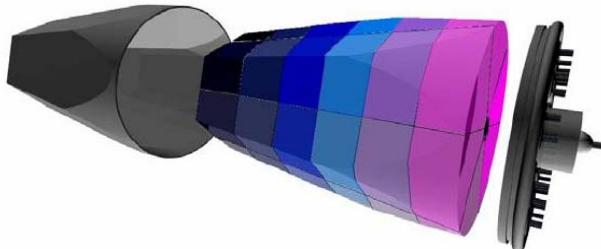




C001 Depletion Scans

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D.S. Judson, P.J. Nolan, C. Unsworth

UK AGATA Community Meeting, University of Liverpool
24th November 2009



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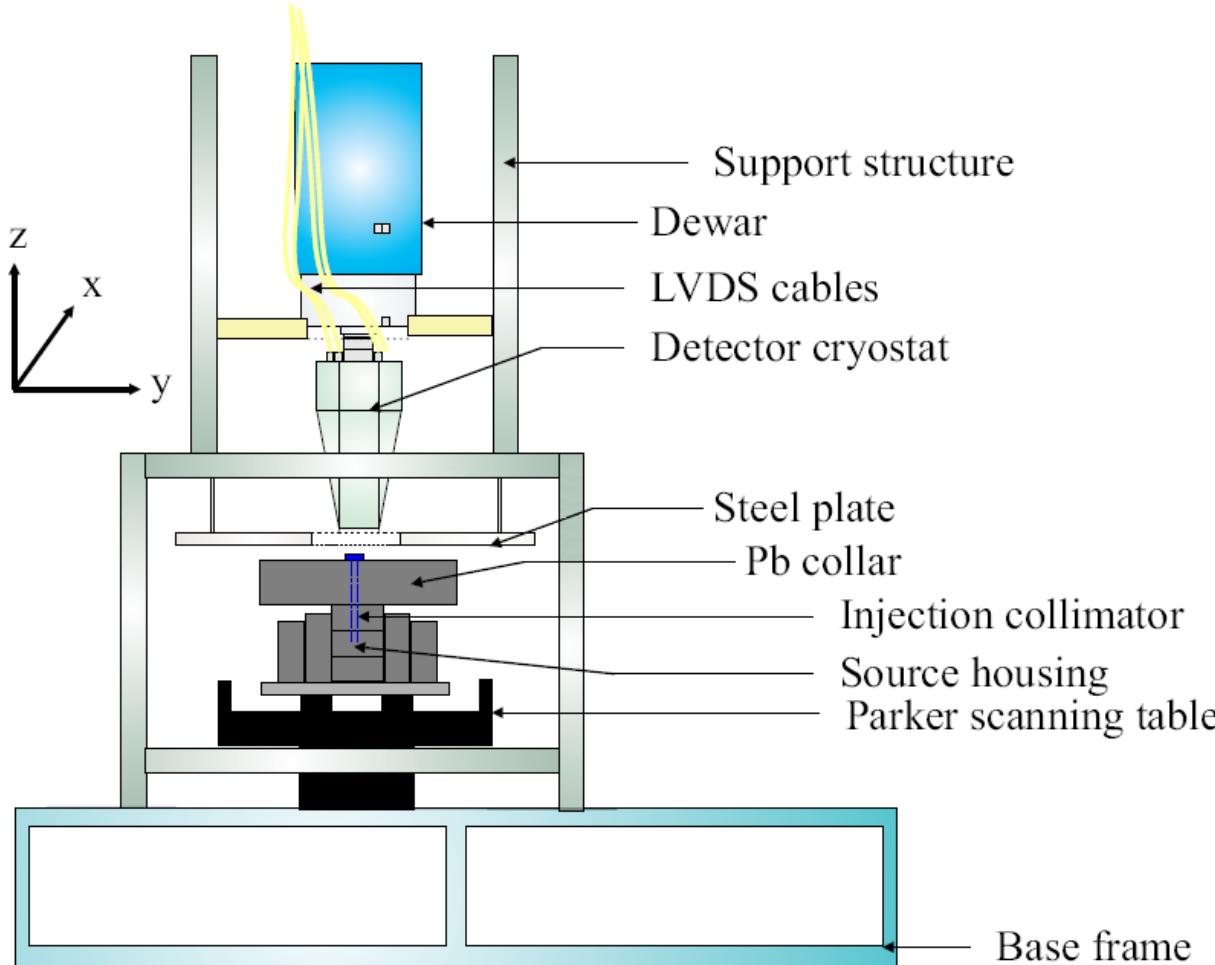


- Overview

- Fits in with WP2, M2.5 and M2.9
 - 'Det. 1 (& Det. 2): Comparison of MGS electric field sims. with exp. Pulse shapes
- Experimental Setup
- Results
- MGS Simulations
- Next Steps



• Experimental Setup



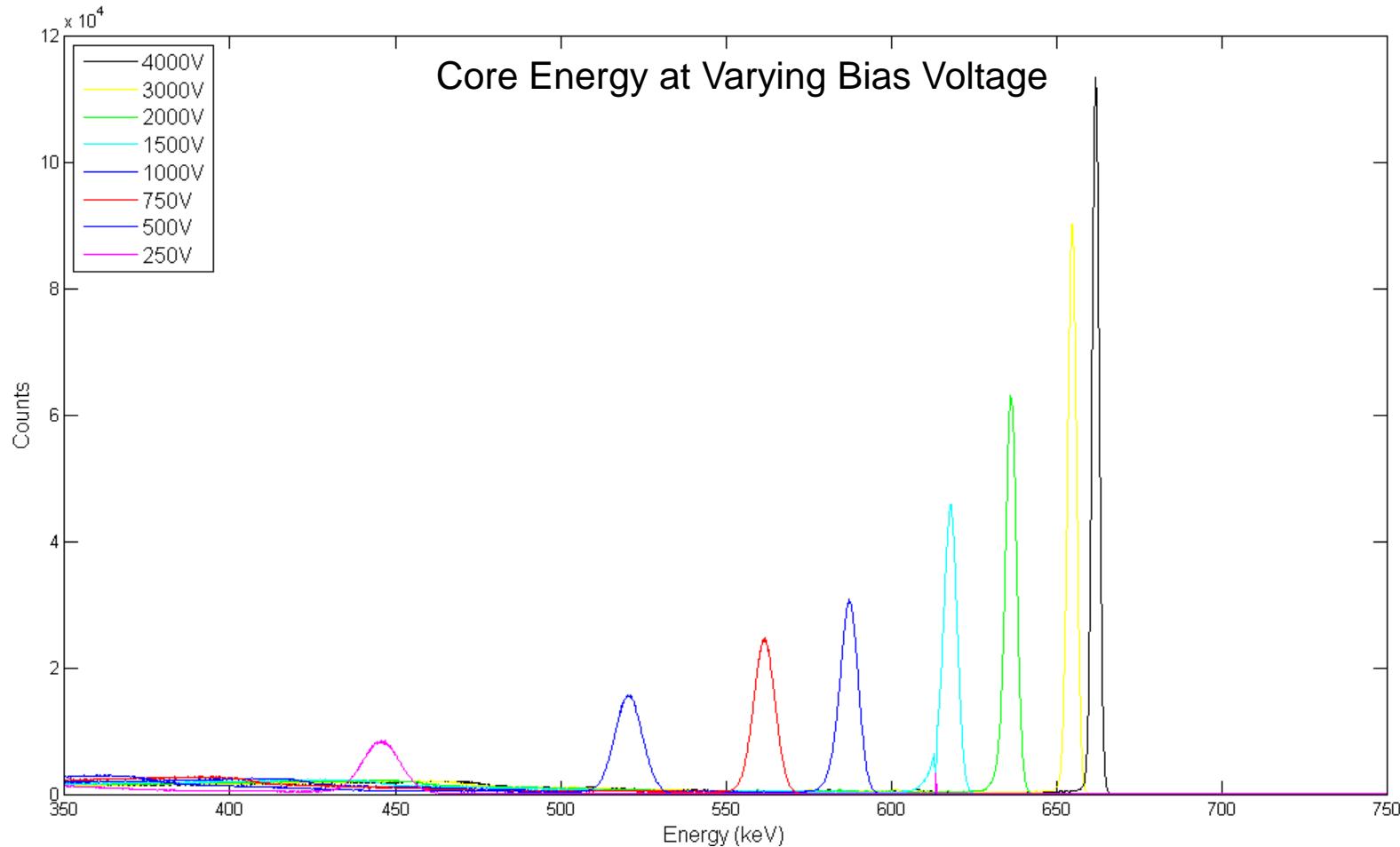
- Acquire in singles mode
- Scan detector on 2mm^2 grid @ 30s per scan position
- Demand fold-1 (i.e. 1 hit seg.) events of full ($662\text{keV}^{137}\text{Cs}$) energy

(Image adapted from M. R. Dimmock, PhD Thesis, 2008)



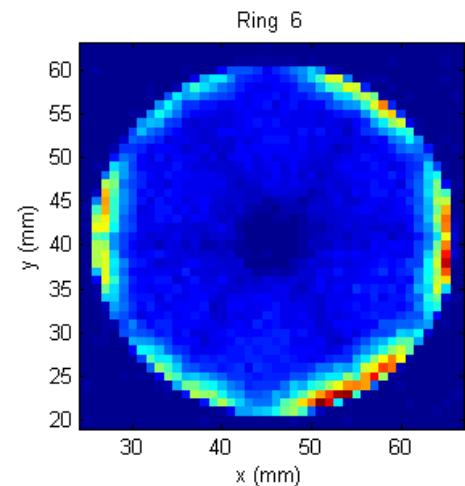
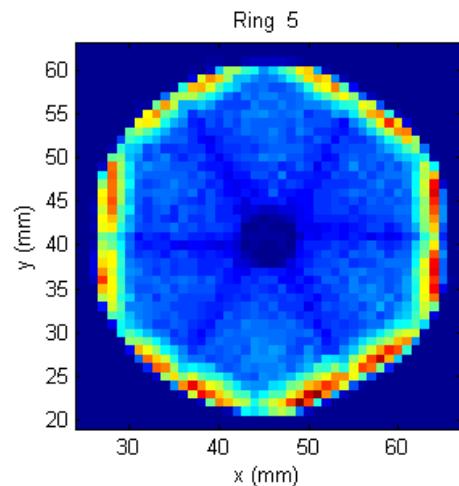
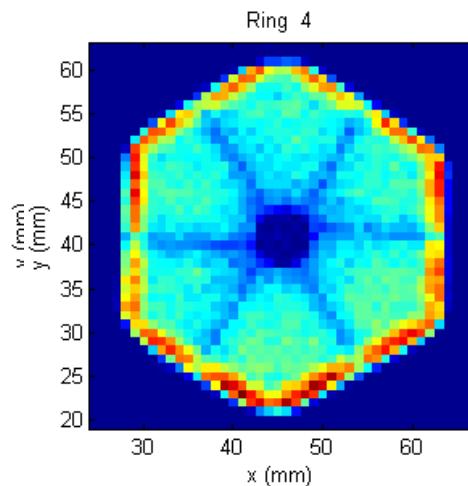
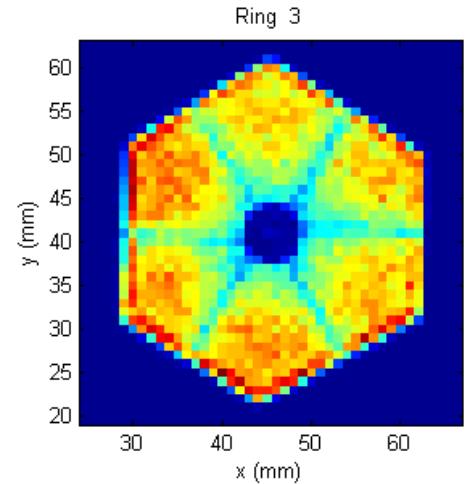
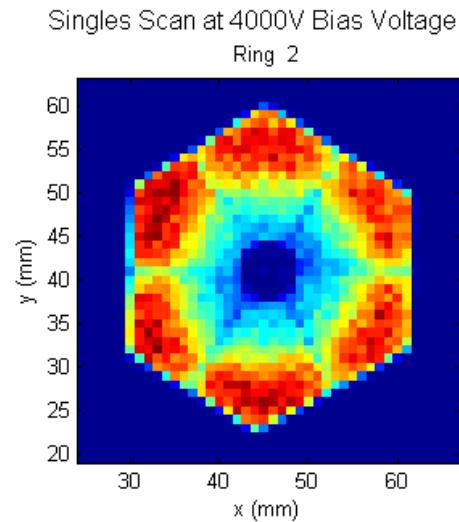
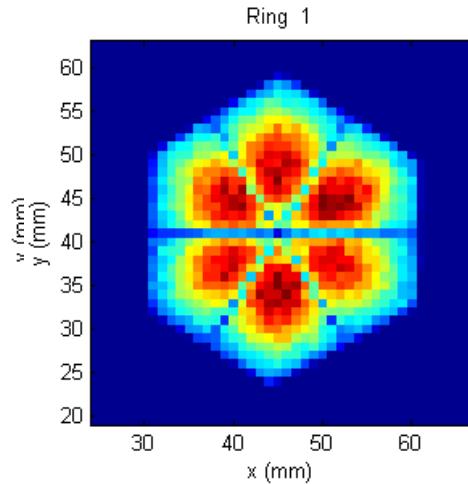
- Experimental Setup (cont.)

- Repeat for various HV Bias Voltages



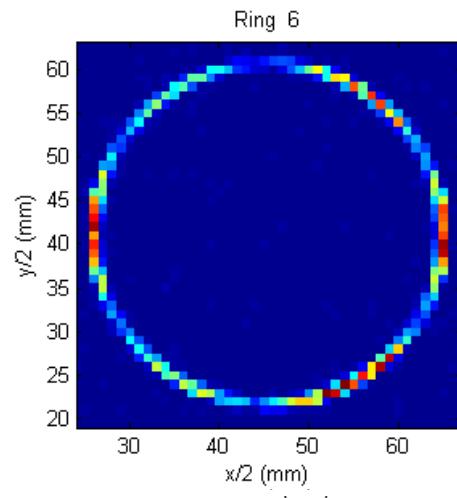
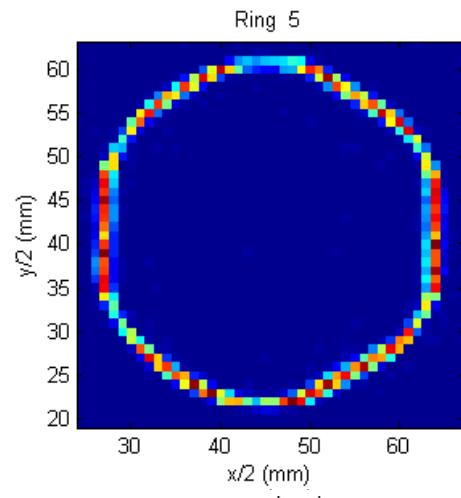
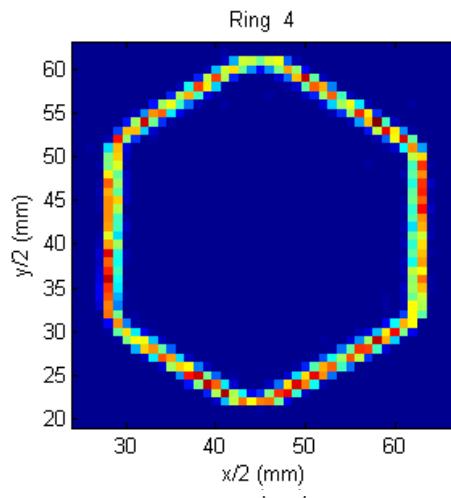
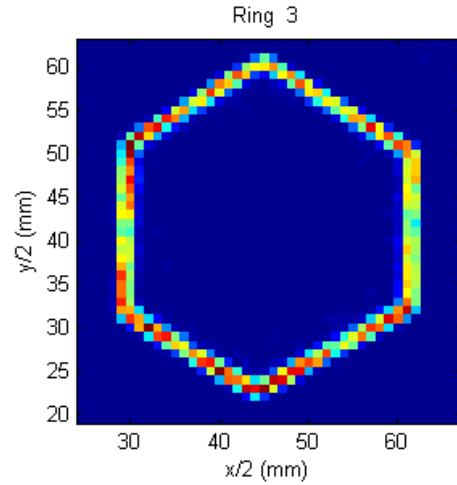
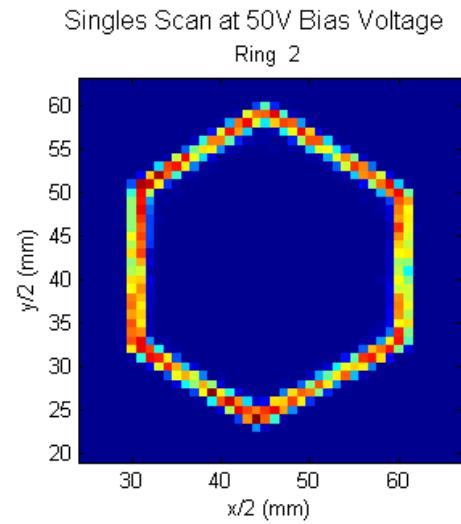
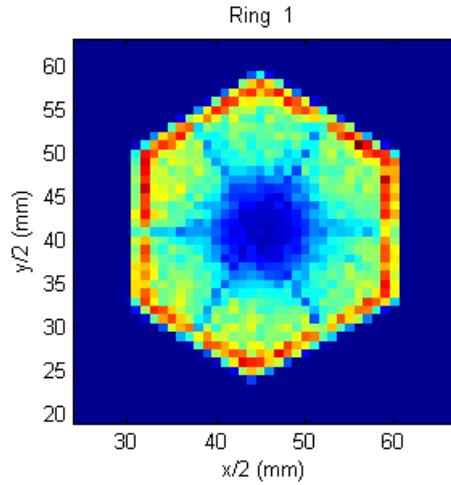


• Results





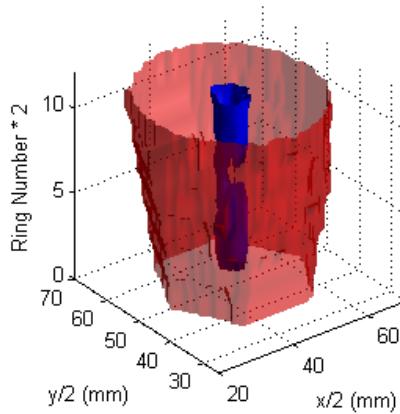
• Results



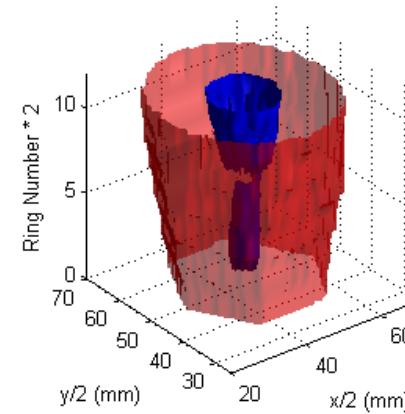


- Results (cont.)

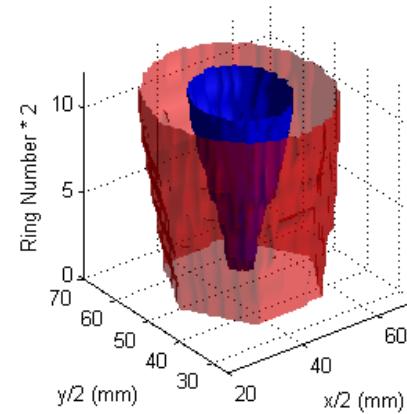
Undepleted Volume Of Detector at 4000V



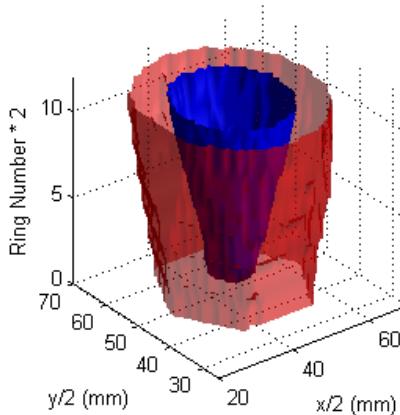
Undepleted Volume Of Detector at 3000V



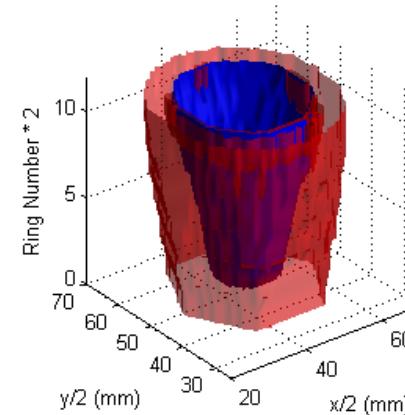
Undepleted Volume Of Detector at 2000V



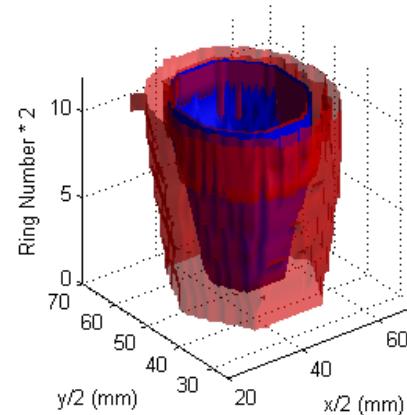
Undepleted Volume Of Detector at 1500V



Undepleted Volume Of Detector at 1000V



Undepleted Volume Of Detector at 750V



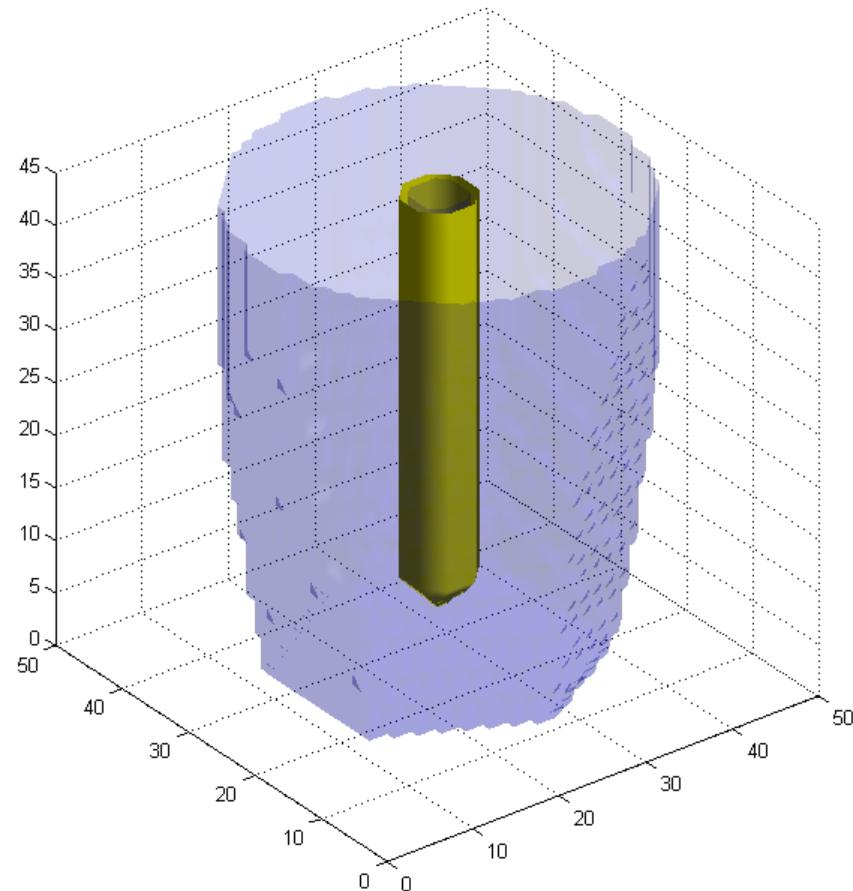


- MGS Simulations

- C001 simulated for all experimental bias voltages using MGS
- Impurity concentrations (supplied by Canberra)
 - Front: $0.65 \times 10^{-10} \text{ cm}^{-3}$
 - Back: $1.4 \times 10^{-10} \text{ cm}^{-3}$
- Image results in similar fashion...



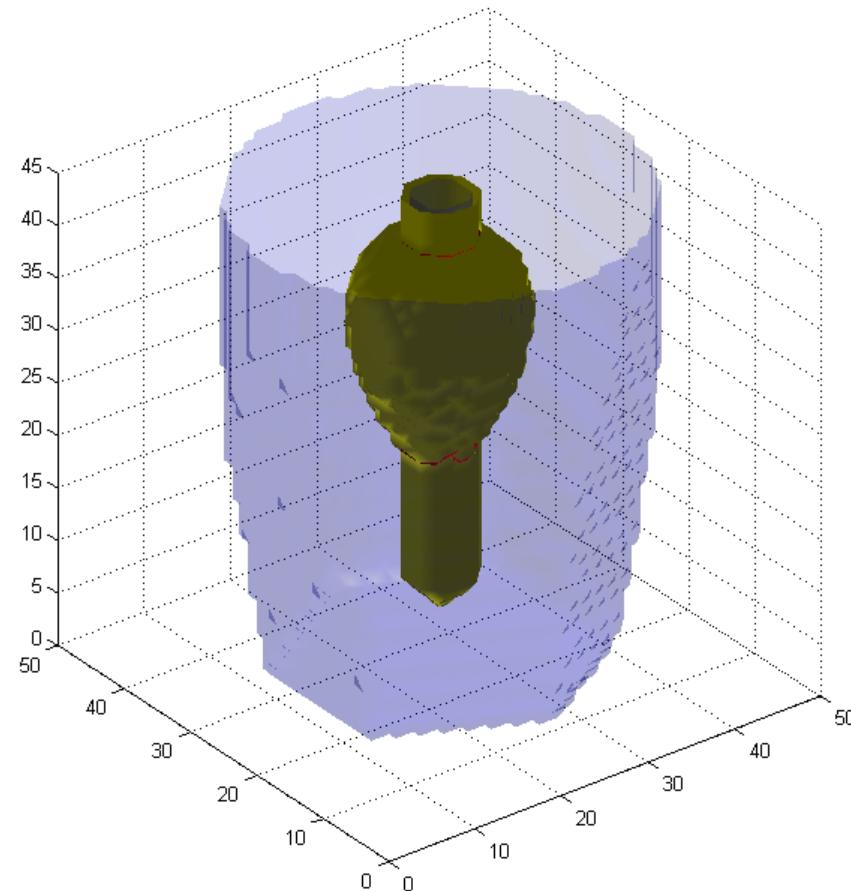
- MGS Simulations (cont.)



Detector fully
biased (4500V)
→ 100% depleted



- MGS Simulations (cont.)

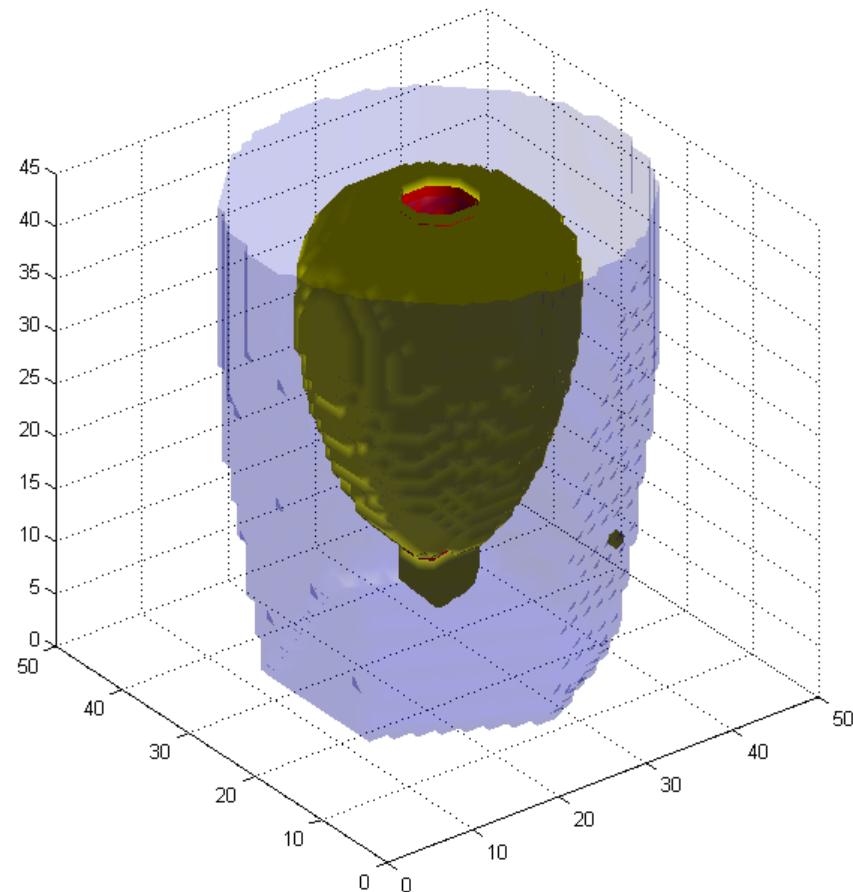


Detector at 3000V

→ 94.8% depleted



- MGS Simulations (cont.)

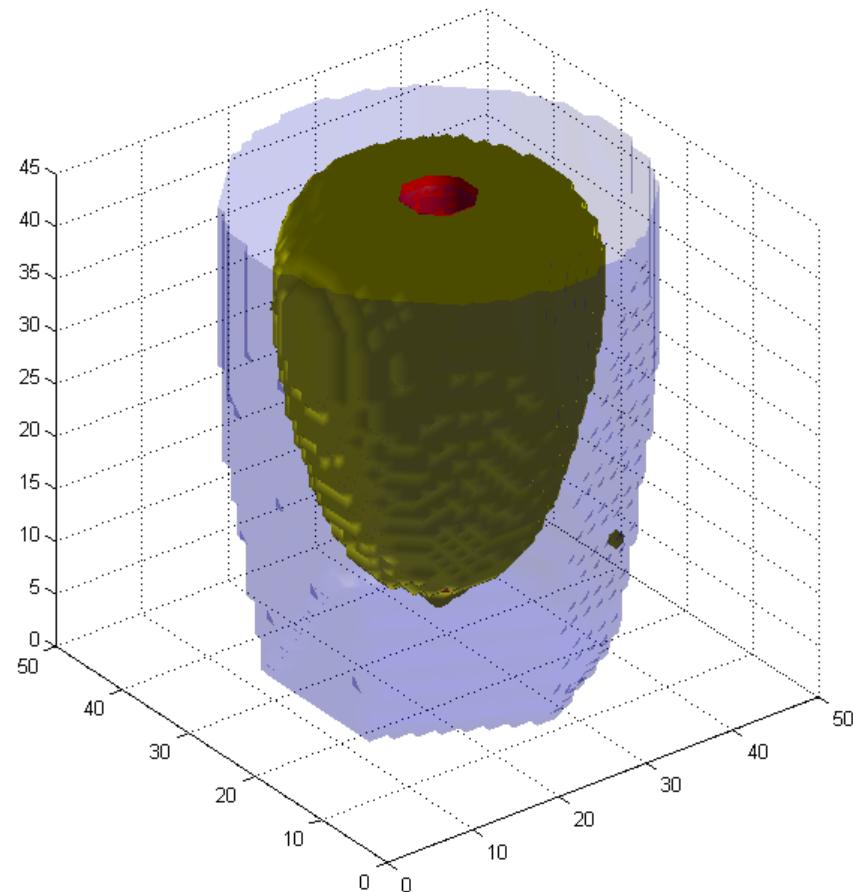


Detector at 2000V

→ 76.6% depleted



- MGS Simulations (cont.)

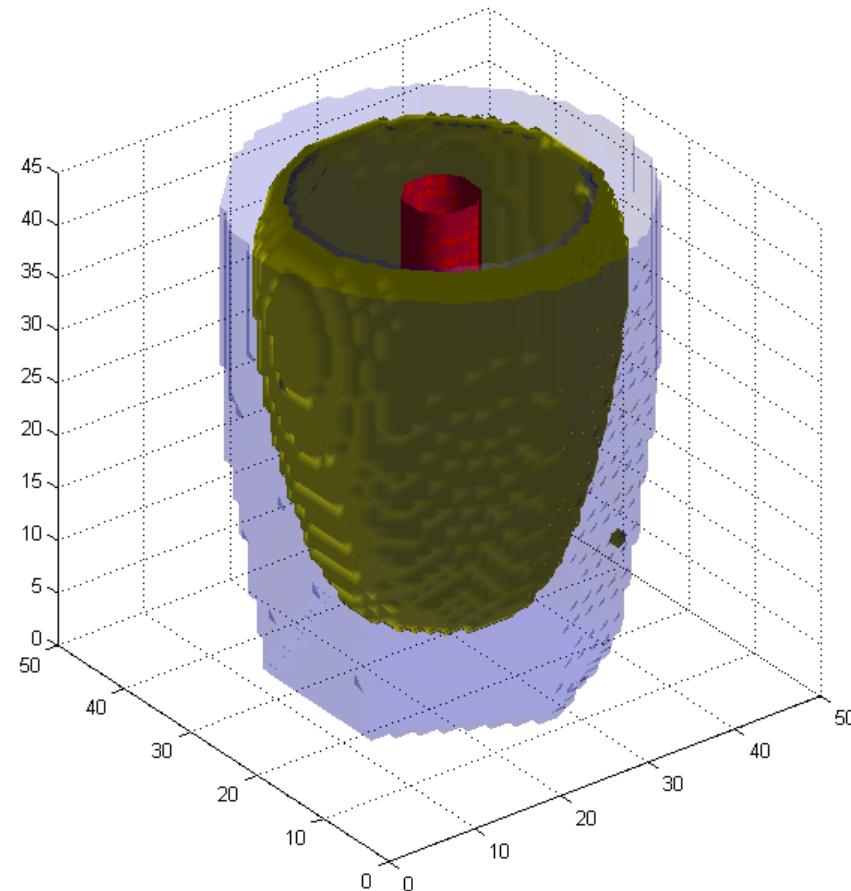


Detector at 1500V

→ 62.2% depleted



- MGS Simulations (cont.)

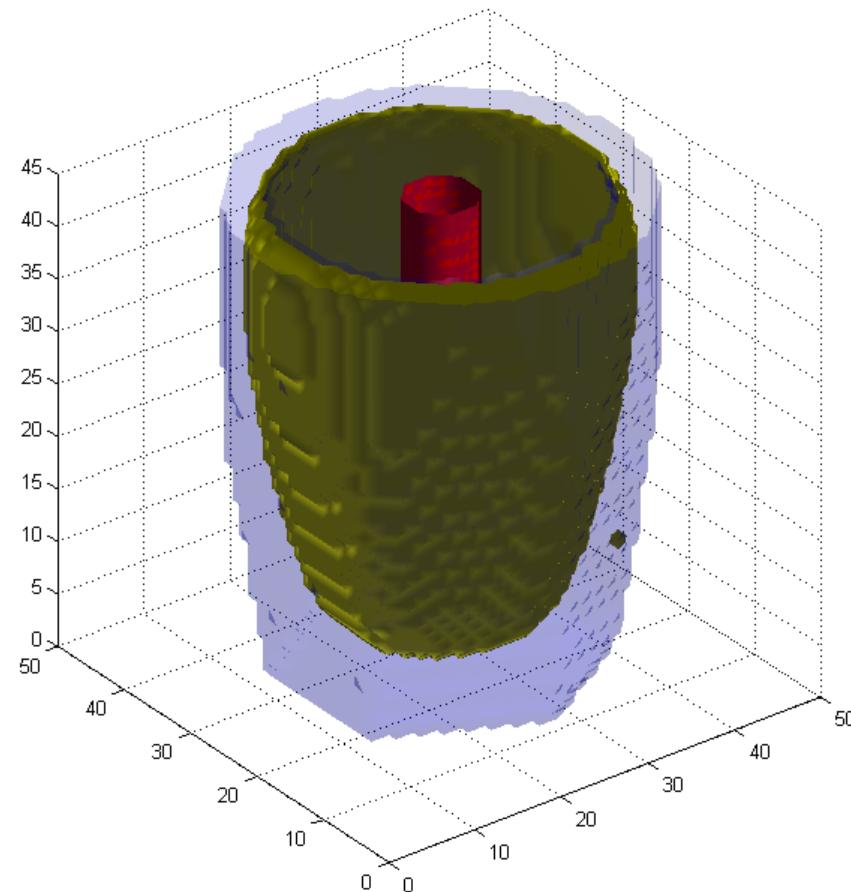


Detector at 1000V

→ 44.0% depleted



- MGS Simulations (cont.)

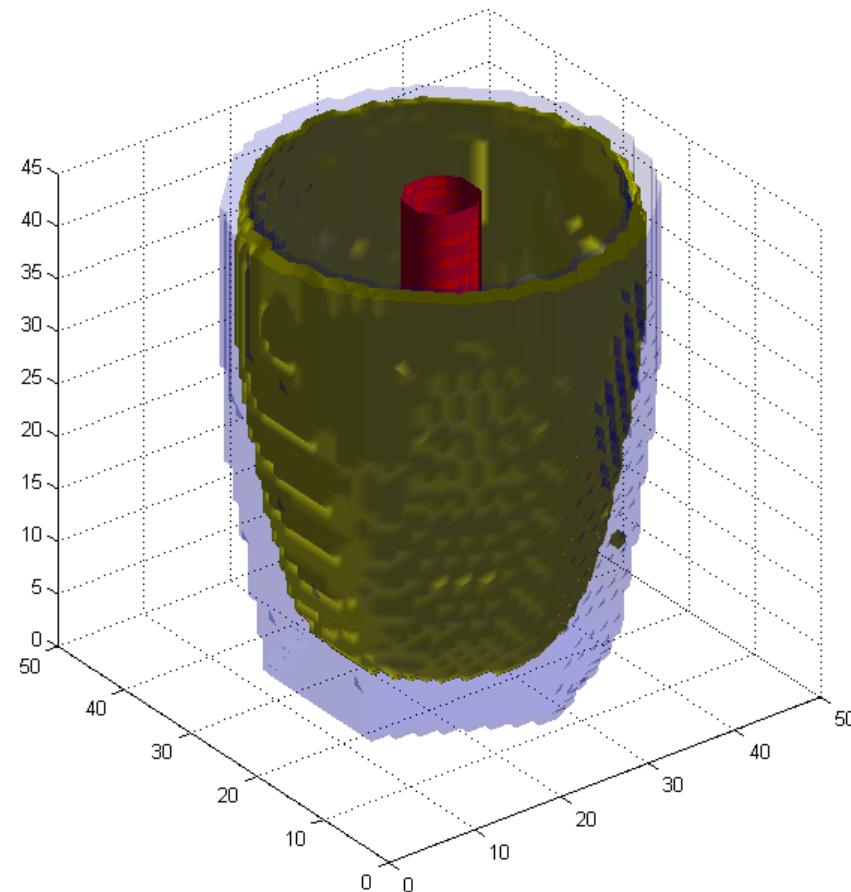


Detector at 750V

→ 33.8% depleted



- MGS Simulations (cont.)

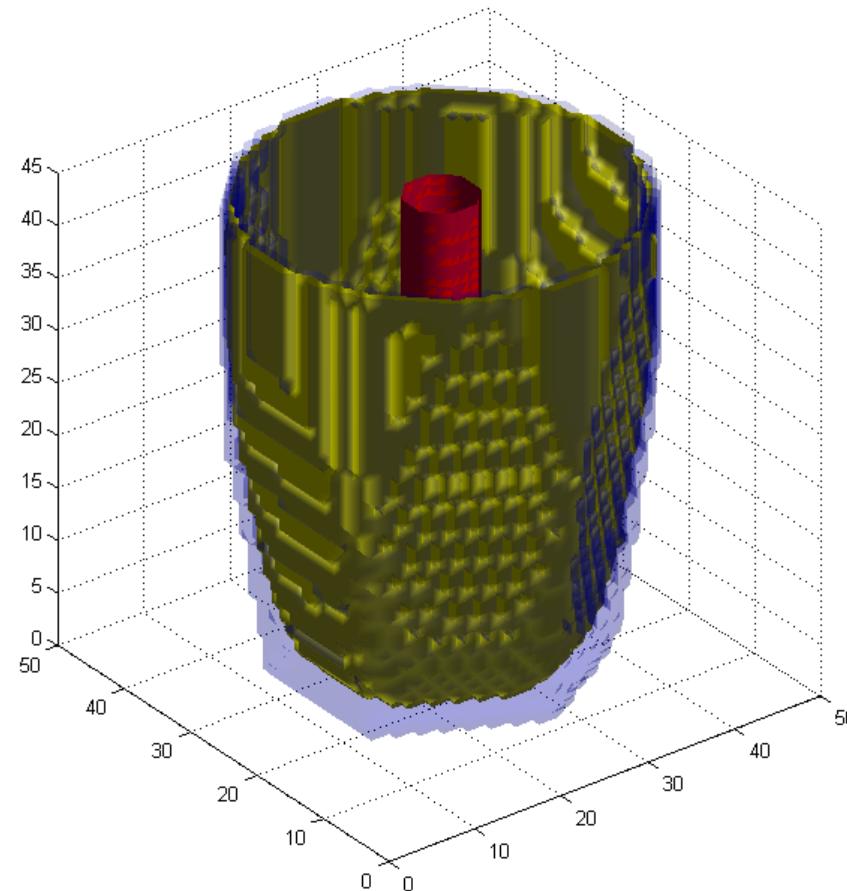


Detector at 500V

→ 22.6% depleted



- MGS Simulations (cont.)

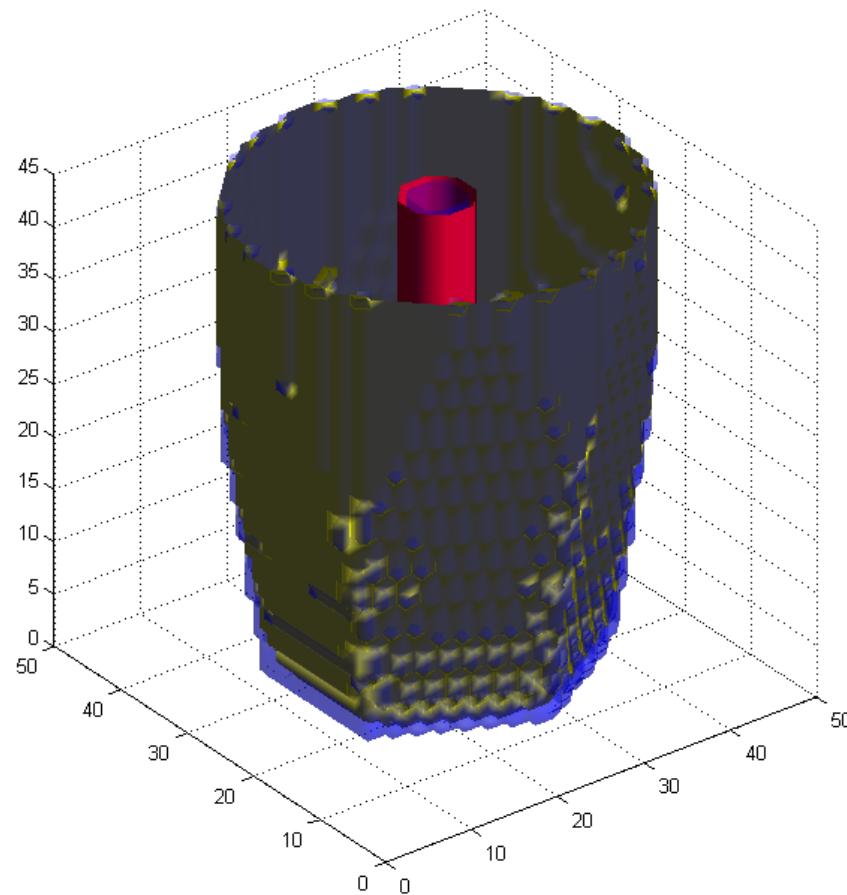


Detector at 250V

→ 10.4% depleted



- MGS Simulations (cont.)

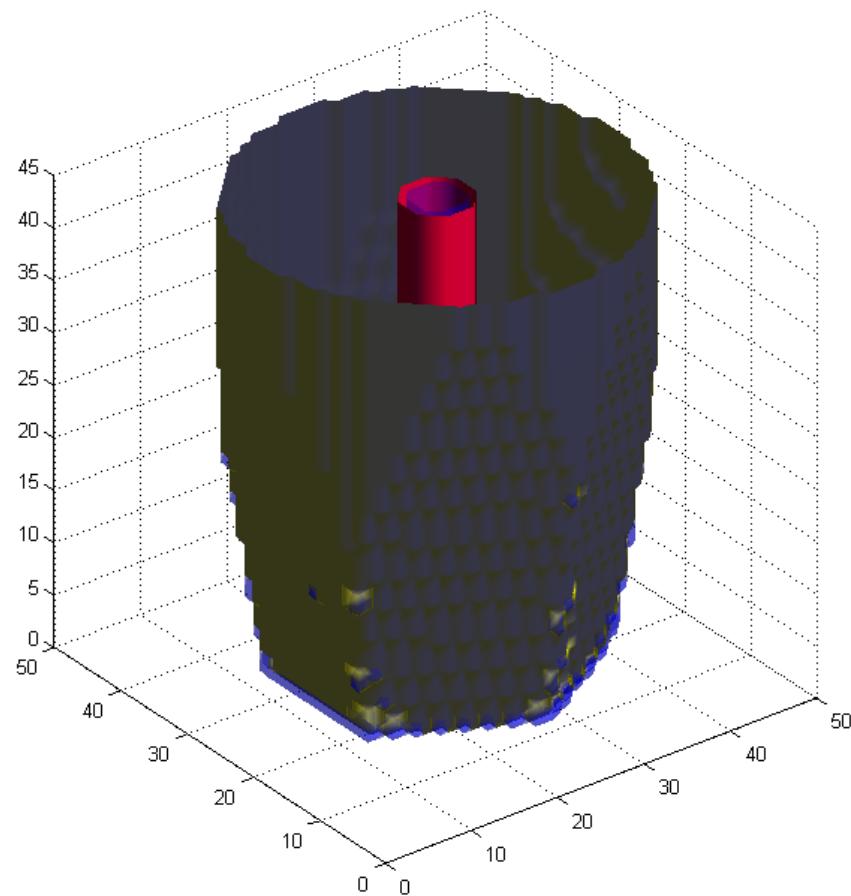


Detector at 100V

→ 1.7% depleted



- MGS Simulations (cont.)

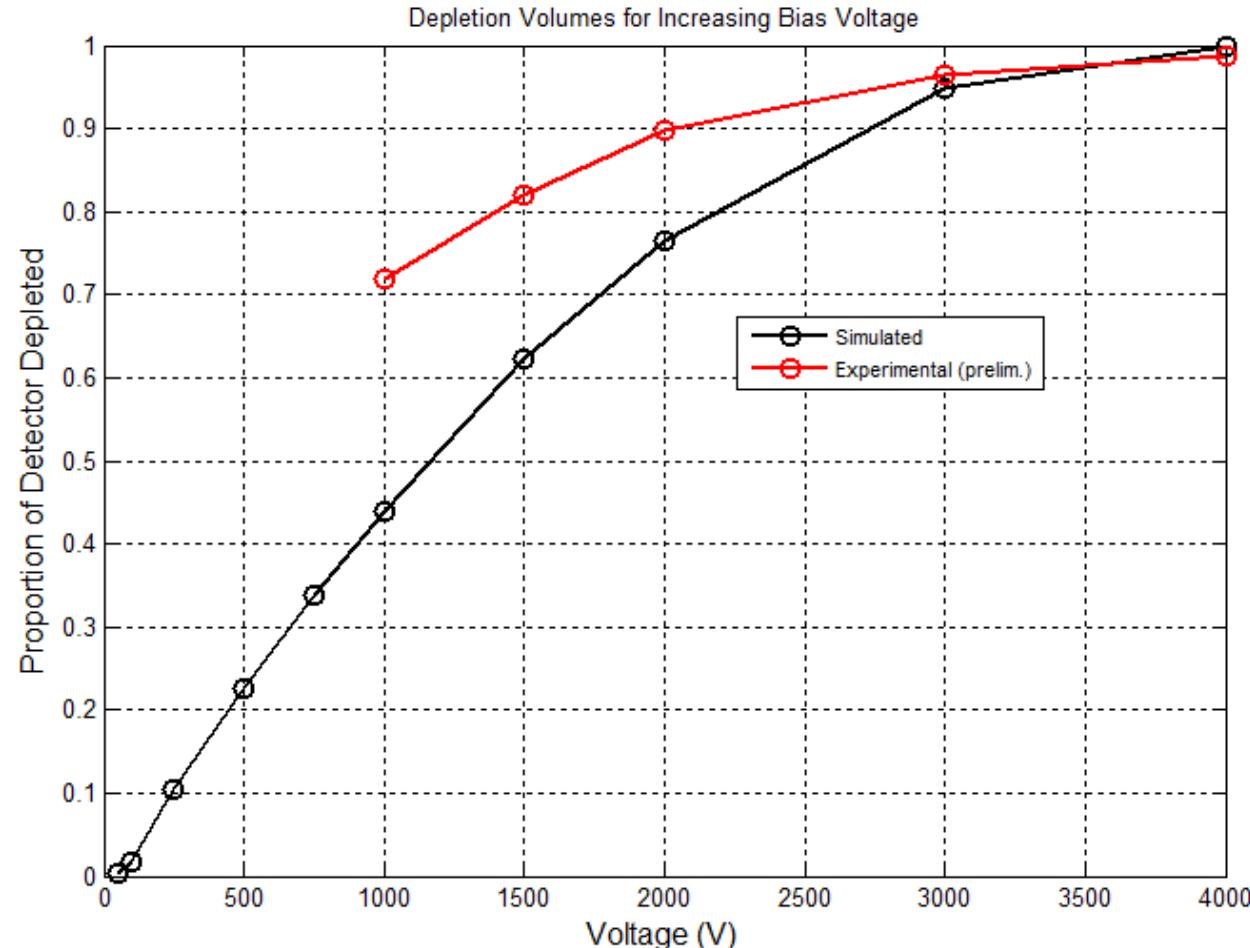


Detector at 50V

→ 0.3% depleted



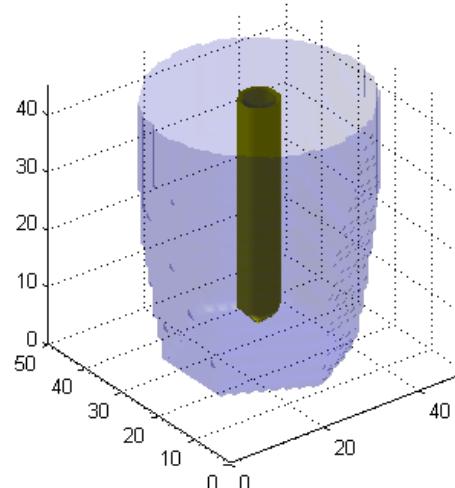
- MGS Simulations (cont.)



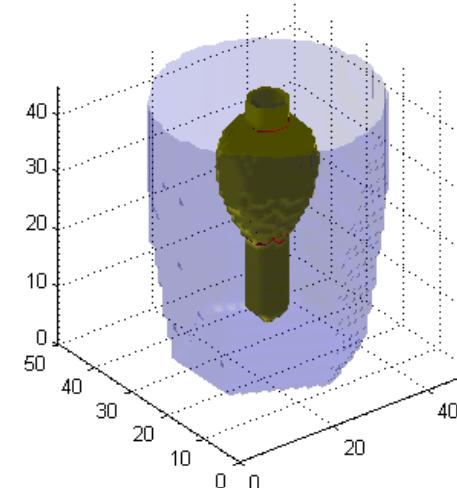


• MGS Simulations (cont.)

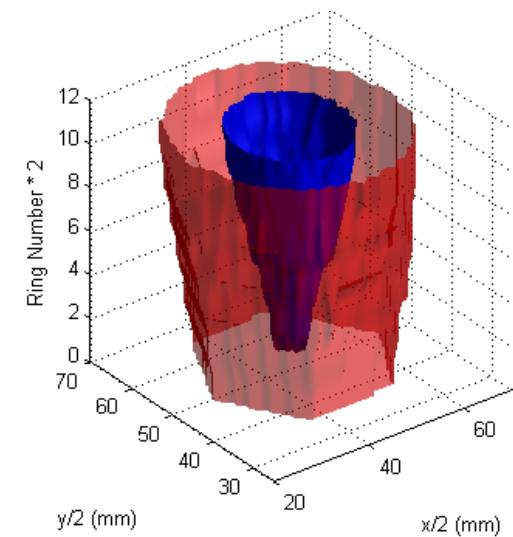
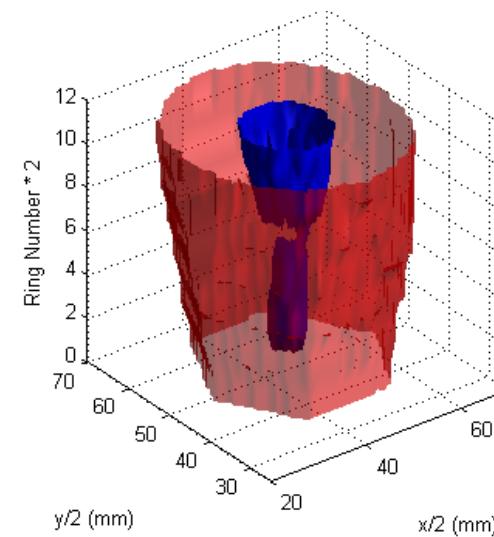
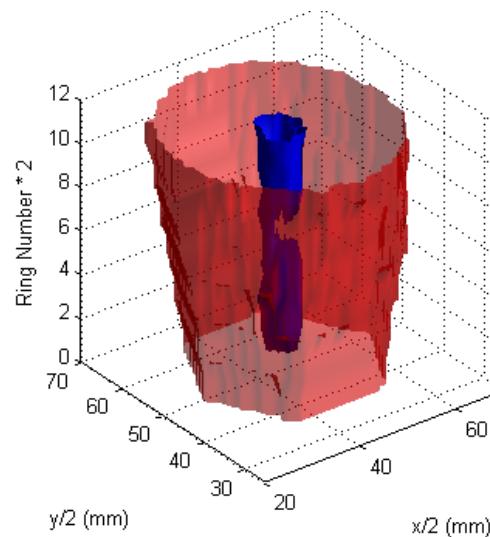
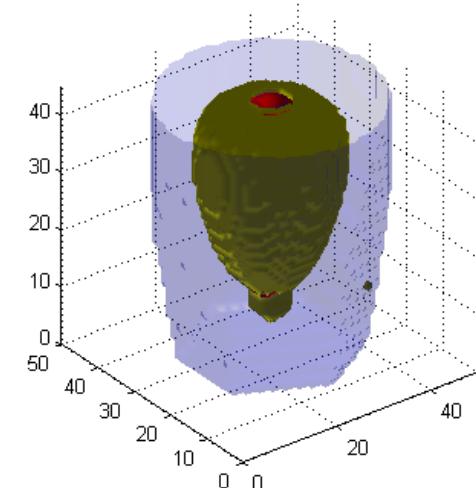
Undepleted Volume Of Detector at 4000V



Undepleted Volume Of Detector at 3000V



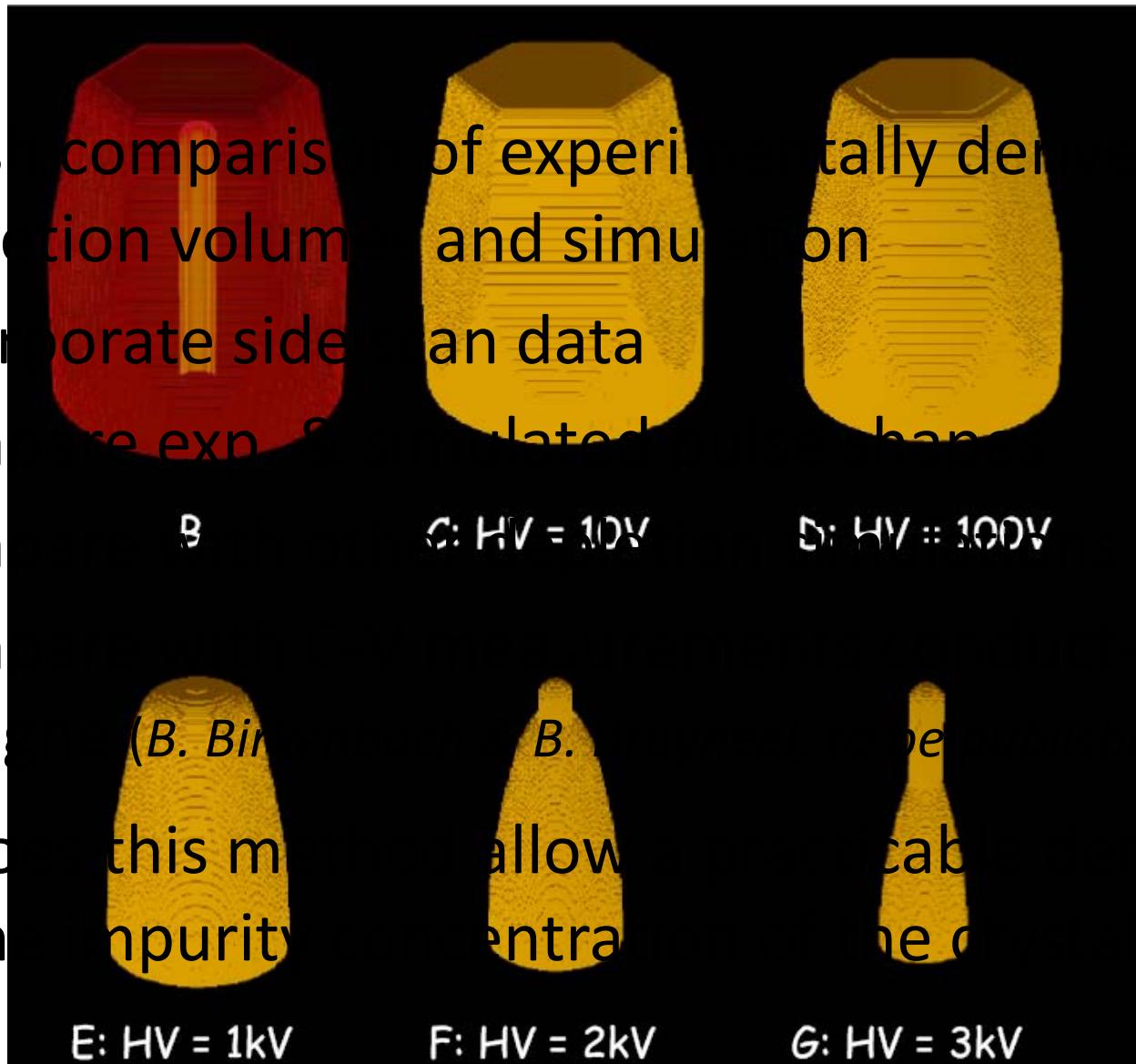
Undepleted Volume Of Detector at 2000V

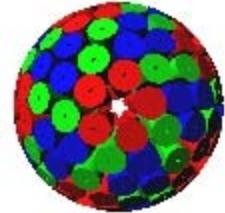




- Next Steps

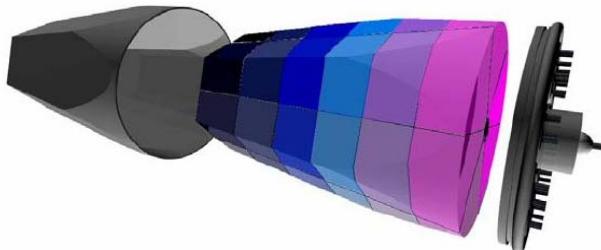
- Finish comparison of experimental depletion volume and simulation
- Incorporate side plan data
- Compare exp. vs. simulated depletion volumes
- Compare B (C) and C (B)
- Compare depletion volumes measured in Cologne (B. Birkenbach) and Heidelberg (B. Lippert) for the same detector (not yet done)
- → do this mainly for shallow detectors (cabins) to investigate the dependence of the impurity concentration on the central depletion volume ??





Questions & Comments...

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H. Boston, S.J. Colosimo, J. Cresswell, D.S. Judson
P.J. Nolan, C. Unsworth



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• Exp. Volumes at Low Bias

