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An incremental approach for all-sky searches for continuous gravitational wave signals

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All-sky searches for continuous gravitational wave signals, like those expected from asymmetric rotating neutron stars, require to analyse long stretches of data in order to increase the signal-to-noise ratio.

Typically, the heavy processing part starts after all the data to be analysed have been collected. Such a strategy is sub-optimal from a computational perspective and can significantly delay in the dissemination of results. This will be a very relevant problem for third generation detectors, like ET, due to the expected long data taking periods and the anticipated large overall computing cost of the analyses.

Analysing the data as long as they are produced, on the other hand, is not feasible without a careful algorithmic design, due to the huge amount of disk space it would be needed to store the intermediate products.

In this talk we introduce a promising implementation of an incremental search (based on the Frequency-Hough transform pipeline), which allows us to pile up the analysis intermediate products with a reasonable storage burden, and with a very small or null sensitivity loss with respect to the standard non-incremental approach. This allows to better distribute the available computing power making the analysis faster, more robust with respect to possible temporary shortages of computing resources or malfunctions of relevant services and, possibly, opening the way toward more sensitive searches.

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