

### 3 Participants

The following table lists the participants to the ELT Design Study specified herein.

Participant No	Organisation (name, city, country)	Short name	Short description (i.e. fields of excellence) and specific roles in the consortium
1.	European Southern Observatory <i>International Organization; Garching bei München, Germany</i>	ESO	Lead organisation for the ELT Design Study. Main European astronomical infrastructures provider, with 40 years experience in design, integration and operation of modern facilities. ESO has currently 11 Member States (Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Portugal, Sweden, Switzerland, United Kingdom), with Finland joining mid-2004. It has built and runs 2 optical/infrared observatories in Chile, where it is also constructing a third one on the Chilean Altiplano (ALMA project, in cooperation with the US).
2.	Advanced Mechanical and Optical Systems (AMOS) <i>Liège, Belgium</i>	AMO	AMOS was founded in 1983, employs 65 people specialized in design and manufacturing of high accuracy mechanical and optical systems, mainly realized for space industry and astronomical observatories. Within the framework of the ELT Design Study, AMOS will be in charge of the design, construction and testing of a representative friction drive breadboard.
3.	ASTRON <i>Dwingeloo, The Netherlands.</i>	AST	<p>ASTRON (formerly NFRA) is a scientific governmental organization with the goal to promote the orderly and successful development of astronomy in the Netherlands. Its programme to implement this strategy has two principal elements:</p> <ul style="list-style-type: none"> <li>• the operation of front line observing facilities, incl. especially the Westerbork Radio Observatory.</li> <li>• a strong technology development program, encompassing both innovative instrumentation for existing telescopes and the new technologies needed for future facilities.</li> </ul> <p>The technology component encompasses both radio and optical (infrared) instrumentation. The optical instrumentation group has expertise in designing and building optical instrumentation and has built the spectrograph of VISIR (mid-IR spectrograph for VLT), the complete cold bench of MIDI (mid-IR interferometer for VLTI), the SPIFFI 2k-camera for Simoni (VLT). Presently, the group is involved in the designing and building of the mid-IR spectrograph of MIRI for the James Webb Space Telescope, the near IR spectrograph for X-Shooter (VLT).</p>
4.	The Australian National University, Mt Stromlo Observatory <i>Weston, Australia.</i>	ANU	<p>R&amp;D of optical fabrication and measurement techniques for deformable mirrors (09300) and Simulation codes development &amp; AO test case analysis (09500).</p> <p>Expertise in design, and construction of advanced optical systems of exacting tolerances, numerical simulation, modeling and optimization, and thermal analysis. Expertise in systems engineering and control theory. Design and manufacture of Gemini South Adaptive Optics Imager (GSAOI) and Gemini Near-infrared Integral Field Spectrograph (NIFS) for imaging spectroscopy with adaptive optics. Direct access to kiln glass-slumping expertise and Supercomputer Facility within Australian National University.</p>

5.	CIMNE - Centre Internacional de Mètodes Numèrics en Enginyeria <i>Barcelona, Spain.</i>	CIM	<p>Research centre in the development and application of numerical methods to a wide range of engineering problems, incl. non linear analysis, safety analysis, shape optimisation in structural and fluid dynamic problems, CFD studies, simulation of material deformation and forming processes for the manufacturing industry. CIMNE takes an active part in R&amp;D, in co-operation with universities, research organisations and industry world-wide. In the last 15 years, CIMNE has taken part in more than 470 R+D projects with the financial support of the European Community, the Spanish Ministry of Industry, CIDEM, CIRIT and CICYT, among others, as well as some 200 Spanish and international enterprises.</p> <p>CIMNE will study the internal and external air flow in the enclosure of the ELT to determine wind loads on external structures and air flow pattern in the vicinity of the building. Internal air flow analysis will provide information on ventilation (air renovation), the load on the optics, the temperature distribution in the building and the heat transfer between the interior and the exterior of the enclosure. Finally, it will also help to determine the influence of the enclosure shape and, above all, size, on the results.</p>
6.	Cranfield <i>Cranfield, United Kingdom.</i>	CRA	The Precision Engineering Group at Cranfield has specific expertise in the development of ultra precision machine tools and processes. Specific developments focus on the fabrication and measurement of large and complex shape optics for ground and space based instruments. The Group works in close collaboration with a number of spin-out companies and itself runs precision and ultra precision fabrication laboratories.
7.	Durham University <i>Durham, United Kingdom</i>	DUR	The <i>Astronomical Instrumentation Group</i> in Durham has specific expertise in the design, construction, and commissioning of astronomical adaptive optics systems and spectrographs. It is one of the largest groups of its kind in the UK consisting of 30 academics, research scientists, engineers, technicians, and graduate students. It will contribute to task 09400, Novel Adaptive Optics Concepts, and to task 11200 on Instrumentation.
8.	Fogale <i>Nîmes, France.</i>	FOG	SME with strong expertise in metrology, including but not limited to metrology for the integration and operation of modern astronomical telescopes. Major supplier for the 11-m South African Large Telescope project, currently under construction.
9.	Galway University <i>Galway, Ireland.</i>	GAL	University groups in Physics and I.T. Departments with particular expertise in astronomical instrument design and construction (e.g. high time resolution instrumentation), adaptive optics and atmospheric modelling, and applications of high performance computing to engineering modelling and simulations.
10.	Grantecan <i>La Laguna, Spain.</i>	GRA	Spanish public company, in charge of the design, development, installation and commissioning of the 10 meter telescope GTC, under construction at the Roque de los Muchachos Observatory (ORM) in the Canary Islands. Strong experience in segmented telescopes and infrastructures design and construction.
11.	Instituto de Astrofísica de Canarias <i>La Laguna, Spain.</i>	IAC	Major Spanish public research and technology organisation (RTO) in the field of astrophysics; in charge of the European Northern Observatory (ENO) at the Canary Islands, hosting a significant battery of telescopes that are owned and operated by more than 60 research institutions from 19 countries. Large experience in Site Characterisation and instrumentation design and manufacturing.

12.	Instituto Nazionale di Astrofisica <i>Florence, Italy.</i>	INA	National government organization for research in astronomy, astrophysics and related technologies. It embraces the former 12 astronomical Italian Observatories. INAF operates a 3.5m telescope in Canary Island and shares the Large Binocular Telescope in Arizona. Within INAF, the Observatory of Arcetri is leading technological research on Adaptive Optics.
13.	CNRS-INSU  <i>CRAL, Saint Genis Laval, France</i>  <i>LAM, Marseille, France.</i>  <i>Observatoire Paris-Meudon</i>  <i>Meudon (Paris), France.</i>	INS	INSU laboratories include:  CRAL (UMR5574) has a well known track record in instrumentation of major observatories, particularly in the field of 3D spectroscopy. It has developed instruments for CFHT, WHT, is leading a proposal for a second generation instrument (MUSE) at the VLT, and is involved in JWST instrumentation. CRAL also has strong expertise in high resolution imaging techniques, adaptive optics, laser guide stars, MCAO, image deconvolution, etc.  The Laboratoire d'Astrophysique de Marseille (LAM, UMR6110) is part of the Observatoire Astronomique de Marseille-Provence (OAMP). LAM has a well known track record in telescope optics (design, aspherics, polishing, etc.) and in ground and space instrumentation (VLT, JWST, Galex, COROT, HERSCHEL, etc.).  Consisting of two Unités mixtes de Recherche: GEPI (UMR8111) and LESIA (UMR8109).  Observatoire de Paris is the largest astronomical center in France with about 1000 employees, out of which 750 are permanent. It consists of 7 laboratories. It has a well known track record in various ground and space instrumentation projects. Some of the projects relevant to the purpose of this ELT design study are: VLT / Giraffe, VLT / NAOS, JWST / MIRI.
14.	ITER - Instituto Tecnológico y de Energías Renovables <i>San Isidro, Spain.</i>	ITE	The main objective of ITER is the development of research projects related to Renewable Energies and realization of tests in the Wind Tunnel. The Wind Energy Department staff has a 15-years experience in the development of wind studies as well as in carrying out projects of calculation of wind loads and pressure distribution in the wind tunnel.
15.	JUPA SA Transformados Metálicos <i>Yuncos, Spain.</i>	JUP	SME specialized in the field of precision mechanics of large items, ranging from space application to renewable energy technology.
16.	Leiden Observatory <i>Leiden, The Netherlands.</i>	LEI	University group with substantial experience in astronomical techniques, instrument definition, and instrument design. Specific expertise in instrument control and real-time software. The group works in close collaborations with TNO-TPD and ASTRON. The group also has relevant experience in adaptive optics.
17.	Lund University <i>Lund, Sweden.</i>	LUN	University group with wide experience in design of optical and radio telescopes for astronomy. The group has carried out a design study of a 50 m ELT (the Euro50), and led a collaboration for this purpose. It has expertise within systems design, science case, adaptive optics and integrated modeling for astronomical telescopes.

18.	Media C. I. <i>Las Rozas (Madrid), Spain.</i>	MED	SME with expertise in precision mechanics and structures for large telescopes and ground-based instrumentation. Other fields of expertise are aeronautics, aerospace, railroad transportation and automobile. MEDIA provides engineering support for complete product development: design, simulation, production, project management, product assurance and system engineering.
19.	Max-Planck Institut für Astronomie <i>Heidelberg, Germany.</i>	MPIA	Max-Planck-Institute with expertise in cryogenic astronomical instrumentation for large ground-based telescopes. Special experience in precision cryo-mechanics and cryo-physics, IR-detector read out electronics and detector test procedures and facilities. In addition, there is detailed expertise in development and application of astronomical AO systems.
20.	Oxford University <i>Oxford, United Kingdom.</i>	OXF	A university department with a strong research group and experience with design and construction of instrumentation for large telescopes, including VLT and Subaru. The department also hosts the UK Gemini support group, providing experience with observatory operations and strategic planning.
21.	SAGEM (REOSC) <i>Paris, France.</i>	SAG	The REOSC High Performance Optics unit of SAGEM is world leader in large optics manufacturing with key references like the ESO VLT primary (8-m) and secondary mirrors, Coudé Train and delay line mirrors, Gemini primary (8-m) mirrors and instrumentation optics. It also has unique Know How in large optics mass production, with the 42 1.8-m Zerodur segments of the Gran Telescopio Canarias presently under production and several hundreds 80 cm diffraction-limited amplifier slabs supplied to the French Megajoule Laser project.  A technical and financial study of OWL segment production has recently been done for ESO and SAGEM will now focus its contribution to this ELT study on the large Silicon Carbide segments prototypes.
22.	SESO <i>Aix-en-Provence, France.</i>	SES	The Société Européenne de Systèmes Optiques (SESO), located in Aix-en-Provence (FRANCE), is involved in optical manufacturing of components according to customer specifications as well a complete design, manufacturing and testing of any kind of optomechanical systems. Moreover, SESO is one of the world leaders in polishing of large mirrors (by traditional means and/or computer controller machine) with flat, spherical, aspherical, on-axis and off-axis shapes, etc. SESO staff is composed by 65 people, about 30% of them engineers and technicians.
23.	Technion – Israel Institute of Technology <i>Haifa, Israel.</i>	TEC	The physics department has been doing adaptive optics for nearly thirty years. Among its achievements are the invention of the bimorph mirror, new wave front sensors, multi-conjugate adaptive optics, laser and plasma guide stars, stellar interferometers, and more.
24.	University College London <i>London, United Kingdom.</i>	UCL	University group with substantial experience in methods of classical polishing, computer numerically controlled polishing of aspheric optics, and attendant metrology. This work is undertaken in close collaboration with the spin-out company Zeeko Ltd. The group also possesses relevant experience in adaptive optics and coronagraphy, modeling of optical systems, and development of spectroscopic instrumentation for large telescopes.

25.	UK Astronomical Technology Centre <i>Edinburgh, United Kingdom</i>	UKA	Part of the UK Particle Physics and Astronomy Research Council (PPARC), the UK Astronomy Technology Centre (UK ATC) is the national centre for the design and production of world leading astronomical telescopes, instruments and systems. Current major projects include the delivery of systems to the high altitude mountain sites of the Gemini Telescopes Project (8m telescopes in Hawaii and Chile), the Isaac Newton Group of Telescopes (La Palma), the UK Infrared Telescope (Hawaii), the James Clerk Maxwell Telescope (Hawaii), the Herschel Space Observatory (HSO), Mid InfraRed Imager (MIRI) for the James Webb Space Telescope (JWST) and the design and build of VISTA - a 4m wide field telescope in Chile.
26.	Universidad Politecnica Catalonia <i>Barcelona, Spain.</i>	UPC	The Electromagnetic and Photonics Engineering Group of the Universidad Politecnica Catalonia is a well known expert in LIDAR Remote Sensing and Boundary Layer Profiling. In charge of key experiments within the Site Characterisation to determine large scale atmospheric properties.
27.	Université de Nice <i>Nice, France.</i>	UNI	The atmospheric optics group of the Laboratoire Universitaire Astrophysique de Nice has a unique expertise in atmospheric optics for astronomy, both from theoretical and experimental points of view. Most of the major observatories have been characterized by this group: La Silla, Paranal, Cerro Tololo, Cerro Pachon, Roque de los Muchachos, Mauna Kea, South Pole and now Dome C in Antarctica. It developed a whole set of instruments for site testing. Its experience will be crucial in site characterization for an ELT.
28.	University of New South Wales <i>Sydney, Australia.</i>	UNW	University group with experience in instrument development and modelling of adaptive optics performance for both temperate sites and Antarctic locations. UNSW operates a wide-field patrol telescope at Siding Spring Observatory and has developed many novel instrument techniques.
29.	Universita di Padova <i>Padova, Italy.</i>	UPD	The System and Control theory research group of the University of Padova consists of 12 faculty members and about 20 Ph.D. and post-graduate students. It operates in the Department of Information Engineering of the Faculty of Engineering, which has about 100 faculty members and 150 graduate students and research fellows. The areas of expertise of the group comprise analysis, modeling and control of multidimensional systems; modeling, control, estimation and identification of stochastic systems; algorithms for linear and nonlinear filtering, using Kalman filter-based techniques; computational vision with application to control of autonomous vehicles; robotics.
30.	Zeeko <i>East Lockinge, Didcot, United Kingdom.</i>	ZEE	An SME that is undertaking advanced process development, and manufacturing of CNC polishing machines, for producing aspheric and other complex surfaces. The company's products are currently addressing the market for precision optics, but the company is also developing other outlets for its technology, particularly in producing superior prosthetic knee and hip joints, aerospace turbine blades and industrial moulds.