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Specifications, Design, and Commissioning of the Superconducting Multipole Triplets for the SPIRAL2 Super Separator Spectrometer

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The Super Separator Spectrometer (S3) is a large acceptance mass separator which is under construction for use with intense heavy ion beams at the SPIRAL2 facility at GANIL. It is a two-stage separator comprising a momentum achromat stage with two bends by magnetic dipoles to form a fully achromatic image at its focal plane and a mass spectrometer stage with one electric dipole for energy dispersion and one magnetic dipole for momentum dispersion to create m/q dispersion while being achromatic in momentum at the final focal plane. Each of the four bends are preceded and followed by magnetic quadrupole triplets. Seven are superconducting multipole triplets (SMT) while the one following the first magnetic dipole is an open-sided copper-coil multipole to permit the high-power primary beam to exit and be captured by a Faraday cup. In this presentation we present the design requirements and results of commissioning the first SMT.

To achieve the desired high angular, momentum, and charge-state acceptance of S3 the SMTs are designed with a warm-bore aperture of 30 cm and each of the singlets contains sextupole and octupole correcting coils in addition to the quadrupole coils. Each quadrupole singlet also contains a dipole coil for steering corrections, with the first and third singlets of each triplet having vertical dipole correctors wired in series while the central singlet has a horizontal steerer. To avoid large multipole error terms in the fringe fields of these large aperture multipoles a new coil configuration has been implemented*. The cryostats of the SMTs are complex due to the large number of leads and vertical space limitations of the S3 vault.

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*P. Walstrom, NIM A519 (2004) 216

Primary author: Mr AUTHIER, Martial (Irfu, CEA-Saclay)

Co-authors: Mr BERRYHILL, Adam (Cryomagnetics, Inc.); Dr DROUART, Antoine (Irfu, CEA-Saclay); Dr BOUTIN, David (CNRS-Strasbourg); Mr LUTTON, Franck (GANIL); Mr STELZER, Gerald (AML Superconductivity and Magnetics); Dr SAVAJOLS, Herve (GANIL); Dr PAYET, Jacques (Irfu, CEA-Saclay); Dr NOLEN, Jerry (Argonne National Laboratory); Mr STODEL, Marc-Herve (GANIL); Mr COFFEY, Michael (Cryomagnetics, Inc.); Dr MEINKE, Rainer (AML Superconductivity and Magnetics); Dr MANIKONDA, Shashikant (AML Superconductivity and Magnetics); Dr MEHDI, Souli (GANIL); Mr PRINCE, Vernon (AML Superconductivity and Magnetics)

Presenter: Dr NOLEN, Jerry (Argonne National Laboratory)

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