Optics Flexibility and Prehistory

Steven Tepikian

Brookhaven National Laboratory

June 26, 2026

Started at BNL as a graduate student from Stony Brook University in April, 1983.

Just after ISABELLE

BNL will build RHIC – "Relativistic Heavy Ion Collider".

Here are the list of proposed lattices for the RHIC project:

- Alessandro Ruggiero:
  - Symmetric optics
  - Looked at using vertical crossing for collisions.
  - Tried to achieve a large warm drift space, assisted by E. Courant and Al Garren.
- Juan Claus:
  - Developing symmetric optics lattice as well.
- S. Y. Lee:
  - Anti-Symmetric optics

Starting from S. Y. Lee's lattice.

1. Replaced BeamLine with almost equally spaced quadrupoles.
   - With the telescope initially set at $\beta^* = 3\,m$
   - Required a space of about $10\,m$ for the detectors.
2. Fit the dispersion adjusting only the dipoles in BeamLine.
3. Optics was then adjusted with the quadrupoles only.

The committee – headed by Satoshi Ozaki, Harold Hahn and Alessandro Ruggiero – has selected this lattice over the others for three reasons:

1. This lattice fit nicely in the existing ISABELLE tunnel.
2. Provided large warm drift spaces for instrumentation, beam dump, etc.
3. Had better chromatic properties than the other lattices.

Geometry was frozen in January, 1992.

S. Tepikian, M. Harrison, "The Conceptual Design of the RHIC 92 Insertion", AD/RHIC/AP-103 (1992)

Dejan Trbojevic modified this to an imaginary γ_T optics.
However, it came too late for changing RHIC to his optics.

1. Michael Harrison was in charge of construction.
   - RHIC was built on time and in budget.
2. The first full ring test of RHIC was without bipolar power supplies. Thus, the β^* squeeze could not be tested. Initially, RHIC could only be run at $\beta^* = 3\,m$.
3. There was a contest to see who can guess the initial tunes that RHIC would produce.
   - If I remember correctly, Haixin Huang won that contest.
4. We learned that sextupole's in the Yellow ring, where the beam goes counter-clockwise, were wired incorrectly.

... RHIC starts ...