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Near Real-Time Gravitational Wave Data Analysis of the Massive Black Hole Binary with TianQin

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Space-borne gravitational wave detectors can detect sources like the merger of massive black holes. The rapid identification and localization of the source would play a crucial role in multi-messenger observation. The geocentric orbit of the space-borne gravitational wave detector, TianQin, makes it possible to conduct real-time data transmission. In this manuscript, we develop a search and localization pipeline for massive black hole binaries with TianQin, under both regular and real-time data transmission modes. We demonstrate that with real-time data transmission, it is possible to accurately localize the massive black hole binaries on-the-fly. With the approaching of the merger, the localization rapidly shrinks, and the data analysis can be finished at a speed comparable to the data downlink speed.

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