

Opportunities in Electronics & IT

Detectors

- Fast detectors for adaptive optics (visible, IR)
- Fast readout electronics

Control Electronics

- Control systems for active optics
- Fast control systems for adaptive optics
- Control systems for telescope pointing and tracking

Safety & interlock systems

- Extensive interlock system to guard against damage to telescope and dome

Software

- Observatory-level software and libraries
- Hardware control interfaces
- Embedded software in devices

IT Hardware

- Facility control computer systems
- Data acquisition and storage systems
- Network infrastructure

Opportunities in Infrastructure

Electrical Power Systems

- 4 MW of standby electrical power generation capacity

Coating Plant

- Coating plant for production-line cleaning and coating of primary mirror segments (1.4m diameter)
- Coating plant for cleaning and coating of large mirrors (up to 4.2m diameter)

Heavy Handling Machinery

- Handling equipment for precision alignment of 1 tonne mirror segments
- Heavy lifting and manipulation machinery for 20 tonne instruments



E-ELT: Opportunities for companies in all aspects of construction

Engineering

- Steel structure fabrication
- Actuation & metrology
- Drive Motors & bearings
- RAMS and QA

Civil Engineering

- Dome construction
- Civil works
- Transport links
- Consultancy

Optics

- Manufacture of:
 - Large (>1m) optics
 - Small (<1m) optics
- Optical coatings
- Optical systems
- Laser

Cryogenics & HVAC

- Cryogen storage and handling
- Compressors
- Cooling engines
- Vacuum equipment
- HVAC

Electronics & IT

- Detectors
- Control electronics
- Safety & Interlock systems
- Software
- IT Hardware

Infrastructure

- Electrical Power systems
- Coating plants
- Heavy handling equipment
- Water treatment

Opportunities in Mechanical Engineering

Steel Structure Fabrication

- 3,200 tonne steel support structure for telescope
- Over 1000 precision machined support cells for mirrors, well suited to mass production techniques (dimensions c. 1.5m x 1.5m x 1.5m)

Actuation & Metrology

- 5 axes actuation (c. 3mm stroke) for each of 1000 mirror segments, and micron stroke actuation required to deform mirrors
- High precision metrology for each mirror segments
- High precision metrology for support structure
- Encoders for telescope rotation

Drive motors & bearings

- Direct drive motors to rotate entire 3,200 tonne structure about one azimuth angle
- Direct drive motors to rotate circa 1700 tonne sub-structure about one altitude angle
- Hydrostatic bearings to allow these movements

Opportunities in Optics

Optics Manufacture

- Manufacture of 931 hexagonal mirror segments (1.4 m diameter) for the primary mirror
- Manufacture of large mirrors (6m convex, 4.2m concave, 2.7m flat)
- Assorted small optics

Optical Coatings

- Design of optical coatings for 0.4 – 30 micron
- Process design for coating segments *in situ*

Optical Systems

- Manufacture of one 2.7m adaptive mirror (flat, 2mm thick)
- Laser guide star systems (laser source, launch telescope, collection optics)
- Alignment telescopes

Opportunities in Civil Engineering

Dome Construction

- Structure to enclose entire telescope structure (80 m diameter)
- Movable doors provide a 42m diameter opening
- Must withstand weather conditions at 3000m altitude

Civil Works & transport links

- Construction of foundations and concrete base structure for facility (c. 30,000 cubic metres)
- Construction of access roads for heavy construction and transport vehicles
- Water supply

Consultancy

- General engineering consultancy
- Specialist consultancy on wind modelling (exposed location at 3000m altitude)
- Specialist consultancy on Earthquake modelling (quakes of up to 8 on Richter scale are regular)

Opportunities in Cryogenics and HVAC

Cryogen storage & Handling

- Liquid nitrogen storage and handling facilities
- Liquid helium storage and handling facilities

Compressors & Cooling Engines

- Nitrogen liquifiers
- Helium liquifiers
- Gas compressors

Vacuum Equipment

- Portable pumping stations
- Vacuum lines