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Perspectives of measuring gravitational effects of laser light and particle beams

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High energy laser beams and particle beams, such as the one of the Large Hadron Collider (LHC) at CERN, can be used as lab-scale, relativistic sources of gravitational fields. We present a study of the creation and possibility of detection of oscillating gravitational fields from lab-scale, relativistic sources. Lab-based sources allow for signal frequencies much higher and far narrower in bandwidth than what most celestial sources produce. In addition, by modulating the source beams, the source frequency can be adjusted over a very broad range. In this talk we show an analysis of the gravitational field produced by these sources and the responses of a variety of detectors, with the outlook that an adapted version of a recently experimentally demonstrated high-Q monolithic pendulum might be able to detect the gravitational signal produced by the planned high-luminosity upgrade of the LHC. This opens new perspectives of studying general relativistic effects and possibly quantum-gravitational effects with ultra-relativistic, well-controlled terrestrial sources.

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