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Dual-Mode solenoidal spectrometers at ARIEL

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Dual-mode solenoidal spectrometers combine flexibility, high detection efficiency, and precise kinematic reconstruction for reaction studies with rare isotope beams. This concept enables operation in two complementary modes: an active target mode employing a gaseous Active Target Time Projection Chamber (AT-TPC) for studies with low-intensity or extended targets, and a silicon detector array mode providing high-resolution particle tracking for solid targets. The integration of these approaches within a common solenoidal magnetic field allows comprehensive coverage of transfer, elastic, and resonance reactions in inverse kinematics. This talk will cover the technical design principles, operational modes, demonstrated performance through landmark experiments, and implementation roadmap for dual-mode solenoidal spectrometers. This versatility ensures optimal adaptation to the diverse beam conditions and physics objectives across ARIEL's experimental program. The demonstrated performance and adaptability of solenoidal spectrometers make them an especially well suited technology for advancing TRIUMF's nuclear structure and astrophysics research.

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