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[Invited] Targeted high-temperature superconductor wire characterization and selection for electric propulsion applications

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As high-temperature superconductors –in particular REBCO-based coated conductors –begin to find their way into mainstream applications and application prototypes, intended to compete on economic terms with conventional technologies, the need for *targeted* characterization of the as-yet immature, varied and constantly evolving wire component becomes increasingly important. In this talk, on the basis of the Robinson Institute' s characterization for a variety of purposes of a range of contemporary high-temperature superconducting wires produced by different manufacturers, both established and emerging, I will evidence the severe detriments to *efficient* device design that can result from making assumptions based on a limited dataset regarding the relative performance of differently architectured wires across broad regimes of temperature and magnetic field. I will demonstrate how only a detailed characterization under the precise operating conditions of relevance to the particular final application can adequately inform materials selection in the event that the optimal design efficiency is to be achieved. Examples will be shown where the use of detailed, specific performance data at the design stage provided a substantial, measurable improvement in modelled device performance compared to the use of a sparse or generic dataset. This is then shown to correspond to a significant operating temperature buffer post-build, providing the potential for an equivalent reduction in wire quantity required (and associated cost reduction) at the design stage. As design targets become increasingly unforgiving of drastic over-engineering in the move from proof-of-principle to cost-competitive implementation, such detailed performance information on the underlying wire technology becomes an essential prerequisite to the successful realization of project targets.

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