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PHENIX Computing Center in Japan [CCJ]

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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.**

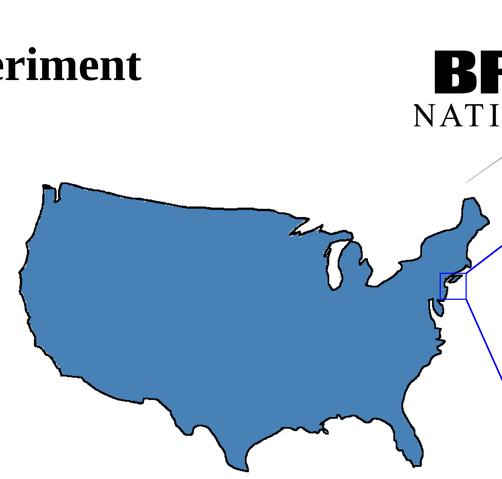
- **RIKEN-CCJ** `http://ccjsun.riken.go.jp/ccj//`
- CPU performance : Pentium III/4 CPU
  - •Use CPU resource of RIKEN Super Combined Cluster System (RSCC)
  - •210 (0.7~2.0GHz, CCJ) +256 (3.06GHz, RSCC) CPUs
- Disk Storage : 53 TB
- HPSS (High Performance Storage System)
  - •Tape Storage: 800 TB (= 4,000 tapes, expandable to 1.2 PB)
  - •4 tape/disk movers / Disk cache 8TB

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.
- 550 collaborators from 13 countries, 62 institutions(as of Mar.05).
- Amount of DATA ~**500TB/year**

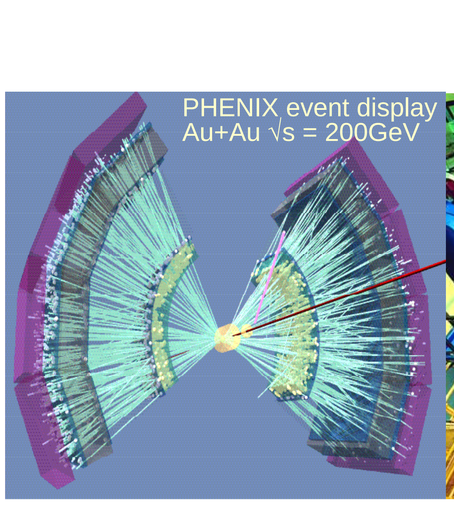
Data of High-energy nuclear phyics experiment

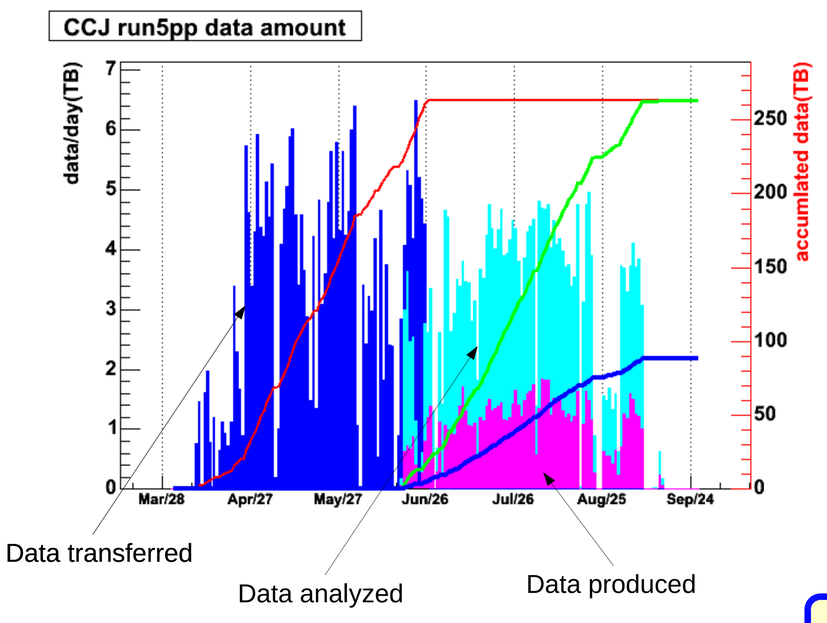
5TB/day = 60MB/sec

Internet

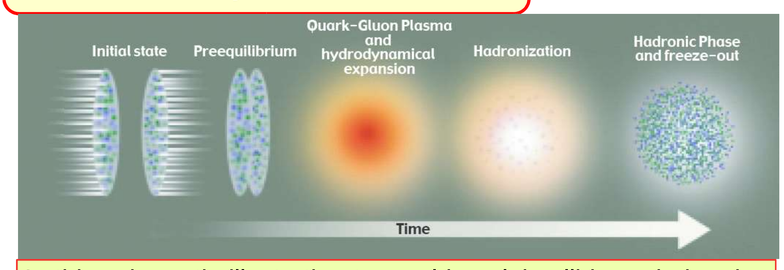


Data transfer between RIKEN and BNL by internet
- In 2005 (PHENIX run5), the raw data were transferred using GridFTP.
  - Transfer is performed simultaneously with archiving to HPSS at BNL.
  - 260 TB of raw data (150K files) were transferred in 80 days (typically 60MB/sec was achieved).
  - Analysis of these data was taken for 90 days by RSCC 200 CPUs and 90 TB of summary data (DST/nDST) were produced.
  - 20 TB of produced data (nDST) were also sent back to BNL.



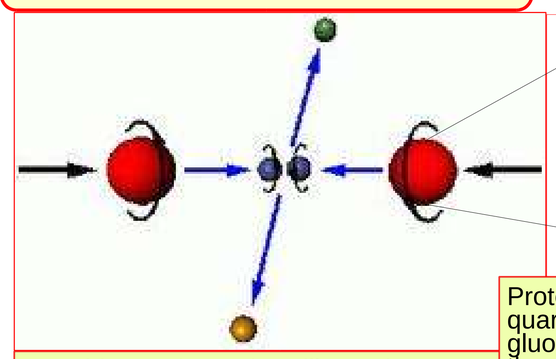


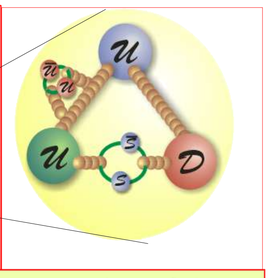
Study of the Quark-Gluon Plasma
with heavy-ion collisions



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

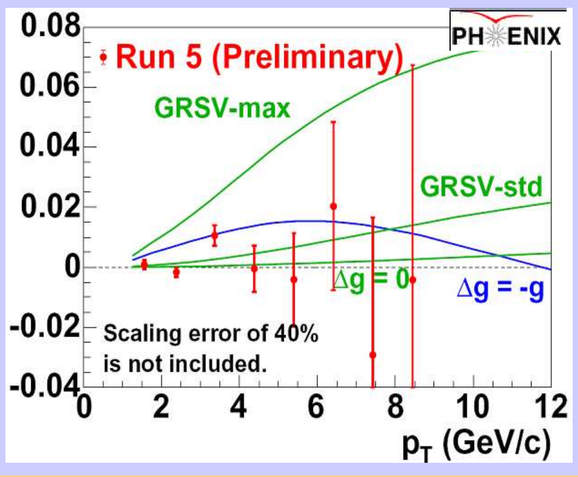




In this schematic illustration two polarized protons collide and obtain important data to understand the spin of the proton.

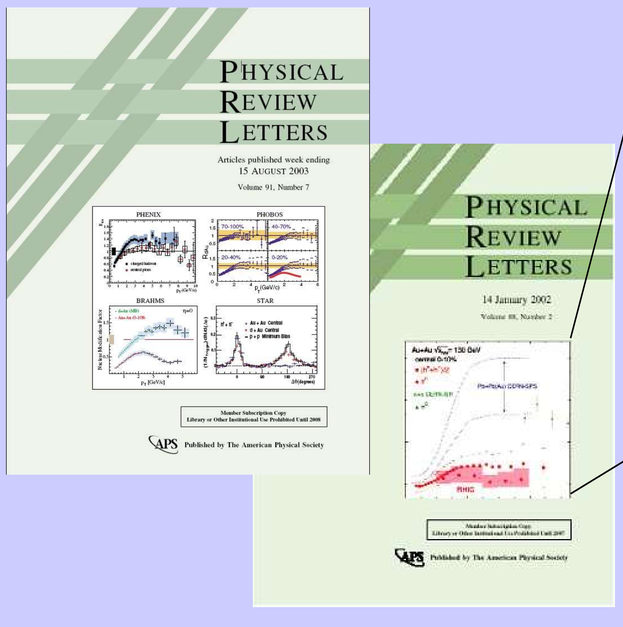
Proton consists of three quarks, sea quarks and gluons. To investigate the spin of gluon in proton, the experiment using polarized-proton is requiered.

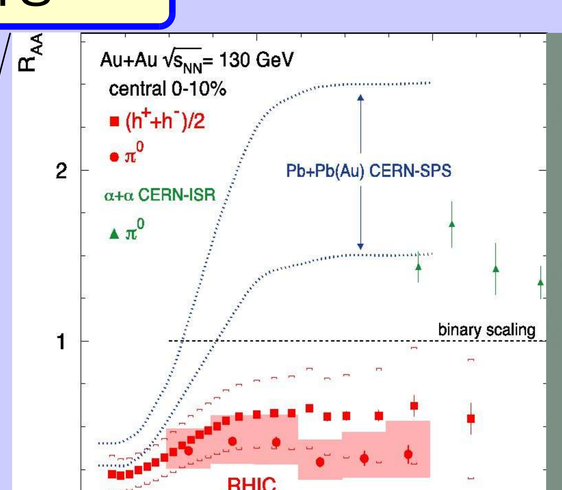
PHYSICS RESULTS



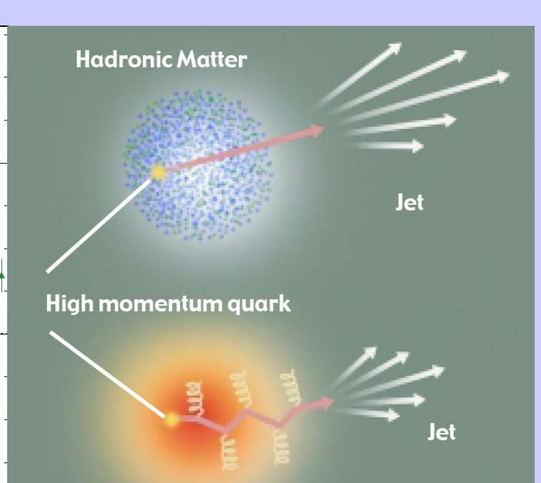
Measurement of the double helicity asymmetry in inclusive mid-rapidity neutral pion production for polarized proton-proton collisions.This is the first of a program to study the longitudinal spin structure of the proton, using strongly interacting probes, at collider energies. In perturbative QCD, A_{LL} 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 standard gluon polarization model.

The Cover of Physical Review Letters





Physical Review Letters 88, 022301 (2002)



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.