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Commissioning the cryogenically cooled gas target and the ionization chamber of HELIOS

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The HELIcal Orbit Spectrometer (HELIOS) has been used to successfully study reactions in inverse kinematics with both stable and radioactive beams; however, initial studies were limited to solid targets. In addition, in the original implementation of HELIOS a telescope of silicon detectors was used for recoil detection and, while it provided particle identification information for recoils with A<30, such a device is limited to rates of ~10 kHz and covers a relatively small solid angle. To broaden the scope of nuclear reactions accessible with HELIOS and to increase recoil detection capabilities, two devices have been developed: a cryogenically cooled gas target, which allows for the study of reactions in inverse kinematics using for example 3He or 4He targets, and a high-rate ionization chamber that captures a much larger fraction of the recoils than the silicon telescope and is capable of detecting heavy recoils with A<150 at rates of up to 500 kHz. The technical details of the new devices are presented and results from the commissioning experiments are discussed.

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