

Abstract for Amaldi12

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Efficient mapmaking of the stochastic gravitational wave background

Gravitational waves from the early universe and unresolved astrophysical sources are expected to create a stochastic GW background (SGWB). Radiometric techniques are used to make upper-limit maps of an anisotropic SGWB by cross-correlating data from pairs of detectors. We have developed algorithms to perform this analysis in a highly efficient way. We fold the cross-spectral density of data from pairs of detectors, the core dataset for a radiometer search, for a whole observation run to one sidereal day's data, providing enormous data compression and computational speed-up. To take full advantage of folded data and to make use of the well-known HEALPix pixelisation and tools, we have developed a new code called PyStoch. PyStoch incorporates tools healpy packages and some more computational tricks that give a factor of few speed-up. Folding and PyStoch together has made it possible to perform radiometer mapmaking in just a few minutes on a typical laptop. Moreover, PyStoch generates skymaps at every frequency bins as an intermediate data product. We hope that these techniques will make stochastic analysis very convenient and enable searches, e.g., blind narrowband search, which were not feasible so far due to computational limitations.