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Arm-Locking Frequency Noise Suppression for Astrodynamical Middle-Frequency Interferometric Gravitational Observatory

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For space gravitational wave (GW) detection, arm locking is a proposal useful in decreasing the frequency noise of the laser sources for current developing space missions LISA and Taiji/TianQin. In this talk, we discuss the application of arm locking to the Astrodynamical Middle-frequency Interferometric Gravitational Observatory (AMIGO) to decrease the frequency noise of laser sources. For AMIGO, the arm-locking technique can suppress the laser frequency noise by three orders of magnitude. The advantage of this is to make the auxiliary noise assignment for AMIGO easier and more relaxed. For the first-generation time-delay interferometry (TDI) configuration, the laser frequency noise contribution is already below the core noise contribution. For the simple Michelson TDI configuration (X0), the arm locking makes the acceleration-thrust scheme, the delay-line scheme, or the combined scheme easier to implement. Within a relatively short period of less than a day (compared to less than twenty days for LISA/Taiji), the Doppler frequency pulling can be efficiently reduced to within ± 0.001 Hz and does not affect the mission duty cycle much.

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