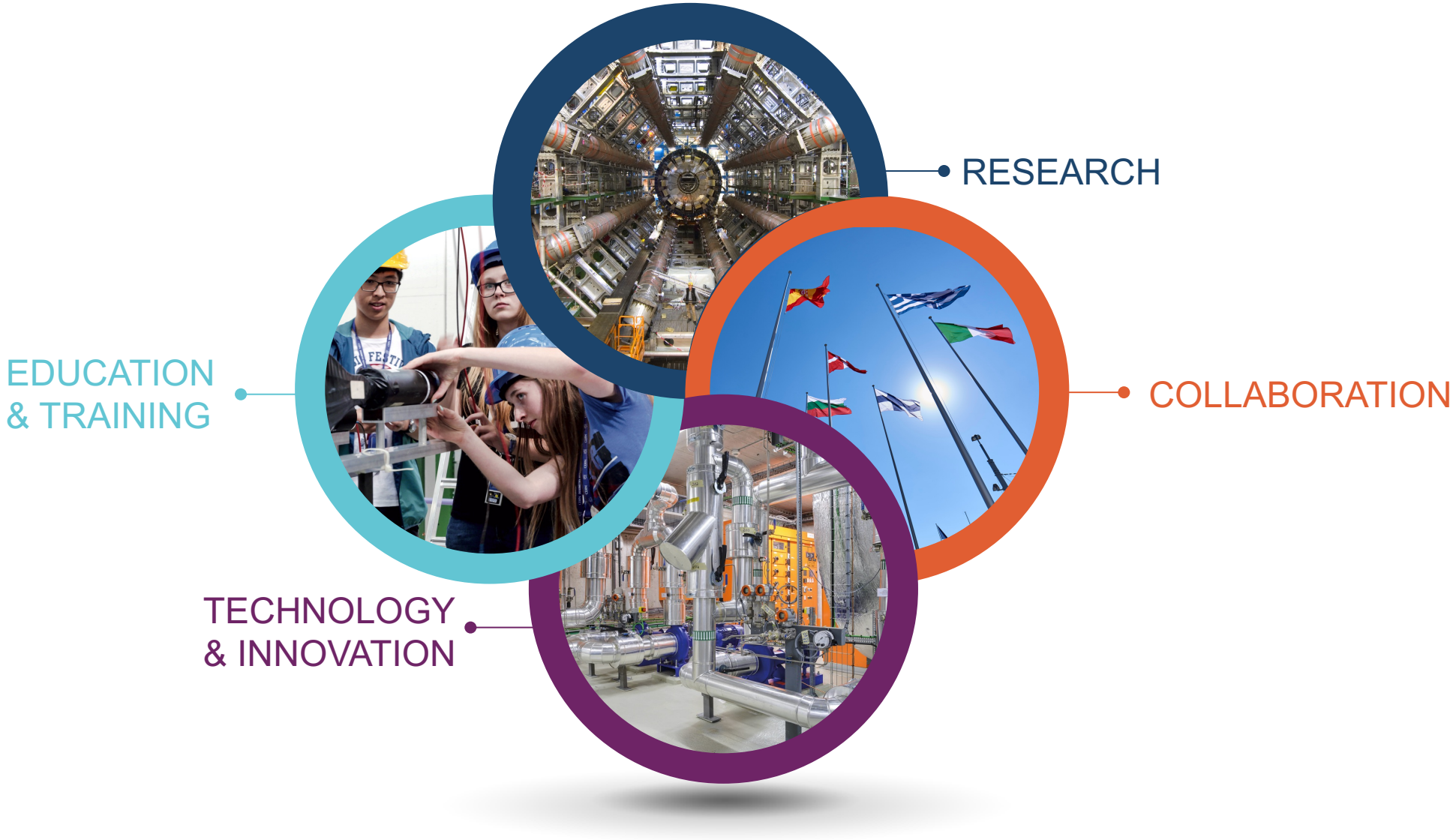
Accelerating Innovation

Knowledge Transfer: from CERN to Society

Dr Ana Rita Pinho
Knowledge Transfer Officer, Business Development & Entrepreneurship, CERN

Four pillars underpin CERN's mission

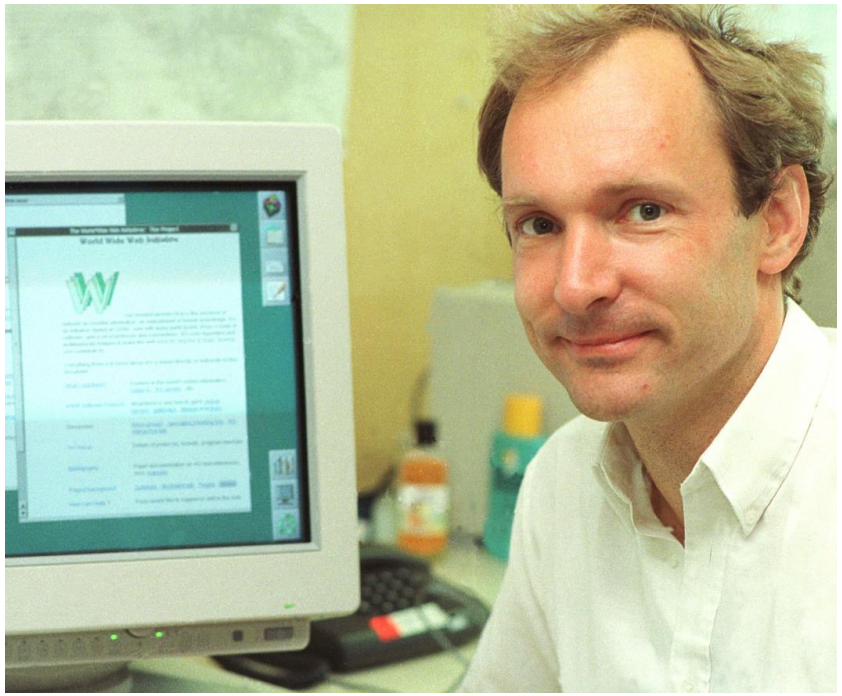


TECHNOLOGY & INNOVATION

KT's Mission

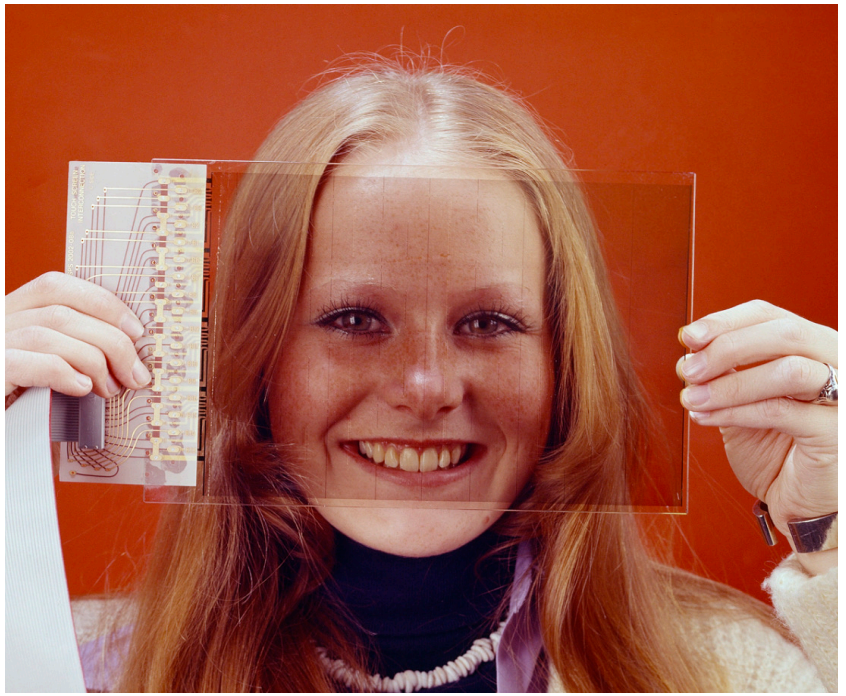

Maximise the technological and knowledge return to society, in particular through Member States industry
Promote CERN as a centre of excellence for technology and innovation
Demonstrate the importance and impact of fundamental research investments

Some historical examples



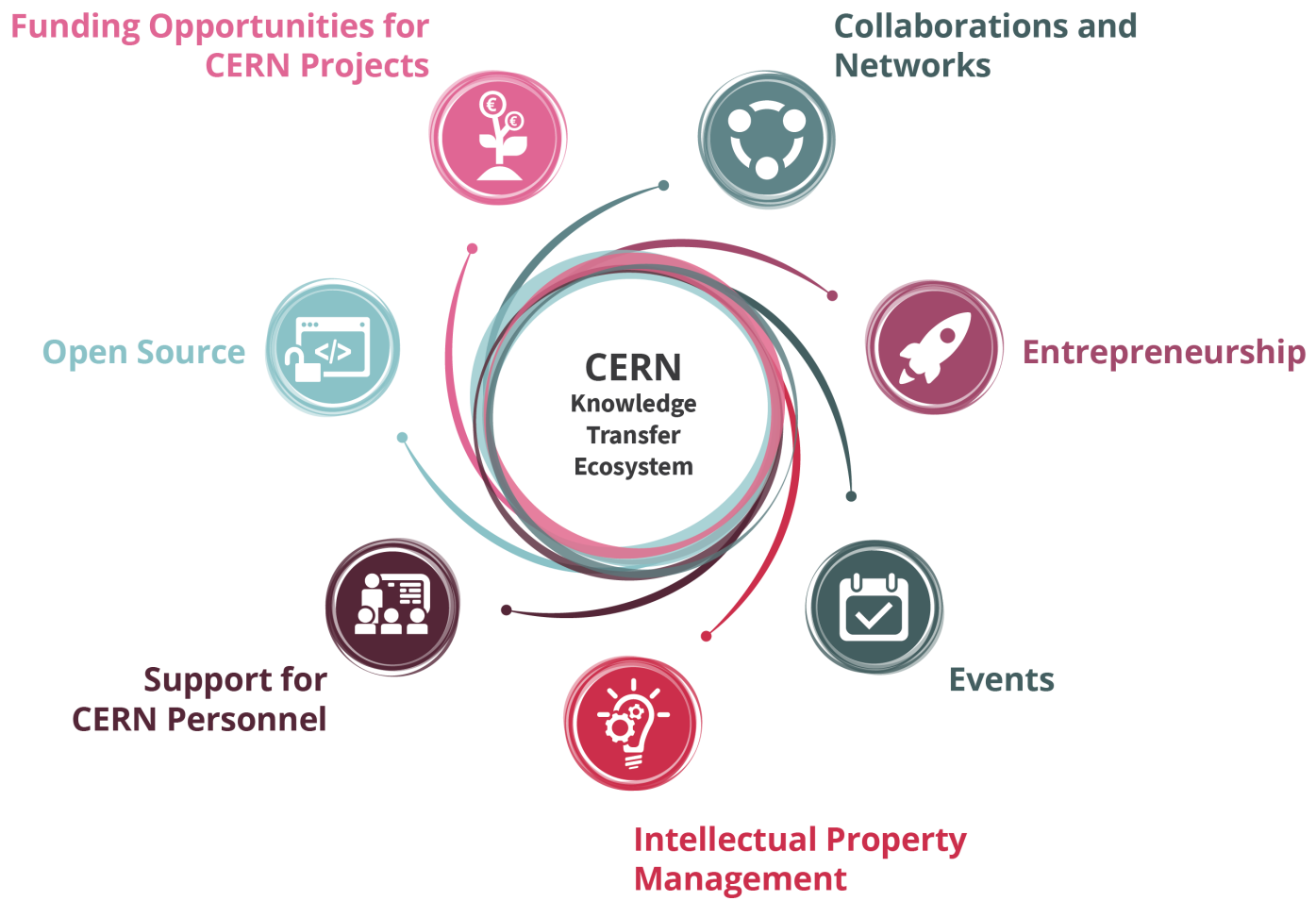
The **World Wide Web** born at CERN, later used by everyone…

Trackball with optical encoders, used later in the mouse of a PC…



The first **touchscreen** to exist was at CERN, later used everywhere…

Our toolbox to accelerate innovation



Some Highlights from 2022

INTELLECTUAL PROPERTY AND LICENSING

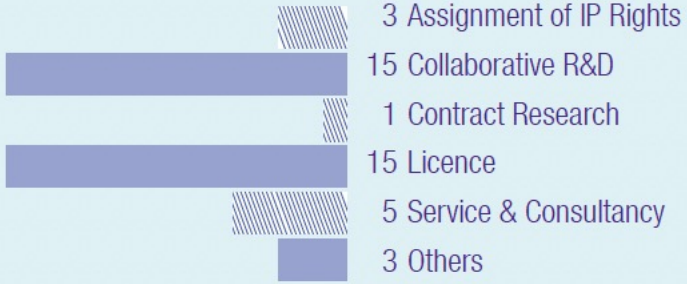
11

New technologies disclosed internally

42

Knowledge Transfer **contracts signed**

Contracts by Type



Contracts by Partner

FUNDING OPPORTUNITIES FOR CERN PERSONNEL

12

Projects funded by the Knowledge Transfer fund and Medical Applications budget

CIPEA CERN Innovation Programme on Environmental Applications

Of which **7** projects have a strong environmental focus thanks to the **CERN Innovation Programme on Environmental Applications (CIPEA)**

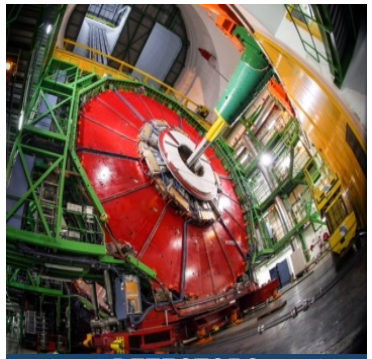
1.47 MCHF

Total funding allocated to projects taking CERN tech into society

50kCHF - 224kCHF

Range of funding received per project


ACCELERATORS


DETECTORS


COMPUTING

Hybrid strategy
tech push & market pull

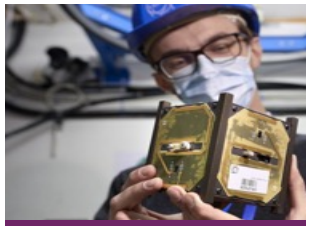
- Mobilize tech experts
- Create tech and IP dossiers
- Scout for technologies

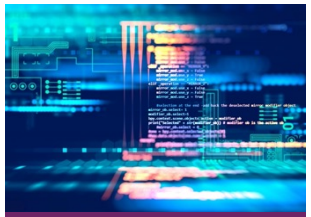
- Mobilize innovation partners
- Create value propositions
- Search unmet needs


HEALTHCARE

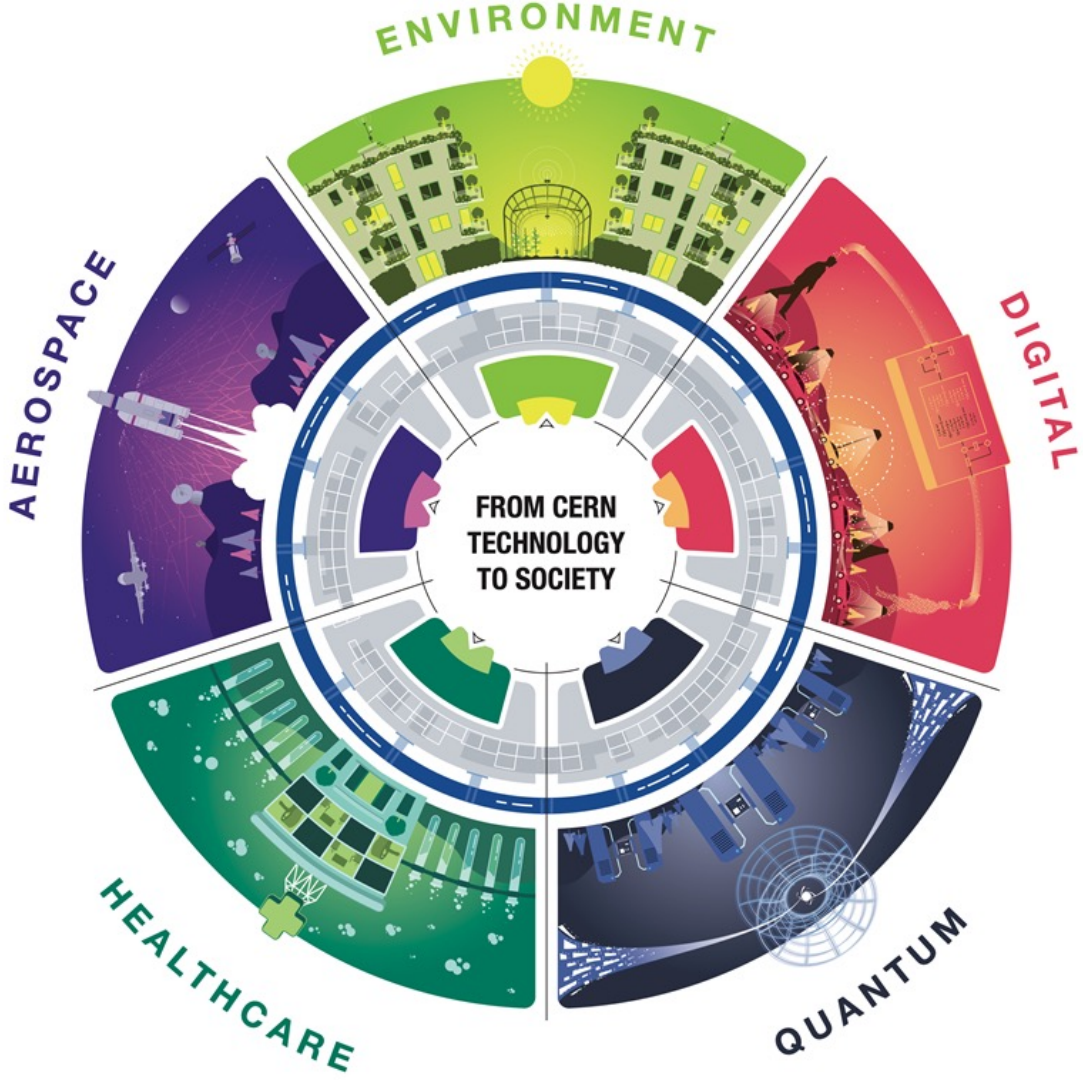

ENVIRONMENT


DIGITAL

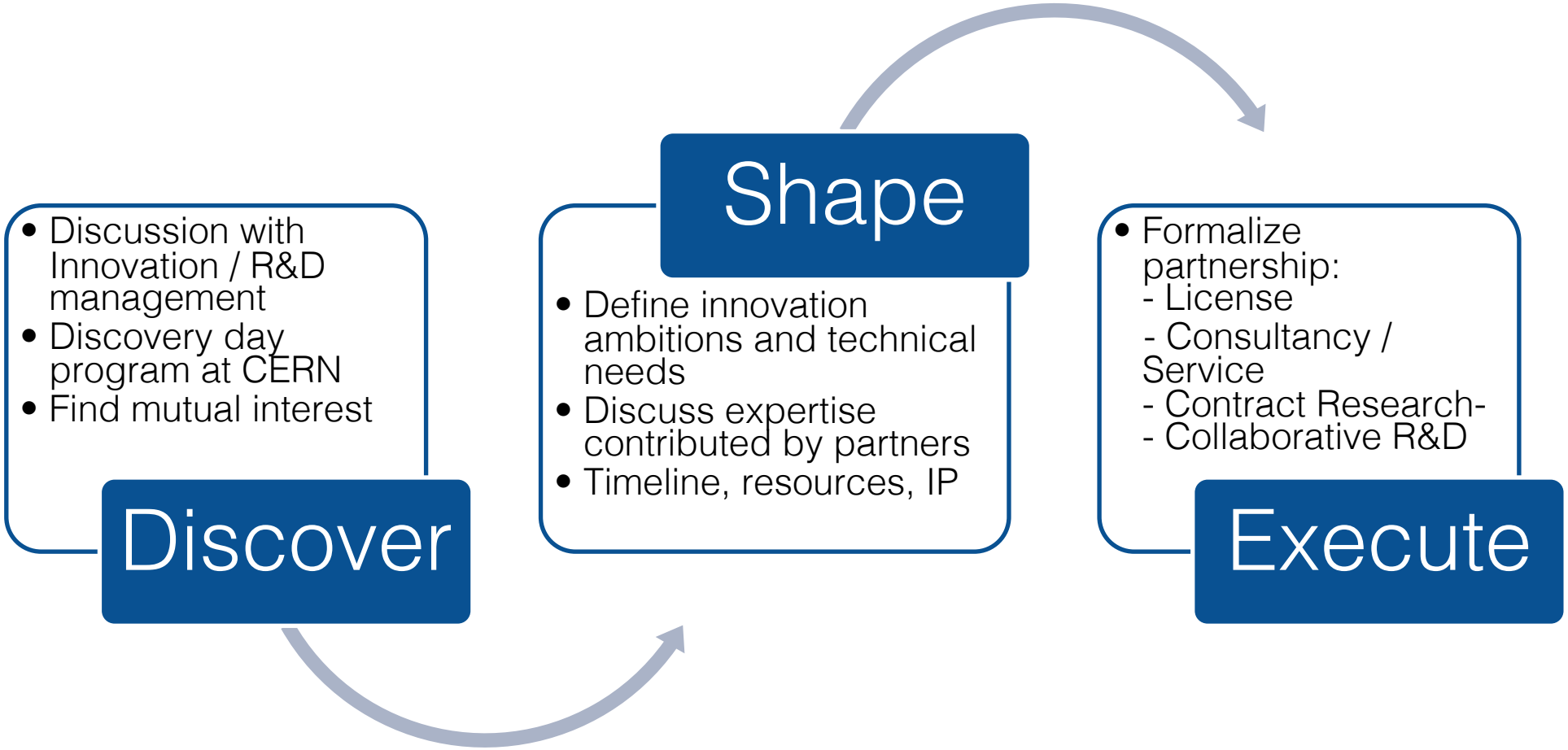

AEROSPACE


QUANTUM

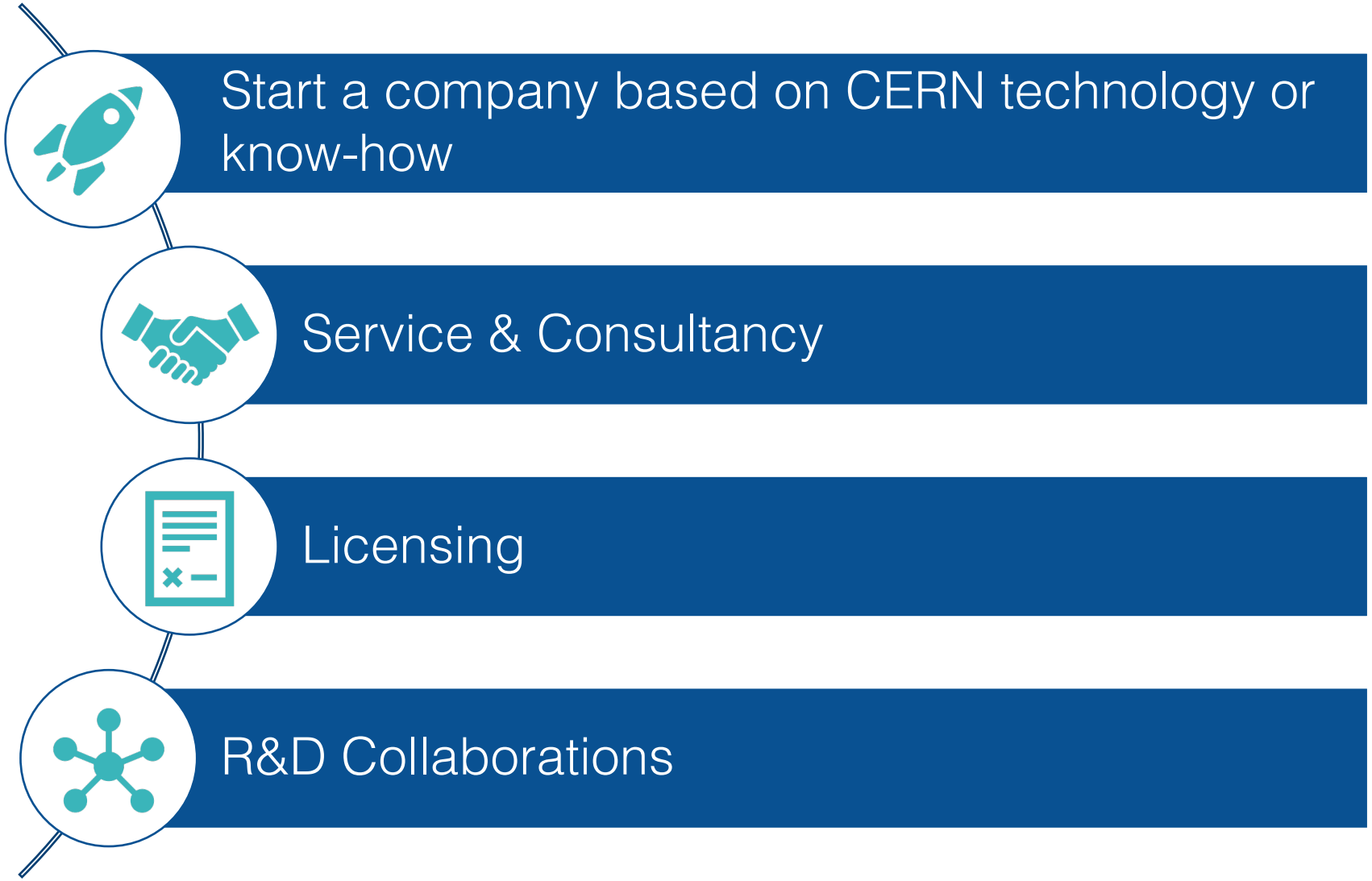
CERN as trusted non-commercial innovation partner



Shaping innovation partnerships



How to collaborate with CERN



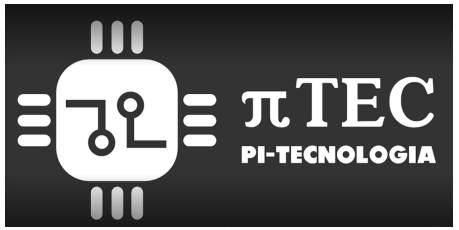
The Medipix Collaborations

Almost three decades of turning technology into applications within various domains

Medipix in a nutshell

- A family of pixel detector read-out chips developed by the Medipix Collaborations.
- Hybrid pixel detectors were developed to respond to a need at the LHC: particle tracking in high rate environments.
- Single particle counting detectors have been widely used in education, space science, materials analysis and X-ray applications.
- <u>Collaborations:</u>
  - Medipix2: 17 members
  - Medipix3: 23 members
  - Medipix4: 19 members

+10 Medipix/Timepix licencees



Aerospace Applications

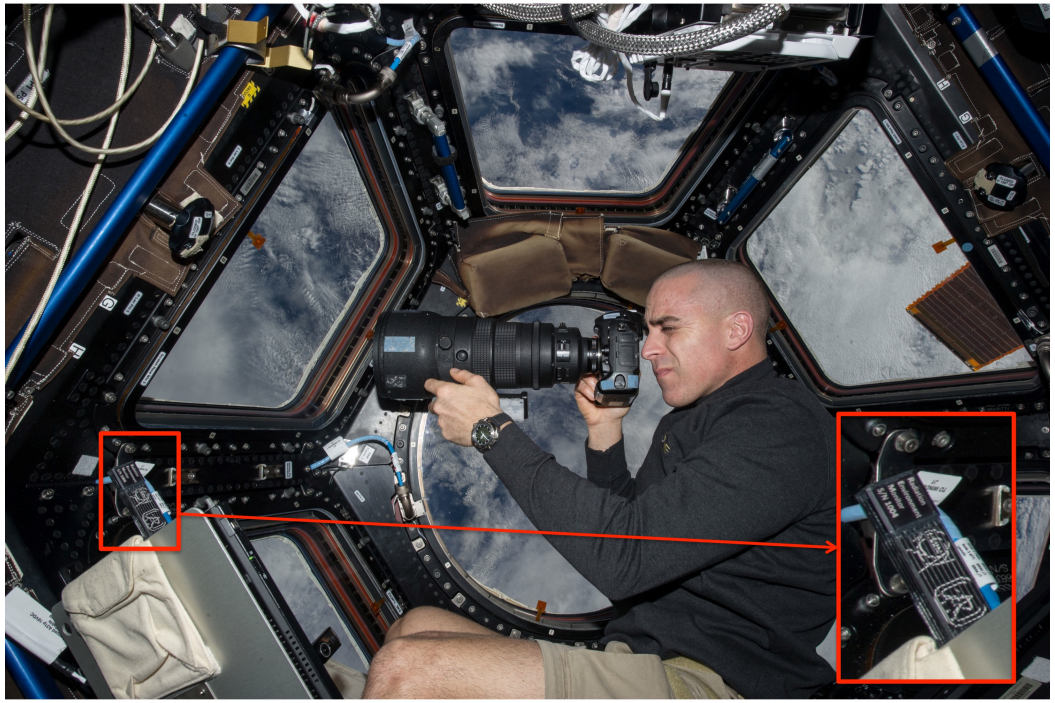


Image of the astronaut Chris Cassidy working near the Timepix USB on the International Space Station (Courtesy of NASA, photo ref. no. iss036e006175)

Image: NASA

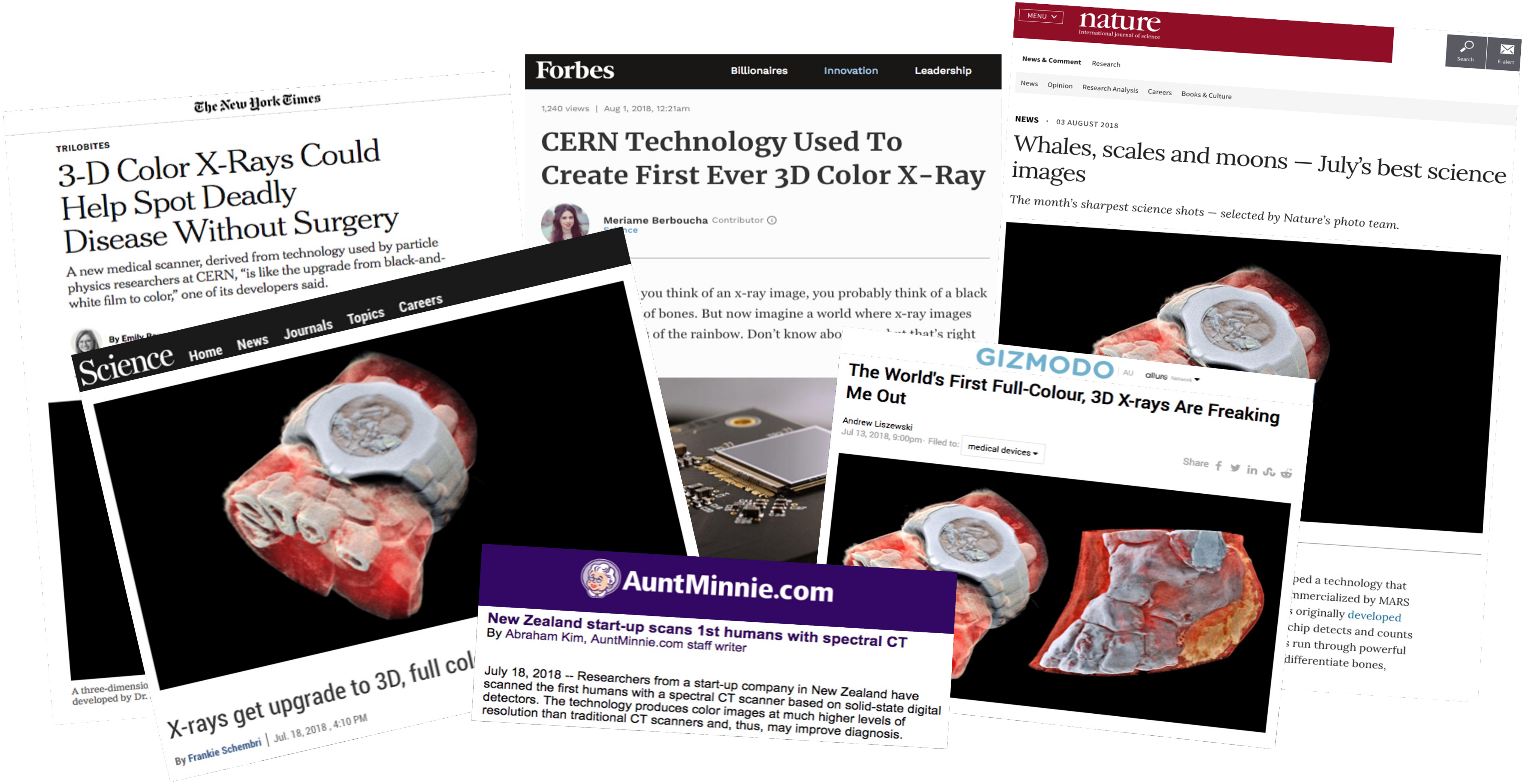
Radiation monitoring in NASA's Orion vehicle and at the International Space Station

Cultural Heritage

InsightART

Measuring the
DNA of your art

Image: InsightART


The New York Times
TRILOBITES
3-D Color X-Rays Could Help Spot Deadly Disease Without Surgery
A new medical scanner, derived from technology used by particle physics researchers at CERN, "is like the upgrade from black-and-white film to color," one of its developers said.
Forbes
Billionaires
Innovation
Leadership
1,240 views | Aug 1, 2018, 12:21am
CERN Technology Used To Create First Ever 3D Color X-Ray
Meriame Berboucha Contributor
nature
International journal of science
News & Comment
Research
News
Opinion
Research Analysis
Careers
Books & Culture
NEWS · 03 AUGUST 2018
Whales, scales and moons — July's best science images
The month's sharpest science shots — selected by Nature's photo team.
Science
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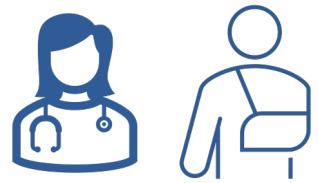
Topics
Careers
X-rays get upgrade to 3D, full col
By Frankie Schembri | Jul. 18, 2018 , 4:10 PM
GIZMODO
The World's First Full-Colour, 3D X-rays Are Freaking Me Out
Andrew Liszewski
Jul 13, 2018, 9:00pm · Filed to: medical devices
AuntMinnie.com
New Zealand start-up scans 1st humans with spectral CT
By Abraham Kim, AuntMinnie.com staff writer
July 18, 2018 -- Researchers from a start-up company in New Zealand have scanned the first humans with a spectral CT scanner based on solid-state digital detectors. The technology produces color images at much higher levels of resolution than traditional CT scanners and, thus, may improve diagnosis.

Medical Applications



License

NS MEDICAL DEVICES

DEVICES | REGULATION | COMPANIES | DISRUPTORS | EVENTS | WEBINARS

ostic Devices » Company News

HSS and MARS Bioimaging partner for MARS 5×120 Extremity scanner

By NS Medical Staff Writer 16 Jun 2023

DIAGNOSTIC DEVICES | DIAGNOSTIC IMAGING

Under the collaboration, HSS and MARS will partner to advance musculoskeletal imaging and diagnosis and study specific aspects of the MARS 5x120 Extremity Scanner and co-develop new scanning technologies and systems

Medical Device Network

News | Analysis | Sectors | Themes | Insights | Companies | Events | Reports | Premium Insights

News | June 16, 2023

MARS and HSS collaborate to advance musculoskeletal imaging

The partnership will assess particular aspects of the MARS 5x120 Extremity scanner.

HEDSAFE

Medical Device Details

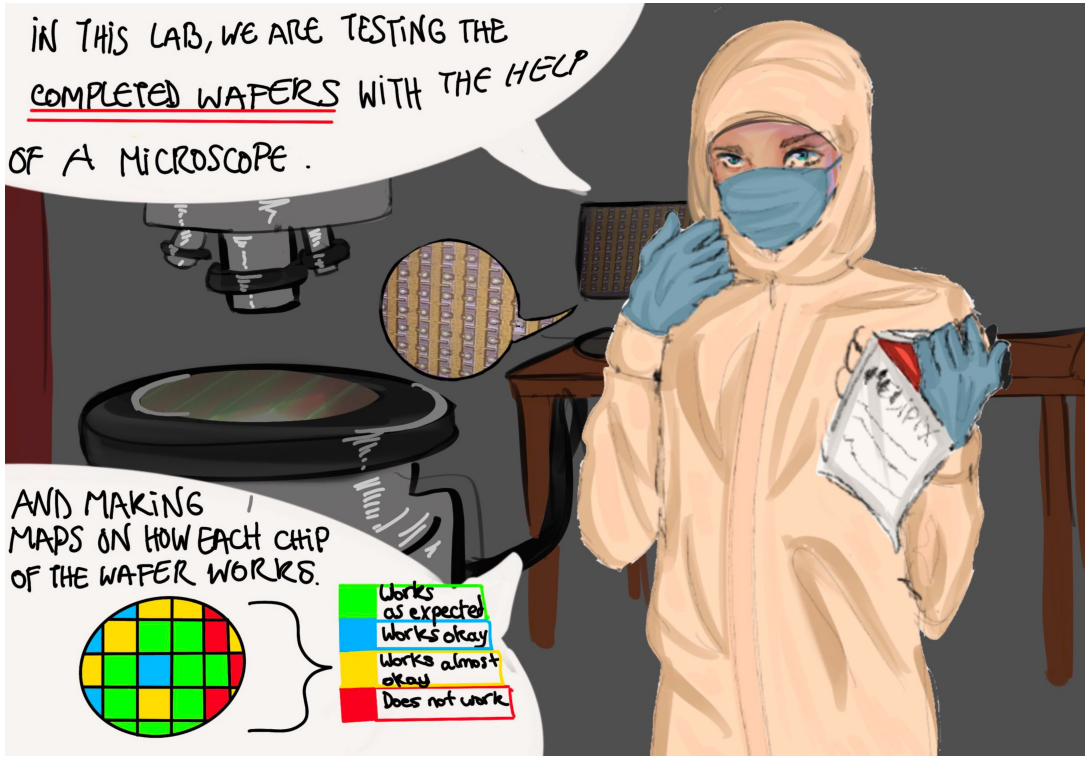
resent different energy

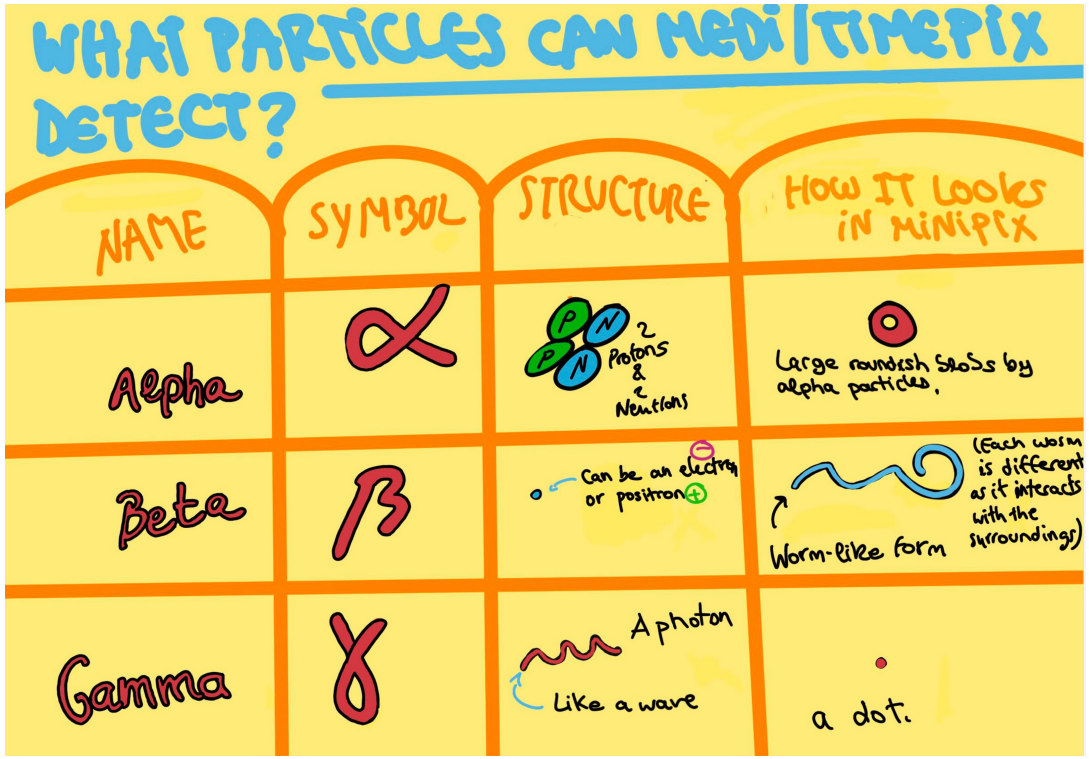
a huge potential for diagnostic

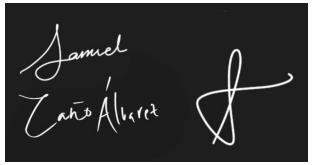
ography extracts more information from a given depo

articles) attached to bio markers could open the field of functional imagi

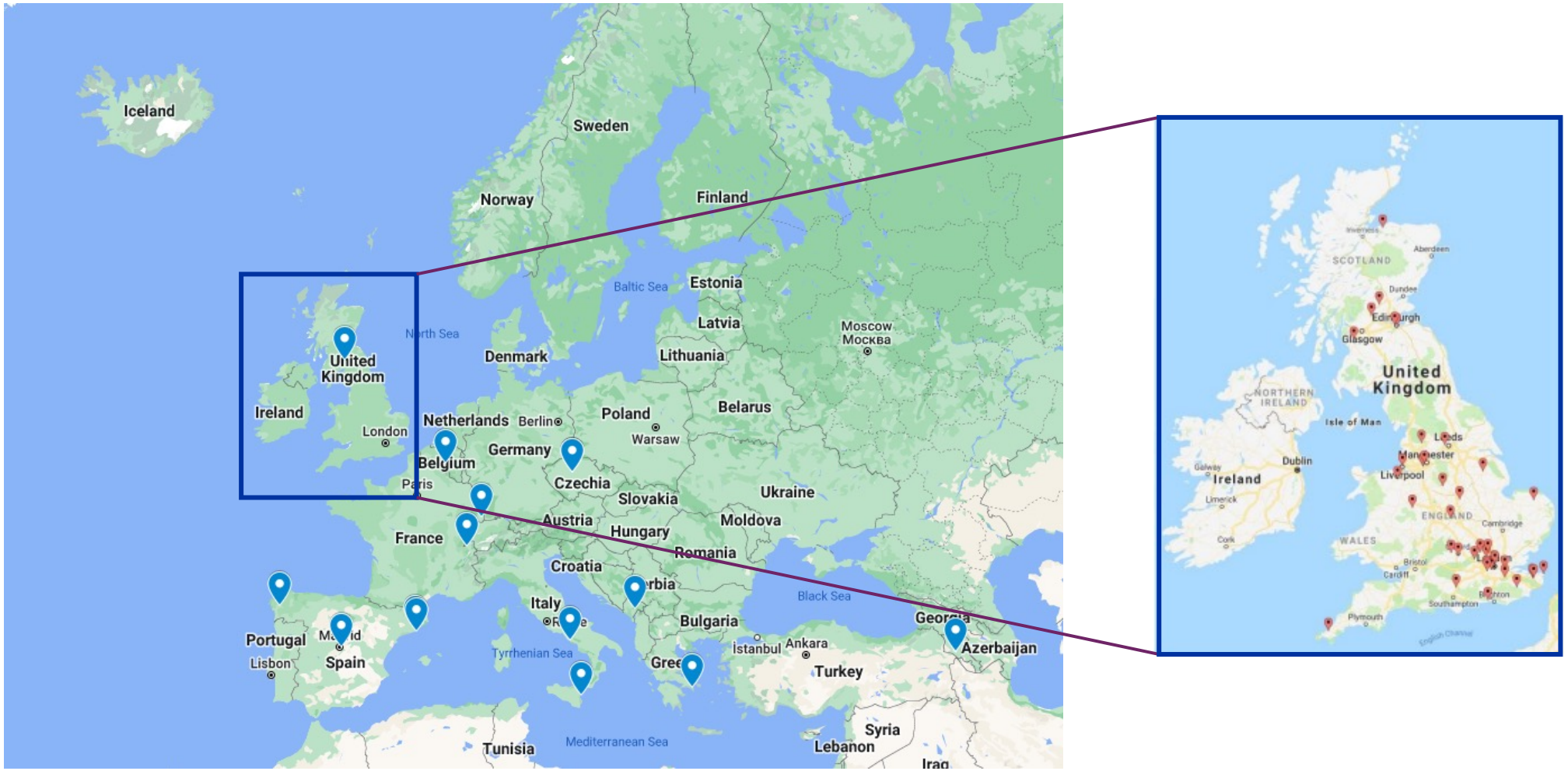
Education


IN THIS LAB, WE ARE TESTING THE COMPLETED WAFERS WITH THE HELP OF A MICROSCOPE.
AND MAKING MAPS ON HOW EACH CHIP OF THE WAFER WORKS.
Works as expected
Works okay
Works almost okay
Does not work

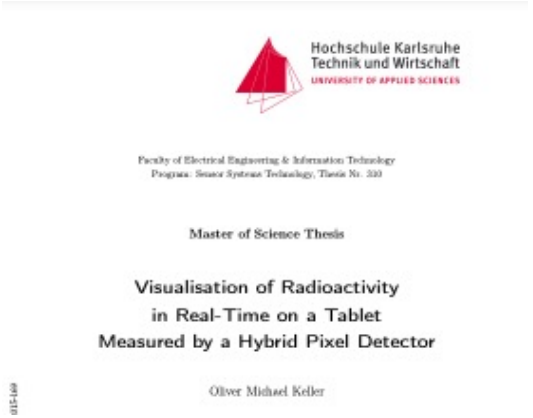

WHAT PARTICLES CAN MEDIPIX/TIMEPIX DETECT?
NAME
SYMBOL
STRUCTURE
HOW IT LOOKS IN MINIPIX
Alpha
2 Protons & 2 Neutrons
Large roundish blobs by alpha particles.
Beta
Can be an electron or positron
Worm-like form
(Each worm is different as it interacts with the surroundings)
Gamma
A photon
Like a wave
a dot.

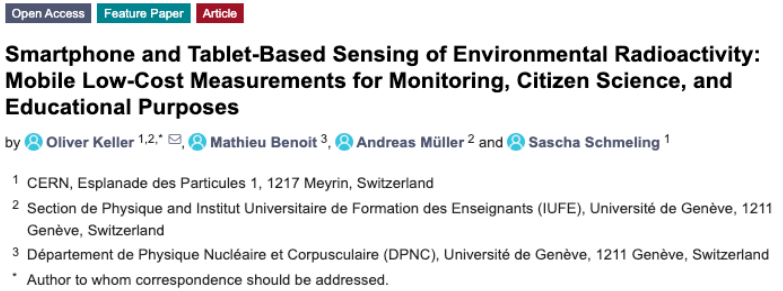


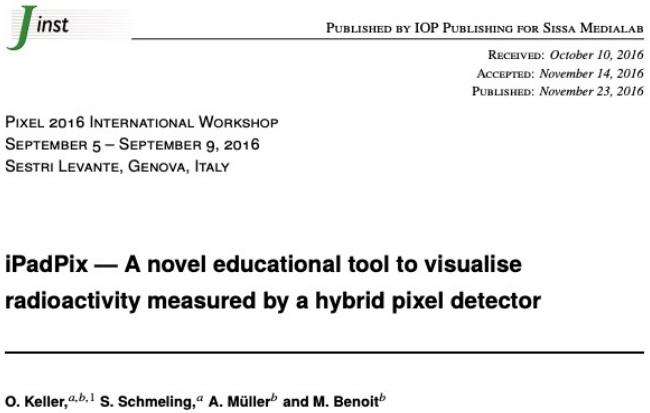
Geographical Distribution of the Kits

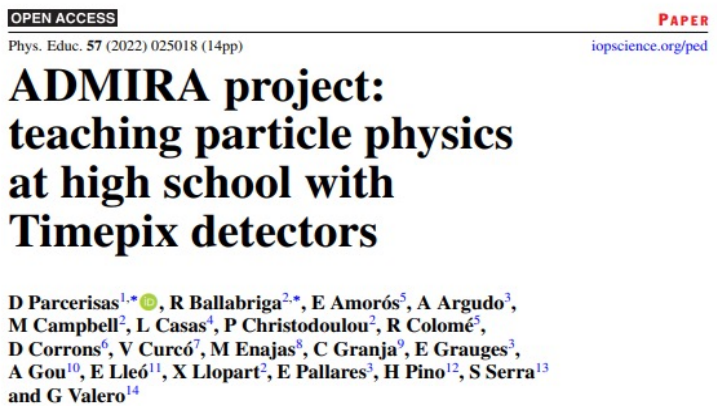


Related Publications

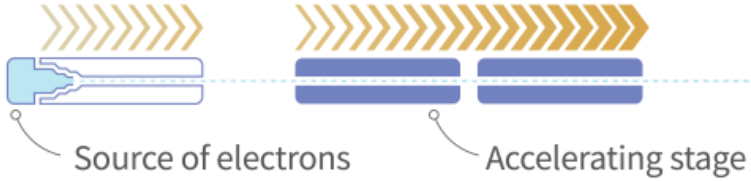


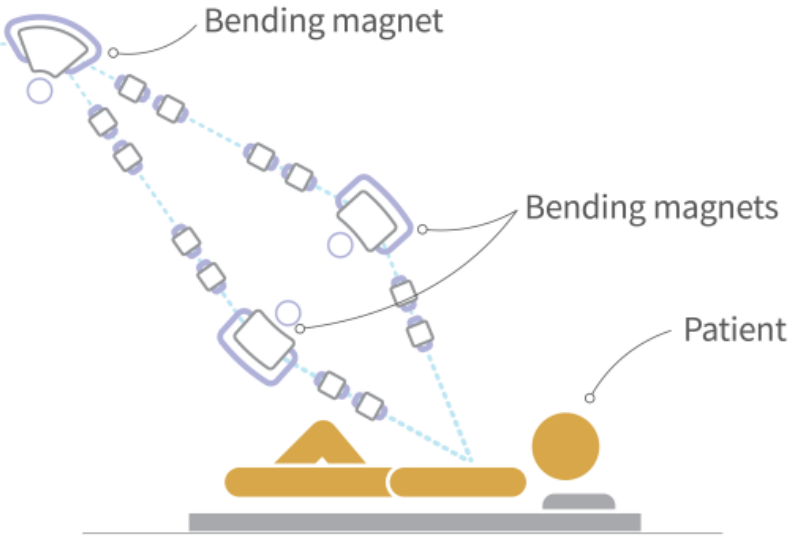


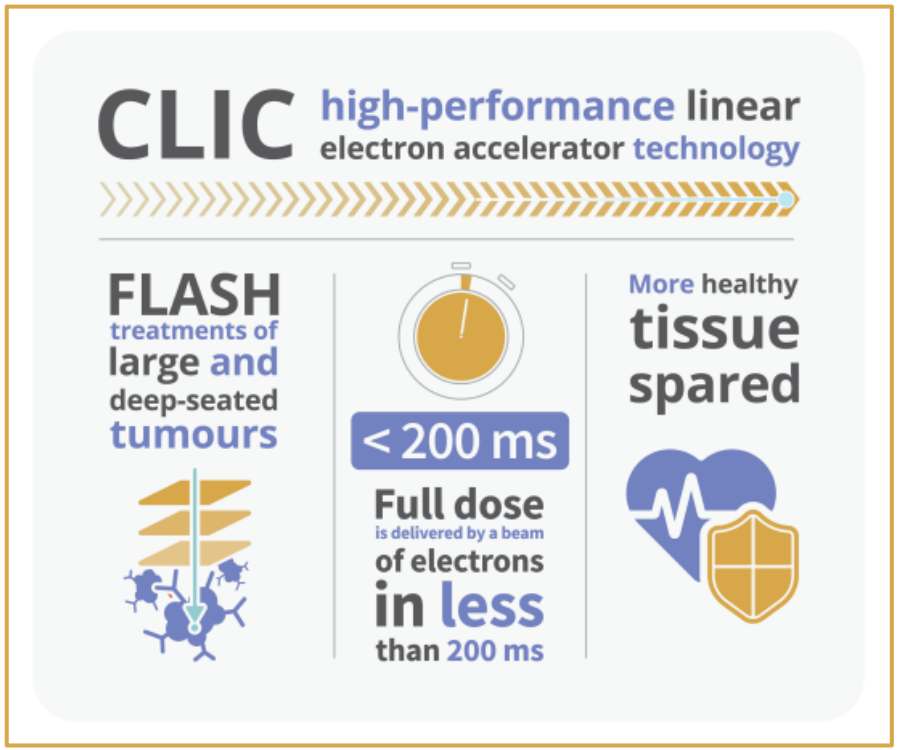




FLASH radiotherapy: very high-energy electrons (VHEE) to treat cancer resistant to conventional treatments → reduced side effects







Innovative Radiation Therapy with Electrons

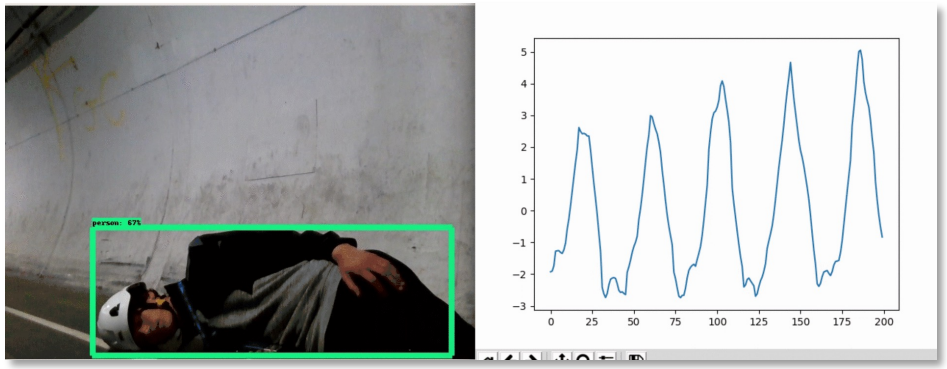
Healthcare

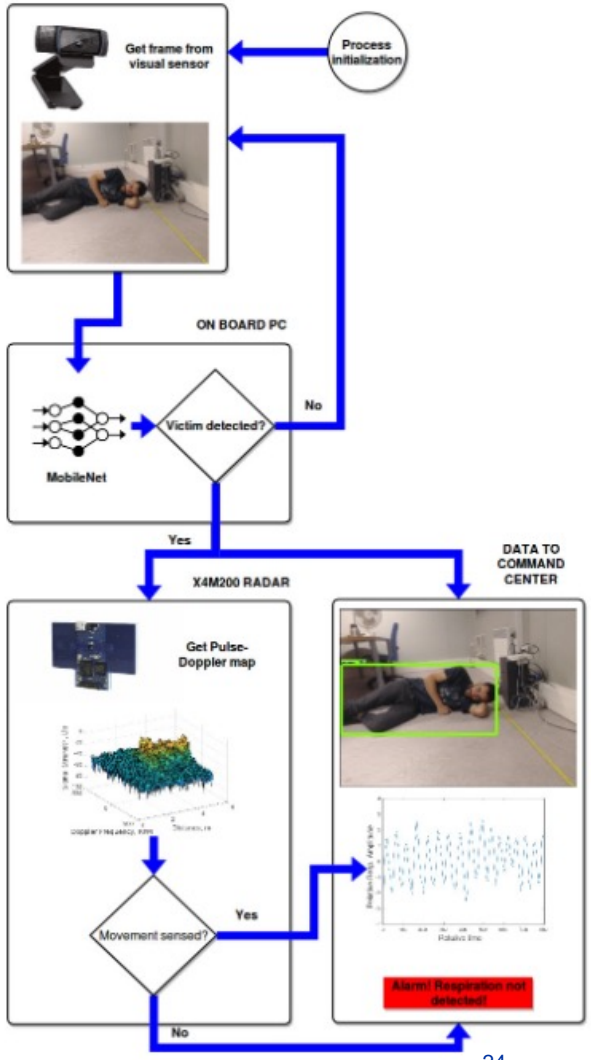
MARCHESE

Machine learning based human recognition and health monitoring system

ML in robotics for safety application

- Developed at CERN using the CERNBot mobile platform
- Spatial calibration method for sensor fusion of standard cameras, thermal cameras, radars and depth sensors
- Contactless human breathing and heartbeat monitoring





CAFEIN: Federated Learning Platform for Collaborative AI Training

MEDICAL APPLICATION
Brain MRI anomaly screening

MULTI-INSTITUTIONAL

CERN CAFEIN

HELLENIC REPUBLIC
National and Kapodistrian University of Athens
EST. 1837

FAKULTNÍ NEMOCNICE BRNO

trustroke

ZENSEACT (Volvo Cars Company) teams up with CERN on extremely fast machine learning using FPGAs.

Collaborative R&D

Collaborative R&D

Collaboration with CORMEC and WUR to support national banks and regulators to detect trading anomalies in commodity and financial markets.

Contract research

Development of high energy beam for testing radiation hardness with ESA.

CERN and ABB team up on reducing electricity in cooling and ventilation.

Collaborative R&D

Smart sensors will transform traditional motors, pumps, etc into wirelessly connect devices → data will be used to create DIGITAL TWINS

PlanetWatch: a CERN Spinoff using the CERN technology C2MON, delivers an end-to-end solution to generate, validate, analyse and record air quality data.

A CERN spin-off

PlanetWatch®

Extreme technologies for the planes of the future

- **Superconductivity:** electrical distribution systems of future hybrid and electric propulsion planes → reduce the weight of aircraft & increase efficiency (Airbus)
- **Cryogenic infrastructures:** material testing at extremely low temperatures →liquid hydrogen storage on aircrafts (Applus+)

"PARTNERING WITH CERN WILL HELP PUSH THE BOUNDARIES OF RESEARCH, AS WE WORK TO MAKE SUSTAINABLE AVIATION A REALITY."

Ludovic Ybanez, Head of superconducting technologies demonstrator at Airbus UpNext.

News › Press release › Topic: Knowledge sharing

CERN and Airbus partnership on future clean aviation

CERN and Airbus UpNext sign a collaboration agreement to assess the use of superconducting technologies for future zero-emission aeroplanes.

1 DECEMBER, 2022

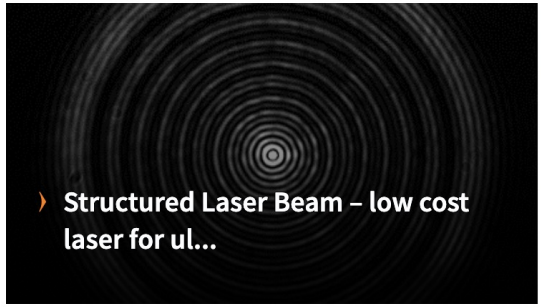
CERN Venture Connect

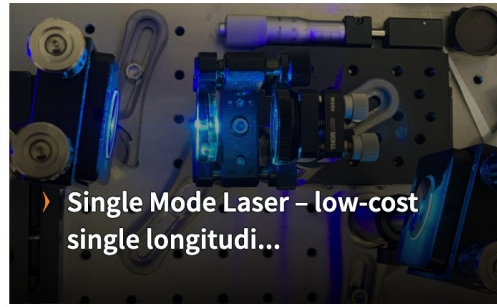
Access Breakthrough CERN technologies

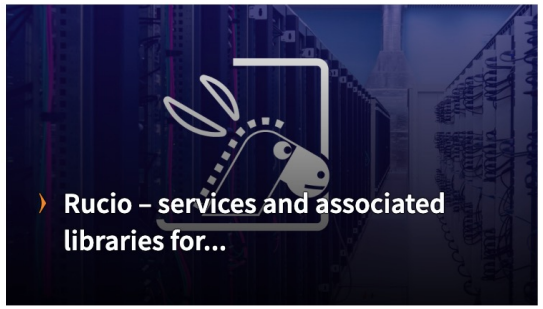
Connect to investors and venture startup economy

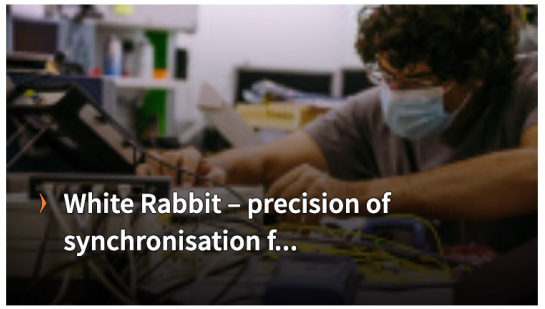
Get 0% Equity Express agreements

2% Royalty on ≥ 1MCHF









Key lessons learned

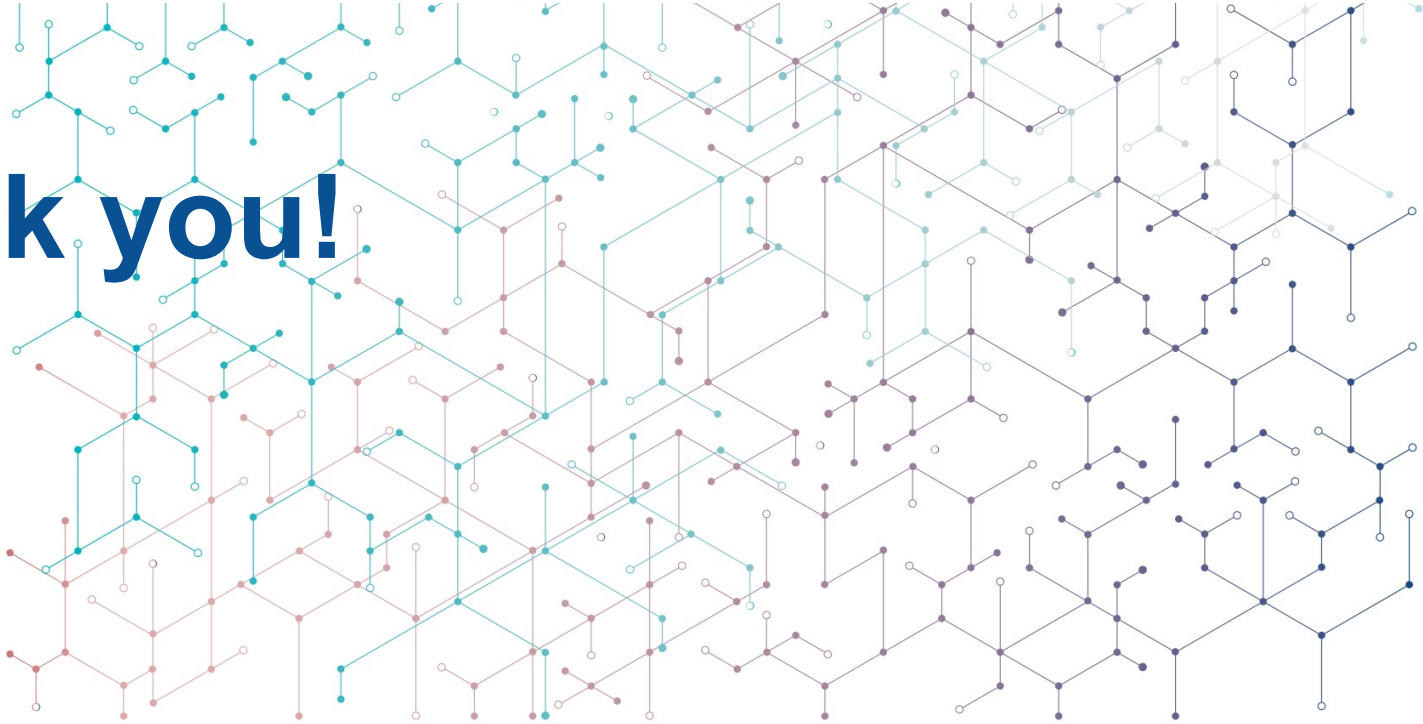
- CERN is strong in the ‘extremes’ of the technology scale;
- You need passionate experts on both sides to succeed;
- Start with a concrete project and clear business need;
- Mind the gap – in language, ‘clockspeed’ and culture;
- Driving deep tech innovation requires courage.

“To know that we **know what we know**, and to know that we do not **know what we do not know, that is true knowledge.**” *Nicolaus Copernicus*

Obrigada! Thank you!

Get in touch!

ana.rita.pinho@cern.ch



With thanks to the CERN community for the daily support of the Organisation's KT mission!

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