

D8.13

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

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Introduction

BIFROST is chosen as an example to illustrate the capabilities of the MCNP-McStas coupling.

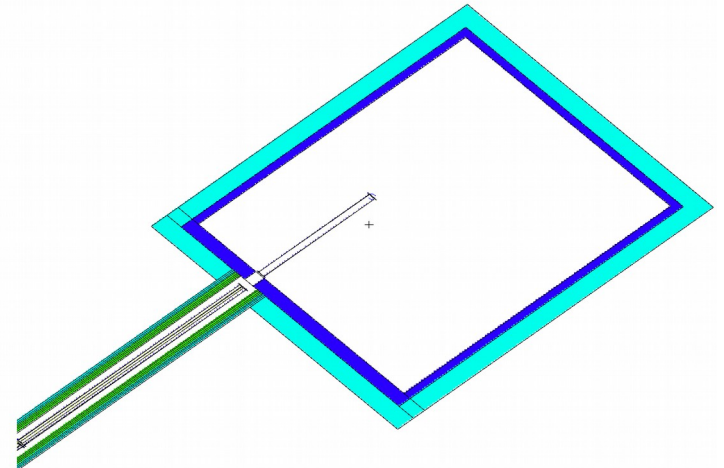
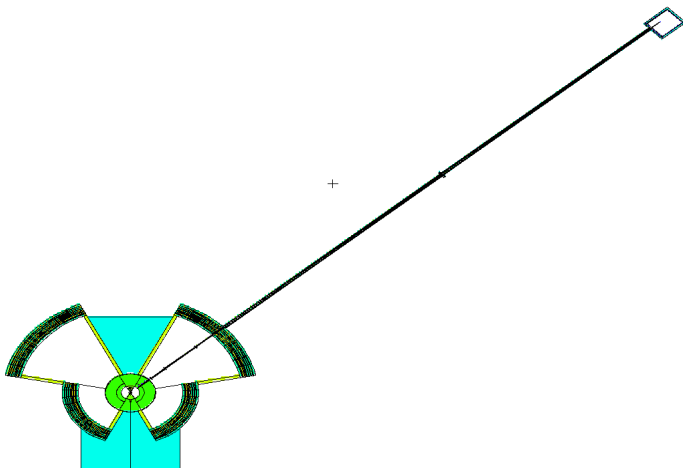
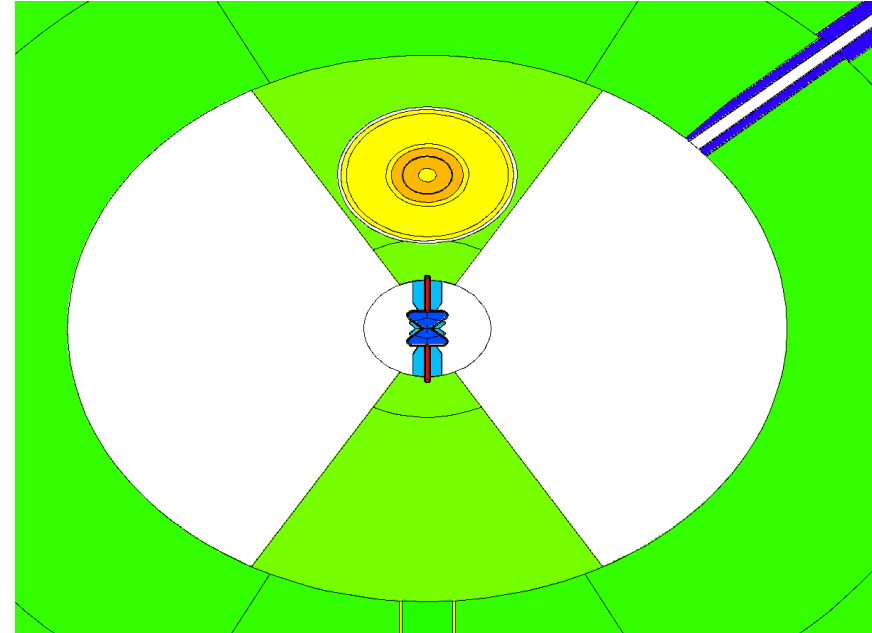
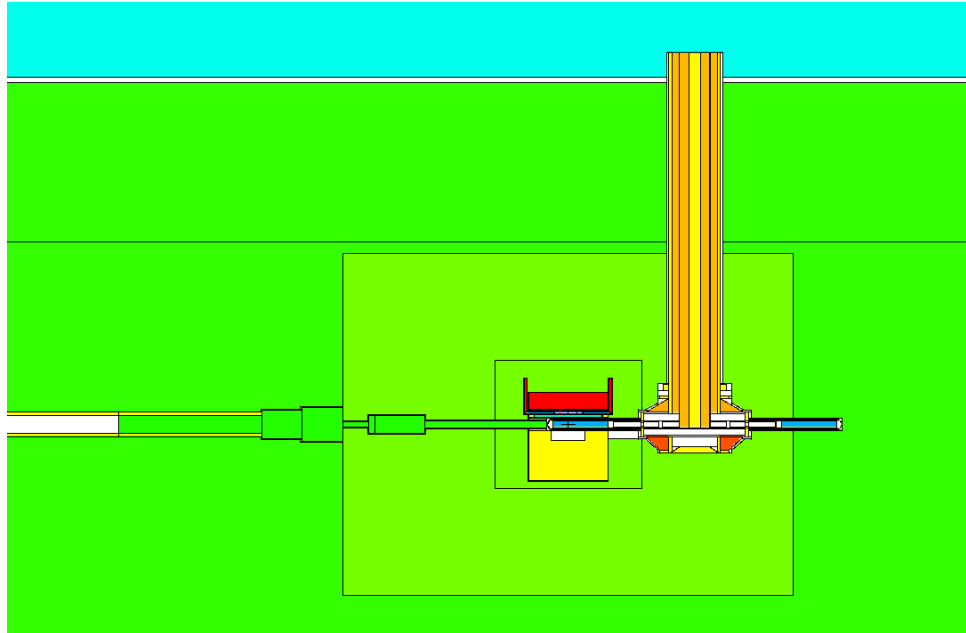
→ Long instrument, elliptical guide

Aim: assess signal and noise (and ratios) at the sample position

Several means to this - focus here on:

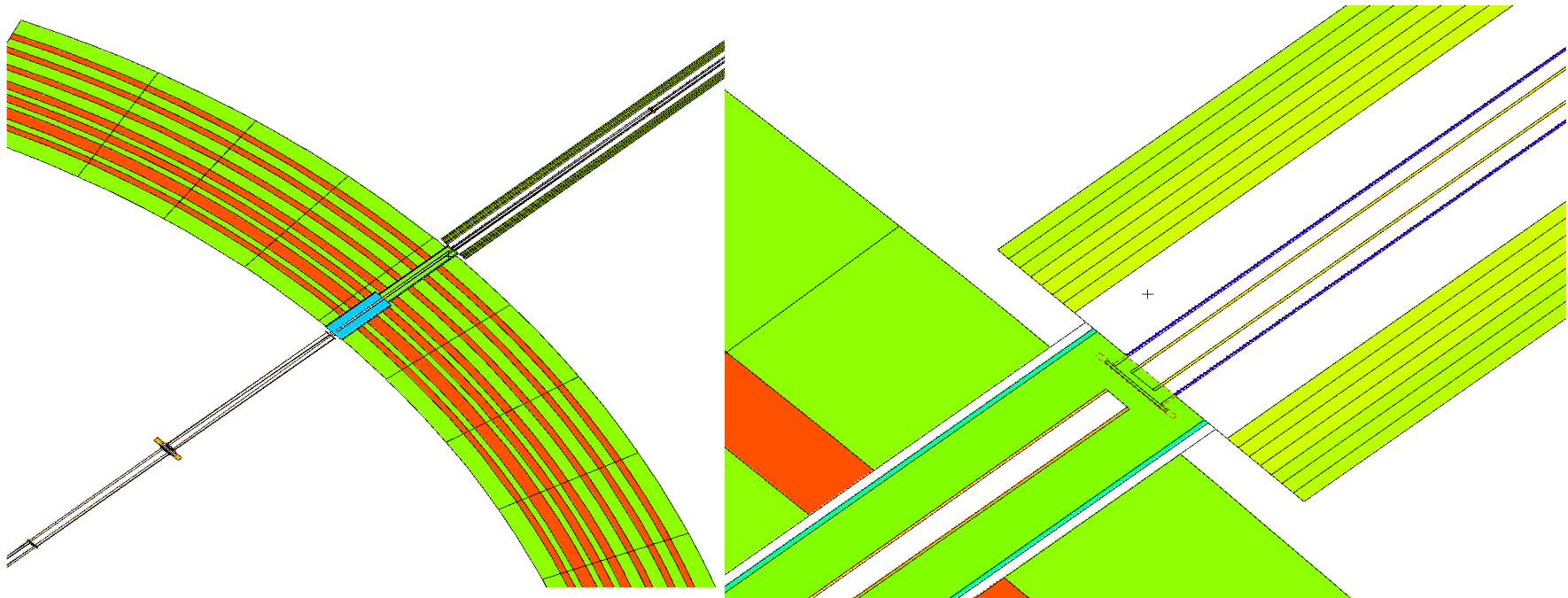
- Comblayer (i.e. MCNP) using McStas only indirectly through embedded SM patch
- MCNP → McStas (via MCPL)

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/Octavio (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

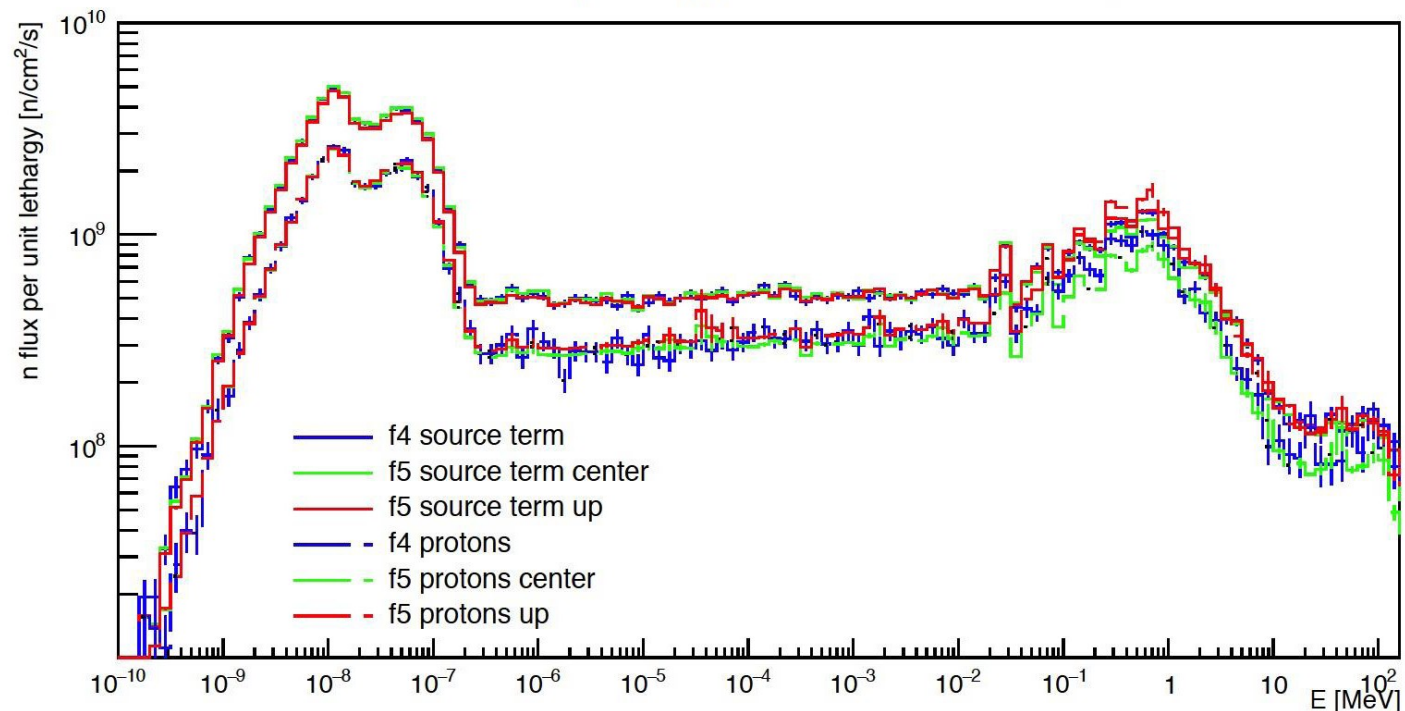
But the first three steps:

- Neutron creation by spallation of protons on W target
- Moderating to the thermal/cold regime
- Emitting through beam extraction

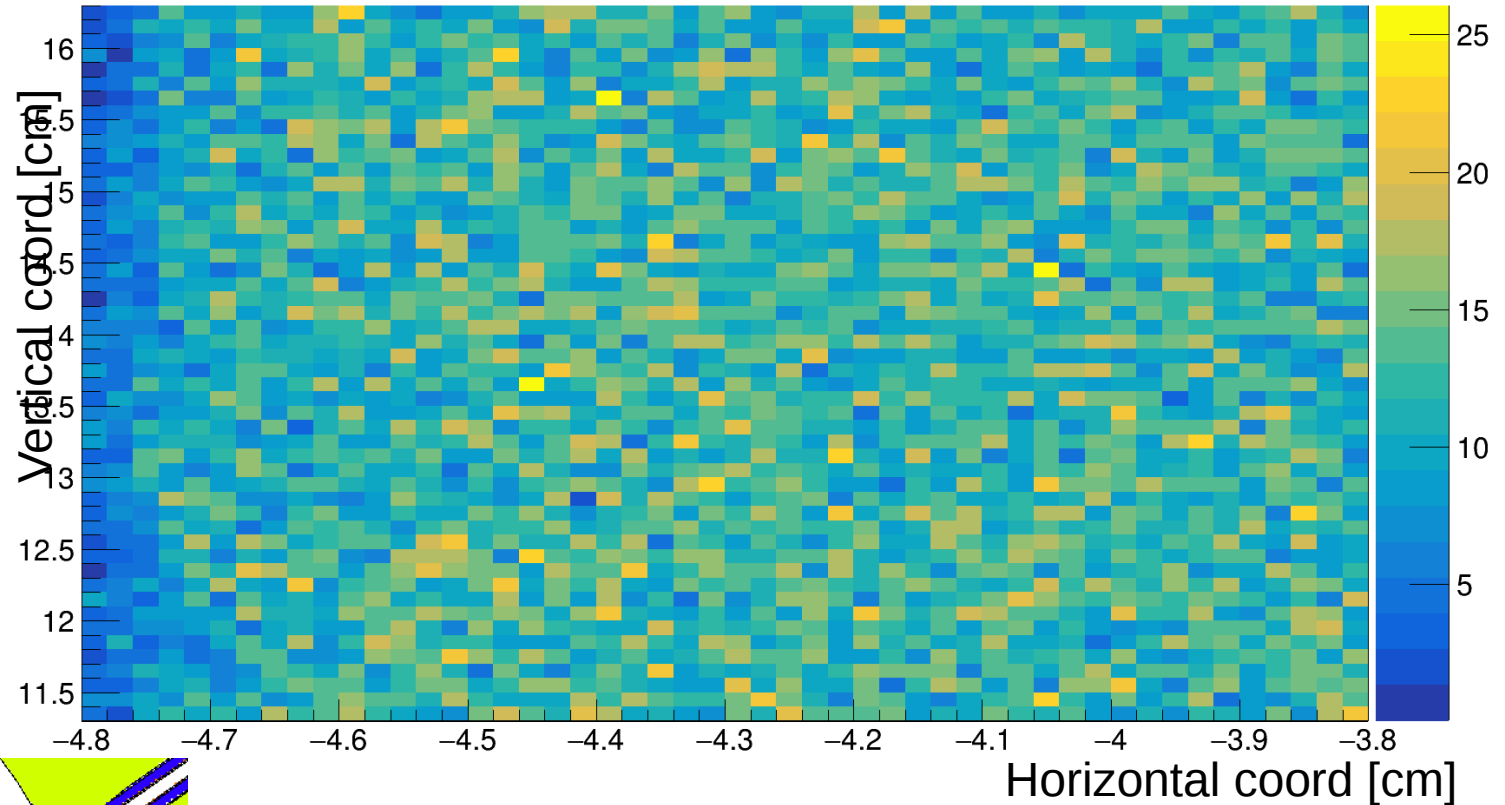
Are exceedingly inefficient => impossible to gather statistics at the sample position

CSPEC 8X10 cm² opening, protons vs source term, corr=1.3

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

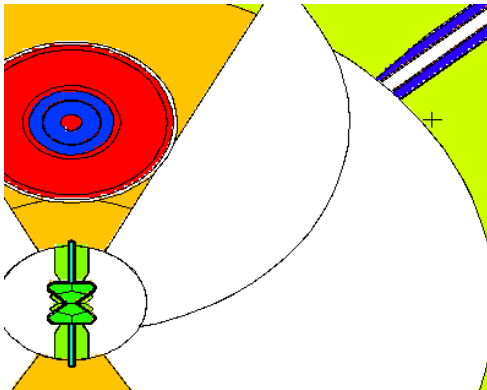


Model validation: input at 2m



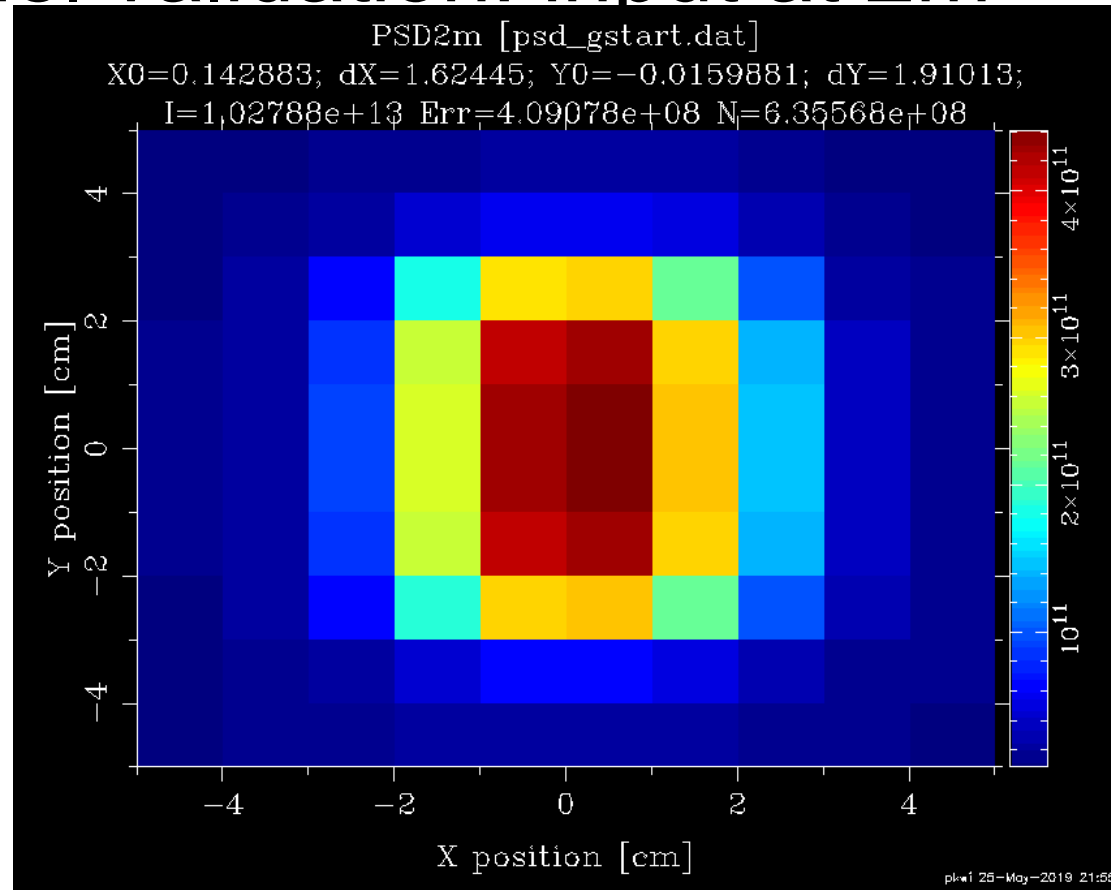
Integrated flux (0-100meV): 1.1E11 n/cm²/s ← Comblayer

This can be directly compared with McStas Mcpl



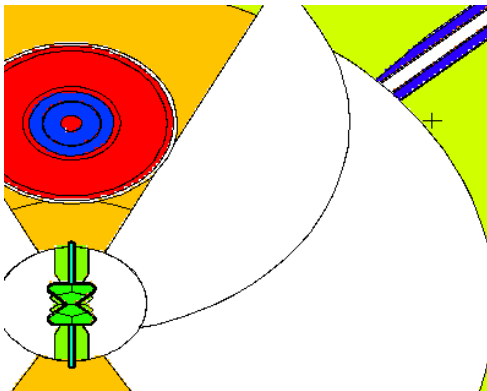
Model validation: input at 2m

Vertical coord [cm]

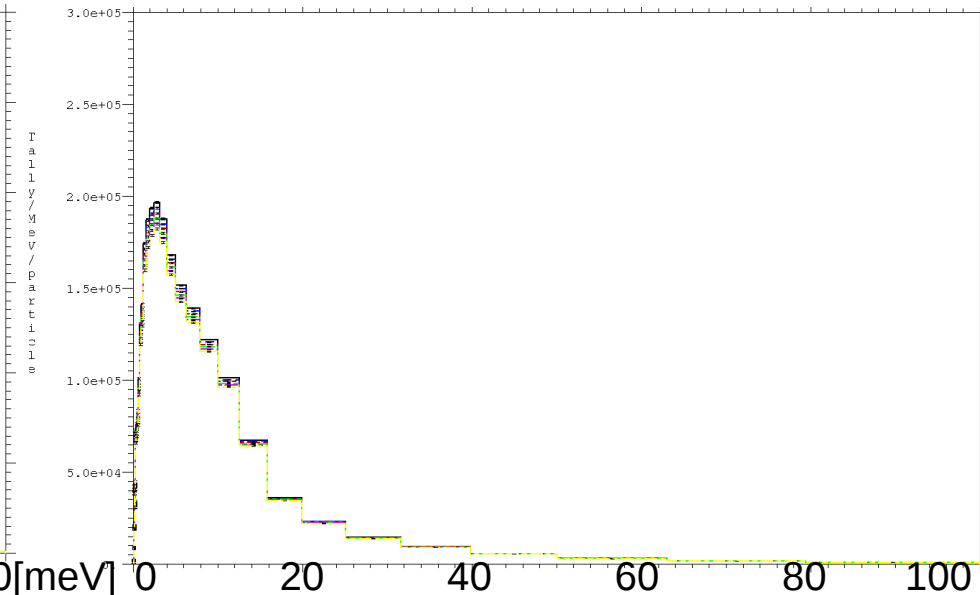
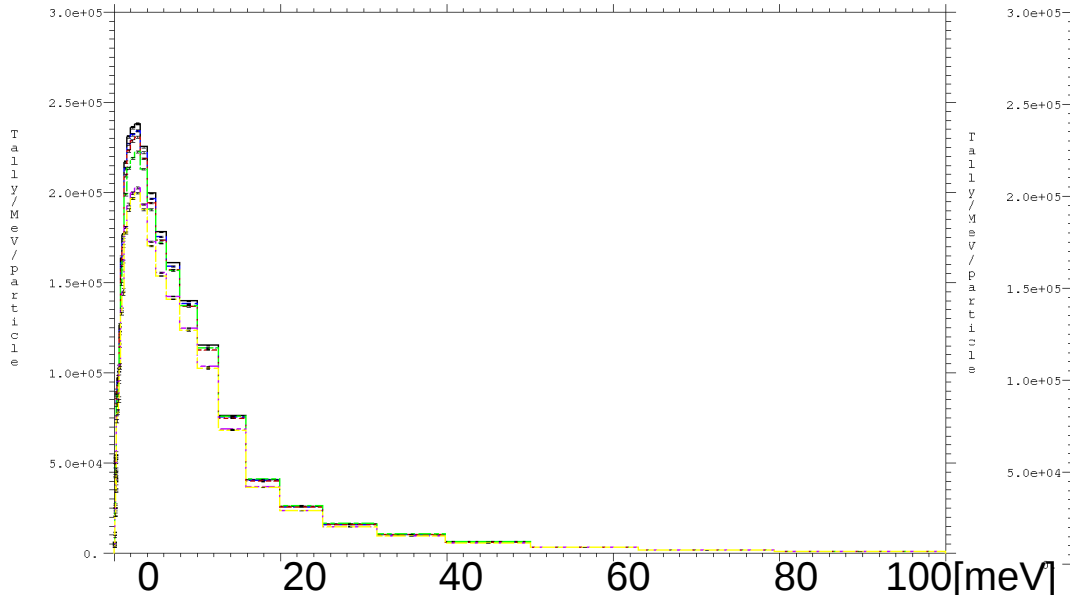
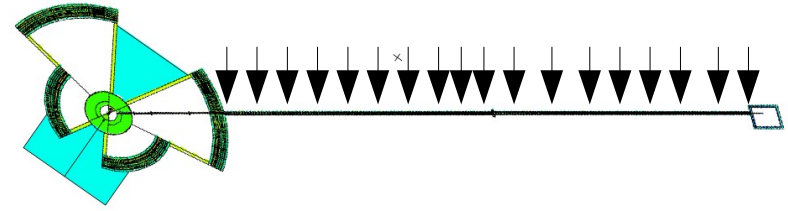
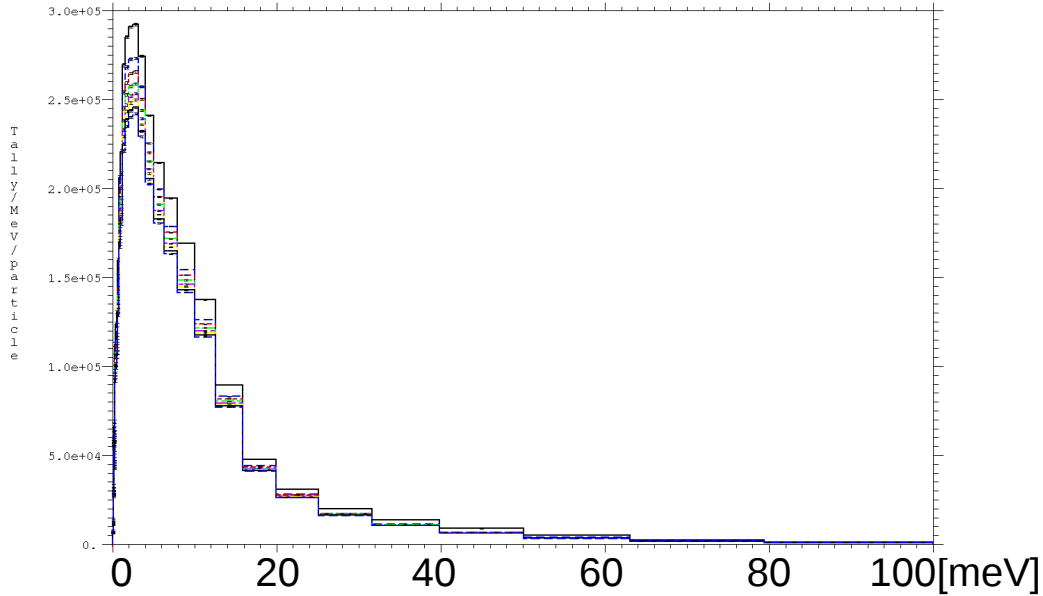


Horizontal coord [cm]

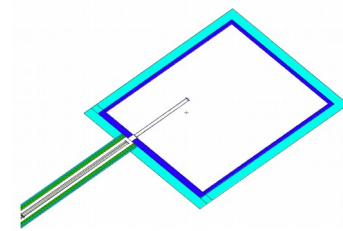
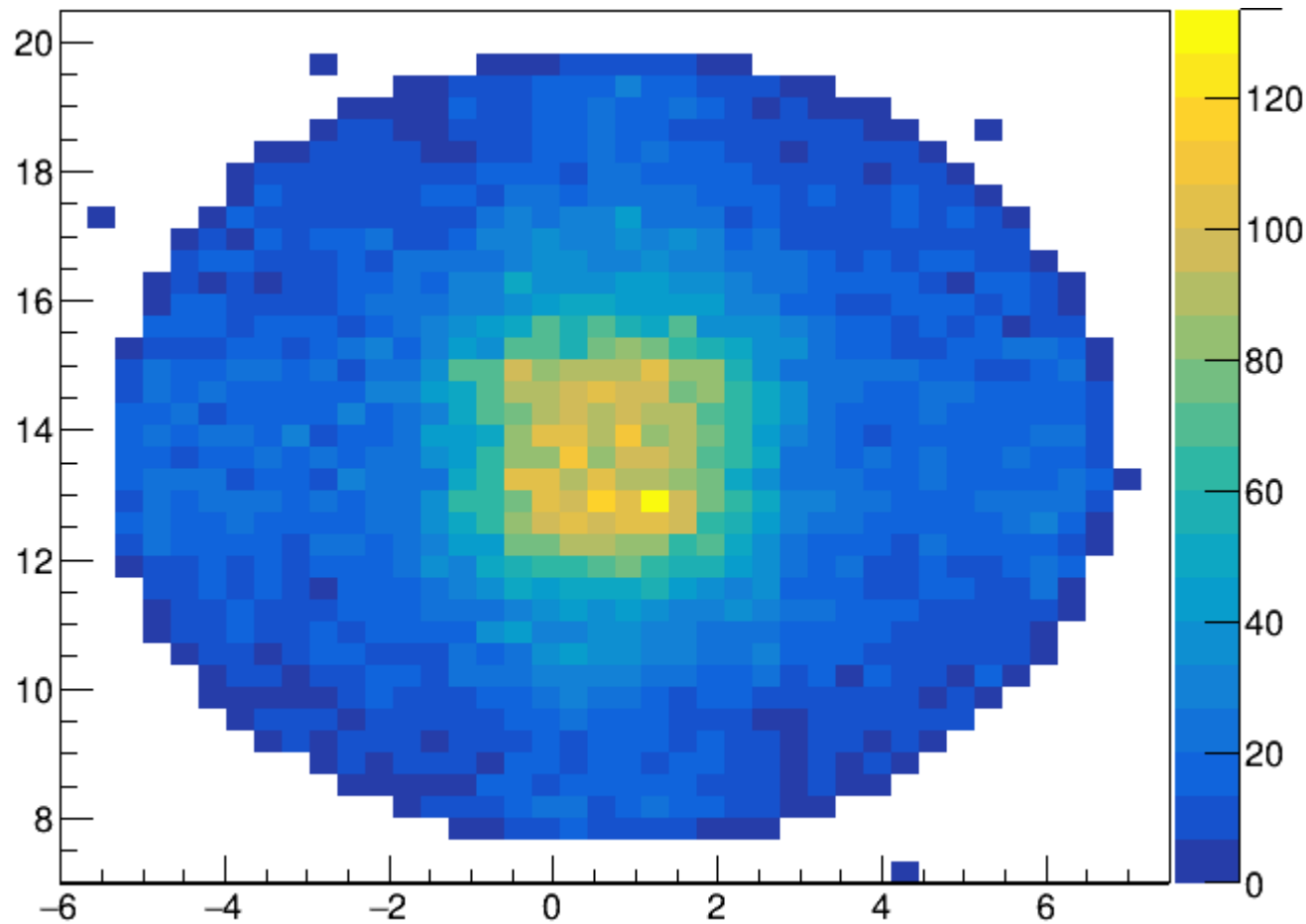
Integrated flux (0-100meV): 1.0E11 n/cm2/s ← McStas



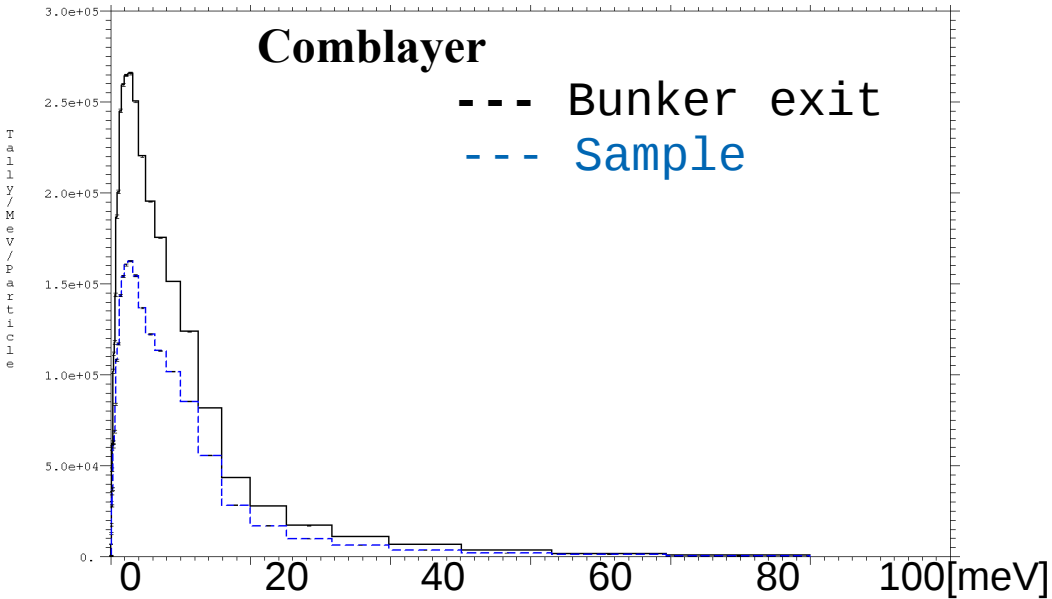
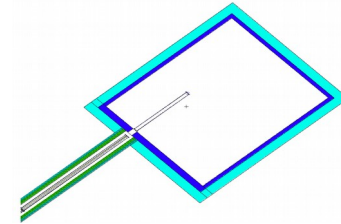
Model validation: spectra along guide



Model validation: distribution at sample



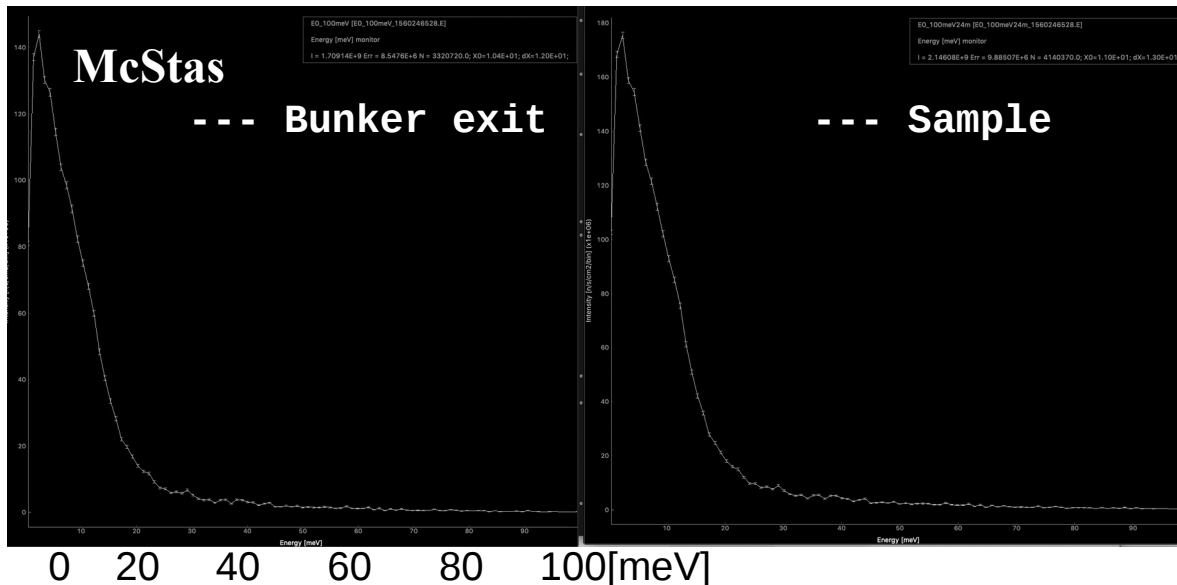
Comblayer vs McStas results



Comblayer loss: 37% (<100meV)

McStas loss: 22% (<100meV)

But, instruments are not identical



Conclusions & next steps

- Comblayer used to generate initial MCNP model
- Some adjustments needed to get a working model
- Using Reflectivity card functionality of ESS-Bilbao (thanks!) allows neutrons transported through 150m guide to sample
- Results are compared with McStas (MCPL based source) and show good resemblance
- Next, finalize documentation – include examples

