

# BEER Instrument update

Premek Beran

IKON 15 - Lund

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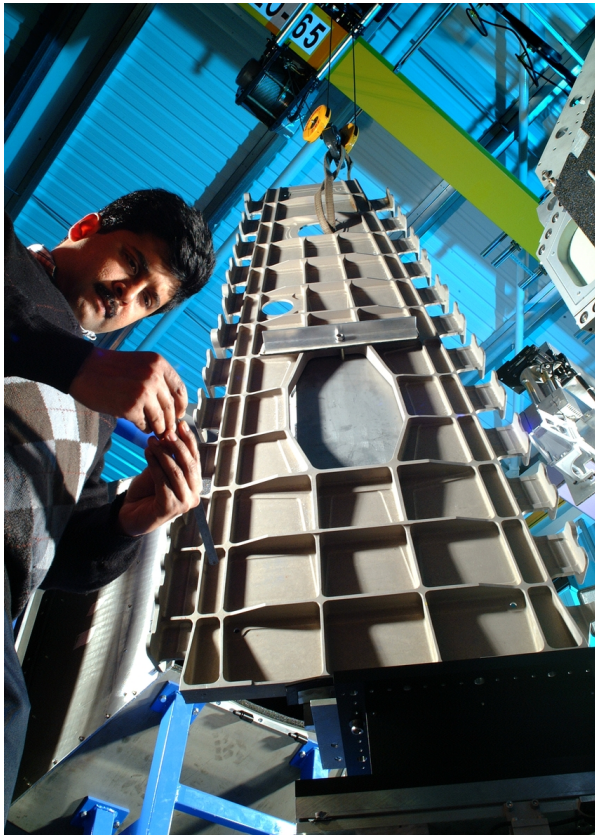
12 September, 2018

- Design solutions & Status
  - Cave and control hutch
  - Positioning of detectors
  - Neutron guide shielding tunnel
  - Safety shutter and shutter pit

# Cave and control hutch

*Scientific background of design*

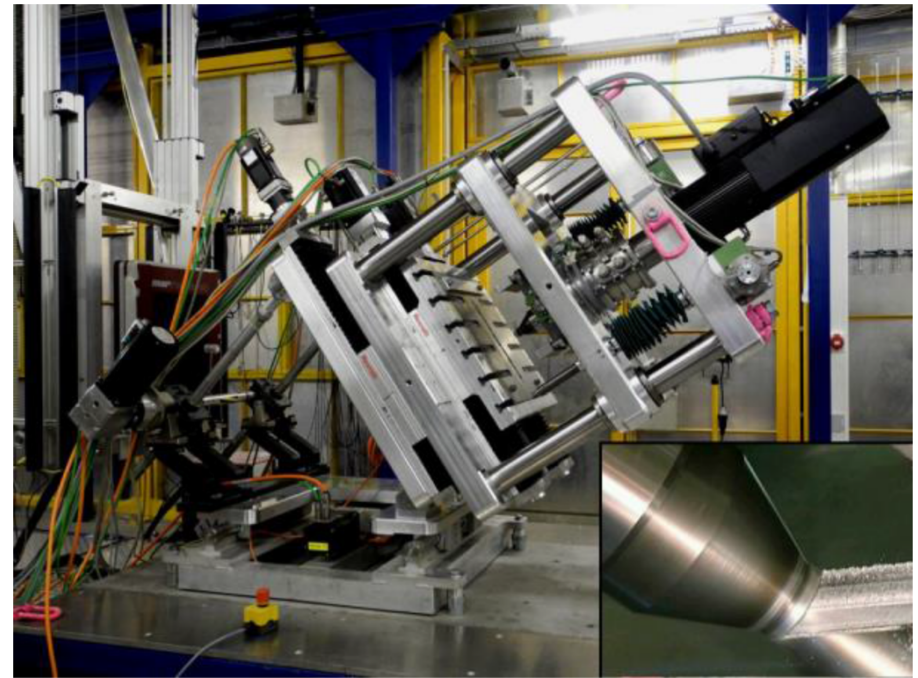
- Engineering samples
  - Big ones
  - Small ones with big sample environment



# Cave and control hutch

*Scientific background of design*

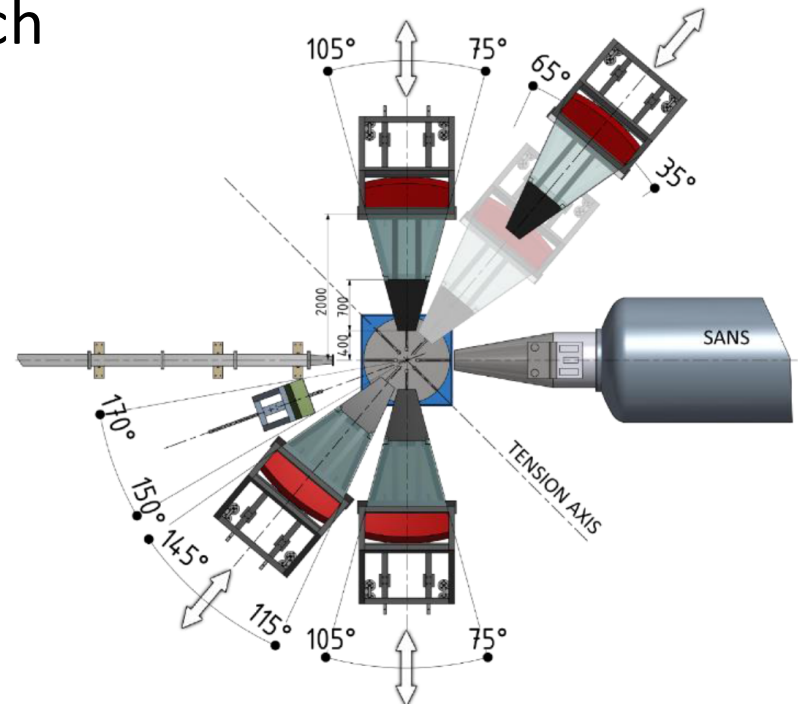
- Engineering samples
  - Big ones
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# Cave and control hut

## *Scientific background of design*

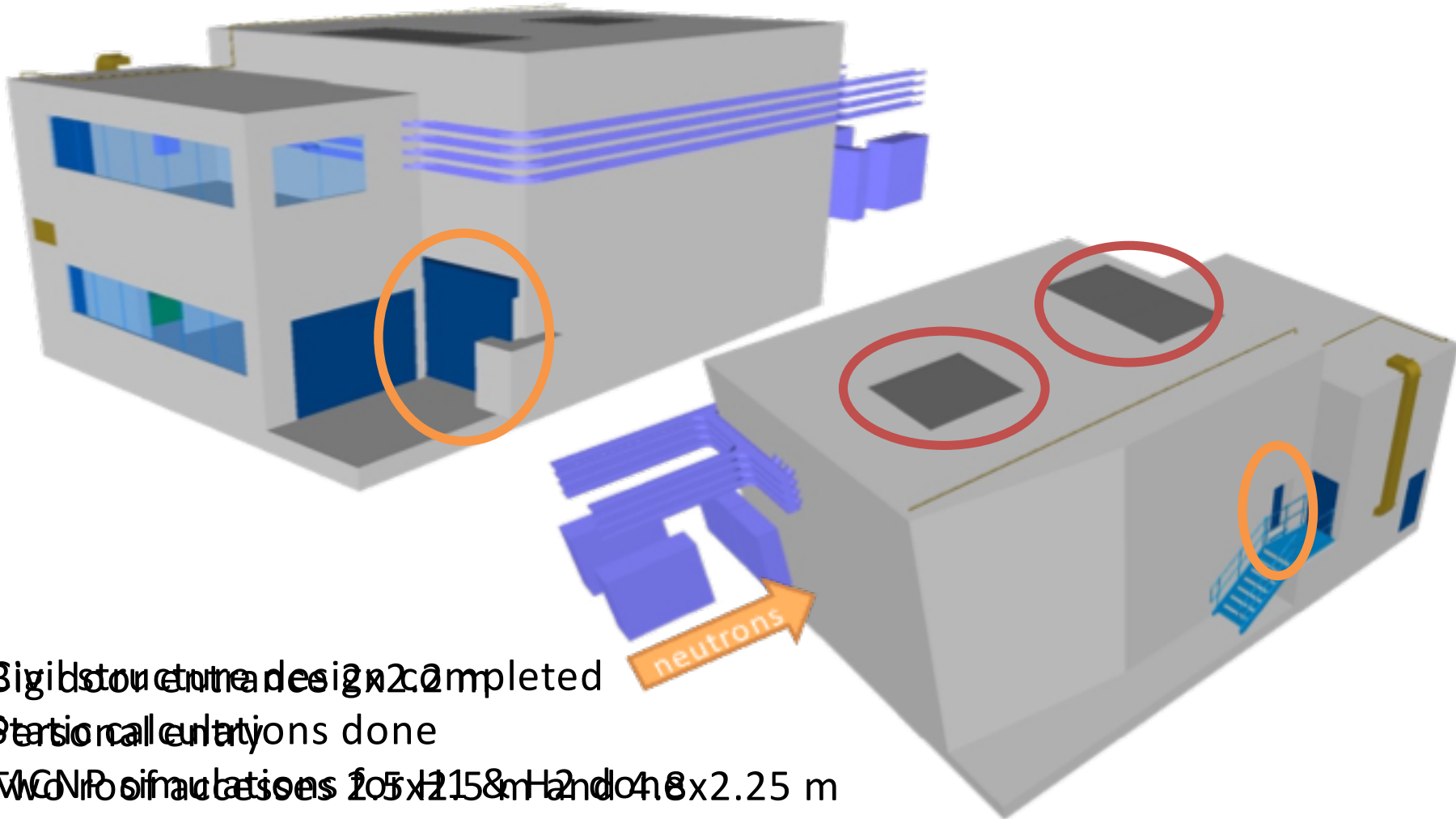
- Engineering samples
  - Big ones
  - Small ones with big sample environment
- Requirements on cave and hut
  - Big space in the cave
  - Access to the sample area
  - Access into the cave
  - Lab for sample preparation
  - Handling inside the cave
- Limitations
  - E01 floor 3 m below TCS
  - Free ramps to E02
  - 3  $\mu\text{Sv/h}$  on outer wall
  - Many more ...





# Cave and control hutch

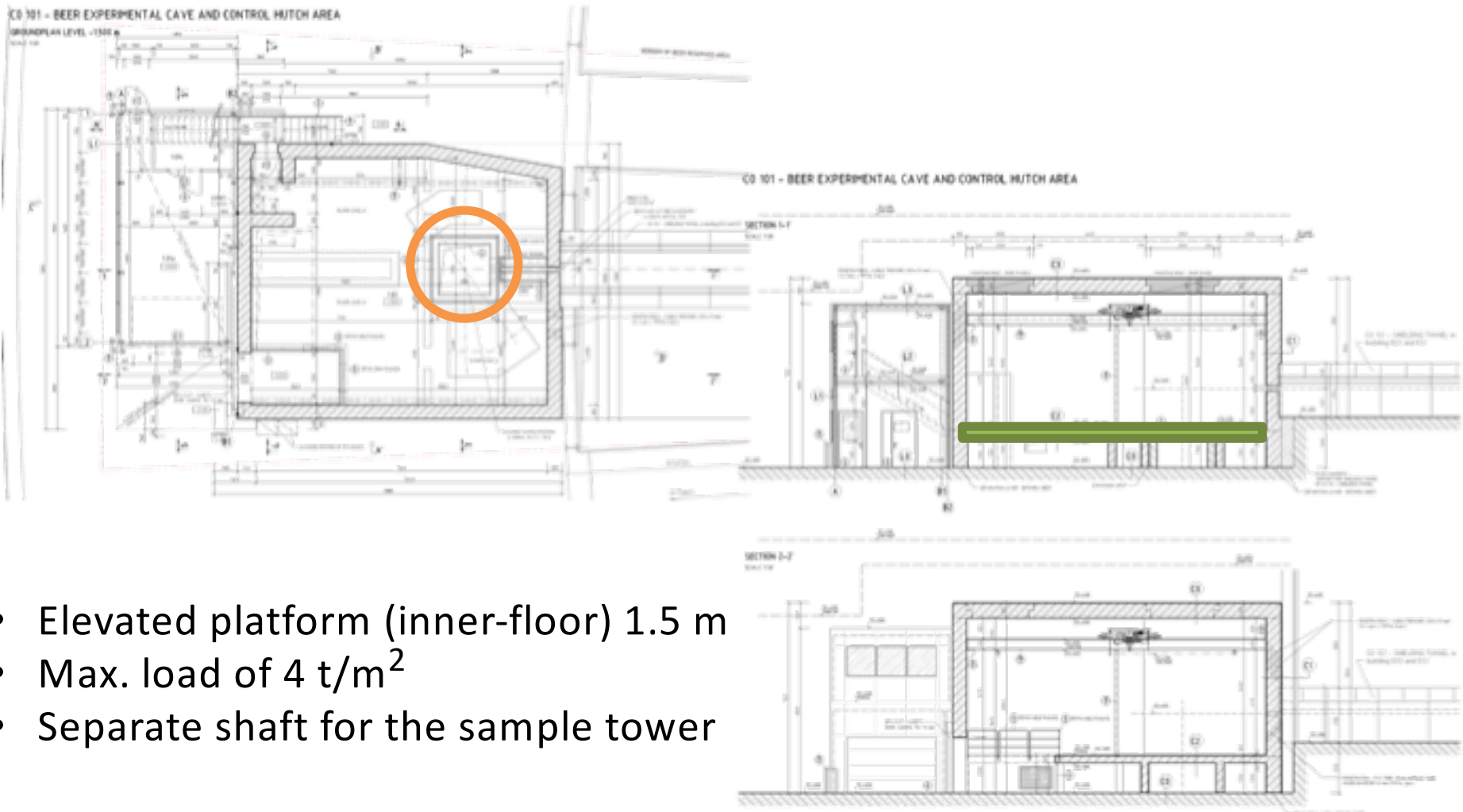
## Design



- Big structure design completed
- Static calculations done
- MCNP simulations  $20.5 \times 21.5$  m and  $4.8 \times 2.25$  m
- **Electrical design delayed – interface with ESS is not properly defined**

# Cave and control hatch

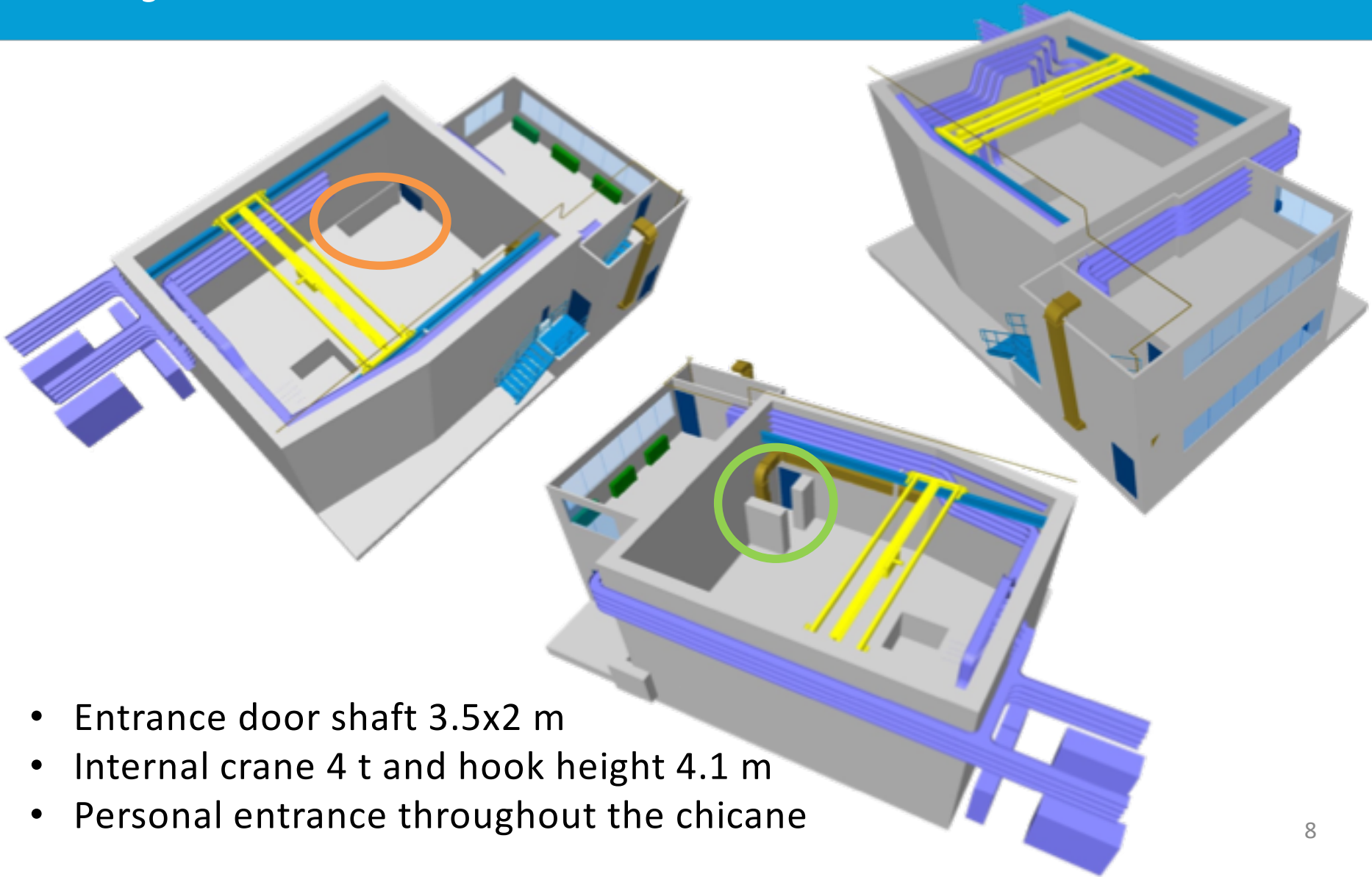
## Design



- Elevated platform (inner-floor) 1.5 m
- Max. load of 4 t/m<sup>2</sup>
- Separate shaft for the sample tower

# Cave and control hut

## Design

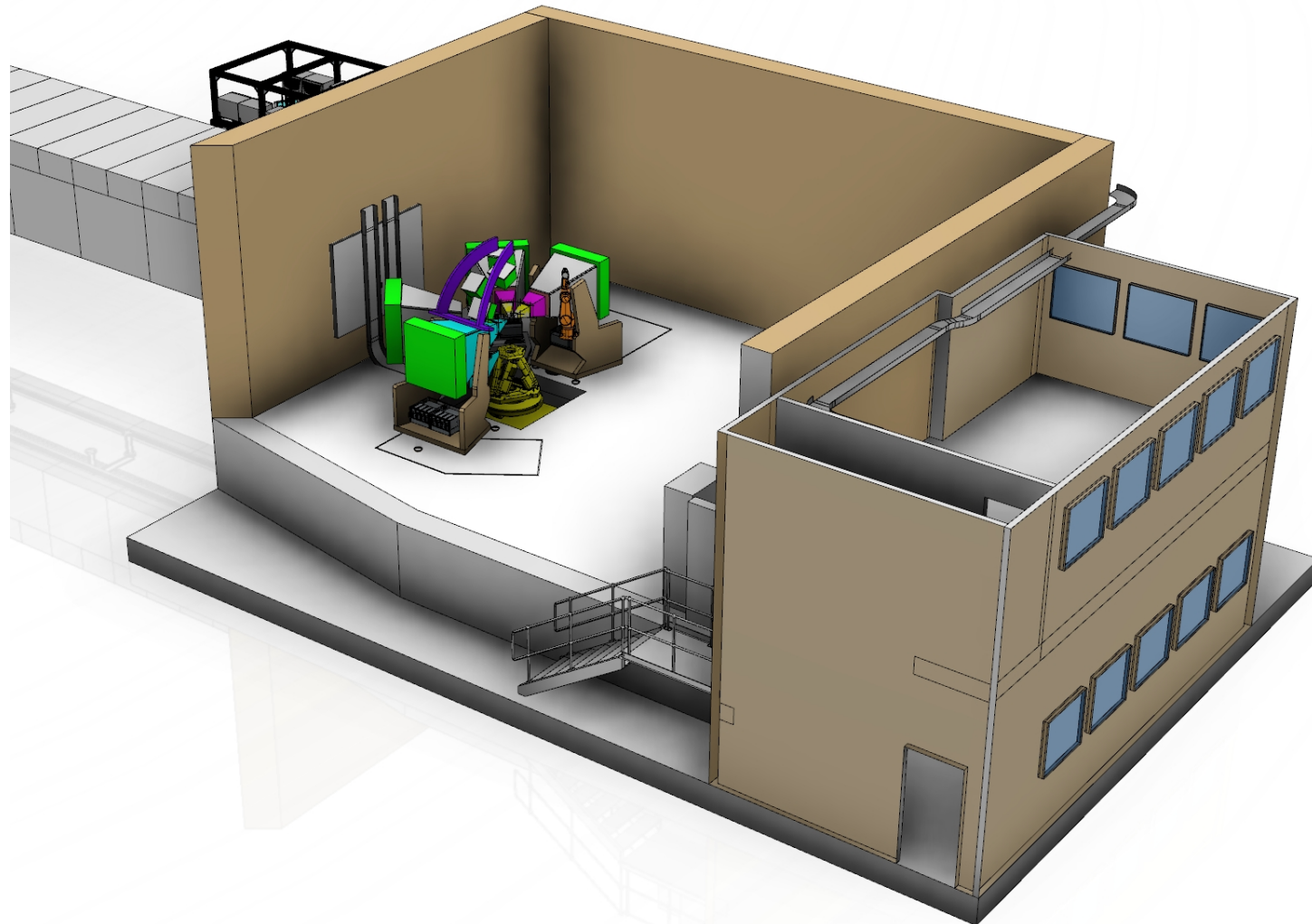


- Entrance door shaft 3.5x2 m
- Internal crane 4 t and hook height 4.1 m
- Personal entrance throughout the chicane



# Cave and control hut

*Design*



# Cave and control hut

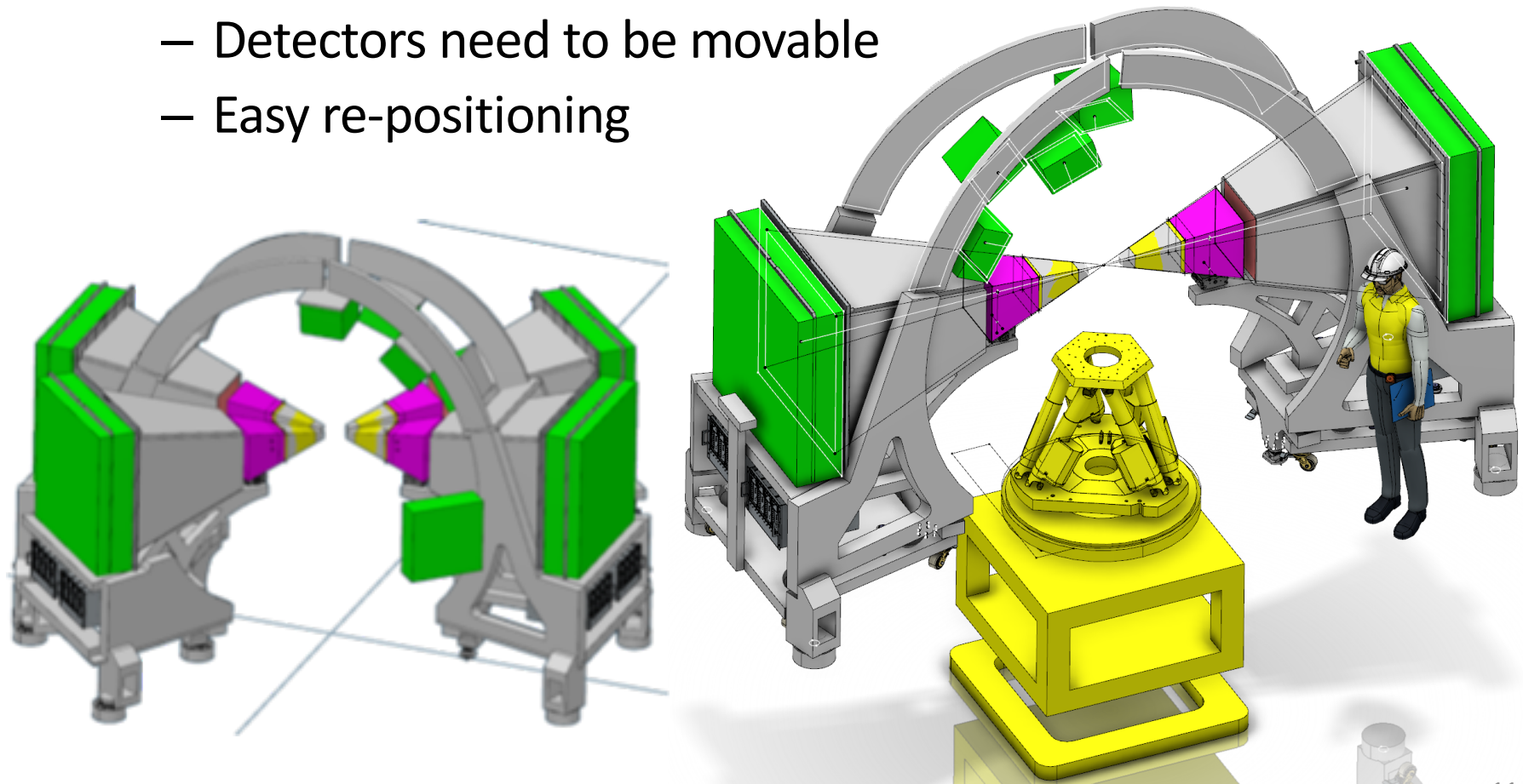
## *Summary data*

- Monolithic reinforced concrete walls and roof
- Elevated platform at 1.5 m with max. load  $4 \text{ t/m}^2$
- Inner walls, ceiling and floor covered by B4C tiles
- Wall thickness 550/600 mm, ceiling 600 mm
- The cave outer dimensions 12.95x11.0x7.5 m (LxWxH)
- Maximum E01 slab load  $108 \text{ kN/m}^2$
- Internal crane of capacity 4 t (hook height 4.1 m)
- Accesses
  - Personal entrance (chicane)
  - Big sliding door (2x2.2 m)
  - 2 times roof opening (2.5x2.5 m, 4.8x2.25 m)
- Hutch two floor mounted steel bearing structure
- Hutch outer dimensions 4.8x9.5x6.5 m (LxWxH)
- Active HVAC system in the cave with air circulation of  $4500 \text{ m}^3/\text{h}$
- Air cushion transport platform between the prep. lab and cave

# Detector re-positioning

*Preliminary design*

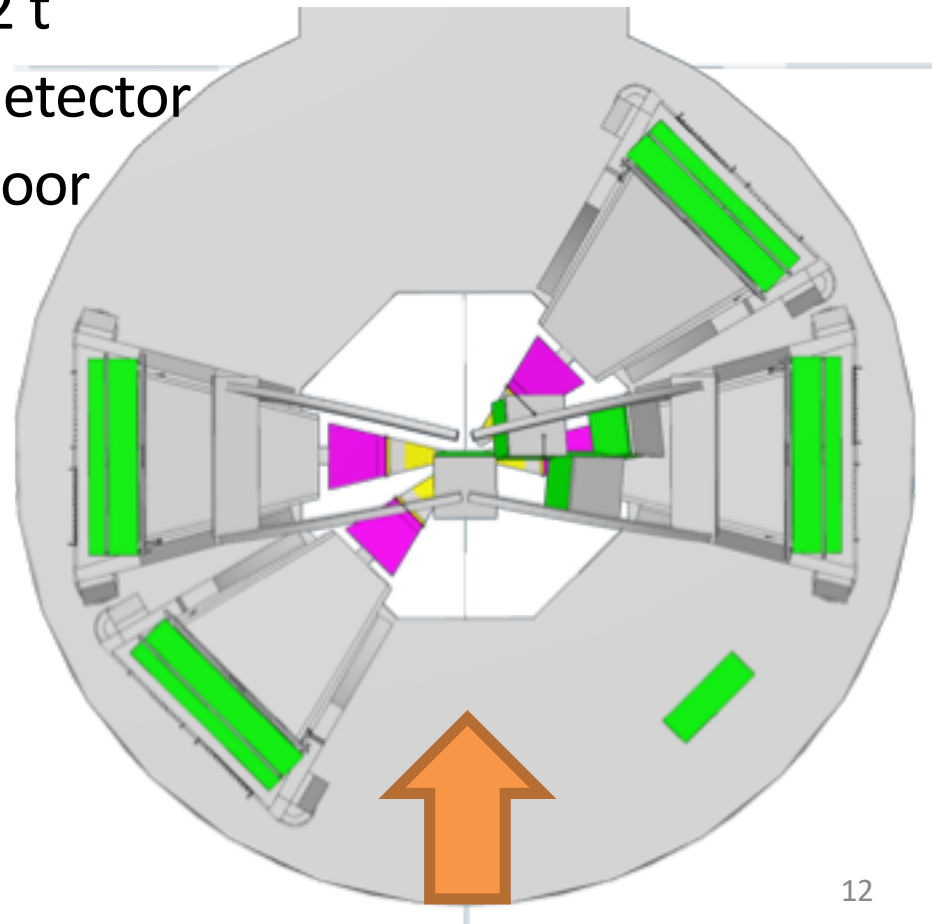
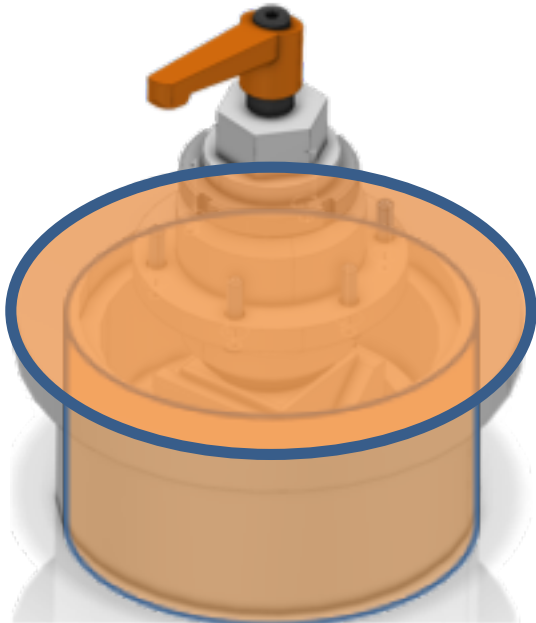
- Access with big sample and/or sample environment
  - Detectors need to be movable
  - Easy re-positioning



# Detector re-positioning

*Preliminary design*

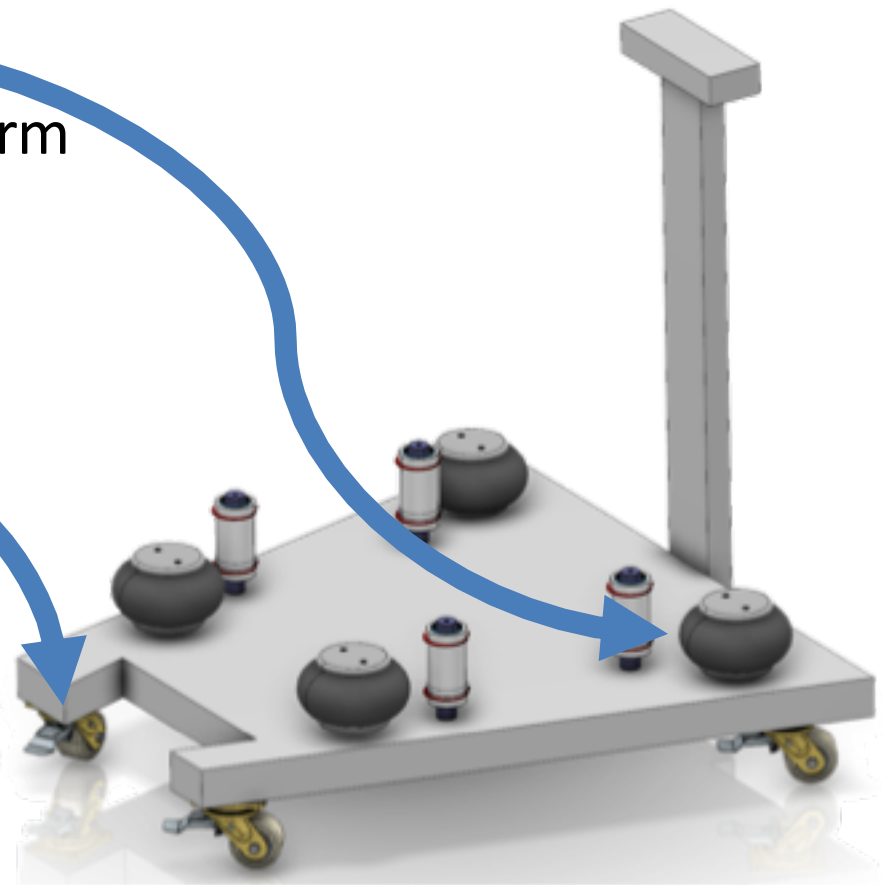
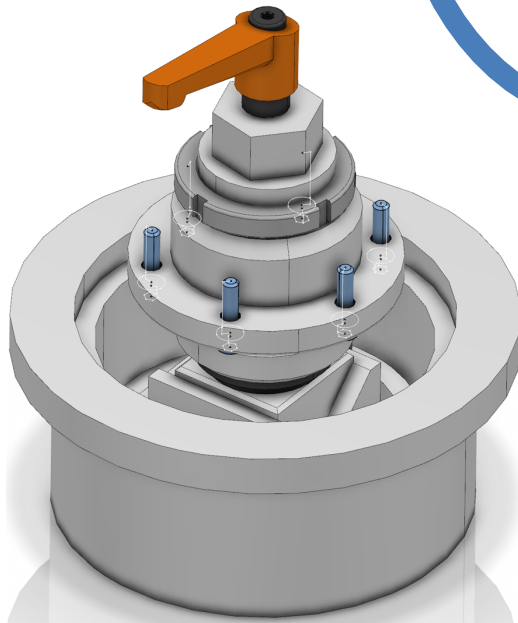
- Shape of the sample tower pit is octagonal
  - Detector weight approx. 2 t
  - 3 kinematic mounts per detector
  - Jars embedded into the floor
  - Jar dimension 24x20 cm



# Detector re-positioning

*Preliminary design*

- Release of kinematics mounts
  - Lift of about 6 cm
  - Detector transport platform
  - Air cushion?

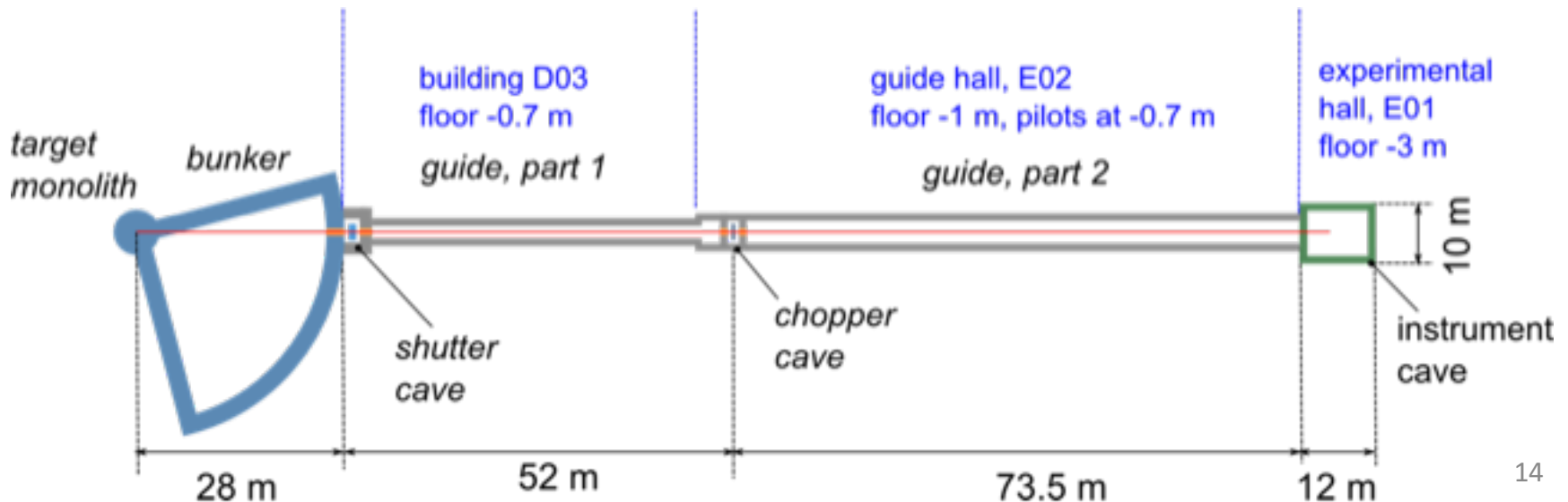




# Neutron guide shielding

## Requirements & layout overview

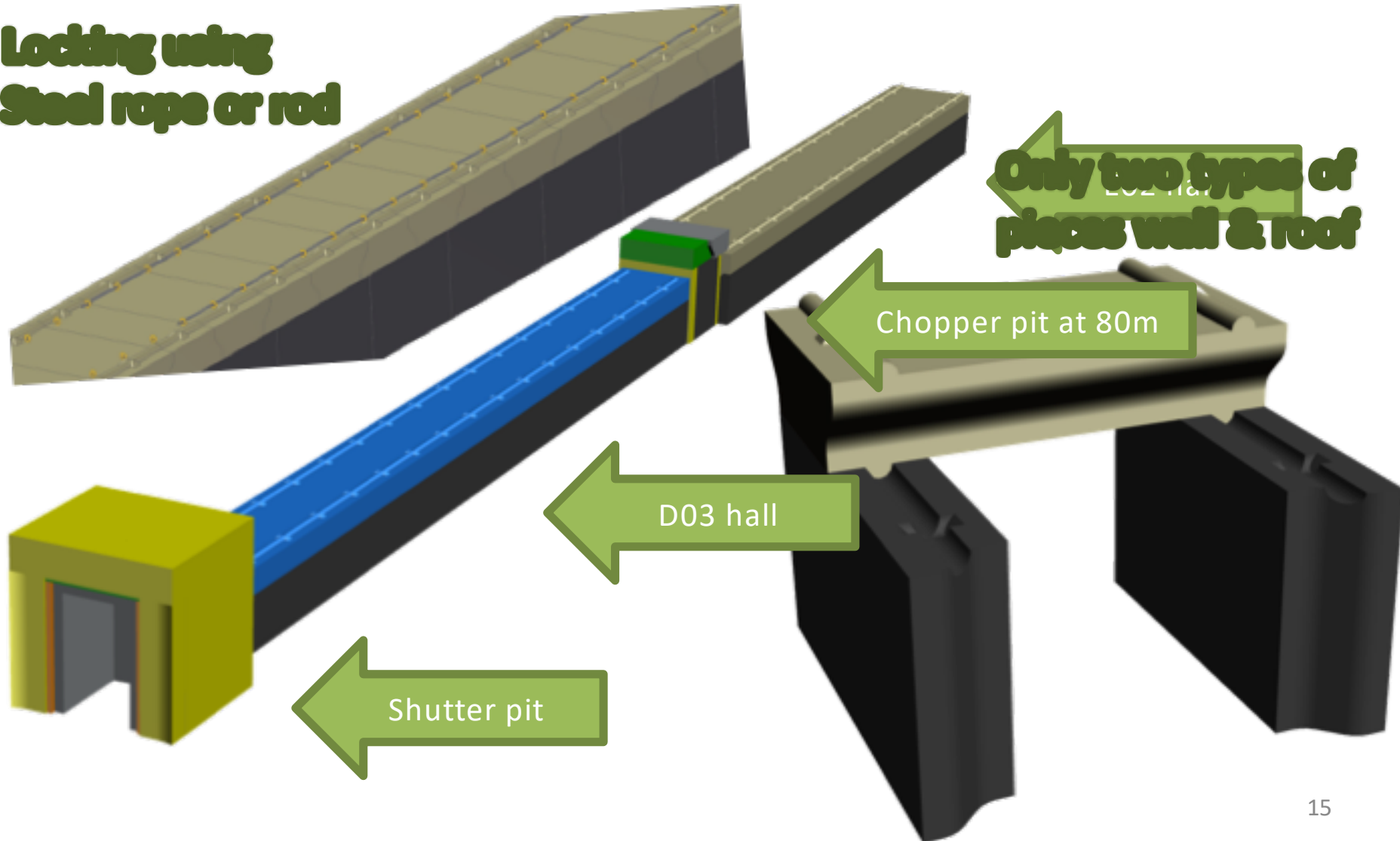
- Two different dimensions
- Integration with the shutter & chopper pit
- Simple to transport and handle/dismantle design
- Small number of different pieces for manufacturing
- Locking system
- Wall thickness 50 cm of regular concrete
- D03-E02 wall interface not solved yet



# Neutron guide shielding

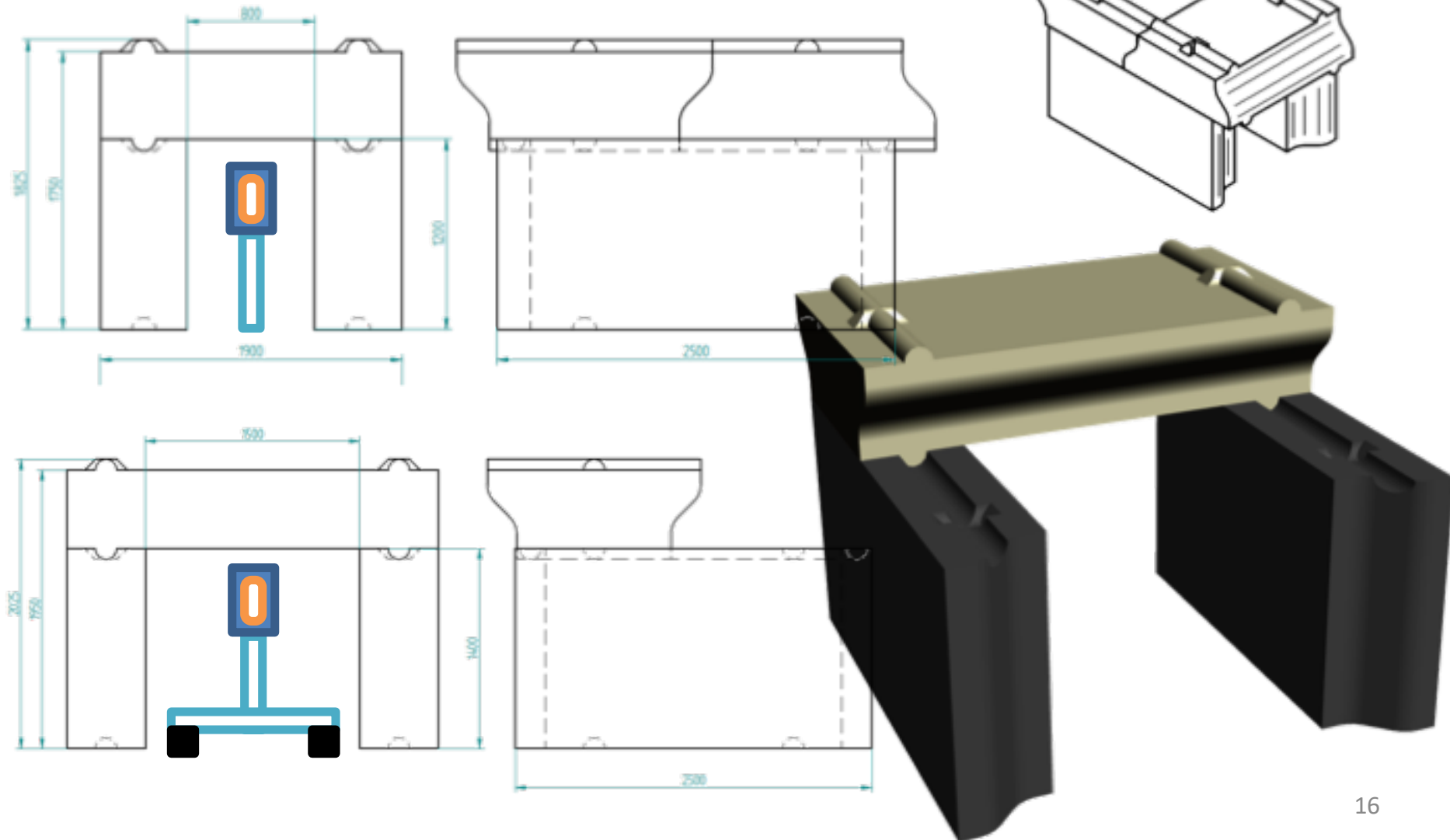
*Precast concrete blocks*

**Locking using  
Steel rope or rod**



# Neutron guide shielding

*Precast concrete blocks*



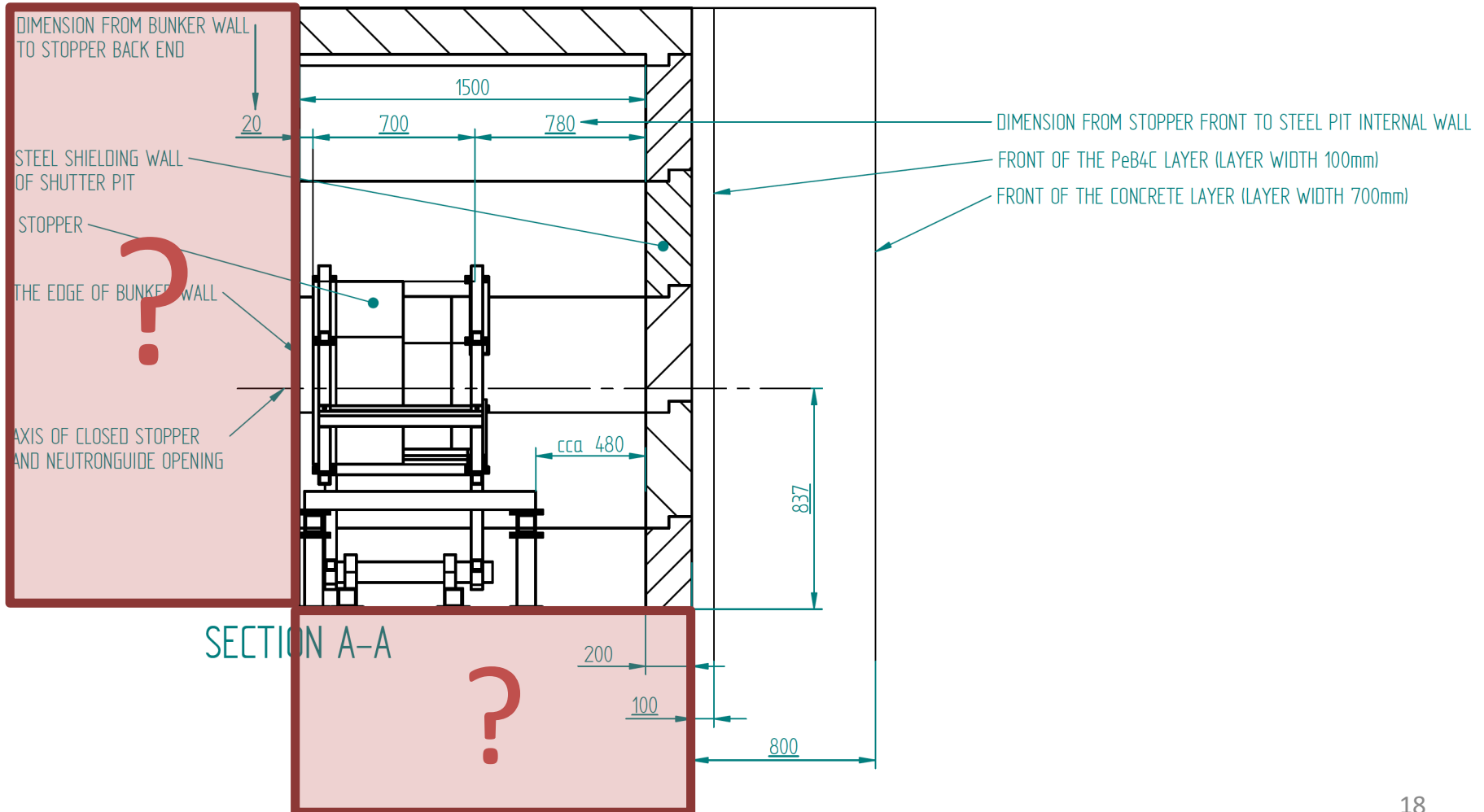
# Shutter & shutter pit

## *Requirements and Preliminary design*

- Design based on MCNP simulations
- Weight of the shutter shielding block is about 1.5 t
- Invers-pendulum concept
- Pneumatic system for opening the shutter
- Self closing design – safety shutter
- Adjustable neutron guide holder
- Shutter pit walls 20 cm steel, 10 B<sub>4</sub>C+PE, 70 cm concrete
- Inner dimensions 1.5x2.5x1.5 m (WxLxH)
- Interface with NMX (wall ends 1.5 m from the NMX beam)
- Interface with the bunker wall and the D03 floor

# Shutter & shutter pit

Preliminary design

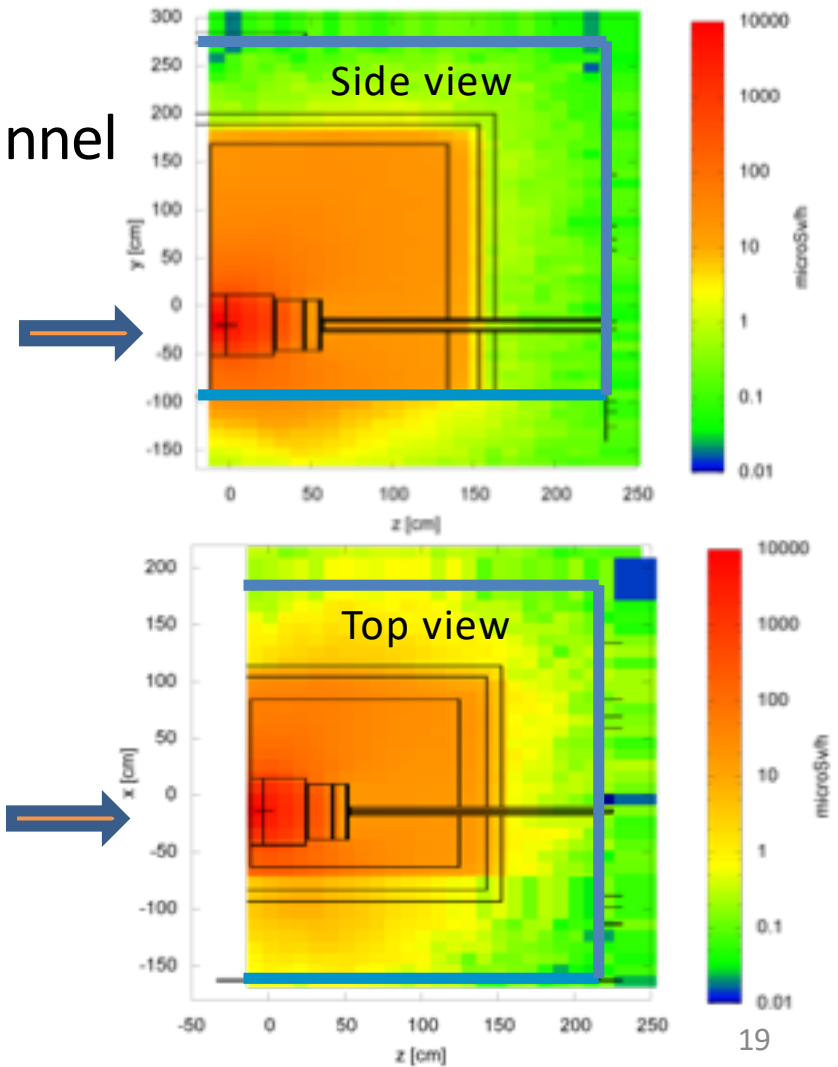
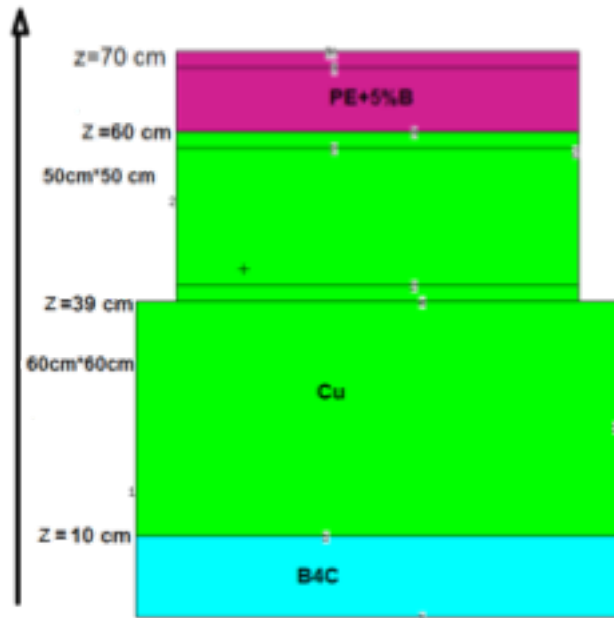




# Shutter & shutter pit

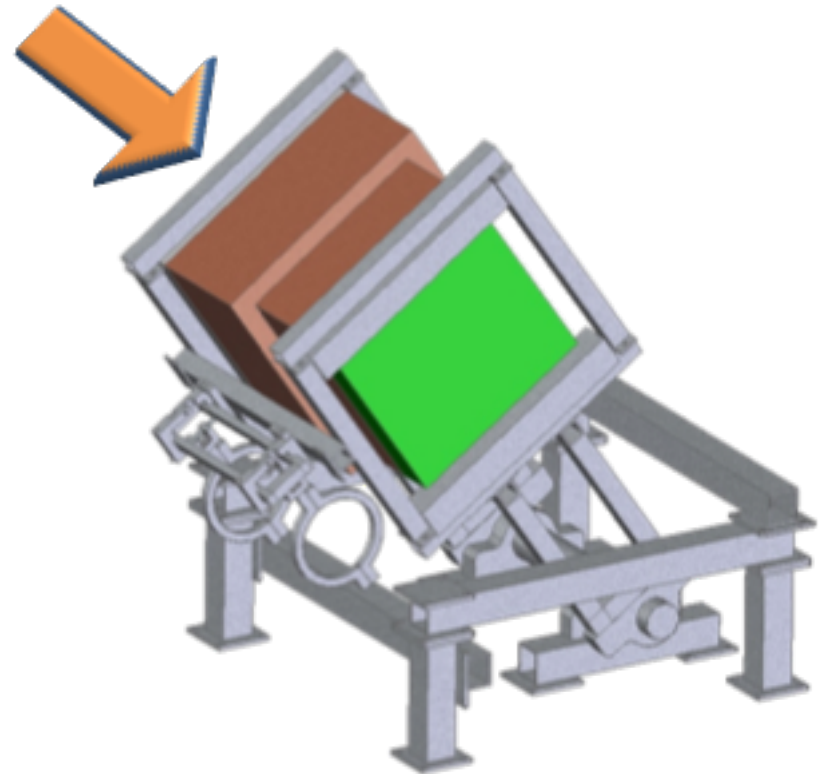
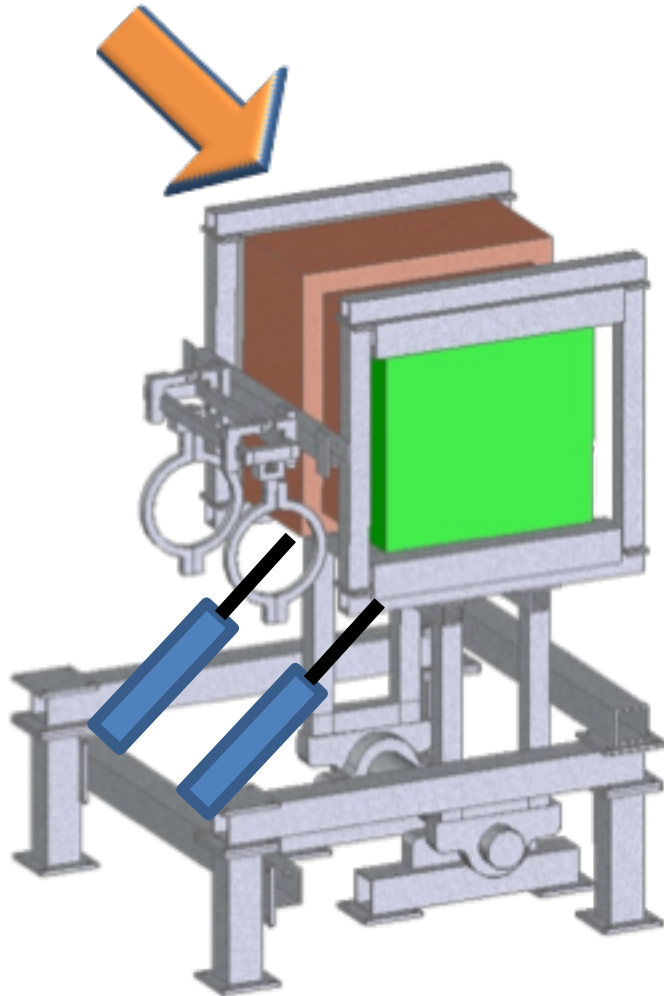
## Radiological simulations

- Shutter body mainly copper
- Dose rate in the neutron guide tunnel decrease below limit after 2 m



# Shutter & shutter pit

*Preliminary design*



Thank you for your attention