



Keck Cosmic Reionization Mapper
Preliminary Design Review Process and Charter
17 & 18 January, 2018

INTRODUCTION

The California Institute of Technology (CIT) and the University of California at Santa Cruz (UCSC) are collaborating with the W. M. Keck Observatory (WMKO) in the development of the Keck Cosmic Reionization Mapper (KCRM) that is an upgrade and extension to the recently commissioned Keck Cosmic Web Imager (KCWI) project for the Keck II telescope at WMKO.

The KCRM project is currently in the preliminary design phase and this document describes the Preliminary Design Review (PDR) process, the PDR success criteria, and the charter for the PDR committee.

KCRM PRELIMINARY DESIGN

The Preliminary Design Process

In the KCRM project preliminary design (PD) phase, science requirements are reviewed in the context of the recent landscape for this instrument. Instrument performance requirements and an operational concept are established using a flow-down process from these science requirements. These determinations in-turn provide the basis for instrument and facility technical requirements, specifications and a documented preliminary design or architecture for each instrument or facility-support system, sub-system and component, hardware or software. Each preliminary design is proposed with sufficient detail to establish that it is feasible and likely to meet its performance requirements. The project plan to completion, including the schedule and budget, is updated to reflect implementation of the preliminary design.

Success Criteria

Success for the PD phase means that the preliminary designs and associated specifications presented in the PD report are accepted by the review committee because the

- preliminary designs meet the science requirements for the instrument
- schedule and management plan presented demonstrate that the remaining work to complete the project can be accomplished
- budget with acceptable contingency is within the cost capped funding

REVIEW PROCESS

Documentation

The primary documentation for the PDR will be a preliminary design report.



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Committee

The PDR committee will use the PD report as the basis for its evaluation, which will take place in a two-day meeting at Caltech. The PDR committee will consist of five to six invited reviewers external to the project, one of whom is the chair of the review committee. In addition, two WMKO staff members not directly involved in the KCRM project may serve as an informational resource for the review committee.

Purpose and Objectives

The purpose of the PDR is to provide an external peer review of the work done in the PD phase and to provide recommendations to WMKO and the KCRM project team on the project designs, predicted performance, and plans for completion.

The review committee's charge is to determine if the project meets the success criteria and to recommend one of three courses of action:

1. Proceed as planned with the KCRM detailed design phase.
2. Proceed as planned with the KCRM detailed design phase after specific issues identified by the review committee have been addressed to the satisfaction of Observatory management.
3. Do not proceed with the KCRM detailed design phase until a second "delta" PDR can be held to evaluate the resolution of specific issues raised by the committee.

In carrying out the review we specifically request that the review committee consider the following questions:

1. Preliminary Designs
 - a. Do the preliminary instrument specifications meet the science requirements?
 - b. Does the PD predicted performance meet the specifications?
 - c. Are the technical requirements for the instrument clear, complete and well defined?
 - d. Are the designs sufficient to establish the feasibility of the proposed design?
 - e. Based on the reviewer's knowledge and experience are the proposed designs feasible?
 - f. Based on the reviewer's knowledge and experience are the proposed designs based on sound scientific principles and best engineering practices?
 - g. Are the interfaces between the facility and the instrument well defined?
 - h. Are the key interfaces between internal instrument subsystems well identified?
 - i. Are the preliminary plans for integration and test clear and well thought out?
 - j. Is the risk identification complete, and if not, what additional risks should be considered?



- k. Are the risk mitigation efforts and future plans likely to result in retirement of the highest risks?
- 2. Documents and Reports
 - a. Does the PD report provide adequate detail on the PD activities?
 - b. Are the interface design documents clear and sufficiently detailed?
 - c. Are the requirements and interfaces definitions (ICD) under effective change control?
 - d. Is clear flow down established from the science requirements to the technical requirements and is there a verification matrix that maps requirement verifications to needed tests?
 - e. If the predicted performance for the designs does not meet the science requirements or the PD specifications are the plans for addressing this sufficient?
 - f. Are the plans for completion of the project, including schedule and budget, sufficiently detailed and complete?
 - g. Based on the reviewer's knowledge and experience, is there adequate contingency and an appropriate list of descope options available to stay within the cost cap budget?
 - h. Based on the reviewer's knowledge and experience is the proposed schedule and budget to completion realistic?

Guidelines

In order to make the KCRM PDR as effective as possible we have established two guidelines for the PDR process:

1. The review will be made on the basis of a written PD report. This report should include all of the materials that the KCRM team believe are appropriate to address the questions in the charter for the review committee. This report may be a single document or a summarizing report with details in sub-reports. No additional materials should be presented at the review except for those needed to answer questions raised by the review committee prior to the review meeting.
2. The review agenda will include time for a presentation that summarizes the report, but it will be assumed that all of the attendees have reviewed the report in detail prior to the meeting.



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Schedule

The following timetable is proposed for this review process:

Date	Description
January 2, 2018	PD documentation released by KCRM to PDR committee
January 11, 2018	PDR committee members submit questions
January 14-16, 2019	KCRM project team response to questions
January 17 & 18, 2019	PDR meeting
February 1, 2019	Preliminary PDR committee report released by chair
February 22, 2019	Final PDR committee report released by chair

COMMITTEE CHARTER

The WMKO instrument program manager, in collaboration with the KCRM project team, has written this charter for the PDR committee. The review committee charter is as follows:

1. Each member of the review committee should read the PD report prior to the review meeting.
2. Each member of the review committee should submit questions as required to the KCRM project team prior to the review meeting to obtain clarification or further information about the PD report and the KCRM project. The WMKO instrument program manager and the Principle Investigator will serve as the points of contact for the submission of questions.
3. Each member of the review committee should consider the answers to any questions asked in item 2.
4. The committee will hold a two-day PDR meeting with the KCRM project team to discuss the preliminary design report and the specific areas covered by the questions listed in the purpose and objectives sub-section of the Review Process section of this document.
5. The committee will hold one or more “executive sessions” during the PDR meeting to develop the committee’s report and recommendations.
6. The committee will provide Requests to Action in their report that fall into three tiers:
 - Tier 1 recommendations must be resolved successfully before the PDR can be considered successfully completed.
 - Tier 2 recommendations must be resolved at/for the Detailed Design Review (DDR).
 - Tier 3 recommendations are offered by the committee for consideration by the design team but are not considered binding.
7. At the conclusion of the PDR, the committee will provide a brief presentation summary of the review outcomes to the WMKO instrument program manager, the KCRM project principal investigator and the KCRM project team.



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8. The chairperson of the review committee will lead the drafting of a written report. A preliminary or summary report will be issued within 7 days of the meeting and the final report will be issued within 21 days of the review meeting. This report should summarize the important issues discussed at the review meeting and present the committee's findings.
9. The preliminary and final reports of the PDR committee will be delivered to the Observatory Director.



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APPENDIX A: KCRM PRELIMINARY DESIGN REPORT OUTLINE

The KCRM Preliminary Design Report outline, in draft form, is as follows:

KCRM Preliminary Design Manual

Table of Contents:

1. Executive Summary

2. Introduction

- 2.1. Revision History
- 2.2. References
- 2.3. KCRM Science
- 2.4. KCRM Science Goals
- 2.5. Representative Science Cases
- 2.6. Operational Concepts and Observing Scenarios

3. Specifications and Requirements

- 3.1. Flow Down of Science Requirements to Technical Requirements
- 3.2. Preliminary Specifications
- 3.3. Compliance Matrix for Requirements

4. Preliminary Design

- 4.1. KCRM optical layout
 - 4.1.1. Spectrograph
 - 4.1.2. Anticipated Spectrograph Performance
 - 4.1.3. Guider design
- 4.2. Optical elements
 - 4.2.1. Dichroic
 - 4.2.2. Fold Mirror 2 (FM2)
 - 4.2.3. Grating Suite
 - 4.2.4. Camera
 - 4.2.5. Detector
- 4.3. Optomechanical Elements
 - 4.3.1. Overview
 - 4.3.2. Dichroic beam splitter
 - 4.3.3. Fold mirror 2 (FM2)
 - 4.3.4. Grating rotator
 - 4.3.5. Articulation stage
 - 4.3.6. Camera



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4.3.7. Detector

4.3.8. Guider

4.3.9. Calibration system upgrade

4.4. System level electrical design

4.5. System level software design

4.5.1. Overview

4.5.2. Instrument control

4.5.3. Planning / Observing tools

4.5.4. Hardware servers

4.6. Installation plan

4.6.1. Overview

4.6.2. Caltech assembly and testing

4.6.2.1. Overview

4.6.2.2. Instrument simulator

4.6.2.3. Installation of elements

4.6.2.4. Testing and characterization of elements

4.6.3. Shipping

4.6.4. Summit installation

4.6.4.1. Overview

4.6.4.2. Prerequisites

4.6.4.3. Crane down and installation in clean tent

4.6.4.4. KCRM Installation plan

4.6.4.5. Testing plan

4.7. Commissioning

5. Management Plan

5.1. Project Structure and Organization

5.2. Project Management

5.3. Risk Assessment and Management

5.4. Work Breakdown Structure

5.5. Schedule

5.6. Deliverables

5.7. Milestones and Reviews

5.8. Budget

5.9. Funding

6. Glossary

7. Appendices



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7.1. Mechanical Requirements Tables