Giornate di Studio
Progetti del Centro Fermi 2020-2022
December 11th-12th 2019

R. Nania

General considerations on projects and short reports for few of them

Museo Storico delle Fisica e Centro Studi e Ricerche Enrico Fermi

Rendiconto 2019

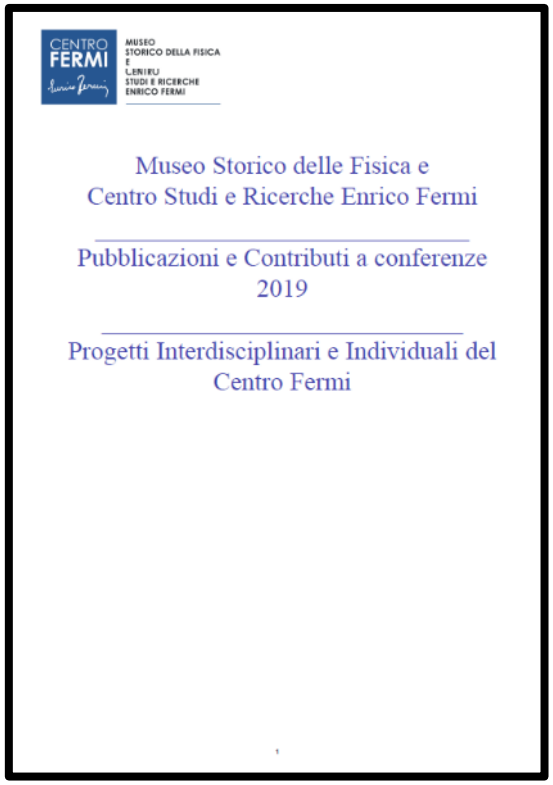
e PTA 2020-2022

Progetti Interdisciplinari

e Progetti Individuali

del Centro Fermi

Centro Fermi: Rendiconto 2019 e PTA 2020-2022 1



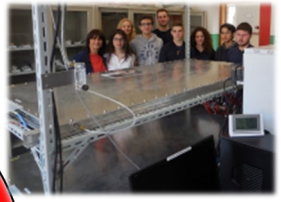
CENTRO FERMI MUSEO STORICO DELLA FISICA E CENTRO STUDI E RICERCHE ENRICO FERMI

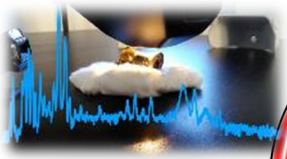
Museo Storico delle Fisica e Centro Studi e Ricerche Enrico Fermi

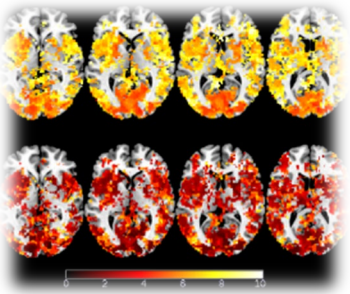
Pubblicazioni e Contributi a conferenze 2019

Progetti Interdisciplinari e Individuali del Centro Fermi

Centro Fermi Projects 2020





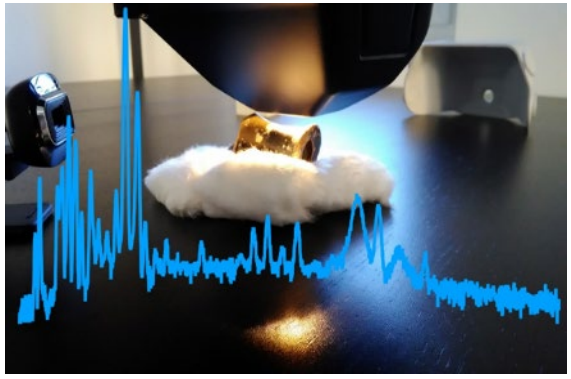


CENTRO FERMI
Enrico Fermi

The northest CR detectors in the world
Pisano-Gnesi-Noferini

Extreme Energy Events

VIEWLAB

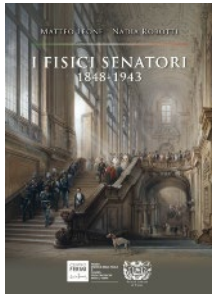


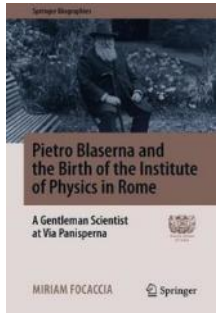
First measurements performed with Museum Lilibeo, also with TTRX, and in the new laboratory inside the Palazzina *Albertin-Festa*

The Museum is open !
Focaccia-Piscicchia-Coccetti

MUSEO

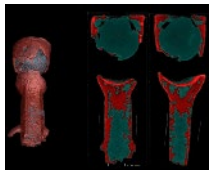
STORIA DELLA FISICA





New Publications
Focaccia,Robotti,Rossi

CENTRO FERMI
Enrico Fermi

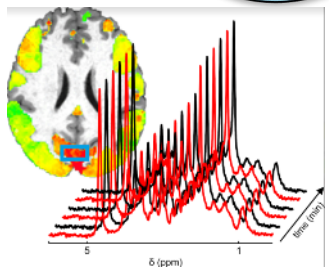


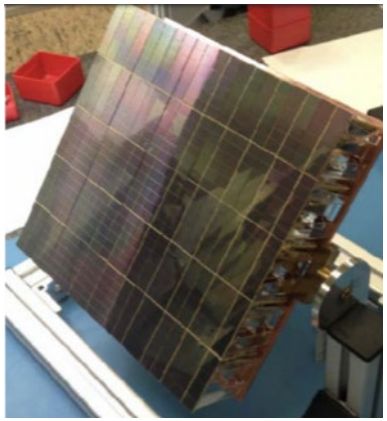
SAPIENS F. Bernardini
TNAAF R. Senesi

Cultural Heritage

BioMedicine

T-MENS and MICROBRADAM D. Mascali F. Giove
IMDO- MONDO M. Marafini
Local Neuronal Microcircuits – MNL



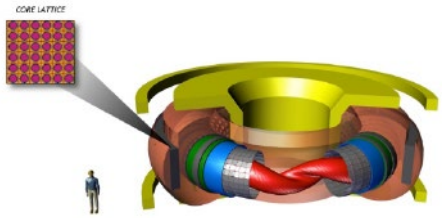


Quark Gluon Coloured World – QGCW
BETASTRUCTURE ← NEW !
Open Problems im Quantum Mechanics – PAMQ K. Piscicchia
Photonic Microcavity G. Fringenti
SiPM at criogenic temperature - K-SiPM M. Garbini
Fundamental Space Physics - FISP C. Paris
Innovative Mirror Coating Research - ICORE

Fundamental Physics

ENERGY

Intrinsic Secure System - SIS
Concentrated PhotoVoltaic - CPV



Progetti Individuali

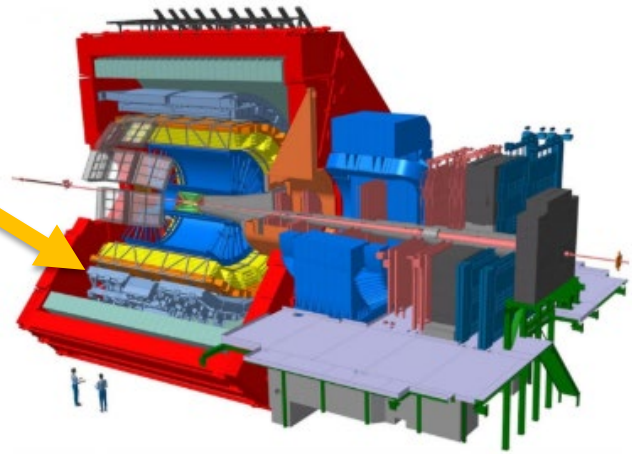
D. Francia

- Cosmological Radiative Transfer in Early Structure [CORTES]
- Higher Spins and their Symmetries [HIGHSPINS]
- Sistemi Complessi e Autogravitanti [SCA]
- The Algebraic and Geometric Structure of Supergravity from Black Holes to Condensed Matter [SUGRAPHENE]
- The Double Copy Paradigm [DCP]

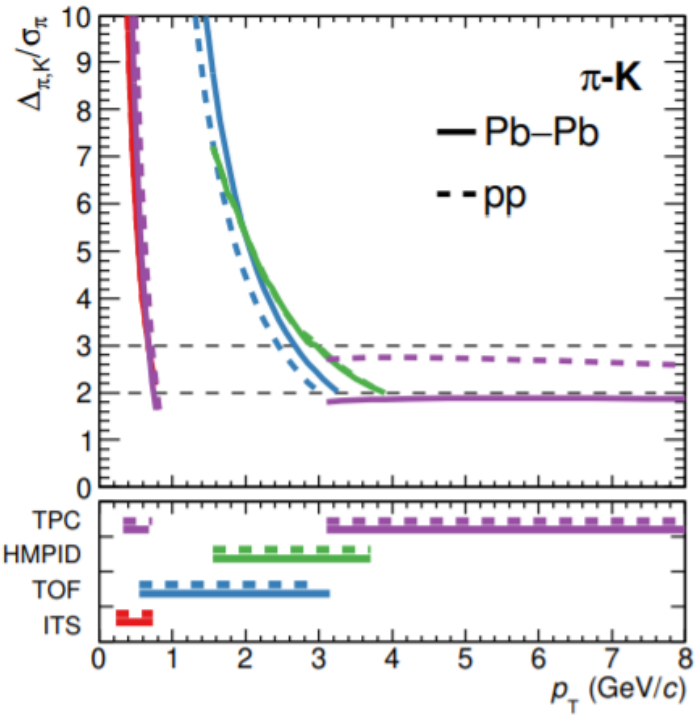
- Radiazioni Ionizzanti e Effetti su nuovi Target Biologici [BioTarget]

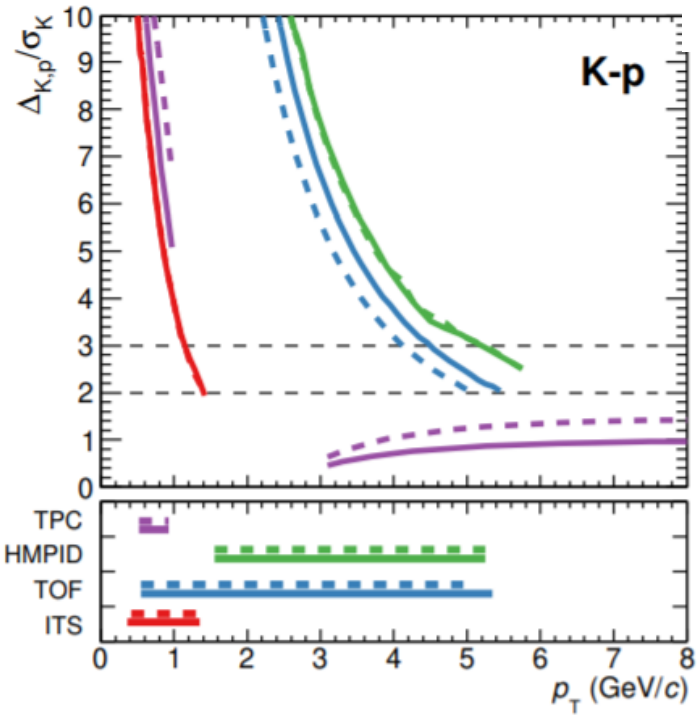
Quark Gluon Coloured world – ALICE and beyond

Time of Flight based on MRPC , 144 m^2



Particle separation (n. of sigmas)



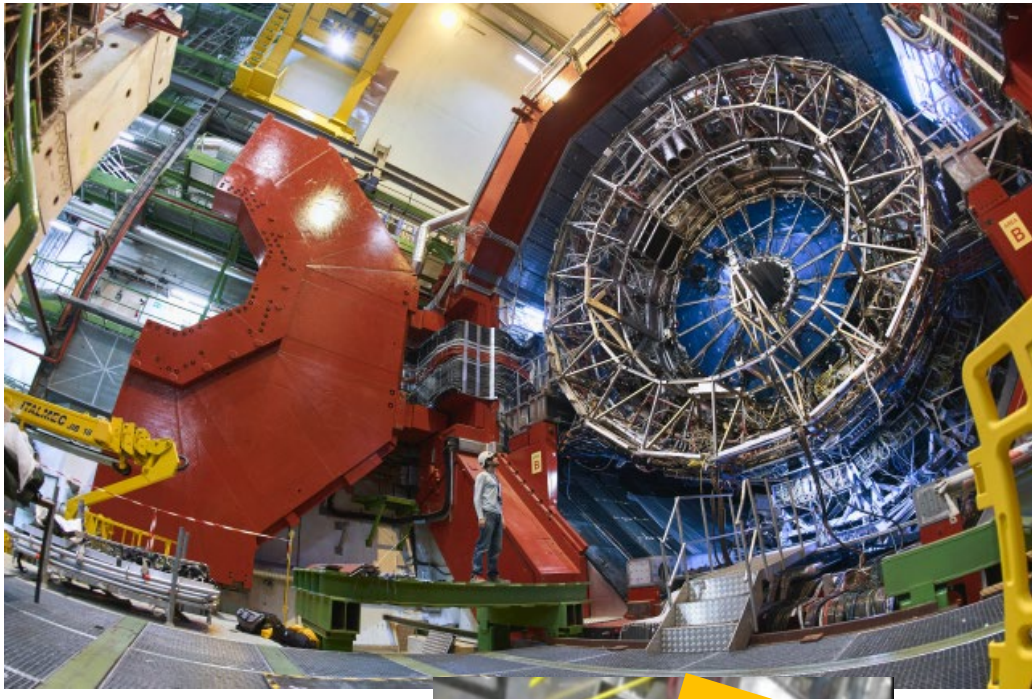


Latest published results on PID performances of TOF arXiv:1910.07678v1

Quark Gluon Coloured world – ALICE and beyond

TOF-Upgrade

A1395/A1396 == power supply
Upgrade will ensure more stability
(SEU protection, see August report)
DRM2 == readout card
Upgrade will ensure:
- GBTx link
- continuous readout for TOF in Run3/4
- Less interdependence in hardware (each crate receives clock independently)



Not always easy !

Status installation end November

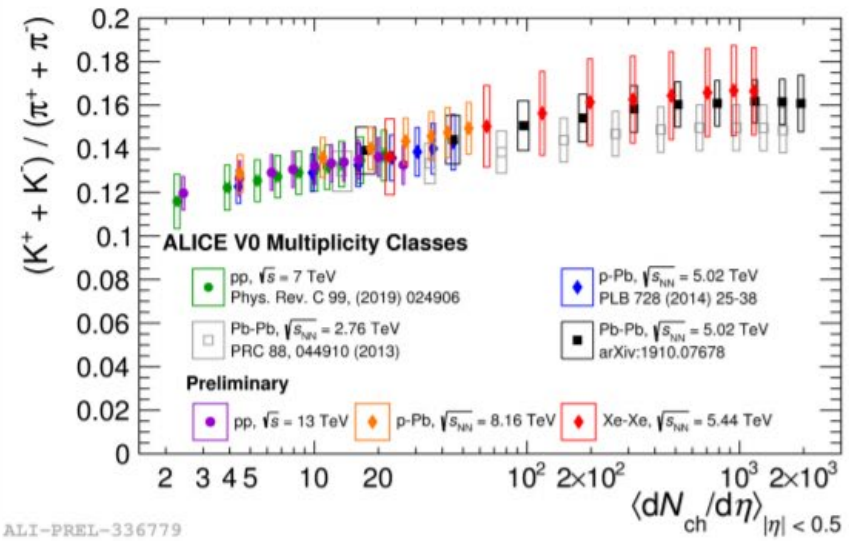
Module	Total	A-SIDE		C-SIDE		Total
		Inst.	✓	Inst.	✓	
A1395	144	44	44	64	60	104 (72%)
A1396	72	20	20	28	22	44 (58%)
DRM2	72	18	16	16	16	32 (44%)

CENTRO FERMI Museo Storico della Fisica e Centro Studi e Ricerche Enrico Fermi

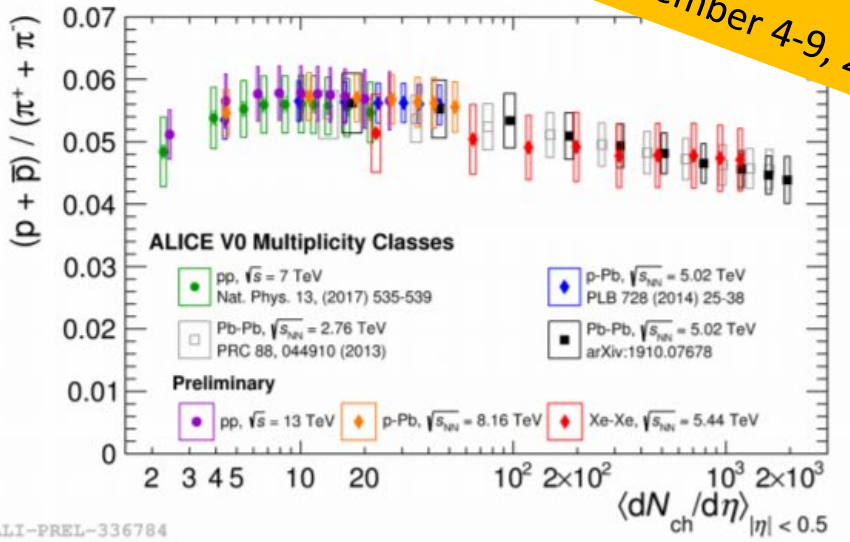
Ratios of integrated yie

S. Pisano talk at Quark Matter 2019
Wuhan, China, during November 4-9, 2019

INFN Istituto Nazionale di Fisica Nucleare



ALI-PREL-336779



ALI-PREL-336784

A continous evolution with multiplicity is observed, independent of the collision system

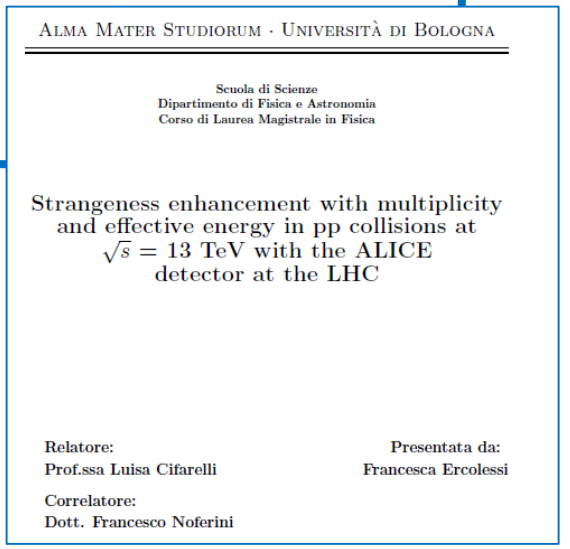
Latest results for π, K, p in p-Pb@$\sqrt{s_{NN}}$ = 8.16 TeV confirm the trend

Ratios in small collision systems at high multiplicity reach heavy-ion values

ALICE

Quark Matter 2019 - November 6th, 2019

E. Ercolessi Master thesis:
Strangeness enhancement with multiplicity and effective energy in pp collisions at s = 13 TeV with the ALICE detector at the LHC


Alma Mater Studiorum · Università di Bologna

Scuola di Scienze
Dipartimento di Fisica e Astronomia
Corso di Laurea Magistrale in Fisica

Strangeness enhancement with multiplicity and effective energy in pp collisions at $\sqrt{s} = 13$ TeV with the ALICE detector at the LHC

Relatore:
Prof.ssa Luisa Cifarelli

Correlatore:
Dott. Francesco Noferini

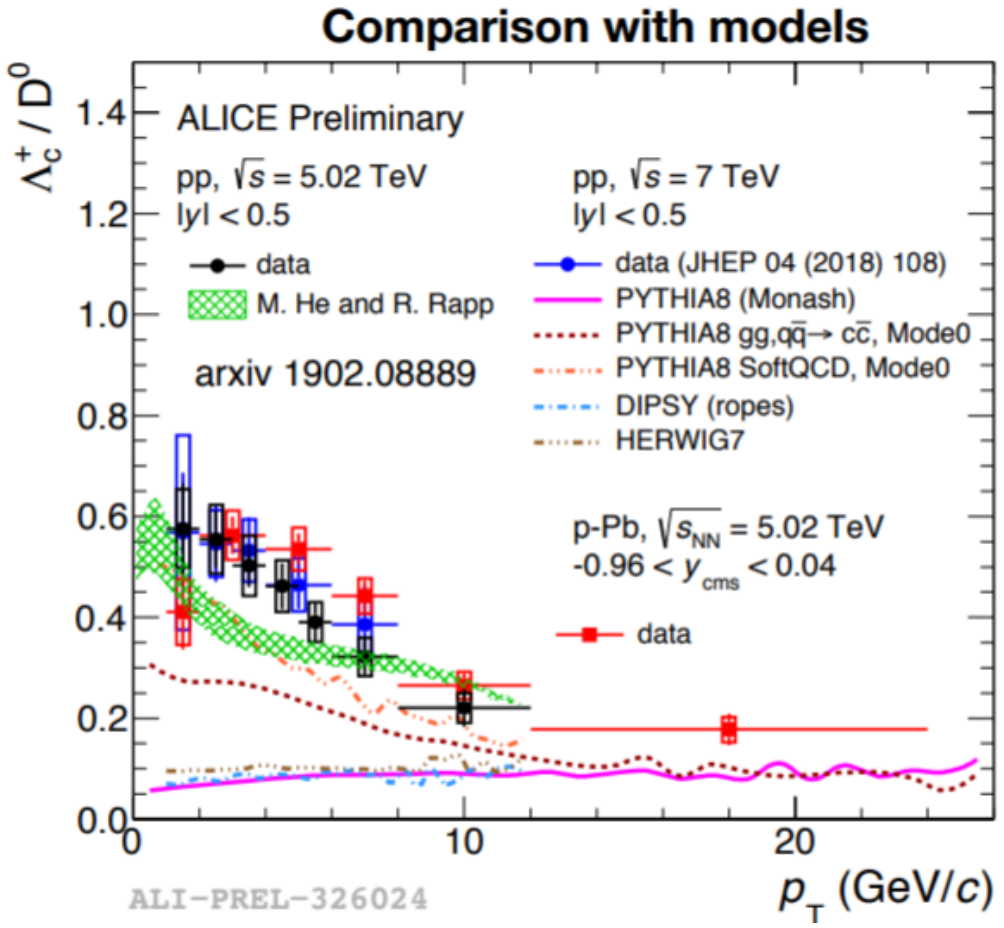
Presentata da:
Francesca Ercolessi

Quark Gluon Coloured world – ALICE and beyond

J. Wilkinson chair paper committee

Differential pt measurement of the **charmed baryon/meson ratio** in different collisions

Importance of **Colour Reconnection** in model prediction
or **Statistical Hadronisation Model** using an augmented list of charmed baryon states



GIOVANNA BENZONI

RICERCATRICE

INFN SEZ. MILANO

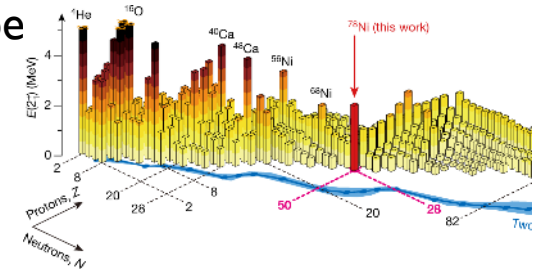
ASSEGNISTA

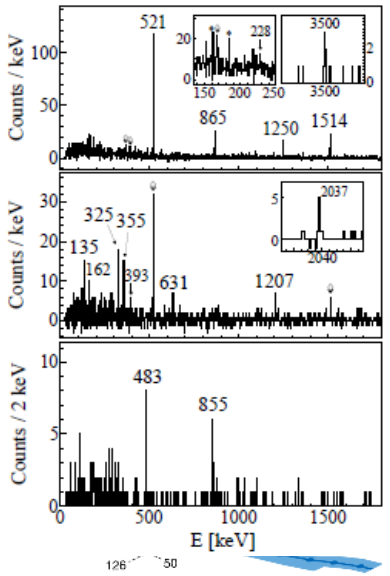
E.R. GAMBA

PROGETTO BESTRUCTURE: NUCLEAR STRUCTURE THROUGH β DECAY

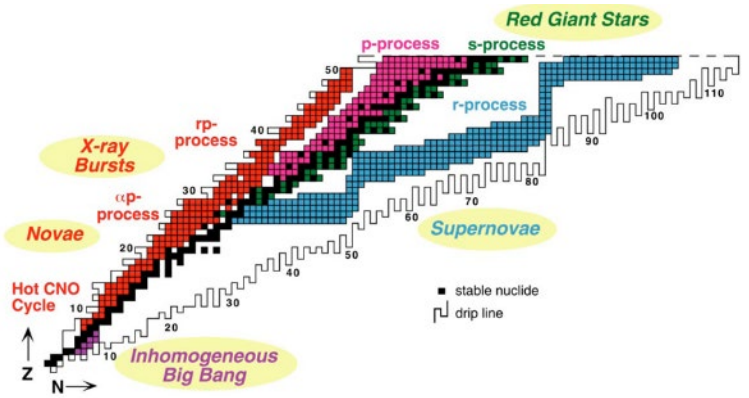
PROGETTO BESTRUCTURE: NUCLEAR STRUCTURE VIA β DECAY

- Study of nuclear structure complementing data coming from
  - ➔ selective tool (selection rules peculiar highlight decay paths)
  - ➔ study of evolution of shapes and exotic shape
  - ➔ evolution of magic numbers





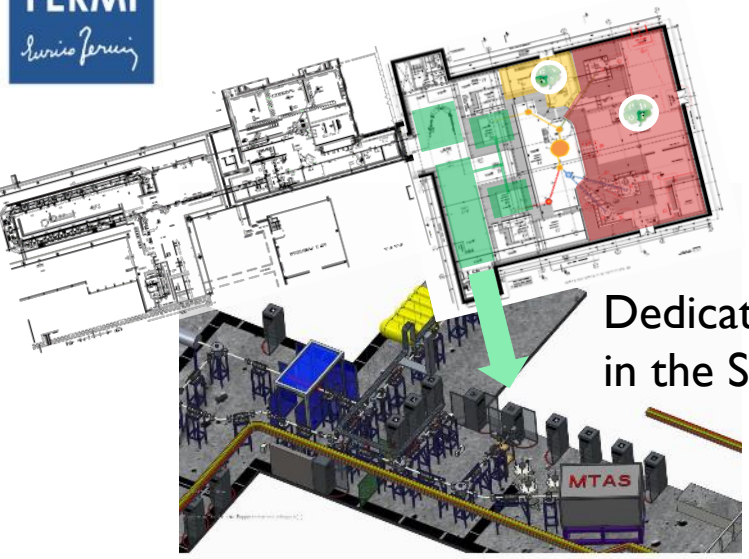
- Study of β decay properties ($T_{1/2}$, P_n, BR, S_β…..)
  - ➔ strong link to stellar nucleosynthesis (inputs for r- and s-process)



- Exotic decay modes: PDR via β decay
- Fundamental questions: CKM unitarity via study of super-allowed decays
- Complementarity with other approaches
- A number of everyday applications of β-decaying sources can be found, for instance, in nuclear medicine, such as the use of unstable isotopes for Positron Emission Tomography imaging, and in nuclear safety related to decay heat evaluation in nuclear power plants.

Simple equipment: a beta-decay station (b-DS) @ SPES

PROGETTO BESTRUCTURE: NUCLEAR STRUCTURE VIA β DECAY



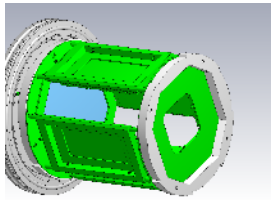
Dedicated exp hall in the SPES building

SPES @ LNL: Facility for the production of RIB

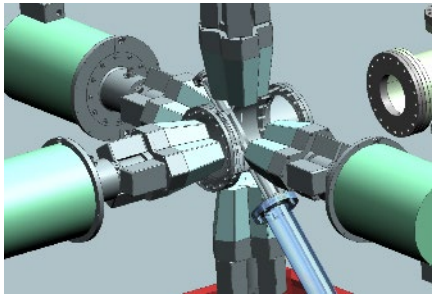
- New High power compact CYCLOTRON 70 MeV 750 μA
- New configuration of High power ISOL System (8 kW Target ion source)
- ALPI superconductive linac (up-graded) for RIB's reacceleration

b-DS installation @SPES

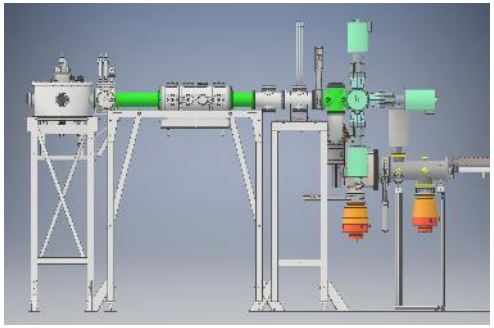
Measurement of γ and β radiation in coincidence

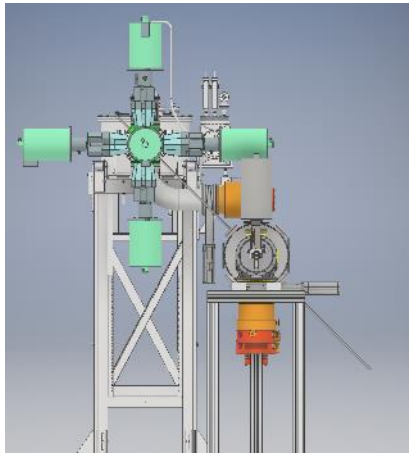


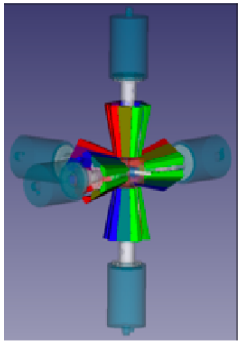
EJ212 Plastic det. with SiPM readout

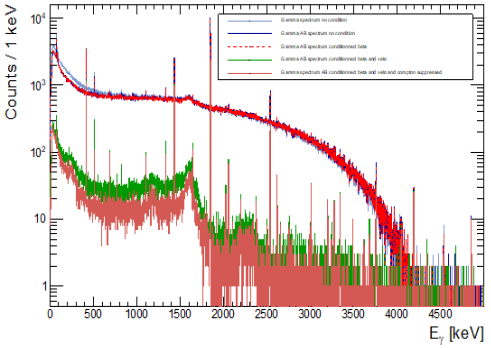


HPGe det.









Simulation and dedicated data analysis tools

PROGETTO BESTRUCTURE: NUCLEAR STRUCTURE VIA β DECAY

Project Goals:

- Creation of an **event generator for beta-decay** including also the delayed particle-emission channels, to be used as input for GEANT4 simulations of the response function of experimental arrays in realistic simulations and experiment simulations;
- Define geometry and performances of experimental array via **GEANT4 simulations**;
- Feasibility studies of the **coupling of newly developed detectors for the measurement of specific quantities,** such as new scintillators for neutron detection;
- Take part in the **installation and first measurement** at the beta-decay station that is being prepared for the SPES radioactive beams facility at LNL;
- Definition and proposal of the commissioning test and first **experimental campaigns** at the beta-decay station in LNL;
- Participation in the experimental activity in foreign laboratories;
- Participation in international conferences and workshops;

A complete program for a new grant , from the simulation to the design to the construction to the data analysis.

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Museo Storico della Fisica e Centro Studi e Ricerche Enrico Fermi

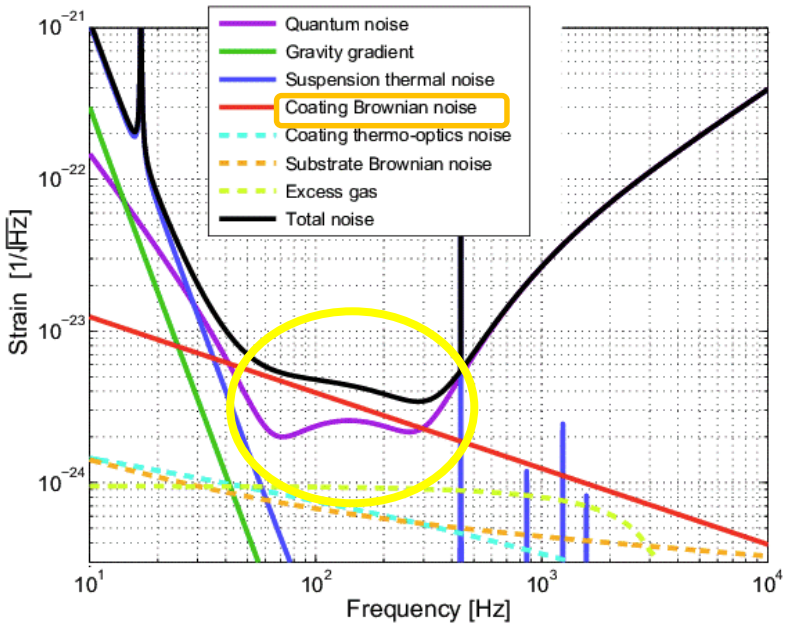
iCoRe – Innovative Coating Research

Innocenzo M. Pinto, PI

Rome, December 11-12 2019

The iCoRe Project

Advanced Virgo noise Budget
[Li et al., PRD 89 (2014) 092004]



- Increasing the visibility distance of **interferometric detectors of gravitational waves** is mandatory for Multimessenger Astronomy. **Thermal noise (TN) in the high-reflectance coatings of the antenna test-masses (cavity mirrors) sets the visibility distance of these instruments.**

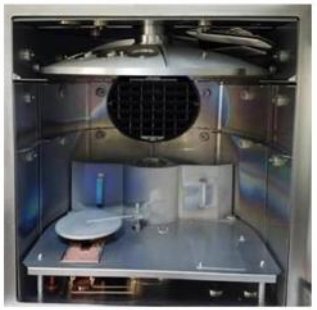
- The iCoRe project aimes at exploring **nm-layered glassy oxide composites as low-noise coating materials**, with an eye to cryo-operation for 3rd generation detectors (Einstein Telescope).

- iCoRe Researchers:
  Innocenzo M. Pinto, PI [OSA Fellow "for fundamental contributions to thermal noise reduction in the mirror coatings of the LIGO detector"]
  Maria Principe [L'Oreal-UNESCO Women in Science Award 2018]
  Elisabetta Cesarini [Centro Fermi postdoc, until April 1st 2019]
  Chao Shiuh [professor, National Tsing-Hua University, Taiwan, ROC]

- **Experience:** the iCoRe Researchers invented the optimized coating design adopted by Advanced LIGO and Virgo detectors [*IP, MP et al.*, PRD-81 (2010) 122001]; proposed and validated the idea of nanola-yered optical films [*IP, MP & SC*, Opt. Expr. 22 (2014) 22847]; invented and developed the GeNS system for mechanical Loss angle measurements [*EC*, Rev. Sci. Inst. **80** (2009) 053904].

The iCoRe Facilities at Univ. Sannio and Salerno

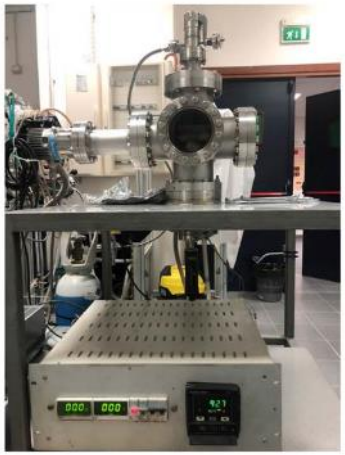
iCoRe Optical Film Deposition Lab
at the University of Sannio



- Up to 6 co-deposited materials;
- Dual e-beam (one installed);
- Plasma IAD;
- Fully programmable deposition with GUI;
- Accuracy/repeatability at the Å level;

iCoRe Optical Thin Film Characterization Facilities
at the University of Salerno

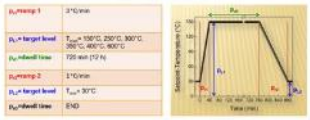
Left to right, top to bottom:
FEI Tecnai 20 (TEM);
Zeiss LEO-EVO 50 (EDS-SEM);
Zeiss Sigma Gemini (FE-SEM);
Renishaw Invia (Raman);
JPK Nanowizard 3 (AFM);
Philips 'Xpert-Pro (XRD);

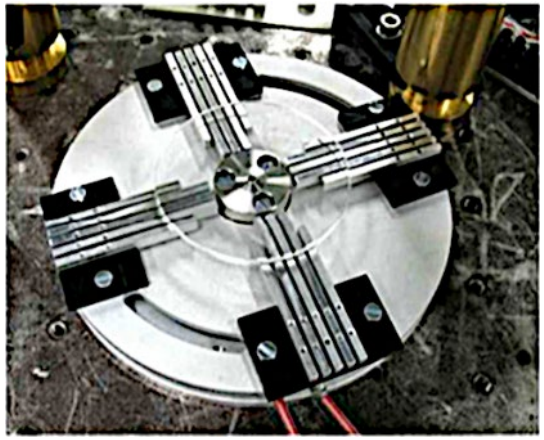


iCoRe 2019 - Fully programmable, controlled atmosphere annealing oven designed & built (collab. with University of Salerno).

- May accommodate up to 3-inch Ø dyes;
- Max annealing temperature : 900 ° C;
- Fully programmable annealing schedule;
- PID feedback-controlled heater power supply with 0.05 °C accuracy/stability;
- High-vacuum or controlled atmosphere (air, O_2, N_2 ,etc.)

Annealing Details





Close-up of GeNS (Gentle Nodal Suspention) for Mechanical loss measure-Ment in Rome Tor Vergata

iCoRe Results (2019)

Theoretical/Modeling

We implemented **exhaustive simulations**, based on available data on candidate (amorphous) materials to identify binary nanocomposites yielding the best performance (lowest thermal noise and optical absorption) in a full-HR coating with 5ppm transmittance at 1064nm, designed for LIGO-Virgo.

Five alternative designs were identified, yielding a reduction of the coating noise power spectral density by a factor between 0.3 and 0.4 compared to present design, and checked for robustness against material and deposition tolerances.

Noise PSD (and Coating Loss Angle) Reduction Factor compared to Reference (Si/Ti::Ta, 5.32ppm@1064nm)

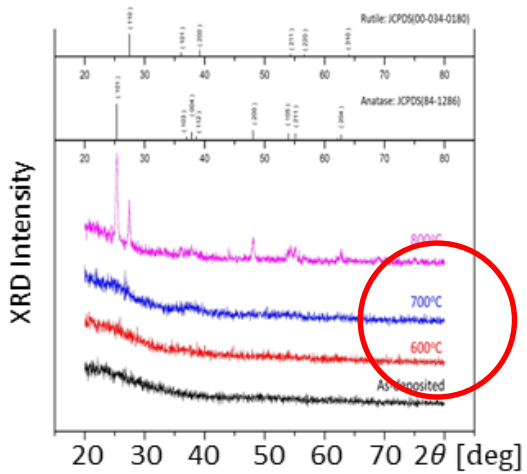
	SiO_2	Al_2O_3	HfO_2	Ta_2O_5	ZrO_2	Nb_2O_5	TiO_2
SiO_2	x	>1	>1	>1	>0.794	>0792	>0.309
Al_2O_3		x	>1	>1	>0.833	>0.795	>0.352
HfO_2			x	>1	>1	>0.849	>0.663
Ta_2O_5				x	>1	>0.802	>0.415
ZrO_2					x	>0.79	>0.369
Nb_2O_5						x	>0.433
TiO_2							x

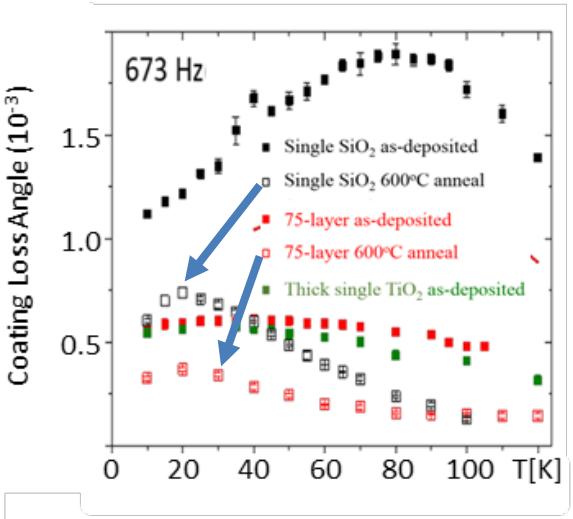
Prototypes of the above designs are now scheduled for deposition in our Lab at the University of Sannio.

Experimental/Characterization

We performed **16 deposition runs, for a total of 74 nanolayered prototypes**. These were characterized morphologically using AFM, (FE)SEM, XRD and SAXS helping to fine-tune the deposition parameters.

Our results confirm a steady increase of the maximum annealing temperature before crystallization occurs with decreasing thickness of the nanolayers.





Preliminary measurements (in collaboration with S. Chao, NTHU, Taiwan, ROC) indicate that nanolayered Silica/Titania composites have lower losses compared to the materials presently in use, and exhibit no sensible cryo-peak.

Confirmation of the above results will be a breakthrough in the design of advanced+ and 3rd gen gravitational detectors

iCoRe Workplan (2019)

The iCoRe workplan for 2020 can be summarized as follows.

1. In house deposition of nanolayered quarter-wavelength-thick (at 1064nm) films based on the five best nanocomposite designs identified in 2019 (10 prototypes for each design);

2. In house morphological characterization of the above films (using TEM, SAXS, (FE)SEM, XRD and Raman spectroscopy). Measurement of the optical and mechanical losses in collaboration with Virgo-VCR/LIGO-OWG groups in the frame of the LIGO-Virgo Collaboration (LVC);

3. In house deposition of full HR-coatings featuring 5ppm transmittance at 1064nm (typical LIGO-Virgo test-mass coatings) using Silica as low index material and the above best nanocomposites as high-index material in a Bragg (stacked half-wavelength doublets) configuration (ten prototypes each); in house morphological analysis; direct measurement of thermal noise (collaboration with MIT and ENS);

4. In house deposition and characterization of Alumina/Silica nanolayered composites (best designs identified in 2019) as as possible cryo-friendly low-index materials for the Einstein Telescope.

Existing collaborations with partner Labs (TorVergata, Firenze/Urbino and Genoa Virgo-VCR groups) will be strenghtened; new collaborations (Ecole Normale Superieure of Lyon, MIT) will be fostered for the direct measurement [*IP, MP et al.*, PRD-81 (2010) 122001] of the noise power spectral density; the construction of a QDPI facility for the direct measurement of thermal noise in thin films is under discussion.

CENTRO FERMI
Enrico Fermi
MUSEO STORICO DELLA FISICA E CENTRO STUDI E RICERCHE ENRICO FERMI

Sistemi Intrinsecamente Sicuri

Accelerator Driven Systems for Research on Nuclear Technology

[SIS]

Project Leader: *Giovanni Ricco*

Project Coordinator: *Marco Ripani*

INFN

European Commission

Ge N E R G

ANSALDO NUCLEARE
Ansaldo Energia Group

ENEA
Agenzia nazionale per le nuove tecnologi
l'energia e lo sviluppo economico sostenib

CONSORZIO RFX
Ricerca Formazione Innovazione

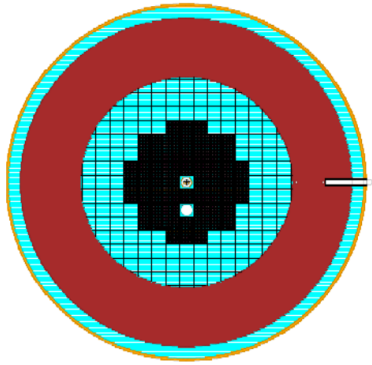
UNIVERSITAS STUDII PADUANI MCCXXII

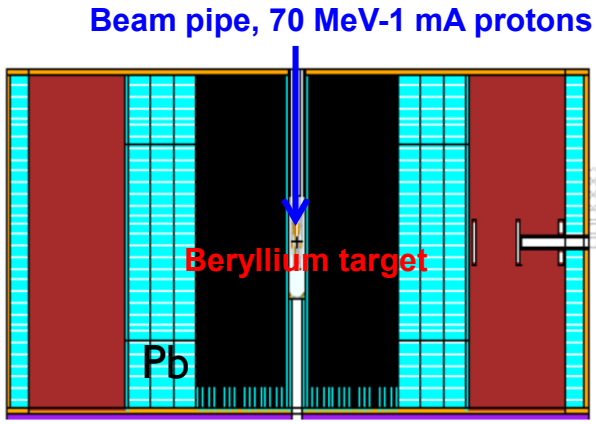
GHENT UNIVERSITY

SAPIENZA
UNIVERSITÀ DI ROMA

create

Project main goals and results achieved in 2019

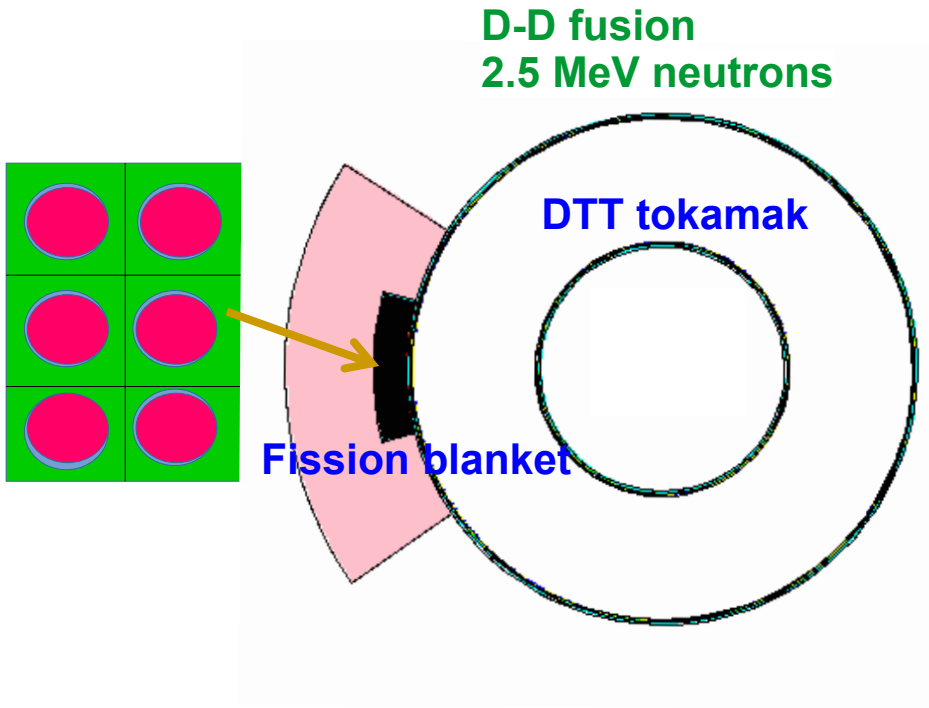




Innovative low-power ADS concept:

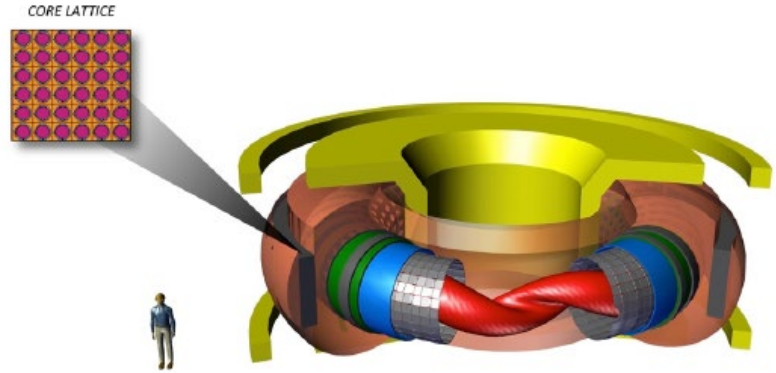
- fast neutron spectra in the core
- soft or thermal spectra in the reflector

Conceptual design paper published (F. Panza et al., An ADS irradiation facility for fast and slow neutrons, EUROPEAN PHYSICAL JOURNAL PLUS 134 (2019) 195)



Milestone 1: Completion of studies for pilot experiment on fusion-fission hybrid concepts (100 % completed, published in proceedings of FUNFI3 conference)

Milestone 2: Completion of studies on fusion-fission hybrid based on RFP fusion machine and publication of a paper (100% completed , conference proceedings published on journal, C.Bustreo et al., Fusion Engineering and Design 146 (2019) 2725)



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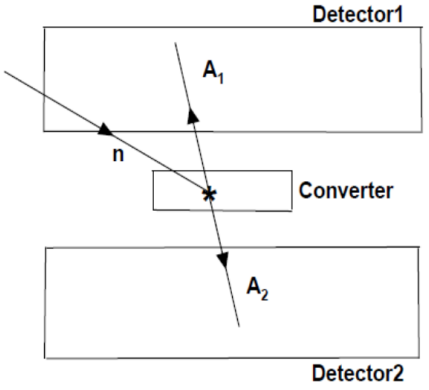
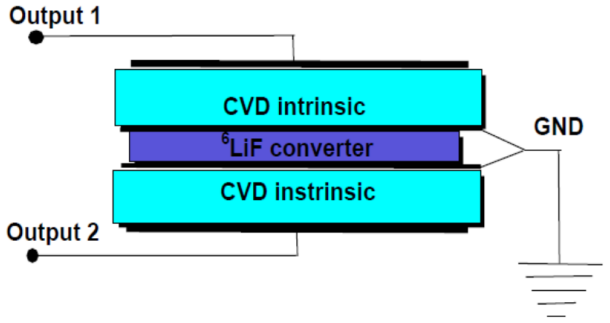
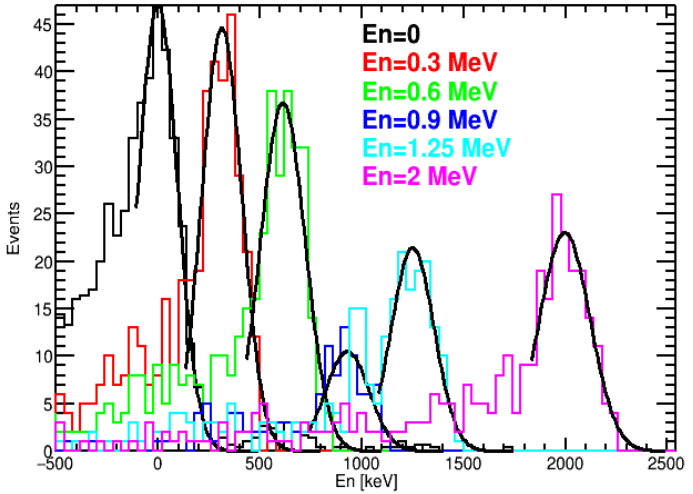
Milestone 3: extension of studies on hybrid fusion-fission system based on RFP fusion machine, considering alternative fuels among which the possibility to use spent fuel (Not possible to complete because postdoc took a permanent position at ENEA → *will be likely performed by considering an ITER-like high power fusion reactor, in collaboration with ENEA, considering both spent fuels and reprocessed fuels*)

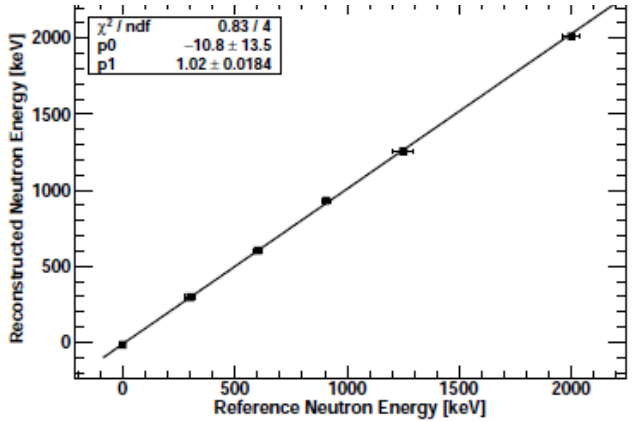
Milestone 4: Prepare paper on diamond sandwich detector characterization at PTB Braunschweig (100% completed, paper published, M. Osipenko et al., Calibration of a Li-6 diamond-sandwich spectrometer with quasi-monoenergetic neutrons, NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT 931 (2019) 135)







- Experiment at PTB (Braunschweig) with certified monochromatic neutron source
- five beam energies + thermal calibration: 0-2 MeV
- reference energy reconstruction within 20 keV
- absolute neutron efficiency knowledge within 5%
- Resolution about 100 keV excluding energy loss tail at l.h.s. of distribution.



Possible master thesis at University of Milan

Plans for 2020-2022

Neutronic characterization of a TRIGA reactor in a sub-critical configuration

Fabio Panza[a], Marco Ciotti[a], Nadia Cherubini[a], Valentina Fabrizio[a], Luca Falconi[a], Francesco Filippi[a], Renato Gatto[b], Luigi Lepore[a], Mario Carta[a], Alessandro Dodaro[a], Francesco Orsitto[c], Mikhail Osipenko[d], Giovanni Ricco[d,e], Marco Ripani[d,e], Massimo Salvatores[f]

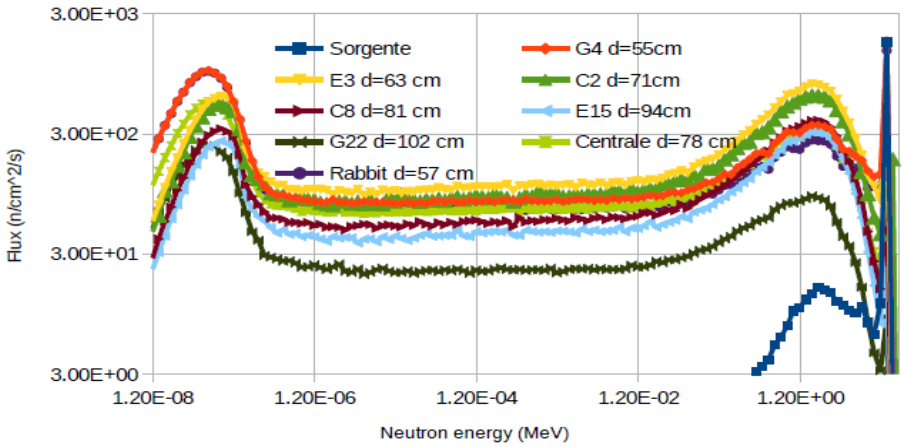
[a] ENEA Casaccia S. Maria di Galeria - Roma (Italy)
[b] La Sapienza University
[c] CREATE Consortium - Napoli University – Italy
[d] Istituto Nazionale di Fisica Nucleare - Sezione di Genova, Genova, Italy
[e] Centro Fermi - Museo Storico della Fisica e Centro Studi e Ricerche "Enrico Fermi', Rome, Italy
[f] Senior Scientific Advisor

Coupling between a D-T neutron generator and TRIGA-RC1 reactor operating in subcritical mode to simulate the behaviour of a fusion-fission hybrid system

Thermofischer MP-320 D-T neutron generator

TRIGA-RC1 reactor

Simulated neutron spectra



CPV: Concentrated Photovoltaic

Coordinator:

Prof. Sandro Centro, University of Padua

Participants:

Dr. Nardello Marco, Centro Fermi, Research fellow, 09/06/2016-June 2019

Place of Work & Collaborations:

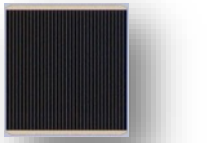
Dept. of Physics and Astronomy “Galileo Galilei” University of Padua

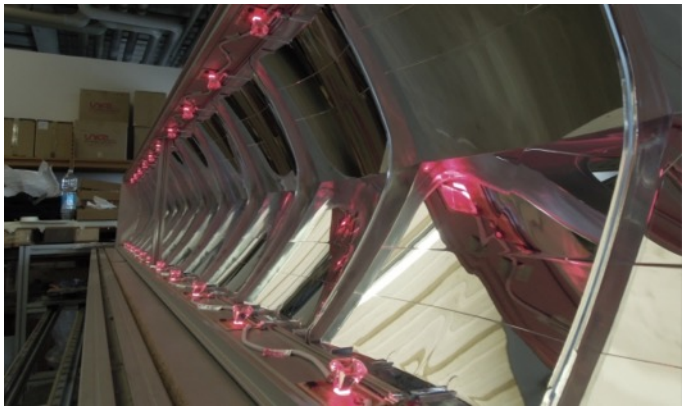
CPV: Concentrated Photovoltaic

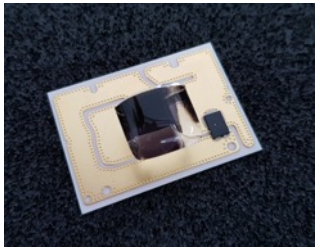
Project main goal

Producing an industrial CPV photovoltaic system

- *3J solar cells*
  - *High efficiency (η=44%)*
  - *Small surface (5,5x5,5mm)*
  - *Allow for light concentration*
  - *Better behavior at high temperature*
- *Recyclable materials*
  - *Avoids problems of Si decommissioning*
- *Concentration (700x)*
  - *Al mirrors, PC substrate*
  - *SiO_2 prism as a secondary optic*
  - *Low cost*
  - *Better quality than lenses*
  - *Low volumes*
- *Solar tracking*
  - *Higher light collection*
  - *Higher complexity and costs*







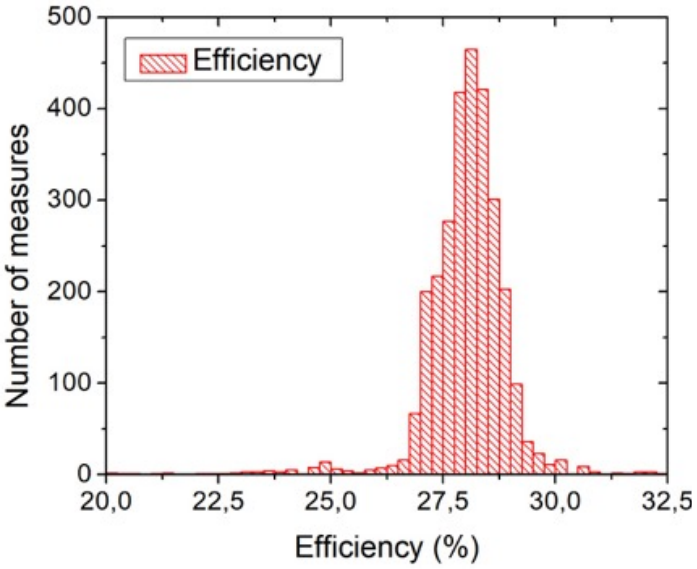
CPV: Concentrated Photovoltaic

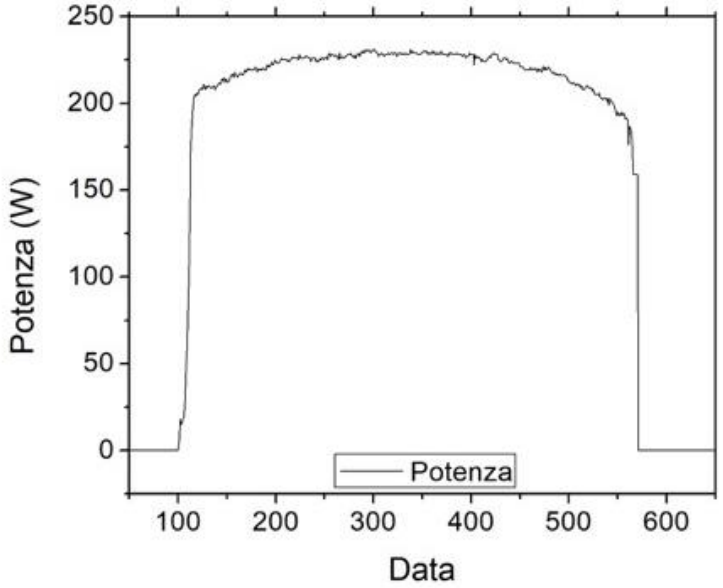
Results achieved in 2018/9

First installation at production site

San Vendemiano (TV)

- *Performances*
  - *2430W (700W/m² DNI) produced AC current*
  - *2910W production for 24 modules at CSOC (900W/m² DNI, ambient T 25°C)*
  - *Nominal efficiency at CSOC 28%*
  - *Nominal efficiency (at CSTC) 31% for modules DC production*





CPV: Concentrated Photovoltaic

Installation in Sicily *Proto Serramenti, industry in Agrigento*

Performances:

- *3100W (830W/m^2 DNI)*
- *3361W – 28% (CSOC)*
- *3735W – 31% (CSTC for modules DC production)*

Efficiencies confirmed

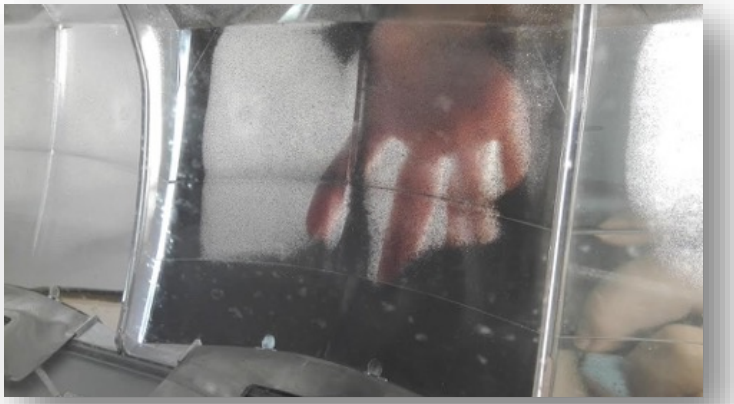
More power produced throughout the year because of better environmental conditions

CPV: Concentrated Photovoltaic

Important improvements

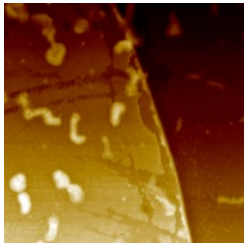
Deposition of aluminum layer

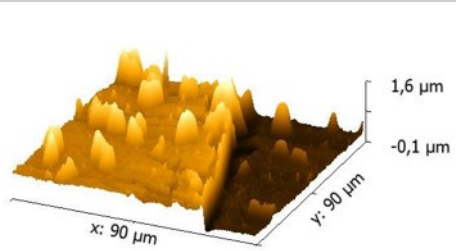
- *Good reflective power*
- *Weakness of protective SiO_2 layer (only 10nm)*
- *Permeation with water can ruin the mirror*

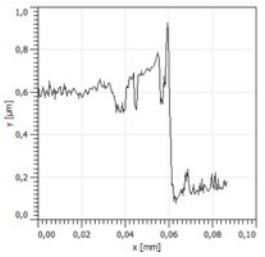


Already done

- *SIMS analysis shows modification of chemical structure and topography*
- *Thickness of SiO_2 layer of 10nm*





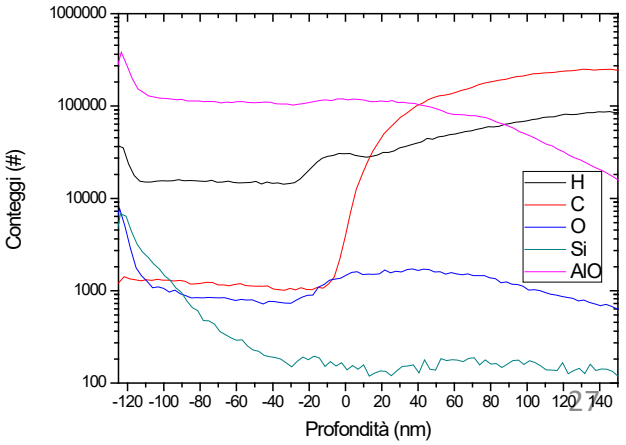


(Collaboration with UniPD)

To be done

- *Increasing SiO_2 Thickness*
- *Change of deposition method*

(Collaboration with SuNaGen)



CPV: Concentrated Photovoltaic

Monitoring of pilot installation

- *Energy production*
- *Efficiency*
- *Reliability*
- *Behaviour at different environmental conditions (hot summer)*
- *Intervention in case of problems*

Further developement of the system

- *Modification of the receiver assembly*
- *Cost reduction (less material)*
- *Changing of custom layout*
- *Possiblity of using a complete and improved receiver produced by AzurSpace (less suppliers in the chain)*
- *Need for a feasibility study and new handling techniques*
- *Need for a modification of the optics*
- *Study of a new deposition af Al layer*

- **Needs of the project**

The possibility to have a grant is very important for the future
Other expenditure (consumable/missions) around 20 k€ /year

- **External funding**

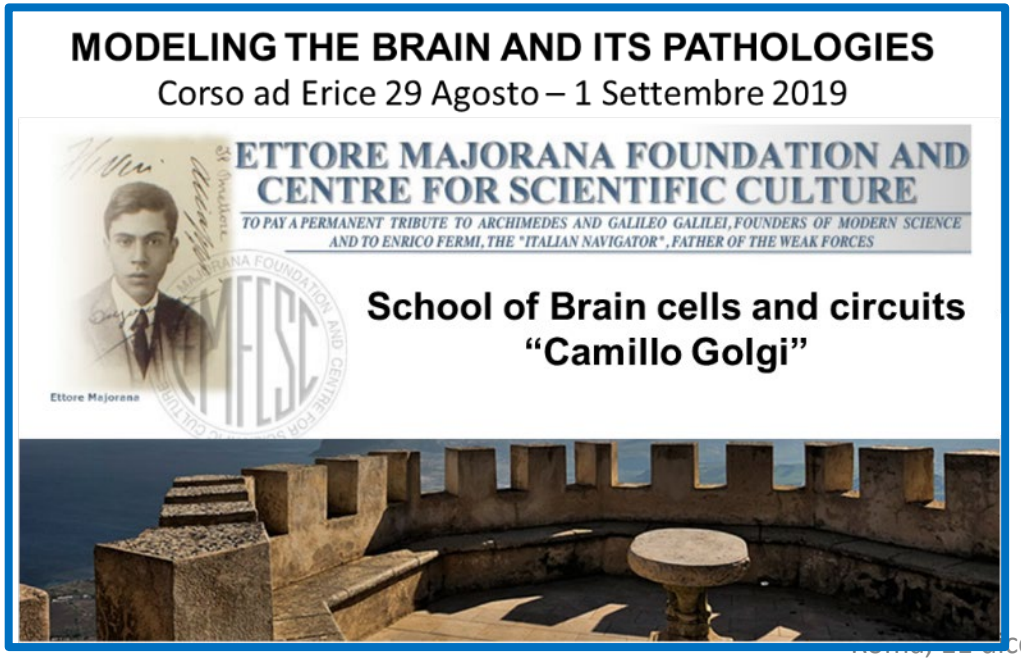
Possible funding through agreements with the industries involved in the project
***In 2016 CF received 42.7k€** due to the provided industrial consulting.*
Since its beginning, several contributions from Regione Veneto to the industries involved in the project (several hundreds k€)

MNL
MICROCIRCUITI NEURONALI LOCALI

Responsabile: Prof. Egidio D'Angelo

Grantista Centro Fermi: Teresa Soda (Completato)

Composizione del gruppo di ricerca:
Claudia Gandini W-K, UCL-IoN, full professor
Francesca Prestori, Università di Pavia, RU
Lisa mapelli, Università di Pavia, RTD-B
Claudia Casellato, Università di Pavia, RTD-A
Fulvia Palesi, Università di Pavia, RTD-A



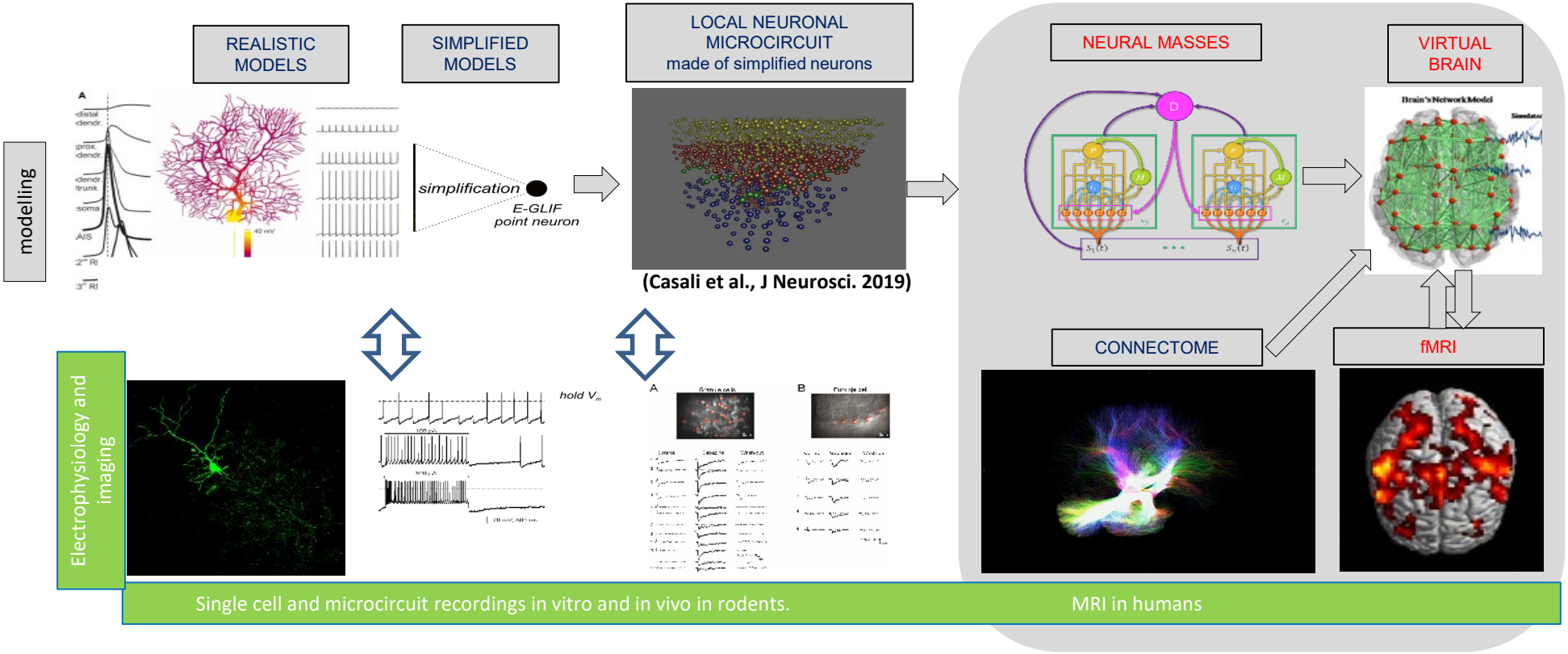
MNL studia i meccanismi funzionali dei microcircuiti neuronali locali del cervello, ne genera modelli matematici e li impiega per spiegare i segnali ottenuti mediante tecniche di MRI.

1) Come si manifesta l'attività dei microcircuiti neuronali a livello dell'attività cerebrale?
2) Come viene generato il segnale BOLD-fMRI ?
3) Si può ricostruire la mappa fMRI partendo dall' attività dei microcircuiti neuronali?
4) Come si integrano i dati MRI nei modelli di funzionalità del cervello ?

Finanziamenti
Centro Fermi – 1 AR senior (scad. 31 Gennaio 2019)
Human Brain Project – AR & research funds
UNIPV - structural funds & personnel, PhD

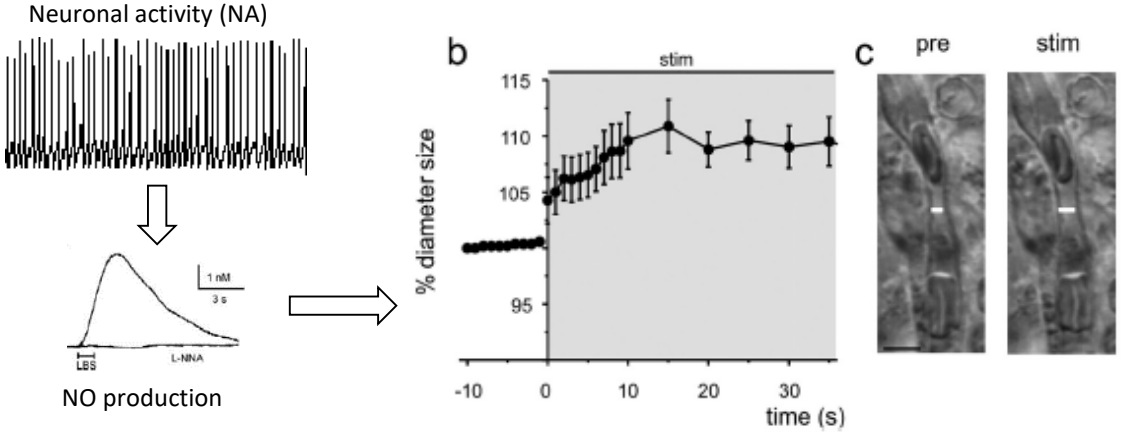
MNL

Schema generale dell'attività di ricerca per la ricostruzione dell'attività cerebrale: neuroni, microcircuiti, modelli matematici del cervello e segnali MRI



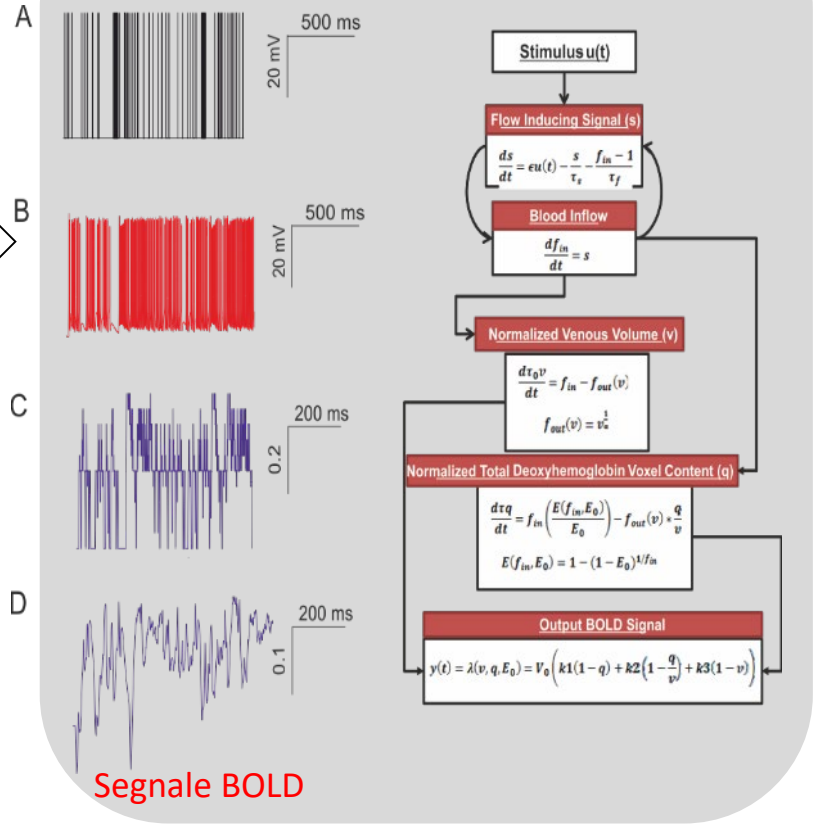
Modellizzazione bottom-up del segnale BOLD del cervelletto

Dati sperimentali (Mapelli et al., J Neurosci. 2017)



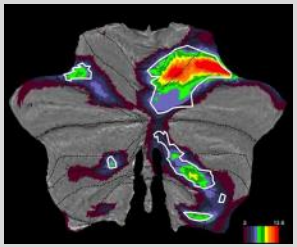
Neurovascular coupling (NVC)

Modello del segnale BOLD



Ballon-Windkessel model (Diwakar and D'Angelo, in preparation; modified from Friston et al., 2008)

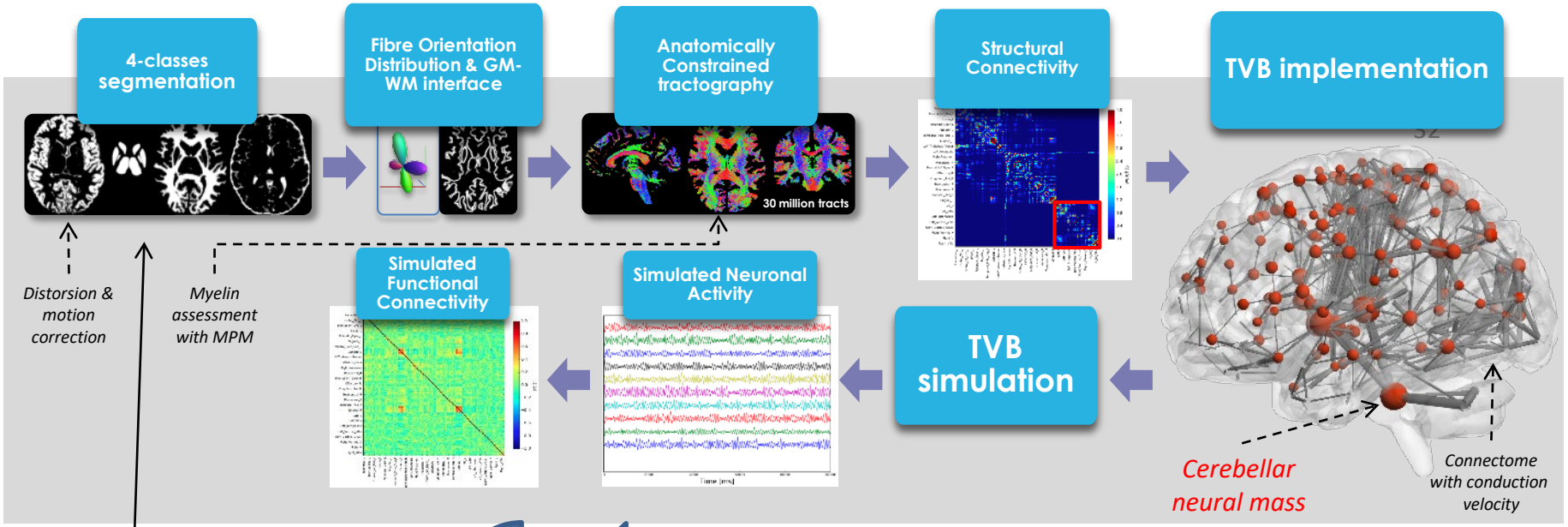
Mappa fMRI simulata



Incorporazione dell'algoritmo nei voxel di un modello di larga scala del cervelletto attualmente in costruzione.

MNL

Integrazione di modelli e dati MRI per applicazioni di ricerca e cliniche



MNL – attività futura

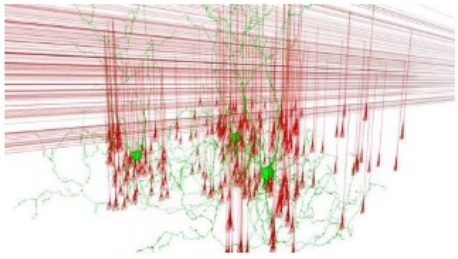
MNL propone di sviluppare la sua attività operando in punti nodali della modellistica delle funzioni cerebrali:

(1) Completamento del modello dell'accoppiamento neurovascolare per ricostruire,per la prima volta, la mappa del segnale BOLD del cervelletto dall'attività dei singoli neuroni.

(2) Sviluppo della prima "neural mass" specifica del cervelletto per analizzare i segnali fMRI BOLD nel simulatore The Virtual Brain.

(3) Applicazione dei modelli a dati derivati da soggetti (disponibili tramite collaborazioni con la rete IRCCS neurologica) affetti da patologie del sistema nervoso (malattia di Alzheimer ed atassie cerebellari) per predirne l'evoluzione e disegnare possibili interventi terapeutici e riabilitativi.

Queste attività sono assolutamente uniche e guadagano valore aggiunto dalla interazione con Human Brain Project, che espande i risulati della ricerca a livello Europeo e fornisce le infrastrutture modellistiche necessarie. Inoltre hanno diretti risvolti clinici e tecnologici oltre che scientifici.



Hackathon CEREBELLUM MODELLING

13 - 15 January 2020 | Pavia, Italy

BioTarget – Radiazioni Ionizzanti: Effetti su nuovi Target Biologici

TARGET BIOLOGICI: MICROTUBULI

- I Microtubuli sono componenti del citoscheletro cellulare; costituiti da due isoforme di tubulina (α e β);
- È stata marcata l'isoforma α, tramite una reazione d'immunocitochimica;

MISURE STORM (Stochastic Optical Reconstruction Microscopy)

- Ricostruzione della struttura/organizzazione dei microtubuli.

LINEE CELLULARI UTILIZZATE

Linea cellulare HTB-126 (carcinoma mammario umano - triplo negativo)	Linea cellulare HTB-125 (epitelio mammario umano non tumorale)

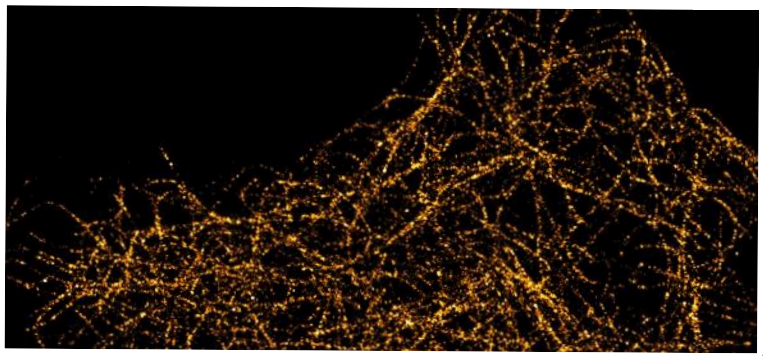
IRRAGGIAMENTI (TIFPA Trento)

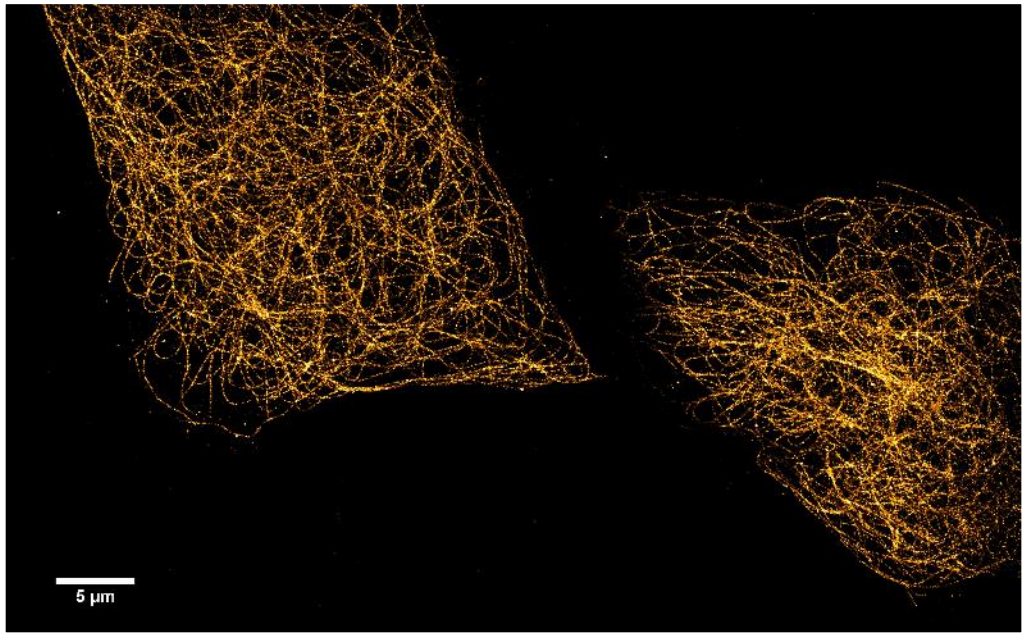
- Dosi uniche (non frazionate) di raggi X da 4Gy ed 8Gy
- Dosi uniche (non frazionate) di protoni da 4Gy ed 8Gy

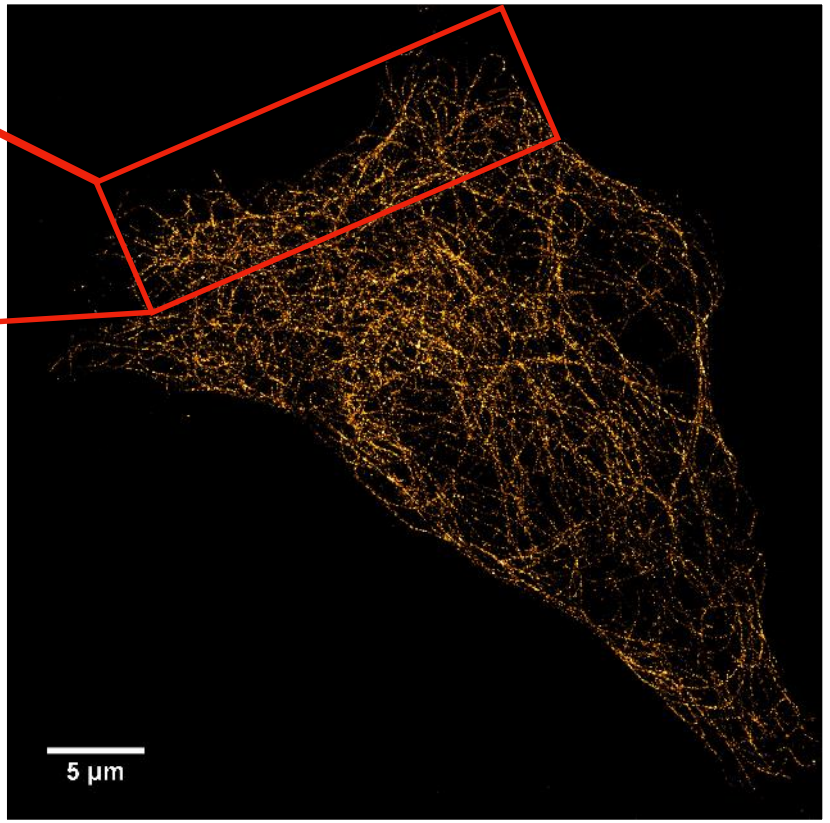
NB: Grazie alle simulazioni MC (Fluka) svolte dal gruppo del progetto MONDO si è potuto verificare che il contributo alla dose delle particelle secondarie generate dall'interazione dei protoni con il setup sperimentale (Petri dish e mezzo di coltura) è trascurabile rispetto alle dosi del fascio primario.

BioTarget - Radiazioni Ionizzanti: Effetti su nuovi Target Biologici

Linea cellulare HTB-126(carcinoma mammario umano) Controllo



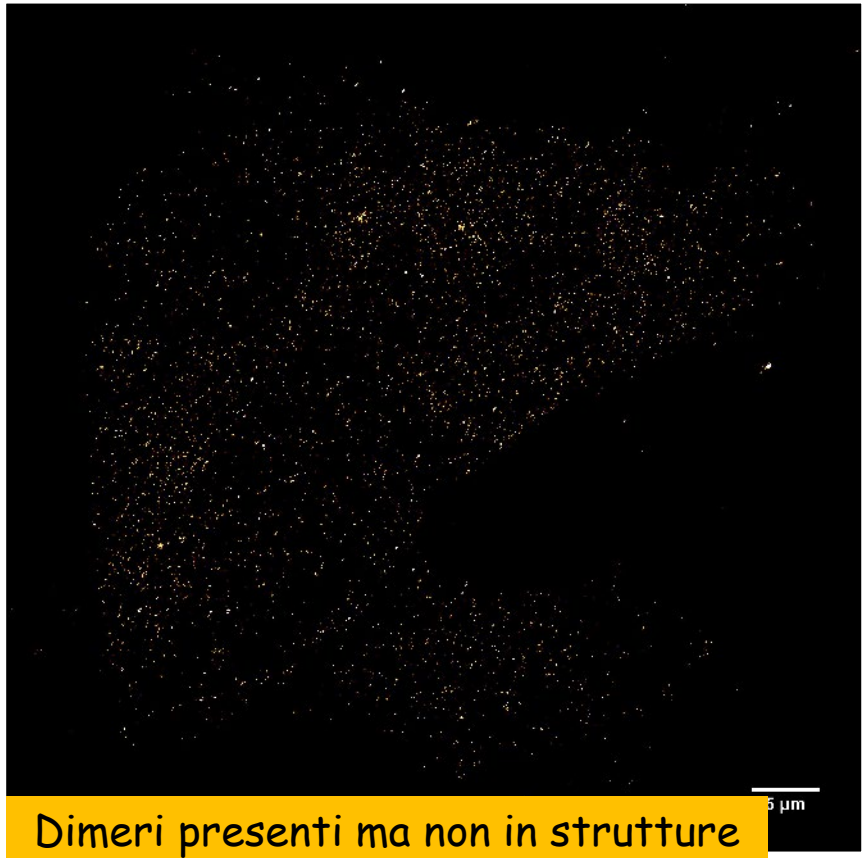




BioTarget - Radiazioni Ionizzanti: Effetti su nuovi Target Biologici

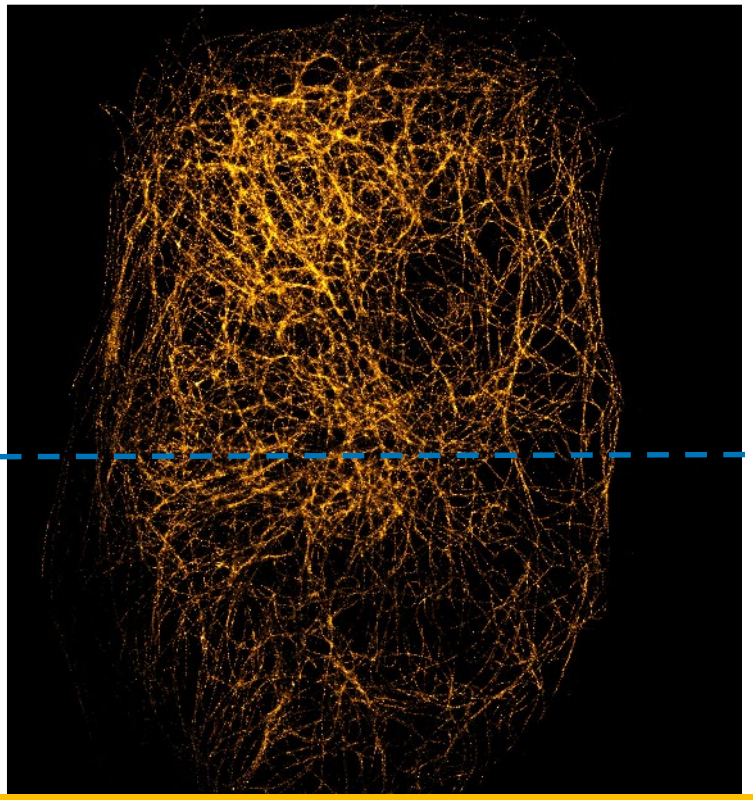
Linea cellulare HTB-126 (carcinoma mammario umano)

8 Gy raggi - X



Dimeri presenti ma non in strutture microtubuli . Da studiare nel tempo

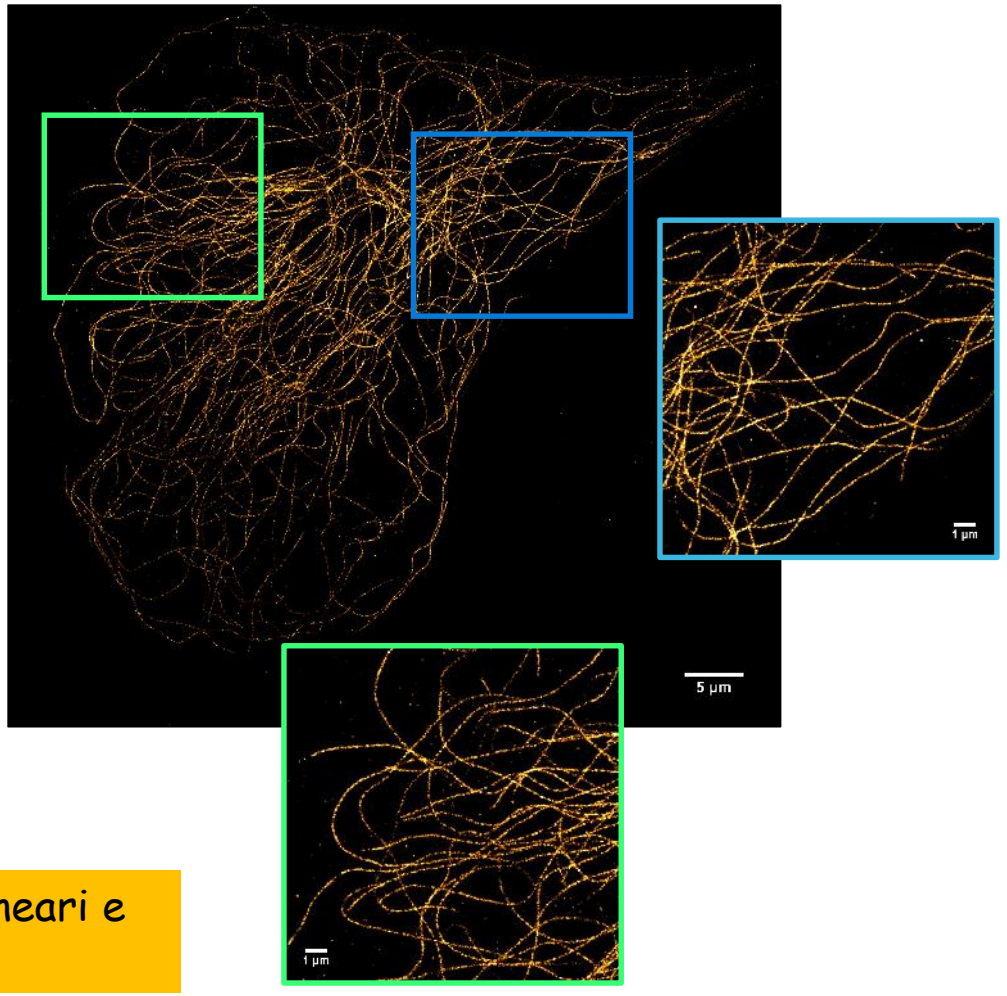
8 Gy protoni



Disuniformità di densità : riorganizzazione interna dei microtubuli

BioTarget - Radiazioni Ionizzanti: Effetti su nuovi Target Biologici

Linea cellulare HTB-125(epitelio mammario umano non tumorale) Controllo



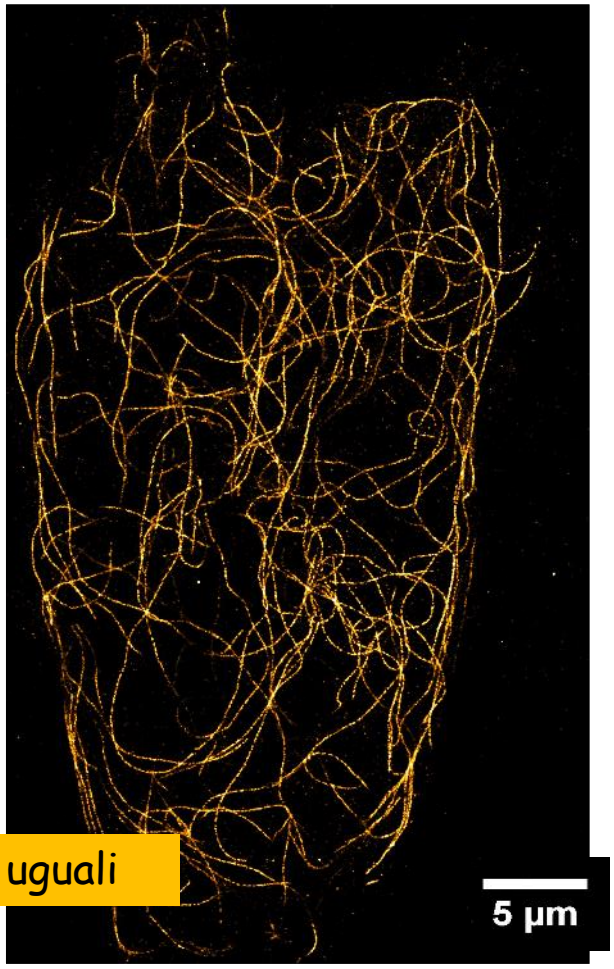
Strutture microtubuli meno dense, più lineari e meglio definite

BioTarget - Radiazioni Ionizzanti: Effetti su nuovi Target Biologici

Linea cellulare HTB-125 (epitelio mammario umano non tumorale)

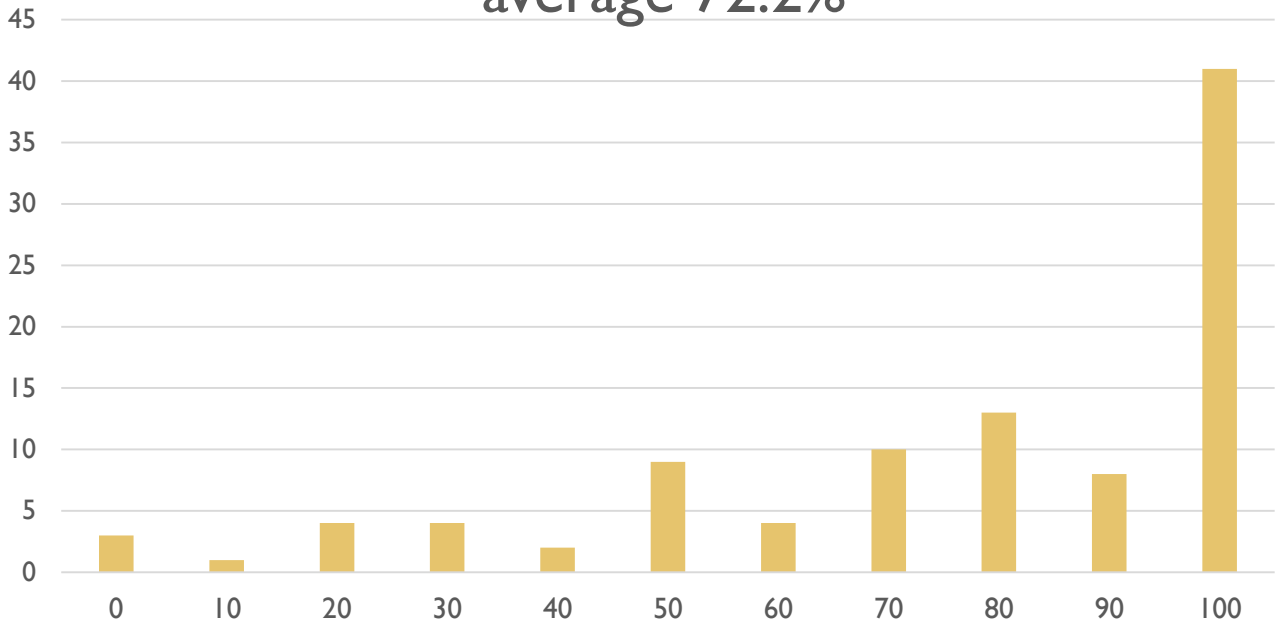
8 Gy raggi - X

8 Gy protoni

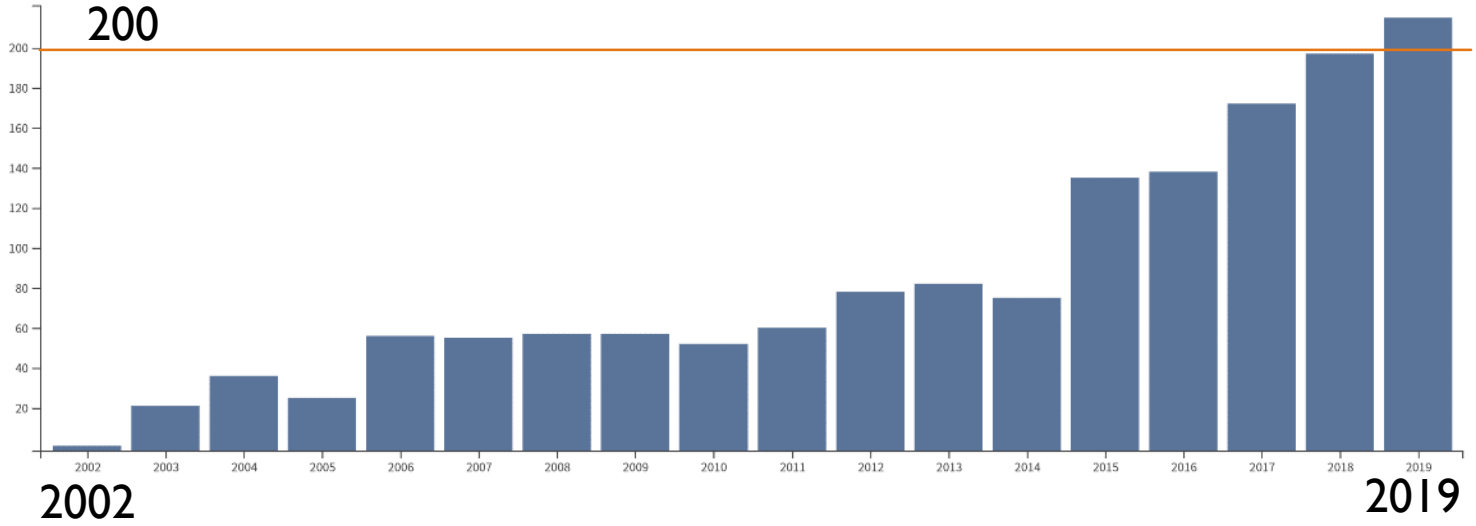


Strutture essenzialmente uguali

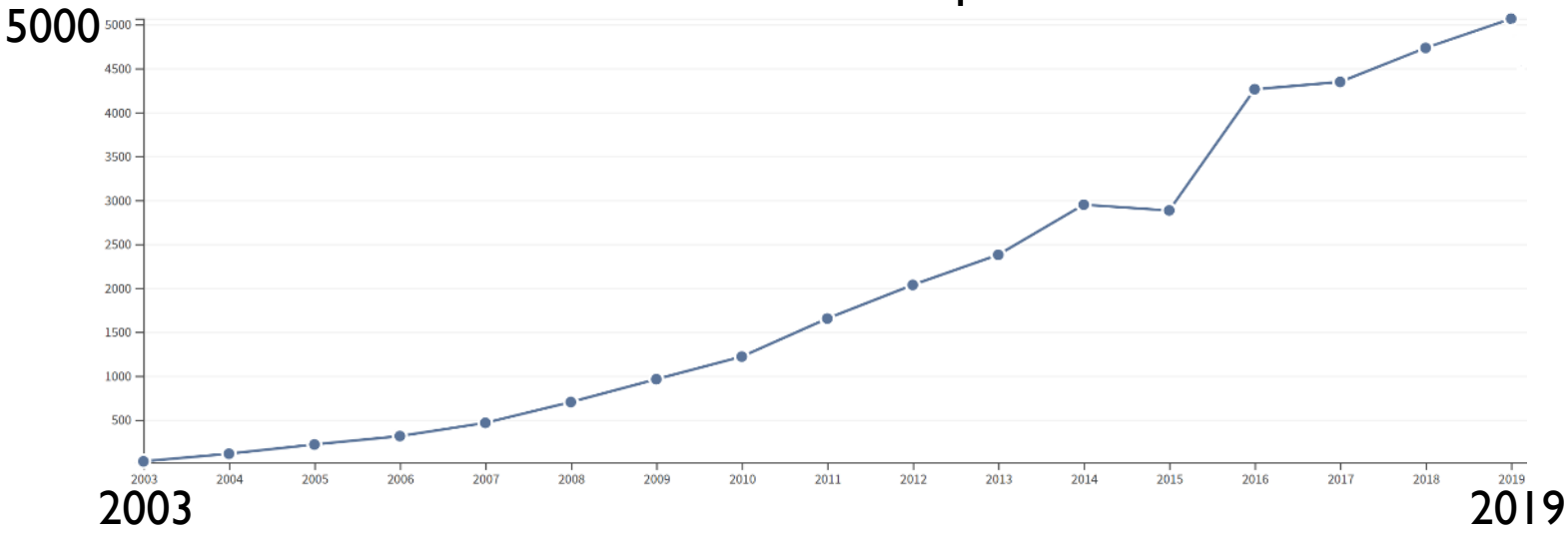
% realization of Milestones 2019
average 72.2%



Total publications 1512



Sum of Times Cited per Year



Final considerations

All projects demonstrate a great ingenuity and new ideas at the frontier of technological and theoretical research

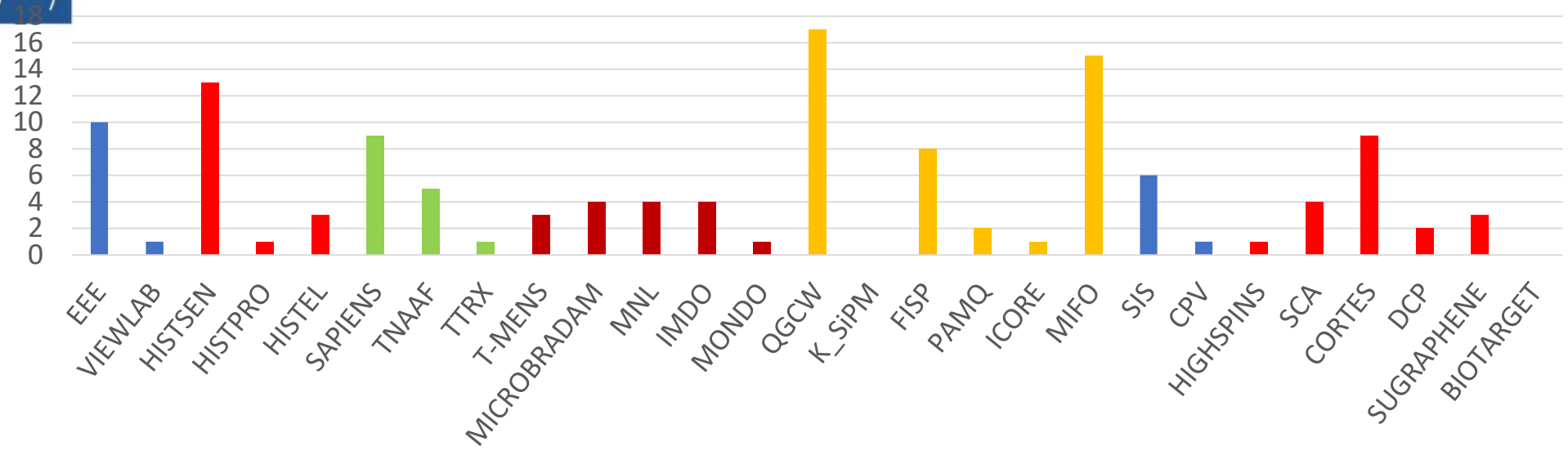
The number of publications, citations and the high fraction of achievements of the milestones indicates **a good quality and important recognition of the results**.

All projects are based on a strong collaboration with other Institutes and Univerisities (how it could be different in research!), but Centro Fermi has also the strength to propose and lead some of them which are unique and original in their scope. This is **why Centro Fermi has its own position within the national research institutes.**

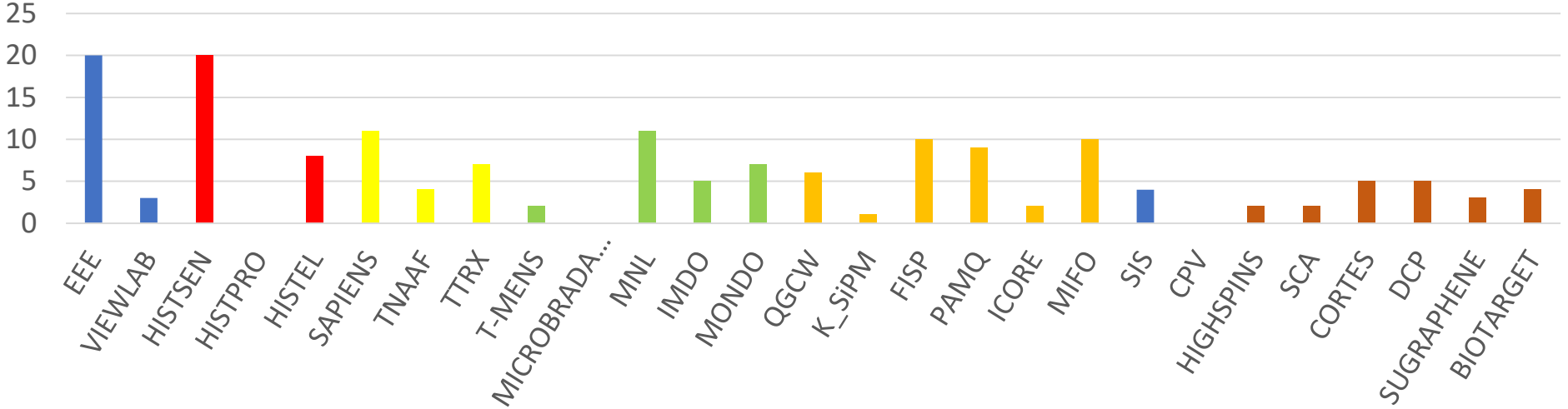
Unfortunatelly the budget constraint (expecially with the new Palazzina now operational) presently prevents to support all the projects in a sufficient way. As for the other research institutes, this requires a **change in paradigm, often underlined by our President, with more and more efforts from all of us to search for external funding and support to give a future to all our projects.**

BACKUP

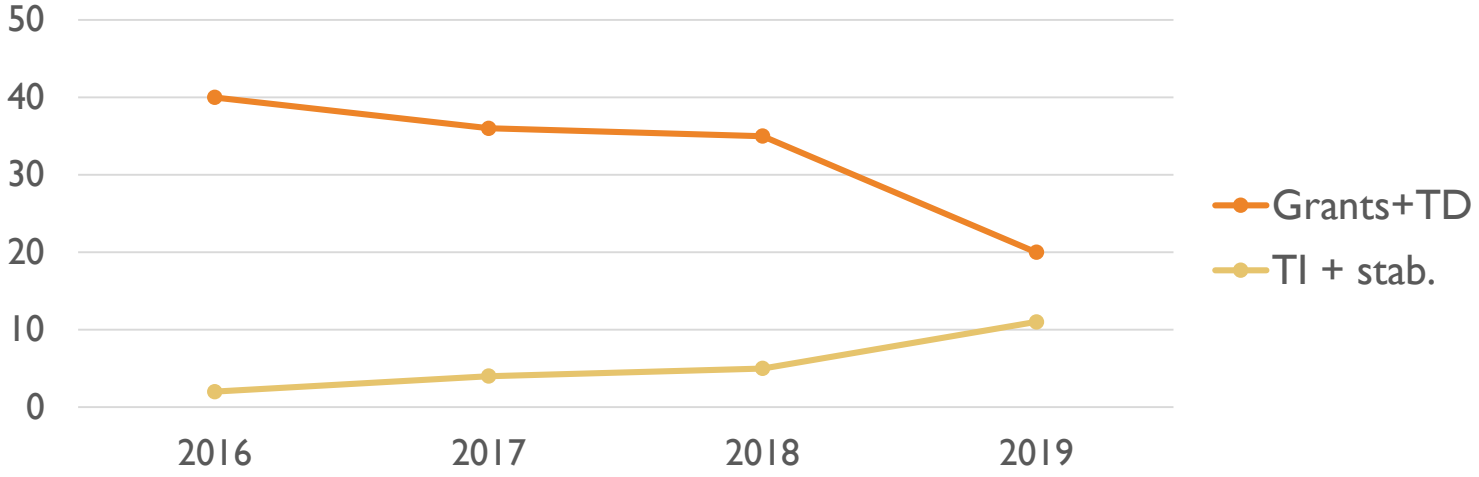
Pubblicazioni 2019



Conferenze 2019



Ricercatori Centro Fermi : Grants, TD and TI



Grants al 30/11/2019