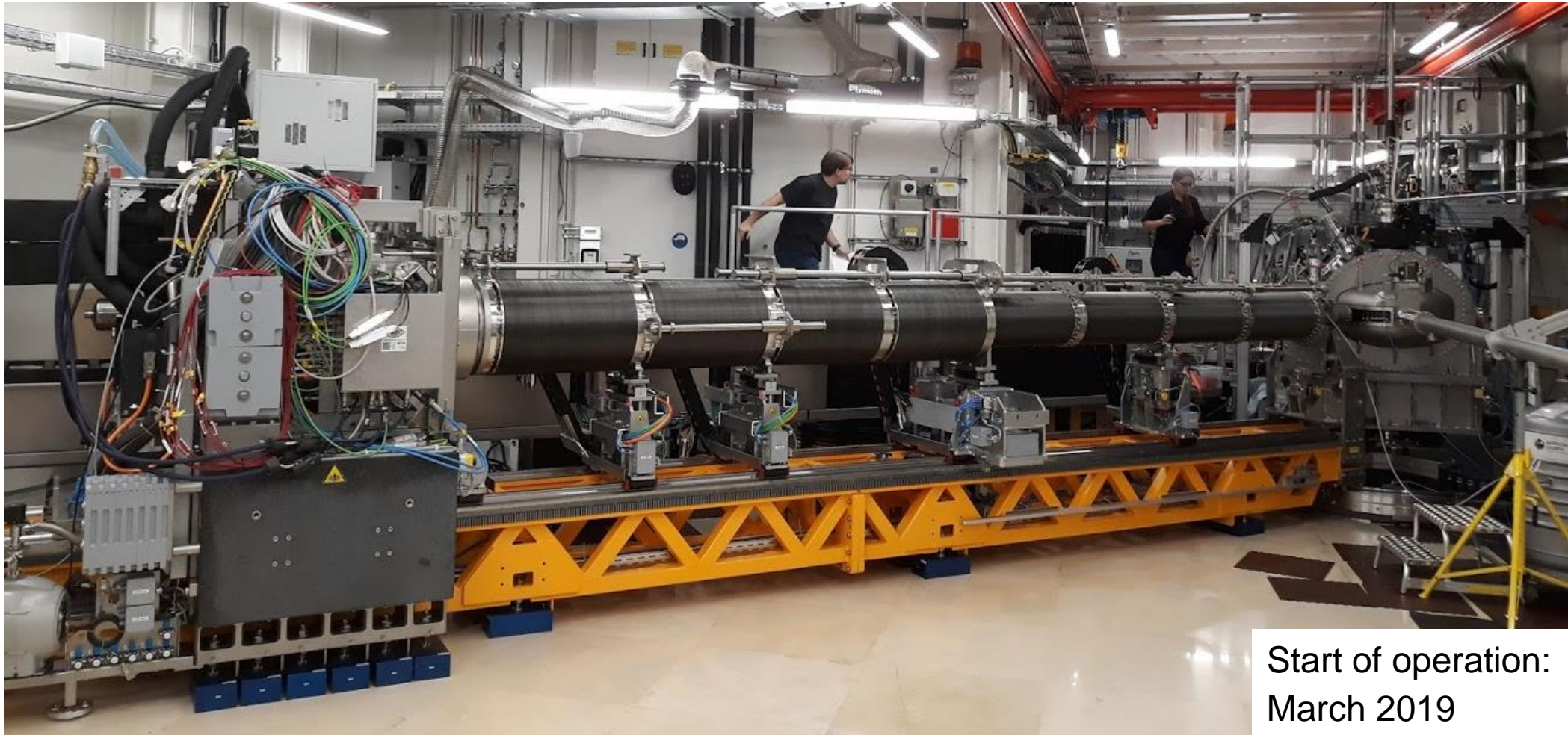


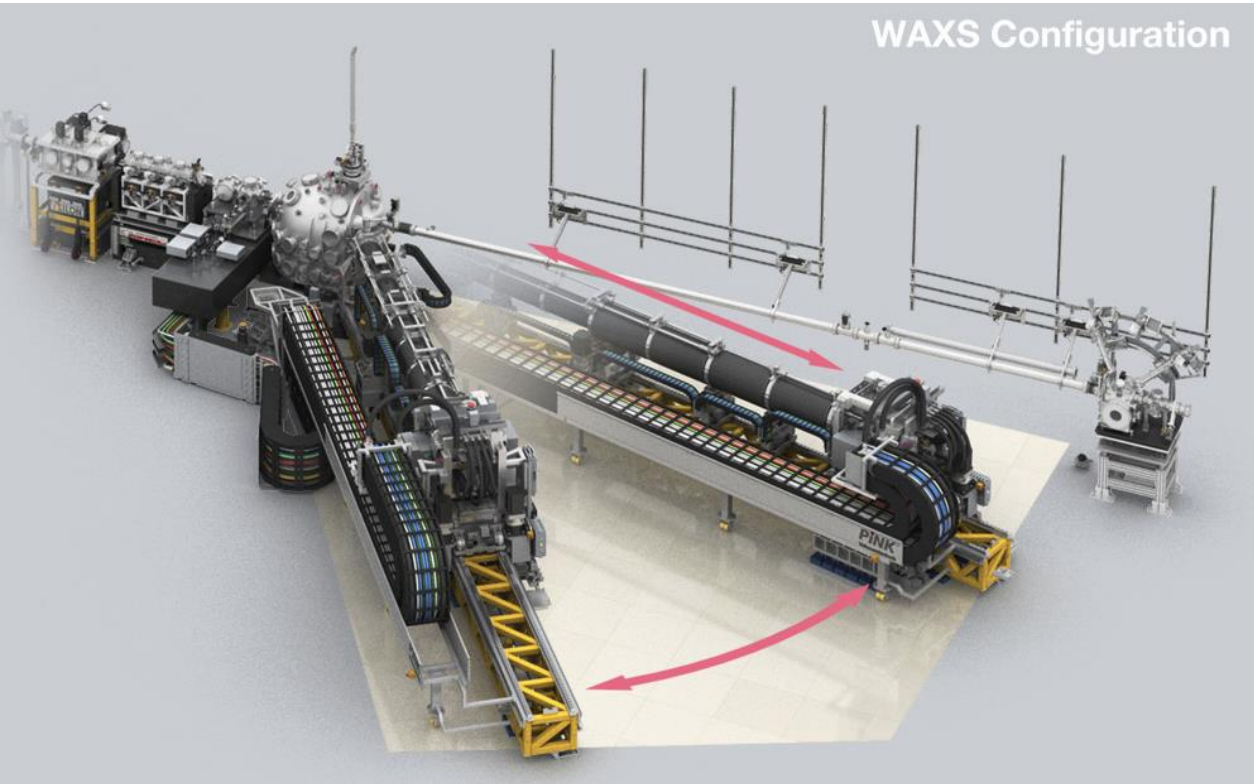
# Call 10 Townhall Meeting, 10 Nov 2022

MID: Materials Imaging and Dynamics Instrument



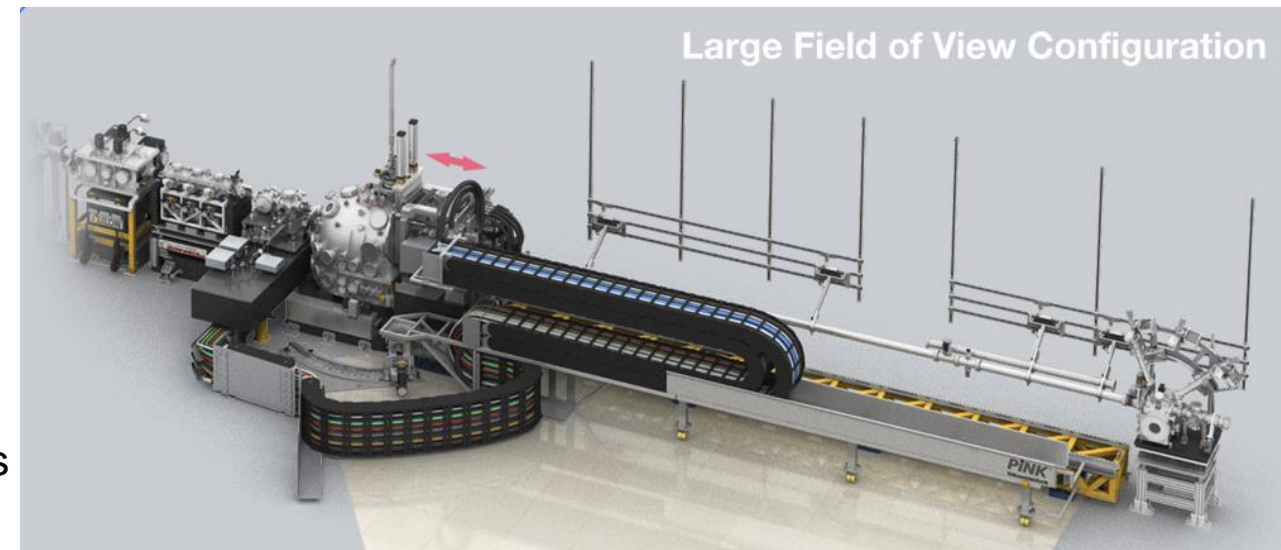
Start of operation:  
March 2019

# MID: versatile hard X-ray instrument for scattering and imaging



- AGIPD: MHz area detector,  $10^6$  pix,  $200 \mu\text{m}$  pix size ePix, Gotthard detector, CCD cameras, Jungfrau (in progress)
- Versatile setup, multi-purpose interaction chamber Windowless (in-vacuum setup) or sample env in air
- Sample - detector dist: 0.2 m (LFOV) to 8 m (HiRes)  $2\theta$  up to  $\sim 50^\circ$ , 5 - 24 keV (7-18 keV standard range)
- SASE, self-seeding, or Si monochromators (111) & (220)

X-ray scattering and imaging: SAXS, WAXS, XPCS,  
Phase contrast imaging, holography, CXDI and speckle methods  
Nuclear resonant scattering, fs laser pump - X-ray probe  
Nano-focusing techniques, split-delay, jets, pulsed B field,...



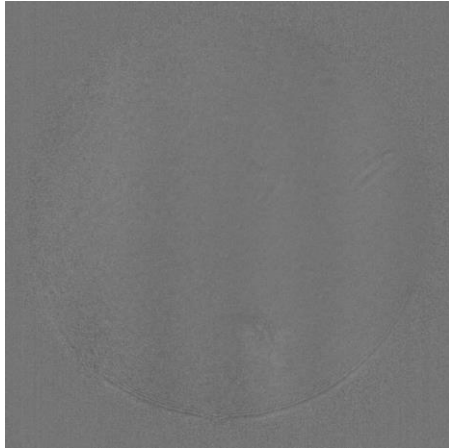
A. Madsen *et al.*, JSR (2021) **28**, 637

<https://scripts.iucr.org/cgi-bin/paper?S1600577521001302>

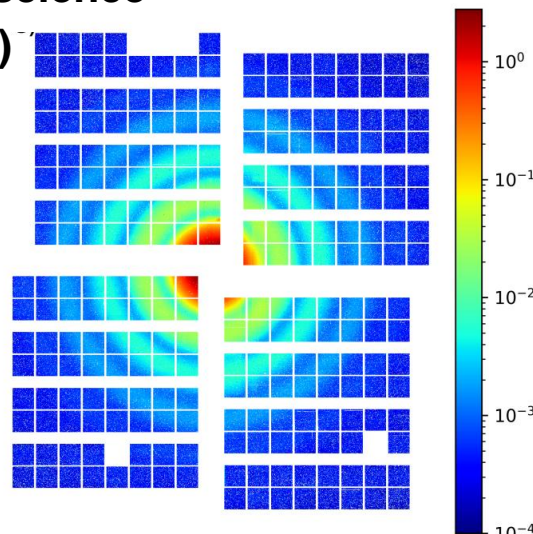


# MID science

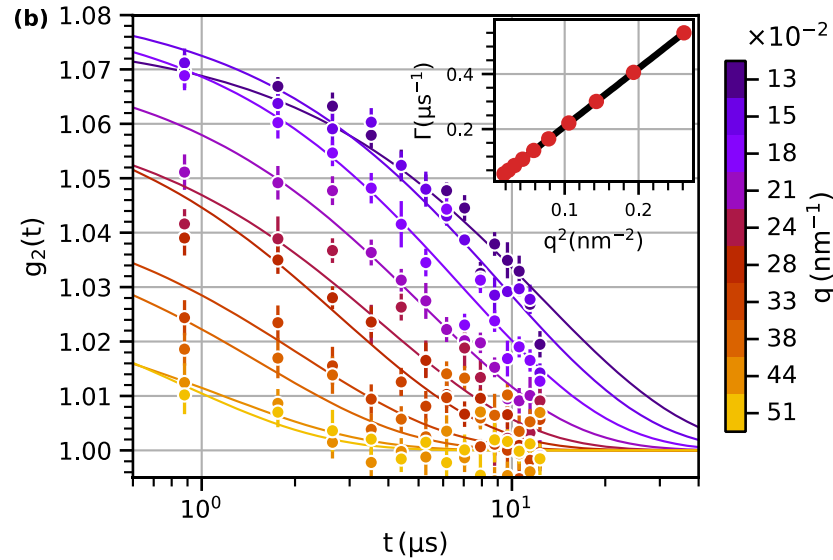
Cavitation bubble dynamics  
(TR imaging, NF holography)



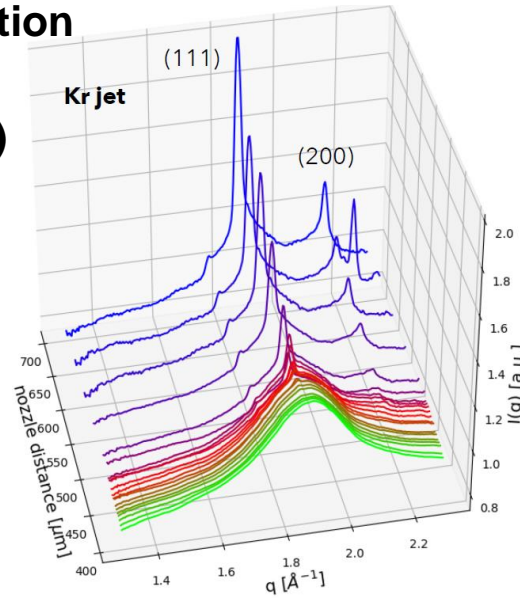
Colloidal science  
(TR-SAXS)



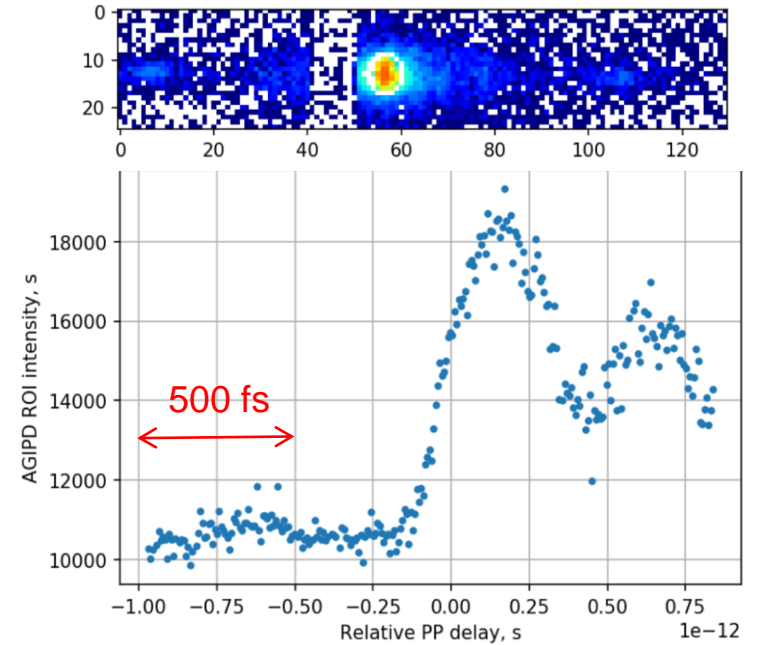
## Protein dynamics (MHz XPCS)



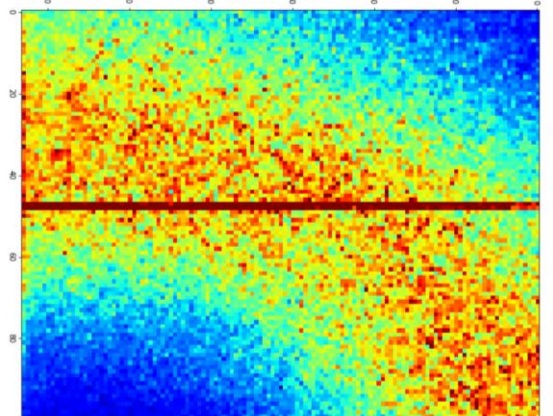
## Crystallization kinetics (TR-WAXS)



## LA phonons in STO (fs laser pump – X-ray probe)



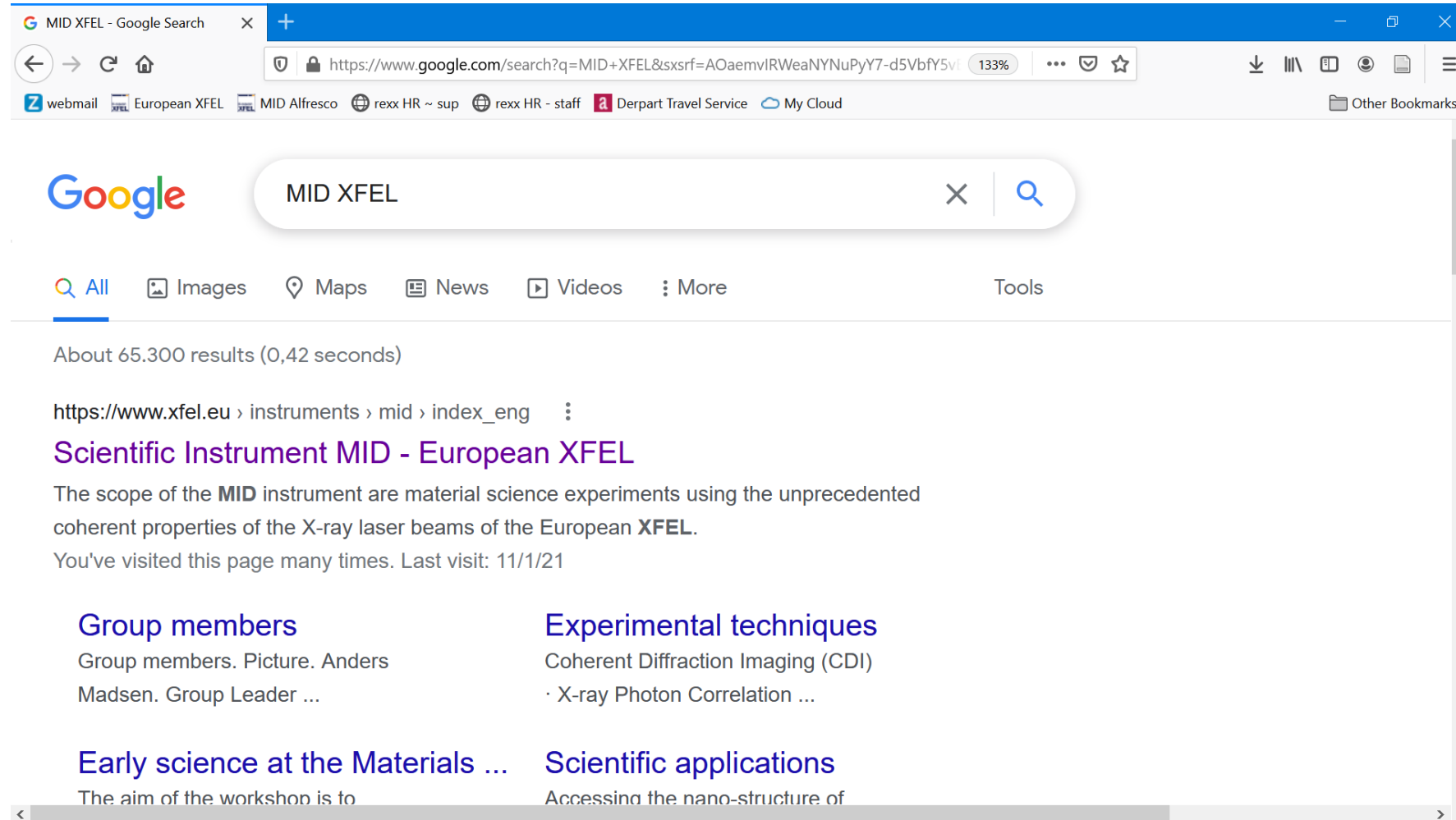
## Coherent scattering and speckle



# MID in Call 10

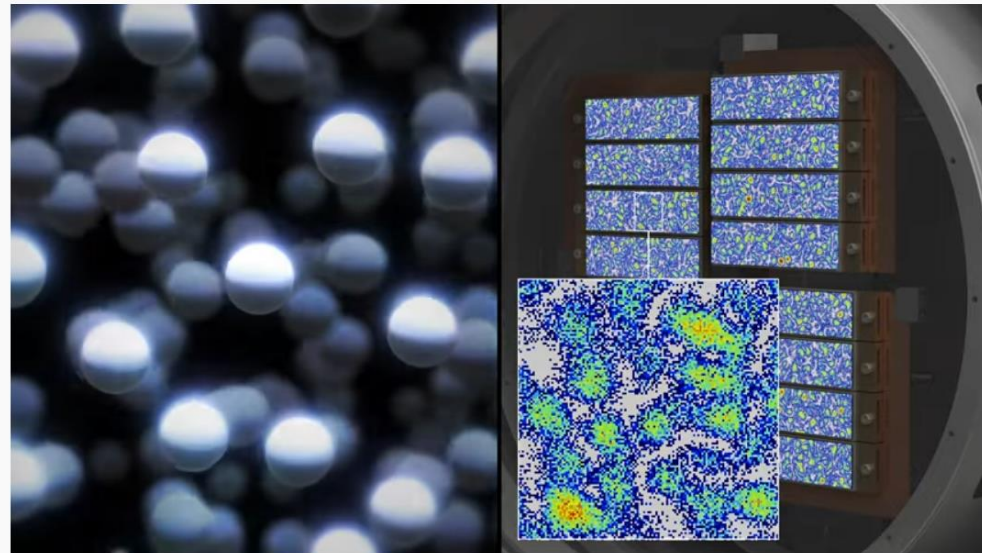
- **Specifications similar to Call 9**
- **Standard configuration available for small-angle MHz XPCS**
  - AGIPD MHz area detector, 1M pixels, 200 um pixel size
  - 7–12 keV, ~2 mJ/pulse (SASE)
  - Min. correlation function lag time 440 ns, max. lag time 88 μs
  - q-range (8 m sample–detector distance):  $\sim 7 \times 10^{-3} - 0.1 \text{ \AA}^{-1}$  (small angle scattering)
  - Beam size on sample:  $\sim 0.5 - 10 \text{ μm}$  with large NA optics,  $> 10 \text{ μm}$  with tunnel optics
- **Hard X-ray split-and-delay line open for proposals (two color, XPXP, XSVS,...)**
  - Photon energy:  $\sim 7 - 10 \text{ keV}$
  - Delay range:  $-10 - 800 \text{ ps}$
  - Bandwidth:  $\sim 6 \times 10^{-5}$ ,  $2 \times 4 \text{ Si}(220)$  reflections
- **Self-seeding available (discuss with us well ahead submission of the proposal)**
  - Up to  $\sim 0.8 \text{ mJ}$  achieved in  $\sim 1 \text{ eV}$  bandwidth at 9 keV
  - Tested up to  $\sim 18 \text{ keV}$ , some optimization required...

# Need more information?



Get in touch!! [mid-info@xfel.eu](mailto:mid-info@xfel.eu)

# MID on YouTube



The MID instrument at the European XFEL

<https://www.youtube.com/watch?v=S-ACzHyFIIk>

<https://www.youtube.com/watch?v=vCrriuHSWsc>



MID change of configuration time-lapse