

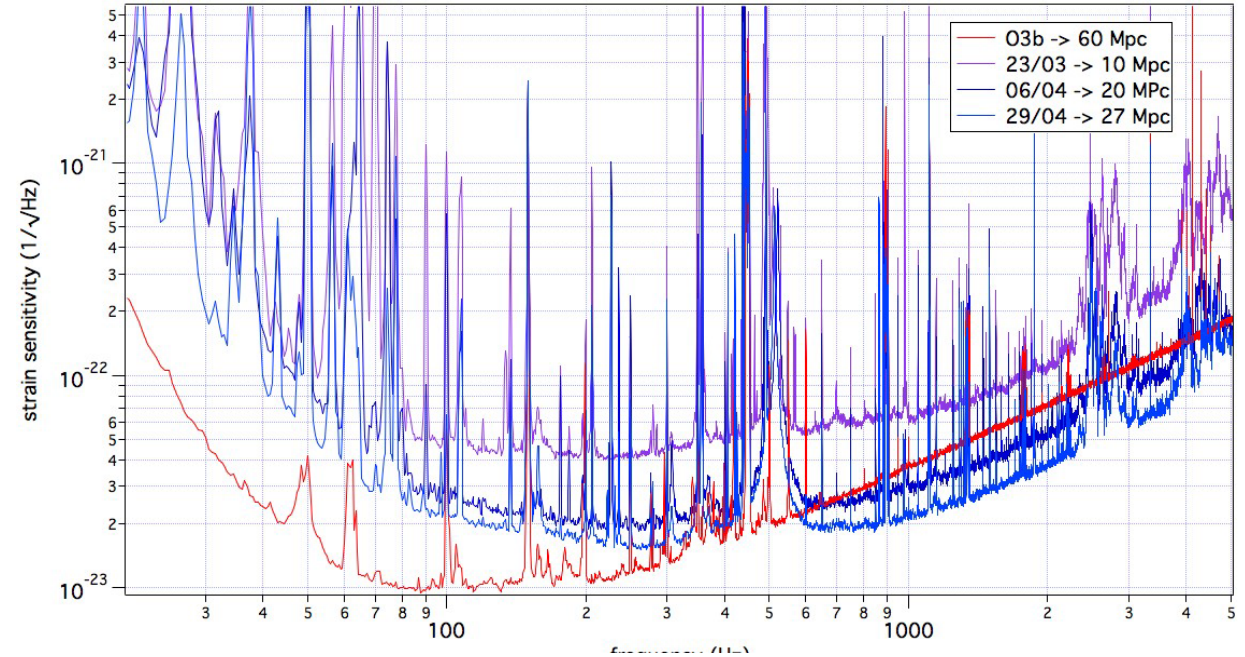
Virgo status

Gianluca Gemme

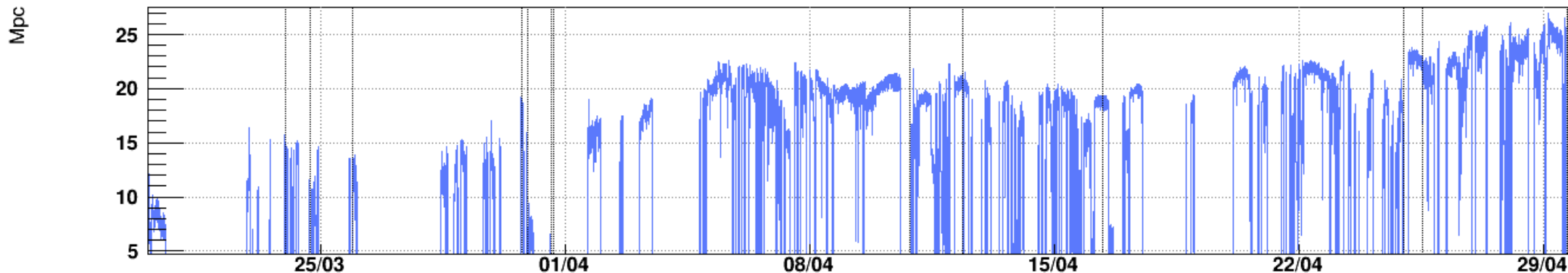
for the Virgo Collaboration

Current status and sensitivity progress

- Stable and automated lock in low noise condition
- Duty cycle as high as 85% during commissioning run over a week-end
- Best BNS range around 27 Mpc
- O3 high frequency sensitivity surpassed

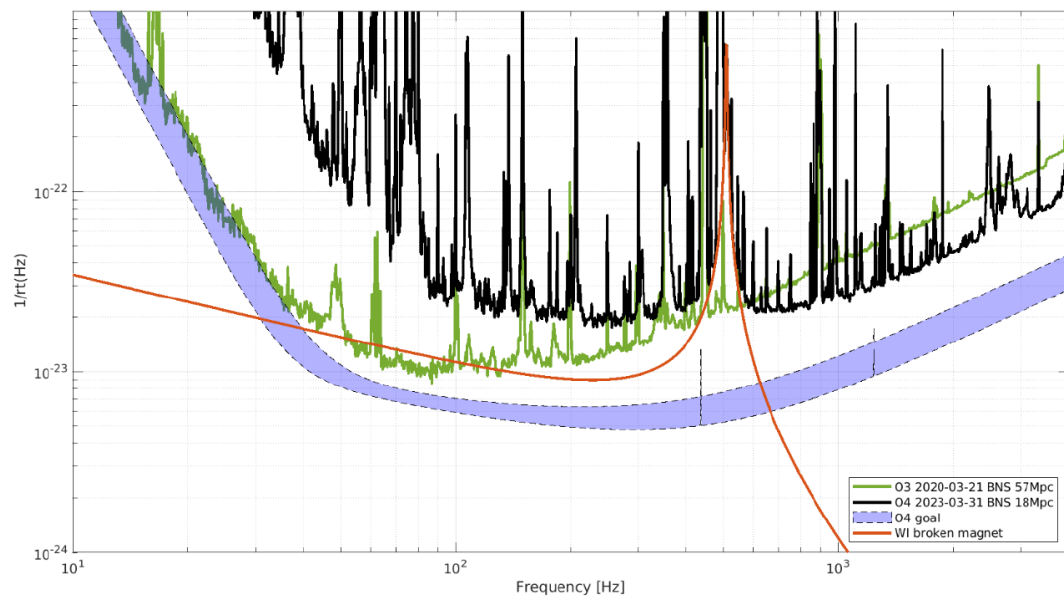


V1:Hrec_Range_BNS_TIME

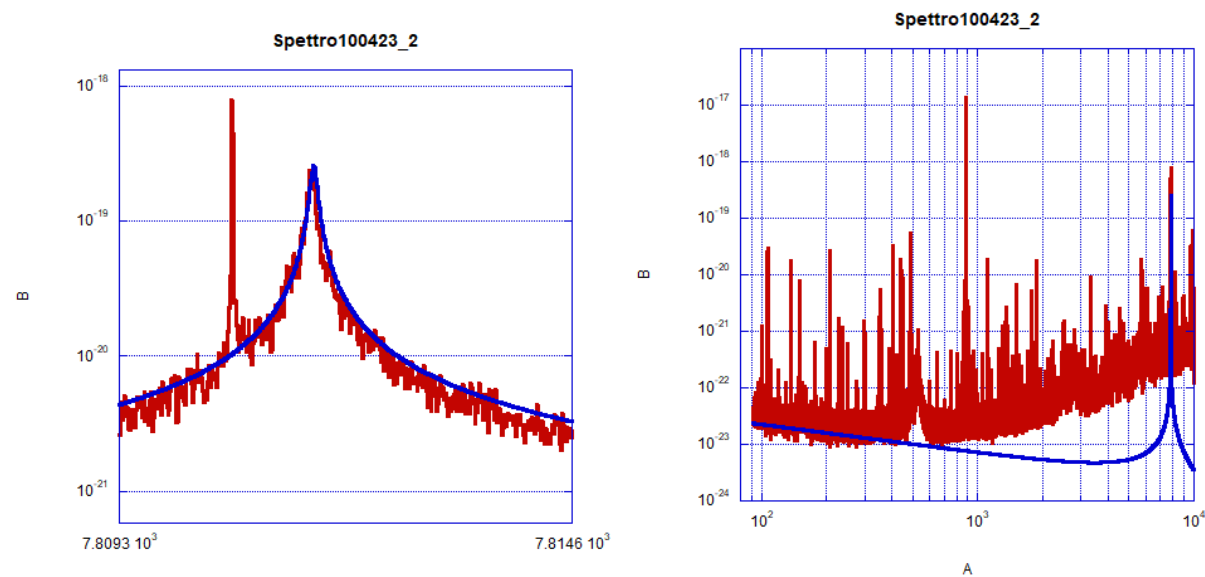


Evidence of extra thermal noise

- Evidence of thermal noise peak around 500 Hz
 - Due to one of the magnets of the WI mirror
 - Can explain part of the measured noise but not all
 - Known since March
 - Plan for repair available



- Evidence of a $1/\sqrt{\text{Hz}}$ (thermal?) noise
 - Same shape as thermal noise
 - Measurement of mirror quality factors have shown that NE test mass is lower wrt the others by a factor of ten (or more);
 - Upper limit of NE mirror thermal noise is compatible with the observed noise



Virgo plans for O4

- Fixing thermal noise requires to break vacuum
- Virgo Collaboration decision: do not join run on 24/5
- Fix thermal noise
 - repair WI magnet
 - replace NE mirror (spare available)
 - overall ~3 weeks vacuum break
- ITF recovery continue commissioning towards design sensitivity
 - Current: ~27 Mpc
 - Remove thermal noise ~45 Mpc
 - Reduce control noises ~60 Mpc
 - 3 dB FIS ~60÷70 Mpc (Fall 2023)
- Uncertainty on final sensitivity (and schedule) depending on the outcome of actions to fix thermal noise