RIKEN

Advanced Center for Computing and Communication
http://accc.riken.jp

PHENIX Computing Center in Japan [CCJ]

A.Kiyomichi, T. Ichihara, Y. Watanabe, S. Yokkaichi, O. Jinnouchi, H. En'yo and Y.Goto (RIKEN, RBRC)

RIKEN CCJ Project

- **Regional computing center in Japan for BNL-RHIC experiment especially for PHENIX collaboration.**
- **CCJ serves for RHIC physics activity in Japanese and Asian scientists.**
- **Analysis of large scale data and simulation.**

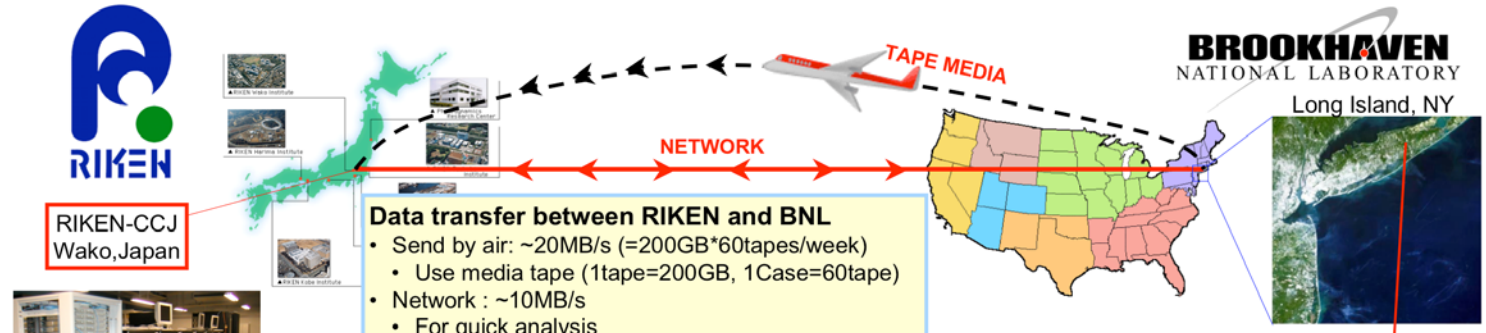
RIKEN-CCJ http://ccjsun.riken.go.jp/ccj/

- CPU performance : 508 Pentium III/4 CPU (Total: 1,111 GHz)
  - 252 (0.7~2.0GHz, CCJ) +256 (3.0GHz, RSCC) CPUs
  - Use CPU resource of RIKEN Super Combined Cluster System (RSCC)
- Disk Storage : 38 TB
- Tape Storage: ~600 TB (= 3,000 tapes, expandable to 1.2 PB)
  - HPSS (High Performance Storage System)

PHENIX Experiment http://www.phenix.bnl.gov/

- Collisions of polarized protons and heavy ions are delivered at BNL-RHIC.
- Understand the spin structure of the proton through polarized proton collisions.
- Search for quark gluon plasma, a state that existed at an early stage after Big Bang.

Amount of DATA **~200TB/year**

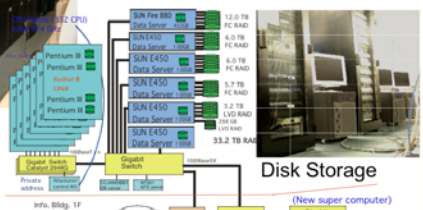


Data transfer between RIKEN and BNL

- Send by air: ~20MB/s (=200GB*60tapes/week)
  - Use media tape (1tape=200GB, 1Case=60tape)
- Network : ~10MB/s
  - For quick analysis

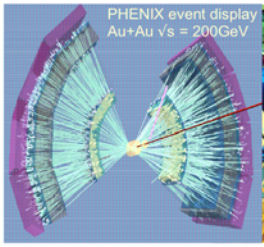
Linux PC Cluster (RIKEN-CCJ)

Disk Storage



Tape Storage

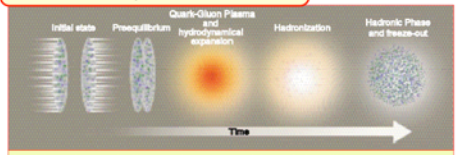
Linux PC Cluster (RIKEN-RSCC)



PHENIX

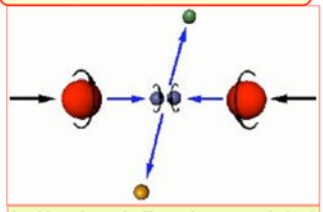
Relativistic Heavy Ion Collider
Brookhaven National Lab.

Study of the Quark-Gluon Plasma
with heavy-ion collisions



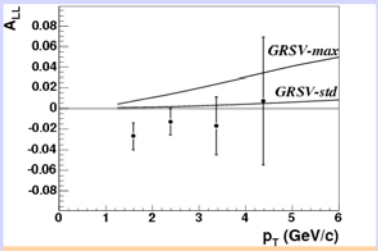
In this schematic illustration two gold nuclei collide and give rise to thousands of quarks and gluons, which then equilibrate into a hot cauldron of matter, the quark-gluon plasma. As this plasma cools, it condenses into the ordinary particles seen by the detectors.

Study of the Proton Spin Structure
with polarized-proton collisions



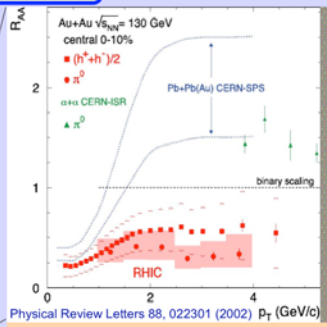
In this schematic illustration two polarized protons collide and obtain important data to understand the spin of the proton.

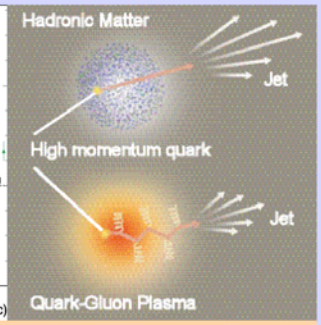
PHYSICS RESULTS



Measurement of the double helicity asymmetry in inclusive mid-rapidity neutral pion production for polarized proton-proton collisions. This is the first of a program to study the longitudinal spin structure of the proton, using strongly interacting probes, at collider energies. In perturbative QCD, A_{LL} is directly sensitive to the polarized gluon distribution function in the proton through gluon-gluon and gluon-quark sub-processes. The observed asymmetry is small and consistent with a small gluon polarization.

The Cover of Physical Review Letters





Plotted as a function of transverse momentum (p_T) is the ratio, R_{AA}, of the measured yield of charged and neutral pions in Au-Au collisions to the yield that would be expected based on an extrapolation of proton-proton collisions. The PHENIX results and measurements taken at lower energies at the CERN SPS are qualitatively different. At RHIC higher p_T seems to be depleted, which was predicted assuming an energy loss of partons in dense matter.