

**$n^*48.3$  Hz Bumps LHO ER13,  
nonlinear coupling from central  
station tank motion?**

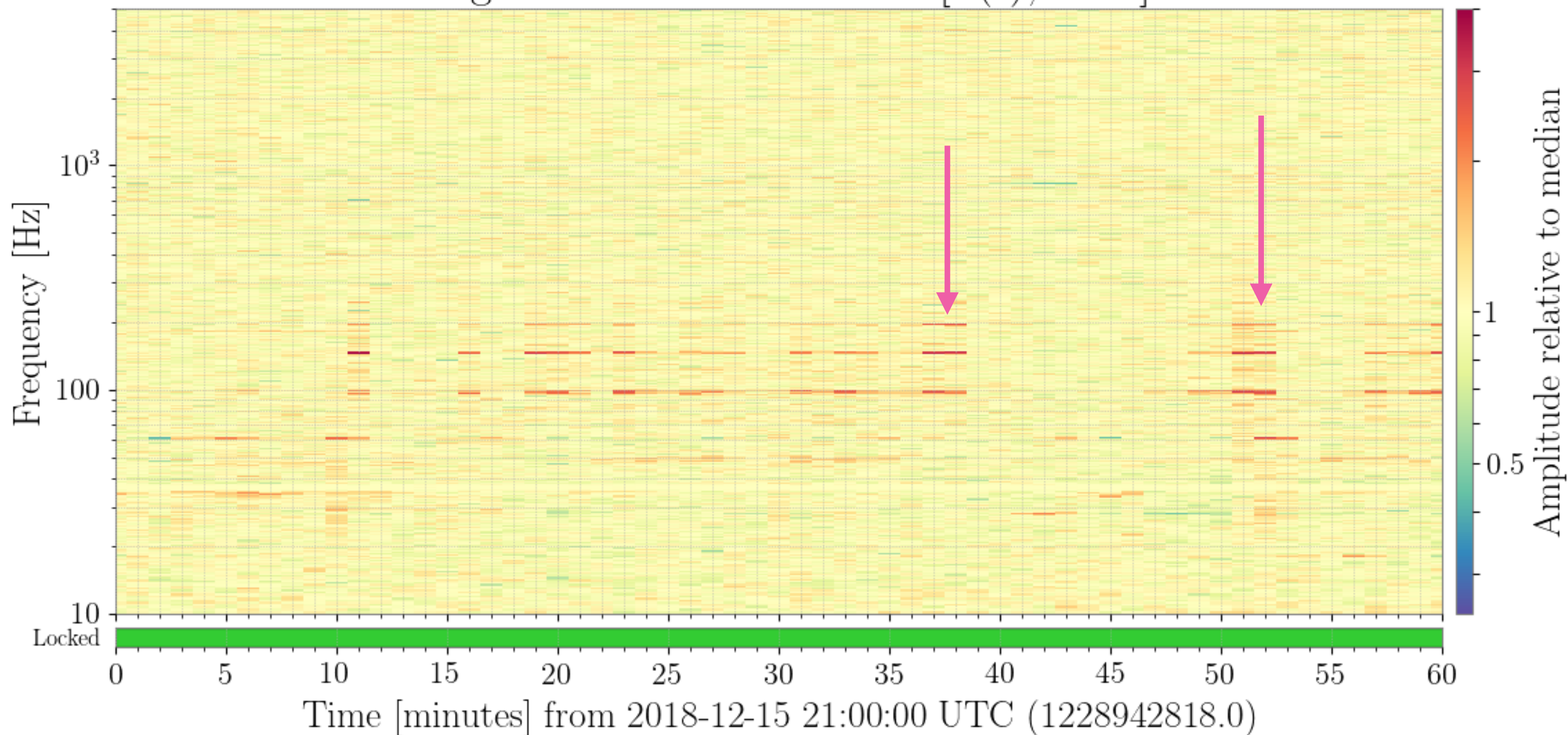
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# Conclusions

- 48.3Hz and first harmonic peak show up sharply in central station accelerometers, loudest in HAM3 PR2 ACC
- DARM has  $n \cdot 48.3\text{Hz}$  bumps that are broadened (possibly by scattering) and show more harmonics (also show up as glitches)
- The accelerometer is a quantized peak that switches in frequency in  $\pm \sim 7\text{Hz}$  steps

# n\*48.3Hz bumps on/off during typical hour

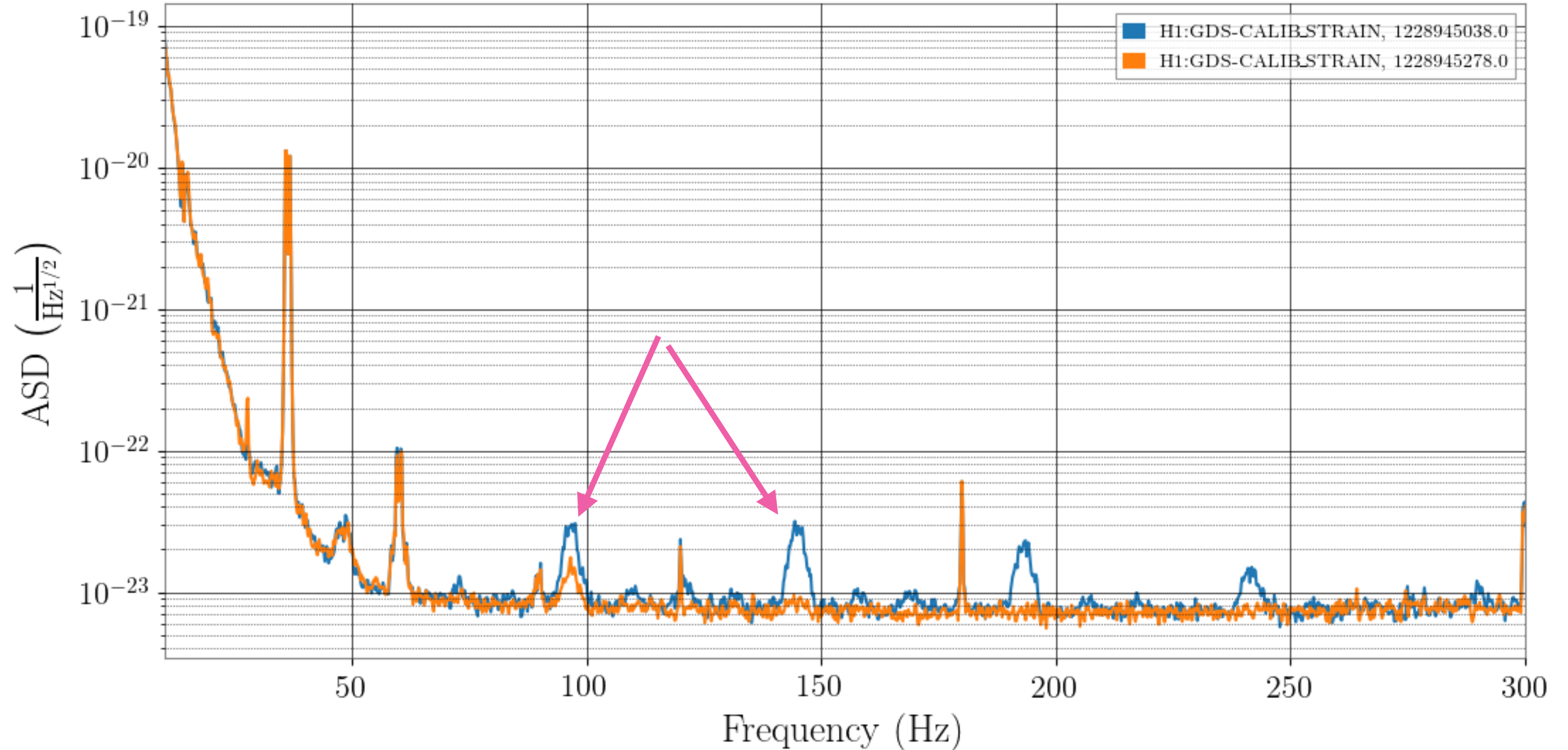
H1 gravitational-wave strain [ $h(t)$ , GDS]





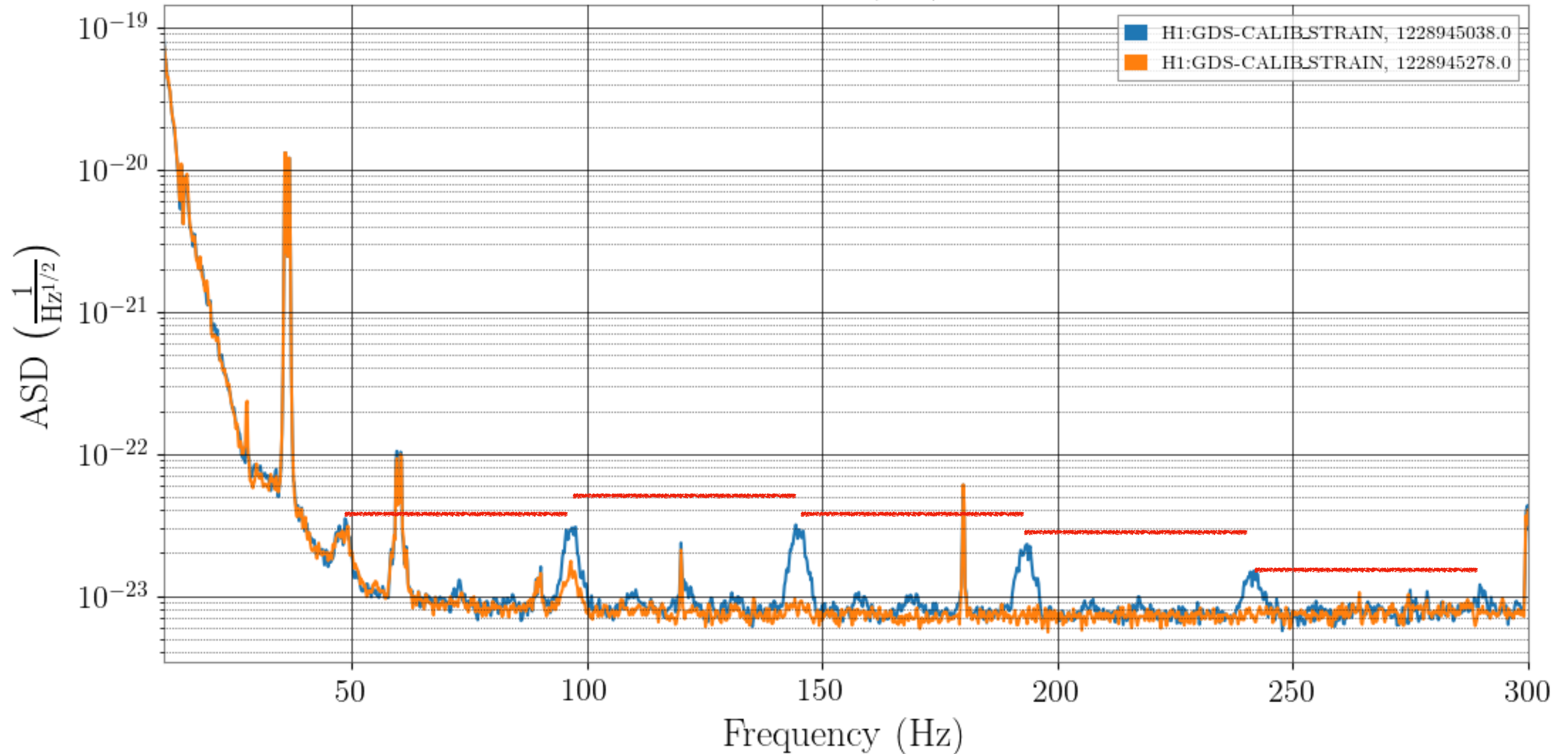
# Here's what it looks like good/bad in $h(t)$

Spectrum: H1:GDS-CALIB\_STRAIN,reduced  
2018-12-15 21:37:00.000 — 1228945038 (100.0), fftlength=5.0, overlap=0.8



# These bumps are harmonics of 48.3Hz

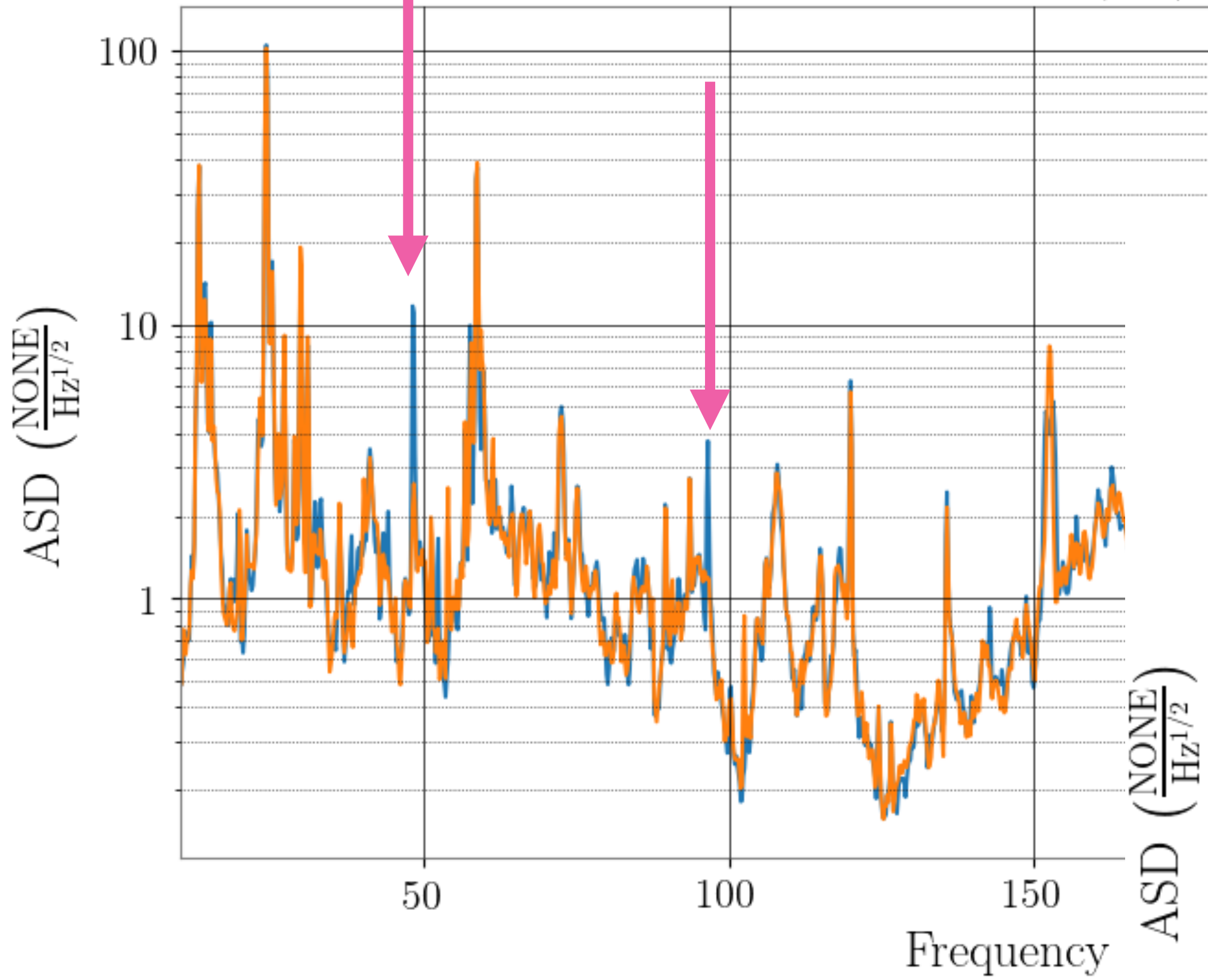
Spectrum: H1:GDS-CALIB\_STRAIN,reduced  
2018-12-15 21:37:00.000 — 1228945038 (100.0), fftlength=5.0, overlap=0.8



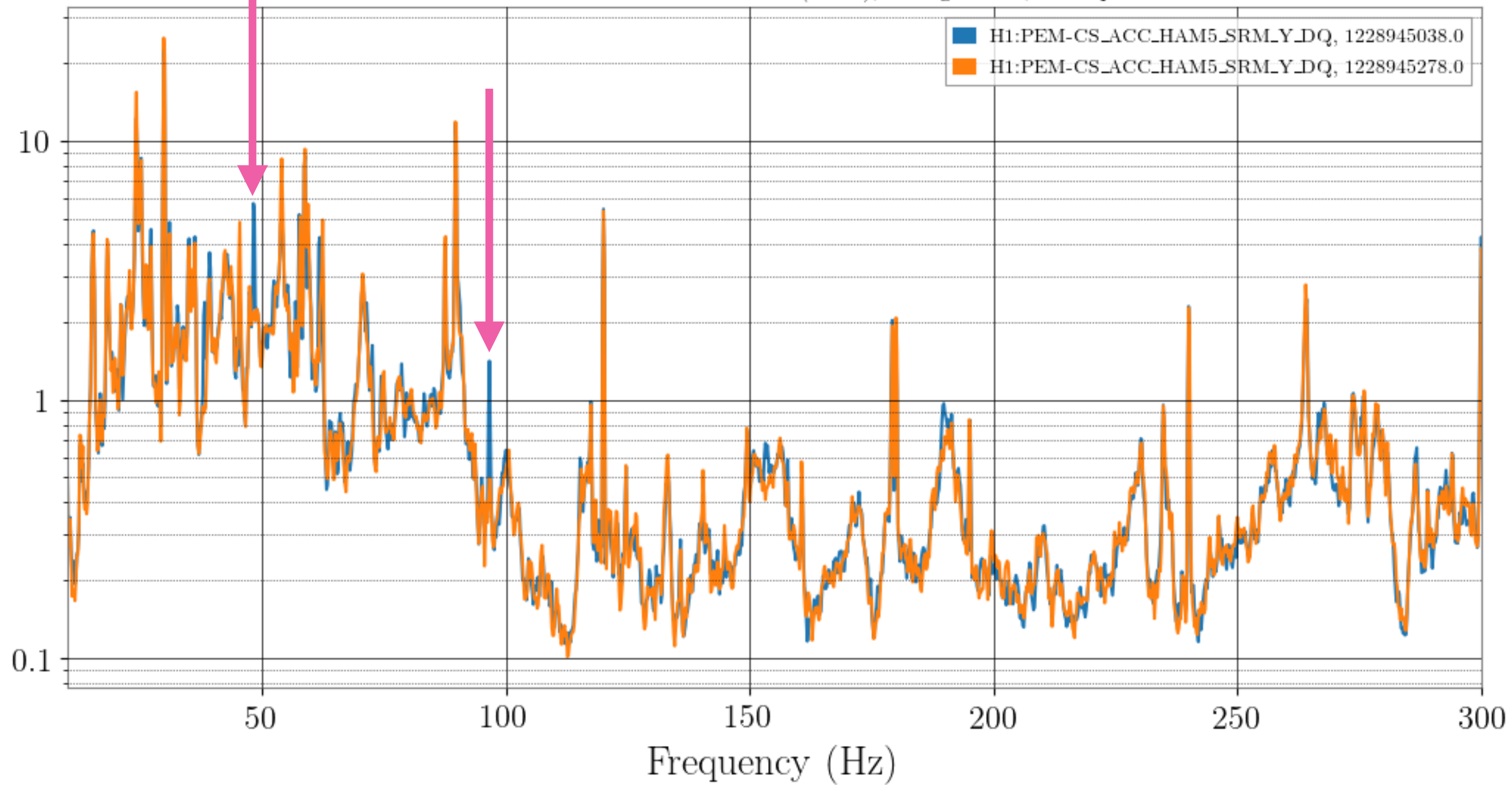


# Accelerometers in the central station see this, strongest in HAM3, peaks in ACC more sharp, suggests scattering broadening the h(t) bumps

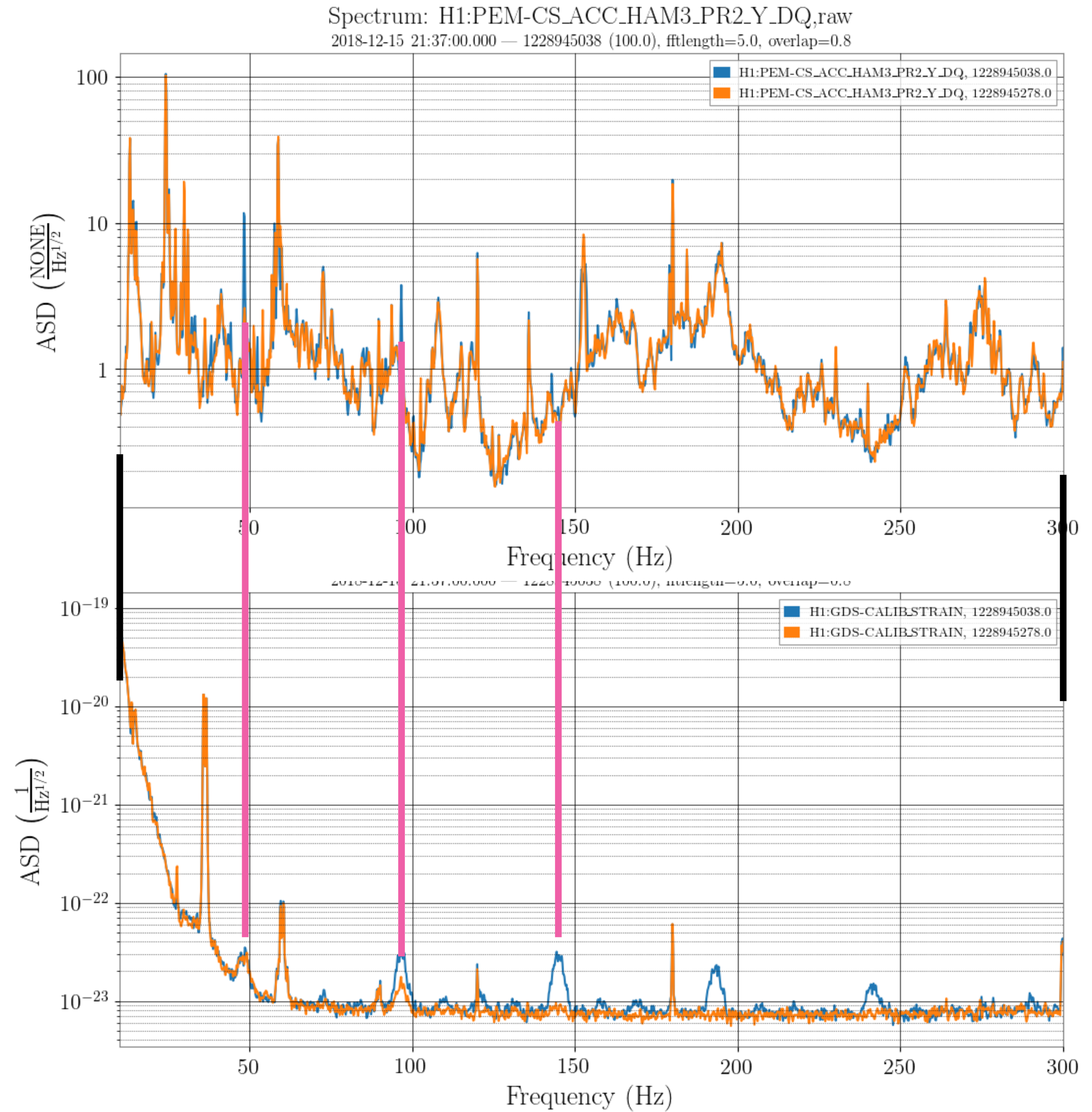
Spectrum: H1:PEM-CS\_ACC\_HAM3\_PR2\_Y\_DQ,raw  
2018-12-15 21:37:00.000 — 1228945038 (100.0), fftlength=5.0, overlap=0.8



Spectrum: H1:PEM-CS\_ACC\_HAM5\_SRMLY\_DQ,raw  
2018-12-15 21:37:00.000 — 1228945038 (100.0), fftlength=5.0, overlap=0.8

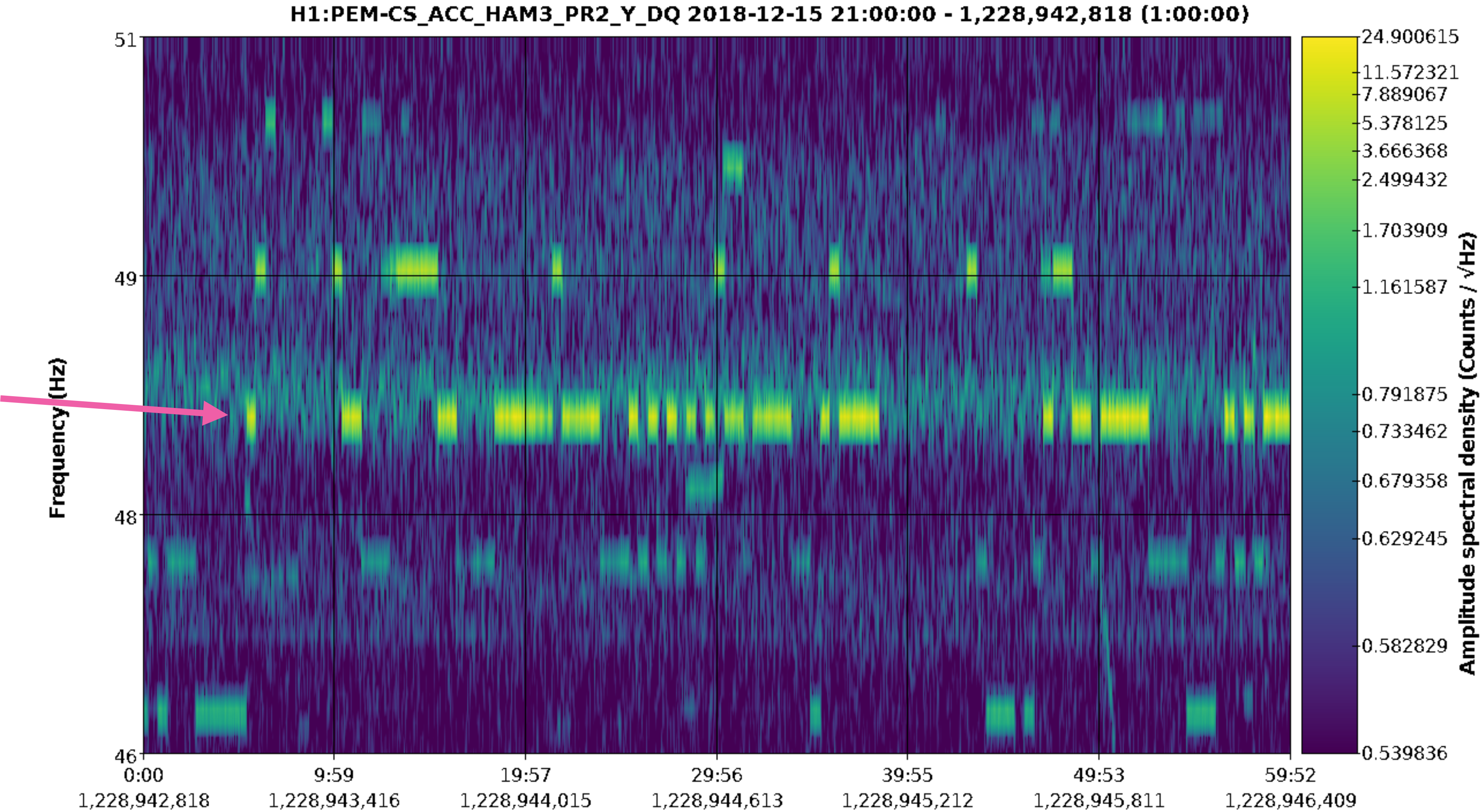


# Here's ACC and h(t)





The cause in the accelerometer looks to be some switching/  
quantized frequency [ $\pm$  ~7Hz steps] (switching power supply?)



Fs=4,096Hz, sec/fft = 10.00, overlap = 0.80, fft length=40,960, #-FFT = 1796, bw = 0.10, in samples = 14,746K, low = 0.20



# Fundamental frequency in acc is 48.3Hz

Spectrum: H1:PEM-CS\_ACC\_HAM3\_PR2\_Y\_DQ,raw  
2018-12-15 21:37:00.000 — 1228945038 (100.0), fftlength=30.0, overlap=0.8

