

Triaxial Superconducting Power Cables

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TRIAxIAL CABLE DESIGN

Ultera is currently working to develop an exciting new conductor design that promises to reduce material cost, reduce cooling requirements, and increase the energy efficiency. A new Triaxial conductor design places all three phase conductors concentric around a common central core. This concept reduces the quantity of HTS wire needed, and reduces the cold surface area, thereby reducing cooling requirements. Electrical field cancellation is achieved by the three concentric phases being 120 electrical degrees apart. A common copper shield is used to carry neutral currents. This new design is a significant step towards reducing system costs and achieving a commercially viable product. The Triax design specifically addresses the two major cost components in a superconducting cable system: HTS wires and refrigeration.

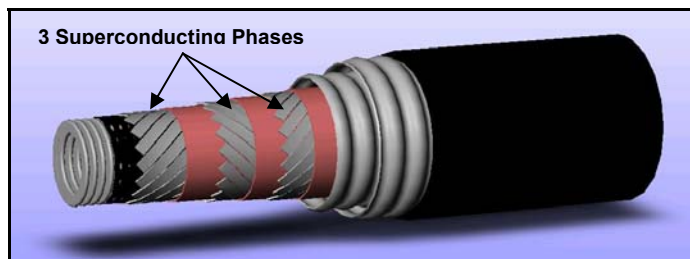


Figure 1 - Triaxial Superconducting Cable

The first full-scale prototype of the Triax design was built and tested at Ultera's development partner Oak Ridge National Lab (ORNL) during the fall of 2002. A picture of the termination design can be seen in Figure 5. The three concentric phases are connected to copper leads that continue throughout the length of the termination. The three phase connections are shown at the right side of the termination while the neutral bushing is hidden on the back side of the termination body. The triax termination is a slim design in which the body of the termination is no larger in diameter than the cable cryostat.

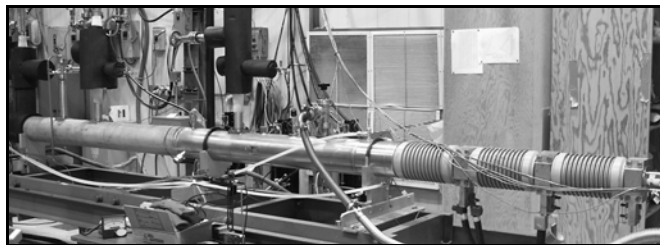


Figure 2 - Full scale Triax termination under test at ORNL.