

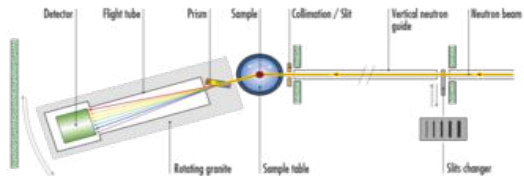
D50-Tomo

Alessandro Tengattini,
Edward Andò,
Duncan Atkins,
Nicolas Lenoir,
Cino Viggiani.

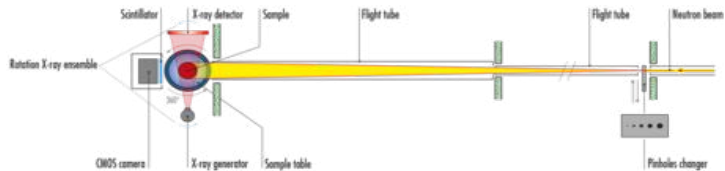
15th Jan 2018

Grenoble

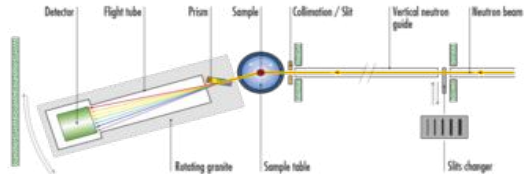
Reflectometry mode



Imaging mode

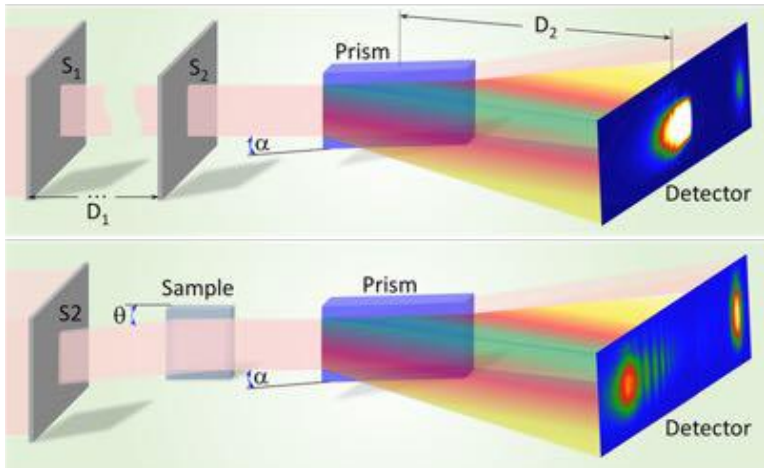


Reflectometry mode

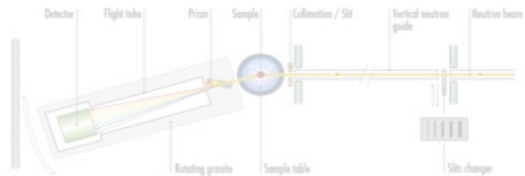


Imaging mode

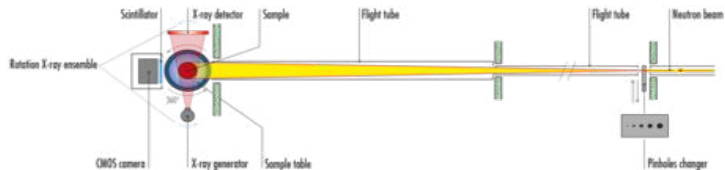




Reflectometry mode



Imaging mode



Absorption: The Beer-Lambert Law

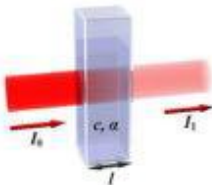
August Beer (1825-1863): Added absorption coefficient and related to conc. in solution.

Pierre Bouguer

Astronomer: Light is diminished as it passes through the atmosphere.

Johan Lambert

Mathematician, first to prove that π is irrational.
No absorption coefficient



$$A = -\log(I_1 / I_0) = \epsilon c l$$

ϵ : Extinction coefficient

c : Concentration

l : Path length



Laboratoire 3SR & HZB-Berlin

Light water imbibition into Gres des Vosges Sandstone

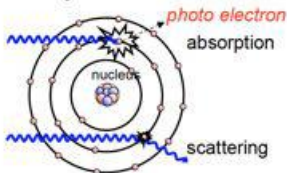
Neutron Radiography



X-ray Radiography



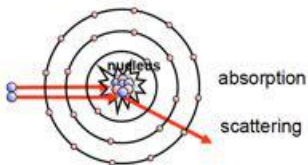
X-rays



Attenuation coefficients with X-ray [cm²]]

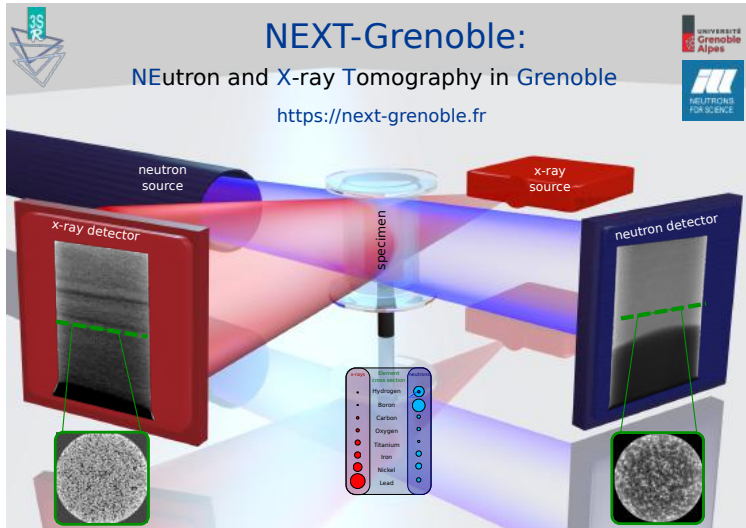
Z	1a	2a	3a	4a	5a	6a	7a	8	9	10	20	30	40	50	60	70	8			
H	0.02																He	0.02		
Li	0.36	0.72												B	C	N	O	F	Ne	0.17
Na	0.53	0.24												Al	Si	P	S	Cl	Ar	0.25
K	0.14	0.26	0.48	0.73	1.04	1.38	1.72	1.57	1.78	1.96	1.91	1.84	1.42	1.32	1.50	1.23	1.30	1.20	0.73	0.71
Rb	0.07	0.08	0.13	0.20	0.30	0.43	0.58	0.71	0.88	0.13	0.57	0.44	0.21	0.38	0.28	0.36	0.31	0.25	0.20	0.15
U	1.42	2.73	5.54	15.70	25.47	33.48	34.47	32.82	30.24	30.63	30.94	29.86	23.73	22.83	20.78	20.72				0.77
Pt	11.03	24.47																		
Co	0.79	6.23	6.46	7.33	7.68	5.66	6.69	6.48	13.17	10.91	11.70	12.49	9.32	14.07						
Ta	15.95	36.05	49.04																	

neutrons

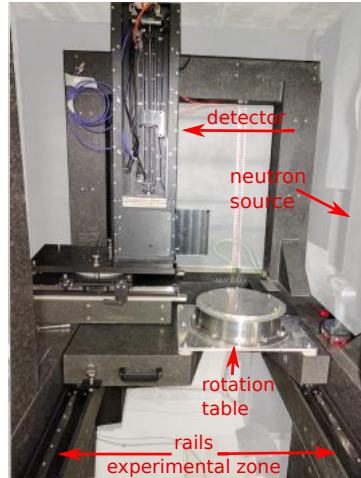
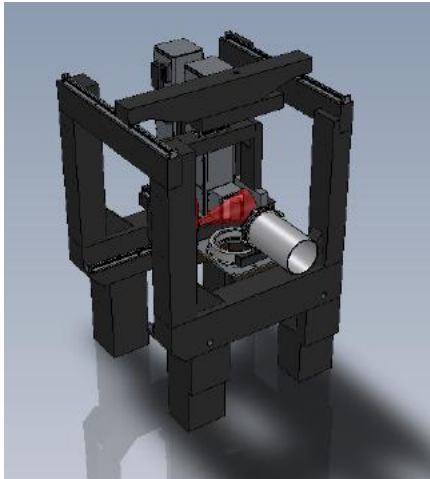


Attenuation coefficients with neutrons [cm²]]

Z	1a	2a	3a	4a	5a	6a	7a	8	9	10	20	30	40	50	60	70	8			
H	3.44																He	0.02		
Li	1.30	0.70												B	C	N	O	F	Ne	0.15
Na	0.09	0.15												Al	Si	P	S	Cl	Ar	0.05
K	0.06	0.08	0.00	0.00	0.72	0.54	1.21	1.16	1.00	2.06	1.17	0.36	0.89	0.47	0.67	0.73	0.28	0.28	0.28	0.28
Rb	0.08	0.14	0.17	0.22	0.48	0.37	0.38	0.32	0.60	1.21	0.84	115.11	7.52	0.21	0.30	0.20	0.20	0.20	0.20	0.43
U	0.28	0.07	0.52	1.99	1.45	1.47	4.06	2.24	0.40	3.08	1.23	16.21	0.47	0.38	0.27					
Pt	0.24																			
Co	0.14	0.43	1.02	5.72	17.47	94.58	1679.04	0.93	32.42	2.26	5.48	3.53	3.62	2.71						
Ta	0.09	0.46	0.92	9.80	50.20	2.86														



Working environment



Medium-resolution detector

Our first detector:



Its technical specification

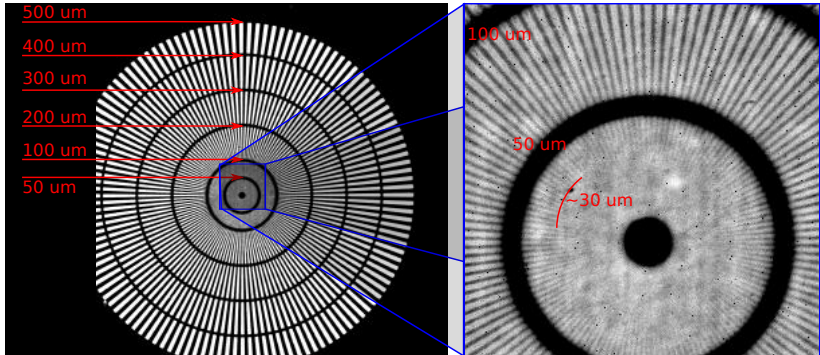
- Maximum field of view: **170x170 mm** (in different working environment it is possible to go up to 200x200 mm)
- Resolution: from 160 microns at 160x160 down to **30 microns**
- Maximum speed of the camera: 100 Hz.

Resolution – Gadox

10 μm Gadolinium scintillator

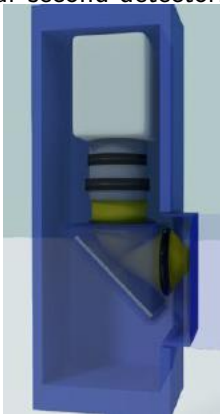
camera counts in the hundreds over few seconds

Line width



High-resolution detector

Our second detector:



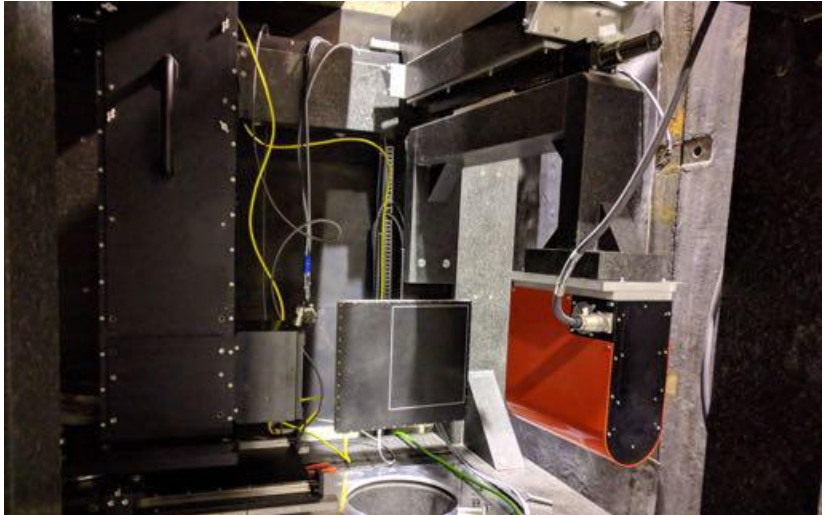
Its technical specification (so far, on paper)

- Heliflex solution to maximize light captured, at the price of a reduced flexibility
- Maximum field of view: 35x35 mm
- Resolution: below **10** μm optically (to be tested with neutrons, 20 μm already tested)

X-ray system

- **Source:** L12161-07 Microfocus X-ray source
- **Detector:** Varex paxscan 25030 HE flat panel
- **Resolution:** down to 7 μm
- **FOV:** 250*300 mm

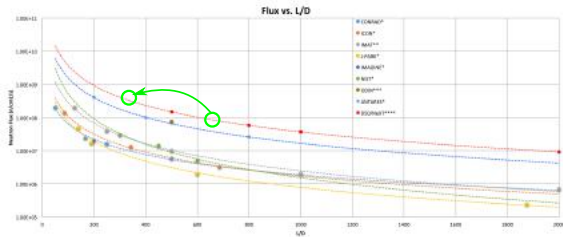
X-ray system



Flux

An increase in shielding to pass from a max 15 mm pinhole to a 30 mm one.

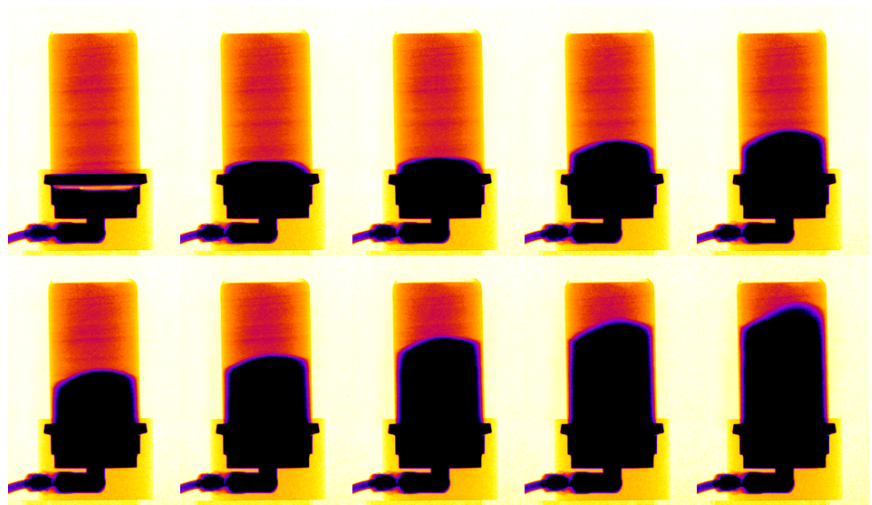
This *should* bring us from a max flux of $7.4 \times 10^7 \text{ n} \cdot \text{cm}^{-2} \cdot \text{s}^{-1}$, for an $L/D = 660$ of to a flux ~ 4 times higher ($2.9 \times 10^8 \text{ n} \cdot \text{cm}^{-2} \cdot \text{s}^{-1}$) for an L/D of 330



D50

What is neutron imaging?

Selected examples of the capabilities of the instrument

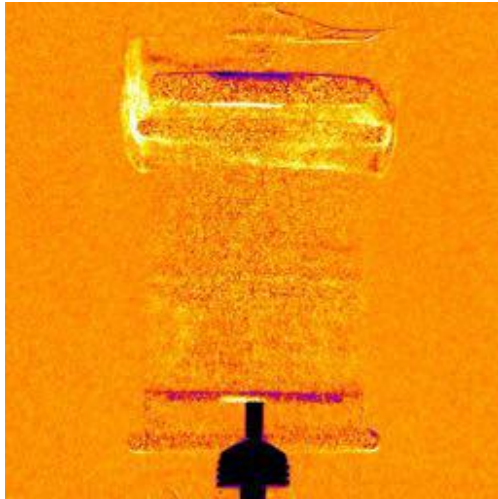


D50

What is neutron imaging?

Selected examples of the capabilities of the instrument

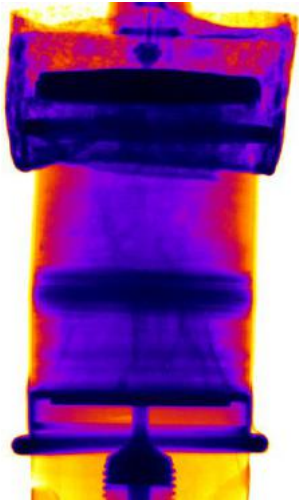




D50

What is neutron imaging?

Selected examples of the capabilities of the instrument

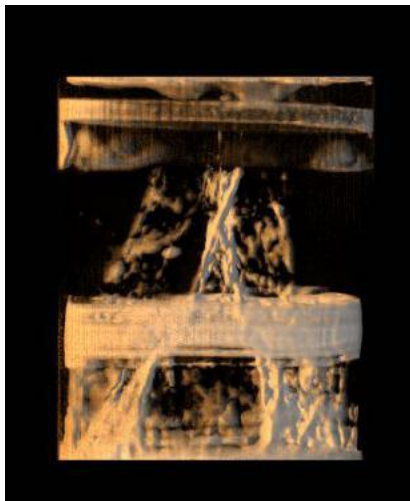


D50

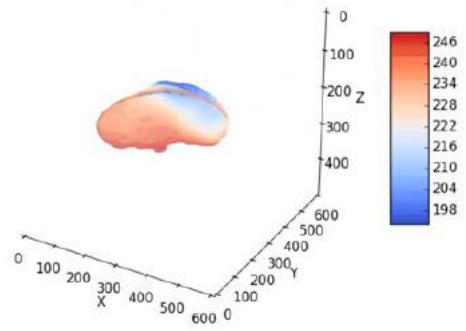
What is neutron imaging?

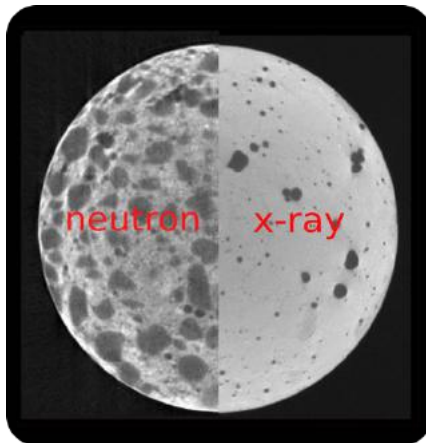
Selected examples of the capabilities of the instrument

Water flow in geomaterials: hydrogen and isotope sensitivity
Concrete: A notable example
And much more!
Website
Future outlook – IM2020(?)



Evolution of the water front in the V2_Erika sample

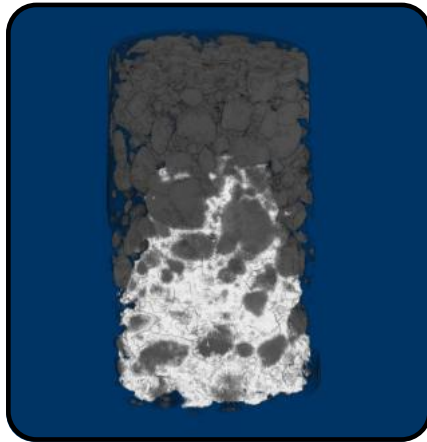




D50

What is neutron imaging?

Selected examples of the capabilities of the instrument

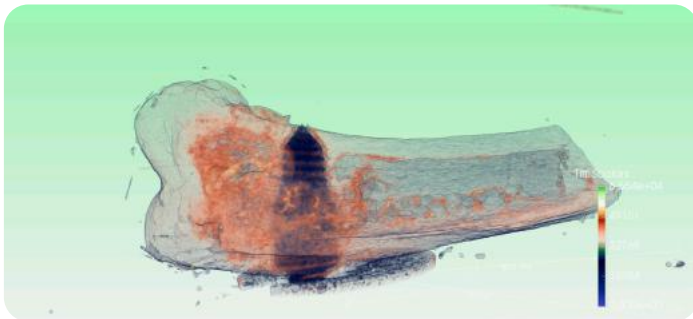


D50

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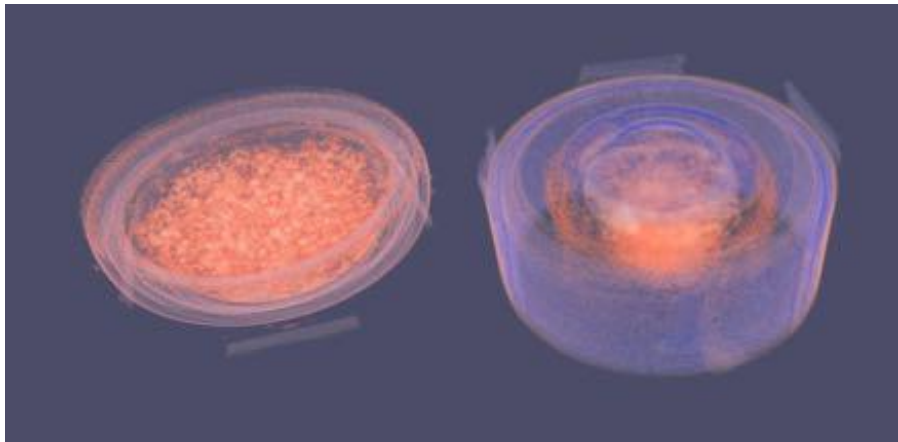


D50

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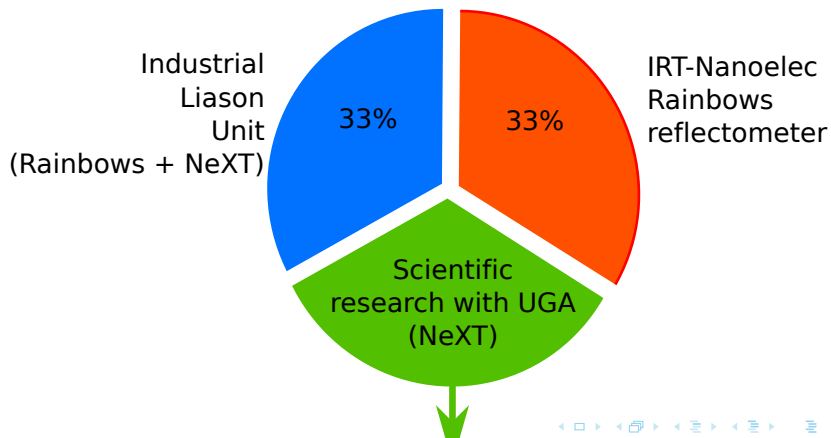


D50
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Water flow in geomaterials: hydrogen and isotope sensitivity
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And much more!
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D50-Tomo a ILL/UGA CRG beamline D50(container of NeXT): time allocation (over 160 days/year)



Our website is <https://next-grenoble.fr/>
Neutron and **X**-Ray **T**omography in Grenoble.

The screenshot shows the homepage of the NEX website. At the top, there is a navigation bar with 'Home' and 'About' links. The main content area is divided into several sections:

- What is NEXT-Grenoble?**: A sidebar section with links for 'Neutron and X-Ray imaging', 'Our instrument: D50', and 'Some of our results'.
- Welcome to NEX-Grenoble: NEutron and X-ray Tomography in Grenoble**: A green banner at the top of the main content area.
- First Meeting of the Steering and Scientific Committees**: A main article with a sub-headline and a paragraph stating: 'The first meeting of the Steering and Scientific Committees will take place on the 28th of October at ILL (see map below)'. Below the text is a map showing the location of Institut Laue-Langevin (ILL) in Grenoble, with a red pin and a pop-up window displaying the address: '71 Avenue des Martyrs, 38000 Grenoble' and a 4.7 star rating.
- Log In**: A sidebar section with input fields for 'Username' and 'Password', and a 'Log In' button.
- Any question? Contact us!**: A sidebar section with the text 'We are open to external proposals.' and buttons for 'Contact us' and 'Proposal guidelines'.
- Project advancement**: A sidebar section with a progress bar showing '100% Experimental area' (green), '90% Mid-res N. detector' (blue), '60% High-res N.' (orange), and '45% Y. coll.' (red).

How about the **future**?

Our proposition for Endurance-II: IM2020

