The beam monitors common project at ESS

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Goal of the project

- Turn-key provision of beam monitoring solutions
  - For each instrument
  - From design to provision, installation and cold commissioning
  - Operating up to 2 MW
  - Standardization

- 2 phases foreseen
  - Design phase: 2019
  - Provision phase: 2020-2025

Phase 1 (2019): design

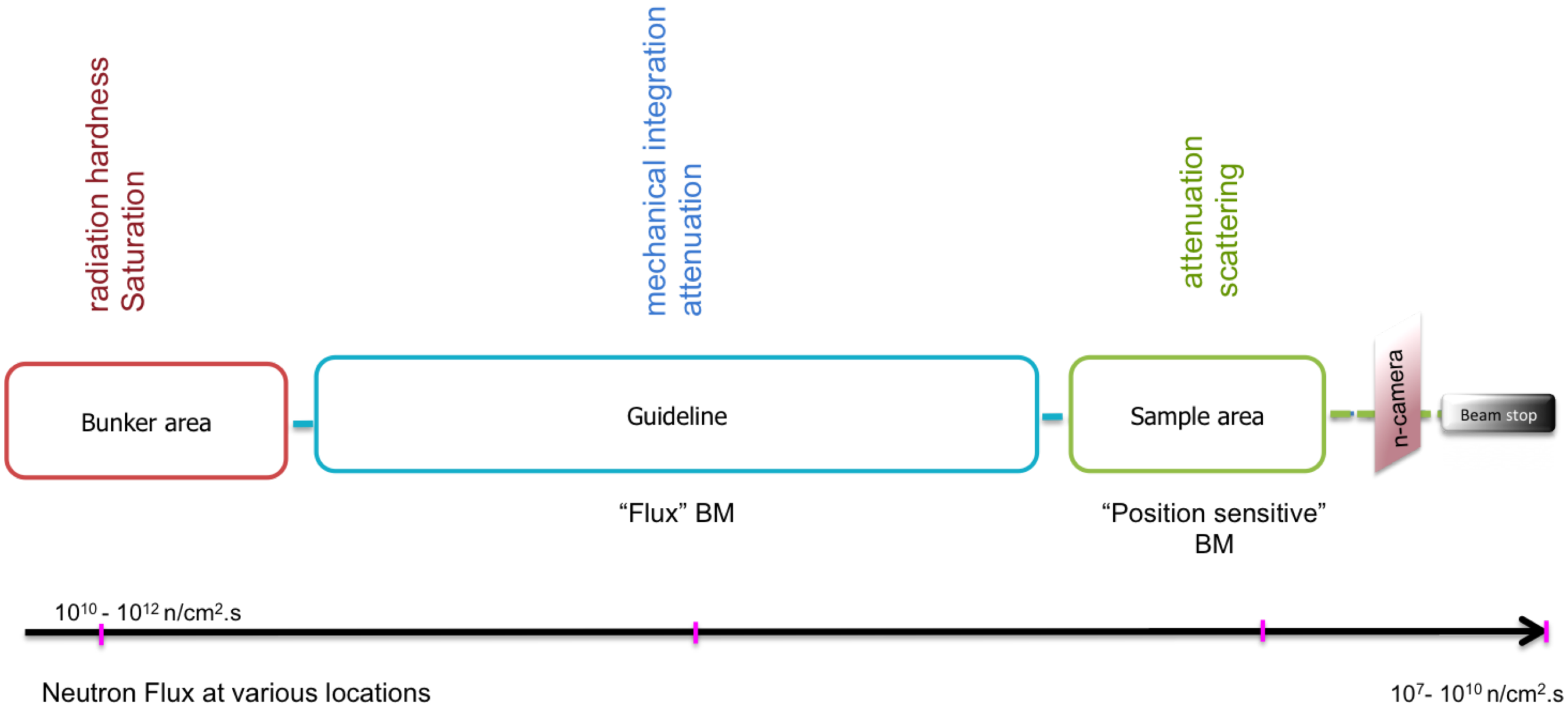
- Preliminary Design Report PDR by September 2019 (initial project scope)
- Critical Design Report CDR by January 2020 (what will be built/procured)

- DG public confluence page for sharing results
  - https://confluence.esss.lu.se/display/DG/Beam+monitors+common+project
  - Contains list of BM needed by ESS instruments (~50)
  - Requirements as currently understood

Phase 2: provision

- Starts in 2020 after completion of design phase
- Includes
  - Procurement
  - Site acceptance tests (SAT)
  - Installation
  - Cold commissioning
- High fraction of instrument participation is expected.

BM zones with different focus



Requirements depend on location and function

Table 1: Summary of requirements for the monitors at various position.

Position	ESS requirement	Intensity measurement	Good time resolution [< 100 us]	PSD	Attenuation	Functionality @ 2 MW?	Moveable	Dual monitor	Discrimination	Stability (during typical experiment)
Near monolith	✓	✓	✓	✗	< 2 % @ 10 Å	✓	✗	✗	Discriminate fast neutrons + gamma	< 5 % variation during lifetime
Outside bunker	✗	✓	Optional	Optional	< 2 % @ 10 Å	Optional	Optional	Optional	Discriminate fast neutrons + gamma	< 5 % variation during lifetime
After chopper (system dependent)	✓	Chopper diagnostics: ✗ guide diagnostics: ✓	✓	Optional	< 2 % @ 10 Å	✓	Optional	Optional	Slow neutron and gamma distinction important	< 5 % variation during lifetime
At critical guide piece	✗	✓	✗	Optional	< 2 % @ 10 Å	Optional	Optional	Optional	Neutron/gamma	Same as above
@ Sample	✓	✓	✓	Optional	< 2 % @ 10 Å **low scattering**	✓	Optional	Optional	Neutron/gamma	0.1 – 0.5 % due to normalization
Post-sample	✗	✓	✓	Optional	< 2 % @ 10 Å **low scattering**	✓	Optional	Optional	Neutron/gamma	Optional

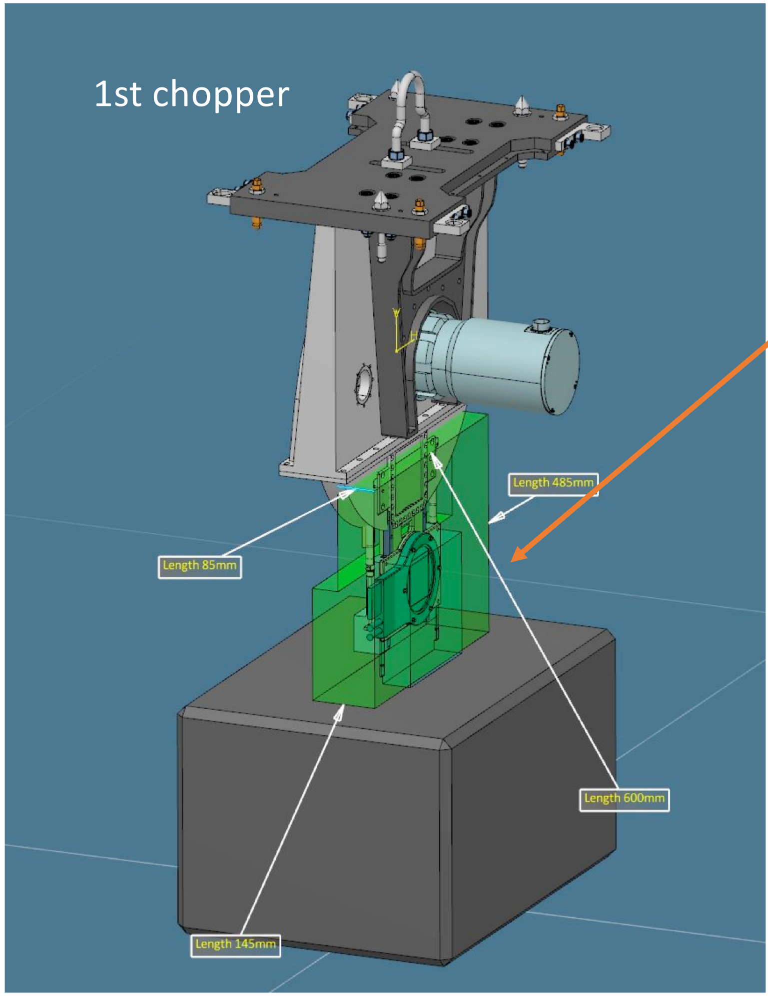
Preliminary BM choices

- Qualified per location (rate capability, saturation)
  - Bunker: fission chambers, ionization chambers, GEM
  - Guide/choppers: γ monitor, V monitor, external efforts (B-GEM, N-GEM, ESS Bilbao)
  - Sample: wire detectors
  - Transmission: wire detectors
- Qualification per function
  - Only flux?
  - Flux and time resolution?
  - Efficiency? Only for thermal neutrons?
- Input from instruments
  - McStas models (please upload to nosg-baselines repository)
  - Commissioning plan

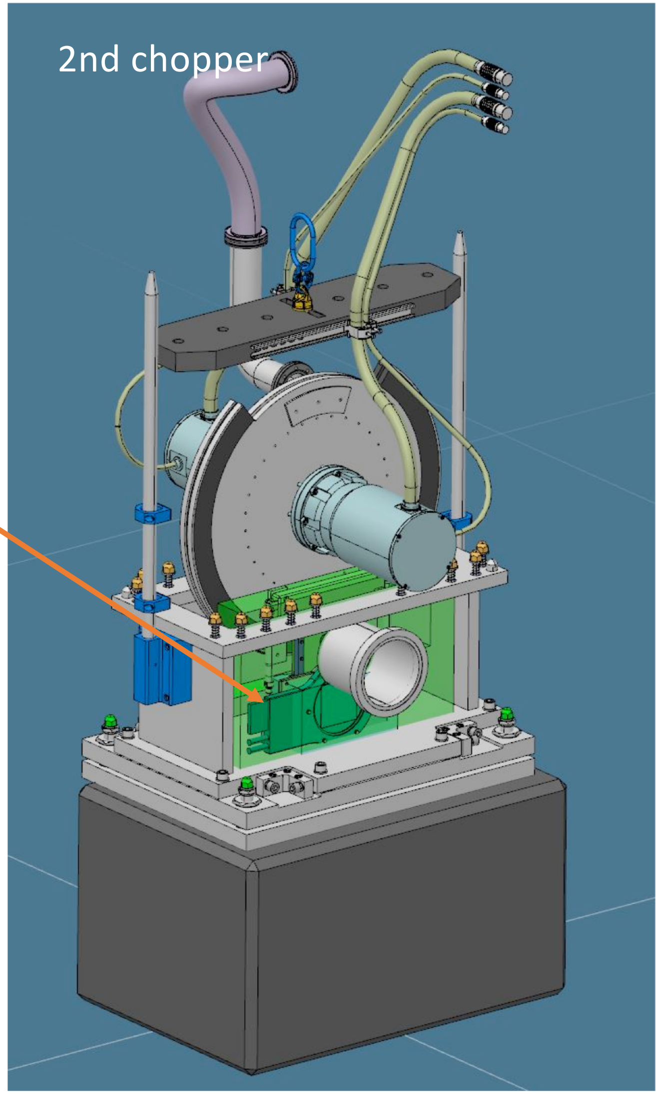
Priorities of DG in the coming months

- Analyze requirements for bunker and guides/choppers (Kalliopi: 50% of time, already started)
  - Identify which detector choices need further development
  - Prepare in-beam tests at high flux environments (to be performed latest by end of year)
- Mechanical integration (Ioannis, up to 50% of time, already started)
  - Reserve envelopes in instrument CAD drawings
  - Determine utilities
  - Meetings with instrument engineers over IKON16
- Standard readout integration (Steven, 10-15% of time)
- Continue other monitor efforts (parasitic and quasi-parasitic)
  - Proof of concept for γ monitor in place (publication in progress, Fatima/Richard)
  - Upcoming in-beam tests at HZB (V17, V20) for Vanadium monitor (Vendula)
  - See also talks in 2nd part of BM session

Envelope example from NMX



Reserved space in green



Validation and qualification for use at ESS

- Detection efficiency
  - Response both at high and at low fluxes
- Beam attenuation including vacuum windows and realistic mechanical integration
- Time resolution
- Discrimination against fast n and γ background
- Stability
- Simplicity of integration with the ESS backend readout
- Maintenance plan