

O3 LIGO-Virgo-KAGRA update, July 18 2019

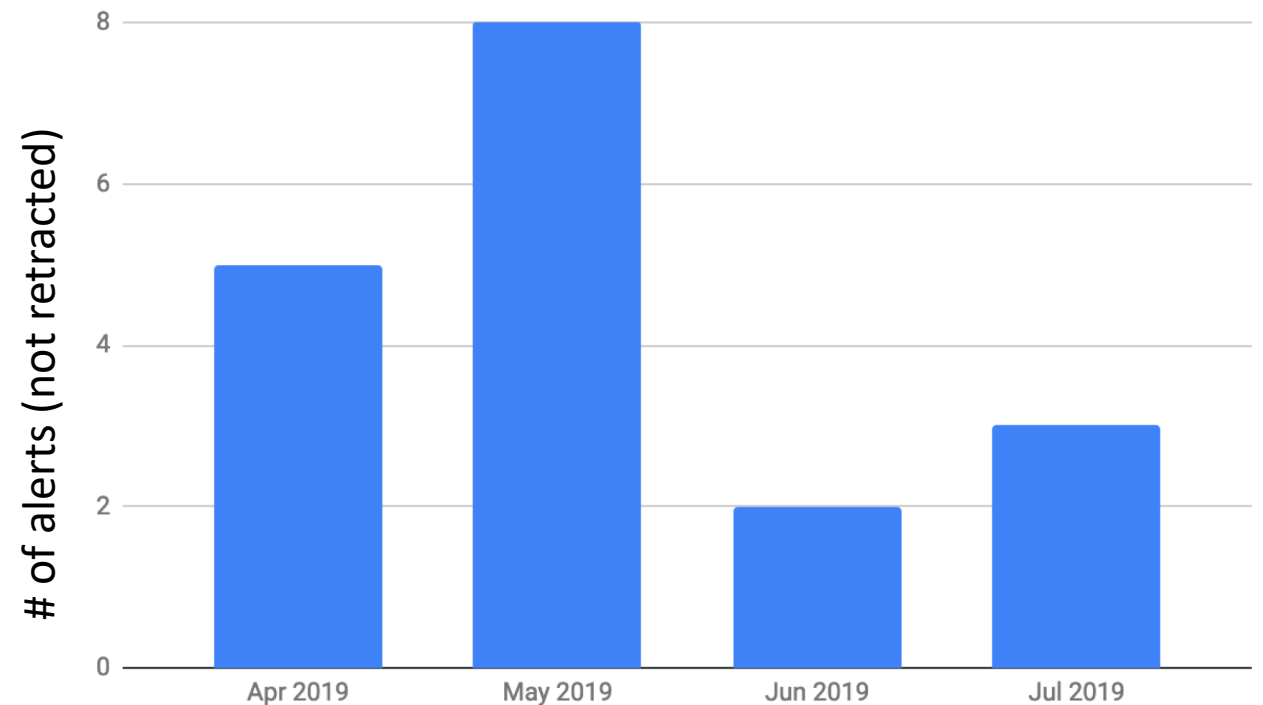
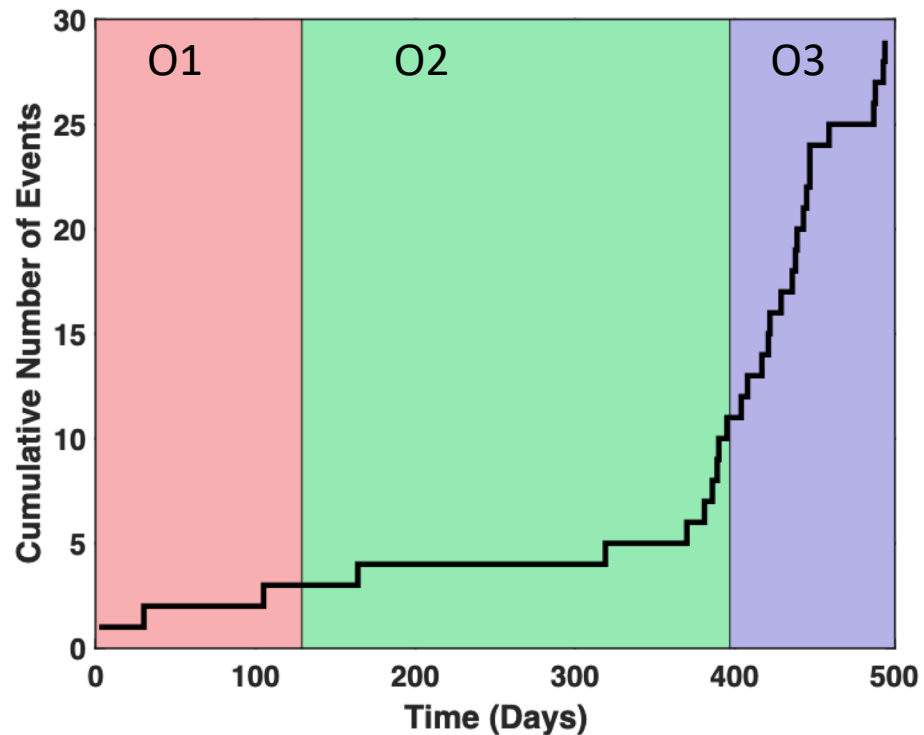
Joseph Betzwieser, Keita Kawabe, Nicolas Leroy, Shinji Miyoki,
Brian O'Reilly, Alessio Rocchi, David Shoemaker, Matteo Tacca

Summary

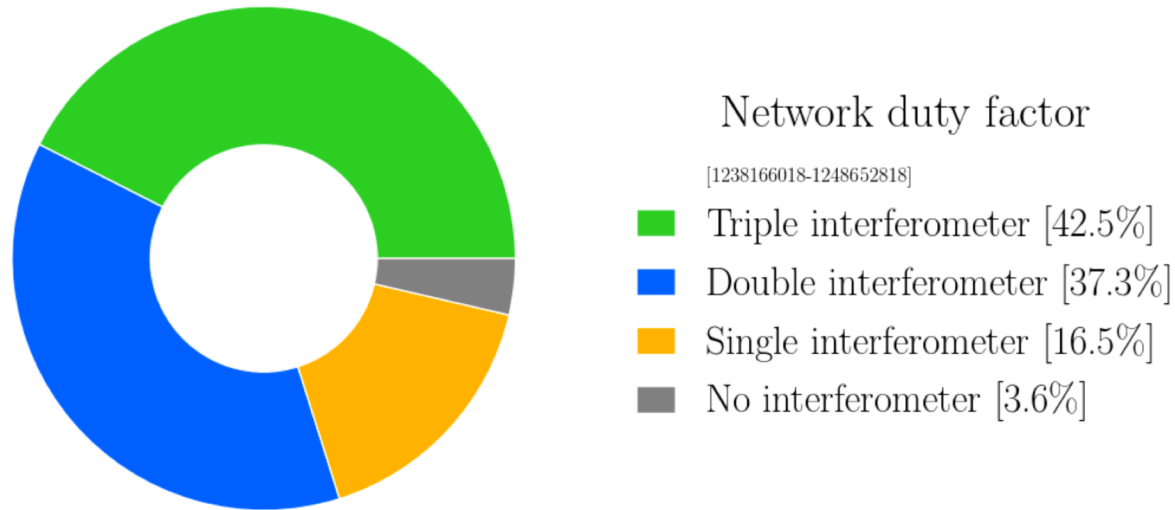
- Four public alerts since last meeting (June 20).
- Minor but non-negligible hit on duty factor due to LLO shutdown (Hurricane Barry) and problem of one of the photodiodes for Virgo.
 - Cumulative duty factor 79.8% with at least two interferometers vs 82% as of last month's meeting, 3.6% of no-IFO time vs 2.2%.
- One month commissioning break: 1st to 31st Oct 2019.
 - No LIGO and Virgo observation during the break.
 - We plan to shift the end date of O3 by 1 month to April 30 2020.
- KAGRA: Potentially serious technical issues found, no change in the plan to attend O3. Performed engineering runs (single 3km arm as well as short Michelson).

Four public alerts since the last meeting

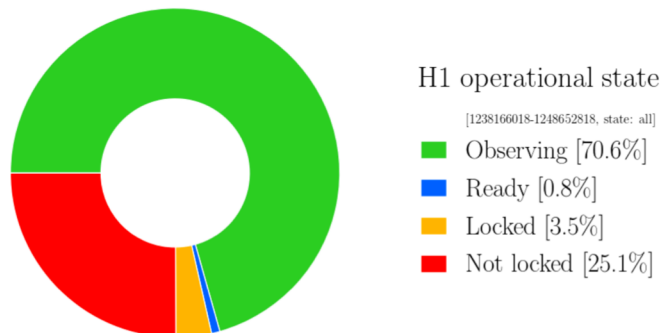
- [S190630ag](#), [S190701ah](#), [S190706ai](#), [S190707q](#), all likely BBH.



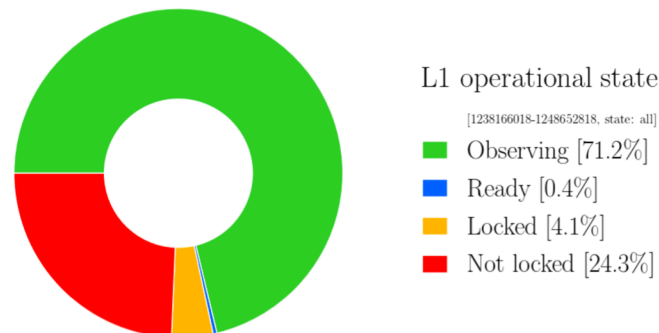
Detector Performance: O3 Cumulative Duty Factor



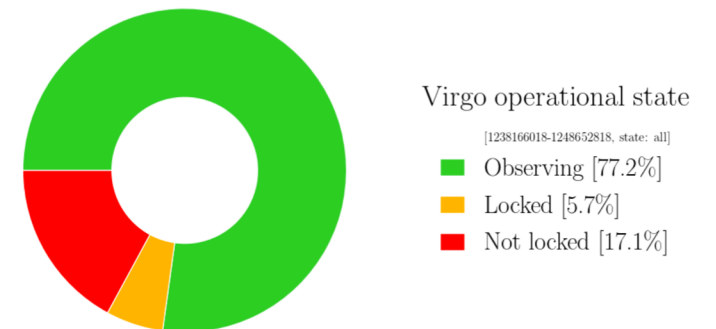
- 42.5% Triple IFOs (down from 46.5)
- 79.8% Double or Triple (down from 82.2)
- 3.6% zero IFO (up from 2.2%)
- (Downtime includes everything including but not limited to maintenance)



7/18/19

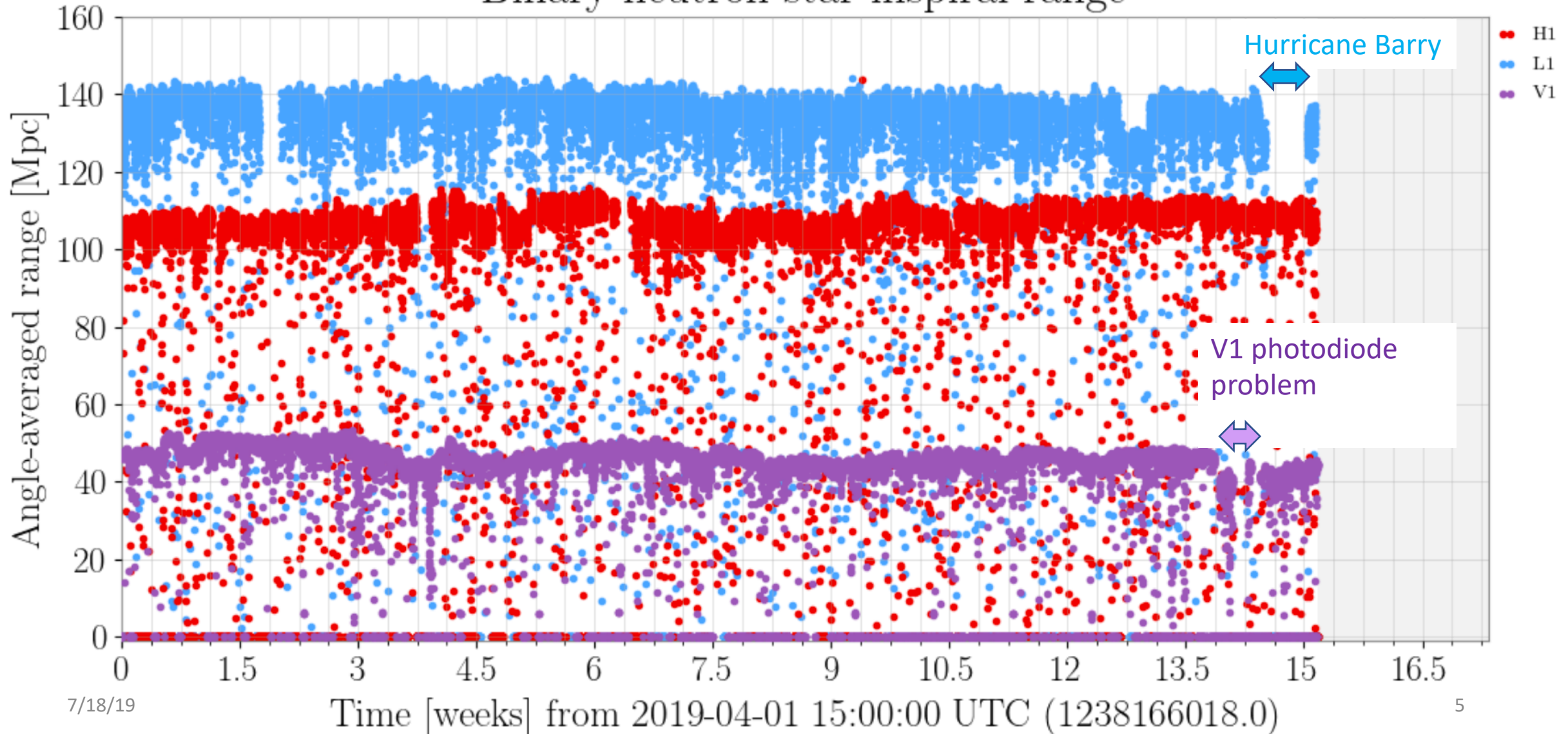


G1901349-v4 Open LVEM Forum



Non-planned down time: Hurricane (L1), hardware (V1)

Binary neutron star inspiral range



LLO shutdown due to Hurricane Barry

- Hurricane Barry impacted the Gulf coast the weekend of July 13th, coming ashore as a category 1 hurricane in Louisiana
- End of the last observing mode segment prior to the storm making landfall was 03:50 UTC on July 12th
 - Ground motion induced by the storm prevented observing mode after that
- LLO management decided to close LLO on Friday morning (July 12th) for safety of the staff and site
- Site reopened on Monday morning (July 15th) with no issues, reaching observing mode at 21:09 UTC
- Total down time at LLO due to the storm and shutdown was **3.7 days**
- **1% impact** on the expected year long run duty factor

Virgo photodiode problem

- Since an unlock on Sunday July 7th at 15:08 UTC, Virgo experienced the failure of one of the main photodiodes to monitor GW.
- No available spares at that time, decision to run in a configuration with only one photodiode -> some troubles arose in the lock acquisition and in the automation -> **three days** to fully recover the interferometer.
- Now the interferometer is back in a good and stable state.
- The standard working configuration will be restored next Tuesday July 23rd.

Commissioning Break 1st to 31st Oct 2019

- Expect no observation by LIGO/Virgo: 1/Oct/2019 1500 UTC - 1/Nov/2019 1500 UTC.
- New end date planned to be April 30 2020 to preserve 1 year observation.

Oct. 2019: LIGO will attack specific issues at each site.

Category	Specific task(s)	Motivation
In-vac scattering mitigation (both)	H1 and L1: In-vac window swap. L1: More in-vac baffles.	Smaller scattered light noise.
Squeezing improvement (H1 only)	Replace damaged fiber.	Smaller shot noise via more pump power into in-vac squeezer.
Vacuum (both)	L1: X-arm accumulation test, identify (and fix) the leak. H1: Swap aging equipments.	Reduced residual gas effect for L1. Risk mitigation for H1.
Environment (H1 only)	Wind fence.	Better duty factor, possibly reduced glitches, when windy.
Seismic isolation (H1 only)	Thermal control of tilt sensor.	More robust control.

Oct. 2019: Virgo will attack two of the main limitations

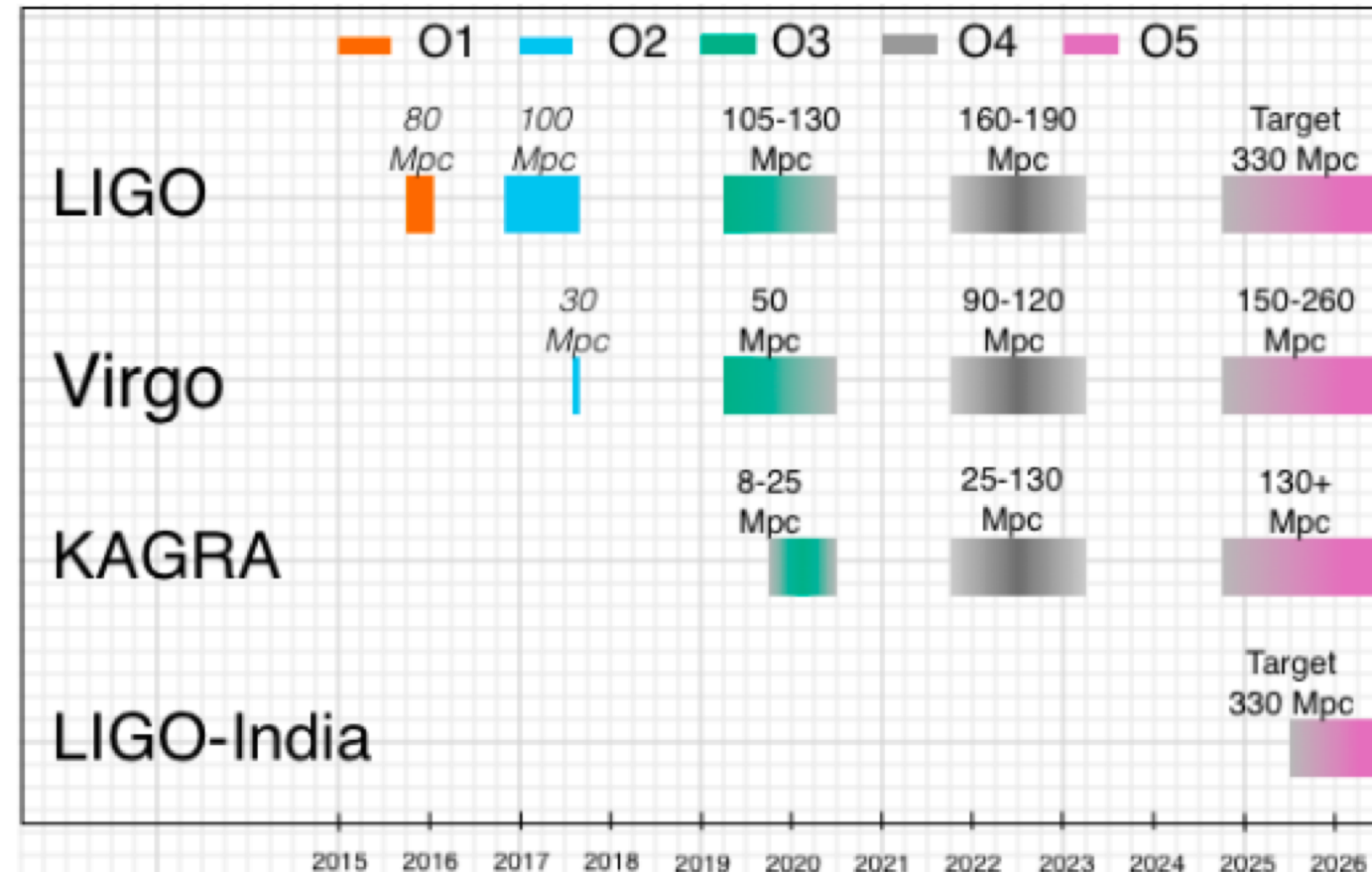
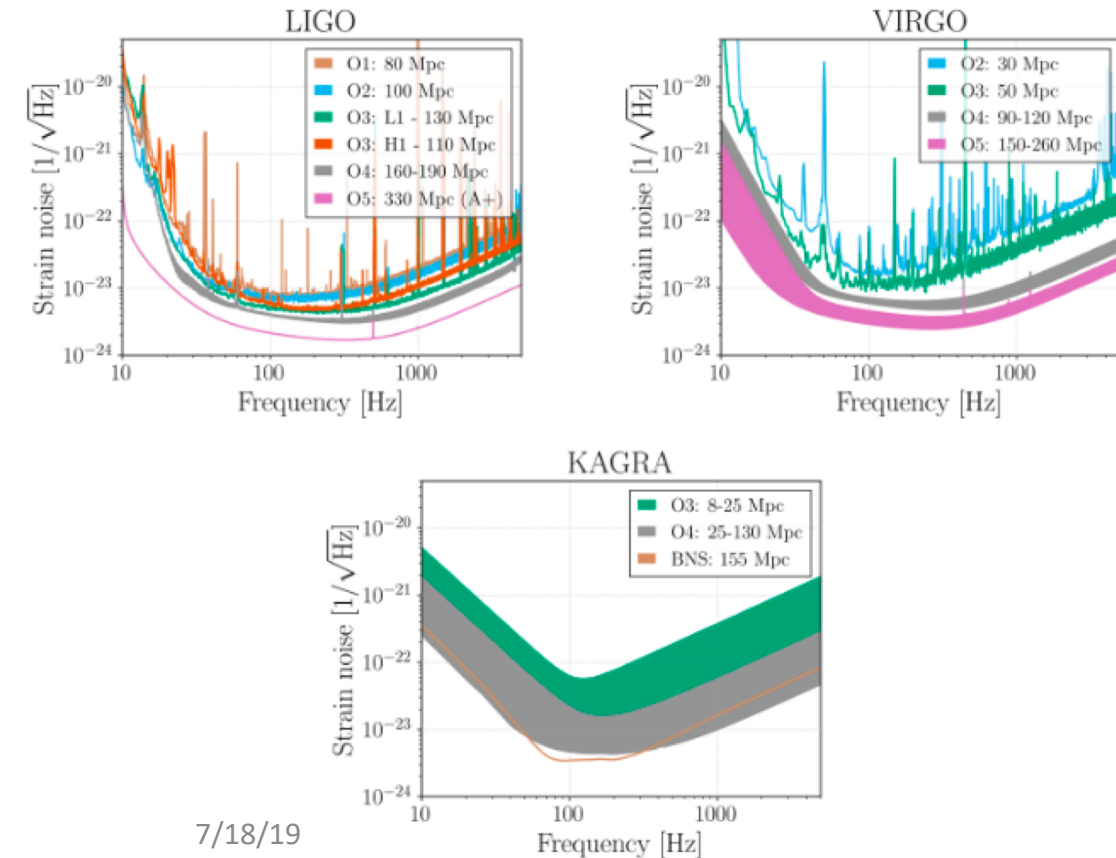
Category	Specific task(s)	Motivation
Scattered light investigation	Cure the scattered light on the external input optics bench (known issue). Tests along in-vacuum beam path to better identify the source of scattering (and possibly cure them)	Better sensitivity Better control signals
“Flat noise” investigation	Sensitivity in the mid-frequency range is limited by the unknown “flat noise”, related to the DARM offset. Install high-power, low efficiency photodiodes to increase the DARM offset and make new tests and measurements.	Better sensitivity

KAGRA status update

- Newly found issues: Birefringence of sapphire ITMs. Cryocoolers for radiation reduction shields.
 - No change in the plan to join O3.
- Being discussed: Stability and noise of the instrument in light of those findings, mitigation strategies, interferometer configuration selection (FPMI or DRFPMI) VS sensitivity e.g. BNS range, data analysis plan using KAGRA data.
- Performed Engineering runs with a single 3km arm as well as short Michelson configuration.
 - Duty cycle was 94.8% with a single arm and 99.2% for short Michelson.

For your longer term planning: P1900218, our best estimate LIGO-Virgo-KAGRA plan as of now

- <https://dcc.ligo.org/public/0161/P1900218/002/SummaryForObservers.pdf>



Announcement

- JRPC co-chairs
 - LIGO: Lisa Barsotti -> David Shoemaker (this already happened)
 - Virgo: Nicolas Leroy -> Alessio Rocchi (in transition)
- Virgo observation manager
 - Alessio Rocchi -> Matteo Tacca (in transition)