Relative Timing of Glitches: Information from PTmon

LIGO

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Relative Timing of Glitches: Information from PTmon

First pass on analysis of triggers:

some of the more obvious patterns, Feb 17 – Mar 8

- **Glitches not caused by seismic disturbance**

- **Glitches following seismic disturbances, snr < 10**

- **Glitches following seismic disturbances, snr > 100**

Different channels serve as markers for AS_Q in each scenario

Relative Timing of Glitches: Information from PTmon
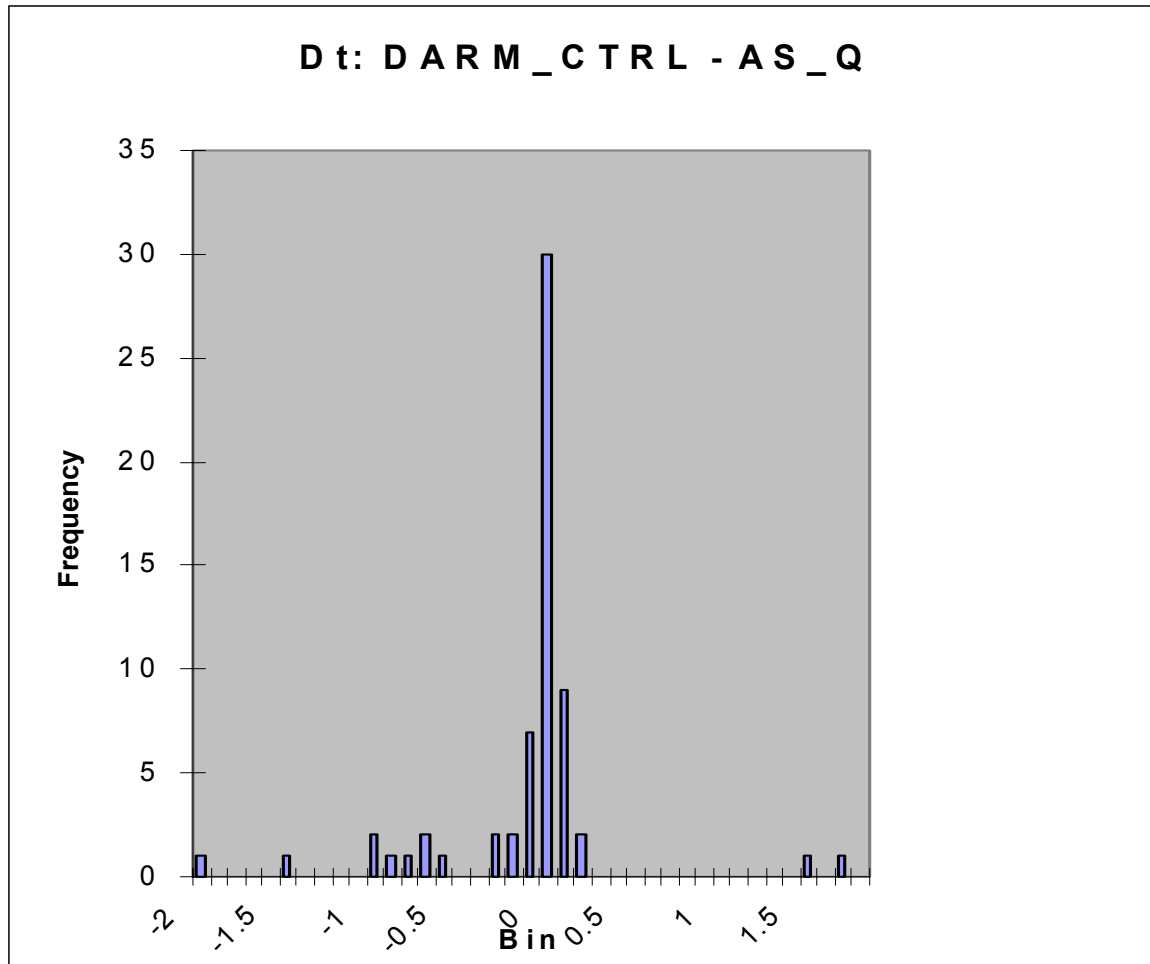
Glitches not following seismic disturbance:

best marker usually DARM_CTRL

- **DARM_CTRL glitches within 0.1 s of AS_Q: 79 %**

    additional glitches within 2 s :   10 %

- **POB_I _and_ POB_Q glitches nearest neighbors to AS_Q: 10%,**

    $|\Delta t| <\sim$ 0.2s

- **No other glitch close in time: 5%**
    [AS_Q glitches include loss/acquisition of lock :-( ]

D t: D A R M _ C T R L - A S _ Q

AS_Q glitches following low (4-10) snr seismic glitches

LVEA → POB_I & POB_Q, AS_Q   Time after seismic glitch 0.5-2 s,

or ~5-6 s

PSL accelerometers   (3.5 s)

MC_F/MC_L

AS_Q, REFL_I/Q   (4-7 s)

Note: Both paths may be followed

DARM_CTRL? May be within 2-3 s of AS_Q, may not be around

Low seismic noise at end stations

- When **EX** or **EY** → **POB_I** & **POB_Q**,

    AS_Q usually within 0.5 - 2 s of **POB_I**

    may glitch close to **DARM_CTRL**

- **Chains:** Revolving sequences of seismic and IFO glitches,

    including AS_Q (5 glitches each), lasting 1-2 minutes.

    AS_Q may or may not coincide with another IFO glitch.

    AS_Q glitches appear to decrease steadily in amplitude.

High seismic snr (>100) – LVEA only

Usually set triggers on all channels, including

DARM_CTRL and POB_I & POB_Q and REFL_Q

$|\Delta t|$ (AS_Q - seismic channel) ~ 3-5 s
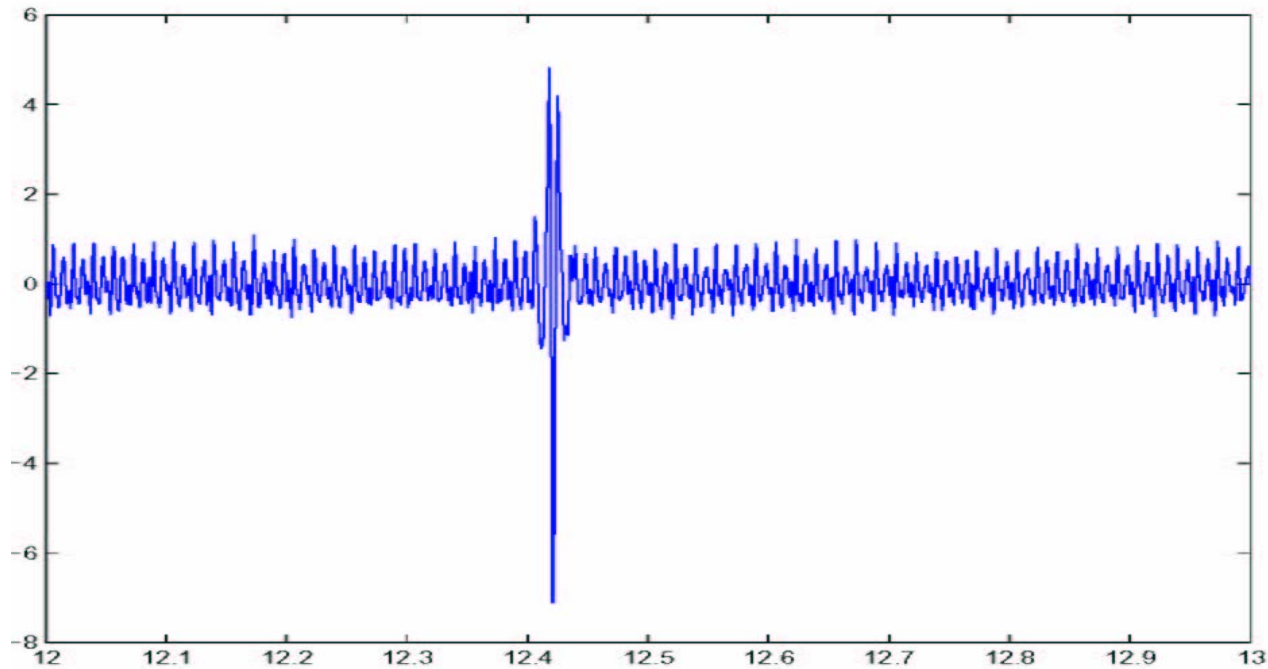
$|\Delta t|$ (AS_Q – IFO channel) < 0.1 s

These can also start a revolving chain,

with high snr (~35-45) for first AS_Q glitch

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Example of an AS_Q glitch found by PTmon

coincident with POB_I & POB_Q following LVEA_SEISX/Y/Z

Summary

Choosing veto channels may be more efficient

if surrounding channels are considered

e.g. if a block of seismic signals is observed, look for PSL/MC/REFL_Q

signals within the next 5-7 s, and POB_I & POB_Q within 2 s

If a DARM_CTRL is found, look back 5 s.

Good marker for AS_Q if no seismic signal found