VEGA, D. Mourard et al.

Observatoire de la Côte d'Azur, march 15th

Brief presentation of VEGA

Current status

Expected performances

Organizational aspects

- Schedule, budget, manpower
- Integration and first light

VEGA main characteristics

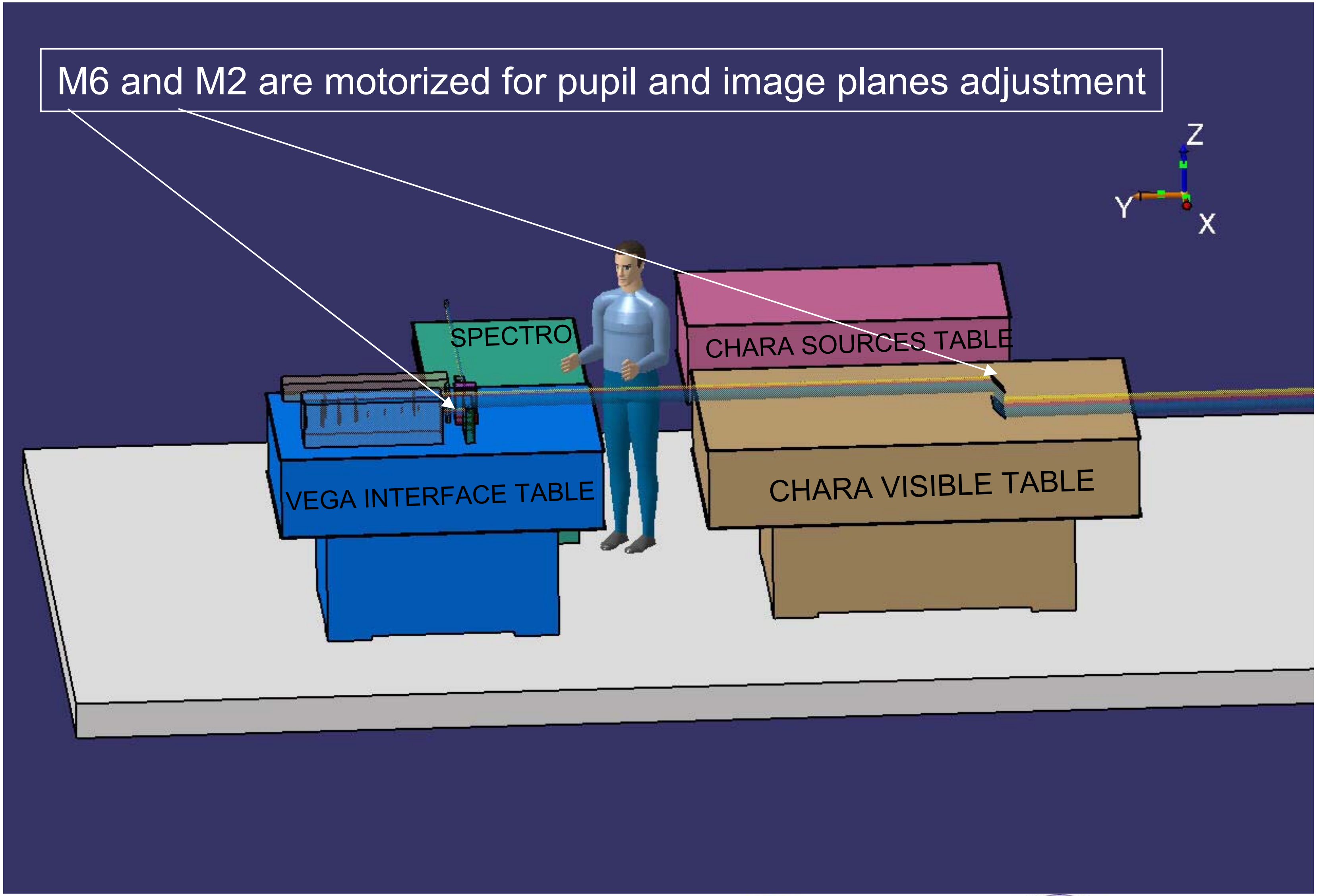
Access to the visible: 0.45 to 0.9 µm. Slit height: 4'' (2'' in SPIN mode)
2 photons counting detectors: ALGOL with about 200 spectral channels

Spectral resolution (dispersed fringes mode):

- 1500 with 1 camera: $\Delta\lambda$=140nm
- 6000 with 2 cameras: $\Delta\lambda_{1-2}$=35nm, λ_1-λ_2=150nm
- 30000 with 2 cameras: $\Delta\lambda_{1-2}$=8nm, λ_1-λ_2=30nm

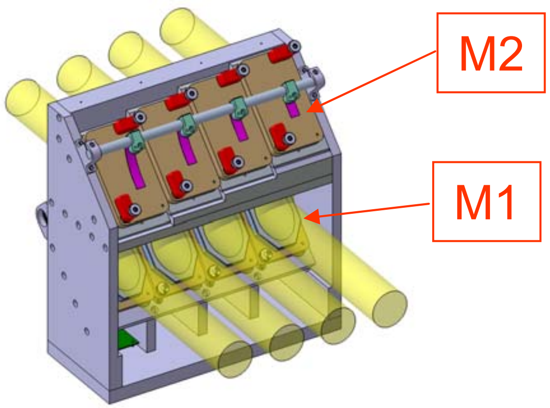
Polarimetric capabilities: SPIN
Combination of 4 telescopes in the dispersed fringes mode
Automatic control, data reduction pipeline 2T (4T) mode.

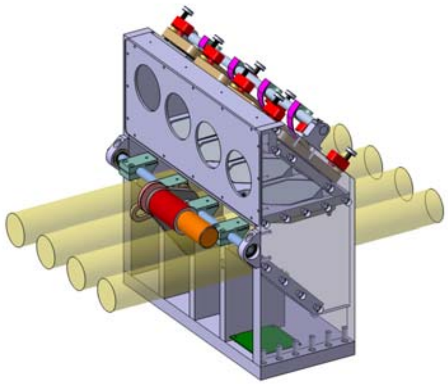
General layout



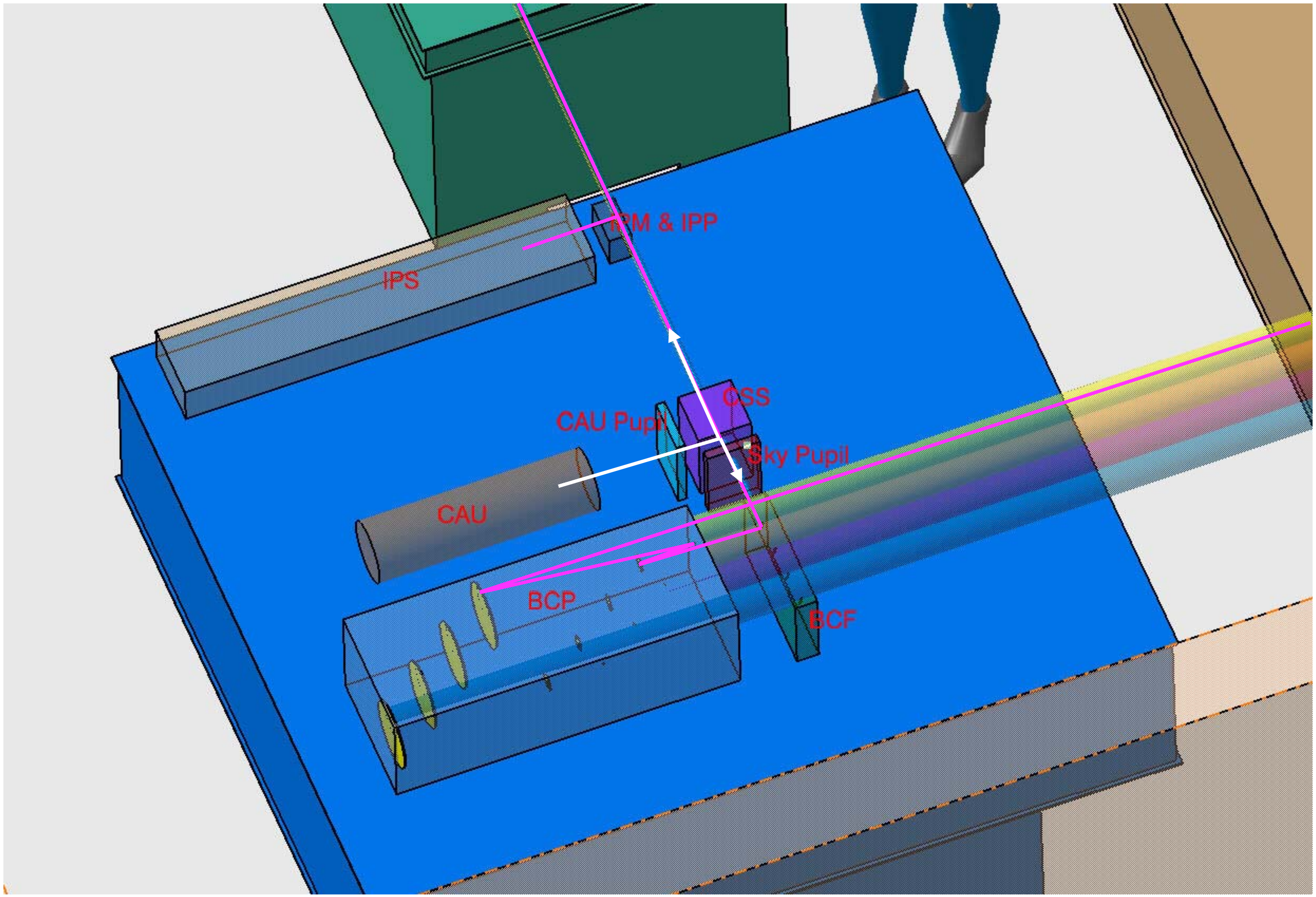
Periscopic optic (PGO)

- CHARA subsystem installed just after the tip/tilt subsystem.
- Design by Laszlo
- Building in progress (end of march)
- The 4 M1s are removable
- Each M2 is motorized for tip/tilt adjustment



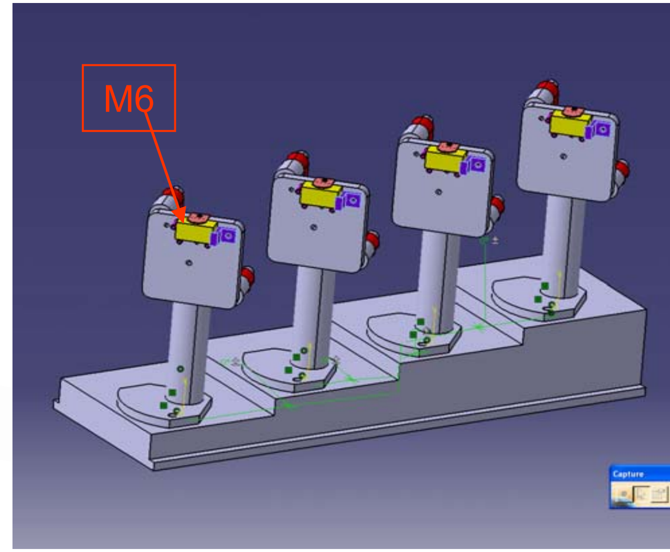


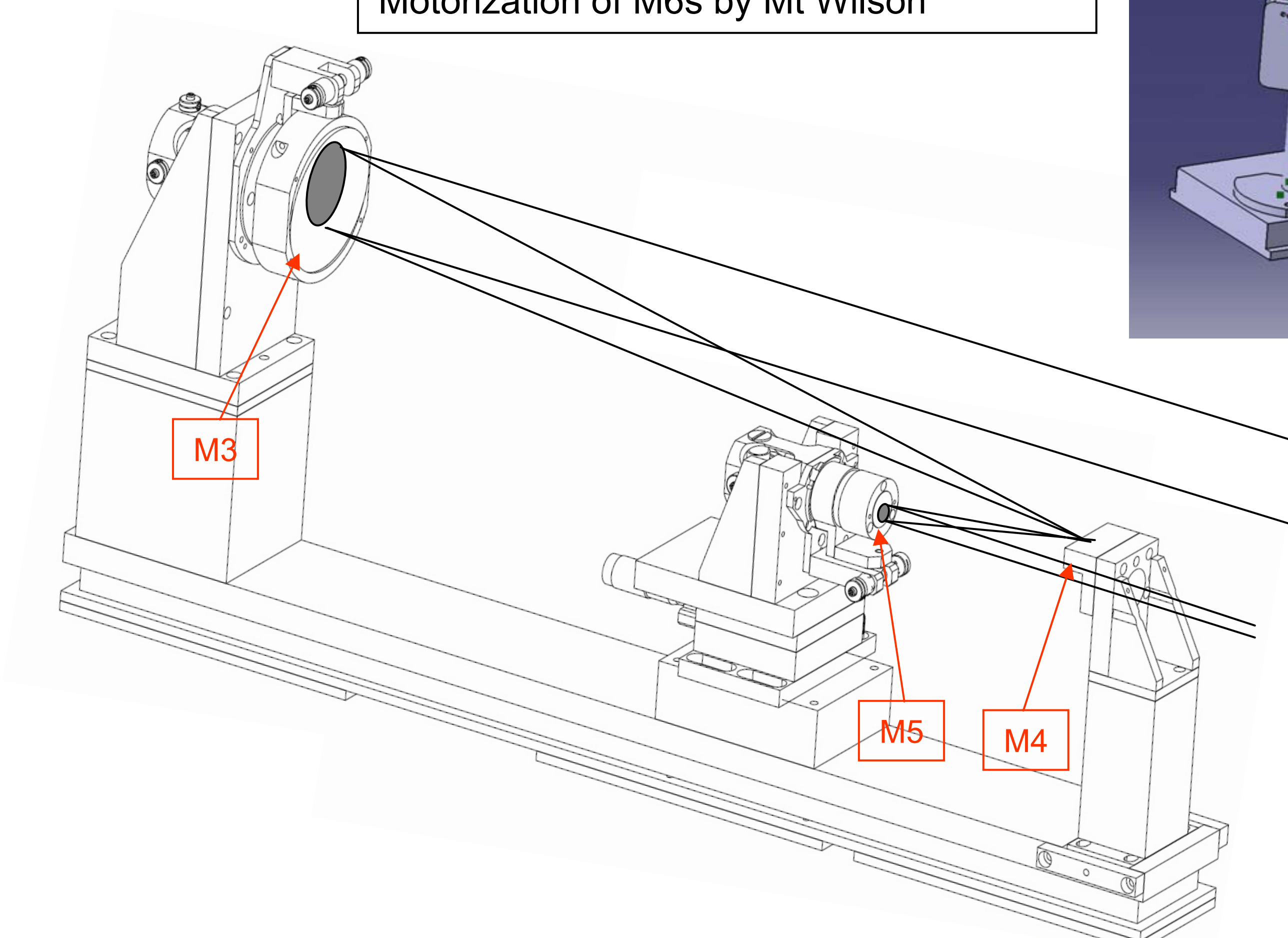
Interface layout



Beam compression and configuration (BCP & BCF)

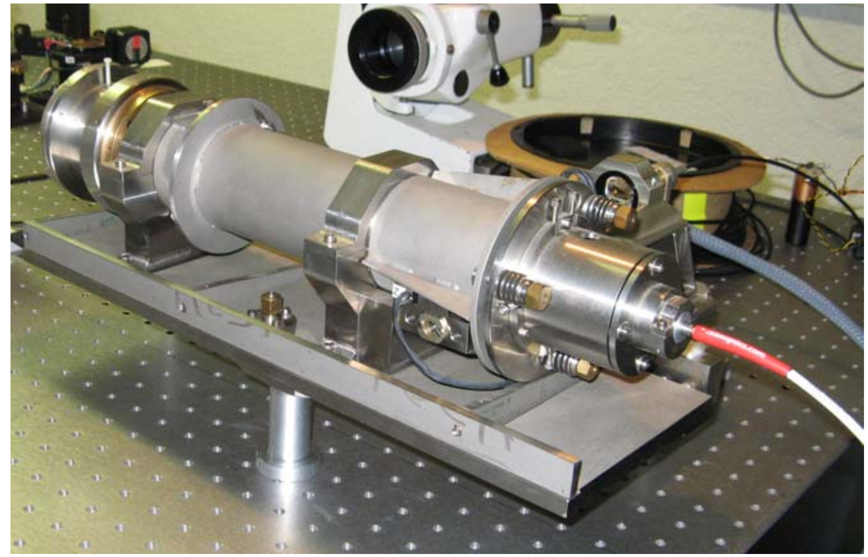
Mechanical design is finished
Building of BCPs in Atlanta (april/may?)
Building of BCF in Nice (in progress)
Motorization of M6s by Mt Wilson

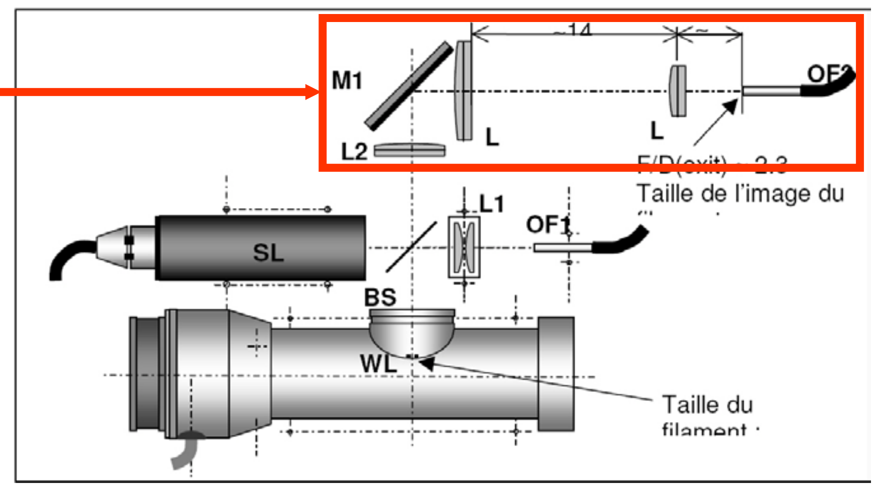




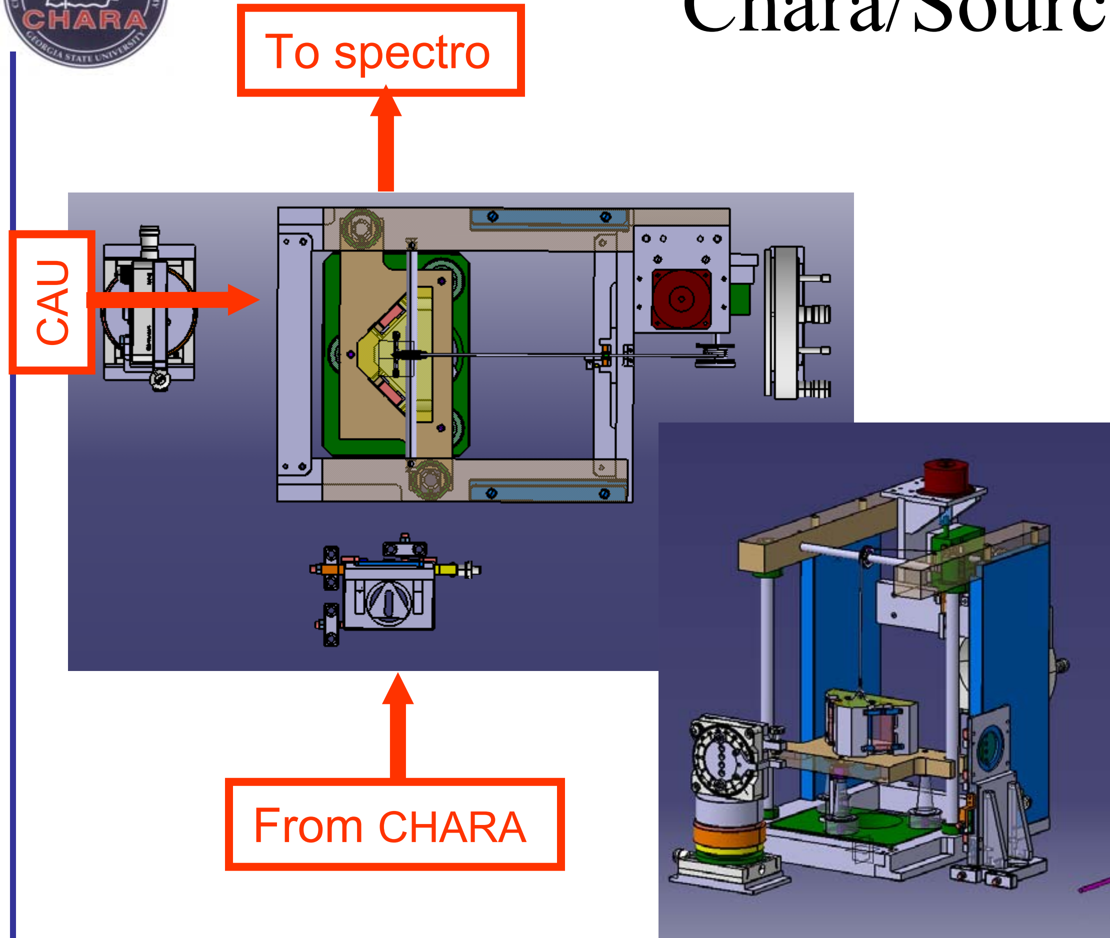
Calibration and Alignment Unit (CAU)

- Four functions are permitted:
  - Laser diode for alignment
  - Spectral lamp for calibrations
  - Wide field white light source for flat field
  - Unresolved white light sources for dispersed fringes optical simulator
- New mechanical design in progress





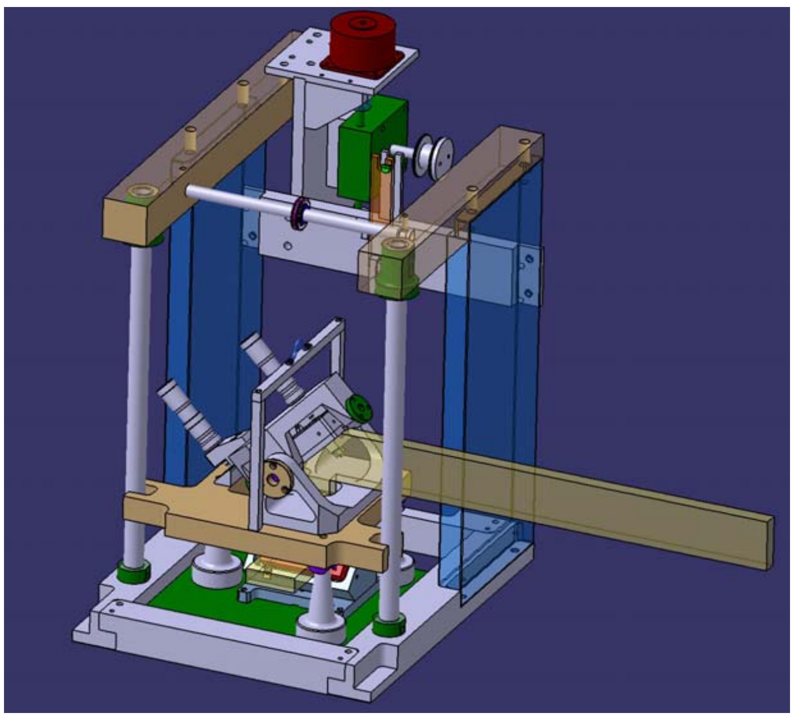
Chara/Source Selector (CSS)

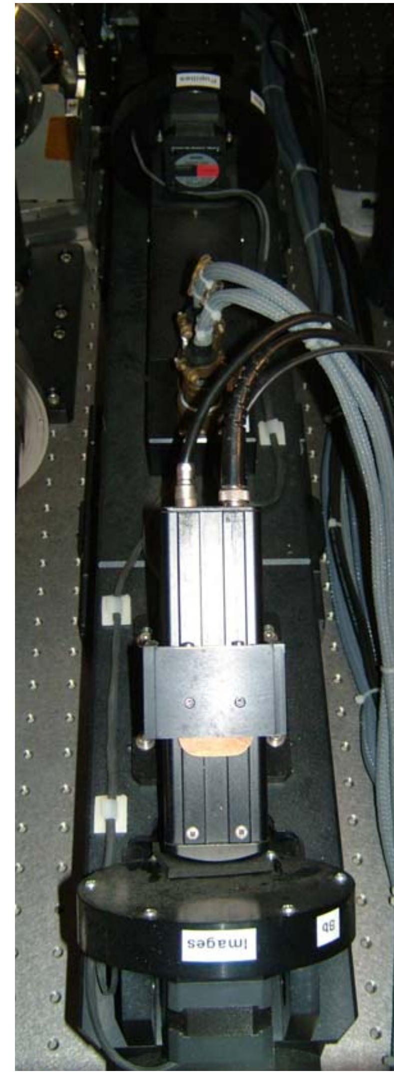


- Allow to rapidly switch from the CHARA beams to the calibrating beams
- Already tested (5s)
- Integration in Grasse in progress.

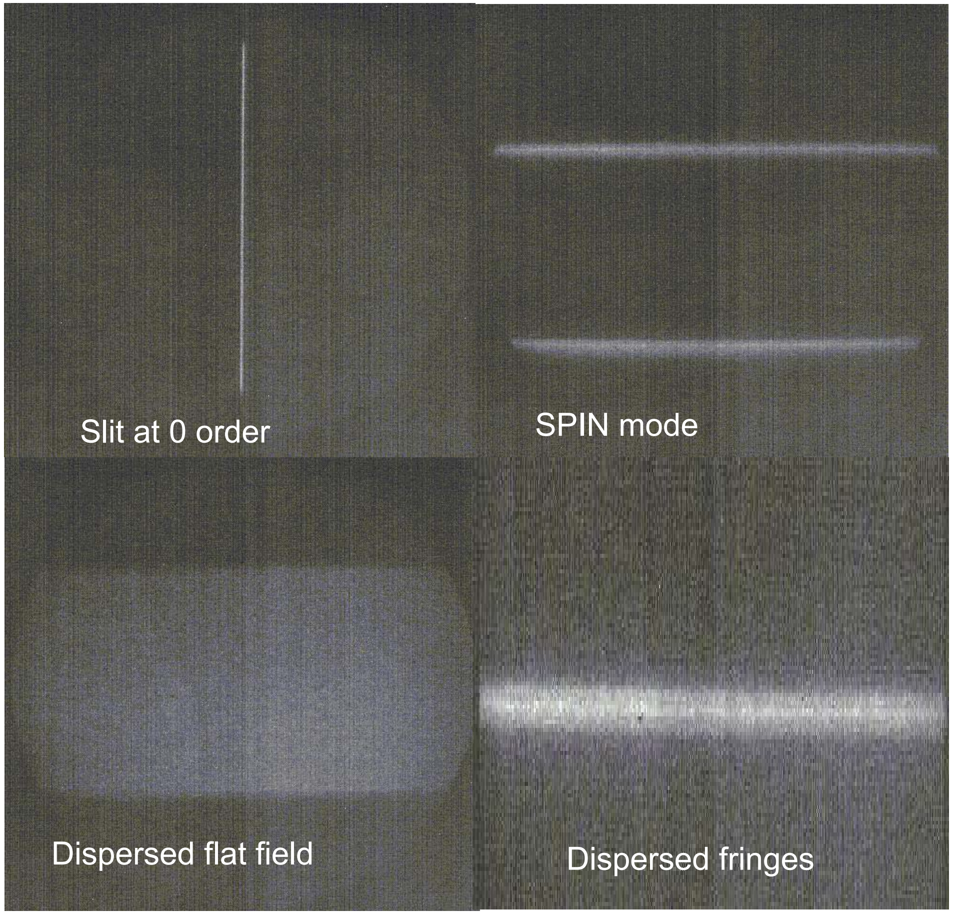
Image Pupil System (IPS)

- Internal structure (stainless) finished. Optical integration in progress
- Mechanism in fabrication
- Same motorization as CSS
- 4 beams for Image and Pupil plane control



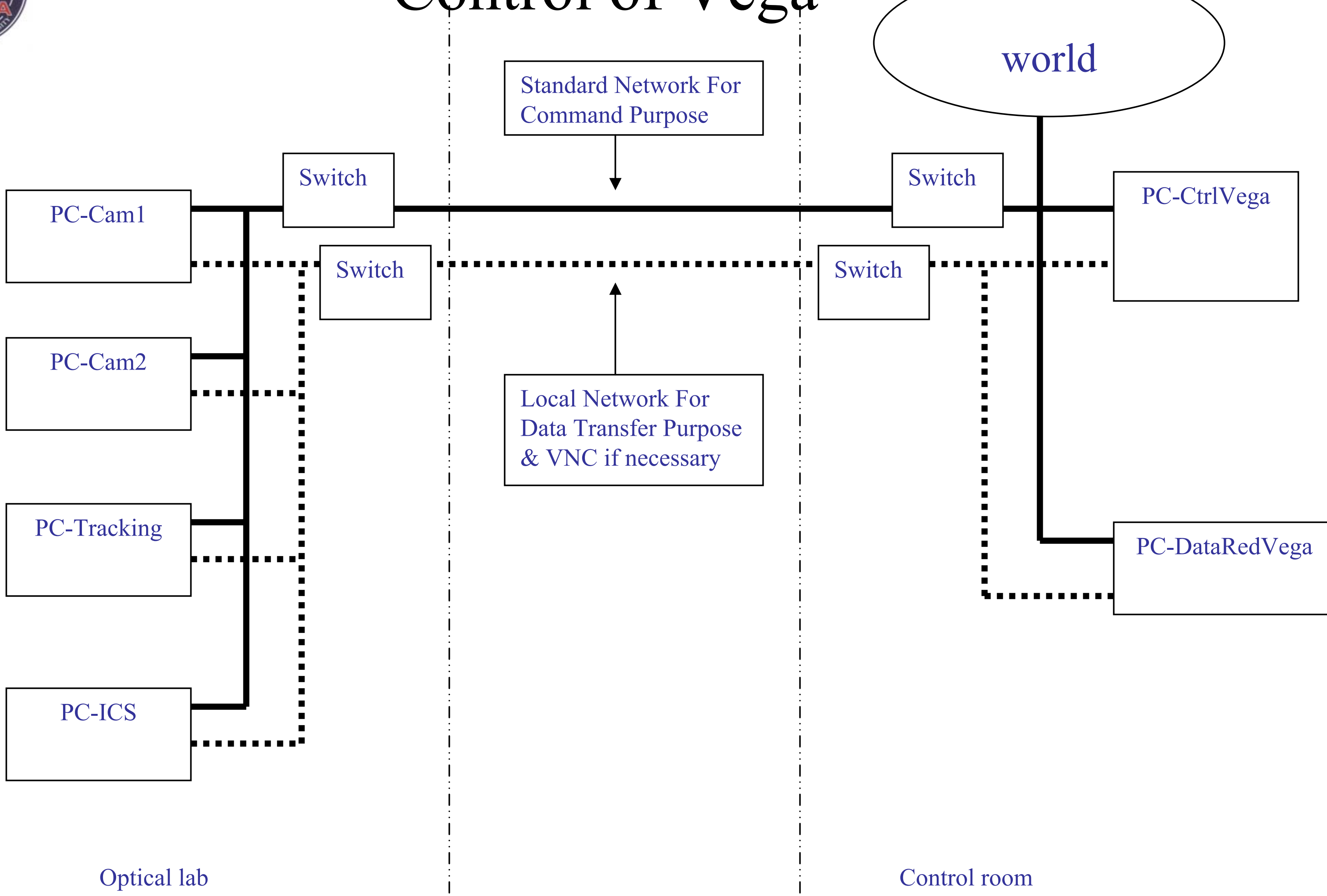


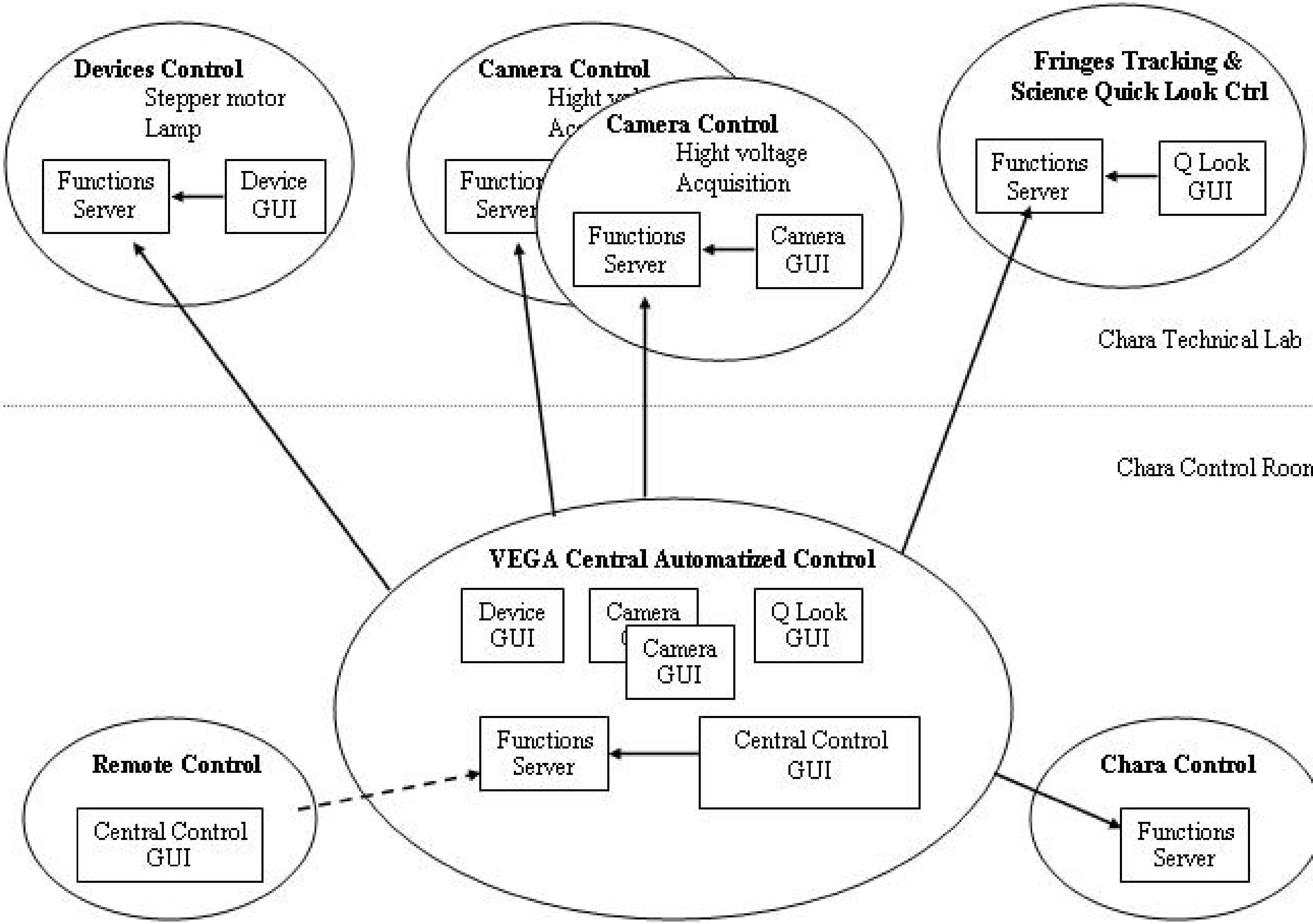
VEGA Spectrograph

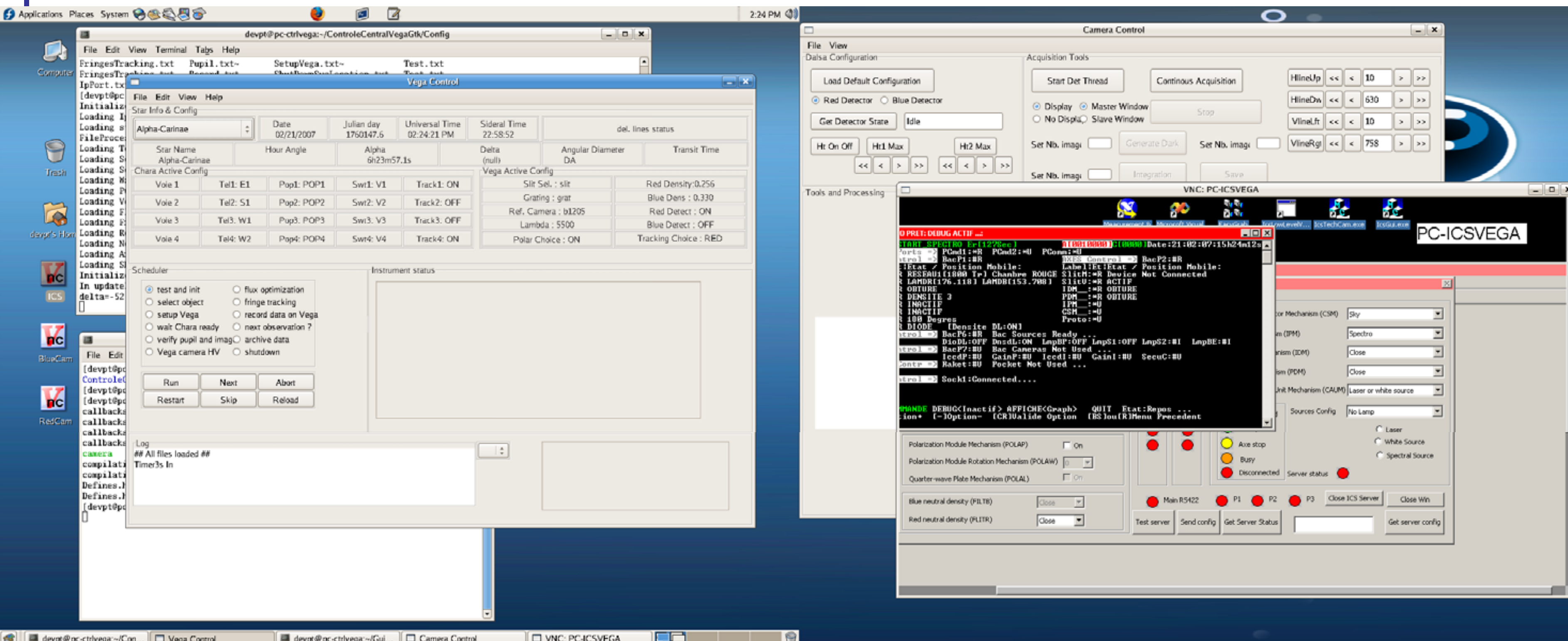


New Ag coating
New slit
Calibration in progress in lab

Control of Vega




Devices Control
Stepper motor
Lamp
Functions Server
Device GUI
Camera Control
Functions Server
Camera Control
Hight voltage
Acquisition
Functions Server
Camera GUI
Fringes Tracking & Science Quick Look Ctrl
Functions Server
Q Look GUI
Chara Technical Lab
Chara Control Room
VEGA Central Automatized Control
Device GUI
Camera
Camera GUI
Q Look GUI
Functions Server
Central Control GUI
Remote Control
Central Control GUI
Chara Control
Functions Server



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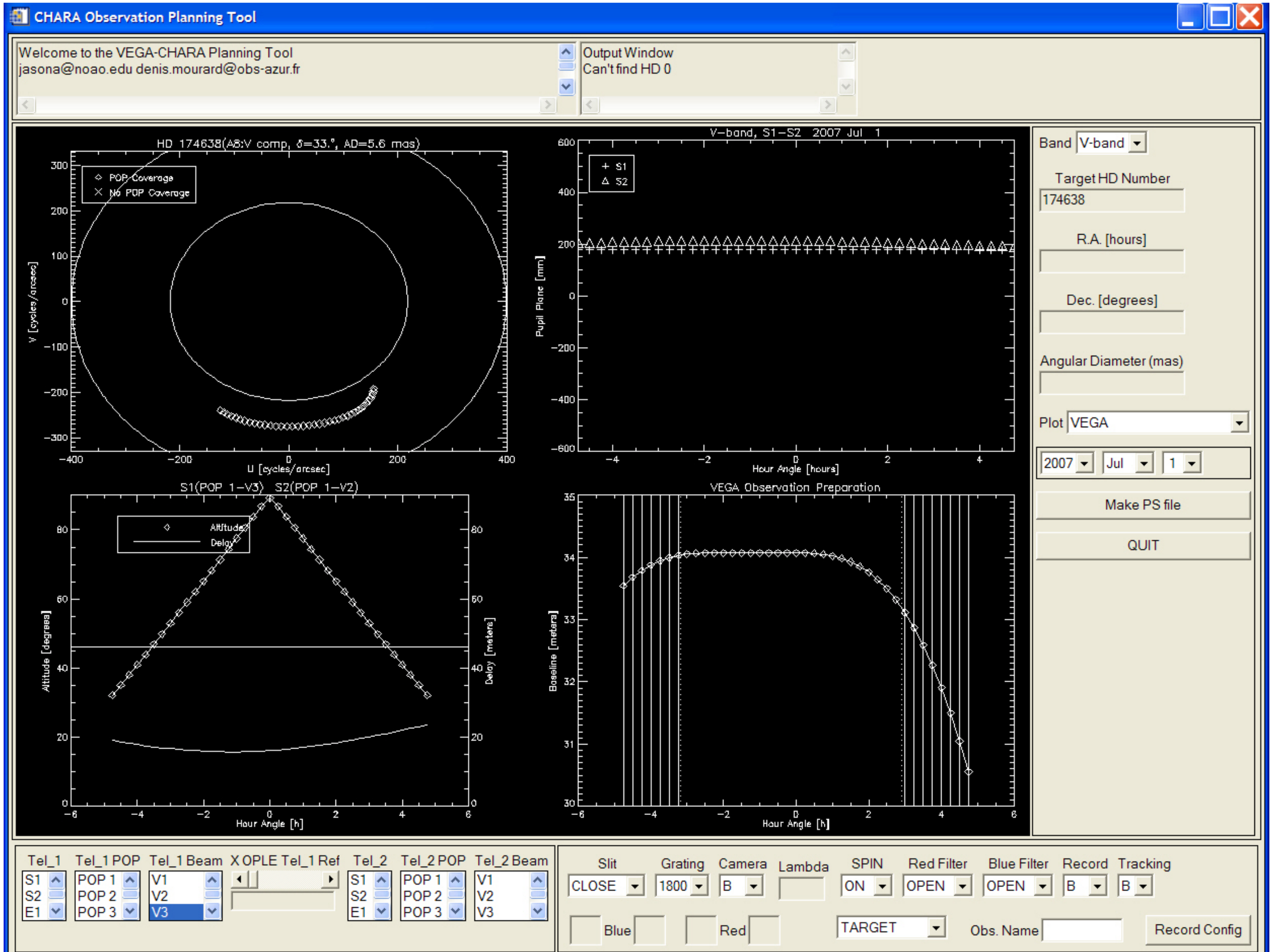
vega_plan: preparation of observations

Adaptation of chara_plan: visible, pupils, link to VEGA control



Expected performances

<u>Hypothesis</u>

For a m_V=0 star, N_{ph}=1000 ph/s/cm²/A

Visible transmission

- Q_{CHARA} = 0.01 (→ 0.15)
- Q_{VEGA} = 0.15 (13 mirrors @ 0.98 + 1 grating 0.6 + slit 0.3)
- Q_{ALGOL} = 0.3

Exposure time t_0=20ms

Instrumental visibility 0.8

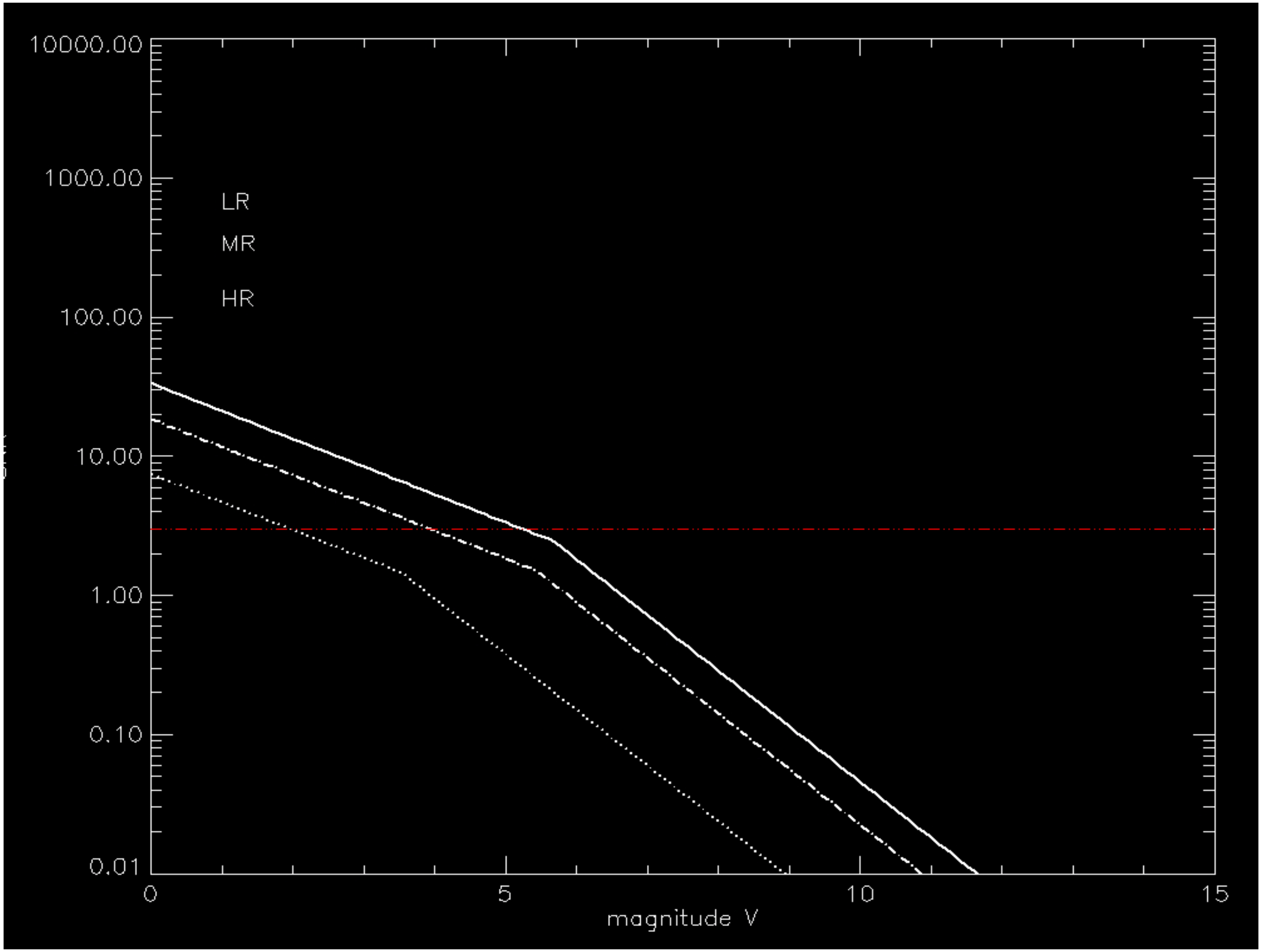
r_0 estimations @ 650 nm:

- Median conditions: r_0 = 11.0 cm = 8.0*(650/500)$^{6/5}$: seeing=1.25"
- Excellent conditions: r_0 = 20.6 cm = 15.0*(650/500)$^{6/5}$: seeing 0.7"

<u>Estimations of limiting magnitude: 4 cases</u>

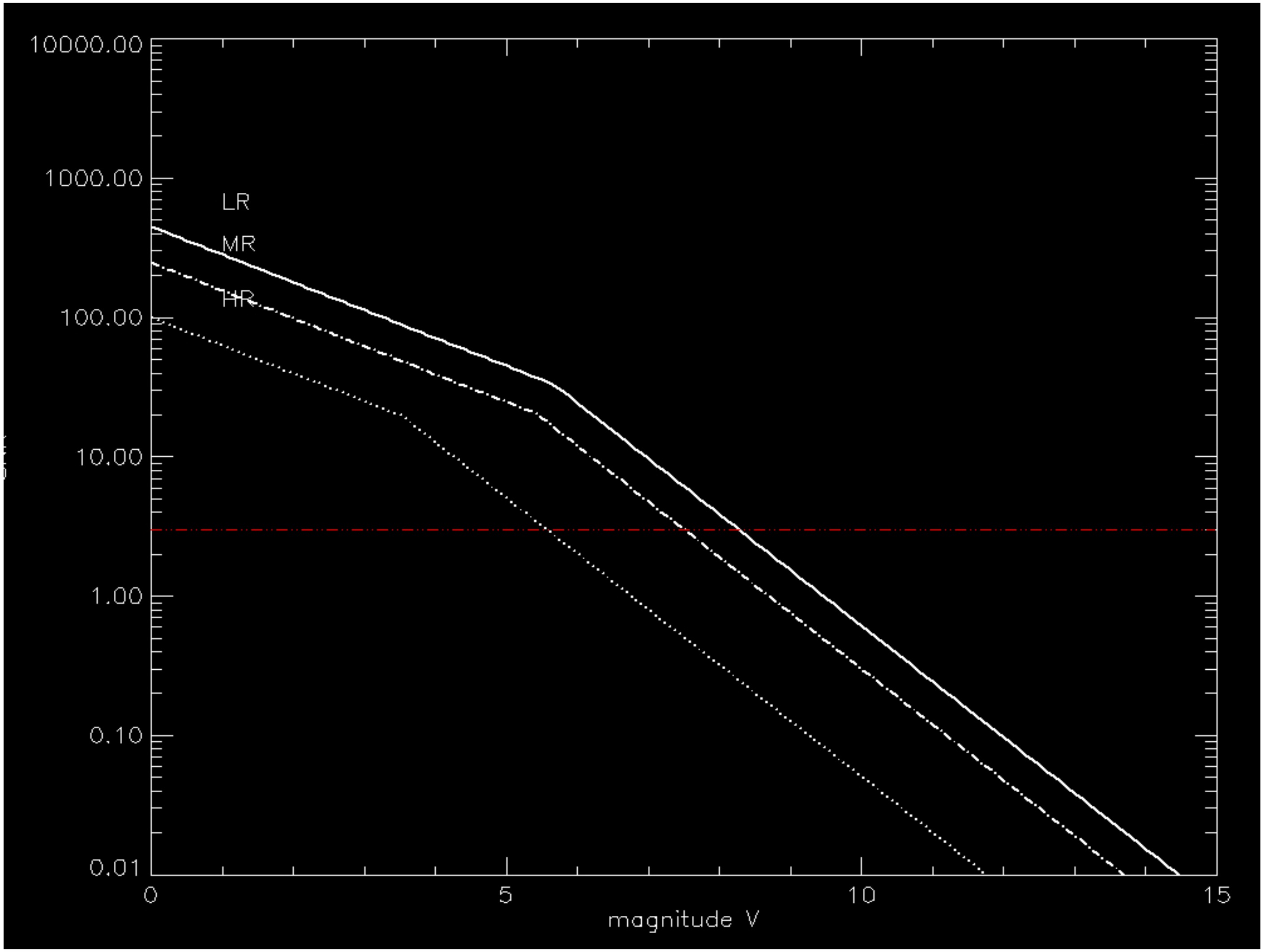
1. Q=0.01, without external fringe stabilization
2. Q=0.01, with external fringe stabilization
3. Q=0.15, with external fringe stabilization
4. Q=0.15, AO (S=0.50), with external fringe stabilization

Fringe stabilization: OPD less than ~1% of l_c, i.e. 150µm (resp. 30, 10) in HR (resp. MR, LR)



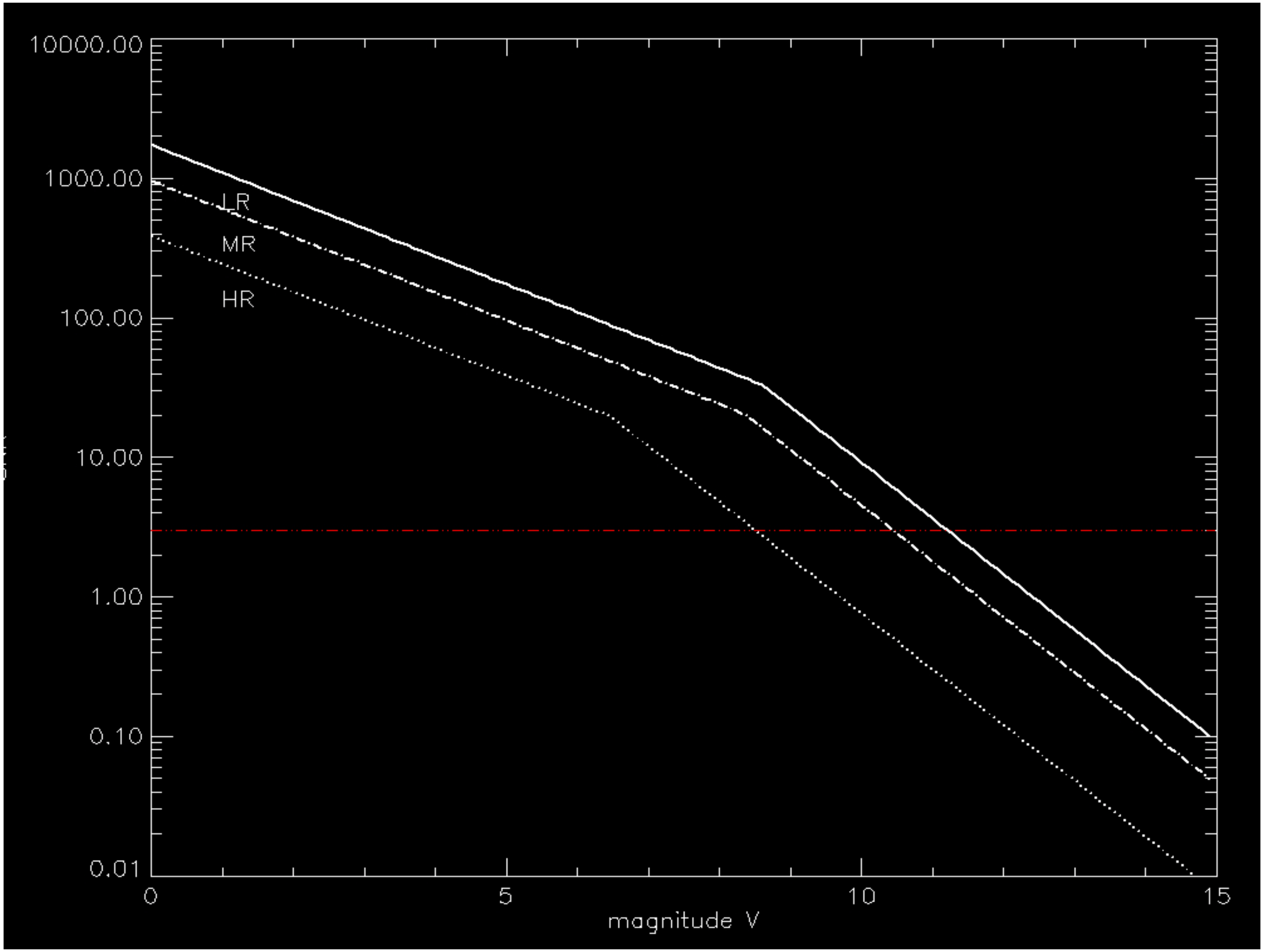
10s of integration. λ=650nm. Without fringe tracking

SNR for $|V_{\lambda 1}.\ V_{\lambda 2}|$ with $\Delta\lambda_1$= 50 nm (40, 6.7) and $\Delta\lambda_2$= 0.4 nm (0.13, 0.02)



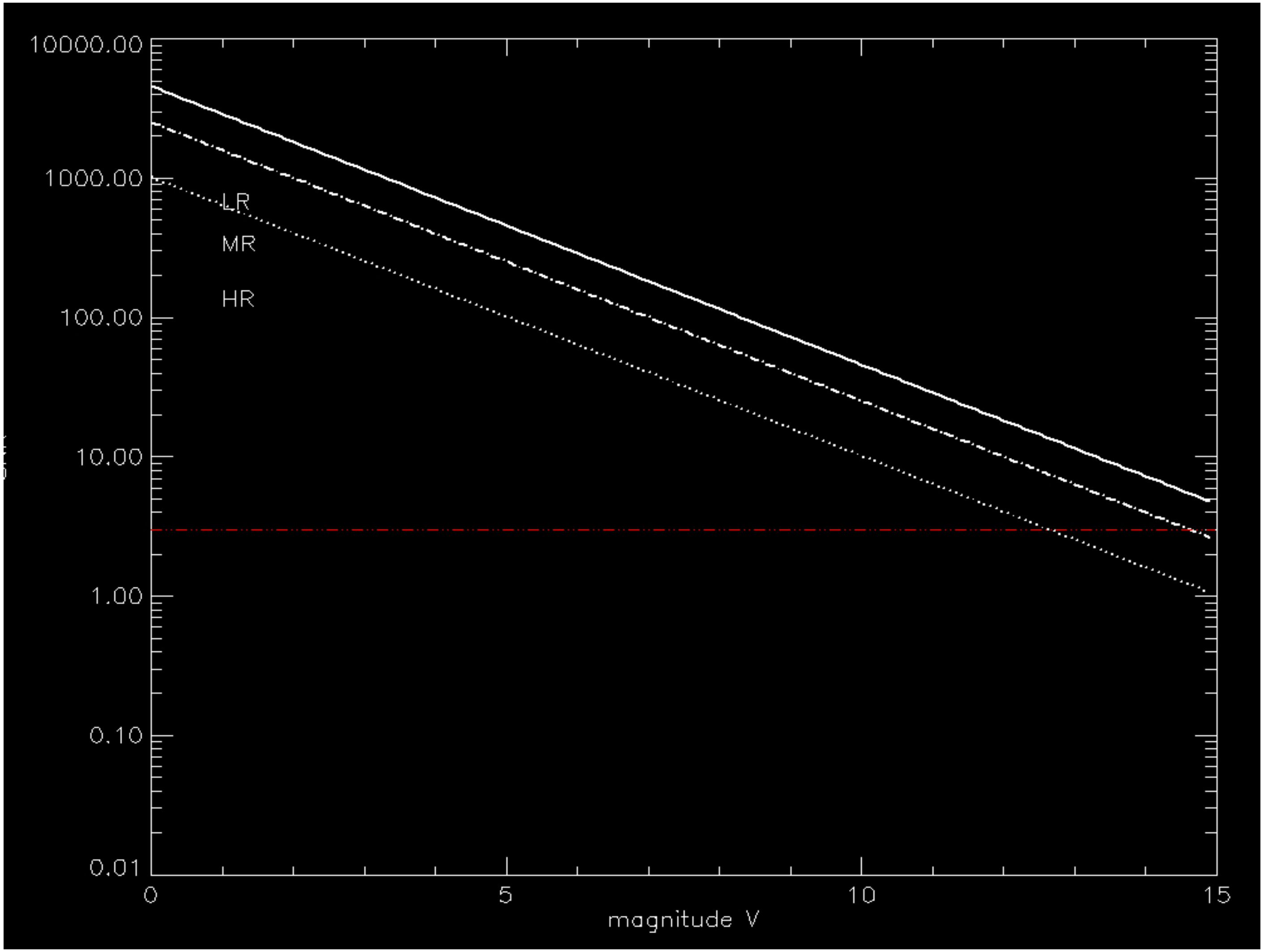
30mn of integration. λ=650nm. With fringe tracking

SNR for $|V_{\lambda 1}. V_{\lambda 2}|$ with $\Delta\lambda_1$= 50 nm (40, 6.7) and $\Delta\lambda_2$= 0.4 nm (0.13, 0.02)



30mn of integration. λ=650nm. With fringe tracking. Qchara=15%

SNR for $|V_{\lambda 1}.\ V_{\lambda 2}|$ with $\Delta\lambda_1$= 50 nm (40, 6.7) and $\Delta\lambda_2$= 0.4 nm (0.13, 0.02)



30mn of integration. λ=650nm. With fringe tracking, Qchara=15%, AO (S=50%)

SNR for $|V_{\lambda1}.\ V_{\lambda2}|$ with $\Delta\lambda_1$= 50 nm (40, 6.7) and $\Delta\lambda_2$= 0.4 nm (0.13, 0.02)

Schedule

- Spectro+CSS+CAU: end of march
- IPM+IPS: mid-april. *End of ICS*
- BCF: mid-april
- Prototype of BCP in Grasse: end of april
- Tests in Grasse: April+May. *End of DCS, OS, DRS*

- End of PGO building: end of march
- Building of BCP in Atlanta: April+May

- Transportation in june
- Integration end of june (travel before 21th)
  - Spectro+CAU+CSS+IPS+IPM
  - BCF+BCP+PGO
  - First light

Status of the 4T mode

All subsystems are 4T compatible.

Two special aspects:

- Narrower fringes
  - Change the spectrograph's magnification:
    - Optical study already done
    - Easy implementation if necessary but reduced spectral band
  - Better photon centroiding algorithms:
    - from 1 pixel to ¼ pixel
    - Work in progress
- 6 fringe systems
  - Definition of estimators: closure phase, V^2_1 to V^2_6
  - Data reduction pipeline: online and offline

The internal simulator allows recording 4T dispersed fringes

Funding aspects

VEGA 2006: 60 k€

VEGA 2007: 70 k€

- Already obtained: 52.5 k€
- Wait for 10 k€ more from OCA
- Wait for 8 k€/year from CNRS/USA collaboration

- Already engaged: ~25 k€
- Need to be engaged: ~45 k€

Do not account for ‘old’ REGAIN expenses as well as CHARA expenses

Estimation for coming years: about 20 to 25 k€/year (travels, VEGA)

People involved

Core Team OCA:

- Astronomers: Alain Blazit, Daniel Bonneau, Denis Mourard, Philippe Stee
- Enginneers: Jean-Michel Clausse, Aurélie Marcotto, Alain Roussel, Yves Hugues, Guy Merlin, François Hénault

Extended scientific group at OCA, Lyon, Grenoble and Paris (~10p)

Integration team:

Jean-Michel Clausse, Yves Hugues, Aurélie Marcotto, Denis Mourard

First run:

Daniel Bonneau, Jean-Michel Clausse, Denis Mourard

Conclusions

End of June: integration and first light
Science and data reduction preparation
Frequent news on: http://www.obs-azur.fr/gemini/projets/vega/en/news/index.htm

VEGA+IR really fundamental

- Unique science, complementary approaches (see Philippe's talk)
- Fringe stabilization
- Dual operation of CHARA is really a great chance for VEGA

Current strategy: 3 phases for VEGA

- Phase 0: a 'small team' instrument for qualification and performances
- Phase 1: a collaborative instrument with involvment of a VEGA core team member
- Phase 2: if possible, a general user instrument. Remote observing.

Prospects for 4T operation, SPIN (polarisation); AO or Courtés mode (increased sensitivity)