Letter to the Editor of ESD Association Newsletter 'Threshold'

CHARGEABILITY AND INFLUENCE OF SURFACE CHARGE

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Keith Davies reported in the October/November issue of Threshold on the new IEC TC-101 'guidance' document that is nearly ready for publication. He comments about measuring 'chargeability' in terms of the charge separated between contacting and rubbing surfaces. While measurements of 'charge' can be very useful, I think it is important to realise that in many situations it is not the charge residing on a surface that is significant but the influence this charge has on items nearby. The same quantity of charge can have very different effects, in terms of local surface voltage (for risks of electrical breakdown) or induction effects, depending on the capacitance experienced by the charge on the material surface. In a paper I presented at the recent IEEE-IAS meeting in Phoenix, Arizona [1] I introduced the term 'capacitance loading'. This is the ratio of nearby influence of charge (for example, as fieldmeter observations) for charge isolated in space to the influence observed for this same charge on the material. Experimental studies have shown how, for example, the presence of conductive threads in cleanroom garment fabrics can suppress surface voltages to levels likely to be acceptable – even though the 'resistivity' and charge decay time values would suggest otherwise. Some results of 'capacitance loading' measurements by tribocharging and corona charging were included in the paper presented by Ray Gompf at the Symposium in Orlando [2].

Keith also noted that the IEC TC101 document will 'allow use' of a charge plate monitor for measurements of (e) and (f) - rubbing of materials and web and film materials etc. It needs to be noted that this is NOT an appropriate method. A charge plate monitor is for measuring air ioniser performance - not the density of charge on materials. If a charged garment fabric that includes conductive threads is brought up to a monitor plate then charge on the fabric will be shared with the plate by capacitive coupling and/or conductive linkage. The area of the fabric coupling may well be many times larger than the size of the plate, depending on the role of the conductive threads. Hence the 'reading' will not relate to the local density of charge on the fabric. With a simple dielectric layer, a meaningful result will only be obtained if the plate capacitance is known - and fringing field effects noted. The right way to measure the density of charge on layer and web materials is to use an electrostatic fieldmeter with an appropriate size guard plate.

[1] J. N. Chubb "*Measurement of tribo and corona charging features of materials for assessment of risks from static electricity*" IEEE-IAS Meeting, Phoenix, Arizona, Oct 1999

(The conference paper and copies of the overhead transparencies used are available on the JCI Website at http://www.jci.co.uk)

[2] R. Gompf, P. Holdstock, J. N. Chubb *"Electrostatic test methods compared"* EOS/ESD Symposium, Orlando, Florida. Sept 26-28, 1999 p49