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X-PIPELINE: Gravitational-Wave Burst search applied to LIGO data

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The rapid analysis of gravitational-wave data is not trivial for many reasons, such as the non-stationary nature of the background noise in gravitational-wave detectors and the lack of a definite and exhaustive waveform models, especially for gravitational-wave burst signals. One active research area is based on the use of X-PIPELINE [1], a software package designed for performing autonomous searches for un-modelled gravitational-wave bursts (GWBs). Functions in X-PIPELINE such as automated running, including background estimation, efficiency studies, unbiased optimal tuning of search thresholds and prediction of upper limits, are all performed automatically without requiring human intervention. X-PIPELINE has a novel approach based on spherical radiometry [2]. The core of our spherical radiometer pipeline is a set of fast cross-correlator codes written in C. This engine, called X-SPHRAD, transforms the problem of computing correlations between time series data streams into the spherical harmonic domain and allows correlation between detectors (in a network) to be performed quickly. X-SPHRAD is focused on optimising the sensitivity of the search. Applications of X-PIPELINE include the general problem of identifying signals of duration greater than 1 second, for which sources include GRBs and some classes of supernova.

[1] P.J. Sutton et al. New Journal of Physics 12 (2010)

[2] K. Cannon Physical Review D 75, 123003 (2007)

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Auteur principal: Mme MASSERA, Elena (University of Sheffield-LIGO scientific collaboration)

Orateur: Mme MASSERA, Elena (University of Sheffield-LIGO scientific collaboration)

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