Search for gravitational wave trains with the spacecraft ULYSSES


Abstract

We report on the search for periodic gravitational wave signals in the mHz band conducted with the spacecraft ULYSSES. Gravitational wave signals generally provide information about the distance of the source; ULYSSES' data have a "key" for each kind of source one looks for; for binaries the galactic centre is accessible to our experiment. The Neyman Pearson method, with its two strategies of 'attempting detection' and getting a threshold for no detection, is discussed with great care. With it we did not find significant evidence for positive detection, but established, at the 90% confidence level, upper limits to the amplitude significantly better than previous work. The weaker condition SNR = 1 corresponds to signal amplitudes \( h \) which vary from \( 10^{-15} \) to \( 4 \times 10^{-15} \) for different frequencies. Similar results and thresholds have been obtained for chirped signals. These upper limits have interesting astrophysical consequences for a possible binary of massive black holes in the galactic centre.

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