

#### 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



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#### **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,  $\lambda_1$ - $\lambda_2$ =150nm 30000 with 2 cameras:  $\Delta\lambda_{1-2}$ =8nm,  $\lambda_1$ - $\lambda_2$ =30nm

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











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# 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















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# Interface layout



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#### Beam compression and configuration (BCP & BCF)

M5

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M4

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





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#### 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

















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





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#### 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









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#### VEGA Spectrograph





New Ag coating New slit Calibration in progress in lab

















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## vega\_plan: preparation of observations

Adaptation of chara\_plan: visible, pupils, link to VEGA control





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#### Expected performances

Estimations of limiting magnitude: 4 cases

- 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  $I_c$ , i.e. 150 $\mu$ m (resp. 30, 10) in HR (resp. MR, LR)



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10s of integration.  $\lambda$ =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)













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30mn of integration.  $\lambda$ =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)

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30mn of integration.  $\lambda$ =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)

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



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### 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













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# 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  $\frac{1}{4}$  pixel
    - Work in progress
- 6 fringe systems
  - Definition of estimators: closure phase,  $V_1^2$  to  $V_6^2$
  - Data reduction pipeline: online and offline

The internal simulator allows recording 4T dispersed fringes



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#### 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)



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### 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



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# CHARA

#### 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)



