

Future experimental beam studies relevant to VLHC

A report on the February 2000 US-LHC
Collaboration Meeting

on

Accelerator Physics Experiments for Future Hadron
Colliders

Tuesday, 22 February 2000	Wednesday, 23 February 2000
<p>Session 1: Single Beam Investigations Chair: R. Talman, Cornell</p> <p>08:20 D. Lowenstein Welcome</p> <p>08:30 Th. Roser RHIC Run 2000 plans</p> <p>08:55 Ch. Montag Persistent current effects in HERA</p> <p>09:20 W. Fischer RHIC dynamic aperture and beam lifetime studies in 2000</p> <p>09:45 Coffee Break</p> <p>10:00 F. Pilat Local non-linear IR correction studies</p> <p>10:25 D. Trbojevic Beam growth studies with primary and bent crystal collimators</p> <p>10:50 Discussion</p>	<p>Session 3: Experimental Techniques Chair: O. Brüning, CERN</p> <p>08:30 P. Bagley Local coupling correction</p> <p>08:55 W. Turner Bunch by bunch measurement and optimization of luminosity in LHC</p> <p>09:20 F. Schmidt Detuning, resonances and the complete nonlinear model determined from turn-by-turn pickup data</p> <p>09:45 Coffee Break</p> <p>10:00 Y. Papaphilippou Broad band impedance measurement from turn-by-turn pickup data</p> <p>10:25 M. Bai Measurements with AC dipoles</p> <p>10:50 W. Fischer Transverse echos in RHIC</p> <p>11:15 Discussion</p>
<p>Session 2: Colliding Beam Investigations Chair: M. Syphers, FNAL</p> <p>01:30 P. Bagley Tevatron Run II plans</p> <p>01:55 T. Sen Beam-beam studies at the Tevatron</p> <p>02:20 O. Brüning Beam-beam effects in the LHC</p> <p>02:45 Break</p> <p>03:00 M. Furman Beam-beam simulation of separated beams</p> <p>03:25 V. Shiltsev Beam-beam compensation at the Tevatron: R&D Status</p> <p>03:50 V. Ptitsyn Beam-beam studies at RHIC</p> <p>04:15 Discussion</p>	<p>Session 4: Collaboration Organization and Summary Chair: F. Pilat, BNL</p> <p>01:30 R. Talman Summary Session 1</p> <p>01:50 M. Syphers Summary Session 2</p> <p>02:10 O. Brüning Summary Session 3</p> <p>02:30 Break</p> <p>02:45 Discussion Collaboration organization, short- and long-term plans (DRAFT)</p> <p>05:00 Close Out</p>
06:30 No-host dinner, Costa de Espana, Port Jefferson	

<http://www.agrhichome.bnl.gov/LHC/org/Beam2000/index.html>

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2 day workshop: 3 Sessions, plus Close-Out

- Single beam investigations
- Colliding Beam investigations
- Experimental techniques

4/30/00

M. Syphers / APS VLHC mini-symposium

Major Areas of Discussion

- RHIC/Tevatron operation/studies plans
- IR corrections -- LHC and RHIC
- Beam-beam effects -- RHIC, Tev, LHC
- Persistent current effects -- HERAp
- Luminosity (bunch-by-bunch) optimization
- Detuning resonances via turn-by-turn data
- Broad band impedance measurements
- Local coupling correction
- AC dipoles, echos, ...

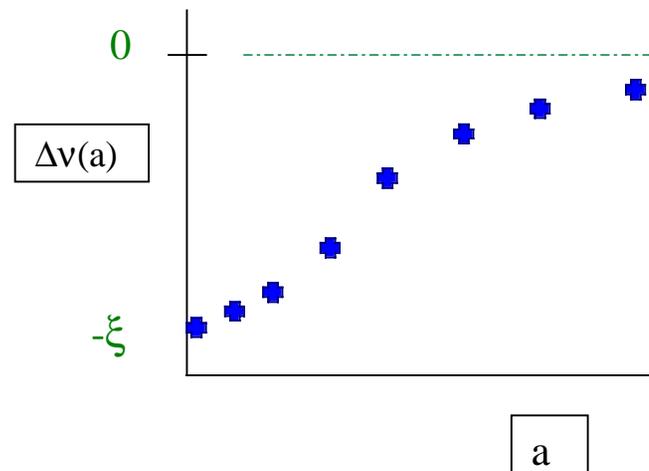
POSSIBLE TOPICS FOR ORGANIZED EXPERIMENTS/STUDIES:

IR Corrections

IBS -- problem for studies, or study the problem...

Beam-beam tune footprint (HO and LR)

Beam-beam $\Delta\nu(a)$ -- á la E-778



Crossing Angle Studies

Lifetime

Synchro-betatron resonances

Dynamic Aperture

Bringing beams into collision

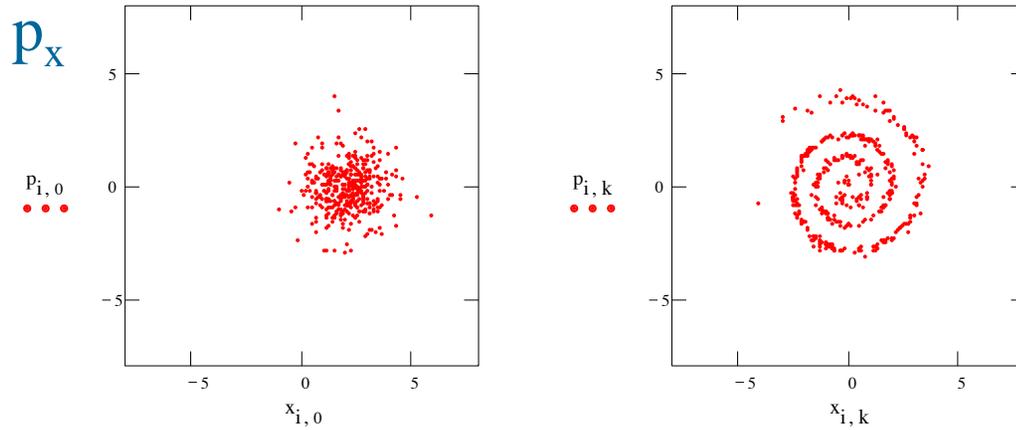
Coherent Beam-beam modes

Observable?

Feedback?

$$\nu_0 = 20.618 \quad \xi = 0.007$$

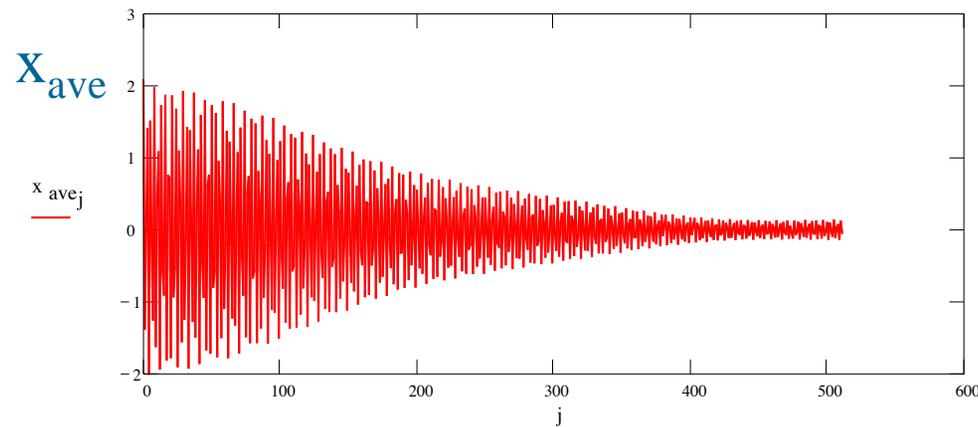
$$\Delta x = 2$$



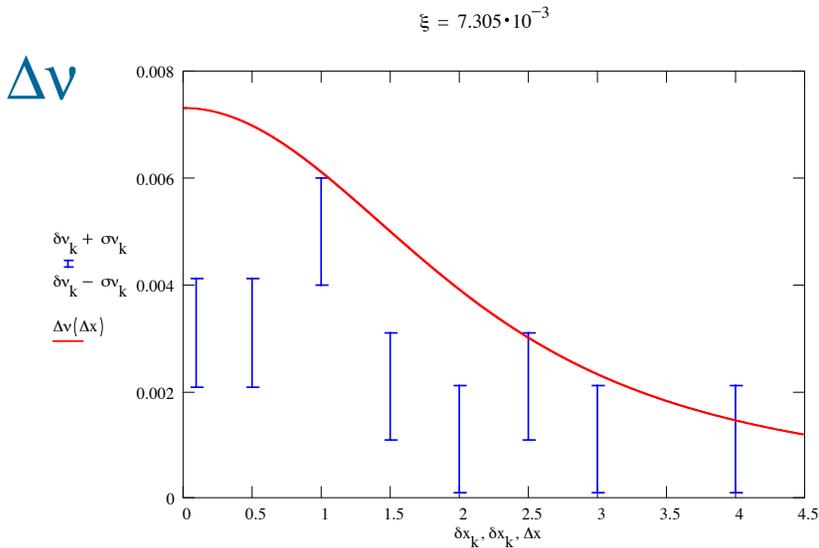
Simulation:
 induce a betatron
 oscillation of a low
 intensity, low emittance
 bunch interacting
 with a strong bunch
 ($\xi = 0.007$) at one
 interaction point...

X

$$x_{ave_j} := \frac{1}{N_{part}} \cdot \left(\sum_i x_{i,j} \right)$$



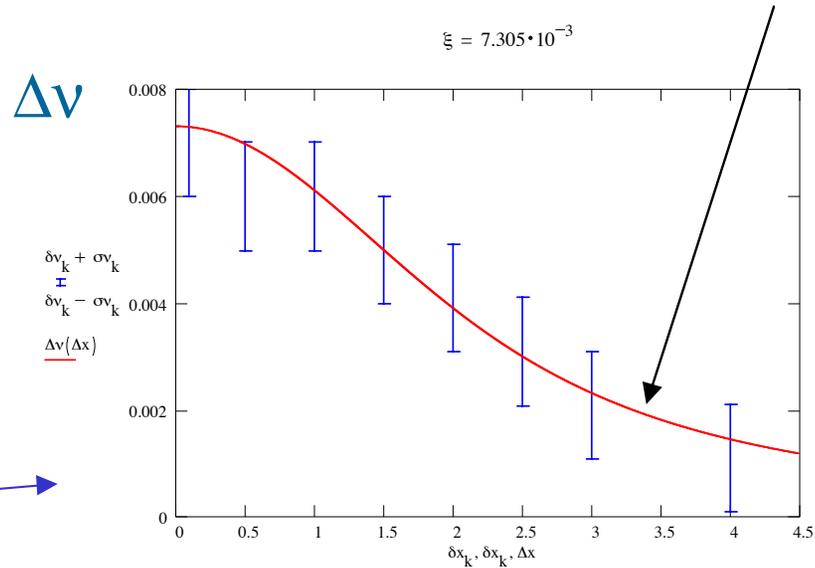
Measure average
 bunch position vs. time
 (turns) and measure
 tune...



Strong beam emittance =
 $6\pi\sigma^2\gamma/\beta = 20 \pi \text{ mm-mr}$

Single particle prediction

Weak beam
emittance
= $20 \pi \text{ mm-mr}$
= $2 \pi \text{ mm-mr}$



Kick ampl. (σ)

Next Steps... ..proposals to be generated:

- IR Corrections -- commissioning plan for IR correction system in RHIC
 - Setting of nonlinear correctors; future applications to LHC
- Beam-beam studies -- broad in scope; RHIC and Tevatron (HERAe/p?)
 - Beam-beam footprint measurements (Tevatron/RHIC)
 - Search for coherent π mode (predictions for RHIC)
- Collimation -- RHIC system; use to study IBS?
- Luminosity -- test LHC process at RHIC?
- AC Dipole -- install in RHIC, summer 2000; use as diagnostic tool to be explored

Fall Workshop...

- A workshop at/near Fermilab is to be organized for Fall 2000
- Hope is for strong proposals of above experiments (or others) for discussion
- Further topics to be explored...

to be announced soon on VLHC web page and via emails...