"Secondary sources" panel

The "sources" are varied: electrons, protons, X-rays (coherent & incoherent), gamma-rays, neutrons

Context-I: building the case of a pan-EU proposal on targetry, i.e. to get support for all our various future target needs

Context-II: different needs depending if "exploratory" physics, or "beamline" (with the need to delivery a stable source to users)

Objectives: draw a panorama & discuss issues related to "secondary sources" targets, future needs could form seed for JRAs

Agenda:
I-type of targets needed
II-target fielding & characterization needs
III-discussion on target manufacturing
IV-discussion on "target network"

I-Types of targets needed

Type	Future needs
Gas jets	Modelling, 3D shaping, sharp gradients, clustering measurement
Capillaries	Surface roughness, modelling
Gas cells	modelling
Solids	Many… multi-layer, shaping, material, free-standing, coating, roughness, structure, etc
Droplets	Stabilization
Liquid crystals	Diameter increase, characterization, stabilization, high Z
Cryogenic	Thinner, shaped
Near-critical density/nano-materials	Shaped, control of parameters, material, etc

"established" targets, but need for improvement, mass production, cost reduction, shaping, modelling, etc

"newer" targets, with high potential, lots to explore and characterize

+importance of the issue of multi-targets (pump-probe exp.) → robotics?

II-Target fielding & characterization needs

- Typical number per run?

  Depends on model "exploratory" or "beamline" from 10s to 10ks

- Special issues in mounting them? Need for development?

  Lots of needs, especially in a "beamline" approach, EMP studies needed as well

- Protection?

  "next neighbor" question to be solved

- Debris?

  Limit the mass! Polarize the debris? Intermediate optics (liquid metal, PM)

- Inline or offline characterization?

  A priori we want everything, doable? Coupled with the issue of what can survive in the chamber

III-Current & future target manufacturing & characterization needs

- Wide range of capabilities exist in the community, but not accessible to all (only a few labs [RAL, GSI,…] have integrated capabilities)
- Limitation by present costs?
  - Yes, so important need for source physicists to have access to experts at "supported costs"
- Future trends: **automation**, 3D printing, high-resolution, integrating multiple targets
- Need to keep in mind that target needs planning, budget, development
- Need for every target to be characterized?
  - → need for target standardization, but works only in "beamline" approach
- What parameters are most important? Is there a standard?
  - Really depends on application… need strong interaction between target & source physicists

IV-Ideas for target network

- Objectives?

  get access to experts: design, fabrication, training (distributed vs. integrated capability [RAL]);

  expressed need for network+training+JRAs

- Needed capabilities? Contributing capabilities?

  TSN, and other: many capabilities in labs, ELI is also a growing force in target fab

  integrate more material labs/groups to attract more capabilities

- Different needs depending if "exploratory" physics, or if "beamline" (with the need to delivery a stable source to users)

  exploratory → development

  beamline → cost & number of sturdy targets: there a **real** need for high-rep rate & mass production

- Need for research?

  access to facilities by teams needed (e.g. CELIA & CEA teams studying EMP)

- Access model?

  users facility → ideally linked with beamtime allocation

  in-house facilities → access on proposals

Supplementary slides used during the panel discussion

I-Types of targets needed → what are the future needs?

Gas jets
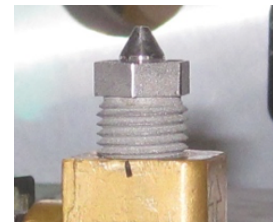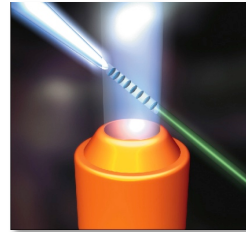
→ 3D shaped, modeling?
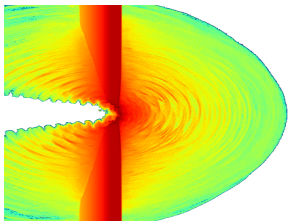→ Sharp edges, small sizes

Capillaries
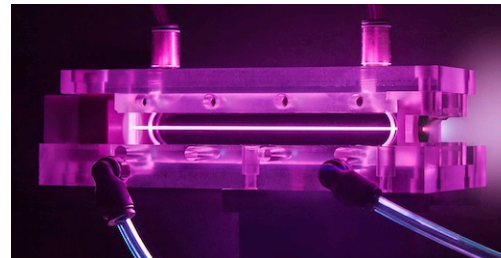
Gas cells
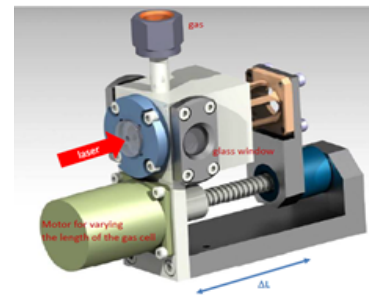
I-Types of targets needed → what are the future needs?
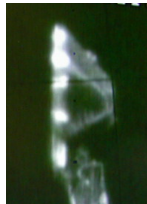
water droplets

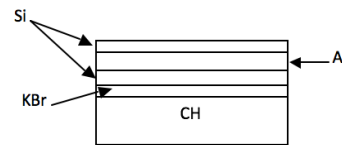**Droplets:**
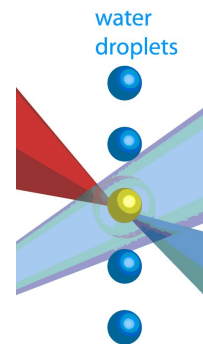
Solid targets:

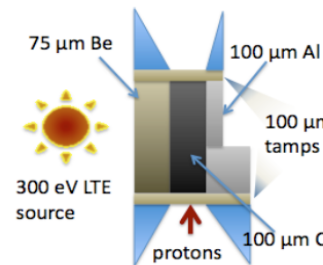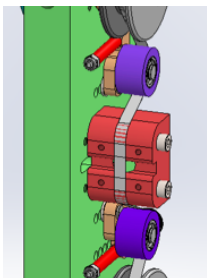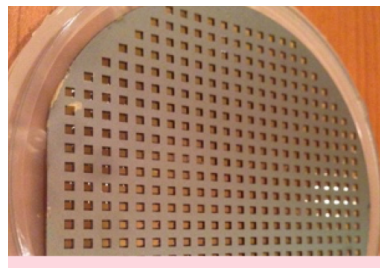simple,   shaped,   multi-layer,   structured,   free-standing
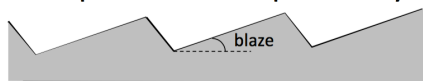
Si

Al

KBr

CH

75 µm Be   100 µm Al

100 µm tamps

300 eV LTE source

protons   100 µm C
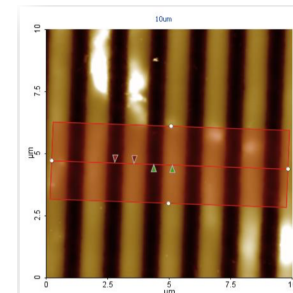
Forms: tape,   membranes,
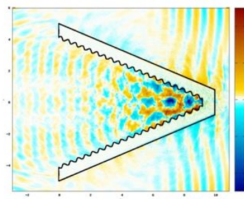
What we should need

- Metallic foils targets and uncoated gratings
- Periodic patterns of triangular section (sawtooth) with different blaze angles (same period and depth of Mylar targets)
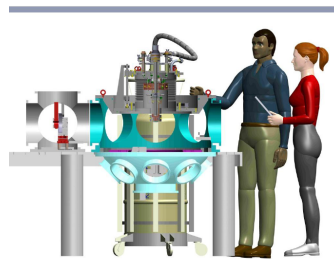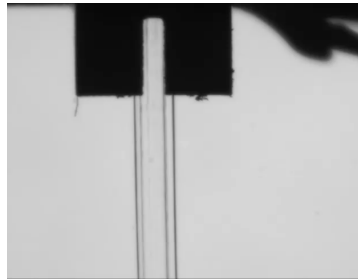

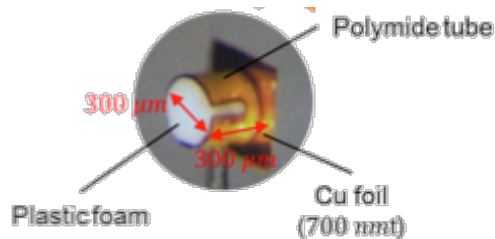- "Bidimensional" and more "exotic" grating targets

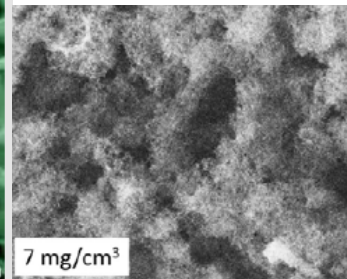# I-Types of targets needed → what are the future needs?

Cryo target
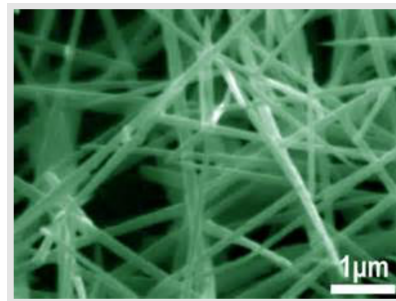

Near-critical density targets:

foams,   "nano"-wires,   NanoLab   high-pressure gas jets

→ 3D shaped, modeling?
→ Sharp edges, small sizes

What we should need

- Customizable nanowire length (1 to 20 µm), areal density homogeneity AND very good alignment
- Customizable nanowire orientation to the foil surface

or