LABOCA Commissioning Plan

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0.2	05.07.06	G. Siringo	Sec.5; Sec.6	
0.3	06.07.06	A. Weiss	Sec. 7	added new section
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0.6	11.07.06	G.Siringo	Tab. of contents, Sec.1,3,6,7	corrected typos, improved table

Table of contents

1 Purpose

The purpose of this document is to provide an overview as well as a coarse schedule for the technical and astronomical tests required for the commissioning of LABOCA (Large APEX Bolometer Camera).

2 Scope

This document applies to the LABOCA facility instrument.

3 Documents

3.1 Applicable documents

AD-01	APEX LABOCA Instrument Specifications	APEX-MPI-SPE-0008
AD-02	APEX Standard Hardware Interfaces	APEX-MPI-ICD-0003
AD-03	APECS Bolometer Observing Software	APEX-MPI-DSD-0019
AD-04	Multi-beam FITS Raw Data Format	APEX-MPI-ICD-0002

3.2 Reference documents

RD-01	LABOCA Optics Design Description	APEX-MPI-DSD-0018
RD-02	LABOCA Design Description	APEX-MPI-DSD-0016
RD-03	BoA Design Description	APEX-MPI-DSD-0017
RD-04	LABOCA Handling Document	APEX-MPI-MAN-0016

4 Definitions

Within this document we will use the following definitions, or the understanding shall be:

LABOCA	Large APEX Bolometer Camera
APECS	APEX control software

5 General Schedule for LABOCA Sep./Oct. 2006 at Apex

Week 35 (28.8 -) : Instrument installation (day time access to the telescope only)
36 (04.9.-) : Installation and technical tests
37 (11.9 -) : First light; Instrument commissioning
38 (18.9.-) : Science verification (all partners)
39 (25.9.-) : First LABOCA scientific observing run
…
42 (16.10.-) : end of mission
43 (23.10.-) : optional, SZ experiment on sky.

6 Technical Work and Astronomical test during installation phase

6.1 Week 35: Installation

- Verify the integrity of the instrument after shipping
- Cryostat installation
- Geometric alignment of the optics with laser
- Electronics & backend installation
- Cryogenic tests and first cool down

Hardware requirements at APEX (required from 28.8 onwards)		
Cryogens:	Liquid N_2: 5 liters/day	Liquid ^{4}He: 7 liters/day
Gases:	Availability of pressurized N_2 and ^{4}He gas cylinders equipped with the corresponding manifolds	
Storage and handling:	Liquid N_2 storage container, 20-30 liters, with pressure option (e.g. *Air Liquide TR21* or equivalent) Liquid N_2 pressurization manifold (e.g. *Air Liquide DL3* or equivalent) ^{4}He flexible transfer line One or more buckets for N_2 handling (1-3 liters, e.g. *Air Liquide AGIL* serie)	

6.2 Week 36: Technical Tests

- Verify the functionality of the system
- Noise measurements on absorber and noise analysis
- Measure bolometer sensitivity with hot-cold measurements
- Radio alignment of the optics with bolometers

- Verify the homogeneous illumination of the full array
- Test the communication between APECS and the LABOCA objects (backend and frontend computers)
- Test the data acquisition at different sampling rates
- Test the data acquisition with wobbler, if available
- Optimization of the bolometer recycling procedure

6.3 Week 36/37: Astronomical Tests

- First light
- Search for initial pointing offsets
- Test APECS pipeline reduction (pointing, focus, skydip reduction)
- Test Bolometer observing modes (pointing, focus, skydip, onoff, mapping)
- Determine the default focus positions (subreflector x, y, z offsets)
- Determine beam shape and flat field for all bolometers (beam maps, absorber)
- Determine astronomical calibration (counts/Jy from planet pointings and maps)
- Investigate acceleration and microphonic noise
- Maximize the sensitivity (signal-to-noise ratio) by optimization of the observing strategies (scanning speed, rectangular vs. spiral patterns, …)

7 Week 37/38: Astronomical Commissioning

- Establish calibration scheme: define a list of secondary calibrators, measure flux in comparison to planets (pointing, on-offs, sky dips)
- Determine calibration accuracy
- Provide a dedicated pointing model (planets, secondary calibrators, QSOs)

- Mapping verification:
  1. Test noise behaviour as a function of mapping speed and mode
  2. Test telescope path as function of mapping speed and mode
  3. Define an optimal range for the mapping speed
  4. Test stability of large (>1deg) drift maps
  5. Test restoration of extended emission for different mapping parameters
  6. Map sources of known structure and flux with different mapping parameters (see section 8)
  7. Test noise behaviour for deep maps
- On-off verification (only if wobbler is available, which is unlikely):
  1. Test on-off flux as a function of wobbler throw, wobbler period, nicking interval, sampling rate and source flux
  2. Define default on-off parameters (wobbler period, nicking time, sampling rate)
  3. Measure on-off flux of compact sources with known 850mu flux (Jy to mJy)
- **Get press release quality maps** during these tests, in part. for ESO's Committee of Council which meets on Sept.27 in Santiago (material distributed Sept. 20th, late(r) update for presentation welcome).

8 Source list and visibility for astronomical tests and commissioning

Planets: (fluxes calculated from ASTRO for Sep. 14th using a beam size of 18'')

Night: Neptune (25.67 Jy @350GHz, 2"),
Uranus (68.86 Jy @350GHz, 3.5")

Day: Saturn (1873.72 Jy @350GHz, 15"),
Jupiter (4676.88 Jy @350GHz, 32")

Galactic targets: mainly bright (few Jy) high mass star--forming regions with known structure. Sources are listed in Figure 2.

Extragalactic targets: (to fill gap at LST = 24h) **NGC253, NGC7552.** Both are starburst galaxies with bright (~3Jy), compact central molecular gas concentrations. NGC7552 has been mapped by Spitzer as part of the SINGS legacy project.

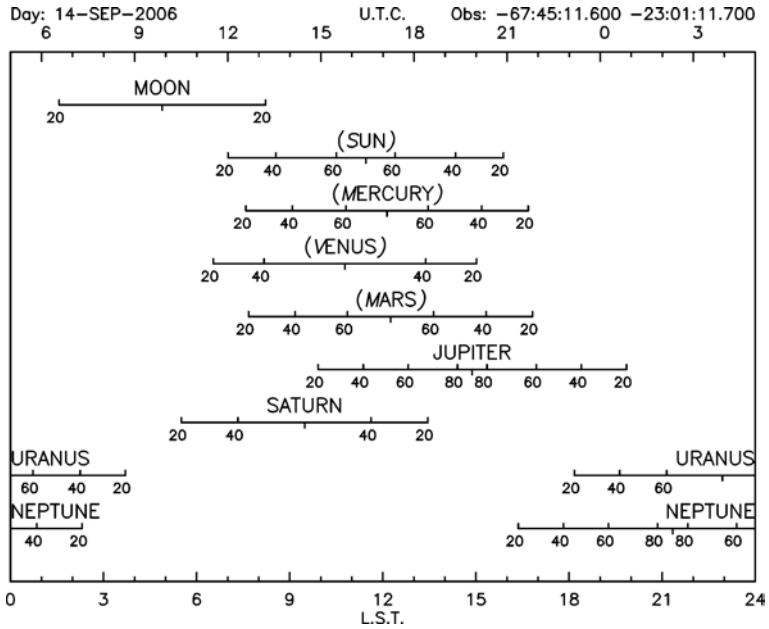

Figure 1: Planet visibility chart for Sep. 14th 2006

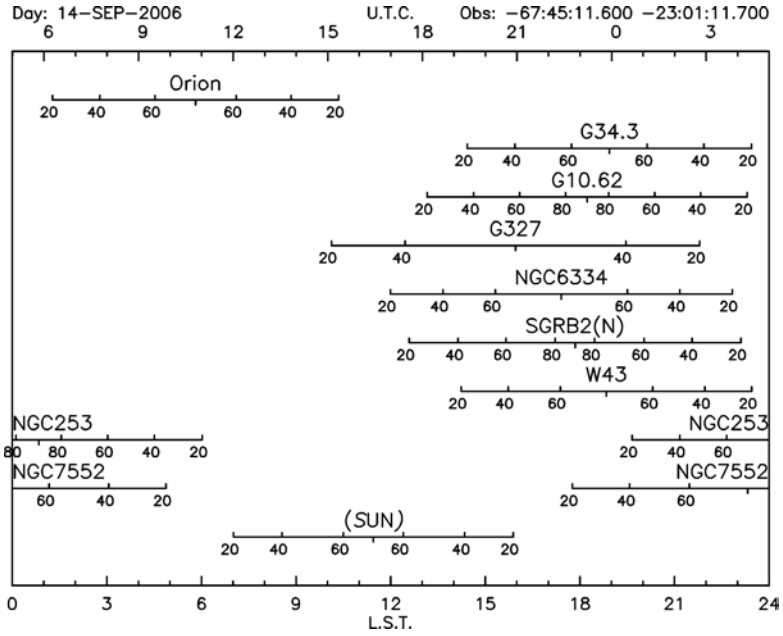

Figure 2: Visibility plot for galactic and extragalactic targets.