Contribution ID: **3502** Type: **not specified**

P4.2024 Light-shining-through-wall searches for axion-like particles using laser-driven plasma

Thursday, 11 July 2019 14:00 (2 hours)

See full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P4.2024.pdf

Not all key questions in fundamental physics can be readily investigated using conventional high-energy particle collider technology. In particular, alternative methods are required to search for novel low mass particles with very weak coupling to ordinary matter. It is anticipated that the next generation of high-intensity laser facilities will offer vital new methods for investigating axion-like particles, or ALPs, which are natural by-products of string theory. ALPs are relatives of the QCD axion, which remains the most popular explanation for the lack of CP violation in the strong interaction. Furthermore, ALPs and QCD axions remain popular candidates for dark matter, and confirmation of their existence would be an outstanding milestone in fundamental physics.

Thus far, most of the work devoted to high-intensity laser-based searches for ALPs have focussed on the interplay between laser pulses in the vacuum. However, our approach exploits laser-plasma interactions; in particular, we suggest that combining the laser-wakefield accelerator paradigm with state-of-the-art magnet technology provides an interesting alternative to conventional searches for ALPs. We will introduce our new approach to "light-shining-through-wall" searches for ALPs [1], and discuss recent developments.

[1] David A Burton and Adam Noble 2018 New J. Phys. 20 033022.

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Session Classification: Poster P4

Track Classification: BPIF