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Contents

1 Introduction

This report summarises my visit to Paranal on 16-22 Oct 2006; overall impressions both of Paranal and VISTA are very favourable; a number of suggested action items are discussed below (marked with bullet points).

2 Paranal Observatory and VLTs.

Paranal Observatory runs extremely efficiently, residencia is excellent.
VLT observing runs very smoothly. The VLT control room layout is very good - 5 keyboards & 10 monitors per UT. (2 TCS general, 2 active optics/guiding, 2 weather, 2 instrument, 2 for visiting observer).
BOB, active optics, autoguiding & instrument all interact very efficiently and in a highly automated way; the TOs have little to do most of the time, just occasional mouse clicks.

On talking to some ESO staff astronomers etc, general impressions of VISTA are very positive but most of them have not actually been inside the enclosure yet.

- So, it would be a good idea to organise a "VISTA Open Day" to show the system to interested Paranal staff, possibly after the interior is cleaned up and/or after telescope acceptance.

3 VISTA

3.1 General

Overall impression is excellent: in terms of telescope stiffness, active optics,
enclosure ventilation and air-con, ease of access, glycol cooling, safety switches etc. VISTA's general 'look and feel' is excellent, and looks significantly better in comparison with older 4-metre telescopes I've come across e.g. WHT, AAT.

There are a surprisingly high number of cables and ducts in general !

3.2 Enclosure

Enclosure has good working space, construction looks robust, quality of finish looks good. Ventilation doors and windscreen are generously sized.

Flat-field screen has minor 'join stripes' visible, but a very small percentage of the area.

- One half of f-f screen (nearer the crane) appears visibly dirty while the other half is clean - dirty half needs a clean at some point.

Slit door locking pins look very robust, end stops, limit switches and earthquake restraints all present as expected.

Enclosure moving mechanisms work very well and quietly, especially dome rotation which gives similar noise level to a microwave oven. (Sensibly, rotation is limited to 0.6 deg/sec under manual control, 2 deg/sec under remote).

Dome ceiling fans are effective (but rather noisy !).

HVAC system is not running at present, but hardware and ducts look very generously sized for the relevant air volumes.

Dome Crane and Coating area Crane - reaches are both generous.

Provision of access platforms, ladders and accessibility of motors etc is excellent, except for the tricky Cass rotator area.

Good redundancy in e.g. dome rotation motors (4), coolant pumps (all in redundant pairs), etc.

Very good safety features: guardrails, safety signs, E-stop buttons, exit signs, smoke detectors, fire extinguishers, emergency lighting, etc.

Safety - currently there are small clearances between Telescope front-end guard rails & the (removable) main hatch guard rails, and also between Dome electronics cabinets & main hatch guard rails.

- Serious pinch hazards here - I suggest shortening the guard rails at both ends to increase the clearances to a safe width, then deploy traffic cones when hatch is open to stop people walking through gaps and falling down the hole ?

Crane access catwalks - have removable handrails only held in place by gravity. There is a remote chance of these jumping out of sockets and falling on M1 in an earthquake (or being dropped during an intentional removal).

- Suggest attach backup cables to these handrails to be safe. (If they pendulumed, they can only hit the telescope top-end ring which is not really serious).

3.2.1 Enclosure unwanted light issues

Enclosure light-tightness: with all power off and sunlight outside, this is very dark but not quite perfect.
No 'direct-to-sky' pinholes at all - well done. A few non-direct diffuse 'glows' are visible around top & bottom of slit doors, cladding joins etc.
(After 5 min dark adaptation, you can see your hand in front of these glows, but cannot see your hand in front of the floor). These glows are a long way from the flat-field screen, and flat-field screen lamp-off brightness is much darker than 1 feeble torch shone up to it, so current level is probably good enough for most daytime calibration purposes, especially if subtracting lamp-on and lamp-off frames.

- Not currently clear if any 'un-switch-offable' lights inside the dome - various red/green indicators are 'permanently on' under manual control. These are (allegedly) supposed to go off under LCU control, this needs checking. Fire alarm control panel may be 'permanently lit', if so it will need a cover.

- Vent door photocells (6) are _inside_ the dome and are ON under local control. This may be different under auto control, needs pursuing. These are largely useless anyway since louvres provide a physical barrier. A determined idiot can still poke an arm through louvres above the photocell beam and lose a hand – photocells don't prevent this.

- Windscreen and slit door photocells - one pair for both, behind the windscreen but still a potential straylight problem. Get rid of them and replace with lockout switch on removable windscreen panels ? As above, a determined idiot can poke fingers through windscreen slots and get them chopped off – photocells do not prevent this.

- Possible lighting issue during commissioning: office-level lighting will be required in Office, toilet and IPL. Light leaks upwards via the intermediate floor are then a concern, either via windows in upper staircase (need curtains) or the gaps in Az floor (due to be reduced). For added light-proofing during commissioning, some black curtains across the ground floor corridor are probably worthwhile, so the office/toilet/IPL are 'light areas' while the mirror wash area can be kept semi-dark.

3.3 Telescope Structure

Telescope structure is basically complete except for cables, with dummy Camera, dummy M1 and dummy M2 Unit in place. Looks very well engineered and robust.
Real M2 unit has been fit-checked, is now in storage in Instrument Prep Room.

Juan Delgadillo (the LCU expert) called away due to family funeral , so motorised motion not currently enabled, but structure looks excellent and very rigid, is balanced and moves easily on Alt hand-crank, ~ 40 secs zenith to horizon.

Cabling quality is good (though not quite complete yet).
Cass cable wrap looks very well engineered.

Space around Cass/camera area is pretty tight - access to M1 support system is possible but fiddly.

3.4 M1 Supports

Axial supports essentially working, but various swap-outs have been required for unknown reasons .Couple of 'dodgy' axials have a systematic offset ~ 10N between demand & actual, which is intermittent. Reason currently unclear.

- need more diagnosis, and/or more verified spares, and/or a bench tester with load cell so we can test the spares before swapping them in ?

AJB walking across M1 Dummy in closed loop - axial supports behaved as expected. This is worse than any reasonable wind load, so a good demonstration that wind should not create instabilities in the system.

Lateral supports mostly working but a few niggles: DC offsets between demand and actual pressure, and oscillations in pressures near zenith (i.e. low pressure values). In open-loop, 1 of 4 valves is "bad" and 1 is "slightly bad".
In closed-loop, all 4 oscillate roughly in phase. Oscillations decrease moving away from zenith, and disappear below ~ 80 deg alt. DC offsets however remain - these are different between the 4 valves so will affect mirror shape.

- Chase down oscillations and pressure offset between 4 valves.

Driving from ~ 50 deg to zenith with force balancing ON worked fine, all loops stayed well behaved and definers didn't saturate – suggests system should work well after valve problems are sorted out.

Nasty effect during shutdown or Canbus crash ... after OFF button is hit, nothing happens for ~ 20 sec then a "hiss-BONG" as force demand is rapidly zeroed and dummy M1 falls onto rest pads (!). Similar during Canbus crash: force demands appear to stay frozen until the reboot rapidly zeroes them.

- Investigate graceful hardware-based M1 support shutdown in event of software crash ?

3.5 Office and Instrument Prep Room

Enclosure office: unfurnished at present, but space looks generous for our purposes e.g. copying a VLT console area.

Instrument Prep Lab: space is adequate but quite tight. SCPs and He pipes all present.
Lighting: good, possibly need extra spotlight at north (working) end ?

Lab is formally non-compliant because IR camera can't pitch vertical as-is so filters can't be exchanged inside the lab. To enable this, we need two minor modifications:

- (a) chop off the air duct near the concertina door up to a 2.5m height, to gain width and allow the camera pitch gearbox to remain attached in the lab. Also (b) raise the 2 Southern light fittings up flush to the ceiling. This will increase headroom and permit the camera to pitch to vertical inside the Instrument Prep Lab.

This avoids conflict between filter changes and mirror handling, and generally reduces extraneous movements of the Camera.

Instrument Prep Lab lights-off darkness level: is pretty good (much darker than the RAL lab) but not total blackness:

- Red on-lamp on SCP on outer wall. Small green LEDs inside cable duct on ceiling. Small cracks around edge of concertina door. Shield these.

3.6 Miscellaneous.

Storage area: is relatively small. Additional storage proposed via new crane reaching to Intermed. floor, looks like a good idea.

M1 installation into dome: route via washcart on az floor is not fully detailed, e.g. where M1 + washcart can sit while permitting required dome rotation. Cannot use M1 cover this way.

- Look at alternative via installation of M1 direct into M1 Cell ? i.e. remove top end, park washcart outside, transfer dummy M1 out to washstand, then in again (for practice) then out onto chocks on ground. Then transfer real M1 onto washcart with LZOS tool, add M1 cover, and lift real M1 into Cell with Vertex tool.

Camera mounting: Cass locking pin is pneumatic operated (both ways). Too late to move pin position at this stage without major disassembly of whole Cass bearing.
There is a spring-loaded (removable) widget between V-blocks to reduce V-block load and deflections during camera mounting.

- RAL currently not informed about this widget ? ... PFJ emailed, 17 Oct.

Telescope Azimuth at camera mounting... several possibilities, but still TBD.

- “Old” plan with telescope pointing SE puts camera over removable hatch stowing position (which is now NW). Telescope S is possible, but top-end cradle at N may interfere; also this requires telescope to rotate after camera is lifted up (because top-end overhangs main hatch at S). Telescope SW looks possibly best – if necessary, first remove Cass cablewrap cradle at NE floor ?

Glycol system: if it leaks, we get a 5 bar fountain until the header tank empties and the pump stops - will be more than 100 litres spill (!). This isn't ideal.

- Regular inspection of hoses, or consider adding some sort of moisture sensor(s) at telescope level which turn off pumps if water lands on them ?

Resolution of temperature sensors: the telescope sensors *need* resolution (not accuracy) of 0.1 C or better to avoid excessive steps in focus compensation.

- Check this resolution isn’t degraded too much by the Canbus or ADC.

Big red buttons (one per VLT) in Paranal control room: VLT operators apparently hit theirs occasionally when “nasty noises” are heard on dome audio monitor. We do need one.

- Earthquake sensors: VLT has accelerometers which trip their M1 clamps. These used to trip accidentally, but apparently don’t any more – should we copy them ?

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