This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 730871.

Materials for extreme thermal management
PowerMat (WP17)

WP17 Kick-off Meeting, CERN Geneva 05.05.2017

Lorenzo Peroni (POLITO)

Task 3 description

Task 3: Dynamic testing and online monitoring

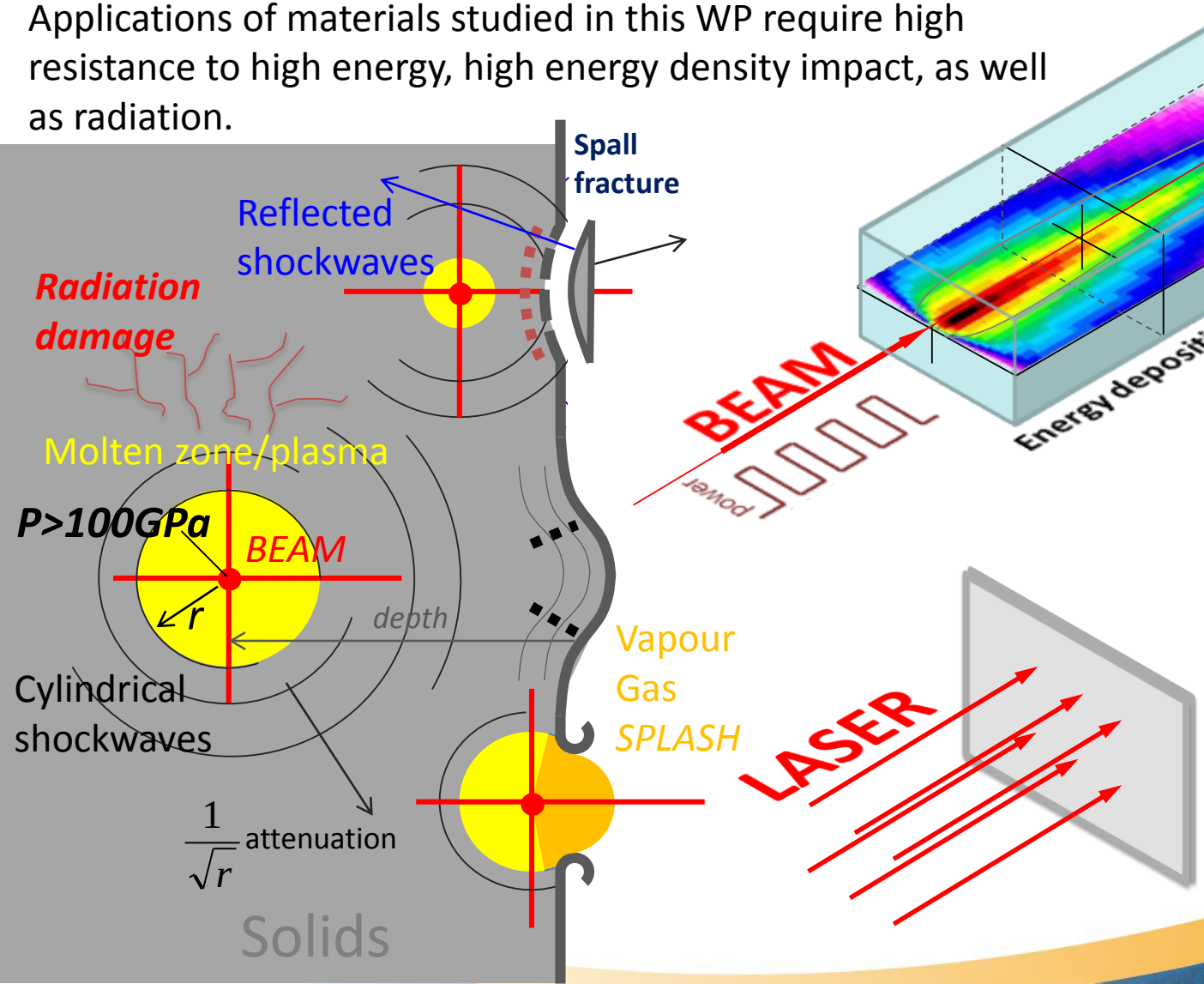
Testing of material samples in a broad range of environments:

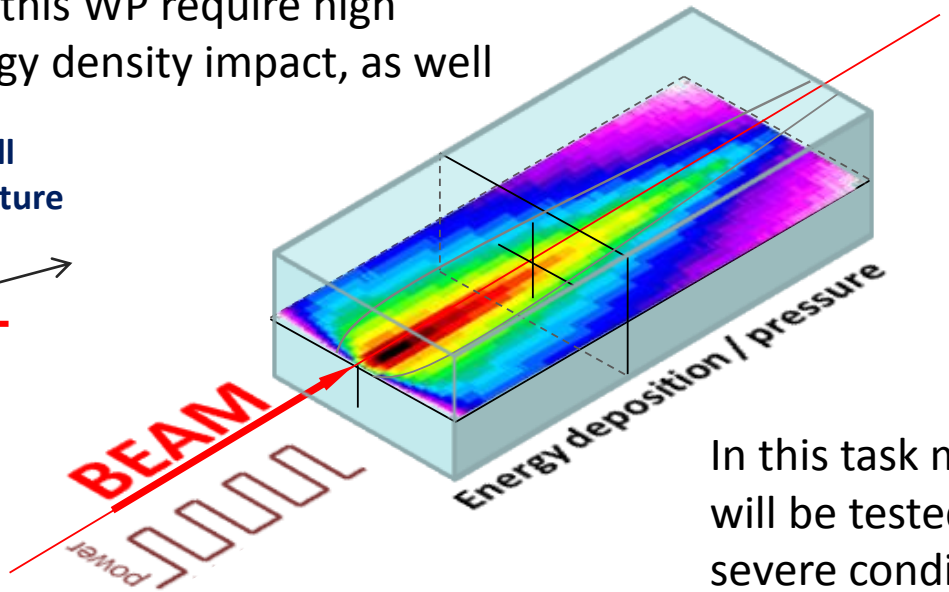
- Mechanical testing in quasi-static and dynamic conditions, at various temperatures
- Tests under very high power laser and particle beams
- Irradiation tests with online monitoring of properties evolution
- Hydrodynamic simulations of experiments - EOS, spall strengths for new materials

Participants: CERN, ELI-NP, GSI, POLIMI, POLITO

Task 3 description

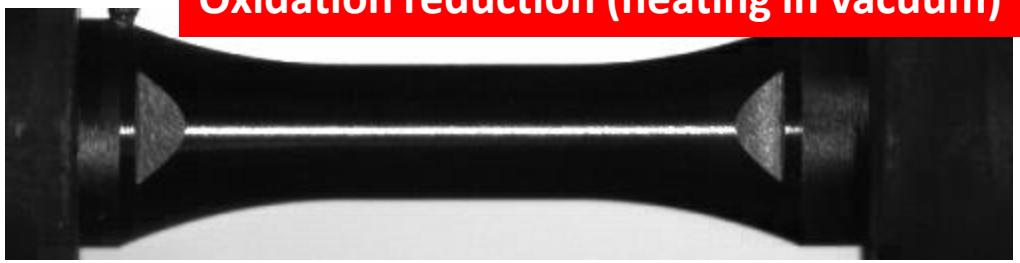
Applications of materials studied in this WP require high resistance to high energy, high energy density impact, as well as radiation.



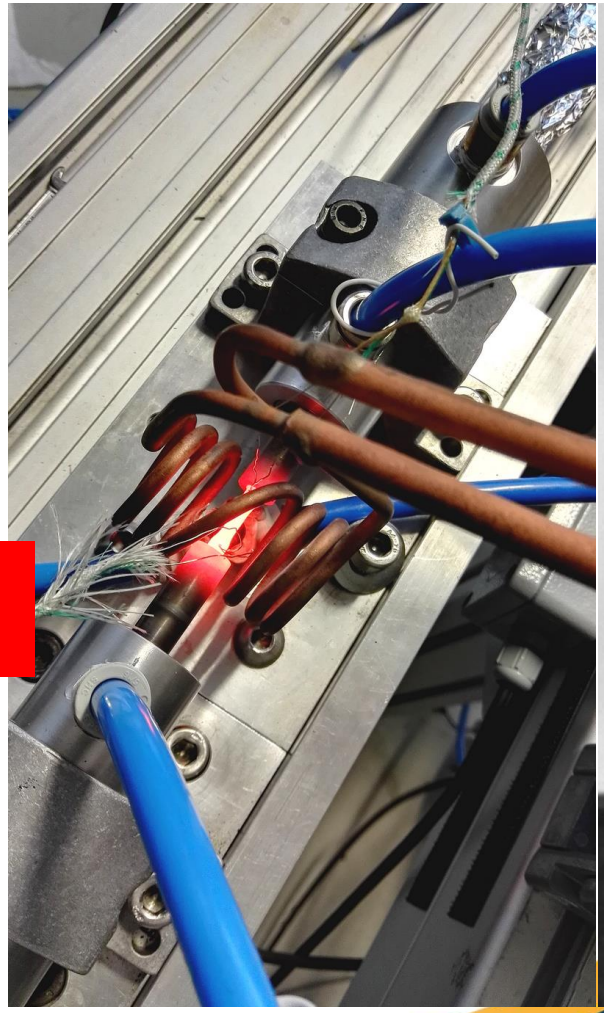


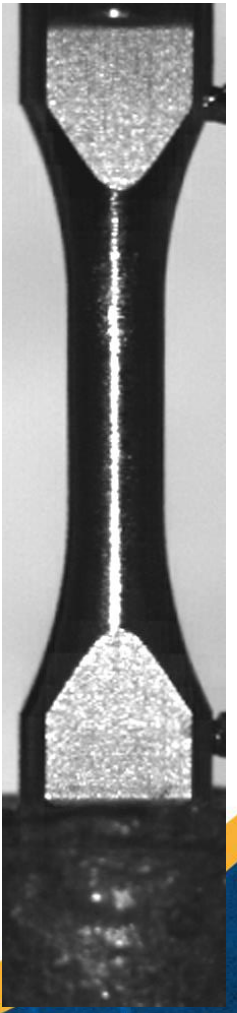
In this task materials will be tested under severe conditions such as high strains or energy density deposition, as well as irradiate them with protons, ions and laser beam.

Mechanical testing in quasi-static and dynamic conditions, at various temperatures

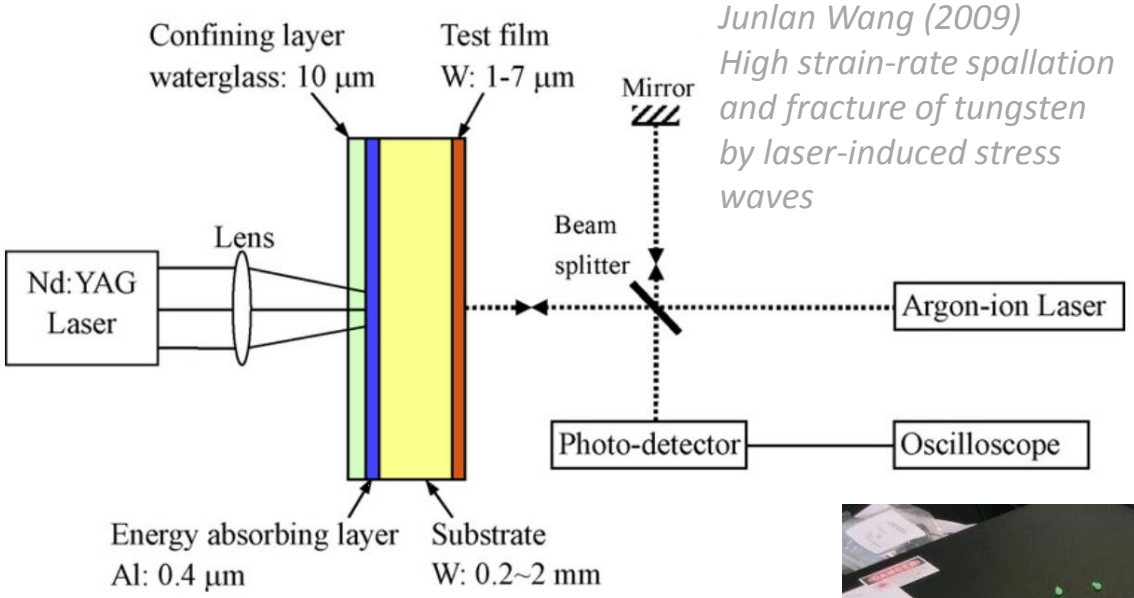


Non metallic material (brittle)
Oxidation reduction (heating in vacuum)





Tests under very high power laser beams (GSI, ELI-NP)



Lili Hu, Phillip Miller, Junlan Wang (2009) High strain-rate spallation and fracture of tungsten by laser-induced stress waves

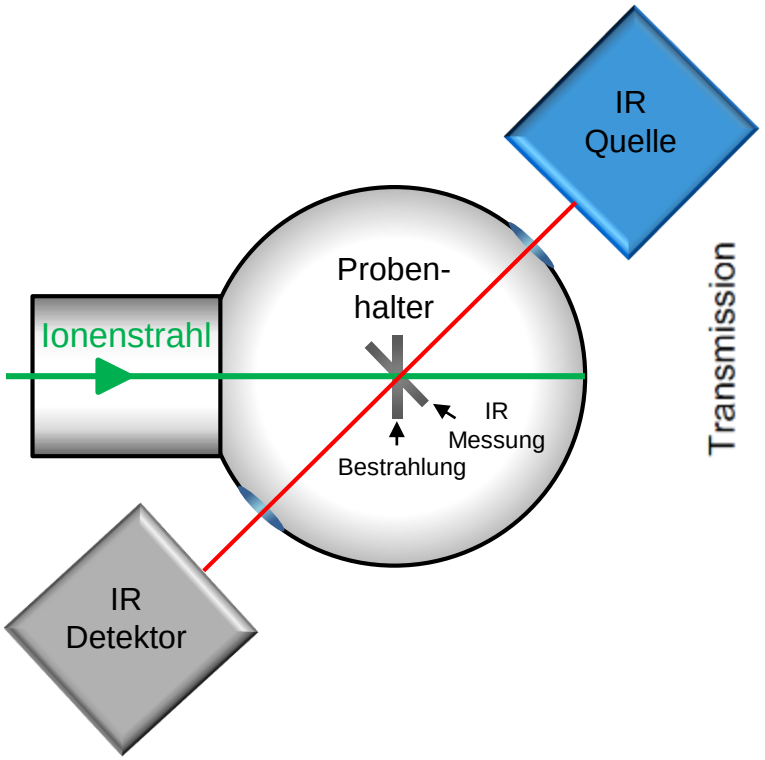
Tests under very high power p^+ and laser beams (GSI, ELI-NP)

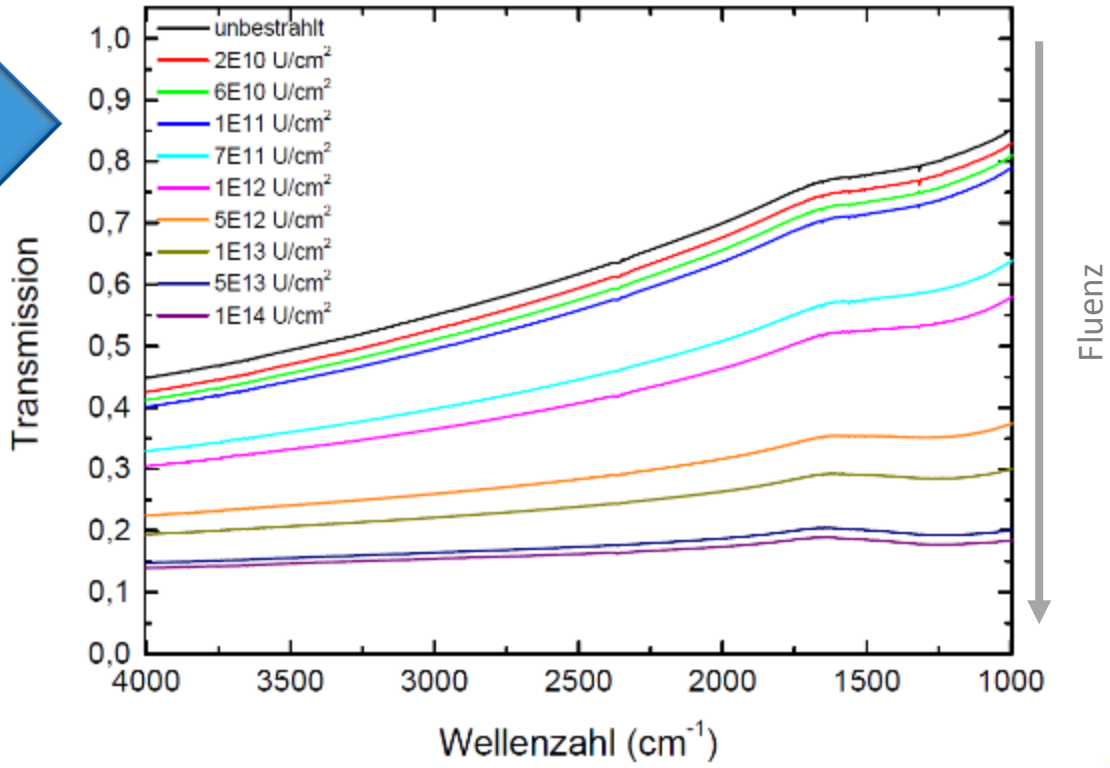
p^+ from **HiRadMat**, CERN and ELI-NP

Explore VH intensity (**Phelix**, GSI), multi PW **laser facility** (**ELI-NP**)

Numerical simulations?
Equipments exchange

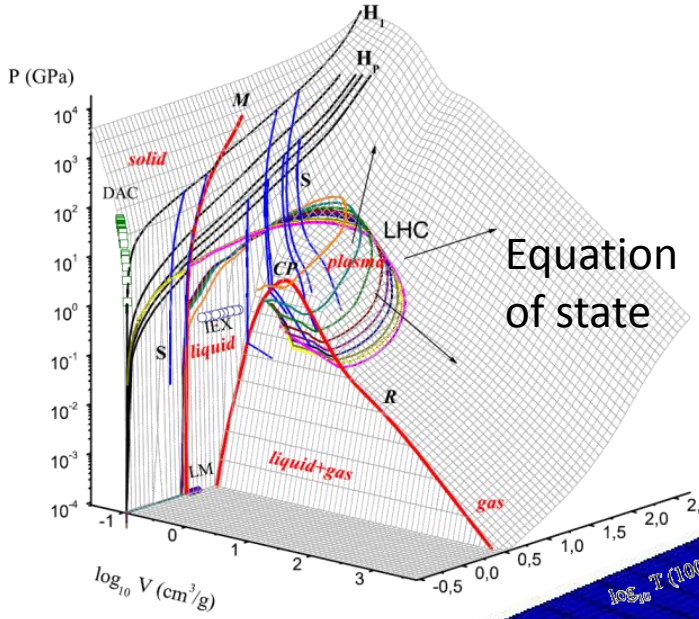
Irradiation tests with online monitoring of properties evolution (GSI)





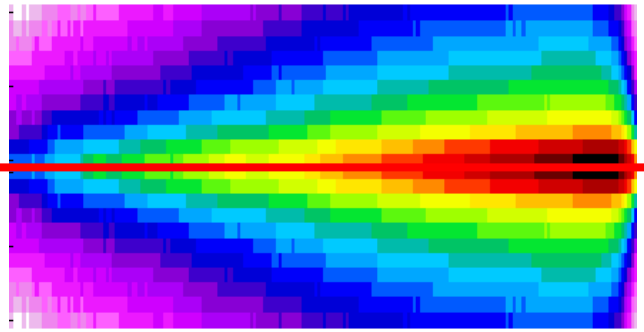
sp^3 → sp^2

Hydrodynamic simulations of experiments
EOS, spall strengths for new materials

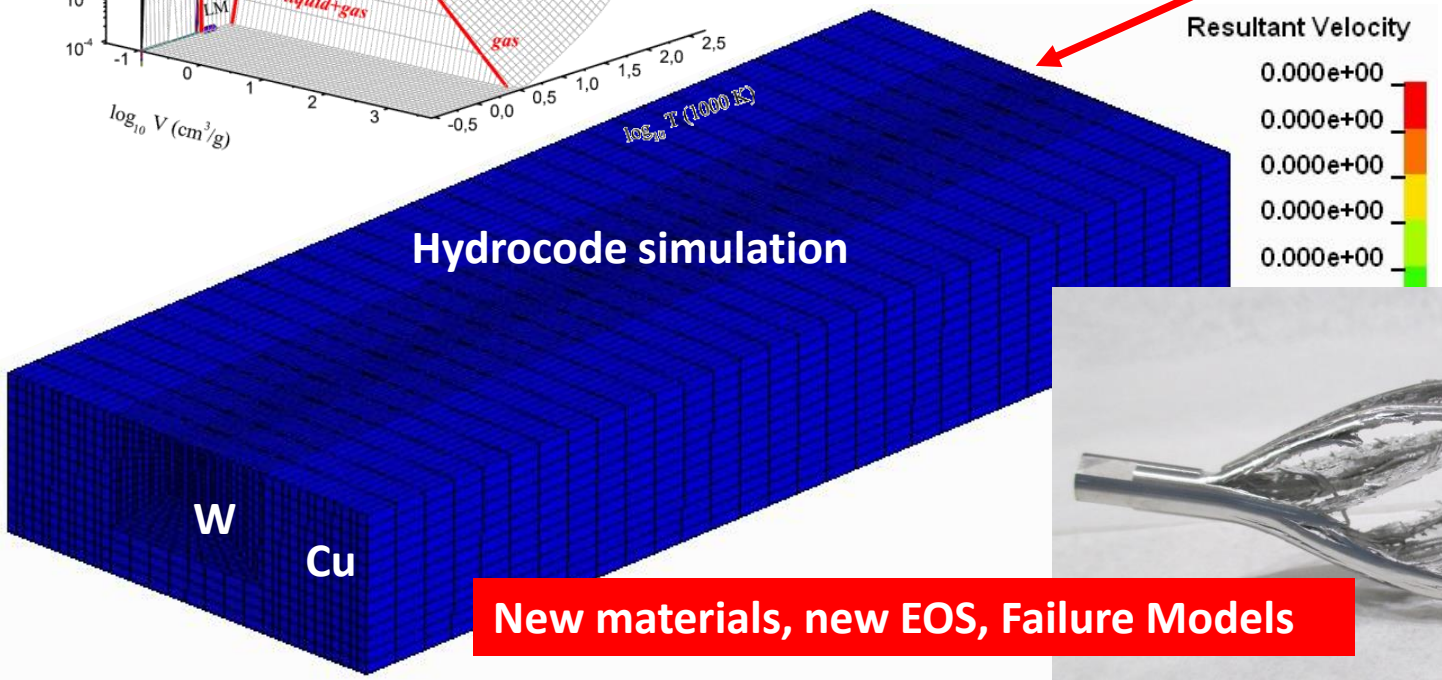


Equation of state

Energy deposition



Particle beam



New materials, new EOS, Failure Models

Deliverables

- Task 17.2) Comparative compendium of the developed materials [month 40]
- Task 17.4) Report on simulations on irradiation effects [month 44]
- Task 17.3) Irradiation test results: Beam impact on new material and composite [month 48]
- Task 14.4) Production of material samples (as large as possible for each industry to demonstrate workability) [month 24]

Milestones

- Task 17.1) Organisation of PowerMat kick-off meeting, with publication of talks on Web [month 6]
- Task 17.2) Material characterisation, with publication of results on Web [month 18-24]
- Task 17.3) Irradiation, with publication of report on web[month 27]
- Task 17.4) Irradiation effects analysis, with publication of report on web[month 36]
- Task 17.5) Report on studies, with publication of report on web, [month 46]
- Task 14.4) Prepare first samples [month 12]

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 730871.

ARIES

Thank you!