



INFN

Knowledge and Technology Transfer

Speranza Falciano
INFN Executive Committee

CVI Meeting at TIFPA
October 19-21, 2015

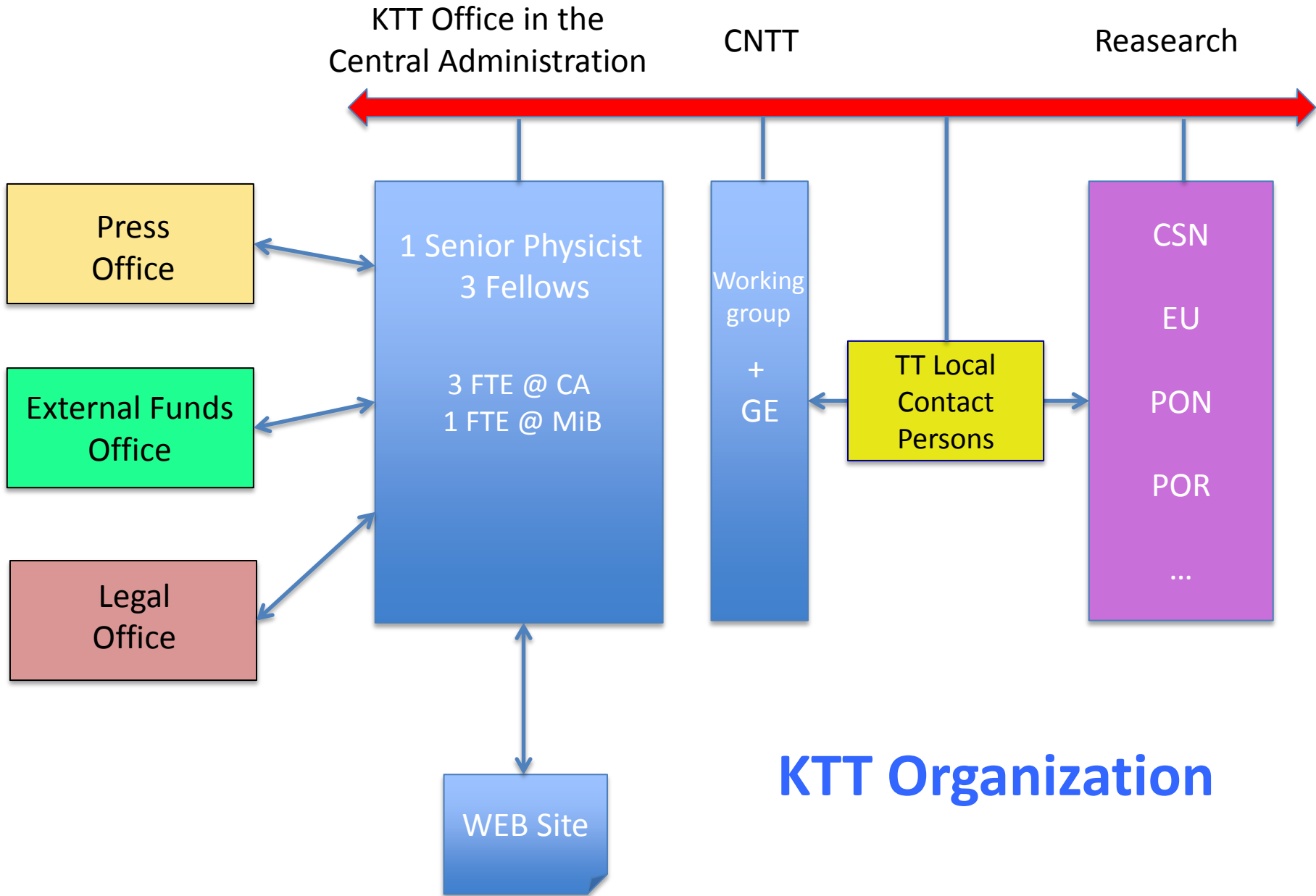
Introduction

- It is since 2013 we do not present KTT to CVI.....
- 2014 and 2015 have been another two fruitful years for the knowledge and technology transfer activities at INFN.
- Dissemination of INFN Intellectual property (IP) generated by the Institute, often together with other Institutions or Companies, is slowly increasing.
- But..... we still have margin to improve our KTT results.

Outline

- Where we are
 - CNTT (National Committee for Technology Transfer and External Training)
 - Network of local TT contact persons (TT Representatives)
 - KTT Office and support
 - New rules for IP management
 - Present results of KTT activities
- Qualified, ongoing activities to improve strategy
 - Improved ILO
 - CERN Incubator Centers
 - Framework agreements with Companies
 - Technology networks (CHnet, RadNet, ...)
 - Study of INFN economic impact
 - External funds and importance of agreements at Regional level
 - Communication (Internal and external announcements of KTT activities)
- Conclusions

Where we are



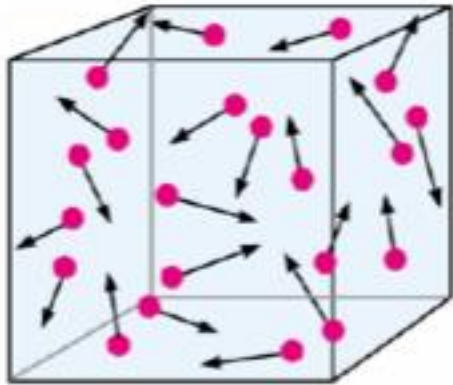
Summary of KTT Organization

- Core

- CNTT (National Committee for Technology Transfer and External Training)
 - Chair
 - TT Office Representatives
 - 2 Local TT Representatives (Physicist and Engineer)
 - 1 Expert of external training (Physicist)
 - 1 Expert of technology transfer (Physicist)
 - The President of CSN5
 - 1 ex-officio member from INFN Executive Committee
- Network of local TT contact persons (25 Local TT Representatives + TIFPA+ GSSI)
- KTT Office and support : 1 Senior Physicist (Responsible), 3 Fellows (2 in CA and 1 at MiB)

- Links

- Press Office
- Legal Service (specialized in IP management and cooperation agreements)
- External Funds Office



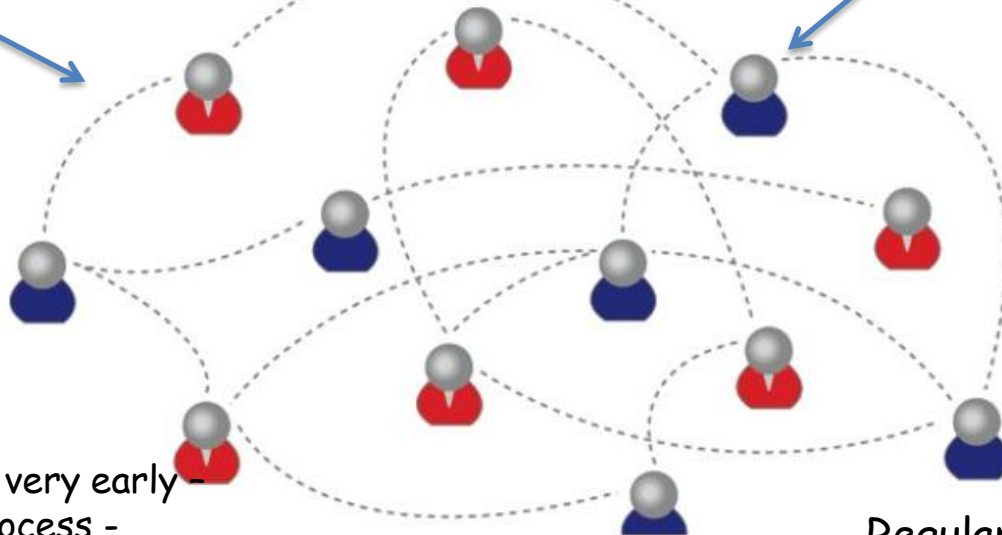
Science & Technology

27 TT Representatives working in the INFN units in connection with the scientific network. They may count on an efficient central service (Tool Box) to build up valorization projects from the scientific output.



Tool Box

Local TT Representatives



Co-funded projects
Licencing
Patenting
Creation of spin-off
Contracts
TT Call Center
.....

Regular training meetings (every 2 months) are foreseen for the TT Reps, organized by the CNTT.

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scouting activity (identify very early - e.g. during the approval process - research activity which has potential commercial interest, find possible partners/competitors, in a few words and if appropriate, help the activity to be even more TT oriented and exploit peculiarities of the project).

New TT Rules approved

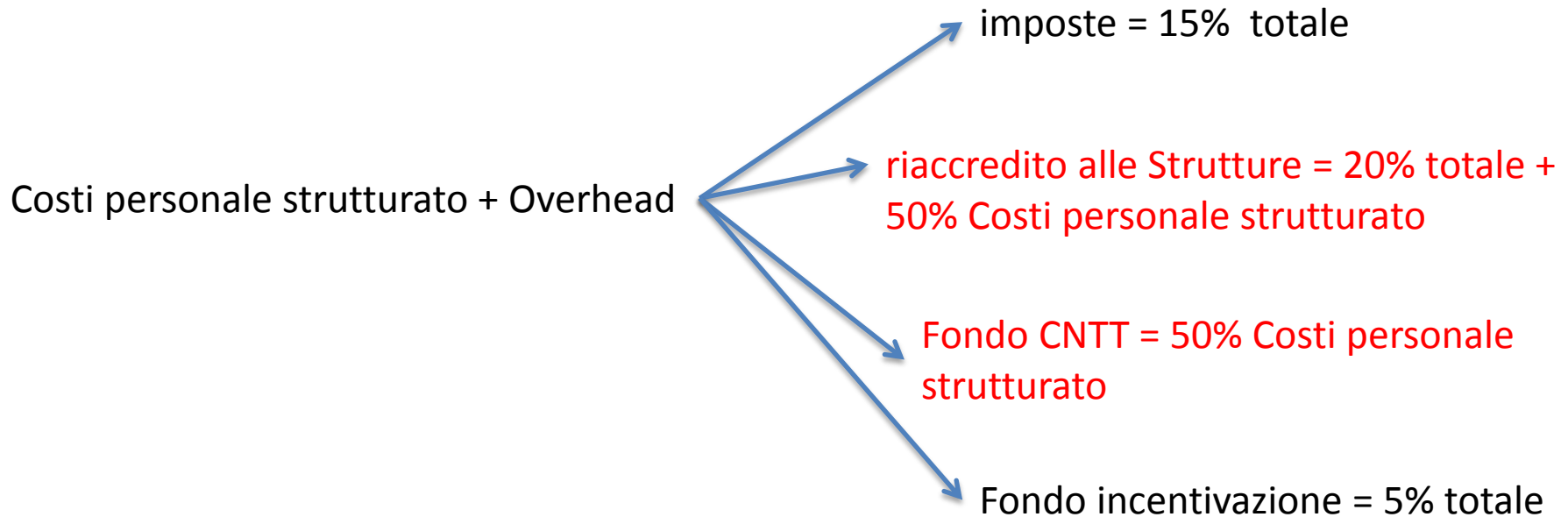
- To improve in a substantial way the results of TT activities, we decided to study carefully the bottlenecks of the entire system, including the rewards and putting attention to the fact that we have no dedicated money for protection and valorization of the IP generated by INFN.
- A strategic decision was taken at the end of 2013 in order to **solve "timing" and "funding" problems**. In particular we decided to take actions in order to:
 - reduce the time from the "idea" to the "patent/contract/etc.";
 - speed-up the entire process by delegating to the INFN Units to handle locally the TT actions by performing guided procedures without passing by the central office (under limited conditions);
 - track (using TT identifiers) all the TT actions with an economic impact in the central accounting division in order to monitor and analyse the results;
 - change the rules in order to have a different distributions of the income to reward the inventors and the corresponding INFN Units, to build a budget for the CNTT to be invested in valorization.

1. R&D activities for third parties
2. IP valorization → reward the inventor (equo premio)

R&D activities for Third-party (revenue distribution mechanism)

totale = Costi vivi dell'attività + **Costi personale strutturato** * + **Overhead***

Costi vivi dell'attività  riaccredito alle Strutture

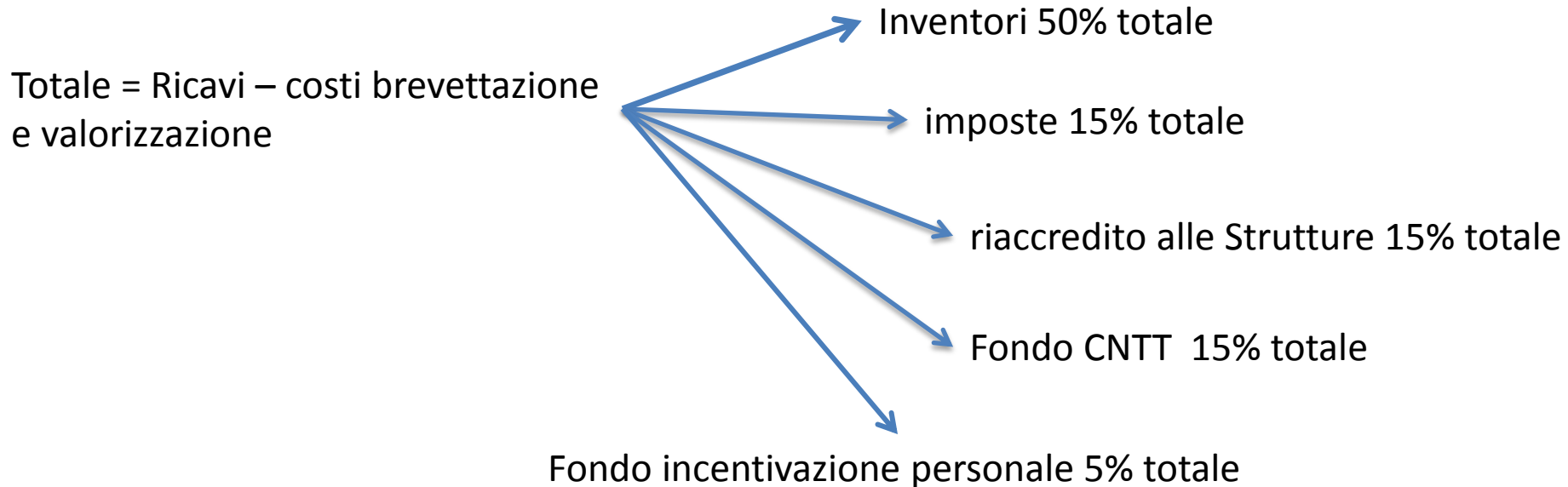


*in rosso quote variabili e percentuali dipendenti da quote variabili

IP valorization (1)

(revenue distribution mechanism)

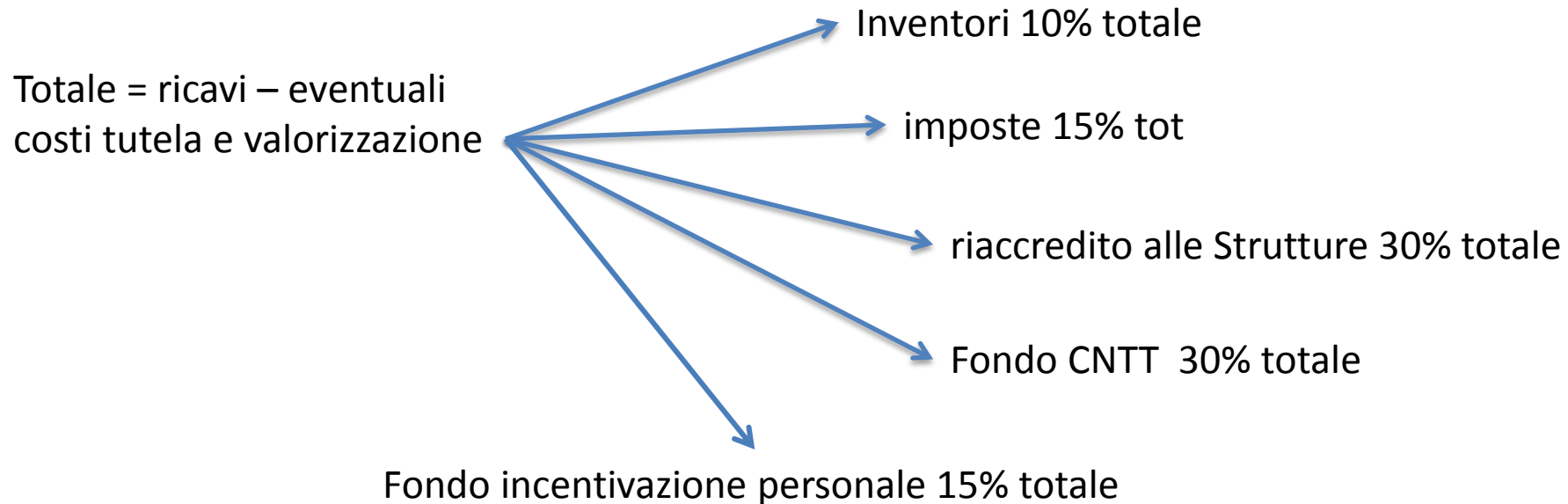
CASO 1: risultati brevettati o brevettabili; art. 65 Codice Proprietà Industriale Digs 30/2005



IP valorization (2)

(revenue distribution mechanism)

CASO 2: invenzioni “minori”; art. 64 Codice Proprietà Industriale Dgls 30/2005



Ripartizione proventi

Ripartizione Proventi Contratti TT	inventori	Fondo Incentiv. Personale	strutture	Fondo CNTT	tasse e costi generali
Attività R&D a favore di terzi Rif. Art. 22 Disciplinare INFN	Non prevede valorizz. IP	5% tot	80% tot meno quota fondo CNTT	metà dei costi personale strutturato	15% tot
Valorizzazione CASO 1: Brevetti; rif. art. 65 Dgls 30/2005 rif. Art. 12 c. 1,2 Art. 27 c.1a Disciplinare INFN	50% tot	5% tot	15% tot	15% tot	15% tot
Valorizzazione CASO 2: Altre invenzioni; rif. art. 64 Dgls 30/2005 rif. Art. 12 c. 3 e Art. 27 c.1b Disciplinare INFN	10% tot	15% tot	30% tot	30% tot	15% tot

INFN Patent Portfolio (1)

Since 2011 a completely renewed patent portfolio:

41 new patent applications

19 filed in more than 1 State (till now)

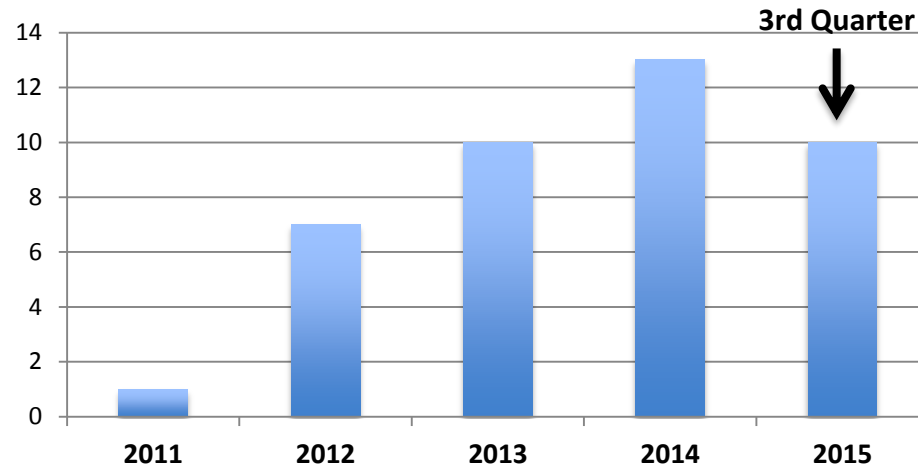
6 patented with industrial partners

7 already on a valorization plan selected on the basis of maturity
(likely to be granted and/or addressing an expressed industrial need)

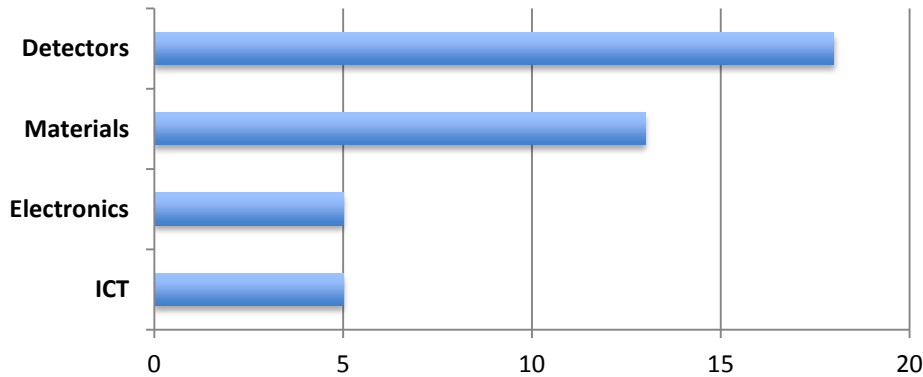
4 of which in partnership with patent brokers

INFN Patent Portfolio (2)

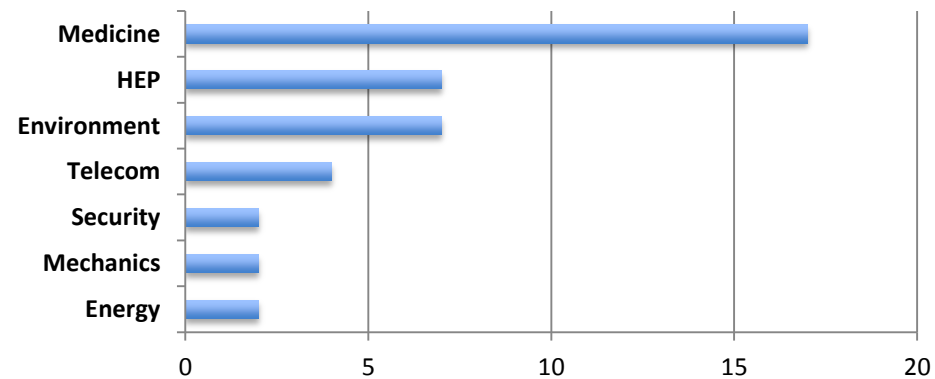
Patent applications



Research fields

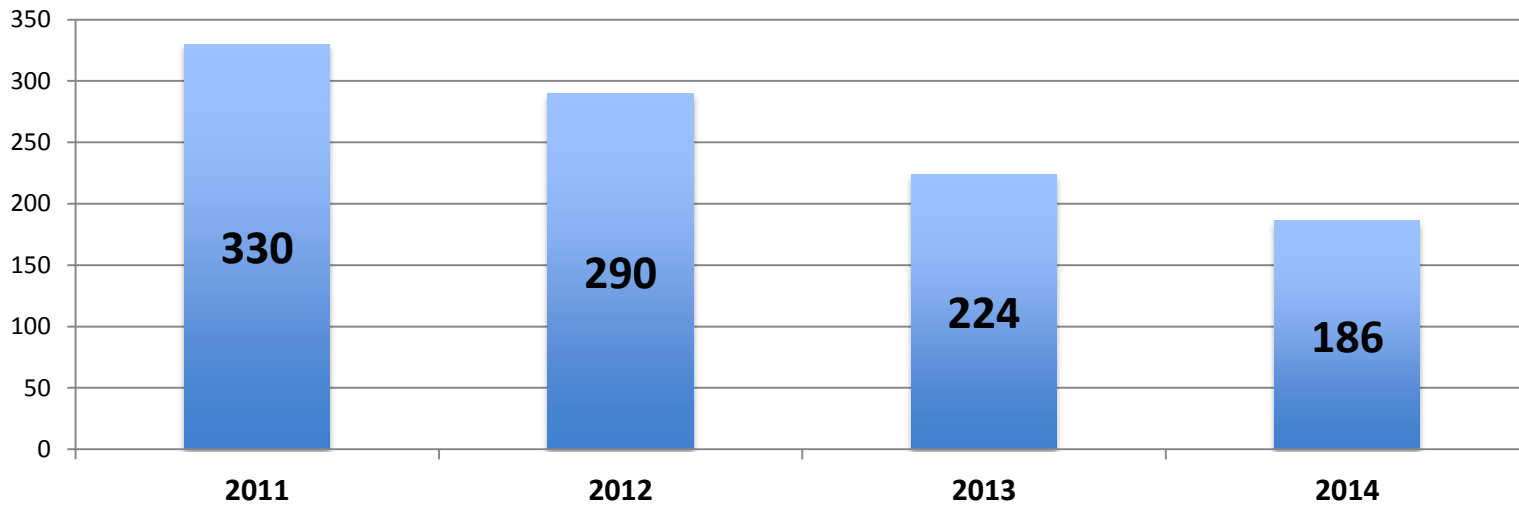


Application fields



Time To Patent (days)

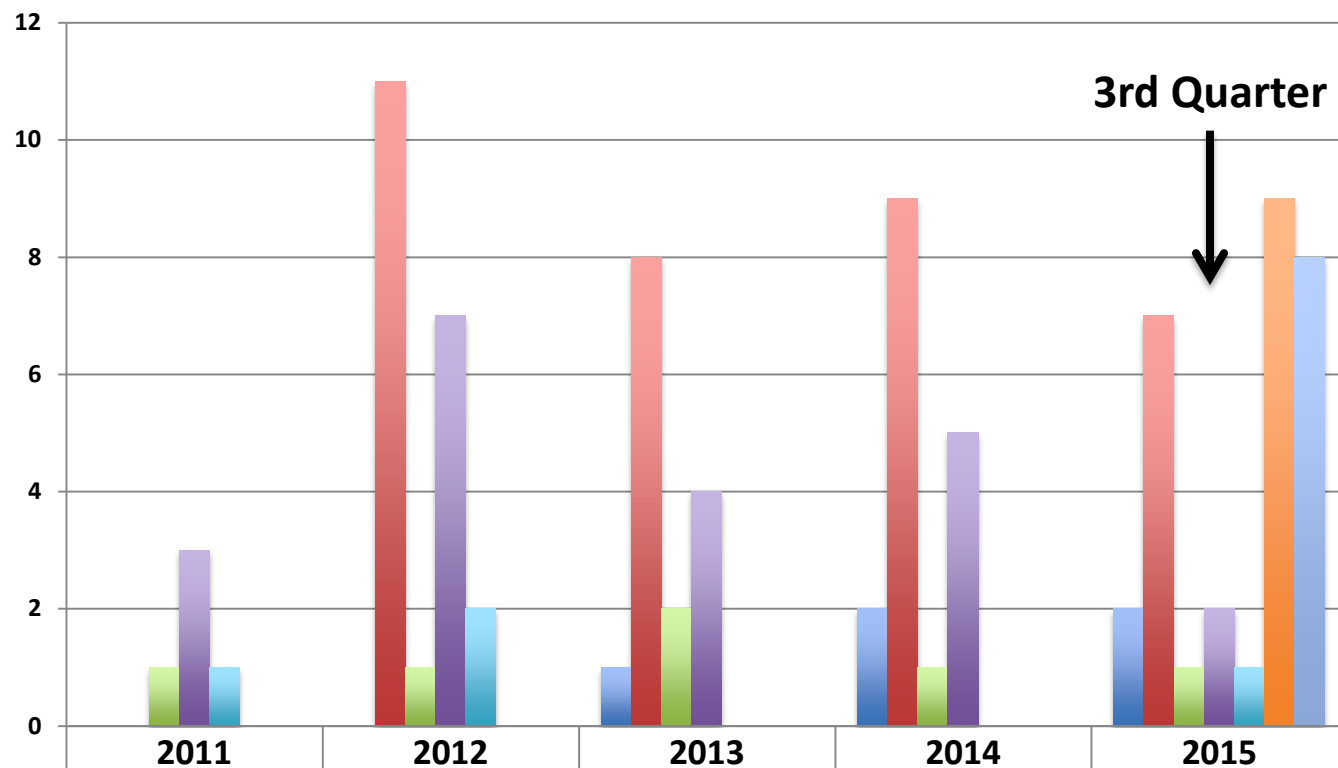
SHORTEST TTP in 2015= **13 days**



Short time to patent reduces:

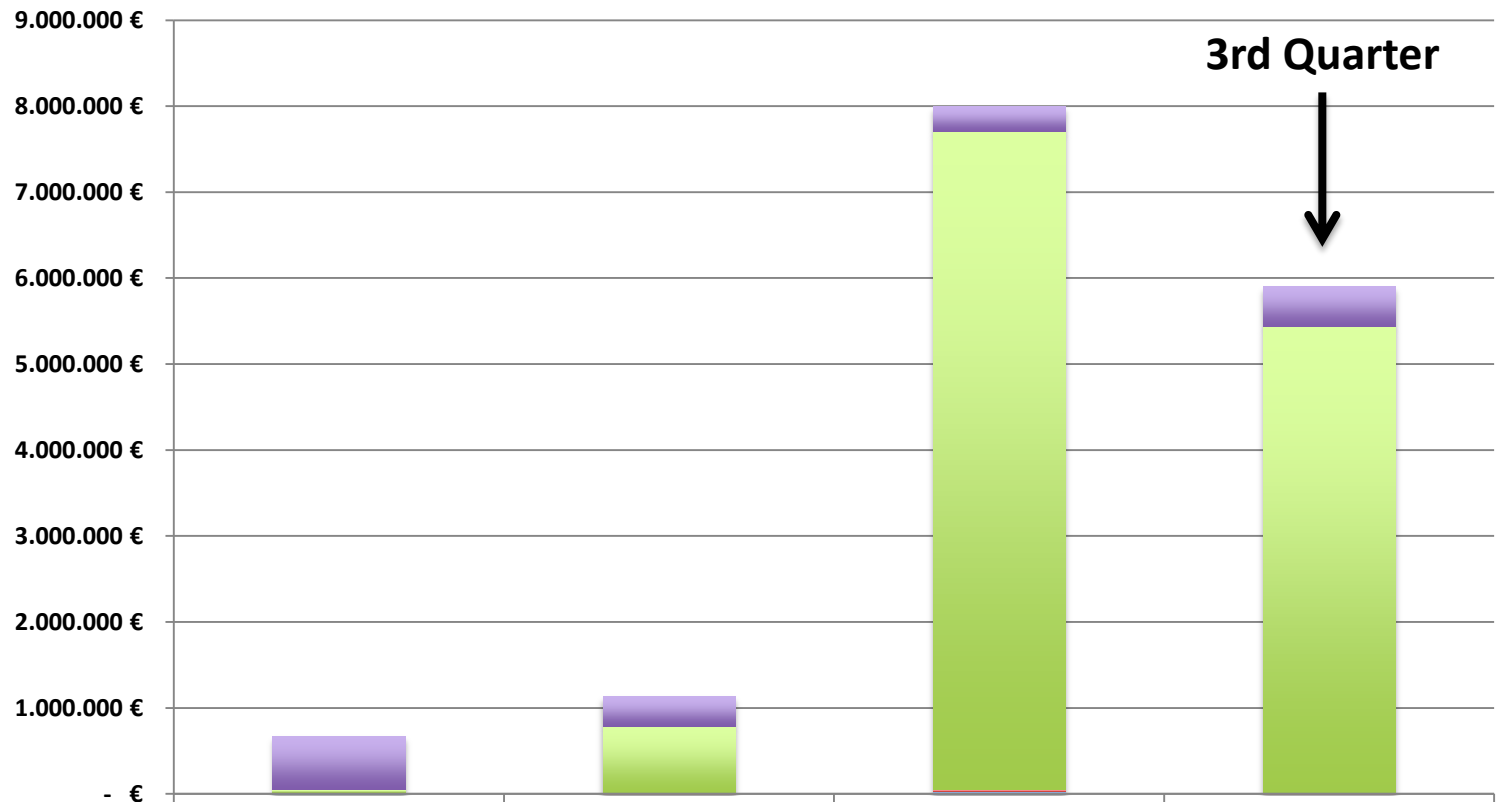
1. Chances for *Prior art* to be found
2. Scientific publication delays
3. time to *license*

Technology Transfer Agreements



Framework Agreement			1	2	2
Commissioned Research		11	8	9	7
License agreement	1	1	2	1	1
Cooperation agreement	3	7	4	5	2
Framework agreement with spin off	1	2			1
NDA	n/a	n/a	n/a	n/a	9
Work in progress					8

Technology Transfer Income



	2012	2013	2014	2015
COOPERATIVE RESEARCH	622.757 €	343.953 €	287.165 €	467.703 €
COMMISSIONED RESEARCH	30.000 €	788.456 €	7.653.129 €	5.416.929 €
SPIN OFF	1.000 €	1.000 €	20.000 €	20.000 €
LICENSING	20.000 €	- €	33.673 €	- €

More News

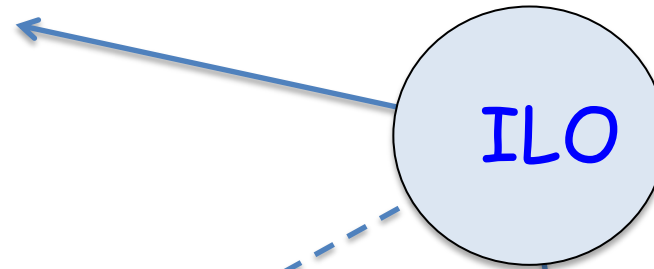
- In addition we have developed **software tools** for “trouble ticketing” and “templates” for the different procedures to be found in the TT Web site.
- Workflows of documents with authorization procedures and a dedicated Database are in preparation in order to **automate the approval process** for the different types of TT actions (patents, collaboration agreements, etc.).
- Dedicated **training sessions** at the INFN Units.
- Start detailed study of economic impact of TT actions.

Ongoing, qualified activities to improve strategy

ILO : Industrial Liaison Office

The effort we can do in our corner.....

CERN



Extend CERN ILO
To EU Research
Infrastructure

ESRF



ESS



ITALY AT CERN

8 - 10 OTTOBRE 2014

ITALY AT CERN, 7-10 ottobre 2014

7-10 October 2014 CERN di Ginevra
Birmo/Rome - Milano

Organized by:

1. Industrial Liaison Officer at CERN
2. Camera di Commercio Italiana per la Svizzera (C.C.I.S.)
3. Rappresentanza Permanente d'Italia presso le Organizzazioni Internazionali di Ginevra

This is an open showcase of Italian industry at CERN to establish technical and commercial links, also outside CERN with the help of CCIS.

		ITALY AT CERN 8-10 OCTOBER 2014
	Design and construction of mechanical components for scientific research and for the most qualified industrial vacuum sectors.	www.catechtechnology.com/
	Leader on market of resistive and superconducting magnets for high energy physics and thermonuclear fusion applications.	www.asg-it/
	Data-Acquisition Electronics, Power Supply Systems and Powered Crates.	www.caen.it/
	Performing precision mechanical machining of medium and large-sized components that require high quality standards	www.castellini.it/
	Production and turnkey solutions for synchrotron light and particle accelerator research equipments.	www.cinea.com/
	World leader in leading edge magnesium diboride (MgB ₂) technology.	www.columbusuperconductors.com/
	Industrial automation components supplies for the distribution of high quality and reliable products.	www.comer-italia.com/
	Cryogenics and high vacuum equipment, heat exchangers and superconducting cables.	www.criotec.com/
	RF power amplifiers, solid state or tube technology for particle accelerators and medical accelerators.	www.db-science.com/
	General contractor specialized in civil works and in high tech electrical and HVAC installations.	www.gruppodimensione.com/
	Designs, develops, manufactures and assembles products in stainless steel and special alloys for Scientific Research & Industry.	www.ecor-research.com/
	Mechanical working and dimensional test, until large dimension.	www.euromecarLett/
	Designer and manufacturer of customized plants, structures and mechanisms for physics and nuclear fusion research.	www.fantini spa.it/
	Italian industry leader in harnesses and electrical panels.	www.htcrl.com
	Industrial Engineering, Electrical & Mechanical Design, PCB Design & Manufacturing.	www.linkengineering.it/
	Engineering numerical analysis services.	www.ltcacolli.it/
	Expert provider of services for the development and production of PCBAs and mechatronic assemblies.	www.me-vinco.it/
	Electric motors, generators, power electronics, industrial control systems for Metals, Oil & Gas, Energy and heavy duty industries.	www.nidec-asi.com/
	Power supplies for Research and Biomedical Particle Accelerators; RF turn-key systems.	www.oceim.com/
	Specialized in Earth Moving Machines and Aerial Platforms project engineering and manufacturing.	www.palazzani.it/
	PCB provider that is specialized in prototypes, small series of high technology.	www.phoenixpcb.it
	Research Purity Specialty Gases and Mixtures, Cryogenic and Packaged Gases, Gas Delivery Systems and Equipment.	www.rivoirgas.it
	Development and production of NEG solutions and CapaciTom® and NEXTom® pumps families for UHV-XHV systems.	www.sasgroup.com/
	Special cables manufacturer for main industrial application.	www.sami.it/
	Engineering and manufacturing of special plants for high energy research.	www.sea-alp.com
	Safe energy preservation and renewable energy.	www.sielups.com/
	Leader manufacturer of copper and optical cables, flame retardant, halogen-free, fire resistant for harsh environment.	www.technikabel.it/
	Designing plastic products and designing, manufacturing and supplying moulds for plastics.	www.unitekitalia.com
	Leader manufacturer of critical mechanical equipment for Power, Oil&Gas, Petrochemical and Food & Pharma markets.	www.waltertosto.it/



ILO Industrial Opportunities Day

11 June 2015 *Centro Congressi, CNR Area della Ricerca*
Europe/Rome timezone



A day dedicated to explore the opportunities of business and knowledge transfer that CERN, ESRF, ESS and national Labs offer to Italian SMEs

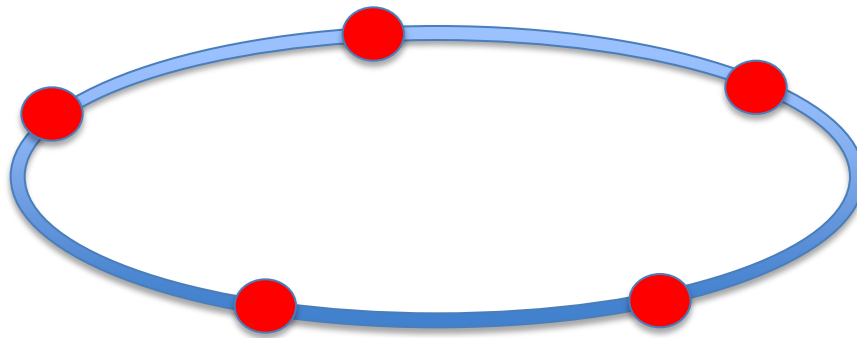
The Industrial Opportunity Day has been organized to present the main projects launched by those Physics European Labs, where the collaboration with the Italian scientific community, supported by INFN and CNR, is well established.

The event has been structured in an introductory plenary session in the morning and four parallel sessions in the afternoon, dedicated to the most relevant industrial sectors (mechanics, cryogenics, vacuum, magnets, electronics & ICT, civil engineering).

This first national event will be followed by further meetings at regional level that will make it possible to focus the attention on the specific local industrial capabilities and to discuss initiatives to better exploit locally the technology transfer opportunities.

Business Incubator Center (BIC) in Italy using CERN Technologies

- Creativity and innovation flourish when people come together and share ideas, which is why the **CERN KT Group** actively promotes, encourages and supports cross-sectoral activities.
- The interaction of research centers and universities, commercial organizations, students, scientists and entrepreneurs transforms the knowledge of high-energy physics into tangible opportunities for business. In particular, 2014 saw the expansion of **CERN's Business Incubator Centres of CERN Technologies in the Member States** (UK, The Netherlands, Austria, Greece, Norway).
- **BIC** will support the development and exploitation of innovative ideas in technical fields broadly related to CERN's activities in high energy physics such as accelerators, cooling technology, detectors, electronics and high performance computing.
- CERN will contribute with the transfer of technology and know-how through technical visits to CERN, - up to 40 hours free access to technical expertise and facilities, give support at the BIC and preferential-rate licensing of CERN intellectual property, use of the "CERN Technology" and "CERN Spin off" labels. INFN and related partners will provide office-space, expertise, business and fundraising support.



"Distributed BIC"

● = Node

- Starting in 2013, the possibility of a CERN BIC in Italy was discussed.
- Our **funding model (mostly regional)** allows for a **distributed incubator** which was finally accepted by CERN and then extended to other Member States.
- Today we are finalizing the **CERN-INFN BIC agreement** which foresees nodes at : Politecnico di Torino, Lazio (INFN-ASI), Friuli-Venezia Giulia (AREA Science Park), Puglia, Veneto (PD-LNL), Sardegna (Sassari University).
- In this distributed model, CERN only deals with INFN BIC coordinator.

Business Incubator Centres of CERN Technologies

Established incubators:

UK	STFC-CERN BIC
Netherlands	NIKHEF-CERN BIC
Norway	NTNU-CERN BIC
Greece	Technopolis-CERN BIC
Austria	accent-CERN BIC

Advanced pipeline:

France and Finland

[Italy](#)



How does it work in practice?

(STFC example)

- Potential applicants submit "expression of interests"
- STFC and CERN evaluate them and decide who to invite to a technical visit at CERN (funded by STFC)
- CERN KT co-organizes the visits and put the potential applicants in contact with technical experts at CERN who could help
- If the visit at CERN is successful, potential applicants are invited to formally submit an application to the scheme (this includes a business plan)
- A committee composed by STFC, CERN, a Venture Capitalist and ESA evaluates the requests
- The selected applicants are admitted to the incubator (sometimes with some caveats)

Turning CERN technologies into new business opportunities

 **STFC**


technology

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[How to apply](#)

[News and events](#)

[Our successes](#)

[Location](#)

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Welcome to the STFC CERN BIC

High energy physics accelerating business

Creating innovative new products, services and business opportunities from high energy physics technologies

The STFC CERN Business Incubation Centre (BIC) offers funding, business support and technical assistance to entrepreneurs and small high-tech companies seeking to accelerate their innovative business concepts.

Focused on developing new products and services using technologies originally developed for use in high energy physics research, this pilot scheme draws on the world-leading capabilities of the Science and Technology Facilities Council (STFC) and the European Organization for Nuclear Research (CERN), home of the Large Hadron Collider.

The BIC combines the incubation experience of STFC with the unique opportunity to access STFC and CERN intellectual property (IP), technologies and expertise. It will help businesses to grow from technical concept to market reality, from small start-ups into thriving high-tech companies.

There is an open call for applicants to join the scheme and the deadline for applications is **June 2013**.

For all the latest news, information and opportunities at the STFC CERN BIC, follow us on twitter [@STFC_B2B](#) .



Framework Agreements with Industry (1)

- The **collaboration with the national industry** has been highlighted by means of research agreements with some important firms having a long standing tradition of collaboration with INFN or having a matching strategy.
- These agreements **address research topics of common interest**, include exchange of personnel and financial support for young people with technological skills (2 fellows + 1 RTD).
- Agreements include protection of IP (background and foreground), possibility to participate jointly to external calls, collaboration limited to R&D as large volume productions must go through public competitions.
- A cooperation agreement between INFN and **Confindustria** has been approved by the Parties allowing for specific regional agreements under this general framework.

Framework Agreements (2)

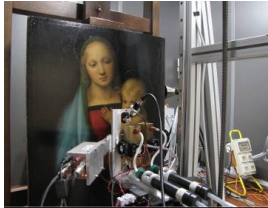
Ansaldo N.	Energy
CAEN	Scientific Instrumentation (Electronics)
Sogin	Decommissioning of nuclear plants Nuclear waste management
ITEL	Accelerators for medical and industrial applications
ELSE N.	Detection of ionizing radiation Monitoring/treatment of radioactive waste Decommissioning of nuclear power plants
LFfoundry	Microelectronics for HEP

INFN Technology Networks

- It was almost natural for us to propose a virtual connection of different INFN units with similar expertise on a given technology or group of technologies for the same application, therefore we decided to build "national networks" on selected technologies or topics.
- New idea : perform training and "internal technology transfer" in order to increase the capacity of the network, especially at national level.
- At the same time the European Committee stated that :
"Clusters are powerful engines of economic development and drivers of innovation in the European Union. They provide a fertile business environment for companies, especially SMEs, to collaborate with research institutions, suppliers, customers and competitors located in the same geographical area"
- INFN Networks may evolve to include not only INFN personnel and INFN instrumentation, but also companies, consortia, public and private subjects, spin-offs, etc.
- **CHnet** : a network of accelerators and mobile instrumentations for the conservation and restoration of the cultural heritage.
- **RadNet** : a network of irradiation facilities built around the INFN National Labs and their accelerators.

CHnet

A network of accelerators and mobile instrumentations for the conservation and restoration of the cultural heritage.



Tecnologie per i Beni Culturali



Analisi elementali e/o composizionali sia in laboratorio che in situ

- ✓ (μ) XRF/ (μ) XRD
- ✓ (μ) Raman
- ✓ Spettrofotometria

Datazioni

- ✓ Radiocarbonio (AMS)
- ✓ Termoluminescenza (TL/OSL)

Analisi con acceleratore

- ✓ Pixe/Pige/BS/RBS
- ✓ Ionoluminescenza

Imaging Tomografico

- ✓ Indagini microtomografiche in laboratorio con risoluzione spaziale massima dell'ordine di 10 μm e indagini tomografiche, sia in laboratorio che in situ, con raggi X di energia massima 200 keV

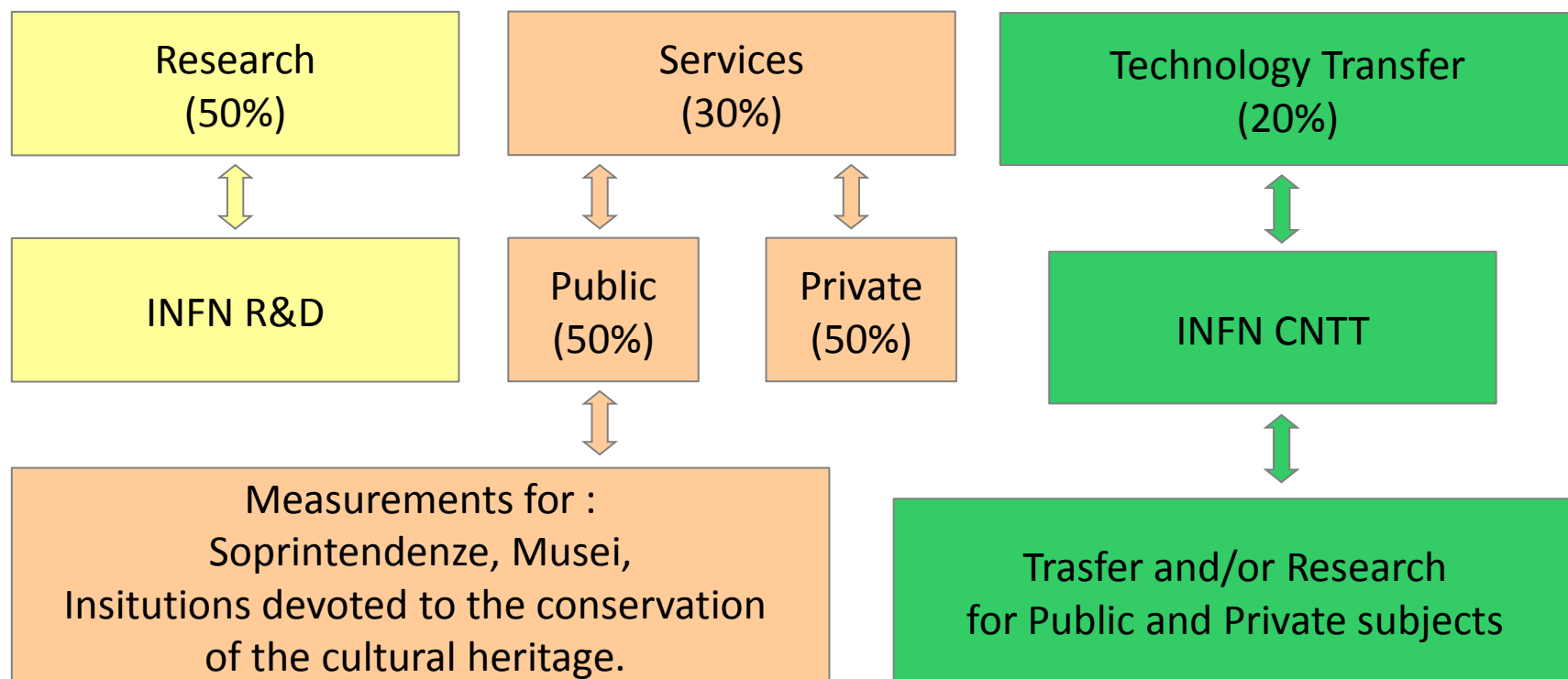


CHNet

La rete INFN dedicata ai Beni Culturali



INFN Network for Cultural Heritage (12 INFN Units)



Training camp for CH

- From June 15th to 20th 2014 the **Museo Civico in Sansepolcro (AR)** hosted the first in situ international school on advanced non-invasive diagnostic tools applied to the study of Cultural Heritage materials.
- The second edition of the School is now in progress at **L'Aquila at the Palazzetto dei Nobili**, the first historical building of the town restored after the earthquake.
- The school, **organised by OPD, CNR, INFN, INSTM** and the local district, is intended for young researchers and PhD students in conservation sciences, as well as restorers and conservators, and will be a solving-oriented Training Camp aimed at presenting and discussing some specific problems related to artworks conserved by the Museum or be available by the local institutions.
- The training camp is **supported by MIUR** through the Italian infrastructure for Cultural Heritage **IPERION-CH.it**, which aims at providing to Cultural Heritage researchers and conservators access to its laboratories, its archives and its technical-scientific expertise.



COMUNE DI SANSEPOLCRO

PORTALE WEB DEL COMUNE DI SANSEPOLCRO

FOTO:
Luca Piomboni
Fotoclub Sansepolcro

HOME IL COMUNE INFORMA TURISMO E CULTURA EVENTI E SPORT COME FARE PER CONTATTI

ISTITUZIONE

- [ALBO PRETORIO](#)
- ▶ [IL SINDACO](#)
- [GIUNTA](#)
- ▶ [CONSIGLIO](#)
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- ▶ [AMMINISTRAZIONE TRASPARENTE](#)
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UFFICI

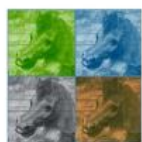
[Consulta l'archivio comunicati](#)

A SANSEPOLCRO LA PRIMA SCUOLA INTERNAZIONALE PER LA DIAGNOSTICA NON INVASIVA DEI BENI CULTURALI

Dal 15 al 20 giugno 2014 il Museo Civico di Sansepolcro ospiterà la prima scuola internazionale sulla diagnostica avanzata non invasiva per lo studio dei materiali dei Beni Culturali, organizzata da Opificio delle Pietre Dure di Firenze, Consiglio Nazionale delle Ricerche, Istituto Nazionale di Fisica Nucleare, Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali (INSTM) e Comune di Sansepolcro. La scuola di alta formazione è rivolta a giovani ricercatori e dottorandi nelle scienze applicate alla conservazione ma anche a restauratori e conservatori per lo studio di problematiche inerenti alcune opere di rilievo del Museo Civico o provenienti dal territorio del comune di Sansepolcro. Il training camp sarà supportato dal MIUR attraverso l'infrastruttura italiana per i Beni Culturali imperio-ch.it, tra i cui compiti sono previsti l'implementazione di servizi di accesso ai propri laboratori e archivi e il trasferimento di competenze tecnico-scientifiche a ricercatori, studiosi e conservatori dei Beni Culturali, per l'analisi e lo studio di opere d'arte, monumenti e siti archeologici.

2015

TRAINING CAMP



IPERION CH.it



Meetings, lectures and practical experiences of non-invasive diagnostics applied to cultural heritage at the Palazzetto dei Nobili in L'Aquila



CVI Meeting at TIFPA
October 19-21, 2015

La scienza al servizio dell'arte

CICLO DI SEMINARI sulla diagnostica non invasiva per i Beni Culturali in occasione del secondo Training Camp di IPERION CH.it

Palazzetto dei Nobili, AQ, 15-20 ottobre 2015

GIOVEDÌ 15 OTTOBRE

- 9.00 – 9.45** – Inaugurazione e saluti istituzionali
9.45 – 10.00 – Presentazione delle attività di IPERION CH.it
– S. Legnaioli, *INSTM* – F. Taccetti, *INFN*
10.00 – 10.30 – L'Aquila dopo il terremoto. Ripartire dal patrimonio culturale – A. Vittorini, *Soprintendente unica per l'Aquila e il cratere*
11.00 – 12.00 – Casi studio per il training Camp: le opere messe a disposizione dall'Arcidiocesi dell'Aquila – G. Simone, *Ufficio Beni Culturali Mobili dell'Arcidiocesi dell'Aquila*
12.00 – 13.00 – Oltre il visibile: introduzione all'imaging multispettrale – R. Fontana, M. Barucci, *INO-CNR* - S. Legnaioli, *INSTM*
14.30 – 15.30 – Analisi non invasive di materiali pittorici con spettroscopie molecolari – C. Miliani, *ISTM-CNR*
15.30 – 16.30 – I raggi X e l'arte, diagnostica e scoperta. Viaggio all'interno di un'opera – M. Bettuzzi, *INFN*
16.30 – 17.30 – Rilievo 3D per documentazione, ausilio al restauro e fruizione – R. Scopigno, *ISTI-CNR*

SABATO 17 OTTOBRE

17.00 – 18.00 – L'Università degli Studi dell'Aquila per la Scienza e Tecnologia dei Beni Culturali – S. Sfarra, G. Cerichelli, C. Casieri, *UNIVAQ*

DOMENICA 18 OTTOBRE

17.00 – 18.00 – Applicazione della spettrometria di massa isotopica allo studio dell'opera d'arte: indagini sulla provenienza e autenticità¹ – S. Nisi, *INFN*

MARTEDÌ 20 OTTOBRE

- 9.00 – 9.30** – La diagnostica applicata ai Beni Culturali: l'interfaccia col mondo della tutela e degli studi storico-artistici – C. Frosinini, *Opificio delle Pietre Dure di Firenze*
9.30 – 10.00 – La diagnostica applicata ai Beni Culturali: l'interfaccia col mondo del restauro e degli studi sulla tecnica artistica – R. Bellucci, *Opificio delle Pietre Dure di Firenze*
10.00 – 10.30 – Applicazioni della tecnica LIBS nella Diagnostica per i beni Culturali – V. Palleschi, *INSTM*
11.00 – 11.45 – Laser cleaning – S. Siano, *IFAC-CNR*


SEMINARI DIVULGATIVI E APERTURE AL PUBBLICO

VENERDÌ 16 OTTOBRE

- 15.00 – 16.00** L'Università degli Studi dell'Aquila per la storia dell'arte del territorio – C. Pasqualetti, *UNIVAQ*
16.00 – 17.00 Tecniche di indagine per le pitture murali – A. Felici, *Opificio delle Pietre Dure di Firenze*
17.00 – 18.00 La fisica per i beni culturali: oltre il visibile – P. A. Mandò, *INFN*

SABATO 17 e DOMENICA 18 OTTOBRE

17.00 – 18.30 APERTURA AL PUBBLICO DEI LABORATORI DI DIAGNOSTICA ALLESTITI PRESSO IL PALAZZETTO DEI NOBILI

CVI Meeting at  IPERION CH.it
October 19-21, 2015

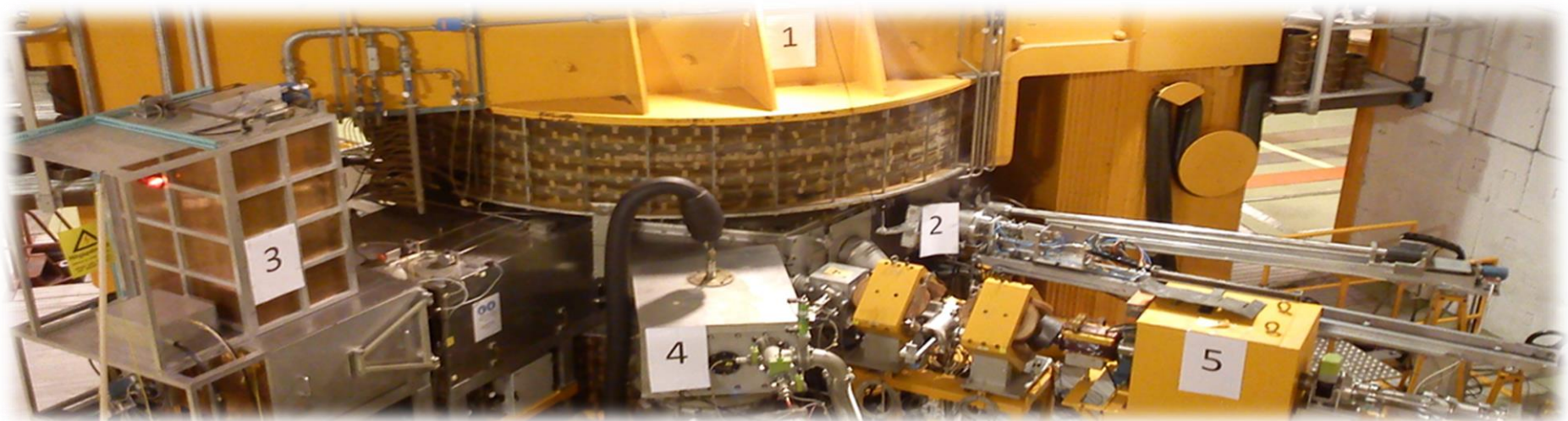


RadNet

A network of irradiation facilities built around the INFN National Labs and their accelerators to study the radiation damage of electronic instruments and systems.

INFN interest : validation of electronics and detectors

- In the next years there will be a large activity to validate the electronics for the HL-LHC experiments.
- INFN has the accelerators to do so in the national Labs.
- Worldwide there is a general lack of such centers (In EU only 3 certified labs are ok for ESA : Louvain, PSI and Jyväskylä).
- The Space Agencies (ASI in Italy) and the companies interested in space missions are continuously looking at qualified irradiation centers.



Single Event Effects: not only in space or colliders

SEE concerns for electronics used in:

- **Aerospace**
 - Satellites
 - Civilian and military aircraft
- **Medical**
 - Implanted electronic devices (pacemakers, defibrillators...)
- **Nuclear Industry**
 - Instrumentation and control in proximity to reactors
- **Transport**
 - Electronics in cars and trains
 - Signalling and traffic control networks
- **IT Networks and Telecommunication...**



What can we offer?

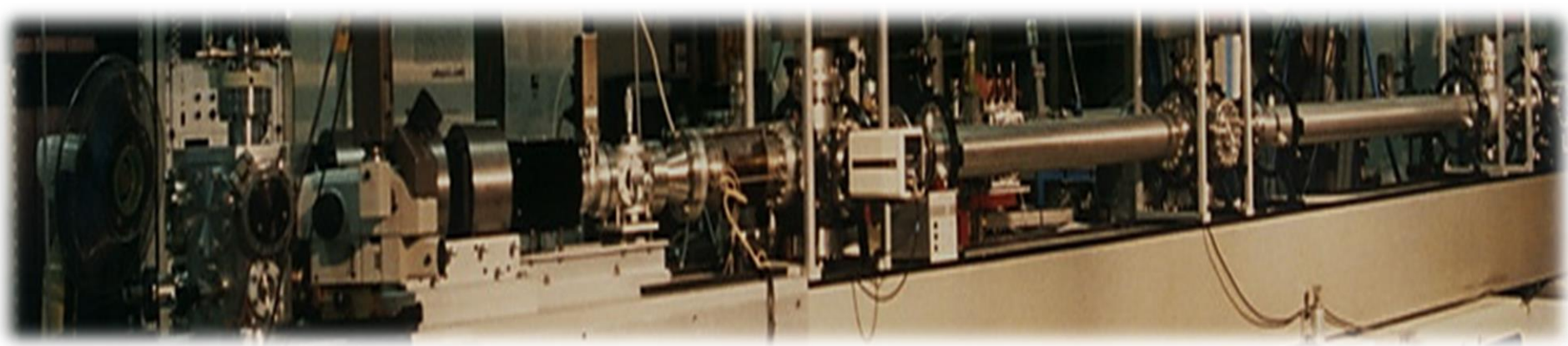
- Gamma sources, X-Ray sources
- Electron beams at BTF
- Proton beams (100 keV to 230 MeV)
- Ion beams
- In future also neutrons (also high energy with the phase δ of SPES)
- Excellent groups studying radiation damage (Bergamo/Pavia, Padova, al.)

WARNING: in the field of gamma sources and neutrons from reactors there is a consolidated experience at ENEA.

Laboratori Nazionali di Legnaro

- Tandem: protoni < 28 MeV, ioni
- Tandem+ALPI ioni @ alto LET, alto range
- CN: protoni < 7 MeV, neutroni
- AN2000: protoni e $\alpha < 2$ MeV
- impiantatore ionico: protoni < 100 keV
- SPES (in progetto): neutroni e protoni < 70 MeV
- Microbeam capability at TANDEM & AN2000

D.Bisello/INFN PD



Ioni pesanti e camera ESA a Legnaro

- **14 MV** Tandem accelerator.
- 2 irradiation chambers, online dosimetry.
- Remote controlled μm 3 axis stage.
- Standard ESA sample holder.
- Auto-shutter at programmed dose.

M/Q=5	DUT energy [MeV]	Range in Si [μm]	Surface LET [$\text{MeV mg}^{-1} \text{cm}^{-2}$]
$^1\text{H}^{1+}$	28	4340	0.02
$^7\text{Li}^{3+}$	56	376	0.37
$^{12}\text{C}^{6+}$	94	164	1.53
$^{16}\text{O}^{7+}$	108	107	2.95
$^{28}\text{Si}^{11+}$	157	61	8.6
$^{35}\text{Cl}^{12+}$	171	50	12.7
$^{83}\text{Ni}^{16+}$	220	37	29.4
$^{63}\text{Cu}^{16+}$	220	34	31.9
$^{79}\text{Br}^{18+}$	241	22	41.8
$^{107}\text{Ag}^{20+}$	266	29	58.4
$^{127}\text{I}^{21+}$	276	30	65.4
$^{197}\text{Au}^{26+}$	275	26	79.1

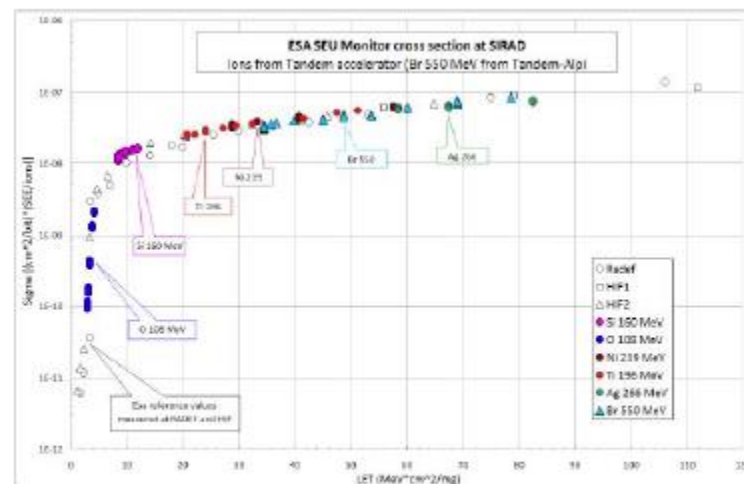
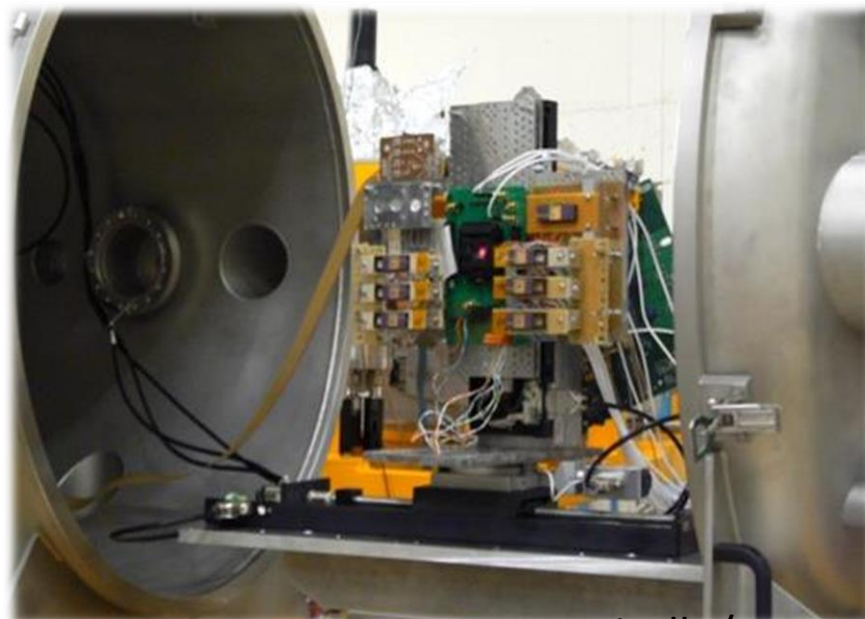
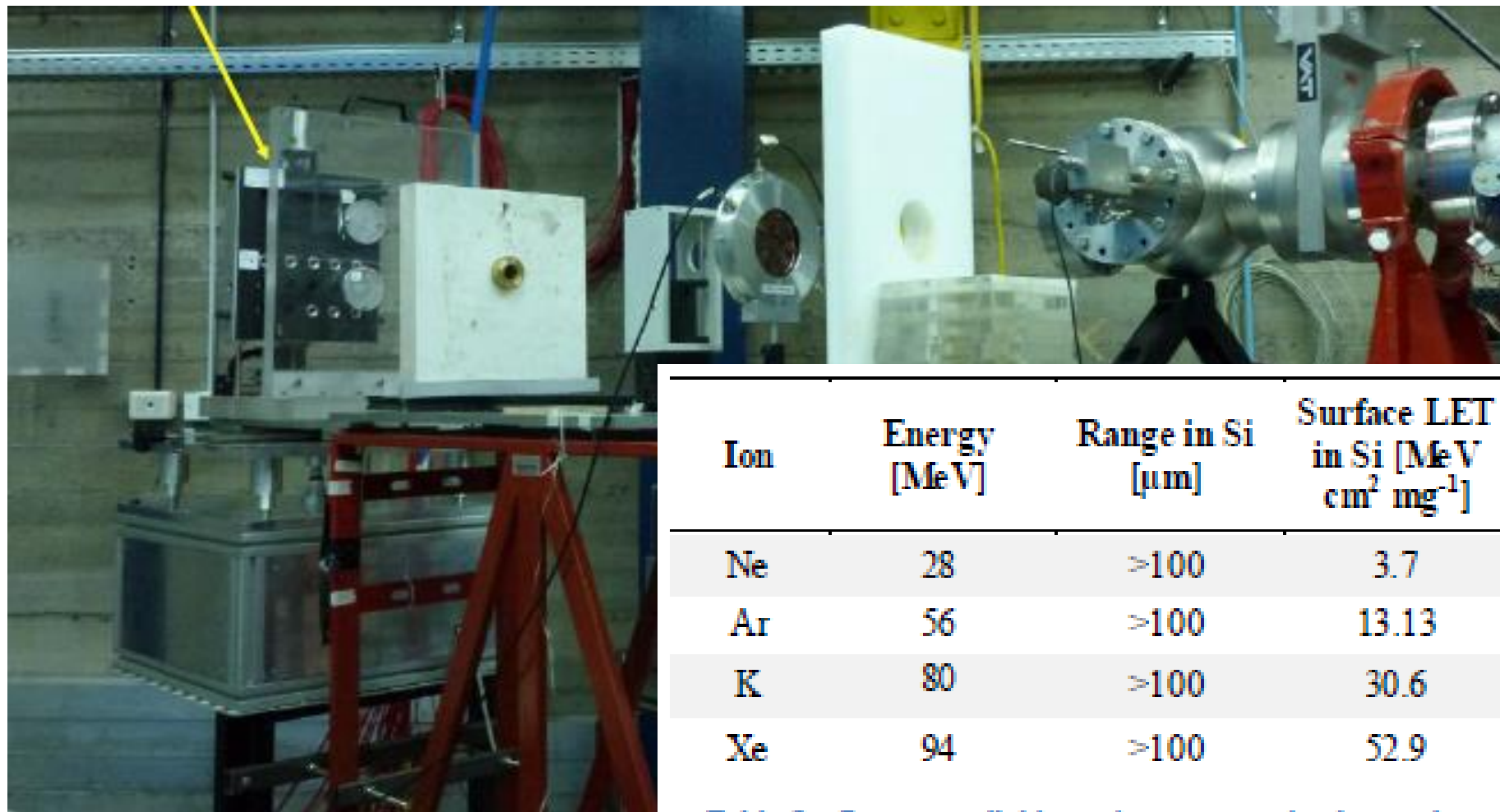


Fig. 2: SEU cross section of the ESA SEU Monitor measured at SIRAD (solid markers) using ion species from Tandem and a Br 550 MeV beam from Tandem-Apili complex. For comparison, cross section measured at Radeff and HIF facilities are also shown (empty markers).



Laboratori Nazionali del Sud

- CS: protoni < 100 MeV, ioni @alto LET/range
- Tandem: protoni e ioni come LNL



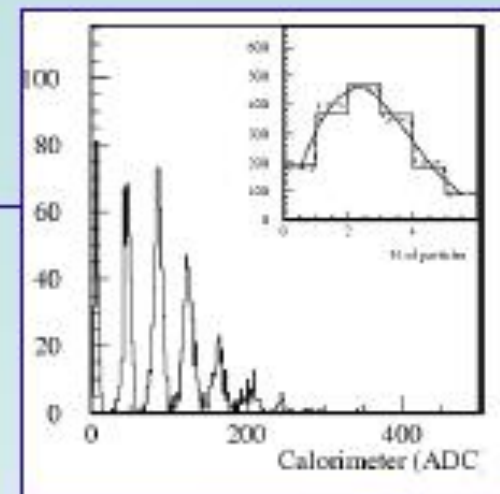
Ion	Energy [MeV]	Range in Si [μm]	Surface LET in Si [$\text{MeV cm}^2 \text{mg}^{-1}$]
Ne	28	>100	3.7
Ar	56	>100	13.13
K	80	>100	30.6
Xe	94	>100	52.9

Table 2 – Beams available at the superconducting cyclotron.

Laboratori Nazionali di Frascati: Beam Test Facility

Fascio di positroni o elettroni, con una intensità modulabile grazie alla dispersione in energia introdotta dal bersaglio, selezionando l'energia e tramite dei collimatori, fino ad ottenere il regime di singola particella per impulso

<i>Number (particles/pulse)</i>	$1 \div 10^5$	$1 \div 10^{10}$
<i>Energy (MeV)</i>	25-500	25-750
<i>Repetition rate (Hz)</i>	20-50	50
<i>Pulse Duration (ns)</i>	10	1 or 10
<i>p resolution</i>	1%	
<i>Spot size (mm)</i>	$\sigma_{x,y} \approx 2 \times 2$ (single particle) up to 10×10 (high multiplicity)	
<i>Divergence (mrad)</i>	$\sigma'_{x,y} \approx 2$ (single particle) up to 10 (high multiplicity)	



Multi-purpose facility:

- **Detector calibration and setup**
- **Calorimetry**
- **High multiplicity efficiency**
- **Detectors aging and efficiency**
- **Beam diagnostics**



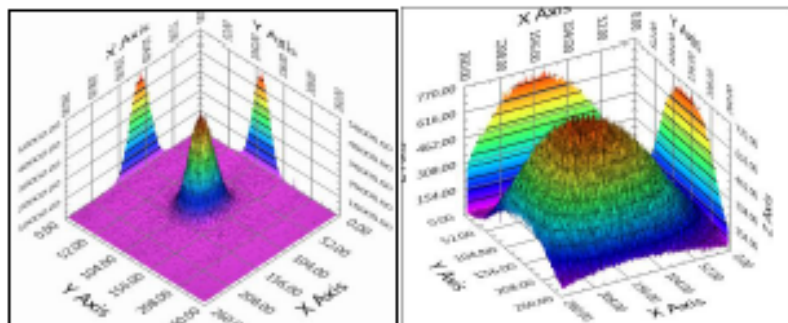
P. Valente – CSN3, Roma, 2 Feb. 2009



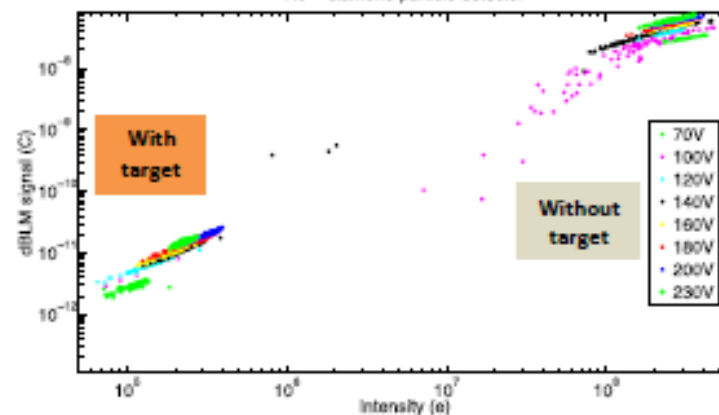
Beam parameters

The beam can be delivered in different modes: **dedicated** running or **parasitic** operation and **with** or **without** attenuating target. Different ranges of beam parameters can be achieved:

Parameter	Parasitic mode		Dedicated mode	
	With target	Without target	With target	Without target
Particle species	e ⁺ or e ⁻ Selectable by user	e ⁺ or e ⁻ Depending on DAFNE mode	e ⁺ or e ⁻ Selectable	
Energy (MeV)	25–500	510	25–700 (e ⁻) 25–500 (e ⁺)	250–730 (e ⁻) 250–530 (e ⁺)
Energy spread	1% at 500 MeV	0.5%	0.5%	
Repetition rate (Hz)	Variable between 10 and 49 Depending on DAFNE mode		1–49 Selectable	
Pulse duration (ns)	10		1.5–40 Selectable	
Intensity (particles/bunch)	1–10 ⁶	10 ⁷ –1.5 10 ¹⁰	1–10 ⁶	10 ³ –3 10 ¹⁰
Maximum average flux	3.125 10 ¹⁰ particles/s			
Spot size (mm)	1–25 (y) × 1–55 (x)			
Divergence (mrad)	1–2			



HS – diamond particle detector



Other possible participating INFN Labs

- LABEC Firenze: protons/ions (3 MV)
- TIFPA Trento: protons < 230 MeV
- CNAO: protons < 240 MeV, C > 400 MeV/amu
- Napoli (Univ.): protons/ions(3 MV)
- LENA (Pavia): neutrons from reactor

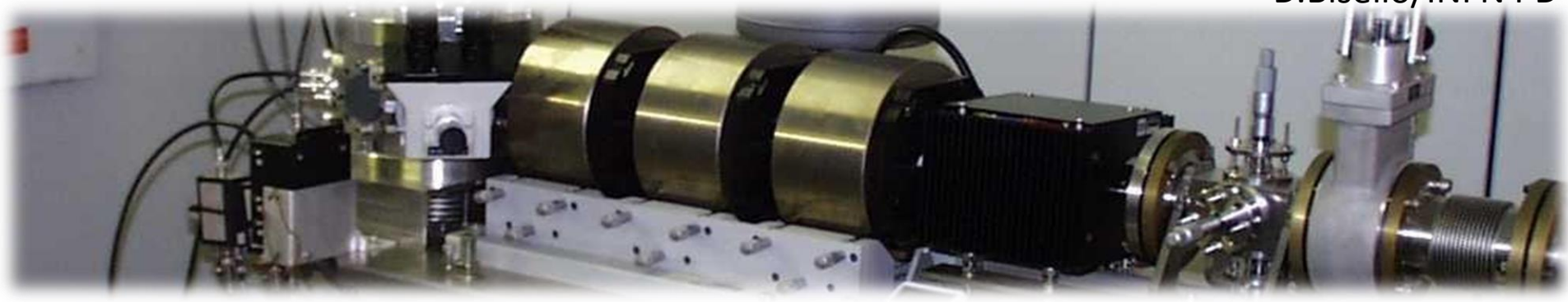


CNAO synchrotron (Pavia)

Is it possible to face this challenge?

- LNL and LNS consider this activity very important but they have no dedicated personnel to run it.
- At LNS the activity has been carried out with the help of external companies (MAPRAD, IMT).
- At LNL the activity is carried out by the UNIPD/INFN PD group.
- LNF and TIFPA are ready to start.
- Must invest in personnel (mainly technicians) and instrumentation.
- RadNet is supported by the INFN Management.

D.Bisello/INFN PD



Short term programme

We try to build the network with a central INFN coordination to:

- Centralize the information (web-site) for Institutions and Companies.
- Standardize the dosimetry of the centers.
- Elaborate common access rules.
- Study collaboration agreements with external agencies and users.
- Be a central place with technical competence to draw framework agreement in this field (ex. ASI/ESA-INFN).

Some news on the network expected by the end of 2015.

Which metrics ?

- The **measurement of TT activities** is a difficult task as there are many factors (internal and external to the performing organization), that are difficult to measure. Sometime, even defining a metric can be a distortion. At this stage we would rather consider **indicators** for which we set metrics but without any suggestion to take them face value to **measure** TT.
- The purpose of a performance metrics is to measure how well a given program meets its goals. Without a clear mapping of the metrics to the goals, the metrics activities lose their principal meaning. Therefore, before establishing performance metrics, it is important to state the TT program's goals then define the metrics as support to achieve those goals.
- A public research organization like INFN places an emphasis on the public benefits to be gained from its research. In this respect, technology transfer is understood as a mean to serve the society and the program goals reflects this attitude. A listing of the TT goals are shown in the following slide.

Sample TT Program Goals

Impact

Humanitarian and economics benefit
Leverage Technology for humanitarian and economic benefits

Financial management

Spend taxpayer funds responsibly

Strategic benefit

Technology Leveraging

Organize technology to increase return on R&D investments

Minimize cost of innovation

Find cost effective solutions; make-vs - buy decisions; reduce financial burden

Enhance Recognition and prestige

Improve rankings, leading to more funds

Innovation Management

Innovation spirit

Foster it to maximize innovation

IP Protection

Capture and protect IP innovations

TT evaluation actions

- Collaboration with **LIUC - Università Carlo Cattaneo** : studying the impact of INFN-Industry collaboration starting with interviews to Companies and Researchers to understand the details of the collaboration → build indicators to monitor and measure the TT actions (1 dedicated Fellow at MiB).
- Impact and intersection with External Fund activities.
- Mapping of “collaborations” (Consortium, Companies, District, Public and Private Institutions, ...experiments, PON, POR, etc.) at a regional level in order to study in detail which are the sectors to be stimulated.

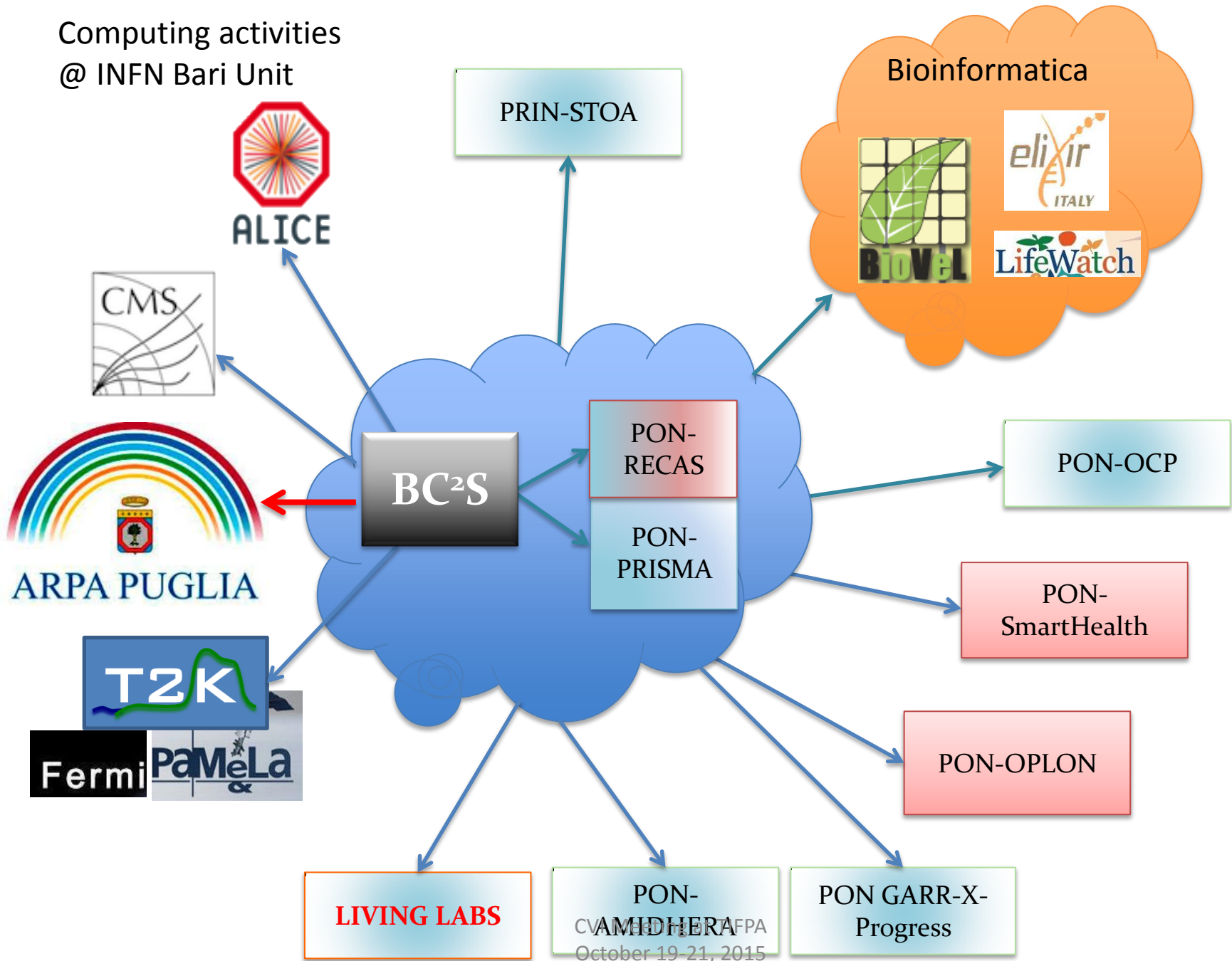
External funds & TT

- Stronger and stronger connection due to the fact that :
 - TT has no dedicated money.
 - External projects may help to enhance some R&D activities with both a research & TT flavour.
- This is why we had a **joint meeting** at MiB on Nov. 2014 addressing activities related to Horizon2020 which rewards the projects promoting synergy between Industry and Research. The meeting saw the participation of Regione Lombardia, Confindustria and MISE.
- This is an event we have to repeat, but with more focus on specific items if we want some practical follow-up.

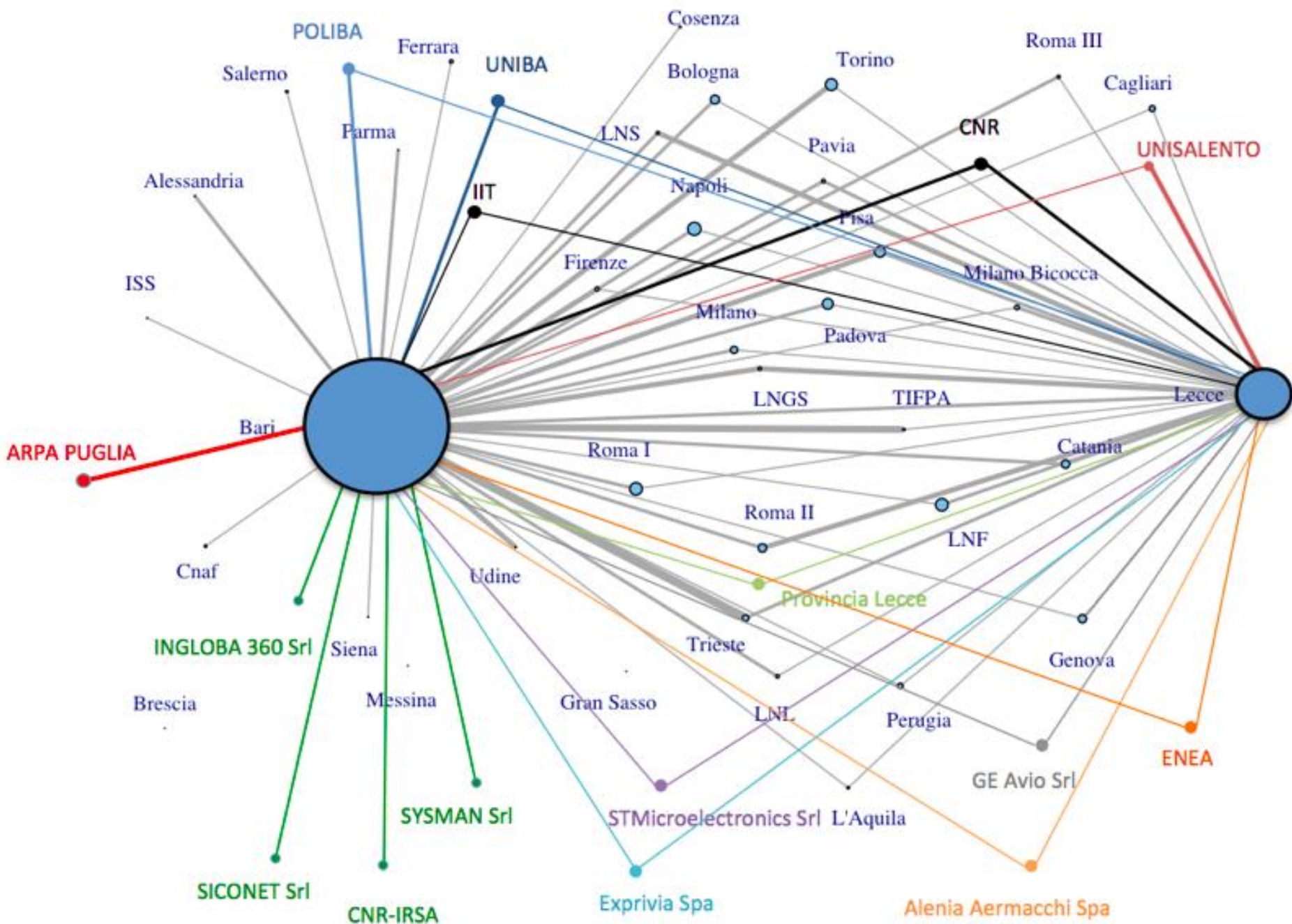
Exercise : mapping external funds & TT initiatives

- Very important to start activities which may help the enhancement of reaserches giving TT impact later on or that do not have funds in the institutional budget.
- External projects funded by EU, Italy and italian Regions
 - INFN experiments connections (INFN Bari and Lecce with all other INFN Units);
 - Bari and Lecce in the Consortium-District-Companies (e.g. DHITECH).
 - Connections due to Third Parties Contracts (e.g. A Company pays INFN for a service)
 - Connections due to projects supported by external funds (both through Consortium or directly financed like ReCaS e PRISMA)
 - All the remaining connections through several tpes of agreements.

Computing activities
@ INFN Bari Unit



Regione Puglia



TIFPA : Trento Institute for Fundamental Physics and Applications

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A TRENTO UN NUOVO ISTITUTO DI FISICA E TECNOLOGIE



Publicato Venerdì, 21 Dicembre 2012 14:42



Si chiamerà Trento Institute for Fundamental Physics and Applications (TIFPA) ed è il nuovo Centro Nazionale dell' INFN dedicato alla ricerca in fisica fondamentale e alle sue applicazioni. Il TIFPA, con sede presso il Dipartimento di Fisica dell' Università, è stato inaugurato il 15 gennaio e vede l'apporto dell'Università di Trento, della Fondazione Bruno Kessler e dall'Agenzia Provinciale di Trento per l'Adroterapia (ATreP). In particolare il TIFPA svilupperà applicazioni di microsistemi al silicio basati su sensoristica e microelettronica usata per esperimenti di fisica delle particelle, strumentazioni e tecniche di supercalcolo per la ricerca spaziale e applicazioni biomediche. Entro la fine del 2013 è infatti prevista l'entrata in funzione della nuova macchina per la protonterapia. (e.c.)



FaLang translation system by Faboba

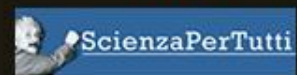
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a cura dell'[Ufficio Comunicazione INFN](#)

CVI Meeting

tutte le notizie INFN

- Opportunità di lavoro
- Tutte le notizie INFN
- Ufficio Comunicazione
- Comunicati
- Rassegna



Conclusions

- 2014 and 2015 have been another two fruitful years for the knowledge and technology transfer activities at INFN.
- Dissemination of Intellectual property (IP) generated by the Institute, often together with other Institutions or Companies, is slowly increasing.
- We still have margin to improve our KTT results :
 - Find good interfaces to talk to Companies and exploit Regional Calls to build "centers of excellence" where Academy, Research Institutions and Industry meet their challenge".
 - Improve the "Tool Box" having a better and better feedback on the quality of the TT activities, that is find a good metrics.
 - Exploit better the external funds (EU, national and regional funds)
 - Future sees the management of huge projects like those mentioned by the President (Sardinia, Abruzzo, Puglia) and the recent success in the Human Brain Project opens new scenarios in the interdisciplinary field.