Student Engineering Projects 2019

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  These are ING's major projects:

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[INGPUBLIC]

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This is an important source of breaking news concerning the Isaac Newton Group of Telescopes (ING) especially with regard to telescope time. To subscribe or manage your subscription, visit: [INGNEWS] home page.

Student Engineering Projects for 2019

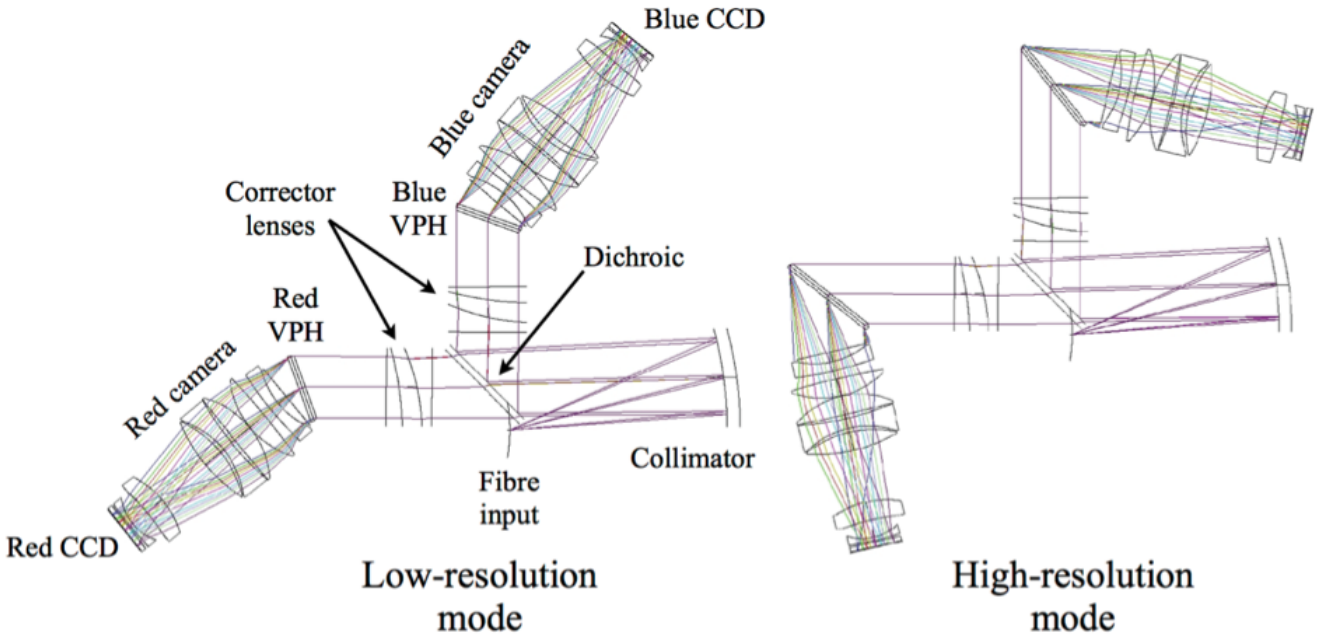
WEAVE

WEAVE is the next observing facility being built for the 4.2-m William Hershel Telescope. The facility comprises a new 2-degree field-of-view prime focus corrector with a pick-and-place fibre positioner, a small number of individually deployable integral field units (IFUs), and a large integral field unit. The IFUs and the MOS fibres can be used to feed a dual-beam spectrograph and the facility is expected to be on-sky by 2019.

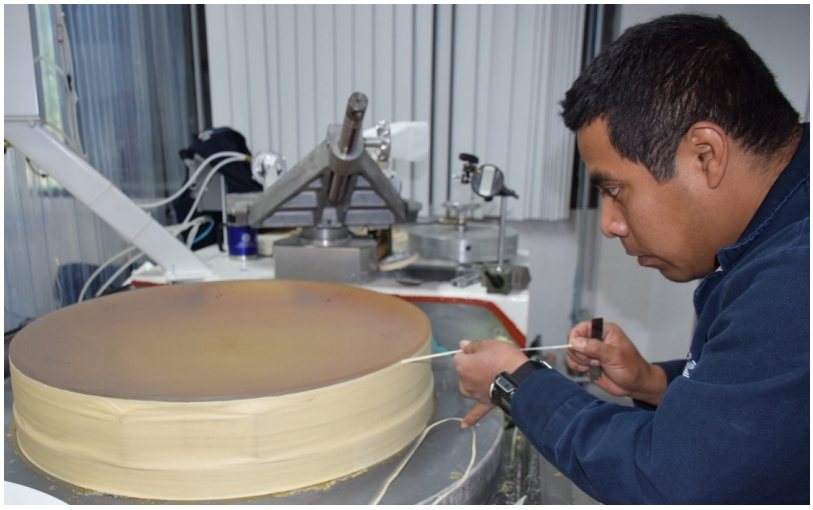
Project 1: Planning integration of the spectrograph into GHRIL

Background

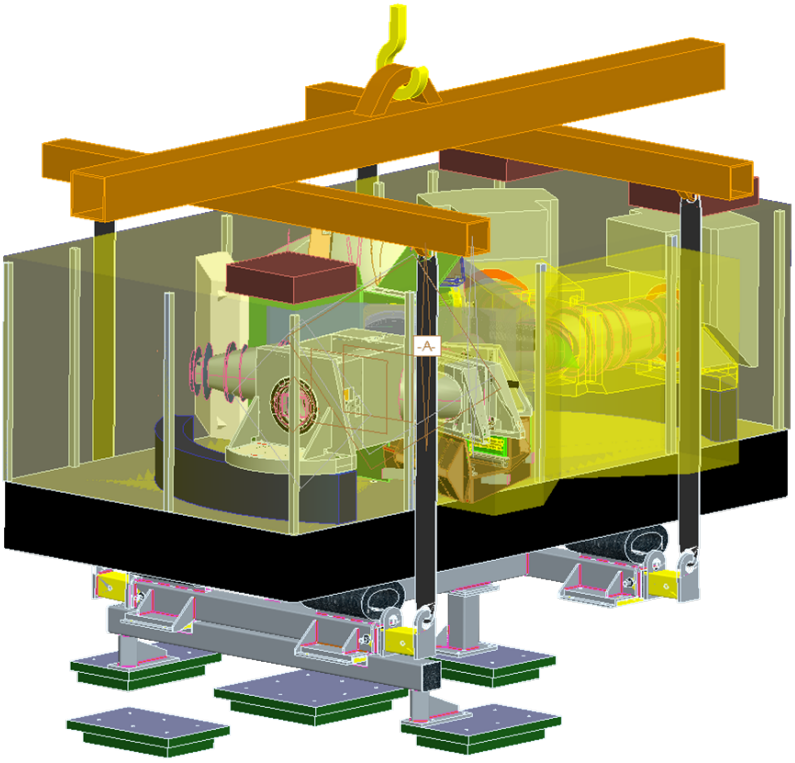
The WEAVE spectrograph is a dual-beam optical system which incorporates a dichroic at ~600nm and has a grating exchange mechanism that provides two resolution modes in each arm; a low-resolution mode at 5000 and a high-resolution mode at 20 000.



The WEAVE spectrograph will be permanently housed in the GHRIL enclosure (one of the two Nasmyth platforms of the WHT telescope), providing a stable and clean environment for the instrument. To better appreciate the size of the spectrograph, below is a picture of the collimator being prepared for polishing:



The spectrograph will be assembled on its optic table, enclosed in a light-tight assembly and the whole structure lifted into GHRIL:



Situation

The WEAVE spectrograph is composed of several pre-integrated sub-systems that will be assembled together at the WHT. The institution responsible for the development of the instrument will provide general guidelines and recommendations that will need to be further developed and detailed for the WHT and the working environment.

The current GHRIL enclosure will be refurbished to be turned into a clean room where dust, temperature and humidity will be monitored and controlled.

Project

ING will manage the integration process from the delivery of the crates to the WHT and the installation of the spectrograph into the GHRIL enclosure. The ING will also provide support for the assembly of the instrument in GHRIL and will ensure that the clean room environment is maintained.

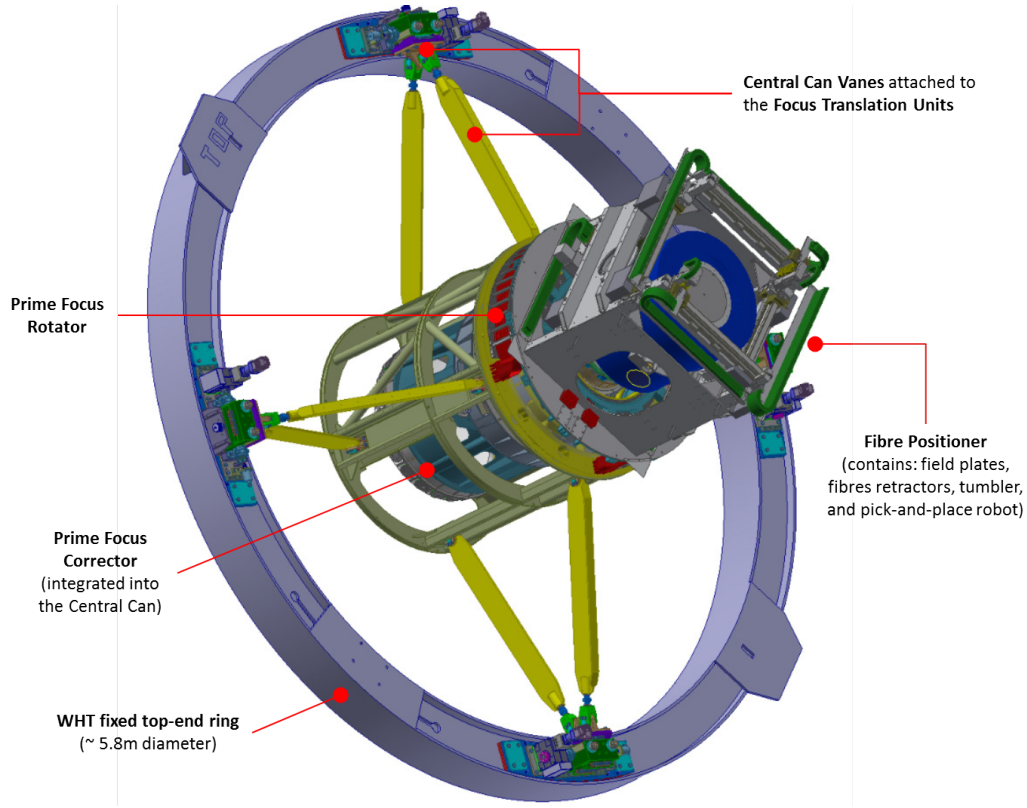
The complete process for integrating the spectrograph into GHRIL needs to be designed and detailed as far as possible, in order to:

1. Allow early procurement of any specific tools that may be needed
2. Anticipate any potential issues and reduce risks
3. Estimate the resources that will be required to deliver the working environment

Project 2: Planning the optical assembly and testing of the corrector

Background

The Prime Focus Corrector is a sub-system of the WEAVE Focal Plan Assembly (WFPA), interfacing with the Focus Translation System (as described in Project 1), the Positioner System and the optical fibres feeding the spectrograph. The corrector is made of a mechanical barrel that contains six corrector lenses assembled in their cell and aligned with respect to the main optical axis of the telescope.



The purpose of the WEAVE Prime Focus Corrector is to correct for the optical aberrations in the two-degree field-of-view. The corrector also includes an Atmospheric Dispersion Corrector (ADC) which consists of two pairs of counter-rotating, air-separated doublets, to compensate for atmospheric dispersion whilst the telescope is moving in elevation.

Situation

The corrector is currently being manufactured by SENER and will be delivered as a complete, fully-aligned unit. The Focus Translation System is built and includes mechanical dummies which represent the corrector and rotator. This will be used to simulate the volume and mass of the final assembly.

The philosophy for assembling the corrector has already been drafted and is split in two distinct phases:

1. The corrector will be integrated within the Central Can and aligned with respect to the rotator mechanical axis of rotation.
2. The whole WFPA (with the corrector) will be mounted onto the telescope top-end and will be aligned with respect to the WHT optical axis (defined by the primary mirror).

Phase 1 will be performed while the WFPA is on its trolley situated at the WHT ground floor. It will involve the opto-mechanical alignment as well as testing of the control software (to rotate the ADC mechanisms).

Phase 2 will require the telescope optical axis to be identified. The various targets that will be used will be previously positioned to ensure an absolute reference is set.

Fine tuning of the WFPA alignment will be carried out on sky by pointing at bright stars.

Project

The project will involve work to deliver Phases 1 and 2. The corrector will be optically tested to ensure the optical performance is met. For this, various tests will be designed and planned into the main assembly philosophy. The opto-mechanical tools and alignment jigs will be specified, procured, and tested.

Project 3: WebSocket-based communications framework for GUIs

The ING is investigating a possibility of moving most of the user interfaces to the browser. This has many benefits compared to classical desktop applications and should make deployment of applications much easier. In the past, web-based GUIs with a live content use the so-called AJAX communication framework. A disadvantage of this is that it has a significant overhead when transferring data and can thus cause more load on the network infrastructure and can slow down the applications. A more efficient method, called the WebSocket protocol, is now supported by all major browsers. WebSockets are rather low-level, and can make programming tedious. A higher-level protocol which builds on top of WebSockets is called WAMP and promises to provide mechanisms such as publisher-subscriber to web-based applications. Although this protocol is very new and still under development, there are already implementations for many programming languages.

The ING has carried out some experiments using raw WebSockets, but has no experience with WAMP.

Project

This project consists of creating demo versions of servers using languages used at the ING (Python, Java, C++) and the client (GUI) versions using preferably Dart or Javascript. The task is to provide patterns for the creation of servers and clients which would be easily reused by the ING engineers when creating new web-based applications.