VLTI in the next decade

Jean-Philippe Berger
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Science vision for the VLTI

What we have learned
Challenges for the decade
Preparing the future

VLTI in the ELT era

Jean-Philippe Berger
VLTI Programme Scientist
WHAT WE HAVE LEARNED
The VLTI went from snapshot to imaging

SNAPSHOT

IMAGING

Both have their scientific interests: scheduling and operations heavily affected
Temporal monitoring not so easy at VLTI
Not many surveys until PIONIER.

What we have learned
Spectro interferometry was enabled

But was severely limited because the VLTI lacked robust phasing

What we have learned
CHALLENGES FOR THE DECADE
The scientific ambition is multiple

Understand the structure of AGN nuclei

Understand how stars evolve and interact with their environment

Combination of surveys, monitoring and detailed imaging & astrometric campaigns

Challenges for the decade
Couple imaging and spectroscopy and use **simultaneously** the VLTI instruments

Leinert ++ 2004
Van Boekel ++ 2003

MATISSE

GRAVITY

MALBET ++ 2007
Kraus ++ 2008
Tatulli ++ 2008
Benisty ++ 2010

PIONIER

iShooter ??

Challenges for the decade

CHARA science meeting (March 2015)
Enable astrometry

Goal: 10 μas / 5mn

2”

VLT NACO

Keck AO

GRAVITY (first years)

GRAVITY (goal)

Goals

CHARA science meeting (march 2015)
Expand the user base and join synergies

**Develop VLTI expertise centers:** Provide VLTI users with support in preparing their proposals, reducing their data and reconstructing images

**SPHERE**  
**ALMA**  
**PIONIER**

**Challenges for the decade**
Technical and operational challenges

- All telescopes with star separators
- AO for the Auxiliary Telescopes (NAOMI)
- IR wavefront sensors for UT telescopes
- Baseline monitoring (astrometry)

Accommodate all scientific requests: snapshot, imaging, temporal monitoring. **Service mode**

Transforming the lab

Improve UT perf: vibes + AO

Challenges for the decade
PREPARING FOR THE FUTURE
An ongoing ESO-community prospective effort

How VLTI can remain relevant in the ELT era?

VLTI community days (EWASS June 2015)
Interferometry white book
There are several possible directions

- Polarimetry
- High dynamics
- "Wide" field astrometry
- Sensitivity
- High spectral resolution (> 30000)
- Higher angular resolution ???
- Increased imaging capability (more tel)

- Fundamental stellar physics (PLATO)
- Asteroseismology synergy
- Kinematics of accretion/ejection
- Star-Environment interaction

- Planet formation
- Exoplanet & Brown dwarfs in HZ
- EXO Planet:GAIA and EXAO follow-up
- Visitor vs. Facility ?

- Preparing the future
The VLTI should reach its full potential in the next decade

1. Develop surveys and large programs to answer questions with statistical significance

2. Develop spectro-imaging capability with robust fringe tracking

3. Expand the user base with VLTI expertise centers and develop synergies (with CHARA!!)

4. Very important engineering effort

CHARA science meeting (March 2015)
VLTI timeline

VLTI Future directions

Epoch I
2004-2017

Spectro-Imaging
MIDI-AMBER

VLT-Expertise center

Visitor Focus

CHARA
synergy

Epoch II
2017-2030

K
GRAVITY-Imaging

L-N
MATISSE

H (J)
PIONIER ++

Epoch III
2025 - ...

Visible - High spectral resolution

VLTI-NTelescopes

GRAVITY “Wide field”

Coordinated by EII: Future of interferometry working group

Other initiatives

PFI* Visl

*Planet Formation Imager