



WET baffle installation and results

21 Sept. 2010, Weekly Meeting

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Baffle installation

Friday Sept. 10th

- to dump the ring of light scattered by the West flange of the WE tower (VIR-0493A-10)
- baffle placed between Mirror and West flange, see details in #27781.



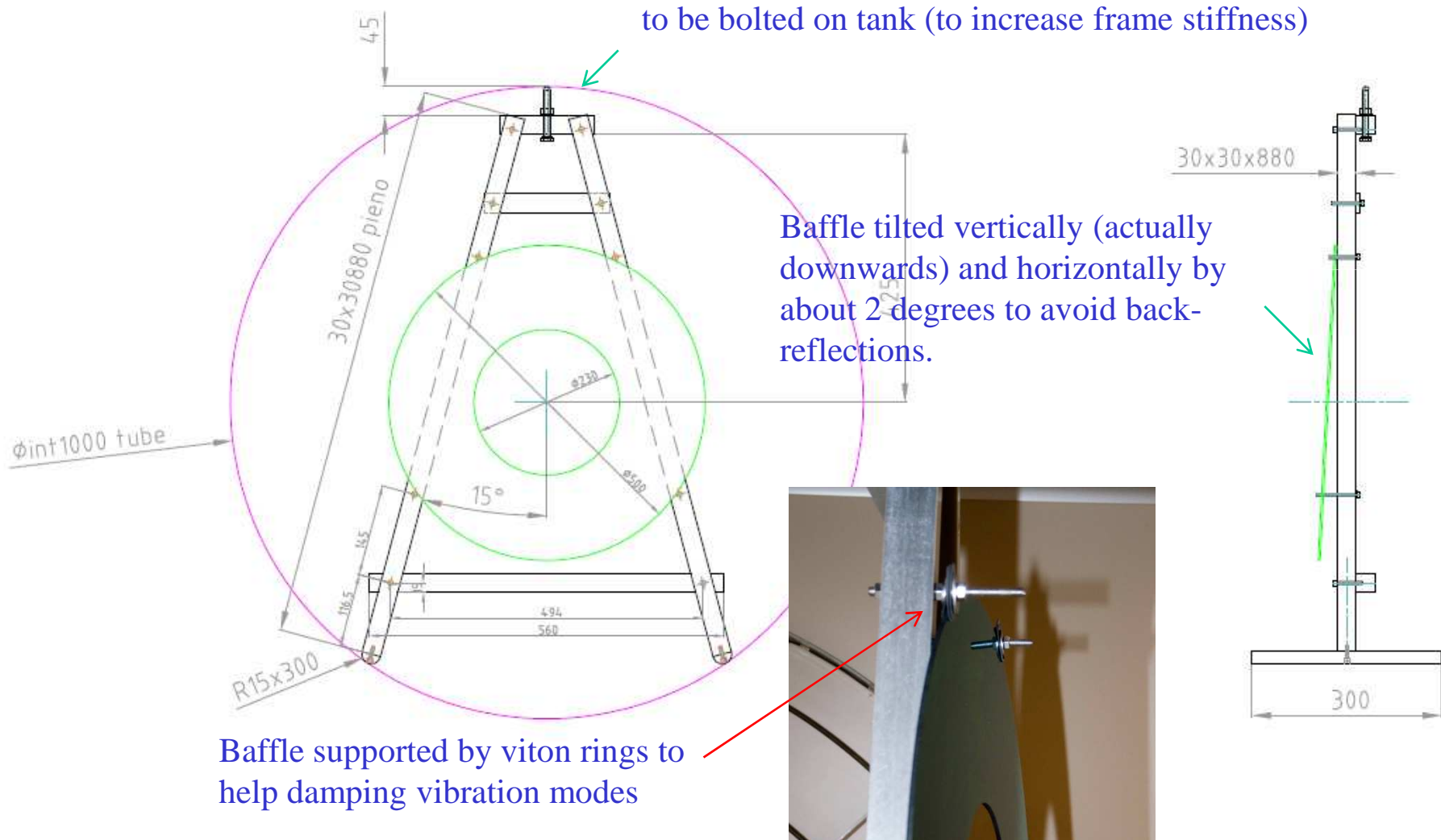
More pictures in Shared Scratch/WE baffle





Frame design *(by EGO vacuum team)*

- Need to avoid low frequency modes and large Q, to reduce diffused light effects. (note that NE baffle is suspended by wires instead).

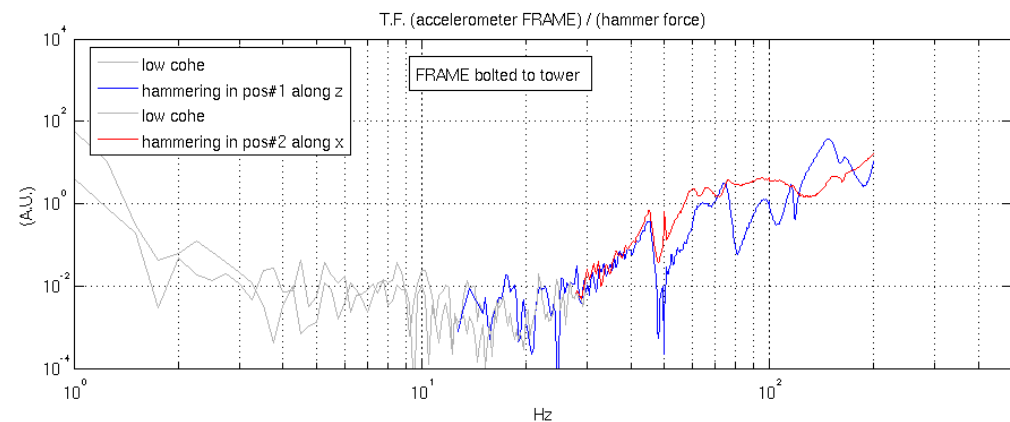
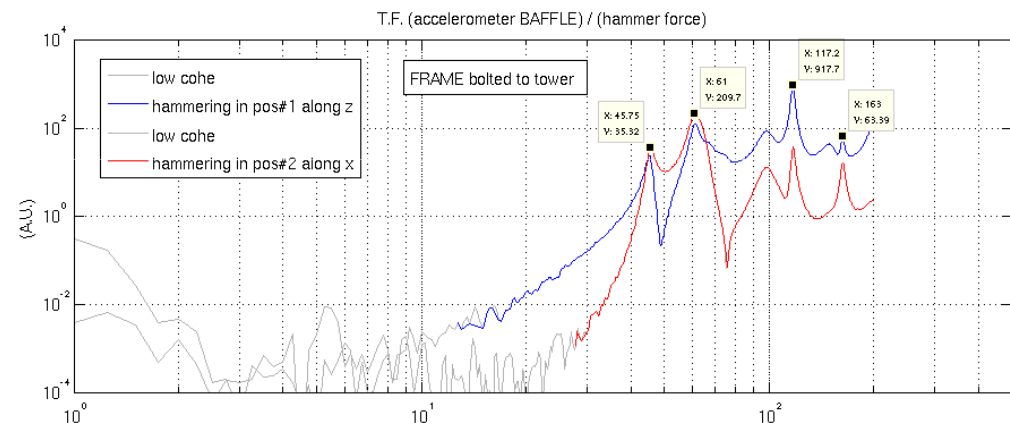
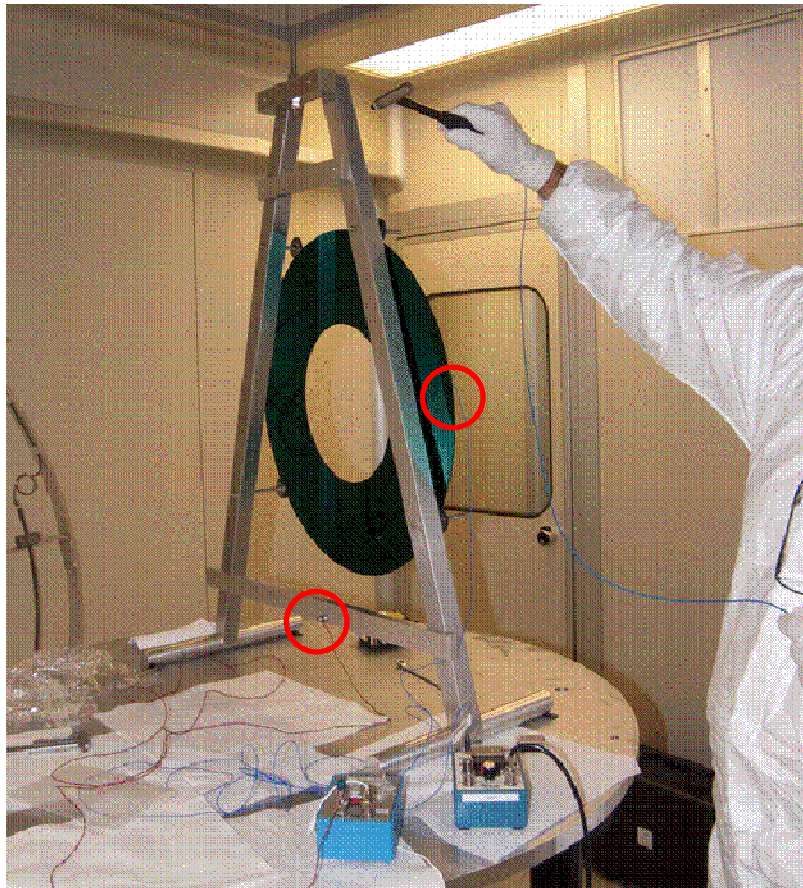




Mechanical modes of the baffle+frame

Measured with hammer+accelerometers setup (eLog #27785 for details)

- Frame (once bolted) is stiff (no resonances below 200Hz)
 - Baffle first resonance at about 45Hz. Amplification of modes is not large ($Q \approx 20$).
- >> 45 Hz resonance might be critical (several sources of vibration noise, i.e. cooling fans). Need seismic injection around this frequency to test diffused light effects.





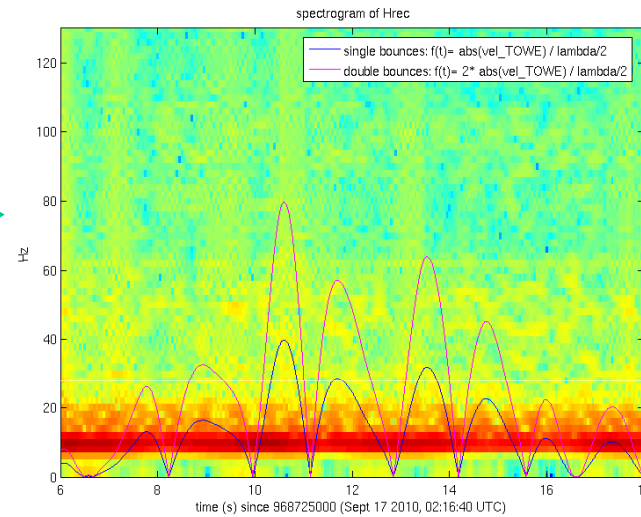
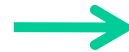
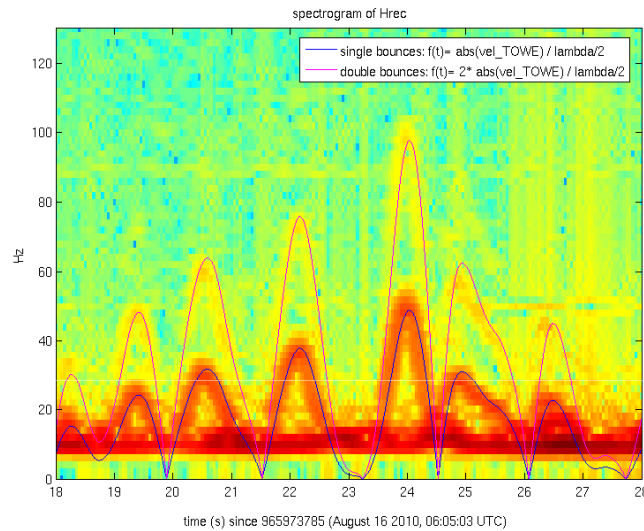
Consequences?

- No visible impact on horizon
- But visible effect on microseism related noise...

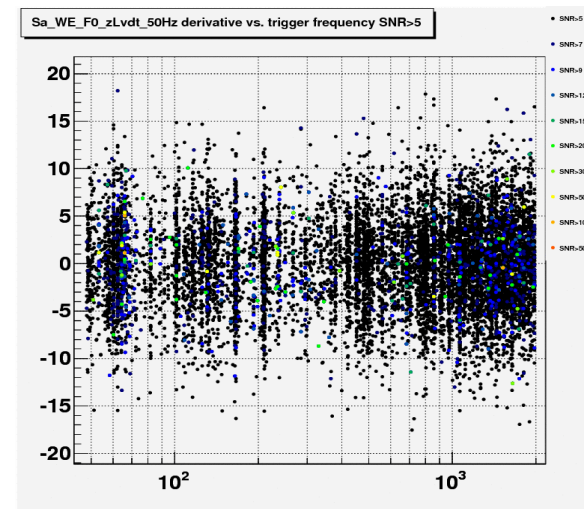
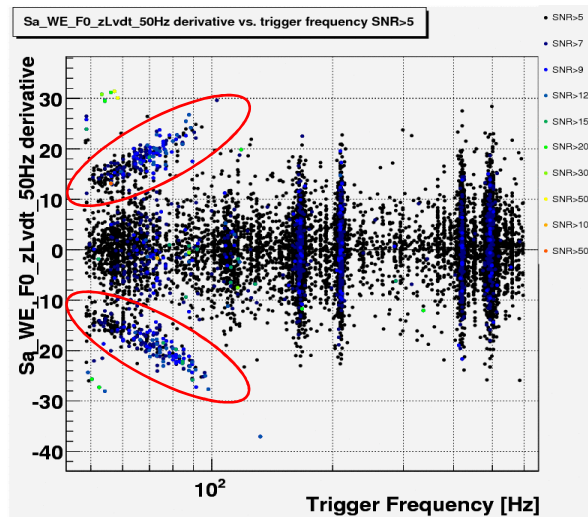


Improved noise during bad-weather

- No more “arches” associated to large swings of WE tower during intense microseism
- Reduced Low Frequency glitches rate, DQ veto based on WE_zLVDT moved to cat3.



(# 27862)



(provided by F.Robinet)

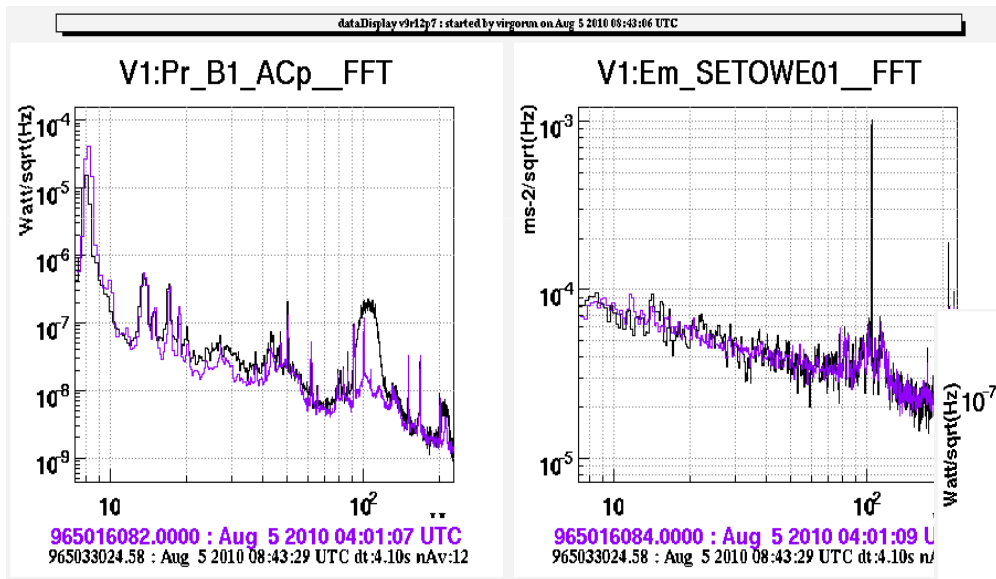


Which reduction of back-scattered light?

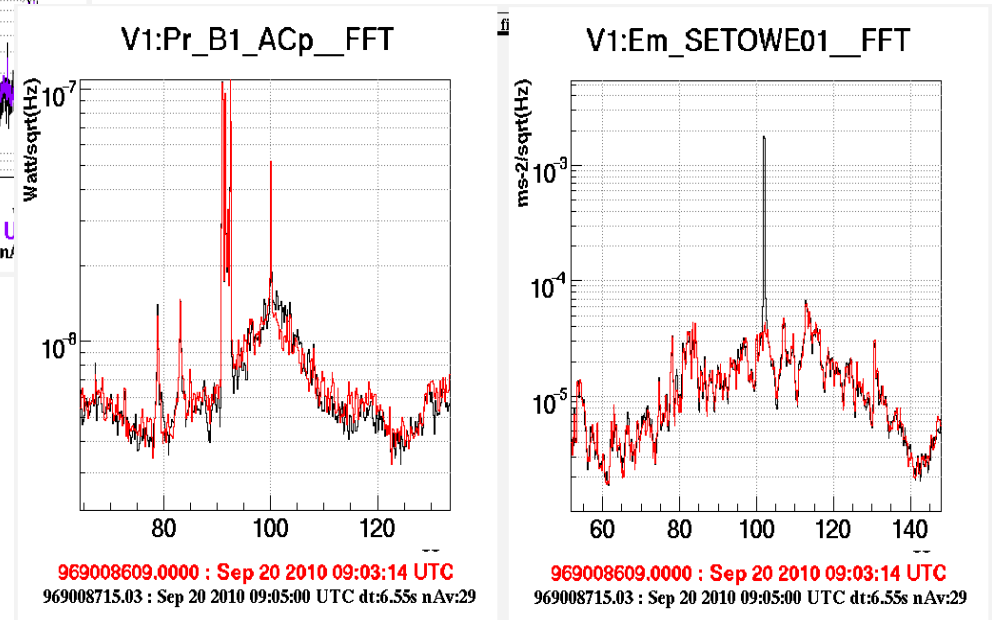
Repeated tower seismic injections (yesterday, #27866)

- Same excitation (slightly larger) at 100Hz now produces (almost) no effect:

Seismic injection BEFORE:



with BAFFLE:

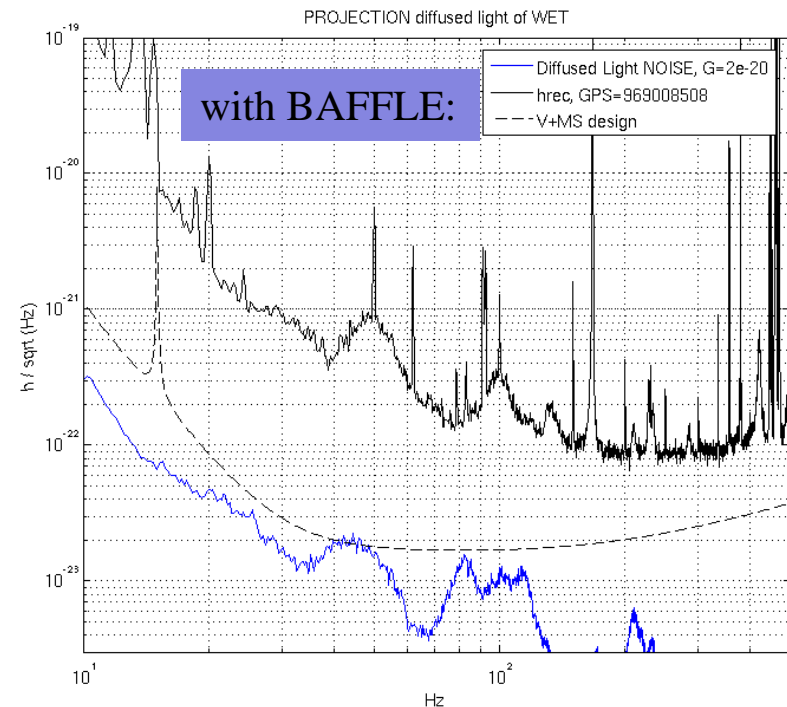
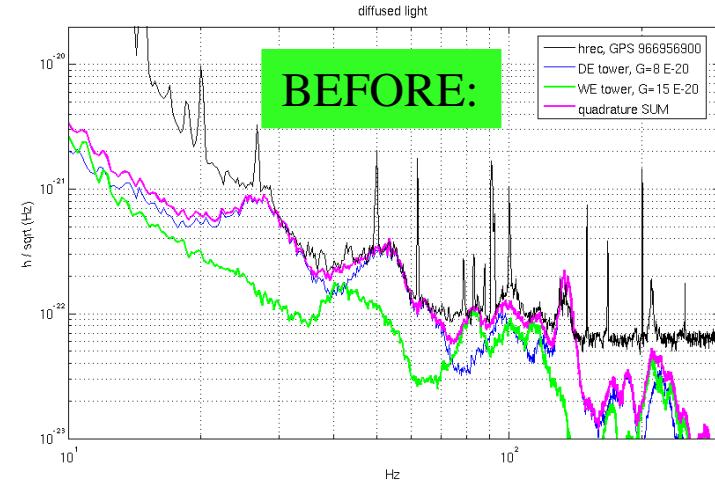




Which reduction of back-scattered light?

- Better evaluation is done fitting with noise model (#27870):
 - >> Coupling factor evaluated at 100Hz has reduced by about ten times, from $G \approx 20E-20$ to $G \approx 2E-20$
 - >> Tentative projection using seismic noise measured at tower flange (Em_SETOWE) goes slightly below V+MS design.
 - >> But, need to check for possible light back-scattered by the baffle at 45Hz.

We need more a powerful tool to efficiently shake towers at low frequency (vendors contacted).

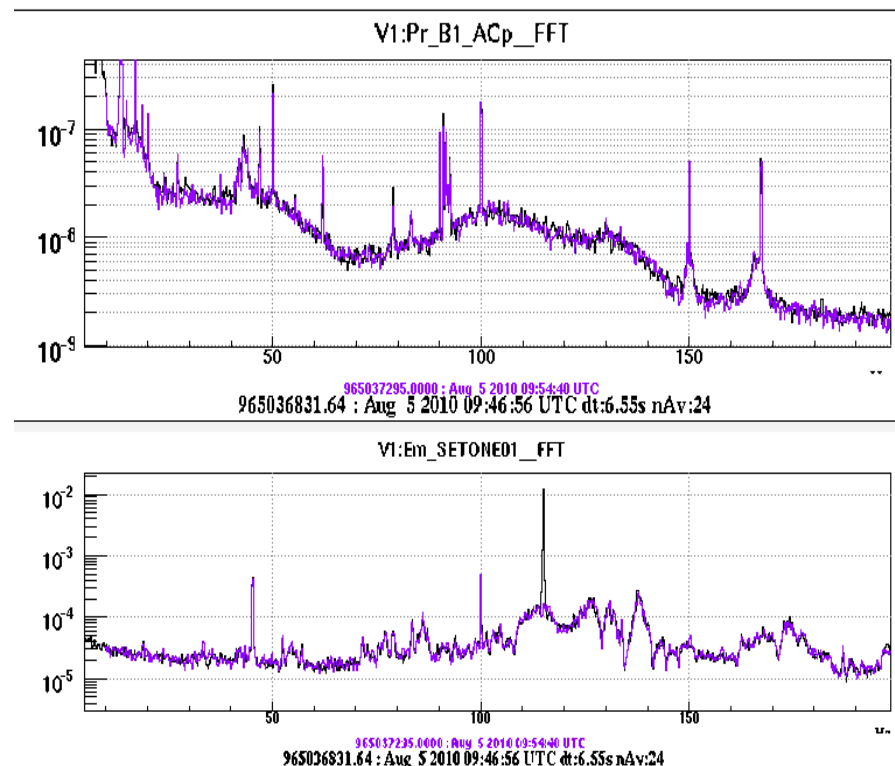




WE tower versus NE tower

- Upper limit on coupling factor measured at NE gives: $G \leq 7 \text{ E-21}$ (WE has $G=20\text{-}21$)
>> NE tower back-scatters (at least) 3 times less than WE tower
- WET larger diffused light can be explained by the higher RMS roughness of WE mirror (*LMA meas. in J.Marque presentation [VIR-0205A-10](#)*) and a bit larger power losses of West cavity (from most recent simulations). Study is ongoing.

100 Hz seismic line at NET: (Aug.5)





Conclusions

Consequences of WE baffle installation:

- Improved bad-weather noise
- Tentative projection says noise is at V+MS design, but need to check possible reintroduction from baffle at 45Hz.
- NE tower back-scatters at least 3 times less light, this might be consequence of lower NE mirror roughness RMS. Needs more studies.