



ENRICO FERMI INSTITUTE COLLOQUIUM

MEASUREMENT OF COSMIC RAYS IN THE GALAXY USING THE H_3^+ SPECTRUM

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The Enrico Fermi Institute has published an enormous amount of direct measurements of cosmic rays but the measurements have been limited on the earth or in the solar vicinity. I would like to talk on our measurements of cosmic rays using chemistry and spectroscopy which I have used since the discovery of interstellar H_3^+ in 1996 [1]. This method has no luxury of measuring the cosmic ray spectrum nor atomic identity but allows us to measure average cosmic ray energy far in the Galaxy like in the Galactic center (GC) and beyond. By using the H_3^+ spectrum we have measured the cosmic ray ionization rate ζ to be on the order of $10^{-17} s^{-1}$ in dense clouds, $10^{-16} s^{-1}$ in diffuse clouds in the Galactic disk, and $10^{-14} s^{-1}$ in the warm and diffuse gas in the GC [2]. These results squarely negate the previous idea of the homogeneous filling of the Galaxy by cosmic rays. The cosmic ray energy density 1000 times higher in the GC than in the solar vicinity was unexpected and its astrophysical implication will be discussed.



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