

**Test Method of Specified Requirements of
Electromagnetic Shielding Textiles
FTTS-FA-003**

FTTS-FA-003 Electromagnetic Shielding Textiles

It has been proven that cellular phones, computers, microwave ovens and other electronic devices release electromagnetic waves which could harm the human body, but the problem is generally ignored. Electromagnetic shielding textiles prevent these rays from reaching the human body.

Electromagnetic Shielding Textiles are classified into three types:

1. Compound fabrics achieve electrical conductivity through the inclusion of metallic fibers thinner than human hair. These fibers are spun together with natural fibers.
2. Conventional woven fabrics achieve electrical conductivity by undergoing processes such as electrolytic plating, plasma-sputtering deposition and metal deposition. These processes fix electrically conductive metal particles on the surface of the fabric.
3. Polymers are blended with electrically conductive metal particles blended to nano-size, and then the blend is formed into fibers and spun. Fabrics made with this method will not lose their electromagnetic shielding character, even after many launderings.

Electromagnetic Shielding Textiles have two classes – Professional Use and General Use. Taiwan technology for general-use Electromagnetic Shielding Textiles achieves shielding up to a level of 30dB. Professional use products achieve shielding from at least 30dB up to 50dB and higher.

1. Scope

This criterion is applicable to textiles in all forms, including woven, knitted, coated/laminated fabric and non-woven. To consider the durability, the pretreatment, ex: repeated laundering, weathering, may be required.

2. Terminology

- ◆ dB (Decibels): a unit of electromagnetic shielding.
- ◆ Shielding Effectiveness
 - (1) With radiated power as its measurement, shielding effectiveness can be calculated according the following formula:

$$SE = 10 \log P1/P2 \text{ (dB, Decibels)}$$

P1 = received radiated power with the shielding material present;

P2 = received radiated power without the shielding material.

- (2) With electric fielding effectiveness can be calculated according the following formula:

$$SE = 20 \log EP1/EP2 \text{ (dB, Decibels)}$$

E1 = electric field intensity being measured thru shielding material;

E2 = electric field intensity being measured with no shielding.

3. Performance specification

3.1 The functional requirements in the test method are classified according to product end-use.

3.1.1 Class I--Professional use

For medical devices, safety uniform, shielding material for electronic component, assembly equipment and other application.

3.1.2 Class II--General use

For casual wear, uniforms (computer and telecom company), aprons, maternity dress or protective covers for consumer electronic products and other application.

(1) Class I – Professional use

Grading	Excellent	Very good	Good	Moderate	Fair
Range	SE > 60 dB	60 dB ≥ SE > 50 dB	50 dB ≥ SE > 40 dB	40 dB ≥ SE > 30 dB	30 dB ≥ SE > 20 dB

(2) Class II – General use

Grading	Excellent	Very good	Good	Moderate	Fair
Range	SE > 30 dB	30 dB ≥ SE > 20 dB	20 dB ≥ SE > 10 dB	10 dB ≥ SE > 7 dB	7 dB ≥ SE > 5 dB

Remark 1 :

SE : Shielding Effectiveness (dB)

ES : Percentage of Electromagnetic Shielding(%)

Remark 2 :

Shielding Effectiveness (dB) can be calculated and converted into Shielding Effectiveness (%). Please refer to the Appendix Table for details.

3.2 General requirement for pretreatment

Item	Basic requirement	Test method
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Washing durability	professional use: mainly tested in original state general use:, tested in original state, after 20 washes, 50 washes or by request	woven, coated/laminated fabric and non-woven fabric: washed based on AATCC 135 (1)IV(A)ii; knitted: washed based on AATCC 135(2)IV(A)ii.
Accelerated ageing	> Grade 4	ISO 105 B02

4. Test method

4.1 Test sample:

4.1.1 Take 3 specimens in 30cm x 30cm

4.1.2 Tested sample should be preconditioned in a $23\pm 2^{\circ}\text{C}$, $65\pm 5\%$ RH environment for 24 hours prior to test. The test must be operated immediately after conditioned.

4.2 Apparatus

4.2.1 Coaxial fixture: There are two different types-- Flange Version and Capacitive Coupling

4.2.2 Vector Network Analyzer: The measurement method is valid over a frequency range of 30 MHz ~ 3 GHz.

4.3 Test procedure

- (1) The initial test for electric field (E2) shall be conducted with no sample being mounted.
- (2) The following test for electric field (E1) shall be conducted with sample being mounted.
- (3) Shield effectiveness (SE) can be calculated accordingly to the following formula:

$$SE = 20 \log E1/E2 \text{ (Decibels, dB)}$$

4.4 Result

4.4.1 The test report should give test values of SE at 300, 900, 1800, 1900 and 2450 MHz or any frequency requested by client.