SIMIND Simulation current set up.

The current SIMIND build is used on my laptop with Linux OS. The cluster will also operate under Linux so this build should work but seems to have some issues, probably due to frequent changes to installation which occurred during the rush for MIC. However, I am able to run sufficiently on the laptop for now.

The latest SIMIND update (05/20) includes the Z coordinate in the List mode format output.

Last month Michele and I worked through an issue with the coordinate determination in which the Z coordinate output did not match the expected crystal position and the orientation appeared flipped. This is now solved, producing X, Y and Z in the .lmf file.

The file is read with the Matlab script SIMIND_unlist.m which extracts the Z coordinate and sorted the events into 4 layers in accordance with our DOI algorithm. I have edited this file to suit the changes made (05/20) but is largely the same as Kjell's initial design.

I have tested SIMIND with a planar phantom simulation by running the following command in the terminal :

```
simind
slitslat/26:10/x6:w/14:2/15:2/tr:5/03:5/02:10/04:0.01/16:0.6/29:20/84
:2/OU:5 Mss_planar_Test slitslat.cor
```

I outline the components of the command here to ensure clarity and correctness on of understanding.

Simind: runs the simind software

Slislat: calls the slitslat geometry file

26:10 : Index 26 determines the number of photons per projection in millions (10,000,000 here)

X6:w : determines the collimator scatter material, here w is tungsten.

14:2 : phantom type 2 = rectangular

15:2 : source type 2 = rectangular

Tr:5 : sets simulation to tomographic to true. total photon history = photon histories * number of projections

Indices 03, 04, 05 are phantom dimensions x, y, z which are set to 10, 5, 0.01

16:0.6 source position in x directions. 0.6 used to centre the source with the centre slat of the collimator

29:20 : projections angles set to 20

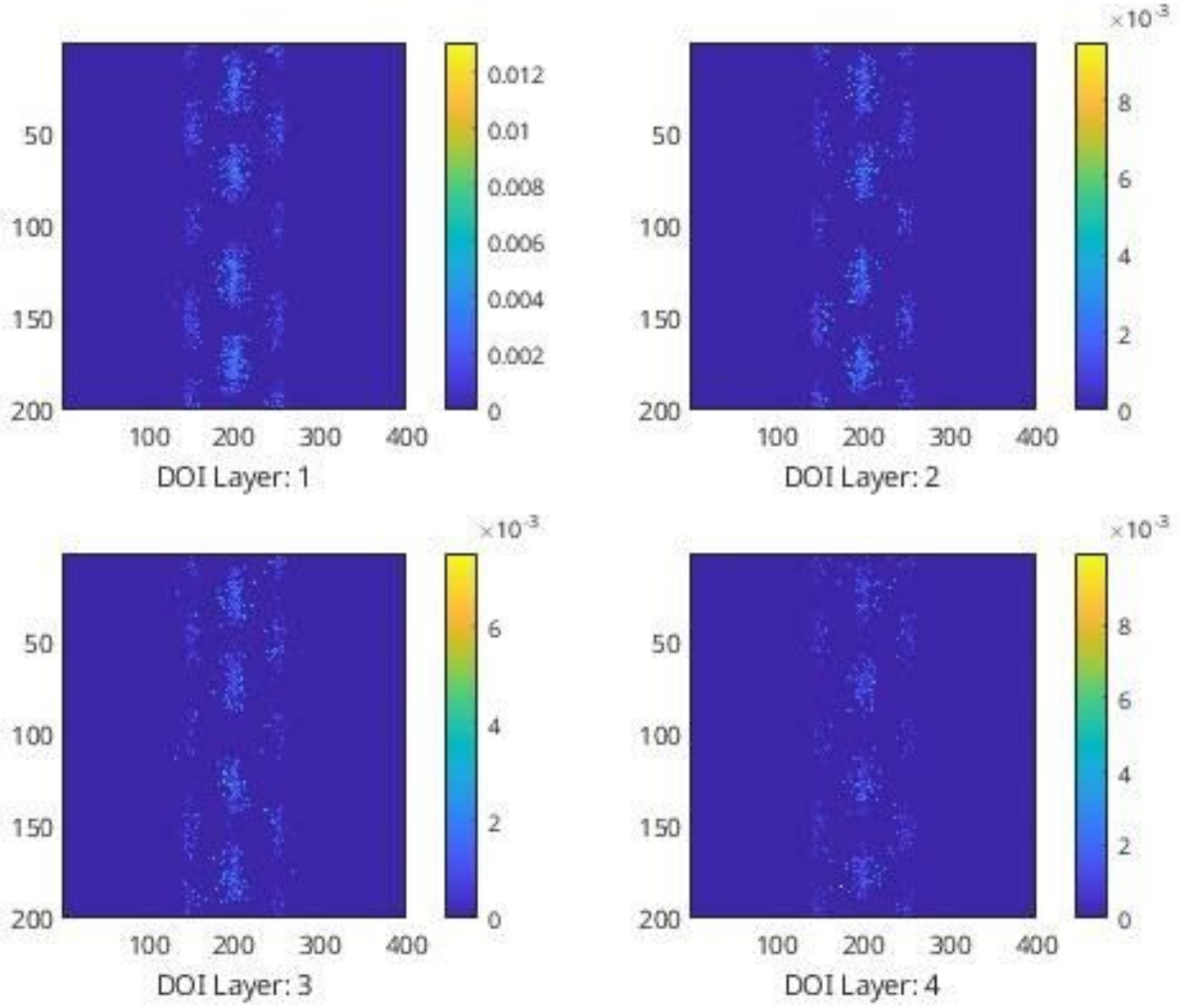
84:2 : output file format set here to .lmf

OU:5 : output data here set to give x, y and z coordinates

MSS_planar_test: output file name

Slitslat.cor: geometry file used to determine the rotation of the phantom to cover 20 detector locations

The output of this experiment is shown below.




As I understand the output of the simulations are not absolute values which we use in planar reconstruction. Instead the values seen in this image are a weighting which determines the probability of an event at each position. The 4 layers here are a product of the binning algorithm

which separates the events according to the 4 crystal layers. The issues we face now involve the statistics and half slits in the collimator.

The projection images seem to produce very low counts and have to be run for a very long time to get good statistics. Index 26 is set to values as high as 1000 which increases the time significantly but yields little improvement. Have I misunderstood the use of index 26?

The mini slits is an issue we have recently discussed, the real system makes use of neighbouring detectors to expand the FOV of any given detector head. Two half slits are combined to produce a mini slit in between two detector heads. Could this be achieved by simulating 3 collimators at a time?