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An Infrared Multiobject Fiber–Fed Spectrograph for the Calar Alto Observatory

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Abstract. We report the first use of a near infrared multiobject spectrograph that can acquire 1–2.5 μm spectra of up to 35 objects in a 1000 arcsecond field.

1. Introduction

Recent technological advances have revolutionized observations in the near infrared, and instruments based on optical fibers are poised to make a significant impact in several fields of astronomy. This paper presents technical details and initial observational results for a new infrared fiber–fed multiobject spectrograph based at the 3.5 m telescope on Calar Alto, Spain.

2. The Instrument

The spectrograph combines the Spaltspinne ("slit spider") fiber positioning device with the MAGIC infrared camera (Pitz 1993, Herbst *et al.* 1993). Figure 1 is a schematic drawing of the optical path. The fibers are only 60 cm long, resulting in minimal focal ratio degradation and good transmission over the J (1.13–1.37 μm), H (1.5–1.8 μm), and K (2.0–2.4 μm) photometric bands. The grism is a resin replica design, with a Milton–Roy 150 line mm^{-1} grating bonded to the hypotenuse of a prism fabricated of Ultran 30 (Schott). The grism gives spectral resolution $\frac{\lambda}{\Delta\lambda} \sim 200$ and permits simultaneous H and K band coverage in first order and J band coverage in second order. Measurements in the lab and on the telescope indicate that the transmission of the grism exceeds 75%.

3. First Observations

We commissioned the spectrograph in January 1994 at the 3.5 m telescope on Calar Alto, Spain. The 400μm core of the fibers corresponds to a 2.4 arcsec aperture at this telescope. Figure 2 shows a typical 10 second exposure of the Orion stellar cluster. The wavelength ranges from 1.5 μm on the left to 2.4 μm on the right. Approximately 25 distinct stellar spectra appear in the image, with the balance of the fibers being assigned to empty sky. An equal duration off–source exposure has been subtracted to remove airglow lines and thermal emission. The remnant excess noise appears at the longest wavelengths. Figure 3 contains a

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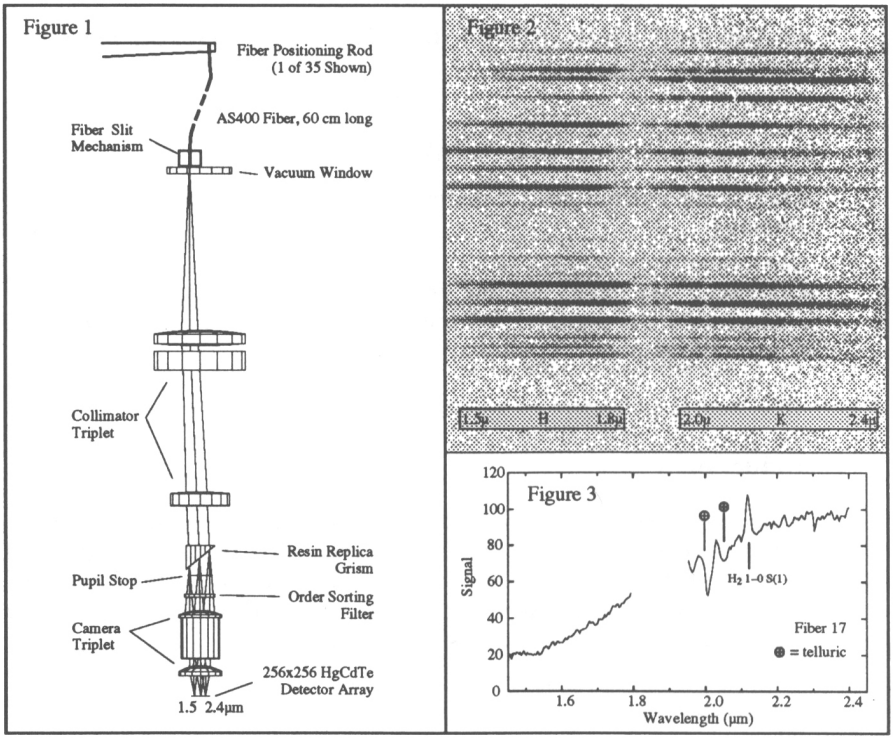

typical spectrum extracted from the average of $\sim$ 100 such exposures. These spectra will form part of the dataset used in an ongoing program to analyze the stars in embedded infrared clusters.

4. Conclusions

Poor weather conditions prevented an assessment of the instrument's throughput on the telescope in 1994 January. Nevertheless, we identified several modifications to the Spaltspinne / MAGIC fiber–fed infrared spectrograph which will improve its performance in the coming months, and we plan to have the instrument in regular operation for observing programs at Calar Alto by mid–summer 1994.

References

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