Extended Q-Range SANS at the SNS

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Franz Gallmeier:	Neutronics
Andre Parizzi:	Electrical Systems
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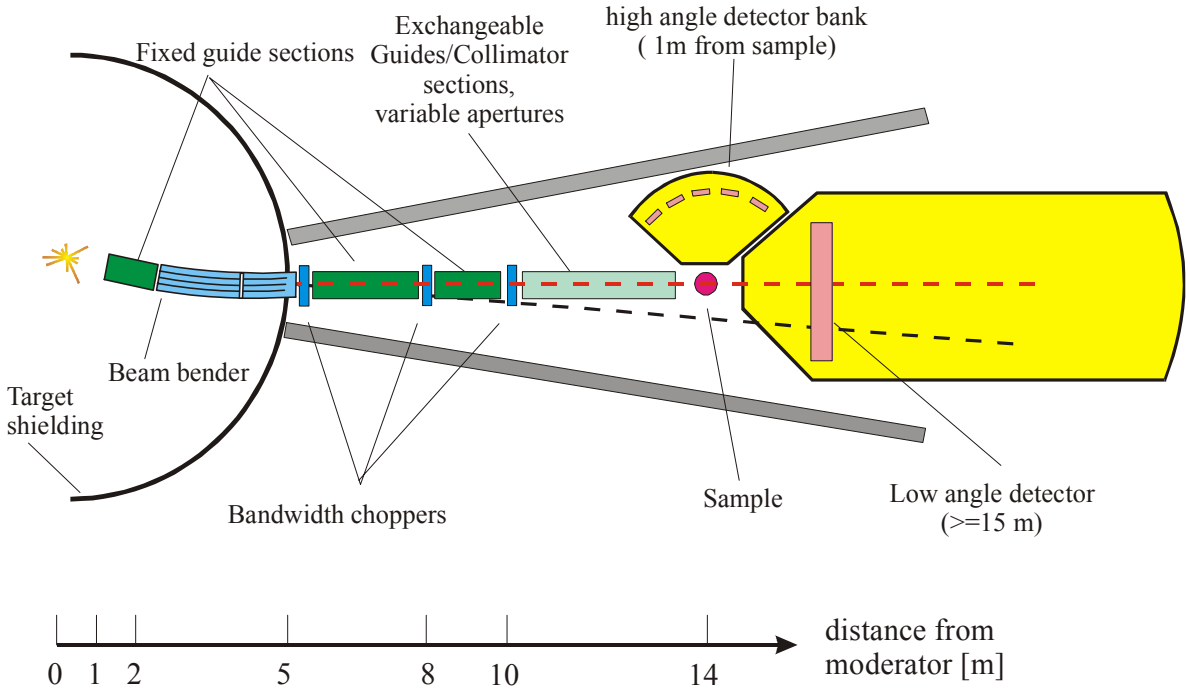
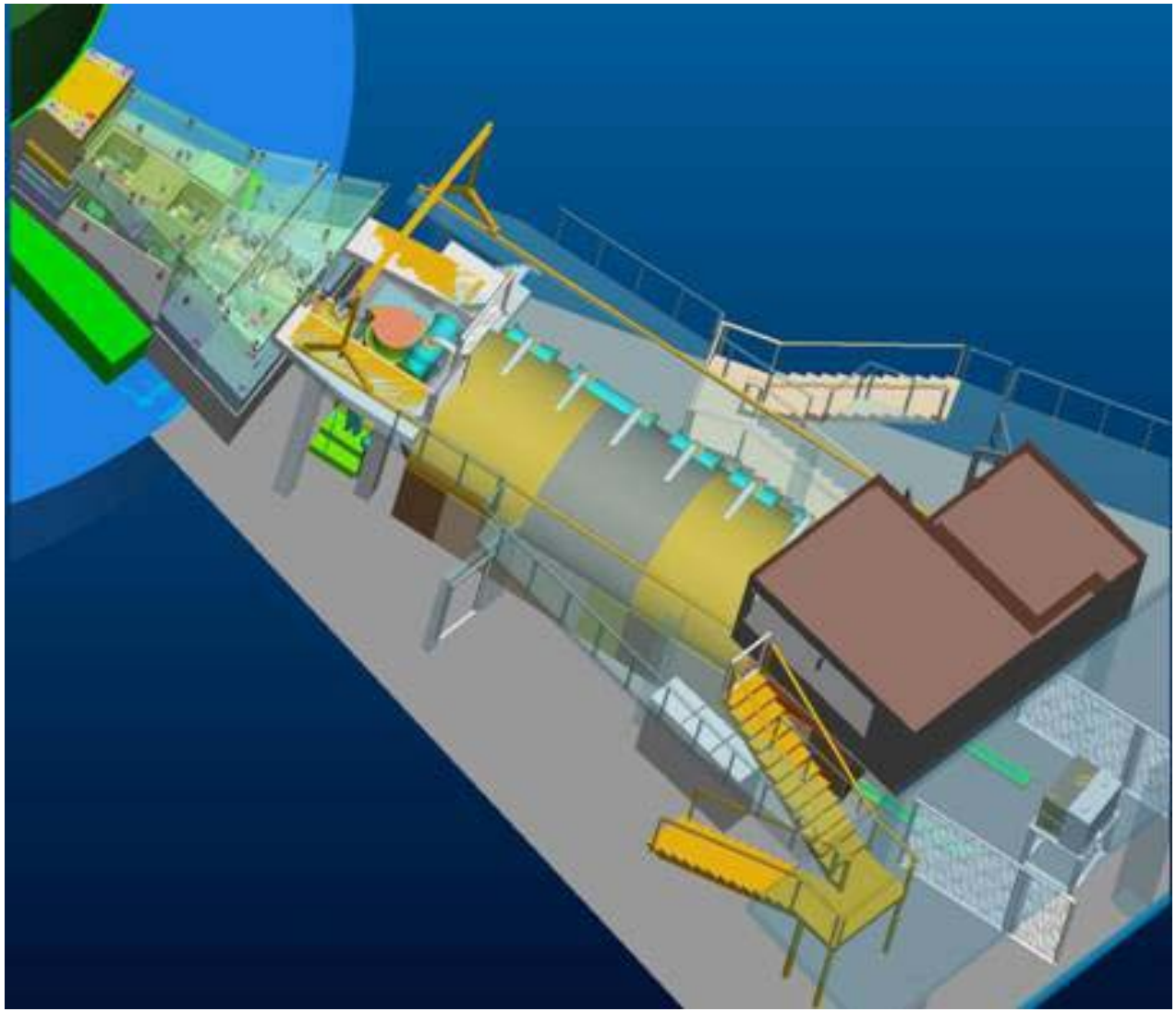
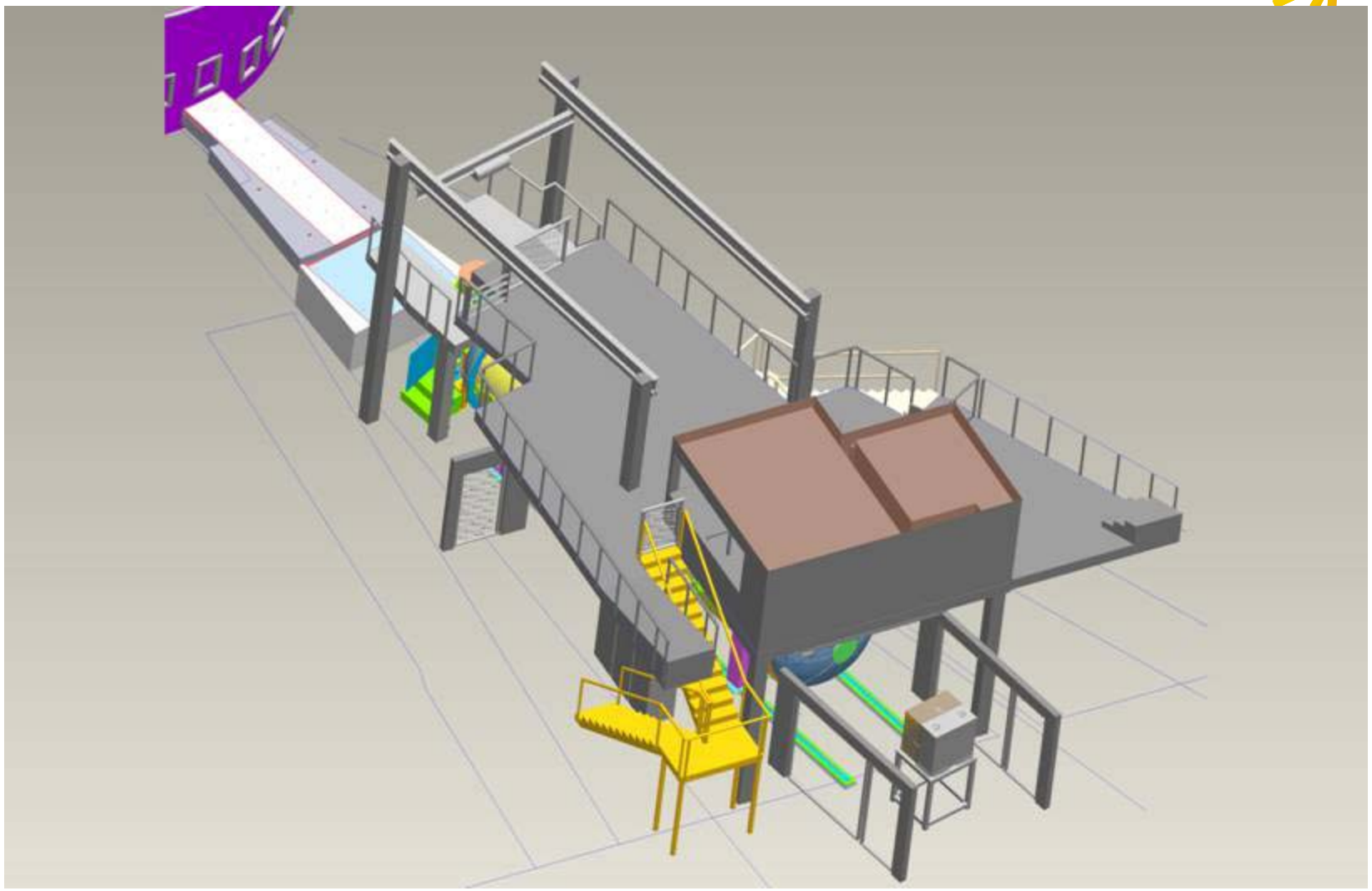
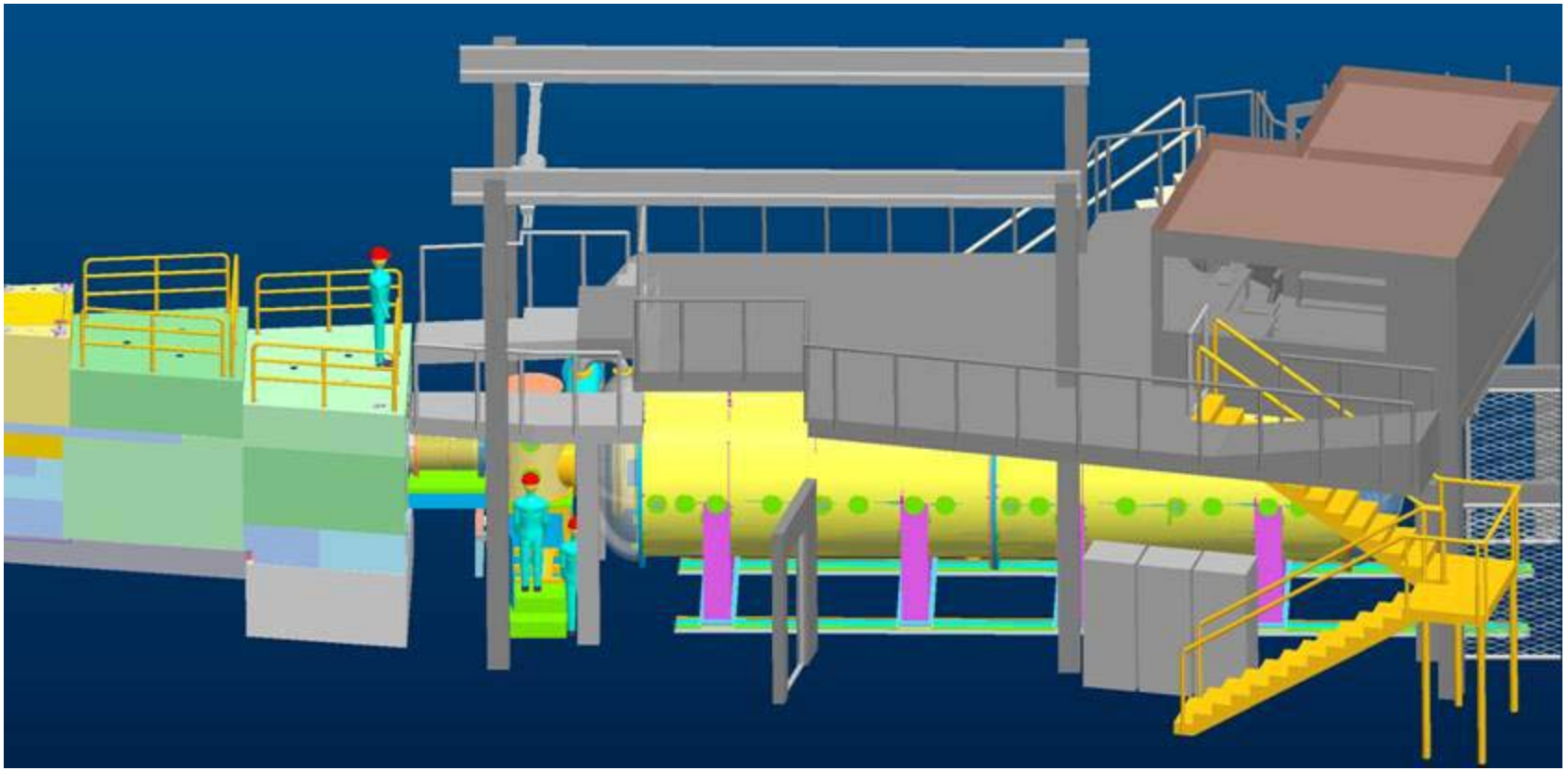


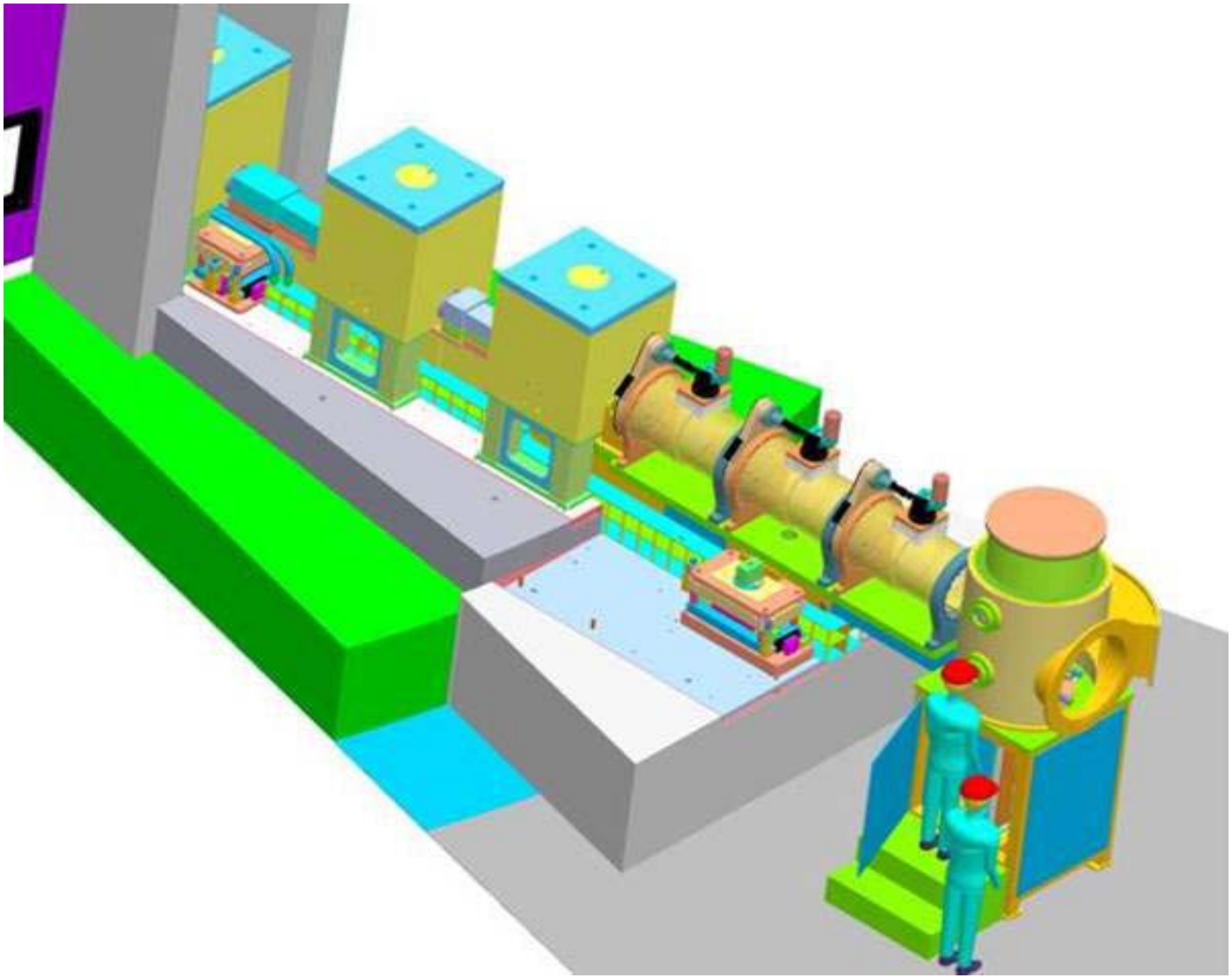
Design Goals

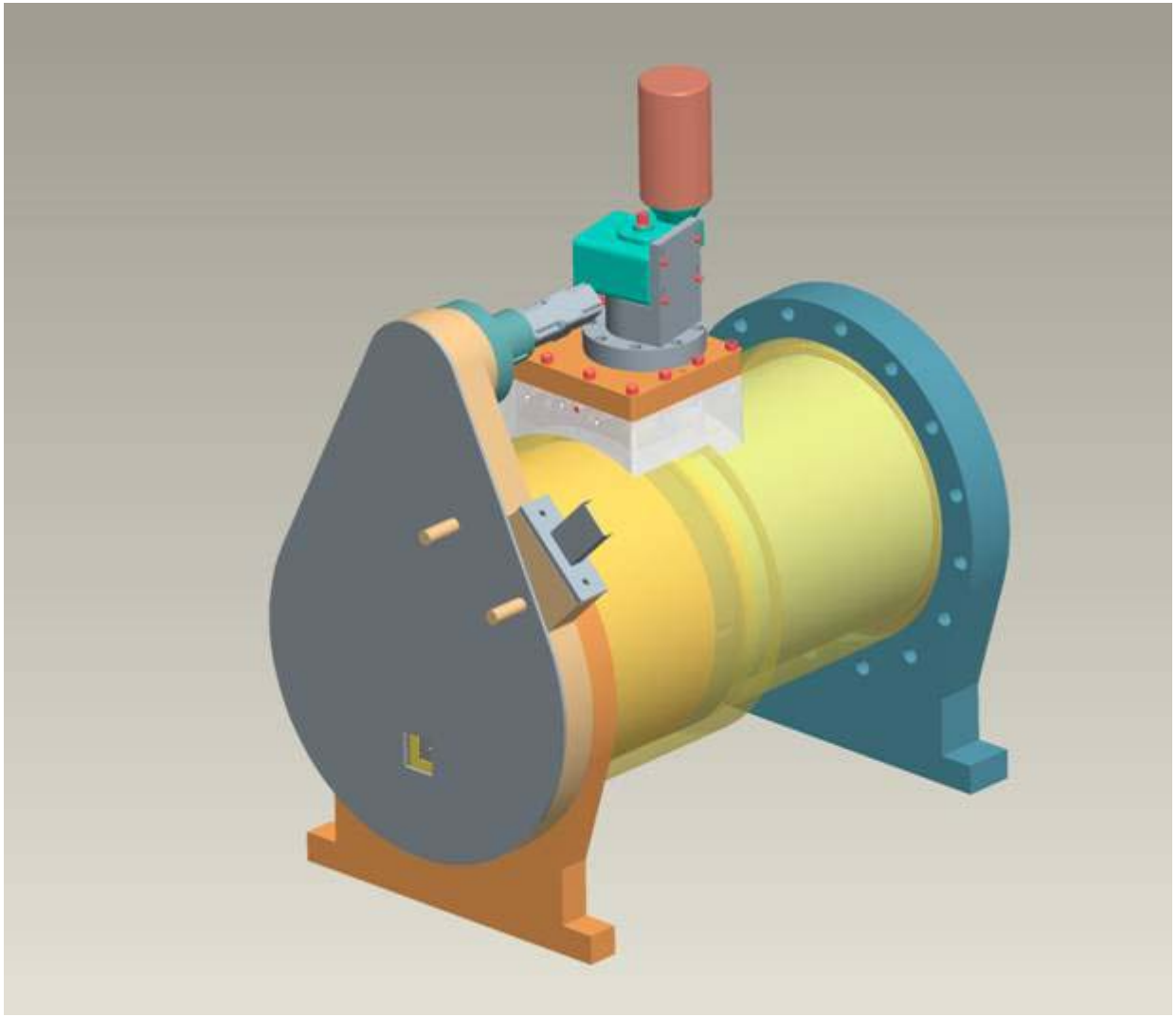
- **Multiple length scale –covers four decades in Q-range (0.004-10Å^{-1})**
- **High intensity**
- **High wavelength-resolution**

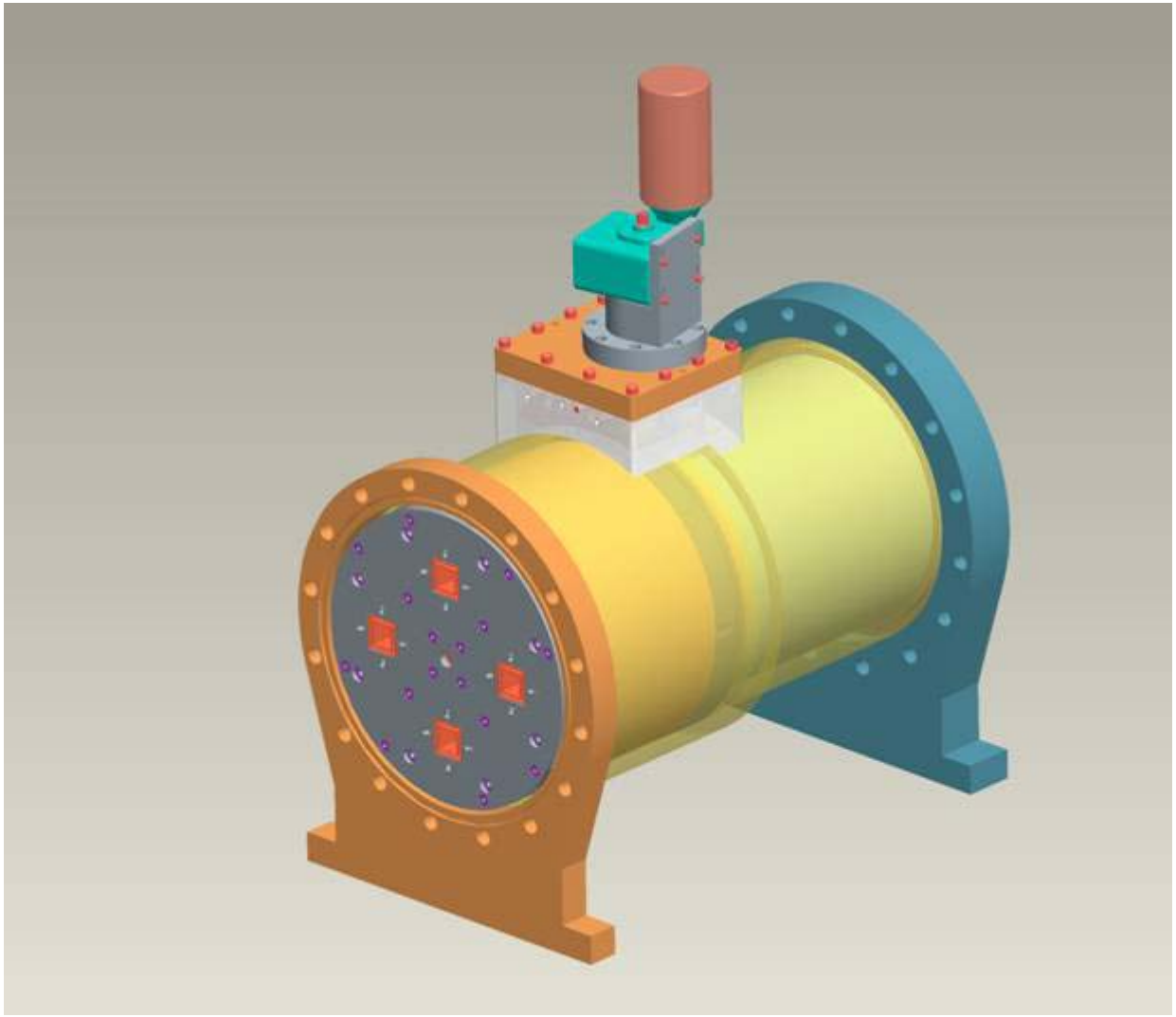


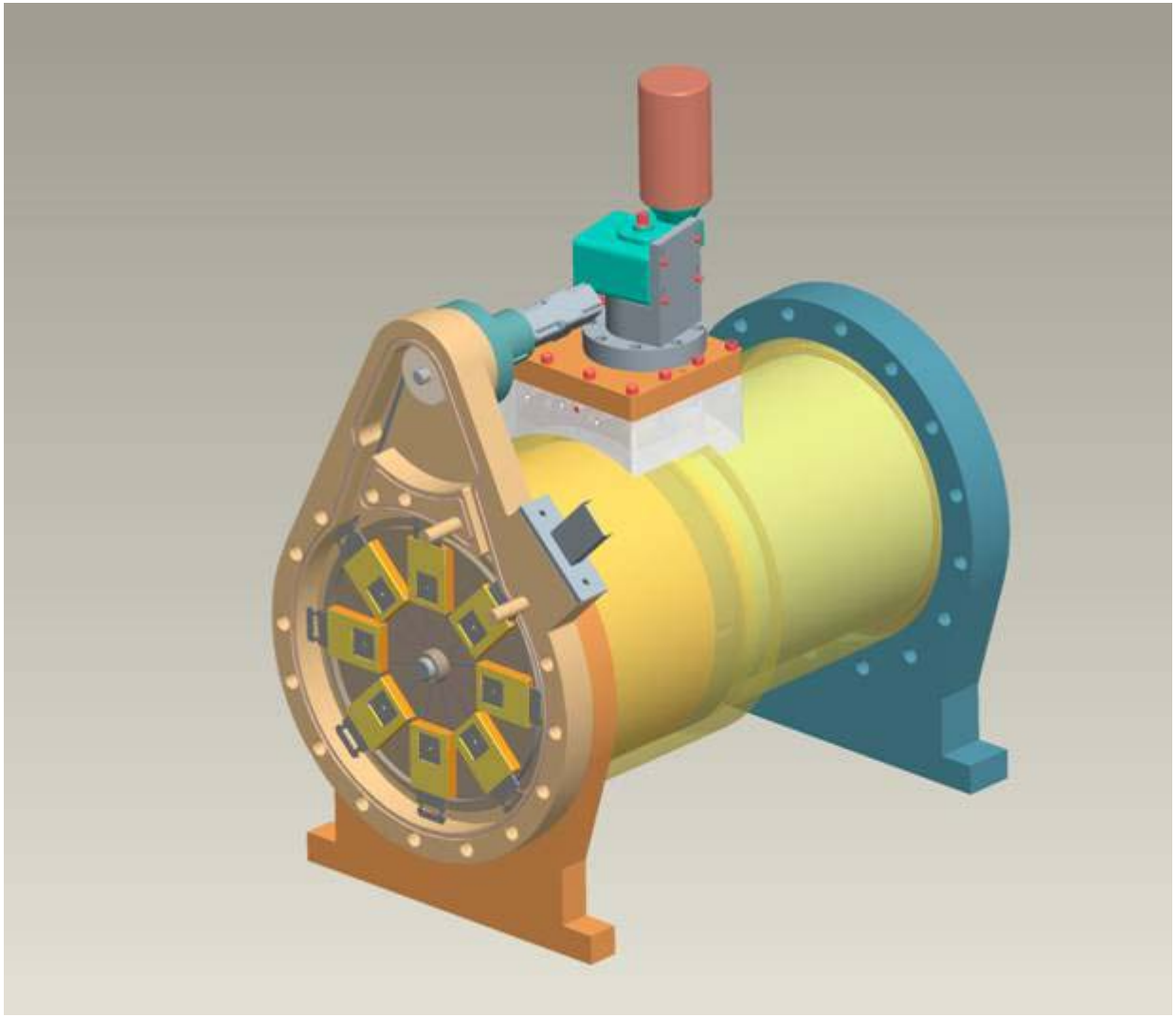


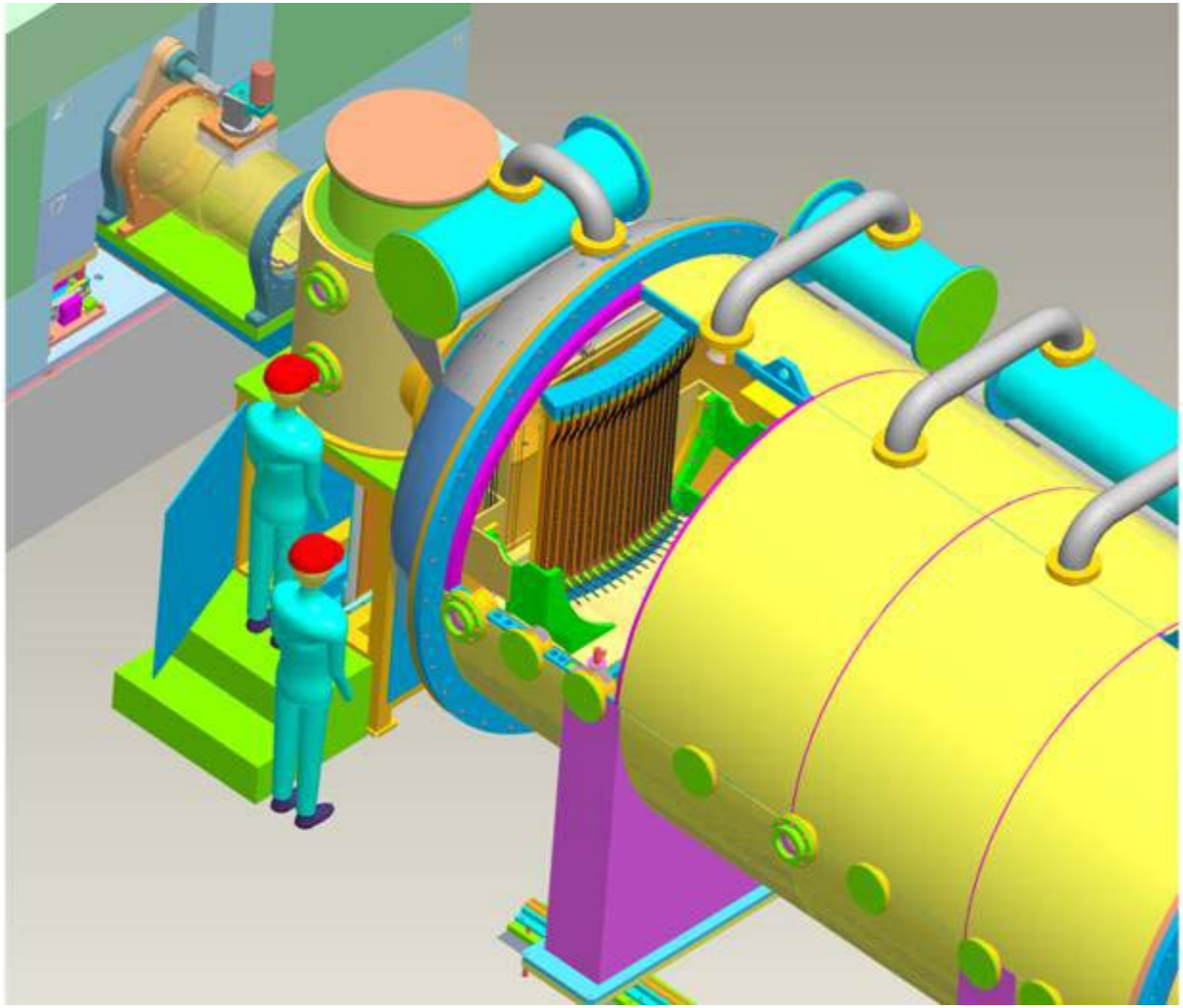


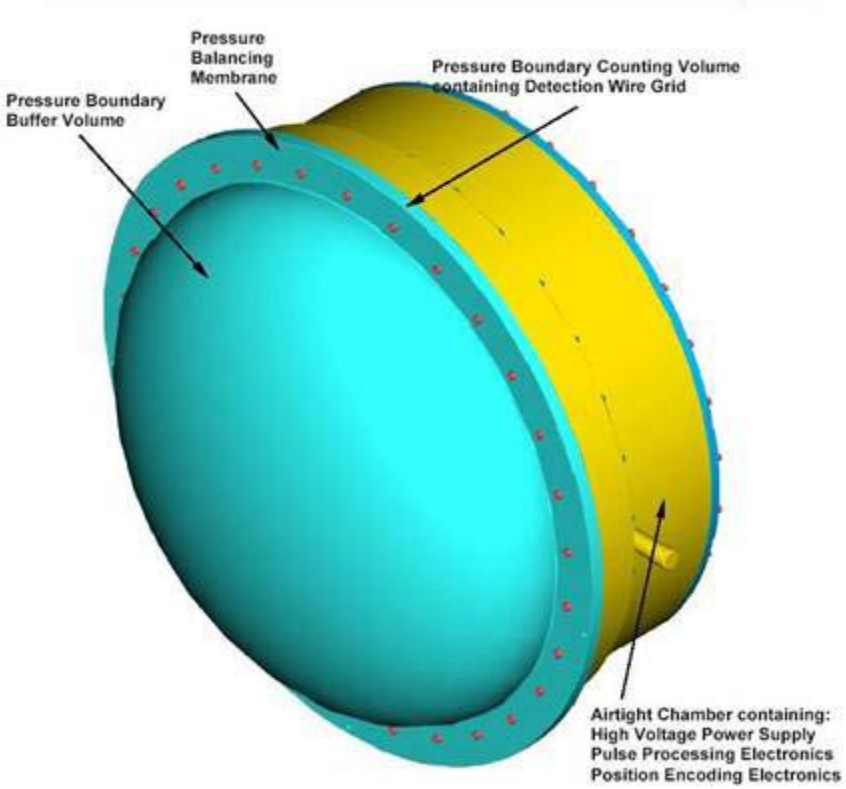


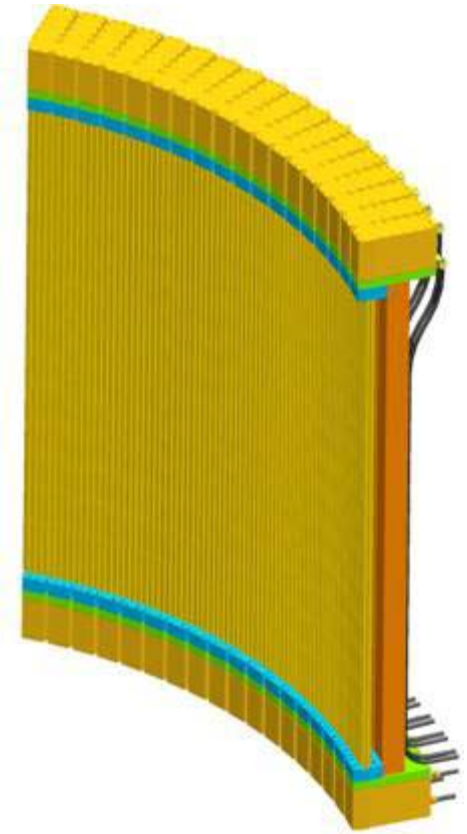






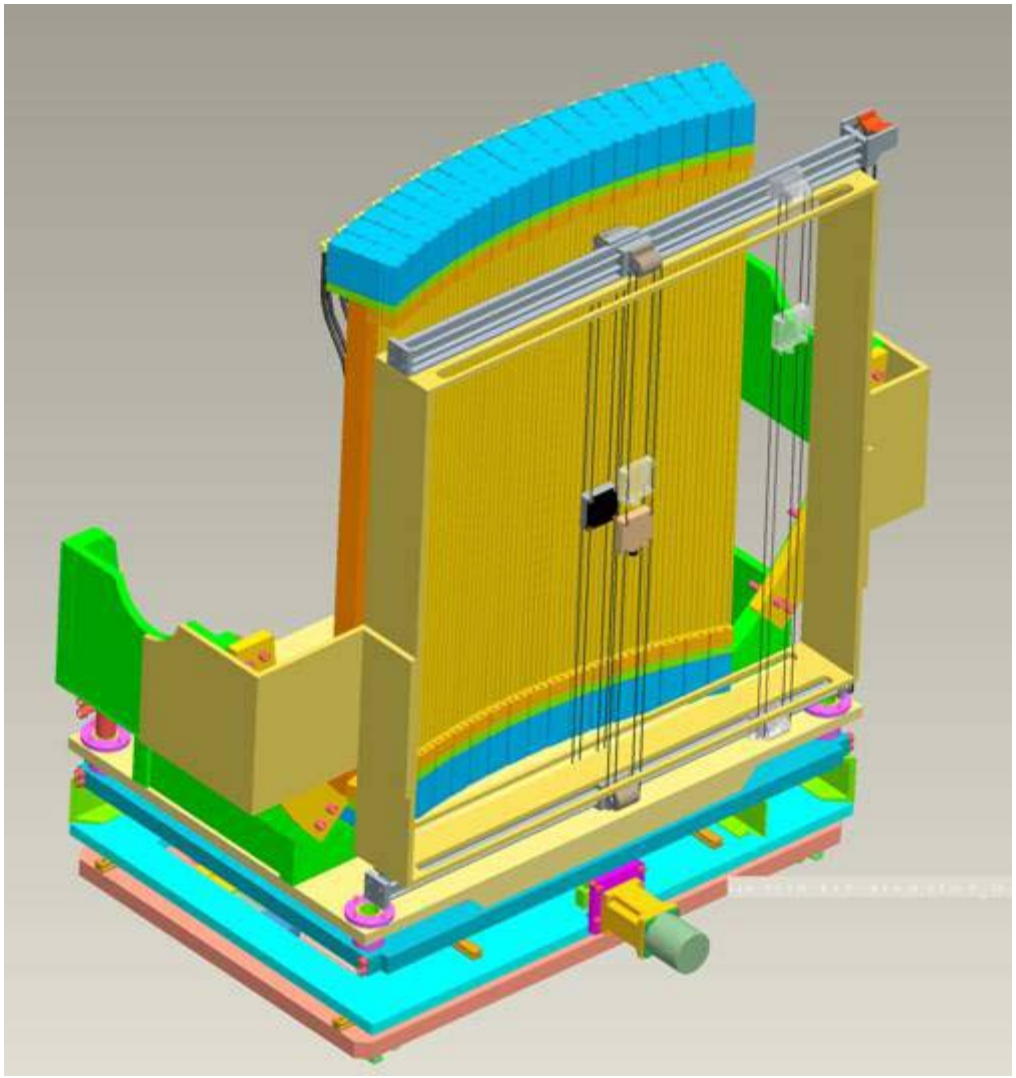




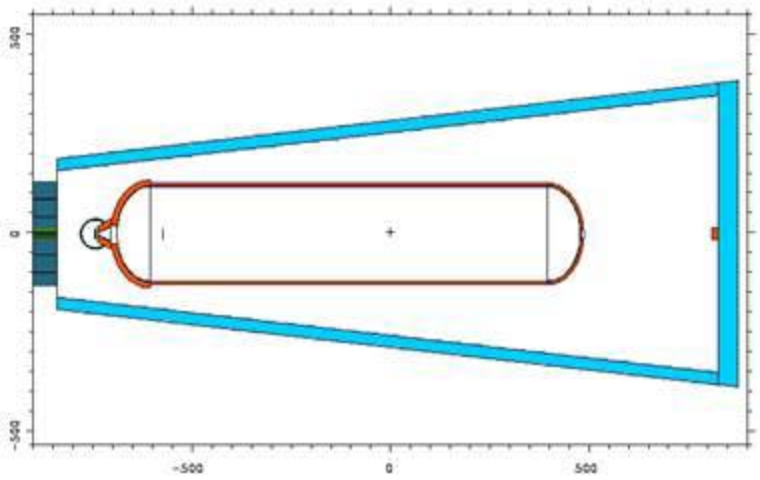


Baselline Design:
1m^2 2D-PSD at 5mm resolution

New prototype: 8mm 3He Tubes.
Higher rate; higher efficiency; lower parallax; easy to service; in-house detector electronics.

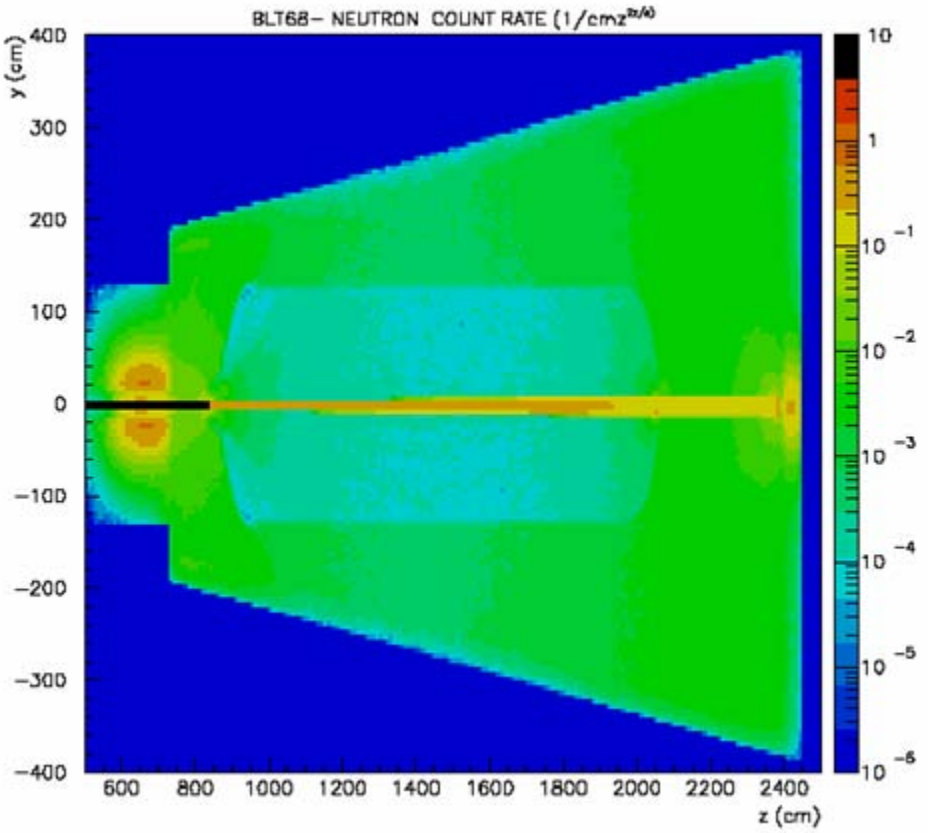


Background (fast neutron shielding)



Scattering Tank Shielding:

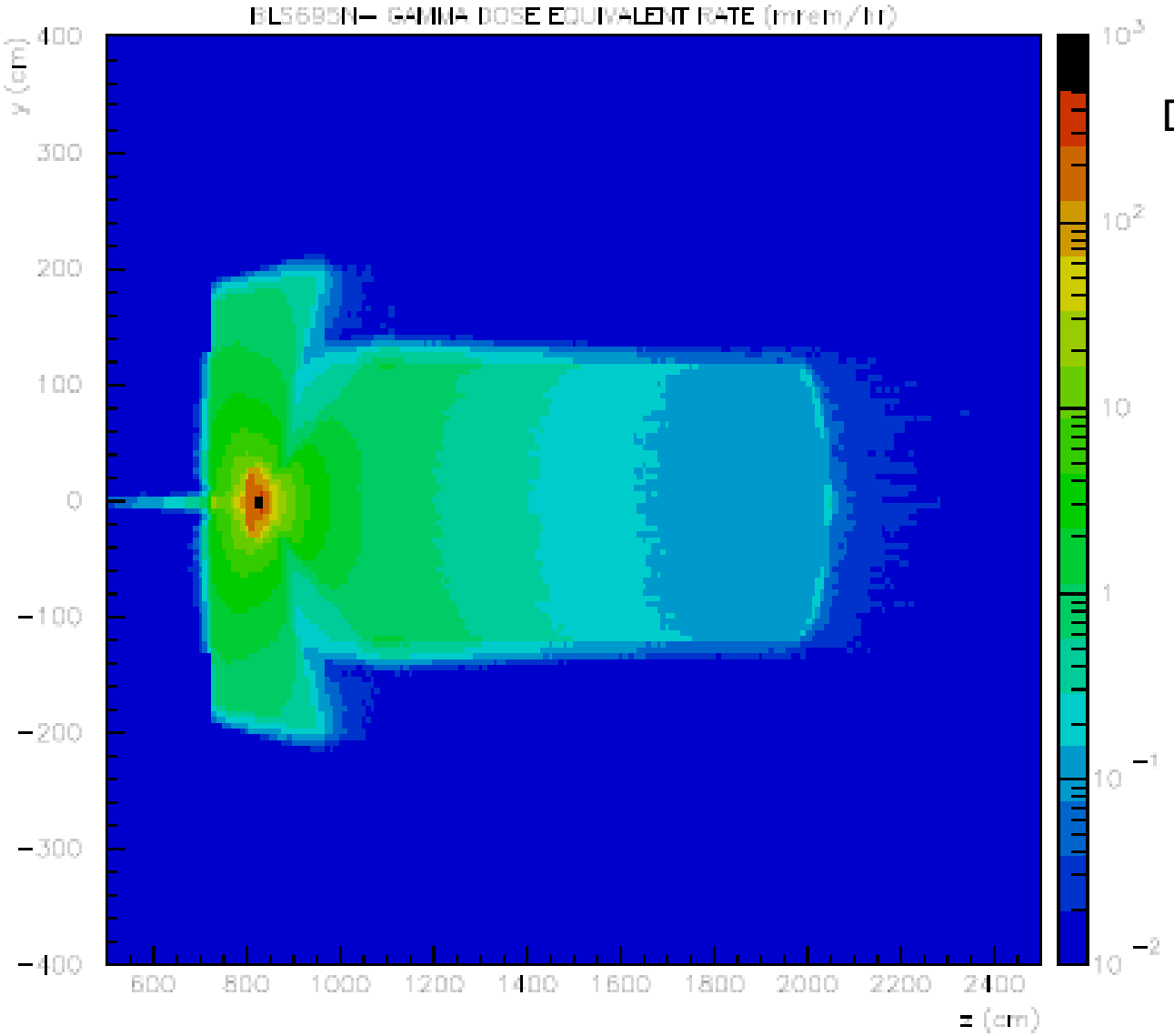
¼” B_4C inside.
8” concrete around.



Background count rate in neutrons/cm^2/s on a 1” 3He Tube at 10 bar. The shielding reduces the background by a factor >20

F. Gallmeier

Thermal Neutron Shielding



Dose rate for worst case:

Beam full open
2x2X2cm^3 water sample

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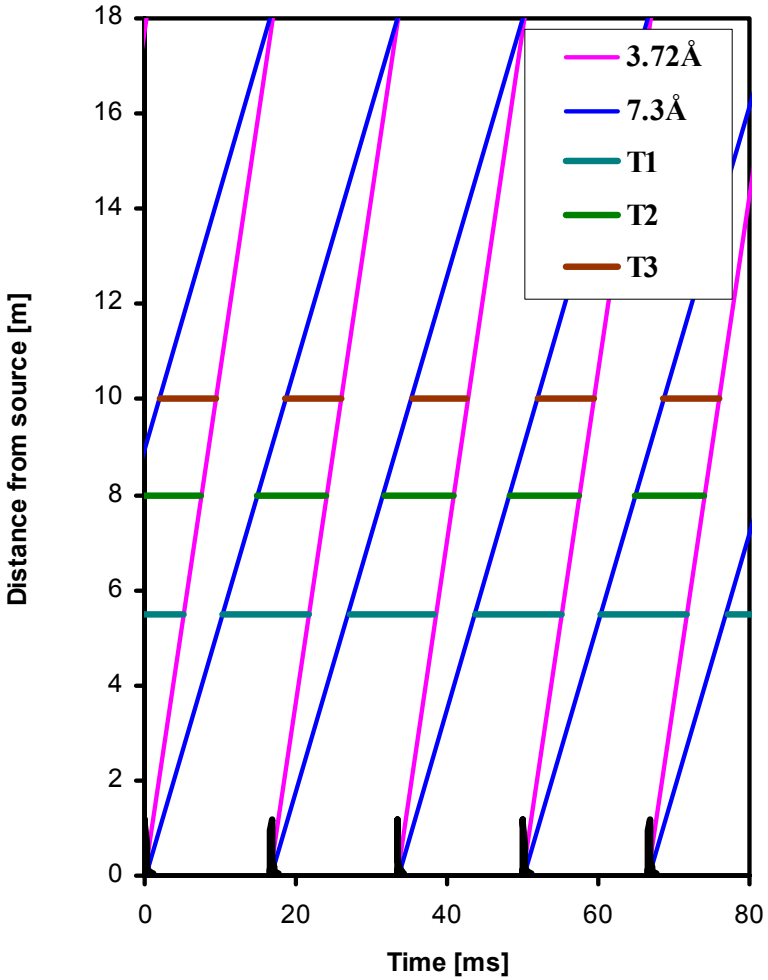
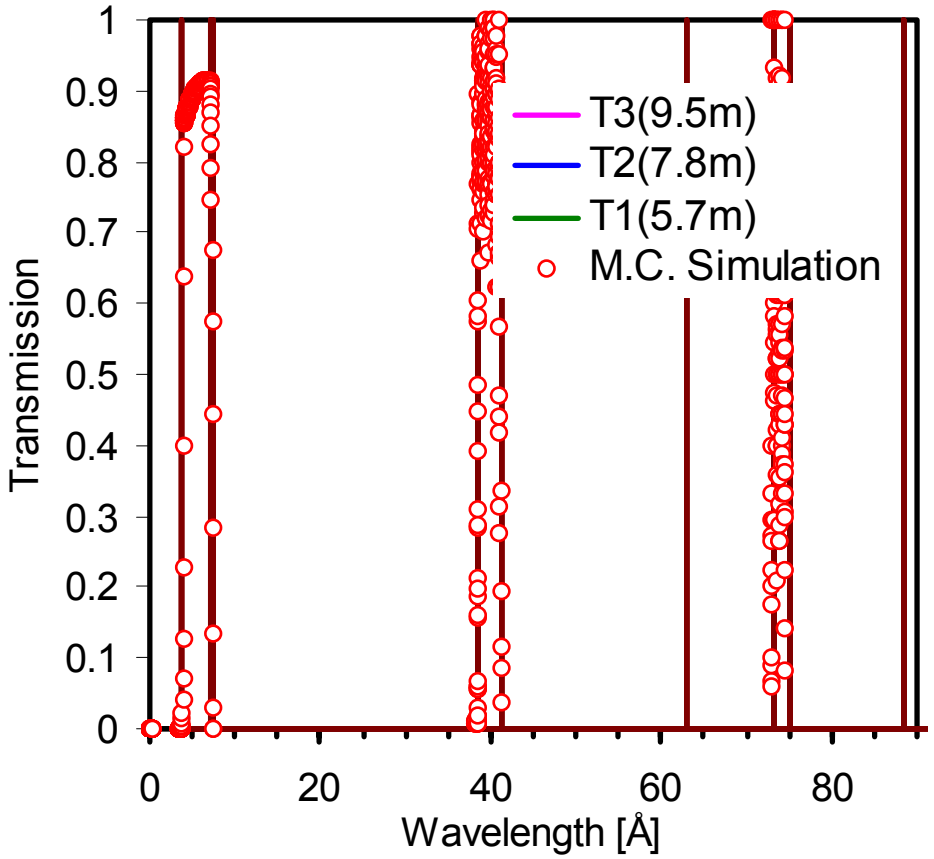
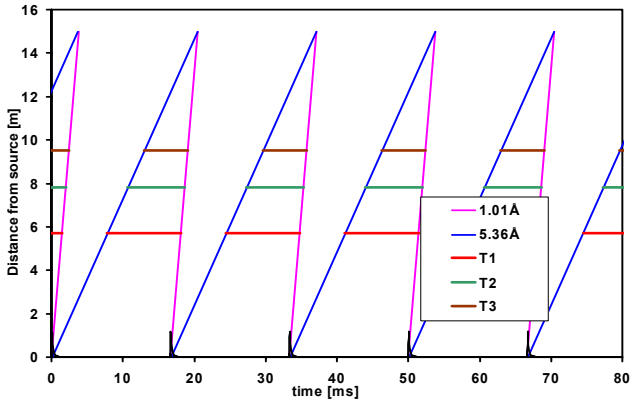
Bandwidth and leakage

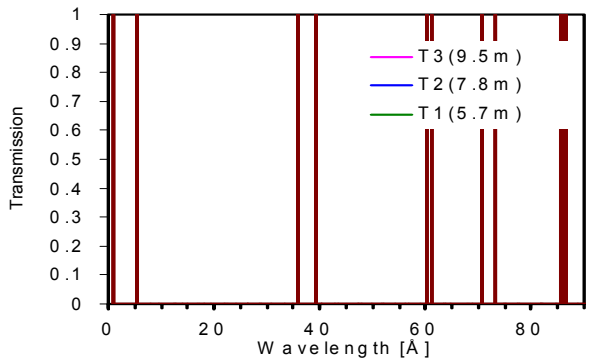




Detector at 18m, second frame

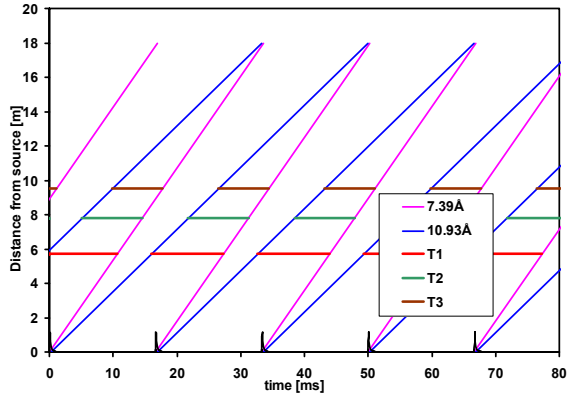
Q-Range

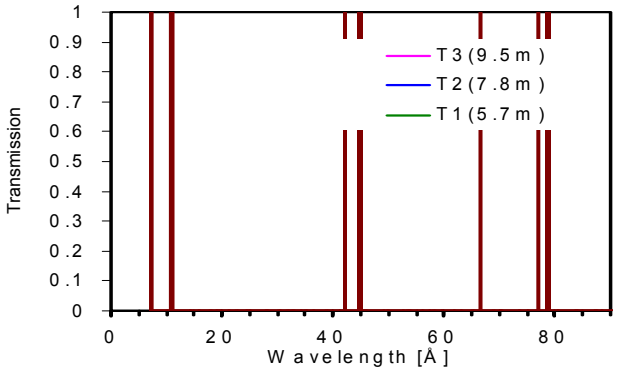




Detector=15m

First Frame, Q=0.028-3.3Å^{-1}.
Second Frame, Q=0.017-0.76Å^{-1}.
Third Frame, Q=0.011-0.38Å^{-1} .

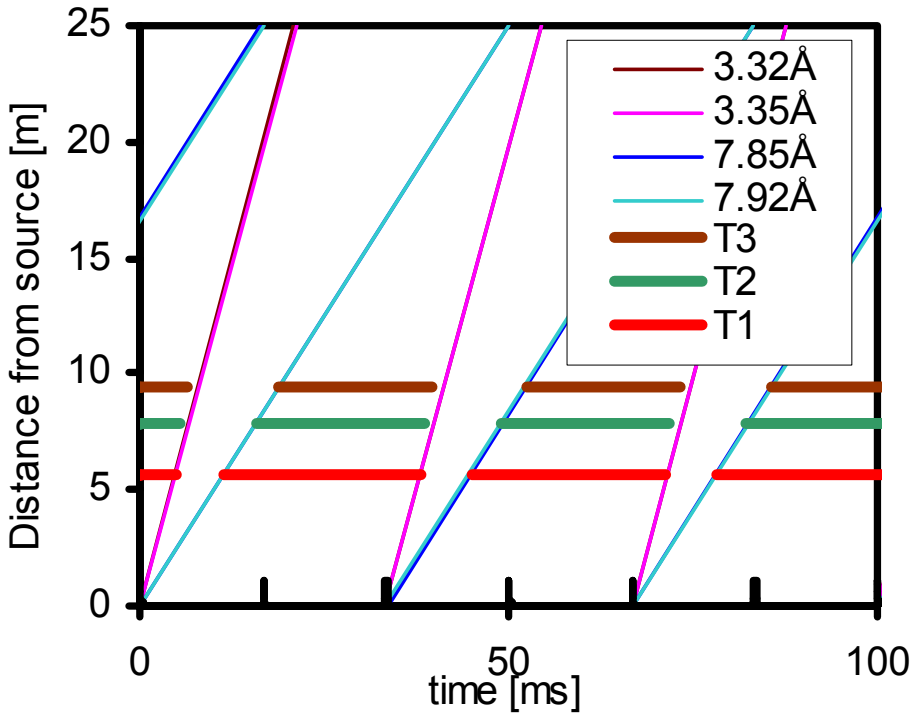


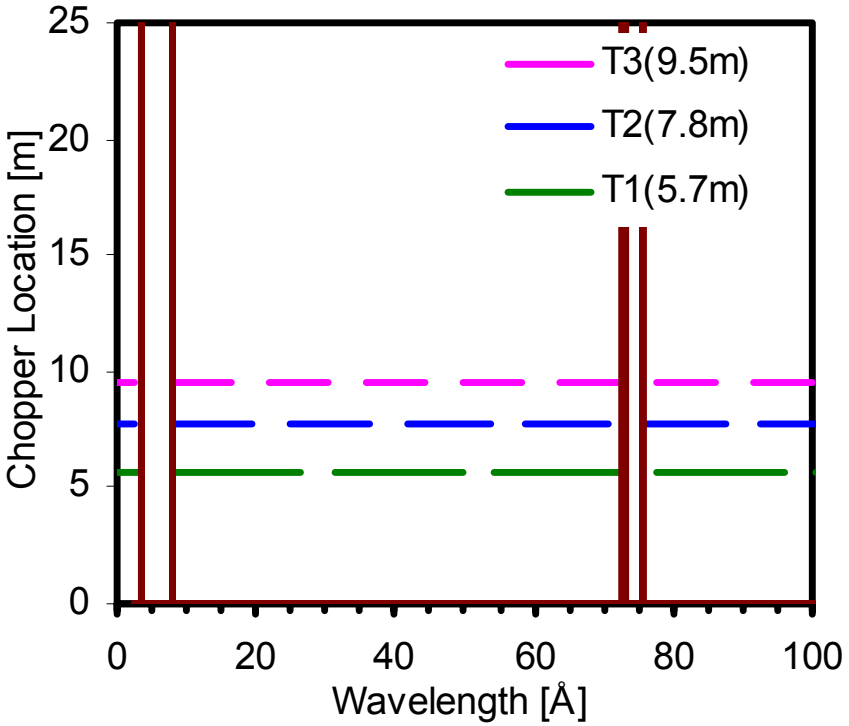


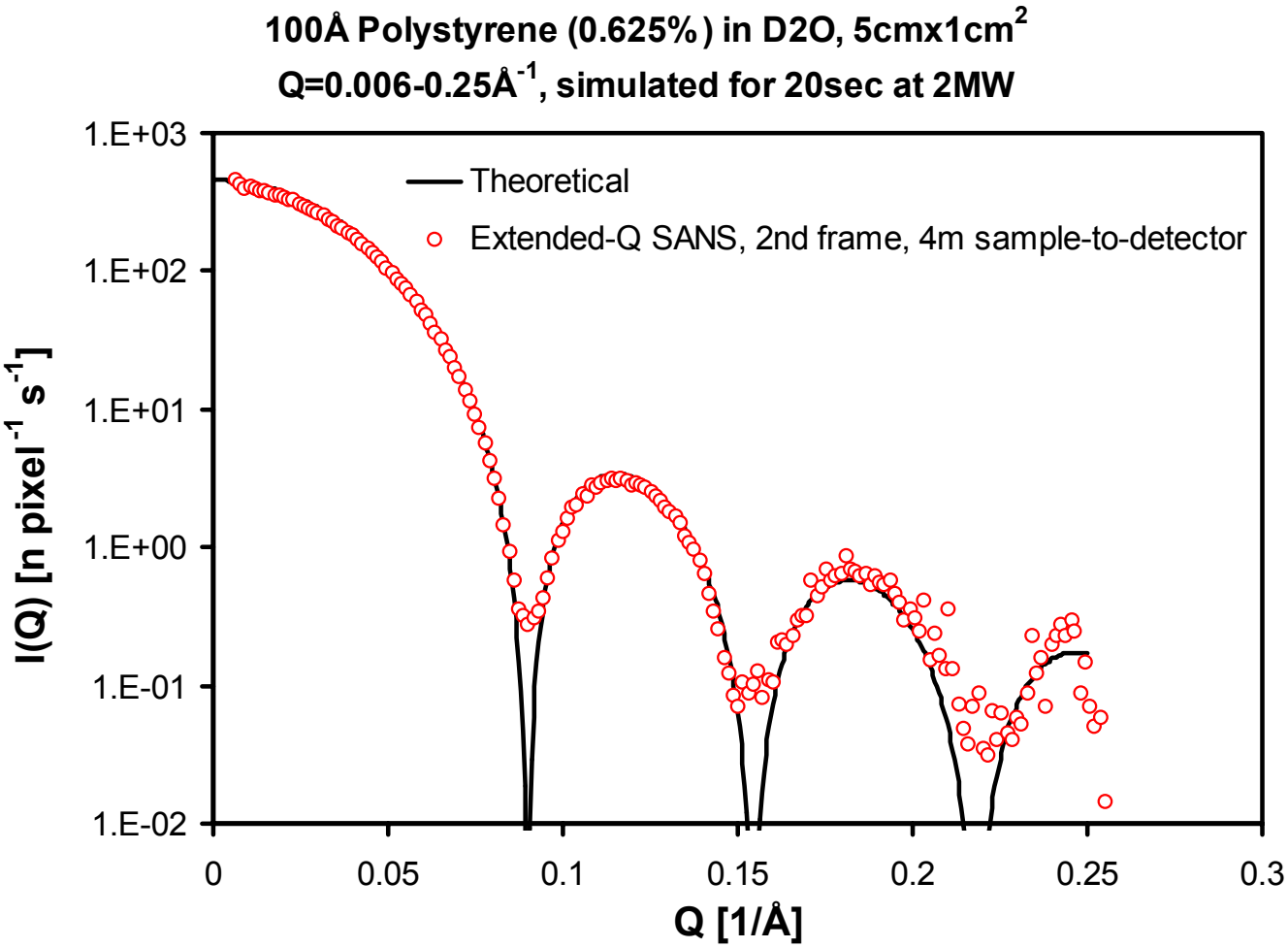
Detector=18m

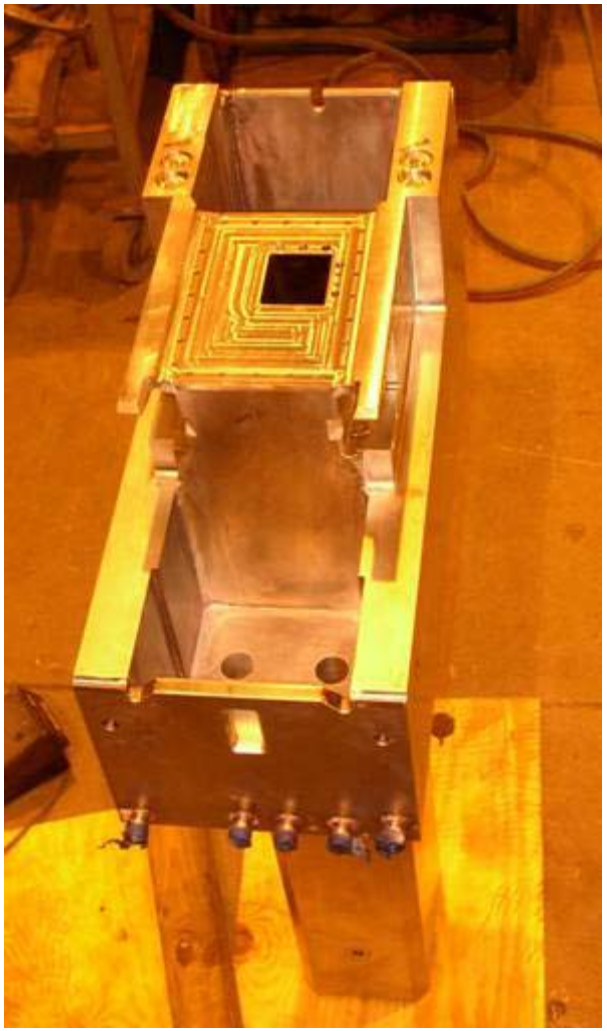
Second Frame, Q=0.005-0.26Å^{-1}.
Third Frame, Q=0.003-0.15Å^{-1}.
Fourth Frame, Q=0.0026-0.085Å^{-1}.

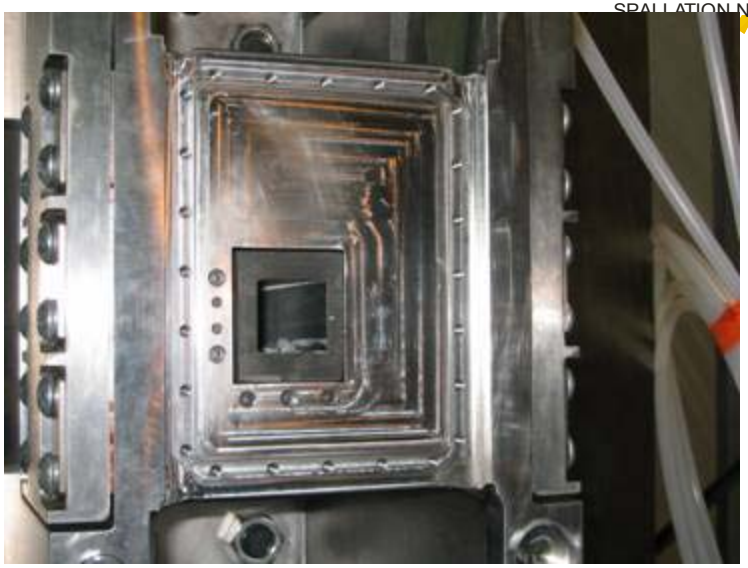
Pulse Rejection

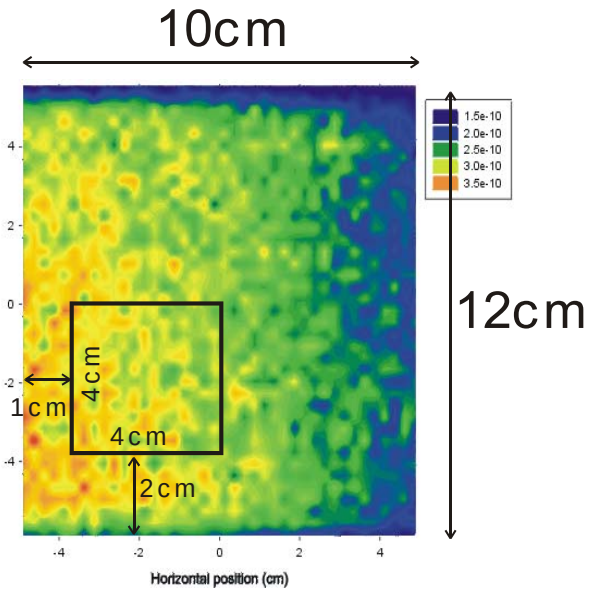





100Å Polystyrene (0.625%) in D2O, 5cmx1cm2
Q=0.006-0.25Å-1, simulated for 20sec at 2MW
Theoretical
Extended-Q SANS, 2nd frame, 4m sample-to-detector
I(Q) [n pixel-1 s-1]
1.E+03
1.E+02
1.E+01
1.E+00
1.E-01
1.E-02
0
0.05
0.1
0.15
0.2
0.25
0.3
Q [1/Å]






10cm
12cm
4cm
1cm
4cm
2cm
1.5e-10
2.0e-10
2.5e-10
3.0e-10
3.5e-10
Horizontal position (cm)


SwissNeutronics