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The Hardness of the Radiation in the Warm Ionized Medium

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The warm (~ 10^4 K) ionized component of the interstellar medium (ISM) can be separated into discrete HII regions and "diffuse ionized gas" (DIG). HII regions are zones of ionized gas surrounding massive stars. The DIG is more diffuse and although its emission is fainter, a greater amount of the Galaxy's free electrons are associated with the DIG owing to its larger volume. Despite years of study, significant questions remain about the relationship and differences between the DIG and HII regions, although most previous works have found that massive stars provide the primary source of ionization for both. Here, we use Green Bank Telescope (GBT) Diffuse Ionized Gas Survey (GDIGS) data to investigate the ionic abundance ratio $y^+ = He^+/H^+$ in HII regions and the DIG. GDIGS was the first fully-sampled radio recombination line survey, covering $32° > l > -5°$ and $|b| < 0.5°$ and providing an unbiased view of the Galaxy's ionized gas. Because the ionization potential of helium is almost twice that of hydrogen (24.6 eV versus 13.6 eV), the value of y^+ is indicative of the hardness of the radiation field. We here use GDIGS data to compute y^+ for HII regions and the DIG separately and to investigate any differences in the derived distributions of y^+.