AN IMAGING SURVEY OF THE GALACTIC H-ALPHA EMISSION WITH ARCMINUTE RESOLUTION

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1. Introduction

We are presently carrying out a northern hemisphere survey of the Galactic Hα emission. Our instrument, the Virginia Tech Spectral Line Imaging Camera (SLIC) utilizes a fast objective lens ($f/1.2$) with a cryogenically-cooled TK 512×512 CCD. A filter wheel in front of the lens allows us to select interference filters, including a narrowband Hα filter and a broader bandpass continuum filter in a line free part of the spectrum. The fast optics in combination with the low noise CCD result in sub-Rayleigh sensitivity at confusion limited levels. (1 Rayleigh = $10^6/4\pi$ photons cm^{-2} s^{-1} sr^{-1}.) This corresponds to an emission measure sensitivity of ≈ 1 pc cm^{-6}. Parameters of our system are given in Table 1.

Our survey with its 1.′6 resolution is complementary to Reynold's and collaborators' WHAM (Wisconsin H-Alpha Mapper) survey which collects detailed spectral information with approximately 50′ resolution. Other efforts in the southern hemisphere are also complementary to ours. These include a similar survey by J. Gausted, P. McCullough and D. Van Buren, a galactic plane Schmidt survey by Q. Parker and collaborators, and Fabry-Perot observations by D. Russeil and collaborators at Marseille. See papers by McCullough (p. 184), Parker (p. 179) and Russeil (p. 186), this volume.

2. Survey Availability

Our survey has covered 1.3 sr (as of 9/96). The survey already reveals a wealth of structure including very faint filaments away from the galactic plane. Because the survey is CCD based, it contains the full range of

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TABLE 1. SLIC Parameters

Filter Bandpass	1.75 nm
CCD Quantum Efficiency	80% @ 650 nm
CCD Dark Current	10^{-3} e^{-1} s^{-1}
Focal Length	58 mm
Pixel Size	1′.6
Circular Field Diameter	10°
Tracking Precision	2″

surface brightness from sub-Rayleigh structures to 10^3 Rayleigh features (and brighter) near the plane, without saturation of the brighter features. The resolution of the survey makes it ideal for comparison with IRAS maps and X-ray observations, as well as HI observations in order to study the relationship between the various phases of the ISM and the warm ionized medium.

We are presently calibrating the existing observations and shall soon make them available as FITS images at our web site:

`http://www.phys.vt.edu/~astrophy/halpha.html`

We have also constructed mosaics of several extended regions near the galactic plane. These are available as GIF and JPEG images at our web site. The mosaics are presented in a nonlinear display to show qualitatively the detailed structure.

3. Early Scientific Results

We have carried out deep Hα observations of fields in which other groups have observed apparent anisotropies in the cosmic microwave background. Our results rule out any significant contribution from foreground galactic free-free emission (Simonetti *et al.* 1996).

We have also discovered a supershell inflated by stellar winds from young stars associated with the HII region W4. This structure was previously thought to be an open galactic chimney.

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References

Simonetti, J.H., Dennison, B. and Topasna, G.A., 1996. Astrophys. J. Letters, 458, L1