FAST Proposal Coverpage

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Project Name:

Astrophysical constraints on the proton-to-electron mass ratio with FAST

Project Summary:

(A 1 paragraph summary of your project, including its scientific goals and how you will address them. This information will be potentially public.)

The most critical and fundamental question in the entire physics is whether the laws of physics and the physical constants are the same at all times and places in the Universe. One physical constant with the greatest attention, is the dimensionless physical constant μ, the proton-to-electron mass ratio. The importance of μ is not only due to its dependence on the masses of the most elemental particles, but also because the variation of μ can be directly monitored from the astronomical spectral line observations. In particular, the rotational transitions of CH_3OH and its isotopes CD_3OH are sensitive to the changes in μ. And the related line transitions can be covered by the frequency range of FAST. The high sensitivity of FAST provides new opportunities to significantly improve upon measurements made to date. In this project, we will observe two candidate sources to search for the CD_3OH 1.2 GHz line. And if the sensitivities reached a 1 mJy level, we would detect CD3OH 1.2 GHz line emission with an expected intensity of 5 mJy. Based on the new detections, the study of μ-study could be significantly driven forward.