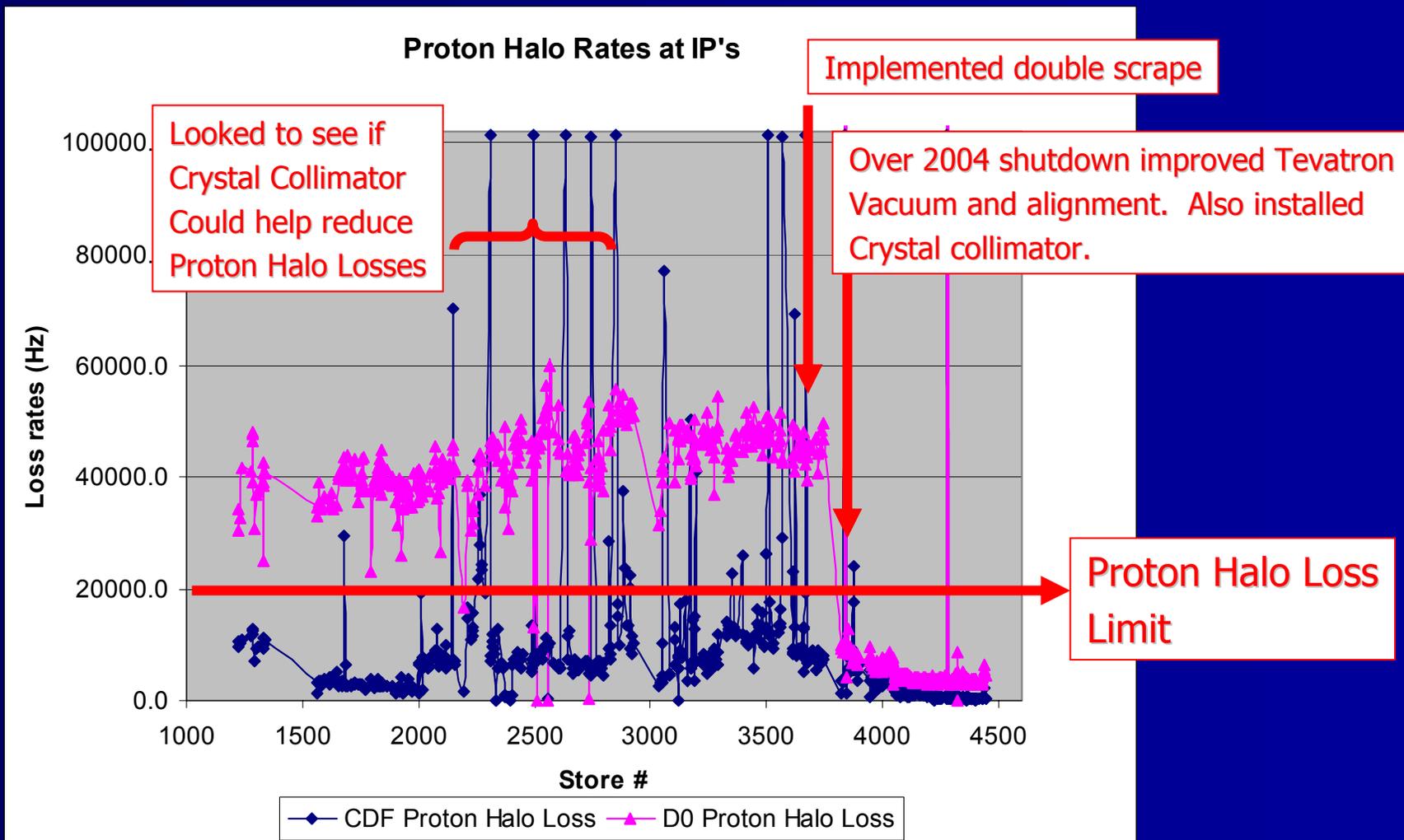


Tevatron Crystal Collimation

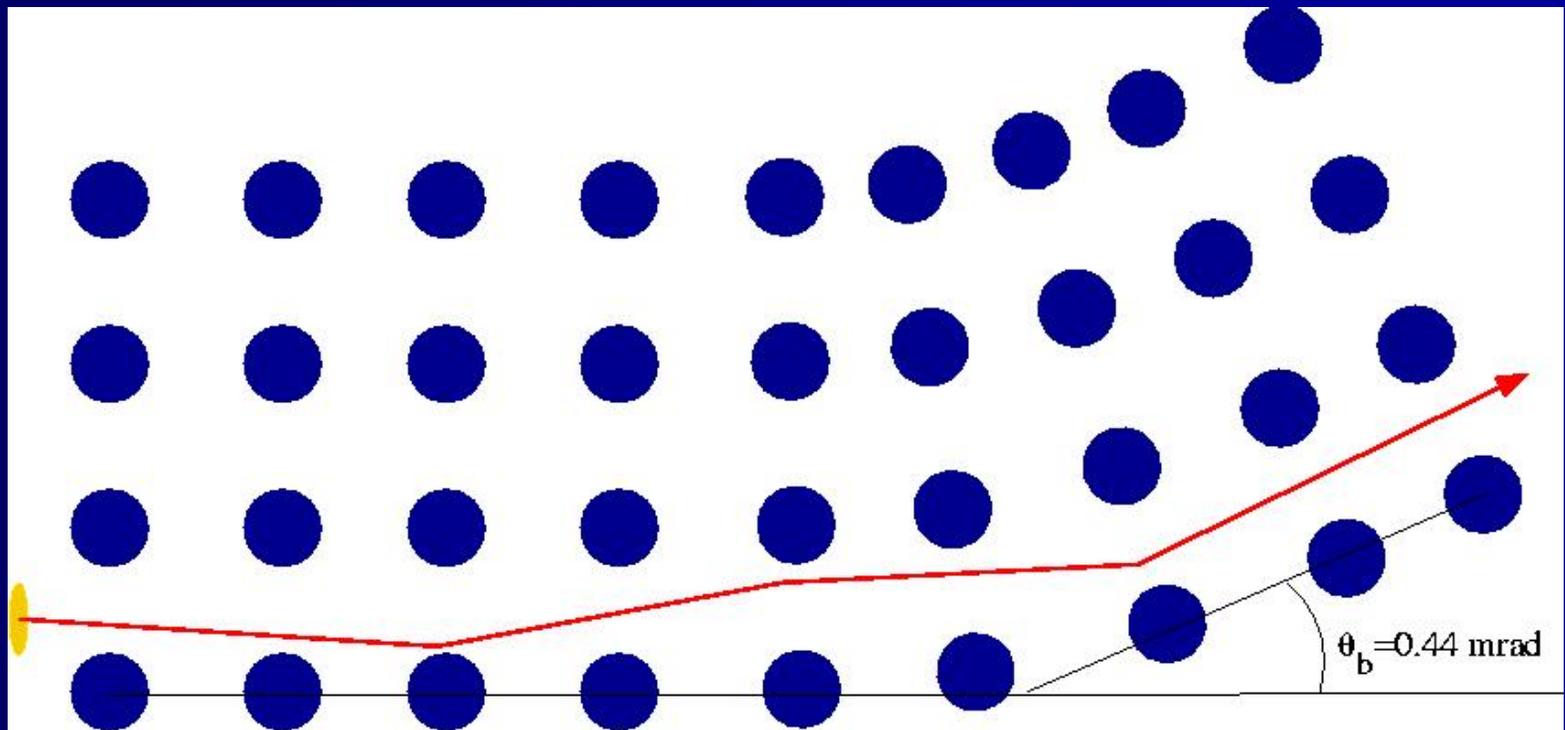
Dean Still 10-24-2005

- History and motivation for using a bent crystal collimation system in the Tevatron.
- Explanation of a bent Crystal Collimator.
- Results of Crystal Collimator Studies.
- Concluding statements.

Motivation for Crystal Collimation

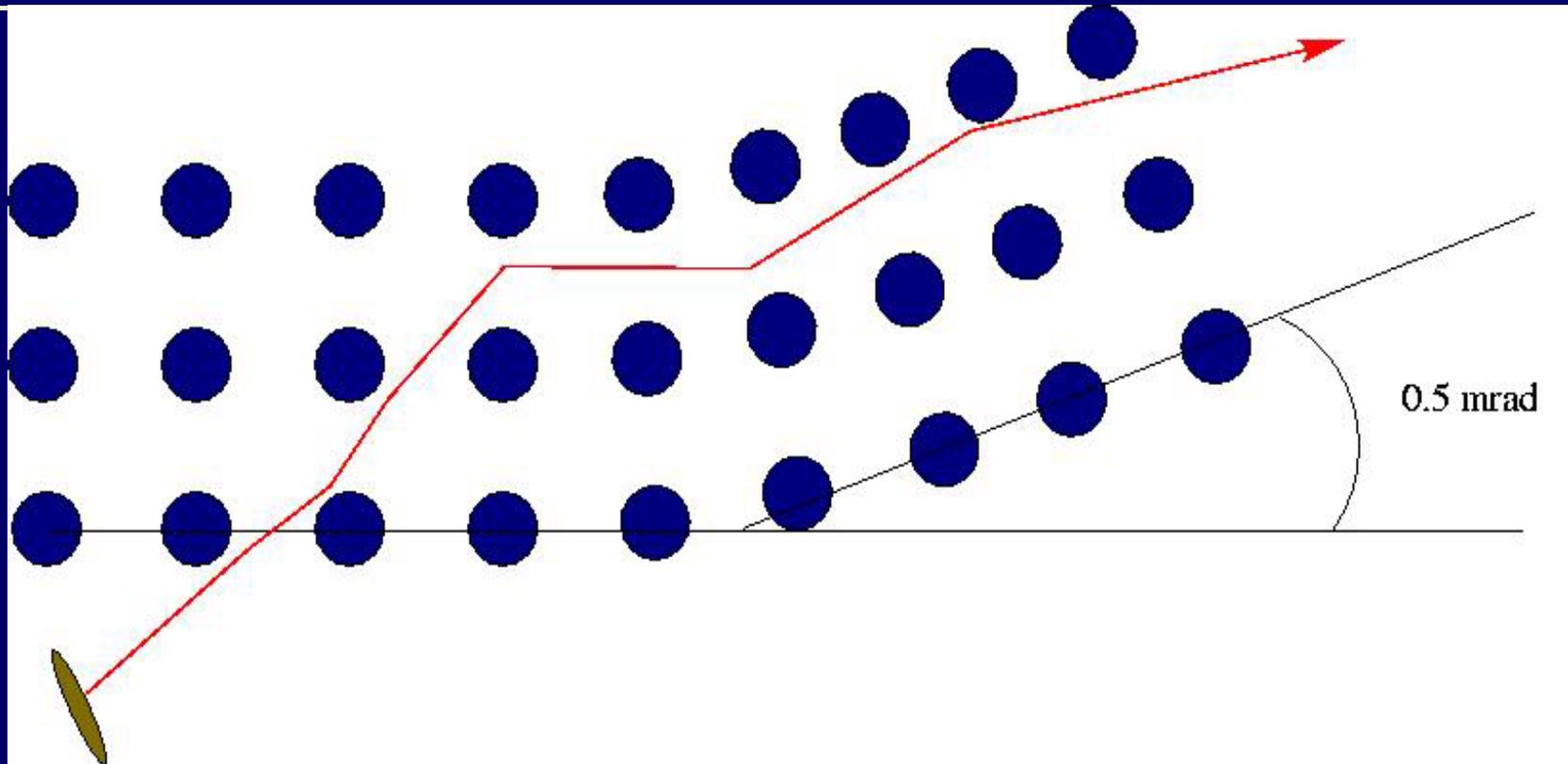


Crystal Channeling



If particles entering a crystal are properly aligned to the crystal planes, they will follow the planes, even if the crystal is bent. (Courtesy R. Fliller- Halo 03 Conference)

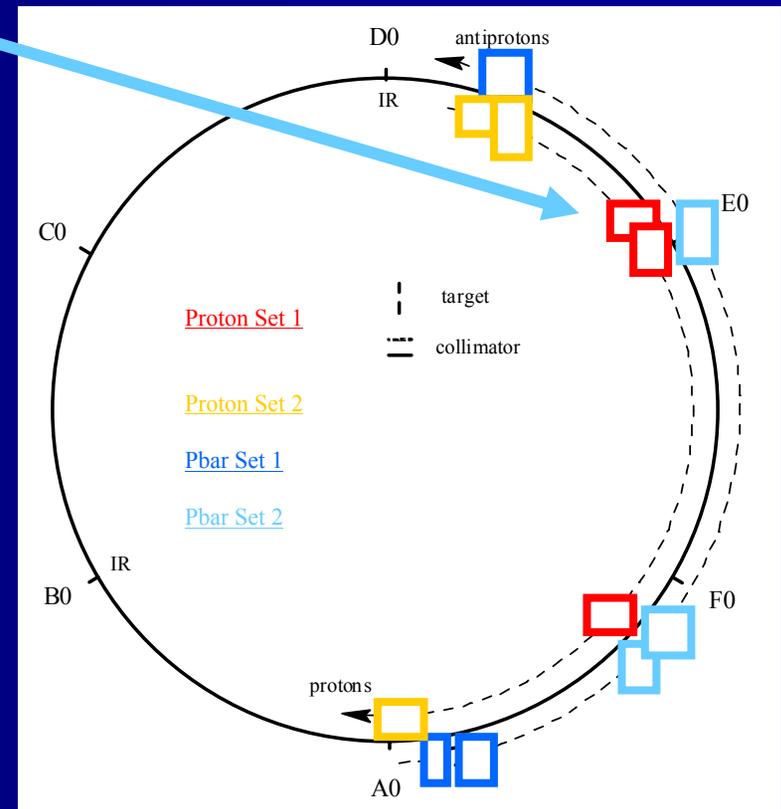
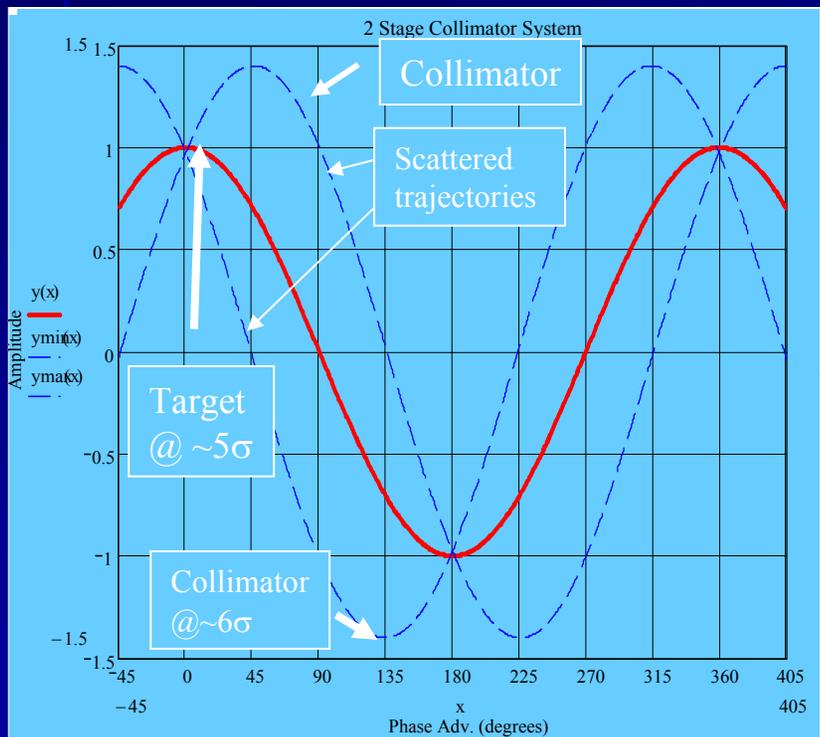
Volume Capture



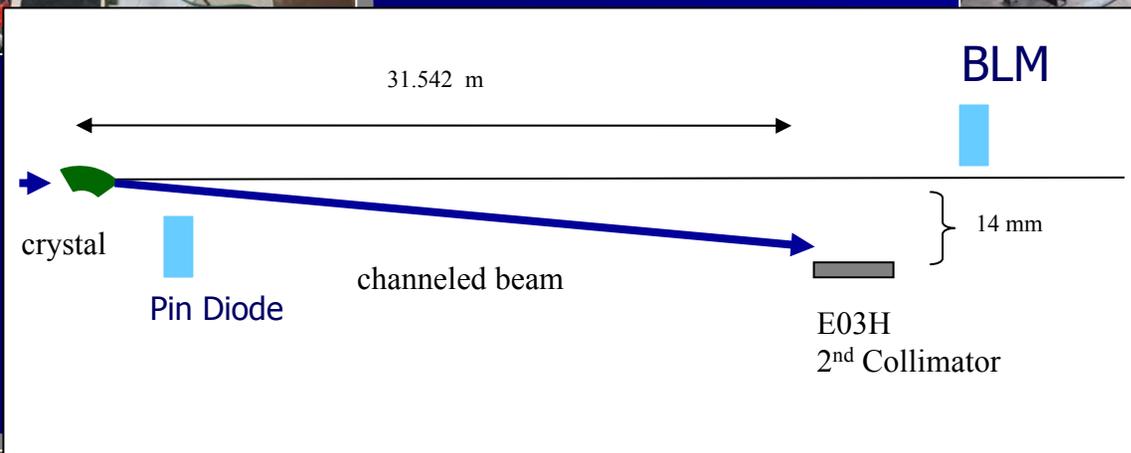
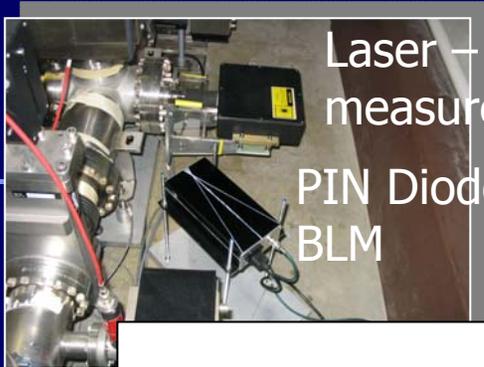
Particles that enter the crystal, not aligned to the planes, can scatter so that they have the correct angle to the planes, then channel the remaining distance in the crystal. (Courtesy R. Filler- Halo 03 Conference)

Where to Install Crystal Collimator System

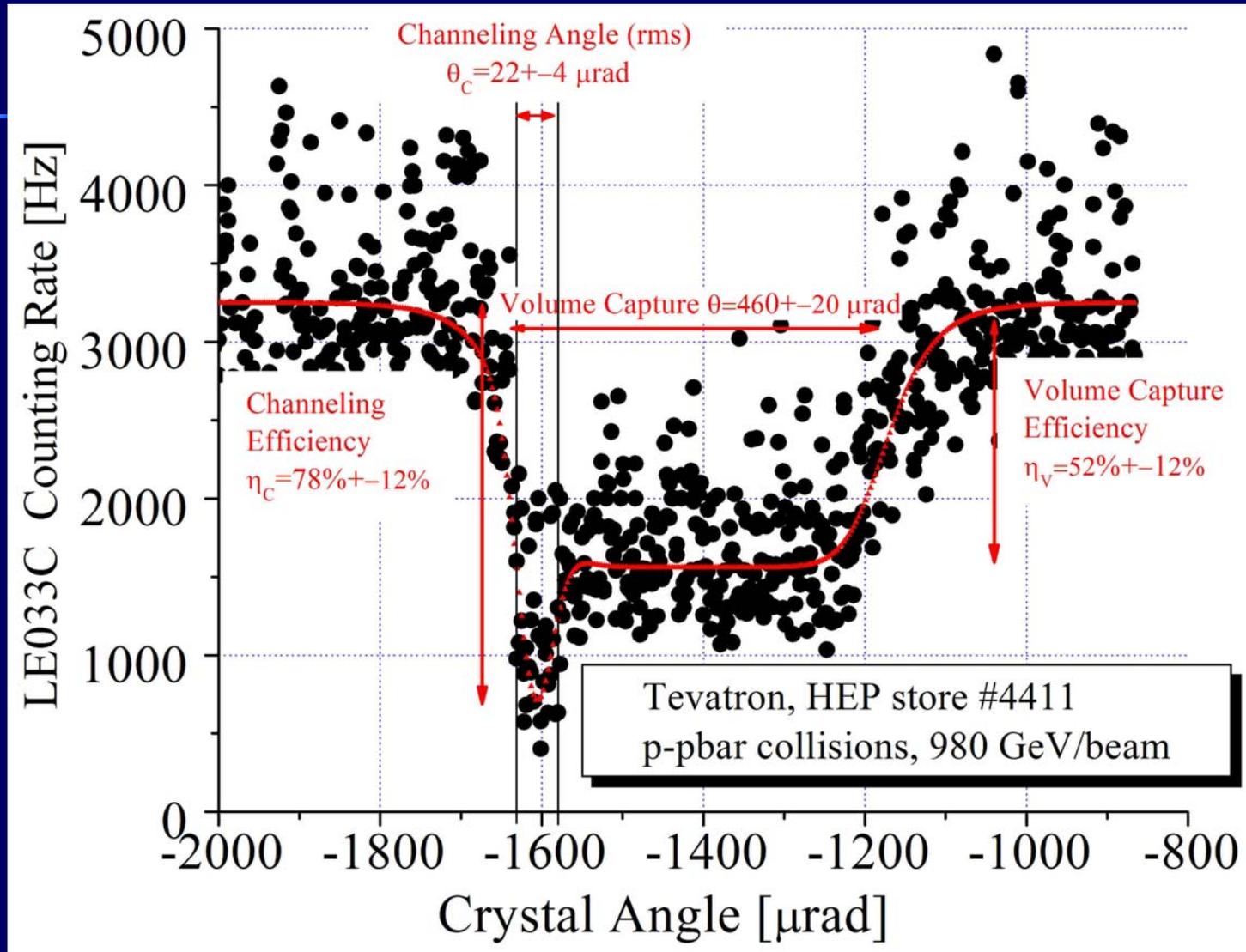
Install Crystal Collimator at E0 to replace a Tungsten Target and utilize the rest of the collimator 2 stage System.



Crystal Collimator System



Bent Crystal: 980GeV Channeling

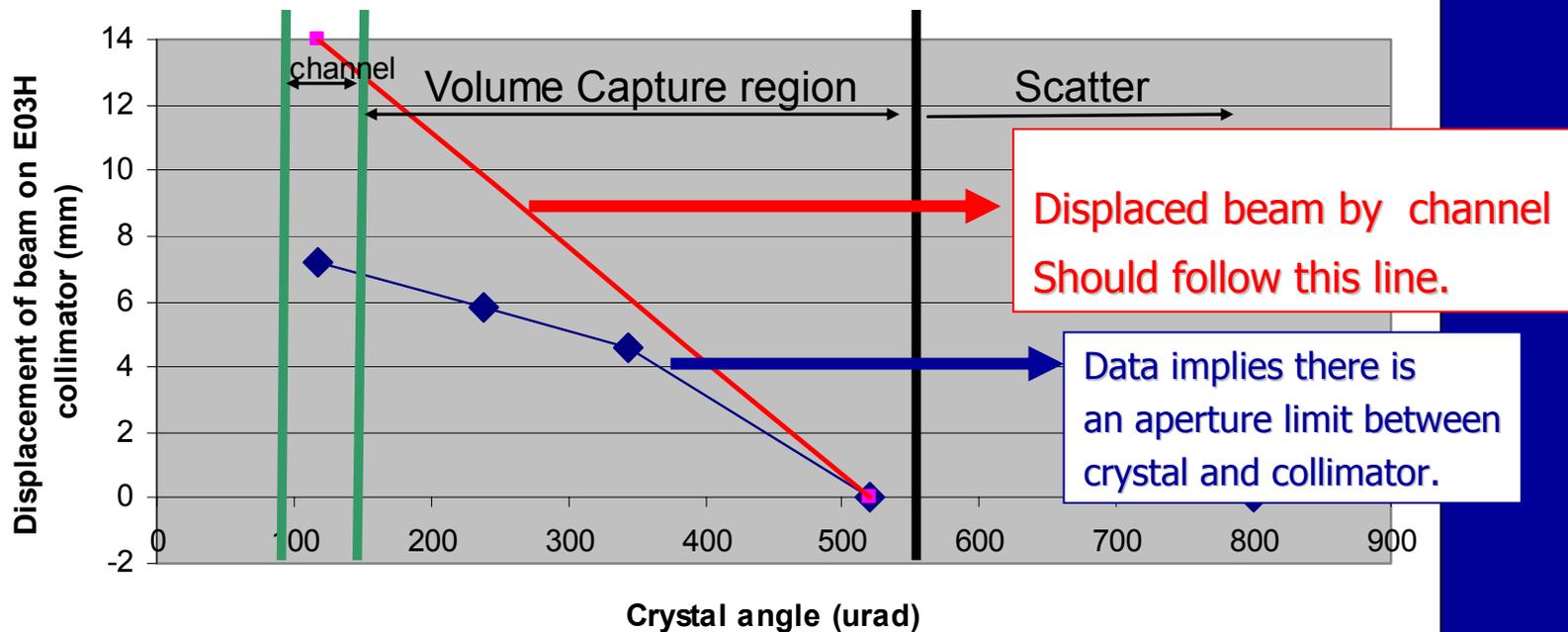


Collimating the Channeled Beam



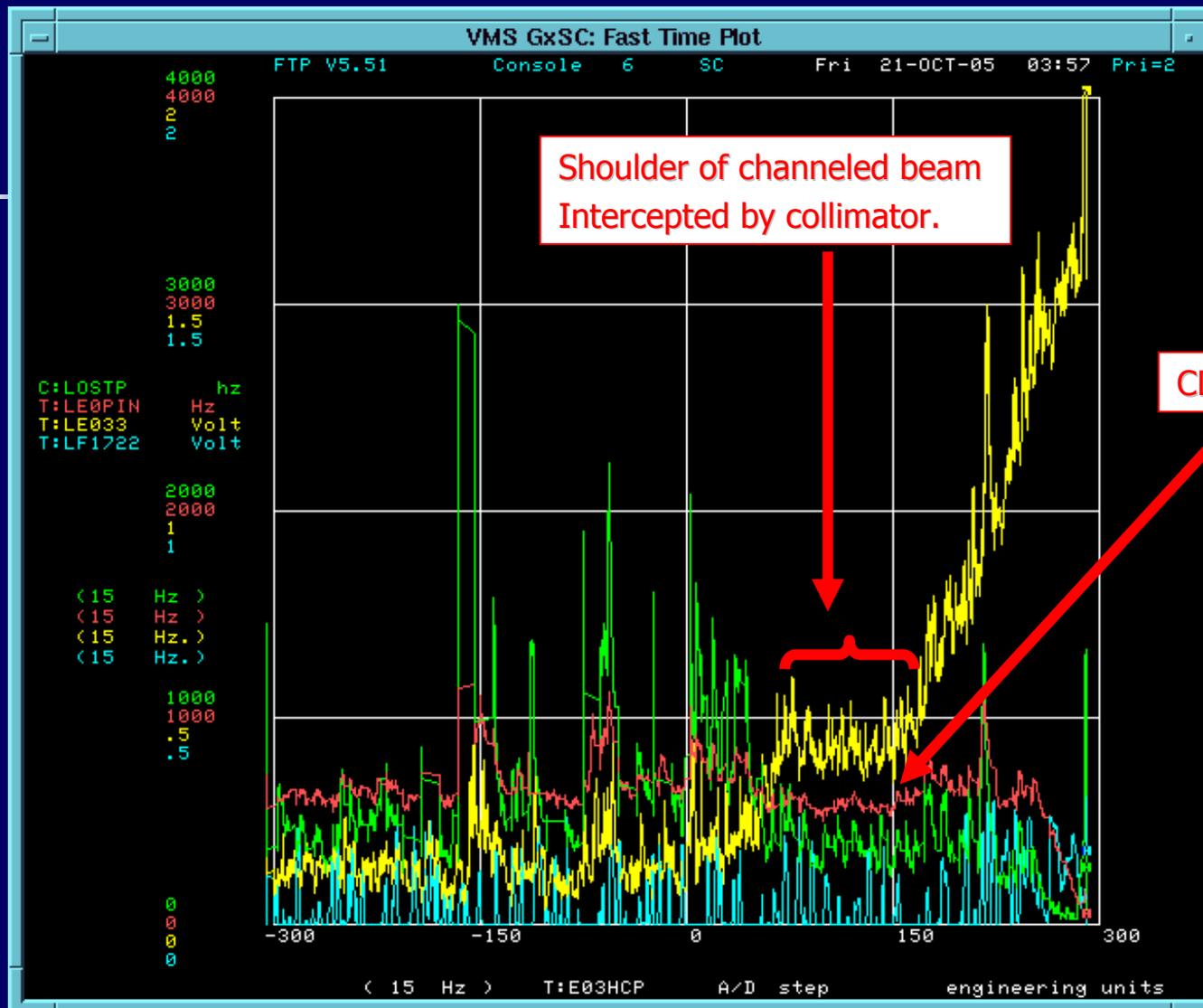
Channeled Beam is Aperture Limited

Displaced Beam at the E03H Secondary Collimator



Therefore, hard to conclude about effects on halo reduction

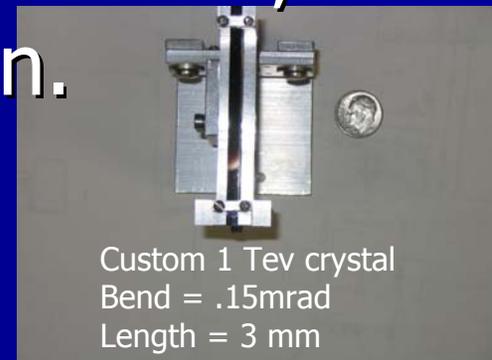
Hopeful Future Result



Future Plans



- Finish data collection and analysis using current BNL crystal with purpose of answering "Does CC reduce CDF and D0 proton halo losses?"
- Next long shutdown - install custom crystal from Protvino and gather data, analyze and prepare conclusion.



Custom 1 TeV crystal
Bend = .15mrad
Length = 3 mm

Concluding Statements

- Demonstrated channeling in a bent crystal with good efficiencies.
- Unable to make a conclusion about reduction of halo effect due to limited aperture effects of current crystal
- Hopeful with new crystal that we can come to a conclusion about amount of halo reduction that can be seen.
- LHC is looking at our results because there is a proposal to use crystal collimator in phase II of their system.

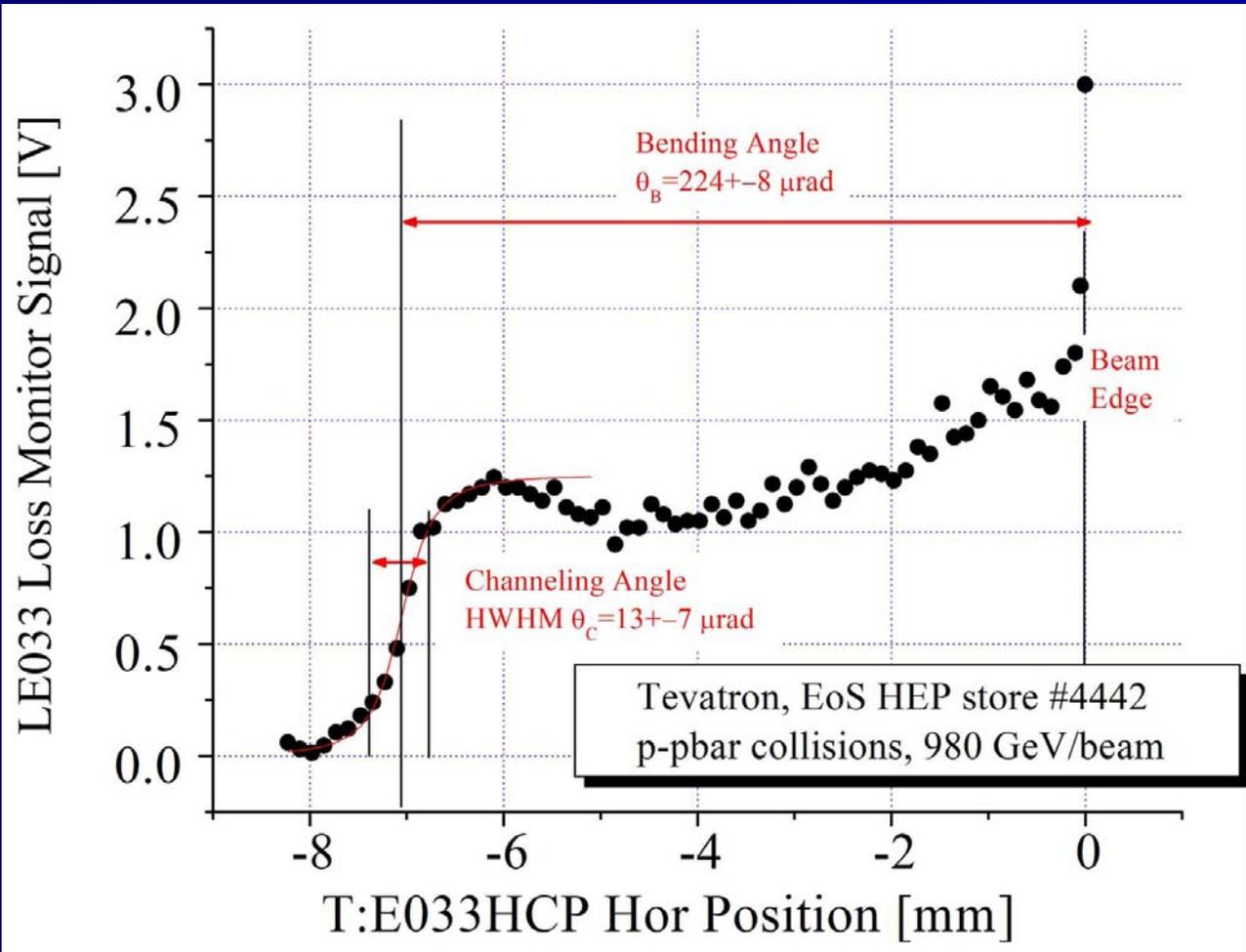
Acknowledgements

- Nikolai Mokhov
- Sasha Drozhdin
- Ray Filler
- Dick Carrigan
- Todd Johnson
- Vladimir Shiltsev
- Jerry Annala
- Rob Reilly
- Derek Plant

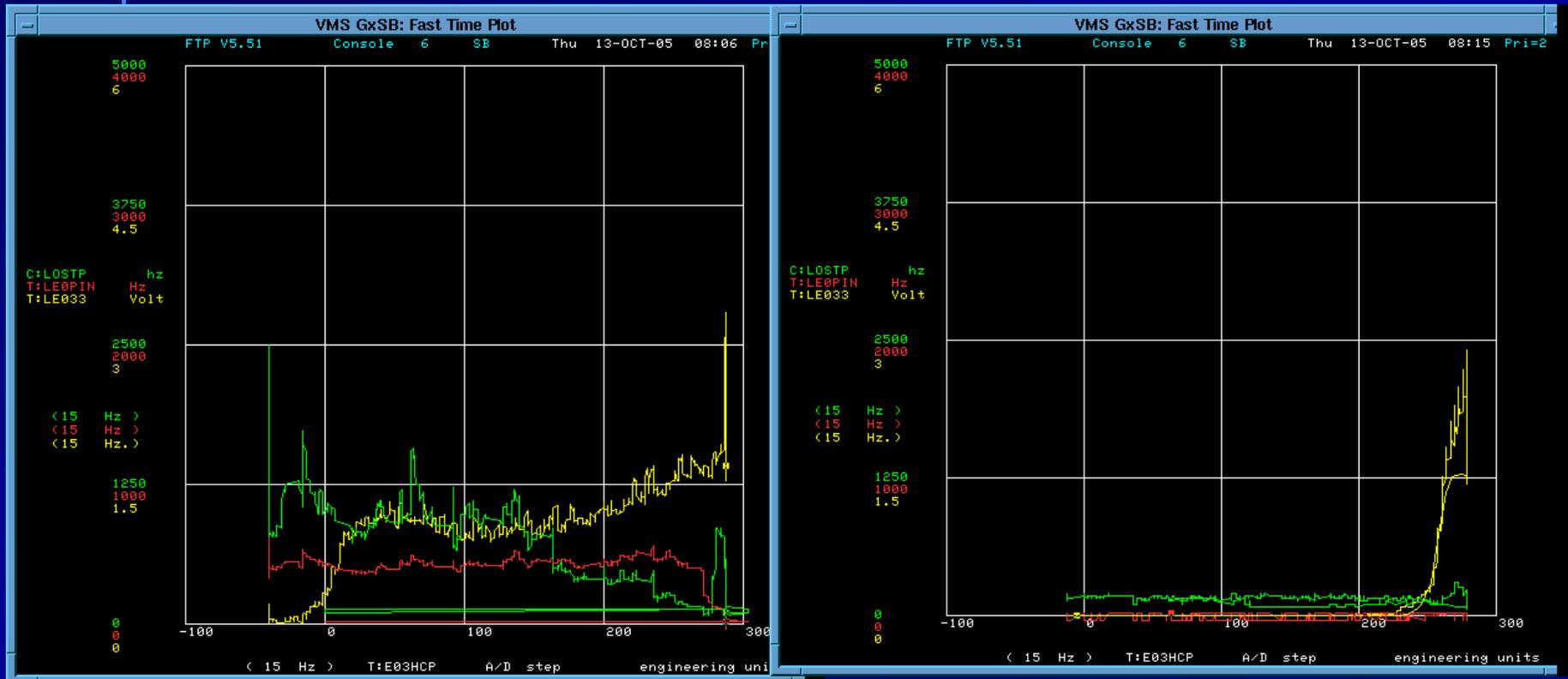
Extra Slides

Checking Angle of Channel particles.

This does not match the ~ 440 μrad determined by the volume capture Area.



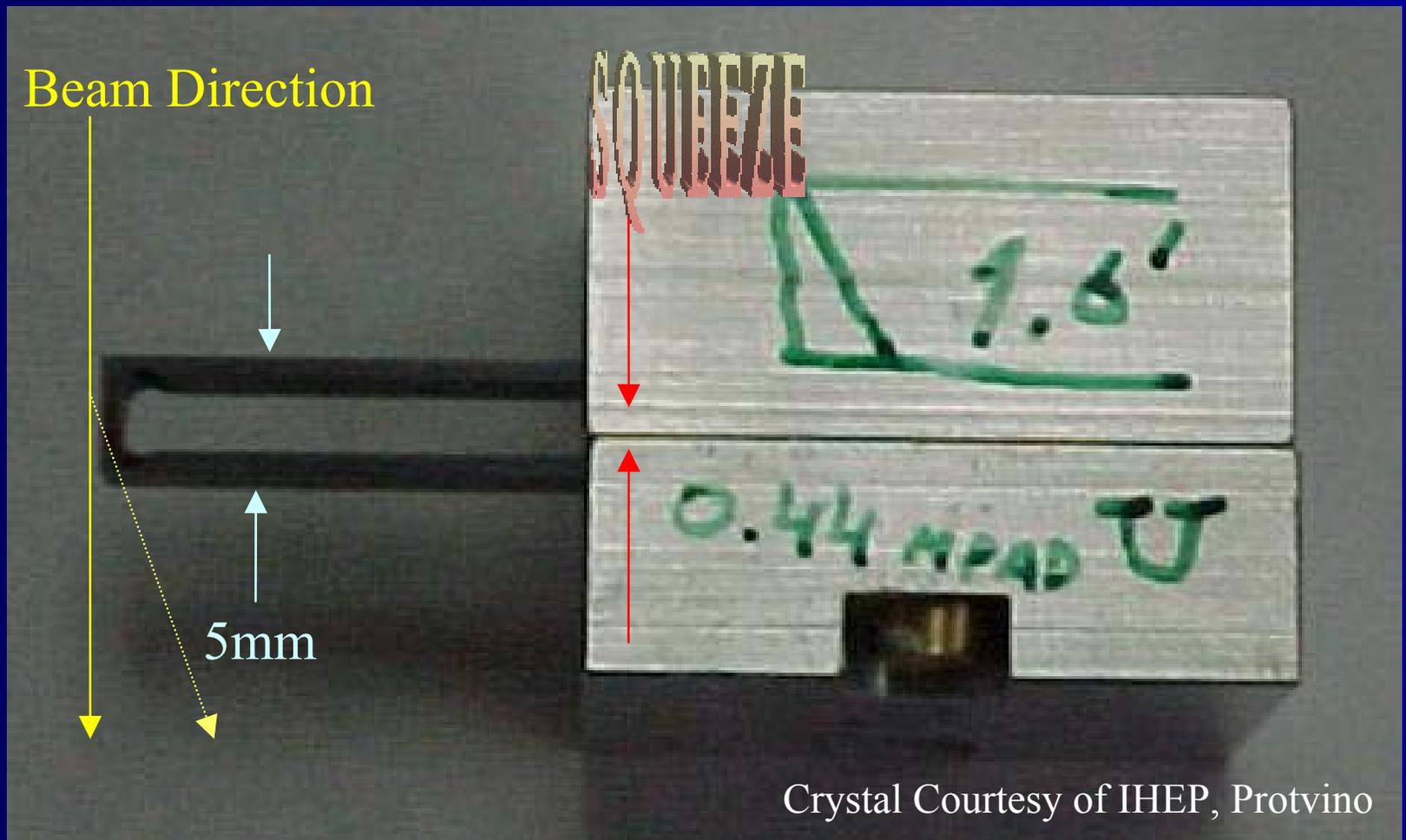
The Channeled beam



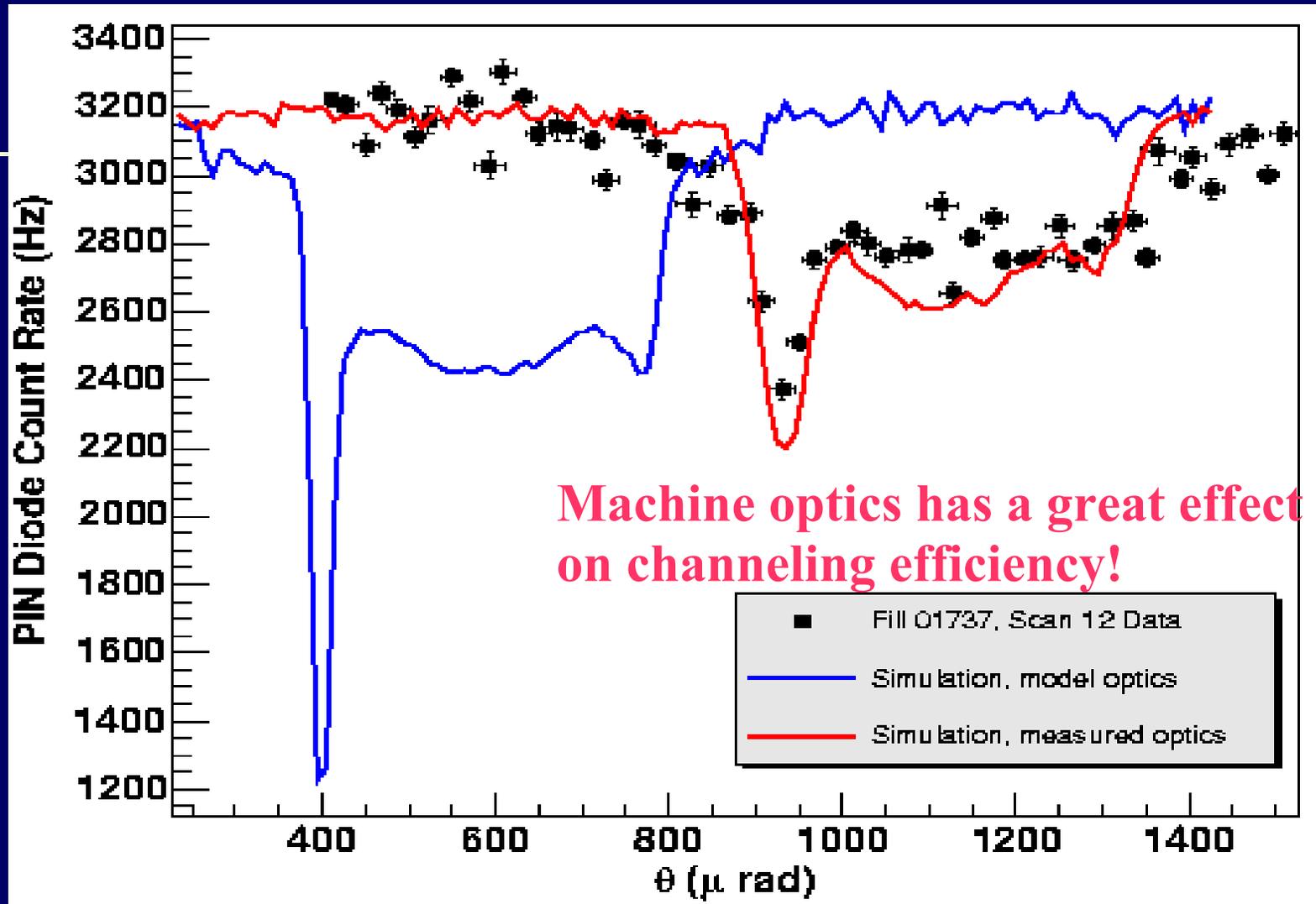
Data for inserting E03H Secondary
Until it reaches the core beam with
Beam channeled ~ volume capture area.

Data for inserting E03H secondary
Collimator with the no channeling.
Crystal is pulled out.

Crystal



Simulation of Data from RHIC 2001 Run



(Courtesy R. FLiller. Halo 03 Conference)

Results of a 3urad scan from a 36x36 end of store study 9-30-2005

