



Virgo Update



B. Mours

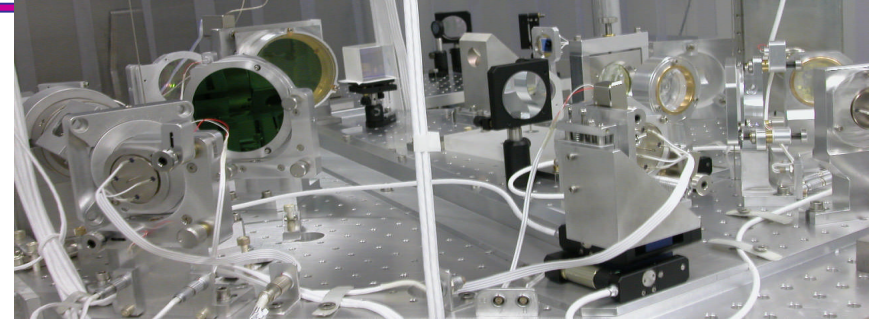
LIGO-G060105-00-Z



Fall 2005 shutdown

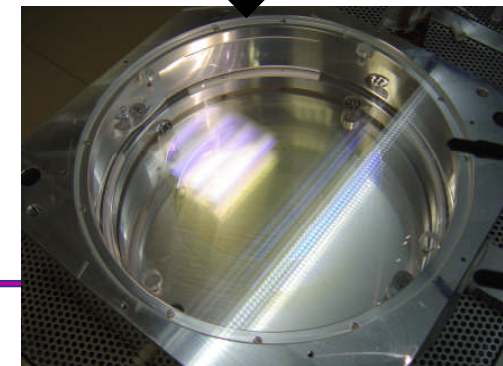
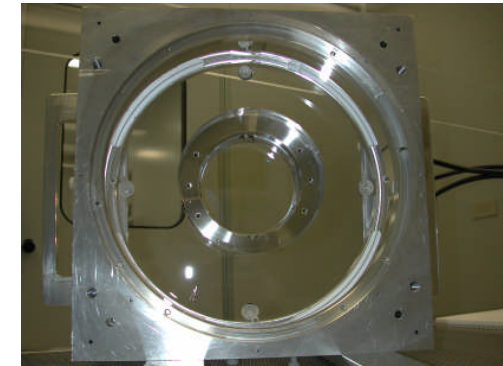
- **New injection bench**

- ◆ Full redesign
- ◆ Faraday isolator
 - » Go to the nominal power
- ◆ New Input Mode cleaner alignment scheme



- **New Recycling mirror**

- ◆ Go to a monolithic mirror
- ◆ Change the input telescope
 - » Use parabolic mirrors on the “injection bench”
- ◆ Adjusting the reflectivity (92%→95%)
 - increase of the recycling factor



- **Expect 500W on the beam splitter**

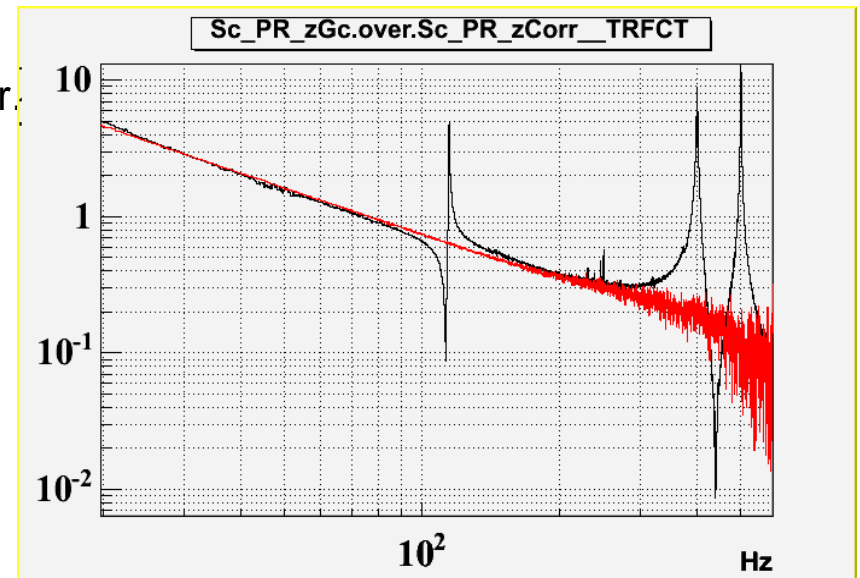
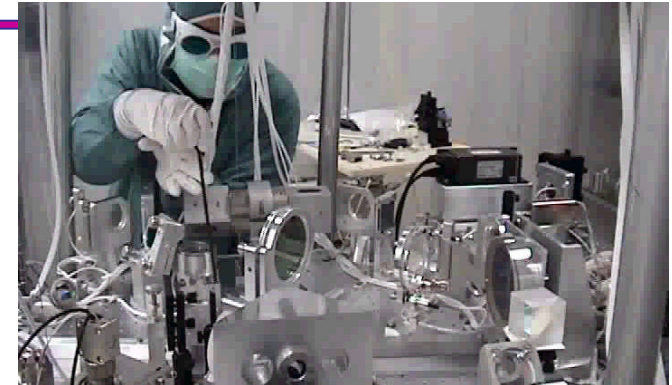
- ◆ x20 compared to C7

- **Back to vacuum end of November**



Virgo re-commissioning

- **December:**
 - ◆ Restart the local controls
 - ◆ Realign the injection system
- **January**
 - ◆ Relock the input mode cleaner (5 Jan 06)
 - ◆ Realign the input telescope
 - ◆ Measure TF for the new recycling mirror.
- **February**
 - ◆ Relock the long cavities
 - » 88% beam matching up to now
 - ◆ Relock the reference cavity
- **March**
 - ◆ Relock the full Virgo
- **Slow down by the usual problems:**
 - ◆ Alignment, broke a translation stage, pico-motors, faulty electronic,,...





Virgo status now

- Virgo locking scheme:

- ◆ Variable finesse technique:

- » Lock on the half fringe
- » Used transmitted beam to lock the cavities
- » Start the frequency stabilization servo
- » Align PR mirror
- » Fringe offset adiabatically reduced
- » Use different error signals

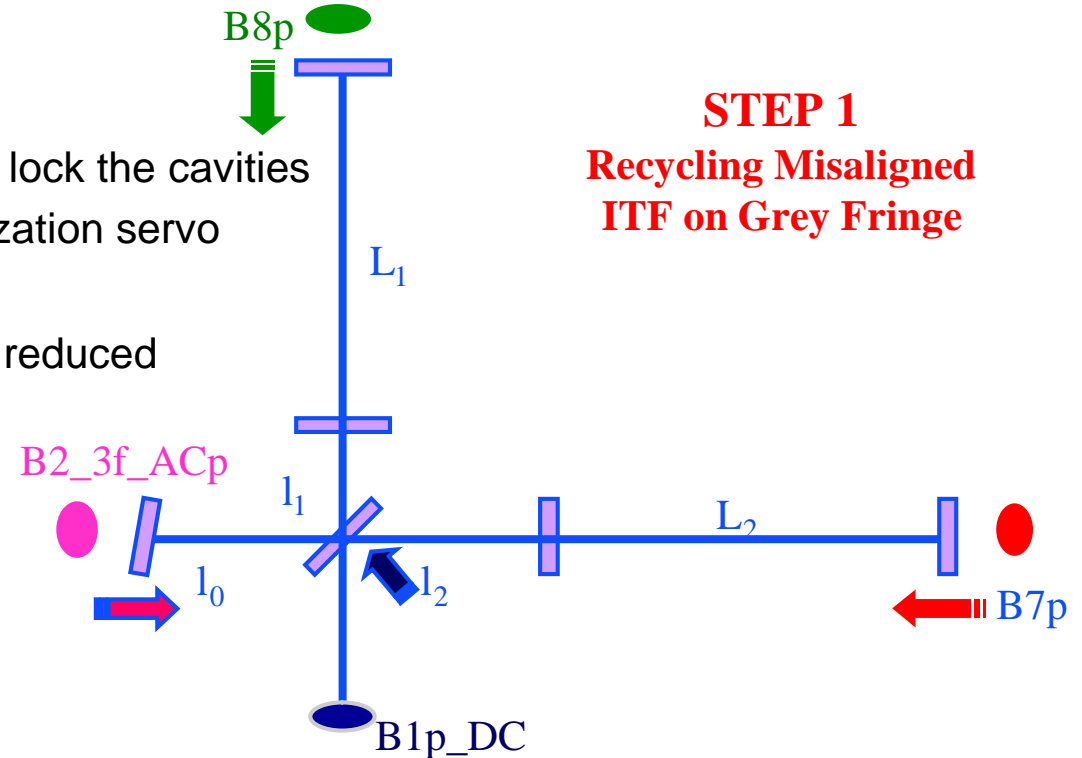
- Now (Saturday)

- ◆ ITF relock:

- » PR aligned
- » 5% of the dark fringe

- ◆ Power in the arms 2X before shutdown

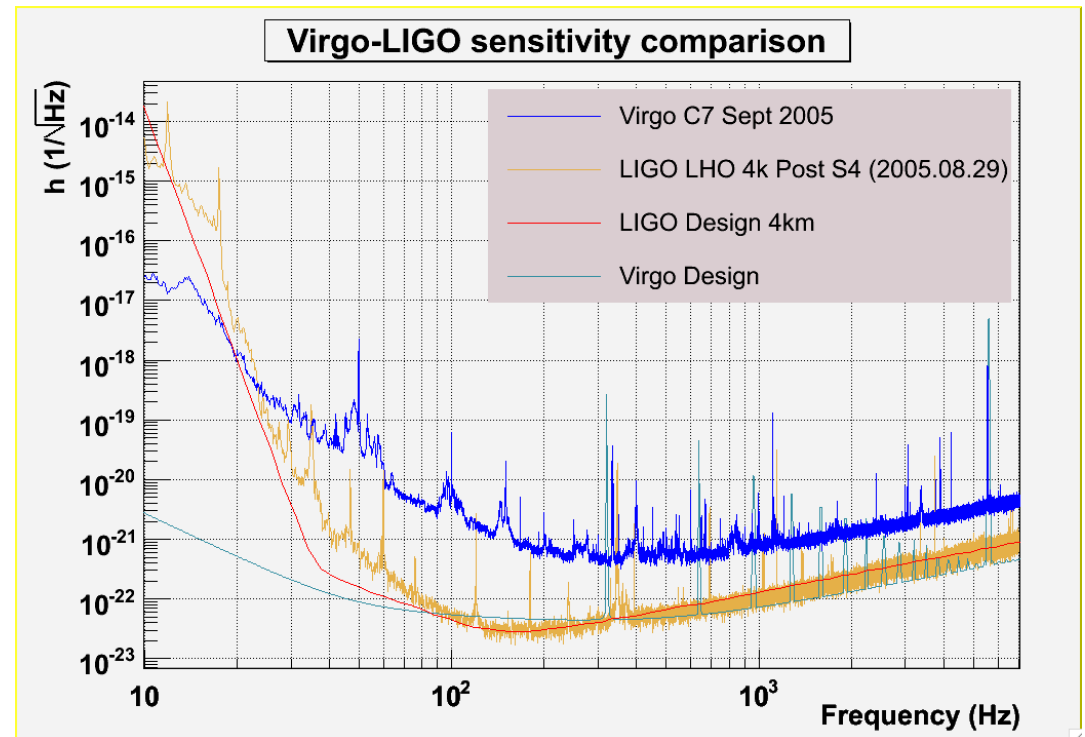
- » still a factor 10 to go





Data Analysis: some examples

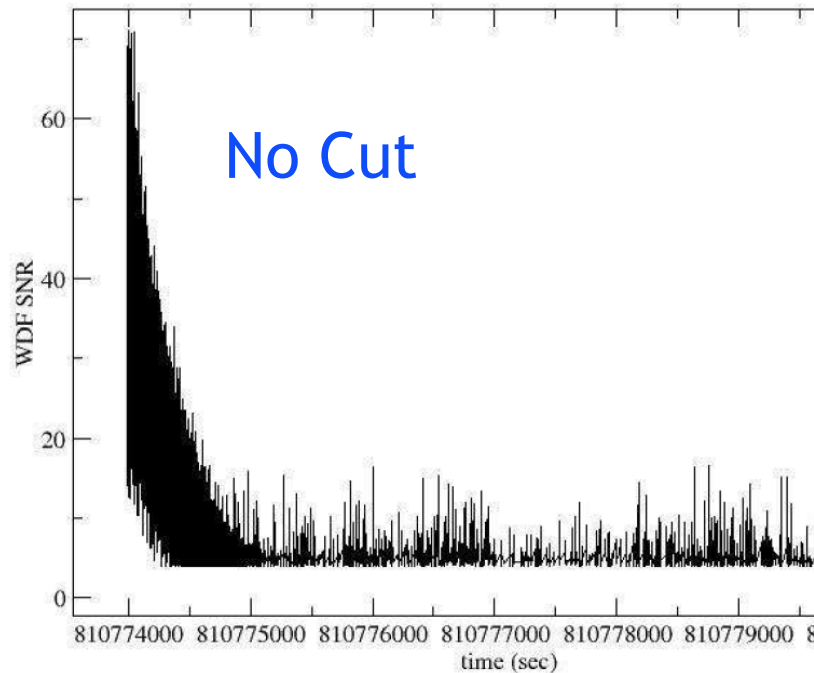
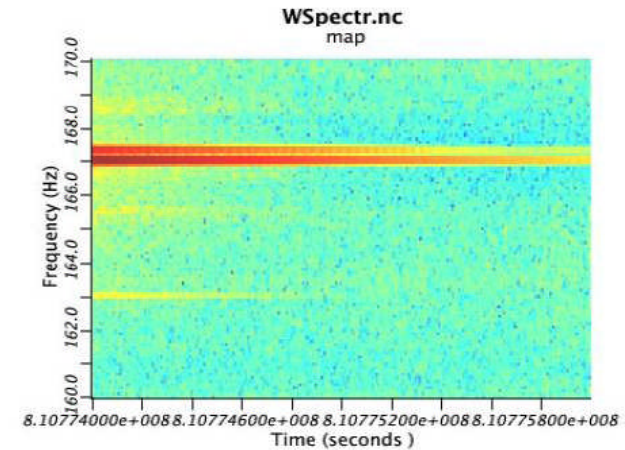
- Using C6/C7 data (Aug-September 05)
 - ◆ C7; inspiral horizon = 1.5 Mpc (optimal orientation)
- Goal
 - ◆ Develop the data analysis
 - ◆ Understand better the detector noises and non stationarities



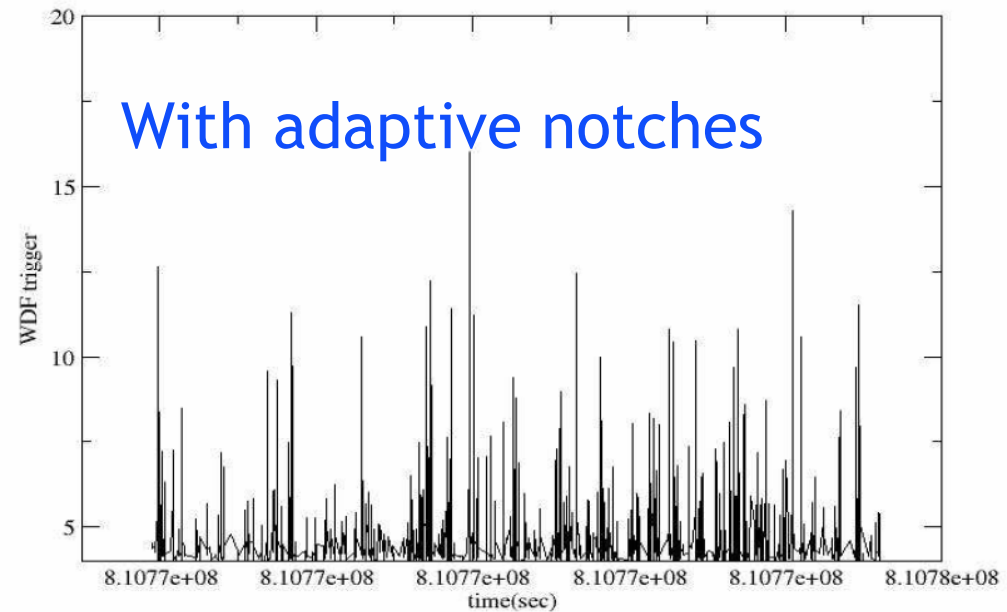


Learn how to deal with relock

- Well known problem of excitation after a relock
 - ◆ Trigger rate of some burst algorithms before/after cutting violin/internal modes resonances: (167-333-3884-3916 Hz)



March ,2006

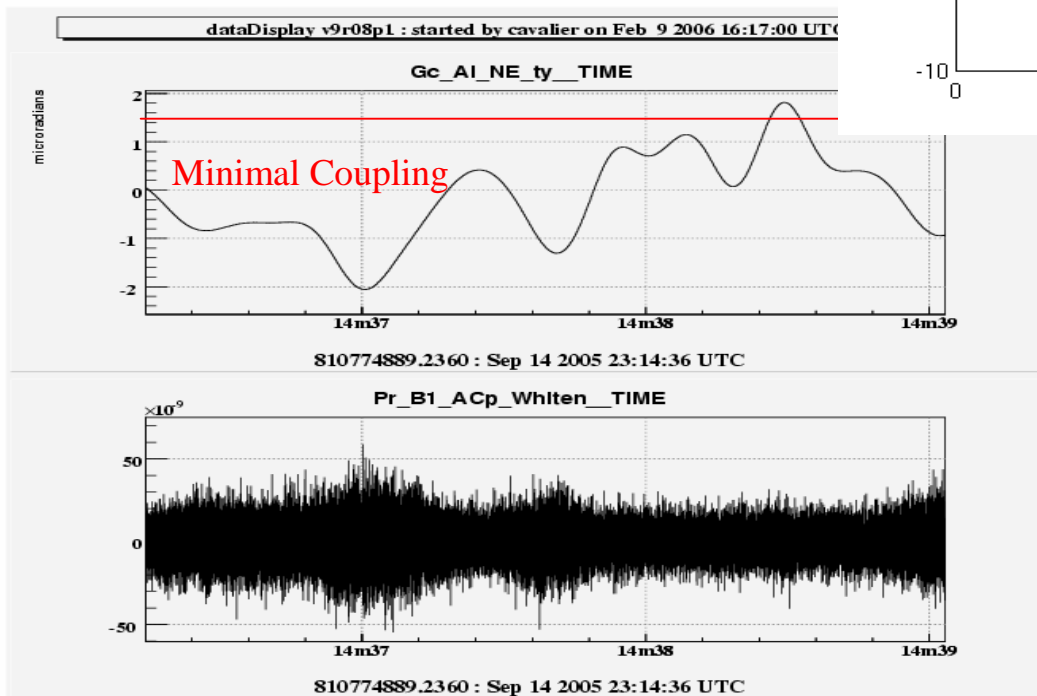
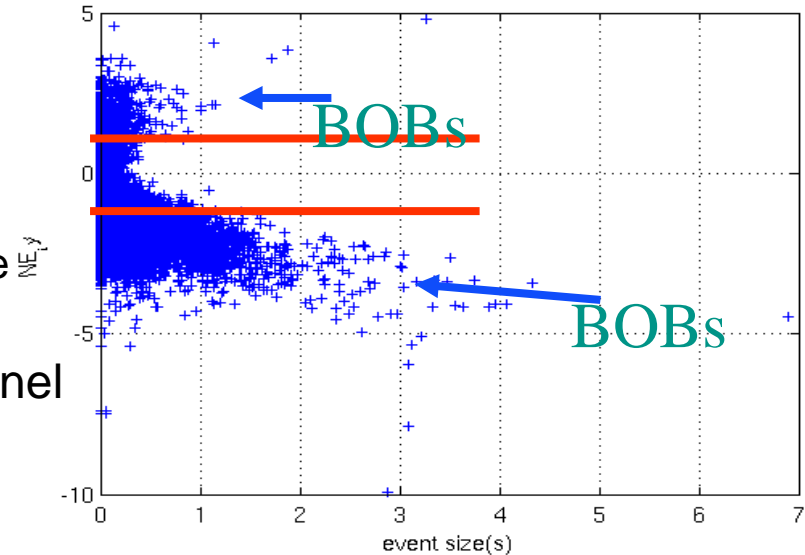


Virgo Status – LSC meeting



Burst of burst events

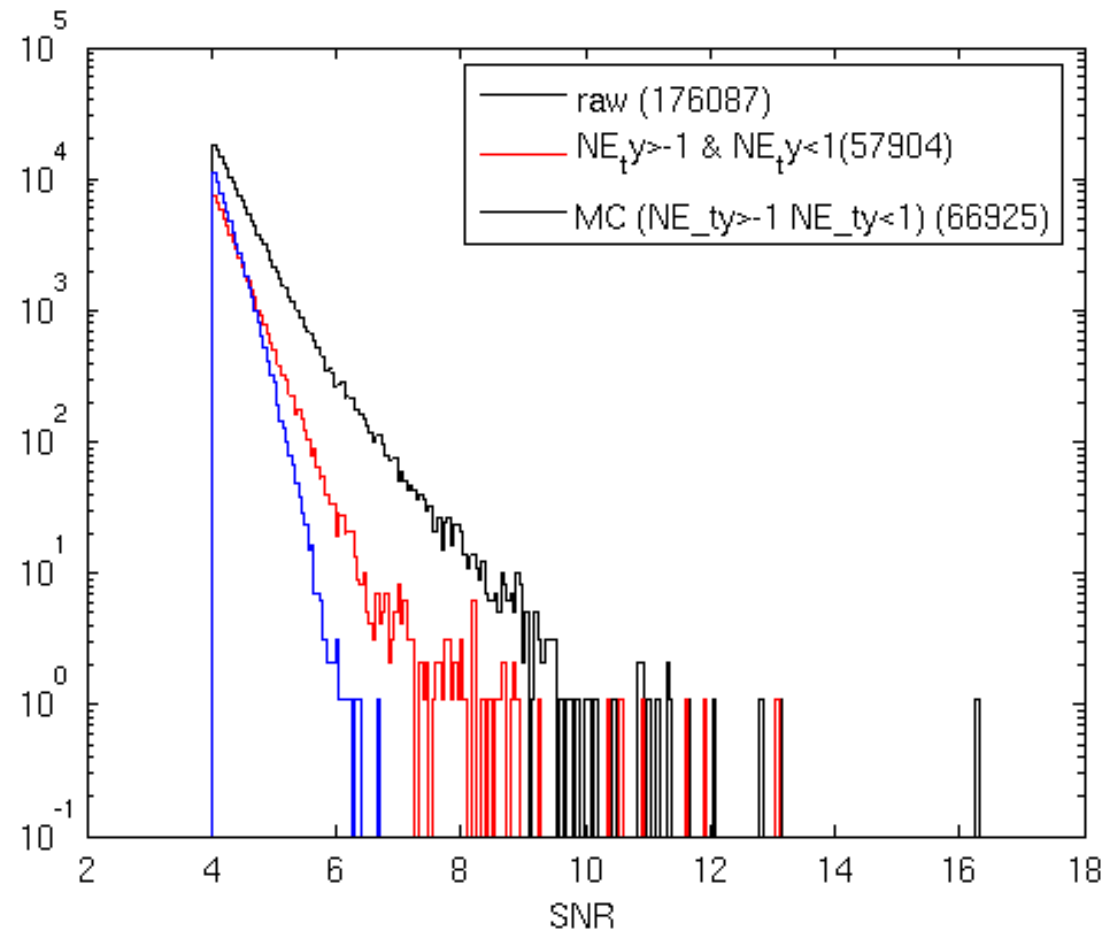
- “Burst of Bursts”:
 - ◆ Observe long events (after clustering)
 - ◆ Correlated with mirror angle
 - » The residual angular motion change the coupling with the frequency noise
 - ◆ Non stationarities in the whitened channel





Example of Bursts distribution

- Mean Filter algorithm
- Veto on misalignment
 - ◆ 30% dead time
- Get closer to the MC distribution

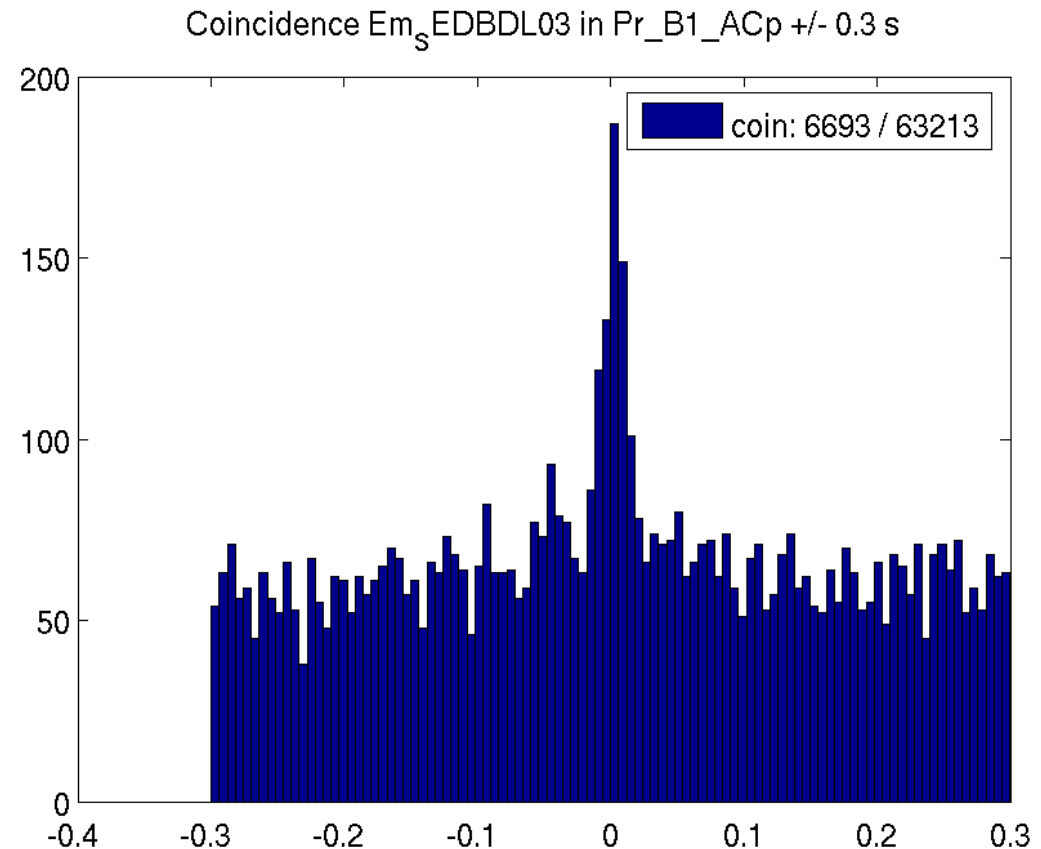




Other problems found with bursts

- Bursts in dark fringe and detection bench accelerometer

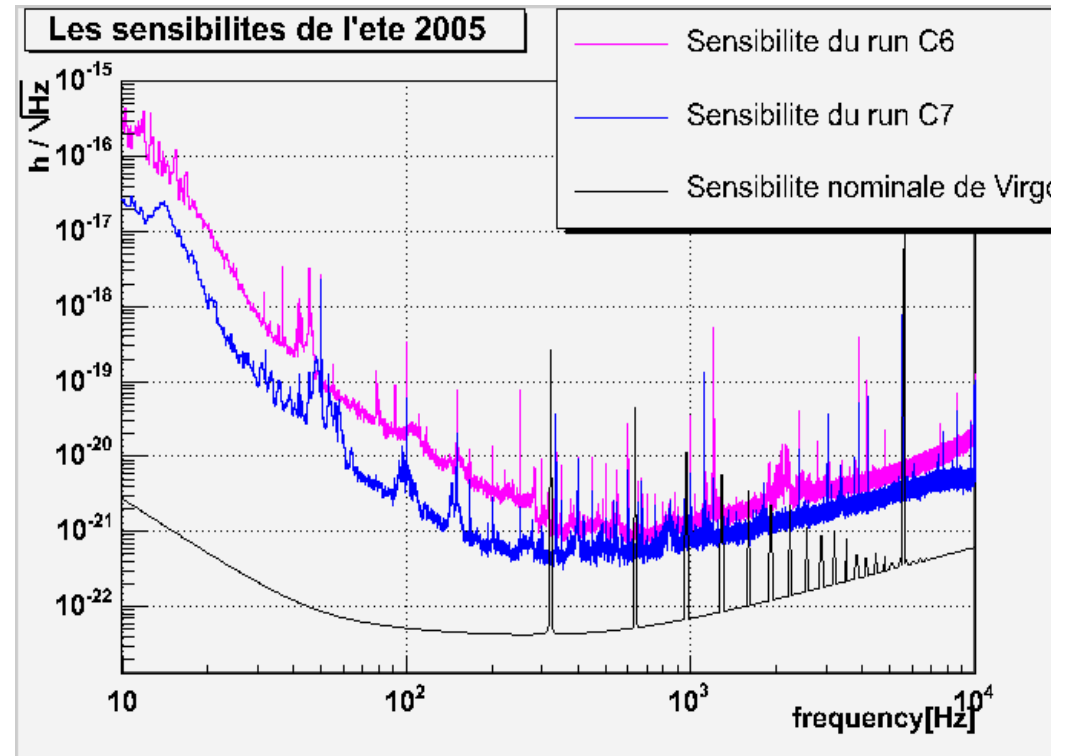
- Origin:
 - ◆ Centering of the quadrant every 6 second





C6-C7 data quality

- Not science quality data
 - ◆ But good to learn et get ready
- C6-C7 period:
 - ◆ Fast commissioning progress
 - ◆ Only a few months of stable operation





Next Virgo steps

- 2006
 - ◆ Interferometer restart: Now
 - ◆ Recycled ITF commissioning: 3 Months
 - » Start data taking during weed-ends and nights
 - ◆ Noise hunting: 4 Months ?
 - ◆ Start a Science Run (NS-NS horizon around 15/2.5 Mpc?)
 - ◆ Data taking > 30% of the time ?

- 2007
 - ◆ A possible shutdown to fix problems
 - ◆ Commissioning and noise hunting
 - ◆ Nominal sensitivity
 - ◆ Data taking > 50% of the time



Virgo+

- Independent changes
 - ◆ Same optical layout
 - ◆ Monolithic suspension
 - ◆ 50 W laser
 - ◆ “Short” shutdown
- “Low” cost upgrades
 - ◆ 1-2 M€
- Installation target: early 2008

Inspiral Range (Mpc): (averaged over 1000 yr)

	Virgo	Virgo+ (a)
NSNS	12	46
BHBH	58	234

