
DTU

D8.13
“Optimization study of selected instrument using CombLayer and McStas-MCNP”

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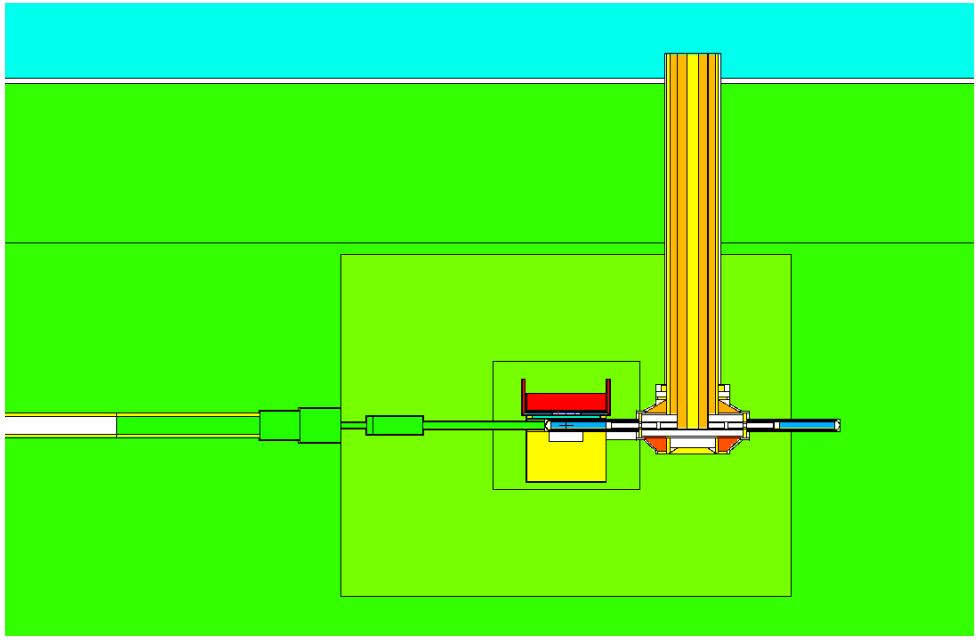
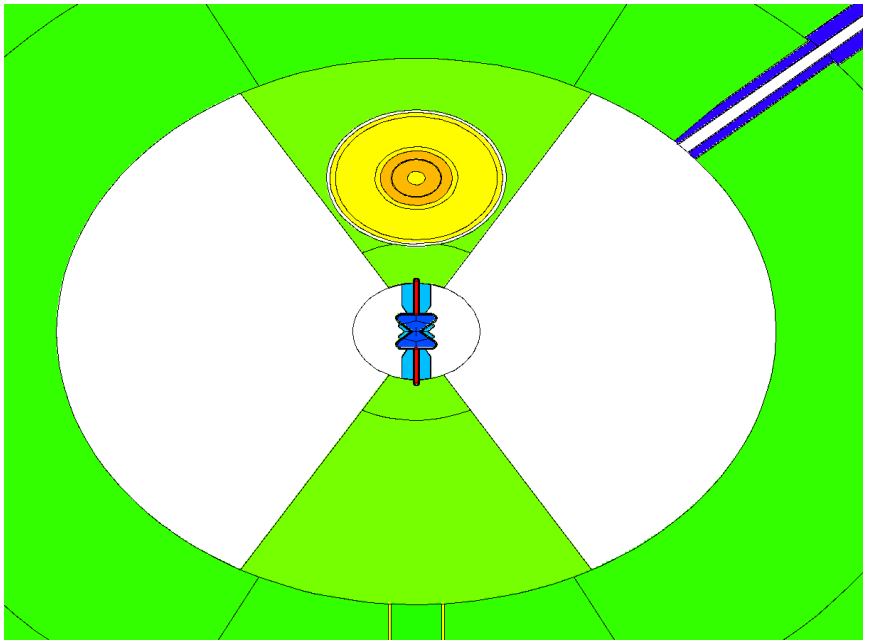
Introduction

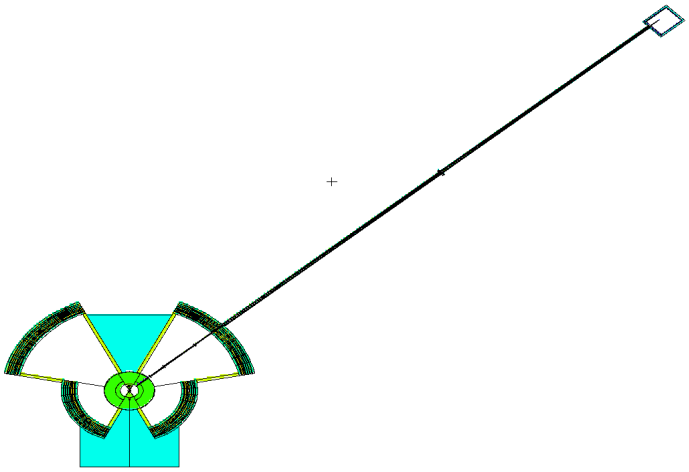
BIFROST is choosen as an example to illustrate the capabilities of the MCNP-McStas coupling.
→Long instrument, elliptical guide
Aim: assess signal and noise (and ratios) at the sample position

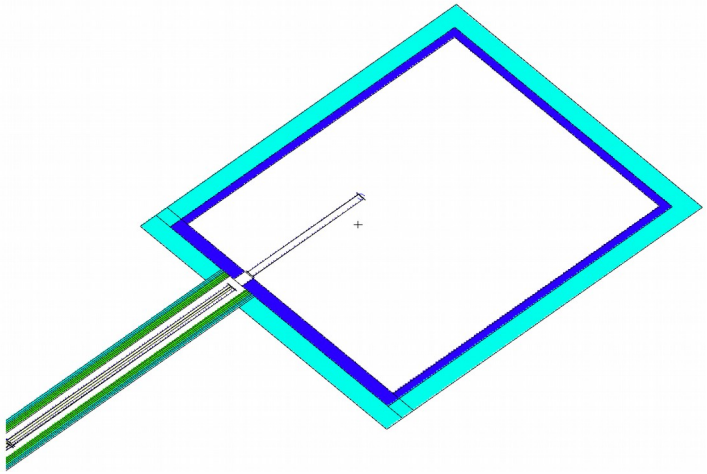
Several means to this - focus here on:
- Comblayer (i.e. MCNP) using McStas only indirectly through embeeded SM patch
- MCNP→McStas (via MCPL)

Comblayer model



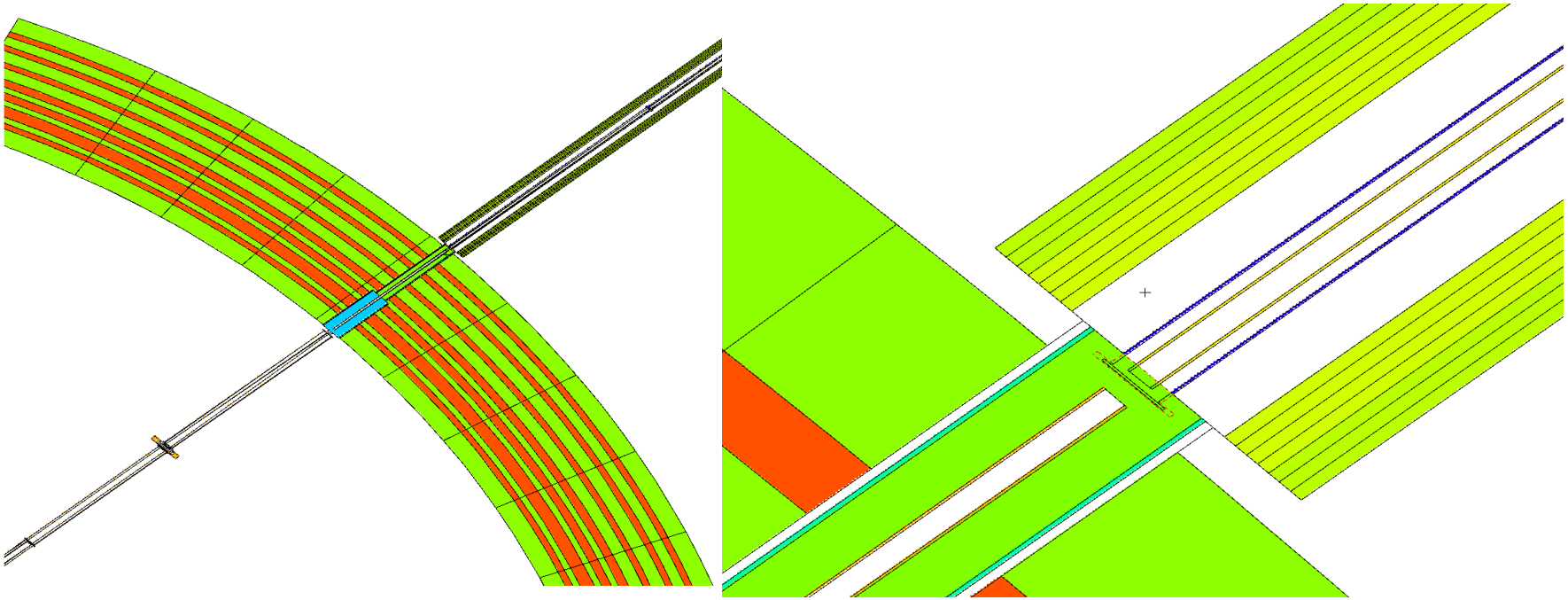






Comblayer model post-processing

Fresh out of CombLayer, the model suffered from several child-diseases



Could/should be fixed in CombLayer, but were fixed by hand in MCNP.
Following this, we have a model that runs.
….but very inefficient

Comblayer model post-processing

Introducing McStas inspired supermirrors, following the work of Miguel (see separate presentation)

```
REFLE48 1294 1 -4505
REFLE49 1309 1 -4513
REFLE50 1310 1 -4513
REFLE51 1311 1 -4513
REFLE52 1312 1 -4513
REFLE53 953 1 -4359
c
REFF1 0.99 2.19E-2 10 6.07 3E-3 $supermirror from hell
c
RFLAG1 2
RFLAG2 2
RFLAG3 2
```

=> functioning model, able to model:

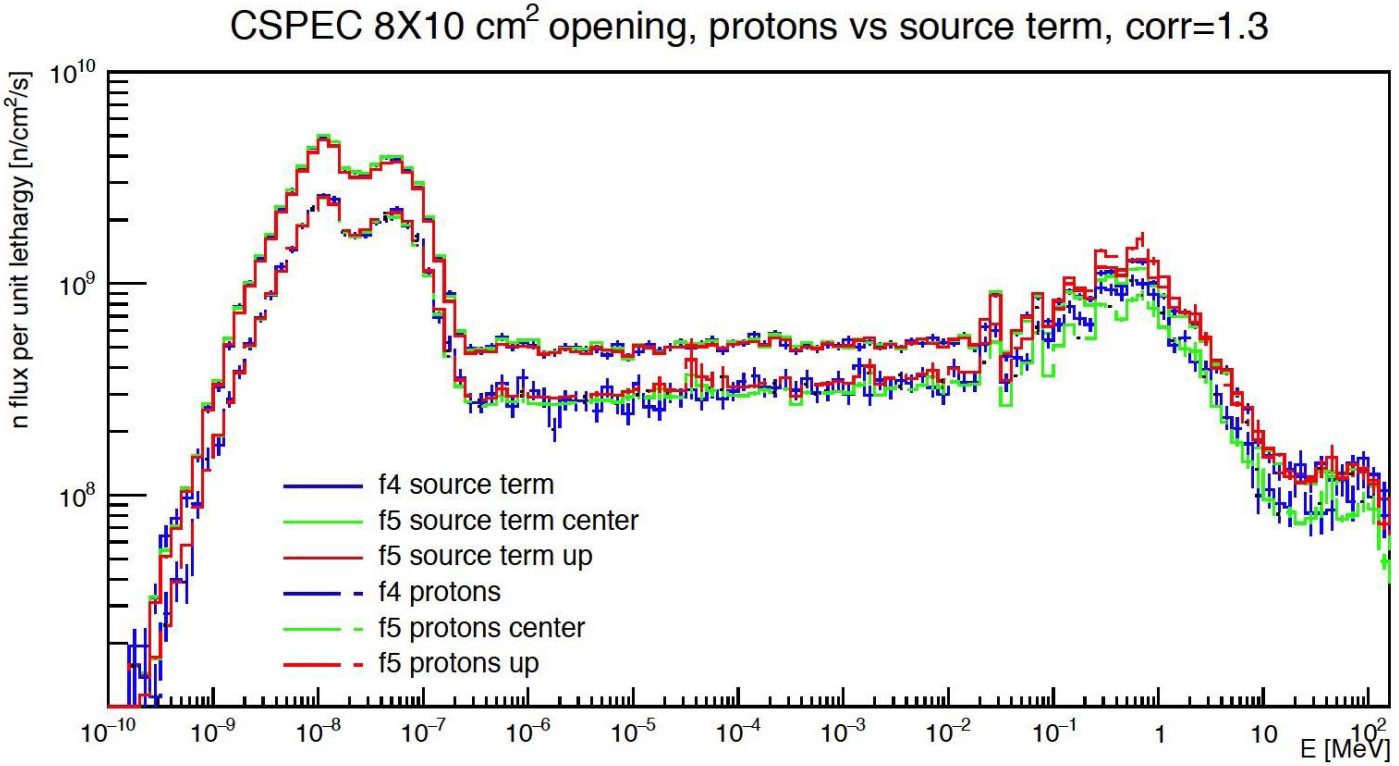
→Neutron creation by spallation of protons on W target
→Moderating to the thermal/cold regime
→Emitting through beam extraction
→Transporting through 160m of guide
→Tally at sample position

Comblayer model post-processing

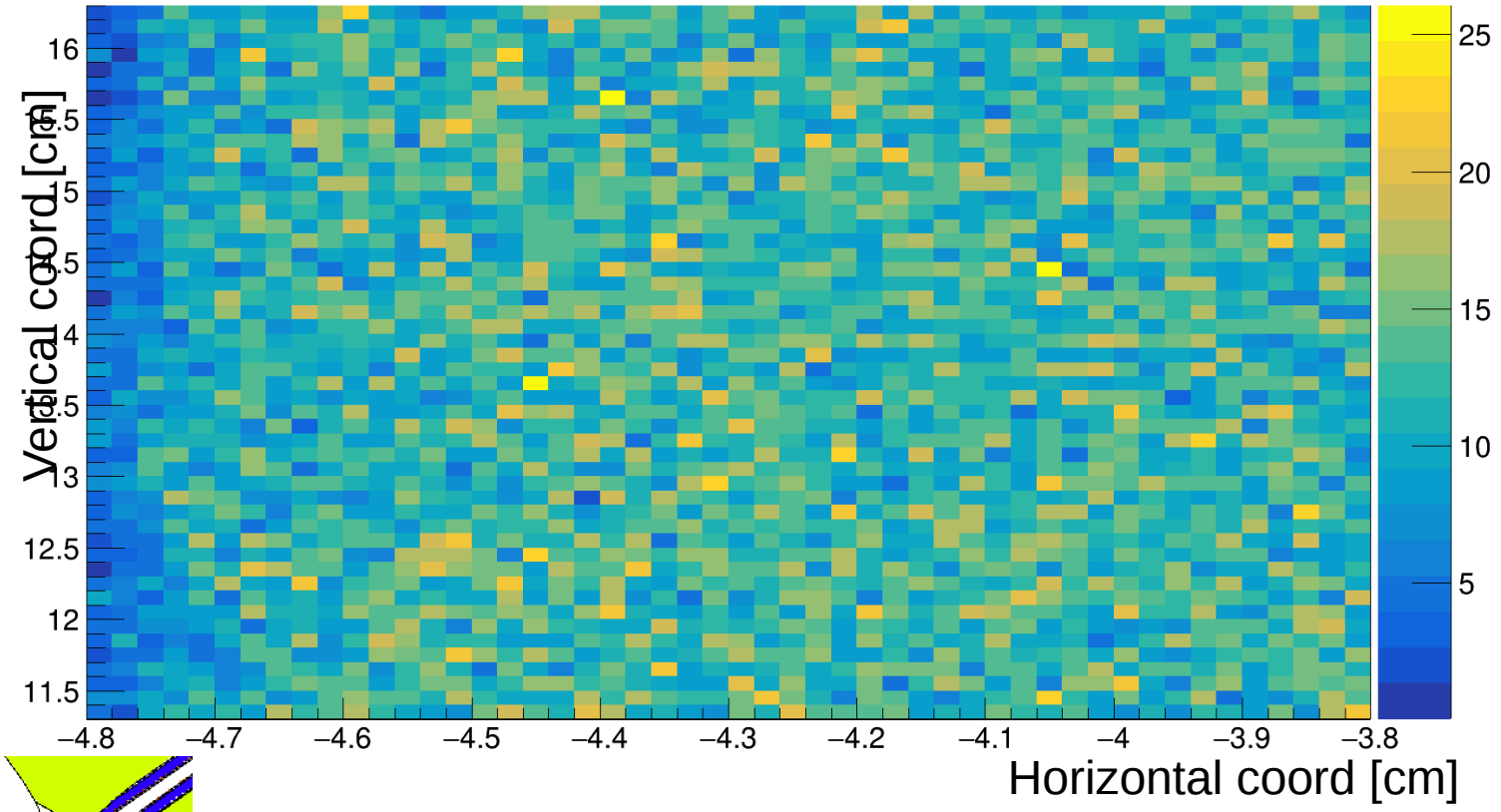
But the first three steps:
→ Neutron creation by spallation of protons on W target
→ Moderating to the thermal/cold regime
→ Emitting through beam extraction

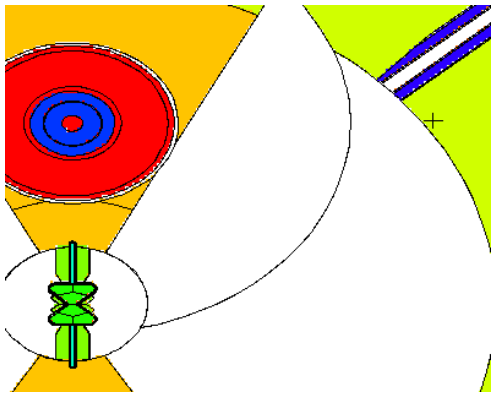
Are exceedingly inefficient => impossible to gather statistics at the sample position

=> Switch to use neutron source at the beam extraction (r=2m). Procedure is described in ESS-0416080



Model validation: input at 2m

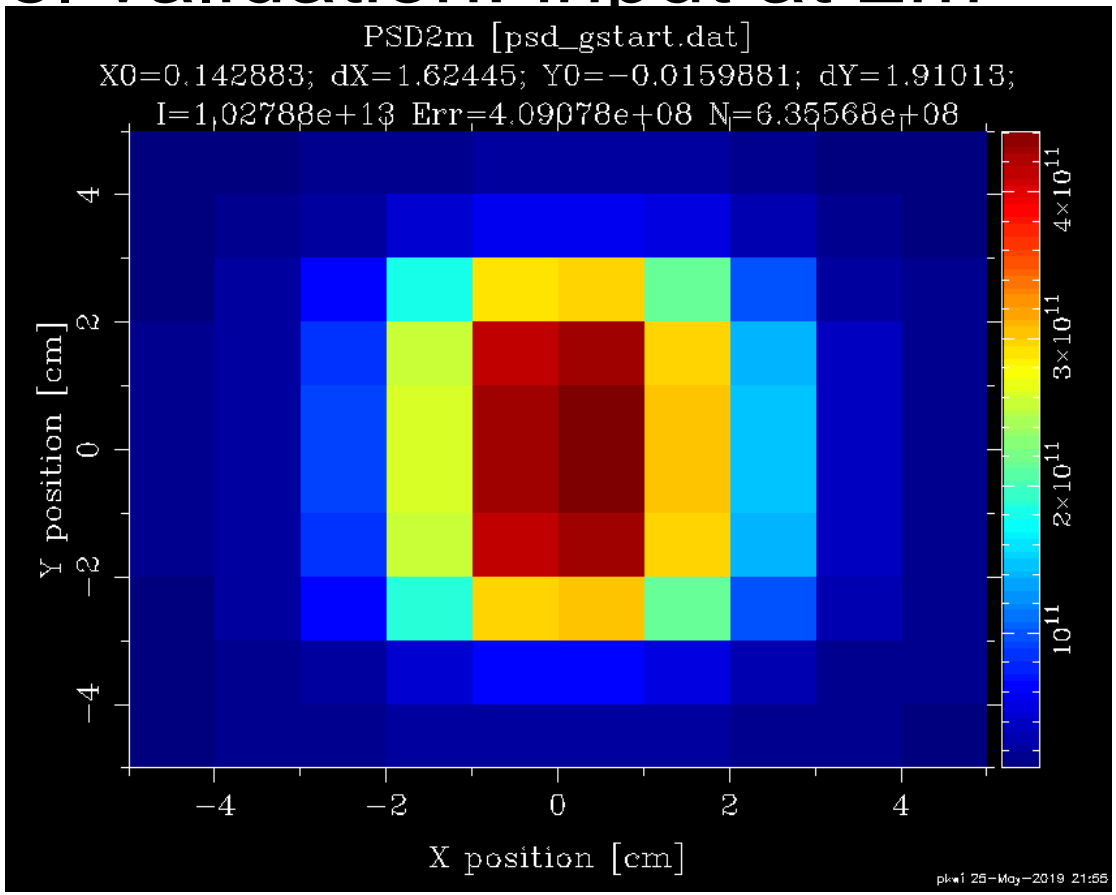




Integrated flux (0-100meV): 1.1E11 n/cm2/s ←Comblayer

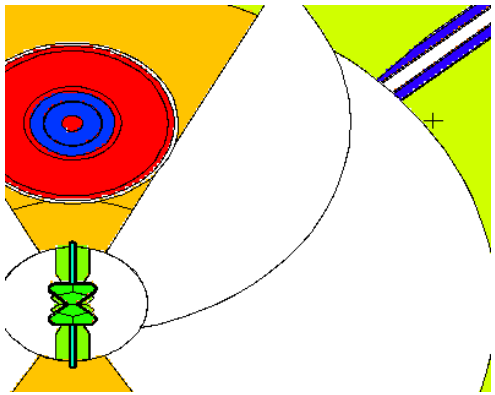
This can be directly compared with McStas Mcpl

Model validation: input at 2m



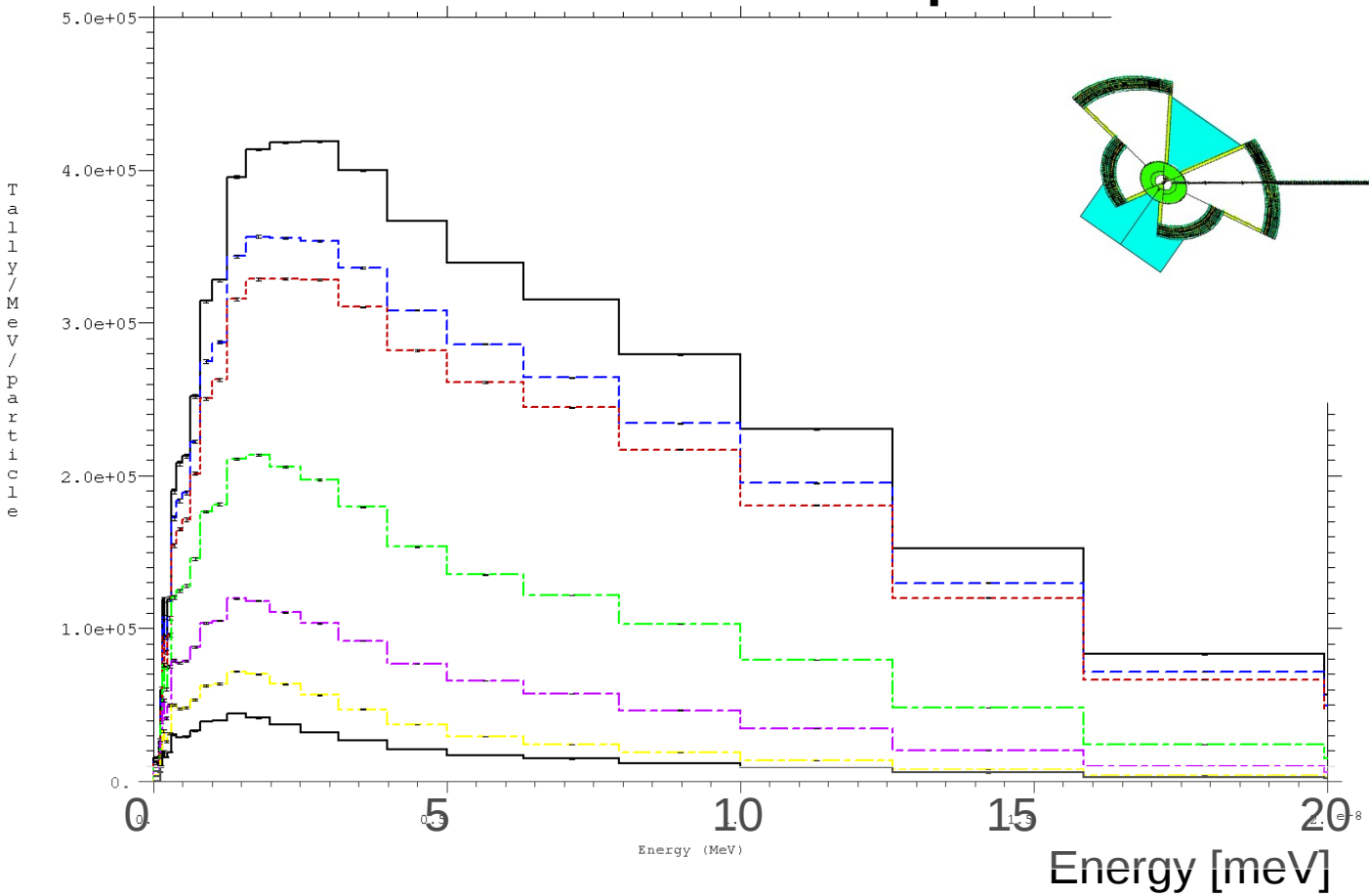
Vertical coord [cm]

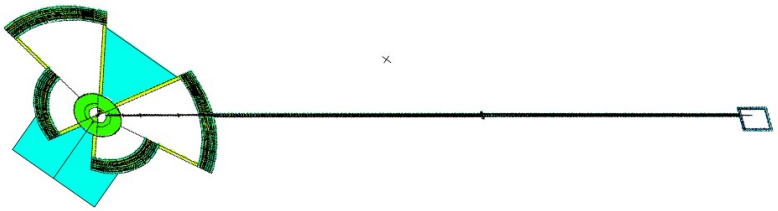
Horizontal coord [cm]



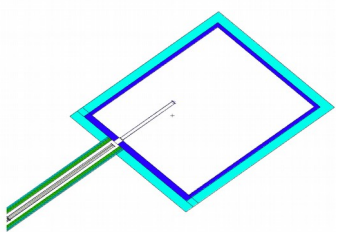
Integrated flux (0-100meV): 1.0E11 n/cm2/s ←McStas

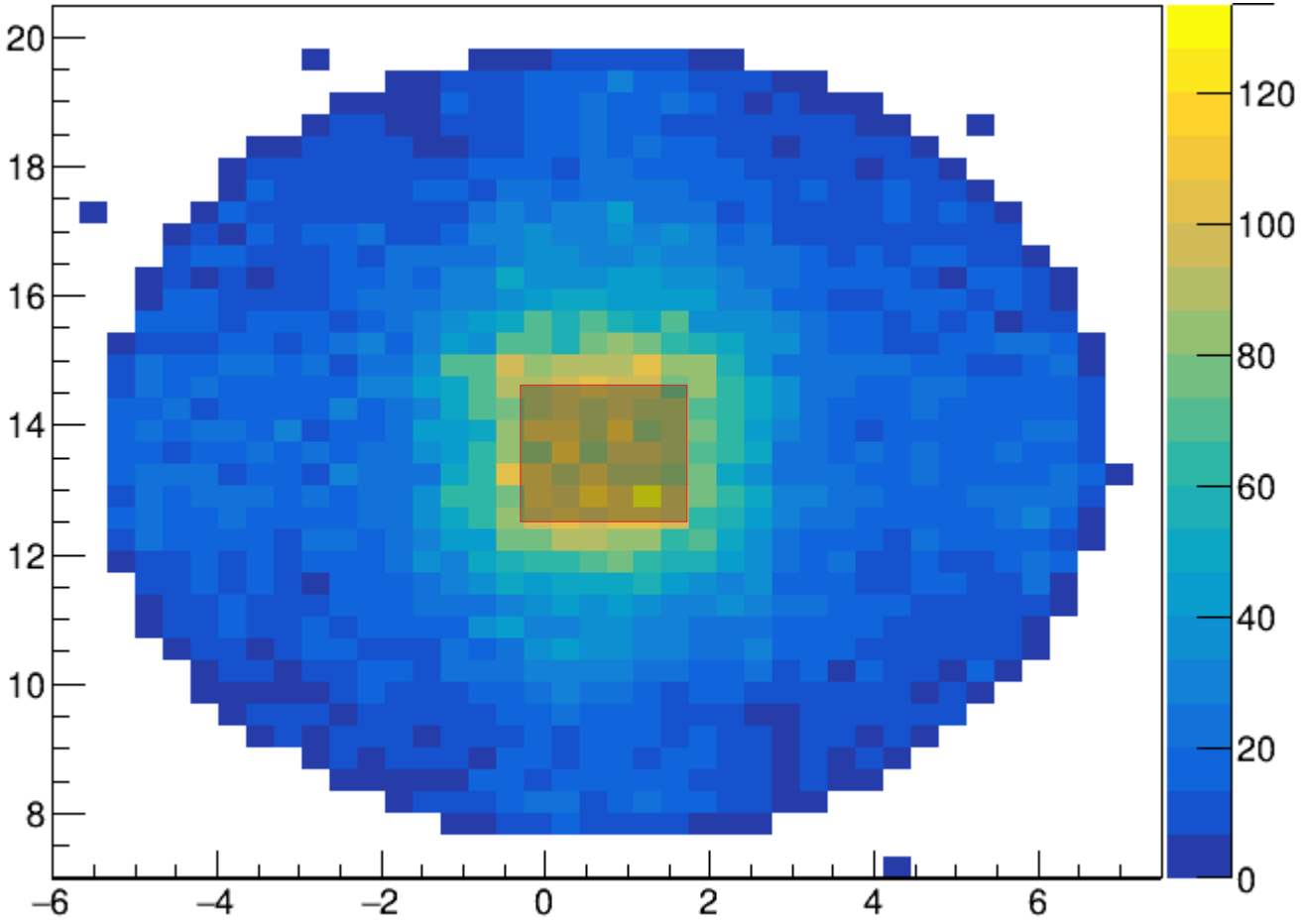
Model validation: spectra along guide



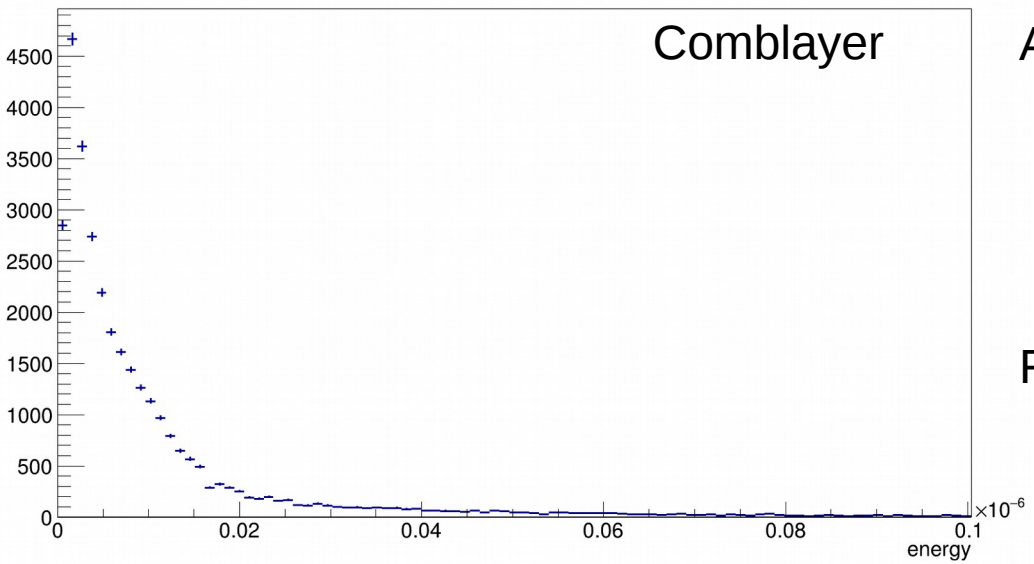


Model validation: distribution at sample

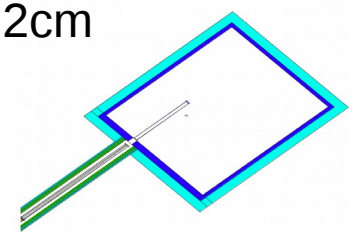




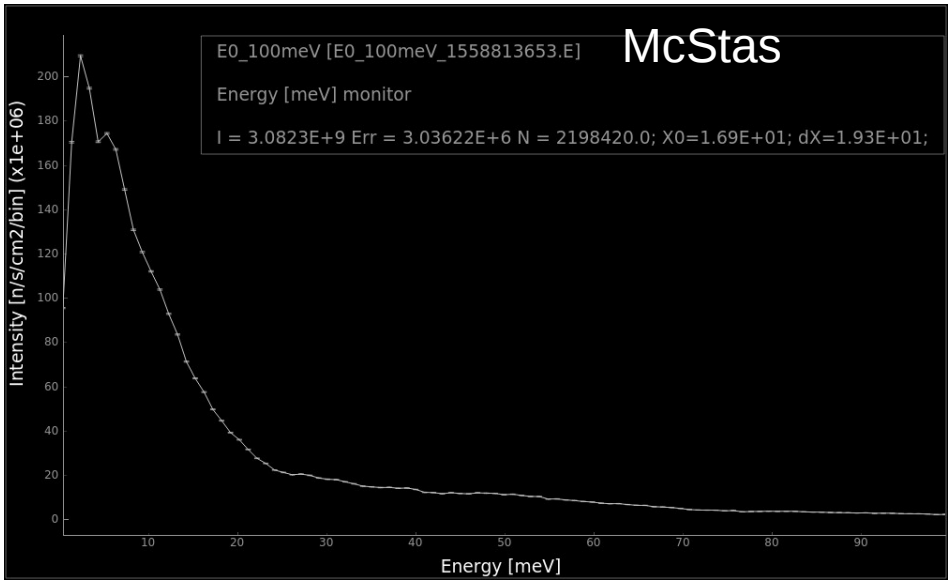
Comblayer vs McStas results



Averaged over 2cm x 2cm



Flux: <u>2.8E8 n/s/cm2 (<100meV)</u>



Flux: <u>7.7E8 n/s/cm2 (<100meV)</u>

i.e. x3 difference: under investigation..

Conclusions & next steps

- Factor 3 difference between McStas and MCNP observed
- Some of it can be attributed Al windows, but work ongoing to resolve/improve resemblance

- Next, study noise at sample
  - .Fast neutrons + gammas
  - Compare to Scatterlogger: mixed approach where reflection is carried by McStas but lost weight handed to MCNP