A plan for the VLTI

Grenoble - 15/16 January 2014
2 Timescales

- Preparing for GRAVITY and MATISSE

- VLTI in the ELT Era (ESO VLT White book)
Requests

- Prepare the infrastructure for GRAVITY and MATISSE
- Improve VLTI performance:
  - Robustness to weather conditions: adaptive optics on ATs (NAOMI)
  - Robustness to vibrations in the UTs: active vibration control strongly recommended by STC
  - Sensitivity and spectral resolution: provide fringe tracking
- Improve the access to the VLTI community:
  - Science ready pipelines: ESO deliverables
  - Phase 3 (science ready) data product repository: ESO repository (JMMC repository: OIDB).
  - Production of phase 3 products by ESO: not resourced
  - Providing reconstructed images: community
  - Promoting the use of VLTI: community (ESO)
### An important effort

<table>
<thead>
<tr>
<th>NOW</th>
<th>Status</th>
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<tbody>
<tr>
<td>MIDI</td>
<td>Removed in P94</td>
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<tr>
<td>PIONIER</td>
<td>Removed in P94</td>
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<tr>
<td>AMBER</td>
<td>Stays until:</td>
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<tr>
<td>FINITO</td>
<td>Stays if AMBER stays</td>
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<tr>
<td>NAOMI</td>
<td>PDR end of 2014 ?</td>
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<tr>
<td>VIBRATION</td>
<td>No project yet</td>
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<tr>
<td>GRAVITY</td>
<td>PAE + shipment end of 2014</td>
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<tr>
<td>MATISSE</td>
<td>GRAVITY + 1yr ?</td>
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<tr>
<td>PRIMA</td>
<td>Decision February 2014</td>
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<td>2GFT</td>
<td>Delayed 2016 ?</td>
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**Need for a holistic technical implementation plan**
Details

PRIMA-Astrometry:

- Commissioning process interrupted 2011;
- Switched to “engineering mode” to enable “experimental” astrometry and evaluate performance;
- Conclusion of engineering period: system as designed can’t deliver the requested performances for science case. Need an improved baseline calibration.
- Gate review principle endorsed by ESO management and approved by STC: 29/30 January
  - Non-ESO board;
  - Validity of PRIMA recovery plan evaluated (technical, resources, managerial)
  - Pertinence of science case in the exoplanet context.
- Based on review, the ESO management will take the decision to continue or not PRIMA-Astrometry
Details

◆ PIONIER:

- Recommended by STC, principle of its extension approved by Paranal director pending status clarification and agreement with IPAG.
- Technical solution to relocated PIONIER proposed by Paranal: no resources.
- Phase 1: If implemented will remain one/two years with current status.
- Phase 2: Service mode?
- Phase 3: Upgrade (J, medium resolution)?
Details

◆ AMBER
  - Can stay after the lab modification;
  - Aging instrument
  - Drop in number of night requested (end of its life as it is ?)
  - Will it be competitive at the time GRAVITY comes is offered?
  - Spot could be used for J,H + 4T + spectral resolution ?
  - What do we do with AMBER ?
Details

◆ NAOMI: PDR in view (end 2014) slow pace

◆ Vibrations control: Identified as priority by STC. Currently no formal project at ESO

◆ 2nd generation fringe tracking: Postponed to 2016. Serious problem for MATISSE.
The future of VLTI

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The best angular resolution accessible in Europe (for a long time);
After a huge investment it is finally working well
AT sub array
Two new instruments coming;
ESO (service mode, archives, maintenance, stability)
An untapped potential in the study of stellar environments and AGN;
An untapped potential in the study of multiplicity (massive stars, brown dwarf, ysos)
An untapped potential in the study of temporal variability (ysos, novae, evolved stars Bes)
An untapped potential for creativity (GRAVITY)?
- Workhorses topic that appear in almost all prospective exercises e.g. Astronet, NASA, US decadal (YSOs and AGNs) with growing interests from the community.
- A very active community, well organized (schools, EII ...)
- A unique potential for community growth (e.g. PIONIER days)
- Entire bandpasses unexplored (can be opened for 1 Meuro);
- JMMC: a community center that develops useful software for the community with high reactivity.
- An untapped potential of synergy with ALMA
- Optical interferometry is a serious contender to become the post-ELT ground based optical facility (ok we are speaking about decades ...)
The community is small and partly interferocentric;
The accessibility to reduced data is a problem (prebiscit of PIONIER’s black box + service package): 10 years after this is a problem.
Long-baselines lacking: deficit of resolved stellar surfaces
The funding context (ELT) is hostile
ESO lack of flexibility
The ESO current organisation context (no more Paranal VLTI, probably no more Garching VLTI) weakens the possibility to develop the VLTI in a holistic way (fragmentation)
Plans for the future

- Make GRAVITY and MATISSE a success
- Construct a real lobbying power (science based)
- Need for the presence of the VLTI in the VLT whitebook (“VLT in the ELT era” status not clear)
- Explore ways to accompany the VLTI user:
  - ARC-like center? JMMC, EII funding
- High dynamic binary explorer (4T, L band (nulling?), precision closure phase)
- J, H with medium resolution imager (molecular bands in cool atmospheres, envelops, Paschen Beta spatially resolved mass accretion/mass loss, radius-luminosity)
- Very high spectral resolution in the visible, 4T: link with asteroseismology?
- 6 telescope imager? limitations in imaging power clearly visible, the necessity to tackle temporary varying processes.
- Heterodyne interferometry at Paranal?
A POSSIBLE roadmap

- 2014: Start community discussion on VLTI “nodes”? (EII)
- 2015: Stellar physics 2.0 workshop (short wavelengths oriented) with VLTI whitebook in mind?
- 2016: removal of AMBER
- 2016: decision on fringe tracker solution
- 2018: decision on PIONIER++ (J,H Medium resolution)
- 2018: decision on Binary Hunter (BROWNIE)
- 2020s GRAVITY/MATISSE return of experience in imaging: should we go 6T?
Discussion

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Questions?

◆ Period 94 shutdown tbc
◆ What should we do with AMBER?
◆ How does the community structures itself (inspiration from ALMA?):
  • to interact with ESO (e.g: future of operations, decision on AMBER)
  • to prepare accompany GRAVITY and MATISSE: ARC (?)
    ▪ Xavier Haubois (JMMC)
  • What European initiatives?
◆ How to you see the future of VLTI?
  ♦ A possible Roadmap:
    • 2014: Start community discussion on VLTI “nodes”? (EII)
    • 2015: Stellar physics 2.0 workshop (short wavelengths oriented) with VLTI whitebook in mind?
    • 2016: removal of AMBER
    • 2016: decision on fringe tracker solution
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    • 2020s GRAVITY/MATISSE return of experience in imaging: should we go 6T?
◆ Connexion with PFI?