

**Southern African Large Telescope
High-Resolution Spectrograph**

SALT HRS

3200BP0020 Management Plan

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TABLE OF CONTENTS

1	INTRODUCTION.....	3
2	ORGANIZATION CHART	3
3	REPORTING	4
4	DOCUMENT MANAGEMENT PLAN.....	4
4.1	NUMBERING.....	4
4.2	FORMATS	5
4.3	PUBLICATION	5
4.4	VERSION CONTROL	5
5	SCHEDULE MANAGEMENT	6
6	BUDGET MANAGEMENT.....	6
7	STATEMENT OF WORK.....	6
8	INTERFACE MANAGEMENT	6
8.1	INTERFACE MODIFICATIONS	7
8.2	MANAGEMENT INTERFACE.....	8
9	PROCUREMENT ISSUES, EQUIPMENT CONTROL AND NON-DELIVERABLES.....	8
10	QUALITY ASSURANCE.....	8
11	CONTINGENCY MANAGEMENT	9
12	DESCOPING PLAN	10
13	CHANGE CONTROL.....	10

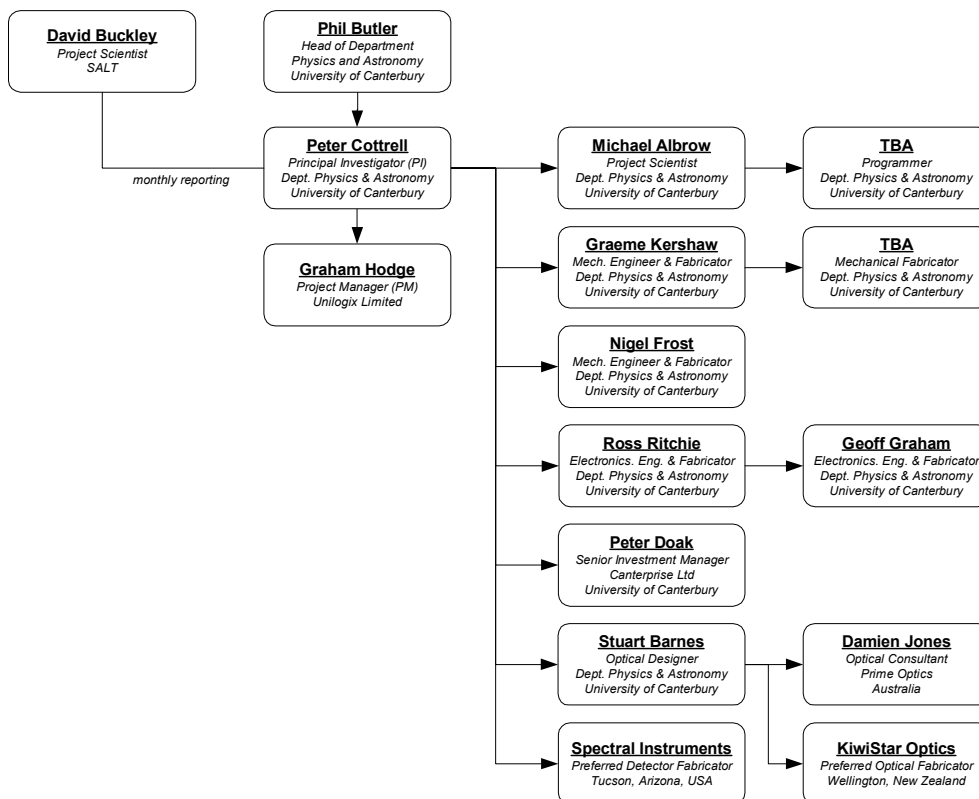
1 Introduction

This document describes the management plan for the design of the SALT High Resolution Spectrograph (SALT HRS) developed by the SALT HRS Principal Investigator (PI) and Project Manager (PM).

This replaces the PDR document with the same number except that it is Issue 2.

2 Organization Chart

The figure below presents the organizational chart for SALT HRS. It includes each of the personnel at the University of Canterbury (hereafter UC) who will be working on SALT HRS, as well as two preferred key outside contractors, Spectral Instruments for the detector and KiwiStar Optics for the optical fabrication. Some of the positions in the UC tree are unfilled, but recruitment will occur once approval to proceed to the construction phase is received.



3 Reporting

The SALT HRS PI, in cooperation with the Project Manager (PM), shall report quarterly on the status of the SALT HRS project. The report shall include a progress report, financial report, a schedule update and a discussion of any significant issues affecting the work. In addition, the PI will provide monthly technical status reports to the SALT Project Scientist by email. The latter will include minutes of meetings and other relevant material.

The Quarterly Report shall be distributed to the SALT Project Scientist and the Head, Department of Physics and Astronomy, University of Canterbury.

4 Document Management Plan

SALT HRS will establish a web-based system of electronic document distribution.

4.1 Numbering

SALT HRS will use a document numbering plan to identify uniquely every document produced in the design, development, delivery and commissioning of SALT HRS. Included will be all schematics, diagrams, science and technical reports, presentations, review materials, software listings and similar materials. Not included are web pages, e-mails, phone records or other forms of personal communications. However, some of the latter will be incorporated into the documents on the web.

The SALT HRS document numbering plan shall conform to the SALT document numbering standard wherever possible.

SALT HRS documents numbers shall be of the form SALT-32XXyyZZZZ-NNNN where XX denotes the SALT HRS subsystem, yy is the document type as specified in the Project Directive: Document and equipment numbers, ZZZZ numbers sequentially the documents for each XX, and NNNN is an item number within a document.

The SALT HRS subsystems (XX as noted above) are assigned numbers as follows:

00	Management
10	Optical aspects, including input optics
20	Mechanical aspects
30	Fibre injection mechanical aspects
40	Operations
50	Electronics and control
60-80	TBD
90	Detector (from Spectral Instruments)

The SALT HRS design has evolved from an R2 échelle grating and catadioptric camera (PDR1 in September 2003) to an R4 échelle grating, dichroic filter and two fully refractive cameras (PDR2 in July 2004). The CDR documents use the same reference

numbers as previously, except that the 'R4' has now been removed from the title of each document and the Issue number has been incremented by one.

The Fibre Instrument Feed (SALT-34XXyyZZZZ-NNNN) is intimately linked to the design and operation of SALT HRS but it has not been included in this organisational arrangement as it has passed its CDR and is proceeding to construction.

4.2 Formats

The SALT HRS programme is a SALT consortium project and as such is an international endeavour. It is not possible to standardize on any platform, operating system or publication format. We will rely instead on common sense and the inter-operability of many modern computer programs and electronic formats.

- Text document formats include (in order of preference): PDF, MS Word, LaTeX, RTF and Postscript.
- Spreadsheets: MS Excel
- Engineering Drawings: Mechanical Desktop 6, IGES, STEP

4.3 Publication

Each official document will be given a number according to its place in the work breakdown structure, and its name will be entered into a web-based master document list. It will be added to the SALT HRS web site in one of the allowed electronic formats.

4.4 Version Control

With so many electronic formats involved in the SALT HRS programme, no specific version control tool is appropriate for the whole program. Each test document will have a version number, a date, and a short 'Issue History' in the front to summarize how one version is different from the previous version. The date must use 4 digits for the year, and the month must be spelled out (abbreviations are allowed). Two-digit year numbers and any use of month numbers are strictly forbidden.

Wherever possible, documents should be revised in a 'clone then change' procedure in which a copy is made of the document, and then that copy is made into the next revision. Names should reflect version numbers. As an example, a sequence of publications for the document 'fred.doc' should be added to the document web site as 'fred 1.0.doc', 'fred 1.1.doc', 'fred 2.0.doc' and so on.

This recommendation shall not apply for unpublished documents that are in a state of flux, such as mechanical drawings that are being refined hourly or daily. Once published on the web site, a document shall not be removed or replaced by a document of the same name.

5 Schedule Management

The SALT HRS Project Manager (PM) will use MS Project as the scheduling tool. This is adequate, but not ideal, for the job. [APT Assistant, which is a specialised WBS development package, has also been used.] The PM will modify the schedule according to progress once each month, in association with the monthly report. The detailed work breakdown structure and its commentary are given in a separate document [3200BP0021 sched_budg and as fully rolled out Gantt charts in 3200BP0028_Gantt].

6 Budget Management

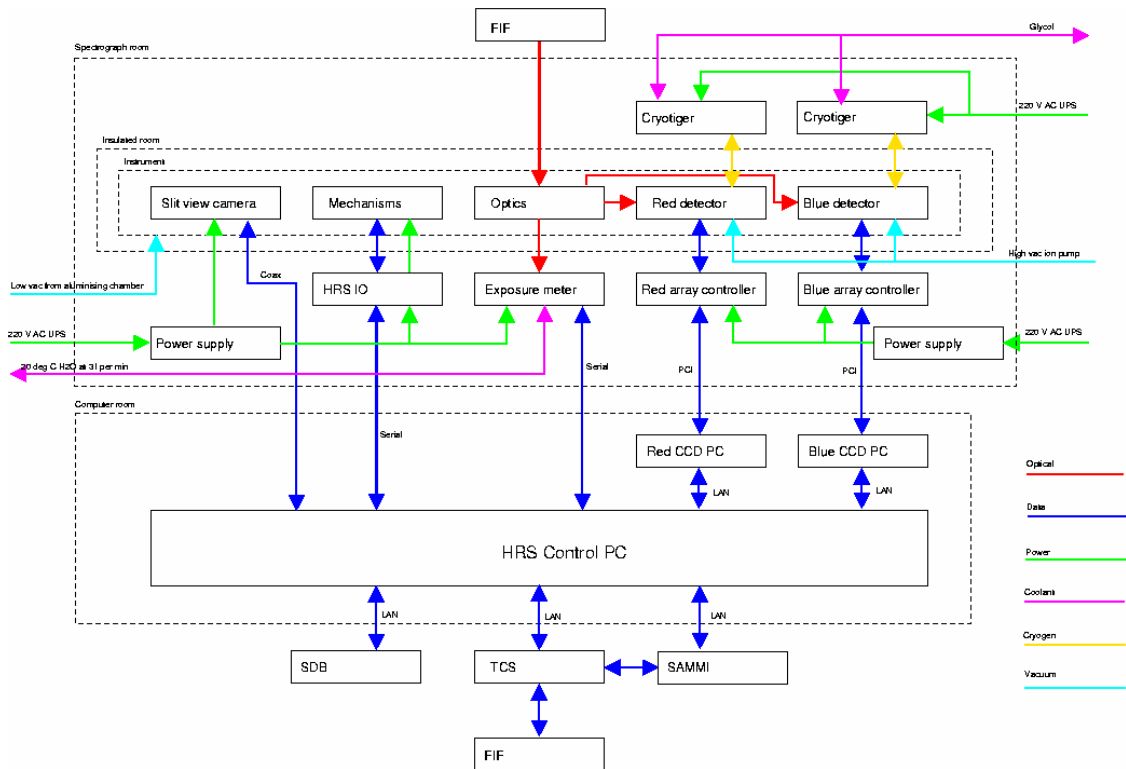
The SALT HRS PM will use MS Project to track the budget, expenses, balance, and contingencies during the project. MS Project is inadequate to produce the sort of detailed, exact cost data suitable for billing and auditing, so this detailed cost reporting will be done by the administrative support staff of the University of Canterbury's Department of Physics and Astronomy, using the University of Canterbury's Financial System. Accounting statements will be produced quarterly. For CDR a detailed budget spreadsheet is given in a separate document [3200BP0022_budget.xls] and a budget commentary in 3200BP0021_sched_budg.

7 Statement of Work

A Statement of Work is included in the CDR package as 3200AE0024 SOW.doc for SALT HRS to SALT and contains minor updates (e.g., the specific dates of CDR) with respect to the PDR version.

8 Interface Management

Details of the external and internal interfaces for SALT HRS are given in 3200AS0023 (ICD) and the key interrelationship figure is shown below.



One external interface is to the telescope facility as a whole, providing electrical power and access to the Telescope Control System (TCS) and another is to the Fibre Instrument Feed (FIF) and is governed by a separate ICD [3400AS0015 SALT FIF ICD].

Physically SALT HRS is in the Spectrograph Room in the basement of the SALT facility and requires these interfaces: optical, mechanical, electrical, cryogenic, water, vacuum lines and communications.

8.1 Interface Modifications

Each interface will be detailed, and changes negotiated, during the critical design phase. Each update will be categorized as follows:

1. Refinement of detail, all parties in agreement;
2. Modification of interface, no effect on performance, cost or schedule;
3. Modification of interface, with an effect on performance, cost or schedule.

Category 1 and 2 items may be approved by the mutual agreement of the SALT HRS PI and PM. Category 3 items must be further analyzed to determine exactly what the effect will be on the delivered system. Changes can only be made with the mutual agreement of the SALT Project Scientist, the SALT HRS PI, and the person responsible for the other side of the interface (FIF PI).

8.2 Management Interface

The SALT Project Scientist communicates directly with the SALT HRS PI.

9 Procurement Issues, Equipment Control and Non-deliverables

As SALT HRS is being built assuming significant financial input from the SALT Project, procurement of materials (optical glass and fabrication, gratings (échelle and VPH), dichroic filter, CCDs) will have to be procured through funds made available by the SALT Project Scientist on the authority of the SALT Board. This will require significant liaison between the SALT PS and the SALT HRS PI and his team.

It is anticipated that once an order is placed for most of the optical materials (glass for the lenses and mirrors) they will be shipped directly to the figuring contractor(s). Following this process and sub-assembly and alignment, the subsystem will be shipped to the University of Canterbury (UC) for integration into larger subsystems with SALT HRS.

The échelle and VPH gratings, dichroic filter and CCD systems will be ordered and shipped to UC for assembly into their mounting subsystem and integration into SALT HRS.

The Department of Physics and Astronomy at UC has a large machine shop with skilled machinists and the capacity to employ additional labor as required. UC will set up a secure and clean integration facility for storing, assembling and integrating subsystems and the instrument as a whole.

SALT HRS deliverables are governed by the SALT Project's SALT HRS Statement of Work. The SALT HRS PI will procure, as a part of SALT HRS design and fabrication, some items that are not deliverables. Such items include test equipment not suitable for shipment to, or useful in, Sutherland. For example, such items will include optical bench fixtures for component level assembly and testing, tooling and metering equipment for mechanical integration of the instrument, optical elements for acceptance testing of individual optical components, and miscellaneous mechanical and electronic components for assembling and testing SALT HRS mechanisms and assemblies.

10 Quality Assurance

The Department of Physics and Astronomy at the University of Canterbury has a wide experience in building a range of astronomical instrumentation for its observatory, Mount John University Observatory, as well as for a range other research projects within the Department. A high level of workmanship has been achieved in these endeavours, and that experience was one aspect that was recognised by the SALT consortium when it visited the UC facilities in February 2000. On the basis of this visit the SALT Board continued to encourage the use of UC facilities to construct SALT HRS.

With CDR taking place at UC the external reviewers and SALT members will be able to review these capabilities. As part of the review there will be two site visits: one to the IRL optical workshops in Wellington and the other to Mt John Observatory.

UC's experience in quality assurance will play a role in the design and fabrication of SALT HRS. SALT HRS will be built with the ruggedness that was used in the in-house construction of the 1m telescope and HERCULES spectrograph for Mt John. UC will receive reports from contractors about the fabrication and testing of optical components, which it will supplement with tests and measurements at the component, assembly and subsystem level. Appropriate care will also be taken in the construction of all mechanical and electronic components.

11 Contingency Management

Although best endeavors will be exercised by our preferred optical fabrication contractor (KiwiStar Optics), they will not be able to obtain insurance cover for breakage of the optics while they are being figured. [The glass materials will be insured during testing, storage and shipping.] This is a risk that needs to be recognized by the SALT consortium.

The SALT HRS PI requires both a budget and schedule contingency.

The schedule contingency of 100 days is derived from the initial estimate of the time to deliver, showing that SALT HRS is scheduled to have its pre-ship Acceptance Test 18 weeks prior to its installation at Sutherland.

The budget contingency consists of 20% of all future aspects of the project.

We identify material risks to the SALT HRS budget and schedule as follows:

1. External - problems in optical fabrication process;
2. External - delay in the supply of échelle grating;
3. External - delay in the supply of the Detector subsystems.

Item 1 will be mitigated through an already existing good working relationship with the preferred optical fabricator and through monthly visits to the fabrication supplier. Item 2 is a long lead-time (~12 months) single item and we will seek to enhance the existing relationship which we have with Robert Martin in Manufacturing Engineering of Newport Corporation (formerly Richardson Grating Laboratory). If there is a delay in the delivery of this item then we will progress the project to a phase where we can secure the completed items and move the staff to other projects within UC until the grating is received. Item 3 has been removed substantially from the critical path, but it could be mitigated through the purchase of a COTS CCD system for testing purposes.

The budget and schedule contingencies will be sufficient for items 1, 2 and 3. Item 4 is covered in the budget for the financial insurance component.

12 Descoping Plan

There are two types of descoping options, depending on when they must be invoked. There are design-phase descopings and fabrication-phase descopings. As SALT HRS has relatively few operational modes to be implemented commissioning-phase descopings are not considered as a viable descoping option.

SALT HRS has progressed to a sufficiently detailed design state that relatively few design-phase descopings now exist. The only remaining one is to reduce the number of fibres and resolving power options for the fixed object and sky and the ‘nod & shuffle’ optics. We are currently have 3 resolving power options for the fixed object and sky mode, but will only implement 1 resolving power option (the lowest) in the ‘nod & shuffle’ mode at the commissioning phase. The other 2 resolving powers for ‘nod & shuffle’ will be an upgrade path and will require two further pairs of image slicers.

Fabrication-phase descopings include:

- relaxing the optical tolerances and hence sacrificing image quality;
- as a result of fabrication misadventure (e.g., breaking of one, or more, of the optical elements), a revised design could be developed.

Discussions about descoping will be invoked whenever a cost, schedule or interface change is deemed to be significant by the SALT HRS PI and the SALT Project Scientist.

13 Change Control

Once the SALT HRS design completes the CDR review, and any changes required resulting from this review have been implemented, the design will be placed under formal “change control”. This means that any material change to the design will require explicit approval from the Project PI.

To qualify as a “material change”, the proposed change would have to impact the project in one of the following ways:

- impact the performance of the final instrument
- potentially delay the project, however slightly
- potentially increase the cost of the project

Changes that meet the above criteria may be permitted, but only if explicitly approved in writing by the PI. Changes that do not meet the above criteria may only be made with the agreement of the PI and PS.

Normal implementation design work, provided it does not meet the above criteria, will not be under formal change control. The HRS team understands that any issue arising during the construction phase which may impact the work of any other team member must be shared and resolved. The HRS team is currently operating an “Issues Register” for this purpose, which is circulated to all HRS team members and reviewed regularly at team meetings as appropriate.