# *SPINOR Spring 2005 Mega-run Observing Plan*

## Objectives

1. Demonstrate capabilities of the full set of SPINOR achromatic polarization optics, especially the new polarization modulator with reduced fringing and the half wave retarder in front of the polarizing beam splitter.
2. Demonstrate operation of the Sarnoff CAM1M100 SFT.
3. Demonstrate TCP/IP control of Sarnoff, Rockwell, and perhaps Pluto cameras so that headers go along with data.
4. Perform a broad band Dunn Solar Telescope polarization calibration using cross disperser on Sarnoff camera and Rockwell camera at 1.5648μm
5. Perform chromospheric observations using the IRT 849.8nm, 854.2nm, and 866.2nm, Helium-I 1083.0nm, and Helium d3 587.6nm.
6. Perform photospheric observations using Fe 630.2nm and Fe 1564.8nm.

## Pre-Run Setup

1. Install Hagrid (Sarnoff) and Hogwarts (Pluto) computers in ASP rack and Harry (Rockwell) on a table next to the HSG.
2. Rename all the computers and set to NSO 146.5.2.17x addresses.
3. Install new parallel port break out panel in ASP rack and run cables to all camera control computers.
4. Temporarily set up Pluto and Sarnoff camera on bench for DLSP point spread function testing.
5. Install ASP synchronizer code modifications and begin debug.
6. Create UBF, camera_init, and camera_scan files for H-alpha slit jaw images.
7. Do any mechanical modification needed to mount the half wave retarder in front of the polarizing beam splitter.

## Visiting Observers:

David: 28 April - 11 May
Hector: 30 April - 8 May
Rebecca: 30 April - 14 May
Anna: 16 May - 21 May
Ita, Marian, Juanma: 21 May - 28 May

## Schedule:

**28 April - noon 30 April** This is done on a non-interference basis and after hours.

1. Install computers
2. Install cameras
3. Install and debug new ASP Software

**Noon 30 April - 3 May**

1. Software debug with full system including NSO cameras.
2. Check observing modes using IDL
3. Chromospheric HSG setup

**4 May - 6 May noon** Chromosphere 1a – Rebecca Centeno Elliot (2.5d) Sunspot chromospheric

dynamics. Perform a time sequence of quiet sun in all chromospheric lines. In <= 90 seconds create a short map. Estimate is that 8 to 10 steps of 0.375 arc seconds and 128 summed frames at 20Hz will work. This is 16 accumulations. Repeat this for an hour. Slit width is 50 μm or 0.37 arc seconds. That means about 40 repeats. On one day we perform maps of an active region in conjunction with Lockheed.

**6 May noon - 8 May** Window polarizer (2d or until we get a full day)

**9 May - 10 May** Chromosphere 1b - Rebecca (2 + 2.5 = 4.5d) Same as Chromosphere 1a.

**11 May = 14 May** Chromosphere 2 - Rebecca for Javier Trujillo Bueno and Manolo Collados Vera(4d) Spicule and prominence maps. Set slit perpendicular to solar limb and scan parallel to limb sufficiently long to cover targets. For spicules do repeats of just enough steps to cover evolution of the spicule in question. For prominences span the extent of the prominence. This needs more careful thought. What slit width is to be used? Would the slit parallel to the limb work better?

**16 May - noon 21** May Chromosphere 3 - Anna Pietarila (5.5d). Quiet Sun chromospheric dynamics. Perform a time sequence of quiet sun in all chromospheric lines. In <= 90 seconds create a short map. Estimate is that 8 to 10 steps of 0.375 arc seconds and 128 summed frames at 20Hz will work. Repeat this for an hour. That means about 40 repeats. Good seeing is critical. After the time series perform a map of 40 arc seconds length or about 170 steps of 0.375 arc seconds each. Then go back to the time series.

**Noon 21 May - 22 May** Photospheric setup (1.5d)

**23 May - noon 28 May Photosphere** - Ita, Maria Jesus Martinez Gonzalez, Juanma ?, and Juan manuel Borrero Santiago (5.5d) Maps of active regions. Number of frames = 64 or equivalently 8 accumulations. Step size 0.375 arc seconds. Make square maps of about 80 arc seconds. This means about 200 steps. Is there any desire to perform photospheric dynamics observations?

**Noon 28 May - Noon 6 June Setup** ??? - Bala (9d)

## Set Up General:

*Mount new achromatic half wave retarder between HSG slit and polarizing beam splitter. Once a camera is working, align rotation of half wave retarder using polarizer in front of slit oriented horizontally or vertically. Tune half wave plate rotation to extinguish one beam.
*UBF set up for H-α. UBF and camera_scan files for on and off band H-α exposures alternating during Maps.

## Chromospheric setup:

See “Horizontal Spectrograph Chromospheric Setup” on the SPINOR web site.
*308.57 l/mm grating. *50 μm slit width
*Angle of incidence 55.5 degrees.
*Anchor is 1083.0 nm on Rockwell IR camera. Set up pick off mirror as close to the light beam from HSG collimator to grating as possible. Tweak grating angle as necessary so that pick off is centered on the line. Use SPINOR IR AR coated 1000mm camera lens. Perhaps use Sarnoff camera at 541.5nm for setup.
*Use the shorter wavelength NSO IRT pre-filter for both bert and ernie. Set up bert for straight through 849.8nm and use pick-off mirror for ernie 854.2nm. (Same arrangement as November 2004). Use NSO 1219mm fl camera lens.

*Use longer wavelength NSO IRT pre-filter on Sarnoff camera for 866.2nm.
Place fold mirror next to 1219mm lens to pick off beam for Sarnoff.
Use Visible AR coated SPINOR 1000mm fl camera lens.
* Set up Pluto camera for d3 587.6nm. Use visible AR coated SPINOR 1000mm camera lens. This leg may need to be folded for fiber optic cables to reach from camera to computer.
* Set up an NSO SI 804 camera for 557.6nm. Use the NSO 1700mm singlet lens.

Phase all computers to new polarization optical setup.
Record test data with all new cameras and verify soundness of data before proceeding.

## Photospheric setup:

See "Horizontal Spectrograph Photospheric Setup" on the SPINOR web site.
The object in setting up for the photospheric observations is to disturb as little of the chromospheric setup as possible as Bala will want the chromospheric setup at then end of this run.
The ASP bert and ernie cameras, prefilter, fold mirror, and camera lens can stay where they are.
The 1083.0nm pick off mirror on the inside of the HSG near the HSG collimator can stay in the same place.
*Swap from the 308.57l/mm grating to the 600l/mm grating (upside down). The blaze angle becomes 73º when upside down. Set the angle of incidence to 73.0º.
* Move the 866.2nm and 587.6nm fold mirrors to intercept 630.2nm and 1.5648nm. A nice overlapping order for 1.5648 is 521.6nm.
* 630.2nm on Sarnoff. Use a 1000mm fl SPINOR visible AR coated camera lens.
* 1564.8nm on Rockwell camera. The NSO 1564.8 pre-filter is in a wooden box in the SPINOR cabinet. This filter should be mounted in a ring that has aluminum on the camera side. The reflective side of the interference filter faces the camera detector. Use the Infrared AR coated SPINOR 1000mm camera lens.
* The Pluto camera is not used. The Hogwarts/Pluto computer can remain powered off during this run.
* Photospheric observations will run at 20Hz (Rate of 3).
* The number of frames will most likely be 64 or 8 accumulations. These values will have to be set for all computers, Harry, Hogwarts, Hagrid, bert, and ernie. A SaveSettings can be used to capture these settings for bert and ernie.
* Bert and Ernie, though not used in the setup, must be operated. Put dummy tapes in the drives and use them day after day. SPINOR timing does not work without at least one of bert and ernie.

## Data:

ASP data go onto 8-mm tape. These tapes should be kept at the DST until the end of the Mega Run and sent to Boulder with Bala. Bala keeps the 8-mm tapes from his run.

Slit jaw images go to DLT during the run. The Mega Run slit jaw DLTs go to Boulder with Bala. Bala keeps his slit jaw DLTs.

Harry, Hagrid, and Hogwarts send data to their local disc drives in real-time. At the end of the day, data need to be sent to the SAN for archiving.
Log in as 'asp' if not already. On Harry one may have to log off as 'tdarnell' and log in as 'asp'
Select the 'C Shell' icon.
Bring up a windows directory of the data disk where the data file for the day has just been filled. On Hagrid and Hogwarts, this is d:/Data/Spinor. On Harry, this is d:/.
At the 'C Shell' command prompt enter "tosan dirname" where "dirname" is the name of the directory where today's data header files reside as shown on the windows directory. On Harry these directories are yymmdd, on Hagrid yyyyddoy, and on Hogwarts yyddoy. If 'tosan' reports an error immediately, run it again. If 'tosan' reports an error after listing all the ".ready" files but before transferring them, run 'readytosan dirname". This command skips transferring all the data files again.

Scientists will want to copy data from Harry, Hagrid, and Hogwarts to their own USB disc drives. They can do this after observing, even at the same time the "tosan" exercise is going on.

Once data have been transferred from the SPINOR computers to the SAN and written to DLT *and* the scientists have picked up the data desired on their USB drives, data can and will have to be removed from the SPINOR computer hard drives. It is likely that only one purge of data will be required, that being at the time of the swap to the photospheric setup, but frequently check the 'properties' of the D:/ drives on the SPINOR computers for sufficient room for a day of observations and warn scientists when drives are near full. At full speed and 64 frames, the Rockwell camera can record about 6.5GB/hour.

## After Bala's Run:

The Sarnoff camera and computer will stay at NSO available for summer or fall SPINOR observing. The Sarnoff will be facility camera for the remainder of 2005. (It will need to return to Boulder late calendar 2005 or early calendar 2006 for programming according to DST communication protocol). For convenience, the LCD, keyboard, and mouse could be packed in their boxes when SPINOR is not being used. The Sarnoff box, Hagrid box, and Sarnoff cable box are under the HSG and should be moved to a safe location for storage. The 1-inch filter holder on the front of the Sarnoff camera is to be returned to HAO.

The Rockwell and Pluto cameras, cables, funnel, Hagrid computer, Hogwarts computer, LCDs, keyboards, mice, and mouse pads must be packed for return to Boulder. Bala will transport these half way to Boulder after his run and Hector will take them on the remainder of the trip. All boxes are under the HSG. The LCD monitors are tricky, a screwdriver end is required to make the base fold. One of the screens must rotate 90º to fit into the packing box. There are instructions in the boxes. Here is a list, not necessarily complete.

Rockwell Camera
Rockwell Camera Power supply
Funnel with metal stem
Power supply to camera cable
Power supply AC cable
One 3m CameraLink cable
Harry computer
Harry AC power cable
Harry mouse
Harry keyboard
Harry mouse pad
Harry LCD monitor
LCD analog cable
LCD AC power cable

Pluto Camera with protectors on fiber optic inputs and C-mount CCD cover
Pluto Camera Power supply
Power supply to camera cable
Power supply AC cable
One 10m single strand fiber optic cable with end protectors
Two 10m double strand fiber optic cables with end protectors
Hogwarts computer with protectors on fiber optic inputs
Hogwarts AC power cable
Hogwarts mouse
Hogwarts keyboard
Hogwarts mouse pad
Hogwarts LCD monitor
Digital cable for LCD
AC power cable for LCD

Sarnoff camera Thorlabs filter holder. Leave scratched C mount to C mount ring on the camera. The red CCD cover is taped to the mount.

Take extreme caution with the five fiber optic cables connected to the Pluto camera. With the Pluto/Hogwarts(Oscar) boxes, there are three Ziploc bags for the fiber optic cables. The size of the bags indicates the size of the coils for the fiber optic cables. I recommend coiling them one at a time, starting with the single strand cable, then the double strand cables. If you know the audio technician over and under technique for coiling cables, use it (ask Chris). With the Pluto box there is a bag of cable end protectors for the cables, camera, and computer.

Before disconnecting the parallel cables attached to the new shiny panel with the eight 25-pin "D" connectors, please label both ends. All these cables can remain at the DST in the SPINOR cable box or wherever. Before disconnecting camera strobe cables, please label both ends, "ASP photospheric", "ASP chromospheric", "Rockwell", and "Sarnoff/Pluto". All these cables can remain at the DST. This might be a good cloudy day project.

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