

Osaka Symposium and New Accelerator Projects in Japan

(A Trip Report)

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1. The Osaka Symposium

XVI RCNP Osaka Symposium on Multi-GeV
High-Performance Accelerators

2. New/Proposed Accelerator Projects

Projects in Japan

Projects in China

3. Coolers and Beam Cooling

Newly proposed beam cooling methods

1. The Osaka Symposium

XVI RCNP Osaka Symposium on Multi-GeV
High-Performance Accelerators

Purpose:

- To celebrate the 50th anniversary of RCNP
(Research Center for Nuclear Physics)
- To propose a new cooler-synchrotron-collider
- To review the performance and technology development of cooler rings, synchrotrons, and colliders.

March 11 - 14, 1997, Osaka, Japan

3 days, fully packed with talks

16 people from outside of Japan, all expenses paid

Panel review of the proposed RCNP project

Symposium Program:

- Cooler Rings and Cooling Methods
 - T. Tanabe (INS): Electron Cooler at TARN II
 - J. MacLachlan (FNAL): Electron Cooling
 - F. Caspers (CERN): Stochastic Cooling
 - B. Franzke (GSI): Diagnosis of Cooled H.I. Beams
 - D. Prasuhn (KFA, Juelich): Performance of COSY
 - D. Reistad (TSL): Performance of CELSIUS
 - L. Tecchio (Legnaro): The CRYSTAL Project
 - M. Grieser (MPI): Heavy Ion Storage Ring TSR
- Colliders
 - A.M. Sessler (LBL): The Development of Collider
 - J. Wei (BNL): The RHIC Project
- Other multi-GeV Machines
 - K. Sato (RCNP): Multi-GeV Machine at RCNP
 - Y. Yamazaki (KEK): 50-GeV Proton Synchrotron
 - W. Gu (IMP): HIRFL - CSR Project in Lanzhou
 - A. Goto (RIKEN): RIKEN RI Beam Factory
 - T. Katayama (INS/RIKEN): e^- & RI Collision
 - T. Tamae (Tohoku): 1.2 GeV Stretcher - Booster
 - A. Ando (Himeji): New SUBARU - Isochronous Ring

H. Sato (KEK): KEK 12 GeV-PS and Upgrade
P. Schwandt (IUCF): 20 GeV Synchrotron for Spin

- Theories

B. Autin (CERN): Recent Trends in Lattice Design

S.Y. Lee (IUCF): Nonlinear Dynamics

Y. Batygin (RIKEN): Emittance preservation

A. Garren (LBL): Lattice for μ^+ - μ^- collider

- Technologies

S. Wolff (DESY): Superconducting Magnets

C. Ekstrom (TSL): Internal Targets

M. Kumada (NIRS): Ultimate Power Supply

K. Noda (NIRS): Slow Beam Extraction at HIMAC

The Proposed RCNP Cooler Collider:

- Store/collide protons, light ions, electrons, polarized ions
allow collision between different species
- Collision energy at multi-GeV range
adjustable, around 5 GeV/u
- Various kinds of beam cooling for emittance preservation
intrabeam scattering is strong for low energy ions
- Two independent rings, flexible modes for storage and collision
- “Figure of 8” configuration for depolarization minimization

2. New/Proposed Accelerator Projects

New projects in Japan:

- SPRING-8
- Japanese B-Factor
- 50-GeV Proton Synchrotron
- New SUBARU - Isochronous Ring
- RIKEN RI Beam Factory
- Japanese Linear Collider
- RCNP (Osaka) Cooler Collider
- ...

Proposed projects in China:

- Synchrotron Light Source at Shanghai
- Tau-Charm Factory at Beijing
- Heavy Ion Cooling Storage Ring at Lanzhou
- Hefei Synchrotron Light Source Upgrade

3. Coolers and Beam Cooling

Methods of Beam Cooling:

- Radiative Cooling

1956, Kolomenski and Lebedev

natural in circular machines; 3D

for electrons and other radiative particles; high energy

- Electron Cooling

1967, Budker

using cold electron beams; 3D

for protons and ions; low to medium energy

- Stochastic Cooling

1968, van der Meer

using GHz pick-ups, amplifiers, and kickers; 3D

for charged particles; any energy

- Laser Cooling

1975, Wineland, Dehmelt, Hansch, Schawlow

based on velocity-selective transfer of photon momentum

for partially stripped ions; longitudinal

applied to ion beams by MPI Heidelberg group and Aarhus group; achieved 1 mK ($\Delta p/p \approx 4 \times 10^{-7}$)

- Ionization Cooling
 - 1980, Skrinsky
 - based on energy loss by particles passing through a material medium
 - for muons
- Optical Stochastic Cooling
 - 1993, Mikhailichenko, Zolotarev, Zholent,
 - using wigglers for pick-ups and kickers, and wide-band lasers as amplifiers; ~ 90 GHz
- Stimulated Radiation Cooling
 - 1996, Bessonov and Kim
 - using wide band lasers as a wiggler for damping
 - for non-fully-ionized ions
- Laser Cooling in 3D
 - 1994, Okamoto, Sessler, Moehl
 - using coupling cavities or dispersive location rf cavities on synchro-betatron resonance
 - for laser cooling of ions in all 3 dimension
- Tapered Cooling for Beam Crystallization
 - 1995, Wei, Li, Sessler, et. al.
 - forcing particles of different momenta to circulate at the same angular frequency