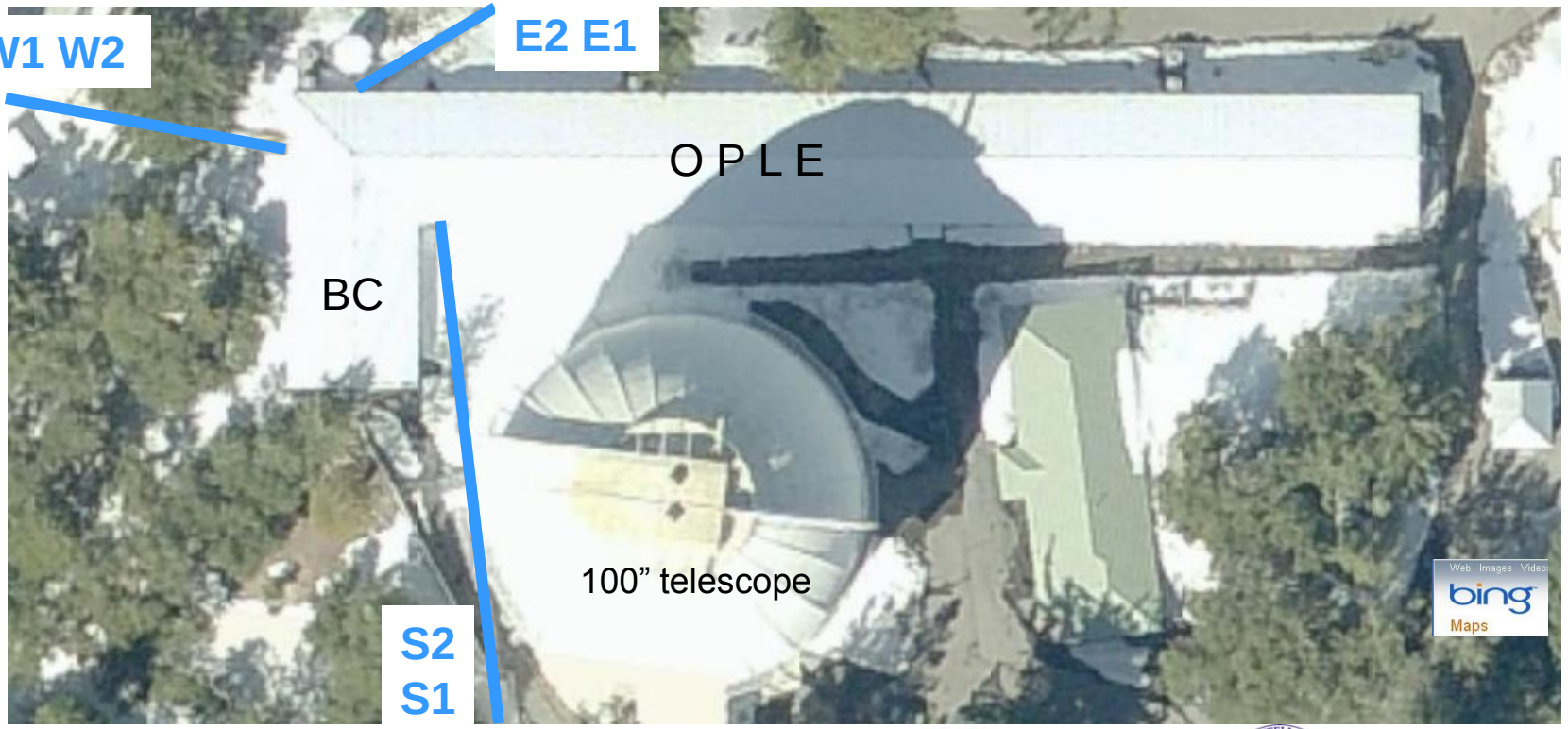
Report from the Beam Combination and OPLE Lab

Judit Sturmann



Topics

- 2010, the year of mixing and matching

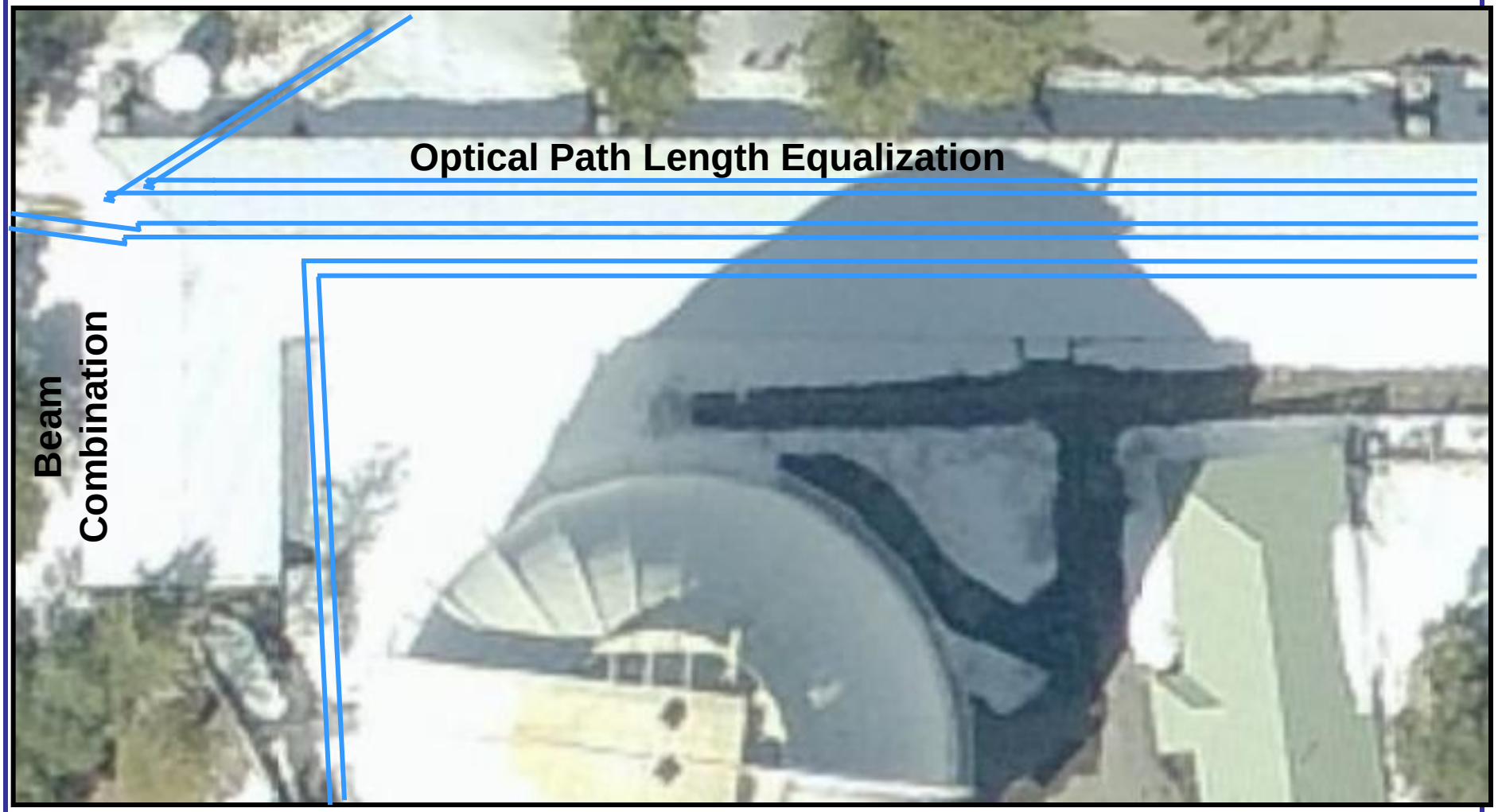
  maximizing access to observing time

- Maintenance and improvements

  in the background

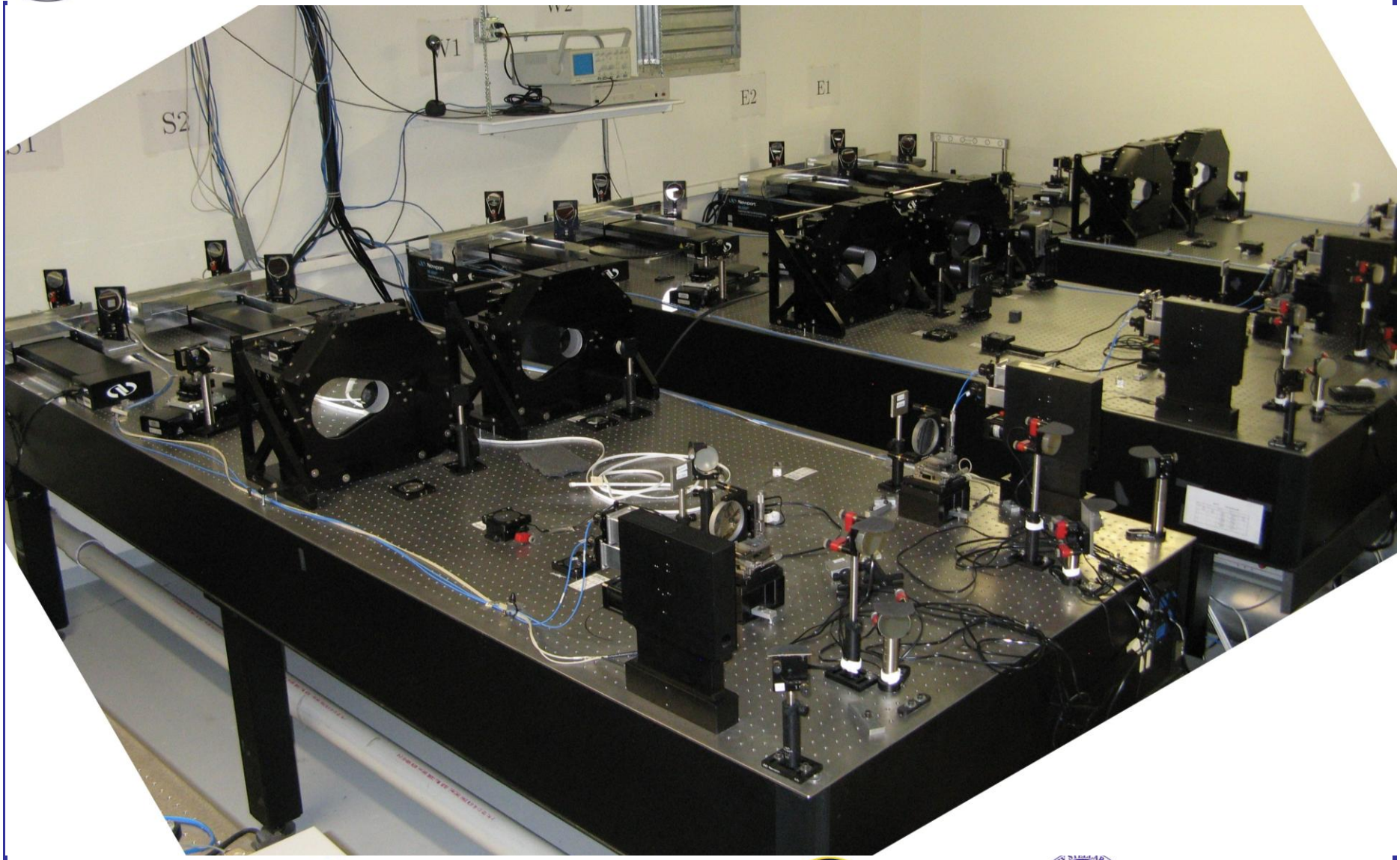
  - Delay lines
  - Light path issues
  - NIRO / CLIMB news

What's Happening Under the Roof

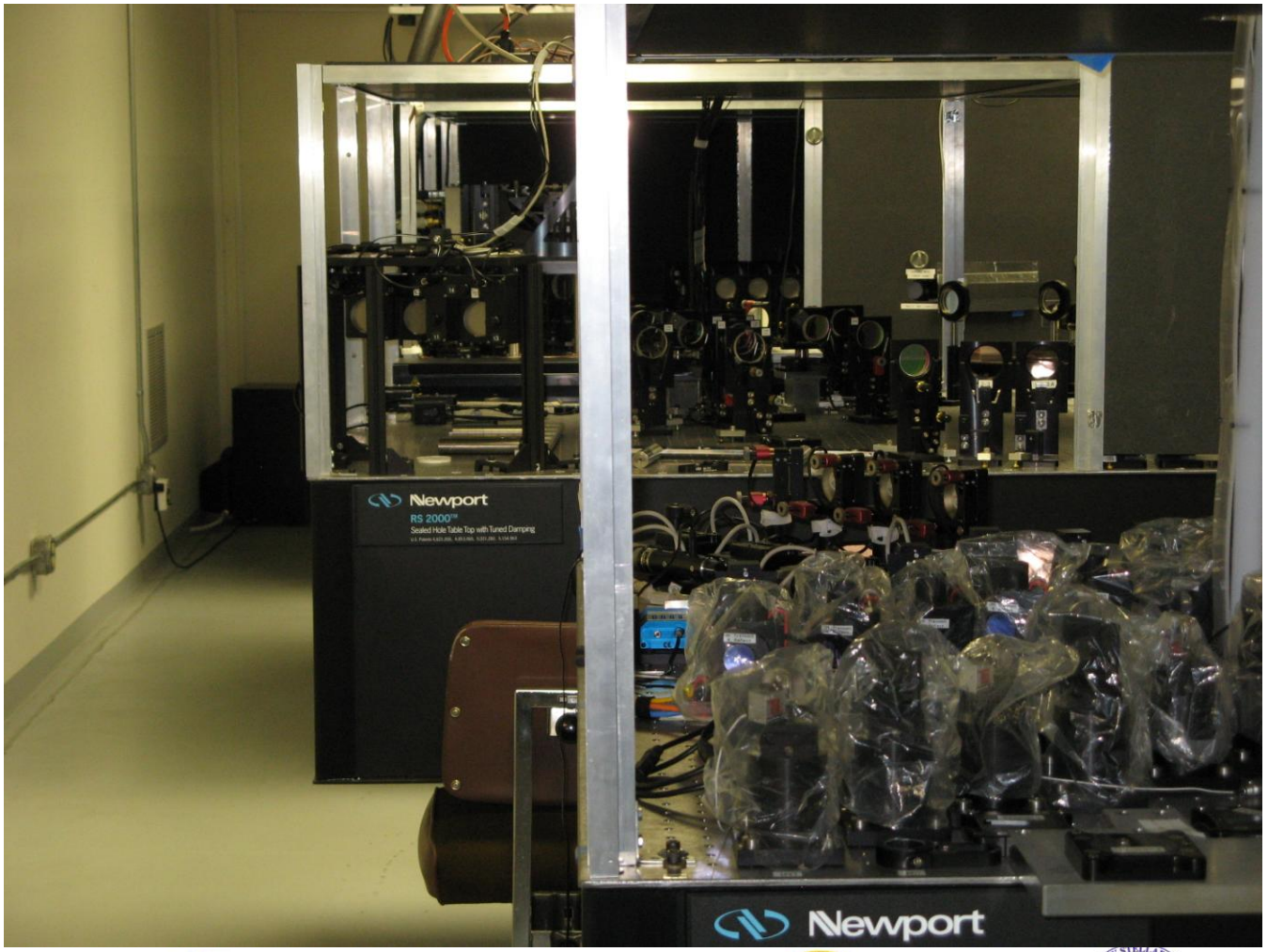


OPLE Delay Lines

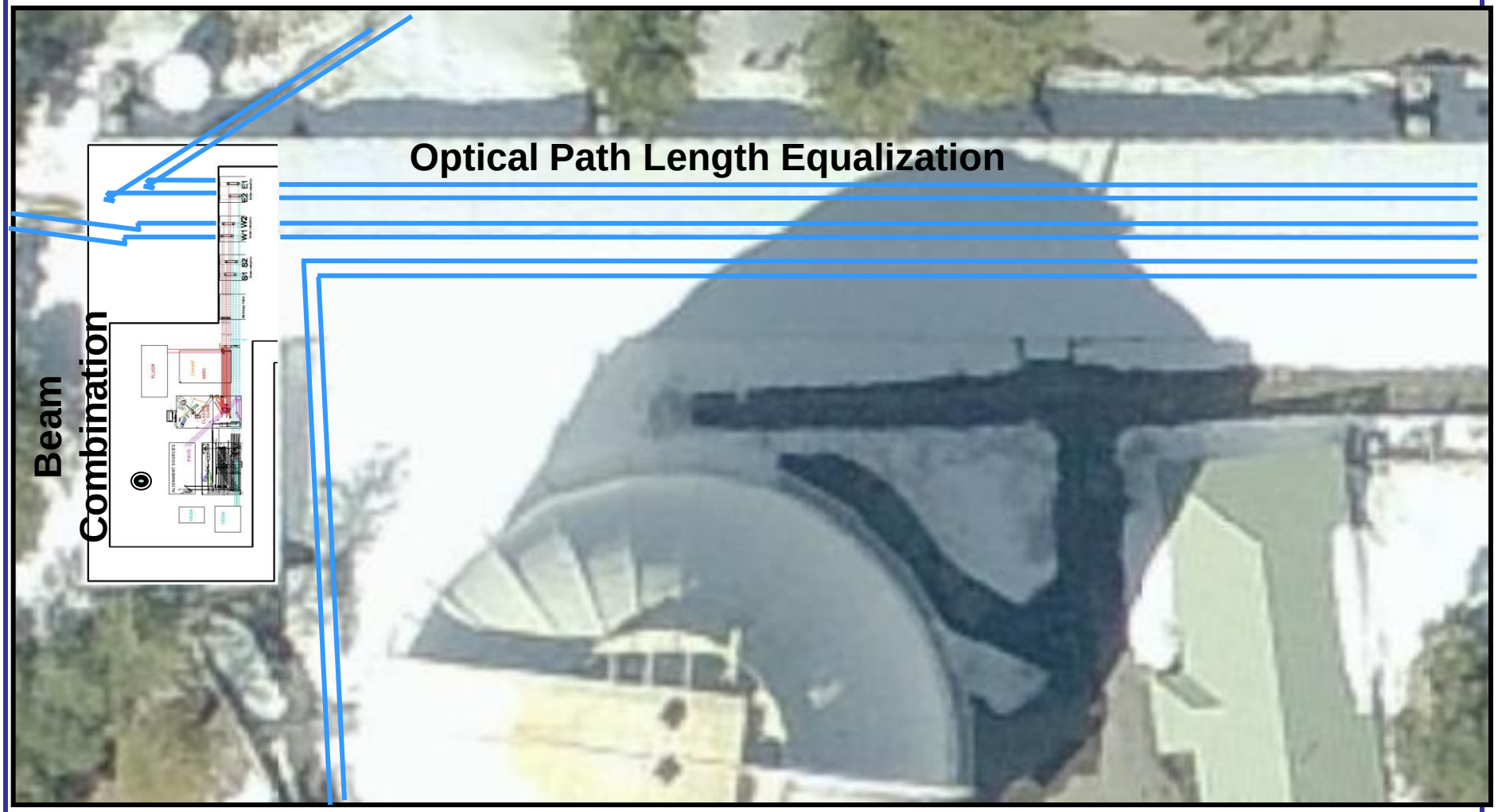
Beam Sampling, Beam Compression

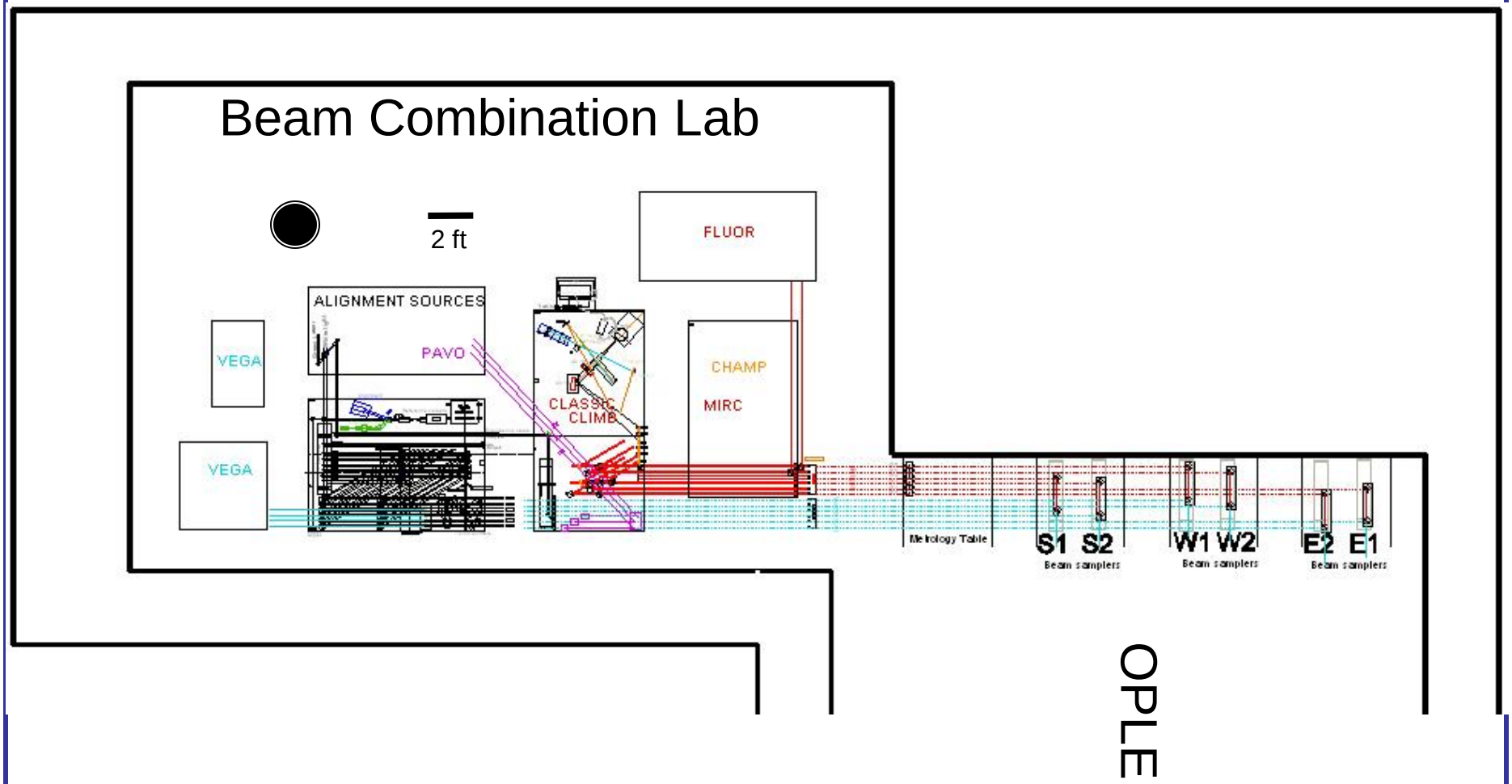


Looking Toward the Beam Combination Lab



What's Happening Under the Roof

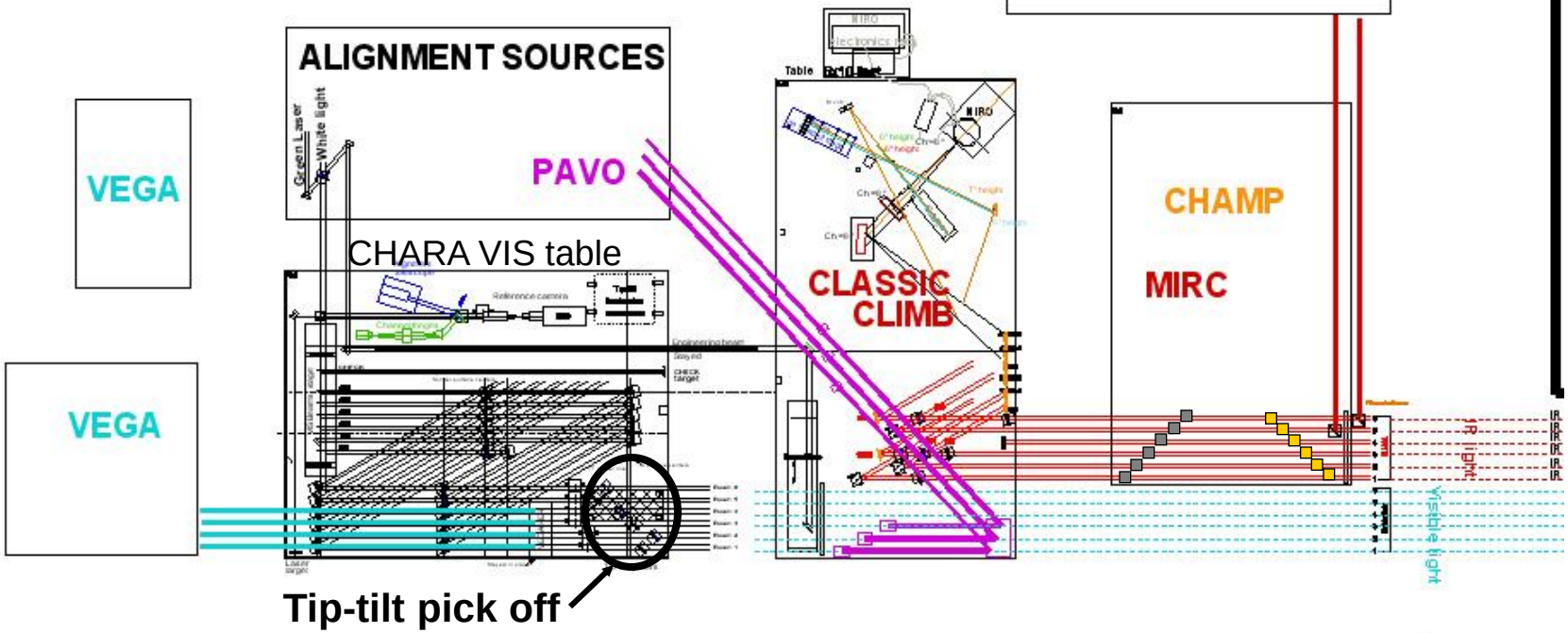



Beam Combination Lab
2 ft
FLUOR
ALIGNMENT SOURCES
VEGA
PAVO
CLASSIC
CLIMB
CHAMP
MIRC
VEGA
Metrology Table
S1 S2
Beam samplers
W1 W2
Beam samplers
E2 E1
Beam samplers
OPLE

Beam Combination Lab

8 beam combiners
- 6 for science (2 VIS + 4 IR)
- 1 for alignment and phasing
- 1 future fringe tracking, CHAMP

Tip-tilt detection



Combinations of Combiners

Shared telescopes (same objects) phase matched combiners, fringes at the same time

CHAMP (6) - MIRC (6) - VEGA (4) - PAVO (3)
CHAMP (6) - CLIMB (3) - VEGA (4) - PAVO (3)
FLUOR (2) - VEGA (4)
FLUOR (2) - CLASSIC (2)

Different telescopes parallel combiners running independently

CLASSIC (2) – CLIMB (3)
CLASSIC (2) - MIRC (4)
CLASSIC (2) – VEGA (4)
CLASSIC (2) – PAVO (3)

CLASSIC (2) – FLUOR (2)

FLUOR (2) - CLIMB (3)
FLUOR (2) - MIRC (4)
FLUOR (2) – VEGA (4)
FLUOR (2) – PAVO (3)

Maximizing Relevant Results

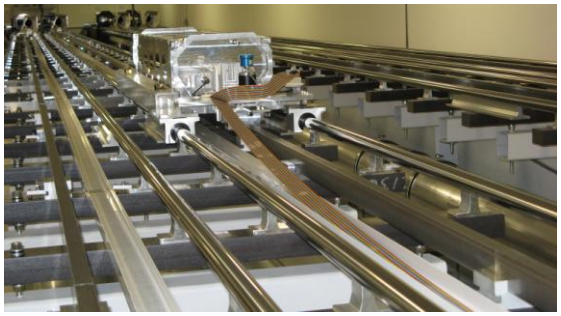
by maximizing access time

- Current scheduling wizard setting: more time to more observers
- More data when everything works more frustration when some don't

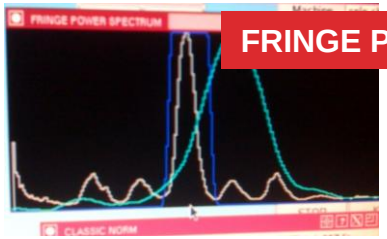
- Maintenance in the background - Some risk involved!
  - time only for reconfiguration and quick adjustments in observing season
  - fix only when brakes - added unpredictability
    - potentially much longer down time
  - less time for improvements (a longer term risk)

OPLE Cart Troubles

Some reasons for “cart stuck”,



“cart vibrates”

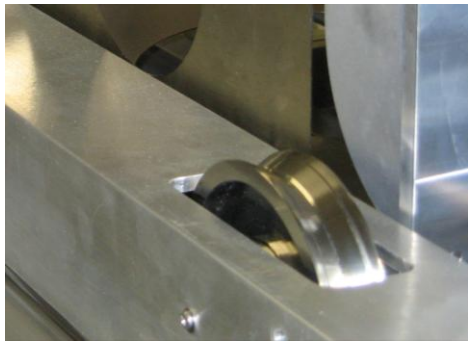


FRINGE POWER SPECTRUM

Picture by Tabetha
Nov. 11, 2009

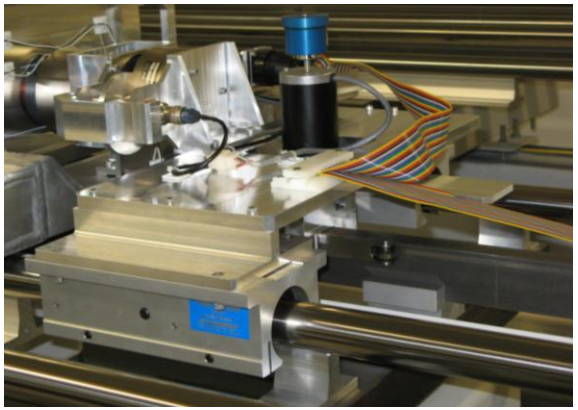
Excessive load due to:

- Bad rail alignment *
- Sticky cables
- Wearing of the bearings



Not enough friction due to:

- Not optimal spacing
- Black powder on drive rail



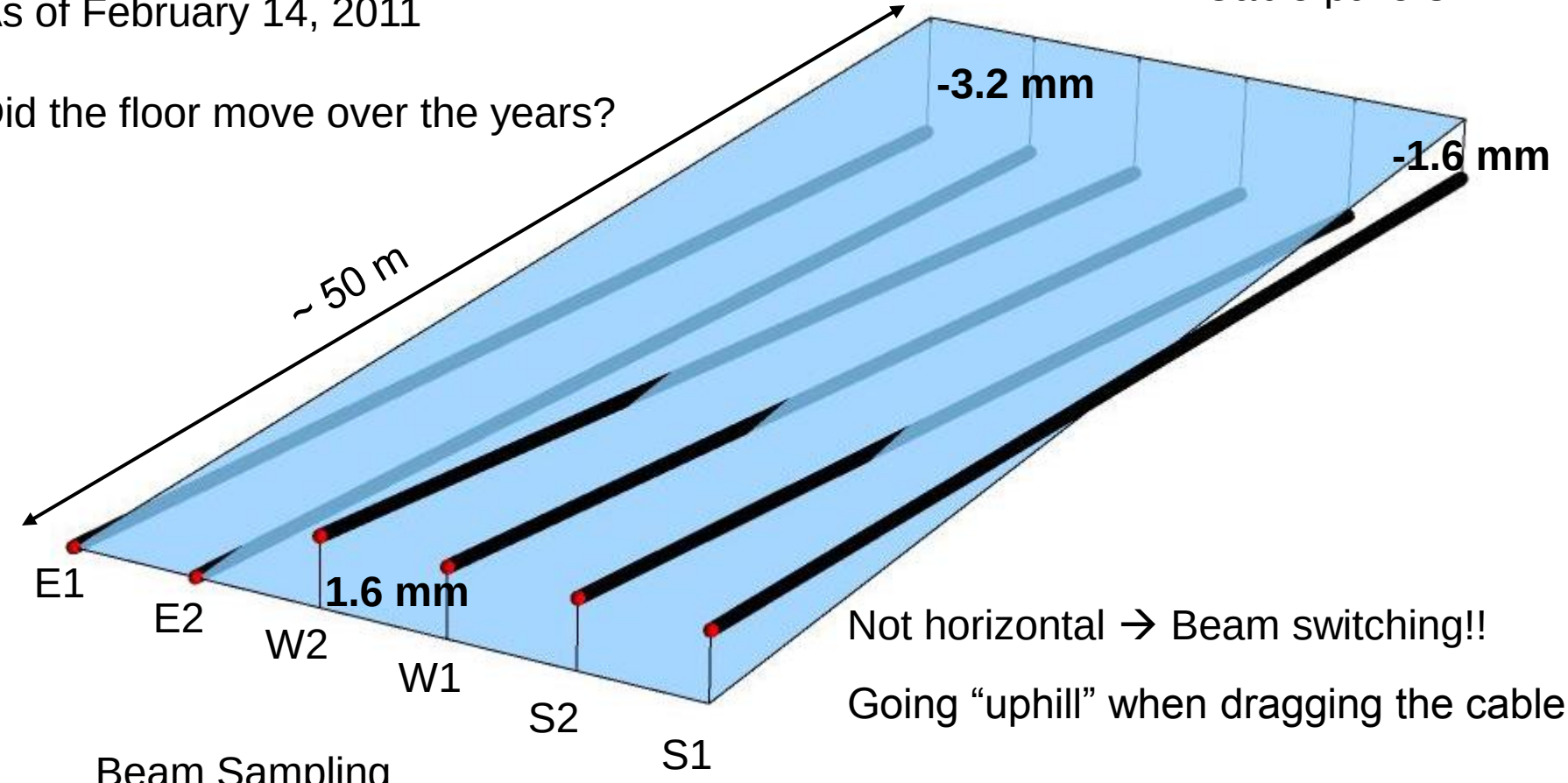
Control issues:

- Controller fuse
- Amplifiers tuning

The Overall Positions of Rails

As of February 14, 2011

Did the floor move over the years?



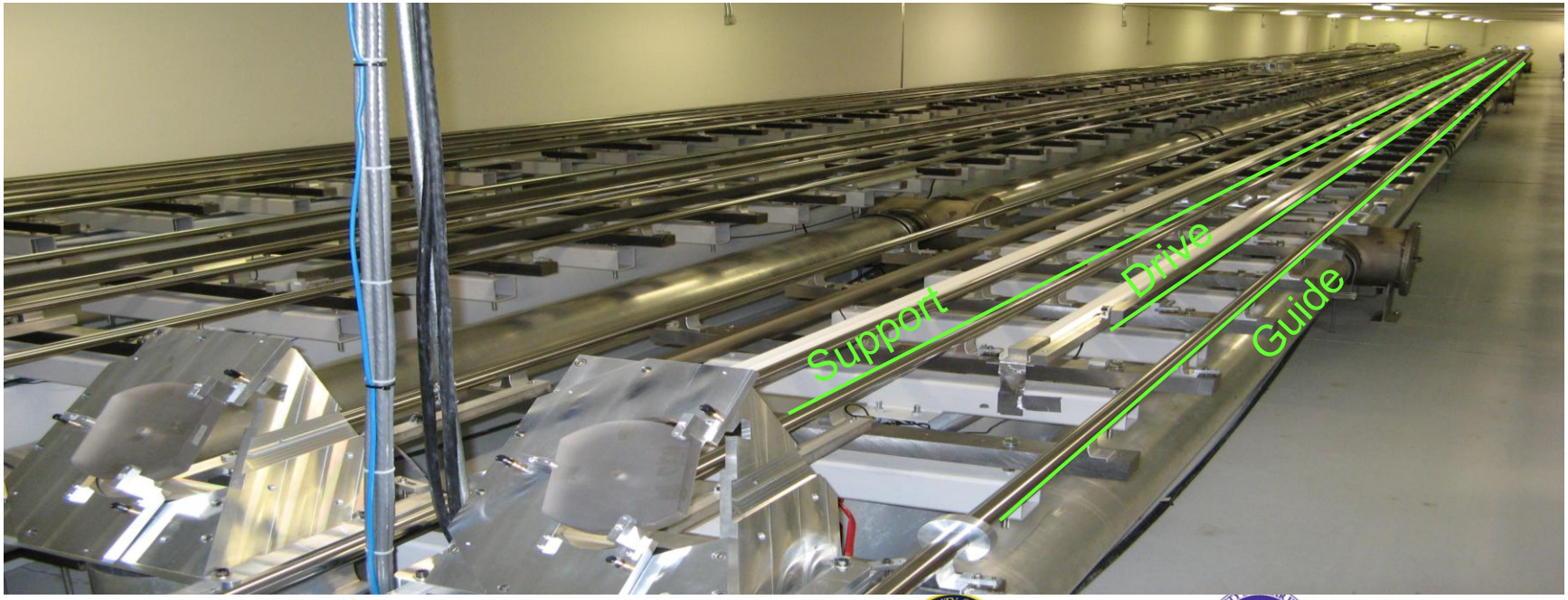
Not horizontal → Beam switching!!

Going “uphill” when dragging the cable

Rail Alignment

Takes a long time to properly align and they keep moving like all things

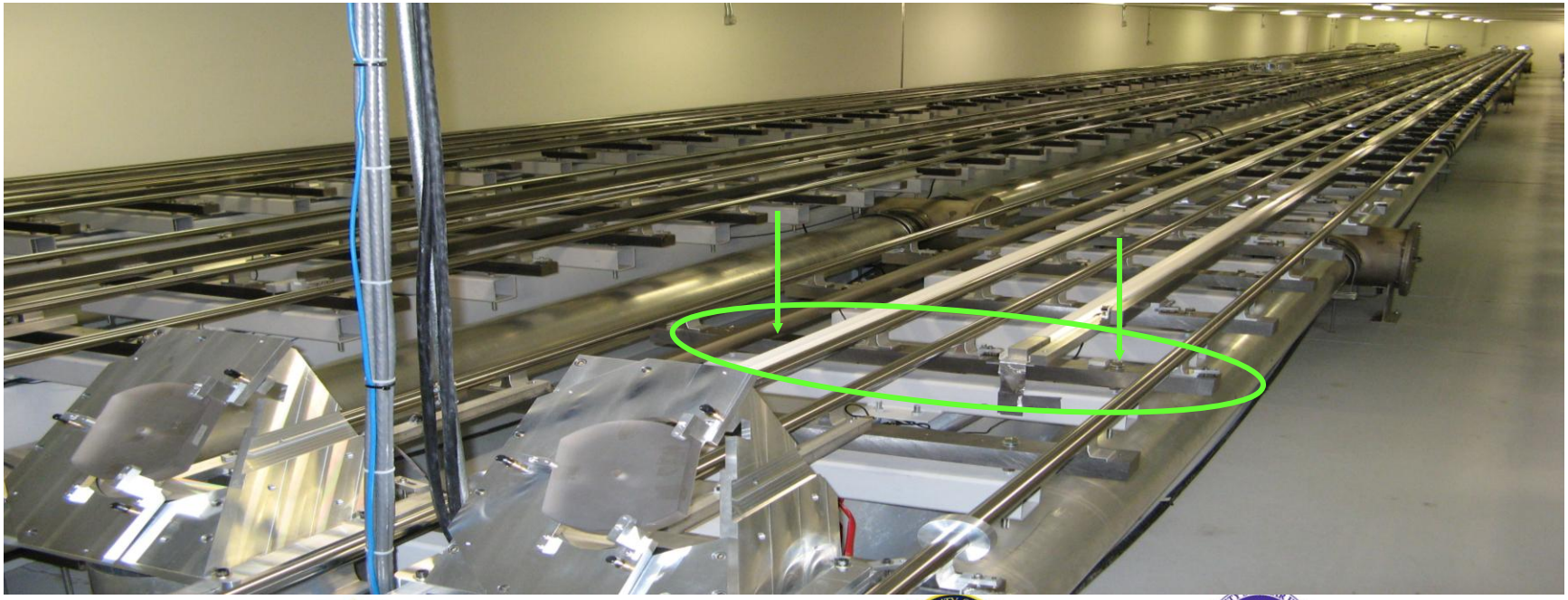
- there are three rails, ~50 m, per telescope



Rail Alignment

Takes a long time to properly align and they keep moving like all things

- there are three rails, ~50 m, per telescope
- about 80 sleepers across, height adjustments at the two sides



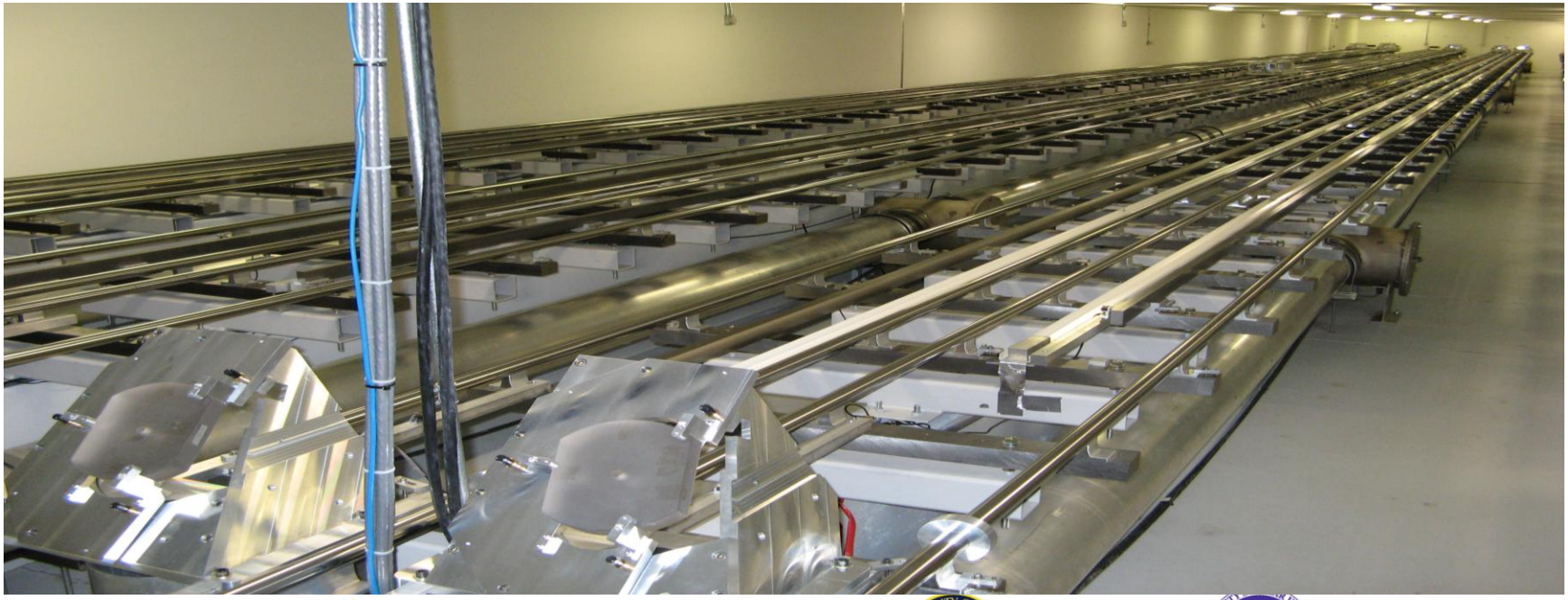
Rail Alignment

Takes a long time to properly align and they keep moving like all things

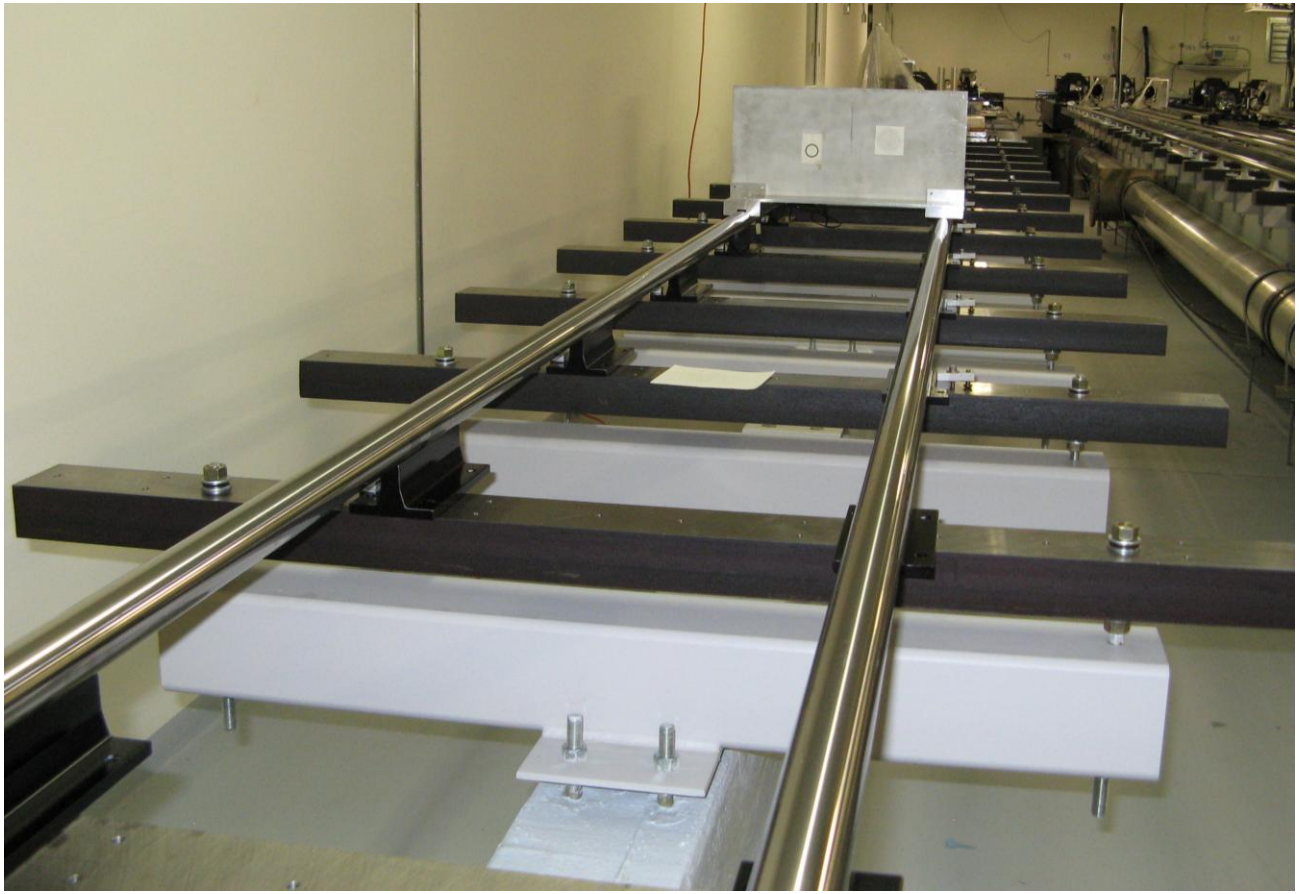
- there are three rails, ~50 m, per telescope
- about 80 sleepers across, height adjustments at the two sides
- the alignment of all three rails is important

  x,y,z and spacing to keep the beam stable

  to keep the carts moving at all.



Optical Bench, the 7th Rail



6 m long

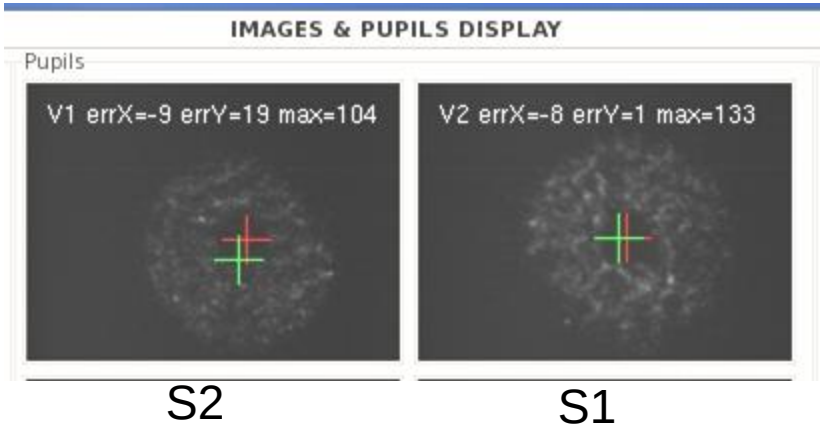
Same spacing
as delay lines

All testing tools fit
Rail telescope, etc.

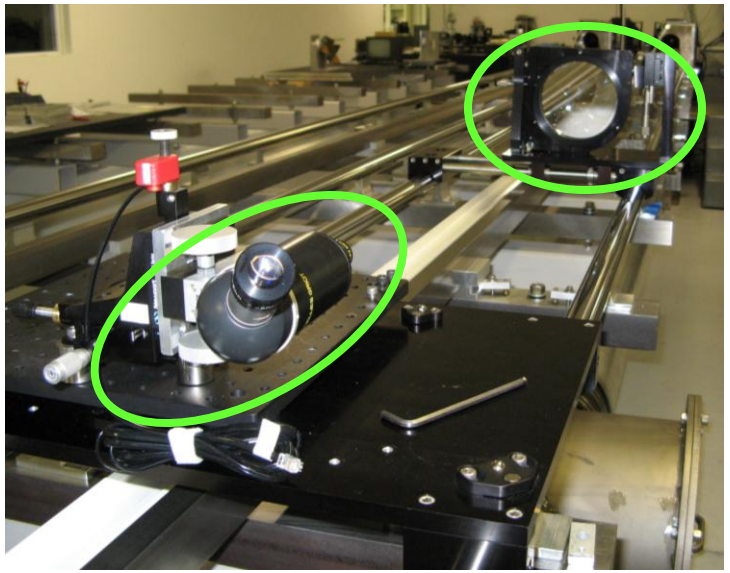
Easier access from
both sides

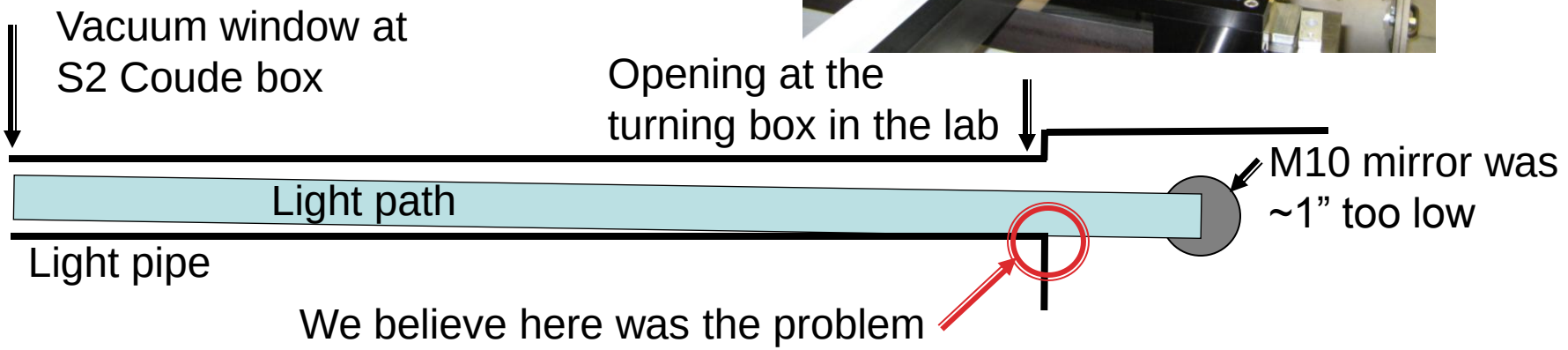
S2 Vignetting

Part of VEGA display



The rail telescope gives a detailed view into the light pipe





Why the Difference in Polarization

By design, there should not be any,
if all the coatings are the same on each corresponding surface of the six lines.

Most likely reason of the polarization problems:
The lines became non-symmetric in 2007, when in order to increase transmittance we started replacing bare aluminum coated surfaces with over-coated silver all the way to M2.

Meanwhile we learned that the silver coating did not last anywhere outside the lab.

From the 2011 season the symmetry will be restored,
but with more aluminum surfaces.

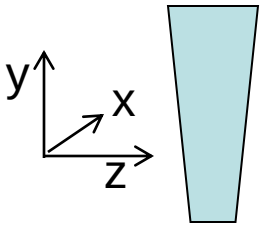
All surfaces from M1 to M9 will be aluminum.

There are 3 more surfaces left, which could be silver:
OPLE cart primary, and the BRT primary, secondary

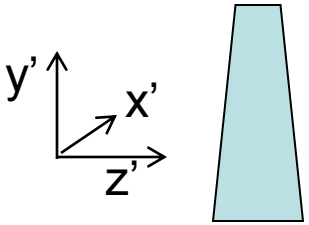
Another Correction for Symmetry

Orientation of vacuum windows (0.62 < wedges < 0.82 arc min)
at the two ends of the light pipes

ideally



some mirrors
in between



The pairs in fact were oriented randomly, non of them being opposite.

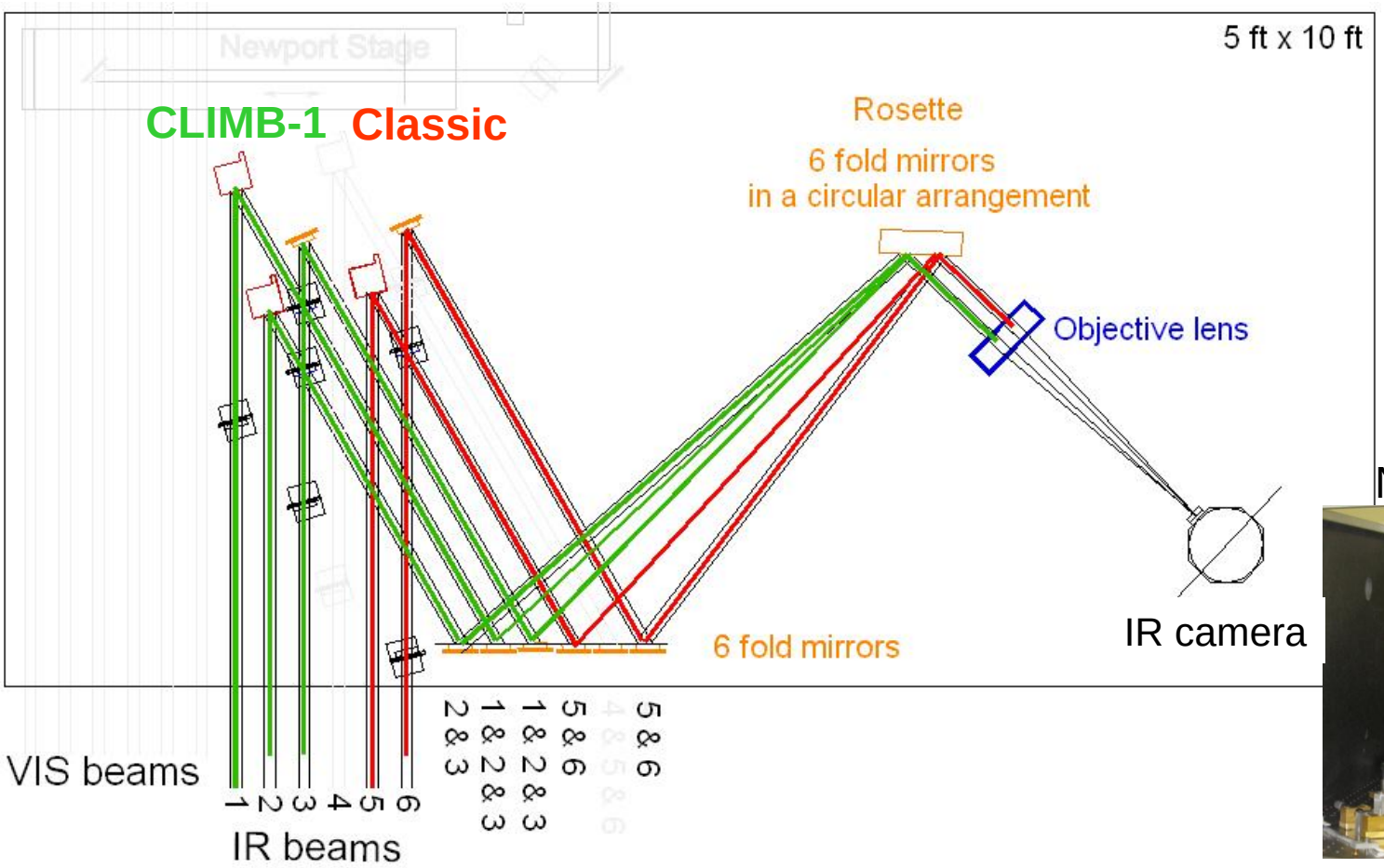
This introduced **random dispersion differences between the lines.**

Steve Ridgway: “If the wedges aren't aligned oppositely, it could give
up to 3.5 arcsec dispersion between 0.5 and 2.5 microns, most of it short of 1 micron.”

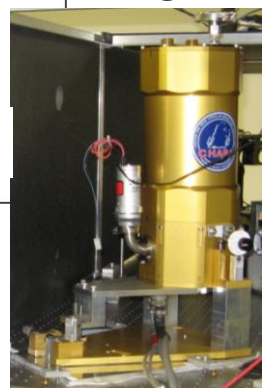
They will be rotated correctly by the start of the coming season.

CLIMB-1 and Classic Setup

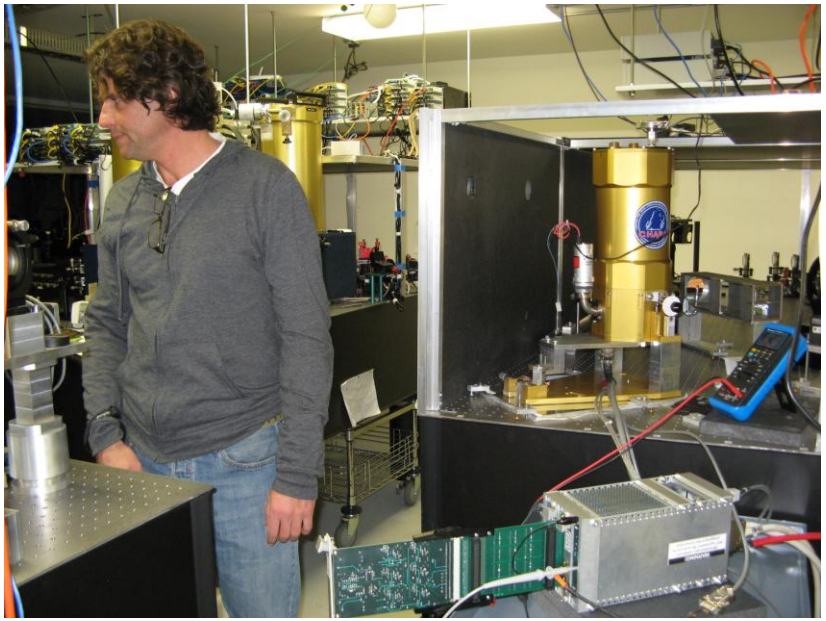
The setup is the same since last year and stays indefinitely

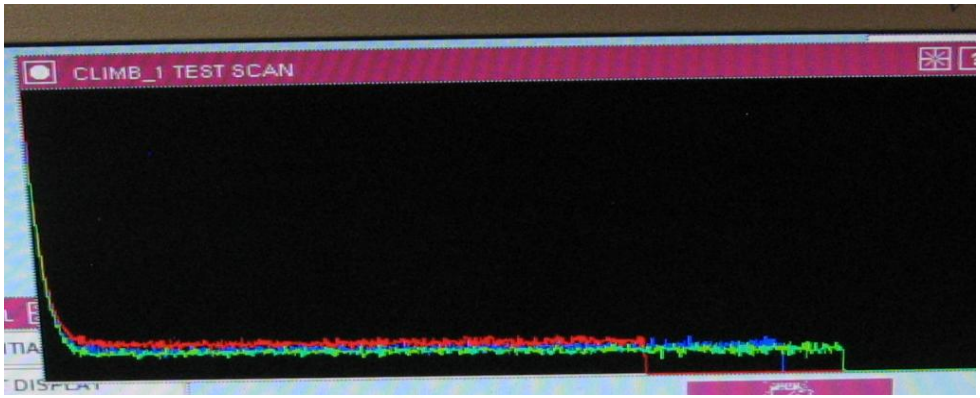


NIRO



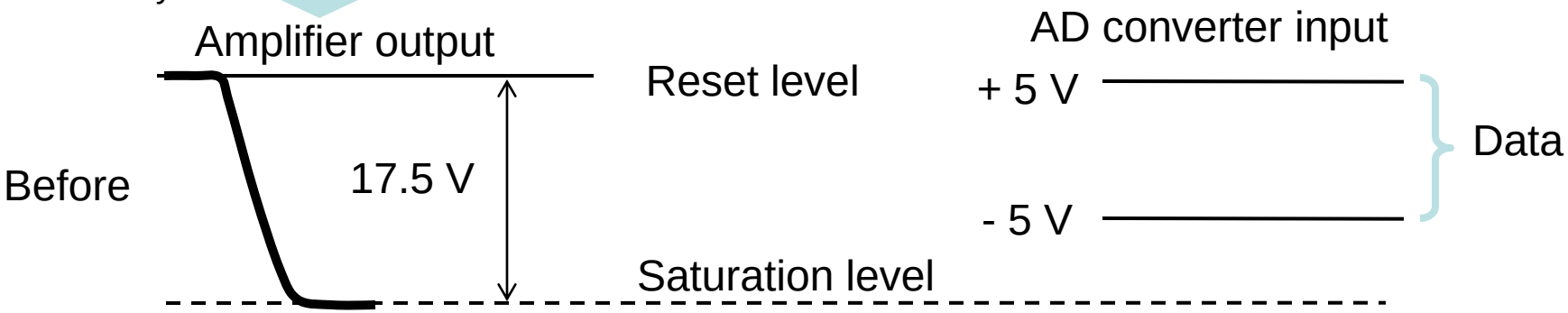
Adjusting NIRO Electronics



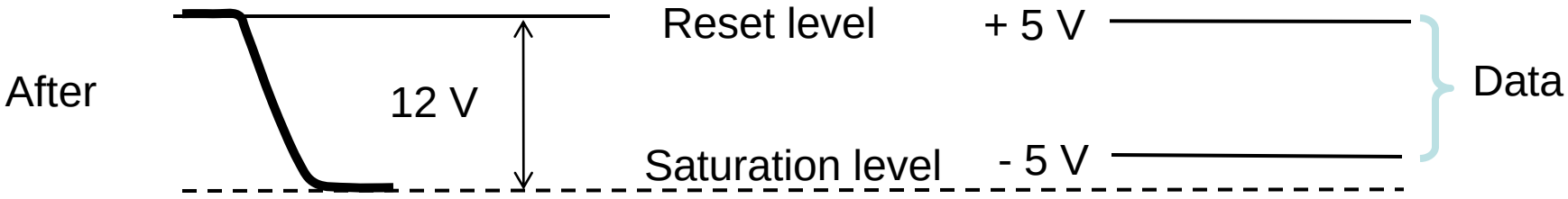


Better Dynamic Range

Signal from the detector-array → Amplification



We are interested in mapping the whole curve, we do see saturation.

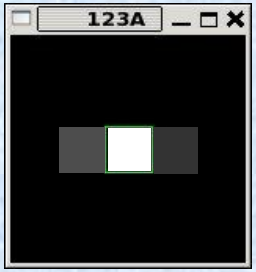


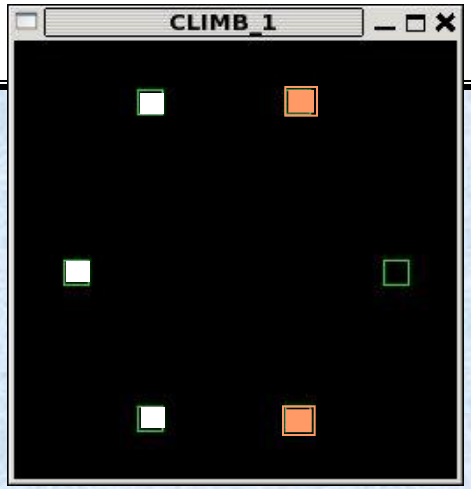
Better mapping can be achieved by changing the gain of the chip.
This adjustment is inside the dewar.

No work on NIRO image quality since last report at CHARA Meeting 2010 Pasadena

NIRO Performance Improvement

Laboratory tests using the engineering beam





March 3, 2010 using ENG beam though 123 B K cont narrow band (24 nm) filter	B1 only	B2 only	B3 only
123 A In/Total = Ratio [%]	62-64	64-68	65-70

Similar setup in 2006, NIRO imaging with OAP: ~40% in 1 pixel.

NIRO image quality is better, but may be there is still room for improvement.