Custom Mirror Drive Systems for Ground-Based Telescopes

GTC Secondary Mirror Drive System

Positioning system for the secondary mirror of the 10.4 m Gran Telescopio de Canarias (GTC) located at La Palma (Spain).
Two stage system: a high precision hexapod and a fast tip-tilt chopper to drive a 1.2 m and 46 kg beryllium mirror.
System water-cooled with integrated power and control electronics and heated external covers.

Main features:
• Active alignment stage in 5 DOF with incremental accuracy of 1.5 µm in displacements and 0.5 µrad for rotation
• Fast guiding for image motion corrections
• Chopping motion up to 5 Hz for infrared observations with 0.02 µrad repeatability and jitter below 1 µrad.

VISTA Secondary Mirror Drive System

Positioning system for the secondary mirror of the 4-m class wide field survey telescope, VISTA, hosted at Cerro Paranal Observatory (Chile).
High precision hexapod to drive in 5 DOF a 1.2 m and 240 kg mirror.
Water cooled power and control electronics implemented following ESO standards.

Main performances:
• Absolute accuracy better than 30 µm for displacements and 4 µrad for rotations
• Incremental accuracy better that 2.5 µm and 0.5 µrad.
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E-ELT Fifth Mirror Field Stabilization Unit

M5 Field Stabilization Unit conceptual design and performance validation by means of the design and integration of a scale-one demonstrator for the phase B design of the European Extremely Large Telescope (E-ELT). The M5FU is a fast correcting optical system that shall provide tip-tilt corrections for the telescope dynamic pointing errors and for the effect of atmospheric tip-tilt and wind disturbances.

The main parts of the M5FU are:

• The M5 is an elliptical mirror of 2.9 m x 2.4 m with an expected mass of 360 Kg
• The mirror tip-tilt movement is done by means of 3 piezo-actuators that can move a mass of 200 Kg with a range of 450 μm.

IRAIT Secondary and Tertiary Mirror Drive Systems

Positioning system for the secondary and tertiary mirrors of 0.8 m IRAIT robotic mid-infrared telescope to be hosted at Dome C in the Concordia Station (Antarctic).

Focus and chopping mechanism for the 0.13 m secondary mirror with +/- 10 μrad accuracy.

Tertiary mirror rotation mechanism with 0.18º angular accuracy.

Power and control electronics for remote operation.

Minimum operation temperature at -80ºC.

EST Secondary Mirror Drive System

Positioning system conceptual design for the secondary mirror of the 4 m European Solar Telescope (EST). The telescope study is performed by a European collaboration under the Seventh Framework Program (FP7).

A precision hexapod to align the 0.8 m SiC mirror in 5 DOF and a fast tip-tilt system for image correction with a 150Hz bandwidth.

Cooling system and thermal control to remove the solar heat from the mirror.