

Einstein@Home search for periodic gravitational waves in LIGO S4 data

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A search for periodic gravitational waves, from sources such as isolated rapidly-spinning neutron stars, was carried out using 510 hours of data from the fourth LIGO science run (S4). The search was for quasi-monochromatic waves in the frequency range from 50 Hz to 1500 Hz, with a linear frequency drift \dot{f} (measured at the solar system barycenter) in the range $-f/t < \dot{f} < 0.1 f/t$, where the minimum spin-down age t was 1000 years for signals below 300 Hz and 10 000 years above 300 Hz. The main computational work of the search was distributed over approximately 100 000 computers volunteered by the general public. This large computing power allowed the use of a relatively long coherent integration time of 30 hours, despite the large parameter space searched. No statistically significant signals were found. The sensitivity of the search is estimated, along with the fraction of parameter space that was vetoed because of contamination by instrumental artifacts. In the 100 Hz to 200 Hz band, more than 90% of sources with dimensionless gravitational-wave strain amplitude greater than 10^{-23} would have been detected.