In Summary

Attempt to capture the information in all the talks
Our Hosts: Arcetri

~ 120 employees:
- 60 astronomers/technology staff
- 30 technical-administrative
- 30 PhD/post-doc (15-20 calls/year)

Close cooperation with the Astronomy group of UniFi
Analysis

• Maria Rioja: SFPR and FTP methods
  • Sensitivity through Coherence
  (120-fold increase (300% in diameter)
  cf 4-fold in BW (40%))
  • Astrometry — Weak Sources
Analysis

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Analysis

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- Sensitivity through Coherence
  (120-fold increase (300% in diameter)
cf 4-fold in BW (200%))
- Astrometry — Weak Sources
Continuum

- Jose Luis on Science: Very interesting probes of the AGN jet physics, particularly with registration

- Sol on MFPR: New analysis technique. Not completed, but promising

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(Near) Future of mm- Pulsar Astronomy

• Efforts to test General Relativity and other theories of Gravity by imaging directly Sgr A* with mm-VLBI.

• Includes the search for pulsars around Sgr A*, complementing the results by the black hole imaging. Pulsars potentially allow to measure the mass, spin and quadruple moment of the black hole with uncertainty (see Psaltis, Wex & Stone).

• Global collaboration with Event Horizon Telescope.

More info: blackholecam.org || eventhorizontelescope.org
Lines

- Valentin on evolved stars:
- Luca on SFR:
- Anita on multiple masers and physical conditions
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Reports

• Thomas Kr
• DY Byun
• Robert Laing
• Alexey Rudnitsky
• VLBA (Thomas)
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Characterisation

- Andrei
- Dodson
### Characterisation

- Andrei
- Dodson

#### SFPR for Imaging at 86 GHz

Combined aspects of imaging at 86+ GHz makes SFPR a very attractive option for AGN and BH studies:

<table>
<thead>
<tr>
<th>Imaging consideration</th>
<th>Generic dependence on $\nu$</th>
<th>86/230 GHz: SFPR GMVA/EHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fringe spacing</td>
<td>$\propto \nu^{-1}$</td>
<td>1/3 (1/3)</td>
</tr>
<tr>
<td>Scattering</td>
<td>$\propto \nu^{-2}$</td>
<td>1/9 (1/27)</td>
</tr>
<tr>
<td>AGN opacity</td>
<td>$\propto \nu^{-1}$</td>
<td>1/3 (1/81)</td>
</tr>
<tr>
<td>Phase noise</td>
<td>$\propto \nu^{+1}$</td>
<td>10/1 (10/81)</td>
</tr>
<tr>
<td>Effective antenna area</td>
<td>$\propto \nu^{-1/2}$</td>
<td>$\sqrt{3}/1$</td>
</tr>
<tr>
<td>SEFD</td>
<td>$\propto \nu^{+1}$</td>
<td></td>
</tr>
<tr>
<td>Amplitude noise</td>
<td>$\propto \nu^{3/2}$</td>
<td></td>
</tr>
<tr>
<td>Filling of uv-plane</td>
<td>$\propto \nu^{+1}$</td>
<td></td>
</tr>
<tr>
<td>Effective structural sensitivity</td>
<td>$\propto \nu^{+1/2}$</td>
<td></td>
</tr>
<tr>
<td>Effective dynamic range</td>
<td>$\propto \nu^{3/2+\alpha}$</td>
<td></td>
</tr>
<tr>
<td>Effective resolution</td>
<td>$\propto \nu^{1/4-\alpha}$</td>
<td></td>
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</tbody>
</table>
Characterisation

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Hardware

- Han x2
- Jung
- Orfei
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Mesh Trichroic for triple-feed simultaneity: **Conceptual idea**

- The frequency-dependent differential phase-shift, respect to a reference point (ex: centre), would create the required off-axis phase-fronts and enable this functionality.
- Real converging beams will require additional optimisation.

⇒ This is an ongoing development
- Han x2
- Jung
- Orfei
- Pisano
Hardware

- Hovatta
- Nesti
- Miroslav
- Alef
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- Nesti
- Miroslava
- Alef

New Opportunities
- can develop multi-wavelength VLBI now!
- backends with very high data rates (see JRA DNA: DBBC3 with up to 128 Gbps; 4x 4GHz dual pol - 32Gbps)
- High bit-rate recorders: Mark 6 (64 Gbps w. 4 units @EHT)
- Broad-band LNAs and feeds
- Scientific opportunities:
  - multi-wavelength VLBI mapping
  - multi-wavelength spectroscopy
  - multi-wavelength polarimetry
  - multi-wavelength single-dish
  - geodetic VGOS compatibility
- New: no different LOs and huge sky frequency