

# COLINA: Conical liquid noble gas apparatus for CEvNS detection

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We recently proposed the development of an innovative single-phase noble liquid time projection chamber (TPC) to detect CEvNS. Two distinct ideas are combined to maximize the potential of the technique. 1) The signal will be amplified through electroluminescence (EL). 2) The TPC will be shaped as a conical frustum.

Single-phase EL is unaffected by charge trapping which is the major deterrent of dual-phase noble liquid TPCs for CEvNS searches at shallow depths. However, it requires extremely high electric fields. Such fields can be reached by using very thin wires  $\sim \mu\text{m}$ -scale diameter. This is an impediment to produce large amplification regions. Common TPC shapes are thus limited in size and target mass. The conical shape allows to maximize the mass by drifting all charges towards a small amplification region at the smaller circle of the cone. Such scheme appears as cost-efficient as it allows for good coverage with few sensors.

The final goal is to deploy COLINA, a conical TPC capable of holding  $\sim 50$  kg of LXe, at the largest spallation neutrino source, the European Spallation Source. Simulations point to a conservative energy threshold as low as  $\sim 0.5$  keVnr. The detector will allow for operation with different noble gases. The increase in density of liquid-phase, compared to gaseous-phase, results in large CEvNS interaction rate with rather small detectors. In fact, COLINA will produce the larger CEvNS statistics in all the considered isotopes, Xe, Kr and Ar, and will do so in unexplored energy regions for the process, where the physics relevance is maximal.

In this poster I'll detail the COLINA detection concept as well as highlight its expected performance and physics case.

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