CYCLOTRON INSTITUTE RESEARCH SEMINAR

The Role of Electrons in β Decay

Dr. Ania Kwiatkowski, TRIUMF

Radioactive decay processes are of intrinsic interest to nuclear physicists, but they also play a pivotal role in stellar nucleosynthesis, investigations of the neutrino's character, and fundamental symmetries. Although more than a century has passed since the discovery of radioactivity, the underlying mechanisms are not fully understood. Yet radioactive decay processes are of interest not only to nuclear physics but also for their role in for example nucleosynthesis. Stellar environments are hot and dense, which can lead to ionization or even nuclear excitation. The high charge states change the possible decay channels: orbital electron capture in bare ions is forbidden, and bound-state β decay may become possible. Most studies of β decay occur under terrestrial conditions (on neutral or low charge states). To understand β decay under conditions more similar to the stellar environment requires highly charged ions and detector set up compatible with highly charged ions (HCI).

I will discuss how ion traps can be used to meet both of these needs. An electron beam ion trap (EBIT) charge breeds singly charged ions through successive electron impact. For the decay spectroscopy a linear Paul trap is well-suited as it is backing free, offers good optical access, and provides long storage times. With these primary ingredients in place the electronic influence on β decay can be studied.

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