



The European Synchrotron Radiation Facility

**is a powerful x-ray light source and
the global leader in photon science by
users and output**



User Facility based on scientific excellence

11,000 users between 2009 and 2012

1900 publications per year (2011)

Average facility cost of 50 k€/publication

Scientific Excellence

30 Nature and Science papers in 2011

3 Nobel Prizes: 4 winners among users

Societal Impact

Fundamental science: Environment, Energy & Health

~25% of research linked to industry R&D

Training of PhD students and Postdocs

Condensed Matter, Materials, Life Sciences Research

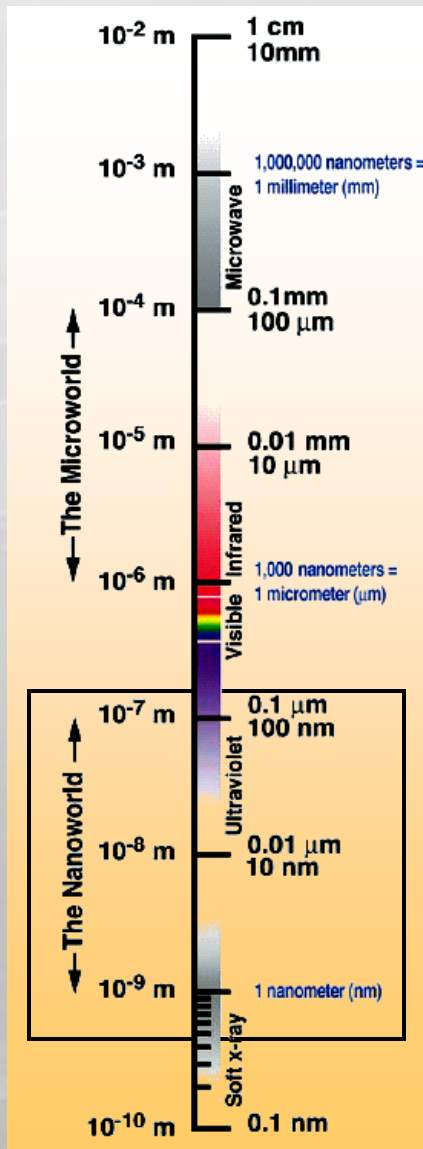
Nanoprobes for the exploration of the Nanoworld: electrons and X-rays

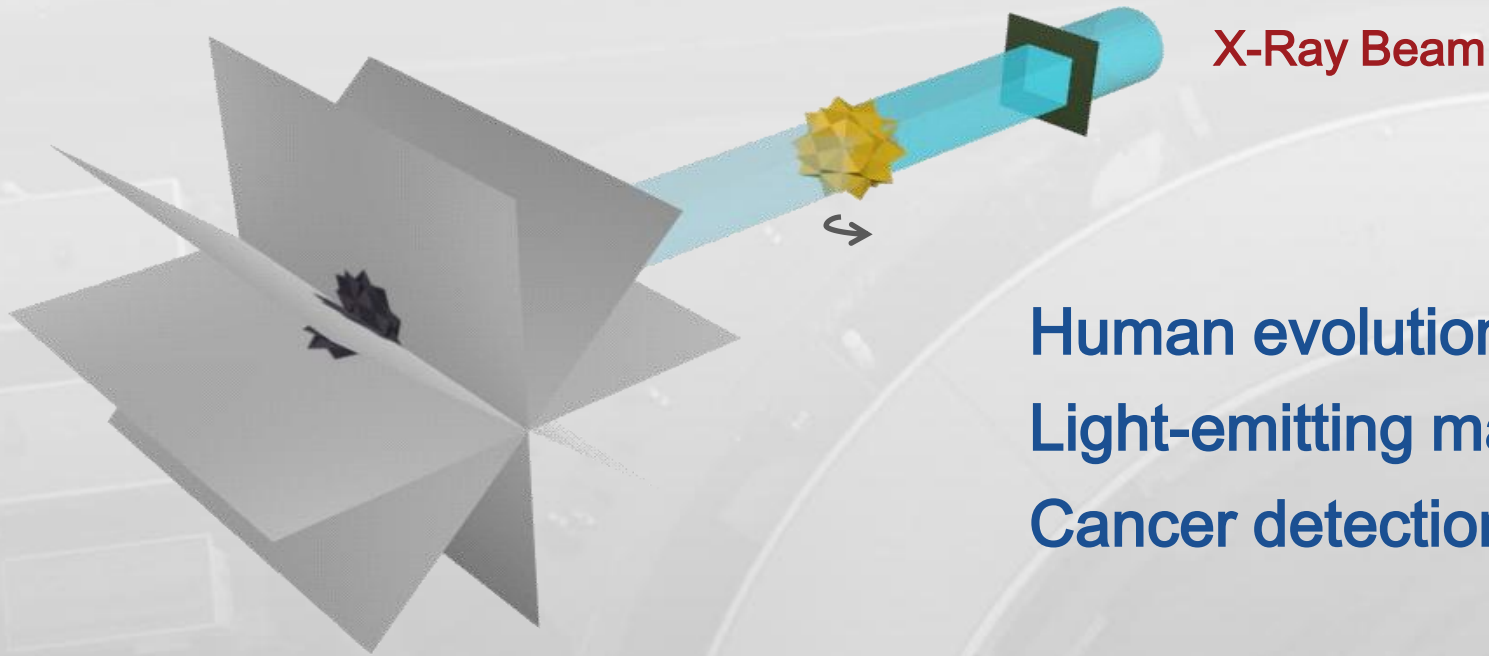
No diffraction limit

X-rays: nano-beams, coherence, high energies

Nano-metre real space resolution with diffraction and spectroscopy methods: single atom to 3D features

Time-resolved studies from the *ms* to the *ns* regimes (complement X-FELs)



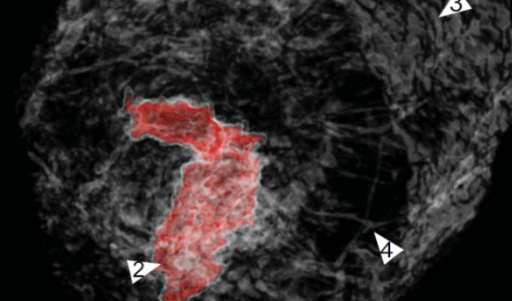
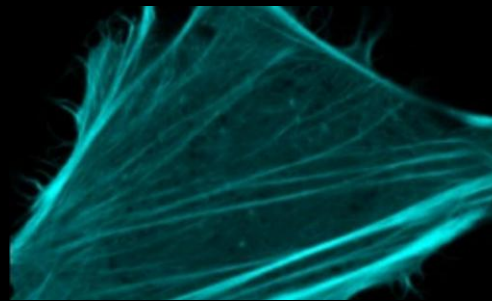


Human evolution
Light-emitting markers
Cancer detection

Sediba: closest ancestor

Fluorescent proteins

SE-CT: breast tumor



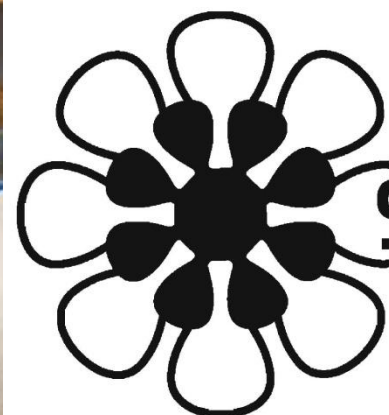
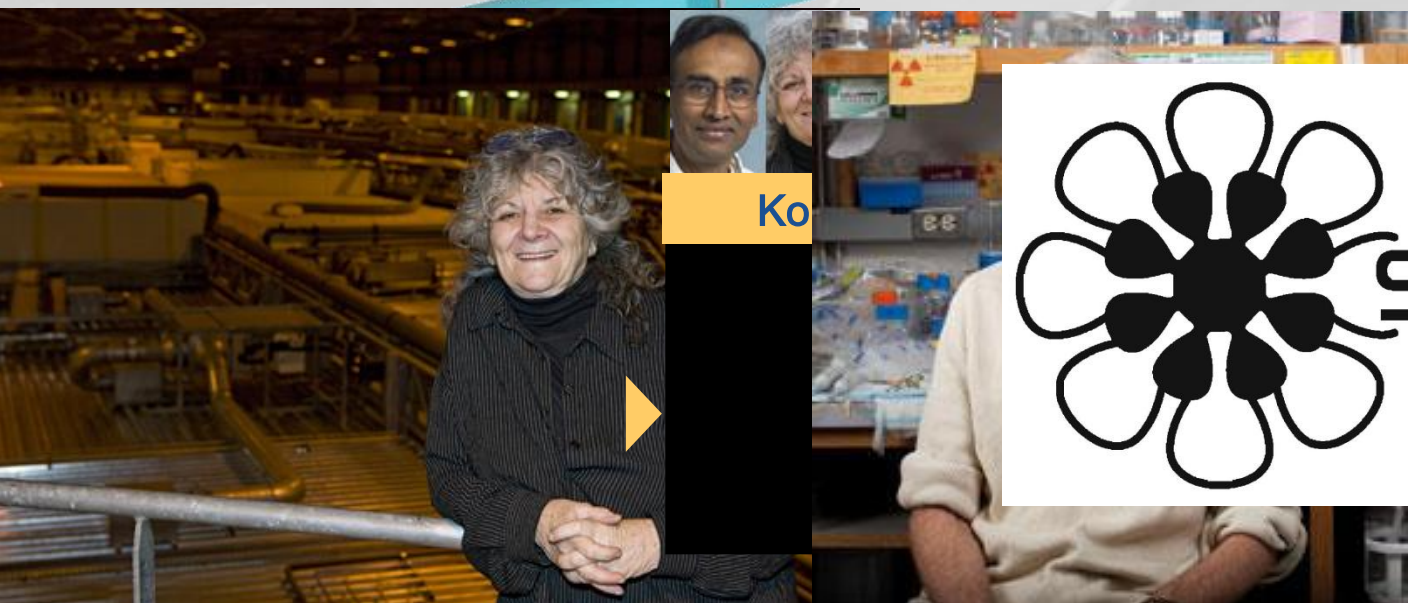
2.3-1.8 my

today

in 10 years ?

Protein construction
Cell communication
Fighting flu

Micro-diffraction



savira
pharmaceuticals

molecules

proteins

virus

cells

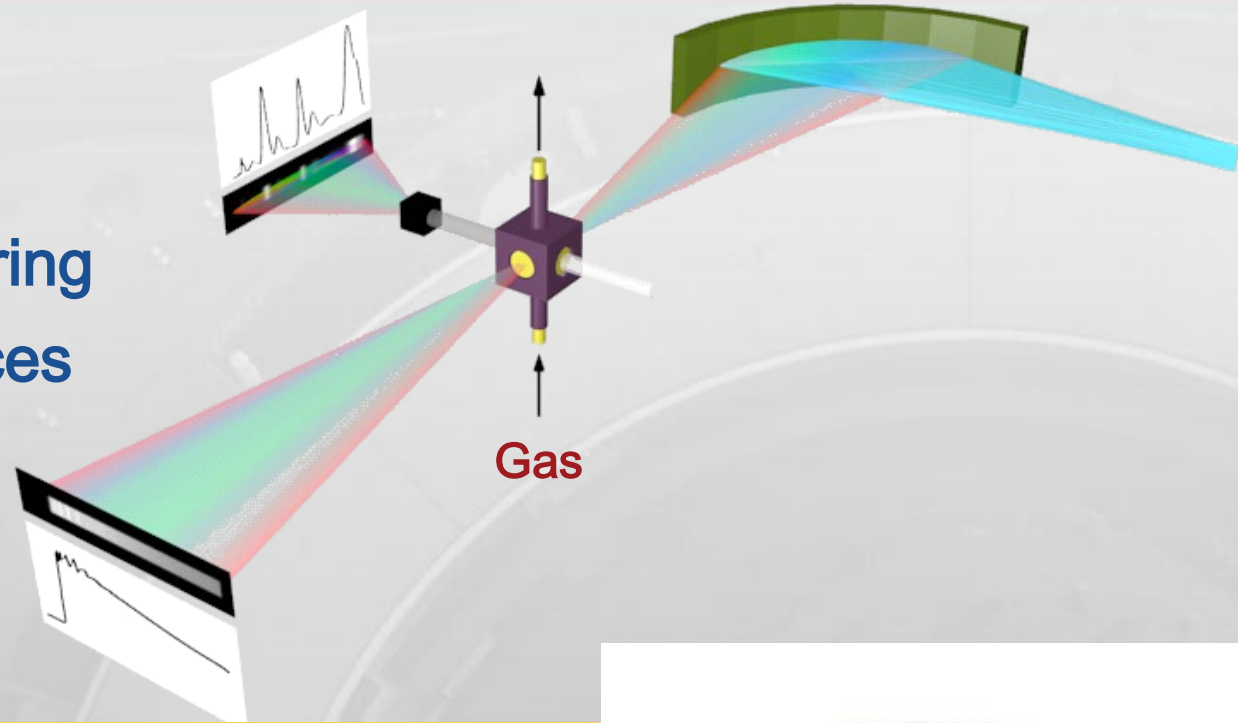
drugs



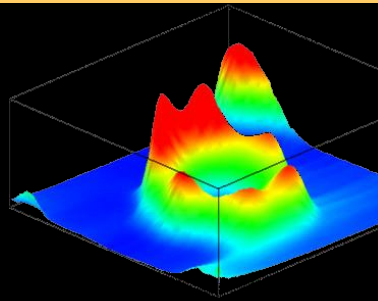
Air pollution

Materials manufacturing

Nanoelectronic devices



Nano-LED




SAINT-GOBAIN
GLASS

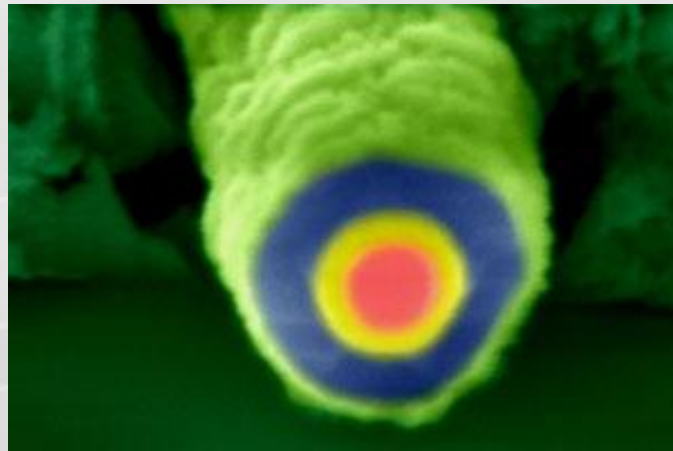


nanometer

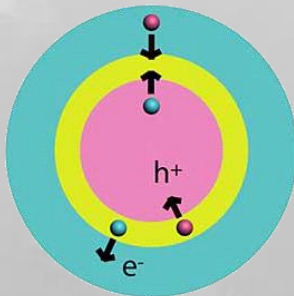
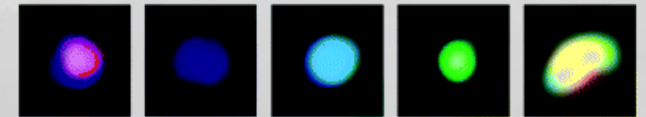
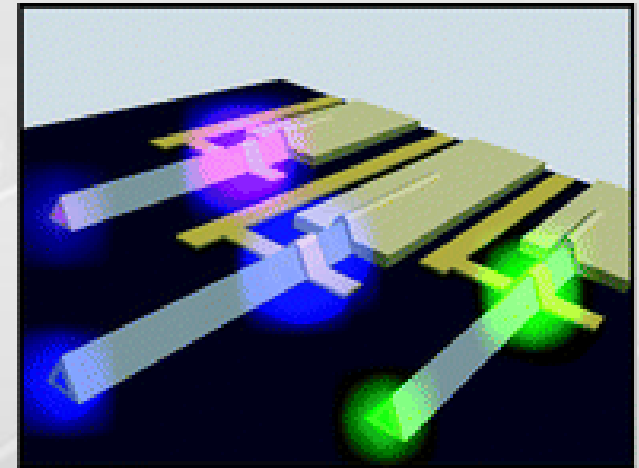
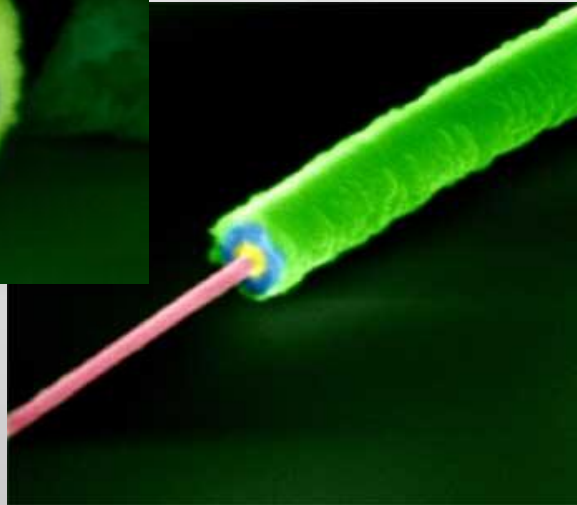
micrometer

millimeter

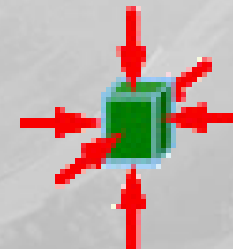
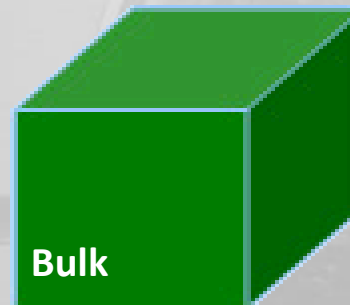
centimeter



200 times thinner
than a human hair



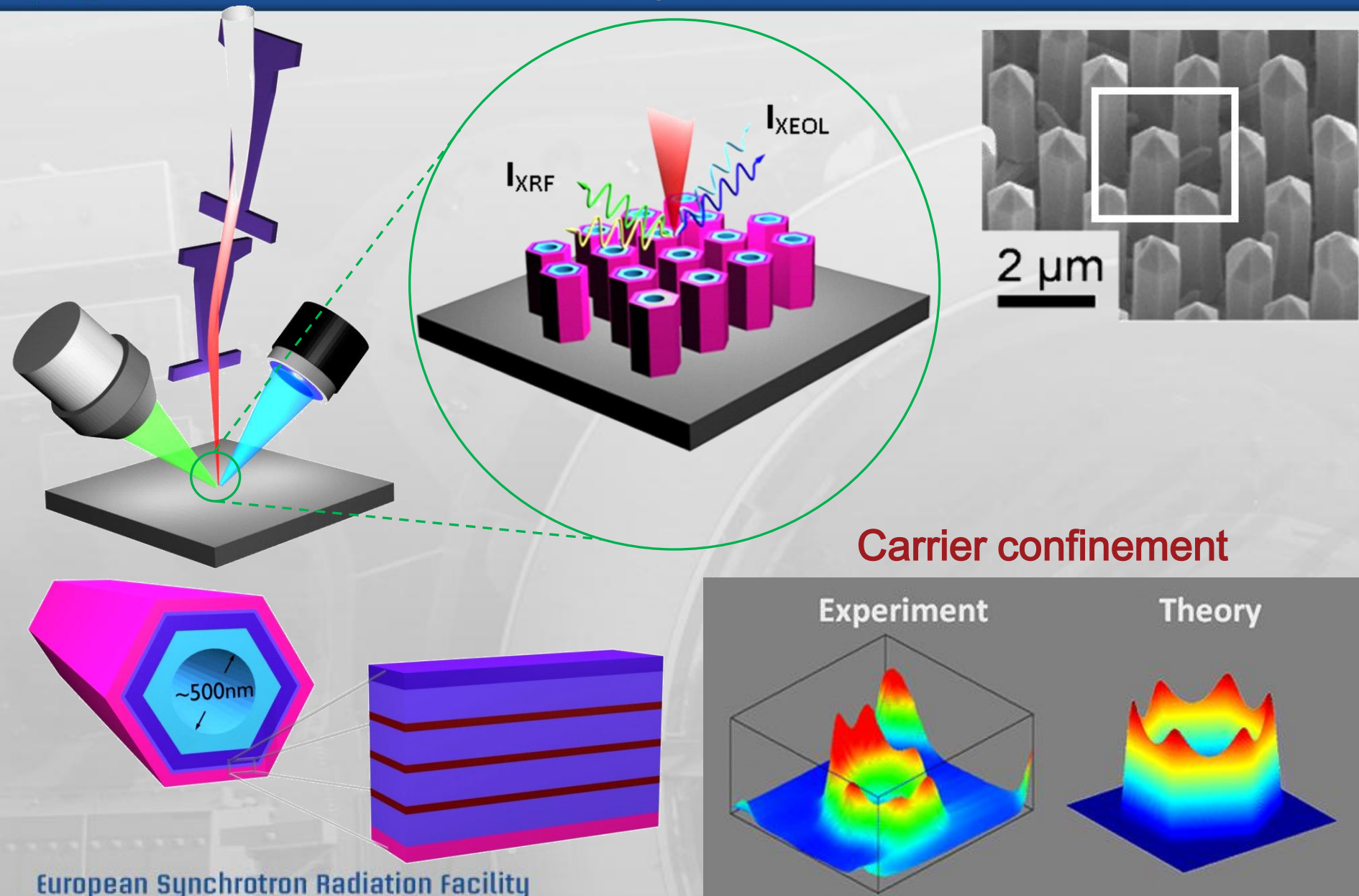
Uncertainty principle

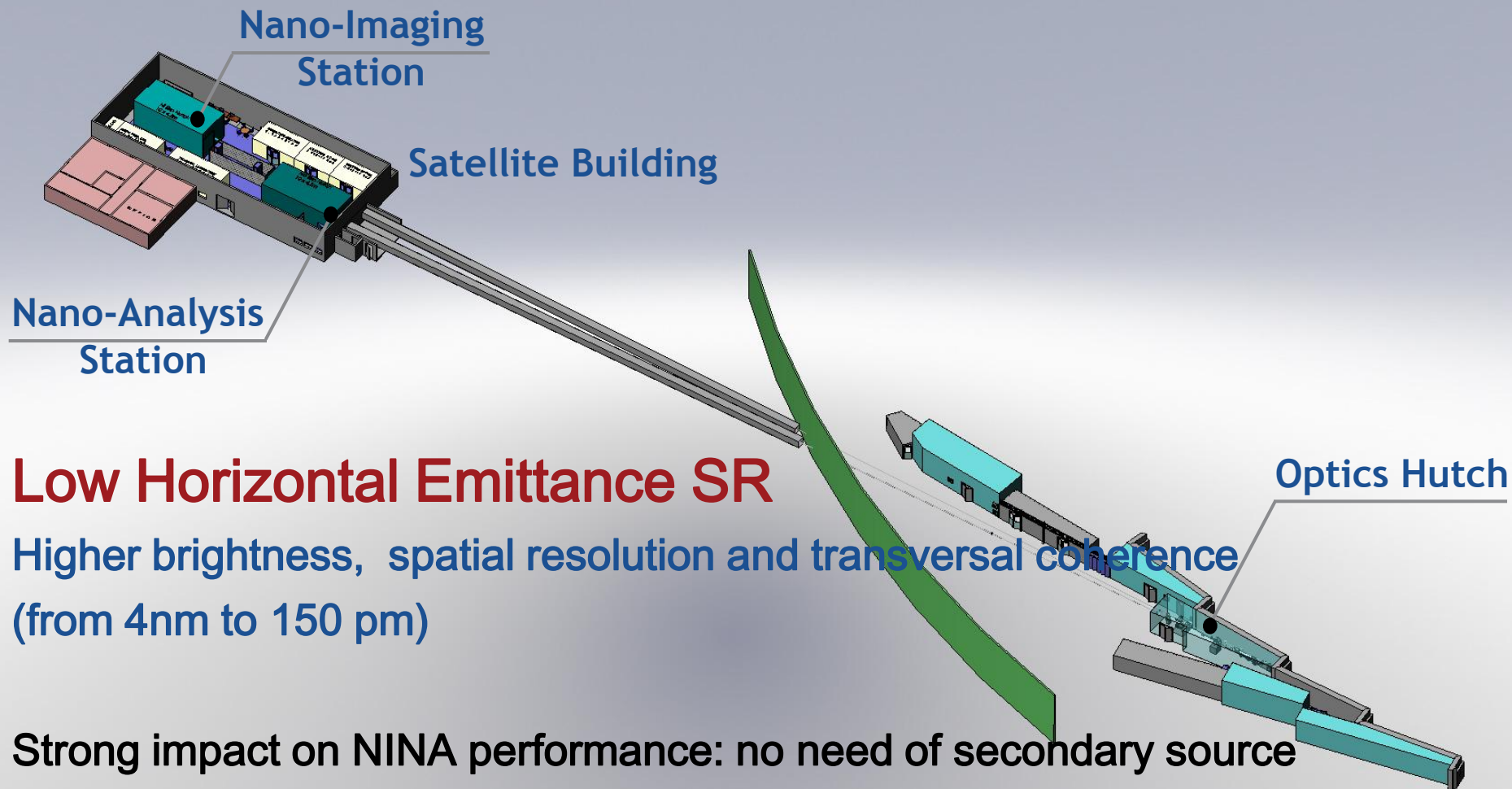


1 – 50 nm

$$\Delta x \Delta p \geq \frac{\hbar}{2}$$

Confinement effect: light emission enhances & shifts in wavelength!





Low Horizontal Emittance SR

Higher brightness, spatial resolution and transversal coherence
(from 4nm to 150 pm)

Strong impact on NINA performance: no need of secondary source

Nanometer-sized beam with much higher photon flux (x 50)



