

Beam Splitter / Fold-Mirror Suspension (BSFM)

Details of OSEMs, Magnets, Coil Drivers and maximum DC drive range at each stage

T1100602-v2

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Max DAC Voltage	(Differential voltage across the Plus and Minus legs)
[V p]	
10	

Suspension Stage	OSEM Type	Magnet Type	Magnet Size diameter x thickness	Coil Magnet Actuation Strength	Coil Magnet Actuation Strength
Units	[]	[]	[mm]	[N/A]	[N/mA]
Top (TOP_M1)	BOSEM	NdFeB	10 x 10	1.694	0.001694
Intermediate Mass (MID_M2)	BOSEM	SmCo	10 x 5	0.963	0.000963
Optic (BOT_M3)	none	none	n/a	n/a	n/a

Coil Driver	DC Transconductance	DC Max Current Output	DC Current Range	DC Current Range Requirement	Frequency Range
Units	[mA/V]	[mA p]	[mA pp]	[(m_p) or (m_rms)]	[Hz]
Triple TOP (D0902747-v4)	11.919	119.19	238.38	80 (p), 200 (rms)	$f < 1 \text{ Hz}$, $\text{Hz} < f < 100 \text{ Hz}$
Triple Acq. (D0901047-v4)	0.32635	3.2635	6.527	M2: 2.5 (p)	$f < 1 \text{ kHz}$
Modified Triple Acq. (L1200226-v2)	2.8284	28.284	56.568	n/a	n/a

Degree of Freedom (DOF)	Stage	DC Compliance at Mass	Lever Arm	# of OSEMs	DC Compliance at Coil Driver Output	DC Max Disp. from Coil Drive	DC Max Disp. from Coil Drive	DC Disp. Range from Coil Drive	DC Disp. Range from Coil Drive
Units	[]	[(m/N) or (rad/N.m)]	[m]	[]	[(m_p) or (rad/mA)]	[(m_p) or (rad p)]	[(um_p) or (urad p)]	[(m_pp) or (rad pp)]	[(mm_pp) or (mrad pp)]
Longitudinal	M1	0.001528	1	2	5.177E-06	6.171E-04	617.07	1.234E-03	1234.142
Pitch	M1	0.137720	0.055	1	1.283E-05	1.529E-03	1529.37	3.059E-03	3058.743
Yaw	M1	0.152080	0.104	2	5.359E-05	6.387E-03	6386.88	1.277E-02	12773.757
Longitudinal	M2	0.003691	1	4	1.422E-05	4.640E-05	46.40	9.281E-05	92.807
Pitch	M2	0.303950	0.0707	4	8.278E-05	2.701E-04	270.14	5.403E-04	540.283
Yaw	M2	0.329090	0.0707	4	8.962E-05	2.925E-04	292.49	5.850E-04	584.971
Longitudinal	MODM2	0.003691	1	4	1.422E-05	4.022E-04	402.17	8.043E-04	804.334
Pitch	MODM2	0.303950	0.0707	4	8.278E-05	2.341E-03	2341.25	4.683E-03	4682.509
Yaw	MODM2	0.329090	0.0707	4	8.962E-05	2.535E-03	2534.90	5.070E-03	5069.804

References

DAC Voltage T1200311-v1
 OSEM and magnet details M0900034-v4
 OSEM Coil/Magnet Actuation Strengths T1000164-v3
 DC Compliances for long/pitch/yaw https://redoubt.ligo-wa.caltech.edu/svn/sus/trunk/Common/MatlabTools/TripleModel_Production/
 Model: ssmake3MBF rev1891
 Parameters: bsfmopt_metal.m rev2005
 DC compliance == Transfer function from given stage drive to test mass; L to L,P to P, and Y to Y
 Coil driver requirements T080065-v1
 Informed by <https://awiki.ligo-wa.caltech.edu/a/IGO/TripleSuspensionActuation>
 Coil Driver DC Transconductance <https://alog.ligo-la.caltech.edu/a/LOG/index.php?callRep=4495>
 Lever Arms D1000392-v7