



Precise localizations of Fast Radio Bursts to unveil their local environments

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Extended Abstract

Fast Radio Bursts (FRBs) are millisecond duration, extremely luminous bursts detected at radio frequencies. Hundreds of FRBs have been detected to date, but their nature still remains unclear. To be able to clearly identify the systems associated to the production of FRBs, it is critical to determine the local environments where FRBs occur. Due to the large distances to these extragalactic sources, we need a large number of very precise localizations that can only be carried out with very long baseline interferometric (VLBI) observations.

The European VLBI Network (EVN) is currently the only instrument capable of localizing FRBs down to the milliarcsecond level. This level of precision was critical to associate the first localized FRB, 20121102A, to the inside of a low-metallicity star-forming region in a dwarf galaxy and physically related it to a compact (< 0.7 pc) persistent radio source [1]; and a second repeating FRB, 20180916B, to just outside the edge of a prominent star-forming region of a nearby spiral galaxy [2].

The PRECISE project (Pinpointing REpeating CHIME Sources with EVN dishes) is monitoring repeating FRBs discovered by the CHIME/FRB Collaboration on a regular basis. PRECISE aims to localize these FRBs with milliarcsecond accuracy, with the ultimate goal of disentangling the environments where FRBs can be produced. In this talk I will discuss the importance of milliarcsecond localizations, the PRECISE project, and the localizations achieved until now, which have unveiled a variety of environments where FRBs can be found that challenges multiple models, including the localization of FRB 20200120E in a completely unexpected environment: the inside of a globular cluster in M81 [3].

References

- [1] B. Marcote, Z. Paragi, J. W. T. Hessels, et al., “The Repeating Fast Radio Burst FRB 121102 as Seen on Milliarcsecond Angular Scales”, *The Astrophysical Journal Letters*, **834**, 2, Jan 2017, pp. L8, <https://ui.adsabs.harvard.edu/abs/2017ApJ...834L...8M>.
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- [3] F. Kirsten, B. Marcote, K. Nimmo, et al., “A repeating fast radio burst source in a globular cluster”, *arXiv e-prints*, **arXiv:2105.11445**, May 2021, <https://ui.adsabs.harvard.edu/abs/2021arXiv210511445K>.