The KOPIO Cathode Front End readout card prototype

From preamps

- 48 differential inputs
  - Low pass filters
  - FADC drivers
  - Baseline offset (48 channels)

10 bit FADCs
- 25 - 65 Ms/sec.
- 6 octal chips, 48 channels

Front end FPGAs (6)
- Latency and raw data event buffers.
- Pulse shape analysis: time vernier, uncalibrated charge
- Output serializer

NIM L0 trigger

LVDS LINK (RJ45)
- Up CLK (25 MHz)
- UP Link (200 Mbauds)
- Down Link (200 Mbauds)
- DownCLK 25 MHz
- System clock selector

Collector FPGA (1)
- Sub event builder.
- VME A24D32 interface
- LVDS Link interface
- Parameters protocol

VME serCLK, for one crate test system

J.P. Martin, LCWS paris, 20 April 2004
View of the top layer of the PCB, with the copper pour removed.
Front end FPGA firmware blocks

- Latency buffer, dual port 128 x 80 bits 5.12 micro @ 25MHz
  - HITDET.
- Dual port trigger window buffer 8 x 512 x 16 bits
- Asynchronous processing of one event:
  - Event raw data buffer
  - Fast digital filter, time vernier
  - Slow digital filter, uncalibrated charge
- Time stamp
- Trigger FIFO
- Flags
  - Handshake
- FADC data
  - Memory available
- Raw Data stream
  - Time
  - Charge
  - Flags
  - Done
- Event assembly
  - Header generation
  - Parameter protocol
  - Serial link handler
- Raw Data stream
  - Time
  - Charge
- Flags
- Done
  - Local LVDS link, 200 MBauds
  - 25 MHz FADC bits
  - 100 MHz
  - 80 Transfer command
  - First read address
  - 10 Memory available
  - 28
  - 24
  - 28
  - (WBfullFlag)
  - 24
  - Event time stamp
  - Trigger number
  - New event
  - L0
  - SPILL
General specifications

Input: 48 differential pairs, 100 position connector, fine pitch flat cable.

Analog conditioning:
- fixed gain (1x to 20x practical)
- low pass filter (Nyquist)

FADC: 10 bits, ± 0.5Volts full scale.

Trigger window: 0 to 100 microseconds
Hit detector pulse shape segments: 0 to 4 microseconds, retriggable

Firmware digital filters/shapers

VME A24D32 interface

Cost of FADCs and FPGAs: 14 Euros/channel
Total cost, low volume, hand assembly: 60 Euros/channel