

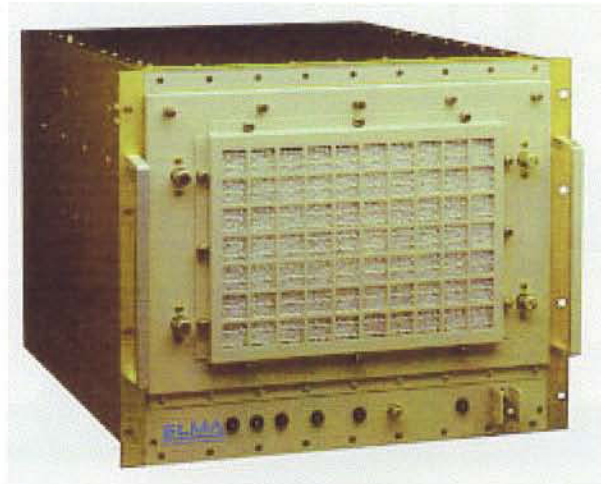


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MACHINERY - COMPONENTS - TECHNOLOGY

SHIELDING EFFECTIVENESS OF A 12R2 RUGGED COTS ENCLOSURE

Report No : 12'555



Client : ELMA ELECTRONIC AG
Location : Rossens
Date : October 24, 2000
Mandate No : 99-4310

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shielding effectiveness of a 12R2 Rugged cots enclosure

1. Introduction

A 12R2 rugged cots enclosure has been measured (front side).

The shielding effectiveness (EM-field) has been measured in the frequency range 30 MHz-3 GHz. The transmitting and the receiving antennas were polarized vertically. The enclosure has been placed horizontally (s. drawing on the diagrams).

2. Test set-up

All measurements were performed in the anechoic chamber. Two small transmitters were installed in the rack, one for the frequency range 30 MHz...1 GHz and another for the frequency range 1...3 GHz. These transmitters are supplied by battery to avoid any cable. A biconical antenna, a log-periodic and a horn antenna were used to cover the frequency range 30 MHz...3 GHz. A spectrum analyzer monitored with a PC was used to do the measurements.

The measurement consists of a comparison between the levels received with the transmitter only and the levels received with the transmitter installed in the rack. The difference gives the shielding effectiveness. Fig. 1 shows the test set-up (s. appendix A, p. 3).

Instruments

$f < 1$ GHz

Spectrum Analyzer:	HP8562 A (88-14)
Pre-amplifier:	none
Transmitter (EM-field):	Antenna h = 95 mm (93-87)
Receiving antenna:	Schwarzbeck 9103 (82-02) and UHALP 9108 (90-30)

$f > 1$ GHz

Spectrum Analyzer:	HP8562 A (88-14)
Pre-amplifier:	none
Transmitter (EM-field):	Antenna h = 25 mm (93-10)
Receiving antenna:	Horn EMCO 3115 (90-29)
Cables:	Sucoflex 104



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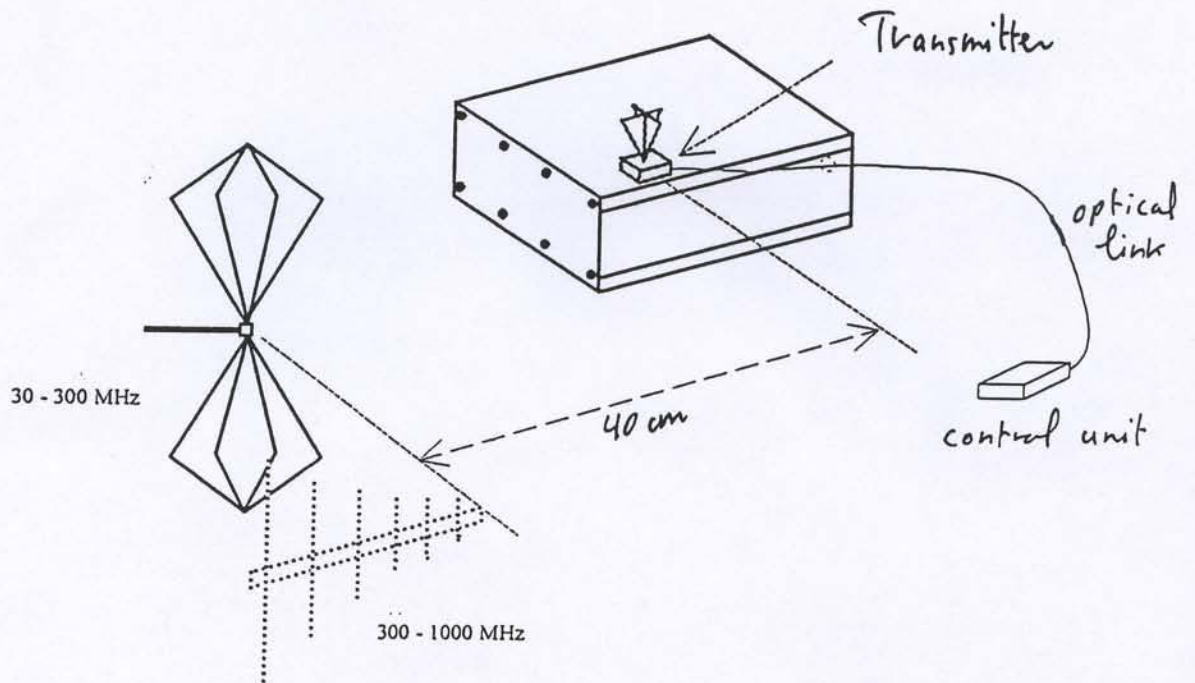


Fig. 1 Test set-up for shielding effectiveness measurements (EM-field)
(horn antenna not represented)



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3. Results

The results are given in the appendix A. The following table gives a summary of the results:

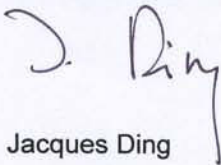
Configuration	Material	Shielding effectiveness (dB) minimum			Rack positioning
		30... 300 MHz	300... 1000 MHz	1...3 GHz	
original	original	>58*	>56*	>54*	horizontal

Table 1 12R2 rugged cots enclosure

* = The shielding effectiveness measured was limited by the dynamic of the measurements

Rossens, November 3, 2000

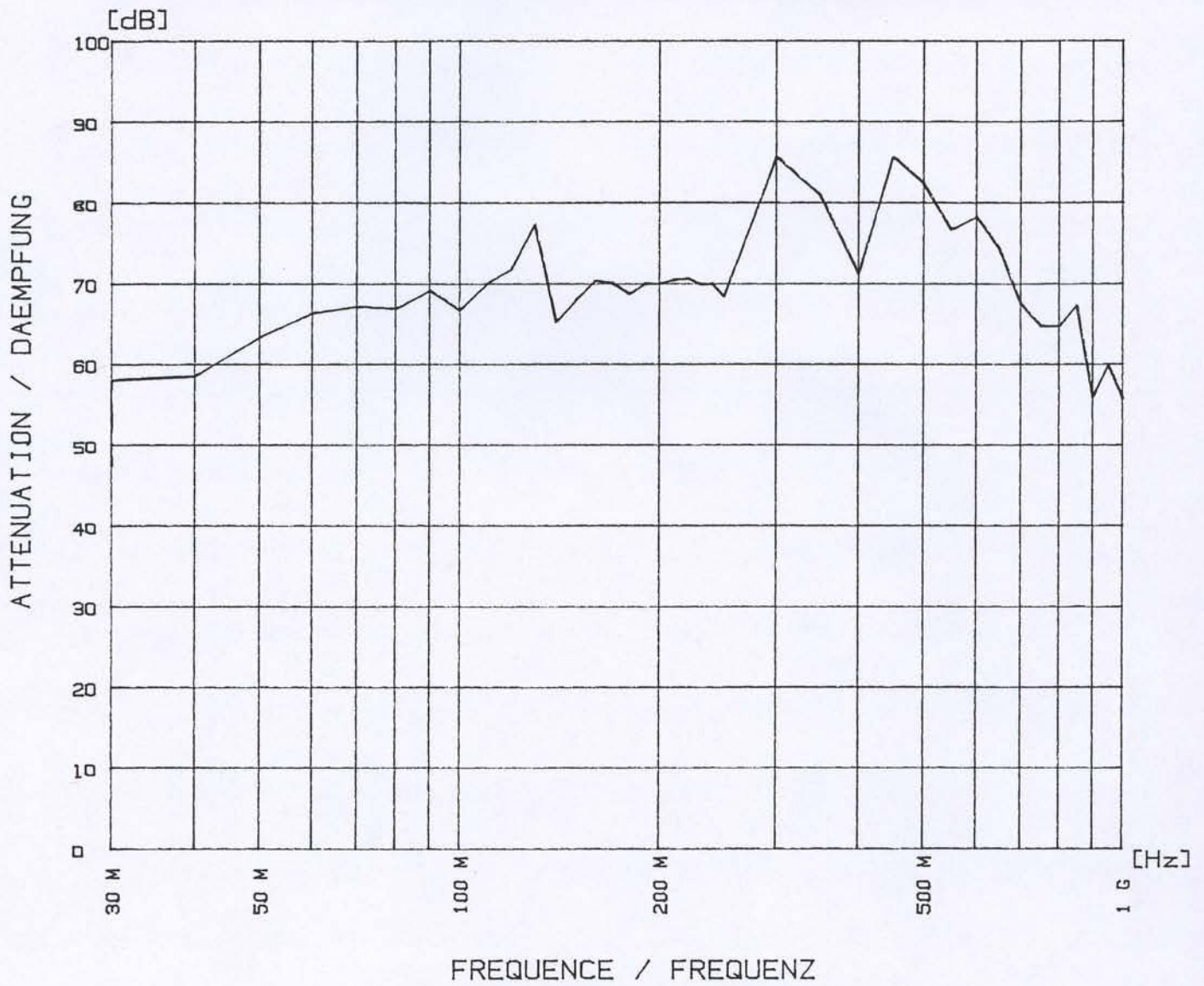
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Jacques Ding

Appendix A

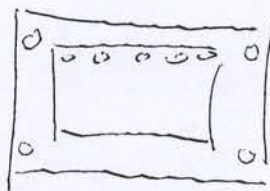
12R2 rugged cots enclosure

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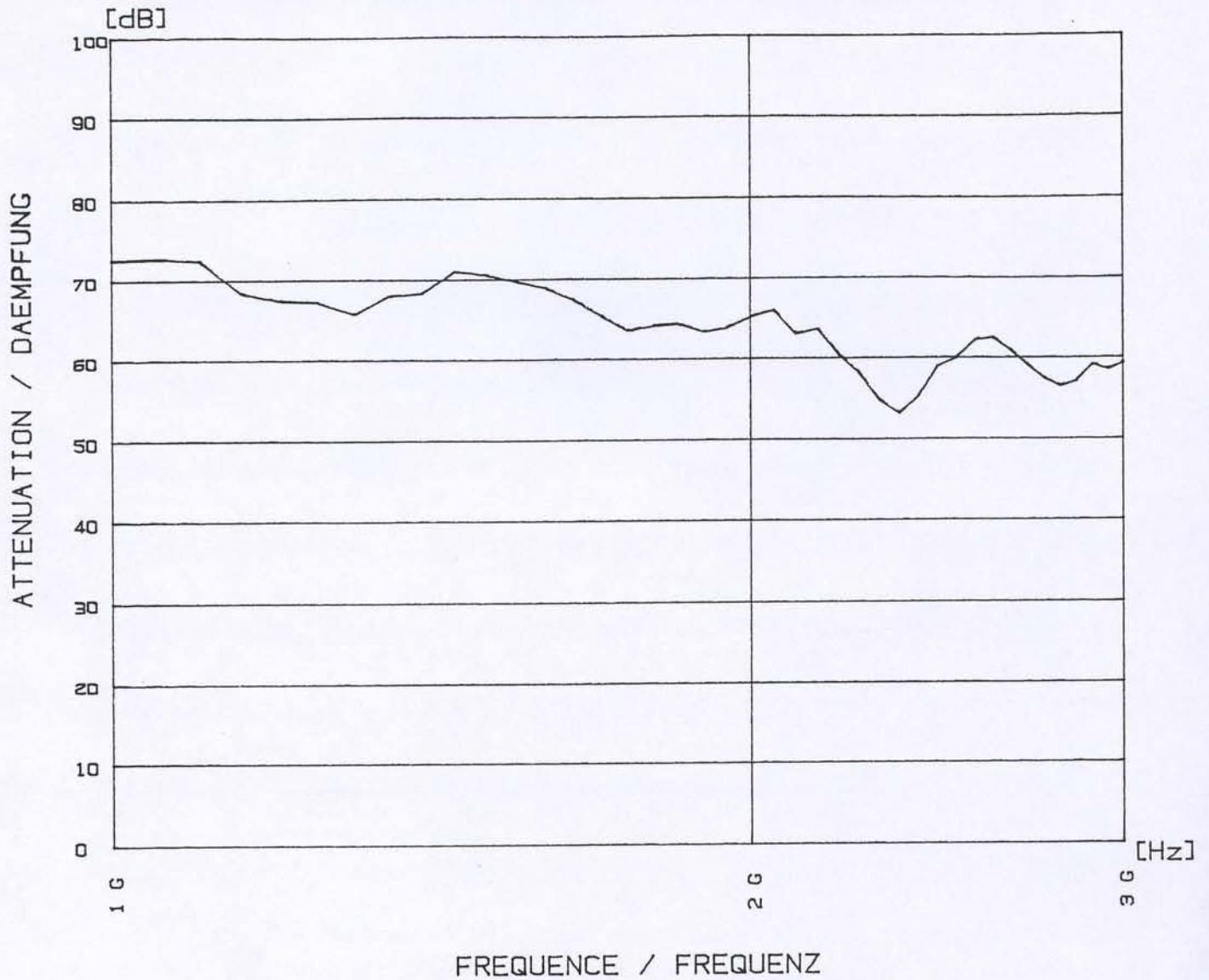
DATE : 24 Oct 2000
 HEURE : 14:51:26
 COLLABORATEUR : J. Ring
 BOITIER MESURE : catefr
 REMARQUES :

front

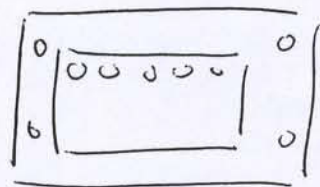


FRONT

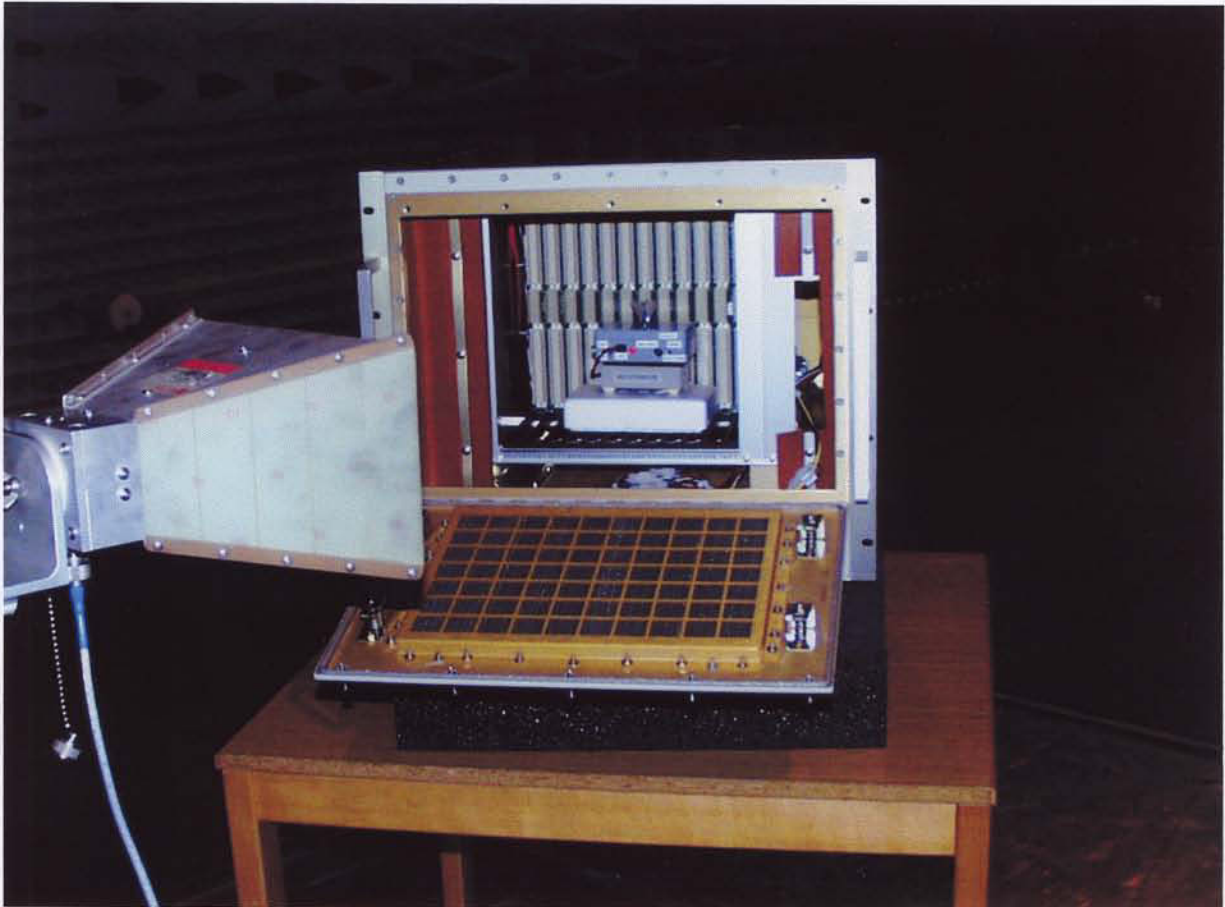
ATTENUATION DE BOITIERS - CHAMP E / SCHIRMDAEMPfung - E-Feld



DATE : 24 Oct 2000
 HEURE : 17:22:24
 COLLABORATEUR : J. Ding
 BOITIER MESURE : cotehf
 REMARQUES : front



FRONT

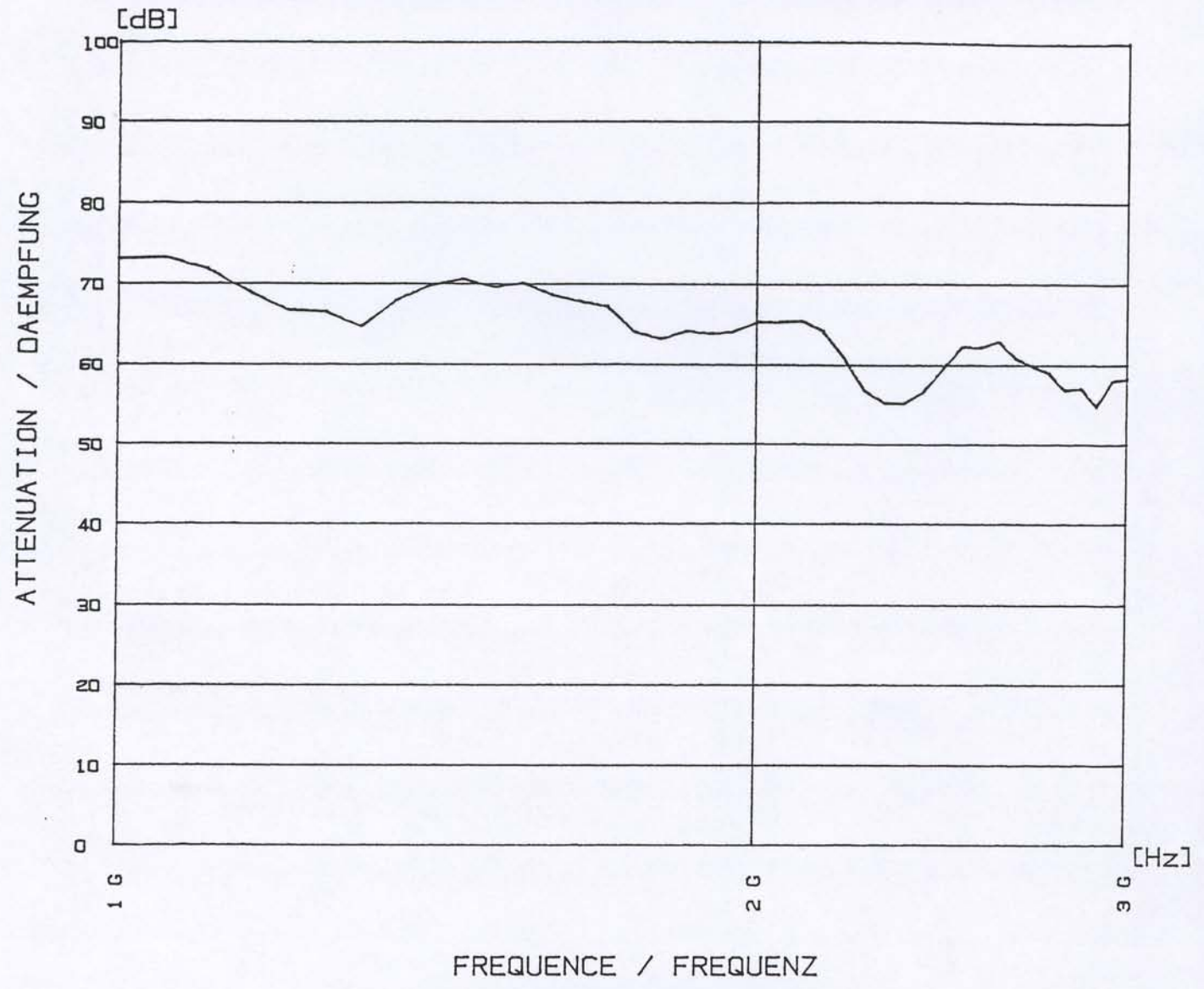


Measurement above 1 GHz with the horn antenna. The front door of the enclosure is intentionally opened to show the transmitter.

Appendix B

Dynamic of measurements

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DATE : 24 Oct 2000
HEURE : 16:58:43
COLLABORATEUR : J. Ding
BOITIER MESURE : dynahf
REMARQUES : Max, Dynamic