Contribution ID: **78** Type: **Presentation**

# KWISP - Hunting Chameleons with the CAST Experiment at CERN

*Wednesday 20 June 2018 12:25 (5 minutes)*

The KWISP (Kinetic Weakly Interacting Slim Particle) detector is part of the CAST experiment at CERN exploring the dark sector. It utilizes an ultra-sensitive opto-mechanical force sensor for the search for solar chameleons. A chameleon is a hypothetical scalar particle postulated as dark energy candidate, which has a local density-dependent direct coupling to matter. Considering this characteristic a flux of solar chameleons hitting a solid surface at a grazing incidence angle will, under certain conditions, reflect and exert the equivalent of a radiation pressure. To exploit this trait the KWISP sensor consists of a thin and rigid dielectric membrane placed inside a resonant optical Fabry-Perot cavity utilizing an active electrooptical feedback system to keep the laser frequency-locked. The reflection of the chameleons off the membrane surface causes a displacement from its equilibrium position, which again will cause cavity mode frequencies to experience a shift. This shift is then sensed in the feedback correction signal. The sensitivity of the detector is determined by the finesse of the cavity and can be enhanced by exploiting the property of the membrane as a mechanical resonator and cooling it down to sub-K temperatures resulting in a projected force sensitivity as low as ~ 8.0*10^(-18) N/Hz^(1/2), yielding various possible applications for the study of new physics.

**Primary authors:** GARDIKIOTIS, Antonios (University of Patras); HOFFMANN, Dieter (Technische Universitaet Darmstadt (DE)); CANTATORE, Giovanni (University of Trieste); FISCHER, Horst (University of Freiburg); BAIER, Justin (University of Freiburg); ZIOUTAS, Konstantin (CERN); SCHUMANN, Marc (University of Freiburg); KARUZA, Marin (Universita e INFN Trieste (IT)); VRETENAR, Mario (University of Rijeka); CETIN, Serkant (Istanbul Bilgi University (TR)); FUNK, Wolfgang (CERN); SEMERTZIDIS, Yannis (Institute for Basic Science (KR))

**Presenter:** BAIER, Justin (University of Freiburg)

**Session Classification:** Plenary short presentations