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Gravitational lensing with SKA-VLBI precursors: testing the ΛCDM model at milliarcsecond scales

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Current cosmological controversies are coming down to the precision level of observations. Future wide-field surveys with the next generation of telescopes will open the so-called “era of precision cosmology”, but that era has already started at the radio wavelengths with Very Long Baseline Interferometry (VLBI). The powerful combination of strong gravitational lensing and VLBI observations eases the study of the sub-galactic scales at cosmological distances, directly testing the basic assumptions of our current cosmological framework.
In this talk, I will show our recent results on the constraints on the nature of dark matter from the analysis of giant gravitational arcs observed with global-VLBI. These results are as stringent as those derived from the Lyman-α forest observations of cosmic structure and from the number statistics of the observed satellites of our Galaxy. Our work demonstrates the power of this method and anticipates what SKA-VLBI will be able to reveal.
Nevertheless, there are currently only a handful of extended radio-loud arcs known. I will discuss the on-going efforts and future prospects for searching for lenses in wide-field radio surveys. The SKA1-MID surveys are expected to reveal ~10^5 strong lenses, but only with the VLBI capability it will be possible to follow-up the most promising objects at an unprecedented sensitivity and milliarcsecond angular resolution. With the (very) long baselines, SKA-VLBI will unveil also the faintest gravitational arcs, providing the statistical significant sample needed to finally determine the mass of the dark matter particle.

keywords

VLBI; cosmology; radio-continuum; gravitational lensing; AGN; source finding

In-person or online?

in-person

Career level

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