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Recent Developments of the Laser Oscillator Synchronization for the FERMI Seed Laser

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The local laser synchronization is known to be of high importance for Free Electron facilities, affecting both machine performance and pump-probe FEL-external laser experiments. So, there has been a continuous effort to improve the timing jitter of all machine lasers. One of the main contributions to the overall timing jitter comes from the locking of the local laser oscillators to the reference signal of the facility. Here we describe the latest developments and progress in this direction related to the FERMI seed laser system. The first investigated aspects includes the characterization and optimization of the locking performance of the commercial Ti:Sapphire oscillators Vitara T and HP (Coherent). We present data on the performance of three different oscillators of this type, as well as on the effect of adding an additional cavity length control actuator. The second presented aspect is related to the plan to extend the optical synchronization layout: for some planned seed laser operation modes two Ti:Sapphire oscillator need to be synchronized simultaneously. For this purpose, studies of optimum schemes for locking the two oscillators are in progress, first results are presented.

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