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VLT PROGRAMME

VERY LARGE TELESCOPE

VLT Instrumentation Software

Acceptance Test Plan
Template Document

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CHANGE RECORD

ISSUE	DATE	SECTION/PAGE AFFECTED	REASON/INITIATION DOCUMENTS/REMARKS
1	17/08/2000	All	First issue
2	28/03/2002	All	MAR2002
3	31/03/2003	All	APR2003
4	31/03/2004	1.2 3.9 4.2	Added Control Model tests. APR2004
5	13/01/2005	1.2 3.9 3.10.6 3.4.1 3.4.3 3.4.4 3.6.2 3.6.3 3.7.1 3.10.4 3.10.5 Chapter 4 Chapter 5	Added tat tests Examples changed Added reference to document on DFS in the VCM Added TAT001 and VCM006 Updated according to new test scheme (VLTSW20040158) Removed unnecessary manual pages
6	16/02/2007	3.4.4 3.10.4 3.10.5 Chapter 6	ic0SelfTest replaced by inscSelfTestICS updated links to TWiki pages new (VLTSW20060060)

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1 INTRODUCTION

1.1 PURPOSE

Purpose of Preliminary Acceptance Europe (PAE) is to verify the readiness of an instrument, in terms of fulfilling requirements, before being shipped to Chile for commissioning.

According to the VLT Software Management Plan **[AD 10]**, an Acceptance Test Plan (ATP) document has to be issued by the consortium in charge of the instrument and reviewed by ESO well before the foreseen PAE. Such a document must contain a list of tests, which have to successfully pass in order to certify that the instrument has completed the implementation phase and is ready for commissioning. As a result of PAE, an Acceptance Test Report (ATR) document has to be produced.

The ATR document normally consists of the ATP added with the results of the PAE, including any relevant comment/remark. It has to be prepared by the consortium and agreed with ESO, before being issued.

The present document provides structure and contents of an ATP document and indicates which characteristics the software for an instrument, to be operated and maintained at Paranal, is expected to have, in terms of packages and standards used. In particular it aims to emphasize the importance of using common software to implement common functionality: it increases the maintainability of the final product.

This document is intended to be applicable to all contracts with consortia for. It should therefore be added to the list of applicable documents in the related Statement of Work.

1.2 SCOPE

The present document describes all tests foreseen for PAE, to verify the completeness of the instrument software before shipment to Chile. It covers the whole set of functionality as described in the User Requirements document.
The Software PAE normally takes place at the location where the instrument has been assembled and integrated.
The execution of a sub-set of the tests also in the VLT Control Model in Garching, e.g. to verify the interface with TCS or the Data Flow Software (Archive, Observation Handling Tool), is considered integral part of the PAE and is mandatory for all new instruments.
The availability of automatic regression test procedures is also considered mandatory for all new instruments and their successful execution is also part of the Software PAE run.

*This document aims to provide instrumentation software responsible, from ESO and from consortia, with a template of Acceptance Test Plan (ATP) document. Instrument specific ATP documents should be based on this template. They must contain **at least** the tests described herein (whenever applicable), and possibly add instrument specific tests.*
Paragraphs in italics should be removed.

1.3 APPLICABLE DOCUMENTS

The following documents, of the exact issue shown, form a part of this document to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered as a superseding requirement.

Reference	Document Number	Issue	Date	Title
[AD 01]	GEN-SPE-ESO-19400-0794	3.0	In preparation	DICB – Data Interface Control Document
[AD 02]	VLT-SPE-ESO-10000-0011	3	In preparation	VLT Software Requirements Specification
[AD 03]	VLT-PRO-ESO-10000-0228	2	In preparation	VLT Software Programming Standards
[AD 04]	VLT-PLA-ESO-10000-0441	1.0	01/05/1995	VLT Science Operation Plan
[AD 05]	VLT-MAN-ESO-17210-0667	1.2	08/10/2001	Guidelines for VLT applications.
[AD 06]	VLT-SPE-ESO-17212-0001	4	13/01/2005	INS Software Specification
[AD 07]	VLT-SPE-ESO-17240-0385	4	13/01/2005	INS Common Software Specification
[AD 08]	VLT-ICD-ESO-17240-19400	2.6	17/11/1997	ICD between VCS and Archive
[AD 09]	VLT-ICD-ESO-17240-19200	1.3	07/06/2000	ICD between VCS and OH

[AD 10]	VLT-PLA-ESO-00000-0006	3	In preparation	VLT Software Management Plan
[AD11]	VLT-SPE-ESO-*xxxx-xxxx*	1	*xx/xx/xxxx*	*XXXX* Control Software User Requirements

1.4 REFERENCE DOCUMENTS

The following documents are referenced in this document.

Reference	Document Number	Issue	Date	Title
[RD 01]	VLT-MAN-ESO-17200-0888	1.0	17/08/1995	VLT Common Software Overview
[RD 02]	VLT-MAN-ESO-17200-0642	4	29/04/2004	VLT Common Software Installation Manual
[RD 03]	VLT-SPE-ESO-17100-3439	1	In preparation	Paranal Network/Computers Design Description
[RD 04]	VLT-MAN-SBI-17210-0001	3.7	05/10/2001	LCU Common Software User Manual
[RD 05]	VLT-MAN-ESO-17210-0600	1.7	02/10/1998	Motor Control sw User Manual API/ACI
[RD 06]	VLT-MAN-ESO-17210-0669	1.6	02/10/1998	Motor Engineering Interface User Manual
[RD 07]	VLT-MAN-ESO-17210-0619	2.4	31/03/2004	Central Control Software User Manual
[RD 08]	VLT-MAN-ESO-17210-0707	1.6	30/09/1999	On Line Database Loader User Manual
[RD 09]	VLT-MAN-ESO-17210-0771	1.8	06/10/2001	EVH User Manual
[RD 10]	VLT-MAN-ESO-17210-0770	1.8	30/09/2001	Extended CCS User Manual
[RD 11]	VLT-MAN-ESO-17210-0690	5	31/03/2002	Panel Editor User Manual
[RD 12]	VLT-MAN-ESO-17240-0853	3	26/03/2004	INS Common sw – oslx User Manual
[RD 13]	VLT-MAN-ESO-17240-0672	1.6	25/09/1998	CCD Detectors Control Software User Manual
[RD 14]	VLT-MAN-ESO-14100-1878	1.4	01/12/2003	IRACE-DCS User Manual
[RD 15]	VLT-MAN-ESO-17240-0934	5	31/03/2004	Base ICS User Manual
[RD 16]	VLT-MAN-ESO-17240-2265	4	05/04/2004	Base OS Stub User Manual
[RD 17]	VLT-MAN-ESO-17240-1913	4	31/03/2004	Installation Tool for VLT Sw packages
[RD 18]	VLT-MAN-ESO-17240-2153	4	31/03/2004	Startup Tool Stub User Manual
[RD 19]	VLT-MAN-ESO-17220-0737	3	28/03/2002	HOS – Sequencer User Manual
[RD 20]	VLT-MAN-ESO-17220-1999	4	19/04/2004	Broker for Observation Blocks User Manual
[RD 21]	VLT-MAN-ESO-13640-1388	3	31/03/2004	FIERA CCD Controller Software User Manual
[RD 22]	VLT-MAN-ESO-17240-2240	4	31/03/2004	Common Software for Templates User Manual
[RD 23]	VLT-MAN-ESO-17240-1973	5	13/01/2005	Template Instrument User Manual
[RD 24]	VLT-MAN-ESO-17240-2606	3	31/03/2004	Base ICS GUI User Manual
[RD 25]	VLT-MAN-ESO_17200-0908	1.4	15/02/2001	Tool for Automated Testing User Manual

1.5 ABBREVIATIONS AND ACRONYMS

This document employs several abbreviations and acronyms to refer concisely to an item, after it has been introduced. The following list is aimed to help the reader in recalling the extended meaning of each short expression:

AIV	Assembly Integration and Verification
ATP	Acceptance Test Plan
ATR	Acceptance Test Report
CCS	Central Control Software
CPU	Central Processing Unit
DCS	Detector Control Software
DFS	Data Flow System
ESO	European Southern Observatory
FITS	Flexible Image Transport Format
GUI	Graphical User Interface
HW	Hardware
ICS	Instrument Control Software
INS	Instrumentation Software Package
I/O	input/output
ISF	Instrument Summary File
IWS	Instrument Workstation

LAN	Local Area Network
LCC	LCU Common Software
LCU	Local Control Unit
MS	Maintenance Software
N/A	Not Applicable
OMT	Object Modeling Technique
OO	Object Oriented
OOD	Object Oriented Design
OS	Observation Software
PAE	Preliminary Acceptance Europe
P2PP	Phase 2 Proposal Preparation
RAM	Random Access Memory
SW	Software
TAT	Tool for Automated Testing
TBC	To Be Clarified
TBD	To Be Defined
TCS	Telescope Control Software
TIM	Time Interface Module
TRS	Time Reference System
TSF	Template Signature File
UIF	(Portable) User Interface (Toolkit)
VCM	VLT Control Model
VLT	Very Large Telescope
VLTI	VLT Interferometer
VME	Versa Module Eurocard
WS	Workstation

1.6 GLOSSARY

No special definition is introduced in this manual

1.7 STYLISTIC CONVENTIONS

The following styles are used:

bold
: in the text, for commands, filenames, pre/suffixes as they have to be typed.

italic
: in the text, for parts that have to be substituted with the real content before typing.

`teletype`
: for examples.

<name>
: in the examples, for parts that have to be substituted with the real content before typing.

bold and *italic* are also used to highlight words.

1.7.1 Data Flow and Processor Model Diagrams

Data Flow and processor Model Diagrams are based on De Marco/Yourdon notation for real-time systems **[RD 20]**.

1.8 NAMING CONVENTIONS

This implementation follows the naming conventions as outlined in **[AD 03]**.

1.9 PROBLEM REPORTING/CHANGE REQUEST

The form described in **[RD 02]** shall be used.

2 OVERVIEW

The present document is structured as follows:

- Chapter 3 gives a detailed description of the tests to be performed.
- Chapter 4 describes the exact sequence of actions to be executed during PAE.
- Chapter 5 contains the manual pages of the test scripts used to run the tests.

2.1 HARDWARE REQUIREMENTS

The list below refers to the Template Instrument XXXX. It must be modified to reflect the actual requirements of each specific instrument.

In order to perform the whole set of tests described in this document, the following computers and hardware components must be available:

- One Instrument Workstation
- Two LCUs for ICS
- One LCU for the TCCD
- One Sparc LCU for IRACE
- One Sparc LCU for FIERA

2.2 SOFTWARE REQUIREMENTS

In order to perform the whole set of tests described in this document, the following software components must be available:

- UNIX Operating System (see **[RD 02]** for the types and versions supported).
- VLT Common Software – MAR2001or higher, installed according to **[RD 02]**.
- Access to the *cmm* Archive.

3 TEST DESCRIPTION

3.1 DOCUMENTATION

This section describes the documents produced for PAE.

3.1.1 Instrument Software Acceptance Test Plan

It is prepared and reviewed before PAE.
It consists of the present document.

3.1.2 Instrument Software User and Maintenance Manual (DOC001)

It is based on **[RD 23]** and includes:
1. One chapter dedicated to an overview of the architecture of the whole Instrumentation sw (LAN, computers, processes, environments, and database).
2. One chapter dedicated to the installation of the whole Instrumentation Software.
3. One chapter dedicated to observation scenarios, including a layout of the GUIs.
4. One chapter dedicated to Templates.

3.1.3 Instrument Software Acceptance Test Report

It is produced after PAE.
It is derived from the present document, in particular chapter 4, by adding the results and comments from PAE.

3.2 STANDARDS

The following aspects of the Instrumentation Software will be verified through code inspection.

3.2.1 Programming Standards (STD001)

Compliance with Software Programming Standards (**[AD 03]**) is verified through code inspection on files (randomly around 10% of the total source code) of all main categories (C++, C, tcl).
Since this verification takes time, it is recommended to do it separately before the actual PAE takes place.

3.2.2 Standard Architecture (STD002)

The LAN and hardware platforms (WS, LCUs), including names, are conform to what specified in **[RD 03]**.
For VLTI, VST, La Silla instruments an equivalent reference document should exist.

3.2.3 DCS packages (STD003)

DCS uses the standard DCS package FIERA (**[RD 13]**) *or CCD (**[RD 14]**) or IRACE (**[RD 21]**).*
Exceptions must be justified and agreed upon at FDR latest.

3.2.4 ICS package (STD004)

ICS uses the base ICS package *icb* **[RD 15]** and *icbpan* **[RD 24]**.
The specific code developed for the instrument ICS must be justified and documented.

3.2.5 OS package (STD005)

OS uses the common OS package *BOSS*, **[RD 16]**.
The specific code developed for the instrument OS must be justified and documented.

3.2.6 Startup procedures (STD006)

Startup/Shutdown procedures are based on the common tool *stoo,* **[RD 18]**.
If not based on stoo, at least a short description of the startup procedure (processes started, initialized attributes, commands sent) must be included in the documentation (see 3.1.2).

3.2.7 Rules and package for templates (STD007)

Templates use the common library *tpl* and follow the rules defined in **[RD 22]**.

3.2.8 Instrument Configuration files (STD008)

All files dealing with the instrument configuration for Paranal belong to one single dedicated module (*xxmcfg*).
The User Manual describes the procedures to be followed to keep under sw configuration control any change to the Instrument configuration parameters.

3.2.9 Users name (STD009)

The target Instrument WS defines two users:
1. *xxxxmgr*, responsible for the installation
2. *xxxx*, who runs the instrument sw.

For both users, INTROOT and INS_ROOT must be defined according to the standard adopted at Paranal:
- INTROOT set to /vlt/*XXXX*/INTROOT
- INS_ROOT set to /data/*XXXX*/INS_ROOT

3.3 INSTALLATION

All tests described in this section must be executed at the AIV premises as user *xxxxmgr*

3.3.1 Make sure that the Instrument Software is built from scratch (INS001)

It is possible to rebuild from scratch the complete instrument software and related environments.
Before running the installation procedure, the old contents of
$INTROOT, $INS_ROOT, $VLTDATA/ENVIRONMENTS, $VLTDATA/config
are (re)moved, to verify that installation can be done from scratch.

3.3.2 Usage of pkgin to build the Instrument Software (INS002)

The Instrument Software installation is based on *pkgin* (**[RD 17]**).

In any case, there must be an automatic installation procedure. To minimize the downtime of the target host during software upgrades at Paranal, verify that the installation procedure is or can be split into two main phases (as pkgin does):
1. *Creation of the INTROOT, placing there all files needed by the instrument software, creation of CCS and LCU environments. It should be possible to execute this phase off-line, not necessarily on the target WS.*
   It should be possible to copy the result (INTROOT) to the target host.
2. *The rest of the installation (environment initialization and startup, scan links creation and scan system startup) is always executed at the target host. If possible, this phase should not need access to the sources, only to the INTROOT produced by the first phase.*

It must be possible to execute each of these steps with one single UNIX shell command.

3.3.3 Access to cmm Archive (INS003)

The complete code is accessible and can be retrieved from the *cmm* Archive. This can be verified by checking the contents of the file *xxins/config/xxinsINSTALL.cfg*.
In order to be able to repeat the tests at any time with exactly the same configuration**, all module versions are explicitly registered** in this file.

3.3.4 Installation failures check (INS004)

The installation procedure, being based on *pkgin*, allows easy tracing of failures and possible reasons.

3.3.5 Instrument package for P2PP (INS005)

As result of the build and installation procedure, the Instrument Packages *XXXX.zip* (*o*bservations) and *XXXX_tec.zip* (maintenance), as defined by P2PP, are produced and placed in $INTROOT/config.

3.4 SUB-SYSTEMS TEST

All tests described in this section must be executed at the AIV premises as user *xxxxmgr*

3.4.1 DCS test (DCS001)

Run dedicated test procedure(s), which exercises for every individual detector system (DCS):
- the proper startup/shutdown
- state change
- execution of the main operations when online:
  - one single exposure, for all implemented read-out modes, or a selection of them, if too many.
  - verify if FITS files are properly saved in $INS_ROOT/SYSTEM/DETDATA.

An example is provided in xxmmpe/test/xxmmpeTestDCS.
It must be possible to run the same test under tat (see **[RD 25]***).*

3.4.2 ICS special device LCU test (ICS001)

Run for each ICS special device from the vxWorks shell a low-level test, which exercises the device functionality by accessing directly the associated driver.

Examples are available in ic0sen/test.

3.4.3 ICS special device test (ICS002)

Run for each ICS special device a self-test procedure, which exercises:
- state change
- SETUP all functions in all possible named positions (or samples over a continuous range),
- STATUS –header

An example is available in xxmmpe/test/xxmmpeTestICS.
It must be possible to run the same test under tat (see **[RD 25]***).*

3.4.4 ICS test (ICS003)

Run the ICS self test procedure, based on *inscSelfTestICS*. It exercises:
- the proper startup/shutdown
- state change
- SETUP all functions in all possible named positions (or samples over a continuous range),
- STATUS -header -dumpFits.

An example is available in xxmmpe/test/xxmmpeTestICS.
It must be possible to run the same test under tat (see **[RD 25]***).*

3.5 GRAPHICAL USER INTERFACE

All tests described in this section must be executed at the AIV premises as user *xxxx*

3.5.1 DCS stand-alone GUI (GUI001)

The DCS stand-alone GUI allows performing all main operations foreseen:
- startup/shutdown
- go online
- set simulation level
- define a setup
- execute an exposure.

3.5.2 ICS stand-alone GUI (GUI002)

The ICS stand-alone GUI is based on *icbpan* and allows performing all main operations foreseen:
- startup/shutdown
- go online
- set global simulation level
- set single device simulation level
- define a setup
- execute a setup

3.5.3 OS Control GUI (GUI003)

The OS Control GUI has the following characteristics:
- It is complementary (not alternative) to BOB, in particular
  - there is no START button
  - there are PAUSE, CONTINUE, CHANGE exp. time, ABORT one single exposure, whenever applicable.
- It shows a summary of the current instrument status
- It shows the current instrument mode
- It shows the main ongoing activities (e.g. status of running exposures).

3.5.4 OS Status GUI (GUI004)

The OS Status GUI shows the detailed status of the whole instrument and its devices.

3.5.5 GUIs layout (GUI005)

GUIs used during observations fit into the scheme and space adopted by Paranal.
In particular, they fit into two screens:
1. Main screen for BOB (left) and OS control (right).
2. Second screen for image display with RTD.

3.6 OS

All tests described in this section must be executed at the AIV premises as user *xxxxmgr*

3.6.1 Startup/Shutdown (OS001)

Run the startup/shutdown procedure, based on the *stoo* package, for the whole instrument.
Exercise also the state change commands (STANDBY, ONLINE, OFF).

3.6.2 Single exposure (OS002)

Execute, through a dedicated test script, one single exposure for each observing mode, involving all sub-systems (DCSs, ICS), and verify the result (FITS file) and its contents. Verify also that the generated FITS file is placed by *volac* in the right directory for archiving: $INS_ROOT/SYSTEM/ARCDATA.
An example is available in xxmmpe/test/xxmmpeTestOS.
It must be possible to run the same test under tat (see **[RD 25]***).*

3.6.3 Templates (OS003)

Execute through a dedicated test OB (file *.obd*), in sequence the complete set of templates implemented.
An example is available in xxmmpe/test/xxmmpeTestTPL.
It must be possible to run the same test under tat (see **[RD 25]***).*

Purpose is not to verify the scientific result, but just the technical result.
In particular, the run time of such an OB should not be more than one hour, possibly < 15 minutes.
Templates, which require the availability of sub-systems (typically acquisition templates, which require the telescope) should preferably implement a simulation of the missing sub-systems. Alternatively, they should not be part of the complete test OB and be included instead in a separate dedicated test OB, to be run only when the sub-systems are available.

3.6.4 Interface P2PP-BOB (OS004)

Verify that the P2PP and the Instrument Package are properly installed on the Observation Handling Workstation.
Define an OB with the P2PP tool and fetch it from BOB. Execute it from BOB.
For test purposes P2PP can be installed and started on the Instrument Workstation (see manual page of inscP2PPInstall).

3.7 MS

All tests described in this section must be executed at the AIV premises as user *xxxxmgr*

3.7.1 Technical templates (MS001)

All MS procedures are implemented in form of technical templates.
Exceptions should be justified and agreed upon.
An example is available in xxmmpe/test/xxmmpeTestMS.
It must be possible to run the same test under tat (see **[RD 25]***).*

3.7.2 Results format (MS002)

The results produced by MS procedures are archived either in form of an ASCII file, with the same format supported by the CCS sampling tool (for those results obtained through this tool or equivalent), or as part of the operational logs file (short-FITS format).

3.8 ALARMS

All tests described in this section must be executed at the AIV premises as user *xxxx*

3.8.1 Emergency cases (ALM001)

The main emergency conditions that may affect the instrument are identified and documented.

3.8.2 Simulate alarms (ALM002)

Alarms corresponding to emergency conditions are implemented in the software.

If possible, check that these alarms work. If it is impossible to test the real cases, HW shall implement simulation conditions. The SW simulation shall be done if there is really no other alternative. Special care will be taken for Emergency Stops, if any.

3.8.3 Configure alarm conditions (ALM003)

Alarm thresholds (if applicable, e.g. LN2 tank level, temperature threshold) can be set through a GUI.

3.9 AUTOMATIC REGRESSION TESTS

All tests described in this section must be executed at the AIV premises as user *xxxxmgr*

3.9.1 Full cycle (TAT001)

It must be possible to verify with an automatic procedure, i.e. with no user interactions, that the complete Instrument Software can be rebuilt from scratch, the environments can be created and started and all sub-systems tests are performed successfully. This procedure must be based on the VLT standard Tool for Automatic Tests (*tat*, see **[RD 25]**).
An example is available in xxmmpe/test/TestList.lite

3.10 VLT CONTROL MODEL

All tests described in this section must be executed on the VLT Control Model (VCM) in Garching as user *xxxxmgr*.

3.10.1 Make sure that the Instrument Software is built from scratch (VCM001)

See INS001.

3.10.2 Build the Instrument Software for the VCM (VCM002)

Because of the different hardware available in the VCM, the installation module to be used in *xxmgar*. Files in this module contains all the definitions characterizing the Garching configuration.

3.10.3 Templates (VCM003)

Execute through a dedicated test OB (file *.obd*), in sequence the complete set of templates implemented.

3.10.4 Interface P2PP-BOB (VCM004)

Verify that P2PP is running on the VCM OH Workstation and OBs can be transferred to BOB (see instructions under *http://websqa.hq.eso.org/sdd/bin/view/VLTSW/IWSDfsSetup*).

3.10.5 Interface OS-Archive (VCM005)

Verify that all FITS files generated when running an OB are transferred to the online Archive WS (see instructions under *http://websqa.hq.eso.org/sdd/bin/view/VLTSW/IWSDfsSetup*).

3.10.6 Automatic Regression Tests (VCM006)

Execute the automatic regression test procedure for the VCM configuration.
An example is available in xxmgar/test/TestList.lite

4 TEST EXECUTION

This chapter describes, in tabular form, the sequence of actions/commands performed during the PAE to run the complete set of tests/verifications.

The last column in the table is reserved for notes and remarks to be added during PAE and included in the ATR document.

The names of commands and scripts refer to the Template Instrument XXXX. They have to be adapted to each specific instrument.
It is assumed that the installation module for the location where AIV takes place is named xxmmpe. It must be changed according to the actual AIV location.

4.1 AT THE AIV PREMISES

Test ID	Action/Command	Expected results	Notes/comments
DOC001	Check contents of Software User and Maintenance Manual	Document structure and contents similar to **[RD 23]**	
STD001	Inspect around 10% of the code	Compliance with **[AD 03]**	
STD002	Check contents of Software User and Maintenance Manual	Compliance with **[RD 03]** or equivalent	
STD003	Code and documentation inspection	Standard DCS packages are used. Exceptions are explained, justified and agreed by ESO.	
STD004	Code and documentation inspection	Standard ICS package is used. Exceptions are explained, justified and agreed by ESO.	
STD005	Code and documentation inspection	Standard OS package is used. Exceptions are explained, justified and agreed by ESO.	
STD006	Code and documentation inspection	Standard startup package is used. Exceptions are explained, justified and agreed by ESO.	
STD007	Code and documentation inspection	Standard templates package is used. Exceptions are explained, justified and agreed by ESO. Compliant with rules described in **[RD 22]**	

STD008	Code and documentation inspection	All configuration files are in module *xxmcfg*. Manual describes clearly procedures to update the instrument configuration.	
STD009	Login on the Instrument WS as user xxxxmgr and xxxx	It is possible to login as xxxxmgr and xxxx. INTROOT and INS_ROOT set as in section 3.2.9	
INS001	Run as user *xxxxmg*: mv $HOME/XXXXSource $HOME/XXXXSource.old mkdir $HOME/XXXXSource cd $HOME/XXXXSource cmmCopy xxmmpe cd xxmmpe/test; make export TARGET=INTEGRATION ../bin/xxmmpeTestClean	$INTROOT, $INS_ROOT $VLTDATA/ENVIRONMENTS are empty. $VLTDATA/config/lxx* files do not exist. Same check on DCS SLCUs, if any.	
INS002	Run as user *xxxxmgr*: cd $HOME/XXXXSource export TARGET=INTEGRATION pkginBuild xxmmpe	No errors from *pkginBuild*. INTROOT and INS_ROOT contain all files needed to run the instrument software.	
INS003	Check contents of *xxmmpe/config/xxmmpeINSTALL.cfg*	Only *cmm* modules are used to build the software from scratch. For each module, the version is specified.	
INS004	Check contents of INSTALL/pkginBuild.err	File does not contain errors.	
INS005	Check contents of $INTROOT/config	The following files exists: XXXX.zip XXXX_tec.zip	
DCS001	Run as user *xxxxmg*: cd $HOME/XXXXSource/xxmmpe/test ../bin/xxmmpeTestDCS	The script terminates without errors.	
ICS001	Login on the LCU *lxxics2*: rlogin lxxics2 From the vxWorks shell run: -> lcubootAutoLoadNoAbort 1,"xxidev",0 -> xxidevTestVx "/iser0"	The program executes without errors all what specified in 0	
ICS002 ICS003	Run as user *xxxxmg*: cd $HOME/XXXXSource/xxmmpe/test ../bin/xxmmpeTestICS	The program executes without errors all what specified in 3.4.3 and 3.4.4	

GUI001	Run as user *xxxx*: xxinsStart –panel TCCD xxinsStart –panel FIERA xxinsStart –panel IRACE xxinsStart –panel TCCD_RTD xxinsStart –panel FIERA_RTD xxinsStart –panel IRACE_RTD	It is possible to execute all operations described in 0 on each of the DCS panels	
GUI002	Run as user *xxxx*: xxinsStart –panel ICS	It is possible to execute all operations described in 3.5.2	
GUI003	Run as user *xxxx*: xxinsStart –panel OS_CONTROL	It is possible to execute all operations described in 3.5.3	
GUI004	Run as user *xxxx*: xxinsStart –panel OS_STATUS	It is possible to execute all operations described in 3.5.4	
GUI005	Run as user *xxxx*: xxinsStartup Wait that the startup configuration panel pops-up Push the button START	The default panels fits into two screen and the layout is the same as described in 3.5.5	
OS001 OS002	Run as user *xxxxmgr*: cd $HOME/XXXXSource/xxmmpe/test ../bin/xxmmpeTestOS	The script executes without errors all what specified in 3.6.2 Verify that the results are stored in FITS file(s) and check contents.	
OS003	Load from BOB panel the file XXXX_gen_tec_SelfTest.obd Run from BOB panel that OB. Verify that this OB contains all observation templates.	The OB terminates successfully	
OS004	Start p2pp as user *xxxxmgr* (see 3.6.4) Build an OB, which produces at least one FITS file Fetch the OB from the BOB panel and start it.	The OB can be defined with the P2PP GUI and executed without errors from BOB.	
MS001	Load from BOB panel the file XXXX_gen_tec_MSTest.obd Run from BOB panel that OB. Verify that this OB contains all maintenance templates.	The OB terminates successfully	
MS002	Check results of the execution of XXXX_gen_tec_MSTest.obd	The format is the same as specified in 3.7.2	
ALM001	Check contents of Software User and Maintenance Manual	Emergency cases are identified and documented	

ALM002	Run as user *xxxxmgr*: cd $HOME/XXXXSource/xxmmpe/test ../bin/xxmmpeTestAlarms	All foreseen software alarms are one by one triggered. Verify that alarms simulated by HW trigger software alarms	
ALM003	Run as user *xxxx*: xxinsStart –panel ALARM	It is possible to configure through a GUI alarm conditions	
TAT001	Run as user *xxxxmgr*: cd $HOME/XXXXSource/xxmmpe/test export TARGET=INTEGRATION tat	PASSED	

4.2 IN THE VLT CONTROL MODEL

VCM001	Run as user *xxxxmgr*: mkdir –p $HOME/XXXXSource cd $HOME/XXXXSource rm –rf xxmgar cmmCopy xxmgar cd xxins/test; make export TARGET=CM_FULL ../bin/xxmgarTestClean	$INTROOT, $INS_ROOT $VLTDATA/ENVIRONMENTS are empty. $VLTDATA/config/lxx* files do not exist. Same check on DCS SLCUs, if any.	
VCM002	Run as user *xxxxmgr*: cd $HOME/XXXXSource export TARGET=CM_FULL pkginBuild xxmgar	No errors from *pkginBuild*. INTROOT and INS_ROOT contain all files needed to run the instrument software.	
VCM003	Make sure that TCS is online Start the Instrument Software. Run: xxinsStart Load from BOB panel the file XXXX_gen_tec_SelfTest.obd Run from BOB panel that OB. Verify that this OB contains all observation templates.	The OB terminates successfully	
VCM004	Start *p2pp* on the OH WS (see 3.10.4). Build an OB, which produces at least one FITS file Fetch the OB from the BOB panel and start it.	The OB can be defined with the P2PP GUI and executed without errors from BOB.	
VCM005	Make sure that the on-line archive is active (see 3.10.5) On the on-line archive WS verify that the FITS files produced with the last OB executed have been transferred.	The FITS files are on the on-line archive WS disk.	
VCM006	Run: cd $HOME/XXXXSource/xxmgar/test export TARGET=CM_FULL; tat export TARGET=CM_WS; tat	 PASSED PASSED	

5 REFERENCE

This section contains the manual pages of the test scripts/procedures implemented.
Only manual pages providing additional information needed to properly execute the tests have to be presented here.

6 VERIFICATION MATRIX

6.1 Instrument specific requirements

The following table contains the links between the instrument specific requirements, defined in **[AD11]**, and the corresponding test.

Req.	TEST	DESCRIPTION
REQ01	ICS003	List of devices and assemblies
REQ02	ICS003	Lamps in stand-by state
REQ03	ICS003	Derotator modes
REQ04	ICS003	Measures to overcome mechanical backlash
REQ05	ICS003	Gratings setup parameters
REQ06	DOC001	Sensors sampling period
REQ07	DCS001	UV detector size
REQ08	DCS001	IR detector size
REQ09	DOC001	Cryogenic devices kept to the necessary minimum
REQ10	DOC001	List of observing modes
REQ11	OS002	Automatic settings in UV spectroscopy
REQ12	OS002	Automatic settings in IR spectroscopy
REQ13	OS002	Automatic settings in dichroic spectroscopy
REQ14	OS002	Automatic settings in IR imaging
REQ15	OS001	Description of state OFF
REQ16	OS001	Description of state LOADED
REQ17	OS001	Description of state STANDBY
REQ18	OS001	Description of state ONLINE
REQ19	STD008	Save and retrieve Instrument Configuration
REQ20	STD008	User acknowledgement before changing Instrument Configuration
REQ21	STD008	Protection of Instrument Configuration files
REQ22	VCM006	Device hardware simulation
REQ23	VCM006	Support full hardware simulation
REQ24	DCS001	Data acquisition maximum speed
REQ25	DCS001	Maximum Software overhead for data acquisition
REQ26	GUI001	Display all images
REQ27	OS002	Maximum delay between acquisition and display
REQ28	GUI001	Mouse driven operations on image display
REQ29	OS002	Image files in FITS format
REQ30	OS002	FITS header conform to ESO standards
REQ31	OS002	Sensors information in the FITS header
REQ32	DOC001	Typical disk storage requirement for one night
REQ33	DOC001	Maximum disk storage requirement for one night
REQ34	OS002 OS003 MS001	Archive all image FITS files
REQ35	OS003	Archive in background
REQ36	OS003 MS001	On-line data processing on the IWS
REQ37	ICS003 DCS001 OS002	Information to be logged
REQ38	GUI003	Information displayed in the OS control GUI
REQ39	GUI004	Information displayed in the OS status GUI
REQ40	GUI005	User Station screen 1 contents
REQ41	GUI005	User Station screen 2 contents
REQ42	OS004	P2PP on dedicated screen
REQ43	N/A	Off-line data reduction on dedicated WS and screen

Req.	TEST	DESCRIPTION
REQ44	OS003	Functionality required from TCS
REQ45	ALM001 ALM002	Hardware interlocks
REQ46	OS003	Science operations according to the Science Operations Plan
REQ47	OS003	Parameters during science operations in high level units
REQ48	OS002	Check for parameters value validity
REQ49	OS003	Parallel setup of devices
REQ50	OS003	Lamps with warm-up time switched on at the first setup
REQ51	OS003	Continuous derotator motion during integrations
REQ52	MS001	Parameters during maintenance operations in high level or engineering units
REQ53	MS001	Maintenance operations supported by Templates
REQ54	OS003 MS001	List of Templates
REQ55	OS002	Maximum time for bias exposure
REQ56	all	List of scripts/procedures for the test Software
REQ57	ALM002 ALM003	Software alarms warn for approaching hardware interlock conditions
REQ58	ALM002	Warnings shall be logged
REQ59	ALM002	Warnings treated as low priority alarms
REQ60	ALM002	Alarms displayed with standard tool
REQ61	GUI005	Alarms GUI permanently displayed in the User Station
REQ62	ALM001	List of Alarms
REQ63	ALM002	Alarms shall be logged
REQ64	ALM002 ALM003	Sounds associated to alarms
REQ65	ALM002	Alarms monitoring also in STANDBY
REQ66	ICS003	Initialization maximum time
REQ67	ICS003	Setup maximum time

6.2 General requirements for Instrumentation Software

The following table section contains the links between the general requirements for instrumentation Sw, defined in **[AD 06]**, and the corresponding test.

Req.	TEST	DESCRIPTION
INS01	DOC001	Define Instrument ID and prefix in agreement with ESO
INS02	DOC001 ICS001	Time critical synchronization via Time Reference System
INS03	STD002	Naming conventions for Instrument LAN nodes
INS04	INS003	Instrument Software divided into the standard INS Modules
INS05	INS002 STD006	Facilities to build, install, startup and shutdown must be available
INS06	OS003	On-line data processing done within templates, if no real-time requirements
INS07	OS003	ESO approval required for on-line data processing
INS08	OS003	ESO approval required for the choice of on-line data processing tool
INS09	GUI001 GUI002 GUI003 GUI004 GUI005	All GUIs based on the VLT panel editor
INS10	all	Test Software part of the mandatory deliverables. Standard minimum set applicable
INS11	INS001 INS002	Use Template Instrument to build a new instrument from scratch
INS12	INS003	Use *cmm* for Software configuration control management (Archive)
INS13	INS003	Follow *cmm* modules naming conventions

Req.	TEST	DESCRIPTION
INS14	STD001	VLT programming standards applicable to Instrumentation Software
INS15	STD006	Instrument configuration under Software configuration control
INS16	STD006	Instrument configuration files in one single *cmm* module belonging to MS
INS17	STD002	One CCS environment for each LAN node
INS18	STD002	Use CCS-lite
INS19	STD002	CCS environment name same as LAN node name
INS20	STD009	Two users for each instrument
INS21	STD003	Use CCD Software for Technical CCDs
INS22	STD003	Use IRACE Software for Infra-red scientific cameras
INS23	STD003	Use FIERA Software for optical scientific cameras
INS24	STD003	Use *dxf* for data transfer between nodes
INS25	STD003	Use *rtd* for Real-Time display
INS26	STD004	Use *icb* for ICS processes and *icbpan* for ICS GUIs
INS27	STD005	Use *boss* for OS processes
INS28	STD007	Use *tpl* for templates
INS29	STD003 STD004 STD005	Use *oslx* for FITS keywords handling
INS30	INS002 INS004	Use *pkgin* for build and installation
INS31	STD004 STD005 STD008	Use *ctoo* for Instrument configuration files handling
INS32	STD006 OS001	Use *stoo* for startup and shutdown
INS33	ICS003	ICS controls all devices, except detectors
INS34	STD003 STD004 STD005	ICS, DCS and OS implement standard states
INS35	STD003 STD004 STD005	ICS, DCS and OS implement standard commands
INS36	STD008	ICS, DCS and OS configuration parameters values shall not be hard-coded
INS37	STD003 STD004 ICS002	ICS and DCS LCU status stored in the database
INS38	DCS001 ICS003 OS002	ICS, DCS and OS parameters values shall not be changed until a new command requests for it
INS39	DCS001 ICS003 OS002	ICS, DCS and OS set and actual values stored in separate database attributes
INS40	ICS003	Status of ICS on-going and completed actions shall be accessible
INS41	DCS001 ICS003 OS002	ICS, DCS and OS Set values shall be checked for validity
INS42	DCS001 ICS003 OS002	ICS, DCS and OS keywords shall be syntactically checked against dictionary
INS43	STD003 STD004	Use CCS scan system to transfer ICS and DCS parameters values from LCU to IWS database
INS44	DCS001 ICS003	ICS and DCS part of FITS header shall contain full status information and some statistics
INS45	VCM003	ICS and DCS part of FITS header shall be produced also in simulation

Req.	TEST	DESCRIPTION
INS46	OS003	ICS, DCS and OS keywords in the FITS header should be syntactically checked against dictionary and comply with the rules defined in the Data Interface Control Document.
INS47	GUI001 GUI002	ICS and DCS stand-alone GUI must be available
INS48	DCS001 ICS003	ICS and DCS complete logging: commands, errors, LCU boot, sensors values, movements
INS49	VCM006	ICS and DCS simulation at WS level
INS50	VCM003	ICS devices simulation at LCU level
INS51	GUI001 GUI002	ICS and DCS simulation shall not be hidden to the user
INS52	VCM003	ICS and DCS simulation shall be indicated in the FITS header
INS53	DOC001	Implementation of ICS special devices must be approved by ESO
INS54	INS003	ICS *cmm* modules follow the naming conventions
INS55	DCS001	One DCS responsible for each camera (one camera may control a mosaic)
INS56	OS002	Handling of FITS header size between DCS and OS
INS57	VCM003	DCS DFE simulation at LCU level
INS58	N/A	DCS hw simulation at DFE level
INS59	VCM006	DCS readout frames simulation supported
INS60	STD003	DCS must support highest possible duty cycle
INS61	STD003	DCS DUMP command for image re-transmission
INS62	STD003	Save readout data also in case of failure
INS63	DCS001	DCS data saved in FITS format uncompressed
INS64	DCS001	DCS data saved in binary format
INS65	OS002	DCS data saved on dedicated disk not concurrently accessed by other applications
INS66	STD003	DCS must check for disk space availability before starting an exposure
INS67	DCS001	Windowed and binned readout supported
INS68	GUI001	DCS data optionally displayed with different orientation
INS69	STD003	DCS responsible for shutter time. If shutter controlled by ICS, use TRS for synchronization
INS70	STD003	Actual exposure time should take into account shutter opening and closing time
INS71	STD003	DCS *cmm* modules follow the naming conventions
INS72	OS002	OS Server responsible for coordination of single exposures
INS73	OS003	OS Server shall handle overlapping exposures
INS74	OS003	OS Server shall handle parallel exposures
INS75	OS002	Results of exposures shall always be archived (FITS format)
INS76	OS002 OS003	OS Archiver shall not affect the observing cycle. Archiving errors shall be reported to BOB
INS77	OS003	FITS files containing results of exposures shall follow naming conventions
INS78	OS003	OS includes templates
INS79	N/A	SOS responsible for coordination of exposures involving more than one instrument
INS80	GUI003	Mandatory OS parameters are available
INS81	OS002	Use standard exposure types
INS82	OS003	Follow rules for FITS files and keywords contained in the Data Interface Control Document
INS83	OS003	Implement complex operations in Templates
INS84	DOC001 OS003	Implement special functionality (e.g. auto-guiding, active optics) in separate OS process
INS85	MS001	All AIV and Commissioning activities supported by technical templates
INS86	GUI003	Implement OS Control panel
INS87	GUI004	Implement OS Status panel
INS88	OS004 VCM004	Follow ICD between OS and OH
INS89	VCM005	Follow ICS between OS and Archive
INS90	INS003	OS *cmm* modules follow the naming conventions

Req.	TEST	DESCRIPTION
INS91	STD008	All Instrument configuration files in one *cmm* module belonging to MS
INS92	INS003	All dictionary files in one *cmm* module
INS93	INS003	Instrument configuration parameters protected from not authorized users
INS94	STD008	Use standard mechanism to control Instrument configuration changes
INS95	STD008	Instrument configuration changes shall be logged in FITS format
INS96	MS001 INS005	MS procedures implemented as technical templates. A Technical Instrument Package must exist
INS97	MS002	Results of technical templates logged in FITS format or in CCS sampling tool format
INS98	INS003	MS *cmm* modules follow the naming conventions
INS99	N/A	ESO authorization needed if *p2pp* complemented by a dedicated OSS tool for OB preparation tool
INS100	N/A	Special tool for target selection, if needed, part of OSS
INS101	N/A	OSS *cmm* modules follow the naming conventions
INS102	DOC001	Alarms must be listed in ISFS document and detailed in ISDD document
INS103	ALM002	Alarms implementation compatible with the CCS Alarm System
INS104	ALM002	Alarms triggered only if the value of the related database attribute is up-to-date
INS105	ALM002	Alarm database attributes associated to sensors must follow a standard naming scheme
INS106	GUI004	Alarm conditions displayed in the OS status panel
INS107	GUI005	Panels shall not pop-up and disappear automatically
INS108	GUI005	Static placement of panels
INS109	GUI005	A GUI shall not automatically close another panel
INS110	GUI005	User Station must follow standard configuration (2 screens). Extensions must be agreed with ESO
INS111	OS003	Follow standard interface to TCS/VLTI
INS112	INS002	Installation module shall follow the standard naming convention
INS113	OS001	Instrument specific adds-on to *stoo* functionality must be in the installation module
INS114	DCS001 ICS003	Restart one INS module without restarting the whole INS Software
INS115	DCS001 ICS003	ICS and DCS must provide own startup/shutdown scripts for the stand-alone mode
INS116	DOC001	Documentation in same electronic format used at ESO
INS117	DOC001	Instrument Software architecture must follow the scheme described in the INS Software Specs
INS118	STD001	Use VLT common software wherever possible
INS119	DOC001	Software activities included in the Instrument Software Management Plan
INS120	N/A	Instrument Software User Requirements document reviewed before PDR
INS121	N/A	Freeze Software User Requirements at PDR
INS122	N/A	Review Software Functional Specification at PDR. Recommended a few iterations before
INS123	N/A	Before PDR run Template Instrument, build Instrument Software skeleton, check performances
INS124	N/A	Review Software Design document(s) at FDR. Recommended a few iterations before
INS125	N/A	Review Acceptance Test Plan document at FDR.
INS126	N/A	Before FDR Instrument skeleton according to actual configuration, no code except for prototypes
INS127	TAT001 VCM006	Software test procedures automatic and reproducible, based on tat
INS128	DOC001	Accept. Test Plan, User and Maintenance manual ready for PAE. Recommended a few iterations before
INS129	TBD	Acceptance Test Report produced as result of PAE
INS130	DOC001	Agree with ESO intermediate check points between FDR and PAE
INS131	all	PAE at integration premises and in the VLT Control Model

Req.	TEST	DESCRIPTION
INS132	DOC001 INS003	Software and documentation under *cmm*
INS133	OS003	OS shall be able to handle secondary guiding TCCDs in parallel to science exposures.

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