Centre for Energy Research

BNC
Budapest Neutron Centre

Cold moderator test facility

2023 January progress

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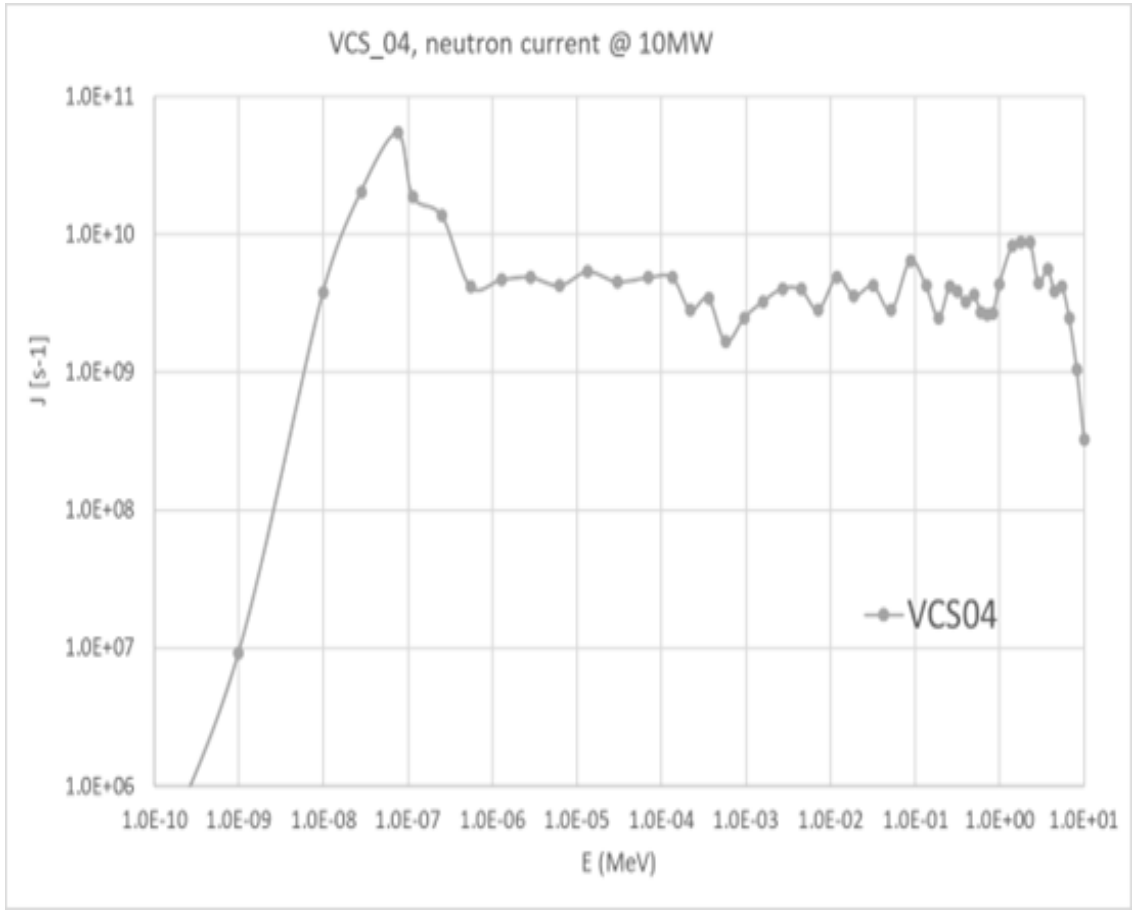
Budapest Research Reactor (BRR)

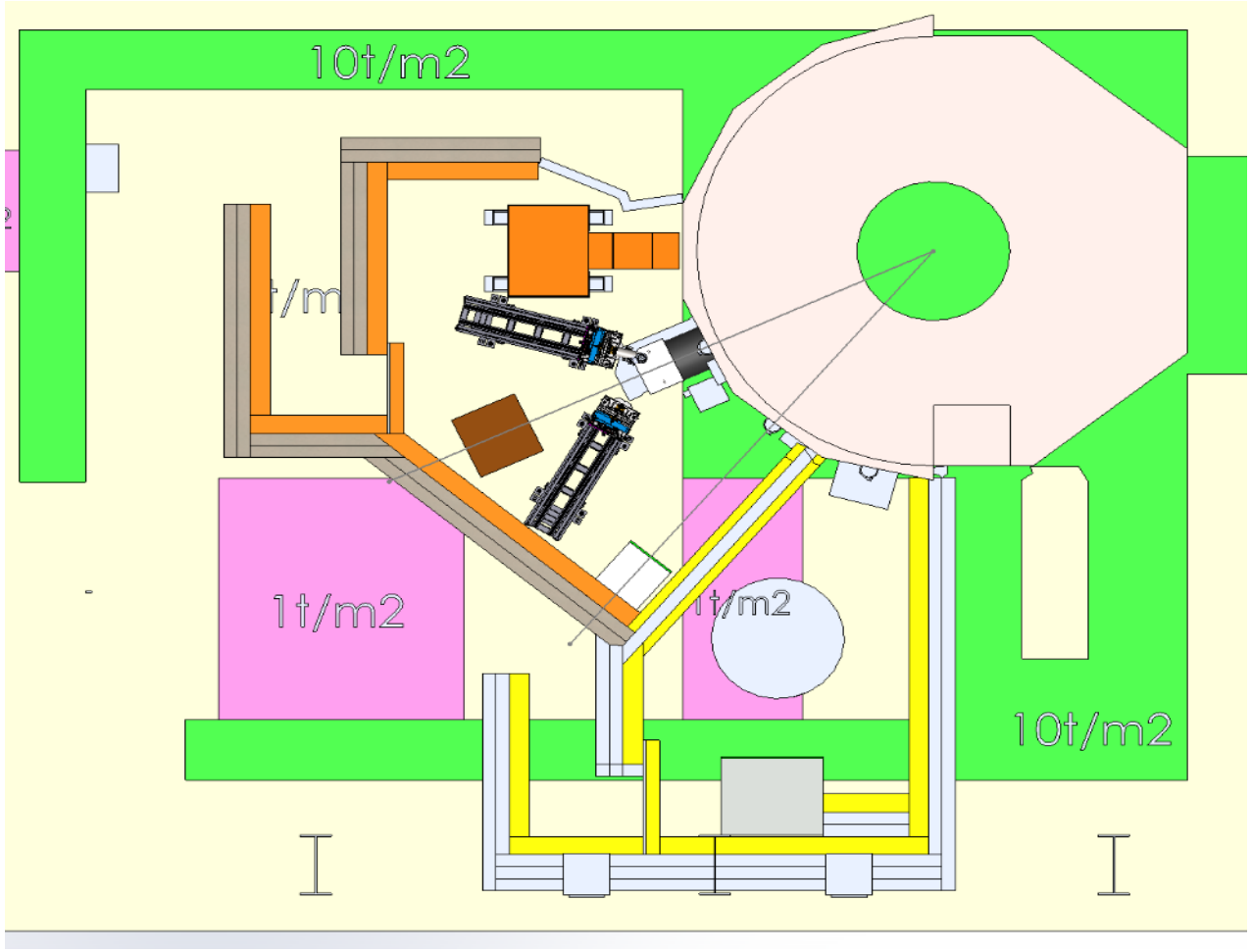
Commissioned in 1959 at 2.5MW
Refurbished, upgraded to 10 MW in 1992;
Maximum thermal flux: 2.1×10^{14}
Cold source, SM guide system installed in 2000.

Fuel: 20% (LEU Russian) until 2028
Operation licence 2023/33

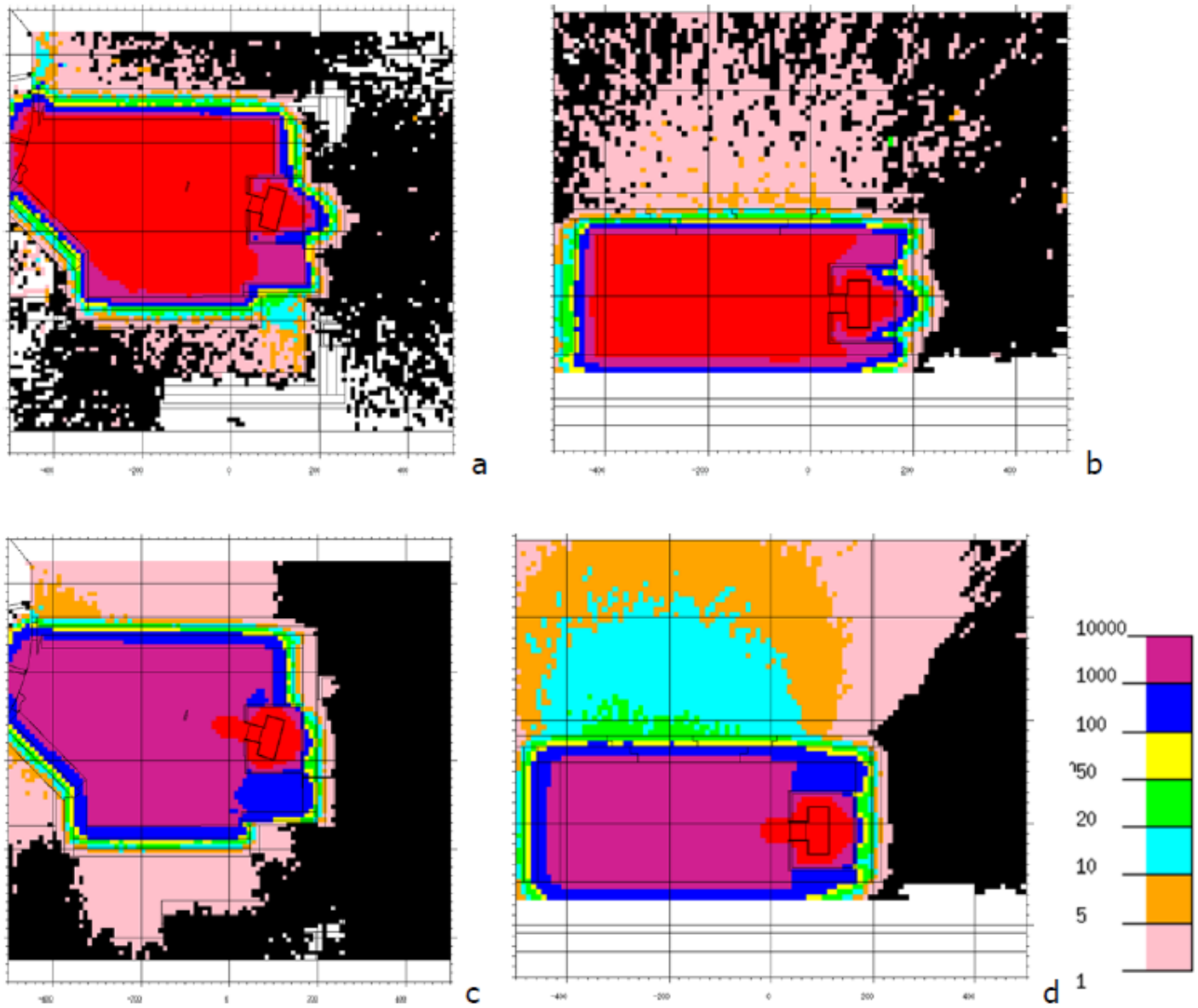
Monte Carlo simulations for optimal modification of the biological shielding for the horizontal neutron beamline 4



Adatok	4. sz. csatorna	egység
diam_beam_port	10,5	cm
A_beam_port	86,59	cm^2
sum_n_current@beamport	2,81E+11	n/s



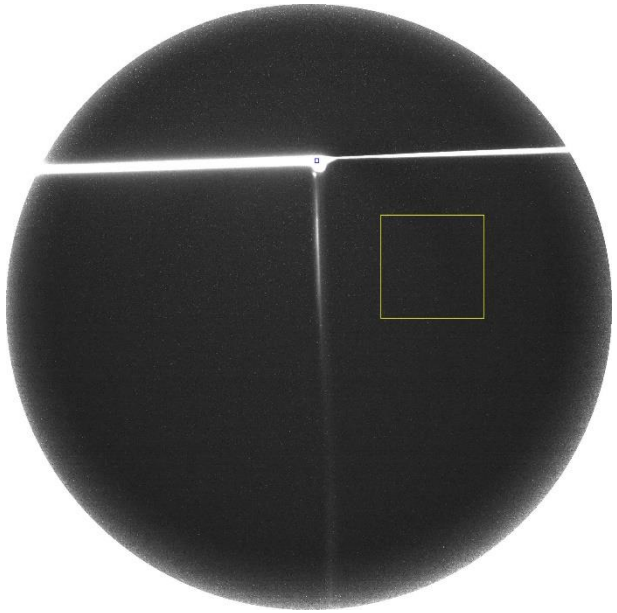
Anyagok	felhasználás
bórsav por (BoPo)	neutron: abszorber
bórsavas víz (BoAc)	neutron: termalizálás + abszorber
bóros polietilén (BoPE)	neutron: termalizálás + abszorber
beton (Concr)	gammavédelem: abszorber
ólom (Pb)	gammavédelem: abszorber
Fe	besugárzott minta

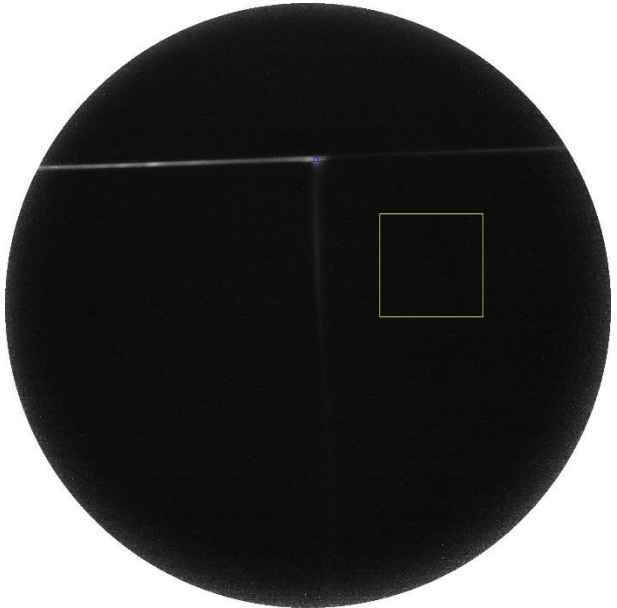


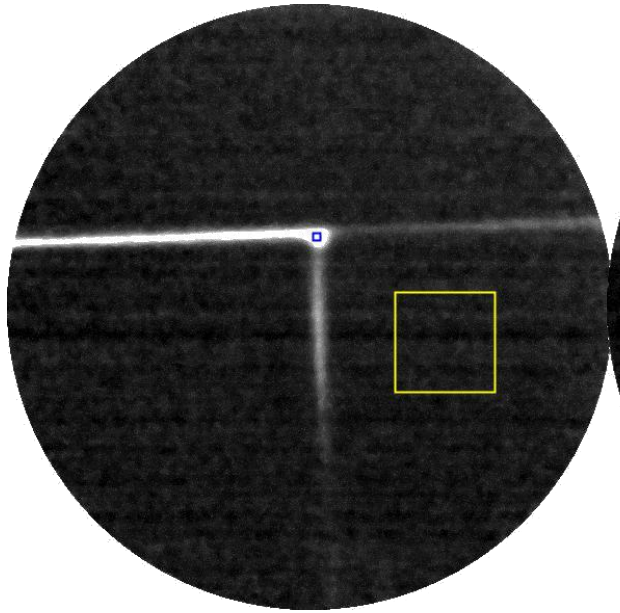
1. ábra: A 4. sz. csatornára jellemző neutronnyaláb esetén (besugárzott minta nélkül), a rétegezett elrendezést alkalmazó biológiai védelemmel kialakuló neutron (a: vízszintes metszet, b: függőleges metszet) és gamma (c: vízszintes metszet, d: függőleges metszet) dózisteljesítmény szintek (e, µSv/h skála)

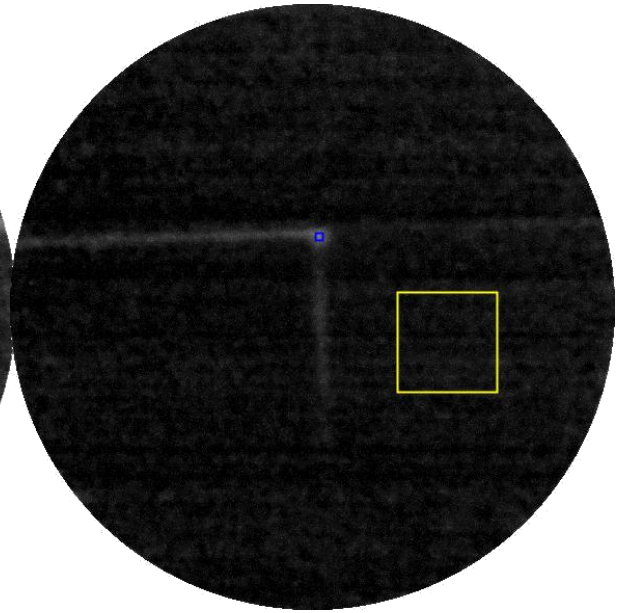
Type of imaging: thermal and fast neutron radiography
Measuring instrument: RAD station

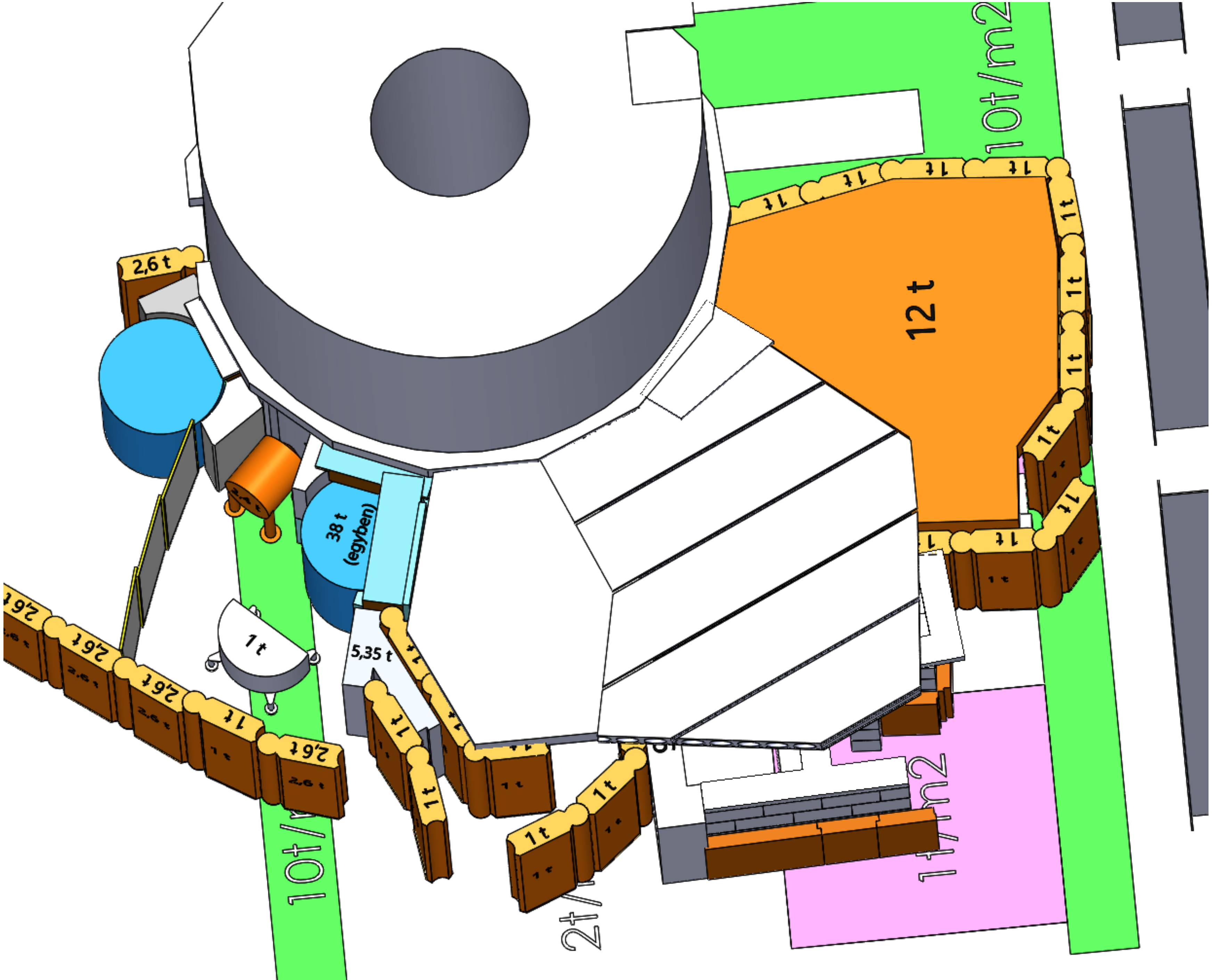
setup	ROI	Mean transmission (rel. unit)	StdDev (rel. unit)	Effect of 100 mm extra layer
1	blue	0.72	0.042	
2	blue	0.002	2.48E-04	0.003
1	yellow	6.38E-04	1.04E-04	
2	yellow	2.21E-04	6.82E-05	0.347

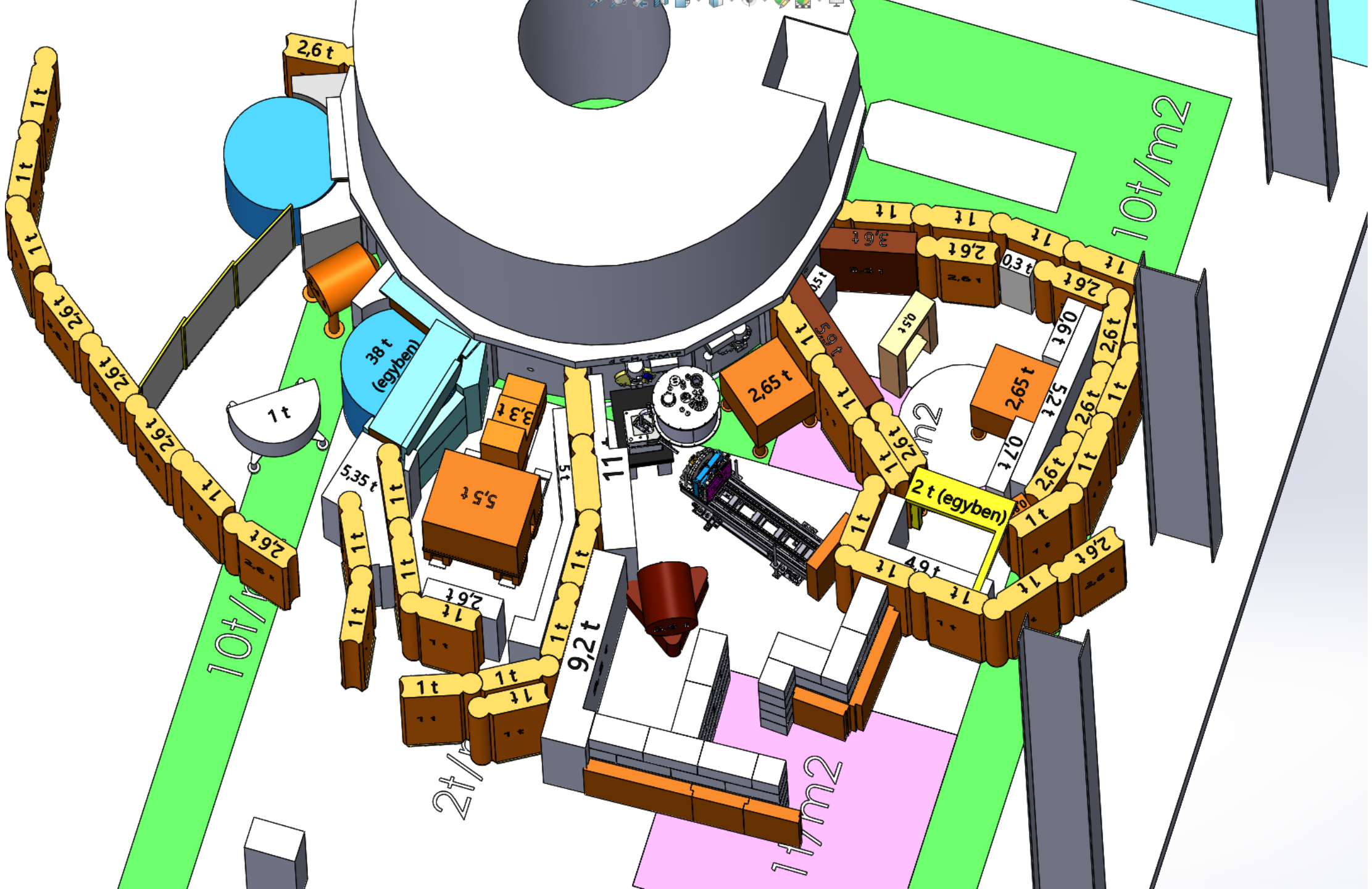









10t/m2
12 t
1t
2,6 t
38 t
(egyben)
5,35 t
1 t
2,6t
10t/m
2t/
1t/m2


10t/m2
2,6 t
1 t
38 t (egyben)
3,3 t
5,5 t
5,35 t
2,65 t
5,9 t
3,6 t
2,6 t
0,3 t
1,5 t
0,5 t
1,9 t
5,21 t
0,7 t
2 t (egyben)
4,9 t
11 t
9,2 t
5 t
2t/m2
1t/m2

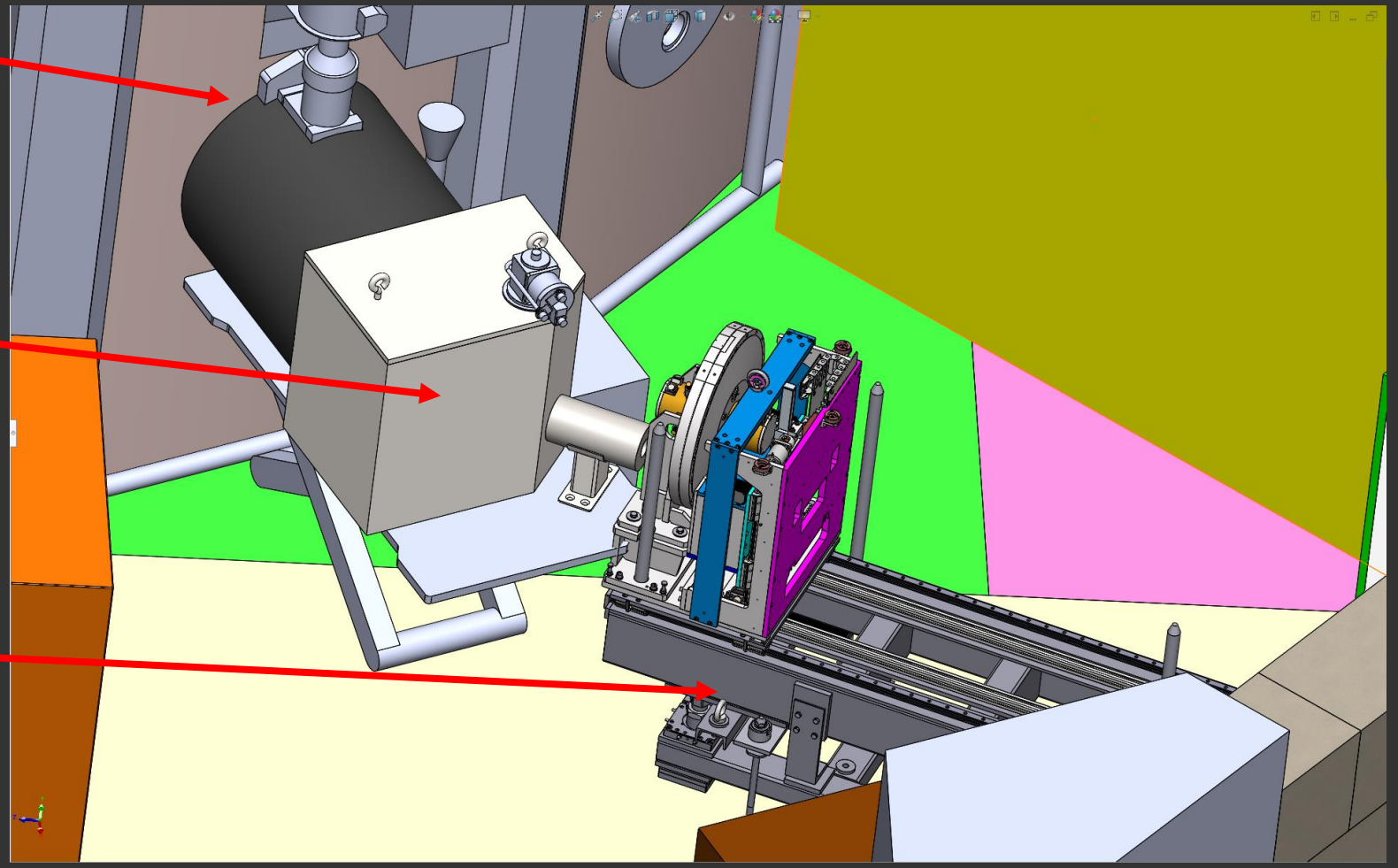
4 CH. CMTF
2,65 t
5,9 t
1 t
1 t
1 t
0,5 t
2,6 t
1 t
2 t (egyb
1 t
4,9 t
1 t
1 t
1 t
5 t
1 t
1 t
1 t
1 t
1 t
3,3 t
5,5 t
2,6 t
1 t

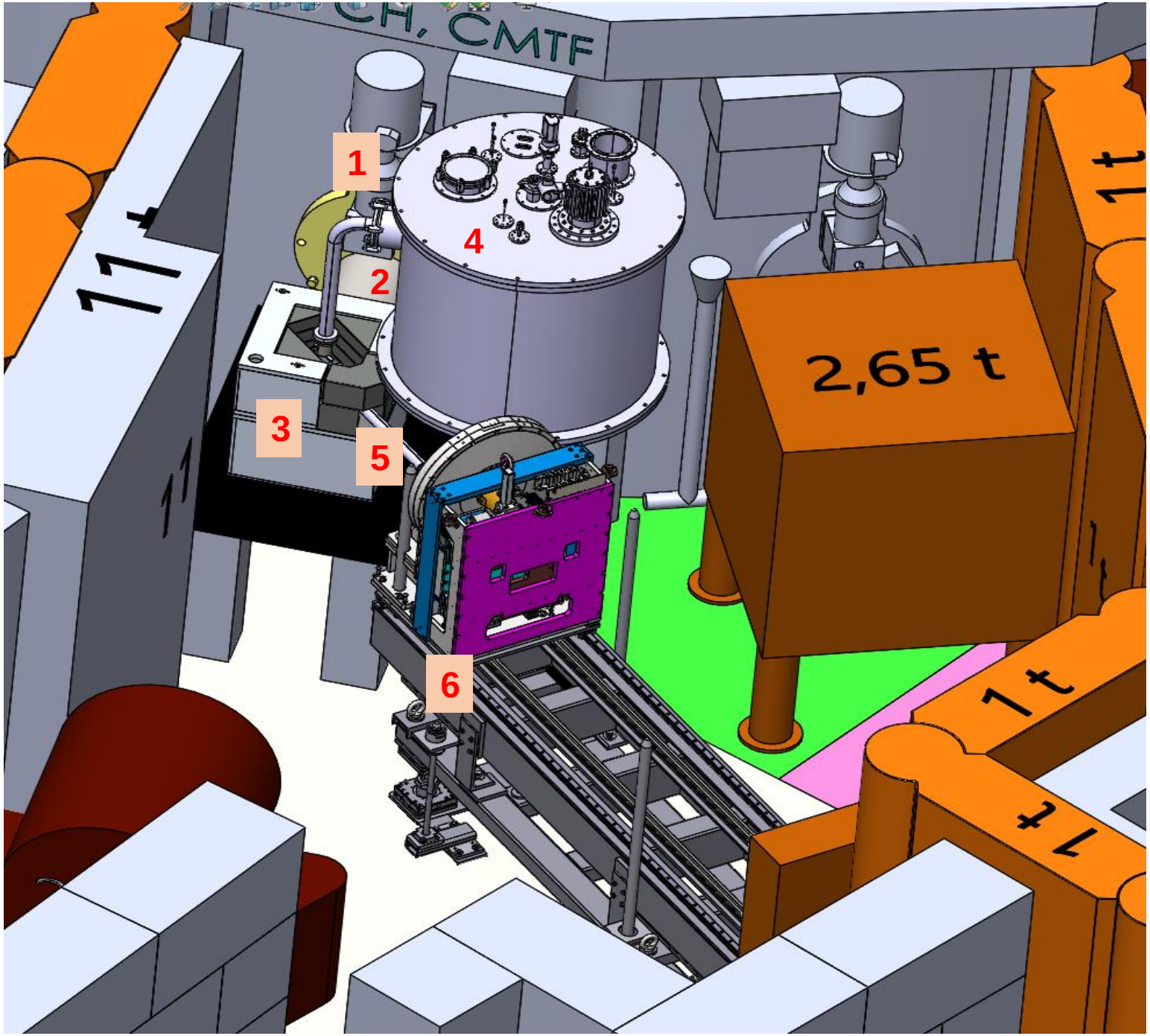
Main components of CMTF

I) Radial channel with fast neutrons

II) Target box with Be disk, Pb reflector and prototype cold source

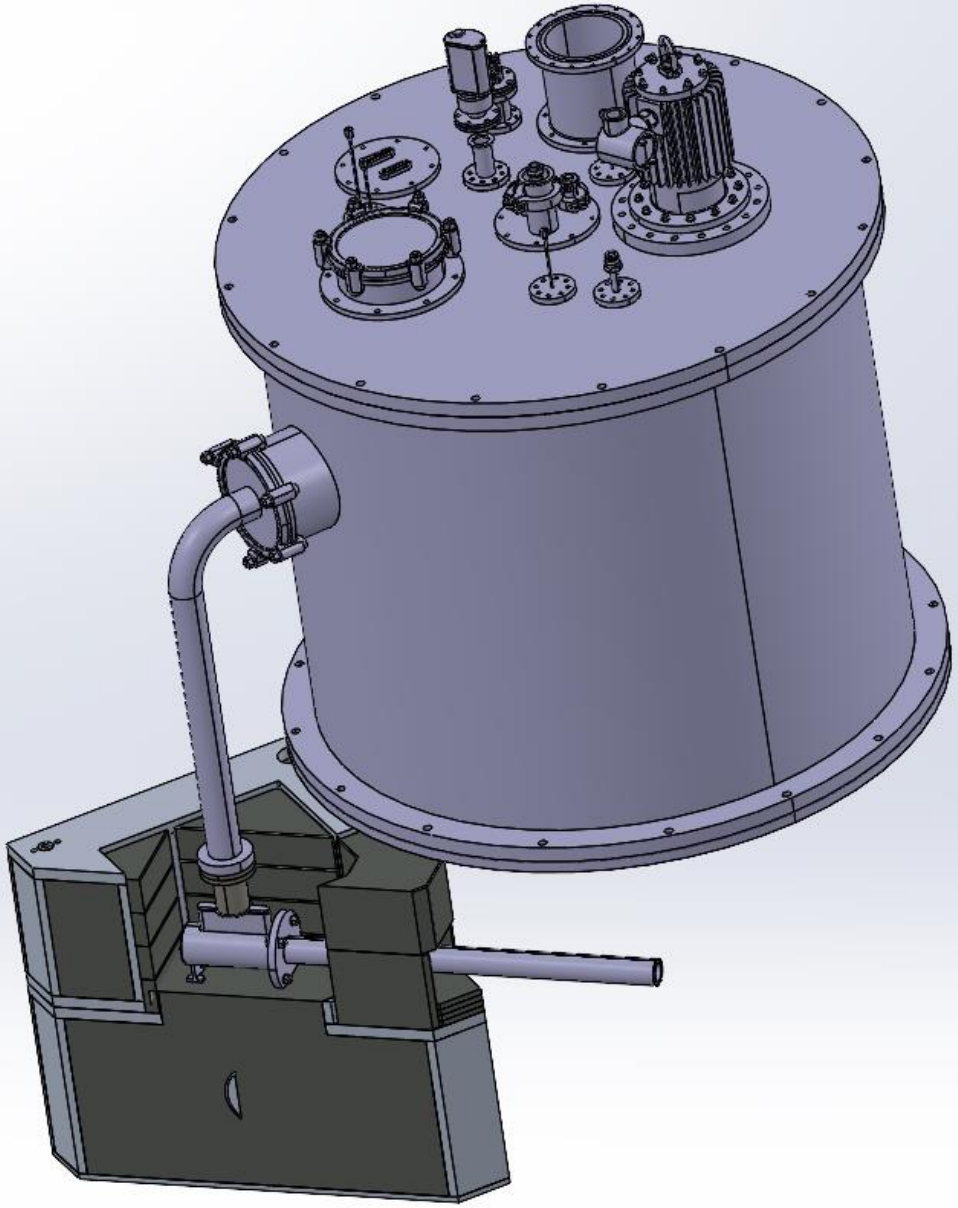
III) Camera obscura pinhole with chopper

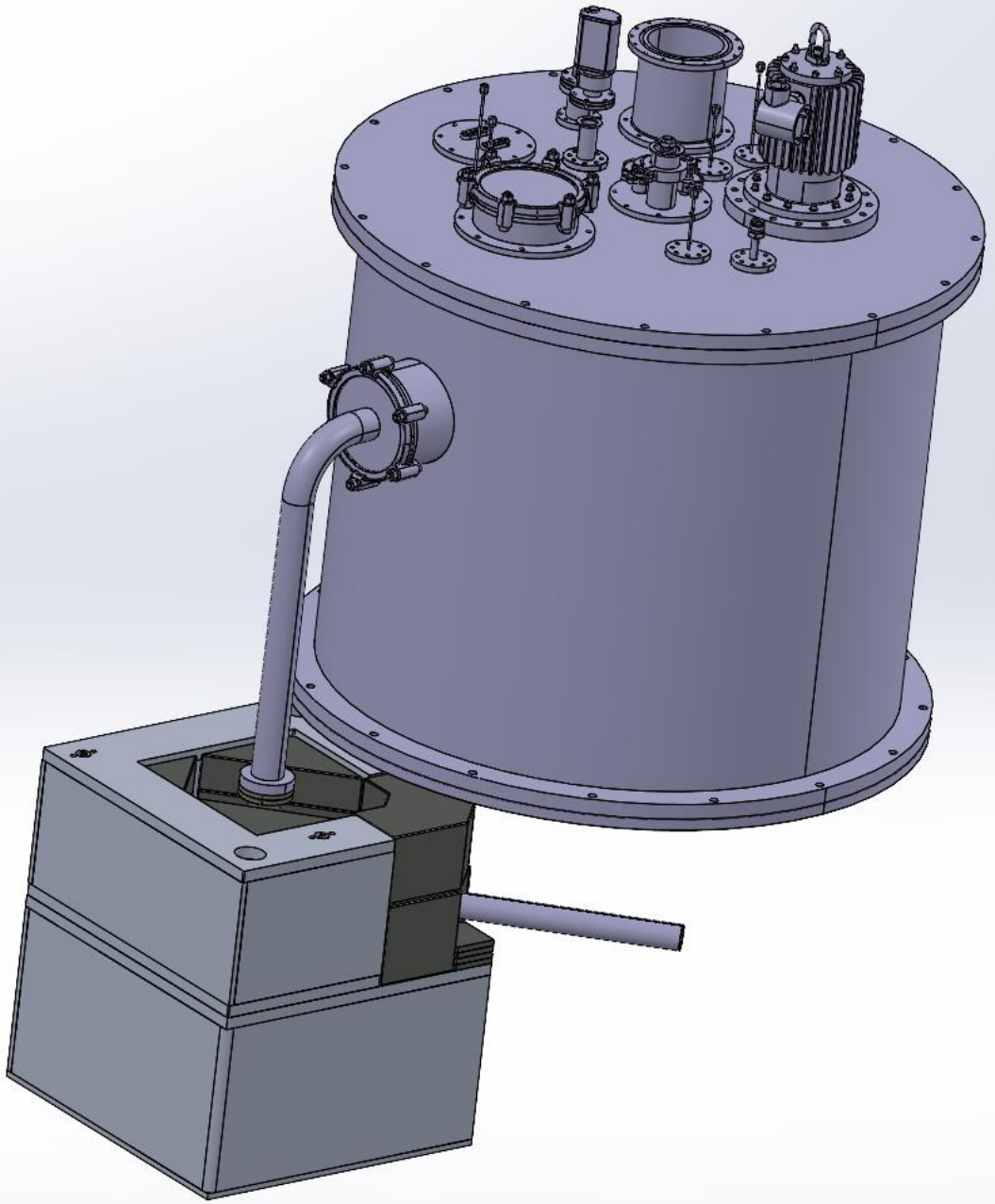


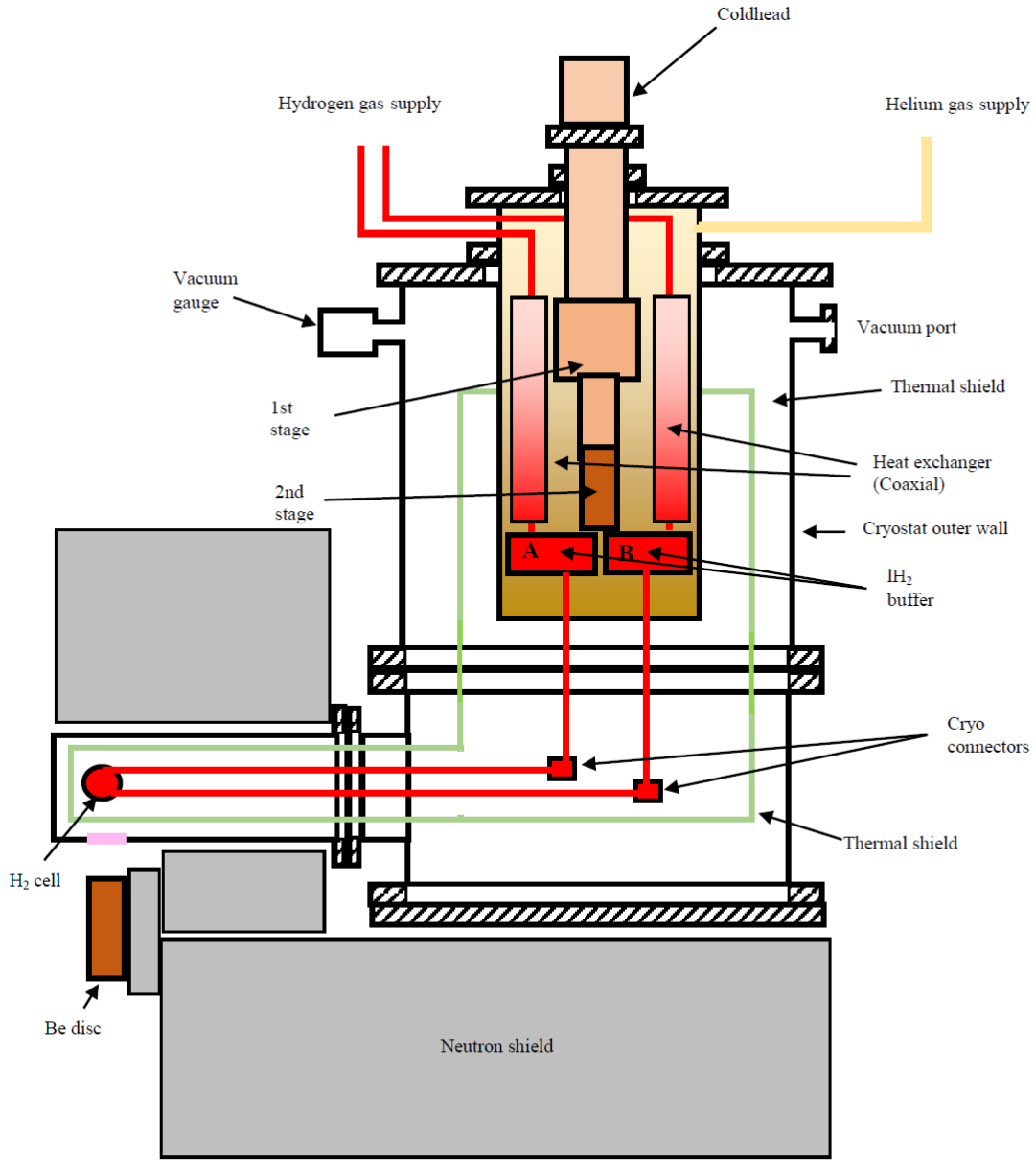


The Cold Moderator Test Facility (CMTF) at BRR

- channel #4 (1)
- the beam take-off collimator (2),
- out-of-pile neutron reflector (3),
- cold moderator cryostat (4),
- cold neutron beam optical guide (5)
- the pin-hole camera device (6) for TOF spectral measurements.





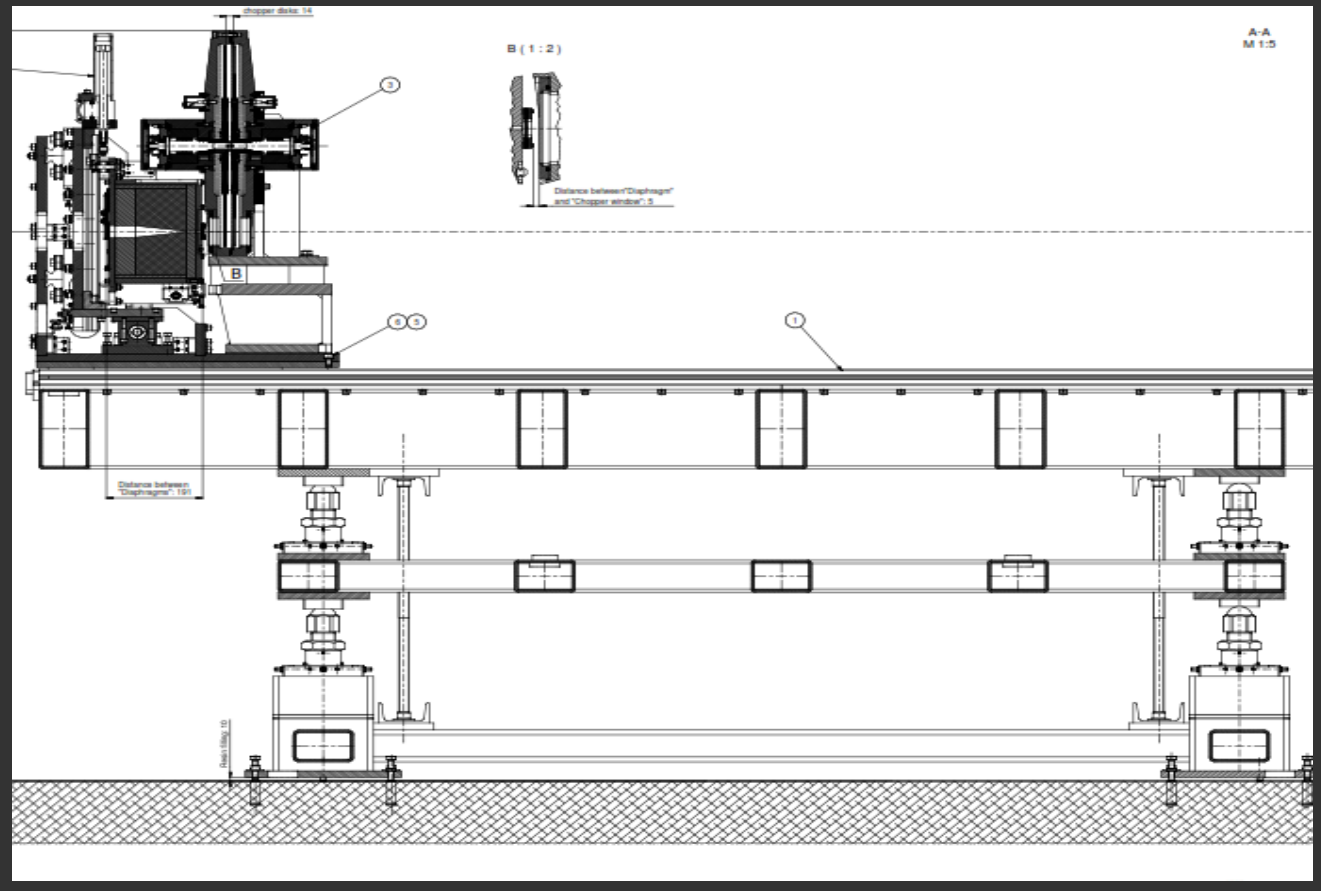


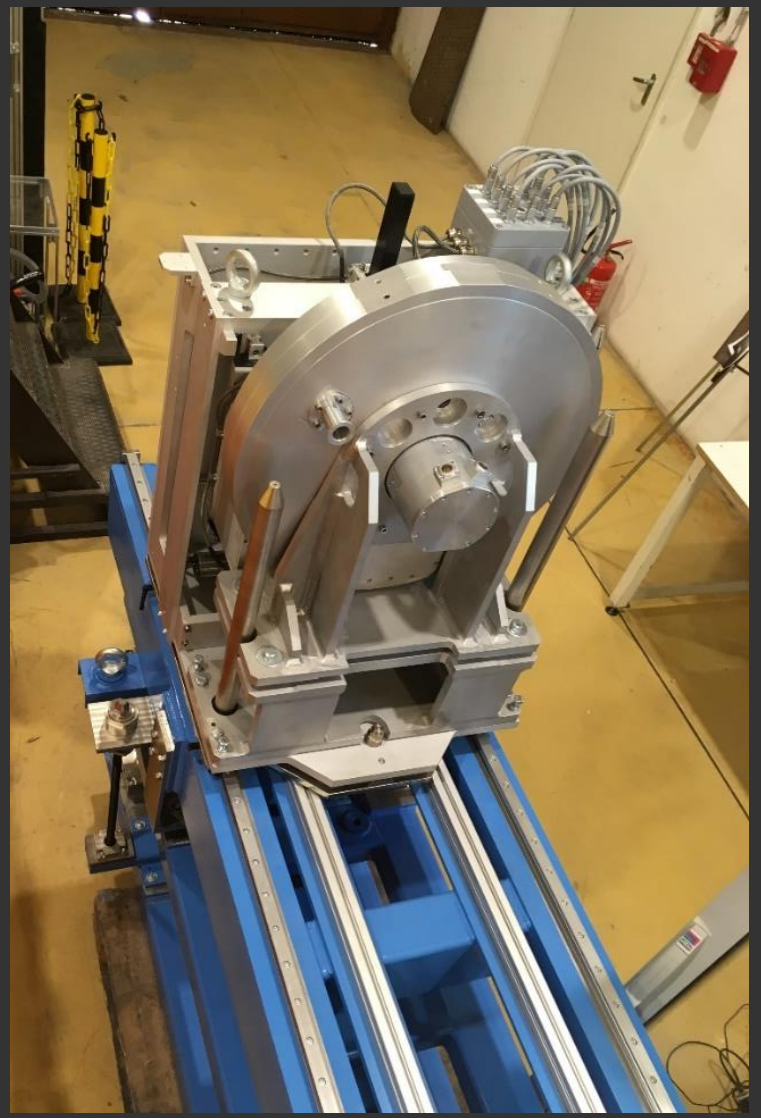
: Neutron transparent window

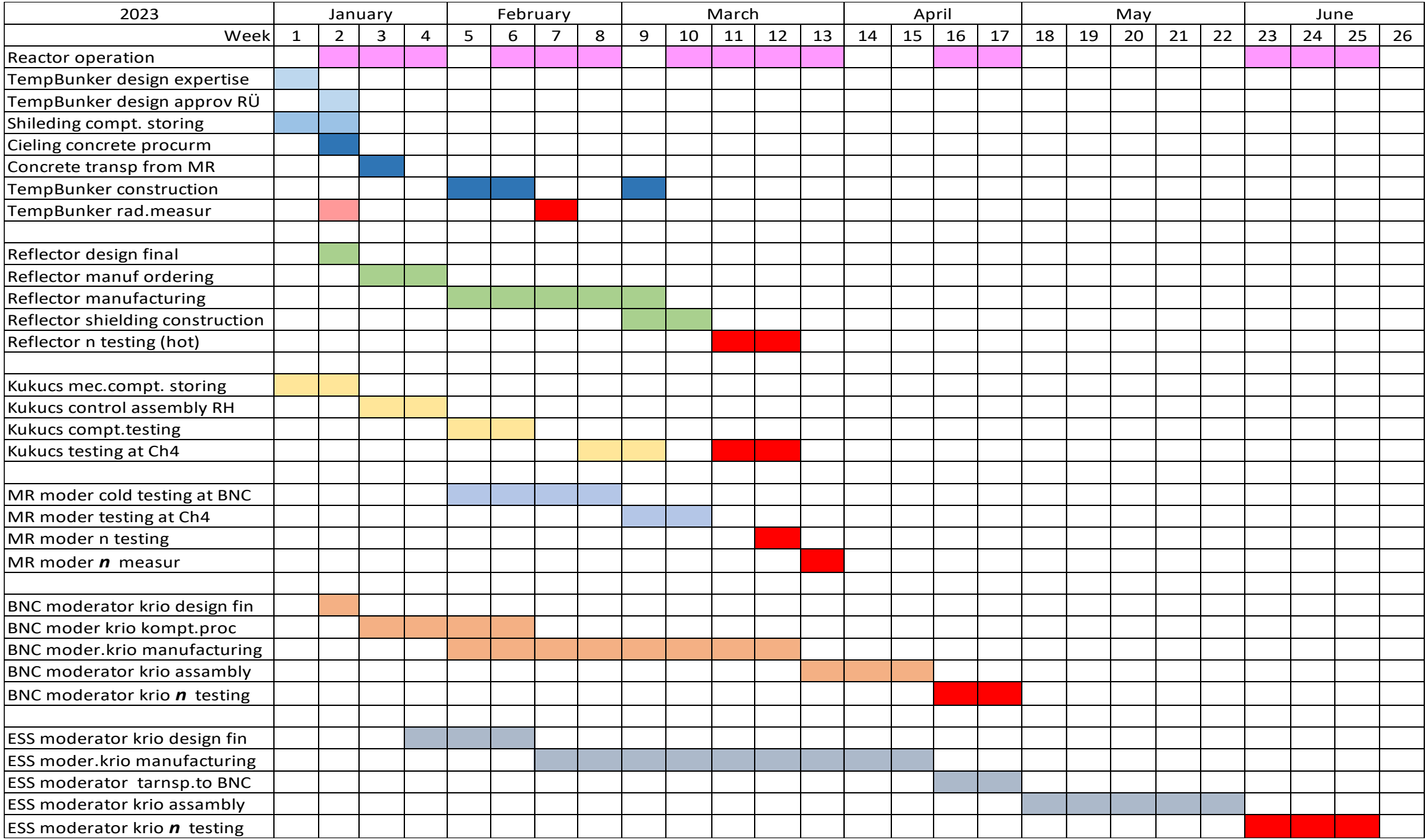
Pinhole and chopper system

- The pinhole and chopper assembly can be moved on a rail
- Available pinhole sizes: 0.5, 1.0, 1.5, 2.0 mm

- Double chopper system with 5° slit opening
- Chopper speed: max. 30 Hz
- Chopper-detector distance: 2m






2023
January
February
March
April
May
June
Week
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Reactor operation
TempBunker design expertise
TempBunker design approv RÜ
Shileding compt. storing
Cieling concrete procurm
Concrete transp from MR
TempBunker construction
TempBunker rad.measur
Reflector design final
Reflector manuf ordering
Reflector manufacturing
Reflector shielding construction
Reflector n testing (hot)
Kukucs mec.compt. storing
Kukucs control assembly RH
Kukucs compt.testing
Kukucs testing at Ch4
MR moder cold testing at BNC
MR moder testing at Ch4
MR moder n testing
MR moder n measur
BNC moderator krio design fin
BNC moder krio kompt.proc
BNC moder.krio manufacturing
BNC moderator krio assambly
BNC moderator krio n testing
ESS moderator krio design fin
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