

## TWO SIGHTLINES TOWARD THE GALACTIC CENTER WITH REMARKABLE $\text{H}_3^+$ and CO SPECTRA

TAKESHI OKA, *Department of Astronomy and Astrophysics, and Department of Chemistry, the University of Chicago, IL 60637*; T. R. GEBALLE, *Gemini Observatory, Hilo, HI 96720*.

Until last year the known stars in the Galactic center with sufficiently smooth spectra and of sufficient brightness to be suitable for high resolution infrared absorption spectroscopy of  $\text{H}_3^+$  and CO were limited to a narrow range of longitudes, from the central cluster of hot stars to approximately 30 pc east of the center. In that region we have discovered a vast amount of warm ( $T \sim 250$  K) and diffuse ( $n \sim 100 \text{ cm}^{-3}$ ) gas.<sup>ab</sup>. In order to more fully characterize the gas within the  $r \sim 180$  pc Central Molecular Zone (CMZ) it is necessary to find additional such stars that cover a much wider longitudinal range of sightlines. We are in the process of identifying luminous dust-embedded objects suitable for spectroscopy between 170 pc east and west and 14 pc north and south of Sgr A\* using the Spitzer GLIMPSE and the 2MASS catalogues.

Here we present spectra of  $\text{H}_3^+$  and CO towards two such objects, one located 140 pc west of Sgr A\* close to Sgr E, and the other located on a line of sight to the Sgr B molecular cloud complex 85 pc to the east of Sgr A\*.<sup>c</sup> The sightline to the west passes through two dense clouds of unusually high negative velocities in Sgr E which show strong absorptions by both  $\text{H}_3^+$  and CO. This sightline also samples a portion of the Expanding Molecular Ring (EMR) which shows strong  $\text{H}_3^+$  absorption but undetectable CO clearly indicating that the gas is diffuse, similar to sightlines closer to Sgr A\*. The  $\text{H}_3^+$  spectrum toward Sgr B reveals at least ten absorption components covering over  $200 \text{ km s}^{-1}$  and by far the largest equivalent width ever observed in an interstellar  $\text{H}_3^+$  line. The CO spectrum is similarly complex but covers a somewhat narrower velocity range indicating mixture of dense and diffuse environments is present along this line of sight. Together the CO and  $\text{H}_3^+$  spectra appear to provide the first near-infrared view into that hotbed of star formation.

Although further characterization of gas in those two sightlines and many more new sightlines must await observations of  $\text{H}_3^+$  and CO this July at the Gemini South Observatory, clearly we are opening up a new vista of the CMZ.

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<sup>a</sup>Oka, T., Geballe, T. R., Goto, M., Usuda, T., & McCall, B. J. 2005, ApJ, 632, 882

<sup>b</sup>Goto, M, et al. 2008, ApJ, 668, 306

<sup>c</sup>Geballe, T. R. & Oka, T. 2010, ApJL, 709, L70