

D1100291, aLIGO LHO Monuments

- 1) The intent is that this document (to include an Excel spreadsheet of coordinates AND a drawing) cover all monuments for use in aLIGO Initial Alignment at I
- 2) Note that the Test Stand (TS1 and TS2) monuments have their own local coordinate systems, which are in general rotated (slightly) from the global coordinate frame.

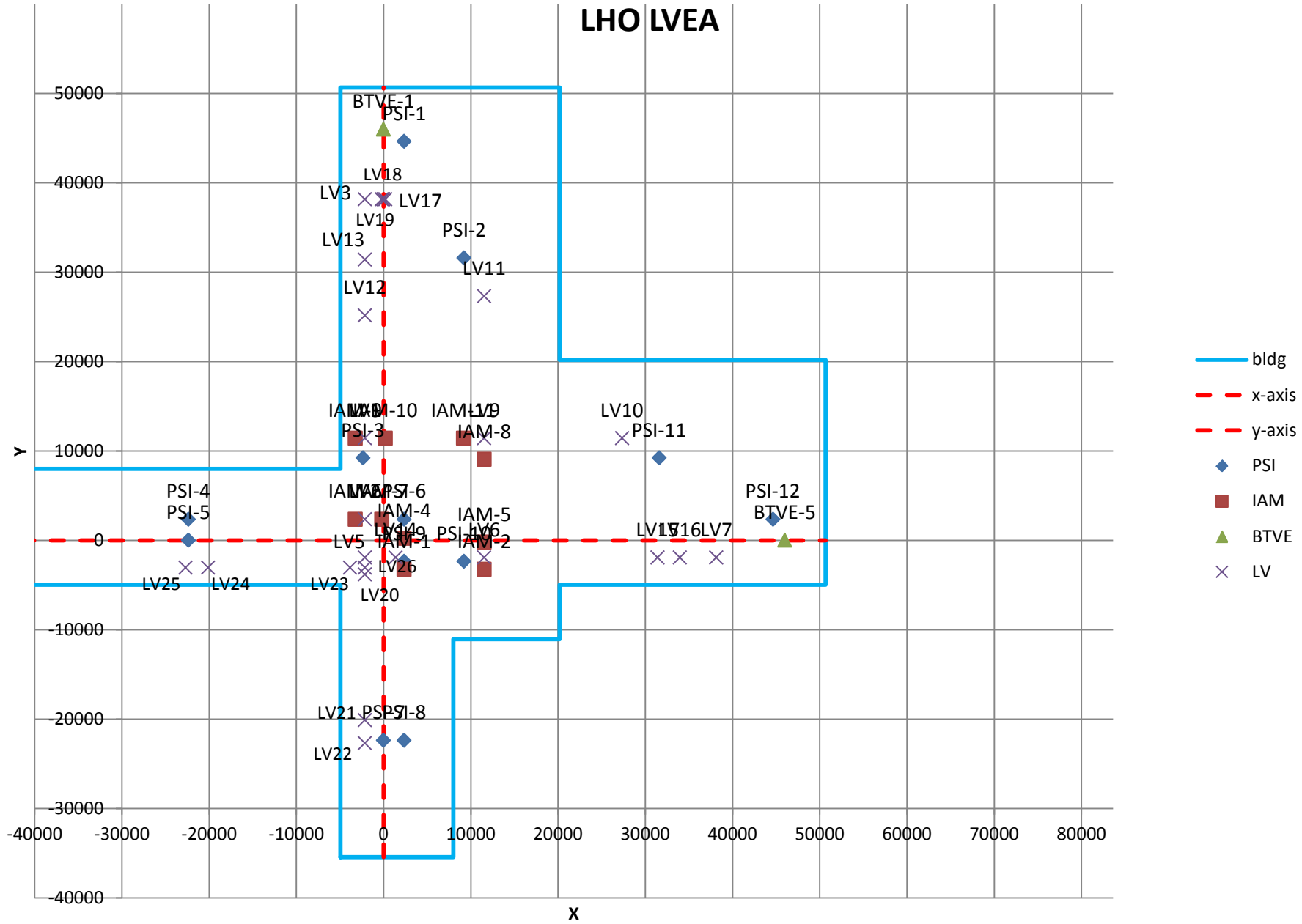
THESE TS MONUMENTS SHOULD EACH BE ONLY USED AS A SET AND NOT IN COMBINATION WITH THE OTHER MONUMENTS!

Sources:

D970210-v1	Initial LIGO monuments BTVE, IAM and PSI. Updated/re-surveyed list/drawing, but not a complete set for all of iLIGO
D970210-v2	update to drawing for aLIGO, including LV monuments (to be developed/posted)
LVEA 15Nov2011	LV1 thru LV16. Jason Oberling & Doug Cook, 15 Nov 2011 (prepared earlier in the year)
D1100291-v1	Dennis Coyne added monument LV17 for aLIGO H2 ITMy alignment
D1100291-v2	Doug Cook added monument LV18 for aLIGO H1 ITMy alignment

LHO.

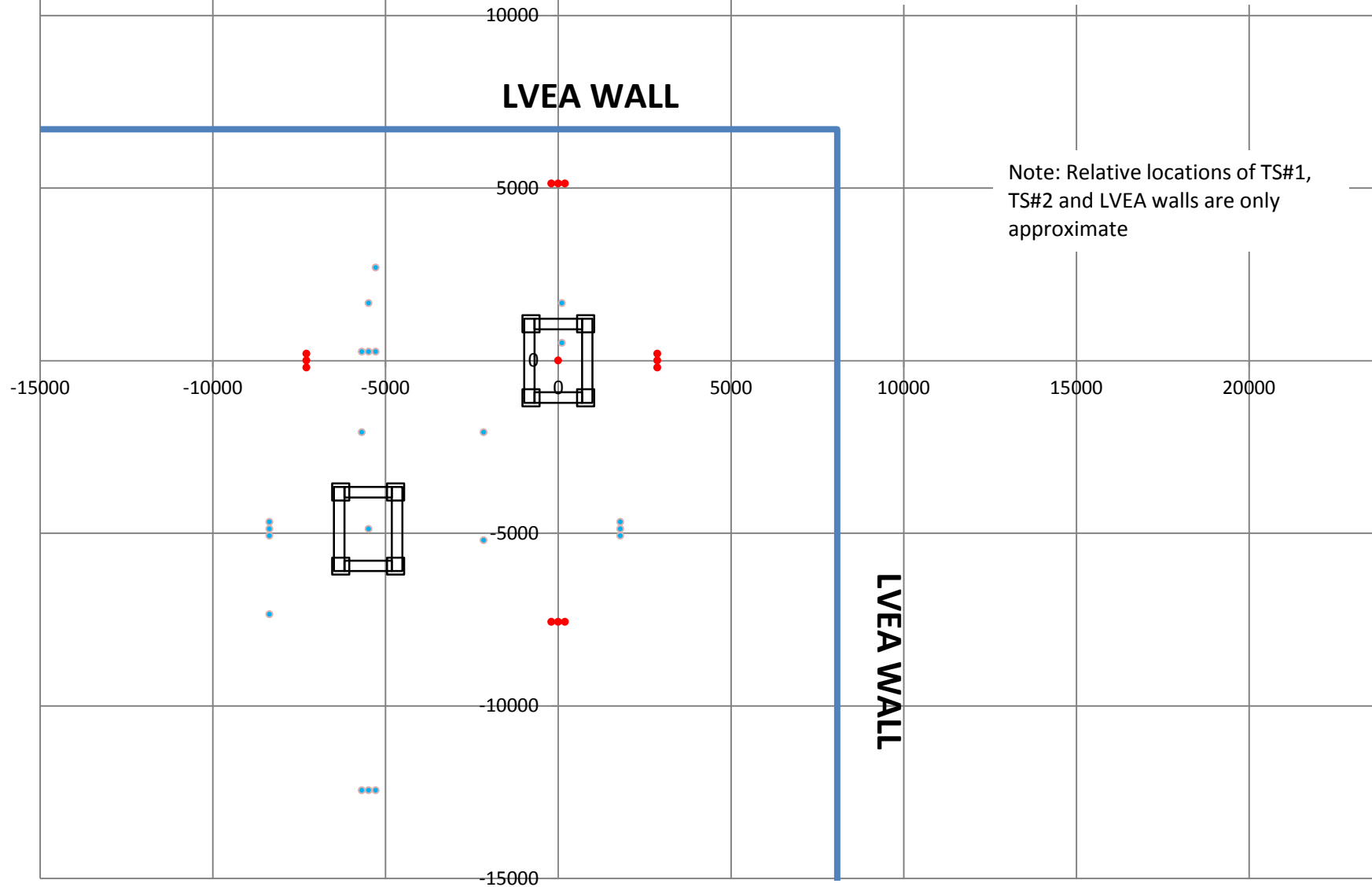
LHO LVEA



designation	X	Y	Z	building
BTVE-1	0.0	46000.0	-1061.2	
BTVE-5	46000.0	0.0	-1061.2	
IAM-1	2362.3	-3251.2		
IAM-2	11543.0	-3251.2		
IAM-3	213360.0	-3251.2		
IAM-4	2362.3	212.9		
IAM-5	11543.1	-200.0		
IAM-6	-3251.2	2362.2		
IAM-7	-200.0	2362.2		
IAM-8	11543.0	9060.0		
IAM-9	-3251.2	11428.0		
IAM-10	200.0	11428.0		
IAM-11	9163.1	11428.0		
IAM-12	-3251.2	213360.0		
PSI-1	2362.3	44643.1	-1854.2	
PSI-2	9219.6	31601.7	-1855.5	
PSI-3	-2362.2	9219.6	-1849.6	
PSI-4	-22382.7	2362.2	-1855.2	
PSI-5	-22382.7	0.0	-1852.2	
PSI-6	2362.2	2362.2	-1850.4	
PSI-7	0.0	-22382.7	-1858.0	
PSI-8	2362.1	-22382.7	-1855.5	
PSI-9	2362.2	-2362.2	-1858.0	
PSI-10	9219.6	-2362.2	-1856.5	
PSI-11	31601.1	9219.6	-1855.7	
PSI-12	44642.6	2362.2	-1853.4	
LV1	-2132.9	11428.0		
LV2	-2133.6	2362.2		
LV3	-2131.6	38158.1		
LV4				
LV5	-2133.6	-1930.7		
LV6	11543.0	-1930.7		
LV7	38155.0	-1930.7		
LV8				
LV9	11543.0	11428.0		
LV10	27340.1	11428.0		
LV11	11543.0	27306.3		
LV12	-2132.2	25171.9		
LV13	-2131.9	31415.1		
LV14	1375.2	-1930.7		
LV15	31426.7	-1930.7		
LV16	33967.1	-1930.7		
LV17	200.0	38158.1		
LV18	0.0	38158.1		
LV19	-200.0	38158.1		
LV20	-2133.6	-3830.7		

LV21	-2133.6	-20122.0		
LV22	-2133.6	-22692.0		
LV23	-3831.0	-3050.7		
LV24	-20122.0	-3050.7		
LV25	-22692.0	-3050.7		
LV26	-2133.6	-3050.7		

LHO LVEA Test Stands and Monuments



TEST STAND #1

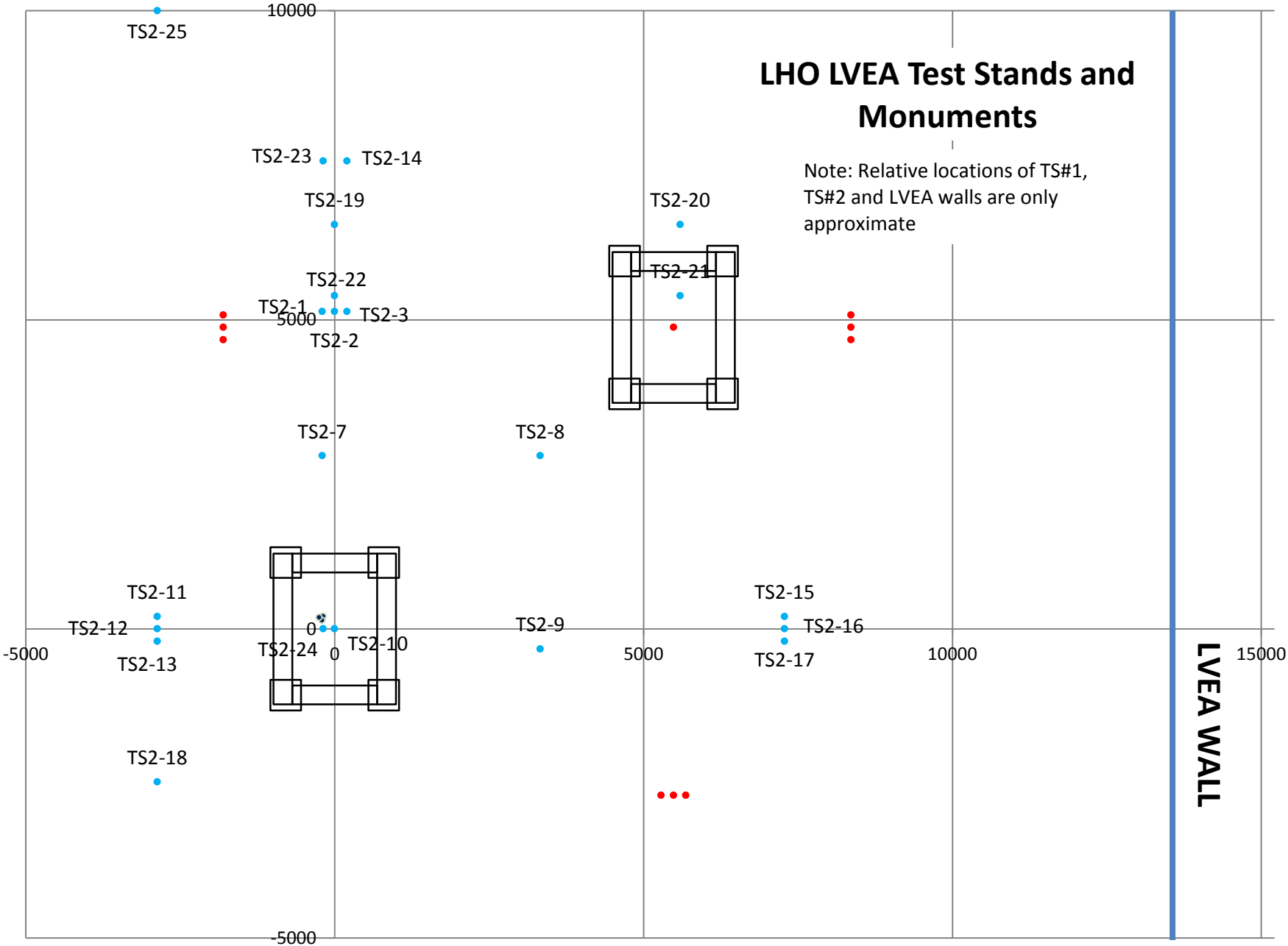
designation	Local		Source	comments	RELATIVE TO TS#2	
	X (mm)	Y (mm)			X (mm)	Y (mm)
TS1-1	-200.0	5133.0	D1101596-V2	Test Stand 1 (TS1)	5286.4	10009.8
TS1-2	0.0	5133.0	D1101596-V2	Test Stand 1 (TS1)	5486.4	10009.8
TS1-3	200.0	5133.0	D1101596-V2	Test Stand 1 (TS1)	5686.4	10009.8
TS1-4	-200.0	-7570.0	D1101596-V2	Test Stand 1 (TS1)	5286.4	-2693.2
TS1-5	0.0	-7570.0	D1101596-V2	Test Stand 1 (TS1)	5486.4	-2693.2
TS1-6	200.0	-7570.0	D1101596-V2	Test Stand 1 (TS1)	5686.4	-2693.2
TS1-10	0.0	0.0	D1101596-V2	Test Stand 1 (TS1)	5486.4	4876.8
TS1-11	-7289.0	200.0	D1101596-V2	Test Stand 1 (TS1)	-1802.6	5076.8
TS1-12	-7289.0	0.0	D1101596-V2	Test Stand 1 (TS1)	-1802.6	4876.8
TS1-13	-7289.0	-200.0	D1101596-V2	Test Stand 1 (TS1)	-1802.6	4676.8
TS1-15	2872.0	200.0	D1101596-V2	Test Stand 1 (TS1)	8358.4	5076.8
TS1-16	2872.0	0.0	D1101596-V2	Test Stand 1 (TS1)	8358.4	4876.8
TS1-17	2872.0	-200.0	D1101596-V2	Test Stand 1 (TS1)	8358.4	4676.8

BS HR		
BS AR		

LHO LVEA Test Stands and Monuments

Note: Relative locations of TS#1, TS#2 and LVEA walls are only approximate

LVEA WALL

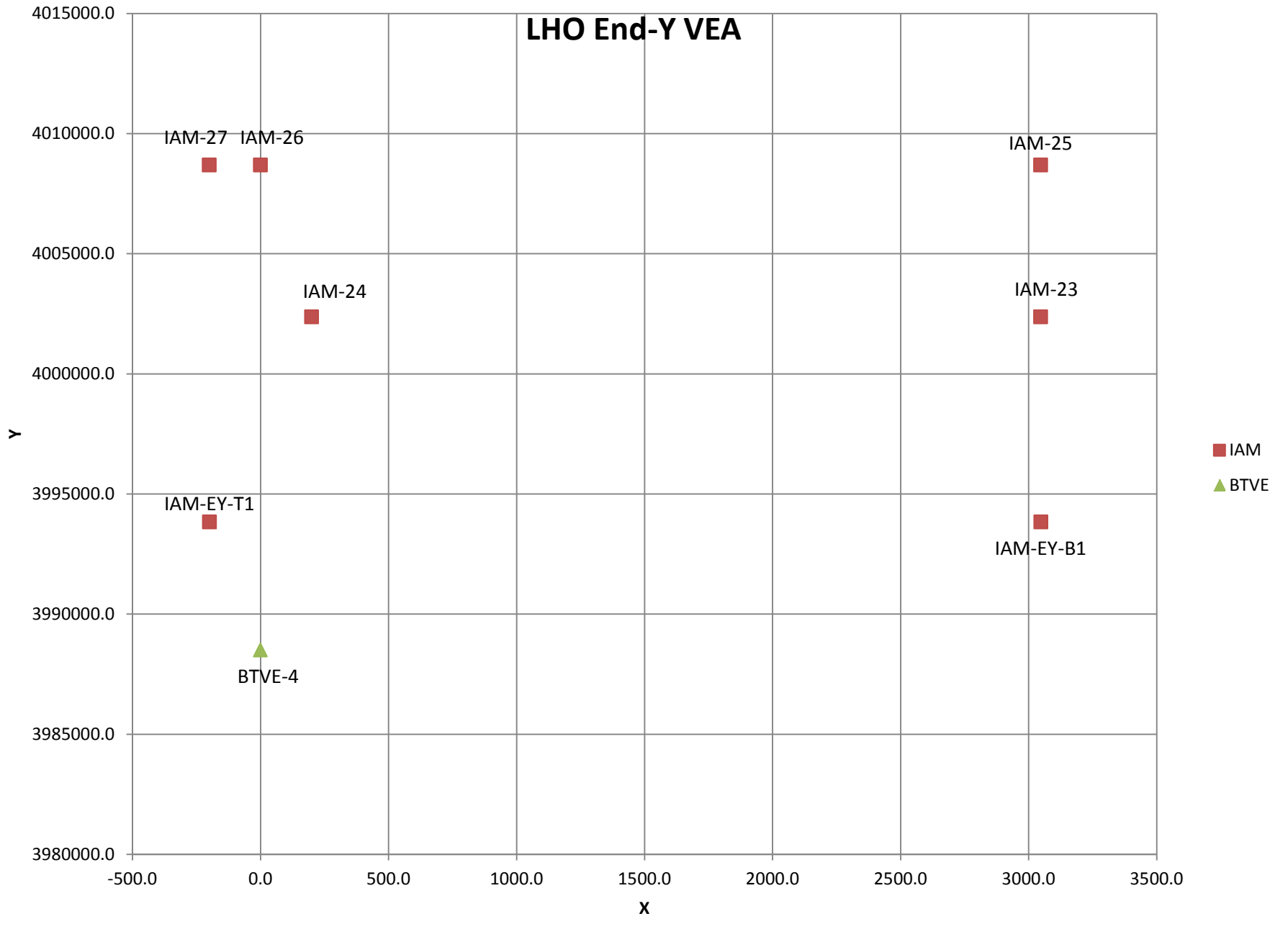


TEST STAND #2

designation	Local		Source	comments	RELATIVE TO TS1	
	X (mm)	Y (mm)			X (mm)	Y (mm)
TS2-1	-200.0	5133.0	D1101596-V2	Test Stand 2 (TS2)	-5686.4	256.2
TS2-2	0.0	5133.0	D1101596-V2	Test Stand 2 (TS2)	-5486.4	256.2
TS2-3	200.0	5133.0	D1101596-V2	Test Stand 2 (TS2)	-5286.4	256.2
TS2-4	-200.0	-7570.0	D1101596-V2	Test Stand 2 (TS2)	-5686.4	-12446.8
TS2-5	0.0	-7570.0	D1101596-V2	Test Stand 2 (TS2)	-5486.4	-12446.8
TS2-6	200.0	-7570.0	D1101596-V2	Test Stand 2 (TS2)	-5286.4	-12446.8
TS2-7	-200.0	2800.0	D1101596-V2	Test Stand 2 (TS2)	-5686.4	-2076.8
TS2-8	3327.3	2800.0	D1101596-V2	Test Stand 2 (TS2)	-2159.1	-2076.8
TS2-9	3327.3	-326.1	D1101596-V2	Test Stand 2 (TS2)	-2159.1	-5202.9
TS2-10	0.0	0.0	D1101596-V2	Test Stand 2 (TS2)	-5486.4	-4876.8
TS2-11	-2872.0	200.0	D1101596-V2	Test Stand 2 (TS2)	-8358.4	-4676.8
TS2-12	-2872.0	0.0	D1101596-V2	Test Stand 2 (TS2)	-8358.4	-4876.8
TS2-13	-2872.0	-200.0	D1101596-V2	Test Stand 2 (TS2)	-8358.4	-5076.8
TS2-14	200.0	7570.0	D1101596-V2	Test Stand 2 (TS2)	-5286.4	2693.2
TS2-15	7285.0	200.0	D1101596-V2	Test Stand 2 (TS2)	1798.6	-4676.8
TS2-16	7285.0	0.0	D1101596-V2	Test Stand 2 (TS2)	1798.6	-4876.8
TS2-17	7285.0	-200.0	D1101596-V2	Test Stand 2 (TS2)	1798.6	-5076.8
TS2-18	-2872.0	-2475.7		Test Stand 2 (TS2)	-8358.4	-7352.53
TS2-19	0.0	6540.7		Test Stand 2 (TS2)	-5486.4	1663.9
TS2-20	5594.5	6540.7		Test Stand 2 (TS2)	108.08	1663.9
TS2-21	5594.5	5388.6		Test Stand 2 (TS2)	108.08	511.83
TS2-22	0.0	5388.6		Test Stand 2 (TS2)	-5486.4	511.83
TS2-23	-183.9	7570.0		Test Stand 2 (TS2)	-5670.34	2693.2
TS2-24	-183.9	0.0		Test Stand 2 (TS2)	-5670.34	-4876.8
TS2-25	-2872.0	10000.0		Test Stand 2 (TS2)	-8358.4	5123.2

	TS#2 cartridge		Source	comments	Global	
	X (mm)	Y (mm)			X (mm)	Y (mm)
BS HR	-183.90	202.60	D0901920-v11	center BS HR face	-202.60	-183.90
BS AR	-202.60	136.60	D0901920-v11	chief X ray intersection with BS AR face	-136.60	-202.60
BS ARS	-249.80	184.00	D0901920-v11	chief Y ray intersection with BS AR face	-184	-249.8

LHO End-Y VEA



designation	X	Y	Z	building
BTVE-4		0.0	3988503.6	-1056.9
IAM-22	3048.0	3776167.2		
IAM-23	3046.9	4002371.8		
IAM-24	200.0	4002371.8		
IAM-25	3047.0	4008691.8		
IAM-26	0.0	4008691.9		
IAM-27	-200.0	4008691.9		
IAM-EY-B1	3048.0	3993835.0		
IAM-EY-T1	-199.4	3993835.0		

designation	X	Y	Z	building
BTVE-1	0.0	46000.0	-1061.2	
BTVE-4	0.0	3988503.6	-1056.9	
BTVE-5	46000.0	0.0	-1061.2	
IAM-1	2362.3	3251.2		
IAM-2	11543.0	3251.2		
IAM-3	213360.0	3251.2		
IAM-4	2362.3	212.9		
IAM-5	11543.1	-200.0		
IAM-6	3251.2	2362.2		
IAM-7	-200.0	2362.2		
IAM-8	11543.0	9060.0		
IAM-9	3251.2	11428.0		
IAM-10	200.0	11428.0		
IAM-11	9163.1	11428.0		
IAM-12	3251.2	213360.0		
PSI-1	2362.3	44643.1	-1854.2	
PSI-2	9219.6	31601.7	-1855.5	
PSI-3	-2362.2	9219.6	-1849.6	
PSI-4	-22382.7	2362.2	-1855.2	
PSI-5	-22382.7	0.0	-1852.2	
PSI-6	2362.2	2362.2	-1850.4	
PSI-7	0.0	-22382.7	-1858.0	
PSI-8	2362.1	-22382.7	-1855.5	
PSI-9	2362.2	-2362.2	-1858.0	
PSI-10	9219.6	-2362.2	-1856.5	
PSI-11	31601.1	9219.6	-1855.7	
PSI-12	44642.6	2362.2	-1853.4	

designation	LV Coordinates		LV Location	Visually Identified LV?	Coordinate Information Source
	X	Y			
LV1	-2132.9	11428.0	LVEA	Y	LIGO ISC Initial Alignment Logbook from Hugh, start date 1-12-99, page 101; coord verified by S. Lorimer & E. Prieto 9/12/11
LV2	-2133.6	2362.2	LVEA	Y	LIGO ISC Initial Alignment Logbook from Hugh, start date 1-12-99, page 101; coord verified by S. Lorimer & E. Prieto 9/12/11
LV3	-2131.6	38158.1	LVEA	Y	LIGO ISC Initial Alignment Logbook from Hugh, start date 1-12-99, page 101; coord verified by S. Lorimer & E. Prieto 9/12/11
LV4	UNK	UNK	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; Mark on W wall, coords unk
LV5	-2133.6	-1930.7	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV6	11543.0	-1930.7	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV7	38155.0	-1930.7	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV8	UNK	-1930.7	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; Mark on N wall, x coord unk
LV9	11543.0	11428.0	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV10	27340.1	11428.0	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV11	11543.0	27306.3	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV12	-2132.2	25171.9	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV13	-2131.9	31415.1	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV14	1375.2	-1930.7	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV15	31426.7	-1930.7	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV16	33967.1	-1930.7	LVEA	Y	Monument set by D. Cook, J. Oberling, S. Lorimer, and E. Prieto 8/3/11 - 8/8/11; coords verified by S. Lorimer & E. Prieto 9/12/11
LV17	200.0	38158.1	LVEA		Monument requested by D. Coyne for H2 ITMy alignment
LV18	-200.0	38158.1	LVEA		Monument requested by D. Cook for H1 ITMy alignment

IAM Number	IAM Coordinates		IAM Location	Visually Identified IAM?
	X	Y		
22	3048.0	3776167.2	End Y	Y
23	3046.9	4002371.8	End Y	Y
24	200.0	4002371.8	End Y	Y
25	3047.0	4008691.8	End Y	Y
26	0.0	4008691.9	End Y	Y
27	-200.0	4008691.9	End Y	Y
EY-B1	3048.0	3993835.0	End Y	Y
EY-T1	-199.4	3993835.0	End Y	Y

Coordinate Information Source

D970210, page 5

D970210, page 5

LIGO ISC Initial Alignment Logbook from Hugh,
start date 1-12-99, page 138; D970210

Monument set by D. Cook, J. Oberling, and S.
Lorimer on 1-4-12

Monument set by D. Cook, J. Oberling, and S.
Lorimer on 1-4-12

Monument set by D. Cook, J. Oberling, and S.
Lorimer on 1-4-12

LIGO ISC Initial Alignment Logbook from Hugh,
start date 1-12-99, page 100

LIGO ISC Initial Alignment Logbook from Hugh,
start date 1-12-99, page 100