CSO SPECIAL SCIENCE SEMINAR

TIME: 11:00AM, Wednesday 27th June 2007

PLACE: CSO Conference Room

TITLE: H_3^+, a new astrophysical probe, and revelation of warm and diffuse gas near the Galactic center

SPEAKER: Professor Takeshi OKA
Department of Astronomy and Astrophysics and Department of Chemistry, the Enrico Fermi Institute, the University of Chicago

ABSTRACT:

With a super-massive black hole at the core, the region near the Galactic center is the hub of activity. Emissions from radio to X-rays and the densities of stars and gas all peak in the region. It also harbors the Central Molecular Zone (CMZ), a region of radius ~ 200 pc which has the highest concentration of molecules in the Galaxy. Our infrared spectroscopic observations in the last five years have shown that sightlines toward the CMZ have H_3^+ column densities that are ~ 10 times higher than the highest observed in the Galactic disk.

Using this richness of H_3^+ with its unique characteristics as an astrophysical probe, a new category of gas with high temperature (~ 250 K) and low density (≤ 100 cm^{-3}) has been revealed in the CMZ. Our observations of 8 sightlines toward bright infrared YSOs by the UKIRT, Subaru, Gemini South, and VLT and their analyses suggest that the gas is ubiquitous and has a high volume filling factor in the CMZ. The relation between this newly found gas and previously known, i. e., the cold (~ 50 K) and high density ($\geq 10^4$ cm^{-3}) gas observed by radio emission of CO, CS, HCN and other molecules, the hot ($10^{4\text{-}6}$ K) gas with high electron densities (~ 10 cm^{-3}) inferred from hyper-strong radio-wave scattering, and the ultra-hot ($10^{7\text{-}8}$K) gas emitting X-rays is speculated.

Caltech Submillimeter Observatory (CSO) Hilo office is located in the University Park, at the corner of Komohana – Nowelo Street.
111 Nowelo Street, Hilo HI 96720 (Phone: (808) 935-1909)