A. PROJECT SUMMARY

The goal of this project is the study of collisions between relativistic nuclei, ultimately leading to a determination of the properties and of the equation of state of nuclear matter over a wide range of temperatures and densities. High energy density physics is a rapidly growing field that spans a broad range of physics sub-discaplines including nuclear physics, plasma physics, laser physics, fluid dynamics, and magnetohydrodynamics. The astrophysics results from new terrestial and orbital observatories have enabled study of high energy density physics on the stellar, galatic, and universal scales through the study of giant planets, brown dwarfs, white dwarfs, neutron stars, supernovae, gamma-ray bursters, and the big-bang. Laboratory studies, as opposed to astrophysical observations, allow controlled and precise studies of matter under extreme conditions. However, without the possibility of laboratory studies of nuclear matter in bulk (such as in neutron stars) one resorts to the challenging studies of the finite, transient systems produced in reltivistic nucleus-nucleus collisions. These studies probe the high temperature region of high energy density physics phase space, in which there is a transition between hadronic and partonic matter, the quark-gluon plasma (QGP). Although it is clear that dense quark matter is created in the early stages of relativistic heavy-ion collisions, identification of the phase transition boundary will require a comprehensive and correlated set of measured collision observables, as well as, and of equal importance, realistic and extensive calculations which relate the observables to nuclear matter parameters.

This is just a style point, but I don't think you need 'and of equal importance'

For the next three years, analysis, and interpretation of data taken with the Solenoidal Tracker At RHIC (STAR) experiment at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL) and the Compact Muon Solenoid (CMS) experiment at Large Hadron Collider (LHC) at the European Center for Nuclear Research (CERN). Although the data from the RHIC program identifying en running since 2000, has provided clear evidence of for the formation of quark matter the phase transition boundary between the QGP and a hot hadronic gas has proven challenging. To further the understanding of the phase transition boundary, the RHIC program advisory committee has approved a fourteen week beam energy scan. The UCD group will take a lead rol in the preparation for this scan of low energy RHIC runs. Analysis of these data will allow a detailed and comprehensive study across a broad range of temperatures and densities. The CMS detector facility is a large multi-purpose particle physics experiment at the LHC facility at CERN. This collider facility will start operations with pp collisions at an energy of 14 TeV in the center-of-mass in 2008. In 2009, the facility will collide Pb+Pb at 5.5 TeV per nucleon for a total center-of-mass energy of 1.1 PeV. The LHC operations will include a one month heavy-ion run each year. The particle physics goals of the LHC are discoveries of the Higgs Boson and super-symmetric particles. The goal of the heavy-ion program is to use rare probes to determine the properties of the QGP. Specifically, the CMS detector at the LHC will have unique capabilities for measuring heavy flavor, jets, and vector boson probes which are expected to yield information about the earliest stages of these heavy-ion collisions. The UCD group will concentrate their efforts on the flow of heavy flavors (J/ψ, Υ) which will allow a determination of maximum densities achieved in these collisions.

The last sentence seems a bit vague with the phrase 'maximum densities'. I was kind of left wondering maximum densities of what?