X-Band Work in Fermilab Technical Division: Status Report and Future Plans

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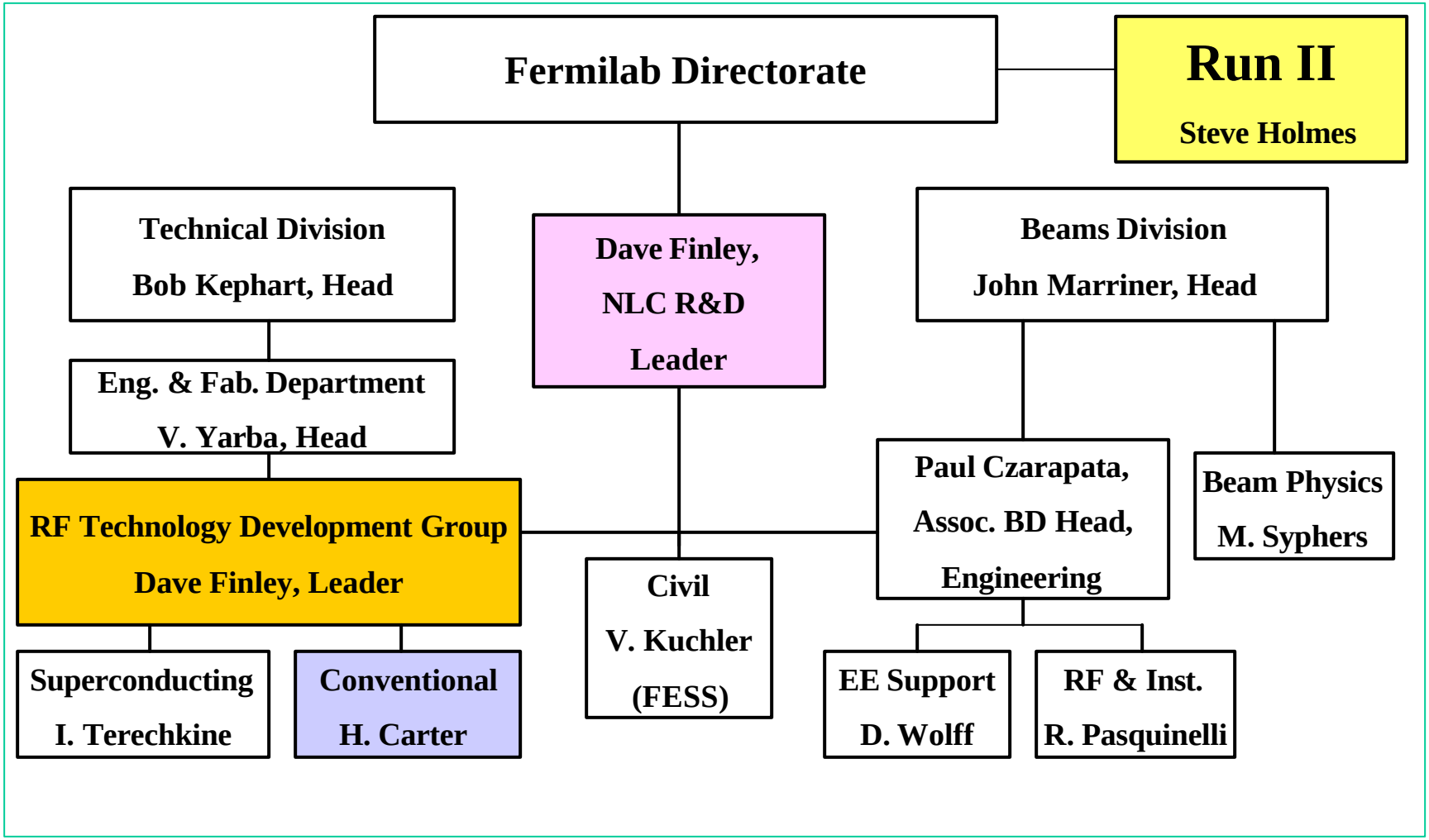
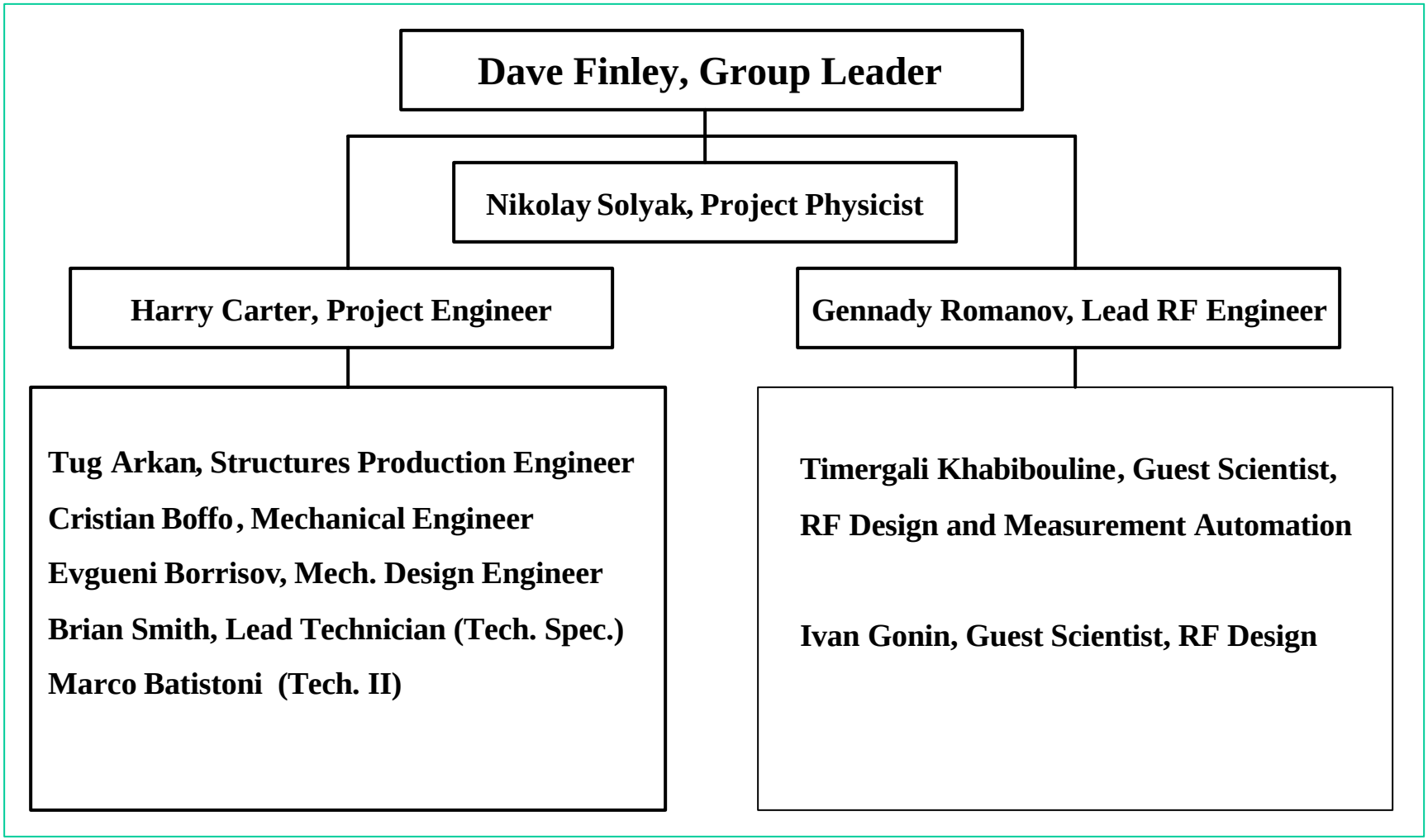
Outline

- **Organizational Changes**
- **Work Accomplished (Since ISG7)**
- **Status of Ongoing Work**
- **Future Plans**

Organizational Changes: NLC Collaboration at Fermilab



RF Technology Development (Conventional) Group
Personnel & Responsibilities

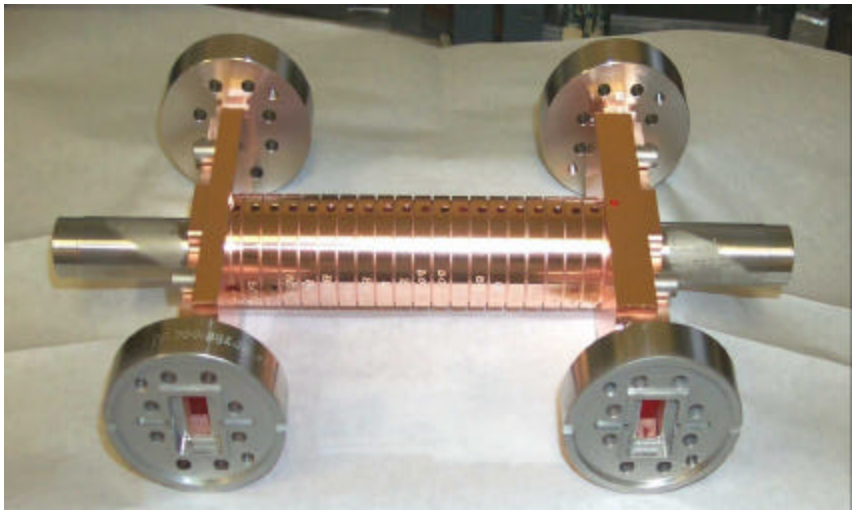


Work Accomplished

- Structure Production
- Engineering Teams
- RF Development & Testing
- Girders
- Special Projects

Work Accomplished: Structure Production

- **We have produced two 20 cm. long traveling wave structures thus far: FXA-001 and FXA-002.**
- **We are in the process of producing FXA-003 and FXB-001, both delayed due to the very late delivery of the large vacuum furnace from AVS (currently being installed and commissioned at IB4 as we meet)**
- **We are continuing to improve our fabrication methods and processes**
- **We are working to broaden our base of vendors capable of producing high precision machined parts (2 for disks and 3 for couplers) for structures**



Work Accomplished: Engineering Teams

Originally created to help focus on Technical Division FY02-03 goals for Linear Collider R&D.

For X-Band (NLC)

- **Structures (Mechanical)**
- **Structures (Electrical/RF)**
- **Girders**
- **Vacuum System**
- **Cooling Water System**
- **Specifications Development**
- **Quality Assurance Development**
- **8 Pack Integration**

Both TESLA and NLC

- **FNAL Cleaning Facility**
- **SBIRs**
- **Permanent Magnets**
- **Demonstration of Remote Accelerator Operation**
- **Siting LC's near Fermilab**

Work Accomplished: Girders & Special Projects

Girders

- Girders for FXB structures at NLCTA will remain the "strong-back" design presently used
- NLCTA quadrupole spacing may be adjusted to accommodate a slightly longer strongback that will contain three 0.6 m long structures
- An NLC prototype girder will be developed and tested at Fermilab independent of the Eight Pack Project (not tied to the Eight Pack schedule)

Special Projects

- DLDS Induction Brazing (we are assisting BD in this effort, as well as investigating other possibilities)

Status of Ongoing Work: RF Development & Testing

RF Design Work

- **Have Acquired Software and Hardware to Facilitate RF Design and Analysis ----- We are planning a significant upgrade (hardware and software) to enhance our computational ability in either the end of FY02 or early in FY03**
- **Have Worked to More Fully Understand the Relationship Between Component Mechanical Design and Electrical Performance**
- **We are reviewing both standing wave and traveling wave designs as they become available**
- **Just completed coupler redesign for FXB series of structures**

Status of Ongoing Work: RF Development & Testing

RF Testing:

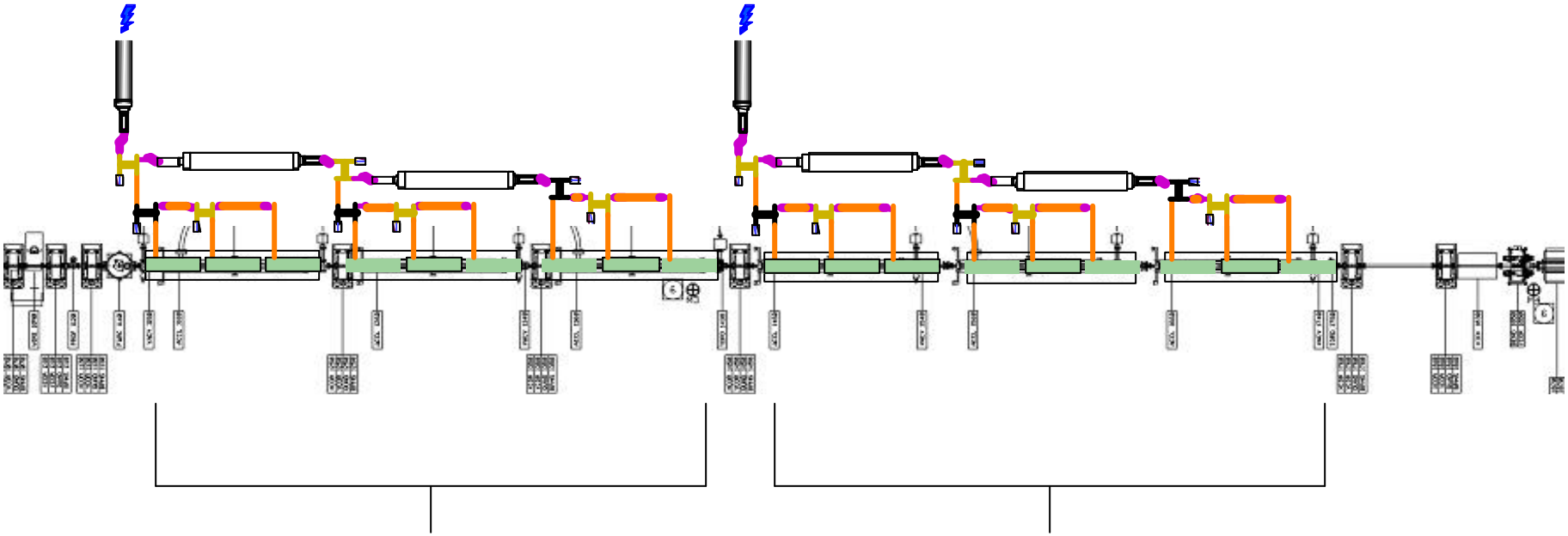
- **Have developed single cell, bead pull, and plunger RF measurement hardware and have automated the measurement process using LabView**

Future Plans: Structures for Eight Pack Test

- Eight Pack Test at SLAC (Dave Schultz, Proprietor)
  - In Phase II, a "pack of eight klystrons" will feed
    - 11.424 GHz X-Band power into a modified DLDS system and power two girders worth of structures with the full power and energy required by the NLC design.
  - The goal is to be operational by mid 2004

- Girder A System: Nine 0.6 m Long High Gradient Test Structures (FXBs, aka H60VG3)
- Girder B System: Nine 0.6 m long NLC Main Linac Structures (FXCs, aka HDDS-1)

The 8-Pack Test in NLCTA



High Gradient Structures (FXBs)
On NLCTA-type Strongbacks
(Girder A)

NLC Prototype Structures (FXCs)
On NLCTA-type Strongbacks
(Girder B)

Future Plans: NLC in TD for FY02

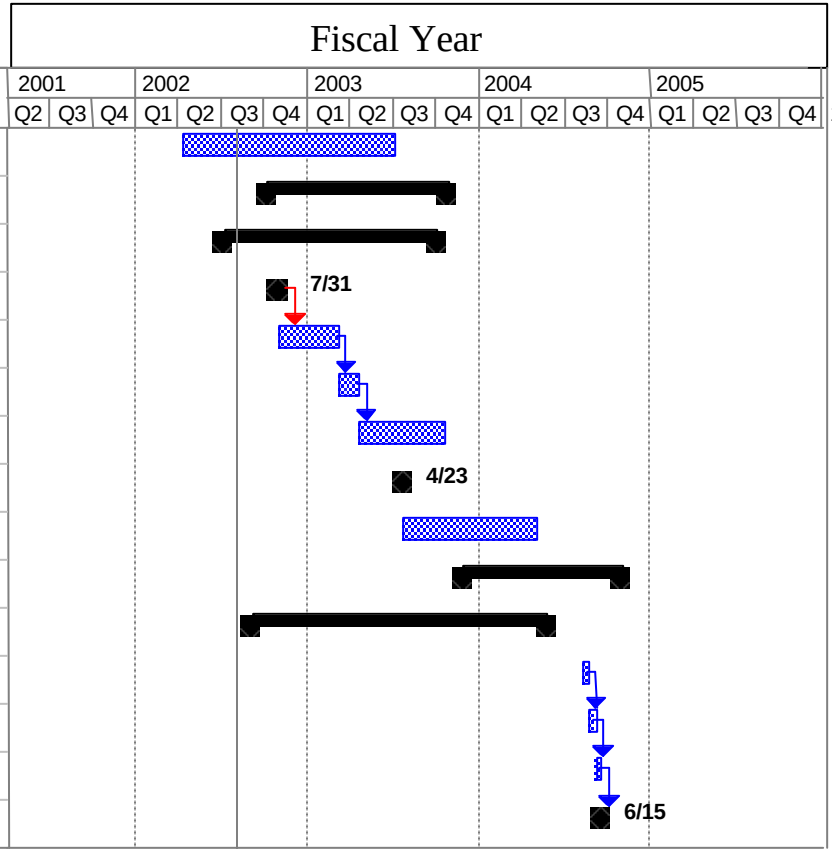
- In the remainder of FY02:
  - Complete FXA-003
    - 20 cm long, conventional machined, high gradient, 45 mm OD
  - Make FXB-001 and 002
    - 60 cm long, conventional machined, high gradient, high phase advance (150 deg.), low group velocity (VG3), 61 mm OD
    - FNAL coupler design with full radius slots, no cell tapering
  - Start to order parts for FXC Prototype
    - Prototype NLC Main Linac Design >>> The Real Thing (at least the first accelerating structure prototype, HDDS-1)
    - 60 cm long, assume diamond turned, real accelerators
    - **Note: Need FXC design (including couplers) by July 2002**

Future Plans: NLC in TD for FY03

- In FY03 (Assume flat funding, $1.95M):
  - Build FXB-003 thru FXB-011 (Split effort with KEK?)
    - May require new coupler design --- TBD after some high power test results for FXB-001 and 002 are available.
  - Build FXC Prototype, then FXC-001 and 002 (See how many we actually have in mid to late FY03 and decide what to do in FY04 (at least 7 more FXCs required)
  - Finalize NLC girder design and construct prototype for testing (vibration, stability, etc.) at FNAL with “dummy” structures, water cooling, vacuum, waveguide connections, HLS, movers, etc.

Production Schedule

ID	Task Name
1	Parts Procurement for FXB Structures
2	**FXB Series Structure Production (0.6m)**
14	**Girder A (actually A1+A2+A3)**
36	**Design for FXC Series Structures Completed**
37	Parts Procurement for FXC Prototype
38	Construct FXC Protype
39	Test FXC Prototype at SLAC
40	**FXC Prototype Proves to be Good**
41	Parts Procurement for FXC Series Structures
42	**FXC Series Structure Production (0.6m)**
51	**Girder B (NLC Prototype Girder @ FNAL)**
58	Install FXC Structures on Girders A4-A6
59	Align FXC Structures on Girders A4-A6
60	Ship Girder A4-A6 Assemblies to SLAC
61	**Girder A4-A6 Assemblies Arrive at SLAC**



Summary

- Delay in receipt of our large vacuum furnace has impacted our structures production schedule, but we will meet our FY02 plan.
- We are continually improving our RF testing and measurement capability in support of structure production.
- We are strengthening our structure and coupler design capability.
- Girder R&D work is in progress.
- Funding will remain a serious constraint on our (as well as the rest of the collaboration's) ability to accomplish our goals in a timely manner.