

BLR Physical Conditions in Extreme Population A Quasars: a Method to Estimate Central Black Hole Mass at High Redshift

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We describe a method for determination of physical conditions in the broad line regions of a significant subsample of Seyfert-1 nuclei and quasars. Several diagnostic ratios based on intermediate (AlIII 1860, SiIII 1892) and high (CIV 1549, SiIV 1397) ionization lines in the UV spectra of quasars are used to constrain density, ionization and metallicity of the emitting gas. We apply the method to two extreme Population A quasars - the prototypical NLSy1 I Zw 1 and a high- z NLSy1-like object, SDSS J120144.36+011611.6. We find well-defined physical conditions: low ionization (ionization parameter $\xi < 10^{-2}$), high density ($10^{12} - 10^{13} \text{ cm}^{-3}$) and significant metal enrichment. Ionization parameter and density can be derived independently for each source with an uncertainty that is always less than ± 0.3 in logarithm. We use the product density times ionization parameter to estimate the broad line region radius and the virial black hole mass. Estimates of black hole masses based on the "photoionization" analysis described in this paper are probably more accurate than those derived from the radius - luminosity correlation.

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