

Executive publishable mid-term summary

The main objective of the three-years ESTAT-Garments project (2002-2005) is to supply the standards body IEC TC101 (Electrostatics) with a basis to qualify the effectiveness of clothing used for the ESD-safe handling (commonly named ESD-garments) of ESD (ElectroStatic Discharge) sensitive devices and to develop appropriate test methods for the characterisation of such ESD protective garments. The approach is aimed at achieving an understanding of the electrophysical processes regarding composite textile materials as well as the total system, including the sensitive devices. During the first half of the project a lot of effort has been paid for the assessment of risks for ESD damage of electronic components with reference to charged clothing. In addition to the study of failure mechanisms and thresholds for damage of novel electronic devices, electrostatic processes on and in ESD fabrics, related to electrostatic discharges, have been under study. A major task has been also the evaluation of existing test methods (both standard and existing major laboratory methods) for full ESD garments and garment fabrics.

The studies have shown that ESD threats to electronic components with reference to garments are not the same as those of charged garments in flammable atmospheres. It is not only a question of lower ESD risk levels in electronics industry than in flammable atmospheres but also partially different mechanisms for a catastrophic ESD event. Direct discharge from charged clothing is not the only threat with reference to garments. Perhaps more severe threat to electronic components is the device charging due to electric field external to charged clothing of an operator (i.e. electric field due to charge on an ESD garment or on normal clothing under the ESD garment). A risk of device failure will happen if the device get a low-ohmic contact to ground or another conducting object after the charging (Charged Device Model ESD). The assessment of risks has resulted in a list of factors which should be taken into account, together with ESD withstand data of devices, when evaluating test methods for ESD garments as well as for garment fabrics. The key parameters to control are electric field external to the garment and peak discharge current as well as charge transfer in a direct ESD.

The main purpose of ESD-garments in electronics industry is to protect sensitive electronics from ESD damage caused by a charged person (operator). Thus any good test method for ESD protective garments should assess garment's ability to provide ESD protection. Existing standard and major laboratory test methods for ESD garments and garment fabrics have been evaluated with reference to their ability to provide ESD protection for sensitive devices. The study has been done with carefully selected state-of-the-art ESD fabrics and garments used in electronics industry. The tested garment fabrics include surface conducting, core conductive, hybrid conductive and stainless steel fibres. Main emphasis has been in garments used in clean rooms, because they are, from the testing point of view, the most challenging. Some additional tests with core conductive garments will be required before full conclusions can be done. According to the preliminary results, current standard test methods do not characterise correctly the protective performance of modern ESD garments. Some existing, non-standardised methods, however, seem to have potential for future standard test methods. Some modifications, however, would be required for the methods.

It is targeted that the results of the evaluation of existing test methods will be presented at the IEC TC101 WG5 meeting in Genova in February. A public summary report will be available by the meeting.