L1 Violin Modes

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(very preliminary)

The presented results were obtained with the line monitors running in Livingston. Two channels L1:LSC-AS_Q and L1:LSC-REFL_I were monitored for violin resonances around 343.4 and 347.0 Hz. I used approximately 48 hours of trend data produced by line monitors starting at 01.10.02 2:00 UTC (see Figure 1). Two gaps between 15-25 and 38-48 correspond to day time when interferometer is not in lock.

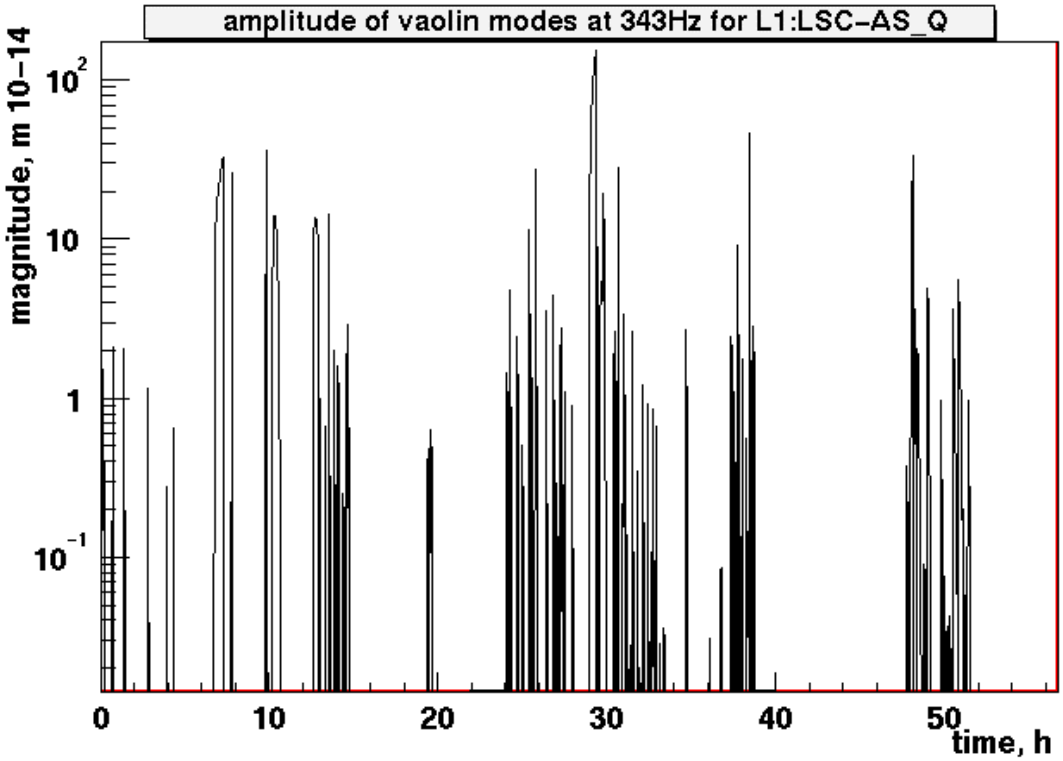


Figure 1. Amplitude of violin resonances a function of time.

The line monitors measured amplitude, frequency and phase of these lines as a function of time with time stride of 32 sec. The violin resonances are measured when they are excited in the beginning of a lock section. Ones excited the violin resonance rings down with a decay time around 2min. For example Figure 1 shows the ringdown curves for violin resonance at 343.667 Hz. The decay time measured from these curves is 250sec, which corresponds to $Q = 5.4 \cdot 10^5$.

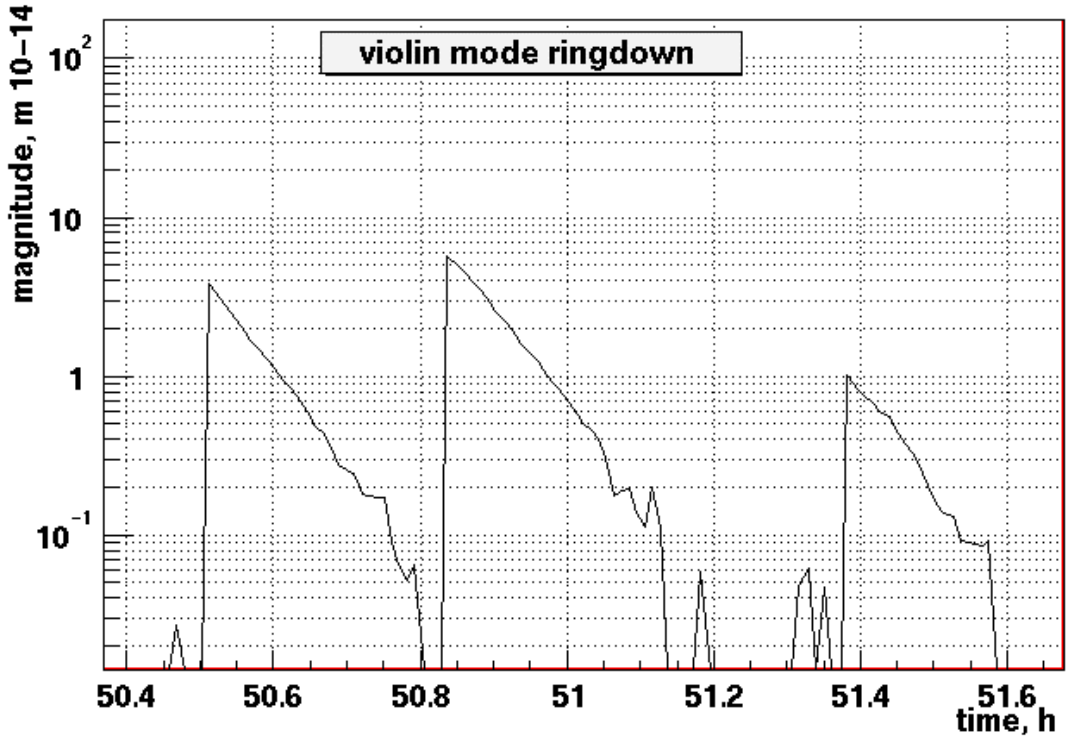


Figure 2. Violin ringdown.

There are 2 groups of lines around 343.4 Hz (see Figure 3a-b), probably due to excitation of violin modes of two different mirrors.

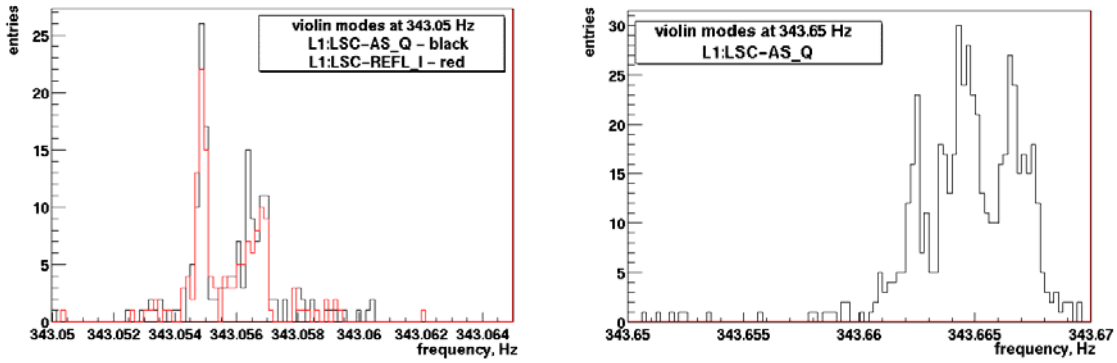
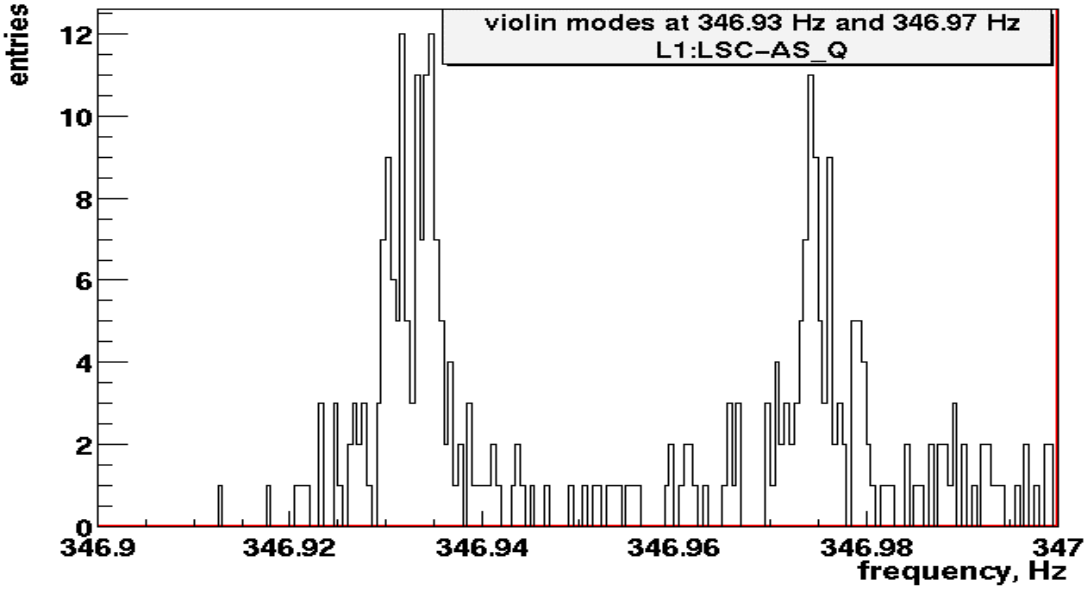


Figure 3. a b

For 343.05 Hz modes, violin excitation is present both in L1:LSC-AS_Q and L1:LSC-REFL_I channels. At the same time a group of resonances at 343.66 Hz is not present in the common mode channel. Figure 4 shows two group of resonance probably due to excitation of the other two mirrors. More statistics is needed to measure frequencies of the violin modes within each group. Perhaps it would be possible to link these four groups of violin resonances to test masses if to look at violin resonances in one arm data and in the Michelson control channel.


violin modes at 346.93 Hz and 346.97 Hz
L1:LSC-AS_Q
entries
0
2
4
6
8
10
12
346.9
346.92
346.94
346.96
346.98
347
frequency, Hz