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# M1Or2C-05: Optimizing electric field enhancement of HTS cables

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Recent developments in high temperature superconducting (HTS) cables have allowed for reductions in conductor diameter. For electric transport applications operating voltages required for HTS cables range from 1-10 kV. The reduction in conductor diameter represents higher electric fields on the surface of the conductor. Based on the electrical insulation strategy employed for the HTS cables there is also the potential for further electric field enhancement if the electrical insulation is not directly bonded to the HTS conductor or ground layer. In this instance the cryogen becomes part of the electrical insulation which can effect the dielectric integrity of the cable.

As part of our strategy to reduce electric field enhancement we have studied cryogenic epoxies as a technique to enable direct bonding with the conductor to reduce electric field enhancement. As part of our continued research we have focused on techniques to directly apply the ground layer to the electrical insulation utilizing either conductive epoxies or paints.

The paper discusses the partial discharge behaviors of various small scale samples measured at 77K in high purity vacuum, pressurized helium gas, and liquid nitrogen. The dielectric measurements enable the feasibility of the various conductive epoxies and paints as the ground layer of HTS cables to be assessed. The paper also provides electric field analysis to show where electric field enhancement has been reduced with these techniques.

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