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Ion Trapping in Liquid Argon

Tuesday 26 May 2020 14:00 (18 minutes)

Noble liquid detectors are now ubiquitous in dark matter and neutrino physics experiments. The ability to purify the liquid of electronegative contaminants to the extent that electrons liberated by ionizing particles can be drifted over several meters with minimal attenuation, while maintaining the initial spatial orientation of the charge distribution, is now considered routine. With such capabilities in hand, we consider in this presentation the possibility of trapping ions in a liquid argon medium in a highly-localized spatial region for extended durations using the technique of radiofrequency quadrupole, or Paul, traps that is commonplace in mass spectroscopy devices and atomic physics experiments. We will present initial simulations and preliminary designs of such a situation, and introduce motivating ideas for why such an exercise may yield new insights into noble liquid detectors.

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