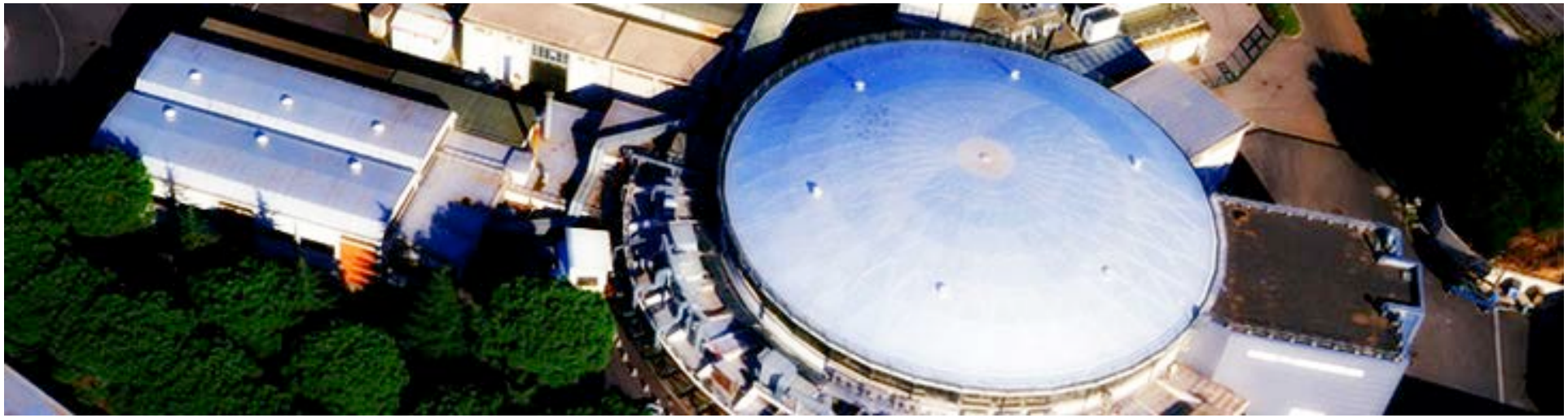
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati



Laboratori Nazionali di Frascati
Research Division

P.Gianotti

Oraganization

The **Research Division** of the LNF carries out scientific activity in the field of **particle physics**, **astroparticle physics**, **nuclear physics**, **theoretical physics**, and **technological research**, according to the provisions of the five INFN National Commissions.

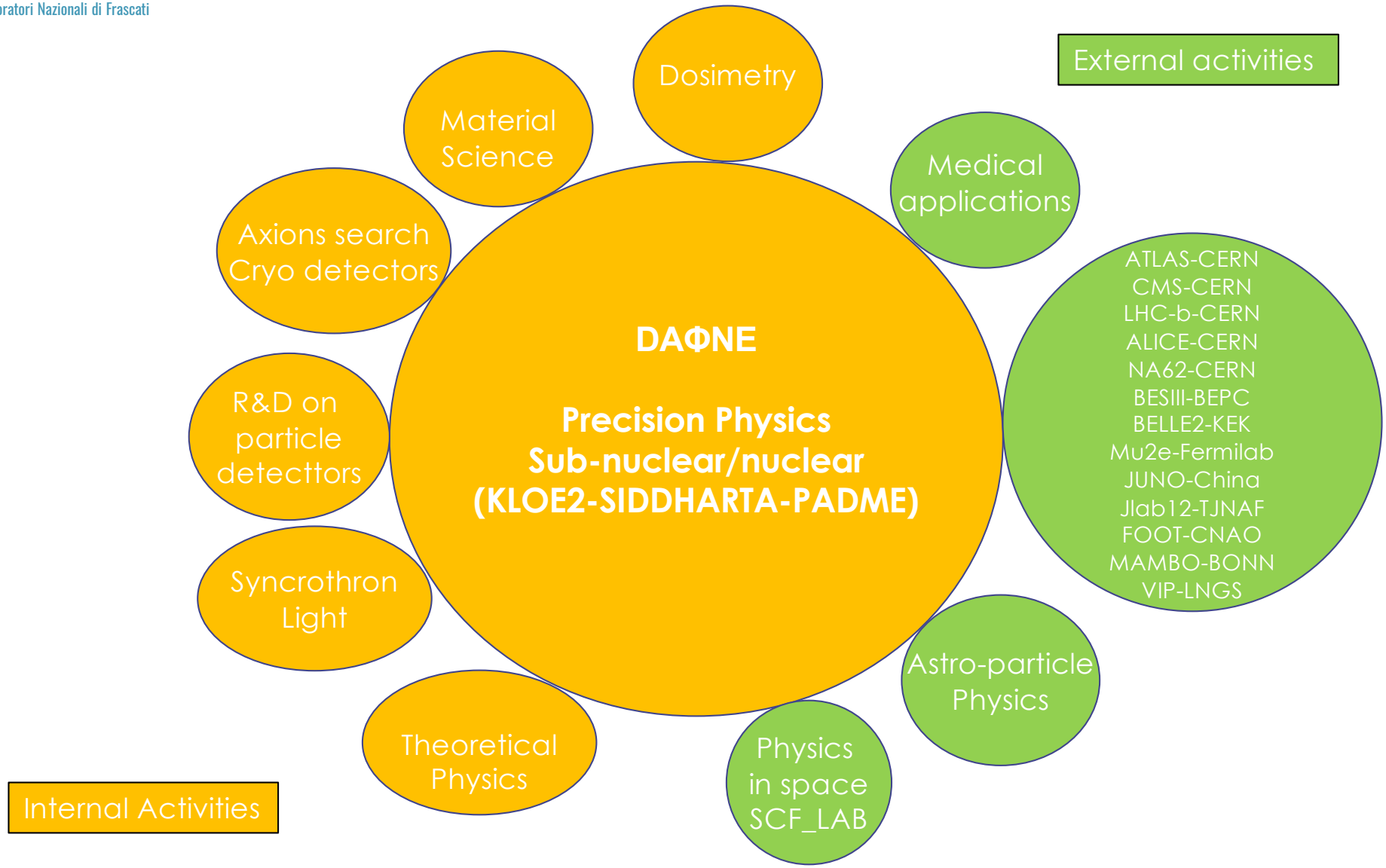
Around 200 people (employees, fellows and associates) work in the division with a percentage of researchers and technologists of 70%.

The division includes:

- 5 services (Mechanics, Electronics, Computing, Synchrotron Light, Outreach);
- 2 technical units;
- a documentation and library office;
- a secretariat office.

INFN LNF
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

Activities



INFN LNF
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

Particle Physics research

- Higgs boson;
- CP violation;
- Flavour physics;
- CKM matrix parameter study;
- QCD study;
- Rare decays;
- Dark matter.

Overall 71 people involved (52.1 FTE)

Nuclear Physics

- Structure and dynamics of hadrons;
- Hadron spectroscopy;
- Quark-Gluon-Plasma;
- Nuclear astrophysics and interdisciplinary research.

VIP

KAONNIS

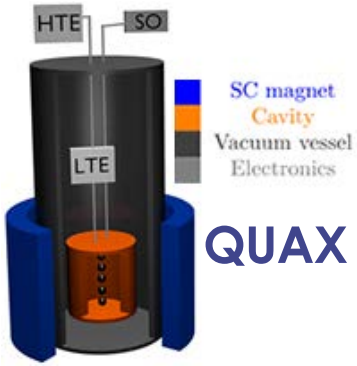
Overall 42 people involved (32.25 FTE)

Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

Astroparticle research

- Neutrino Physics;
- Dark matter search;
- Flavour physics;
- Universe radiation;
- Relativity.

CYGNO

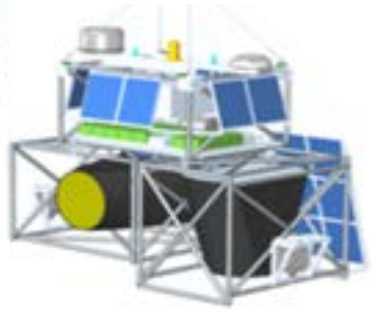


QUAX

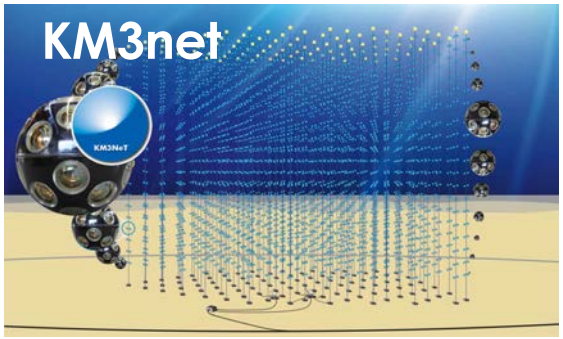
JUNO

SCF_Lab
INFN LNF

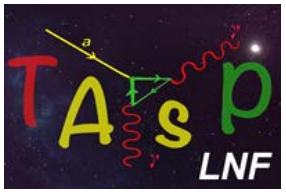
SPB2



Overall 24 people involved (15 FTE)

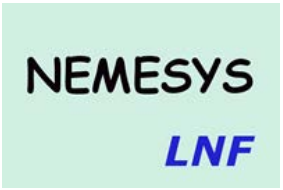


Theoretical Physics



TAsP
(Theoretical Astroparticle Physics)

ENP
(Exploring New Physics)



NEMESYS
(Non equilibrium dynamics models and excited state properties of low-dimensional systems)

Overall 9 people involved (7.9 FTE)

Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

Technological research

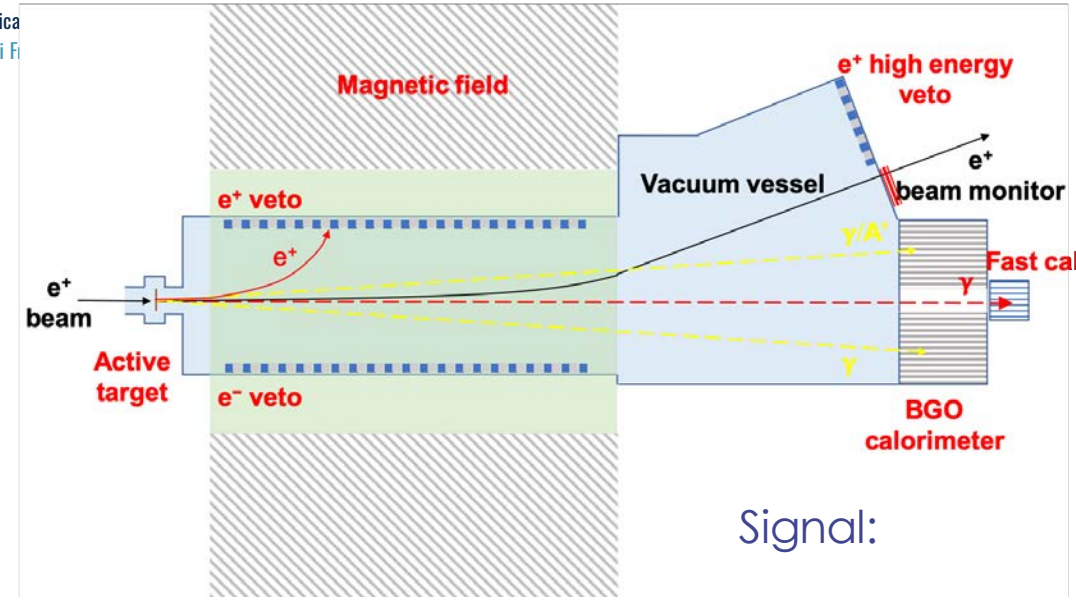
LNF are engaged in numerous projects involving the use of fundamental research tools and techniques in other interdisciplinary fields.

- Particle detectors;
- Particle accelerators;
- Electronics and software development;
- Interdisciplinary applications of INFN cutting-edge techniques.

Overall 138 people involved (61.9 FTE)

Line	Experiment	Sec participating	PI
ri	3D_SIAM	FI LNF LNS LE PG TiFPA	M. Menichelli
ac	ARYA	LNF* NA RM	**R. Cimino**
ri	DARTWARS	LE LNF* MIB SA TIFPA	**C. Ligi**
in	ENTER_BNCT	PV LNF LNL TO	S. Altieri
in	GLARE_X	LNF* GSGC TIFPA	**G. Delle Monache**
ri	IDDLS	BA CNAF LNF LNL NA PG PI RM1	D. Cesini
ac	LEMAACC	LNF	**O. Blanco Garcia**
ri	LLMCP	BO LNF	V. Vagnoni
ac	NUCLEAAR	LNF* RM	**A. Marcelli**
in	OLAGS	GE FI PI LNF	F. Sorrentino
ri	PAPRICA	LNF MI RM1	I. Mattei
in	RESOLVE	TO LNF LNL	F. Picollo
in	SAMADHA	FI LNF NA TO TS	S. Vernetto
ac	SHERPA	LNF* RM1	**M. Garattini**
ri	SIMP	LNF* PI SA TIFPA	**C. Gatti**
ac	SL_COMB2FEL	LNF LE MI NA RM RM2	**E. Chiadroni**
ac	SL_EXIN	MI LNF RM	A. Rossi
ac	TERA	RM LNF NA TO	S. Lupi
ac	TUAREG	LNF RM	**D. Alesini**
ri	URANIA_V	FE LNF*	**G. Bencivenni**

PADME Experiment



Signal:

$e^+e^- \rightarrow A'\gamma$

Background:

$e^+e^- \rightarrow \gamma\gamma(\gamma)$
$e^+N \rightarrow e^+N\gamma$
Beam induced background

The PADME experiment employs missing mass technique:

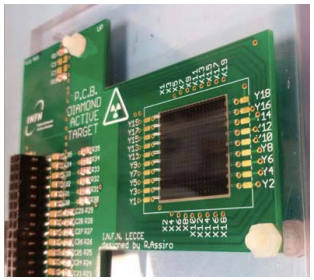
$$M^2_{A'} = (\bar{P}_{e^+} + \bar{P}_{e^-} - \bar{P}_{\gamma})^2$$

A' mass up to 23.7 MeV/c^2 and mixing parameter $\varepsilon^2 > 10^{-6}$ for 4×10^{13} Positrons On Target (POT) → 2 years of data taking.

The PADME detector

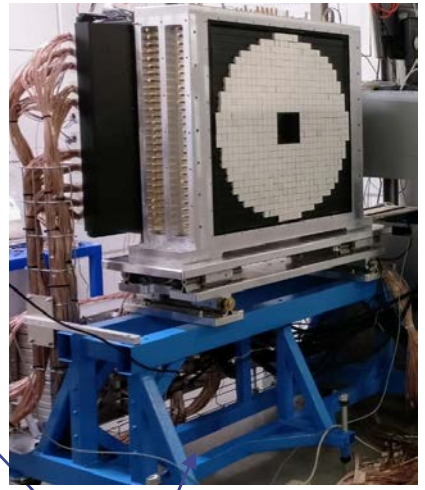
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

Active target
Lecce & University Salento



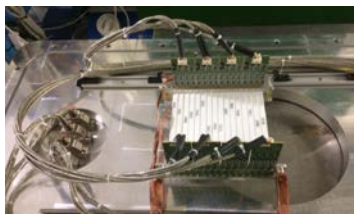
Dipole magnet
(CERN TE/NSC-MNC)

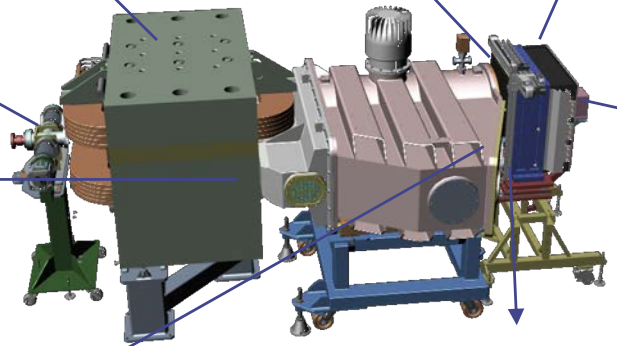
C-fiber window

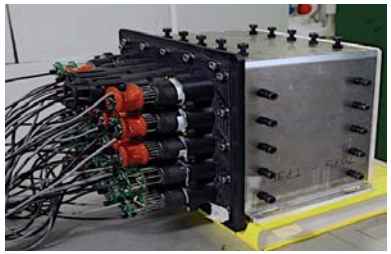


BGO calorimeter
(616 L3 endcap crystals: Roma, Cornell U., LNF, LE)

Veto scintillators
(University of Sofia, Roma)



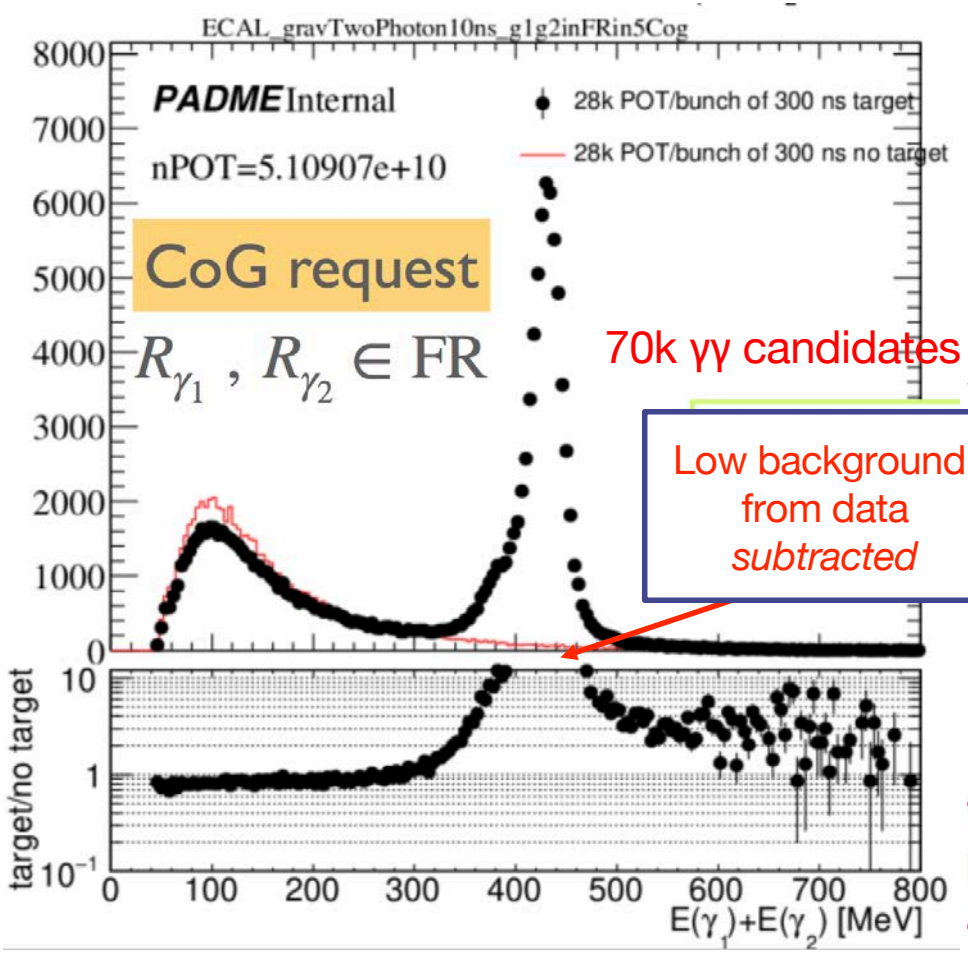




PbF_2 calorimeter
(MTA Atomki, Cornell U., LNF)

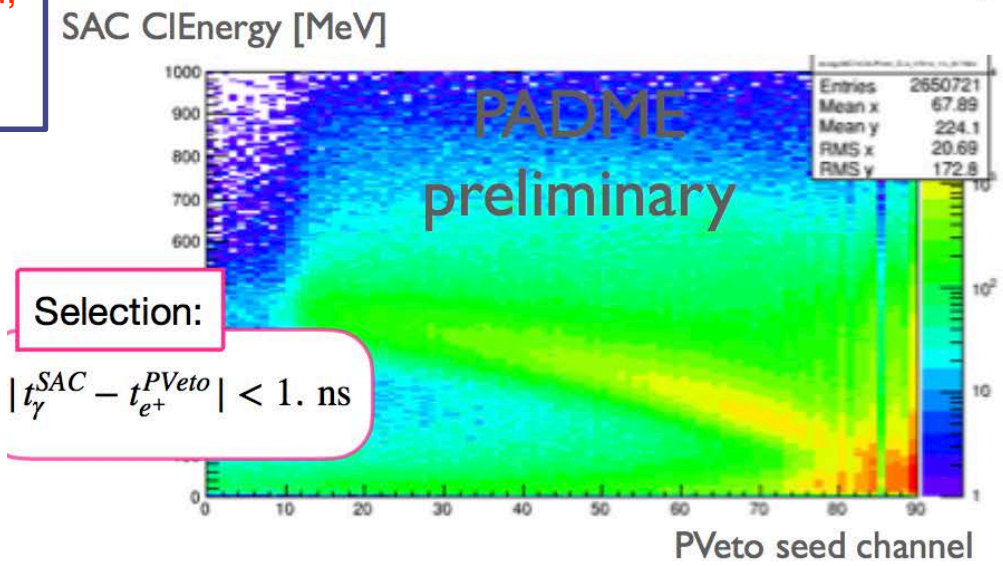
TimePIX3 array
(ADVACAM, LNF, RM1)

SM Physics at PADME



- ~70K candidate in %1 of the Run2 data sample
  - **Expect order 7M events in RUN2**
- BG further reduced wrt RUN1

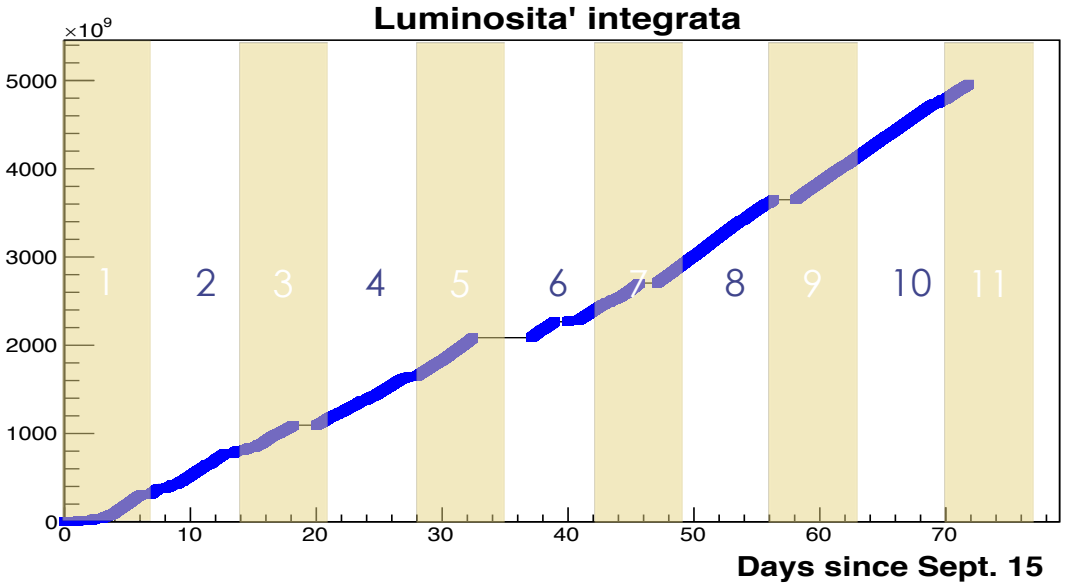
$$e^+N \rightarrow e^+N\gamma$$

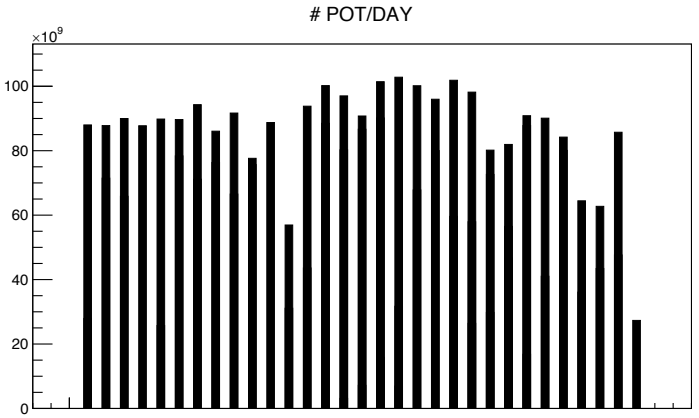


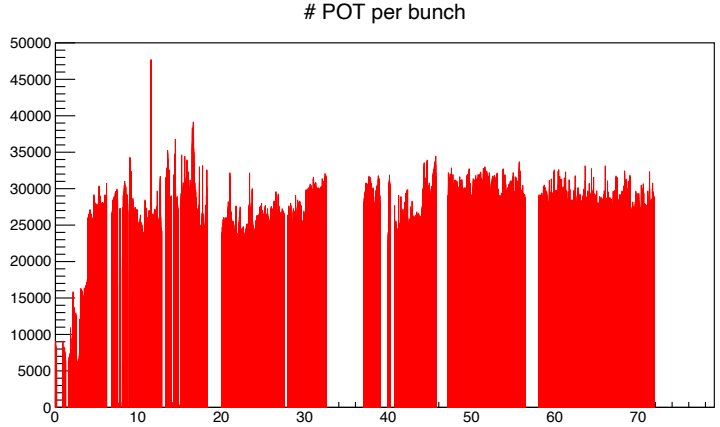
Cleaner data of Run2 will allow an easier comparison with simulation and a physical measuremets

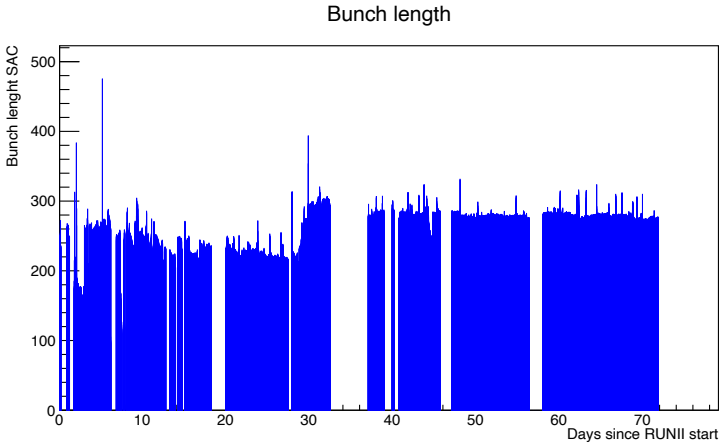
PADME Run2

Good beam conditions for the experiment reached. 15th Sep. start of PADME Run2 .





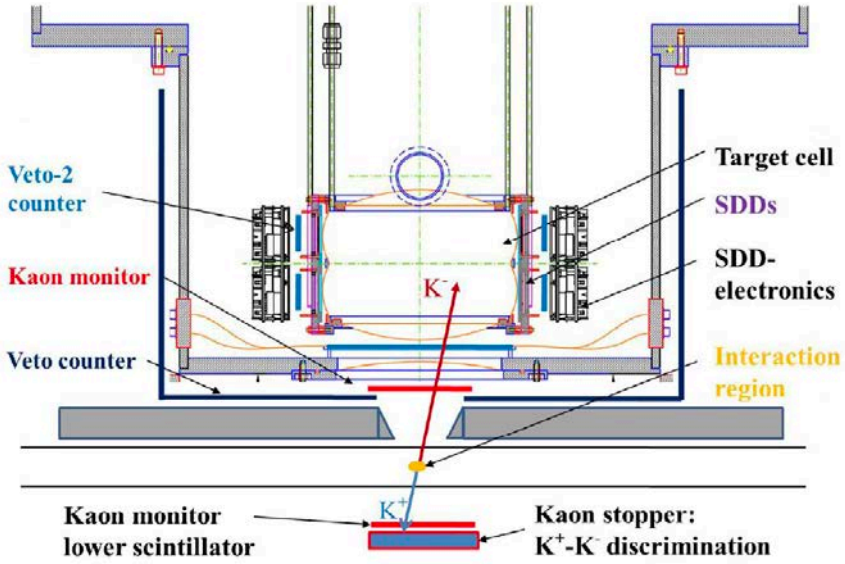




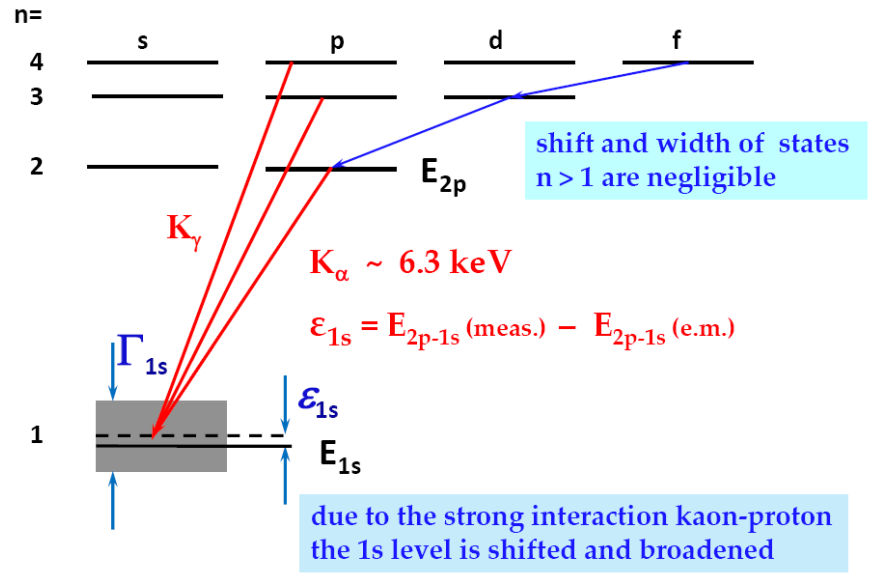
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

SIDDHARTA-2

Measurement of X-RAY TRANSITIONS TO THE 1s STATE



Silicon Drift Detector system for high precision spectroscopy of light Kaonic-atoms.



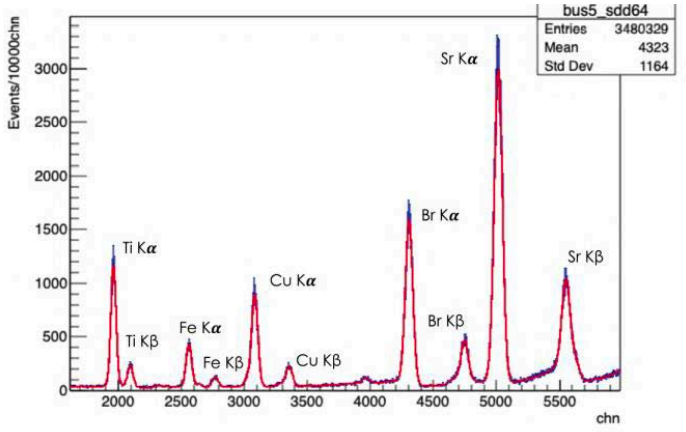


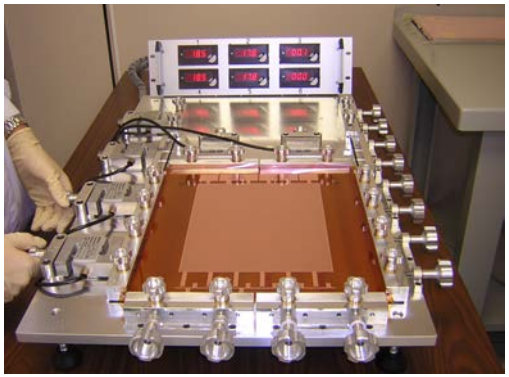
Figure 6.4: Silicon Drift Detector energy spectrum obtained with SIDDHARTINO in DAΦNE.

Presently in phase-1 with Siddhartino.
S/B ratio 1/10 for K-^{4}He measurement with ~ 30 pb^{-1}

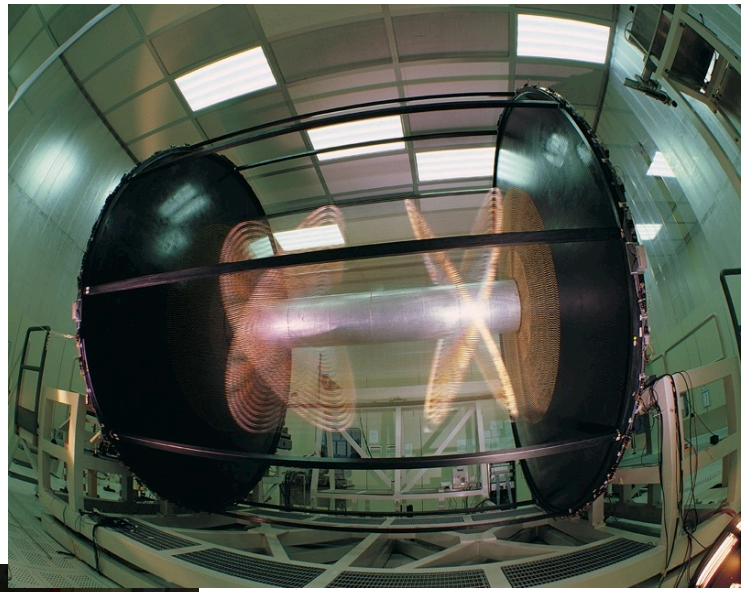
Novel Gaseous Detectors

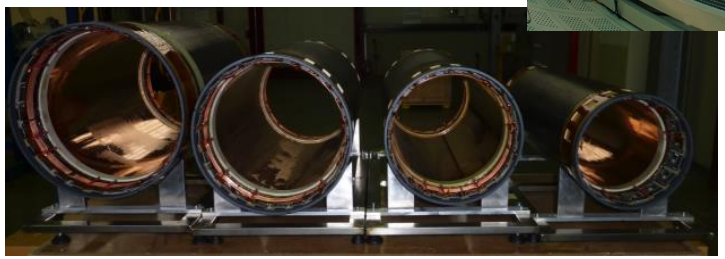
LNF has a long tradition of R&D, design and manufacturing of gaseous detectors:

- wire tubes operated in proportional or streamer mode (1985 -1990);
- RPC with glass electrodes (1991-1994);
- large drift chamber (1995 -1997);
- Micro-Pattern-Gaseous-Detector (MPGDs – since 2000) for large high energy physics experiments.



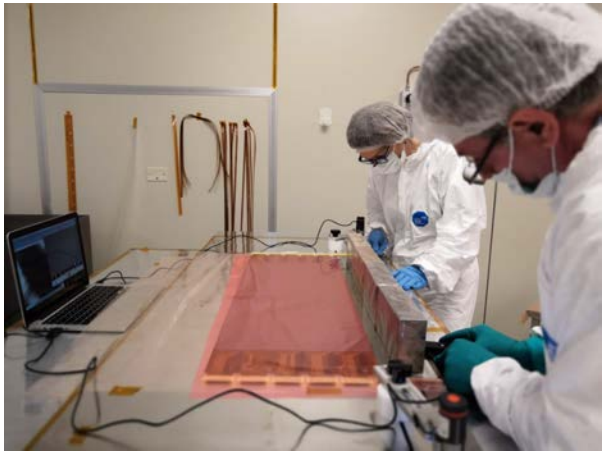
- planar GEMs for for fast muon triggering for LHCb;
- the first low mass **full Cylindrical** and dead-zone-free GEM (CGEM) detector as Inner Tracker for the KLOE2;
- R&D on novel MPGD with the introduction of the innovative μ-RWELL gaseous detector;
- The μ-RWELL is object of several applications in HEP (LHCb, CepC, FCC-ee) as well as thermal neutron detection (EU project - uRANIA-Attract);
- The first Cylindrical μ-RWELL will be built in the next 2-3 years in the framework of the EU project CREMLIN-plus;
- Development ongoing for FCCee and CepC IDEA detector.





Vertex gaseous detectors

- Precision cuts of anodes and GEM foils;
- Planar gluing: Anodes, GEM, Cathodes;
- Cylindrical gluing of Gem, Anood and Cathode
- Insertion of the 5 cylinders with the Vertical Insertion Machine (VIM) and sealing
- Final sealings;



L3 of CGEM-IT construction just finished @LNF

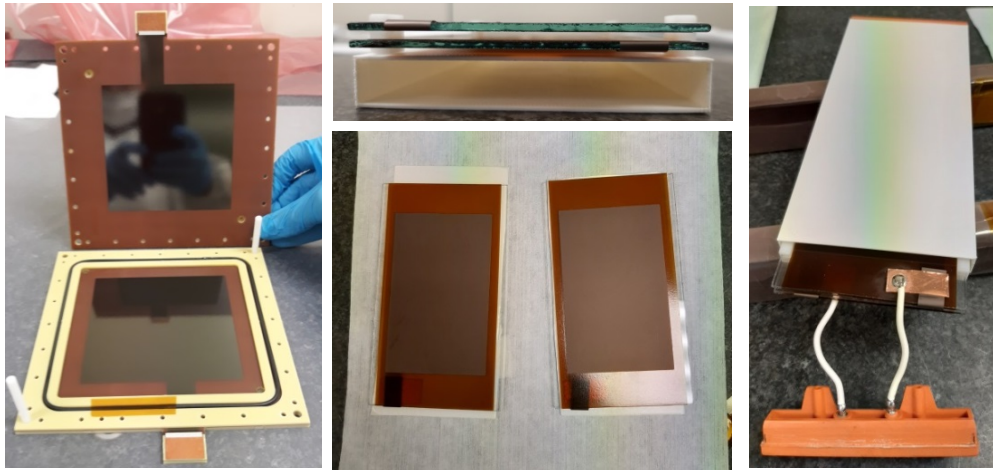
L1 and L2 at IHEP since December ‘19 taking cosmic data

A new Lab, new ideas…

In Bd. 8 a 20 sqm Lab devoted to this activity

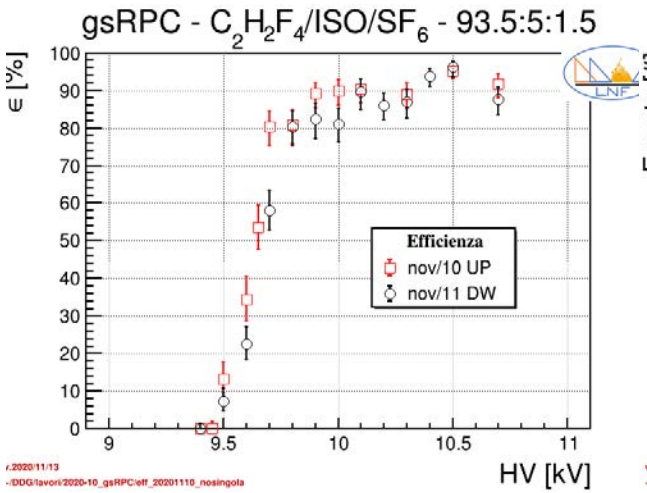
A completely different concept from the one used in traditional RPCs, based on volume resistivity electrodes (phenolic resin or glass) not easily modulated.

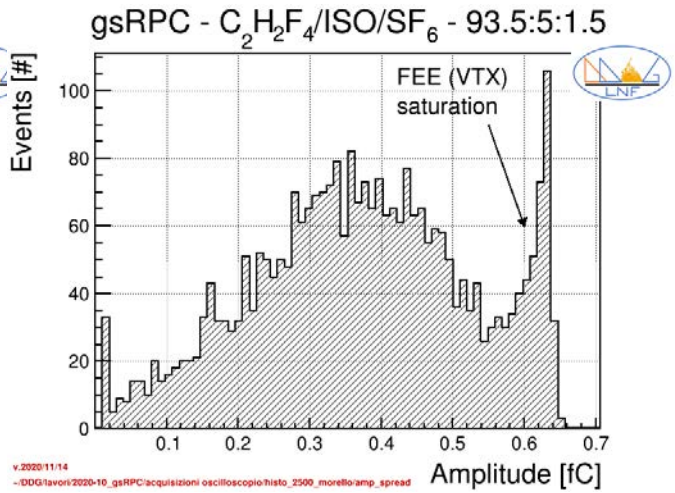
The idea → surface resistivity electrodes made with industrial technique of DLC deposition on flexible or semi-rigid supports. The surface resistivity of the DLC can be modulated over a wide range: 100 kΩ/sq ÷ 10 GΩ/sq.

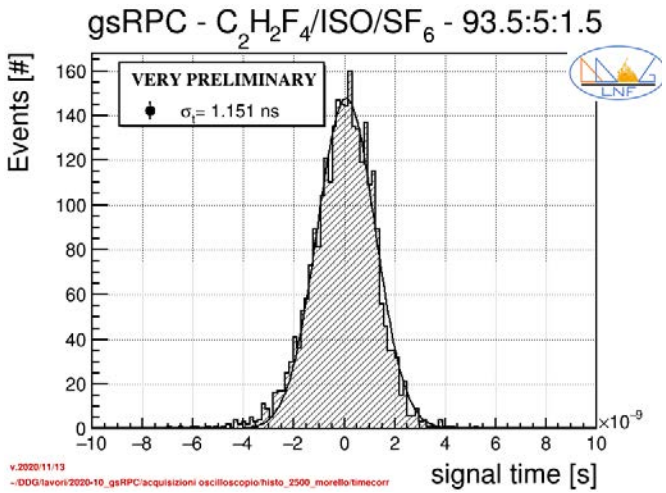


Brevetto in Italia N. 102020000002359
INFN – Istituto Nazionale di Fisica Nucleare "ELETTRODO PIANO A RESISTIVITÀ SUPERFICIALE MODULABILE E RIVELATORI BASATI SU DI ESSO."

gSRPC: first results



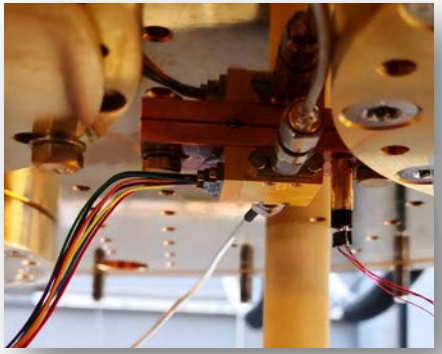




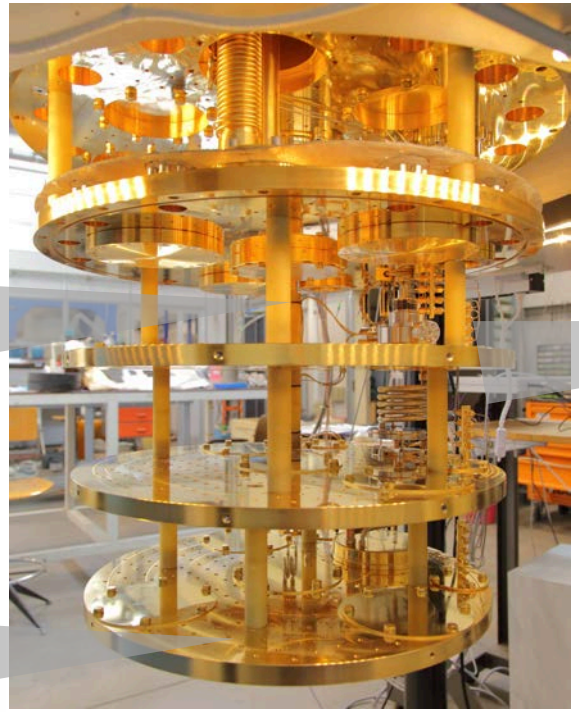
- Long efficiency plateau: > 1kV. Maybe longer but … very large signals: > 600mV (fC)
- NO INSTABILITY and/or continuous current
- Good time resolution: After subtraction of scintillator trigger contribution compatible with $\sigma_t \sim 875$ ps

COLD Lab

http://coldlab.lnf.infn.it

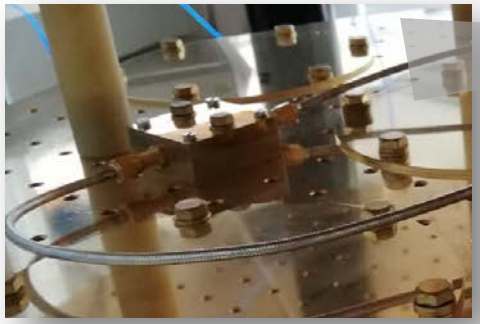


HEMT (6-20 GHz) 4K amplifier



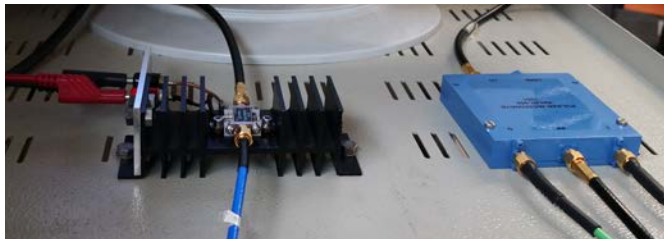
4 RF lines installed from 300 K to MixCh

FET LNA 8-12 GHz and IQ-mixer (10-12 GHz)



Sample holder for SC chip at 10 mK for single photon device

Leiden CF-CS-110-1000	
Cryo free Sumitomo PT	1.5 W at 4.2 K
Cooldown time (with LN)	3 days
Base temperature (measured)	8 mk
Cooling power at 100 mK (measured)	450 mW (up to 700 mW with a new pumping system)

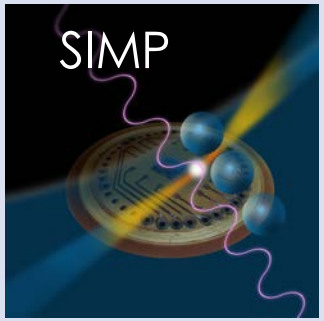


Room T ampli & DAQ

Developing new tools

The idea is to use Quantum technologies to improve detectors

Single microwave photon detectors



Units
LNF (Resp Naz)
INFN Pi
INFN Sa
TIFPA-FBK
CNR Nano NEST
CNR IFN
INRIM

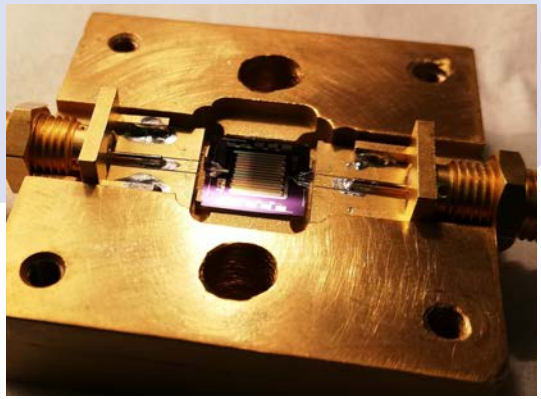
DART WARS

Units
MIB (Resp Naz)
LNF
INFN Sa
TIFPA-FBK
INFN Lecce
IBS-CAPP
INRIM

Detector Array Readout with Travelling Wave AmplifieRS

TWJPA: under measurement at LNF

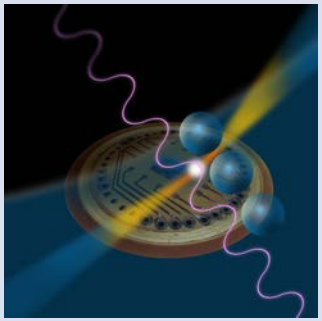
Its a chip fabricated at INRiM, composed of **900 consecutive cells cointaining each an RF SQUID**. Unnder test now at LNF and at IBS-CAPP



Development of new tools

Development of single microwave photon detectors

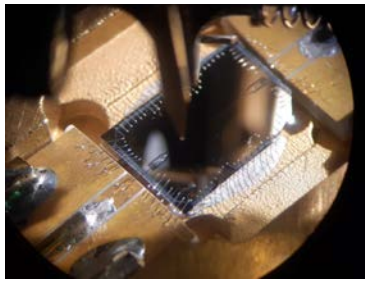
http://coldlab.lnf.infn.it



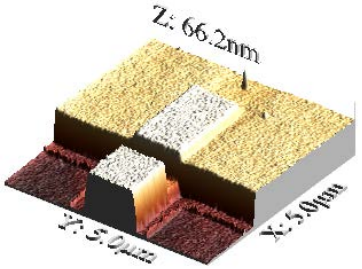
Units
LNF (Resp Naz)
INFN Pi
INFN Sa
TIFPA-FBK
CNR Nano NEST
CNR IFN
INRIM

1. Josephson junctions (JJ) fully characterized at LNF in a dilution refrigerator

2. RF test of Al transmission line

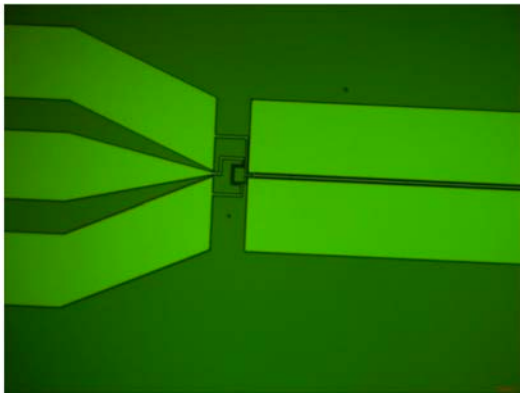


Chip with Al transmission line bonded on the sample holder

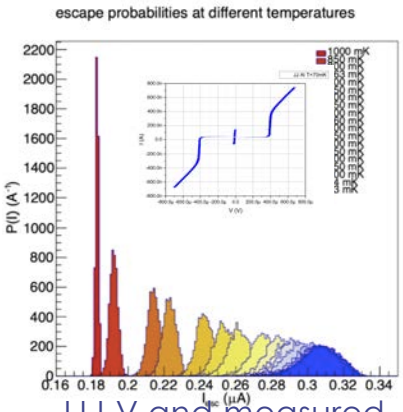


AFM Image of a JJ fabricated at CNR-IFN

3. Fabrication of first photon counter based on JJ ongoing



Photon detector composed of a transmission line terminated with a tunable JJ (DC Squid)



JJ I-V and measured escape currents

D Alesini et al Journal of Low Temperature Physics https://doi.org/10.1007/s10909-020-02381-x

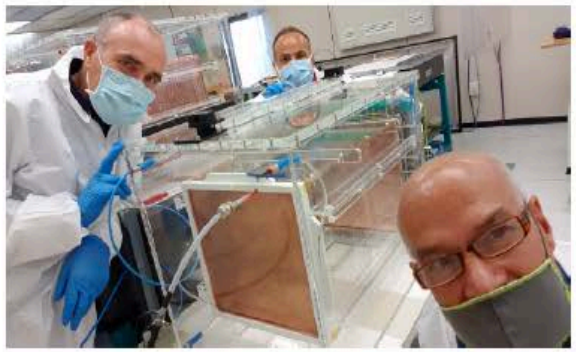
D Alesini et al 2020 J. Phys.: Conf. Ser. 1559 012020

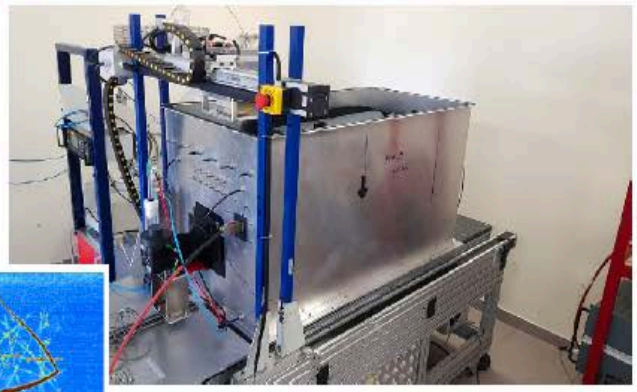
CYGNO/INITIUM

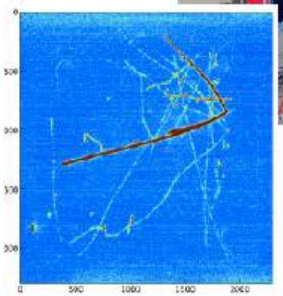
The CYGNO project aims to develop a large TPC with optical readout for high precision tracking of low energy O(keV) nuclear recoils.

INFN (LNF, RM1, RM3, Dip di Ing. Chimica), GSSI, Centro Fermi University of Sheffield, University of New Mexico, University of Hawaii, University of UFJF Brasil

1 m³ demonstrator for directional dark matter search and solar neutrino physics







LIME first events

PHASE 0: R&D

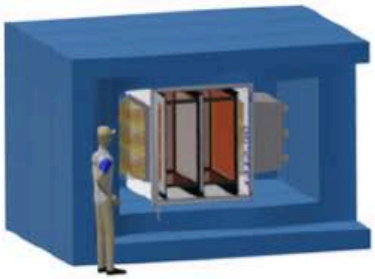
2016/17	2018/19	2019/20	2021/22	2023
@ ROMA1/LNF	@ LNF	@ LNF/LNGS	@ LNF/LNGS	@ LNGS
ORANGE	LEMON	LIME	Construction & test	Installation & commissioning

- 3D printing
- 20 cm drift

- 50 cm drift
- underground tests
- shielding

PHASE 1: 1M³ DEMONSTRATOR

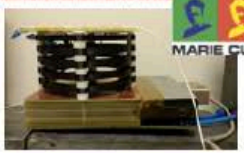
CYGNO/INITIUM



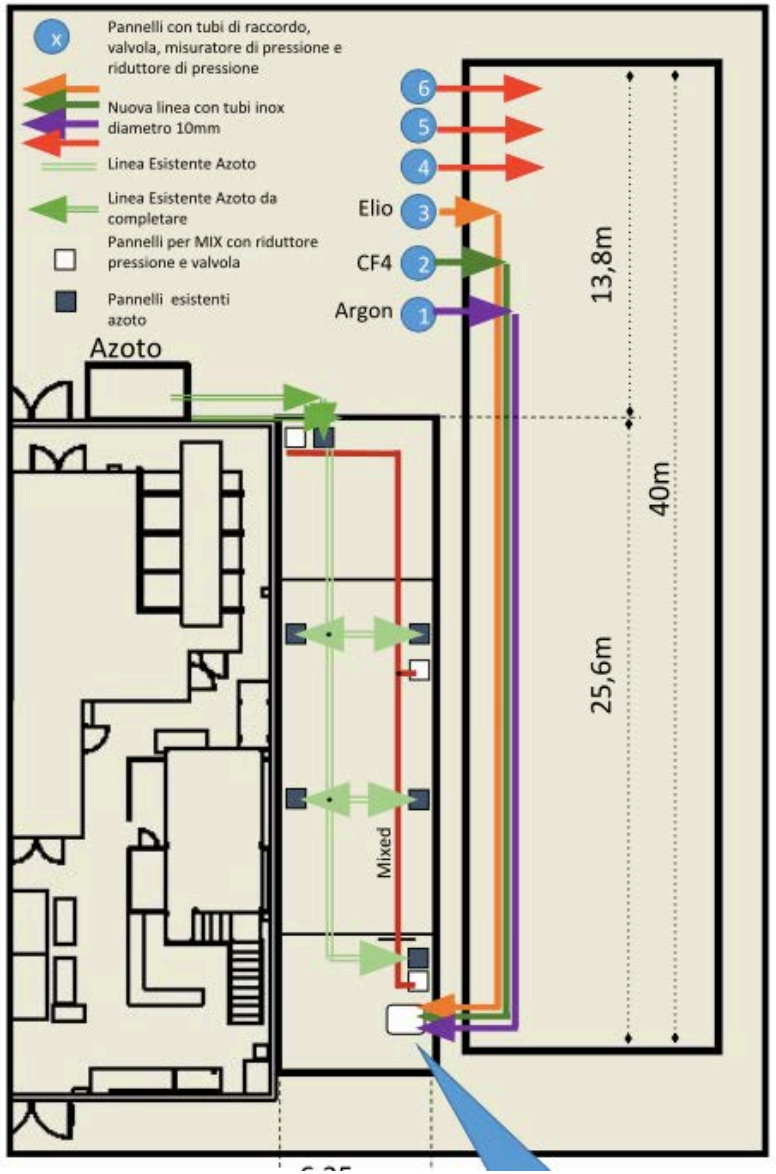
- background
- materials test
- gas purification
- scalability
- reliability

PHASE 2 - CYGNUS 30-100 m³

NEGATIVE ION



COVID output: arXiv:2007.00608, arXiv:2005.12272, arXiv:2004.10493
+ 2 other papers under internal review before submission



A dedicated lab in Bd. 48 and 28 has been settled.

LHC detector upgrade

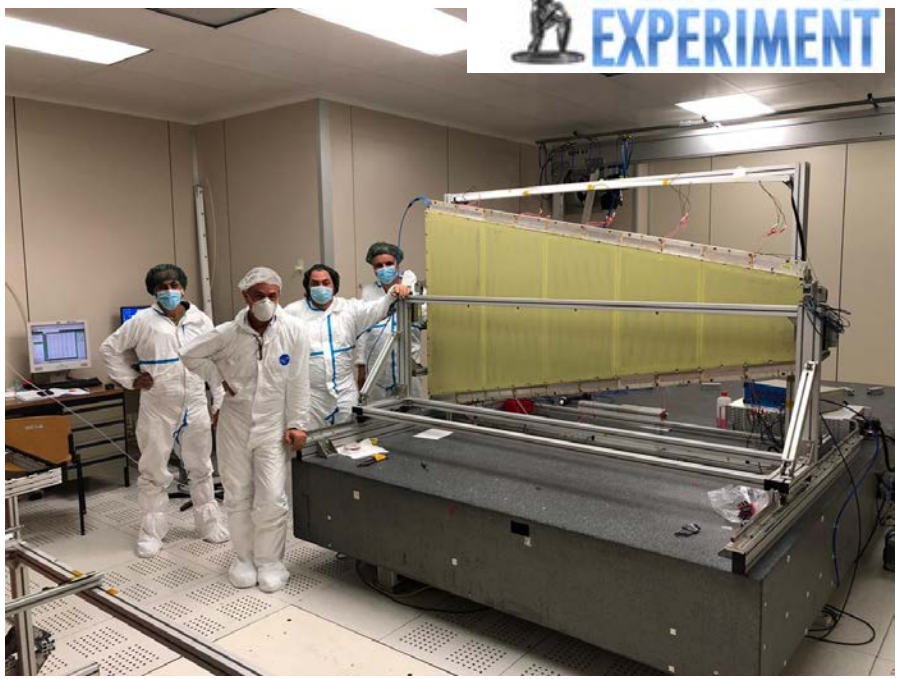
The LHC is in Long Shutdown 2:

- upgrading the LHC experiments;
- finalising the LHC Injector upgrade;
- preparing the High-Luminosity LHC which will be the major particle physics programme during the second half of the decade and beyond.

ATLAS, CMS, ALICE and LHCb are working to improve detector capabilities for Run3.

ATLAS NSW

- MicroMegas chambers have been **chosen for the ATLAS upgrade of the forward Muon Spectrometer for their excellent performance in tracking particles (res.~100 μm, eff.~95%) up to high fluxes.**
- The construction of such large area detectors has shown some challenges which required studies and special procedures
- **Main issues have been solved**
- **LNF has produced 32 fully validated SM1 chambers.**

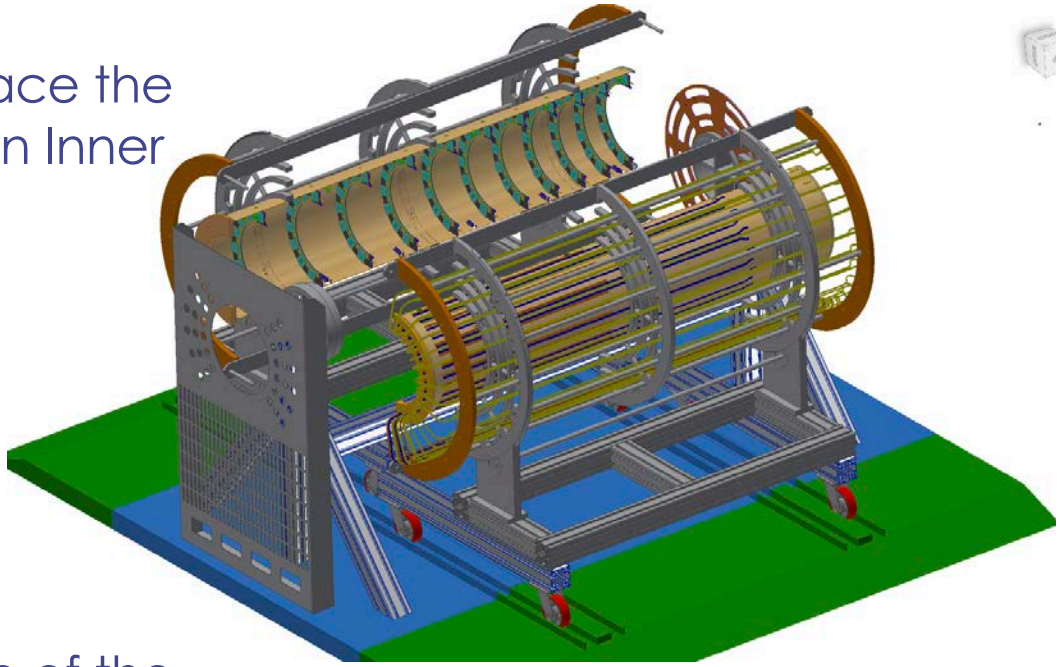


Support to France, Germany and Russia. Russian chambers will be reworked at CERN by LNF personnel.

Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

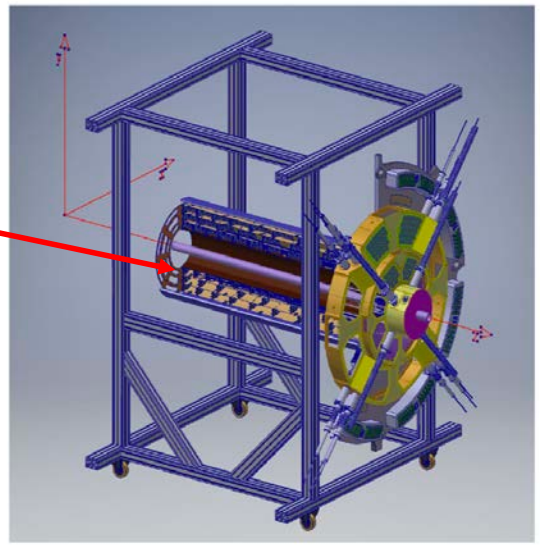
ATLAS ITK

For Phase 2 upgrade ATLAS will replace the vertex detector with a new, all-silicon Inner Tracker (ITk).



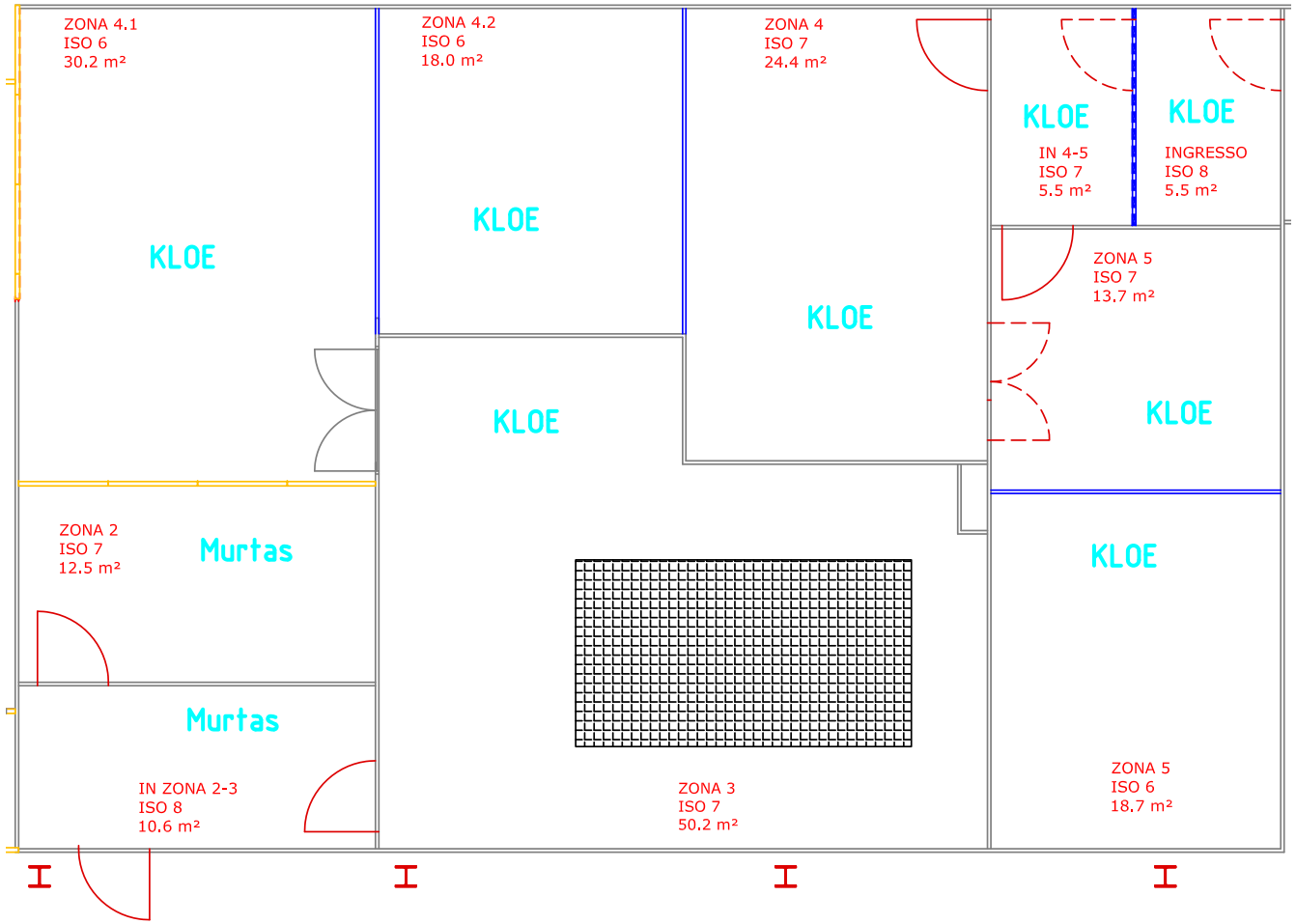
LNF is responsible for:

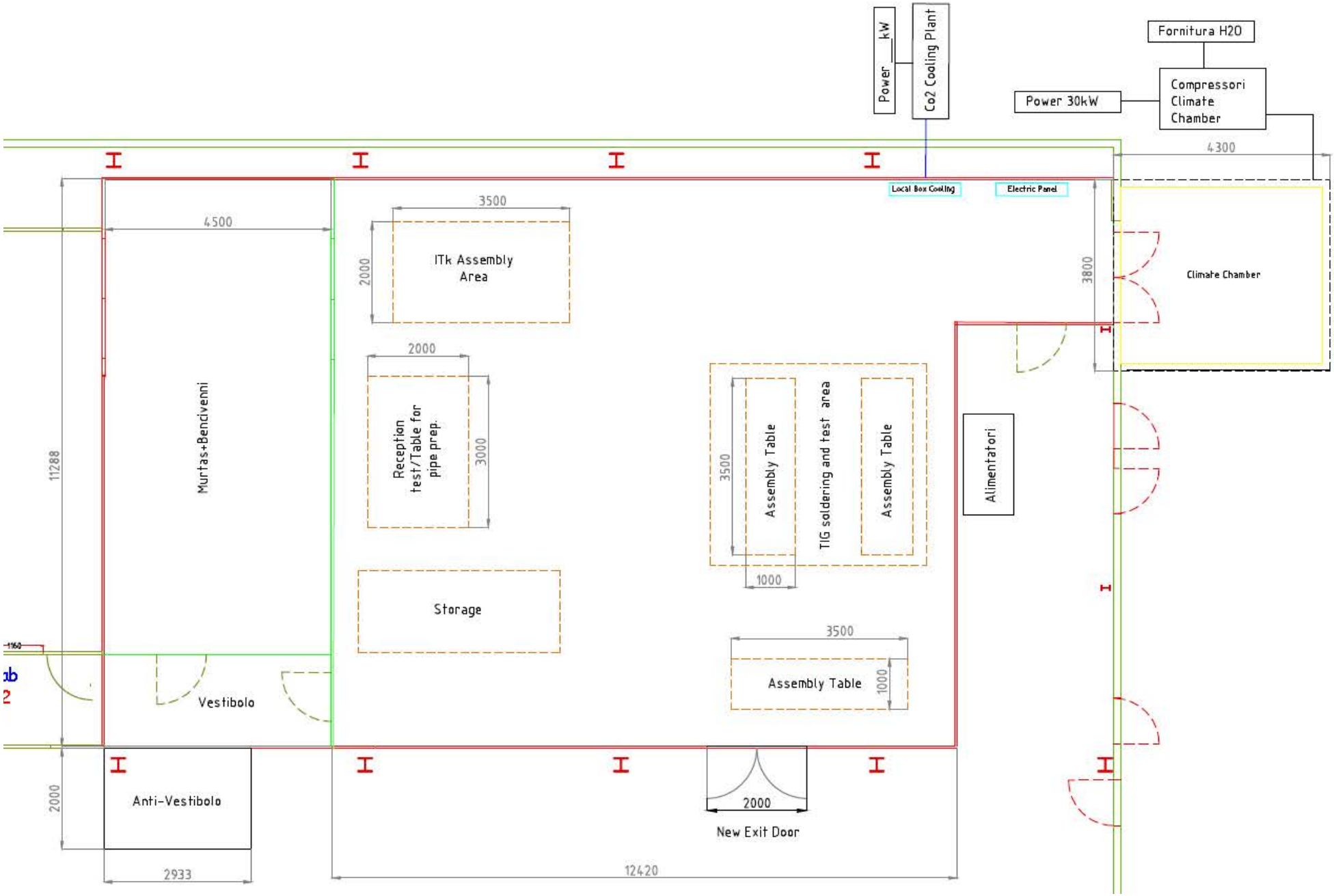
- construction of one outer endcap of the ITk. Assembly will take place in Bd. 8.
- Design and construction of Patch-Panel of all ITK



ATLAS ITK

The work wirequire a reorganization and upgrade of the existing Clean-Room (ex-KLOE) of Bd. 8.




Power kW
Co2 Cooling Plant
Fornitura H2O
Power 30kW
Compressori Climate Chamber
4300
Local Box Cooling
Electric Panel
3500
ITk Assembly Area
2000
4500
Climate Chamber
3800
2000
Reception test/Table for pipe prep.
3000
Murtas+Bencivenni
11288
3500
Assembly Table
TIG soldering and test area
Assembly Table
1000
Alimentatori
Storage
3500
Assembly Table
1000
Vestibolo
Anti-Vestibolo
2000
2000
New Exit Door
2933
12420

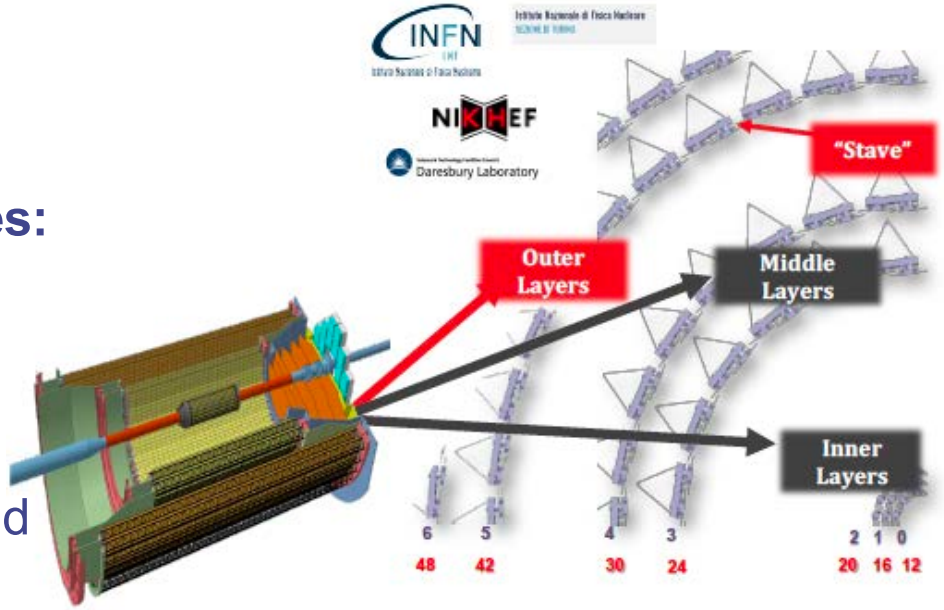
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

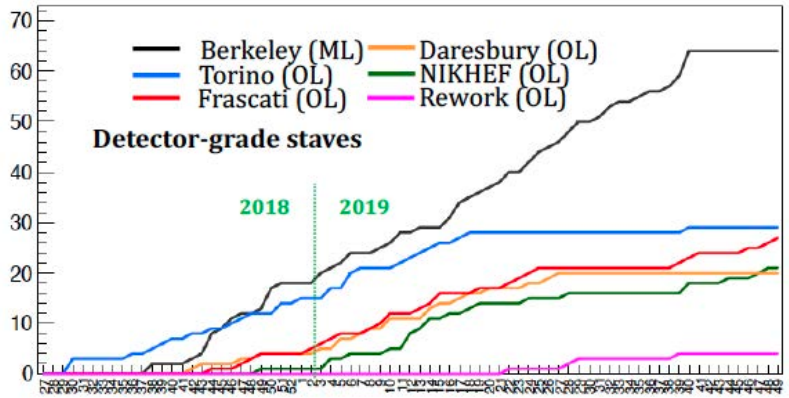
ALICE ITS

Production at LNF from Feb 2018 to June 2019.

The LNF group also contributed to the development and debug of the procedures:

- Debug of the readout system
- Development of wire bond repairs using conductive glues
- Development of mechanical procedures and tooling to rework finished staves





Work done in the Clean-Room Bd. 27.
A new CMM bought for this purpose.

CMS and LHCb

LNF CMS group is responsible for the **construction of GEM chambers** for the muon upgrade. 14 Chamber have been already realized and installed (GE1) a second bunch of 53 (GE2) is ongoing.

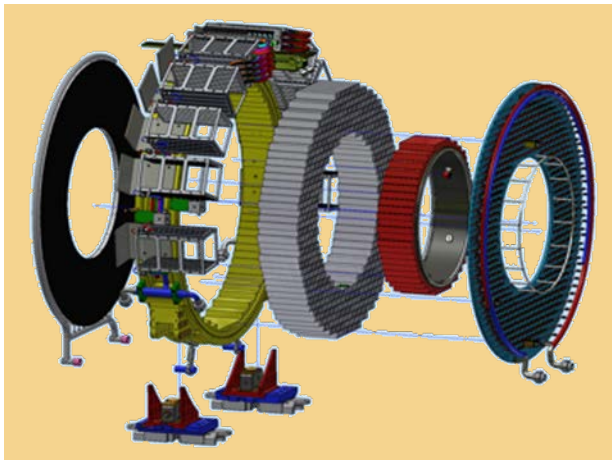
At LHCb the main upgrade regards the Trigger System that has to reach the capability of digesting luminosity of $2\times10^{33}cm^{-2}s^{-1}$.
The new Muon System off-detector electronics (nODE) has been redesigned to be compliant with the 40 MHz readout of the detector by the LNF electronic team (LNF-SEA).

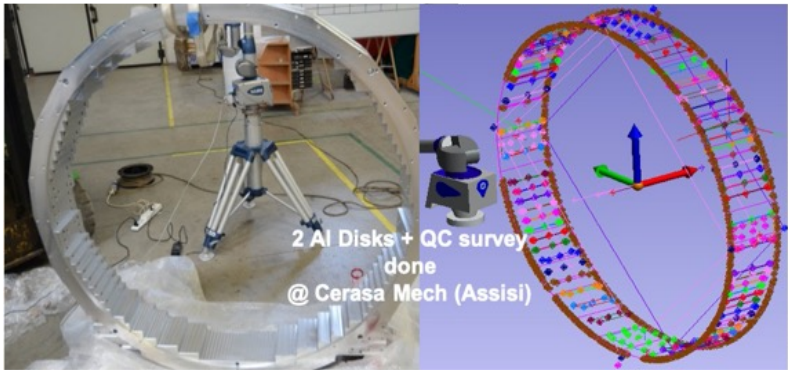
Matteo Palutan is the new LHCb deputy spokesperson (since Summer 2020).

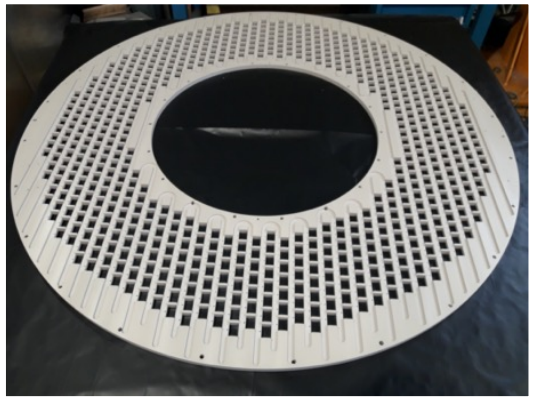
LNF LHCb is also responsible for the SMOG2 project: the first internal fixed gas target at the LHC installed in summer 2020.

MU2e

- Ecal construction under LNF coordination

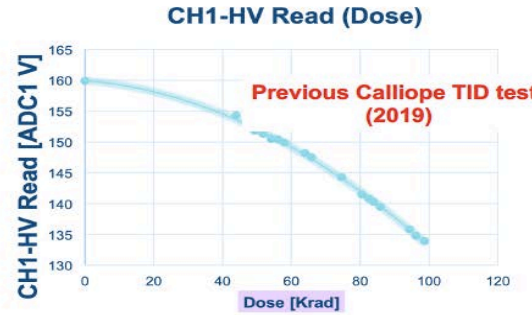


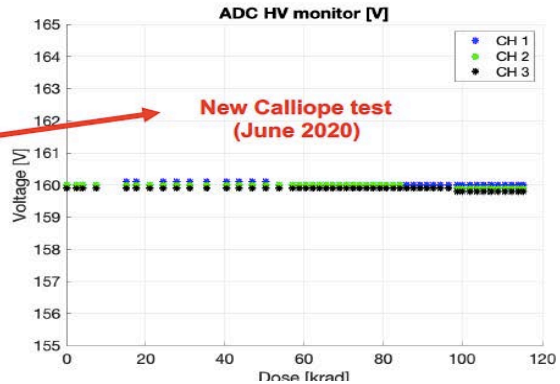


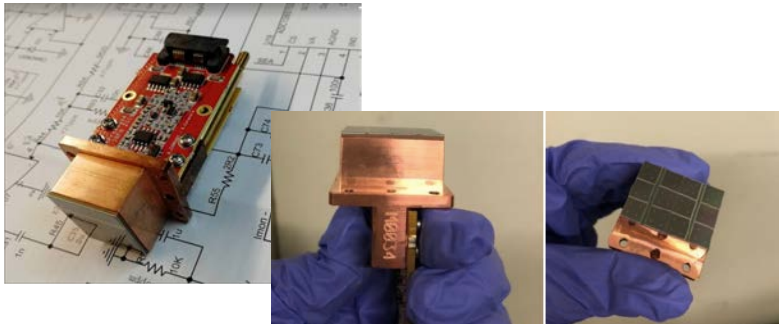


- **FEE developed at SEA, LNF.** Long series of radiation hardness tests with ionizing dose, neutrons/protons. Latest version rad-hard up to 100 krad, 10^{12} n/cm^2 ➔ FEE production started: **80 boards already at LNF, completion expected for end of 2020**

- SiPM gluing on holders +FEE assembly under way at LNF ➔ **work moved from FNAL to LNF due to COVID-19 pandemics**







aMUSE (advanced Muon Campus in US and Europe Contribution)

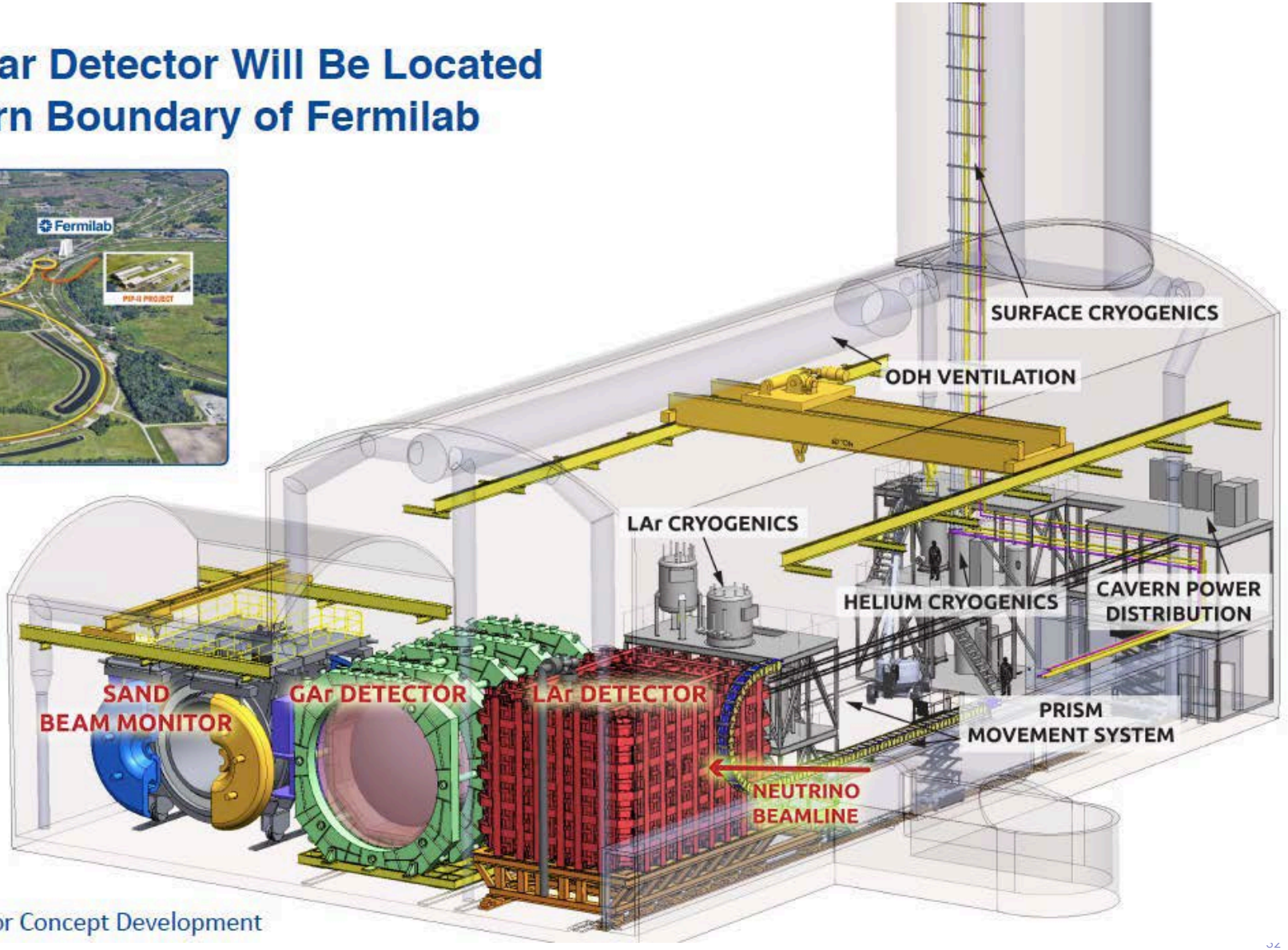
Simona Giovannella is the International Coordinator of the aMUSE consortium.

The Project coordinates the activities of about 80 researchers from 12 European research institutes and industries participating to the search for New Physics in the muon sector and to the design of a new generation muon accelerators in high-profile US laboratories (Fermilab, BNL, SLAC).

Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

SAND: Near Detector for DUNE

The DUNE Near Detector Will Be Located At The Western Boundary of Fermilab



DUNE-ND I&I Team
Supported Early Detector Concept Development

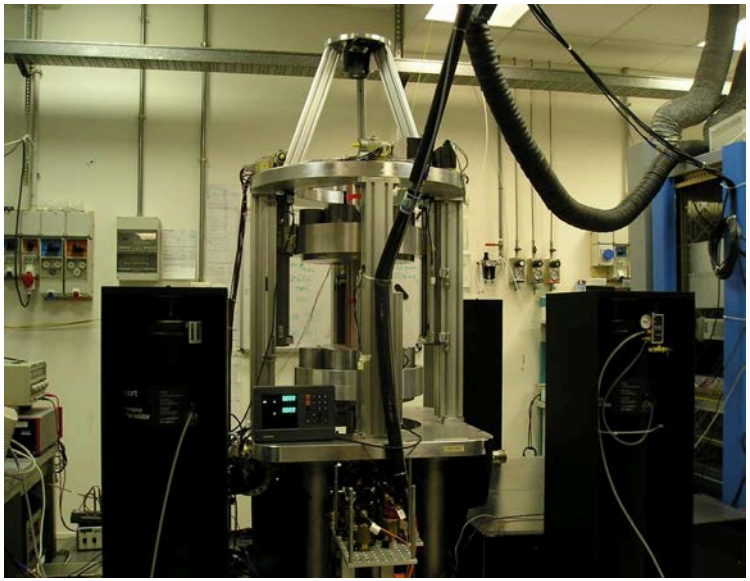
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

Measuring the Gravitational Constant MEGANTE project

The precise determination of the gravitational constant G remains a challenging endeavour.

MEGANTE will address this issue by carrying out precision G determinations making use of original experimental strategies based on quantum sensors.

Unprecedented accuracy levels will be achieved using **cold atoms in free-fall** to probe the gravitational field, surpassing thus the state-of-art measurements based on torsion balance and simple pendulum.

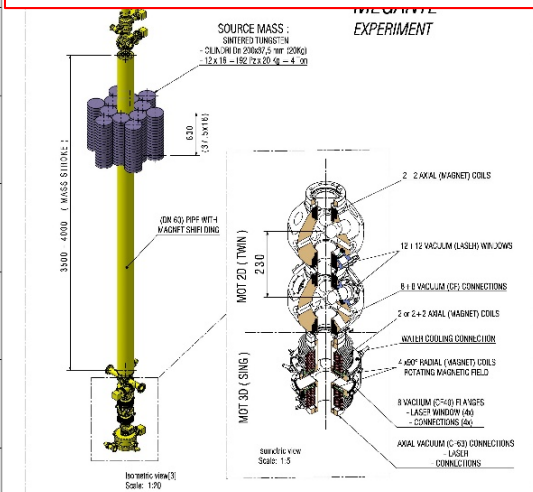


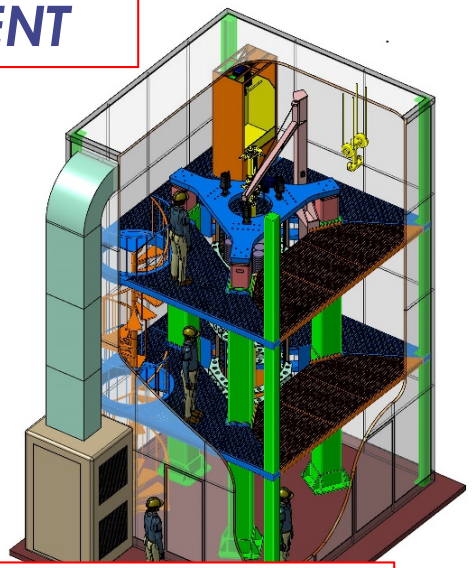
MAGIA detector

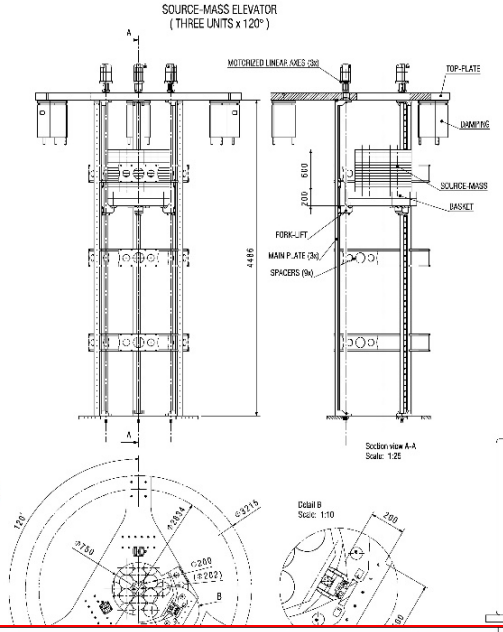
***G. Lamporesi, A. Bertoldi, A. Cecchetti, B. Dulach, M. Fattori, A. Malengo,, S. Pettorruso, M. Prevedelli, G.M. Tino,** *Source Masses and Positioning System for an Accurate Measurement of G,* **Rev. Scient. Instr. 78, 075109 (2007)**

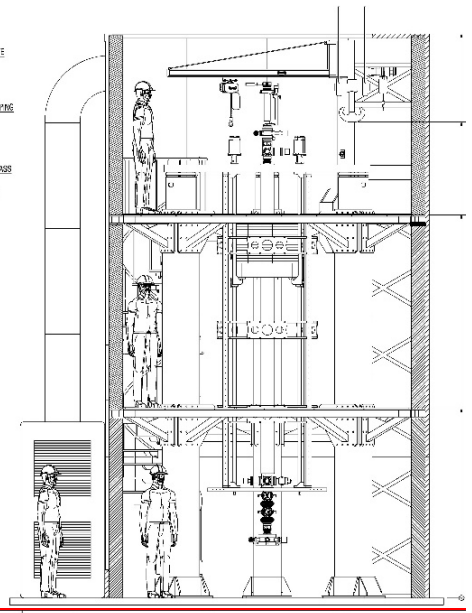
ERC-2018-STG - ERC Starting Grant
Gabriele Rosi - Firenze

MEGANTE EXPERIMENT



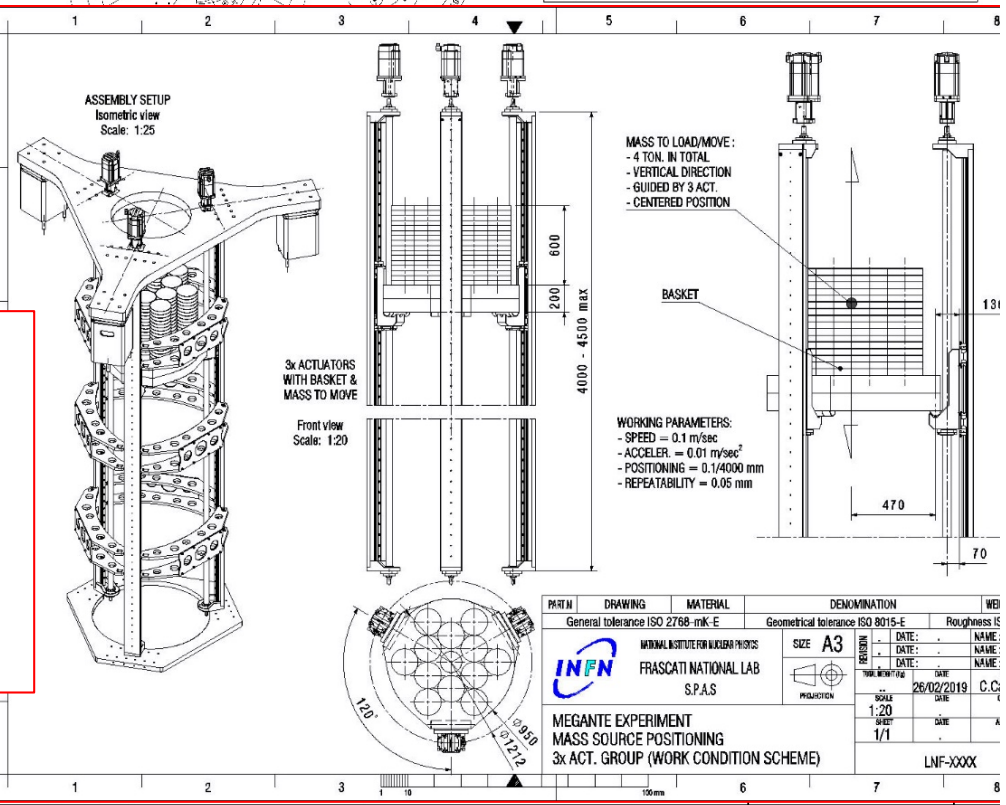






COMPONENTISTICA BOSCH-REXROTH PER MOVIMENTAZIONE

		COSTO	QU	TOTALE	
MECCANICA					
ASSI VERT. (3x)	R151057990 VITE A SFERE CON CHIOCCIOLA	3,559.61	3	10,678.83	SENZA IMS
	R168500010 ROTAIA SFERE IMS* IMS2A-KSA	7,190.74	3	21,572.22	-3,971.22
	R168100010 PATTINO SFERE IMS* IMS2A-KWD	2,059.65	3	6,178.95	-5,728.56
	R159123030 SUPPORTO RITTO SEB-F-A 30	1,658.82	3	4,976.46	
	R159163520 SUPPORTO RITTO SEB-L-S 35	384.00	3	1,152.00	
	R165131220 PATTINO SFERE CS KWD-035-FNS-C1-P-1	150.13	3	450.39	
	https://www.youtube.com/watch?v=WOLiCfhmKVI *		TOTALE	45,008.85	-9,699.78
AZIONAMENTO					
UNITA' MASTER (1x)	R911382896 MS2N07-D0BHN-CMSG2-NNNNN-NN (MOTORE)	3,076.04	1	3,076.04	
	R911295324 HMS01.1N-W0036-A-07-NNNN (INVERTER)	1,296.12	1	1,296.12	
	R911340358 CSH02.1B-CC-EC-ET-L3-NN-NN-FW (UNITA' CONTROLLO)	1,910.40	1	1,910.40	
	R911347115 FWA-INDRV*-MPC-20VRS-D5-1-ALL-ML (SOFTWARE)	1,000.05	1	1,000.05	
	R911336255 PFM04.1-512-NW	126.54	1	126.54	
	R911317797 RKB0013/00,25	22.98	1	22.98	
	R911306620 HAS01.1-050-072-MN	34.41	1	34.41	
	R911306330 HAS02.1-001-NNN-NN	46.69	1	46.69	
	R911372089 RH2-022DBB-NN-010,0 (CABLES)				
UNITA' SLAVE (2x)	R911382896 MS2N07-D0BHN-CMSG2-NNNNN				
	R911295324 HMS01.1N-W0036-A-07-NNNN (I				
	R911339883 CSB02.1A-ET-EC-NN-L3-NN-NN-F				
	R911347143 FWA-INDRV*-MPB-20VRS-D5-1-S				
	R911330280 FWS-INDRV*-MP*-**VRS-NN-PR				
	R911306330 HAS02.1-001-NNN-NN				
	R911372089 RH2-022DBB-NN-010,0 (CABLES)				
POWER SUPPLY	R911297460 HMV01.1R-W0018-A-07-NNNN (P				
	R911382794 HNF01.2D-F240-R0026-A-480-NN				
	R911306584 HNL01.1R-0980-C0026-A-480-NN				
	R911306630 HAS01.1-175-NNN-MN				
	R911347042 SWA-IWORKS-MLD-14VRS-D0-DV				
	R911389200 RKB0021/003,0				



FIRST DIMENSIONIG OF VERTICAL DRIVE SETUP IN COLLABORATION WITH BOSCH-REXROTH & COST ESTIMATE OF STANDARD COMPOPNENTS: 73 K€ +IVA

Cesidio.Capoccia@lnf.infn.it

Beamlines @ DAΦNE

Building 12

OPEN to USERS

1) SINBAD - IR beamline (1.24 meV - 1.24 eV)
2) DXR1- Soft X-ray beamline (900-3000 eV)
3) DXR2 – UV-VIS beamline (2-10 eV)

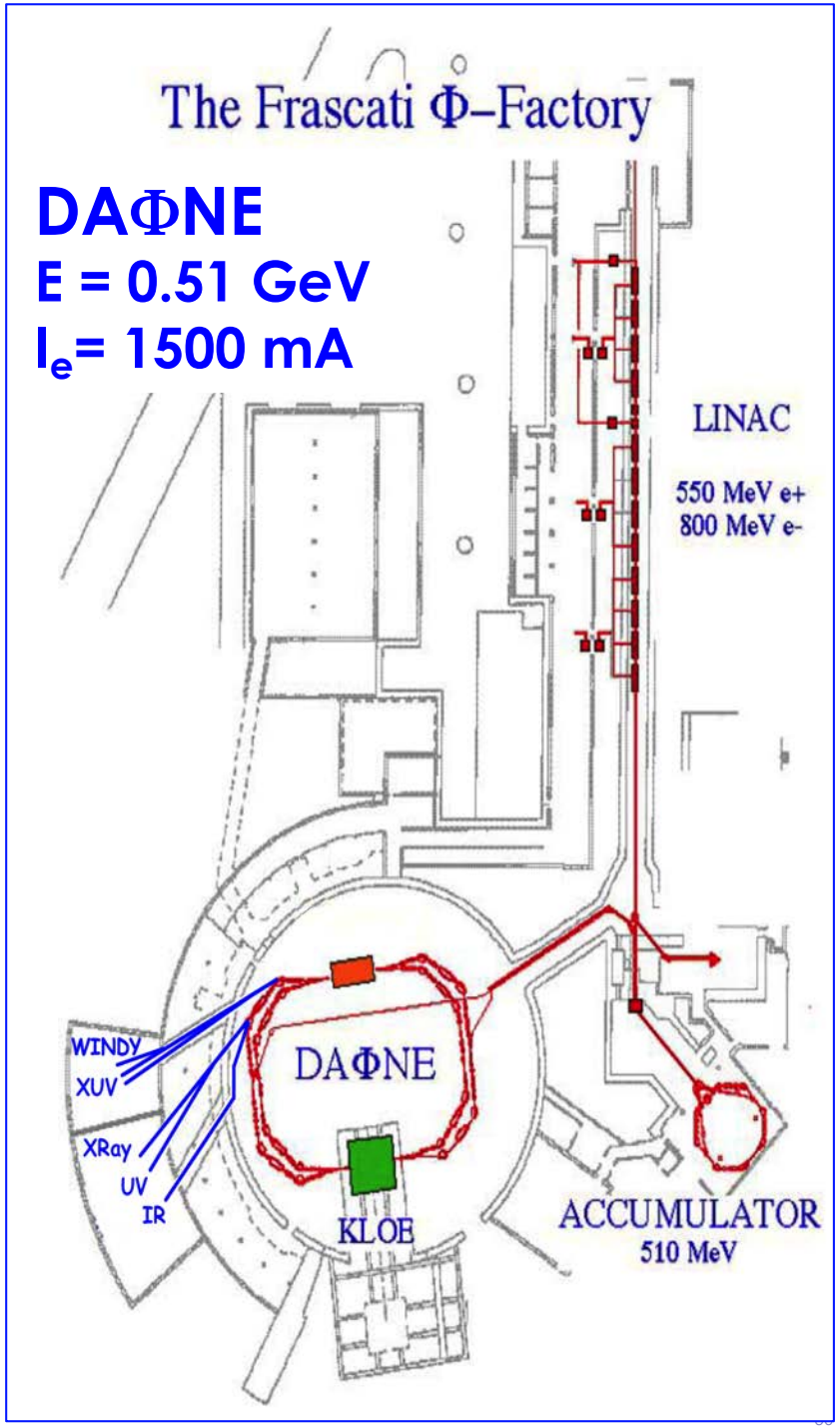
Building 13

XUV beamlines UNDER COMMISSIONING

4) XUV1 - Low Energy Beamline (30-200 eV)
5) XUV2 - High Energy Beamline (60-1000 eV)

UNDER Construction

6) New XUV2 Branch White Line - CERN WINDY



DAFNE-Light Activity

Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

The activity at DAFNE-Light restarted in May 2020 with in-house measurements and works for third parties, online schools on cultural heritage and with users by the end of June 2020 initially only Italian but in September also the first external user coming from Cyprus and related to the EU CALIPSOplus (2018-2021) project for Transnational Access to SR beamlines.

Italian Users: between the end of June and beginning of October about **7 proposals** related to studies in the field of **cultural heritage**, **material science** and **environment** received beamtime at the **SINBAD IR beamline some including also the use of the SEM-EDS microscope**.

Proposals that receive beamtime

Material Science

Molla2: Extra framework molecules in lazurite: a combined XAS/FTIR study (**Roma Tre**)
MIOP: Mid-IR Oxide Plasmonics (**Sapienza, Rome**)

Environmental Studies

FAST: Multi-analytical approach to determine element and spectral variation and distribution in Pteris seedlings exposed to arsenic (**Sapienza, Rome**)

Cultural Heritage

CulturalFTIR: Application of FTIR Technique to Cultural Heritage (**CNR - Sapienza**)
CHNET:
FTIR and Raman studies on ancient manuscripts (**Sapienza, Rome**)
Analysis of paintings of Antonello Da Messina (**ICR - Istituto Centrale per il Restauro**)
Work for third parties:
FTIR, Raman and SEM-EDS studies on fragments of ancient rock paintings (**Alfa restauri**)

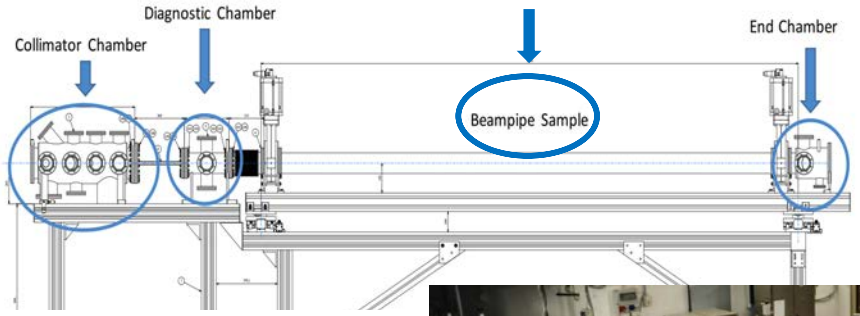
INFN LNF
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

Beamline WINDY (CERN-INFN)

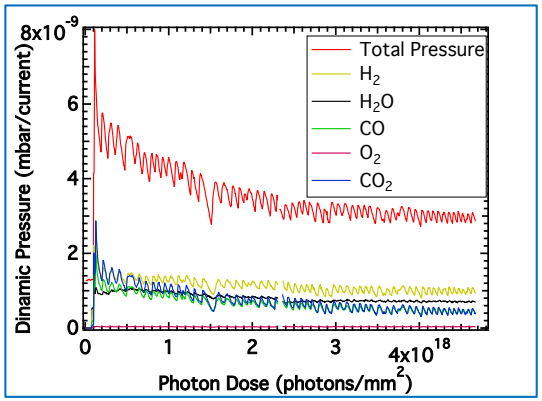
WHITE LIGHT LINE FOR DESORPTION YIELDS

WINDY - Construction of a dedicated white light beamline for synchrotron radiation-based material studies in the framework of the High Luminosity LHC and Future Circular Colliders.

Synchrotron radiation-based material studies to achieve information on surface reflectivity, photon and photo-induced desorption yield, secondary electron emission, chemical modifications etc. on **small samples** using the existing **XUV beamlines and conventional sources** and on real long beampipes using the WINDY beamline.



Schematic view of the WINDY beamline setup



Some preliminary results achieved with the DAFNE XUV synchrotron radiation on small samples :
Gas desorption during photon irradiation.

Studies are on going on surfaces of small samples using the XUV experimental chambers and conventional sources waiting for the SR beam.

Outreach

Since 20 years the outreach service of the Research Division in promoting the spreading of the scientific and technological culture with **educational programs**, addressed to students, teachers and general audiences of every age, from Italy and abroad.

Insights and education about the INFN-LNF research are offered thanks to the organization of **guided tours** and **open days**, **stages for students**, **refresher courses for teachers**, **seminars** and **divulgation events**.

Due to the pandemic the activity now is completely online, but the service is more active than ever!

Main 2020 events

INSPYRE 2020 – INternational School on modern PhYsics and REsearch (online edition)
30 Mar. - 3 Apr.

Researchers @Home
A series webinars on modern physics subjects addressed to high school students. From Apr. to Jul. every week.

Summer School 2020 – online
15 -19 Jun.
webinars to orient high school students towards university choice and STEM

Un Tuffo nel Mistero – Colloqui in rete
From Sep. every 15 days a webinar on scientific subject for general public

Incontri di Fisica 2020
4 - 6 Nov.
the 20th edition of refreshment course of Modern Physics for high school teachers, now also opened to scientific journalists.