Status and plans of experiment E17 at J-PARC

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Kaonic helium is an advantageous exotic atom to measure KN interaction at threshold energy. Especially X-ray spectroscopy is useful in order to investigate the shift and width of the energy levels, evoked due to strong interaction between nucleus and Kaon.
The 2p level shift was determined in kaonic ^{4}He by the KEK-PS E570 experiment in 2007 [1]. The obtained shift of $2 \pm 2(\text{stat}) \pm 2(\text{sys})$ eV solved the long-standing so-called kaonic helium puzzle: most of the theoretical predictions with optical models estimated a very small shift of $\sim$0 eV, whereas all previous experiments (1971-1983), obtained a large shift of around -40 eV. A new developed model based on coupled-channel calculations [2] predicts a possible large shift ($\pm$10 eV) for the 2p level of kaonic ^{3}He or kaonic ^{4}He, respectively.
Although E570 experiment restricted a large shift for kaonic ^{4}He, the case for ^{3}He is not solved yet. Furthermore, crucial information on the isospin dependence of the KN interaction in kaonic helium can be obtained by measuring X-ray transitions in kaonic ^{3}He. In E17, the X-ray transition 3p$\rightarrow$2d in liquid kaonic ^{3}He will be measured with high precision at the K1.8BR beam line at J-PARC [3], which is one of the first experiments at J-PARC. To achieve the desired precision of $<$2 eV, the principle of the successful setup for E570 will be used, among others the reutilization of Silicon Drift Detectors (SDD).
SDDs are characterized by their good energy resolution ($\sim$140 eV at 5.9 keV) and time resolution ($< 1\mu$s), as well as their thickness of around 500μm which makes these detectors extremely sensitive for low-energy X-rays at high rates. Inside the SDD, electrons are carried by an electric field to the collecting anode in the center. The good energy resolution results from the small value of the anode capacitance, which is independent from the detector area. The detectors will be mounted around the liquid ^{3}He target, inside the chamber. In Vienna, altogether ten SDDs and their preamplifiers were prepared for the final setup. Both in Vienna and at KEK in Japan, all devices were adjusted and subjected to systematic tests in order to optimize them for the experiment. The testing procedure and the arrangement of the devices will be discussed in detail.

[1] S. Okada, et al., Phys. Lett. B 653 (2007) 387.

[2] Y. Akaishi, EXA05, Austrian Academy of Sciences Press, Vienna, 2005, p.45.

[3] R.S. Hayano, Proceedings of EXA08/LEAP08, Eds. B. Juhasz, J. Marton, E. Widmann and J. Zmeskal, Hyperfine Interactions.

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