Lambda Particles Encyclopedia Article

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Lambda Particles

In the early 1950s, physicists were confronted by two varieties of **strange particles**. Although produced by the strong **force**, these particles lived longer than expected and seemed to decay by the electromagnetic or the weak force. Japanese physicist Kazuhiko Nishijima (1926-) proposed that these particles were produced by the strong force in pairs. The particles in question were the kaon, and the much heavier lambda particle that was discovered in 1947. They were termed strange particles because of their different mode of production and decay. Nishijima believed the particles to be produced in pairs and to be subject to the strong force only as long as they remained in pairs. When a pair of strange particles separated from one another, the strong force could no longer act, and the resulting decays were prolonged since they were by the weak force or the electromagnetic force.

The lambda particle is produced along with another strange particle, such as the kaon. The property of strangeness is preserved in the production of the pair. K0 and [b.Lambda]0 particles have a neutral charge, and do not ionize the gas in the detection chamber. They then decay by the weak force, in a process where strangeness is not conserved, although **electric charge** is conserved. It is accepted that the electric charge is conserved under all circumstances.

In many ways, the lambda particle behaves as a heavy **neutron** with strangeness. It can be incorporated into a **nucleus** and join protons attracted electrons to form a strange **atom**. Because the lambda's lifetime is short, however, such atoms explode when the lambda decays. The lambda nuclei show that the lambda is an additional, albeit unexpected, member of the family containing neutrons and protons. Strange **matter** is unstable and studies are conducted on data derived from lifetimes measures in millionths of a second.

In terms of its place in the standard model, the lambda is a hyperon carrying zero charge, a strangeness of -1, with a **mass** of 1,156 MeV, about 20% more than that of the **proton**, making it the lightest strange baryon. It has a lifetime of 2.63 x 10 seconds (meaning decay via the weak interaction). It is composed of one up quark, one down quark, and one strange quark, in essence a neutron where one of the down **quarks** has been replaced by a strange quark. When the lambda decays, the strange quark converts into an up quark.