Detection of the 205 μm [NII] Line from the Carina Nebula

ABSTRACT

Stacey[1], G.J., Oberst[1], T.E., Loehr[2], A., Nikola[1], T., Parshley[1], S.C., Tothill[2], N. F.H., Harnett[2], J.I., Lane[2], A. P., Stark[2], A. A., and Tucker[3], C.R.
[1]Department of Astronomy, Cornell University
[2]Harvard-Smithsonian Center for Astrophysics
[3]Cardiff University

We report the first detection of the 205 μm $^3P_1 \rightarrow {}^3P_0$ [NII] line from a ground based observatory using a direct detection spectrometer. The line was detected and mapped in emission from the Carina starformation region in the Galaxy using the South Pole Imaging Fabry-Perot Interfereometer (SPIFI) on the Antarctic Submillimeter Telescope and Remote Observatory AST/RO at the South Pole. The [NII] line is an important coolant for the diffuse ionized ISM, and (together with the 122 um [NII] line) is an excellent probe of gas density. The [NII] 205 μm line emission peaks at the Carina II HII region, and its strength indicates a low density ($n < 30$ cm^{-3}) ionized medium. When compared with the ISO [CII] observations of this region, we find about half the [CII] line emission arises from this low density ionized gas as well. The detection of this line demonstrates the utility of Antarctic sites for THz spectroscopy.