WEIGHING ATOMS FOR (NUCLEAR) PHYSICS

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Mass measurements allow the determination of a binding energy through the well-known relation $E = mc^2$. The largest demand for masses comes from the nuclear physics community, essentially because there are so many nuclides (and so little time!). Somewhat like the Standard model, which requires masses to be determined experimentally, nuclear theory has still not succeeded in providing reliable predictions for the most exotic nuclides.

The nuclear binding energy gives important information about nuclear structure as well as the energy available for reactions and decays. As such, there are also "applications" that stem from mass measurements of radioactive species, namely weak interaction studies (including neutrino properties) and nuclear astrophysics.

Mass measurements are necessarily of high precision. Thus, they also provide important information concerning quantum electrodynamics, through the *atomic* binding energy. In addition, masses are required for the determination of fundamental constants – and their eventual variation that might one day constrain string theory.

After an introduction to the realms of physics addressable by mass measurements, a quick review of different techniques will be given, concentrating on the most popular of all: the ion trap. In particular, the first results from TRIUMF's Ion Trap for Atomic and Nuclear physics (TITAN) will be highlighted.

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