Magnesium Diboride Flexible Flat Cables for Cryogenic Electronics

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Abstract - Magnesium diboride (MgB$_2$) thin films are a potential alternative to low-temperature superconductors (LTS) due to a higher critical temperature ($T_c$) of approximately 39 K. The reactive evaporation deposition technique also affords relatively simple growth of MgB$_2$ films on flexible substrates compared to high-temperature superconductors (HTS). We have designed and fabricated a cable architecture consisting of MgB$_2$ traces on flexible yttria-stabilized zirconia (YSZ) compatible with commercially available connectors or direct wirebonds. Key performance metrics such as critical current density ($J_c$) and $T_c$ are measured and compared. We discuss thermal conductivity and passivation schemes for these cables.

Index Terms - Cryogenic electronics, interconnections, MgB$_2$, superconducting devices, superconducting thin films.

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