



EUROPEAN
SPALLATION
SOURCE

STAP detectors and monitors

Ioannis Katsioulas

Detector Scientist

ioannis.katsioulas@ess.eu

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Motivation for Beam Monitoring at ESS

Common Beam Monitor (BM) project principles

- The neutron intensity fluctuates with time in neutron spallation sources, depending on the characteristics of the proton beam to the neutron target.
- Multitude of beam line components for instruments at ESS, much greater than for existing neutron sources, implying a greater need for monitoring
- Neutron beam monitors can be permanently or temporarily placed in the neutron beam lines in order to:
 - Characterise moderator performance and in monolith optics
 - Perform chopper diagnostics
 - Spectral normalisation
 - Transmission measurements
 - Calibration of flight paths
- Continuous neutron beam monitoring with high precision is required to ensure correct operation of neutron instruments
 - Monitoring of neutrons in sub-pulse structure is required for instruments with time-of-flight design

Monitor positions and characteristics

BM per instrument

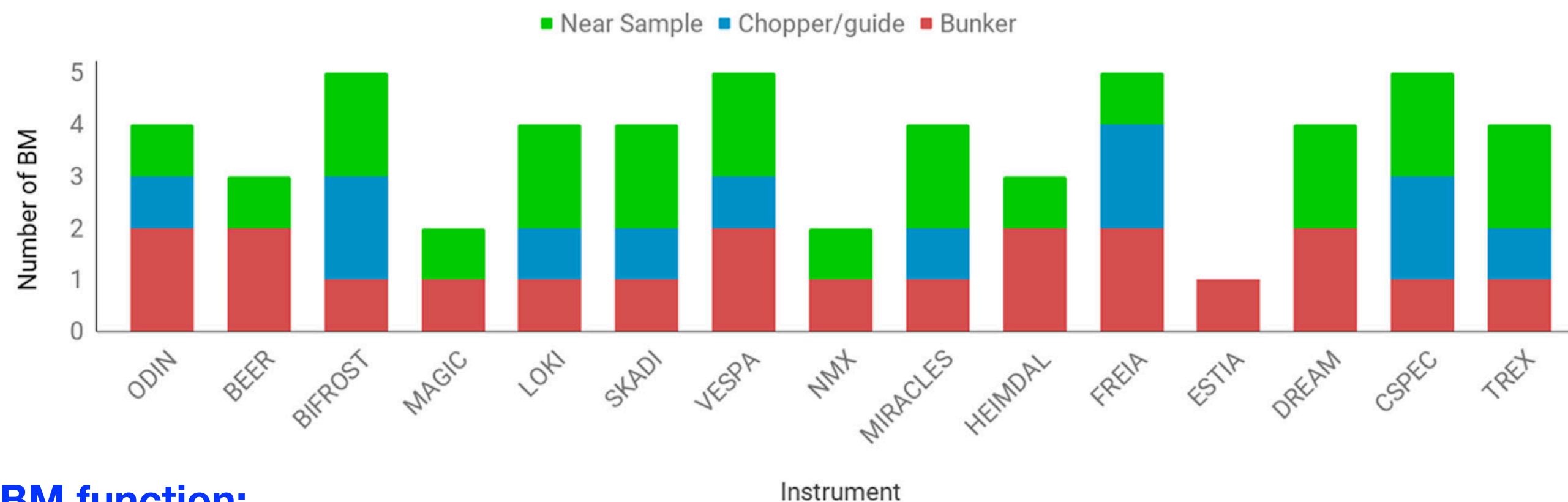
Beam monitors are going to be placed:

- Near the monolith
- Near choppers
- Near the sample position

Functional requirements will provide control over:

- Chopper systems
- Source
- Neutron guides
- Optic elements particular near the monolith
- Spectral calibration of experiments

For specific instruments a transmission monitor will be placed to measure the transmission of the beam through the sample



BM function:

- Detectors with sufficiently low efficiency so that beam remains intact
- Ensure that neutron flux, beam distribution, and pulse timing are as expected from an instrument's design.
- Used to know the neutron flux at the sample in order to correctly interpret the scattering data.

Location	BM desired features	Candidate BM technologies
Bunker	<ul style="list-style-type: none"> • Flux measurements • Timing capabilities • n/γ discrimination • Fast n discrimination 	<ul style="list-style-type: none"> • Fission chamber • Ionisation chamber • GEM
Guides & Choppers	<ul style="list-style-type: none"> • Flux measurements • Timing capabilities 	<ul style="list-style-type: none"> • Ionisation chamber • Quasi-parasitic V monitor • MicroMegas • GEM
Pre sample	<ul style="list-style-type: none"> • Flux measurements • Timing capabilities • Lowest attenuation/scattering • Time of Flight 	<ul style="list-style-type: none"> • MWPC • MicroMegas • GEM

BM common project update

Tentative action plan

- ▶ Produce summary on BM technologies and previous test results
- ▶ Produce activity schedule
- ▶ Update instrument requirements for each zone/position
- ▶ Performance tests of untested (*or partially tested*) technologies
 - ▶ Mandatory and optional tests defined to validate performance
- ▶ Radiation hardness tests
 - ▶ Mainly for bunker monitors and their electronics
- ▶ Present results and propose technologies solutions within available resources and schedule

