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Re-Purposed MCMC for Low-Latency Sky Localization of Gravitational Wave Sources BENJAMIN FARR, VIVIEN RAYMOND, WILL FARR, DIEGO FAZI, Northwestern University, JOHN VEITCH, Cardiff University, ILYA MANDEL, BENJAMIN AYLOTT, University of Birmingham, CHRISTIAN ROEVER, Albert- Einstein-Institut, VICKY KALOGERA, Northwestern University, LIGO-VIRGO COLLABORATION — The electromagnetic followup of a gravitational wave event would not only increase confidence in the first detection, but also allow us to extract substantially more astrophysical information from the source. In order to promptly follow up a gravitational wave trigger, its sky position must be inferred as quickly and accurately as possible from the gravitational wave signature. For compact binary sources, low-latency sky localization is currently done using incoherent methods. These methods, though capable of producing results in seconds, have large uncertainties. We have re-purposed our Markov-Chain Monte Carlo parameter estimation code, originally designed for coherent searches over the 15 dimensional parameter space of a circularized compact binary merger, for low-latency sky localization. We anticipate that MCMC techniques will better estimate confidence regions, but do so with a runtime of hours. We show that through the use of specialized jump proposals and algorithm optimizations, runtime to achieve comparable sky maps can be reduced to minutes.

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