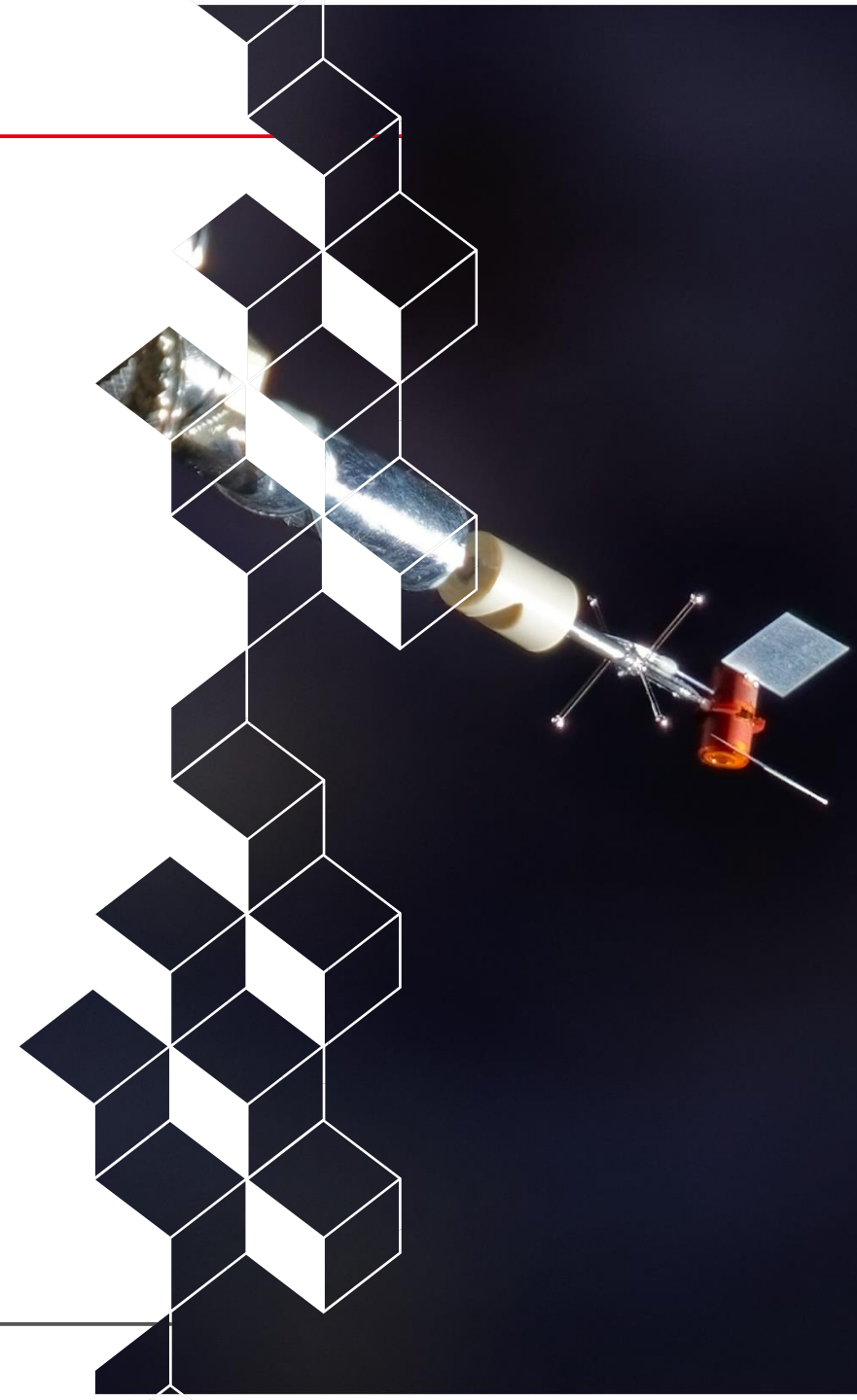


Recent platforms with LMJ

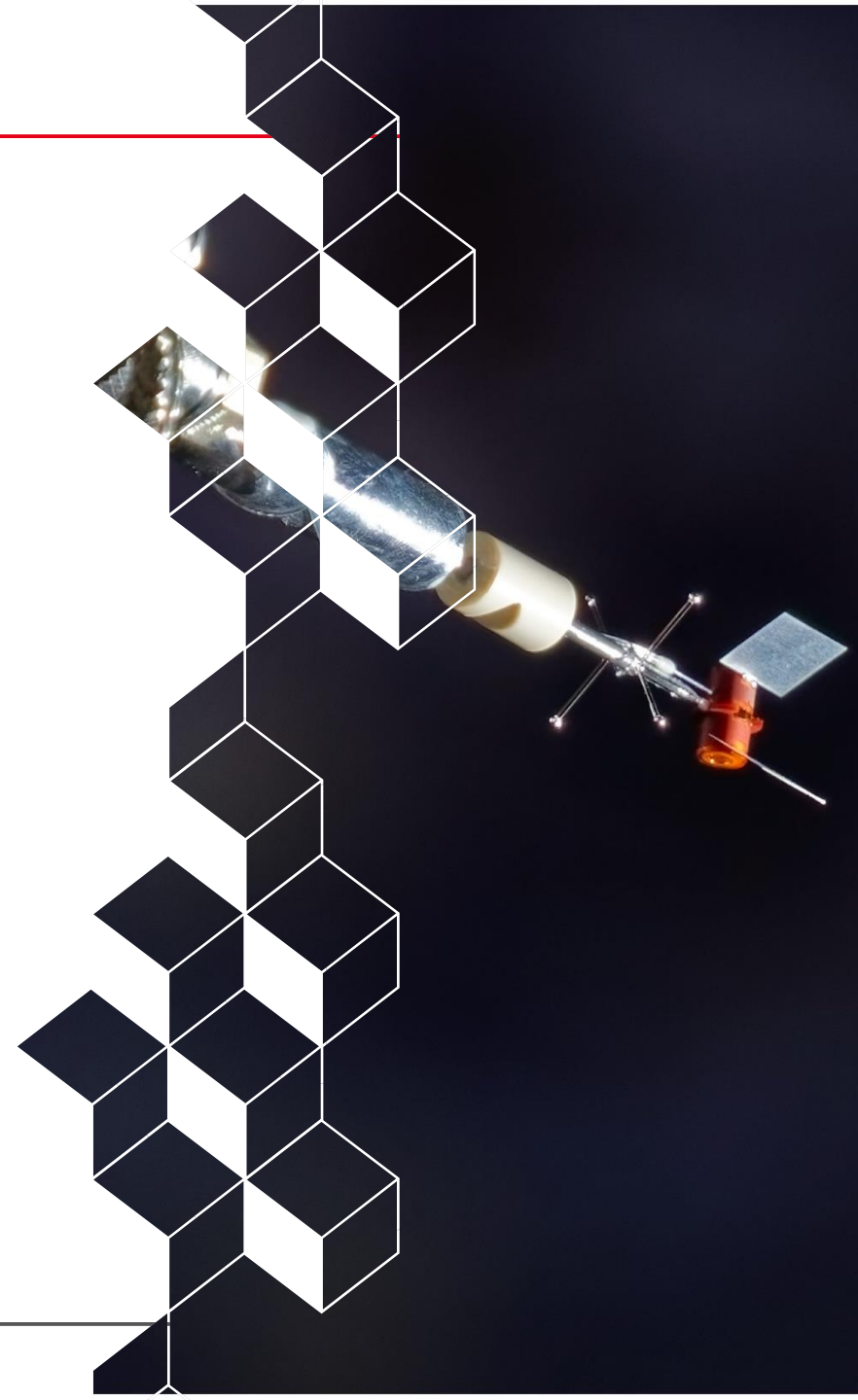
Stéphanie Brygoo

User meeting LMJ 2023 |

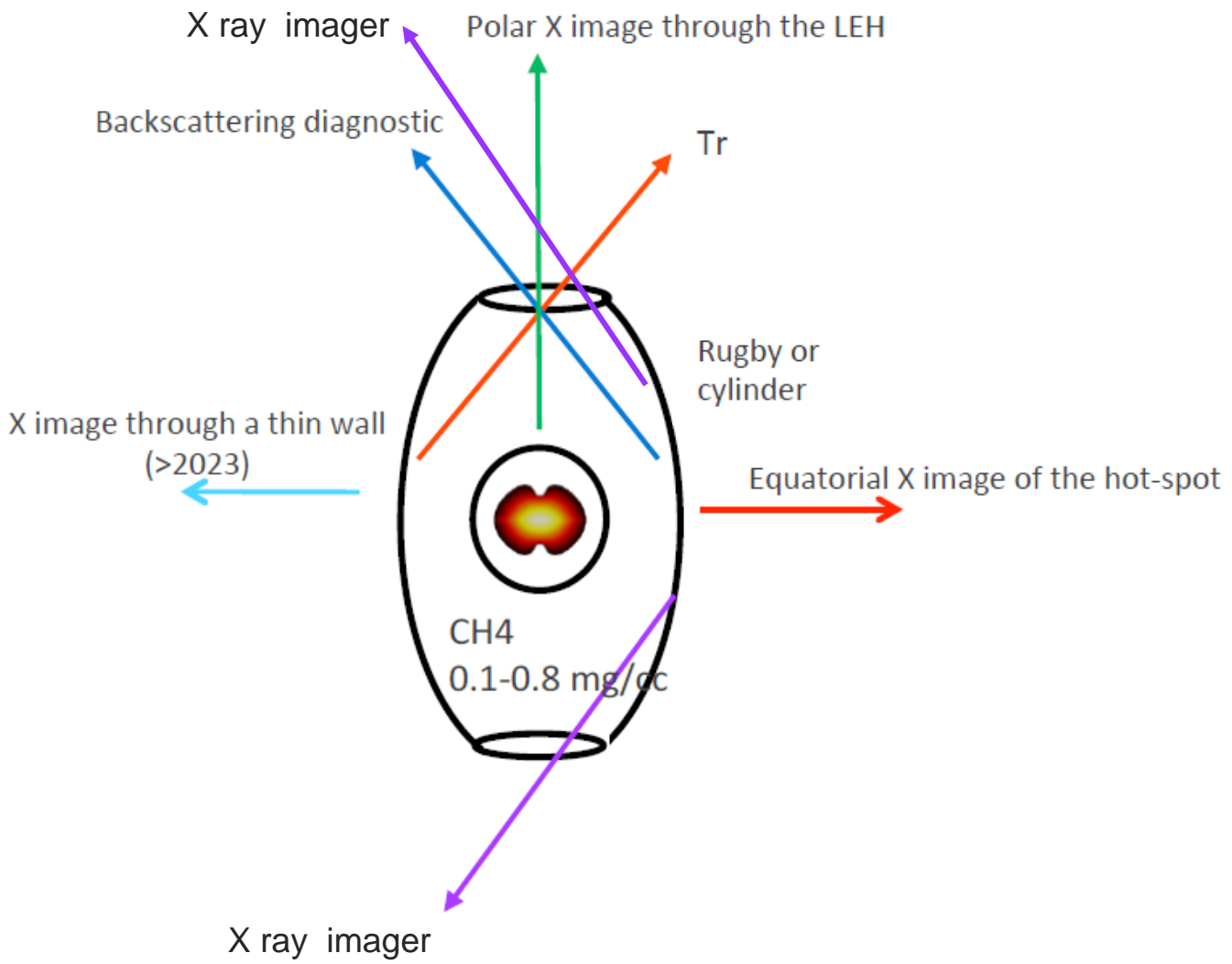
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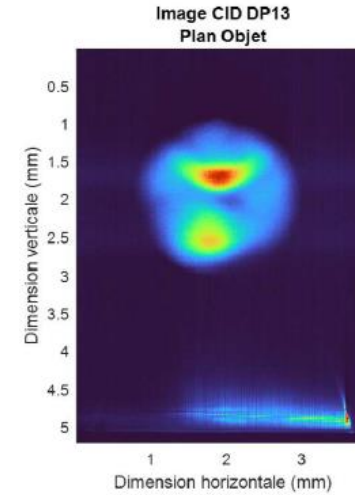
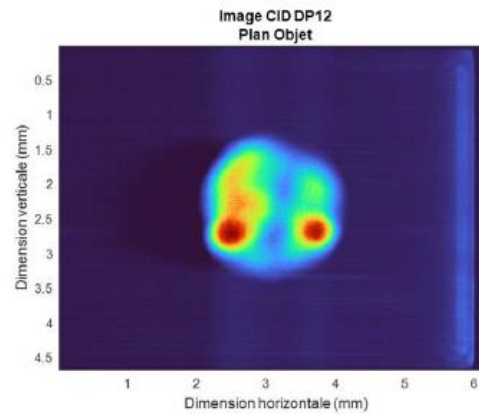
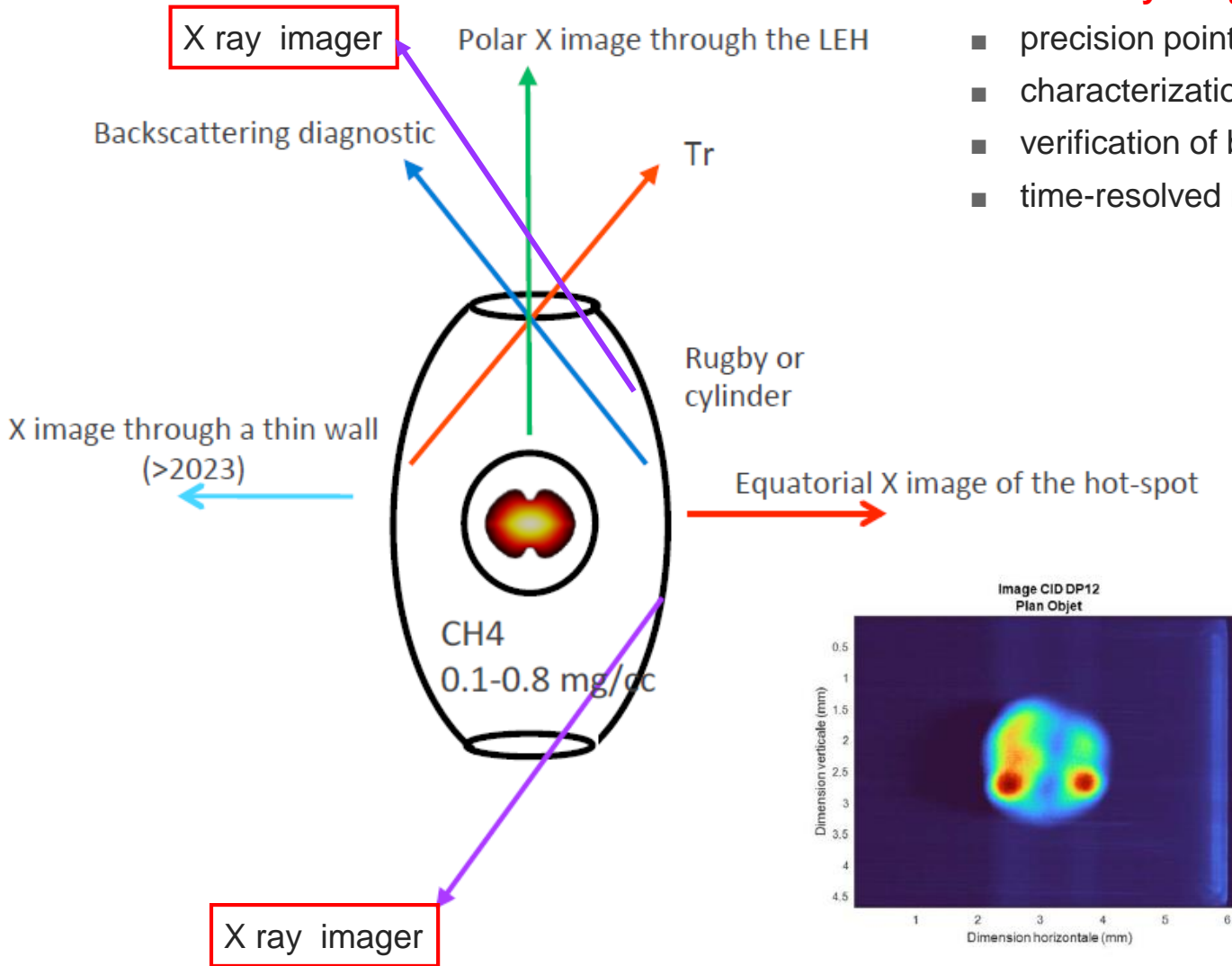


Several diagnostics are being developed for the ICF platform





- **Hard X-ray imagers** dedicated to:
 - precision pointing of laser beams
 - characterization of the laser spots
 - verification of backlighter-target position
 - time-resolved measurements of LEH closure

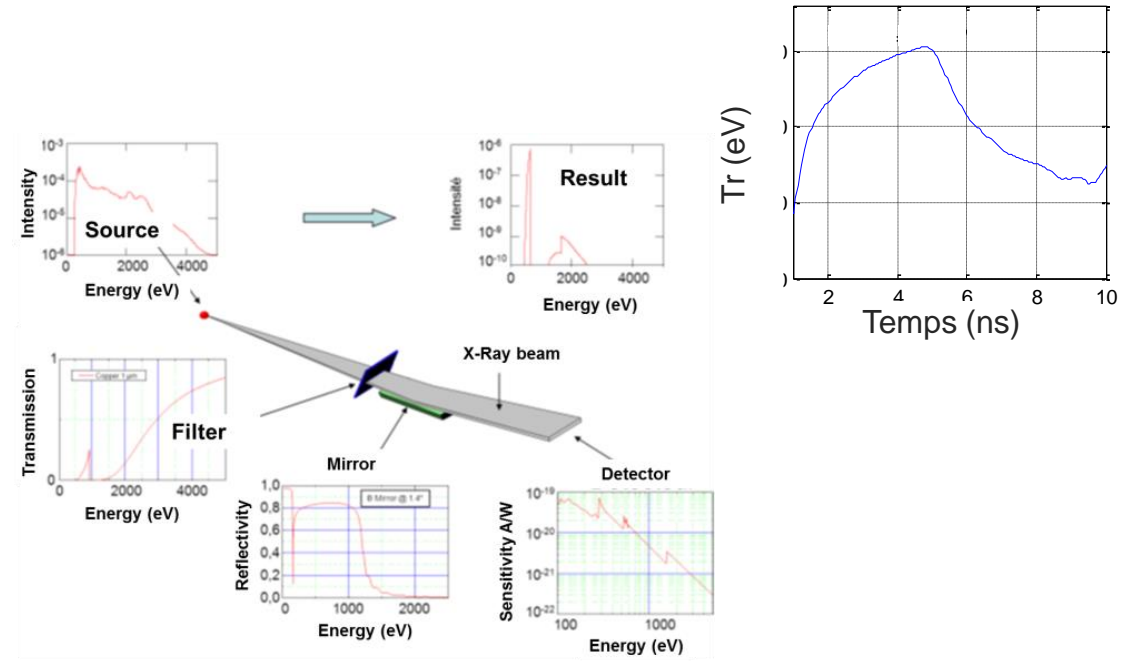
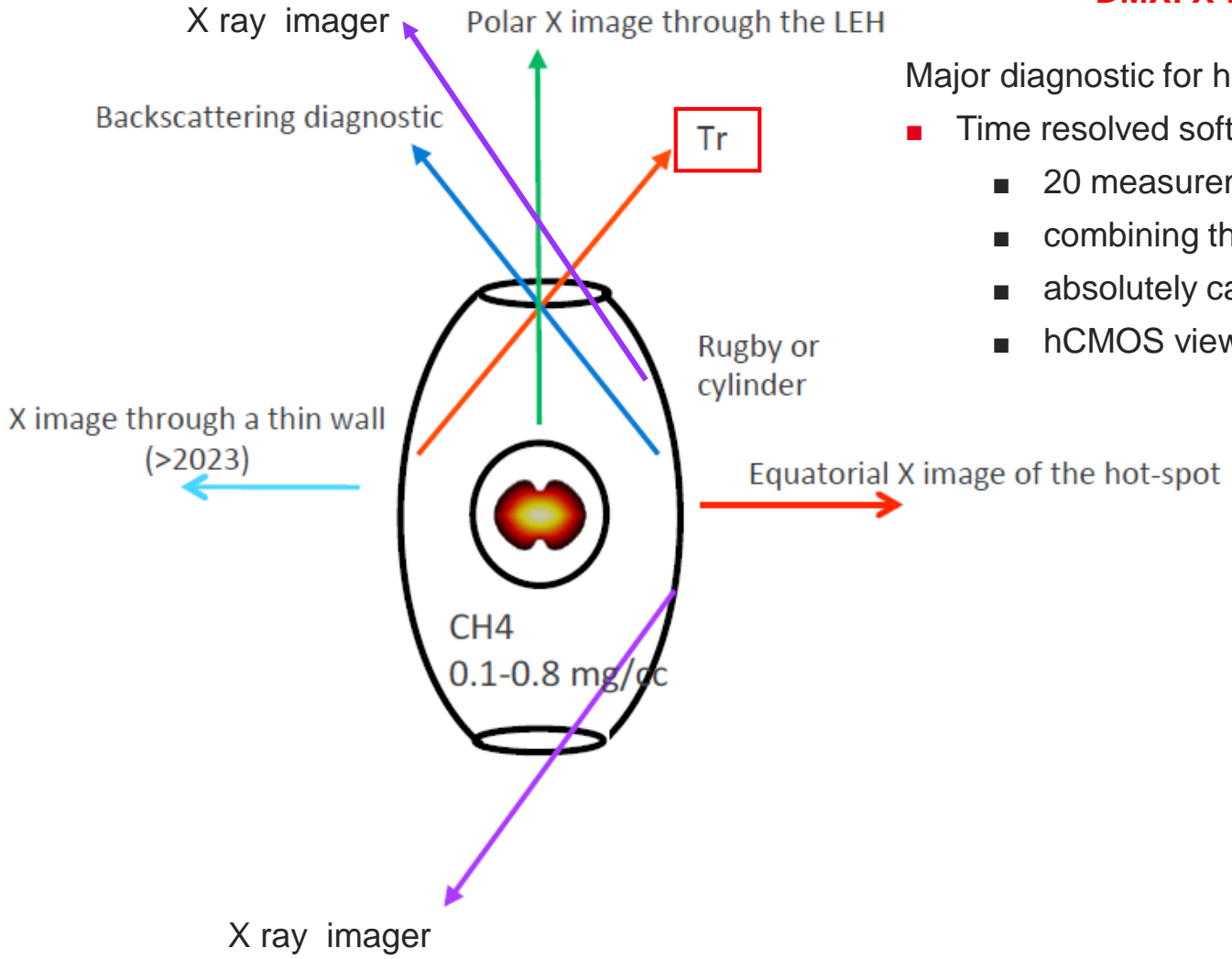


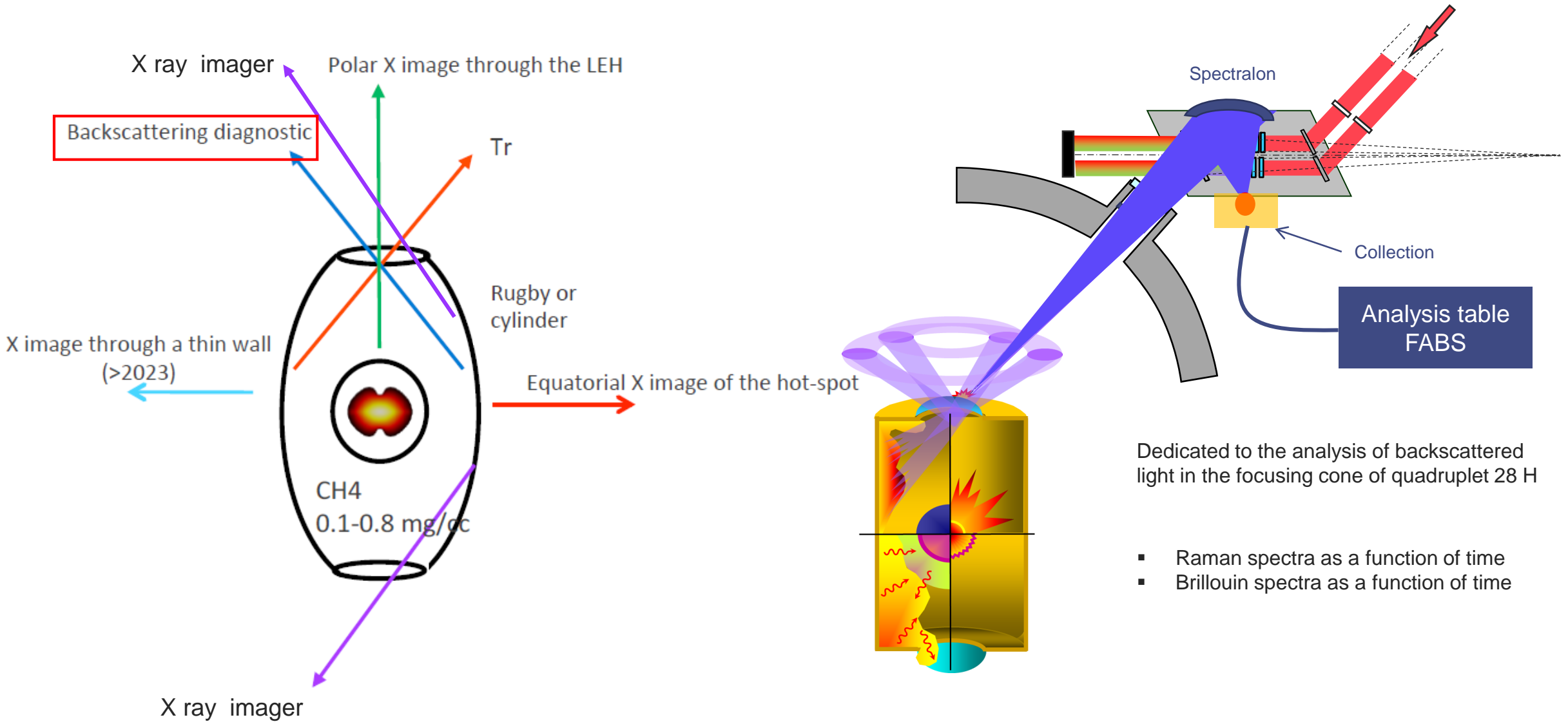


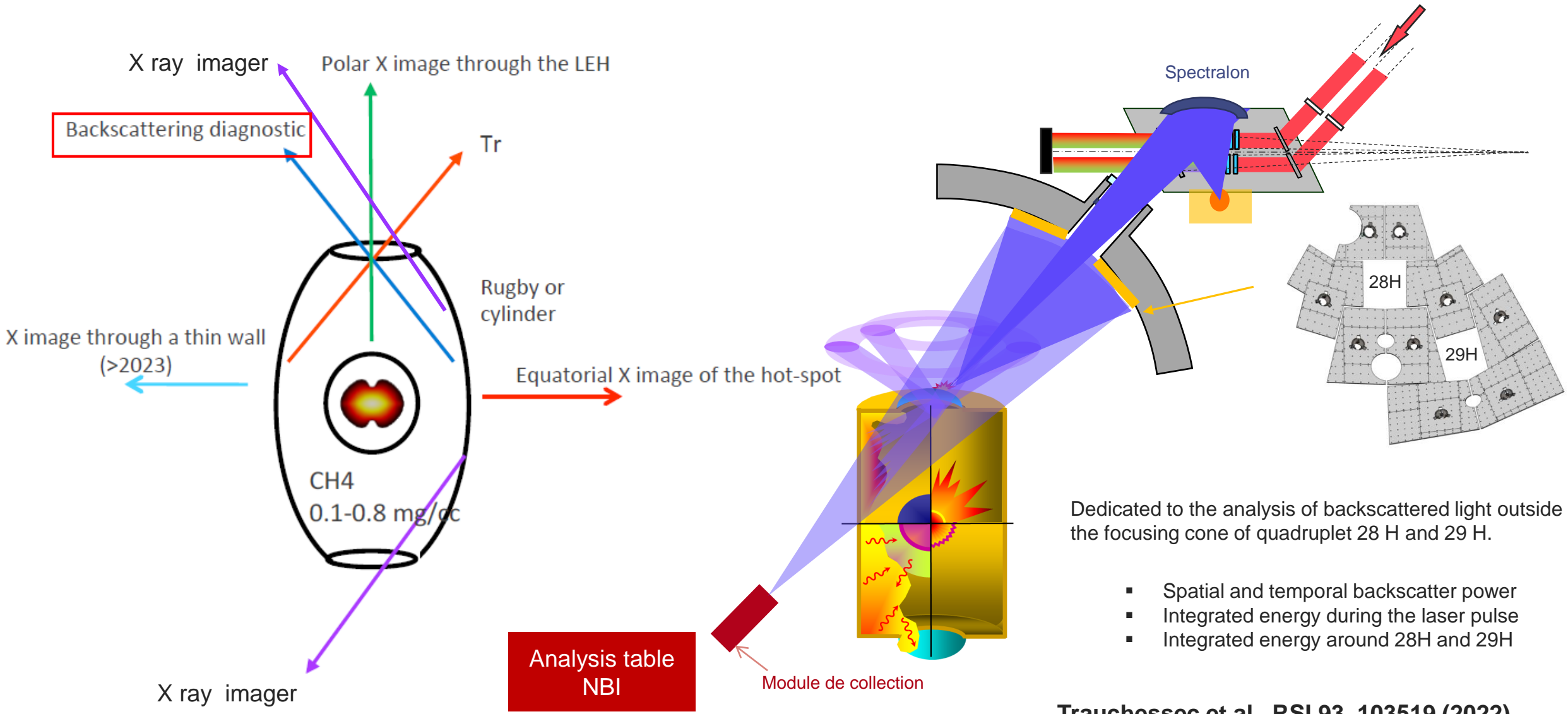
DMX: X-Ray multichannel diagnostic

Major diagnostic for hohlraum energetic performance measurement

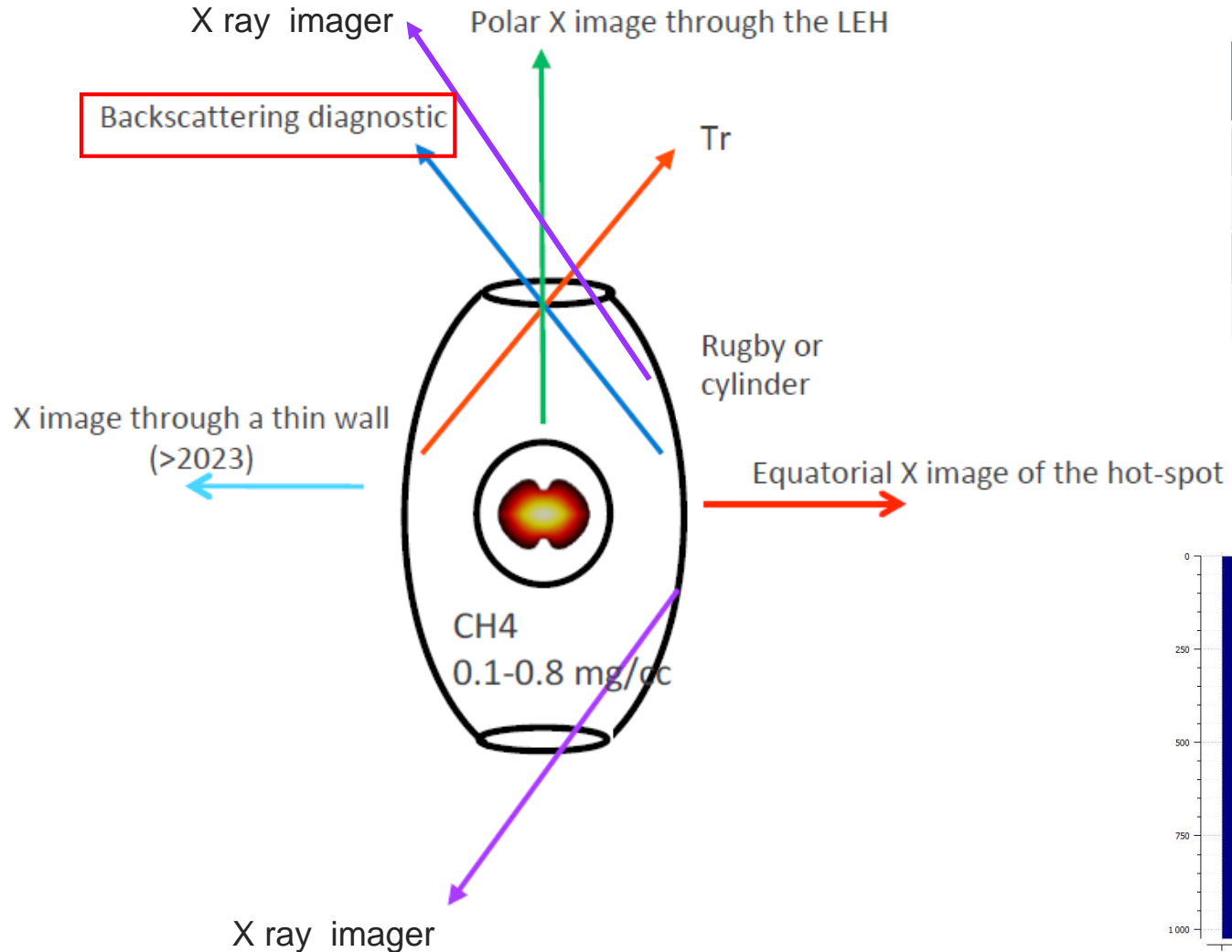
- Time resolved soft x-ray broadband spectrometer (**SX-LB-1t**)
 - 20 measurement channels (50 eV – 20 keV)
 - combining the spectral response of x-ray diodes & grazing incidence mirrors & filters
 - absolutely calibrated (Manson X-ray source & synchrotron)
 - hCMOS view





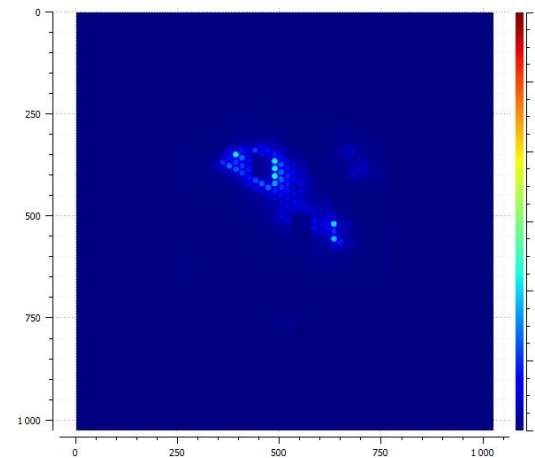


Trauchessec et al., RSI 93, 103519 (2022)

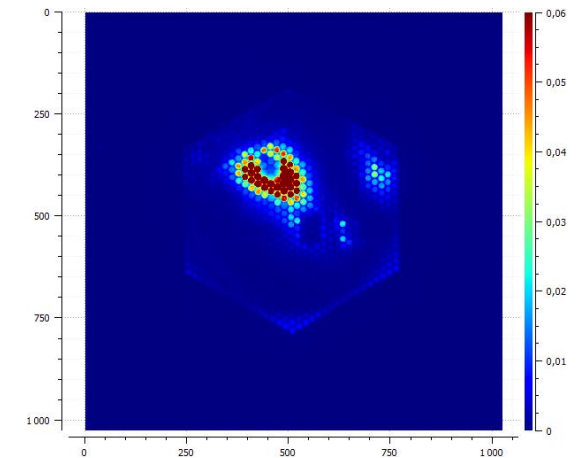


Energie CC Q28H	DP7	DP8 ICCD	DP8 PHT 28H	Ecart ICCD/PHT
12 023 J	11% - 1322 J	1,16 kJ	1,69 kJ	31%
11 825 J	2,8 % - 331 J	0,16 kJ	0,22 kJ	29%
11 700 J	11% - 1287 J	1,05 kJ	1,52 kJ	31%
11 874 J	20% - 2375 J	1,36 kJ	2,05 kJ	33%

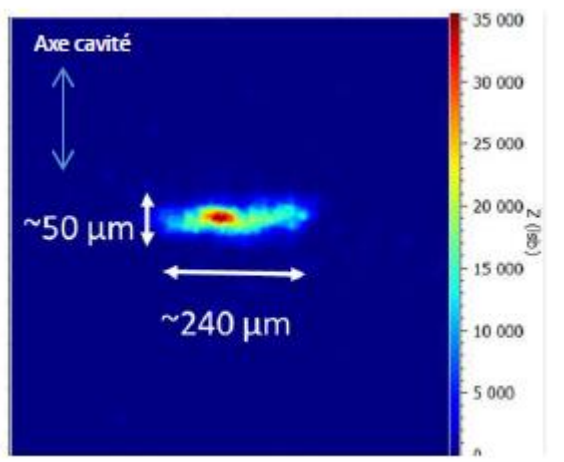
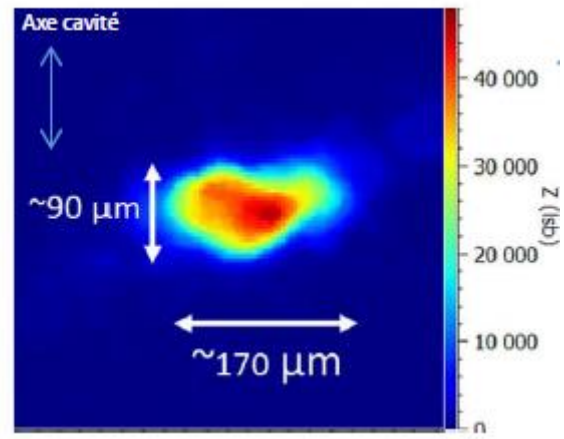
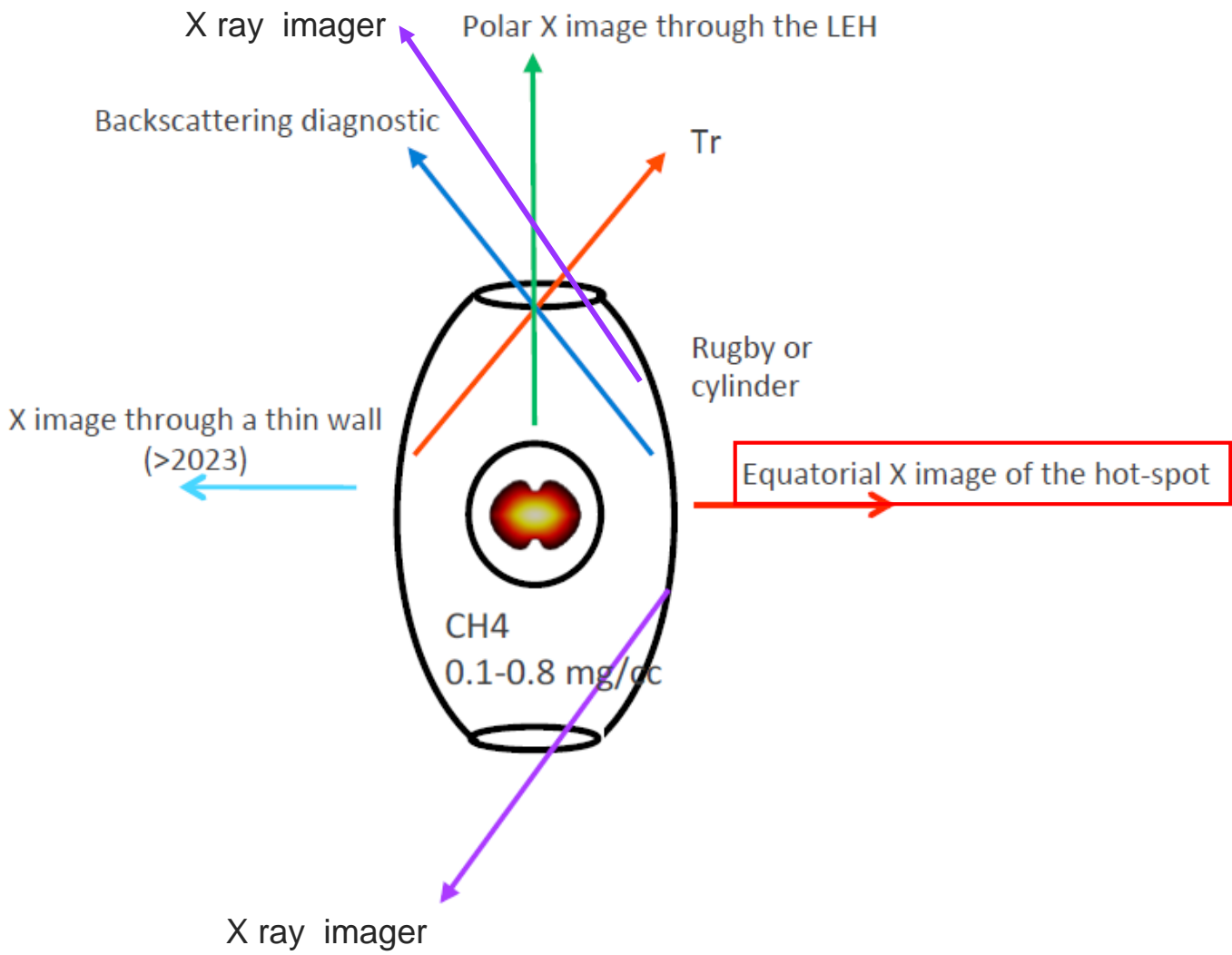
$E_{SBS} = 0,16 \text{ kJ}$

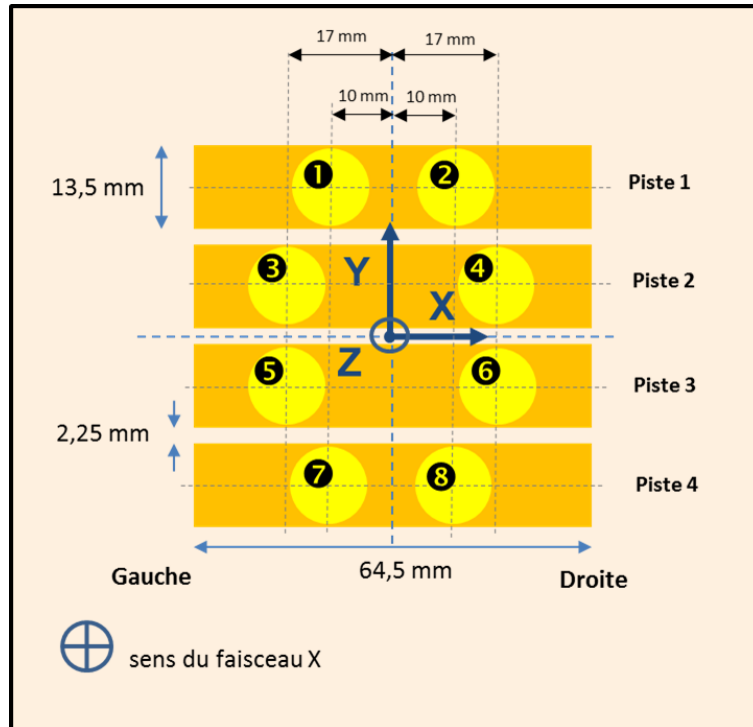
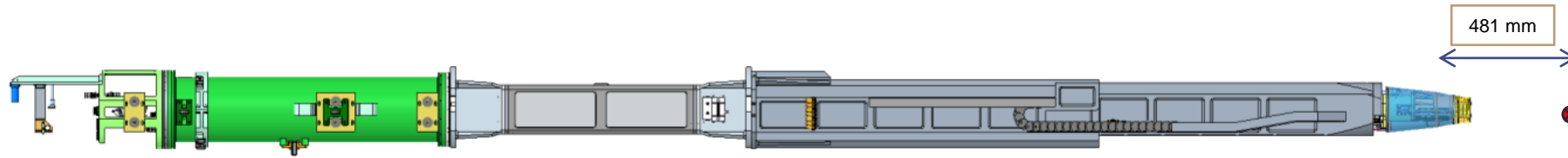


$E_{SBS} = 1,36 \text{ kJ}$

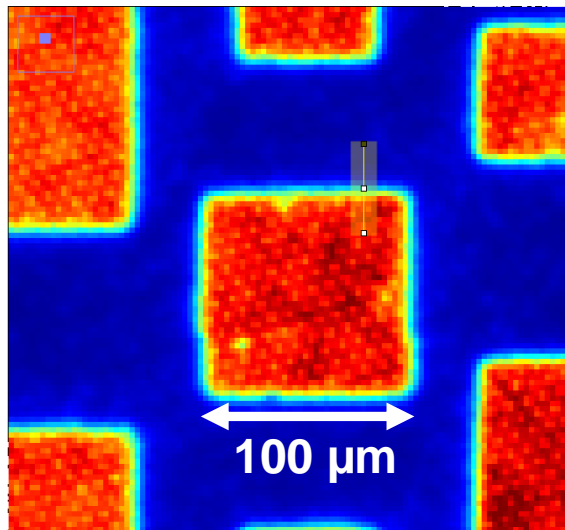
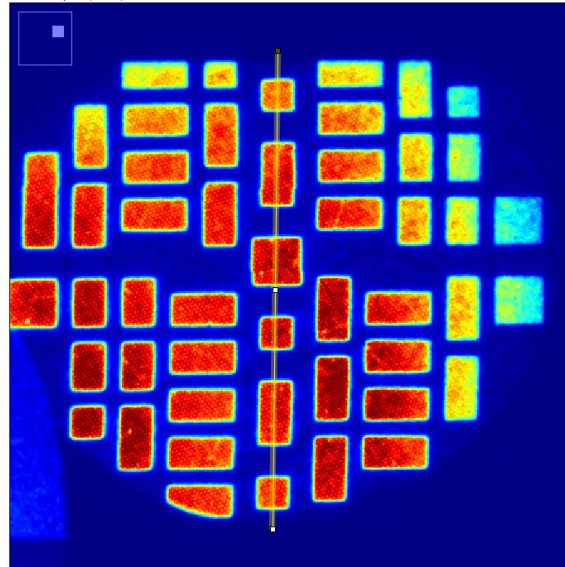
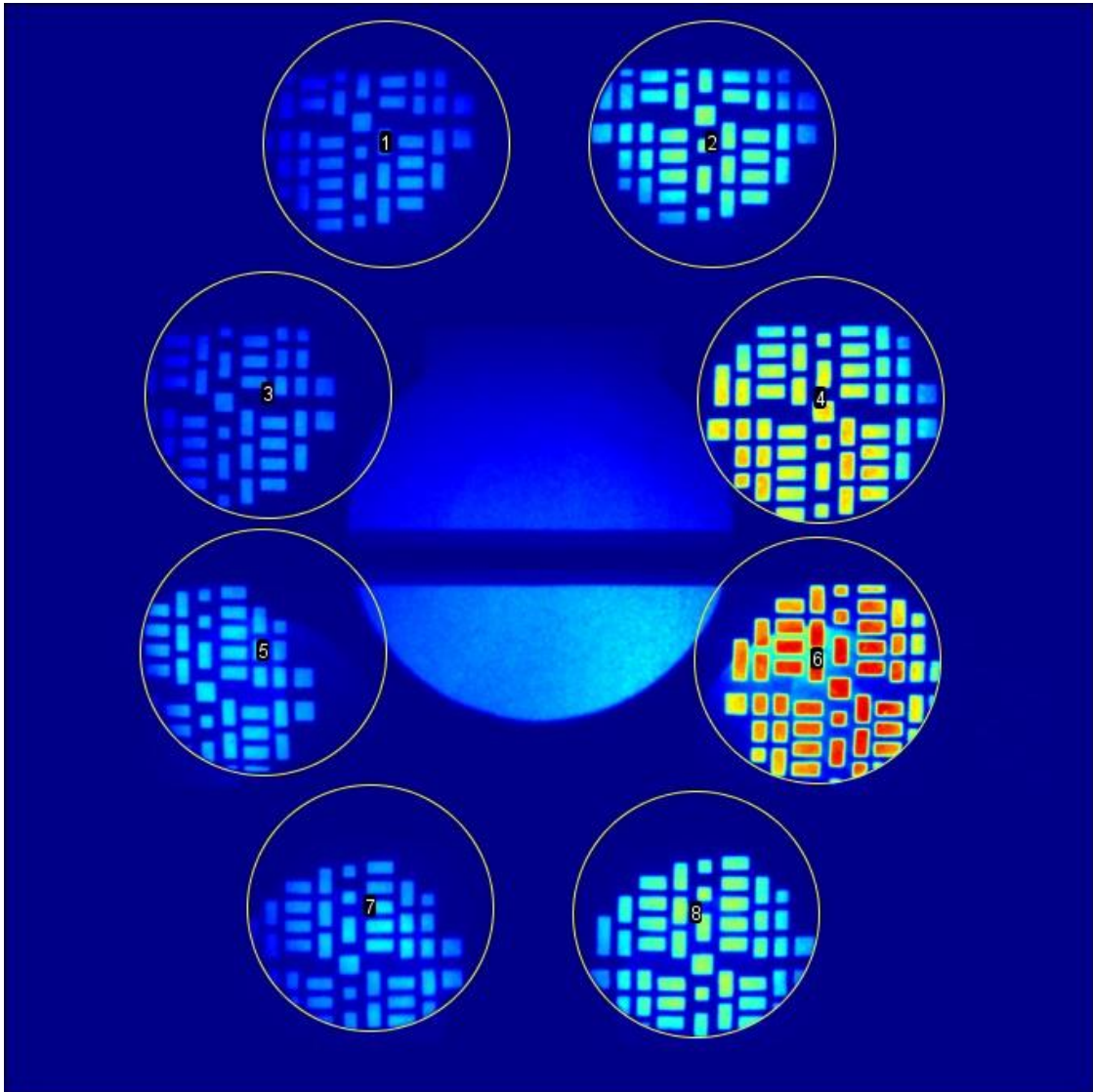


Several diagnostics are being developed for the ICF platform





Parameters	Theoretical values
Magnification	8,3
Field of view	1,5 mm
2D spatial resolution	15,2 μm (field <1 mm) 17,5 μm (field between 1 and 1,5 mm)
Energy range	2 – 12 keV
Temporal resolution	130 ps



Goals :

- Magnification
- Measurement of the spatial resolution
- Timing between rows
- Measurement of the homogeneity field during an LMJ shot
- Check of the intern alignment

Measurements :

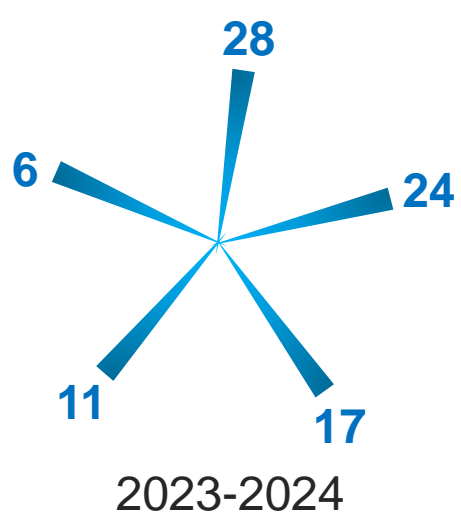
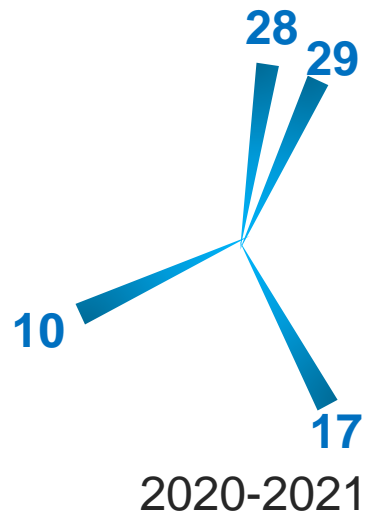
- Resolution at the center $\approx 15,4 \mu\text{m}$
- Resolution large field $\approx 17,0 \mu\text{m}$
- Grandissement = $8,25 \pm 0,15$
- Image $3,97 \mu\text{m} / \text{pixel}$

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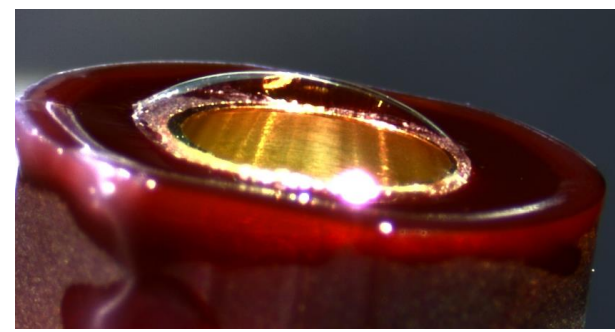
In our case, with $LMJ \leq 10$ quads, a Xenon « gas-bags » has been chosen for the first experiment.



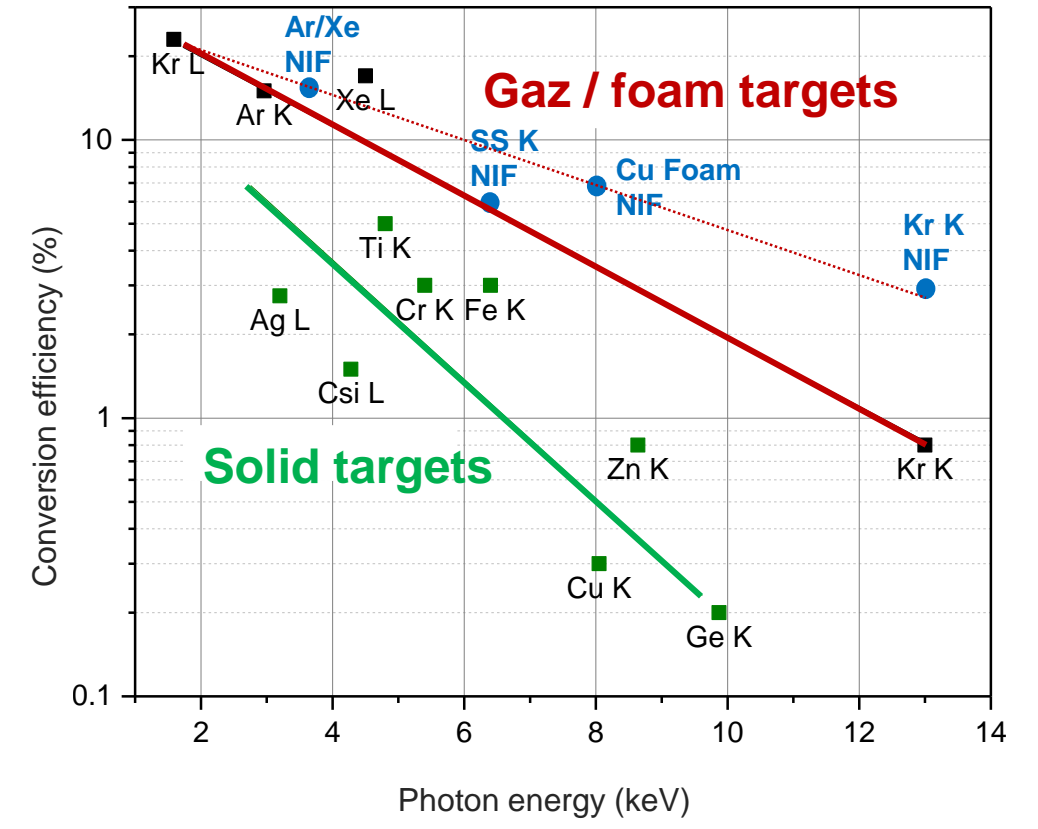
$e_{CHON} = 50\mu m / 70\mu m$



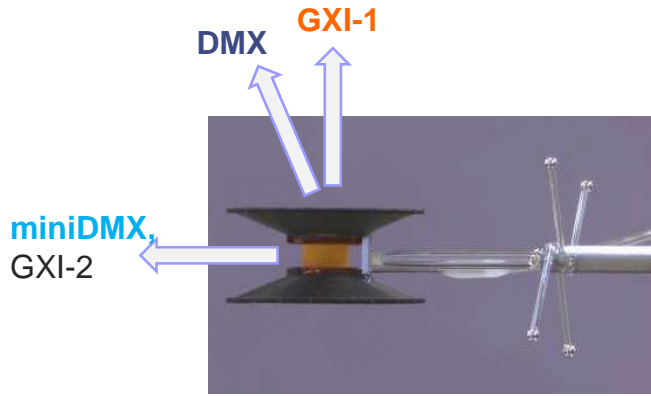
$P_{Xe} = 1.2 \text{ Bar} - 1 \text{ Bar}$



K. B. Fournier et al., "Multi-keV X-Ray Source Development Experiments on the National Ignition Facility", LLNL-JRNL-431295 (2010).

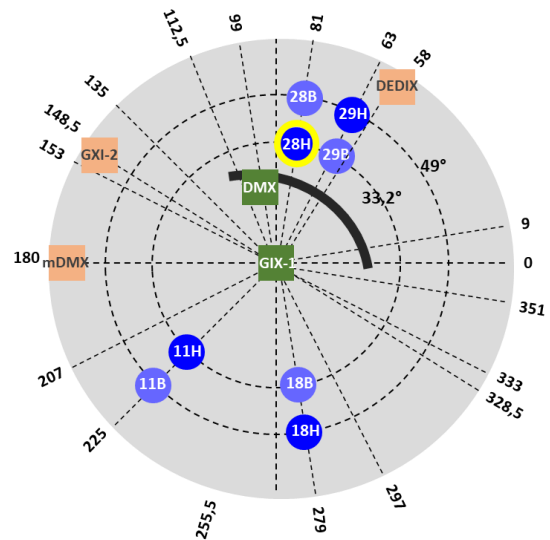


M. Primout et al. « *First high radiant energy xenon-pipe-based x-ray source on LMJ* », Physics of Plasma 29, 073302 (2022).



	Target
	CHON
	Length: 3mm
	Diameter: 3.5mm
	Thickness: 50 μ m
Cavity	
Gas	Xe - 1.2 bar

GXI = Gated X-ray Imager
DMX, miniDMX = broad band X-ray spectrometer

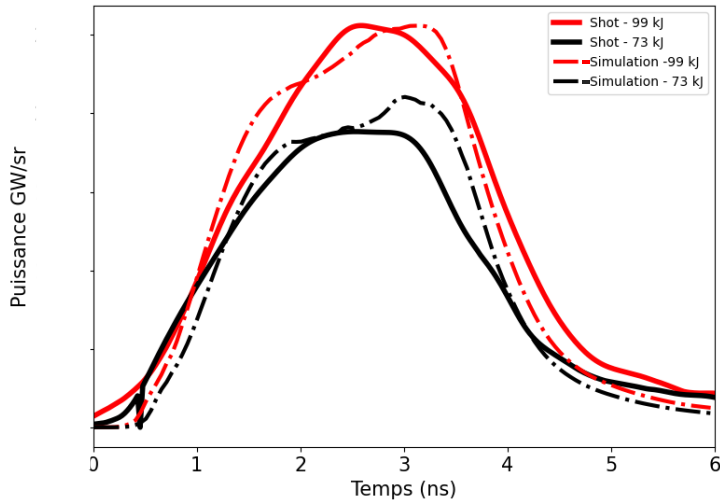


- Upper quad
- Lower quad
- Upper port
- Backscattering measurement
- Equatorial port
- DEDIX solid angle

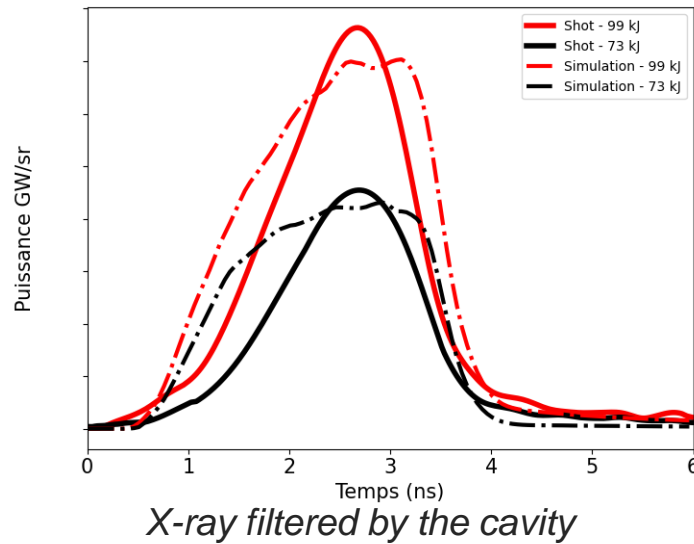
Laser configuration 3 ω 351 nm

Total energy	70 – 100 kJ
Pulse duration	Square 3,5 ns
Pointing	LEH (0; 0; ± 1.5 mm)

DMX – X-ray total power
($\theta=24^\circ$; $\phi=99^\circ$)



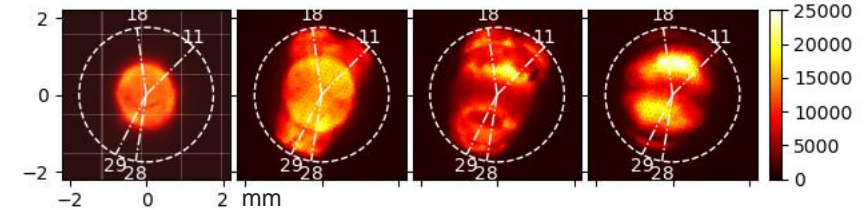
miniDMX – X-ray total power
($\theta=90^\circ$; $\phi=180^\circ$)



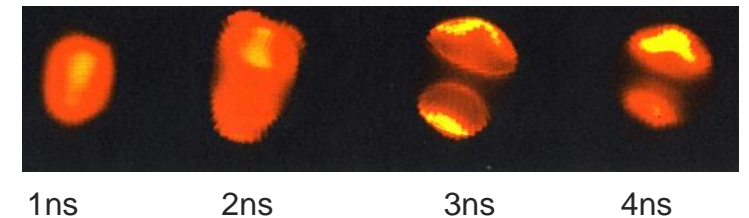
GXI - 1

X-ray band 2-4 keV
($\theta=0^\circ$; $\phi=0^\circ$)

Shot 92 kJ



Simu

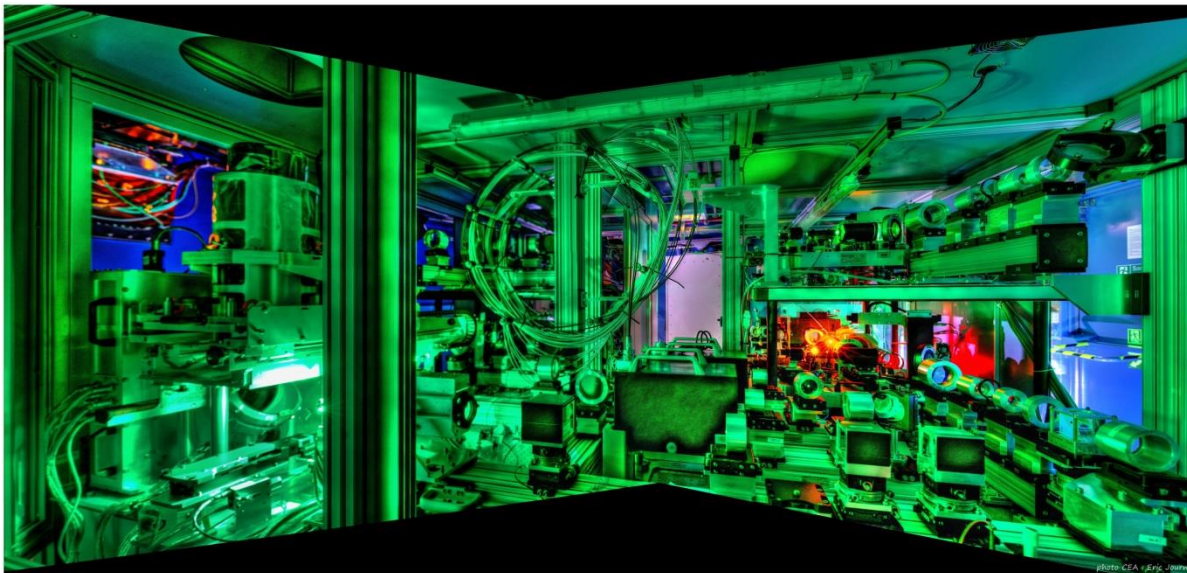


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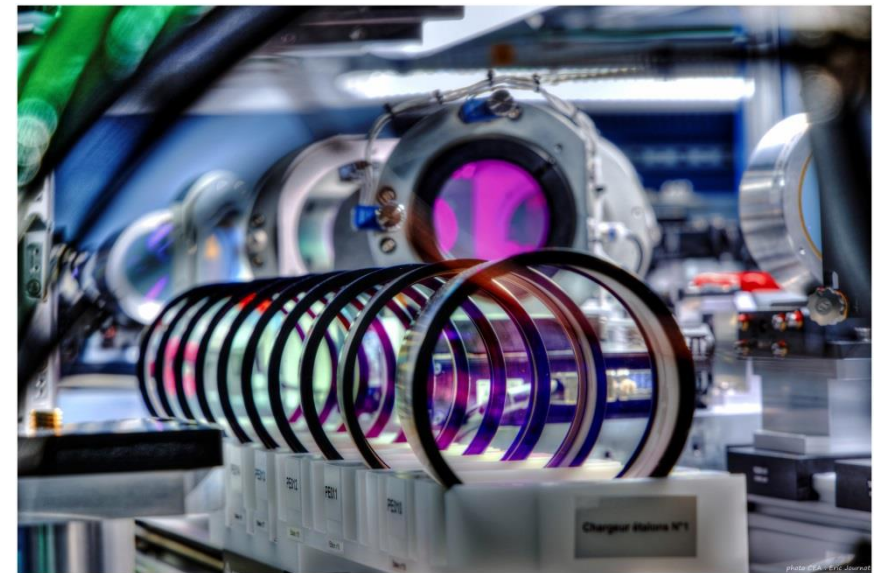


- 1 VISAR at ω and 1 VISAR at 2ω
- 2 SOP cameras with 2 GOI (magnification option and time)
- Positioned at the equatorial plan
- Field of view 1, 2, 5 mm (VISAR + SOP)
- Field of view 10 mm (VDC)



VISAR and SOP table

Etalons

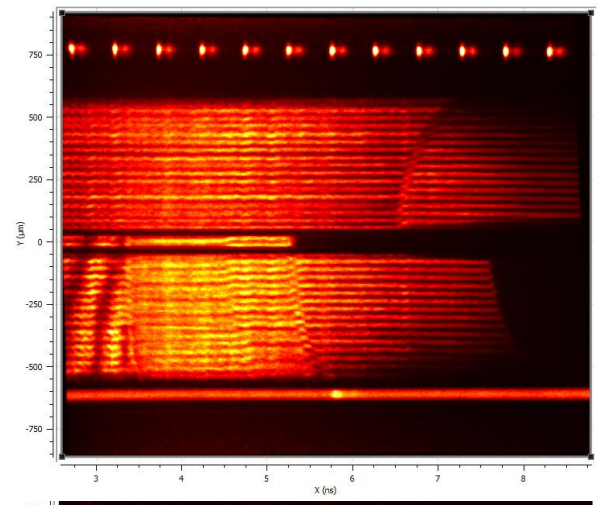


The VISAR/SOP diagnostic has been commissioned in 2020.

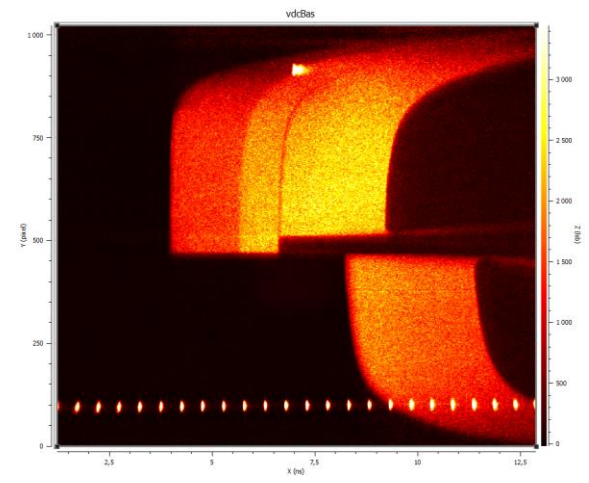


- 1 VISAR at ω and 1 VISAR at 2ω
- 2 SOP cameras with 2 GOI (magnification option and time)
- The VISAR laser will be upgraded next year

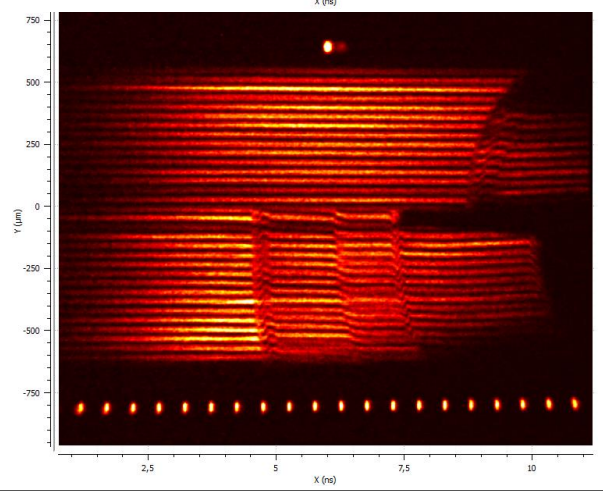
VISAR 2ω (shot 1)



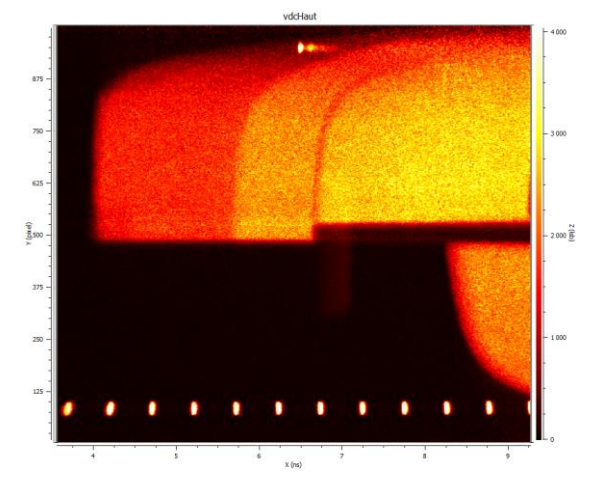
SOP 1



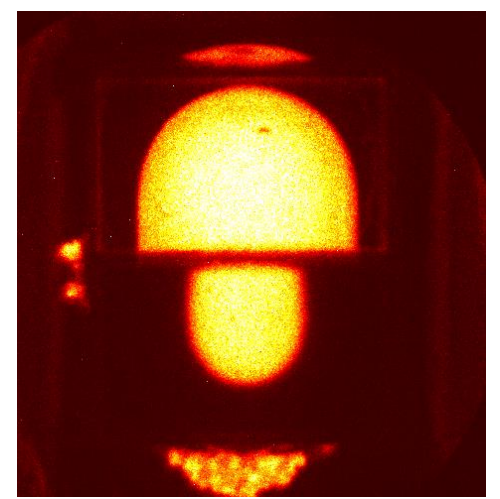
VISAR ω (shot 3)



SOP 2

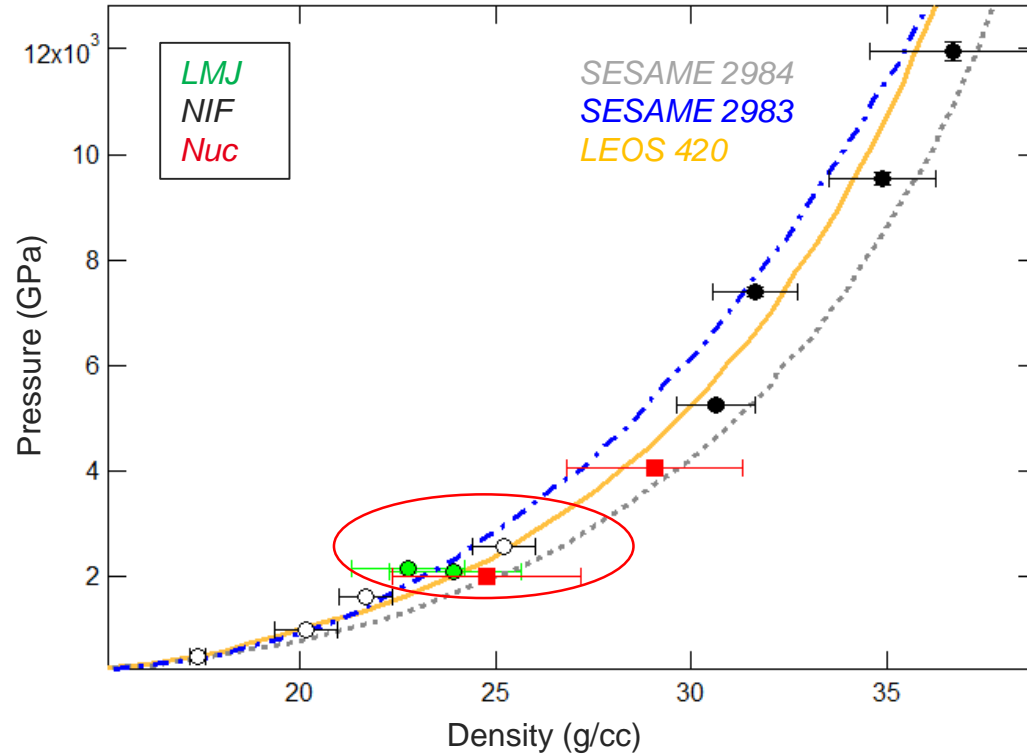


GOI 1

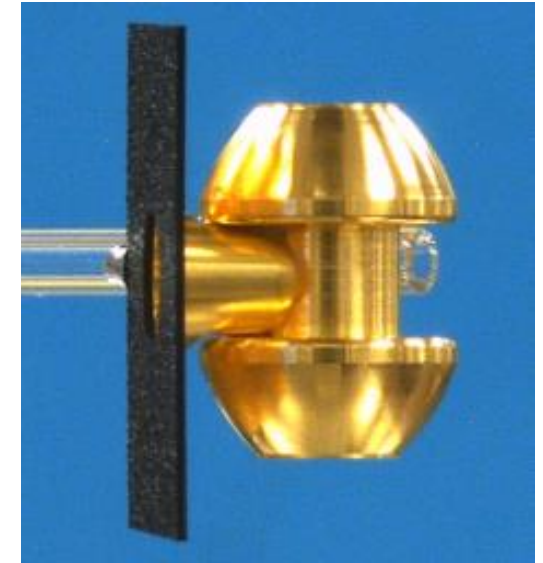
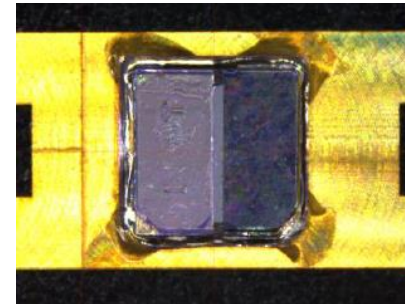
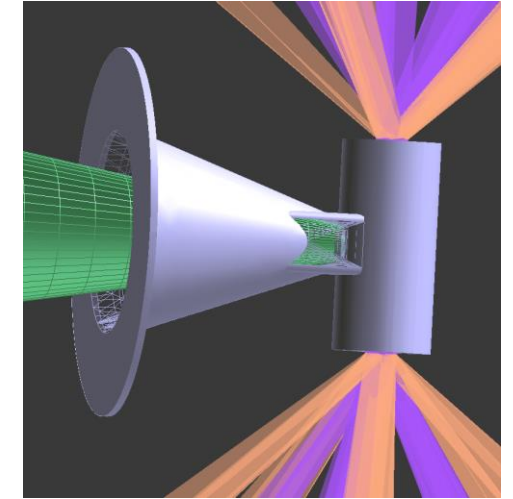
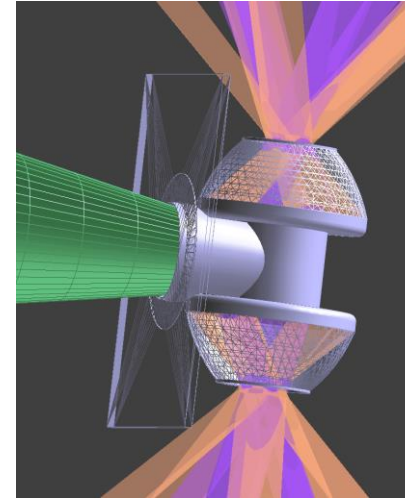




Study of molybdenum: 10 quad max

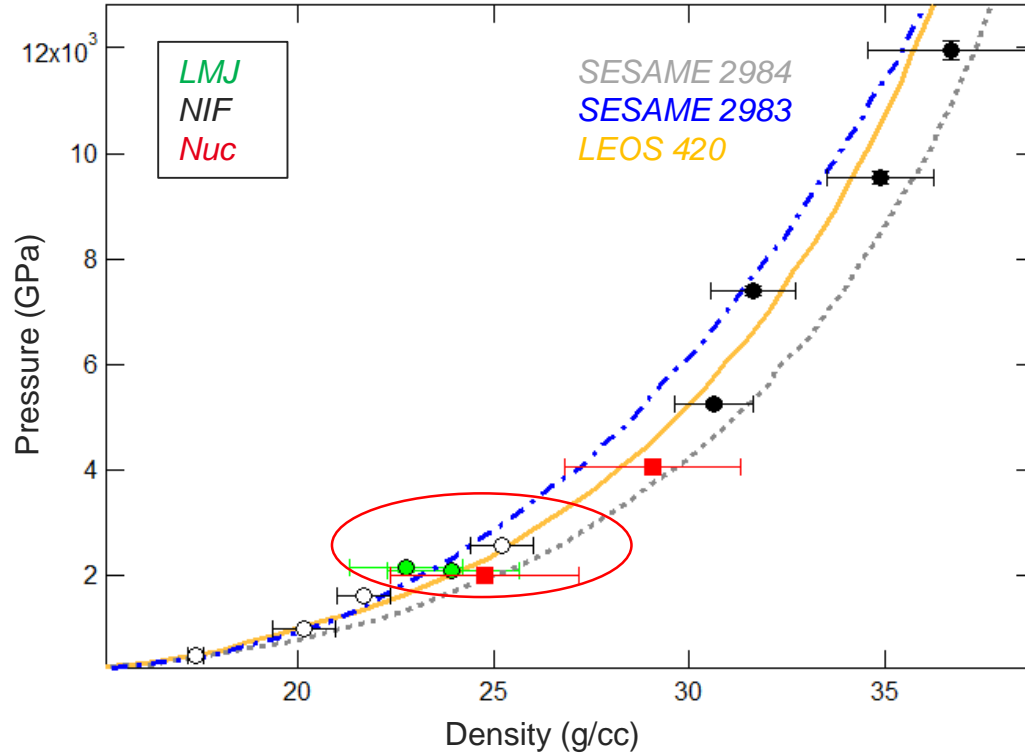


- **Indirect drive: 2023**
- Direct drive: under development

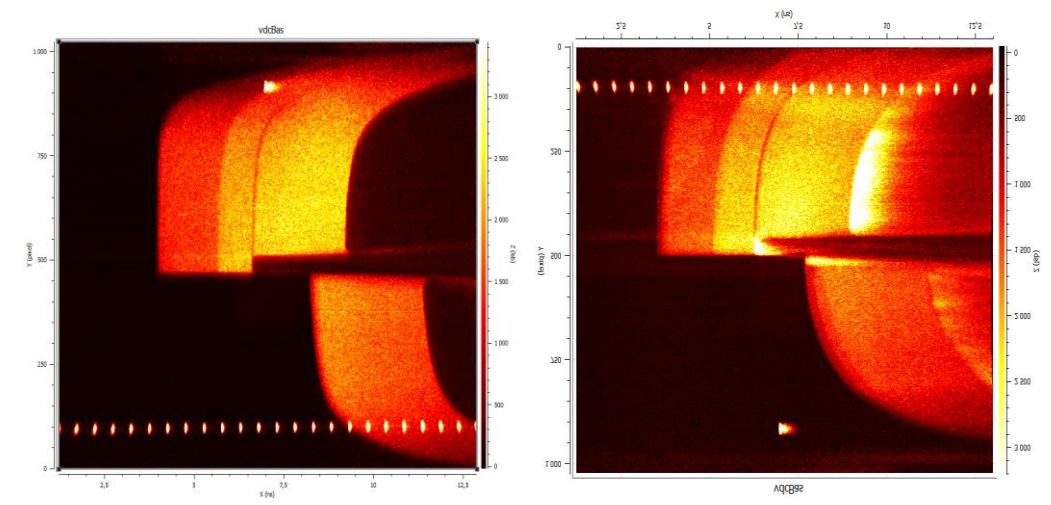
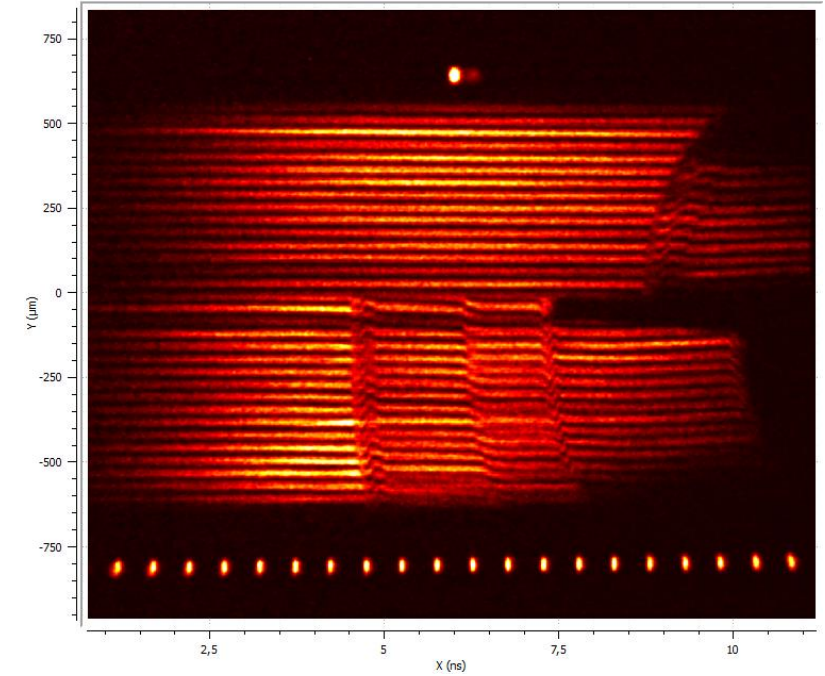




Study of molybdene: 10 quad max

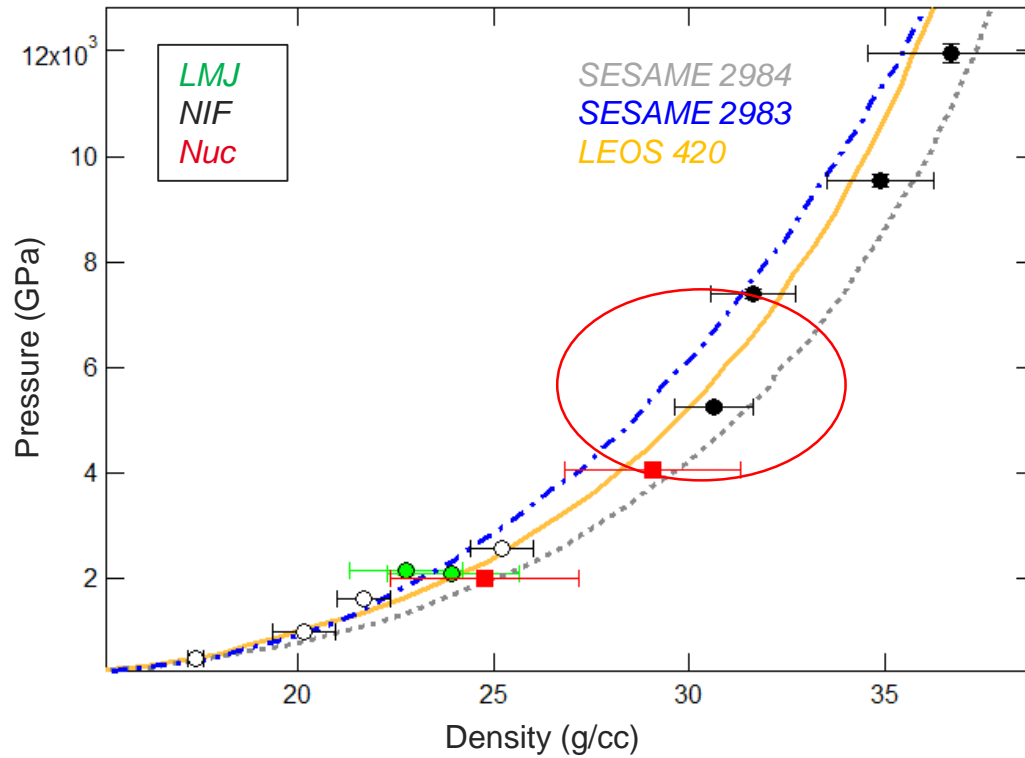


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- Direct drive: under development

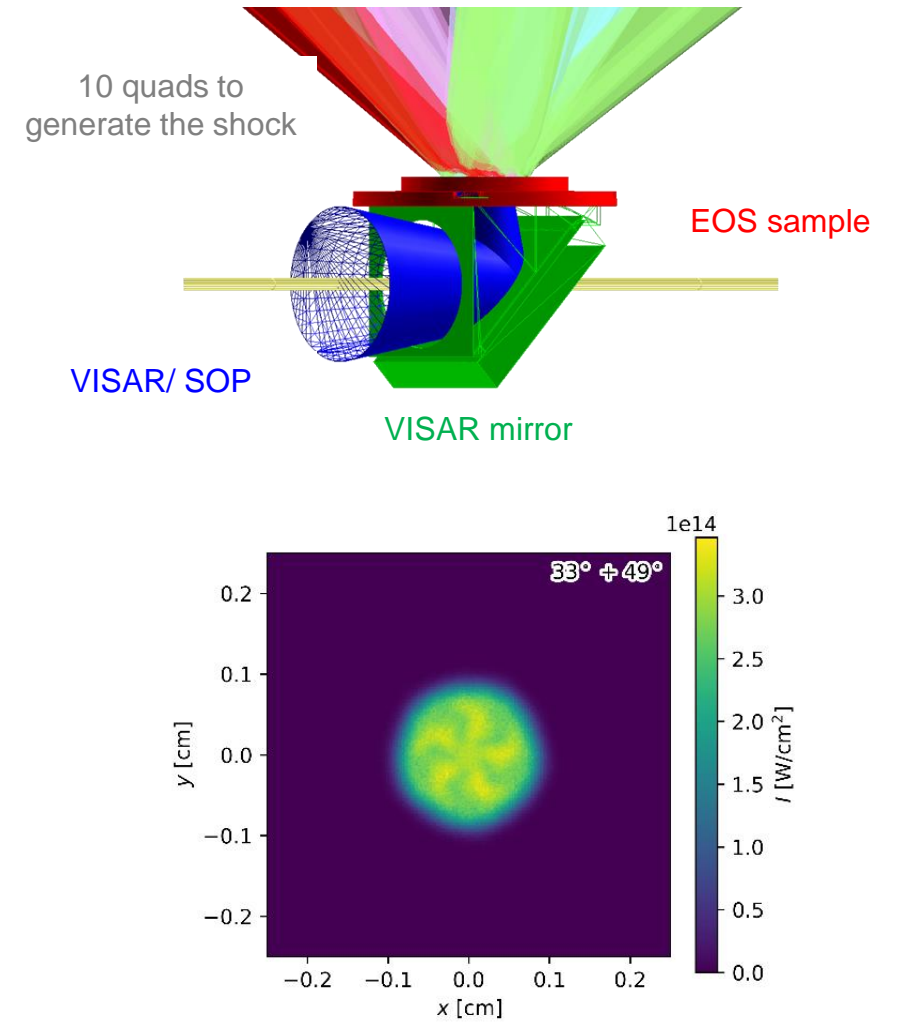




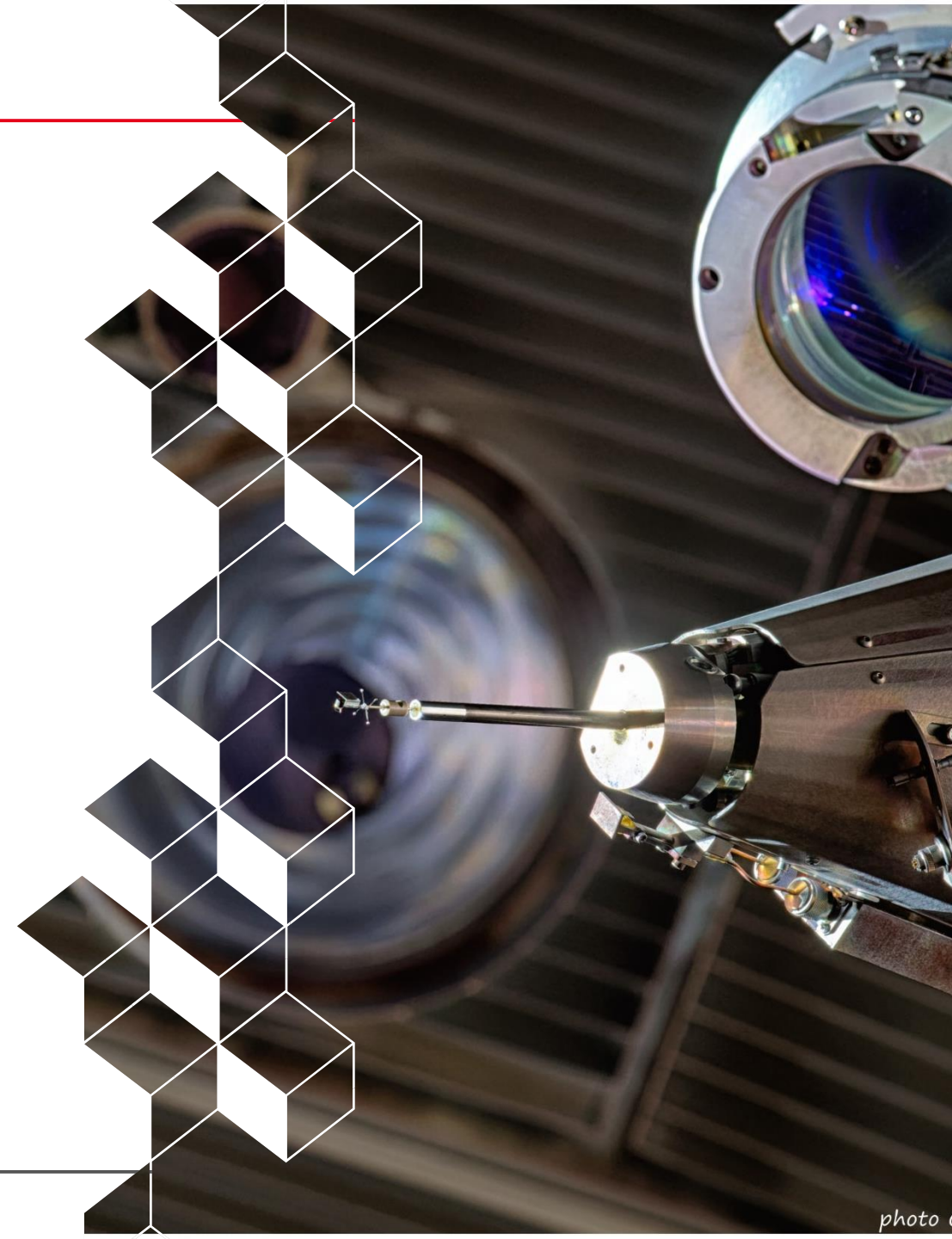
Study of molybdene: 10 quad max

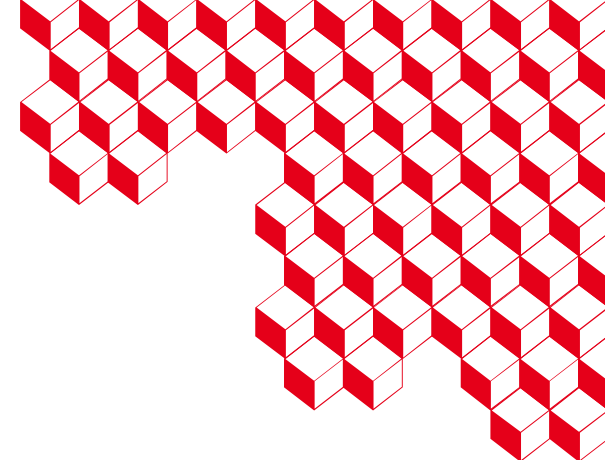


- Indirect drive: 2023
- **Direct drive: under development 2024**



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Thank you for your attention

User Meeting LMJ 2023

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Réalisation des Expériences

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