

International Forum on Detectors for Photon Science

Virtual Thursdays
25th March 2021

MAX IV - Facility Overview **Paul Bell**



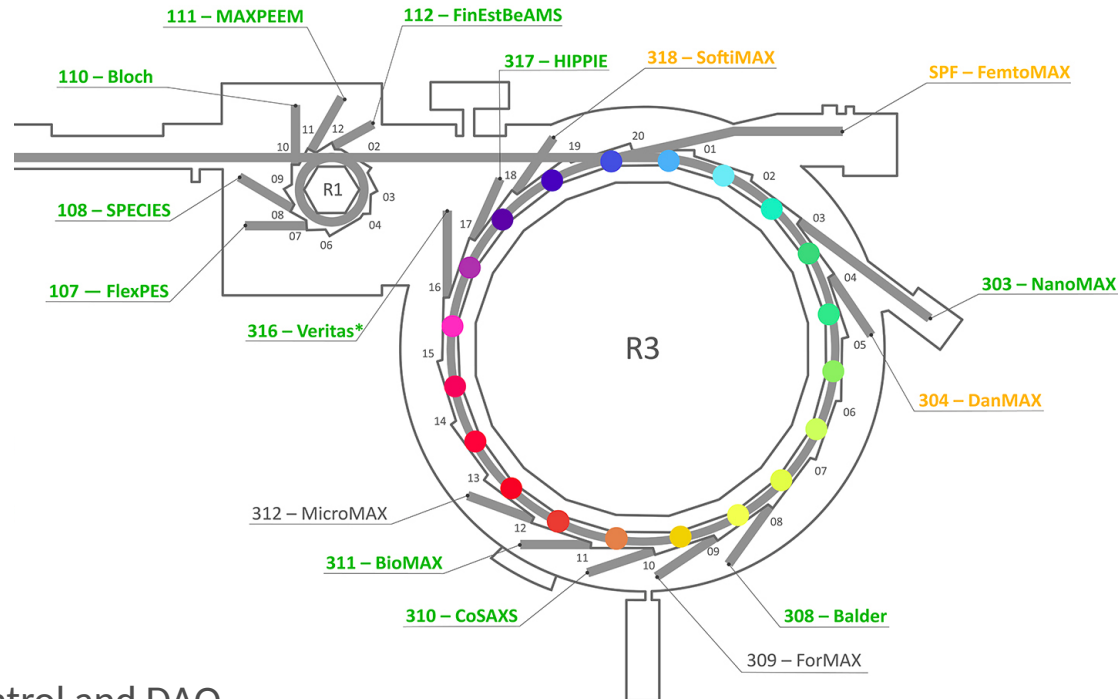
Status and organisation

- 3 GeV and 1.5 GeV storage rings and full energy linac with Short Pulse Facility
- First beamline user operation 2016, now 11 beamlines in operation, 3 in commissioning, 2 in construction.

“Informal Detector Group” est. 2020:

Small number of people from across different teams (controls s/w & h/w, scientific software, IT, beamline office) providing detector support :

- Plan integration of detectors into control and DAQ
- Liaise with detector companies on issues, updates, feature requests...
- Perform SATs and performance studies
- Keep updated in latest developments and advise the beamlines
- Identify and engage in possible collaborations that can benefit new or existing beamlines
- (Seek new resources for in-house projects)



Commercial solutions

All beamlines in operation so far use commercial detectors and cameras.

Rough inventory or **coming soon 2021**:

HPCs

- 3x Dectris Eiger2 4M, 3x Eiger1 1M, 1x Eiger1 16M
- 1x Dectris Pilatus3 2M, 1x Pilatus2 1M
- 1x Dectris Pilatus3 2M (WAXS L-shaped)
- 1x Xspectrum Lambda 3M (WAXS centre hole)
- 1x QD Merlin Quad
- 1x Dectris Mythen

sCMOS

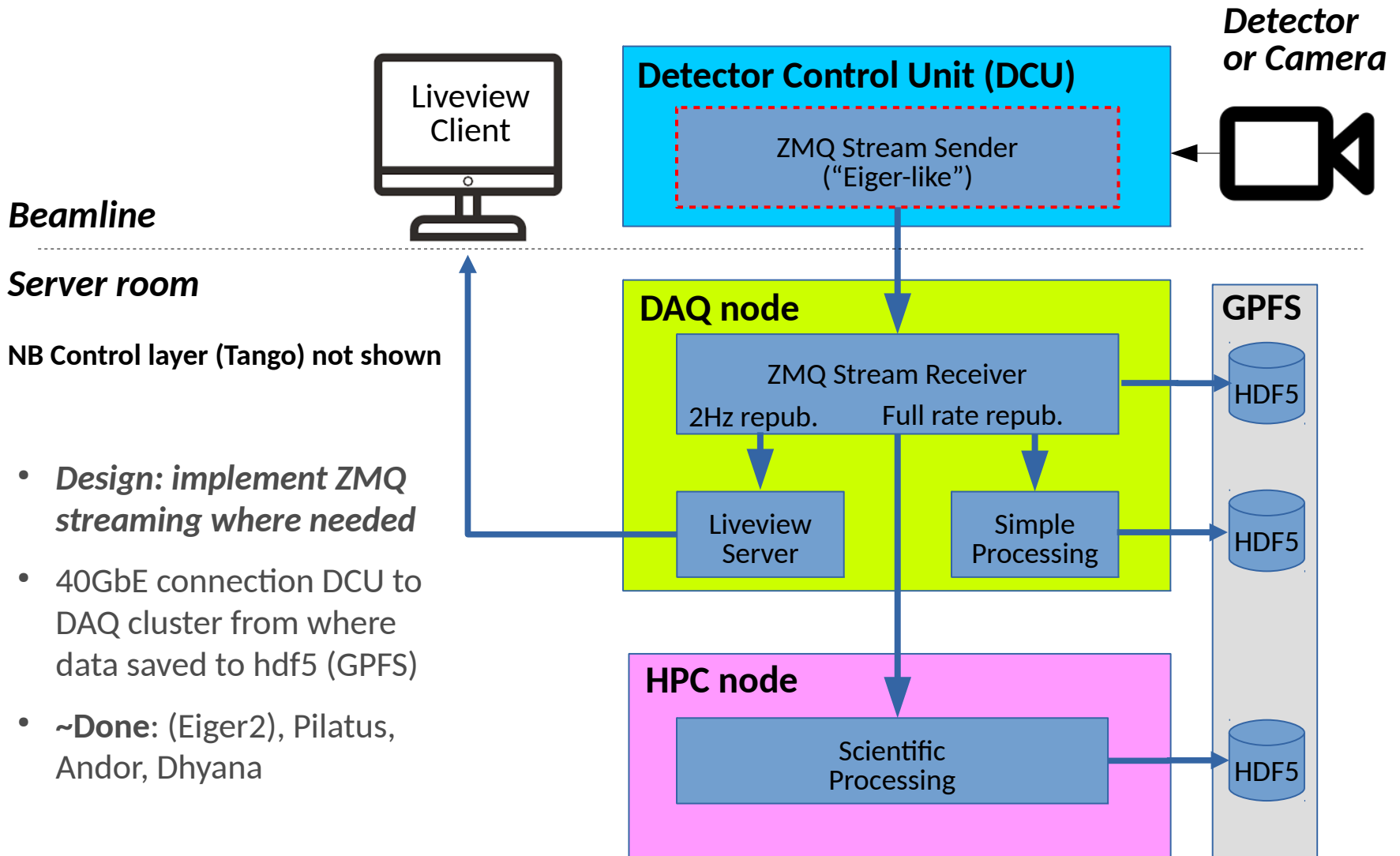
- Numerous Andor Zyla, 1x Andor Balor
- 1x Tucsen “DhyanaX” (NB: Adapted for vacuum following Soleil)

Spectroscopy

- 2x Amptek XR-100 SDD via QD Xspress3
- 2x Rayspec SDD via QD Xspress3
- 1x Canberra/Mirion 7 element SDD / HPGe via QD Xspress3
- 1x Rayspec SDD Xia FalconX



MAX IV DAQ flow scheme



- *Design: implement ZMQ streaming where needed*
- 40GbE connection DCU to DAQ cluster from where data saved to hdf5 (GPFS)
- ~Done: (Eiger2), Pilatus, Andor, Dhyana

When commercial solutions are not enough...

- MicroMAX beamline (under construction) can expect 10^4 photons/pixel/10 μ s:
→ requires a charge integrating detector
- **JungFrau** 1M on loan from PSI:
preparation of DAQ scheme, understand and characterise detector
- Eventual 4M planned for 2022



-
- Strong interest in developing coherent techniques such as **X-ray Photon Correlation Spectroscopy (XPCS)** → requires time resolution
 - Planning to loan a timepix3-based **TRISTAN** 1M from DLS this year to run a demonstration XPCS experiment at the NanoMAX beamline
 - Soft X ray XPCS a further challenge (photon counting in general for soft X rays)
→ *exploring collaboration with Mid Sweden University and Uppsala University on development of small pixel sized LGADs for readout with timepix3 or medipix3*

Summary

- Max IV is in user operation (+ commissioning and construction)
- Implementing a standard DAQ pipeline has been major activity
- Recognition that detectors need dedicated support:
 - Improve and consolidate local knowledge towards a genuine detectors group
 - Respond to needs of beamlines but also be proactive and advise them on their choices in terms of commercial solutions
- Ambition to do more: explore possible collaborations to address specific needs of the beamlines, in both short and long term