DEVELOPMENT OF THE SINGLE FIBRES AND IFUS OF WEAVE

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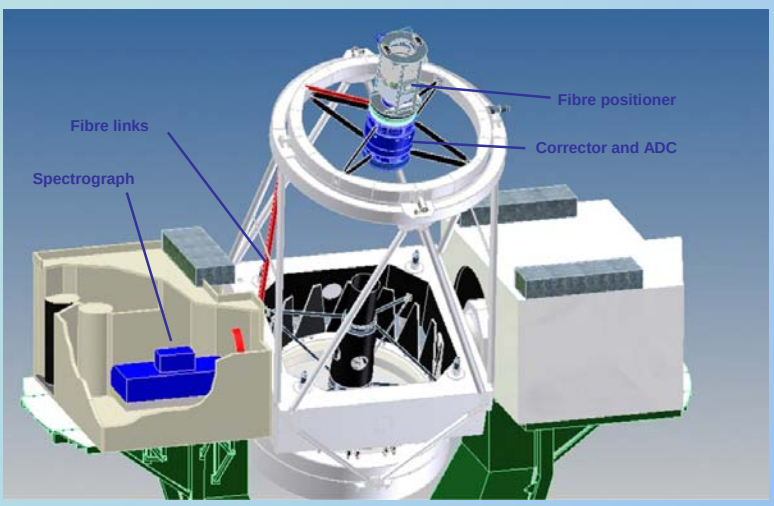


WEAVE concept:

WEAVE is a new wide-field spectroscopy facility proposed for the prime focus of the 4.2m William Herschel telescope.

The facility comprises a new 2 degree field of view prime focus corrector with a 1000-multiplex fibre positioner, a small number of individually deployable IFUs, and a large single IFU.

The IFUs and the MOS fibres can be used to feed a dual-beam spectrograph that will provide full coverage of the majority of the visible spectrum in a single exposure at a resolution ~5000 or two 50nm-wide regions at a resolution of ~20000.

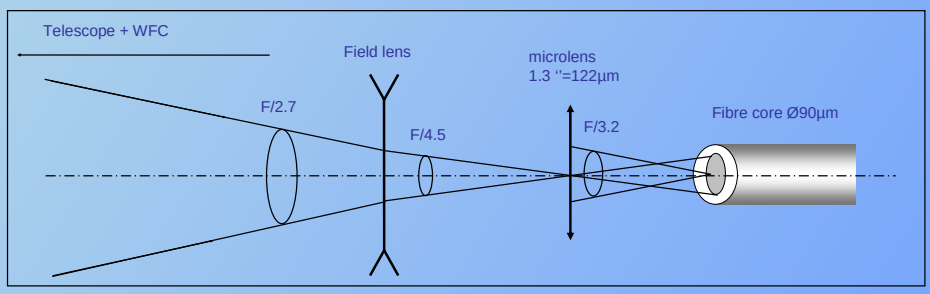
The WEAVE fibres ensure the link between the positioner and the spectrograph.

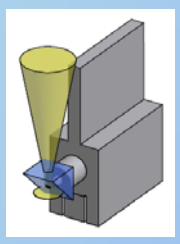
Fibre injection principle for the IFU:

- Field lens to slow down the beam

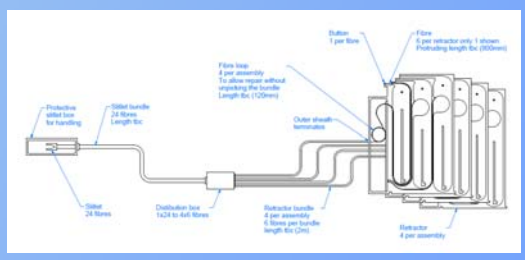
- Pupil image on the fibre core

- Permits to avoid field losses due to gaps between cores





Button of the single fibre



A bundle is composed of 24 fibres that enter into four retractors, each of which holds six fibres.

A possible use of WEAVE: exoplanet searches in star clusters

As more and more exoplanets are found, there are still many things we would like to understand on planet formation and its dependence on the environment. Things like the dependence of planet formation on the metallicity of the host stars or its mass. There are indications that more massive stars and more metal-rich stars are more likely to form giant planets, yet the picture is complicated by the fact that currently available samples comprise stars of different ages and metallicities.
These issues could be conveniently tackled by studying the planet population in several groups of stars with the same age and chemical composition. Such groups of stars are indeed available as stellar custers, both Open and Globular clusters provide interesting samples of stars for which we would like to know the frequency of planets, and the characteristics of these planets. A multi-object spectrograph capable of delivering radial velocities accurate to 10 m/s would be the ideal instrument for this investigation, that is prohibitively costly in terms of telescope time with single-object spectrographs. Could WEAVE provide such a performance ? We believe so, by analogy to what has been achieved by Giraffe. A precision of 30 ms has been claimed by [1]. Like WEAVE, Giraffe was designed to achieve a radial velocity precision of the order of 1 kms. The high resolution mode of WEAVE will have more or less the same resolution as the high resolution mode of Giraffe, but a wavelength coverage that is four times larger. Using the scaling relation provided by [2]

$$\sigma_{\mathrm{RV}} = \mathrm{const} \times (S/N)^{-1} R^{-\frac{3}{2}} (\Delta\lambda)^{-\frac{1}{2}}$$

where *R* is the resolution, *S/N* the signal-to-noise ratio and D*l* the spectral coverage, we conclude that at a given S/N ratio WEAVE should achieve an error in radial velocity a factor of 2 smaller than Giraffe, i.e. of the order of 15 ms.

References:

[1] Loeillet, B., Bouchy, F., Deleuil, M., Royer, F., Bouret, J. C., Moutou, C., Barge, P., de Laverny, P., Pont, F., Recio-Blanco, A., and Santos, N. C., "Doppler search for exoplanet candidates and binary stars in a CoRoT field using a multi-fiber spectrograph. I. Global analysis and first results," *A&A* 479, 865–875 (Mar. 2008).
[2] Hatzes, A. P. and Cochran, W. D., "Radial Velocity Searches for Extra Solar Planets from Keck and McDonald Observatories," in [*From Extrasolar Planets to Cosmology: The VLT Opening Symposium*], Bergeron, J. and Renzini, A., eds., 539 (2000).

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