

Noises vs IFO states

Wind Human Microseism
Earthquakes Trains

LOCK ACQUISITION

LOCKED STATE:
Commissioning Mode

LOCKED STATE:
Low Noise Mode

What we want in different IFO states

❖ Lock Acquisition

- ❖ Avoid saturations by minimizing longitudinal/angular RMSs of test masses

❖ Locked state – Commissioning mode

- ❖ We want the system to be robust, do not really care about noise performance

❖ Locked state – Low noise mode

- ❖ IFO locked, global signals available
- ❖ Noise performance, duty cycle

How to actually achieve these goals depends on
input seismic noise

(BSC, HAM) ISI (+SUS) Tuning

- ❖ **I am not advocating for an “explosion” of cases/states**
→ it could be that at the end a few different tunings are “good enough”
- ❖ Keep characterizing how the input noise changes in different freq bands vs what we want depending on IFO state, and which knobs we have to deal with it (blend freq, blend cut offs, sensor correction, etc..)
- ❖ Transfer (some of) the “intelligence” to the Guardian

Examples of “low hanging fruit”

- ❖ Use LASTI to train the Guardian to minimize angular motion as seen by QUAD optical lever, by monitoring seismic noise in different bands and switch ISI tuning
 - simple example: big changes day vs night in Boston
- ❖ Artificially create large seismic events, and try to see if it is possible to minimize (prevent?) watchdog tripping impact
 - goal: save recovery time (bad use of IFO time, good use of LASTI time)
- ❖ Identify particular needs at the sites, make tests in LASTI if some insight can be gained
 - access to (nearly ∞) dedicated testing time at LASTI

Virgo experience

- ❖ 2004-5: Virgo couldn't lock during windy days
- ❖ 2007-8: Seismic noise does not limit IFO performance, only strong earthquakes unlock Virgo
- ❖ Progression of tuning:
 - ✓ figure out that you can actually do something about it
 - ✓ change control of Superattenuator top stage depending on weather (wind, microseism)
 - ✓ learn weaknesses of your system, and work around them
 - ✓ use global signals once you are locked