HIGH–RESOLUTION V–BAND PHOTOMETRY OF THE MILKY WAY

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High resolution (0°.25 × 0°.25) surface brightness distribution in V of the southern Milky Way over an area of $200° \leq l \leq 60°$ and of $-30° \leq b \leq +30°$ was obtained by photographic plates, taken at La Silla, Chile, with the super-wide-angle camera with spherical mirror of the Astronomisches Institut der Ruhr-Universität Bochum (Schmidt-Kaler et al. 1983). Schmidt-Kaler et al. (1983) and Seidensticker, Schmidt-Kaler, and Schlosser (1982) carried out an analysis of these plates. However, these studies used only a fraction of the whole plate; interesting parts of the sky were chosen near the plate centers, thus minimizing various errors. The plates are now all scanned over the whole field of view with a PDS with a diaphragm of 50 × 50 μm = 0°.12 × 0°.12 on the sky. The image size is 1201 × 1201 pixels per plate. The mean deviation during the scan time was less than 0.1%. Through the identification of about 50 stars and by using their l, b and x, y coordinates, the equations of the plates were solved with eight geometric parameters. The standard deviation of all parameters was less than 0.3 pixels on all plates.

To calibrate the plates in relative intensities, plates of the same emulsion batch, exposed with a wavelength-dependent step wedge and developed in the same bath, were used. A modified algorithm by Moffat (1969) was used in which the unknown source of the spectrograph was superimposed as a wavelength-dependent parameter ($c_{0,j}$). By regression of all points of all curves (j = number of curves), a system of j+2 nonlinear equations was obtained and solved:

$$g(c_{0,j}, c_1, G) = \log(I_{i,j}) = c_{0,j} + c_1 * \log(10^{G*(D-Df)} - 1), \quad (1)$$

with D = measured density on the photographic plate and Df = fog at the unexposed parts of the plate.

During the same night, photoelectric measurements were made for absolute calibration of the plates in S_{10} units. The vignetting of the plates was corrected by

$$f(\Psi) = 1 - 2.43 * \Psi^{1.45} \quad (\psi \text{ in radians}). \quad (2)$$

The zodiacal light contribution, taken from the tables of Levasseur-Regourd and Dumont (1980), were well fit for all plates. The atmospheric extinction turned out to be quite constant within the observing period. The greatest problem was the correction of airglow due to variation within the night. The brightness of the night sky was measured photoelectrically close to the meridian at various zenith distances up to x = 80°. From a sample of such scans during the entire night, the airglow at zenith for the time of exposure was determined. With van Rhijn's (1921) formula, the airglow for the whole plate was corrected:

S. Bowyer and C. Leinert (eds.), The Galactic and Extragalactic Background Radiation, 203–204.

$$I_A(z) = I_{A0} * [(1-c^2) * \sin^2(z)]^{-0.5}, \tag{3}$$
$$c = R_E/(R_E+h),$$

where R_E is the earth radius and h is the altitude of the emitting layer. After all corrections were applied, the plates were transformed into galactic coordinates. The resulting V-band map was obtained by combining and averaging seven plates with a raster of 0°25 × 0°25. This map is shown in Figure 1.

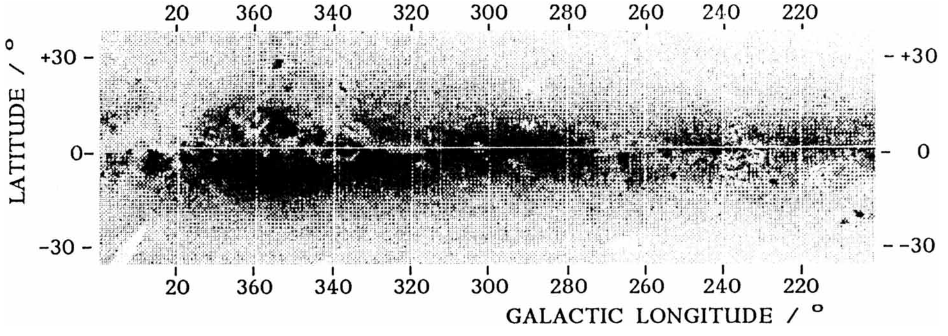

Figure 1. Surface brightness of the Milky Way in V-band. Stars brighter than $m_V = 7.5^m$ were removed. Note the prominent local dust clouds and the bright bulge.

In combination with Kimeswenger et al. (1989, this volume) and Schlosser, Schmidt-Kaler, and Schneider (1989), (U-B) and (B-V) color maps that display global parameters of the galaxy and the central dust lane (see Kimeswenger et al. 1989, this volume) were obtained.

REFERENCES

Kimeswenger, S. et al. 1989, in *Proceedings of IAU Symposium #139, Galactic and Extragalactic Background Radiation,* eds. S. Bowyer and C. Leinert, Kluwer Academic Publisher, Dordrecht, The Netherlands.

Levasseur-Regourd, A.C., Dumont, R. 1980, *Astron. Astrophys.,* **84,** 277.

Moffat, A.F.J. 1969, *Astron. Astrophys.,* **3,** 455.

Schlosser, W., Schmidt-Kaler, Th., Schneider, H. 1989, *Astron. Astrophys.,* in preparation.

Schmidt-Kaler, Th., Seidensticker, K.J., Pröll, H.J., Schlosser W., Beck, R. 1983, *Astron. Astrophys. Suppl. Ser. 51,* 1.

Seidensticker, K.J., Schmidt-Kaler, Th., Schlosser, W. 1982, *Astron. Astrophys.,* **114,** 60.

van Rhijn, P.J. 1921, *Publ. Astron. Lab. Groningen,* 31.