



XFT Status

CDF Trigger Workshop, 17 August 2000

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- XFT Hardware status
- XFT Integration tests at B0, including:
 - XTC t0 calibration
 - Integration with Level 1 and Run Control
- XFT Event Display and XFT Simulation
- Cosmic Ray & Commissioning Run
- Summary



XFT Hardware Status

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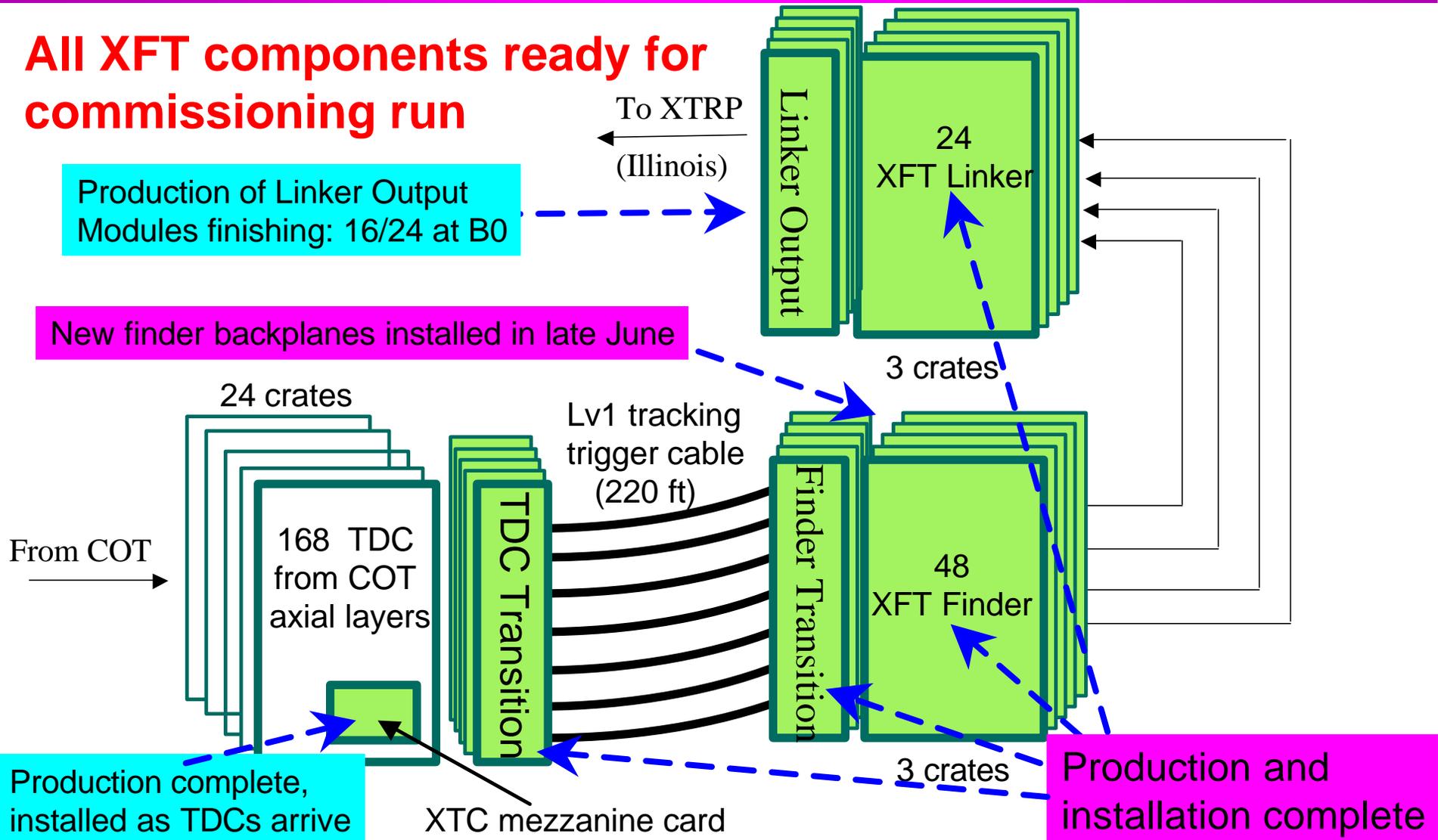
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All XFT components ready for commissioning run

Production of Linker Output Modules finishing: 16/24 at B0

New finder backplanes installed in late June





XTC t_0 calibration

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- XTC classifies COT wire hits as prompt or delayed
 - Need to know time between collision and arrival of earliest possible COT pulses at XTC
- Use COT calibration system to pulse COT
 - Signal travels through COT wires, COT electronics and TDC to XTC
 - Capture XTC data at Finder and set t_0 for the 4 axial superlayers
- Understand XTC t_0 calibration to within a few ns

Jay Dittmann, Ken Bloom



XTC to Finder Integration

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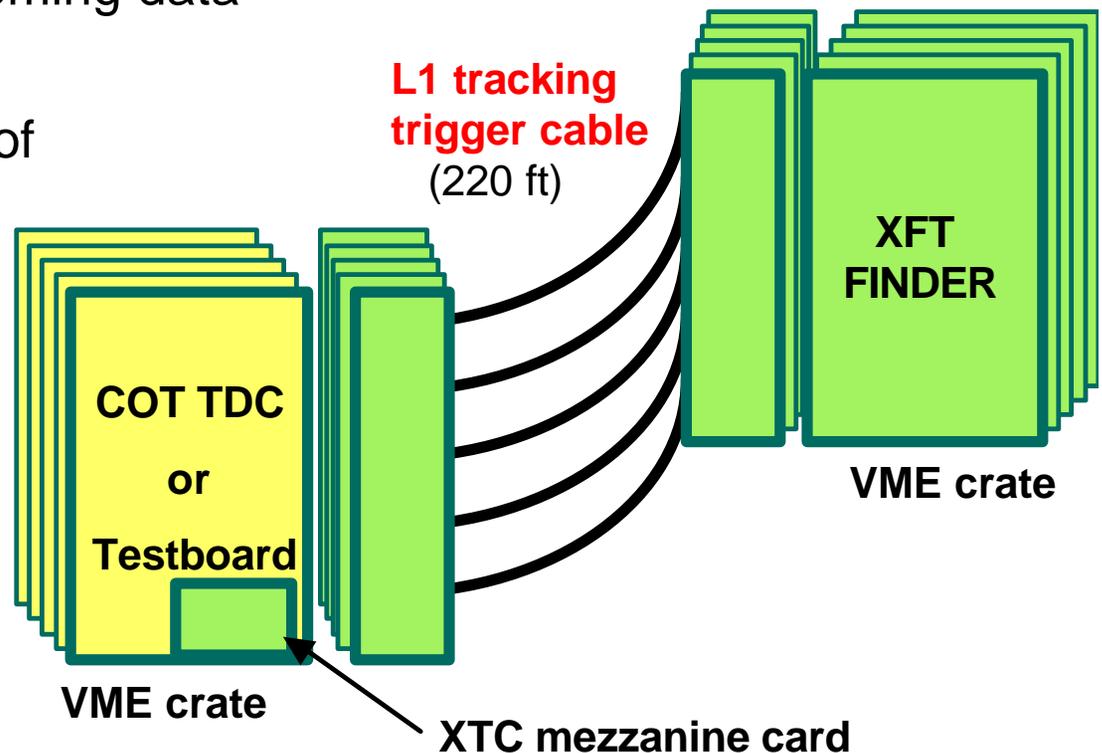
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- Setup

- Transmit bit patterns over L1 tracking trigger cable to Finder

- Results

- Successfully captured incoming data on finder at speed
- Used to check installation of **164 L1 tracking trigger cables**, which bring hit data to Finders



Jay Dittmann, Phil Koehn, Ken Bloom



Finder to Linker Integration

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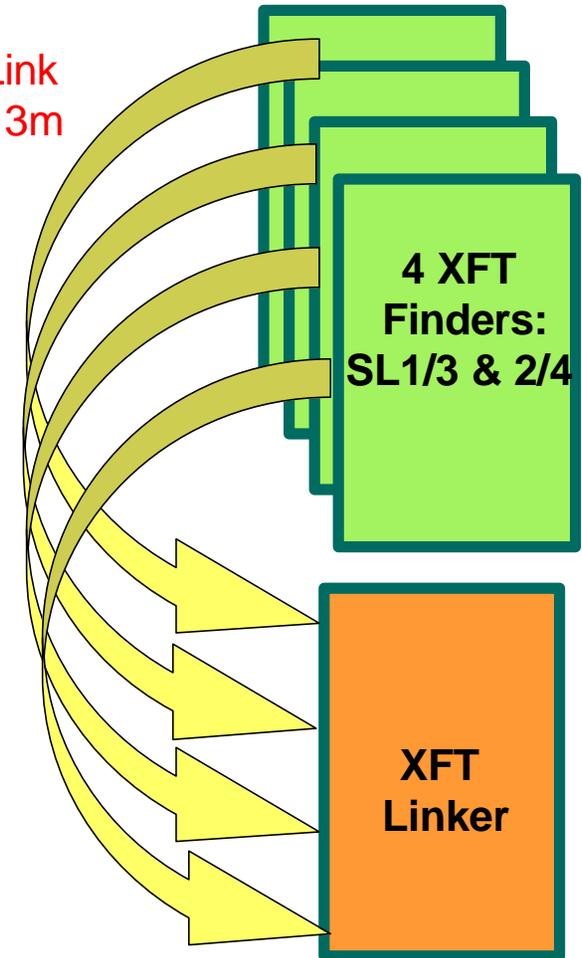
- Setup

- Load Finder input chips with simulated XTC hit data, process in finder and linker at speed

- Results

- **Boards respond to real trigger signals**
- Aligned finder and linker pipelines
- Check **XTC hits, track segments and tracks in L2 buffers** on Finder and Linker
- Formatted data sent off board
- Successful long-term tests on 1 full crate

Channel Link
Cabling < 3m



Evelyn Thomson, Phil Koehn



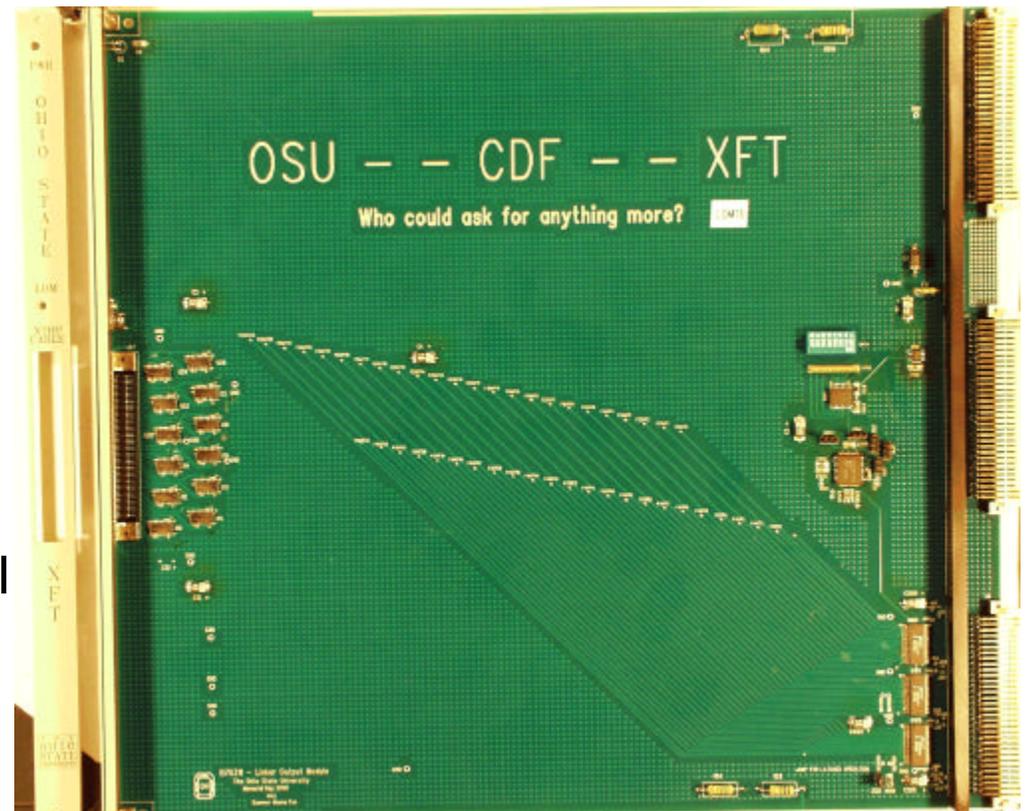
Linker Output Module

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- 30 Production boards constructed at Ohio State (July 2000).
- Modification from previous design to account for tight timing tolerance of eXTRaPolation Module (distributes Linker output to rest of Trigger system)
- Boards being stuffed at OSU now
- 16 modules installed at FNAL
- As more cards are tested, they will be sent to Fermilab for installation



OSU group



Linker to XTRP Integration

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- Wilson Hall setup
 - XFT linker crate
 - 2 XFT linkers
 - **New** XFT linker output modules
 - XFT linker tester
 - XTRP crate
 - XTRP data board
 - XTRP clock/control board
 - XTRP data board transition module
- B0 setup (April 2000)
 - Real trigger signals
 - Old Linker Output Module
- **Integration tests successful!**

Nathan Eddy, Mike Kasten, Phil Koehn





Xtc to Linker Integration

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- Setup
 - Load TDC calibration registers with prompt/delayed signals for 1 event
 - Process in XTC, send over L1 track trigger cables to Finder and Linker
- Results
 - **All boards respond to real trigger signals**
 - Check XTC hits, track segments and tracks in L2 buffers on Finder and Linker
 - Formatted data sent off board at speed
 - **Diagnostic developed to test whole XFT system**
- Status
 - Need to improve control of TS calibration enable signals
 - 1 TDC used so far → ϕ wedge of TDCs soon

Evelyn Thomson, Jay Dittmann



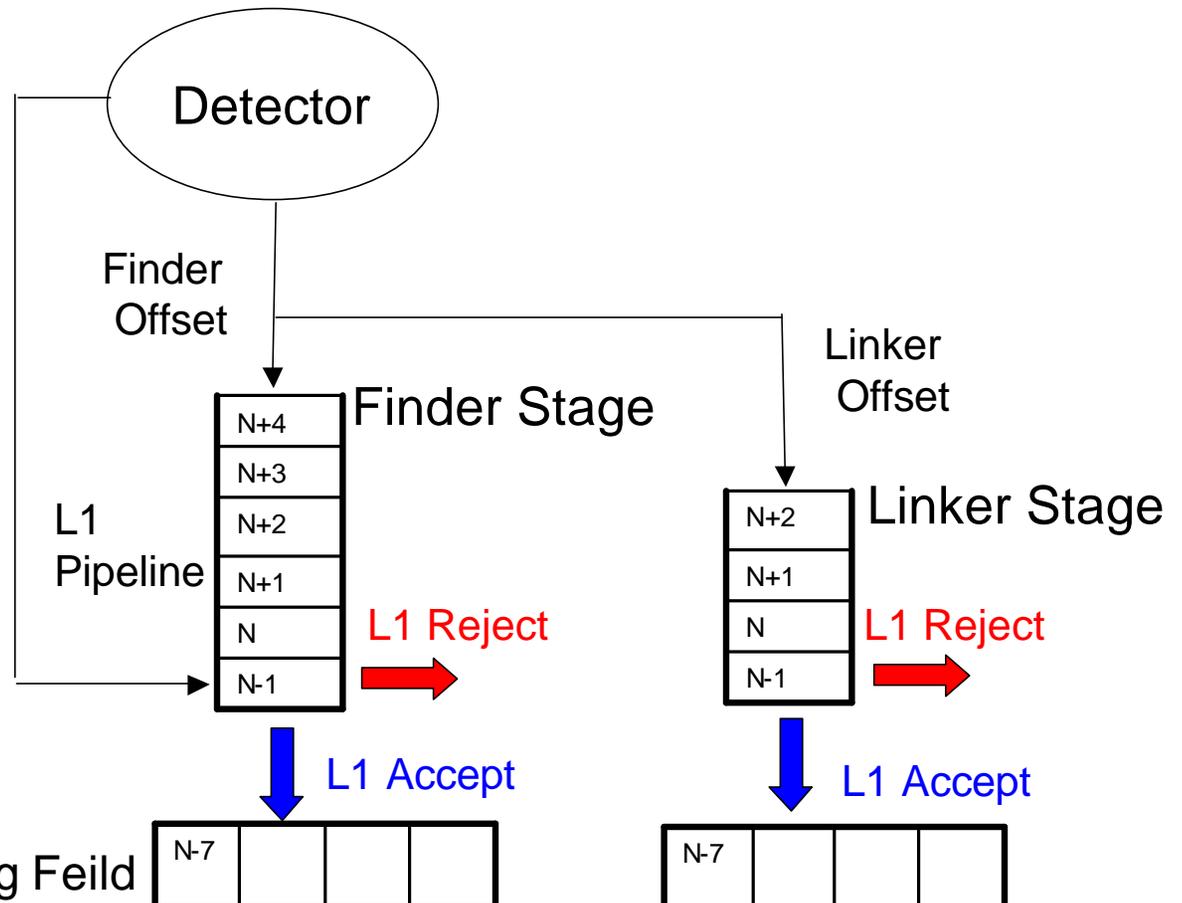
Integration with Level 1

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- Adjust Finder pipeline depth to align XFT with Level 1 system
- Estimate finder offset at 7 CDF clocks, measure with data
- Linker offset/pipeline **fixed** relative to finder offset/pipeline
- Pipeline depths programmable up to ~60 CDF clocks
- Status
 - Much progress made, nearly there!



Chris Neu, Evelyn Thomson, Greg Feild



Integration with Run Control

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- Warm/Cold Start routines being developed to:
 - Check boards exist
 - Check FPGA designs correct and board configured successfully
 - Check pipeline depths and offsets against hardware database
 - Download Finder Dead Wire registers from calibration database
 - Number of dead wires will change during run...
 - Send up to 3 reset messages to any unconfigured boards
- Status
 - Finder code almost complete
 - Linker code needs more work

Chris Neu



XFT Event Display and XFT Simulation

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- Complete bitwise simulation from XTC to Linker
 - Produces simulated events to test hardware
 - Estimate performance and trigger rates
 - Included in MDC2
- XFT event display
 - XTC hits
 - Finder track segments
 - Linker tracks
 - Unpacks XFFD and XFLD banks
 - Very useful for commissioning run and cosmic rays

Brian Winer, Jongyoung Chung



Commissioning Run and Cosmic Rays

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● Commissioning Run

➤ **Provide tracks for use in the Level 1 decision**

- Determine t_0 for XTC cards
- Time in XFT with the rest of the trigger system

➤ **Compare performance with expectations using XFFD and XFLD banks**

➤ Measure (if offline reconstruction available)

- Hit efficiency for COT
- Mask finding efficiency
- Track efficiency
- P_T and ϕ resolution

● Cosmic Rays

- Limited track finding efficiency due to large impact parameter and out-of-time nature of cosmic rays

➤ **Cosmic Ray FPGA designs for Linkers are ready**



Summary

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- **All components of the XFT are ready**
 - Extensive integration tests with real trigger system have already been done
 - More and more of the system will be implemented in these tests as TDCs become available