



Flanders' Mechatronics Engineering Centre
Laboratory for Global Reliability of Electronics

Zeedijk 101
B – 8400 OOSTENDE
BELGIUM

Tel.: + 32 (0)59 56 90 39
Fax: + 32 (0)59 56 90 01
e-mail: info@fmec.be
website: <http://www.kuleuven.be/remi>

Test report FMEC/SE/1408/49

Fonksiyonel Tekstil Ltd

Ecosilver

Note:

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The results in this report apply only to the sample(s) tested.

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Test configuration drawings

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1 Client information

Company name	:	Fonksiyonel Tekstil Ltd
Address	:	Perpa Ticaret Merkezi B Blok Kat 12 No 2054 P 34384 Okeydani/Istanbul Turkiye
Contact name	:	Mr. Methap Yetisgin
Tel	:	
Fax	:	
VAT	:	TC 3880624897
Order n°	:	Ordered by mail
Order date	:	
Samples received	:	1
Project description	:	Ecosilver
Reference documents FMEC	:	--
Reference document client	:	--
FMEC Operator	:	Filip Vanhee Joke Margodt
Customer engineer(s)	:	--
Date(s) of test	:	August 25th 2014

This test report is issued under the

authority of : dr. ir. D. Pissoort
checked by : dr. ir. D. Pissoort

Signature:

Overview of tests

TEM-t cell	:	<input type="checkbox"/>
H-t cell	:	<input type="checkbox"/>
ASTM D4935 cell	:	<input type="checkbox"/>
TEM cell	:	<input type="checkbox"/>
MIL STD 285 (metal cage)	:	<input checked="" type="checkbox"/>
In situ	:	<input type="checkbox"/>
SAE ARP 1705	:	<input type="checkbox"/>
Transfer impedance	:	<input type="checkbox"/>

2 Material Under Test

Description:

Ecosilver

Material samples:

Type and Reference Number : Ecosilver
Manufacturer : Fonksiyonel Tekstil Ltd



3 Test specification, Methods & Procedures

3.1 IEEE-299 and MIL-STD-285

- IEEE-299-2006: IEEE Standard method for measuring the effectiveness of electromagnetic shielding enclosures
- MIL-STD-285: Method of military standard attenuation measurements for enclosures, electromagnetic shielding, for electronic test purposes (1956) – now obsolete, but still used as a reference

The modification consists of the fact that an opening is made in one wall of a metallic enclosures of $2 \times 2 \times 2 \text{ m}^3$, which can be covered by the material under test, instead of testing the whole enclosure as such.



Picture 1: Picture of the IEEE Std 299 modified setup for the characterisation of the shielding effectiveness (SE) of materials

Shielding effectiveness (SE) is measured over the frequency range from 200 MHz up to 10 GHz, covering the frequency bands for:

- TV broadcasting (up to 800 MHz)
- Short range devices and several ISM bands
- mobile phone (GSM and 3G / 4G: 450 MHz, 900 MHz and 1800 – 2100 MHz)
- WiFi and Bluetooth (2.4 GHz and 5 GHz band)

Measurements have been performed in two sessions. The first one covering the frequency band of 200 MHz – 1000 MHz (log-periodic antenna), the second one covering 1 GHz – 6 GHz (horn antenna). This is due to the bandwidth of the antennas.

4 Test results

4.1 Results

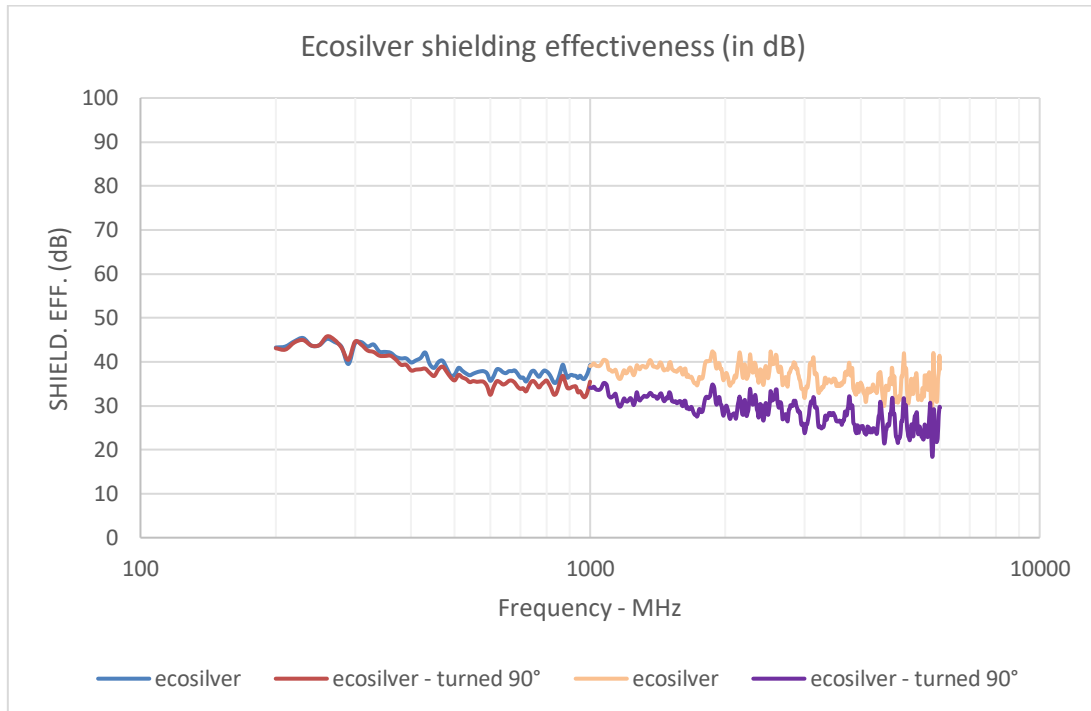


Figure 1: Shielding effectiveness (in dB)

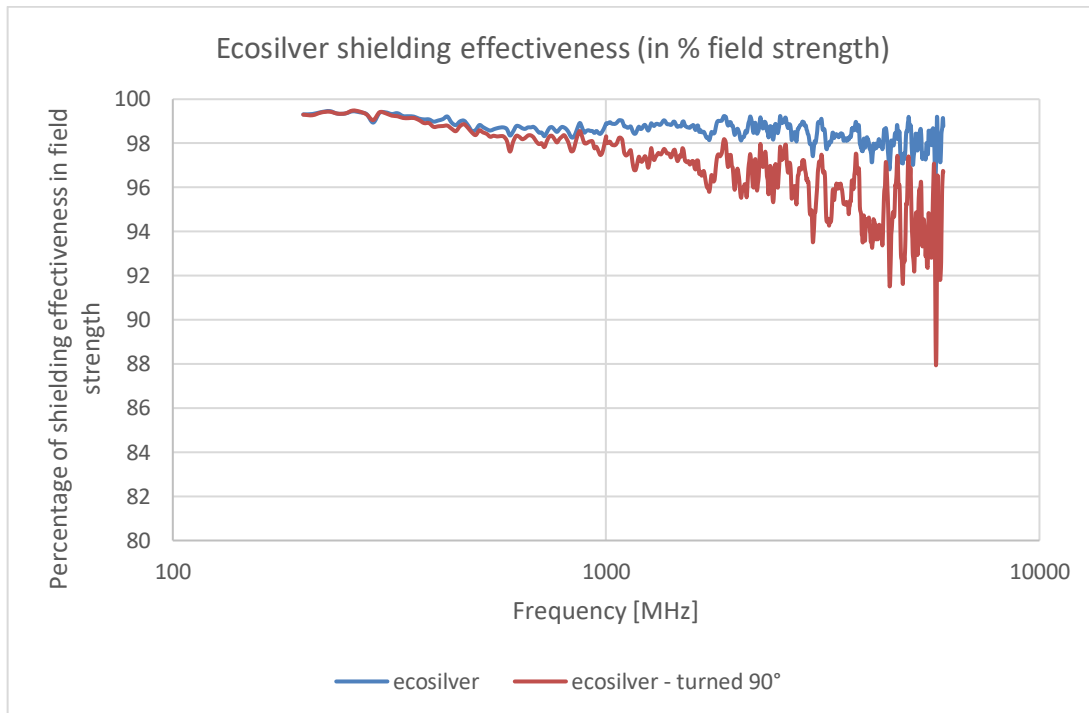


Figure 2: Percentage of shielding effectiveness (in field strength)¹

4.2 Conclusion

From the results depicted in Figure 1, it can be concluded that the material under test delivers a maximum shielding effectiveness of 45 dB in the lower frequency range (200 MHz) and a minimum of 18 dB in the higher frequency range (above 5 GHz).

As can be derived from the graph, the shielding effectiveness of this material is dependent on the polarization of the impinging field and as such, the measured SE value is higher in one direction. This measurement is performed by rotating the sample over 90 degrees while maintaining the polarization of the antenna. Although this difference is limited and mainly noticeable on frequencies above 1000 MHz (= 1GHz).

In Figure 2, these results are given in a percentage of shielding i.e. how much percent of an electromagnetic wave is stopped by the sample. From Figure 2, it can be concluded that the material under test reduces the electric and magnetic field by 99% in the lower frequency range (200 MHz) and by around 92-94% in the higher frequency range (above 5 GHz). This is only valid under the conditions as measured and for the specific sample under test.

¹ The percentage shielding effectiveness expressed in field strength is calculated as follows: $\% SE = (1 - 10^{SE(dB)/20}) * 100$

Appendix 1: Test Equipment used:

Instrument	Manufacturer	Model
Logperiodic antenna 200 MHz-1GHz	EMCO	3146
Horn antennas (0.9 – 18 GHz)	SCHWARZBECK	BBHA9120 D1
MIL STD 285 cell (2X2X2 m ³)	FMEC	
Network Analyzer 14 GHz	R&S	ZVB14
Software automatic shielding measurements	FMEC	



Appendix 2: Test configuration Drawings:

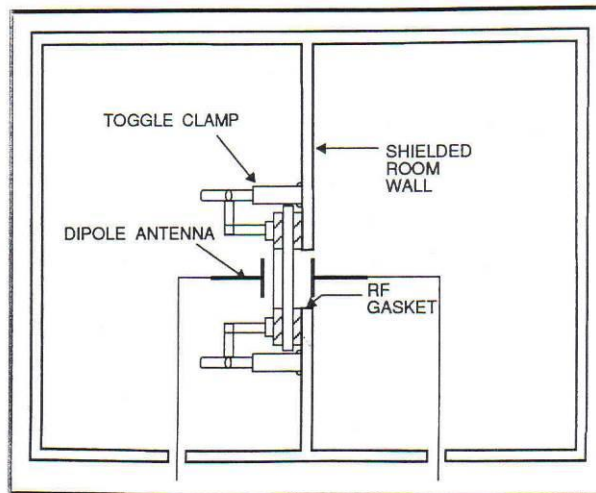


Figure 3: Test configuration drawing: IEEE 299 (MIL STD-285)

Appendix 3: Photographs of E.U.T.



Picture 2: Test set-up with Log. Per. antenna (200 - 1000 MHz)



Picture 3: Test set-up with Horn antenna (1 - 6 GHz)