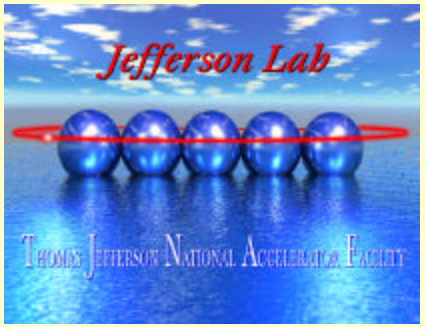
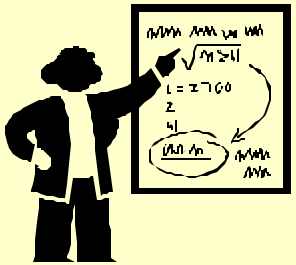
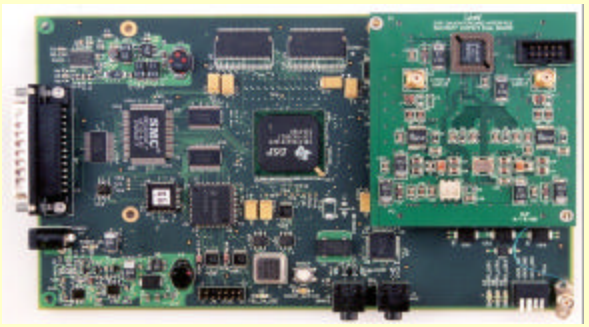


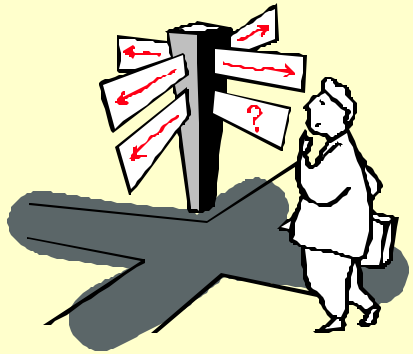




Workshop on Low-Level RF Controls For Superconducting Linacs

April 25 –27, 2001

Institutions Represented



Argonne National Laboratory
Brookhaven National Laboratory
Caltech/LIGO
CEA Saclay
CERN
Cornell University
DESY
Fermi Lab
FZ Rossendorf
General Atomics
IKP TU Darmstadt
IPN d'Orsay
Jefferson Lab
Lawrence Livermore National Laboratory
Los Alamos National Laboratory
National Superconducting Cyclotron Laboratory
Old Dominion University
SNS/ASD
TRIUMF
ZTEC

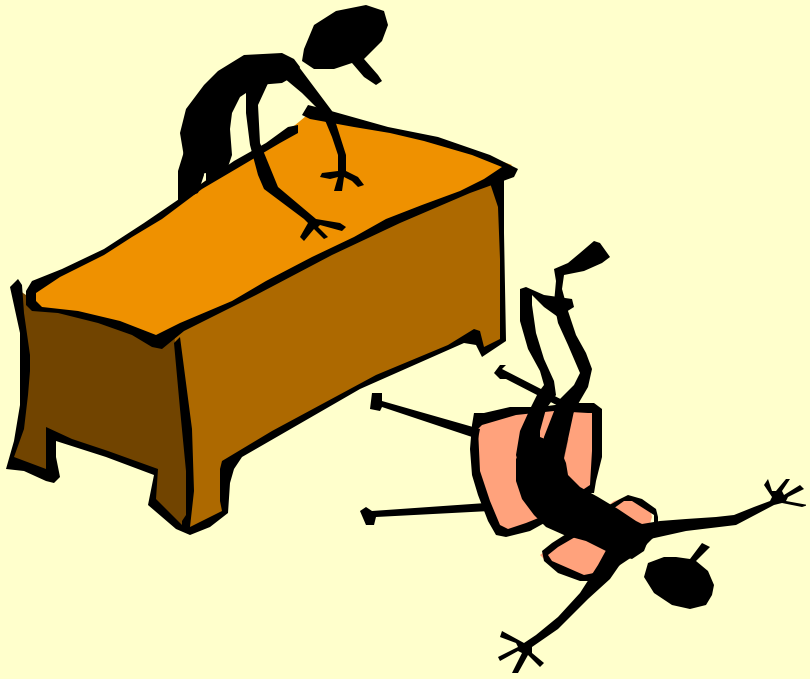
Why are we here?

New SC accelerators are being built, planned, and proposed

- SNS/NSP (Jaeri)
- TESLA
- RIA
- CEBAF Upgrade
- Energy Recovery Linacs (ERLs), for FELs and Light Sources

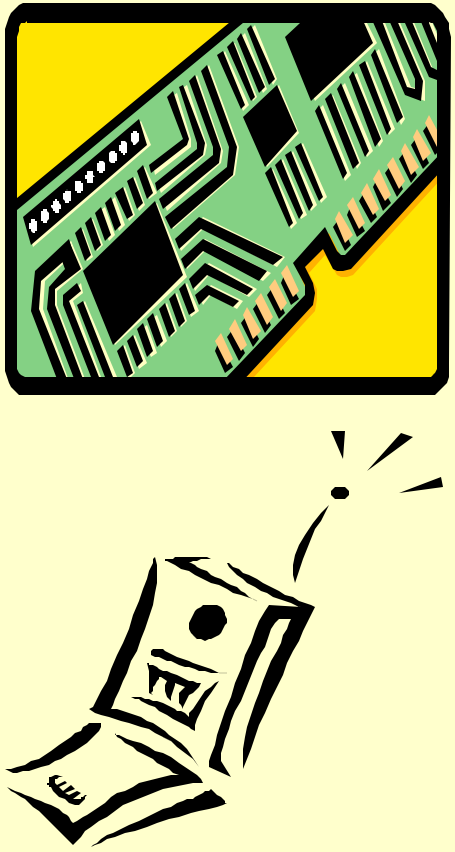
Operational Requirements Adding to the Complexity of Field Control

- High Gradient
- High or Moderate Q_L
- Beam Loading
- Pulsed or CW (RF/Beam)
- One Klystron/One Cavity or One Klystron/Multiple Cavities
- Relativistic and Non-Relativistic Particle Acceleration



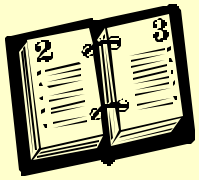
The Technology is Changing and So Should We

- Controls and Electronic Implementation
- New Advances in High-Speed Digital Processors and Gate Arrays (system on a chip!)
- Controls System Design: Feedback/Feed forward
- Modeling and Development Tools



Goals of the Work Shop

- Review Present Status of SC LLRF Design.
- Discuss Immediate and Future Applications.
- Discuss Common Design Issues such as Algorithms and Implementation.
- Develop Solutions for the Different Applications.
- Initiate New Collaborations and Strengthen Existing Ones.



Work Shop Agenda and Organization

Wednesday

8:00 – 12:10 Plenary Session, Moderator: Jean Delayen

12:10 – 14:00 Lunch

14:00 – 14:30 Form Working Groups

14:30 – 17:30 Working Group Sessions

Session 1: Working Group 1 (WG1) Application Specific Issues and Conceptual Designs

ARC Auditorium (Mosnier/Reece)

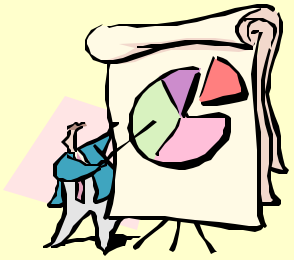
Session 2: Working Group 3 (WG3) Implementation/Design

ARC 233/231 (Rohlev/Musson)

18:15 Dinner Behind Residence Facility

Wednesday Dinner

- "Pig Pickin"
- Besides Pork there will be Chicken and Vegetables
- Beer, Wine, Tea and Lemonade
- Music Provided by "Orion" Playing Traditional Mountain and Celtic Music



Work Shop Agenda and Organization

Thursday

8:15 – 12:00 Plenary Session, Moderator: Warren Funk

12:00 – 13:30 Lunch

14:00 – 17:30 Working Groups

Session 1: Working Group 2 (WG2): RF Field Control Schemes, RF System Modeling, RF System Operation

ARC Auditorium (Simrock/Beard)

Session 2: Working Group 3 (WG3) Implementation/Design (wrap up if needed)

ARC 231 (Rohlev/Musson)

Additional Sessions: Special Interest Groups, e.g. SNS, RIA, ERLs, etc. (ARC 233, 333)

Dinner On Your Own

Work Shop Agenda and Organization

Friday

8:30 – 10:00 Working Group Report Writing,
Special Interest Group Meetings

10:15 – 12:30 Working Group Presentations and Discussions
Moderator: Curt Hovater

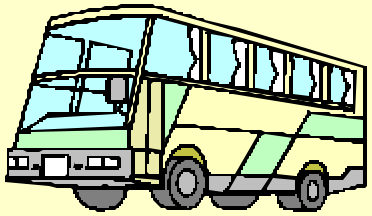
Working Group 1 Alban Mosnier (CEA)
Working Group 2 Stefan Simrock (DESY)
Working Group 3 Tony Rohlev (LANL)

12:30 – 13:30 Lunch

13:30 – 14:30 Open Forum: What was good / What was bad / Do we do this again in two years?

14:30 – 14:45 Closing Remarks

15:00 – 16:30 Tour of SRF Facilities and FEL



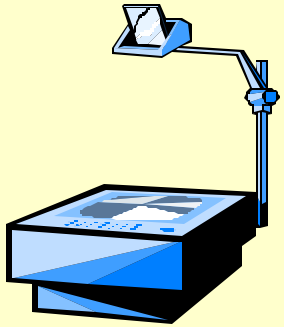
Multimedia Room (ARC 333)

- Three PC's
  - Word, power point, Adobe
  - Email
  - Web Interface
- Printer
- Scanner

Work Shop Reminders

- Check in at the registration table if you haven't done so already
- Sign up for Friday afternoon tour if you plan to go
- Lunch is available in the JLAB Cafeteria, located in CEBAF Center

Special Thanks



- Administrators

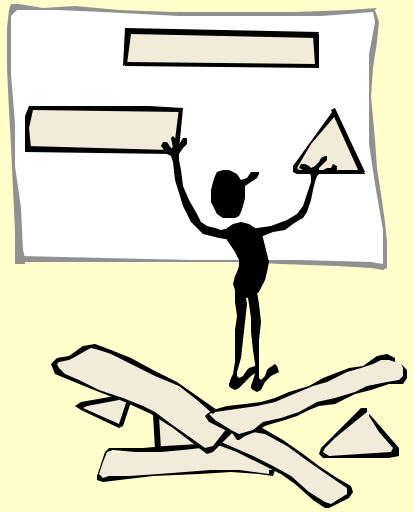
  Sherry Thomas, Diane Sarrazin, and Samika Smith

- Conference Administrators

  Ruth Bizot, Martha Hightower, Cynthia Lockwood, and Noel Vermeire

Working Groups (Or why we did what we did)

- Most folks wanted either WG1 and WG2 or WG3 and WG2
- Therefore we decided to have parallel sessions on Wednesday to address the charge of WG1 and WG3.
- Thursday would be joint session for WG2 and WG3
- In addition we wanted to make room for special interest groups on Thursday and Friday



Working Group 1 (WG1): Application Specific Issues and Conceptual Designs

1. Compile a list of applications (e.g. SNS, RIA, TESLA, ERLs) and identify top level rf parameters (e.g. Q_l , pulsed or cw, beam loading, low/high beta etc.).

2. Write RF system requirements (e.g. required amplitude, phase and resonance control) and identify differences among different applications.

3. Compile a list of various conceptual designs (e.g. Self Excited Loop (SEL), digital/analog/combination, generator-driven I/Q, amplitude/phase, etc.).

4. Match up control designs/solutions with different applications. Identify pros and cons for each combination of application/design.

5. Working group recommendations for each application.

Working Group 2 (WG2): RF Field Control Schemes, RF System Modeling, RF System Operation

1. Compile a list of possible algorithms, procedures and diagnostics for each conceptual design (as identified in Charge 3 of WG1). Start with a list of questions. Examples for questions to be answered:
   a) What are the different implementations of a SEL?
   b) Do we need piezo tuners in a high Q_l cavity, are they reliable?
   c) Feedforward (FF): when and where to implement.

2. How do we model an rf control system? Subsystem models for amplifiers, cavities, nonlinear effects, mechanical dynamics of the cavity, diagnostics (beam phase, detuning).
   a) Can we make a modeling menu?
   b) Can we develop a generic model applicable to the various schemes?

3. Implementation (realization) of the model in a digital controller
4. If possible compile a checklist which guides the rf system designer to the optimum design

Working Group 3 (WG3): Implementation/Design

1. Performance limitations of digital and analog designs
   a) Identify pros and cons
   b) Is analog still viable? Under what conditions?
   c) Software vs. hardware

2. Industry standards vs. custom design:
   a) Identify state-of-the-art and future directions in electronic components
   b) In-house vs. out-of-house design for digital control

3. DSP and FPGA vs. ASIC, performance vs. cost
4. What is the best family/chip/chip set (Altera, Xlinx, AD, TI, Intersil, Motorola etc.) for your application?
5. Reliability, maintainability, operability of low-level rf control systems
6. Automated operation of large-scale rf systems
7. Integration with other subsystems
8. Global vs. local controls
9. Calibration of rf system parameters and commissioning issues