H_2 AND H I EMISSION LINE IMAGING OF THE RING NEBULA NGC 6720

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ABSTRACT. We present infrared emission line images of the $v = 1 \rightarrow 0$ S(1) transition of molecular hydrogen and Brγ recombination line of atomic hydrogen which cover the entire extent of NGC 6720, the Ring Nebula. The maps presented here are the highest angular resolution images of these transitions yet produced for this object, and have very low relative positional uncertainty. As a result, we clearly resolve the spatial stratification of the ionized and shocked molecular zones within the nebula discussed previously by Beckwith *et al.* (1978). The relative spatial distribution of molecular and ionized hydrogen we observe is typical of several planetaries which exhibit shocked H_2 emission (eg. see Zuckerman and Gatley 1987), and is similar to that predicted by the interacting-stellar-winds model of planetary nebulae formation (see Volk and Kwok 1985 and references therein).

These data, and data from the *Infrared Astronomical Satellite*, were used to determine the H_2, HI, and dust mass within the nebula. The quantitative results are summarized in Table 1. We find, using the recent model of Schonberner (1983), that our measured luminosity for the central star is consistent with evolution from a one solar mass AGB star. We also show that: 1) the Ring is optically thick in the H Lyman continuum, 2) absorption of trapped line radiation is a sufficient energy source to account for most of the observed dust luminosity, 3) the Ring displaces an insufficient volume to sweep up the observed dust mass from the interstellar medium, and 4) the measured H_2 mass is undergoing a period of net photodissociation.

TABLE 1. DERIVED PROPERTIES OF NGC 6720

Parameter	Value	
Distance	525	pc
E_m	5.9×10^{4}	cm^{-6} pc
IRE	1.1	
F_{IR}	3.7×10^{-9}	erg s^{-1} cm^{-2}
L*	135	$L_\odot$
L_{IR}	31.7	$L_\odot$
M_{H_2}	2.7×10^{-6}	$M_\odot$
M_d	1.2×10^{-3}	$M_\odot$
M_g	3.9×10^{-2}	$M_\odot$
N(< 912)	9.5×10^{45}	photons s^{-1}
n_e	600	cm^{-3}
r*	2.9×10^{-2}	$r_\odot$
T*	1.17×10^{5}	K
T_d	50	K
T_e	10^{4}	K

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