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the WITCH experiment: status and perspectives

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The WITCH set-up (Weak Interaction Trap for Charged Particles) combines a double Penning trap system to store radioactive ions and a retardation spectrometer to probe the energy of the daughter recoil ions. The primary aim is to search for scalar or tensor interactions in nuclear beta decay by precisely determining the beta-neutrino
correlation coefficient a. This can be extracted from the measured energy spectrum of the recoiling nuclei after beta decay. The two Penning traps serve to provide a pure and scattering free source for this.
All parts of the set-up are now operational and the first recoil ion spectrum was measured in 2006 in the decay of 124In. Although statistics were not yet sufficient to extract weak-interaction information, the charge state distribution of the recoiling daughter nucleus 124Sn could be derived from this.
In 2007 the aim was to measure a via the recoil spectrum of 35Ar. This turned out to be difficult due to a large contamination of 35Cl in the beam (factor 20), and the rapid loss of 35Ar both in REXTRAP and in WITCH due to charge exchange. Further, it was found that unwanted particles are also trapped in several regions inside the WITCH setup due to a combination of the electric and magnetic fields. Therefore, instead of taking radioactive beam time this year, it was decided to first solve these problems. This is in progress now.
At the same time a magnetic-shielding for the REX-EBIS beam line is being constructed, which will allow to power up the magnet to 9T without interfering with beams in the REX beam line. Also a small buffer gas filled RFQ to transform the beams from the WITCH surface ion source into bunched is being developed. This will then make the WITCH experiment independent of other experiments and will increase significantly our tuning and testing possibilities. Finally, the installation of a tape station for precision nuclear spectroscopy, making direct use of the pure and high intensity sample in the WITCH Penning trap, is being prepared too.

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