2.7 – The mechanical design

The mechanical project comprises two well separated parts, the fore-optics box and the bench spectrograph.

2.7.1 The fore-optics box

The fore-optics box is mounted on a side of the Instrument Selector Box of the telescope, using a flange with 6 bolts distributed on a circle. The fore-optics box contains the following main components:

1) a moveable plate, operated by remote control, supporting the two interchangeable sets of fore-optics lenses that provides the different magnifications (see section 2 for a discussion of the optics). We are presently discussing the need leave room for an additional fore-optics system, that could be useful if the system is to be used with adaptative optics in future.
2) a third fore-optics system for the sky IFU, which is not moveable. It is suspended "above" the interchangeable fore-optics, in such a way that it does not limit the access to adjust or align the main fore-optics.
3) a sliding plate that allows 3 different Shot filters and a blank space to be interchanged by remote control. Note that the focus of the telescope is 150 mm outside the external surface of the ISB. The filter plate is placed in this space, before the magnification lenses.
4) a mask, very close to the microlens array, that can slide and presents different options, like full illumination of the array, illumination of only half of the array for shuffle- and- node observations, or a slit that allows only a column of the array to be illuminated, in order to study the profile of the image of individual fibers on the CCD. The mask is remotely controlled.
5) an adjustable systems to hold the microlens arrays, able to provide alignement od the arrays with the fore-optics. This is a critical adjustment, but it does not require remote control.

Although a same field lens is designed for the two fore-optics sets with different magnifications, it is not situated at the same distance of the microlens array in the two cases. In other words, if we make the option of using a single field lens for the two sets, we would have to adjust its position along the optical axis. We prefer to duplicate the field lens, so that a single lateral displacement of the supporting plate changes the whole set, magnification lenses plus field lenses.

In summary, 3 systems mounted on sliding tracks are remotely controlled, for the interchange of fore-optics, of filters and of masks.

The microlens holder, fiber bundle, stress-release box, will be very similar to those of the prototype. A direct inspection of the prototype is better than a any description.

The fore-optics box is illustrated in Figures 2.7-1 . The mechanism used to hold the filter plate is not shown, nor the mask. note the sky fore-optics, hanging above the main fore-optics in use.

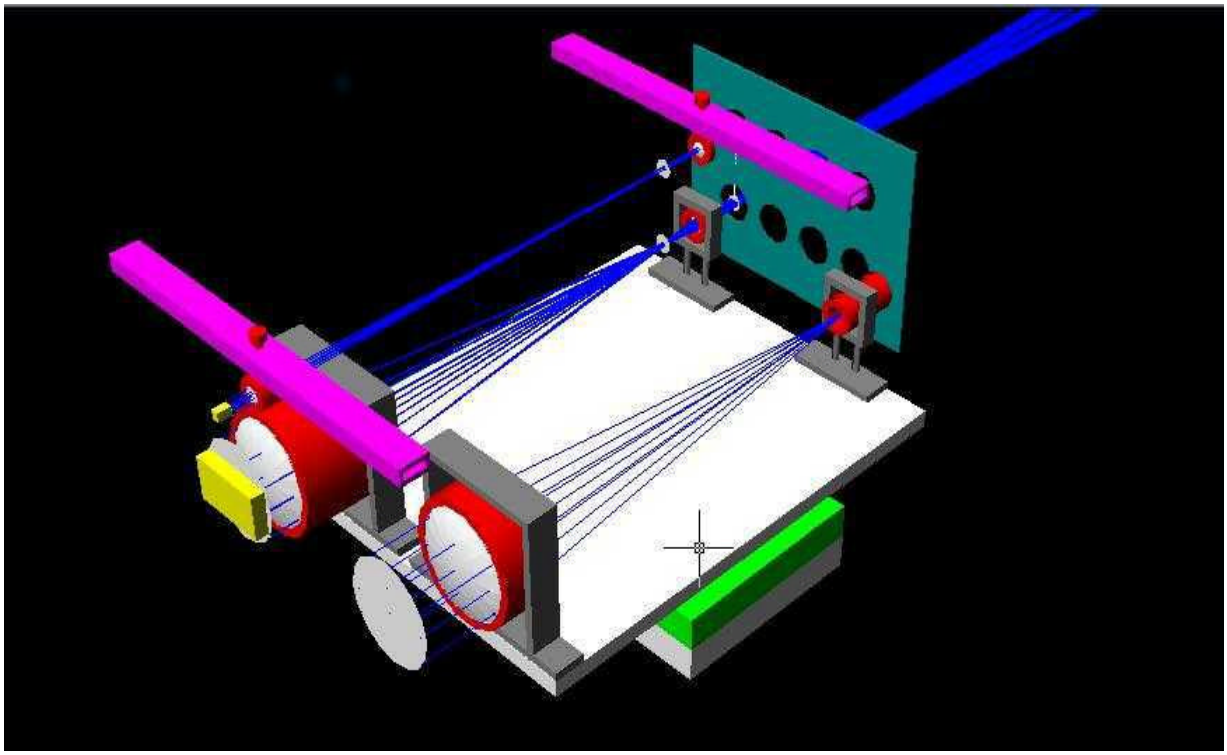


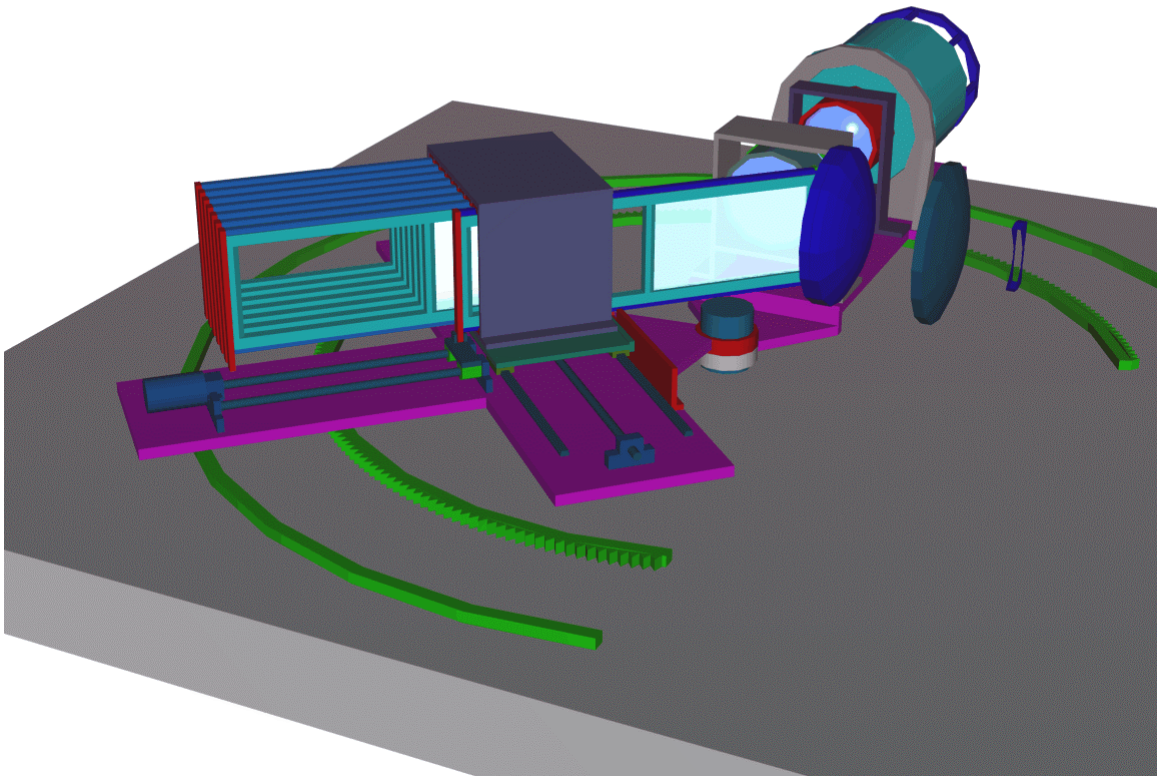
Figure 2.7.1 *The interchangeable fore-optics and the sky IFU fore-optics*

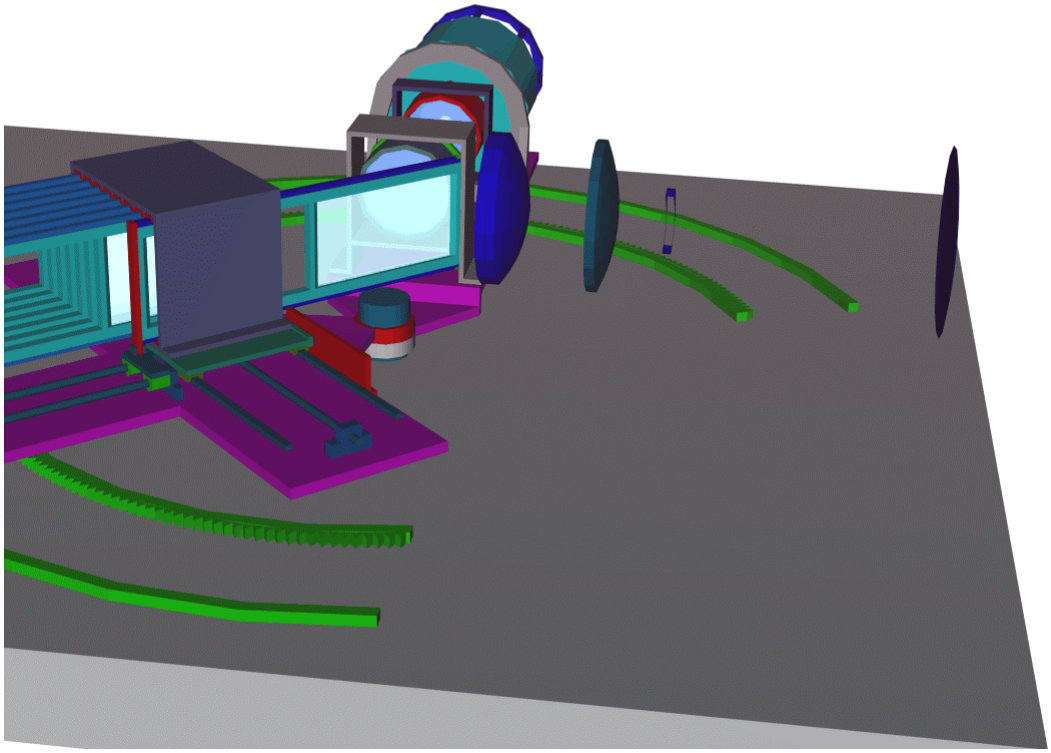
2.7.2 The bench spectrograph

The bench spectrograph will be installed on the platform of the telescope, which is part of the azimuth mount. The spectrograph is mounted on a 2.4m x 2.4m table of aluminium honeycomb structure with 150 mm thickness, supported by 4 pneumatic short legs for vibration isolation. The whole spectrograph will be covered with an aluminium cover that will isolate it from external light.

The fiber slit is mounted on a system that allows fine adjustment of the position and angle of the slit. The collimator mechanical parts are usual lens supports, directly fixed on the bench, with capability for optical alignment.

Independent rotation of the transmission gratings and of the camera, is provided by two independent support plates that share a same central axis and a same circular rail. Usually, the camera is placed at an angle about twice the angle of the grating, with respect to the beam coming from the collimator, in order to be close to the Bragg condition. The two independent plates can rotate around the central axis that passes through the center of the grating which is being used. On their external parts, the plates are supported by a rolling ball systems (two for each plate) that run on a circular rail, purchased from THK. The next figures illustrate this geometry.





The rotation of the grating exchanger and of the camera is provided by two similar systems, with a motor that rotates a screw mounted under each plate, running along a common toothed ring fixed on the bench. The maximum angle of the camera will be about 67 ^{o}. Absolute encoders mounted on the rotation axis will provide reading of the angle of the camera and of the grating.

An important component is the grating exchanger, which looks like the carriage of a slide projector. It is able to offer a choice of 8 gratings (possibly at the beginning of the operations only a smaller number will be available). Two sliding systems, based on THK rails, are needed to change the grating: one moves the grating carriage, and the other moves the grating in and out.