Proceedings of the ESO Workshop on Two Dimensional Photometry Soon Available

The Proceedings of this workshop have now been edited and will be available in print at the end of April 1980.

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2.2

In the format used at La Silla, the camera scanned 1,532 lines of 113 pixels each, and the "data window" (the area from which data were recorded) was 1,500 by 72. The frame is read perpendicular to the wavelength dispersion, i.e. one scan-line corresponds to one wavelength.

Photon and ion events are of a substantial size, covering up to 5 and 9 lines, respectively, for the 1,532 by 113 format. On passing through the shift register array these data are analysed by a hard-wired pattern recognition system, and the centre of the event, in the direction perpendicular to the scan-line, is determined. This position is then transferred to the computer system for incrementing the associated memory location, there being one location for each pixel within the "data window". Ion events are rejected in the pattern recognition system by comparing data in the photon + ion shift registers with those in the ions-only shift registers.

The number of photons per pixel per second beyond which saturation occurs depends on the speed with which the frame is read. With the large format used during the observations at La Silla, 1,532 lines of 113 pixels each, saturation starts at a rate of photon arrival in excess of one photon per pixel per second.

In practice, saturation is seldom a problem since the instrument is used to observe extremely faint stellar objects or extended objects of faint surface brightness. But care must be exercised in the choice and the observations of standard stars.

3. Data Acquisition and Data Reduction

The IPCS was installed on the 140-mm camera of the Boller and Chivens spectrograph at the Cassegrain focus of the 3.6-m telescope. As stated in section 2.2, the data window is 72 x 1,500, i.e. one IPCS image or frame is formed by 72 spectra of 1,500 pixels each. The distance between the individual spectra is 1".7 and the whole image covers 2'. With the 600 lpm grating, the wavelength range covered is 4320 Å, corresponding to 2.28 Å per pixel.

An image of the He-Ar comparison spectrum is taken for each galaxy or star image, and when observing galaxies which extend over the whole slit length, images of the blank sky are also taken to enable sky subtraction to be performed. As usual, the pixel-to-pixel variations are calibrated by taking an image of a flat field, and the response curve versus wavelength is determined by observing standard stars.

At ESO in Geneva, there are two ways of doing the dispersion correction of the images. One way is to consider each of the 72 spectra individually and to reduce them separately as if, for example, they were IDS scans. A batch command allows automatic reduction of all the individual spectra in a frame after the first one has been reduced.

The main shortcoming of this method is that it does not use all the information contained in the arc images; specifically, it does not use the fact that each line of the comparison arc is continuous and can be represented by a smooth function such as a polynomial. Dr. Werner Krischer at CERN has developed a powerful computer programme to extract the shape of particle tracks recorded on bubble chamber photographs. This programme is being adapted to the reduction of IPCS spectra by Cheryl Bettels of ESO with the help of Dr. Krischer and Dr. Danziger.

4. Results on Elliptical Galaxies

4.1 Scientific Rationale

It has been known for several decades that a small fraction of elliptical galaxies contain some ionized gas.

Basic information such as the spatial distribution, the angular momentum, and the total mass of the interstellar gas in ellipticals is essentially missing. Even the origin of the gas is uncertain.

The amount of gas now observed in elliptical galaxies is much smaller than the quantity of gas produced by the stars through their evolution. There must, therefore, be an effective mechanism removing most of the gas from the ellipticals. Moreover, there is a large dispersion in M_{gas}/M_{total} among ellipticals. Could this be caused by an irregular rate of gas production? or is it due to irregularities in the regime of galactic winds believed to sweep ellipticals of most of their interstellar gas? An alternative explanation for the dispersion in M_{gas}/M_{total} is that some ellipticals are accreting intergalactic gas, as suggested by the recent discovery that a number of ellipticals have large irregular-shaped clouds of neutral hydrogen. If this later explanation turns out to be correct then the usual assumption, that galaxies do not receive any new material after the epoch of galaxy formation, should be abandoned.

A second important question relative to the interstellar gas in elliptical galaxies is the relationship between the interstellar gas and the radio galaxy phenomenon. It has recently become evident that many radio galaxies exhibit extended (i.e. extra-nuclear) optical emission features. In some cases, studies of long slit spectrograms have led astronomers to suggest that such features are "jets" of material, related in some unspecified way to the radio features or optical continuum jets being shot out from the galaxies' nuclei. A study by Ford and Butcher (*Ap.J.* 1979, in press) of the emission in M87, however, led those astronomers to conclude that the features in that galaxy are most likely manifestations of matter *infall* into the nucleus.

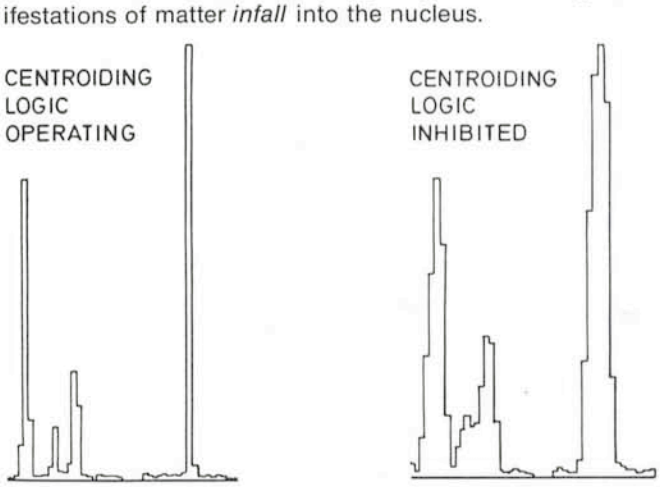

Fig. 2: *Comparison lines. The centroided line-spread-function is less than one channel wide, while the non-centroided case extends over many channels.*