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Wed-Mo-Po3.04-02 [22]: Design and development of small model HTS coil system for Skeleton Cyclotron

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We proposed the air-core cyclotron using high-temperature superconducting (HTS) technology, named Skeleton Cyclotron, as high intensity compact cyclotron. Skeleton Cyclotron consists of split main coils generating the isochronous field and sector coils generating the azimuthally varying field (AVF). Rapidness and reproducibility of magnetic field change for various particle and various energy are improved. Currently, we are carrying out a feasibility study on a variable-energy multi-particle Skeleton Cyclotron for medical radioisotope (RI) production. It is necessary to develop the following HTS magnet technologies for Skeleton Cyclotron: 1) the no-insulation (NI) winding technique for high current density and high thermal stability; 2) reduction method of screening current for highly precise magnetic field and optimal operating current pattern for temporal stability of magnetic field; 3) our proposed Y-based Oxide superconductor and Reinforce Outer Integrated (YOROI) structure with a high mechanical strength structure for circular and noncircular coils; and 4) optimal configuration design of HTS multi-coil system. Therefore, the small model HTS coil system to generate the magnetic field for accelerating proton up to 5 MeV of energy at an extraction radius of 20 cm is designed and manufactured to verify the key issues in HTS magnet technologies for Skeleton Cyclotron. In this presentation, the design and progress in development of the small model HTS coil system is reported.

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