Using the CHARA Alignment Laser
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April 25, 2008

The CHARA alignment laser has multiple purposes.

One purpose is to verify the alignment of the beam train from a telescope to the beam combiner in use. Users can make small adjustments to the alignment of certain optical elements of the CHARA beam delivery system using the alignment laser. This is done before observation starts. [1.]

During observations the alignment laser serves as the indicator where the star should be in the acquisition field in order to get a lock on the tip/tilt system. [Not described in this document.]

When reversed with retro reflectors, the alignment laser, often combined with the white light source (WL), is also used to align beam combiners. This should be done daytime. [2.]

The alignment laser, 17 mW HeNe, is located in the Beam Combining Laboratory on the "Sources" table along with WL. The alignment beam can be injected into two beam positions at a time though the CHARA VIS beam combiner. CHARA VIS beam combiner is also the reference for phasing up all beam combiners linked to the Array.

All GUIs shown here can be called from the menu on the "observe" screen on any CHARA computer in the control side, including all laptops in the lab. The other option is using one of the Nokia palm computers, on that you have to call the GUIs from a command line logged in as "observe".

1. How to verify/adjust the alignment of the beam train

The laser beam direction is the reverse of the direction of the starlight, so checkpoints are checked from the laser to the telescopes.

- The laser is always on. If not, report to CHARA staff.
- Make sure ND=0 is selected on the laser filter wheel

Laser_Filters		
^ ND 0.0 ⌄ ND 1.0 ⌄ ND 2.0 ⌄ ND 3.0 ⌄ ND 4.0 ⌄ ND 5.0		
IDN	UPDATE	REOPEN COMMS
PING	REOPEN	QUIT

Command line : xfilter

- Move the VIS beams selector to beams 5&6

VIS Beams		
POWER Home 5&6 1&4 2&1 3&2 4&3 5&6		
Ping!	Reopen	Quit

- Open shutters: Laser, B6

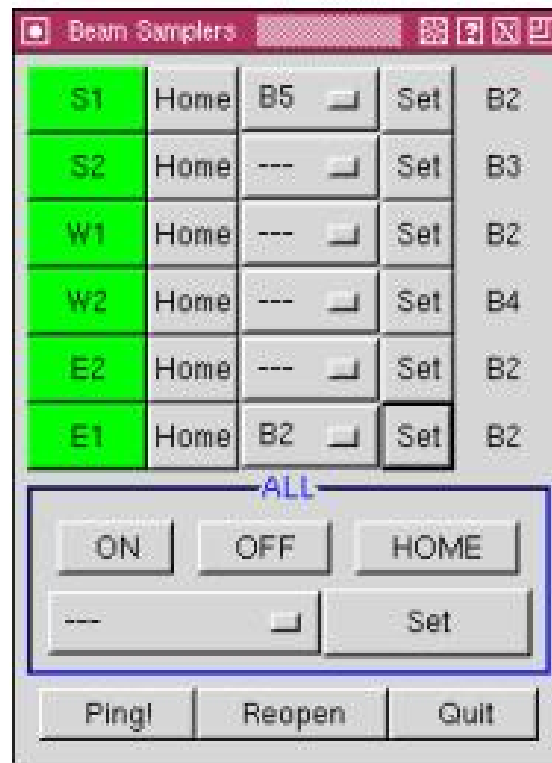| SHUTTERS					
UPDATE	CLOSE ALL	ALIGN56 ⬚		CONFIGURE	
Laser	WL	Ref	B1	B2	B3	B4	B5
B6	IRB1	IRB2	IRB3	IRB4	IRB5	IRB6
PING	REOPEN	QUIT

Command line : xshutgtk

▪Make sure no beam sampler is on Beam 6.

The right column shows the
status of the beam samplers.

Select a position in the
middle column, and hit Set
to send the Beam Sampler
to the selected position.

▪Check Beam 6 on the Far Target on the East telescopes table

You have to go behind this target and look on the other side to check the
spot. There is a laptop there to use for adjustments, if necessary.

• Change the Iris size to create an easy pattern to use for alignment. The laser spot is a diffraction pattern normally defined by the main Iris.

DEC = Decrease by one step
INC = Increase by one step
BEAM => Homes (closes) and sets it to
　　　　the nominal beam diameter = 19 mm

Command line : iris

▪Adjust beam 6, if necessary using Pico1.

The first button allows you to select B6.
When B6 is selected hit MOVE, this pops up a new window, which allows you to move the beam.

Command line : xpico1

▪This is an optional check, rarely shows the need for adjustment.

Insert the target on the IR table.
Check Beam 6 on the target. Use the Iris control again for easiest spot. If adjustment is necessary dial #8 "Las" on the pico motor controller on the top of VIS table, and use the hand paddle attached to it. When done, remove the target and dial #1 again on the controller!
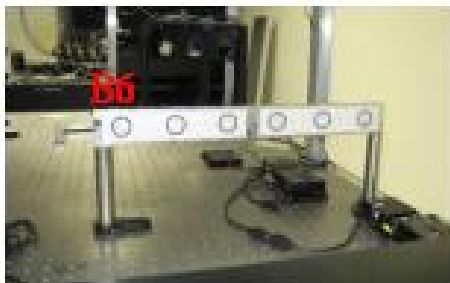
If you do any adjustment here, you have to repeat B6 adjustment on the Far Target.

▪Select the pair of beams that you want to align.

If this is different from 5&6, move VIS Beams to the selected pair. (See above.)
Open the shutters in your beams.
Make sure that no Beam Sampler is set on your beams. (See above.)

▪Check your beams one by one on the target, adjust if necessary using Pico1 controller.
Make sure you select the correct optics to move. For example if VIS Beams 3&4 was
selected, to move beam 3 you have to select 3&4-3 on Pico1. (See above.)

▪Send the Beam Samplers of your telescopes to your chosen beam positions.

▪Check/adjust the alignment of the dichroic.

There are stops in front of each
Beam Reducing Telescope (BRT)
secondary mirror for a target. The
targets are labeled for each
telescope. Insert the target and
adjust the dichroic using Pico1
controller. It is located under the W
table.
Dial up your dichroic (for ex:
E1dich) on the controller, and use
the hand paddle. Or use the
handheld Nokia, command xpico1,
and select your dichroic there.
Choose a nice diffraction pattern for
accuracy by adjusting the Iris!

▪Check the alignment of the BRT.

Make sure that the cart is all the way in the back, at the back limit switch.

Place the rail target on the rail near
the home sensor at the front.
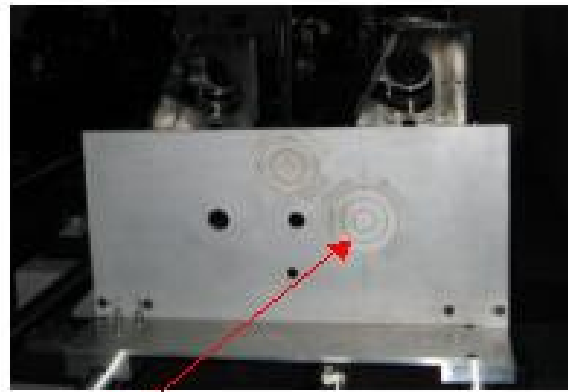
Check the backside of the rail target.

This rarely happens, but if the laser spot coming back from the cart is not centered,
that is off by more than 2 mm, ask for help. (Judit, or a CHARA member on duty)
When the laser spot looks good here, go on to the next step.

▪ Check/align M10 mirror

Make sure that the vacuum pipe is at a low pressure, below 10 torr. Open the
periscope cover. Go to a control side computer and bring up the telescope GUI.
Using the GUI turn on the TV, select M10 alignment. You should see the laser beam
at the telescope on the TV.
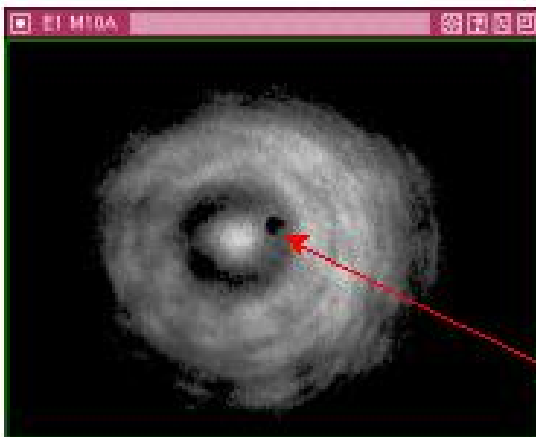
If the center of the diffraction pattern
is not as well defined as in this
picture, adjust the iris.

Using Pico2 controller, select your
telescope's M10. In this example
E1M10, and move the M10 mirror to
center the laser spot on the black dot

After that, this line is ready for observation, and the laser can be used to guide
acquisition during the night. If star acquisition and locking on tip/tilt turns out
to be troublesome, CHARA staff will deal with the problem.

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2. How to use the alignment laser for aligning beam combiners

▪Follow the previous procedure [**1.**] up to 'Check/adjust the alignment of the dichroics'. When this is done,

▪place the small retro reflector designated to the telescope to be used on its kinematic base.

(These small corner cubes are for alignment only, they are not good for phasing up beam combiners. That procedure is described elsewhere.)

From this point detailed procedures are different for different beam combiners.

▪Place the designated target to its place for the beam combiner to be aligned.

If you are on the VIS side,

▪make necessary adjustments in your setup.

If you are aligning a beam combiner on the IR side,

▪check/adjust the IR mirror of the telescope, which is on the beam to be aligned using Pico2 controller. For example, if you are aligning IR beam 5 to CLASSIC, and S1 in on beam 5, select S1IR on Pico2.

▪Make adjustments, if necessary in your setup.