Ten years of VLTI conference

Panel discussion on the future of interferometers in the era of ALMA, ELTs and the space missions

Introductory remarks

Guy Perrin

l'Observatoire de Paris | LESIA

Laboratoire d'Études Spatiales et d'Instrumentation en Astrophysique

Thursday October 27, 2011

Ten years of VLTI conference

Panel discussion on the future of VLTI in the era of ALMA, ELTs and the space missions

Introductory remarks

Guy Perrin

l'Observatoire de Paris | LESIA

Laboratoire d'Études Spatiales et d'Instrumentation en Astrophysique

Thursday October 27, 2011

Context of the panel discussion

- ESO is thinking of its future in the context of ALMA and the E-ELT.
- A ***Long Term Plan*** (not yet released) is being put together to define the future of VLT(I):
  - What's next after 2nd generation instruments?
  - What is the future of Paranal?
- A steady level of funding is anticipated for the VLT in the E-ELT era:
  - No funding for extra ATs;
  - What fraction for VLTI?
- Interferometry has to play a role: the VLTI is a unique infrastructure (not only the 4x8 m telescopes).

Context of the panel discussion

- GRAVITY and MATISSE will be in operation in 2014-2015.
- Nothing is scheduled after that.
- A ***White Paper*** is to be written (by ESO) to define what VLTI will be after 2016.
- We, as a community, are willing to be part of this effort.
- The panel discussion is the first step of this process.

Preliminary remarks after John Monnier's talk

List of topics addressed by optical/IR interferometry so far:

- stellar physics (large variety of topics);
- young stellar objects and the birth of planets;
- planet detection through astrometry (direct M);
- solar system: asteroids, an interesting new field;
- AGN (new unique direct constraints of AGN paradigm);

The VLTI (Int'l interferometry) Community is not as large as those who promote ALMA, the E-ELT and SKA (can't we do something for cosmology?) but it is not that small though (this conference is a good proof).

A good sample of astrophysics topics addressed and interferometry is of high value for the future of astronomy

VLTI and the competition

- ***CHARA***:
  - 6x1m fixed telescopes
  - up to 330 m baseline
  - extension to longer baselines

  (project to use the ISI telescopes)
  - visible and near-infrared

- ***MROI*** (not yet, to be completed?):
  - 10x1.4m movable telescopes
  - up to 340 m baseline
  - visible and near infrared

- ***NOI***:
  - 6 siderostats + 4 1.8m outriggers
  - up to 437 m baseline
  - visible

- ***Keck Interferometer*** (to be stopped?)
  - 2x10m telescopes
  - near and mid-infrared

- ***ISI*** (to be discontinued?)
  - 3x1.5 m telescopes
  - up to 64 m baseline
  - heterodyne at 11 μm

- ***SUSI***:
  - 2x0.10m siderostats
  - up to 640 m baseline
  - visible

VLTI and competition

Pluses of VLTI:

- 4x8m telescopes;
- 4x1.8m movable telescopes: expandable to 8 (8 delay lines, 6 for now)
- baselines from 8 to 200m.
- metrology systems: astrometry.
- dual field capability: astrometry and fringe tracking on reference source.
- 3T, 2T fringe tracking systems with 4T systems to come (sensitivity and spectral resolution).
- quasi-simultaneous NIR to MIR observations.
- potential for new instruments (up to 6T imaging instruments).
- large community of users and experts.
- powerful organization to maintain and operate the interferometer.

New groundbreaking things can (must) be tried!

Some details to have in mind when discussing optical interferometers

N-telescope interferometer: flux of each telescope needs to be divided into (N-1) parts -> N cannot be too large.

Number of baselines increases like N(N-1)/2, closure phases increase like (N-1)(N-2)/2:

4T case: 6 baselines, 3 closure phases	phase ratio=50%
6T case: 15 baselines, 10 closure phases	phase ratio=67%

An interferometer is all the more efficient to reconstruct images as the number of telescopes is large:

-> snapshot imaging mode for $N \geq 4 \ldots 6$

4T-6T optical interferometry is a reasonable goal for sensitive and high fidelity imaging interferometry

The VLTI and beyond

The VLTI is the only interferometer in Europe.

Several key technologies used on VLTI have been demonstrated on US interferometers by Europeans (e.g. fibers, integrated optics).

For interferometers to make progress in Europe, on-sky tests will have to be carried out and VLTI is the only platform we have.

PIONIER is an excellent example in-between a prototype and a science instrument.

Possibility for a visitor instrument needs to be maintained at VLTI.

VLTI could also be used to prepare for a post-VLTI instrument (longer baselines ?).

Possible ideas for next generation instruments

Imaging machine with 1 or 2 more (fixed?) ATs

Imaging machine with hybrid combination of UTs and ATs

More wavelengths: introduce visible λ for stellar physics (Hα, high spatial resolution) at the cost of changing/recoating optics.

Introduce spectro-polarimetry to measure magnetic fields.

Focus on sensitivity for high spectral resolution and fainter sources (IR APDs will help).

Longer time scale: increase baselines by coupling VLTI to VISTA (1.5 km) … other post-VLTI ideas.

Points for the discussion

What is currently missing at VLTI?

Necessity of a third generation instrument(s) after PRIMA, GRAVITY and MATISSE (2016-2025)? What kind?

Are extra ATs needed? What if no fundings are found for extra ATs?

…

Panel members

Andreas Quirrenbach	post-VLTI, stellar physics
John Monnier	CHARA YSO, stellar physics
Marin Elvis	AGN
Markus Kissler-Patig	E-ELT
Damien Ségransan	PRIMA, exoplanets
Leonardo Testi	ALMA

+ the audience