SEARCH FOR HOT AND BRIGHT STARS FOR H_3^+ SPECTROSCOPY NEAR THE GALACTIC CENTER

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It is becoming increasingly clear that H_3^+ is abnormally abundant near the Galactic center and that it is a powerful probe for studying the gas in that region. To date we have observed a dozen sightlines toward bright and hot stars close to the Galactic plane (within 3 pc) and located in the region from the center to 30 pc east of the center. They are mostly stars belonging to the super-massive Quintuplet Cluster and the Central Cluster, but also include few lying between the two clusters. All sightlines showed H_3^+ with column densities on the order of 4×10^{15} cm^{-2} demonstrating the ubiquity of H_3^+, its high volume filling factor, and high ionization rate of H_2 in the region.[a]
We plan to expand the region in which we have probed for H_3^+ by two orders of magnitude in solid angle by covering the whole of the Central Molecular Zone (CMZ), the region with a radius of $\sim$ 200 pc from the center. For this purpose, the first requirement is to find bright and hot stars suitable for the H_3^+ spectroscopy in this more extended region, in which few if any such stars are known outside of the clusters. We are using the recent GLIMPSE Point Source Catalogue provided by the Spitzer Space Telescope together with 2MASS photometry to identify such stars. Out of the over one million stars in GLIMPSE that are in the sightline to the CMZ, we have selected those few thousand stars with $L < 7.5$ mag. We then use results of *J, K, L* photometry to eliminate likely late-type stars, whose complex photospheric spectra would make it difficult to isolate the weak interstellar lines of H_3^+. For the few hundred stars thus chosen, we are obtaining medium resolution ($R \sim 2000$) spectroscopy from 1.6 to 2.4 μm. The presence or absence of CO overtone bands (2-0, 3-1, 4-2, ...) near 2.3 microns allow us clearly discriminate the hot stars from late-type stars.
So far we have observed 84 candidate hot stars and found a dozen that are usable for H_3^+ spectroscopy. Some of them are probably foreground stars. High resolution spectroscopy of low excitation CO lines and of H_3^+ are required to establish the positions of these stars along the line of sight and the environments in which any H_3^+ is located. The completion of this project will take several years. Quite apart from the application to the H_3^+ spectroscopy, finding *bona fide* young stars near the Galactic center is itself an interesting discovery.

[a] M. Goto, Usuda, Nagata, Geballe, McCall, Indriolo, Suto, Henning, Morong, and Oka, ApJ, 688, 306 (2008)