GW170608: Structure of the Noise Fluctuations

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Abstract

The evaluation of the event GW170608 must be made new. During the “routine instrumental procedure” in Hanford the damping of the pendulum of the mirrors was obviously reduced. As a result, the GW signal became artificially longer.

On June 8, 2017, LIGO should have watched the gravitational wave event GW170608. At the same time there was the following special feature [1]:

“GW170608 was observed during a routine instrumental procedure at LHO... The frequencies of angular excitations are equally spaced between ~19Hz and ~23Hz... This procedure covers from ~2 minutes before to ~14 minutes after GW170608, shown in Figure 4 (left)… To characterize this noise we show amplitude spectral densities derived from 240 s of data both before the onset of the angular excitations and during the excitations around the event time in Figure 4 (right). No effect on the spectrum is visible above 30 Hz.”

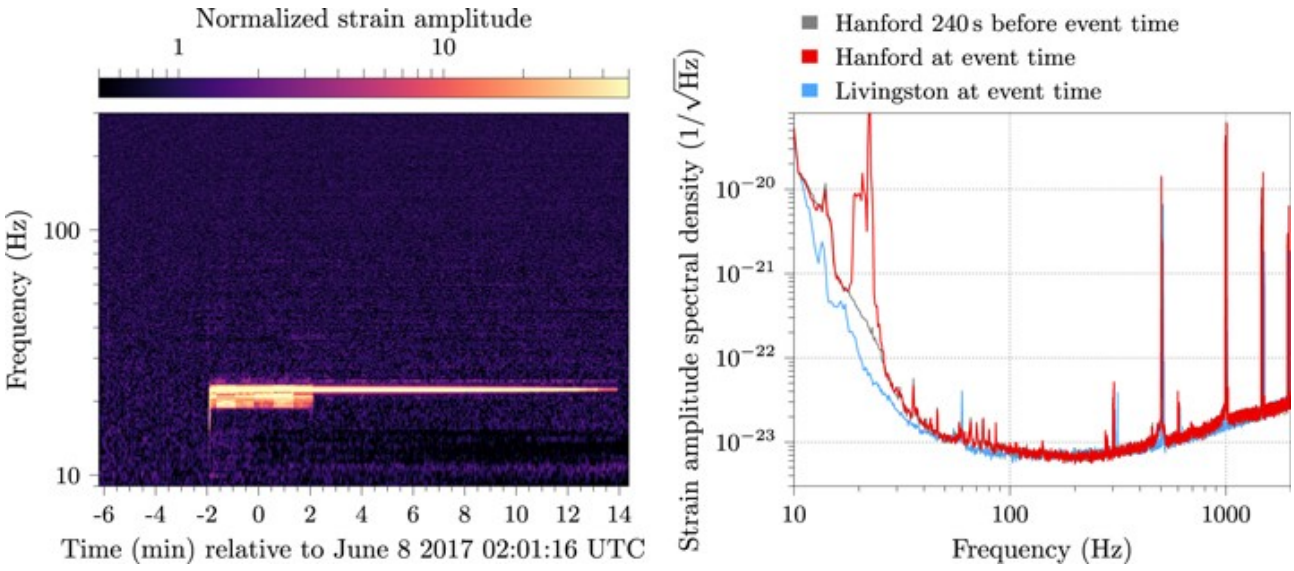

Fig. 1. Figure 4 [1].

The last sentence is important, because the identified GW signal started at about 30Hz. In this way, the authors want to prove that the instrumental disturbance has no effect on the GW signal. But they overlook another effect.

Let's take a closer look at the spectrogram. I have made these a bit more contrasting and brighter, fig. 2.

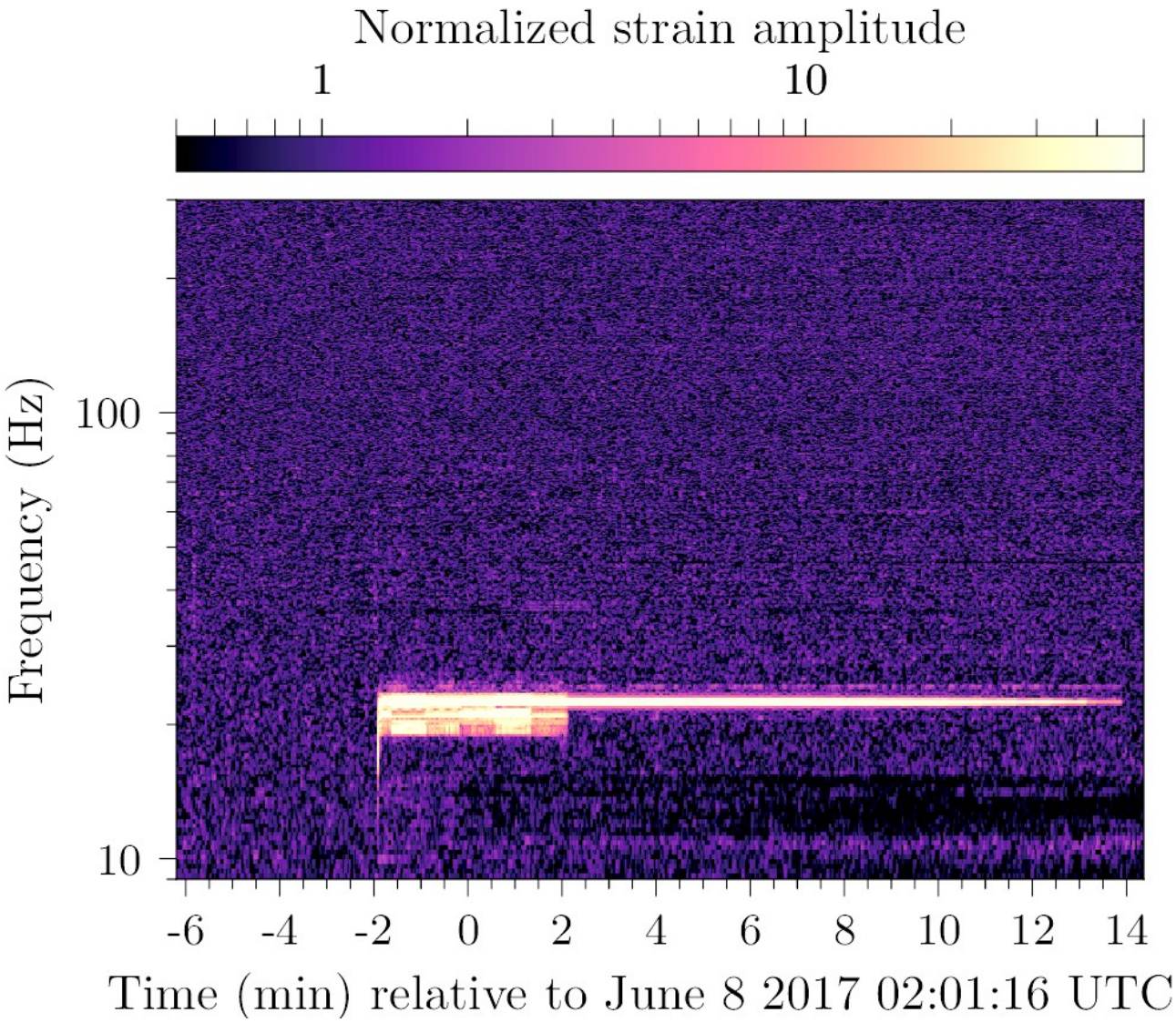

Fig. 2

Far left, before the disturbance (which was just caused by the correction of the mirrors), the noise fluctuations have point-like structure. During the disturbance, on the other hand, it is easy to see a horizontal pattern along the time in the wide frequency range and also well above 30Hz.

What is happening? I guess that during the “routine instrumental procedure” in Hanford the damping of the pendulum of the mirrors was little bit reduced. As a result, in the wide frequency band each noise fluctuation resulted in a longer

reverberation. The spectral noise density remained about the same, but the shape of the noise fluctuations has changed – they have been extended in time.

Therefore, I would expect the same effect for the signal itself. And indeed, Hanford Chirp is more than four times longer than Chirp of Livingston, fig. 3.

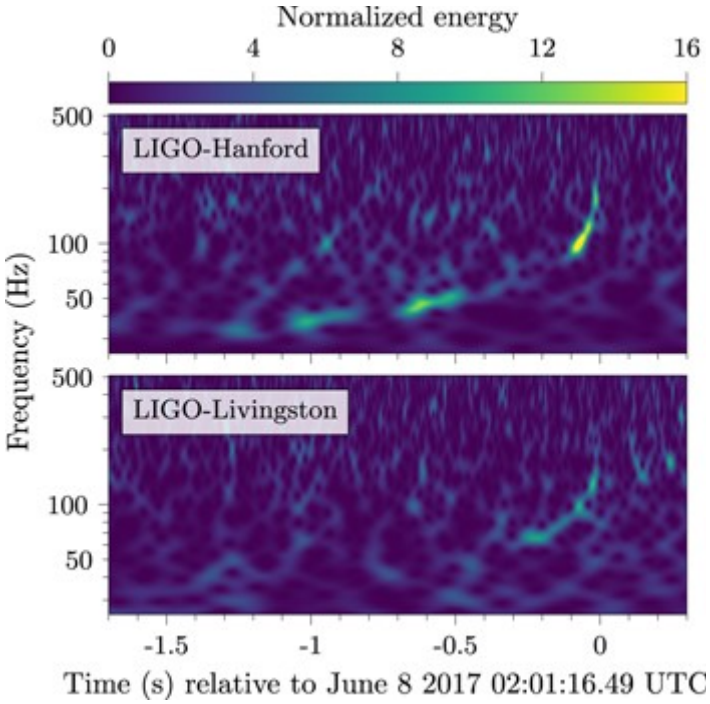

Fig. 3

Meanwhile, the relativistic template was adapted to a 2-second Hanford chip. And that is wrong, because this signal has just been artificially stretched. The evaluation of the event GW170608 must therefore be made new.

Reference

[1] GW170608: Observation of a 19 Solar-mass Binary Black Hole Coalescence. 2017. The American Astronomical Society.
http://iopscience.iop.org/article/10.3847/2041-8213/aa9f0c