

NEDA: Performance of different configurations



Tayfun H  y  k



VNIVERSITAT
DE VALÈNCIA

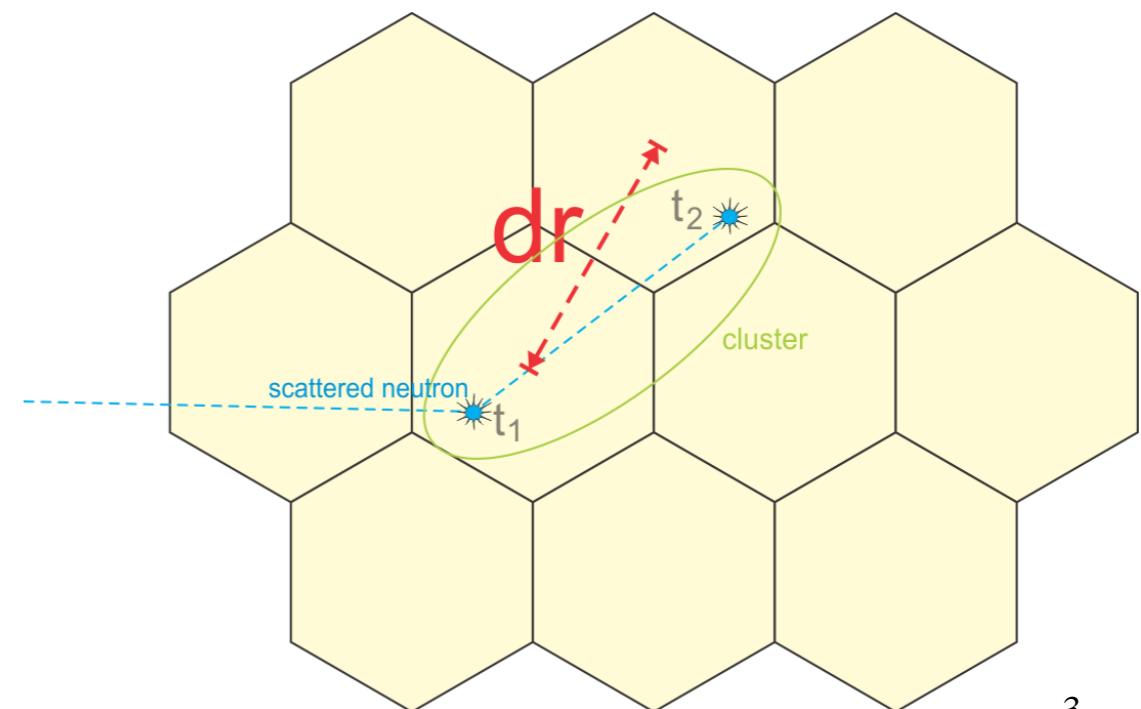
Introduction

Introduction:

In this study, we examine the efficiency and cross talk for different geometries and materials for the future neutron detector array NEDA.

The Cluster Method

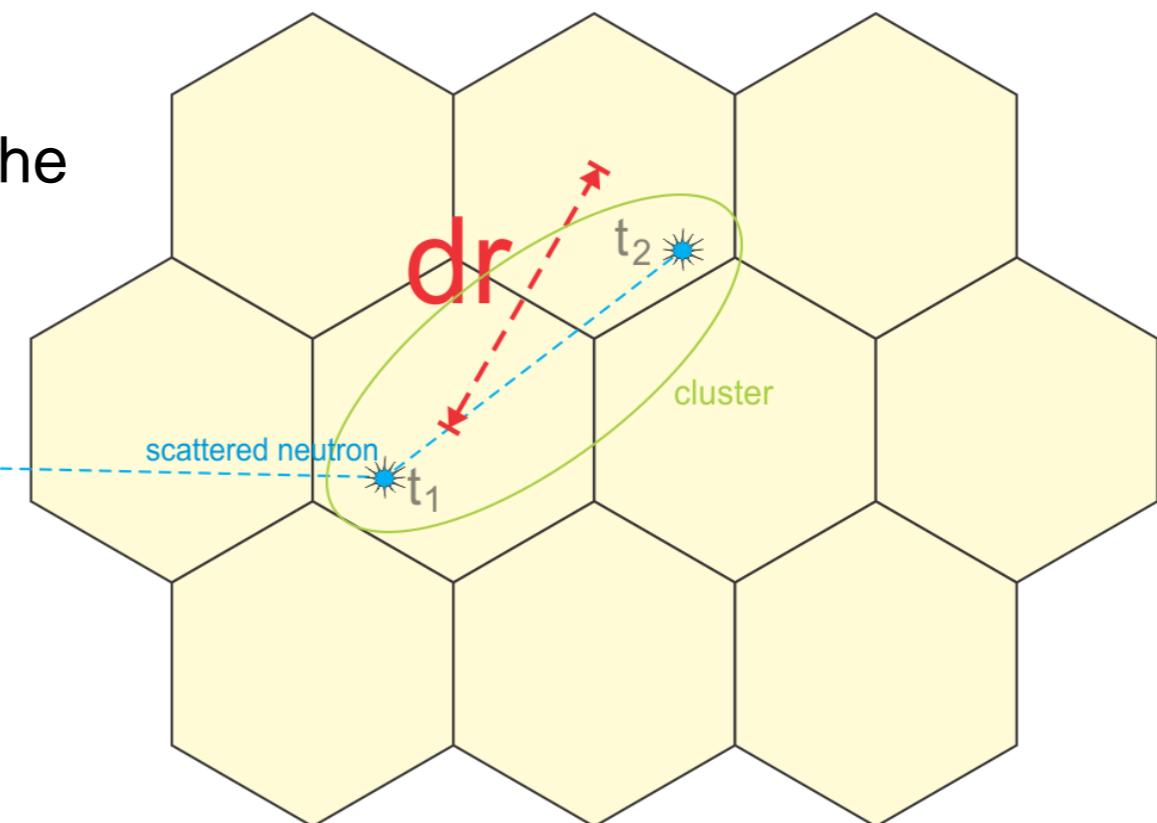
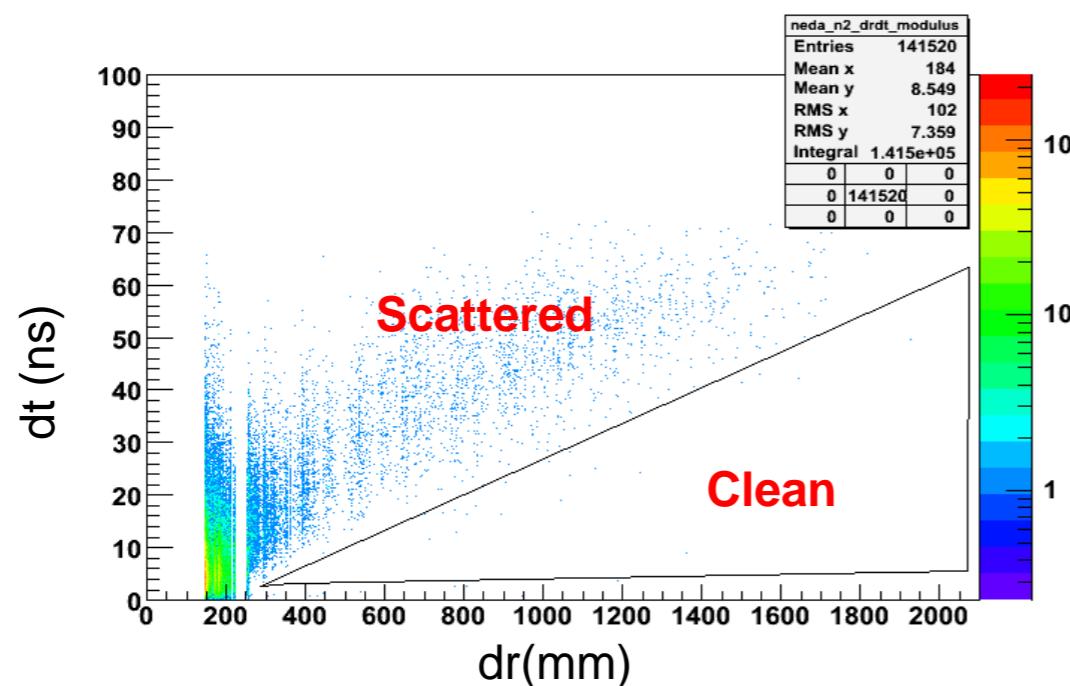
- The events that fire more than one detector are clustered, depending on the location and the time interval between two interaction points.
- Finally, number of clusters gives the number of neutrons detected.



Introduction

Basics of the method:

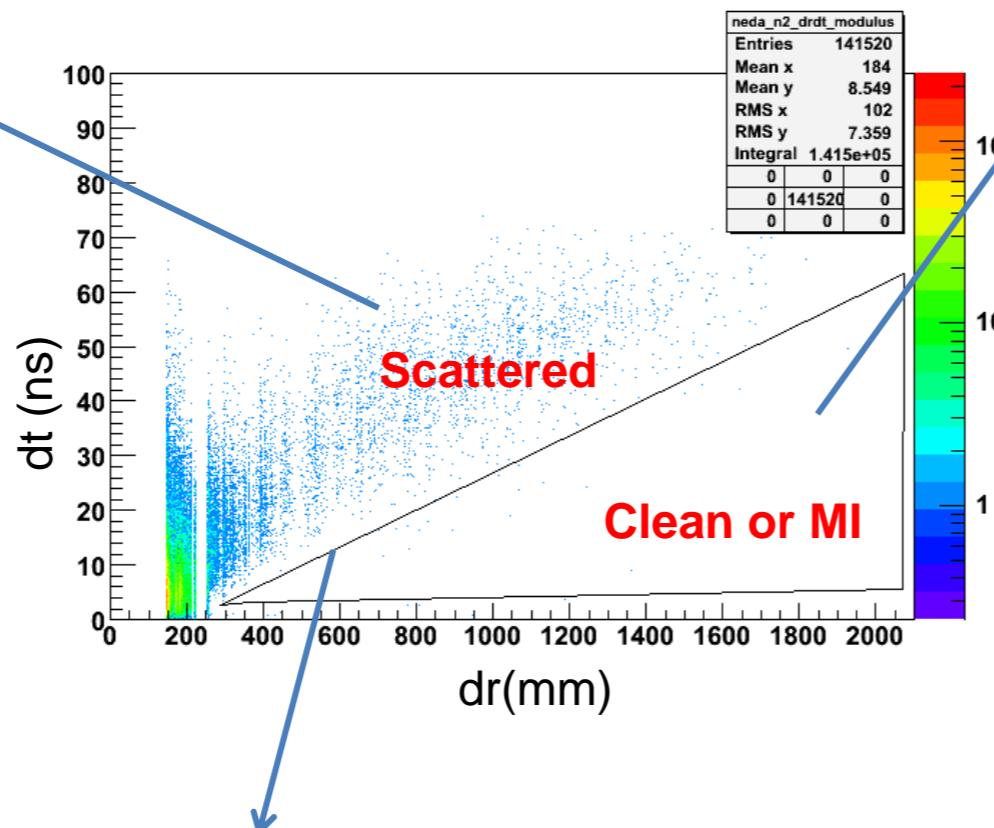
- **The drdt plot:** One can see on this plot, the scattered events or the neutrons $m_n > 1$.
- **The drdt cut:** We apply a geometrical cut on the drdt plot in order to distinguish the scattered events from the clean $m_n > 1$ events.



Evaluation

Simulated neutron multiplicity: $m_n=1$

Interpreted as
 $\text{Eff}(1n)$ using the
cluster method



The gate is fixed for given geometry.

The clean $m_n > 1$ are misinterpreted (MI) events, since the simulated $m_n = 1$

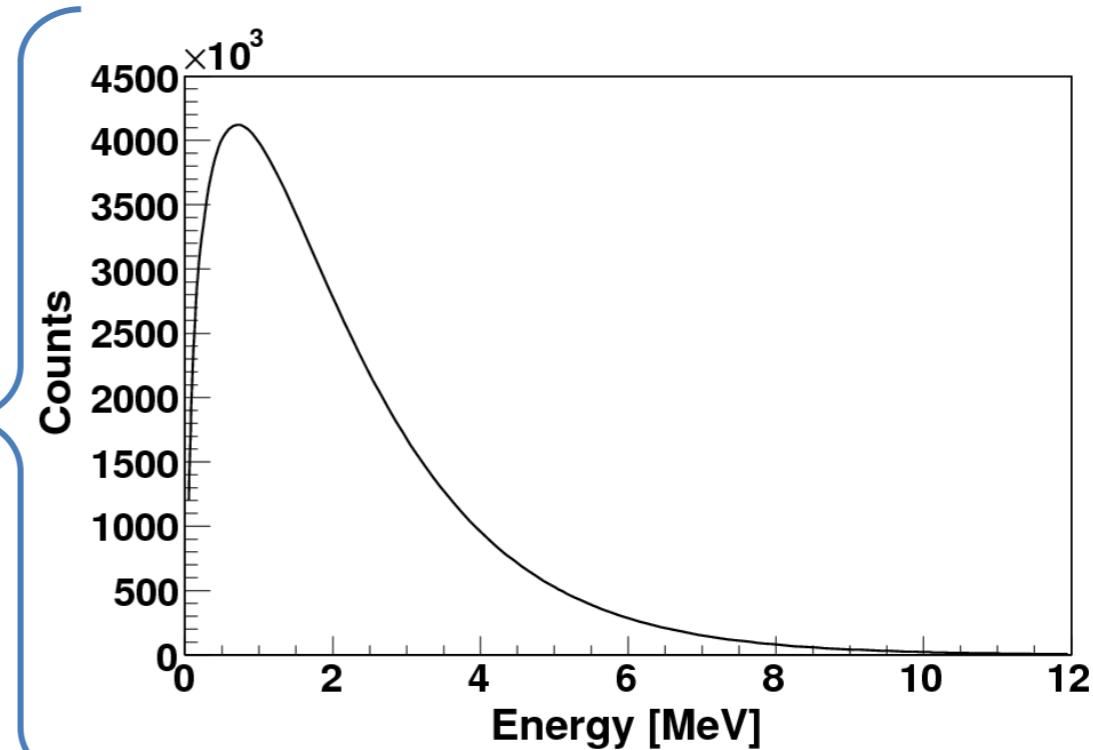
$$MI = \frac{N(m_{n,>})}{N(m_n)}$$

- MI: Misinterpretation probability
 $N(m_{n,>})$: Number of neutrons misinterpreted as higher m_n than the simulated m_n
 $N(m_n)$: Number of neutrons interpreted with the given m_n

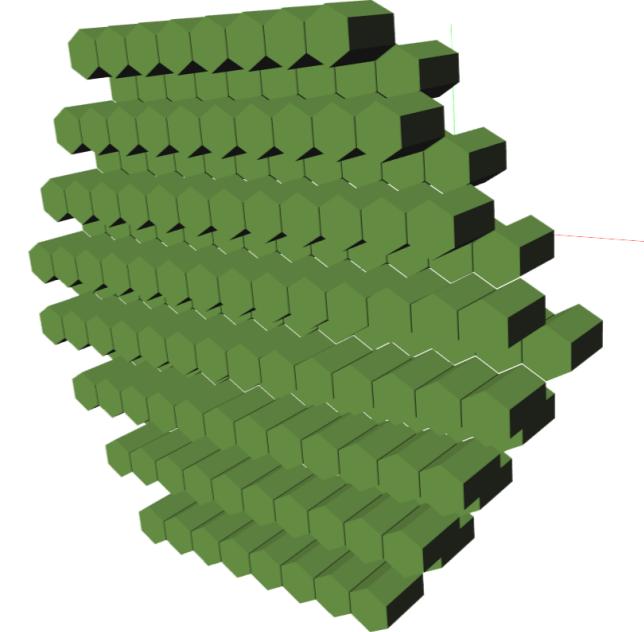
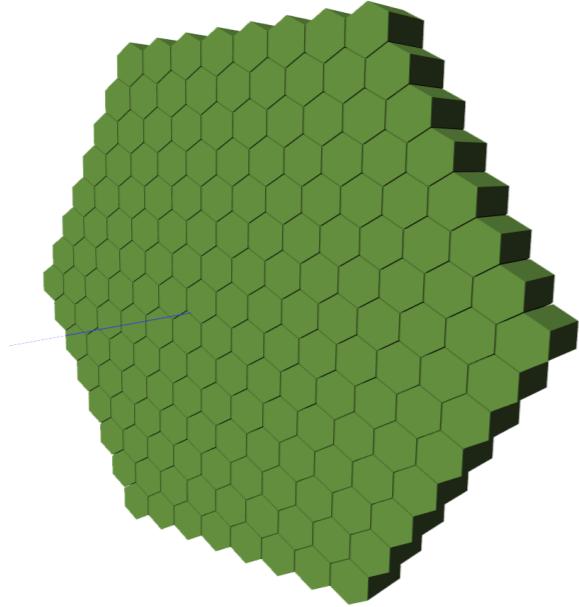
MI probability is in the order of 10^{-4}

Conditions

- ❖ Geant4.9.2.p03
- ❖ 2 mm thickness of Al walls
- ❖ Characteristics of the Source:
 - Neutrons – energies sampled from a ^{252}Cf source
 - Neutrons were isotropically emitted in 4π
- ❖ 50 keV_{ee} threshold is applied for the light output
- ❖ Two types of material have been simulated:
 - BC501A (C_8H_{10})
 - BC537 (C_6D_6)

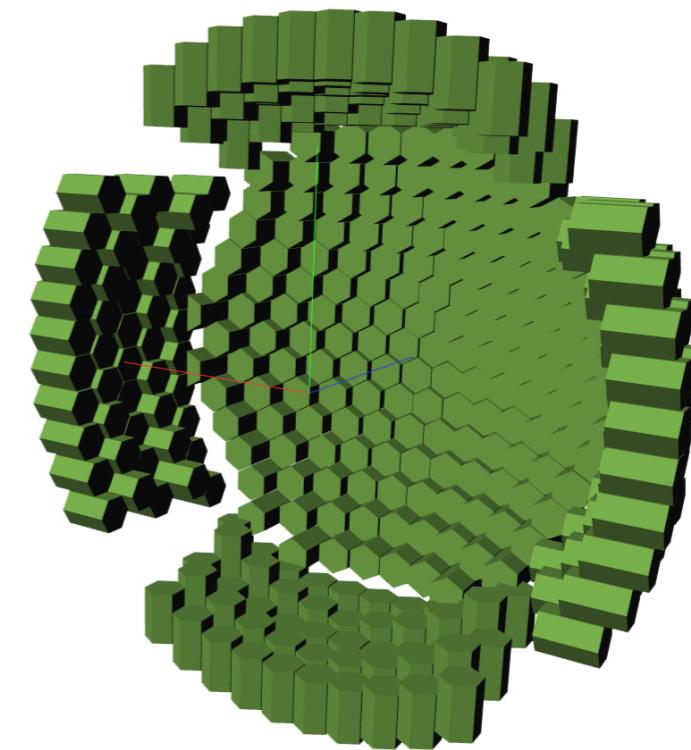
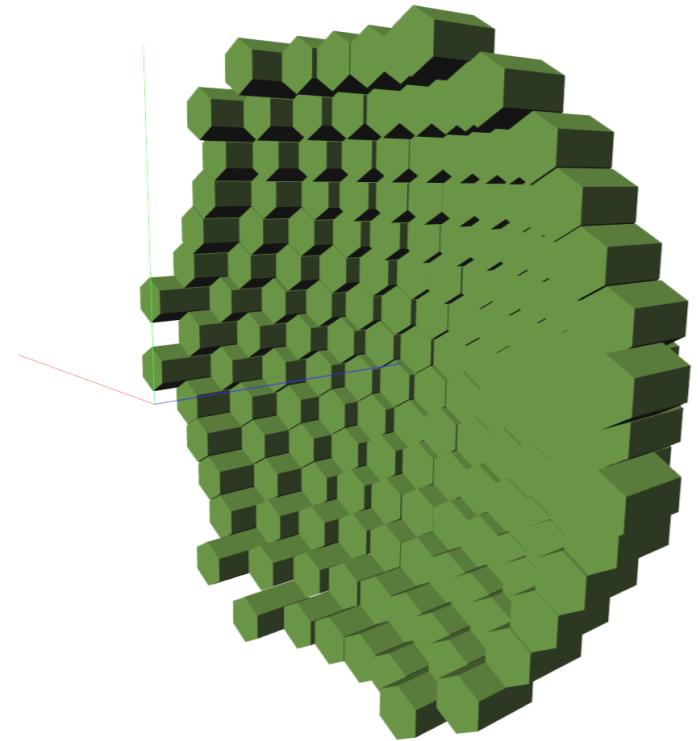


Geometries: Flat



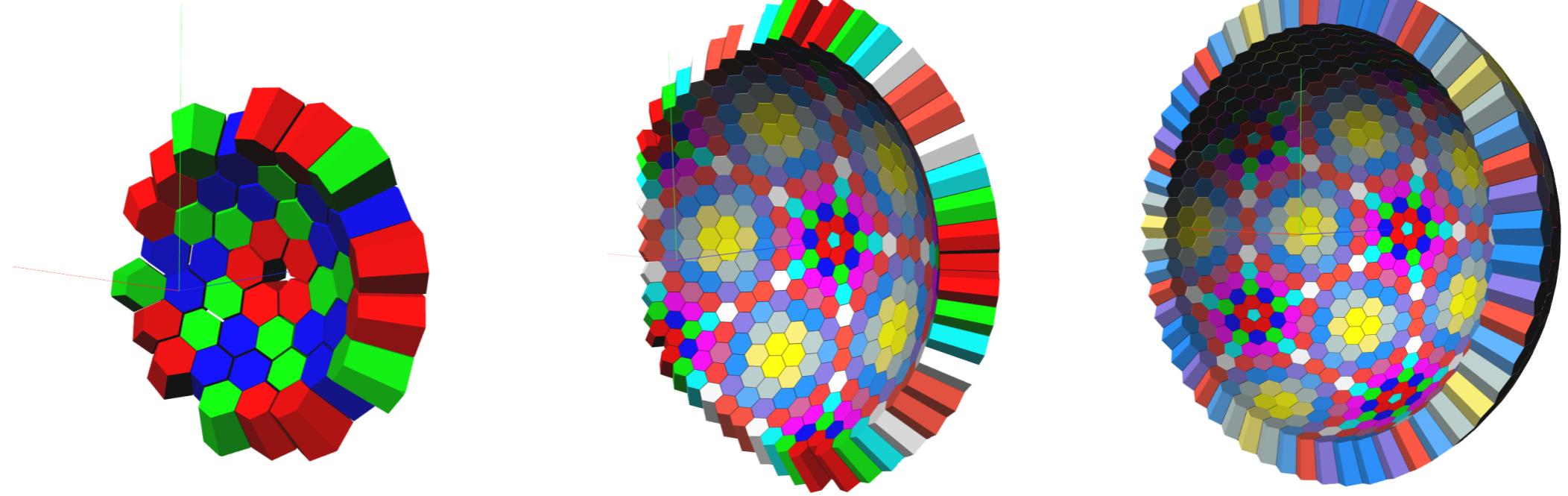
Flat	Geometry name	Zigzag
1m	Distance from the source	1m
169	Number of modules	169
3 l	Average cell volume	3 l
507 l	Total volume	507 l
0.52π	Solid angle coverage	0.45π

Geometries: Staircase



Staircase 1π	Geometry name	Staircase 2π
1m	Focal point	1m
163	Number of modules	355
3 l	Average cell volume	3 l
489 l	Total volume	1065 l
0.92π	Solid angle coverage	1.88π

Geometries: Spherical



Geometry name	Spherical N180	Spherical 1 π	Spherical 2 π
Focal point	0.5 m	1 m	1 m
Number of modules	45	326	606
Average cell volume	4.5 l	~2 l	~2 l
Total volume	202.5 l	~652 l	~1065 l
Solid angle coverage	1 π	1 π	2 π

Preliminary Results: Efficiency

