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PROBING KEPLERIAN ROTATION IN QUASARS USING MICROLENSING-INDUCED LINE PROFILE DISTORTIONS

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Reverberation mapping accurately determines virial black hole masses for redshifts z < 0.2 using the relationship between the Hβ broad-line region (BLR) size and the 5100 Å continuum luminosity established with $\gtrsim$ 200 AGNs. For quasars at z $\sim$ 2-3, determining the BLR size is time-consuming and limited by seasonal gaps, requiring $\sim$ 10-20 years of monitoring C IV emission lines. In this work, we demonstrate that an efficient alternative is to use a continuum size-luminosity relation, which can be obtained up to 150 times faster using photometric reverberation mapping (PRM). We outline the method and its feasibility based on simulations and propose an observational strategy that can be carried out with ground-based meter-class telescopes equipped with narrow and medium-band filters. As a case study, we focus on the ESO La Silla 2.2 meter telescope observations with a well-defined sampling rate which recovers our predictions - a testament to the validity of our scaling relation. These observations provide the scaling factor between the accretion disk and the C IV-based BLR sizes, which is (1) crucial for estimating the masses of black holes at higher redshifts extending beyond the cosmic noon, (2) evaluating the contribution of the diffused continuum emission and assessing the standard accretion disk theory, and, (3) validating quasars as cosmological distance indicators and bridge the gap between the local and early Universe. I will also highlight some recent advances in preparation for Rubin's first light and a sneak-peak on Gemini/SCORPIO - an 8-channel imager and spectrograph poised to be the workhorse for Rubin's follow-up.