

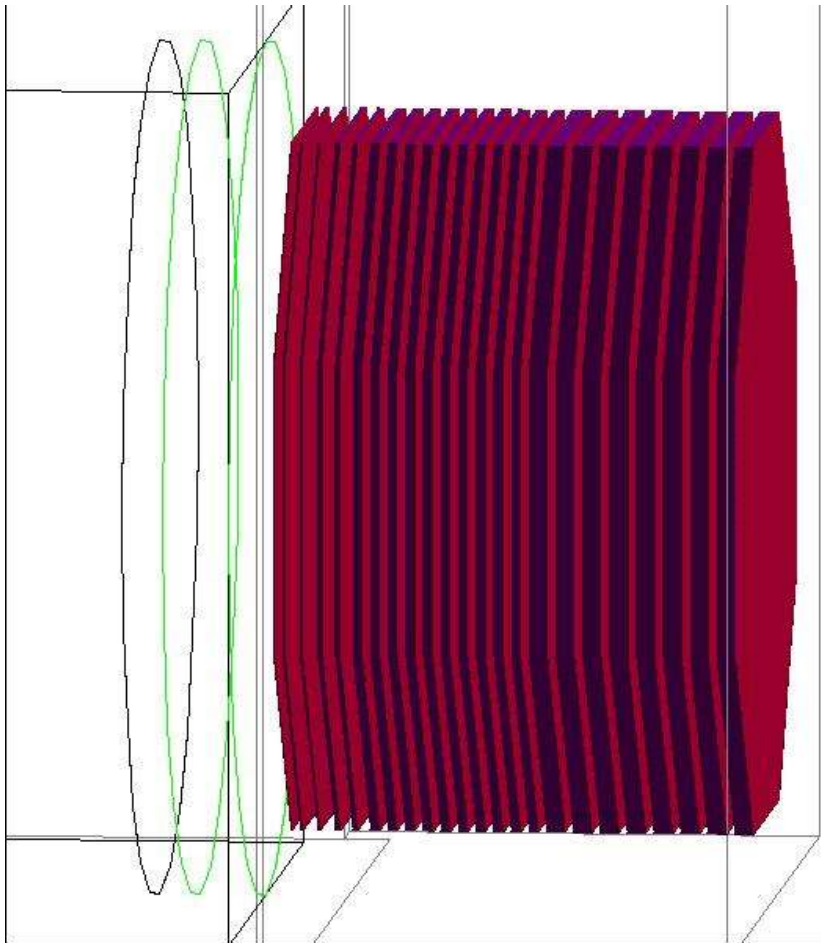
**Octagonal MRD Study**  
**Using Geant4**

Mike Litos  
Boston University

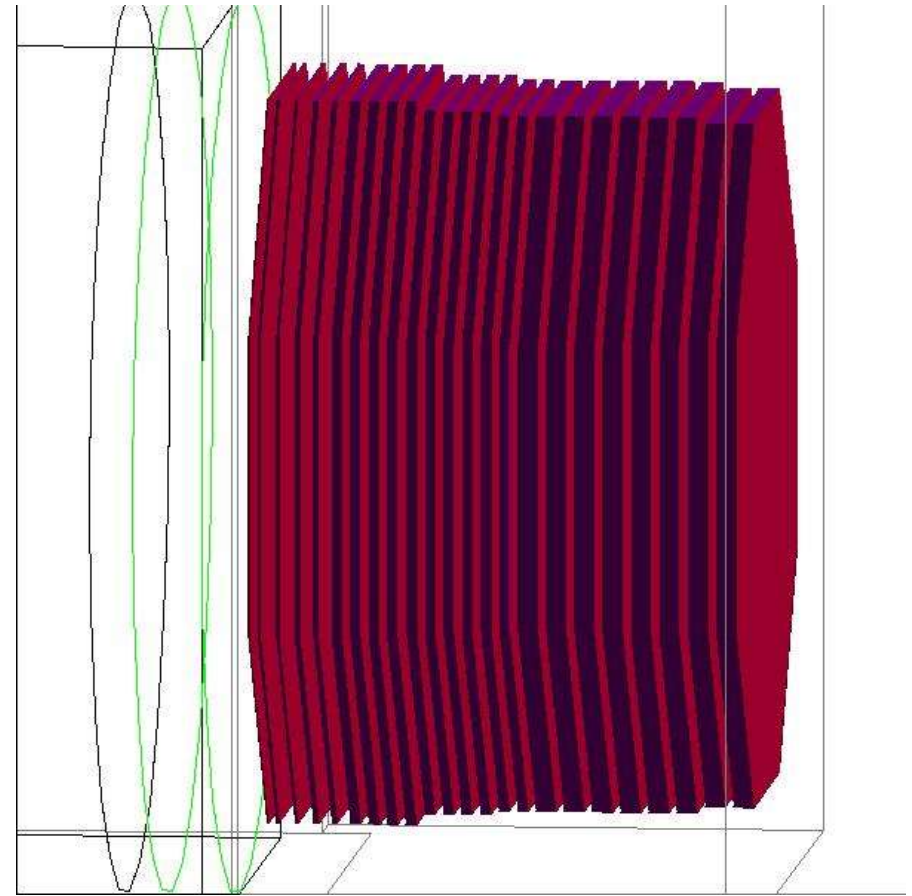
*Dec. 15th, 2005*

Square Shaped Face:  
**MRDSqr**

**MRDOctI:**  
Level Octagons



**MRDOctII:**  
Tiered Octagons



Beam Direction

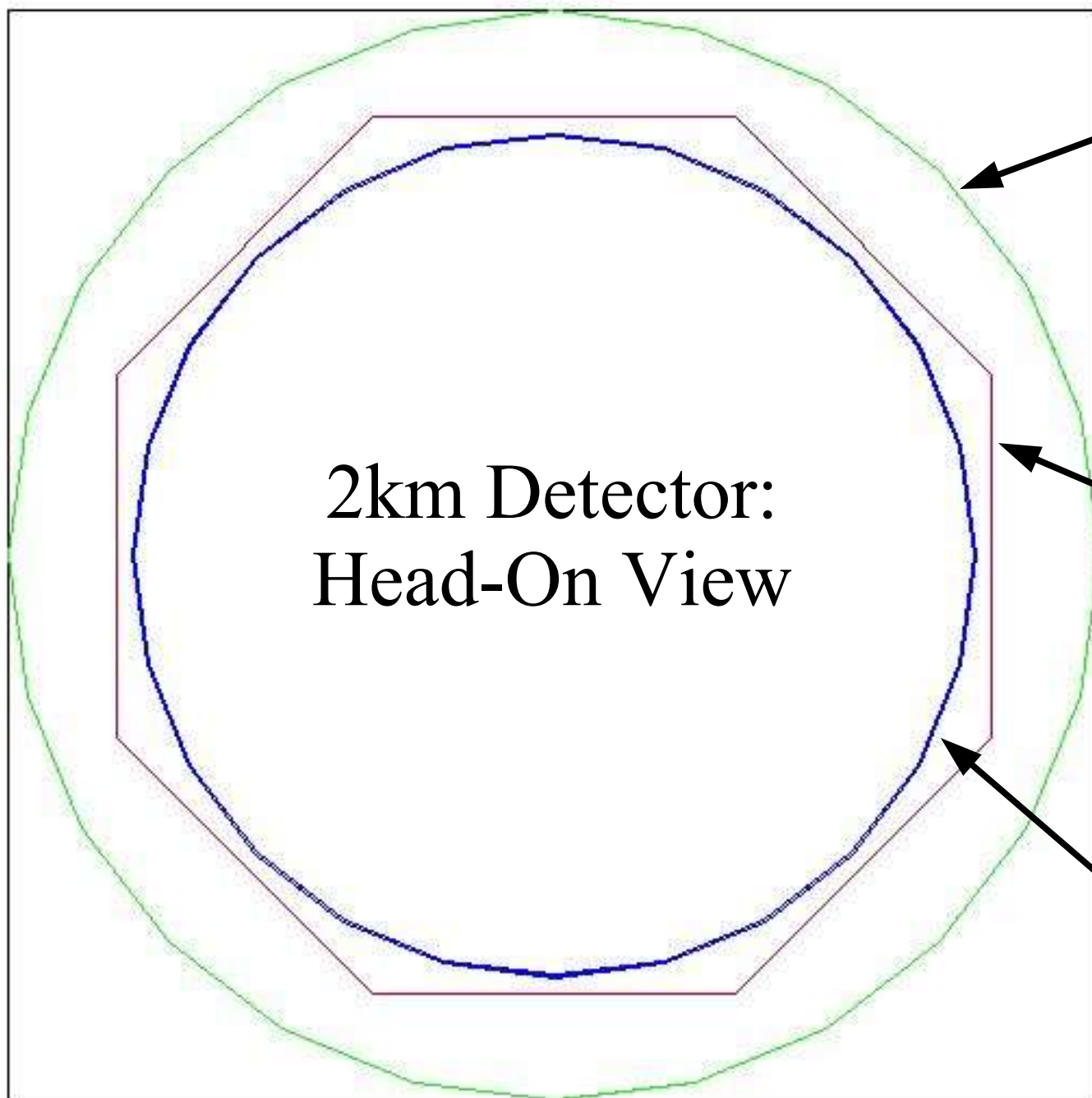


2km Detector:  
Head-On View

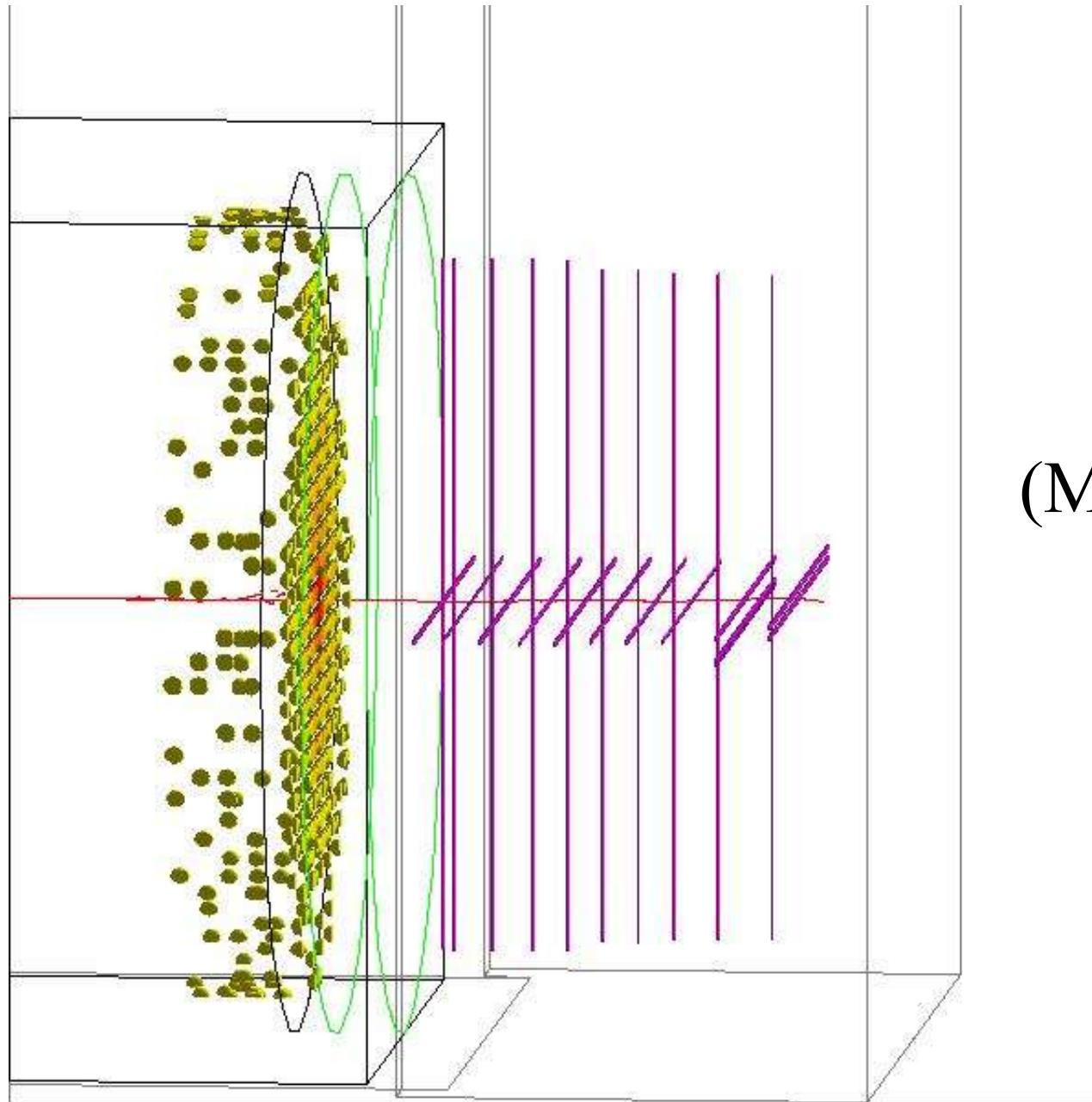
Water  
Cherenkov  
(middle)

MRD  
(downstream)

FGD/1ArD  
(upstream)



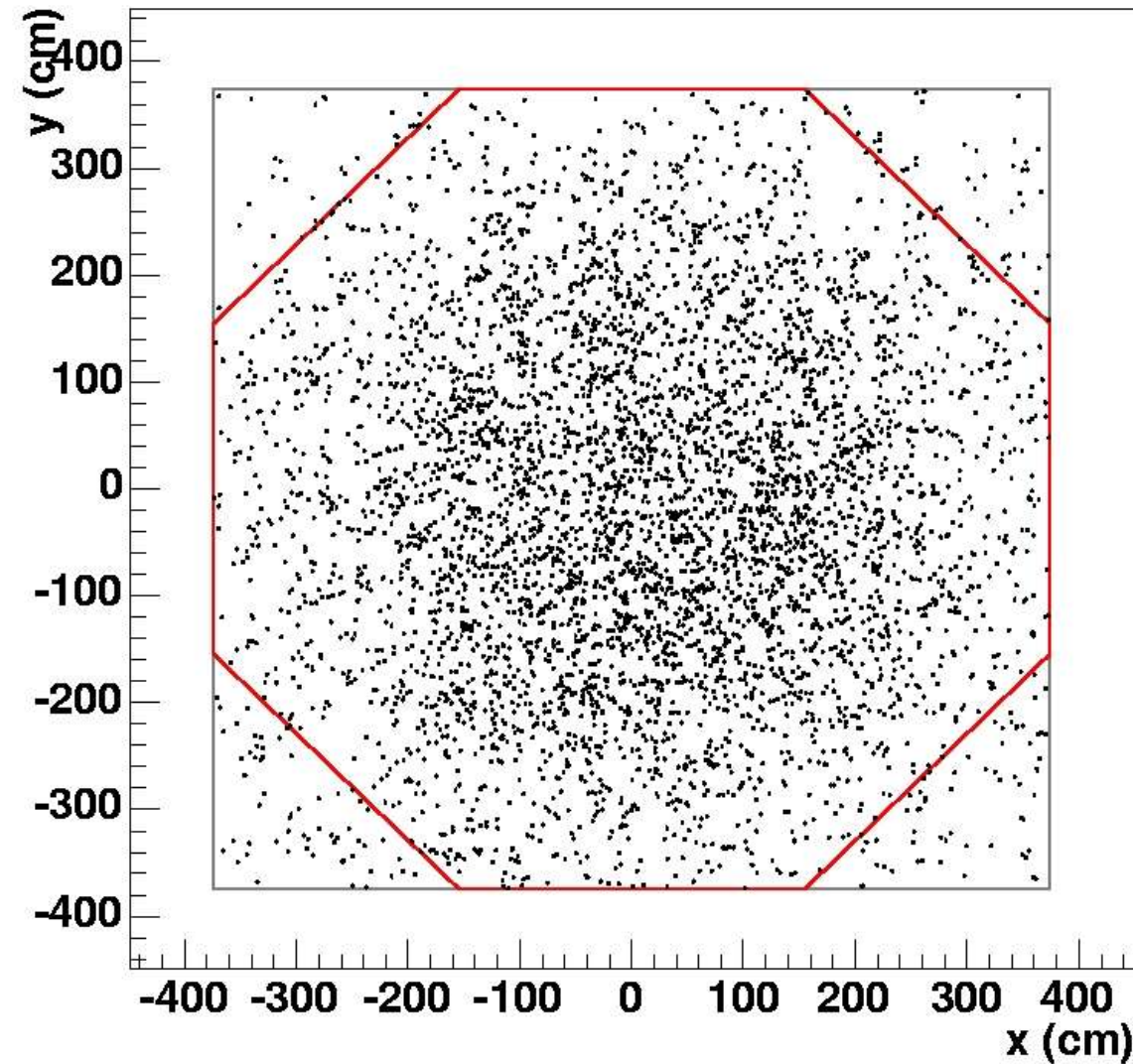
# Visual example of an MRD Hit:



(MRDOctII)

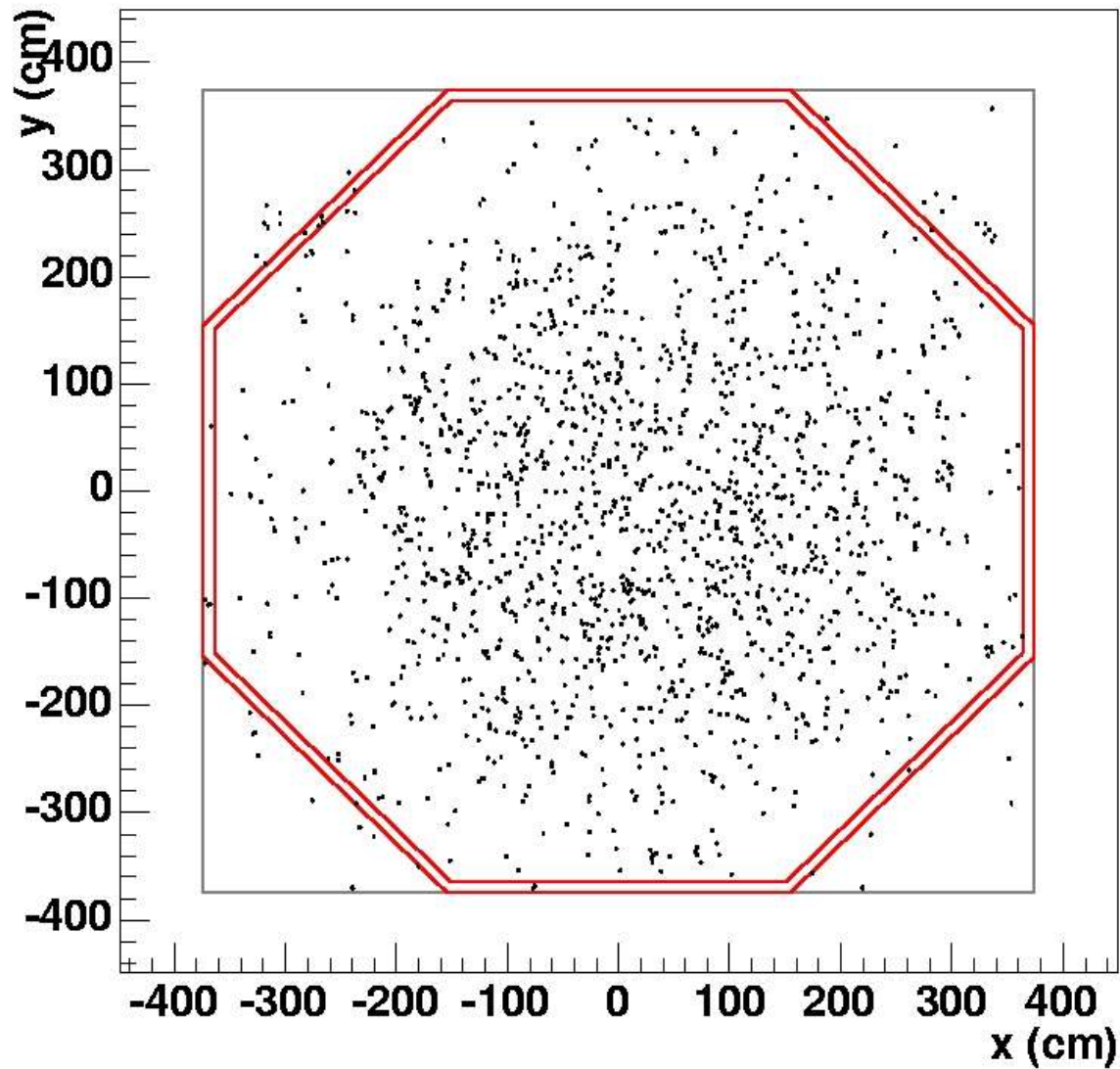
## 3<sup>rd</sup> Module (Front)

Number of  
Muons Captured  
Compared to MRDSqr:  
MRDOctI: 94%  
MRDOctII: 94%



(Note: Shows **only** MRDSqr muons)





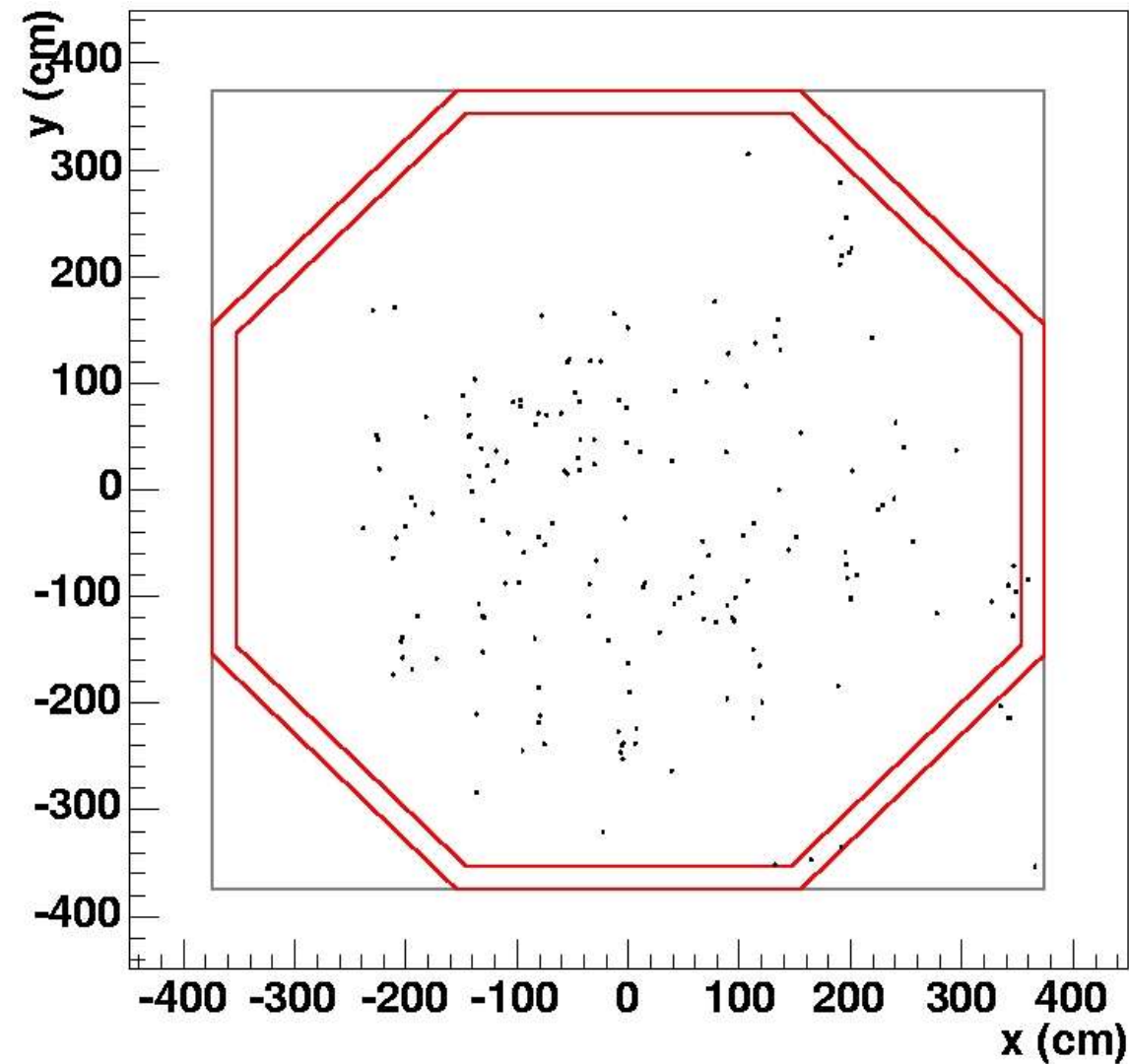
## 12<sup>th</sup> Module (Middle)

Number of  
Muons Captured  
Compared to MRDSqr:  
MRDOctI: 98%  
MRDOctII: 98%

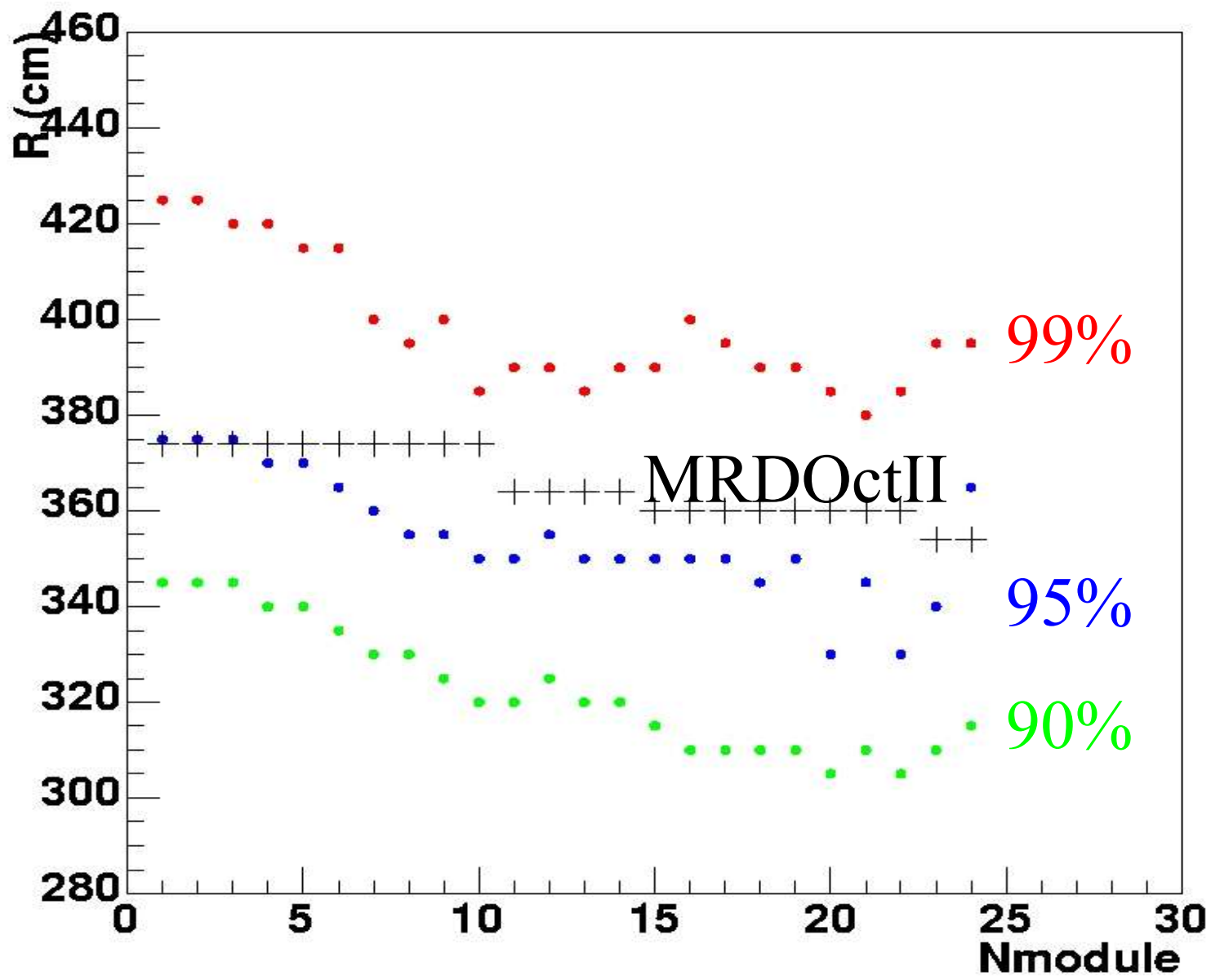
(Note: Shows **only** MRDSqr muons)

## 24<sup>th</sup> Module (Back)

Number of  
Muons Captured  
Compared to MRDSqr:  
MRDOctI: ~100%  
MRDOctII: ~95%



(Note: Shows **only** MRDSqr muons)



Radii where 99%, 95% and 90% of events are accumulated in MRDSqr.



## Conclusion:

The Geant4 simulation shows that the **MRDOctI** or **MRDOctII** geometry will have a **sufficient muon capture efficiency** (~95%) compared to **MRDSqr**.

## Future Studies:

Compare **energy reconstruction efficiency** of the different geometries.

Also, compare **energy** and **angular resolution**.