RHIC Beam Experiments 2003

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RHIC Beam Experiments Workshop

Beam Exp 2003 - Outline

- Goals and "boundaries" of beam experiments
- Recall of RHIC Retreat conclusions
- Overview Beam Ex program for run 2003
- "Extra" proposals (outside labs)
- Written beam experiments proposals
- Workshop goals

  review of general plans 2003 (machine, experiments)

  beam experiments program(→prioritization)

  review of beam diagnostics and techniques

  collaborative aspects (→remote operations)

Beam Ex: goals/boundaries

GOALS

- Machine ultimate **performance**
- **Luminosity** increase, upgrade (RHIC-II)

  upgrades are not straightforward (HERA, Tevatron)

  effort and investment are needed to prepare them

- Inter-lab **collaborations** (common goals, exploit synergies, remote ops? etc.)

Beam studies → operations

Examples 2001:

- IR correction, linear→ nonlinear
- Chromaticity measurements via radial excitation
- Octupole compensation

2001 RHIC Beam Experiments

Beam studies program in parallel to Operations and Machine development for

- Testing new techniques (→operations
- Collaborative beam experiments (CERN, FNAL,…)

70 h (gold run) and 20 h (PP run)

Main activities/results:

- IR measurements/corrections
- Beam-beam studies
- Longitudinal and transverse impedance
- Resonance compensation
- Spin manipulations
- Pressure rise investigations / 110 bunches
- Testing of new decoupling techniques
- Beam dynamics studies

Beam Ex Program 2003

AC dipole	M. Bai
Beam-beam	W. Fischer
Chromaticity	S. Tepikian
Collimation	A. Drees
Flattop studies	V. Ptitsyn
Instabilities	M. Blaskiewicz
Pressure rise, e-cloud	S.Y.Zhang
Stochastic cooling	M. Blaskiewicz
Transition studies (alpha-1)	C. Montag

Discussed at the workshop Thursday afternoon

RHIC Beam Experiments 2003

RHIC Beam Experiments 2003

Next Meeting: Fri October 4 | **RHIC Run 2003** | **Beam Experiments 2001**

Beam Ex 2003 Organization

Beam Ex Program	Beam Ex Info/Proposals	Beam Ex Material
AC Dipole (M. Bai)	AC dipole memo	
Beam-beam (W. Fischer)	Beam-beam WEB page List of beam-beam experiments	RHIC beam-beam papers
Chromaticity (S. Tepikian)	Chromaticity on the ramp -Horizontal Chromaticity on the ramp - Vertical	chromaticity via head-tail SPS RF phase modulation
Collimation (A. Drees)		
Flattop, Nonlinear, IR (V. Ptitsyn)		
Instabilities (M. Blaskiewicz)	Instabilities memo	
Pressure rise / e-clouds(S.Y.Zhang)	Pressure rise paper	
Stochastic Cooling (M. Blaskiewicz)	Stochastic cooling (M.Brennan)	
Transition (alpha-1) (C. Montag)		

RHIC 2003 BEAM EXPERIMENTS WORKSHOP

BNL September 26-27, 2002 ***WEBPAGE***

http://www.agsrhichome.bnl.gov/AP/RHIC2003/BeamEx2003

Beam Ex 2003 - scheduling

Conclusions from RHIC Retreat 2002 (march):

Monday	Scheduling Meeting (decision)
	scheduling physicist (1)
	experiment liaisons (5)
	run coordinator (1)
	beam experiments (1)
	Roser, Pile (+ Management if necessary)
Tuesday	Time Meeting (broadcast)
Weekly	Experiments Meeting
Weekly	Beam Experiments Meeting
Daily	9 o'clock meeting
	during set-up and ramp-up only
	to handle 'emergency' situations

Beam Ex 2003: scenario

For each mode in run 2003 (d-Au, PP):

Set-up	2 weeks: start-up, new system commissioning
Ramp-up	3 weeks: luminosity increase
Running	~12 weeks d-Au ~4 weeks pp

Dedicated beam experiments time during running periods

Preparation activity parasitic to set-up and ramp-up time
(instrumentation, diagnostics, application commissioning, etc.)

Beam experiments time: 12 h/ week

- Program, written proposals, prioritization (at workshop, at weekly meetings) → weekly scheduling
- If necessary compromise on beam ex length, rather than frequency

“Summer Fridays” schedule

- July 19 — AC dipole (M.Bai)
- July 26 — Instabilities (M.Blaskiewicz)
- Aug 2 — Flattop (V.Ptitsyn)
- Aug 9 — (OFF)
- Aug 16 — Beam-beam (W.Fischer)
  Collimation(A.Drees)
- Aug 23 — Pressure rise (S.Y.Zhang)
- Aug 30 — Stochastic (M.Brennan)
- Sep 6 — Chromaticity experiments (S.Tepikian)
- Sep 13 — (Spin 2002)
- Sep 20 — (Shelter Island)
- Sep 26-27 — Beam Experiments Workshop

Proposals from collaborators

Collaborative studies in 2001 (examples)

- IR measurements and corrections (CERN, FNAL)
- Resonance driving terms, coupling resonance (CERN)
- Beam-beam (FNAL, LBL)

Proposals for 2003 from collaborators

- RF phase modulation, chromaticity (O.Bruning) → Rhodri talk
- Measure synchrotron radiation suppression (H.Burkhardt)
- Head-tail chromaticity measurement (R.Jones) → Rhodri talk
- IR correction – cont'd (J-P. Koutchouk) → operations
- Coupling feedback (J-P. Koutchouk)
- Resonance driving terms – cont'd (F. Schmidt) → Frank talk
- Quench limit test with beam (R. Schmidt)

Measure of total energy loss

measure accurately the total energy loss at moderate relativistic energies

Motivation: free space synchrotron radiation well known at high energy

Lower energies→ coherent radiation + shielding by conducting pipe

RHIC → coasting beams → measure shielding effect (γ 50-300)

Previous measurements: SPS (limited by vacuum quality), HERA

RHIC parameters attractive, suppression substantial

Au 70 GeV: 0.06

Au 100 GeV: 0.44

Suppression much less for protons

~2 h coasting beam in RHIC – different energies – different species

Field stability and monitoring important

(HERA, SPS→ precision 10^{-5} in 1 h possible)

Measure of quench limits

LHC machine protection

Issue: validation of calculation/simulation of quench limits

- How well do these estimate compare with reality?
- How can we set BPM thresholds to adequately protect the machine without 'crying wolf' too often?

Experiment: produce a quench in a controlled way

- Orbit bump → increase beam intensity
- Record beam and magnet parameters, post mortem data
- Quench in a **independently powered magnet** and in a **string**
- **BLM thresholds** on the basis of experimental data

Quench limit predictions for RHIC, analysis

(Verena Kein, doctoral student will visit RHIC in early 2003)

Coupling feedback

J-P. Koutchouk

- Use **coupling transfer function**

- Used already but not in a feedback loop
- Recent studies by S. Farthoukh→**principle, requirements**
- **1 shift at SPS** → 1 point measured for frequencies outside the beam eigen-frequencies
- Used **AC dipole mode of excitation** (avoid blow-up)
- Analysis in progress
- If confirmed → test on a RHIC ramp?

Beam Ex written proposals

Written proposals for experiments (←memos)

- Experiment goal and feasibility
- Benefits for the machine (operations, performance, upgrades)
- Measurement description (specify instrumentation, applications, MCR resources, time needed etc.)
- Plan for data analysis
- Output

Selection and prioritization

Example CERN → formal committee

RHIC 2003 → use **workshop** to start prioritize program

collect written proposals by mid december, **review**

use **weekly beam-ex meetings** to update

WS agenda - Overview

Overview Session

Thursday September 26 – morning

Welcome	S. Ozaki	9:00-9:10
Overview Run 2003	T. Roser	9:10-9:40
RHIC physics experiments 2003	T. Ludlam	9:40-10:20
COFFEE		10:40-11:10
Run 2003 scheduling	A. Rusek	11:10-11:30
Beam studies at the Tevatron	F. Schmidt T. Sen	11:30-12:00

WS agenda – Beam Ex program

Beam Experiment Program

Thursday September 26 – afternoon

AC dipole	M. Bai	1:30-2:00
Beam-beam	W. Fischer	2:00-2:30
Chromaticity	S. Tepikian	2:30-3:00
Collimation	A. Drees	3:00-3:30
COFFEE		3:30-4:00
Flattop and nonlinear	V. Ptitsyn	4:00-4:30
Pressure rise, E-cloud	S.Y.Zhang	4:30-5:10
Transition	C. Montag	5:10-5:30

WS – diagnostics & techniques

Diagnostics & Techniques
September 27 – morning

Instabilities and stochastic cooling	M. Blaskiewicz	9:00-9:30
RHIC diagnostics in 2003	P. Cameron	9:30-10:00
Chromaticity via head-tail and	R. Jones	10:00-10:45
COFFEE		10:45-11:05
Measurement of resonance driving terms	F. Schmidt	11:05-11:35
Progress on RHIC and LHC Beam-beam simulation at LBL	M. Furman	11:35-12:00

Workshop agenda – remote ops, closeout

Remote Operations, Closeout
Friday September 27 – afternoon

Overview of Remote Operation Workshop	T. Satogata	1:30-2:00
Beam experiments and remote operations	F. Pilat	2:00-2:15
Discussion, prioritization	ALL	2:15-3:15
Workshop Summary	F. Pilat	3:15-3:30