

Engesserstraße 12 - Building 30.36  
D-76128 Karlsruhe  
<http://www-ieh.etec.uni-karlsruhe.de>

Telefon: ++49-721-608-2520  
Fax: ++49-721-695224

December 04, 2000

submitted by: Wolfsperger / Börninck

phone: ++49 721 608-3054/2514

---

## *EMC - Testing*

---

### **Report No. 2000 - 89 a**

## **Shielding Effectiveness of the subrack europac pro with textile gaskets**

Customer: Schroff GmbH  
75334 Straubenhardt

Examination Engineers: Dipl.-Ing. S. Börninck  
Dipl.-Ing. H. A. Wolfsperger

This report consists of 7 numbered pages. The examination results are only related to the equipment under test.  
Without permission of the examination engineers it is not allowed to extract copies from this report.

## 1. Summary

The shielding effectiveness of the *europac pro subrack with textile gaskets* was performed in the frequency range from 30 MHz to 1 GHz.

## 2. General

Equipment under test:	europac pro subrack with textile gaskets, 6HE x 84TE, 235mm depth
Delivery of EUT:	November 11, 2000
Place of Examination:	Anechoic chamber of the Institute of Electric Energy Systems and High- Voltage Technology University of Karlsruhe Kaiserstrasse 12 76128 Karlsruhe
Date of Examination:	November 11, 2000
Representative Customer:	Herr Reiser Herr Benko
Examination Engineers:	Dipl.-Ing. H. A. Wolfsperger Dipl.-Ing. S. Börninck
Examination:	Shielding effectiveness in the frequency range from 30 MHz to 1000 MHz according to VG 95 373, Part 15.

## 3. Test Set-Up

The tests were performed in a shielded semi-anechoic chamber lined with absorbers of 1 m length (useful volume approx. 12 x 4.5 x 5 m<sup>3</sup>, LxWxH). The test equipment consisted of:

- Test receiver ESVP (Rohde & Schwarz).
- Signal generator SMH (Rhode & Schwarz).
- Power amplifiers BTA 01221000 (9 kHz .... 220 MHz) and BLWA 2010200 (220 MHz ... 1000 MHz) from BONN GmbH.
- Logarithmic-periodical antenna VULP 9118-G (30 MHz - 1100 MHz, 1 kW) from Schwarzbeck as transmitting antenna.

Fig. 1 illustrates the test set-up measuring the shielding performance.

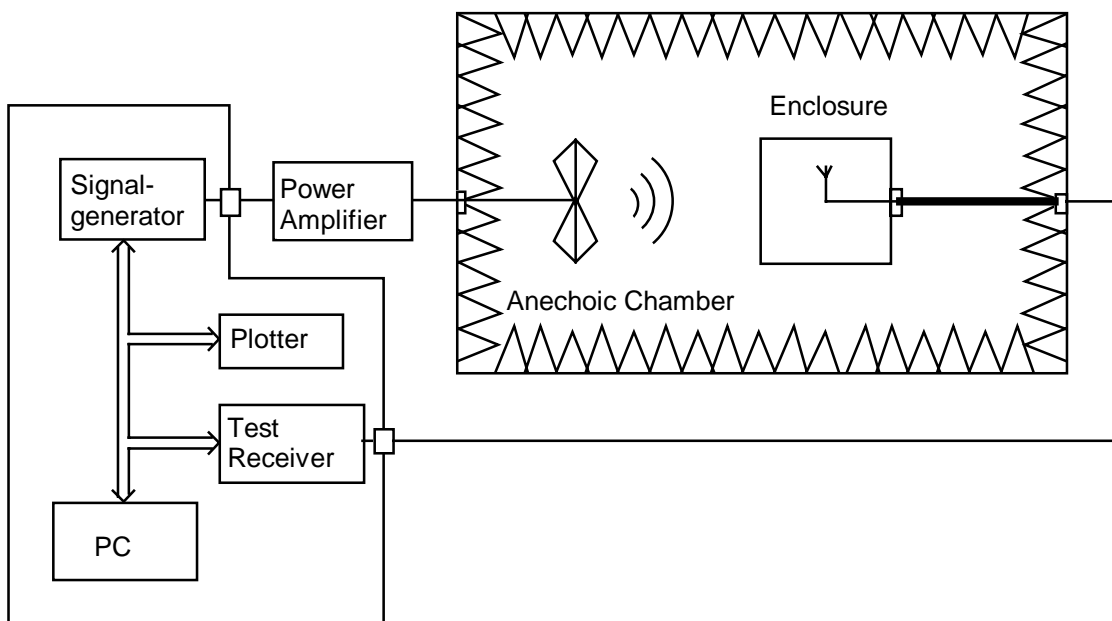


Fig. 1: Test set-up.

The distance between the EUT and the antenna was 3 m, the transmitting antenna was vertically polarized. A receiving antenna was located in the center of the cabinet.

## 4. Measurement Procedures

### 4.1 Shielding Effectiveness

The measurement was performed according to the middle point method in the frequency range from 30 MHz to 1 GHz. This method is an insertion loss method. Coupling is first measured with no enclosure present and then with the enclosure inserted. During the measurement the antenna separation and orientation are kept constant.

The enclosure shielding effectiveness is the difference between the reference level  $a_0$  (in the absence of the enclosure) and the level  $a_1$  within the enclosure (Figure 2).

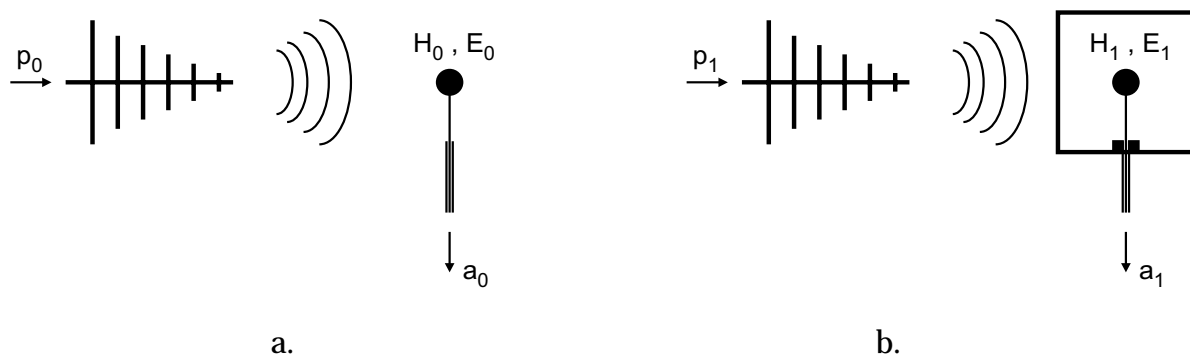


Fig 2: Shielding Effectiveness of enclosures.  
 a) Measurement in the absence of the enclosure.  
 b) Measurement within the enclosure.

The shielding effectiveness is calculated from

$$a_s = a_0 - a_1$$

in dB.

### 4.2 Dynamic Range

The *dynamic range* is determined as the difference between the reference level  $a_0$  and the level measured without receiving antenna. It depends on the noise level of the equipment (e.g., the shielding effectiveness of the cables and the intrinsic noise of the receiver). The dynamic range takes into account the maximum shielding effectiveness which can be measured with the actual test set-up. Fig. 3 illustrates the dynamic range, which is more than 100 dB in the frequency range from 30 MHz to 1 GHz.

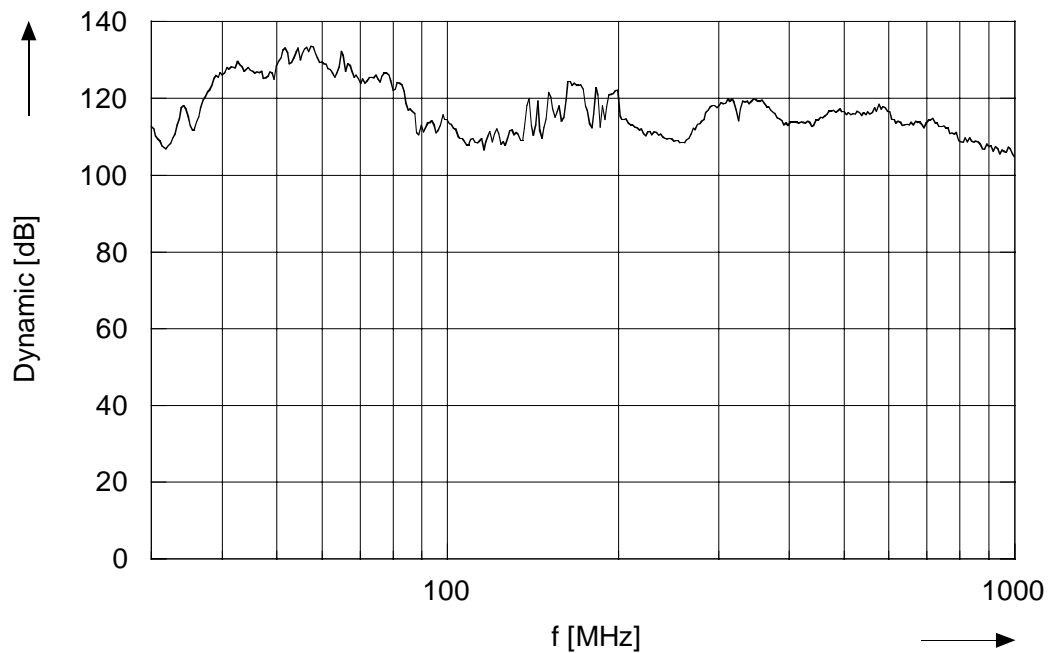


Fig 3: Dynamic Range for the shielding effectiveness measurement in the frequency range from 30 MHz to 1 GHz (vertical polarization).

## 4.3 Measurement Results

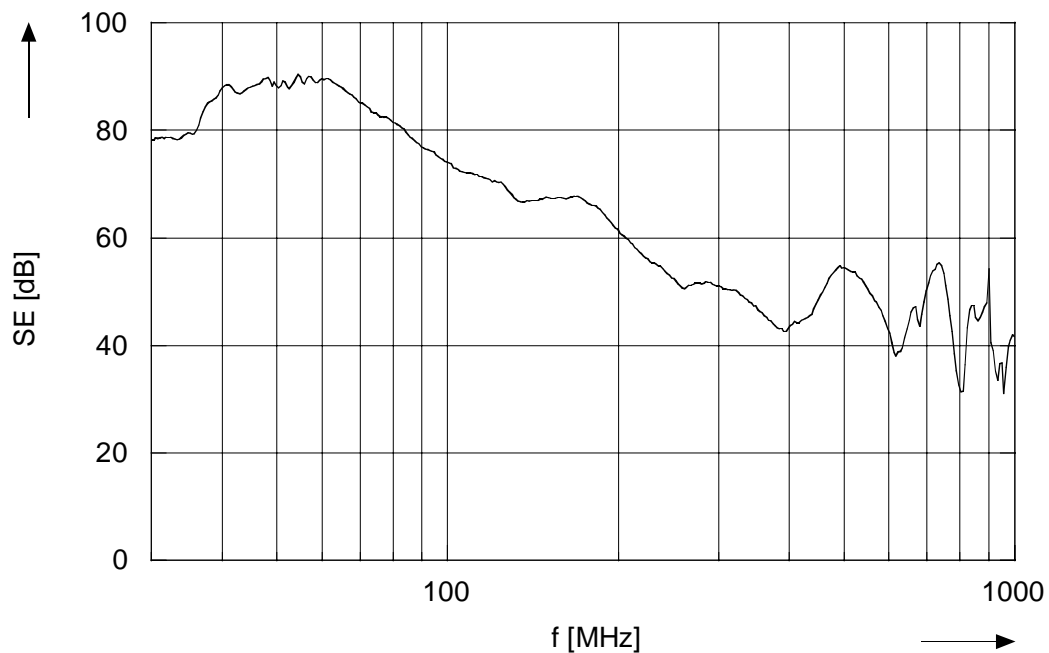


Fig. 4: Shielding effectiveness europac pro with textile gaskets in the frequency range from 30 MHz to 1 GHz, direct radiation on the front side, vertical polarization.

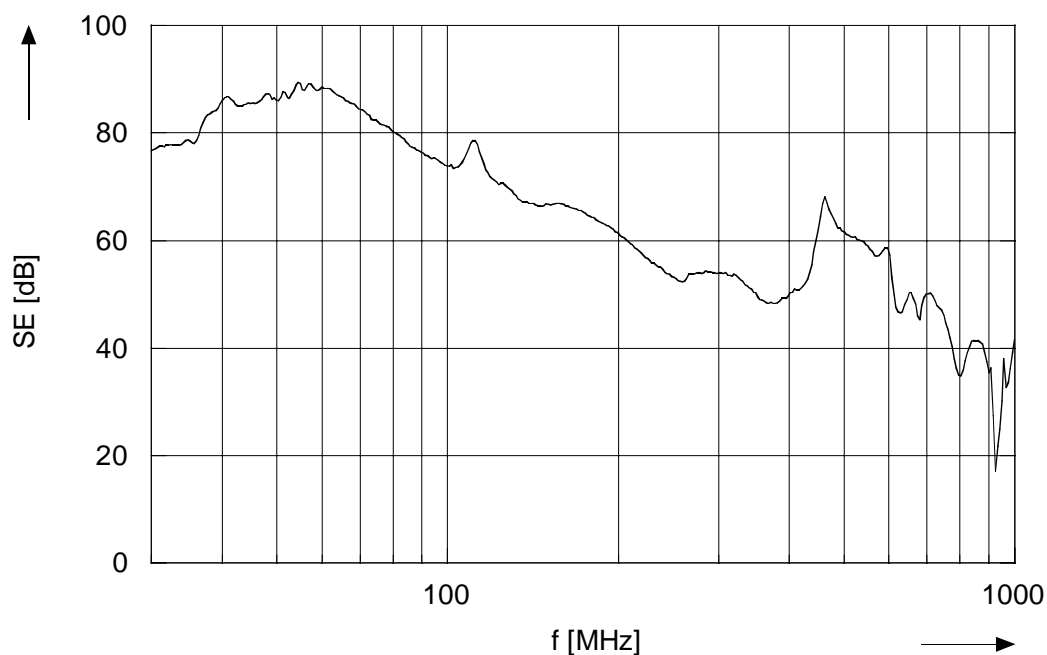


Fig. 5: Shielding effectiveness europac pro with textile gaskets in the frequency range from 30 MHz to 1 GHz, direct radiation on the right side, vertical polarization.

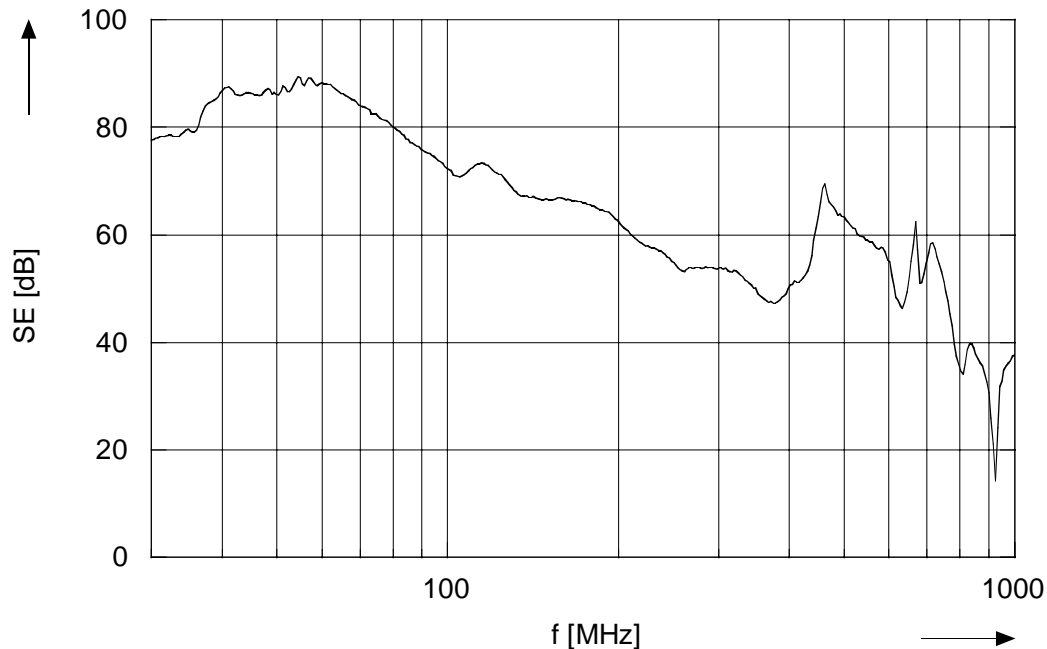


Fig. 6: Shielding effectiveness europac pro with textile gaskets in the frequency range from 30 MHz to 1 GHz, direct radiation on the left side, vertical polarization.

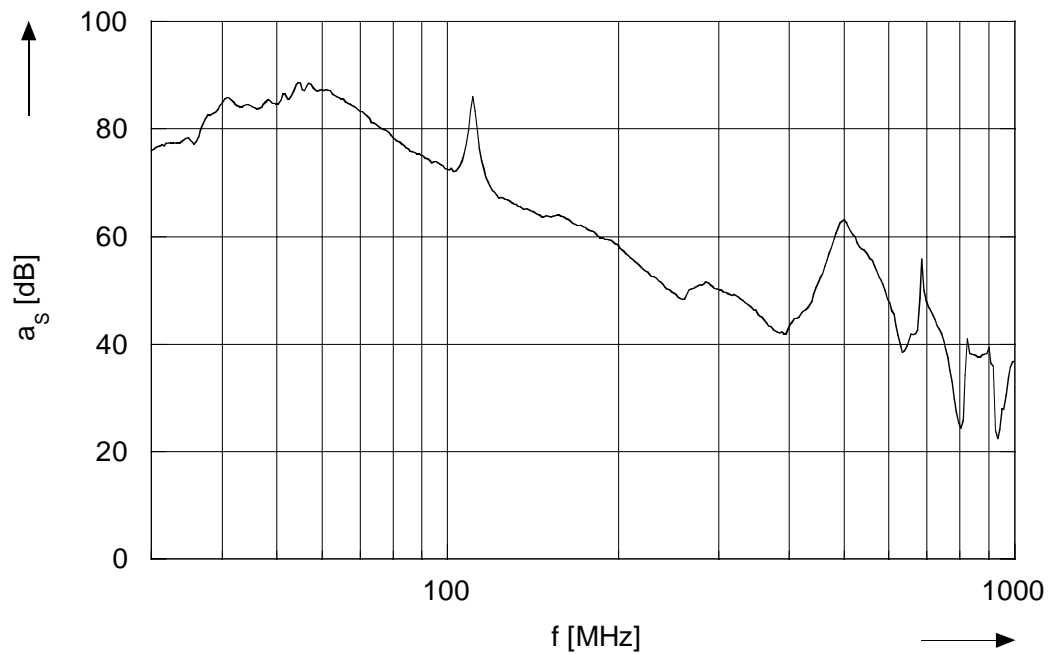


Fig. 7: Shielding effectiveness europac pro with textile gaskets in the frequency range from 30 MHz to 1 GHz, direct radiation on the rear side, vertical polarization.

November 30, 2000, Karlsruhe

---

Dipl.-Ing. Hans A. Wolfspurger

---

Dipl.-Ing. Stefan Börninck