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CALIPSO : a moderated positron calibration source for proton spectroscopy

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Proton spectroscopy in neutron beta decay gives a complementary access to λ (ratio of the weak coupling constants g_A⁄g_V) and enables new searches for physics beyond the Standard Model. In experiment, low-energy protons (E_k≤751.4 eV) are usually guided and selected using electromagnetic fields. Precise knowledge of the electrostatic potentials is mandatory as it can drastically bias proton selection. For instance, electrostatic potentials have to be known with an accuracy of a few mV in aSPECT and in PERC to reach the aspired precision. Furthermore, as experimental conditions can directly impact the field (temperature effect on electrode position and work function, surface condition, charging traps⋯), it is mandatory that the electrostatic measurements are performed in-situ.
For such applications we are developing CALIPSO, a source of moderated positrons. Positron moderation in a suitable material with negative positron work function produces a beam of positively charged particles with a very low energy spread (~30 meV) and a well-defined emission angle. Simulations were performed and showed that such a source is sensitive enough to compare two potentials down to ˜10 mV. Our goal is to build a source of moderated positrons that fulfills all the requirements of proton spectroscopy experiments, such as compatibilities with UHV and high magnetic fields.
I will present the concept, experimental setup and simulations of the CALIPSO source.

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