Formation and Evolution of Galaxy Bulges
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VIRUS-W A fiber based integral field unit spectrograph for the study of galaxy bulges

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Abstract. We presented the design for a fiber based integral field unit spectrograph for the new two meter class Wendelstein telescope in Bavaria, Germany. The proposed spectrograph will feature a fiberhead consisting of 246 individual optical fibers and a field of view of approximately $1' \times 2'$ and two different spectral resolution modes optimized for the study of bulges of local late-type galaxies.

Keywords. galaxies: bulges, galaxies: kinematics and dynamics, instrumentation: spectrographs

1. Introduction

We develop a fiber based integral field unit (IFU) spectrograph for the new two meter Wendelstein telescope in Bavaria. The design is heavily based on the VIRUS spectrograph proposed for the HETDEX experiment (see Hill *et al.* 2006 to Kelz *et al.* 2006). It will feature a fiberhead consisting of 246 individual optical fibers and a large field of view of about $150'' \times 75''$. We aim for two different modes of spectral resolution. The low resolution mode — dedicated to stellar population studies — with R $\simeq$ 3000 will cover the wavelength range from 4750 Å to 5600 Å enabling the observation of H_β and the Fe5270, Fe5335 and Fe5406 lines and their corresponding pseudo-continua up to z $\simeq$ 0.03. The medium resolution mode — dedicated to kinematical studies — with R $\simeq$ 7850 will enable the study of velocity dispersions down to 17 km/s. The covered wavelength range will be 370 Å wide and reach from 5070 Å to 5445 Å. This covers the Mg lines at 5167 Å, 5172 Å and 5183 Å up to a redshift of 0.03. Given an about eight times larger spatial coverage and a spectral resolution which is higher by a factor of two, VIRUS-W will extend studies of the SAURON (see e.g. Davies *et al.* 2001, Bacon *et al.* 2001) spectrograph into the direction of local late-type and lower mass galaxies. Based on the experience from the VIRUS prototype we estimate about one year for the construction. Since the Wendelstein 2 m telescope will not be available by then we may start observing with VIRUS-W at the McDonald 2.7 m Harlan Smith Telescope in Texas.

2. Optical design

The input focal ratio of the spectrograph is f/3.35. The fibers are arrayed in a pseudoslit which is located within a folding mirror. An anti reflective coated cylindrical normalizer lens is attached to the fibers. The two volume phase holographic gratings can

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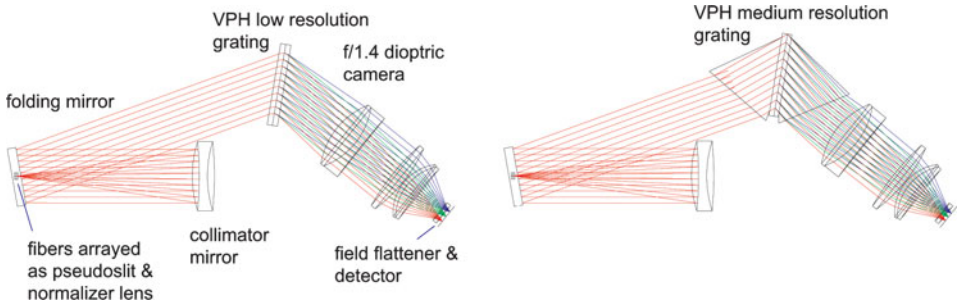

Figure 1. VIRUS-W in low resolution (left) and medium resolution (right) configuration.

be exchanged while keeping position of the camera fixed. The f/1.4 dioptric camera is based on the SALT telescope High Resolution Spectrograph red arm camera designed by Bernard Delabre at ESO and incorporates mostly spherical components. The utilization of fibers allows to place the spectrograph inside a climatized room underneath the telescope dome. Drifts due to temperature changes or changing g vector are therefore avoided. We chose to implement a rectangular IFU geometry $20/21 \times 12$ fibers with a pitch of 255 μm. Given a f/3.65 beam this results in a head size of 5.36 mm $\times$ 2.68 mm or a $150'' \times 75''$ field of view, the fiber have a diameter of $4.4''$ on sky and cover an area of 14.1 arcsec^2 each.

3. Sensitivity

Based on theoretical predictions by the grating manufacturers and the current telescope design a preliminary calculation suggests a signal to noise ratio of about 10 for the medium resolution mode, a one hour exposure and an object with a V band surface brightness of 22 mag arcsec^{-2}.

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