



LCIE

# TEST REPORT

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Version : 01

|                                |  |
|--------------------------------|--|
| <b>Subject</b>                 | <b>Measurement of electromagnetic shielding effectiveness</b><br><b>IEC 61587-3 (2013)</b> |
| <b>Issued to</b>               | <b>Schroff SAS</b><br><b>4 rue du Marais</b><br><b>67660 BETSCHDORF</b><br><b>France</b>   |
| <b>Apparatus under test</b>    |  |
| ↳ Product                      | VARISTAR CP  |
| ↳ Trade mark                   | SCHROFF  |
| ↳ Manufacturer                 | nVent / SCHROFF  |
| ↳ Model under test             | Varistar CP EMC Cabinet with fan top cover   |
| ↳ Serial number                | CAB 3  |
| <b>Test date</b>               | July 25, 2022 to August 1, 2022  |
| <b>Test location</b>           | PULVERSHEIM  |
| <b>Composition of document</b> | 12 pages   |
| <b>Document issued on</b>      | August 12, 2022  |

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**Approved by :**  
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**Technical manager**



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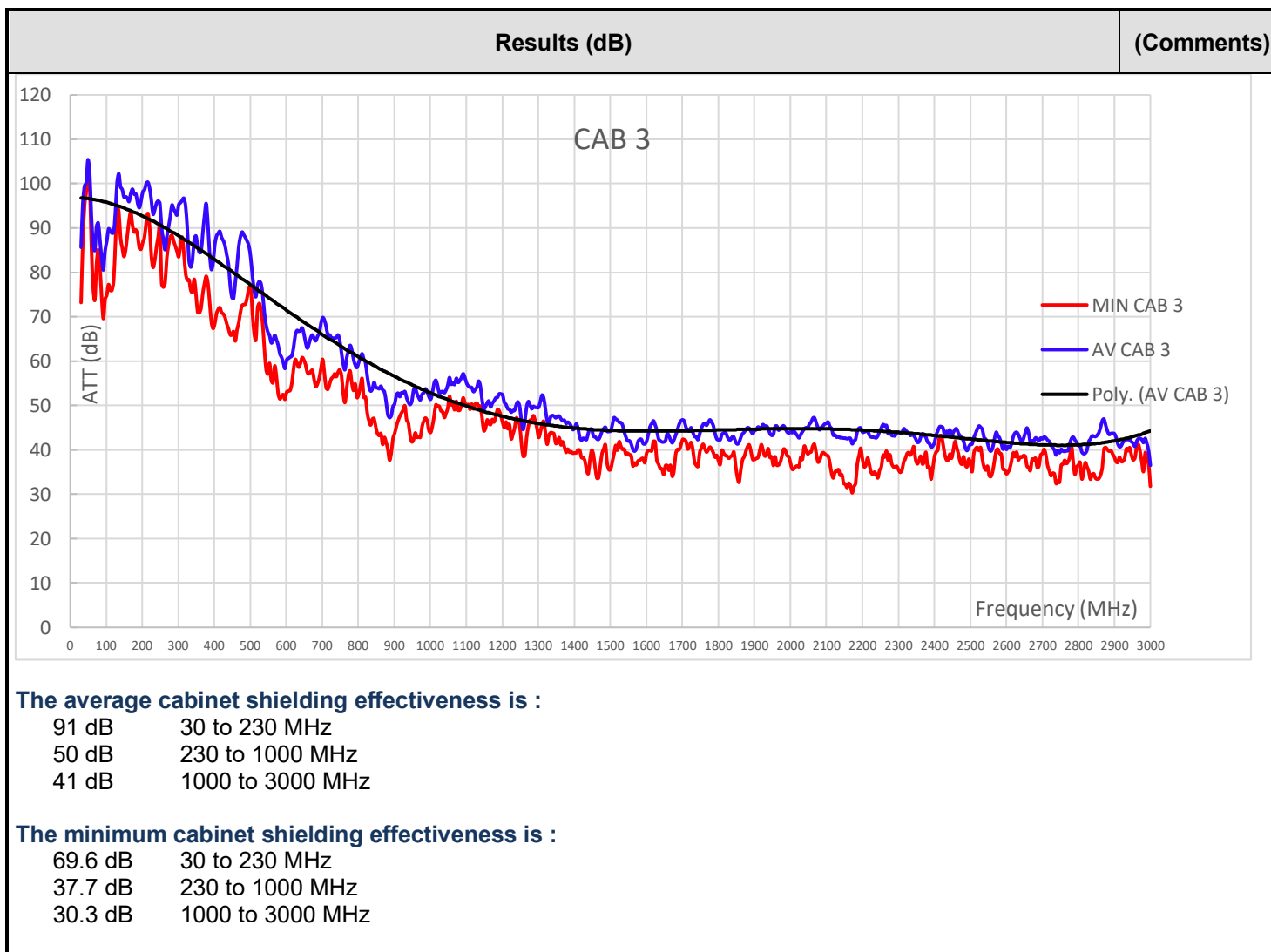
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**1. TEST PROGRAM**

**1.1. REQUIREMENTS FOR SHIELDING EFFECTIVENESS**

**Standard:** IEC 61587-3 (2013)



## 2. EQUIPMENT UNDER TEST : CONFIGURATION

### 2.1. INFORMATION

**Customer:**

| Name                    | Company     |
|-------------------------|-------------|
| Daniel THOMAS           | Schroff SAS |
| Christophe MARCINKOWSKI | Schroff SAS |

### 2.2. HARDWARE IDENTIFICATION:

**Equipment under test (EUT):**

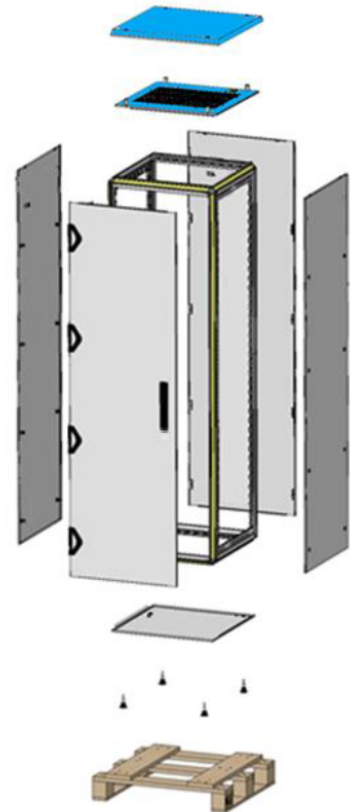
Varistar CP EMC Cabinet with fan top cover

Serial Number: **CAB 3**

## CAB 3 : Varistar CP EMC cabinet with fan top cover

2000H600x600 cabinet as following :

- 20630-099 : Frame 2000H600x600
- 24630-016 : Levelling feet
- 21630-464 : EMC gasket kit
- 21630-474 : Side panels
- 21630-529 : Steel door
- 21630-553 : Rear panel
- 21630-603 : Fan top cover
- 21630-629 : Base plate



Equipment Under Test



### **3. MEASUREMENT SETUPS**

#### **3.1. ENVIRONMENTAL CONDITIONS**

Date of test : July 25, 2022 to August 1, 2022  
Test performed by : Thomas SUTTER  
Atmospheric pressure (hPa) : 990 to 1005  
Relative humidity (%) : 30 to 60  
Ambient temperature (°C) : 22 to 25

#### **3.2. TEST SETUP**

The measurements are carried out in a 3 meters semi-anechoic chamber.

The transmitting antenna is in VERTICAL polarization a calibrated POD, and in HORIZONTAL polarization a double little conical antenna. The transmitting antenna is connected to the outside transmitting equipment : tracking generator out of the spectrum analyser.

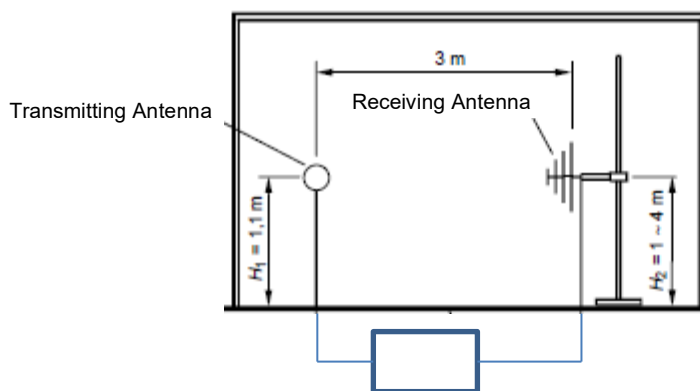
The receiving antenna is a biconical / logarithmic-periodic combined antenna for the frequency range 30 to 3 000 MHz. The signal is preamplified and sent to the input of the spectrum analyser.

### 3.3. REFERENCE MEASUREMENTS

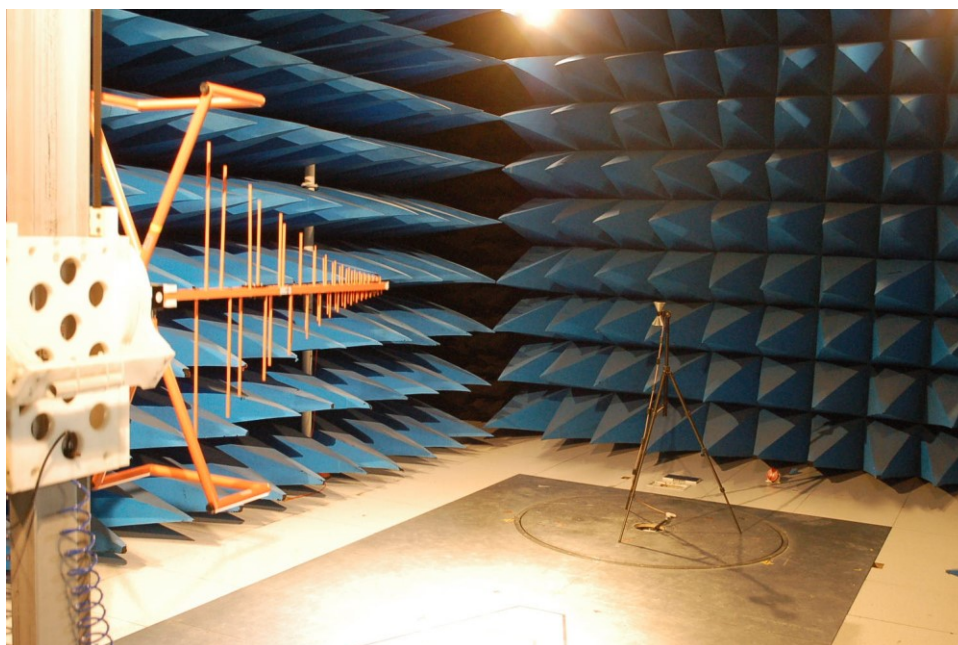
Reference measurements E1 (dB $\mu$ V) are performed without the test specimen. The antenna must be placed in the position in which it will be when the test specimen will be present. The transmitting antenna must be positioned at a distance of 3 m from the antenna of reception and the two antennas face each other in the same direction as the one for calibration.

Measurements use both horizontal and vertical polarities.

The receiving antenna is polarized in the same way. Scans in frequency follow increments not exceeding 5 MHz between 30 MHz and 3000 MHz. The receiving antenna is scanned at heights of 1 m to 4 m. The value higher E1 signal for each frequency should be recorded.

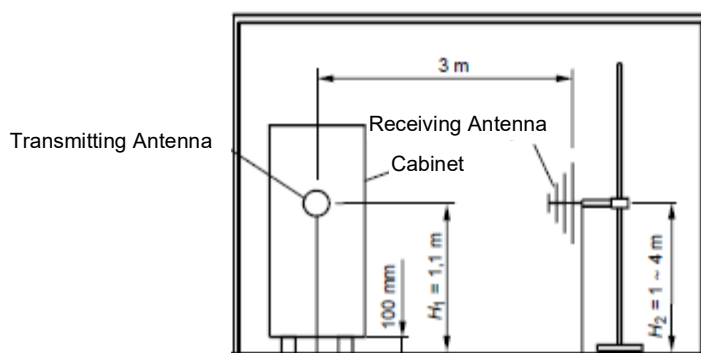


spectrum analyser in VNA mode + HF sweeper



### 3.4. CABINET MEASUREMENTS

The cabinet is set 10 cm above the ground on its isolating palett.  
The transmitting antenna is placed centrally inside the test specimen in the same direction than that of the reference measurement and suspended by a non-conductive material.







### 3.5. TESTS REQUIREMENTS

Measurements are made using both horizontal and vertical antenna polarities. The transmitting antenna and the receiving antenna are polarized of the same way. Measurements of the frequency increment are made. The equipment under test is rotated 360 ° on its vertical axis (by means of a table) and the maximum value of the signal is determined by increments of 90 ° in the frequency range 30 MHz to 3000 MHz. Frequency sweeps follow increments not exceeding 5 MHz between 30 MHz and 3000 MHz. The receiving antenna is scanned at heights of 1 m to 4 m. The highest value of E2 signal (dBµV) from the combined sweep of the turntable and the antenna height is recorded for each frequency.

### 3.1. TEST EQUIPMENT LIST

| Apparatus          | Trade Mark               | Type       | Registration number |
|--------------------|--------------------------|------------|---------------------|
| Semi-Anechoic room | SIEPEL                   | --         | D3044022            |
| Spectrum Analyzer  | ROHDE & SCHWARZ          | FSU26 B10  | A2642063            |
| RF Sweeper         | ROHDE & SCHWARZ          | SMB100A12  | B2163024            |
| Antenna            | Seibersdorf Laboratories | PCD8250    | C2040204            |
| BILOG antenna      | SCHAFFNER                | CBL6143    | C2040217            |
| Cable              | Flex                     | SMA 2m     | A5329567            |
| Cable              | TMS                      | SMA 2m     | A5329470            |
| Cable              | Rohde & Schwarz          | N 7m       | A5329474            |
| Cable              | Megaphase                | N 1m       | A5229722            |
| RF Preamplifier    | Mitec                    | 0.01-6 GHz | A7085019            |

### 3.2. EMC LABORATORY UNCERTAINTY

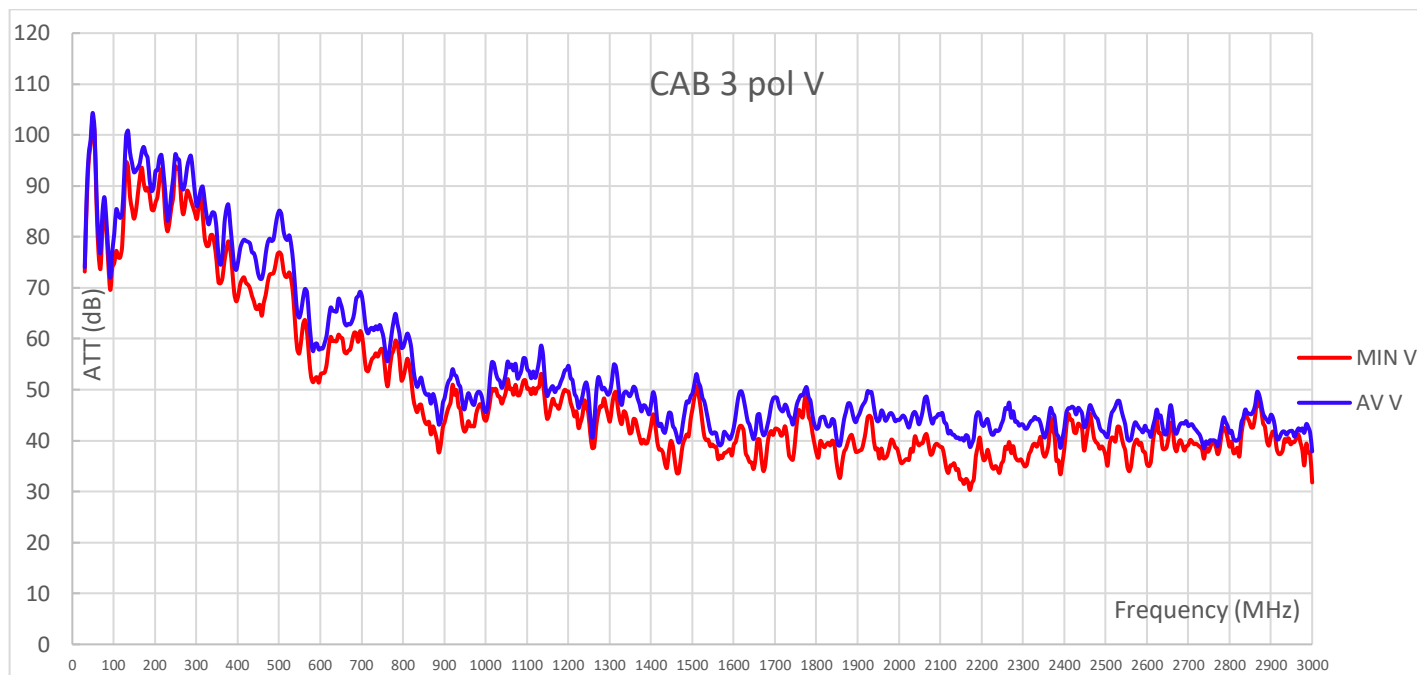
| Kind of measurement   | Wide uncertainty laboratory (k=2) ±x(dB) | CISPR uncertainty limit ±y(dB) |
|---|--|--------------------------------|
| Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC | 5.26                                     | 6.3                            |
| Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC   | 5.33                                     | 6.3                            |
| Measurement of radiated electric field from 1 to 6 GHz cage 1 : D3044020                | 4.90                                     | 5.2                            |
| Measurement of radiated electric field from 1 to 6 GHz cage 2 : D3044022                | 5.12                                     | 5.2                            |
| Measurement of radiated electric field from 6 to 18 GHz cage 1 : D3044020               | 5.45                                     | 5.5                            |
| Measurement of radiated magnetic field from 10kHz to 30MHz on the OATS                  | 4.41                                     | /                              |

If the wide uncertainty of the laboratory is lower or equal to CISPR limits (CISPR 16-4-2:2014), conformity or nonconformity with a limit of disturbance is thus in the following way given:

- conformity is considered reached if no measured disturbance exceeds the limit of disturbance.
- nonconformity is considered reached if any measured disturbance exceeds the limit of disturbance.

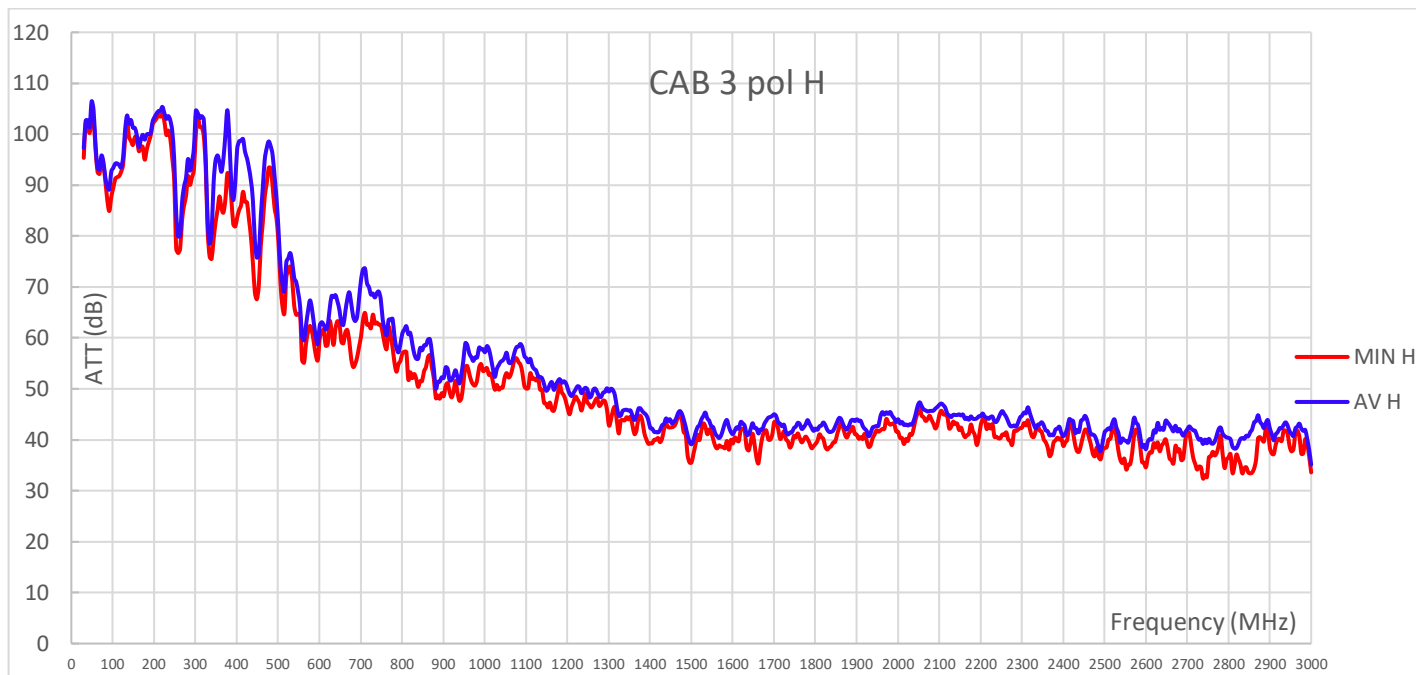
## 4. TESTS RESULTS

### 4.1. VERTICAL SHIELDING EFFECTIVENESS VALUES



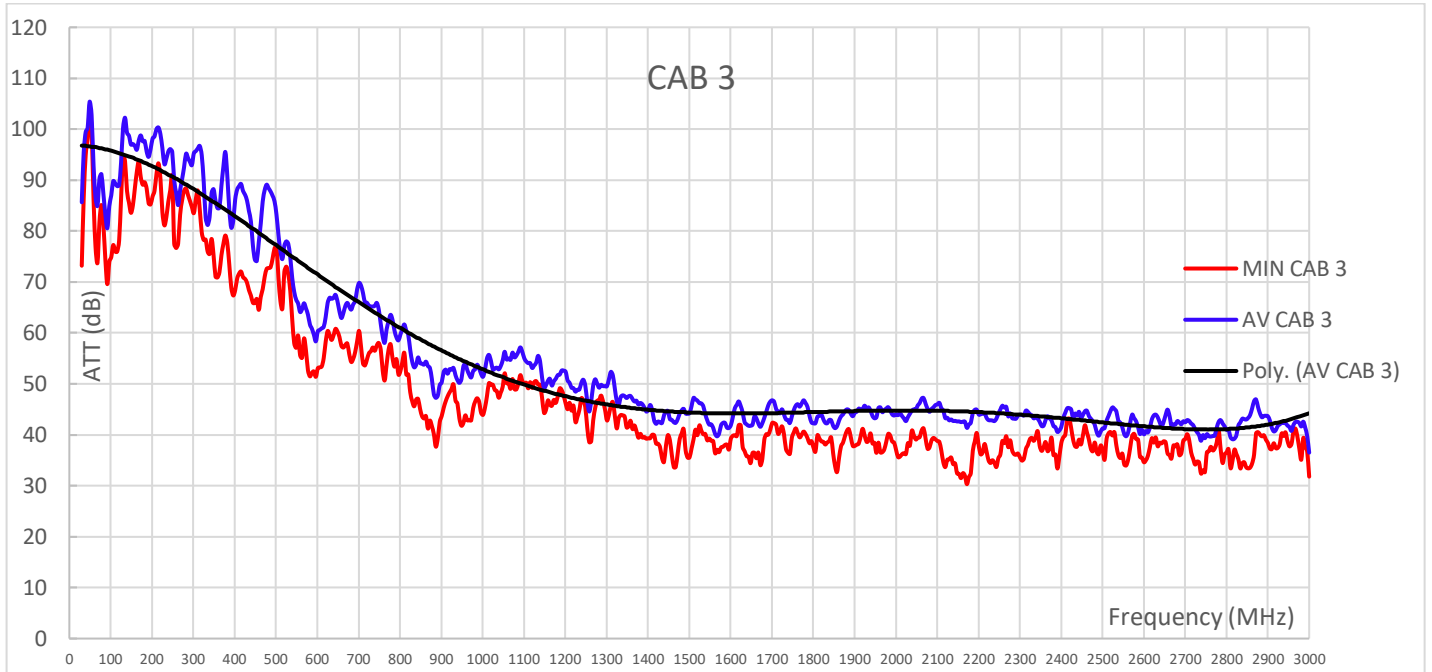
| Freq. (MHz) | MIN V | AV V |
|-------------|-------|------|
| 30-230      | 69.5  | 72.0 |
| 230-1000    | 37.6  | 43.2 |
| 1000-3000   | 30.3  | 37.9 |

## 4.2. HORIZONTAL SHIELDING EFFECTIVENESS VALUES



| Freq. (MHz) | MIN H | AV H |
|-------------|-------|------|
| 30-230      | 84.9  | 89.1 |
| 230-1000    | 47.6  | 50.2 |
| 1000-3000   | 32.4  | 35.1 |

### 4.3. COMBINATED SHIELDING EFFECTIVENESS VALUES



**The average cabinet shielding effectiveness is :**

|       |                  |
|-------|------------------|
| 91 dB | 30 to 230 MHz    |
| 50 dB | 230 to 1000 MHz  |
| 41 dB | 1000 to 3000 MHz |

**The minimum cabinet shielding effectiveness is :**

|         |                  |
|---------|------------------|
| 69.6 dB | 30 to 230 MHz    |
| 37.7 dB | 230 to 1000 MHz  |
| 30.3 dB | 1000 to 3000 MHz |