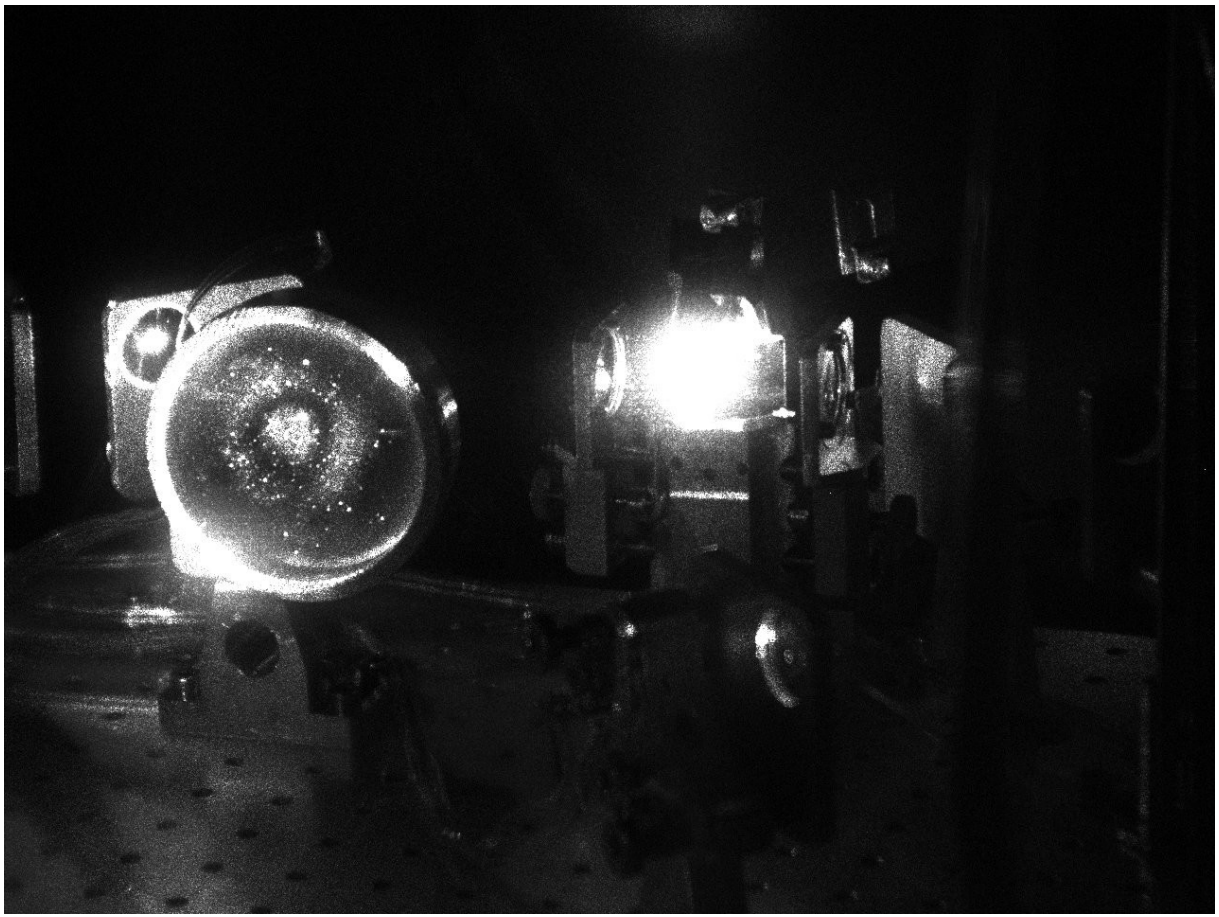
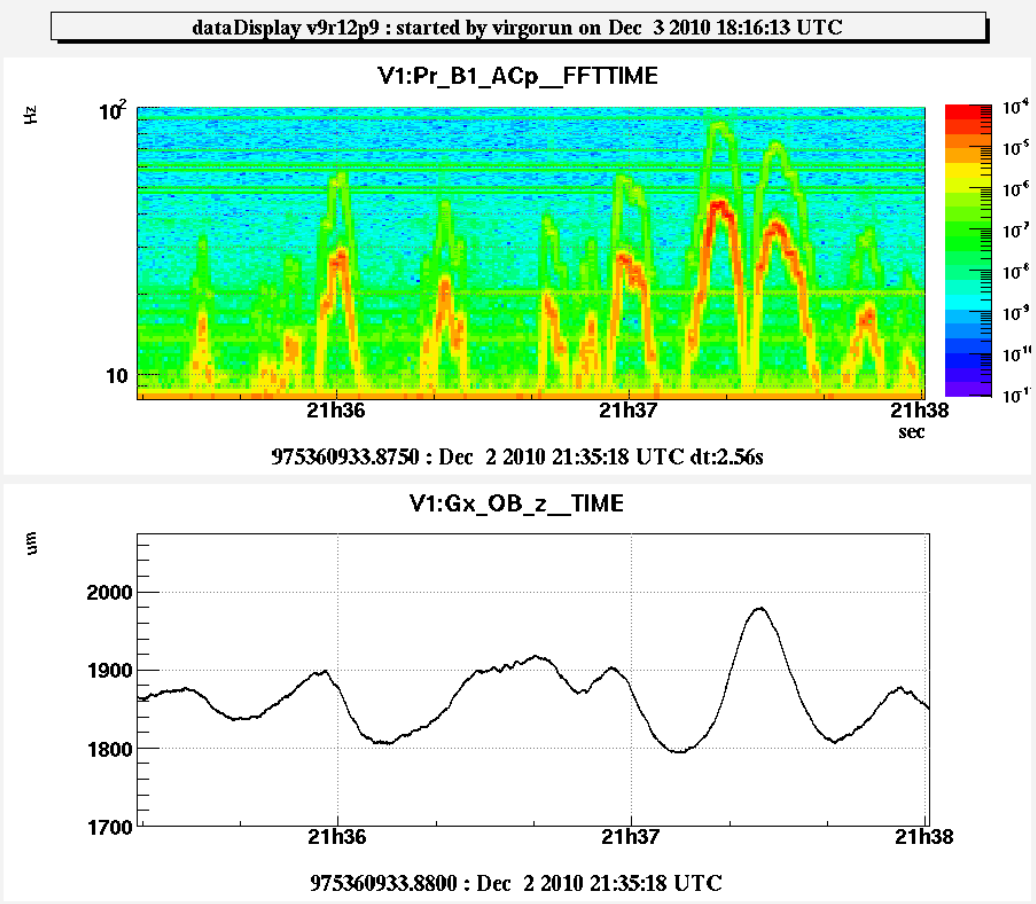
Coupling factor of OB scattered light



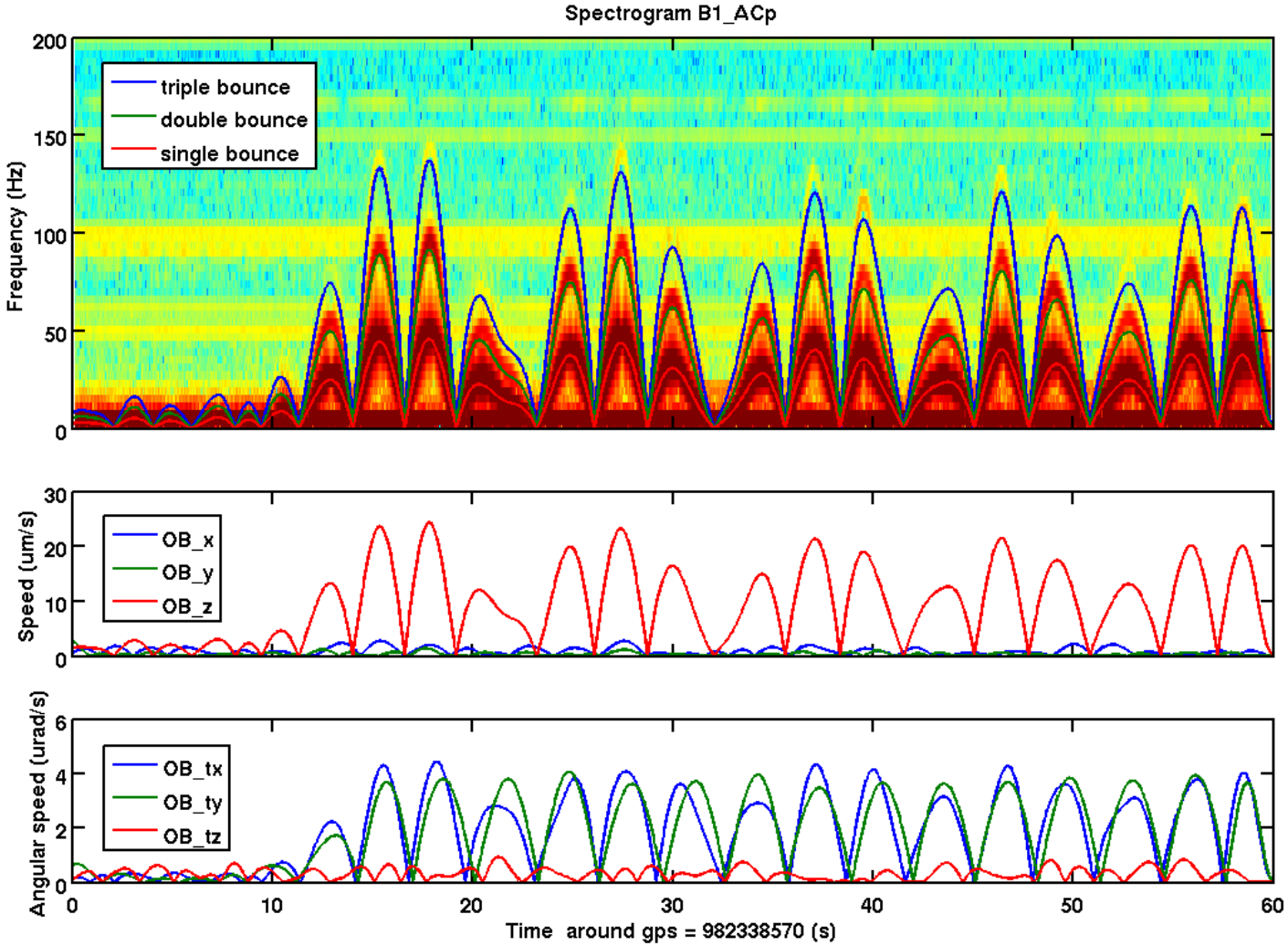
Bas Swinkels

Introduction



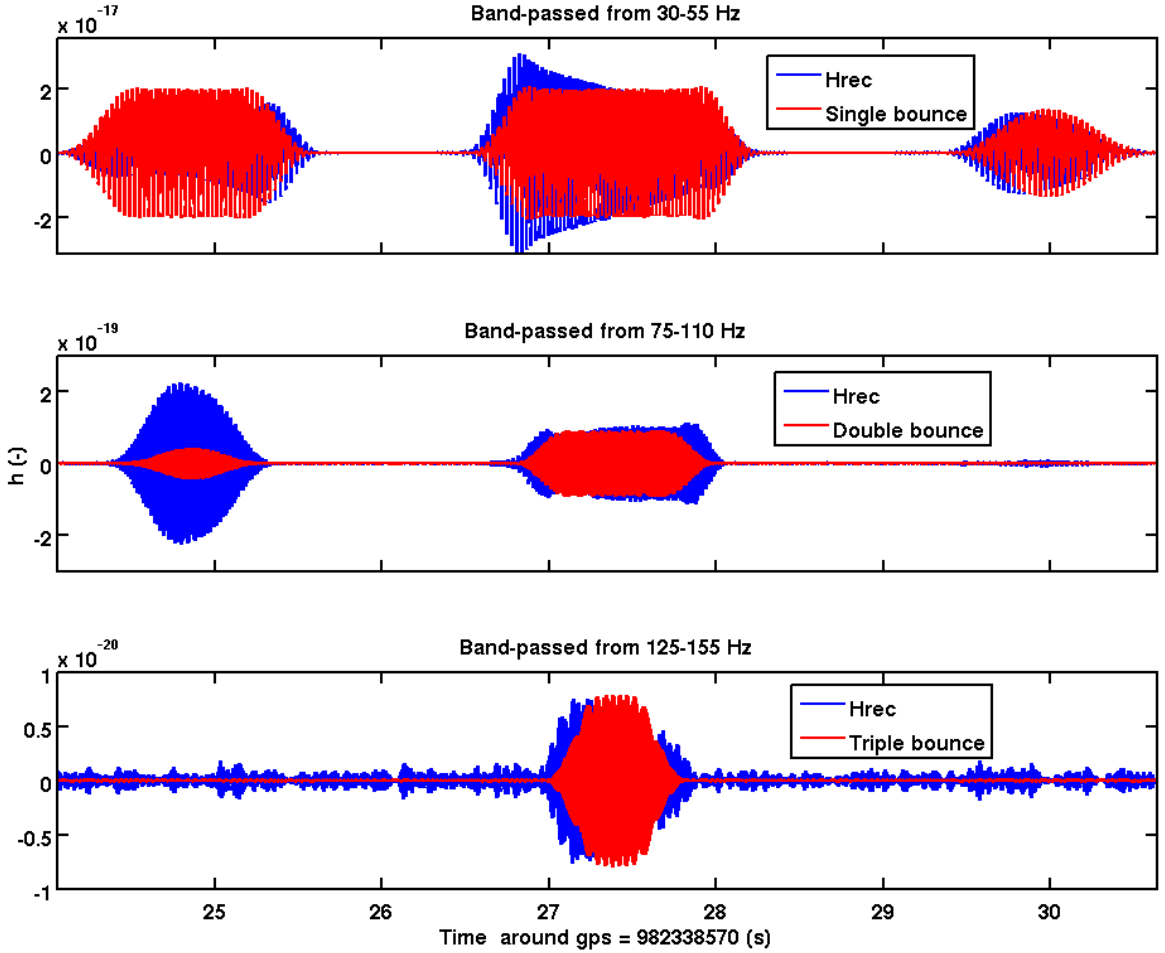
- Fringes seen first when top-stage of OB was opened (P. Ruggi, logbook #28459), first estimate of coupling factors (#28501)
- Seen again yesterday due to problem with OB_z/tx (see previous talk, G. Vajente)
- Dedicated injection of 160mHz line on OB_zCorr

Fringes



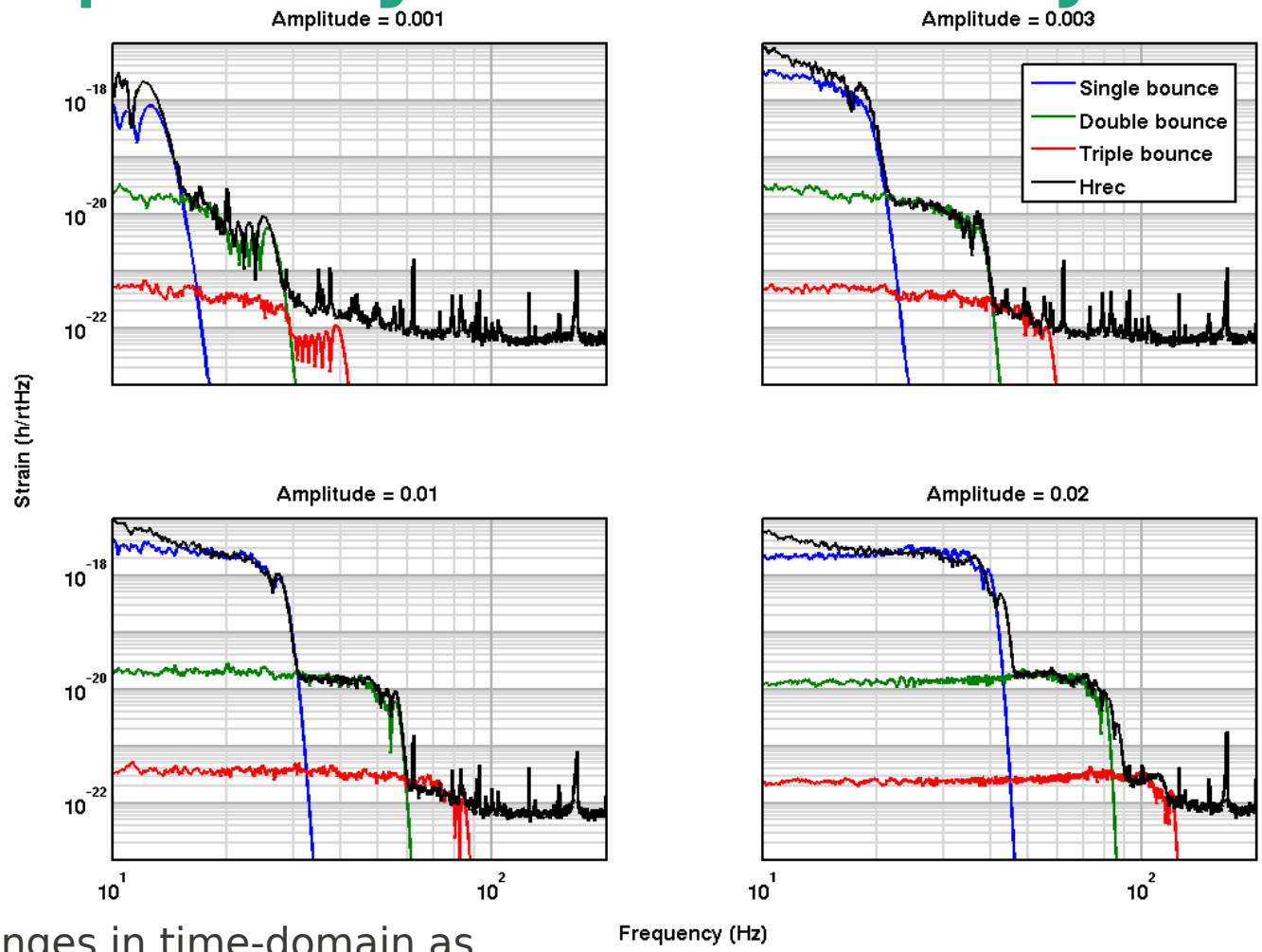
- Up to triple-bounce fringes visible, well predicted by
  f_fringe = n * 2/lambda * d(Gx_OB_z) / dt
- ~10% underestimate of f_fringe, either Gx calibration or complex bench motion

Time domain



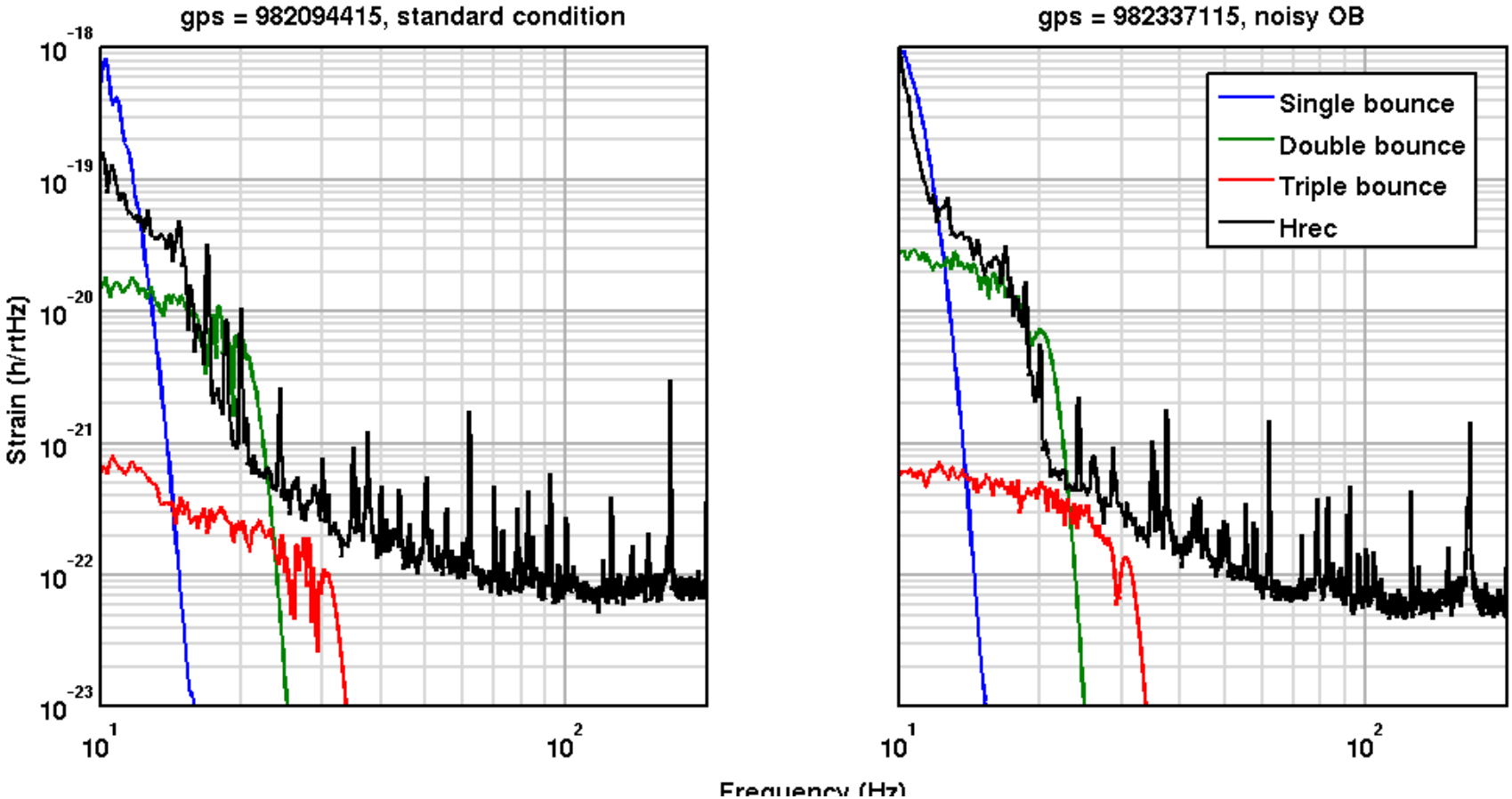
- Project fringes in time-domain as
  h_fringe = G_n * sin(4*pi*n*z_OB/lambda)
- Band-pass and compare with h-rec to obtain G_n (see logbook #25500)
- Result: G1 = 2e-17, G2 = 9e-20, G3 = 8e-21

Frequency domain, injections



- Project fringes in time-domain as
  h_fringe = G_n * sin(4*pi*n*z_OB/lambda)
- Compute spectra and compare with hrec to obtain G_n
- Result: G1 = 2e-17, G2 = 1.8e-19, G3 = 4e-21

Frequency domain, quiet



- Projection in standard condition is clearly overestimated
- Proof that scattered light path is between suspended elements (OB and ITF)
- No direct measurement of quiet motion, all sensors see ground motion

Concluding

- Time-domain and frequency domain results consistent
- Similar value as found last month with top-stage open (logbook #28501)
- G's are very high compared to external bench, but not unthinkable given large clipping/scattering
- Consistent with estimate based on M1/M2 resonances:
  G ~= 1e-16 (Virgo note VIR-0070A-08, E. Tournefier)
- Noise projection in quiet condition too high, since no accurate sensor/model available, work in progress
- For AdV:
  -reduce G (proper dumping, superpolished mirrors)?
  -improve z-control of bench?

End