Proposal Abstract:

We propose to observe a 15.5 degree × 5 degree area and a 5 degree × 7 degree area at the tail of the Magellanic Stream at 3σ sensitivity limit of N(HI)~3×10^18 cm^−2. Our pilot survey using FAST found that the tail of the Magellanic Stream is more extended and diffuse than previous thought. This is consistent with our new UV absorption line observations, suggesting that the tail of the Stream is highly ionized and likely to extend a few ten degrees beyond the HI emission mapped by previous surveys. The newly proposed FAST observations will help determine how far the Stream would extend at unprecedented sensitivity, providing (I) a new understanding on the full length of the Magellanic Stream, which will challenge existing simulations on LMC/SMC trajectories, and (II) a high-sensitivity high-resolution catalog of HI clouds toward the tail of the Stream, which help better understand how clouds are disrupted by and mixed with ambient ionized gas in the Milky Way halo. Our work will have a far-reaching impact on the understanding of the multiphase structure of the Milky Way's CGM, which is a critical and active field in galaxy formation and evolution.