Contribution ID: **14** Type: **Presentation**

Axion-plasmon polariton in stronlgy magnetized plasmas: a novel way to probe axions

Monday 18 June 2018 15:30 (20 minutes)

Axions are hypothetical particles related to the violation of the charge-parity symmetry within the strong sector of the Standard Model, being one of the most prone candidates for dark matter. Multiple attempts to prove their existence are currently performed in different physical systems. Here, we predict that axions may couple to the electrostatic (Langmuir) modes of a strongly magnetized plasma, and show that a new quasi-particle can be defined, the {\it axion-plasmon polariton}. The excitation of axions can be inferred from the pronounced modification of the dispersion relation of the Langmuir waves, a feature that we estimate to be accessible in state-of-the-art plasma-based experiments. We discuss possible experimental setups where the axion-plasmon polariton method can probe or exclude axions and anticipate some astrophysical implications of the axion-plasmon coupling.

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Session Classification: Plenary presentations