[2-4-6] Proton Drift Chamber 1, 2 (PDC1, PDC2)

* Design

PDC1 and PDC2 are placed downstream of SAMURAI magnet, and used to measure the momentum of projectile-rapidity protons. Since counting rate is expected to be low and in order to reduce number of planes, position information is obtained using the cathode readout method. For the anode plane, Walenta-type drift chamber, with 8mm drift length, is adopted in order to reduce the number of anode wires. Three kinds of cathode orientation are used to detect multi particles.

Parameters for the cathode readout are as follows.

anode wire	30 μ m ϕ Au-W/Re, 16mm pitch (8mm drift length)
potential wire	80 μ m ϕ Au-Al, 16mm pitch
anode – cathode gap	8mm
cathode wire	80 μ m ϕ Au-Al, 3mm pitch
cathode strip width	12mm (4 cathode wires are or-ed for one strip)

Present design of PDC is as follows. Anode wires are or-ed and positive HV is applied. Anode wires are not readout. Slight negative HV is applied to potential wires. Cathode strips are directly connected to the readout without decoupling capacitors.

Present design of the PDC is shown in Fig 2-4-6.

configuration	cathode(U)-Anode(V)-cathode(X)-anode(U)-cathode(V)
wire angle	X(0°), U(+45°), V(-45°)
Effective area	1700mm x 800mm
anode wire (U,V)	106 anodes/plane x 2cplanes = 212 anodes
potential wire (U,V)	107 potentials/plane x 2 planes = 214 potentials
cathode wire (U,V,X)	544 wires/plane, 136 cathode strips (4 wires are or-ed)/plane
HV	Anode(+), potential(-)
Operating gas	Ar+25% i-C_4H_{10} or Ar+50%C_2H_6

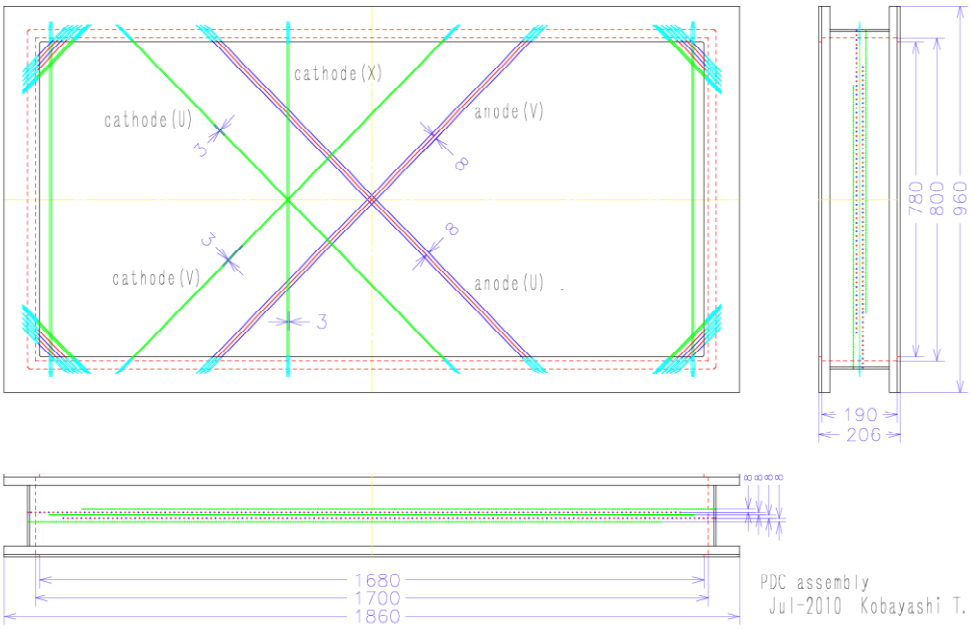

Fig 2-4-6: PDC assembly

*Readout (status)

We have tested the charge division readout for cathode signals in order to reduce the readout channel. Cathode strips are daisy-chained by resistors, and cathode charges are read out via charge sensitive pre amp in every 8 strips. Using a prototype detector (600mm x 480mm effective area) with roughly the same geometry, position resolution of 1mm (rms) were obtained for x-rays. With this method, about 110ch of charge sensitive preamp, shaping amp, and peak sensitive ADC's are necessary to read 2 PDC's.

Since 2 proton events can not be handled properly by this method, we are developing a new readout circuit: every cathode signals are connected to charge sensitive preamp, shaper, sample & hold, and digitized in the front-end board (FEB, 16ch/board), and digital data are sent to the VME memory. This method also improve the position resolution by ~factor of 5. About 810 ch of circuits (8-9 FEB's/plane x 6 planes) are necessary.