



# LHC Transverse Feedback Overview

Peter Cameron

# Outline



The Charge

The Agenda - how it's organized

How the Agenda addresses the Charge

Action Items from the Workshop

Transverse feedback - what, why, when,...

The FY05 Task Sheet

Project Scope, Boundaries, Responsibilities,...

Milestones

# The Charge



1. Can the 2005-2008 resource-loaded action plan be validated?  
Are resources adequate to meet the schedule?
2. Will current design meet tune, chrom, and coupling spec?  
Is the spec sufficiently detailed and precise?
3. Does the spec adequately address the evolution from low-intensity commissioning to high-luminosity operations?
4. Does the schedule insure high probability that TF will be available when ramping begins? Will TF be needed?
5. Is the Control System interface sufficiently well defined?
6. Is the commissioning plan adequate for this stage of the project? Will sufficient resources (manpower) be in place?
7. What are the prioritized action items?

# Agenda: results ▶ details/plans ▶ schedule



## Monday, April 4th

**0900 - Introduction and Overview - Pete Cameron**

**0945 - The LHC Specification - Rhodri Jones**

**1045 - Results from the BNL 245MHz system - Pete Cameron**

**1145 - Coupling Measurement on the Ramp - Yun Luo**

**1330 - Direct Diode Detection - Rhodri Jones**

**1415 - 3D Results from CERN, FNAL, and BNL - Pete Cameron**

**1500 - The 60Hz Problem - Pete Cameron**

**1600 - System Architecture - Pete Cameron**

**1635 - The DAB Board - Rhodri Jones**

## Tuesday, April 5th

**0900 - Both Sides of the Interface to Controls - Pete Cameron**

**0935 - Addressing the Specification - Pete Cameron**

**1025 - The Commissioning Plan - Rhodri Jones**

**1115 - Cost and Schedule - Pete Cameron**

# Agenda and Charge



Introduction and Overview

The LHC Specification

Results from BNL 245MHz system

Coupling Measurement

Direct Diode Detection

3D Results from SPS, FNAL, BNL

The 60Hz Problem

System Architecture

The AFE and Digitizer Board

The DAB Board

Both Sides of Interface to Controls

Addressing the Specification

The Commissioning Plan

Cost and Schedule

TF Design Review 4-5 April 2005

**Can the 2005-2008 resource-loaded action plan be validated? Are resources adequate to meet the schedule?**

Will current design meet tune, chrom, and coupling spec? Is the spec sufficiently detailed and precise?

Does the spec adequately address the evolution from low-intensity commissioning to high-luminosity operations?

Does the schedule insure high probability that TF will be available when ramping begins? Will TF be needed?

Is the Control System interface sufficiently well defined?

Is the commissioning plan adequate for this stage of the project? Will sufficient resources (manpower) be in place?

What are the prioritized action items?

# Action Items from the Workshop



- 60Hz harmonics exciting the beam
  - urgent need for RHIC **balancing test**, LHC comparison
- Coupling
  - breaks tune feedback
  - Continue to explore the 6 parameter measurement (does not stress the PLL)
  - Test **coupling feedback at RHIC**
- Chromaticity
  - Test **chromaticity feedback at RHIC**
  - Interaction of chrom mod ( $\sim 100\mu$ ) with orbit feedback?
  - Explore the Bruning method (also, does not stress the PLL)
- DAB board delivery & drivers, Controls Interface,...

# What, why, when



## What

Transverse Feedback - not just tune, but rather tune, chrom, and possibly coupling

## Why

snapback - chromaticity (can't correct w/ feedforward)

model imperfections

"because it's there"

## When

most useful at commissioning, snapback will require chrom feedback during operations

# The FY05 Task Sheet



- Travel to CERN to support collaboration - done
- Evaluate CERN SPS 2004 studies - done
- RHIC installation of baseband motion control pickups - done
- Assemble and operate baseband PLL at RHIC - done, ongoing
- Data from RHIC Run 5 - 245MHz and baseband systems - done, ongoing
  - tune
  - coupling
  - chromaticity
  - emittance growth
  - loop parameters
  - noise floor, S/N,...
- FNAL - install and evaluate direct diode AFE - done, ongoing

# Scope, Boundaries, Responsibilities...



- Explored in detail in talks on System Architecture and the Interface to Controls
- Boundaries/Responsibilities between CERN and BNL are clearly defined

# Scope, Boundaries, Responsibilities...



- CERN provides
  - kicker amplifiers, kickers, and pickups
  - Direct Diode Detection AFEs
  - Digitizer boards
  - DAB64 Boards
  - VME crates and crate computers for CERN installation
- LARP provides
  - VME crates and crate computers for LHC test installation at BNL
  - gate array programming
  - FEC programming
  - LabVIEW control program, collaboration on CERN equivalent (FESA)
  - specification and testing of LHC TF Applications software
  - testing at RHIC, with and without beam
  - pre-beam and beam commissioning support

# Milestones



Apr 05 - PDR

Jun 05 - finalize prototype system architecture (need 60Hz balancing at RHIC, clarification of 60Hz magnitude at LHC)

Nov 05 - prototype (4 planes) ready for RHIC beam

Feb 06 - deliver 2 planes to CERN for SPS testing

Apr 06 - FDR (you're invited!)

May 06 - SPS testing, initial Controls integration (FESA)

Jun 06 - finalize architecture

Nov 06 - final system (4 planes) ready for RHIC beam

Feb 07 - deliver final system to CERN, system integration and testing

Summer 07 - system commissioning with beam