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Abstract:

ZTF J1406+1222 is a recently identified hierarchical triple system that hosts a likely black widow pulsar in a binary system with a 1-hour orbital period and an outer cool subdwarf star in a 11-kyr orbit. Previous searches for radio pulsations from this system were inconclusive, giving luminosity upper limits that are consistent with the radio luminosity of many other pulsars located at a comparable distance to ZTF J1406+1222. We request 1.2 hours of observing time on FAST (including overheads) to perform a deep search for radio pulsations from this system. The detection of pulsations would make it possible to: (i) nail down the black widow nature of the inner binary component and confirm it as the most compact system of this class observed so far; (ii) search for gamma-ray pulsations using Fermi data; (iii) derive a timing solution possibly using Fermi data and/or through future dedicated radio timing observations, leading to the determination of key pulsar parameters and potentially paving the way to precision tests of the strong equivalence principle of the general theory of relativity.