CELT Technical Note No. 5

CELT Segment Positioning Actuators - Requirements

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Number of Actuators

The current segmentation calls for 1080 segments
plus (1080 / 6 =) 180 spare segments.
Three actuators per segment are used to control piston/tip/tilt of the segment.; 3 * (1080 +180) = 3780 + spares $\Rightarrow$ ~ 4000 actuators.

Each actuator connects to the segment through a whiffletree
used to more uniformly distribute the load to the segment.

Requirements (Keck actuators are shown for comparison)

	Keck	**CELT**
Range	> 0.6 mm	> 1.2 mm
Rms position error averaged over 20 min	< 20 nm	< 7 nm
Tracking rate	2 to 10 moves / sec	
Slew rate	> 10 μ / sec	> 10 μ / sec
Transverse load capacity	> 14 kg	> 5 kg
Axial load capacity	> 150 kg	> 30 kg
Axial stiffness	> 5.9 x 10^7 N/m	> 1 x 10^7 N/m (~100 Hz resonance)
Transverse stiffness	> 12.7 x 10^5 N/m	> 1 x 10^5 N/m
Local ave power dissipation	< 10 W	< 2 W
Lifetime		ten ~ 30 nm moves / sec

	continuously for 10 years
Survival temperature	2 ±20 ^{o}C
Operating temperature	2 ±8 ^{o}C
Operating humidity	0 to 100% condensing
Electrical shock resistance	yes
Dust protected	yes
Easy Installation and Removal	yes

Budget Goal

Less than ~ $2000 / actuator including electronics and cabling