1 PESSTO : Public ESO Spectroscopic Survey for Transient Objects:

PI: S. J. Smartt, Queen's University Belfast, UK

1.1 Background

The proposal "A public spectroscopic survey of the Transient Universe" was recommended for implementation by the OPC and PSSP. We have formally named the survey "PESSTO : Public ESO Spectroscopic Survey for Transient Objects".

We have set up a management structure as outlined in Figure 1. The PI of the proposal (S. J. Smartt) is now the Survey Director and we have put in place an Executive Board consisting of members from main partners and leaders of input surveys. M. Sullivan (Oxford) is the first Chair of this Board. The Board have ultimate responsibility for delivery of a successful survey and have the authority to change the leadership and direction of the operating team.

While the Board will act as the highest level decision making body of the survey, the implementation of PESSTO will be carried out by the Survey Director and his operating team. This team contains four main groups

- Observing and management team (Leader : M. Sullivan) : responsible for ensuring that all the NTT runs are staffed as described in the Sect. 2.
- Target and Alert Team (Leader : A. Pastorello) : responsible for collating the data from the various input surveys and ensuring that the observing teams have access to target information for OB definition and design
- Data reduction and Quality Control team (Leader : S. Valenti) : responsible for providing the pipeline reduced data products and ensuring that a quality control system is implemented for data release.
- ETABASE and Archive Team (Leader : O. Yaron) : responsible for ingesting the reduced spectra from the survey into a publicly accessible database and making it available to the PESSTO survey team and the public

Our wiki page for the survey (which will change to be linked under www.pessto.org) is currently :
`http://star.pst.qub.ac.uk/sne/snewiki/index.php/Main_Page`

We recognise and accept the constraints that the OPC have put on the PESSTO program, which were communicated to us by Bruno Leibundgut in telephone conversations and emails :

- The team should assemble relevant spectra in ESO archive
- 45n/semester for 4 yr with option of 1 more year pending formal review on NTT
- Report to OPC in normal way each semester
- Formal review after 2 yrs full review with PSSP
- Requirement to release classification spectra as soon as taken and publicise objects for detailed study.

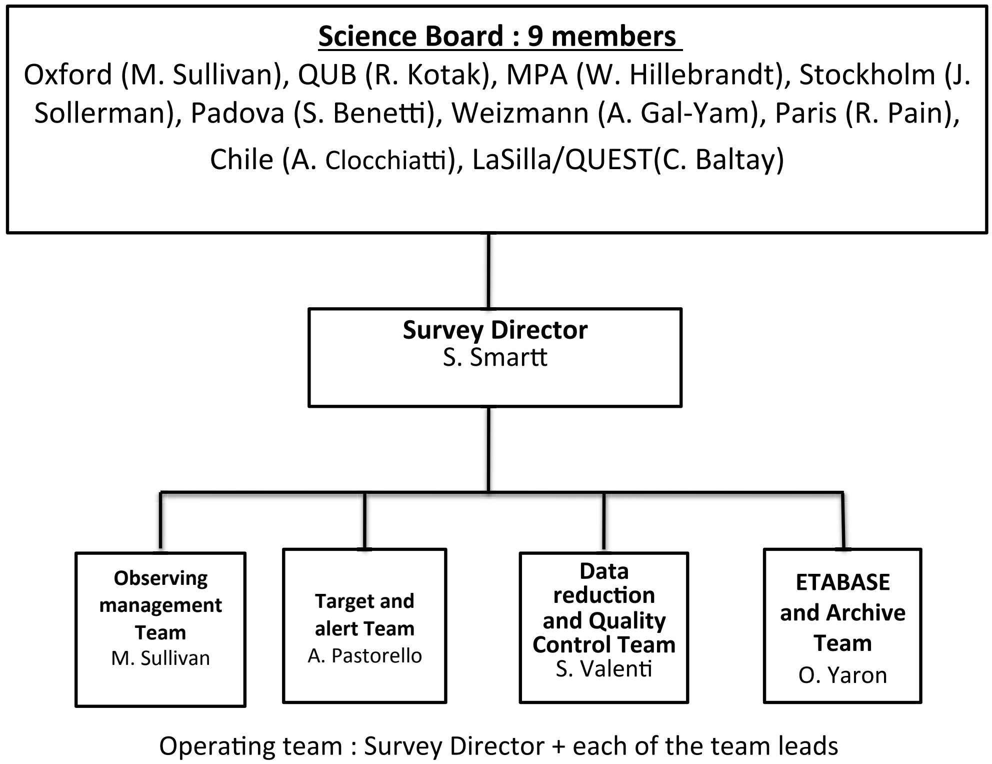

Fig. 1: Management structure for the PESSTO team. The Board have ultimate responsibility for delivering a successful survey and data and have appointed S. Smartt as Survey Director.

2 Survey Observing Strategy

All observations will be executed in visitor mode, as required by ESO. A requirement of the PESSTO survey is rapid reduction of the spectroscopic data to ensure that the transient object management (both classification and follow-up) proceeds smoothly and rapidly. Hence we have designed the Survey Observing Strategy jointly with the Data Reduction plan to ensure that this critical aspect of the survey is properly resourced and efficiently implemented. This Section deals with the procedure for selection of transient targets, preparation of the OBs and execution of the observations.

Providing coverage with experienced observers for 90 nights per year is a significant challenge. We have the commitment of all our consortium member institutions to provide the manpower to cover the observing runs and data reduction. We are also committed to delivering student training on the NTT as an integral part of this Public Survey. Given that the survey will run for either four or five years, we will necessarily have a turn-over in student and postdoctoral staff. Hence we request a waiver of the the normal ESO rule that only co-I's on the original proposal can be funded as observers. We will recruit and train a large number of PhD students in carrying out the observations and data analysis, as well as science exploitation, and a waiver of the normal rule is essential for logistically managing this survey. In addition, many institutes will recruit new postdocs in their teams who will carry out the observing programme in the future.

We are proposing the following strategy.

- Each 10N run within a lunation is broken down into 3 shifts 4ON/5OFF/3ON/5OFF/3ON (as illustrated in Fig.2, and discussed in Sect. 2.1). The run will be covered by 2 observers who travel to Chile. The first is the lead observer, an experienced observer of postdoc level or above. The other is a student, who must have had some previous observing experience (i.e. should not be a complete novice). Previous NTT experience is not specifically required. We request funds from ESO to cover the costs of these two observers (which meets the normal ESO rules for runs longer than 5 nights) . The PESSTO team will encourage partner institutes to send a third student observer, for training, subject to agreement from ESO. The third observer funding would be covered by the partner institutes rather than ESO.
- The experienced (lead) observer should stay for at least the first run of 4 nights, during which time he or she should ensure that the experienced student is trained on the NTT and comfortable to run the remaining 2×3N shifts runs by themselves. In some cases the experienced observer will stay to cover the first 2 shifts.
- When the lead observer departs, the trained student then takes over the role of lead observer for the remaining two shifts. The purpose of having a third student observer would be to train as many students as possible giving a larger pool of experienced student observers for future years.
- The 2 observers in Chile will be supported by a data reduction team in Europe (or equivalent home institute). This must be a minimum of one named person who will carry out the data reduction during the lunation. The requirements are listed below in the Data reduction Strategy Section. It will be the responsibility of each institute to ensure that the observing team and the data reduction team are functional and meet the requirements laid out here.
- We define the "Observing Team" as the NTT observers together with the data reducers in Europe (or other home institute).

The observing team are responsible for coordination with the Target and Alert Team to define and prepare the night plan and the instrument OBs for the entire run covering one lunation.

We will run the observing time in Queue mode fashion, with approximately 70% of the OBs normally being defined not later than 3 days before each run starts. However as our science goals require us to find, classify and follow-up transients discovered as young as possible, hence it is essential that we have the flexibility to change targets and definte OBs up to and during the run. Members of the PESSTO survey (especially those linked to the feeder surveys) can propose urgent observations of new targets also during the observing run (a type of internal ToO mode). The Target and Alert Team can accept or reject the proposed targets for the ToO mode and supplies the necessary information to the observers, requiring immediate observations. A typical situation is when a survey for transient objects is producing targets rapidly enough that fast transients can be identified on the same night, so that we will allow our own ToO type of over-ride. We will design a web-based tool for the input surveys to send target information, and this will be managed by the "Target and Alert Team". The La Silla observers will design the OBs based on this information. We are developing this web-based tool at Queen's.

The *Observing and Management Team* are in charge of ensuring that all the runs are staffed properly and that the experienced and student observers are allocated to the runs properly. The Team leader will draw up the observing rota for each period and also ensure that there are named researchers in Europe to take care of the rapid reduction and analysis as discussed below. This is mainly a personnel task but requires linking with the other teams to ensure that the appropriate expertise is available on every run.

2.1 Scheduling requirements

In each calendar year we request that PESSTO runs for 9 lunations and that during each lunation we have a 10N run, which is broken down into sub-runs of 4N, 3N and 3N, each separated by 5N. The optimal schedule for these runs is illustrated in Fig. 2. The reason for running for 9 lunations instead of the full calendar year is

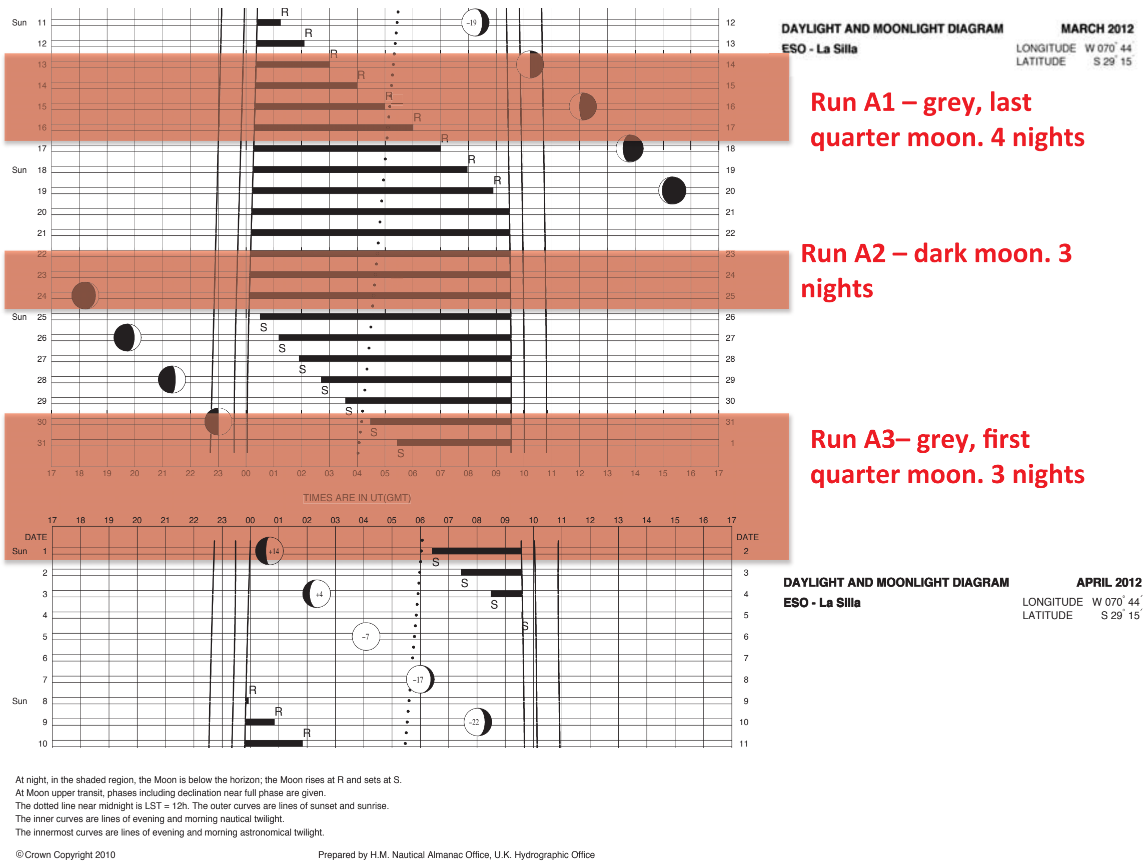

Fig. 2: Example of the observing strategy during one lunation. One run of 10N during a lunation (labelled run A) will be broken down into three sub-runs (A1, A2, A3) of duration 4N, 3N and 3N.

that the total time for the survey was recommended by ESO to cover a 5-year period (rather than 4). Hence PESSTO could either have less frequent runs over 12 months, or more densely sampled runs over a shorter period. Given the science proposed, the PESSTO Board and Survey Director strongly recommend that the survey runs for a shorter period in any one year.

The 9 lunations will cover the periods 1 Jan - 30 Apr and 1 Aug - 31 Dec. We will not observe during the three months May - July. This will benefit the ESO community as we will avoid the RA ranges that traditionally have high pressure (see Call for Proposals P89 - Fig 3) on the NTT. The high pressure RA range is 16.30 - 18.30, as this is the Galactic Centre season. For extragalactic SN searches and follow-up, we want to avoid this period (May - July), but the ESO commuity traditionally has high demand for NTT use to observe the Galctic centre, plane and bulge. This also matches the period during which the LaSilla/Quest SN survey will operate, and this survey will be a major source of targets. The one exception to this is that we ask to run in May-June of P89, for two reasons (see Tables 1 and 2). One is that the Benetti Large Programme will be subsumed within our Survey, but we have an agreement to share time with them to ensure that proprietary program is complete. The second is that we want three months of survey operations, and two months break to smooth out all the data flow and logistics of running a real time transient classification and follow-up campaign of this magnitude.

Table 1: Scheduling requirements. Note that the 10N runs will be broken down into three sub-runs of 4N, 3N and 3N, separated by approximately 5N (see Fig. 2).

Period	Number of nights	Number of runs per period	Number of observer per runs	Average run length
P89*	40*	4*	2*	10N*
P90	60	6	2	10N
P91	30	3	2	10N
P92	60	6	2	10N
P93	30	3	2	10N
P94	60	6	2	10N
P95	30	3	2	10N
P96	60	6	2	10N
P97	30	3	2	10N
P98	50	6	2	10N

* : as discussed in the original proposal. Part of the PESSTO team (PI: Benetti) have a large program running, which will be subsumed into Public Survey (184.D-1140 ; Supernova Variety and Nucleosynthesis Yields). 184.D-1140 is scheduled to have 3N per month in Period 89, during Apr-June and Sept. (total of 12N). The 40N requested in P89 includes those 12N, and the PESSTO team will work with the 184.D-1140 PI to ensure that the science in 184.D-1140 is completed sufficiently.

2.2 Observing requirements

The observing requirements and list of runs for two example periods (Period 90 and Period 91) are given in Table 2. Indicative RA ranges for the targets (which can't be defined as this is transient classification and follow-up) are given. In even number periods we request 6 runs, each spread over 6 lunations as detailed in Section 2.1.

We have not provided priorities for each of the RA ranges, as they are all equally weighted. The RA ranges of our targets will be determined by the feeder surveys that will produce the target lists. The southern SkyMAPPER survey will run all year, with a relatively flat weather pattern. The LaSilla/QUEST survey will not run during May-July, hence in odd number periods we request only three months and will have fewer targets in the RA range 15hr-20hr. In summary we have low priority for the range 15hr-20hr, and equal priority for the other RA ranges. It is essential that we have roughly equal monitoring periods across 9 lunations between August through to April in order to match with the survey discoveries and to ensure we provide the time-series follow-up as presented in the original proposal.

3 Survey data calibration needs

The final data product is a wavelength calibrated, flux calibrated and telluric corrected spectrum of each target (with several epochs for the monitoring targets). For EFOSC2 the standard calibrations taken during the night (and afternoons) will be sufficient. Observations of flux standards and telluric standards will be taken three times in any one night, as is standard for SN time series spectra.

For SOFI, our experience with the NTT Large Programme (Benetti et al. 184.D-1140) informs our plans for calibration. We will ensure that a telluric standard is taken at a similar airmass to the SN target, and these can be frequently shared between standards. Spectroscopic flux standards will be observed approximately 3-4 times during the SOFI observing and we have previously employed this strategy successfully in 184.D-1140.

Table 2: Observing requirements

Period	Month	Run	RA ranges s	N. of Nights	Av. Moon	Transp.	Instrument
P89	APR	A1	08-19hr	4	G	Any	EFOSC2+SOFI
P89	APR	A2	08-19hr	3	D	Any	EFOSC2+SOFI
P89	APR	A3	08-19hr	3	G	Any	EFOSC2+SOFI
P89	MAY	A1	10hr-21hr	4	G	Any	EFOSC2+SOFI
P89	MAY	A2	10hr-21hr	3	D	Any	EFOSC2+SOFI
P89	MAY	A3	10hr-21hr	3	G	Any	EFOSC2+SOFI
P89	JUN	A1	10hr-21hr	4	G	Any	EFOSC2+SOFI
P89	JUN	A2	10hr-21hr	3	D	Any	EFOSC2+SOFI
P89	JUN	A3	10hr-21hr	3	G	Any	EFOSC2+SOFI
P89	SEP	A1	19hr-04hr	4	G	Any	EFOSC2+SOFI
P89	SEP	A2	19hr-04hr	3	D	Any	EFOSC2+SOFI
P89	SEP	A3	19hr-04hr	3	G	Any	EFOSC2+SOFI
P90	OCT	A1	21-06hr	4	G	Any	EFOSC2+SOFI
P90	OCT	A2	21-06hr	3	D	Any	EFOSC2+SOFI
P90	OCT	A3	21-06hr	3	G	Any	EFOSC2+SOFI
P90	NOV	B1	00-08hr	4	G	Any	EFOSC2+SOFI
P90	NOV	B2	00-08hr	3	D	Any	EFOSC2+SOFI
P90	NOV	B3	00-08hr	3	G	Any	EFOSC2+SOFI
P90	DEC	C1	02-10hr	4	G	Any	EFOSC2+SOFI
P90	DEC	C2	02-10hr	3	D	Any	EFOSC2+SOFI
P90	DEC	C3	02-10hr	3	G	Any	EFOSC2+SOFI
P90	JAN	D1	04-12hr	4	G	Any	EFOSC2+SOFI
P90	JAN	D2	04-12hr	3	D	Any	EFOSC2+SOFI
P90	JAN	D3	04-12hr	3	G	Any	EFOSC2+SOFI
P90	FEB	E1	06-14hr	4	G	Any	EFOSC2+SOFI
P90	FEB	E2	06-14hr	3	D	Any	EFOSC2+SOFI
P90	FEB	E3	06-14hr	3	G	Any	EFOSC2+SOFI
P90	MAR	F1	07-17hr	4	G	Any	EFOSC2+SOFI
P90	MAR	F2	07-17hr	3	D	Any	EFOSC2+SOFI
P90	MAR	F3	07-17hr	3	G	Any	EFOSC2+SOFI
P91	APR	A1	08-19hr	4	G	Any	EFOSC2+SOFI
P91	APR	A2	08-19hr	3	D	Any	EFOSC2+SOFI
P91	APR	A3	08-19hr	3	G	Any	EFOSC2+SOFI
P91	AUG	A1	17hr-02hr	4	G	Any	EFOSC2+SOFI
P91	AUG	A2	17hr-02hr	3	D	Any	EFOSC2+SOFI
P91	AUG	A3	17hr-02hr	3	G	Any	EFOSC2+SOFI
P91	SEP	A1	19hr-04hr	4	G	Any	EFOSC2+SOFI
P91	SEP	A2	19hr-04hr	3	D	Any	EFOSC2+SOFI
P91	SEP	A3	19hr-04hr	3	G	Any	EFOSC2+SOFI
P92	pattern	repeats	(as per P90)	...	...	...	

Again these can be shared between targets. For example 12min telluric standard + 8 min spectrophotometric flux standard (20 mins) taken between the observations of 2 targets (2 OBs of 2.5hrs) is typically sufficient to service both targets and is about 6% of the target time. To calibrate JHK imaging, we typically employ 3-4 NIR standard *fields* (but only if the conditions are photometric), and this generally allows photometry to 3-5% precision which is the scientific aim. For non-photometric nights we will employ 2MASS calibrations and revisit fields to set up a secondary sequence when necessary (on subsequent photometric nights). While we can not be too prescriptive in terms of exact time accounting for standards, our experience with SOFI dedicated nights is around 10% for the calibrations needed to calibrate spectra and photometry to the precision required for SN physics.

There are no other special requirements and the calibration data will be self-contained within the Public Survey time.

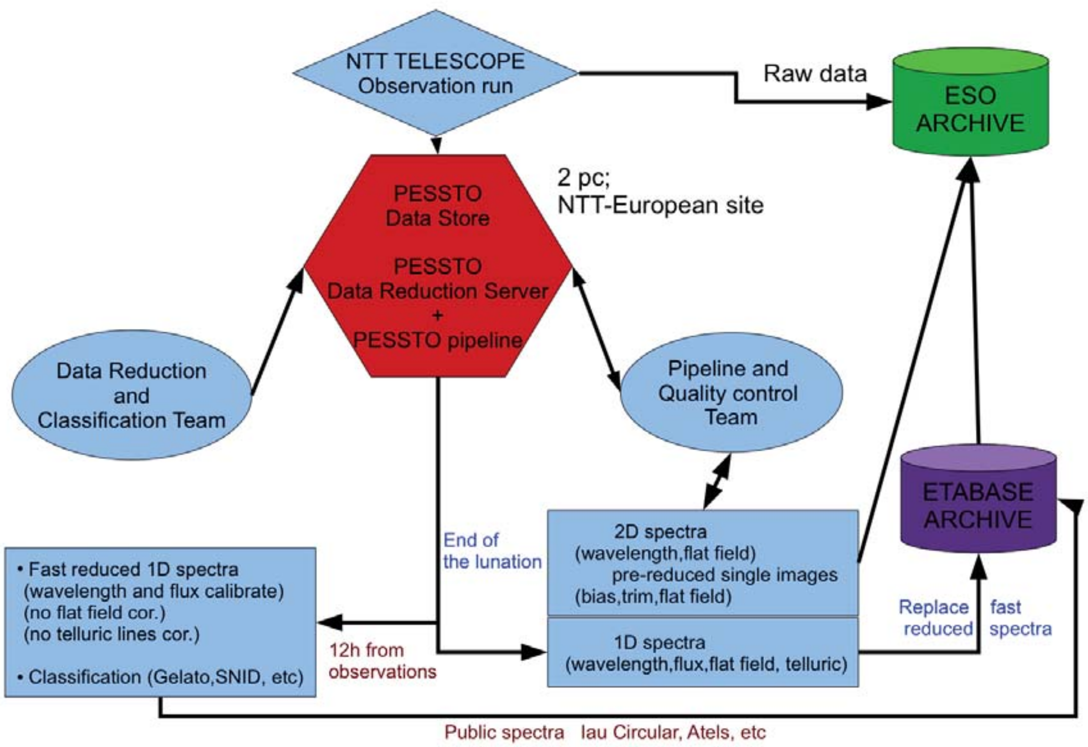

Fig. 3: PESSTO flow diagram for data reduction.

4 Data reduction process

The data reduction for PESSTO is defined by two competing needs. One is to have reduced, calibrated spectra of **new** transients available to the consortium and to the public within 24rs of the end of the Chilean night. This is a requirement of PESSTO initiated by the PESSTO Board and Survey director. This data product is defined as the “rapid spectra”. The second, competing, requirement is to have highest quality data reduction product (defined as the “final spectra” data product) to be ingested into the ESO archive. We recognise that producing a “final spectra” data product within 24hrs of the end of the Chilean night is difficult, if not impossible task due to the manual interaction often required to produce spectra which are as good as can reasonably be expected (e.g. optimally calibrated fluxed spectra, best possible host galaxy subtraction, telluric absorption removal, complete de-fringing). Hence we have a two stage approach to the reduction process.

4.1 "Rapid Spectra" reduction process

All the collected spectra of new transients will be rapidly reduced by the Data Reduction and Classification Team (see next section), using a dedicated tool *PESSTOfastspec*, we have constructed and tested for the current ESO LP (184.D-1140). This is a python script that is part of the reduction pipeline we are using. *PESSTOfastspec* is a python script based on the python modules pyraf and pyfits that provides a fast reduction of the EFOSC2 spectra using pre-reduced calibration files available in the PESSTO pipeline archive. The extraction will be still computed manually by the reducer (in order to be able to reduce also spectra with low signal to noise ratio), while wavelength and flux calibration will be performed using pre-reduced calibration files from previous runs. A check in wavelength calibration is then automatically performed using the sky lines. For the fast spectra reduction no fringing correction will be applied and no telluric features will be removed. The spectra of the new transients will be than classified and uploaded on the ETABASE public archive immediately (see the flow diagram in Fig. 3).

We request the ability to place a machine (linux based operating system) on La Silla, with a version of our pipeline running. This will allow the observers the ability to do immediate reductions to check signal and scientifically inspect fast and interesting transients. Between the observers and the european back-up team, all data will be reduced within 24hrs *and* a spectral type deduced.

We want to make this machine identical to the one we have purchased and installed already in Padova. It is a Dell rack mounted machine :

- Dell PowerEdge R710 Rack Chassis, Up to 6x 3.5" HDDs, C2, TPM, No Internal TBU Support
- Operating system : centos
- We need to have the machine networked and an IP address. We need to be able to access the machine remotely to administer the pipeline software.
- Timeline for installation is before the first PESSTO run in April 2012. We will aim to ship it out to La Silla approximately 2 months before the first run. If ESO can network the system we can ensure it works remotely and we will arrive earlier than normal for final shake down. We envisage Stefano Valenti will do the first observing run to ensure systems are working.

4.2 "Final Spectra" reduction process

Data Reduction and Classification Team will be also in charge of performing the "Final " reduction, but on a longer time scale. This includes the pre-reduction of all the images acquired during each lunation with EFOSC2 and SOFI and the reduction of all the spectra. The pre-reduction for the EFOSC2 images include correction for bias, trim, overscan and flatfield, but also fringing correction for the images in I band. The pre-reduction for the SOFI images include also sky-subtraction and correction for illumination and crosstalk (see SOFI manual). All correction will be performed using the calibration data obtained during the same lunation. The final spectra reduction of EFOSC2 data include bias,overscan, trim and flatfield correction, wavelength and flux calibration and correction for the telluric features. Also these are computed using the calibration files obtained during the same lunation. Several tools are already included in our reduction pipeline in order to perform this reduction. A python tool for SOFI spectra reduction will be constructed and tested and included in our pipeline in the next few months in order to perform the final spectra reduction of SOFI data using our pipeline. All the final reduced data will be uploaded both on the ETABASE archive and the ESO archive. The fast reduced spectrum on the ETABASE archive will be updated with the final reduced spectra. This data product is the final spectra that we will deliver to the ESO archive, we do not plan a full re-processing of data at the end of the survey as by

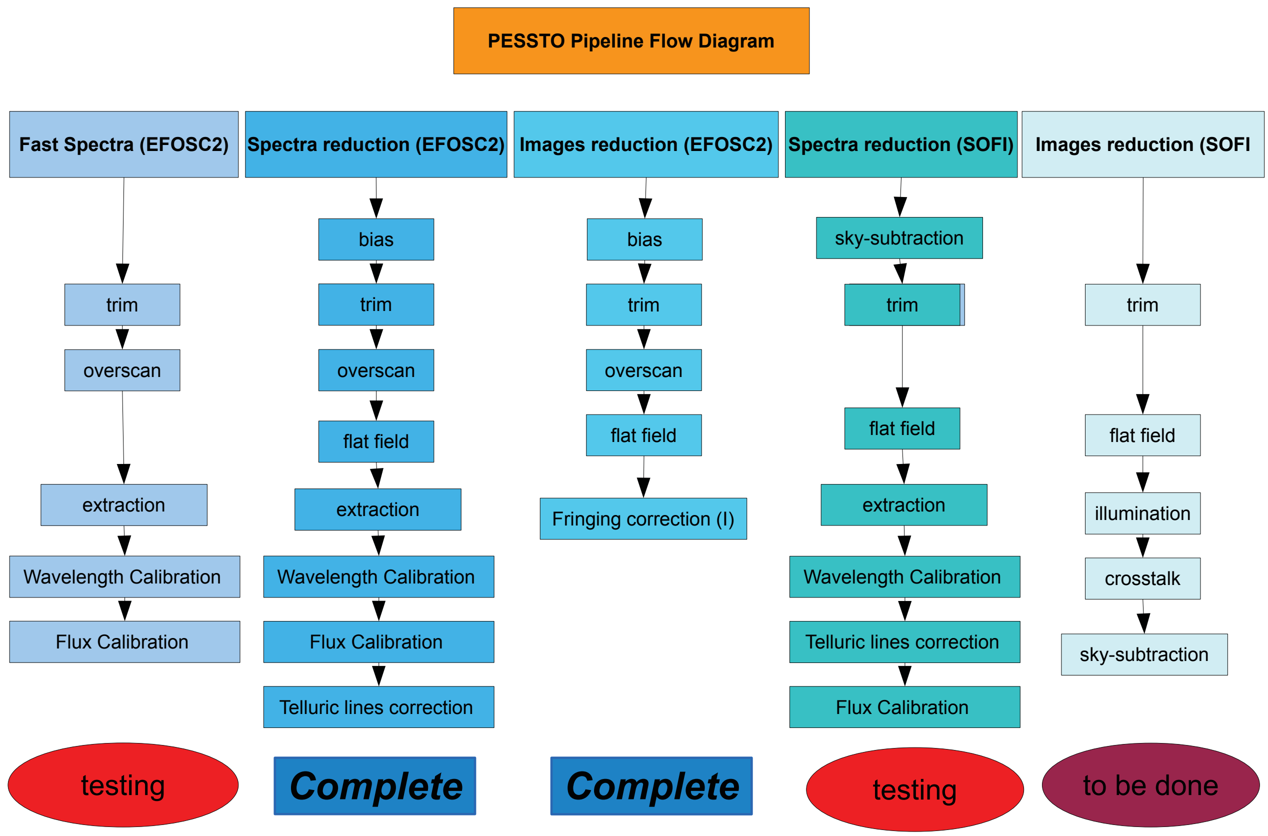

Fig. 4: Flow diagram for data reduction steps in the EFOSC2 and SOFI pipelines

definition we will already have produced our best quality data product at the end of each Period, as described here.

The actual processing steps for the data reduction of the EFOSC2 and SOFI imaging is illustrated in Fig. 4.

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

The data reduction process is not dependent on significant computing needs, as it is reduction of single-chip, single object, medium-resolution spectra. Hence there is no major hardware purchasing required for data reduction - all the participating institute partners would have adequate computing facilities to deal with data reductions as required. The University of Padova will host the PESSTO Data store, which is the staging area for the raw data ingest and the location for the data reductions. While this is not a major hardware project, adequate backup and redundancy will be employed to ensure there is no risk of data product loss. There is a requirement for final data storage (as discussed below) but this again is fairly trivial in terms of disk space. However a significant amount of user interaction is required for the reductions, even with the pipeline. Fig.9 shows a conservative estimate of the data volume that will be accumulated during the 5-yr survey. The total is around 1TB, which is easily manageable for ESO and in fact all major institutes would be capable of hosting

Raw Data Volumes from PESSTO (assuming 5 yrs)			
EFOSC2 Raw Data Volume	**No. of Image** (per night)	**Size of Chip** (MB)	**Total data** (GB)
Raw Science data	100	10	1
Flats	25	10	0.25
Biases	25	10	0.25
Skyflats	25	10	0.25
Total (per night)			1.75
SOFI Raw Data Volume	**No. of Image** (per night)	**Size of Chip** (MB)	**Total data** (GB)
Science data	1000	2	2
Flats	250	2	0.5
Biases	250	2	0.5
Skyflats	250	2	0.5
Total (per night)			3.5
Total Number of nights	450		
Weather loss	1		
Total number of EFOSC2 nights (80%)	270		
Total number fo SOFI nights (20%)	68		
Total EFOSC2 data volume (GB)	473		
Total SOFI data volume (GB)	236		
Total Data Volume (GB)	709		

Archived Science data from PESSTO (assuming 5 yrs)			
	No. of Image per night	Size of Chip (MB)	Total data (GB)
EFOSC2	100	10	1
SOFI	1000	2	2
Total Number of nights	450		
Weather loss	0.75		
Total number of EFOSC2 nights (80%)	270		
Total number fo SOFI nights (20%)	68		
Total EFOSC2 data volume (GB)	270		
Total SOFI data volume (GB)	135		
Total Data Volume (GB)	405		

Fig. 5: A conservative estimate of the total data volume that will be accrued during the survey.

all the data. The challenge in PESSTO is not the data volume, but ensuring that the spectral reductions are consistent and homogeneous, providing the reduced spectra of transients as soon as possible to the community and ensuring the meta-data (information on the transient and its spectral classification) are linked easily and efficiently to the reduced publicly released spectra.

The Raw Data Volume (0.7TB) will be publicly available in the ESO archive, and we will also keep a copy on the PESSTO Data Store server (at University of Padova), which will be used for all pipeline reductions. Along with the 1D fully calibrated spectra, we will also release the detrended 2D images so that a re-extraction can be done by any interested user (e.g. to improve galaxy background subtraction, or extract another part of the host galaxy for metallicity measurements). We will link the calibration frames (flux and telluric standards) to these data products so that a user-defined product is easily constructed.

During an observing lunation, as described in Sect. 2 above, the Observing Team in Chile will be supported by the a “Data Reduction and Classification” team in Europe. This team will copy all data at the end of the Chilean night to the PESSTO Data Store. This will be a Linux machine based at the University of Padova which will host the EFOSC2 and SOFI pipelines that we already have constructed for the current ESO LP (184.D-1140) using these two instruments. The "Data Reduction and Classification" team in Europe will directly access the pipeline here (through VNC or other virtual machine processes) and reduce the data to 1D, flux calibrated spectra as discussed in Sect.4. The Observing Team in Chile will do some rapid data reduction at the NTT, but the "Data reduction and Classification Team" in Europe will be the backup and ensure all data is reduced at the end of the night. This team as a whole are responsible for the producing the "Rapid Spectra" and "Final Spectra" within the timescales given in Sect.4. The personnel for this team will be drawn from the people within Table 6, Mark Sullivan will be in charge of drawing up the shift rota for both the NTT observers and the data reducers based in Europe. We will have a strict rota system for the data reduction and the team members will commit to being fully available for the lunation for data reduction, fast classification and final ingest into the archive system. As head of the Data Reduction and Classifcation team, Stefano Valenti will oversee the process of data reduction and ensure the teams fulfill their responsibilities.

All imaging data taken with EFOSC2 and SOFI will go through the data reduction pipeline illustrated in Fig.4.1, and will be publicly released along with the 2D spectral images at the end of the lunation.

6 Data quality assessment process

The "Data Reduction and QC team" (Team leader : S. Valenti) will carry out systematic checks on the quality of the spectroscopic reductions. The team will be in sole charge of the EFOSC2 and SOFI pipelines, and will have responsibility for maintaining the software and providing any updates (e.g. with respect to instrument adjustments, FITS header changes etc). The team will ensure that all data are reduced, calibrated and gathered for archiving in a homogeneous way.

The methods used will be

- Full documentation and user manual for the reduction pipeline (will be made public on our PESSTO webpages)
- Workshops organised during October 2011 - April 2013 (i.e. covering first year of survey, and 6 months preparation) to familiarise all users with the pipeline
- Random set of spectra taken from the "Final reduced" data sets and one of the QC team will inspect these each lunation
- Random set of images taken from the "Final reduced" data sets and one of the QC team will inspect these each lunation

7 External Data products and Phase 3 compliance:

The PESSTO team are committed to providing prompt and useful data products to the consortium and the public. We recognise the need for Phase 3 compliance and also the requirement that we should assemble the time series data in an easily usable, searchable and accessible format. This comes from the OPC and PSSP recommendations. Additionally the OPC and PSSP recommended that we assemble all publicly available time series spectra that exist already (through ESO programmes and others) in order to enhance the value of this SPS. We recognise that this is reasonable and essential - there are already many types of supernovae for which excellent template time series spectra already exist e.g. normal type II-P , Ia and Ic SNe in solar-type metallicity environments. We have already developed a database system that serves these data to the public and this will form the basis of our system to release the data quickly and also to archive the final data products in a scientifically useful way (search by object, type, class, etc).

We are calling this part of the survey the *ETABASE* system - *ESO Transient Database*. The data products and meta-data that we will return as Phase 3 are as follows

Table 3: Allocation of resources within the team. The percentage FTE **per year** from the current team members. In total we have 7.8 FTE per year dedicated to the project. This also does not include a a number of additional PhD students and postdocs at our institutes who will be hired to work on the survey and contribute through observing, data reduction and scientific analysis.

Name	Function	Affiliation	Country	% FTE allocated to project
Team Leads				
S. Smartt	Survey Director	Queen's U.	UK	50
M. Sullivan	Obs. Management Lead	Oxford	UK	50
A. Pastorello	Target Lead	INAF Padova	It	50
S. Valenti	Data reduction Lead	INAF Padova	It	50
O. Yaron	Archive Lead	Weizmann Inst.	Is	50
Target and Alert Team				
N. Elias-Rosa,		ICE(IEEC-CSIC)	ES	20
V. Stanishev,		CENTRA/IST	PT	20
S. Taubenberger,		MPA	DE	20
M. Stritzinger,		Stockholm	SE	20
G. Pignata,		Univ. Chile	CH	20
J. Anderson,		Univ. Chile	CH	20
R. Kotak,		Queen's U.	UK	30
M.T. Botticella		Naples	It	20
C. Baltay		Yale	US	20
K. Maguire		Oxford	UK	20
S. Bongard		LPHNE	FR	20
M. Dennefeld		IAP-PARIS	FR	20
Data Reduction and QC team				
B. Schmidt,		ANU	AUS	20
C. Inserra,		Univ. of Catania	It	30
S. Mattila,		Univ. of Turku	FI	20
M. Fraser,		Queen's U.	UK	50
F. Patat,		ESO	DE	10
M. Sullivan,		Oxford	UK	...
G. Pignata,		Univ. Chile	CH	...
E. Cappellaro		INAF Padova	It	30
E. Kankare		Univ. of Turku	FI	30
Archive Team				
R. Kotak		Queen's U.	UK	...
S. Valenti		INAF	It	...
S. Benetti		INAF	It	30
A. Pastorello		INAF	It	...
M. Sullivan,		Oxford	UK	...
A. Gal-Yam		Weizmann	Is	20
S. Smartt		Queen's U.	UK	...
K. Smith		Queen's U.	UK	30
J.B. Marquette		IAP-PARIS	FR	20
Observing Management Team				
M. Sullivan,		Oxford	UK	...
M. Dennefeld		IAP-PARIS	FR	...
TOTAL % FTE per year				780

1. One-dimensional wavelength and flux calibrated spectra for every target observed (either EFOSC2 only, or EFOSC2 and SOFI), including the extracted sky spectrum, the variance spectrum map. As discussed in Sect.4, the "rapid spectra" will be released within 24hrs of the end of Chilean night. The "final spectra" will be released to PESSTO consortium team at the end of the lunation, and publicly at the end of the Period in which the data were taken.

2. Two-dimensional wavelength calibrated and distortion corrected spectral frames. These frames will also be released so that users can, if necessary, go back one step to adjust the extraction (e.g to change galaxy background subtraction, or to extract the galaxy itself as a way to measure metallicity in some cases). We cannot forsee all uses that external scientists may have, hence we will provide this product as an added extra to ease the re-extraction and flux calibration of spectra.

3. Spectral time series for EFOSC2 optical (and were appropriate SOFI NIR) for the targets that we pick for detailed monitoring. In the science proposal we proposed to gather time series for 150 objects.

4. The associated information on the target will be released : host galaxy (if catalogued), redshift, type, discovery dates and details. A spectral type will be estimated through one of the standard SN cross-correlation tools (SNID ; Superfit ; GELATO). The choice of which one to use will be made as we test how to integrate this classification within the data flow from spectral reduction to the public archive server.

5. We will maintain a unique target identifier, precise coordinates for each target during the whole survey and ensure that all data products (1D, 2D spectra) are named and tagged accordingly. The catalogues of observations, and associated information (galaxy, redshift, SN type etc) will be delivered to ESO at the end of each Period. These catalogues will be formatted according to ESO Phase 3 standards.

6. For the majority of the transient objects selected for time series follow-up monitoring, we will gather photometric time series (light curves) to support the scientific programme. These will come from a combination of the EFOSC2 and SOFI imaging at the same time as spectra are taken; the SkyMAPPER (multi-colour) photometry which will be provided during their SN rolling search; our personal access to the SWOPE telescopes, the LCOGT and Liverpool Telescopes, the CHASE 0.5m and the Tenerife Carlos Sanchez telescope. The photometric data (i.e. measurements) will be linked to the spectra within the *ETABASE* system when the photometric sequence is complete.

We will work with ESO to ensure that the spectra we provide will comply with Phase 3 data standards which will be extended in due time to account specifically for spectroscopic data products. [1]

However already within our consortium we have a database infrastructure built that is ready to receive the various strands of the spectral reduction and make them publicly available along with the associated meta-data and information on targets. The Wiezmann group (led by Avishay Gal-Yam, and with Ofer Yaron as head of our archive team) have developed the "WIS Experimental Astrophysics Spectroscopy System" (WISEASS). [2] This searchable database is now the world leading repository for publicly available supernova and transient spectra. It has built on the functionality of SUSPECT and is better designed than the other internal archives that some of our institutes have running locally (e.g. in QUB and Padova). It is also scalable in that it could receive *all* of the 1D spectra from the PESSTO survey and serve it directly to the public.

We propose to work with ESO to implement a long term solution to the curation and archiving of the PESSTO spectra, based on the functionality and user interface of WISEASS. The options and current status of our system is as follows.

- The WISEASS system is fully operational, and includes much (if not all) of the publicly available set of spectra for those SNe which have excellent time series spectra. These include prototypes for the various "normal" SN types (Ia, Ib, Ic, IIb, II-P, II-L) and many of the more peculiar exotic explosion types that have been discovered over the past two years.

[1] http://www.eso.org/sci/observing/phase3.html
[2] http://www.weizmann.ac.il/astrophysics/wiseass/

- The WISEASS system can be searched by : object name, type, date, position.
- The WISEASS system as it stands would currently be capable of ingesting the 1D time series spectra from the "rapid spectra" pipeline and making it available publicly. The system could also be updated to take the "final spectra".
- We have already tested ingest into WISEASS direct from the *PESSTOfastspec* output and are developing methods to make this function work automatically and smoothly.

8 Timeline delivery of data products to the ESO archive:

A work plan for the future is as follows

1. To comply with the Phase 3 requirements, we will ensure that the data products which go immediately into WISEASS (the final spectra, at the end of the lunations) are then transferred to ESO. The "rapid spectra" will be available within 24hrs of the end of the Chilean night through WISEASS, and the "final spectra" will be transferred to ESO at the end of the Period.
2. However we believe that for the Phase 3 data for transient time series spectra to be scientifically useful, a database search tool *at ESO* is required to provide all the information. This also needs to serve the 2D images (pre-extraction) stage.
3. We will develop a plan with ESO archive group to provide an ESO based search facility, similar to (or based on) WISEASS that will provide a scientifically useful search engine aswell as serving the data. This ESO based archive (ETABASE) would be a natural long term home for all public spectra that we have already integrated within WISEASS. Solutions range from a link to WISEASS from the ESO portal (which we can do immediately), a live mirror of WISEASS at ESO that is updated daily, to a standalone copy of WISEASS that ESO maintains and can modify.
4. The development of this database structure will take place in discussion with ESO. *In order to host a useful interface to the ESO Phase 3 data, we would require software development support in Garching to develop and maintain this database.*
5. By the end of first year of survey operations (April 2013) we will ensure that all time series SN data products from non ESO facilities that are scientifically valuable (as determined by the Archive Team) are provided as part of Phase 3. These will be provided *if* the data that we have within WISEASS meets the Phase 3 standards.

We note that already we have the infrastructure (WISEASS) to make the pipeline reduced data publicly available and we will work with ESO to find a long term solution to providing a scientifically useful search engine with functionality for the transient community.