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AC and pulse operation of HTS magnets

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At the Research Center for Nuclear Physics (RCNP) of Osaka University, we have been developing magnets utilizing first generation high-temperature superconducting (HTS) wires for this decade. Three model magnets were fabricated; a mirror coil for an ECR ion source, two sets of race track coils for a scanning magnet, and a 3T super-ferric dipole magnet having a negative curvature. They were excited with AC and pulse currents as well as DC currents and their performance was investigated. Following preliminary developments, a cylindrical magnet has been built for a practical use to polarize ultracold neutrons (UCN). The field strength at the center is higher than 3.5 T which is required to fully polarize 210 neV neutrons. The magnet can successfully polarize UCN generated by the RCNP-KEK superthermal UCN source. One dipole magnet is under fabrication, which is used as a switching magnet after the RCNP ring cyclotron and is planned to be excited by pulse currents. We plan to deliver beams to two target stations by time sharing. We will begin performance test soon. For future application we are designing a separated sector cyclotron and a rotating gantry for heavy-ion therapy by utilizing HTS magnets.

Keywords: cylindrical magnet; dipole magnet; first generation HTS wire, AC?pulse operation