2.8 Science *(Al Wootten)*

Planned versus actual accomplishments over the period

- Monitoring of site conditions continues, with monthly posting of data to the ALMA/NA website. Further iteration on the Operations needs for site characterization continued. Progress is on schedule.
- Science IPT has provided review panel members and observer expertise Computing CDR2 (report in final discussion as of 2004 July 30) and for evaluation of design of the ALMA Total Power Back End (TPBE). Progress is on schedule.
- Several telecons of the Calibration Group occurred, to stimulate progress on the further development of the Calibration Plan and the deployment of elements of the Plan on the ATF prototype interferometer. Progress is on schedule.
- The Science IPT worked with the Back End IPT on TPBE parameters (gain flatness, digitizer range, sideband separation and digitizer offset). In close collaboration with the BE IPT, a CRE was developed for a TPBE design in response to the BE CDR. This is an unplanned accomplishment.
- Tom Wilson, Science IPT co-lead, attended the ALMA Board in Garching during 2004 June 23. The Science IPT provided support to the ASAC as it responded to its Charges from the Board and has provided organizational support for its Sept. 27-8 meeting in Charlottesville. Progress is on schedule.
- Science IPT/NA also supports the ANASAC; this body was included in planning discussions of the AAS Town Meeting which have occurred. Progress is on schedule.
- The Science IPT worked closely with the Operations Group and Paul van den Bout, Head of the NA ARC in preparation for ALMA Operations. Progress is on schedule.
- The American Astronomical Society ALMA Town Meeting to be held at 1:00 pm on 2005 January 11 (Tuesday) during the 205th AAS Meeting held in San Diego, CA was planned. Additional planning for ALMA representation at meetings in Fall 2004 was carried out. Progress is on schedule.
- The ALMA/NA Biweekly Calendar was issued 2004 7 & 21 June and 5 & 19 July. A quarterly ALMA web newsletter was published on the ESO website; a similar vehicle for NA is in final planning stages. Progress is on schedule.

Technical status and technical performance results achieved over the period

- ***Calibration*** The Calibration Group has been reinvigorated under the leadership of Jeff Mangum. Discussions with the BE IPT have begun (see above) on BE CDR-inspired redesign of the Total Power Back End. Holdaway, Stirling, Richer and Hills have produced a grid of atmospheric models with which to model WVR performance in a study to determine the most effective way to combine fast switching and WVR correction of atmospheric phase perturbation.
- ***Imaging*** Holdaway is finishing his work on a paper on Multiscale CLEAN, an algorithm expected to be important to ALMA imaging. Holdaway also traveled to the AOC where he discussed T. Cornwell's new method of 'w-projection' with him. 'W-projection is expected to ease pointing self-calibration, considerably improving ALMA images.
- ***Configuration*** The plan for calibration of ALMA baselines, a complex process for an array in which several elements move every few days, is in its final draft stages.
- ***DRSP*** Authors of projects in the *Design Reference Science Plan* have been polled to provide details of the calibration needs, particularly the accuracy, for their projects. The

responses have been presented to the ASAC and reviewed, and a document summarizing them is being prepared for issue during 2004 August. This will form the basis for re-assessment of ALMA's calibration accuracy needs by the Calibration Group.

- ***Technical*** D. Emerson, ALMA/NA Instrument Scientist, worked with the BE IPT to develop specs for the TPBE, authoring a CRE which was submitted. Emerson also worked to determine the influence of a planned 94 GHz radar, **CLOUDSAT**, on ALMA.

Highest level technical and managerial risks and concerns

- (Risk expressed in Apr-May report reiterated). A concern for the Science IPT is the delay in the milestone for first fringes to occur at the ATF. Several upcoming milestones were set based upon the previously planned 2004 November 1 target date; this has apparently slipped to 2005 April 1 and will force slippage of Science IPT milestones. Some of these milestones will be reworked, so that portions of them not dependent upon actual measured equipment performance can be met with simulations of performance pending subsequent measurement. In particular, tests of the WVR had been planned at the ATF. In the currently understood schedule, field tests have slipped to after April 2005. Therefore we will issue a report without ATF tests on the WVR strategy. Given the weather patterns at the ATF it is unlikely that WVR field testing can now be completed before winter 2005/6. As reported in June 2003, the baseline at the ATF is likely to be too short for atmospheric phase correction demonstrations; the field testing is mainly to demonstrate operation of the instrument.

Planned activities for next period

- The Science Requirements document was discussed in a CCB meeting 2004 July 29 with revisions suggested. Approval is expected for this document very soon.
- ASAC Charges are expected from the Board meeting 2004 August 5. The Science IPT will work to aid the ASAC in response to those charges with expected approval of the Management IPT for expenditure of this effort.
- A progress report on the feasibility study for the amplitude calibration device is expected in September.
- A draft recommendation for ALMA instrumental modes to be supported during Early Science phases will be released.

Staffing

During 2004 June-July the staffing level for the Science IPT North America was 2.05 FTE spread over the efforts of six actual persons. James Gibson of UCB worked on an absolute calibration scheme with Jack Welch under a contract which expired 2004 June 30. Two persons not on the ALMA payroll are expected to be transferred to that shortly—Darrel Emerson, ALMA/NA Instrument Scientist and Alwyn Wootten, ALMA/NA Project Scientist. Plans to augment staff with personnel to carry out commissioning of ALMA equipment at the ATF have been placed on hold pending planning for those activities, now expected to begin not sooner than 2005 April 1.