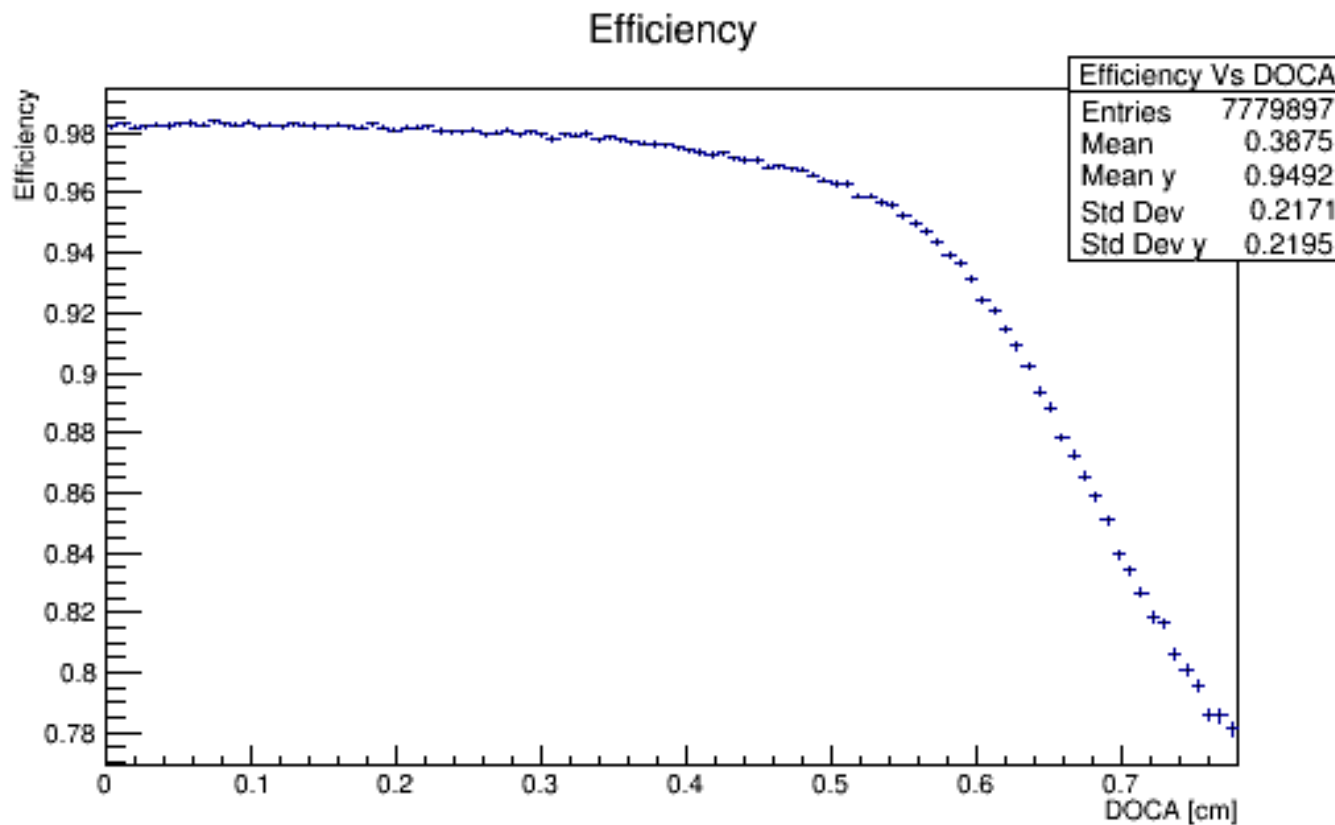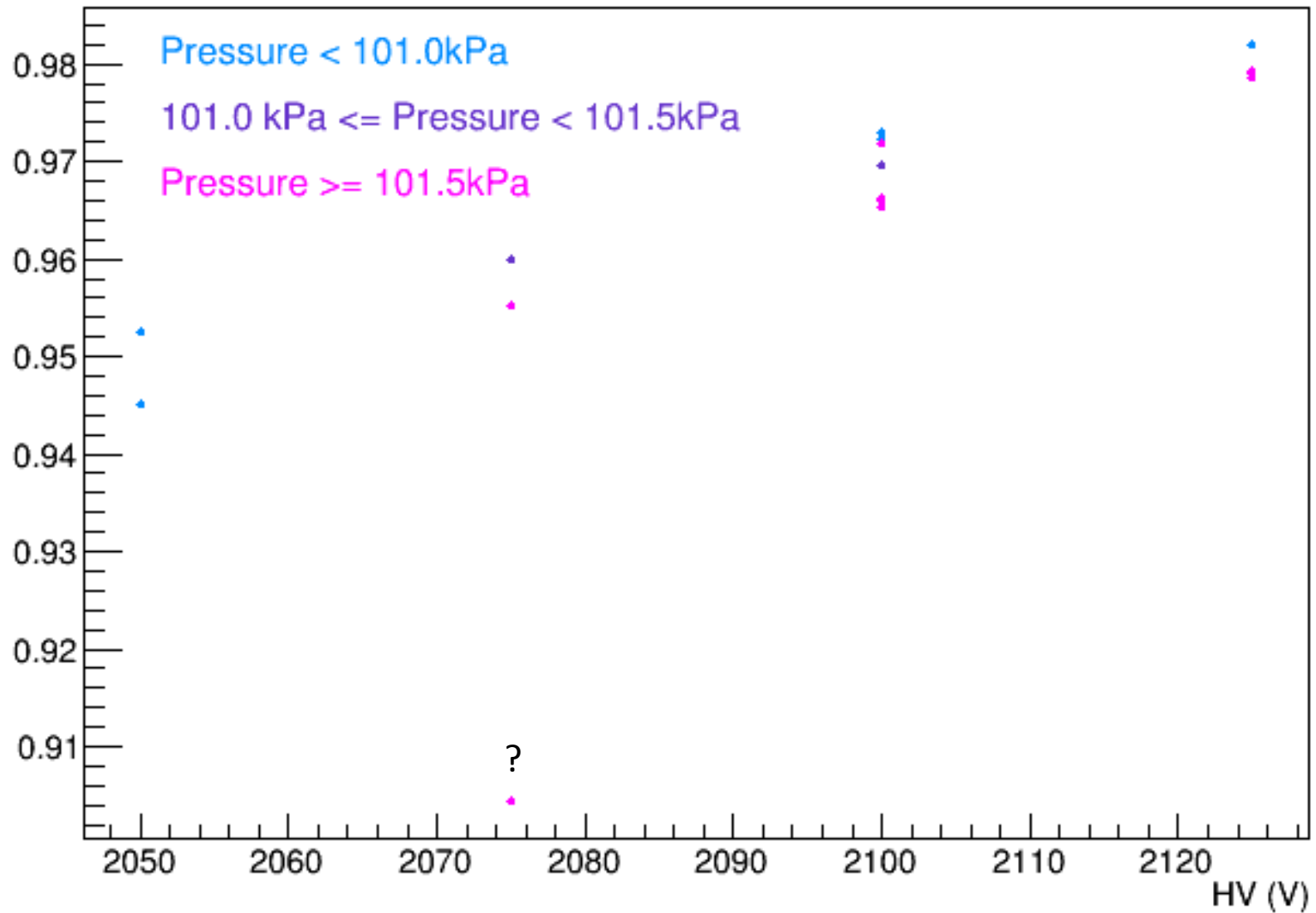CDC efficiency vs DOCA for run 21981, CDC HV=2125V, 50nA beam, 100.5kPa

Efficiency = hits found/hits possible; hits are summed over all tracks found
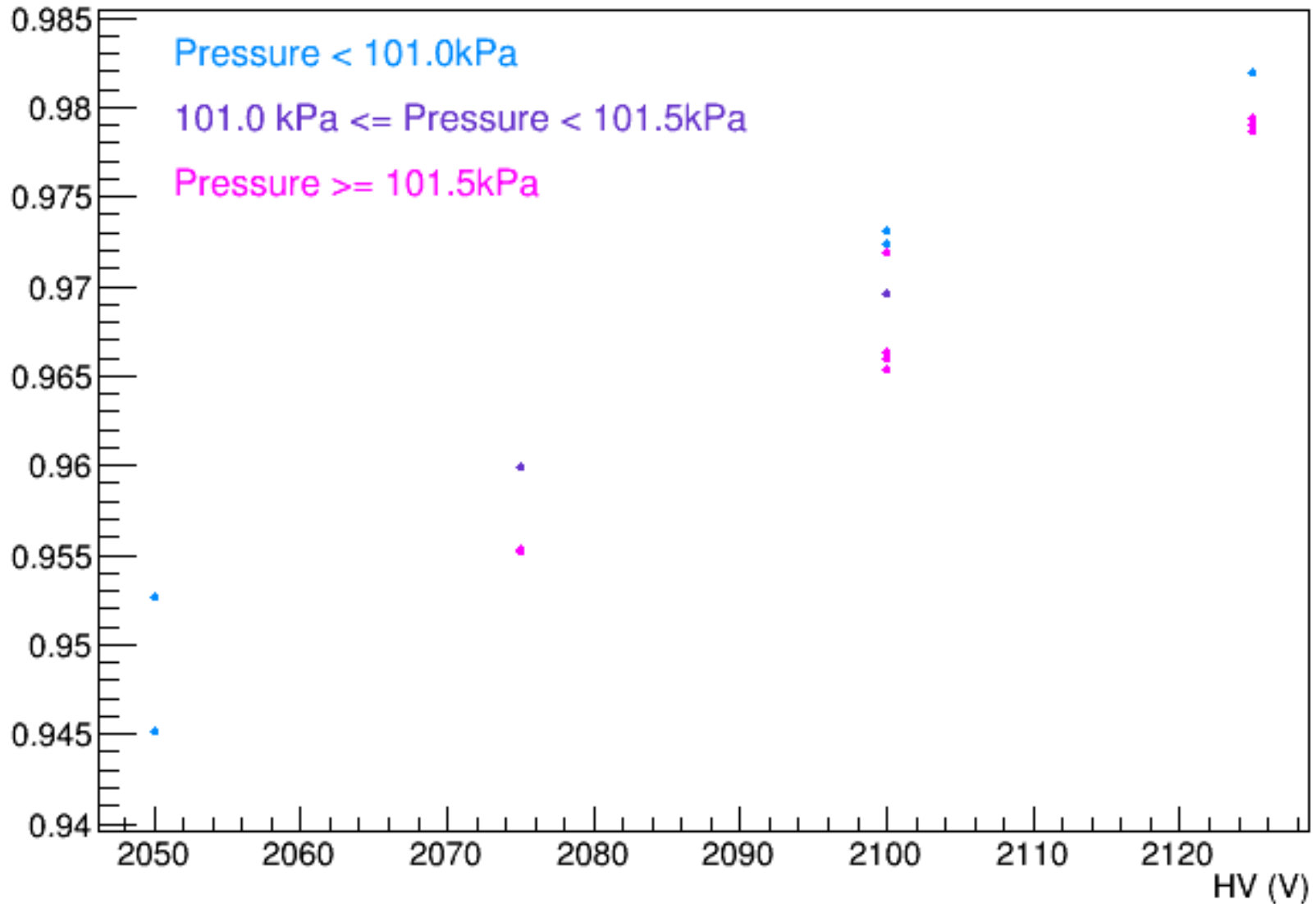
CDC efficiency (DOCA 0 to 3mm) Dec 2016 runs

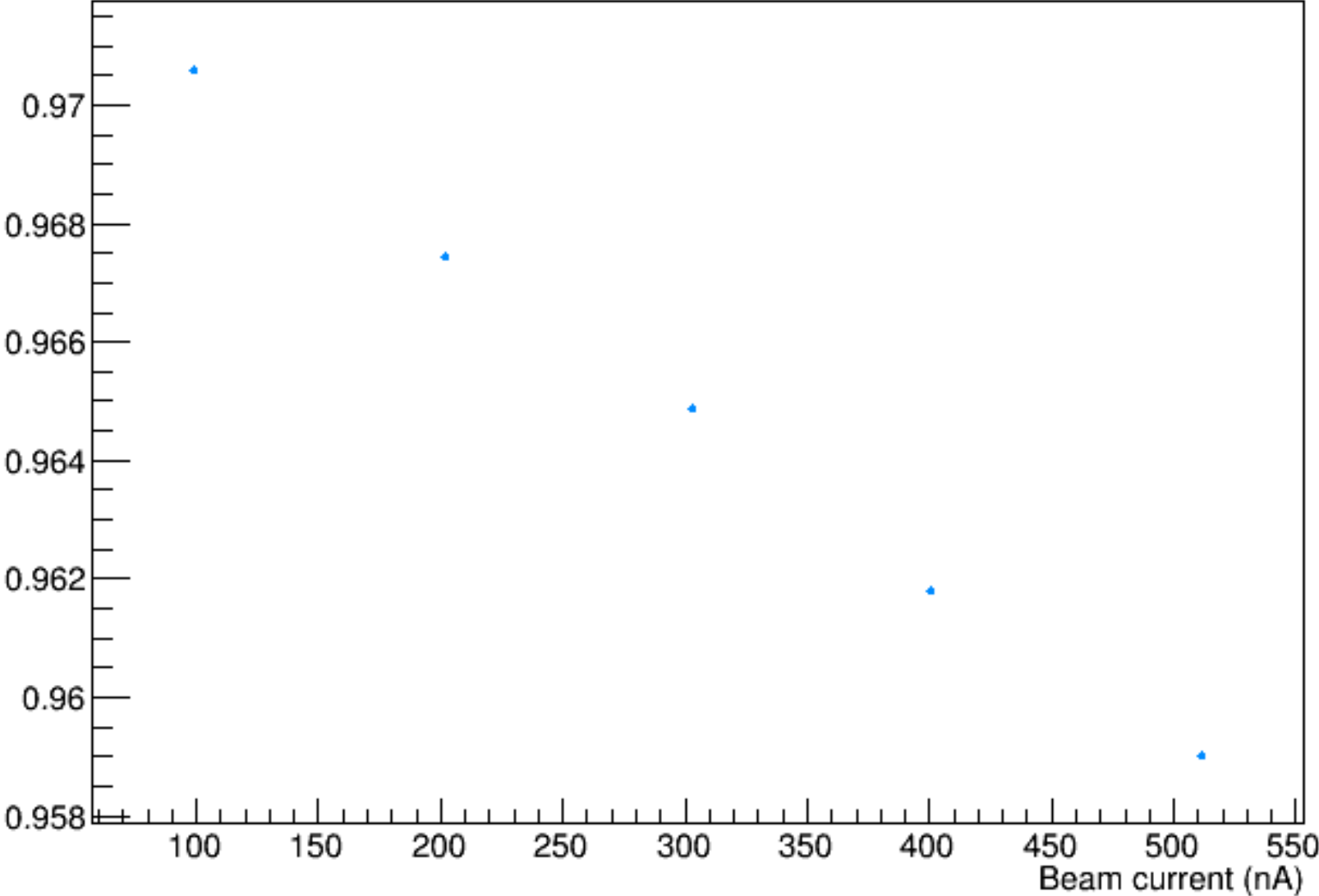Used 2125V drift time relationship for everything, reasonable for 0-3mm

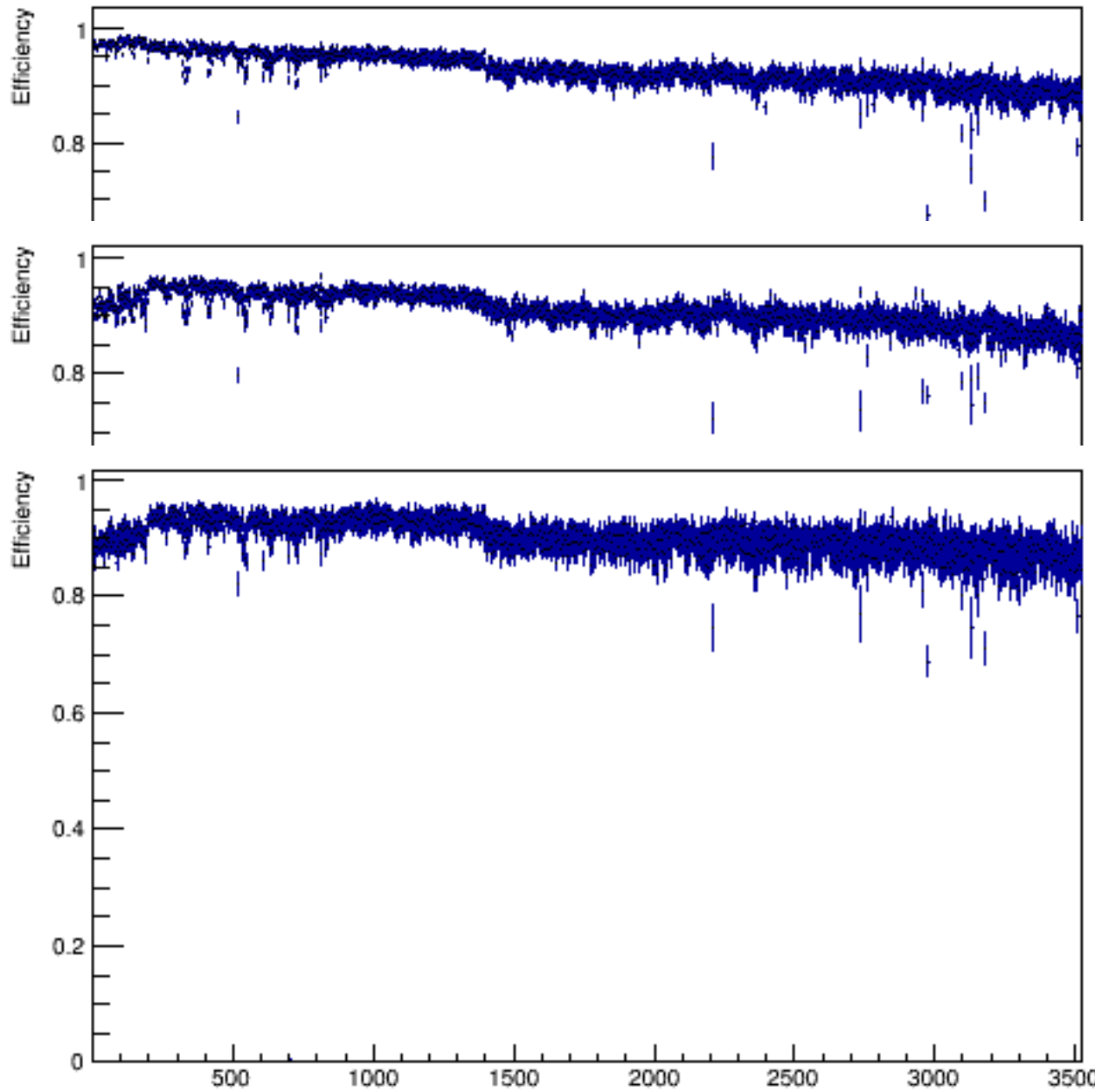CDC efficiency (DOCA 0 to 3mm) Dec 2016 runs

This is not the expected steep rise & plateau, maybe I would obtain that by selecting min ionizing tracks perp to beam

High intensity beam current scan, CDC HV mixed, 2025 to 2125V

CDC efficiency (DOCA 0 to 3mm) Dec 2016 runs 22063-8, 102.3kPa
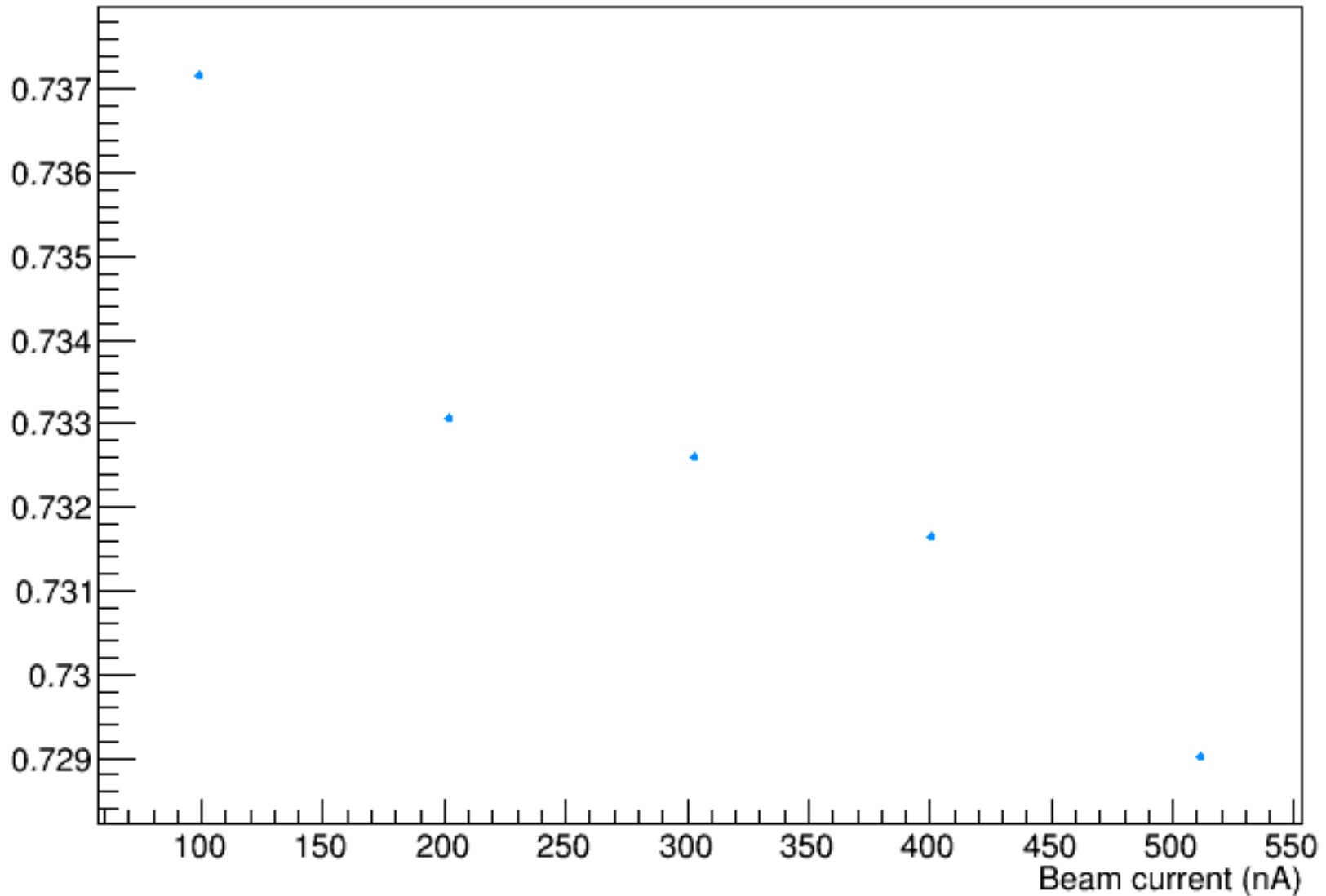
Efficiency

Run 21981
2125V 50nA

Run 22068
mix V 100nA

Run 22063
mix V 500nA

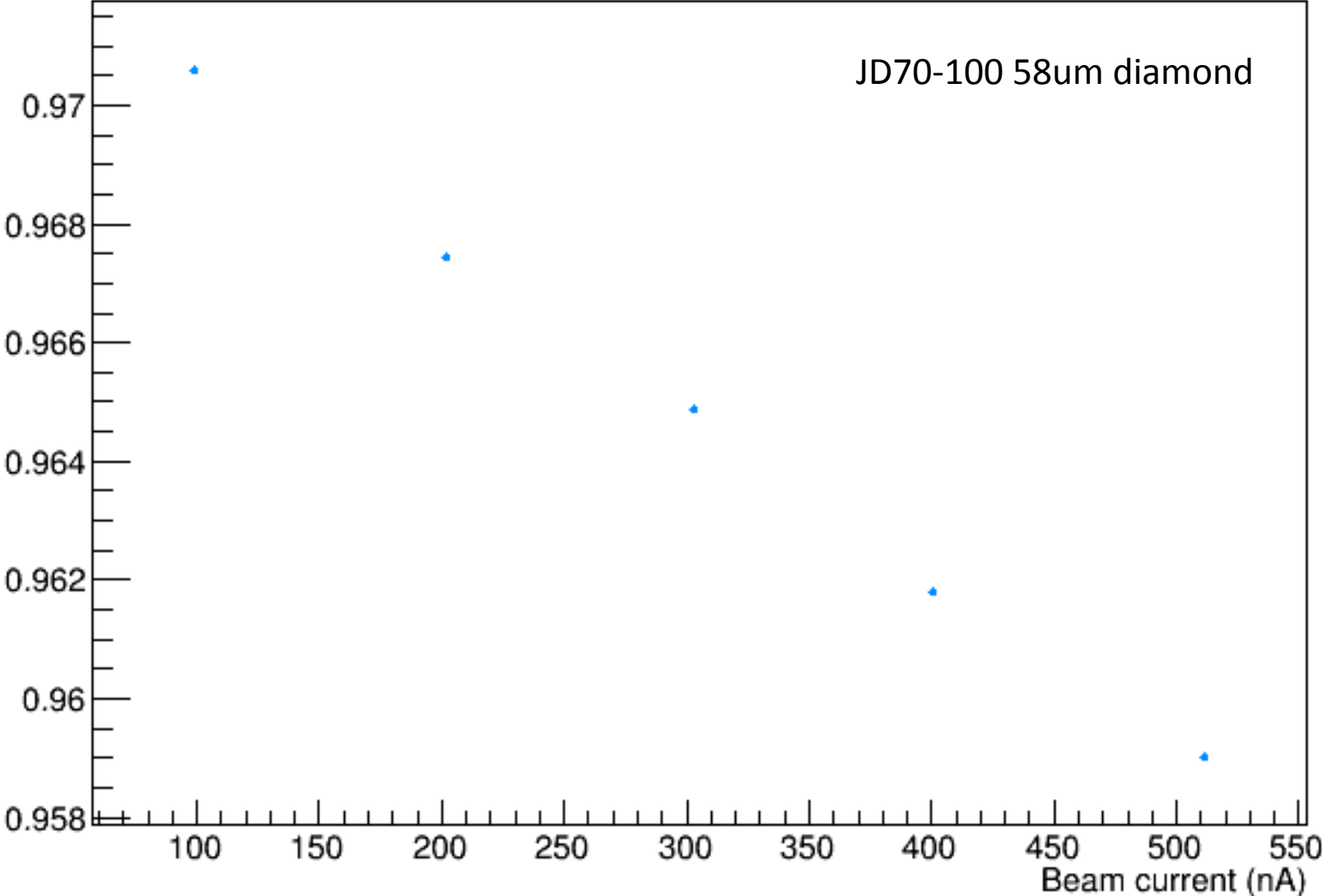High intensity beam current scan, CDC HV mixed, 2025 to 2125V

CDC efficiency (DOCA 7 to 8mm) Dec 2016 runs 22063-8, 102.3kPa
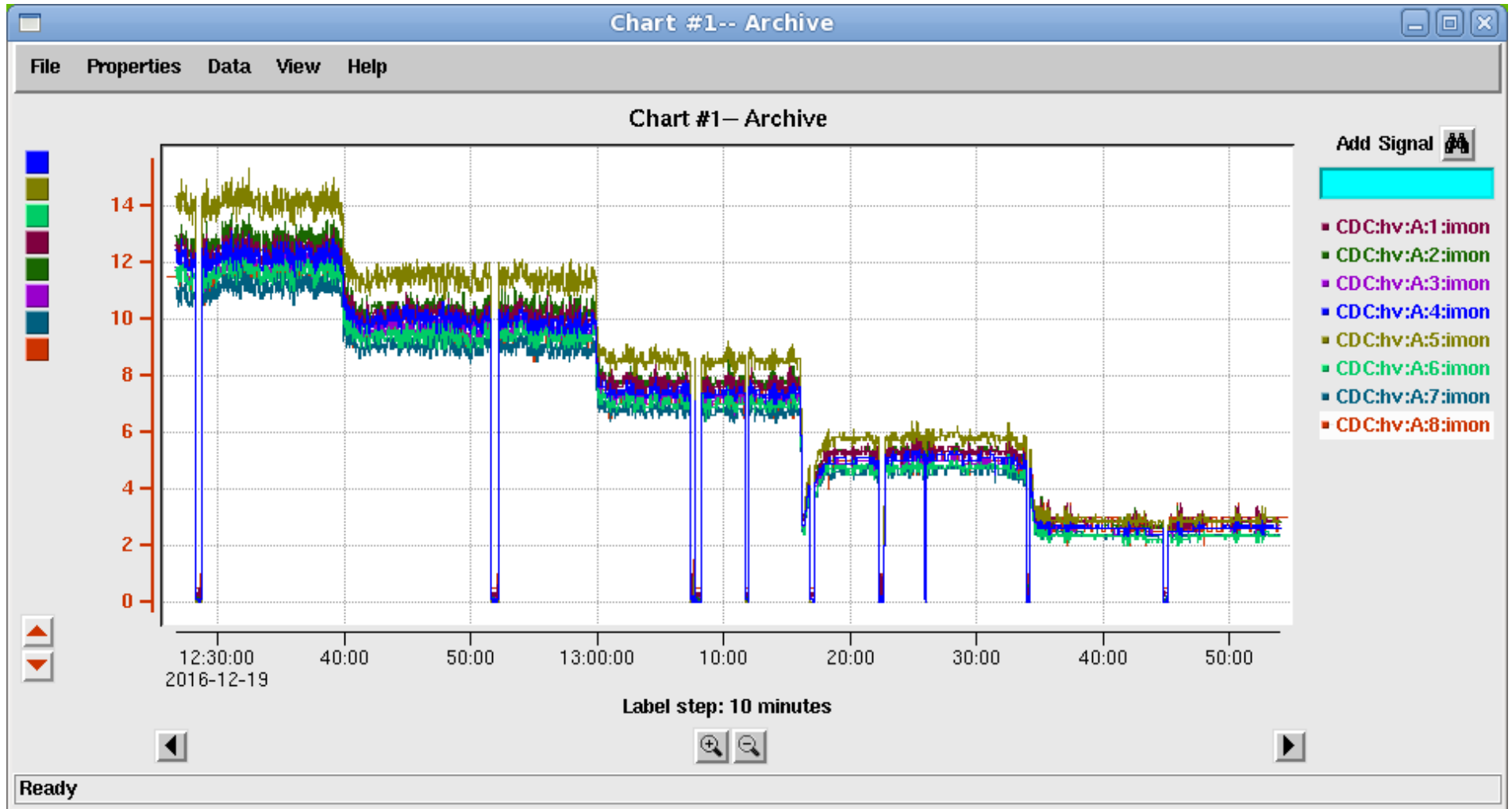

Mean efficiency for DOCA 7 to 8mm is 0.8 for run 21981, 50nA beam, CDC at 2125V

High intensity beam current scan, CDC HV mixed, 2025 to 2125V
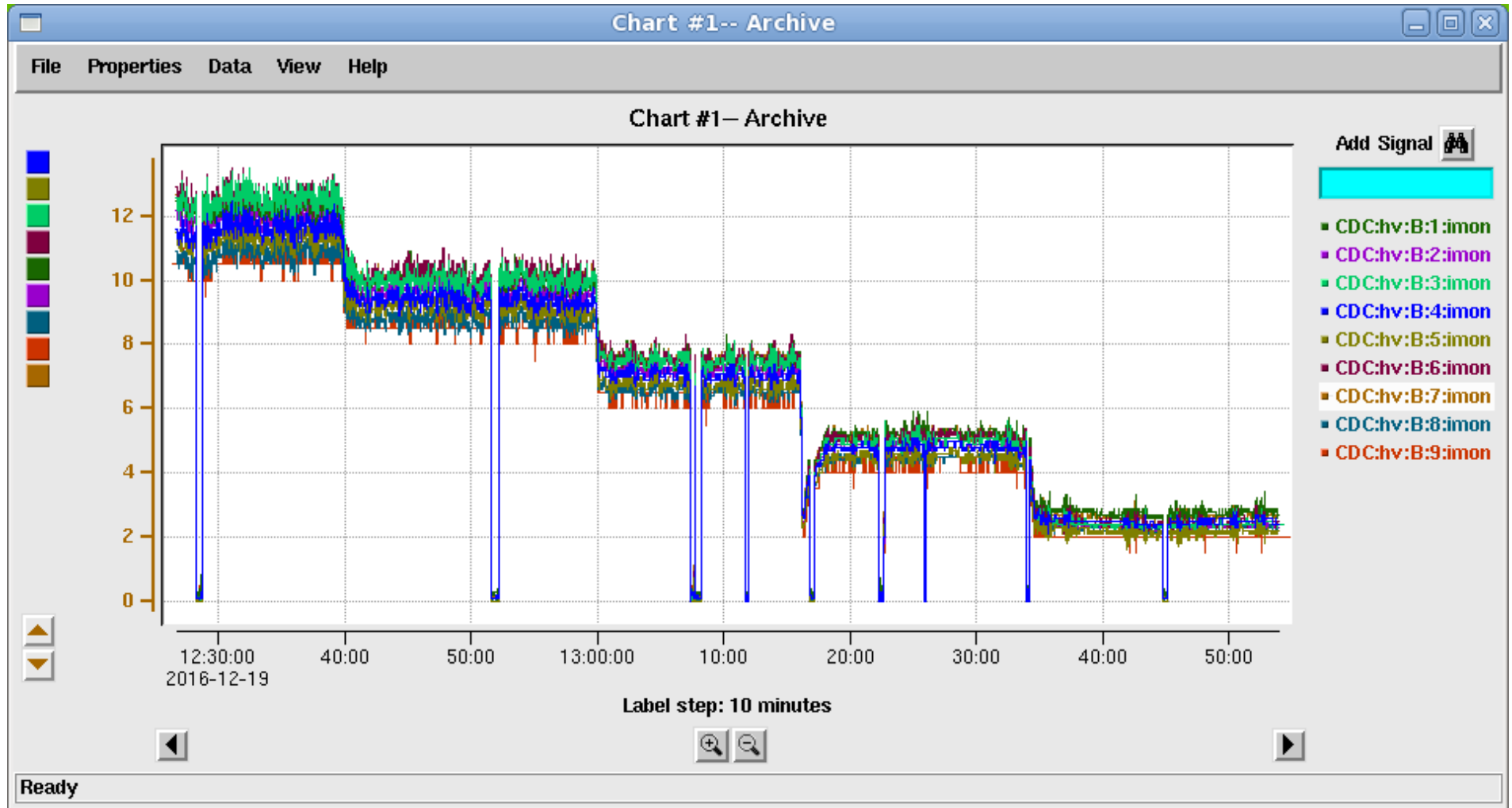
CDC efficiency (DOCA 0 to 3mm) Dec 2016 runs 22063-8, 102.3kPa
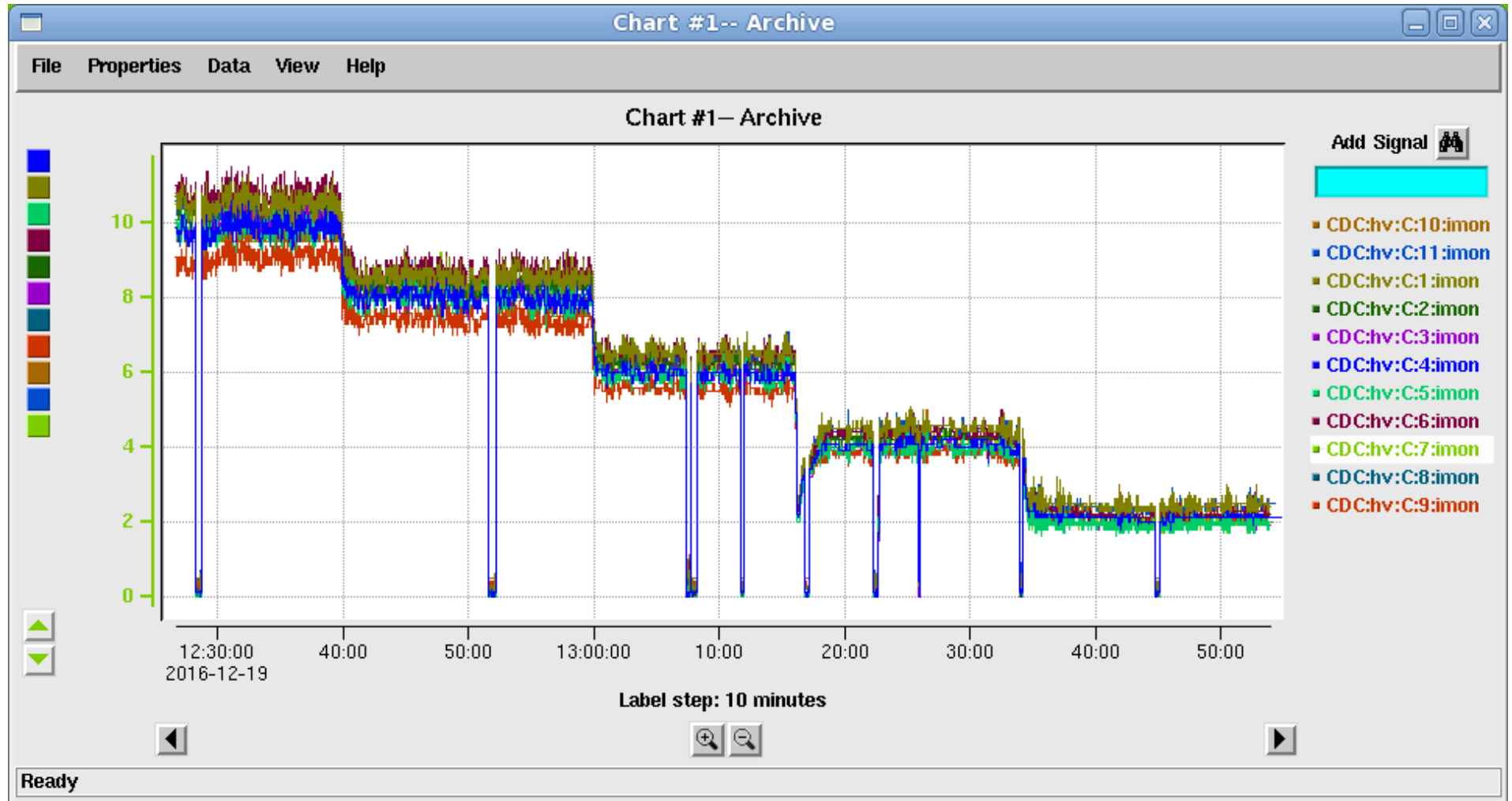
JD70-100 58um diamond

Beam current scan (500nA to 100nA), currents in CDC ring A (at 2025V)
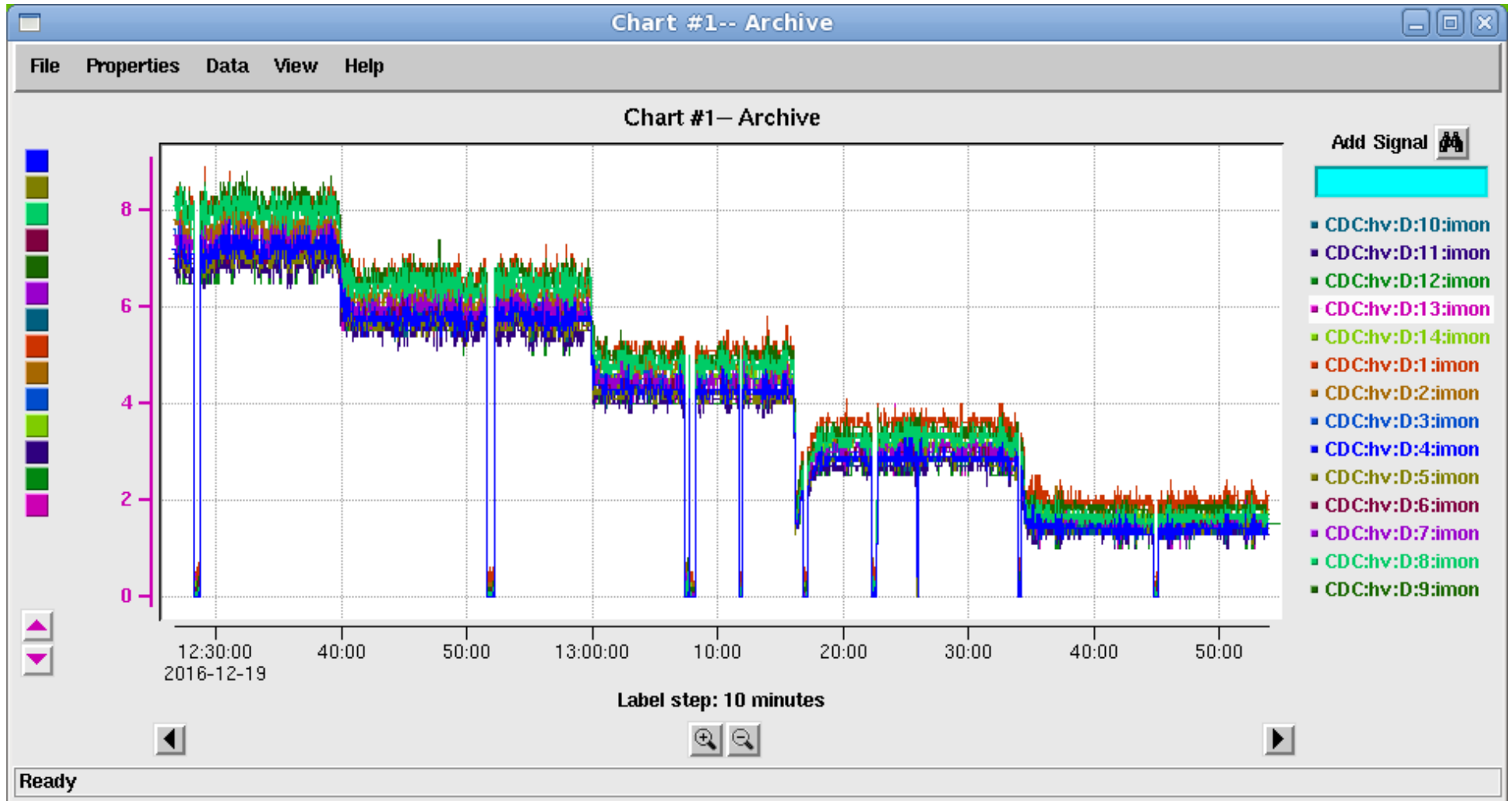
Beam current scan (500nA to 100nA), currents in CDC ring B (at 2100V)

Beam current scan (500nA to 100nA), currents in CDC ring C (at 2100V)

Beam current scan (500nA to 100nA), currents in CDC ring D (at 2125V)

CDC current during beam intensity scan (A5, B1, C1, D1)
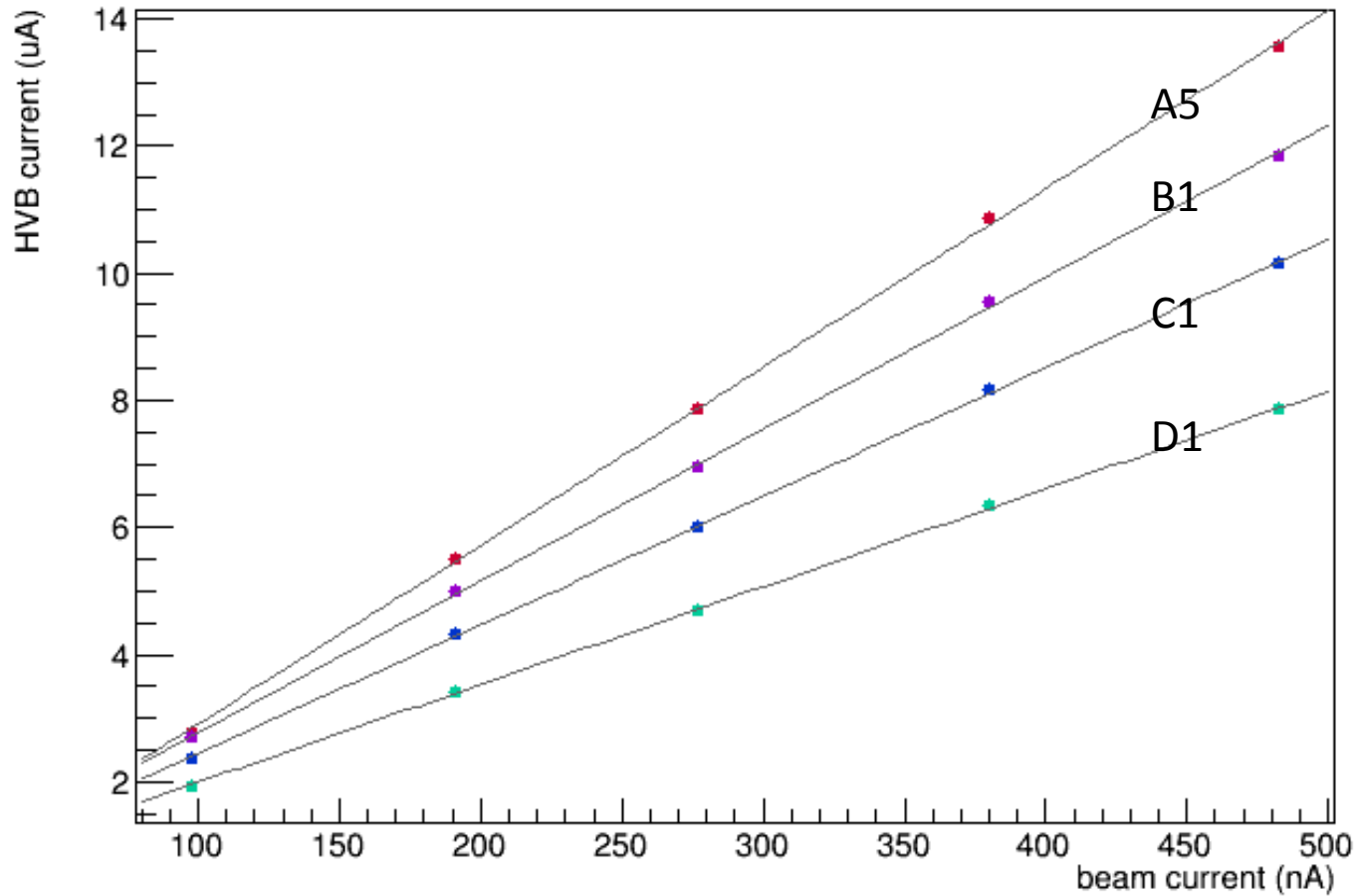
A5 fit   P0 =   0.106 +/- 0.091   p1 =   0.0280 +/- 0.0003
B1 fit   P0 =   0.391 +/- 0.0730   p1 =   0.0239 +/- 0.0002
C1 fit   P0 =   0.425 +/- 0.0377   p1 =   0.0202 +/- 0.0001
D1 fit   P0 =   0.455 +/- 0.0366   p1 =   0.0154 +/- 0.0001

What current would we see in the CDC inner rings with 500nA beam and HV 2125V ?

Look at run 22053: 147nA beam, CDC HV 2125V and JD70-100 58um diamond

Current in board   A5 was   9.2 uA
                          B1   4.9 uA
                          C1   3.6uA

Using the fitted functions from the beam current intensity scan at 2025V,

Ratio of I(A5, 2025V, 500nA beam) / I(A5, 2025V, 150nA beam) = 14.1/4.3

Use this to scale up I(A5, 2125V, 147nA beam) from run 22053 to 500nA.

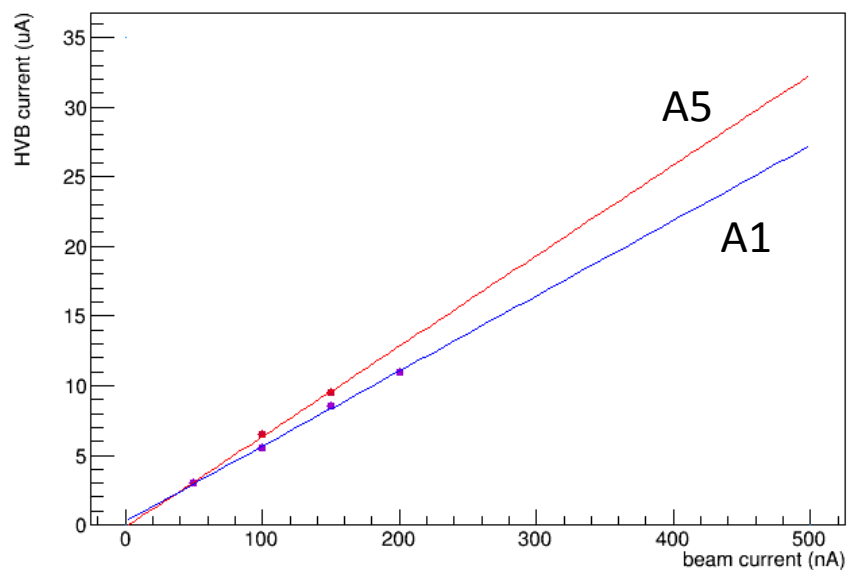A5: 9.2 x 14.1/4.3 = 30.2 uA   estimate 30uA for board A5 at 2125V, 500nA.

Similarly for B1:

B1: 4.9 x 12.3/4.0 = 15.1 uA   estimate 15uA for board B1 at 2125V, 500nA.

EPICS data from high current running on Dec 17 with CDC at 2125V
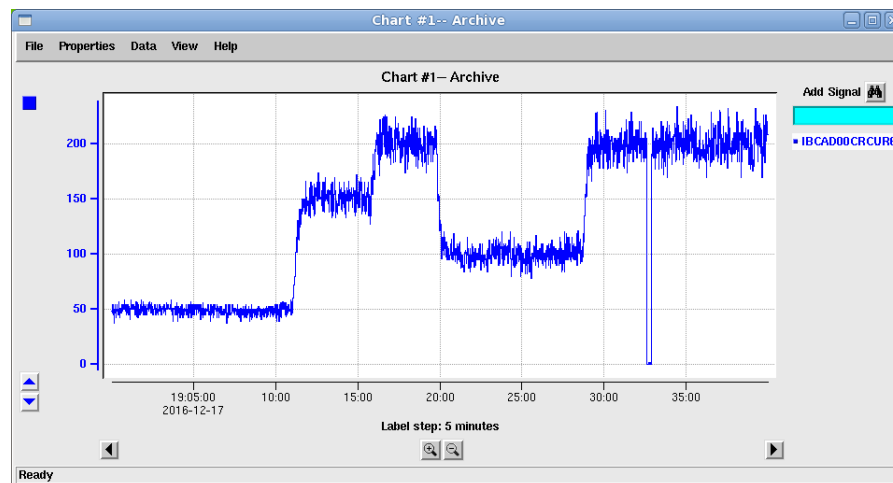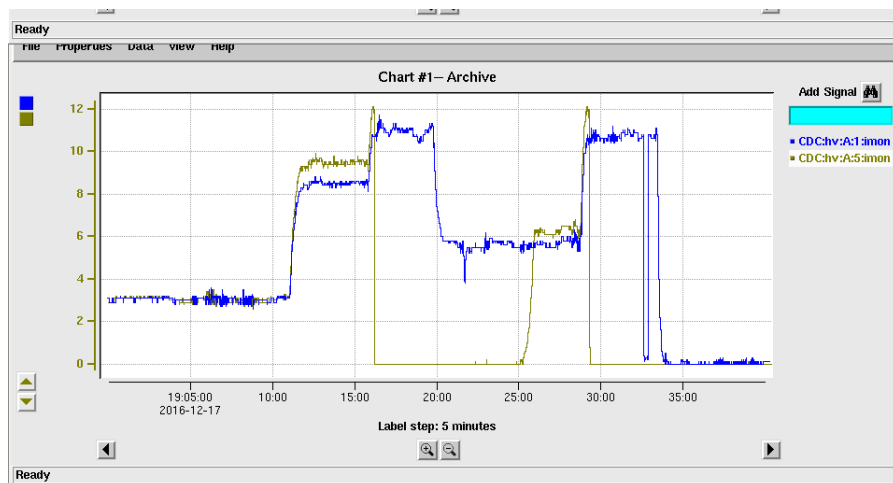
Fit HVB current vs beam current and extrapolate to 500nA (at 2125V)

NB Vmon for A5
was 2130V at this
time

CDC current at 2125V during high beam current runs on Dec 17 (A5, A1)

What current would we see in the CDC inner rings with 500nA beam and HV 2100V ?

Look at run 21973: 16nA beam, CDC HV 2100V and JD70-100 58um diamond

Beam current was   16nA mean   85 nA max

Current in board   A5 was   0.73 uA mean 3.9uA max
                    B1   0.64 uA mean 2.8uA max

Using the fitted functions from the beam current intensity scan at 2025V,

Ratio of I(A5, 2025V, 500nA beam) / I(A5, 2025V, 16nA beam) = 14.1/0.54

Use this to scale up I(A5, 2125V, 16nA beam) from run 21943 to 500nA.

A5: 0.73 x 14.1/0.54 = 19.0 uA   estimate 19uA for board A5 at 2100V, 500nA.

Using max values instead of mean, and I(A5, 2025V, 85nA beam)= 2.5uA

 A5: 3.9 x 14.1/2.5 = 22.0 uA   estimate 22uA for board A5 at 2100V, 500nA.

Amplitude histogram for hits on tracks from the target, perpendicular to beam
Run 22016, CDC at 2125V, beam current 150nA, atm pressure 100.0kPa

CDC amplitude (tracks, theta 85-95 deg, z 50-80cm)
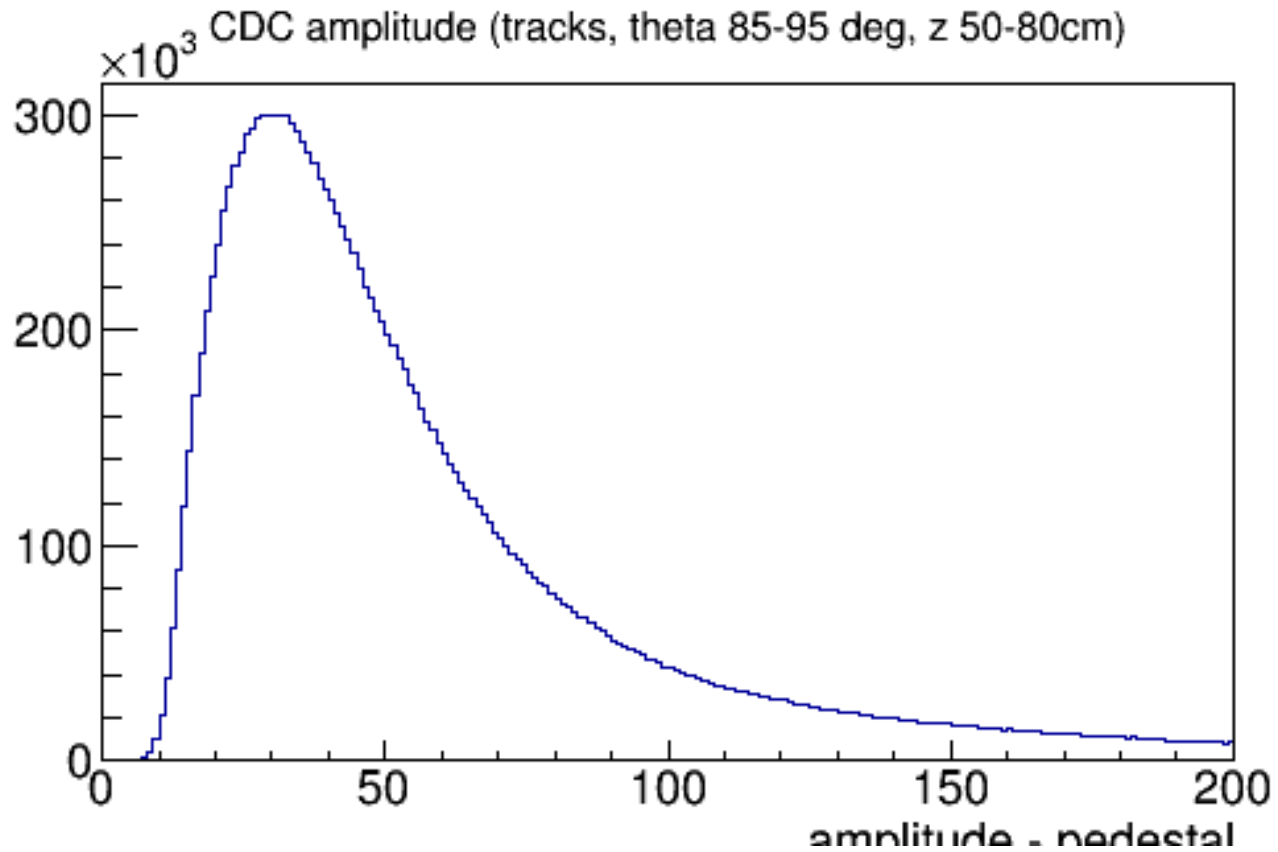
MIP is at 29.1
Easy to fit

Amplitude histogram for hits on tracks from the target, perpendicular to beam
Run 21945, CDC at 2125V, beam current 150nA, atm pressure 101.7kPa

CDC amplitude (tracks, theta 85-95 deg, z 50-80cm)
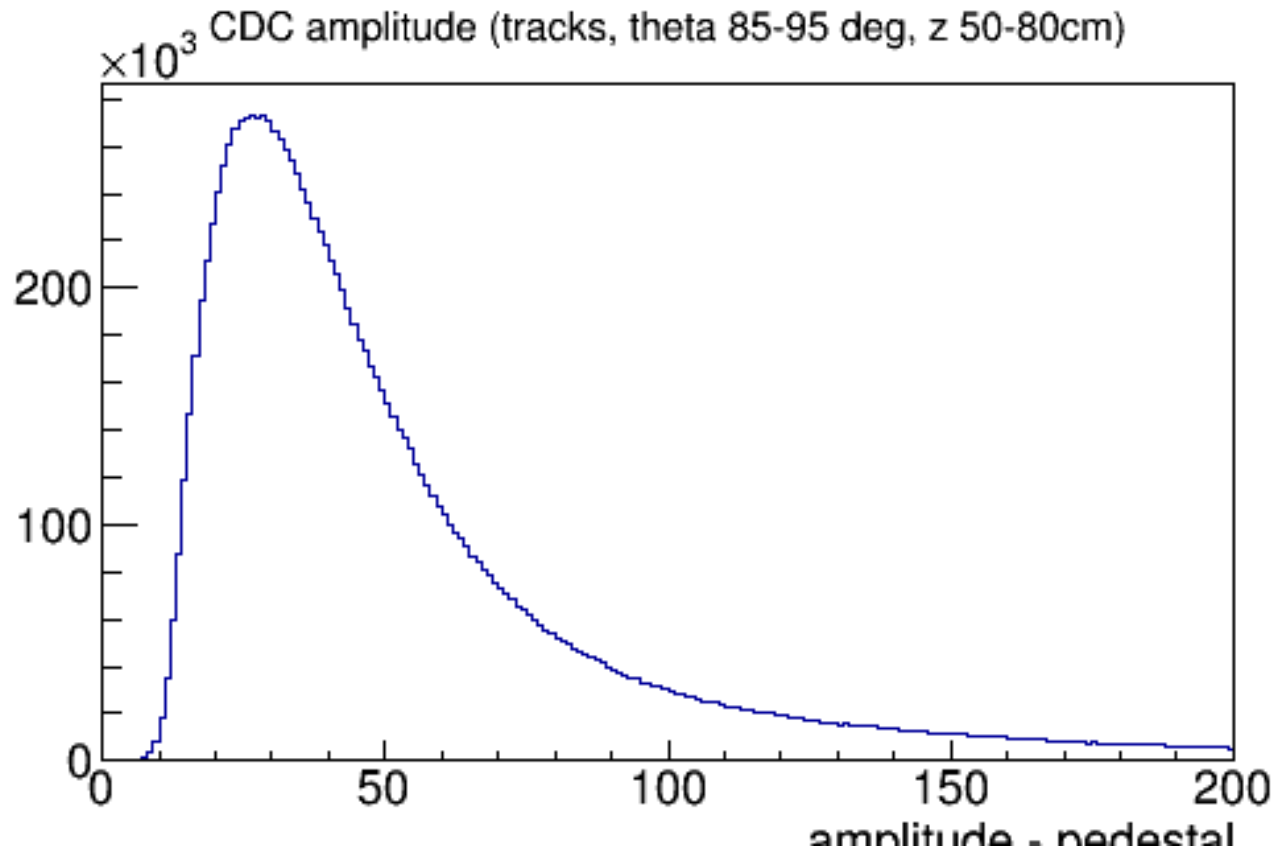
MIP is at 26.3
Edging towards threshold

Amplitude histogram for hits on tracks from the target, perpendicular to beam
Run 21946, CDC at 2100V, beam current 150nA, atm pressure 101.7kPa

CDC amplitude (tracks, theta 85-95 deg, z 50-80cm)
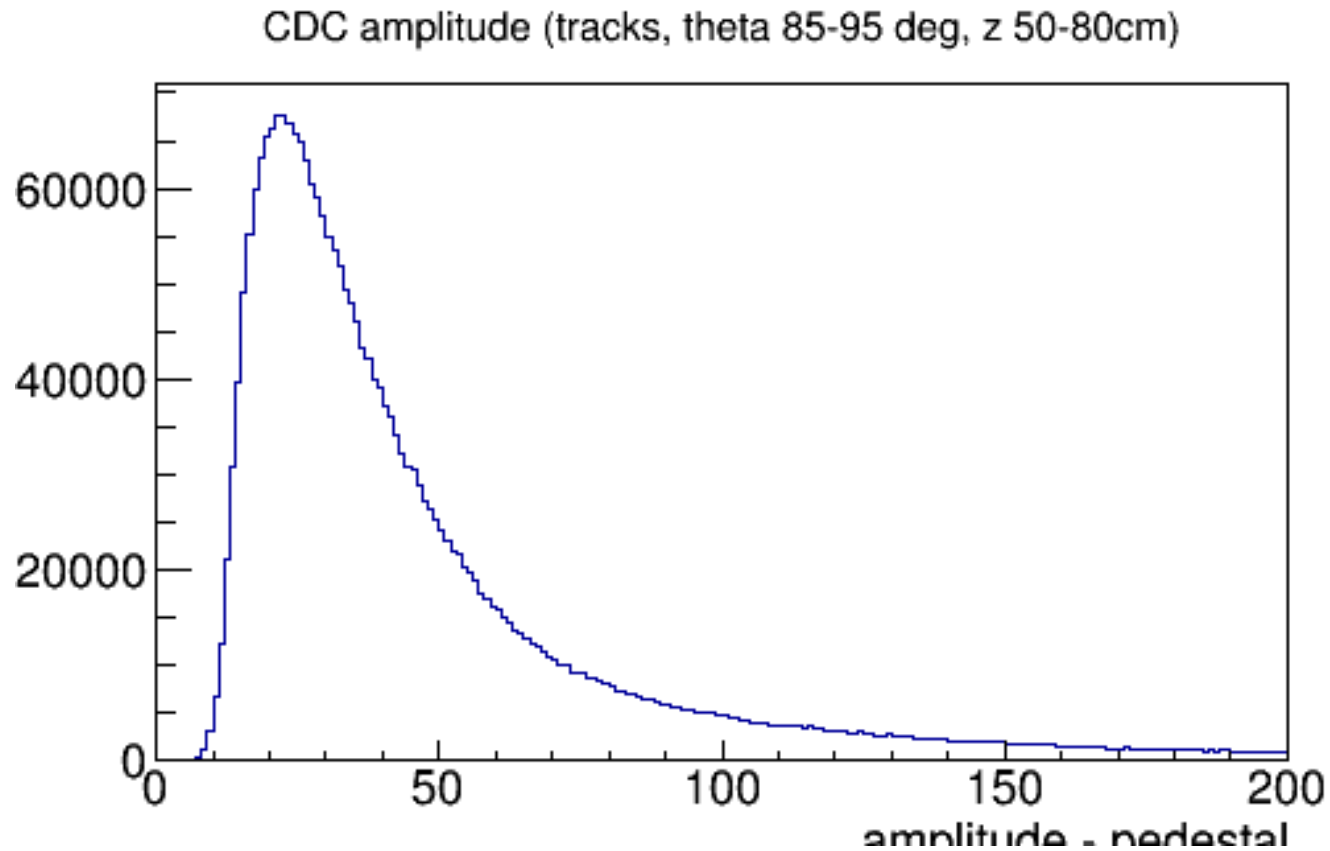
MIP is at 21.1
Too close to threshold
However, lower pressure data would be easier to fit