DØ Forward Proton Detector

Readout and Trigger Chains

Status and Plans

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Goals

Our immediate goal is to integrate our detectors into the DØ electronics and data.

I. Complete testing TPP at an AFE test stand — complete by end of March

II. Add gap+jet triggers to DØ trigger list

III. Enable FPD scintillator trigger AND/OR terms

IV. Develop FPD sDAQ

V. Installation of a full Readout chain for one spectrometer for Phase 0 — complete by mid April

VI. Complete installation of Readout chain for Phase I — 10 detectors/5 spectrometers — complete by end of May

VII. Complete installation of Phase I Trigger chains for Phase $I^{\mathcal{T}}$ — 10 detectors/5 spectrometers — complete by end of June

Progress

I. Tremendous progress in January understanding data taken using our standalone system. Capable of reading only one spectrometer at a time, but triggering is more sophisticated. Elastic events stress our tracking and alignment algorithms and allowed us to uncover and fix a few bugs in cabling and software.

II. Have essentially completed Phase I (5 spectrometers) hardware installation in the TeV tunnel: detectors, LVPS, A/S, safety systems, monitoring.

III. In February operations were limited as most of manpower went to Brazil for LISHEP2002. Still, steady progress was made.

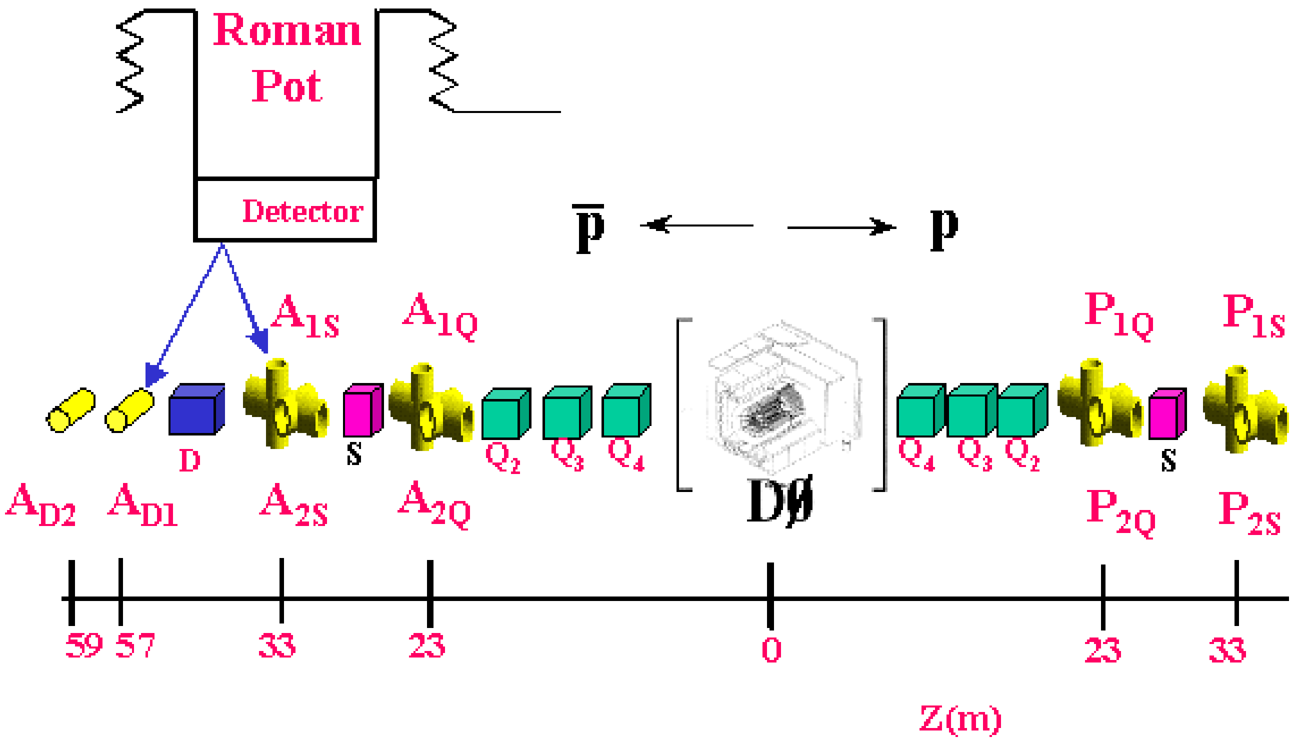
IV. Recently have collected higher quality data after using accesses for minor repairs and improvements. This puts us in a position to involve more people in shifts, since not only experts are required to run shifts. We hope to dramatically increase our presence in the DØ Control Room.

V. We plan to use the May/June shutdown to switch over to the multiplexors. These have been succesfully tested by Vladimir and Victor. This will give us 18 pot control, more diagnostic capability, more software control of system, and will require fewer rack monitors.

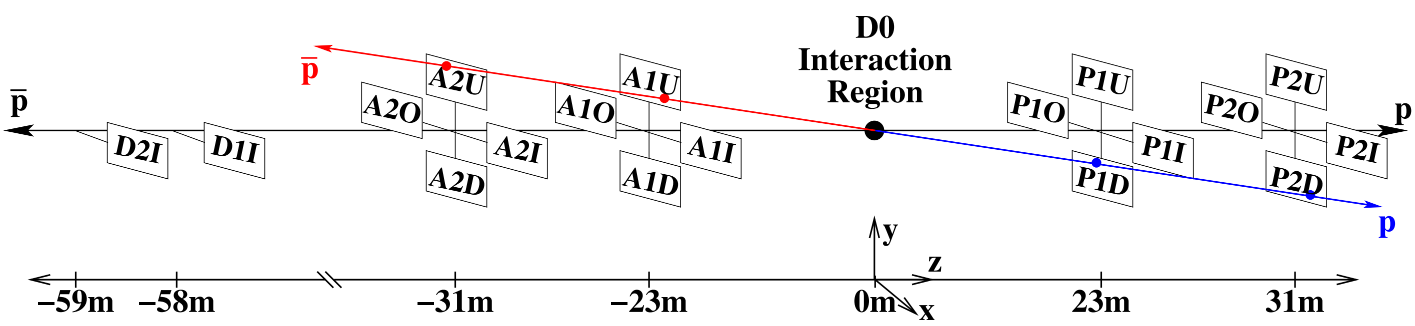
VI. TPP progress.

FPD Description

FPD Detectors

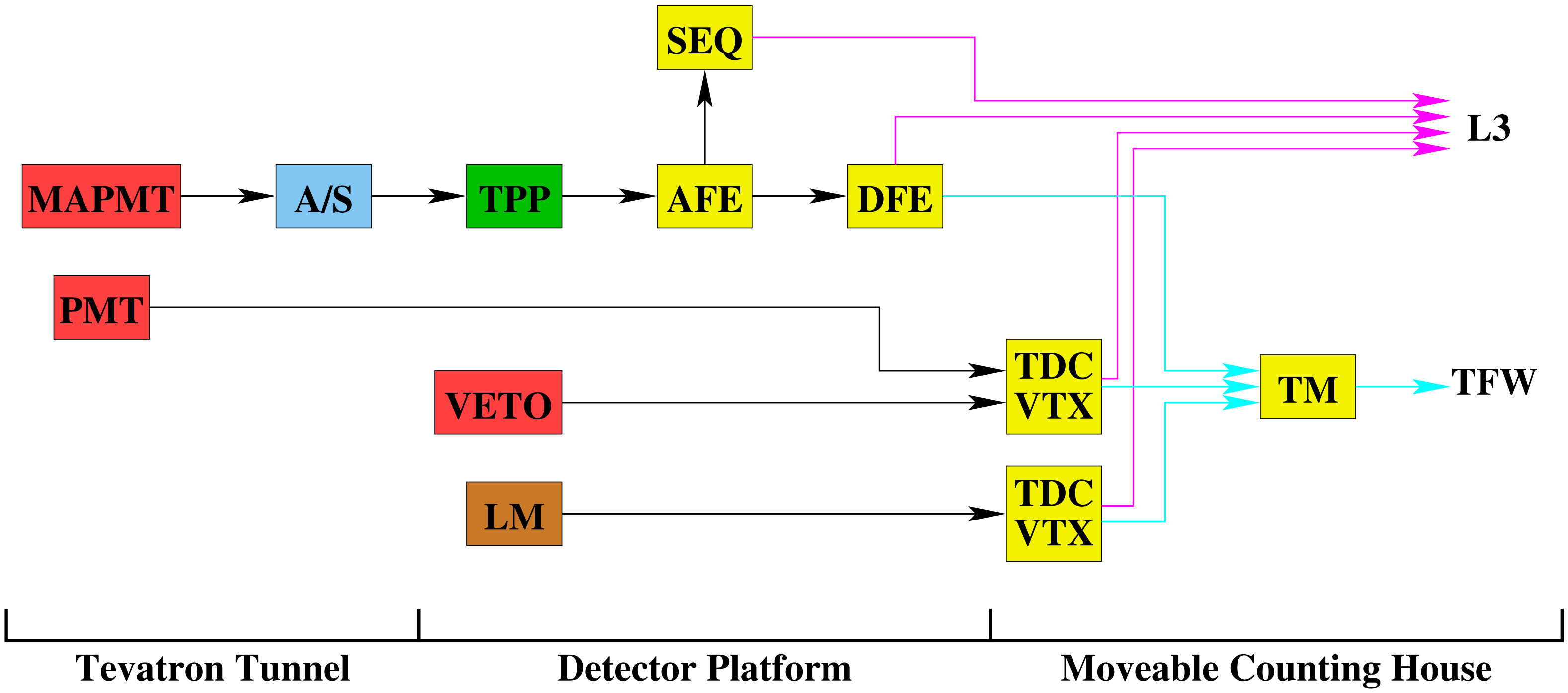


FPD Spectrometers



FPD Description

FPD Block Readout and Trigger Chains



Transition Patch Panel

The TPP Serves to:

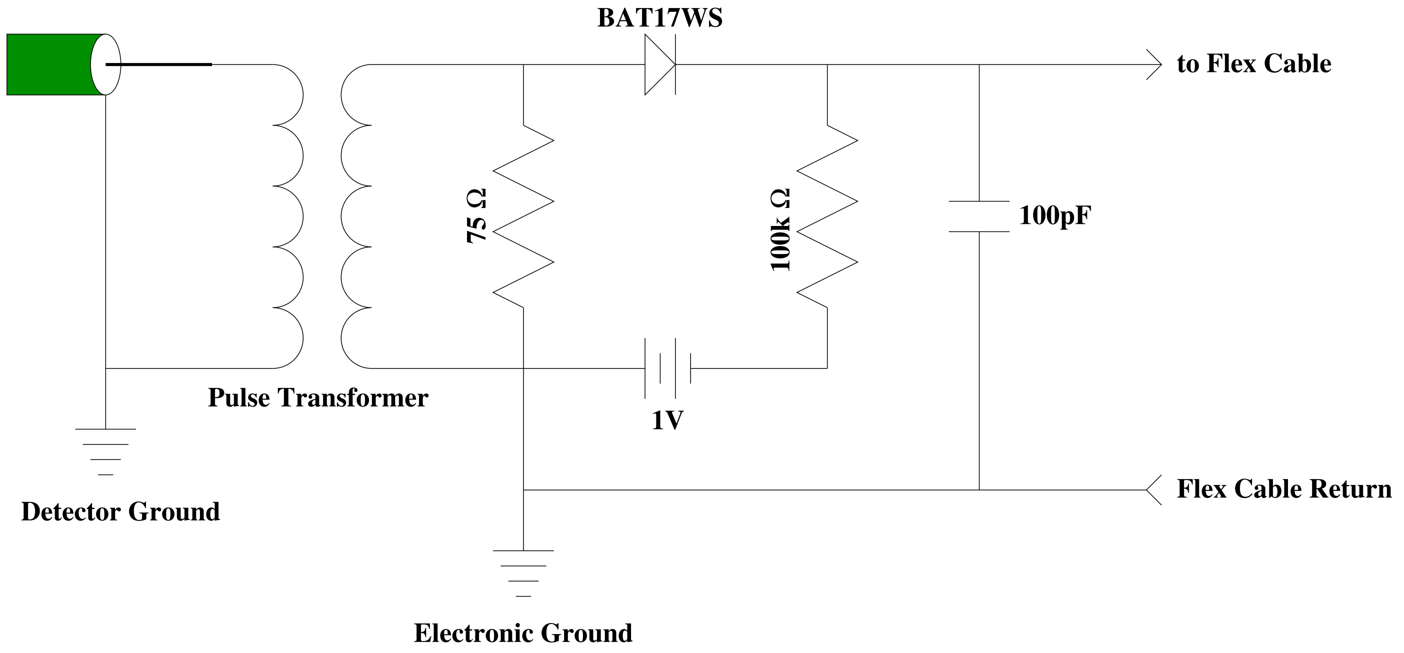
I. Make the transition from 16-channel bulkhead connectors to 64-channel flex cables

II. Isolate tunnel/detector ground from DØ platform ground

III. Transform signals to mimic output from VLPCs

IV. Discard extra charge so as to use the dynamic range of the SIFT chips

TPP Circuit



Transition Patch Panel

The TPP Tests:

I. Determine charge division components to maximize dynamic range of SIFT chip

II. Determine need for biasing diodes

III. Determine need for connecting *detector* and *electronic* grounds

IV. Map out channels for both left and right AFE boards

V. Check for cross talk

VI. Check for common mode noise

VII. Simulate and study timing requirements

VIII. failsafe checks

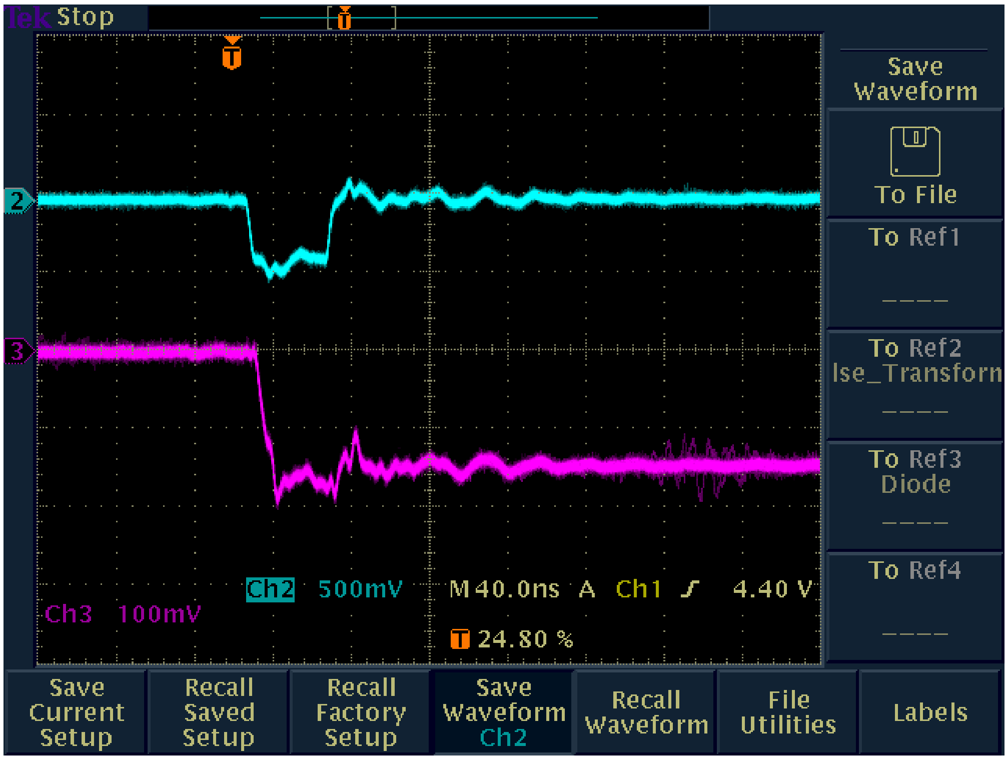


Figure 1: TPP Input (blue) and Output (violet) on 40 ns scale.

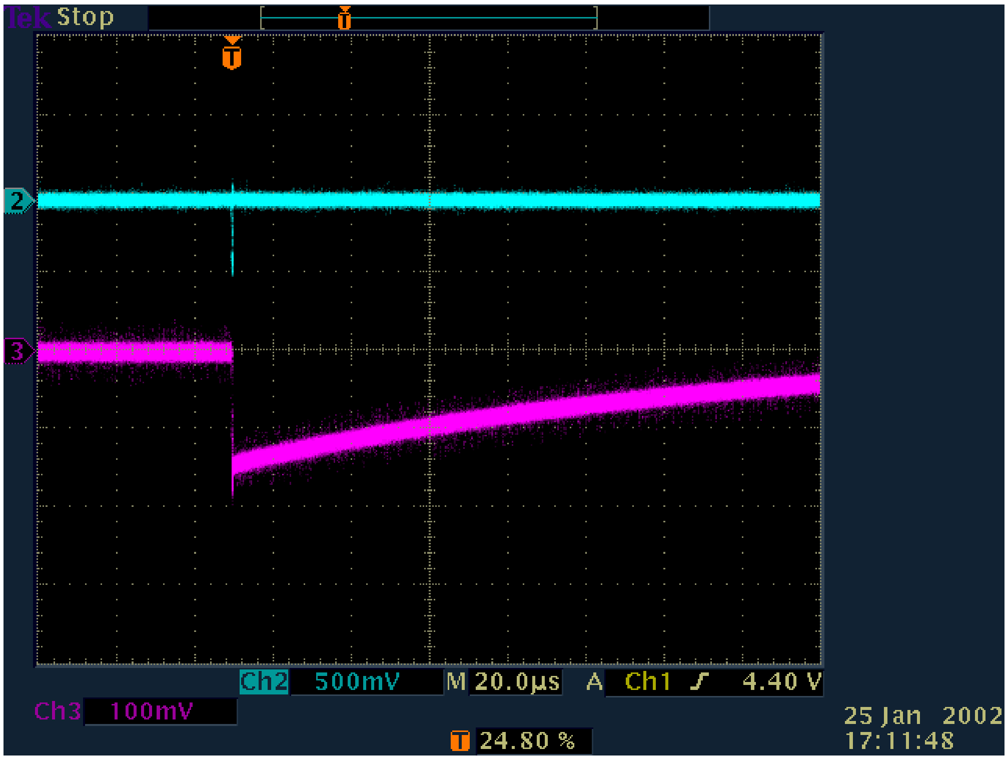


Figure 2: TPP Input (blue) and Output (violet) on 20 μs scale.

Hardware Requirements

Incremental hardware additions for phased installation of FPD Readout and Trigger Chains

- Phase 0 — Dipole spectrometer → AFE → Sequencer → L3
- Phase I — 10 pots (5 spectrometers) → 3 AFEs → 3 Sequencers → L3
- Phase $I^{\mathcal{T}}$ — Phase I + DFE triggering
- Phase II — Phase $I^{\mathcal{T}}$ + Quadrupole In&Out spectrometers (18 pots)

Required Quantity	Required Hardware	Installment Phase	Target Start Date
1	Vicor Power Supply	Phase 0	15 Apr., 2002
1	Backplane	Phase 0	15 Apr., 2002 ???
1	AFE	Phase 0	15 Apr., 2002 ???
1	Sequencer	Phase 0	31 Mar., 2002
3	50-conductor grey cable	Phase 0	31 Mar., 2002
1	1553 cable	Phase 0	31 Mar., 2002
1	Smoke Detector	Phase 0	31 Mar., 2002
2	AFE	Phase I	1 May, 2002 ???
2	DFE	Phase $I^{\mathcal{T}}$	30 Jun., 2002
10	LVDS cables	Phase $I^{\mathcal{T}}$	30 Jun., 2002
2	AFE	Phase II	31 Jul., 2002
1	DFE	Phase II	31 Jul., 2002
10	LVDS cables	Phase II	31 Jul., 2002

Table 1: