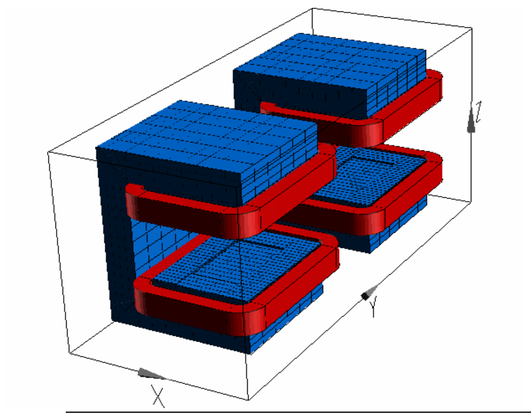
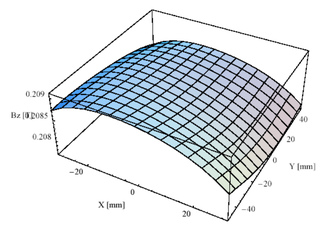
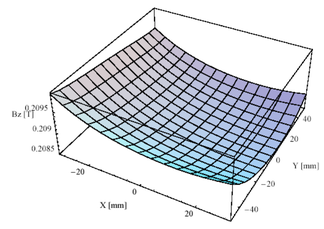
Magnets

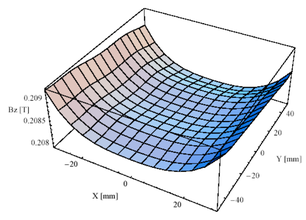




Z-0



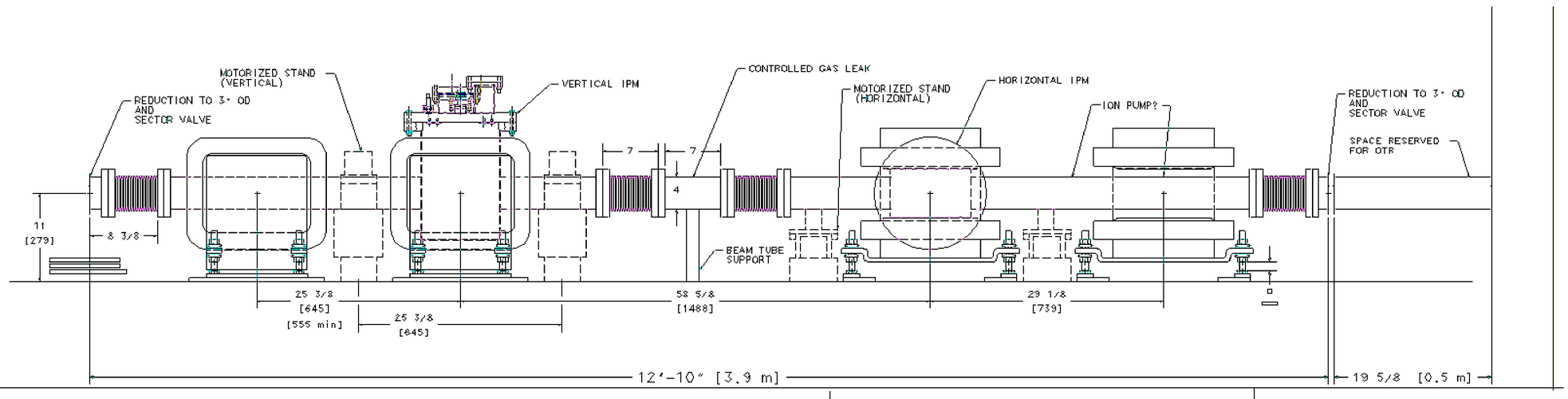
Z-30



Z-57

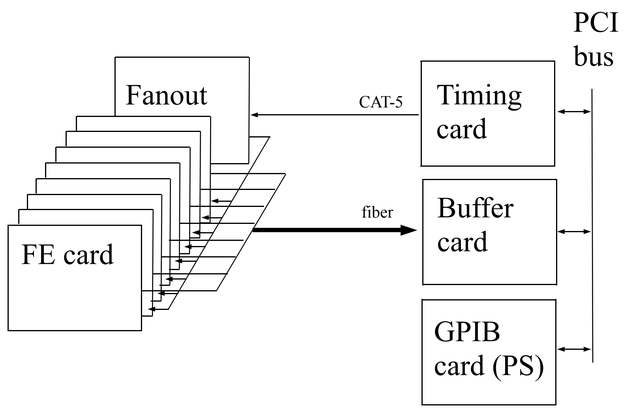
A good magnetic field quality is required to properly focus the electrons. Pairs of identical magnets be operated in series to cancel the effect of the beam. The residual orbit distortion is expected to be less than 100 um. Without correction, a single magnet would create up to 12 mm orbit excursion around the ring.

Layout

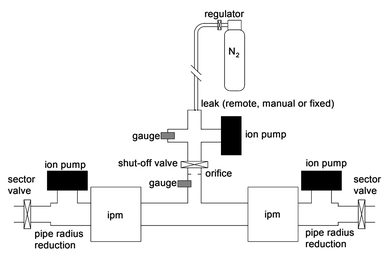


DAQ

The data acquisition system will use the QIE chip, developed at Fermilab. Charge integration and digitization will be done in the tunnel, (in order to minimize cable noise) and data sent on optical links to a data buffer card in a standard PC situated in the service building. Timing and clock pulses will be generated upstairs from Tevatron RF and beam synch signals, and sent down to the QIEs thru a simple fanout card. The components in the tunnel are selected to withstand a higher radiation dose than the than the QIE itself.



Vacuum pressure control

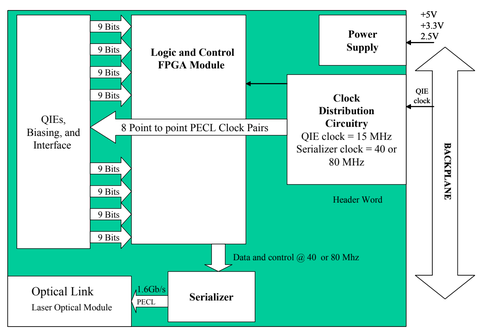


To control the local vacuum pressure, and hence the ionization signal, a controlled leak will be installed, with differential pumping to keep the "pressure bump" closed.

Calibration

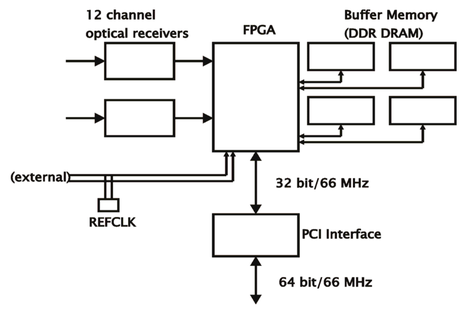
The IPMs will be fitted with an internal electron source for calibration. In addition, it is foreseen to install a prototype OTR (optical transition radiation) detector in the same location, to be used for cross-calibration.

QIE Front-end ard (PPD)



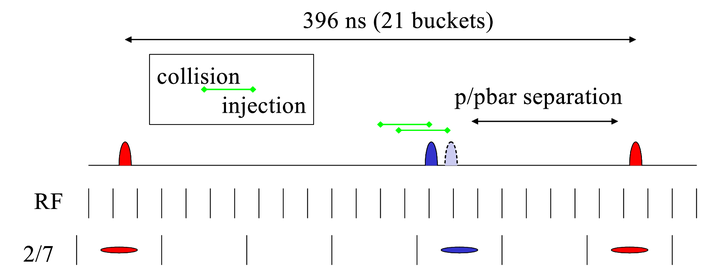
The QIE FE card integrates the signals from 8 anode strips and generates a serial data stream on optical fiber. About 128 channels will be instrumented.

Buffer card (CD)



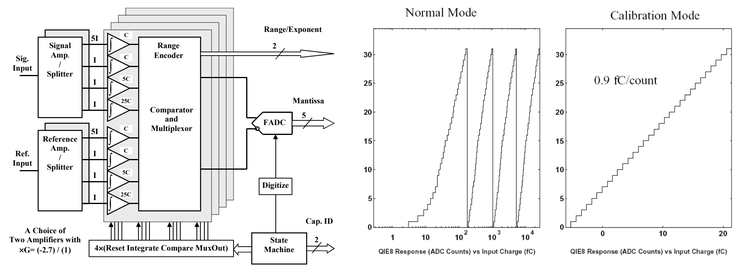
The buffer board will capture data from multiple fiber links at a very high rate (~26 Gb/s), store it in internal memory, and allow it to be read out over the considerably slower PCI bus.

Timing



At the IPM location, the minimum distance between proton and pbar bunches is about 8 RF periods. The QIE will sample continuously at 2/7 times the RF frequency, and the system will be phased to keep bunches within a single integration period.

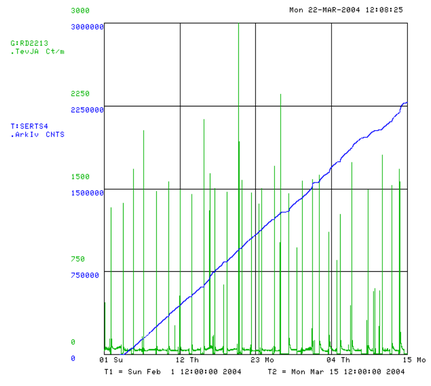
QIE8 chip



The QIE chip uses parallel circuitry to achieve a deadtimeless continuous integration. Two modes of operation are of interest, "calibration mode" (linear) with an LSB of 0.9 fC, and "normal mode" (quasi-logarithmic) with an LSB of 2.6 fC.

Radiation levels in Tevatron

The QIE chip is not radiation hard, but tolerates at least 20 krad. Measurements in the Tevatron tunnel indicate that the average radiation dose close to the cable trays is about 1.1 krad/ year, at the chosen location. The highest instantaneous dose is during halo removal (scraping) and occasional unclean aborts, when the system is not foreseen to be used.



Above picture and graph show the ionization chamber used for the radiation measurements, and the instantaneous and integrated dose. Each count correspond to 62.5 urad.