

Virgo update

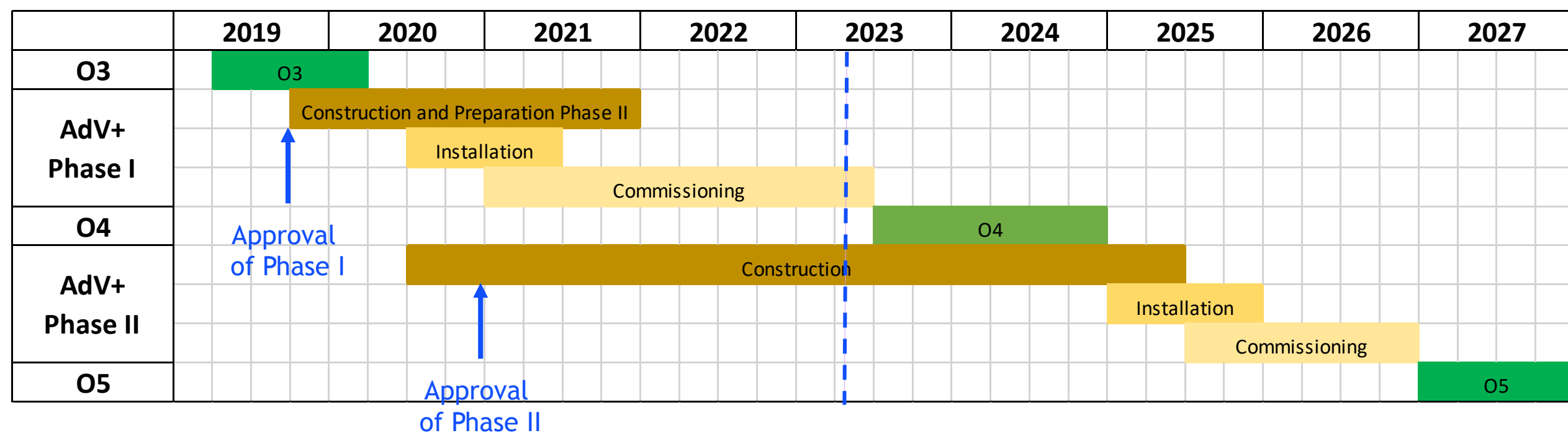
Raffaele Flaminio

CNRS - Laboratoire d'Annecy de Physique des Particules

for the Virgo Collaboration

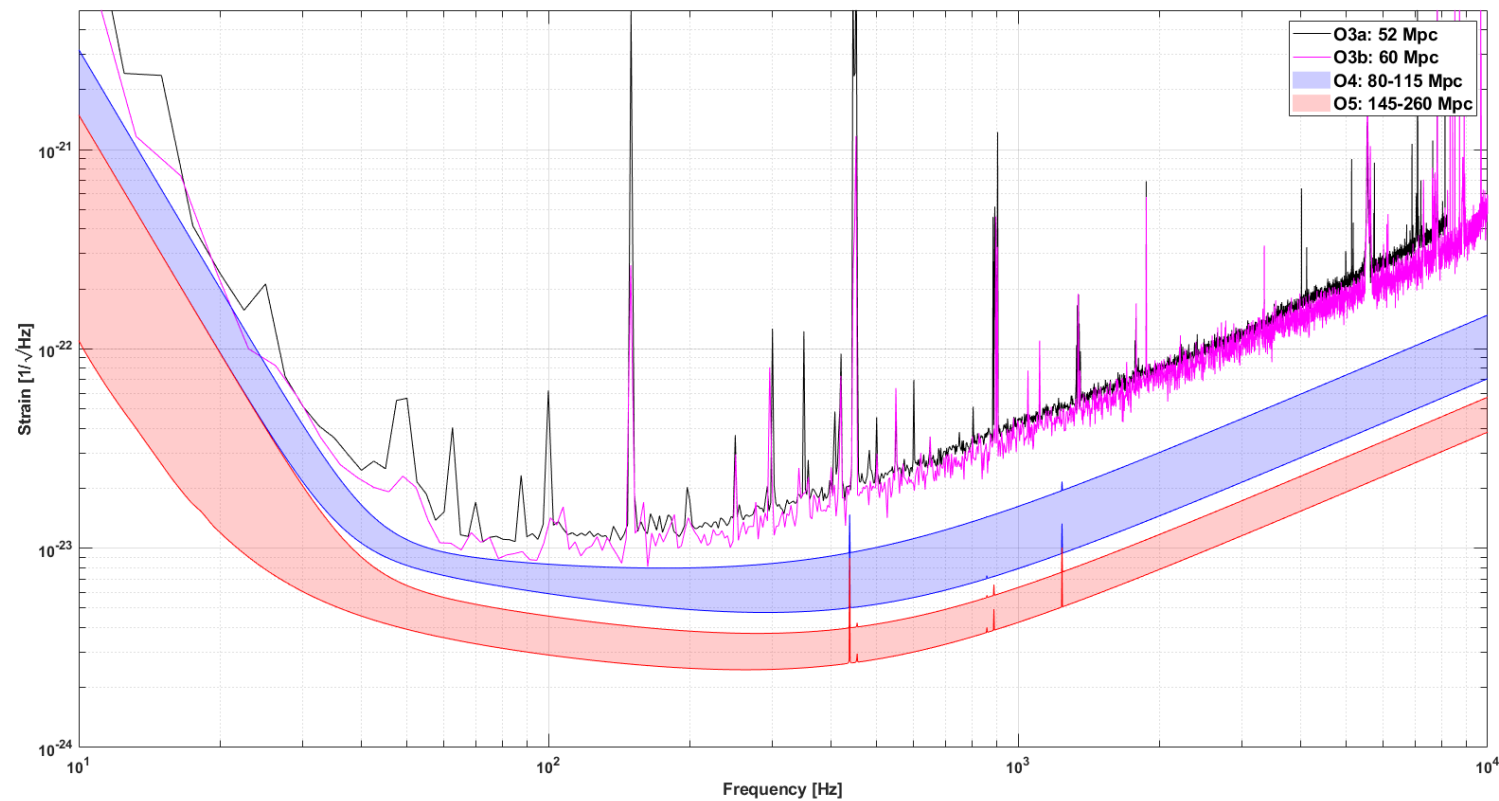
Advanced Virgo+ schedule

- New planning with O4 duration = 18 months and O4 start = May 24th



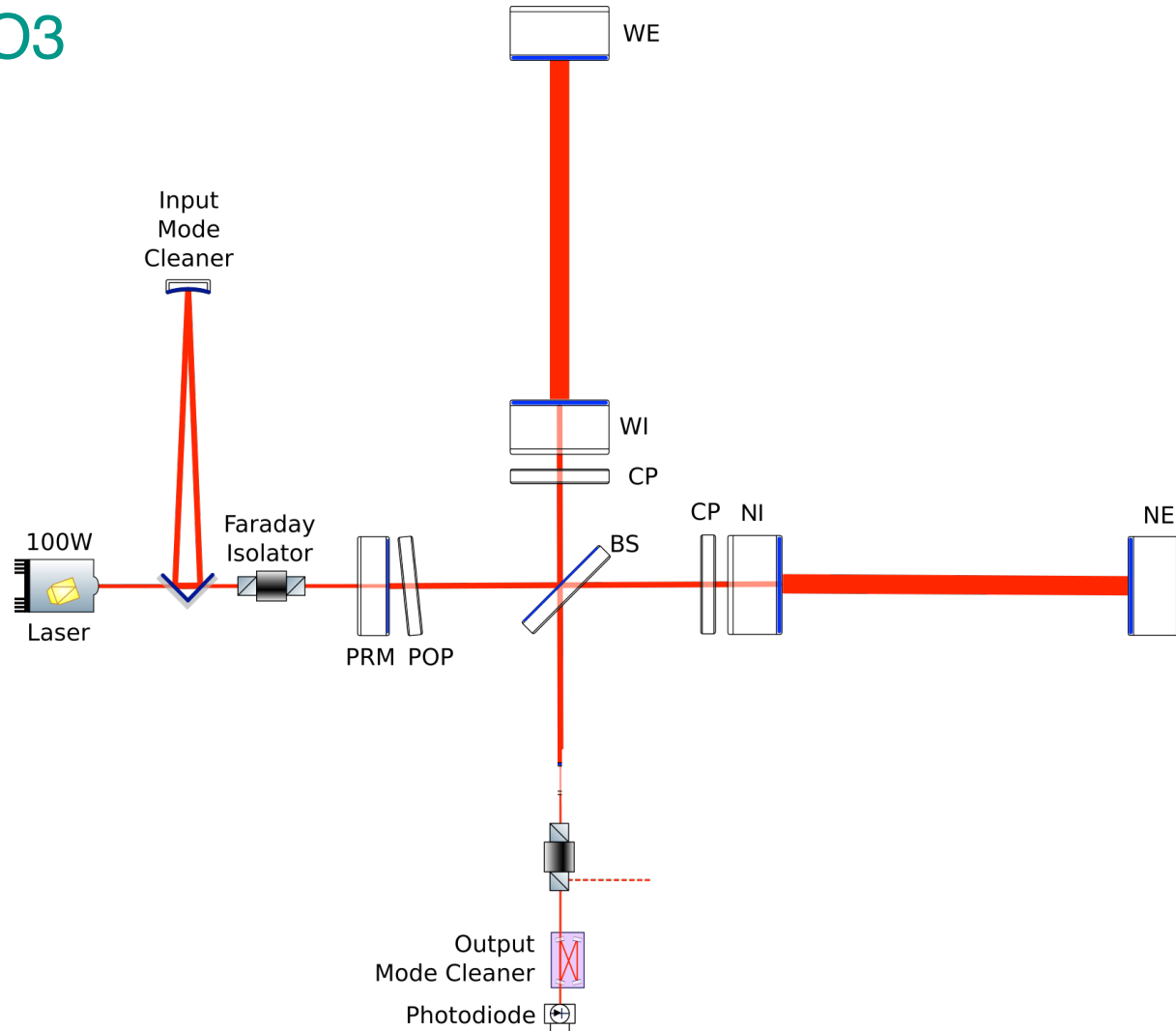
Advanced Virgo+ design sensitivity

- Phase I: reduce quantum noise, hit against thermal noise. BNS range: 100 Mpc's
- Phase II: lower the thermal noise wall. BNS range: 200 Mpc's or more

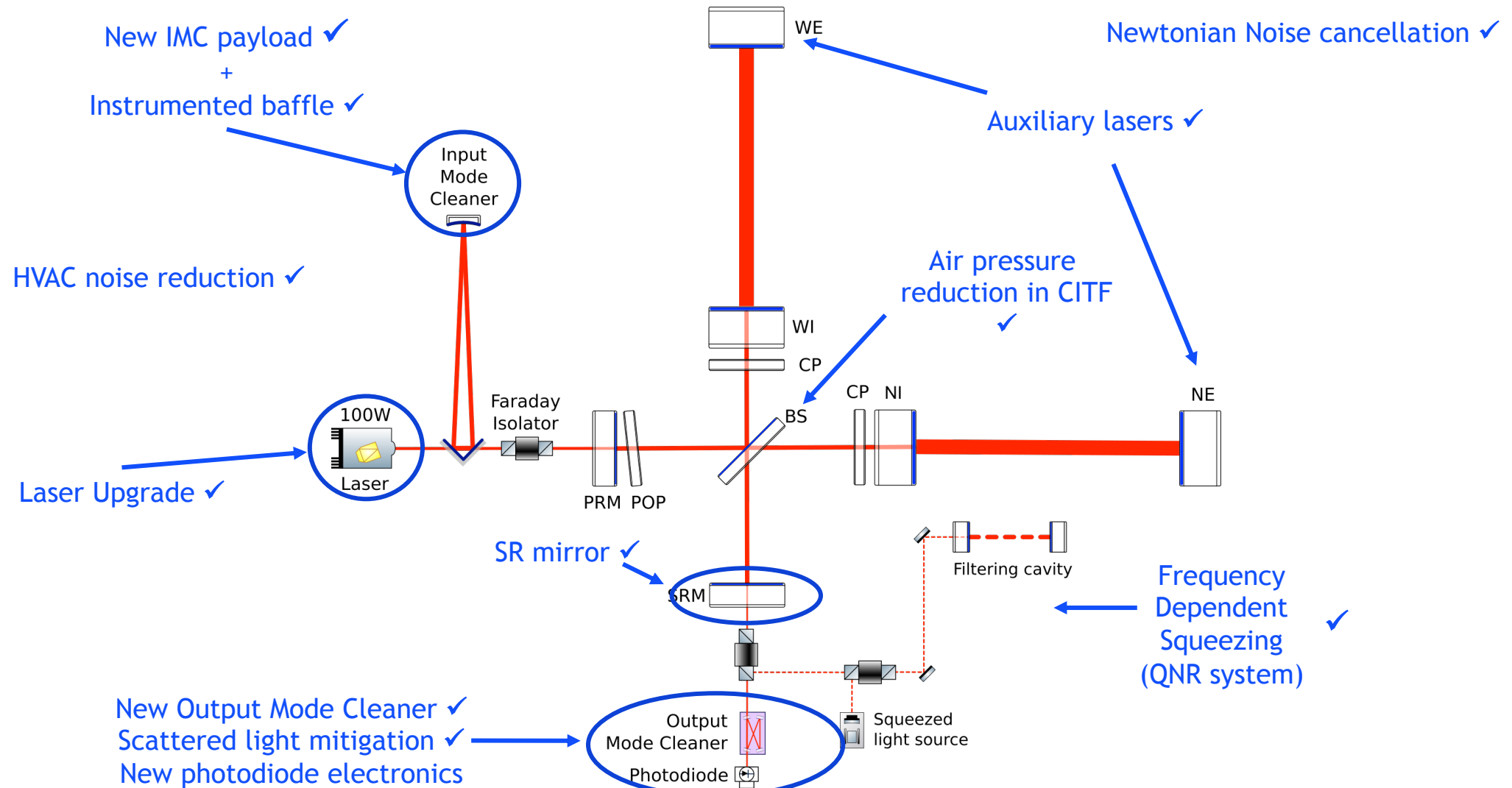


Advanced Virgo+ Phase I

- Configuration during O3



Advanced Virgo+ Phase I

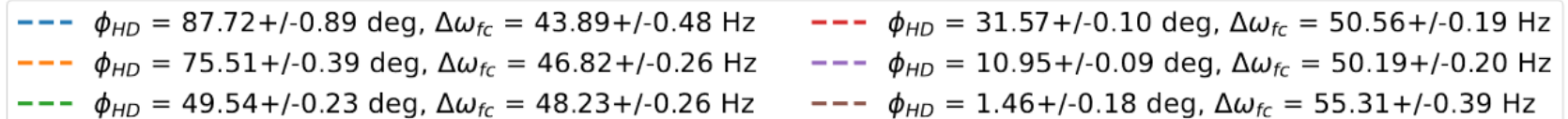
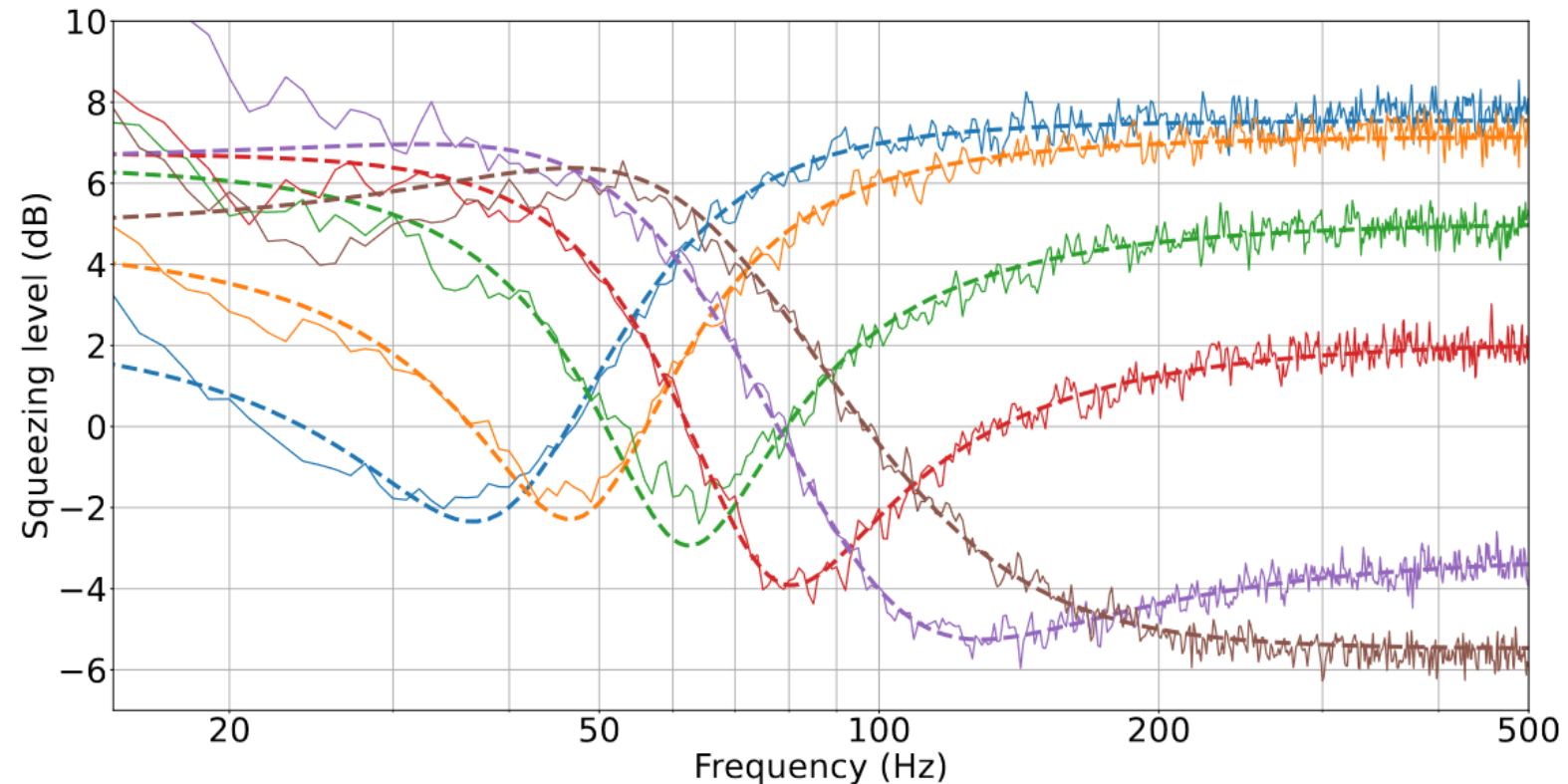


Reminder

- Installation completed in the first semester of 2021
- First 2-hours operation of dual recycled interferometer in November 2021
 - ◆ 33W input power
- Day-long operation of the dual recycled interferometer achieved in the fall of 2022
 - ◆ Additional thermal actuator added to improve control over recycling cavity geometry
 - ◆ First implementation of automatic alignment loops
- Break of one mirror suspension mid-November 2022 during a venting
 - ◆ 2 months to repair, retune interferometer and start noise hunting again

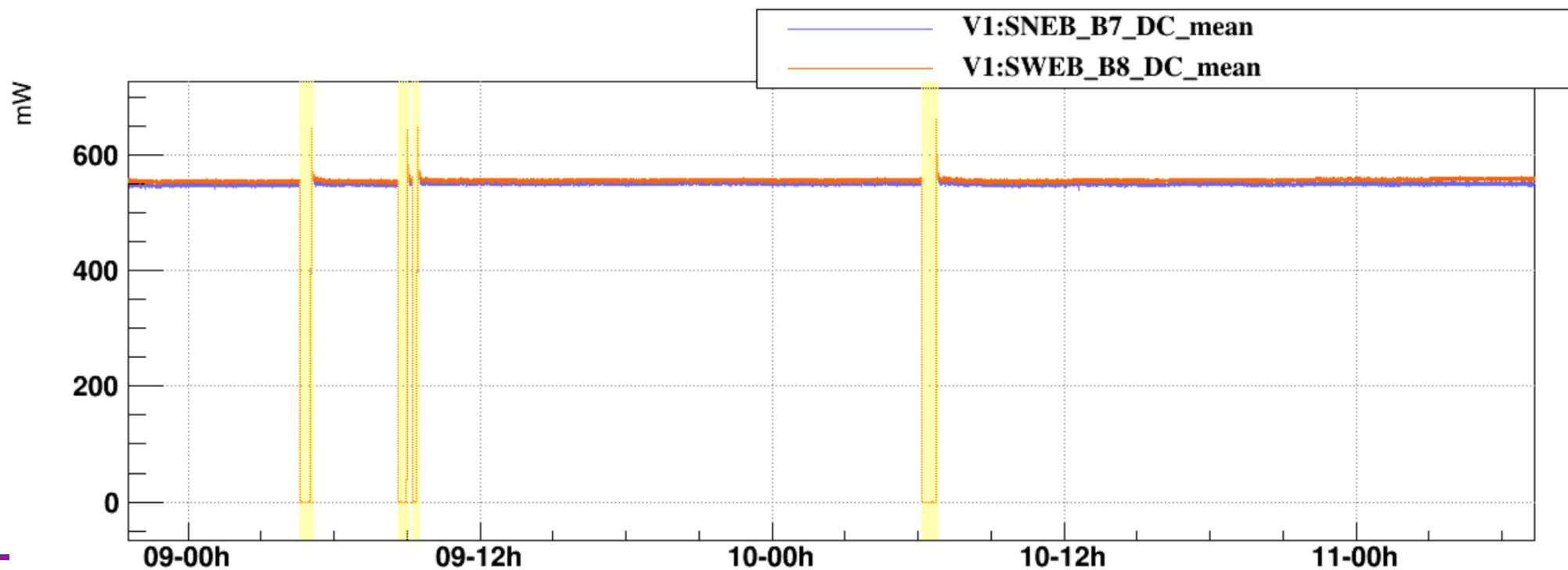
Reminder

- In parallel, squeezed vacuum source operated for long periods in 2022
 - ◆ Frequency dependent squeezing observed down to 25 Hz



Recent news

- Difficulties with degeneracy of recycling cavities
 - ◆ Excess of power on dark fringe and optical offsets on interferometer control signals
- Decision to lower the input power to 23 W to easy low noise operation
- Two days Easter mini-run confirms ability to control the interferometer over long periods



Recent news

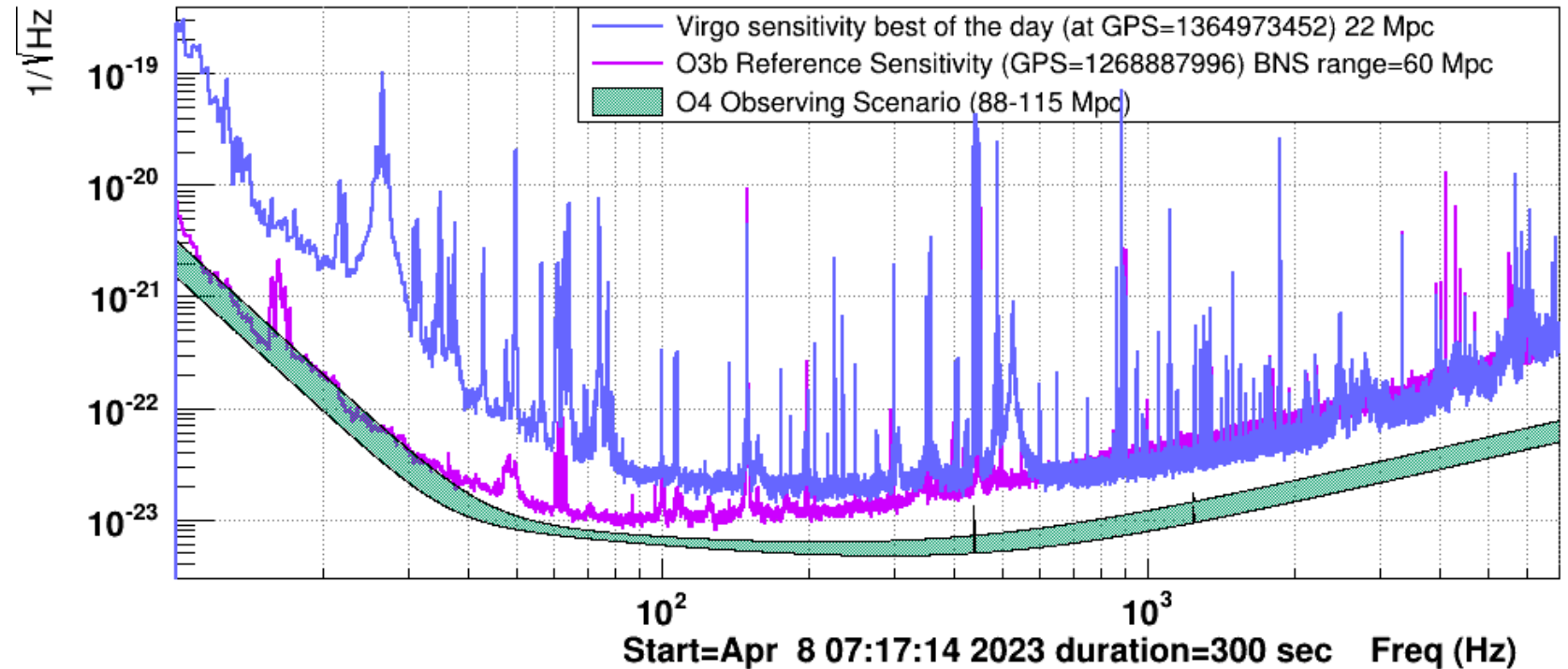
- Best sensitivity so far

- ◆ BNS range: 22 Mpc

- Sensitivity investigations

- ◆ Low frequency: control noise
- ◆ Mid frequency: not fully understood yet
- ◆ High frequency: combination of quantum noise, electronic noise and laser noise
 - » Able to see improvement compared to O3 thanks to signal recycling

Sensitivity for best BNS range of the day (22 Mpc)



Perspectives

- Working hard to be able to start the run on May the 24th
- Might need intervention inside the vacuum chamber to solve some of the issues
- Observing plans will be updated in May