ISIS-TS1 modeling & neutron production benchmark studies

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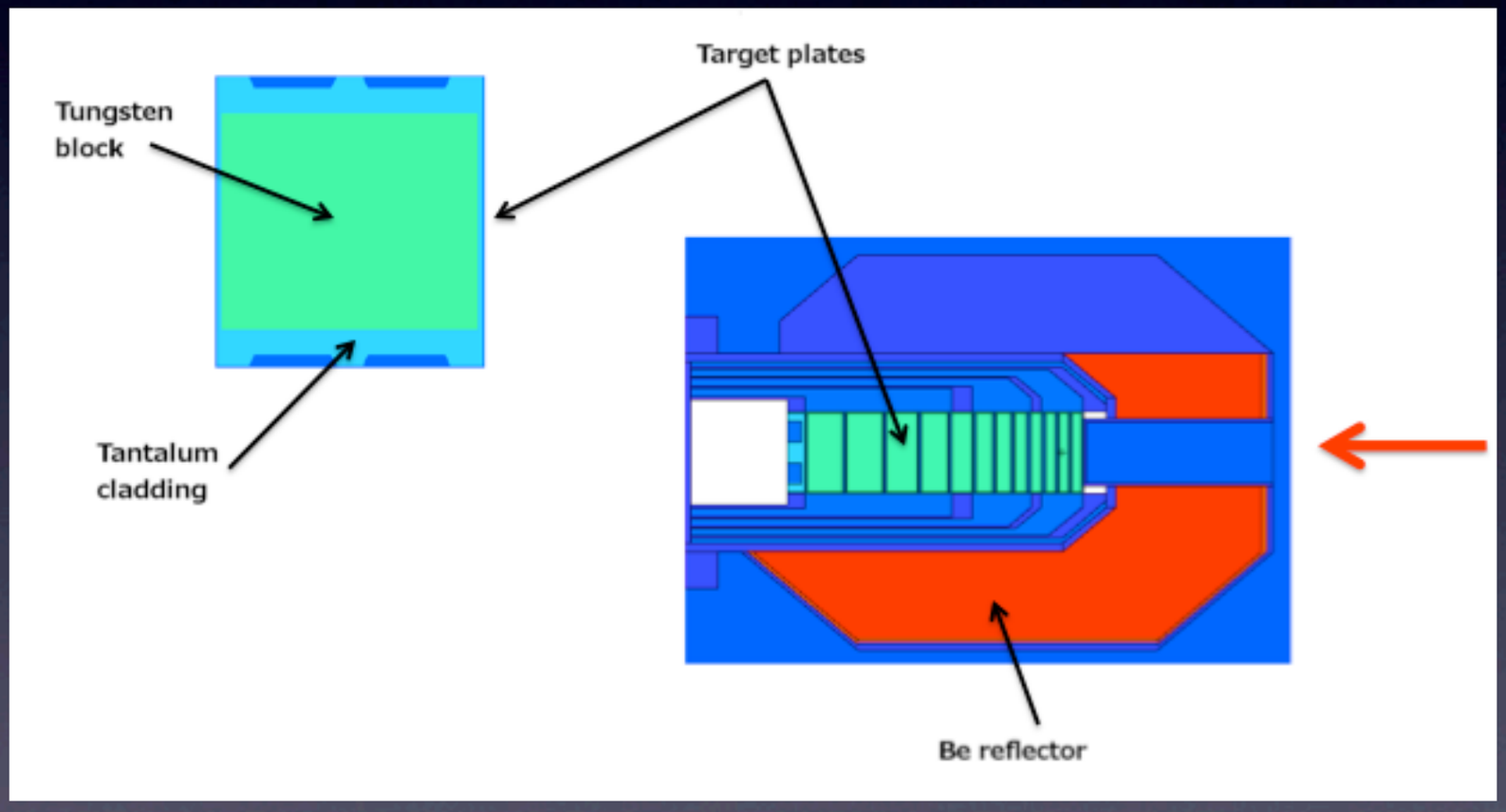
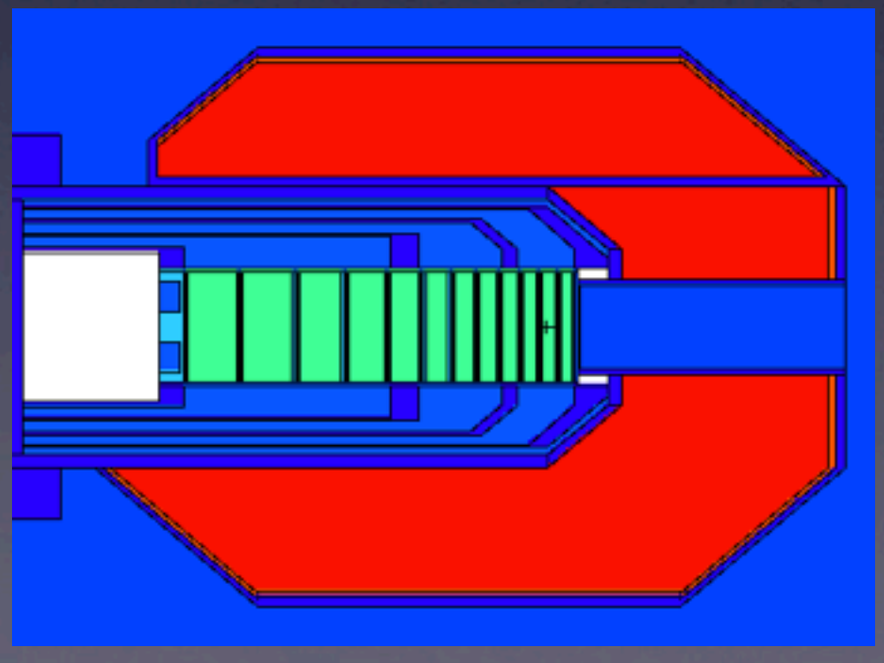
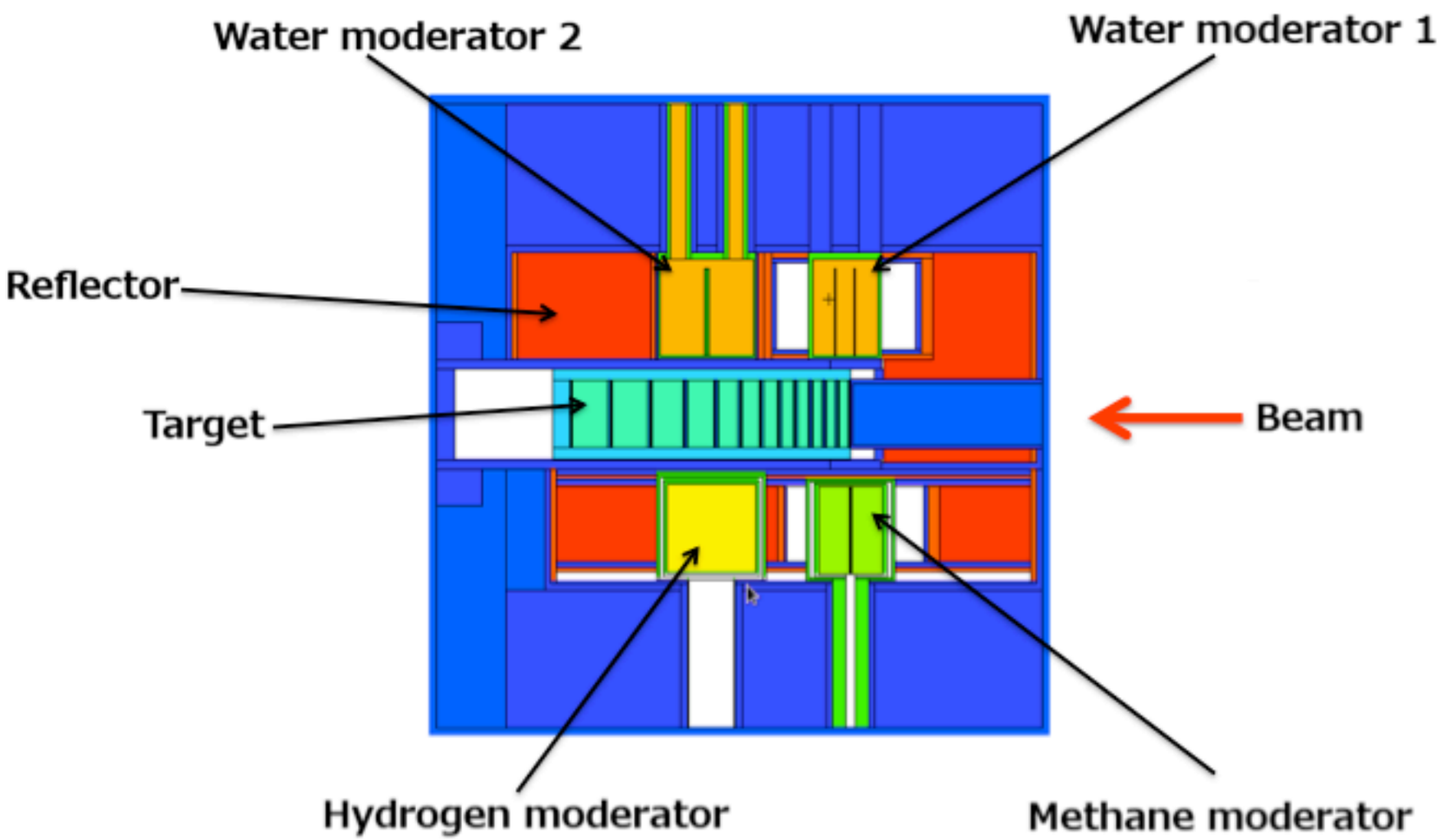
RAL - 28 Feb 2013

MCNPX geometry

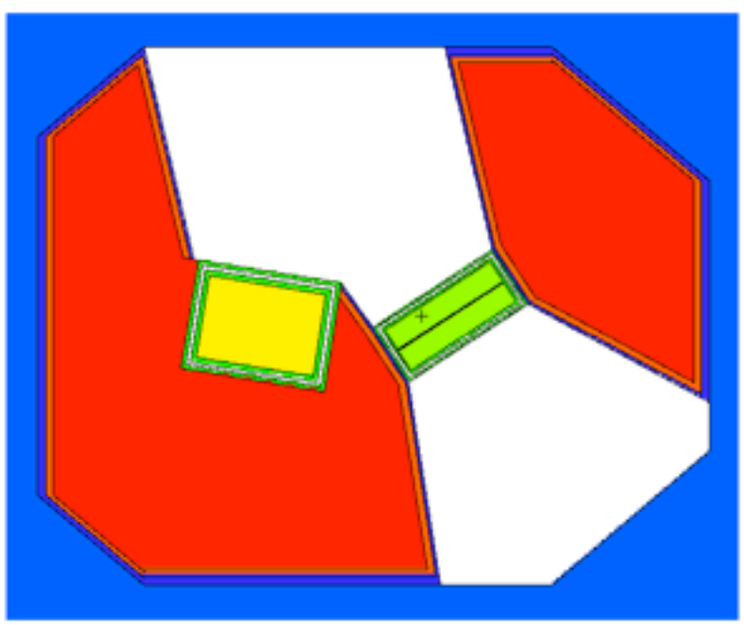
- The target



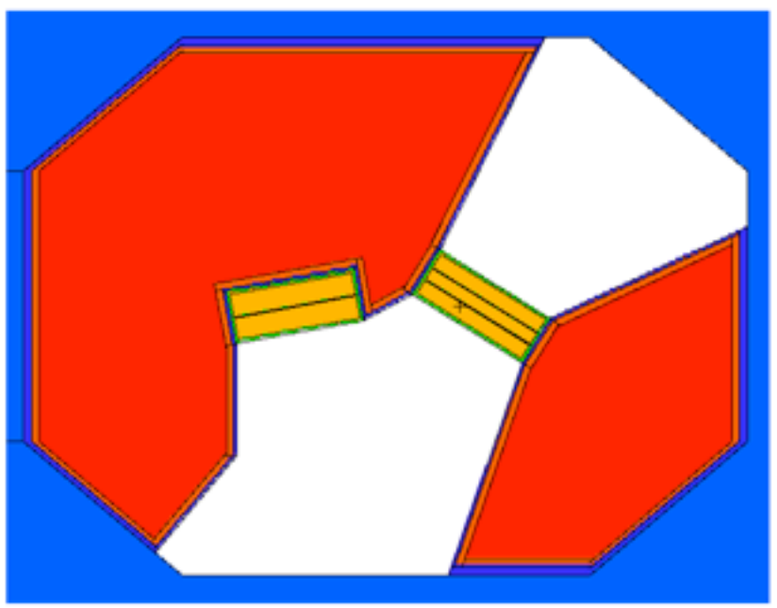


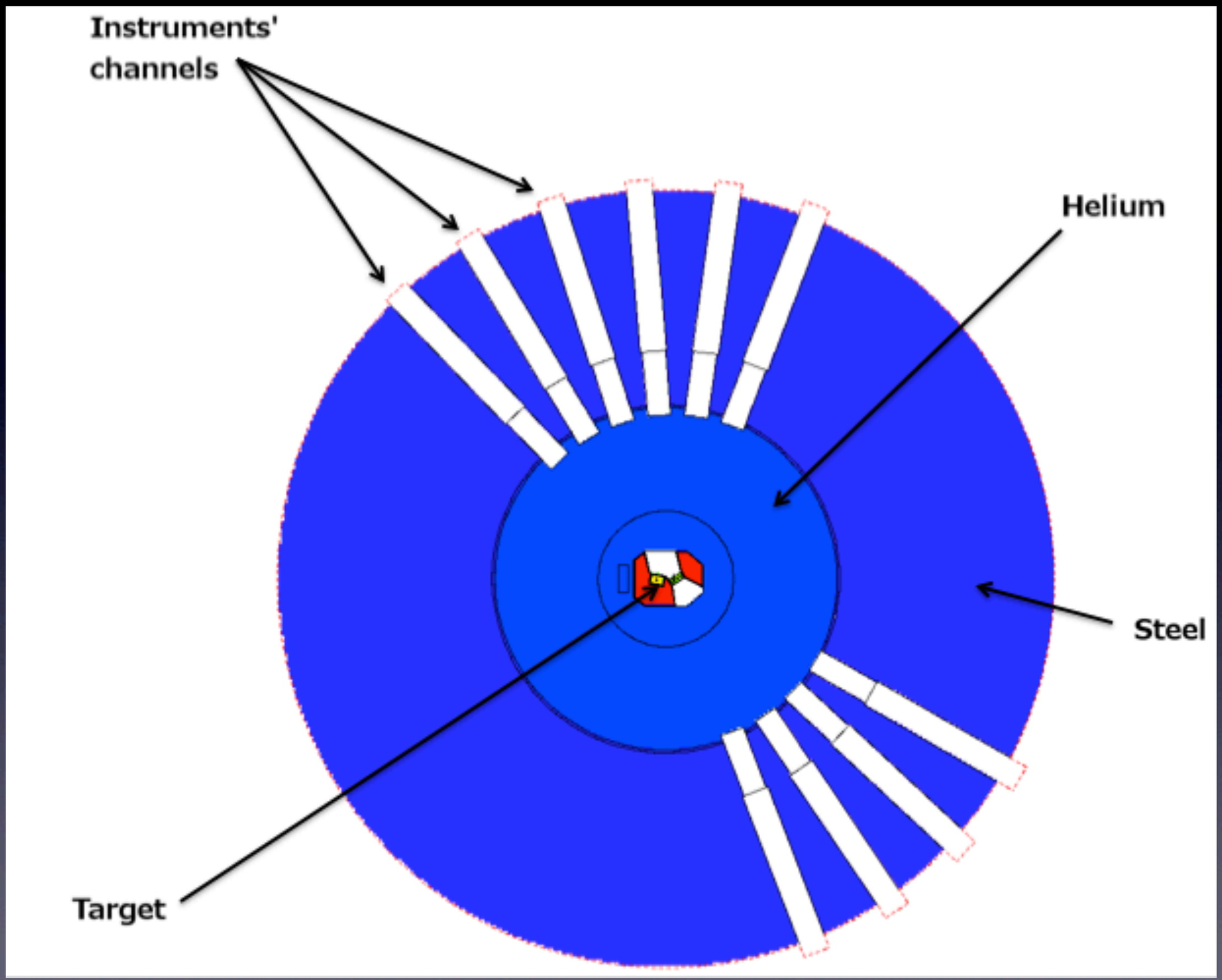


Lower moderators



Upper moderators



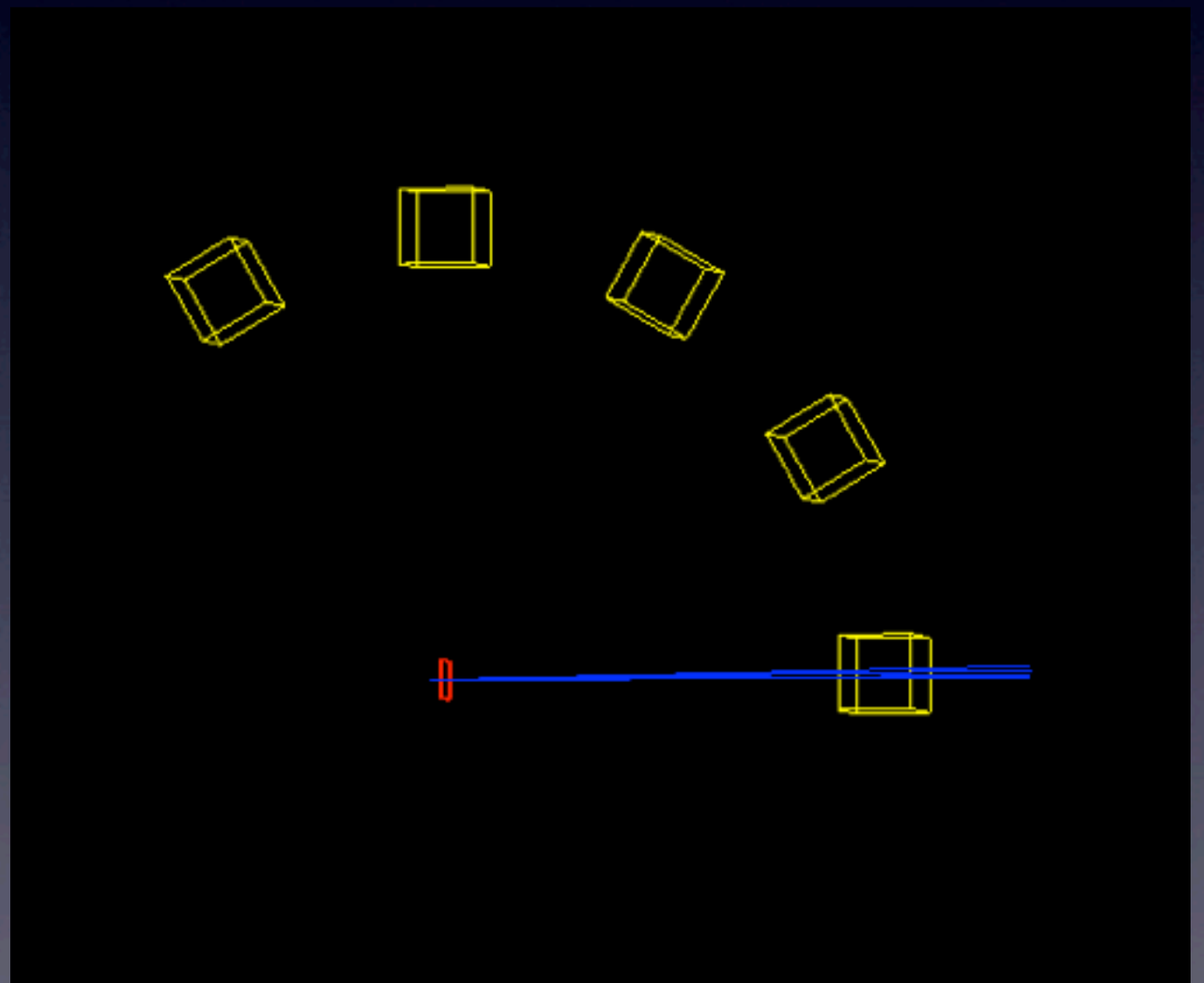

Instruments'
channels
Helium
Steel
Target

GEANT4

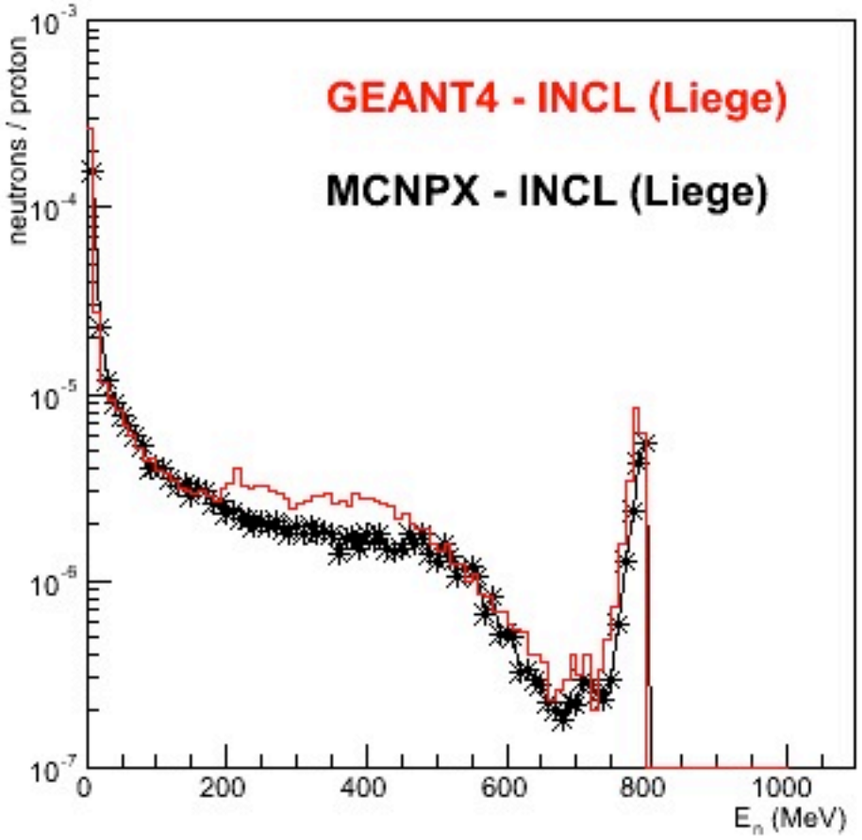
- Running the code ...

Neutron production - thin W target

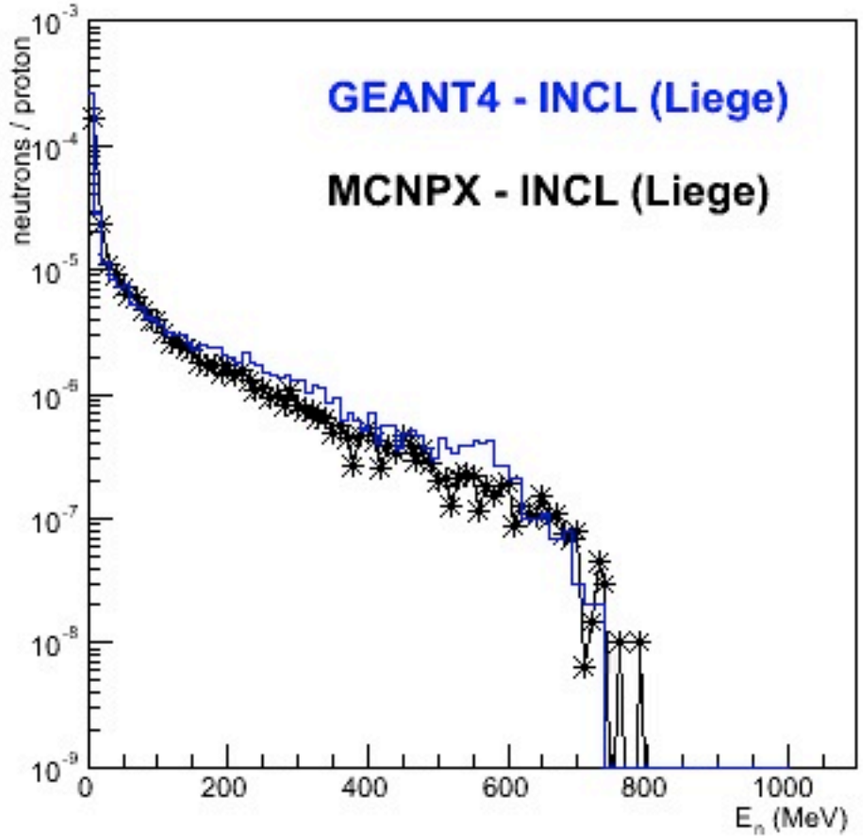
- 1 mm W target
- 800 MeV protons
- neutron counters at various angles + total neutron production



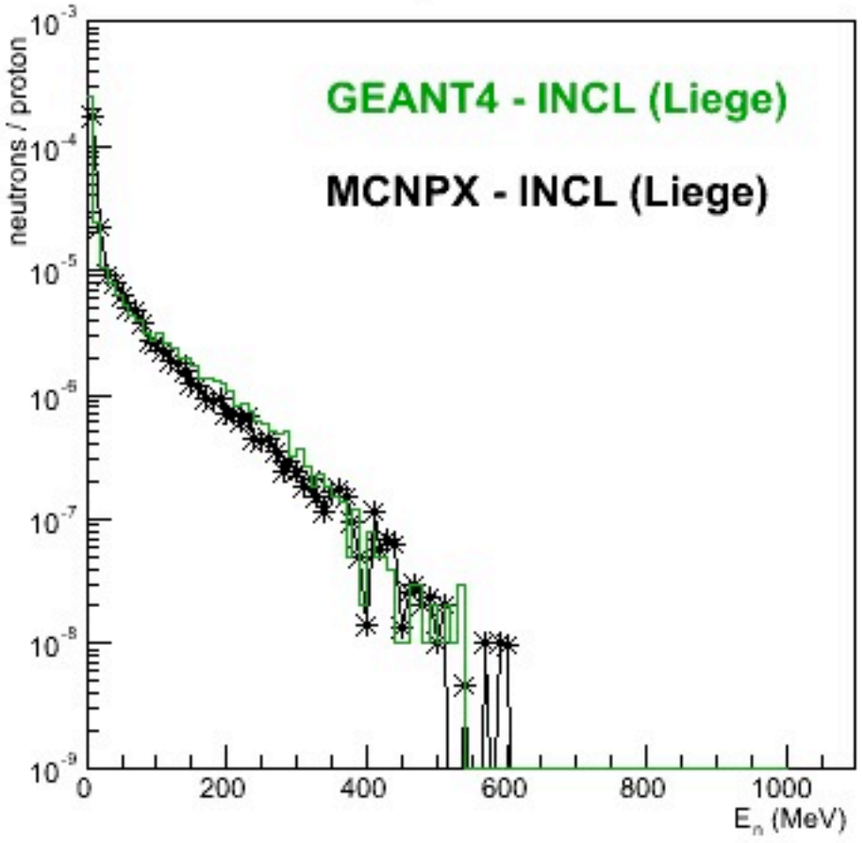
neutron yields at 0°



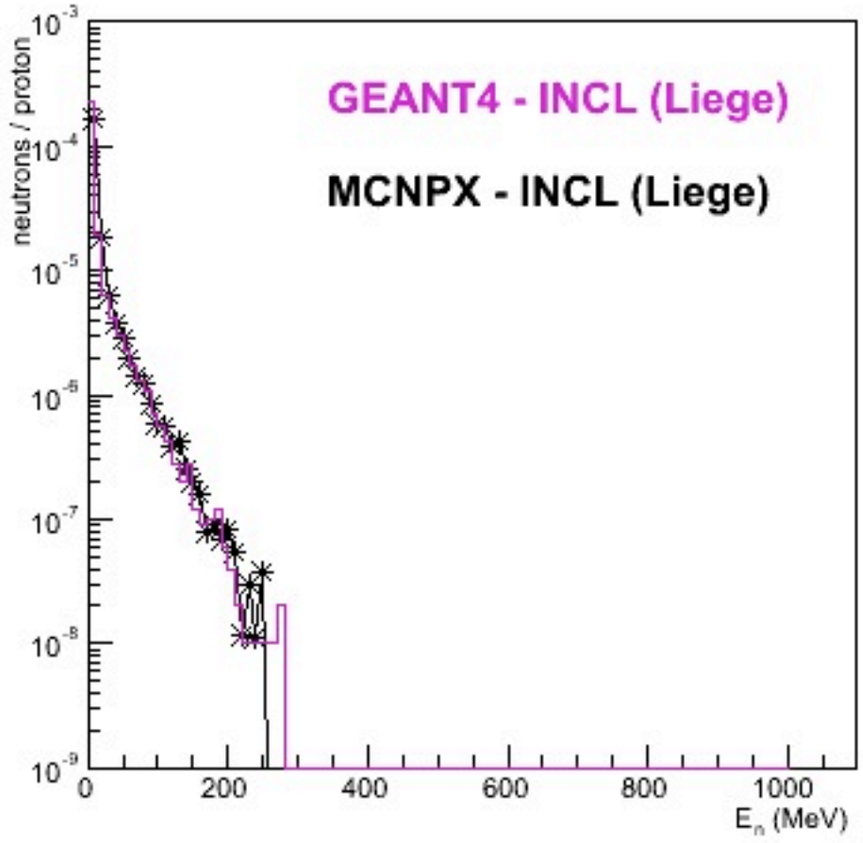
neutron yields at 30 °

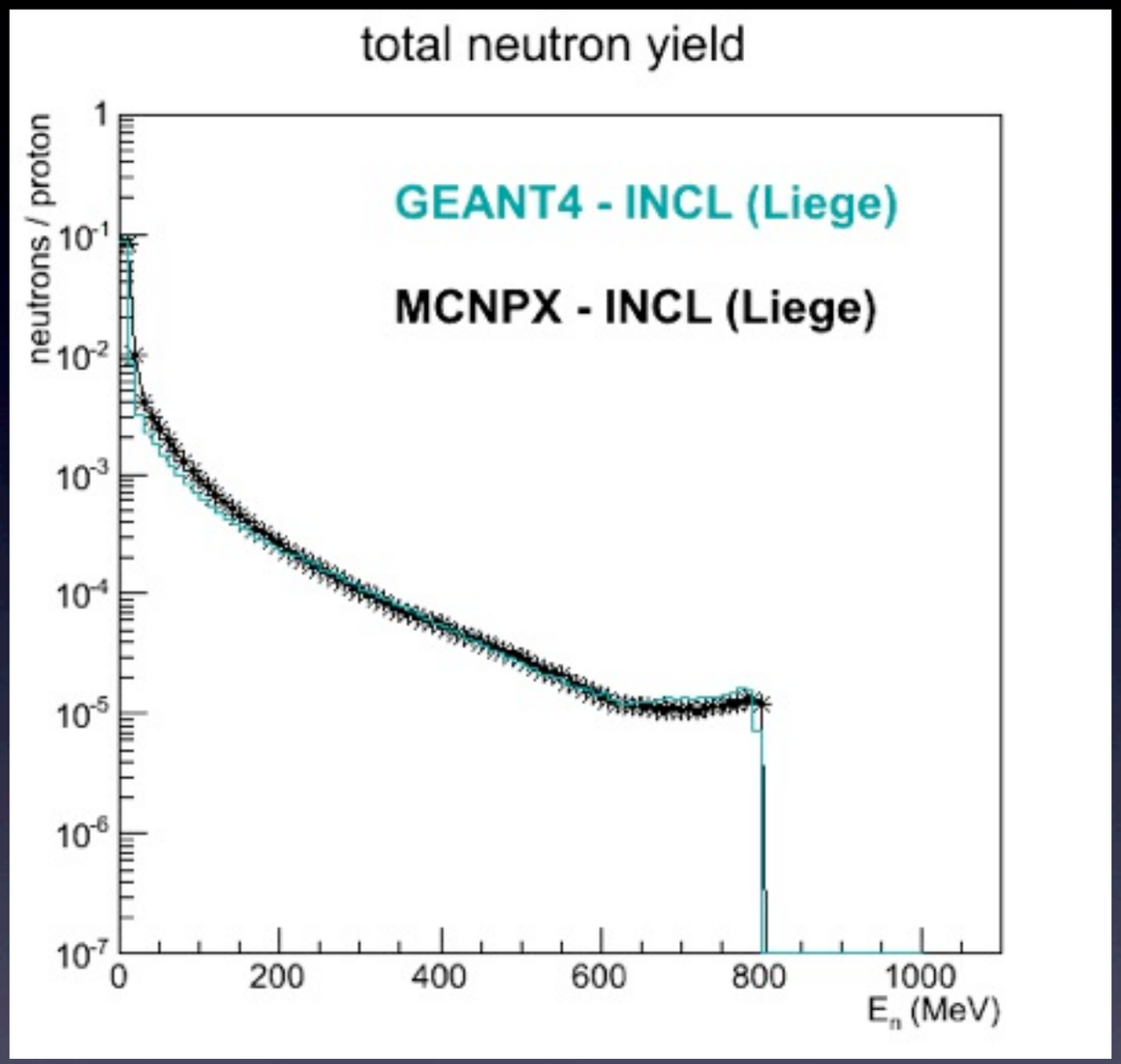


neutron yields at 60 °



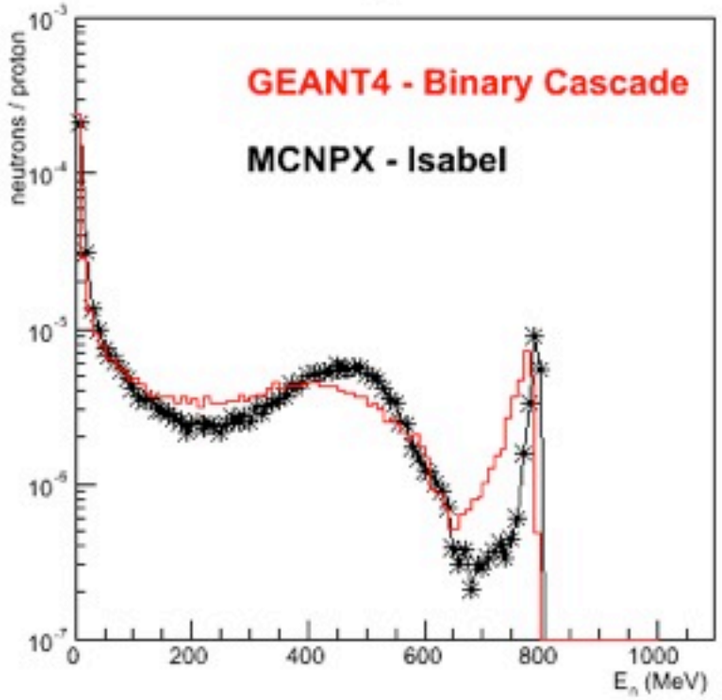
neutron yields at 120°

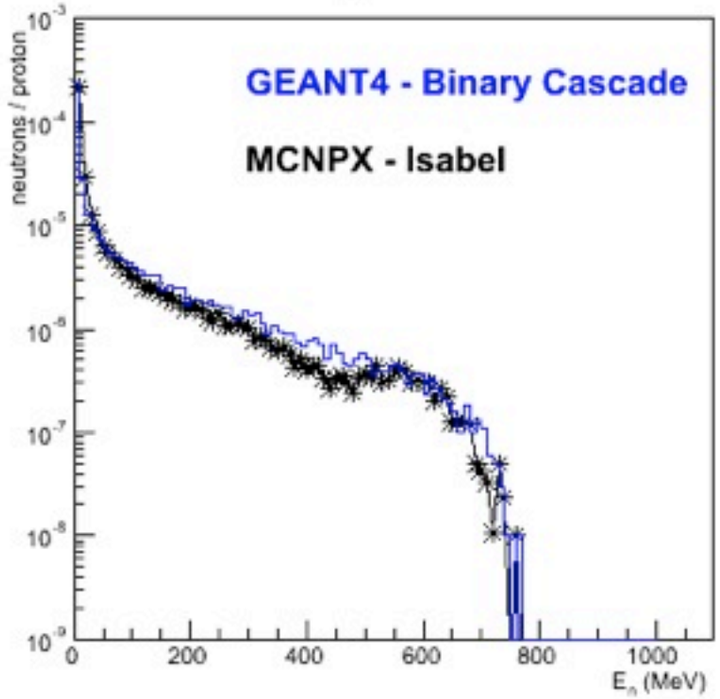


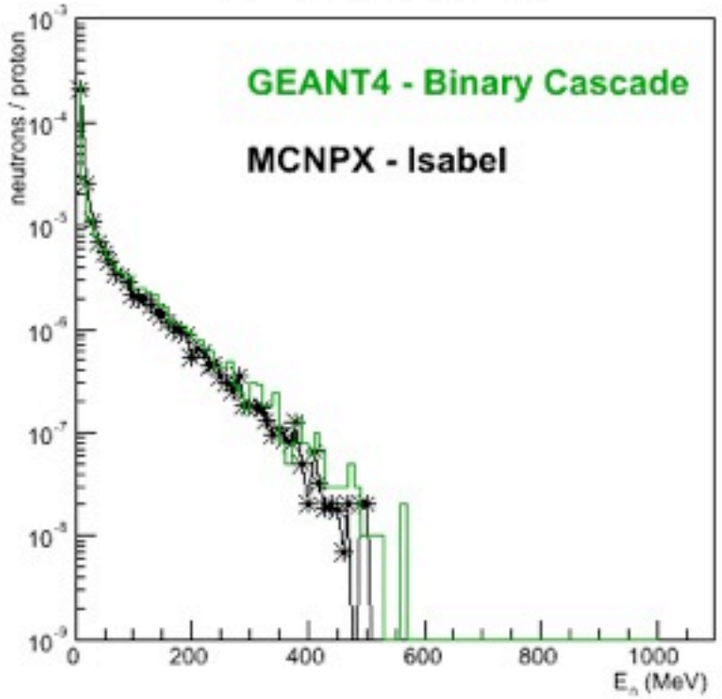


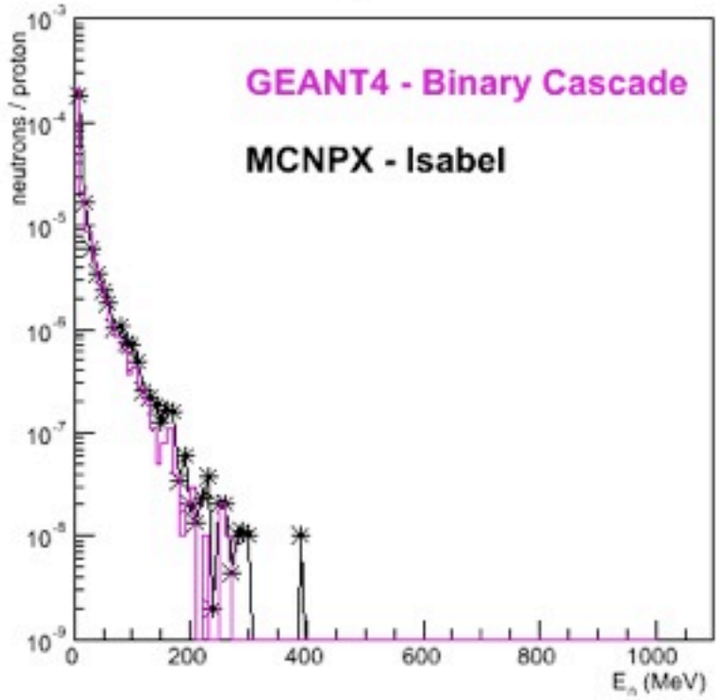
- INCL is worldwide recognized as the best intra-nuclear cascade model available;
- however, below 150 MeV proton energy this model is not so good because it does not include pre-equilibrium: the INCL cascade is directly "coupled" to equilibrium de-excitation handled by ABLA and therefore it does not describe well enough low energy reactions (where nuclear structure effects start to play their role).

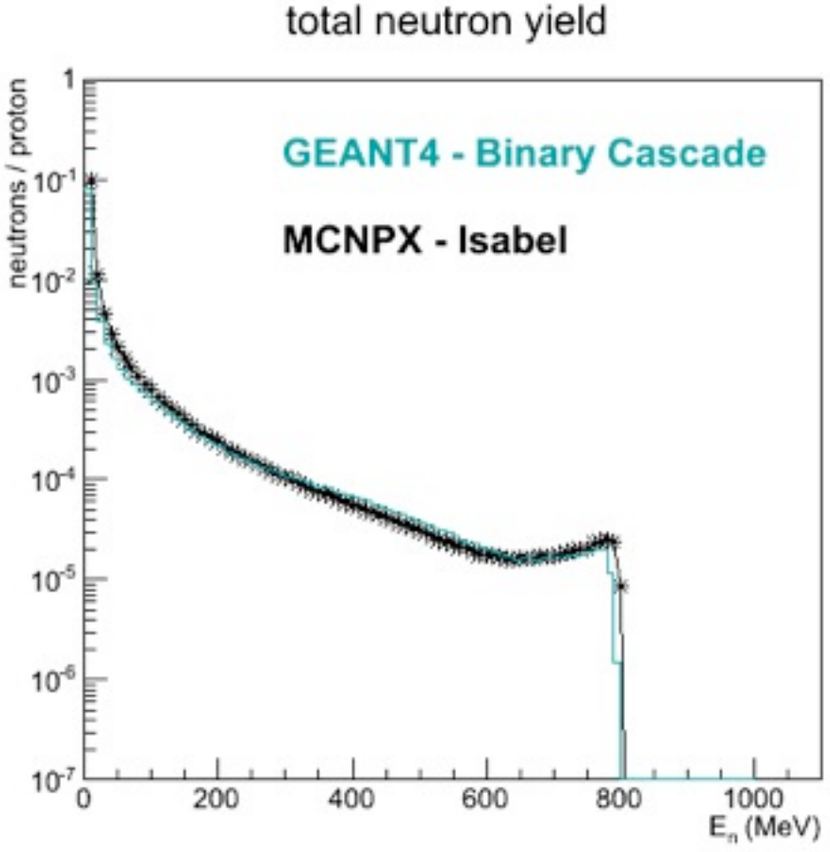
Models which do incorporate pre-equilibrium











Summary

- ISIS-TS1 geometry fully implemented into GEANT4 and MCNPX;
- Various physics models validations under way for tungsten targets;
- The two codes predictions are in reasonably good agreement;
- We are now ready to proceed with the optimization studies;