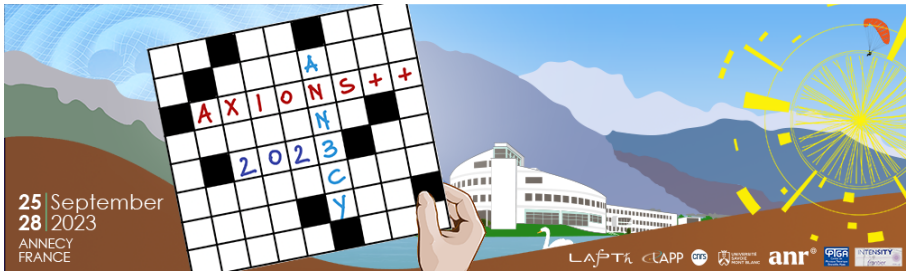

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New solar X-ray constraints on keV ALPs and Kaluza-Klein axions

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The Sun represents a particularly interesting source for keV axions since a fraction of them would be trapped into the solar gravitational field and would then accumulate over cosmic times. The decay of such trapped axions into photons would contribute to the observed X-rays coming from the Sun. The requirement that the axion-induced photons flux should not exceed the solar X-ray measurements is then a powerful way of constraining axion models.

In this talk, we first study the case of Axion-Like Particles (ALPs) in the keV-range. By updating the production mechanisms in the Sun and by accounting for the absorption of the trapped ALPs by the Sun during their orbits, we derive the most constraining limits on ALPs between 3 keV and 40 keV that are not relying on any assumption about the local dark matter density.

Secondly, we discuss the case of axions propagating in large extra dimensions. In such a framework, besides the QCD axion, the Sun would produce a tower of massive Kaluza-Klein (KK) axions with masses in the keV-range. The KK axions could then be gravitationally trapped around the Sun. By revising the phenomenology and the constraints on such particles, we reduce by six orders of magnitude the axion-decay event rate in a detector on Earth. However, we will also see that the trapped KK axions offer an interpretation for the unexplained non-thermal distribution of the solar X-rays.

This talk is based on https://arxiv.org/pdf/2303.06968.pdf and on https://arxiv.org/pdf/2107.13337.pdf

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