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M2Po2E-03 [51]: Low cost transposed cables for coil windings made with Bi2223 and REBCO HTS tapes

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HTS tapes, because of their widths and large shape aspect ratios, have not been readily manufacturable into Rutherford or Roebel cables, even though these kinds of cables are required for many large coil applications. A type of transposed Roebel cable is under development with 2G tape, but its design flexibility is limited, its processing is very complex, and it requires that much of the 2G tape feedstock be discarded. However, our recent advances in cabling provide an opportunity to develop and produce long lengths of low-cost HTS transposed tape cables for fabricating many types of coils. Using our cable design model, combined with the properties of Sumitomo NX and 2G tapes, we have identified architectures for producing prototype transposed HTS tape cables by this new cabling approach. Test runs with a 6-strand cabling machine were completed to establish the feasibility of producing and attaining target performance levels. Degradation of I_c in the cabled tapes, as compared to their pre-cabled I_c 's was found to be minimal. Bend tolerance tests on cables comprised of 8 and up to 16 tapes demonstrated that I_c does not start to decrease until bend diameters go well under 20 cm. Longer length cables were produced and test coils wound –with tests confirming that these cables are well suited for the fabrication of HTS-based coils with the required large operating currents. These developments pave the way to now develop and produce long lengths with many more tapes and achieve 2, 5 and 10 kA class cables for high field usage in a large variety of magnet types.

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