

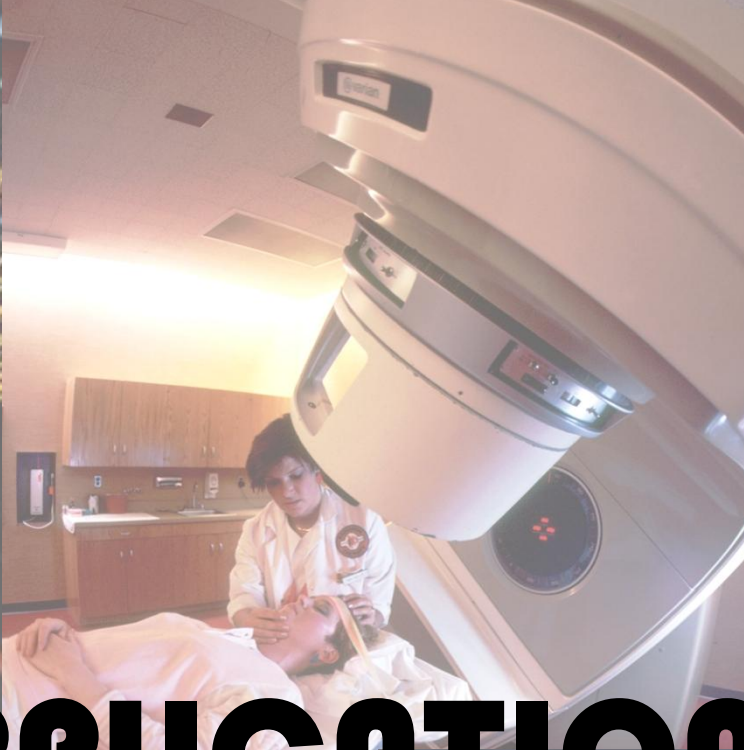
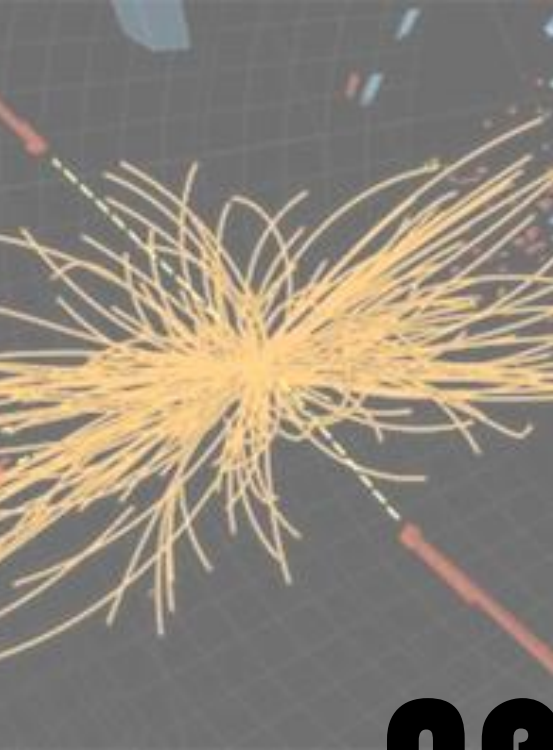
ENGINES

OF

DISCOVERY

GIOVANNA CAMPOGIANI

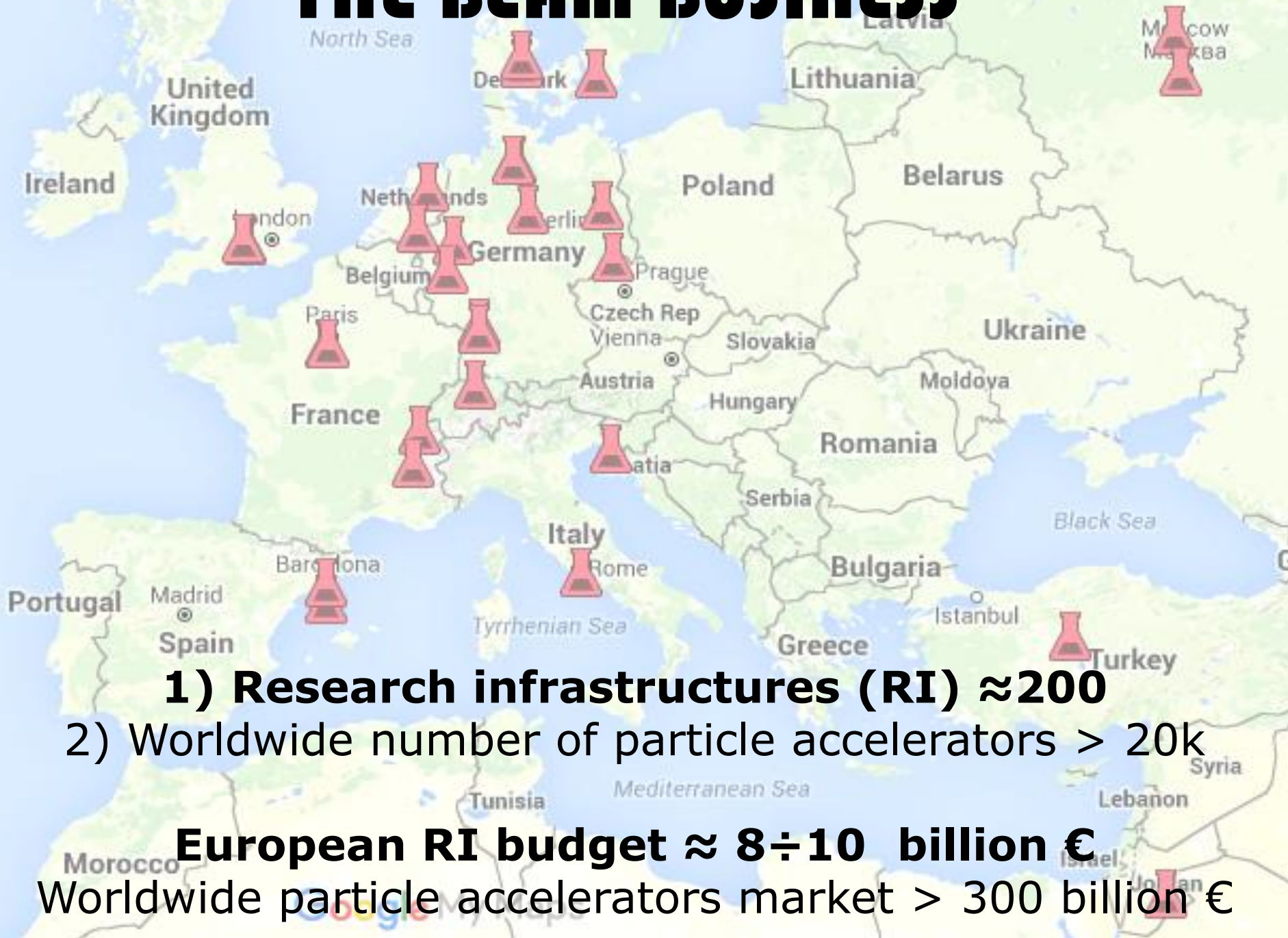
WIRE 16



APPLICATIONS



THE BEAM BUSINESS



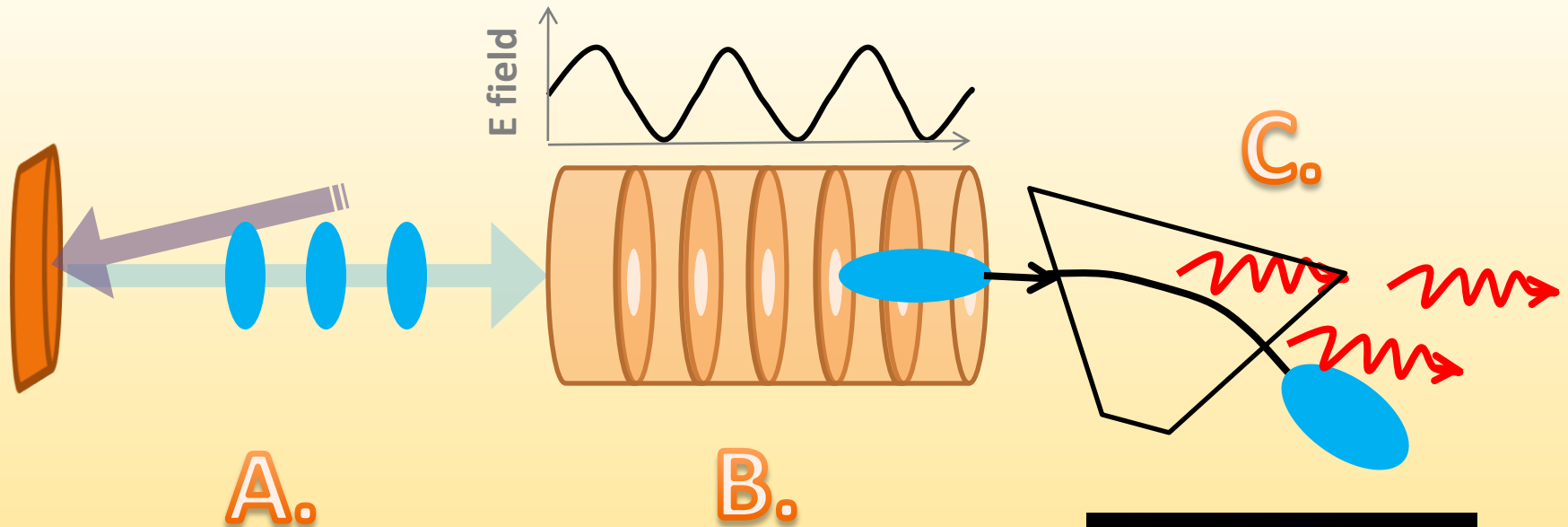
1) Research infrastructures (RI) \approx 200

2) Worldwide number of particle accelerators $>$ 20k

European RI budget \approx 8÷10 billion €

Worldwide particle accelerators market $>$ 300 billion €

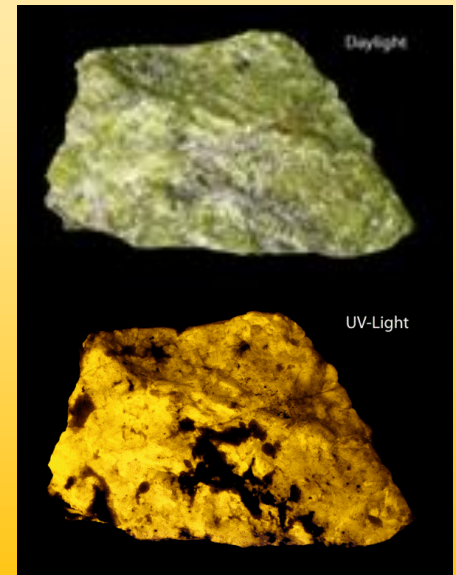
HOW IT WORKS



A. CHARGED PARTICLES SOURCE

B. ACCELERATING SECTIONS

C. INTERACTION REGIONS



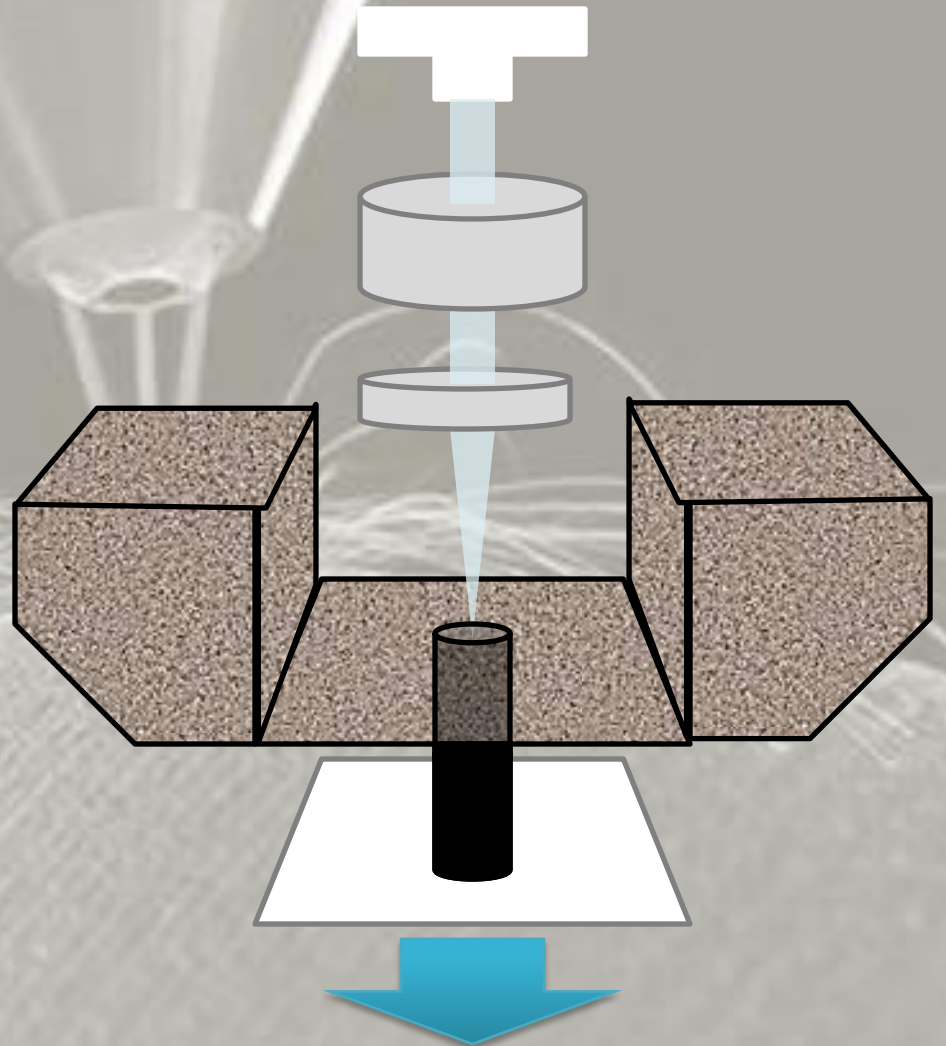
ADDITIVE MANUFACTURING

INDUSTRIAL 3D PRINTING

Electron Beam Melting (EBM)

An electron beam deposits energy on a metallic powderbed, layer by layer

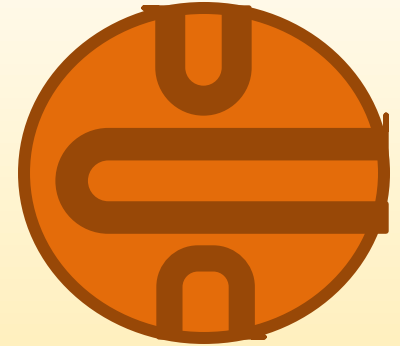
- It builds **under void**
→ **minimal contamination of materials**
- optimal for high reflectivity materials such as copper and other metals



PHYSICS-BASED DESIGN

Geometrie ottimizzate per

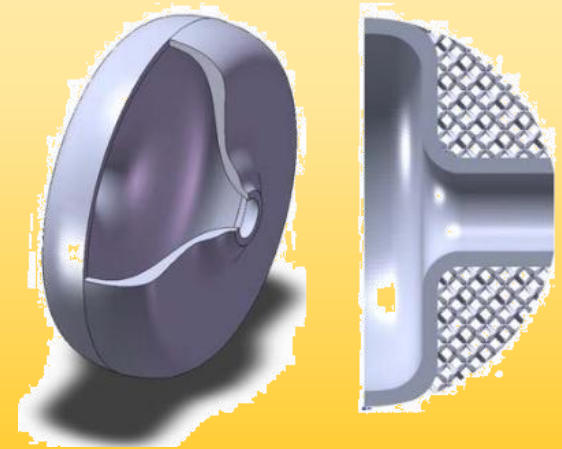
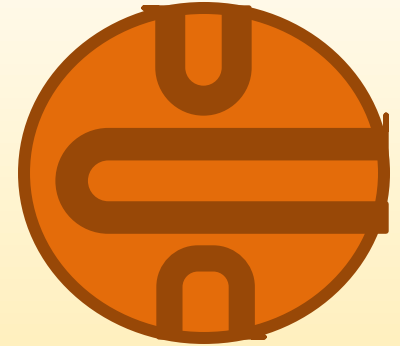
- Thermal management
- Stress management
- Maggiori gradienti acceleranti con
 - a) Cristalli fotonici metallici, dielettrici o misti
 - b) Capillari per accelerazione al plasma



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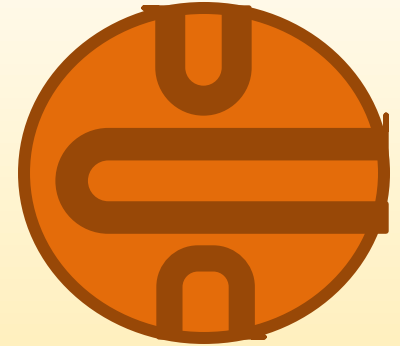
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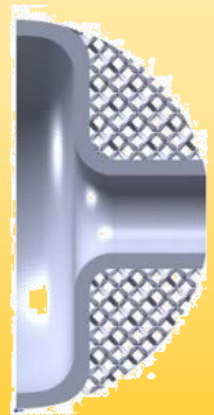
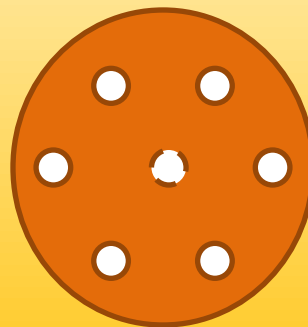
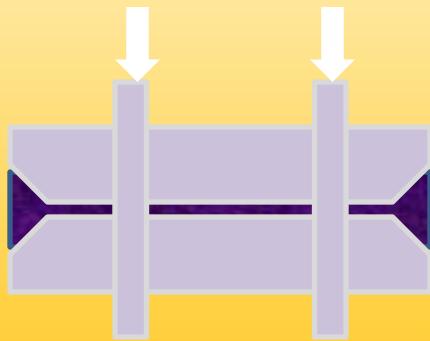
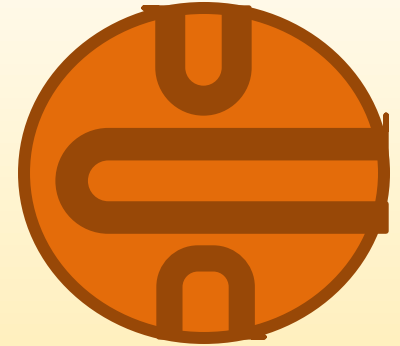
- Thermal management
- Stress management
- Cheaper and more compact acceleration
 - a) **Photonics crystals:** metallic, dielectric or a mix
 - b) **Capillaries** for novel acceleration schemes



PHYSICS-BASED DESIGN

Geometrie ottimizzate per

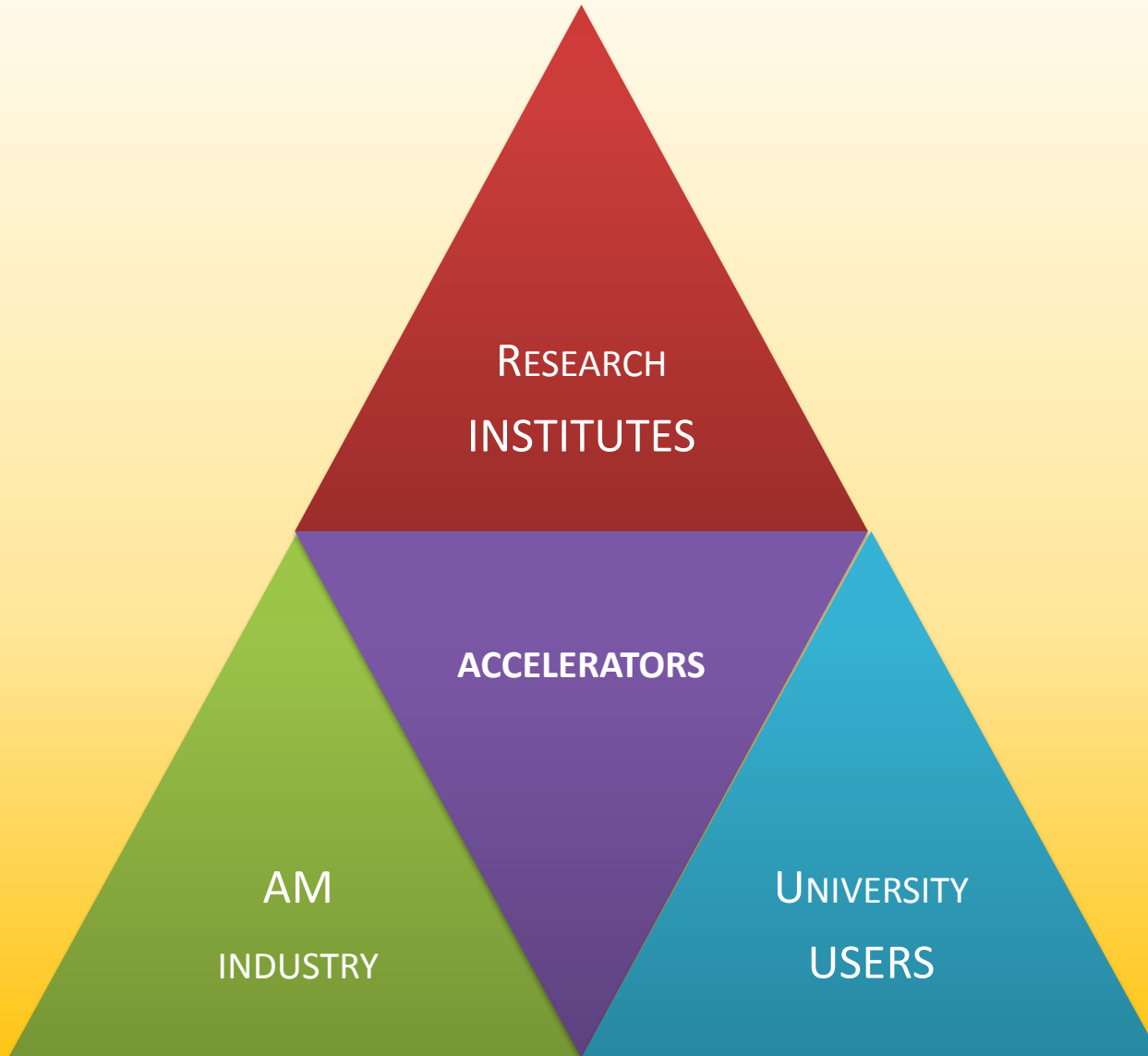
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OTHER SINERGIES

- **3D printed detectors**
- Substitution of **parts on the spot**
- **Rapid prototyping** of elements and components
- Interaction with **open source and makers communities**

CONCLUSION



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WIRE 16

THANK YOU

A photograph of a particle accelerator tunnel. In the foreground, a large, polished copper pipe runs horizontally. The background shows a complex network of metal structures, pipes, and electrical equipment, illuminated by blue and yellow lights. The overall scene is industrial and technical.