

Opportunities for Industry

G. Anelli, KT Group Leader, IPT Department

30.05.2016



A whole spectrum of opportunities



Licensing

Service and
Consultancy

R&D
collaborations



Knowledge Transfer 2015



Contents

4 | Messages from the Management

8 | From physics to society
From physics to medicine and biology
From physics to aerospace
From physics to safety
From physics to global communities

38 | Open knowledge

Enabling Open Science with Open Access and Open Data
Open Source technology for Open Science
CERN at the heart of vibrant global open source communities
CERN opens
CERN Open Source Hardware

48 | How KT does KT

Identifying new CERN technologies
Choosing the best dissemination strategy
The Knowledge Transfer Fund
Promoting and marketing CERN technologies to industry
Legal advice on IP matters

46 | Innovation for business

Business Incubation Centres in CERN Member States
Innovation events and initiatives

62 | Knowledge exchange and collaboration

Networks
EU-sponsored research collaborations
International organizations
Knowledge-sharing events

70 | Training, education, and outreach

The Beamline for Schools competition
Fellow, Associates, Students and Apprentices
Marie Skłodowska-Curie Actions
Education and public outreach
KT training for CERN Staff

Visit our website
to have a look at
our technology
portfolio in detail

[www.cern.ch/
knowledgetransfer](http://www.cern.ch/knowledgetransfer)

Knowledge Transfer

 Search

[Home](#) [Technology Transfer Office](#) [Life sciences](#) [Our team](#) [Contact us](#)

Technology portfolio

All CERN technologies listed below are available for licensing and/or research collaborations with industry or institutes:

- 3D Magnetic sensor calibrator
- Compact cryogenic cooling pump
- CRISTAL
- Cryogenic optical fiber temperature sensor
- Cryogenic Saving Unit
- Diaphragm System
- Evacuable Flat Panel Solar Collector
- Fast front-end readout electronics for photon and electron counting applications
- Gas electron multiplier
- High performance time to digital converter
- High power high frequency loads for energy recovery
- Hood clamp/hell tool
- Indico
- Integrated CO₂ cooling system
- Invenio
- MammoGrid
- Medipix2
- Method for the production of carrier-free radioisotopes
- Micro Chemical Vias
- Micro-irradiation particle detector for hadrontherapy
- Mounting mechanism for cantilever with high precision positioning
- Multifunctional detector
- Neutron-driven element transmuter
- NiceAdmin
- NINO
- Non-evaporable getter (NEG) thin film coatings
- OrinPix Data compression
- Palladium thin-film coatings
- PHOSWICH
- Power converter with integrated energy storage
- Pulse tube refrigerator/cryo-cooler
- Quantum osimetry
- Reduction of SEY by magnetic roughness
- Resistive MicroMegas
- RF Waveguide Vacuum Vate
- ROOT
- Single layer 3D tracking semiconductor detector
- Thermally insulatable vessel
- Titanium polishing

[View technologies by domain »](#)



From high vacuum...

- **NEG** (Non-Evaporable Getter thin film coatings)

Technology used to create and maintain ultra-high vacuum in the accelerator vacuum chambers.



... to solar energy!

- License and partnership with a start-up company

Development of a commercial product able to use diffused or indirect light and reach very high temperatures of up to 300 degrees
Development of a prototype production chain



Vacuum is an excellent insulator!



Solar panels plant

- **Civil-engineering company opened a new solar power plant**

Environmentally friendly "solar field" heats close to 80,000 cubic metres of bitumen to 180 degrees.



Installation at GVA airport

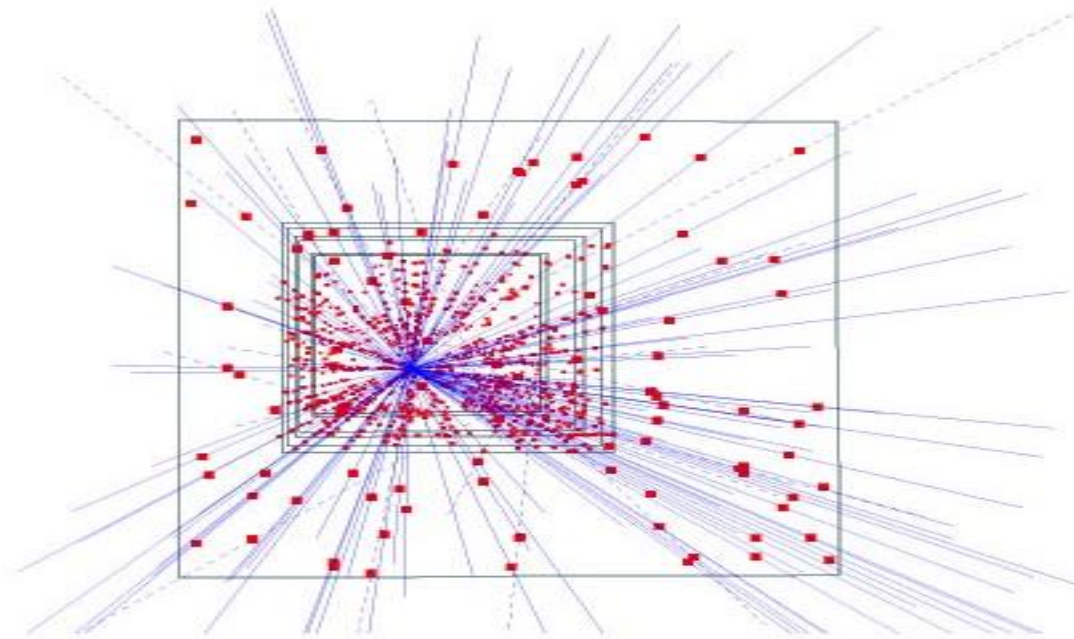


Integrated Circuits

- Medipix and timepix families
- NINO: low-power front end amplifier-discriminator ASIC (8 and 32 channels per chip)
- HPTDC: High-performance Time to Digital Converter (up to 32 channels per chip)

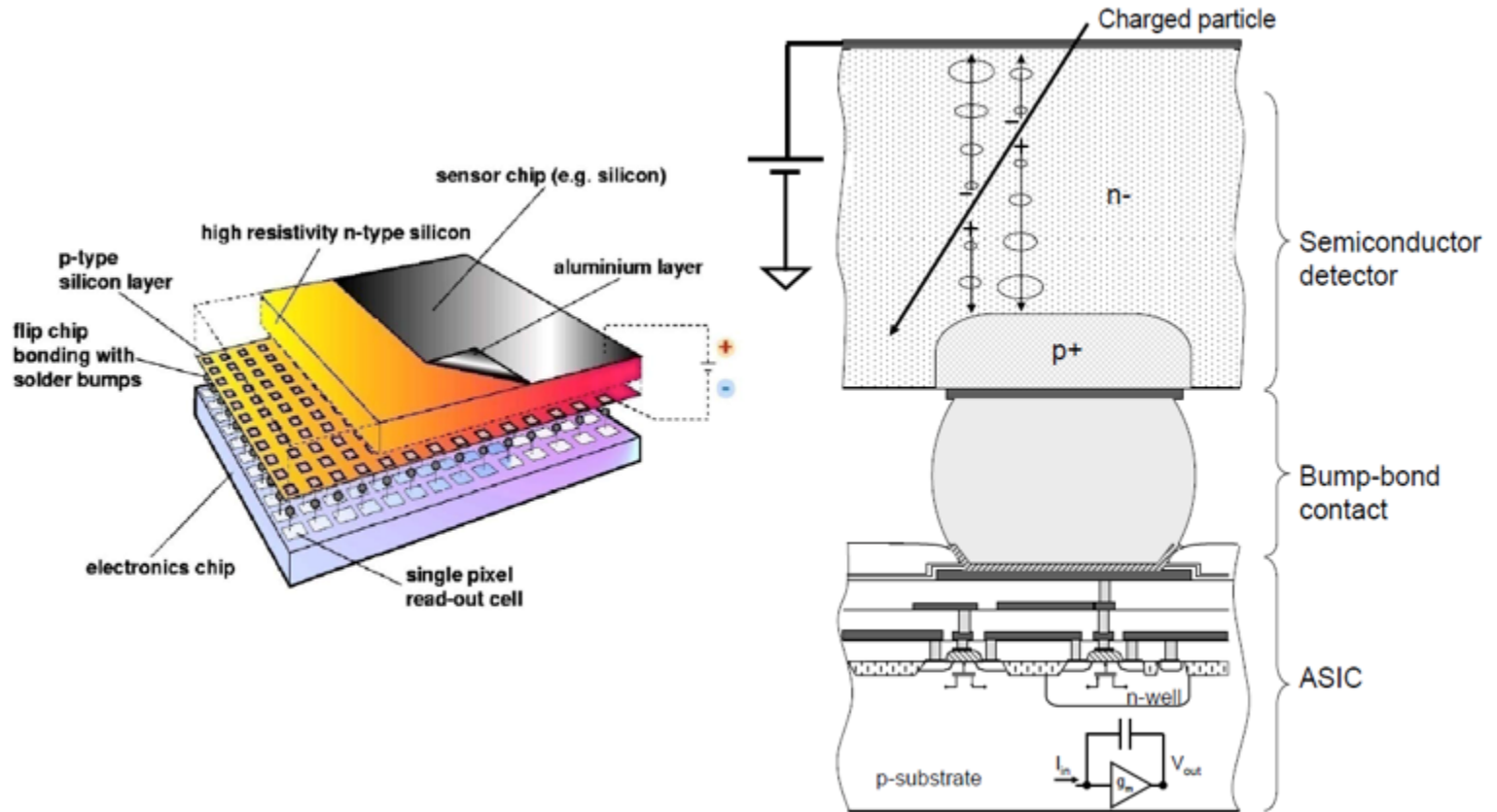
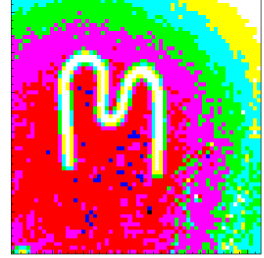
Silicon pixel detectors (SPDs)

- **Hybrid silicon pixel detectors** for tracking applications in High Energy Physics



153 high energy particle tracks flying through a telescope of half a million pixels in the WA97 experiment back in 1995

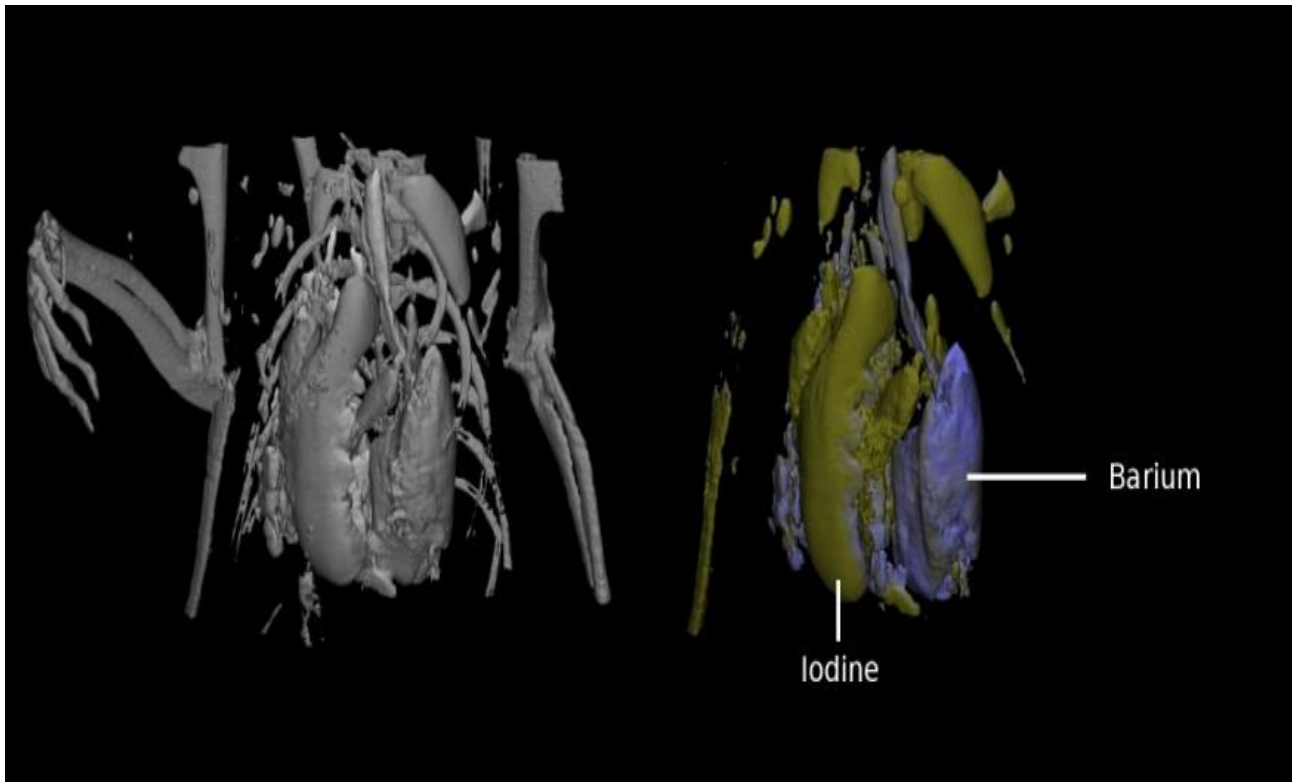
Medipix



Application: Medical imaging

- **MARS project**

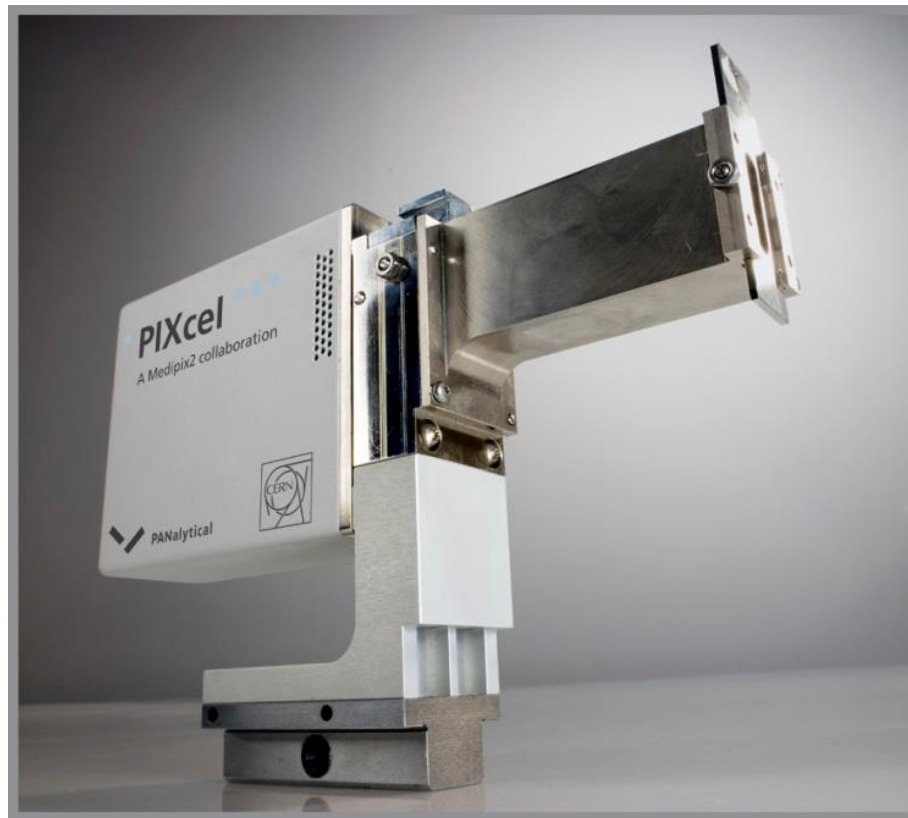
Colour CT X-ray scanner based on the Medipix technology



(courtesy of MARS Bioimaging Ltd)

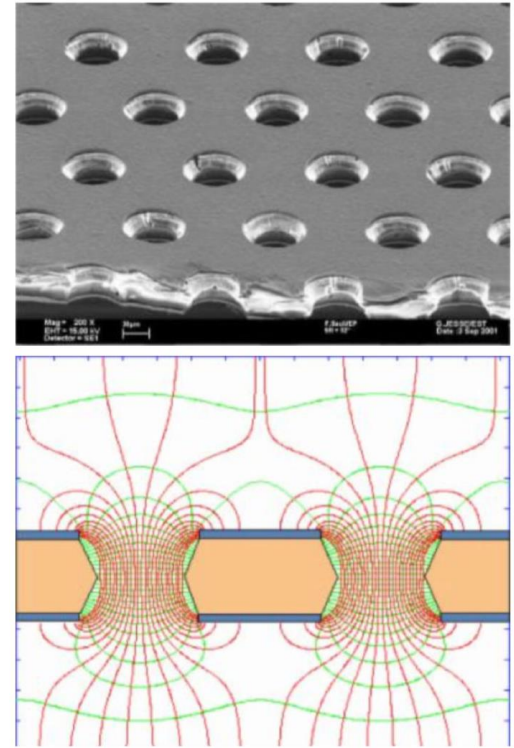
Application: Material analysis

- Partnership and license agreements with a company to build a X-ray diffractometer

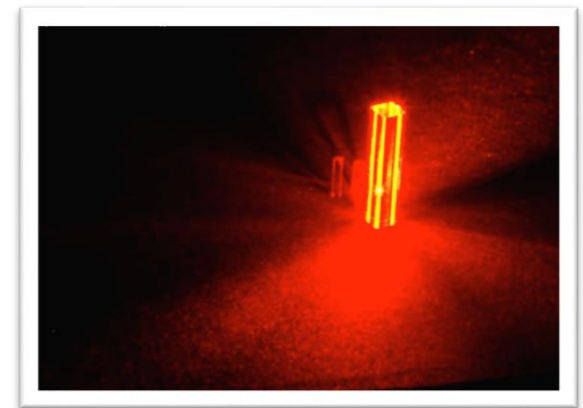


Other Detectors

GEM Detectors and other MPGD

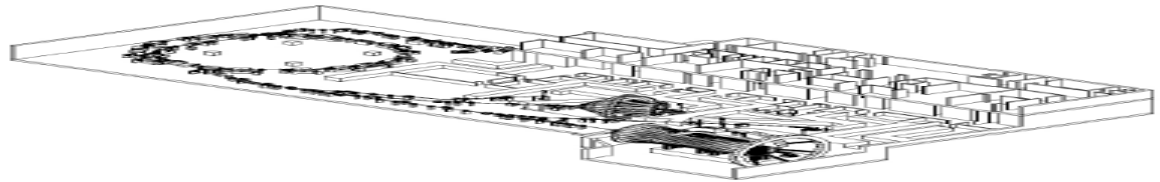


Photonic Crystals



CERN's PIMMS Study

PIMMS 2000
(coordinated by
CERN) has led to:



fondazione CNAO

Treatment centre in Pavia, Italy.

First patient treated with Carbon ions in November 2012!

ebg MedAustron

Treatment centre in Wiener Neustadt, Austria,
foundation stone 16 March 2011, will be ready in 2015

CNAO



CNAO

First realisation of the PIMMS concept (adapted by TERA and INFN)

700 patients so far

74% carbon ions, 26% protons

CE certified Dose Delivery System produced by CNAO:
5 DDSs purchased by MedAustron

Ongoing collaborations with INFN and CERN



MedAustron



Photo: MedAustron



MedAustron in 2015

Getting ready for treating patients in 2016:

First patient positioning system ready

TPS optimised on the whole data-flow chain

Installation of the 90° bending magnet

Synchrotron ready for 24/7 operations

Two agreements signed with CERN:

Extension of collaboration

exploitation of jointly developed know-how



AMIT – Advanced Molecular Imaging Technologies

a cyclotron
small enough
to fit in a hospital lift



Photo: CIEMAT



AMIT

A multilateral collaboration of Spanish institutes and industries

Compact cyclotron for single dose production of radioisotopes for non-standard PET demands

First prototype in 2016, and possibility of industrialisation

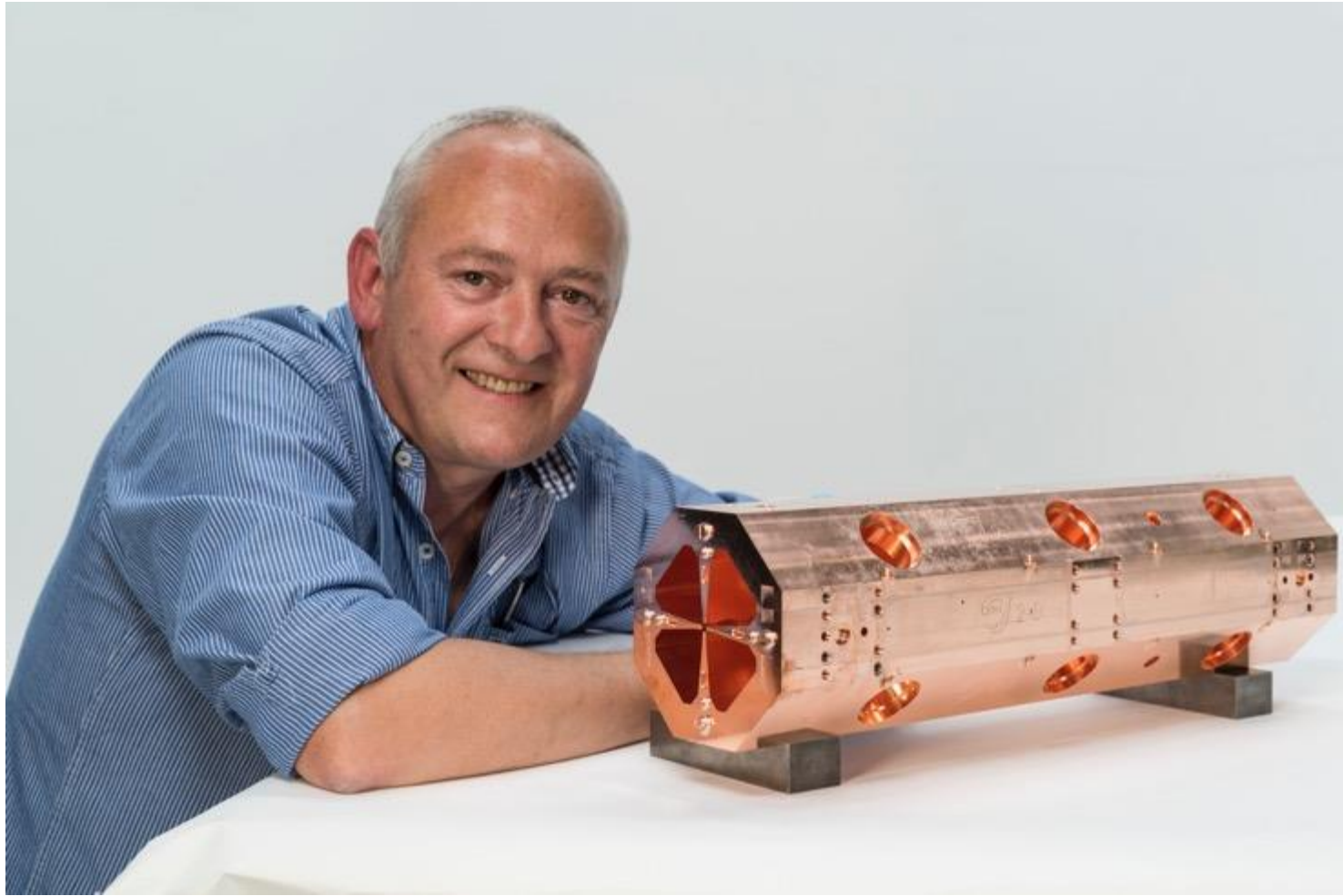
CERN:

Collaboration agreement with CIEMAT

Technical contribution: Cryogenic Supply System and low-loss transfer line from CSS to the magnet



The miniature linear accelerator



The miniature linear accelerator

A new high-frequency RFQ

Compact, lightweight, low beam loss
2.5 MeV/m (vs <1 MeV/m)

First application:

proton therapy (commercialised through CERN's spin-off A.D.A.M. S.A.)

Potential applications: on-site radioisotope production, alpha-particle radiotherapy, analysis of archeological materials



MEDICIS

MEDical Isotopes Collected from ISolde

Production of radioisotopes for research

Started as KT Fund project:
shuttle robot to transport irradiated targets



ClearPET

dedicated PET for breast imaging



ClearPEM

Two prototypes in hospitals in Portugal and Italy

KT Fund project to lower the production cost of ClearPEM modules

SiPM: better image reconstruction, more compact modules

Optimization of the DoI reconstruction (patent application filed)

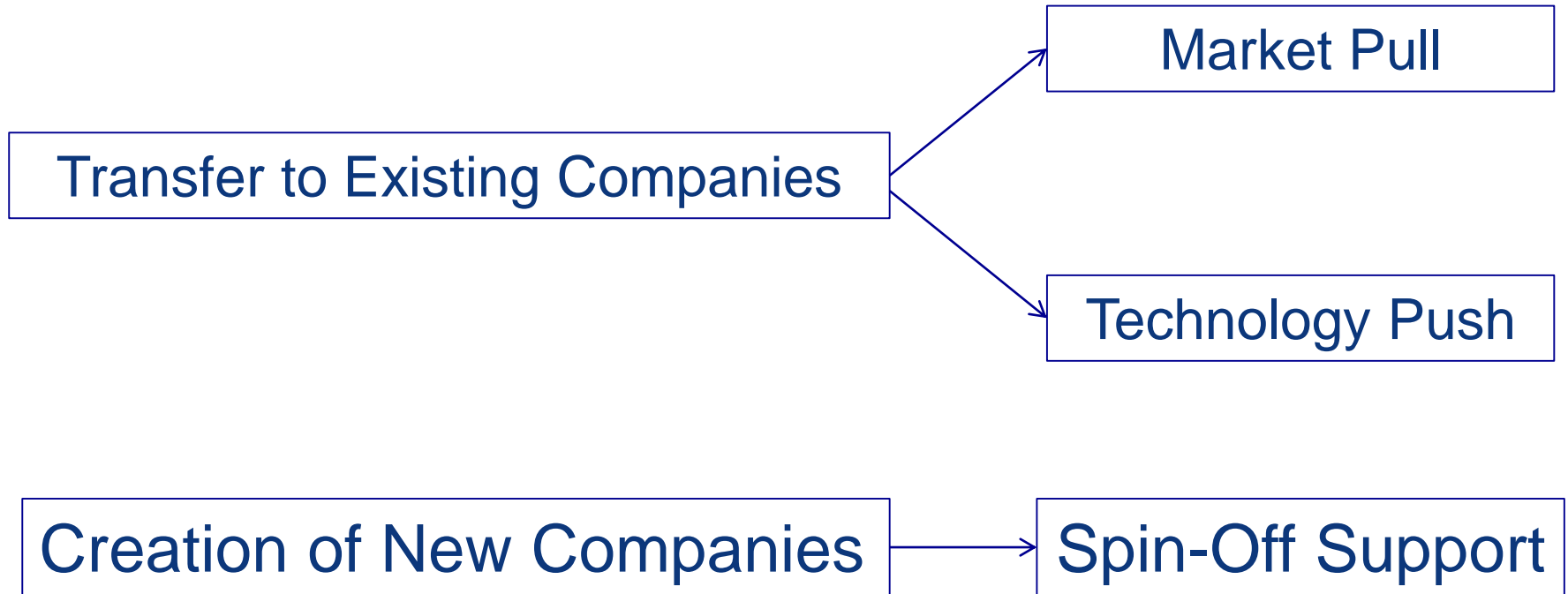


Softwares

- FLUKA: Simulation of particle interaction with matter
- Geant4: Simulation of particle interaction with matter
- ActiWiz: Simulation of material activation problems
- Invenio: Integrated digital library and repository system
- KiCad: EDA Software Suite
- Root: a data analysis framework
- RadShip: management of radioactive materials shipping
- CERN VM-FS: Web based network file system



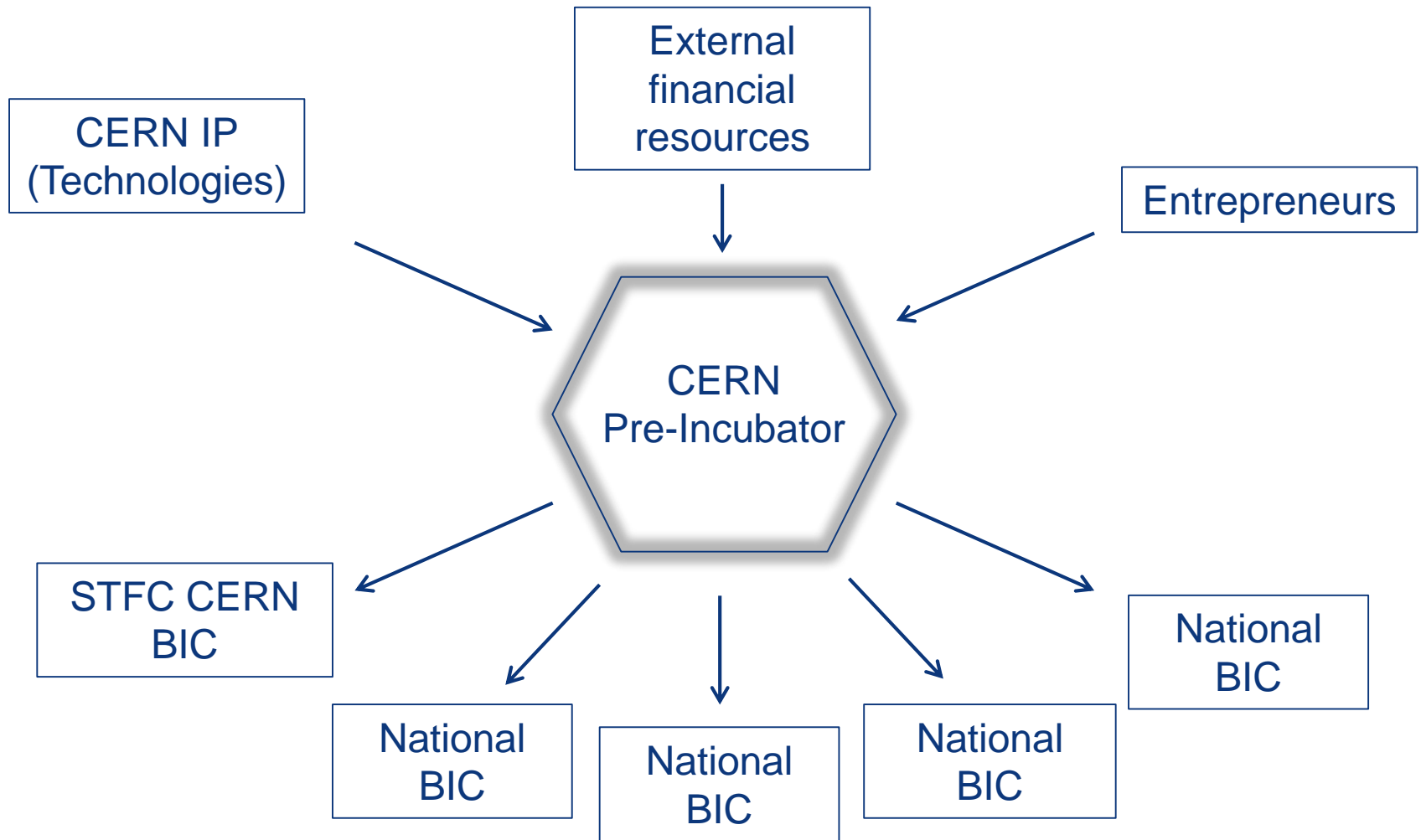
KT implementation ways



spin-off



CERN Business Ideas Accelerator



CERN BIC Network

Established incubators:

UK – STFC-CERN BIC

Netherlands – NIKHEF-CERN BIC

Norway – NTNU BIC of CERN Technology

Greece – Technopolis BIC of CERN Technology

Austria – Austria BIC of CERN Technology

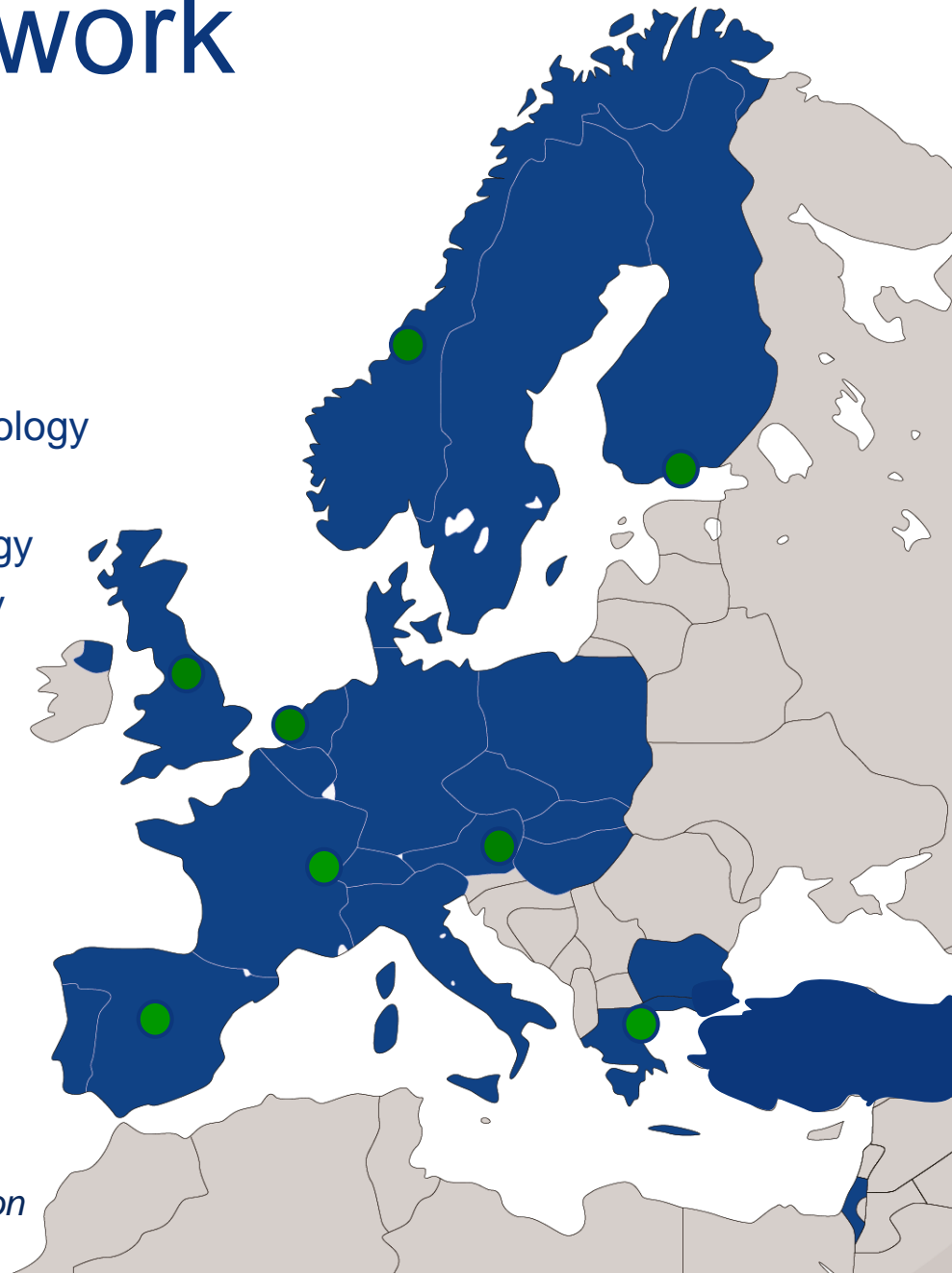
France – InnoGEX BIC of CERN Technology

Finland – Finnish BIC of CERN Technology

Spain – Spanish BIC of CERN Technology

Advanced Pipeline:

Italy



Entrepreneurship Development



Fostering an Entrepreneurship Culture

Facilitating CERN Spin-Off creation



Network of BIC's of CERN Technologies

STFC-CERN BIC (UK, 2012)



CROFT
Additive
Manufacturing

CamsTech Ltd



NTNU BIC of CERN Tech. (NO, 2014)



NIKHEF CERN BIC (NL, 2014):



Austria BIC of CERN Tech. (AT, 2014):



InnoGex (FR, 2015):

