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Memorie della

INAF and E-ELT

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Abstract. Since its entry in the Treaty Organisation (ESO) Italy and INAF contributed in science and technology to the existig and to-build suite of telescopes and instrumentation. ESO started the new challenge of builiding the E-ELT, the largest telescope ever built, and Italy, through INAF, is part of the program. This contribution provides a brief overview of the participation of INAF in the E-ELT programme describing the context in which such a participation occurs and assessing the added value it represents for the Italian Astronomical Community.

Key words. Instrumentation, Astronomical Technology

1. Introduction

The participation of Italy through INAF to the E-ELT program is the natural evolution of more than 30 years of fruitful collaboration between the Italian Astronomical Community and ESO. Italy joined ESO on May 24^{th} 1982 as the 8^{th} member of the Organisation, about 20 years after ESO foundation and about 20 years ahead of INAF foundation.

In the 30+ years elapsed from joining, ESO became the central and preferred data source for Italian Optical-IR astronomers, as well as one of the major destinations, together with the LBT (Large Binocular Telescope) of new astronomical technologies developed in Italy.

In the last decade INAF coordinated the activities of the Italian Astronomical Community largely composed by its staff members and its associates, i.e. researchers from universities or other research institutions formally associated to INAF programmes.

INAF endorses and supports the E-ELT programme as a natural scientific and technological step forward in the productive collaboration with ESO.

2. Italy (INAF) and ESO

The long lasting collaboration between the Italian Astronomical Community, later represented by INAF, and ESO has been fruitful for both parties. Italy contributed skilled scientists and engineers that have been incorporated in the Organisation providing fresh ideas for scientific and instrumental programs.

Italy provided ESO with fundamental industrial contributions to frontline technologies, such as devices for Adaptive Optics, and also valuable contributions in the area of telescopes and infrastructures construction.

Researchers and engineers belonging to Italian Institutes actively contributed in the design and procurement of components and subsystems for scientific Instruments as members or leaders of Instrument Consortia.

Respectively ESO provided the Italian astronomical community with access to state-of-the-art optical-IR observing facilities operated in a stimulating scientific international environment.

ESO also transferred to the Italian community scientific and technological know-how as well as system of project organisation, e.g. standards, project monitoring, etc. These boosted a number of important industrial growth opportunities with valuable economical return.

A major example of the mutual fruitful collaboration is the VLT. Beside industrial contributions to the infrastructures and the telescopes mechanics and optics, Italian researchers joint at different level the Consortia delivering UVES, GIRAFFE, VIMOS and some VLTi facilities as part of the first generation of Instruments.

Fully integrated and tested subsystems have been delivered in the second generation of VLT instrument for X-shooter and SPHERE, stating the progressively increased maturity of our community.

Finally a participation to the last generation of VLT instruments, the one for which a cash contribution was for the first time requested in a logic of "cash versus GTO" exchange, is currently given by INAF to ESPRESSO, MOONS and ERIS with, case by case, recognised technical and system leadership.

The important contribution in cash INAF is providing for these projects is a further proof of the commitment of INAF versus ESO.

3. INAF and the E-ELT

The next important step for ESO is the E-ELT. INAF looks at its participation to the E-ELT program as the natural evolution of the commitment and interest of the OPT-NIR Italian Astronomical community in ESO.

This is of particular importance being the OPT-NIR Community the second largest community in INAF, after High-Energy Astrophysics, hence a high priority for us.

E-ELT represents also a renewed challenge for the Italian Industry to which INAF provides support.

The interest of INAF for the E-ELT has been clear since the early phases of the project. INAF Researchers took part with major or minor roles to the following E-ELT Instrument design studies:

- MAORY (lead) - Diolaiti (2010)
- MICADO (minor) - Magrin et al. (2010)
- CODEX (major) - Pasquini et al. (2010)
- SIMPLE (lead) - Origlia et al. (2010)
- OPTIMOS (EVE/DIORAMAS) (considerable) - Spanò et al. (2010), Le Fèvre et al. (2010)
- EPICS (minor) - Vérinaud (2010)

In addition personnel from INAF was seconded at ESO in the E-ELT Project Office during the design study until the delivery of the first construction proposal (D'Odorico et al. 2010).

Italy through INAF joined the E-ELT at the Council meeting of December 2012 (ad referendum then confirmed) and approved the kick-off of the 2 phases approach in the December 2014 Council meeting. The Extraordinary contribution by Italy amounts to 52 Meuro over 10 years. Italy has, up to now, regularly paid the quotas.

Unlike the regular contribution of Italy to ESO, which is handled by MAECI (Ministry of Foreign Affairs) and is automatic, the E-ELT extraordinary contribution is under the direct responsibility of INAF and is covered with money flown by MIUR (Min. of University and Research). The extraordinary contribution for E-ELT by INAF is about the same size of the amount allocated for CTA and SKA (with which E-ELT competes in resources repartition).

The implications of having E-ELT under INAF-MIUR budgets is primarily the fact that it is not granted by law. The commitment of MIUR versus INAF for E-ELT shall be renewed in every yearly budgetary law. In order to grant the renewal it is important to keep the appeal of the initiative and the engagement of the community as high as possible. If we are left without money by the Ministry we will have to negotiate a bailout. Also If we are dissolved (as INAF) continued participation cannot be guaranteed.

The extraordinary contribution is intended to solely cover the fee to ESO for the participation to the E-ELT program. The Participation to Instrument Consortia, through cash and FTEs, as well as the R&D activity oriented to the E-ELT, is supported via other funding channels. Among these the most important is surely the "progetti premiali" scheme.

4. Progetti Premiali

In recent years MIUR introduced the concept of Progetto Premiale. A fraction of the budget of the Italian Research Institutions is retained to form a plafond for projects of special international relevance (about 100 Meuro per year). These funds are re-distributed (via calls or other means) in proportion of the scientific ranking of the single Institution. In last quadrennial evaluation process INAF has been ranked very high and hence an important quota of these funds (about 13 Meuro per year) has been given back to the us.

About 11.5 Meuro of premiali have been distributed over the last 3 years to ESO related activities. Of these about 6 Meuro for E-ELT (T-REX 1 and T-REX 2), 3 Meuro for ALMA and 2.5 Meuro for VLT related activities. Other premiali with specific scientific targets (e.g. WOW on extrasolar planets) are not specifically dedicated to ESO but have direct interactions with ESO science programs.

5. INAF current activities in E-ELT

INAF researcher are currently involved in a number of activities on the E-ELT. INAF is part of the AdOptica Consortium for the procurement of the M4 Adaptive Unit. The PDR contract has recently been concluded and the contract for the construction has been signed.

INAF will lead an international Consortium to build the Multi-conjugated Adaptive Optics Module MAORY. The Agreement is in currently being finalised and the signature is expected in late 2015.

INAF also leads an international Consortium/initiative to build the High Resolution Spectrograph HIRES. A call for the phase-A has been recently issued by ESO and the Consortium/Initiative is currently preparing the answer to the call. Minor but relevant participations are foreseen in the imager MICADO and in the Multi Object Spectrograph MOS Consortia.

6. Conclusions

In the framework of the long-lasting fruitful collaboration with ESO, INAF contributed science and technologies from the early phases to the E-ELT program.

Lately INAF formally joined the E-ELT program representing Italy and providing the extraordinary financial fee required for the participation.

INAF supports its researchers members or leaders of Instrument Consortia and boosts industrial activities related with the E-ELT.

INAF is deeply and enthusiastically involved in the E-ELT program and looks forward to the many years of success in Science it enables.

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