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Guidelines for the Preparation of Survey Management Plans - VISTA

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CHANGE RECORD

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2.0	18.10.2006	All	Revision by J. Emerson
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1. Scope: Guidelines for the Public Survey Management Plan

The Principal Investigators (PIs) whose Public Survey proposal has been reviewed by the Public Survey Panel (PSP) and recommended by the Observing Programme Committee (OPC) are now asked to submit their Survey Management Plan (SMP). The SMP is an integral part of ESO's appraisal of the proposal and it will be reviewed by ESO as follows:

- The SMPs are reviewed by ESO in consultation with the chair of the PSP. The generated Review Items (RIX'es) are sent to the PIs for comments and revisions.
- The revised SMPs are reviewed by a panel composed of the head of the Data Management and Operations Division, the VLT programme scientist, and the corresponding Paranal instrument scientist. In the case of VISTA the panel will also include the VISTA Principal Investigator. The head of the EST will be part of the panel as rapporteur.
- The review panel recommendations are sent to the Director General, for approval or further actions required.

~ 75% of ESO available time[1] on VISTA will be used for Public Surveys which will be conducted in Service Mode (SM). Therefore with respect to the standard Phase 1, the SMP represents an additional form requested from the PIs, which aims at collecting the necessary information to carry out Public Surveys in SM, and allows for an efficient and timely planning of Phase 2 and telescope operations.

The SMP must illustrate the observing strategy, the survey data calibration needs, the data reduction process, the manpower and hardware capabilities, the data quality assessment process, and the data product delivery to the Virtual Observatory (VO).

2. List of Abbreviations & 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:

DEC	Declination
DG	Director General
EST	ESO Survey Team
EPS	ESO Public Surveys
ETC	Exposure Time Calculator
FTE	Full Time Equivalent
g-lat	Galactic Latitude

[1] For VISTA the UK accession agreement states: 75% of the time available on VISTA will be used for common Large Scale Survey Programmes.

g-long	Galactic Longitude
PI	Principal Investigator
P2PP	Phase 2 Proposal Preparation
PSF	Point Spread Function
PSP	ESO Public Survey Panel
OPC	Observing Programme Committee
RA	Right ascension
RIX	Review Items
SADT	Survey Area Definition Tool
SM	Service Mode
SMP	Survey Management Plan
SDSS	Sloan Digital Sky Survey
VISTA	Visible and Infrared Survey Telescope for Astronomy
VIRCAM	VISTA infrared camera
VLT	Very Large Telescope
VST	VLT Survey Telescope
VO	Virtual Observatory

3. List of Applicable and Referenced Documents

The ESO Public Surveys (EPS) for VISTA selected by the PSP and recommended by the OPC will be described at http://www.eso.org/observing/webone.html

The mechanisms that ESO has developed to manage EPS with VST and VISTA from proposal preparation to the acceptance of data products into the ESO archive are described at http://www.eso.org/observing/AboutSurveys.html

The protocol for accepting data products, their ingestion into the ESO archive and the development of the interface for harvesting data products are currently described at http://www.eso.org/observing/ps/VOS-RRD.pdf

Special tools to carry out the EPS Phase 2 developed to simplify the Phase 2 preparation for surveys are the Survey Area Definition Tool (SADT), which allows the user to efficiently tile a given survey area which is described at www.vista.ac.uk/observing/sadt/ and the upgrade of the P2PP capabilities at www.eso.org/observing/p2pp/P2PP_future.html which includes: Time-linking of OBs; Definition of groups of OBs; and Import of target fields produced by the SADT.

VISTA functionalities are described at www.vista.ac.uk , and the VISTA exposure time calculator is available via www.vista.ac.uk/observing/etc/.A glossary of specific terms for VISTA observations are available at http://www.vista.ac.uk/glossary.htm

Information on seeing and weather statistics on Paranal is available at
http://www.eso.org/gen-fac/pubs/astclim/paranal/index.html

4. Structure and contents of the SMP

The PI of an OPC-recommended EPS is asked to submit the SMP document, which consists of the following sections:

- Survey observing strategy;
- Survey data calibration needs;
- Data reduction process;
- Manpower and hardware capabilities devoted to data reduction and quality assessment;
- Data quality assessment process;
- Data products and VO compliance;
- Timeline delivery of data products to the ESO archive.

The description of the content and the required information for each Section are described below.

4.1 Survey Observing Strategy

The PI must provide the observing plan for the duration of the entire survey based on the relevant EPS review deadlines illustrated at http://www.eso.org/observing/AboutSurveys.html .The observing plan must take into account the time requested for the execution of the complete survey on a semester-by-semester basis, as well as realistic expectations concerning the execution of observing blocks on the basis of external conditions (e.g. observations with 0".4 seeing cannot be acquired in a sequence of contiguous 8 hrs exposures!). In the review by the EST these requests will be compared with those stated in the submitted proposal. Specifically, this section must describe:

a) Scheduling requirements:

- total number of semesters, as well as the time requested per semester;
- total number of tiles (one for the start of each OB), their priorities and boundaries (either polygon or requested boundaries in RA, DEC, or g-long, g-lat) [2];
- number of repeats of these tiles in each filter;

[2] The SADT can help with generating the number within boundaries – use the mode where no guide or wave front sensor stars are sought.

- filters requested for each tiles, and requirements on the sequencing of observations. For example: are all tiles to be imaged in a given filter before moving to the next, or differently? Priorities for the filters?
- moon phases requirements, transparency requirements;
- time constraints – absolute or relative (see www.eso.org/observing/p2pp/P2PP_future.html).

b) Observing requirements:

- Requirements on seeing, transparency and fraction of Moon illumination as function of filter (see www.eso.org/observing/p2pp/P2PP_future.html);
- depth/exposure times (as a function of filter); whether any sky exposures are required in addition to the exposures at the target position;
- use of micro-step or jitter pattern: please be aware that Detector #16 in VISTA has a 200 pixel large bad pixel area. Specify the patterns required;
- indicate clearly whether a specific pawprint strategy is preferred over the standard 6-pawprint sequence (i.e. the order of the pawprints) covering a full tile.
- If not using 6-pawprints to make a tile in a single OB please give your preferred strategy and justification.

The following Table shows an (incomplete) example of much of the information required for the case of a standard 6-pawprint tiles in single filters where one tile occupies the whole OB (<1hr) (an Excel spreadsheet version is downloadable from www.vista.ac.uk/observing/spreadsheet/)

Table 1

R	Z	Y	J	H	Ks	FROM
Time & depth on sky in coadded Tiles						
Depth (Vega) required		21.9	21.4		20.3	Science
Sigma (Vega) required		10	10		10	Science
SED Assumed		BB5000K				PI
Aperture assumed - arcsec		1.6	1.6		1.6	PI
In band sky brightness assumed – Vega mag/arcsec		17.2	16.0		13.0	PI
Airmass assumed		1.5	1.5		1.5	PI
In band on-chip image size assumed - arcsec		1.0	0.9		0.8	PI
Extra Extinction assumed		0	0		0.08	PI
1Time required per object sec		3000	2400		10800	ETC
Area required sq. deg		230	230		230	Science

2	Tiles required to cover area(s)	145	145	145	SADT
	Priorities of different areas?				PI

Single Tile Strategy

Parameters set

3	Detector Integration Time (DIT) sec	20	10	6	PI
4	Exposure coadds (Ndit) #	5	8	15	PI
5	Exposure loops (Nexp) #	1	1	1	PI
6	Microsteps (Nmicro) # steps < 3 arcsec	1	1	1	PI
7	Jitters (Njitter) # steps odd # of 0.5 pixels < 30 arcsec	5	5	5	PI
8	Pawprints in tile (Npaw)	6	6	6	PI
	Repeat tile in same OB how many times?				PI
	Multiple filters in same OB? If so which?				PI
	Multiple tile positions in same OB? If so number?				PI

Resulting values

9	Total Exposure time/tile sec	3000	2400	2700	R3*R4*R5*R6*R7*R8
10	Total Elapsed time/tile sec	3378	2868	3378	ETC
	Total Elapsed time/tile hr	0.94	0.80	0.94	R10/3600
	Observing efficiency/tile %	88.8	83.7	79.9	R9*100/R10
11	Time per object for s-to-n sec -single OB	1000	800	900	R9/3
	Total object S/N - single OB – for QC monitoring	5.9	6.2	2.9	ETC

Multiple Tile Strategy

12	# of Tiles per filter for S/N	3	3	12	R1/R11
	Time links between OBs in same filter on a Tile?				PI
	Priorities between OBs in same filter on a Tile?				PI
	Time links between OBs on a Tile in different filters?				PI
	Priorities between OBs on a Tile in different filters?				PI
	Time links between Tiles by position?				PI
	Priorities between Tiles by position?				PI

	Total Elapsed Hours per filter	408.2	346.6	1632.7	R2*R10*R12/3600

You are encouraged to provide a (possibly expanded) version (or versions for more complex surveys) of such a Table/spreadsheet in your SMP.

ESO reserves the rights to optimize the scheduling in the RA-DEC space, as the data for the different surveys are acquired.

The PIs must familiarize themselves with the tools being developed by ESO to carry out the EPS Phase 2, e.g. SADT (www.vista.ac.uk/observing/sadt/) and the upgrade of P2PP (www.eso.org/observing/p2pp/P2PP_future.html), and provide information in the SMP about whether they are developing or testing any tools for planning and supporting the Survey Phase 2, and the monitoring of the status of the SM observations.

4.2 Survey Data Calibration Needs

Following established procedures for instrument commissioning at Paranal, a detailed observatory calibration plan will be prepared only after commissioning of VISTA[3], on the basis of its actual on-sky performance. It is therefore not possible to provide, at the moment, a definitive assessment of the content of the calibrations to be supplied by the observatory or of the ultimate photometric accuracy to be expected. The observatory calibration plan is not intended to satisfy (all) the needs of each single public survey.

The SMP must include the survey data calibration needs. The PI must describe any survey calibration needs whose executions require telescope/instrument time and have implications on their operations.

- Goal for photometric accuracy and homogeneity, astrometric accuracy within each tile, area or across different survey fields; need for airmass standards; list of specific additional requirements and frequency of calibrations (e.g. every observing night, every week, etc.).
- Calibrations aimed at the survey data including sky concentration, illumination correction; any additional flat-fielding requirements/strategies; correction for fringing in the *z* band (or any other).

4.3 Data reduction process

The PIs must submit a detailed description of the data reduction process as executed by the pipeline to be used. A block diagram synthesizing each step from the raw data to the calibrated product should be presented. The diagram must be accompanied by a detailed description indicating, for each step of the data reduction:

- the input science or calibration data to be used,

[3] For information a proposed draft for the VISTA Calibration plan is available at www.vista.ac.uk/vdfs/esoqc1/.

- the purpose of the step and the algorithms to be executed,
- the resulting intermediate products and their expected accuracy where applicable.

Applicable references to published descriptions of the adopted pipelines should be given, if existing.

4.4 Manpower and hardware capabilities devoted to data reduction and quality assessment

The PI must provide a description of:

- the detailed responsibilities of the members of the survey team;
- expected FTE already committed or to be committed;
- ESO will deliver the raw data to the Public Survey team on specific request. The PI must describe the tools, procedures and available hardware to deal with the data flow from the ESO telescopes.

4.5 Data quality assessment process

Although each product or set of products from EPS will be delivered with a measurement of fundamental quality parameters and their errors, the SMP must contain a section describing in detail the quality control process to be applied to the data. Specifically, this section should describe:

- quality control criteria and samples of control data to be used for validation;
- any other procedures that the team intends to carry out for quality assurance purposes;
- software tools to be used;
- planned validation of tools, procedures, and products.

The PIs are reminded that they have the sole responsibility of the quality and accuracy of the data products delivered to ESO archive, even if ESO reserves the right to carry out independent validation of representative parts of the delivered datasets.

4.6 Data products and VO compliance

Survey products will be delivered to the ESO archive in a format fulfilling the VO requirements. The following data products form part of the core delivery to the ESO archive:

- astrometrically and photometrically calibrated, co-added, re-gridded tiles, along with their respective weight maps, in all of the project-relevant filters;

- source catalogues for a tile based on individual, co-added bands. Associated source catalogues linking the parameters of individual objects across all of the observed filter bands;
- the survey products must be supported and characterized by additional information, i.e. meta-data, which provides a full description for their scientific exploitation. For a description and definition of meta-data we refer to: http://www.eso.org/observing/ps/VOS-RRD.pdf

In the case of VISTA, the tile is defined to be the basic building block of the survey because it allows a better synergy with the VST optical data products which will be present in the ESO archive. This will also ensure that there is a unique entry in the source catalogue for any objects within the same VISTA pointing[4]. For programs which do not observe a full tile in an OB, the partially filled tiles should be the basic building block, although where these partial tiles can be combined to make the full tiles this should be done.

The precise content of the catalogs to be delivered will depend on the scientific goals and exploitation possibilities of each individual EPS. The SMP should contain a detailed description of the proposed catalog contents, in addition to the core items listed above. In coordination with the PSP, ESO reserves the right to request from the PIs the expansion of the catalog contents with additional items that could enhance the scientific value of the data products or their use by the community at large.

The SMP should detail whether ESO may have access to more advanced science products, such as PSF-matched images and/or matched-aperture photometry across all observed filters, photometric redshifts, etc..

4.7 Timeline delivery of Data products

The PI must provide a time-plan which describes the data delivery to the ESO archive as the SM observations and the delivery of the raw data product progress. Following the PSP's recommendation, data products from the EPS team are normally expected to be delivered to the ESO archive within the semester following the one in which the raw data were sent to the EPS teams.

This timeline must include the milestones set by the progress reviews which will be conducted every 6 months, and the observing plan review every 4 semesters. These progress reviews will include status of data delivery from ESO to the EPS team, data delivery from the EPS teams to the ESO archive and VO, and delivery of data product from ESO archive to the community.

[4] The standard 6-pawprint sequence for a tile covers each sky position twice. Therefore catalogues from single pawprint for the same tile (or pointing on the sky) will be degenerate and not of optimal depth, since it is exposed for only half of the total exposure time.

5 Procedure for the Submission of the SMP

The relevant Guidelines for the SMP will be posted on the ESO web pages after the 03.11.06, and the form for the ESO SMP can be retrieved at www.eso.org/observing/webone.html.
The submission, review process, iterations and final approval of the SMP will follow and proceed according to the following timeline:

- Notification to successful PI of VISTA PS of the PSP and OPC outcome by 01.12.06.
- Deadline for submission of SMP by PIs of the OPC recommended EPS noon CET on the 16.02.07. SMP to be sent to team leader of EST (marnabol@eso.org).
- EST review ends on the 07.03.07 , with feedbacks sent to PIs so that synergies and optimisation between surveys can be implemented and the SMP revised.
- Submission of revised SMP by noon CET on the 02.04.07.
- End of SMP review and approval by ESO DG by the end of May 2007.