Long Term Strategy at the ESRF and Detector Developments In Europe and the World

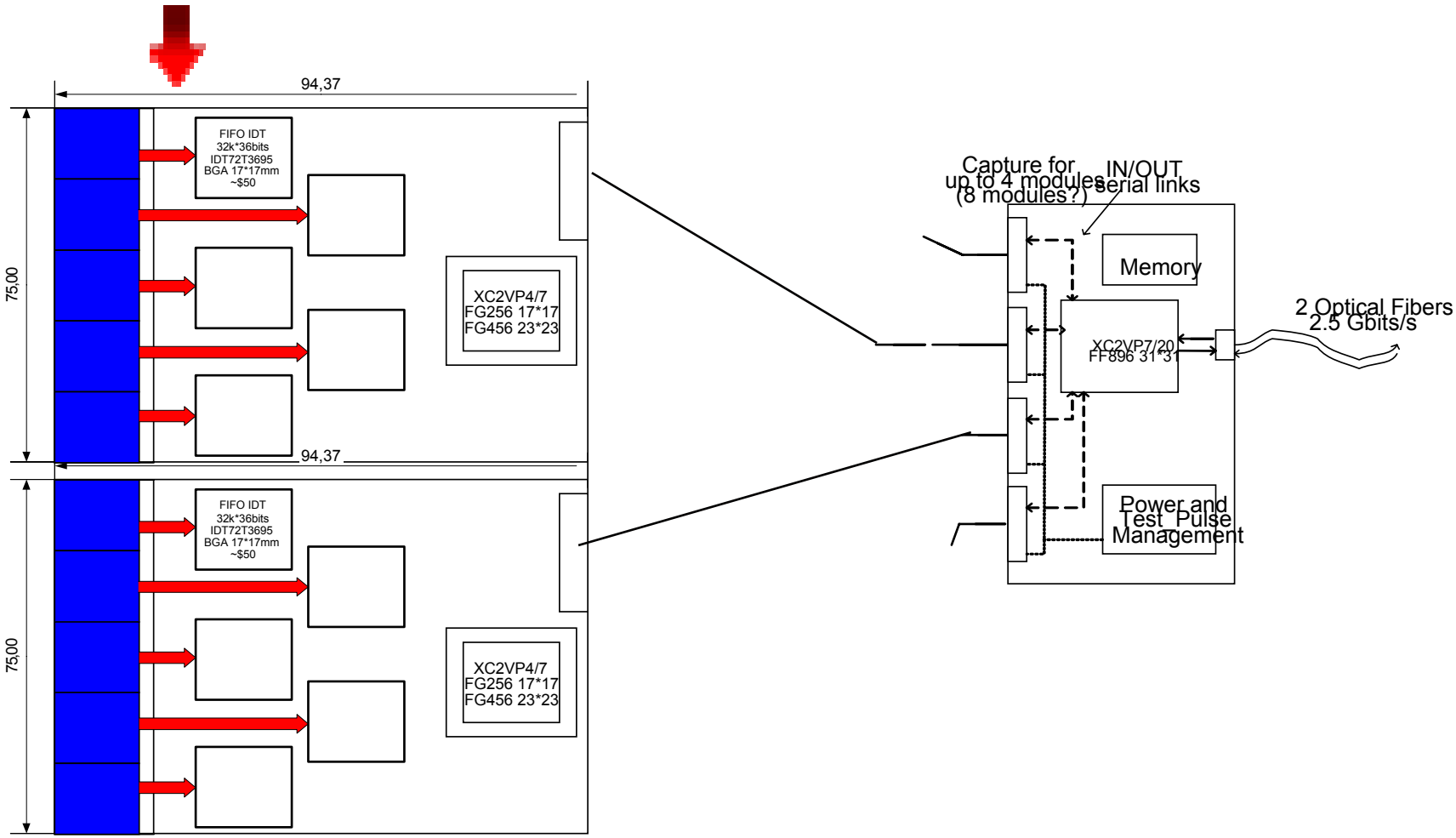
Scientific Infrastructure and Experimental Programme

- Example: DETECTORS (…. all happening after the sample)
  - Systematic under-funding:
    - ESRF: ~50M€/1000M€=0.05
    - CERN: ~0.33
  - Large Angular Collection
  - Time Resolution
  - Integration with Optics and Software Developments
  - It does not necessarily require new technology

What is the ESRF doing ?

Read-Out < 0.3 ms

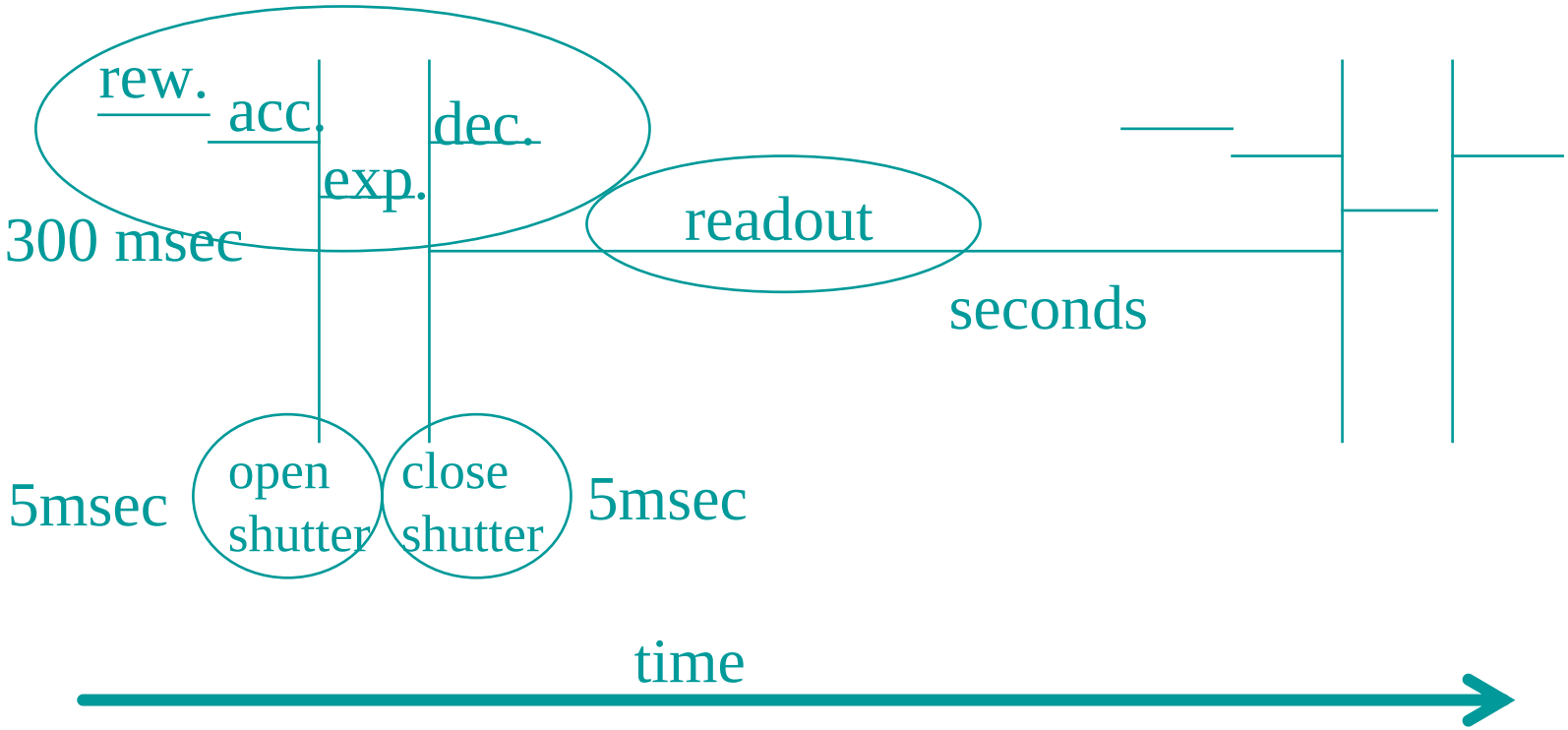
16 Gbit/s



How efficient are we?

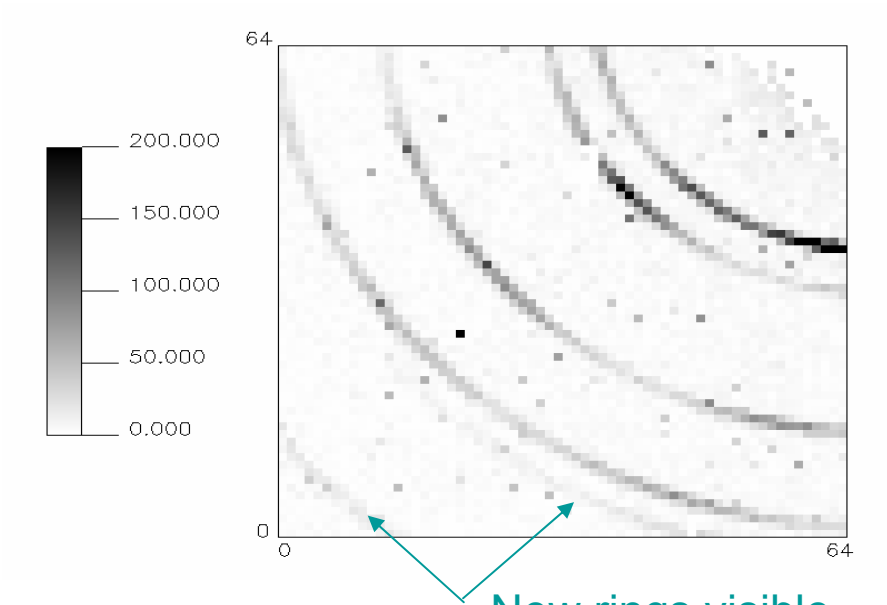
- Incident flux (spectral):
  - $\Delta\lambda/\lambda$ 1st harmonic = 10^{-2}
  - $\Delta\theta/\theta$ Si (111) = 10^{-4}
  - IXS $\Delta\lambda/\lambda = 10^{-7}$
  - Total power generated = 10^{3} Watt
  - Total power on sample = 10^{-3} Watt
- Emitted signal (spatial):
  - Fluorescence: 10^{-4} covered
  - Powder diffraction: 10^{-7} covered

Faster, Better, and New Science



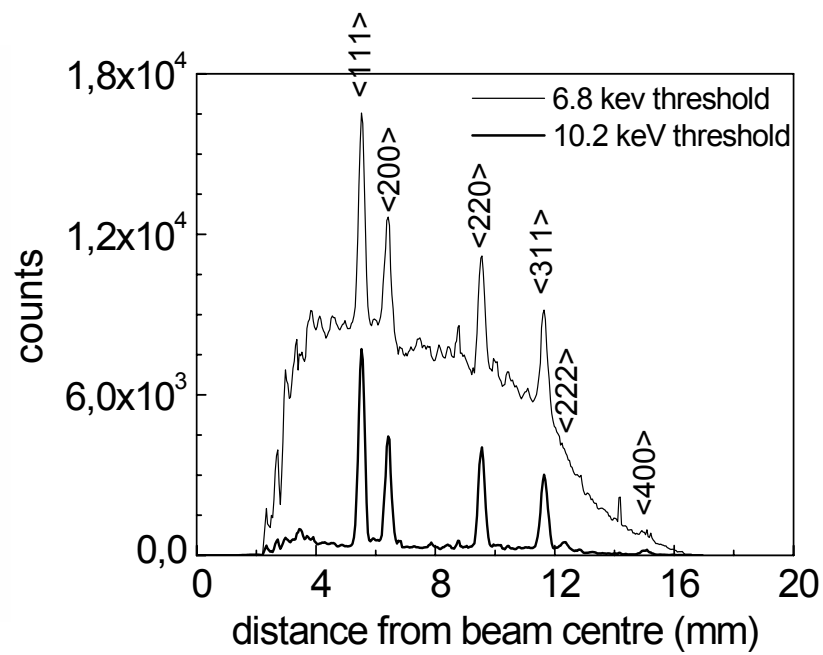
Faster, Better, and New Science

Detection threshold above kα Cu



New rings visible

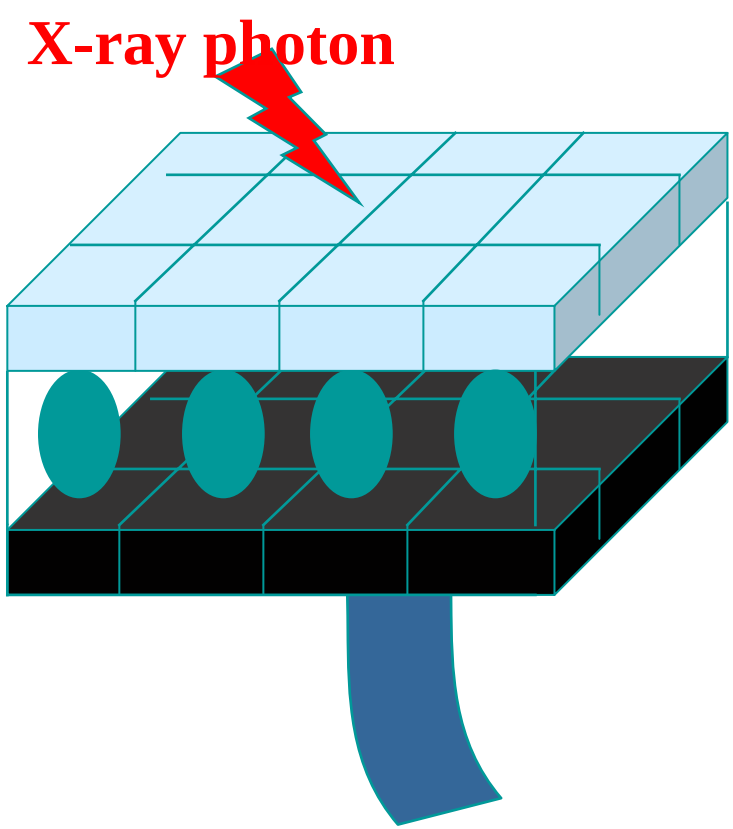
Ring integration spectra



Benefits :

Elimination of fluorescence background reduces image noise allowing to more easily detect weak scattering features

Faster, Better, and New Science

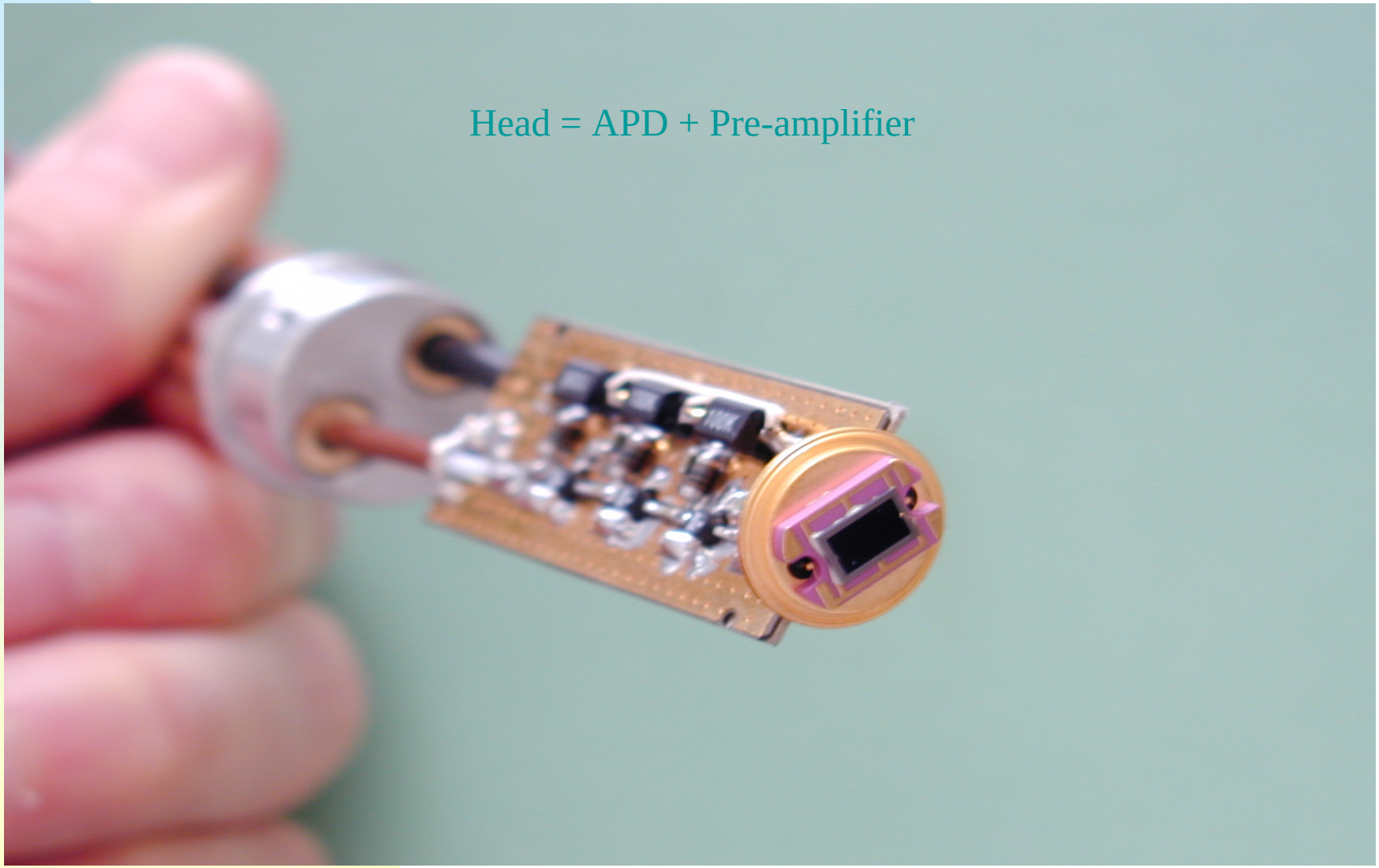


Direct conversion of
X-rays to electrical signal
Si, GaAs, Cd(Zn)Te,…
best spatial resolution

ASICS with **intelligent pixels:**
Auto correlator per pixel

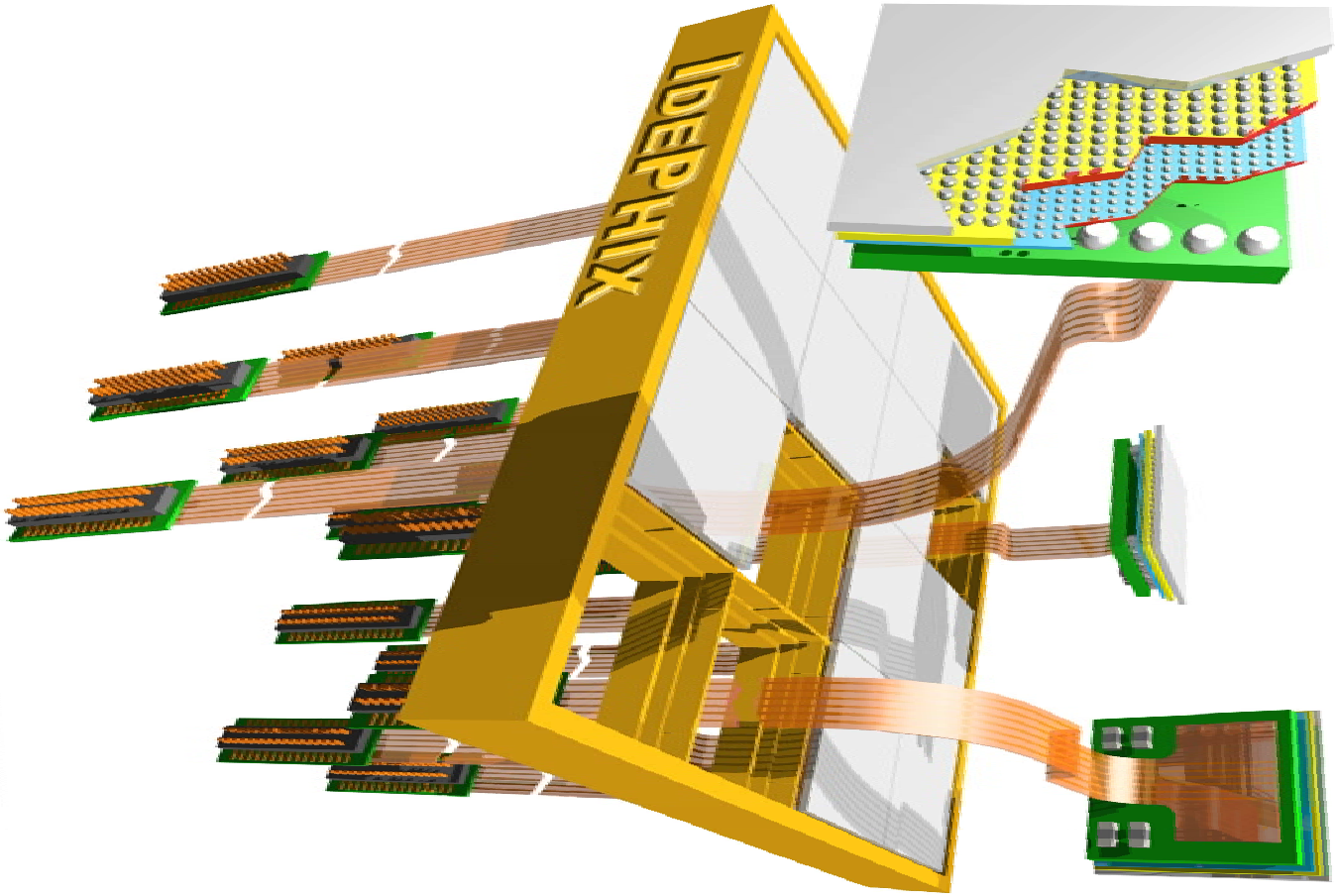
3D connectix for **4-side buttable**

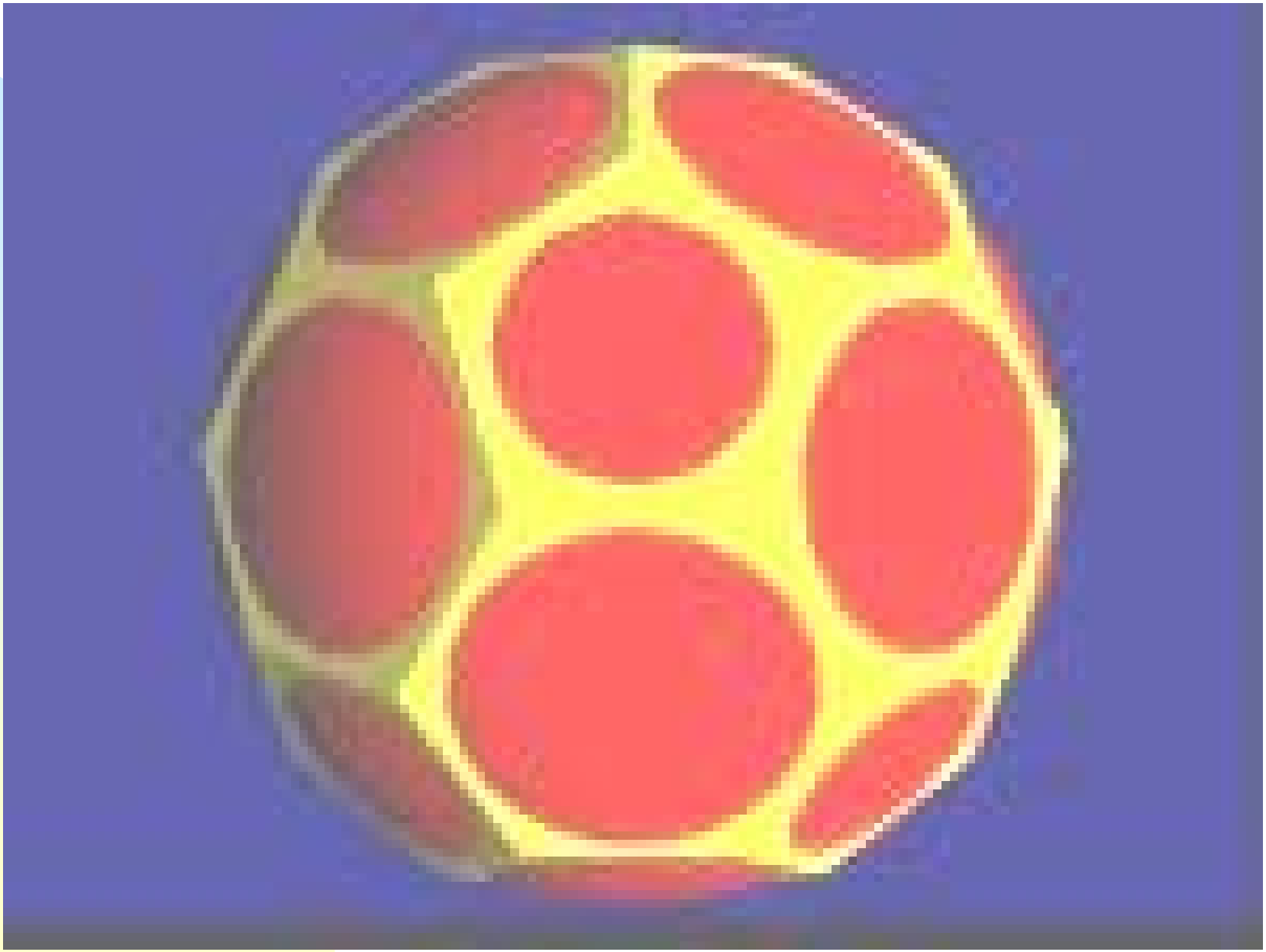
Faster, Better, and New Science



Faster, Better, and New Science

- Faster and Better Macromolecular Crystallography, by continuous rotation.
- Better Macromolecular Crystallography, by low noise, energy discrimination.
- SAXS with micro-second time resolution, example: muscle diffraction.
- 2D X-ray Photon Correlation Spectroscopy.
- Faster Nuclear Resonance scattering.
- Faster and better X-ray magnetic scattering.
- 4π fluorescence detection.
- …….


IDEAL HIX



Scientific Infrastructure and Experimental Programme

- Example: DETECTORS

  - Identify New Science *(see ESRF UM Workshop)*

  - Identify Large Gains:

    ☺ X-ray Fluorescence

    ☺ Diffuse X, SAX,… Scattering

    ☺ Inelastic and Nuclear Scattering

    ☺ Combine to X-ray Imaging

    ☺ ……..

  - Identify Pilot Programmes