Atacama
Large
Millimeter
Array

Optical Pointing System Integration and Commissioning

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Specification Document

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Change Record

Revision	Date	Author	Section/ Page affected	Remarks
1	2006-12-26	Jeff Mangum	All	Initial Draft
2	2007-01-03	Jeff Mangum	All	Revisions following Ralph Marson comments
3	2007-01-19	Jeff Mangum	2, 3	Revisions following first OPT coordination telecon

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Contents

1 Objective

The integration and commissioning tasks for the Optical Pointing Telescope (OPT) system will allow for the use of this system as a production antenna acceptance tool. In the following I list the required tests, and their associated software requirements, which must be completed at the ATF before delivery of this system.

The final verification goal of these tests is to derive a pointing model which is consistent with that derived by the AEG.

2 Requirements

In the following I list the capabilities that must be available for OPT system integration and commissioning:

— **General:**

1. The antenna must be steerable and capable of pointing and tracking a given (Az,El) direction at sidereal rates.
2. The antenna must be capable of recording time-stamped Az-El coordinates during position tracking.
3. The OPT signal must be available both to the monitor and control system and any real-time monitoring systems (such as video monitors in the ATF Control Building).
4. It must be possible to access all OPT monitor and control points from either a command line or a GUI.
5. It must be possible to make real-time changes to the OPT focus and monitor the effect of those changes on a video monitor.
6. It should be possible to perform daytime observations with the OPT using the IR filter.

— **Monitor and Control:**

1. It must be possible to command the antenna to perform offset positioning using both the Mount GUI and from a script.
2. It should be possible to command the antenna in a spiral pattern.
3. Log messaging should indicate magnitude of position corrections due to precession and pointing model.
4. All possible pointing model terms available within the TPOINT analysis package (and the tcspk pointing kernel) must be available for inclusion in the online pointing model.
5. The Computing IPT software must be capable of writing a properly-formatted TPOINT star position file which allows for proper analysis of OPT pointing measurements.
6. It must be possible to set and query the current pointing model terms in use.
7. Must be able to dump derived star centroid (Az,El) positions to an ASCII text file at rates of at least 1 Hz (faster would be better).
8. Must be able to select a list of several hundred stars with appropriate criteria (lying within specified magnitude, LST, elevation, and time ranges, isolated, etc.) from the Tycho2 database. This selection should be done with a simple GUI which allows for target list editing before submission. A model for this tool would be the “Tycho” GUI developed for the AEG testing.
9. It must be possible to perform OPT measurements in “manual mode”, independent of the scheduling software.
10. Manual mode observations must write data to the archive to be accessible for later analysis.
11. Manual and automatic (using the scheduling softwar) mode observations must write data to a simple ASCII file for simple data quality investigation.

3 Integration and Commissioning Tests

1. OPT focus optimization. Done with real-time monitoring of star image on video monitor while changing focus.
2. Centroid finding algorithm verfication. Done by noting change in peak position derived with changes in star position on CCD. Look for quantization of derived positions.
3. OPT-to-antenna (Az,El) coordinate frame alignment. Done with cross-scan measurement of a star while continuously dumping centroid position to an ASCII file. Rotation of CCD will show up as shift in Az or El with constant offset in El or Az, respectively.
4. OPT plate scale measurement. Done with fixed offset measurements. Should also check plate scale variability over center half of CCD.
5. All-sky pointing.
6. Offset pointing.
7. Tracking stability test (time scales from 30 seconds to 1 hour). Done while continuously dumping centroid positions.