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Scientific Goals of the TIGERISS Mission

TIGERISS, the Trans-Iron Galactic Element Recorder for the International Space Station, is an Ultra-Heavy Galactic Cosmic Ray (UHGCR) detector that will launch to the ISS in 2027 with an assignment to Columbus SOX. TIGERISS builds on the TIGER and SuperTIGER mission heritage and will measure the elemental abundances from $_{5}$B to $_{82}$Pb for ˜400 MeV/nucleon to ˜10 GeV/nucleon. With a minimum geometry factor of 1.10 m^2 sr, TIGERISS, in one year of operation, will match the statistics seen by the first SuperTIGER balloon flight without the need for atmospheric corrections.

TIGERISS will achieve single-element resolution measurements across this wide range of charge, allowing us to test cosmic-ray origins, including their source environment and acceleration mechanism. Previous work from SuperTIGER showed that GCR measurements up to $_{40}$Zr support a source acceleration model where supernovae in OB associations preferentially accelerate refractory elements that are more readily embedded in interstellar dust grains than volatiles. This injection of the GCR into the ISM appears to follow a charge dependence consistent with their grain sputtering cross sections. However, for Z>40, SuperTIGER saw an enhancement of volatile and dominantly r-process elements which suggests that there may be an additional GCR source or a change in the acceleration model. TIGERISS's measurements will allow us to check SuperTIGER's results and see if that enhancement continues beyond $_{56}$Ba, which would allow us to potentially determine if it is from an additional r-process source, a new feature in the acceleration mechanism, or both. With TIGERISS's results covering nearly the entirety of the s-process, r-process, and rp-processes of nucleosynthesis, we will add to the wider multi-messenger effort to determine the relative contributions of supernovae (SN) and Neutron Star Merger (NSM) events.

Collaboration(s)

TIGERISS

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