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Hunting Chameleons with the CAST Experiment at CERN

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Dark energy poses one of the most intriguing mysteries of our time and so far no experimental efforts could validate any of the existing theories. In 2003 the chameleon, a neutral spinless scalar particle, had been postulated as possible candidate. This particle couples to photons and can be produced in the Sun by the Primakoff effect. The CERN Axion Solar Telescope (CAST) aims to detect these solar chameleons by two different methods. First, their coupling to photons is utilized by exploiting the inverse Primakoff effect in a strong magnetic field. Chameleons convert to X-ray photons, which then are detected by the GridPix detector, a combination of a Timepix ASIC and a Micromegas set-up. The second method takes advantage of the screening mechanism of the chameleons based on their coupling to matter. Depending on the ambient matter density the effective mass of the chameleon changes and under certain conditions the particle gets reflected off a material surface. By using an optomechanical force sensor the KWISP detector aims to measure the pressure exerted by the chameleons reflecting off a thin membrane. In this talk both detection methods used at CAST will be presented.

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