



S5 Inspiral Hardware Injections

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LIGO-G070165-00-Z

S5 Hardware Injections

- Hardware injections performed around once per day
 - » Mass pairs: 1.4-1.4, 3-3, 10-10, 1.4-10 solar masses
- Online search runs templates with 1 to 3 solar masses
 - » SNR threshold of 6
 - » Low mass injections seen by the online search (eg in InspiralMon)
- Once per day, check for online inspiral triggers at the time of inspiral hardware injections
- Web pages:
http://ldas-jobs.ligo-la.caltech.edu/~inspiral/bns/hardware_inj/hardware_inj.html

L1 Inspiral Hardware Injections between Nov 04 2005 06:00:00 UTC and Mar 21 2007 08:00:00 UTC

 Display: Missed Weak Found Not Analyzed

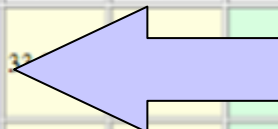
Hardware Injections						Instrumental Sensitivity		Inspiral Triggers						Parameter Accuracy (detected - injected)		
GPS End Time	End Time	Dist (Mpc)	Mass 1	Mass 2	Chirp Mass	BNS Horizon	Expected SNR	GPS End Time	SNR	Dist (Mpc)	Mass 1	Mass 2	Chirp Mass	Time (ms)	Chirp Mass	Frac Dist
858490930.190	Mar 21 2007 05:41:56 UTC	60.00	3.000	3.000	2.612	33.880	8.58	858490930.192	7.91	64.42	3.163	2.833	2.605	1.68	-0.006	0.074
858419763.149	Mar 20 2007 09:55:49 UTC	15.00	1.400	1.400	1.219	32.469	17.42	858419763.149	18.66	13.92	1.673	1.178	1.219	-0.10	-0.000	-0.072
858403585.149	Mar 20 2007 05:26:11 UTC	40.00	1.400	1.400	1.219	32.586	6.56	858403585.149	7.31	35.68	1.463	1.341	1.219	0.14	0.001	-0.108
858395955.190	Mar 20 2007 03:19:01 UTC	25.00	3.000	3.000	2.612	32.638	19.83	858395955.191	20.31	24.23	3.172	2.840	2.612	0.70	0.000	-0.031
858335531.149	Mar 19 2007 10:31:57 UTC	25.00	1.400	1.400	1.219	34.000	10.95	858335531.148	9.18	29.60	1.961	1.018	1.217	-1.57	-0.002	0.184
858329602.149	Mar 19 2007 08:53:08 UTC	25.00	1.400	1.400	1.219	34.146	10.99	858329602.149	11.78	23.20	1.464	1.342	1.220	0.14	0.001	-0.072
858134379.149	Mar 17 2007 02:39:25 UTC	35.00	1.400	1.400	1.219	31.575	7.26	858134379.149	7.17	35.25	1.464	1.342	1.220	-0.35	0.001	0.007
857914226.190	Mar 14 2007 13:30:12 UTC	60.00	3.000	3.000	2.612	33.519	8.49	857914226.191	11.57	43.67	3.170	2.839	2.611	0.95	-0.001	-0.272

L1 Inspiral Hardware Injections between Nov 04 2005 06:00:00 UTC and Mar 21 2007 08:00:00 UTC

Display: Missed Weak Found Not Analyzed

Hardware Injections						Instrumental Sensitivity		Inspiral Triggers						Parameter Accuracy (detected - injected)			
GPS End Time	End Time	Dist (Mpc)	Mass 1	Mass 2	Chirp Mass	BNS Horizon	Expected SNR	G	Time (ms)	Chirp Mass	Frac Dist						
858490930.190	Mar 21 2007 05:41:56 UTC	60.00	3.000	3.000	2.612	32.469	17.42	8584	1.68	-0.006	0.074						
858419763.149	Mar 20 2007 09:55:49 UTC	15.00	1.400	1.400	1.219	32.586	6.56	858403585.149	0.10	-0.000	-0.072						
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858335531.149	Mar 19 2007 10:31:57 UTC	25.00	1.400	1.400	1.219	34.146	10.99	858329602.149	-1.57	-0.002	0.184						
858329602.149	Mar 19 2007 08:53:08 UTC	25.00	1.400	1.400	1.219	31.575	7.26	858134379.149	0.14	0.001	-0.072						
858134379.149	Mar 17 2007 02:39:25 UTC	35.00	1.400	1.400	1.219	33.519	8.49	857914226.191	-0.35	0.001	0.007						
857914226.190	Mar 14 2007 13:30:12 UTC	60.00	3.000	3.000	2.612	11.57	43.67	3.170	0.95	-0.001	-0.272						

Injection details:
Time, distance,
masses



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GPS End Time	End Time	Dist (Mpc)	Mass 1	Mass 2	Chirp Mass	BNS Horizon	Expected SNR	GPS End Time	SNR	Dist (Mpc)	SNR	Dist (Mpc)	SNR	Dist (Mpc)	SNR	Dist (Mpc)	SNR
858490930.190	Mar 21 2007 05:41:56 UTC	60.00	3.000	3.000	2.612	33.880	8.58	858490930.190	18.66	13.9							
858419763.149	Mar 20 2007 09:55:49 UTC	15.00	1.400	1.400	1.219	32.469	17.42	858419763.149	18.66	13.9							
858403585.149	Mar 20 2007 05:26:11 UTC	40.00	1.400	1.400	1.219	32.586	6.56	858403585.149	7.31	35.68	1.463	1.341	1.219	0.14	0.001	-0.108	
858395955.190	Mar 20 2007 03:19:01 UTC	25.00	3.000	3.000	2.612	32.638	19.83	858395955.191	20.31	24.23	3.172	2.840	2.612	0.70	0.000	-0.031	
858335531.149	Mar 19 2007 10:31:57 UTC	25.00	1.400	1.400	1.219	34.000	10.95	858335531.148	9.18	29.60	1.961	1.018	1.217	-1.57	-0.002	0.184	
858329602.149	Mar 19 2007 08:53:08 UTC	25.00	1.400	1.400	1.219	34.146	10.99	858329602.149	11.78	23.20	1.464	1.342	1.220	0.14	0.001	-0.072	
858134379.149	Mar 17 2007 02:39:25 UTC	35.00	1.400	1.400	1.219	31.575	7.26	858134379.149	7.17	35.25	1.464	1.342	1.220	-0.35	0.001	0.007	
857914226.190	Mar 14 2007 13:30:12 UTC	60.00	3.000	3.000	2.612	33.519	8.49	857914226.191	11.57	43.67	3.170	2.839	2.611	0.95	-0.001	-0.272	

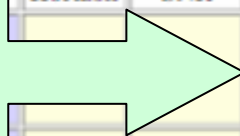
Instrument details:
BNS horizon,
expected SNR

L1 Inspiral Hardware Injections between Nov 04 2005 06:00:00 UTC and Mar 21 2007 08:00:00 UTC

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Hardware Injections						Instrumental Sensitivity		Inspiral Triggers						Parameter Accuracy (detected - injected)		
GPS End Time						BNS Horizon	Expected SNR	GPS End Time	SNR	Dist (Mpc)	Mass 1	Mass 2	Chirp Mass	Time (ms)	Chirp Mass	Frac Dist
858490930																
858419763						32.469	17.42	858419763.149	18.66	13.92	1.673	1.178	1.219	-0.10	-0.000	-0.072
858403585.149	Mar 20 2007 05:26:11 UTC	40.00	1.400	1.400	1.219	32.586	6.56	858403585.149	7.31	35.68	1.463	1.341	1.219	0.14	0.001	-0.108
858395955.190	Mar 20 2007 03:19:01 UTC	25.00	3.000	3.000	2.612	32.638	19.83	858395955.191	20.31	24.23	3.172	2.840	2.612	0.70	0.000	-0.031
858335531.149	Mar 19 2007 10:31:57 UTC	25.00	1.400	1.400	1.219	34.000	10.95	858335531.148	9.18	29.60	1.961	1.018	1.217	-1.57	-0.002	0.184
858329602.149	Mar 19 2007 08:53:08 UTC	25.00	1.400	1.400	1.219	34.146	10.99	858329602.149	11.78	23.20	1.464	1.342	1.220	0.14	0.001	-0.072
858134379.149	Mar 17 2007 02:39:25 UTC	35.00	1.400	1.400	1.219	31.575	7.26	858134379.149	7.17	35.25	1.464	1.342	1.220	-0.35	0.001	0.007
857914226.190	Mar 14 2007 13:30:12 UTC	60.00	3.000	3.000	2.612	33.519	8.49	857914226.191	11.57	43.67	3.170	2.839	2.611	0.95	-0.001	-0.272

Trigger details:
SNR, distance,
time, masses

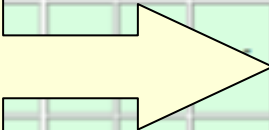


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Hardware Injections						Instrumental Sensitivity		Inspiral Triggers					Parameter Accuracy (detected - injected)			
GPS End Time	End Time	Dist (Mpc)	Mass 1	Mass 2	Chirp Mass			Dist (pc)	Mass 1	Mass 2	Chirp Mass	Time (ms)	Chirp Mass	Frac Dist		
858490930.190	Mar 21 2007 05:41:56 UTC	60.00	3.000	3.000	2.612							1.68	-0.006	0.074		
858419763.149	Mar 20 2007 09:55:49 UTC	15.00	1.400	1.400	1.219			92	1.673	1.178	1.219	-0.10	-0.000	-0.072		
858403585.149	Mar 20 2007 05:26:11 UTC	40.00	1.400	1.400	1.219	32.586	6.56	858403585.149	7.31	35.68	1.463	1.341	1.219	0.14	0.001	-0.108
858395955.190	Mar 20 2007 03:19:01 UTC	25.00	3.000	3.000	2.612	32.638	19.83	858395955.191	20.31	24.23	3.172	2.840	2.612	0.70	0.000	-0.031
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858329602.149	Mar 19 2007 08:53:08 UTC	25.00	1.400	1.400	1.219	34.146	10.99	858329602.149	11.78	23.20	1.464	1.342	1.220	0.14	0.001	-0.072
858134379.149	Mar 17 2007 02:39:25 UTC	35.00	1.400	1.400	1.219	31.575	7.26	858134379.149	7.17	35.25	1.464	1.342	1.220	-0.35	0.001	0.007
857914226.190	Mar 14 2007 13:30:12 UTC	60.00	3.000	3.000	2.612	33.519	8.49	857914226.191	11.57	43.67	3.170	2.839	2.611	0.95	-0.001	-0.272

Trigger accuracy:
time, mass,
distance

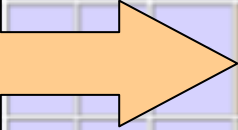


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858419763.149	Mar 20 2007 15:00:00 UTC	15.00	1.400	1.400	1.219	32.469	17.42	858419763.149	18.66	13.92	1.673	1.178	1.219	-0.10	-0.000	-0.072
858403585.149	Mar 20 2007 15:00:00 UTC	15.00	1.400	1.400	1.219	32.586	6.56	858403585.149	7.31	35.68	1.463	1.341	1.219	0.14	0.001	-0.108
858395955.191	Mar 20 2007 15:00:00 UTC	15.00	3.000	3.000	2.612	32.638	19.83	858395955.191	20.31	24.23	3.172	2.840	2.612	0.70	0.000	-0.031
858335531.149	Mar 19 2007 10:31:57 UTC	25.00	1.400	1.400	1.219	34.000	10.95	858335531.148	9.18	29.60	1.961	1.018	1.217	-1.57	-0.002	0.184
858329602.149	Mar 19 2007 08:53:08 UTC	25.00	1.400	1.400	1.219	34.146	10.99	858329602.149	11.78	23.20	1.464	1.342	1.220	0.14	0.001	-0.072
858134379.149	Mar 17 2007 02:39:25 UTC	35.00	1.400	1.400	1.219	31.575	7.26	858134379.149	7.17	35.25	1.464	1.342	1.220	-0.35	0.001	0.007
857914226.190	Mar 14 2007 13:30:12 UTC	60.00	3.000	3.000	2.612	33.519	8.49	857914226.191	11.57	43.67	3.170	2.839	2.611	0.95	-0.001	-0.272

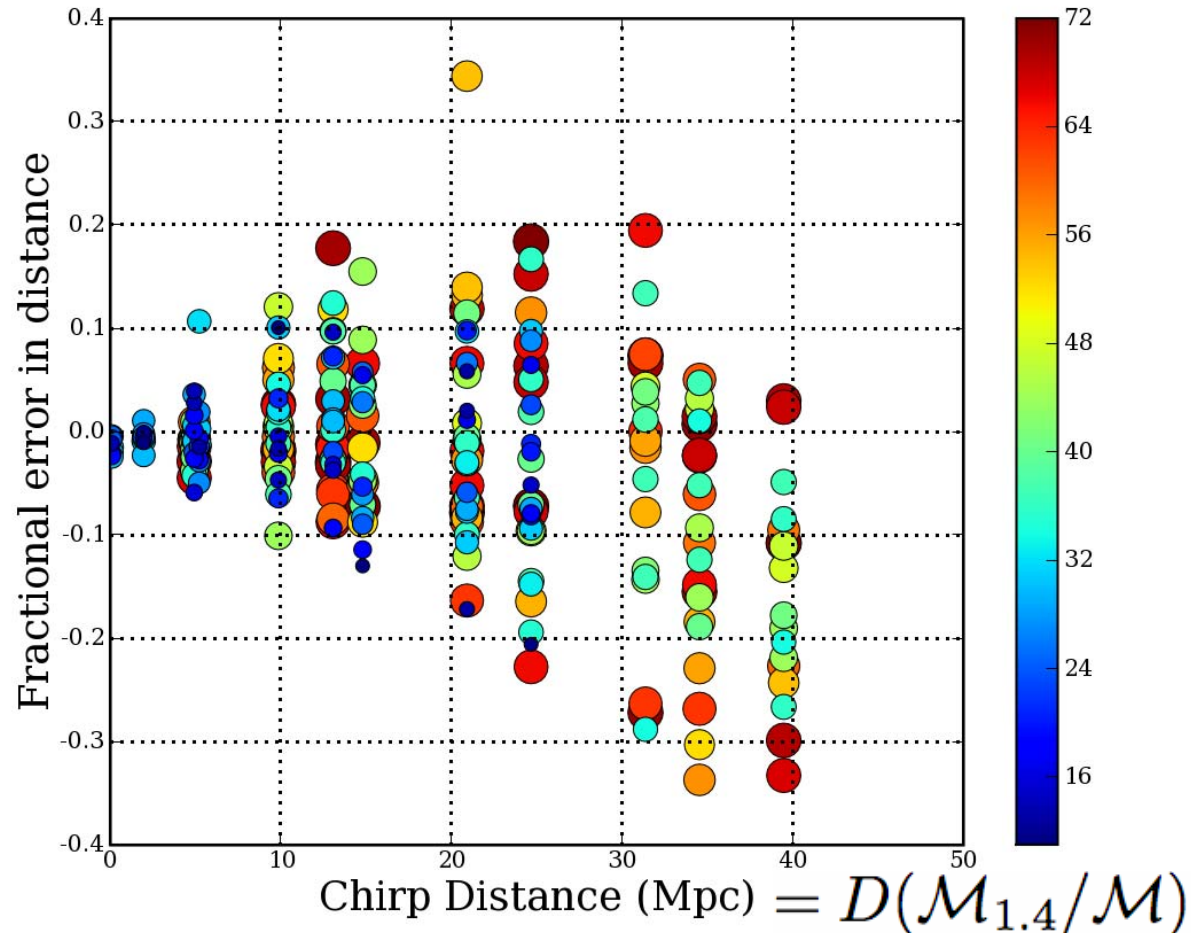
Quiet Injection
(SNR < 7):
May not see



825126982.149	Feb 28 2006 01:56:08 UTC	2.00	1.400	1.400	1.219	19.663	79.13	825126982.149	79.20	1.99	1.673	1.178	1.219	0.14	-0.000	-0.007
825115598.149	Feb 27 2006 22:46:24 UTC	10.00	1.400	1.400	1.219	Data Not Analyzed		No Triggers within 10 ms of Injection						No Triggers		
825074834.149	Feb 27 2006 11:27:00 UTC	5.00	1.400	1.400	1.219	22.439	36.12	825074834.150	38.16	4.70	1.462	1.341	1.219	0.39	0.000	-0.059
825034460.190	Feb 27 2006 00:14:06 UTC	40.00	3.000	3.000	2.612	19.530	7.42	No Triggers within 10 ms of Injection						No Triggers		
824998925.149	Feb 26 2006 14:21:51 UTC	10.00	1.400	1.400	1.219	18.657	15.02	824998925.149	14.97				1.217	-0.35	-0.002	-0.005
824858296.149	Feb 24 2006 23:18:02 UTC	2.00	1.400	1.400	1.219	19.765	79.51	824858296.149	79.14				1.219	0.10	0.000	0.005
824555709.149	Feb 21 2006 11:14:55 UTC	10.00	1.400	1.400	1.219	25.846	20.00	Missed injection: No triggers at injection time Only L1 injection missed during S5								
824337447.149	Feb 18 2006 22:37:13 UTC	25.00	1.400	1.400	1.219	23.433	7.50									
824268704.190	Feb 18 2006 03:31:30 UTC	25.00	3.000	3.000	2.612	25.630	15.57	824268704.191	14.09	27.40	3.170	2.839	2.611	0.70	-0.001	0.096
824207349.190	Feb 17 2006 10:28:55 UTC	25.00	3.000	3.000	2.612	24.620	14.96	824207349.191	15.39	24.06	3.697	2.446	2.606	0.46	-0.005	-0.038
824051618.149	Feb 15 2006 15:13:24 UTC	5.00	1.400	1.400	1.219	20.639	33.22	824051618.150	32.13	5.14	1.463	1.341	1.219	0.39	0.000	0.028

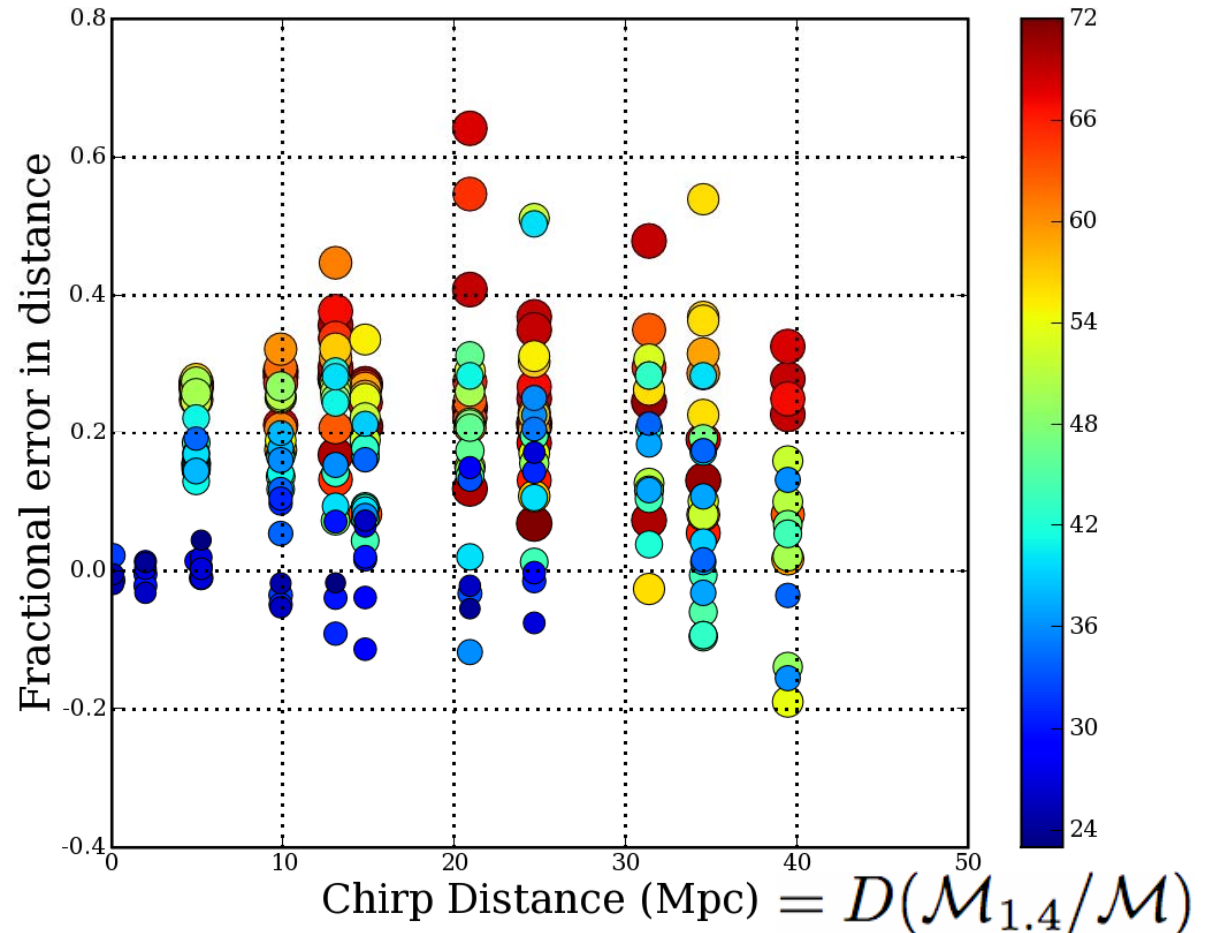
Parameter Accuracy — L1 Distance

- More recent injections larger and redder
- Check of calibration - errors centred around zero
- Errors scale with distance



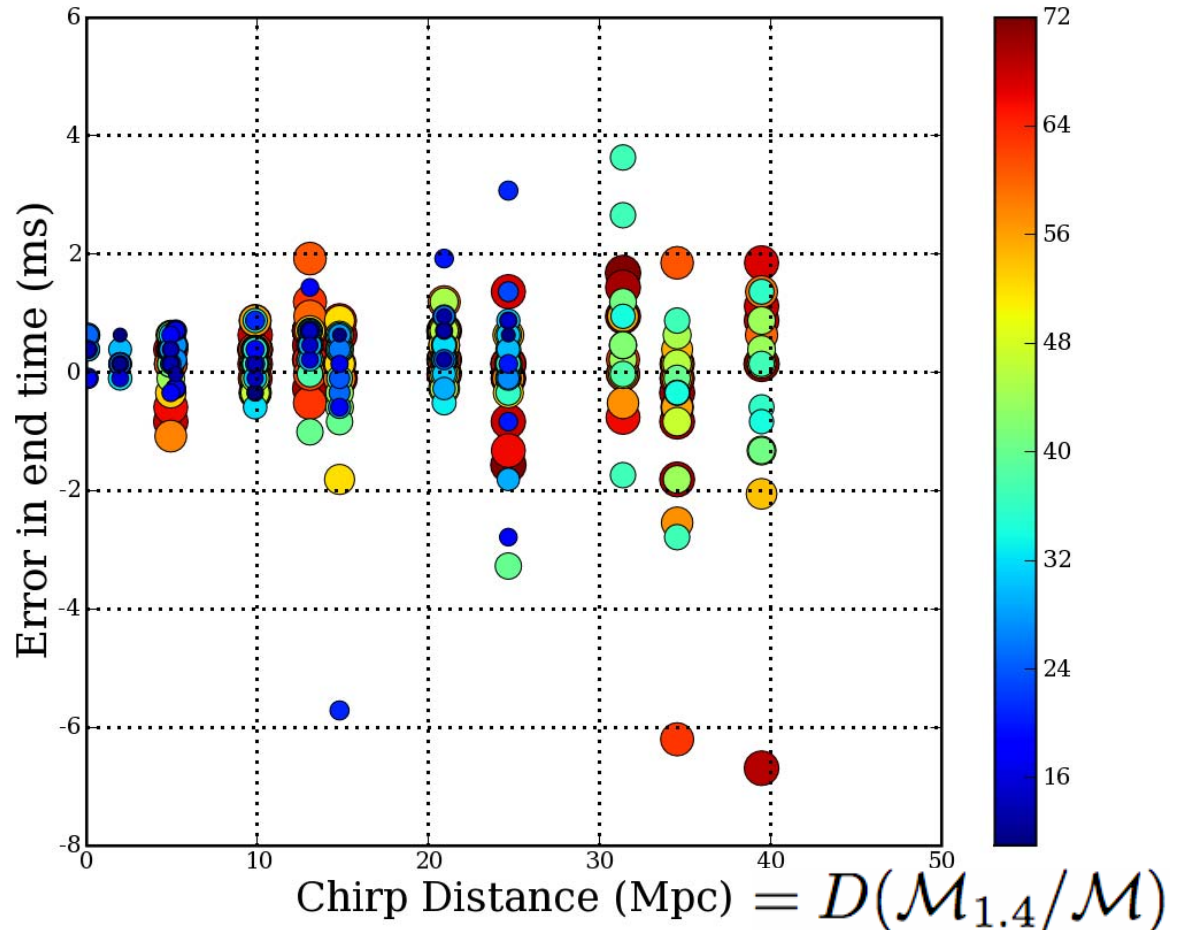
Parameter Accuracy — H1 Distance

- More recent injections larger and redder
- Check of calibration - clearly shows 20% offset



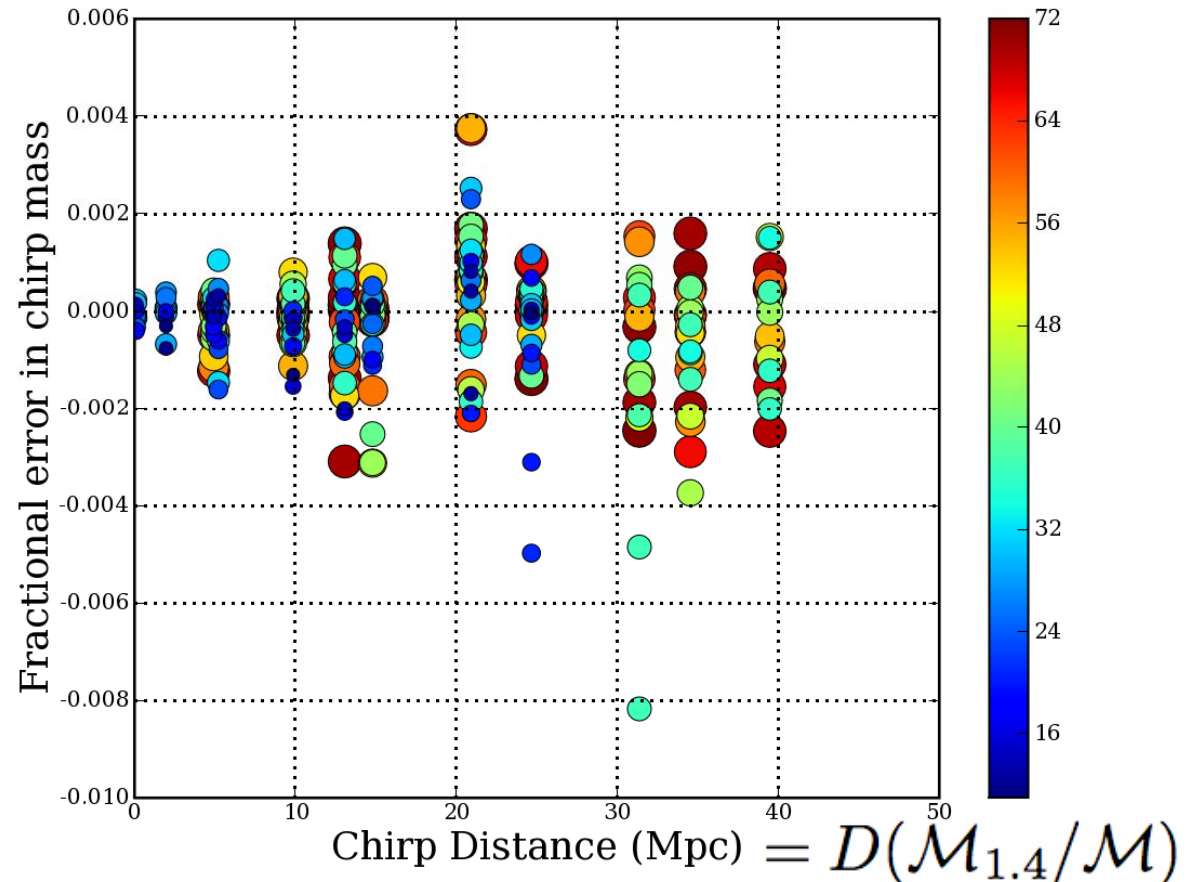
Parameter Accuracy — L1 End Time

- More recent injections larger and redder
- Errors scale with distance



Parameter Accuracy — L1 Chirp Mass

- More recent injections larger and redder
- Errors scale with distance



Future Plans

- Move to V3 calibration and $h(t)$
- Extend mass range of online search
- Other suggestions welcomed

Scheduled Inspiral Hardware injections between Mar 21 2007 08:00:00 UTC and Mar 28 2007 08:00:00 UTC

GPS End Time	End Time	Dist (Mpc)	Mass 1	Mass 2	Chirp Mass	Expected SNR for range of 15.0 Mpc	Expected SNR for range of 9.0 Mpc
858579868.060	Mar 22 2007 06:24:14 UTC	40.00	10.000	10.000	8.706	Masses outside online bank range	
858603832.190	Mar 22 2007 13:03:38 UTC	60.00	3.000	3.000	2.612	8.73	5.24
858717801.190	Mar 23 2007 20:43:07 UTC	25.00	3.000	3.000	2.612	20.96	12.58
858765990.060	Mar 24 2007 10:06:16 UTC	150.00	10.000	10.000	8.706	Masses outside online bank range	
858773320.149	Mar 24 2007 12:08:26 UTC	25.00	1.400	1.400	1.219	11.11	6.66
858800513.190	Mar 24 2007 19:41:39 UTC	40.00	3.000	3.000	2.612	13.10	7.86
858903924.149	Mar 26 2007 00:25:10 UTC	15.00	1.400	1.400	1.219	18.51	11.11
858934006.060	Mar 26 2007 08:46:32 UTC	100.00	10.000	10.000	8.706	Masses outside online bank range	
858951377.190	Mar 26 2007 13:36:03 UTC	40.00	3.000	3.000	2.612	13.10	7.86
858990043.190	Mar 27 2007 00:20:29 UTC	60.00	3.000	3.000	2.612	8.73	5.24
859054424.060	Mar 27 2007 18:13:30 UTC	100.00	10.000	10.000	8.706	Masses outside online bank range	
859079160.149	Mar 28 2007 01:05:46 UTC	40.00	1.400	1.400	1.219	6.94	4.16