The European Extremely Large Telescope
The E-ELT

- 40-m class telescope: largest optical-infrared telescope in the world.
- Segmented primary mirror.
- Active optics to maintain collimation and mirror figure.
- Adaptive optics assisted telescope.
- Diffraction limited performance.
- Wide field of view: 10 arcmin.
- Mid-latitude site (Armazones in Chile).
- Fast instrument changes.
- VLT level of efficiency in operations.
The Science

• Contemporary science:
  Exoplanets: radial velocity detections, direct imaging, transit spectroscopy, proto-planetary disks
  Fundamental physics: GR in the strong field limit, variation of fundamental constants, expansion history of the Universe
  Resolved stellar populations: beyond the Local Group
  The physics of high-redshift galaxies
  …and much more!

• Synergies with other top facilities:
  ALMA
  JWST
  LSST and other survey telescopes
  SKA

• Discovery potential:
  Opening new parameter space in terms of spatial resolution and sensitivity
The E-ELT Project

- Top priority of European ground-based astronomy (on Astronet and ESFRI lists).
- Cerro Armazones in Chile selected as the E-ELT site in April 2010.
- Project fully approved in Dec 2012.
- Construction started in 2013.
- Start of operations early next decade.
- Construction cost: 1083 M€ (including first-light instrumentation).
The Telescope

- Nasmyth telescope with a segmented primary mirror.
- Novel 5 mirror design to include adaptive optics in the telescope.
- Classical 3 mirror anastigmat + 2 flat fold mirrors (M4, M5).

- Two instrument platforms nearly the size of tennis courts can host 3 instruments each + Coudé lab.
- Multiple laser guide stars, launched from the side.
- Nearly 3000 tonnes of moving structure.
The Mirrors

M1: 39.3 m, 798 hexagonal segments of 1.45 m tip-to-tip: 978 m² collecting area

M4: 2.4 m, flat, adaptive
    6000 to 8000 actuators

M5: 2.6 x 2.1 m, flat,
    provides tip-tilt correction
The Dome

- Classical design.
- Diameter = 86 m, height = 74 m.
- ~3000 tonnes of steel.
- Fully air-conditioned and wind shielded.
The Instruments

- The telescope can host eight instruments.
- 2007 – 2010: eight instrument and two adaptive optics module concept studies were conducted by the community.

- Instrument Roadmap (2011):
  - Following recommendations by the E-ELT Science Working Group and ESO's Scientific Technical Committee two first-light instruments have been identified: a diffraction-limited near-infrared imager and a single-field near-infrared wide-band integral field spectrograph.
  - The next group (ELT-3, 4 and 5) has been broadly identified as covering the mid-infrared, as well as multi-object and high-resolution spectroscopy.
  - Planet camera and spectrograph on separate track.
  - Flexibility is maintained by including an as yet unspecified instrument.
  - All concept studies remain in the pool of possible instruments.
# Instrument Roadmap

<table>
<thead>
<tr>
<th>Year</th>
<th>ELT-IFU</th>
<th>ELT-CAM</th>
<th>ELT-MIR</th>
<th>ELT-4 (MOS or HIRES)</th>
<th>ELT-5 (MOS or HIRES)</th>
<th>ELT-6</th>
<th>ELT-PCS</th>
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<td>2012</td>
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<td>VISIR</td>
<td>Develop science requirements for MOS/HIRES</td>
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<td>Call for proposals for ETD</td>
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<td>Selection ELT-MOS/HIRES</td>
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<td>Call for proposals</td>
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<td>Pre-studies taking the form of phase A or delta-phase A work and/or ESO-funded Enabling Technology Development (ETD)</td>
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<td>first light</td>
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<td>Development of Technical Specifications, Statement of Work Agreement, Instrument Start</td>
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*Notes:*
- TRL: Technology Readiness Level
- ELT: European Extremely Large Telescope
- IFU: Integral Field Unit
- CAM: Camera
- MIR: Mid-Infrared
- MOS: Multi-Object Spectrograph
- HIRES: High-Resolution spectrograph
The Site

Following an extensive site testing campaign, involving several sites in Chile, Morocco, the Canary Islands, Argentina, Mexico, etc, ESO Council selected Cerro Armazones as the E-ELT site.

Selection criteria: impact on science, outstanding atmosphere, but also construction and operations logistics (roads, water, electricity, nearby cities, ...).
More information

The science users web pages:
www.eso.org/sci/facilities/eelt

The E-ELT Construction Proposal:
www.eso.org/sci/facilities/eelt/docs/eelt_constrproposal.pdf

The E-ELT Science Case:

The E-ELT Design Reference Mission:

The public web pages:
www.eso.org/public/telesinstr/eelt.html

Brochures, Posters, etc:
www.eso.org/public/products/brochures/

Gallery:
www.eso.org/public/images/archive/category/eelt/