Burst Data Analysis

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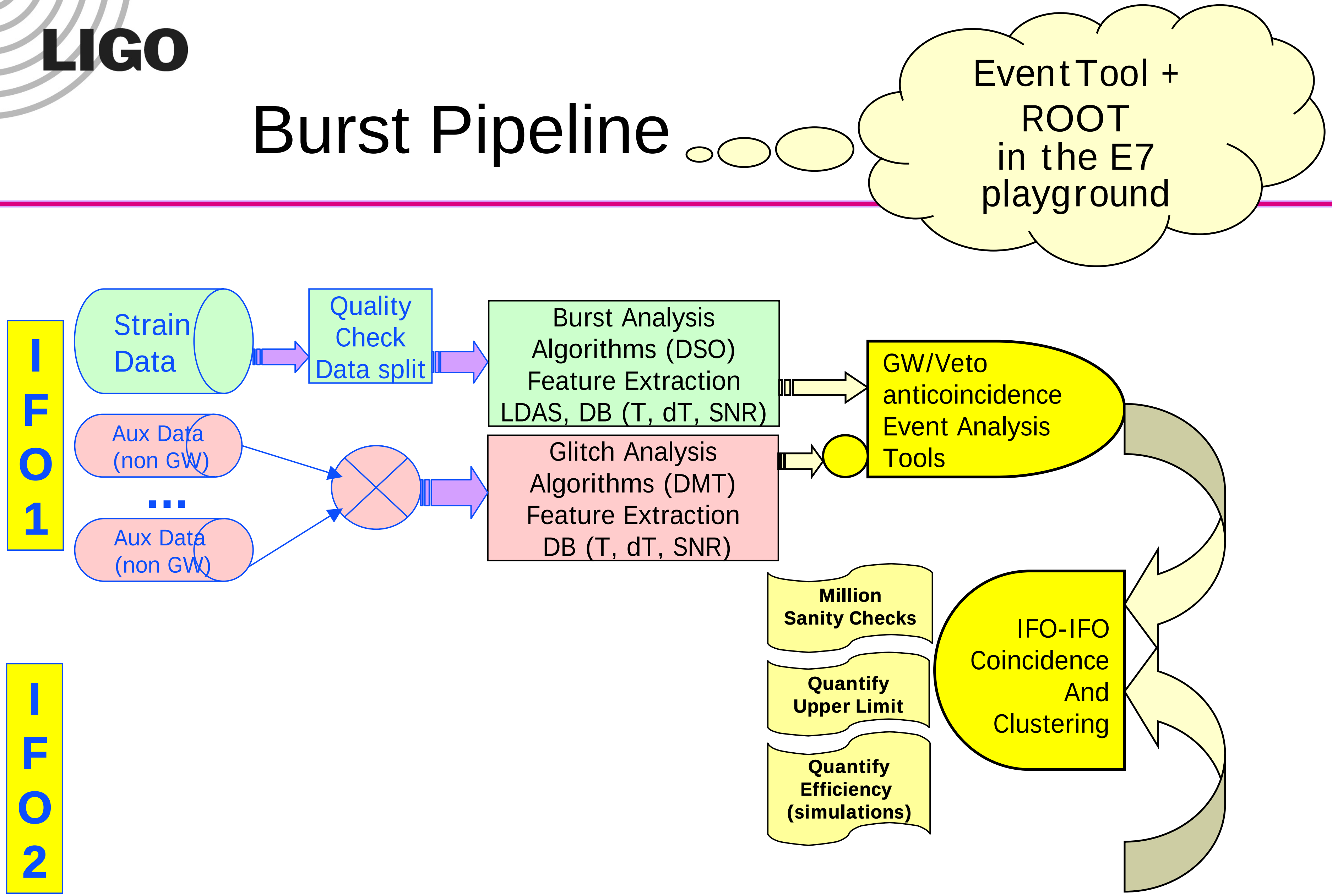
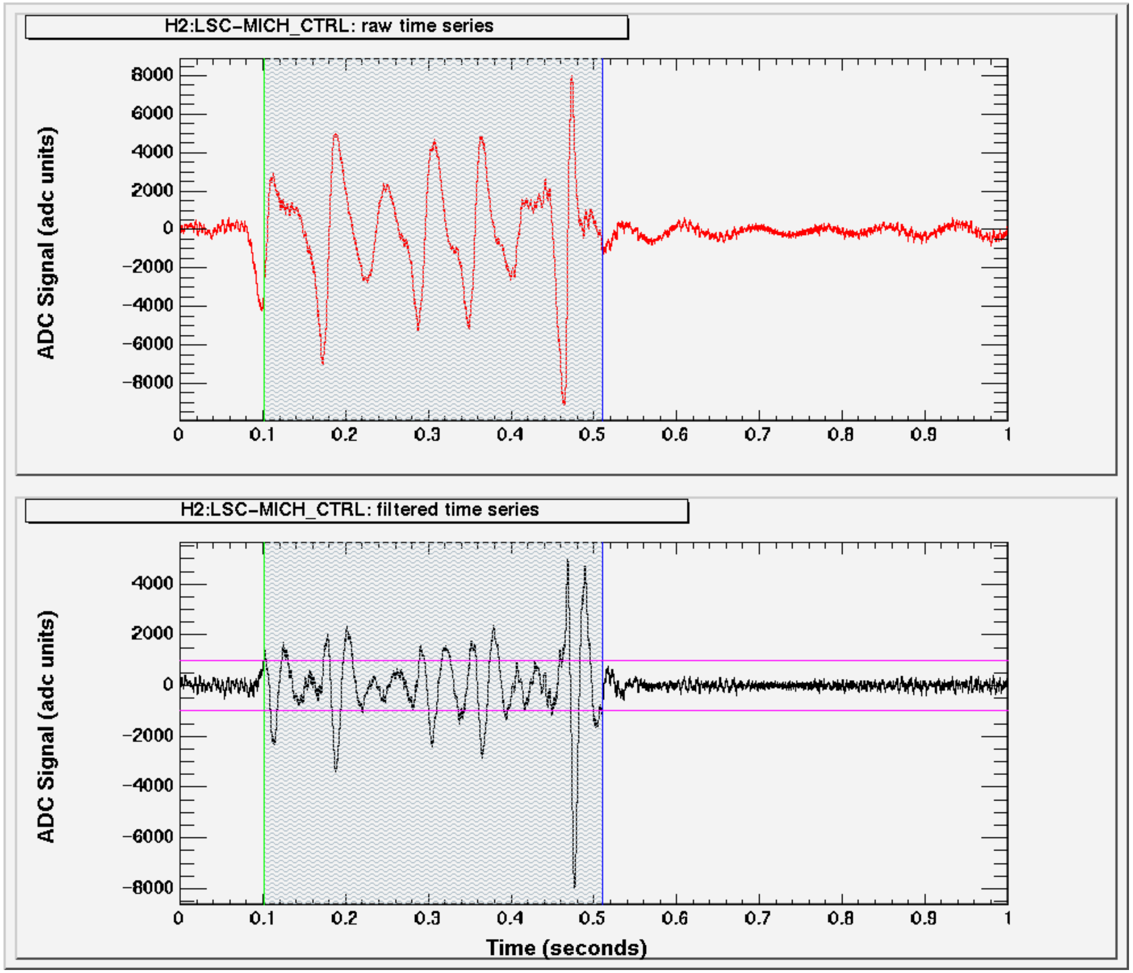
Burst Pipeline



The veto search: running **absGlitch** on auxiliary channels

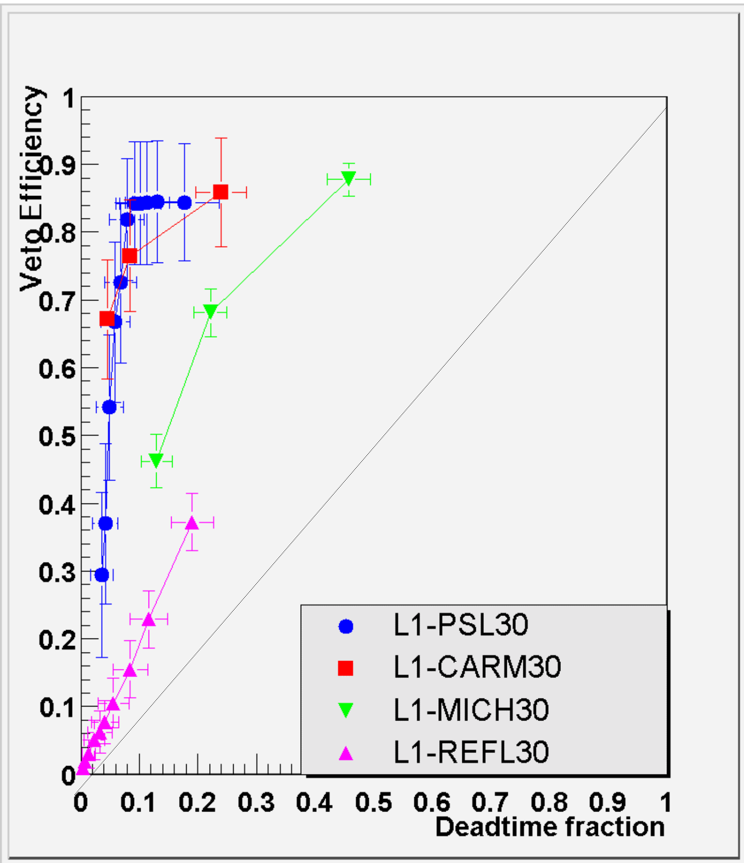
The absGlitch glitch finder, when ran on auxiliary channels:

1. Filters the time series (typically, 30Hz HP)
2. Finds times when the signal crosses an ABSolute threshold
3. Calculates max amplitude and duration
4. Records to DataBase



Various veto options: the ε–τ plots

Choice: PSL at L1 MICH_CTRL at H2

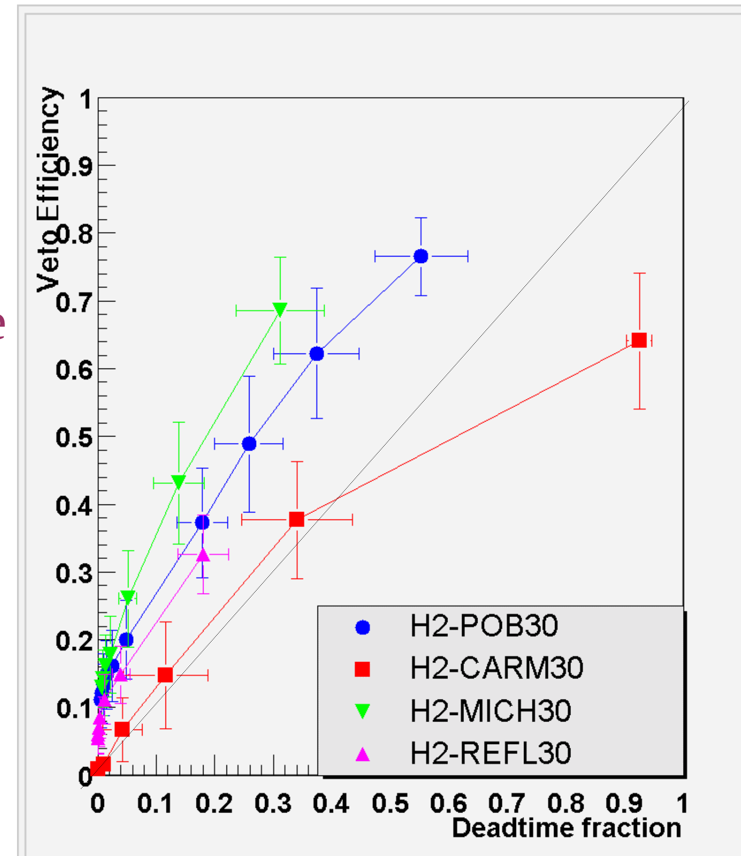


Notation:

$\varepsilon = N_{vetoed}/N_{total}$

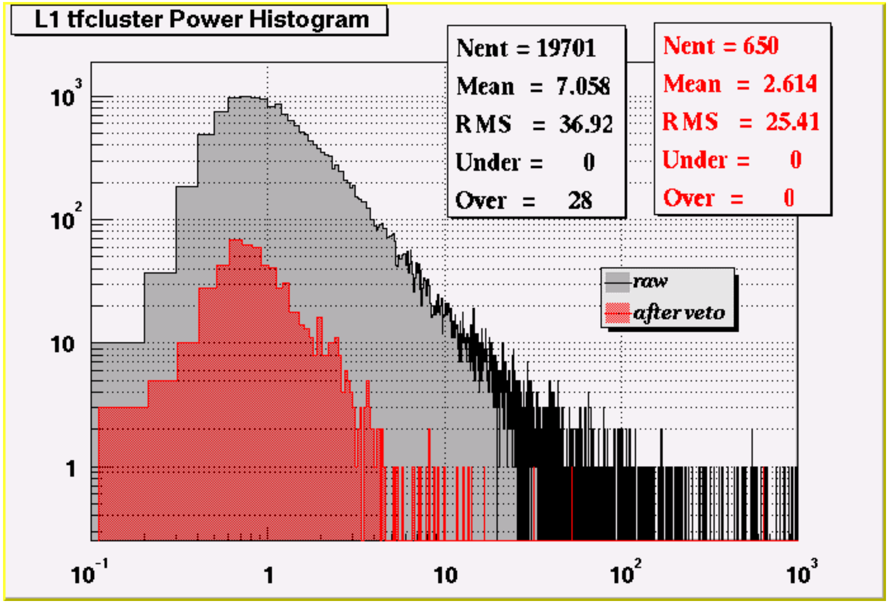
τ=dead/total time

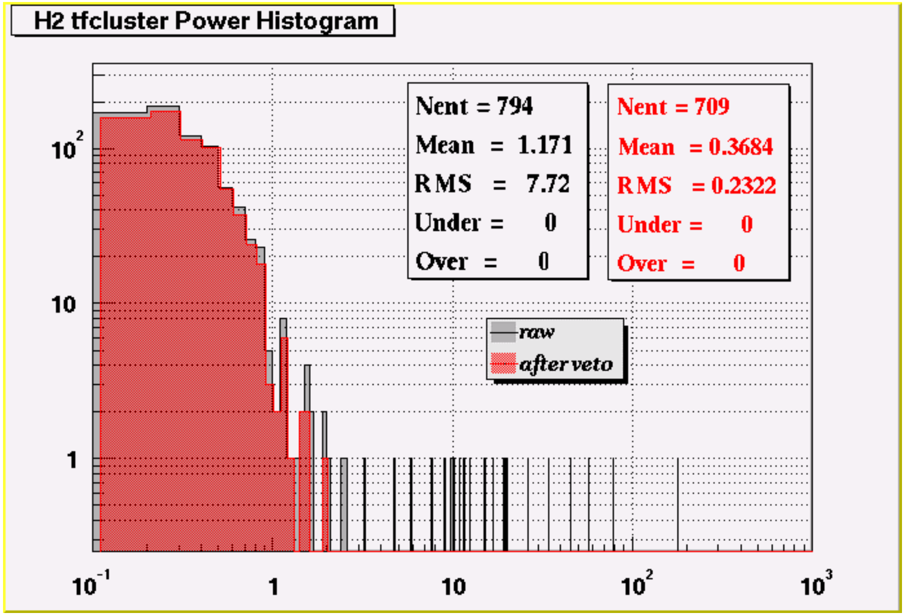
Based on the TFCLUSTER DSO output



TFCLUSTER event histogram, before and after vetoes

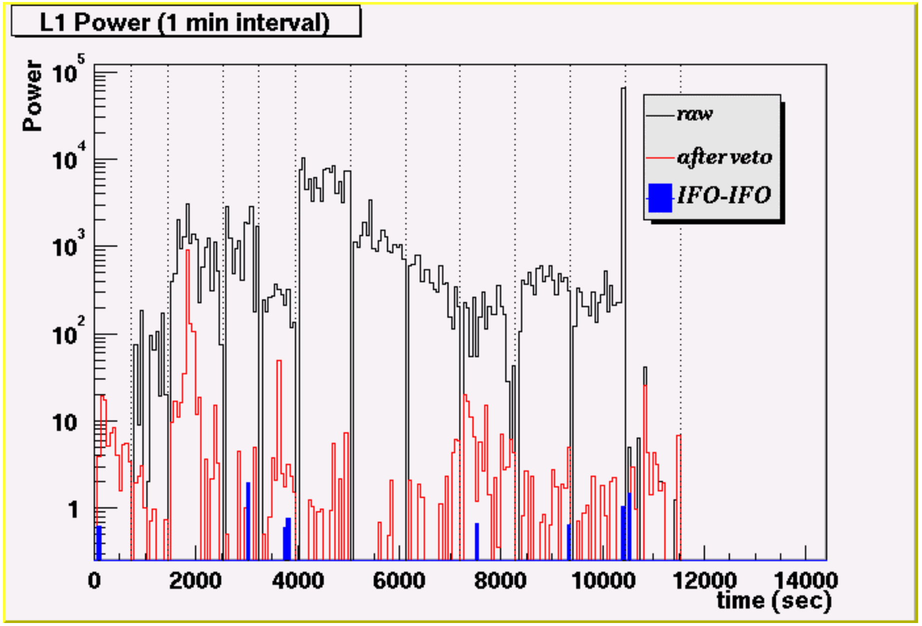
- At both IFOs, the veto is very efficient at removing “high power” events (tails).
- The efficiency is much higher at L1 because L1 was much noisier to start with.
- The residual number of events at the two sites is comparable.

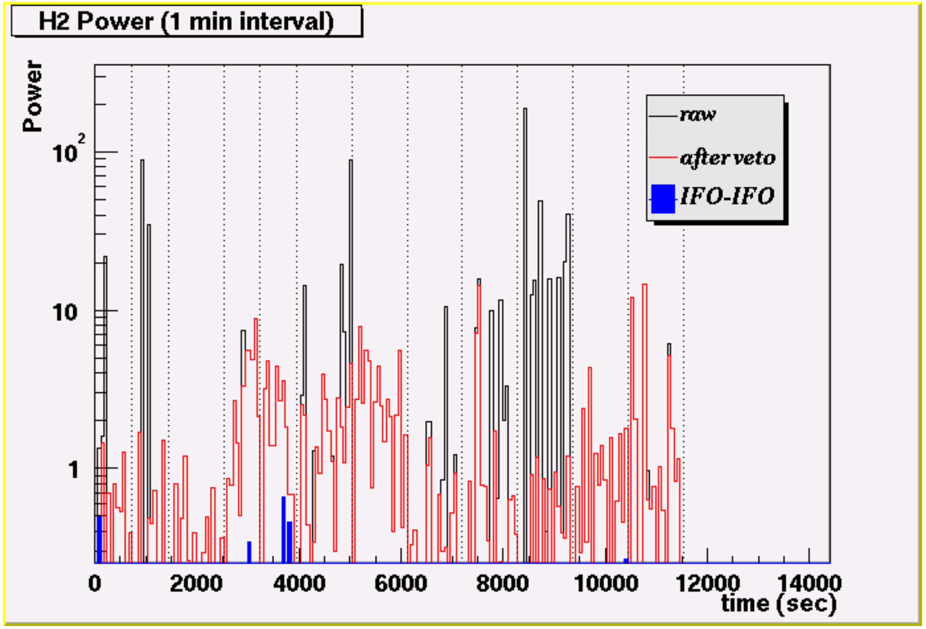




Introducing the IFO-IFO coincidence

- After veto application, ~ few events/minute at each site
- The IFO-IFO coincidence (requirement: ± 0.5 sec) reduces to 10 events in 3 hours





Note: 0.5 sec is a conservative interval choice, <u>to be refined by further requirements…</u>

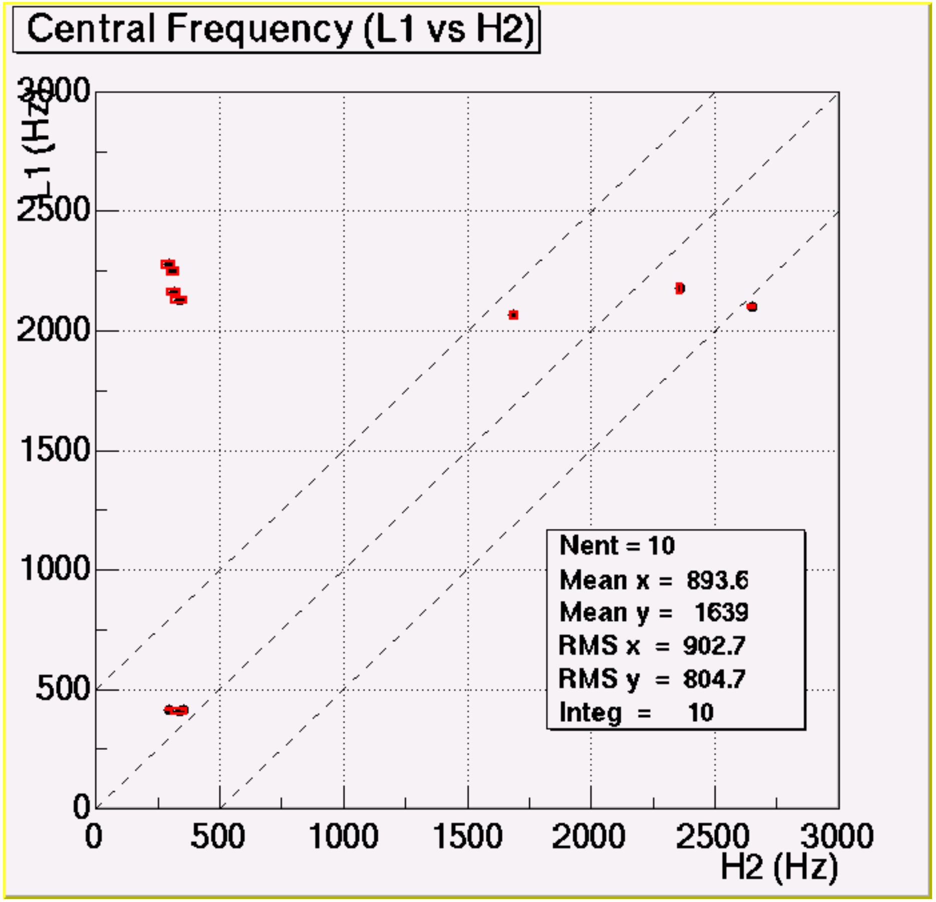
Adding a frequency requirement for TFCLUSTER events

A first additional requirement: agreement between frequencies at the two IFOs, within 500 Hz

NOTE: this requirements needs to be optimized by looking at simulation injections (TBD)

With this “weak” requirement: 4 survivor events

⇨ **back to the time series!**



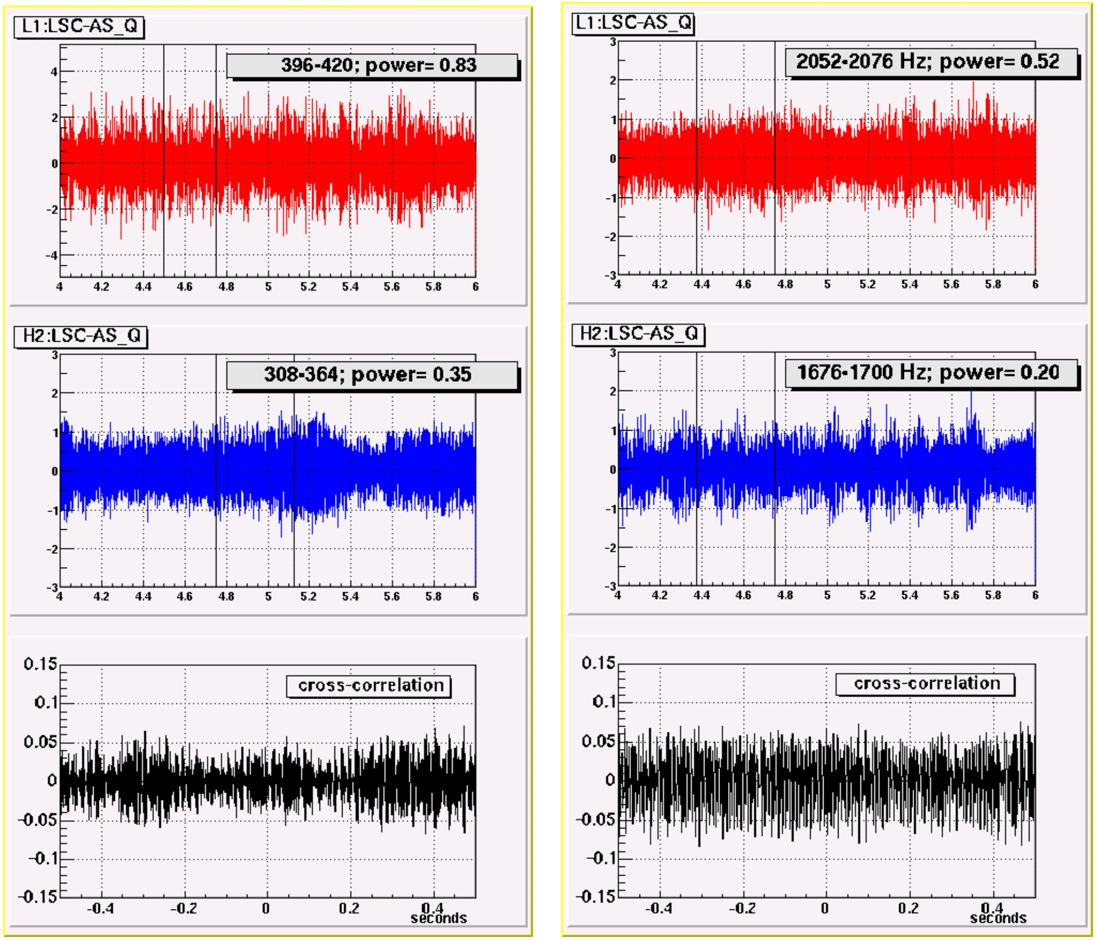
Survivor candidates

Each survivor candidate is to be analyzed at the level of time series, for instance by looking at the cross-correlation between sites

$$r = \frac{\sum_i [\,(x(i) - mx) * (y(i-d) - my)\,]}{\sqrt{\sum_i (x(i) - mx)^2}\;\sqrt{\sum_i (y(i-d) - my)^2}}$$

This is still a TBD item!
to be tuned by instrumental simulation injections

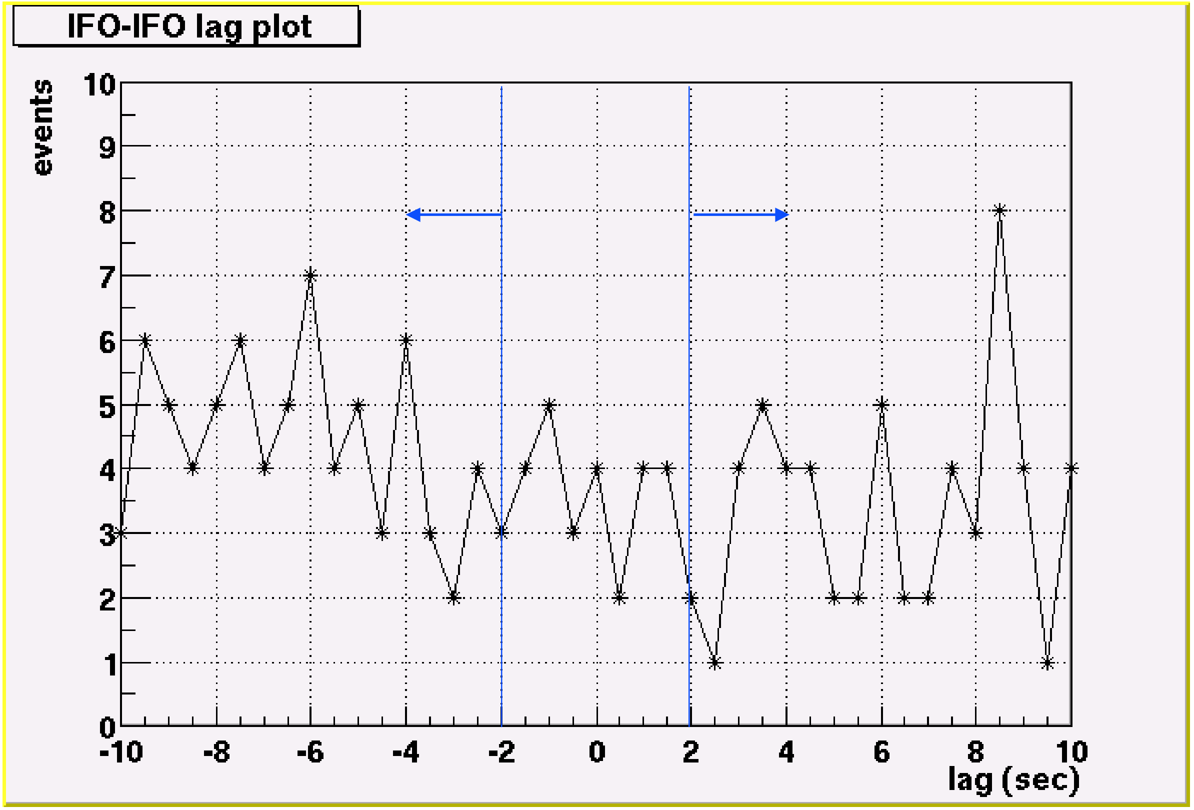
2 of the 4 candidates: uncorrelated?



Background: coincidence lag plot

The background (false coincidences) can be estimated by non-physical time shifts between time streams (0.5 to 10 sec)

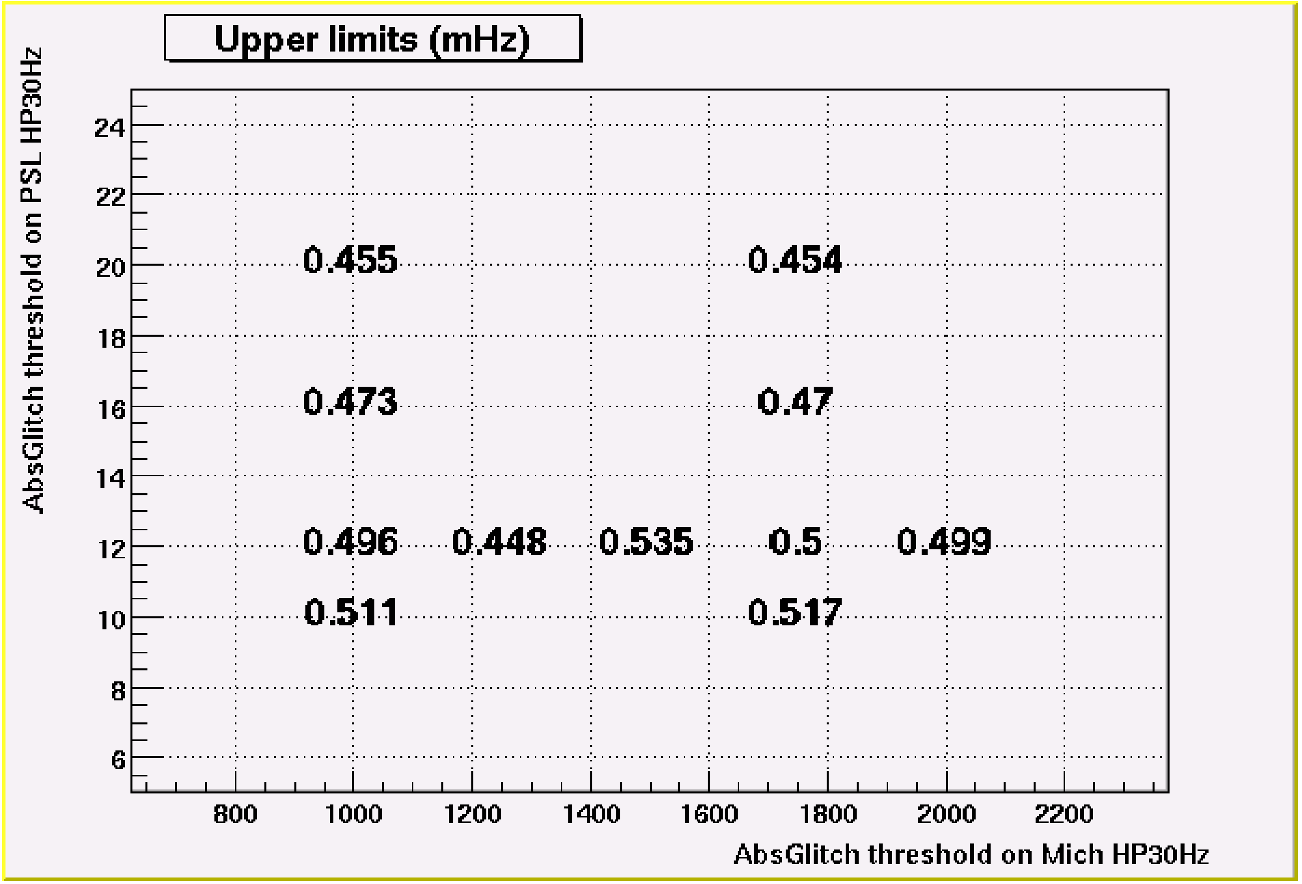
There is no evidence of a peak at zero lag!



Burst rate upper limits for various veto thresholds

For different choices of veto thresholds:

90% C.L. upper limits of Feldman-Cousin confidence belts that include zero.
No detection.

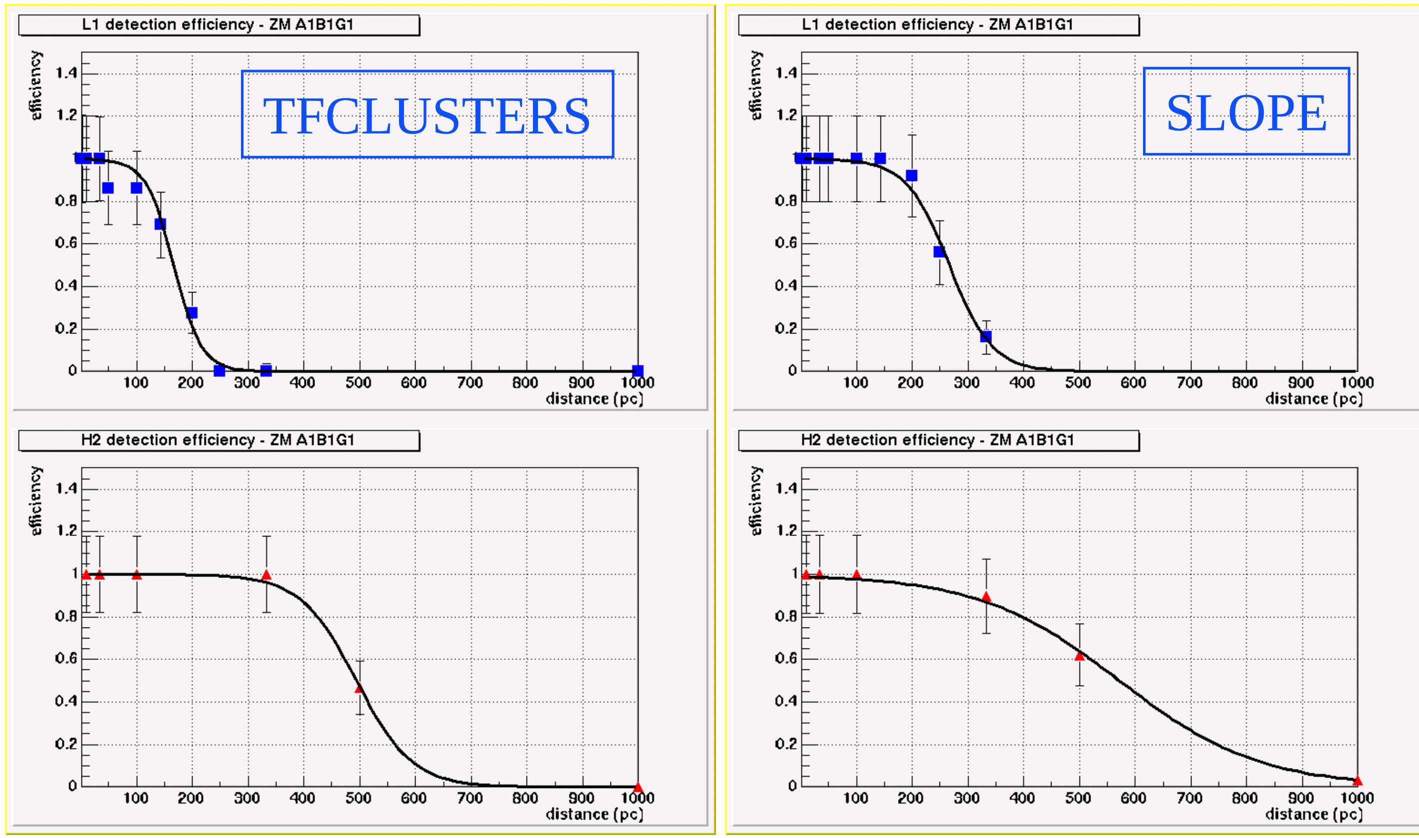


<u>Preliminary</u> work on simulations (software injection)

Injection of (32 ZM-A1B1G1 waveforms) x (11 distances) x (3 DSOs) (ajw)

NOTE:
There is an undetermination of the absolute scale of distances!

Work in progress: sampling more sources and directions



LIGO

Remaining steps

- Complete veto tuning (almost done)
- Complete study of efficiency of the DSOs (in progress)
- Tune the coincidence algorithm on the basis of simulation results (both software injections in the time series and instrumental injections)
- Push the whole E7 data set through the pipeline