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Test bench for the ISOLDE Superconducting Recoil Separator ISRS

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The ISRS is a novel high-resolution recoil separator to be installed at the radioactive ion beam facility HIE-ISOLDE at CERN. The design of the ISRS spectrometer exploits the time-of-flight of the fragments produced in the reaction target to perform the particle separation. By injecting the reaction fragments into a particle storage system composed of an array of iron-free superconducting multifunction magnets (SCMF) cooled by cryocoolers, and integrated into a compact storage mini-ring using Fixed Field Alternating Gradient focussing (FFAG) it is possible to reach resolutions of 1/2000. The present design is compact (3.5 m diameter) with a relatively low magnetic field ($< 3\text{T}$) that should manage to recirculate with 100% efficiency a cocktail beam of heavy mass isotopes (up-to mass 234) at 10 MeV/u with a 30% momentum spread.

A prototype of a 90° bending magnet composed of a CCT solenoid (FUSILLO) with a pure dipole central field of 3.0 T has been developed by CERN.

However, in a first stage we are making a design using short/compact straight iron-free CCT magnets. This prototype called MAGDEM (Magnet Demonstrator) will be integrated into a dedicated beam transport and focusing system and assembled into a fully operational ion test bench. The focusing system, target chamber, and focal plane detectors are under study at IEM-CSIC within the MRR-ISRS-Spain project.

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