# Report on the characterization of a EMI Shielding layer "Spylock 35"

Tests performed by KUL (Belgium), 2020

Laboratory for EMC and global reliability of electronic systems

## 1. Architectural Shielding

Vianovix are specialists in architectural shielding against microwave and radiofrequency radiation, providing solutions for existing buildings and new constructions worldwide.

Electromagnetic shielding materials are more and more incorporated in the construction of new buildings, and can easily be retrofitted in existing constructions to reduce radiation intensity in living and working spaces.

Architectural shielding materials are used to reduce the exposure of a building's occupants to electromagnetic radiation emitted by nearby sources of microwave and radiofrequency radiation, to protect sensitive electronic equipment from interference and to prevent data theft/hacking.
Sources of electric and magnetic energy are mobile phone towers (4G, 5G, 6G) and many other electronic devices also, including wifi.

The Vianovix Spylock 35 layer supplies windows with an invisible electrically conductive coating, specially designed to give maximum electromagnetic shielding.

*Figure 1 : Iconic installations include the Louise Tower, Brussels*

## 2. Shielding Effectiveness analysis

Samples of the conductive foil, labeled as "Spylock 35" have been characterized about the **S**hielding **E**ffectiveness (**SE**) against electromagnetic waves. Tests were performed to RF shielding standards making it the highest quality transparent window film shielding product. The foil has a very high optical transparency (≥75 VLT) and is intended to by placed on windows (architectural shielding).
This report concerns the Vianovix EMI Shielding layer type "Spylock 35" and 1 layer of the material was applied.

## 3. Levels of attenuation and frequency

In order to get a better idea of the technical requirements and specifications of the necessary attenuation or attenuation, the following table provides a brief overview of known public radio communications services.

| **Frequency** | **Application or service** |
|---|---|
| 1 MHz | AM medium wave radio |
| 27 MHz | License free Citisen Band |
| 100 MHz | FM radio |
| 100 – 150 Mhz | Mobile communications (services) |
| 150-550 MHz | Lower TV bands (VHF) |
| 433 MHz | License free short distance communications |
| 600 – 800 MHz | Upper TV bands (UHF) |
| 900 MHz | GSM 900 |
| 1800 MHz | GSM 1800 |
| 2,4 – 2,5 GHz | License free short distance (Blue Tooth) |
| 3 GHz | 5G network |
| 3 GHz – 30 Ghz | Radar |

The following table provides an overview of the conversion between attenuation in dB and the corresponding reduction in normal numbers :

| Attenuation (dB) | Field strength | Power |
|---|---|---|
| 0 | 0 | 0 |
| 20 | 90% | 99% |
| 30 | 96% | 99.9% |
| 40 | 99% | 99.99% |
| 60 | 99.9% | 99.9999% |
| 80 | 99.99% | |
| 100 | 99.999% | |

## 4. Test methodology

Two test setups are used, depending on the frequency range of concern.

**ASTM D4935**

A first one is the TEMt cell, simulating far-field plane wave conditions in the frequency range from 10 MHz up to 1 GHz. The cell is based on the ASTM D4935 cell. Due to its circular section, no discrimination of directional dependency against the polarization of electromagnetic waves can be observed.

The design has been adapted for a quick and easy use, but also to enable the discrimination of SE in function of the polarization of the impinging electromagnetic field

Due to its construction, and a non-contacting inner conductor, an E-field like SE is obtained directly from the measured data. Applying an appropriate correction factor, the SE value for far-field plane wave conditions is obtained. Samples are 15 x 15 cm. Both curves are shown in the graphical representation.

**IEEE Std 299™ (previously MIL STD 285)**

A second testup is derived from the standard IEEE Std 299™ (previously MIL STD 285). The method is shown in the next figures. It consists of a shielded room (Faraday cage), where in one of the walls, an opening can be covered by the material under test.
As long as the SE of the metal cage is higher than the SE of the test sample, the resulting measured SE will directly correlate to the SE of the material under test.

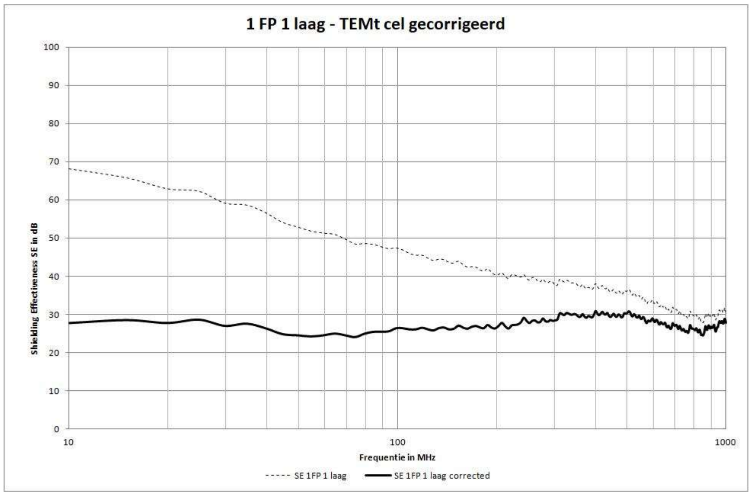
Samples are 60 x 60 cm. The frequency range for this test was from 1 GHz up to 10 GHz.

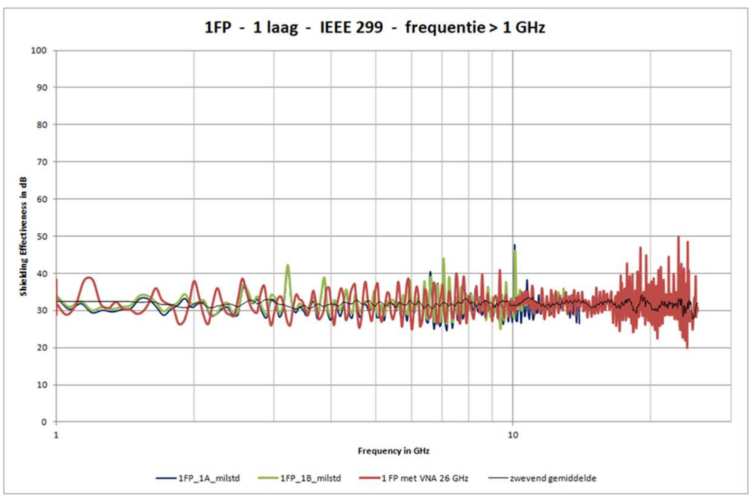
**ASTM D4935**

The standard ASTM F3057 does basically not differ from the “modified IEEE Std299” as a concept.
The main difference is that all parameters are defined, such as aperture and measuring distances. This standard is used when the film is laminated between 2 glass panes.

Both tests yield similar attenuation results.

## 5. Test results Spylock 35 Shielding Effectiveness




## 6. Conclusion

It can be concluded that the Vianovix conductive foil “Spylock 35” can be characterized by a Shielding Effectiveness (SE) of ≥**32 dB**, in the frequency range from 10 MHz up to 26 GHz.

## 7. Product overview

**Standards/compliance:**
ASTM D4935
IEEE Std 299 (previously MIL STD 285)

**Patented Technology**
WO2012/080951 A1

**Intended Use:**
Provide RF attenuation against electronic eavesdropping, data theft/hacking and for security and defense purposes.

**Applications**

- Complete building envelope
- Private homes
- Government buildings
- Server rooms
- Air traffic control towers
- Military
- Network operation centers
- Ships windows
- Shielded cabinets
- Industries processing confidential or high security data

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