Instrumentation at Paranal Observatory – maintaining the instrument suite of 5 large telescopes and its interferometer alive

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ABSTRACT

This presentation provides interesting miscellaneous information regarding the instrumentation activities at Paranal Observatory. It introduces the suite of 23 instruments and auxiliary systems that are under the responsibility of the Paranal Instrumentation group, information on the type of instruments, their usage and downtime statistics. The data is based on comprehensive data recorded in the Paranal Night Log System and the Paranal Problem Reporting System whose principles are explained as well. The work organization of the 15 team members around the high number of instruments is laid out, which includes:

- Maintaining older instruments with obsolete components
- Receiving new instruments and supporting their integration and commissioning
- Contributing to future instruments in their developing phase.

The assignments of the Instrumentation staff to the actual instruments as well as auxiliary equipment (Laser Guide Star Facility, Mask Manufacturing Unit, Cloud Observation Tool) are explained with respect to responsibility and scheduling issues. The essential activities regarding hardware & software are presented, as well as the technical and organizational developments within the group towards its present and future challenges.

Keywords: Instrumentation, Paranal, Maintenance, Downtime, Statistics, Organization, Workload, Assignment

1 INSTRUMENTS AT THE ESO PARANAL OBSERVATORY

The full set of instruments at Paranal is currently comprised of 12 VLT (Very Large Telescope) instruments, 5 in the VLTI (VLT Interferometer), 4 Auxiliary systems (LGSF - Laser Guide Star Facility, MASCOT - Miniature All Sky Cloud Observation Tool, MMU - Mask Manufacturing Unit, TCCDs (Technical CCDs for Image Analysis and Guiding, used in all Unit Telescope foci, Auxiliary Telescopes and VLTI [32 systems in total]), VIRCAM (the instrument of the VISTA Telescope), OMEGACAM (the instrument for the VST (VLT Survey Telescope) and 7 future systems under development in Europe.

The original Test Camera currently occupies the Visitor Focus on UT1 and OMEGACAM is waiting in standby for the final integration of the VST.

Please see below the distribution of the instruments:

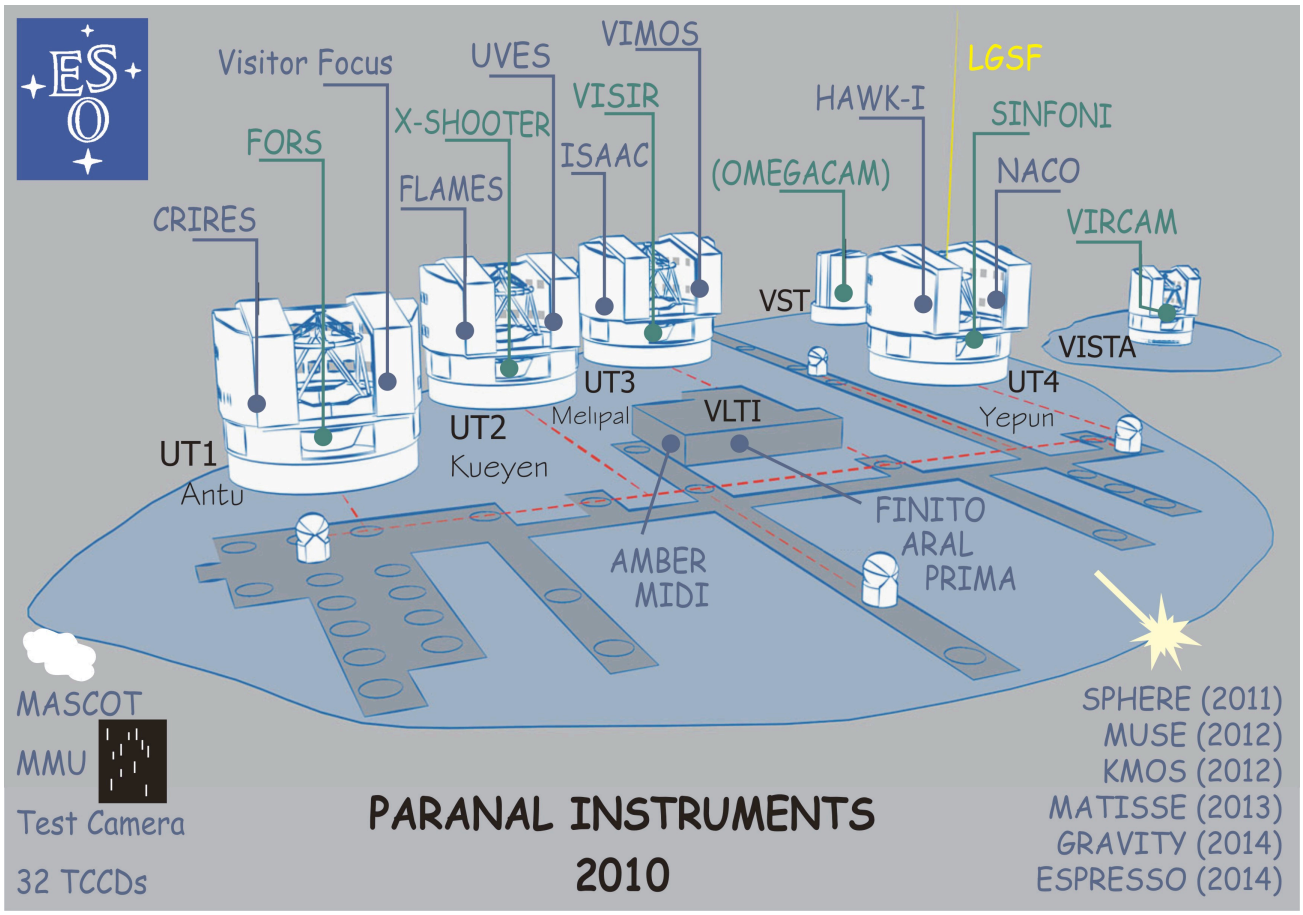

Figure 1: Paranal Instruments 2010

As our group is strongly focused on the operational aspect of instrumentation, static information such as resolution, sensitivity, optical and scientific characteristics of our systems will not be detailed. Instead, this presentation will focus on the operational units and characteristics that are closely linked to Paranal Instrumentation activities.
These are related to components and subsystems that demand a great deal of daily care, maintenance or that are prone to failure. Such systems are typically found in the following areas:

- Calibration lamps: Due to their nature, the emitted flux is variable and needs to be monitored closely. Action must be taken (adjustments or replacement) whenever values are out of the given tolerance band.
- All kind of electro-mechanical assemblies: Maintaining / verifying the correct reference positions (alignment); finding an optimized speed (particularly after problems); replacing and repairing limit switches, drives, amplifiers and controllers in case of failure. This includes, as well, iris-type shutters that have a relative high rate of failure compared to other moving assemblies.
- Cryogenic and vacuum control: Daily check of temperatures and vacuum quality; use trending of cryogenic parameters to detect and correct system degradation before failure; refilling systems with liquid nitrogen (LN_2); regular replacement of components in closed cycle coolers.
- Image quality issues: Minimization of detector read-out noise (strong variation over long time scales); bias and sensitivity adjustments (the latter may be tuned by thermal and occasionally gas treatments); and post-intervention alignments.

The below table gives a rough idea of the quantity of components and subsystems of the currently commissioned instruments and related devices:

Table 1: Instruments and their Instrumentation relevant characteristics

Instrument	*Calibration lamps*	*DC motors (ambient)*	*Stepper motors (ambient)*	*Stepper motors (cryogenic)*	*Piezos*	*Commercial electronic boards & units*	*Custom mask slots*	*No. of CCDs and IR detectors*	*Total no. of pixels (millions)*	*Cryostats*	*Shutters (iris-type)*	*Daily LN_2 consumption (l)*	*No. of cryogenic cold heads*	*No. of Temperature controllers*	*APDs*	*Adaptive Optics actuators*	*Lasers*	*Alarm sources*
CRIRES	*4*	*13*	*-*	*6*	*1*	*91*	*-*	*5*	*3.15*	*1*	*1*	*-*	*3*	*4*	*60*	*62*	*1*	*7*
FORS2	*14*	*43*	*-*	*-*	*-*	*67*	*10*	*4*	*33.6*	*2*	*-*	*8*	*-*	*2*	*-*	*-*	*-*	*2*
FLAMES	*12*	*17*	*-*	*-*	*-*	*53*	*-*	*1*	*8.4*	*1*	*1*	*12*	*-*	*2*	*-*	*-*	*-*	*2*
UVES	*8*	*17*	*-*	*-*	*-*	*95*	*-*	*3*	*25.3*	*2*	*9*	*18*	*-*	*6*	*-*	*-*	*-*	*6*
X-SHOOTER	*6*	*13*	*-*	*-*	*-*	*51*	*-*	*3*	*14.7*	*3*	*2*	*50*	*-*	*15*	*-*	*-*	*-*	*10*
ISAAC	*3*	*-*	*1*	*9*	*-*	*42*	*-*	*2*	*2.1*	*1*	*1*	*-*	*2*	*5*	*-*	*-*	*-*	*3*
VIMOS	*15*	*20*	*24*	*-*	*-*	*64*	*40*	*4*	*33.5*	*4*	*4*	*40*	*-*	*12*	*-*	*-*	*-*	*12*
VISIR	*2*	*-*	*-*	*8*	*-*	*44*	*-*	*2*	*0.2*	*1*	*-*	*-*	*3*	*2*	*-*	*-*	*-*	*8*
HAWK-I	*-*	*-*	*-*	*2*	*-*	*27*	*-*	*4*	*16.8*	*1*	*1*	*45*	*1*	*2*	*-*	*-*	*-*	*7*
NACO	*5*	*24*	*3*	*-*	*-*	*63*	*-*	*3*	*2.1*	*3*	*-*	*30*	*1*	*5*	*4*	*187*	*-*	*11*
SINFONI	*5*	*23*	*-*	*4*	*-*	*75*	*-*	*1*	*4.2*	*1*	*3*	*50*	*-*	*7*	*64*	*62*	*-*	*5*
LGSF	*-*	*40*	*-*	*-*	*28*	*88*	*-*	*-*	*-*	*-*	*5*	*-*	*-*	*6*	*-*	*-*	*5*	*10*
VIRCAM	*1*	*2*	*-*	*-*	*-*	*27*	*-*	*18*	*67.1*	*1*	*-*	*-*	*5*	*2*	*-*	*-*	*-*	*30*
AMBER	*1*	*12*	*-*	*3*	*4*	*30*	*-*	*1*	*1.0*	*1*	*13*	*25*	*-*	*2*	*-*	*-*	*-*	*1*
MIDI	*1*	*6*	*-*	*-*	*2*	*27*	*-*	*1*	*0.06*	*1*	*-*	*35*	*1*	*6*	*-*	*-*	*1*	*7*
FINITO	*-*	*6*	*-*	*-*	*15*	*28*	*-*	*10*	*0.12*	*2*	*-*	*20*	*-*	*2*	*-*	*-*	*1*	*2*
ARAL	*1*	*28*	*-*	*-*	*-*	*68*	*-*	*1*	*0.3*	*1*	*-*	*20*	*-*	*-*	*-*	*-*	*-*	*-*
PRIMA	*1*	*5*	*4*	*-*	*16*	*47*	*-*	*2*	*0.06*	*1*	*4*	*20*	*-*	*1*	*-*	*-*	*1*	*2*
Test Camera	*4*	*3*	*-*	*-*	*-*	*38*	*1*	*1*	*4.2*	*1*	*1*	*8*	*-*	*1*	*-*	*-*	*-*	*2*
MASCOT	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*1*	*0.4*	*-*	*1*	*-*	*-*	*-*	*-*	*-*	*-*	*-*
MMU	*-*	*2*	*-*	*-*	*-*	*4*	*-*	*-*	*-*	*-*	*2*	*-*	*-*	*2*	*-*	*-*	*1*	*8*
TCCD (32 units)	*-*	*-*	*-*	*-*	*-*	*5*	*-*	*1*	*0.4*	*-*	*-*	*-*	*-*	*1*	*-*	*-*	*-*	*-*

In addition, the infrastructure for maintenance for keeping all these instruments running must be provided and maintained, such as:

- LN_2 transfer lines, tanks, vacuum pumps, vacuum sensors: typically more than one of each per cryostat
- Handling tools and carriages for dismounting and storage (individual for each instrument)
- 5 test benches for motors, detector control systems and CCDs
- MMU: approx. 1100 manufactured custom masks (30x30cm approx.) per year (for FORS2 and VIMOS)
- LGSF yearly consumption: 360l Ethylene Glycol, 122g Rhodamine 6G, 4.8l chromatography water
- LGSF´s number of interlock conditions: 83

2 INSTRUMENTATION STAFF AT PARANAL

The Instrumentation Group at Paranal Observatory currently consists of 15 members (8 engineers, 3 physicists and 4 technicians) who have worked an average of 6 years on site and many of whom have seen the number of instruments grow since the beginning of the VLT (Very Large Telescope).

Table 2: Current Instrumentation staff and their responsibilities

Name	Post	Primary Responsibility	Secondary Responsibility	Qualified for	Speciality
José Luis Álvarez	Laser Specialist	LGSF, Test Camera	--	NACO, SINFONI, FINITO, SPHERE	Physics, Lasers
Juan Beltrán	Laser Technician	--	LGSF	FLAMES, NACO, TCCD, MASCOT, SINFONI	Electronics
Pierre Bourget	Instrumentation Engineer	AMBER, FINITO	VIMOS, FORS, OMEGACAM, SPHERE	VISIR, MIDI, PRIMA, VIRCAM	Optics, Mechanics
Roberto Castillo	Mechanical Engineer	X-SHOOTER, SINFONI	NACO, ARAL	VIMOS, CRIRES, FLAMES, HAWK-I, FINITO, KMOS	Mechanics, Cryogenics
Álvaro Diaz	Instrumentation Technician	--	--	FORS, FLAMES, AMBER, PRIMA, VIRCAM, TCCDs, MASCOT	Electronics, Control Systems
Gordon Gillet	Group Leader, Electronics Engineer	CRIRES, SPHERE, KMOS	--	NACO, SINFONI	Electronics, Instrument Safety
Nicolás Haddad	Instrumentation Engineer	MIDI, VIRCAM, CCDs	FLAMES, AMBER, PRIMA	VIMOS, OMEGACAM, IRACE, MUSE, Test Camera	Electronics
Alfredo Leiva	Instrumentation Technician	MMU	TCCDs	FORS, UVES, FLAMES, AMBER, PRIMA, FINITO, ARAL, OMEGACAM	Electronics
Pedro Mardones	Instrumentation Engineer	PRIMA, MASCOT	LGSF, VIRCAM, IRACE	ISAAC, CRIRES, AMBER, VISIR, X-SHOOTER, CCDs	Physics, Electronics
Jared O'Neal	Instrumentation Engineer	NACO, ARAL, IRACE	CRIRES, ISAAC, SINFONI, SPHERE	UVES, VISIR, X-SHOOTER	Physics, Software
Mauricio Ribes	Instrumentation Engineer	UVES, FLAMES	HAWK-I, MUSE	VIMOS, ISAAC, TCCDs, MASCOT, Test Camera, Visitor Instruments	Electronics, Projects
Miguel Riquelme	Instrumentation Engineer	FORS, VISIR, OMEGACAM, TCCDs	X-SHOOTER, FINITO, KMOS	HAWK-I, AMBER, MMU	Electronics
Pascal Robert	Instrumentation Engineer	VIMOS, HAWK-I, MUSE, Visitor Instruments	UVES, Test Camera	ISAAC, LGSF, MIDI, FINITO, VIRCAM, CCDs	Electronics
Chester Rojas	Instrumentation Technician	--	VIMOS, MMU, MASCOT	CRIRES, FLAMES, PRIMA, ARAL, X-SHOOTER, TCCDs, Visitor Instruments	Mechanics, Cryogenics
Javier Valenzuela	Instrumentation Engineer	ISAAC	CRIRES, VISIR, MIDI, CCDs, Visitor Instruments, KMOS	X-SHOOTER, MMU, IRACE, MUSE	Electronics, Software

3 ASSIGNMENTS OF STAFF TO THE INSTRUMENTS

While the number of people (4) was equal to the number of instruments 10 years ago, today this relation is closer to 0.7. In this sense the staff assignment to instruments and duties has to be optimized and modified in several ways.

3.1 General responsibilities

Instrument issues are addressed by several groups of people:

- Astronomers (Science Operations Department of Paranal): Use the instruments at night, report problems, maintain the observation and calibration templates
- Software Group of Paranal Engineering: installs patches and necessary error fixes while keeping the software under a strict configuration control
- Maintenance Department of Paranal: performs most of the regular and preventive maintenance of the instruments (e.g. refilling of liquid nitrogen, registering of operational values, regular replacement of consumables)
- Quality Control Group in ESO Headquarter: analyzes daily calibration data and provides warnings in the case of problematic changes in data trends
- Instrumentation team of Paranal Engineering: responsible for the system as such and in particular the hardware

Over the last years, periodic regular maintenance has been increasingly outsourced to Paranal's Maintenance Department. This development shifted the available manpower from routine tasks towards specialized work on punctual problems and analytic work on the failure modes of the instruments. The complexity of some problems requires more and more the development of certain analytic tools (hardware but also special software not covered by the Software Group), which takes over an increasing part of our activities.

We are facing also frequent requests from the science side to improve the quality of the instruments. Some of those requests result in the creation of a multi site project whose manager may be from Paranal Instrumentation of from any of ESO's organizational units. In any case, our involvement in such projects is substantial.

3.2 Instruments and staff assignments

In general, the work shift system on Paranal is based on an 8 days on / 6 days off schedule. This allows, in principle, to have 2 staff members covering the same tasks / instruments during their respective, alternate shifts. However, as staff members are occasionally absent due to vacations, trainings, etc. this coverage is never complete throughout the entire year. For this reason, Paranal Instrumentation has assigned at least four persons to each system:

1) The main responsible (who is the interface to the world in matters of major interventions and problems)
2) The secondary responsible (who may also take urgent decisions on the system), works on opposite shift of 1)
3) Two (or more) qualified people (in opposite shifts) who know the system well and are able to handle typical problems, especially in periods when neither 1) nor 2) are available.

With this assignment we achieve the 100% coverage for each system over the year, keeping the rule that at least one of the four persons must be on the mountain at any day of the year.

Special shifts may be defined whenever there is a major planned intervention on an instrument, big unforeseen failures or unplanned absences of staff members. This typically happens 2-3 times per year per staff member.

The challenge in these assignments is the continuous optimization of the available personal skills and inclinations of staff towards certain types of instruments, a balanced distribution of workload generated by the single systems and an ongoing review of tasks that may be outsourced to or taken over from other groups. Changes are typically necessary once or twice a year, or at extraordinary occasions such as staff rotation or a major change in the equipment (new instruments' arrival, old instruments' decommissioning).

3.3 LGSF

Unlike the other instruments, the Laser Guide Star facility is run in "expert mode". The 2 staff members assigned to this system are required to work specially tailored shifts driven by the LGS runs which are typically 11 days per moon period.

The following table shows an extract of the responsibility chart that details the assignments of staff to instruments. The relatively well-balanced coverage of systems by staff in both shifts and by staff working non-standard shifts (group leader and LGSF) can clearly be seen.

Table 3: Extract from the responsibility chart

Instrument		ISAAC		FORS		CRIRES		UVES		FLAMES		VISIR		NACO		SINFONI		HAWK-I		MIDI		AMBER	
Shift A	Shift B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
G. Gillet						1								3		3							
J. Álvarez														3		3							
J. Beltrán		3								3				3		3						3	
	P. Bourget				2								3								3		1
	R. Castillo						3				3				2		1		3				
A. Diaz				3						3												3	
N. Haddad										2										1		2	
	A. Leiva				3				3		3												3
	P. Mardones		3				3						3										3
J. O'Neal		2				2		3				3		1		2							
	M. Ribes		3						1		1								2				
M. Riquelme				1								1						3				3	
P. Robert		3						2										1		3			
Ch. Rojas						3				3													
	J. Valenzuela		1				2						2								2		

"1": main responsible, "2": secondary responsible, "3": qualified staff

4 OPERATIONAL STATISTICS

4.1 Tools for statistics

A Paranal instrument's performance is typically measured by the following tools:

- **Paranal Night Log**: A record that is filled by the operating astronomers each night. From here we extract the time (in hours and minutes) that a certain instrument was "on sky" doing science. In addition (but not of interest for our statistics), it contains all the information on the programs, objects and technical issues which have been performed and experienced during that night. It's typically several tens of pages long. Technical downtime is recorded when an instrument that was scheduled to do science on sky is not available for technical reasons and that could not be replaced by another program on a different instrument in the same telescope.

- **Paranal Problem Reporting System (PPRS):** This system is a database for documenting failures, normal maintenance actions, and configuration changes for any system (not only instruments) on Paranal. The report may be issued by any staff member at Paranal, but most of them are authored by nighttime observing staff, followed by daytime astronomical staff and then engineers. They are immediately assigned to a specific group (as the best guess of the issuer - typically Instrumentation, Software, Science Operations, Maintenance, Network or Computer Hardware), but may be reassigned to a more appropriate team at any time during the process of the problem handling.
  Their priority ranges from "Critical", "Necessary", "Desirable", and "None", and the status can be "New", "Assigned", "Open", "On Hold" or "Closed".
  When we are dealing with an actual problem, the issued tickets are used to follow up the remedy of it, including assignments of the responsible group and staff members and the detailed steps to fix the problem. It also records the night downtime produced by the failure (in a very precise way), and the hours of work needed for repair (depending on the input of the involved staff). All tickets are kept in the system for an indefinite time and may be searched in a powerful way for keywords or many other criteria.

4.2 The impact of each instrument on our work load

For the following statistics, the information of the PPRS is processed in terms of night downtime of the instrument that has been assigned to the Instrumentation team. Unlike typical statistics, it does not show the percentage of an instrument's downtime with respect to the planned observation time, but rather relative to the total downtime of all instruments. It also shows the relative amount of work time needed to follow up Instrumentation-related problems (which may be day or night work), as documented in the PPRS tickets. Only instruments which directly affect scientific observations are shown.

Table 4: Relative downtime and Instrumentation work load

	Relative Downtime					Relative Work Load				
	2006	***2007***	***2008***	***2009***	***2010****	***2006***	***2007***	***2008***	***2009***	***2010****
CRIRES	-	7.5%	2.6%	8.8%	14.0%	0.7%	5.9%	3.8%	5.6%	5.4%
FORS1	7.7%	2.5%	1.4%	-	n.a.	0.1%	2.7%	2.7%	1.0%	n.a.
FORS2	3.3%	0.3%	0.6%	9.4%	4.7%	0.9%	2.9%	1.4%	7.9%	14.6%
FLAMES	2.6%	6.7%	7.5%	6.6%	3.0%	0.4%	5.9%	6.0%	7.2%	6.3%
UVES	4.5%	7.3%	0.4%	3.5%	-	2.3%	3.5%	1.6%	2.7%	3.7%
X-SHOOTER	n.a.	n.a.	n.a.	9.0%	17.0%	n.a.	n.a.	n.a.	5.5%	10.0%
ISAAC	4.4%	8.3%	8.7%	3.7%	11.2%	5.9%	15.2%	6.6%	15.6%	26.7%
VIMOS	44.7%	36.2%	70.6%	38.0%	12.6%	1.1%	10.2%	16.4%	9.1%	8.0%
VISIR	6.3%	3.4%	1.1%	0.4%	-	49.7%	6.2%	2.3%	2.4%	-
HAWK-I	-	1.0%	0.8%	0.9%	0.8%	-	1.6%	1.5%	2.2%	0.1%
NACO	15.8%	12.5%	1.4%	5.4%	2.2%	11.1%	14.2%	2.9%	5.0%	11.4%
SINFONI	5.7%	2.8%	1.9%	2.2%	1.5%	3.8%	0.5%	1.2%	0.3%	1.2%
LGSF[1]	-	5.9%	0.8%	7.0%	15.0%	19.6%	19.7%	37.2%	26.9%	5.6%
VIRCAM	n.a.	n.a.	n.a.	-	-	n.a.	n.a.	n.a.	0.3%	-
AMBER	1.4%	4.6%	1.7%	3.8%	6.9%	3.6%	6.1%	6.0%	2.4%	1.4%
MIDI	0.3%	0.2%	-	0.3%	-	0.5%	0.9%	0.3%	0.2%	0.4%
PRIMA	n.a.	n.a.	n.a.	-	-	n.a.	n.a.	n.a.	-	-
FINITO[1]	-	-	0.2%	-	1.3%	-	-	0.5%	0.1%	0.5%
ARAL[1]	-	0.4%	-	-	-	-	0.2%	0.4%	-	-
TCCDs[1]	3.4%	0.6%	0.3%	1.2%	9.9%	0.4%	4.3%	9.2%	5.7%	4.5%
Absolute reported down time / work time	126h	148h	213h	153h	40h*	281h+	1537h	2346h	1745h	421h*

[1] Auxiliary systems which are used together with one of the other instruments
[+] The work load reporting was introduced only in 2006, so this data does not reflect the full year.
[*] The shown value refers to the months January to April, so the extrapolated absolute value for 2010 is about three times that high.

The produced amount of downtime does not only depend on an instrument's intrinsic inclination to failures (which can be seen over a series of years on some of them), but also on the usage by the scientific community, which varies from one period to another. Abnormally large downtimes, such as with VIMOS, require deeper investigations, measures and a constant joint effort to reduce downtime (as successfully happened in 2009-2010).
The correct reporting of problem-related work time is an as-of-yet unresolved issue at Paranal. It might be done in different ways by different reporters so that the absolute quality of these data must be questioned.
In any case, the less downtime recorded and the less work time spent to fight these problems, the better job we have done in preventing instrument failures.

5 A TYPICAL DAY IN INSTRUMENTATION

In general, there is of course no "typical day" in our Instrumentation team. The tasks that need to be done vary over the weeks, months and years, thus making the professional life less monotonous. In this sense the day described here is simply a blend of almost everything that may happen in a year, starting from daily issues and ranging up to long term issues:

Alarm handling
Each instrument has a connection to the Central Alarm System (CAS) of Paranal, to which dangerous vital conditions are being forwarded. These alarms are mostly related to cryogenic problems as indicated by parameters such as temperature and vacuum as well as the state of the cryogenic systems such as liquid nitrogen level or compressor error states. The CAS transmits information to pagers that are carried by 2-3 responsible members of the group and that respond immediately to the indicated problem. At night, for reasons of response time, the Telescope and Instrument Operators are the first to look into such problems, but they can contact an Instrumentation team member at any time when more expertise is required.

Problem handling
Unfortunately, but as can be expected from our large set of instruments and subsystems, there are only few days per month when all instruments work without reported problems or causing downtime for scientific observations. A Problem Report is issued in the PPRS system for every problem, modification, or reconfiguration. Among our many morning tasks is to review the tickets from the previous night that were assigned to Instrumentation, assess actions to remedy them, resolve them whenever possible, and forward them to other groups whenever indicated. In this context, the prioritization of tasks is an important aspect in the team work of our group and the optimization of all instruments' performance. It depends highly on the observation schedule for the coming nights, the severity of the problem, and the estimated duration of the possible remedies. All these factors lead to a compromise on how much effort has to be put into the current instrument problems.

Performance monitoring
The Paranal Observatory has been equipped with a comprehensive database of instrument performance. The daily checks include the noise/bias/sensitivity/dark levels of all detectors, the illumination levels of calibration lamps, parasitic lights, focus checks, spectral acuity, throughput and alignments.

Engineering support
Instrumentation staff is regularly assigned addition managerial duties by the supervising Engineering department. These managers, which are known as "UT Managers" or the "VLTI Manager", are required to be on-call and coordinate the tasks carried out throughout the day in the telescopes, the startup and handover of the telescopes to the astronomers at sunset, and the resolution of emergency problems at night. As the dedicated work time for this assignment is hardly above 10% per day, it is done in parallel with other tasks.

Weekly reporting
On Tuesday afternoons, the two work shifts overlap. It is very important that we have a weekly meeting of the Instrumentation group so that all the completed and pending tasks from the previous shift are presented in detail to the arriving shift. All important actions taken, pending issues, and problems are noted in a file that serves as the daily notepad for our activities. Our weekly meeting also serves to finalize this file, which is distributed as the "Instrumentation Weekly Report" to a wide selection of people throughout the organization.

Figure 2: Extract of a weekly report

WEEKLY MINUTES 20.04.2010 – 27.04.2010

Group Contact Point(s) this week: **RCA, GIG**

Meeting participants: ADI,BEL,GIG,JVA,NHA,MAS,PBO,RCH,RIM

Misc. **Miscellaneous** Misc.

Date [dd.mm.yyyy]	Name(s)	Action [What, When, How, Results]	Ref. PPRS	Ref. WO
22.-24.04.2010	JVA	Design Document for testing Video Board and Preamplifier was finished and sent to GIG. A test bench for doing some design tests is being prepared in the Integration hall.		
24.04.2010	LEA, PBO	Integration hall was ordered and cleaned for preparation of the next SINFONI intervention (30.04.)		
20.-26.04.2010	RCA	Shutter integration ongoing (6 units). Currently waiting for parts from J.-L. Lizon		
24.04.2010	LEA	Document preparation of safety instructions and procedure for replacement and maintenance of battery in Turbo molecular pumps Seiko Seiki series STP-H200/H300. The document can be found in Instrumentation shared folder: MiscProcedures\TMP battery safety instructions. It's open to comments and suggestions		
22.-27.04.2010	MAS	Cryogenics mechanisms repeatability tests and report continues. Many problems with CONICA delayed the progress. Reported below. SINFONI, MIDI, VISIR still pending. Draft is available in Instrumentation/Miscellaneous folder.		
21.04.2010	RCA, RIM	LISA detector was dismounted and then was sent to J.-L. Lizon upon his urgent request.		
22.-24.04.2010	BEL	Update LGSF spare part list, C. Sagüez talk to include these part LGSF in MAXIMO.		

UT1 **Visitor Instruments** UT1

Date	Name(s)	Action	Ref. PPRS	Ref. WO
		Test Camera tests are pending due to a necessary network hardware modification.		

UT2 **FLAMES** UT2

Date	Name(s)	Action	Ref. PPRS	Ref. WO
21.04.2010	RIM, LEA	Warning about the GIRAFFE LN2 line temp, the temperature sensor was found damaged , it was replaced. Also the communication between LN2 level sensor and CFC controller was repaired.	35139	
23.04.2010	RCA	Vacuum alarm activated due to a degradation. The automatic sequence started. It was possible to observe a vacuum degradation during the last week, the origin of the problem is not clear. Under monitoring.		
26.04.2010	RCA, S. Poupar	Vibration tests have been finished. As the new damping is working very well, there is no reason any more to switch off the pump during VLTI runs.		

UT2 **UVES** UT2

Date	Name(s)	Action	Ref. PPRS	Ref. WO
26.04.2010	RIM, LEA	The D2L lamp was reported malfunctioning; it was inspected and found not operating. The lamp was replaced.	35246	

Maintenance planning and execution

The Instrumentation group relies on the Maintenance department for many daily routine tasks such as Liquid Nitrogen refilling, monitoring of vital data and also for support of big interventions like instrument dismounting or movement of heavy equipment. The coordination of these tasks and the planning with the help of our CMMS is also part of our work. On the other hand, for specific work (that has been defined beforehand as a maintenance plan in the CMMS) we get work orders issued from Maintenance to our staff when we deal with more complex tasks.

Projects

Some problems and upgrades are handled as projects, which can range from one man projects for a small measurement / maintenance tool up to big upgrade projects driven by the experts at the ESO headquarters. In any case, our involved

staff members participate in frequent progress meetings with an adequate number of participants, and of course in the assigned project work.

Instrument Operation Team
The Instrument Operation Team for each instrument typically meets 2-6 times per year to discuss operational aspects and can decide to kick off related upgrade projects. It largely consists of astronomers and data handling staff from headquarters, but a member of the Paranal Instrumentation group is always involved as well.

Scheduling
Normal staff scheduling is done approximately 3 months in advance in accordance with the official plan for the Paranal Observatory, which indicates the dates for observations and technical interventions. With the exception of the team leader (Mon-Fri) and the two LGSF experts, Instrumentation team members work a regular 8/6 (mainly Tuesday-Tuesday) shift. However, interventions and missions that require specialists to be present may require special shifts for single staff members. As a result, the average number of regularly performed 8/6 shifts (regarding the 12 remaining team members) fluctuates between 12 and 14 (per person) over the last years.
This figure is of course influenced by training periods inside and outside Paranal, duty travel, vacations and medical leave.

Student internships
Our observatory offers summer internships to Chilean students. The scope of the work must be well-defined and followed up with the goal of obtaining usable results by the end of the internship, which typically last several shifts.

Internal development
New staff members have to reach a workable knowledge of all our systems within a reasonable time. Depending on their background, this period varies between 3 and 9 months. Most of this formation is based on "learning by doing" performed by all our group members in an occasional and opportunistic manner.

Training
The training needs of staff members are intensively discussed in advance for a one year period. In addition to on the job training by e.g. staff on mission from other sites of the organization, it is usual for a staff member to attend a 1 week external training program (for example Adaptive Optics, Detectors, Cryogenics) approximately every second year.

Missions to new instruments
The many instruments under planning and development at various sites in Europe can benefit from our experience and requirements for achieving smooth day to day operation in the future. Thus we also seek to participate to a certain extent in the processes of the project, starting from the review of documents until yearly visits to the growing instrument hardware.

6 PREPARING FOR THE FUTURE

Staff rotation
With a staff circulation of a little more than 1 per year (regarding 15 staff members over the last 10 years) it is not too difficult to maintain continuity on most of the systems. It is also supported by the high similarity of many of our instruments as well as the deep entanglement of everyone's tasks. On particularly demanding instruments like VIMOS, the loss of an expert is clearly seen for several months in the downtime statistics.
However, the circulation of staff also opens the easy possibility to rearrange responsibilities (ref. Table 3) in order to optimize the relation of personal capabilities and preferences with the requirements of our instruments and subsystems.

Group development
The development of our group as a whole is a slow movement from specific technical tasks towards managing our instruments as System Engineers. This aspect is also regarded in occasions when a vacancy opens up (see "Staff Rotation" above).

Challenges with current instruments

Despite the fact that the statistics in chapter 4 imply a steady state behavior of our instruments, there are frequent surprises that require major attention. Amongst them are:

- Failing or aging components that cannot be replaced easily by a spare as they are specially built or spares are obsolete. In this case, a careful assessment of the consequences of a (non-) retrofit has to be performed and fed into an upgrade project. These upgrades typically involve extensive design work and support from our mechanical workshop. Involving new commercial suppliers is also sometimes necessary, however difficult in terms of meeting the same specifications as the original part (which are mostly not completely known).
- Removals or swaps of instruments to other foci / telescopes which that a retrofit of infrastructure in the place of destination.

Future instruments

Although the Paranal Observatory has reached a steady state of operation and is almost fully equipped with instruments in the VLT foci and the VLT interferometer, there is still a challenging future to come for their Instrumentation. It ranges from the commissioning of the already integrated wide field camera OMEGACAM, the expected arrival of 3 more VLT instruments (KMOS, SPHERE and MUSE, the two latter ones with state-of –the-art AO systems), an additional AO system (GRAAL) for the current HAWK-I instrument, the combined focus instrument ESPRESSO, to more VLTI instruments as MATISSE, GRAVITY and (as visitor instrument) PIONIER.

In the scope of new VLT instruments, the AOF (Adaptive Optics Facility) needs to be mentioned, which will induce major changes in one of the four VLT Unit Telescope (as e.g. a deformable secondary mirror), with a not fully predictable level of contribution from our team with respect to the AOF itself or necessary adaptations of the affected instruments.