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Bubble growth dynamics in the PICO bubble chambers (G)*

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Astronomers have observed, through observations of galaxy rotation curves and luminous mass, that our understanding of the dynamics at the scale of galaxies is incomplete; they were the first to challenge the standard model and notice there's something missing or lacking in our understanding. A possible solution to their observation was adding invisible mass which came to be called dark matter. The most accepted theory proposes the existences of a Weakly Interacting Massive Particle (WIMP) that would have the properties of dark matter. As its name implies WIMP searches would fall under the category of rare event searches which require extremely low and well understood backgrounds. PICO is one of many direct dark matter search experiments, it utilizes the acoustics of growing bubbles nucleated from minute energy depositions within a superheated liquid to detect particle interactions. It was observed that bubbles nucleated from alpha particle interactions were louder than bubbles nucleated from neutron particle interactions; which lead to the development of the Acoustic Parameter, known as the AP. Through the analysis of bubble growth dynamics we will attempt to answer the questions of why and how different particles have different acoustics. The answer resides in examining the excess energies deposited by alphas and neutrons to form mono-nucleated bubbles and the thermodynamic conditions of the detector.

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