Contribution ID: **74** Type: **not specified**

Ultra-Relativistic heavy ion physics and detectors

Thursday, 29 October 2015 11:30 (2 hours)

In ultra-relativistic collisions of heavy ions at the Large Hadron Collider (LHC) and the Relativistic Heavy Ion Collider (RHIC) large amounts of transverse energy and thousands of particles and anti-particles can be created in a single event and measured by experiments. The system that is created is extremely hot (T ~ 2 x 10^12) at temperatures expected only within the first microseconds after the Big Bang. Normal hadrons cannot exist at these temperatures, which are ~ 200,000 times hotter than the sun's core, and a "soup"of quarks and gluons called the quark-gluon plasma (QGP) is formed. The soup is observed to flow easily, with extremely low viscosity, suggesting a nearly perfect liquid of quarks and gluons. New results from heavy-ion collisions at the LHC have extended the study of the QGP initiated at RHIC to higher temperatures and harder probes. Measurements of very energetic jets, extremely large transverse momentum particles, and heavy flavors indicate a very dense and highly interacting system that is opaque to energetic partons. I will present a motivation for physics in this field, and an overview and interpretation of new results. The RHIC and LHC experiments and their features that allow such measurements will also be presented.

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