

Profiles suitable for the in-kind contributions in 2022-2023

Vacancy Notice 1: Control Software engineer

We are looking for software engineers to join the team in the *Control Software and Engineering Department* that implements control software for the Extremely Large Telescope and its tools.

The department comprises a team of around 50 engineers organized in 5 groups and is responsible for the definition, design, and implementation of complex control systems for ESO's telescopes and instruments. The three groups Observatory Control, Instrument Control and Real Time Control Software are working on different subsystems of the control system of the ELT and its instruments.

Main Duties and Responsibilities:

- Contribute to the design, implementation, and test of the ELT control software.
- Support commissioning of the ELT control software on site in Chile
- Interface and provide support to users of real time control or instrument frameworks, e.g. instrument consortia (only for Real Time and Instrument control software)

Key Competences and Experience:

Essential:

- Minimum of 3 years of experience in software development;
- Experience developing SW with C++ (preferably C++17 or above) and Python under Linux;
- Knowledge of standard software development processes, preferred agile or iterative;
- Knowledge of SW engineering principles, tools for configuration management, bug reporting...;
- Experience in working in a team;
- Curiosity and eagerness to learn;
- Ability to work in a matrix structure for different projects and with different teams, also in parallel;
- Flexibility to adapt quickly to new ways of working or new responsibilities.

Desirable:

- Experience with real-time distributed control systems;
- Experience with multi-threaded applications;
- Experience in development of software frameworks;
- Experience implementing graphical user interface with Qt.
- Experience in working in international/multicultural teams;

Desirable for joining the Real Time Control group:

- Experience in Linux and network performance tuning and optimization, e.g. CPU affinity, IRQ affinity, NUMA;
- Knowledge about network concepts: Ethernet (GbE), UDP, IGMP etc.;
- Experience with high performance computing (HPC) incl. usage of accelerators like GPUs;
- Knowledge of control systems theory and/or digital signal processing software.

Desirable for joining the Observatory or Instrument Control group:

- Experience with real-time distributed control systems using field-buses.
- PLC Programming (IEC 61131-3) and OPC UA.
- Sound knowledge of motion control and low level control of hardware devices.
- Experience with TwinCAT and Beckhoff PLCs.
- Experience with detectors or camera control.

Qualifications:

University degree in computer science or equivalent.

Starting date & duration:

As soon as possible.
3 years.

Duty station:

Garching bei München.

The possibility of remote working from the candidate's home country can be considered. In this case, regular visits (e.g. 2 weeks per quarter) to meet with the rest of the team will be necessary.

At the end of the contract a few missions to Chile are possible for the first deployment of the control system.

Vacancy Notice 2: Control Engineer

We are looking for a control engineer to join the *Control Engineering group* within the *Control Software and Engineering department*. The department comprises about 50 software and control engineers, who work closely with other departments at ESO as well as many national and international institutes and industrial consortia to define and develop state-of-the-art research facilities for ESO's observatories in Chile, especially for the ELT. You will be working closely with various ESO project teams on the ELT programme.

Main Duties and Responsibilities:

- Providing support to ESO projects for the design, analysis, test and optimization of control systems
- Investigating, designing and simulating suitable controller concepts, methods and algorithms with emphasis on impact analysis and compensation methods for vibration-caused disturbances of the ELT instruments
- Conducting performance tests, verification and optimization, both in model-based simulations and on scale-down test setups in a laboratory environment

Key Competences and Experience:

Essential:

- Experience in the development and implementation of high-accuracy / high speed servo-controlled systems, using advanced control methods
- Solid theoretical knowledge of complex control systems, including characterization, modelling and analysis of opto-mechanical (or comparable) systems
- Excellent knowledge of standard numerical simulation tools for complex control systems such as Matlab / Simulink

Desirable:

- Experience in:
 - structural analyses
 - optical detectors
 - active optics / deformable mirrors
 - implementation of real-time computing systems
- Experience in working in international/multicultural teams.

Qualifications:

University degree in control engineering or equivalent.

Starting date & duration:

As soon as possible.

3 years.

Duty station:

Garching bei München.

Vacancy Notice 3: Detector electronics engineer

We are looking for an electronics / detector systems engineer to join the *Electronics Engineering Department* to cover a wide range of roles, working in all aspects of designing, testing, and delivering new infrared and/or visible detector systems and their electronics to the ELT instruments. The Electronics Department comprises 32 electronic engineers, physicists and technicians who are responsible for the definition, design, and implementation of complex control systems for advanced optical and infrared astronomical instrumentation, detectors and telescope systems required for ESO's Observatories in Chile.

Main Duties and Responsibilities:

- Detailed design of new electronics for next generation detector controllers which will include complex FPGA circuit design using formal VHDL design techniques, high voltage clock and bias circuitry, low noise electronics, high speed electronics and electronics for cryogenic operation.
- Design, build and integrate complex astronomical detector systems, including the required electronics and hardware.
- Integrate, qualify, and test visible imaging systems using calibration techniques.
- Conduct technical assessments of instrument requirements and analyse detector system performance.
- Collaborate with ESO Engineers from other projects and Observatories, to define common approaches and standards and share experiences.

Duties and responsibilities are not limited to the above, and a flexible approach and willingness to adapt is required.

Key Competences and Experience:

Essential:

- Visible, (CCD and/or CMOS) detector system design, integration, qualification, and test,
- FPGA based digital logic developments in VHDL, including a good understanding of FPGA design and architectural concepts for FPGA based SoCs,
- Analogue electronic circuit design including very low noise electronics (DC to 100 MHz),
- High-speed electronic schematic design and its corresponding PCB layout,
- Rigid-flexi PCB design,
- Effective and committed team player with ability to look for pragmatic solutions
- Excellent cross-disciplinary communication skills both oral and written

Desirable:

- Test bench design for simulation and verification (e.g. with UVVM, VUnit, cocotb),
- Specific experience with Xilinx FPGA platforms and vendor tools,
- Familiarity with version control and continuous integration tools (GitLab, Jenkins),
- Experience with software scripting languages, such as Python,
- SPICE modelling,
- Semiconductor detector physics,
- Handling of sensitive and expensive opto-electrical components, clean room experience,
- Ability to and experience of working efficiently within an international and multi-cultural environment both independently and with diverse stakeholders including ability to build and manage collaborative working relationships with multi-disciplinary stakeholders,
- Pro-active approach to contribute ideas for improvement and future developments.

Qualifications:

University degree (MSc or an equivalent educational level) in preferably electronics or physics with at least 3 years of proven electronics experience within the area of the aforementioned essential competence.

Starting date & duration:

As soon as possible.
3 years.

Duty station:

Garching bei München

Vacancy Notice 4: Physicist or young system engineer for opto-mechanical system simulations

The *Systems Engineering Department* is looking for a young engineer or physicist to support its team of systems engineers following up the ELT instrumentation development.

The ELT instruments are built by consortia of European scientific institutes. The ESO engineers and scientists are accompanying and following up these developments, as well as organizing regular reviews of the projects. An essential element of these reviews is to look critically at the design and check the performance of these complex instruments. Modeling of (parts of) the instrument, simulation of its expected performance, computation of technical budgets, analysis of system behavior... need to be performed with different methods to provide independent cross-checks.

You would be supporting us in performing such analyses systematically, thoroughly, and regularly. You will get to know the ELT instruments very intimately, broaden your technical competences and gain a strong experience in contact with experts in the various engineering disciplines within ESO and the consortia. You will also acquire experience on the management of large instrumentation projects by supporting the ESO project managers and systems engineers during the project follow-up, progress meetings and reviews.

Main Duties and Responsibilities:

- Develop opto-mechanical and physical models of (parts of) the ELT instruments;
- Simulate complex processes and control systems to evaluate their performance;
- Detail and compute technical budgets (dynamic image quality, pointing accuracy, mass, power, pre-setting duration, ...);
- Analyse test data and compare them to simulations;
- Support the ESO system engineers and managers in organizing and leading technical meetings, participate to progress meetings and project reviews with the instrument consortia. Coordinate the follow-up of the action items, change requests...

Key Competences and Experience:

Essential:

- Good physics and opto-mechanical background;
- Polyvalent and diverse knowledge of astronomical instrumentation
- Strong data analysis competence using Python (preferred), MatLab or IDL.
- Experience in scientific instrumentation modelling and simulations.

Desirable:

- Experience in the optical design tool Zemax;
- Experience with STOP analysis (Structural – Thermal – Optical – Performance).

Qualifications:

University degree in opto-mechanical engineering or in physics with a few years of experience in scientific instrumentation.

Starting date & duration:

As soon as possible.

3 years.

Duty station:

Garching bei München.

Vacancy Notice 5: A junior engineer for support in configuration control

We are looking for a junior engineer with a very systematic mind to support the ELT System Engineering team in the configuration and location management of the ELT deliveries.

The Extremely Large Telescope distinguished itself from former ESO projects by the extremely large number of components. For example, the ELT will contain about 1000 mirror segments, each containing tens of complex sub-assemblies, resulting in several tens of thousands of individual components, which need to be followed-up. For every sub-assembly, its internal configuration and location needs to be known at any point in time. Especially during the assembly and integration phase of the telescope, the logistics of the project need to be brought to an industrial level. The first components of the ELT are currently being delivered and need to be entered into the database.

You will work on configuration and location management in the context of a large scientific facility, its logistic aspects, digitalization of workflows and processes, and data & information management. You will also interact with engineers of all involved disciplines, and thus acquire a broad technical overview of the project. You will also have the opportunity to visit the construction site of the ELT and work with colleagues on-site in preparing, testing, and running the location management system there.

Main Duties and Responsibilities:

- Discuss with the various ELT work package managers, to identify and structure the relevant and essential information that needs to be stored for each ELT sub-system and component (e.g. item & serial numbers, internal configuration, test sheet, tuning parameters, ...);
- Collect the data, check for correctness, completeness and compliance with the needs and prepare them for integration into the database;
- Develop Python / Excel-scripts to automatize the import of the data into the database;
- Work within the ELT System Engineering team on optimizing the configuration management and location concepts for the ELT.

Key Competences and Experience:

Essential:

- A good technical background in engineering (electronics, mechanics, and optics) to identify the essential characteristics of each sub-system;
- A systematic and rigorous way of working and an analytic mind to organize the data in a logical way during the whole life of the project;
- A good knowledge of Python and Microsoft Excel to prepare and format the data;
- The flexibility and willingness to work in a large multi-cultural team, including contact with industrial partners in many European countries and with the maintenance team in Chile;
- A high capacity of listening to various points of view and synthesizing them.

Desirable:

- A knowledge of configuration and location management tools (like PDM, IBM Maximo or Microsoft Navision)
- A pro-active approach to contribute ideas for improvement and future developments.
- A previous experience in configuration management or logistics / inventory management

Qualifications:

University degree in engineering (e.g., mechatronics).

Starting date & duration:

As soon as possible. 3 years.

Duty station:

Garching bei München.

A few missions to Chile are possible to support the configuration management on-site.

Vacancy Notice 6: Data engineer

We are looking for a Data Engineer to oversee the evolution of the Paranal Datalab and assure a smooth transition from the current version. We seek an individual with good interpersonal communication skills and the ability to work collaboratively in a multidisciplinary and multicultural team. This role will drive technical and infrastructure innovation and the person should be able to execute highly technical work efficiently and within time constraints.

The Paranal Datalab is the set of tools and technologies that support the data & system analysis processes. Its main goal is to systemize the use of data, analytics, and ML/AI to make better decisions. It encompasses all the following layers: data storage and processing, data ingestion, data transformation and modelling, business intelligence, analytics, ML/AI, MLOps, data discovery and finally collaboration.

The Datalab is undergoing a complete upgrade in 2022, following a review by an external data architect. The data analytic needs of Paranal have evolved beyond simple monitoring and the generation of regular automatic reports. With the planned integration of the ELT into the Paranal Observatory, a move to more remote and lean operations is required. A new central operations control centre is envisaged for future integrated operations across the sites, allowing for centralised monitoring, analysis and control of all systems and facilities. At this control centre all relevant data streams will need to be provided to enable the continuous data analysis of the ongoing operations, and data-driven operational decisions. The data architect will outline requirements for the evolution of the Datalab (expected 2022Q4).

Main Duties and Responsibilities:

- Full implementation of the new Datalab system as outlined in the plans and documentation delivered by the data architect (expected 2022 Q4).
- Schedule and plan for the transition from the old system to the new Datalab, and the decommissioning of the old Datalab, ensuring the continuity of essential services.
- Maintenance documentation plan, schedule, and staffing plan for the new system.
- Establish full system maintenance yearly budget over the next 5 years.
- Manage and oversee cloud resources
- Support IT in the administration of cloud and on-premise resources
- Development of a system to monitor utilization of cloud services closely and constantly, with a breakdown by type of service (i.e. Infrastructure, platform, software).
- Cloud services yearly budget for the next 3 years, with a breakdown by type of service and Paranal system domain.
- Maintenance training plan and schedule for staff involved in maintenance and user support.
- User training plan and schedule for staff (end users of the Datalab).
- Work with data science team and support from data engineering point-of-view all existing and new projects

Key Competences and Experience:

Essential:

- Minimum 3 years' experience in data engineering
- Proven experience in at least one cloud platform
- Experience managing interdependencies between cloud and on-premise applications
- Practical knowledge of handlings varied data types and concepts for storing and processing large and or heterogenous data volumes
- Experience building Data Lake and Data Warehousing solutions
- Working professional level of English

Desirable:

- Hands-on skills of data engineering tools and frameworks such as Hadoop, Spark, Kafka
- Practical knowledge of container technologies such as Docker and Kubernetes

Qualifications:

University degree in computer science or equivalent.

Starting date & duration:

As soon as possible.

3 years.

Duty station:

Paranal Observatory (Chile).

Vacancy Notice 7: RAMS engineer

We are looking for a RAMS engineer to support the planning and execution of the Integrated Operations (IOP) Programme in Paranal Observatory. The IOP Programme aims at the definition and implementation of the future operation model for the Extremely Large Telescope (ELT) and the Very Large Telescope (VLT). This new operation model is based on the three pillars: lean, remote and high performance. The VLT unit telescopes and the corresponding infrastructure were designed and build in the 1990's To be compliant with the three pillars, several major upgrade projects need to be implemented to enable remote control/ monitoring and predictive/prescriptive maintenance. The main task of the RAMS engineer will be to ensure that RAMS requirements and budgets are properly defined and that the later upgrades are compliant with these.

Main Duties and Responsibilities:

- Definition and maintenance of RAMS requirements and budgets for the Integrated Operation Programme;
- Follow-up and control of outsourced upgrade activities on the VLT;
- Verification of upgrades;
- Analysis of the ELT RAMS budget and their impact on future operations;
- Support implementation of predictive and prescriptive maintenance at VLT and ELT.

Key Competences and Experience:

Essential:

- Reliability, Availability and Maintainability and Safety Analysis (RAMS);
- Root Cause Analysis (RCA);
- Predictive and prescriptive maintenance techniques;
- Good command of written and spoken English.

Desirable:

- Application of Industry 4.0 technologies for the upgrade of industrial or operational facilities;
- Advanced remote control and monitoring technologies;
- Project management and contract follow-up;
- Good knowledge of Spanish.

Qualifications:

University degree in engineering.

Starting date & duration:

Q4 2023.
3 years in Chile

Duty station:

The duty station will be Paranal Observatory in Chile with a working schedule 8 days on duty / 6 days off duty (8x6) with accommodation provided on site.