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Abstract:

Planetary nebulae (PNe) are the key object to the transition from stellar to interstellar materials. The observed ionized gas of PNe is far less than the expected materials from the central stars in mass, indicating the presence of neutral components. Circumstellar envelopes may experience an evolution from molecular- to atomic- and to ionic-dominant. However, although molecular hydrogen has been detected in hundreds of PNe, only a few PNe were detected in atomic hydrogen. Thanks to the precedence sensitivity of FAST, we propose to search for circumstellar HI 21 cm feature in a sample of PNe. The observational results allow us to determine the mass (or upper limit) of neutral matter, the terminal velocity of stellar wind, and the mass-loss rate in the early phase of PNe. As a byproduct, we would estimate the distances of PNe through the HI 21cm absorption from the interstellar medium. Our pilot observations have successfully demonstrated the feasibility of this program. In this proposal, we plan to observe 17 PNe conforming to dedicated selection criteria that maximize the possibility to detect circumstellar HI.