IONIZATION OF H_2 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_3^+ have revealed a high ionization rate of H_2 on the order of $\zeta \sim 3\times10^{-15}$ s^{-1} in wide regions of the Central Molecular Zone (CMZ), a region with a radius of $\sim$ 150 pc at the Galactic center.[ab] 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.[c] 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.[d] We then use the corrected X-ray flux to calculate ionization rates of H_2 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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[a] Oka, T., Geballe, T. R., Goto, M., Usuda, T., and McCall, B. J. 2005, ApJ, **632** 882

[b] Geballe, T. R., and Oka, T. 2010, ApJ, **709** L70.

[c] Pavlinskii, M. N., Grebenev, S. A., and Syunyaev, R. A. 1992, Sov. Astron. Lett., **18** 116.

[d] Morrison, R. and McCammon, D. 1983, ApJ, **270** 119.