



## An introduction to the use of Shielding tape and aluminum foil

Shielding tape and aluminum foil are often used during pre-compliance measurements to connect cable braids, close slits and gaps to connect energy and other numerous reasons.

The topic of shielding tapes will be covered in this newsletter. Some tapes are claimed to have a conducting adhesive layer whereas others have a corrugated structure. This newsletter summarizes specific test results to provide basic insight. An qualitative analysis will not be given nor is it the purpose of this article to make any judgements.

### Names and Conventions

Several makes and types of tape will be described. Their designation is given in table 1.

Item	Make	Type
A	Dynamic Range	n/a
B	Joinset	Both-MTN-ca-aa-40-5
C	Joinset	Both-MTN-aa-ca-0.08
D	Würth	300 335 0
E	Coroplast	Unknown
F	Chomerics	CCJ-36-201-0100
G	3M	1245
H	Würth	301 332 0
I	Joinset	Both-MTH

Table 1: Tape names and conventions

### Resistance

The resistance can be measured in two ways:

- The 'through' resistance that includes the resistance of the adhesive layer.
- The surface resistance: the resistance of the conducting material.

The through resistance provides information about the adhesive layer, whether it's conducting or not. The surface resistance provides information about the conducting properties of the basic material.

The surface resistance is expressed as  $\frac{\Omega}{m^2}$

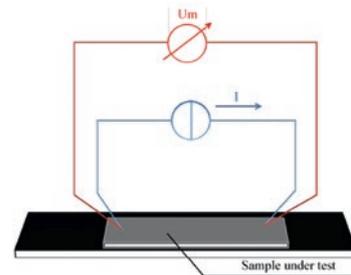


Figure 1: Measurement of surface resistance.

It can be seen in figure 1 that a current is injected and the voltage drop across the test sample is measured. It is of main importance to measure as depicted, i.e. not using the leads of the current source as this introduces a measurement error. The through resistance can be measured in a similar fashion as figure 2 shows.

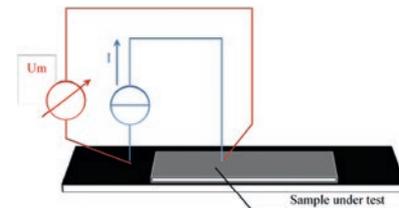


Figure 2: Through resistance.

### About the author

"Mathieu Melenhorst is working at Alewijnse Marine Nijmegen as Designer at the department Conceptual Design & Consultancy with focus on EMC, Lightning and Power Quality". Together with Dr. Ir. Mark van Helvoort Melenhorst co-wrote the book "EMC van Installaties - Op weg naar elektromagnetische compatibiliteit", issued by BIM Media, The Netherlands (ISBN 978-90-125-8552-1).



Table 2 summarizes the measurement results.

Item	$R_{\square} \left[ \frac{\Omega}{\text{cm}^2} \right]$	$R_{\text{through}} \text{ [m}\Omega\text{]}$
D	0.002	49.25
E	Unknown	2305.00
F	0.0016	576.50
G	Unknown	21.50
H	1.0	811.50
I	0.007	59.75

Table 2: Measured resistances

### Shielding effectiveness

The shielding effectiveness is measured using a coupled TEM cell. This instrument consists of two chambers that are coupled by an aperture. The aperture is covered with the sample under test. Both chambers can be regarded as resized coaxial structures that maintain their 50 Ω impedance which explains the 50 Ω terminators at both ends. Figure 3 schematically represents the measurement set-up.

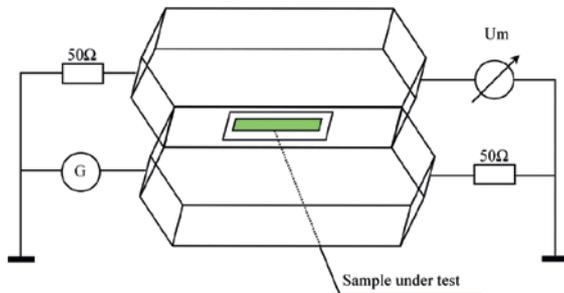


Figure 3: Schematic representation of dual TEM-cell measurement.

The measurement setup as built at the author's home is shown in figure 4.



Figure 4: Measurement setup for determination of the shielding effectiveness

The measurement results of the shielding tapes are shown in figure 5.

Refer to table 1 for the legend to figure 5. The dynamic range shows the maximum achievable attenuation with the given setup. The repetitive minima are likely caused by cavity resonances. The highest attenuation is provided by the aluminum tapes that are made by Joinset. The tape from Würth is a copper tape whereas the Chomerics tape is made of aluminum. The Chomerics tape width is 25 mm so two strips that overlap were used to fully cover the aperture which the Würth tape covered with one layer. The Coroplast tape is not primarily intended for EMC purposes. It was included in the measurements for information purposes.

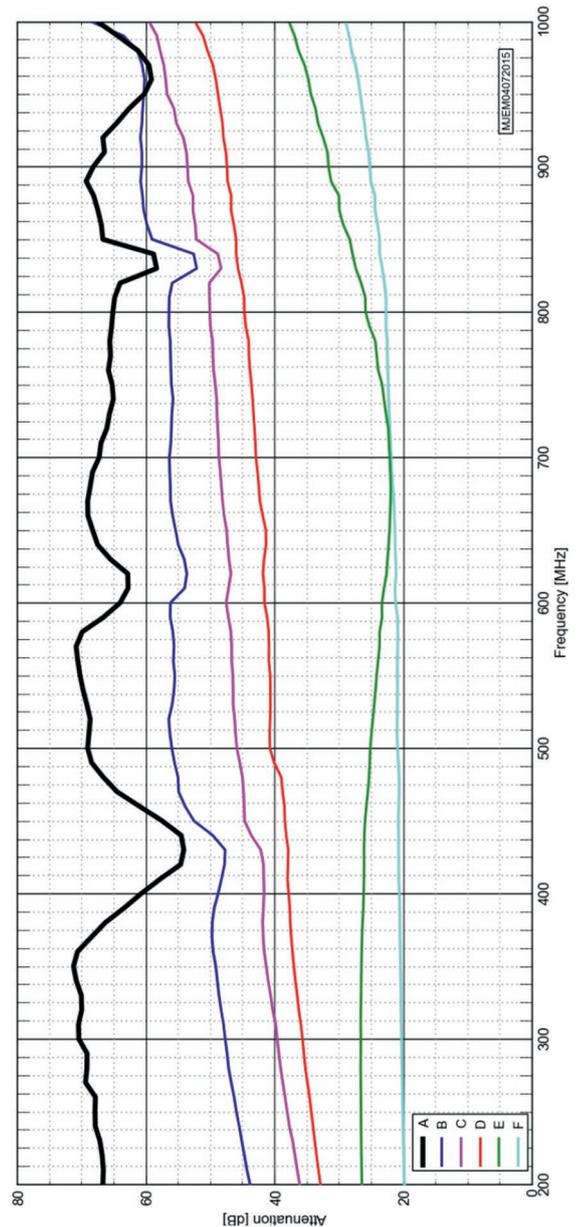


Figure 5: Shielding effectiveness results of various shielding tapes.

It would be premature at this point to correlate the through and surface resistance to the shielding effectiveness of a shielding tape. Contact pressure is key for achieving proper contact. The local absence of adhesive seems to decrease the resistance further in case of corrugated tapes.



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