RAVEN

Shin Oya & RAVEN members

2015/1/13 @ Subaru User’s Meeting

Shin Oya & RAVEN members
1. Overview of RAVEN Project

• MOAO demonstrator (1st on 8m class)
  – Experiment in laboratory room
  – On-sky engineering & science verification

• Canadian group project
  – 6M CAD by BCKDF/CFI Leading Edge Fund
  – University of Victoria (UVic)
  – NRC Herzberg-Astronomy (HA)

• Supported by Japanese group
  – Subaru Tel. (infra/manpower)
  – Tohoku Univ. (basic experiment in laboratory, Y. Ono)

• Schedule
  – 2010-2013: Development at UVic
  – 2014: Test in Sim.Lab (Jan-Apr); Eng.Obs. in May & Aug
  – 2015: Sci. & Eng.Obs. in S15A
2. MOAO: Multi-Object Adaptive Optics

- Each object direction
- Multiple WFSs
- Each DM
- IFU spectrographs
- FoR: 3 arcmin
- FoV: a few arcsec
- Diffraction-limited targeted only

Open loop
3. System Specifications

Guide Stars: 3(2) NGS (R<14) + LGS (center) in 3.5’ φ FoR
Objects: 2 objects in 2’ φ FoR

<table>
<thead>
<tr>
<th>Num. of Science Channel</th>
<th>2 ( = num. of Deformable Mirror)</th>
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<tbody>
<tr>
<td>Wavefront Sensors</td>
<td>3 NGSs +1 LGS / 10x10 SH</td>
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<tr>
<td>Deformable Mirror</td>
<td>11x11 (ALPAO 97)</td>
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<tr>
<td>Available Field Size</td>
<td>FoR: 3.5’ for NGS (2’ Φ full for Sci) FoV: 4” (each channel)</td>
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<td>Wavelength range</td>
<td>Sci: 0.9-2.5um ; WFS: 0.6-0.9um</td>
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<tr>
<td>Science Instrument</td>
<td>IRCS (Imaging, Grism, Echelle)</td>
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<tr>
<td>Ensquired Energy</td>
<td>&gt; 30% in 140mas slit (0.75” seeing)</td>
</tr>
<tr>
<td>System transmission</td>
<td>&gt; 80% of AO188</td>
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</table>
4. RAVEN at Nasmyth IR
5. Observing Scene
6. The First Light

On-sky functional test

- RAVEN receives light from the telescope correctly
- MOAO work with actual atmospheric turbulence

Demonstration Image: Saturn (Lardiere+14, SPIE9148, 0T)

May 13 & 14, 2014
7. Ensquared Energy (0.14")

- **No AO**: EE=12%
- **MOAO**: EE=25%
- **GLAO**: EE=17%
- **SCAO**: EE=41%

The result of the first engineering run (Lardiere+14, SPIE9148, 0T)
8. Performance Verification

August 6-10, 2014

X: spatial dimension, Y: spectral dimension

H-band Echelle
Simultaneous observation of two stars

H+K grism
Simultaneous observation of a galaxy & sky background
9. Items in 2015

• Data analysis

• Lab. experiment (summit, remote control)
  – MOAO performance
    • GS(config., brightness, LGS)
    • WFS(speed, algorithm)
  – Performance for astronomical observation
    • Object position control (fine adjustment, tracking)
    • Efficiency (system transmission, overhead)

• Science observations
  • S15A: Open-use + Engineering