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## Much-needed high-Z (p,X) cross sections for TIGERISS and other cosmic-ray missions

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Great advances are happening in our understanding of our Galaxy and its physical phenomena, courtesy of missions such as TIGERISS (Trans-Iron Galactic Element Recorder on the International Space Station), which will be the first single instrument to look at elemental abundances spanning B to Pb. However, the accurate interpretation of these advanced observational data is contingent upon accurate cross-section data, which are currently quite lacking and inadequate. There are gaps in data and unreliable measurements abound, and there have been very little drive to address these concerns, especially for proton spallation (p,X) cross-sections in high-Z and high-energy regions, which are imperative to study cosmic ray origins. To that end, our team at NASA Goddard has established a collaboration with various institutions to perform a series of cross-section experiments for the reaction channels of utmost importance. The first of these experiments was performed in March 2024, at Brookhaven National Lab. Proton beams with energies between 0.2 to 2.5 GeV were irradiated upon a natural Cr and a monoisotopic Mn target, and the cross sections of several  $\text{natCr}(p,X)$  and  $^{55}\text{Mn}(p,X)$  reactions are currently being determined, using known gamma-ray lines of unstable daughter products. The second in this series is a planned experiment at FRIB, where we are currently setting up a  $^{52}\text{Cr}$  primary beam, for bombardment on a liquid Hydrogen target to study  $^{52}\text{Cr}(p,X)$  reactions. Our team has also become limited members of the NA61 collaboration, who performed a proton-spallation experiment at CERN, where high-Z isotopic beams up to Si were incident on a  $\text{CH}_2$  target. We will report upon how these experiments will help TIGERISS, and our future plans in this endeavour.

### Collaboration(s)

TIGERISS collaboration

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