Cassegrain ADC – Full Scale Development
Project Work Plan: Revision 2.0

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1. Introduction

The purpose of the Cassegrain ADC project is to provide an Atmospheric Dispersion Corrector that will fully compensate for effects of atmospheric dispersion down to a 60º zenith angle of the Keck 1 telescope for a wavelength range of 0.31 to 1.1 microns.

In February 03 the Conceptual Design of that Cassegrain ADC was completed and reviewed. The CARA board approved start of the Preliminary Design Study in April 2003 and it was completed and reviewed in October 2003. In May 2003 Detailed Design was completed and reviewed.

This work plan deals directly with the Full Scale Development and Testing phase. The instrument would be Installed and Commissioned in the final phase.

2. Work Scope

2.1. Instrument Specifications and Requirements

The Cassegrain ADC Requirements Document Version 1.3 defines the Instrument Specifications and Requirements to be followed in this phase

2.2. Telescope/Observatory Interface Control Document (ICD)

The Cassegrain ADC ICD Version 1.2 covers the Interface of this instrument to the telescope and infrastructure.

2.3. Optical Glass Purchase

The optical glass has been ordered from Corning and delivery to Zygo is expected in late May for fabrication into the ADC prisms. The contract for the optical fabrication has already been let.

2.4 Optical Coatings

The prisms will be coated to conform to the optical specifications. Presently the plan is to coat both sides of both prisms with MgF, and then send them to the Livermore Lab to apply a Solgel coating to both sides of both prisms. It is possible that we will also want to apply a hydrophobic coating as the last step in this process. This layer would protect the Solgel from the effects of water deposition on the prisms. If we decide that this is necessary, this coating would likely be applied at Lick Observatory.

2.5 Detailed Mechanical Fabrication and Assembly

The mechanical fabrication would be carried out in this phase, using the drawings produced and reviewed in the Detailed Design Phase.

An assembly and alignment plan was written in the Detailed Design phase and this plan will be used for initial assembly and alignment.

2.6 Electrical Fabrication

The electrical fabrication will be completed in this phase including the purchase of all bought parts. The hardware will be ordered at the being of this phase.

All electrical systems will be powered and tested before connection to the mechanical hardware.

2.7 Software

A complete prototype has been written as part of the Detailed Design phase, including the ADC service dispatcher, client library, and engineering GUI. The dispatcher was written in Tcl/Tk to take advantage of its power as a rapid-prototyping tool. The current plan is to use a Tcl/Tk version as the delivered software.

2.9 Testing

The complete system including mechanics, electronics and software will be tested for a minimum of 100 hours and at least 3 zenith angles. The electronics can be tested cool (5C), but the full scale mechanism is too large to test in our environmental chamber. We plan to test in the High bay of the Lick Instrument Lab and can have that area cool to the ambient outside temperatures which could approach 0C in the winter when the tests are planned.

We plan to test witness samples of the ADC prism's coating in our Spectrum Analyzer.

2.8 Schedule

The schedule for this phase and the remaining project is attached. We are planning to be ready for a Pre-Ship Review in March 05. The Optics purchase and fabrication are the time critical part of the schedule.

2.9 Budget

The project budget as it was estimated at the start of Full Scale Development is attached.

3 Specifications

Defined in the ADC Requirements Document, Version 1.3

4 Project Team

Principle Investigator – Joe Miller
Project Scientist, Optical Designer, and Deputy PI – Drew Phillips
Optician – David Hilyard
Mechanical Engineer – Vern Wallace
Electronic Design – Barry Alcott
Software – Will Deich
Project Management – David Cowley
CARA Instrument Program Oversight – Sean Adkins

5 Decision Matrix

5.4 The PI and the Deputy PI will make all performance decisions.
5.5 Staffing decisions will be made by the Project Manager in consultation with the PIs and CARA.
5.6 Budget decisions within the approved budget will be made by the Project Manager in consultation with the PIs and CARA.
5.7 Budget decisions exceeding the approved budget (including any expenditure of the contingency amount) must be approved by the CARA Instrument Program Manager.
5.8 Telescope interface decisions will be made by CARA through the Instrument Program Manager.

6 Risk and Contingency

The technical and budget risks are considered moderate at this stage (FSD) of the development. The contingency is detailed in the budget

7 Work Breakdown Structure

Full Scale Development Phase

1. Optical Fabrication
   1.1. Optical Fabrication at Zygo
   1.2. Testing for compliance to specifications by Zygo

2. Optical Coating
   2.1. Final optical coating specification
   2.2. MgF coating
   2.3. Solgel coating
   2.4. Hydrophobic coating if necessary
   2.5. Testing of witness samples

3. Mechanical Fabrication
   3.1. Mech Engineering

3.2. Frame Assembly
3.3. Ball Screw Assembly
3.4. Motor/Gear Box
3.5. Cladding
3.6. Cell Assembly
3.7. Fiducal assembly
3.8. Jack Stand
3.9. Test stand
3.10. Handling fixture
3.11. Dummy Prisms
3.12. defining points

4. Electrical Fabrication
   4.1. Mount Electronics\
   4.2. General Wiring
   4.3. Test and troubleshoot
   4.4. Documentation
   4.5. New boards
   4.6. Misc. Electronic

5. Software
   5.1. Software coding/checks
   5.2. Slitmask milling changes

6. Assembly, Alignment and Testing
   6.1. Assemble and align Mechanical system as per Detailed Design Phase Plan
   6.2. Electronic components burn in tests
   6.3. Intergrated Instrument testing as per Testing Plan

7. Preparation for Pre-Ship Review

8 Deliverables

- Coated ADC prisms installed in cells and mechanical assembly
- Mechanical Assembly as per DD drawings and specifications
- Updated Mechanical drawings and parts list
- Electronic Assembly and components as per DD drawings, schematics and specifications
- Updated Electronics schematics and parts list
- Software control integrated to the DCS
- Results of integrated testing
- Packing crates as required
- Shipping and installation plan
- Updated budget to complete

9 Milestones

- Start of Full Scale Development June 04
- Start of integrated testing Dec 04
- PSR Sept 05
- Delivery to Keck Oct 05
- Installation and Commissioning Oct/Nov 05

10 Schedule

The project schedule is included

11 Budget

The proposed budget tracking sheet and cost codes are attached (attachment 2). A graph showing the rate of expenditures is also attached. This graph would be updated monthly at the time of the budget report and would include actual expenditures.

12 Project Tracking

Monthly reports will be sent to the project team, SSC and CARA on about the 20th of each month. The report will include an update of the technical and budgetary status, and the schedule.

Monthly reports will be in a version of the new format requested by CARA as modified by agreement between the Project Manager and the CARA Instrument Program Manager.

13 Revision History

Revision 1.0 April 15, 2004
Revision 2.0 May 25, 2004