

Report on the last two weeks of data taking

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September 23rd FNAL

- Since Saturday September 6th the detector is running with 480 active channels (both Collection and Induction plane are fully equipped).
- Sources of noise have been investigated and individuated through dedicated runs. Josh will report on this in detail.

Some data runs were taken in order to study/optimize wire planes transparency:

- Run 405 --> 30 events

Bias Voltages:

K = - 4kV SH = - 134V IND = - 102V COLL = - 69V

$E1 = E2 = E3$

E1 is the field in the drift region

E2 is the field between the shield and the Induction plane

E3 is the field between the Induction and the collection planes

- Run 406 --> 30 events

Bias Voltages:

K = - 4kV SH = - 134V IND = - 69V COLL = + 61V

$E2/E1 = 2$ and $E3/E2 = 2$

- Run 407 --> 20 events

Bias Voltages:

K = - 4kV SH = - 135V IND = - 87V COLL = - 26V

$E2/E1 = 1.46$ and $E3/E2 = 1.274$

Some data runs were taken in order to study charge quenching at different Electric Fields in the drift region:

Run	Cathode HV (kV)	Shield BV (V)	Induction BV (V)	Collection BV (V)	E1 (V/cm)	E2 (V/cm)	E3 (V/cm)
407	-4.0	-135	-87	-26	82	120	153
409	-4.5	-151	-97	-28	92	135	172
416	-5.0	-168	-108	-31	103	150	191
422	-5.0	-168	-108	-31	103	150	191
427	-5.0	-168	-108	-31	103	150	191
417	-5.5	-185	-119	-35	113	165	210
418	-6.0	-202	-130	-38	123	180	229
419	-6.5	-219	-141	-41	134	196	250
420	-7.0	-236	-152	-45	144	210	267
421	-7.5	-253	-163	-48	154	225	287
422	-8.0	-269	-173	-51	164	239	304

Track bending at and point understood

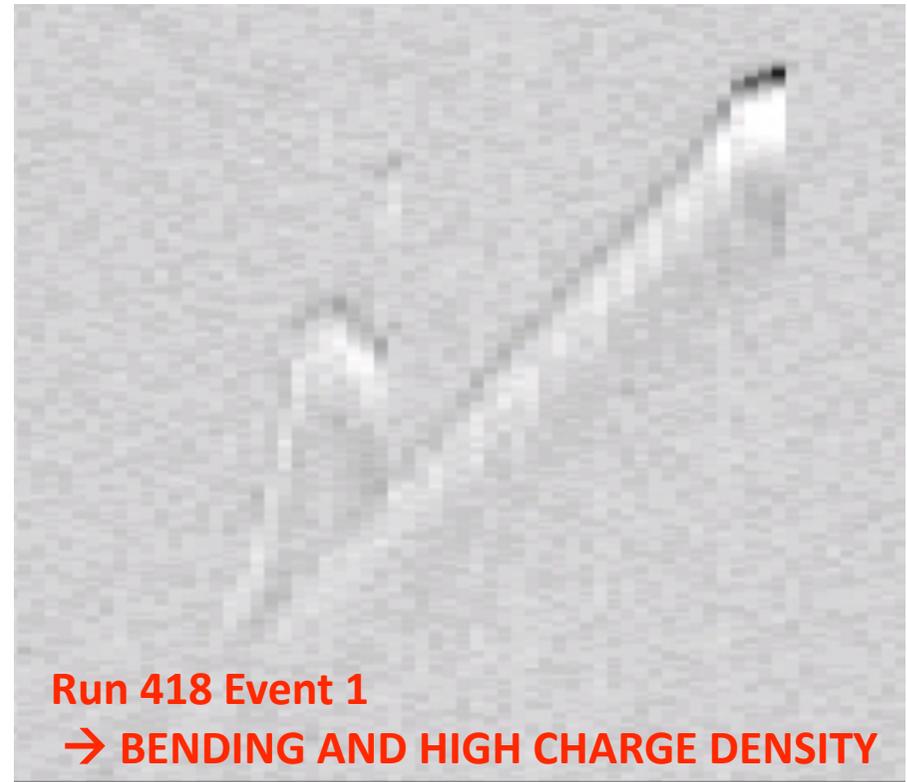
- When $E2/E1$ and $E3/E2$ are high also the ratios between drift velocities are high => track end bends.
- Moreover the higher E Field between wire planes is, the shorter is the time needed to collect charge produced between wire planes => track is darker in the region between the wire planes.



Run 405 Event 24
→ NO BENDING

Cathode : -4kV
Shield: -134V
Induction: -102
Collection: -69
E1= 82 V/cm
E2= 82 V/cm
E3= 82 V/cm

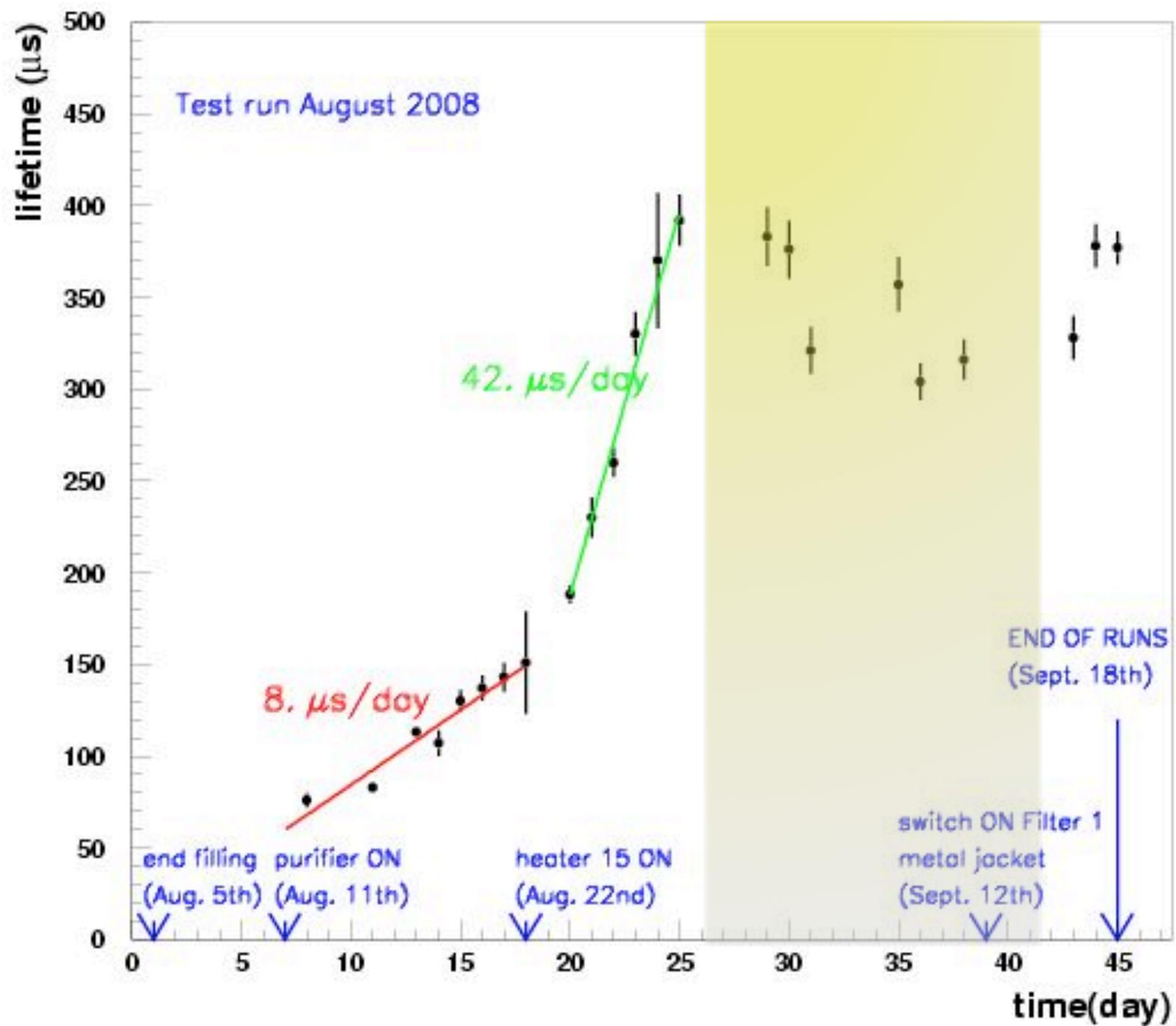
Cathode : - **6.0 kV**
Shield: - 202 V
Induction: - 130 V
Collection: - 38 V
E1= 123 V/cm
E2= 180 V/cm
E3= 229 V/cm



Run 418 Event 1
→ BENDING AND HIGH CHARGE DENSITY

Report on Purity Measurement

- Purity plot has been updated to the last day of run (September 18th) with the exception a 4-5 days of acquisition stop due to several reasons
 - fake trigger picked up by the system probably from some environmental noise. On the event display a spike on all 480 channels is present at the trigger time (about 155 samples).
 - One of the two Modules for PreAmps Power Supply got AC fuses blown out (probably because this device was switched on – off too fast).
 - The Scintillator Paddle S2 was getting light (maybe the external coverage of the paddel was damaged during the last change of the external trigger geometry..)
- Plot is reported in next slide



- Since the beginning of data taking purity has been increasing at constant rates:
 - ✧ 8 $\mu\text{s}/\text{day}$ at beginning
 - ✧ 42 $\mu\text{s}/\text{day}$ after switching ON the Vessel Heater
- Then no measurements were taken during the long weekend including Labour Day
- Starting from the first days of September LAr purity seems to decrease or at least not to increase...
- On Sept. 12th we could switch to Filter 1, which was equipped with (Andy's) new metal vacuum jacket. Purity re-starts to increase, even if not at the expected rate.

Possible explanations for purity rate loss:

- ① Some instability of the cryogenic system was observed from Aug. 26th up to Sept. 3rd (oscillating behaviour and progressive decrease from ~7% down to 0% of HTR-52 - cryocooler - when HTR-15 - cryostat - is ON, 24% set point), it was noticed that the Nitrogen bottle for the purifier purge was empty.

This may have caused some loss in the insulation efficiency and consequent increase of the heat load into the system.

It is possible that the increased heat load at the purifier might have lowered the GAr flow rate through it (and consequently reduced the purification rate).

- ② The purification filter, in use since the beginning of August, could have been exhausted after one month of LAr recirculation.

Which was the cause for purity rate loss?

Heat load increase, exhaust filter or a combination of facts?