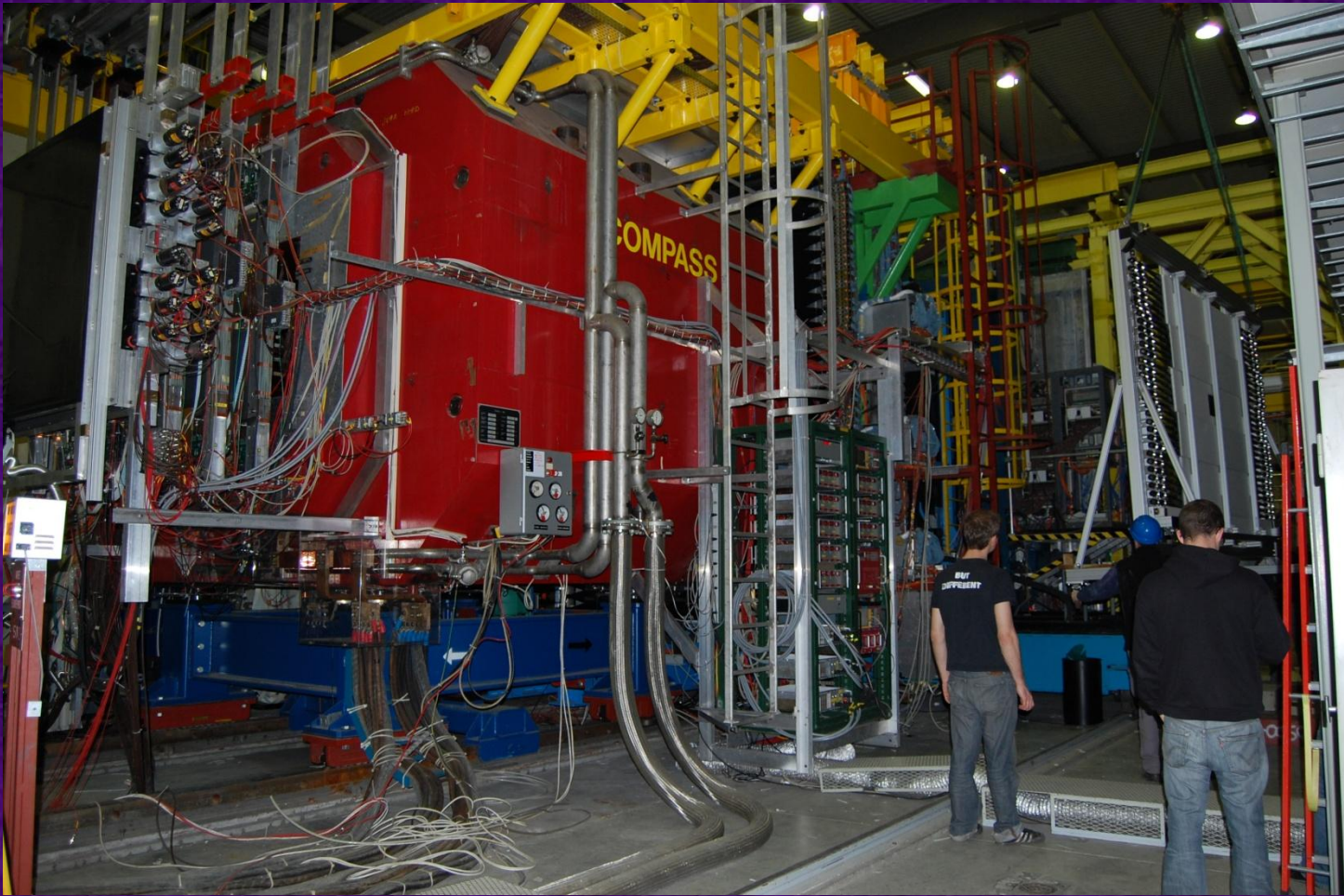




COMPASS Trigger System Hodoscopes



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Supervisor: Nick du Fresne von Hohenesche, *University of Mainz*

COMPASS images: courtesy of Jens Barth, *University of Bonn*

COmmon

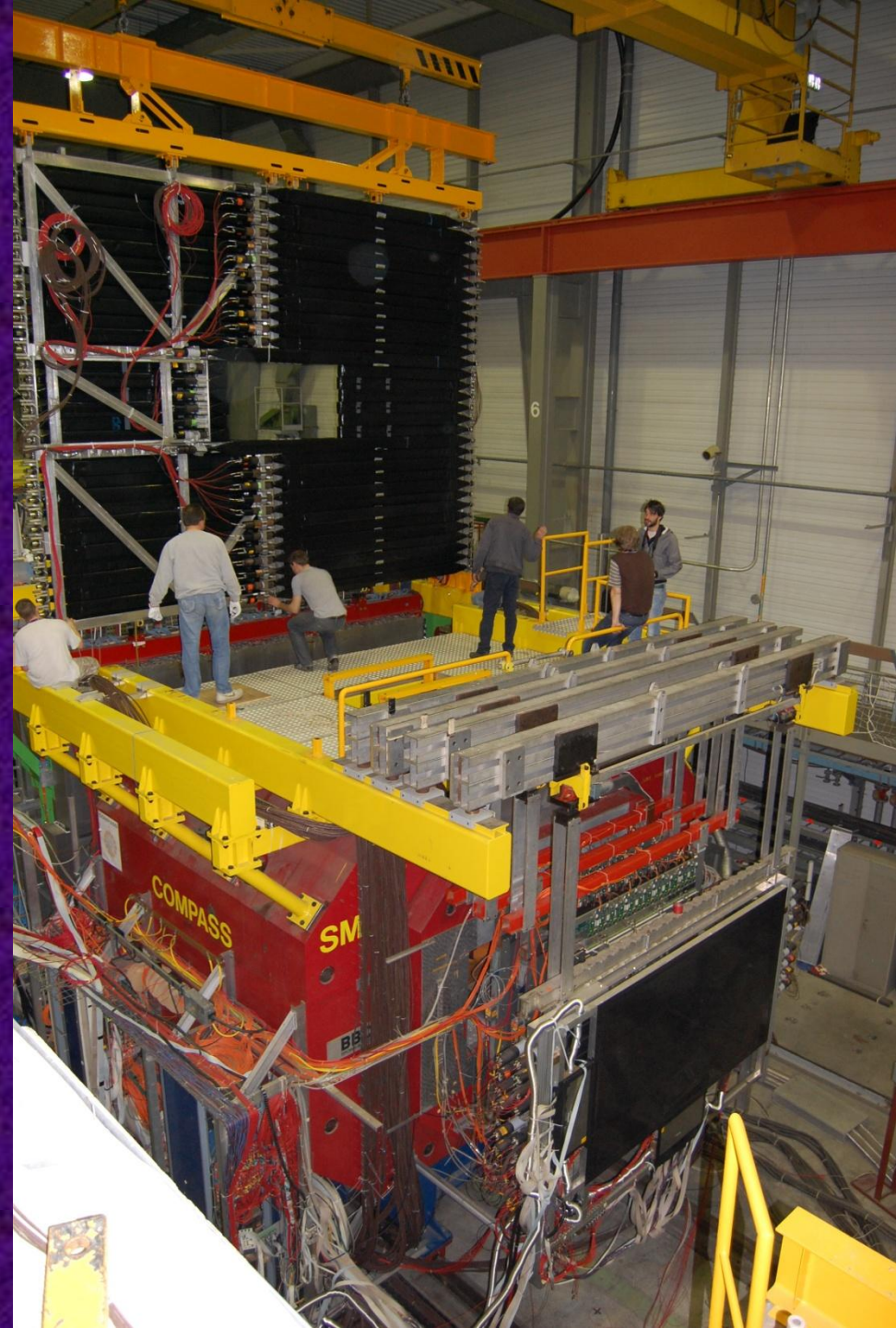
Muon and

Proton

Apparatus for

Structure and

Spectroscopy



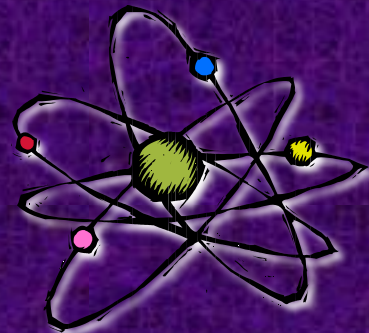
COMPASS is located in Prévessin.



It started taking technical run data in 2001.



We hope to discover the spin structure of nucleons.



Components of COMPASS

* Large angle & small angle spectrometers

* Muon or hadron beam

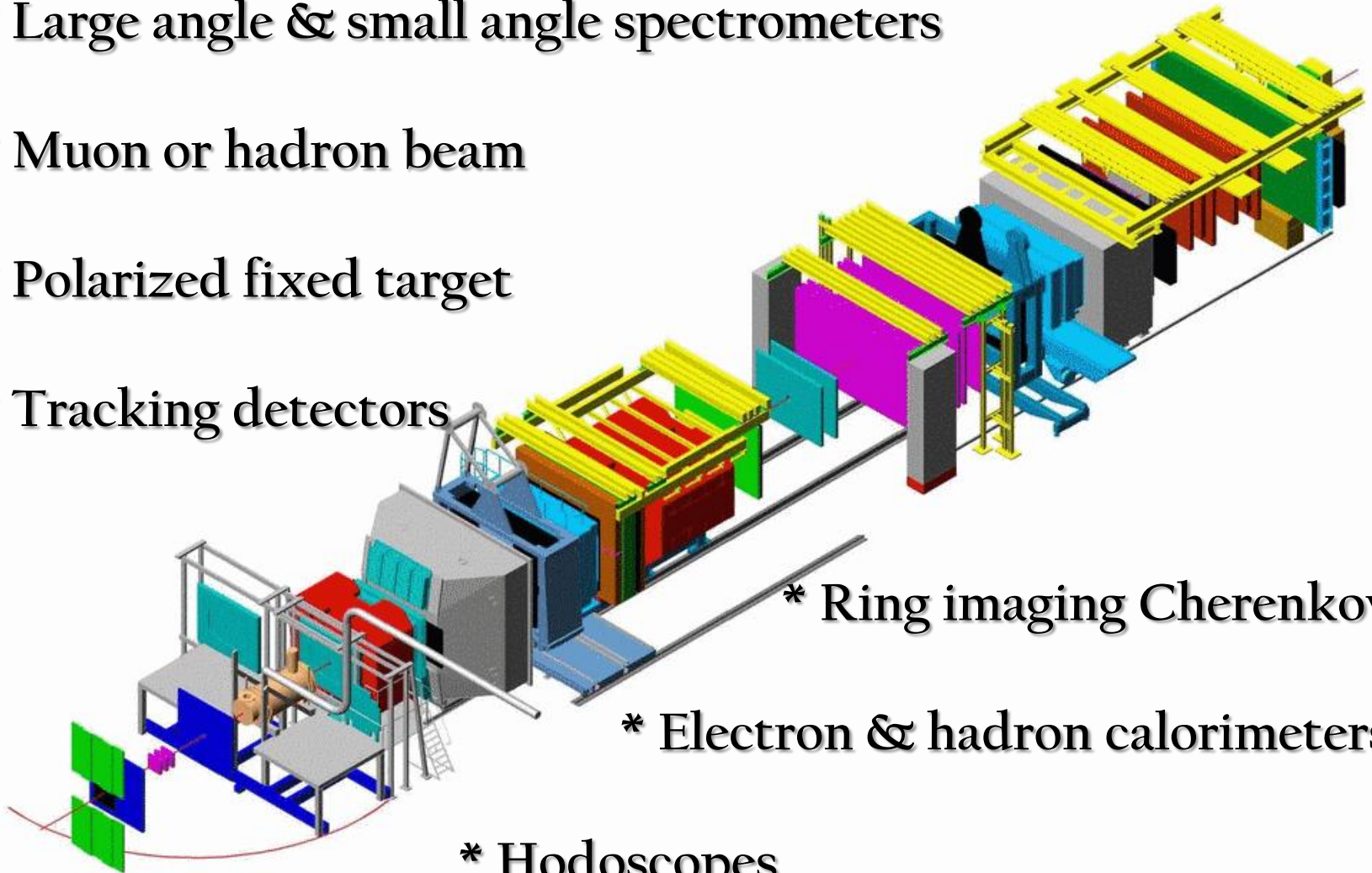
* Polarized fixed target

* Tracking detectors

* Ring imaging Cherenkov

* Electron & hadron calorimeters

* Hodoscopes



Hodoscopes

Components

- * Scintillators
- * Light guides
- * Magnetic shielding
- * Photomultiplier tubes
- * High voltage dividers



Hodoscope Magnetic Shielding

Components

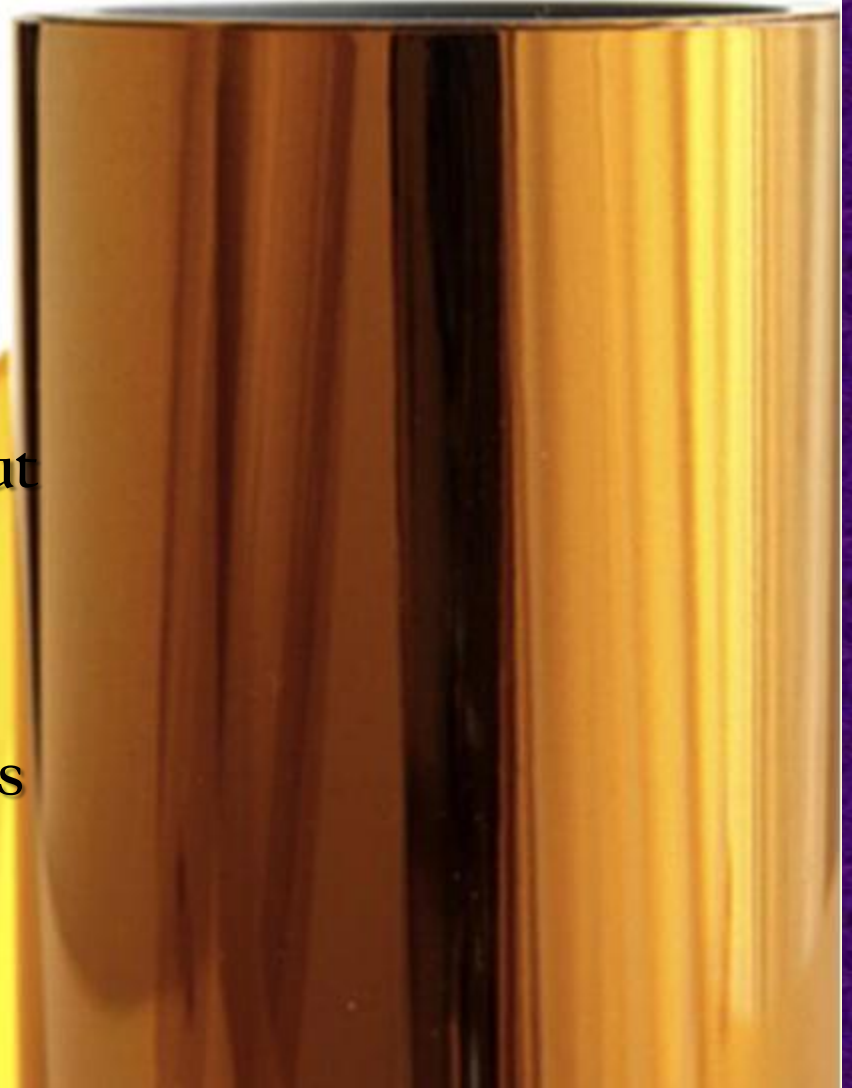
- * Soft iron core
- * A little electrical tape
- * Kapton insulation layer
- * Mu-metal
- * Another Kapton insulation layer
- * Photomultiplier tube



Hodoscope Magnetic Shielding

Tasks

- * Cut squares of Kapton
- * Wrapped mu-metal inside and out
- * Slid “scrolls” inside soft iron cores



Hodoscope FAQ



Questions

* *What?*

Hodoscopes create a trigger signal. . .

* *When?*

Within a 500 ns window of detecting a relevant physics event. . .

* *How?*

By looking for coincidences (particles, whose trajectories can be retraced to the target via comparing the positions where they hit H1 and H2). . .

* *Why?*

To reduce the amount of data that needs to be stored.

Polarized Target

- * Ammonia or lithium deuteride

- * 60 mK

Transverse Polarization

- * 3 cylindrical cells (D=3 cm)

- * $\uparrow\downarrow\uparrow$ or $\downarrow\uparrow\downarrow$

- * 30 cm/60 cm/30 cm

- * 10 cm spacing

Longitudinal Polarization

- * 2 cylindrical cells (D=3 cm)

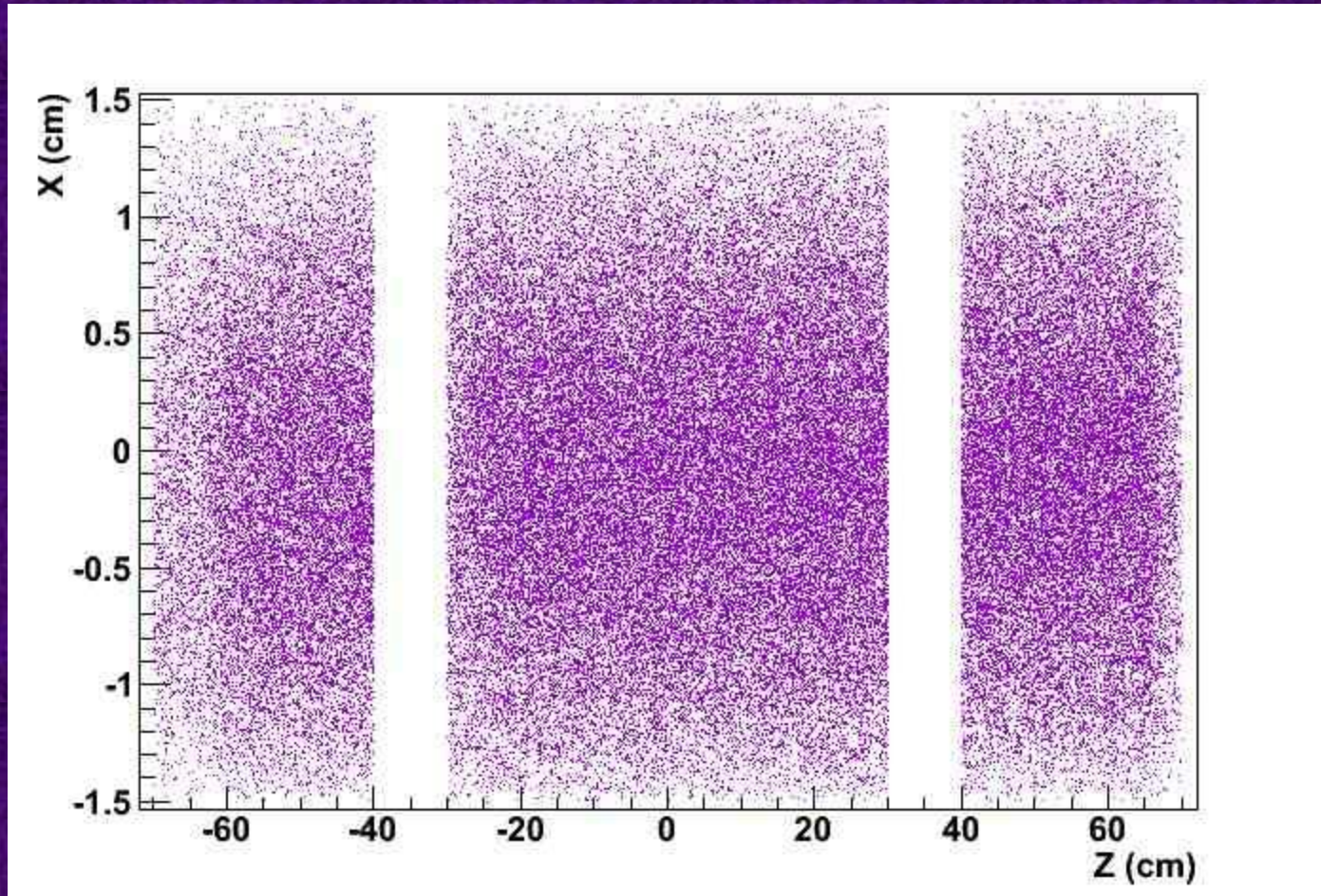
- * $\leftarrow \rightarrow$ or $\rightarrow \leftarrow$

- * 60 cm/60 cm

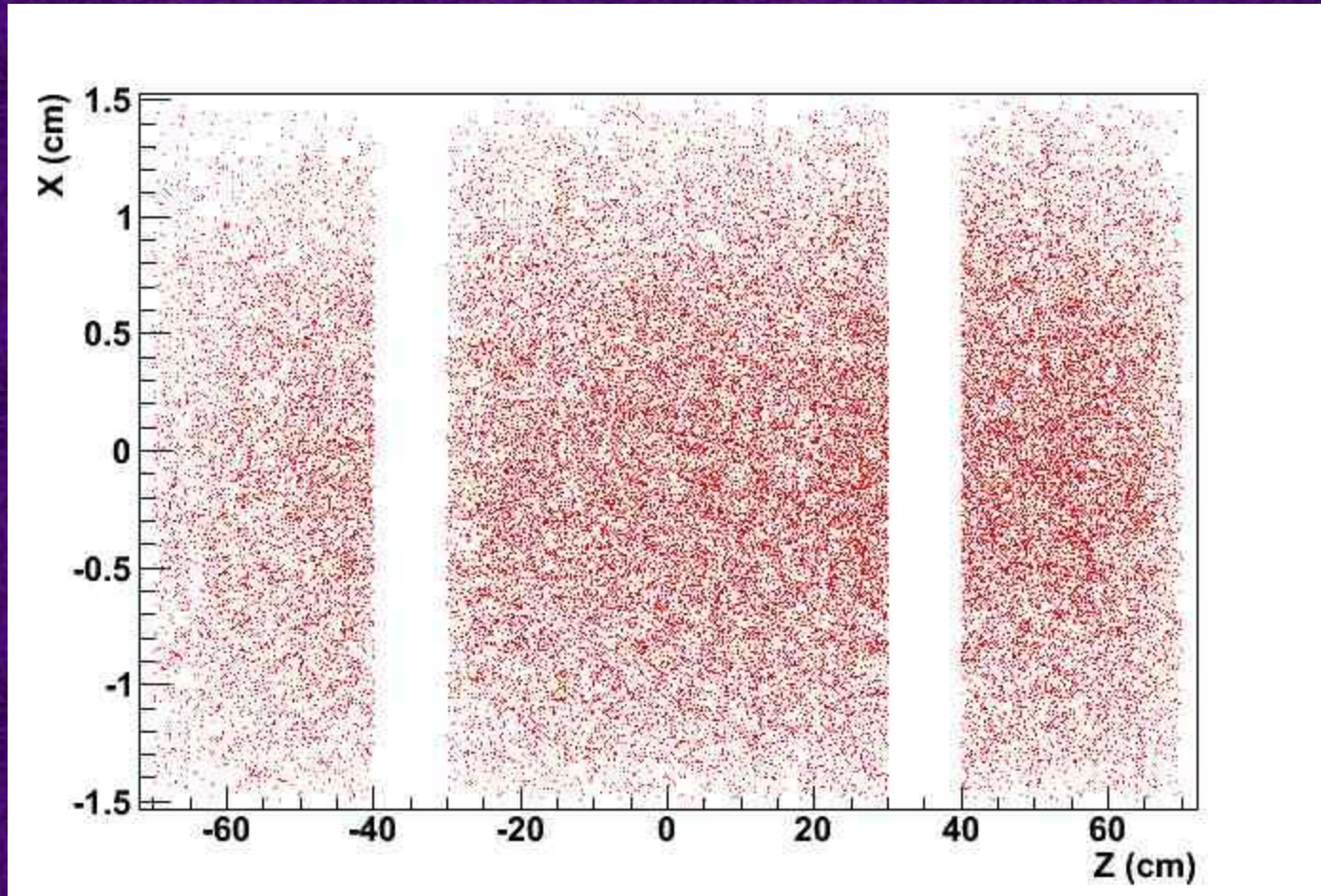
- * 10 cm spacing

There are 3 cells so the average acceptance is the same for \uparrow and \downarrow .

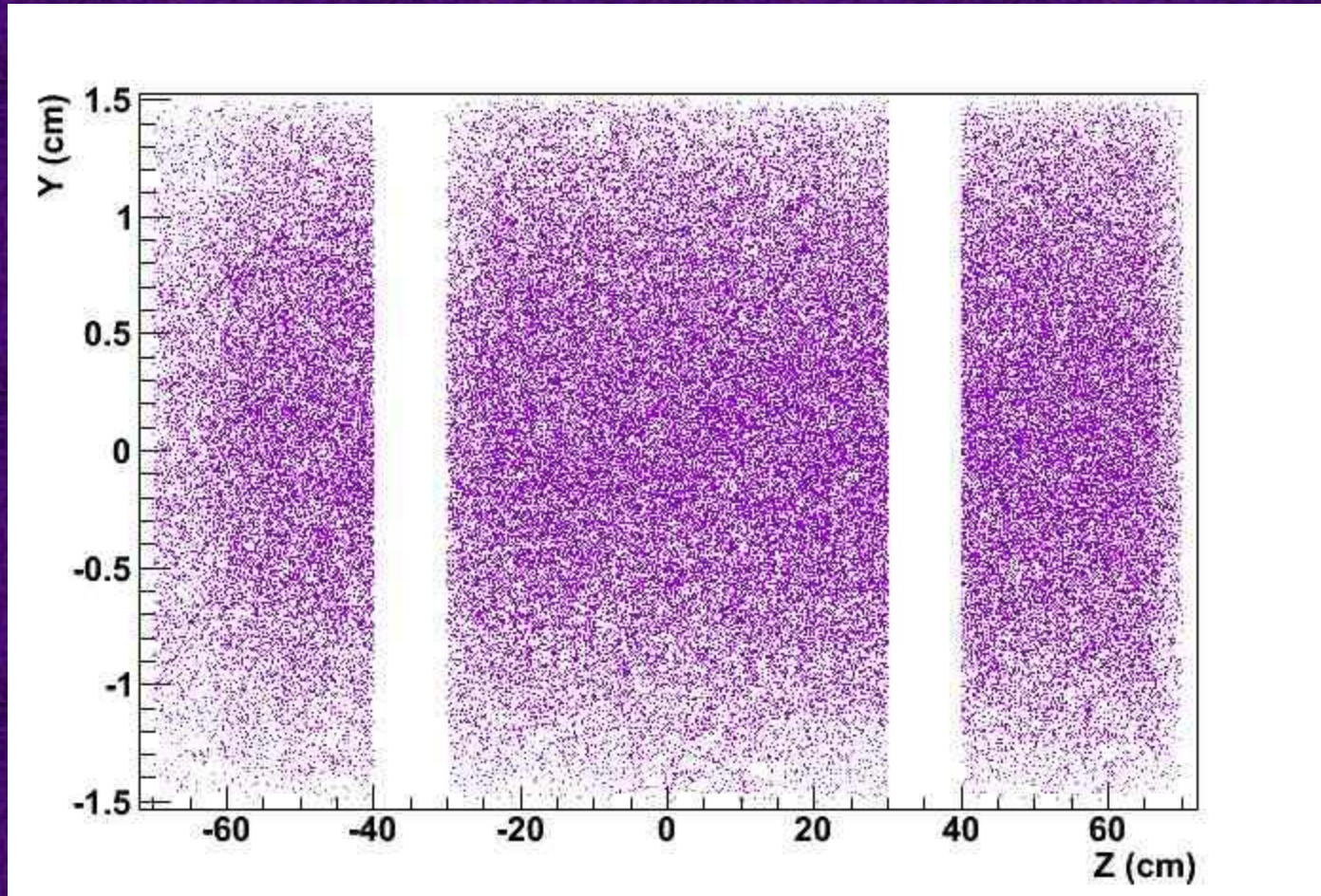
Primary Vertices with Target Cuts 2007



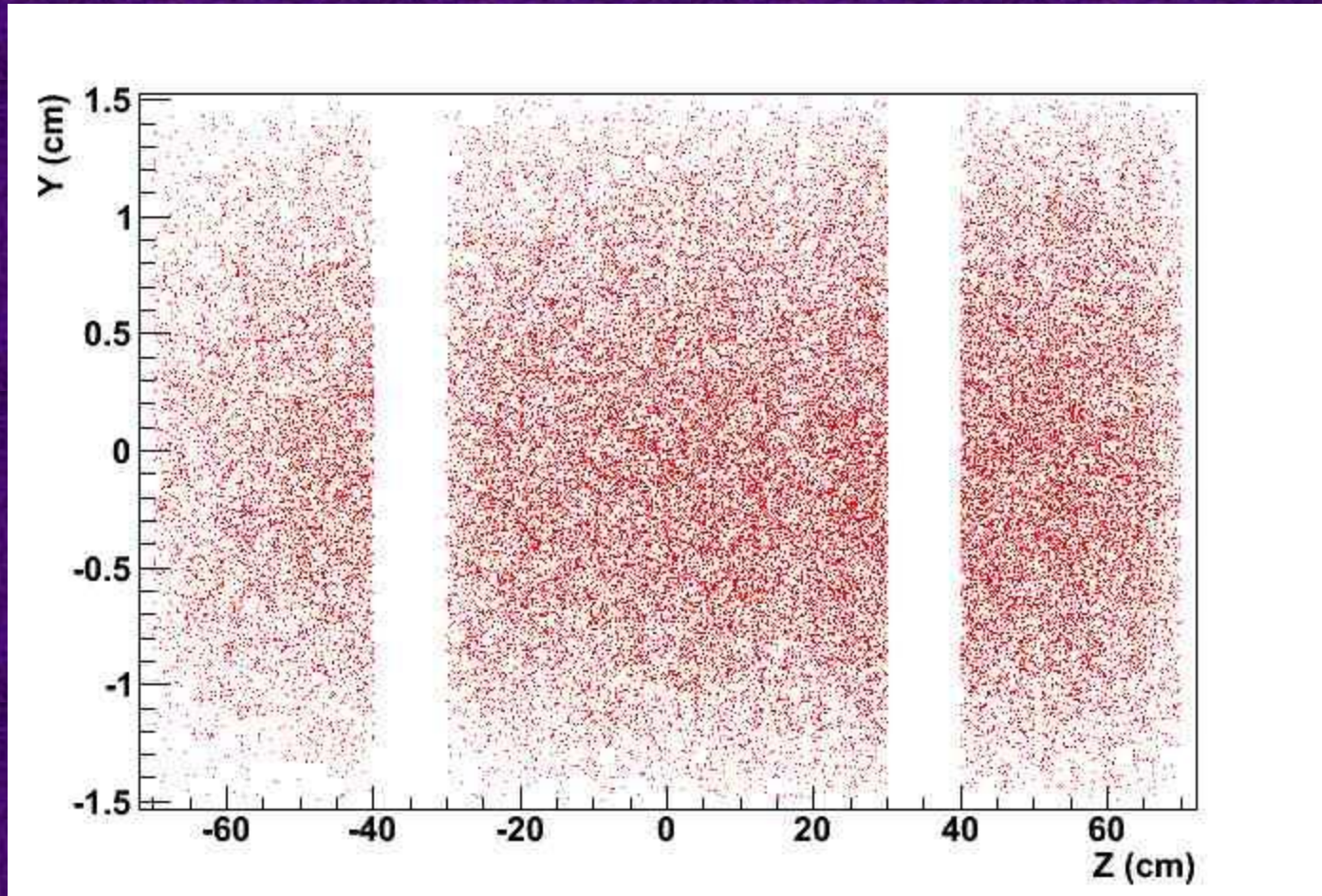
Primary Vertices with Target Cuts 2010



Primary Vertices with Target Cuts 2007



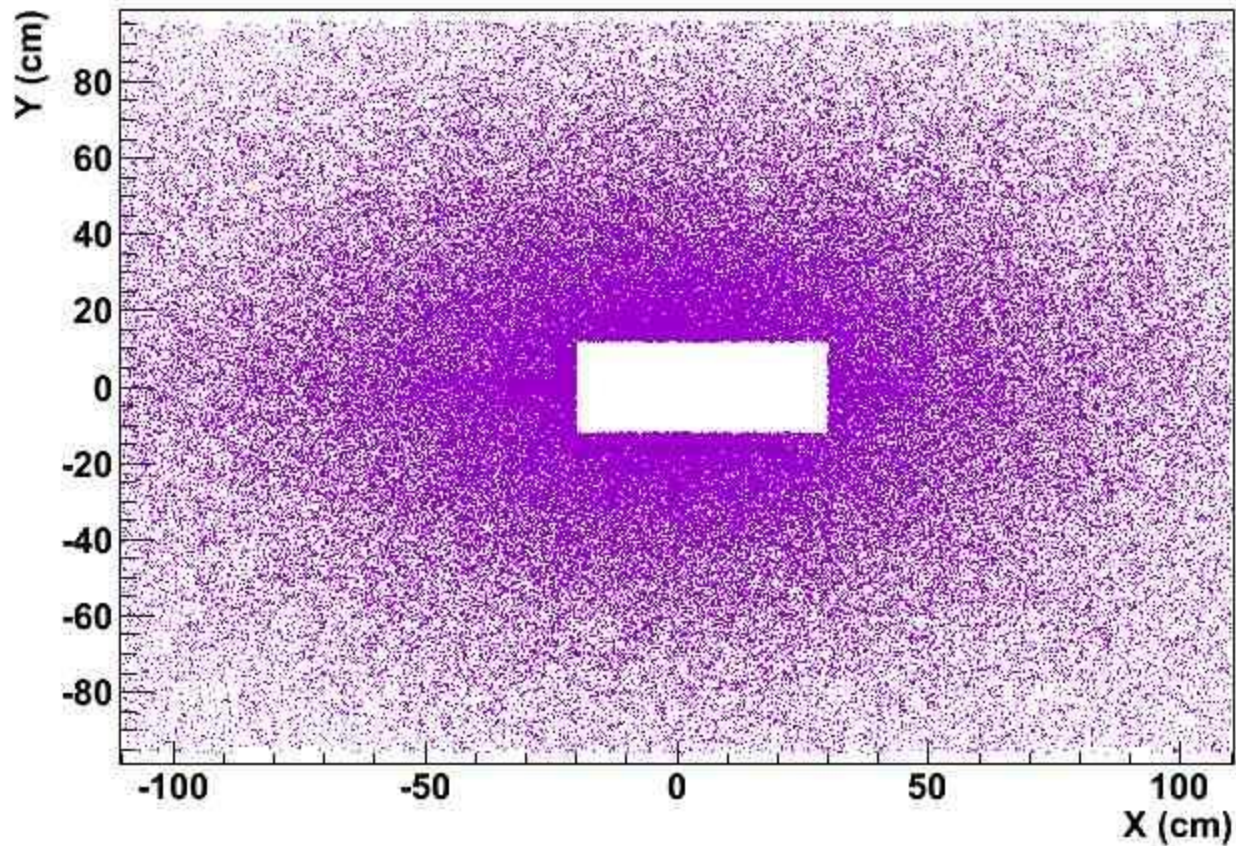
Primary Vertices with Target Cuts 2010



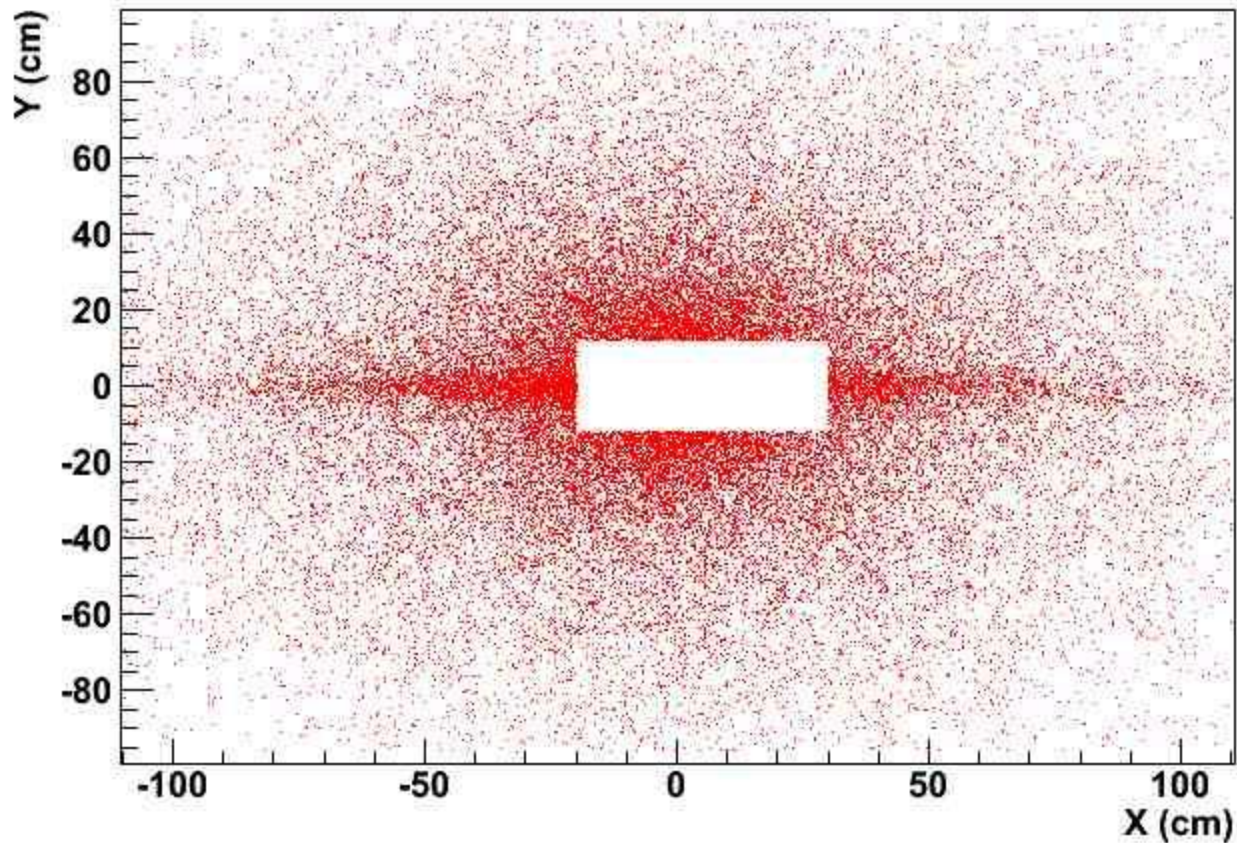
Hodoscope 1 (H1)



Extrapolated Tracks to HI 2007



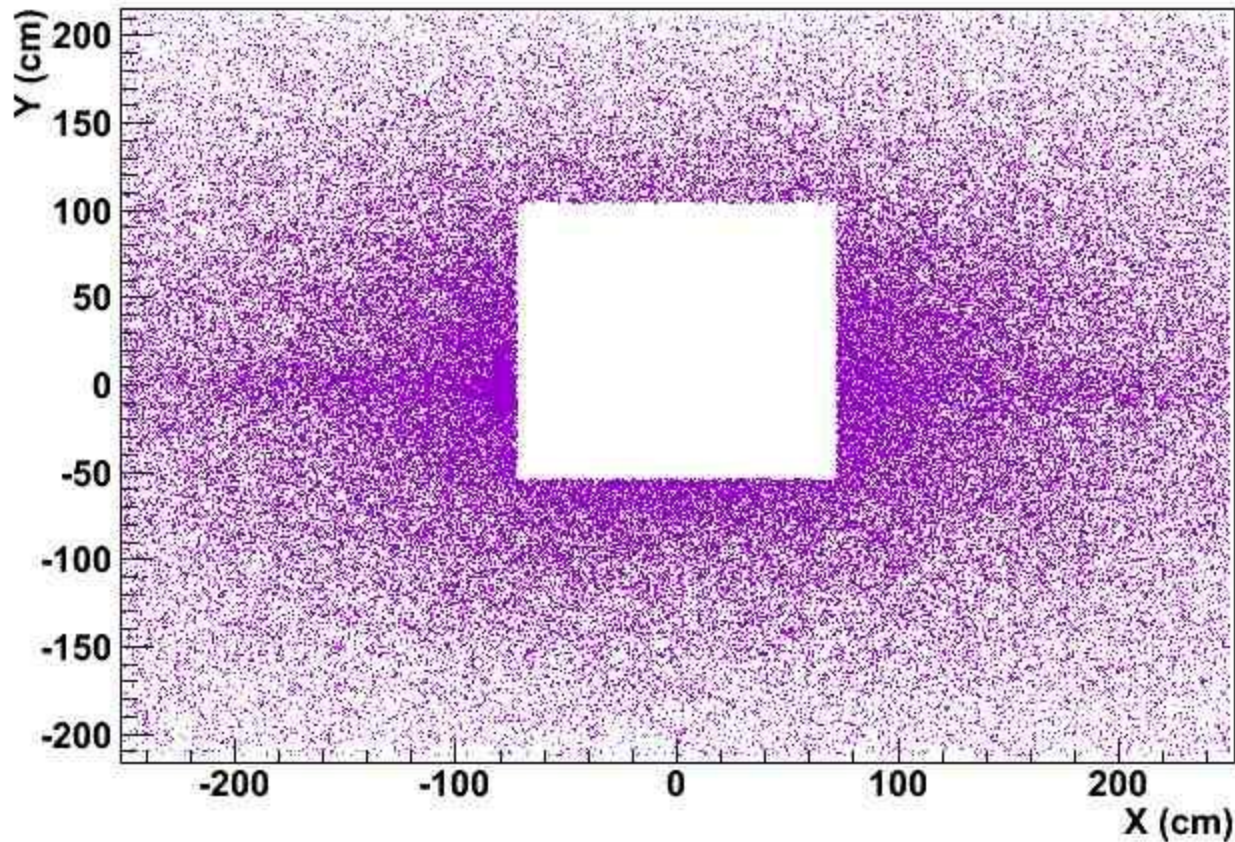
Extrapolated Tracks to H1 2010



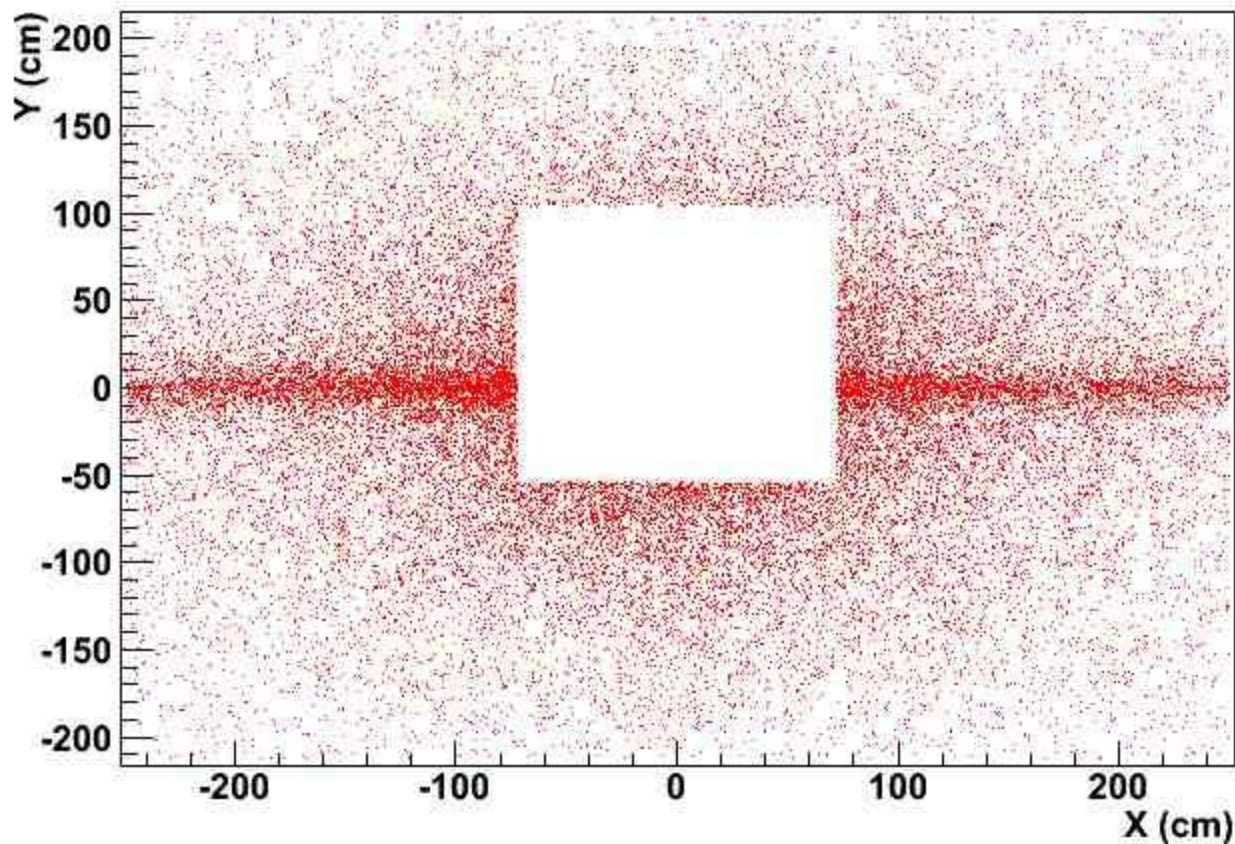
Hodoscope 2 (H2)



Extrapolated Tracks to H2 2007



Extrapolated Tracks to H2 2010



Summary of My Project

- * Became acquainted with C++, ROOT, and PHAST
- * Tested photomultiplier tubes and high voltage dividers
- * Connected photomultiplier tube signal cables
- * Tuned high voltage levels and signal thresholds
- * Assembled and installed magnetic shielding
- * Made cuts to plot only primary vertices located in the target cells
- * Extrapolated particle trajectories to hodoscope planes
- * Compared new 2010 data to 2007 data

Adventures



* Montreux

* Zürich

* Venezia

* Interlaken

Questions?

