DKIST Critical Science Plan Workshop #5:
Wave generation and propagation

JIRA: Writing a Science Use Case – Getting started
http://nso-atst.atlassian.net/
Collaborative JIRA environment for Science Use Case development

If you do not yet have an account, email an account request to:
DKISTCSP@nso.edu
DKIST CSP JIRA Site (https://nso-atst.atlassian.net/secure/Dashboard.jspa)
Create a new Science Use Case

(NOTE: Summary == Title)
DKIST CSP: JIRA User’s Guide

Editing your Science Use Case (PI, Co-I)

Physical conditions at the Current Sheet trailing CMEs

CMEs eruption are known to have a trailing current sheet where reconnection occurs and that likely results in the post flare loops arcades. By doing off-limb spectroscopy and polarimetry of this region we can constrain the physics of the reconnection processes.
DKIST CSP **Science Use Case** development strategy:

1. Formulate science context and goals  
   (JIRA form tabs – General Information, Science Justification, Target Specifics)

2. Identify observational needs (spectral lines of interest, pattern, cadence, sensitivities)  
   (JIRA form tab – *Observation Specifics*, Instrument Specifics)

3. Determine useful DKIST instrument suite  
   (JIRA form tabs – Observation Specifics, Instrument Specifics)  
   - **FIDO** – aka Coudé configuration and Data Rate tool, aka Beam Splitter Tool

4. Assess instrument performance capabilities  
   (JIRA form tabs – Instrument Specifics)  
   **Instrument Performance Calculators (IPCs)**
## Determine useful DKIST instrument suite

### DKIST Instrument Summary Table

<table>
<thead>
<tr>
<th>Instrument Type</th>
<th>Spectral Range</th>
<th>Spectral Resolution</th>
<th>Spatial Sampling</th>
<th>Maximum Instantaneous Field of View</th>
<th>Maximum Sampled Field of View</th>
<th>Peak Cadence</th>
<th>Analogous Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visible Broadband Imager (VBI)</strong></td>
<td>390-550nm (sequential filter sequencing)</td>
<td>N/A</td>
<td>0.011&quot;</td>
<td>45° x 45°</td>
<td>2' x 2' (sequential field sampling)</td>
<td>3.2 sec (reconstructed) 0.03 sec (raw images)</td>
<td>ROSA, Hinode/BFI High cadence, high spatial resolution</td>
</tr>
<tr>
<td><strong>Visible Spectropolarimeter (VISP)</strong></td>
<td>380-900nm (3 spectral windows at a time)</td>
<td>&gt;180,000</td>
<td>0.0195&quot; (arm 1) 0.0236&quot; (arm 2) 0.0295&quot; (arm 3)</td>
<td>5 slits Width x Length 0.028&quot; or 0.041&quot; or x 50&quot; (arm 1) 0.053&quot; or x 60&quot; (arm 2) 0.106&quot; or x 75&quot; (arm 3)</td>
<td>Slit length x 2'</td>
<td>0.5-10 sec per slit position (polarimetry) 0.02-0.2 sec per slit position (intensity-only)</td>
<td>SPINOR, Hinode/SP, IRIS, GRIS Scanning spectograph, high spectral fidelity</td>
</tr>
<tr>
<td><strong>Visible Tunable Filter (VTF)</strong></td>
<td>520-870nm (sequential scans through multiple spectral lines)</td>
<td>FWHM 6-8 pm</td>
<td>0.014&quot;</td>
<td>60° x 60°</td>
<td>60° x 60°</td>
<td>Typical scan times per spectral line: 0.5-2 s (intensity only); 2-10 s (polarimetry)</td>
<td>IBIS, CRISP, GFPI Imaging spectropolarimeter</td>
</tr>
<tr>
<td><strong>Diffraction Limited Near Infrared Spectropolarimeter (DL-NIRSP)</strong></td>
<td>500-900nm 900-1350nm 1350-1800nm (1 filter band per channel)</td>
<td>125,000</td>
<td>0.03&quot; (high res) 0.077&quot; (mid res) 0.464&quot; (wide field)</td>
<td>2.4&quot; x 1.8&quot; (high res) 6.16&quot; x 4.62&quot; (mid res.) 27.84&quot; x 18.56&quot; (wide)</td>
<td>2' x 2'</td>
<td>Depends on resolution and total field of view. E.g. 6s for one tile, on-disk, high resolution, full polarimetry</td>
<td>SPIES True Imaging Spectropolarimeter: simultaneous 2D FOV and spectral information using fiber-fed IFU</td>
</tr>
<tr>
<td><strong>Cryogenic Near Infrared Spectropolarimeter (Cryo-NIRSP)</strong></td>
<td>1000-5000nm (1 filter band at a time. About 70 s to switch filters)</td>
<td>100,000 on-disk 30,000 off-limb</td>
<td>0.12&quot; [along slit] (no Adaptive Optics)</td>
<td>2 slits 0.15&quot; x 120&quot; slit 0.5&quot; x 240&quot; slit</td>
<td>4' x 3' (near limb) 5' round (off-limb)</td>
<td>Heavily depends on signal to noise. Maximum frame rate is 10 frames per second e.g. 1s per slit position near-limb/chromosphere CYRA (BBSO) Cryogenic, scanning spectograph, novel diagnostics</td>
<td></td>
</tr>
<tr>
<td><strong>Cryo-NIRSP Context Imager</strong></td>
<td>1000-5000nm (1 filter band at a time, with fast switching time to support sequential observations during a single-band spectrograph scan.)</td>
<td>N/A</td>
<td>0.052&quot; (no Adaptive Optics)</td>
<td>100' x 100'</td>
<td>4' x 3' (near limb) 5' round (off-limb)</td>
<td>Heavily depends on signal to noise. Maximum frame rate is 10 frames per second e.g. 1s per slit position near-limb/chromosphere CYRA (BBSO) Cryogenic, scanning spectograph, novel diagnostics</td>
<td></td>
</tr>
</tbody>
</table>

This table is meant to give an idea of the capabilities of the DKIST first light instrument suite. It cannot capture the precise science that is provided by the flexibility of the instruments. For more information, visit [http://dkist.nso.edu/CSP/instruments](http://dkist.nso.edu/CSP/instruments).
Facility Instrument Distribution Optics (FIDO):

- FIDO diverts short and *passes long wavelengths* with each successive beamsplitter encounter (a few exceptions)
- Changing from one optical configuration to another is a manual process that requires up to one day to complete
- Cryo-NIRSP receives all the light, can not operate simultaneously with any of the other DKIST instrumentation or the adaptive optics system, can be accessed within several tens of minutes.

See Summary FIDO document and download: [http://dkist.nso.edu/CSP/instruments](http://dkist.nso.edu/CSP/instruments)
## DKIST Instrument Summary Table
[http://dkist.nso.edu/CSP/instruments](http://dkist.nso.edu/CSP/instruments)

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Wavelength (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBI Blue</td>
<td></td>
</tr>
<tr>
<td>Ca II K</td>
<td>393.327</td>
</tr>
<tr>
<td>G-band</td>
<td>430.52</td>
</tr>
<tr>
<td>Continuum</td>
<td>459.287</td>
</tr>
<tr>
<td>H-beta</td>
<td>486.1</td>
</tr>
<tr>
<td>Access to entire spectral range between 300-900 nm</td>
<td></td>
</tr>
<tr>
<td>ViSP</td>
<td></td>
</tr>
<tr>
<td>Na D</td>
<td>589.6</td>
</tr>
<tr>
<td>Fe I</td>
<td>630.25</td>
</tr>
<tr>
<td>H-alpha</td>
<td>656.3</td>
</tr>
<tr>
<td>Ca II</td>
<td>854.2</td>
</tr>
<tr>
<td>VTF</td>
<td></td>
</tr>
<tr>
<td>H-alpha</td>
<td>656.292</td>
</tr>
<tr>
<td>Ti O</td>
<td>705.839</td>
</tr>
<tr>
<td>Fe XI</td>
<td>789.186</td>
</tr>
<tr>
<td>VBI Red</td>
<td></td>
</tr>
<tr>
<td>Fe XI</td>
<td>789</td>
</tr>
<tr>
<td>Ca II</td>
<td>854.2</td>
</tr>
<tr>
<td>Fe XIII</td>
<td>1074.7</td>
</tr>
<tr>
<td>He I</td>
<td>1083</td>
</tr>
<tr>
<td>Si X</td>
<td>1430</td>
</tr>
<tr>
<td>Si IX</td>
<td>3935</td>
</tr>
<tr>
<td>Fe I</td>
<td>1565</td>
</tr>
<tr>
<td>DL-NIRSP</td>
<td></td>
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<td>1250</td>
</tr>
<tr>
<td>Si IX</td>
<td>1430</td>
</tr>
<tr>
<td>CO</td>
<td>4651</td>
</tr>
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<td>Cryo-NIRSP</td>
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Visible light cameras for instruments are provided by a UK consortium.

[NSO] [KIS] [HAO] [AURA]
Check your selection using the Beam Splitter (FIDO) and Data-rate Analysis Tool

INPUTS:
Wavelengths and modes for each desired instrument.

Priorities can also be used for optimization (instrument selection).

Output to be included under INSTRUMENT SPECIFICS tab on JIRA form.
Instrument Performance Calculators (IPCs)

- Set of tools (i.e. software programs/applications) to explore instrument capabilities – e.g. line selection, exposure times, SNR etc.
- A *separate* IPC needs to be run for each instrument. VBI and VTF are Java applications (1.9); ViSP and DL-NIRSP run in IDL (8+). (The Cryo-NIRSP IPC unfortunately is not yet ready for distribution)

**Instrument Performance Calculators:**
http://dkist.nso.edu/CSP/instruments

Output can be attached to JIRA form for sharing with team and for possible future Science Use Case development.

BUT relevant content of IPS must be entered into Science Use Case as well.
http://nso-atst.atlassian.net/  Instructions: UC-69

All CSP  Save as  Details  ⭐

Critical Science...  Type: All  Status: All  Assignee: All  Contains text  More  Search

UC-72  Observe Coronal and Chromospheric Jets in ...
UC-71  Structure, Dynamics, and Magnetic Environ...
UC-70  Magnetic structure, formation and evolution ...
UC-69  Science Use Case instructions
UC-65  Evolution of 3D magnetic configuration at m...
UC-64  FIP fractionation as tracer of solar wind sour...
UC-63  Short-term evolution of internetwork magnet...
UC-62  Are quiet-Sun internetwork fields turbulent? ...
UC-61  DKIST and Solar Orbiter observations for un...
UC-60  Coronal helium abundance from joint DKIST ...
UC-59  Co-ordinated observations with DKIST and S...

Critical Science Plan: Use Case (UC) Development / UC-69

Science Use Case instructions

Type:  Science Use Case
Status:  OPEN  (View workflow)
Priority:  Minor
Resolution:  Unresolved
Labels:  None

ASSIGNEE:
Mark Rast
REPORTER:
Mark Rast
Principal Investigator:
Mark Rast

Votes:
0
Watchers:
0

TARGET SPECIFICS
INSTRUMENT SPECIFICS

PI Affiliation:
Use Case Principle Investigator is generally also the UC creator. PI can add Co-I's (via 'Additional Users to E-mail' field) and can re-assign UC to another PI. Co-I's must have CSP JIRA account (send email address DKISTCSP@nso.edu for account request).

Abstract:
Please provide a short summary of your
DKIST CSP: JIRA User’s Guide

Status and Labels Fields

- For now please do not select *Start Progress* (which changes the *Status* field)

- If you worked on your Science Use Case as part of a DKIST CSP Workshop, please edit *Labels* as:
  - CSPW-SPD2016
  - CSPW-Huntsville
  - CSPW-DC
  - CSPW-Freiburg
  - CSPW-Nagoya
  - CSPW-JHU/APL
  - **CSPW-Newcastle**
  - CSPW-NMSU
  - CSPW-Rice
  - CSPW-Bozeman
  - CSPW-Synoptic as appropriate.
http://dkist.nso.edu/CSP

- Critical science description (living document) with links to Science Use Case titles and abstracts, and ultimately their full text
- Links to Instrument and other summary documents
- Links to beam-splitter configuration and data rate analysis tool (FIDO)

NOTE: LINKS to ALL documents and tools at MASTER LINK: https://dkist.nso.edu/CSP/instruments. Everything can be found through this one link.

http://nso-atst.atlassian.net/
Collaborative JIRA environment for Science Use Case development, and ultimately Observing Proposal development

https://www.dropbox.com/sh/uzwdc03ayovxr5o/AABuZbWtCnfPqG8F2zHaeCFta?dl=0
Dropbox link with summary documents (Instruments, Data Handling System (DHS), Facility Instrument Distribution Optics (FIDO), JIRA User’s guide), and Instrument Performance Calculators (IPCs)