



To Observe with Tio Filter

1. Start PCOcamera_2 software
2. set the correct exposure between 1-1.3ms) (press "set")
3. Press "Start" for a live image or "Acquire" to get a single still image
4. set min= \sim 1000, max= \sim 9000, or any other numbers that satisfy your taste, (press "set")
5. Go to "Data Config" and set params if needed (FOV should be 77 arcsec)
6. Click on "TCS Connect", wait until box below is checked
7. Select Target
8. Click on "Bursts" to open new dialog window. There you can input a number of parameters:
 - select the number of images per burst (recomm. 100, but can be as low as 50 if seeing is exceptional, and A0 is working and you want to get higher cadence. 100 img per burst will give you 15 sec cadence; 70 img per burst give you 10 s cadence)
 - input the number of bursts to be taken (100 is a good number);
 - if you prefer to do image selection then check the box and input the number of best images to be saved (70 is a good choice);
 - Click "ok" to begin data acquisition.

To Take Flat Field Data

- Go to "Data Config" to open a new dialog box
- In the drop-down "Image type" menu select "flats", then click on "close"

1. point the telescope to the disk center
2. Click on "Take Flats" to open a new dialog window
3. Select method "Walk"
4. input number of bursts of flat field images (25 is a good number)
5. if two instruments are taking flats simultaneously, make sure that one of them has "do not move guider" box checked. Recommendation: Ti0 moves the telescopes and Ha has the "do not move box" checked.
6. wait until it is finished (~3min)

To Take Dark Frame

- Go to "Data Config" to open a new dialog box
- In the drop-down "Image type" menu select "dark", then click on "close"
- Go to "Bursts" and use "100" images per burst and "1" burst, click "ok"
- You are done with observations

To Observe with Ha Filter

Mode 1: Single wavelength

- In the "Halpna Control" section enter the desired filter position and press "set"
- Next steps are the same as steps 1-8 in "To Observe with Tio Filter"
- EXCEPTIONS AND RECOMMENDATIONS:
- use 2x2 binning to reduce exp time and file size and avoid oversampling
- flat field data should be taken at the same wavelength and with the same exposure that was used during the observations
- to get flat field data use the same steps as in "To Take Flat Field Data"
- to get dark frame use the same steps as in "To Take Dark Frame"

Mode 2: Line Walk

- in live image mode decide at which wavelength you want to observe as well as choose exposure time for each wavelength; write them down
- Click "Line Walk" to open a new dialog box
- check the wavelength you want to use; the code will "walk" throu the line and will "stop" to take data at selected wavelength. When data at all selected wavelength have been taken, then one "run" is finished.
- select how many burst per wavelength you want to take. Example: Ha-1.0 – 4 bursts; Ha center -1; Ha+1.0 – 1.
- Next, in the bottom row enter the exposure time for each wavelength
- At the top of the dialog box enter the number of images per burst, the number of "runs" or line scans or "walks" (the above example indicates that 6 bursts will be taken in one run)
- If you need image selection then check the appropriate box, also enter the number of best images to save
- When done, click "Ok"
- flat field images should be taken at each wavelength and with the corresponding exposure
- do not forget about darks!

Pointing:

Each Hinode target tracks along a tracking curve. For example

```
/*          Date          Time Tracking Offset-X Offset-Y */
/*          (UT)          Curve No. (deg) (deg) */
Re-point Start 2011/07/29 17:00:00 1 00.0000 00.0000 /* 0.0/ -0.1 : # HOP 196 (at disk center). */
```

The tracking curve is in column 4. There are usually 4 curves. Each tracking curve looks like this:

```
/* Track No. Ref-Time of Tracking Helio-long. Helio-lat. Rot. Rate */
/*          Date          Time(UT) (degree) (degree) (deg/sec) */
Track 1 2011/07/29 17:00:00 00.00 05.57 0.00015417
```

Using tracking curve info one can calculate pointing at any moment in the future

- 1) start `sswidl`
- 2) execute `> print, (hel2arc(5.57,0.0,date='2011/07/29'))*60.`
This converts coords in N05.57 E00.0 into arcsec from the disk center
you will get: 0.00000 0.858795
- 3) execute `> print, rot_xy(0.0,0.8587,h*3600.,date='2011/07/29')`,
where h is time interval in hours starting from the date and time in the tracking curve,
i.e., 17:00UT 2011/07/29 till time of your interest. Let's say you want to see what corrdts
will be 19 hours later:
- 4) execute `> print, rot_xy(0.0,0.8587,19*3600.,date='2011/07/29')`
one will get: 172.813 1.38818, which are x and y in arcsec from the disk center.

ATTENTION: Watch for SOT pointing offset, which can be significant!

Data Processing

To Prep Flats

```
SSWIDL> .r prep_flats3
SSWIDL> prep_flats3, date='YYYYMMDD', [/BFI] [,/NFI] [,/NOARCHIVE]
YYYYMMDD is date of observations
/NOARCHIVE - if set the data will be downloaded from PC0 or PC02 computers
this option is necessary only when processing data on the day of
observations
/BFI - (broadband filter imager) if set the data will be downloaded from
PC02 computer this option is necessary only when processing data on
the day of observations
/NFI - (narrowband filter imager) if set the data will be downloaded from
PC02 computer this option is necessary only when processing data on
the day of observations
Flat and DC images will be saved as an IDL sav file in
/data/rtir/calib/pco/ and /data/rtir/calib/pco2/
```

To Prep Data for Speckle Code

Here, as everywhere else we assume that
original data cubes have names - user.000
reconstructed files have names - user.000.final
fits headers are in files - user.000.txt
where user may be 'avi', 'lim', 'kilcik'

Please, set the keyword appropriately, or modify the following string in your
copy of the code: `IF NOT KYEWORD_SET(user) THEN user='vayur'`. Replace `vayur` with
whatever you want, but use the same name for the entire set, since the user name
will be part of the filename!

Start SSWIDL and type the following:

```
SSWIDL> .r prep_pco_data ! DO IT TWICE! I DO NOT KNOW WHY!
```

```
SSWIDL> .r prep_pco_data
SSWIDL> prep_pco_data, date='YYYYMMDD', [/BFI] [,/NFI], [,/savebest]
                                     [,/copy_nit], [,/ao] [,/NOARCHIVE]
```

Other keywords:

/AO – to let the code know that the data were taken w/ the AO system ON
/COPY_INIT if set the init files prepared for the speckle code will be copied into the speckle code folder and the speckle will be ready to be run (see below) !Note, default rec phase is set to 80%
RES_DIR=: work folder, default is: /data/rtir/"USER"
FIRST=n: if set the code will start from N-th file
LAST=n: if set the code will finish at N-th file
/NOARCHIVE – if set the data will be downloaded from PC0 or PC02 computers this option is necessary only when processing data on the day of observations
/BFI – (broadband filter imager) if set the data will be downloaded from PC02 computer this option is necessary only when processing data on the day of observations
/NFI – (narrowband filter imager) if set the data will be downloaded from PC02 computer this option is necessary only when processing data on the day of observations
SAVEBEST: id set, the best image in the burst will be saved as a fits file in RES_DIR

To Start Speckle Code

- I) in the prompt line of an xterm connected to beehive type the following:
- 1) CD fwoeger_kisip/kisip
 - 2) ./kisip_gui (optional, make sure that all the params are ok, press write and quite)
 - 3) mpirun -np 32 /home/beehive/rtir/fwoeger_kisip/kisip/entry
(this line is also printed on the screen when you quit kisip_gui)
- II) another way to start the code is to use an idl wrapper:
SSWIDL>.r start_speckle

To Monitor (View) Speckle Reconstructed Images

```
SSWIDL>.r loop_display
SSWIDL> loop_display, /CURRENT or /ALL
/FILEIN: part of the file preceding .000.final, if not set FILEIN=USER
DATA_DIR=DATA_DIR: folder data, default is: /data/rtir/"USER"
/CURRENT: id set, latest reconstructed image will be displayed and the code will wait for next one
/ALL: if set, the code will display all rec. images
/NO_FILTER: if set no filtering will be applied to the displayed image.
Note, that the filtering is applied only to a displayed image, not data are affected.
MIN=MIN, MAX=MAX, sets image scale
FIRST=n: Works only if /ALL is set. Then viewing begins from the N-th file
```

To convert FINAL files to FITS files

```
SSWIDL> final2fits, /save, user='vayur'
```

To move data into BBS0 archive

- 1) Connect to noisy as user: OBS
- 2) cd /arch1/YYYY/MM/DD
- 3) mkdir YYmonDD_pcosr (e.g., 10jul15_pcosr)
- 4) cd to YYmonDD_pcosr

- 5) copy data into this new folder
- 6) delete data from /data/rtir/"USER"

II) another way is to use the following command in the prompt line of an xterm:
"ftp_data"

this command will do all the above 5 command (excluding deleting the files)

Observational Priorities

General rules:

- priority is given to rare, not frequent events such as developing active regions, emerging flux systems (formation of pores, AFS, etc) or any other dynamic event;
- Targets followed by Hinode have higher priority. This is especially true when the target is not close to the edge of the disk, unless a special interest exists
- Targets that have been observed by NST (and Hinode)
- ?

Prepare "Observer's Comments on the Data Set"

DATE: 20100317 (obs date)
FILTER: Halpha Lyot Filter (Ti0, G-Band)
OBS TIME: 17:25 - 19:15 UT (period of observations)
TARGET: AR 1054 (AR, QS, filament, etc)
OBSERVER: V. Yurchyshyn, J. Varsik
CADENCE: 11 - 35 s (data cadence)
LENGTH: total 540 bursts; config: 4-Ha-1.0; 1-Ha; 1-Ha+1.0A; 70 img burst; saved 50 best
SP RECONSTRUCTION: yes, by V. Yurchyshyn
SEEING, DATA QUALITY: after 18:30UT data are acceptable
OBS COMMENTS: NSO camera; settings: 10MHz; 2ADC; no hizontal and vertical lines; cadence dropped significantly; 8.2 fps instead of 25fps (2x2 binning)
OPTIONS:

Comments by Scientist:

Anything you wish to put

After Reconstruction Info:

Anything you wish to put

Best Image: (image names can be fig1, fig2, fig3; png, gif or jpeg are ok.)

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