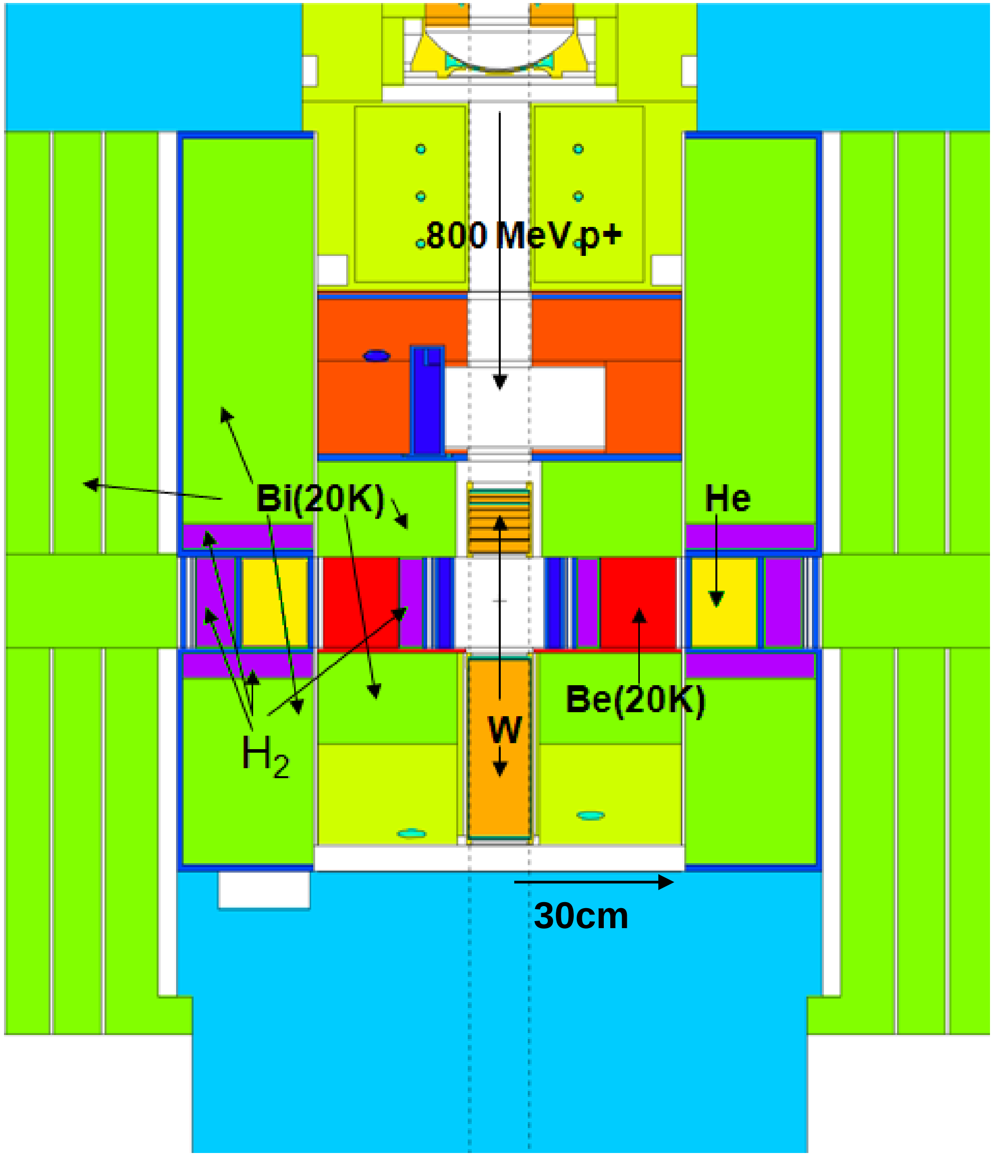
Possible n-nbar production targets

G. Muhrer

Lujan like geometry



$9.42*10^7$ UCN/s/100μA

Heat load @ 100μA ≡ 80KW

Total heat: 66.7 W

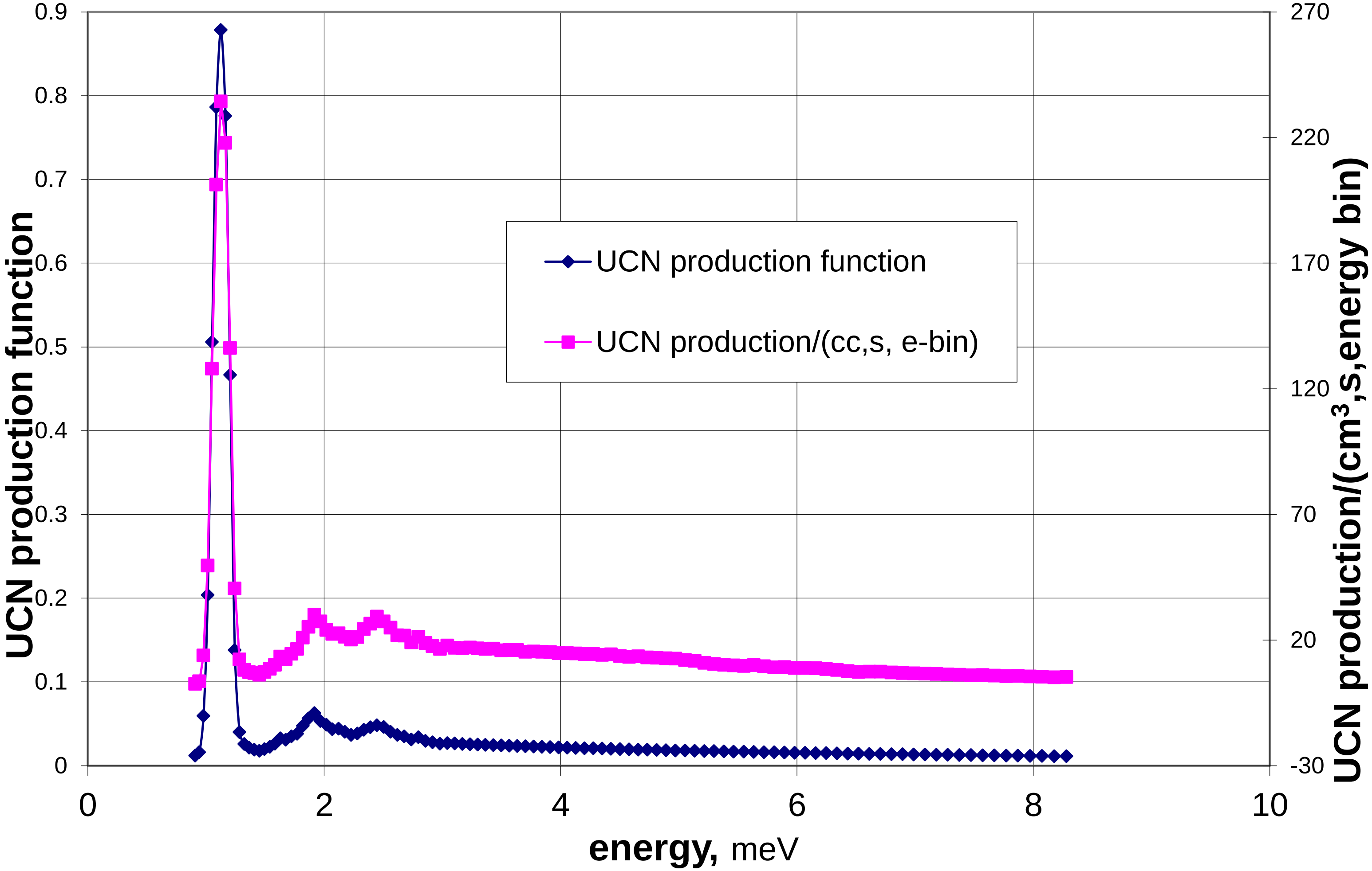
Neutron heat: 44.7 W

Photon heat: 18.7 W

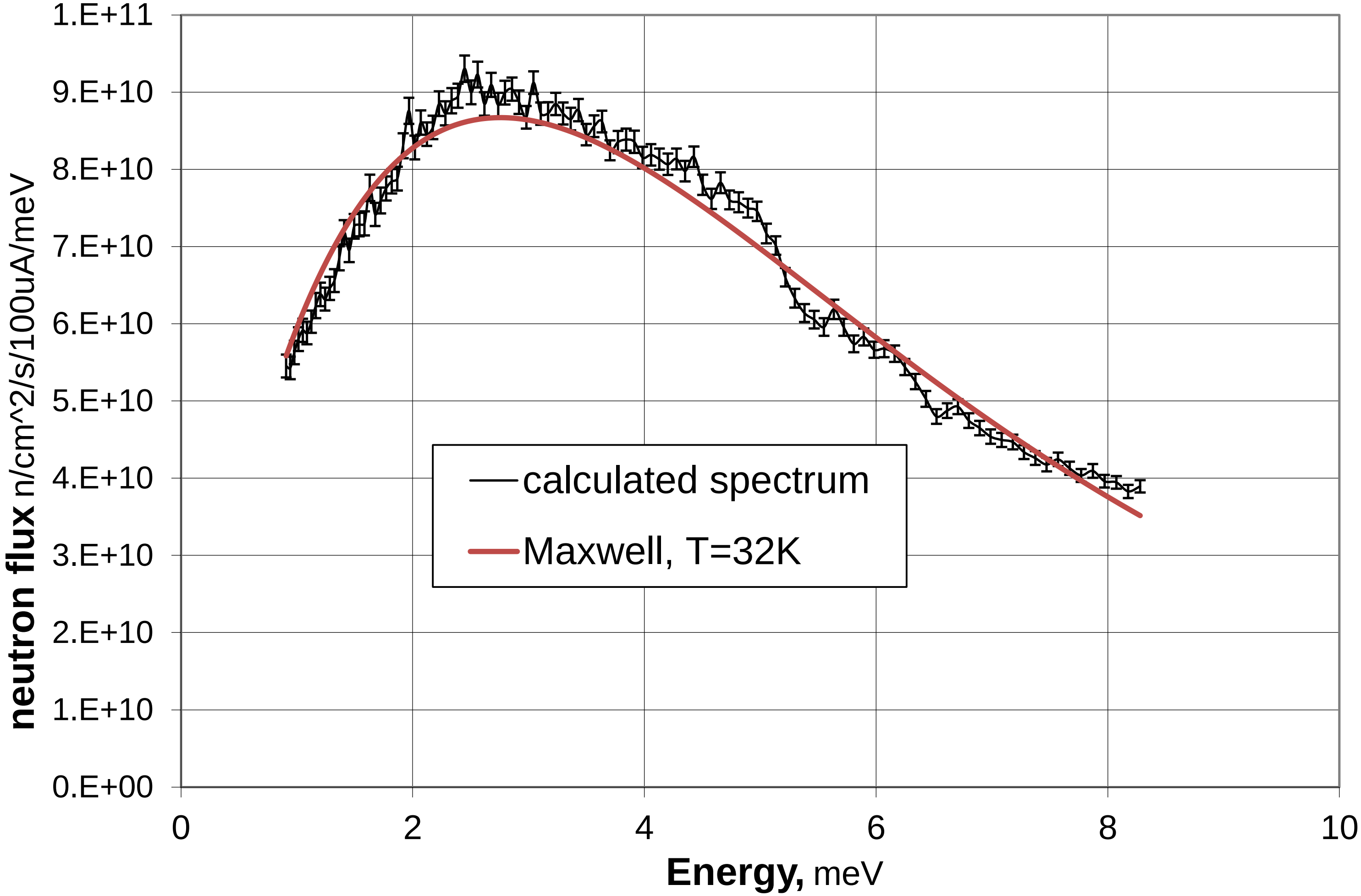
Proton heat: 3.3 W

$1.41*10^8$ UCN/s/100W(heat in the He)

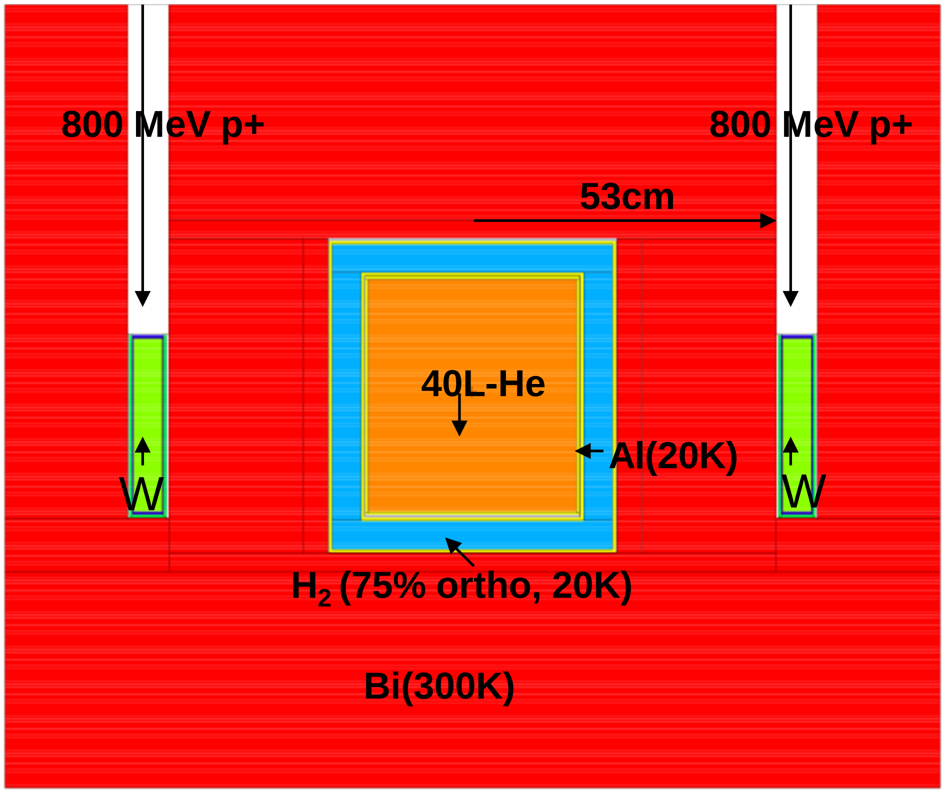
UCN production function



Lujan: Neutron spectrum in He-4



Inverse cylindrical geometry (1)



$6.6*10^7$ UCN/s/100μA

Heat load @ 100μA ≡ 80KW

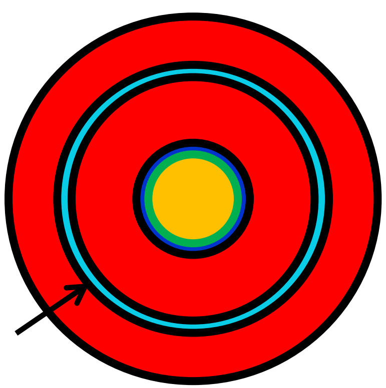
Total heat: 27.4 W

Neutron heat: 17.2 W

Photon heat: 9.6 W

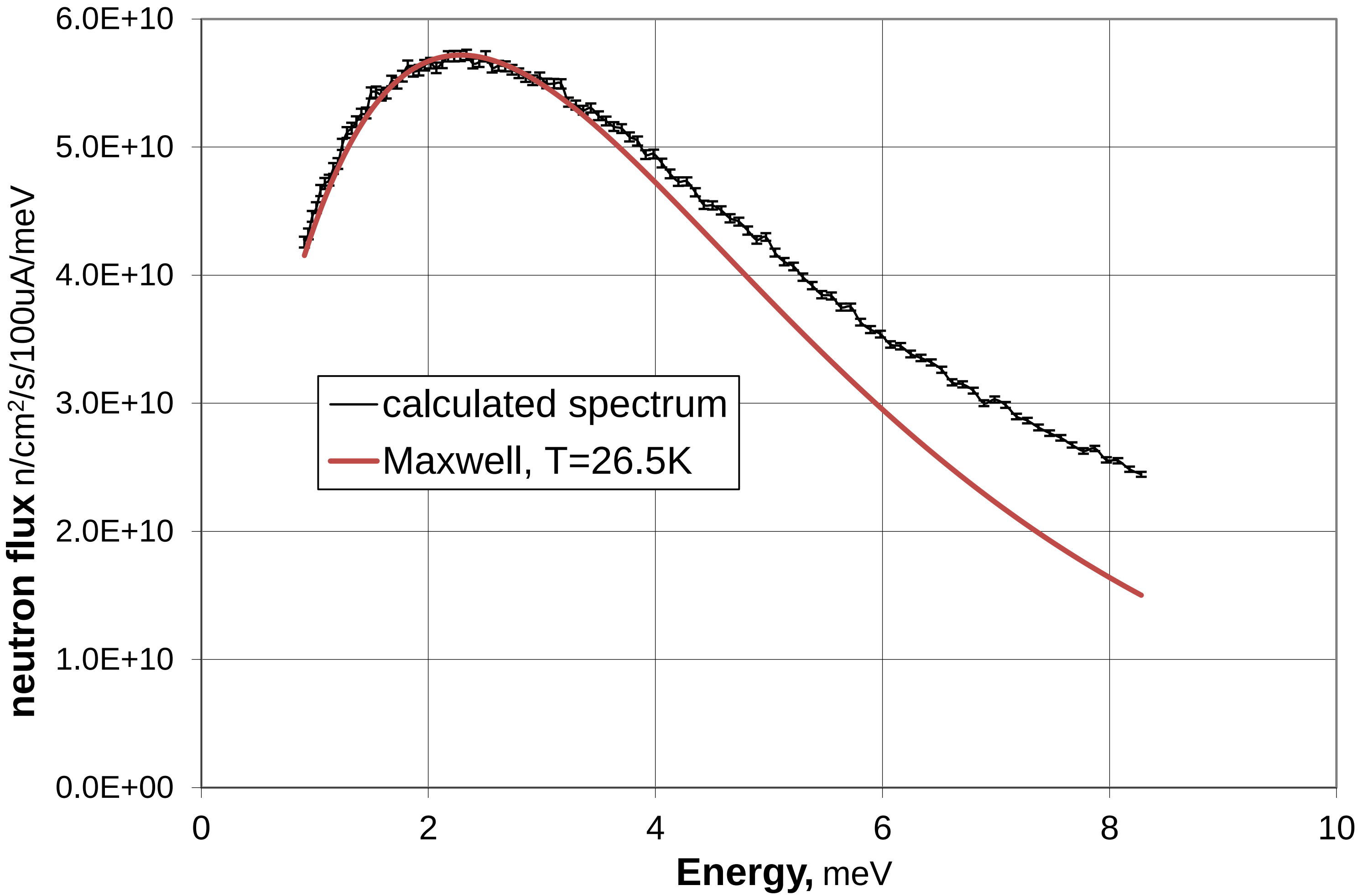
Proton heat: 0.6 W

$2.4*10^8$ UCN/s/100W (heat in the He)

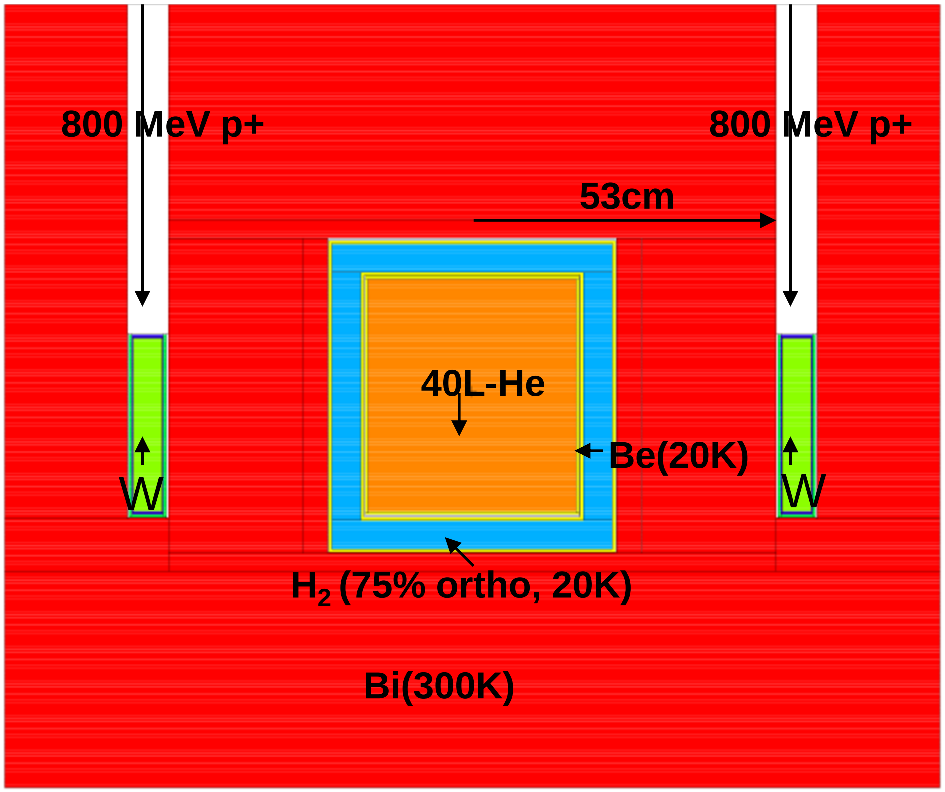


Cylindrical proton target (beam rastered around circumference)

Inverse geometry (1): Neutron spectrum in He-4



ICG (2): Be canisters



$9.5*10^7$ UCN/s/100μA

Heat load @ 100μA ≡ 80KW

Total heat: 23.6 W

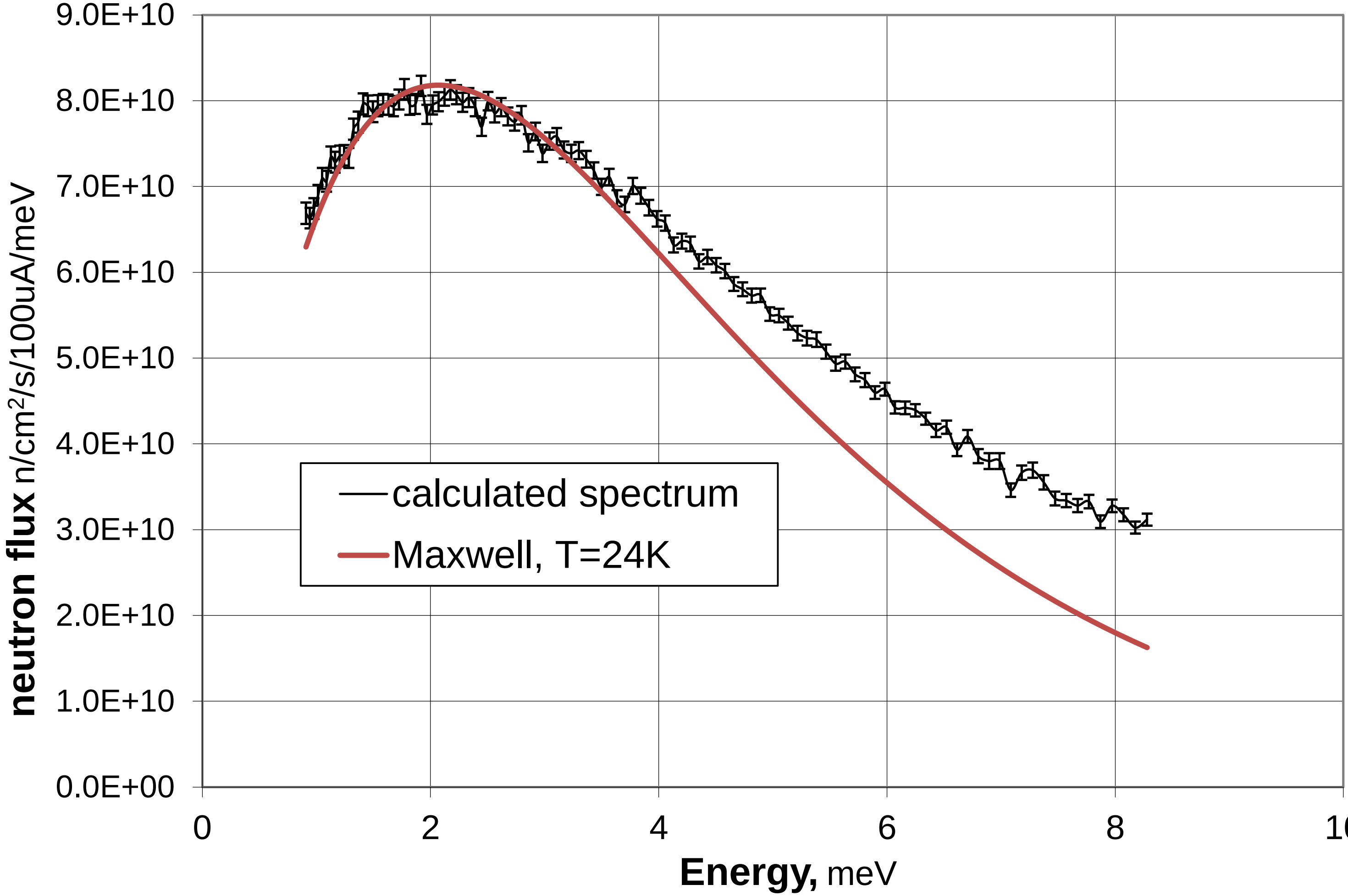
Neutron heat: 15.5 W

Photon heat: 7.5 W

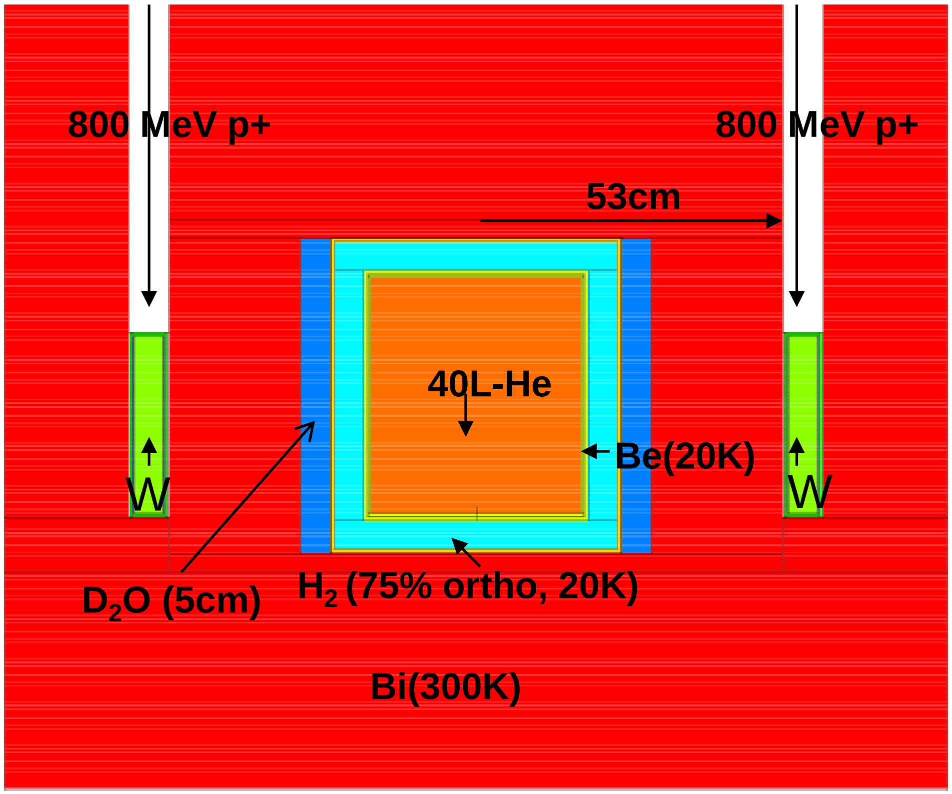
Proton heat: 0.6 W

$4.0*10^8$ UCN/s/100W (heat in the He)

Inverse geometry (2): Neutron spectrum in He-4



ICG (3): D_2O pre-moderator



1.0*10^8 UCN/s/100μA

Heat load @ 100μA ≡ 80KW

Total heat: 18.8 W

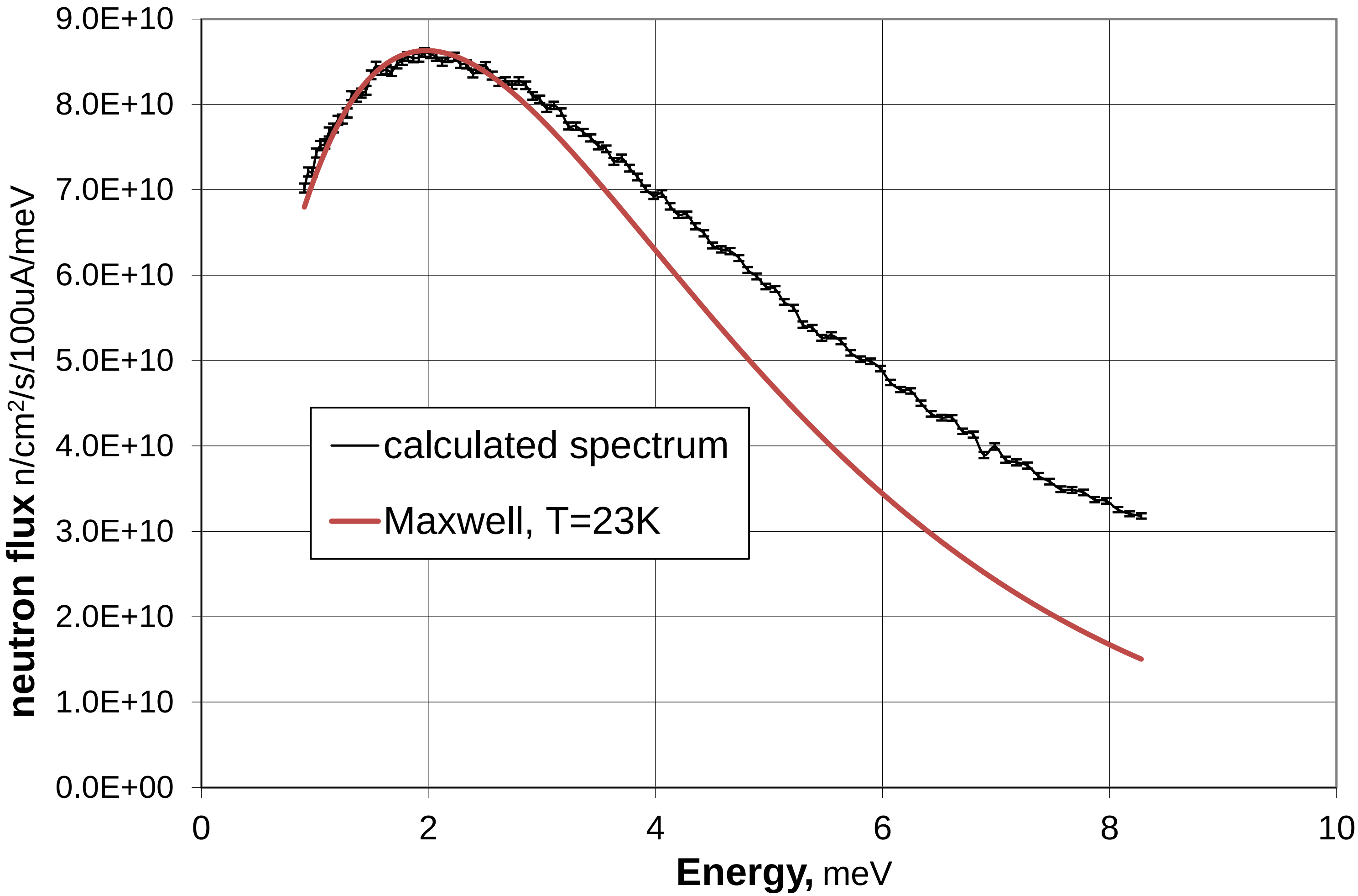
Neutron heat: 9.7 W

Photon heat: 8.4 W

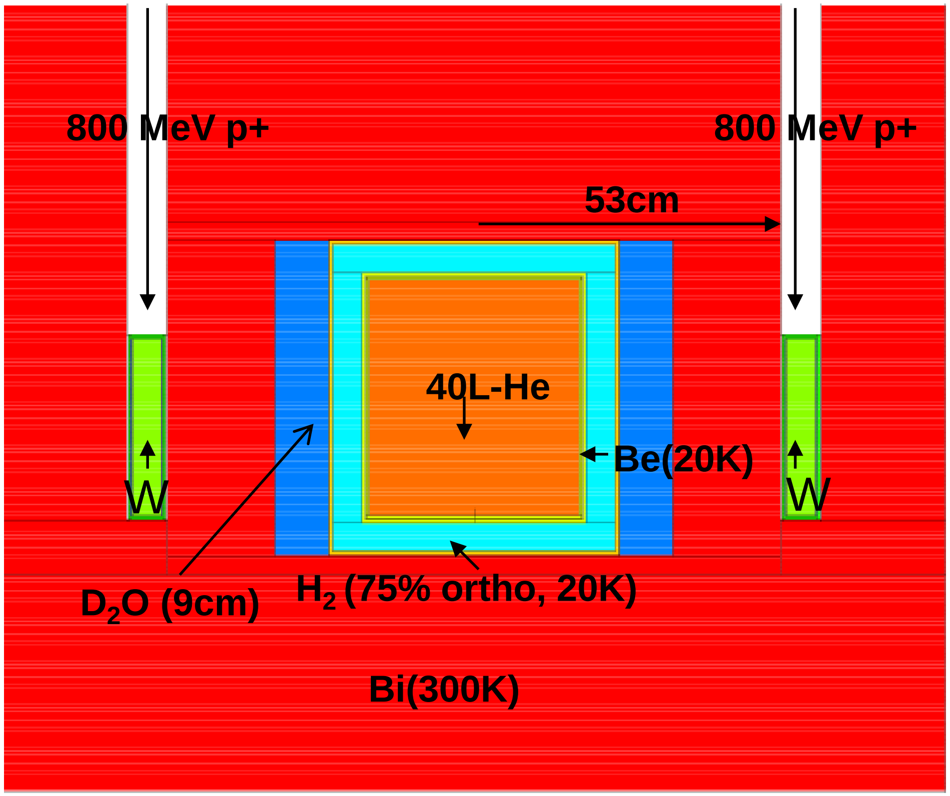
Proton heat: 0.7 W

5.36*10^8 UCN/s/100W (heat in the He)

Inverse geometry (3): Neutron spectrum in He-4



ICG (4): thick D_2O pre-moderator



$9.9*10^7$ UCN/s/100μA

Heat load @ 100μA ≡ 80KW

Total heat: 17.5 W

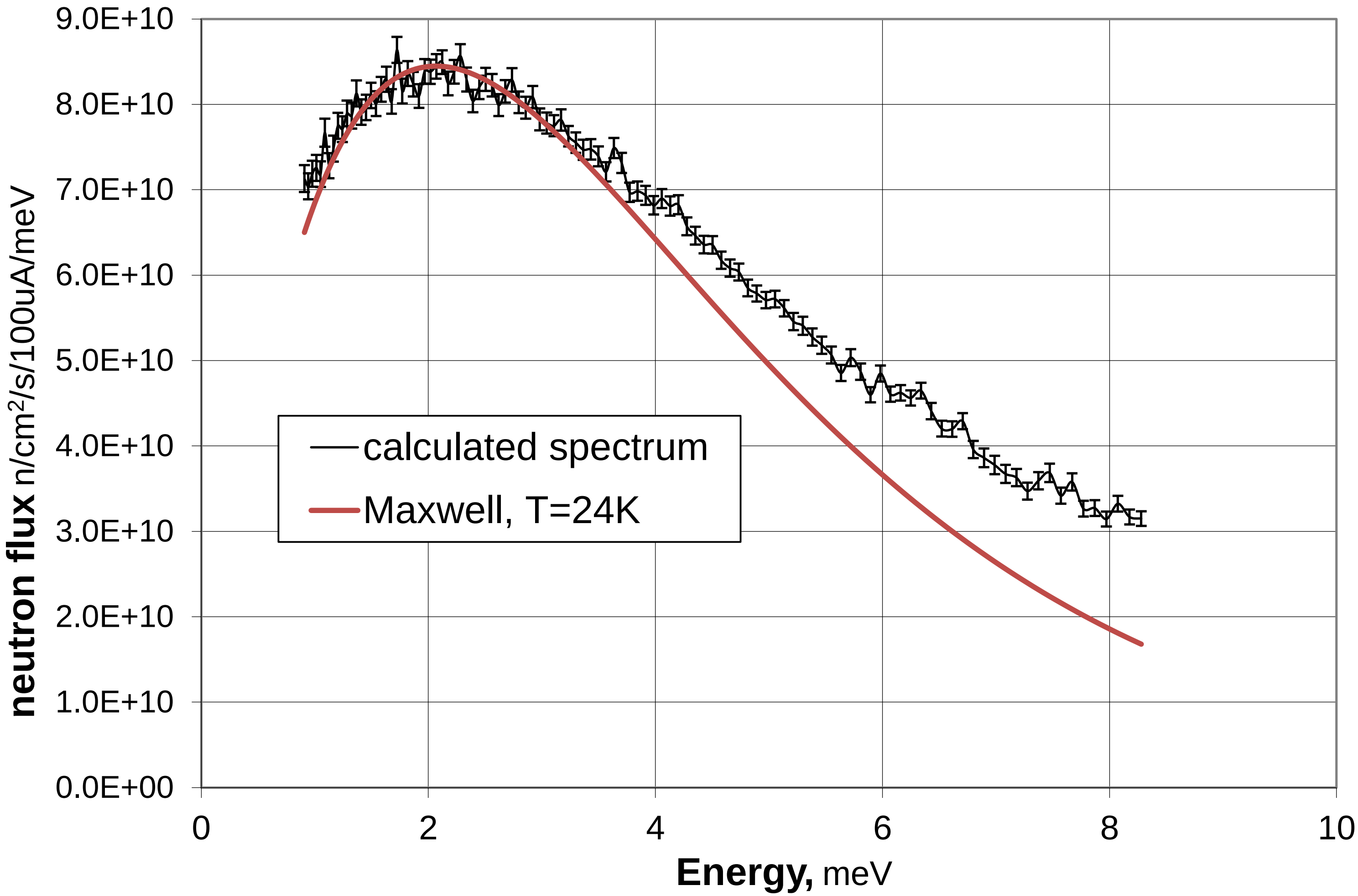
Neutron heat: 8.0 W

Photon heat: 8.6 W

Proton heat: 0.9 W

$5.64*10^8$ UCN/s/100W (heat in the He)

Inverse geometry (4): Neutron spectrum in He-4



Conclusions

- Beryllium canister increase the UCN flux by 50%.
- Beryllium canister decreases the heat load in the He by about 15%.
- Heavy water pre-moderators decrease the heat load in the He by 20-25% (depending on the thickness).
- No significant UCN flux increase has been observed from introducing a heavy water pre-moderator.
- 200 KW maximum power has to be applied as a design criterion.