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Dynamics of Fiber Amplifiers in the Context of Gravitational Wave Detectors' Laser Sources

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After the first direct detection of gravitational waves, the GW community faces the challenge of improving the frequency range and sensitivity of the next generation of GWDs. Two approaches to achieve it are the power scaling of laser sources and the use of cryogenically cooled crystalline silicon-based optical components, which requires the operation at longer wavelength. These improvements need new concepts of laser sources that are not totally defined yet. Fiber amplifiers in Master Oscillator Power Amplifier (MOPA) configuration are demonstrating to be good candidates to meet the requirements of the next generation of GWDs. In this work we study the non-linear processes of gain and temporal dynamics in Er-doped, Yb-doped and Er:Yb-codoped fiber amplifiers with the aim of developing single-frequency, high-power fiber sources at 1µm and 1.5µm with long-term stability. The study of the amplifier dynamics also provides valuable information to realize stabilization loops.

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