

How to make TAIPAN happen

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TAIPAN workshop

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Requirements

- A compelling science case
- A strong and diverse survey team
- Telescope refurbishment, positioner replacement & spectrograph upgrade
- An efficient low-cost operating model
- A clear plan for survey utilisation



Science Case

- Science case components...
 - A small set of compelling primary goals
 - + A clean, direct, one-step measurement of H_0 to $<2\%$ with BAO
 - + Mapping large-scale structure and the velocity field in the local universe to $z \sim 0.1$ to obtain unique cosmological constraints
 - + ...and perhaps others to be discussed at this workshop
 - A diverse set of secondary goals
 - + Generally, science utilising a complete census of galaxies in the local universe down to relatively low masses/luminosities
 - + Also, selected subsets of particular types of target of specialised interest (maybe at higher redshifts or lower luminosities)
 - + The secondary goals greatly extend the scope of the survey science and make the science team broader and more inclusive



Survey Team

- TAIPAN needs a large and diverse survey team...
 - In order to carry out the wide variety of science enabled by the survey and ensure that it is highly productive – i.e. to ensure the the survey offers good value for money
 - In order to generate the strong science case needed to justify and support the survey – i.e. to justify the capital investment by the AAO, to raise ARC LIEF funding for hardware, and to win ARC D-P grants to support survey operations and science
 - The survey team should be open to all, with the only filter requirement being genuine participation and contributions ('moderated natural selection')



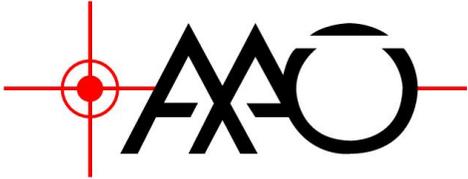
Technical Capability

- The two fundamental technical requirements are:
 - Better performance to go deeper/faster than the 6dFGS
 - Simplified operating model for lower-cost operations
- These imply certain essential technical capabilities:
 - A refurbished UKST able to work reliably and efficiently for >5 years in a way that minimises operating costs
 - A new fibre positioner to replace the aging, unreliable and semi-manual 6dF robot
 - A new spectrograph with greater efficiency, full simultaneous wavelength coverage and higher spectral resolution than the 6dF spectrograph



Operating Model

- A major weakness/risk/cost for the 6dFGS and RAVE surveys was the highly labour-intensive operating model for the UKST and 6dF
 - The cost of full-time observers for 6dFGS and RAVE was ~\$500k p.a., plus substantial repair/maintenance costs covered by AAO (not likely offered for TAIPAN)
- The goal...
 - UKST operations requiring minimal start-up by AAO technical staff and remote/semi-automated observing
 - Minimal repair/maintenance for full duration of survey
 - Operating cost for TAIPAN reduced to \$100-200k p.a.



Survey Utilisation

- Efficient and productive utilisation of the TAIPAN survey requires...
 - A precise and reliable data-reduction pipeline
 - A comprehensive quality assurance regimen
 - A highly detailed and cross-referenced database
 - A team with a broad range of capabilities and effective policies to ensure that all aspects of the science case are fully exploited, and that new science avenues and collaborations are encouraged
- Good models for all these elements are provided by existing surveys (6dFGS, SDSS, GAMA, RAVE etc.)



How to make it happen...

- Building the science case...
 - ...looking forward to the contributions from this workshop
- Forming the survey team...
 - ...look around, meet some of your fellow team members
- Revamping the hardware...
 - Refurbishing the telescope
 - Replacing the positioner
 - Upgrading the spectrograph
- Funding the operating model...
 - Options for funding survey operations



UKST Refurbishment

- Issues...
 - Aging equipment, multiple single point failure modes, no available spares for key components, increasing repair and maintenance requirements, increasing staff costs...
- Requirements...
 - Reliable remote/automated operation, minimal start-up each night, minimal repairs & maintenance for survey duration
- Options, costs and funding...
 - AAO in-house, specialist contractors, or a combination
 - Current cost estimates range from \$0.3M to \$1M
 - AAO Departmental capital funding (or possibly LIEF grant)



Positioner Replacement

- Issues...
 - Existing 6dF robot is old, unreliable and requires a lot of maintenance; it is also fundamentally semi-manual
- Requirements...
 - At least as high a multiplex over at least as large a field
 - Reliable robotic operation without human intervention
- Options, cost and funding...
 - Starbug system, 150-300 fibres, full UKST field of view
 - Funded as GMT MANIFEST prototype from EIF grant
 - Costed at just under \$2M; 50% credit for GMT requested



Spectrograph Upgrade

- Issues...
 - 6dF spectrograph does not cover the whole optical range simultaneously; it is not very efficient; spectral resolution is lower than ideal (at least for measuring dispersions)
- Requirements...
 - Reach 1-1.5 mag fainter than 6dFGS in 1-2 hours
 - Cover (most of) the optical spectral range in one shot
 - Instrumental resolution better than $\sigma = 70$ km/s
- Options, cost and funding...
 - New bench-mount system or revamp 2dF spectrographs
 - Cost (ROM) \$0.5-1.0M; funded via LIEF grant(s)



Project Status

- AAO has negotiated and is near to signing agreement with GMT for Starbug prototype positioner on UKST
- AAO has refurbishment of UKST telescope systems in 2013-14 DIISRTE capital budget (funding permitting)
- Planning LIEF proposal in 2013 for new spectrograph, led by ANU and supported by AAO, Macquarie and as many other institutions as wish to join
- All elements of hardware construction/refurbishment to take place over ~2 years after RAVE ends (2013+2014)
- TAIPAN survey observations planned to start in 2015



Operations Funding Model

- Aim is to reduce operations cost to \$100-200k p.a.
- Funding model:
 - Obtain most of operations funding from ARC D-P grant(s)
 - Institutional partners to provide co-funding alongside D-P (and perhaps underwrite operations if D-P unsuccessful)
- Contributions to LIEF grants for hardware and/or operations funding will give advantages to team members at partner institutions, such as:
 - full early access to TAIPAN data prior to public release
 - authorship rights on 'core' survey papers
 - examples offered by other surveys; details for discussion



Summary

- There are a clear set of requirements for making the TAIPAN survey happen
- A plan for funding the construction/refurbishment of the essential hardware exists; major components of that funding are close to being secured
- Institutions wishing to be partners in the TAIPAN survey are invited to participate in a LIEF proposal in 2013 to fund the spectrograph upgrade and in a D-P proposal in 2014 to fund operations from 2015