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Precision cosmology with time delay lenses: high resolution imaging requirements

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ABSTRACT

Gravitational time delays are a powerful probe of cosmology, provided that the gravitational potential of the main deflector can be modeled with sufficient precision. Recent work has shown that this can be achieved by detailed modeling of the host galaxies of lensed quasars. The distortion of the images as measured over large number of pixels provides tight constraints on the difference between the gravitational potential between the two quasars, and thus on cosmology in combination with the measured time delay. We carry out a systematic exploration of the high resolution imaging required to eploit the thousands of lensed quasars that will be discovered by current and upcoming surveys with the next decade. Specifically we simulate realistic lens systems as imaged by the Hubble Space Telescope, ground based adaptive optics images taken with Keck or the Thirty Meter Telescope. We compare the performance of these pointed observations with that of images taken by the Euclid-VIS and WFIRST surveys. Using as our metric the precision with which the slope of the mass density profile for the main deflector can be measured we find that...

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