A SEARCH FOR [NE II] 12.8 MICRON LINE EMISSION FROM GALACTIC ULTRACOMPACT H II REGIONS

H. MATSUHARA, H. TAKAHASHI AND H. WATARAI
Department of Astrophysics, Nagoya University
Furo-cho, Chikusa-ku, Nagoya 464-01, Japan

1. Introduction

Starburst galaxies are powered by newly formed massive stars, and are heavily obscured by dust, prohibiting the UV and optical studies. A fine-structure line from Ne^+ ion ([Ne II] 12.8 μm) is usually the brightest mid-infrared(MIR) line emitted from starburst galaxies. The [Ne II] line suffers from far less dust extinction than the optical line does, and hence it is often used as a probe for starburst properties of galaxies(Achtermann & Lacy, 1995; Roche *et al.*, 1991). However, the [Ne II] line should not be used as the physical probe unless the relationship between Ne^+ abundance and spectral type of the ionizing star is established for *very dusty H II regions.* To study this, we started the [Ne II] line survey toward dusty ultracompact(UC) H II regions in our Galaxy. The UC H II regions are powered by newly formed early-type stars whose spectral type can be inferred from their radio and far-infrared(FIR) properties.

2. Observations and Results

[Ne II] 12.8 μm line observations have been made with the 2.3m telescope at Wyoming Infrared Observatory (WIRO) on 15-18 March 1997, using a MIR Fabry-Perot Imager(MIRFI) developed at Nagoya University(Watarai *et al.*, 1996). MIRFI provides the [Ne II] line flux with spectral resolving power of 1500 over a field of 10" $\times$ 10" with a plate scale of 2"/pixel(5 $\times$ 5 pixel).

Among the 9 UC H II regions observed so far, the [Ne II] emission was detected from 6 regions . Then the [Ne II] flux is corrected for the interstellar extinction, and using the 2cm continuum flux obtained from

Y. Sofue (ed.), The Central Regions of the Galaxy and Galaxies, 305-306.

radio VLA observations(Wood & Churchwell, 1989; Kurtz *et al.*, 1994), the Ne^+ abundance($[Ne^+/H^+]$) is derived. The results are shown in table 1, together with spectral type of ionizing star inferred from FIR and radio properties(mostly from Wood & Churchwell and Kurtz *et al.*). The values with an asterisk are preliminary ones.

TABLE 1. Observed UC H II regions and their Ne^+ abundance

Name	Galactocentric Distance [kpc]	Interstellar Extinction(A_V)[mag]	Spectral Type FIR / radio	$[Ne^+/H^+]$ $\times 10^4$
G29.96-0.02	4.4	15	O5 / O5.5	0.78
W51d	6.7	20	O4.5 / –	0.10
K3-50A	9.4	30	O6 / O5.5	0.03*
Mon R2	9.3	23	– / B0	0.03*
G35.20-1.74	6.2	23	O9.5 / O9	0.22*
G45.12+0.13	7.1	25	O5.5 / O6.5	0.26*
G133.95+1.06	11.	6	B0 / O9.5	<0.01
G192.58-0.04	11.	5	B1 / B0.5	<2.0
G76.38-0.62	8.3	22	B2 / B1	<1.4

3. Discussion

The [Ne II] emission was not detected from UC H II regions powered by the B0 and later B stars. This is reasonable because the ionization potential of Ne^0(21.56eV) is higher than that of H(13.6eV), and thus B0 (and later B) stars cannot produce Ne^+ regions. On the other hand, if the spectral type is O7 or earlier than O7, one would expect that Ne^{++} is a major species and hence the Ne^+ abundance is relatively small. However, the results does not show such a trend. In addition, 2"/pixel spatial resolving power of MIRFI now enables us to investigate spatial distribution of $[Ne^+/H^+]$ for some objects. This will be described in Watarai *et al.*, 1997.

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