Laboratory News

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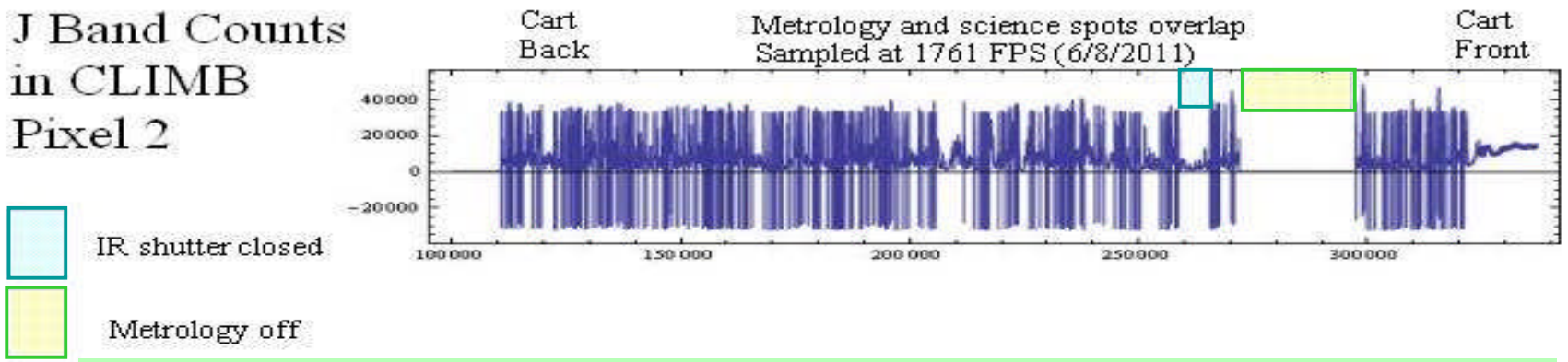
Outline

- *J band - ready to use*
- *Use of the tip/tilt mask*
- *Alignment lasers:*

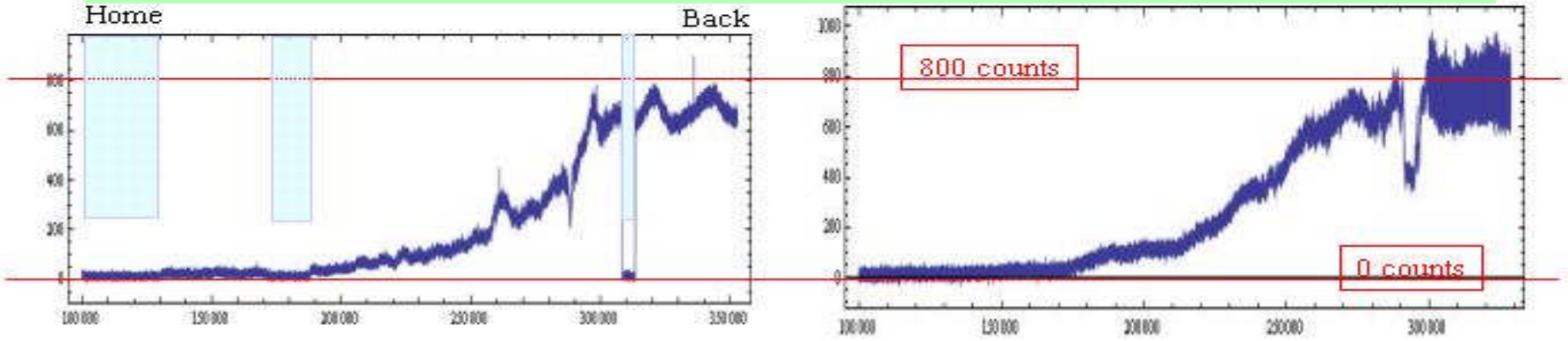
  brighter green + optional red
- *Pupil as seen from the lab*

J – Band Counts in a NIRO Pixel

Original situation: saturated detector all the way !



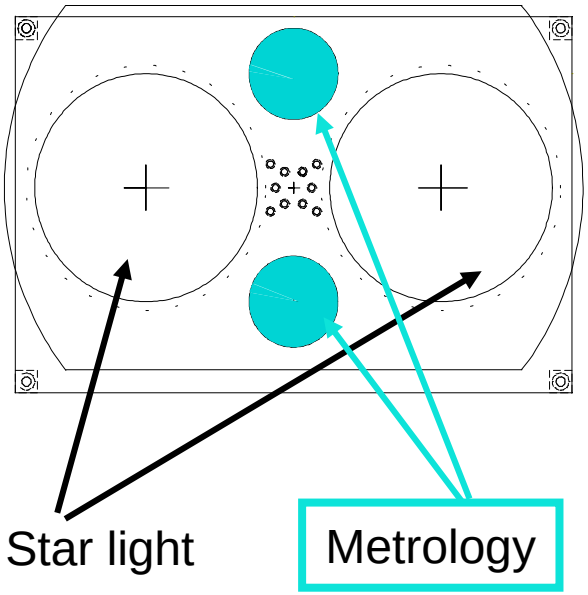
Separating metrology and science beam focus points on the delay line cart secondary eliminated the main source of metrology light leak counts → down to maximum 800 when the cart is in the back, front part is good.



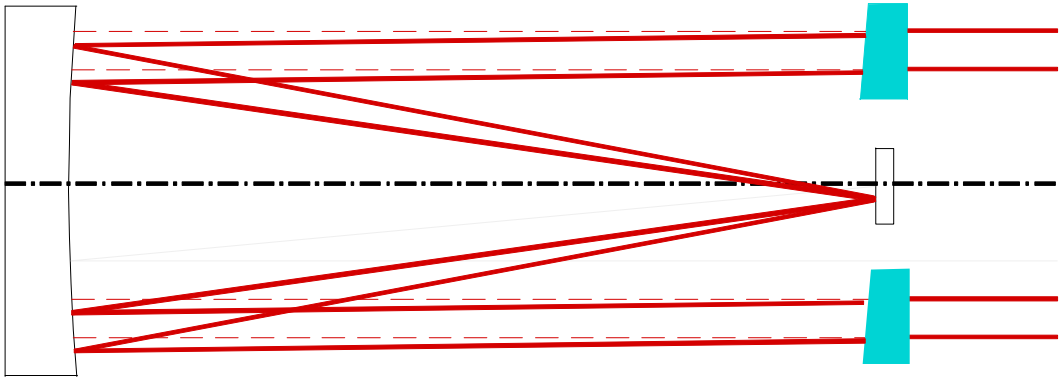
Changing the Metrology Path Inside the Cart

The metrology beam
enters the delay line cart through a slight wedge,
and exits through an identical wedge.

Cart front view

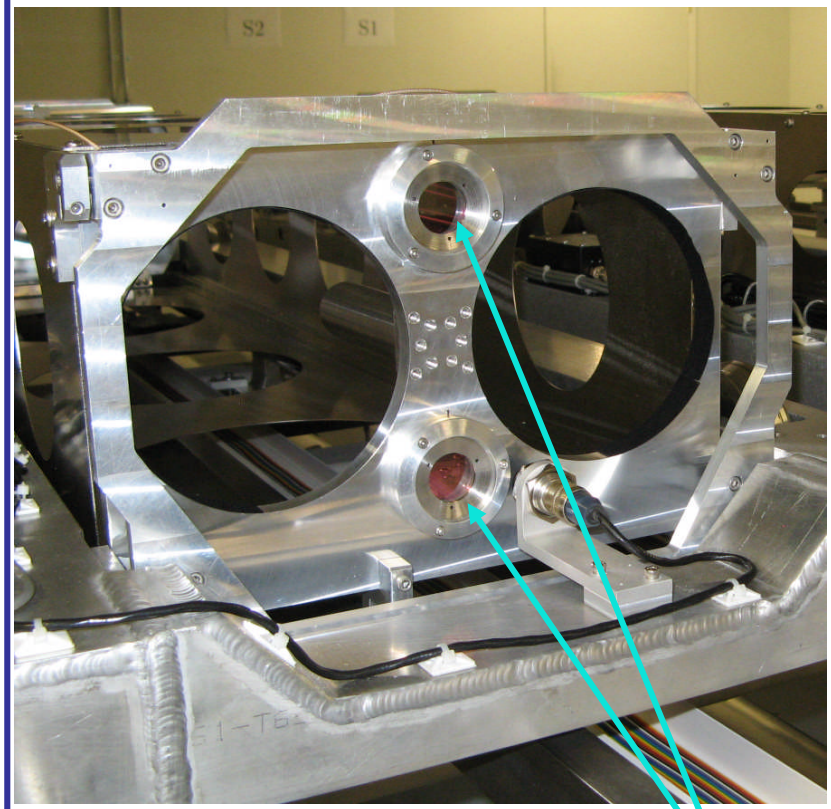


Cart cat's eye side view



The metrology beam is now focused to a different spot on the flat mirror.

Custom Wedges Installed in All Carts

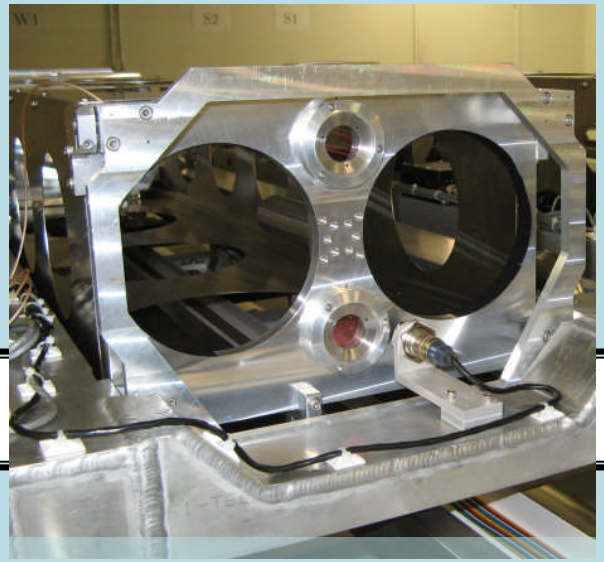


- Science and metrology beam spots are ~ 5 mm apart on cart secondary.

- AR coating on wedges optimized at 1319 nm, the wavelength of the metrology laser

Metrology Laser in CLIMB 1

Wedges in the Met path, CLIMB 1 was aligned with WL source, Corner cubes out,
When Met OFF → Lab background J-band counts < 50



Cart could be anywhere from 0 m to ~19 m

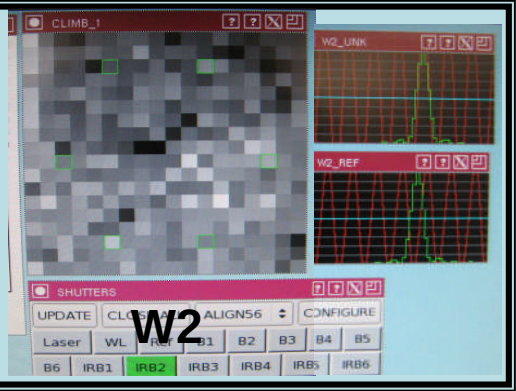
~ bckgr

~ bckgr

~ bckgr

sample rate 618 Hz

J band



Cart is at ~20 m or further back, metrology laser shows up in the detector.

~ 17

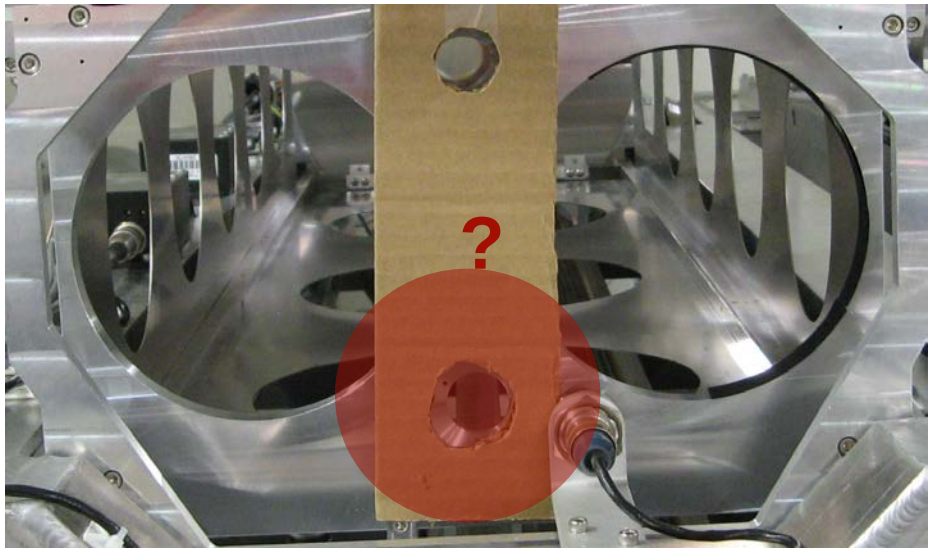
~ 40 -100

~ 0

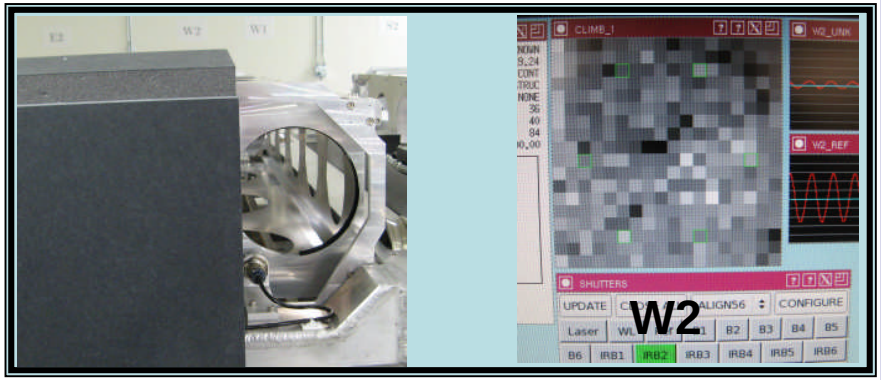
sample rate 618 Hz

J band

Masking Cannot Solve the Problem

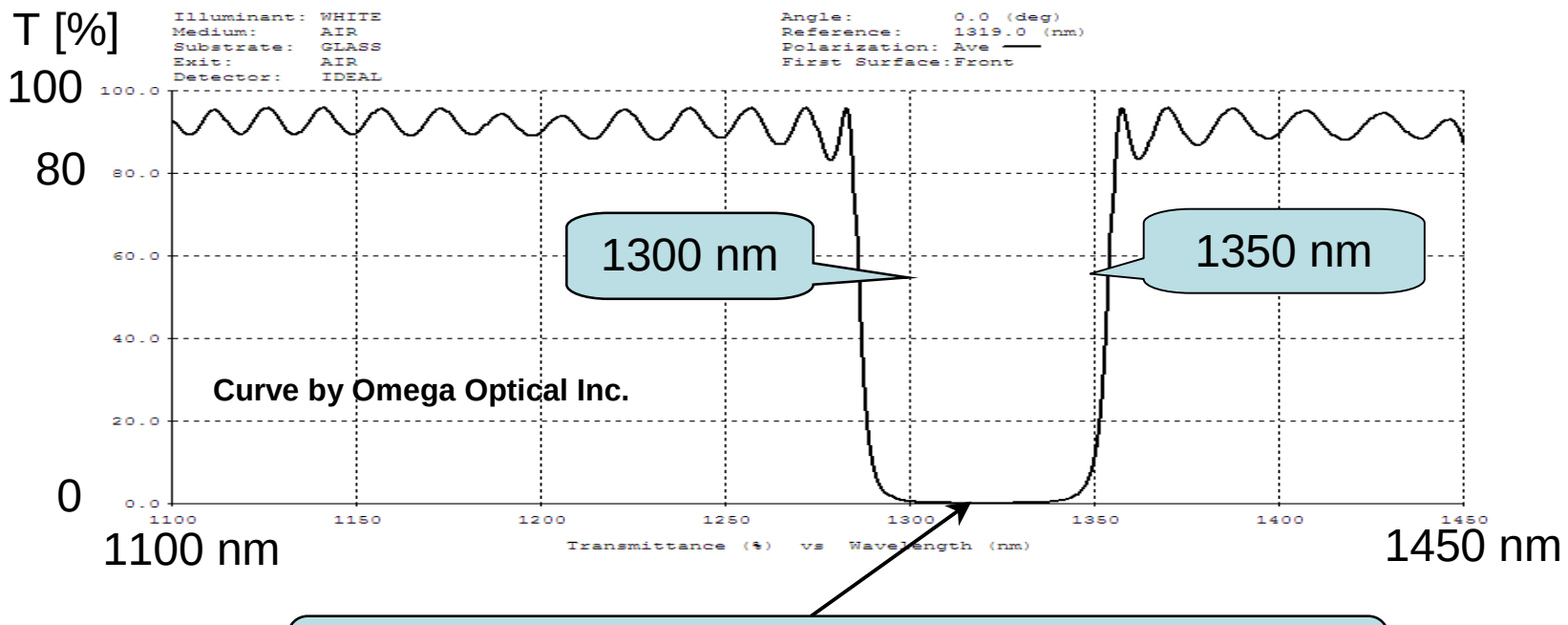


How widely spread is the metrology beam at the back of the rail?



This much of the cart has to be covered to eliminate the metrology laser in the science beam. This is NOT HELPFUL.

Notch Filters Purchased



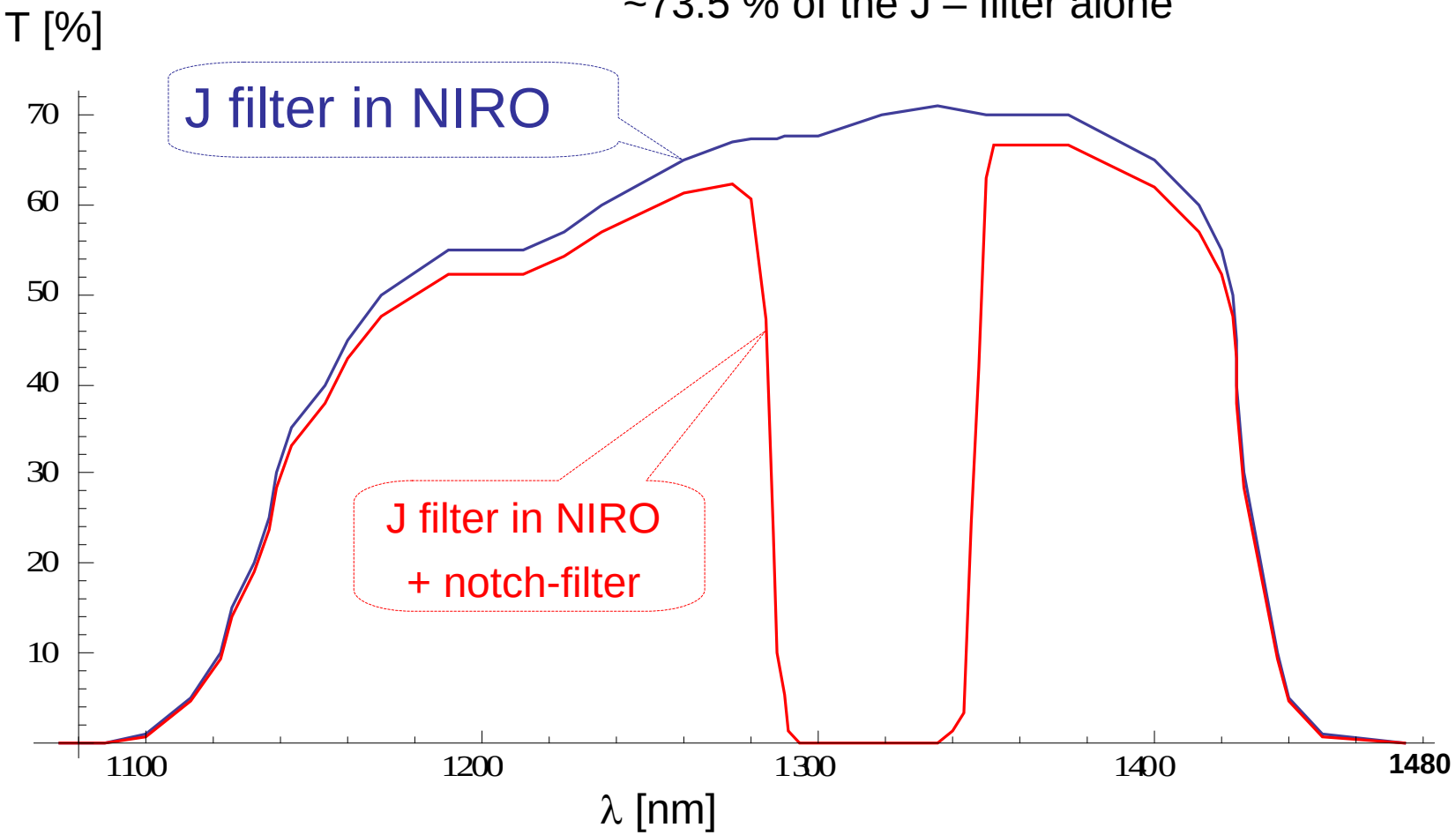
OD > 3 at 1319 nm (metrology wavelength)

J – b a n d

J-band in NIRO

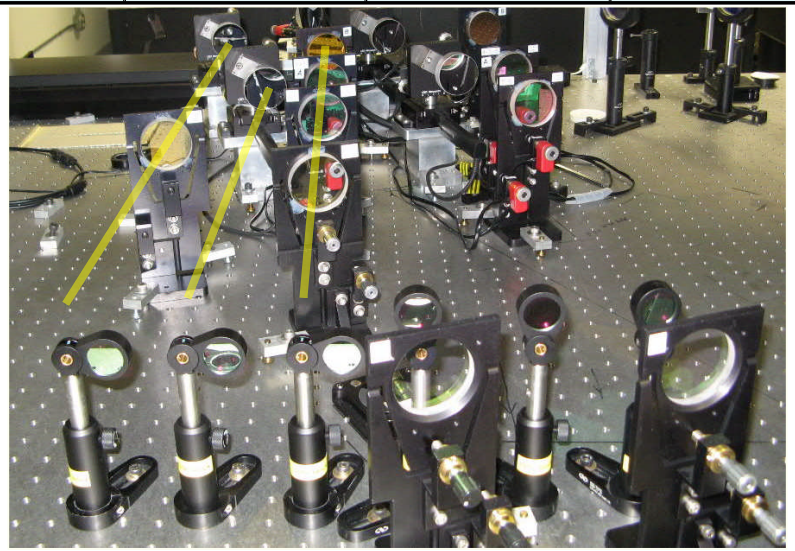
From the curves ➔

Integrated transmittance with the notch-filter is ~73.5 % of the J – filter alone



Notch Filter Test with WL Source Using CLIMB 1

NIRO J band counts **WITHOUT** notch filters **From WL source** ("***tscan***" avg. over 100 scans, 595 Hz)			
Pixel	***B1 (S1)***	***B2 (S2)***	***B3 (W1)***
1	*8 (Bckgr)*	*874*	*811*
2	*847*	*206*	*458*
3	*763*	*213*	*574*
Sum	1618	*1293*	*1843*



NIRO J band counts **WITH** notch filters IN **From WL source** ("***tscan***" avg. over 100 scans, 595 Hz))			
Pixel	*B1 (S1)*	*B2 (S2)*	*B3 (W1)*
1	*13 (Bckgr)*	*695*	*617*
2	*625*	*170*	*348*
3	*558*	*212*	*440*
Sum	1196	*1077*	*1405*

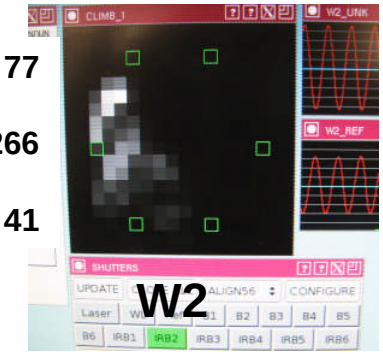
Pixel	***% of counts with notch filters IN***		
1		*79.3*	***75.8***
2	***73.5***	*81.6*	***75.4***
3	***72.8***	*99.5*	***76.2***
Sum	**73.4**	*82.9*	***75.4***

J-band Tests with Metrology

All carts in the back, WL source OFF, Metrology ON

Examples **without** notch filters

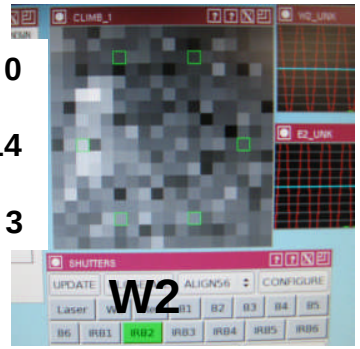
Met signal (mV)	S1 > 1000	*S2* *600*	*W1* *100 -150*
NIRO J band counts **WITHOUT** notch filters **Metrology ON** (“***tscan***” avg. over 100 scans, 595 Hz)			
Pixel	***B1 (S1)***	***B2 (S2)***	***B3 (W1)***
1	*50*	*620*	*75*
2	*280*	*357*	*73*
3	*270*	*194*	*74*



All lines look like this without notch filter, and carts at the back.

Examples **with** notch filters

Met signal (mV)	S1 > 1000	*S2* *600*	*W1* *100 -150*
NIRO J band counts **WITH** notch filters IN **Metrology ON** (“***tscan***” avg. over 100 scans, 595 Hz)			
Pixel	*B1 (S1)*	*B2 (S2)*	*B3 (W1)*
1	*13*	*15*	*12*
2	*- 0.8*	*- 0.8*	*- 1*
3	*2.2*	*2.4*	*2*



All lines were tested: only **S2** and **W2** showed any sign of the metrology. No sign of met.las. from other carts.

At this test J band background (Met OFF) < 18 counts in any NIRO pixel

Summary: Using J – Band

Decide what you need more

All available delay

- **Use the notch filters**
- Permanently installed wedges in the carts + the filters will protect the science beam from the metrology laser

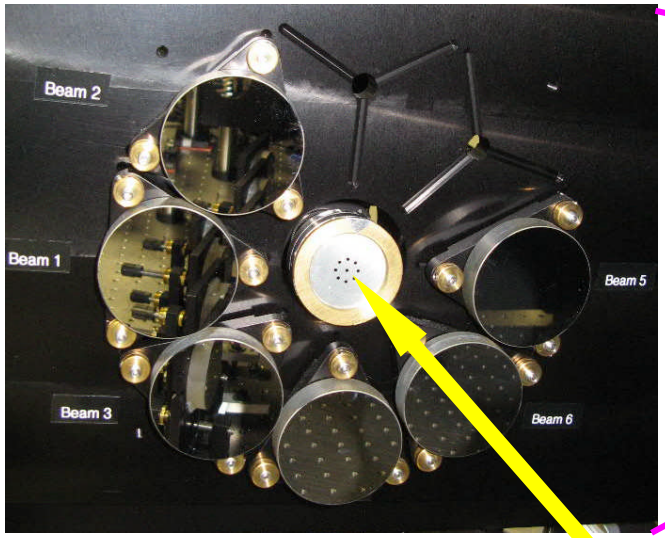
You loose ~ 26 % of J flux

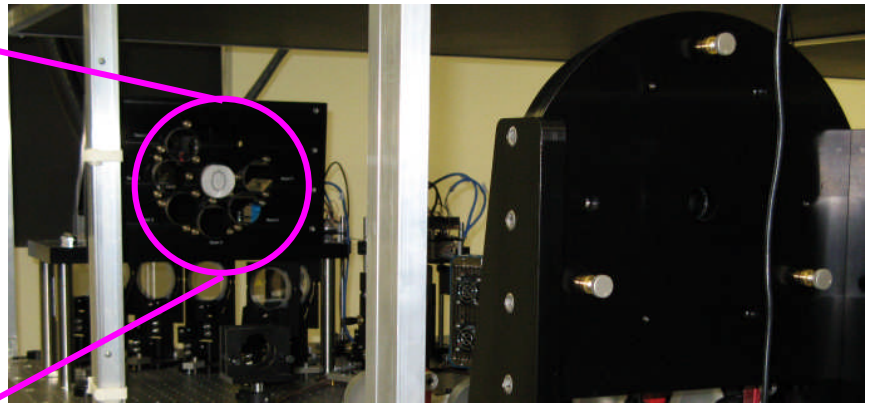
All available J flux

- **Do not use the notch filters**
- Permanently installed wedges in the carts will protect the science beam from the metrology laser only up to 19 m on the rail

You loose ~ 50 % of continuous delay

The Mask in the Tip/tilt Detection System





The size of the holes in the mask was chosen to completely eliminate cross talk between beams.

It does not restrict the field of view!

The field of view of a quad-pixel on the tip/tilt detector is 7 arc seconds (Acquisition ~ 3 arc minutes)

DO NOT TAKE OFF THE MASK

We could make additional masks which would restrict the tip-tilt field of view, if you have a special target to observe.

Green Alignment Laser

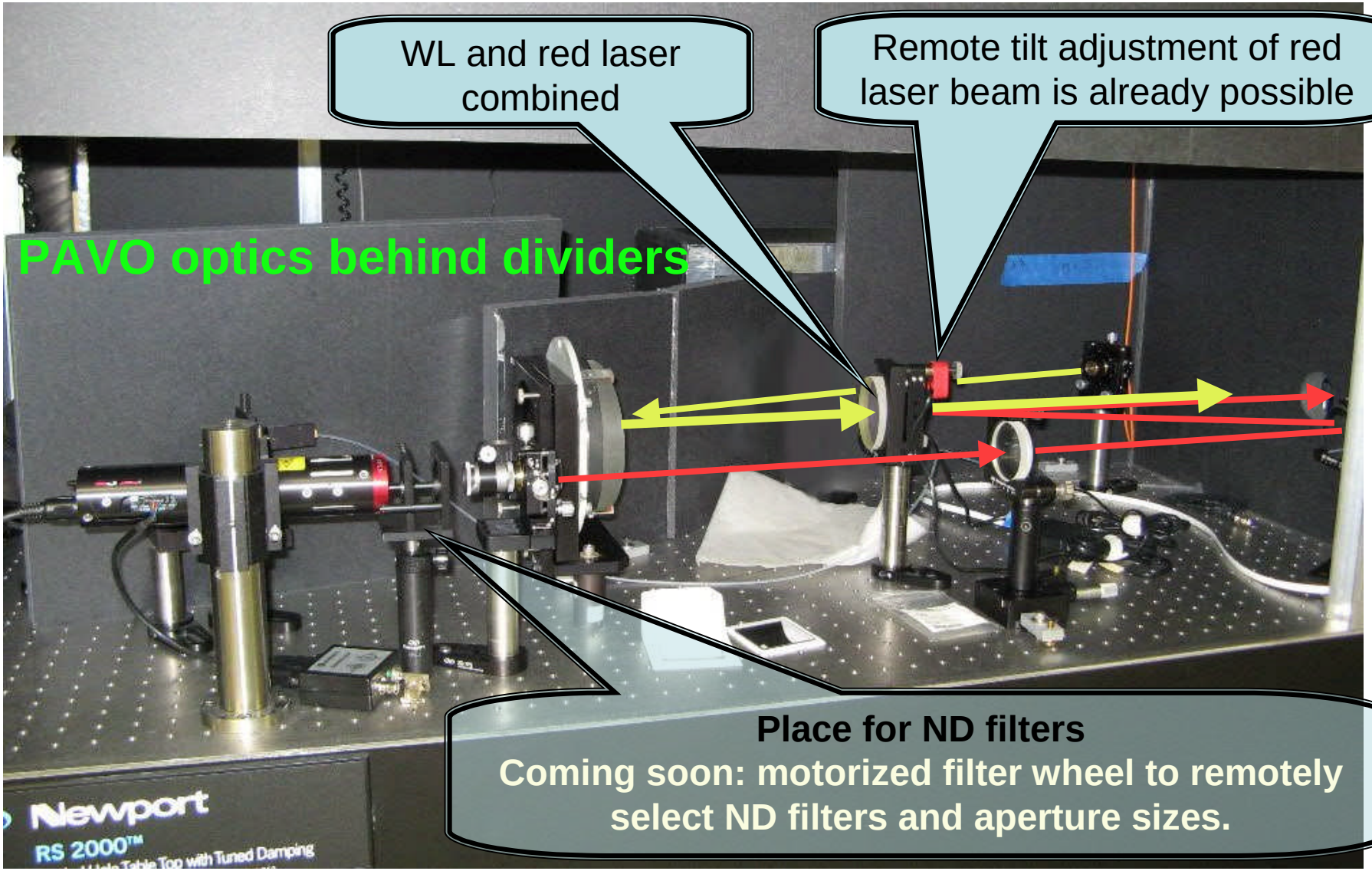
Brighter than ever

The counts in tip/tilt are ~ 8 times more
after complete realignment including the spatial filter.

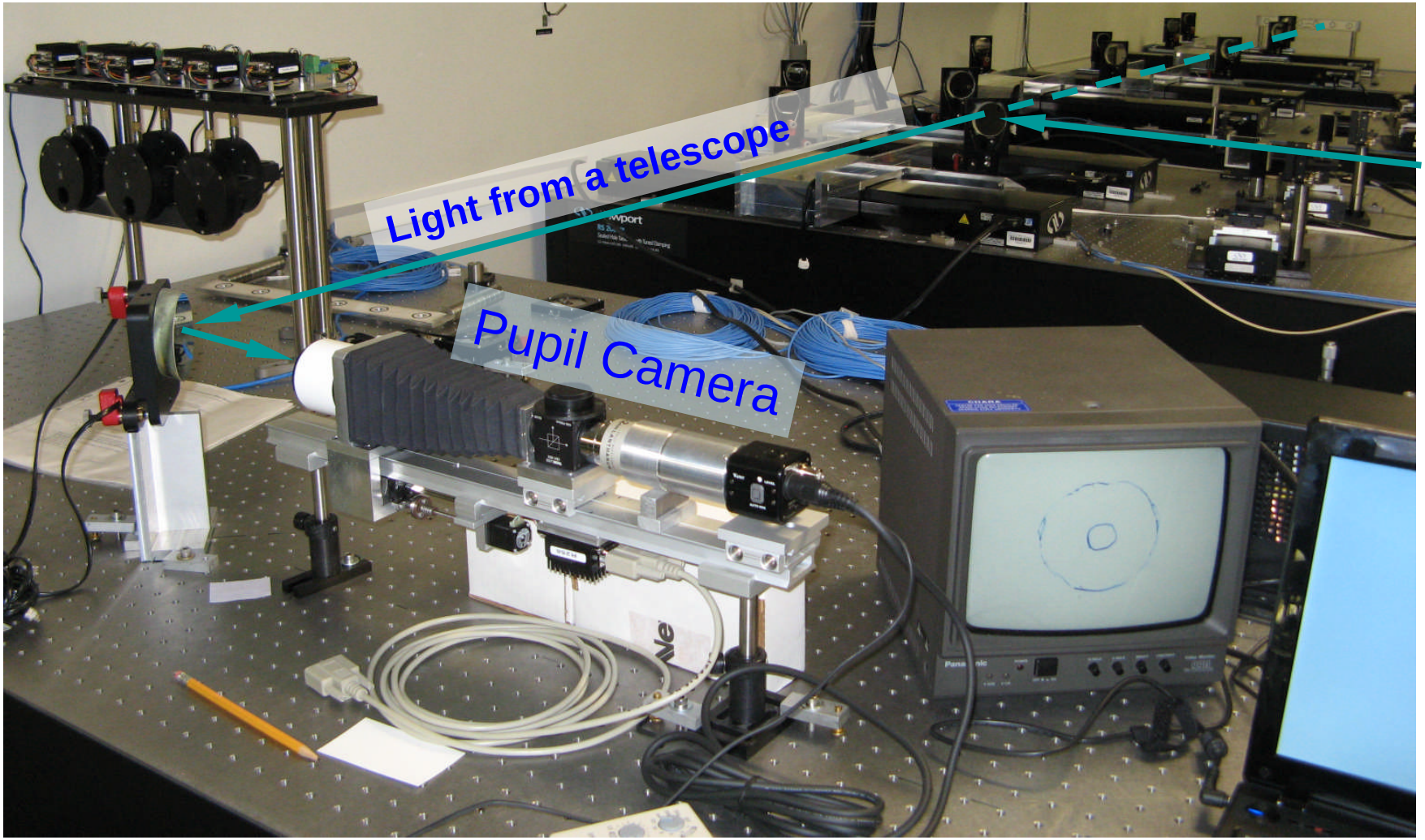
Line	10/30/2012		1/22/2013	
	Beam	Counts	Beam	Counts
S1	3	4000	1	33000
S2	2	2100	2	17900
W1	1	1800	3	14600
W2	6	3500	4	27500
E2	5	1800	5	12700
E1	4	3200	6	24000

In both cases: Integration = 5ms, ND = 5, Iris = “BeamSize”

Alternative Red Alignment Laser



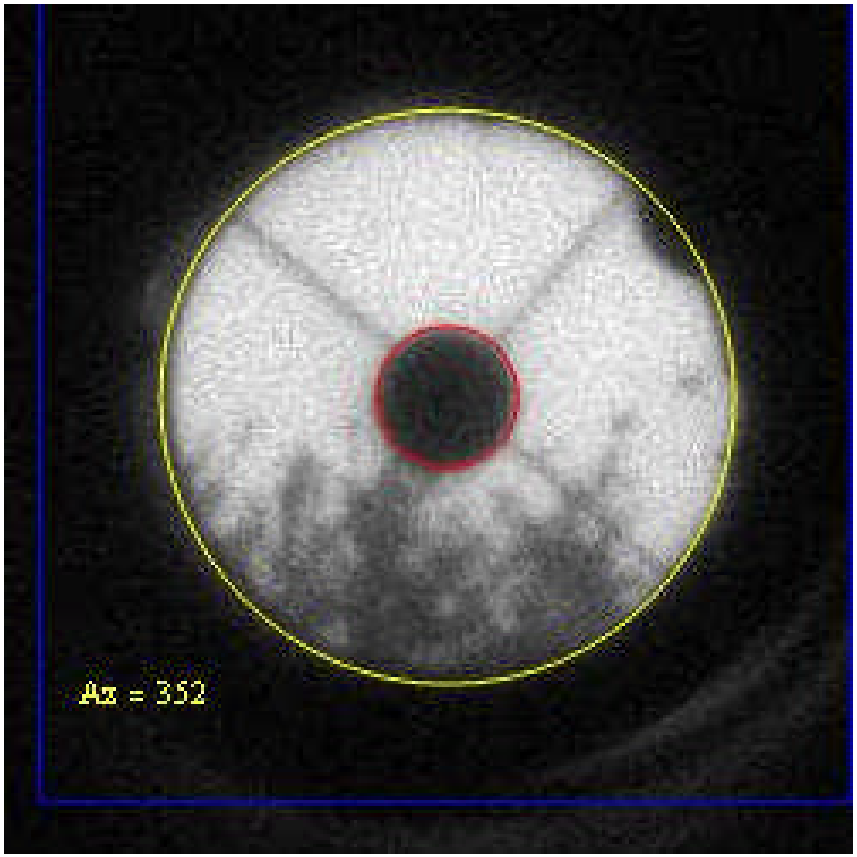
Checking Pupil Motion in the Lab



Trees Around S1

Video taken on 2/13/2013
S1(pop1)

172 deg < Azimuth < 359 deg
El = 30 deg

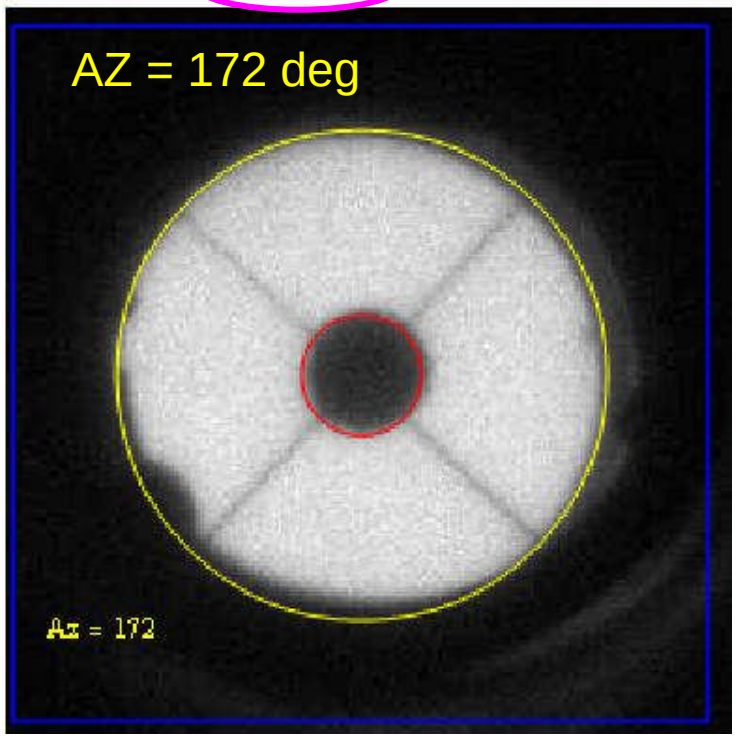


Frame at
Azimuth ~235 deg

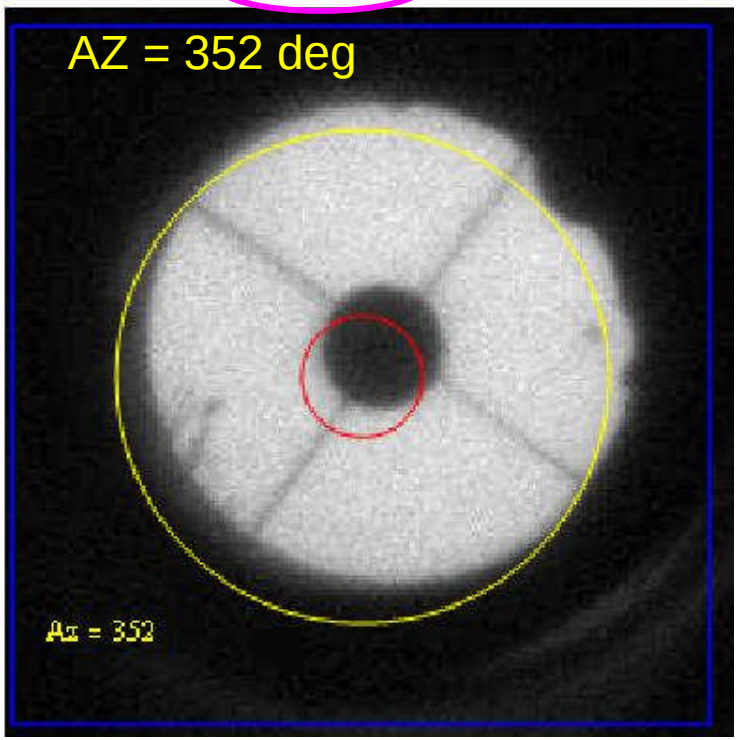
Pupil Motion vs Azimuth Coude Alignment

Test on 2/13/2013 with S1 at El = 30 deg, pop1 was used with deliberately bad Coude

ImageCompose[az1, Pointer, {122, 124}]

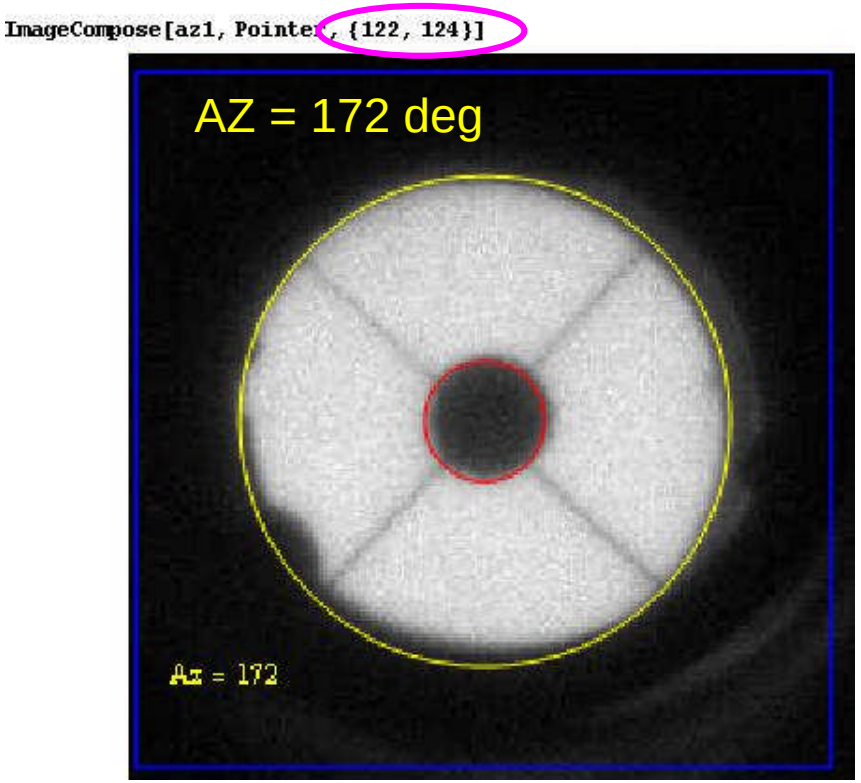


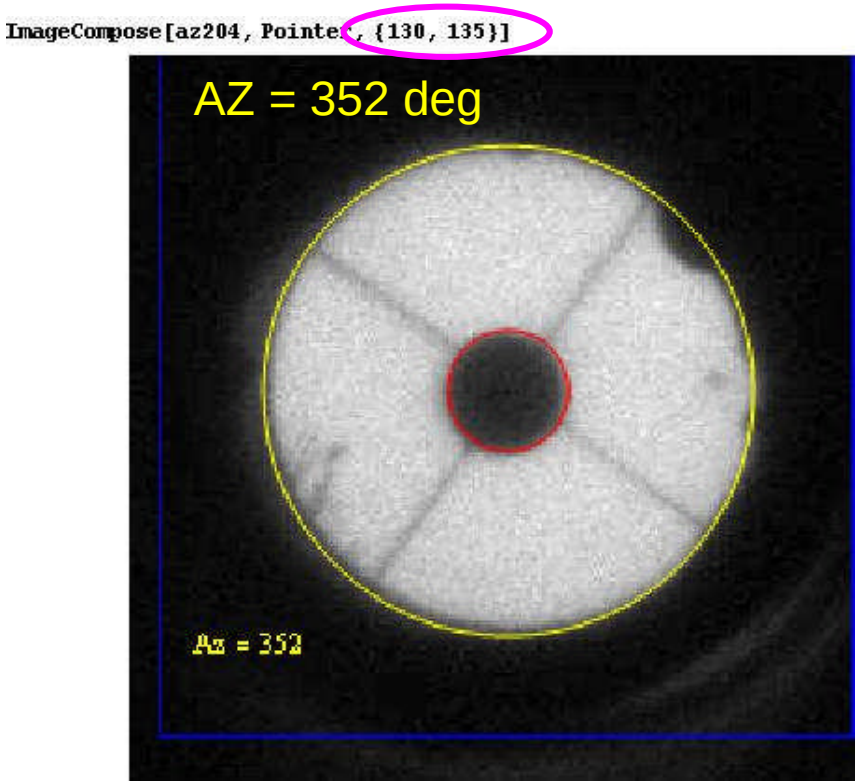
ImageCompose[az204, Pointer, {122, 124}]



Pupil Motion vs Azimuth Coude Alignment

Test on 2/13/2013 with S1 at El = 30 deg, pop1 was used with deliberately bad Coude





➡ Shift was 13.6 pixels in pupil camera => 12.8 % of pupil diameter

Routine AZ Coude check (also on 2/13/2013) → 106 ticks movement in the Acquisition TV.
We keep the Coude alignment far better than this, typically below 30-40 ticks.

Summary: Pupil Motion in the Lab

- **No pupil motion** has been detected as a result of **altitude axis** moving at any scope.

- Pupil motion as a result of **azimuth axis** moving can be easily kept **below 5%** of pupil diameter by making regular Coude alignment checks and adjustments of M7 tilt.

- Pupil motion as a result of **delay line cart** moving can be easily kept **below 5%** of pupil diameter by making regular rail alignment checks and adjustments.

NOTE: There will be a ~10% shift from the Home sensor to the Front-limit, but that (~1.3m) part of the rail is hardly ever used.