4-k LLO IOO global coordinates

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Aaron Bengston, Manfredo Chacon, Dan Dickrell, and David Tanner

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These tables give the positions, unit normals, and the input rays for the IOO optics of the 4-k LLO interferometer. The co-ordinates are in the global coordinate system; dimensions are in mm.

In arriving at these, we've checked the mode-matching calculation, put in the wedge angles and refraction angles in the transmissive optics, and included the tilt of the global coordinate system relative to the horizontal tables. The coordinate axes for LLO are defined by "Determination of Global and Local Coordinate Axes for the LIGO Sites," LIGO-T980044-A. Table 4 shows the following:

xG: Angle relative to local horizontal at Vertex: -3.121×10^{-4} radian

yG: Angle relative to local horizontal at Vertex: -6.107×10^{-4} radian

So, at LLO, LHAM 1 is 4.3 mm higher than LHAM 2.

We used the following parameters in the calculation:

SOS height	139.7
LOS height	243
tan(x-axis angle)	0.000312
tan(y-axis angle)	0.000611
Riser for MC2	4.3
Mode cleaner 1/2 length	12245.4
Riser for MMT2	42
Height of MMT2 (above table)	181.7
Height of MMT3 (above table)	225.7

LHAM tables are taken from the 10/26/97 version of `coorloc.xls` except that the table centers are 200 mm below the global x, y plane.

	Global Coordinates		
	x	y	z
Center of LHAM1	-20119.5	0.0	-200.0
Center of LHAM2	-6400.1	0.0	-200.0
Center of LHAM3	-3831.0	0.0	-200.0

The global coordinates of the centers of all the optical surfaces are in the next table.

	Global Coordinates		
	x	y	z
Fixed SM 1	-19274.8	-462.2	-60.0
Fixed SM 2	-19370.7	-740.7	-60.1
MC1 AR side	-19377.2	-273.0	-59.9
MC1	-19359.9	-255.4	-59.9
MC2	-7209.9	-161.1	-56.2
MC3	-19359.9	-65.4	-60.0
MC3 AR side	-19377.1	-48.2	-60.0
Wave plate	-19375.6	360.0	-60.3
SM1	-19375.2	481.1	-60.4
Polarizer, 1st	-19569.8	454.4	-60.4
Polarizer, 2nd	-19589.7	452.3	-60.4
Faraday 1st	-19631.7	446.6	-60.4
Faraday 2nd	-19651.6	443.9	-60.4
Wave plate	-19699.1	437.3	-60.4
Polarizer, 1st	-19727.8	433.4	-60.4
Polarizer, 2nd	-19747.5	430.0	-60.4
MMT1	-20055.2	387.8	-60.5
MMT2	-6508.8	16.2	-18.3
MMT3	-20883.6	207.8	25.4
IOO Handoff	-4692.0	212.0	27.8
RM back sfe	-4690.6	212.0	27.8

The next table gives the unit normals for the suspended optics.

	Unit normal		
	n_x	n_y	n_z
MC1	0.704358	0.709845	-0.000213
MC2	-1.000000	0.000058	-0.000314
MC3	0.704316	-0.709886	0.000654
SM1	-0.658645	-0.752454	0.000254
MMT1	0.998517	0.054409	0.001675
MMT2	-0.999792	0.020375	-0.000033
MMT3	0.999978	-0.006534	-0.001450

In the next table, the first nummeric column is the distance the input ray has come from the previous optic; the next 3 are the components of the input ray unit vector.

	Input ray	Input unit vector		
	$\|u\|$	u_x	u_y	u_z
Fixed SM 2	294.6	-0.325483	-0.945548	-0.000102
MC1 AR side	467.8	-0.013992	0.999902	0.000352
MC1	12150.4	-0.999970	-0.007761	-0.000309
MC2	12150.4	0.999969	-0.007876	0.000318
MC3	190.0	0.000000	1.000000	-0.000611
SM1	529.3	0.003590	0.999993	-0.000610
Polarizer, 1st	196.4	-0.990718	-0.135931	-0.000226
Polarizer, 2nd	20.0	-0.994478	-0.104945	-0.000246
Faraday, 1st	42.4	-0.990916	-0.134481	-0.000227
Faraday, 2nd	20.1	-0.990921	-0.134447	-0.000227
Wave plate	48.0	-0.990484	-0.137625	-0.000225
Polarizer, 1st	29.0	-0.990893	-0.134651	-0.000227
Polarizer, 2nd	20.0	-0.985431	-0.170074	-0.000204
MMT1	310.6	-0.9907260	-0.135875	-0.000226
MMT2	13551.6	0.9996191	-0.027421	0.003112
MMT3	14376.1	-0.9999065	0.013328	0.003045
IOO Handoff	16191.6	1.0000000	0.000259	0.000146
RM back sfe	1.4000	1.0000000	0.000259	0.000146

Mirror balance angles, calculated by transforming to the local coordinates, are in the next table. All angles are in radians. The first four mirrors (MC and SM) are balanced level. The MMT mirrors are balanced to the angles given below. The angle is the angle that the surface normal makes with the local horizontal. A positive angle means output beam is pitched upwards, assuming level input beam. The angle that the output beam is deflected (for level input beam) is *TWICE* the angles given.

MC1	0.000000
MC2	0.000000
MC3	0.000000
SM1	0.000000
MMT1	0.001396(1.4 mrad)
MMT2	0.000292(0.3 mrad)
MMT3	-0.001770(-1.8 mrad)

Please send comments, questions to `tanner@phys.ufl.edu`.