – 200 MHz) on the EPOSA 04.10

Frequency MHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
33,65	12,1	39,6	27,5		169	133	HORIZONTAL
40,95	32,8	39,6	6,8		103	313	VERTICAL
45,70	9,3	39,6	30,3		282	144	HORIZONTAL
47,70	10,4	39,6	29,2		322	45	HORIZONTAL
48,20	13,7	39,6	25,9		311	49	HORIZONTAL
70,95	15,5	39,6	24,1		176	318	VERTICAL
94,75	10,8	39,6	28,8		156	126	HORIZONTAL
200,00	34,9	39,6	4,7		175	81	HORIZONTAL

4. 3.5.) Measurement with QP-Detector (200 MHz – 1000 MHz) on the EPOSA 04.10

Frequency MHz	Level dBµV/m	Limit dBµV/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
200,00	37,4	39,6	2,2		166	145	HORIZONTAL
204,80	34,1	39,6	5,5		164	167	HORIZONTAL
216,70	31,8	39,6	7,8		144	100	HORIZONTAL
286,70	36,5	46,6	10,1		231	15	VERTICAL
400,00	37,2	46,6	9,4		100	1	HORIZONTAL
800,00	39,3	46,6	7,3		100	101	VERTICAL
866,70	37,2	46,6	9,4		103	259	HORIZONTAL
933,30	39,5	46,6	7,1		191	157	VERTICAL

4. 3.6.) Measurement with QP- and AV-Detector (1000 MHz – 2000 MHz) on the EPOSA 04.10

Due to the large margin of the premeasurements to the limit, no final assessment was made.

4. 3.7.) Measurement with QP-Detector (30 MHz – 200 MHz) on the EPOSA 04.00

Frequency MHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
40,55	19,3	39,6	20,3		173	313	VERTICAL
48,05	12,6	39,6	27,0		200	285	VERTICAL
63,30	17,1	39,6	22,5		179	268	VERTICAL
81,85	25,6	39,6	14,0		172	19	VERTICAL
94,60	21,6	39,6	18,0		175	32	VERTICAL
100,35	14,4	39,6	25,2		100	225	VERTICAL
102,75	13,8	39,6	25,8		100	276	VERTICAL
120,40	16,7	39,6	22,9		233	155	HORIZONTAL

4. 3.8.) Measurement with QP-Detector (200 MHz – 1000 MHz) on the EPOSA 04.00

Frequency MHz	Level dBµV/m	Limit dBµV/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
212,50	12,7	39,6	26,9		236	223	VERTICAL
333,35	38,7	46,6	7,9		139	188	HORIZONTAL
368,60	40,0	46,6	6,6		100	0	HORIZONTAL
737,15	37,6	46,6	9,0		106	19	VERTICAL
777,60	35,7	46,6	10,9		164	11	VERTICAL
819,25	42,4	46,6	4,2		107	356	HORIZONTAL
866,65	45,7	46,6	0,9		113	259	VERTICAL
933,40	41,5	46,6	5,1		111	272	HORIZONTAL

4. 3.9.) Measurement with QP- and AV-Detector (1000 MHz – 2000 MHz) on the EPOSA 04.00

Due to the large margin of the premeasurements to the limit, no final assessment was made.

Test result

4. 3.10.) Measurement with QP-Detector (30 MHz – 200 MHz) on the C-POS 01

Frequency MHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
40,95	27,0	39,6	12,6		100	313	VERTICAL
66,65	30,2	39,6	9,4		100	135	VERTICAL
79,20	26,4	39,6	13,2		274	213	HORIZONTAL
92,00	32,4	39,6	7,2		312	223	HORIZONTAL
106,55	26,4	39,6	13,2		100	135	VERTICAL
116,65	25,6	39,6	14,0		100	170	VERTICAL
122,90	30,8	39,6	8,8		123	31	VERTICAL
147,45	34,0	39,6	5,6		217	296	HORIZONTAL

4. 3.11.) Measurement with QP-Detector (200 MHz – 1000 MHz) on the C-POS 01

Frequency MHz	Level dB μ V/m	Limit dB μ V/m	Margin dB	Exceed- Mark	Height cm	Azimuth deg	Polarization
204,80	39,0	39,6	0,6		161	38	HORIZONTAL
208,90	36,4	39,6	3,2		172	344	HORIZONTAL
286,70	38,7	46,6	7,9		100	14	HORIZONTAL
400,00	34,8	46,6	11,8		100	100	HORIZONTAL
450,55	38,6	46,6	8,0		100	15	HORIZONTAL
466,70	32,0	46,6	14,6		100	338	HORIZONTAL
800,00	35,4	46,6	11,2		100	188	VERTICAL
866,65	39,3	46,6	7,3		119	165	VERTICAL

4. 3.12.) Measurement with QP- and AV-Detector (1000 MHz – 2000 MHz) on the C-POS 01

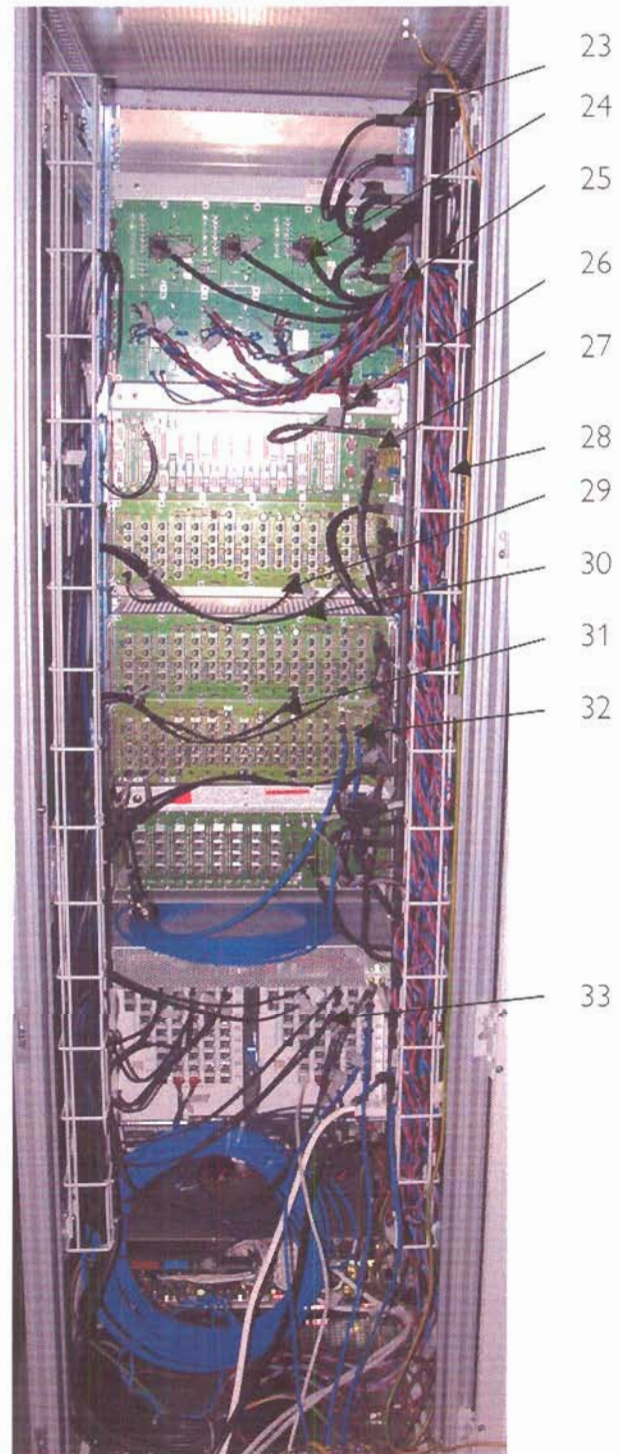
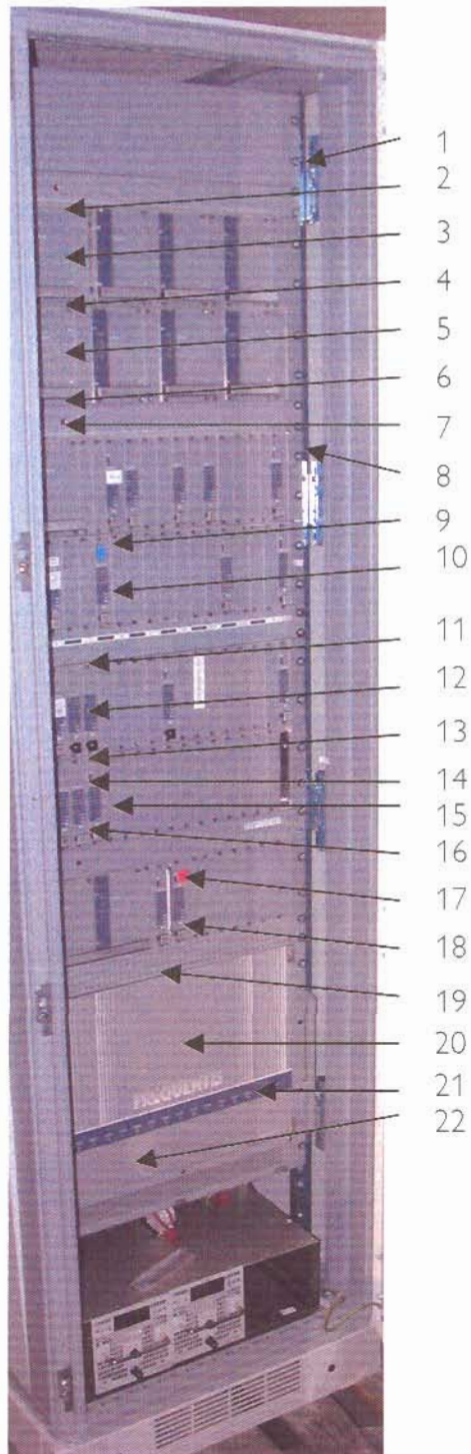
Due to the large margin of the premeasurements to the limit, no final assessment was made.

4. 4.) Electrostatic discharge requirements (ESD) 19" cabinet

Type of test	charging voltage	Basic standard	Test set-up	Comment	Performance criteria
Electrostatic discharge Air discharge	8 kV charging voltage	EN 61000-4-2	EN 61000-4-2		B
Electrostatic discharge Contact discharge	4 kV charging voltage	EN 61000-4-2	EN 61000-4-2		B

Operating mode	Test positions	Criteria of compliance
Normal operation with looping of signals	The 35 test positions are shown in the following graphic.	Before, during and after the test the equipment shall operate as intended, no loss of function or loss of voice links shall occur. Short disturbances on the voice link during the test are allowed. After the test there shall be no degradation of performance.

Test positions for ESD on the 19" cabinet



Test result for the 19" cabinet

Test position	Charging voltage	Type of discharge	Positive discharge	Negative discharge
1	4 kV	contact	OK	OK
2	8 kV	air	OK	OK
3	8 kV	air	OK	OK
4	8 kV	air	OK	OK
5	8 kV	air	OK	OK
6	4 kV	contact	OK	OK
7	4 kV	contact	OK	OK
8	4 kV	contact	OK	OK
9	8 kV	air	OK	OK
10	8 kV	air	OK	OK
11	4 kV	contact	OK	OK
12	8 kV	air	OK	OK
13	4 kV	contact	OK	OK
14	8 kV	air	OK	OK
15	8 kV	air	OK	OK
16	8 kV	air	OK	OK
17	8 kV	air	OK	OK
18	8 kV	air	OK	OK
19	4 kV	contact	OK	OK
20	8 kV	air	OK	OK
<div>OK</div> <div>NOK</div> <div>EUT passed</div> <div>EUT failed</div>				

Test result for the 19" cabinet continued

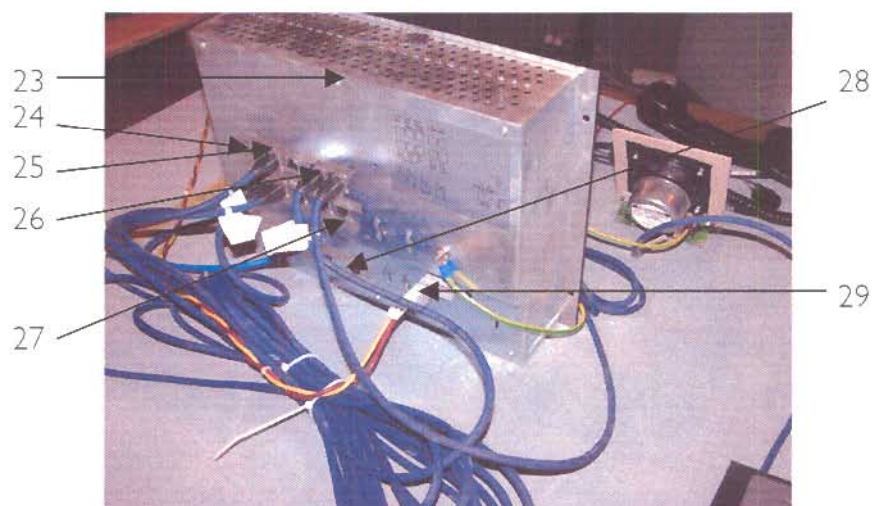
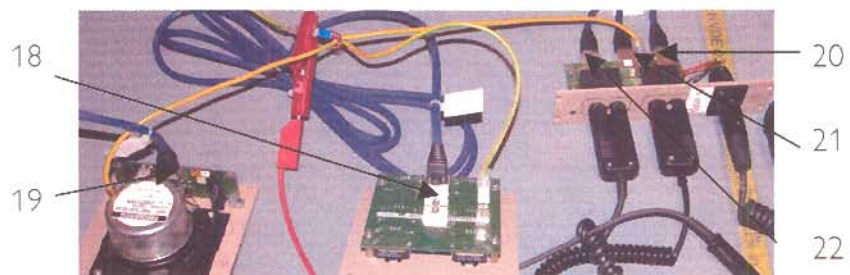
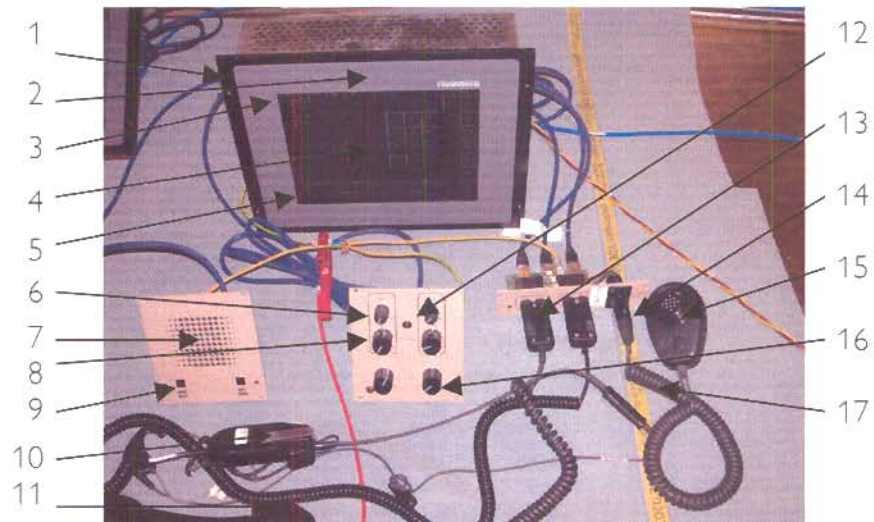
Test position	Charging voltage	Type of discharge	Positive discharge	Negative discharge
21	8 kV	air	OK	OK
22	8 kV	air	OK	OK
23	8 kV	air	OK	OK
24	8 kV	air	OK	OK
25	8 kV	air	OK	OK
26	8 kV	air	OK	OK
27	8 kV	air	OK	OK
28	8 kV	air	OK	OK
29	4 kV	contact	OK	OK
30	4 kV	contact	OK	OK
31	8 kV	air	OK	OK
32	4 kV	contact	OK	OK
33	4 kV	contact	OK	OK
34	4 kV	Indirect HCP	OK	OK
35	4 kV	Indirect VCP	OK	OK
<div>OK</div> <div>NOK</div> <div>EUT passed</div> <div>EUT failed</div>				

4. 5.) Electrostatic discharge requirements (ESD) EPOSA 04.10

Type of test	charging voltage	Basic standard	Test set-up	Comment	Performance criteria
Electrostatic discharge Air discharge	20 kV charging voltage	EN 61000-4-2	EN 61000-4-2		B
Electrostatic discharge Contact discharge	8 kV charging voltage	EN 61000-4-2	EN 61000-4-2		B

Operating mode	Test positions	Criteria of compliance
Normal operation with looping of signals	The 31 test positions are shown in the following graphic.	Before, during and after the test the equipment shall operate as intended, no loss of function or loss of voice links shall occur. Short disturbances on the voice link during the test are allowed. After the test there shall be no degradation of performance.

Test positions for ESD on the EPOSA 04.10



Test result for the EPOSA 04.10

Test position	Charging voltage	Type of discharge	Positive discharge	Negative discharge
1	8 kV	contact	OK	OK
2	20 kV	air	OK	OK
3	20 kV	air	OK	OK
4	20 kV	air	OK	OK
5	20 kV	air	OK	OK
6	20 kV	air	OK	OK
7	20 kV	air	OK	OK
8	20 kV	air	OK	OK
9	20 kV	air	OK	OK
10	20 kV	air	OK	OK
11	20 kV	air	OK	OK
12	20 kV	air	OK	OK
13	20 kV	air	OK	OK
14	20 kV	air	OK	OK
15	20 kV	air	OK	OK
16	20 kV	air	OK	OK
17	20 kV	air	OK	OK
18	8 kV	contact	OK	OK
19	8 kV	contact	OK	OK
20	8 kV	contact	OK	OK
<div>OK</div> <div>NOK</div> <div>EUT passed</div> <div>EUT failed</div>				

Test result for the EPOSA 04.10 continued

Test position	Charging voltage	Type of discharge	Positive discharge	Negative discharge
21	8 kV	contact	OK	OK
22	8 kV	contact	OK	OK
23	8 kV	contact	OK	OK
24*	8 kV	contact	OK	OK
25*	8 kV	contact	OK	OK
26*	8 kV	contact	OK	OK
27*	8 kV	contact	OK	OK
28*	8 kV	contact	OK	OK
29	20 kV	air	OK	OK
30	8 kV	Indirect HCP	OK	OK
31	8 kV	Indirect VCP	OK	OK
<p>OK EUT passed NOK EUT failed * The connectors at these positions need to be better conducted with the case. For the tests this was done with adhesive metal foil.</p>				