Optomechanical Design of the Raven MOAO Demonstrator

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Abstract. The Raven MOAO demonstrator will act as a pathfinder instrument for future MOAO projects. It will be tested on the infrared Nasmyth platform on the Subaru telescope with the IRCS spectrograph. Raven will correct 2 sciences targets within a 3.5 arcmin. FoV from 3 off-axis NGSs and 1 on-axis LGS. This exciting project, being designed and built at the University of Victoria, is now entering its construction phase. Several prototypes of the main subsystems (open-loop WFS, science pick-off arm, trombone, image rotator) have been built and are now being tested to ensure functionality before the full instrument is made.

1. Introduction

The mechanical design for the Raven MOAO system is entering the procurement and construction phase. A conceptual design for the entire system has been done, and prototypes of the more complex subsystems have been built and tested, The final design is being completed.

2. Optical Design

The optical design for Raven has been finalized. It consists of several similar optical paths, and is almost totally symmetric. The two science paths and three open-loop WFS paths are shown in Figure 1.

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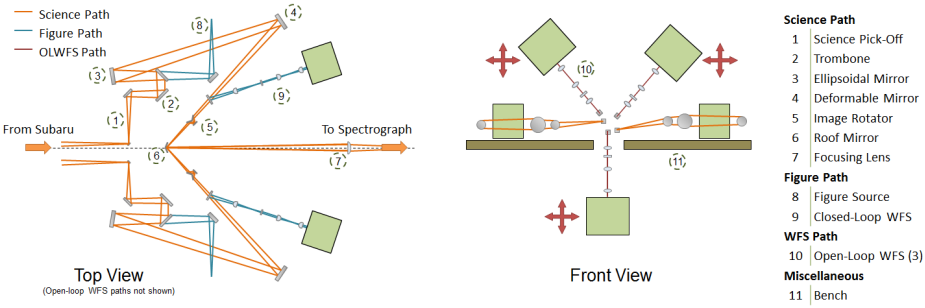

Figure 1. Optical Design

2.1. Colour Asterism

The Raven asterism (Figure 2) consists of three natural guide stars surrounding two science targets. A single laser guide star is located at the center of the field.

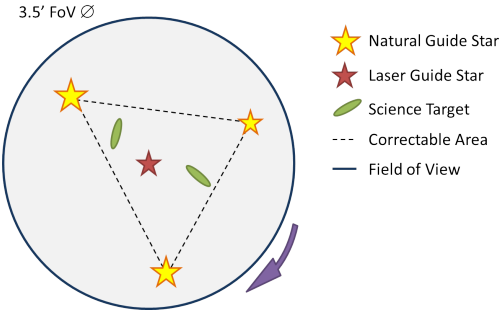

Figure 2: Raven asterism

3. Mechanical Design

The Raven bench will be quite compact which is an inherit feature of MOAO systems. This does make it difficult to make room for everything though. The conceptual mechanical design of the system is shown in Figure 3.

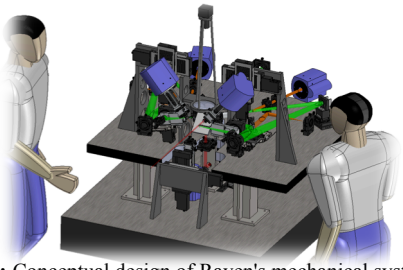

Figure 3: Conceptual design of Raven's mechanical systems

3.1. Science Pick-Off Arm

The science pick-offs on Raven are achieved using a rotating telescopic-periscope design, consisting of two parallel mirrors mounted on a translation stage, which is then mounted on a rotation stage. A prototype design is shown in Due to the uncorrected field rotation during observation at Subaru, the science pick-off arms will be in constant slow motion.

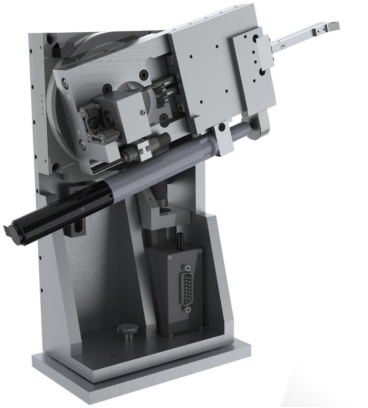

Figure 4: Prototype science pick-off

3.2. Open Loop Wavefront Sensor

The three natural guide stars entering Raven will be picked-off by movable, self-enclosed, wavefront sensors. Each WFS is mounted to a motorized X-Y stage, to track their targets

throughout the night. Constant force springs are used to counteract the gravitational forces on the system. A prototype sensor is shown in

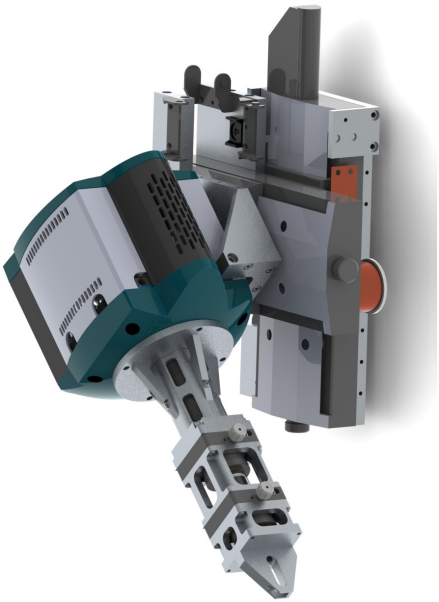

Figure 5: Open loop wavefront sensor