Contribution ID: **3202** Type: **not specified**

P1.4011 Generation of gravitational waves using high-power lasers

Monday, 8 July 2019 14:00 (2 hours)

See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P1.4011.pdf

Gravitationnal waves have been predicted from Einstein's equations since he wrote his theory on General Relativity [1]. A century later, the LIGO [2] and VIRGO interferometers were at last able to pick up a gravitationnal wave from the merging of extremely massive astrophysical objects. The existence of gravitationnal waves now being proved, there is a need to study these waves to better understand how gravitation works, and fondamentally how does the geometry of space-time exactly affects physical phenomenons.
However, observations still rely on the occurrence of a rare and intense astrophysical phenomenon, as if, as a comparison, the only reliable source of observation for high energy photons were gamma-ray bursts. An interesting possibility would be to generate and detect gravitationnal waves in laboratory, which would allow for a more controlled environment for the observation of gravitationnal waves. Unfortunately, deplacements of matter generated in laboratory do not seem to have a big enough yield to allow any detection [3].
Continuing on the path led in 1962 by Gertsenshtein [4] and more recently in a study by Kolosnitsyn and Rudenko [5], we will here evaluate if the generation of gravitationnal waves by light only is a good alternative to the deplacement of mass. We will then discuss on the possibilities of an experiment making use of the peculiar aspects of light only gravitational waves generation and bring more details on what could be a new interesting way to look for gravitationnal waves in the laboratory, but also in the universe. High-power lasers present themselves as an interesting answer for the needs of a source for gravitational wave generation, as they can provide coherent ultra high intensity light beams.

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Presenter: LAGEYRE, P. (EPS 2019)

Session Classification: Poster P1

Track Classification: BSAP