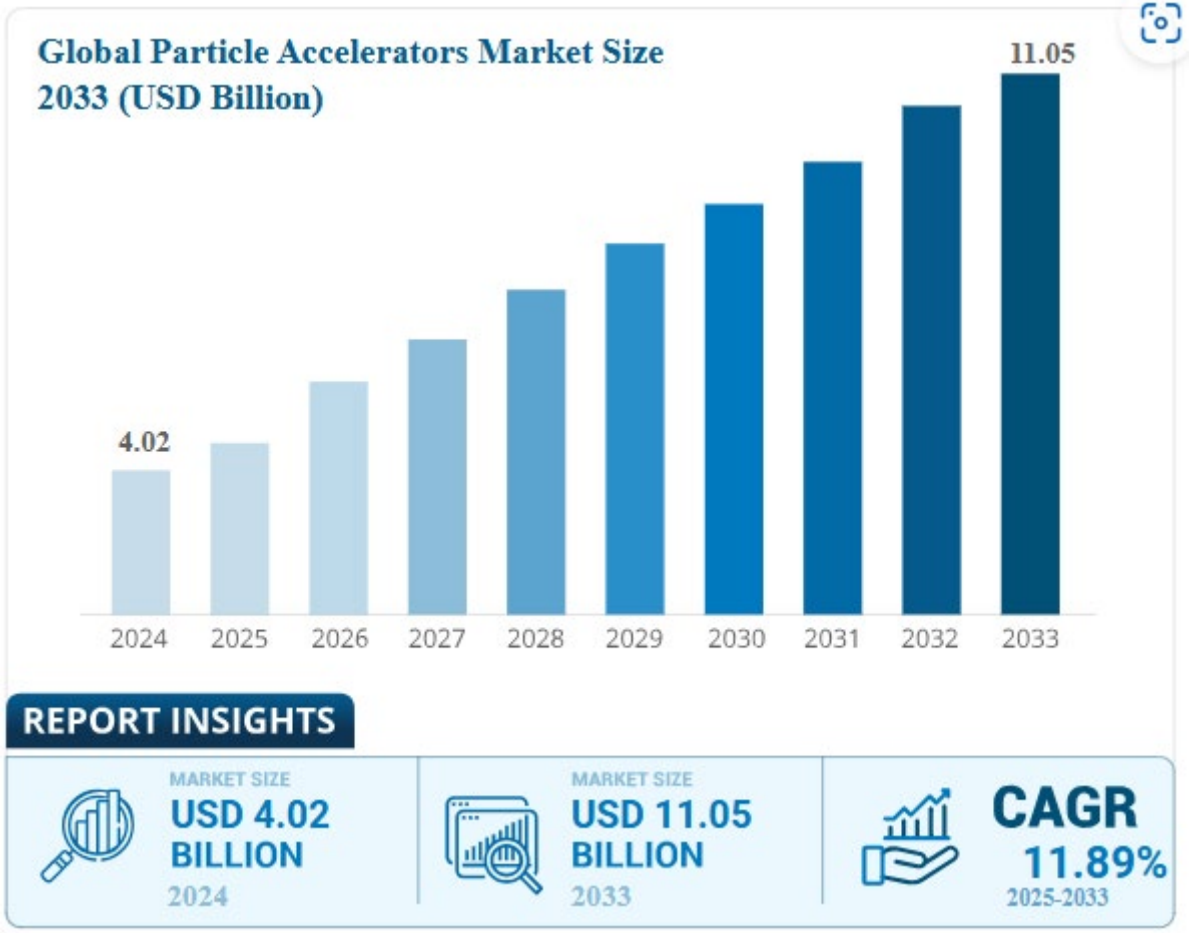
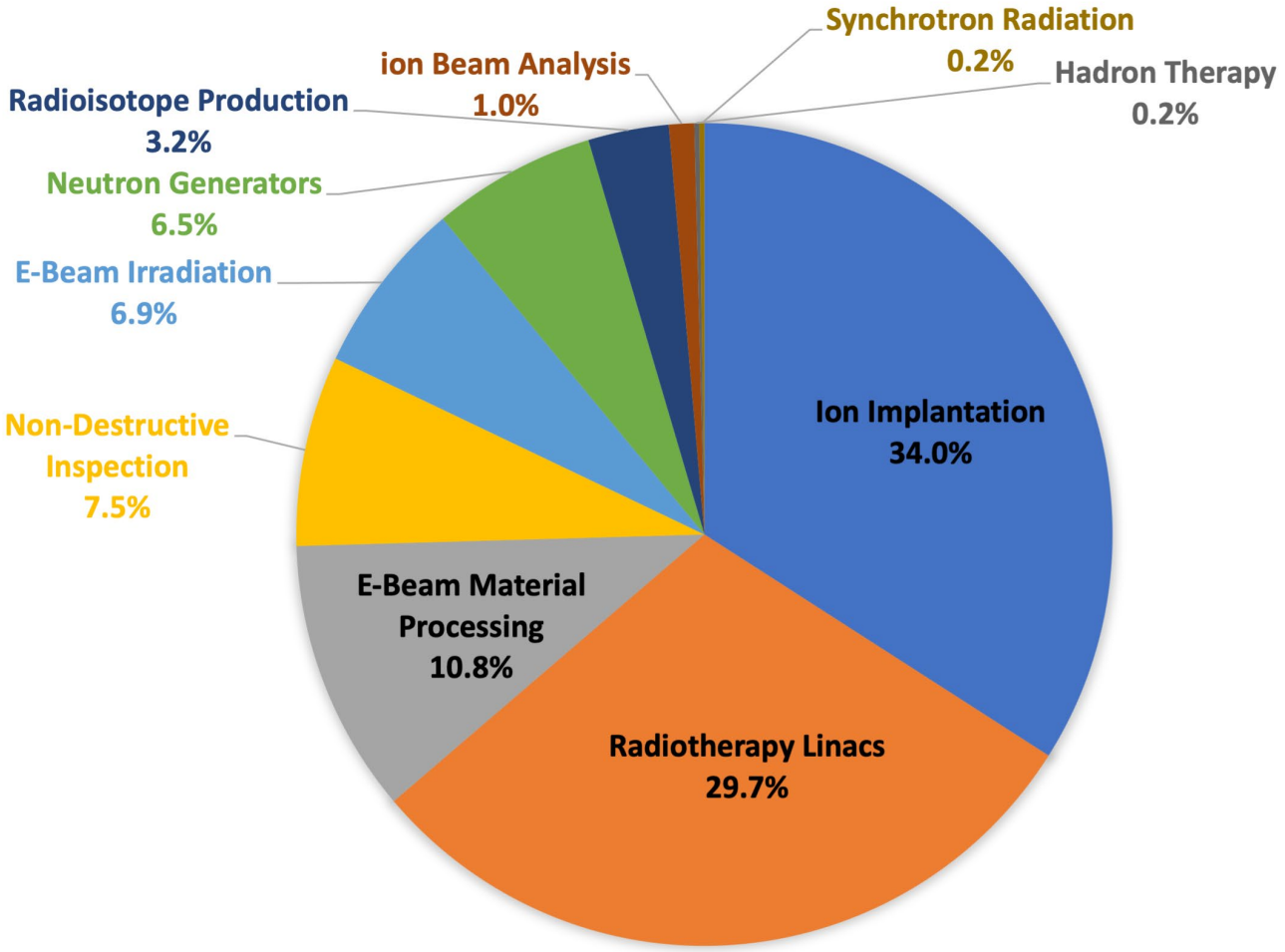
INFN's Technology Transfer in Particle Accelerators sector

50000+ Accelerators worldwide, 11B$ projected market size

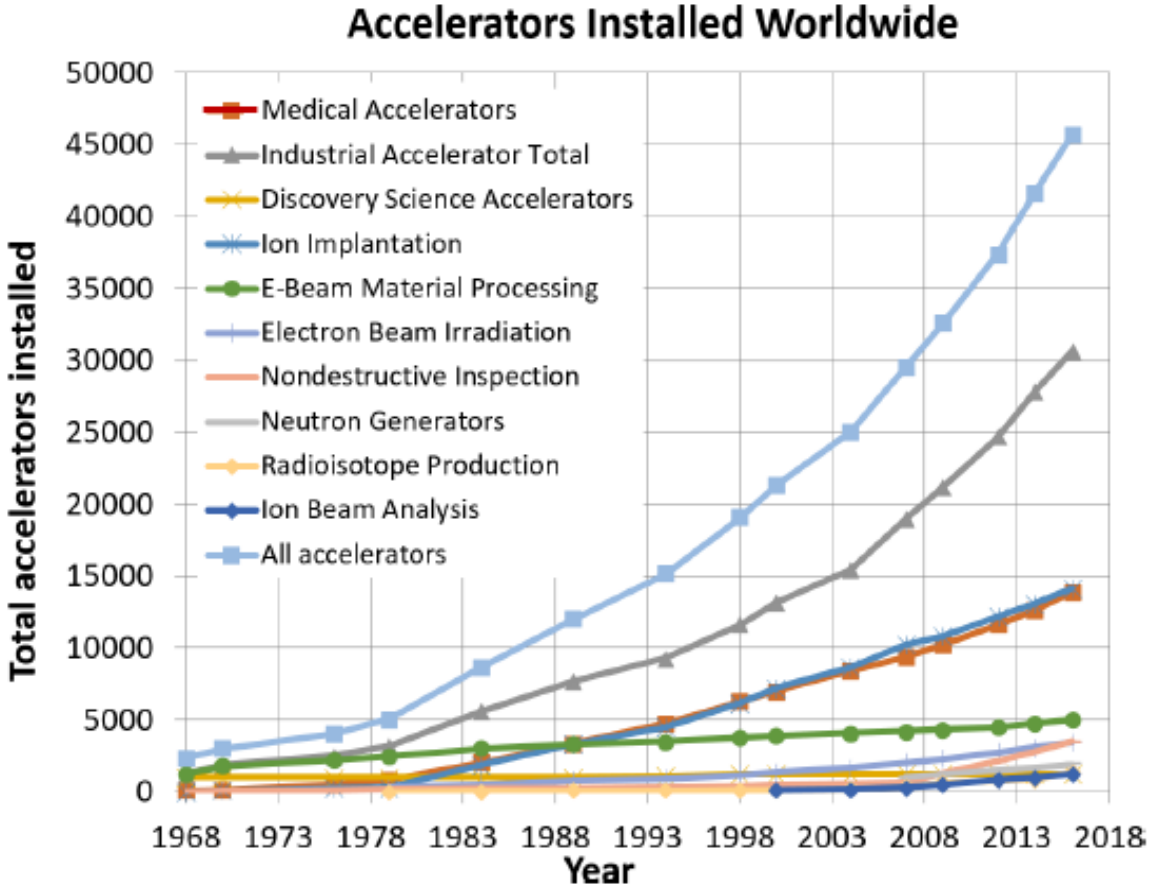


Business Research Insights [1]

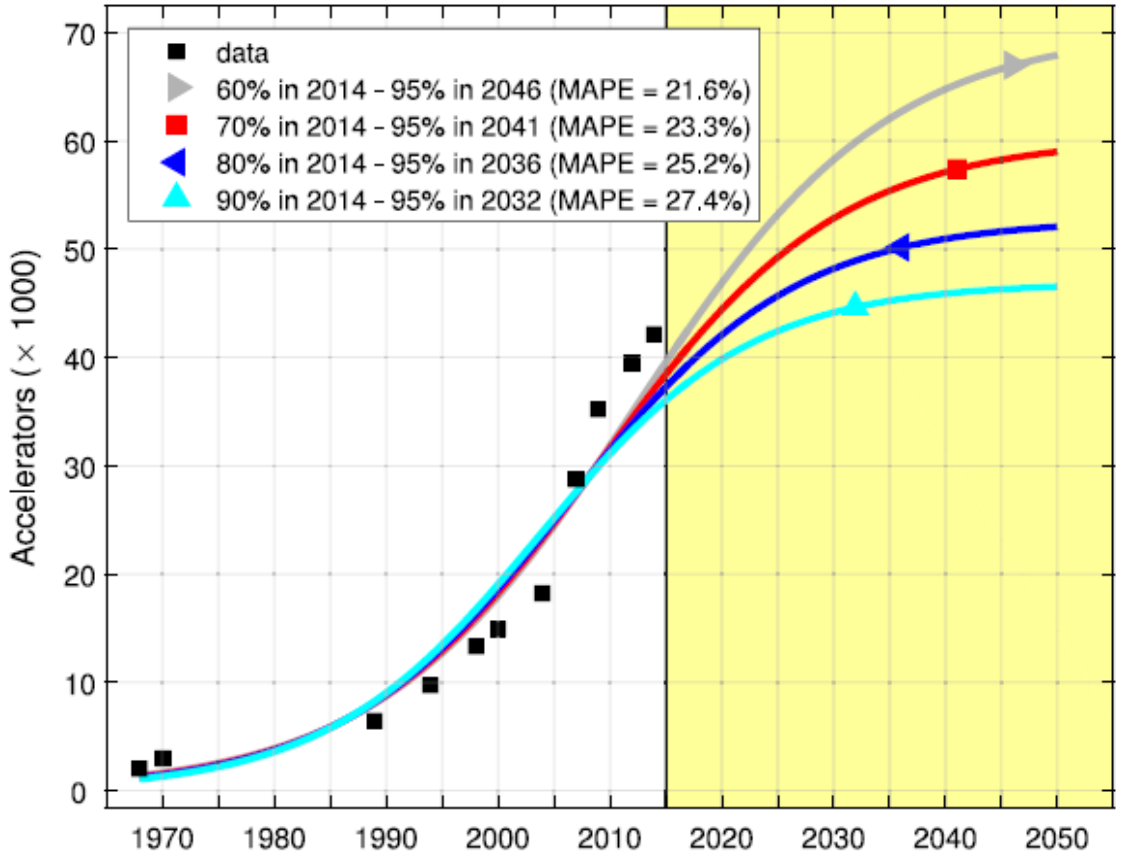


S. Sheehy, Application of Particle Accelerators [2]

Is this growth sustainable?



Doyle et al. The Future of Industrial Accelerators and Applications [4]



Florio et al. The socio-economic impact of a breakthrough in the particle accelerators' technology: A research agenda [5]

Some figures…

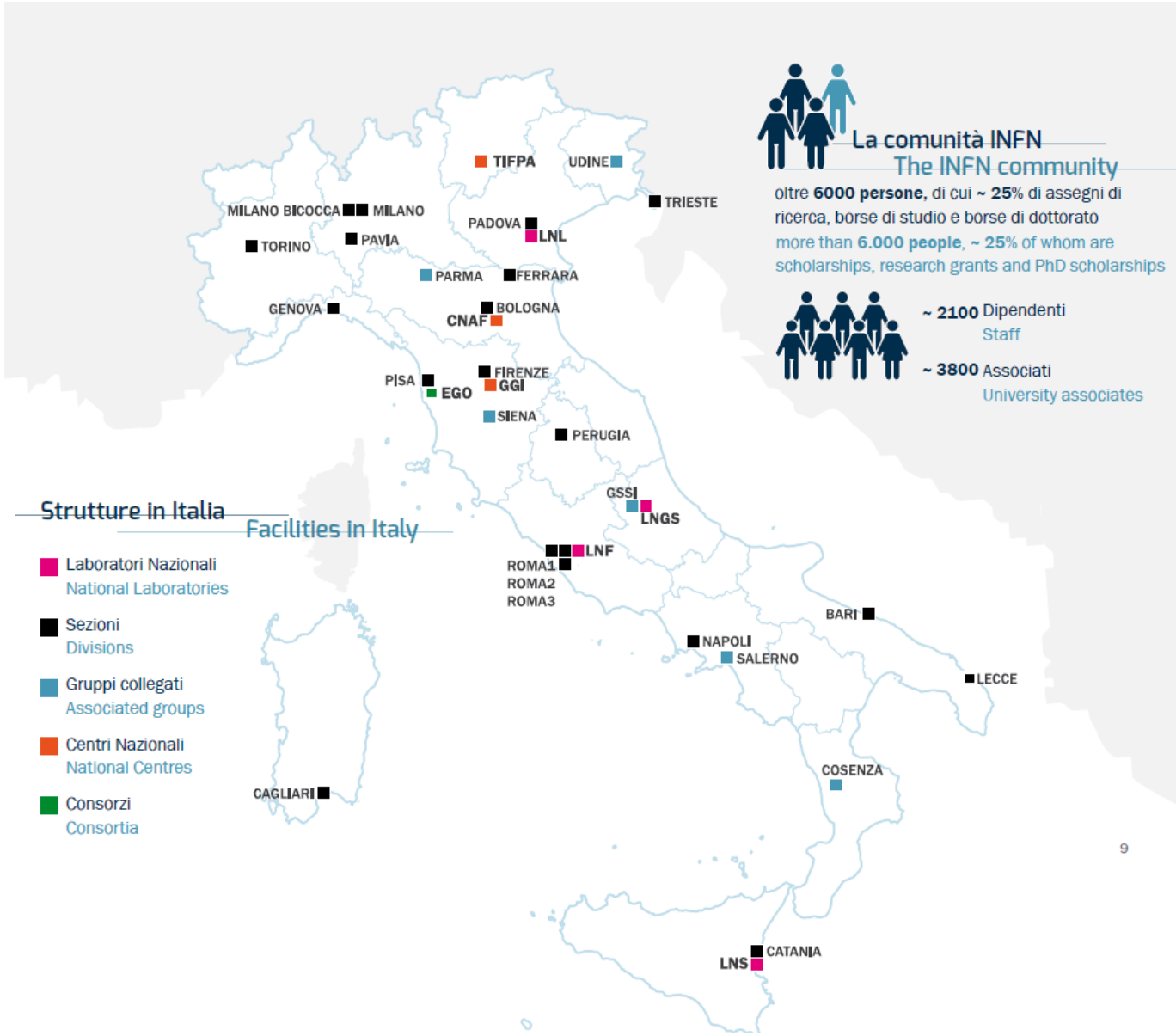
- Elettra's accelerators consume 32 GWh of electric energy per year from the national grid and its two high-efficiency trigeneration plants consume 5.5 million Smc of gas per year to provide uninterruptible electric power, heating and cooling. Due to increased energy prices, in second half of 2024, Elettra reduced beam time to 50% [6]
- In 2023, overall electricity consumption of LNL was 16.7 GWh [9]
- SESAME is the first synchrotron light facility in the region and the world's first large accelerator complex to be fully powered by renewable energy. Electricity for its operations is supplied by an on-grid photovoltaic system having a total power capacity of 6.48 MW [7]
- HZB in Berlin, Germany, that operates the BESSY II synchrotron secured their full electricity needs with renewable energy, saving up to 17,400 tonnes of CO_2 per year [8]

Spread on the territory

20 Divisions

4 National Labs

3 National Centers



2015 – 2024: spotlight on TT

292
Patents filed

52
Licences

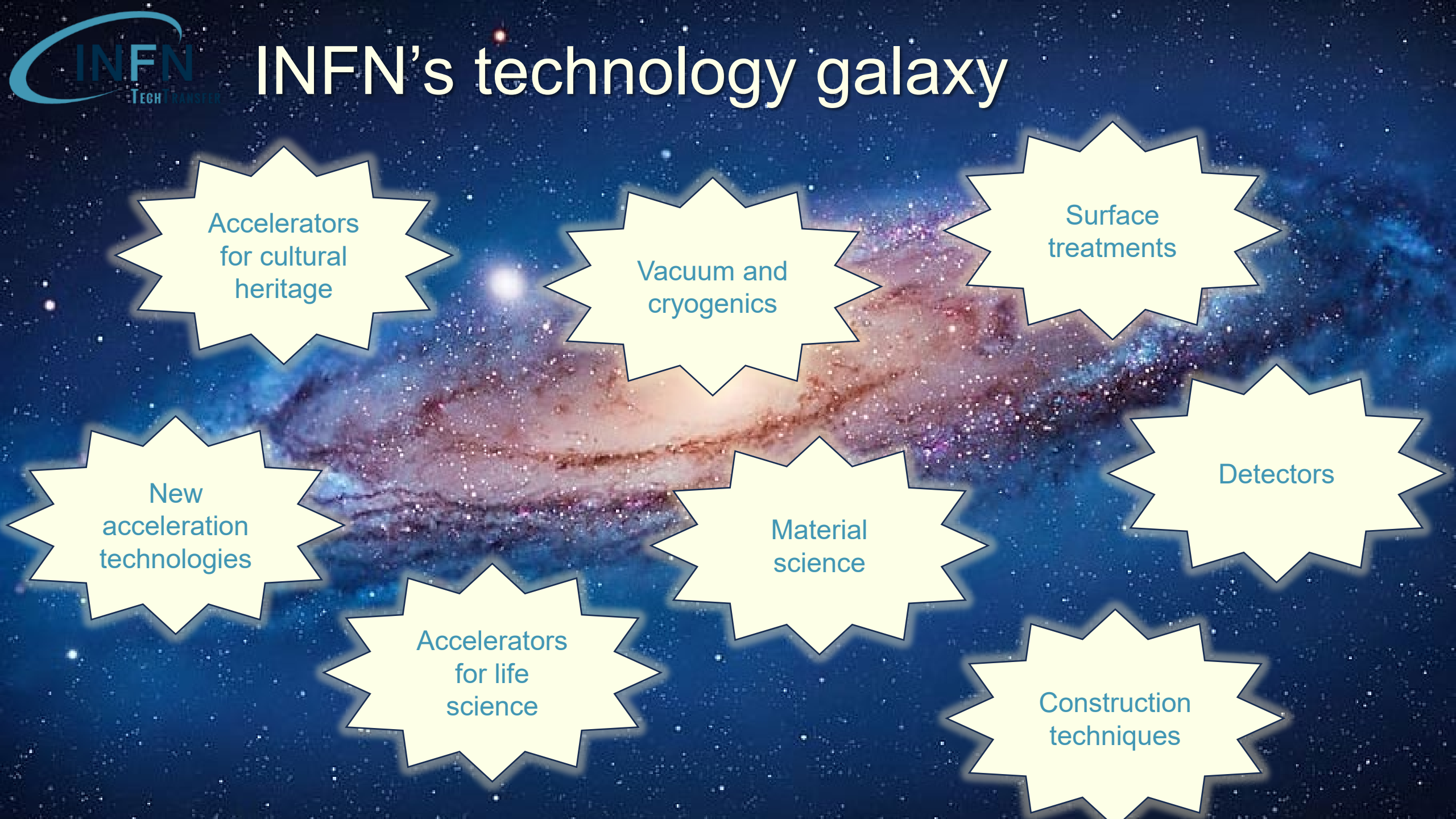
31
PoC projects funded

6
Spin-offs

619
Agreement Signed

403
Partners

INFN's technology galaxy

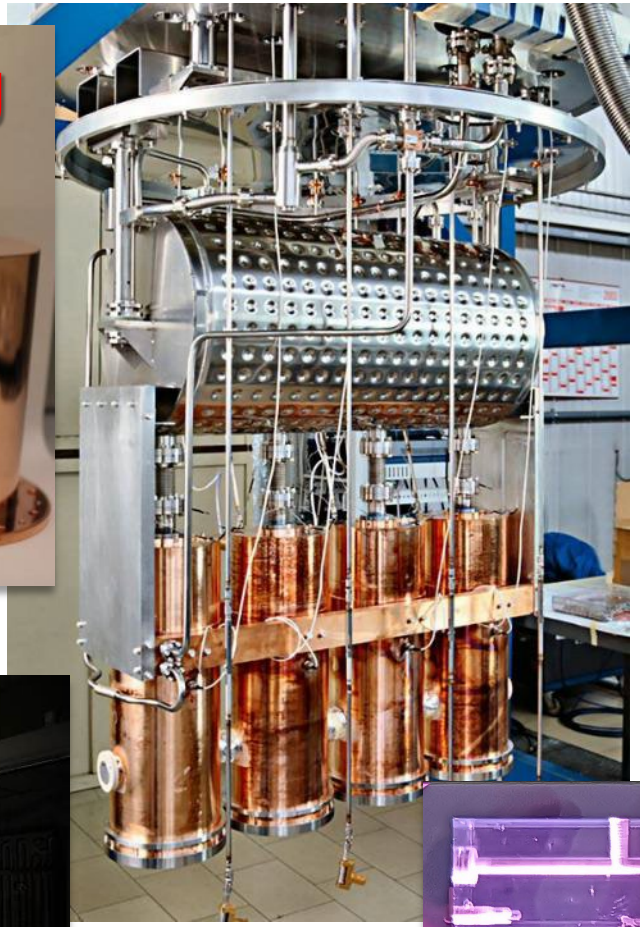


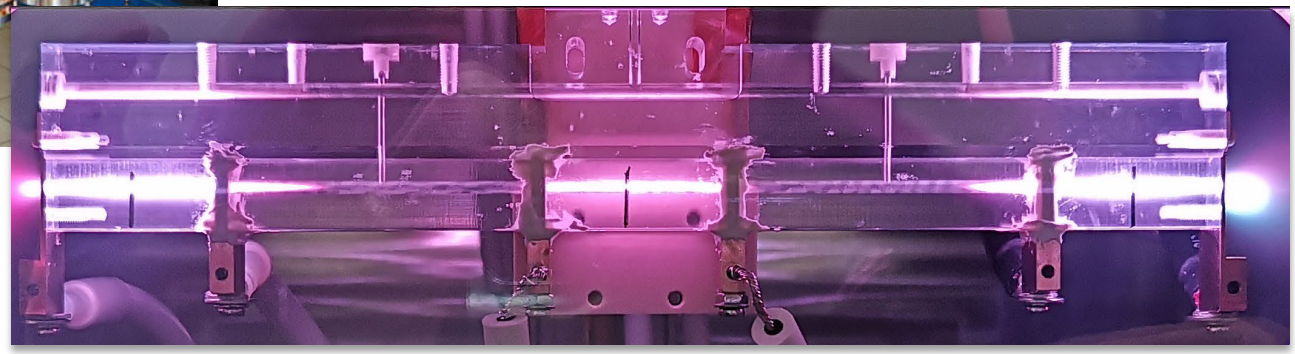
From basic science to…

Industry

From beam production to…

From accelerator development to…

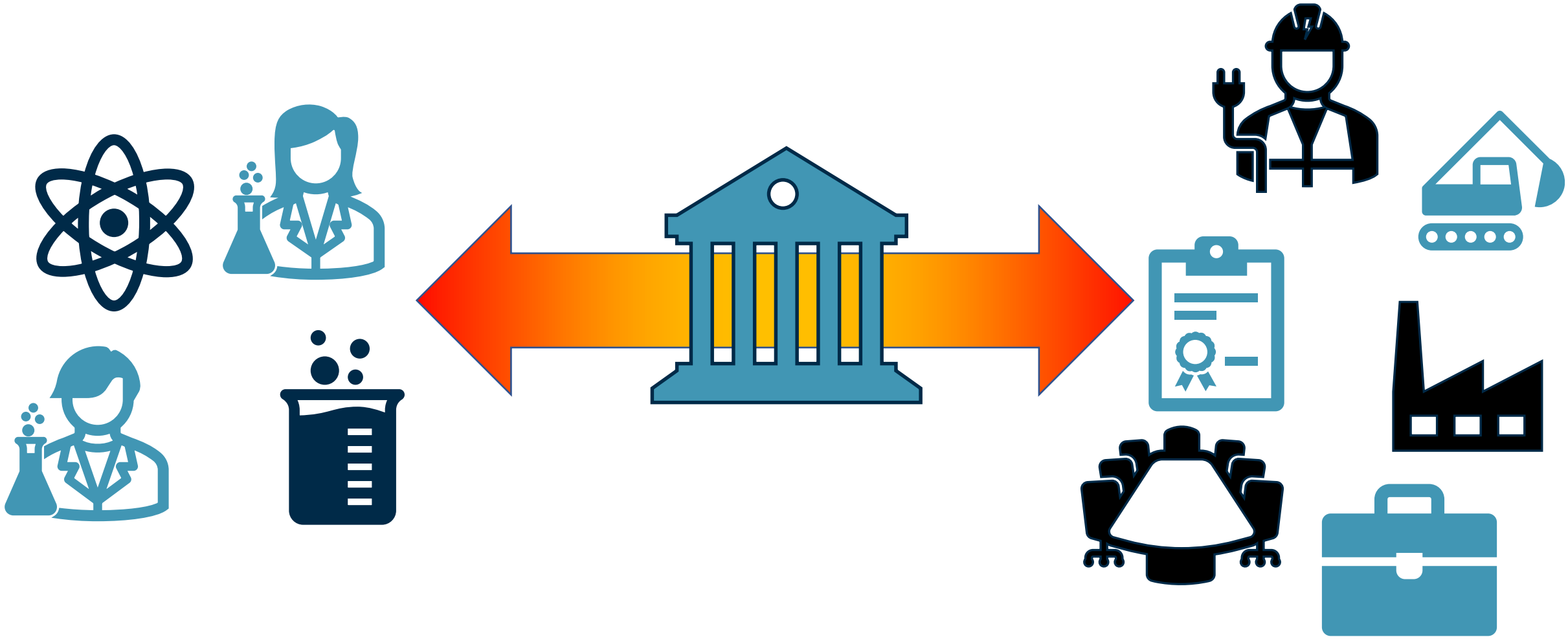




New acceleration technologies

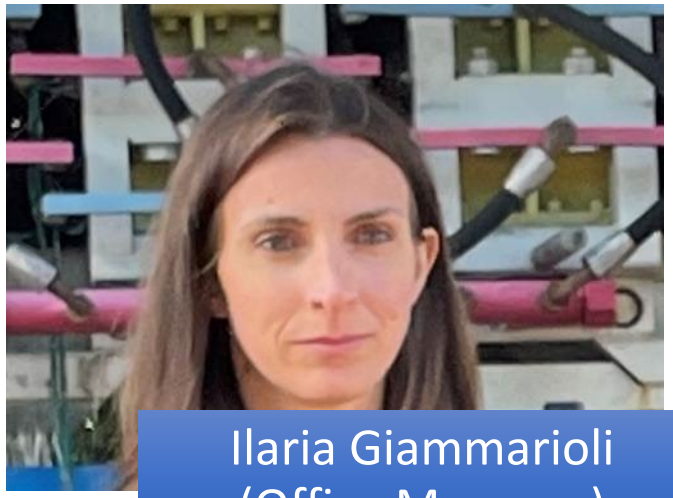

INFN
TechTransfer
INFN is not only a technology purchaser but also a
technology provider

Why a TT Office is needed?



https://istnazfisnucl.sharepoint.com/sites/TrasferimentoTecnologico/SitePages/Formazione-in-Pillole-di-TT.aspx

Thank you! (tto@lists.infn.it)



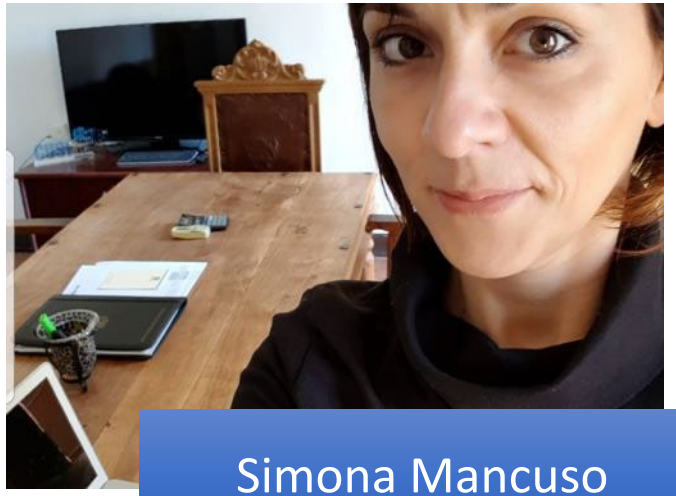
Ilaria Giammarioli
(Office Manager)

Stefania Lucantonio

Pier Paolo Deminicis

Cristina Placido

Diego Tonini



Simona Mancuso

Bibliography

1. https://www.businessresearchinsights.com/market-reports/particle-accelerators-market-108667
2. S. Sheehy, Application of Particle Accelerators, arXiv:2407.10216v1 [physics.acc-ph] 14 Jul 2024
3. Accelerator-based BNCT projects, https://isnct.net/bnct-boron-neutron-capture-therapy/accelerator-based-bnct-projects-2021/
4. Doyle et al. The Future of Industrial Accelerators and Applications. Reviews of Accelerator Science and Technology Vol. 10, No. 01, pp. 93-116 (2019) https://doi.org/10.1142/S1793626819300068
5. Florio et al. The socio-economic impact of a breakthrough in the particle accelerators' technology: A research agenda, Nuclear Inst. and Methods in Physics Research, A 909 (2018) 21–26
6. https://www.elettra.eu/science/top-stories/energy-crisis-impact-on-user-activities-at-elettra-sincrotrone-trieste.html
7. https://www.sesame.org.jo/news/sesame-becomes-worlds-first-large-accelerator-complex-be-fully-powered-renewable-energy
8. Strive towards sustainability. Nat. Phys. 19, 761 (2023). https://doi.org/10.1038/s41567-023-02117-0
9. INFN Environmental report https://www.infn.it/wp-content/uploads/2025/01/Environmental_Report_23.pdf

$$CAGR(t_0, t_n)\% = \left[\left(\frac{V(t_n)}{V(t_0)}\right)^{\frac{m}{t_n - t_0}} - 1\right] \times 100$$

m = periodicity (years=1, months=12, etc)

$t_n - t_0$= number of periods

Distribution by sector and application

Sector	Application	Accelerated particles	Energy (MeV)	N° in the world	Ref.
Medical	Radiotherapy	Electrons → X-Rays	6-25	~12500	2
	Hadron therapy	Protons, ions (C)	250 (p), 450/u (C)	~100	2
	FLASH therapy	Electrons → X-Rays			
	BNCT	Protons → Neutrons		~30	2,3
	Radioisotopes	Protons	7-11 (short life), 70-100 (long life)	~1000	2,4
Industrial	Ion implantation	Ions	10^{-4}-1	~12000	2
	E-beam irradiation	Electrons	1-10		2
	Radiography	Electrons → X-Rays	1-10		2
Ion beam analysis	RBS	Proton, He	1-10		2
	PIXE	Proton, He	1-10		2
	AMS	Ions (C)	1-10		2
Security	Cargo scanner	Electrons → X-Rays	1-10		2
Science	Synchrotron light				2
	Spallation neutron	Protons → Neutrons	1000		2
	…				