

## IONIZATION OF H<sub>2</sub> BY X-RAYS IN THE CENTRAL MOLECULAR ZONE OF THE GALACTIC CENTER

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Recent studies of the Galactic center using the infrared spectrum of H<sub>3</sub><sup>+</sup> have revealed a high ionization rate of H<sub>2</sub> on the order of  $\zeta \sim 3 \times 10^{-15} \text{ s}^{-1}$  in wide regions of the Central Molecular Zone (CMZ), a region with a radius of  $\sim 150$  pc at the Galactic center.<sup>ab</sup> So far we have ascribed this ionization rate, which is an order of magnitude higher than in the Galactic disk, to cosmic rays because of a high density of supernova remnants in the CMZ. In view of the abundant intense X-ray sources from 1 keV to several 10 keV in the region, however, there may be a significant ionization by X-rays also.

We estimate the ionization rate due to X-rays based on the large scale ART-P X-ray map of the Galactic center region.<sup>c</sup> The calculations proceed in two steps. First we allow for the attenuation of the observed X-rays by the foreground gas to obtain the original intensities of the X-ray sources.<sup>d</sup> We then use the corrected X-ray flux to calculate ionization rates of H<sub>2</sub> in the CMZ. The calculation is also related to the heating of the gas by X-rays. Discussion of the details of calculations and the results will be presented.

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

<sup>b</sup>Geballe, T. R., and Oka, T. 2010, ApJ, **709** L70.

<sup>c</sup>Pavlinkii, M. N., Grebenev, S. A., and Syunyaev, R. A. 1992, Sov. Astron. Lett., **18** 116.

<sup>d</sup>Morrison, R. and McCammon, D. 1983, ApJ, **270** 119.