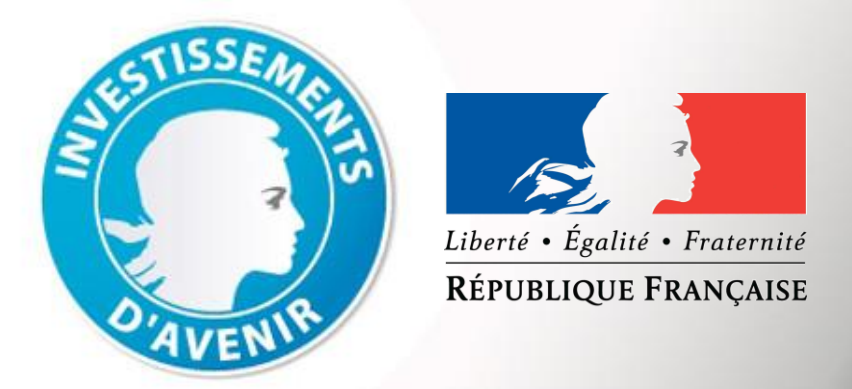


# Status of the tomography beamline *anatomix* at Synchrotron SOLEIL

The construction of ANATOMIX is funded through the French State, EQUIPEX project "NanoimagesX", grant no. ANR-11-EQPX-0031



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<http://www.synchrotron-soleil.fr/Recherche/LignesLumiere/ANATOMIX>  
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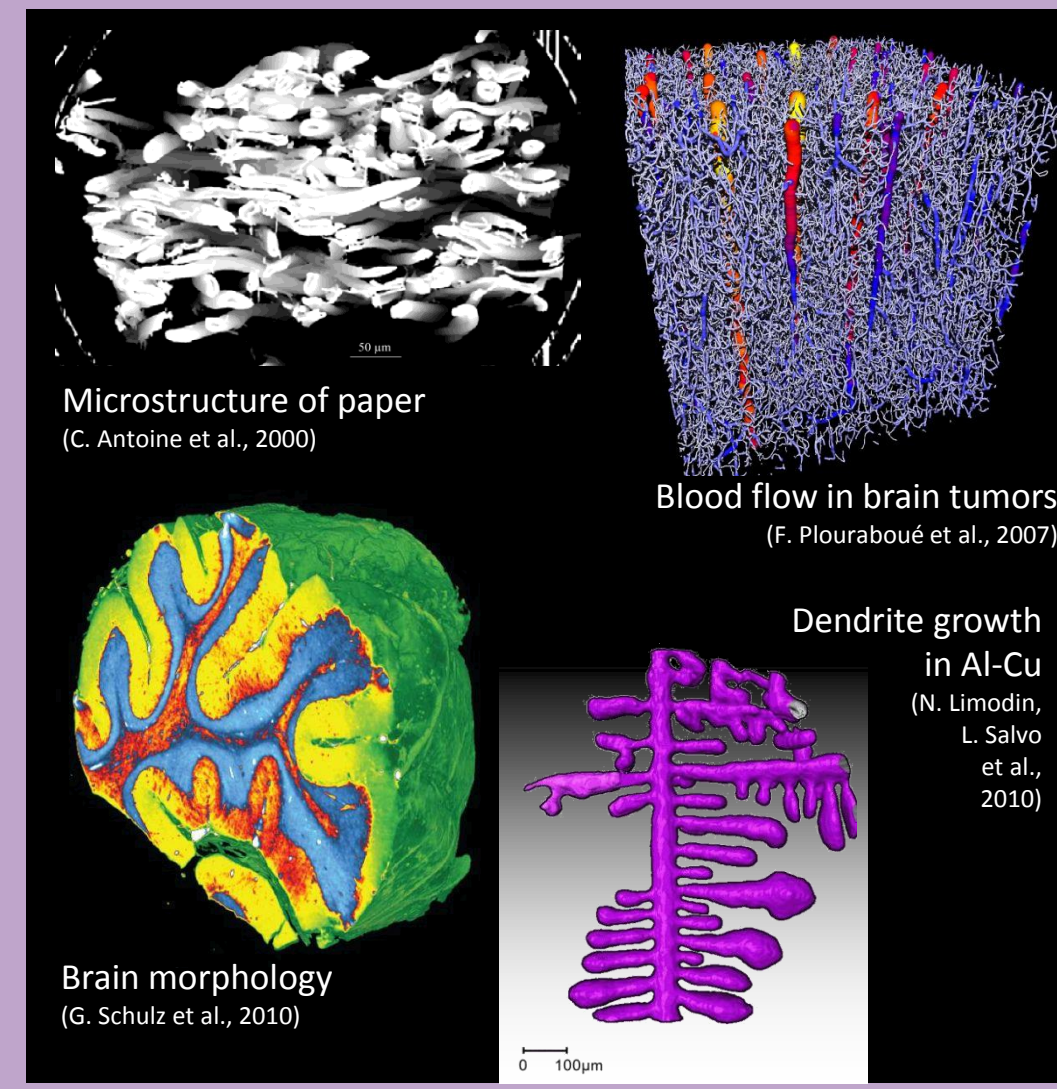
Synchrotron SOLEIL is currently building a long undulator beamline dedicated to hard X-ray full field imaging. With an accessible range of photon energies from 5 to 25 keV, a beam size up to 4 cm width, and two experimental stations covering length scales down to a resolution of 30 nm (pixel size), this beamline will give access to absorption and phase-contrast tomography of biological soft tissue up to several cm thickness, and to X-ray microscopy of biological samples and natural or advanced engineering materials.

## Key facts and parameters

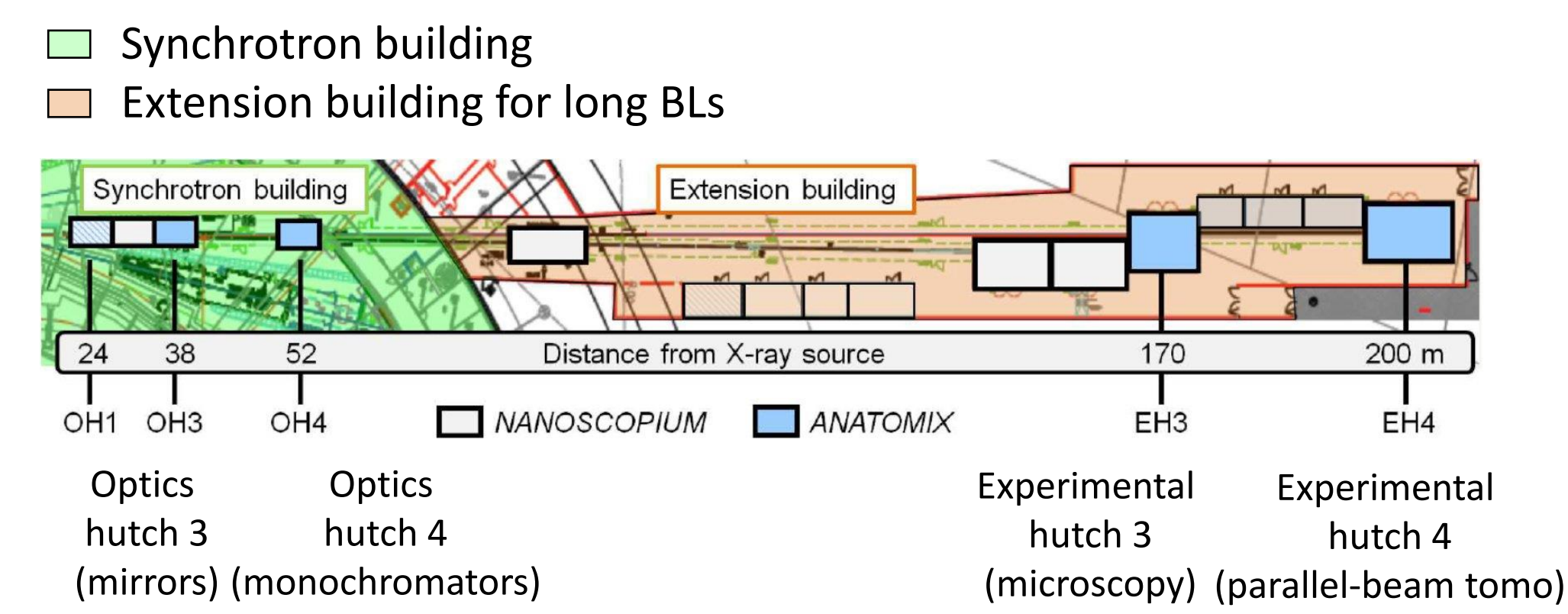
- Hard X-ray full-field imaging methods
- Undulator beamline on canted section (neighbor BL NANOSCOPIUM)
- Energy range: 5 – 25 keV; white beam, multilayer, crystal mono
- Absorption contrast and phase contrast
  - Very high sensitivity
- Spatial resolution:
  - Down to 1  $\mu\text{m}$  (pixel size 200 nm) for parallel beam;
  - Down to 100 nm (px size 30 nm) for microscopy methods.
- Maximum usable beam size (field of view):
  - 4 cm (width)  $\times$  1 cm (height)
- Two experimental hutches
  - EH 1 (170 m): Hard X-ray microscopy
  - EH 2 (200 m): Parallel-beam X-ray tomography
- Funding through French State (EQUIPEX program NANOIMAGESX)
- Beamline scheduled to be operational in 2018.

## Things to see in tomography

- Microstructure in 2D, 3D
- Hidden structures
- Pore networks (foams...)
- Fiber networks
- Subtle density differences
- Fluid mechanics in such media (e.g., blood flow)
- Growth processes
- Failure processes (cracks...)
- Specimens not accessible to sectioning

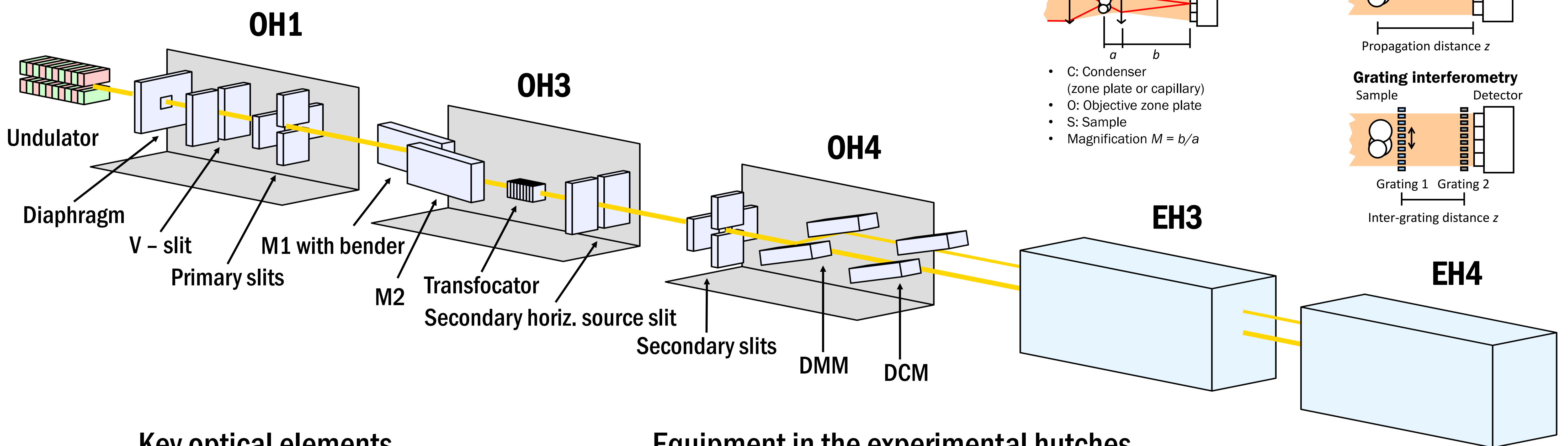


## anatomix floor plan

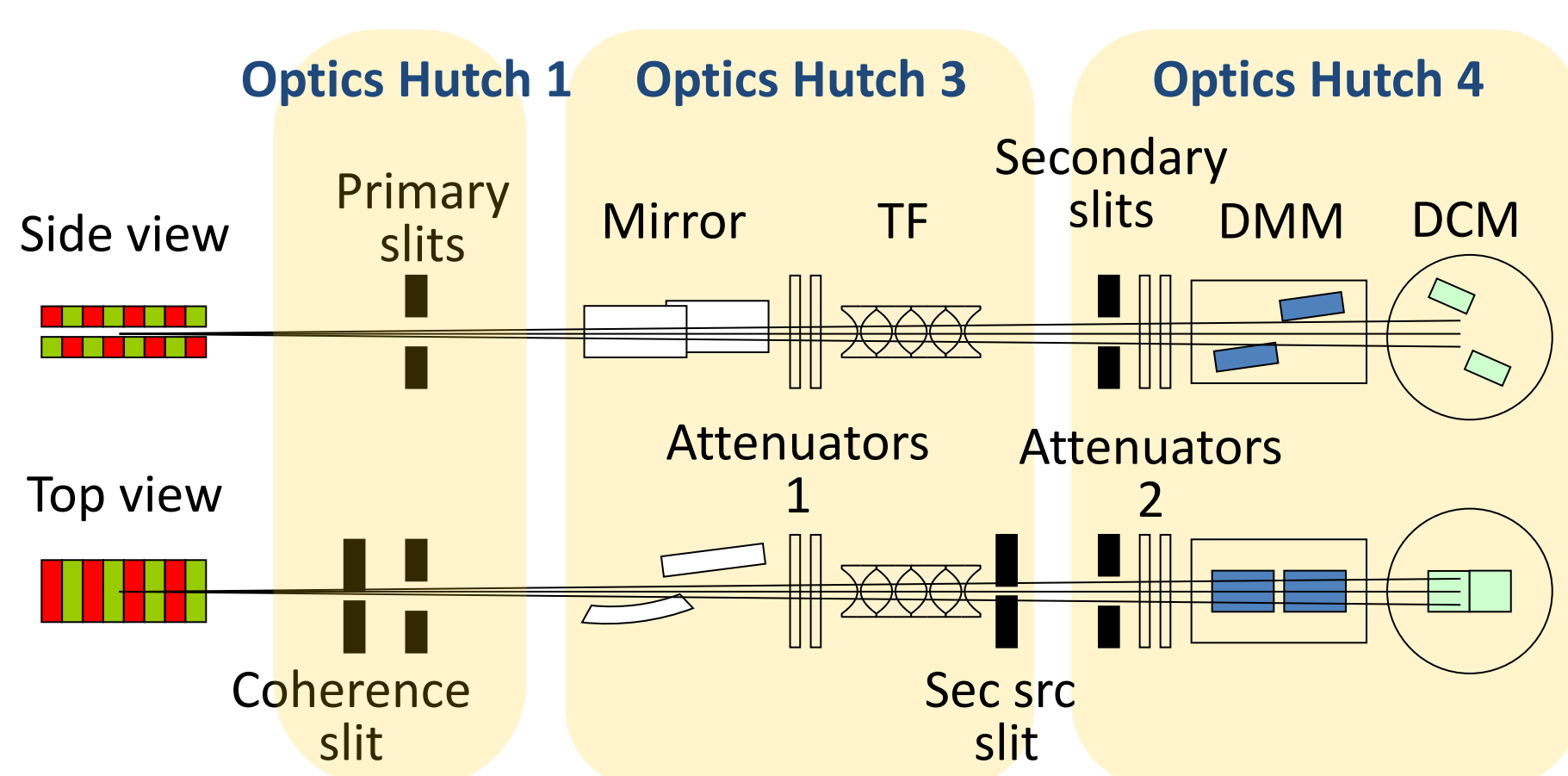


More details can be found in:  
T. Weitkamp et al. "The tomography beamline ANATOMIX at Synchrotron SOLEIL", *Journal of Physics Conferences Series*, **849**: art.n° 012037. (2017). doi :10.1088/1742-6596/849/1/012037

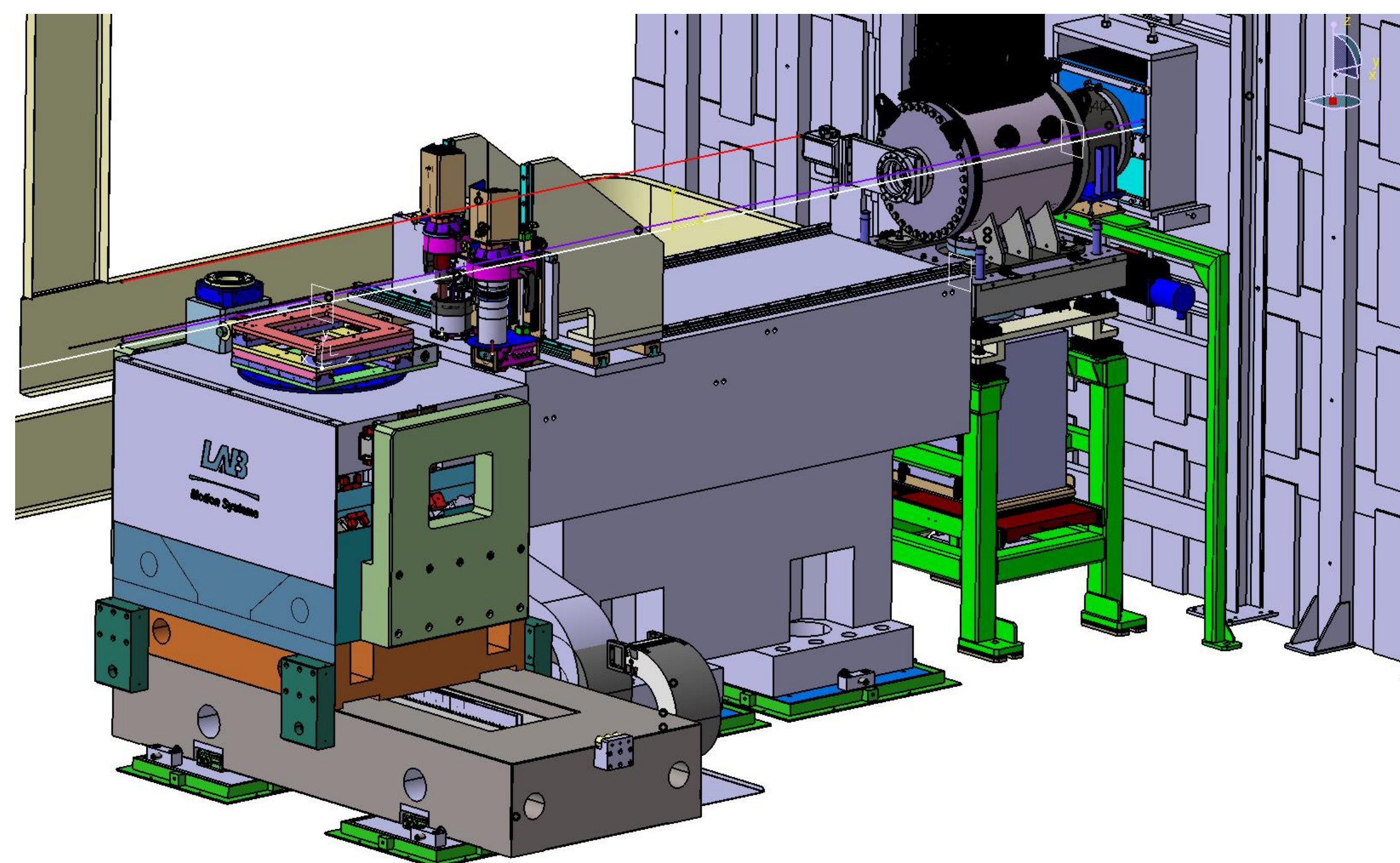
- | Source  | Optics Hutch 1  | Optics Hutch 3   | Optics Hutch 4   | Experiments Hutch 3   | Experiments Hutch 4   |
|---|---|--|--|---|---|
| <ul style="list-style-type: none"> <li>• Undulator U18</li> </ul> | <ul style="list-style-type: none"> <li>• Diaphragm</li> <li>• V slit (0.1 – 0.3 mm)</li> <li>• Primary slits</li> </ul> | <ul style="list-style-type: none"> <li>• Double mirror (removable) M1 bendable</li> <li>• Compound refractive lenses ("transfocator")</li> <li>• Horizontal source slit</li> </ul> | <ul style="list-style-type: none"> <li>• Secondary slits</li> <li>• Double-multilayer monochromator (DMM), <math>d = 2.5 \text{ nm}</math></li> <li>• Double-crystal monochromator (DCM), Si(111)</li> </ul> | <ul style="list-style-type: none"> <li>• Transmission X-ray microscopy</li> <li>• Zernike phase contrast</li> </ul> | <ul style="list-style-type: none"> <li>• Parallel-beam microtomography</li> </ul> |



## Key optical elements

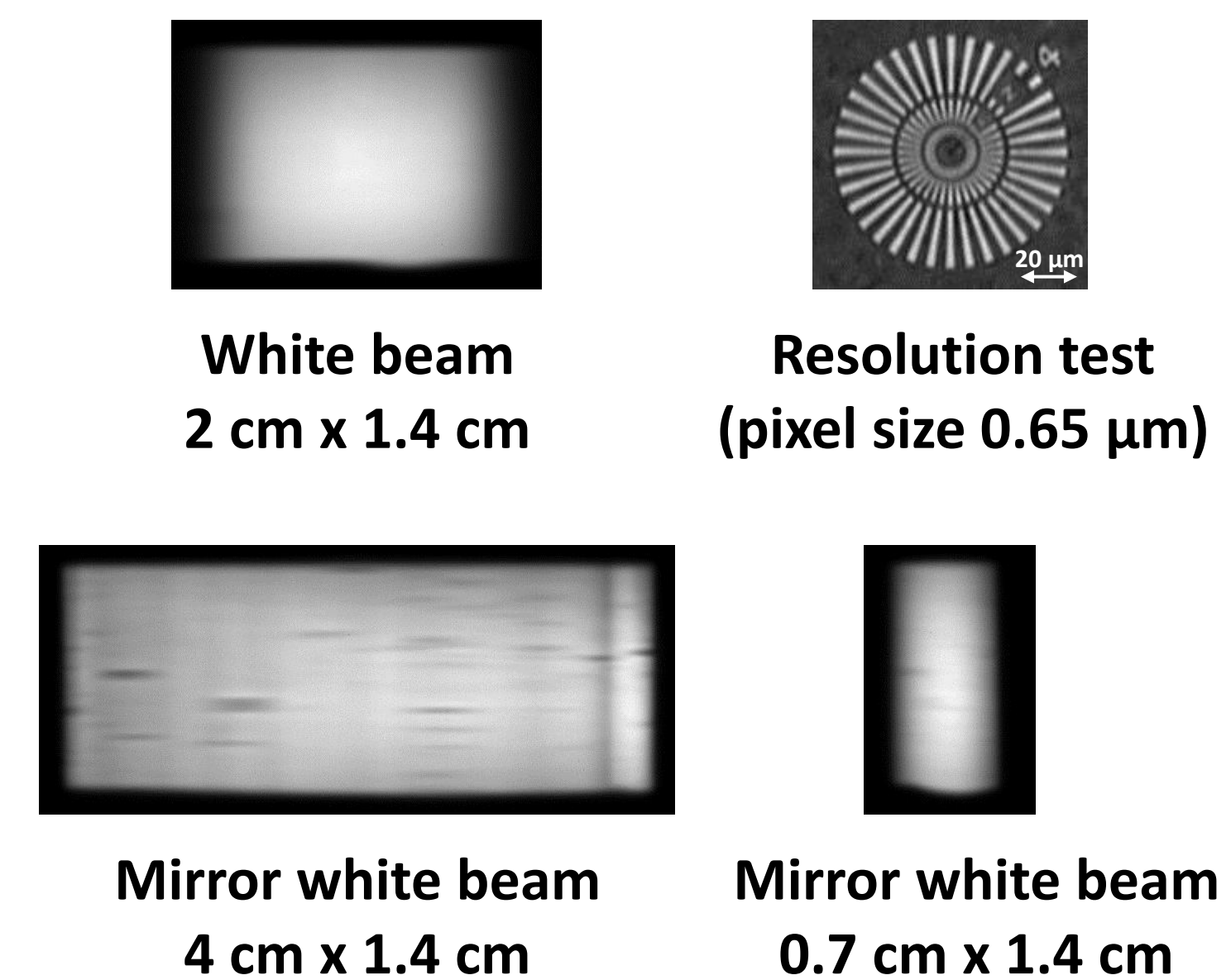


## Equipment in the experimental hutches

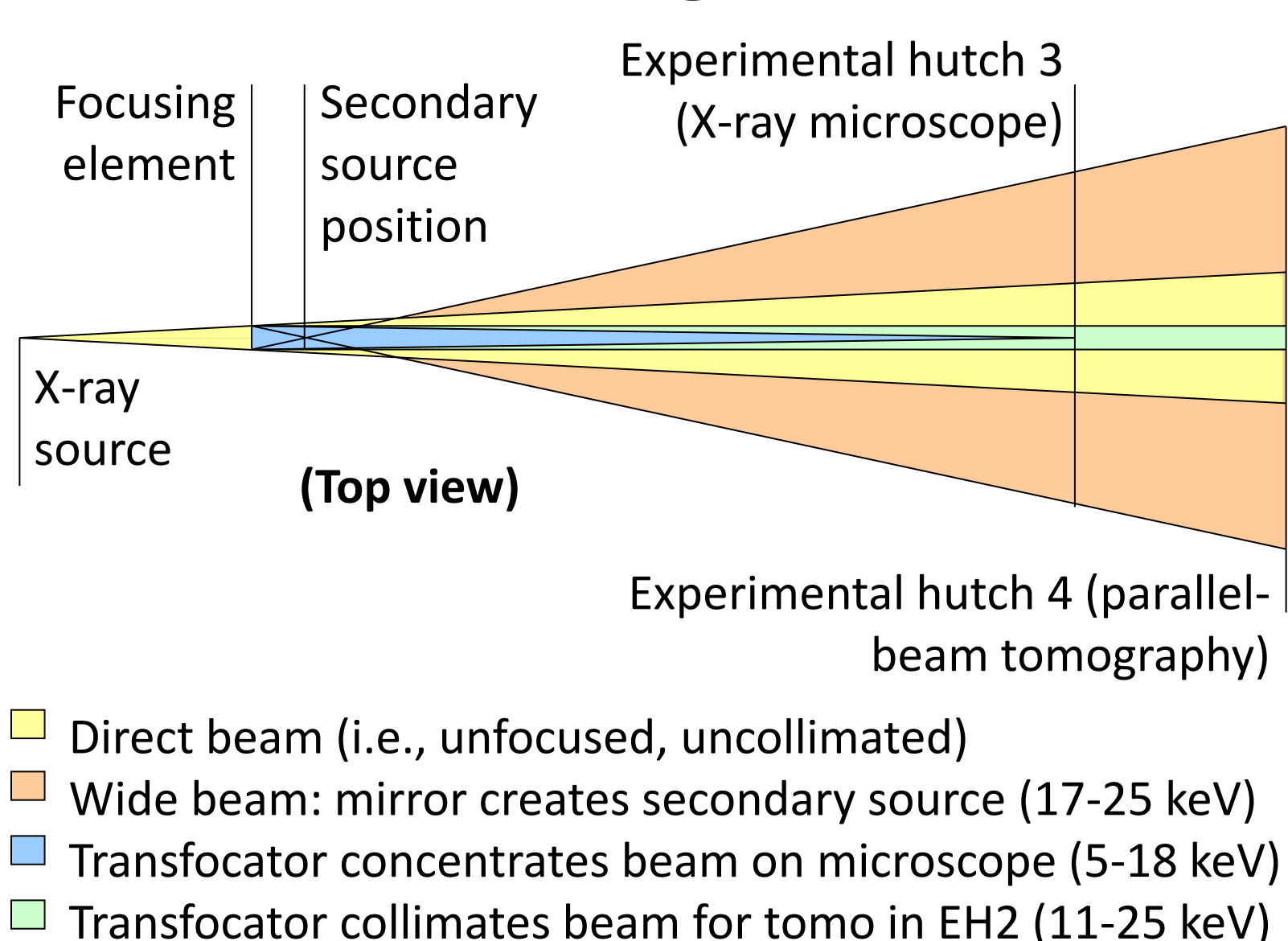


Micro-tomograph and detector table

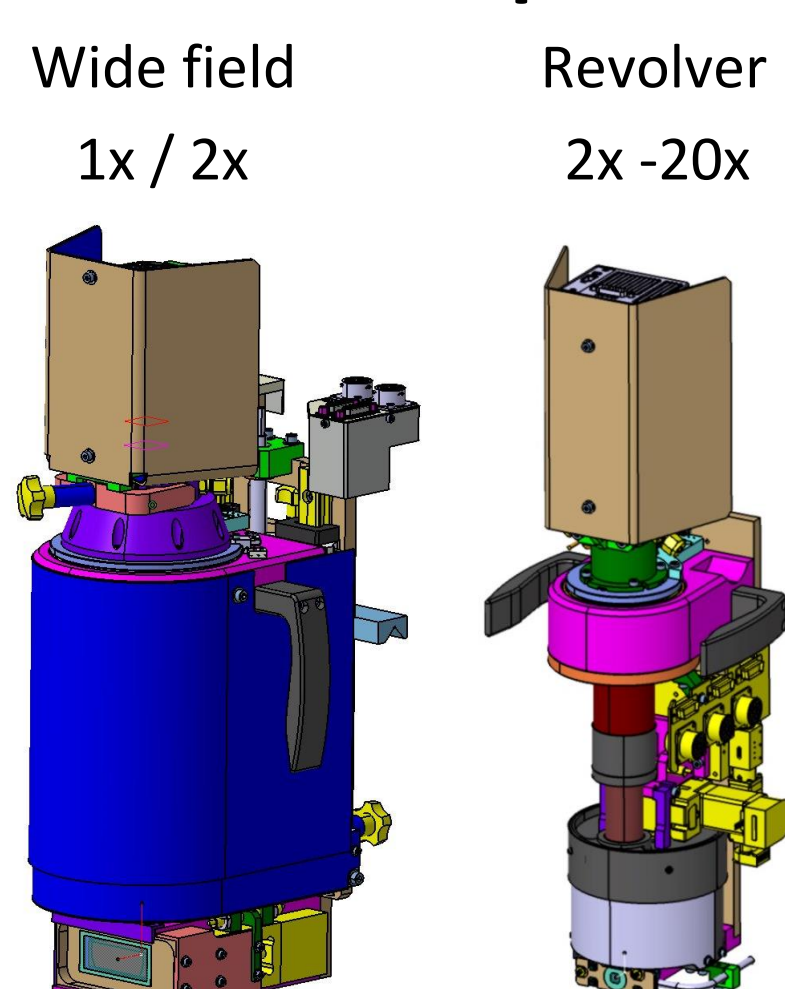
## First beam in EH3



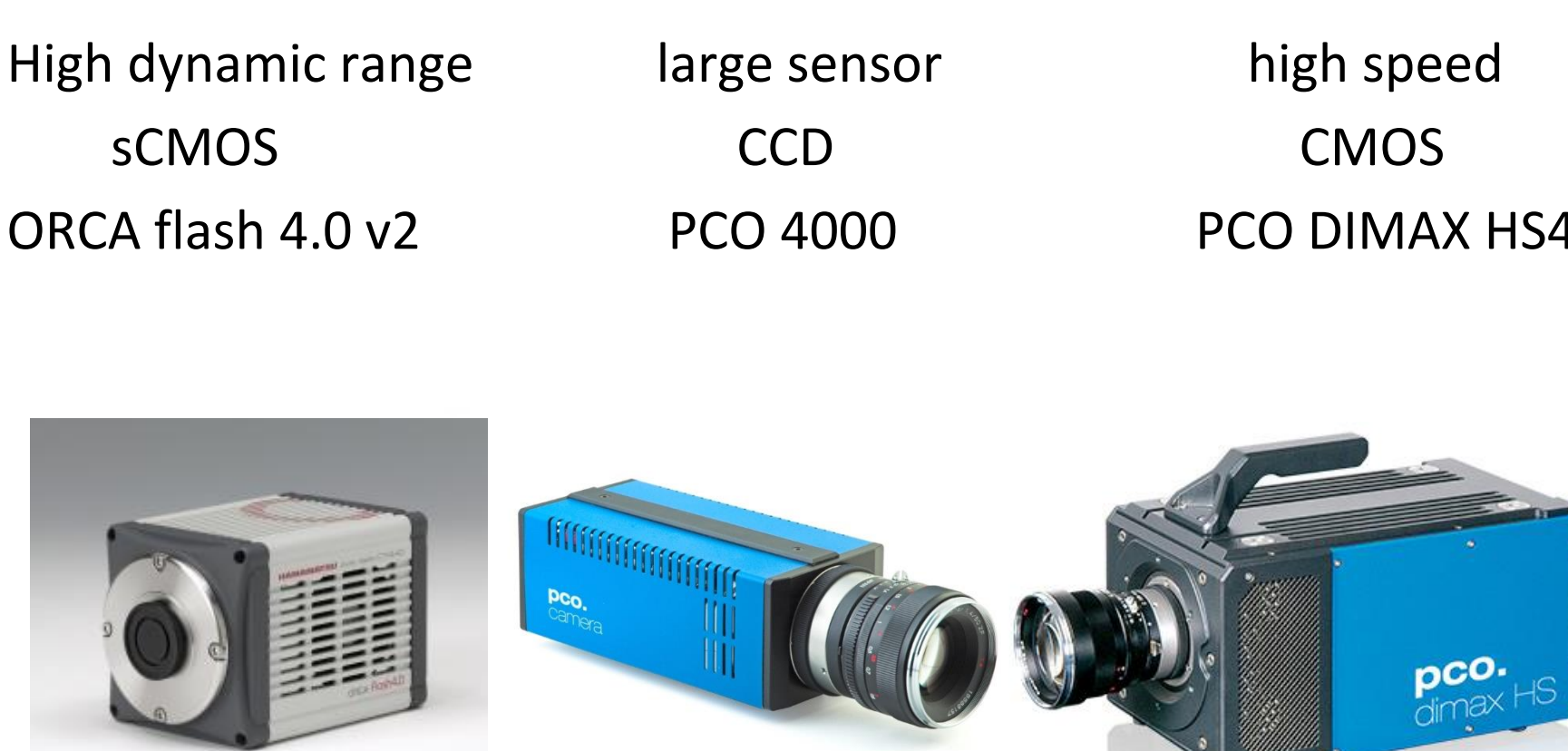
## Beam steering modes



## Detector optics



## Detector cameras



## Current status

- **Optics Hutch 1:** - operational
- **Optics Hutch 3:** - Mirror operational - Transfocator delivery 2018
- **Optics Hutch 4:** - Monochromators delivery end 2017
- Experiments:**
  - Micro-tomograph delivery end 2017
  - TXM operational 2018
- **Expected to be operational in 2018**