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Abstract:

With a shared-risk project at the FAST we discovered a remarkable filamentary feature in the extreme outer Galaxy (Rgc~22 kpc). The structure (namely, "Cattail") has a full length of 5 kpc, about 5 times larger than any other known atomic or molecular gas filaments in the Galaxy (Li et al. 2021, ApJL). The nature of this extraordinary structure could be understood with two possible interpretations: 1) we detect the largest gas filament in the extreme outer Galaxy; 2) we see part of a new spiral arm, or more specifically, a new extension of the Sagittarius-Carina Outer (SCO) arm. However, puzzlings remain for either of the two interpretations. Regarding the {\it filament} interpretation, it is unclear how such a huge gas structure formed in the extreme outer Galaxy, and wether this structure is stable, having substructures as those we see in other giant filaments. Considering the {\it spiral arm} interpretation, it is also puzzling that this new segment does not follow the warp pattern of the Galactic disk. Therefore, here we propose to make FAST new observations to address these questions, and to advance our understanding of the extreme outer Galactic structure.