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A1900 Rigidity Calibration Based on Accelerator RF Timing

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The A1900 fragment separator, located at the National Superconducting Cyclotron Laboratory of Michigan State University, is used to select rare isotopes produced in fragmentation reactions for delivery to downstream experiments. The increasing demand for studies using gas-stopping techniques [1] requires that the energy of the delivered fragments, as given from the beam rigidity measured in the separator, be determined with greater precision than was previously needed. To this end, various test beams with precisely-measured energies have been used to improve the rigidity calibration to an accuracy level of $\pm 0.1\%$ covering a range from 1.5 to 4.5 Tm. A time-of-flight technique to measure the energy of the test beams is described and results given. In this technique, a barium fluoride detector is moved between two positions along the beam path to measure the arrival time of beam particles with respect to the cyclotron RF signal. Also presented is the application of these results to achieve an improved rigidity calibration of the A1900 separator.

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[1] L. Weissman et al., Nucl. Phys. A 746 (2004) 655.

Primary author: GINTER, Thomas (Michigan State University)

Co-authors: ROGERS, Andrew (MSU; present address: University of Massachusetts Lowell); VILLARI, Antonio (MSU); SUMITHRARACHCHI, Chandana (MSU); KWAN, Elaine (MSU); FARINON, Fabio (MSU; present address: GSI); STETSON, Jeff (MSU); HAUSMANN, Marc (MSU); PORTILLO, Mauricio (MSU); NAVILIAT-CUNCIC, Oscar (MSU); WILLIAMS, Scott (MSU); BAUMANN, Thomas (MSU)

Presenter: GINTER, Thomas (Michigan State University)

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