FastSim V0.2.6 Dch Occupancy Studies with Bhwide
April 4, 2011
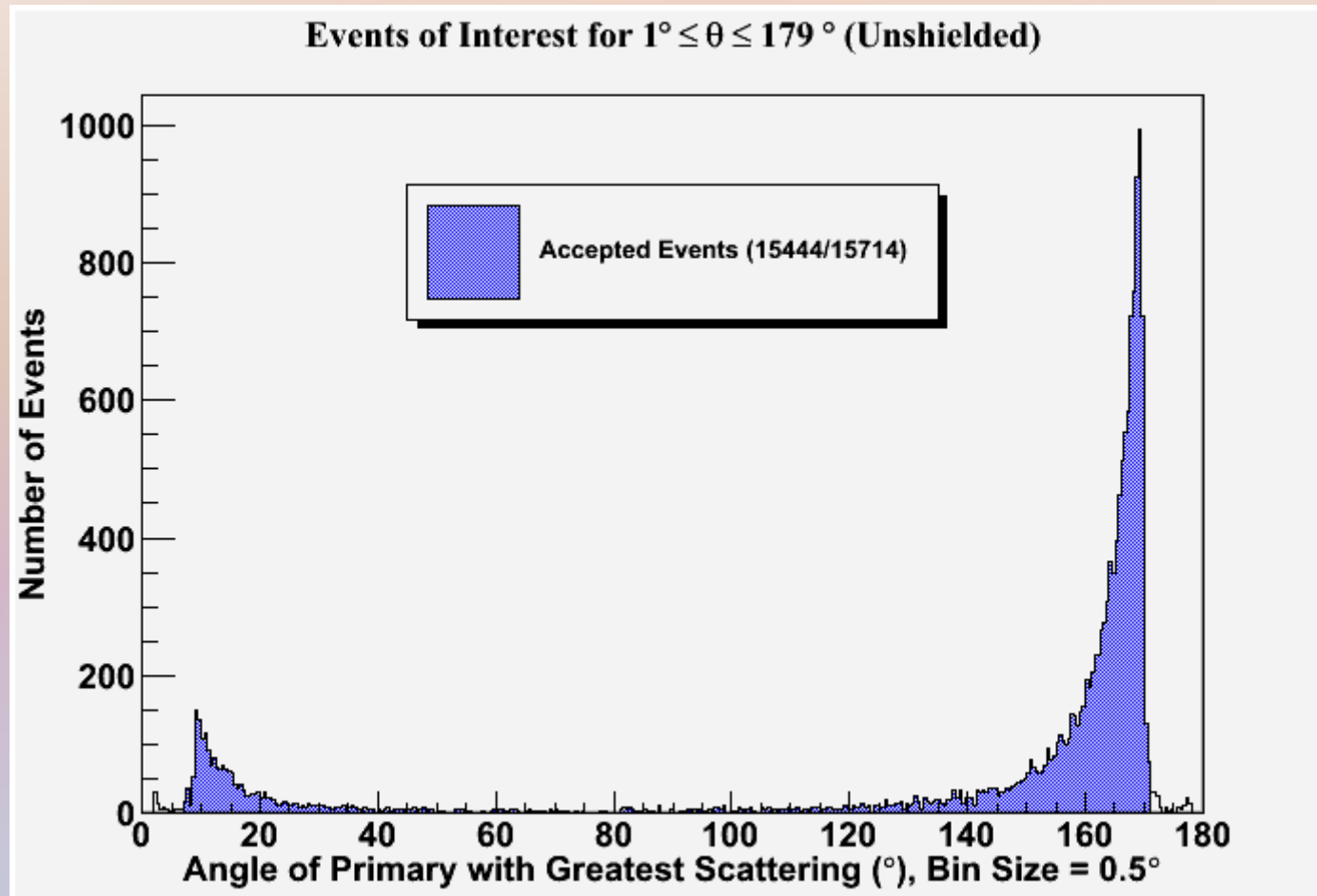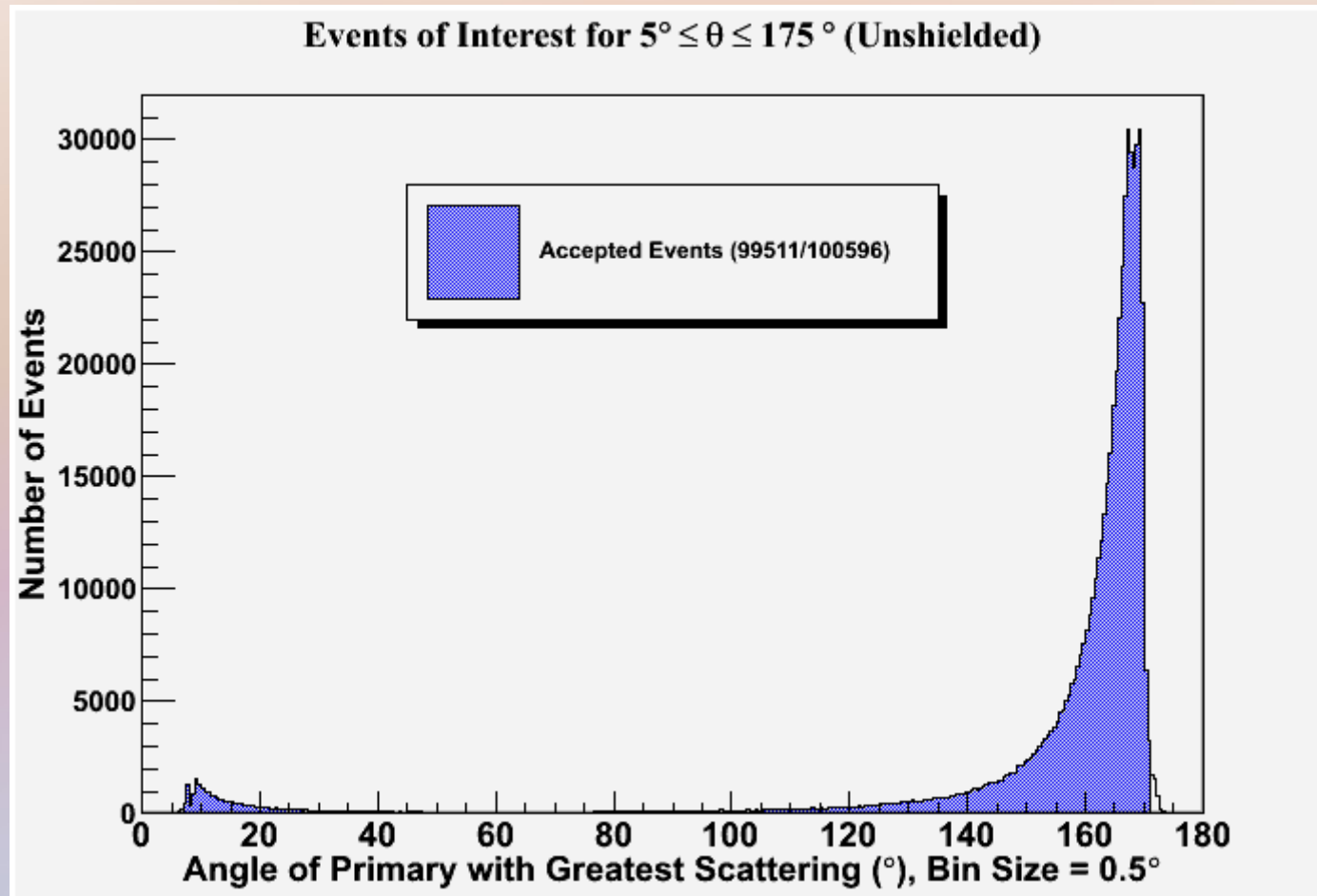
Darren Swersky,
McGill University

Angle Cut Optimization Scheme

• Ran 1000k events at angles 1-179 deg, 2-178 deg, 5-175 deg for Long Backward & Forward geometry, shielded and unshielded, looked for events where something entered drift chamber
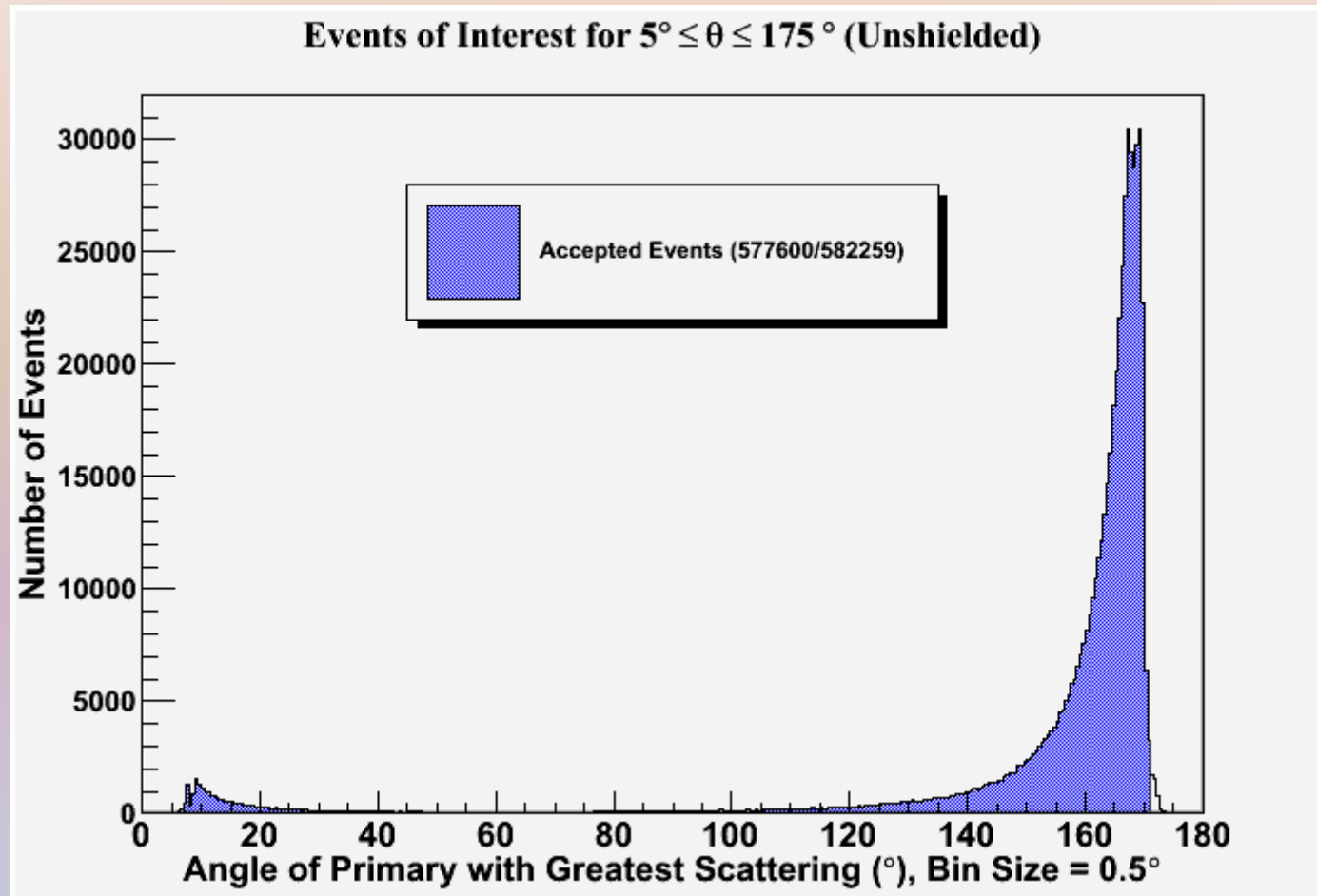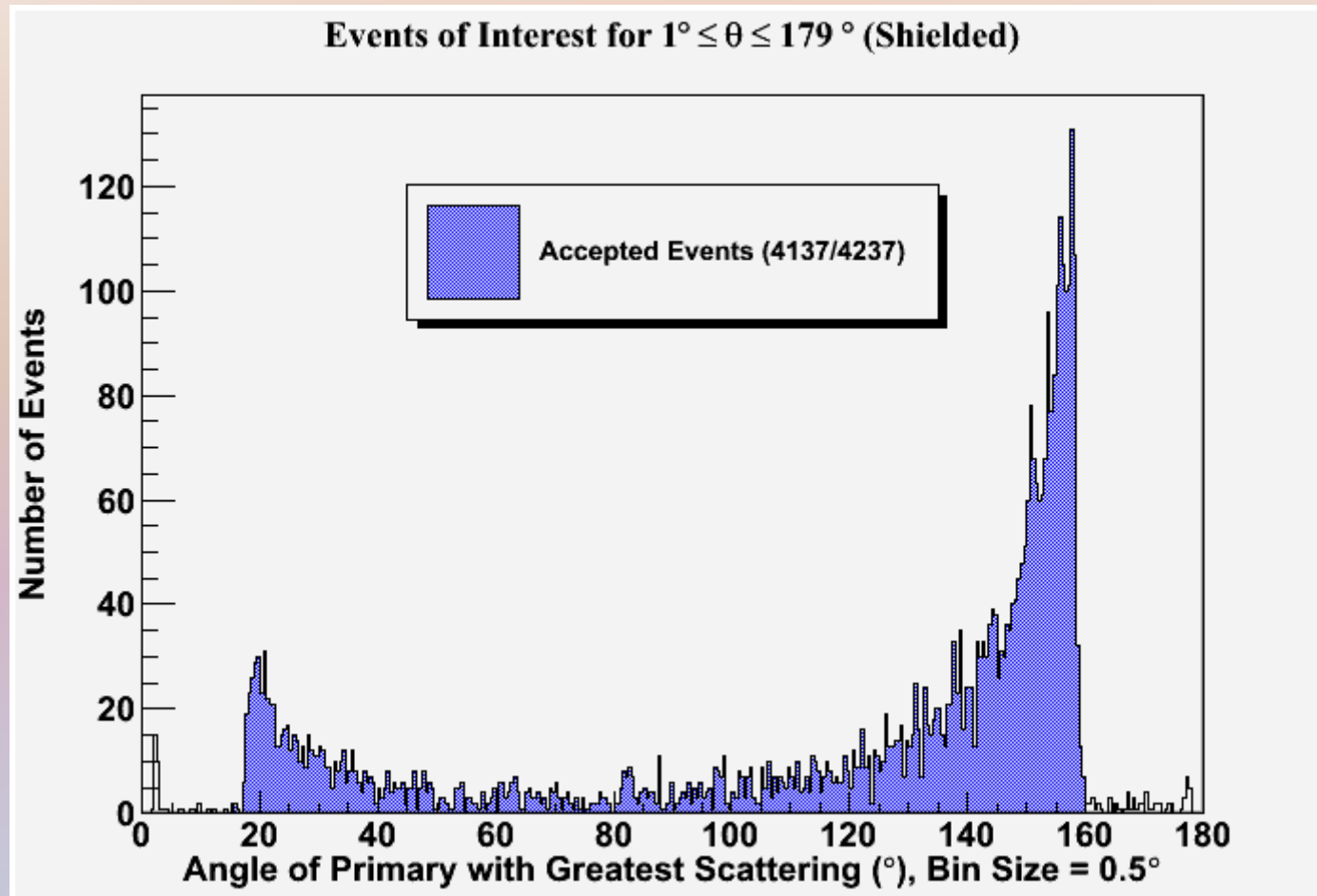
Angle Cut Optimization Scheme: Unshielded

Events of Interest for $1° \leq \theta \leq 179°$ (Unshielded)

Accepted Events (15444/15714)

Number of Events

Angle of Primary with Greatest Scattering (°), Bin Size = 0.5°

Angle Cut Optimization Scheme: Unshielded

Angle Cut Optimization Scheme: Unshielded

Events of Interest for 5° ≤ θ ≤ 175 ° (Unshielded)

Accepted Events (577600/582259)

Number of Events

Angle of Primary with Greatest Scattering (°), Bin Size = 0.5°

Angle Cut Optimization Scheme: Shielded

Events of Interest for $1° \leq \theta \leq 179°$ (Shielded)

Accepted Events (4137/4237)

Number of Events

Angle of Primary with Greatest Scattering (°), Bin Size = 0.5°

Angle Cut Optimization Scheme: Shielded

Angle Cut Optimization Scheme: Shielded

Events of Interest for $5° \leq \theta \leq 175°$ (Shielded)

Accepted Events (145818/147754)

Number of Events

Angle of Primary with Greatest Scattering (°), Bin Size = 0.5°
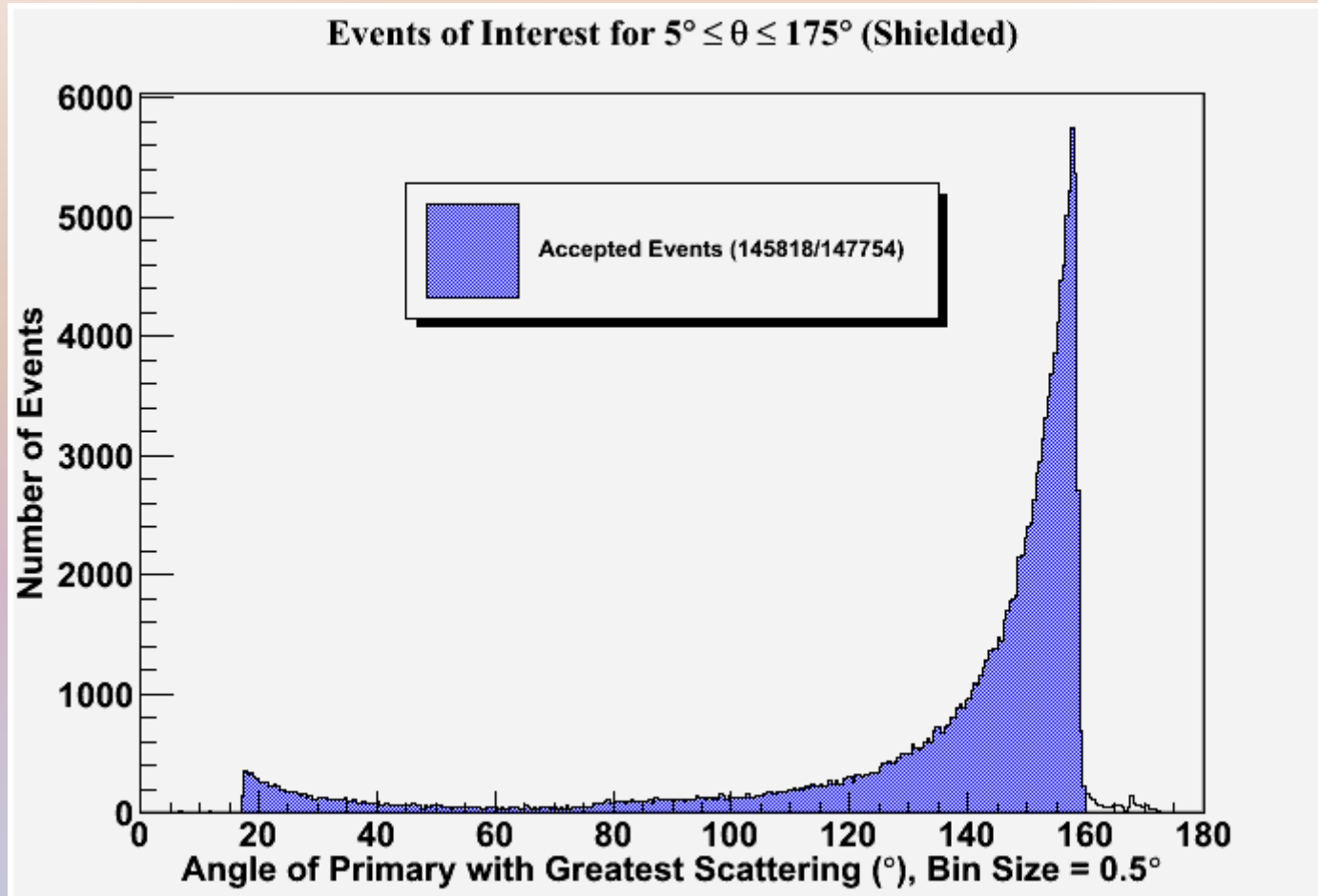
Angle Cut Optimization Scheme: Bhwide Parameters

Configuration	Subsample	σ_{tot} (nb)	Parameter	Value (°)
Unshielded	1	1071.2 ± 0.9	$minThetaElectron$	0.0
			$maxThetaElectron$	9.0
			$minThetaPositron$	0.0
			$maxThetaPositron$	173.0
	2	273.2 ± 0.4	$minThetaElectron$	9.0
			$maxThetaElectron$	180.0
			$minThetaPositron$	0.0
			$maxThetaPositron$	180.0
Shielded	1	197.3 ± 0.3	$minThetaElectron$	0.0
			$maxThetaElectron$	20.0
			$minThetaPositron$	0.0
			$maxThetaPositron$	165.0
	2	45.8 ± 0.1	$minThetaElectron$	20.0
			$maxThetaElectron$	180.0
			$minThetaPositron$	0.0
			$maxThetaPositron$	180.0

Angles are w.r.t. incoming electron

- For each configuration, we have two subsamples, weighted by total cross-section
  - Unshielded case: 400k events for subsample 1, 100k events for subsample 2
  - Shielded case: 80k events for subsample 1, 20k events for subsample 2
- Main consideration in simulated number of events for each configuration is the file size
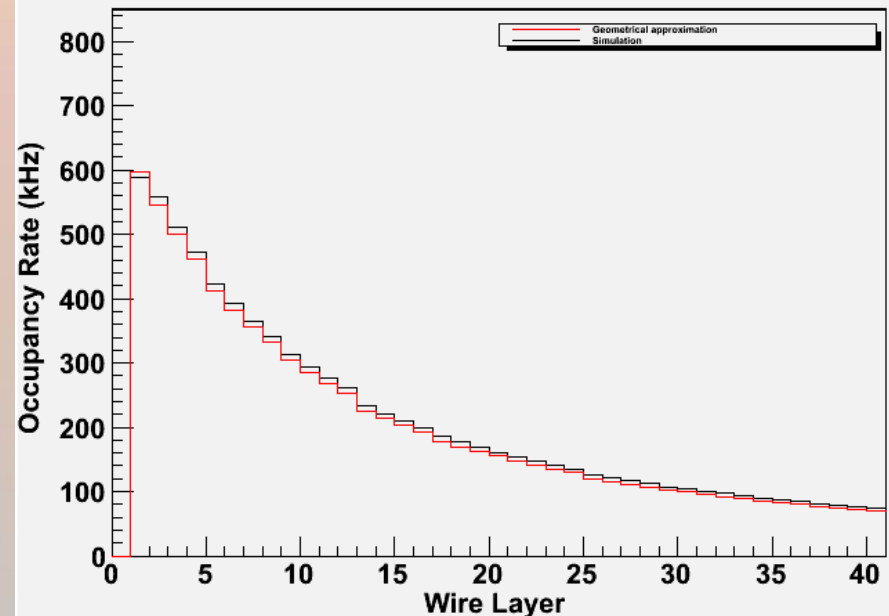
Geometric Consistency Checks

Number of Dch Track Hits vs. θ Compared with Prediction

(Baseline Configuration, Unshielded)

Geometrical approximation
Simulated primaries
Simulated secondaries
(θ taken from mother primary)
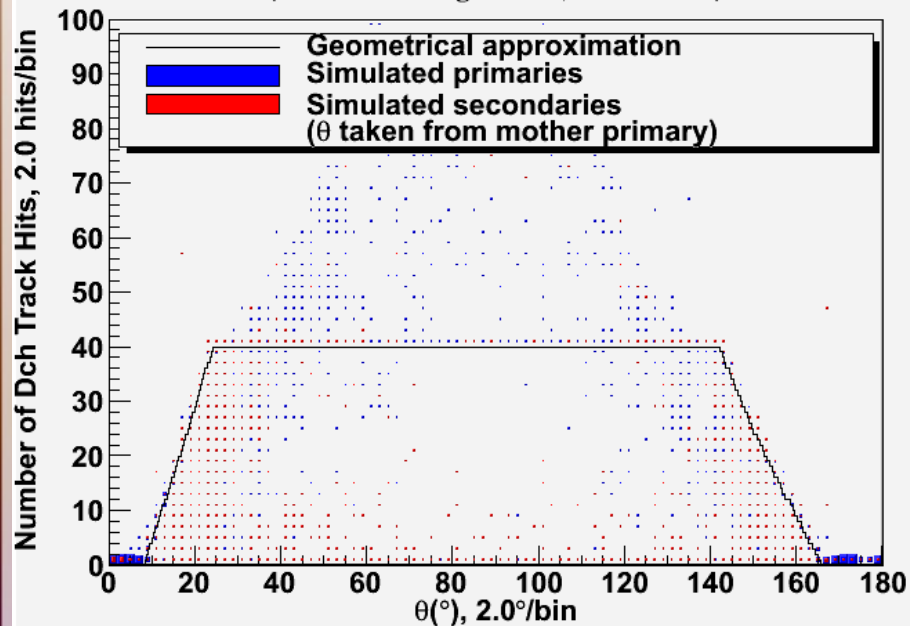
Occupancy Rate per Dch Wire Layer Compared with Prediction
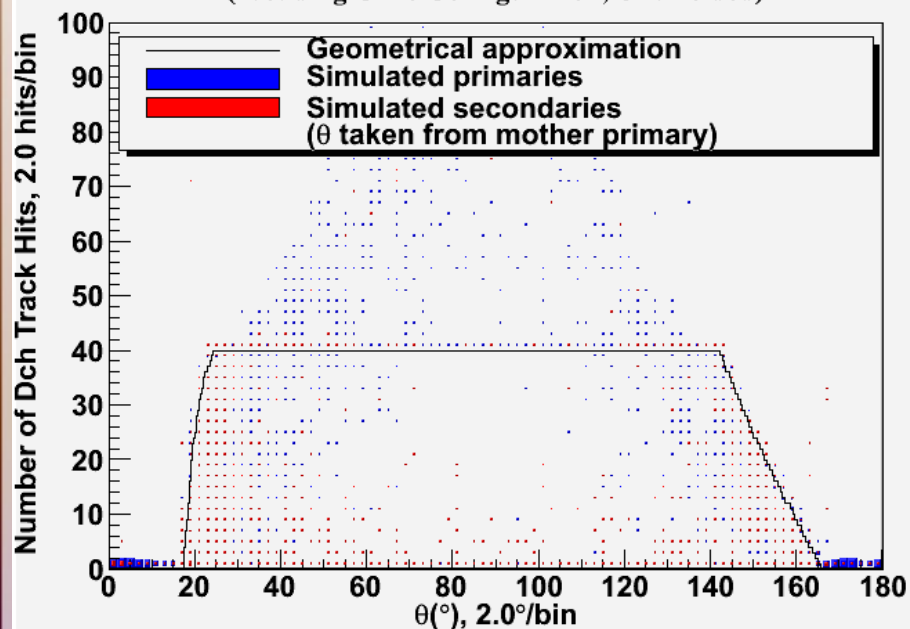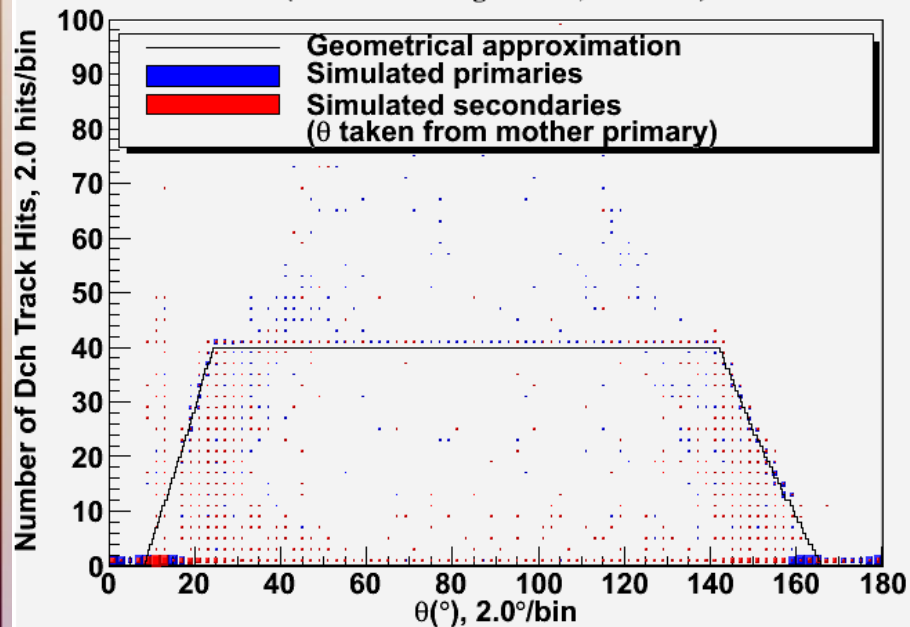
(Baseline Configuration, Unshielded)

Geometrical approximation
Simulation

- New scheme simulations still match well with first-order geometric approximations in unshielded case (axis scaling is set for comparisons with Long Backward & Forward)
- Interesting results for predicted Dch hits vs. angle compared to simulated hits vs. angle
- Right-hand graph: red=geometrical approximation, black=simulation
(legend needs fixing)

Geometric Consistency Checks

- New scheme simulations still match well with first-order geometric approximations in unshielded case (axis scaling is set for comparisons with Long Backward & Forward)
- Interesting results for predicted Dch hits vs. angle compared to simulated hits vs. angle
- Right-hand graph: red=geometrical approximation, black=simulation
(legend needs fixing)

Geometric Consistency Checks

•The match is obviously not good for inner wires in shielded case
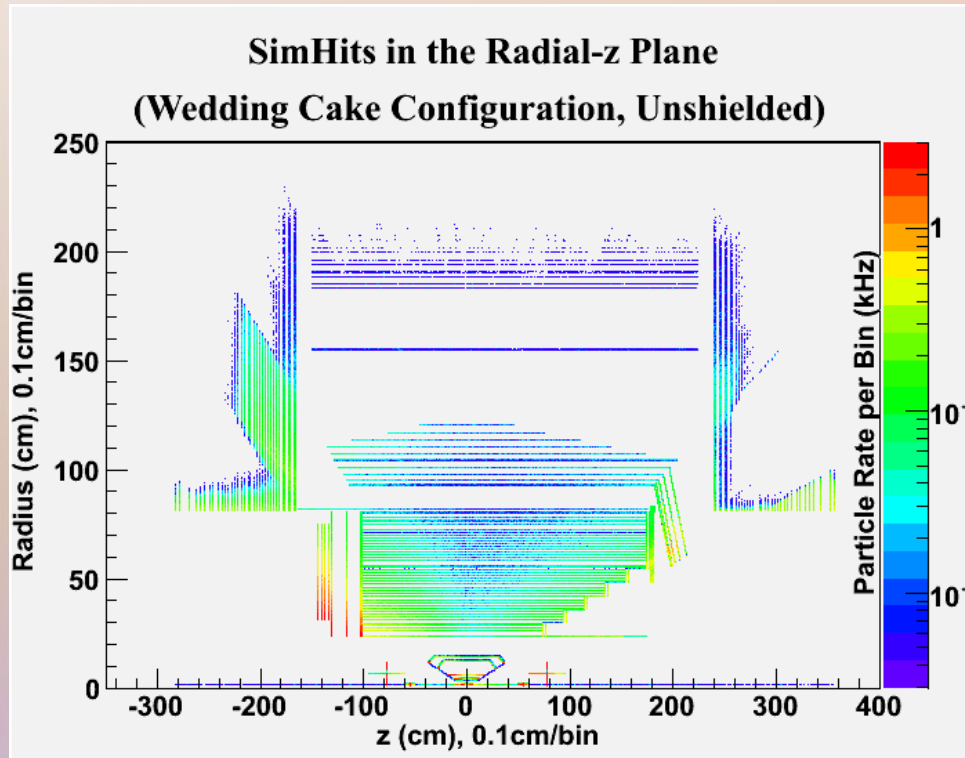
Improved Visualization of Hotspots

SimHits in the Radial-z Plane (Baseline Configuration, Unshielded)

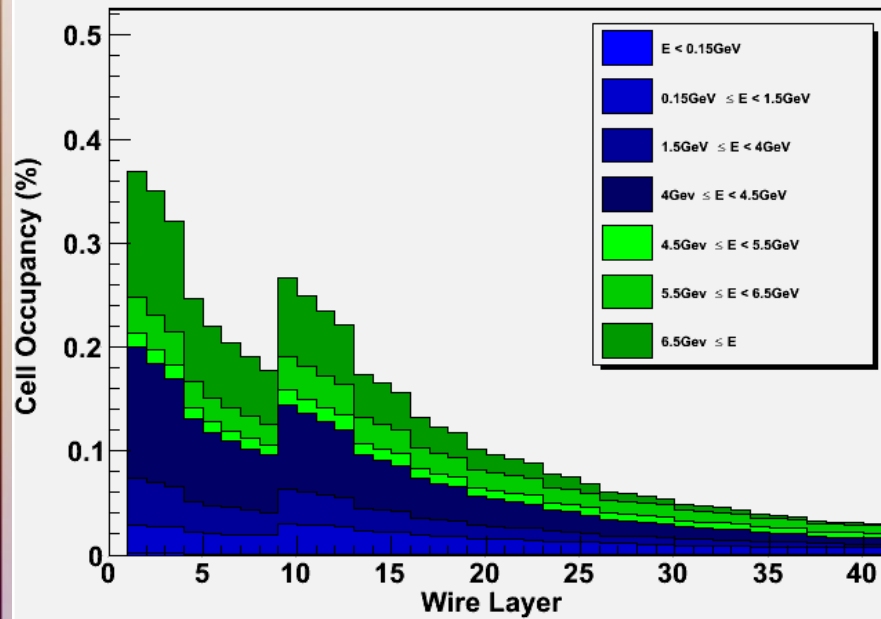**SimHits in the Radial-z Plane (Baseline Configuration, Shielded)**
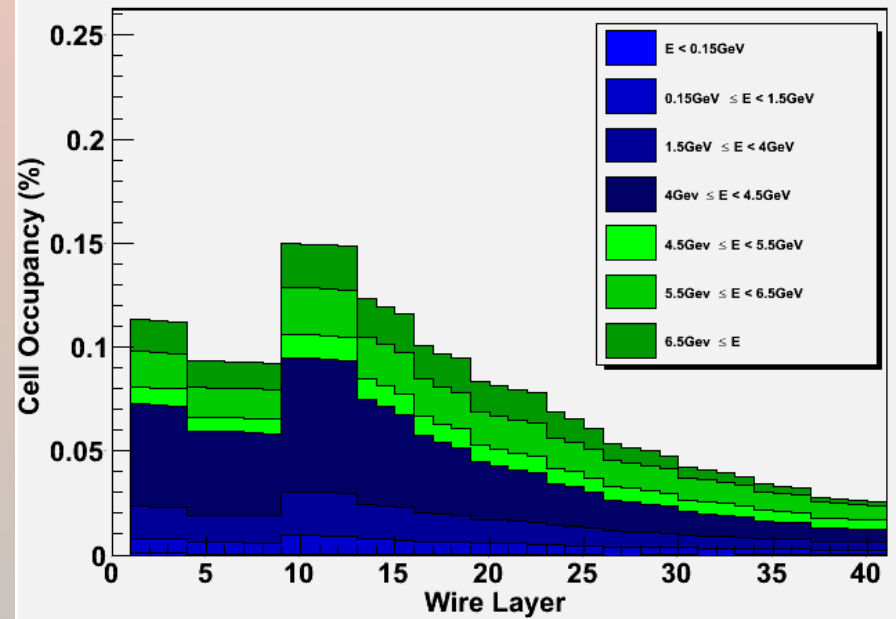
Improved Visualization of Hotspots

SimHits in the Radial-z Plane (Convex Configuration, Unshielded)
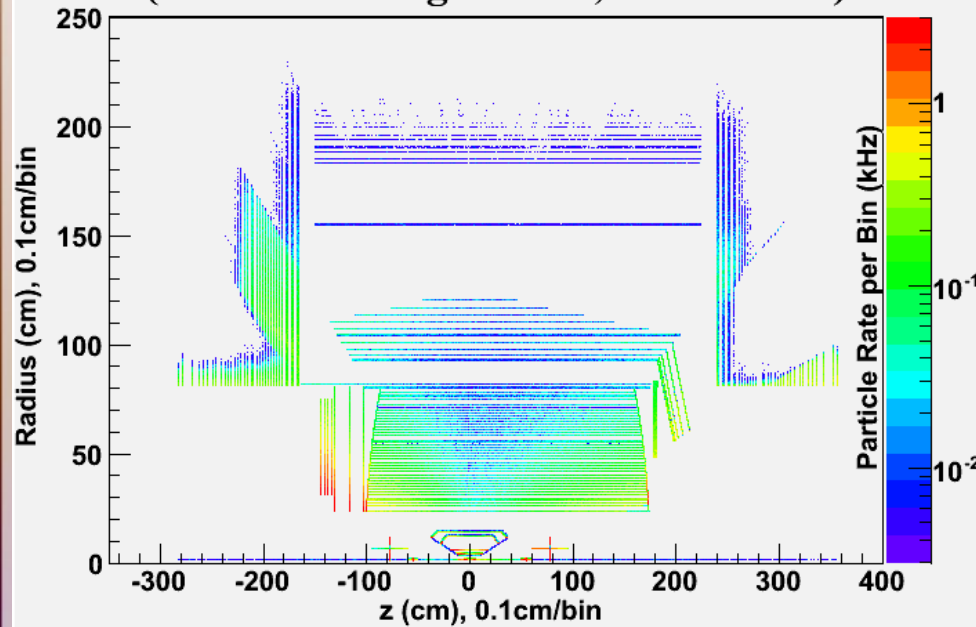
SimHits in the Radial-z Plane (Convex Configuration, Shielded)
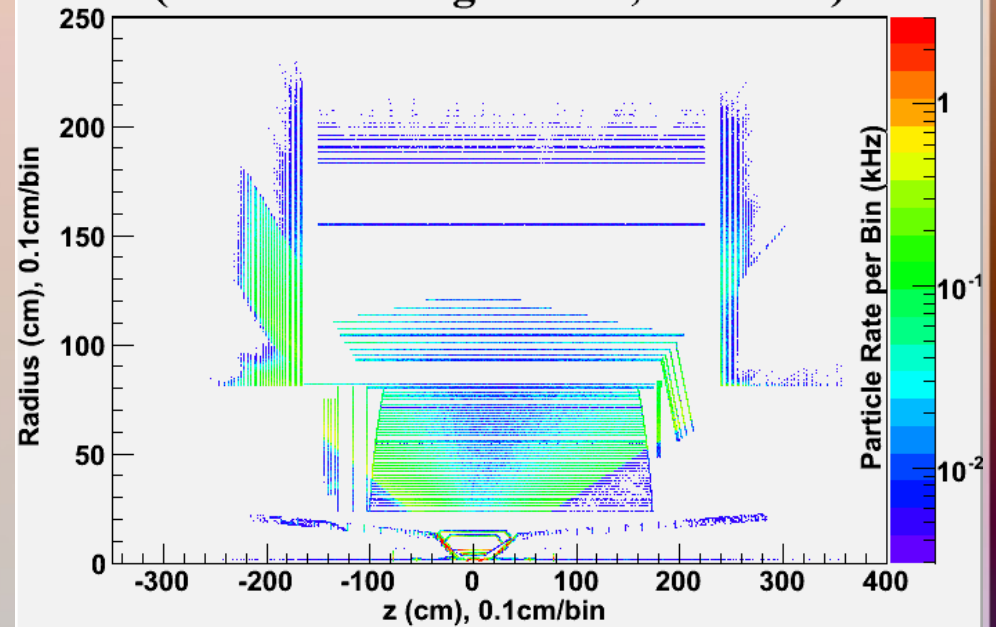
Improved Visualization of Hotspots

Improved Visualization of Hotspots

SimHits in the Radial-z Plane (Wedding Cake Configuration, Unshielded)

SimHits in the Radial-z Plane (Wedding Cake Configuration, Shielded)
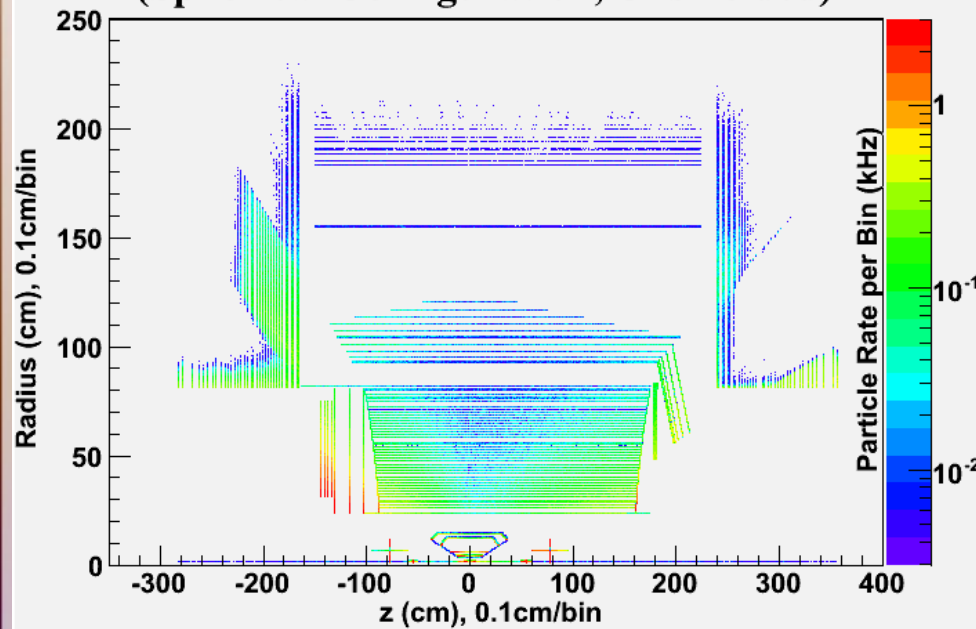
New Cell Occupancy Rates
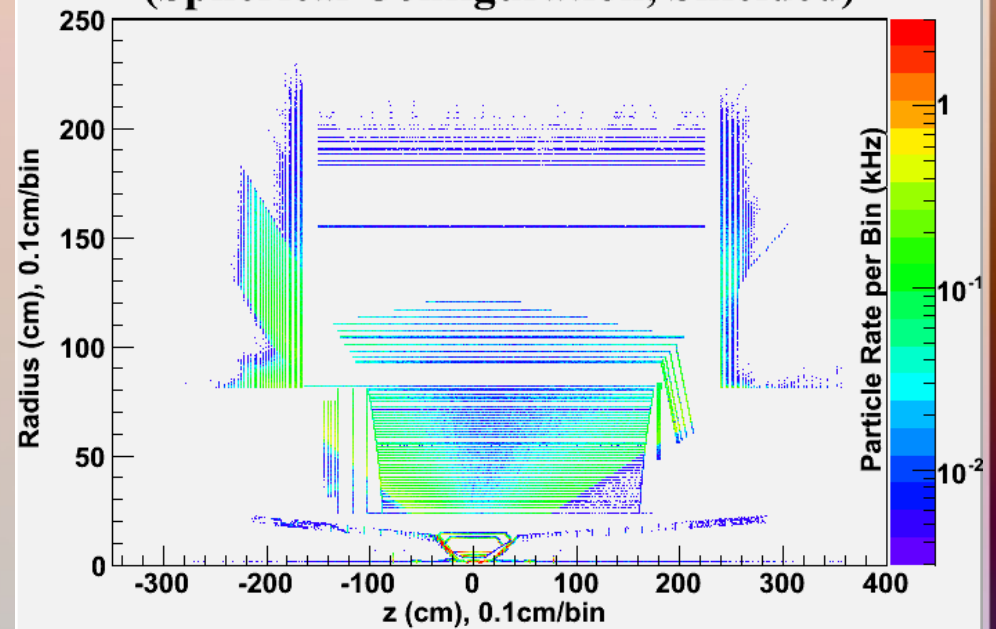
New Cell Occupancy Rates

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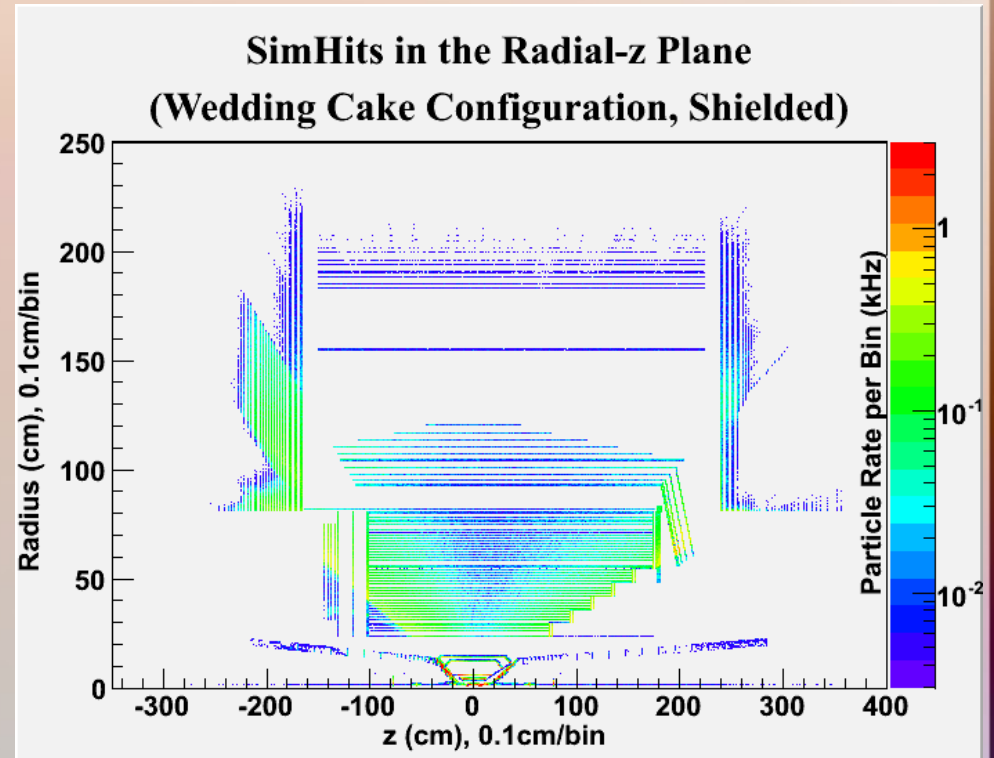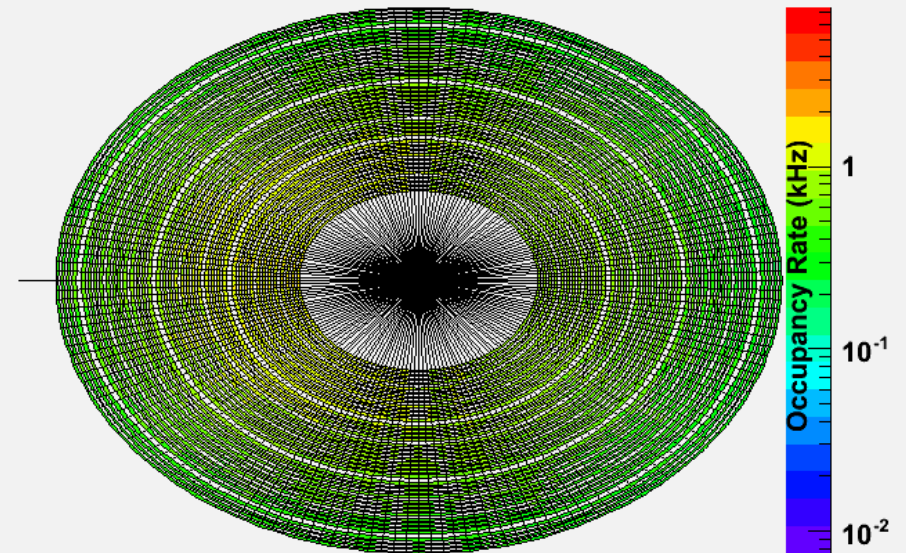
New Cell Occupancy Rates
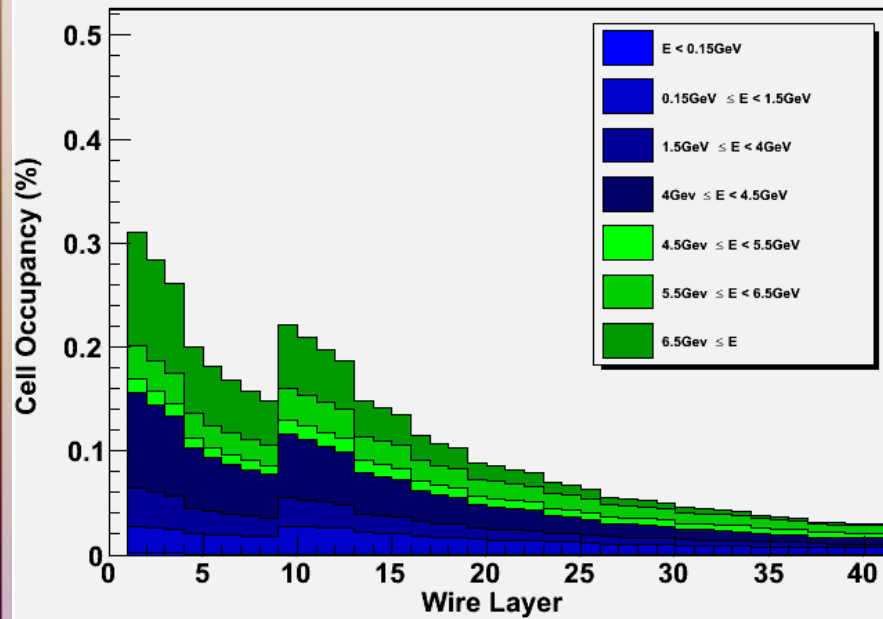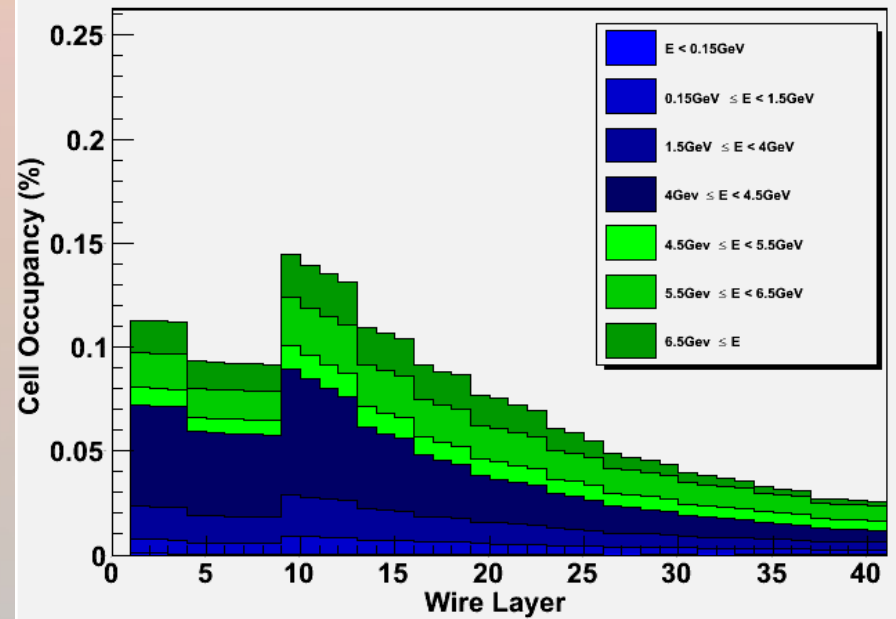
Cell Occupancy in Polar Coordinates

Occupancy Rates in Cylindrical Polar Coordinates
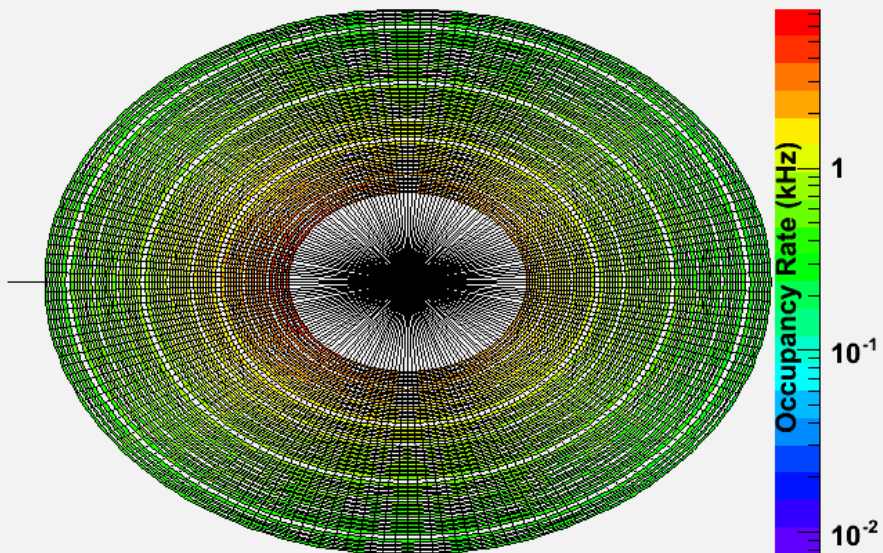(Baseline Configuration, Unshielded)

Occupancy Rates in Cylindrical Polar Coordinates
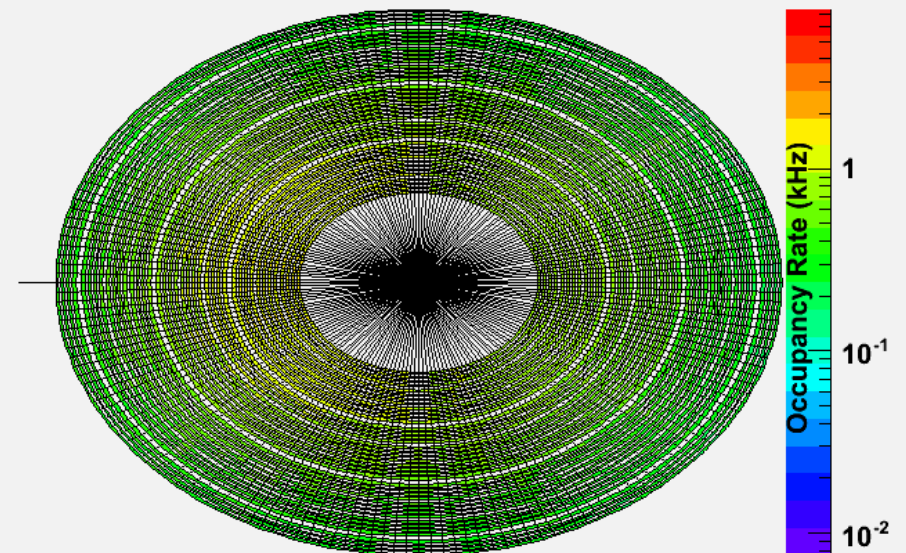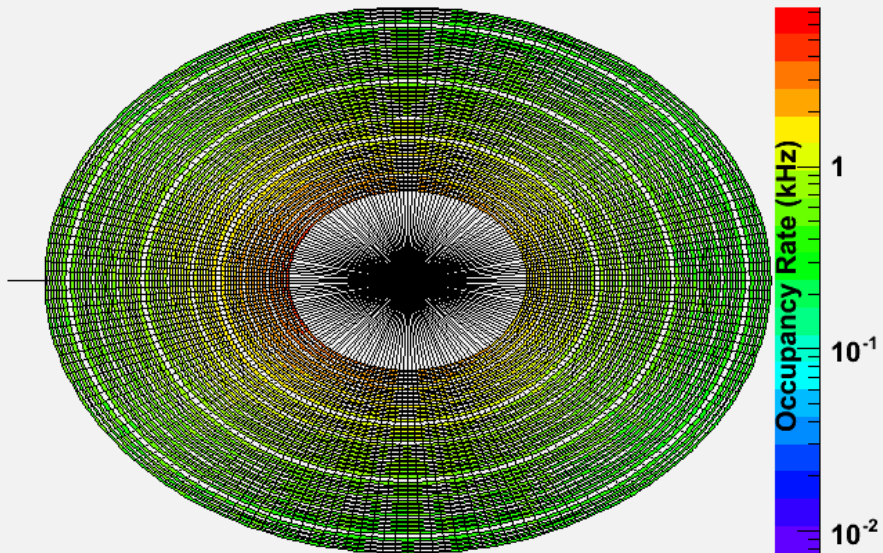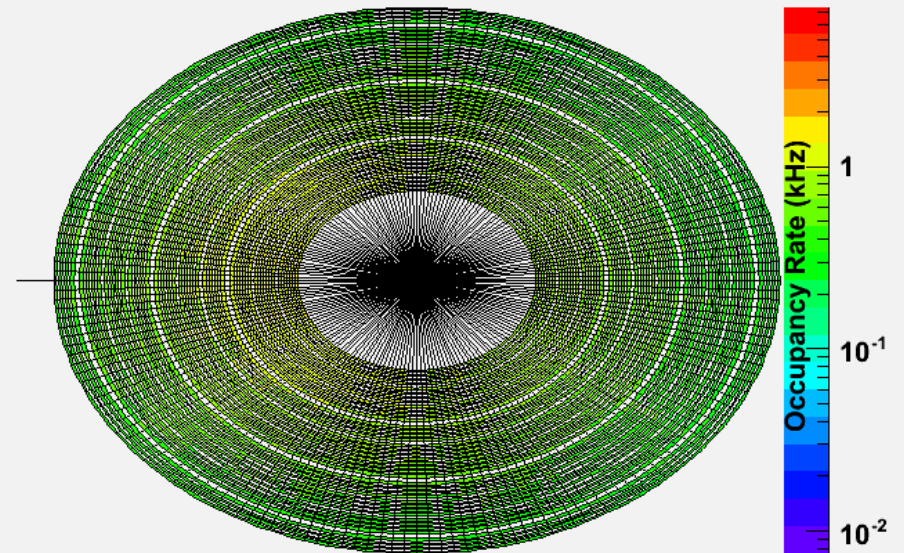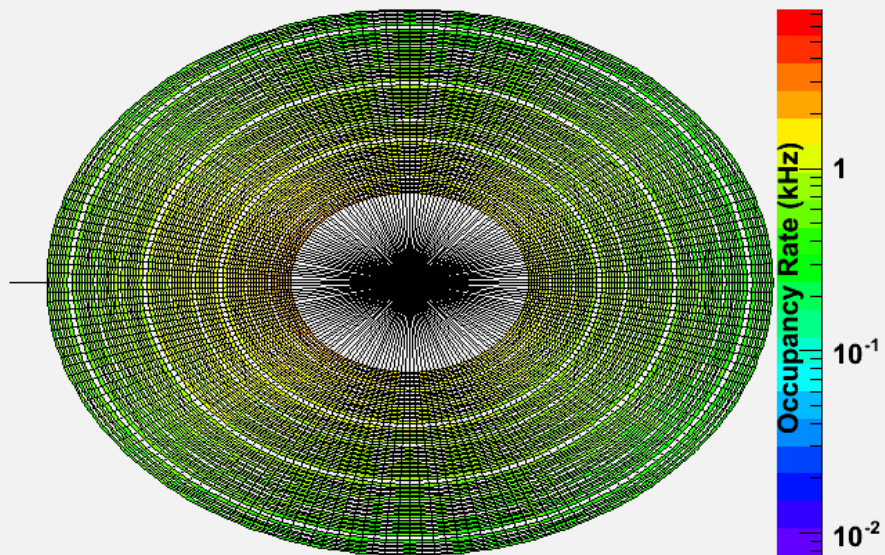(Baseline Configuration, Shielded)

Vertical: y-axis
Horizontal: x-axis

Cell Occupancy in Polar Coordinates

Vertical: y-axis
Horizontal: x-axis

Cell Occupancy in Polar Coordinates

Vertical: y-axis
Horizontal: x-axis

Cell Occupancy in Polar Coordinates
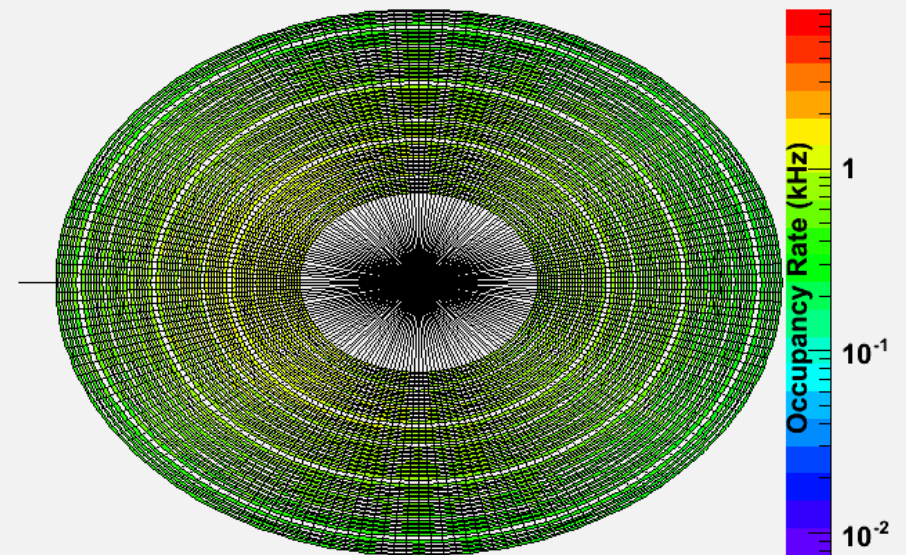
Vertical: y-axis
Horizontal: x-axis

Tracking Particles Entering and Exiting Dch

Rate of Particles Entering and Exiting Right Dch Endplate vs. Radius

(Baseline Configuration, Unshielded)

- Entries through right endplate
- - - - Exits through right endplate

Particle Rate (kHz) vs Radius (cm), 1cm/bin
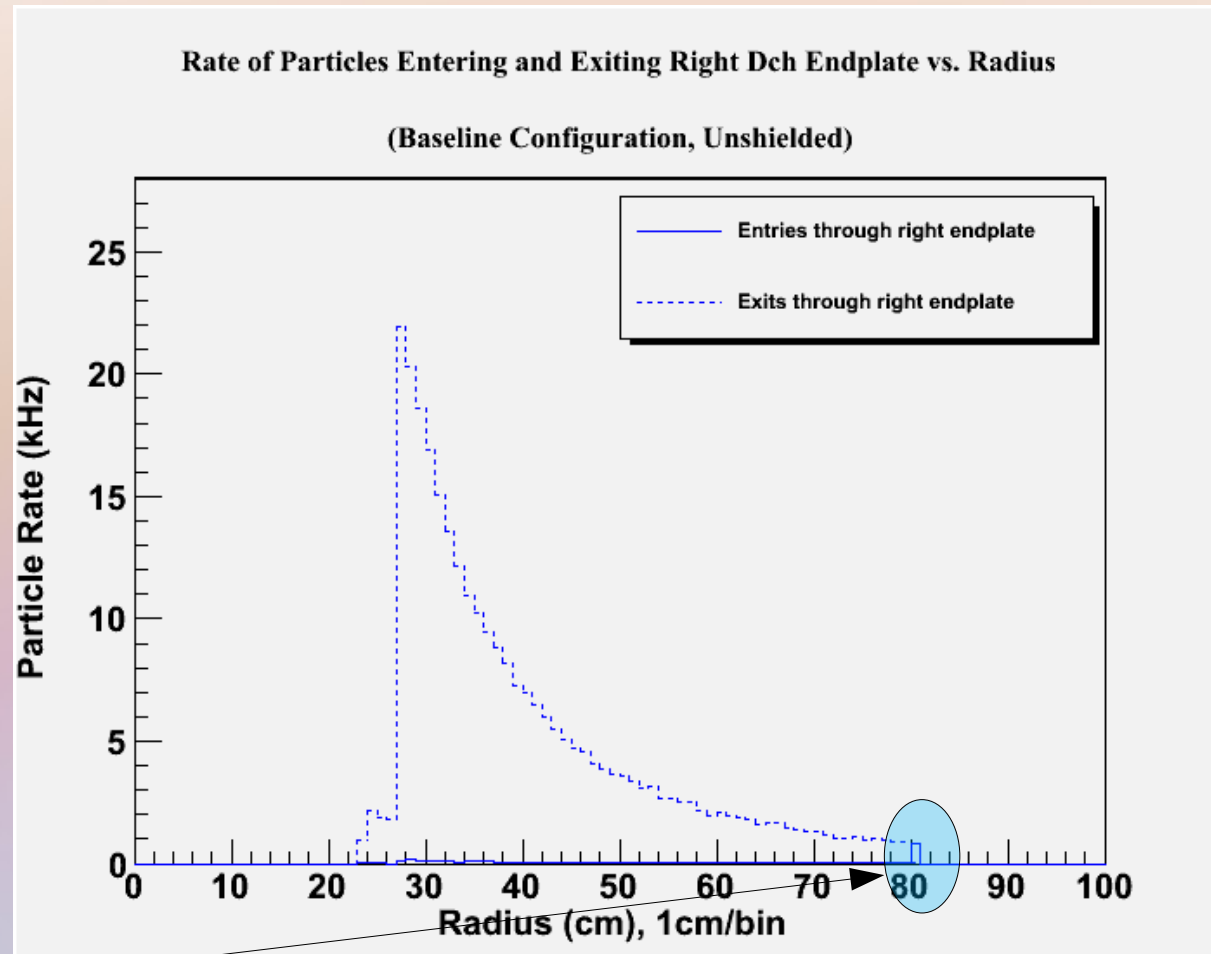
•Code must be modified to better account for particles bouncing off Dch boundaries without crossing, this is next priority

Conclusions
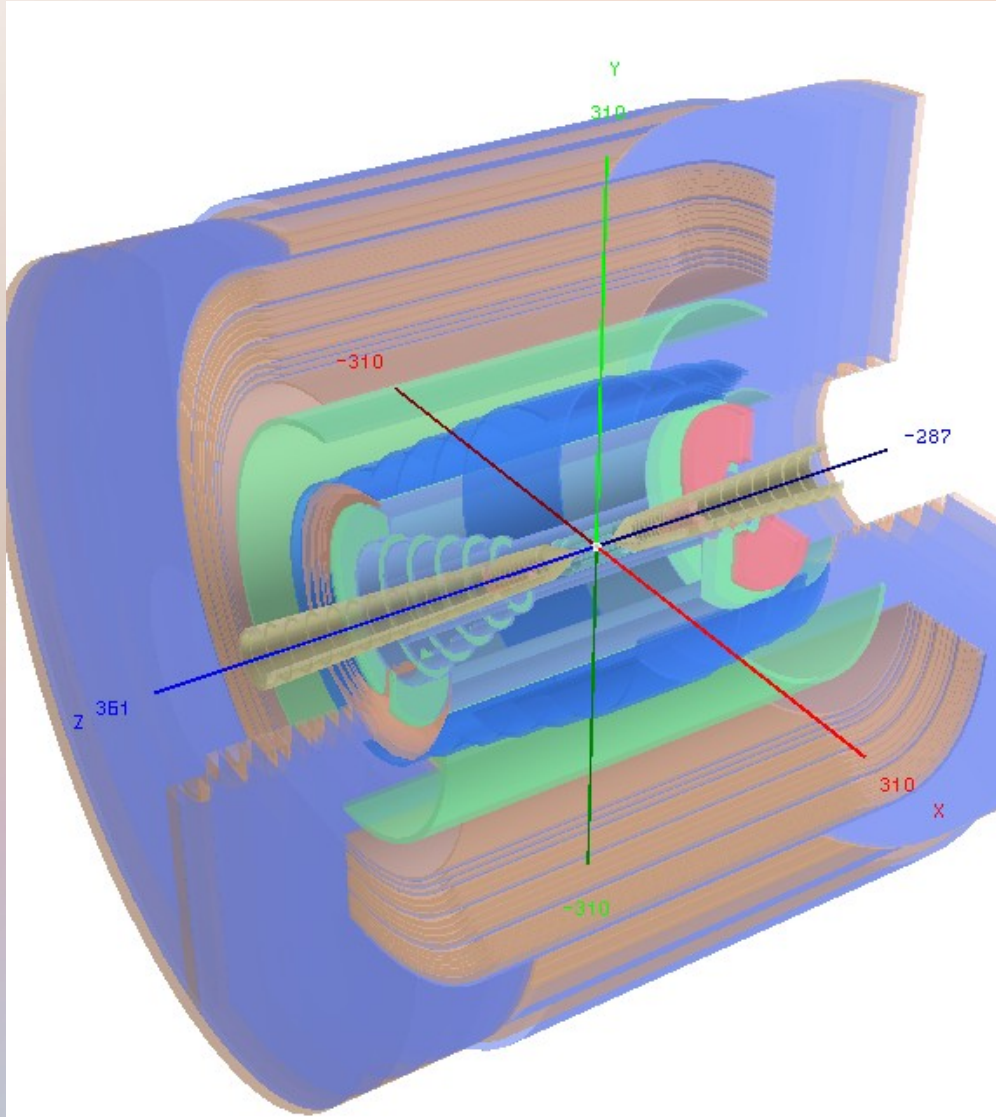
- This analysis uses FastSim V0.2.6, V0.2.7 was released last week
- Beamshield must still be modified to match changes in FullSim as well as to implement improved thickness simulation scheme

Questions from LLWI 2011:
- Why tungsten beamshield instead of depleted uranium?
- Why only wedding cake endplates on one side of Dch?
- Does luminosity vary substantially depending on the flavour of B produced?

Latest BAD will be available at
http://www.hep.physics.mcgill.ca/~swerskyd
/swersky_BAD_april4.pdf