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[N II] Fine Structure Line Emission from the Milky Way

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We discuss preliminary results from a survey of [N II] emission from the Milky Way carried out with the *Herschel* Space Observatory using the PACS and HIFI instruments. With PACS, we have observed the 122 μm and 205 μm fine structure lines towards approximately 150 pointing directions distributed in the plane of the Milky Way, following the in–plane directions observed by the GOT-C$^+$ project (Langer et al. 2010). For each pointing direction we have 25 observations of each line and from the relative intensities of the different lines of sight, find that the [N II] is spatially extended. [N II] emission is detected in a majority of pointing directions, and in almost every direction observed in the inner Milky Way. The ratio of the intensities of the two [N II] lines can be used to determine the electron density in the region, where the [N II] is present (see e.g., Oberst et al. 2006). We find $n(e)$ between 10 and 100 cm^{-3}, and [N II] column densities between 10^{13} and 10^{14} cm^{-2}. These densities are much greater than expected for the Warm Ionized Medium (WIM), and suggest that the [N II] is produced in much denser ionized regions. We also obtained HIFI spectra of the 205 μm [N II] line, and can make detailed comparisons with the GOT-C$^+$ [CII] spectra. It appears that a good fraction of the [C II] components match very well with those of [N II] suggesting that these are interface regions. There are [C II] components without [N II] which may be "CO Dark H_2", while we do not find any [N II] components without [C II].

REFERENCES

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