



S EMC - TESTCENTER ZÜRICH
T Ex-Oerlikon-Contraves AG
S MEMBER OF EMC GROUP
ACCREDITATION No. 034

Accredited according to EN 45001 by:
Swiss Accreditation Service / EAM BERN
Registration number 034

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Swiss Shield® Naturell™

EMC / EMI TEST REPORT
SHIELDING EFFECTIVENESS
EMC-TEXTILE

CUSTOMER: Amstein + Walthert
Beratende Ingenieure AG SIA
Leutschenbachstrasse 45
CH-8050 Zürich / Switzerland

Att: Dr. Georg Klaus
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Fax + 41 - 1 - 305 92 14

TEST DATE: 13. January 1999

USED STANDARDS:

MIL-STD 285	Military Standard Attenuation Measurements for Enclosures, Electromagnetic Shielding, for Electronic Test Purposes, Method of
NSA 65-6	National Security Agency Specification for R.F. Shielded Enclosures for Communications Equipment

TEST PERFORMANCE: Armin Frei

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INSTRUMENTATION:

Instrumentation	Serial-No.	Date of calibration
CCS 760 MK4 Computer controlled EMC-System, 16 Hz - 18 GHz, with		07.98
EMI- Receiver, Electro-Metrics, EMC-30 MK4, 9kHz-1GHz	44136	07.98
EMI- Receiver, Electro-Metrics, EMC-60 MK4, 1GHz-18GHz	44112	07.98
Signal Generator,R&S,SMG,10Hz-1GHz	883318/039	02.98
Microwave Synthesizer, Systron Donner, 1618	47009-1	02.98
Arbitrary Wave Generator, Pragmatic, 2416A, DC-100MHz	820013	01.98
Magnetic Dipol, Rolf Heine, LA-285, 20Hz-30MHz	0000	NA
Loop Antenna, Electro-Metrics, ALR-30, 9kHz-30MHz	114	09.98
Wideband Amplifier,Bonn,BLWA2010-100,100W,200MHz-1GHz	964163	NA
Wideband Amplifier,IFI,M402,60W,10kHz-200MHz	1288-3514	NA
Dipol Antenna(Tx), Electro-Metrics, TDA 25/30, 10kHz - 1000MHz	245	NA
Rod Antenna (Rx), Ise-Micro, R 1030, 10kHz - 100MHz	8	07.98
Dipol Antenna (Rx), Electro-Metrics, TDS 25/30, 200 - 1000MHz	294	NA
HF-Millivoltmeter/Powermeter,R&S,URV5-Z4,10kHz-2GHz	873844/009	02.98
HF-Millivoltmeter/Powermeter,R&S,NRV5-2,10 0kHz-18GHz	8366312/013	02.98
Directional Coupler, 100W, Werlatone, C1634,10kHz-1GHz	2379	1.98
Directional Coupler 25W,mac technology,C424820,1GHz-18GHz	397001	1.98
Microwave Amplifier HP, 8349A, 100mW, 2GHz-20GHz	2512A00774	NA
Double Ridged Guide Antenna(Rx),Electro-MetricsRGA-50/60,1GHz-18GHz	2701	NA
Double Ridged Guide Antenna(Tx),EMCO,3115,1GHz-18GHz	2134	NA

Calibration procedures:

The calibration routine is performed once a year according to the requirements of Swiss Calibration Service (SCS), the German Calibration Service (**DKD**), the US - National Institute of Standards and Technology (**NIST**) and manufacturers.

TEST SETUP: According to MIL-STD 285 / NSA 65-6.
 Antenna distances to tested material: Transmit and receive antenna 0.3m (12 inches)
 Modulation AM 80%,1kHz



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TEST SETUP: According to MIL-STD 285 / NSA 65-6

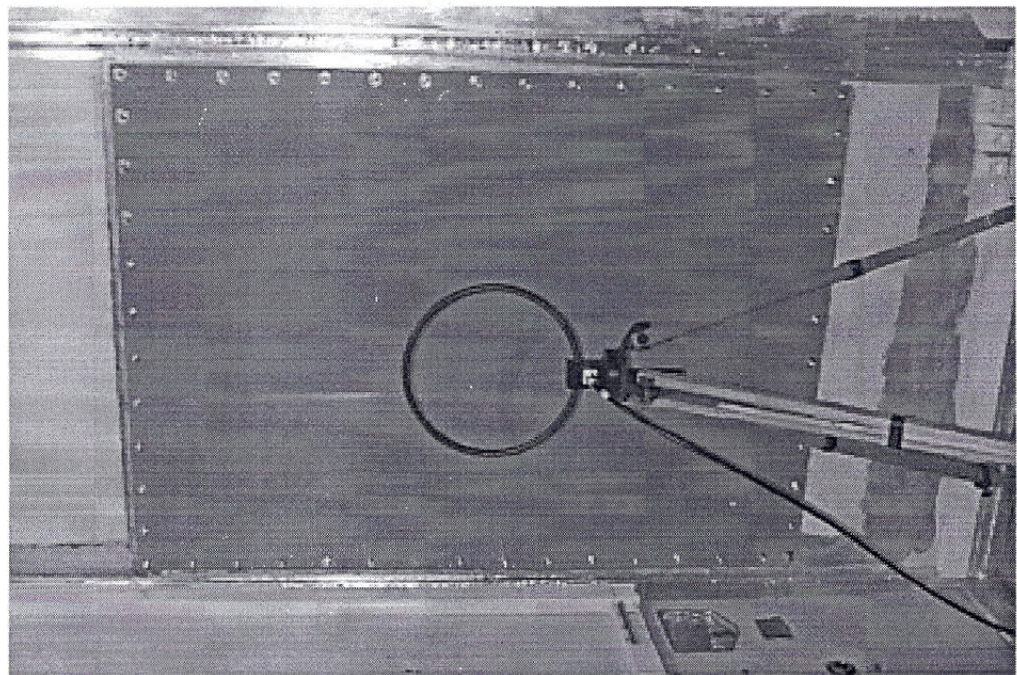
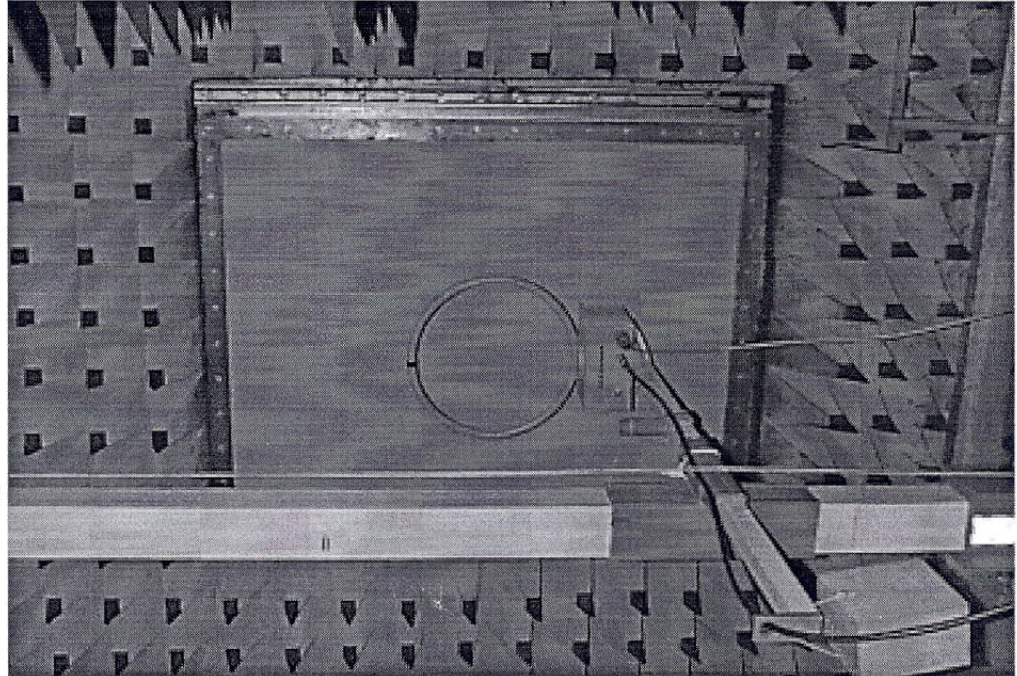
H-Field reference measurement, Transmit and Receive Antenna 10 kHz - 30 MHz





TEST SETUP: According to MIL-STD 285 / NSA 65-6

H-Field shielding eff. measurement, Transmit and Receive Antenna 10 kHz - 30 MHz

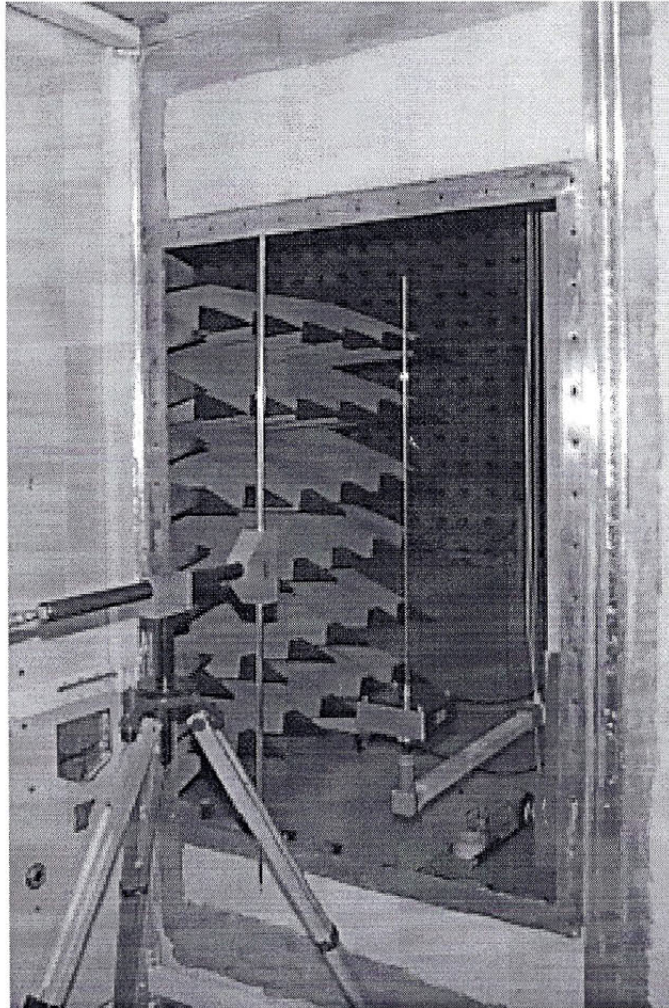




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TEST SETUP: According to MIL-STD 285 / NSA 65-6

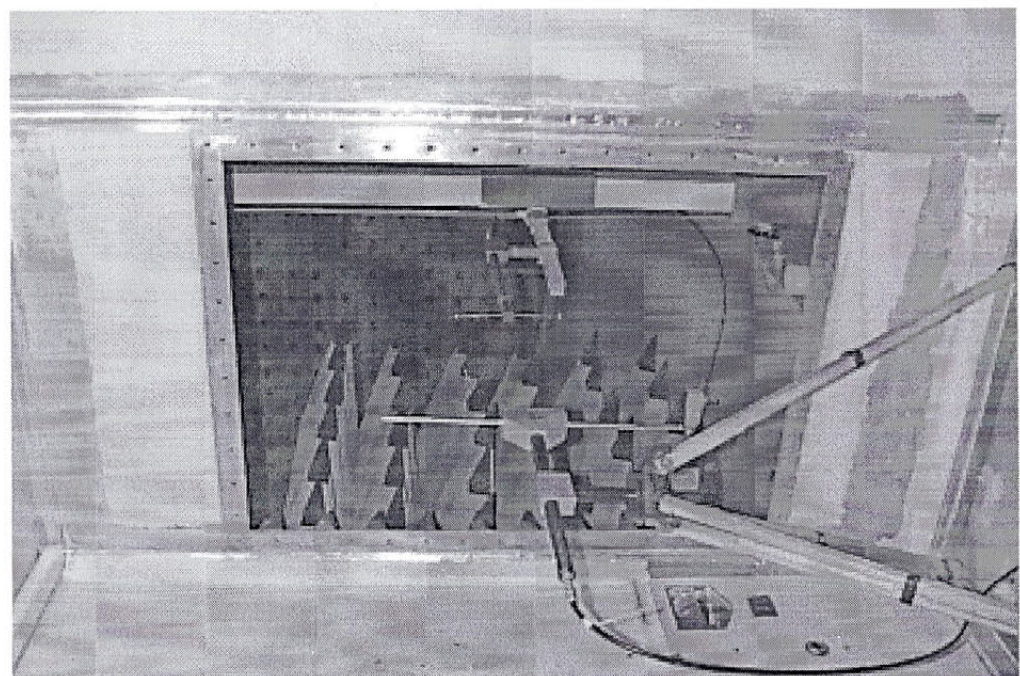
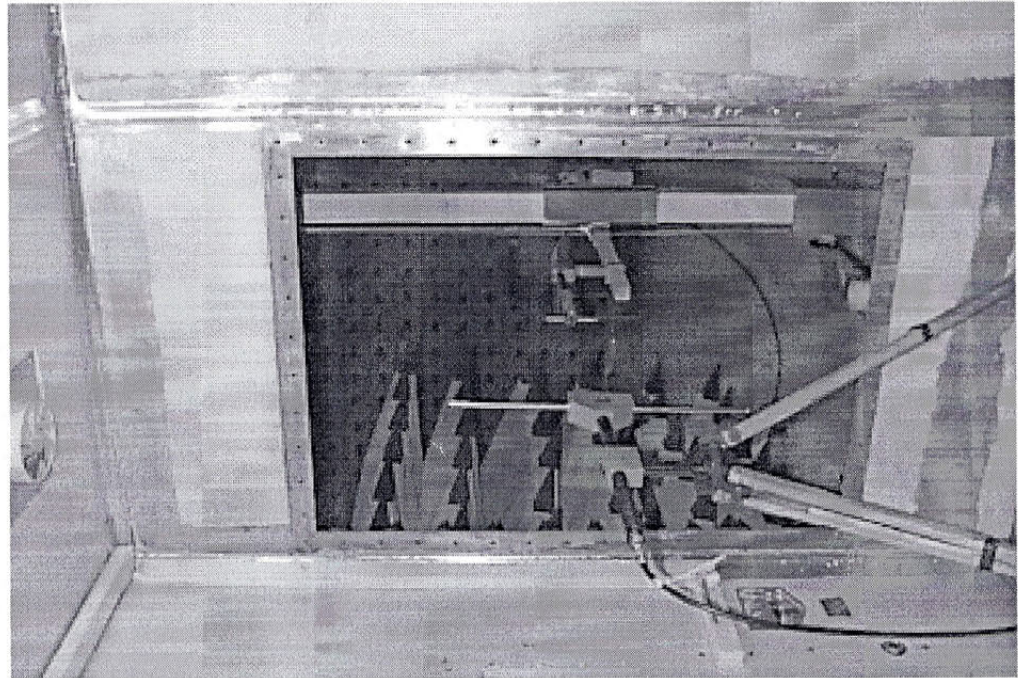
E-Field reference measurement, Transmit and receive Antenna 10 kHz - 100 MHz





TEST SETUP: According to MIL-STD 285 / NSA 65-6

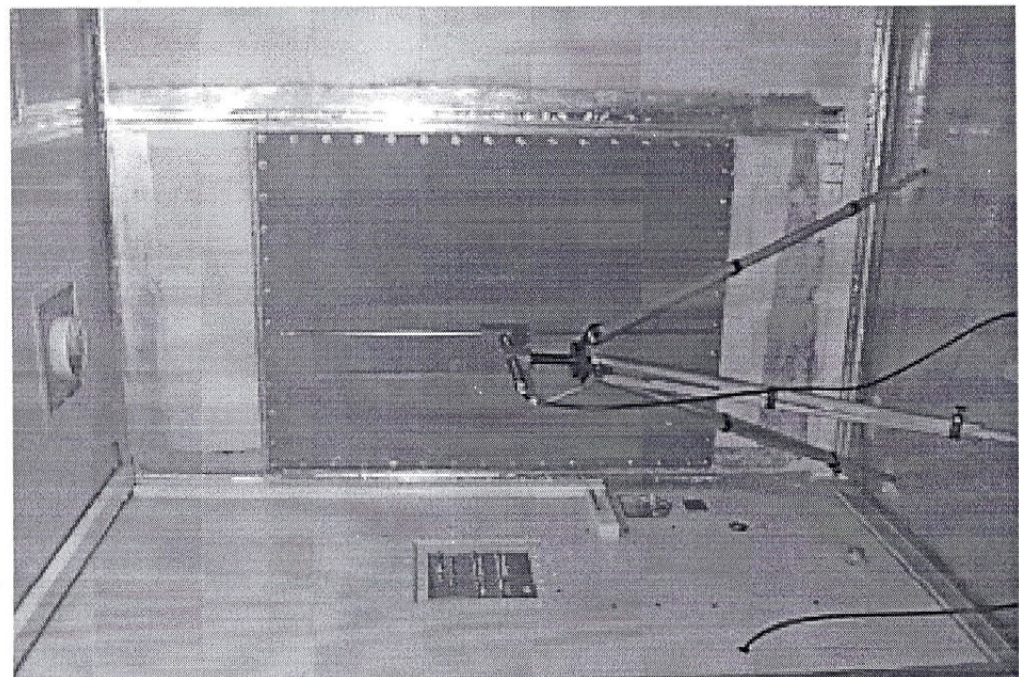
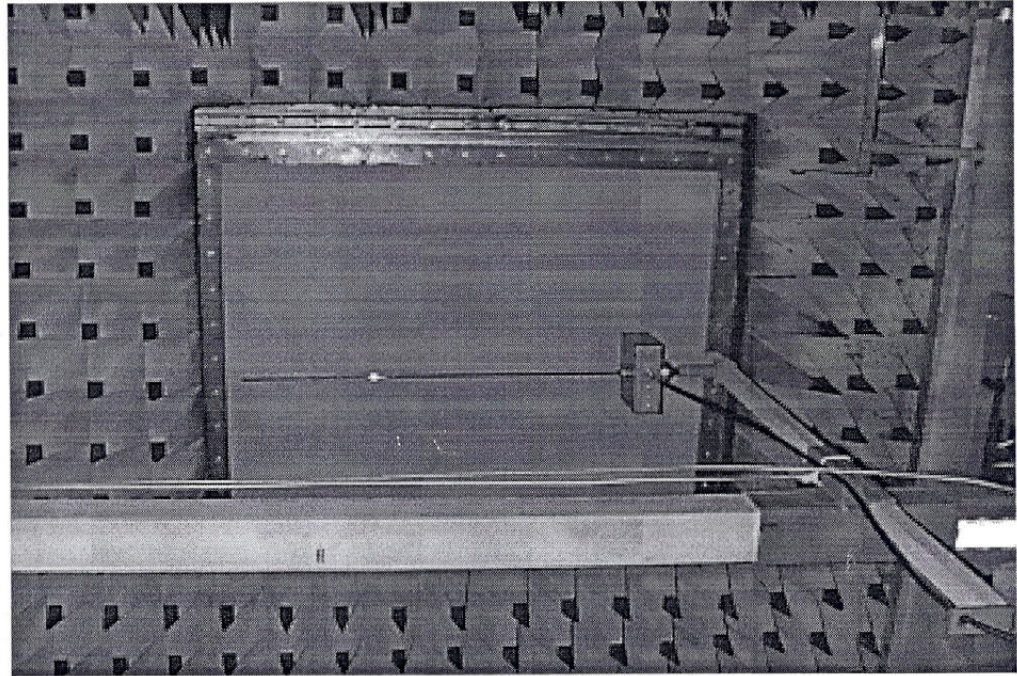
E-Field reference measurement, Transmit and receive Antenna 200 MHz - 1000MHz





TEST SETUP: According to MIL-STD 285 / NSA 65-6

E-Field shielding eff. measurement, Transmit and Receive Antenna 10kHz - 100MHz





TEST SETUP: According to MIL-STD 285 / NSA 65-6

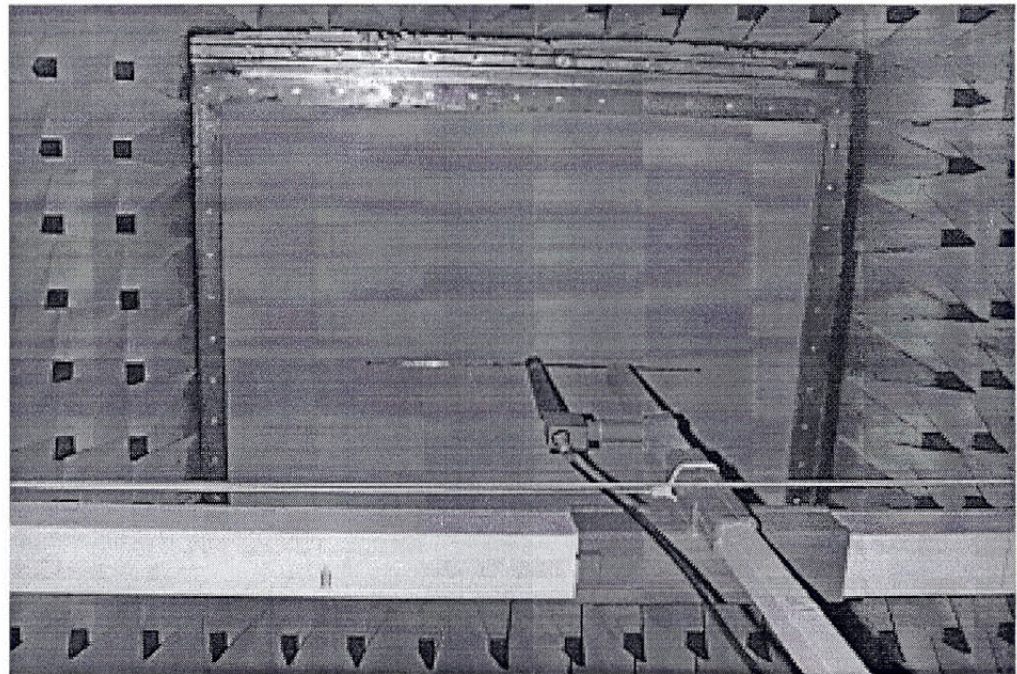
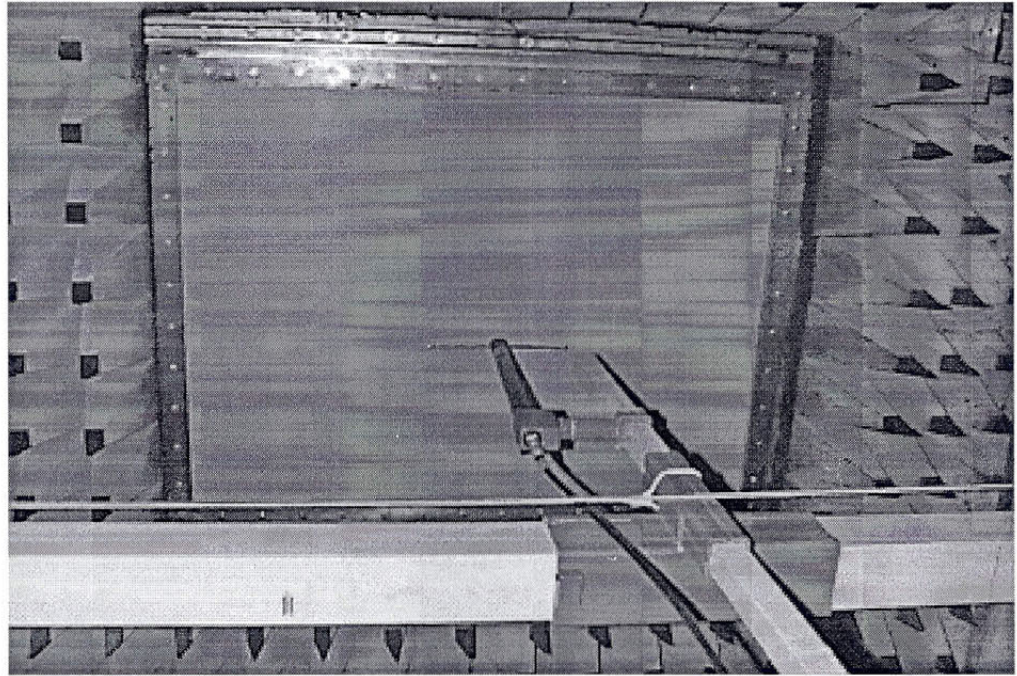
E-Field shielding eff. measurement, Transmit Antenna 200MHz - 1000MHz





TEST SETUP: According to MIL-STD 285 / NSA 65-6

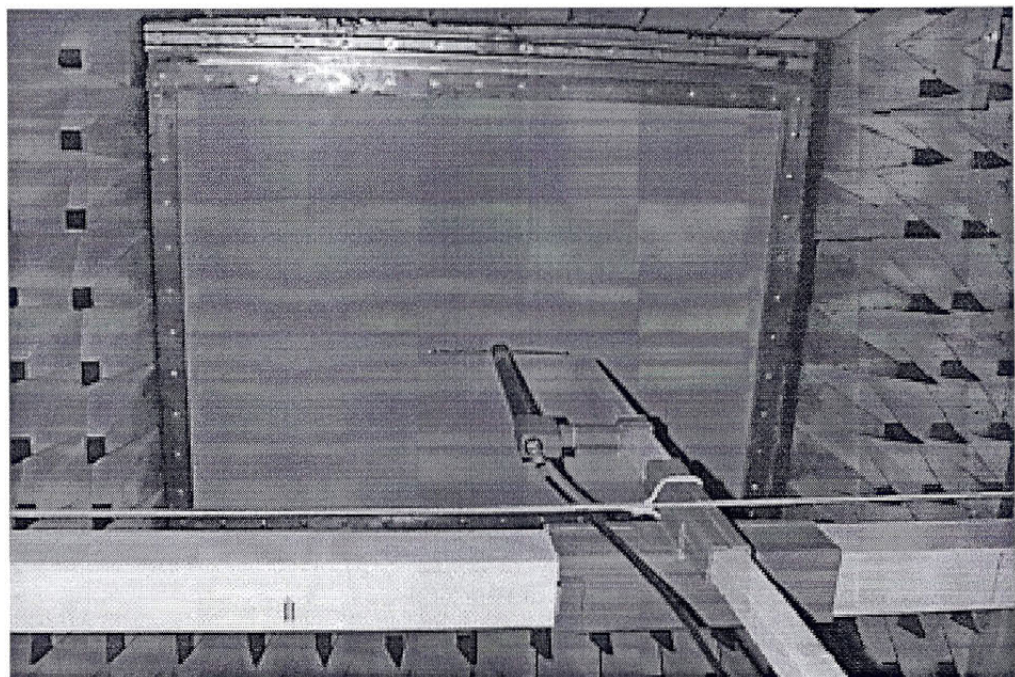
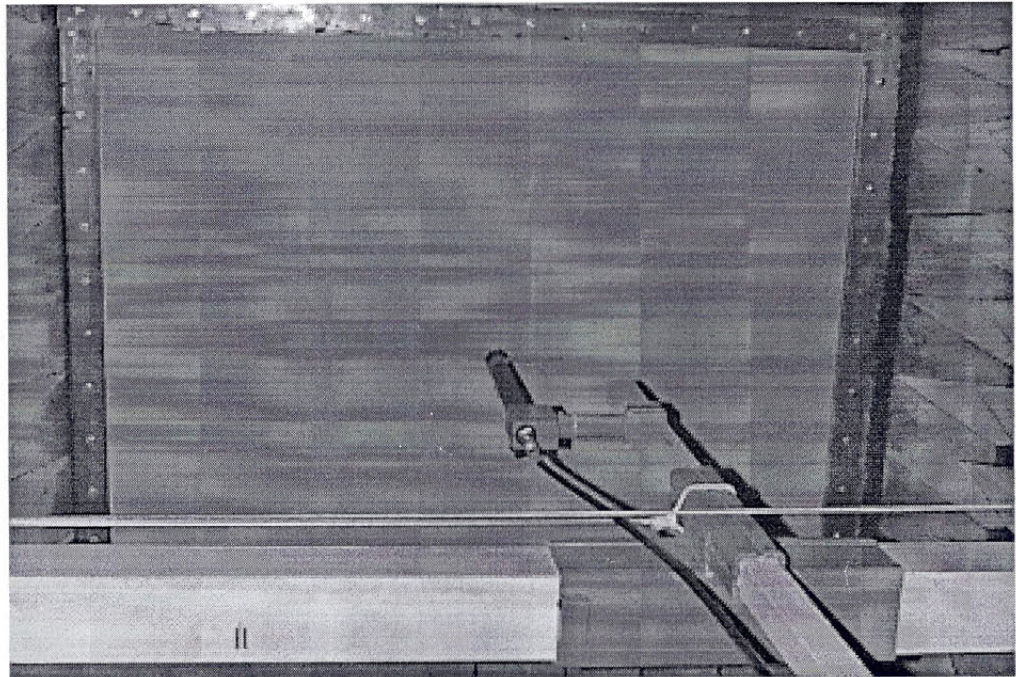
E-Field shielding eff. measurement, Receive Antenna 200MHz - 500MHz





TEST SETUP: According to MIL-STD 285 / NSA 65-6

E-Field shielding eff. measurement, Receive Antenna 700MHz - 1000MHz

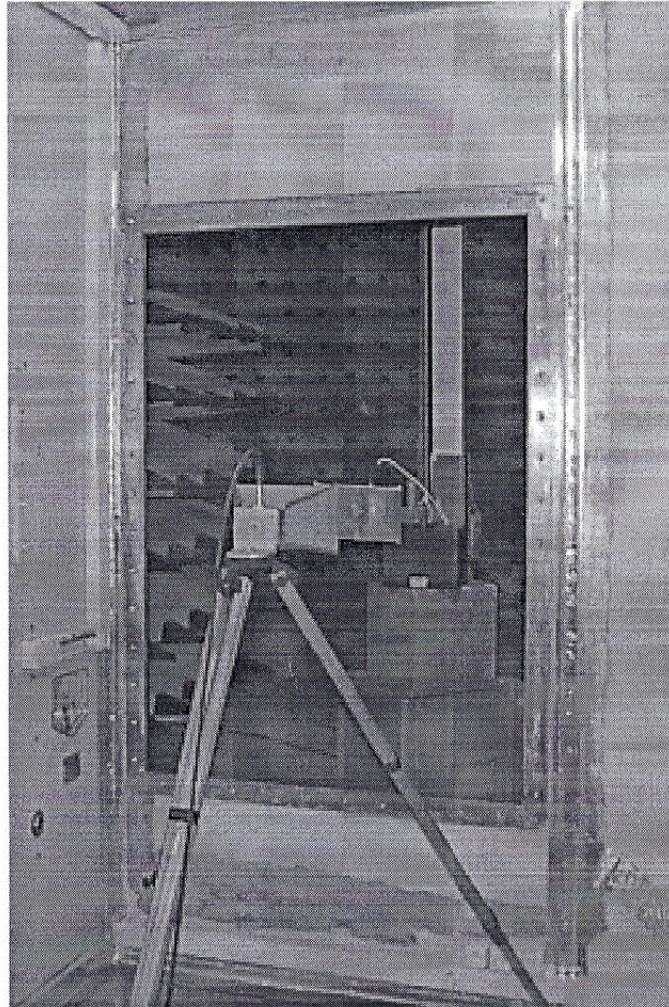




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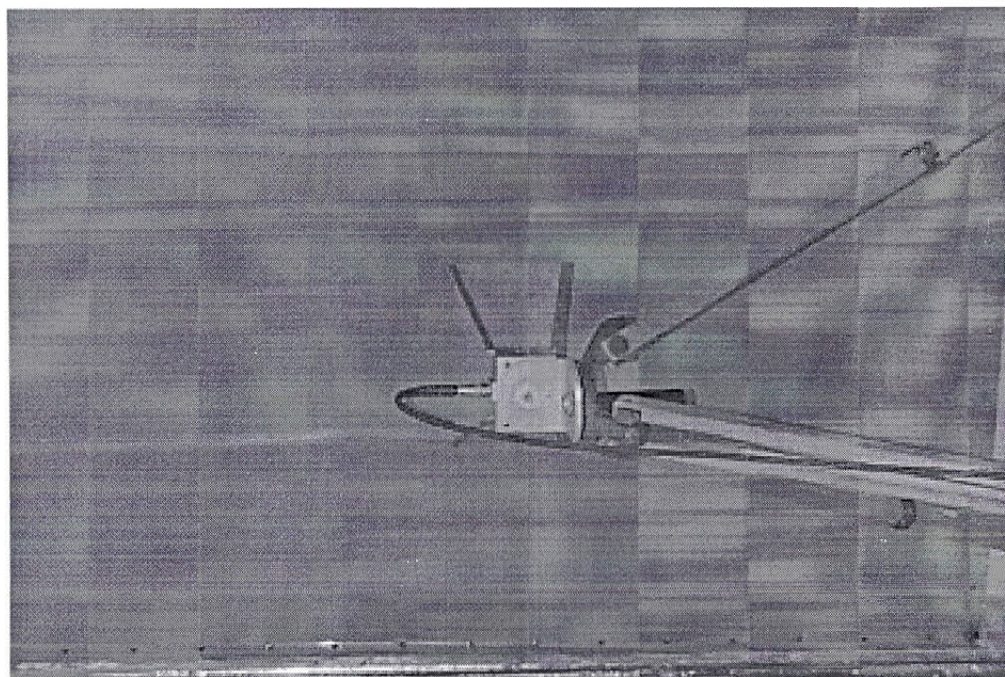
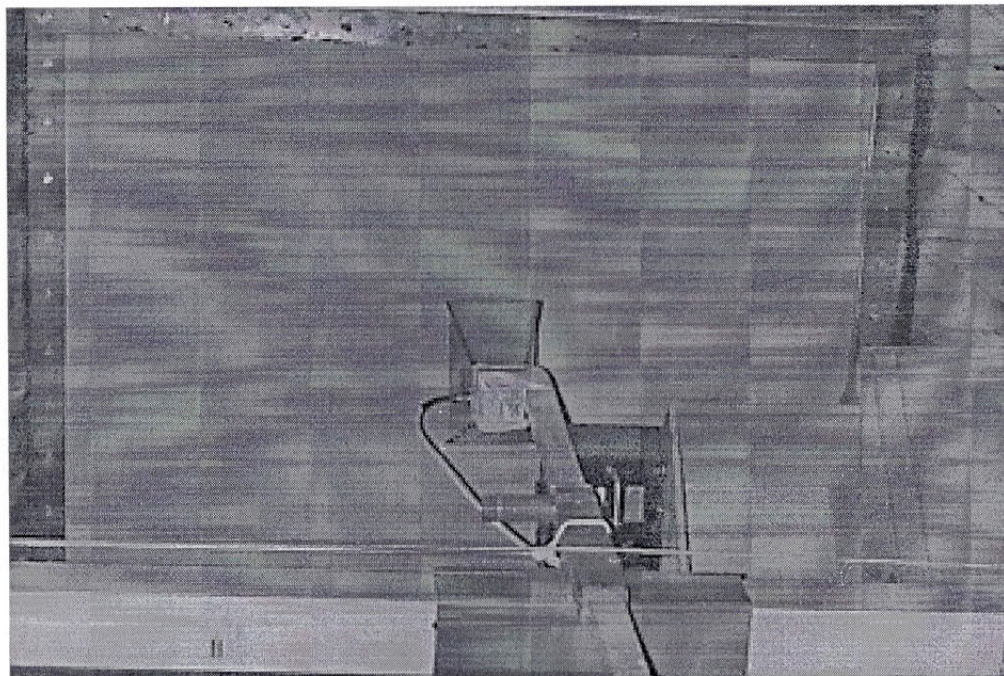
E-Field reference measurement, Transmit and Receive Antenna 2000MHz





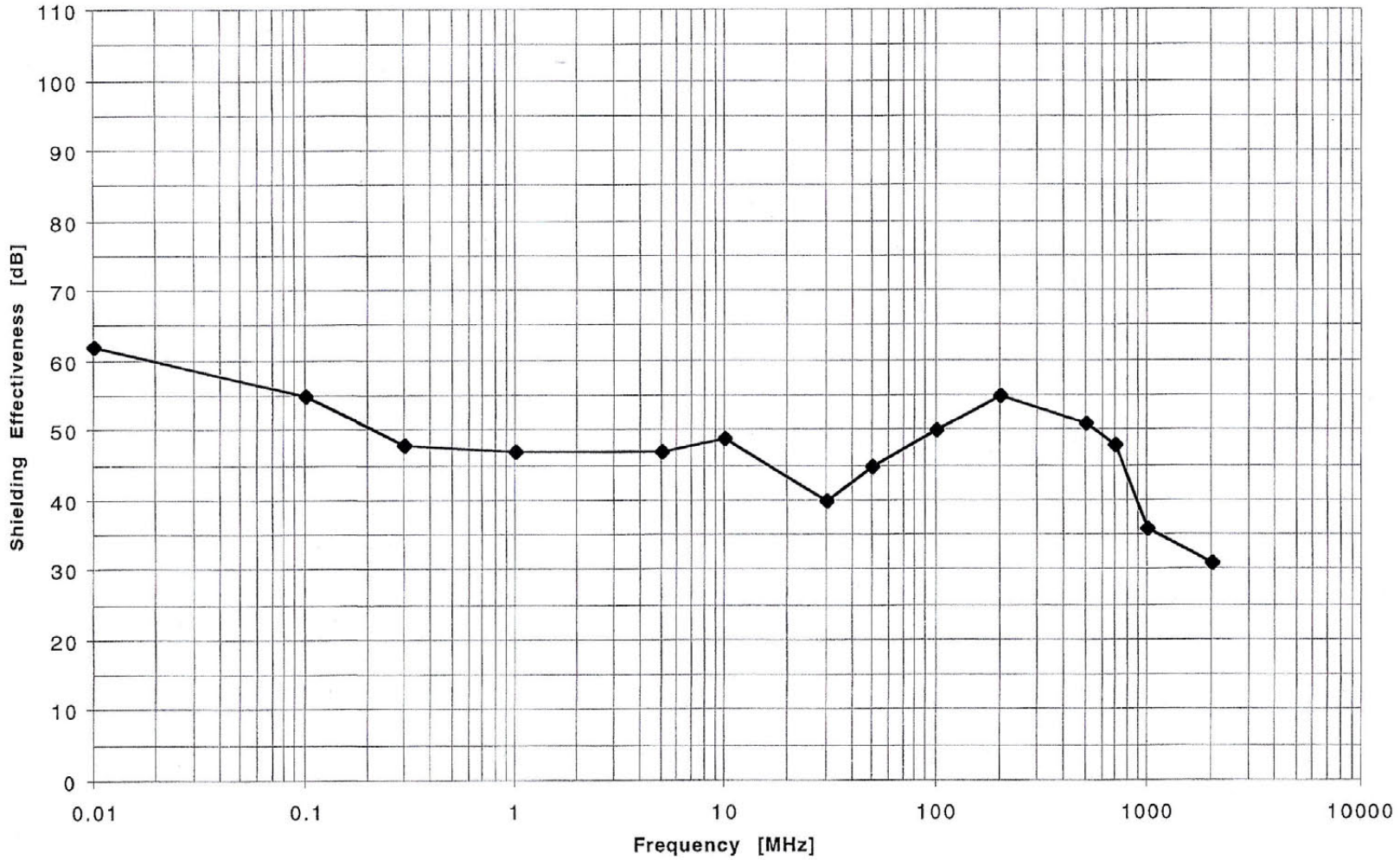
TEST SETUP: According to MIL-STD 285 / NSA 65-6

E-Field shielding eff. measurement, Transmit and Receive Antenna 2000MHz



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Shielding Attenuation according
to MIL-STD 285 / NSA 65-6



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TEST RESULTATS: Shielding effectiveness electrical field



TEST RESULTATS (Table):

Frequency [MHz]	Shielding Effectiveness [dB]
0.01	62
0.1	55
0.3	48
1	47
5	47
10	49
30	40
50	45
100	50
200	55
500	51
700	48
1000	36
2000	31



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CONCLUSIONS:

The test results show that the EMC-Textile has a good shielding effectiveness for electrical fields and no shielding effectiveness for magnetic fields.

SIGNATURE:

Zurich, 14. January 1998

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Armin Frei
EMC Engineer