INTERNAL MOTIONS IN THE PLANETARY NEBULA NGC 6853

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Je voudrai bien parler la langue classique de l'interférometrie, mais le temps nous est cher et je passerai à l'Anglais.

I have made an interferometric study of the planetary nebula NGC 6853. A system with a Fabry-Perot étalon was used, but not a common one. In the classical arrangement known from Fabry's time (Figure 1), the étalon is placed in the exit pupil, formed by a

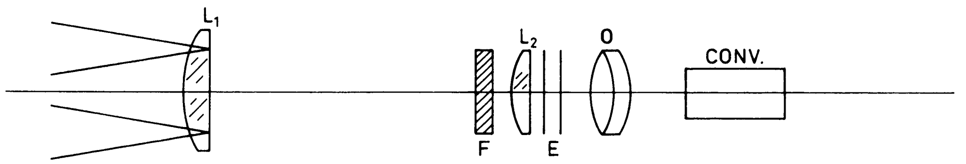

FIG. 1. *A classical arrangement of the Fabry-Pérot étalon.*

field lens, i.e. in the plane where the image of the telescope mirror is formed by this lens, while in our system the étalon is in the focal plane of the telescope and the image of the nebula is formed in the plane of the étalon (Figure 2).

In the classical system the fringes are superimposed on the image of the nebula; we

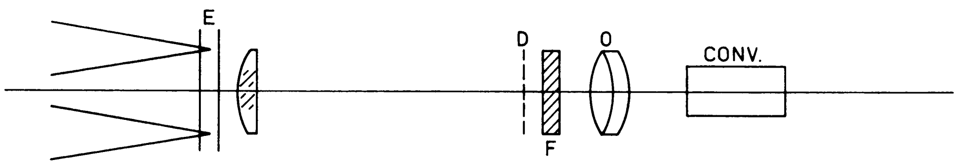

FIG. 2. *A narrow-band filter with Fabry-Pérot étalon.*

see it only at the points where the conditions of maximum transmission are fulfilled. The II system acts as a narrow ($\delta\lambda \approx 0{\cdot}7$ Å) filter; we obtain a picture of the whole nebula in a chosen interval of wavelength. This interval can be changed by changing the annular diaphragm in the exit pupil of the system. The equivalent bandwidth of such a system is 1·1 Å, and the transparency is about 50%. The dimensions of the

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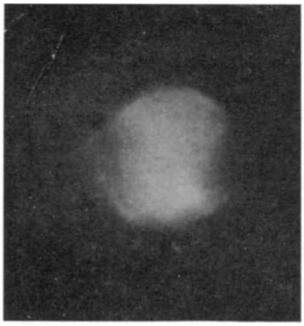

Fig. 3
−135; −165; 16

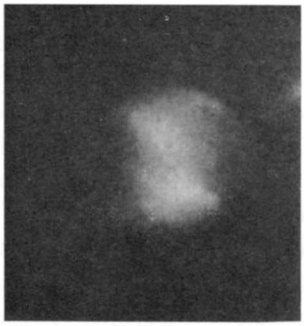

Fig. 4
−25; −45; 6,5

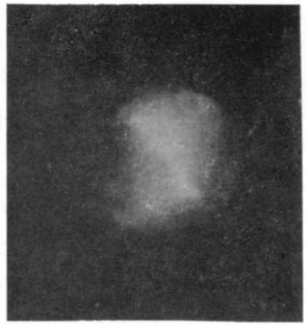

Fig. 5
+48; +98; 10,5

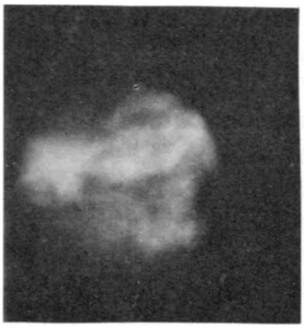

Fig. 6
+30; +59; 17

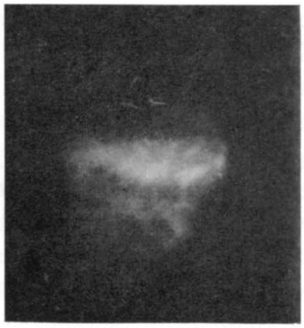

Fig. 7
+59; +90; 0,36

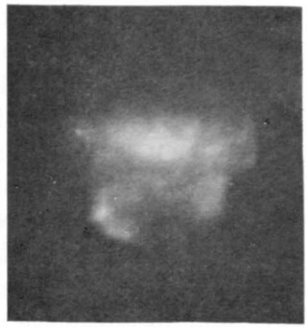

Fig. 8
+99; +118; 1,1

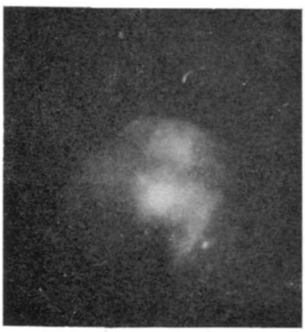

Fig. 9
−41; −89; 0,09

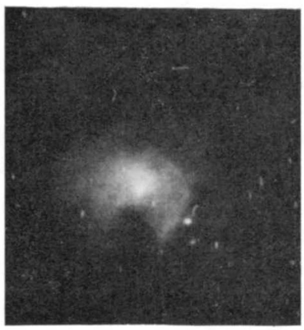

Fig. 10
−11; +19; 0,0006

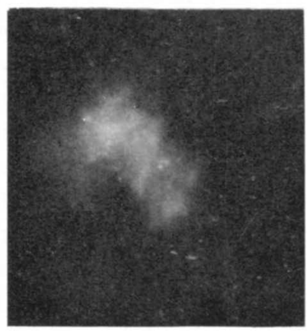

Fig. 11
+99; +147; 0,14

FIG. 3–11. *Three nebulae, each in three different velocity intervals as indicated by first two numbers (in km/sec); third number is relative exposure. Figures 3–5 are NGC 6853; 6–8, NGC 6618; 9–11, NGC 1976.*

fringe isolated are, however, smaller than the image of the mirror, which results in stopping down the telescope. The loss of light is by a factor of $D_0^4/(D_1-D_2)^4$; we cut down the aperture of the telescope in the ratio $D_0^2/(D_1-D_2)^2$, and use only a fraction of the line profile. In the case of a rectangular line profile filling all the mirror image we loose another factor $D_0^2/(D_1-D_2)^2$, where D_0 is the diameter of exit pupil, and D_1 and D_2 are the inner and the outer diameters of the annular diaphragm. The image is therefore photographed by a contact image converter.

The overlapping of the orders of the étalon can be a source of serious trouble; the spacing of the étalon used was chosen to make the 6584 Å and 6548 Å [N II] lines coincide and to put them at a distance of $\frac{1}{2}$ order, i.e. 750 km/sec from Hα. It allowed an interval of velocities of ± 400 km/sec to be studied without obstacles. The [N II] lines were partly transmitted by the interference filter.

The planetary nebula NGC 6853 was studied together with the diffuse nebulae NGC 6618 and 1976. All three nebulae are seen in an interval of radial velocities of ± 120 km/sec relative to the Sun. The bright parts of all three nebulae are seen in all the velocity intervals studied. The changes of shape of NGC 6618 and NGC 1976 when the velocity interval is shifted are much more pronounced than the changes of shape of NGC 6853. The brightness of the high-velocity parts is about 2–5% of the brightness of the nebula in the central part of its emission line. In Figures 3–11 we see the nebulae NGC 6618, NGC 1976 and NGC 6853 in different velocity intervals; these intervals in km/sec and the relative exposures in an arbitrary system are given on the figures. It must be noted that high velocities are found also in NGC 6611 and NGC 6853. Both these nebulae have exciting stars within them. But in the central part of NGC 7000, whose exciting star is outside the nebula, the width of Hα corresponds to the thermal velocities of gas motion.

References

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DISCUSSION

Andrillat: Quel est le temps de pose nécessaire pour obtenir la photographie de la Nébuleuse Dumb-bell?

Sheglov: Il est 10 min pour les parties les plus intenses, et 1 heure pour les régions les plus faibles.

Münch: In relation to Sheglov's report, I must confess my inability to understand why Wilson and I failed to detect ± 100 km/sec components in the Orion Nebula. Our instrumental characteristics and exposures were such that we should have detected such components if they were 5% as strong as the main component.

Vaughan: Is it certain that we have no contamination by very faint lines of other ions in the bandpass of the isolating filter, and that no étalon ghosts are present?

Sheglov: A single modern Fabry-Perot étalon allows us to obtain a contrast of about 100 for close spectral lines; for a spectrograph this is more difficult.