Production of radioisotopes at the high flux reactor of Institut Laue-Langevin

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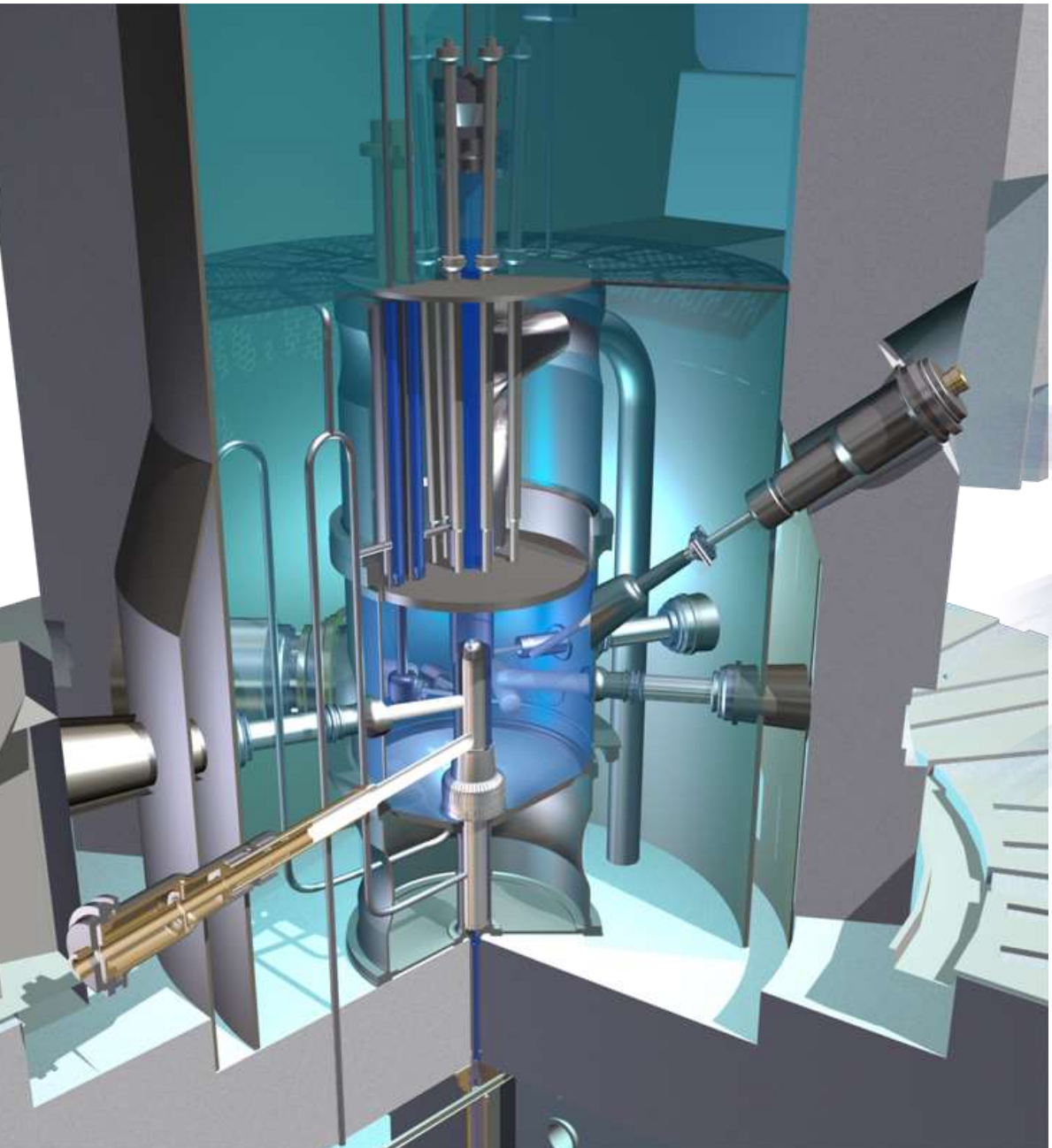
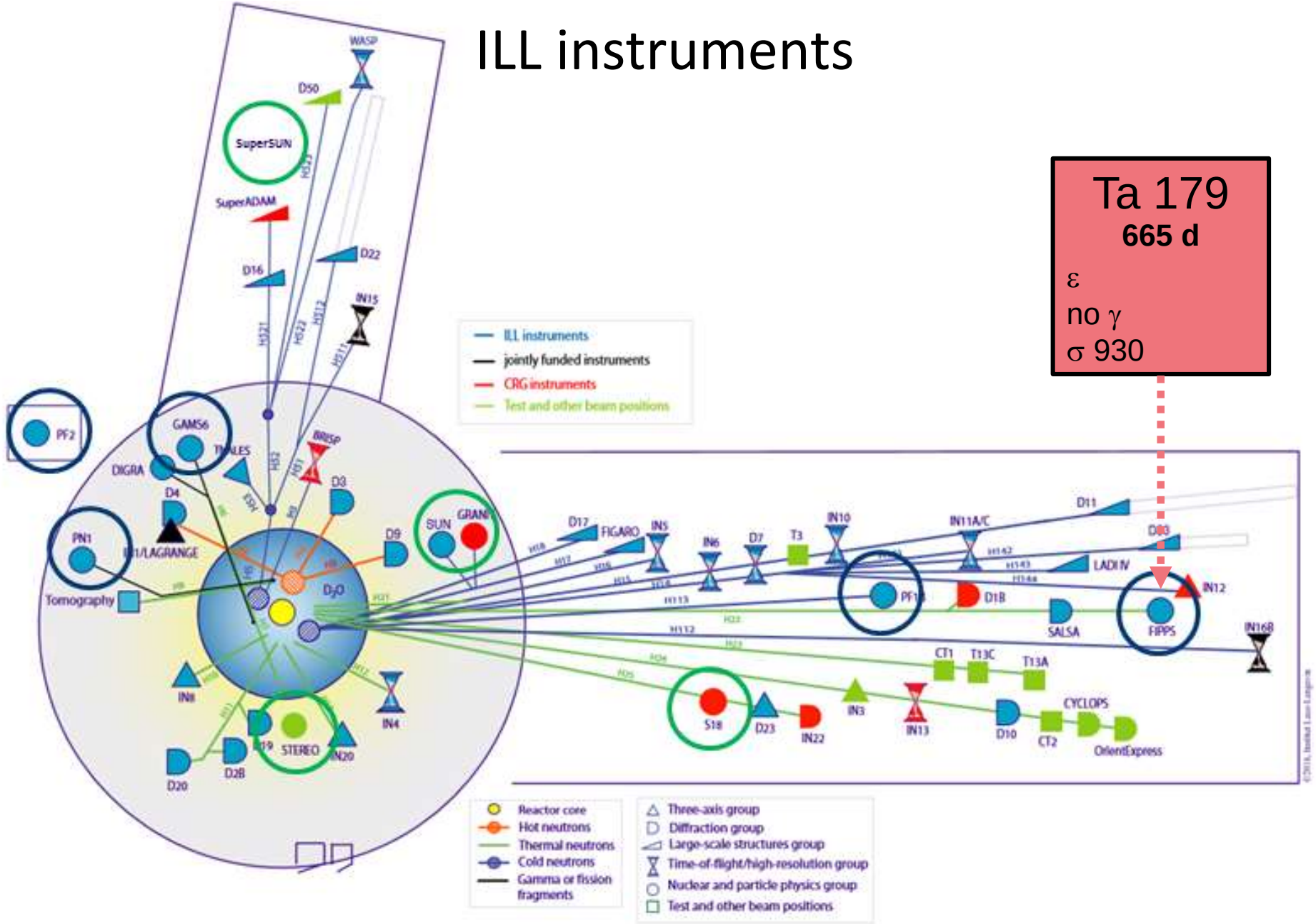
NEUTRONS FOR SOCIETY

The ILL Reactor



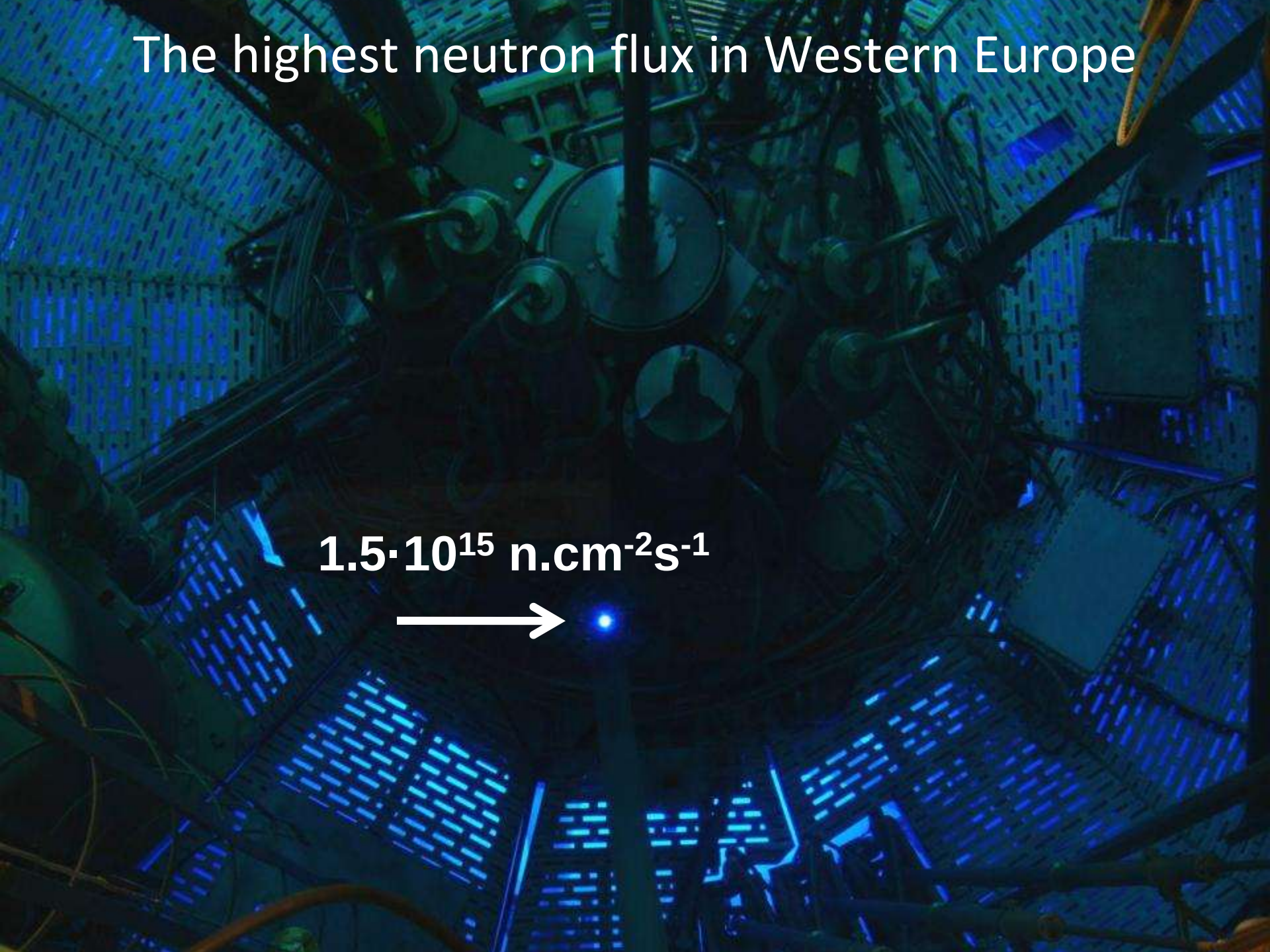
$5 \cdot 10^{18}$ neutrons/s generated at 57 MW

ILL instruments



Over 40 instruments running simultaneously for 150-200 days per year
Neutron beams with up to $2 \cdot 10^{10}$ n.cm^{-2}s^{-1} flux and up to 320 cm^2 area

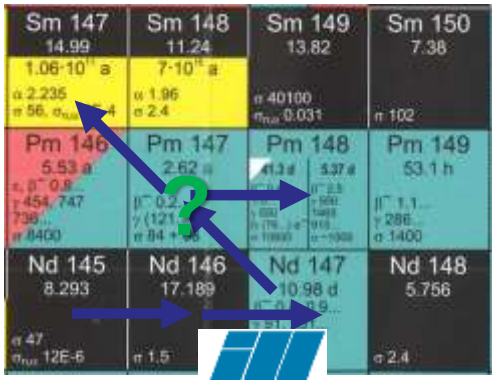
The highest neutron flux in Western Europe

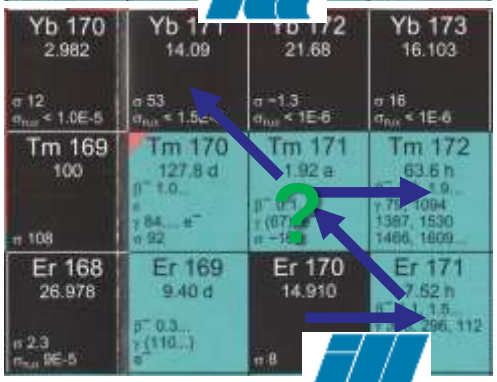


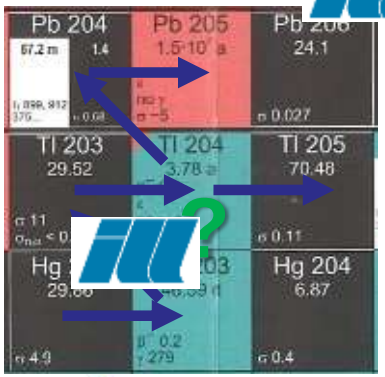
Production of radioisotopes at high specific activity

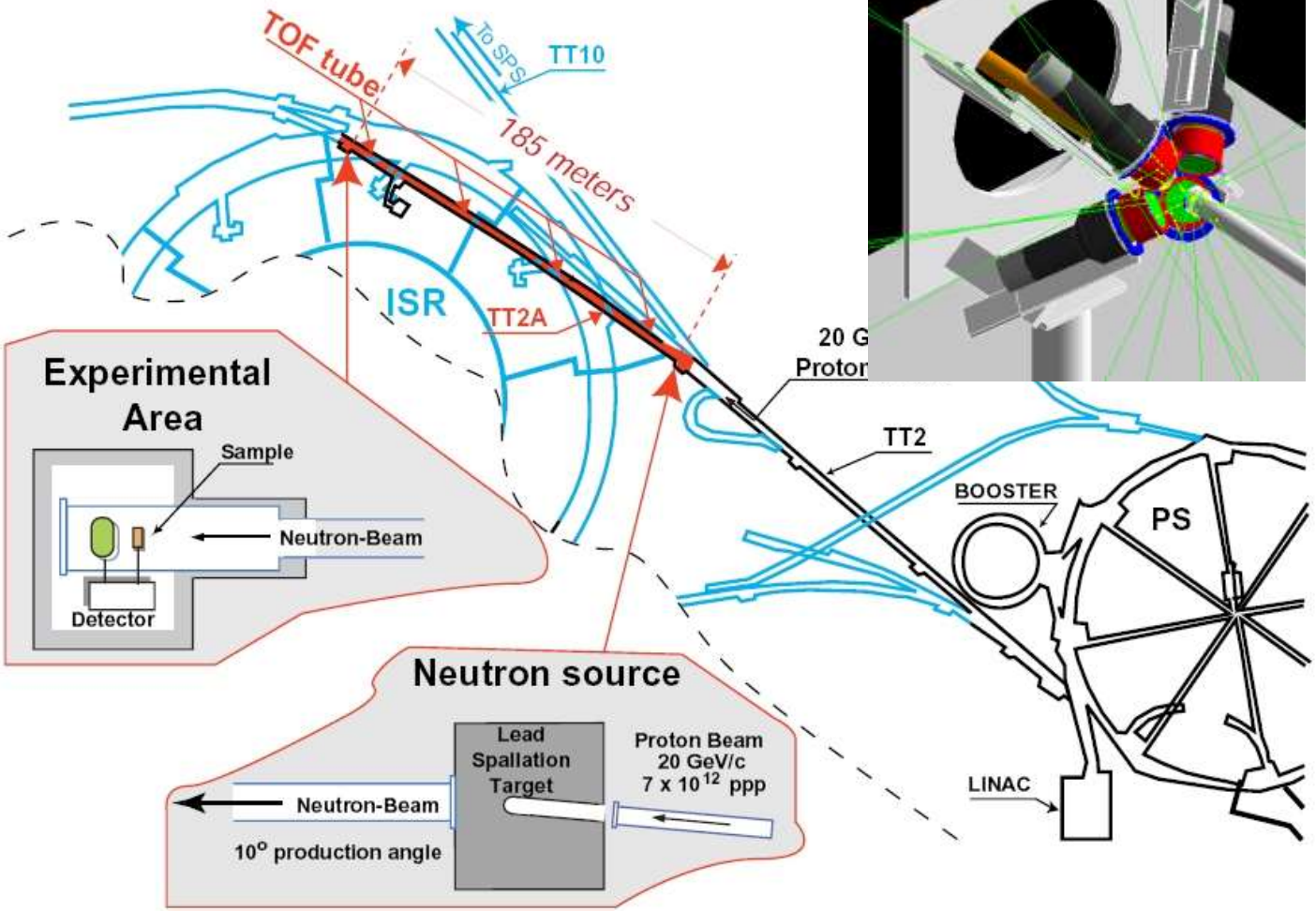
(2n,γ)	Fe 60 **$2.6 \cdot 10^6$ a** β^- 0.2…	Dy 166 **81.5 h** β^- 0.4, 0.5... γ 82	Hf 182 **$8.9 \cdot 10^6$ a** β^- 0.2 γ 270, 156…	W 188 **69 d** β^- 0.3… γ (291, 227...)	Os 194 **6.0 a** β^- 0.1… γ 43 e^-
(n,γ) c.a.	Se 79 **$3.3 \cdot 10^5$ a** β^- 0.2 no γ	Er 169 **9.4 d** β^- 0.3… γ (110..) e^-	Hf 181 **42.4 d** β^- 0.4… γ 482, 133…	W 181 **121 d** ε γ (6...)	Tl 204 **3.78 a** β^- 0.8 ε no γ
(n,γ)β^- *or* (n,γ)EC n.c.a.	Ag 111 **7.45 d** β^- 1.0… γ 342, 245...	Pm 147 **2.62 a** β^- 0.2… γ (121…)	Tb 161 **6.9 d** β^- 0.5; 0.6 γ 26; 49; 75… e^-	Ho 163 **4570 a** ε no γ	Lu 177 **6.65 d** β^- 0.5 γ 208; 113…
generator or daughter	Sc 47 **3.35 d** β^- 0.4; 0.6 γ 159	Nb 95 **35 d** β^- 0.2, 0.9 γ 766…	Mo 99 **66 h** β^- 1.2... γ 740, 181…	Pd 103 **17.0 d** ε γ (357...)	Cs 131 **9.7 d** ε no γ

Neutron capture at s-process branching points









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SOREQ Soreq Nuclear Research Center

האוניברסיטה העברית בירושלים THE HEBREW UNIVERSITY OF JERUSALEM

J. Lerendegui et al. EPJ WoC 193 (2018) 04007.

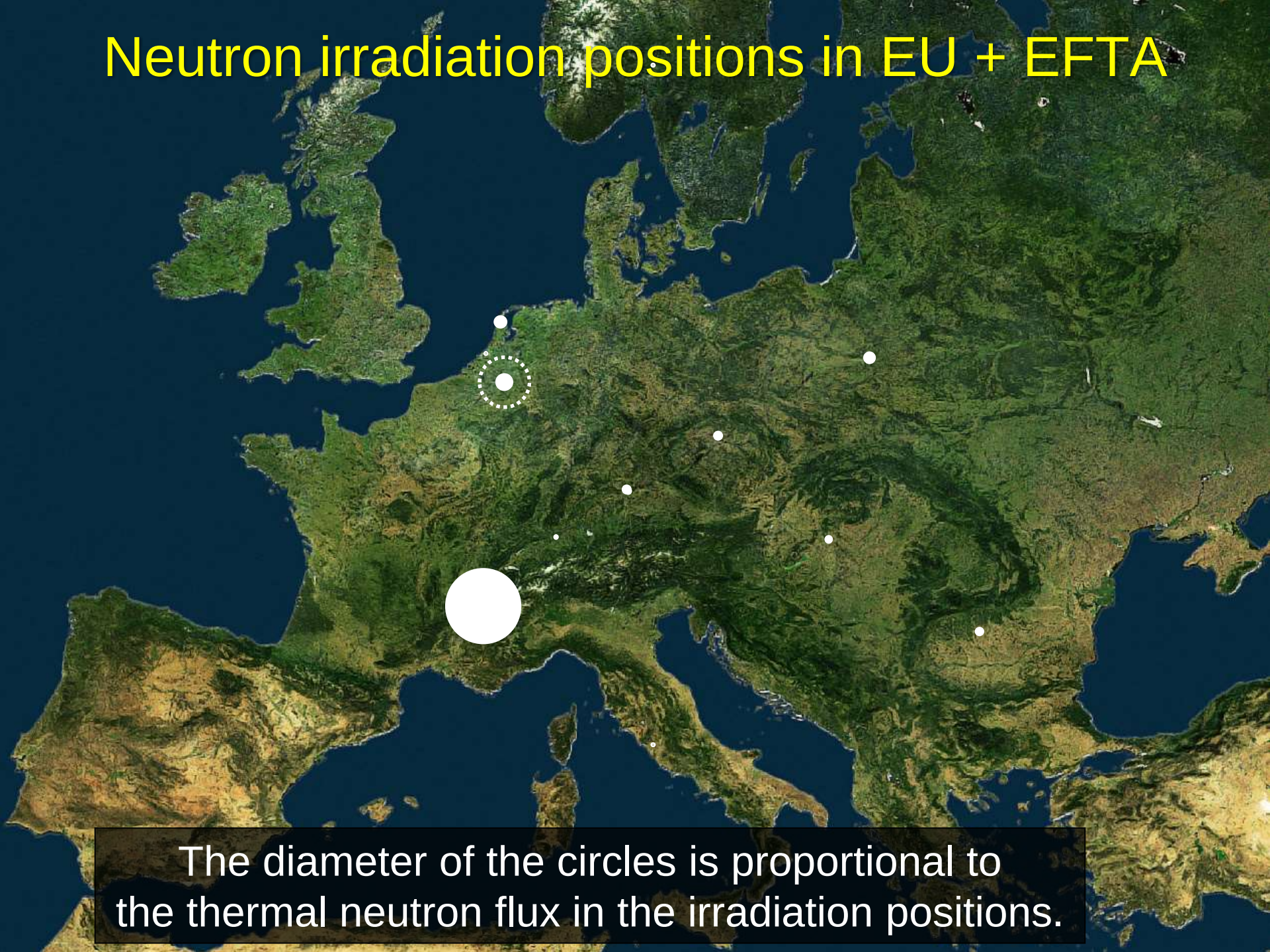
Loading of irradiation capsule with samples.

Fixation of irradiation container in irradiation position.

After irradiation transfer to hot cell.


Decanning.

Neutron irradiation positions in EU + EFTA



The diameter of the circles is proportional to the thermal neutron flux in the irradiation positions.

Mid-term planning

Long irradiation (≈50 days) (fluence ≈(3-5)·10^{21} cm^{-2})	May – Jul 2021
Samples needed for canning	(early) Apr 2021
Short irradiations (≈7 days)	May – Oct 2021
Long reactor shutdown (change of beam tubes, realignment of 14 neutron guides, etc.)	Nov 2021 – Nov 2022
Next long irradiation (probably too late for decay, processing, use within SANDA project period?)	2023