



# Long Term Wide and Massive Binary Monitoring, Scheduling 2013, and the Control Room Upgrade

Christopher Farrington

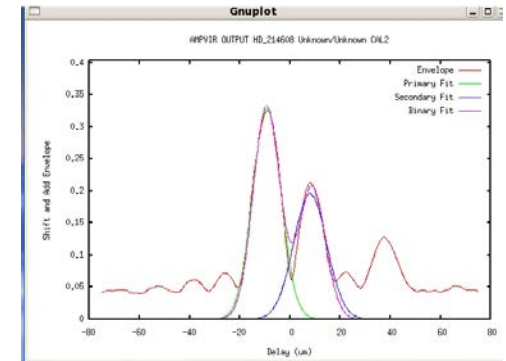
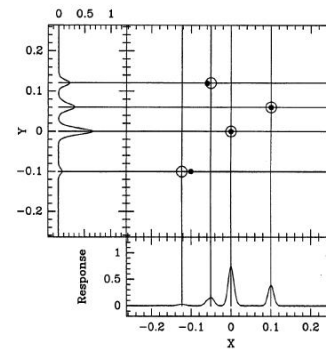
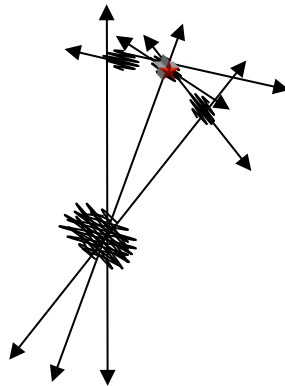
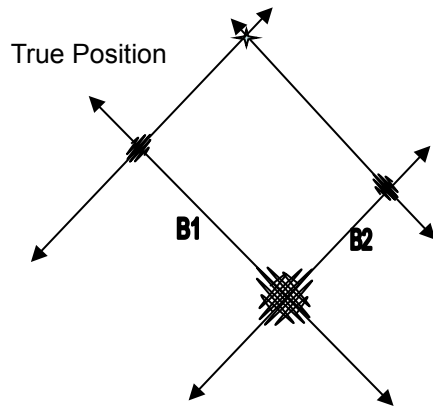
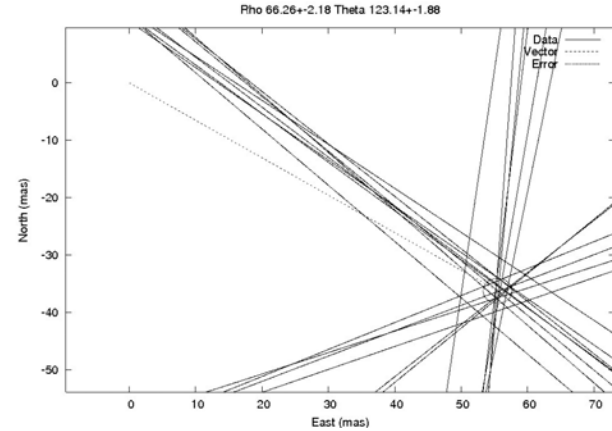
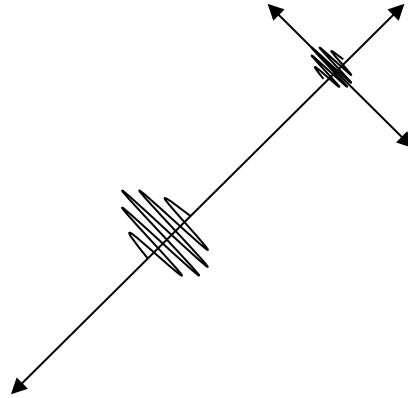
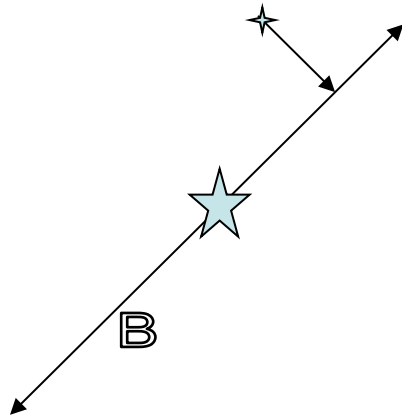
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# SFP Observing





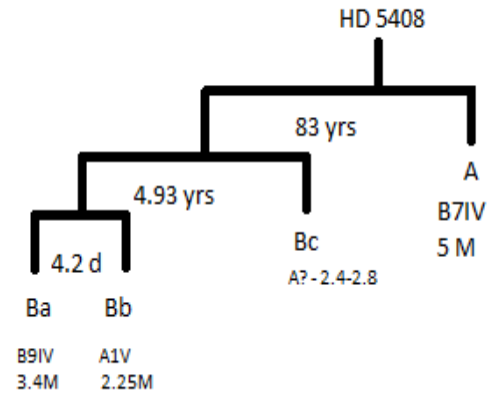
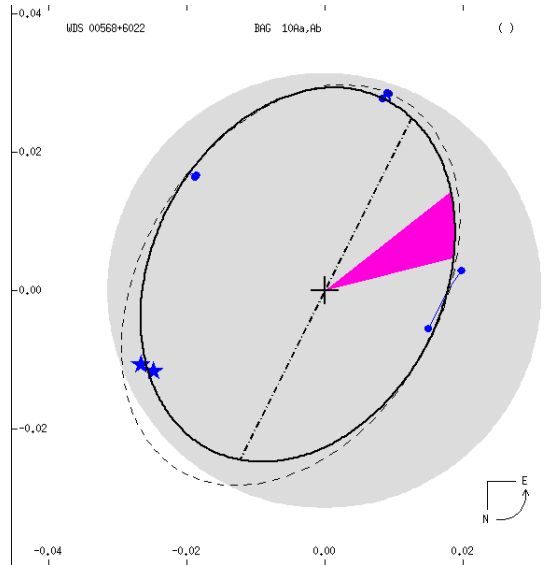
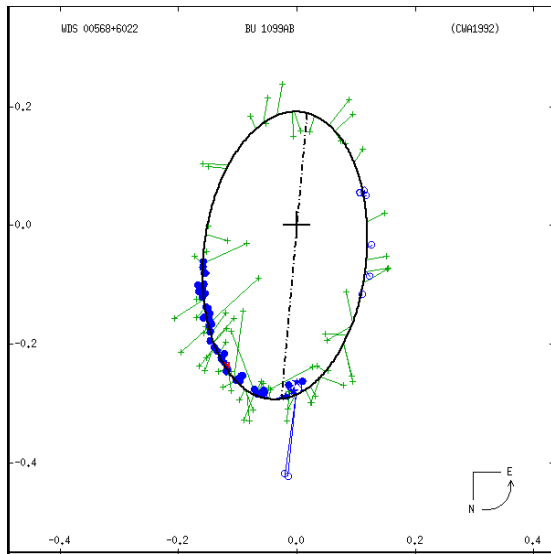
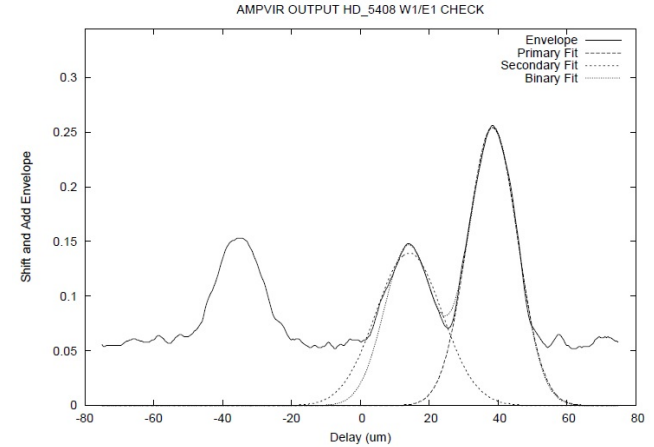
# 2012 Observing

System (HD)	Observations	System (HD)	Observations
5408 B9IVn (SB1,2)	4	134064 A3V (double)	2
8799 F5IVe (SB2)	7	138629 A5V (double)	1
16234 F7V (double)	1	156164 A3IV (double)	2
16811 A0V (double)	1	157482 F7V (SB1)	1
45542 B6IIIe (double)	1	160181 A2Vn (double)	4
56176 G7IV (double)	1	163840 G2V (SB2)	1
58728 F3V (SB2,triple)	1	178911 G1V (SB2)	2
64145 A3V (new SFP)	1	181655 G8V (double)	9
101606 F4V (SB2)	1	193468 F5V (SB2)	4
110106 K3V (SB1)	1	194765 F8V (SB2)	2
124674 F1V (SB1)	1	209790 A3m-F5III	2
129132 G0V (SB1)	2	(SB2)	
131511 K2V (SB1)	2		

# HD 5408

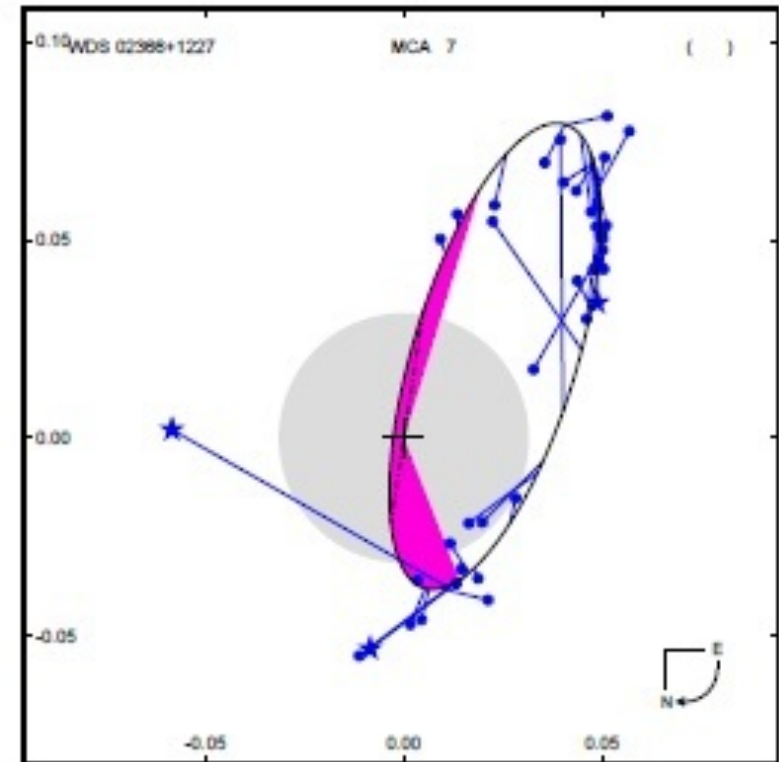
## Quadruple system

- A-Babc = 83 yrs – 250 mas
- **Bab-Bc = 4.9 yrs – 30 mas**
- Ba-Bb = 4.2 days – 0.6 mas



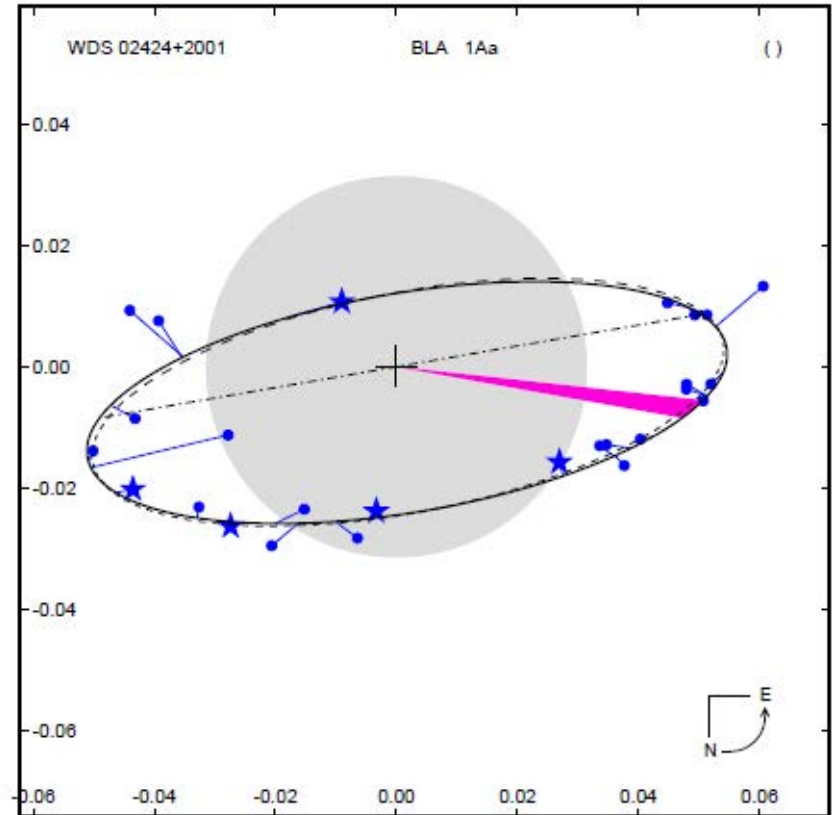
# HD 16234 (31 Ari, MCA 7)

- P: 1.924 years
  - Small  $\Delta m$ , needs more SFP observations as positions observed different from current speckle orbit.
  - Only 1 observation in 2012 due to weather



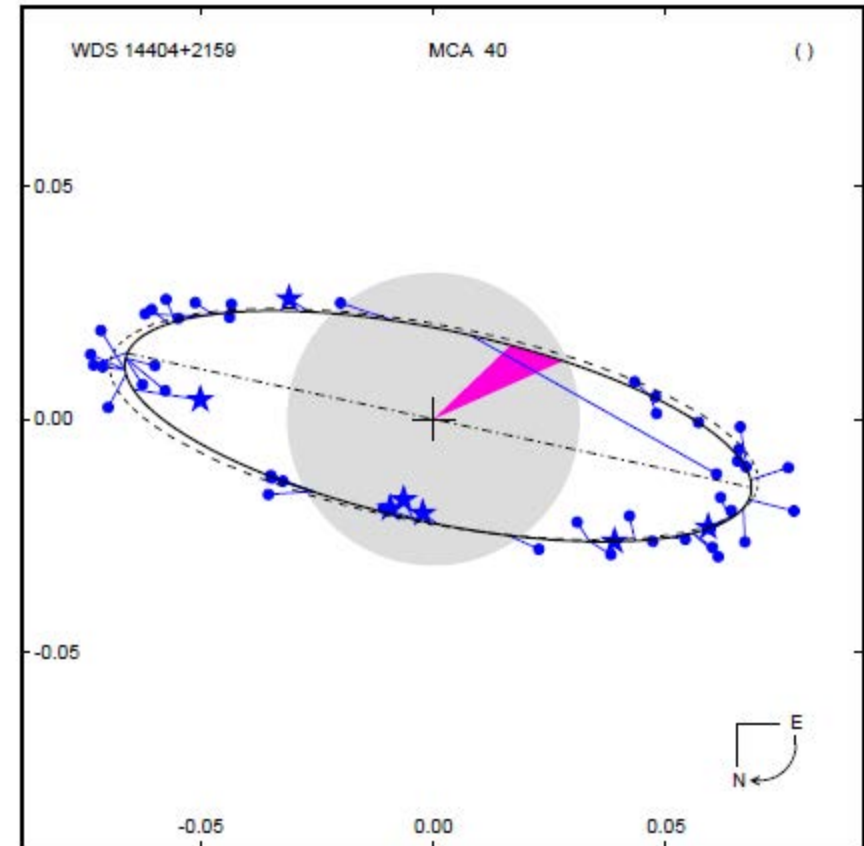
# HD 16811 ( $\mu$ Ari, BLA 1)

- P: 8.85 years
  - Observation in 2007 significantly improved orbit.
  - Only 1 observation in 2012 due to weather

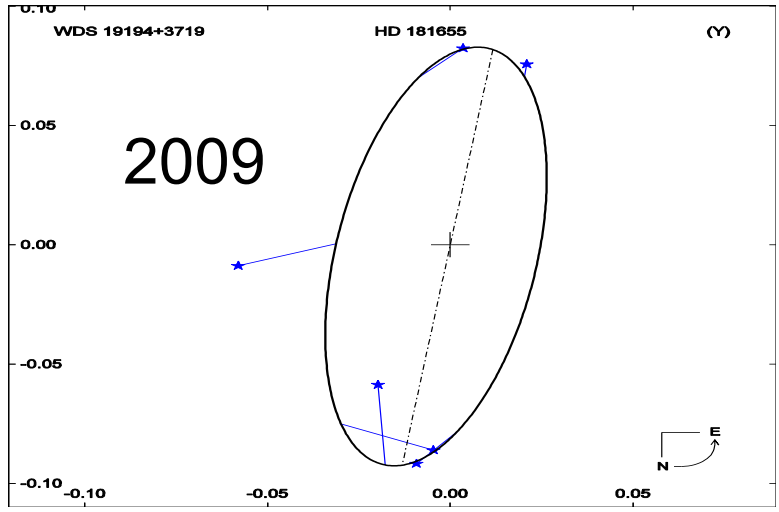


# HD 129132 (MCA 40)

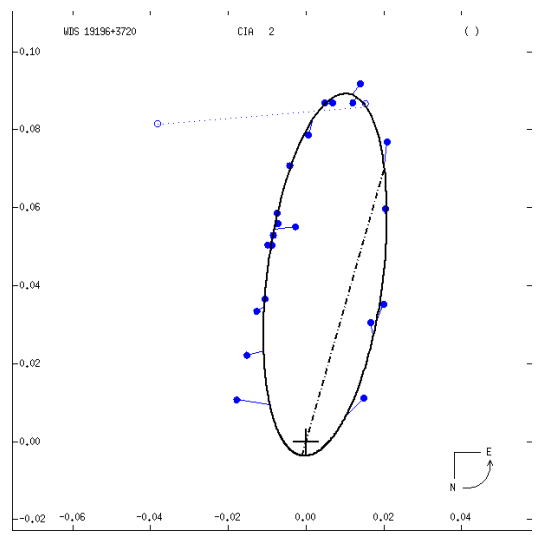
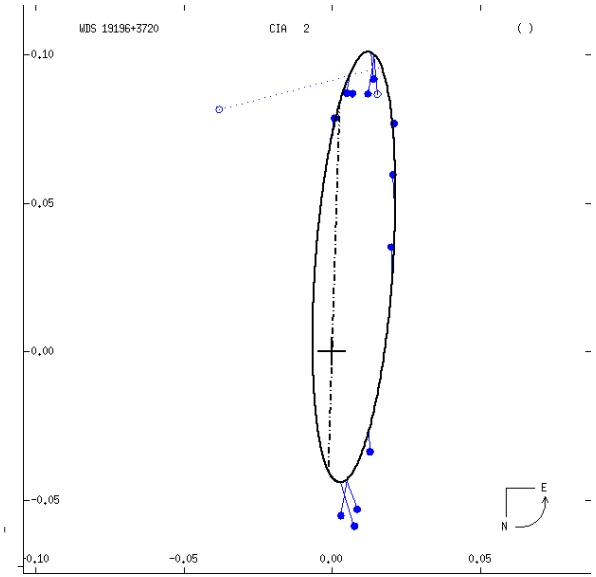
- SFP/Vis triple
  - Inner orbit done by O' Brien, outer by SFP program
  - Horch's 2011 orbit corrected with SFP data, periastron passage April 2013



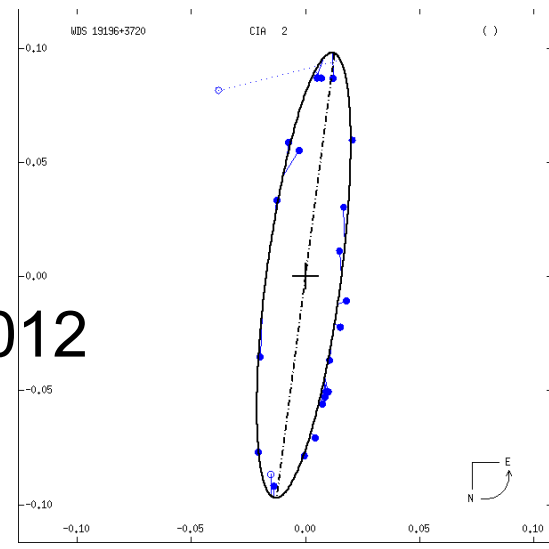
# HD 181655 (CIA 2, HR 7345)



2011



2012

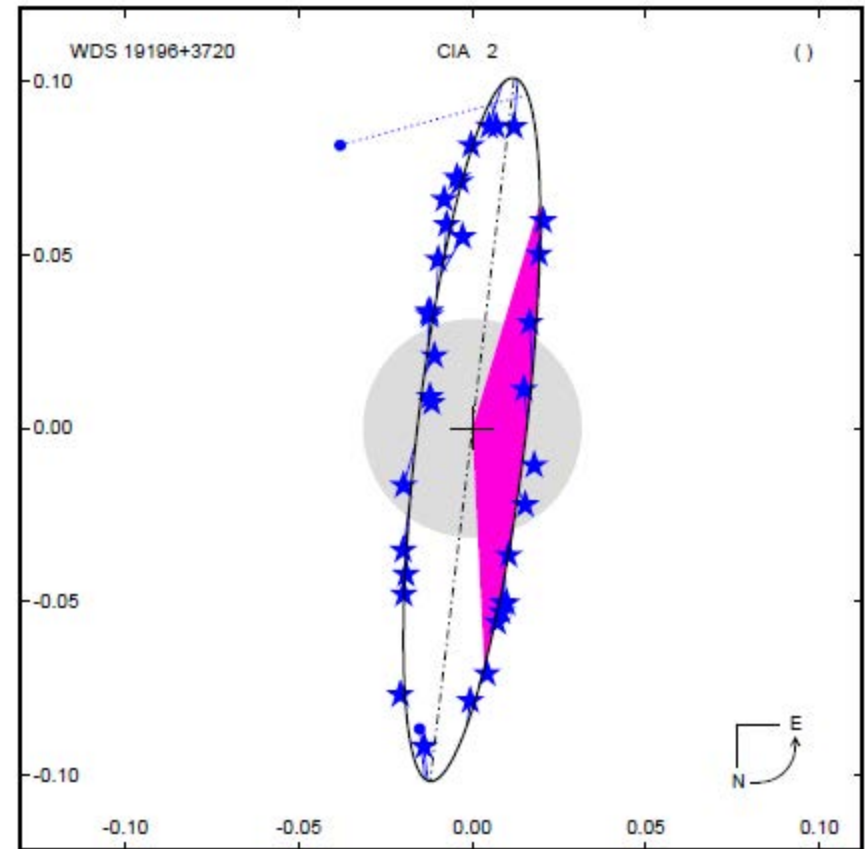


And now....



# HD 181655 (CIA 2, HR 7345)

- Observing since 2005
- First SFP observed in my survey, previously unknown binary.
- Previous to 2011, points only north/south
- R. Griffin is observing spectroscopically
  - Previous spectroscopic measurements show no variation, initially thought to be face on.
  - Inclination for orbit  $\approx 80^\circ$
  - Period = 1.81 years





# Paper SFP-2

- Systems:  $\omega$  And, HR 7272,  $\xi$  Cep
  - All SB2, no previous orbit for  $\omega$  And, speckle orbits for HR 7272 and  $\xi$  Cep
  - Paper should be submitted within the month.
  - Improvement on SFP-1 with inclusion of CLIMB observations, significant increase in duty cycle and baseline coverage.



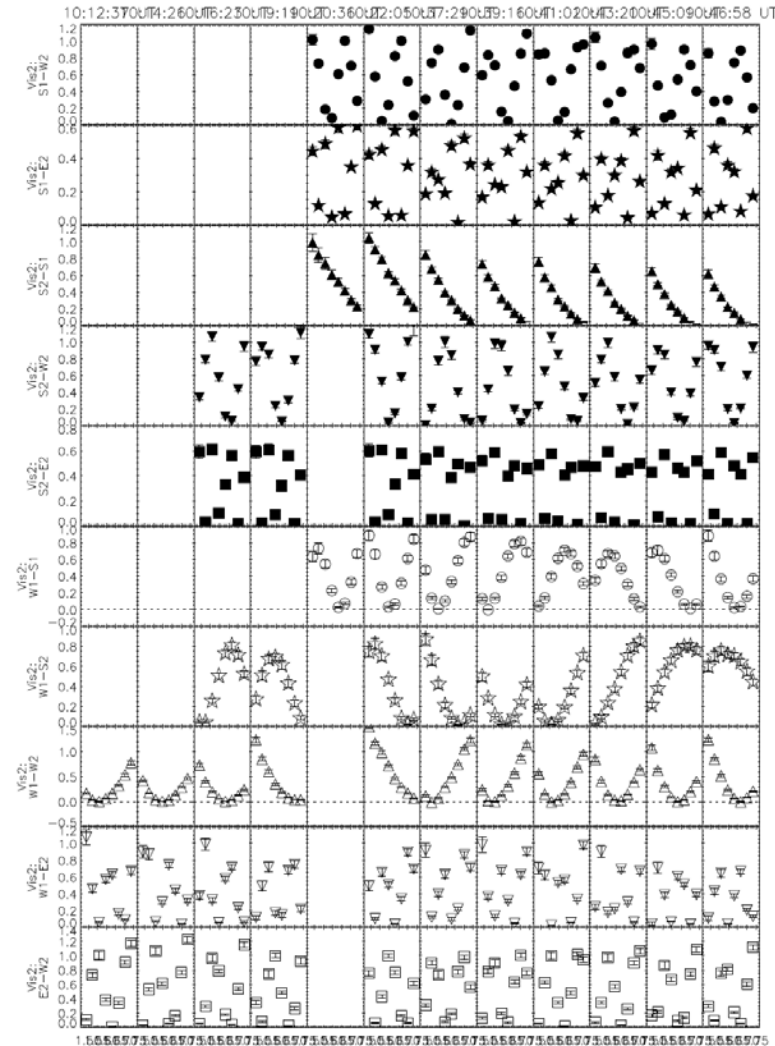
# HD 8799 ( $\omega$ And)

Suggested as a target in 2008 by R.F. Griffin.

Spectroscopic orbit published in 2011

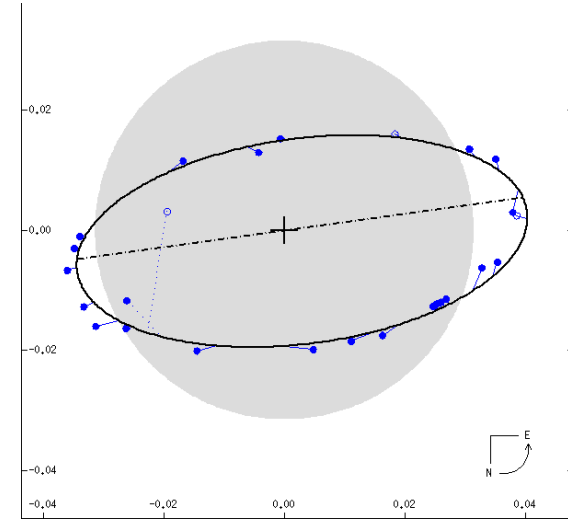
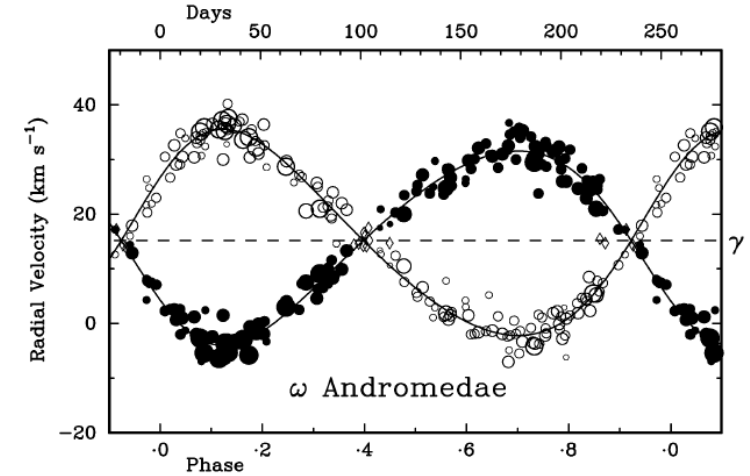
Monitored heavily from 2009 to 2012

VEGA and MIRC data in addition to CLIMB in an attempt to get radii as well as the orbit.



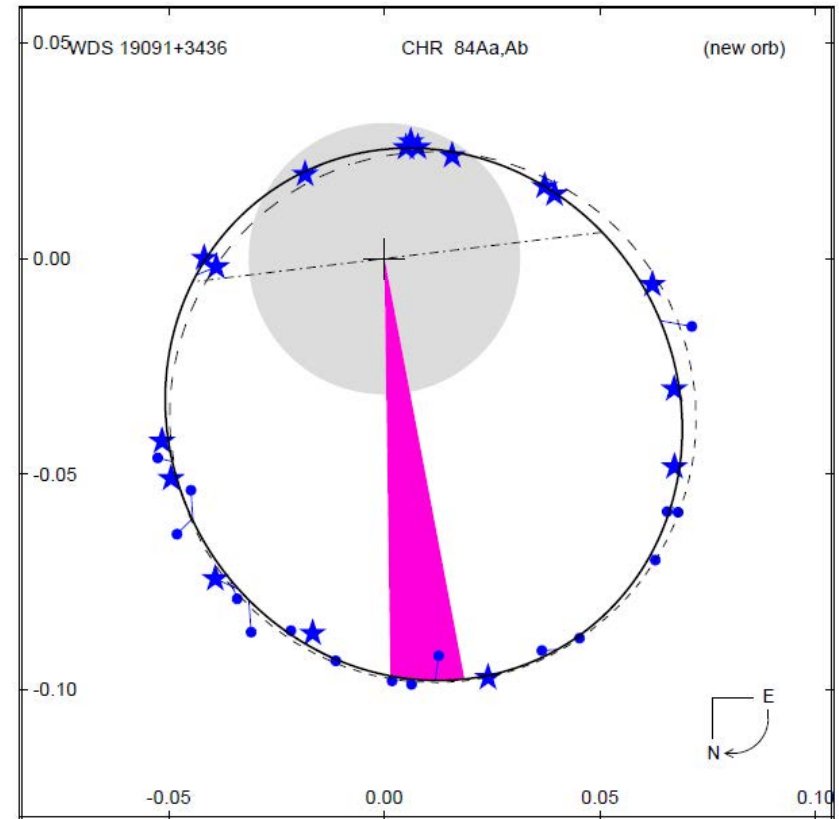
# HD 8799 ( $\omega$ And)

Elements	This Paper
P (days)	$254.888 \pm 0.201$
(yr)	$0.69786 \pm 0.00055$
T <sub>0</sub> (MJD)	$54217.65 \pm 3.21$
(BY)	$2007.3188 \pm 0.0088$
a''	$0.038 \pm 0.001$
e	$0.150 \pm 0.012$
i (°)	$63.33 \pm 2.39$
$\omega$ (°)	$299.51 \pm 4.33$
$\Omega$ (°)	$97.63 \pm 2.21$
K <sub>1</sub> (km/s)	$17.47 \pm 0.30$
K <sub>2</sub> (km/s)	$19.54 \pm 0.30$
$\gamma_0$ (km/s)	$14.82 \pm 0.18$
M <sub>P</sub> (M <sub>☉</sub> )	$0.956 \pm 0.059$
M <sub>S</sub> (M <sub>☉</sub> )	$0.855 \pm 0.061$
$\pi_{orb}$ (")	$0.03962 \pm 0.00213$
$\pi_{Hip}$ (")	$0.03494 \pm 0.0031$



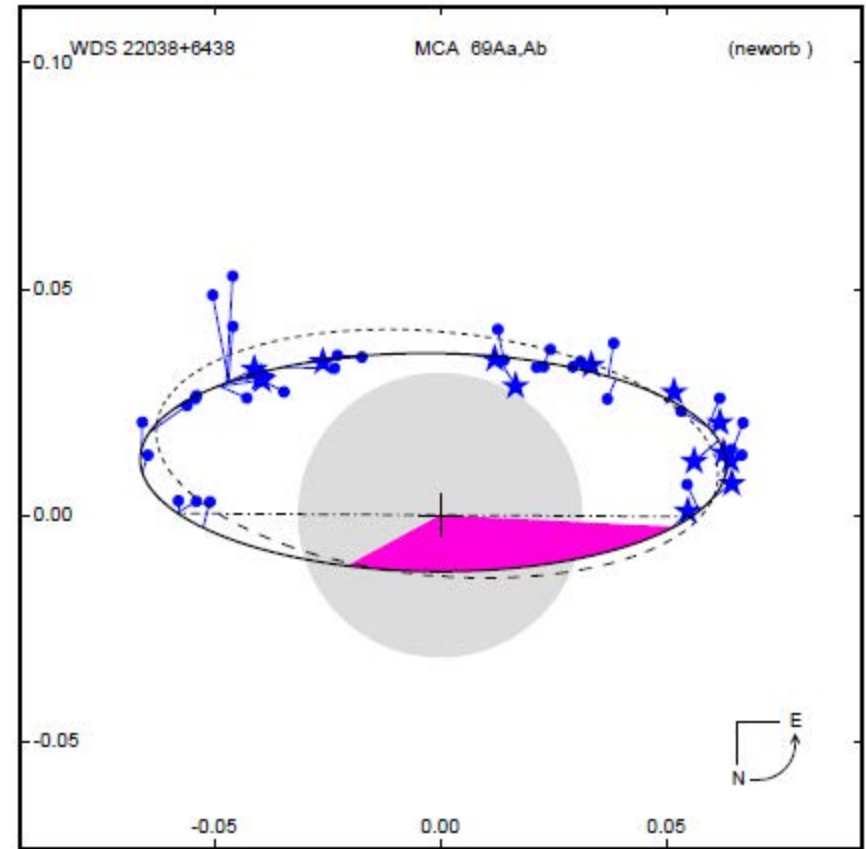
# HD 178911 (HR 7272, CHR 84)

Elements	Tokovinin (2000)	This Paper
P (days)	$1296.3 \pm 1.1$	$1296.984 \pm 0.355$
(yr)	$3.55 \pm 0.003$	$3.55102 \pm 0.00097$
T <sub>0</sub> (MJD)	$50572.2 \pm 1.5$	$50574.95 \pm 1.30$
(BY)	$1997.337 \pm 0.00411$	$1997.34538 \pm 0.00356$
a''	$0.0735 \pm 0.0026$	$0.074 \pm 0.0020$
e	$0.589 \pm 0.004$	$0.597 \pm 0.003$
i (°)	$150.1 \pm 3.7$	$147.29 \pm 0.99$
ω (°)	$262.5 \pm 0.8$	$263.88 \pm 0.87$
Ω (°)	$276.7 \pm 1.5$	$96.91 \pm 1.45$
K <sub>1</sub> (km/s)	$6.57 \pm 0.04$	$6.47 \pm 0.09$
K <sub>2</sub> (km/s)	$8.53 \pm 0.17$	$8.33 \pm 0.18$
γ <sub>0</sub> (km/s)	$-41.01 \pm 0.03$	$-41.04 \pm 0.06$
M <sub>P</sub> (M <sub>☉</sub> )	$1.07 \pm 0.37$	$0.802 \pm 0.055$
M <sub>S</sub> (M <sub>☉</sub> )	$0.84 \pm 0.29$	$0.622 \pm 0.053$
π <sub>orb</sub> (")	$0.025 \pm 0.008$	$0.02826 \pm 0.00170$
π <sub>Hip</sub> (")	$0.0204 \pm 0.0016$	$0.01911 \pm 0.00235$



# HD 209790 ( $\xi$ Cep, MCA 69)

Elements	Pourbaix (2000)	This Paper
P (days)	$818.51 \pm 0.98$	$820.03 \pm 0.58$
(yr)	$2.241 \pm 0.0027$	$2.2452 \pm 0.0016$
$T_0$ (MJD)	$40949.584 \pm 3.36$	$40948.52 \pm 3.84$
(BY)	$1970.992 \pm 0.0092$	$1970.989 \pm 0.011$
$a''$	$0.072 \pm 0.0017$	$0.074 \pm 0.004$
e	$0.50 \pm 0.021$	$0.483 \pm 0.023$
i ( $^\circ$ )	$68 \pm 1.4$	$70.86 \pm 1.63$
$\omega$ ( $^\circ$ )	$273 \pm 1.1$	$272.58 \pm 1.85$
$\Omega$ ( $^\circ$ )	$85 \pm 1.9$	$89.84 \pm 3.41$
$K_1$ (km/s)	$7.16 \pm 0.56$	$7.81 \pm 0.50$
$K_2$ (km/s)	$19.82 \pm 0.55$	$19.98 \pm 0.83$
$\gamma_0$ (km/s)	$-10.74 \pm 0.34$	$-10.59 \pm 0.33$
$M_P$ ( $M_\odot$ )	$1.00 \pm 0.13$	$1.045 \pm 0.031$
$M_S$ ( $M_\odot$ )	$0.36 \pm 0.05$	$0.408 \pm 0.066$
$\pi_{\text{orb}}$ ( $''$ )	$0.038 \pm 2.1$	$0.03810 \pm 0.00281$
$\pi_{\text{Hip}}$ ( $''$ )	$0.03207 \pm 0.77$	$0.03379 \pm 0.00106$





# Scheduling 2013

- First year attempting to schedule Apr-Dec
- Statistics:
  - 265 nights available
  - Optimum time requested: 345.5 nights
    - 30.4% oversubscribed
  - Minimum time requested: 303.0 nights
    - 14.3% oversubscribed
- Currently, Apr-Dec complete.
- Experimental year schedule compared to 2012
  - 345.5(303.0) – 2013
  - 364.75(276.2) – 2012
  - 310.5 assigned in 2013
  - 290.5 assigned in 2012

Beam Combiner	Time Requested (Opt(Min))	% of total available	# of programs
Classic	35(30) days	13.2%	7 3 NOAO, 3 C/P
CLIMB	85(59) days	32.1%	12 2 NOAO, 1 CL/P
JouFLU	54(39) days	20.4%	4 1 F/V
MIRC	100.5(77.5) days	37.9%	15 2 M/V
PAVO	71(47) days	26.8%	9 3 P/C, 1P/CL
VEGA	51 days	19.25%	20 1 V/F, 2 V/M



# Scheduling 2013

Month	Available	# of programs	Requested: Opt(Min)
April	30	9	30 (27) A:30.5
May	31	9	35 (28) A:35
June	30	9	41.5 (30.5) A:30.5
July	31	9	45 (33) A:34
August	31	12	47 (31) A:31
September	30	8	37.5 (32.5) A:32.5
October	31	9	46.5 (38.5) A:45
November	29	13	46.5 (29.5) A:35
December	22	10	34.5 (28) A:28



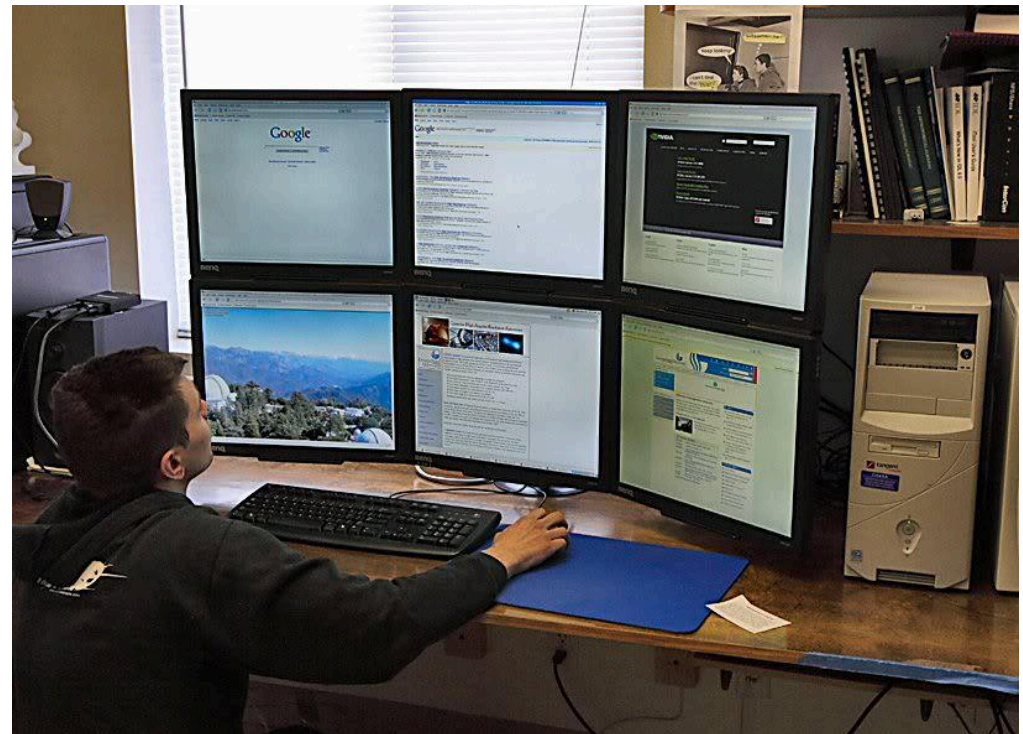
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# Control Room Upgrade

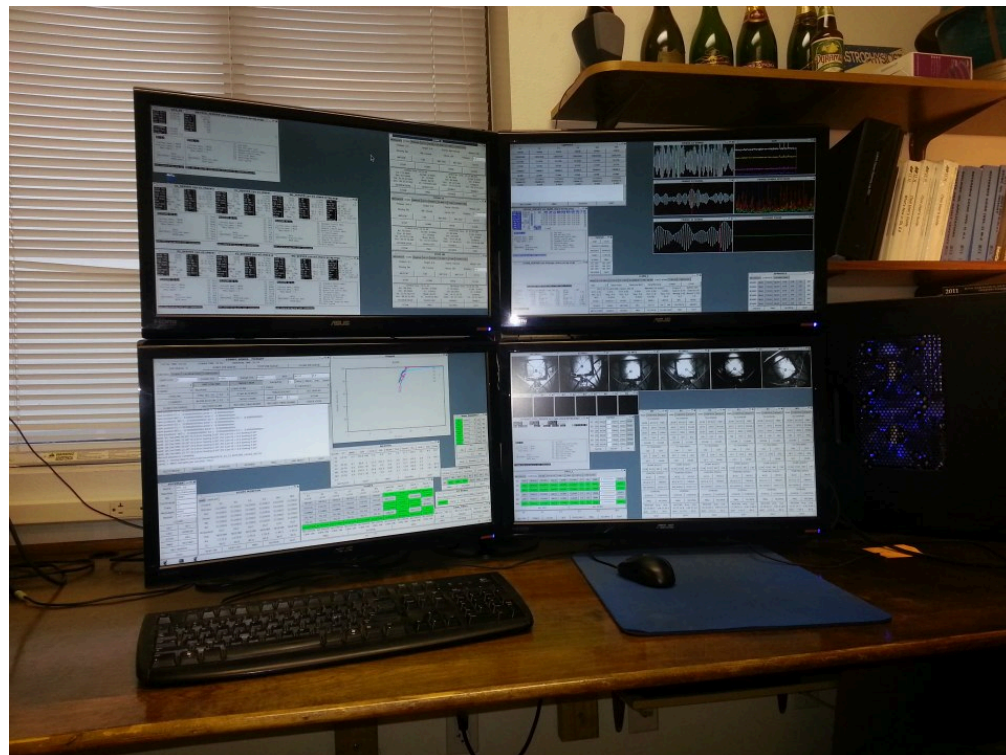
- Advent of dome servers, 6 beam MIRC, and old/dying monitors, the control room monitor array needed an upgrade.

- $2 \times 3 = 3600 \times 2048$



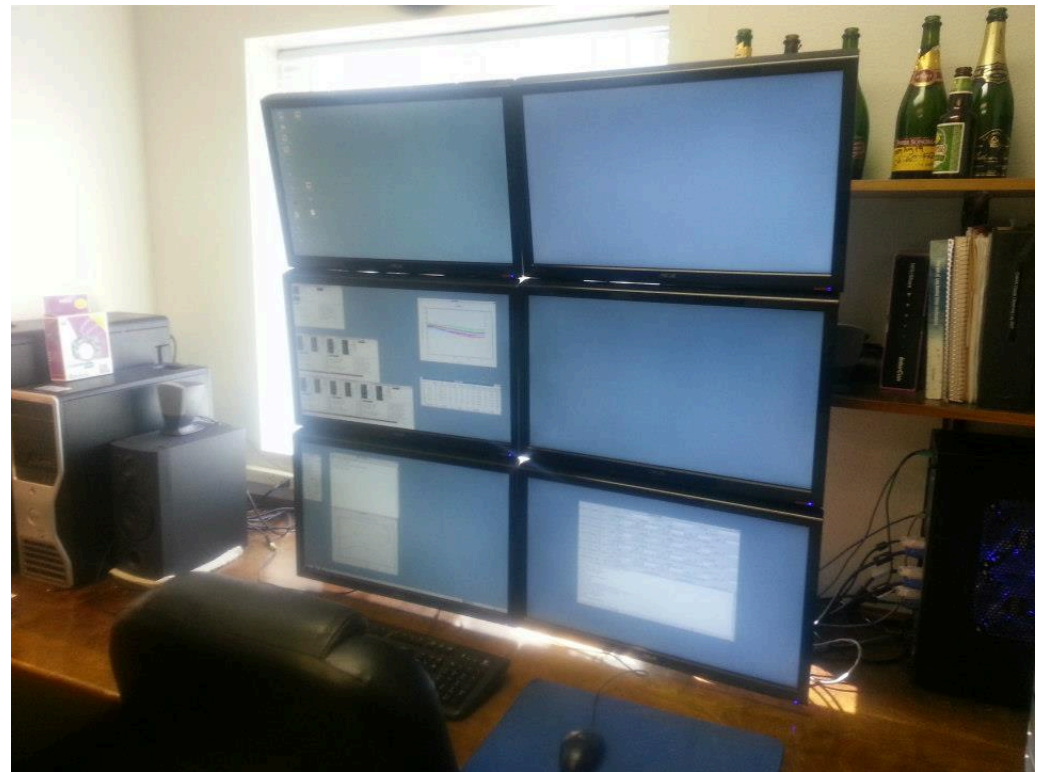
# Control Room Upgrade

- Stage 1: (Dec 2012)
  - New monitors
  - From 19" 4x3 to 24" widescreen 16x9
  - Small increase in screen space:
  - 3600x2048 to 3840x2400



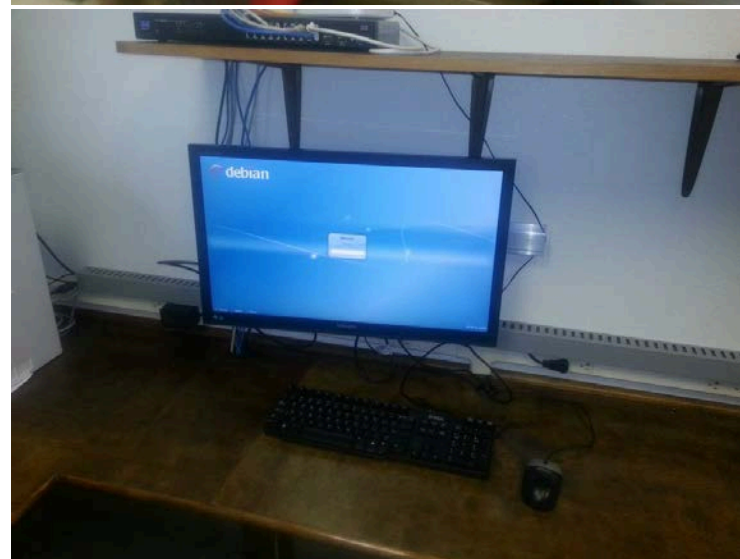
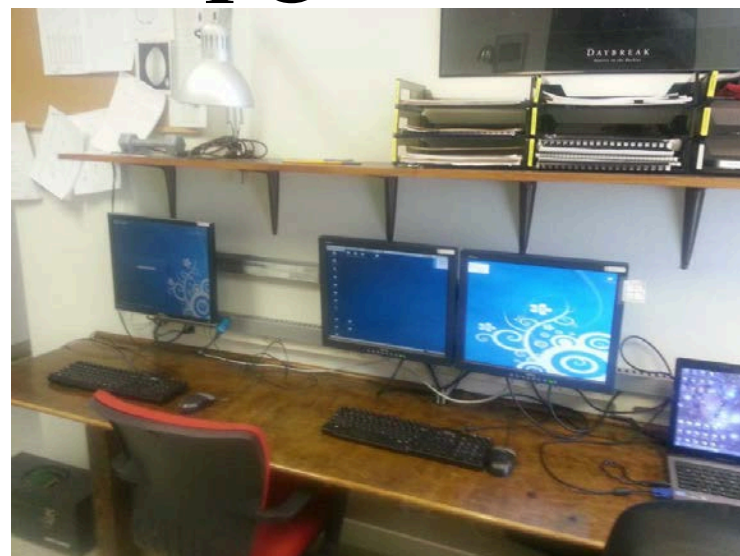
# Control Room Upgrade

- Stage 2: (Jan 2013)
  - Taller pole, extra arm, 2 more monitors (yay sale)
  - Significant increase in screen space
  - 3840x2400 to 3840x3600



# Control Room Upgrade

- Stage 3: (Mar 2013)
  - Desk space still lacking, needed a way to get more room.
  - Extra Chief mounts interchangeable with monitor Array.
  - Custom made wall bars (Milled H-beams), mounted to wall.
  - 4 beams (3 on hand, one to be purchased), sent off to be powder coated
  - All 3 VEGA monitors, and current and future MIRC 27” monitors





# Control Room Upgrade

