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DARKER: a science case to shed light on dark matter and dark energy with the tri-band receivers

Gravitational lensing is one of the most powerful tools to investigate the dark Universe (dark energy via gravitational time delays and dark matter (via low mass lenses). Nevertheless, these fundamental cosmological studies are limited by the paucity of lensing systems known to date. Finding novel and effective ways to identify strong lenses represent, therefore, a new challenge that has to be addressed by the time forthcoming optical and radio surveys with the next generation of telescopes will probe large volumes of the sky.

I will present our recent work on the most precise measurement of the gravitational time delay in the lensing system PKS1830-211 using mm-VLBI and single-dish cm observations. This is the first time that gravitational time delays have been measured with VLBI observations. Our results lay the foundations to a novel method to search for strong lenses in the time domain. Such innovative search could pave the way for the exploitation of the monitoring surveys with the Rubin-LSST, thus pushing the potentially new discoveries to a number that largely exceeds the minimum number of lenses necessary to address the current H0 tension and the nature of the dark matter particle. In this context, the follow-up with mm-VLBI will play a crucial role to confirm the low mass lens candidates and the Italian VLBI array with the tri-band receivers could be on the forefront of observational cosmology.

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