PHYSICS

Prof Dr Carsten P Welsch, University of Liverpool

Overview

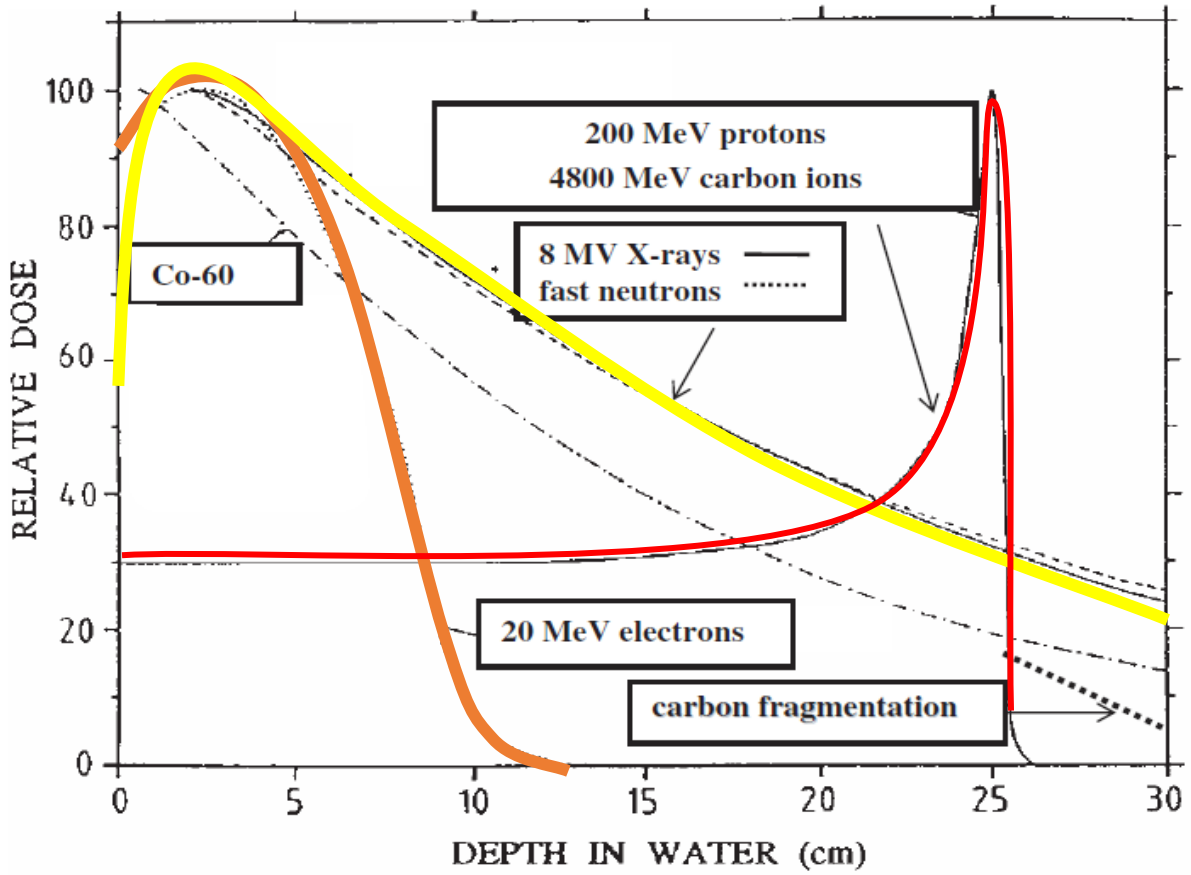
Hollywood Physics

- Particle accelerators
- Superheroes
- New Technologies
- Antimatter


THE FLASH

Proton beams

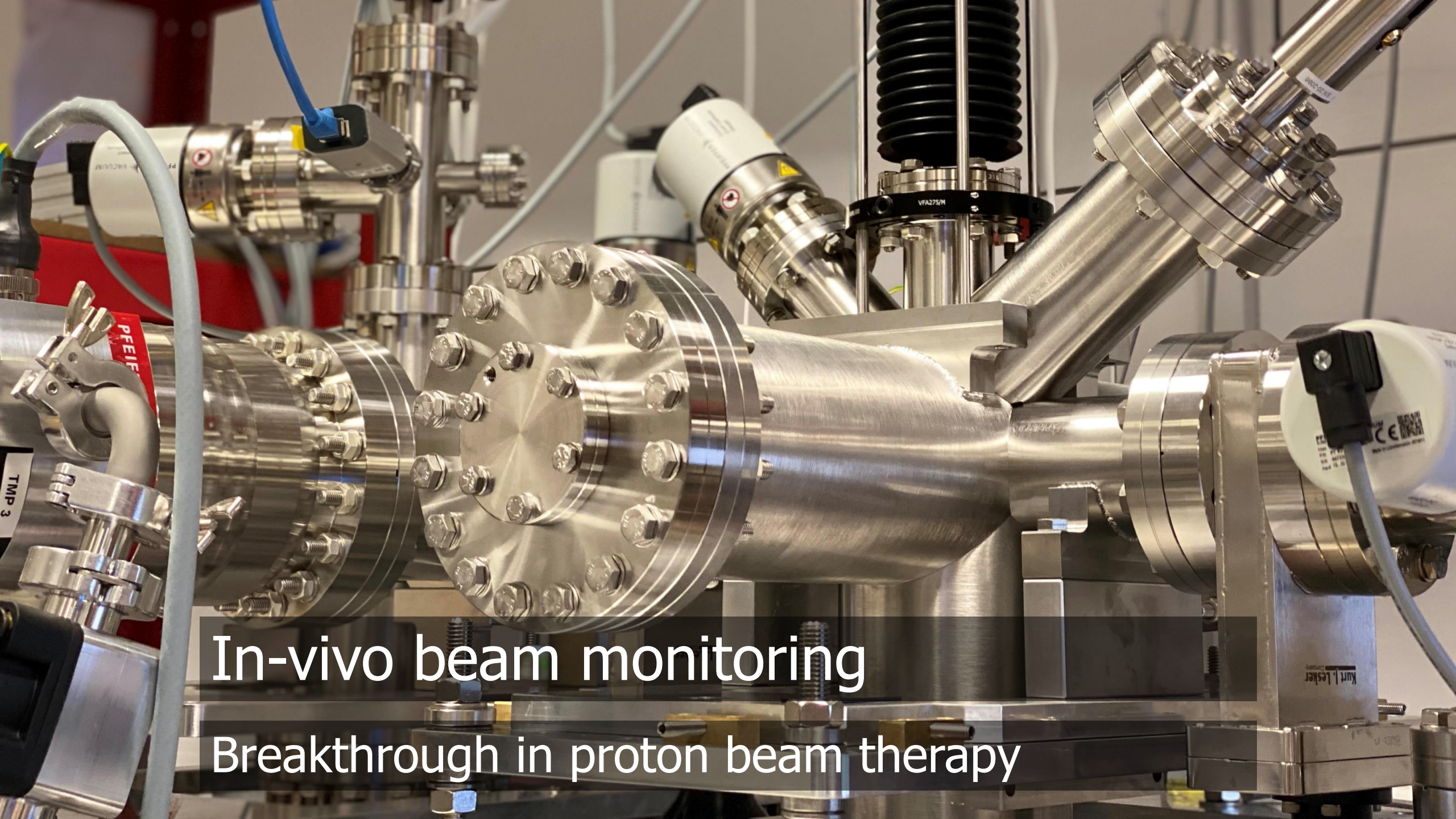
Can help beating cancer sooner



Ion Beam Therapy

Beating cancer sooner

Funded by the
European Union



In-vivo beam monitoring

Breakthrough in proton beam therapy

Can we create new elements?

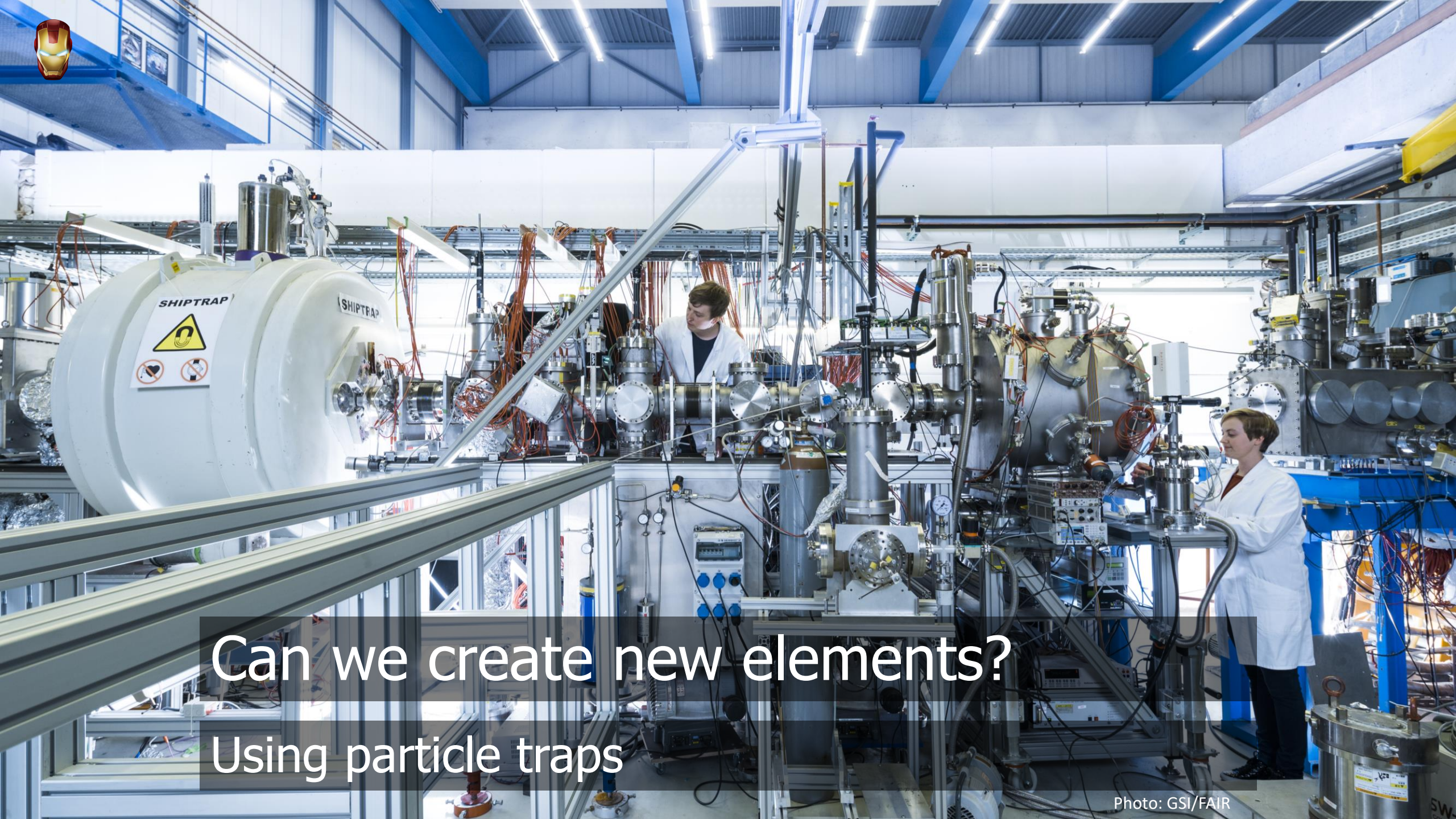
Facility for Antiproton and Ion Research (FAIR)

Photo: GSI/FAIR

Can we create new elements?

Super heavy element R&D

Photo: GSI/FAIR



Can we create new elements?

Using particle traps

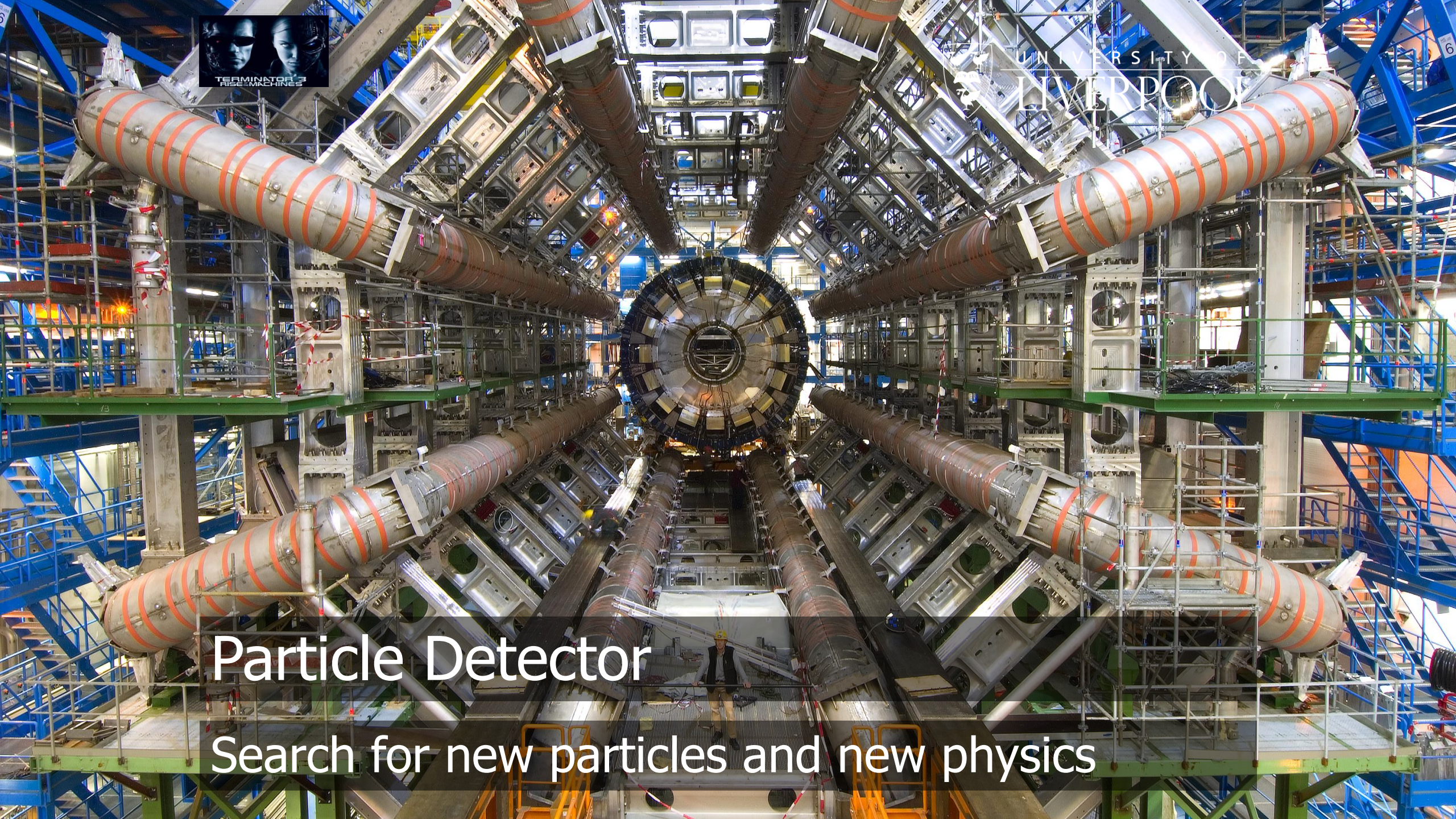
Photo: GSI/FAIR


TERMINATOR 3
RISE OF THE MACHINES

How to capture a T-X cyborg?

High field magnets

Photo: Terminator 3


TERMINATOR 3
RISE OF THE MACHINES
UNIVERSITY OF
LIVERPOOL
Particle Detector
Search for new particles and new physics

Grid computing

The world connects to understand new physics

Photo: CERN

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Science and Technology Facilities Council

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LIVERPOOL JOHN MOORES UNIVERSITY

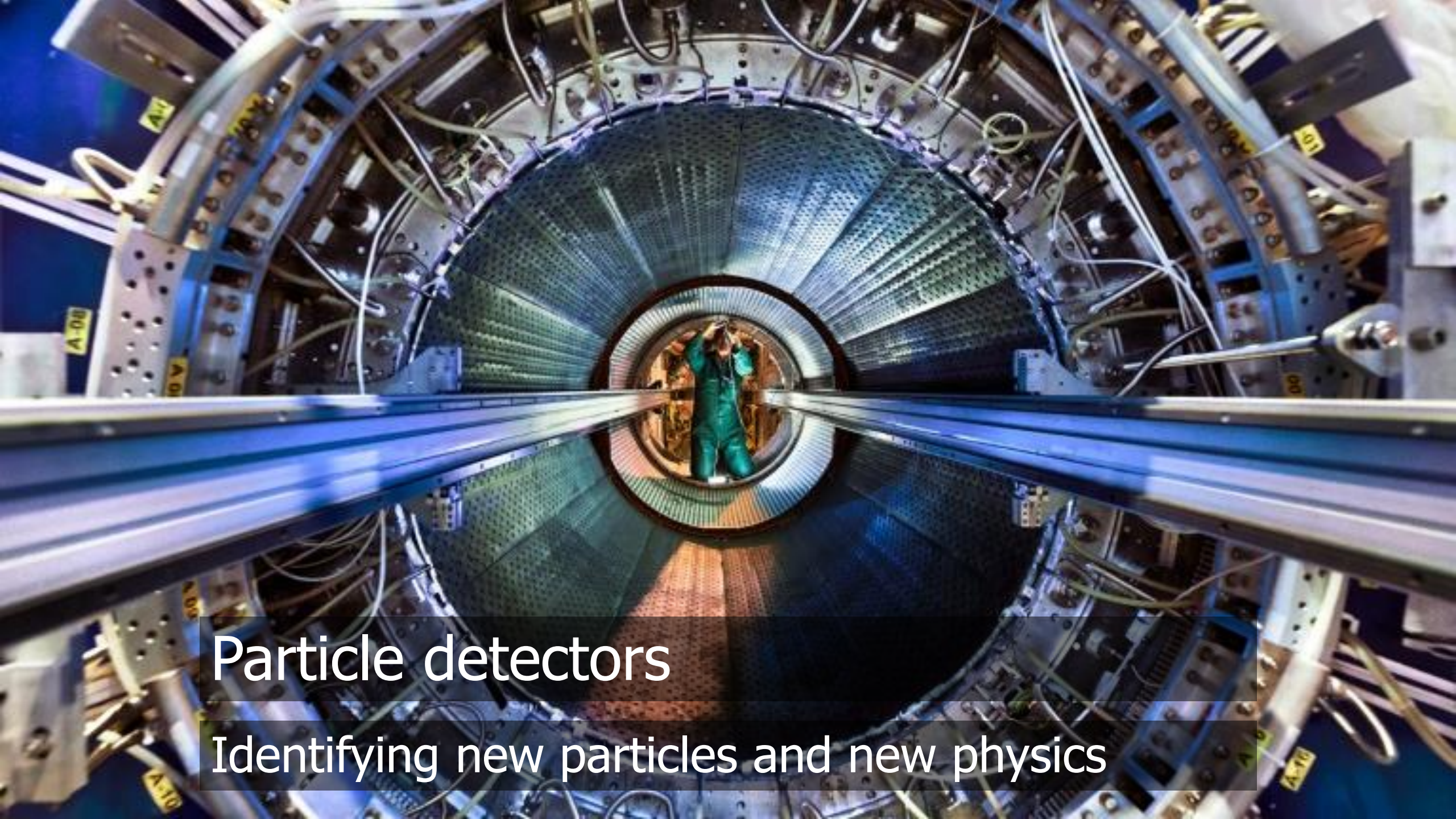

The Science of
STRANGER
THINGS

Stranger Things

Set in 1980s Hawkins, Indiana

Parallel dimensions

Opening a portal to other worlds



Particle detectors

Identifying new particles and new physics

POPCRUSH

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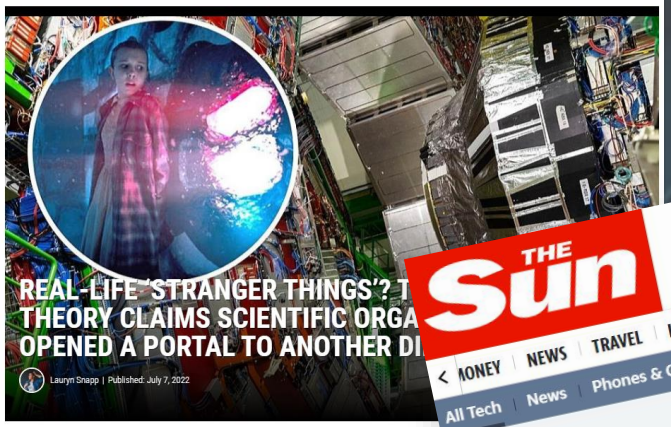

REAL-LIFE 'STRANGER THINGS'? T
THEORY CLAIMS SCIENTIFIC ORGA
OPENED A PORTAL TO ANOTHER DI

Lauryn Snapp | Published: July 7, 2022

Entertainment

NEW YORK POST

MAY 17, 2023

ENTERTAINMENT

'Stra

hings' fans make wacky
n Collider is portal to the

July 6, 2022 | 5:50pm | Updated

THE Sun

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Tech

STRANGER DANGER CERN's July 5 experiment linked to Stranger Things and 'upside down' by conspiracy theorists

Tyler Baum
Published: 17:19, 4 Jul 2022 | Updated: 0:15, 5 Jul 2022

The European

Wednesday, May 17, 2023

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International › Pictures taken above the Large Hadron Collider have stoked fears. Are new...

Pictures taken above the Large Hadron Co
have stoked fears. Are new portals opening

Coming to a ground near you Courtesy Wikicommons

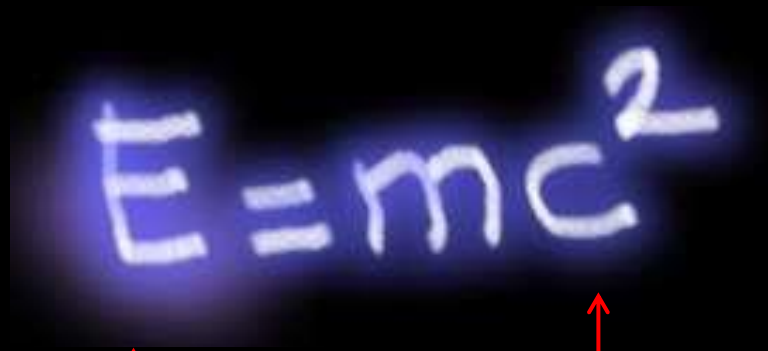
The Large Hadron Collider is apparently opening a portal to hell

Swallow me, hole

Global n

Opening a portal to other worlds


Telekinesis
Unknown forces?



Energy

Speed of light

Wave equation of spin ½ particle

Remember your physics?

Famous equations

ACCELERATORS
VALIDATING
ANTIMATTER
PHYSICS

Dr Lee [illegible]
Liverpool
[illegible], UK

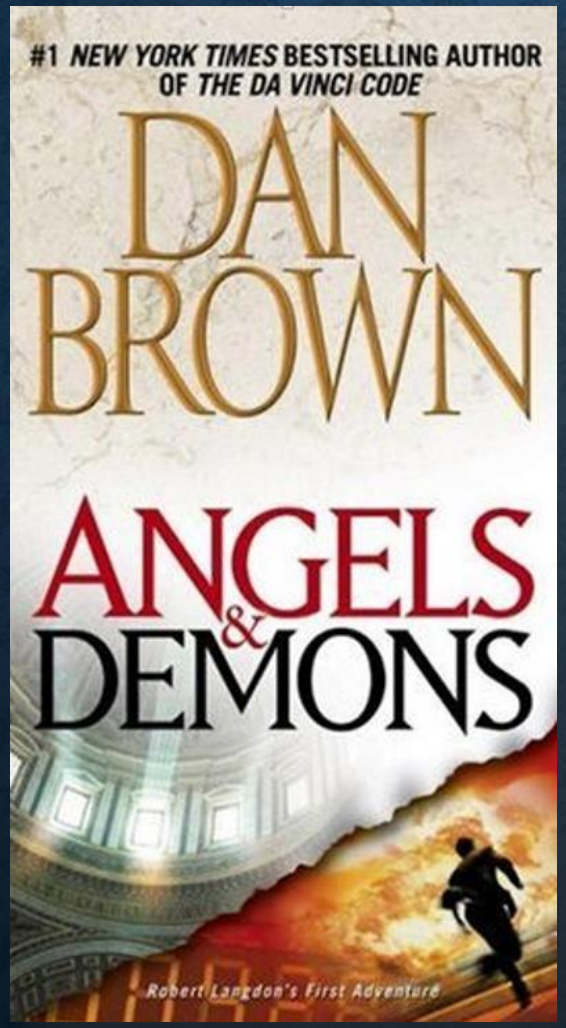
Funded by the
European Union

Antimatter matters!

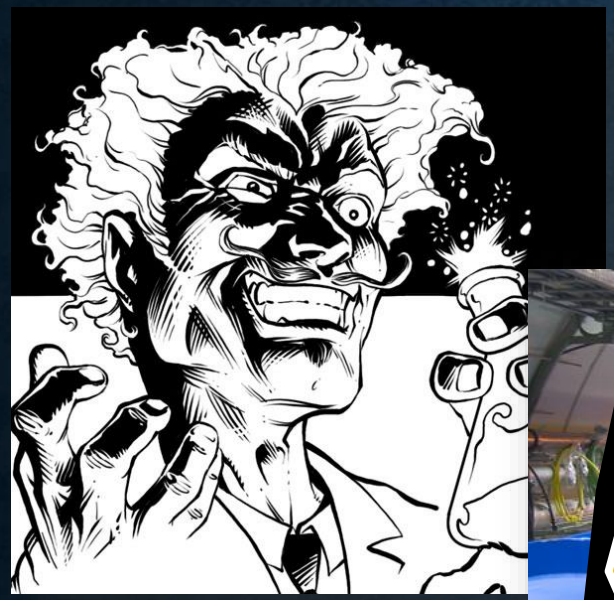
AVA helps us understand nature in all its facets

Photo: CERN

BUILDING AN ANTIMATTER BOMB?



DAN BROWN'S "ANGELS & DEMONS"

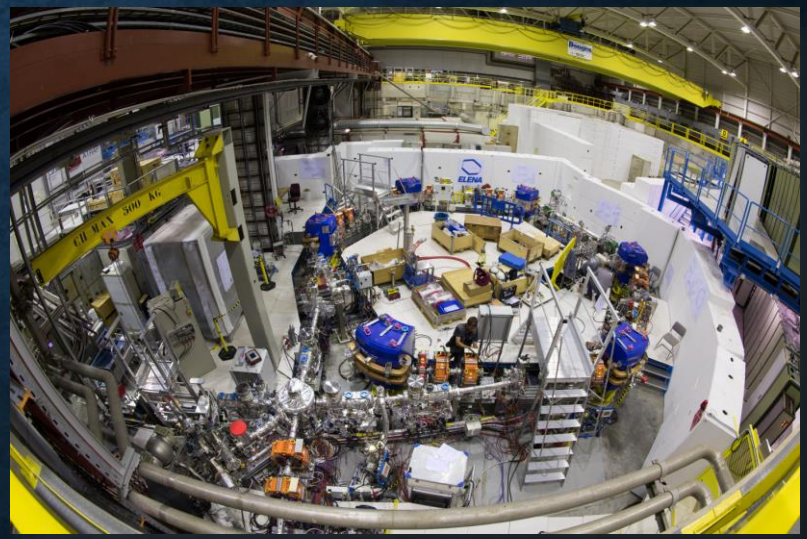


Does the LHC exist @ CERN ?

Yes. Most powerful accelerator ever built.
In operation since 2009.

Is the LHC used for the production of antimatter ?

No.



But:

Antiproton Decelerator.

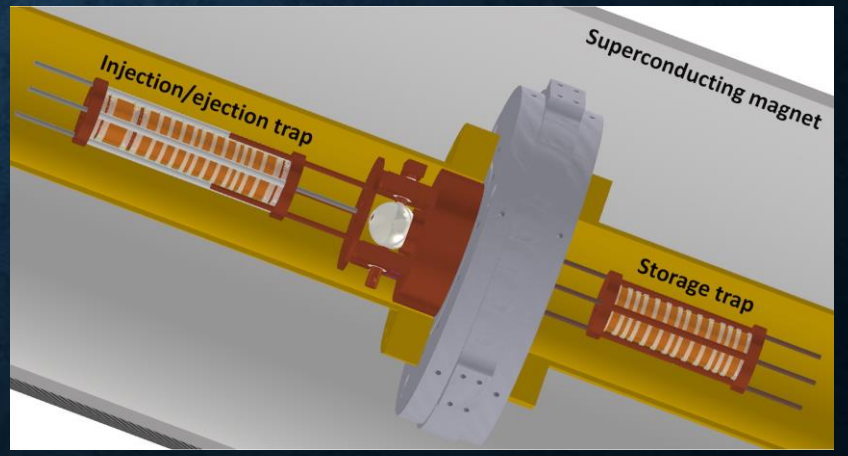
Can we transport antimatter to the Vatican?

No.

Well,…not yet.

BASE - STEP

New project to better understand antimatter.



What's needed to build an antimatter bomb ?

Let's do a little Experiment !

WHAT, IF MATTER MEETS ANTIMATTER?

Anakin

Weight each:

~ 100 k

Darth Vader

Don't invite them together to your party !

Mass that disappears

,000 kilowatt-hours !

ut of 500 (!) nuclear power plants

Energy from 4200 Megatons of TNT

A THREAT ?

$$\text{Efficiency} = \frac{\text{Energy released}}{\text{Mass of fuel used}}$$

Annihilation:	**100.0 %**
Nuclear fission:	**0.1 %**
Nuclear fusion:	**some 0.1 %**
Chemical fuel:	**0.000 000 3 %**

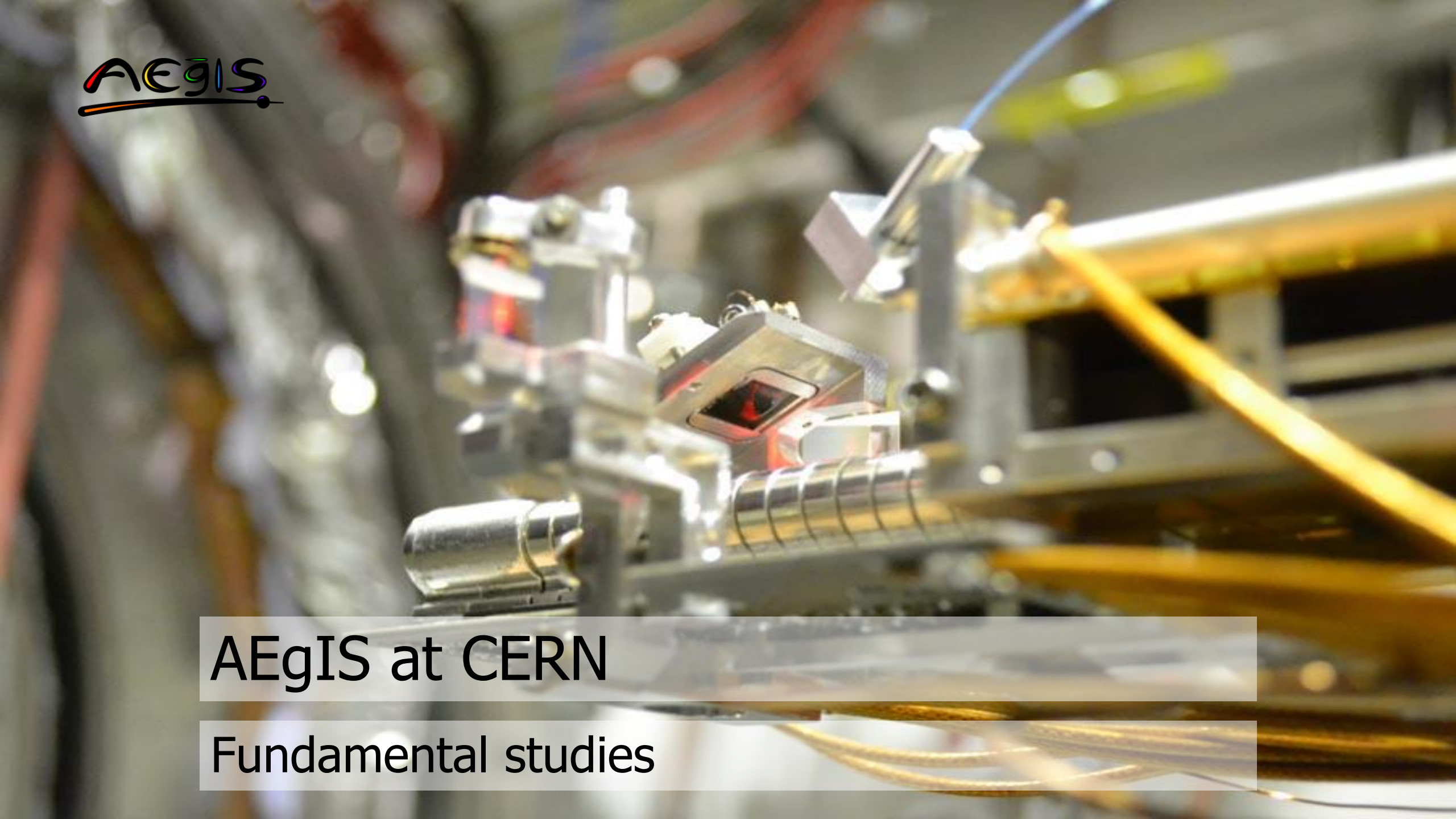
Annihilation: 1000 x more "bang for the gram"

BLOW UP THE VATICAN ???

Missing 'detail':

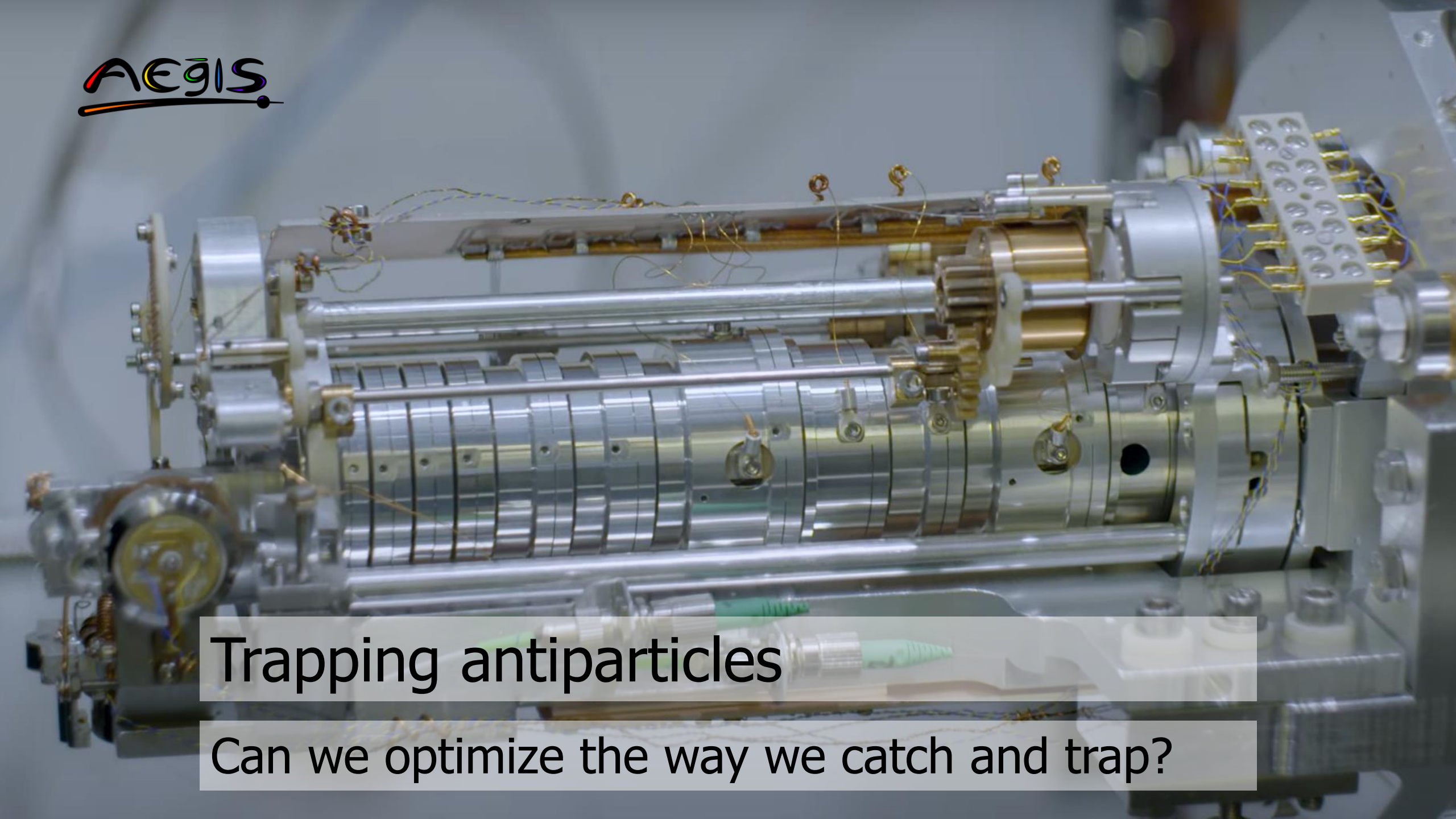
If all the antiprotons we have made in the history of the world were annihilated at the same time….

Not enough energy to boil a pot of tea !!!



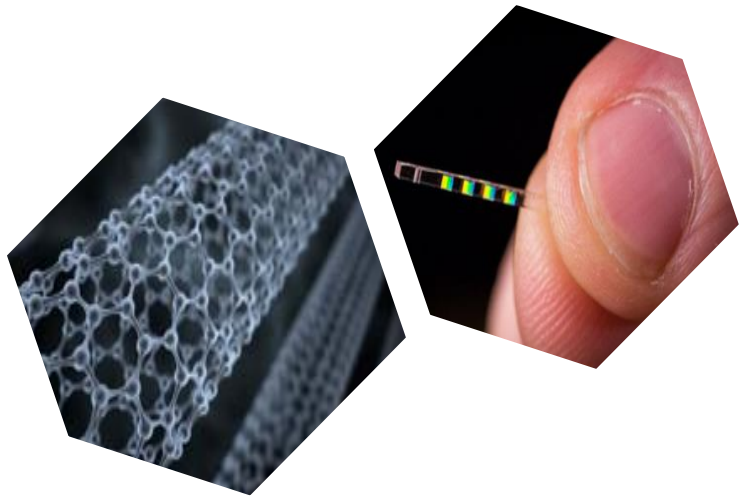
AEgIS at CERN

Fundamental studies



Trapping antiparticles

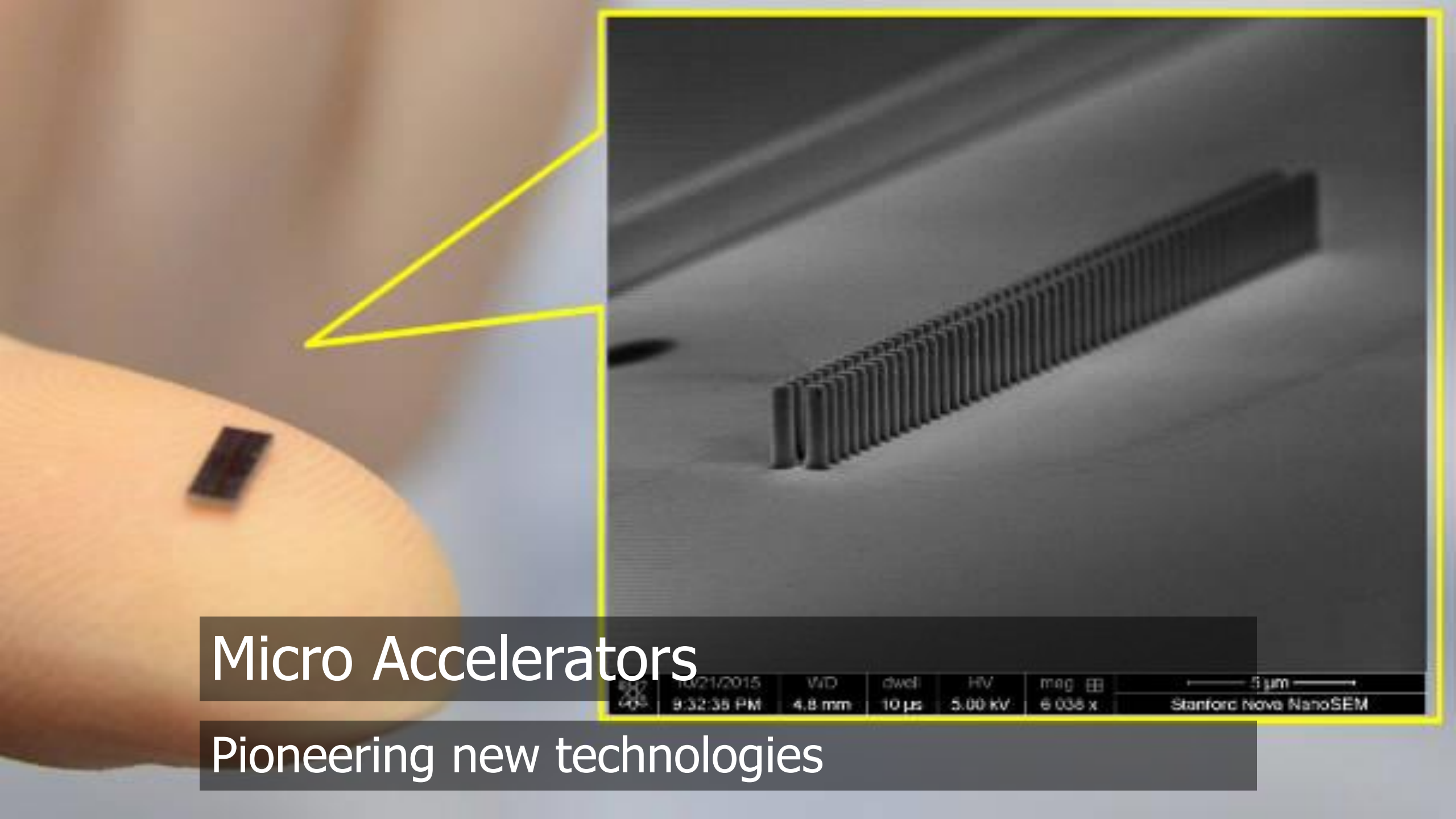
Can we optimize the way we catch and trap?



Using high gradients

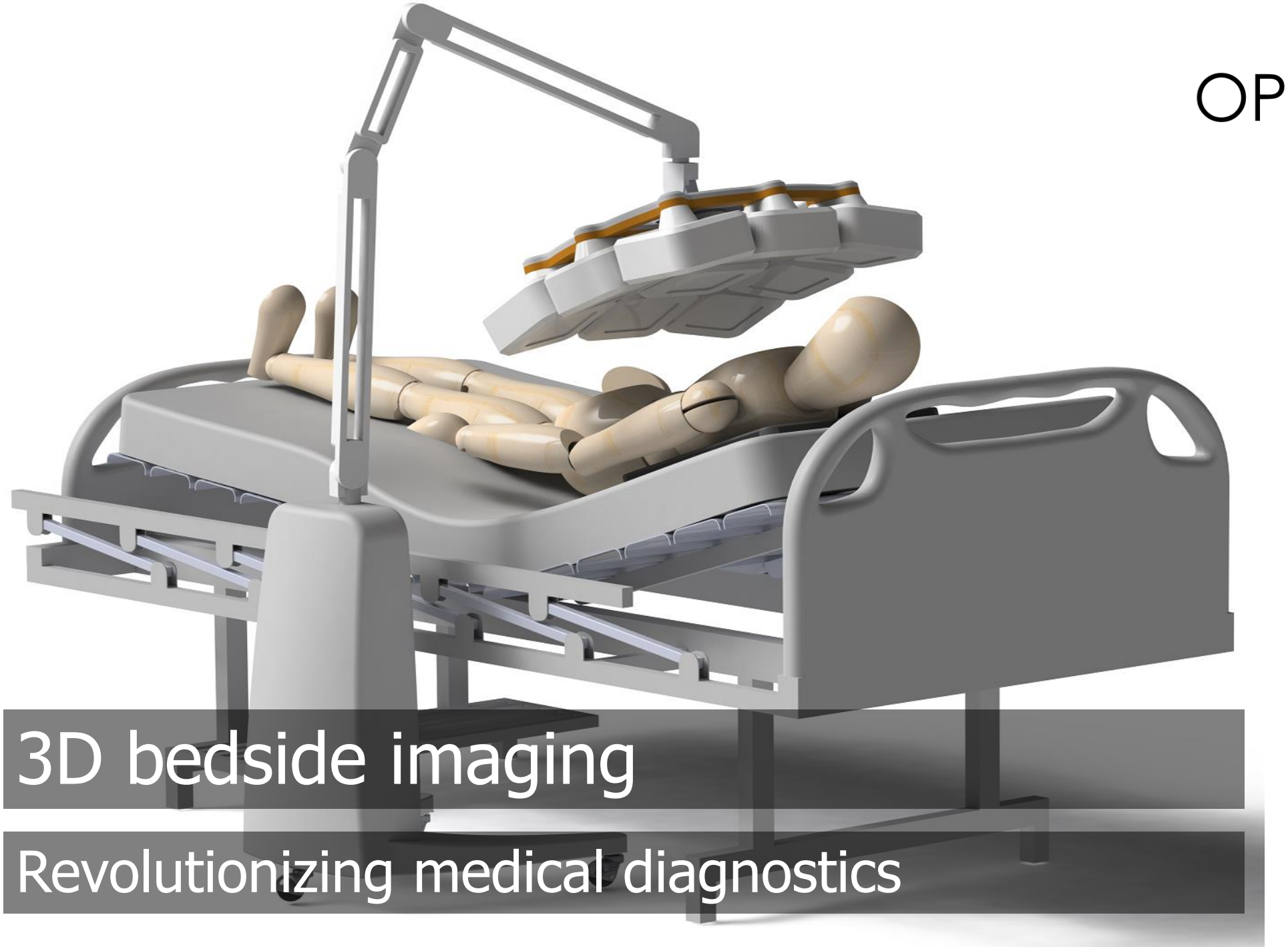
Shrinking the size

Enabling new applications



Micro Accelerators

Pioneering new technologies



3D bedside imaging

Revolutionizing medical diagnostics

Accelerator Research

for sCIence and soCIety

EuPRAXIA

Funded by the
European Union