

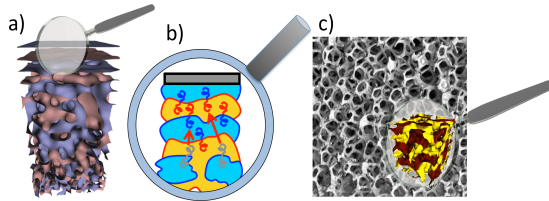
# SKADI

Cost Optimisation Workshop

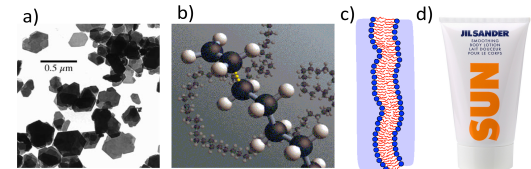
for

Neutron Optics and Instrument Shielding

13th May 2016 | Andrew Jackson on behalf of Sebastian Jaksch & SKADI Team



bicontinuous media



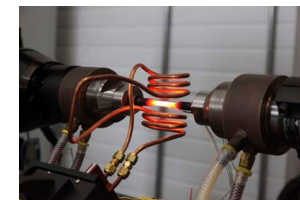
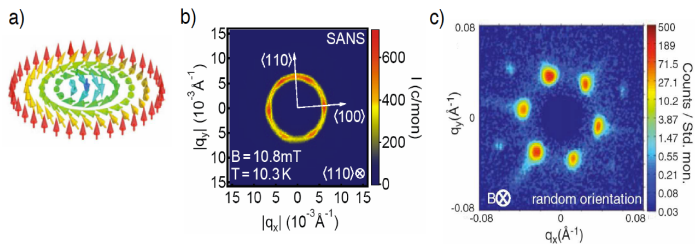
multiscale structures

**SKADI – small-Q, long length scale**

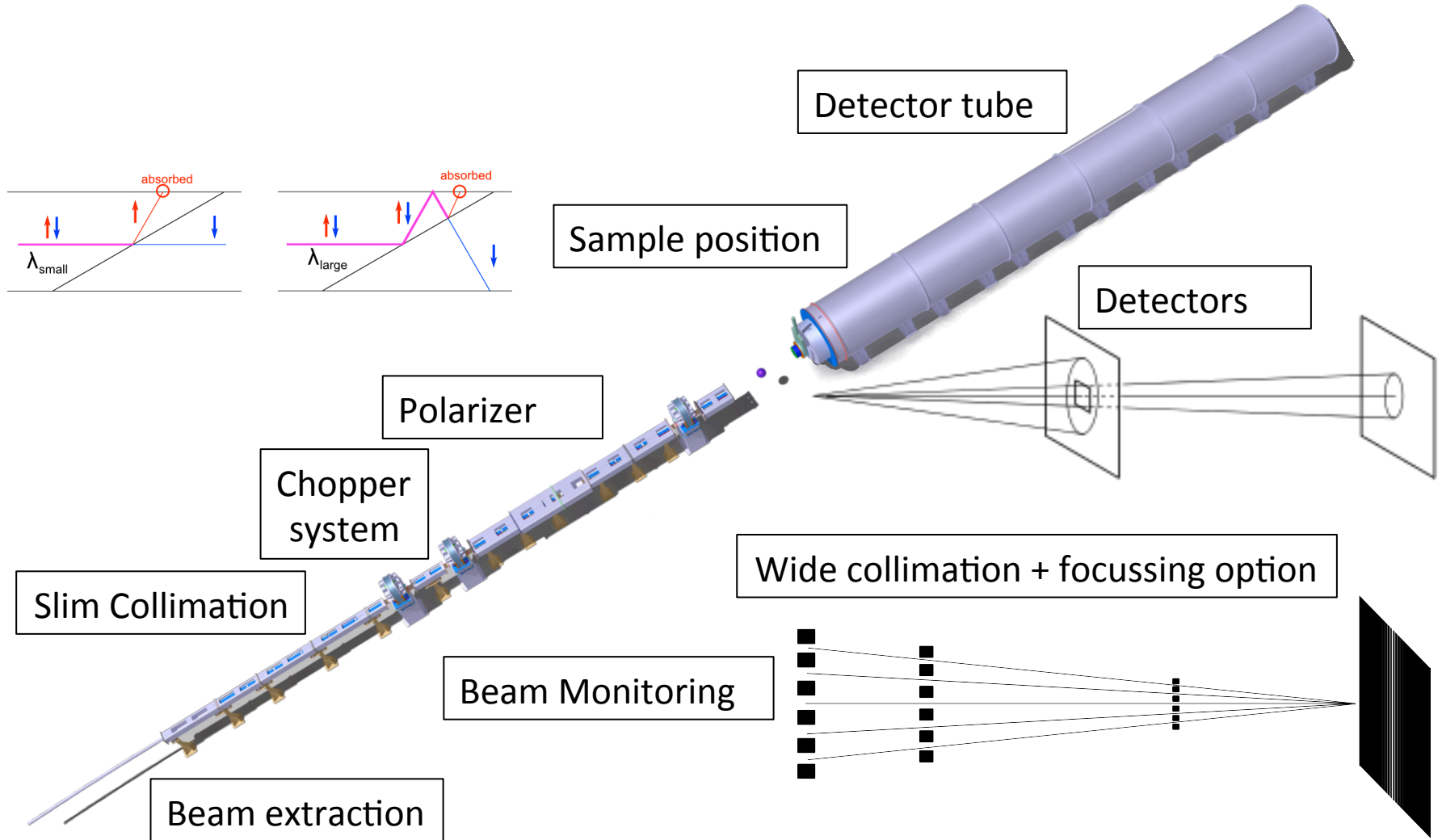
- **Flexibility:** Sample area is 3x3 m<sup>2</sup>
- **Very small Q:** Accessible by focusing optics
- **High dynamic Q-range:** Covering three orders of magnitude simultaneously
- **Polarization:** For magnetic samples and incoherent background subtraction
- **High time-resolution:** Down to 0.1 s for dynamic processes

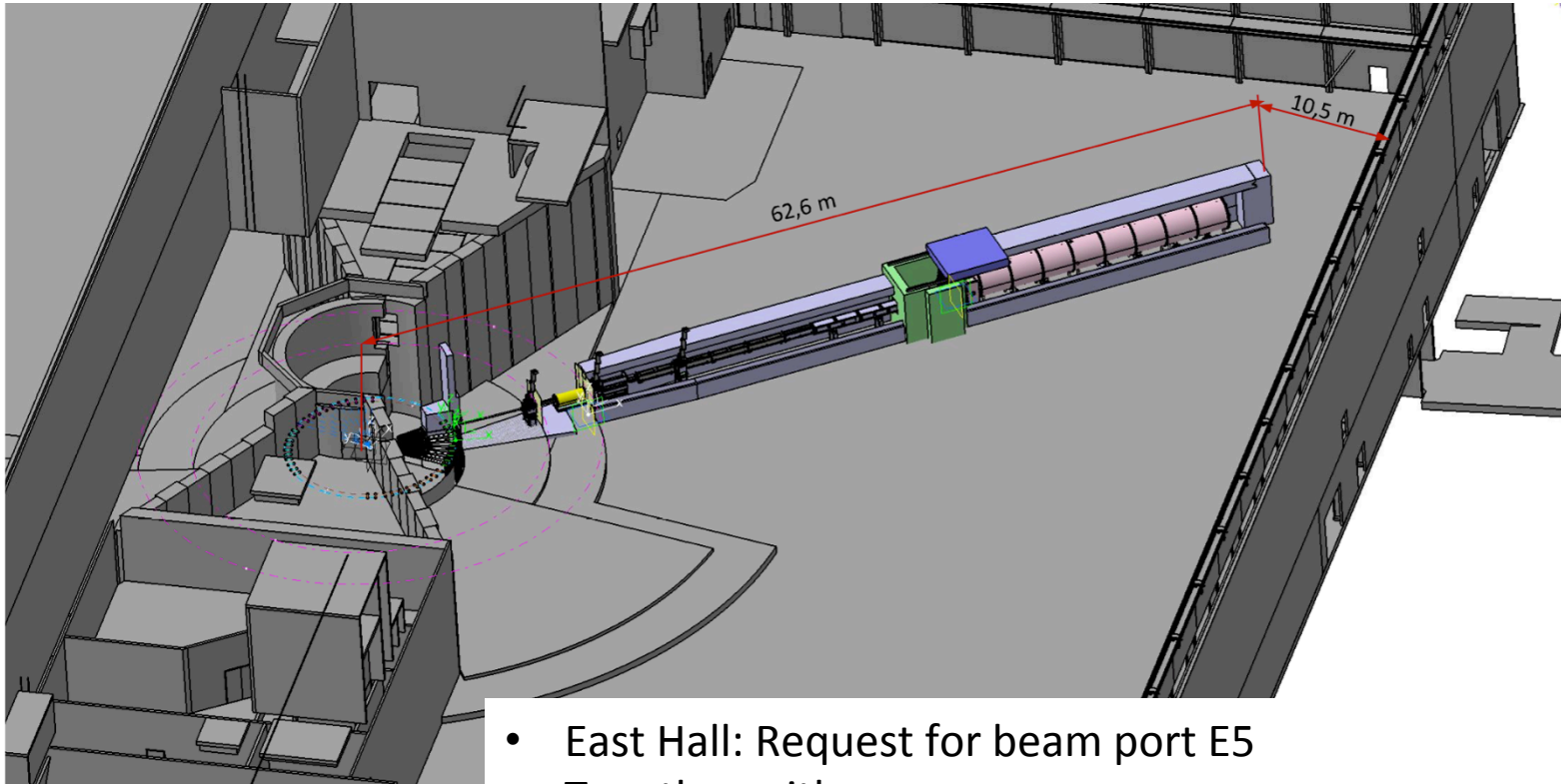
magnetic nanoparticles

custom sample environment



# SKADI: An Overview

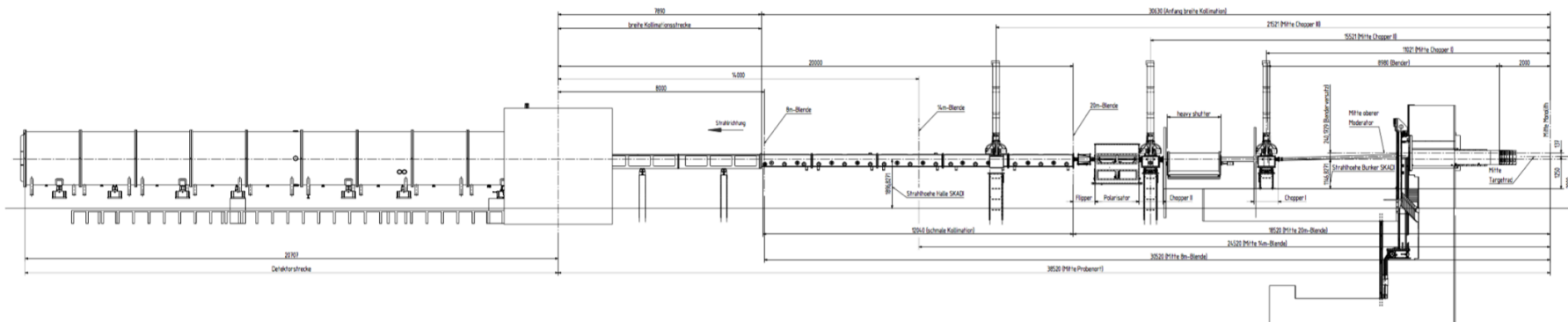




- East Hall: Request for beam port E5
- Together with
  - Endorsed first 16: Estia, VOR, VESPA
  - Endorsed >16: Surface scattering, ANNI
- Access to media by gallery
- Control hutch on top of detector
- Staging area in front of sample cave

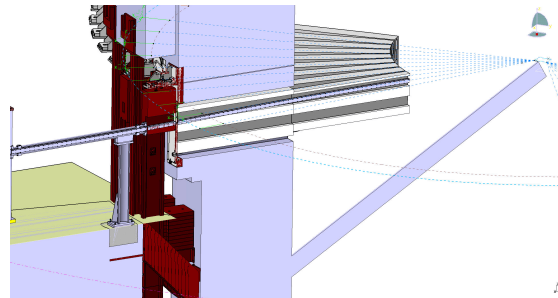
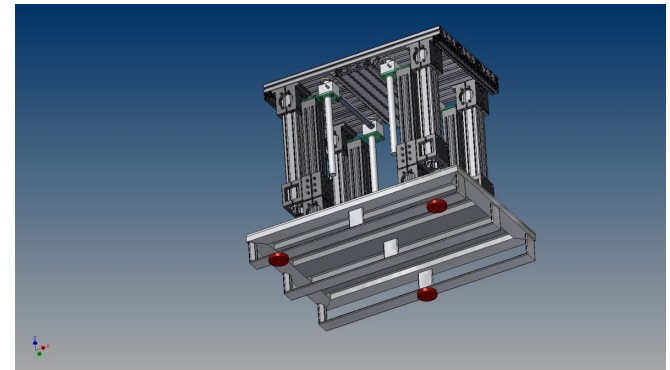
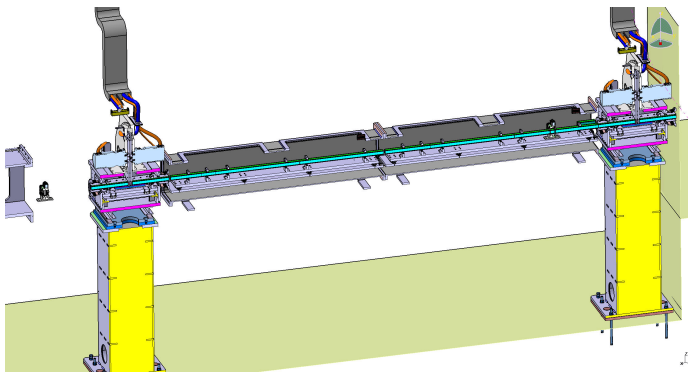
Robustness/Maintenance go hand in hand. Failure should be **anticipated** for minimal impact and **avoided** for optimal instrument operation.

- As little components in bunker as possible (1st Chopper)
- Access to most components possible during beam on target
- Maintenance cycle may change components preemptively
- Upon failure SKADI may continue to work with reduced performance



# Coordination / Sharing with other Instruments

- Common chopper concept with Loki
- Common bunker/shielding concept with other instruments
- Open sample environment platform

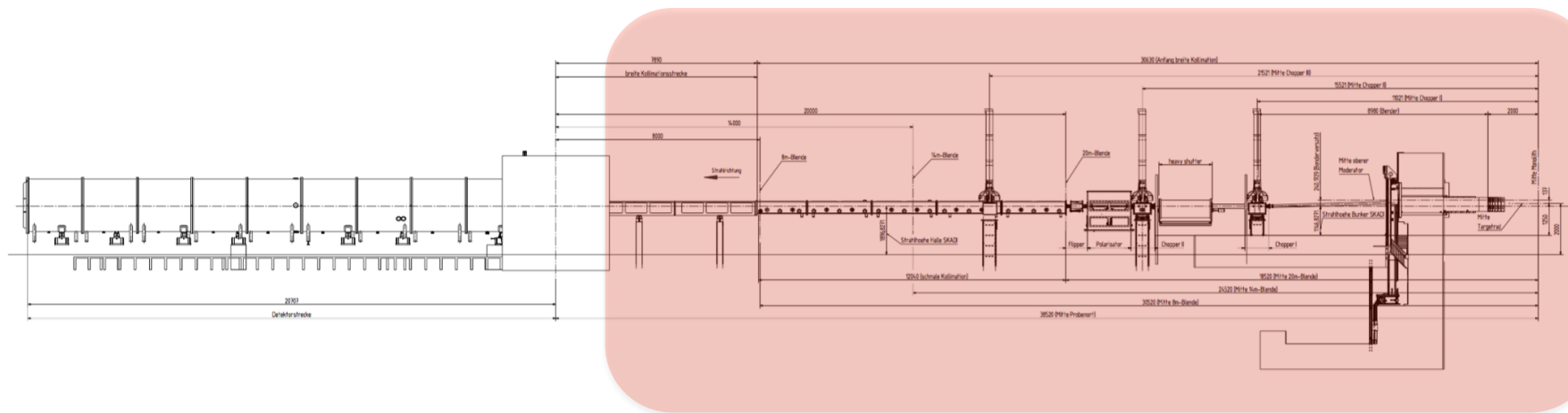


# High Level Requirements

1. SKADI shall allow data collection down to a  $Q_{\min} < 8 \times 10^{-4} \text{ \AA}^{-1}$
2. SKADI shall allow data collection up to a  $Q_{\max} > 1 \text{ \AA}^{-1}$
3. SKADI shall allow data to be collected simultaneously over a dynamic Q-range of  $Q_{\max}/Q_{\min} > 1000$ .
4. SKADI shall allow time resolved studies with a single shot time resolution below 200 ms.
5. SKADI shall match the size of the neutron beam to the size of the sample.
6. SKADI shall allow the Q resolution to be optimized for the experiment
7. SKADI shall provide polarized neutron scattering
8. SKADI shall provide polarization analysis of the scattered neutrons in x and y direction (where z is the flight direction of the neutrons).
9. SKADI shall provide a Q resolution of  $< 10\% \text{ d}Q/Q$  between  $Q = 1 \times 10^{-3} \text{ \AA}^{-1}$  and  $Q_{\max}$
10. SKADI shall allow for custom sample environments of at least  $1.5 \times 1.5 \times 2 \text{ m}^3$  with masses of at least 2000 kg.
11. SKADI should optimize the signal to noise ratio of the small angle scattering.

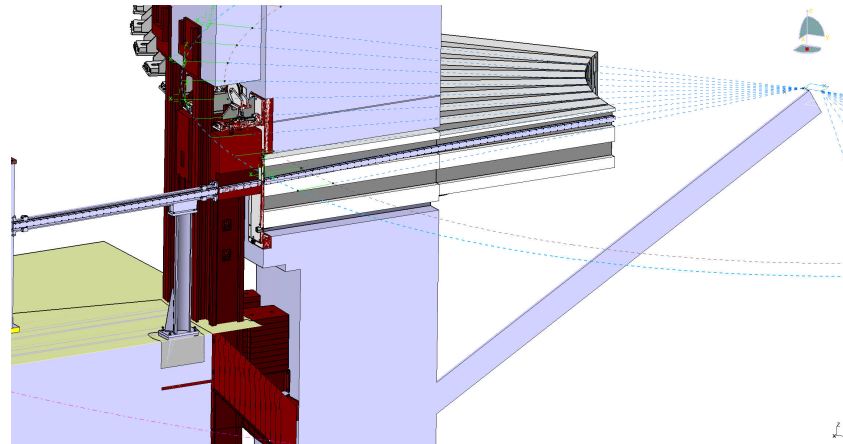
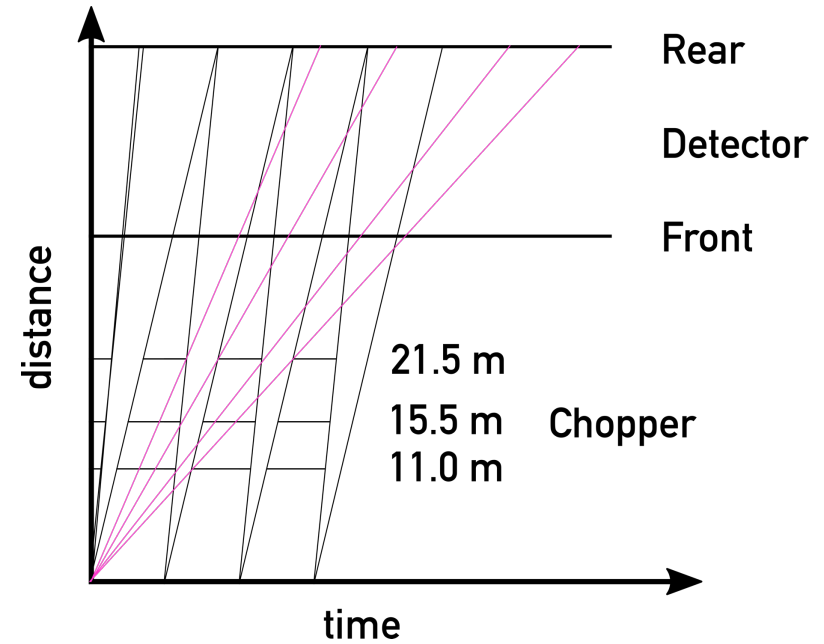


- Transport neutrons from moderator to sample
- Determines wavelength spectrum of transported neutrons
- Determines size and divergence of transported neutrons

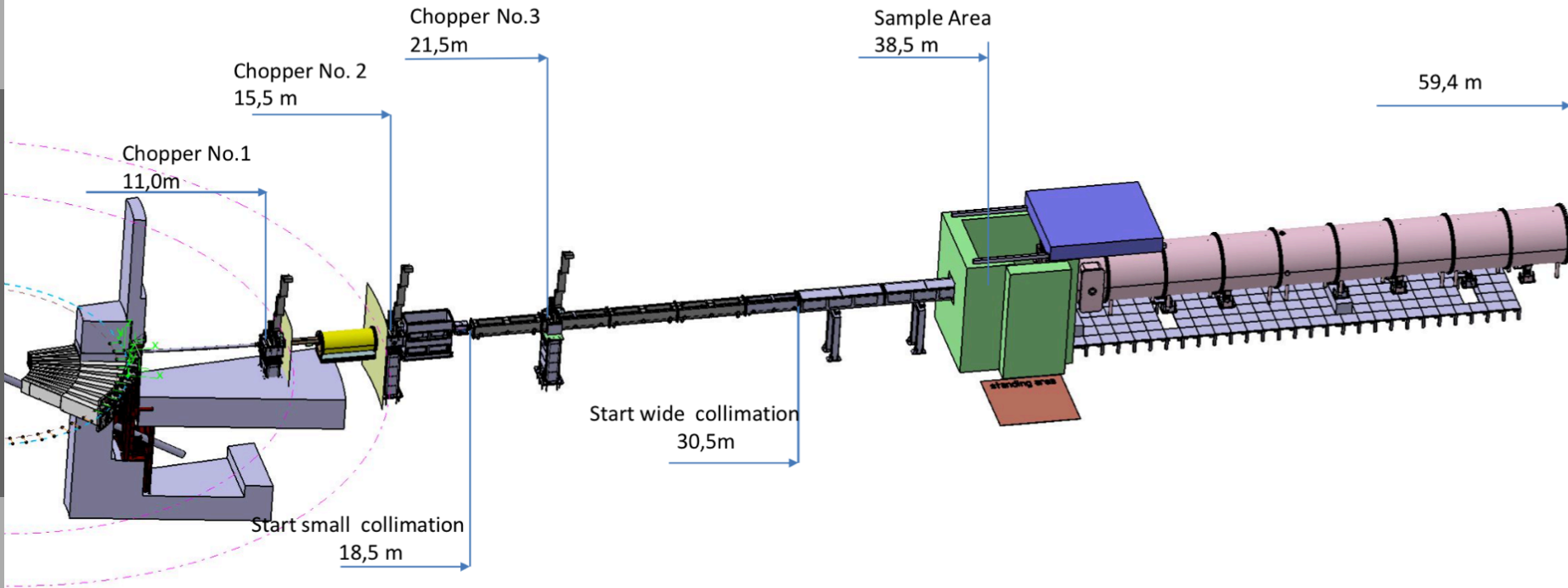




- 3-23 Å wavelength
- 5 Å wavelength band
- 3x3 cm<sup>2</sup> maximum opening
- 8, 14 and 20 m collimation distance
- Twice out of line of sight in bunker
- Homogeneous intensity profile
- Polarization
- Accessibility/Robustness



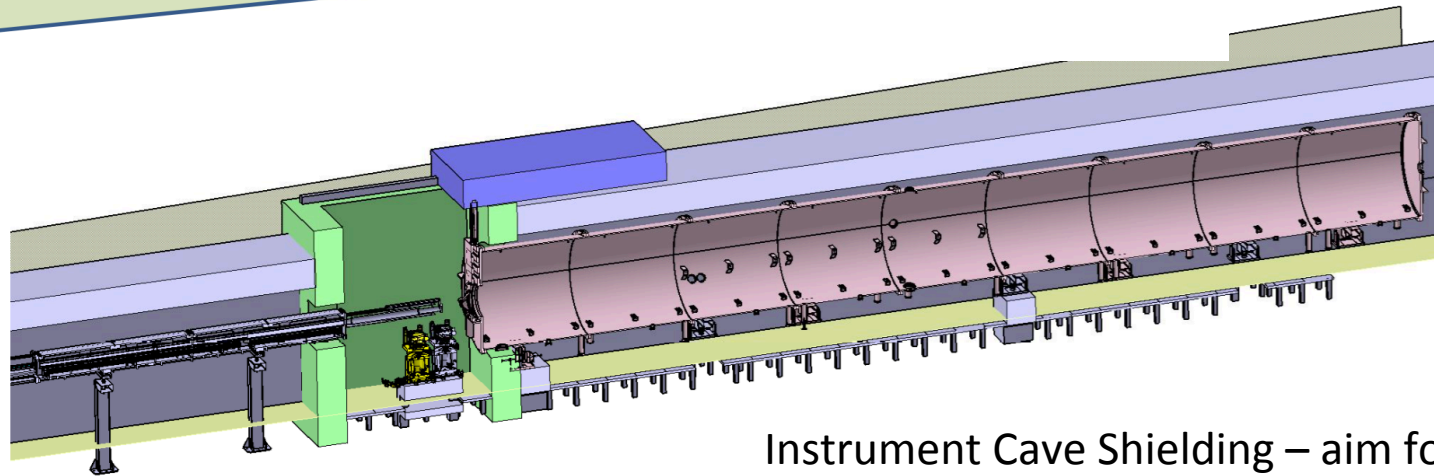
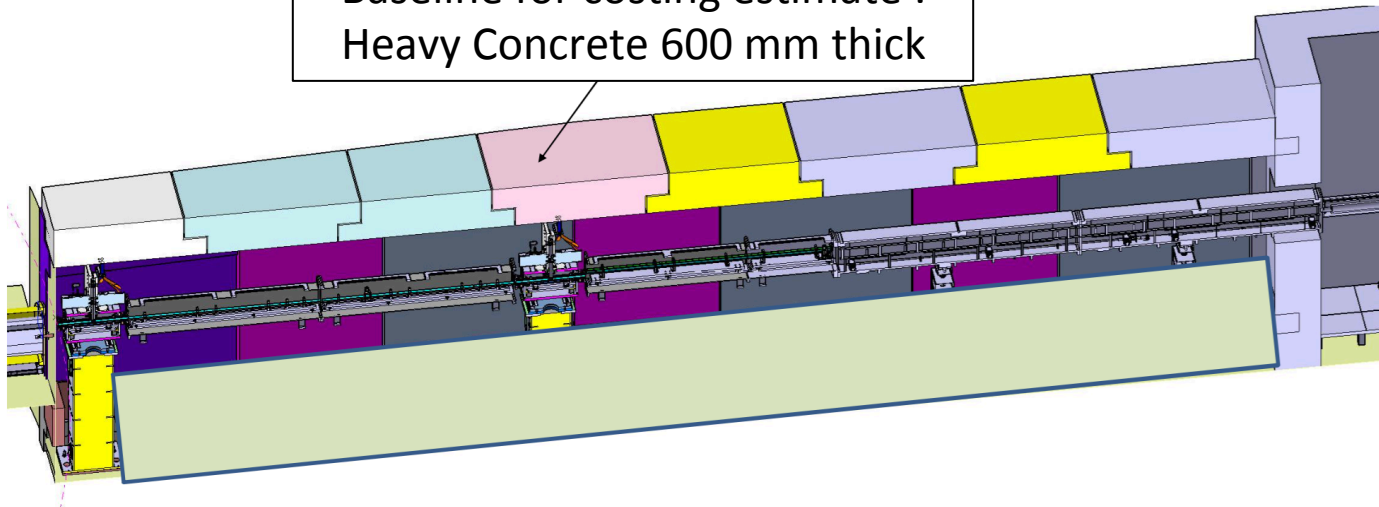
# Instrument Layout



All dimensions from the monolith center

# Shielding “Concept”

Baseline for costing estimate :  
Heavy Concrete 600 mm thick



Instrument Cave Shielding – aim for  
common solution with other  
instruments, e.g. LoKI