Design Specifications for the OMC Suspension

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Property	**Value or Description**	**Comment**	**Comments added for 2nd prototype readiness review Aug/ Sept 2007**
Baseplate Dimensions	450 mm x 150 mm x 40 mm	Baseplate only	Actual silica bench (aka baseplate) 450 mm x 150 mm x 39 mm
Payload Mass	6.0 kg	Baseplate plus components	Design allows for +/-10% (i.e. maximum of 6.6 kg)
Baseplate Material	Light-weighted aluminum, or fused silica	Baseplate provided by ISC	Al bench suspended and tested, silica bench still to be suspended
Baseplate internal modes	First mode > 1000 Hz	Get it above IFO noise minimum and violin mode fundamental	FEA shows ~ 1100 Hz (see supporting documentation)
Isolation	Double pendulum, with two stages of blades for vertical isolation	Isolation of a double is estimated to be sufficient, but analysis of baseplate vibration needs to be written down	Isolation at 10 Hz Long: ~ 5 x 10^-4 Vert: ~ 4 x 10^-3 (exact values depend on level of damping and details of bench design)
Solid-body mode eigenfrequencies	0.8-2 Hz	This is a guideline only. Modes involving stretching of the bottom stage wires will of course be higher.	Actual frequencies are in range 0.5 Hz (lower yaw mode) to ~ 7 Hz (higher roll mode). Details on OMC Suspension wiki site under “Testing” link
Suspension fiber type	Steel - music wire		

Beam height	101.6 mm +/- 2 mm[4.0 inches] above HAM optics table; 25.4 mm +/- 2 mm [1.0 inch] above baseplate	same as iLIGO ISC table beam height	Beam is now below bench, not above
Suspension structure footprint	TBD	Keep as small as practical, to leave as much room as possible on HAM table for other components	
Structure resonances	First mode > 150 Hz		Lowest freq. is ~ 140 Hz (see supporting documentation)
Suspension structure height	725 mm ?	This is not really a spec that needs to defined here	Structure height has been looked at in HAM 6 layout to check it doesn't hit ceiling. (see supporting documentation)
Suspension point locations on baseplate	4 points	Along (150mm) width, as close to edges as possible; along length, position points to reduce plate motion (e.g., 22% of length from ends minimizes static deflection)	Susp. points moved in from edge in width direction to reduce higher pitch mode from 9 Hz to ~ 4 Hz. Susp points are at 20% of length from ends in the long axis direction.
Suspension point design	TBD	Slots in plate, or pegs inserted in side of plate	Countersunk through holes chosen for ease of manufacture of silica bench
Local damping	Active, 6 DOF	Same as IMC	
OSEM type	TBD	Probably 'Birmingham OSEMs'	B'ham OSEMS used
Baseplate positioning & pointing range (DC)	Few hundred microns, few hundred micro-rads	Guesstimate -- what's the IMC control range?	Pointing range using B'ham OSEMs of order 2 milliradians in roll, pitch and yaw
Actuator force spectrum	TBD	Not expected to be critical	
Actuator noise	TBD	Not expected to be	

limits		difficult	
Optical line of sight/clearance reqs			
Electrical wiring to baseplate	TBD	No., gauge, type, connector type	
Accuracy of mechanical pitch and yaw positioning			
Accuracy of mechanical vertical positioning			
Beam dumps on SUS hardware	provide mounting holes on uprights, at beam height		Still to be specified
Mechanical stops for baseplate			In place – see detailed mechanical drawings