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The Structure of Something Strange

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All matter that we encounter in our daily lives is made up of baryons. These, in turn, are built from quarks held together by the strong force. Because of the nature of the strong force, it is challenging to understand the interactions between the quarks and how these give the baryons the properties that we can observe. Despite a century of intense effort, the mechanisms behind properties like the mass and spin of even the most common baryons, the nucleons, are not fully understood. By studying the internal electromagnetic structure of the baryons we can learn more about how the quarks are arranged and consequently about the interactions that bind them together. The structure of nucleons has been and continues to be studied extensively, but it is valuable to also pursue other, parallel avenues of research. A complementary and relatively unexplored approach is to study hyperons, *i.e.* baryons that contain strange quarks, instead. The strange quark is considerably heavier than the up and down quarks and is therefore expected to have a different spatial distribution. What are the implications for the structure and what does this, in turn, tell us about the strong force? Answering these questions allows us to form a more general and complete understanding of how baryons are formed. Hyperons are unstable and this makes them complicated to study compared to the nucleons, but because their decays are "self-analyzing" they also offer unique opportunities. In this talk I will discuss how polarization, entanglement, and self-analyzing decays can be combined to study the electromagnetic structure of hyperons, and show recent results from the BESIII experiment at the Beijing Electron-Positron Collider (BEPCII) where this method has been applied to the Λ hyperon.

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