

How many?

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Detector rate definition

- Different definitions of detector rates exist and have significance for different steps in the readout and data chain (arXiv:1607.02324).
- Global time averaged detector data rate: $\sim 10^7$ for ESS diffractometers (DREAM, HEIMDAL, BEER, MAGIC) – approximate upper limit for data rates.
- All are wire chamber detectors: neutrons arriving at detector will fire up to 6 channels simultaneously, we need to separate and reconstruct events.

Instrument data rates

- Table available at Detector Group area on Confluence:
<https://ess-ics.atlassian.net/wiki/display/DG/Neutron+Detectors+for+ESS+Instrument+Projects>.
- BIFROST might have higher instantaneous rates, but global rate should be reasonably low.
- Numbers that are missing should be added to table.

Data rates from readout

- We need the amount of data generated per electronic channel to be able to calculate the data rate arriving at the Event Formation Unit.
- Current estimate per neutron detected (multiple readout channels triggered) is in the range 64 b-~1 kb. This depends on the division of the event formation processing (lower values if done on readout electronics, higher if done on software).
- We would like to improve the estimate to better understand the upper limit. This depends on output from the Event Formation task.
- Sometimes detector will produce pixel data, not strip data.

Data Packaging

- Packaging of data to be received from readout electronics affects both data rates and packet arrival rates.
- We need to collaborate with the responsible for the readout electronics. We should aim for 9KB packets.
- Estimated minimum bandwidth: 640 Mbps, could reach 10 Gbps, possibly requiring multiple links if more bandwidth is needed.
- 32 bits should be enough for detector ids, even with event processing done on software.
- Solution for event formation should be scalable, as well as number of links.

Event formation pipeline prototype

- A prototype for the event formation processing was developed based on the C-SPEC data format.
- When detailed design starts, an interface control document should be created (per instrument).
- Should involve the persons responsible at the DM group, readout electronics and detector team.