

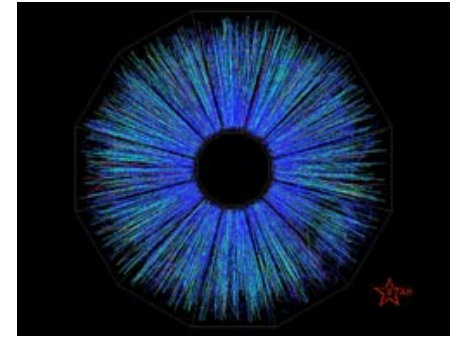
VLHC Update

Welcome everyone to the VLHC Annual meeting
..... a superconducting proton-proton collider with approximately 100 TeV cm
and approximately 10^{34} cm⁻²sec⁻¹ luminosity.

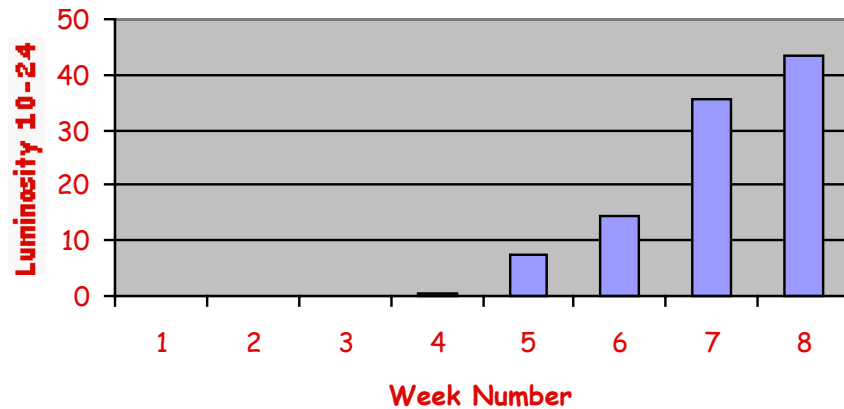
What's new since last year at Monterey ?

- **Good year for hadron colliders** - Tevatron Run II + RHIC first physics run + LHC construction
- **Staging Scenarios**
- **Workshops/Meetings**
- **Upcoming Events**

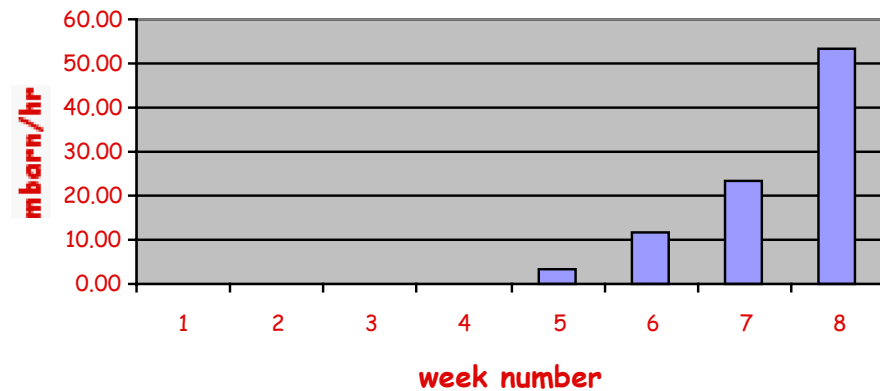
"A Good year for Hadron Colliders" The Latest Hadron Collider - RHIC



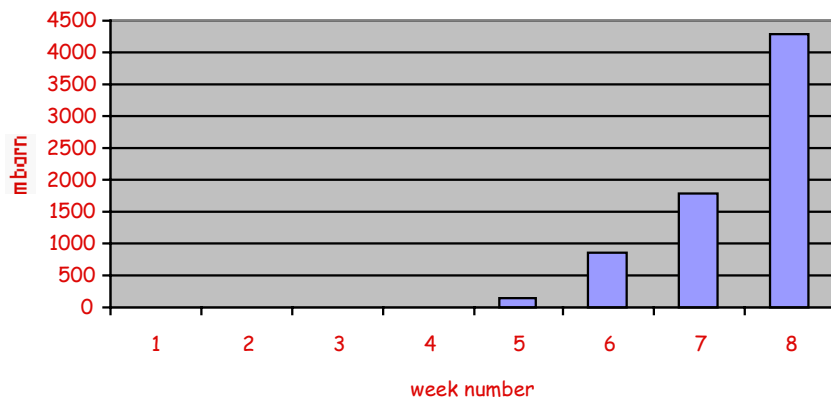
Peak Luminosity per week



Average Luminosity per hour of collisions

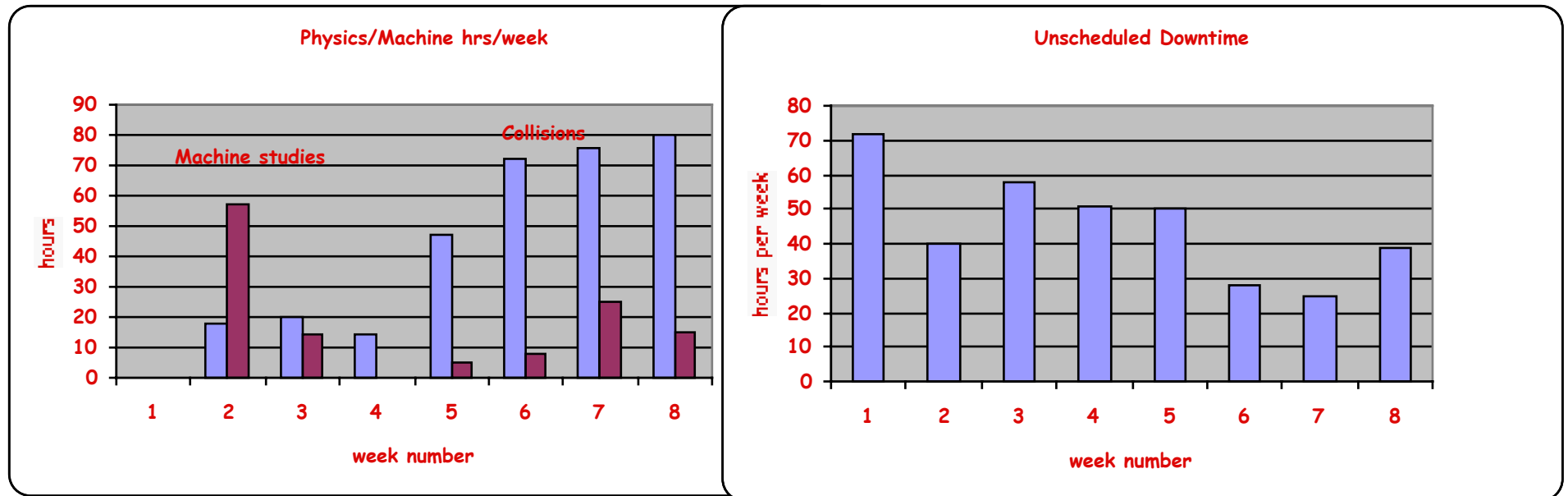


Integrated Luminosity per week



- On this scale the first collisions were about week minus 7
- Physics run started when detectors were brave enough to install silicon !
- All data with Au
- Peak luminosity ~20% of design

"A Good year for Hadron Colliders" RHIC Start-up



- No failed magnets to date - good for VLHC reliability stats
- Essentially no cryogenic downtime
- Power supplies were main problem (downtime & tracking)
- 70% of design energy, no low beta squeeze-fixed lattice

"A Good year for Hadron Colliders" Medium term Future Prospects

We are well placed to increase our knowledge base

- LHC provides construction information/experience
- RHIC gives first access to p-p regime
- Tevatron has high bunch intensities, long range beam-beam etc....
- RHIC has significant flexibility in operating parameters (bunch spacing & intensities, X-ing angle, azimuthal cogging, asymmetric energies, particle species, etc....)
- SPS studies to produce LHC beams

Potentially fertile situation for collaborative efforts

Staging Scenarios

Tacit recognition that it may not be possible (or desirable) to get from here to there in one step.

It does tend to introduce additional complexity and must satisfy certain boundary conditions:

- Must be meaningful for HEP
- Must be consistent with a global perspective e.g. LHC or "super" LHC
- Must be well aligned with the ultimate goal i.e. significant benefit to final stage

Staging scenarios also tend to re-open debate about the ultimate energy/luminosity since one is trying to optimize more than one thing

See Ernie's talk

Workshops 1 - Synchrotron light

BNL Sept. 2000

Workshop Goals

The workshop is intended to be 'An initial investigation into the advantages and drawbacks of synchrotron radiation in a high field VLHC. We would like to identify and clarify future topics for further investigation'.

Synchrotron radiation damping at very high proton beam energies can result in hitherto unobtainable beam densities which may prove to be very beneficial in achieving machine performance goals.

Radiated power will inevitably complicate the beam tube environment (- hadron machines discover electrons !)

Workshops 1 - Synchrotron light

Three working groups:-

- Group 1 Round/Flat Beams
 Dick Talman (GL) - Cornell, Steve Peggs-BNL, Jim Murphy-BNL, John Johnstone-FNAL
- Group 2 Electron Cloud & Vacuum Effects
 Miguel Furman(GL)-LBL, Dejan Trbojevic-BNL, Mauro Pivi-LBL, Oswald Grobner-CERN, Kathy Harkay-ANL, Peter Limon-FNAL
- Group 3 Damping Dynamics
 Alex Chao(GL)-SLAC, Brett Parker BNL, Jie Wei-BNL, Tanaji Sen-FNAL

Group 1/3

Group 2

See Steve Peggs' talk

See Mauro Pivi's talk

Workshops 2 - Beam Based Experiments

BNL Feb 2000

Workshop was really an LHC inspired event rather than a VLHC one but issues (and participants) had a certain overlap with VLHC

Workshop Goals

- Plan experiments in the LHC era
- Plan studies at hadron colliders relevant to the LHC
- Investigate new experimental techniques
- Form experimental collaborations

4 Sessions over 2 days

- Single Beam investigations
- Colliding Beams investigations
- Experimental techniques
- Collaboration organization

See Fulvia Pilat's talk

Workshops 3 - Magnet Technology

FNAL May 2000

Seven sessions over 3 days ~50 participants

A little bit of accelerator physics creeping in.

Universal cry from the magnet guys: **What's the aperture ?**

Superconducting Magnets are the 'enabling' technology for the VLHC. Magnet technology development is our biggest activity related to the VLHC.

Workshops 3 - Magnet Technology FNAL May 2000

(from Peter Limon's summary talk - Magnet Workshop)

- We are beginning a rich and varied R&D program in the U.S.
Is it too varied?
- **No!** At our present level of understanding it is good to have a diverse program:
 - We are at the beginning of a long and possibly difficult research, development and planning effort.
 - We don't know what the best, or even a good direction is — in spite of the fact that each individual knows the only right answer.
 - Some of the technologies are so difficult that they are really experiments, not development. Some may fail!
- It is too early to make the NLC mistake.
- It is too early to restrict the possibilities.

Magnet Technology

What's new in the past 12 months

- National effort on Nb₃Sn - *see Peter Lee's talk*
- Starting to see some early results from high field R&D during the past several months.
- Infrastructure & magnet designs are maturing
- Low field system tests continue. Ideas evolve.

A full session of this meeting devoted to this topic. Wide range of issues - medium field will come up (though probably not in the magnet session). Remember low-field colliders still need high field IR's

Steve Holmes - Magnet Workshop

STRATEGIC QUESTIONS

Easy Questions

- What is motivating the R&D program?
 - Is it high field magnet R&D? or
 - Is it high field accelerator magnet R&D?
- If accelerator magnet R&D, what is providing the context for the work?
 - Is it a small (100 km) ring supporting a high field, 100 TeV ring? Or
 - Is it a large (600 km) ring supporting a low field, 100 TeV ring? Or
 - Is it a staged scenario based on an intermediate circumference ring?

Steve Holmes - Magnet Workshop

STRATEGIC QUESTIONS

Harder Questions

- How much of a benefit is synchrotron radiation, really?
 - Are damping times measured in hours really all they're cracked up to be?
- Is there a magnetic field that is "too high"?
 - At what point does the synchrotron radiation load become unmanageable?
- Is there a magnetic field that is "too low"?
 - At what point does the circumference of the tunnel become unmanageable (for either technical or cost reasons)?
- How much systems engineering should be feeding into the magnet development?
 - How much emphasis should be placed on understanding the power and cryogenics distribution systems that would support a particular magnet

Steve Holmes - Magnet Workshop

STRATEGIC QUESTIONS

Hard Questions

- When and how should specific technologies be abandoned?
 - When and how should cost goals be established?
 - When and how should technical milestones be established?
 - How do we evaluate progress relative to such milestones?

Upcoming Events in the next 12 months

- Collective effects will be addressed at a Workshop to be held at SLAC in the Spring of 01 - hoping to get an improved perspective on physical aperture issues. Might help magnet aperture questions.
- Beam based experiments workshop II with more focus on VLHC issues. To be held at Fermilab in Feb (?) 01
- HEACC in Japan March 01. It appears there will be an invited VLHC talk
- Snowmass is back once again. The HEP community will collectively ruminate on the future. Snowmass meetings are always potentially important. Some of them actually are!
see Peter Limon's talk & the Roundtable discussion
When do we try and answer Steve's hard questions ?

Workshop Overview-Themes

- Technical
 - Magnet technology, Accelerator Physics, Accelerator systems
- Strategic
 - Staging scenarios, Snowmass, Round Table, New Facilities
- Motivation
 - 2 HEP talks, Experimental interface
 - (Bob Palmer will probably address all three categories simultaneously !)

n.b. No detailed design/parameters yet

Workshop Details

- Reception tonight at 18.00, Dinner tomorrow night starts at 18.00.
- Lunch is open. We have tried to leave a reasonable length of time to peruse Port Jeff (provided the speakers control themselves)
- Program Committee
 - The Steering committee
- Local Organizing Committee
 - Peter Wanderer, Steve Peggs, Diana Votruba, Mike Harrison
- Administrative Support
 - Diana Votruba, Anna Petway
- Computing
 - David McChesney We have rudimentary computing; a single telephone network connection, line printer (transparencies)
 - Talks will be put up on the web, like last year