SIM Summary
M. Shao, S. Majewski, K. Johnston

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SIM Astrophysics

SIM is not just an exemplary planet finder / characterizer.

60% of SIM science time for non-planetary astrophysics

High precision astrometry applied to definitive studies of

- Distance scale problem
- Age scale (star clusters)
- Mass-luminosity relation
- Galactic structure / stellar populations / dynamics
- Dark matter (from galaxy scale to MACHO candidates)
- Local group dynamics / cosmology
- AGN structure
- Black holes, other stellar remnants, x-ray binaries
- Establish the inertial frame 50x more precisely than ICRF
- **Target of opportunity capability**
- **PLUS**: 1/3 of total science time still available for *new cutting edge science goals*
Wide Angle Astrometry SIM Science Targets

SIM vs. GAIA

- Nearby Milky Way
- Outer Milky Way
- Nearby Galaxies
- Active Galactic Nuclei
- Precision masses
- Globular clusters

Wide Angle, end-of-mission limit performance
SIM Key Projects exploit unique capability

Each point represents a target requested by a SIM Key Project PI.

Mission Accuracy (Parallax, μas) vs Target Magnitude (V)

- SIM
- GAIA
SIM’s Planetary System Studies

SIM will find and characterize planetary systems:
• Deep survey of 250 stars for terrestrial planets in habitable zone
• Broad survey of 2000 stars for Neptunes at 1-10 AU
• Survey of 200 young stars for Saturn/Jupiters at 1-10 AU

First mission to look for Earth-like planets around nearby stars

<table>
<thead>
<tr>
<th>Minimum Mass Planet Detected</th>
<th>Number of Stars Searched by SIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 ( M_\oplus )</td>
<td>5 stars</td>
</tr>
<tr>
<td>&lt; 2</td>
<td>12</td>
</tr>
<tr>
<td>&lt; 3</td>
<td>45</td>
</tr>
<tr>
<td>&lt; 4</td>
<td>110</td>
</tr>
<tr>
<td>&lt; 5.3</td>
<td>250</td>
</tr>
</tbody>
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10 pc

Nearest

Stars Searched

Planet mass in \( M_\oplus \)
The Facts About SIM Cost

- SIM Implementation cost (phase C/D) is $1,200M in fixed FY05$
  - Includes launch vehicle and reserves
- Phase C/D cost & schedule are extraordinarily robust
  - 54% budget reserve on the Instrument
  - 43% budget reserve on project cost excluding launch vehicle
  - 19% budget reserve on the launch vehicle
  - I&T/ATLO planned schedule longer than Spitzer and Chandra actuals
- A delay to 2015 will cost more, due only to extending Phase B and inflation
- In real-year dollars, the costs for a 2011 and 2015 launches are:
  - LRD $510M $510M zero
  - Sunk Cost $340M $800M $460M
  - Phase B ‘to-go’ (>FY06) $340M $800M $460M
  - Phase C/D cost $800M $890M $90M
  - Phase C/D Reserve (43%) & LV $610M $680M $70M
  - 5-year operations $460M $540M $80M
  - Total: $2,720M $3,420M $700M
- The $3.4B cost represents 25 years of effort (FY’98-FY’23)!
- The Project is technically ready to launch in late 2011 and would save more than $700M