Measurement of the β–ν correlation in ^{6}He using a transparent Paul trap[*]

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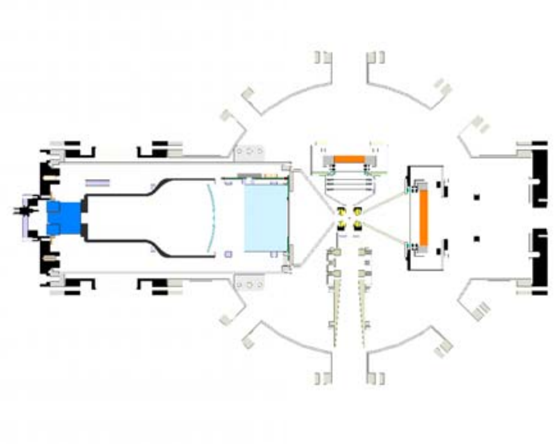
In the framework of the Standard Model (SM), nuclear β–decay is described in terms of current-current couplings, either vector or axial-vector. Other couplings such as scalar, pseudo-scalar or tensor, are permitted by Lorentz invariance but forbidden within the SM. To search for the contribution of such interactions requires high precision experiments, directed to determine unambiguously predicted properties. Here, we address the precise experimental determination of the β–ν angular correlation coefficient *a* by studying the decay of ^{6}He. This is a pure Gamow-Teller decay and according to the SM, *a* must be -1/3. Deviation form this value would imply a new tensor-like interaction involving a new exchange boson thus introducing new physics beyond the SM. Up to date, the most precise measurement of the β–ν angular correlation coefficient in the decay of ^{6}He led to a = -0.3308(0.0030) [1,2].
Experimentally, *a* will be determined by measuring the energy of the recoiling ions in coincidence with the β particles. Despite the low energy of the recoiling ions, this experiment is feasible if the decaying source is held almost at rest in a well controlled environment as such provided by a trap. To this aim, a new facility (LPCTrap) has been constructed and tested during the last 6 years [3]. The facility has been recently coupled to the low energy beam line of SPIRAL/GANIL. The LPCTrap comprises two key elements: 1) a segmented ion cooler, to reduce the time structure, emittance and energy of the incoming ion beam, and 2) a transparent Paul trap to confine the decaying source. The coincidence detection system consists in a set of MCP's detectors and a β-telescope. For the first time, a Paul trap with a novel geometry has been coupled to a radioactive ion beam facility for high-precision nuclear physics experiments. In this contribution we will give a status report of the project underlining the highlights achieved so far and the potential of this novel experimental arrangement in nuclear physics.



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[3] G. Ban *et al.*, Nucl. Instrum. Methods A **518**, 712 (2004)

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