INSpIRe
Investigating Near-Space Interaction Regions: Developing a Remote Observatory
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**INSpIRe STATUS UPDATE**

Before this year, the initiative installed the dome and laboratory and started developing independent control software for several subsystems.
- Developments in 2016 included the install of INSpIRe’s first science instrument (REDDI), the addition of Spirax-Lincoln properties, and a more cohesive graphical user interface.
- This year, we will install the Embry-Riddle Instrument Control System, alongside many mechanical-optical components, and a Fabry-Perot spectrometer to start remote observations.

**NEW SCIENCE OPPORTUNITIES**

The new opportunities have capability for aeronomical research beyond the core science objectives, including day and night-time winds, sodium in the lower exosphere, and other gaseous targets. REDDI is using an unique observing platform to observe night-time thermospheric winds, which could be complemented by daytime thermospheric wind measurements from FP1 in the future. The twin “Visiting Instrument” ports are also suitable for high-througput instruments with research goals other than gaseous research.

**INSpIRe OBJECTIVES**

1. Establish an adaptable research station capable of contributing to many areas of terrestrial and planetary aeronomy.
2. Integrate high-throughput interference spectrometers into a remotely operable configuration.
3. Deploy this instrumentation to a clear-site air, establishing a stable, well-calibrated observing platform.
4. Embark on a series of observations specifically designed to contribute to three major areas of aeronomical research, i.e., gaseous physics, structure/evolving, and variability.

**SYSTEMS BLOCK DIAGRAM**

The INSpIre Launchpad includes a widget for each hardware component. Each widget has its own Functional Global Variable Cluster (FGVC), which is used to populate the daily logs and science data headers.

**SCRIPTING**

Remote users of Fabry may want to build re-usable scripts for encountering tasks, such as tuning the Fabry-Perot. The scripting widget allows users to build, save, load, and recall such scripts. In addition, scripts can be saved in a SQLite file (right).

**CONTROL CPU**

Users may request Fabry to be part of the INSpIre control system or to have exclusive control of the entire laboratory. Web-based control is aimed at the Fabry research station, allowing for experiments at the V=1 part under the control.

**VISITING INSTRUMENT**

A limited number of direct determinations of: Vertical Distribution and Vertical Transport Flux of Atomic Hydrogen in the Upper Atmosphere

The unique capabilities of INSpIre will provide key information to address these questions and may extend aeronomical research into planetary aeronomy.

**INTEGRATED MONITORING**

HIplev has two subsystems that use monitoring. Using globe variable clusters, the INSpIre software control system can access monitoring information and popular tasks high (red), the cluster widget (right), and any generated FFT files (headers) (left) with information that all of the subsystems that can currently monitor.

**INTEGRATED SCRIPTING**

The INSpIre research station has capability for aeronomical research beyond the core science objectives, including day and night-time winds, sodium in the lower exosphere, and other gaseous targets. REDDI is using a unique observing platform to observe night-time thermospheric winds, which could be complemented by daytime thermospheric wind measurements from FP1 in the future. The twin “Visiting Instrument” ports are also suitable for high-throughput instruments with research goals other than gaseous research.

**CONTROL SYSTEM**

The INSpIre control system (left) is responsible for separate parameters and the environmental sensor System (ESS, right), which monitors the temperature, humidity, pressure, and weather inside and outside of the dome. The ESS keeps a data log of those parameters and automatically creates and email points (right) to a recipient list each night.

**INTEGRATED CONTROL SYSTEM**

The INSpIre-Riddle Instrument Control System (IRICS) is responsible for handling and controlling the subsytem control to the main computer. This environment includes:
- Observations
- Calibration lamps
- Slit selection
- Slit position
- Gas pumps and gas valves.

**PRESSURE CONTROL SYSTEM**

Our Fabry-Perot Spectrometers use the two independently controlled pressurized gas reservoirs to tune to a specific wavelength. The Pressure Control System includes (left), right: valve control, command to the pressure regulator and regulators, and pressure sensors.

**INTERFEROMETER CONTROL SYSTEM**

The main part uses two independent interferometers: Fabry-Perot (FFP) interferometers, each with a He-Ne laser optical system, and Fabry-Perot (FP2) interferometer, each designed for separate science needs: Fabry-Perot 1 (FPF1) for sodium and Fabry-Perot 2 (FPF2) for hydrogen. We will use the Fabry-Perot 1 (FPF1) for sodium and Fabry-Perot 2 (FPF2) for hydrogen. The power for Fabry-Perot 1 (FPF1) is +12VDC, and +12VDC for Fabry-Perot 2 (FPF2) and +12VDC for Fabry-Perot 3 (FPF3) at +12VDC. Each FPF port has a specific function and specific wavelength.

**FABRY-PEROT SPECTROMETERS**

The Fabry-Perot 1 (FPF1) operates in the sodium D-line region (5909 A) and the Fabry-Perot 2 (FPF2) operates in the hydrogen (6563 A). Each Fabry-Perot has its own specific focus and specific wavelength.

**SIDEROSTAT**

The siderostat is a precision, light-collecting system with three clamped mirrors, a 200 x 200 x 200 cm mirror, and a mirror to the diffusers, allowing the mirror to block wind and changing weather to move in the diffusers, allowing the mirror to move in a controlled way. The mirror is an 18 cm diameter mirror, made out of glass, that can be moved in two directions. The mirror is a 18 cm diameter mirror, made out of glass, that can be moved in two directions.