

A Beam Request to Measure Aging in the TPC

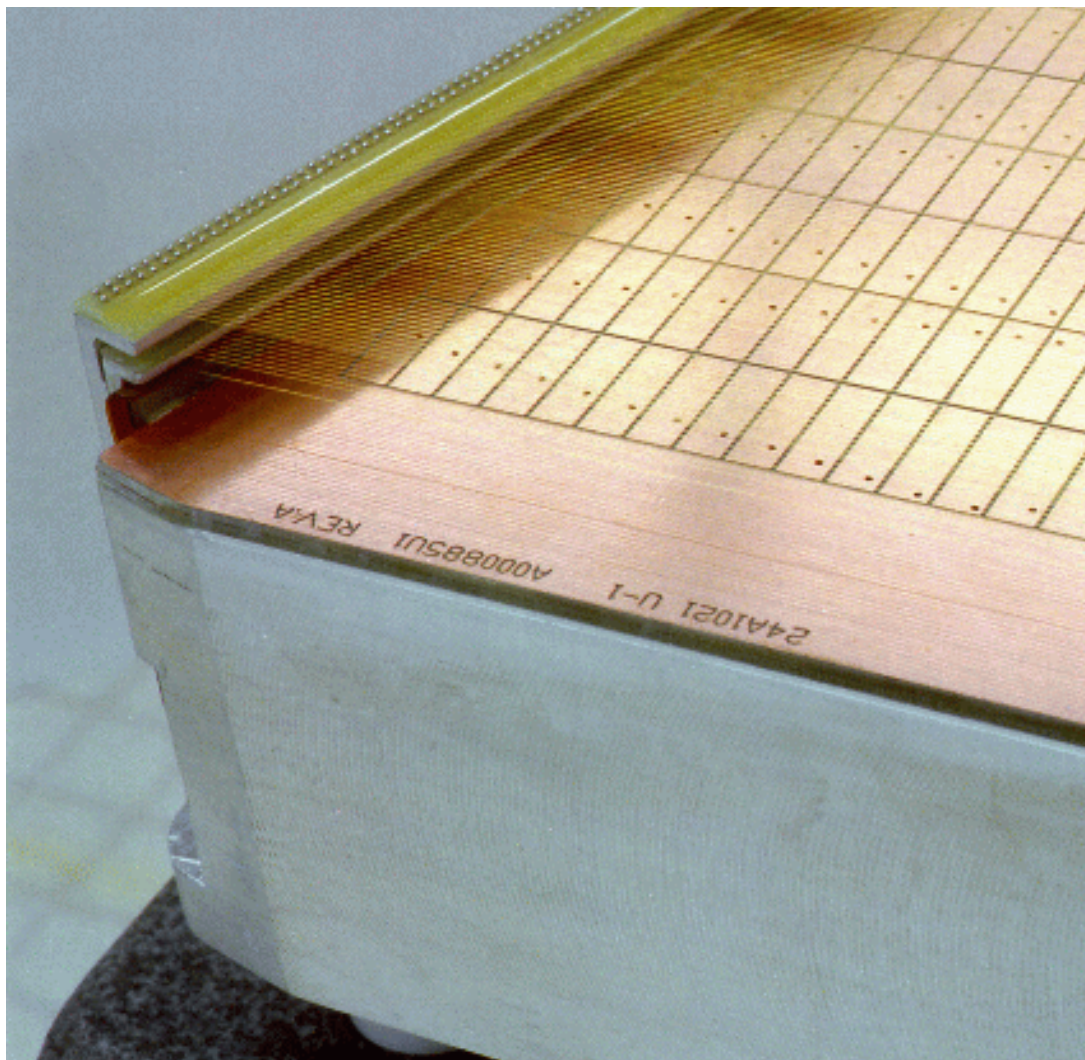
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- **Measure Aging on the TPC Anode and Cathode wires**
 - We have a good at the beginning of Run IX, and another after the 500 GeV run. We would like a point at the end of the run to finish the suite of measurements
- **Sector Alignment studies**
 - We do not have a sector alignment study for Full Field setting
- **The 2009 TPC Review Committee recommended that we run at the lowest possible gain settings in order to decrease the aging on the TPC anode and cathode wires**
 - We don't have the basic data required to make this decision

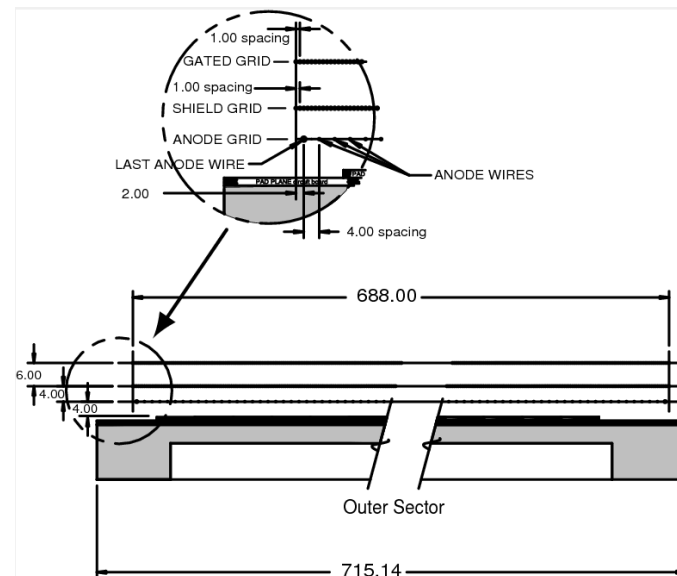
TPC Sector Detail



- Gating Grid
- Ground Shield
- Anode
 - 4 mm pitch, no field wires
 - Spacing: inner \neq outer
- Pad Plane

Sector Operation for 20:1 signal to noise

Sector	anode voltage	gas gain
inner	1170	3770 \pm 10%
outer	1390	1230 \pm 10%



Comparison low luminosity runs pp500 and pp200

Here we compare data obtained at “low luminosity” at the beginning of pp500 (03/24/09) and the beginning of pp200 just after finishing pp500 (04/28/09). For this period it was collected 10 C for all Inner sectors and $10/3.18 = 3.15$ C for Outer sectors (A.Lebedev’s estimation from slow control).

Thus accumulated charge per unit length of wire (assuming its $1/r^2$ charge dependence):

- Inner: $\Delta Q(\langle r \rangle) = 10C / 1.6 \text{ km} = 62.5 \mu\text{C/cm}$ at $\langle r \rangle = 81.4\text{cm}$ (row 5)

- Outer: $\Delta Q(\langle r \rangle) = 2.63C/3.6\text{km} = 7.3 \mu\text{C/cm}$ at $\langle r \rangle = 154.5 \text{ cm}$ (row 28)

If we assume

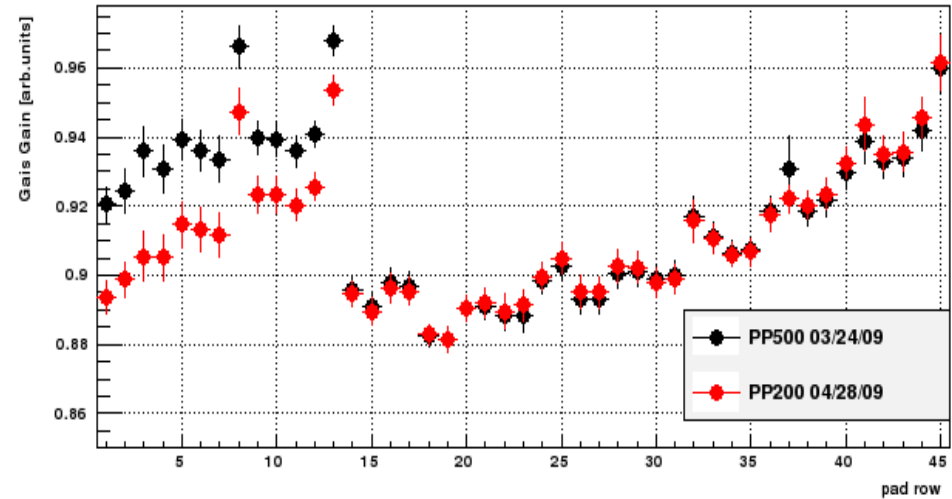
$$R^{-1} = - \Delta Q/(\Delta G/G),$$

$$G \sim \exp(-\Delta Q/R^{-1}), \text{ and}$$

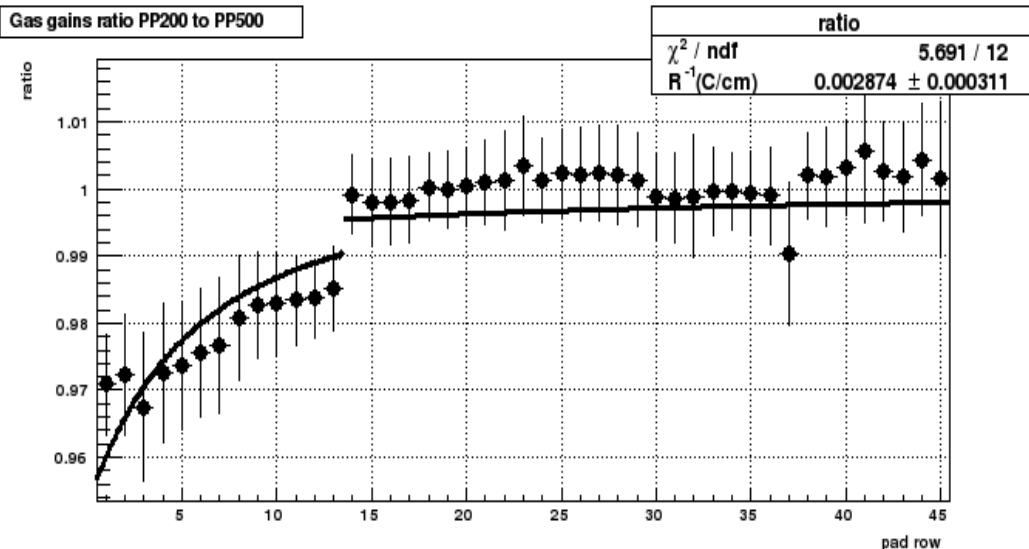
$\Delta Q = \Delta Q(\langle r \rangle)(\langle r \rangle/r)^2$ then fit gives

$R^{-1} = 2.8 \pm 0.3 [\text{mC/cm}]$. This value is a factor of 35 less usually claimed $\sim 100 [\text{mC/cm}]$.

Gas Gains versus pad row at the beginning of Run IX PP500 and PP200



Gas gains ratio PP200 to PP500



- **We could take a 6x6 run at 200 GeV**
 - **Low luminosity to avoid spacecharge and pileup**
 - **Precision differential measurements required**

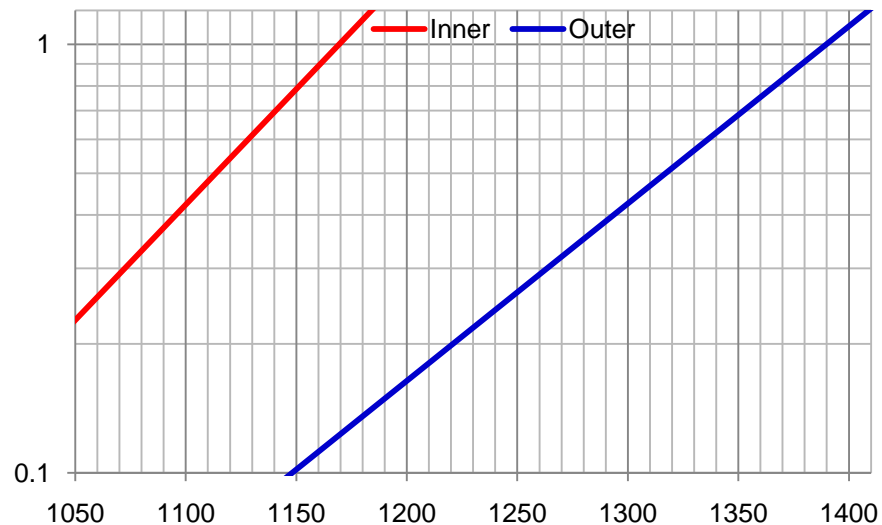
- **We can also take data during the pp2pp run**
 - **We assum 100x lower luminosity (perfect)**
 - **About 5 kHz BBC rate is good and will saturate DAQ 1000**
 - **We assume a minbias VPD trigger is available and can take data at about 500 Hz**

Beam Request



- **dE/dx studies & Alignment studies to be done during the pp2pp physics run**
- **Voltage change studies to be done with dedicated runs to avoid spoiling pp2pp physics**
- **All triggers are VPD minbias trigger**
- **250K events takes 10 (perfect) minutes at 500 Hz**

Inner V	Inner Gain	Outer V	Outer Gain	Event Goal
1170	100%	1390	100%	1 M
1135	66%	1390	100%	1 M
1120	55%	1390	100%	250k
1100	42%	1390	100%	250K
1080	32%	1390	100%	250K
1060	24%	1390	100%	250K
1170	100%	1345	66%	250K
1170	100%	1325	55%	250K
1170	100%	1300	42%	250K
1170	100%	1270	32%	250K
1170	100%	1240	24%	250K



Do it with pp2pp and after pp2pp



- **We can take our long runs at the same time as pp2pp physics data**
- **The lower voltage runs should be dedicated runs**
- **We propose to have pp2pp take its full complement of data (40 hours to tape) and then we retain the beam for another 8 to 10 hours with the pp2pp beam configuration to complete these studies**