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85 - Modelling emission of acoustic energy during bubble expansion in PICO bubble chambers

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The PICO experiment uses bubble chambers filled with superheated C_3F_8 for spin-dependent WIMP dark matter searches. One of the main sources of background in these detectors is alpha particles from decays of environmental ^{222}Rn , which nucleate bubbles that are visually indistinguishable from WIMP candidate events. It was previously determined that alpha-induced bubbles can be discriminated against acoustically, based on the signal from alpha events being consistently larger in magnitude than from nuclear recoil/WIMP-like events. By studying the dynamics of bubbles nucleated by these two types of ionizing radiation from the first stages of their growth, we develop a physical model for the acoustic discrimination for the first time. This model is verified by comparing the simulated and the experimental distributions of acoustic energies radiated during bubble expansion.

Author: KOZYNETS, Tetiana

Co-authors: Dr FALLOWS, Scott (University of Alberta); Prof. KRAUSS, Carsten (University of Alberta)

Presenter: KOZYNETS, Tetiana

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