Overview of the First Look Survey

◆ **What:** A survey to characterize the sky at the sensitivity levels easily achieved by SIRTF, to aid the first wave of observers
  - Target of 100 hours of Director's Discretionary Time
  - 3 components: Extragalactic, Galactic, & Solar System

◆ **Why:** The loss of WIRE deprived the community of knowledge of the mid-infrared sky (esp. at 24 μm) at faint flux levels
  - FLS recommended by Williams Committee

◆ **When:** FLS observations to occur right after the observatory is commissioned. Data products to be publicly available as soon as they are deemed reliable.
  - Survey plan must be robust against changes in launch date

◆ **Who:** The SSC will lead the FLS effort, with Instrument Team involvement, and community input
  - Community Workshop held in Sept. 1999

◆ **Details:** "First Look Survey" link at http://sirtf.caltech.edu
The SIRTF First Look Survey

FLS Extragalactic Component

◆ Preliminary plan: map 5 sq.deg. with IRAC & MIPS at “shallow” level, roughly one minute per pixel on sky
  - 4 sq.deg within Constant Viewing Zone, in area of lowest cirrus near 17h15m+59d30m, where I(100\mu m)=1-2 MJy/sr
  - 1 sq.deg location depends on sky visible at end of IOC:
    ◆ in near-CVZ area of low cirrus at 16h20+54d30’ (ELAIS N1 field), where I(100 \mu m)=0.4 MJy/sr (accessible from end of IOC to Sep 2002),
    ◆ OR within CVZ if area above not accessible at start of science mission
◆ Within above area, a verification survey of ≤0.25 sq.deg, covered with much greater redundancy, with both IRAC & MIPS
◆ Ancillary data planned (will be available after processing):
  - NOAO has committed to optical survey, to R(5σ)~25.5mag
  - Sloan has agreed to observe FLS fields (details to be worked out)
  - Proposal submitted for VLA survey at 1.4GHz to 5σ =90 micro-Jy
  - Options under study for near-IR survey to K~18mag
Preliminary layout of CVZ field on 100 um map

Legend:
- R: Bright Radio Source
- IR: Bright IR source (any IRAS band)
- C: Calibrator Candidate

Planned location of 4 sq deg field - exact shape, location, orientation are TBD

Edge of Constant Viewing Zone

17h28m 17h20m 17h12m 17h04m
◆ "Shallow" survey in MIPS scan-map with 5 passes at fast speed:
  ◆ Total T(integration)= 75 seconds at 24 and 70μm. T(int)=15 sec at 160 μm
  ◆ Depth reached is 1.3 mJy at 24 μm; confusion-limited at 160 μm
  ◆ Rate=1deg² per 4 hours. Estimates for a 5 deg², 20 hr survey:

<table>
<thead>
<tr>
<th>Lambda</th>
<th>5-sigma</th>
<th>Gain/past</th>
<th>Src Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>1.3 mJy</td>
<td>~100</td>
<td>~400</td>
</tr>
<tr>
<td>70</td>
<td>4.5 mJy</td>
<td>~50</td>
<td>~1,500</td>
</tr>
<tr>
<td>160</td>
<td>27.0 mJy</td>
<td>~8*</td>
<td>~2,500</td>
</tr>
</tbody>
</table>

◆ "Shallow" IRAC survey, four bands simultaneously:
  ◆ T(integration) = 5× 12 sec per point; requires ~5hr per deg².
  ◆ Estimates for 5 deg², 25 hour survey:

<table>
<thead>
<tr>
<th>Lambda</th>
<th>5-sigma</th>
<th>Gain/past</th>
<th>Src Count</th>
<th>z(L* Ellip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6 &amp; 4.5</td>
<td>0.04 mJy</td>
<td>&gt;&gt;1</td>
<td>stars+?</td>
<td>~1</td>
</tr>
<tr>
<td>5.8</td>
<td>0.04 mJy</td>
<td>~1*</td>
<td>stars+?</td>
<td>~0.4</td>
</tr>
<tr>
<td>8.0</td>
<td>0.06 mJy</td>
<td>~1*</td>
<td>~1500</td>
<td>~0.3</td>
</tr>
</tbody>
</table>

◆ Verification may use same, or more integration time per sighting
Plan: characterize cirrus and source counts at low Galactic latitudes in two strips, with IRAC and MIPS at "shallow" extragalactic level:
- At $l=285^\circ$, a strip 5' wide and running $-30^\circ<b<0^\circ$
  - Fully sampled for $-10^\circ<b<0^\circ$, but partially filled in for $-30^\circ<b<-10^\circ$
- At $l=150^\circ$, a strip 5' wide and running $0^\circ<b<10^\circ$
- Strips can shift in longitude if launch delayed several months

One strip for characterizing cirrus and source counts toward molecular cloud:
- A 5' by 2° strip through Cham II cloud centered at 12h50m-77d (available from Feb 01 2002 to Sep 18 2002)
- Backup clouds in case of launch slip are under study
- Same MIPS depth as in extragalactic plan, but 10x more time in IRAC

No pre-launch ancillary data recommended
ôme: Characterize the moving object population (number counts, diameters, scale heights), and characterize the zodiacal light
◆ 2 fields of 0.2 sq deg each
  – one in the ecliptic and the other 10-15 degrees out of ecliptic
  – 110-120 degrees solar elongation, pointing back towards the Earth
  – fields are independent of launch date, except avoid Galactic Plane
◆ 3 passes with IRAC in each field to detect moving objects
  – 2-3 hours between each pass
  – 0.06 mJy detection limit with IRAC (8.0 microns)
◆ 1 wider area pass with MIPS to detect objects found by IRAC
  – 1.3 mJy detection limit for MIPS (24 microns)
◆ In ecliptic, detect 108 asteroids with IRAC, 56 asteroids with MIPS, many with diameter less than 1 km
◆ Simultaneous ground-based visual observations required
  – to V=25 if possible