

La Sezione di Pisa dell'INFN

Sede Marzotto



Sede S. Piero



<http://www.pi.infn.it/index.php?id=15>

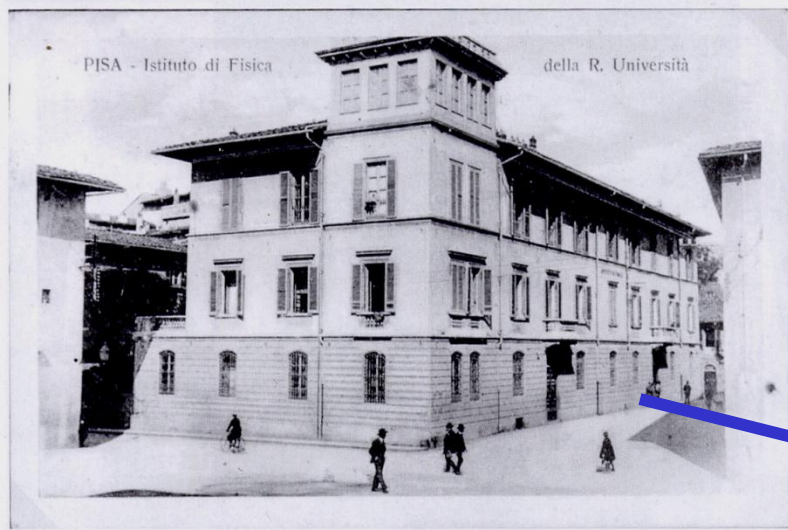


Gruppo Collegato di Siena



Scuola Normale Superiore

La Storia della Sezione



1972



2003



Pisa → S. Piero → Pisa

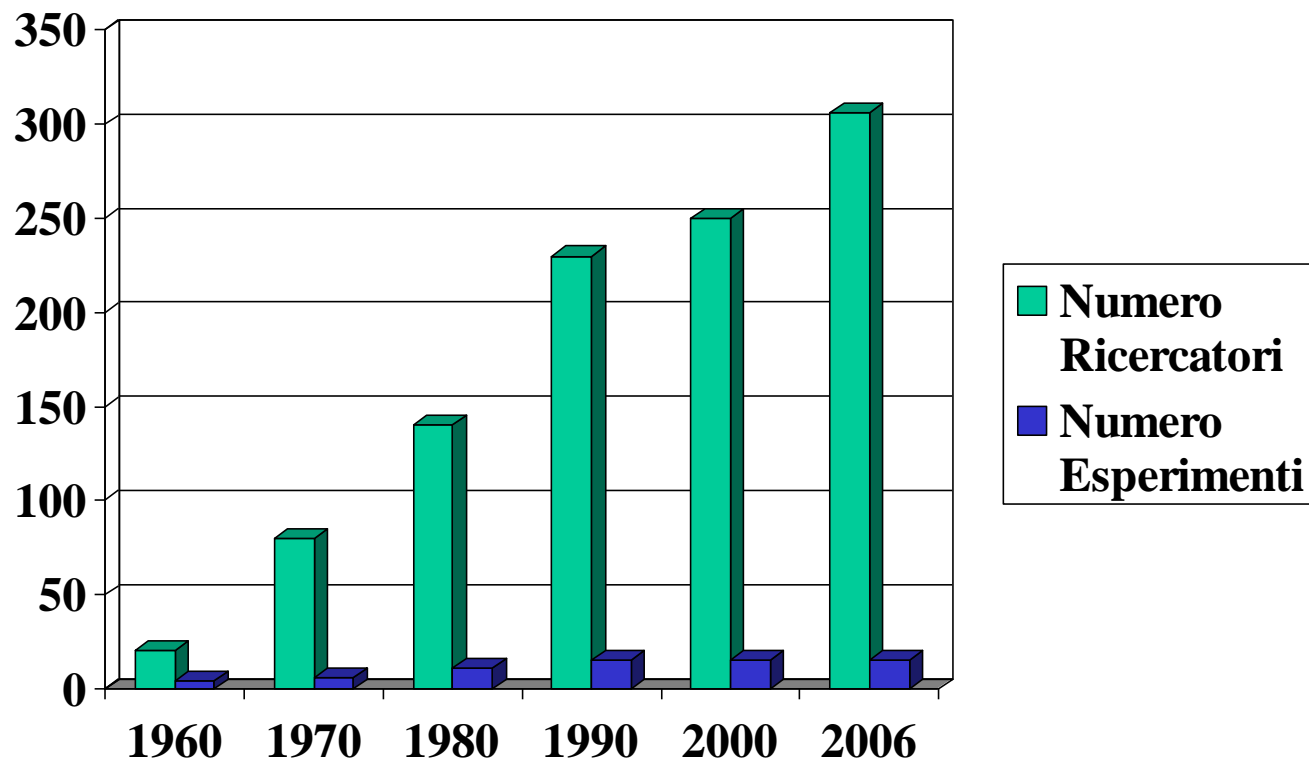


Istituto Nazionale
di Fisica Nucleare

SEZIONE DI PISA

Sezione di PISA

Ricercatori / Esperimenti



109 Dipendenti

293 Associati

402 In totale

PROFILO	LIVELLO		TOTALI
Ricercatore	III	22 di cui 8 a tempo determinato	53
Primo Ricercatore	II	19 di cui 1 a tempo determinato	
Dirigente di Ricerca	I	12	
Tecnologo	III	11 di cui 4 a tempo determinato	16
Primo Tecnologo	II	4	
Dirigente Tecnologo	I	1	
Ausiliare di Amm.ne	IX	0	12
Operatore di Amm.ne	IX	0	
Operatore di Amm.ne	VIII	0	
Operatore di Amm.ne	VII	1	
Collaboratore di Amm.ne	VII	2 a tempo determinato	
Collaboratore di Amm.ne	VI	5	
Collaboratore di Amm.ne	V	2	
Funzionario di Amm.ne	V	1	
Funzionario di Amm.ne	IV	1	
Ausiliare tecnico	IX	0	28
Ausiliare tecnico	VIII	0	
Operatore tecnico	VIII	3 di cui 2 a tempo determinato	
Operatore tecnico	VII	0	
Operatore tecnico	VI	2	
C.T.E.R.	VI	12 di cui 5 a tempo determinato	
C.T.E.R.	V	7	
C.T.E.R.	IV	4	
PERSONALE DIPENDENTE AL 09/03/2006			109

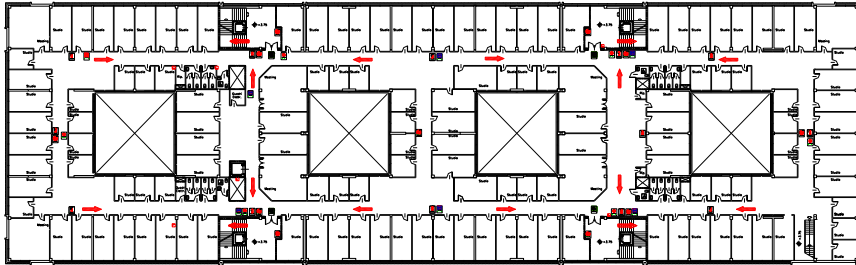
PISA

incarichi di ricerca	65
associazione scientifica	29
prof. a contratto	2
laureandi scientifici	26
borsisti scientifici INFN	10
dottorandi, post doc e assegnisti scientifici	79
specializzandi	3
tecnologi universitari	9
laureandi tecnologici	7
borsisti tecnologici INFN	8
dottorandi, post doc e assegnisti tecnologici	5
collaborazione tecnica	6
associazione tecnica	6

SIENA

incarichi di ricerca	5
associazione scientifica	7
prof. a contratto	1
borsisti scinetifici INFN	1
dottorandi, post doc e assegnisti scientifici	18
tecnologi universitari a tempo determinato	1
associazione tecnica	5

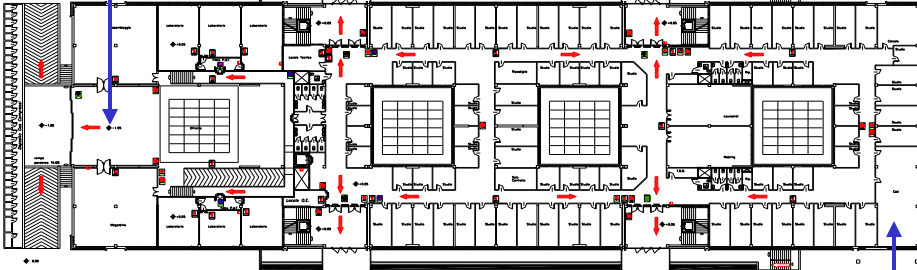
Primo piano - Uffici



Planimetrie Sede ex-Marzotto

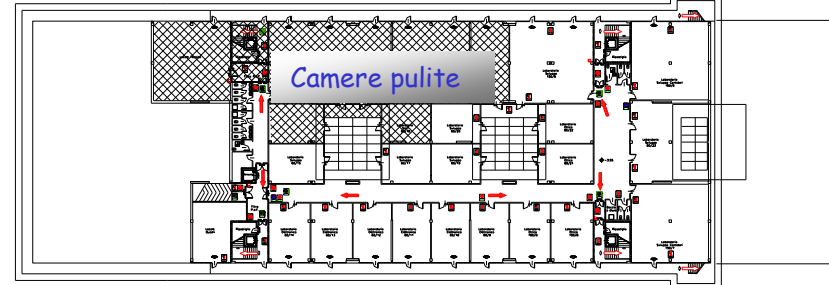
Officina Meccanica

Piano Terra - Uffici

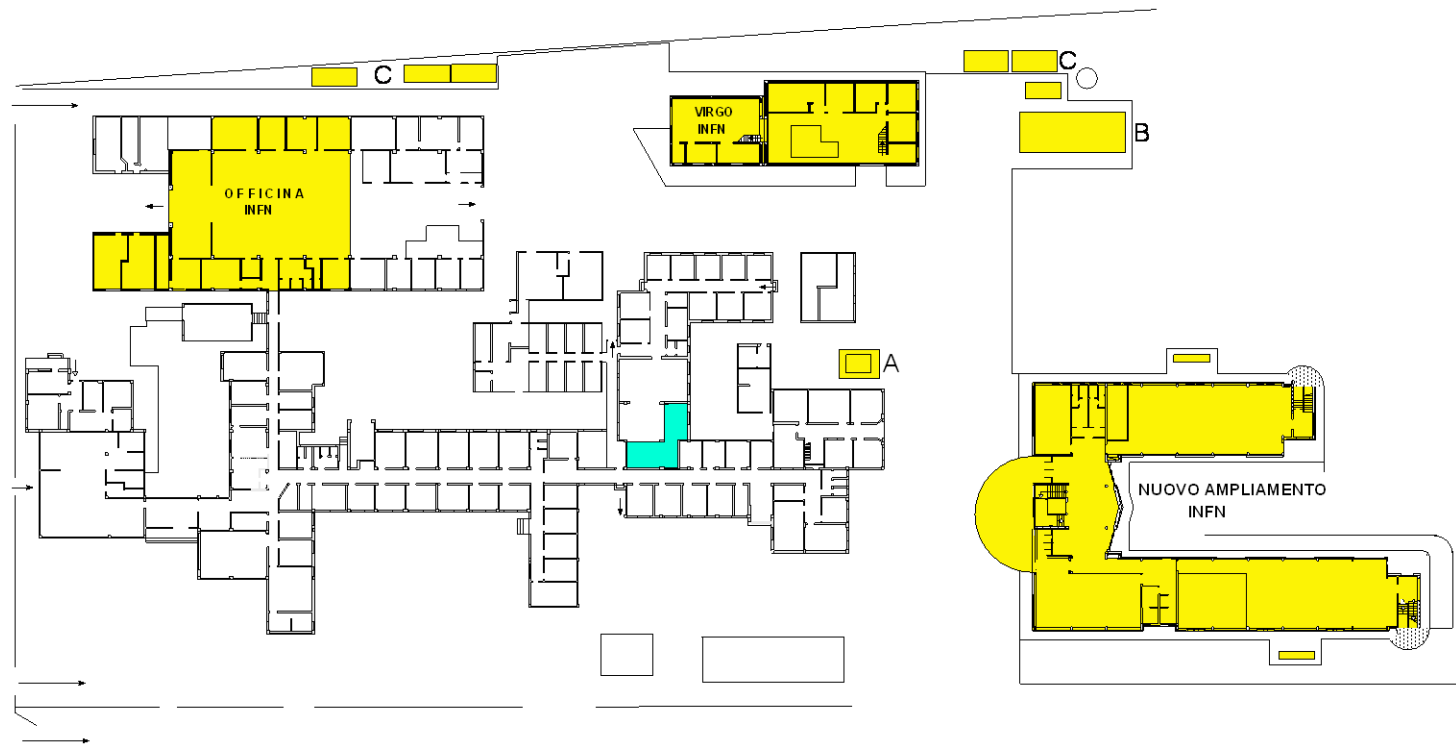


Centro
Calcolo

Piano interrato - Laboratori



Planimetria della Sede di S. Piero a Grado



Dipartimento di Fisica
Istituto Nazionale di Fisica Nucleare
sede di San Piero a Grado Pisa

-  PARTE RIMASTA I.N.F.N.
(convezione del)
-  SALA CALCOLO INFN
(provvisoria)
- A deposito sorgenti
- B centrale termica
- C container/magazzino

Organigramma dei Servizi

- Servizio Amministrazione (Resp. Patrizia BENFATTI)
- Servizio Direzione (Resp. Paolo VILLANI)
- Servizio Tecnico Generale (Resp. Mario IACOPONI)
- Servizio Elettronica (Resp. Fabio MORSANI)
- Servizio Progettazione meccanica (Resp. Fabrizio RAFFAELLI)
- Servizio Officina meccanica (Resp. Andrea DISACCO)
- Servizio Calcolo e reti (Resp. Silvia AREZZINI)
- Servizio Alte Tecnologie (Resp. Filippo BOSI)
- Servizio Prevenzione e Protezione (Resp. Giancarlo DE CAROLIS)

<http://www.pi.infn.it/index.php?id=100>

Servizio di Direzione

Responsabile

- Paolo Villani (Funzionario di Amm.ne)

Segreteria Scientifica

- Lucia Lilli (Funzionario di Amm.ne)
- Claudia Tofani (Collaboratore di Amm.ne)

Segreteria del Personale e di Direzione

- Piergiorgio Masi (Collaboratore di Amm.ne) (*part-time orizzontale 40%*)
- Erika Cioli (Collaboratore di Amm.ne) (*a tempo determinato*)
- Anna Pochini (C.T.E.R.)
- Adele Parodi (*a tempo determinato*)

<http://www.pi.infn.it/index.php?id=30>

Servizio di Amministrazione

Responsabile

- Patrizia Benfatti (Funzionario di Amm.ne)

Ordini

- Roberta Frassi (Collaboratore di Amm.ne)
- Simona Petronici (Collaboratore di Amm.ne)

Mandati di pagamento

- Monica Fagioli (Operatore di Amm.ne)
- Elena Bartalini (Collaboratore di Amm.ne) *(a tempo determinato)*

Missioni

- Clara Scopsi (Collaboratore di Amm.ne)
- Oriana Benedettini (Collaboratore di Amm.ne)
- Silvia Bernardi *(a tempo determinato)*

Servizio Cassa

- Clara Scopsi (Collaboratore di Amm.ne)

Magazzino

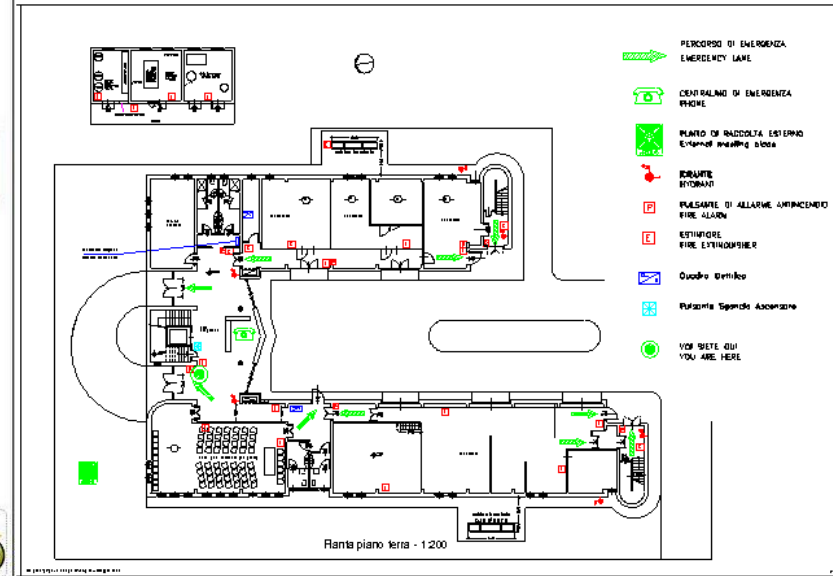
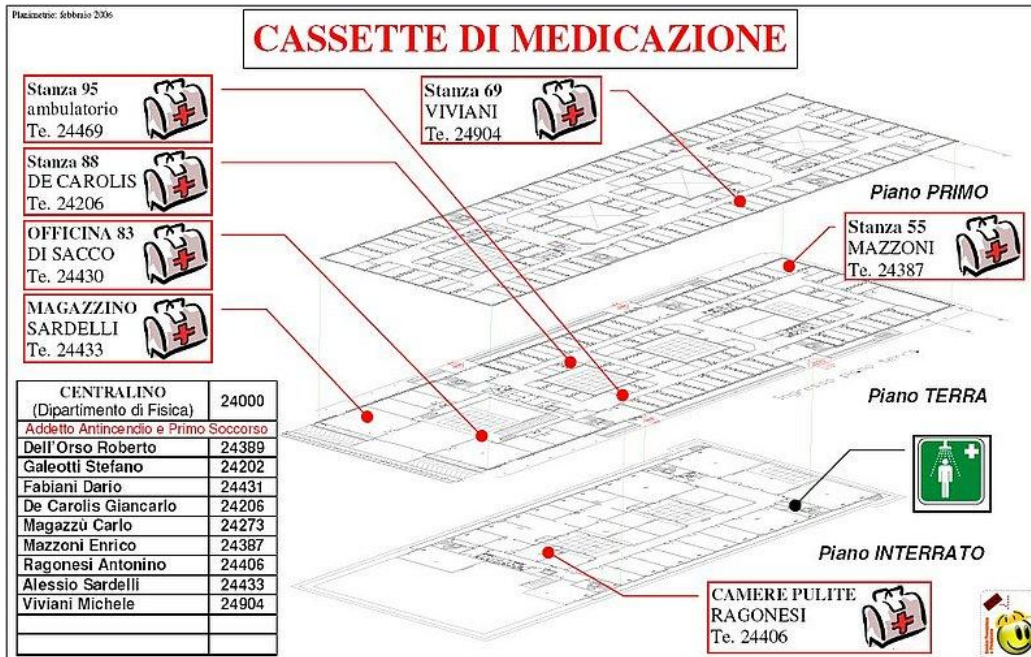
- Alessio Sardelli *(CTER a tempo determinato)*

<http://www.pi.infn.it/index.php?id=29>

☐ Servizio di Prevenzione e Protezione

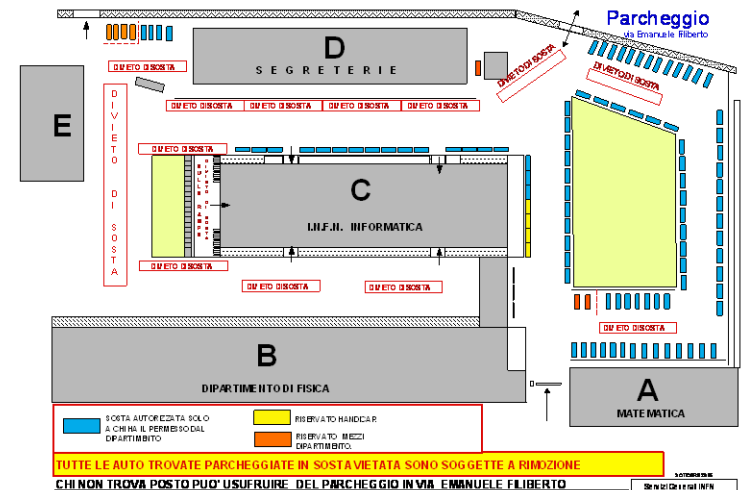
- Giancarlo De Carolis *Responsabile*

<http://www.pi.infn.it/index.php?id=28>



☐ Servizio Tecnico Generale

- Mario Iacoponi *Responsabile*
- Maurizio Garzella



Servizio di Elettronica

Strumenti a disposizione

Personale dipendente

- **Fabio Morsani** (tecnologo - **responsabile del servizio**)
- **Guido Magazzù** (tecnologo)
- **Stefano Galeotti** (tecnologo)
- **Fabio Gherarducci** (CTER)
- **Carlo Magazzù`** (CTER)
- **Aldo Tazzioli** (CTER)
- **Alberto Gennai** (tecnologo - Virgo)
- **Federico Paoletti** (CTER - Virgo)

Personale associato

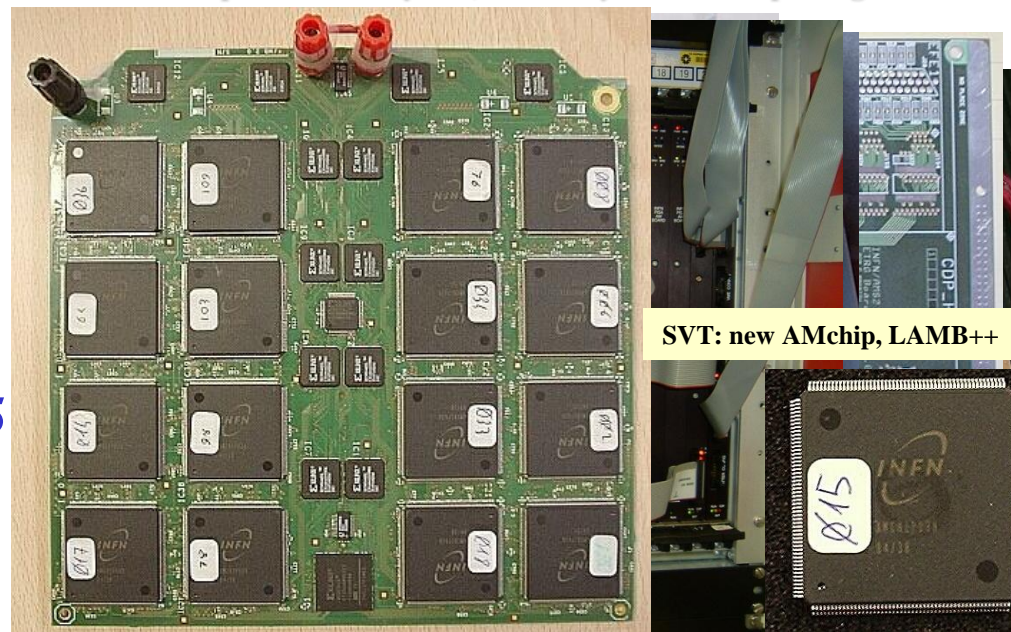
- **Marco Piendibene** (tecnologo universitario)
- **Carlo Avanzini** (tecnico universitario)
- **Luciano Zaccarelli** (tecnico universitario)
- **Fausto Profeti** (tecnico universitario)

Personale a tempo determinato

- **Franco Spinella** (art.23 fino nov. 2007)
- **Elena Pedeschi** (ass. di ric. fino 23/1/08)
-

1. **Software per disegno e simulazione schede**
2. **Software per VLSI**
3. **Software per FPGA Altera, Xilinx, Actel**
4. **Software per microcontrollori Atmel e PIC**
5. **Prototipi PCB dual layer con vias (circa 100 in 2 anni)**
6. **Schede di sviluppo FPGA Altera e Xilinx**
7. **Montaggio e reworking componenti smd (non BGA)**
8. **Strumentazione per test: logic analysers, pattern generators, spectrum analysers, arbitrary waveform/pulse generators**

<http://www.pi.infn.it/index.php?id=25>



Servizio Calcolo a Pisa

- S. Arezzini (Tecnologo) *Responsabile*
- A. Ciampa (Tecnologo)
- F. Donno (Tecnologo) *(congedo dal 2002 (GRID))*
- E. Mazzoni (Tecnologo) *(a tempo determinato)*
- G. Terreni (Tecnologo)
- M. Giannini (CTER)
- T. Palla (CTER) *(part-time verticale(70%))*
- D. Fabiani (O.T.) *(a tempo determinato)*
- M. Vaglini (O.T.)
- S. Marini (borsista tecnologo)
- + M. Davini, R. Amaranti *(Dipartimento)*

Farms della Sezione (fino al 2006)

- ATLAS	20 CPU
- CMS/GRID	23 CPU
- MAGIC	6 CPU
- MEG	6 CPU
- SIENA	25 CPU
- CDF	12 CPU
- TEORICI	30 CPU
- GRID	20 CPU
- EPSI	30 CPU
- APE	

Sala Calcolo (fino al 2006)



• *Supporto scientifico*

• Supporto Farms gruppi sperimentali e teorici

Gruppo I D. Fabiani, E. Mazzoni, G. Terreni

Gruppo II E. Mazzoni, G. Terreni

Gruppo IV A. Ciampa

• GRID

S. Arezzini, A. Ciampa, E. Mazzoni, (F. Donno)

+ M. Davini, R. Amaranti (Centro Calcolo Dipartimento)

Infrastruttura

Servizi di base: AFS, mail, printing service, WEB, ...
Supporto utenti: help desk, supporto amministrazione

- | | |
|----------------------------|-------------------------------------|
| • AFS | S. Arezzini |
| • Backup | S. Arezzini |
| • Conferenze | M. Giannini |
| • Dominio Windows | D. Fabiani, M. Giannini, M. Vaglini |
| • Help desk | D. Fabiani, M. Vaglini, S. Marini |
| • Mailservice | E. Mazzoni, G. Terreni |
| • Network | D. Fabiani, E. Mazzoni |
| • Printservice | D. Fabiani, E. Mazzoni |
| • Storage Area Network | S. Arezzini E. Mazzoni |
| • Supporto Amministrazione | M. Giannini, G. Terreni |
| • Supporto San Piero | M. Giannini |
| • WEB | S. Arezzini, M. Vaglini |

Ricerca e sviluppo

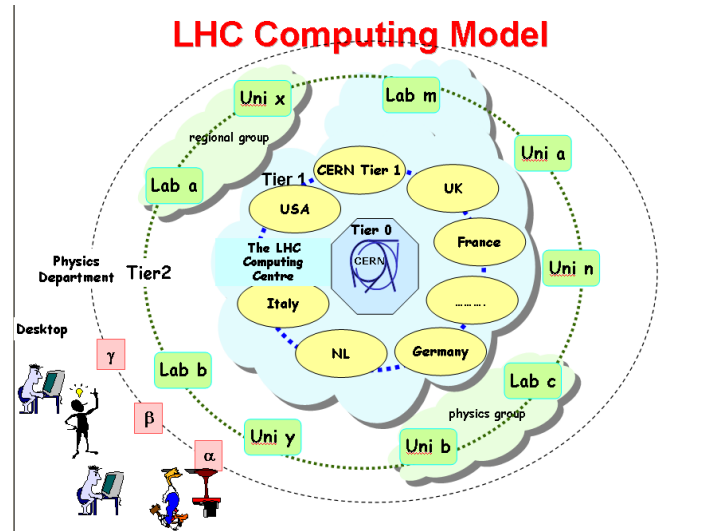
- Attivita' di Technology Tracking
Coordinate da M. Davini
- Comitato Tecnico Scientifico MAN pisana
- Gruppi di lavoro INFN
Netgroup, AFS, Kerberos5, Storage, Mail,
Harmony, Windows

• Farm di sezione

- | | |
|------------|--------|
| – ATLAS | 20 CPU |
| – CMS/GRID | 23 CPU |
| – MAGIC | 6 CPU |
| – MEG | 6 CPU |
| – SIENA | 25 CPU |
| – CDF | 12 CPU |
| – TEORICI | 30 CPU |
| – GRID | 20 CPU |
| – EPSI | 30 CPU |
| – APE | |

Prospettive del calcolo a Pisa

Proposta per un Tier 2 nel quadro di



ma non solo...

La realizzazione del Tier2 per CMS potrebbe essere il catalizzatore per la realizzazione di una

« Facility di calcolo integrata in Sezione »

Dal 2007: Facility di calcolo integrata in Sezione

Sottoprodotto: Tier2 di CMS

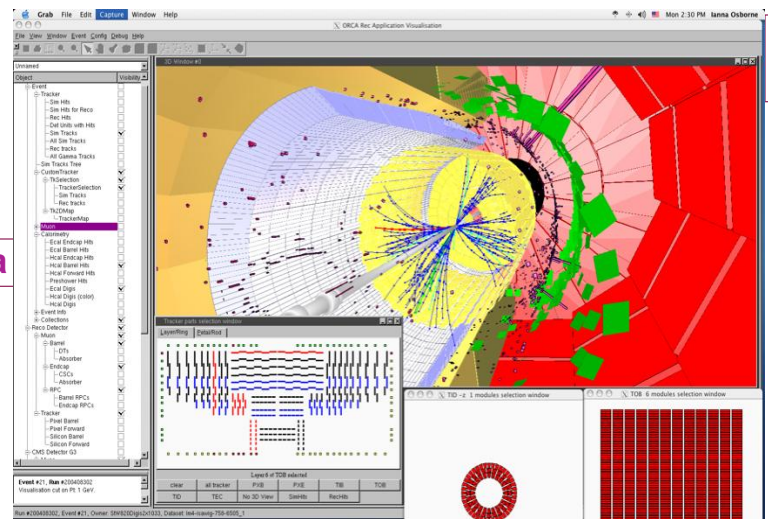
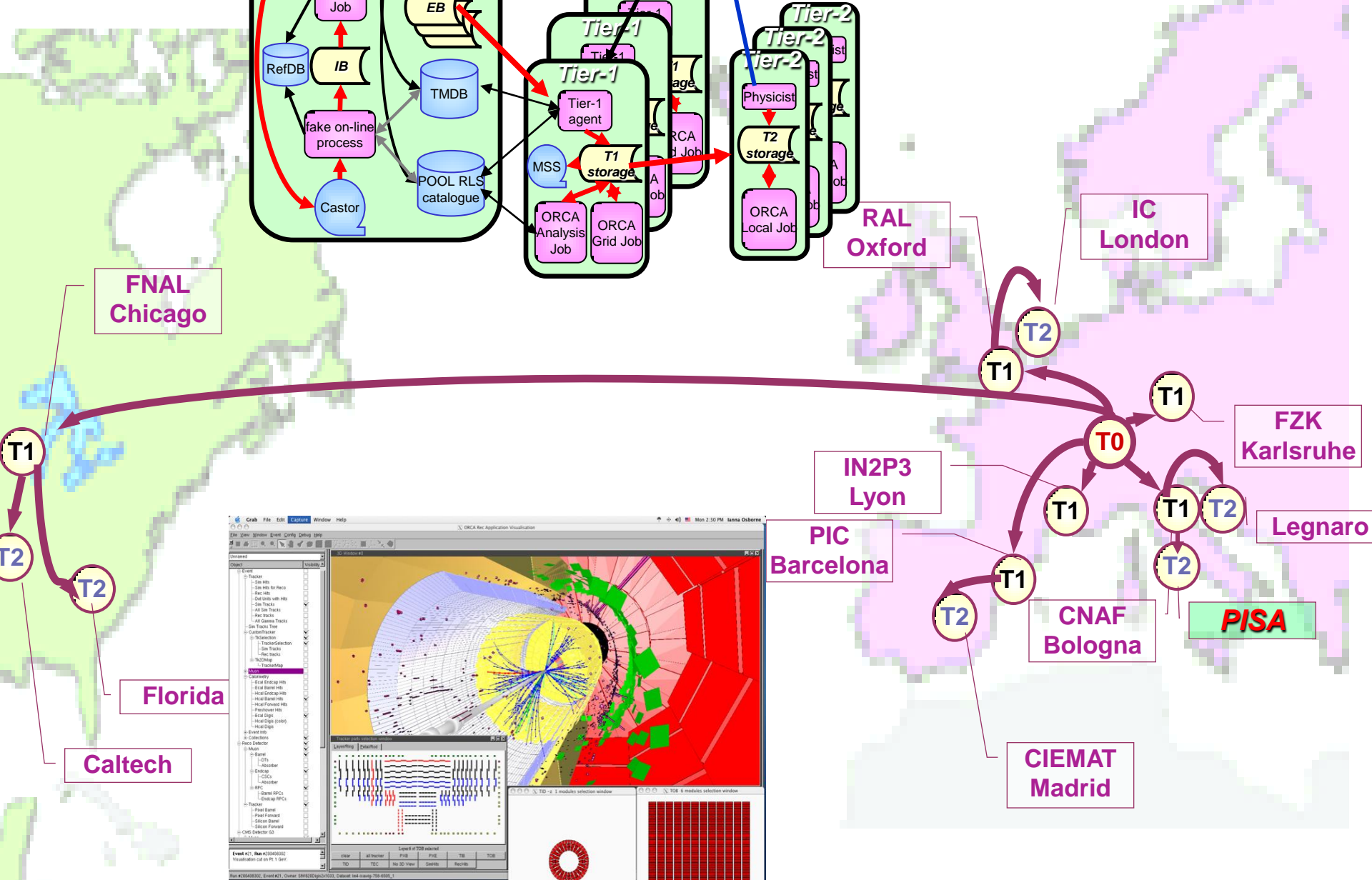
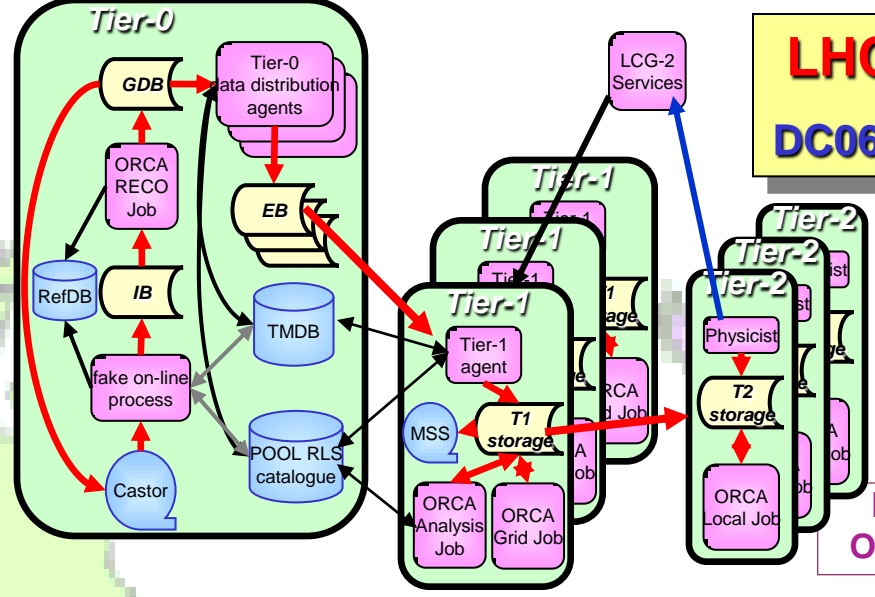
Sinergie tra:

- Dipartimento di Fisica
- Scuola Normale Superiore
- CMS_Sezione di Pisa



LHC Computing GRID (LCG)

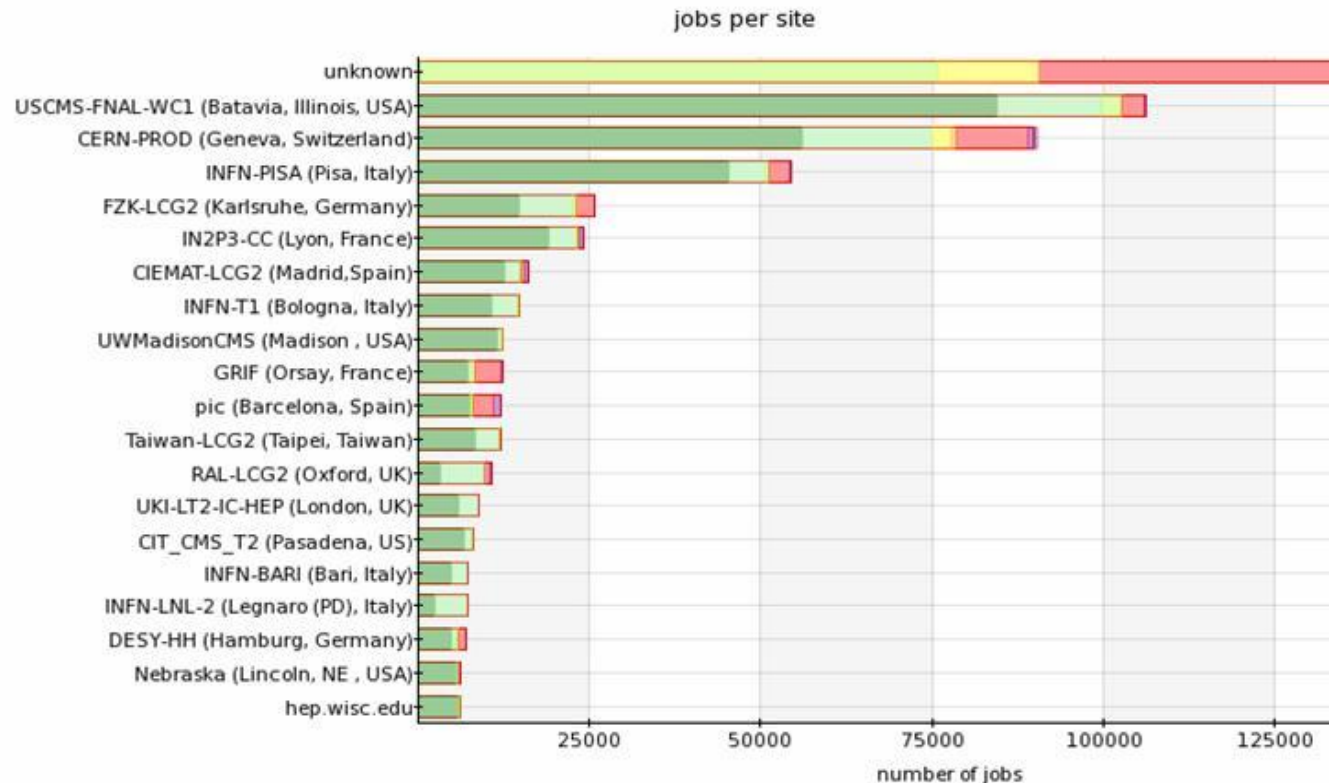
DC06 Data Challenge (CMS-managed)



Attivita' di Pisa per CMS (1)

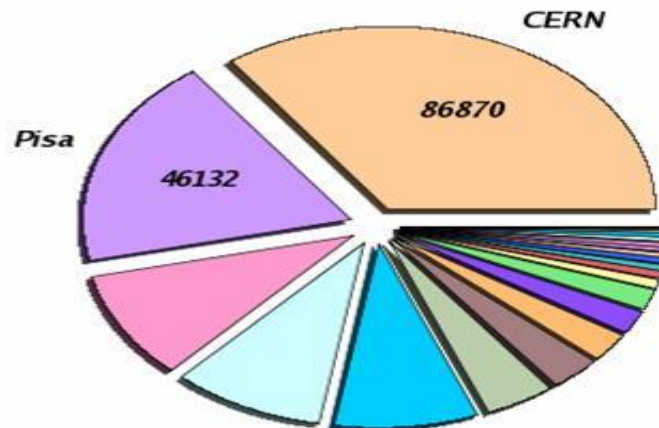
jobsummary waitingtime runningtime

any user
any site
any ce
any submissiontool
any dataset
any application
any rb
production
any grid
 unk pend run term
 done canc abort g-unk
 succ fail a-unk
 donesuccess
2007-03-15 07:33:14 to
2007-05-02 07:33:14
sort by site
 bars in the plot



Attivita' di Pisa per CMS (2)

Current Hours Spent on Successful Jobs (Sum: 248199 Hours)
12 Days from 2007-04-22 to 2007-05-04 UTC



CERN (86870)
T2_Spain (10677)
London_IC_HEP (2335)
Estonia (1042)
MIT (328)
RWTH (1)

Pisa (46132)
PIC (7683)
Florida (1453)
T2_Belgium (992)
Rome1 (285)

FNAL (23738)
Spain_CIEMAT (6261)
Legnaro (1415)
Caltech (991)
T2_DESY (123)

IN2P3 (22788)
Wisconsin (5301)
GRIF (1193)
Bari (754)
CSCS (52)

FZK (21712)
ASGC (4356)
INFN (1131)
Nebraska (563)
RAL (11)

Servizio Officina Meccanica

<http://www.pi.infn.it/index.php?id=23>

Berretta Luca

Fausto Giuseppe

Corucci Luigi

Mariani Filippo

Del Colletto Andrea

Orsini Antonio

Di Sacco Andrea

Tolaini Sergio

+ due borsisti tecnici



Fresatrice a controllo numerico



Stazione di lavoro per elettroerosione a filo



Zona tornitura

Officina a S. Piero

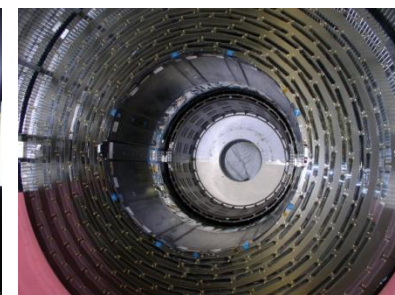
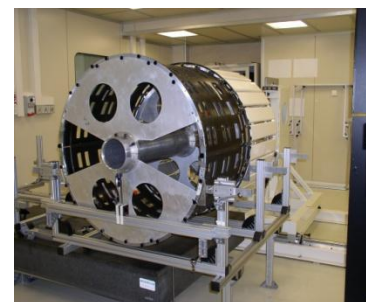


Berretta Luca

Mariani Filippo

T. Lomtadze (art. 23)

G. Petraghani (A.T.)



*Meccanica
TK di CMS*

Servizio di Progettazione Meccanica

Personale dipendente

- **Fabrizio Raffaelli** (tecnologo – responsabile del servizio)
- **Filippo Bosi** (responsabile AT)

Personale associato

- **Andrea Basti** (tecnologo universitario)

Personale a contratto

- Andrea Moggi (tecnologo art.36 fino dicembre 2007)
- Stefano Linari (tecnologo assegno ricerca - CMS)
- Maurizio Massa (tecnologo assegno ricerca – CMS)
-
-
- Sandro Bianucci (contratto univ. – MEG)
- Alessandro Soldani (contratto univ. – CMS)

Tecnologi in outsourcing o in collaborazione

- 7 Ingegneri della Stellar Solution (SLAC - GLAST)
- 3 Ingegneri nucleari di S. Piero (NEMO)

Strumenti a disposizione

- **Software per disegno e simulazione**
CAE I-deas NX12,
Ansys multi-physics ver 10,
Mathcad ver. 11.
- **Hardware**
12 computer da tavolo a Marzotto
5 computer da tavolo a S.Piero
5 portatili
2 plotter a getti d'inchiostro
3 stampanti A3 a getto d'inchiostro
1 fotocopiatrice formato A0

**Nel 2005-2006 picco di 21 Ingegneri di cui solo
3 staff + 1 a tempo determinato forniti dalla Sezione
Gli altri forniti dagli esperimenti CMS, GLAST, MEG,
NEMO,**

<http://www.pi.infn.it/index.php?id=24>

Servizio Alte Tecnologie

Coordinatore: Filippo Bosi

Alessandro Profeti

Antonio Ragonesi

Paolo Mammini

Giulio Petragnani

Marco Ceccanti (art. 15 fino 31/12/07)

Massimo Minuti (art. 15 fino 18/7/07)

Gabriele Balestri (art.2222)

Laboratori

❑ Clean room a Marzotto:

450m² classe 8; 100 m² classe 7

n.6 post. (1.6x0.8m²) classe 5

❑ Clean room a S.Piero:

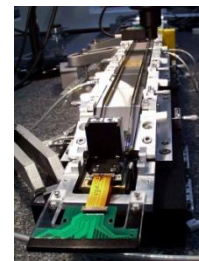
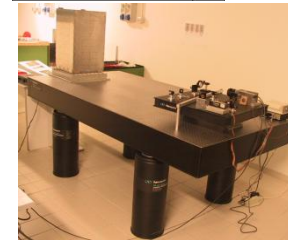
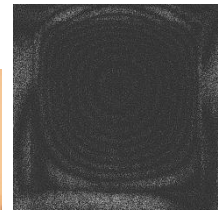
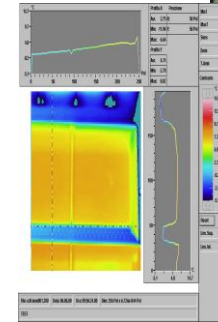
220m² classe 8; 30m² classe 7

❑ Lab. Diagnostica Strutturale



Tecnologie

- Metrologia tridimensionale (a contatto e senza contatto)
- Contaminazione Controllata
- Microsaldatura
- Ispezione ottica
- Test e caratterizzazione sensori al Si
- Tecnologia degli Adesivi
- Termografia
- Micromontaggi di precisione di Meccanica
- Micromontaggi di precisione di Elettronica
- Analisi Vibrazionale (Sistema ESPI e Shaker dinamico fino a 6 Kg)
- Caratterizzazione meccanica dei materiali e della giunzione incollata (macchina di test a trazione fino a 50.000 Nw).
- Test Termici ambientali (camere climatiche)
- Analisi della deformazione (Strain Gauge) ed analisi fotoelastica delle tensioni.





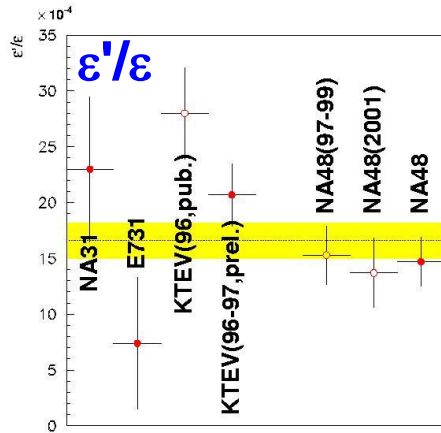
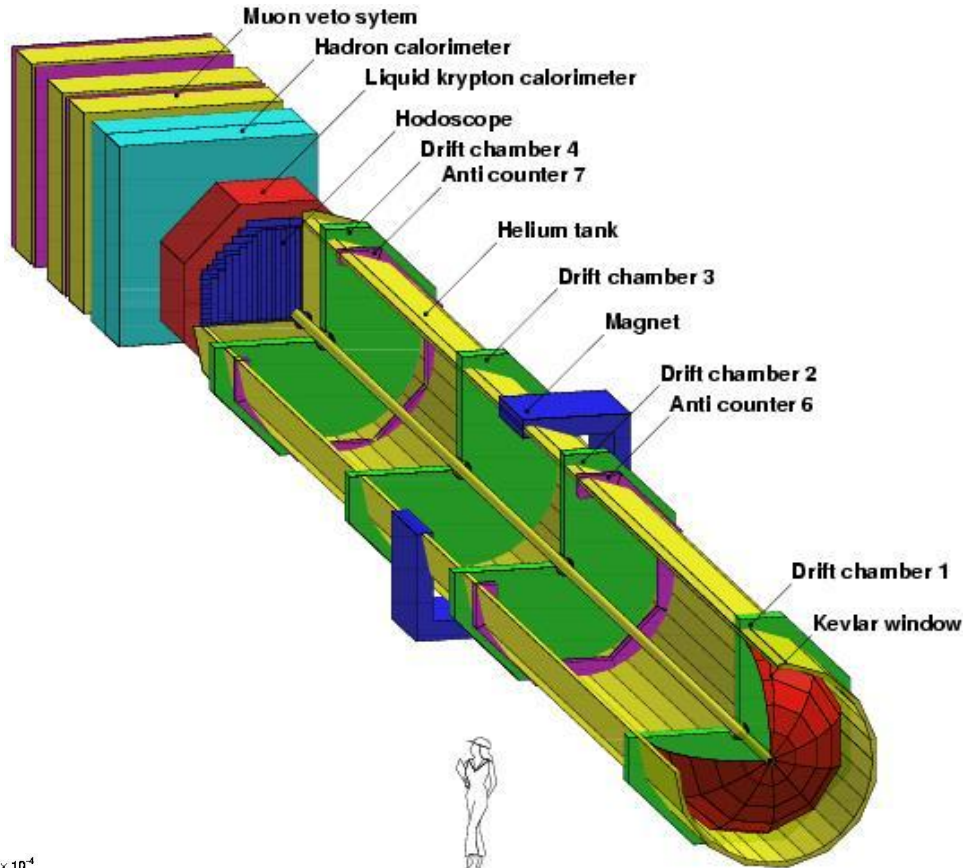
Clean Room facilities in Pisa



Attività di Gruppo I



The NA48 detector

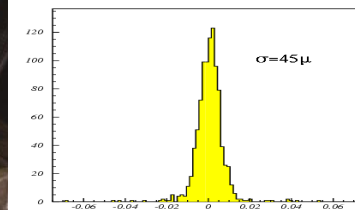
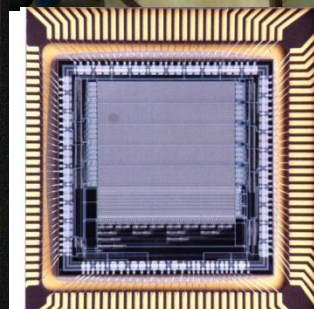
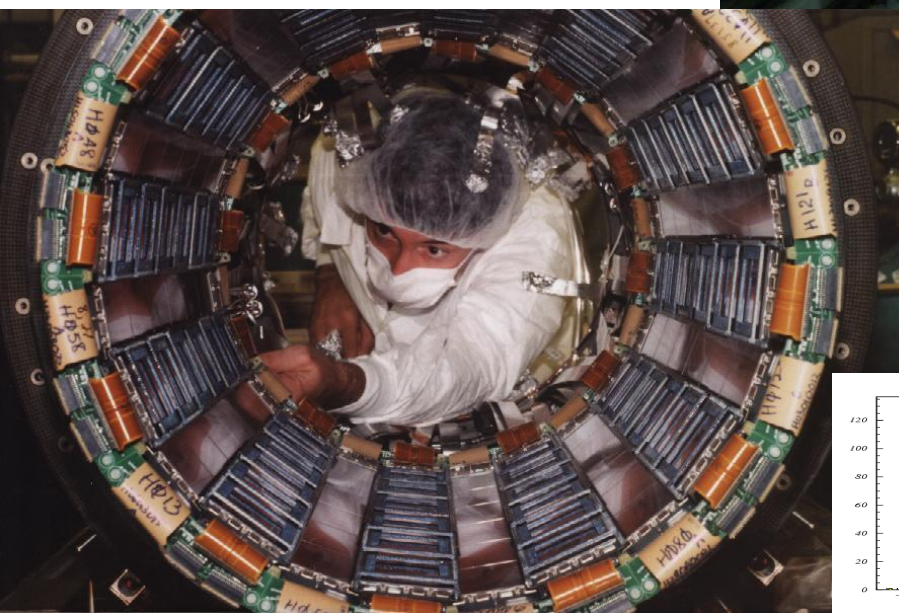
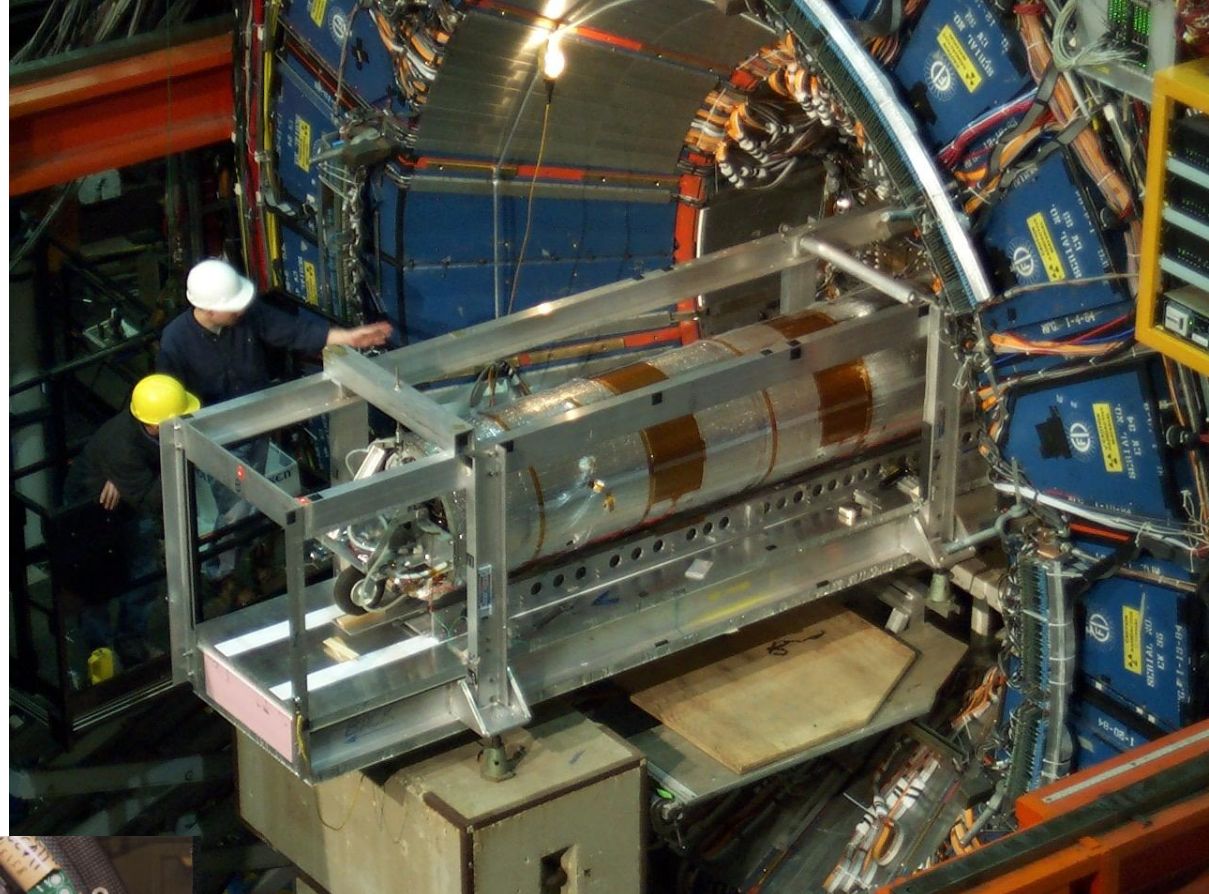
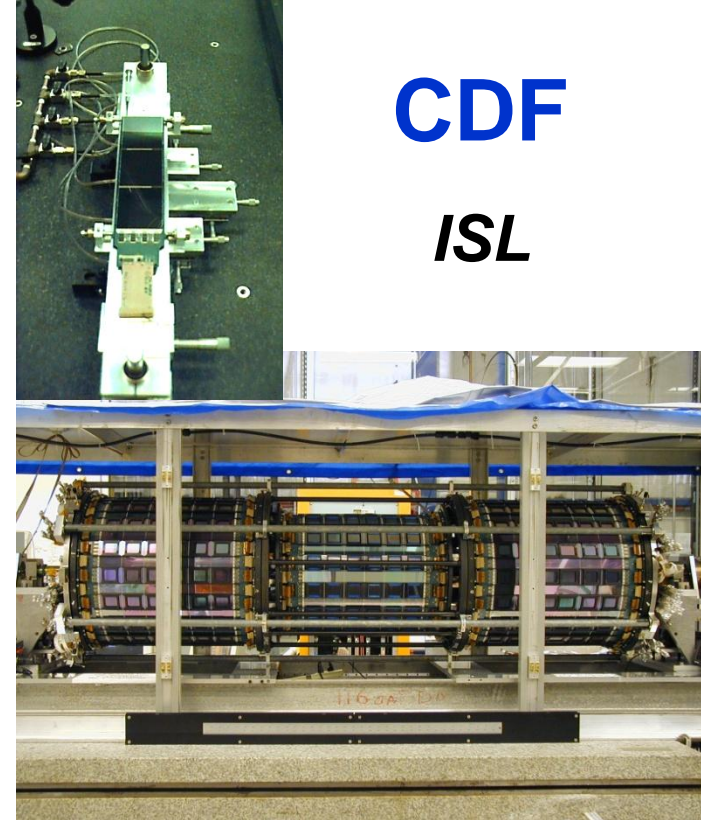


The liquid krypton calorimeter

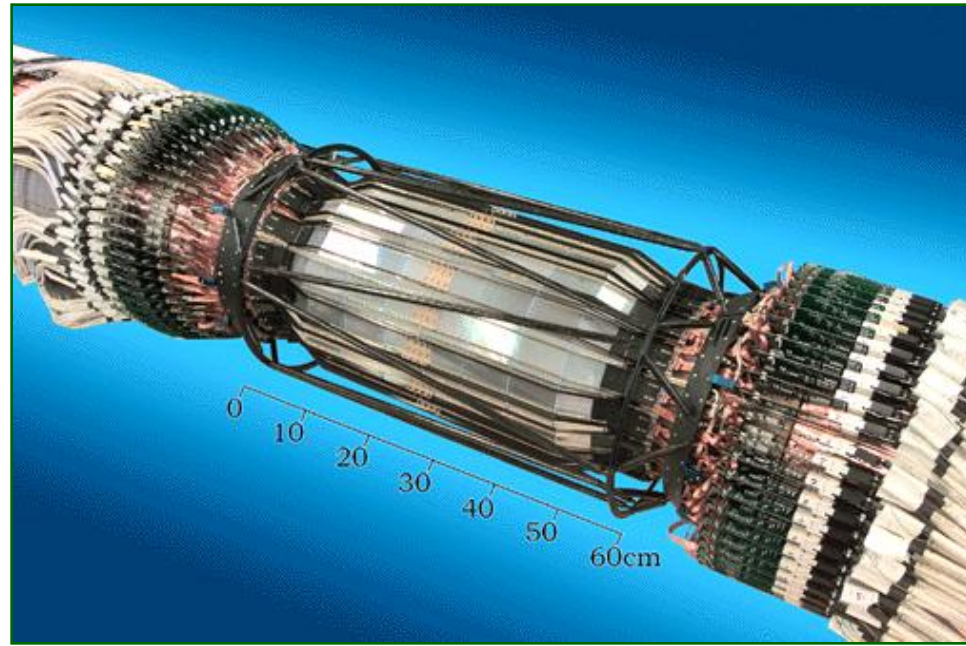
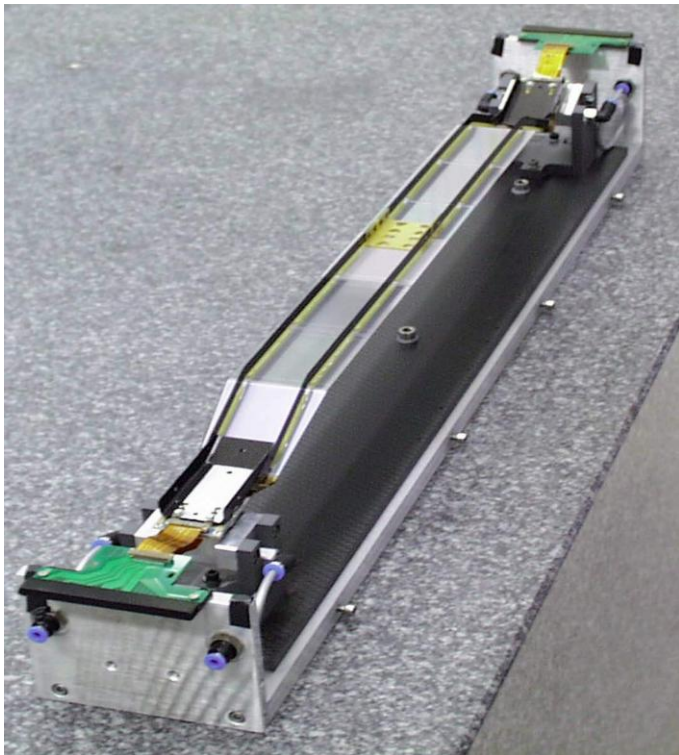
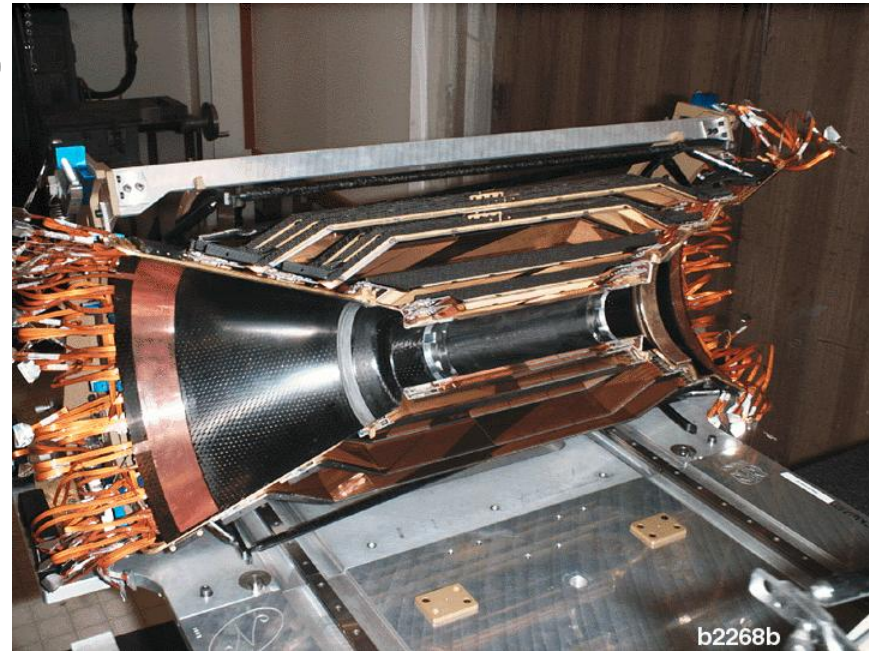
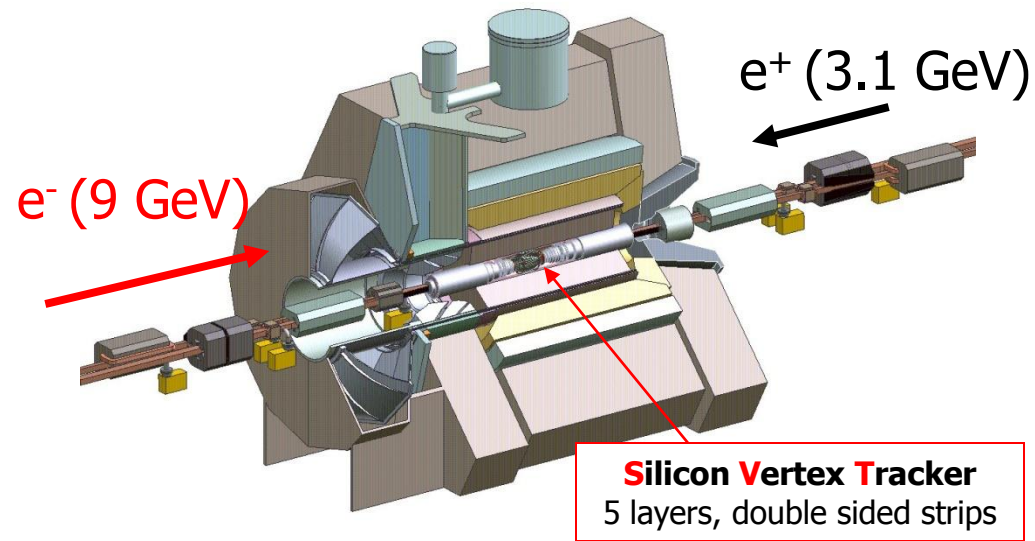


CDF

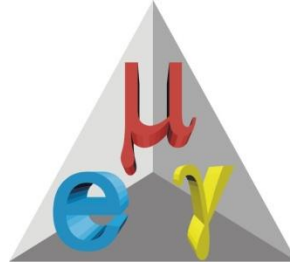
ISL



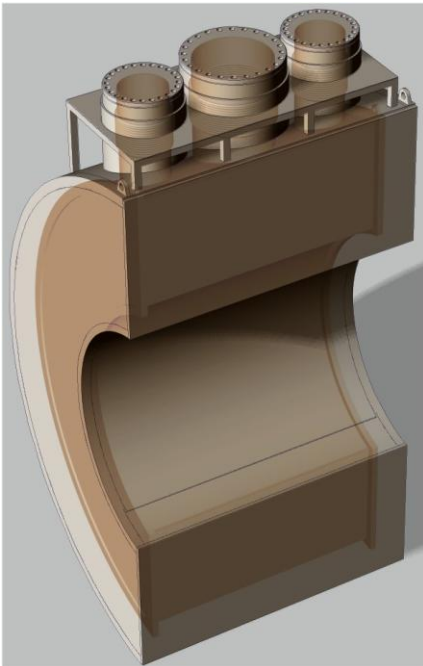
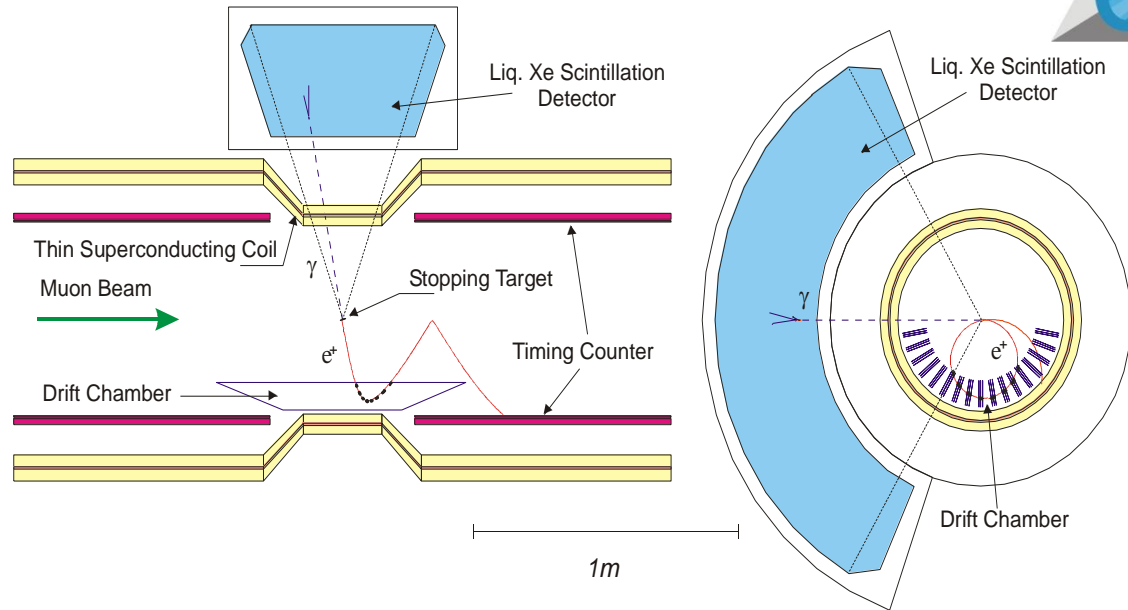
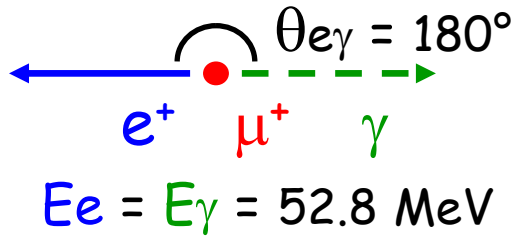
The BaBar detector



The MEG experiment at PSI



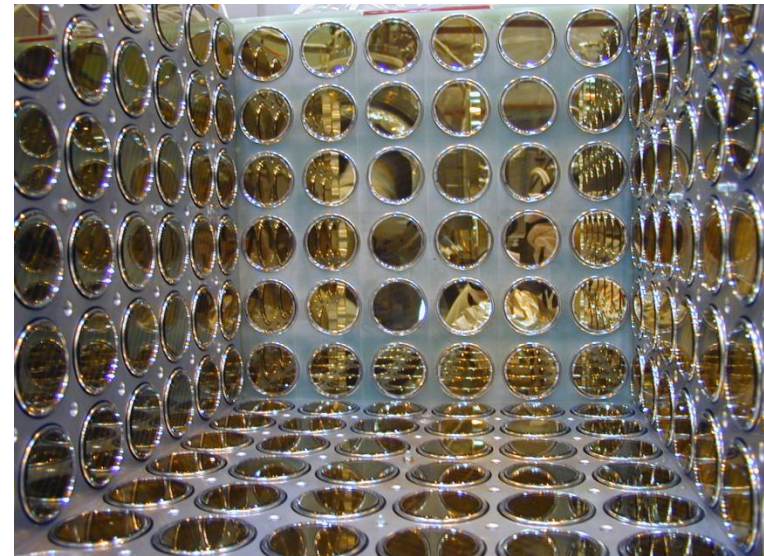
<http://meg.pi.infn.it>



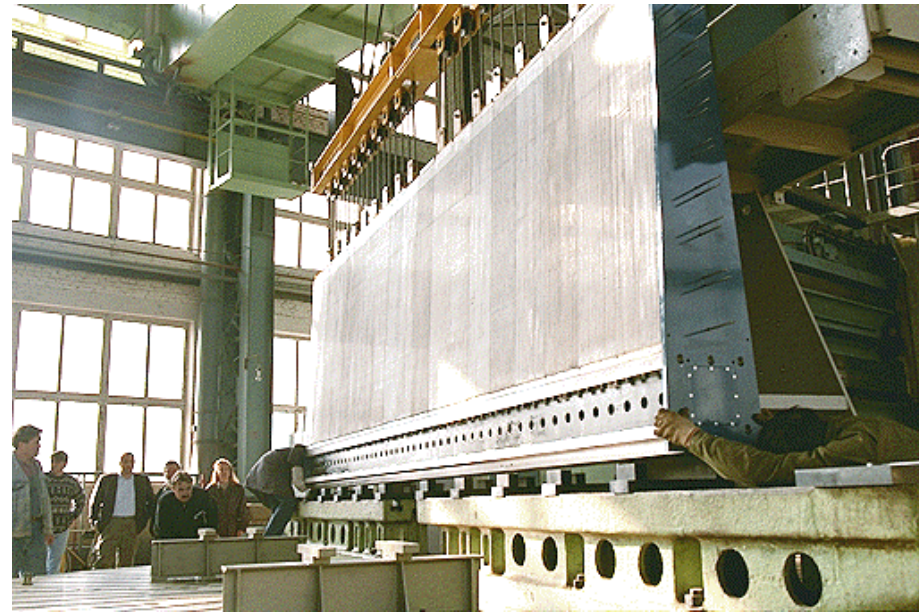
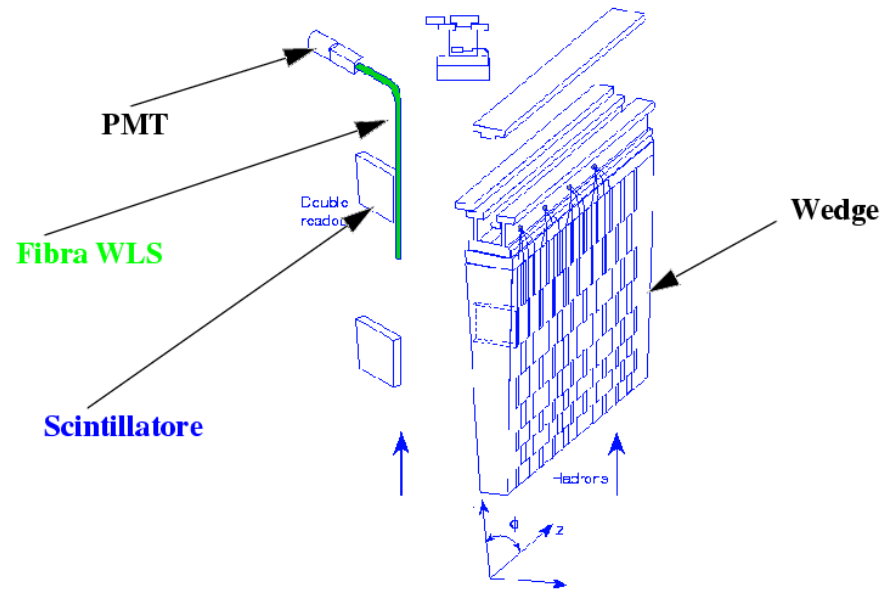
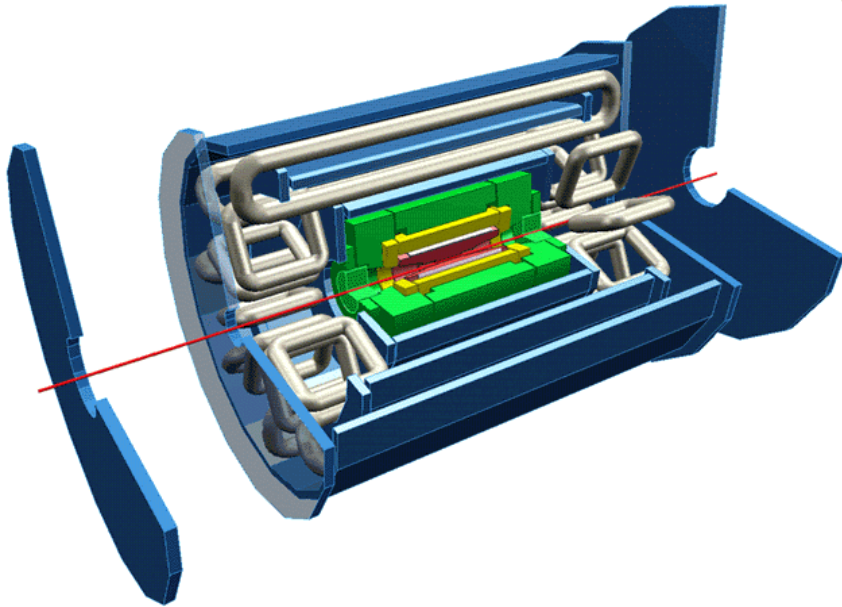
← Cryostat design

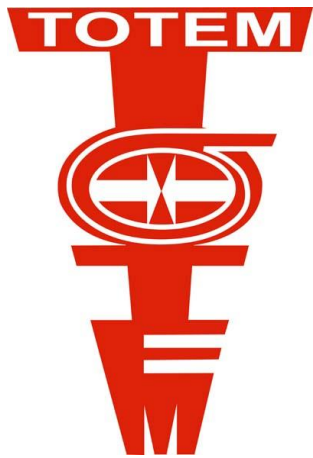
(800 liters of Xe
read by 840
PMTs)

Prototype →
working at PSI
(100 l Xe, 230
PMTs)

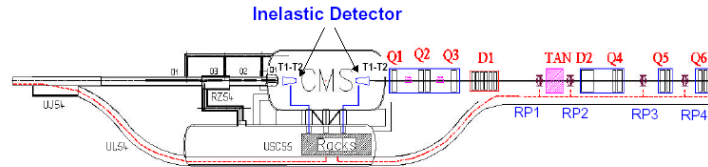


Atlas Tile Calorimeter





Experimental Apparatus

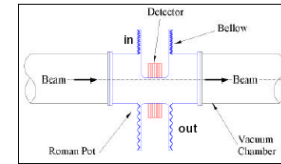


Roman Pots (Elastic and Diffractive)

Integrated with the machine

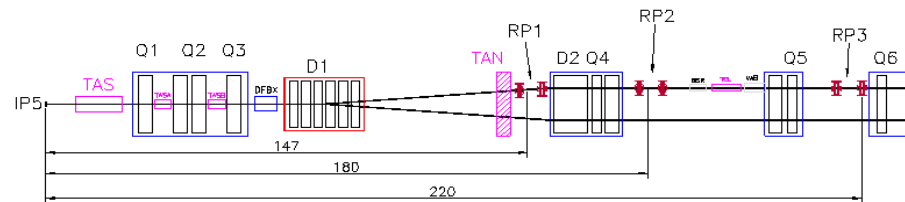
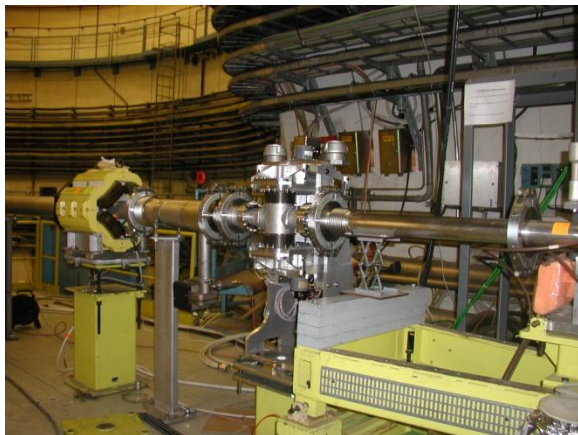
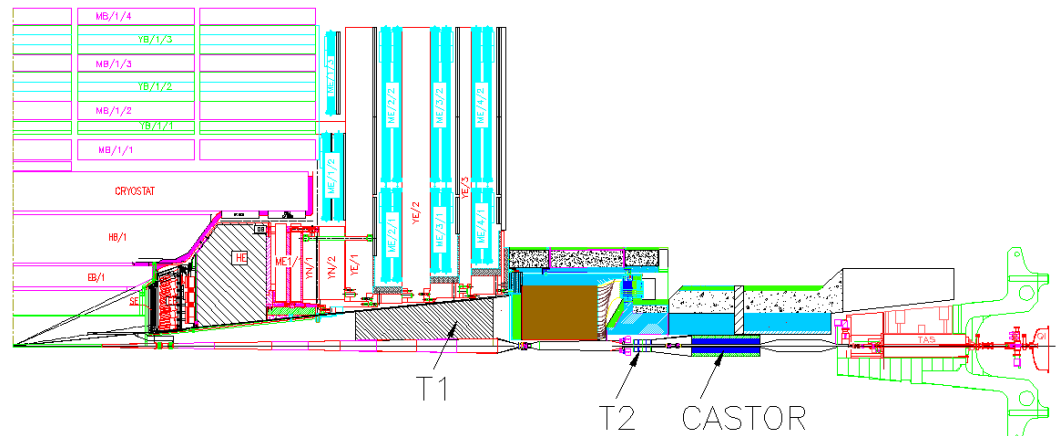
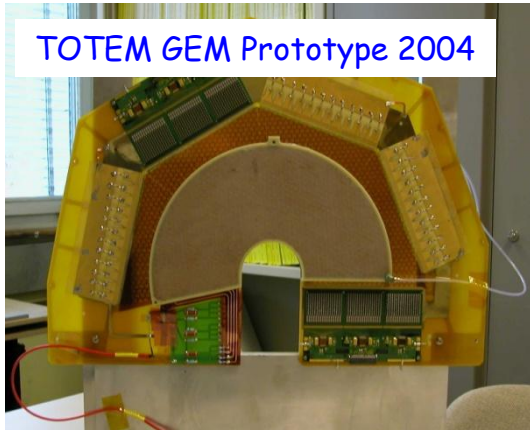
Inelastic Detector

Integrated with CMS



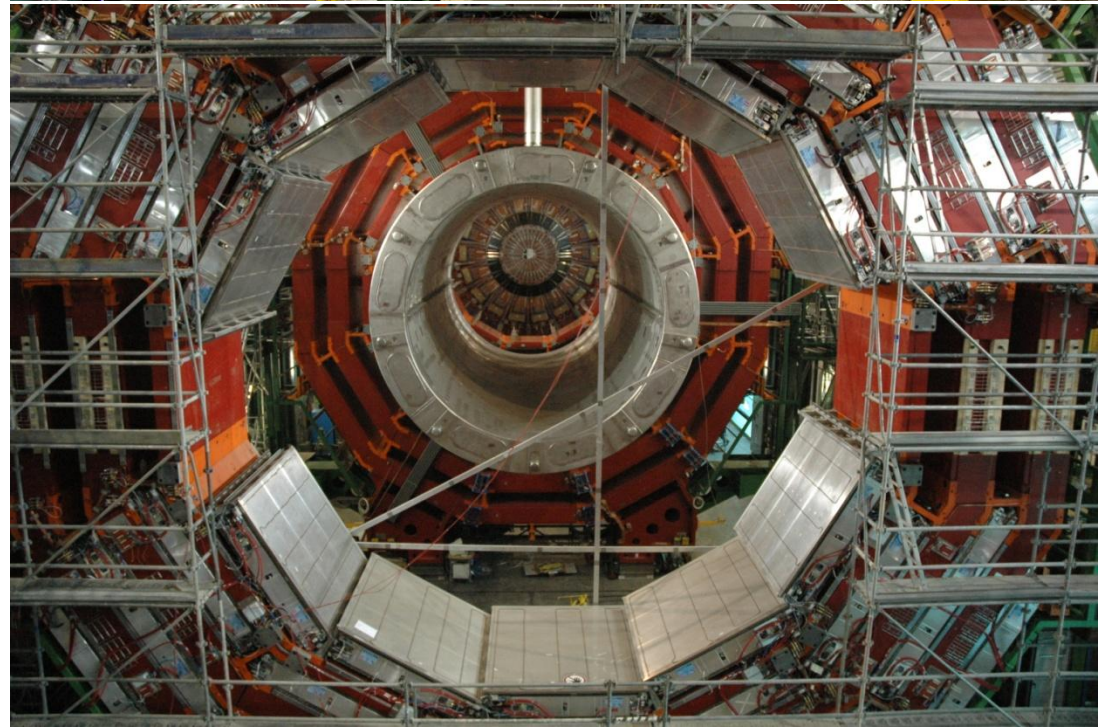
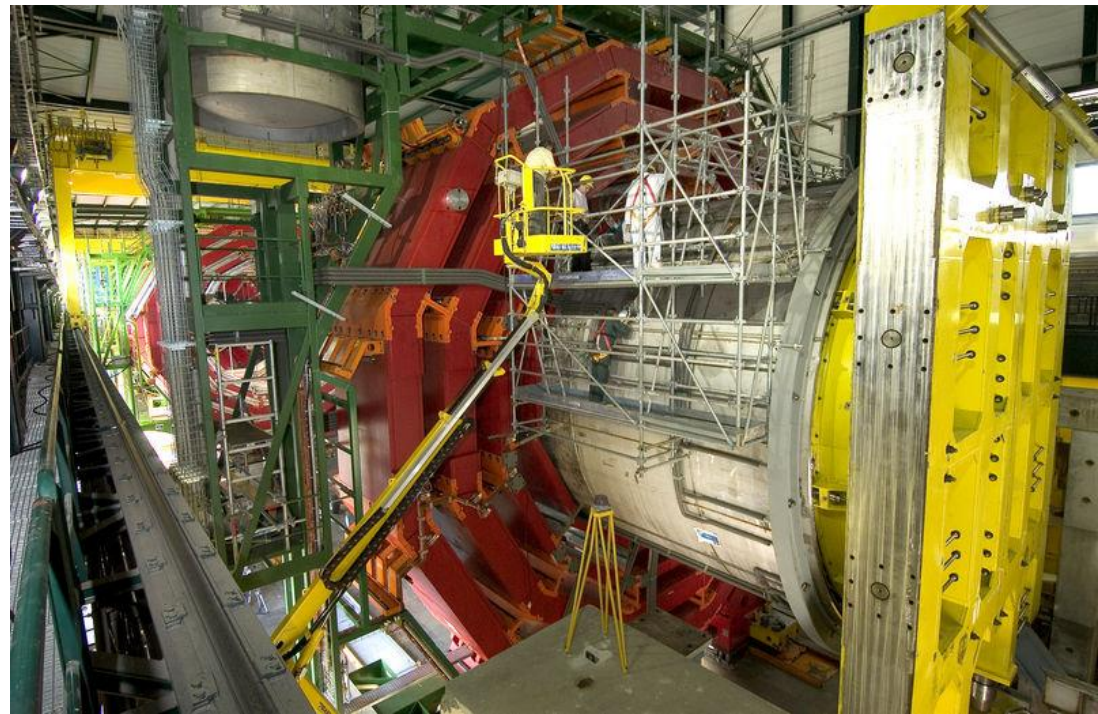
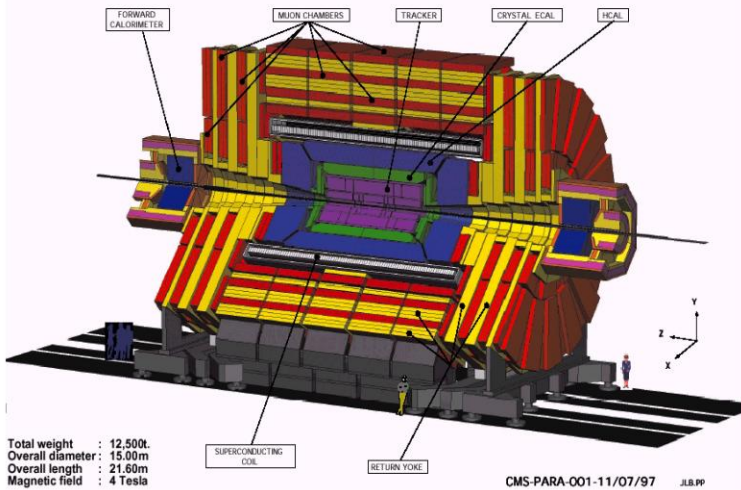
Roman pot

TOTEM GEM Prototype 2004



CMS

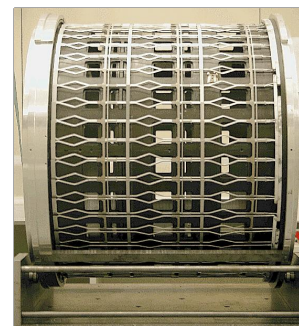
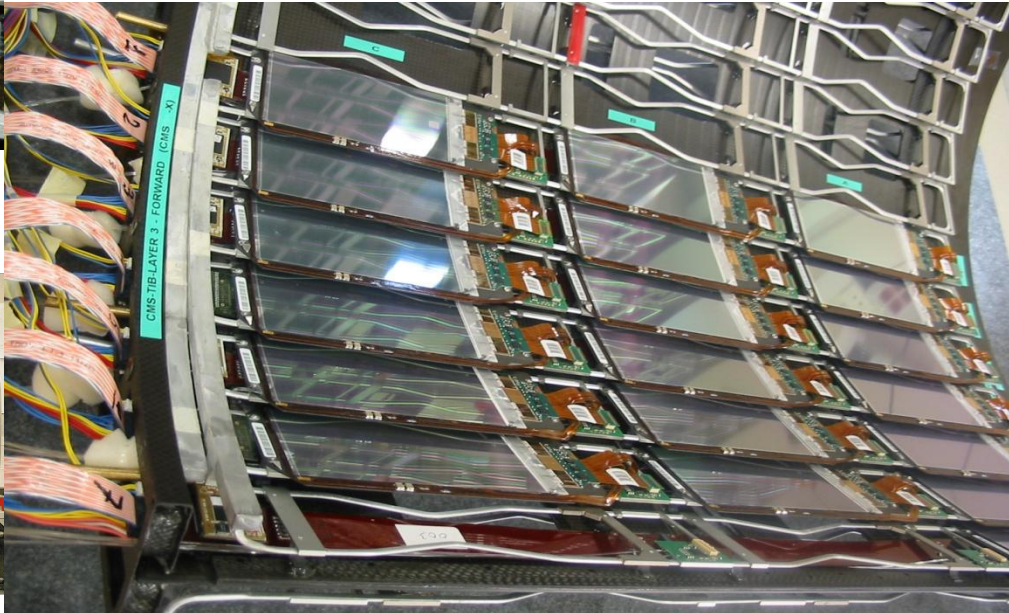
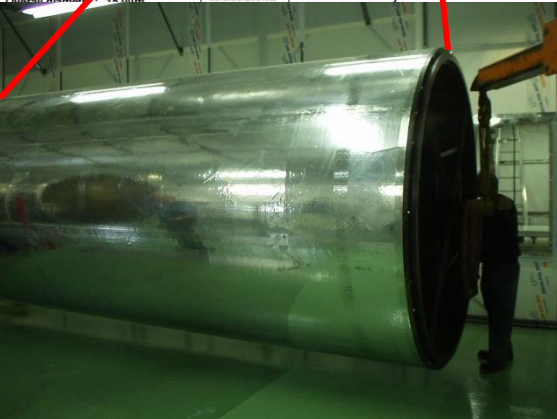
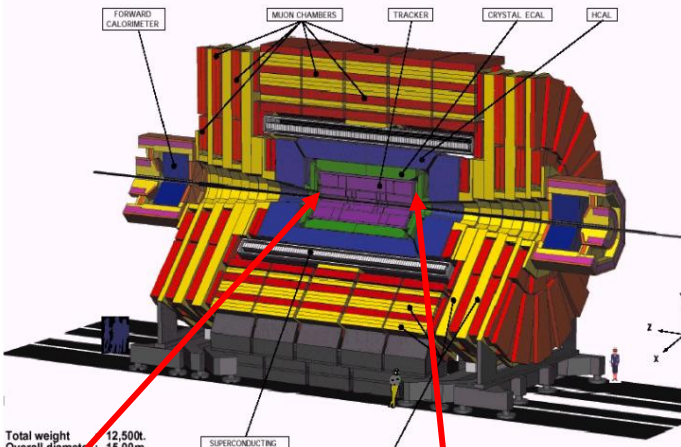
CMS A Compact Solenoidal Detector for LHC



The CMS Tracker

CMS

A Compact Solenoidal Detector for LHC



CMS Tracker

Construction responsibilities in Italy

3000 TIB + 1000 TID including 10% spares

DC-CERN

6000 TOB + 2000 TIB

QTC-PERUGIA

6000 TOB + 1000 TIB + 1000 TID

QTC-PISA

6000 TOB

6000 TOB

2000 TIB

MAC-PERUGIA

MAC/TOB-FNAL

1000 TIB + 1000 TID

MAC-BARI/CATANIA

1000 TIB

BTC-PADOVA

1000 TIB

BTC-PISA

500 TID: R2+ R3/2

BTC-TORINO

500 TID: R1+ R3/2

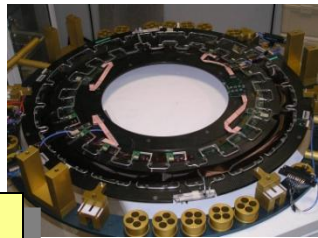
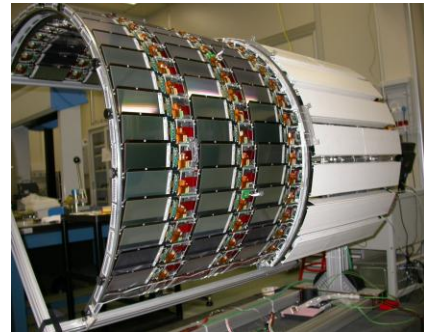
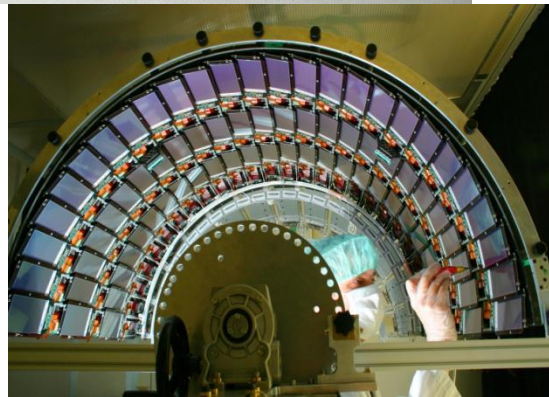
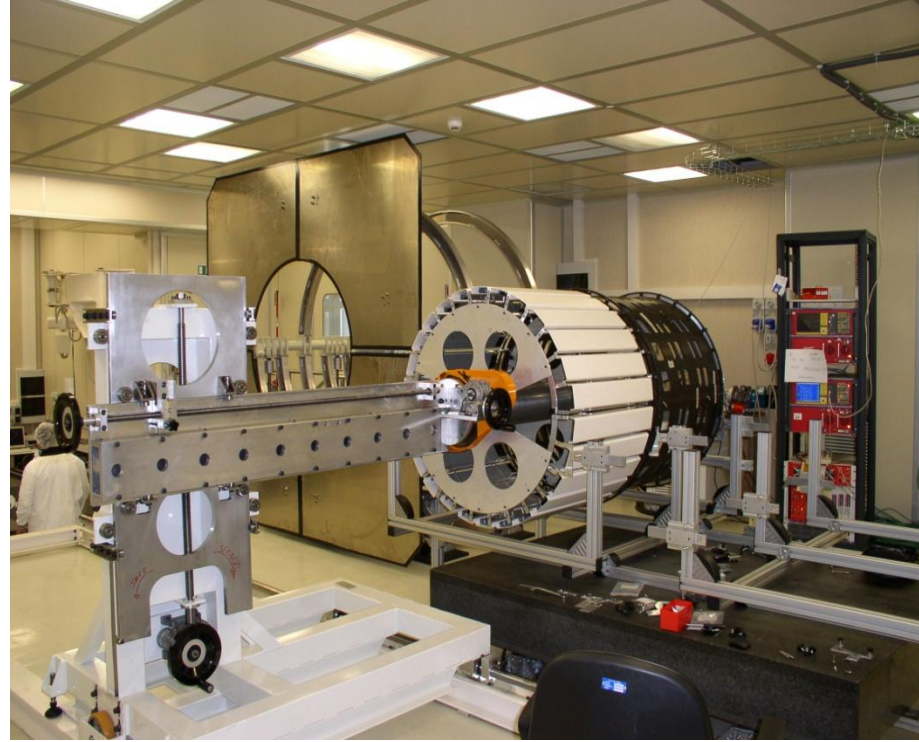
BTC-FLORENCE

1000 TIB

BTC-BARI/CATANIA

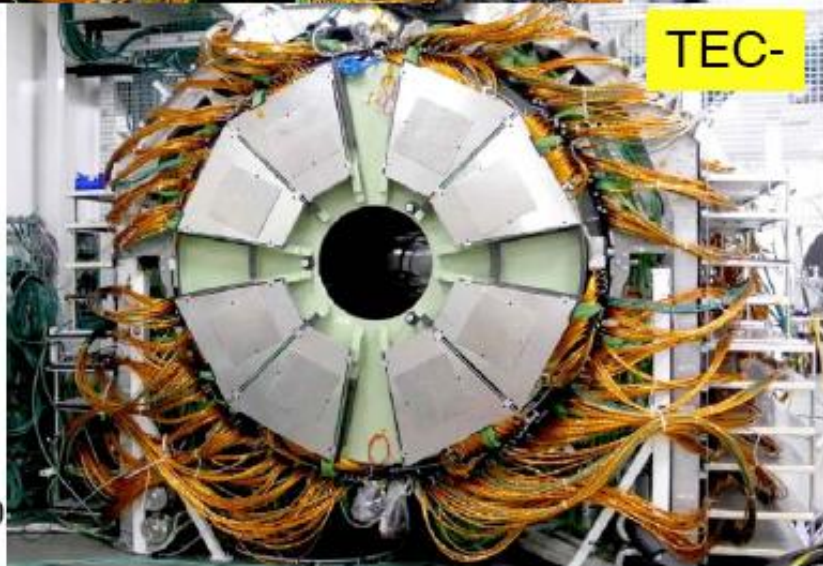
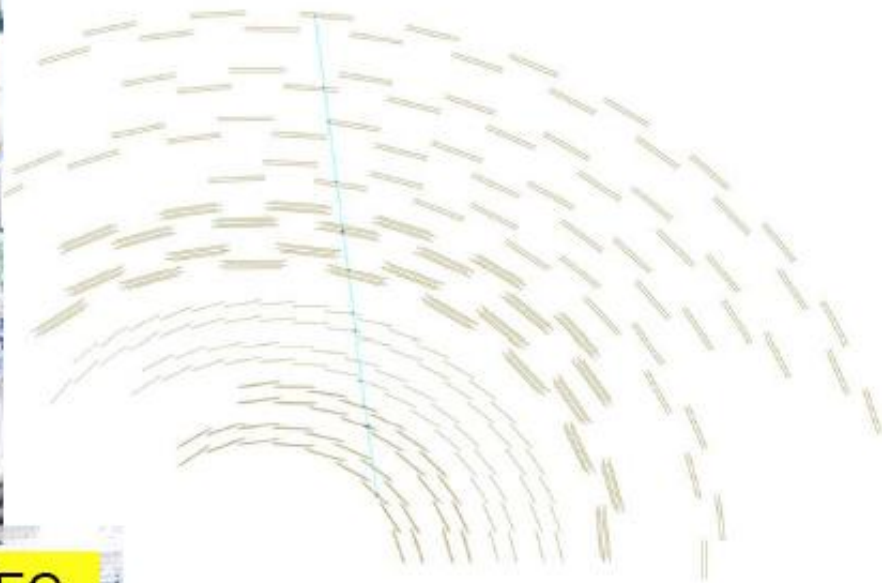
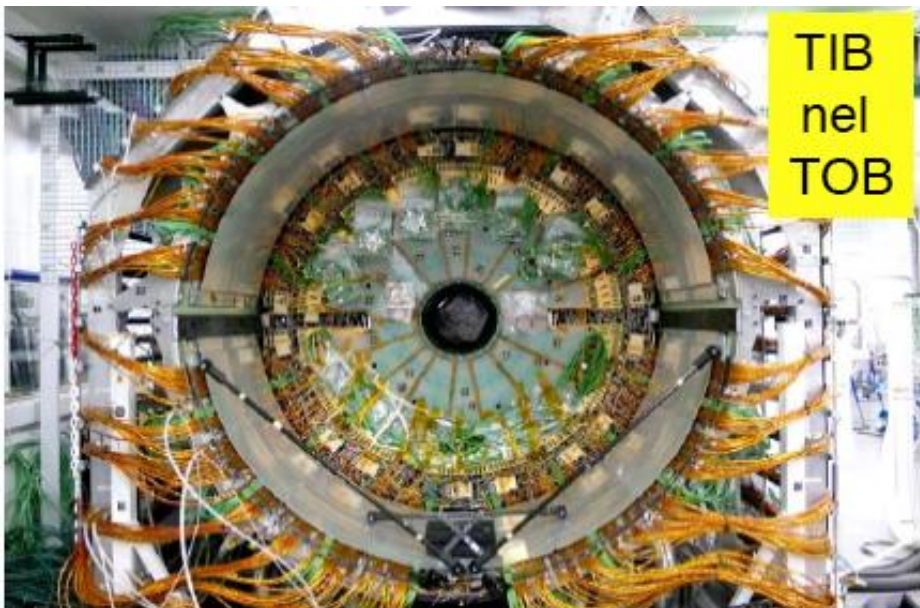
TIB/TID INTEGRATION CENTER
PISA

FINAL ASSEMBLY- CERN



**Clean Room in
S. Piero
CMS TK
Integration**



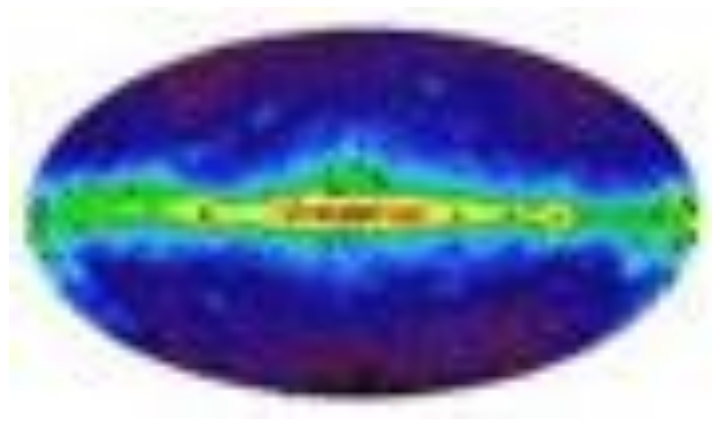


**L'integrazione del TRACKER
è terminata, eccellenti risultati
ottenuti con i cosmici**

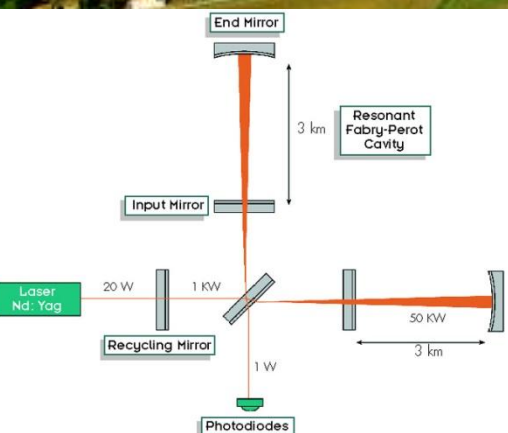
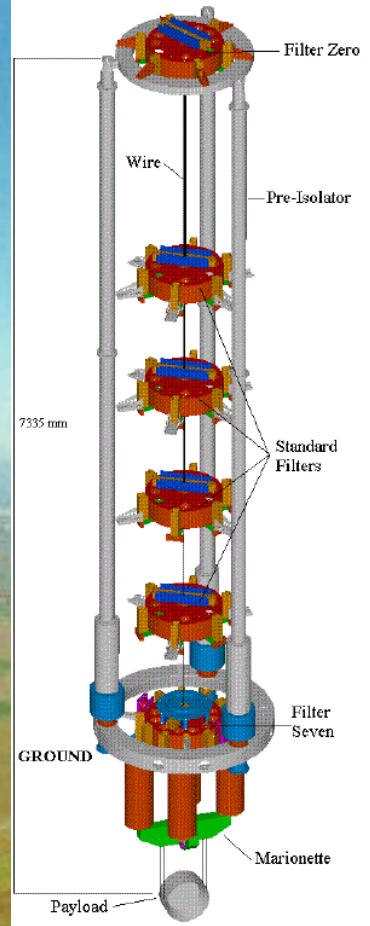
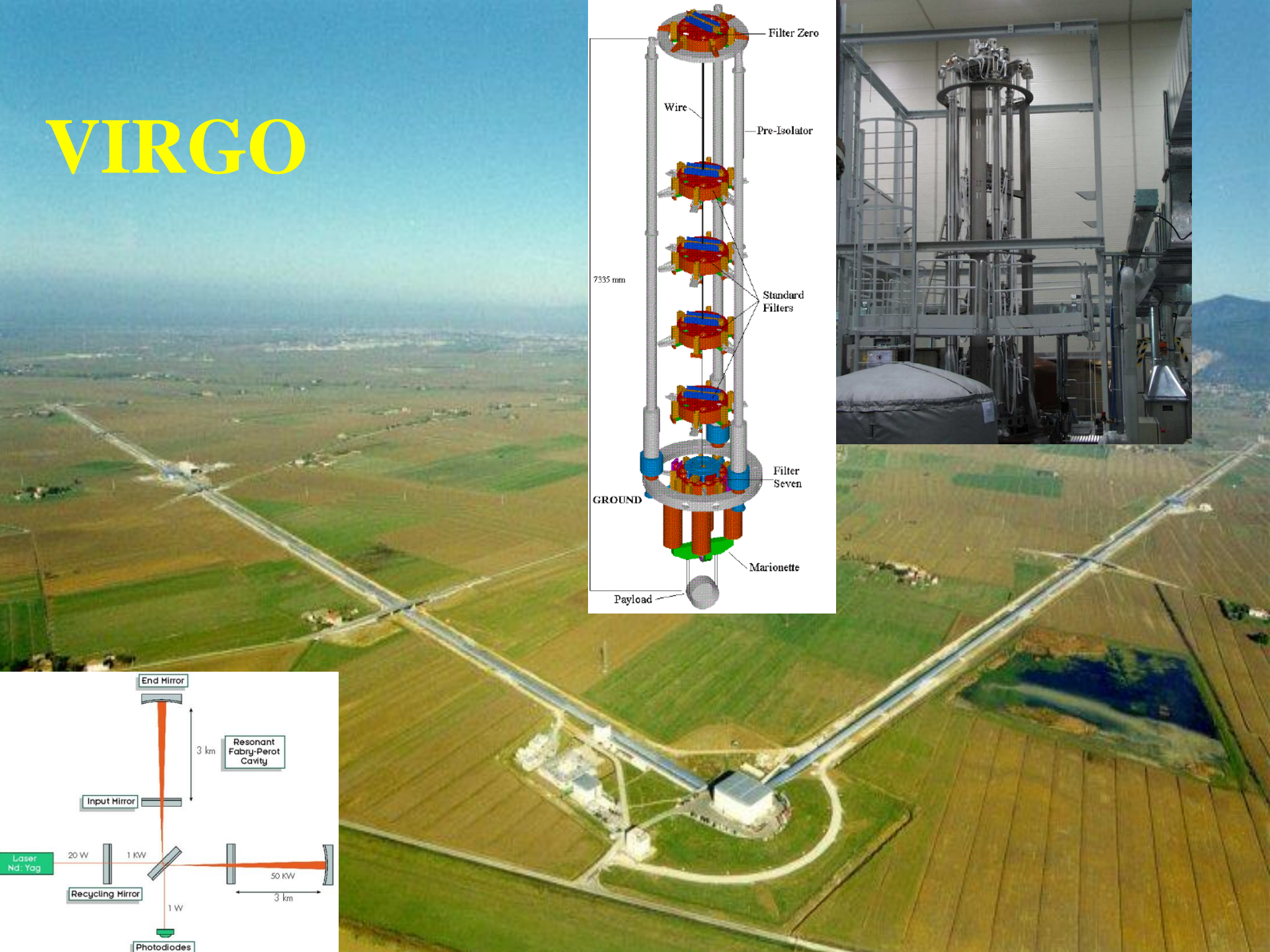
CSN1 0



Attività di Gruppo II

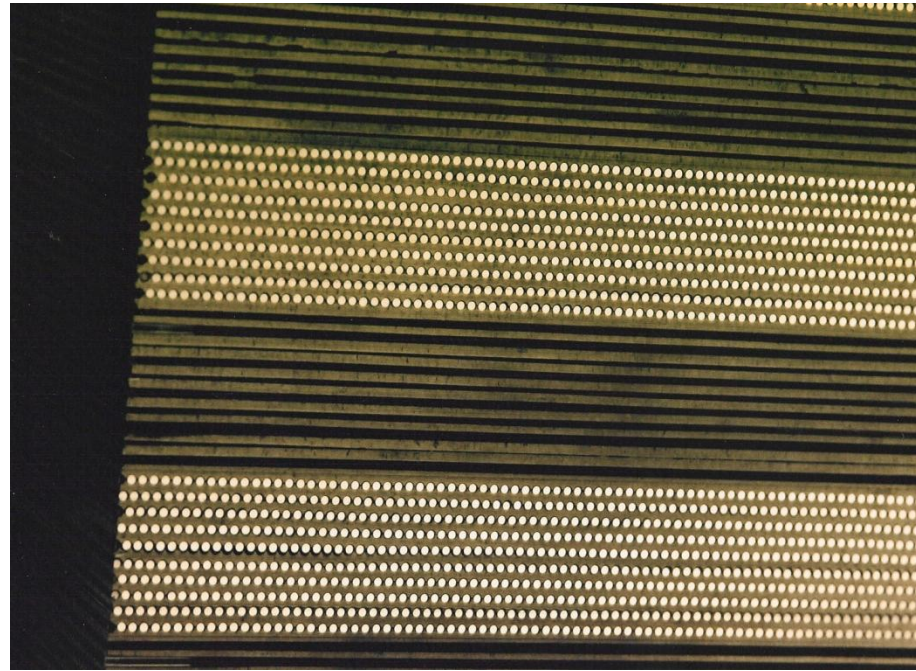


VIRGO



AMS-02 Electromagnetic calorimeter

AMS-02 Detector layout

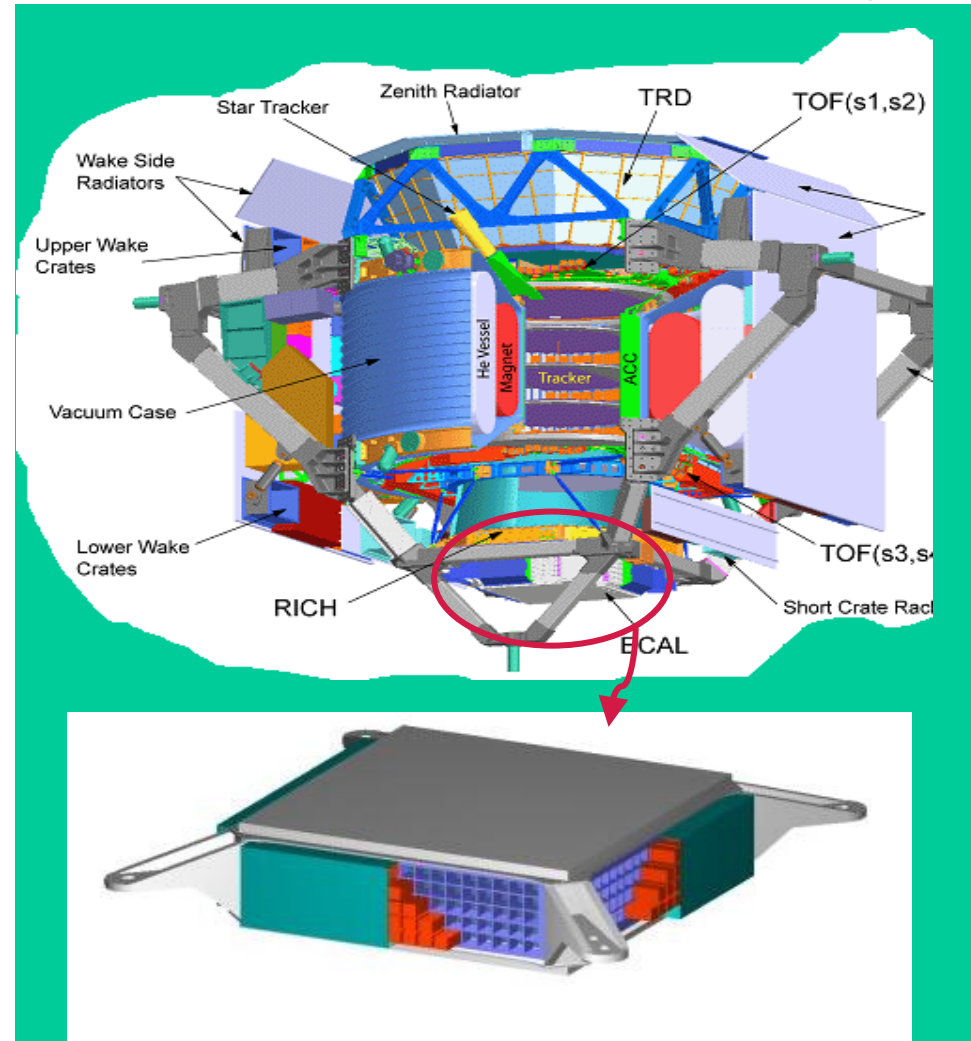


3D "IMAGING" CALORIMETER

- high discrimination power e/h: 10^{-4}
- $\sim 17 X_0$ thickness

• Energy resolution

$$\frac{\sigma(E)}{E} = \frac{10.5\%}{\sqrt{E(\text{GeV})}} \oplus 2.4\% \text{ up to 1 TeV}$$



The MAGIC Collaboration

~ 100 Physicists
17 Institutes
11 Countries

MPI Munich, Germany
U. Würzburg, Germany
U. Von Humboldt, Berlin, Germany

IFAE Barcelona, Spain
UAB Barcelona, Spain
UCM Madrid, Spain

U. Padova/INFN Padova, Italy
U. Siena/INFN Pisa, Italy
U. Udine/INFN Trieste, Italy

ETH, Zurich, Switzerland

Crimean Observatory, Ukraine

U.C. Davis, U.S.A.

U. Lodz, Poland

INR Moscow, Russia

U. Potchefstroom, South Africa

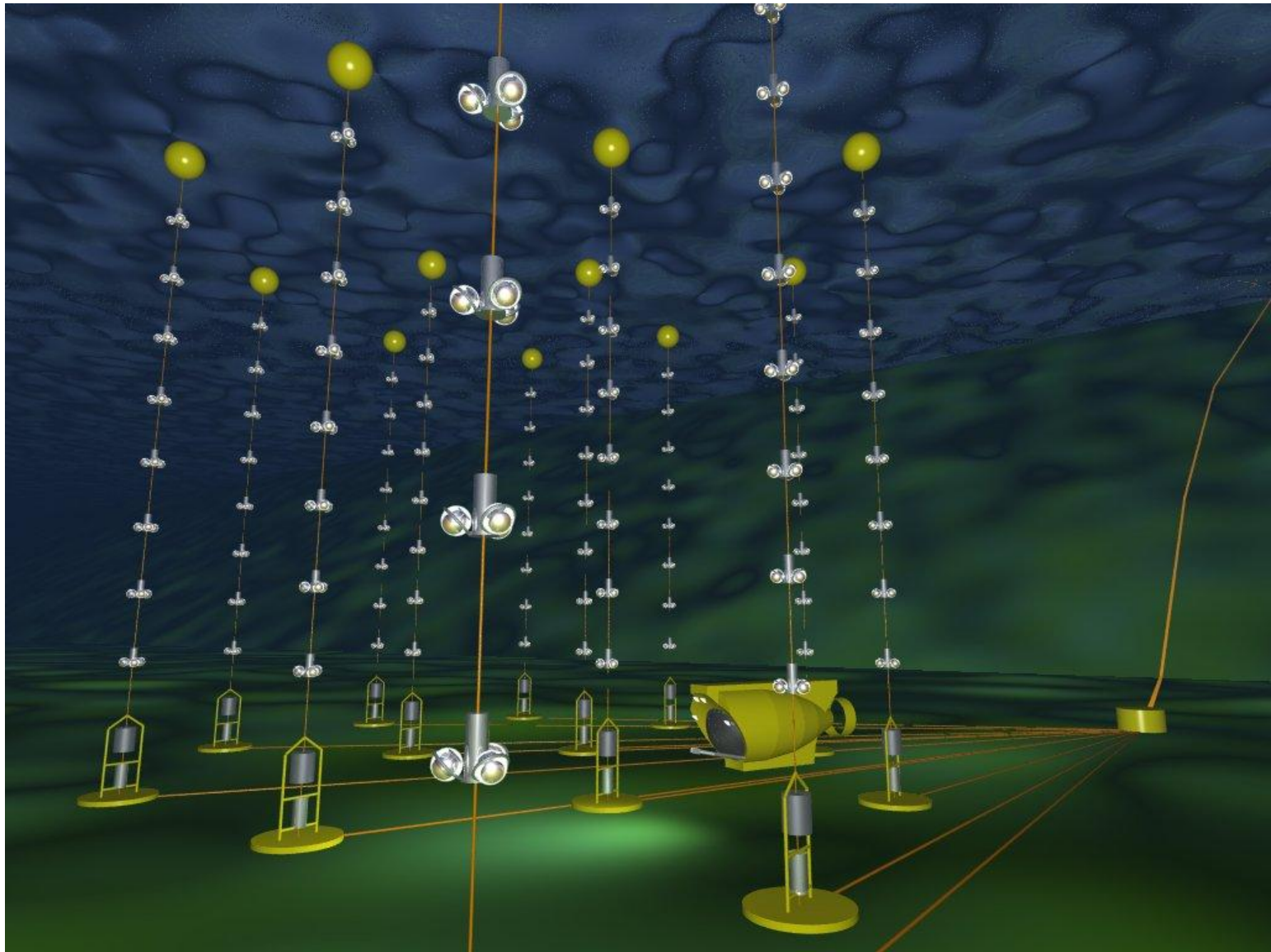
Tuorla Observatory, Finland

Yerevan Phys. Institute, Armenia

CREAM



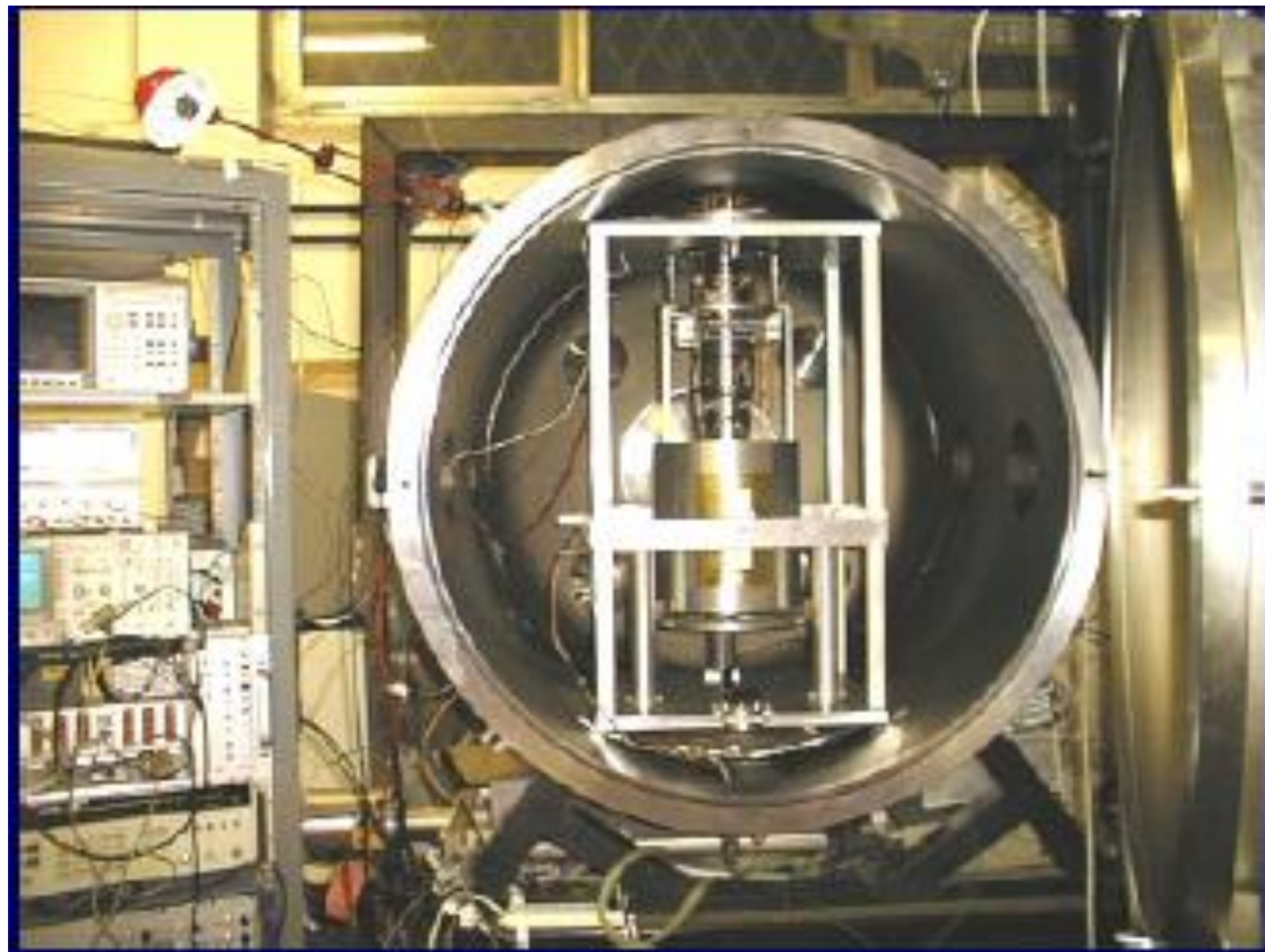
ANTARES - NEMO



PVLAS



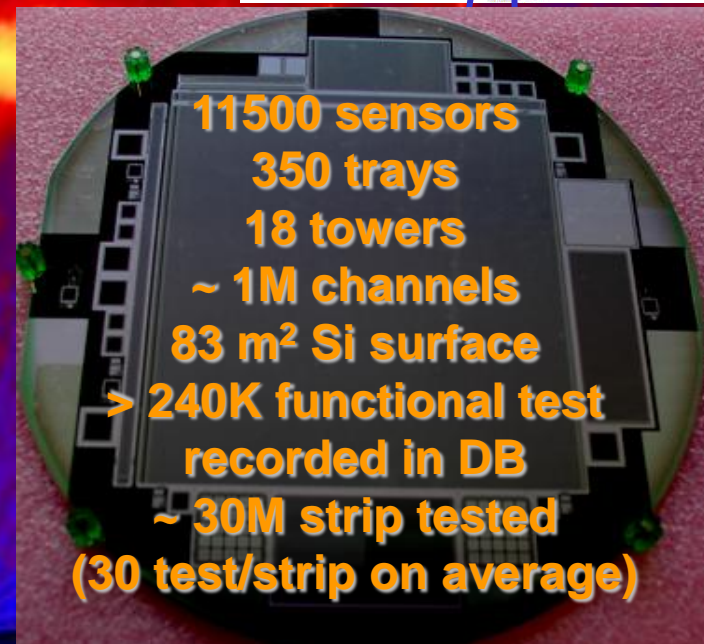
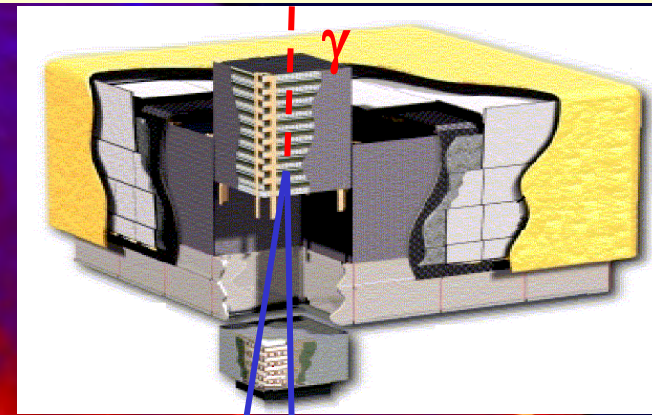
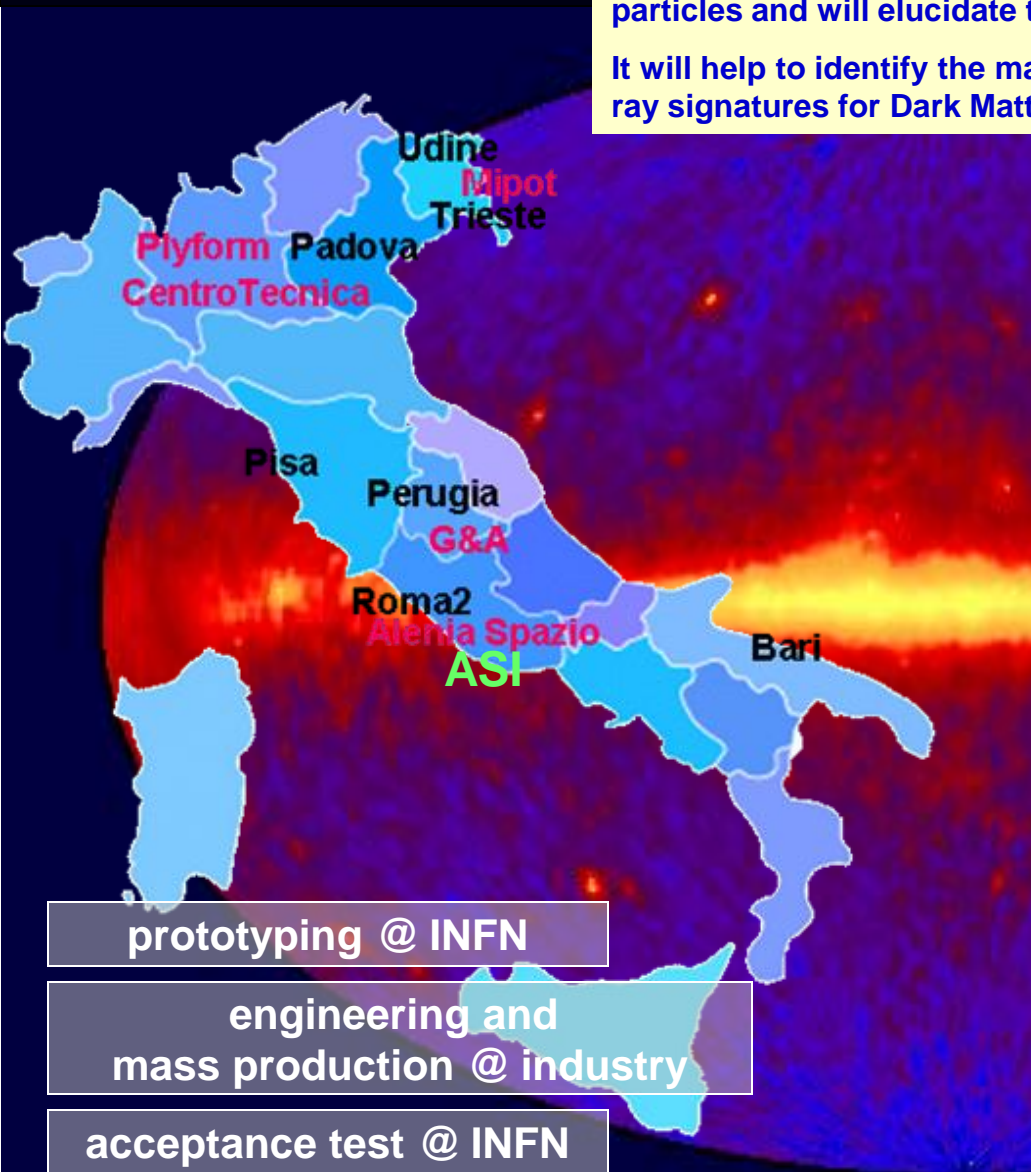
GGG



The GLAST LAT-TKR construction

GLAST will study the processes that expel relativistic plasma and accelerate particles and will elucidate the origin of energetic gamma radiation.

It will help to identify the many unresolved EGRET sources and search for gamma-ray signatures for Dark Matter (Neutralino annihilation).

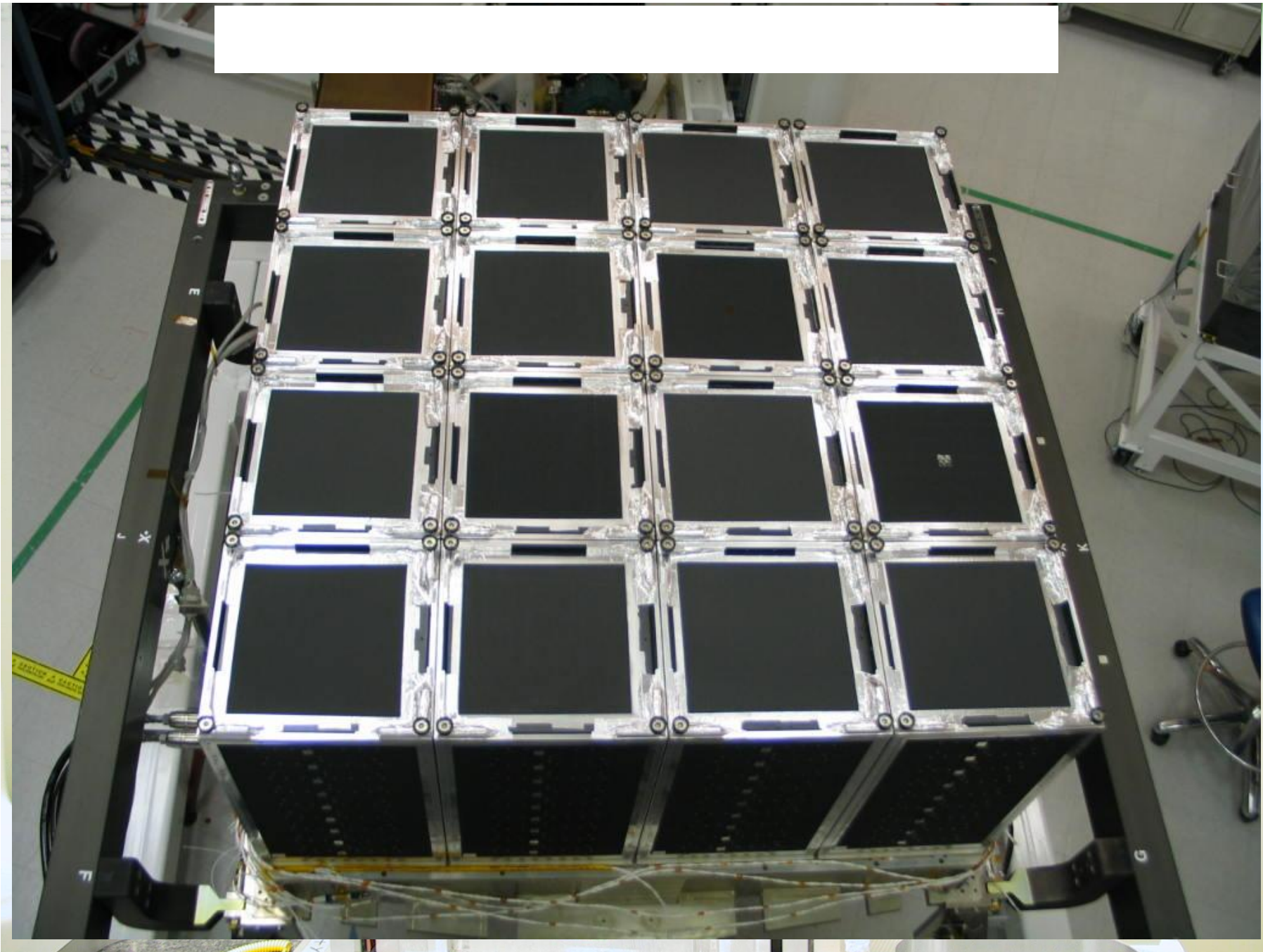


prototyping @ INFN

engineering and
mass production @ industry

acceptance test @ INFN

delivery of the GLAST TKR detector, 16 towers, assembled and tested, by 09/2005



Wafer test

Test phases

Ladder test

Tray test

CPT Tower test

Trays burn-in test with C.R.

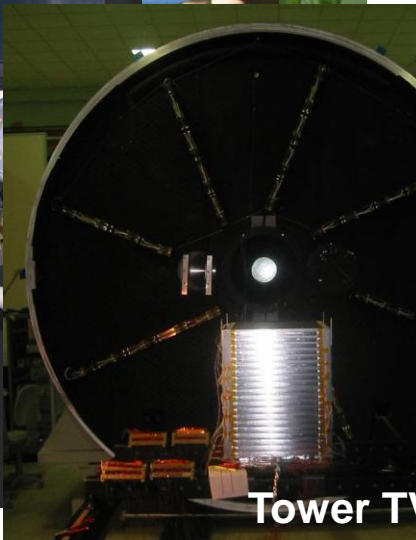
All functional tests performed in the Pisa Lab.



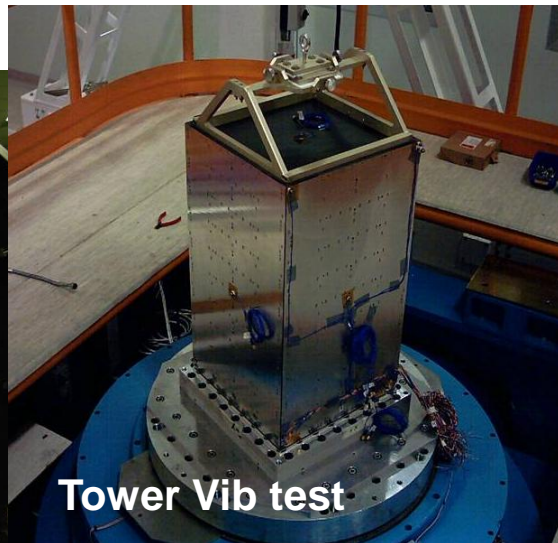
Trays thermal cycle



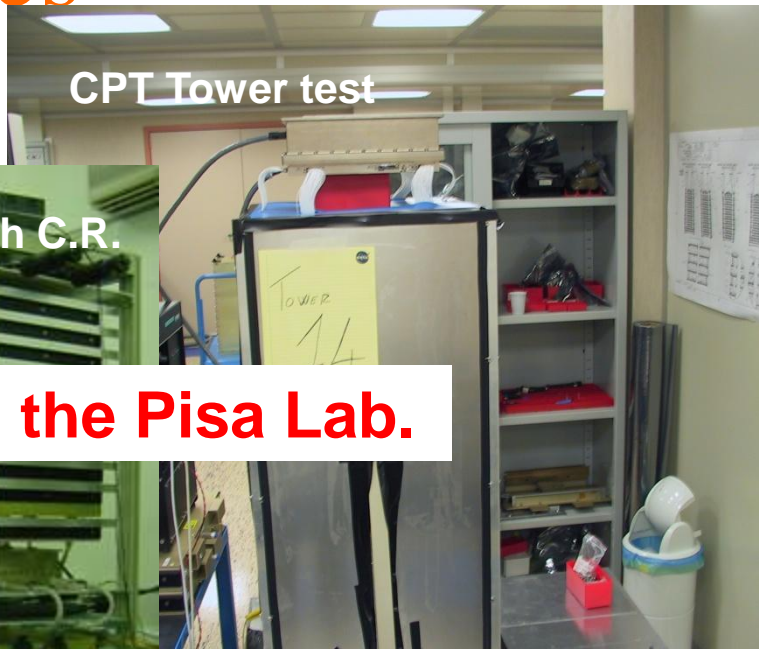
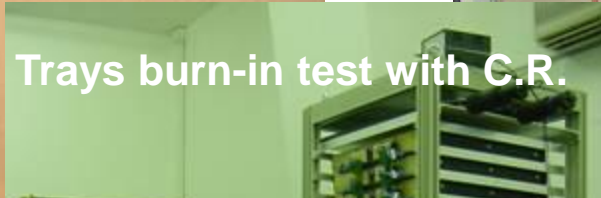
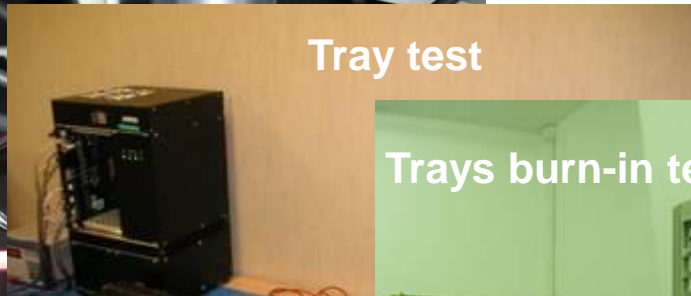
CMM measurements



Tower TV test



Tower Vib test



Gruppo GLAST-Pisa

Fisici

Bellazzini, Brez, Spandre, Angelini, Massai

Latronico (art.23 ASI), Kuss (art.23),
Omodei (dott.), Baldini (dott.), Sgro' (dott.), Razzano (dott.),
4 Laureandi

Tecnici

Corucci

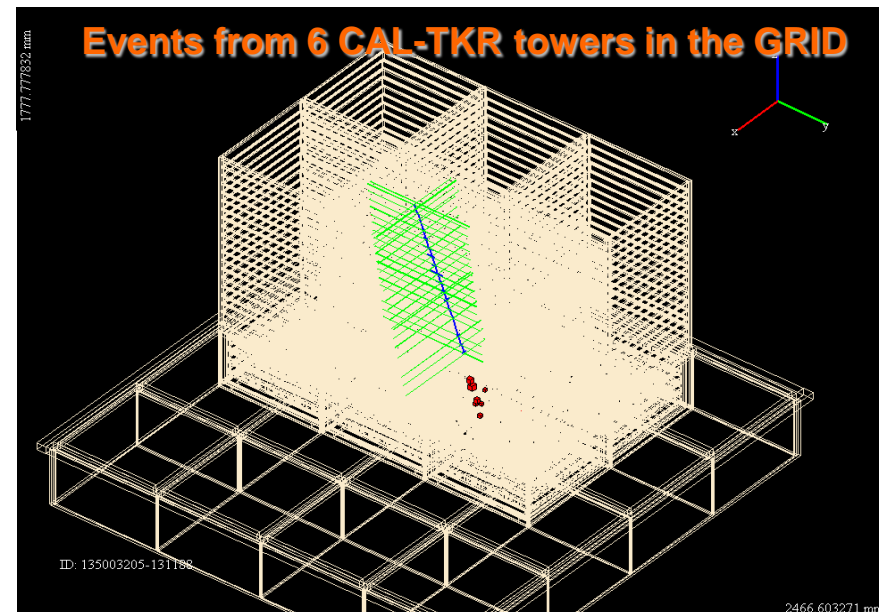
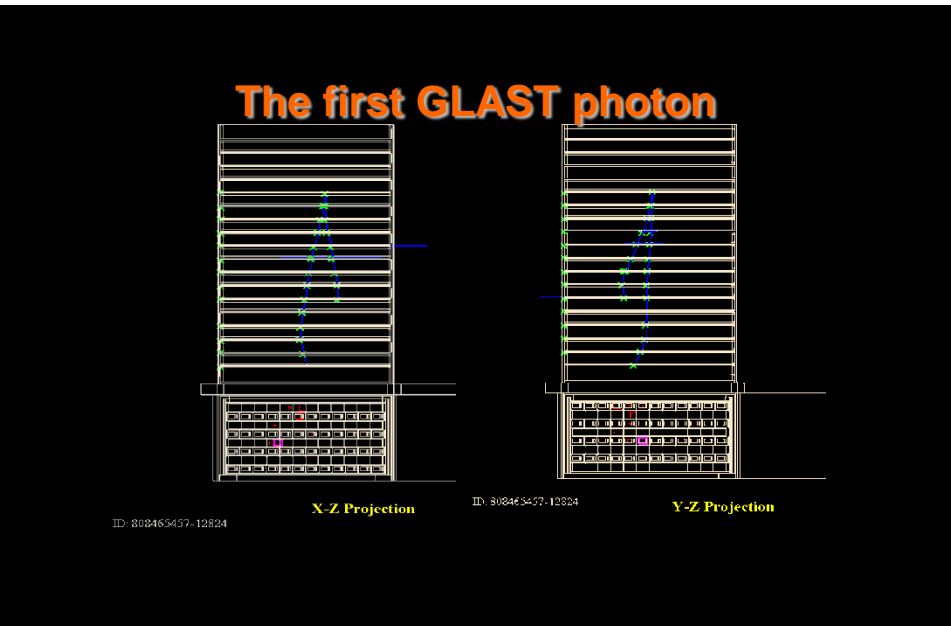
Ceccanti (art.15A.T.), Bianucci (2222 ASI), Fazzi (2222 ASI)
Parodi (Segr. Amministrativa della **Stellar Solution (SLAC)**)

Tecnologi

Minuti (art.15A.T.), Tenze (art. 23 ASI), Bagagli (art.23 ASI)
Pinchera (art.2222 ASI)

7 Ingegneri della Stellar Solution (pagati da SLAC):

Menon, Troianiello, Foglia, Saggini, Bagni, Raposelli,
Bellardi

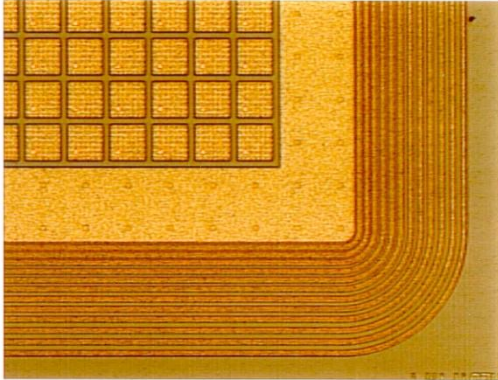


Attività di Gruppo V

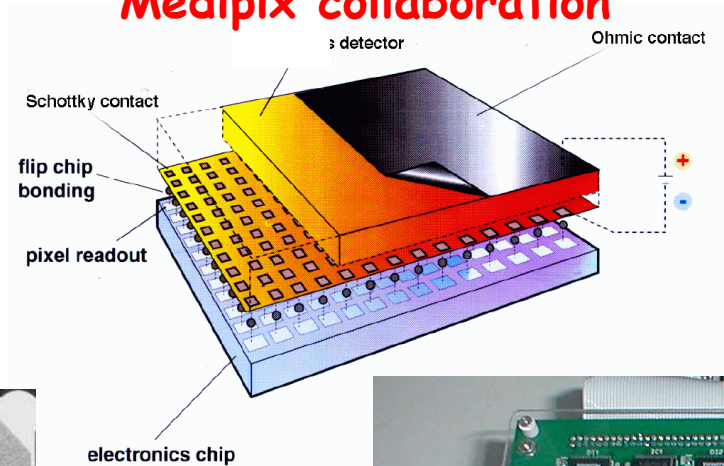


Digital Mammography

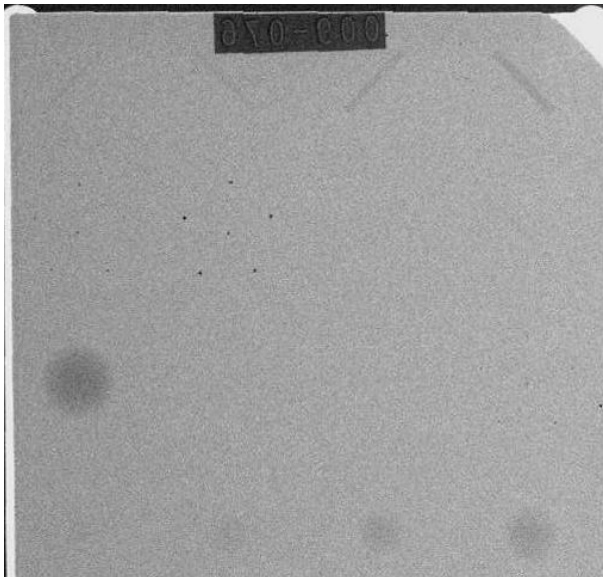
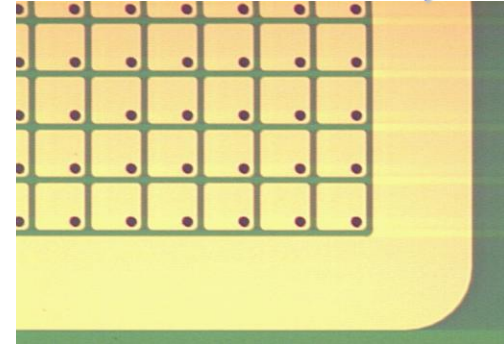
Si pixel detector
IRST, Trento, Italy



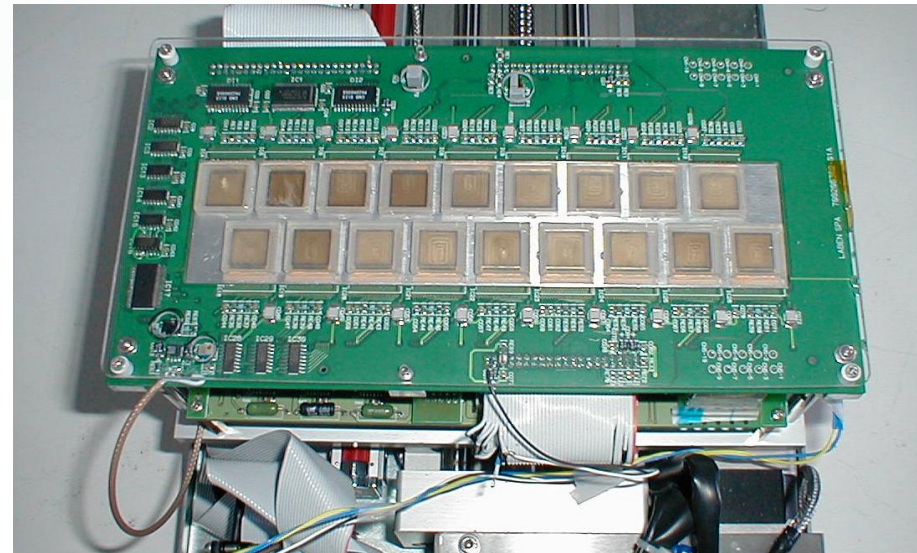
Hybrid Pixel Detector
VLSI RO chip assembly
Medipix collaboration



GaAs pixel detector
AMS, Roma, Italy



Digital Image of a
Mammographic Phantom



Integrated Mammographic Imaging (IMI)
Mammographic Head based on
GaAs pixel detectors

Functional Imaging on small animals with PET and SPECT

Why small animals investigation?

- Rats and mice show genetic likelihood with humans
- Transgenic animals showing particular anomalies are now available

What can functional imaging do?

- Study of mechanism and possible cure of human diseases (e.g. cancer ...)
- Study and validation of gene therapies
- New drug development

Dept of Physics (unit of
AmbiSEN collaboration)



Centro
AmbiSEN



Center of Excellence of the University of Pisa
Environment and Endocrine and Nervous
systems. High Technology Center for the Study of
the Effects of Harmful Agents

University of Ferrara

EMIL FP6 network

YAP-(S)PET: an integrated
PET/SPECT scanner for
small animal imaging



YAP-(S)PET performance

PET mode:

Spatial resolution (iterative algorithm)
Volume: 5.2 mm³ (4.4 mm³) @ CFOV

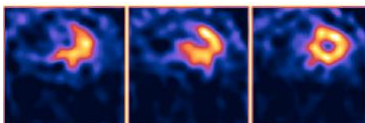
Sensitivity
19 cps/kBq @ CFOV (50-850 keV)

SPECT mode:

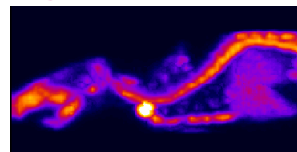
Spatial resolution (iterative algorithm)
Transaxial: 3.1 mm (R) x 3.9 mm (T)

Sensitivity
30 cps/MBq (constant)

SPECT images (Ferrara)

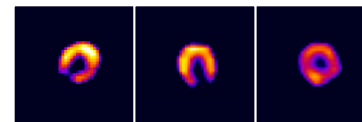


Transaxial sections
of a rat heart
(TcN-PNP5-DBODC)

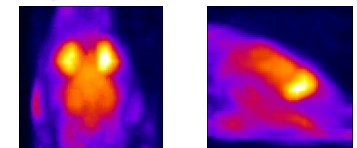


Sagittal section
of a rat skeleton
(^{99m}Tc MDP)

PET images (Pisa)



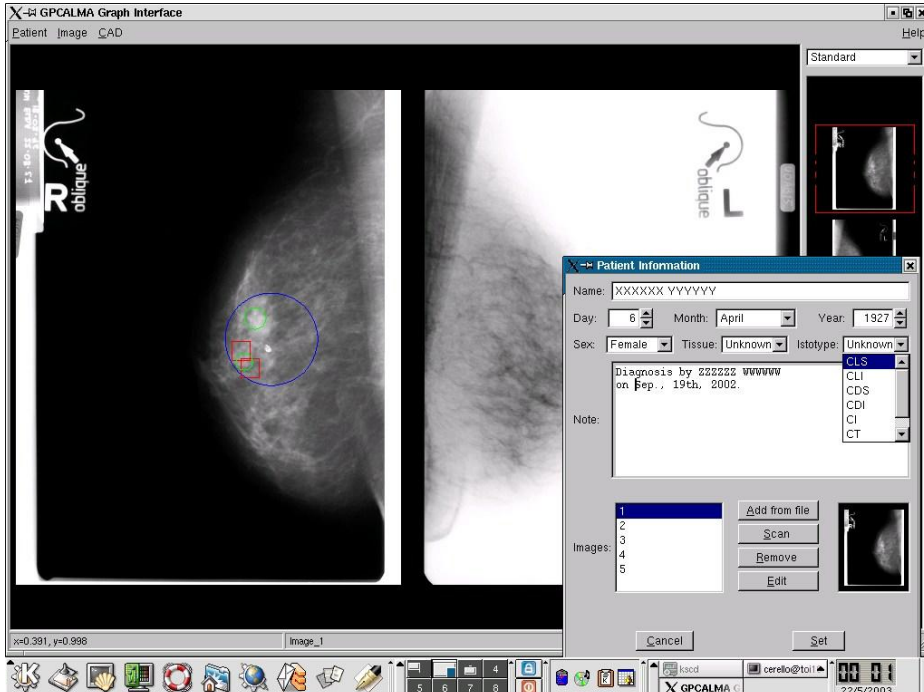
Sections of a rat heart
(¹⁸F FDG)



Horizontal and sagittal
view of a rat brain
(¹⁸F FDG)

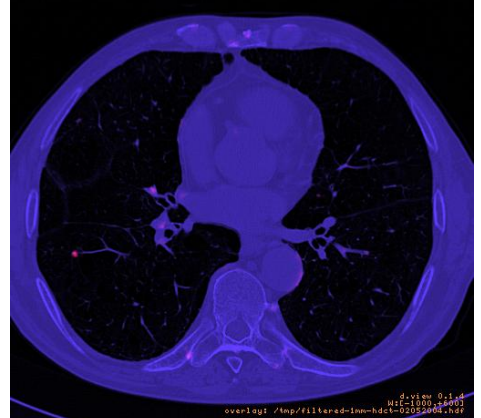
MAGIC-5: GRIDs for medical imaging applications

- Distributed databases
- Distributed algorithms

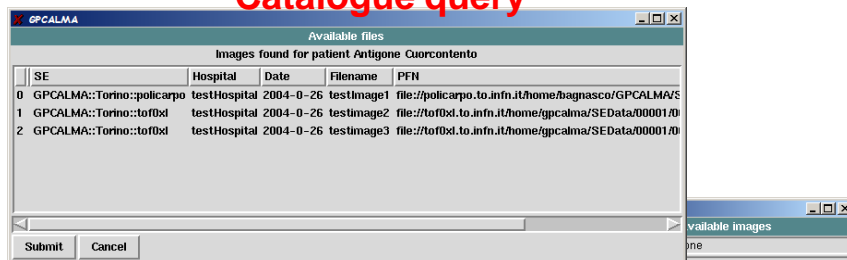


Mammography

Lung CT



Catalogue query



Patient creation

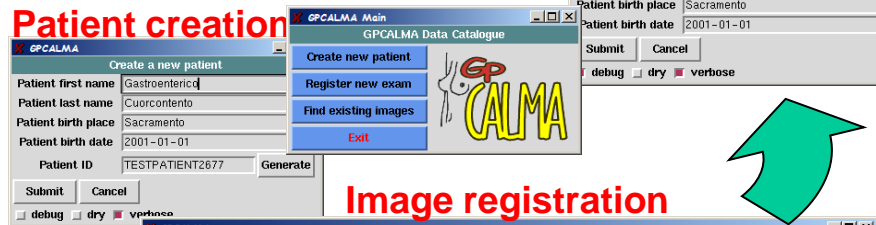
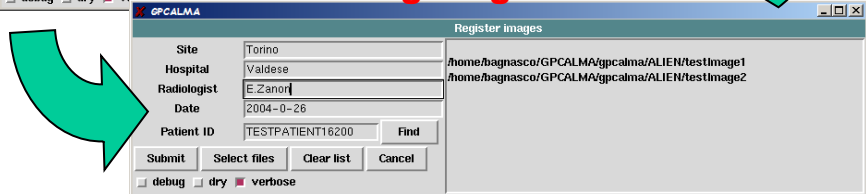
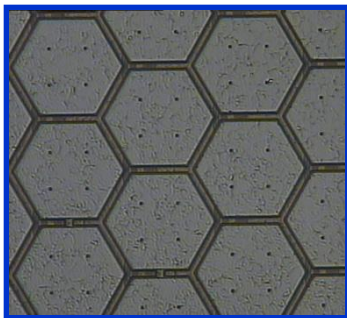
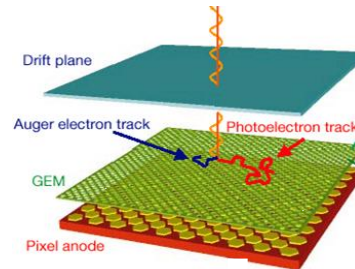
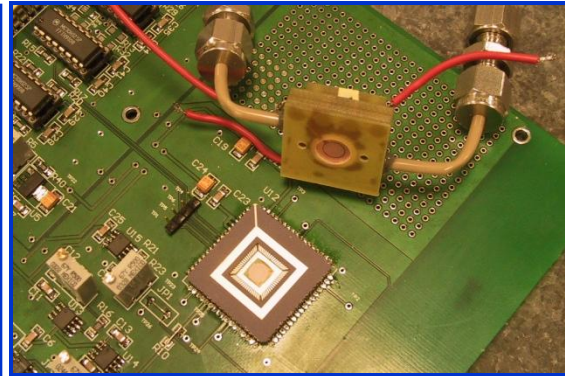
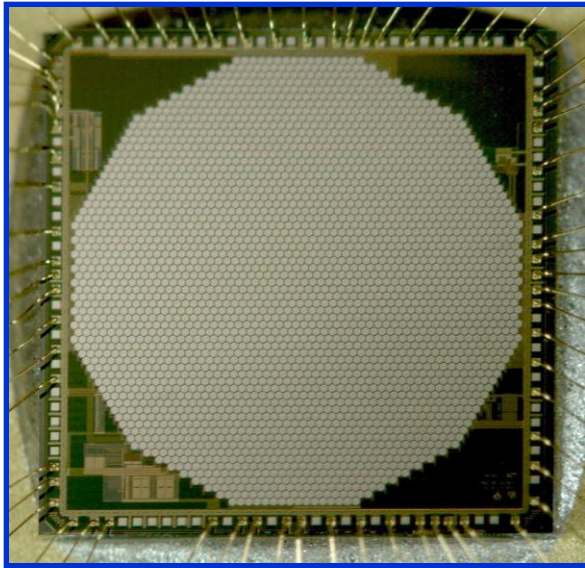
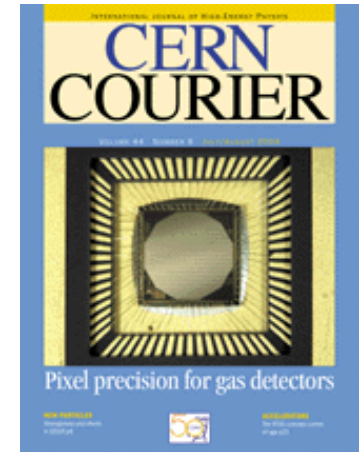


Image registration



The Gas Pixel Detector - PIXILA

A CMOS VLSI chip (2101 pixels at 80 μm pitch) has been produced to be used as collecting anode/read-out chip of a GEM detector for applications in Astronomical X-ray Polarimetry.



Each microscopic pixel is fully covered by a hexagonal metal electrode realized using the top layer of a 6 layers, 0.35 μm CMOS technology.

pixel electronics dimension 80 μm x 80 μm
comprehensive of preamplifier/shaper, S/H and routing (serial read-out) for each pixel

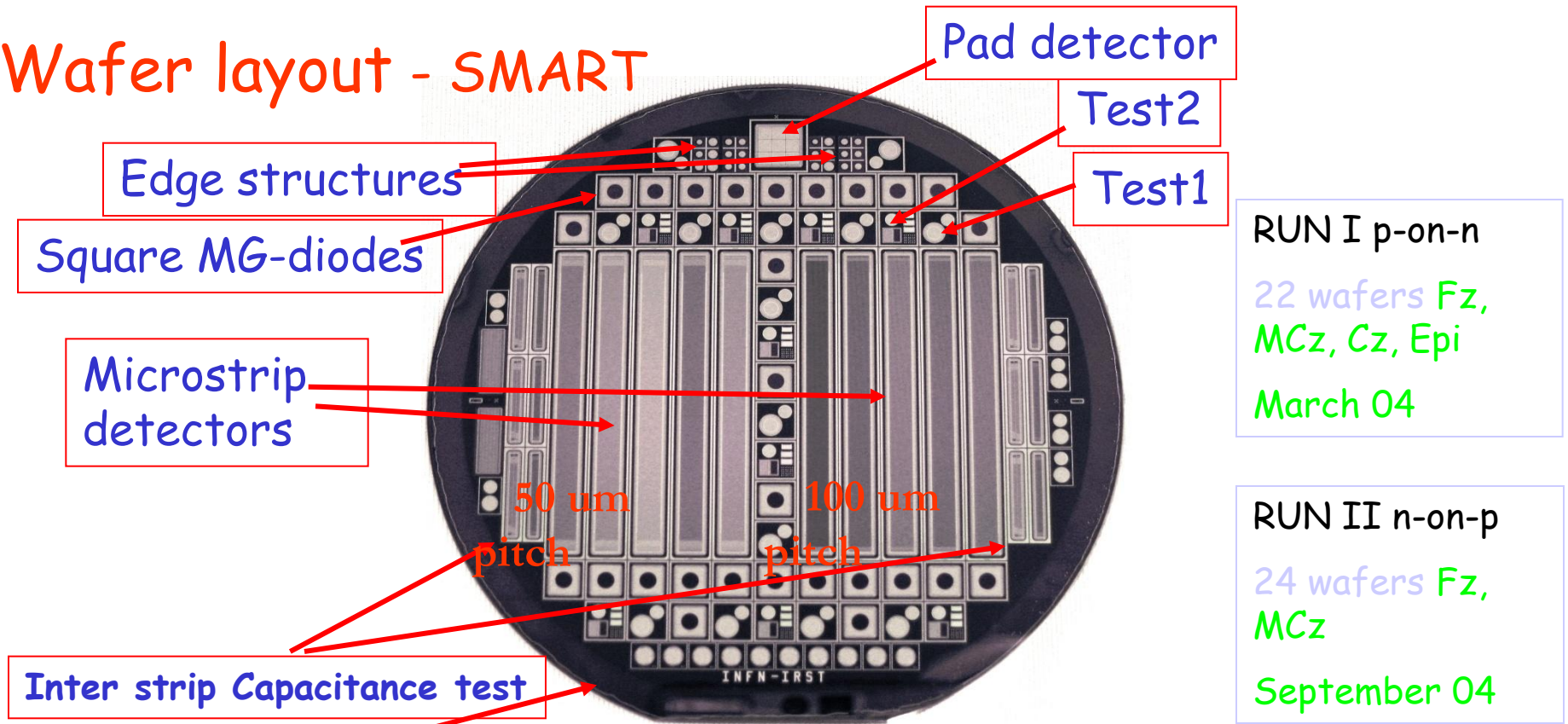
A microscopic view of the CMOS technology. The image shows a dense grid of hexagonal pixels. The pixels are arranged in a regular pattern, and the metal electrode is visible as a dark, textured surface. The image is framed by a blue border.

0.18 μm CMOS technology
active area : 11x11 mm²
8 sectors of 2.8k hexagonal pixels each
50 μm pitch
8 parallel analog buses
self-triggering capability
10 MHz read-out frequency
280 μs (read-out time) frame rate
1 kHz source rate possible

S.M.A.R.T

Structures and Materials for Advanced Radiation hard Trackers

Wafer layout - SMART



- ✓ RD50 common wafers procurement
- ✓ Wafer Layout designed by SMART collaboration
- ✓ Masks and process by ITC-IRST

SLIM5

Silicon detectors with Low Interactions with Material

Tecnologia commerciale CMOS su substrato a bassa resistività':

carica raccolta per diffusione su 10-20 μm di silicio

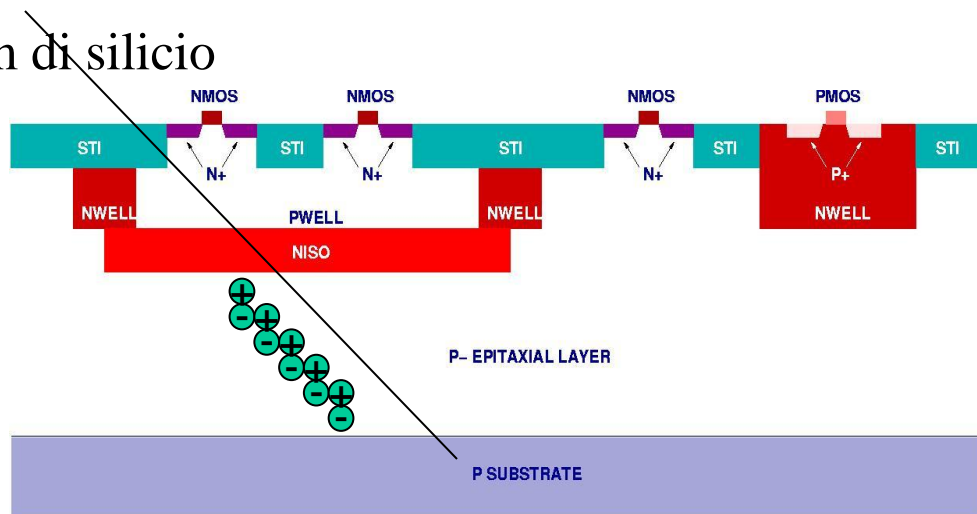
PRIN 2003: realizzati singoli pixel attivi in tecnologia CMOS ST-Microelectronics 0.13 μm in tripla well.

- Parte dell'elettronica di readout del pixel sovrapposta all'elettrodo di raccolta:

- Fill factor >90 %

- Preamplificatore+shaper+discriminatore

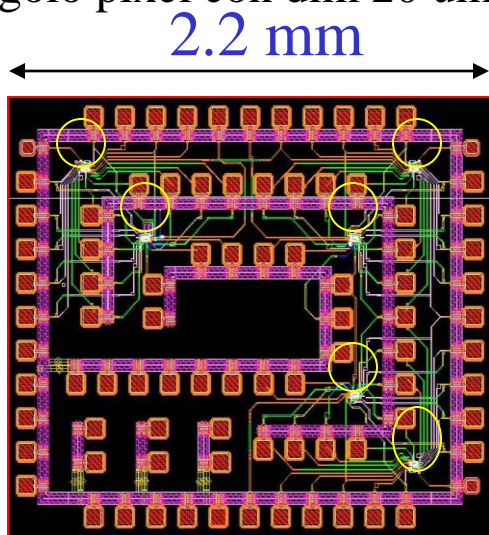
integrato sul singolo pixel con dim 20 μm x 20 μm \rightarrow 40 μm x 40 μm



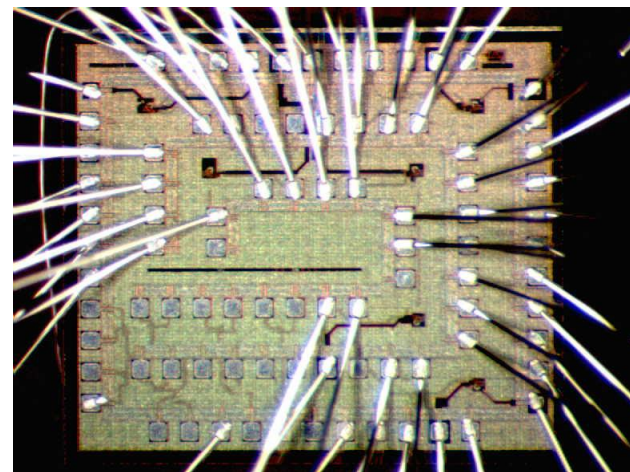
Chip microsaldato sotto test:

- 6 pixel di varie dimensioni
- Con circuito di iniezione di carica

Chip
Layout:

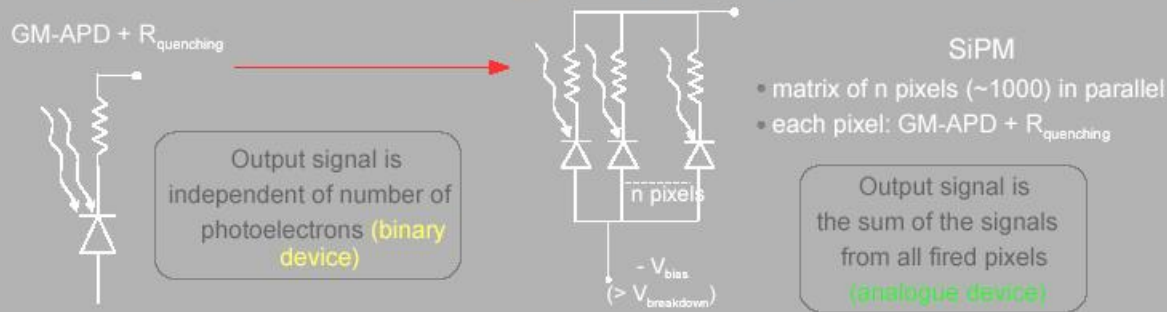


1.9 mm



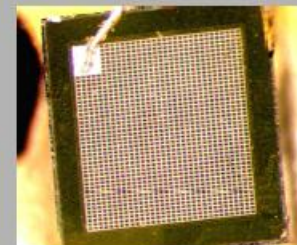
Development and Applications of SiPM to Medical Physics and Space Physics (DASiPM)

The Silicon Photomultiplier (SiPM)



As developed by CPTA, Moscow

- **p-n junction diode biased above the breakdown voltage**
 - Depletion region: $\sim 5\mu\text{m}$ thick, Avalanche region: $\sim 1\mu\text{m}$ thick.
- **The surface is split into microcells – that act like miniature, independent and identical Geiger-mode APDs**
 - This is achieved by depositing the n^+ layer in $30\mu\text{m}^2$ cells
 - In this way the avalanche region is localised to each cell.
- **Avalanche is passively quenched by a resistive layer**
 - The SiC has high resistivity meaning a thin layer can be used.
- **A semi-transparent metal layer forms the electrode**
 - This results in a proportional signal for moderate photon fluxes ($N_{\text{photon}} < N_{\text{cells}}$)



MATRIX

ESPERIMENTO DI RICERCA E SVILUPPO
NEL BIENNIO 2005-2006

C. Avanzini ^(a), M. G. Bagliesi ^(b), D. Busonero ^(b), R. Cecchi ^(b),
P. S. Marrocchesi ^(b), F. Morsani ^(a), A. Pirri ^(b)

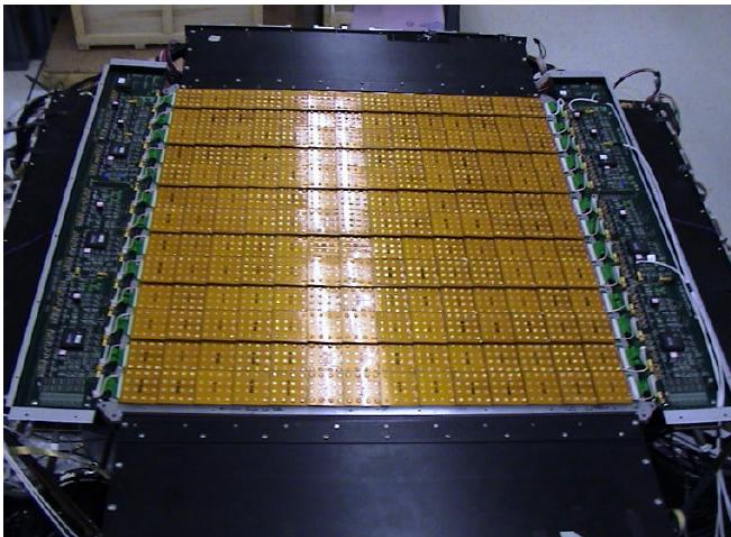
(a) Univ. di Pisa / INFN Sezione di Pisa
(b) Univ. di Siena / INFN Gruppo Collegato

Sviluppo di **elettronica di front-end ad alto range dinamico e basso rumore**

nell'ambito di un progetto integrato per lo sviluppo di
matrici di sensori a semiconduttore con pixels di grandi dimensioni

per l'identificazione in carica della radiazione cosmica primaria
in esperimenti nella **stratosfera o nello spazio**.

Silicon Pad Charge Detector



VA32_HDB14

A new **low-power, low-noise front-end chip with large dynamic range** was developed by IDEAS under specs by Univ. of Kanagawa (Tokio) and Univ. of Siena (PRIN 2000)

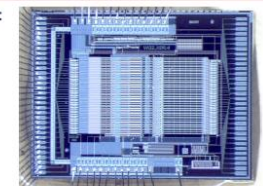
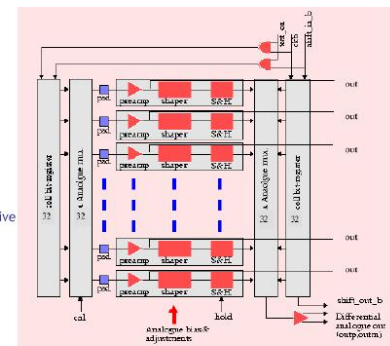
The VA32_HDB14 chip is designed to work for positive and negative input charges, but it is optimized for negative input signals. It can be used, for example, for the readout of:

- MAPMT
- HPD
- SILICON ARRAYS

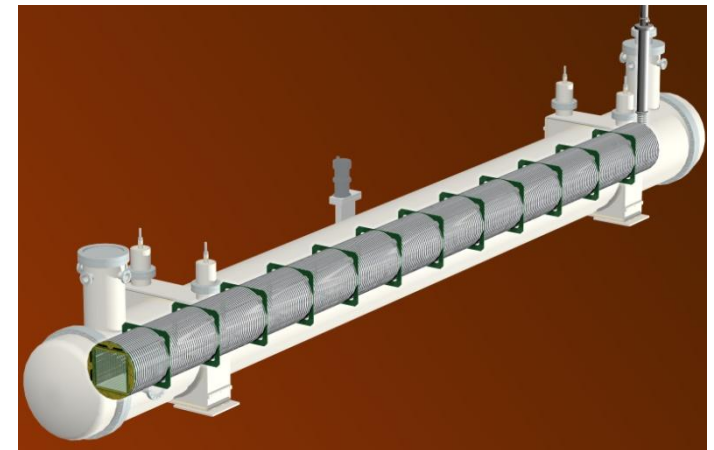
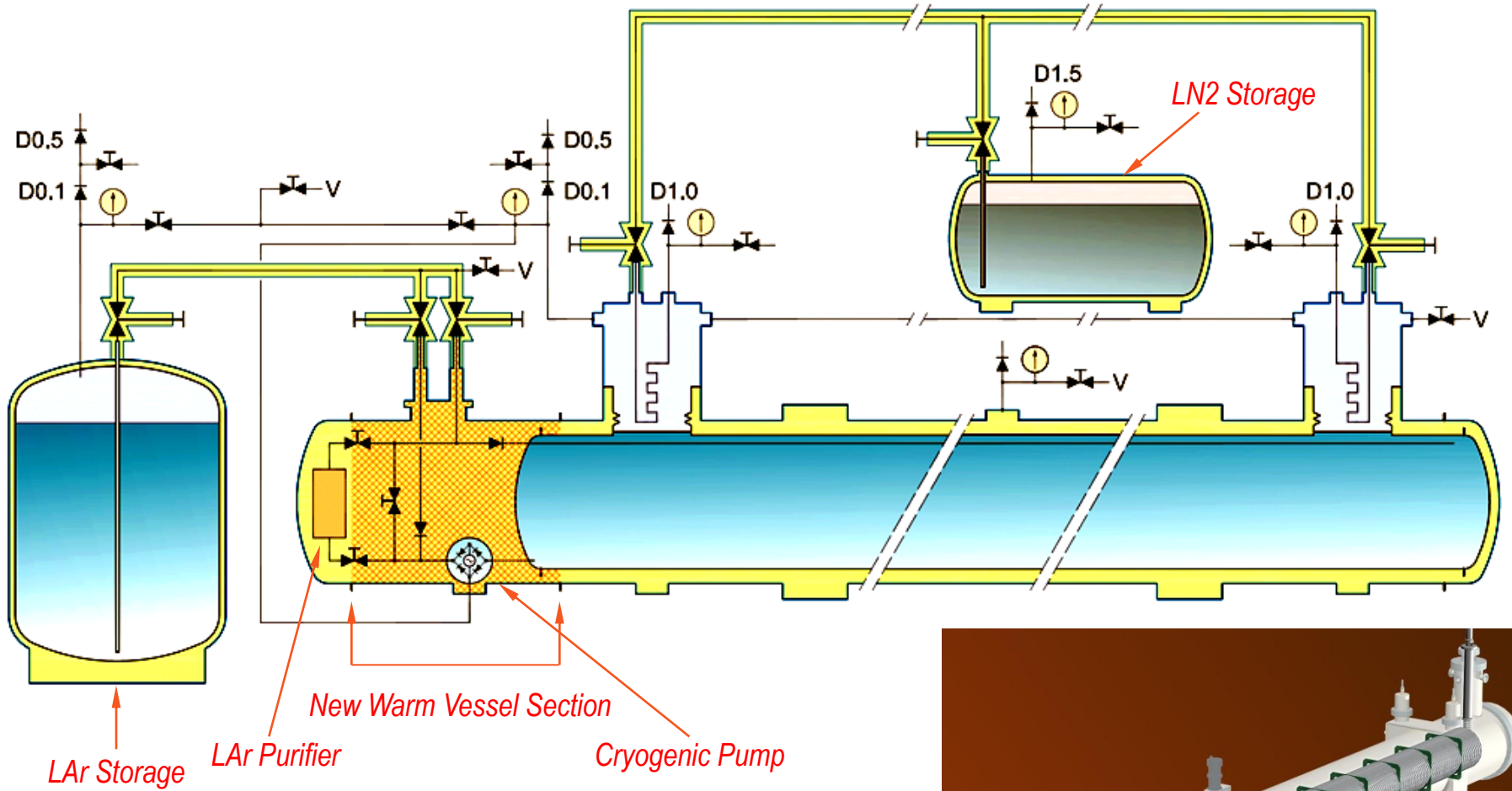


It is a 32 channels **charge sensitive preamplifier-shaper circuit** with:

- ♦ low noise (~ 0.8 fC),
- ♦ low power dissipation: ~ 109 mW (~ 3.4 mW/channel),
- ♦ large dynamic range: -15 pC to 10 pC,
- ♦ less than 2% non linearity in range -8 pC to $+8$ pC
- ♦ peaking time: 1.85 μ s
- ♦ simultaneous sample-and-hold,
- ♦ multiplexed analog read-out,
- ♦ calibration facilities,
- ♦ gain: 73 μ A/pC



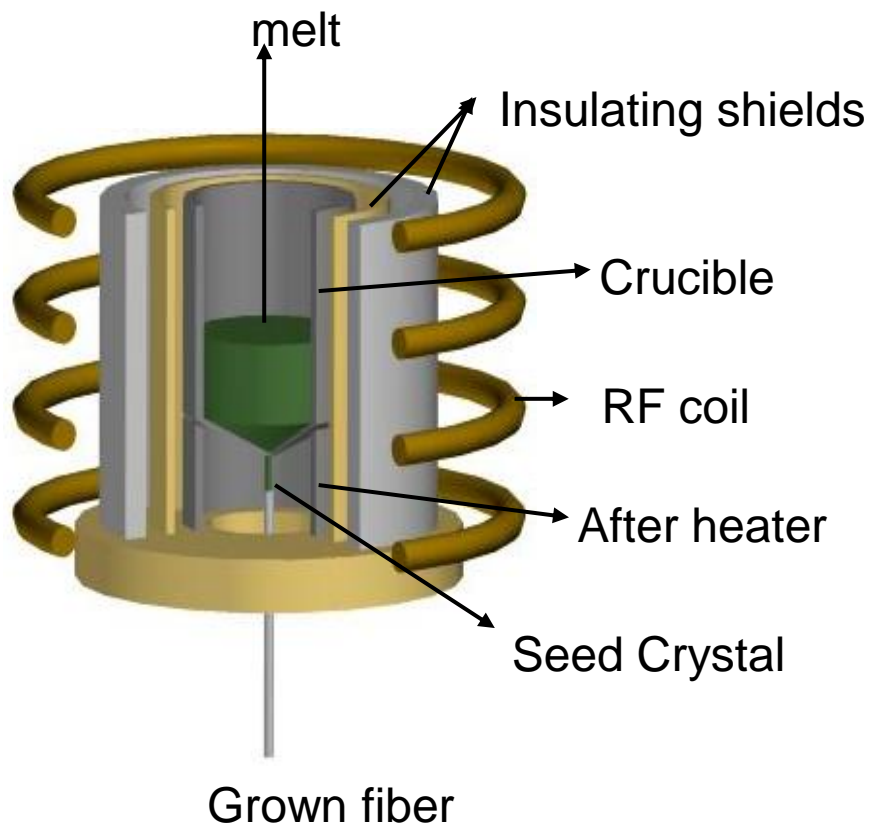
LANNDD-5mD



Cathode and Field Shaping Electrodes

Fiber Scintillating Crystals (FSC)

Micro-Pulling-Down Furnace

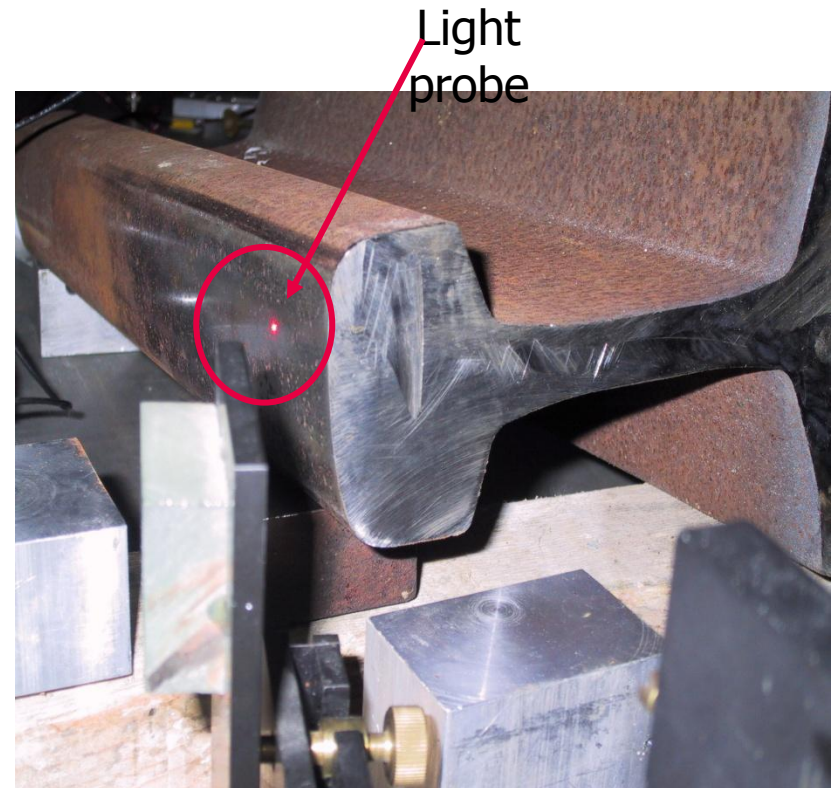
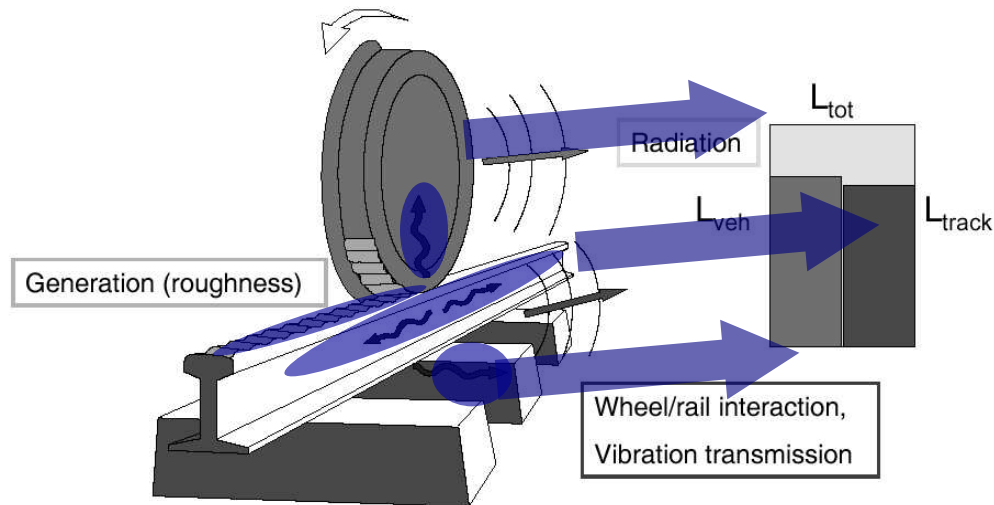


RUGO

Misura della rugosità della rotaia ad alta velocità

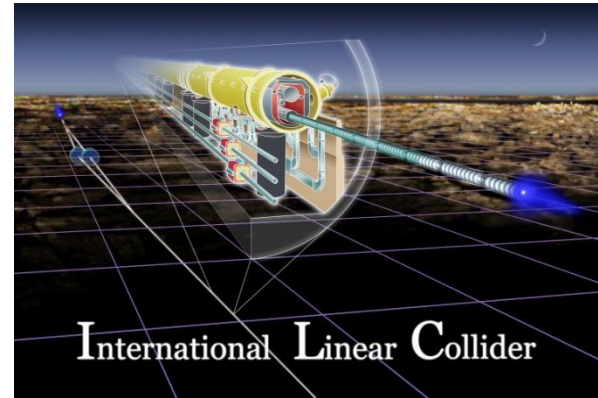
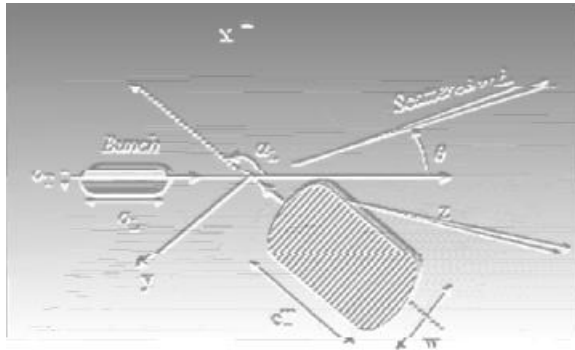
Interference on rail

TWINS model



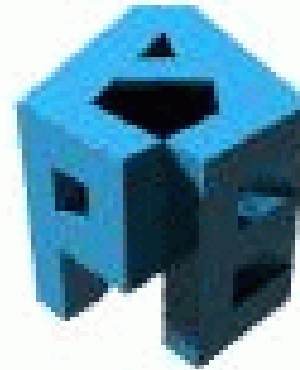
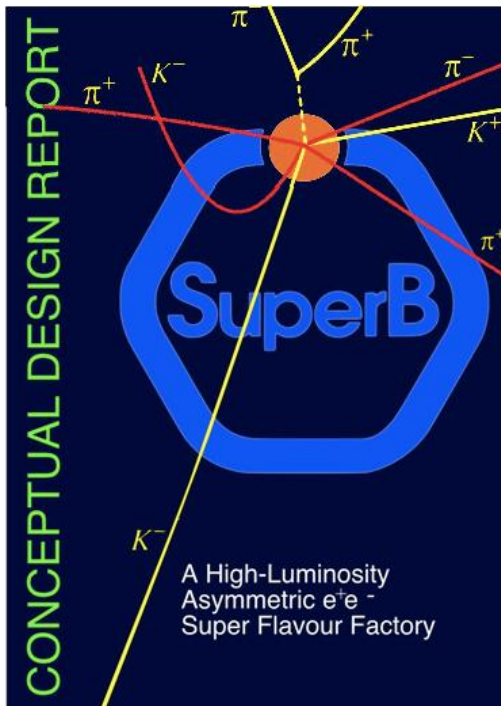
PROGETTI SPECIALI

PLASMONX



ILC

SUPERB



APE



GRID



Teoria dei campi e di stringa

- [PI11](#) Teoria quantistica dei campi, fenomeni critici, gravità classica e quantistica
- [PI12](#) QCD e confinamento, teorie di gauge $SU(N)$, meccanica statistica
- [PI13](#) Aspetti generali e non-perturbativi della teoria quantistica dei campi
- [PI14](#) Dinamica non-perturbativa delle teorie di gauge, teoria delle corde e meccanica statistica
- [TS11](#) Applicazioni dei metodi della geometria differenziale e della topologia alle teorie di campo e delle corde

Fenomenologia delle interazioni fondamentali

- [PI21](#) Teorie di campo e costruzione di modelli per la fisica delle interazioni fondamentali

Fisica nucleare

- [PI31](#) Tecniche microscopiche per sistemi nucleari a molti corpi
- [PI32](#) Fisica dei fasci esotici
- [PD32](#) Sistemi adronici a pochi corpi: nucleoni e nuclei leggeri

Metodi matematici

- [BO41](#) Teoria dei sistemi dinamici con applicazioni a sistemi non-lineari

Fisica astroparticellare

- [CT51](#) Oggetti stellari compatti e materia adronica ad alta densità
- [FA51](#) Neutrini, universo primordiale, materia ed energia oscura, sorgenti di radiazione astrofisiche
- [PD51](#) Inflazione, materia oscura e la struttura a grande scala dell'universo

REPORT OF THE SCIENTIFIC COMMITTEE OF INFN-PISA

Meeting of October 29-30, 2003

John Carr, Andreas S. Schwarz, Fabio Zwirner

November 24, 2003

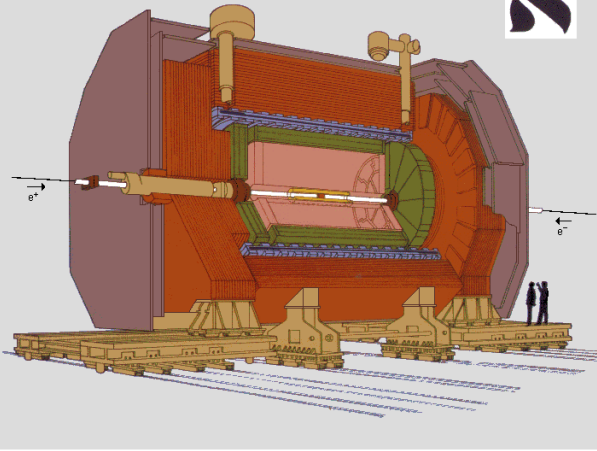
Overall, the committee was very much impressed by the broad spectrum of first class experimental and theoretical activities at the INFN-Pisa. Contrary to the initial reaction that the program might be too diversified, the committee comes to the conclusion that in every project the support needed to achieve the goals is essentially adequate. The procedures by which new projects are initiated and old programs are closed are sound. The committee is especially impressed by the large number of formal international responsibilities (spokespersons, coordinators) that have been put in the hands of members of the Sezione di Pisa displaying the high level of experience and appreciation they have accumulated in our field.

The technical support to the experiments is excellent and in some areas (like the silicon detector laboratory) of unique character. The close proximity and collaboration with the University of Pisa and the Scuola Normale Superiore seem to be very beneficial for all parties involved and generate a lively, invigorating atmosphere.

The committee took notice that in INFN, and especially in Pisa, an increasing fraction of the activity is carried out by researchers on non-permanent postdoctoral contracts. The large number of these contracts, the age distribution of their recipients, and the absence of permanent job openings over the last two years, are reasons for great concern. The need for a regular and predictable inflow of new permanent jobs should be stressed as a top priority to the central INFN and academic authorities. Some form of local planning for new permanent jobs should be made possible, within the available resources.

Altre Slides

ALEPH : data taking at LEP From 1989 to 2000

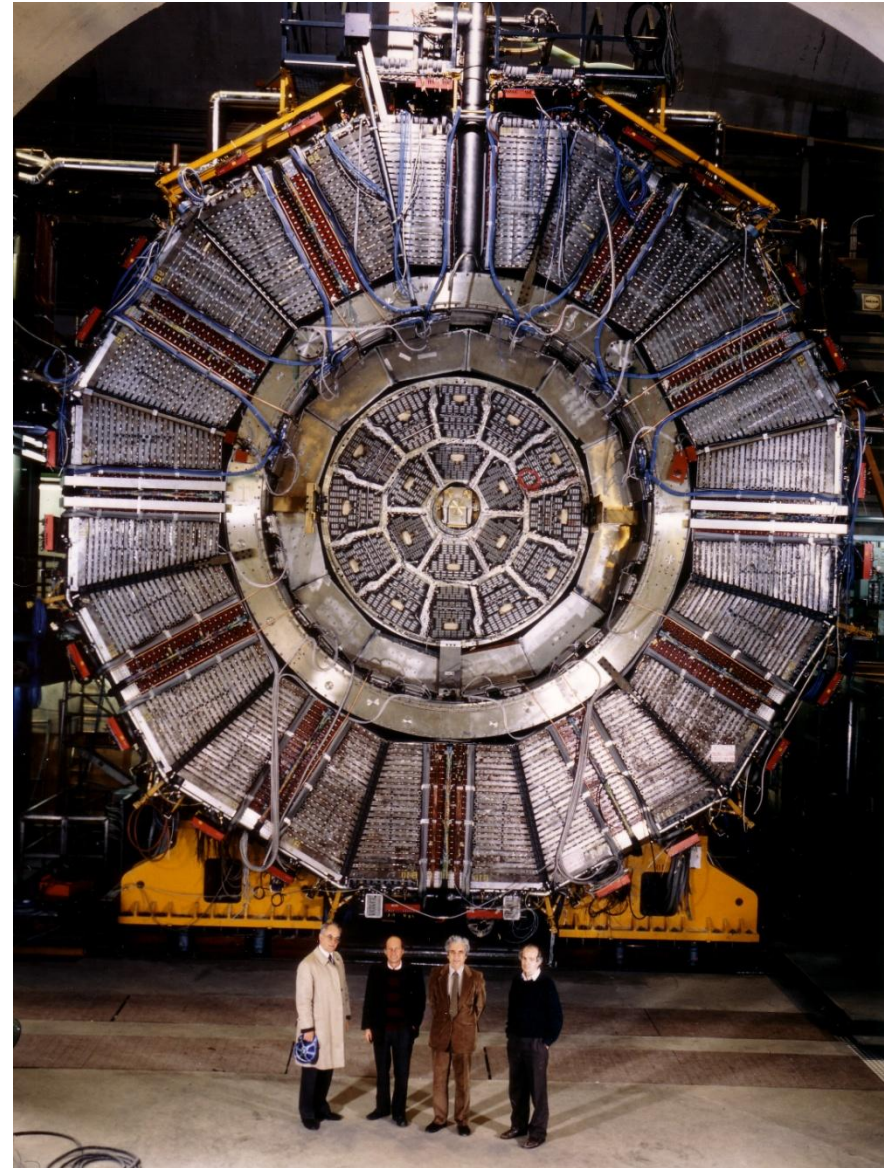


- Vertex Detector
- Inner Tracking Chamber
- Time Projection Chamber
- Electromagnetic Calorimeter
- Superconducting Magnet Coil
- Hadron Calorimeter
- Muon Chambers
- Luminosity Monitors

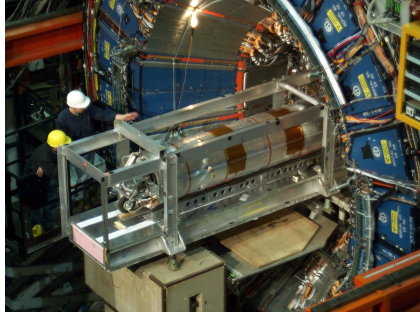
The ALEPH Detector



The ALEPH
Vertex
Detector



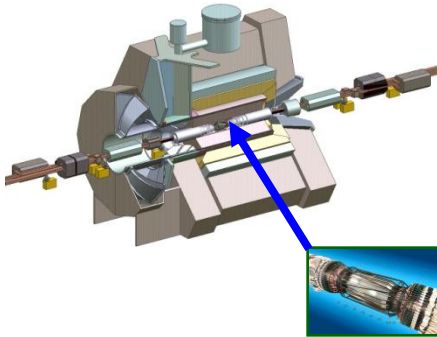
CDF



CMS
+
TOTEM



BABAR

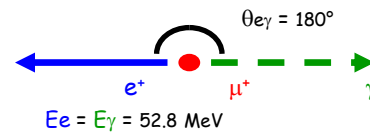
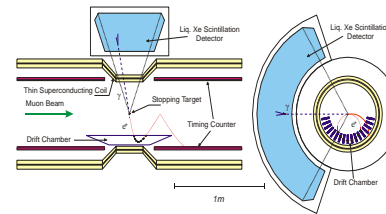
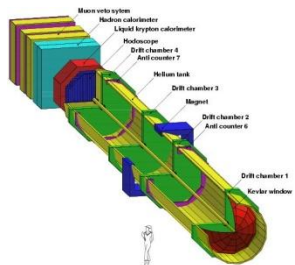


Silicon Vertex Tracker

ATLAS

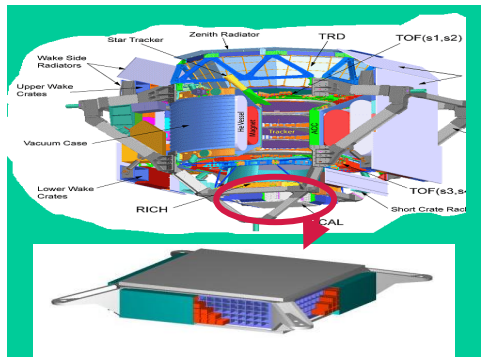


NA48
(P326)

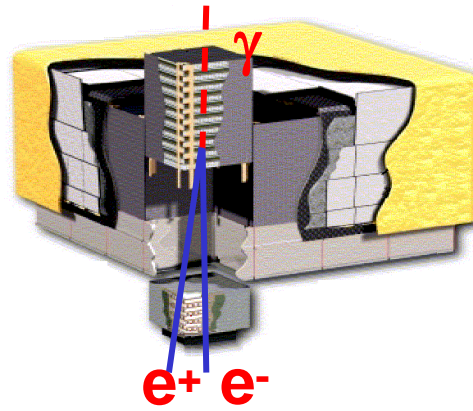


MEG

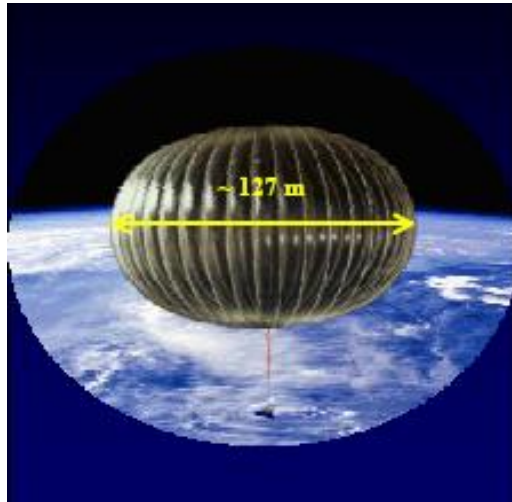
AMS



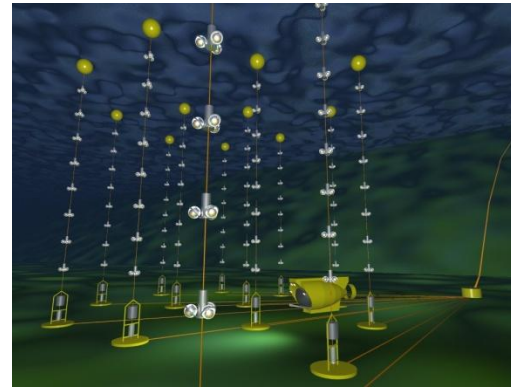
GLAST



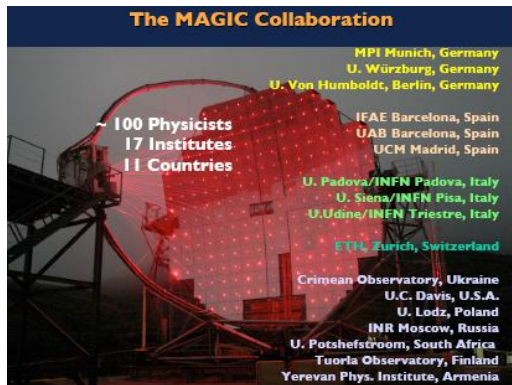
CREAM



ANTARES
NEMO



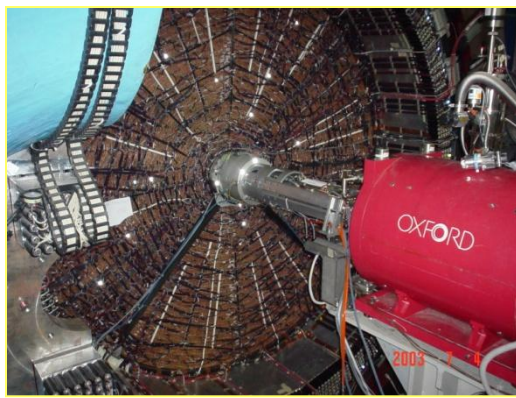
MAGIC



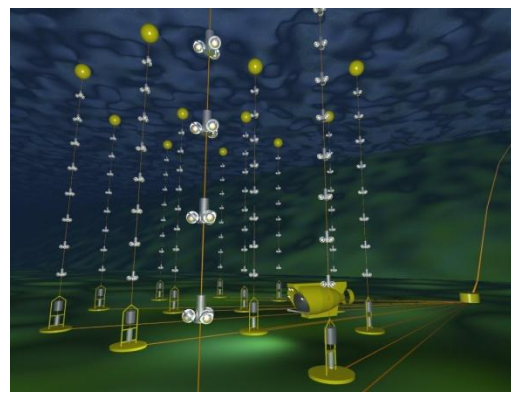
VIRGO



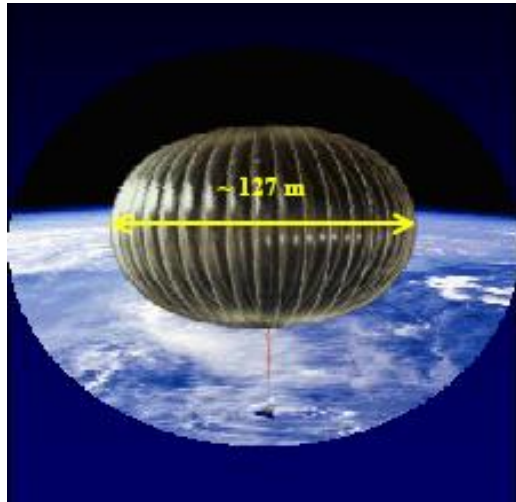
KLOE



ANTARES



CREAM



PVLAS



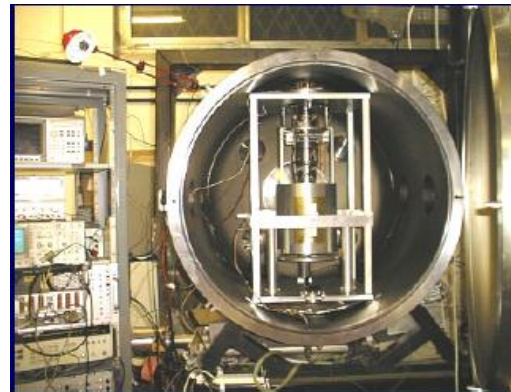
MAGIC

The MAGIC Collaboration

100 Physicists
17 Institutes
11 Countries

- MPI Munich, Germany
- U. Würzburg, Germany
- U. Von Humboldt, Berlin, Germany
- IFAE Barcelona, Spain
- UAB Barcelona, Spain
- UCM Madrid, Spain
- U. Padova/INFN Padova, Italy
- U. Siena/INFN Pisa, Italy
- U. Udine/INFN Trieste, Italy
- ETH Zurich, Switzerland
- Crimean Observatory, Ukraine
- U.C. Davis, U.S.A.
- U. Lodz, Poland
- INR Moscow, Russia
- U. Potshelsboom, South Africa
- Tuorla Observatory, Finland
- Yerevan Phys. Institute, Armenia

GGG





PLANIMETRIA D'ORIENTAMENTO – Piano Terra –



NUMERI DI EMERGENZA

113 POLIZIA	118 SERVIZIO SANITARIO
112 CARABINIERI	115 VIGILI DEL FUOCO

IN CASO DI INCENDIO E DI EMERGENZA

- MANTENERE BRASILE E BRESOCCO
- RISPORONARVE LOCALI E POCHEMENTE

CONSIGLI PER IL PRIMO SOCCORSO IN CASO DI EMERGENZA:

- NON TORNARE IN CASO DI INCENDIO
- NON TORNARE IN CASO DI ESPLOSIONE
- NON TORNARE IN CASO DI TERREMOTO
- NON TORNARE IN CASO DI ALLUVIONE
- NON TORNARE IN CASO DI TERREMOTO
- NON TORNARE IN CASO DI TERREMOTO

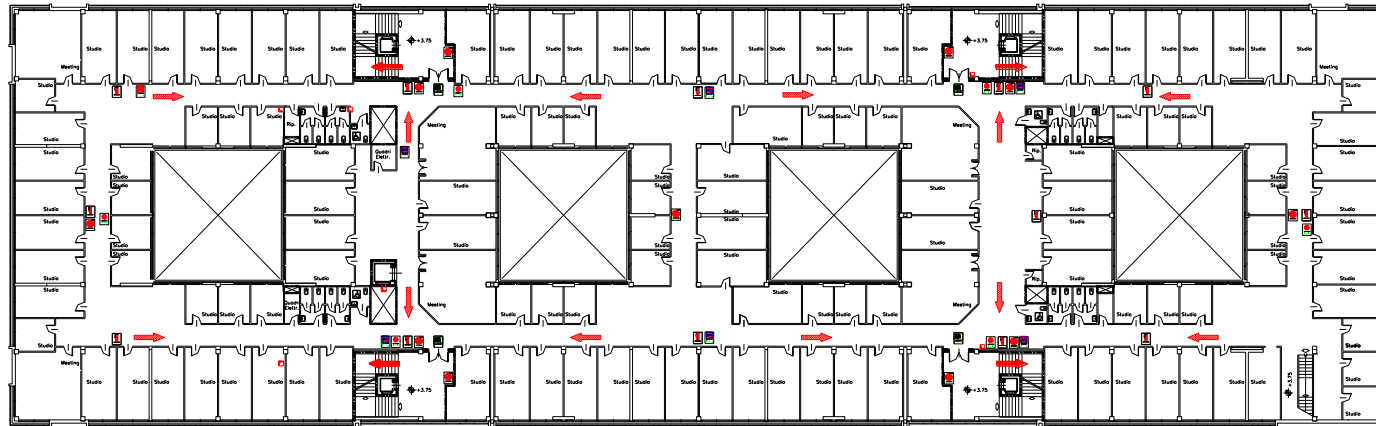
SIMBLOGIA

ESITTO	ESITTO	ESITTO	ESITTO
SCALE	SCALE	SCALE	SCALE
ASCENSORE	ASCENSORE	ASCENSORE	ASCENSORE
ALARME ANTIFUMO	ALARME ANTIFUMO	ALARME ANTIFUMO	ALARME ANTIFUMO
TU SEI QUI	TU SEI QUI	TU SEI QUI	TU SEI QUI

VIE DI ESCO

	PERCORSO ORDINARIO
	PERCORSO SPESALATO
	PERCORSO PER IL SOCCORSO

PLANIMETRIA D'ORIENTAMENTO – Piano Primo –



NUMERI DI EMERGENZA

 **113**
 POLIZIA

 **118**
 SOCCORSO
 SANITARIO
 EMERGENZA

 **112**
 SOCCORSO
 SANITARIO

 **115**
 SOCCORSO
 SANITARIO

IN CASO DIMISSIONE E DI EMERGENZA

 Uscite di emergenza
 Uscite di emergenza

 Uscite di emergenza
 Uscite di emergenza

 Uscite di emergenza
 Uscite di emergenza

 Uscite di emergenza
 Uscite di emergenza

 Uscite di emergenza
 Uscite di emergenza

 Uscite di emergenza
 Uscite di emergenza

SIMBOLOGIA

 Ascensore
 Ascensore

 Ascensore
 Ascensore


 Ascensore
 Ascensore


 Ascensore
 Ascensore


 Ascensore
 Ascensore


 Ascensore
 Ascensore


VE DI ESCO


 Direzione verde


 Direzione rossa


 Direzione rossa


 Direzione rossa


 Direzione rossa


 Direzione rossa


 Direzione rossa

 Direzione rossa

 Direzione rossa

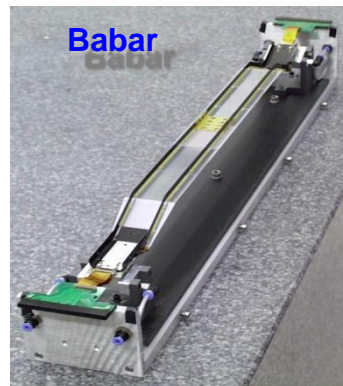
 Direzione rossa

 Direzione rossa

 Direzione rossa

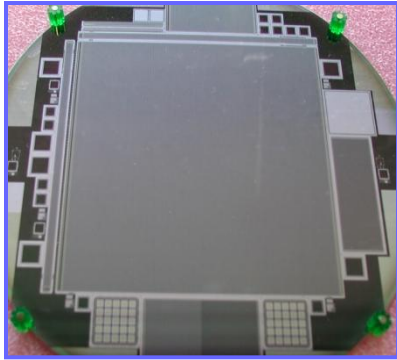


Clean Room facilities in Pisa



GLAST Tracker construction

83 m² silicon detectors in Space



Ladder production status:

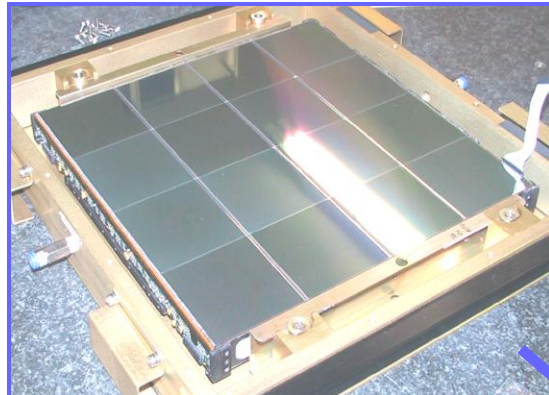
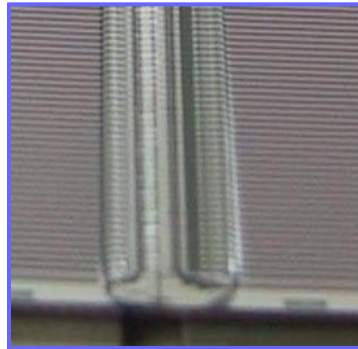
- Completed and tested(INFN) 1200
- Under construction ~650
- rejected <~ 2%
(including start-up problems)
- 0.016% bad chans caused by bonding or probing
- 2 μ m RMS alignment spread

Build and test capabilities demonstrated for flight trays.

Procurement and test finished last

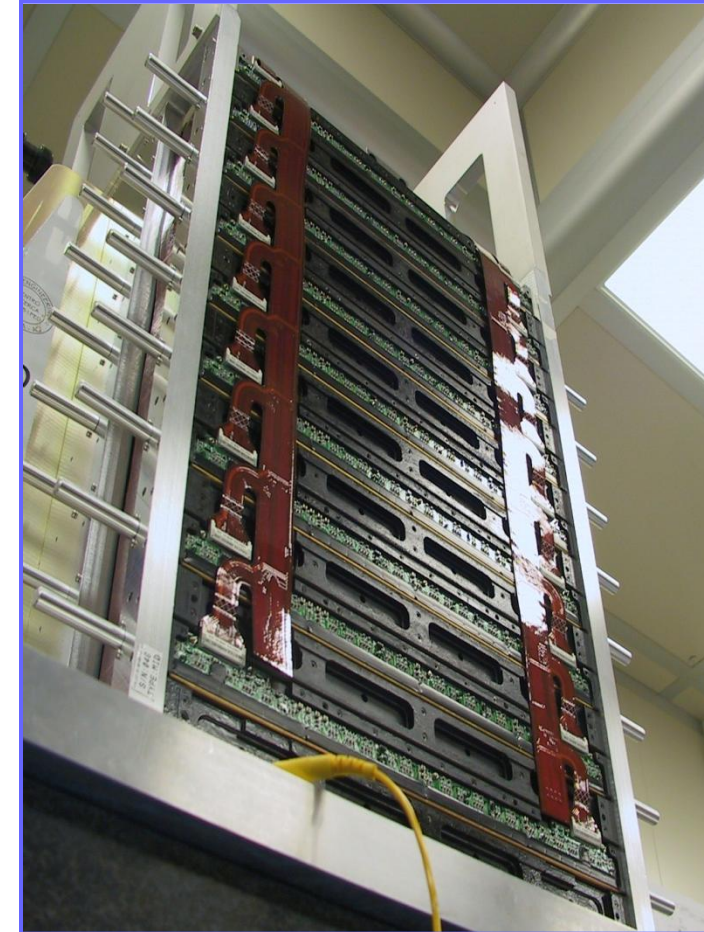
june

- 11500 SSDs in total
- up to 700 SSD/month from HPK and tested at INFN
- final rejection rate ~0.5%



Tray Assembly and Test
G&A (Italy)

Tower Assembly and Test
INFN (Italy)

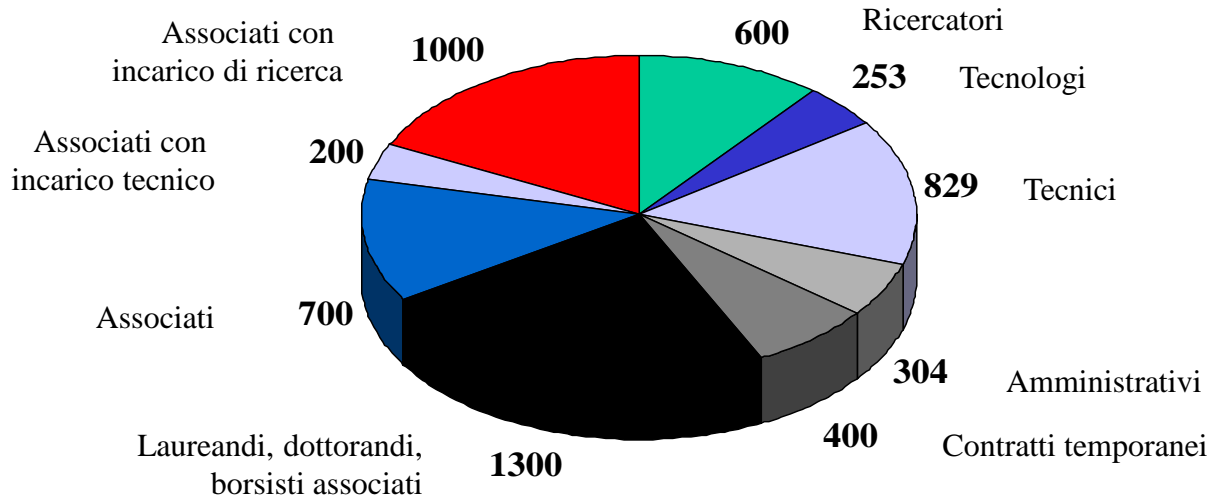


Tower0 currently under functional test with cosmics.

Personale

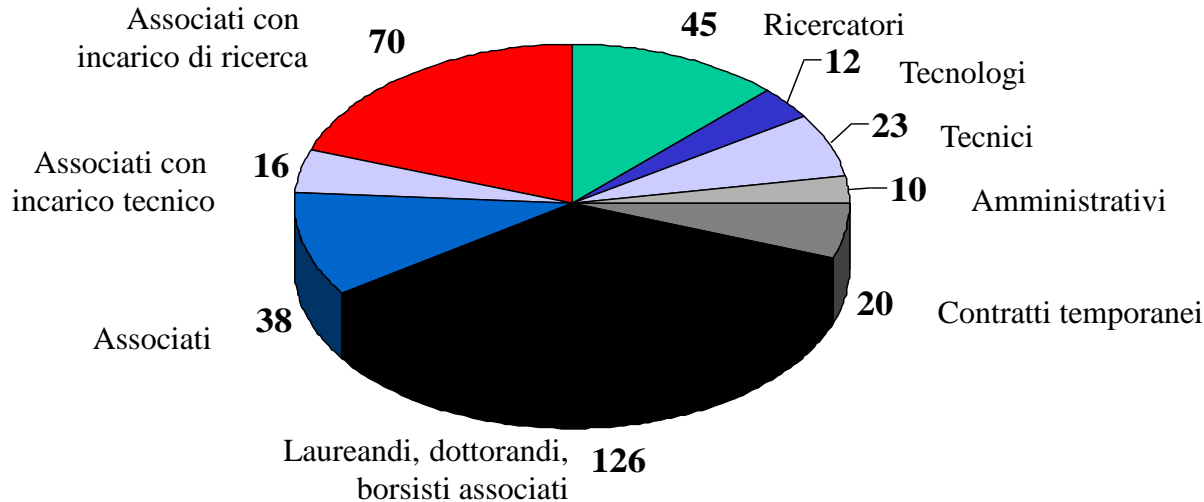
Università

INFN



ITALIA

(5586 unita`)



PISA

(~ 400 unita`)