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Consideration of a Target Network for Advanced Laser Light Sources

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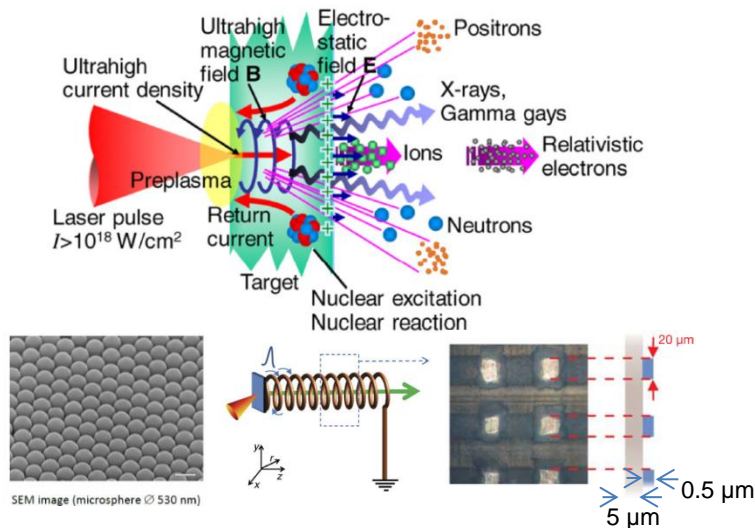
EUCALL SATELLITE MEETING

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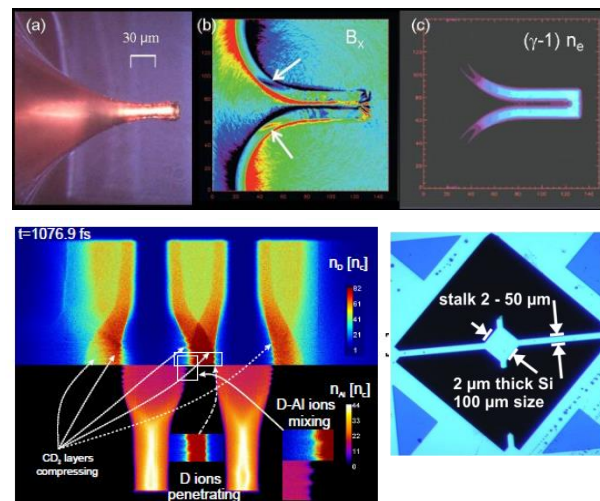
Targets for Advanced Laser Light Sources

LASER-DRIVEN PARTICLE AND RADIATION EMISSION



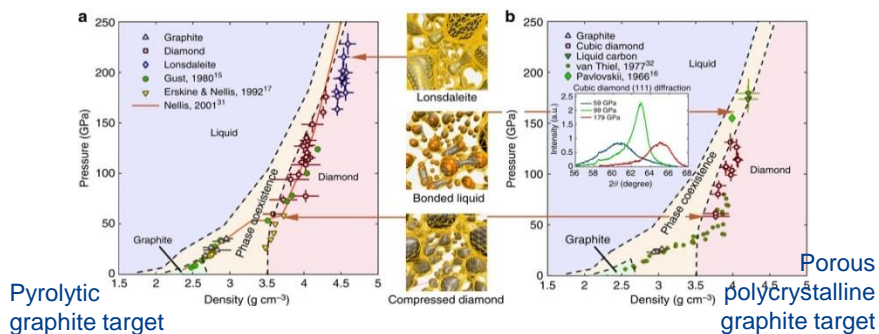
D. Margarone et al.; S. Kar et al.; H. Schwoerer et al.

ELECTRON TRANSPORT and ISOCHORIC HEATING



T. Kluge et al.; L. Huang et al.; K. Zeil et al.

SHOCK-COMPRESSION PHYSICS



Pyrolytic graphite target

Polycrystalline graphite target

D. Kraus et al.

... and much more

- laboratory astrophysics
- warm dense matter
- strong magnetic fields
- material science
- ...

Targets for Advanced Laser Light Sources

TARGET DESIGN

on the basis of

- physical phenomenon under investigation
- experimental configuration
(laser properties, diagnostics)



huge **variety**
of possible target configurations
(often **complex**)

TARGET PROPERTIES

affect strongly the laser-matter interaction process



production
○ controllable and reproducible
characterization
○ density, thickness, crystalline
structure, surface quality

REQUIRED EXPERTISE IN MATERIAL SCIENCE, CHEMISTRY, METROLOGY...

Targets for Advanced Laser Light Sources

TARGET = CONSUMABLE (1 Hz = 3600 targets/hour)



HED Instrument

- DiPOLE
2-20 ns, 100 J, $\lambda=500$ nm, 1-10 Hz
- 100 TW-class CPA Ti:Sapphire
30-50 fs, 3-5 J, $\lambda=500$ nm, 10 Hz



ID 24

- 4-10 ns
- 100-200 J
- $\lambda=1064$ nm
- 1 shot/min



2 X 1 PW

- 15 fs / 30 fs
- 15 J / 30 J
- $\lambda=$ nm
- 10 Hz

10 PW

- 150 fs – 1.5 ns
- 150 J – 1.5 kJ
- $\lambda=$ nm
- 1 shot/min



2 x 1 PW

- 25 fs
- 30 J
- $\lambda=800$ nm
- 0.1 Hz

2 x 10 PW

- 15-30 fs
- 200 J
- $\lambda=800$ nm
- 1 shot/min



large amounts of targets

- 10^3 /experiment
- rapid **prototyping**

+ HIGH REP RATE ISSUES

How do we deal with targetry?

TARGET SUPPLY
will require the
PRODUCTION AND CHARACTERIZATION
of

- **large amounts** of targets
 - huge **variety** of possible target configurations
 - often **complex** targets (rapid **prototyping**)
- + technical issues related to high repetition rate



HOW DO WE DEAL WITH IT?



ASSESSMENT of the CURRENT STATE

- Target needs and issues
- Available target fabrication/characterization capabilities
- Current supply strategies



STRATEGIES

- Possible synergy levels
- A coordinated strategy
- White book/joint document

Targets for Advanced Laser Light Sources

Assessing target needs and target-related issues

Target survey

Poster session

Panel discussion High Repetition Rate Challenges

- General targetry challenges common to multiple classes of experiments.

Agenda

- Challenges
- What are we missing?
- Can we prioritize?
- A targetry network

Targets for Advanced Laser Light Sources

Assessing target needs and target-related issues

Panel discussions

- Targetry for Shock-Compression Physics
- Targetry for Laser-Driven Particle and Radiation Sources
- Targetry for Electron Transport and Isochoric Heating

Agenda (specific for single science case)

- Prototypical experiments
- Target requirements/issues
- Target production and characterization
- Repetition rate

Targets for Advanced Laser Light Sources

Current supply strategies

- Inhouse production (few groups, specific target types)
- Scientific collaborations (co-authorship/in-kind contributions)
- Purchase:
 - commercially available materials
 - customized production in specialized laboratories (up to 10s k€/experiment)
- Costs covered by User Facilities as access costs (CLF, LMJ)

➔ no coordinated strategy to cover the needs of upcoming advanced laser light sources

➔ target purchase accessible only to expert users:
limited access to advanced facilities!

➔ how to establish a sustainable target supply chain across Europe?

Coordinated strategies for target supply

Synergy levels

Networking only

- bilateral collaborations: in-kind contributions/co-authorship
- know-how sharing

How can we promote networking activities?

➔ Workshops

- TARG3 – CLPU Salamanca, 21-23 June 2017
- TFW5 – St. Andrews, 2014

➔ Bilateral founding schemes

➔ Target catalogue/database of available production/characterization techniques

➔ Innovative Training Network

- Training the next generation of target experts
- Community building

Coordinated strategies for target supply

Synergy levels

User Facilities: User Consortium Contributions

Target supply = service to the users community

- ➔ ESRF LTP (Long Term Proposals)
 - 18 shifts every 6 months for 3 years
 - in exchange for an investment benefiting the users community (≥ 80 k€/year)

- ➔ HIBEF UC
 - Discussion: targets as in-kind contribution covering operation costs?

Coordinated strategies for target supply

Synergy levels

Trans-national/Virtual Access

3 PILLARS

- Trans-national access to a pool of research infrastructures
- Joint research activities to improve the service to users
- Networking activities (workshops/trainings...)

Up to 10 M€ which also cover user access costs!

➔ Access to Users Facilities: cover target costs for users??

➔ Virtual access to target fabrication/characterization laboratories
(instrumentation/manpower/know-how)
if possible free of charge



Lobbying for an appropriate call:

2018-2019 – EUROPEAN RESEARCH INFRASTRUCTURES



Consideration of a Target Network for Laser-Light Sources

Panel discussion

Which strategy serves best our user community?

Target Network

- Possible network structure?
- Possible access models?

Lobbying activities at the EU level for an appropriate call

A white book document to

- raise awareness in the scientific community about target related issues
- prepare lobbying activities at the EU commission level
- support partners in their grant writing.

Next steps

Workshop

Talks

- Introduction
- Targetry: state of the art and supply strategies
- Advanced laser light sources

Poster clip and poster session

- Core of the information exchange

Panel discussions

- General target issues for high repetition rate operation
- Specific target needs/issues for science cases
- A coordinated strategy to establish a sustainable target supply chain across Europe

Expected outcome: white book document

Scopes and goals

Research at advanced laser-light sources

- Laser-matter physics: research and applications
- Advanced laser-light sources
- The role of targetry

Targetry for high-power laser experiments

- Target needs
- Targetry: state of the art
- High-repetition rate challenges

Targeting the future: coordinated strategies

- Strategies
- Investigation of the potential of a target network for advanced laser-light sources
- Next actions

List of endorsing partners

Thank you