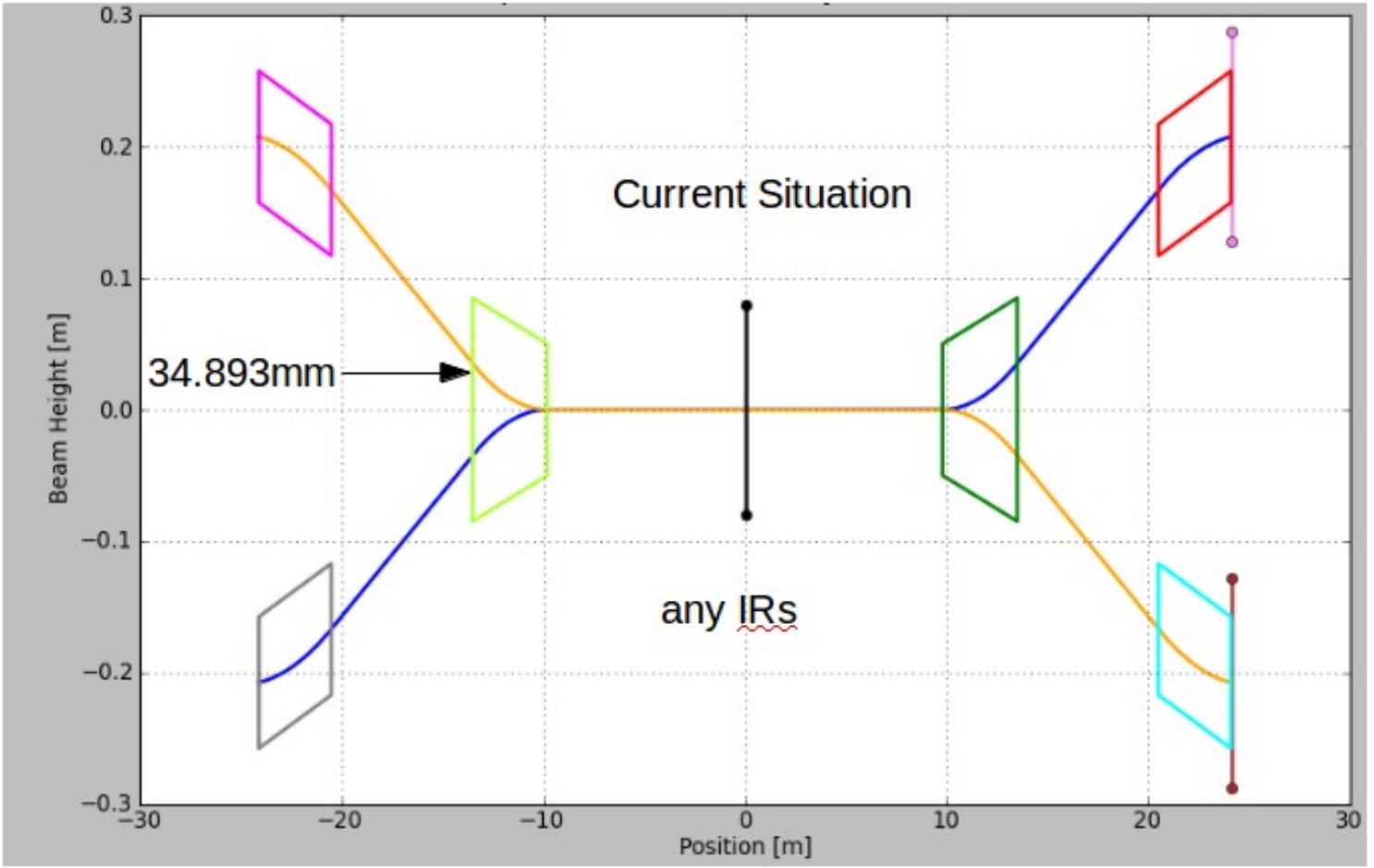
DX Physical Aperture Measurement

Al, Mei, Simon, Steve, Yun

2014 March 26, APEX

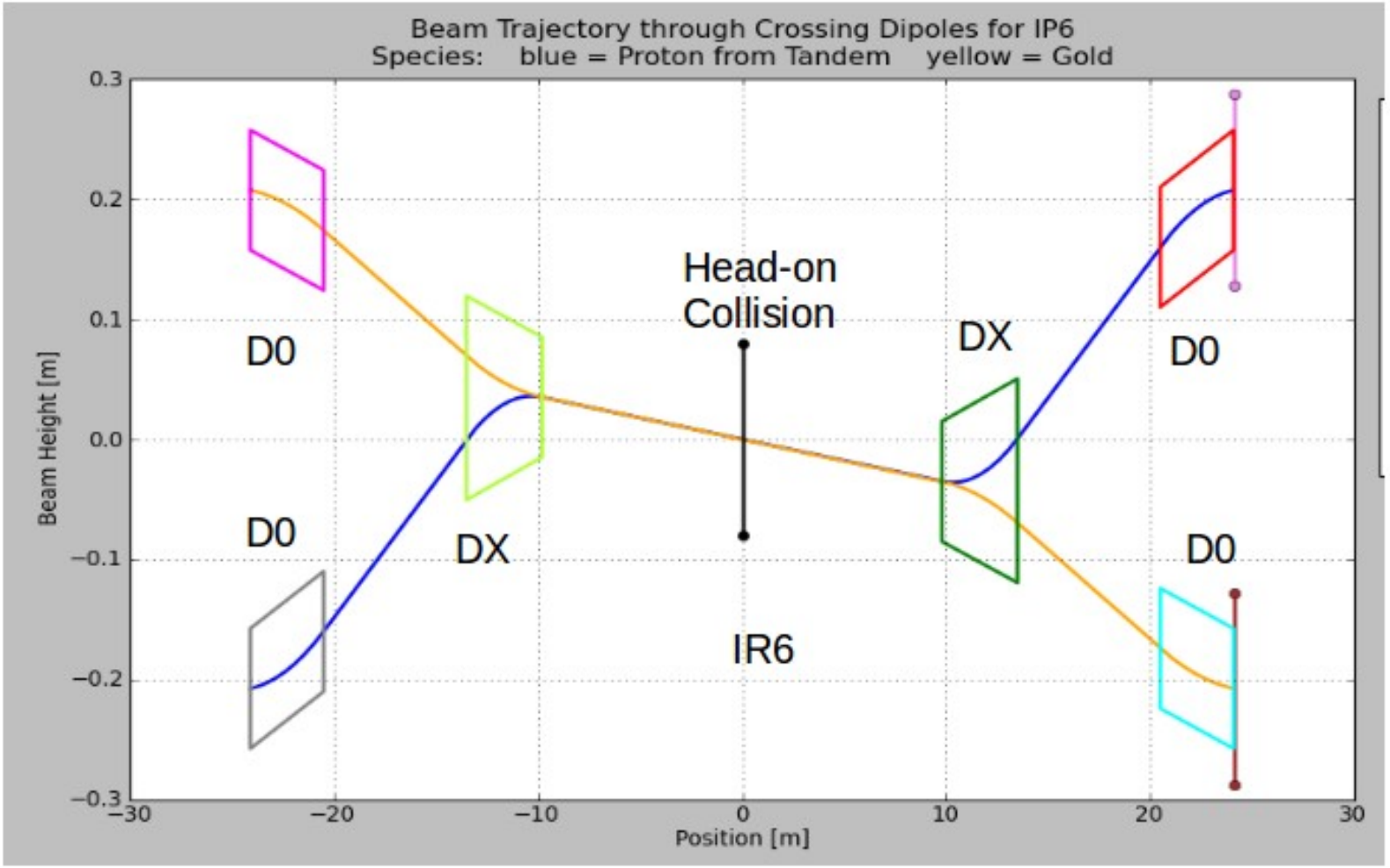
Same Spices & Same Energy



1) For the same species and energies, no orbit tilt between DX magnets.
2) At exit of DX magnets, orbits offset by 34.893mm from the pipe axis.
3) The physical aperture at DX magnets is 68.326mm.

p-Au Collision

WEST

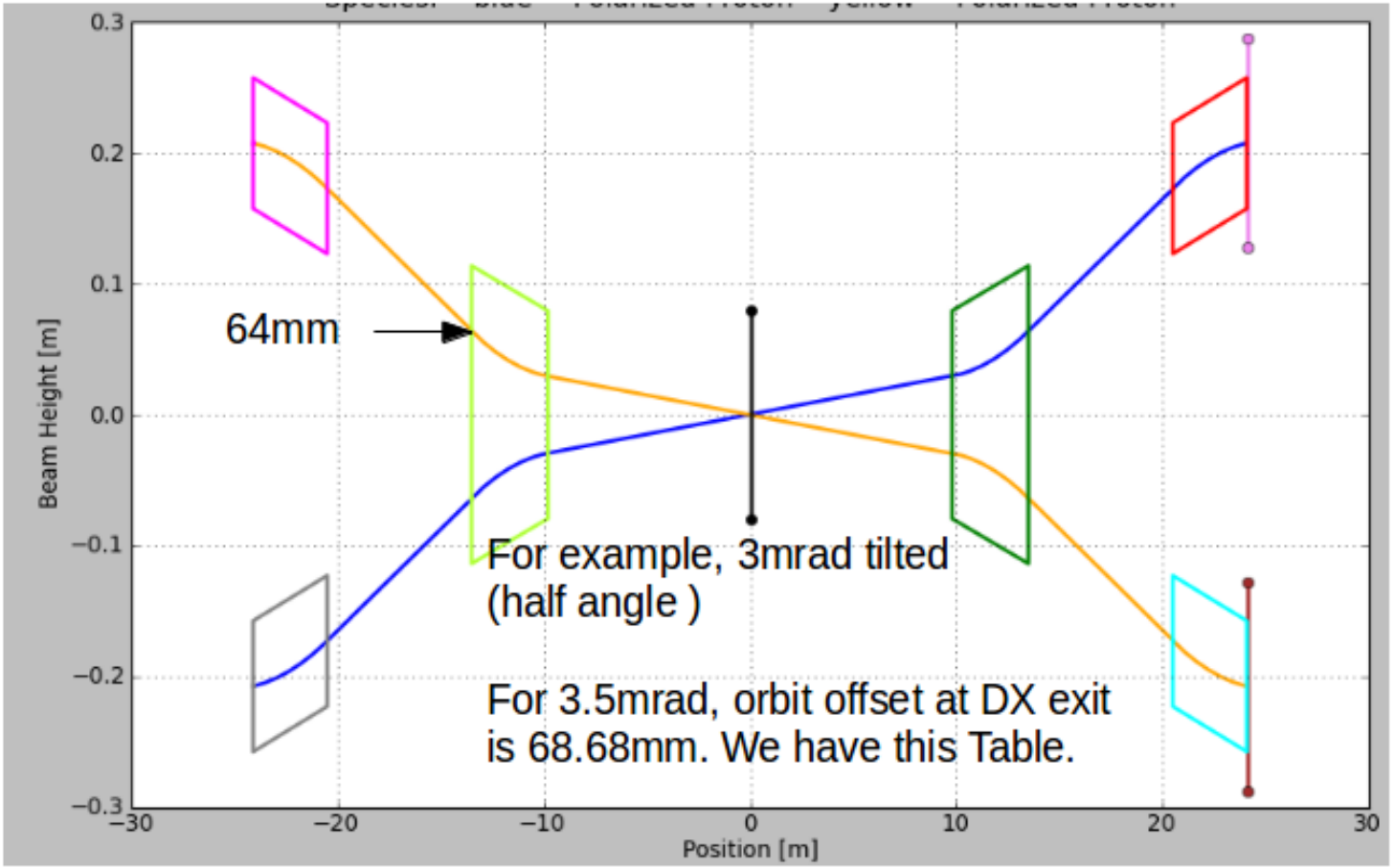


EAST

1) Beam oribts tilted by 3.581mrad w.r.t. The beam pipe axis.
2) p beam: 35.09 and 0.424 mm on both ends of DX magnets.
3) Au beam: 35.09 and 69.303 mm on both ends of DX magnets.

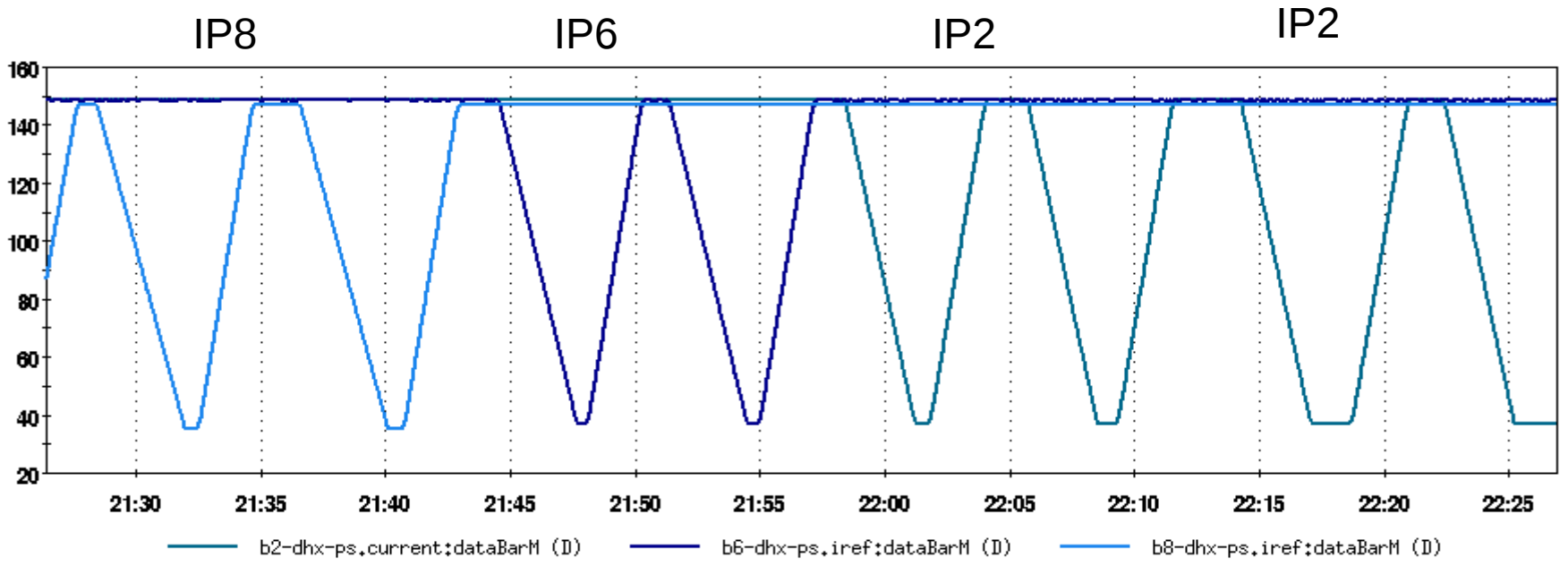
Beam Experiment

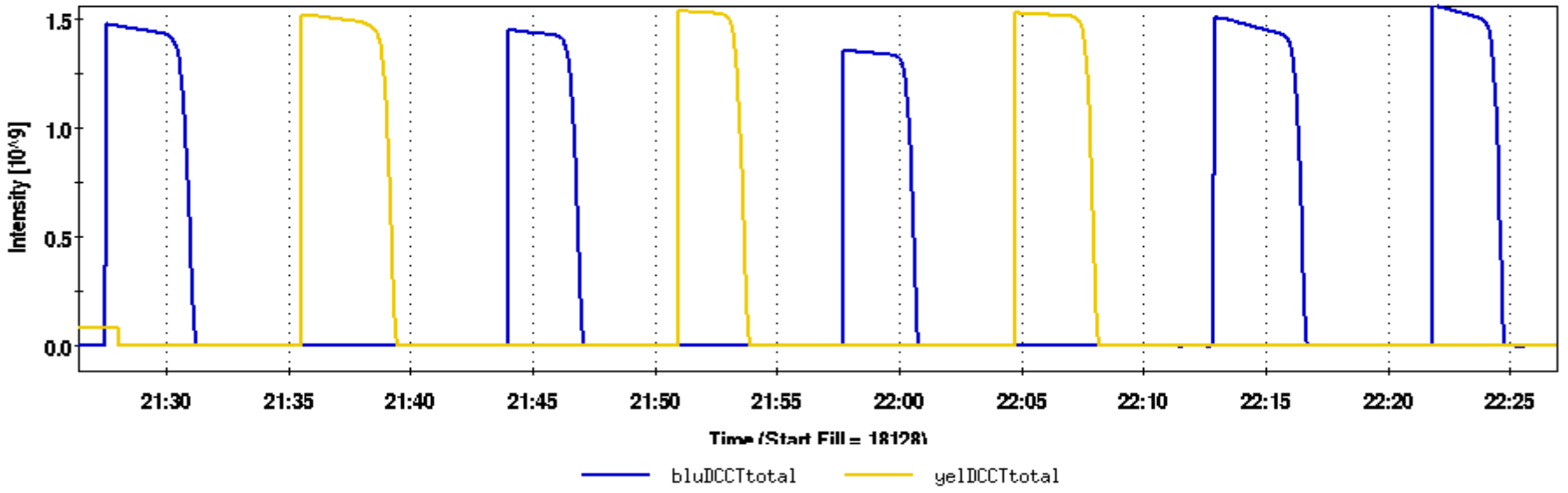
1) Calculate settings of DX and D0 for a tilt angle or a known orbit offset at DX exit.
2) Set these strengths into machine and measure the beam decay.
3) Increase the angle until a huge beam loss is observed.
4) Determine the minimum distance between the beam center and the pipe wall offline.



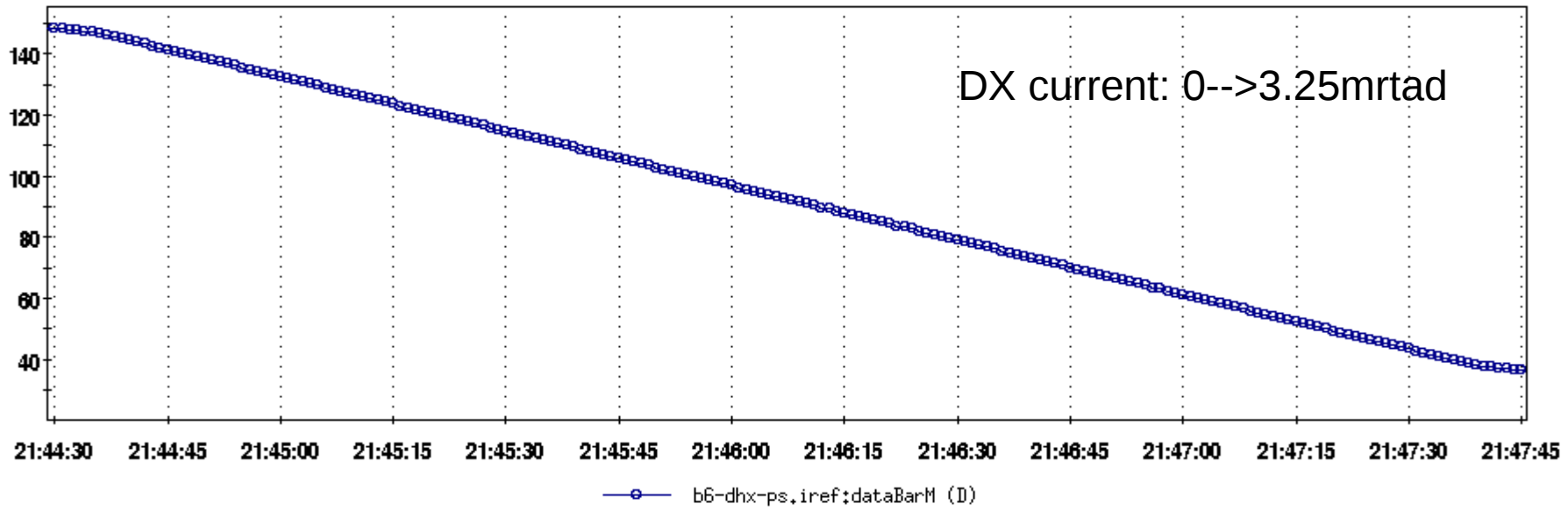
Data Taken

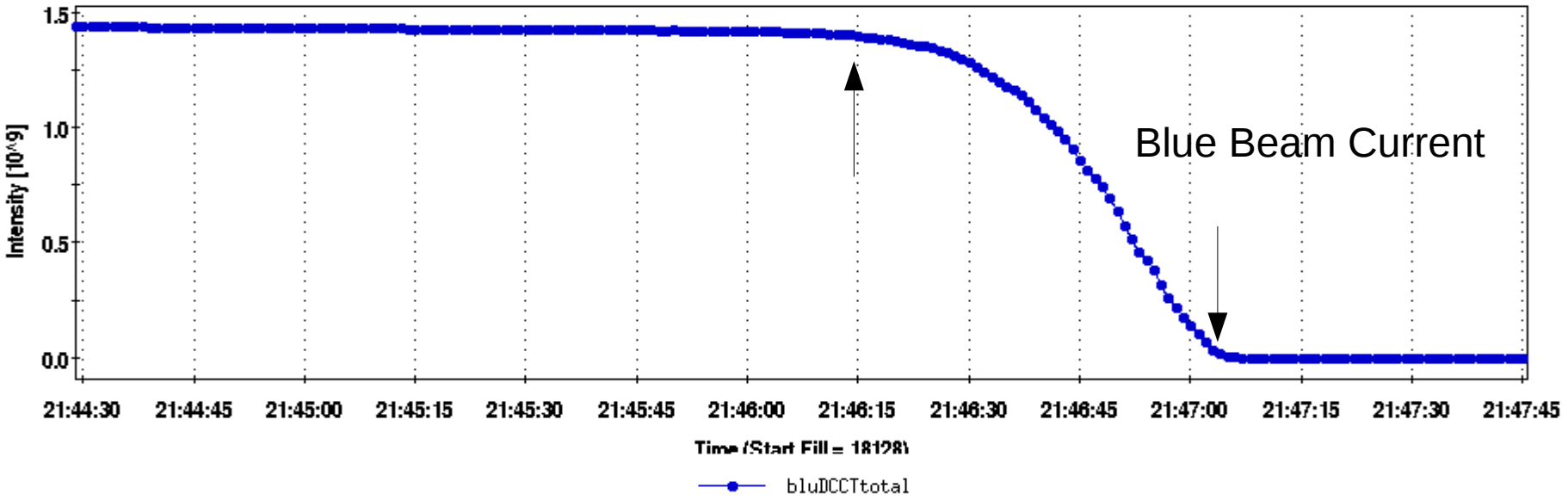
Fill# 18128

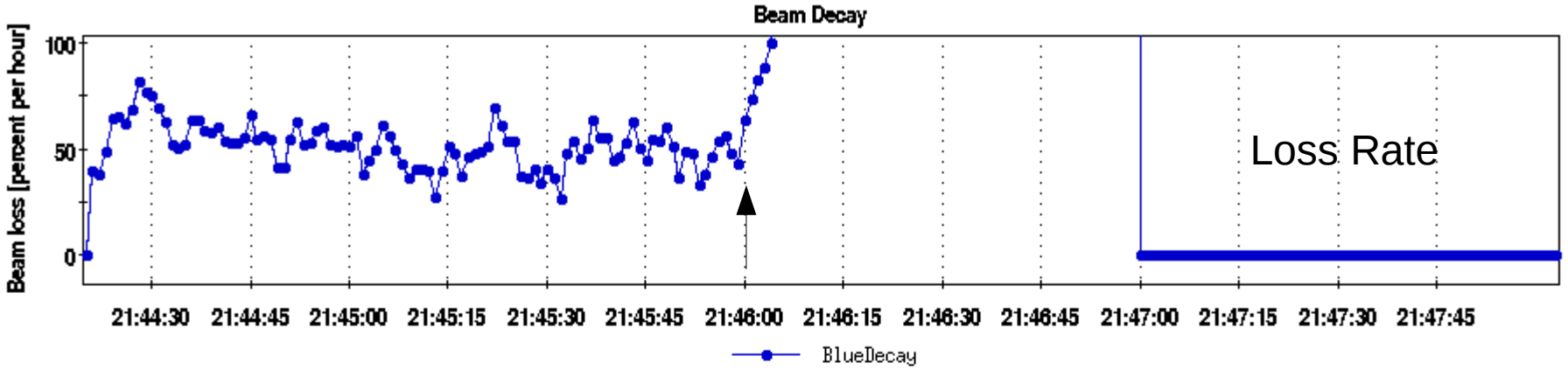


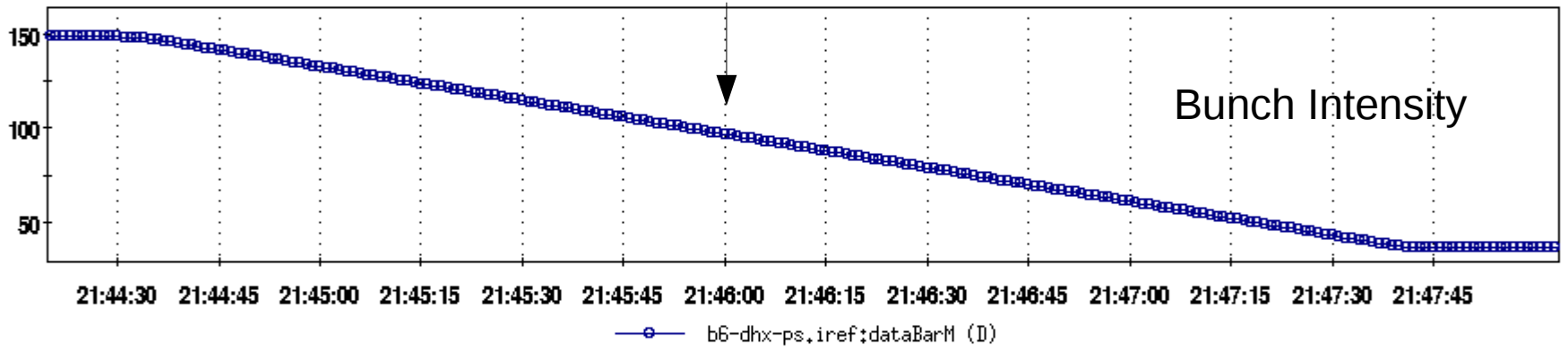


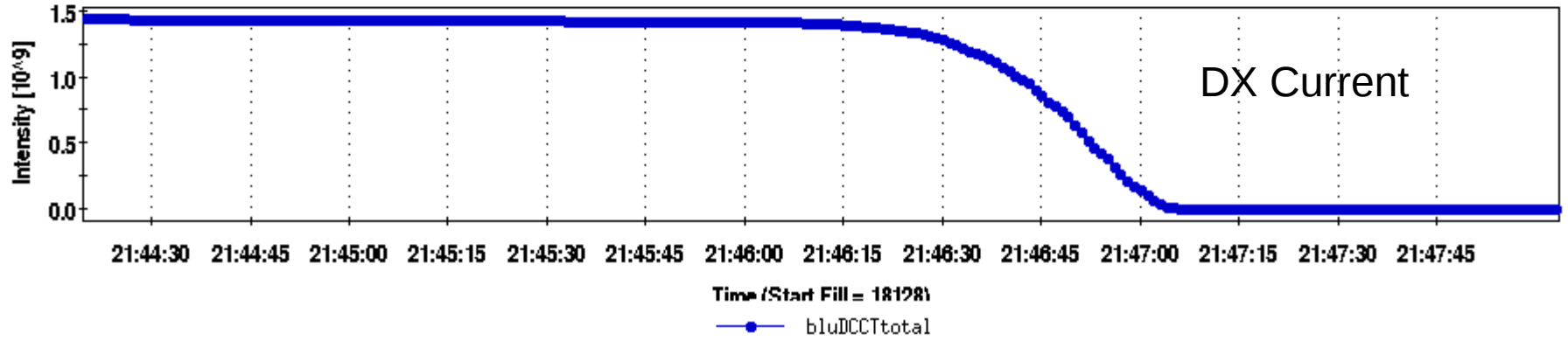
Zoom In


DX current: 0-->3.25mrtad
140
120
100
80
60
40
21:44:30
21:44:45
21:45:00
21:45:15
21:45:30
21:45:45
21:46:00
21:46:15
21:46:30
21:46:45
21:47:00
21:47:15
21:47:30
21:47:45
b6-dhx-ps.iref:dataBarM (D)


Blue Beam Current
Intensity [10^9]
1.5
1.0
0.5
0.0
21:44:30
21:44:45
21:45:00
21:45:15
21:45:30
21:45:45
21:46:00
21:46:15
21:46:30
21:46:45
21:47:00
21:47:15
21:47:30
21:47:45
Time (Start Fill = 18128)
bluDCCTtotal


Beam Decay
Beam loss [percent per hour]
100
50
0
Loss Rate
21:44:30
21:44:45
21:45:00
21:45:15
21:45:30
21:45:45
21:46:00
21:46:15
21:46:30
21:46:45
21:47:00
21:47:15
21:47:30
21:47:45
BlueDecay


150
100
50
Bunch Intensity
21:44:30
21:44:45
21:45:00
21:45:15
21:45:30
21:45:45
21:46:00
21:46:15
21:46:30
21:46:45
21:47:00
21:47:15
21:47:30
21:47:45
b6-dhx-ps.iref:dataBarM (D)


Intensity [10^9]
1.5
1.0
0.5
0.0
DX Current
21:44:30
21:44:45
21:45:00
21:45:15
21:45:30
21:45:45
21:46:00
21:46:15
21:46:30
21:46:45
21:47:00
21:47:15
21:47:30
21:47:45
Time (Start Fill = 18128)
bluDCCTtotal

Summary & Plan

1. Full sets of data taken at injection

   Measurement done at injection after a dipole QLI

2. Detailed data analysis is under way

   likely beam began to loss at 1.6mrad (half of maximum)

3. May repeat this experiment once

   → one confirmation at injection

   → one confirmation at store