Search for Multi-Quark States with the ATLAS Detector

The Standard Model of particle physics attempts to explain the building blocks of matter called fundamental particles and their interactions, which are governed by the four known forces. These fundamental particles are divided into two categories: quarks and leptons. All known matter is made up of either two or three quarks: mesons or baryons. However the Standard Model does not forbid states with four or more quarks. Searches for multi-quarks are currently underway at CERN in Geneva, Switzerland. High energy protons collide at the center of the ATLAS detector and the resulting data is analyzed. We use the short-lived neutral strange particles such as the kaon meson and lambda baryon because of their clean decay signatures. Should a tetraquark state exist and decay into two kaons, one would first reconstruct kaons from their observed decay products and then the invariant mass distribution of two-kaons systems could reveal a tetraquark state. Higher quark states can likewise be looked for with kaon-lambda or lambda-lambda combinations.

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