



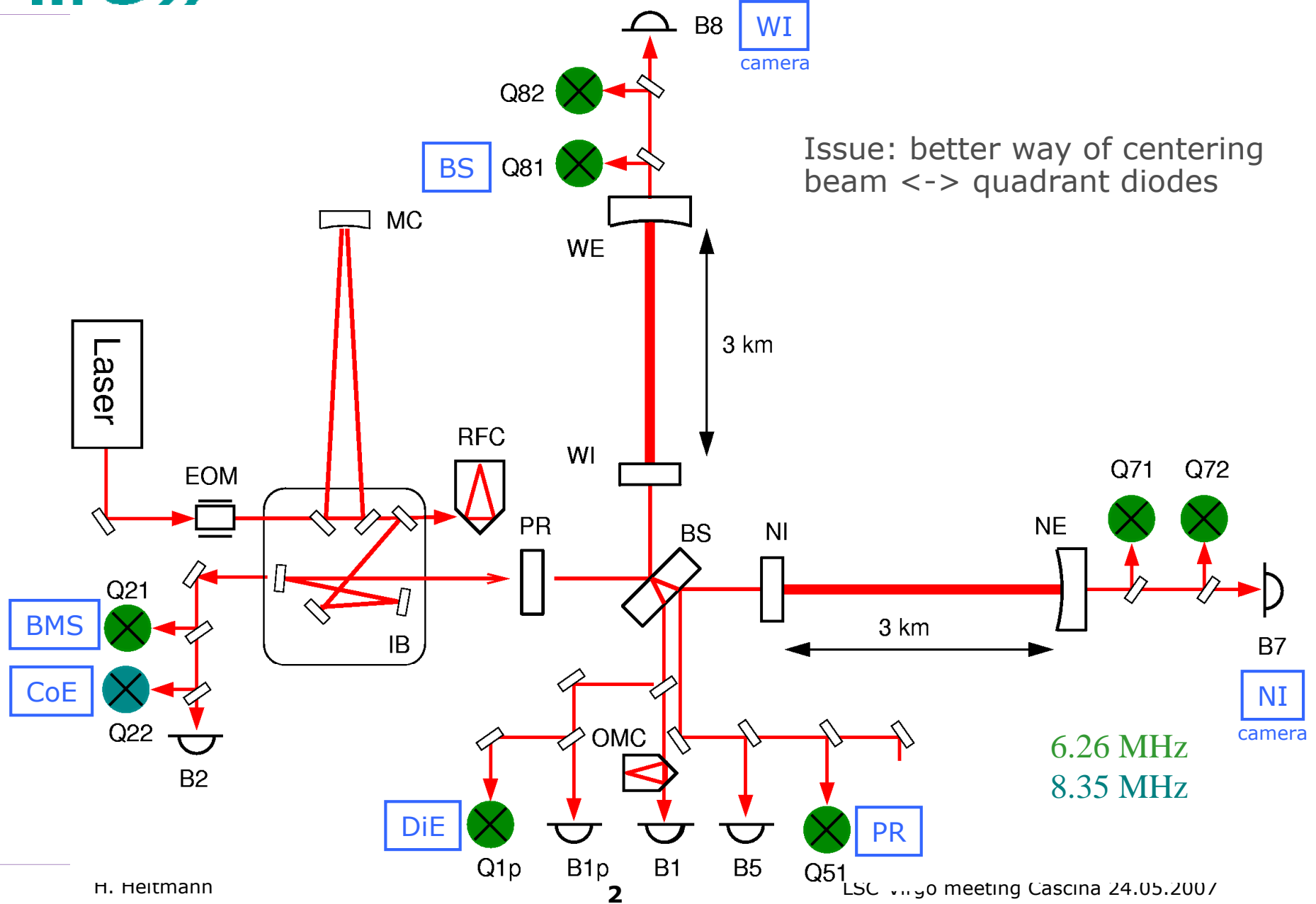
---

# Fast quadrant diode centering system

LIGO-G070348-00-Z

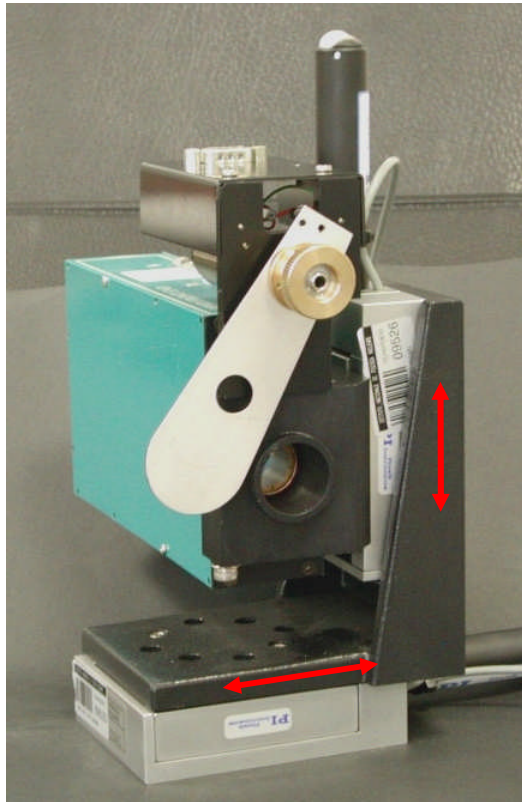


# SR1 alignment layout

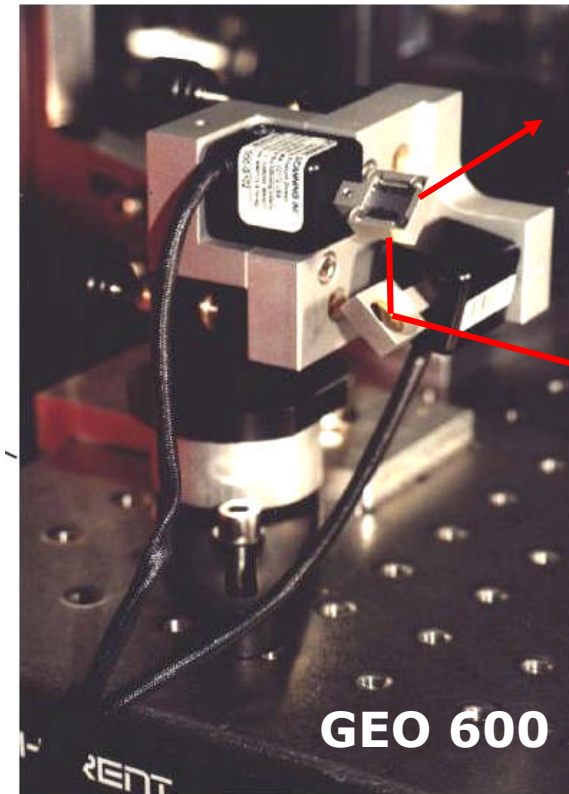
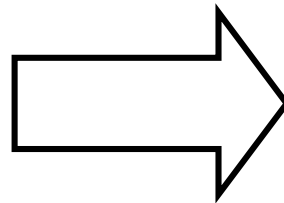




## Foreseen change



Center diode on beam  
(few 100 mHz, noisy)

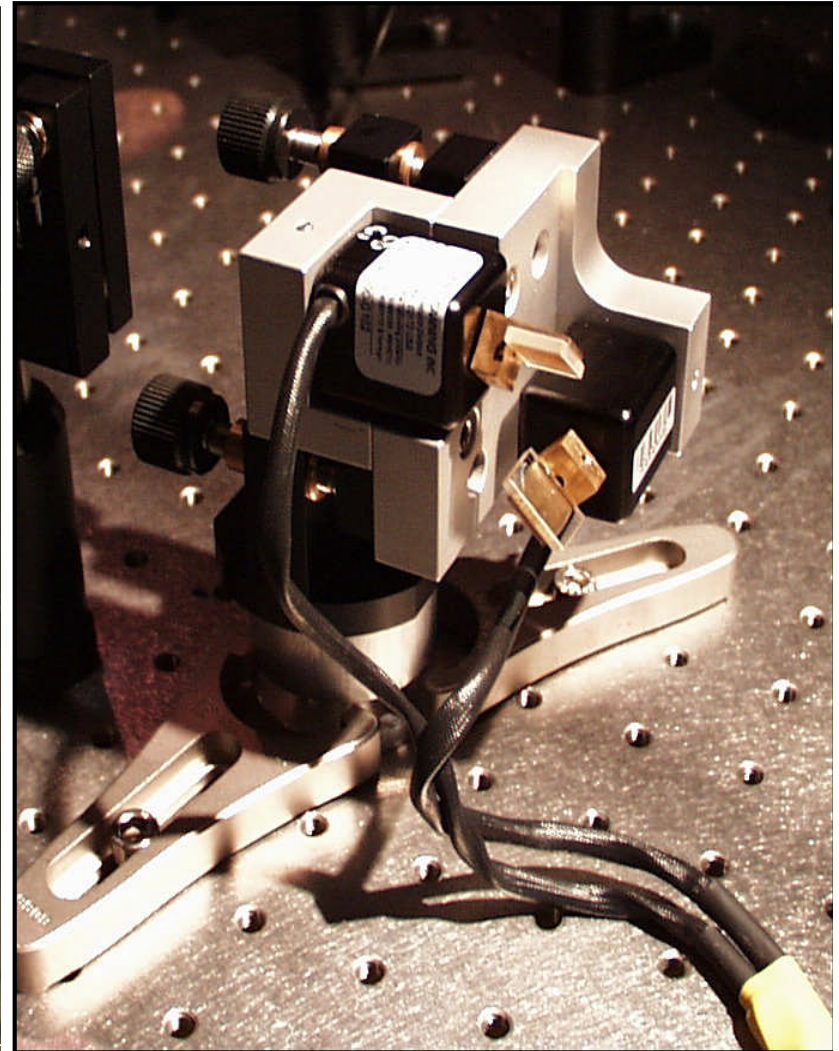
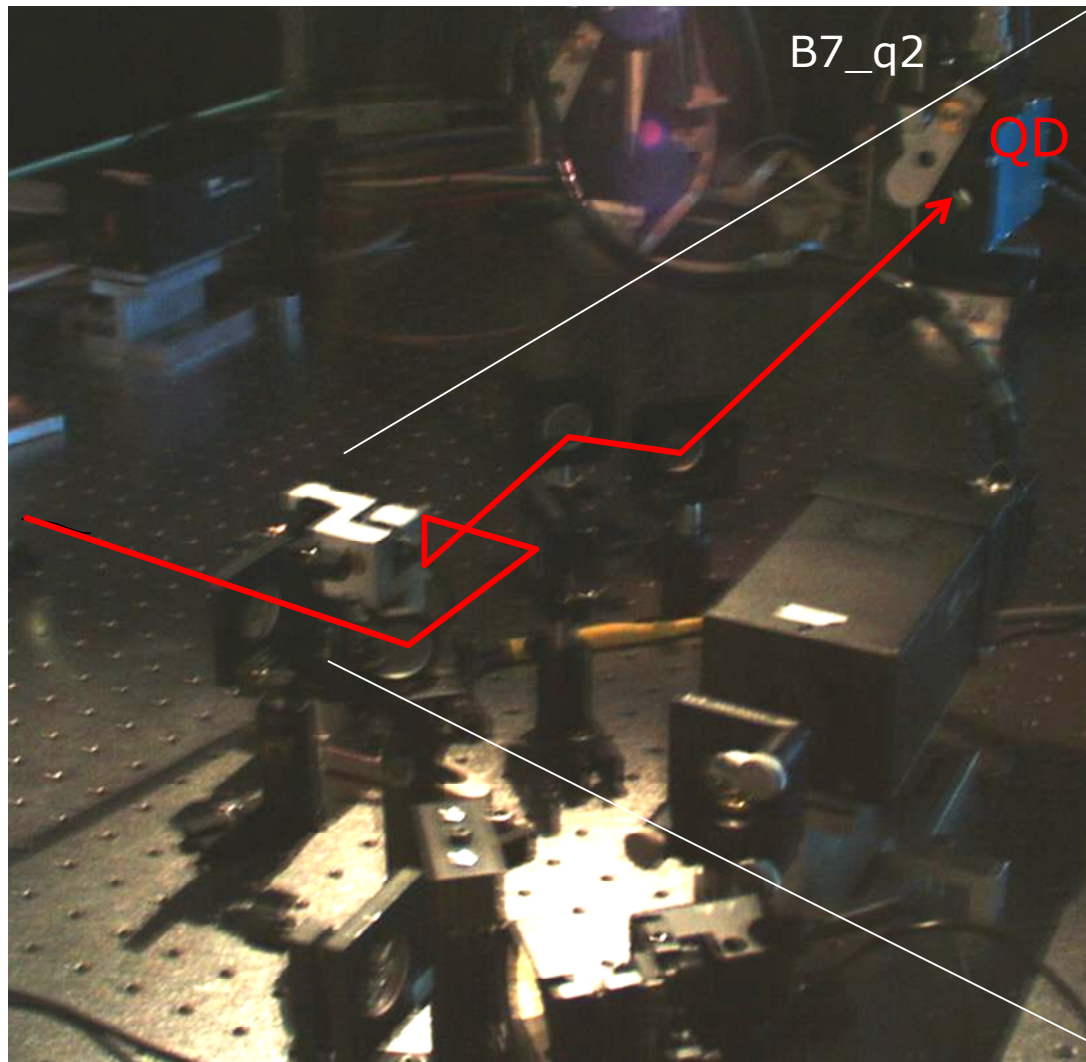


Center beam on diode  
(few 10 Hz)

**ILIAS collaboration GEO – Virgo (H. Grote)**



# Test of GEO system on NE bench

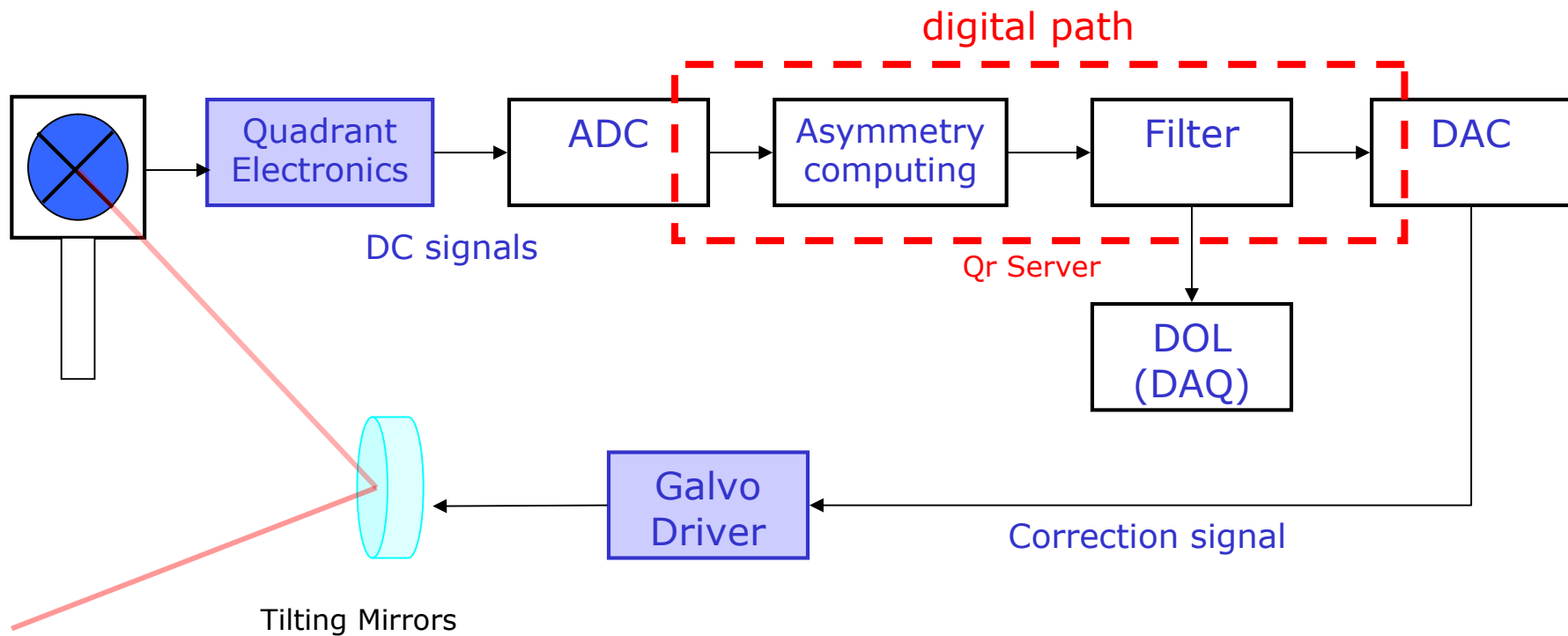


**R. DeRosa, H. Grote, H. Heitmann, J. Marque, A. Masserot**  
**Log entry 12777**



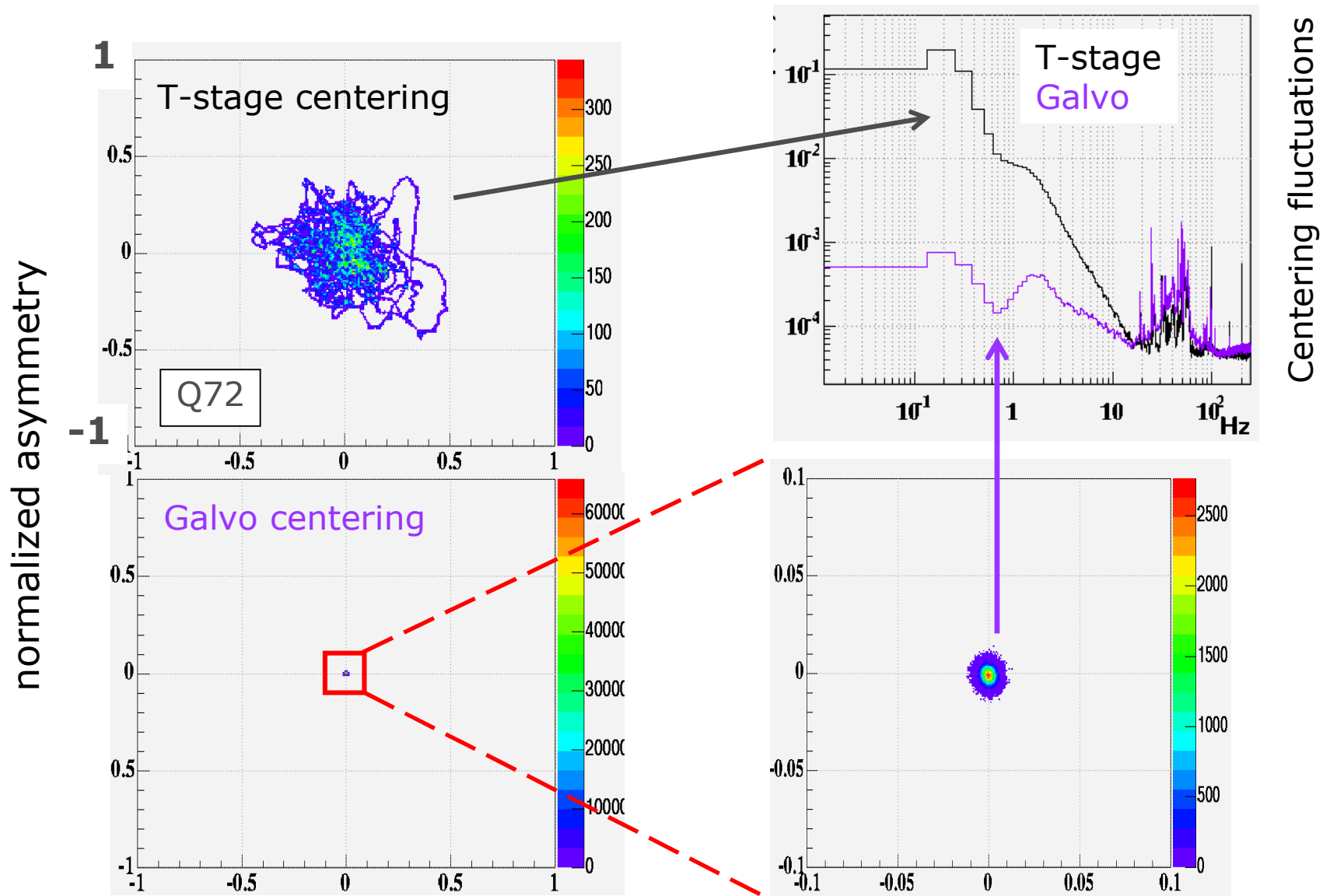
# Galvo feedback on NE bench (07/2006)

- Digital feedback
- Used existing Qr server (slightly modified)
- 30 Hz bandwidth
- Two shifts for making it work





# Galvo system performance





## Fast galvo centering: cost

	QD's to be equipped		10			
		supplier	pcs	spares	price	total
1	<b>Galvo G102</b>	Optoprim (General Scanning)	20	5	385	9625
2	<b>4-channel driver</b>	EGO electronics group	5	1	1300	7800
3	<b>Mechanics</b>	EGO workshop	10	3		100
4	<b>Mirror substrate</b>	Laser Optics, Garbsen	20	5	24	800
5	<b>Coating charge</b>	Laser Optics, Garbsen	1	0	1000	920
6	<b>Mirror mount</b>	Thorlabs	10	3	200	2600
	<b>Total</b>					<b>21845</b>



# Fast galvo centering: planning

<b>Implementation Plan</b>																
	<b>M1</b>				<b>M2</b>				<b>M3</b>				<b>M4</b>			
Tasks and deliverables	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
<b>Tasks</b>																
1: Order galvos, ...																
2: New bench designs																
3: Modify mechanical drawings																
4: Production of mechanics																
5: Adapt global control																
6: Production galvo electronics																
7: Install new centering system																
<b>Deliverables</b>																
1: Mechanics																
2: Electronics																
3: Galvo assemblies																
4: New centering system																

$t_0 = \text{now !}$





## Suggested proceeding

---

### Start project NOW

4 months available for hardware preparation:

=> After SR1: mount 1-2 galvo steering assy's

e.g. one on WE bench, one on detection bench

### Observe for a few weeks

### Then equip other QD's

Pre/Post Virgo+ break?

### Compatibility with new QD front end electronics

In central building: 4 QD's on 1 CPU (Qa34)

CPU load due to

- Correction signal computing for galvos
- Anti-alias filtering for QD signals (for new QD front ends)

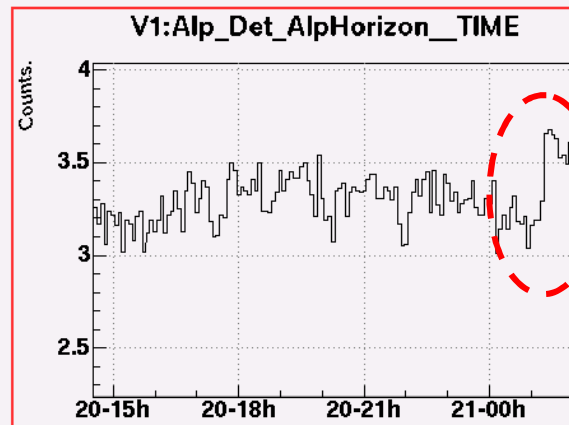
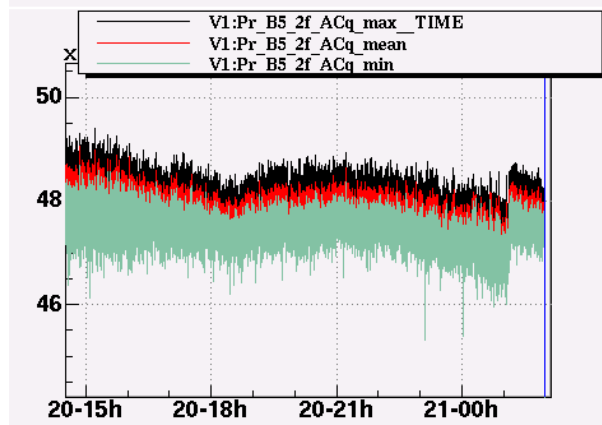
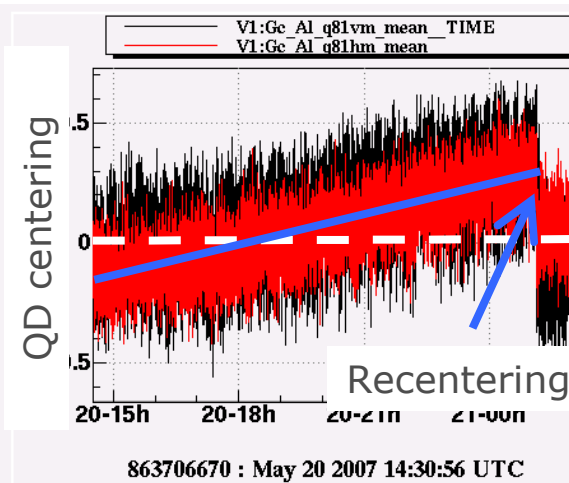
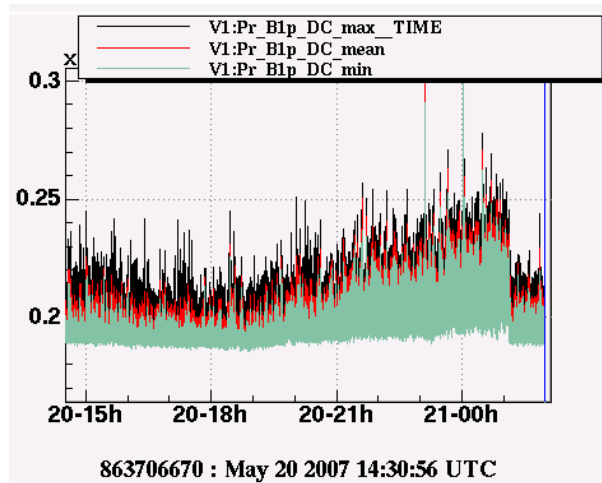
Exact CPU load to be determined; 2 GHz PC boards being prepared

Arrival date of new front end electronics not yet determined

=> Maybe no problem



# SR1 news: Q81 centering problem



Longitudinal signal becomes visible in Q81\_AC signal (-> BS) if QD is miscentered

=>

BS alignment drift

## Solutions

- Compensate BS alignment offset with DC signal in sensing matrix  
But: AC signal not valid if miscentering too large
- **Geo could lend a fast quadrant centering system for Q81**



Start now

=> available at the end of SR1

*End*



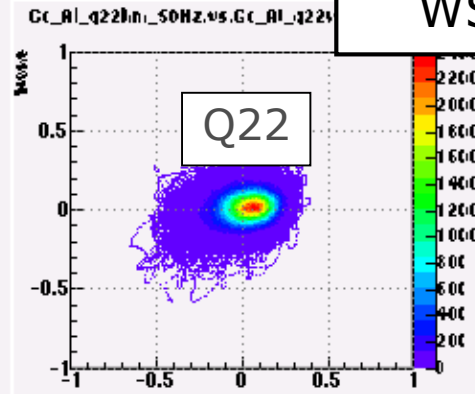
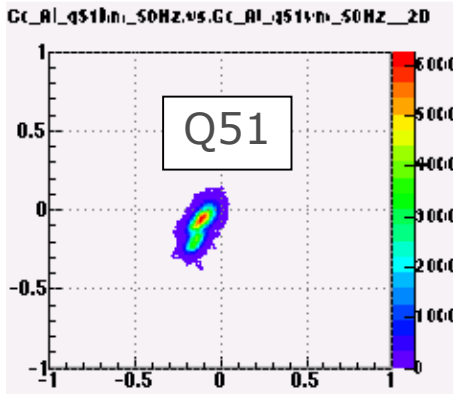
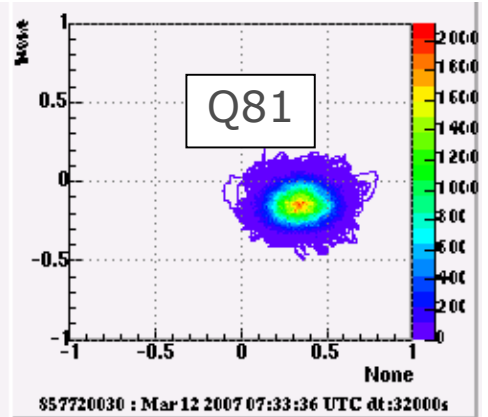
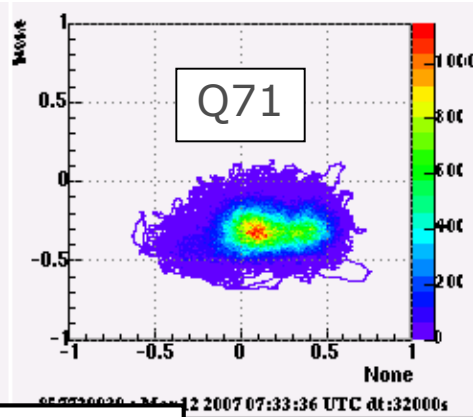
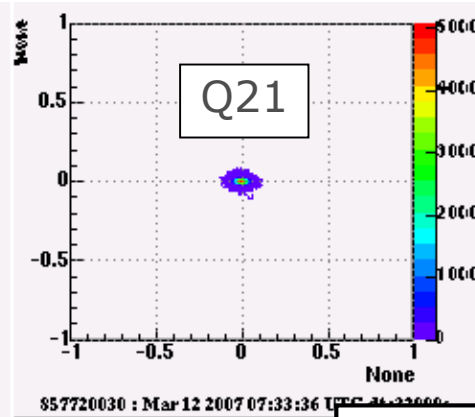
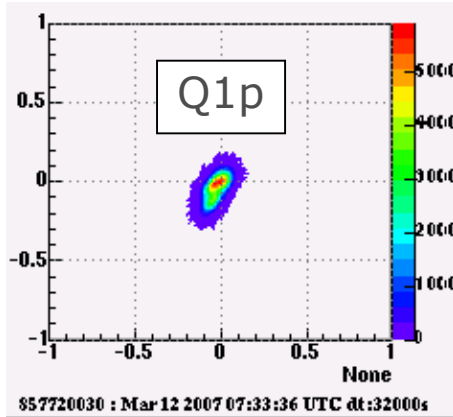
# Present centering accuracy

Dark fringe

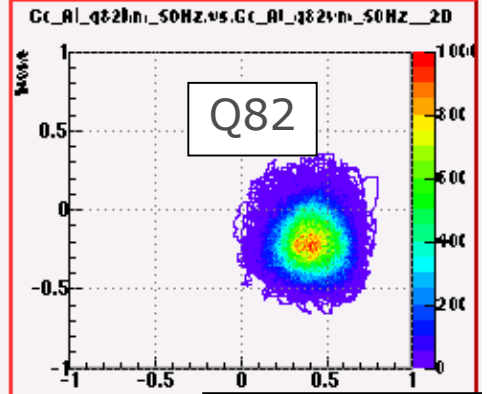
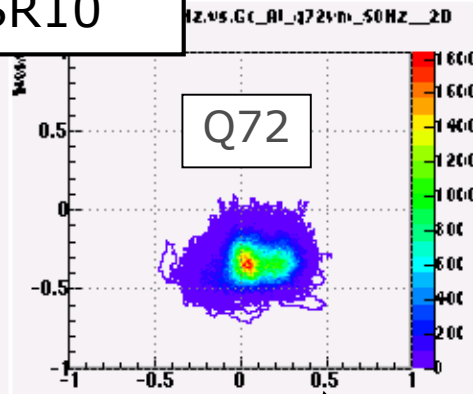
Symm.port

North end

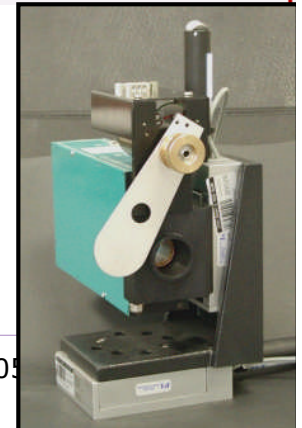
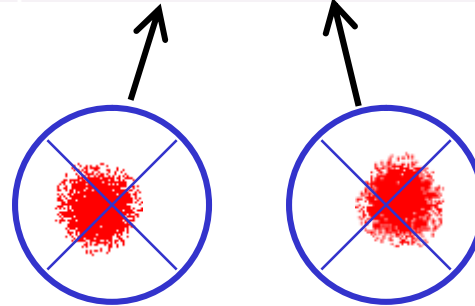
West end



**WSR10**

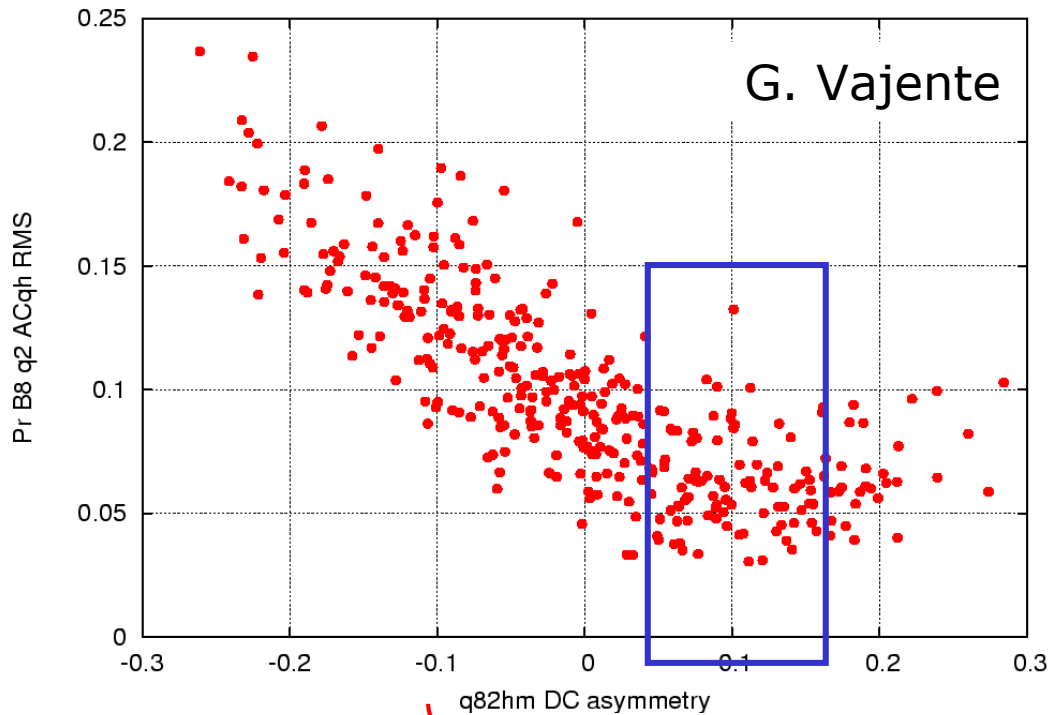


Translation stage centering > 3 sec





# Requirements for centering



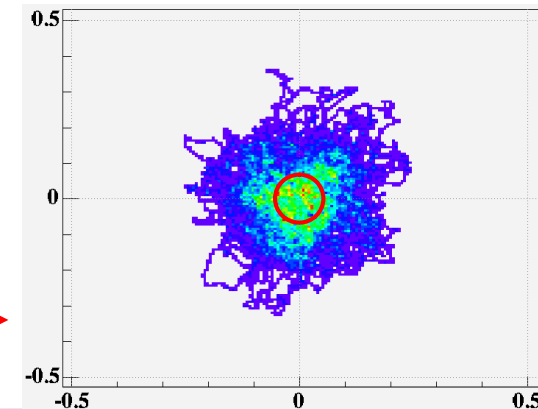
With the present centering configuration (activates every few minutes)

RMS change of a factor of 4

Extrapolating from these measurements...

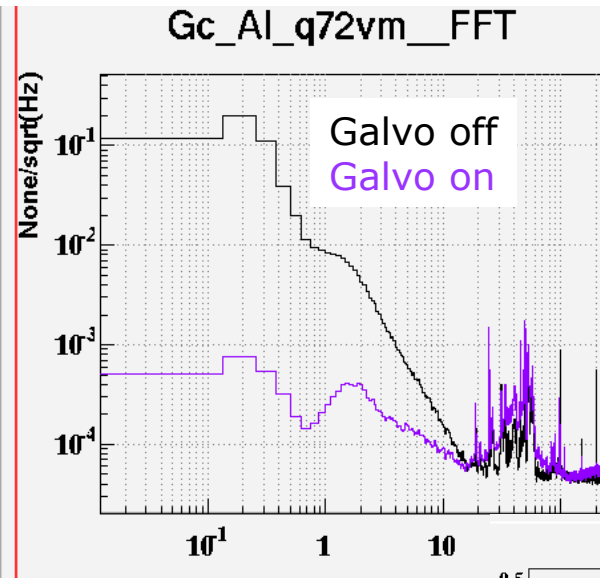
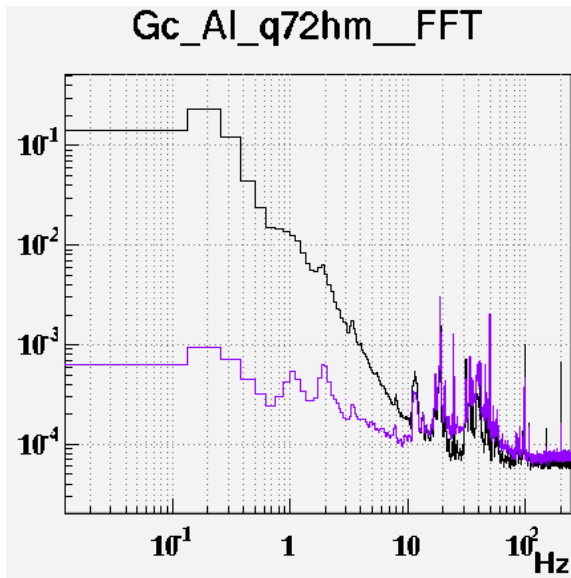
Taking a reasonable range around the “minimum”, the maximum DC asymmetry must be less than 0.1

Even with the best centering rate now possible (every 4-5 seconds) we can't reach this precision.





# Galvo system performance II



Beam position fluctuations become visible in the correction signal

