

# **ILC and Future Programs**

**Stephen Wolbers**  
**February 16, 2007**

# Talks you will hear today (in one hour!)

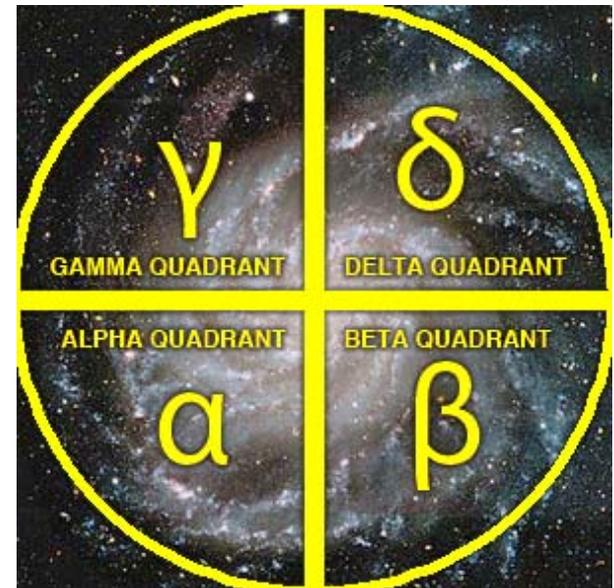
- Steve Wolbers - ILC and Future Programs overview
- Amber Boehnlein - Accelerator and Detector Simulations
- Margaret Votava (for Jerry Guglielmo) - Data Acquisition and Controls
- Vince Pavlicek - Electronic Systems Engineering

# Safety

- I'd like to emphasize right at the start that working safely, and more importantly, not having any injuries, is important to me.
- Please take care, do not take unnecessary chances, ask for help or training when needed.
- I think that together we can keep our workplaces safe and even improve them.

# ILC and Future Programs Overview

- On December 1, 2006 CD was reorganized into 4 “quadrants”
  - “quadrant” is used for lack of a better word.
  - Each quadrant is a set of departments and groups that have some common mission.



[http://en.wikipedia.org/wiki/Galactic\\_quadrants\\_Star\\_Trek](http://en.wikipedia.org/wiki/Galactic_quadrants_Star_Trek)

# ILC and Future Programs

- The name:
  - The ILC part is pretty obvious
  - "Future Programs" encompasses a variety:
    - We work on NOVA
    - We support Run 2 and the accelerator
    - We support CMS and are involved in CMS development
    - We manage PREP and equipment repair
    - Etc.
  - But the emphasis is on the future and enhanced capabilities.

# IFP Mission Statement

- The ILC and Future Programs Quadrant of the Computing Division promotes and fully contributes to and collaborates on International Linear Collider (ILC) and future scientific programs at Fermilab by developing and providing innovative and excellent scientific, computing, engineering and technical skills and techniques.

## How this relates to CD and the lab's mission

- The Computing Division's mission is to play a full part in the mission of the laboratory and in particular to proudly develop, innovate, and support excellent and forefront computing solutions and services, recognizing the essential role of cooperation and respect in all interactions between ourselves and with the people and organizations that we work with and serve.

## How this relates to CD and the lab's mission

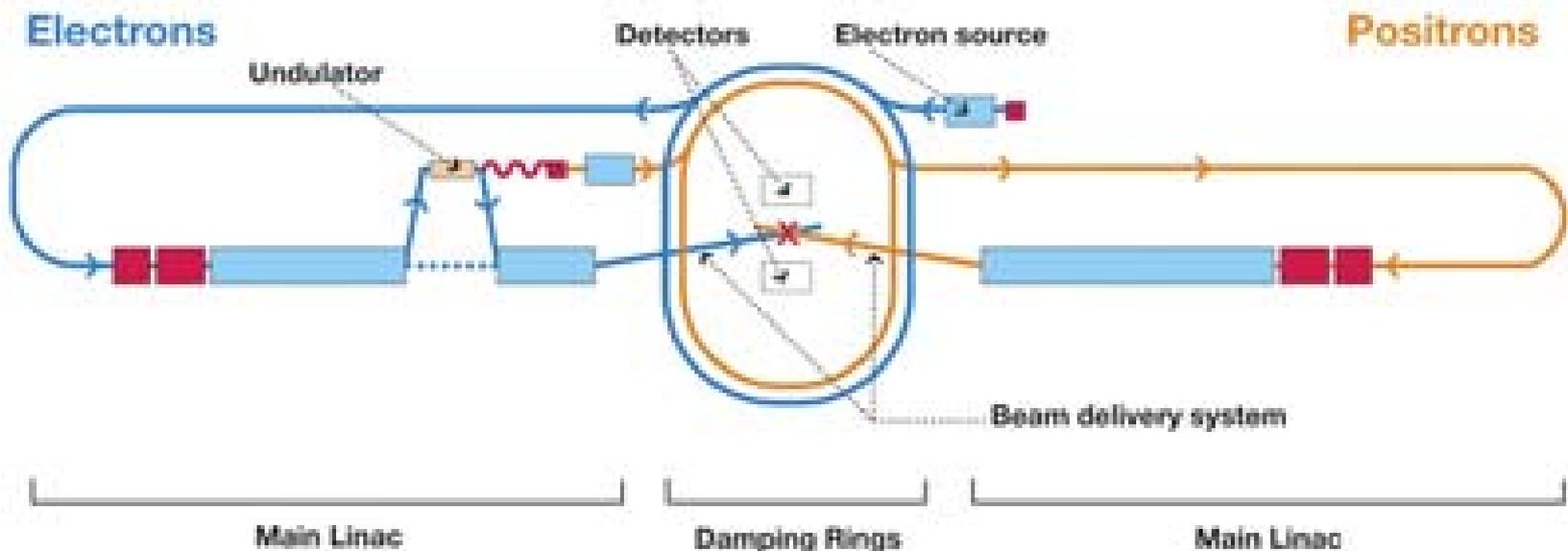
- Fermi National Accelerator Laboratory advances the understanding of the fundamental nature of matter and energy by providing leadership and resources for qualified researchers to conduct basic research at the frontiers of high energy physics and related disciplines.

# How this relates to CD and the lab's mission

- The Fermilab Research Alliance (FRA) proposal has many details about the lab's mission and plans:
  - <http://fra-hq.org/about.html>
- They mention three major areas:
  - Energy Frontier
  - Neutrinos
  - Astrophysics
- I don't have time to go into great detail but it is safe to say that ILC and Future Programs is involved in all three major areas of the laboratory.

# Short ILC Interlude: ILC news

- Preliminary reference design report (RDR) and cost was released last week.
  - Many people in CD and the lab worked on this and will work on test facilities, detector R&D, controls, the Engineering Design Report (EDR), etc.



# Introductions

- **Quadrant Leaders**
  - Steve Wolbers (head)
  - Amber Boehnlein (deputy)
  - Bakul Banerjee (assistant)
  - Vince Pavlicek (assistant)
- **Electronic Systems Engineering Dept.**
  - Vince Pavlicek (acting head)
- **Accelerator and Detector Simulations Dept.**
  - Amber Boehnlein (head)
- **DAQ and Controls Department**
  - Jerry Guglielmo (head)

## The rest of the talks

- The rest of the talks will better cover the three departments.

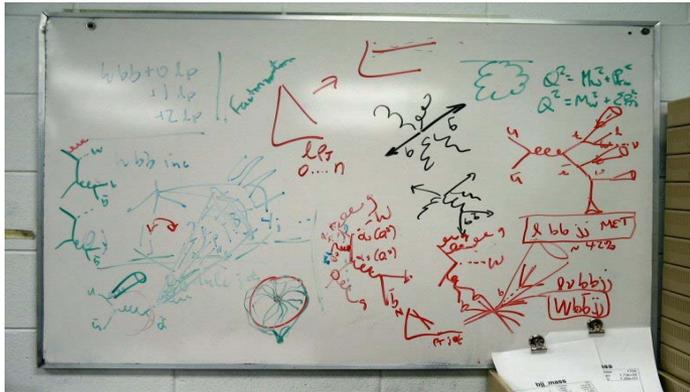
# Accelerator and Detector Simulations

Amber Boehnlein

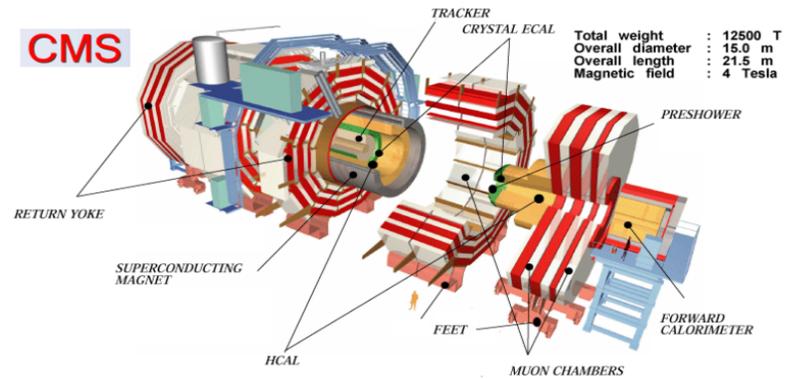
# ADS Mission Statement

- **The mission of the Accelerator and Detector Simulation Department/FNAL CD is to take responsibility in national and international simulation projects for critical contributions by providing leadership, scientific knowledge and technical expertise to the FNAL ILC detector design teams, in the accelerator modeling community, the CMS LHC Physics Center and as members of the Geant4 collaboration. Our significant skills in C++ and other programming languages provides, advances and improves code bases used for simulation and other endeavors.**
- **We contribute to the on-going scientific programs of the laboratory including CMS and Run II and the FNAL neutrino program by providing support and expertise to those communities by providing a library of certified generated events, as well as participating directly in physics analysis.**

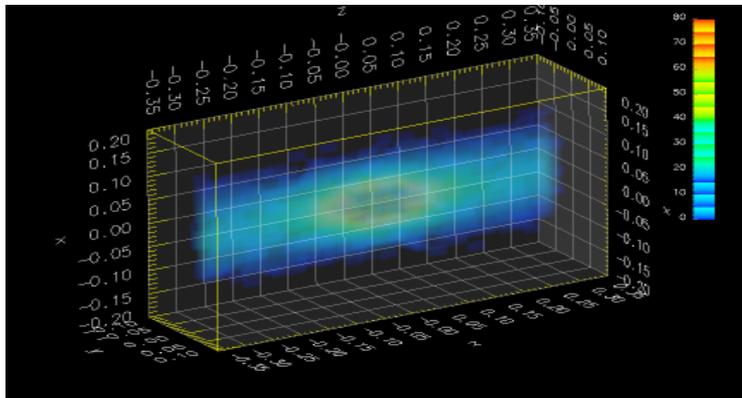
# Simulation Focal Areas



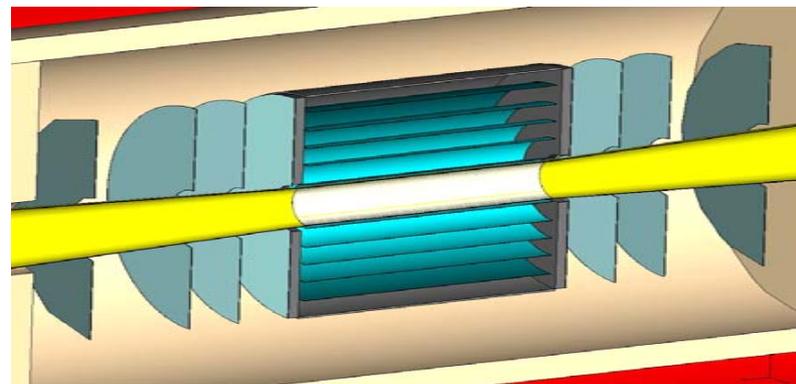
**Physics Generators**



**CMS**



**Accelerator Modeling**

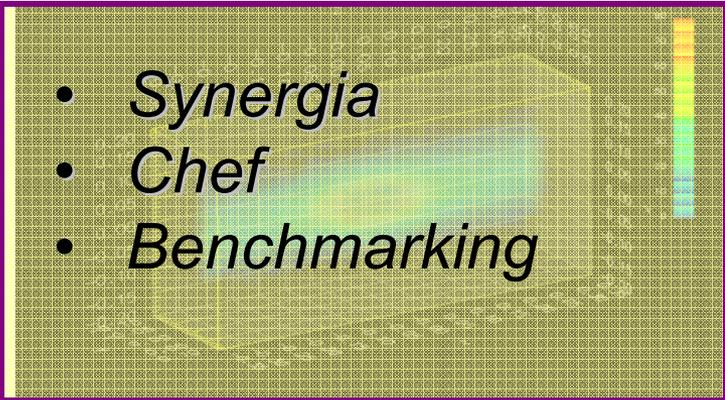


**ILC detector optimization**

# ADS Projects & Tools

- 
- *Pythia*
  - *Patriot*
  - *Data/Monte Carlo tuning*

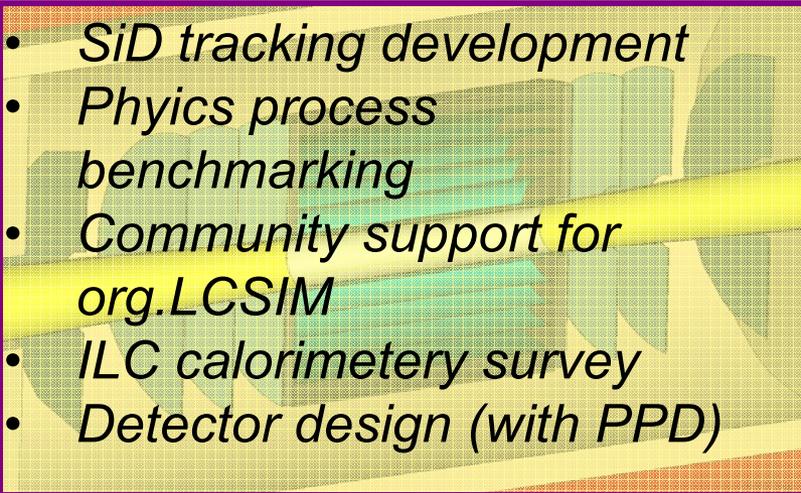
## Physics Generators

- 
- *Synergia*
  - *Chef*
  - *Benchmarking*

## Accelerator Modeling

- 
- *Simulations & Software validation*
  - *Framework/EDM*
  - *LPC Leadership & participation*
  - *GEANT 4 collaboration*
    - *Technical performance*
    - *Hadronic shower parameterization*

## CMS

- 
- *SiD tracking development*
  - *Physics process benchmarking*
  - *Community support for org.LCSIM*
  - *ILC calorimetry survey*
  - *Detector design (with PPD)*

## ILC detector optimization 16

## Contributions and Collaborations

- Accelerator modeling - SciDAC
- Lattice QCD
- GEANT 4 collaboration
- C++ International Standards Body
- FNAL ILC Working Groups
- Experiment collaborators

# DAQ and Controls Department

## **A brief Introduction and Summary of Activities**

# DAQ and Controls Department

## *Mission Statement*

The mission is to provide technical advice, develop and support performant, robust, and well documented DAQ and Controls related software solutions to Fermilab, the Fermilab user community and the global ILC effort in a timely manner, appropriately reflecting Computing Division and Laboratory priorities. The organization provides services tailored to the needs of the client, ranging from design and independent reviews of systems and software to development and support of new systems including high and low level project management where appropriate, with the highest level of professionalism and excellence.

# DAQ and Controls Department

## Activities for LHC and ILC

- *LHC at Fermilab*
  - Storage Server*
  - Snapshot Service*
  - Role Based Access*
- *ILC*
  - ILCTA Controls*
  - ILC Controls*
  - ILC Controls RDR/EDR*
  - ILC@FNAL L2 Manager (M. Votava)*

# DAQ and Controls Department

## Activities for Infrastructure and Management Activities

- *Kernels*
  - Linux and VxWorks Kernel Support*
- *VxWorks*
  - Liaison and Support*
- *Design and Review*
  - Experiments and Facilities*
- *Applications and Drivers*
  - CAMAC, VME, etc.*
- *Meson Test Beam Facility DAQ*

# DAQ and Controls Department

## Activities for Experiment Software

- *Run II*
  - DO Online*
- *SDSS II*
  - DAQ Support*
- *Nova*
  - DAQ Software*
  - L3 Management (G. Guglielmo, M. Votava)*
- *Meson Test Beam Facility*
  - DAQ*

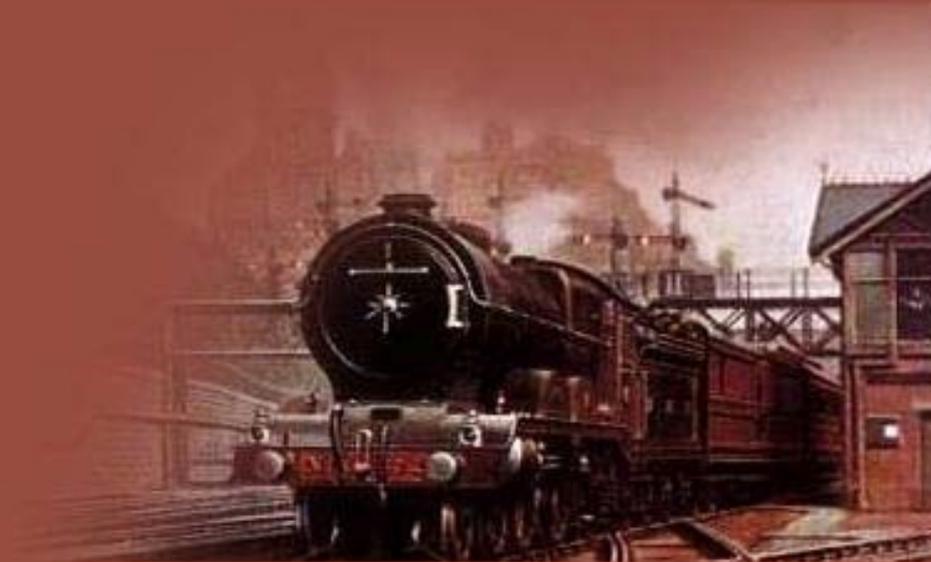
# DAQ and Controls Department

## Activities for a Variety of Projects

- *Accelerator Support*  
*MI and TeV BPM*
- *Collaboration Tools*  
*Control Room Logbook*
- *Real Time 2007 Conference*  
*Committee Chair (M. Votava)*  
*Local Organization (G. Guglielmo)*
- *PREP*  
*KTeV Hall and Support*
- *Experiment Liaison*  
*COUPP, Minerva*

# ESE Department

Intro and current activities

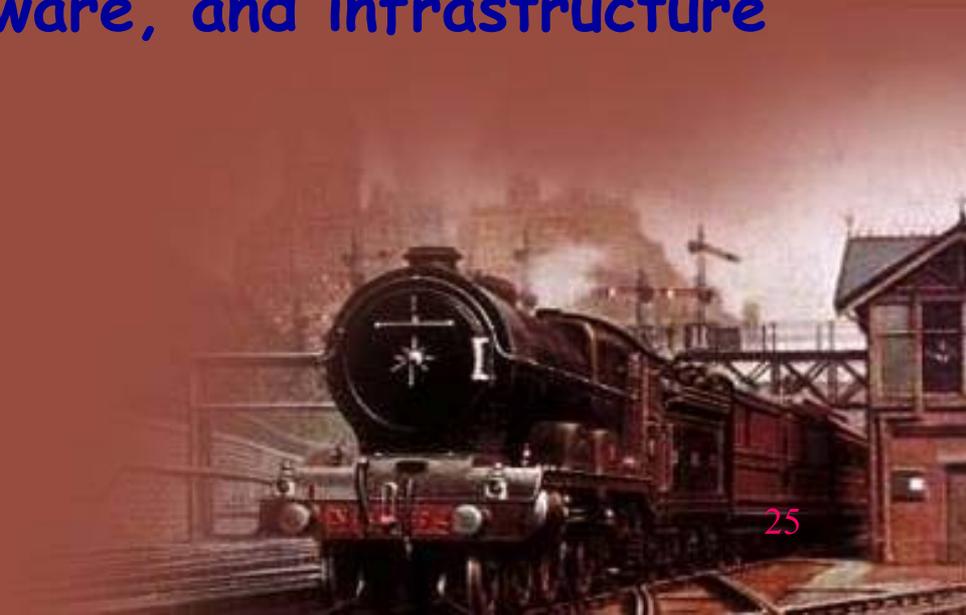


Vince Pavlicek

Electronics Systems Engineering Dept.

# ESE Mission Statement

- The mission of CD Engineering is to provide high quality design, implementation, maintenance and project management support for hardware systems for HEP and Astrophysics experimentalists and phenomenologists. Hardware systems include board and system level hardware and firmware, and infrastructure electronics.



# Department Groups

- DAQ Controls and Timing
- Detector Instrumentation
- Engineering Support
  - Engineers & Engineering Associates
  - Technical Specialists & Technicians



# Example projects

## CDF SVX

### SVX-II (SVX 3 IC) Readout System

Click on Item of Interest

#### SVX-II Silicon Strip Detector System

Number of Channels = 405,504  
Level One Trigger Rate = 50 KHz  
Level 2 Readout Rate = 1 KHz  
Tape Write Rate = 1 to 10 Hz

#### On-Line Processors Interface System

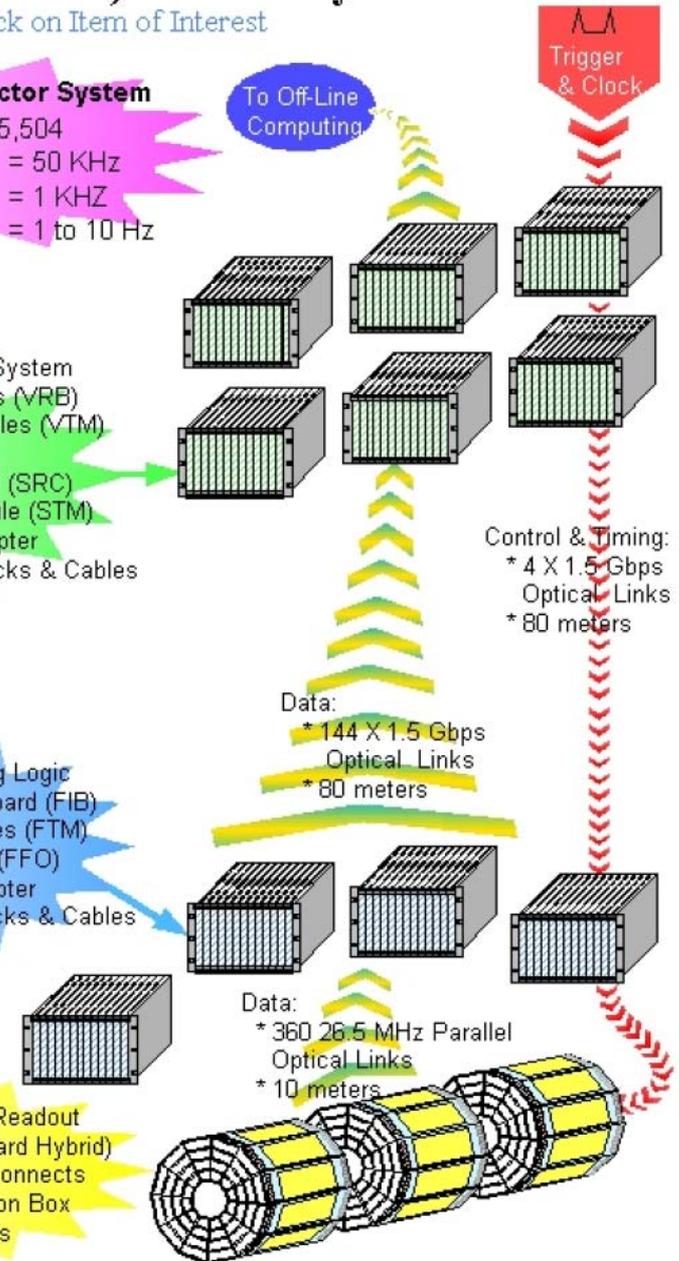
- \* 36 - VME Readout Boards (VRB)
- \* 36 - VRB Transition Modules (VTM)
- \* 1 - VRB Fan Out (VFO)
- \* 1 - Silicon Readout Card (SRC)
- \* 1 - SRC Transition Module (STM)
- \* 1 - VME CPU & 9U Adapter
- \* VME Racks, SubRacks & Cables

#### Detector Area Fast Sequencing Logic

- \* 36 - FIB Fiber Interface Board (FIB)
- \* 36 - FIB Transition Modules (FTM)
- \* 1 - FIB Fan Out Module (FFO)
- \* 1 - VME CPU & 9U Adapter
- \* VME Racks, SubRacks & Cables

#### SVX3 IC Control, Timing & Readout

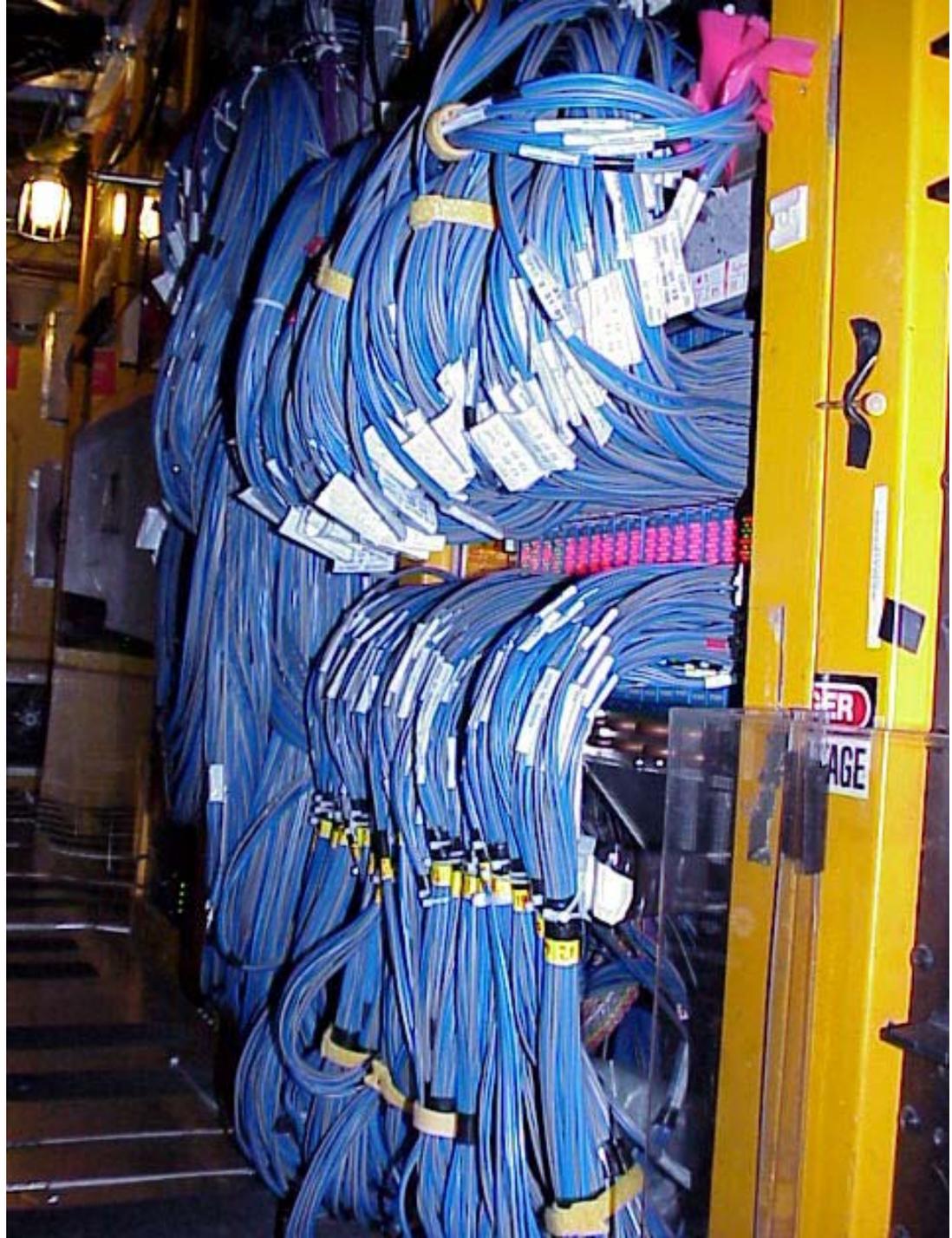
- \* 72 - Port Card (RAD Hard Hybrid)
- \* 72 - High Density Interconnects
- \* 72 - Flex/Ribbon Junction Box
- \* Cables, Connectors



Click on Item of Interest

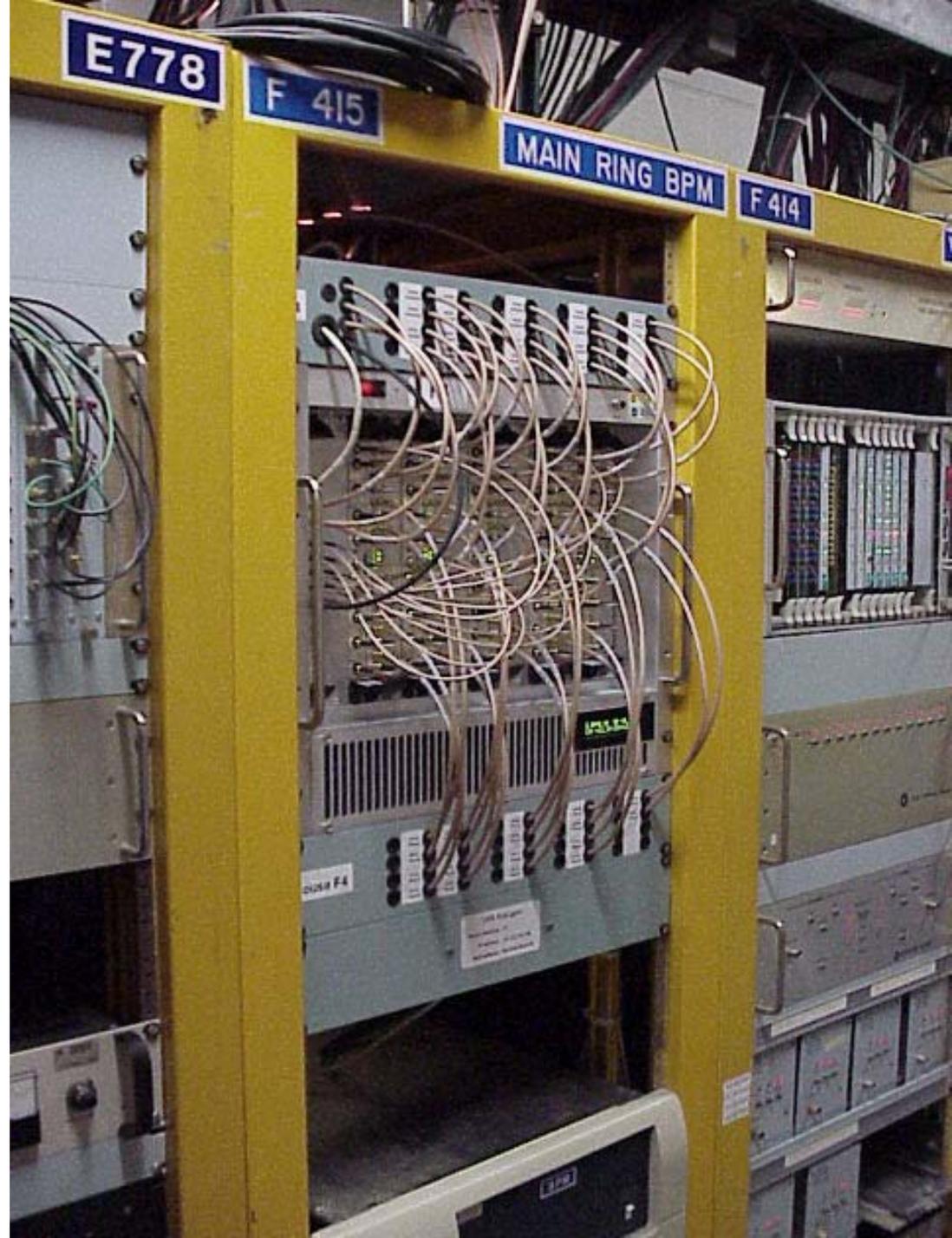
Example projects

## D0 Mixer Installation



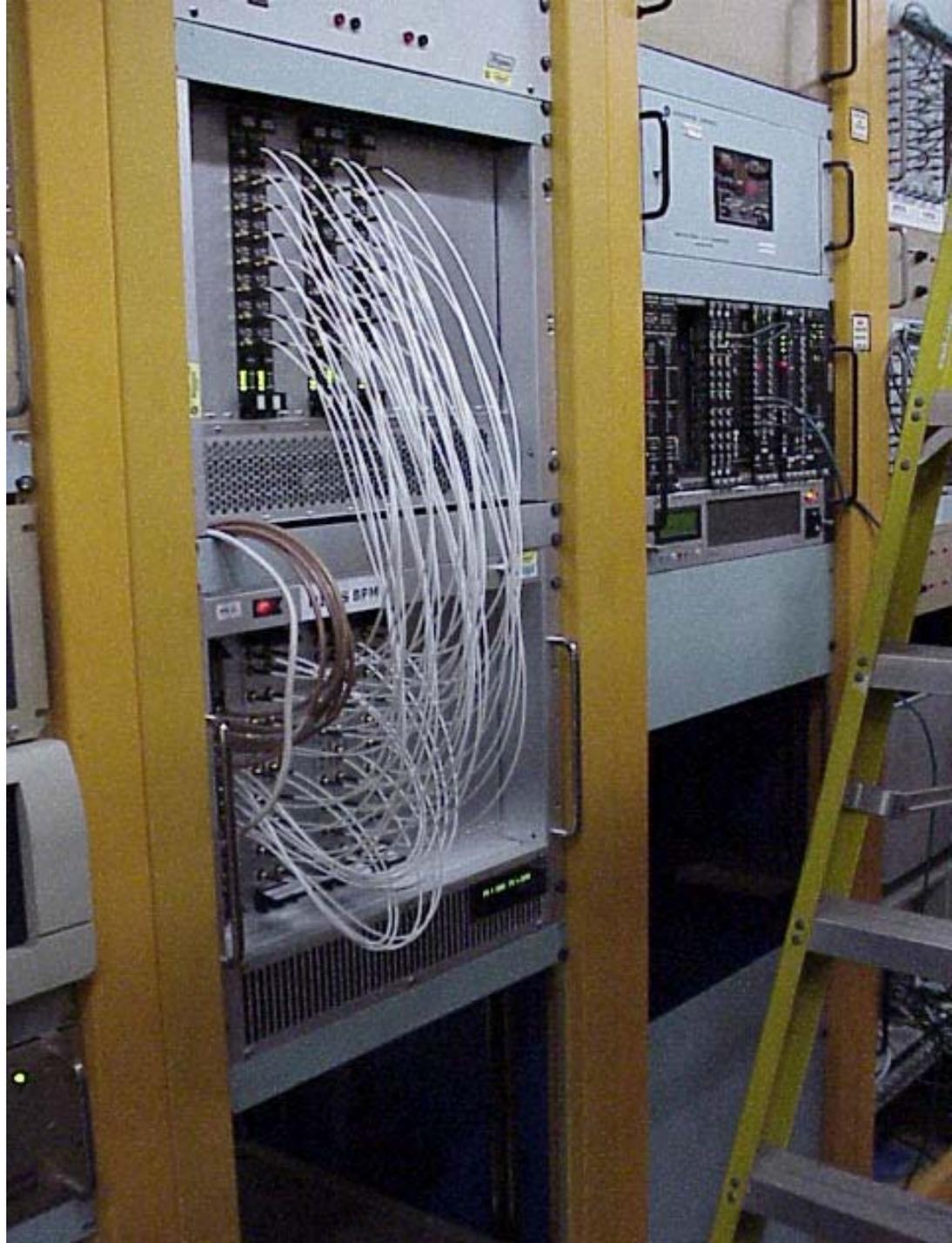
Example projects

# TeV BPM Installation



Example projects

# MI BPM Installation



# Current Activities - ILC

- ILC Super Conducting RF R&D - cavity controller hardware and firmware.
- ILC detector test beam - telescope and DAQ development sharing Phenix hardware.
- ILC BPM R&D, KEK test beam timing cards and support.
- ILC Controls global group - RDR, costing and EDR efforts. Also collaborating with the LLRF and instrumentation areas.

## Current Activities - 2

- CMS pixels - support for silicon production and debugging. SLHC - collaborating with the FNAL contingent.
- SNAP - SLICE card design and interface to ICU. SLICE firmware for data processing.
- Dewar interface cards for SNAP FRIC module environmental testing.
- Phenix silicon upgrade - prototype modules and interconnects design and testing. Test stand development and support.

## Current Activities - 3

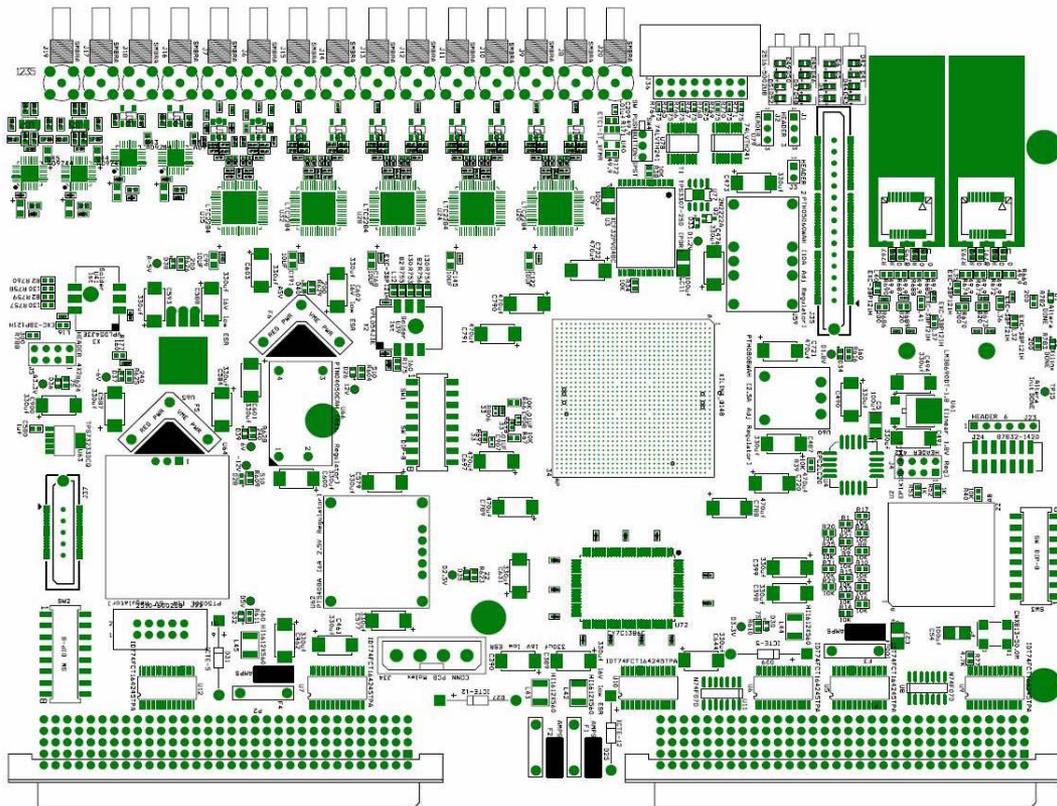
- NOvA DAQ hardware development - Data combiner module, timing system and DAQ farm support.
- MICE - VLSB board support and negotiating an upgrade project.
- Equipment Support - Repair, assembly and rework for experiments, PREP, FNAL and other HEP lab support.

## Current Activities - 4

- AD - IPM and BPM systems support for TeV and Main Injector.
- Run 2 collider experiment support - various modules and systems as needed.

# DESY Simcon Low Level RF Controller (DocDB #1641)

FNAL Low Level RF Controller (DocDB #2008). Production review was today. The new firmware is already very successful.

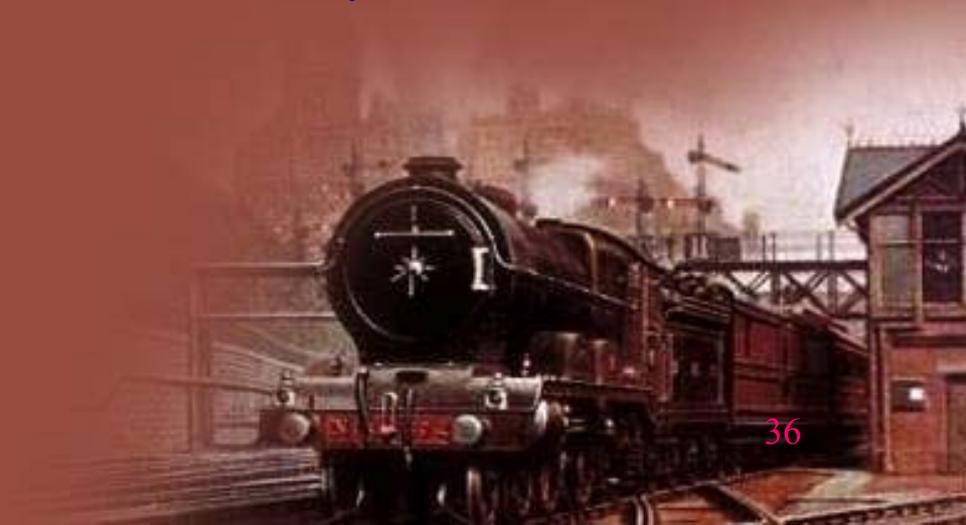


ILC  
Low-Level RF



# Down the Track

- We are a proven collaborator that plans to contribute hardware engineering to controls, instrumentation, detector and test beam tasks.
- We have a disciplined approach to engineering that produces robust designs which meet the customer requirements.
- We understand hardware standards and utilize them where appropriate for cost efficiency.



**Finito**