Studying elementary particles & the quantum realm

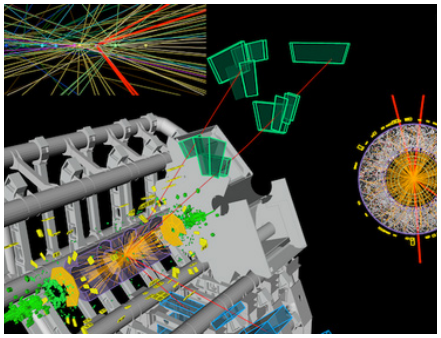
Keith Baker
D. Allan Bromley Professor of Physics

Keith Baker sets new limits on searches for physics beyond the Standard Model.

Baker was inducted into the American Academy of Arts and Sciences and is an American Physical Society (APS) Fellow. He also has received the Edward Bouchet Award from the APS; the Elmer Imes Award for Outstanding Research; the E. L. Hamm Sr. Distinguished Teaching Award; and the National Award for Teaching Learning and Technology. He was honored as a U.S. ATLAS Distinguished Researcher.

Baker has fulfilled his responsibility as a National Science Foundation Committee of Visitors (Particle Physics), and was a judge for the Yale College Porter and Field Prizes.

Baker is the academic editor and co-author of "Quantum Entanglement in High Energy Physics".

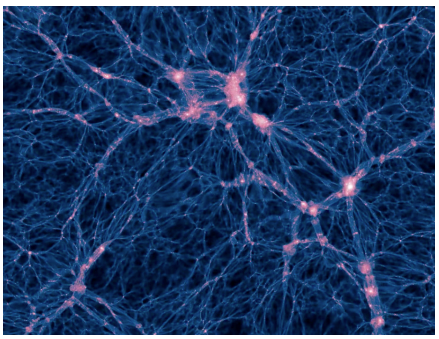


ATLAS

Keith Baker focuses on particle physics research at the energy frontier using ATLAS at the Large Hadron Collider in Switzerland, and precision studies at sub-eV energies. He helped build the ATLAS detectors and was part of the team that carried out the machine learning analysis in the discovery of the Higgs boson, the last elementary particle predicted in the Standard Model of particle physics. Baker is the Yale ATLAS team leader and Yale ATLAS Institute representative. He is also an online data quality transition radiation tracker shifter for ATLAS.

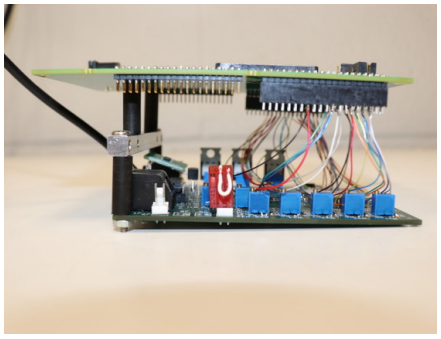
Quantum science & computing in high energy physics

The Baker group studies quantum information science in high energy physics, quantum entanglement, Bell's inequality, and entanglement entropy. The group demonstrates applications of machine learning, quantum computing, and quantum algorithms in physics analyses at high energies to better understand certain anomalies in data from high energy particle physics experiments.



The search for dark matter

Baker is searching for dark matter using the Higgs boson and in the form of axions, which are very low mass particles that are a theorized candidate for dark matter. To enable the latter, the Baker group will install detectors in the new Axion Longitudinal Plasma HAloscope (ALPHA) experiment, located at Wright Lab. ALPHA will search for higher mass axions by employing a novel axion detector called a plasma haloscope. ALPHA will comprehensively investigate how new experimental ideas using plasmas can be used to detect the axion.



Research and development for silicon sensors

The Baker group carries out research and development of monolithic CMOS (complementary metal oxide semiconductor) silicon sensors for use in high energy physics. This makes use of Field Programmable Gate Arrays (FPGA's) and software, as well as analysis programs and programming tools.