The Constraint on the Mass Accretion Rate of Cygnus A with Submillimeter Array

Wen-Ping Lo[1,2]; Keiichi Asada[1]; Masanori Masanori[1]; Ramprasad Rao[1]; Hung-Yi Pu[1]; Geoffrey Bower[1]; Chih-Yin Tseng[1,2]; Makoto Inoue[1]; Paul Ho[1]; Patrick Koch[1]; Satoki Matsushita[1]; Hiroaki Nishioka[1]; Chun-Che Lin[1]; Juan-Carlos Algaba[4]; Kazunori Kazunori[5]; Shane Osullivan[3]
[1]ASIAA; [2]NTU; [3]UHAM; [4]KASI; [5]MIT

How the mass accretion rate of SuperMassive Black Holes (SMBHs) is related to the gas feeding from the larger spatial scales, and how it is related to the energetic jet/outflow activities, are fundamental questions for the understandings of the active galactic nuclei (AGN). Faraday Rotation Measure (RM), the tracer of electron column density and magnetic field strength along the line of sight, is one of the powerful method to constrain the mass accretion rate at the vicinity of SMBH. We present the polarimetric results on the core emissions of Cygnus A utilizing Sub Millimeter Array (SMA) at millimeter wavelengths and derive the constraints on the Faraday rotation measure. There is no statistically significant detection of the polarized emissions from Cygnus A. Low fractional polarization at 230 GHz is presumably due to variating Faraday RM screen since the high percentage of polarization (12 %) have been detected with mid-Infrared observations. With the scenarios of beam and bandwidth depolarizations from the accretion flow, the mass accretion rate and the accretion power can be constrained, and convection-dominated accretion flow solution can be ruled out.