

Trasferimento Tecnologico INFN

bridging the gap between
technology development and product innovation

Andrea Vacchi

INFN Technology Transfer Board



Advanced Radiation
Detectors for Industrial
Use

EPS Workshop 2013 Ravenna (I), 11-12 Nov. 2013

Outline

- Few introductory considerations
- Our resources
- A glance on some results
- Future perspectives

“Investing in research and innovation is a priority for the development of our country and the primary task for public and private subjects consists in making available adequate resources and instruments to face the difficult challenges posed by a widely globalized society”.

- words of the President of the Italian Republic, Giorgio Napolitano, giving a clear image of the paramount importance attributed to the themes bound to research as a key to industrial innovation and social evolution.
- As seen from the point of view of basic research, whose mission lies in investigating nature's laws, through undiscovered paths and finding new unique solutions, this
 - implies a concrete effort in order to get involved in the processes of transferring specific competences,
 - and leads to the valorization of technology and methods resulting from the research work, and requires that scientists also get involved in the management of innovation processes.



COMMITMENT

- Technology Transfer is one of the major challenges INFN faces: the *Institute looks at this activity as an urgent issue coming from the society, while confirming as MAIN target the mission of high level basic research carried on in the fields of nuclear, particle and astroparticle physics, expects that some of the technological assets of INFN should be exploited also for the creation of wealth.*

questions addressed

questions :

- What is the long term vision for TT and what are the metrics for progress towards the long range vision?
- What incentives exist for researchers to collaborate with firms and business R&D departments?
- What kind of support is being built within research systems to sustain TT activities?



Relationships with industrial R&D departments

- Research personnel is motivated mostly by research, and the ***technology transfer activity may be felt as a diversion*** from the attainment of the main goal.
- ***Several actions can help broaden the perspective of researchers to enter into relationships with industrial R&D departments,***
 - ***encourage them to consider an increased set of motivations to be added to pure research***
 - Support is needed for researchers who wish to develop relationships with industrial R&D departments
- ***Institutional incentive and promotion plans for researchers have to be modified to give weight to the activities of technology transfer, like patenting, collaborations with firms and spin offs, in addition to more traditional metrics such as publications.***

CULTURAL EVOLUTION!!!

require researchers who are motivated and capable of looking at technology also from business point of view



- The transformation of technological assets into business opportunities has its roots in technological advances but it will also ***require people within research who are motivated and capable of looking at technology from a business point of view.***
- This will also be needed ***to foster productive communication between research and industrial researchers.***
- Encourage to look at opportunities for ***joint participation in European projects with industrial R&S departments.***
- Creation of local network = CLUSTERS.
- INTERNAL AND EXTERNAL out-reach actions mapping facilities develop joint projects and technology transfer opportunities.
- ***help connect the researchers & technological solutions to the societal and industrial problems that need solving***

PhD students



- PhD students shall be exposed to a broader set of motivations for research.
- In the Italian tradition, PhDs candidates are encouraged to think of research as a goal in itself.
- Students would benefit by being encouraged to look at research experience as a way to attain a broader set of goals, including business development and technological deployment.
- Such a strategy might actually broaden the number of PhD candidates associated with the Institutes as well as giving room in the INFN to young people motivated by different perspectives, ***keen to search for industrial collaboration and looking for it as a way to attain their goals.***
- This action can be supported by industrial fellowships have been activated in collaboration with the industrial enterprises.



Incentivs for TT

- A working group is evaluating ways to account for the **TT effort**, of researchers and technologists, to be introduced in recruitment calls and in career progression procedures

Industrial innovation

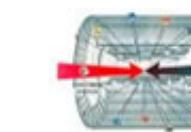
R&D²



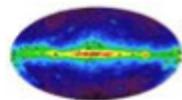
- Industrial innovation starts from the completion of research processes R&D => **more D than R !!!**
- Starting from the newly available technologies and skills and develops advanced products applications product innovation through collaborative research
- This complex interaction requires a supporting structure, it can not be left on the shoulders of researcher alone

INFN Science and technology

Foundamental research is lead through experiments and theory, the needed technology developments and the related applications are supported by dedicated national boards



FISICA
PARTICELLARE



FISICA
ASTROPARTICELLAIRE

subnuclear physics(CSN1)

Astroparticle physics(CSN2)



RICERCA
TECNOLOGICA

interdisciplinary and technology research(CSN5)

FISICA
NUCLEARE

theoretical physics(CSN4)

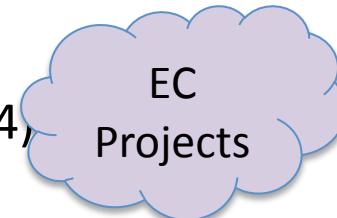
FISICA
TEORICA



National
Projects



Strategic
Projects



EC
Projects



Regional
Projects

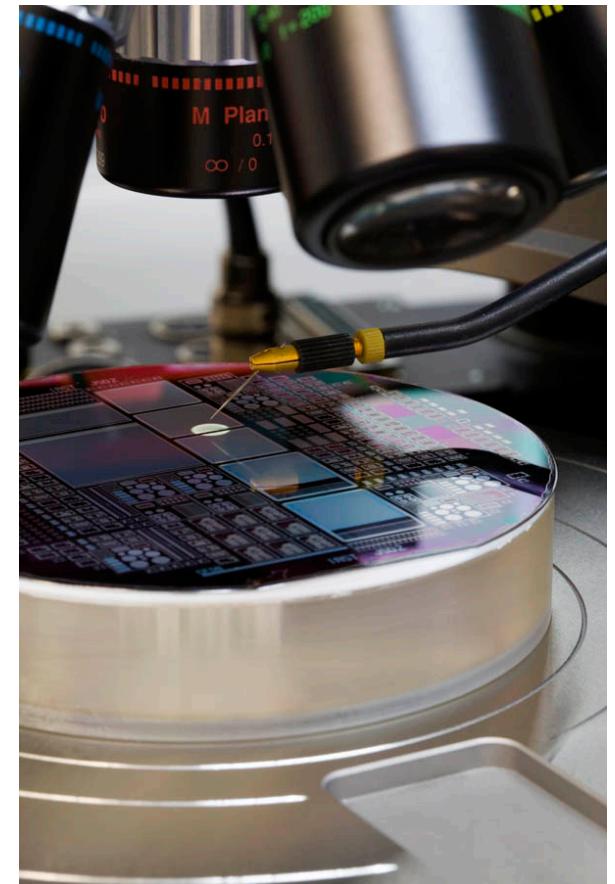
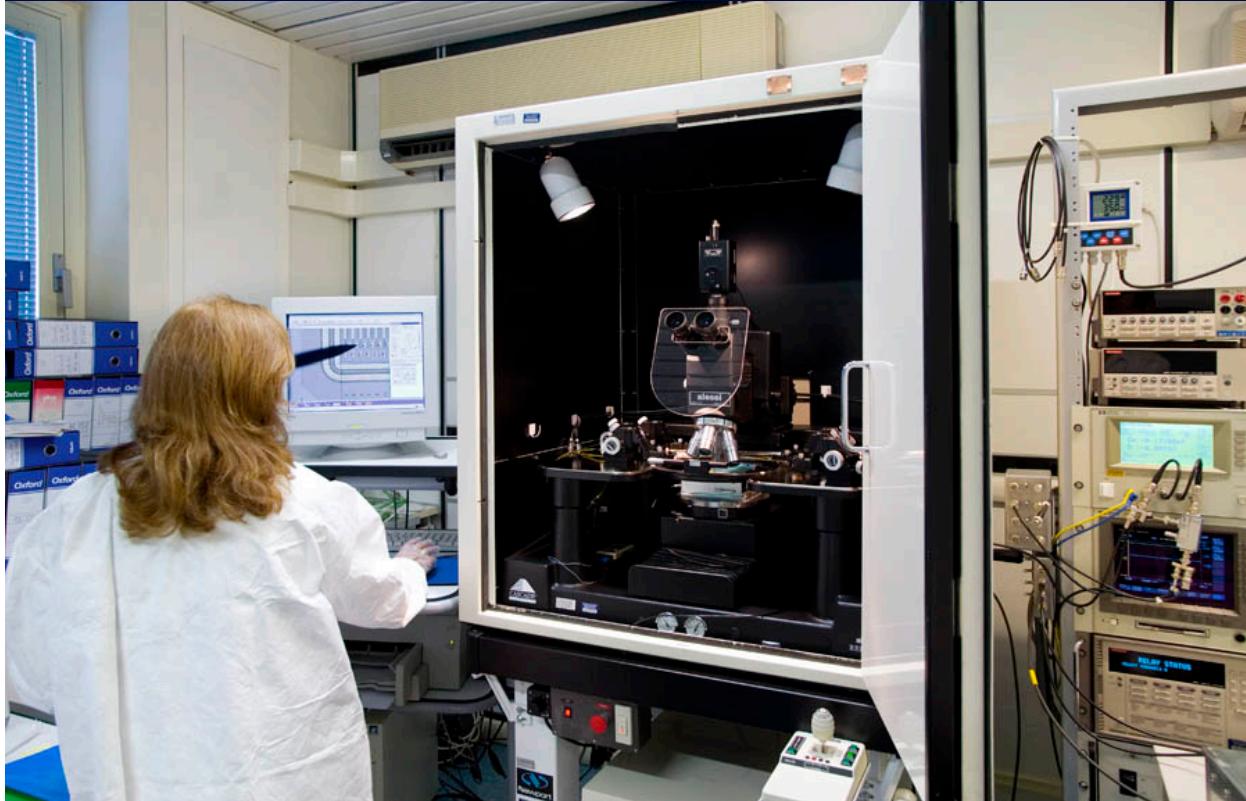
The sites of the INFN Research infrastructure



INFN structures:

- Sections (20)
 - connected structures(10)
 - National Labs(4)
- GSSI –L'Aquila
International PhD School
- TIPFA – Trento
Trento Institute for Fundamental
Physics and Applications
- CNAF - Bologna
National Center for R&D in ICT
- EGO

Among the dotations of an INFN Structure we can find
specialized Clean rooms
semiconductor sensors development and qualification



Three dimension coordinate measuring machine



- Macchina di misura CMM Mitutoyo
- Misura tramite tastatore o telecamera
- Utilizzata per la mappatura del tracker di AGILE

Thermal vacuum chamber



- Camera termica (da -70 a +150 gradi C) e vuoto (1 mbar)
- Capacita' 500 litri
- Passanti da vuoto (2 x 50 pin cannon + 8 coassiali)
- Utilizzata per la qualifica dei vassoi del tracker di AGILE e di SUPER-AGILE



Here automatic 5 axis machining

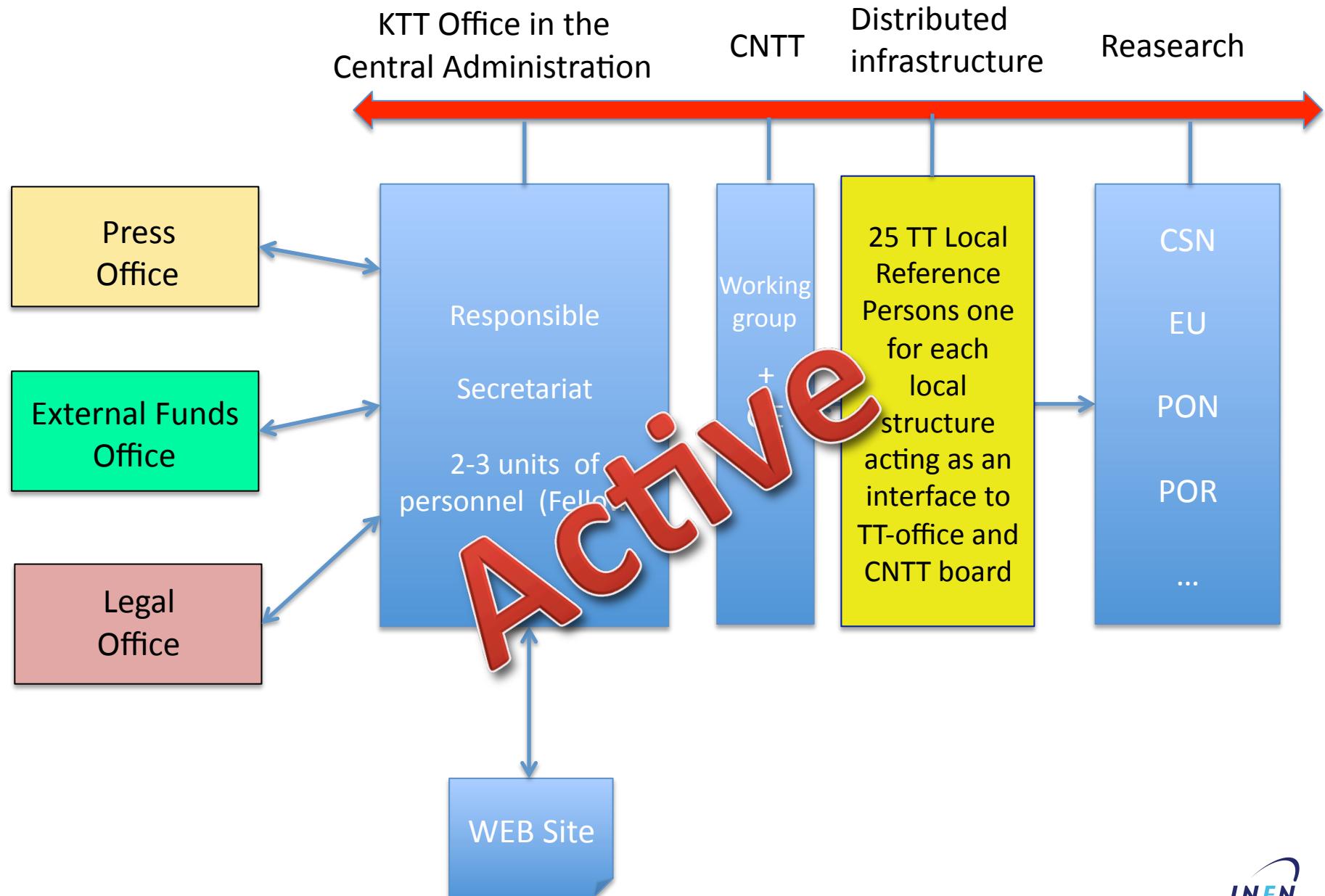
Present actions & future landscape

- reinforce the internal organization in order to exploit completely :
 - the consolidated rules
 - the technological infrastructure almost uniformly distributed in the Italian Regions (a detailed mapping exists and will be available soon on the WEB)
 - the huge number of innovative devices and methodologies built for the experiments or already born with an interdisciplinary flavor.
- improve our TT Office,
- Effective coordination board CNTT (some at full time, giving guidelines),
- get a better link to the research activities in the INFN units via the local TT Reference persons,
- perform regular training programs during the year, pursue a couple of strategic projects.

- Some key points :
 - Organized network of 25 TT local Reference Persons well interfaced to the CNTT + Training on TT
 - Good link to other important INFN services such as :
 - Legal Office
 - External Funds Office (recently renewed)
 - Press Office
 - A useful and attractive WEB site.
 - A dedicated budget.
- Some new points :
 - Perform a better scouting activity (for instance : 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).
 - Support a permanent working group to study the size and the characteristics of the collaboration with national Industry --> provide a working tool for data analysis.

- A network of local **TT Referent** since almost two years in place, one for each INFN section or laboratory, this group has a reference for all issues in **the central TT Office located the AC** (Central Administration);
- The local Referents continuous training through a series of workshops (agenda and reports are available at <https://agenda.infn.it/categoryDisplay.py?categoryId=534>), 8 such meetings have been organized in 2012-13;
- The local Referent will grow as a reference point for all TT related aspects like scouting for patents or other technology valorization actions in direct contact with the Director of the Unit and the central TT Office.
- Dedicated budget in 2013 to KTT : about 100 kEuro.
- **Operatively it is foreseen that the TT activity will be self supporting**

KTT Organization



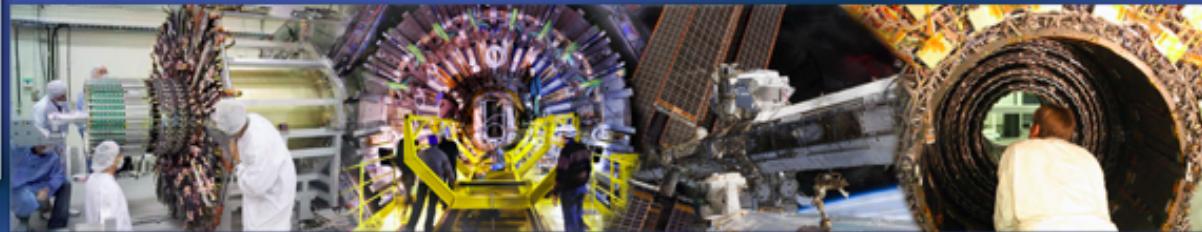
TT actions

Being INFN a fundamental physics research institute its technology transfer regulations are mainly addressed to the valorization of the available experience, know how and findings through:

- **Research contracts**
- **Spin-off (Company)**
- **Services & consultancies**
- **Patents**

DEDICATED WEB SITE

- A new internet page was activated : <http://www.pg.infn.it/cntt7/> whose scope is twofold:
 - Serve the local TT Referent community (each of them has a special access key to prompt news on the page or modify the specific information of his structure)
 - Serve as an interface to feed also external inputs (request of specific technology) and expose the INFN technological infrastructure to the outside world
- Within the new internet site :
 - a complete mapping of the INFN facilities is available : http://www.pg.infn.it/cntt7/infn_facilities/find
 - Forms to request services
 - Database of patents, spin-offs and contracts
 - Regulations Templates

search... 

Menu principale

- [HOME](#)
- [Personale](#)
- [Inventori](#)
- [Industrie](#)
- [Notizie](#)

Notizie recenti

- seminario di formazione INFN "Archeometria e diagnostica sui beni culturali"
- ISTITUTO NAZIONALE DI FISICA NUCLEARE Bando 15894/2013 Concorso per il conferimento di n. 1 assegno di ricerca nell'ambito della ricerca tecnologica
- Itwiin premia la creatività femminile

Accesso riservato

Nome utente *

Password *

| [Bandi attivi](#) | [Convenzioni in atto](#) | [Iniziative](#) | [Aziende accreditate](#) | [Forniture ad aziende](#) |
[Infrastrutture](#) | [Rassegna stampa](#) |

Personale

Lo staff dell' INFN impegnato in attività di trasferimento tecnologico, si occupa di promuovere, coordinare e istituire tutte le iniziative necessarie alla realizzazione degli obiettivi predefiniti in materia di proprietà intellettuale e trasferimento tecnologico dal vigente Statuto dell' INFN, nonché dai più specifici Regolamenti di settore.

[Ulteriori informazioni »](#)

Inventori

INFN riconosce nella procedura di tutela dei diritti di proprietà intellettuale, nella valorizzazione economica delle proprie competenze e infrastrutture e nella creazione di imprese intorno a propri risultati applicativi degli strumenti particolarmente idonei a favorire l'adozione di nuove e convenienti tecnologie generate dalla propria ricerca da parte del mondo produttivo.

[Ulteriori informazioni »](#)

Industrie

La complessità e l'ambizione dei progetti di ricerca INFN poggia anche sulla innata capacità della nostra rete scientifica a relazionarsi in modo proattivo con la migliore capacità tecnologica dell'industria nazionale e internazionale.

[Ulteriori informazioni »](#)

L' INFN ha inoltre istituito il:

- Servizio di raccolta delle esigenze tecnologiche aziendali.



search... 

Menu principale

- HOME
- Personale
 - CNTT
 - UTT
 - Referenti TT
- Inventori
- Industrie
- Notizie

Notizie recenti

- seminario di formazione INFN "Archeometria e diagnostica sui beni culturali"
- ISTITUTO NAZIONALE DI FISICA NUCLEARE Bando 15894/2013 Concorso per il conferimento di n. 1 assegno di ricerca nell'ambito della ricerca tecnologica
- ItwIn premia la creatività femminile

Home » Personale »

Comitato Nazionale per il Trasferimento Tecnologico (CNTT)

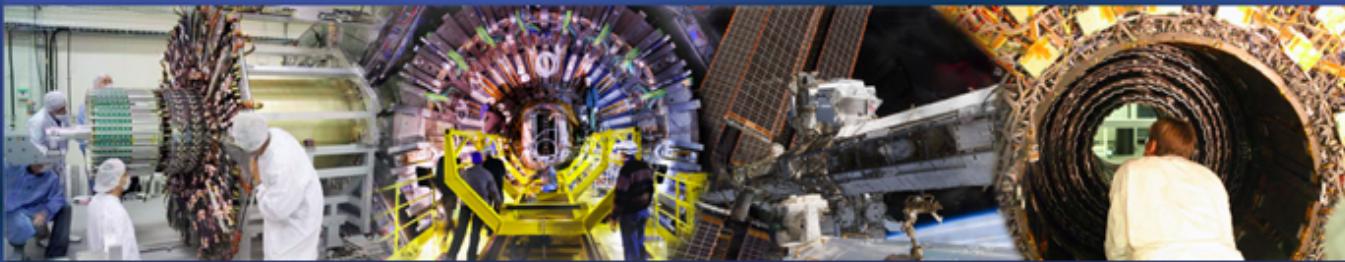
Componenti del Comitato Nazionale per il Trasferimento Tecnologico

(ultimo aggiornamento: Disposizione della Presidenza INFN n. 015420 del 14/01/2013)

	Nome	Cognome	Unità Operativa	CV
Dott.	Andrea	Vacchi*	Sezione di Trieste	
Dott.	Bruno	Checcucci	Sezione di Perugia	
Dott.	Ezio	Previtali	Sezione di Milano Bicocca	
Dott.	Cino	Matacotta	Sezione di Roma	
Dott.	Giovanni	Marsella	Sezione di Lecce	
Dott.	Valter	Bonvicini	Sezione di Trieste	
Dott.	Vincenzo	Palmieri	Laboratori Nazionali di Legnaro	

* Coordinatore.

 Versione stampabile



search...

Menu principale

- [HOME](#)
- [Personale](#)
 - [CNTT](#)
 - [UTT](#)
 - [Referenti TT](#)
- ▶ [Inventori](#)
- ▶ [Industrie](#)
- [Notizie](#)

Notizie recenti

- seminario di formazione INFN "Archeometria e diagnostica sui beni culturali"
- ISTITUTO NAZIONALE DI FISICA NUCLEARE Bando 15894/2013 Concorso per il conferimento di n. 1 assegno di ricerca nell'ambito della ricerca tecnologica
- Itwill premia la creatività femminile

Accesso riservato

[Home](#) » [Personale](#) »

Ufficio Trasferimento Tecnologico

Ufficio Trasferimento Tecnologico

Via Enrico Fermi n. 40 - 00044 Frascati RM - Italia

Fax 06 9422564

trasferimento.tecnologico@lnf.infn.it

Referenti operativi:

Dott. Lucio De Donno

tel 06 94032467 ; e-mail: lucio.dedonno@lnf.infn.it

Dott.ssa Giuseppina Abballe

tel 06 94032660 ; e-mail: trasferimento.tecnologico@lnf.infn.it



Cino Matacotta
Massimo Caccia
Lorenza Paolucci
Pier Paolo Deminicis

[Versione stampabile](#)

- 1 Assegno di Ricerca da questa primavera + 1 AR bandito
- 1 Fisico senior in comando dal CNR con 15 anni di esperienza in KTT
- 1 Fisico senior + 1 Senior Admin.dall'Università dell'Insubria con 10 anni di esperienza in KTT, anche @ CERN KTT network



search...

Menu principale

- * HOME
- › Personale
- › Inventori
- › Industrie
- * Notizie

Notizie recenti

- seminario di formazione INFN "Archeometria e diagnostica sui beni culturali"
- ISTITUTO NAZIONALE DI FISICA NUCLEARE Bando 15894/2013 Concorso per il conferimento di n. 1 assegno di ricerca nell'ambito della ricerca tecnologica
- Itwiin premia la creatività femminile

Accesso riservato

Nome utente *

Password *

Home »

Webform per aziende: conoscenze o necessità tecnologiche

Inviato da webmaster il Lun, 04/02/2013 - 11:38am

Servizio "R.E.T.A." (Raccolta di Esigenze Tecnologiche Aziendali)

Tipo richiesta *

- Richiesta di informazioni su conoscenze tecnologiche
- Si sottopongono delle specifiche necessita' tecnologiche
- Altro tipo di richiesta riguardante il trasferimento tecnologico

Nominativo della Ditta *

Indirizzo postale *

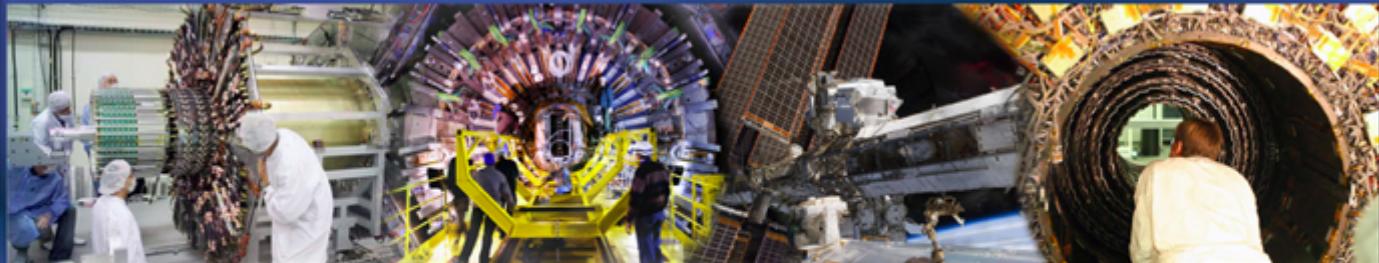
Nominativo di riferimento *

Indirizzo e-mail *

Recapito telefonico *

Altri riferimenti della Ditta

Breve nota descrittiva della richiesta *



search...



Menu principale

- HOME
- › Personale
- Inventori
 - Brevetti
 - Attività a prevalente interesse terzi
 - Spin off
 - Contratti
- › Industrie
- Notizie

Notizie recenti

- seminario di formazione INFN "Archeometria e diagnostica sui beni culturali"
- ISTITUTO NAZIONALE DI FISICA NUCLEARE Bando 15894/2013 Concorso per il conferimento di n. 1 assegno di ricerca nell'ambito della ricerca tecnologica
- Itwin premia la creatività femminile

Home » Inventori »

Brevetti

La procedura operativa

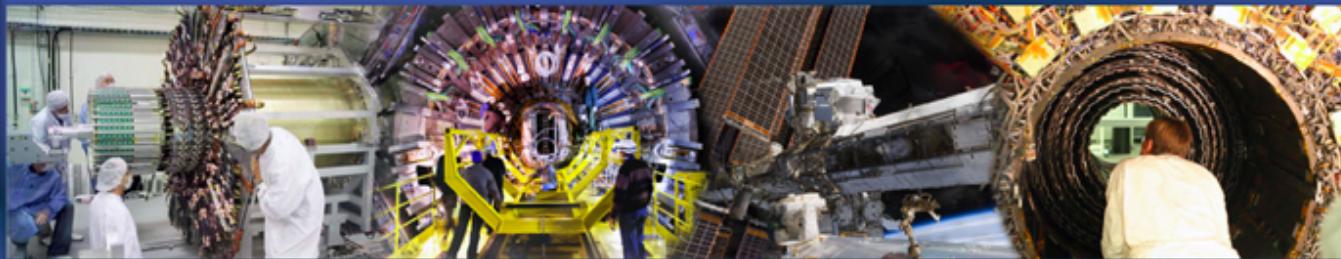
Sotto determinate condizioni, la legge italiana attribuisce agli Inventori dipendenti di Enti di Ricerca pubblici ed Università importanti diritti sulla brevettagione dei risultati della ricerca svolta. Nel pieno rispetto di tale contesto, INFN è tuttavia consapevole che il successo nell'opera di valorizzazione di un'invenzione non può prescindere da una stretta alleanza tra Inventori e enti che hanno promosso la ricerca da cui scaturisce il risultato brevettabile, questo indipendentemente da chi per legge è designato come titolare. Pertanto, si richiede a chiunque abbia conseguito un risultato suscettibile di tutela brevettuale di sottomettere tale risultato, mediante invio dell'allegato modulo di comunicazione di invenzione, a una procedura di valutazione mirata a definirne:

- L'originalità
- I vantaggi tecnologici ed economici
- Il suo potenziale mercato
- La consistenza dei diritti degli Inventori e dell'ente
- L'esistenza di eventuali diritti di terzi

A seguito di tale procedura, sarà definita la praticabilità della tutela mediante domanda di brevetto e saranno definiti, mediante la sottoscrizione di opportuni accordi, gli interessi degli Inventori, di INFN e di eventuali terze parti sui diritti di sfruttamento.

Modelli e normative

- ❑ Modello di accordo di cessione
- ❑ Modello di accordo di co-titolarità
- ❑ Comunicazione di invenzione
- ❑ Comunicazione deposito domanda di brevetto
- ❑ Invention_disclosure_breve
- ❑ Regolamento valorizzazione
- ❑ Codice di proprietà industriale (D.Lgs.2005/30)





Menu principale

- » HOME
- » Personale
- » Inventori
- » Industrie
- » Notizie

Notizie recenti

- seminario di formazione INFN "Archeometria e diagnostica sui beni culturali"
- ISTITUTO NAZIONALE DI FISICA NUCLEARE Bando 15894/2013 Concorso per il conferimento di n. 1 assegno di ricerca nell'ambito della ricerca tecnologica
- Itwlin premia la creatività femminile

Accesso riservato

Nome utente *

[Home](#) »

Ricerca Dotazioni Tecnologiche INFN

Filtri

Unità Operativa

Hall Tecnologica

Tipologia Dotazione

Nome Dotazione

Digitare il testo di ricerca e premere **Invio**

UNITÀ OPERATIVA	HALL TECNOLOGICA	INFRASTRUTTURA	CATEGORIA	NOME
Bari	Elettronica	Laboratorio Di Elettronica	Sistemi di rework BGA	Macchina di rework BGA
Bari	Elettronica	Laboratorio Di Elettronica	Saldatrici circuiti	Stazione di saldatura
Bari	Elettronica	Laboratorio Di Progettazione Elettronica	Software CAD	CADENCE PCB Design
Bari	Elettronica	Laboratorio Di Progettazione Elettronica	Software CAD	CADENCE Custom IC Design
Bari	Elettronica	Laboratorio Di Progettazione Elettronica	Software simulazione/verifica	Synopsys Front End and Verification tools suite
Bari	Elettronica	Laboratorio Di Progettazione Elettronica	Software simulazione/verifica	Xilinx ISE Design Suite

Collaborating with the INFN OUTREACH office

L'INFN tra i protagonisti di TECHITALY 2012

Bruxelles

PORTALE INFN | SERVIZI | ELENCO TELEFONICO

CERCA



Istituto Nazionale di Fisica Nucleare

HOME | ISTITUTO | STRUTTURE | ESPERIMENTI | PROGETTI |

L'INFN TRA I PROTAGONISTI DI TECHITALY

Pubblicato Martedì, 02 Ottobre 2012 12:07



Si è aperto il 2 ottobre a Bruxelles "TechItaly 2012 – L'innovazione industriale come motore della crescita europea", manifestazione promossa e organizzata dalla Commissione Europea e dall'Ambasciata d'Italia in Belgio allo scopo di sottolineare il potenziale nazionale nei settori di eccellenza ad alta tecnologia. L'evento si è aperto nella sede Parlamento Europeo con la sessione inaugurale che vede la partecipazione del Presidente dell'INFN Fernando Ferroni. Sono previsti tre giorni di lavori, durante i quali intervengono oltre 60 relatori. L'INFN presenta le sue ricerche e attività rivolte allo studio e alla conservazione dei beni archeologici e artistici e dedicate allo sviluppo di tecnologie per la rivelazione dei raggi cosmici al di fuori dell'atmosfera terrestre. Intervengono Pier Andrea Mandò, direttore della sezione INFN di Firenze e del Labec, il laboratorio dedicato alle applicazioni delle tecniche nucleari ai beni culturali e all'ambiente, e Roberto Battiston, vice coordinatore internazionale di AMS, l'esperimento di fisica astroparticellare collocato lo scorso anno dagli astronauti dello Shuttle a bordo della Stazione Spaziale Internazionale, e alla cui realizzazione l'Italia ha contribuito in modo determinante. La partecipazione dell'INFN all'evento di Bruxelles è stata coordinata dall'Ufficio Fondi Esteri dell'INFN e grazie al supporto dell'Ufficio Comunicazione.

[Twitter](#) 0 [+1](#) 0 [Share](#) [Pin it](#) [Facebook Share](#)

FaLang traduction system by Faboba



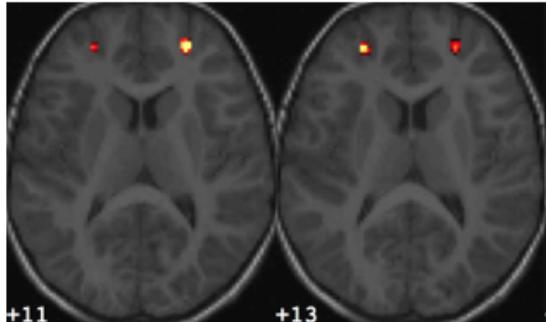
Imaging aiuta a diagnosticare l'autismo infatile

Collaboration agreement with the IRCS "Stella Maris"

The screenshot shows the INFN website with a banner at the top featuring the INFN logo and two researchers in a laboratory setting. Below the banner is a navigation menu with links to HOME, ISTITUTO, STRUTTURE, ESPERIMENTI, and PROGETTI. The main content area features a title "AIUTARE CON LE IMMAGINI A DIAGNOSTICARE L'AUTISMO" and a date "Pubblicato Giovedì, 16 Maggio 2013 10:50". To the right of the article is a sidebar with links to various INFN services and external partners like asimmetrie.it, LHC Italia, and ScienzaPerTutti.

AIUTARE CON LE IMMAGINI A DIAGNOSTICARE L'AUTISMO

Pubblicato Giovedì, 16 Maggio 2013 10:50

 +11 +13

Una ricerca tra fisica e medicina per verificare se è possibile aiutare i medici, con le immagini della risonanza magnetica, a diagnosticare precocemente i casi di autismo nei bambini più piccoli. Cioè in una età in cui è possibile intervenire con terapie comportamentali per aiutare il bambino con autismo a vivere meglio con la sua patologia. Questo progetto di ricerca prevede la collaborazione interdisciplinare dell'IRCCS di Pisa "Stella Maris", dell'Istituto Nazionale di Fisica Nucleare e dell'Università di Udine. Il contributo dell'INFN è nella elaborazione delle immagini e nell'analisi dei dati. Una competenza che viene da anni di ricerche per la messa a punto di sistemi avanzati per gli screening della mammella, le TAC polmonari, le RMN ad alto campo e l'analisi dei dati della risonanza magnetica del cervello. La diagnosi di autismo avviene sulla base di diversi segnali clinici. La ricerca vuole valutare se è possibile contribuire alla diagnosi anche con le neuroimmagini. Lo studio si farà su 30 bambini di età compresa tra i 18 e i 30 mesi e durerà circa due anni.

[Tweet](#) 5 [+1](#) 0 [Share](#) [Pin it](#) [Share](#)

FaLang traduction system by Faboba

Istituto Nazionale di Fisica Nucleare

Opportunità di lavoro
Tutte le notizie INFN
Ufficio Comunicazione
Comunicati
Rassegna

asimmetrie.it
LHC Italia
ScienzaPerTutti
AMMINISTRAZIONE TRASPARENTE

INFN la Piccola e Media Impresa

Catania - LNS

The screenshot shows the INFN website for the Laboratori Nazionali del Sud (LNS) in Catania. The header features the INFN logo and a large image of a particle detector. The navigation menu includes links for HOME, ISTITUTO, STRUTTURE, ESPERIMENTI, and PROGETTI. On the right side, there is a sidebar with links for Opportunità di lavoro, Tutte le notizie INFN, Ufficio Comunicazione, Comunicati, and Rassegna. Below the sidebar are links to external sites: asimmetrie.it, LHCItalia, ScienzaPerTutti, and AMMINISTRAZIONE TRASPARENTE.

L'INFN PER LE PICCOLE E MEDIE IMPRESE DI CATANIA

Pubblicato Giovedì, 31 Gennaio 2013 14:24

 Si rinnova la collaborazione tra l'INFN - Laboratori Nazionali del Sud - e Apindustrie Catania (Associazione delle Piccole Industrie della Provincia di Catania, aggregata a Confindustria Catania) per sviluppare il settore dell'hi-tech, della ricerca e dell'innovazione al servizio delle PMI. Giovedì, 31 gennaio, il Direttore dei Laboratori del Sud dell'INFN, Giacomo Cuttone e il Presidente di Apindustrie Catania, Giuseppe Scuderi, hanno firmato il protocollo che riconferma un'intesa già sottoscritta nel 2005. Il documento sottolinea la comune volontà di avviare iniziative che concorrono a potenziare il tessuto industriale locale e ad ottimizzare l'interazione tra gli Enti Pubblici di Ricerca e le realtà produttive del territorio in tema di formazione, trasferimento tecnologico, ricerca e sviluppo. Questa collaborazione ha tra i suoi obiettivi anche quelli di condivisione di progetti strategici, di assistenza alle imprese esistenti in progetti di industrializzazione dei prodotti e dei processi, di promozione ed assistenza di nuove imprese. Un esempio della già proficua intesa sarà la sottoscrizione di un'ATI tra un gruppo di imprese associate ad Apindustrie e INFN per avviare il progetto AISHa (Advanced Ion Source for Hadrontherapy) una innovativa sorgente in grado di produrre ioni di particolare interesse per l'Adroterapia

[Tweet 5](#) [+1 0](#) [Share](#) [Pin it](#) [Share](#)

Sistemi innovativi per i rifiuti radioattivi (dismantled nuclear power plant)



Istituto Nazionale di Fisica Nucleare

HOME | ISTITUTO | STRUTTURE | ESPERIMENTI | PROGETTI | [info](#)

SISTEMI INNOVATIVI PER I RIFIUTI RADIOATTIVI

Pubblicato Mercoledì, 07 Novembre 2012 11:47



I rifiuti radioattivi provenienti dalle centrali nucleari smantellate potranno essere controllati 24 ore su 24 da remoto. Si potrà monitorare ogni singolo fusto di materiale radioattivo e sapere in tempo reale se emette radiazioni a un livello anomalo, riducendo gli interventi e l'esposizione del personale.

Questo potrà avvenire grazie a rivelatori pilota che verranno sviluppati all'Istituto Nazionale di Fisica Nucleare (INFN) assieme alla SOGIN, la società che si occupa del decommissioning e del trattamento e gestione dei rifiuti radioattivi provenienti dalle centrali nucleari italiane.

INFN e Sogin hanno firmato il 7 novembre a Roma un accordo per una collaborazione che prevede, tra l'altro, un primo progetto per la realizzazione di un sistema tecnologico per il monitoraggio in tempo reale dei rifiuti radioattivi, tramite la tecnica DMRN (Detector Mesh for Nuclear Repositories), che consentirà una nuova metodologia nella gestione dei rifiuti radioattivi.

In particolare, l'accordo prevede una fase sperimentale per la realizzazione di rivelatori di radiazioni ad alta tecnologia che vede coinvolti i Laboratori del sud dell'INFN e la centrale di Garigliano di Sogin (CE).

[Tweet 0](#) [+1 0](#) [Share](#) [Pin it](#) [Share](#)



Opportunità di lavoro
Tutte le notizie INFN
Ufficio Comunicazione
Comunicati
Rassegna

Maria Giuseppina Bisogni
INFN Pisa e UNIPI
On behalf of GLV
Gruppo di lavoro - TT
M.G B., Luca Tomassetti, Marco
Costa

CNTT meeting, Roma 11/4/2012



Metrics & Indicators for the Technology Transfer

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

The GLV group proposes to divide the structure of the TT measurement system in five areas as follows:

New Technology

Collaborative-Public/private Partnerships for Research and development

Scientific Work Products

Professional Valorisation

Outreach

The big effort for this year was to set-up the appropriate metrics to start monitoring the performance of the TT program's goals in a consistent and homogenous way through the years. The next step will consist of developing and implementing a process to consistently capture the data needed to drive the metrics as well automatic reporting capabilities.

Few examples

Cooperative Research with Enterprises (1)

- Activities carried out in collaboration with companies and with convergence of interests of the parties on the subject of research: the technological development is predominant.
- The technology transfer office plays a supporting role in the negotiation and preparation of contracts.
- The statistic does not include the following:
 - Active contracts, participation in tenders or negotiated procedures;
 - Contracts relating to R&D carried out in collaboration with public institutions or other EPR;
 - Research in partnership with companies, with European, national or regional funds.

Cooperative Research with Enterprises (2)

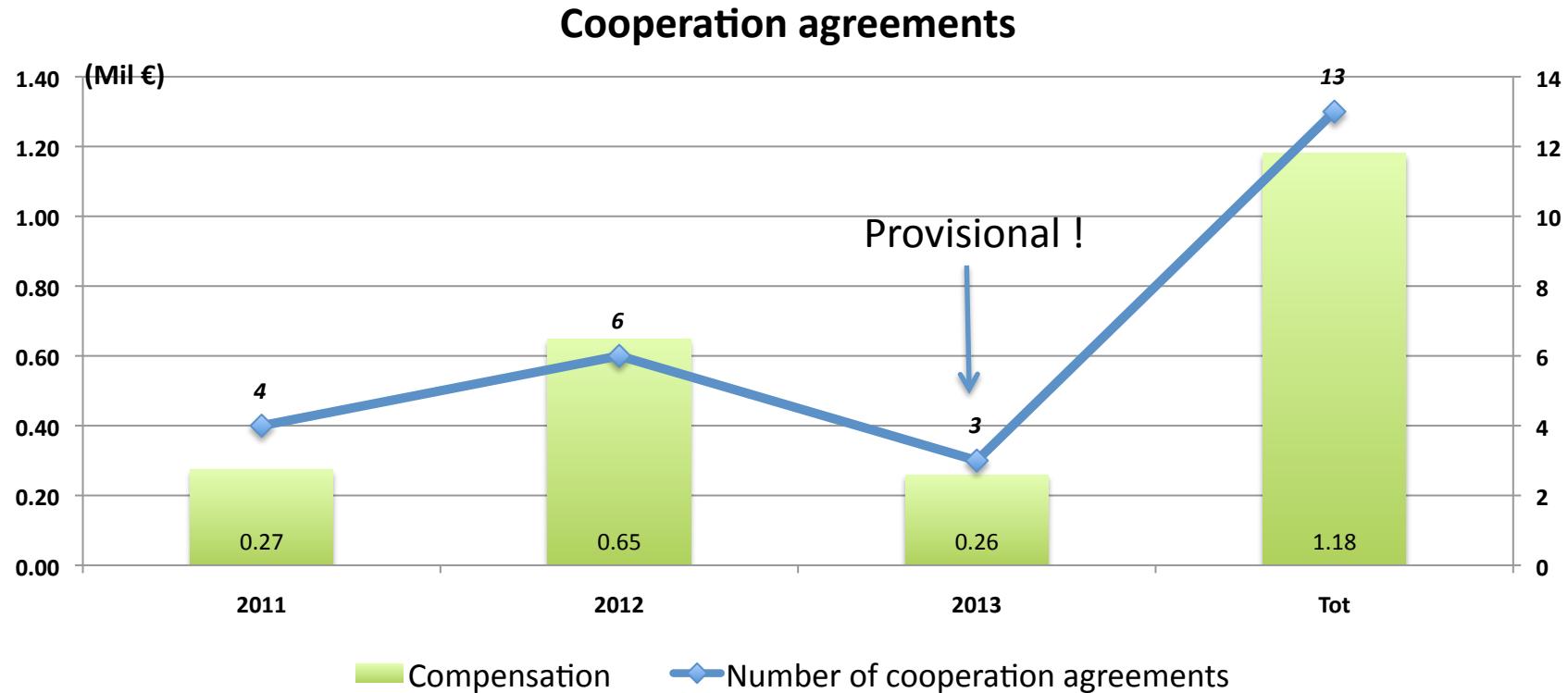
Cooperation agreements	N°	Duration (months)	Revenues
2011	4		€ 273.400
CEI S.r.l.	1	24	€ 145.000
ENEL	1	28	€ 70.000
IMT S.r.l.	1	24	€ 38.400
Selex Sistemi Integrati Spa	1	12	€ 20.000
2012	6		€ 649.250
Fondazione CNAO - Centro di Adroterapia Oncologica	1	15	€ 187.750
ISED S.p.A	1	4	€ 81.000
X-CHANNEL S.R.L.	1	36	€ 144.000
Metaltronica s.r.l.	1	36	€ 96.500
Sensichips s.r.l.	1	18	€ 15.000
SOGIN SpA	1	24	€ 125.000
2013	3		€ 258.000
IBA - Ion Beam Application sa	1	12	€ 50.000
Sensichips s.r.l.	1	Na	€ 8.000
ITEL Comunicazioni S.P.A.	1	Na	€ 200.000
Total amount	13		€ 1.180.650

Cooperative Research with Enterprises (3)

Cooperation agreements per OU	2011	2012	2013	Tot
LNF	2	1		3
LNSUD	1	1		2
Bologna	1			1
Cagliari		1	1	2
Napoli			1	1
Roma	2			2
Torino	1	1		2
Total amount	4	6	3	13

During the analysis period the collaborative tool has been used by 7 Units out of 24 : among these only 5 have made more than one contract with a company.

Cooperative research with enterprises



21 months: average agreement life span

7 on 24: number of OUs involved in cooperation agreements

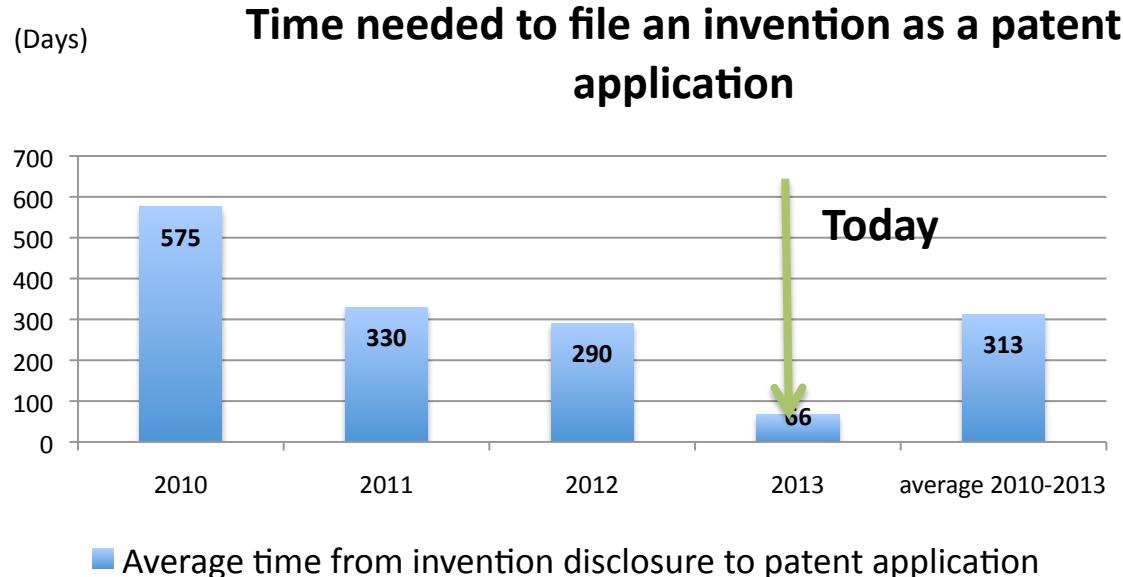
5 on 7: more than 1 contract

CAEN: in progress 2013

Doesn't include contracts on EU, National or Regional funds



Time to patent application



Lower time to patent application file

reduce:

1. Chances for *Prior art* to be found
2. researcher's *concerns about publication*
3. time to *license*

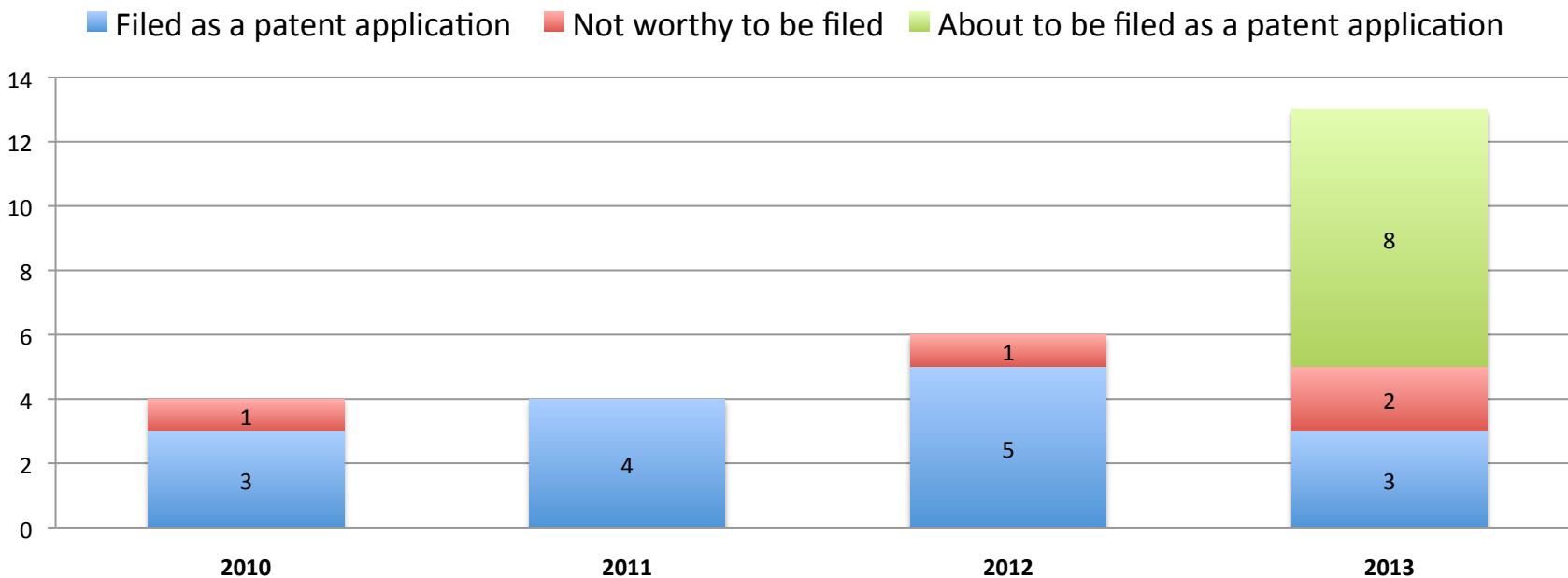
A dedicated **patent structure** is actively working, the flow of actions dedicated to patents is **granting first patent deposition in 6-8 weeks**,

A dedicated **patent valorization structure (broker)** with the duty to follow the potential patent up to the final valorization is in action since Spring.

Invention disclosures

(N° di proposte di invenzione presentate internamente all'ufficio)

Invention disclosure forms



11 on 24: number of OUs that filed at least 1 invention disclosure form to the TTO

3 on 11: number of OUs that filed an invention disclosure for the first time in 2013

examples of
VALORIZATION OF IP : LICENSING PATENTS

Oggetto dell'accordo	Licenziatario	Anno brevetto	Anno stipula	Durata	Corrispettivo
Licenza su brevetti 1. <u><i>dosimetro MatriXX</i></u> 2. <u><i>Startrack</i></u>	IBA <u><i>Dosimetry GMBH (DE)</i></u>	2005 2005	2011	Licenza illimitata temporalmente con clausole rescissorie	20.000 €/anno
Licenza su <u>brevetto metodo e dispositivo RaMoNa</u>	<u><i>Promete S.r.l.</i></u>	2008	2013	4 anni	Royalty 10%

Tabella 5: Accordi di licenza su brevetti INFN

VALORIZATION OF IP : LICENSING KNOW-HOW

#

Oggetto dell'accordo	Licenziatario	Anno stipula	Durata	Corrispettivo
Licenza su dispositivi MEMS denominati <i>Silicon Photo Multipliers</i>	FBK Che ha concesso in <u>public</u> , allo spin off <u>Advansid S.r.l.</u>	2010	Fin quando il prodotto e le nuove versioni restano competitivi sul <u>mercato</u>	Royalty 25%; (12,5% per le nuove versioni tecnologiche del prodotto)
Accordo di ricerca industriale (Progetto DISO) cessione di <u>know how</u>	Best <u>Medical Italia</u>	2013	3 anni	Royalties 15% x 34% (quota titolarità INFN)
Quota parte di <u>licensing know how</u> su contratto di ricerca	ITEL S.P.A.	2013	Fino alla caduta in pubblico dominio di tutto il Know-how	3%

Tabella 6: Accordi di licenza su know-how INFN

VALORIZATION OF IP : MOU-NDA

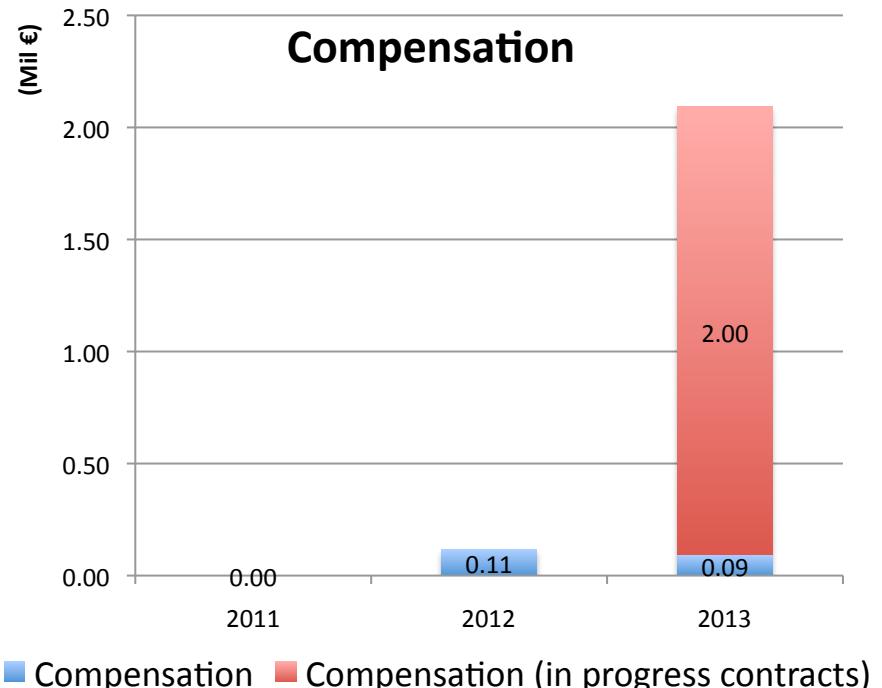
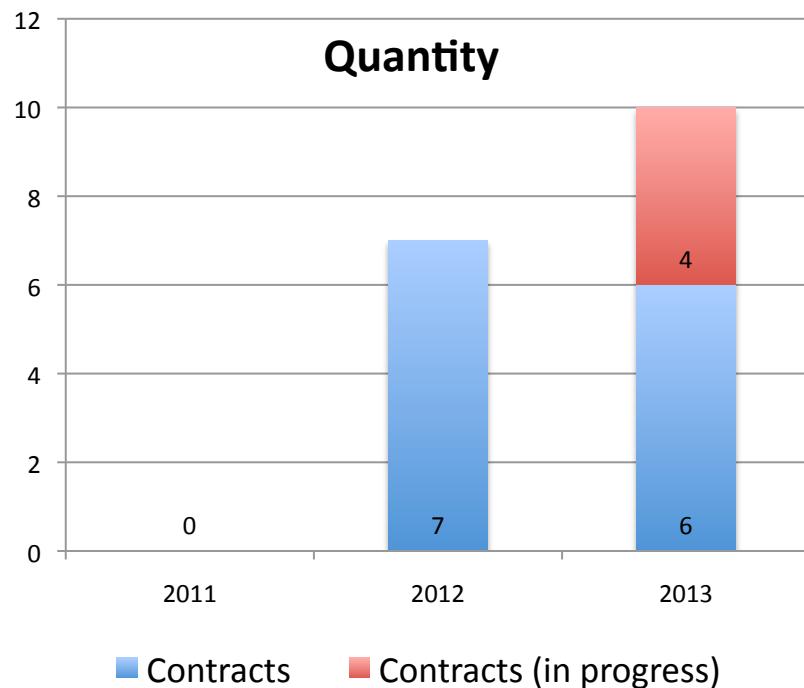
#

ACCORDO	PARTI	STIPULA
Mutual NDA	NVIDIA Corporation	01/08/11
MoU	Best Medical International, Inc	17/02/12
MoU ("SPES" LNL)	Best Medical International Inc. - CNR	26/11/12
NDA	SAES GETTERS spa	17/07/13
NDA	Scionix Holland B.V.	03/06/13

Tabella 7: Accordi di riservatezza e ~~memorandum of understanding~~



Service and consultancy



7 months: average contracts life span (min 3 – max 18 months)

2: number of OUs involved in2012

6: number of OUs involved in2013

N° CONTRATTI C/TERZI	2011	2012	2013
STATO DI LAVORAZIONE / U.O.			
STIPULATO		7	6
LNF servizio FISMEL			1
LNGS		1	
LNL			1
Sezione Firenze LABEC	6		4
IN CORSO DI STIPULA			4
Sezione Lecce			1
Sezione Perugia			2
Sezione Torino			1
NON STIPULATO	2		5
TOTALE CONTRATTI NEGOZIATI	0	9	15
TOTALE ESCLUSI "NON STIPULATO"	0	7	10

Tabella 8: progressione annuale contratti c/terzi per unità operativa

Tra le U.O. quella più attiva è la sezione di Firenze con il LABEC: 9 su 10 contratti stipulati hanno per oggetto delle attività di misurazione effettuate in favore dei partecipanti ad uno stesso progetto di ricerca.

Spin-off 2011-2012

- **Dixit s.r.l.** - [*http://www.dixitsolutions.com*](http://www.dixitsolutions.com) -
<https://www.widen.it>
Computer applications to the biomedical sector by making use of the most advanced web technologies.
- **Pixirad Imaging Counters s.r.l.** - <http://pixirad.pi.infn.it/>
X-ray sensor based on innovative high quality Chromatic Photon Counting.
- **I-SEE s.r.l., Internet-Simulation evaluation envision –**
<http://www.i-seecomputing.com>
Software solutions in a "Cloud" and application services primarily to operators in the fields of Medical Physics - Radiotherapy and Hadrontherapy -, radiobiology, radiation protection.

Spin-off 2013 : 2 in progress

- **De.Tec.Tor. S.r.l (Devices & Technologies Torino)** - <http://www.detector-med.com/>

Products/Services

- Design and implementation of the monitor beam (particle detectors) for control of the dose given to the patient during a treatment of hadron therapy (protons and carbon ions).
- Allows to measure intensity, shape and position of the particle beam with a 'high spatial and temporal resolution, is therefore able to monitor during treatment the radiation dose administered to the patient and verify compliance with the established therapy (treatment plan) .



Events

ENLIGHT

ENLIGHT 10th Anniversary -
PARTNER and ULICE Annual
Meetings

[READ
MORE →](#)

ICTR-PHE

First ICTR-PHE 2012
Conference: Uniting Biology,
Medicine and Physics to fight

[READ PAST EVENTS](#)

CUSTOMIZED PARTICLE DETECTORS

For hadrontherapy

DE.TEC.TOR. offers a customizable range of particle detectors, both for dose delivery system and tools for QA measurements. We are also available for collaboration about new devices for hadrontherapy.

Let us know your requirements and together we can find

[DISCOVER DETECTOR →](#)

News

**SEE YOU AT PTCOG52 –
STAND E2**

[READ
MORE →](#)

**SEPTEMBER, 2012 – NEW
HQ**

Opening new headquarter at
Environment Park of Turin,
Italy
<http://www.envipark.com/>

[READ
MORE →](#)
[READ ALL NEWS](#)

Fitting your requirements

TYPE OF DETECTOR

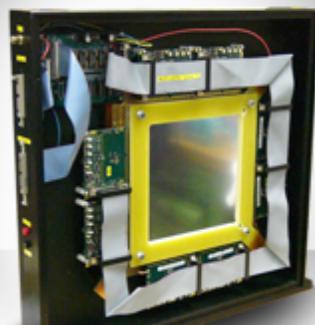
Measurement devices to
different applications

NUMBER OF CHANNELS

Possibility to choose number of
ionisation chambers with parallel

ANODE PATTERNS

Pixels, strips and integrals or
customized patterns



[VIEW OUR PRODUCTS](#)

MATERIAL

Different range of thin film
materials and coating

EASY SET-UP

Suitable set up for every
treatment

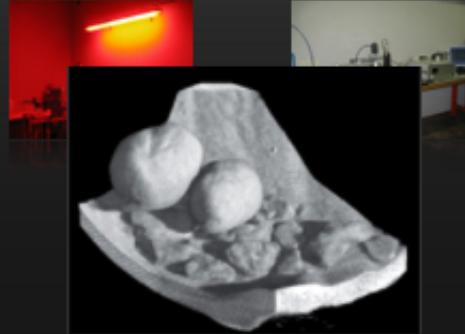
DATA ACQUISITION

Implementing custom
functionality with dedicated HW

- **TecnArt (Torino) -**
<http://www.tecnart.unito.it/>

Products/Services

- An academic spin-off of the University of Torino, being actually formerly recognized also by INFN, which since 2012 operates in the field of diagnostics applied to Cultural Heritage. It was born and being developed in tight contact with University and INFN research, whom it represents a technology transfer. The aim is to apply methodologies and scientific technologies in the field of Cultural Heritage, in order to better know, preserve and enhance historical works of art.
- TecnArt S.r.l. provides, both for public and private institutions, a broad range of services completely dedicated to the authentication and dating of ancient findings, to the analysis of materials constituting works of art and to the study of the conservation conditions in order to develop a correct restoration plan.



Storia



Tecnologia e ricerca per l'Arte

Tecnart S.r.l. offre una serie di servizi dedicati all'autenticazione e datazione di reperti, all'analisi dei materiali costituenti un'opera d'arte e allo studio del suo stato di conservazione. I risultati permettono di avere maggiori informazioni sull'oggetto in analisi, contribuendo ad esempio ad una corretta pianificazione degli interventi di restauro o ad offrire una certificazione oggettiva del valore di un'opera. Pertanto i servizi si rivolgono sia alle istituzioni pubbliche sia al settore privato

TecnArt S.r.l. è uno Spin off Accademico dell'Università degli Studi di Torino che opera nel settore della diagnostica scientifica applicata ai Beni Culturali, attività nata e sviluppata in stretto contatto con la ricerca universitaria e di cui ne rappresenta il trasferimento tecnologico. L'intento è quello di applicare le metodologie e le tecnologie scientifiche al settore dei Beni Culturali per riuscire a conoscere, conservare e valorizzare i beni storico-artistici, garantendo una continua evoluzione delle metodologie di indagine e l'ottimizzazione di strumentazioni per lo studio delle varie tipologie di manufatti.

Promotori



Università degli Studi di Torino
Incubatore di Impresa



Università degli Studi di Torino
Settore Ricerca e Internazionalizzazione

Link

[Unito.it](#)[2i3T](#)

Info

TecnArt S.r.l. - Partita IVA: 10774850019

tel: +39 (0) 11 6707918 - email:
tecnart@unito.it

Webmaster

ema@iif.it

Technology Clusters

- It was almost natural for us to propose a virtual connection of different INFN units with competences on the same item to give life to a “national network” (Technology Cluster, TC).
- A T-cluster includes INFN personnel, INFN instrumentation, companies, consortia, public and private subjects, spin-offs, etc.
- 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

Technology Clusters

- ICT
 - Accelerators
 - Cultural Heritage
 - Medical Applications
 - Silicon Detectors
-

MCloud: infrastructure for “l’Agenda Digitale Marche” (ADM)





MARCHE Region

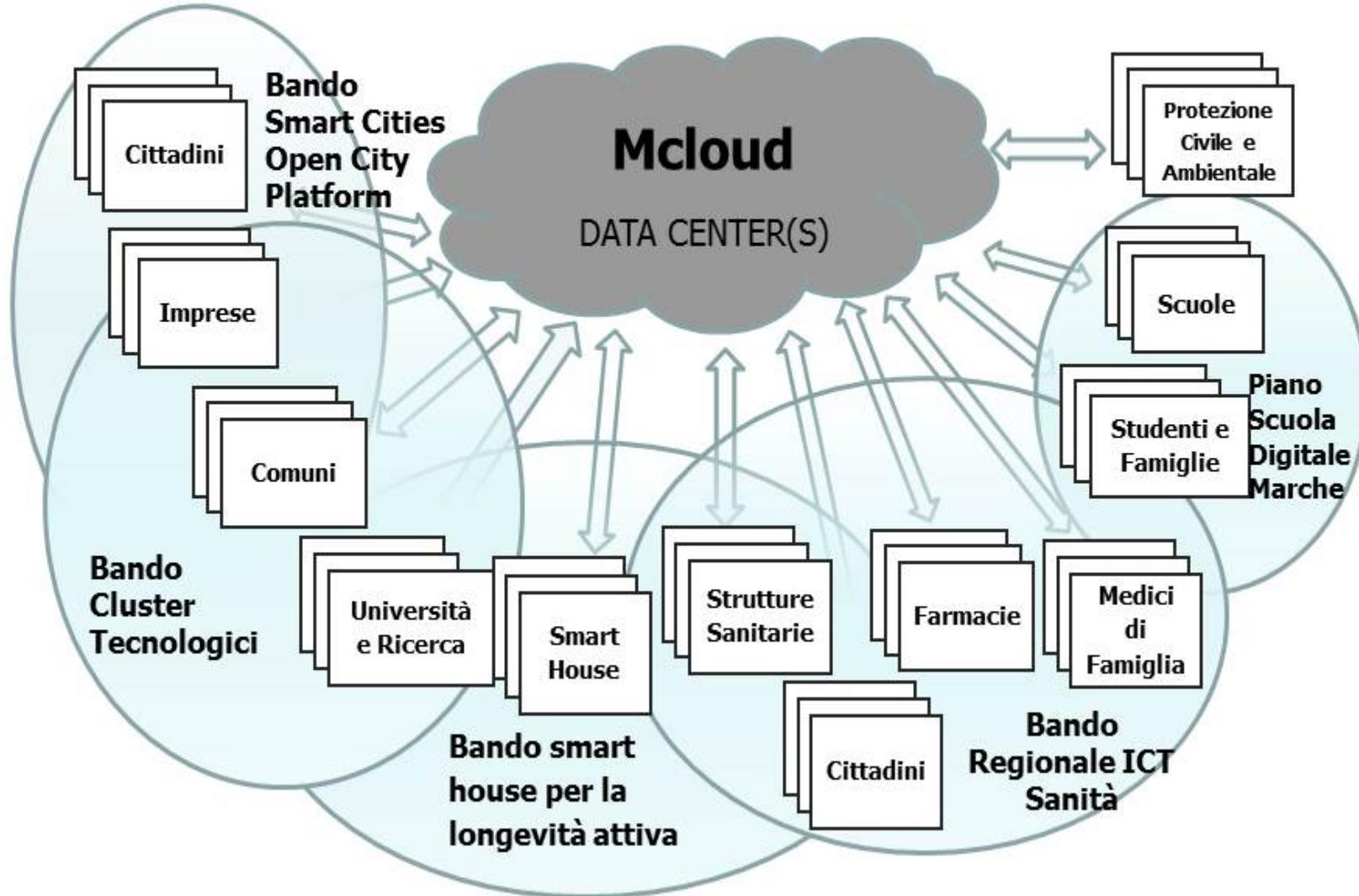


A strategic and innovative project for the Marche Region that, using the new brands and the most advanced Cloud computing Information Technologies, aims to **enhance and develop modern infrastructure and innovative digital services** allowing citizens, enterprises, institutions:

- increase the efficiency and innovation
- develop knowledge and new products
- increase productivity growth
- develop and disseminate advanced skills in the use of ICT
- facilitate the exchange of information and social gathering

and:

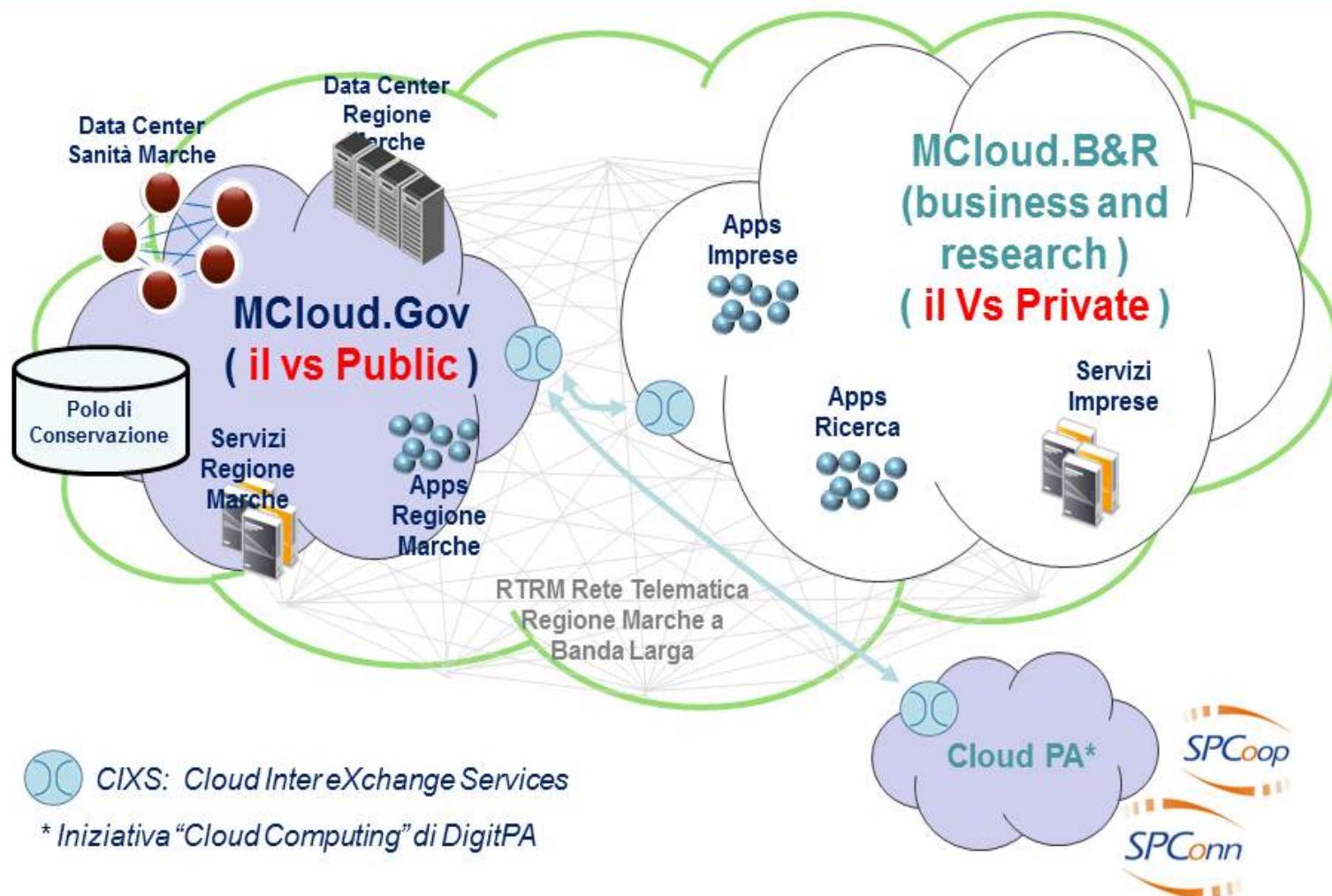
- improving the quality of life of citizens
- savings and more efficient use of public and private resources
- attraction and skills training in a strategic sector such as ICT



Public Administrations: develop and deliver Cloud technologies to simplify the procedures of the offices of the Public and Health Care Administration making them more efficient, less costly, more accessible to citizen.

Citizens: provide opportunities and services to citizens to improve urban mobility, energy management and saving, the general conditions of safety, the ability of home care for the elderly and weak people and effective communication with the public administration.

Businesses: develop and offer innovative services; implement ICT solutions aimed at optimizing production processes / administration.



Pilot Cloud Infrastructure developed in the period July - December 2012

Developed at the Regional Data Center, it is an opensource Infrastructure for evaluation and testing, which delivers the available cloud-based services.

MCloud Online Service for medical reports released in December 2012

(<https://referti.sanita.marche.it/>)

- It allows the online consultation of the results of clinical chemical analyzes carried out in laboratories of the Marche Region.
- Access to medical reports not only by PC or Tablet but also through Smart Phone and Smart TV
- Released for now on an experimental basis by a Hospital and three zones, and used by over 1000 users. Being extended to other areas of the territory.

Service for Energy Performance Certificates (<http://ace.regione.marche.it>)

ACE Service released in Apr. 2013

- It allows the online submission to the protocol of the Regional energy performance certificates of buildings
- Transmitted in a month more than 1,200 practices

**Service for “Visura Catastale” and calculation of the IMU tax
(<http://visuraimu.regnione.marche.it>)**

Services under test, accessible via the strong authentication system for identifying regional FEDCohesion (available for all owners of the Raffaello card).

#DestinazioneMarche, Tourism

A system of **mobile apps, social media channels**, marketing and **web services** declined in accordance with the offer of **regional Tourism (Sea, Taste, Culture, Spirituality, Nature, Villages, Shopping, etc..)**, Designed to make the planning of a trip, the feeling of discovery and the stay of tourists in the Marche a better experience.

At the moment the released app is **Marche in Blu** on the Google Play marketplace.

J.A.NET (JobAgecnyNETwork): Online Employment Agency (statement of willingness to unemployment, consultation of card with personal and professional data, certification request, booking appointments).

The Cultural Heritage Cluster

- Born as an experiment of CSN5, INFN-Dating, it has as reference point the LABEC in Florence.
- The INFN has several Units, distributed on the national territory, dedicated to the study of Cultural Heritage and the development of new techniques for their conservation and restoration. The idea is to merge the expertise of the INFN Units boosting their resources to build a network capable of both satisfying local requests and carrying on technological developments to improve both: the dating techniques and the elemental techniques.
- The idea is that each Unit may participate in more than one line of research, the Units most involved in each line will be the main contact points (red) while the other always interested in the research will be the Auxiliary Divisions (yellow).
- One of the purposes of the cluster is to promote the transfer of technology developed for the small business and help local institutions to re-evaluate and to showcase local artistic heritage

The “Cultural Heritage” network

8 Units with 51 persons

% Women	% U35	FTE
57.6	44.2	32.1

- ✓ Research
- ✓ Technology Transfer
- ✓ Services for others: public and private subjects



Specific competences of the Cultural Heritage network : a starting point

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

Research : some specialization



In situ analysis

Andrea Vacchi INFN EPS Workshop 2013 Ravenna (I),
11-12 Nov. 2013



Dating

SIDENET

Silicon Detector Network

multi-regional technology platform for the development of silicon based sensors and advanced electronics

ABSTRACT

The SIDENET project involves the national network of INFN structures which develop silicon sensors and detectors. It enhances the value of their activity through the support to research and the consolidation of the high level technologies developed. Silicon detectors can find an extended number of applications even outside the research field. SIDENET promotes technology transfer, training, coordination of scientific infrastructures, protection of intellectual property, fostering the development of new companies. Moreover the project activates the interaction with other research institutions and private entities, developing the necessary network of national relations with the perspective of the participation in international calls. Within SIDENET the projects and the laboratories of the 12 INFN structures operating in the silicon detectors context are gathering, this implies the participation of about **230 researchers and engineers, of them about 20% are under 35 and 20% female** (see paragraph 10 c).

SENSOR DEVICES FOR THE MEASUREMENT OF PHYSICAL QUANTITIES

The results will involve many priority intervention areas.:

- ENVIRONMENT: environmental monitoring (sensors for PIXE analysis)
- ENERGY: safety sensors for the nuclear field
- MADE IN ITALY: interaction between research products and production system
- CULTURAL HERITAGE (among others sensors for PIXE analysis)
- HOMELAND SECURITY: monitoring of radioactive sources
- HEALTH AND LIFE SCIENCE devices for early and advanced diagnosis
- SENSOR DEVICES for the measurement of physical quantities
- AERONAUTICS AND SPACE: sensors with high time and energy resolution

KEY WORDS

Silicon Sensors design, Silicon Sensors production, Silicon Sensors characterization, SiPM, SDD, SPD, custom ASIC electronics, Technology Transfer, research-industry cooperation, Horizon 2020 Detectors for soft X-ray applications, Direct detection 2D detectors for storage rings, Area detectors for X-ray FELs, Sensor and interconnect technologies, Hard X-ray indirect detection

Adobe Reader File Edit View Window Help

SIDENET_Project_summary copy.pdf

2 / 52 129% Tools Sign Comment

KEY WORDS

Silicon Sensors design, Silicon Sensors production, Silicon Sensors characterization, SiPM, SDD, SPD, custom ASIC electronics, Technology Transfer, research-industry cooperation, Horizon 2020 Detectors for soft X-ray applications, Direct detection 2D detectors for storage rings, Area detectors for X-ray FELs, Sensor and interconnect technologies, Hard X-ray indirect detection

2 GENERAL MOTIVATIONS, STATE OF THE ART, AIMS

In the past 30 years INFN researchers have reached key positions and taken part in the most significant technological and scientific developments in the field of silicon detectors exploiting the processing technologies developed for the fabrication of integrated electronic circuits. Experiments like ATLAS, CMS or ALICE at CERN-LHC, BaBAR at SLAC or CDF at FERMILAB are examples of the most advanced large detectors making a wide use of silicon sensor technologies and integrated, *custom designed*, readout electronics. In all those detection systems the contribution of INFN researchers and technologists has been significant, if not decisive. Focusing on space applications, which require devices enduring the extreme conditions of the launch and of life in space, we can mention successful and renowned international experiments such as: PAMELA, FERMI-GLAST, AGILE, AMS. The silicon detector technology, the core of those experiments, is mainly the product of Italian knowledge/excellence. It is noteworthy that the experiments presently in orbit at present are equipped with a massive employment of silicon sensors whose realization had been coordinated by INFN researchers.

The international excellence of our work has been documented by a research on the SCOPUS database, focused on experimental publications. The research is based on simple filters and requires the words "silicon detectors" and the affiliation "name of the institute". The results obtained by choosing the research institutes operating in the same field and with the same

Scopus database results

Silicon Sensors

Silicon Detector papers	INFN	CERN	MAX PLANK BRD	CNRS F	IN2P3 F	RIKEN J
1981-2011	1693	944	164	425	218	122
2011	90	45	3	45	20	9
2010	123	40	17	57	16	12
2009	105	32	10	39	20	8
2008	99	45	14	42	11	4
2007	158	67	16	20	13	10

Table 1

3 PARTIES INVOLVED

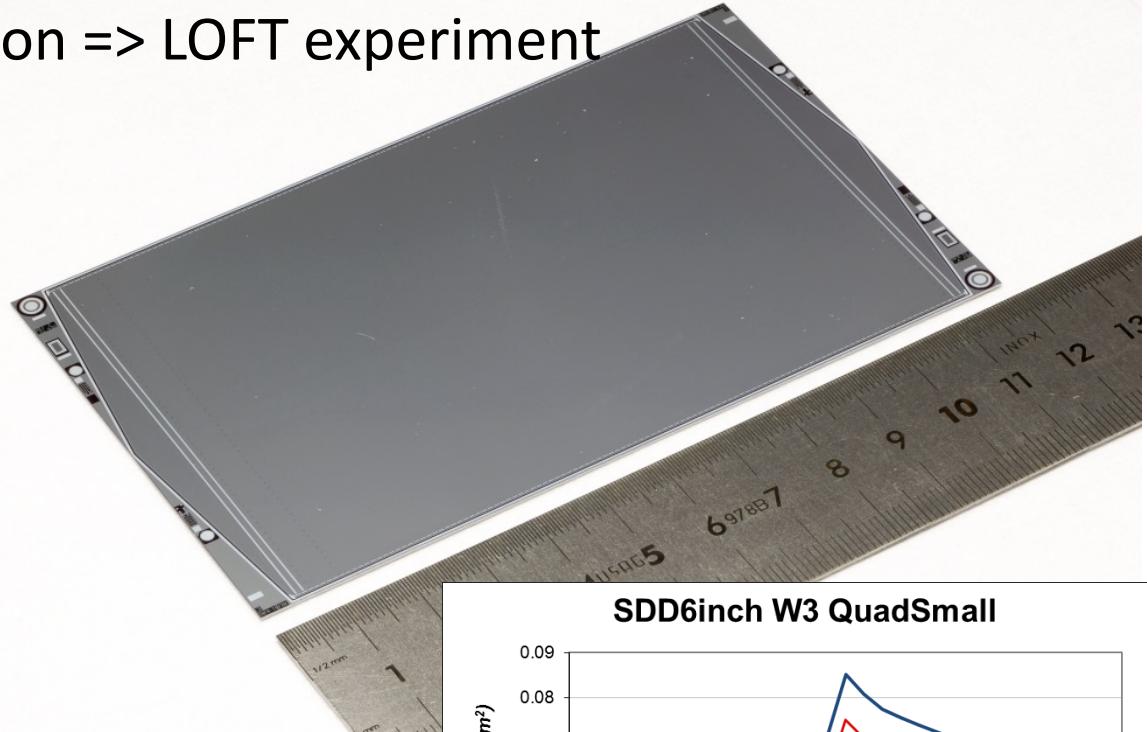
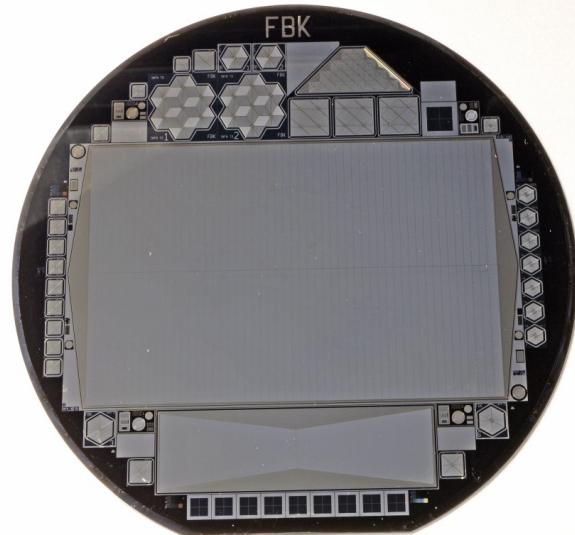
INFN

There is a constant cooperation between INFN companies and other research institutes that determines the excellence in the development of silicon sensors, for which INFN has demonstrated an international competence. In the few examples above we mentioned: FBK; INAF; ASI; ESA; POLIMI and the different structures that operate in this context: INFN sections of Milan, Turin, Trieste, Genoa, Padua, Florence, Pavia, Pisa, Perugia, Rome 1, Naples, Bari and the LNF, LNS, LNL laboratories. The silicon laboratories of these structures are provided with clean rooms dedicated to characterization assembly and integration, advanced instruments, trained staff and researchers committed to the development, characterisation or implementation of silicon sensors. The same can be said for the laboratories devoted to the development of highly integrated readout electronics (VLSI) and for the laboratories for electronic services, which are equipped to build integrated prototypes. Each INFN section involves between 10 and 15 persons and includes technicians, technologists, researchers and partners. Hence the project is addressed to a wide INFN community (200 - 250 among researchers, technicians and technologists), which operates with the most dynamic and promising technology.

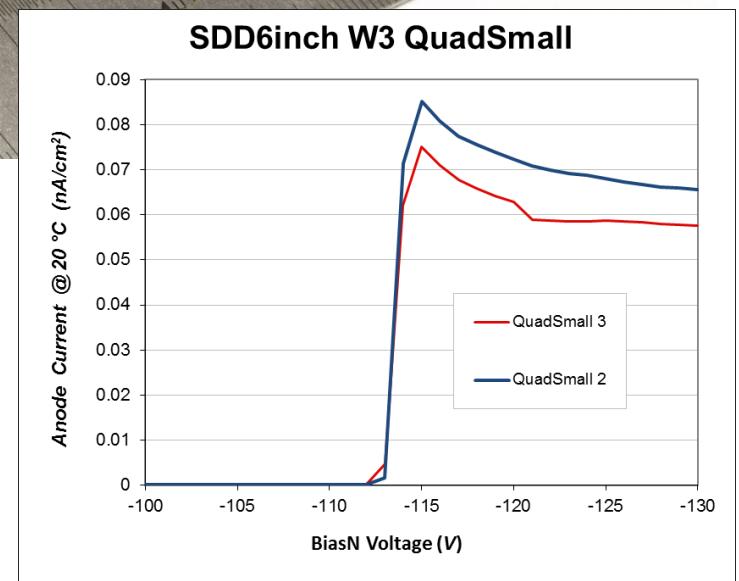
Moreover the dominance of silicon sensor technologies has seen INFN researchers contributing substantially to the majority of the international projects on this matter, creating several spin-off companies and involving high-tech companies such as, among others, ST Microelectronics, Thales Alenia Spazio, Ansaldo Nucleare, Kaiser Spazio, Mipot, Gavazzi, Laben, CAEN, G&A, Plyform, Centrotecnica, Galileo Firenze, Nergal Roma, Marotta Napoli, and so on. This results in a gradual spread of silicon sensor technology also outside the research field in sectors producing high value added instruments for analysis.

FBK-INFN Research Detectors for Soft X-rays

On 6" wafer, world widest SDD ever realized
astrophysics applications, extremely low leakage current high energy
resolution => LOFT experiment

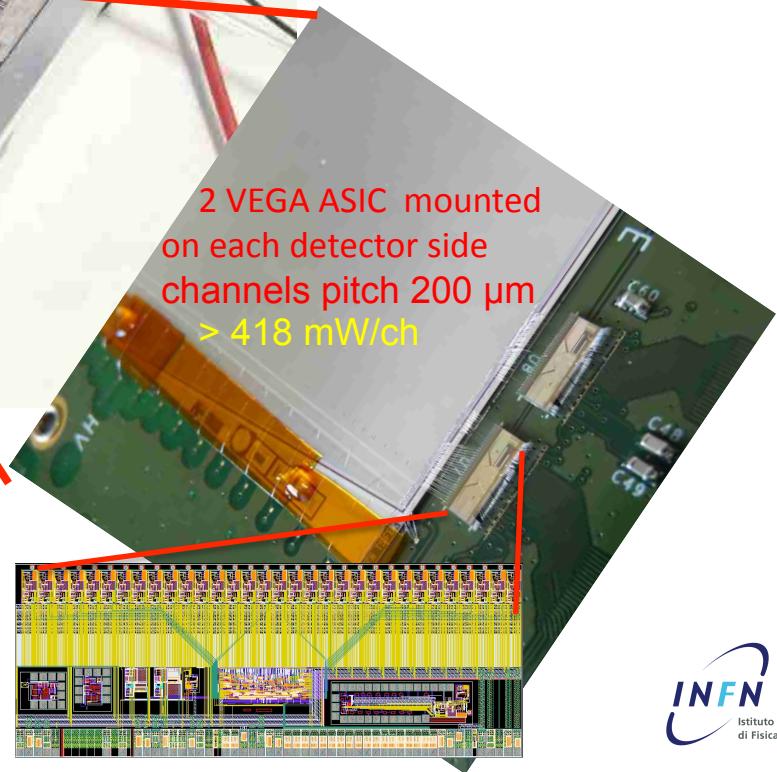
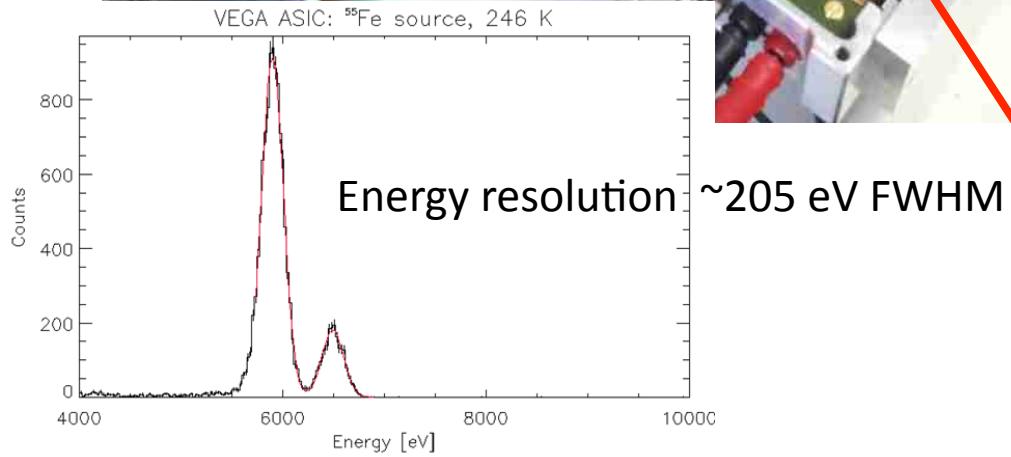
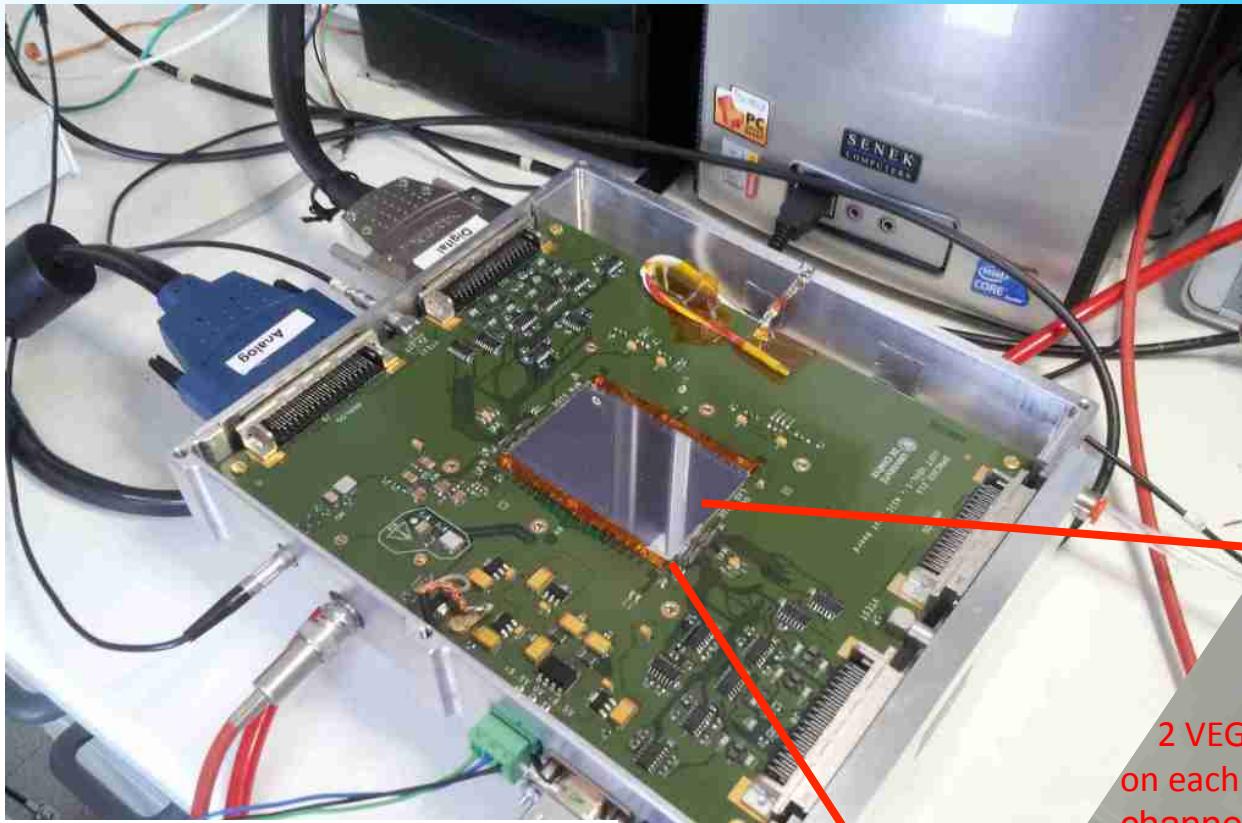


- 1) With the new production process very low leakage current: between 40 e 70 pA/cm² at 20 °C ;=> allows ambient temperature spectroscopy!
- 2) Proposed and developed for the LOFT M3 ESA Cosmic Vision mission (<http://www.isdc.unige.ch/loft/>)



4" SDD with VEGA ASIC readout assembly

VEGA ASIC is a low power mixed signal (analogue and digital) device reading 32 anodes of an SDD designed for high resolution X-ray spectroscopy low power 420uW/ch designed at Politecnico Mi & Uni PV



- For each channel
 - pre-amplifier
 - shaping amplifier
 - discriminator
 - peak and hold
 - channel tuning (thr, on/off, etc)

LOFT (Large Observatory For x-ray Timing in) in one slide

Science: high energy astrophysics - state and nature of matter in ultradense (supra-nuclear) conditions (**Equation of State of NS**); behaviour of matter under strong gravitational field (**General Relativity close to BH**) and ultrastrong magnetic field; multi-purpose general observatory (high energy resolution combined with 10-m² effective collecting area).

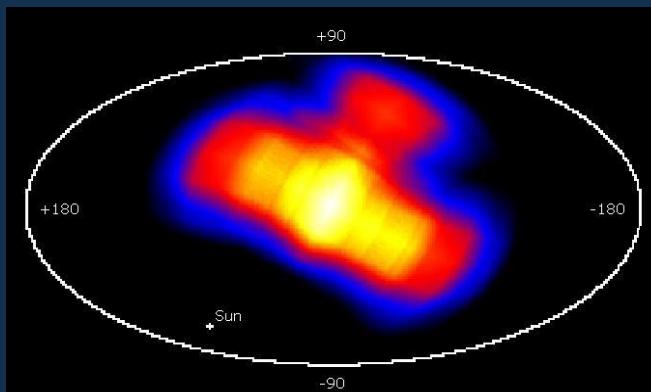
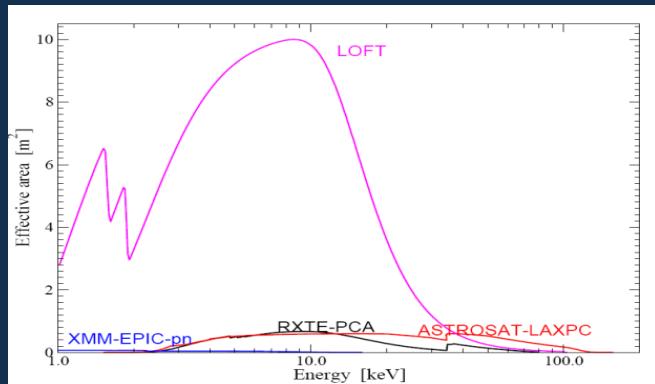
Enabling Technology: large-area Silicon Drift Detectors (INFN-LHC-ALICE heritage, INFN-FBK Loft dedicated development) enable to deploy 18-m² of X-ray detectors in space

Scientific Consortium: Italy (PI), UK, France, Germany, Switzerland, Spain, Denmark, Finland, Poland, Czech Rep., USA, Japan, Brazil, India

Programmatics: ESA M3 mission candidate, final down-selection (5 to 1) early-2014, flight 2022



The LOFT Instruments

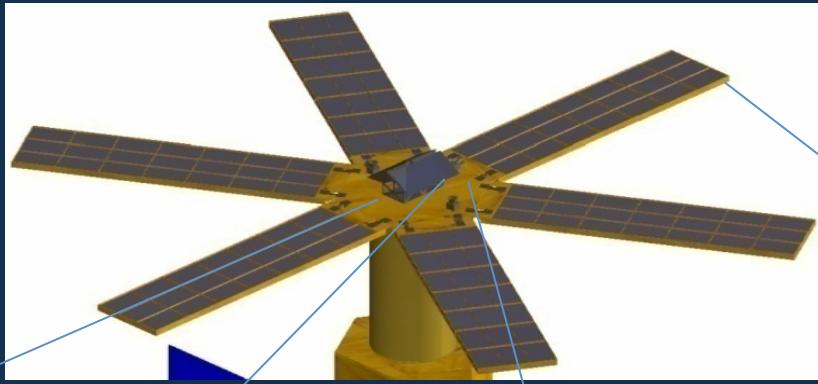


LAD – Large Area Detector

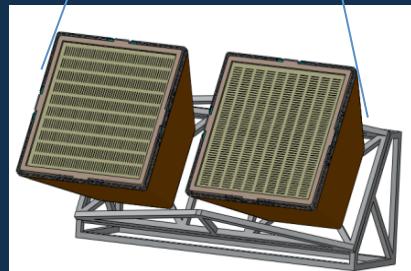
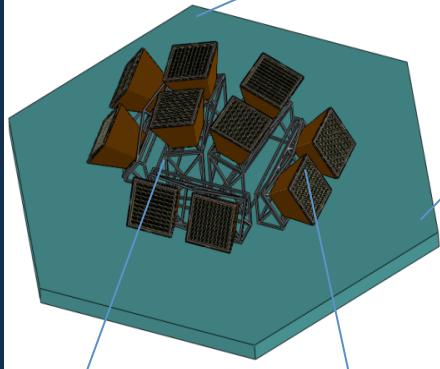
Effective Area	4 m^2 @ 2 keV 8 m^2 @ 5 keV 10 m^2 @ 8 keV 1 m^2 @ 30 keV
Energy range	2-30 keV primary 30-80 keV extended
Energy resolution FWHM	260 eV @ 6 keV 200 eV @ 6 keV (45% of area)
Collimated FoV	1 degree FWHM
Time Resolution	10 μs
Absolute time accuracy	1 μs
Dead Time	<1% at 1 Crab
Background	<10 mCrab (<1% syst)
Max Flux	500 mCrab full event info 15 Crab binned mode

WFM- Wide Field Monitor

Energy range	2-50 keV primary 50-80 keV extended
Active Detector Area	1820 cm^2
Energy resolution	300 eV FWHM @ 6 keV
FOV (Zero Response)	$180^\circ \times 90^\circ + 90^\circ \times 90^\circ$
Angular Resolution	5' \times 5'
Point Source Location Accuracy (10- σ)	1' \times 1'
Sensitivity (5- σ , on-axis)	
	Galactic Center, 3 s
	270 mCrab
	Galactic Center, 1 day
	2.1 mCrab
Standard Mode	5-min, energy resolved images
Trigger Mode	Event-by-Event (10 μs res) Realtime downlink of transient coordinates

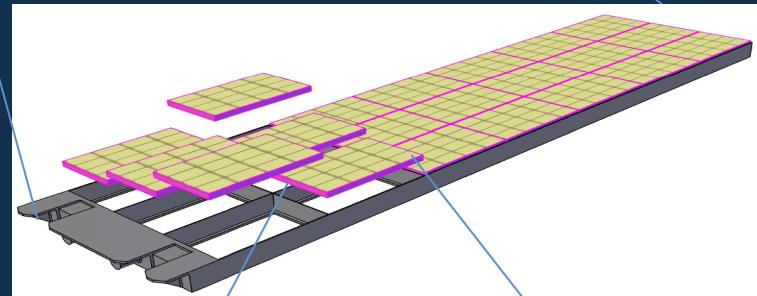


The Wide Field Monitor (WFM)

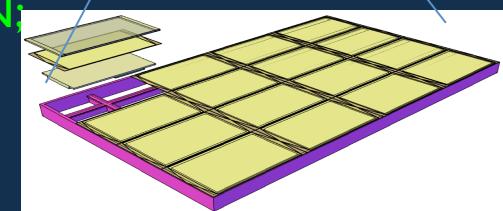


WFM FoV covers >50% of the LAD-accessible sky at any time, in the 2-50 keV energy range

The Large Area Detector (LAD)

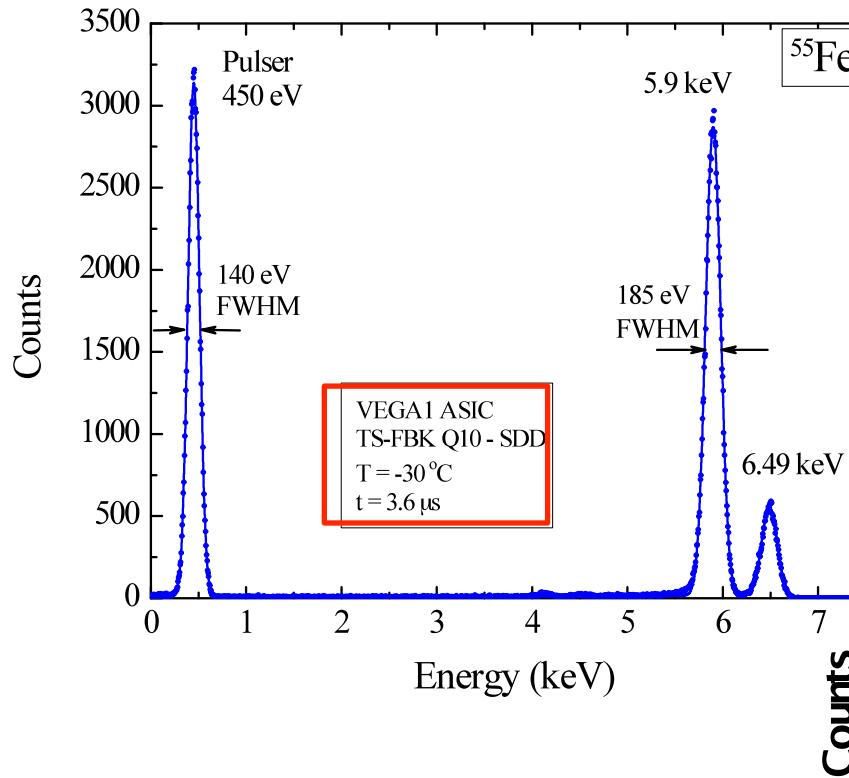


SDD: joint development FBK & INFN;
Detector Realization @ FBK

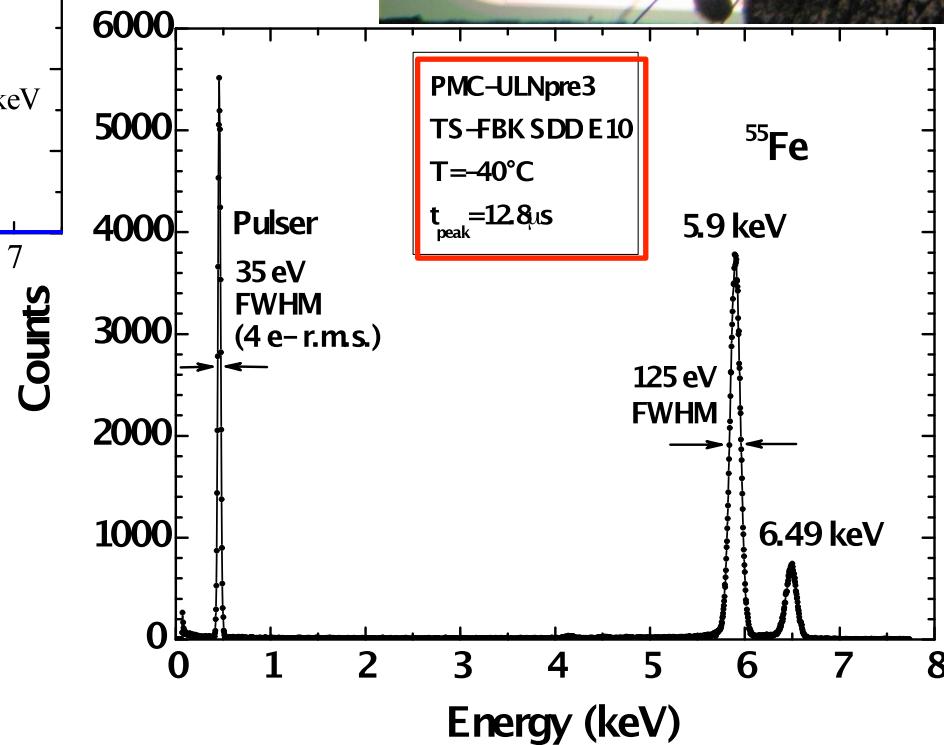


- Fully modular/redundant by design (126 independent modules)
- fine detector segmentation (5×10^5 read-out channels, $0.3 \text{ cm}^2 \text{ e}^{-}$)

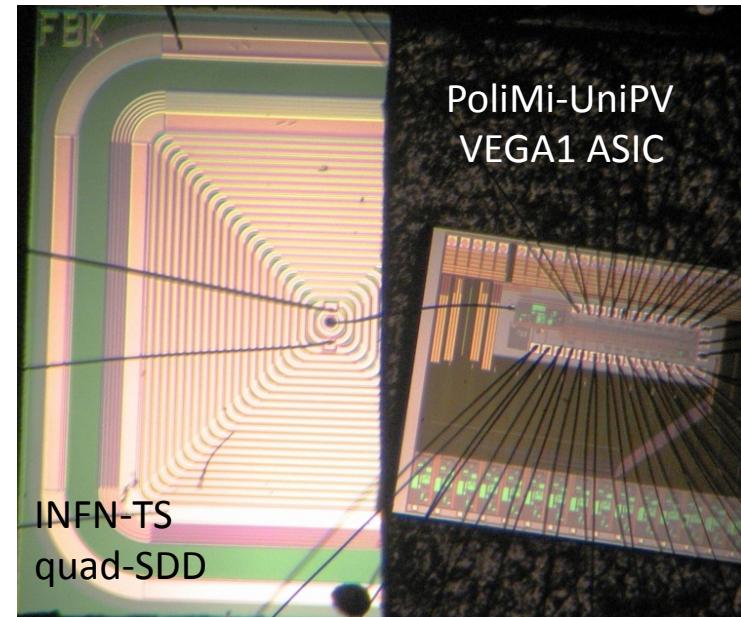
Research Detectors for Soft X-rays: VEGA1 & PMC-ULNpre3 low-power ASICs



Improving energy resolution
Results from two front end approaches,
185 eV & 125 eV at the Fe55 line

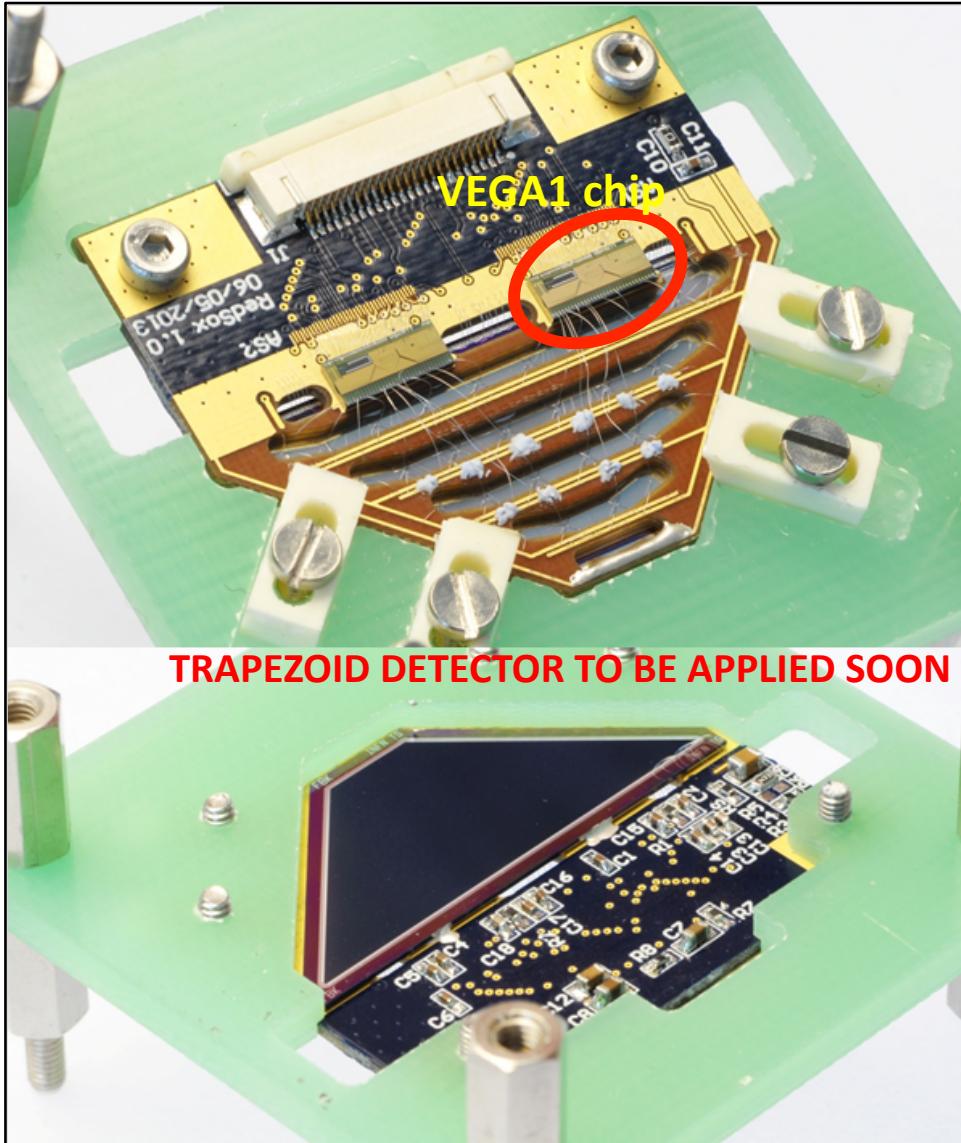


M. Ahangarianabhari et al., VEGA-1: A Low-Power CMOS ASIC for X-Ray Silicon Drift Detectors Low-Noise Pulse Processing, IWORID 2013, 23-27 June 2013, Paris, France, to be submitted soon to Journal of Instrumentations



Research Detectors for Soft X-rays

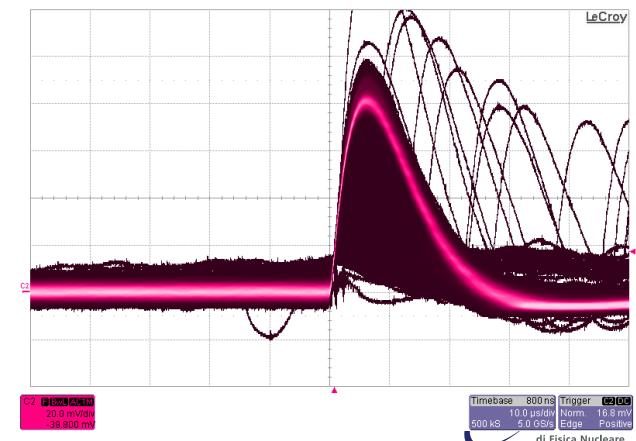
Development in collaboration with Sincrotrone Trieste



Extreme energy resolution and speed requirements

- Custom trapezoid geometry and ASIC VEGA1; characterization in progress
- Dedicated ASIC production

Scope Snapshot
peaking time of 6.6 μ s
 ^{55}Fe @ -20 °C



Concluding

INFN is **very receptive** to encouragement to share knowledge and technology more broadly **for benefits of society**.

Growing awareness of the value of the technological assets developed inside INFN and of the importance of encouraging better technology transfer between INFN and industry. This is currently done mostly through the **involvement of suppliers in the development of technologies**.

Effective actions in advancing technology transfer within INFN need to be based on **clear goals and a long term vision**.

This **cannot be seen only as a complementary activity**

A special effort is on going **to state the goals** and **to develop quantitative measures** that will allow objective measurement of progress as the new technology transfer programs mature within INFN.

Modello di Interazione (1)

In base alla natura del prodotto fornito ci sono due tipologie di interazione:

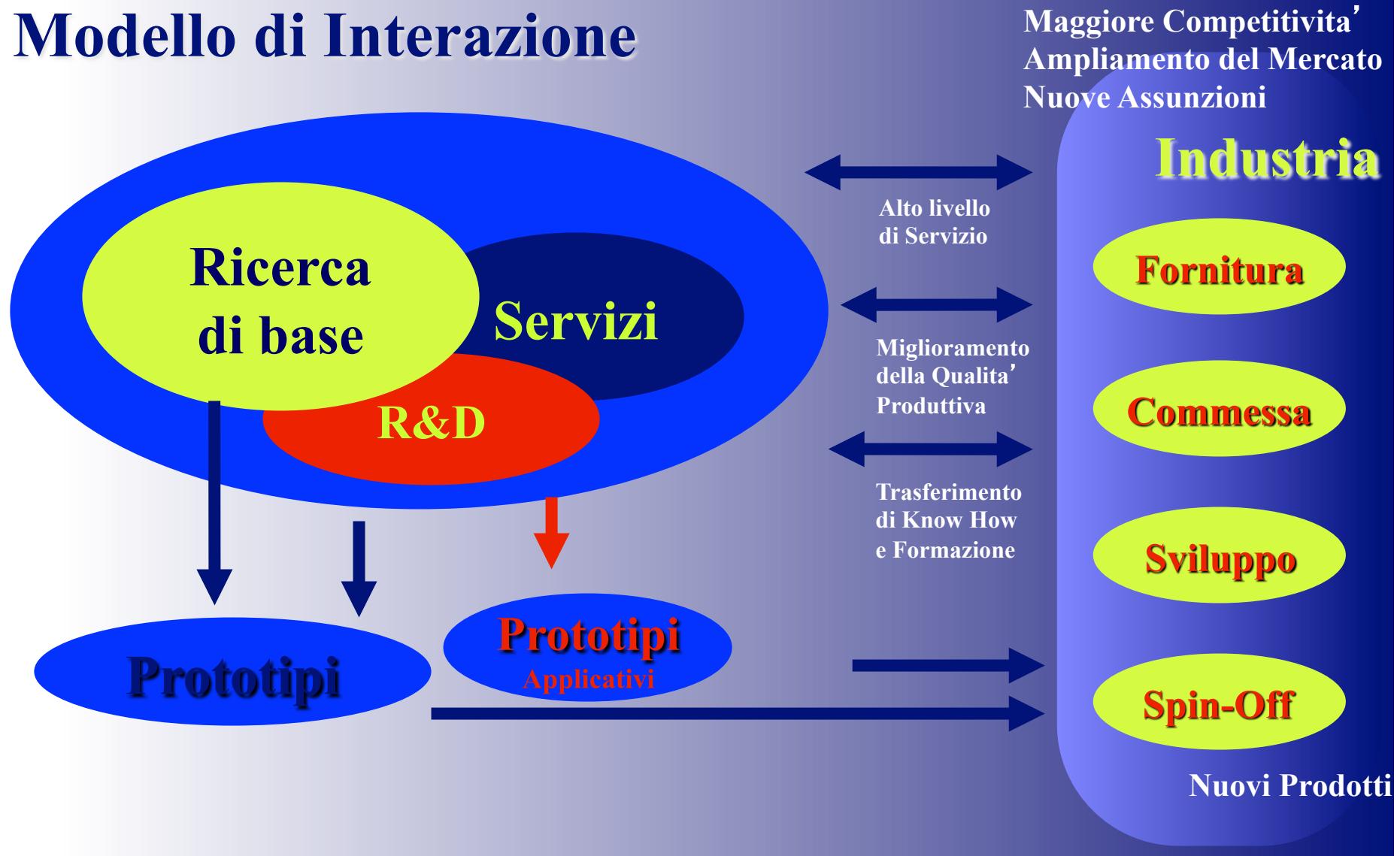
1. Acquisizione di un bene o un servizio disponibile in catalogo, selezionato sulla base della migliore offerta:
 - Acquisizione di un bene o di un servizio privi di un qualche contenuto di alta tecnologia. Questo tipo di rapporto verrà qualificato *come fornitura low tech*.
 - Acquisizione di un bene o di un servizio caratterizzati da contenuto di alta tecnologia. Questo tipo di rapporto verrà qualificato come *fornitura high tech*.

Modello di Interazione (2)

2. Richiesta di un prodotto innovativo:

- Le specifiche del prodotto rientrano nelle capacità tecniche dell'azienda che e' responsabile sia della progettazione che dell'esecuzione del progetto. Il prodotto finale, pur non essendo in catalogo, costituisce una applicazione *innovativa* del *Know How* dell'azienda stessa: *commessa*.
- Le caratteristiche del prodotto non rientrano completamente nelle conoscenze tecniche dell'azienda e la fase di ricerca e sviluppo (R&D) viene svolta in collaborazione con i ricercatori dell'INFN, mentre l'azienda e' completamente responsabile delle fasi produttive: *sviluppo*.

Modello di Interazione



A. Ballabene, V. Buccheri, B. Ceccarelli,
B. E. Ciccone, S. Gentiloni e G. Salina
Andrea Vacchi INFN EPS Workshop 2013 Ravenna (I), 11-12 Nov. 2013

La realizzazione di un'apparecchiatura innovativa deve seguire alcune fasi:

- Definizione delle specifiche del prodotto
- Ricerca applicata alla soluzione dei problemi specifici del prodotto
- Progettazione generale
- Progetto esecutivo
- Realizzazione del prototipo
- Test del prototipo ed aggiornamento del progetto esecutivo
- Produzione di serie
- Test e collaudo
- Installazione.

Coinvolgimento di
ricercatori dell'INFN,
(fase di progettazione,
sviluppo e collaudo)

Modello di Interazione: Sviluppo

- creazione di un nuovo prodotto
- trasferimento di informazioni tecnico-scientifiche avanzate
- introduzione di nuove metodologie di progettazione
- utilizzazione di apparecchiature avanzate di misura INFN

Modalità di trasferimento tecnologico all'impresa