SPIRE & PACS Sorption Coolers Product Assurance Plan

SBT internal ref : SBT/CT/2001-21

	Name & Function	Date	Signature
Prepared	P. Dupont – PA Manager	April 27th, 2001	
Verified			
QA Check	P. Dupont – PA Manager	April 27th, 2001	
Project Approval	L. Duband - Cooler Project Manager	April 27th, 2001	

Service des Basses Températures (SBT)
Département de Recherche Fondamentale sur la Matière Condensée (DRFMC)
COMMISSARIAT A L'ENERGIE ATOMIQUE - GRENOBLE (CEA-Grenoble)
17, rue des Martyrs 38054 GRENOBLE Cédex 9, France.

Document Status

Issue	Revision	Date	Nb of Pages	Modifications
Draft		April 4th, 2001		First draft – released for comments
0	0	April 25th, 2001	36	First Issue
0	1	April 27th, 2001	36	p2, 3 & 4 – upper level defined as SAp

Table of Contents

Table of Figures

Table of Tables

List of Acronyms

AD / RD	Applicable / Reference Document		
ADP (EIDP)	Acceptance (End Item) Data Package		
AIT / (M)AIV	(Manufacturing,) Assembly, Integration & Test / Verification		
CADM	Configuration and Data Management		
CDR (DDR)	Critical (Detailed) Design Review	Revue de conception détaillée	RCD
CEA	Commissariat à l' Energie Atomique		
CIDL / ABCL	(As Built) Configuration Items Data List		
CN	Change Notice	Demande de Modification	DM
CQM	Cryogenic Qualification Model		
DML / DPL	Declared Material / Process List		
DRB	Delivery Review Board	Revue de Qualification	RQ
EM / (P)FM / FS	Engineering / (Proto)Flight / Spare Model		
ETF	Environmental Test Facility		
EV	Evaporator		
FIRST	Far Infrared and SubmillimetreTelescope		
FMECA	Failure Mode Effects and Criticity Analysis		AMDEC
(M)GSE	(Mechanical) Ground Support Equipment		
H/W	Hardware		
HIFI	Heterodyne Instrument for FIrst		
HSE	Heat Switch (on evaporator)		
HSP	Heat Switch (on sorption pump)		
ICD	Interface Control Document	Dossier de Contrôle des Interfaces	DCI
KIP / MIP	Key / Mandatory Inspection Point		
MRB	Material Review Board		
N/A	Not Applicable		
NCR	Non Conformance Report	Fiche d'Anomalie	FA
PACS	Photoconductor. Array Camera and Spectrometer		
PDR	Preliminary Design Review	Revue de Définition Préliminaire	RDP
PTR	Post Test Review	Comité de Revue et d'essai	CRE
PFM	ProtoFlight Model		
QA / PA	Quality / Product Assurance	Assurance Qualité / Produit	AQ / AP
RFA	Request For Approval		

SAp	Service d'Astrophysique		
SBT	Service des Basses Températures		
SCO	Sorption Cooler (full unit)		
S/C	SpaceCraft		
SP	Sorption pump		
SPIRE	Spectral & Photometric Imaging Receiver		
TRR	Test Readiness Review	Bilan Technique	BT

1. SCOPE OF THE DOCUMENT

This document present the Product Assurance activities to be carried-out throughout the SBT Sorption Coolers Project Life, from design phase upon delivery to higher level.

2. DOCUMENTS

2.1 Applicable documents

All Applicable Documents are listed in the AD chapter of the CIDL (HSO-SBT-LI-010).

2.2 Reference documents

	Title	*Reference*	*Iss*	*Rev*	*Date*
RD01	STANDARD Product assurance plan for Space Instruments	SAp-GERES-FLo-436-00	1	0	07/11/00
RD02	Manufacturing, Assembly, Integration & Test Flow Chart	HSO-SBT-FC-003			
RD03	CONSTITUTION D'UN ADP	SAp-GERES-FLo-97-356	1	3	04/03/99
RD04	SPIRE Product Assurance Plan	SIRE-RAL-PRJ-0017	1	0	11/04/01
RD05	PACS Project Product Assurance Plan	TBD	Draft		26/11/99

3. PA MANAGEMENT

3.1 General

This PA Program has been established in accordance with the SAp Product Assurance Plan . This Plan is applicable to all SBT Sorption Coolers models as described in Table 3-1:

Chapter #	PA Requirements	SCO Models			
		STM (x2)	CQM (x2)	PFM (x2)	FS (x1)
3	PA Management	P	A	A	A
4	Material &Process Selection & Control	A	A	A	A
5	EEE Parts Selection & Control	N/A	N/A	N/A	N/A
6	Cleanliness & Contamination Control	N/A	A	A	A
7	Reliability Assurance	A	A	A	A
8	Safety Assurance	A	A	A	A
9	QA Assurance	P	A	A	A
10	Software Product Assurance	N/A	N/A	N/A	N/A
11	Configuration Management & Control	P	A	A	A

A: Applicable N/A: Not Applicable P: Partially Applicable

Table 3-1: Applicability of PA Program to the SCO models

If necessary, this plan will be tailored to the needs of the suppliers (see § 3.5).

The relation of this plan to higher & lower levels is presented in Figure 3-1.

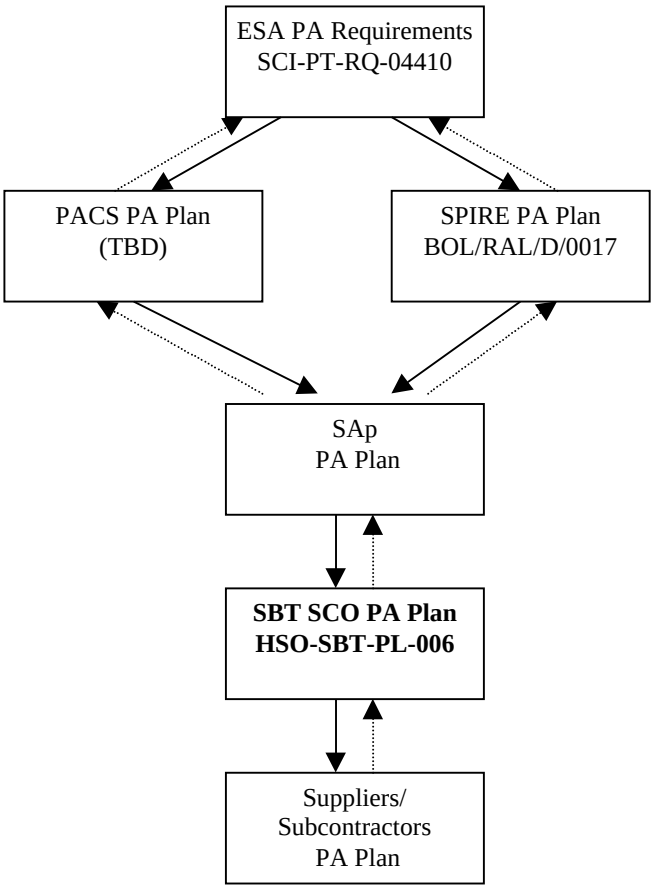


Figure 3-1 : relation between PA documents at different levels

3.2 Organization

SBT has nominated a dedicated PA Manager who is responsible for the implementation and verification of the PA Requirements related to the Sorption Coolers Project. He will be present at SBT facilities whenever needed and will report directly to the Sorption Coolers Project Manager. For what concerns the PA activities, he is in relation with SAp PA Manager. Additionally, a SBT PA representative (located at SBT premises) has been nominated and is in charge of the daily PA activities. He will report to both the PA & Project Manager.

Note that whenever required, PA Manager will be assisted by specialists or experts.

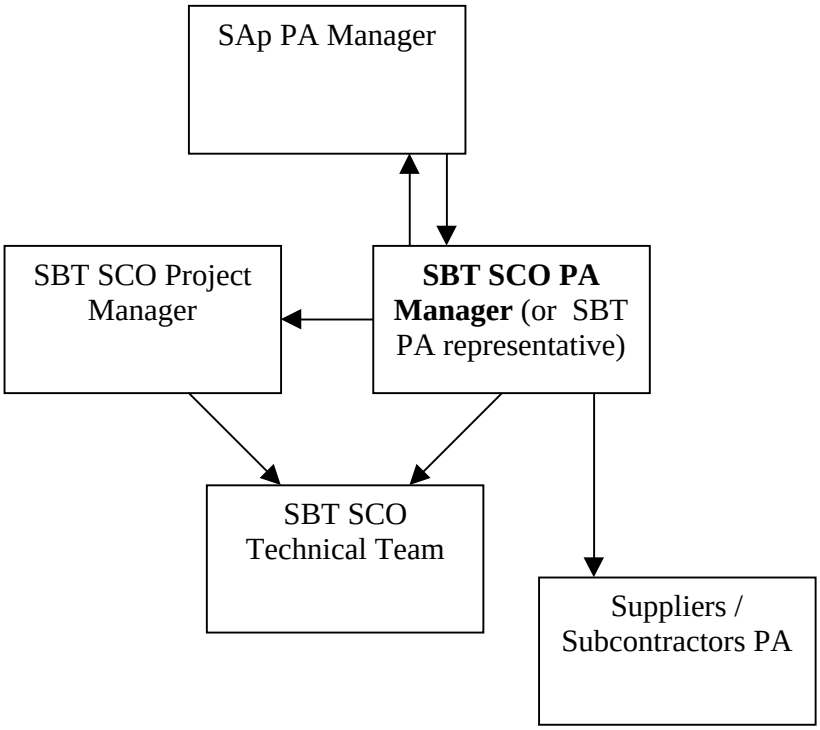


Figure 3-2 : PA organization on SCO Project

3.3 Right of Access

For purpose of Product Assurance or technical coordination, ESA, the Instruments Consortium Product Assurance Representatives and the SAp PA Manager will have access to SBT facilities whenever required (participation to KIP & MIP, audits, reviews, …).

Note that Proprietary rights should be fully respected.

A formal demand will be issued one week prior to visit so one can arrange access to the Project facilities.

3.4 Critical Items Identification & Control

A Critical Item List (CIL) will be prepared and maintained, ensuring that all critical items derived from the different PA disciplines are followed up with the required emphasis. This List will be presented at Project CDR and updated throughout the Project Life.
Additionally, this List will also include items which have a long procurement time (identified as "Long Lead Items").

3.5 Management of Subcontractors

Whenever contractors are employed to provide service or equipment, the PA requirements listed in this Plan will be imposed, tailored to the criticality of the services or products being provided.
Surveillance of PA activities will be carried out by SCO PA Manager (or its representative) who will ensure that appropriate inspections, tests and documentation are specified and completed.

Contractors shall be assessed on the basis of their Product Assurance in addition to their technical capabilities.

3.6 PA Planning & Documentation

This PA Plan will be a controlled document and should be approved by SAp PA Manager.
All project documents (plans, specifications, procedures and design documentation) will be reviewed for compliance with PA Requirements, signed-off and submitted to Configuration Control as explained in § 11.
PA events will appear in the project planning. This planning will be updated on a regularly basis and sent to higher level for review.

3.7 Reporting

Reporting on the progress and status of Product Assurance matters will form part of the regular project reporting procedure and will include information on:

- Status of FMECA & hazard analysis,
- Status of material & processes control program,
- Status for Non-Conformances & Request for Waivers,
- Status of contamination Control Program,
- Overview of major events in the forthcoming period,
- …

note that this list is not exhaustive.

3.8 Training & Certification

SBT ensures that only experienced technicians will be involved in manufacturing and assembly operations. These latest will be part of new processes and assembly evaluations programs. There skills will be evaluated before the beginning of operations. If necessary they will follow additional training courses and certification programs (e.g. certification by upper level authorities of our technicians is foreseen in the field of soft soldering so they will be considered “space qualified”).

4. MATERIALS & PROCESSES SELECTION & CONTROL

4.1 General

SCO PA Manager has the responsibility for selecting materials & processes and for demonstrating their suitability for the intended application.

4.2 Control & Selection of Materials & Processes

Preferably materials & processes that have successfully been applied to previous space projects will be selected.

Materials & Processes which cannot be considered either space proven or standard/established shall be subjected to an evaluation program to assess the suitability for the intended application. This program will be submitted to the upper level PA Manager for approval. Evaluation reports will be issued after qualification.

4.3 Materials Procurement

Materials procurement will be made in accordance to dedicated specifications. Certification to mechanical properties, chemical composition & lot traceability, as a minimum, will be included if appropriate.

4.4 Limited Shelf Life Materials

A system to control Limited Shelf Life Materials (such as adhesives) will be established.

4.5 Critical Processes

Application of critical processes will be either witnessed by PA Manager (or his representative) and/or will be evaluated on reference samples.

4.6 Reporting & Documentation on Materials & Processes

A Declared Materials List (DML) and a Processes Declared List (DPL) will be issued and submitted to the approbation of the upper level PA Manager.

4.7 Request for Approval

Requests for Approval (R.F.A.) will be issued when no sufficient application or qualification history does exists and additional evaluation is required to cover the application. RFA will summarize the proposed evaluation activities.

5. EEE PARTS SELECTION & CONTROL

This chapter is not applicable in the scope of this Project. The only identified EEE parts are the connectors (FR 136 type) that will be delivered by SAp, being thus under their responsibility.

6. CLEANLINESS & CONTAMINATION CONTROL

6.1 General

SCO PA Manager has the responsibility for monitoring contamination and cleanliness of the SCO throughout the project upon delivery to higher level.
MAIV phases will be defined taking into account those requirements (for instance several bake-out under vacuum at elevated temperature are foreseen all along the MAIV phases – refer to doc RD02).

6.2 Cleanliness Plan

A Cleaning procedure taking into account the cleanliness & contamination requirements will be issued.

6.3 Contamination & Cleanliness Monitoring

No Clean-room is foreseen for AIV phases. Nevertheless, contamination and cleanliness levels could be checked, if demanded, before delivery of the SCO to the upper level.

6.4 Storage

Whenever possible, SCO will be protected during non activity phases (i.e. covers or storage in dedicated place).

6.5 Witness Mirrors & Flats

No means to monitor cleanliness and contamination is foreseen.

6.6 Handling, Packing & Shipping

Handling, Packing & Shipping will be performed such as to avoid any damage to the SCO and to ensure the required levels on cleanliness & contamination.

A dedicated procedure will be issued (see also § 9.4.6.).

7. RELIABILITY ASSURANCE

7.1 General

SBT is responsible for the reliability tasks to be performed for its Hardware. Relevant analysis will be performed and reviewed.

7.2 Reliability Analysis

A FMECA study and an Architectural Analysis study will be carried out. Results will be reviewed and included in the current design.
Identified Critical Points and/or Single Point Failures resulting from these analysis will be listed in the CIL.

In addition, a mathematical model is being developed so that the behavior of some critical components (e.g. Kevlar cords) can be better understood.

8. SAFETY ASSURANCE

8.1 General

SBT will ensure that the rules of national safety authorities will be applied as well as safety regulations of the launch vehicle and launch pad.
Potential hazards to personnel and Flight Hardware will be identified and actions will be taken in order to eliminate them or reduce them to acceptable levels. This will apply throughout the MAIV phases.

8.2 Safety Assurance Analysis

A Safety analysis has already been performed on the Coolers Development Models. Results have been reviewed and included in the current design. The structural Failure mode meet the "Leak-before-Burst" requirement so that any catastrophic consequence in case of failure is avoided. A report will be issued.

9. QA ASSURANCE

9.1 General

SBT SCO PA Manager will be responsible for the implementation of QA requirements throughout the project life. He will participate to preparation of materials, components, processes and manufacturing specifications in cooperation with designers and test engineers. In all cases PA Manager will review and approve specifications to safeguard PA requirements.

9.2 Procurement

9.2.1 Selection of Procurement sources

Manufacturers and suppliers will be selected for their proven ability to supply materials & components parts to the required specifications together with the adequate documentation to verify that the requirements of the procurement specification have been met. Procurement sources will preferably have previous experience in supplying space qualified items or materials.

9.2.2 Procurement Documents

Procurement documents and purchase orders will be reviewed for implementation of PA requirements.

9.2.3 Surveillance

SCO PA Manager (or its representative) will carry out surveys of facilities and Product Assurance Systems for critical materials and/or processes.

9.2.4 Incoming Inspection

All materials and assemblies will be inspected for compliance with the purchase order and specification. These records will be maintained in a dedicated folder and the database will be updated. An example of Incoming Inspection Record Sheet (Fiche d'Inspection) is given in annex A-1.
Incoming Inspections will include : review of the Certificate of Conformance & delivered documentation, visual inspection, and if needed testing and/or verification of critical parameters (i.e. dimensional check of specific parts).

9.3 Manufacturing & Assembly Control

9.3.1 Documentation

The Manufacturing and Assembly processes will be analyzed and the sequence of the various steps thoroughly planned. SCO PA Manager (or its representative) will perform surveillance of manufacturing and assembly activities, by means of inspection, for critical parameters of the processes & satisfactory workmanship.
Manufacturing and Assembly of SCO will be supported by appropriate documentation that will give full traceability. This documentation will comprises (this list is not exhaustive):

- MAIV Flow Chart including relevant inspections,
- Drawing List defining items to be manufactured,
- Declared Materials List & Declared Processes List,
- Manufacturing & Inspection Records.

If needed, in-house procedure will be developed for the project. These procedures will be written in French and will be submitted to SAp PA Manager for review & approval.

9.3.2 Reviews

A Formal Review will be held prior to release drawings for manufacturing.

9.3.3 Metrology & Calibration

All special tools & measuring equipment to be used on the SCO Project (wire bonding equipment, oven, balance, mass spectrometer, …) will be submitted to a calibration program. They will also be marked. The mark will include (as a minimum):
- serial number,
- last & next date for calibration & maintenance.

A list of those special tools & measuring equipment will be issued and maintained by QA.

9.3.4 Inspection Points

KIP & MIP have been identified in the MAIV Flow Chart (see doc. RD02) and will be reported in the associated planning, so that upper level representatives will be kept informed and could attend these Inspection Points if desired.

9.3.5 Storage

Dedicated shelves will be used to store all materials & components. These shelves will be located in a dedicated area and will only be accessible to authorized personnel.

9.4 Integration & Test Control

9.4.1 Test Procedures

Tests procedures will be issued for Qualification & Acceptance Tests. They will contain, as a minimum:

- Definition of Hardware under test,
- Test objective,
- Test sequence,
- Success criteria,
- Facilities & support equipment,
- Environmental conditions,
- Hazards/Risks (if any).

These procedures will be fulfilled while playing ("as run" procedure). NCR or open points, if any, will also be reported on the "as run" summary.

9.4.2 Test witnessing

Qualification & Acceptance Tests will be witnessed by PA to ensure that relevant procedure are followed and that adequate records of the activities & test results are taken.

9.4.3 Reviews

A Test Readiness Review (TRR) will be held before the start of each Qualification & Acceptance test. The aim of this review is to verify:

- the configuration under test ("as build" configuration),
- approval status of required documentation,
- the status of the Non-Conformities, Open Work, Waivers,
- readiness of test facility & associated equipment.

This review will give the agreement to proceed for testing.

After the tests, a Post-Test Review (PTR) will be held to assume that:

- no degradation of the tested equipment has occurred,
- test procedures have been completed,
- records of test data have been properly made,
- success criteria have been met.

This review will give the agreement to proceed to the release of the test article.

Test Review Boards will include, as a minimum, Project Manager, PA Manager, AIV Manager. Upper level representatives will be invited.

9.4.4 Test Reports

A Test Report will be issued for each test that and will include, as a minimum:
- a summary of test results,
- a list of NCR raised during testing,
- the "as run" procedure,
- test data,
- environmental control data,
- conclusion.

9.4.5 Logbook

A Logbook will be established for each of the equipment that will trace all operations and tests starting with the final inspection of the Hardware after the manufacturing/assembly phase.
This Logbook will be part of the Acceptance Data Package (ADP).
It will include (as a minimum):
- record of operating time,
- record of mating / demating, commutations,
- operating time and cycles,
- appearance of Non-Conformances and corrective actions taken,
- list of tests or controls carried out.

9.4.6 Handling, Storage, Packaging, Marking & Labeling

A dedicated procedure will be issued explaining how to identify, safely handle and store the various SCO, taking into account the contamination & cleanliness requirements.
Effective implementation of this procedure will be verified by QA.
Transportation of SCO will be done using a dedicated container.
This section will be explained in detail in a further issue of this document. Contamination levels are still TBD.

9.5 Non-Conformances Control

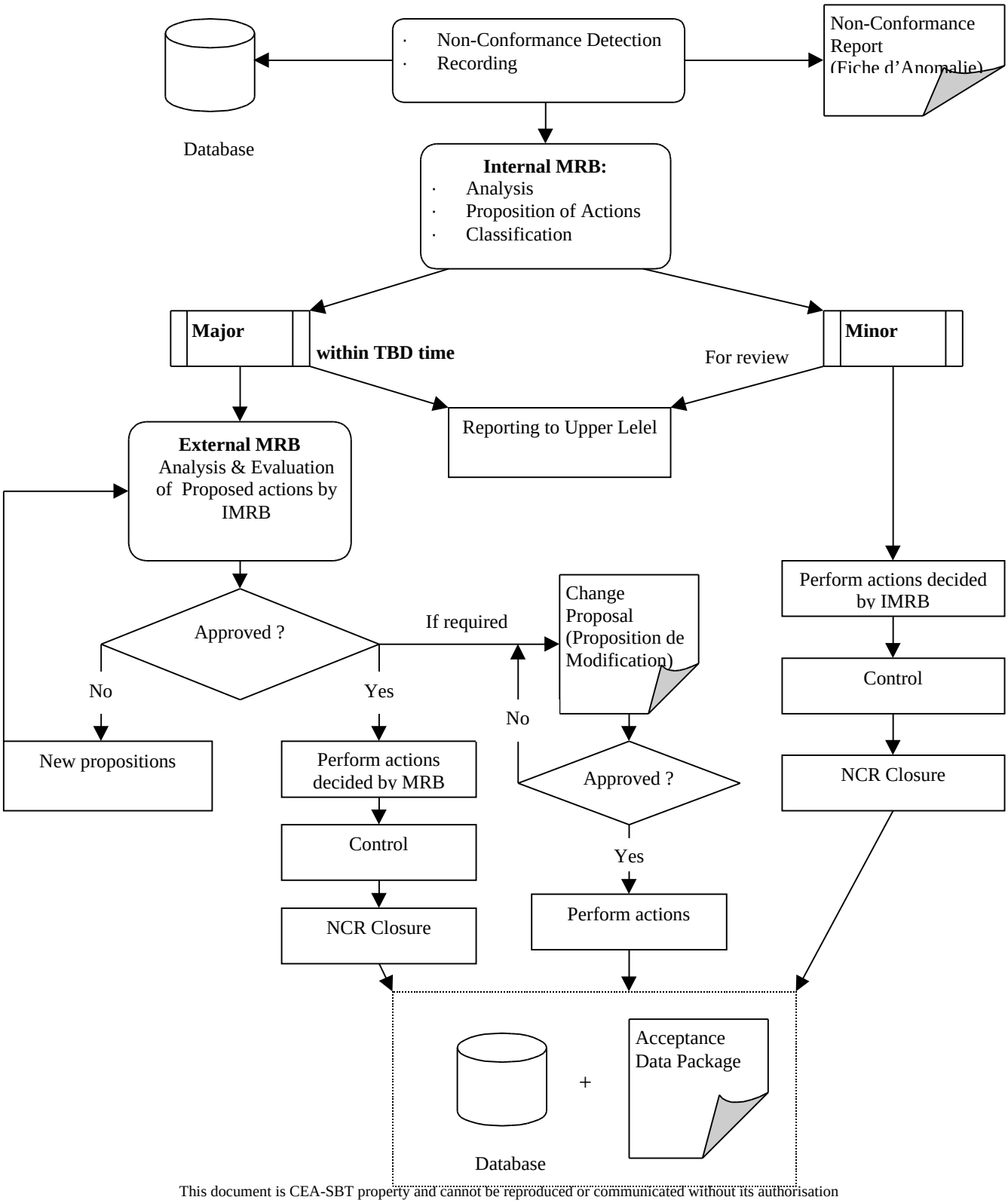
9.5.1 General

PA Manager will establish a Non-Conformances Control system. He will be responsible for its effective application throughout the project life.

9.5.2 Non-Conformances Definition & Classification

Refer to doc. SCI-PT-RQ-04410 (PA Requirements for FIRST/Planck Scientific Instruments).

9.5.3 Non-Conformance Control System



9.5.3.1 Non-Conformance Detection

Immediate action:

As soon as a Non-Conformance is detected, the following steps will be applied:

- maintain in its current state the item under review,
- prevent it from any degradation that may result from this Non-Conformance,
- mention the Non-Conformance on the document used to support the activity at this time (Inspection Record Sheet, Logbook, Procedure, …),
- inform the PA Manager & the Project Manager so they can decide how to manage it.

Recording

If the Non-Conformance is confirmed, it is recorded on a dedicated record sheet (Non-Conformance Report (NCR) – see example in annex A-2). This NCR is then put under configuration by QA that will give it a unique number and update the database. This number is to be reported on the document supporting the activity at this time.

9.5.3.2 Internal MRB

In order to analyze the Non-Conformance, an Internal Material Review Board (IMRB) will be held, which purposes are:

- to identify the causes of the Non-Conformance,
- to evaluate the consequences,
- to propose corrective & preventive actions,
- to propose a classification.

This Board will be chaired by the PA and will be composed of the Project Manager and further specialists on request.

9.5.3.3 Action Propositions

MRB will issue corrective & preventive action propositions that will be fully documented. The nature of these actions can be :

- 'scrap',
- 'use as is', (note that if a specification requirement remains violated, a Request for Waiver (RFW) will be issued and submitted for approval),
- 'repair',
- 'modification' (in this case a formal Change Proposal will be issued and submitted for approval).

These action propositions will be mentioned on the NCR or in the MRB minutes.

9.5.3.4 Upper Level Notification

Once issued and recorded, the NCR is send to the affected entities. If the NCR is classified as Major, it will be send under TBD time to the upper level. Minor ones will also be sent to upper level for review.

9.5.3.5 External MRB

If a Non-Conformance is classified as Major, an External MRB (EMRB) will be held with upper level representatives. Its purposes are to analyze the actions proposed by the IMRB and to approve them or not. If not, new propositions should be issued.
This MRB will be composed, in addition to IMRB, of the upper level PA Manager, Project Manager and further specialists on request.

9.5.3.6 Performing of Actions & Control

The person in charge of the activity will implement the proposed & approved actions. QA will ensure that these actions have been properly implemented.

9.5.3.7 Change Proposal

In case of modification, a formal Change Proposal will be issued and submitted for approval. This Change Proposal will be submitted to Configuration Control.

9.5.3.8 Closure

Once the appropriated actions are realized & controlled, the NCR will be formally closed. For that purpose it should be signed off by PA Manager.
The NCR database will also be updated.

In any case, all NCR relative to an equipment should be closed before equipment delivery.

9.5.3.9 NCR resulting from a subcontractor

Any Non-Conformance that occurred at one of the contractor's premises will be noted on an SBT NCR and the database will be updated.

9.5.3.10 NCR Database

A database will be issued (Excel file) in order to ensure full traceability of problems occurring during MAIV phases. An example of such a file is given in Annex A-3.

9.5.3.11 NCR Reporting

The NCR status report will be presented at equipment reviews (TRR, PTR, DRB, …) and be part of the Acceptance Data Package.

9.6 Acceptance & Delivery

9.6.1 Delivery Review Board

Upon completion of final test & inspection and prior to shipment of any deliverable item, a Delivery Review will be held. The purpose or this review is to ensure that there is adequate documentary evidence to demonstrate that the equipment has satisfied all requirements and identify any possible open work.
The following topics will be reviewed (not exhaustive):

- status of deliverable item ("as build" configuration),
- review Change Proposal status,
- evaluation of test results,
- status of waivers,
- cleanliness status (if required),
- review of deliverable documentation.

The DRB will be composed, as a minimum, of the equipment's PA & Project Managers & upper level's PA & Project Managers.

9.6.2 Acceptance Data Package

An Acceptance Data Package (ADP) will be issued to provide the upper level with sufficient information to continue their work without continuous support of the supplying party. Nevertheless, support can be provided on request.
A typical content of ADP is given in RD03.

10. SOFTWARE PRODUCT ASSURANCE

This chapter is not applicable in the scope of this Project.

11. CONFIGURATION MANAGEMENT & CONTROL

11.1 General

A Configuration Management System will be issued to provide systematic and uniform configuration identification, control & accounting of an deliverable item throughout the design, development, fabrication & testing up to and including its acceptance by the upper level authority.
It will be composed of a document database and several configuration files (one per deliverable item – see example in annex A-4).

11.2 Configuration Items

SBT Configuration Items include:
- Deliverable Items (2 CQM, 2 PFM & 1 FS),
- Relevant Documentation (applicable documents & project documents).

11.3 Configuration Items Data List (CIDL)

For each Deliverable Item a CIDL will be issued. This CIDL will be composed of:
- List of applicable documents,
- List of drawings,
- List of project documents,
- List of NCR,
- Configuration File of the Deliverable Item.

This list will be updated for each review and will give the current status of the Deliverable Item.

11.4 Documentation Control

11.4.1 Identification

Documentation generated by SBT will be referenced as explained below:

HSO-SBT-xx-nnn-I-R

Where:

HSO	identifies the project
SBT	identifies the institute
xx	identifies the type of the document (see table 11.1 below)
nnn	is a sequential number which comes from the documentation database
I	Issue of the document
R	Revision of the document

FC	Flow Chart
ICD	Interface Control Document
LI	List
MoM	Minutes of Meeting
PL	Plan
PR	Procedure
QA	Quality Assurance
RP	Report
SP	Specification
TN	Technical Note

Table 11-1: Document identification

11.4.2 Storage

Project documents will be stored using their reference (eg HSO-SBT-PL-001-1-0.doc). Other documents will keep their original names.
Documents under configuration control will be stored in a dedicated directory so that they can only be accessed in a read-only mode.

11.4.3 Backup

Backup will be performed on a weekly basis on CD-ROM.

11.5 Approval Procedure

Project documents will be reviewed & approved by both PA & Project Managers.

11.6 Configuration Status Accounting

A database will be generated, which will trace all documents associated to the qualification of the equipment.
Configuration files will also be maintained for each article reflecting its current status ("as built").

11.7 Change Processing

Changes to an approved configuration are only possible after formal approval.
Change Requests (CR) will be issued and discussed with upper level authorities if affecting I/F or approved documentation.

11.8 Implementation Verification

Implementation verification will ensure that the as-designed configuration, which is specified in the database, is consistent with the actual hardware implementation.

Annex A-3: example of NCR Database

HSO-SBT-FA-nnn

FA #	*date*	*Libellé*	*article*	*Modèle*	*n°série*	*classe*	*status*	*actions correctrices*	*actions préventives*	*réf MRB*	*date clôture*	*DM réf*	*Comentaire*
001													
002													
003													
004													
005													
006													
007													
008													
009													
010													
011													
012													
013													
014													
015													
016													
017													
018													
019													
020													

Annex A-4: example of Deliverable Item Configuration File

		n° etude	s/s ens.	n° pièce	Issue	S/Ens	Titre	Matière	Qté	Masse	DM	FA	Tracabilité	Traitement	BC/BL	Fournisseur	CoC	usinage	IIR	Commentaires
X		2000-14	B	000	A		Ensemble Cooler													
	X	2000-14	B	100	A	Composants Divers	Composants Divers													
	X	2000-14	B	109	A	Composants Divers	Vis Poulie	TA6V ELI	14											
	X	2000-14	B	114	A	Composants Divers	Vis Poulie Percée	TA6V ELI	4											
	X	2000-14	B	124	A	Composants Divers	Capot Pompe	6061	1											
	X	2000-14	B	128	A	Composants Divers	Roue Dentée	TA6V ELI	4											
	X	2000-14	B	129	A	Composants Divers	Poulie de Tension	TA6V ELI	4											
	X	2000-14	B	132	A	Composants Divers	Cliquet	TA6V ELI	5											
	X	2000-14	B	134	A	Composants Divers	Vis de Centrage	TA6V ELI	2											
	X	2000-14	B	136	A	Composants Divers	Tube Guide	2017 A	5											
	X	2000-14	B	137	A	Composants Divers	Capot Evaporateur	6061	1											
	X	2000-14	B	138	A	Composants Divers	Lame Conductrice	CuC1	1											
							Tresse Cu Lg 75		1											
							Tresse Cu Lg 65		1											
							Suspente Ti		1											
							Suspente Ti		1											
							conncteur saver 37 b		2											
							connecteur femelle 37 b		2											
							vis CHC M3x10	A4	4											
							vis CHC M4x16		6											
							vis CHC M3x8		27											
							écrou H3		8											
							rondelle M3		4											
							ressort		4											
	X	2000-14	B	200	A	Pompe-Ligne-Evaporateur	Pompe-Ligne-Evaporateur													
	X	2000-14	B	201	A	Pompe-Ligne-Evaporateur	1/2 Evaporateur Femelle	TA6V ELI												
	X	2000-14	B	202	A	Pompe-Ligne-Evaporateur	1/2 Evaporateur Mâle	TA6V ELI												
	X	2000-14	B	203	A	Pompe-Ligne-Evaporateur	1/2 Coupelle Femelle Evaporateur	CuC1												
	X	2000-14	B	204	A	Pompe-Ligne-Evaporateur	1/2 Coupelle Mâle Evaporateur	CuC1												
	X	2000-14	B	205	A	Pompe-Ligne-Evaporateur	Tube Evaporateur	TA6V ELI												
	X	2000-14	B	206	A	Pompe-Ligne-Evaporateur	Mousse	Procelit P160												
	X	2000-14	B	207	A	Pompe-Ligne-Evaporateur	1/2 Pompe Mâle	TA6V ELI												
	X	2000-14	B	208	A	Pompe-Ligne-Evaporateur	1/2 Pompe Femelle	TA6V ELI												
	X	2000-14	B	209	A	Pompe-Ligne-Evaporateur	Manchon	TA6V ELI												
	X	2000-14	B	210	A	Pompe-Ligne-Evaporateur	Bague Shunt	CuC1												
	X	2000-14	B	211	A	Pompe-Ligne-Evaporateur	Tube sortie Pompe	TA6V ELI												
	X	2000-14	B	212	A	Pompe-Ligne-Evaporateur	Etui à Charbon	CuC1												
	X	2000-14	B	217	A	Pompe-Ligne-Evaporateur	Bague de Filtre	TA6V ELI												
	X	2000-14	B	218	A	Pompe-Ligne-Evaporateur	Disque Grillage	304L												
	X	2000-14	B	219	A	Pompe-Ligne-Evaporateur	Bout Froid Evaporateur	CuC1												
	X	2000-14	B	220	A	Pompe-Ligne-Evaporateur	Bout Froid Pompe	CuC1												
	X	2000-14	B	221	A	Pompe-Ligne-Evaporateur	Capot	Laiton												
	X	2000-14	B	110	A	Composants Divers	Poulie	TA6V ELI												
	X	2000-14	B	139	A	Composants Divers	Axe Poulie	TA6V ELI												
	X	2000-14	B	300	A	Interrupteur Thermique	Interrupteur Thermique													
	X	2000-14	B	301	A	Interrupteur Thermique	Tête Interrupteur	CuC1												
	X	2000-14	B	302	A	Interrupteur Thermique	Embase Interrupteur	CuC1												
	X	2000-14	B	303	A	Interrupteur Thermique	Support Tête	TA6V ELI												
	X	2000-14	B	305	A	Interrupteur Thermique	Tube Mini Pompe	304L												
	X	2000-14	B	306	A	Interrupteur Thermique	Mini Pompe	304L												
	X	2000-14	B	307	A	Interrupteur Thermique	Bouchon Mini Pompe	304L												
	X	2000-14	B	308	A	Interrupteur Thermique	Capot	Laiton												
	X	2000-14	B	309	A	Interrupteur Thermique	Tube Support	TA6V ELI												
	X	2000-14	B	310	A	Interrupteur Thermique	Support Interrupteur	TA6V ELI												
	X	2000-14	B	311	A	Interrupteur Thermique	Limiteur	TA6V ELI												
	X	2000-14	B	400	A	Structure	Structure													
	X	2000-14	B	401	A	Structure	Semelle	TA6V ELI												
	X	2000-14	B	402	A	Structure	Plaque Inférieure	TA6V ELI												
	X	2000-14	B	403	A	Structure	Plaque Supérieure	TA6V ELI												
	X	2000-14	B	404	A	Structure	Plaque Latérale	TA6V ELI												
	X	2000-14	B	405	A	Structure	Plaque Cote Fixation	TA6V ELI												
	X	2000-14	B	406	A	Structure	Cadre Evaporateur	TA6V ELI												
	X	2000-14	B	407	A	Structure	Cadre Pompe	TA6V ELI												
	X	2000-14	B	530	A	Strap Pompe	Strap Pompe													
	X	2000-14	B	531	A	Strap Pompe	Embout de Tresse	CuC1												
	X	2000-14	B	532	A	Strap Pompe	Embout de Tresse	CuC1												
	X	2000-14	B	530	A	Strap Evaporateur	Strap Evaporateur													
	X	2000-14	B	541	A	Strap Evaporateur	Embout de Tresse	CuC1												
	X	2000-14	B	542	A	Strap Evaporateur	Embout de Tresse	CuC1												