Detectors and observations in O3

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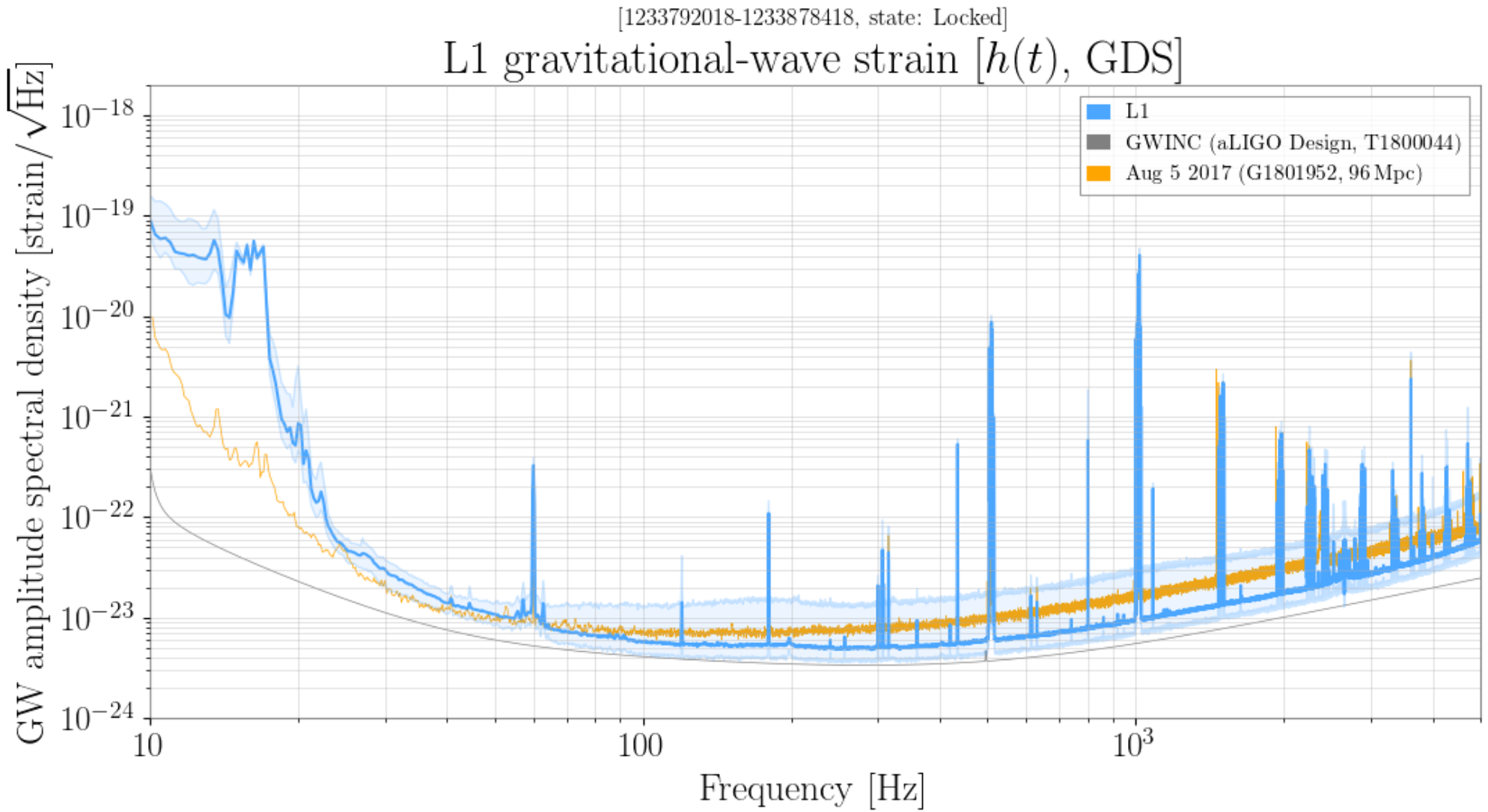
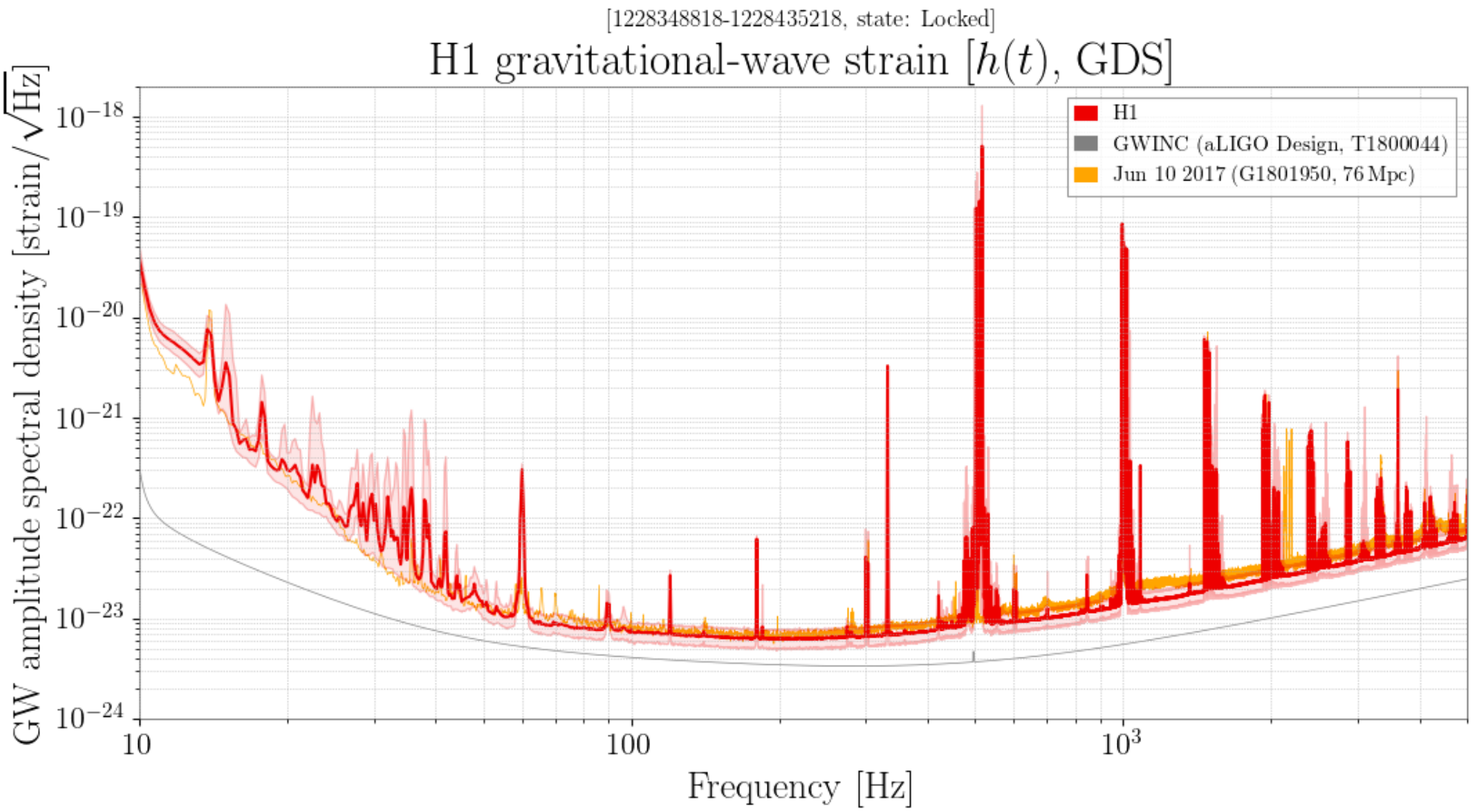
Instrument Status and Plans

- Have seen better sensitivities from all instruments.
  - So far, L1 up to 135Mpc with SQZ, H1 up to 90Mpc, V1 up to 55Mpc with SQZ
  - (In O2, L1~100, H1~80/70, V1~27 Mpc)
  - We're still working hard on reliability and SQZ of H1. This will continue in the first half of ER14.
- ER14 planned from Mar 04, 2019
  - Finalize instruments' configuration, calibration etc.
  - End-to-end test of instruments/software.
- O3 planned from Apr 01, 2019
  - 24/7 operation is the goal, except planned downtime.
  - Past experience suggest ~50-60% triple observation availability
  - Planning to be flexible about H1 commissioning for reliable operation if necessary.
  - Open Public Alert

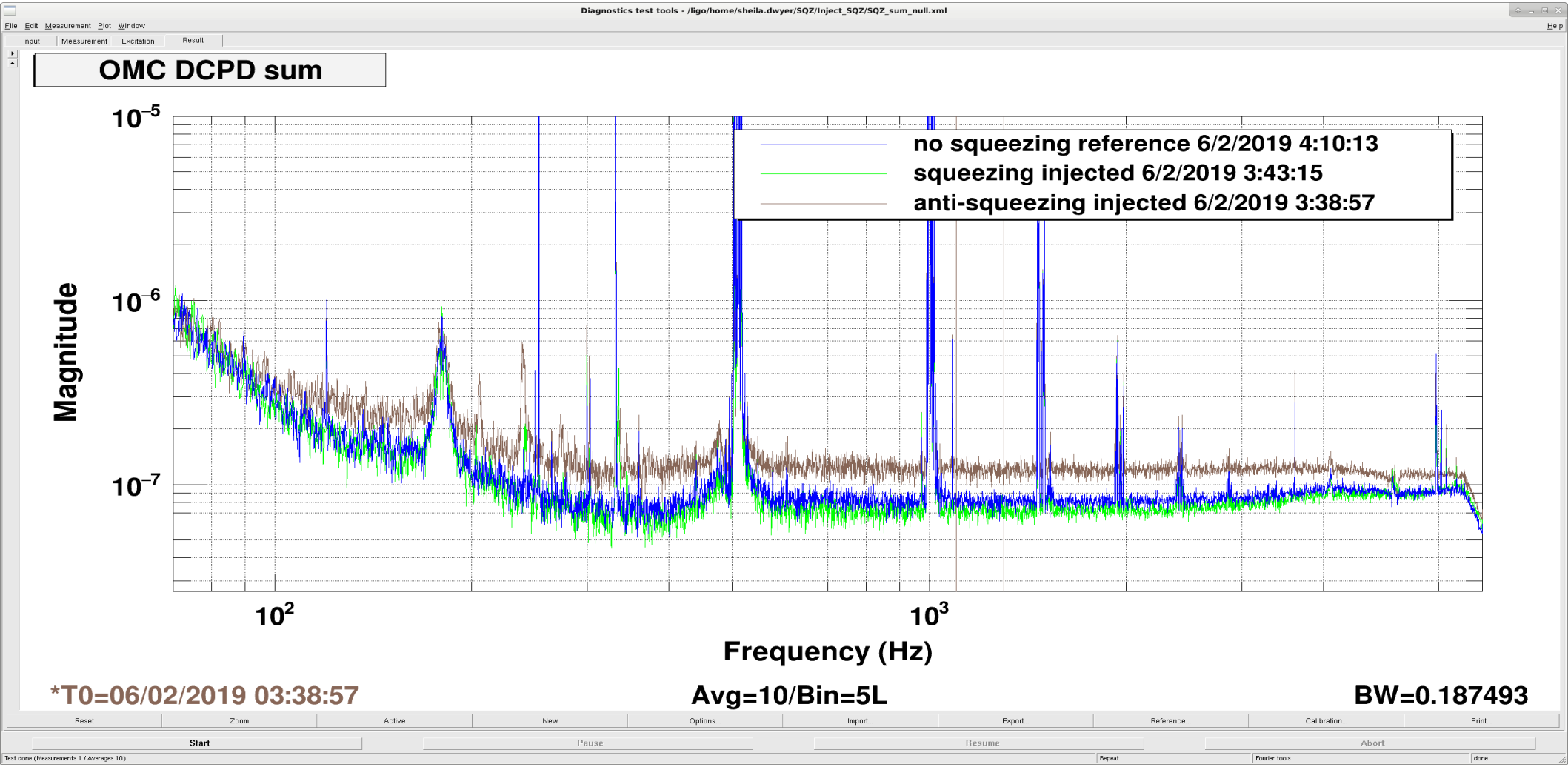
Detector Performance So Far:
L1 135 Mpc, ~3dB SQZ



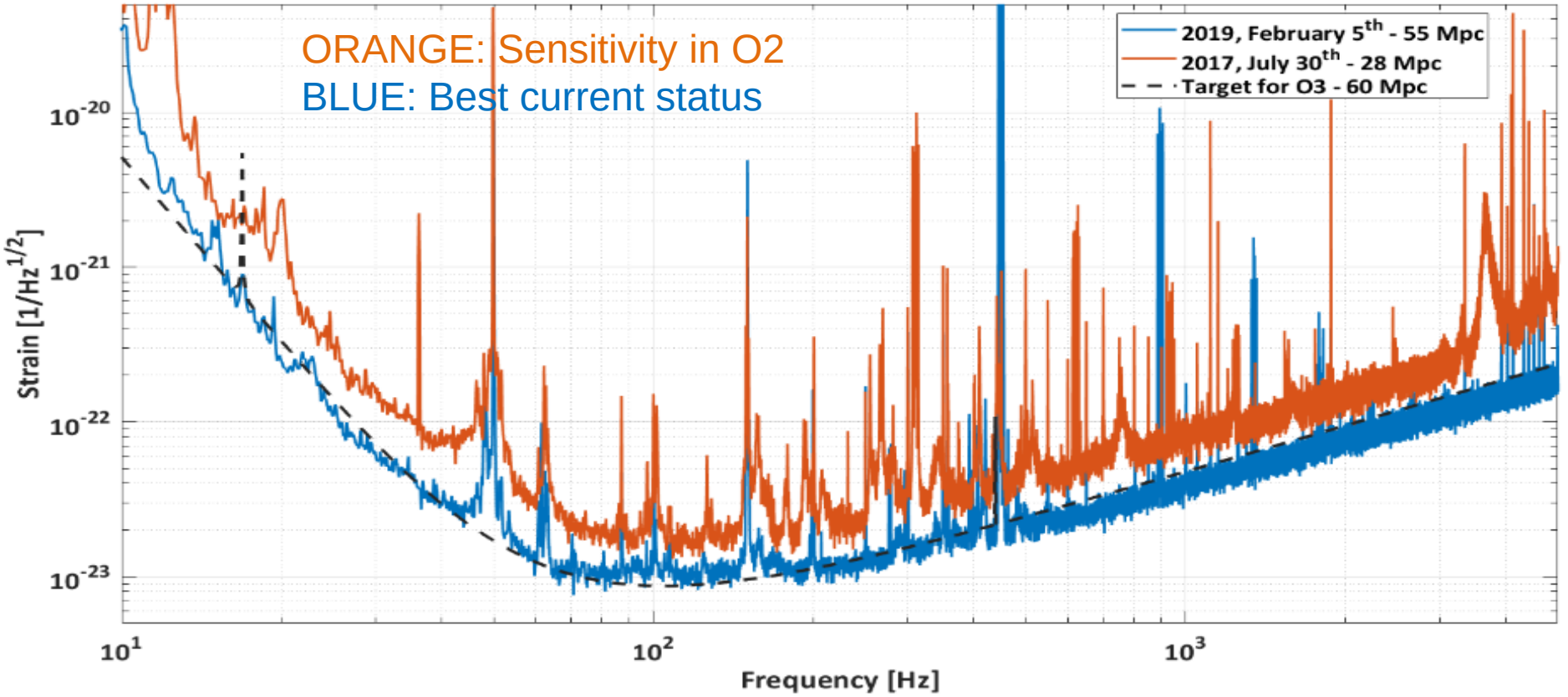
Detector Performance So Far:
H1 up to 90 Mpc, no SQZ



But we observed 0.9dB squeezing last week.



Detector Performance So Far: V1 up to 55 Mpc with SQZ



Best range observed so far close to 55 Mpc for BNS, 650 Mpc for BBH (30 $M_{\odot}$)

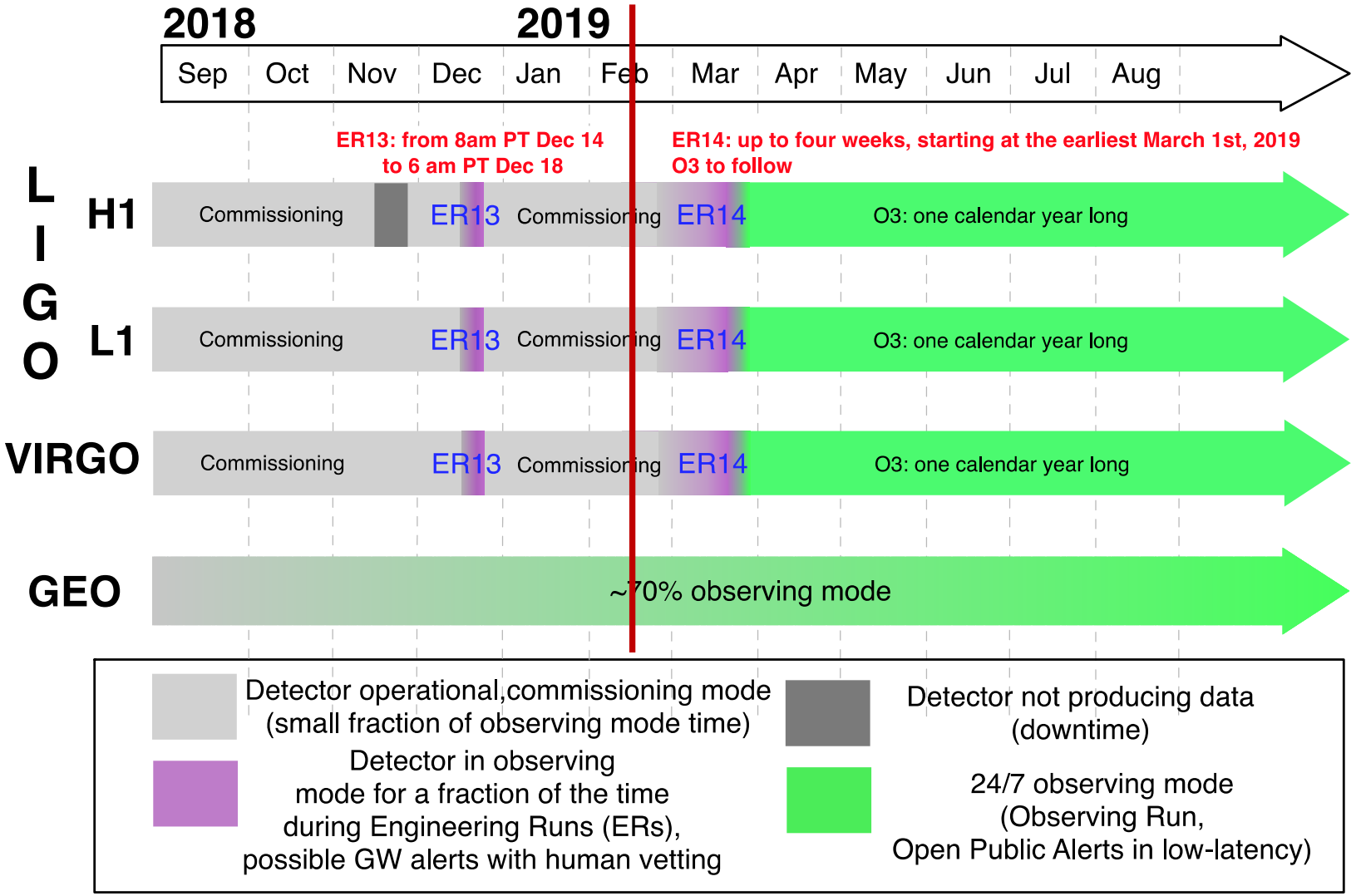
Squeezing is routinely injected

LIGO-VIRGO Joint Run Planning Committee

LIGO-G1801056

Working schedule for O3

(Public document G1801056-v4, based on G1800889-v7)



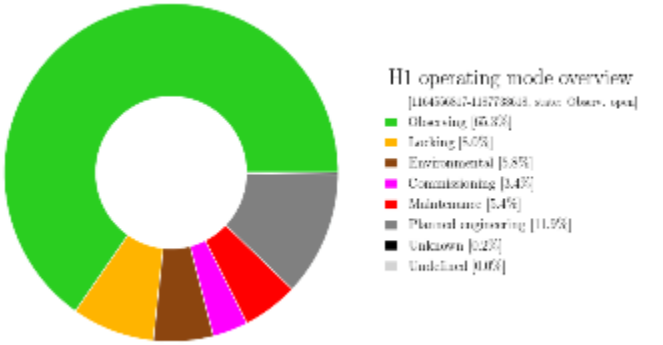
ER14 Observing strategy

- Planned Mar 04,2019 – Mar 31, 2019
- Part of the time will be used to stabilize and make some last improvements on the interferometers
- We will shift to 24/7 operation, with planned downtime for maintenance and commissioning
  - Hanford and Livingston maintenance, Tuesday 15:00 – 20:00 UTC
  - Virgo maintenance, Tuesday 07:00 – 11:00 UTC
- No automatic alert is expected, we will transmit highly interesting triggers after human vetting

O3 Observing strategy

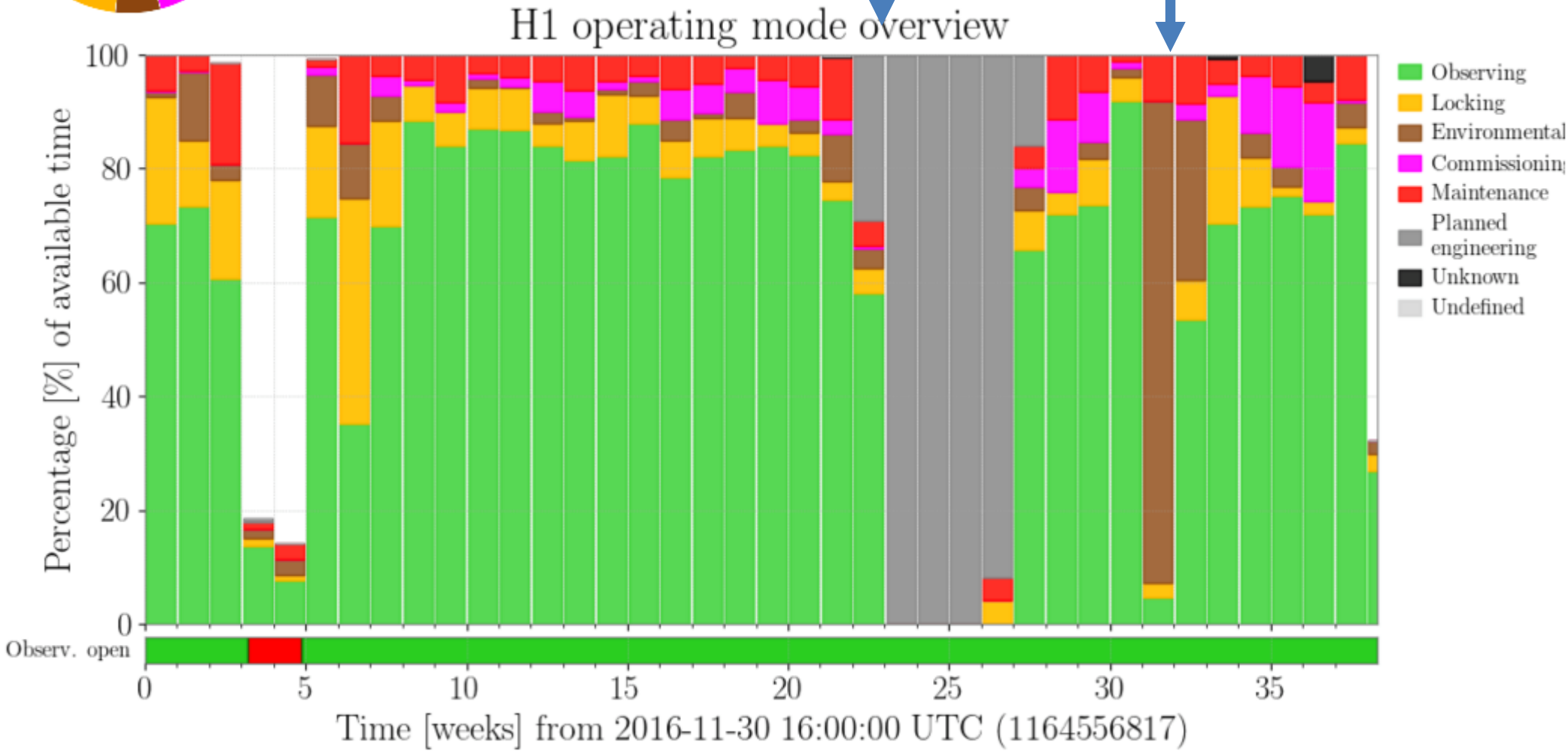
- "Good" single IFO duty factor meant >80% in the past, expect no significant change.
  - Planned down time = maintenance and short commissioning, about 6%. (We ended up using ~10% for this under the same plan in O2.)
  - Short commissioning often improves reliability and/or noise, and informs post-run interventions.
  - We have unplanned down time (EQ, high wind, relocking etc.).
- Coordination between the sites to maximize triple coincidence. https://dcc.ligo.org/L1800079
- We hope H1 operates reliably with SQZ by then, but we'll be flexible to spend more time if necessary.
- Planned engineering: We WILL spend time on problems that need immediate attention, or if we think we can make significant improvement in short period.
  - Ex) H1 vacuum incursion in O2 to diagnose and remove a point absorber from ITMX.

O2 Single IFO Duty Factor for H1



Planned engineering: Vacuum incursion to inspect/remove high absorption spot on one of the mirrors

Environment: Recovery from Montana EQ



OPA

- Sarah/Patrick/Erik's talk

Bonus Slides

Main upgrades since O2: LIGO

- H1 ITMX replaced (high absorption spot)
- All ETMs replaced (better coating)
- All End Reaction Masses replaced (smaller gas film damping)
- New monolithic Signal Recycling Mirror
- New 70W laser (smaller acoustic noise)
  - Higher power for L1 (40-50W)
- Squeezing
- Stray light control improvement
- Tuned mass damper (parametric instability control improvement)

Main upgrades since O2: Virgo

- All TMs suspended with fused silica fibers
- New 100W laser amplifier
- Squeezing
- Stray light control improvement
- Injection optical bench seismically isolated
- Thermally tuned RoCs of ETMs (increased darkness of interferometer output port)