X36b Black hole mass measurements of $z \sim 6$ low-luminosity quasars

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It has been under debate what is the origin of super massive black holes (SMBHs). Recent observations of $z > 6$ quasars have revealed that i) there exist the most massive black holes with $M_{\rm BH} > 10^9 M_\odot$ in such an early epoch, ii) their relative growth with host galaxies is faster at high redshift, and iii) host galaxies are already metal-rich. However, these implications are likely biased as we currently see the most massive and active SMBH population at this epoch. We present the first results of BH mass measurements for the $z \sim 6$ quasars identified through our low-luminosity quasar search with the Hyper Suprime-Cam Subaru Strategic Program (HSC-SSP). The sample in this study is based on our initial discovery of > 30 quasars from the first-year data covering ~ 400 deg^2 (Matsuoka et al. 2016, 2017). The typical absolute magnitude of the new quasars is $M_{1450} \sim -23$, which is about two magnitudes fainter than the SDSS limit. From a deep Gemini/GNIRS spectroscopy with 3.7 hour integration times of one quasar, J2239+0207 at $z = 6.26$, we detect the MgII λ2798 emission line and power-law continuum, from which we obtain its BH mass using the so-called single-epoch method. We find that this quasar is powered by a $10^8 M_\odot$ BH, which is the least massive among the existing sample at $z > 6$, and its bolometric luminosity is close to the Eddington limit, which is similar to the trend of more luminous quasars. In our presentation, we show the obtained spectrum and measured properties of the low-luminosity quasar, with a few more quasars whose observations have been underway with Gemini and VLT.