Istituto Nazionale di Fisica Nucleare

Consuntivi scientifici attività di gruppo 1

Sezione di Pavia: 2018

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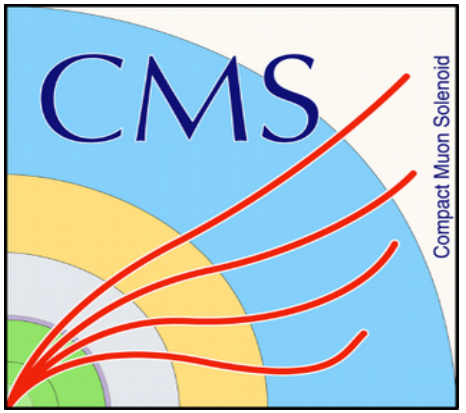
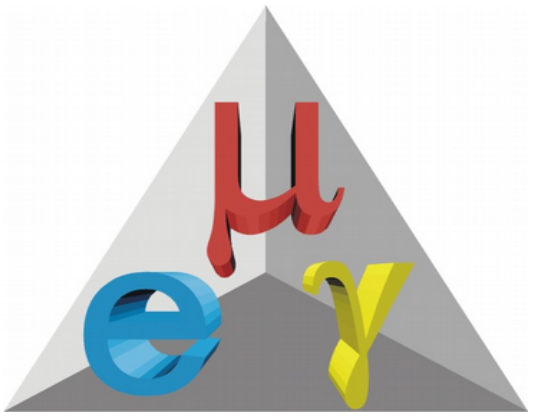
Attività pavesi

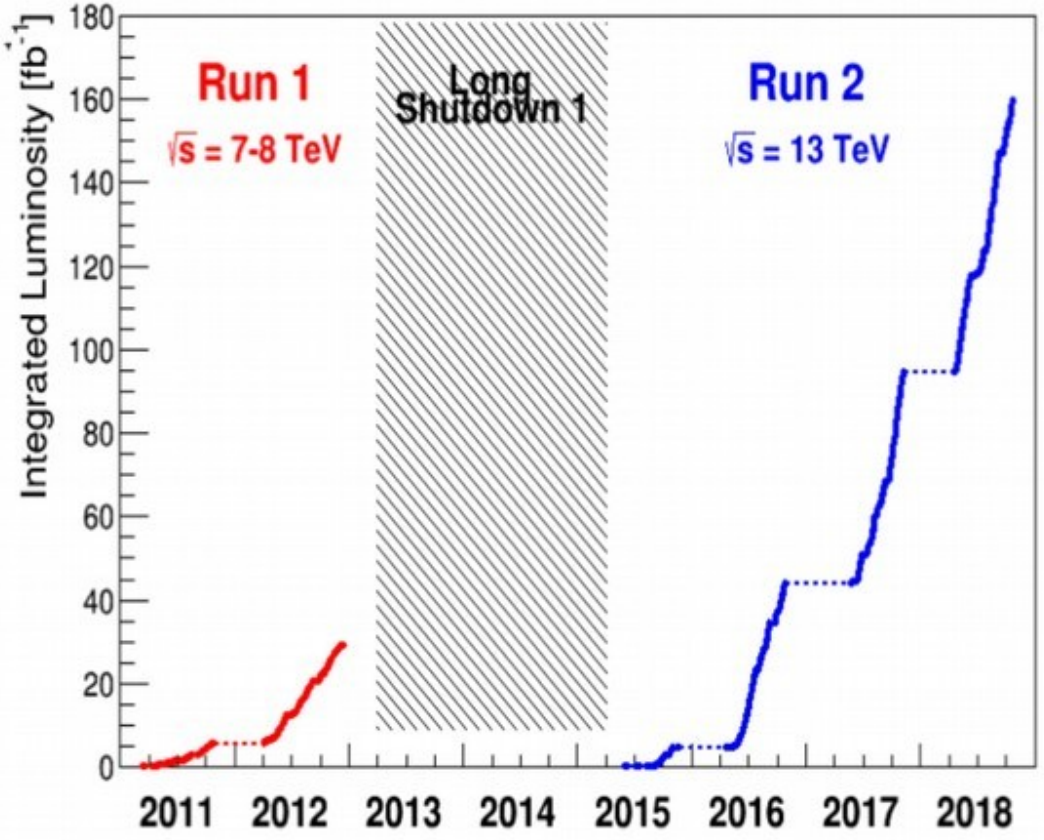
- Frontiera dell'energia
  - **ATLAS** [Responsabile Locale: G. Gaudio]
  - **CMS** [Responsabile Locale: A. Braghieri]
- Frontiera della precisione
  - **MEG** [Responsabile Locale: P. Cattaneo]
- Frontiera …. delle frontiere
  - **RD_FA**: R&D Future Accelerators





LHC

- Luminosità integrata totale ~190 fb^{-1}
  - 160 fb^{-1} a 13 TeV (run 2)
- Long Shutdown 2: 2019-2020

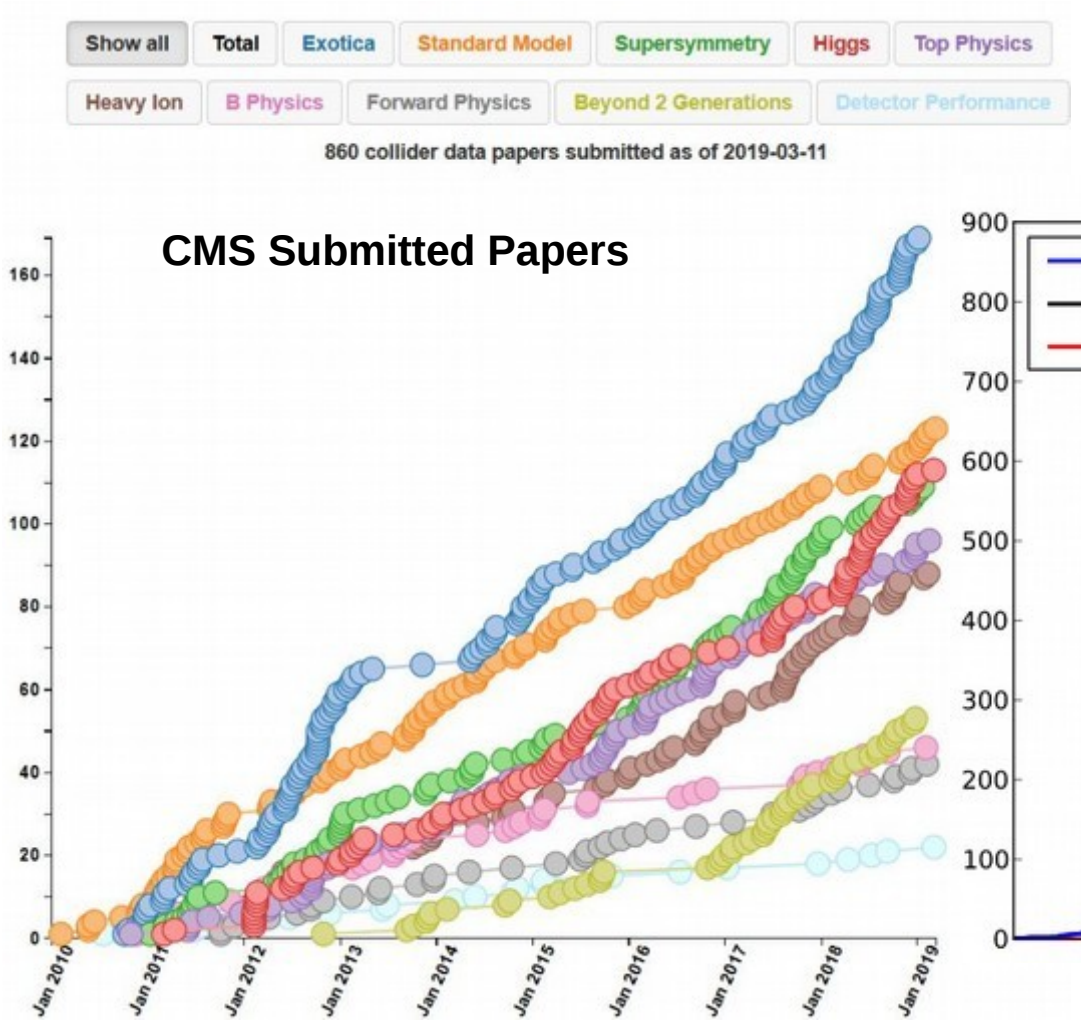


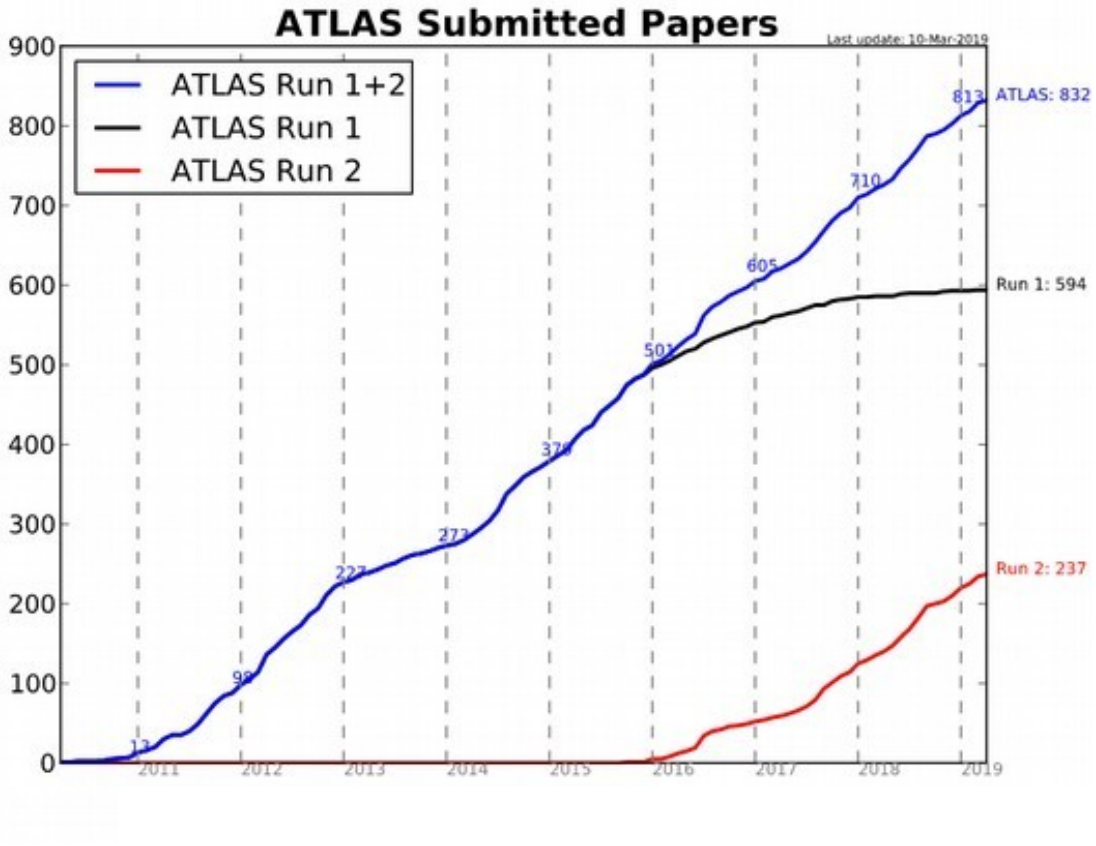
Period	Integrated Luminosity [fb^{-1}]
Run 1	29.2
Run 2: 2015	4.2
Run 2: 2016	39.7
Run 2: 2017	50.2
Run 2: 2018	66.0
Run1 + Run 2	189.3

Run 2 at 13 TeV
160.1 fb^{-1}

Produzione scientifica

- ATLAS e CMS: ~ 850 lavori a testa
  - Circa 100 all'anno



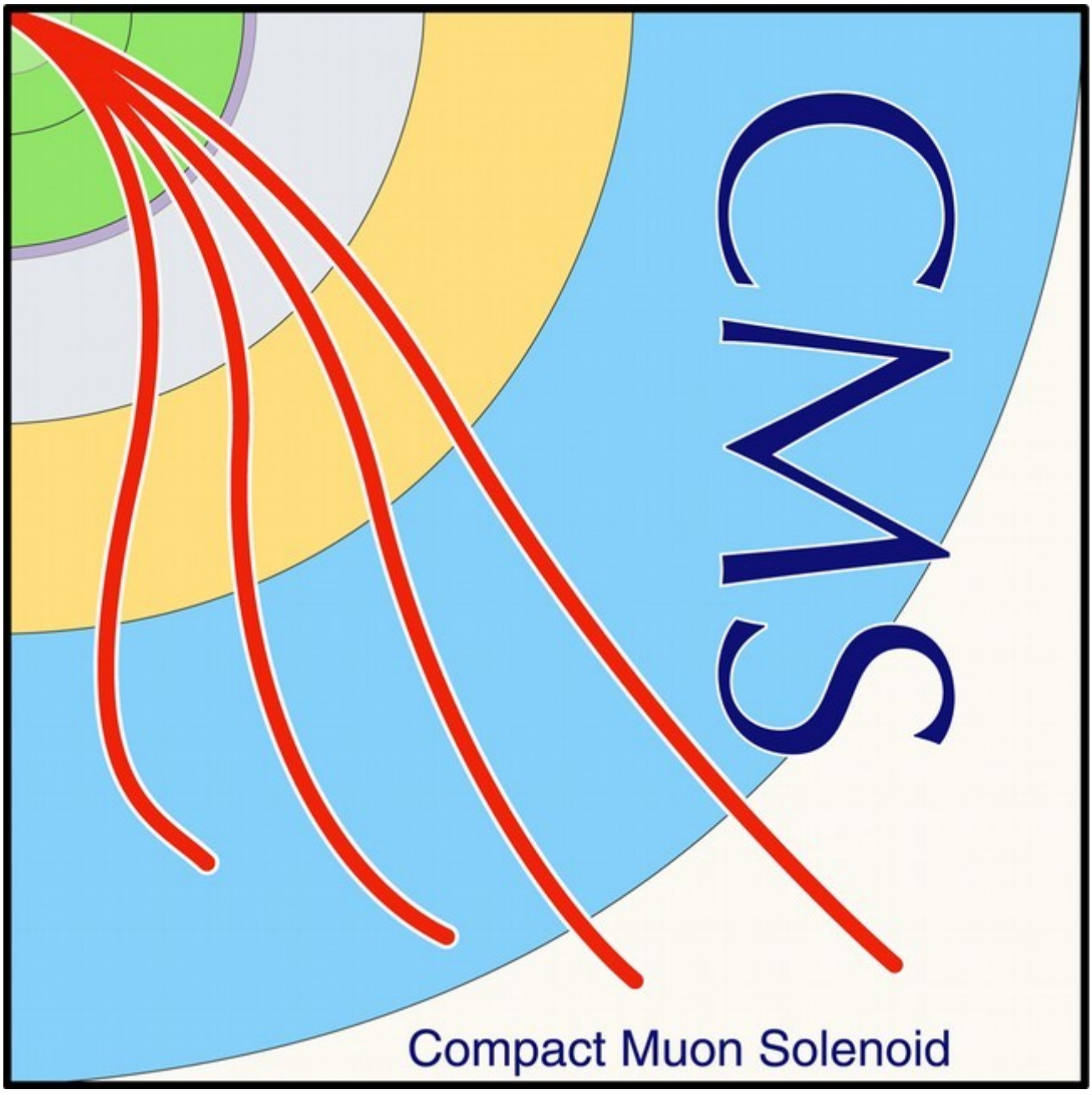


Run 3 goals

- Ramp up graduale: 2021 → 2022 → 2023
  - 1 → 2 (x 10^{34} $cm^{-2}s^{-1}$)
  - Rimanendo sotto pile-up 60
- Integrale: 400 fb^{-1}

Experiment	Target for Run-III
ATLAS & CMS	As much as possible! (pileup < 60 events)
Alice	200 pb^{-1}
LHCb	> 15 fb^{-1} (50 fb^{-1} by LS4)

	2021	2022	2023	Comment
Beam energy [TeV]	7.0			7 TeV is being re-discussed for Run III
Collisions at IP1/5 & IP2/IP8	2736/2736 & 2250/2376			Possible heat-load limitation not included
Bunch length [ns]	1.2	1.2	1.2	1.0 ns after ~10 h of SB, then kept constant
Normalized emittance [μm]	2.5	2.5	2.5	Huge margin taken (could be as small as 1.8 μm)
Bunch charge [10^{11} ppb]	0 → 1.4	1.4 → 1.8	1.8	Intensity ramp up within each year
Peak lumi [10^{34} $cm^{-2}s^{-1}$] @ IP1/5	**0 → 1.55**	**1.19 → 1.98**	**1.98**	**Calculated with γε=1.8 μm (best lumi conditions)**
Integrated lumi in IR1/5 [fb^{-1}]	**18 (19)**	**97 (102)**	**106 (110)**	→ 411 (421)


CMS
Compact Muon Solenoid

CONSUNTIVI 2018 - PAVIA

Anagrafica 2018/19			Associazione		TOT		
COGNOME	NOME	RUOLO	RIC.	TECN.	FTE	Responsabilità	
Aimè	Chiara	LM	x		1		
Braghieri	Alessandro	RIC			0,7		
Calzaferri	Simone	Dott.			1		
De Canio	Francesco	Ass.		x	1	RD53A Core Design Team-Coordination of Monitoring	L3
Fallavollita	Francesco	CERN	x		1	QC GE1/1 & aging tests	
Fiorina	Davide	Dott.			1		
Gaioni	Luigi	RTDB		x	0,7	RD53A Core Design Team-Coordination of Analog	L3
Galizzi	Francesco	Dott.		x	1		
Manghisoni	Massimo	PA		x	0,3		
Montagna	Paolo Maria	RU	x		0,7		
Pedrana	Andrea	Dott.		x	1		
Ratti	Lodovico	PA		x	0,5		
Re	Valerio	PO		x	0,7	Analog Working Group Leader	
Ressegotti	Martina	Dott.	x		1		
Riccardi	Cristina	PA	x		0,9	Resource Manager GEM	L1
Salvini	Paola	RIC	x		0,9		
Sonzogni	Mauro				0,2		
Traversi	Gianluca	PA		x	0,6		
Vai	Ilaria	RTDA		x	0,7	GE1/1 Slice Test commissioning coordinator	L3
Vitulo	Paolo	PA	x		0,8	R&D fase II Upgrade Coordinator Office	L2
				TOTALI FTE PAVIA	15,7		

Il gruppo di Pavia è impegnato in 2 items:

- **TRACKER** detector
- **MUON** system
  - RPC
  - GEM
  - Simulazioni

Parte delle attività riguardano l'**upgrade (-> RD_FASE2)**

3 nuovi Dott/LM.
Ilaria Vai RTD a BG

RD_Fase2 di CMS: impegno del gruppo di Pavia

Nel triennio 2015-2017 le attività che riguardano l' «upgrade» sono state finanziate dall'INFN sotto la sigla «RD_Fase2» con lo scopo di:

- organizzare e supportare le iniziative di R&D finalizzate alla stesura dei TDR (Technical Design Report) dei progetti di upgrade degli esperimenti ATLAS e CMS per la fase HL-LHC
- favorire sinergie tra gli esperimenti ATLAS e CMS

Dal 2018 l'attività di RD_Fase2 continua nell'ambito dei singoli esperimenti ed i preventivi sono stati presentati separatamente da ATLAS e CMS

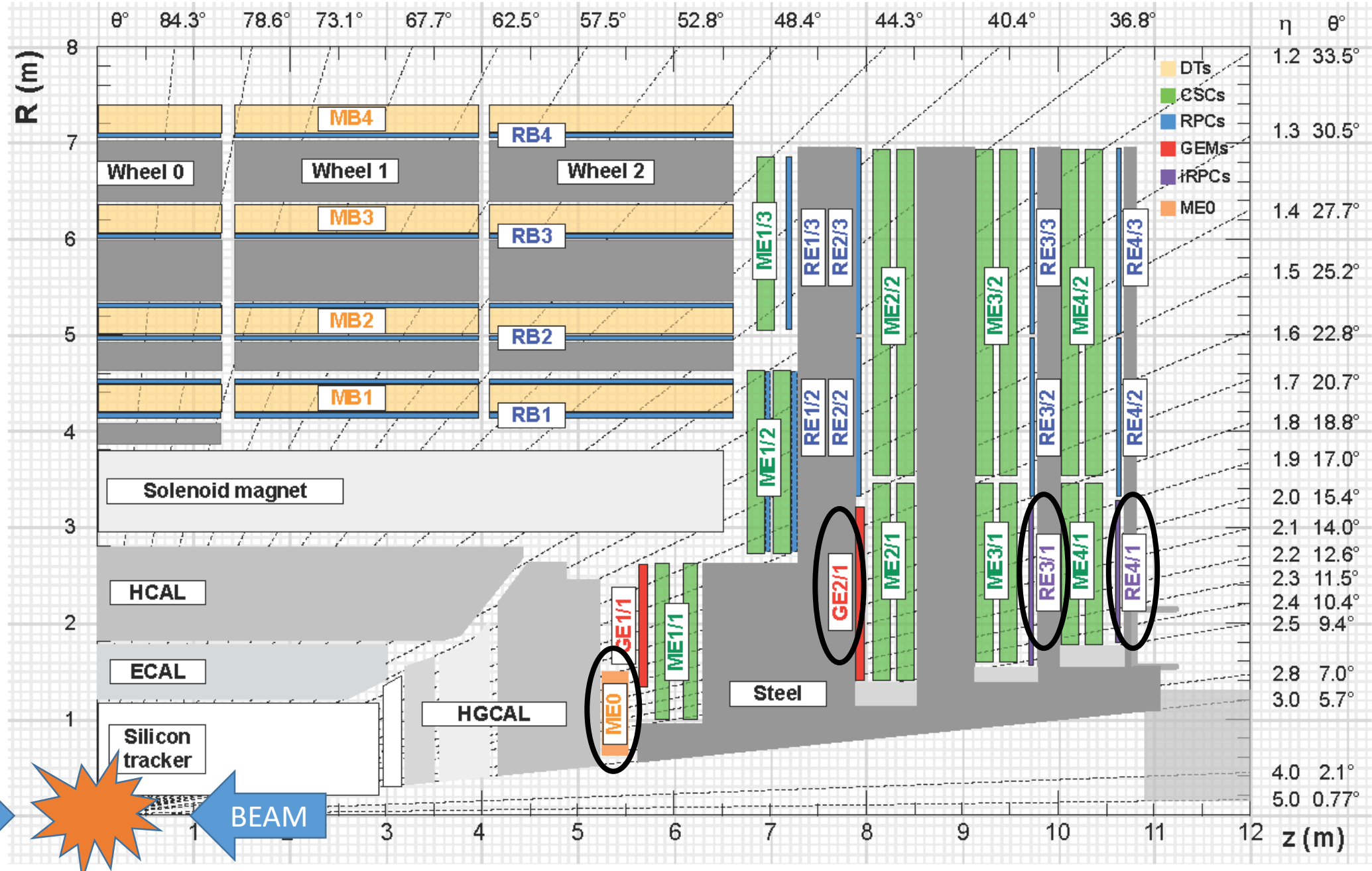
Il gruppo CMS di Pavia è attualmente impegnato per circa il 50% in questa attività.

Upgrade of the Muon Detectors: TDR completato nel 2017 e pubblicato

Sezione longitudinale di un quadrante del rivelatore CMS

nuovi rivelatori previsti nella regione ad «alto» η

RE ⇒ **RPC**
ME/GE ⇒ **GEM**



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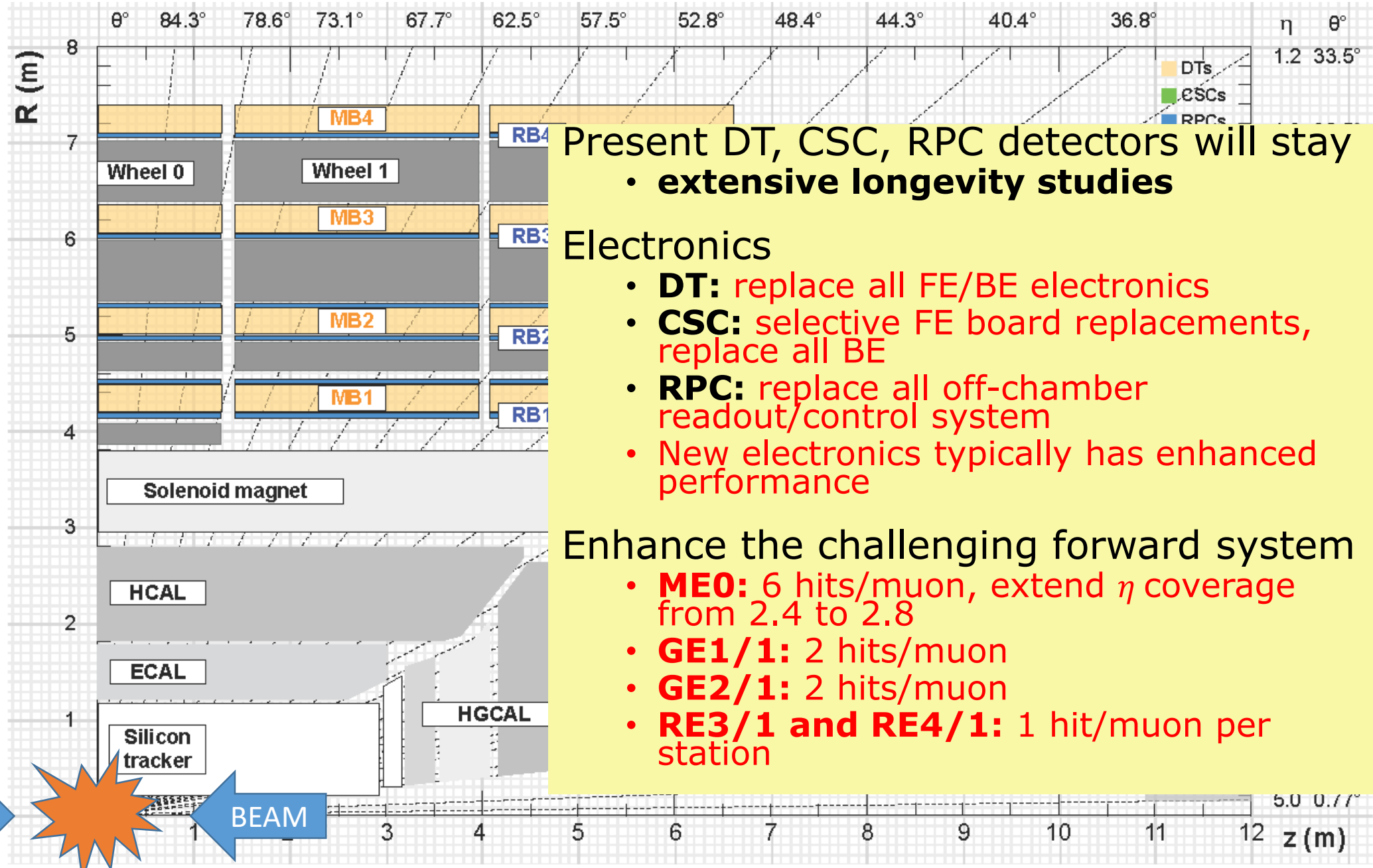


Present DT, CSC, RPC detectors will stay

- **extensive longevity studies**

Electronics

- **DT:** replace all FE/BE electronics
- **CSC:** selective FE board replacements, replace all BE
- **RPC:** replace all off-chamber readout/control system
- New electronics typically has enhanced performance

Enhance the challenging forward system

- **ME0:** 6 hits/muon, extend η coverage from 2.4 to 2.8
- **GE1/1:** 2 hits/muon
- **GE2/1:** 2 hits/muon
- **RE3/1 and RE4/1:** 1 hit/muon per station

RPC Project : (Salvini, Montagna, Braghieri)

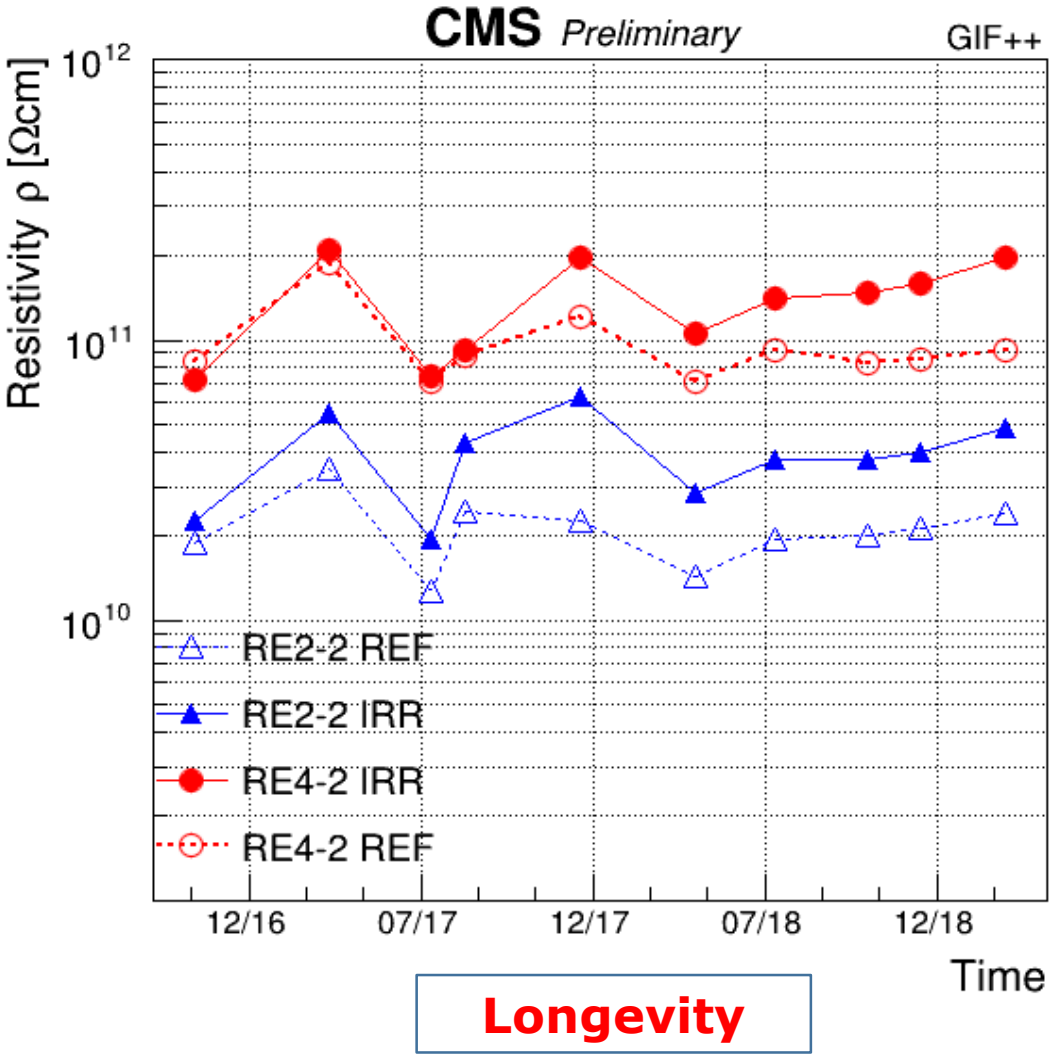
Manutenzione straordinaria in LS2:

- **Campagna di riparazione gas leak**: operazione delicata che coinvolge più rivelatori con parziale estrazione delle camere e talvolta loro apertura per l'accesso alle T del flussaggio, maggior responsabile delle perdite. Fondamentale apporto di Samule Gigli.
- Riparazione connettori HV , Smontaggio RE4 per upgrade CSC

- **Longevity** Q accumulata a fine Marzo 71% di $3xQ_{HL-LHC}$ I parametri del rivelatore (resistività, dark current , noise rate) sono stabili

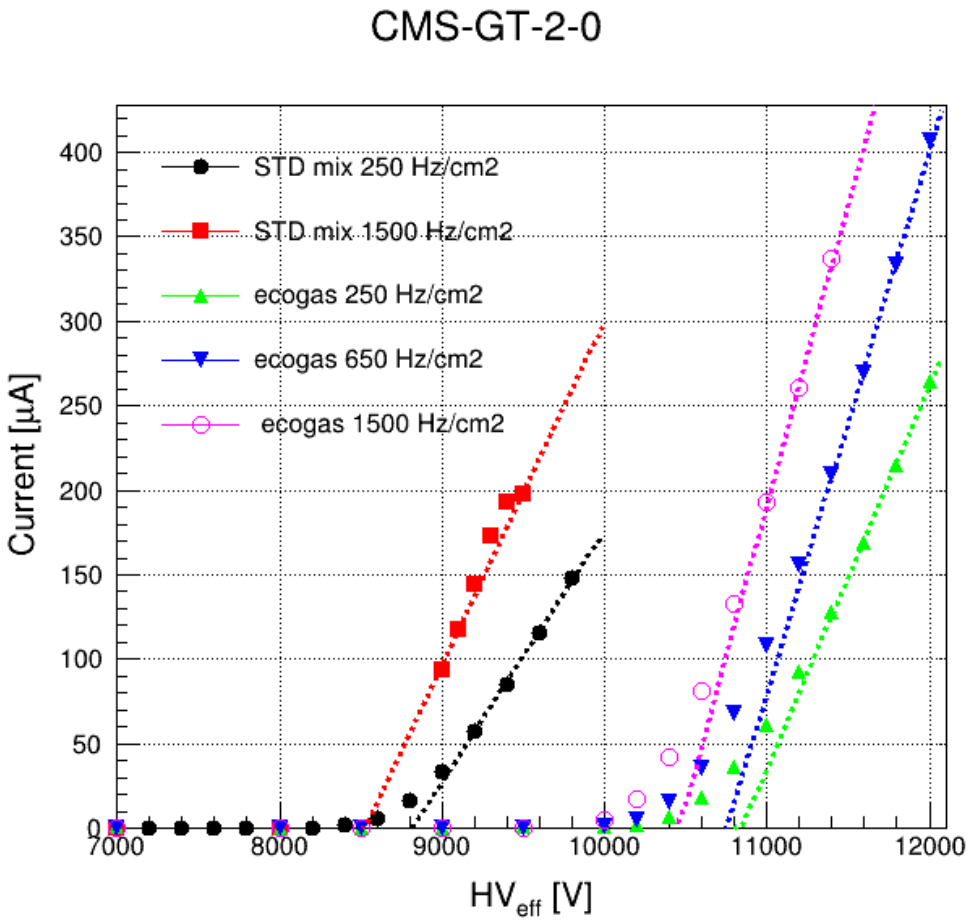
- **Ecogas** RPC testati alla GIF++ con una miscela basata su HFO 1234ze (C3H2F4) : shift di Working Point a diversi bckgrnd rate, misura della corrente di noise e della produzione di HF. Test fatti in collaborazione con Alice, Atlas ed il gas group del CERN

RPC Project :



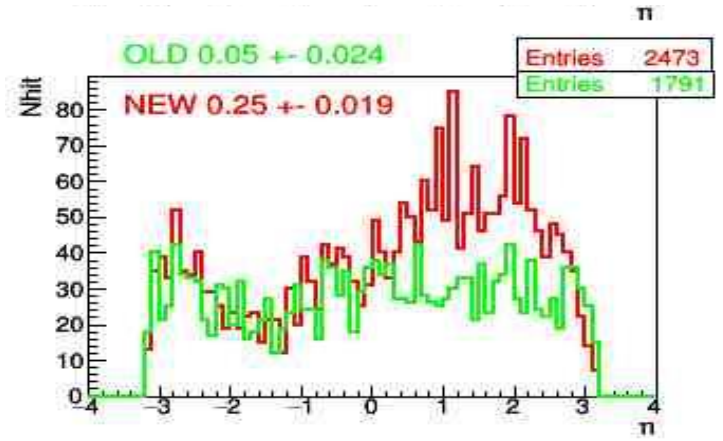
Longevity

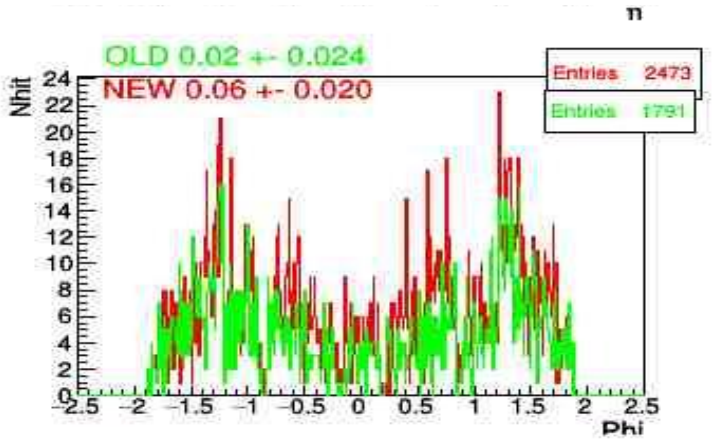
Ecogas



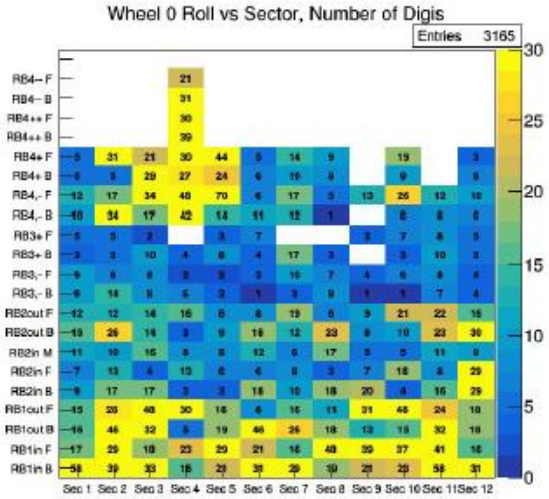
RPC project – simulations & GIF++ tests (Pavia)

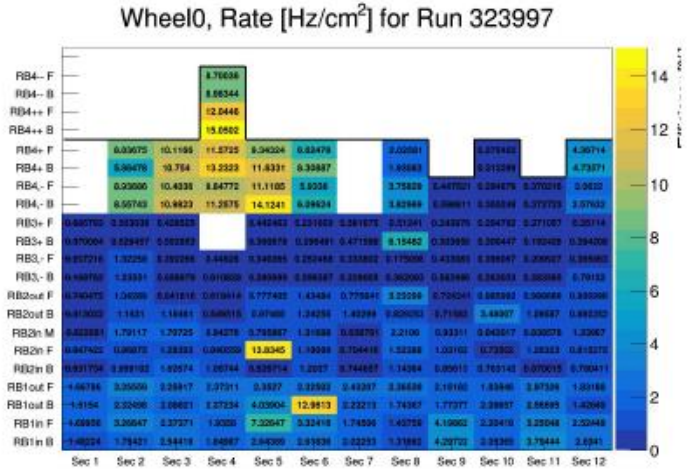
- Studio del background neutronico (vs. eta e vs. phi) con vecchia e nuova descrizione della caverna (verde/rosso)





- Primi confronti qualitativi tra MC e dati sperimentali con nuova descrizione (bassa statistica…)



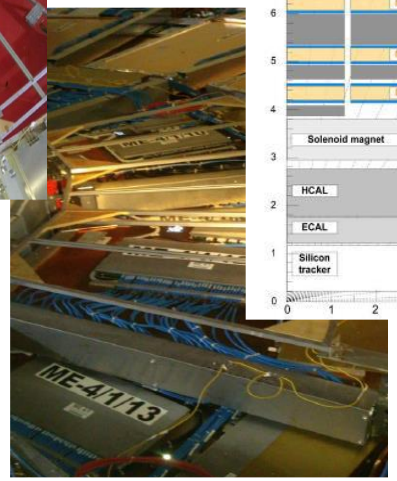


- Partecipazione allo studio della longevity sul sistema attuale e alle attività di analisi dati su rivelatori in test alla GIF++

RPC upgrade (iRPC). Pavia: only GIF++

Installazione dei servizi : in corso senza ritardi sulla schedula prevista

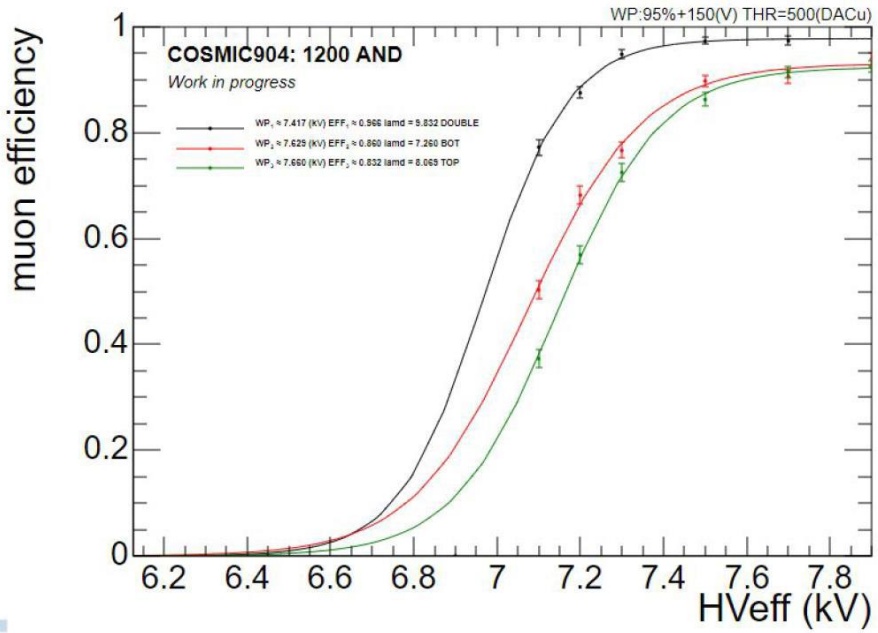
Disegno Meccanico : montato mockup (3 camere) in P5 al fine di definire ingombri e dimensioni esterne



Power System : fine 2018 definite le specifiche e ordinati i prototipi di moduli HV ed LV

Test finale (GIF++) della FEB V1 metà Giugno

- 2D readout design (Strips pitch ≈*0.6÷1.0* cm)
- 2Petiroc 1Cyclone V (48 ch TDC chip readout)
- Test con cosmici con ottima efficienza e basso noise

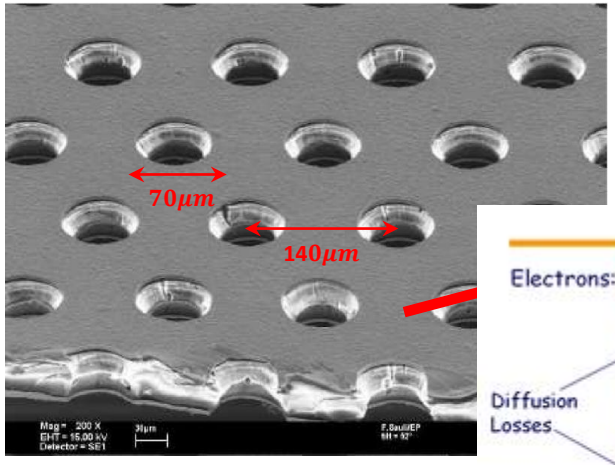


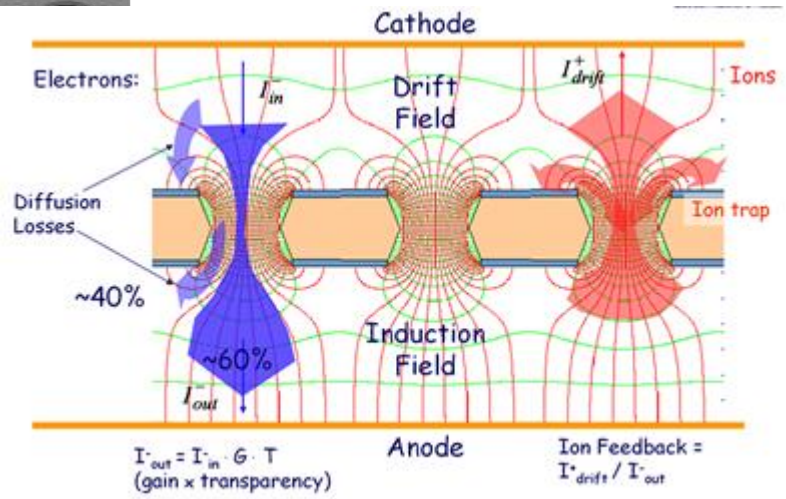
Siti di costruzione (Messico, Ghent): validazione in corso come da schedula, inizio produzione previsto Settembre 2020

Link Board Design: in corso con due possibili scelte per FPGA , non si prevedono ritardi , il test del final design è previsto per fine 2019

Back End Electronics : Non prevista nel TDR , attualmente prototipo in test in IHEP sarà testatp a fine 2019 al CERN su un RPC già equipaggiato con FEB finale

GEM Project.





Sono previsti tre diversi tipi di rivelatori:

- GE1/1 (2019-2020)
- GE2/1 (RD_FASE2, 2022)
- ME0 (RD_FASE2, 2024)

- L'impegno di Pavia è stato due fronti:

➢ **GE1/1. «Slice test» e completamento rivelatore** (M. Ressegotti, I Vai)
  - DCS
  - Commissioning and online operation
  - Integration@P5
  - Misure di aging

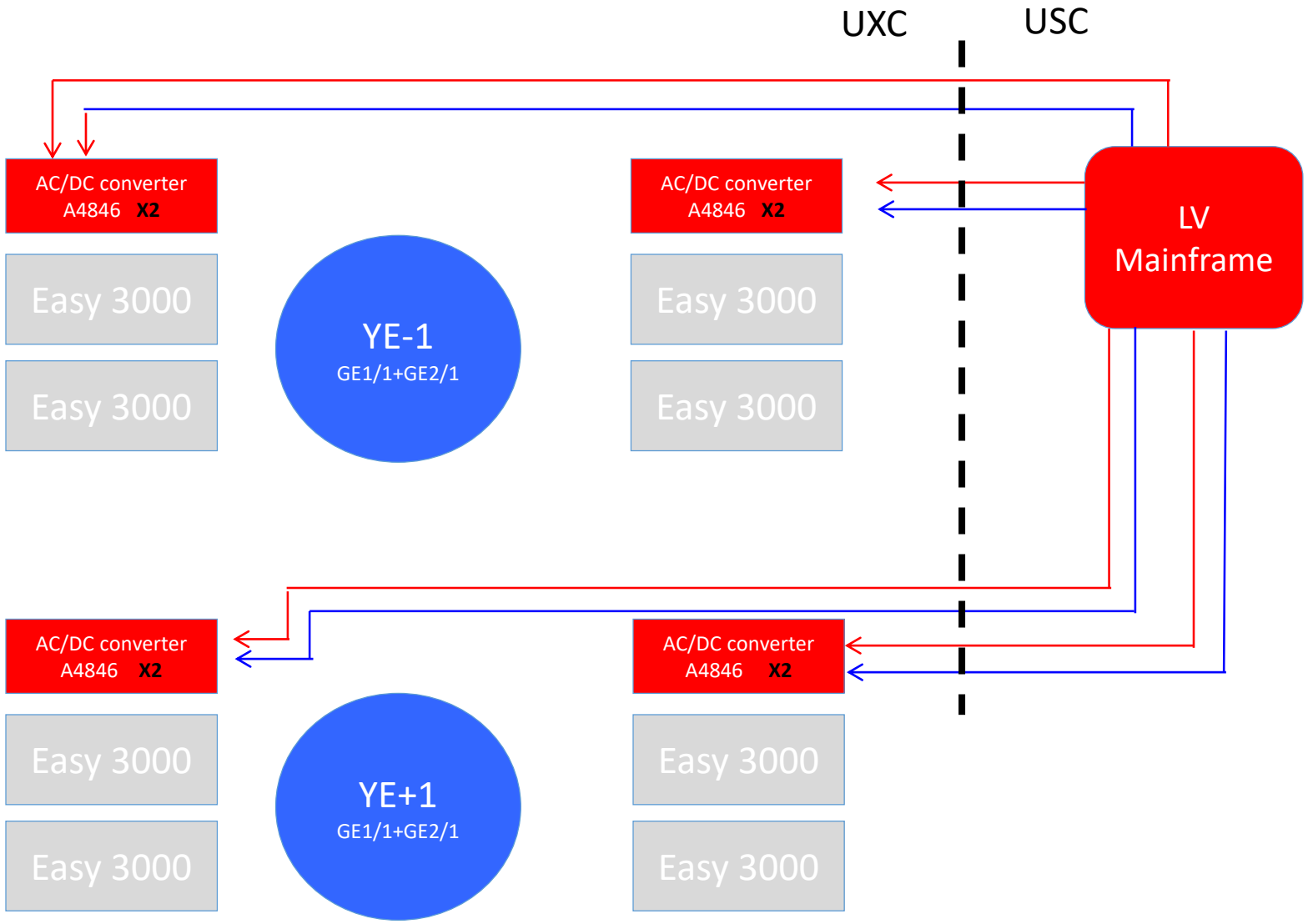
➢ **GE2/1 & ME0. Studio del rivelatore** (C. Aimè, A. Braghieri, S. Calzaferri, D. Fiorina, C. Riccardi, P. Vitulo
  - Caratterizzazione e funzionamento del rivelatore
  - Beam test (in preparazione a Louvain)
  - Studi di outgassing
  - Studio del background
  - Trigger capabilities

GEM Project: GEM detectors GE1/1

Status QC8 e preparazione installazione in CMS

- QC8 è l'ultimo stadio di qualificazione delle superchamber prima dell'installazione a CMS → prevede test con cosmici per misura di efficienza dei rivelatori
  - Setup pronto → ultimi mesi dedicati al debug del sistema di acquisizione dati
  - I primi rivelatori sono stati installati nello stand e sono attualmente undertest
  - La schedula, che per ora stiamo rispettando, prevede la preparazione di un minimo di 10 superchamber entro il 10 luglio e tutto l'endcap negativo entro settembre
- Piano di installazione a CMS:
  - Hardware sistema di gas → in corso in questi mesi
  - Endcap negativo:
    - 10 superchamber dal 10 luglio
    - Resto dell'endcap dal 10 settembre
    - Rate installazione → 2 superchambers al giorno
- DCS per P5:
  - Local version sviluppata completamente (escluso il monitoring del sistema di gas) e attualmente undertest con hardware
  - FSM versione base sviluppata e da testare
  - Deployment in p5 della local version entro la finestra di installazione del 10 luglio

GEM Project: GE1/1 Sistem Overview



The LV system powers the on-board electronics of the GEM chambers

- 1 LV channel per chamber → 144 LV channels

The whole GE1/1 LV Power Supply will consist of

- 1 CAEN SY Mainframe (in USC)
- 8 AC/DC Power converters + 8 EasyCrates (in UXC) located in 4 different racks in UXC
- 24 LV boards for a total of 144 LV channels

Complete installation in July & September-Oct 2019

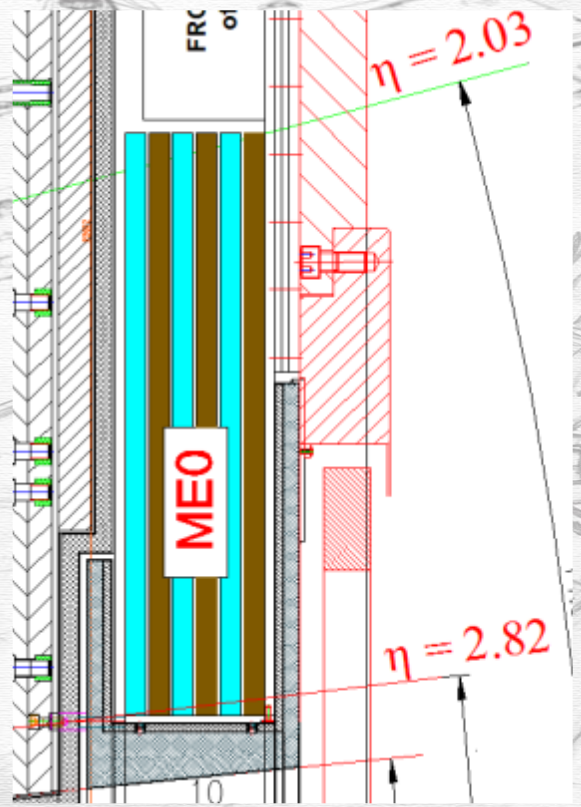
GEM Project: GE1/1 LV System test set-up

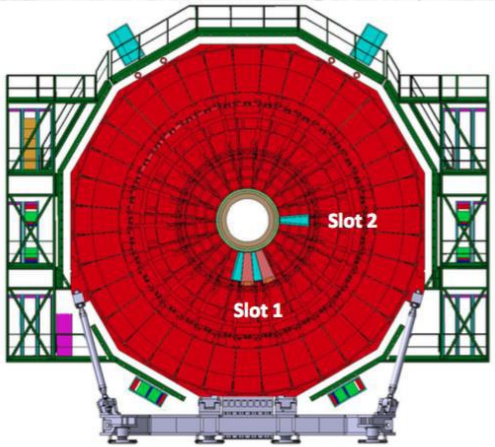
- Rack design and optimization of boards and power distribution
- Realization of the complete working setup in laboratory with all modules, cables and all mechanical parts
- Testing of all equipment that will be installed in CMS endcaps
- Long-term test&monitoring of all LV (and also HV) modules
- Stress tests of the LV boards to verify their stability and the presence of unusual behaviours

GEM Project: GE2/1 e ME0. Studi del rivelatore

Slice Test experience

- Multiple Electronic Channels loss
- Propagation of discharge causes the loss
- We have to pay attention to HIP (Neutrons)





ME0 Project

- GEMs placed at high pseudorapidity region
- High background rate (in particular Neutrons)
- Expected Max Flux ($n/cm^{-2}s^{-1}$):
  $\sim 4\times10^{6}$

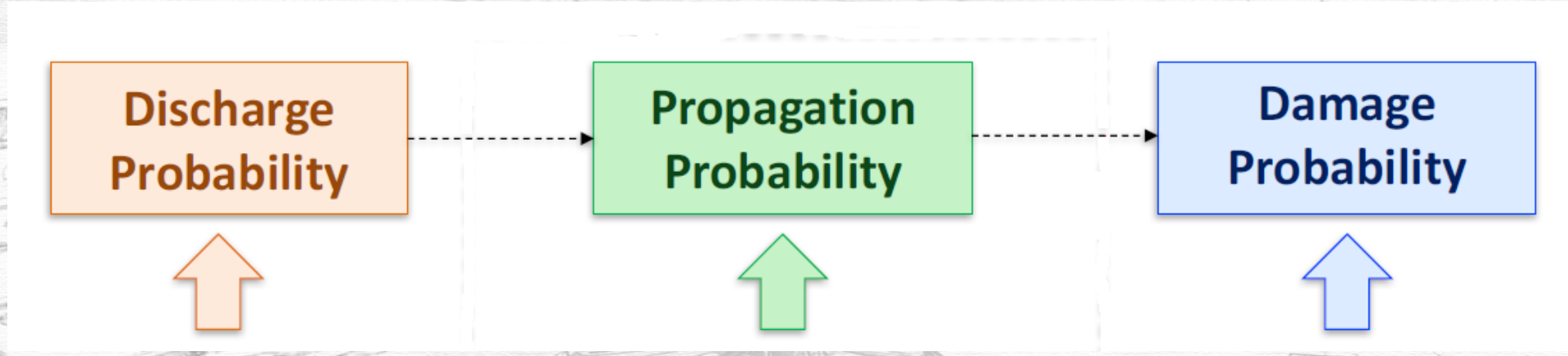
Discharges in GEMs may cause detector (Aging trigger) and electronic damages (Channel loss)

We Must have a wide knowledge about them:

Discharge probability (intrinsic) + Discharge Propagation (detector) + Damage Probability (electronic)

GEM Project: GE2/1 e ME0. Studi del rivelatore

With neutron beam, alpha sources, outgassing



- «No pain No Gain» parameter (cit.)
- Typical of the GEM foils

- Typical of the Detector
  - Geometry
  - HV filters
  - Protection resistance
  - …

- Typical of the electronics

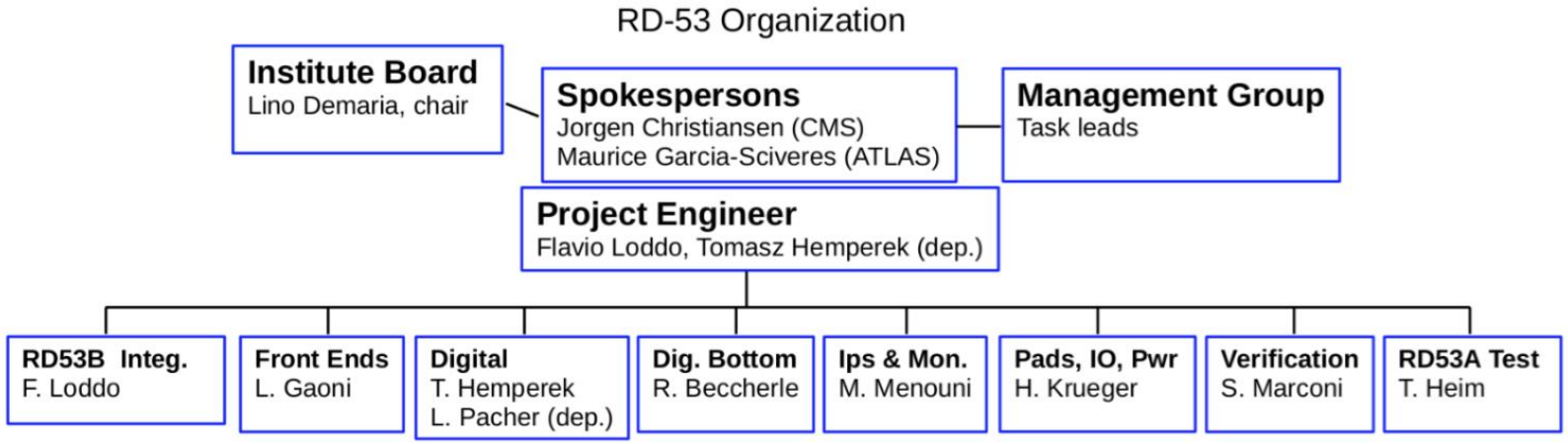
$$P_{disch} = \frac{N_{disch}}{N_{events}}$$ (1, 2)

$$P_{propag} = \frac{N_{propag}}{N_{discharge}}$$ (3)

$$P = \frac{N_{chLoss}}{N_{propag}}$$ (4)

RD53: an ATLAS-CMS-LCD collaboration

- Focussed R&D program to develop pixel chips for ATLAS/CMS phase 2 upgrades and LCD vertex
- Extremely challenging requirements for HL-LHC:
  - Small pixels: 50x50um^2
  - Large chips: ~2cm x 2cm (~1 billion transistors)
  - Hit rates: up to 3 GHz/cm^2
  - Radiation: 1Grad, 10^{16} n/cm^2 over 10 years (unprecedented)
  - Trigger: up to 1MHz with us (~100x buffering and readout)
  - Low power - Low mass systems
  - Data readout: up to 4-5 Gbps
- CMOS technology: 65nm
- Full scale demonstrator pixel chip (RD53A)
- ~150 members of which ~40% ASIC designers, 24 Institutes from Europe and USA, both from CMS and ATLAS experiments



RD53 timeline

2013

Building blocks: Analog FEs, IPs
Digital Architecture
Verification environment
Complex Chip Integration
Radiation characterization of the CMOS 65 nm

2015

Small demonstrators (64x64 pixel matrix)
FE65P2
CHIPIX65-FE0

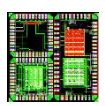
2017

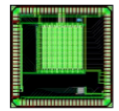
RD53A large scale prototype
400x192 pixel matrix

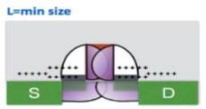
2019

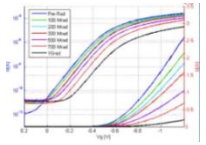
RD53B
~400x400 pixel matrix

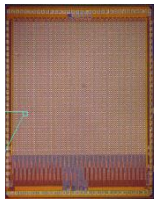
- ATLAS pixel chip
- CMS pixel chip

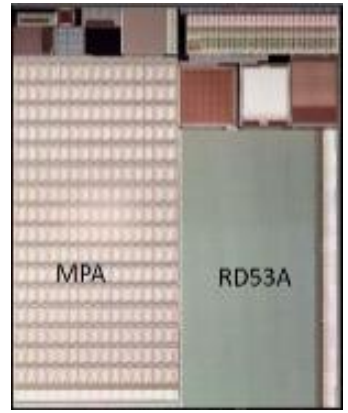






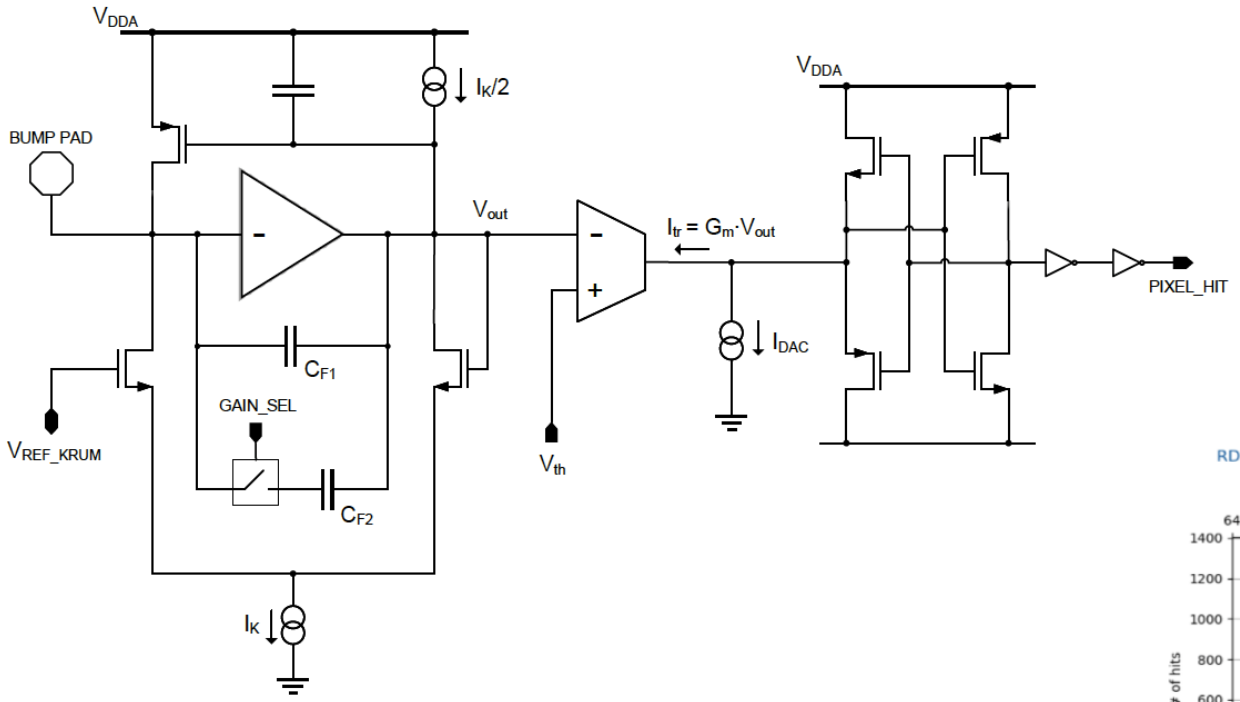


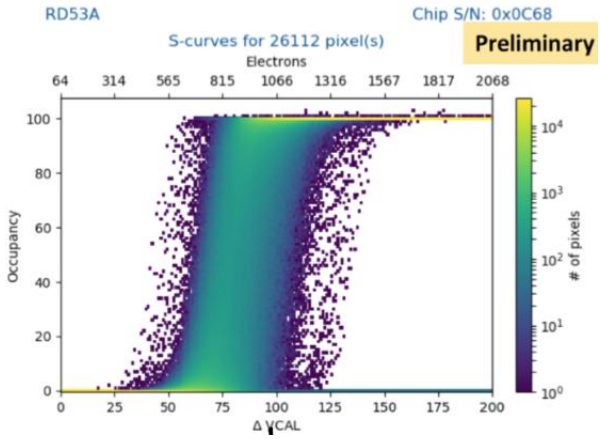


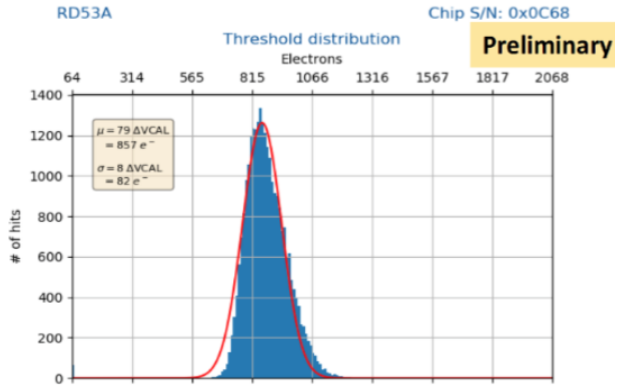


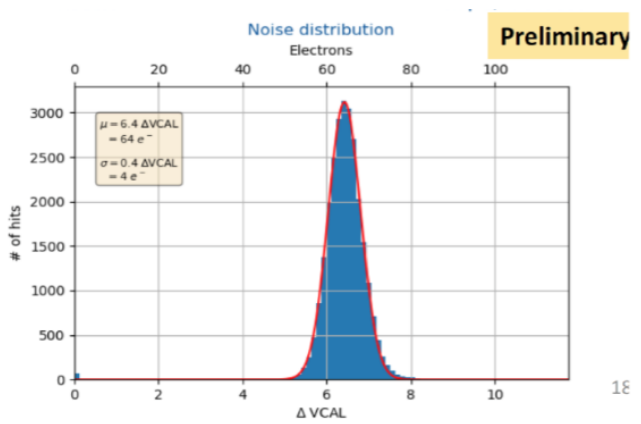
Two submissions with different matrix size: **ATLAS** chip first (Sep. 2019), then **CMS** chip (Apr. 2020)

Linear Front-End (Pavia)









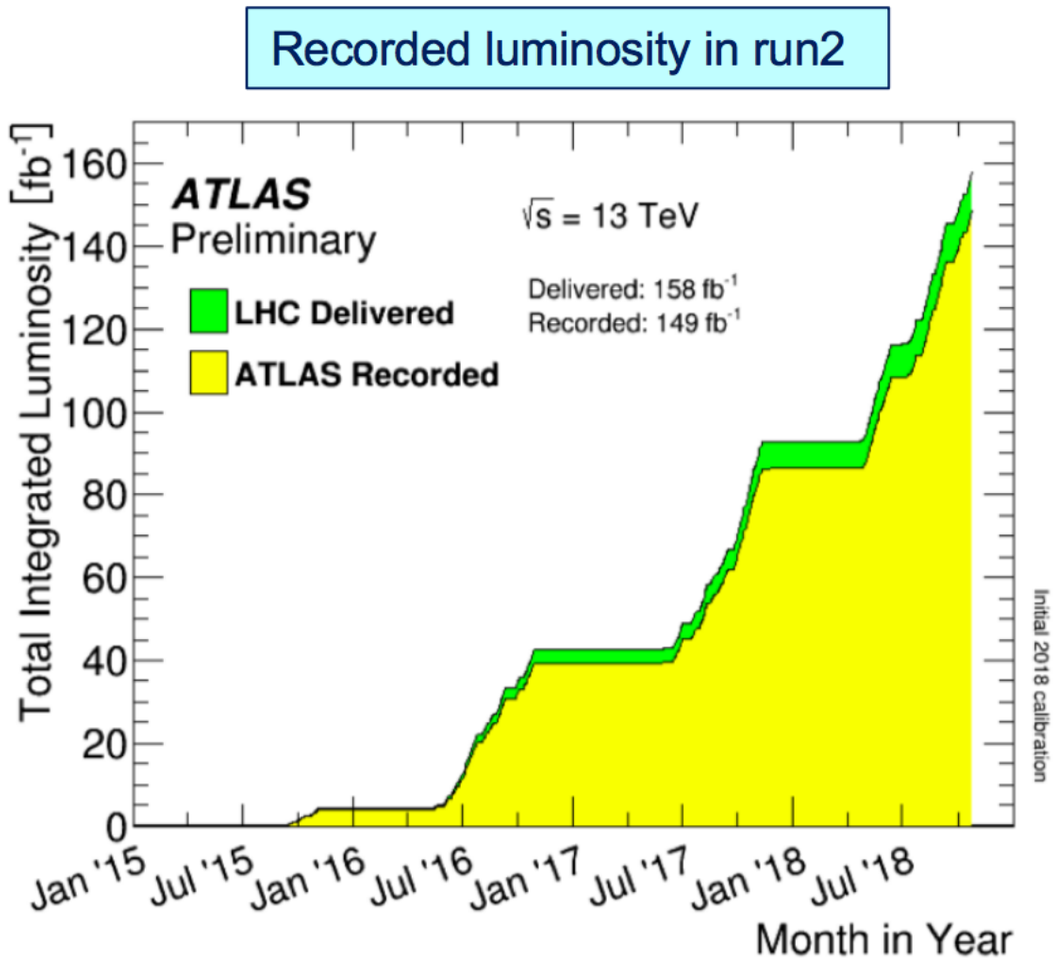
- The front-end can be operated with **threshold <1000 e-**
- Good performance for **noise** and **threshold dispersion**
- **Overdrive** larger wrt other RD53A FEs
- **Radiation hardness**: good, studied up to 1 Grad
- **In RD53B:**
  - Saturation effect in the **TDAC** (present in RD53A) fixed
  - New version of the **comparator** improving the overall overdrive

The CMS Management Board decided the adoption of the Linear front-end (designed by the INFN-Pavia group) for the integration in the pixel readout chip for the CMS Inner Tracker (C-ROC chip)


ATLAS
EXPERIMENT

Consuntivi 2018
ATLAS

Recorded luminosity in run2



149 fb^{-1} recorded in run2

Run2 DAQ efficiency: 94.3%

140 fb^{-1} Good for Physics

Run2 ATLAS efficiency: 88.6%

Atlas Pavia 2018: people

(*) assegno ateneo da aprile 2019
(**) tecnologo INFN da maggio 2019

Ricercatori/Tecnologi	Qualifica	ATLAS	Fase2_ATLAS	TOT
Cova Paolo	RU	100		100
De Vecchi Carlo	Tecnologo	30		30
Farina Edoardo	Dottorando(*)	90	10	100
Ferrari Roberto	DR	40	40	80
Gaudio Gabriella	Ric	80	10	90
Introzzi Gianluca	RU	100		100
Kourkoumeli-Charalampidi Athina	PostDoc(**)	100		100
Lanza Agostino	DT	80		80
Livan Michele	PO	100		100
Negri Andrea	PA	80	20	100
Pezzotti Lorenzo	Dottorando	100		100
Polesello Giacomo	PR	90		90
Rebuzzi Daniela	PA	100		100
Rovelli Giulia	Dottoranda	100		100
Rimoldi Adele	PA	80		80
Sottocornola Simone	Dottorando	90	10	100
Vercesi Valerio	DR	70		70
FTE		**14,3**	**0,9**	**15,2**

ATLAS Pavia Group Activities

Phase 0:

PHYS:
- Analisi Dark Matter
- Higgs MC Manager
- VBS (COST)

TDAQ:
Data Flow

Phase 1:

NSW:
- Costruzione MM
- Servizi NSW
- Integrazione

MUONI:
MDT online Monitoring

FTK:
- Integrazione SW
- Infrastruttura

Phase 2

TDAQ:
- Data Flow
- Readout

HTT:
Integrazione SW

MUONI:
Power system

Phase 0

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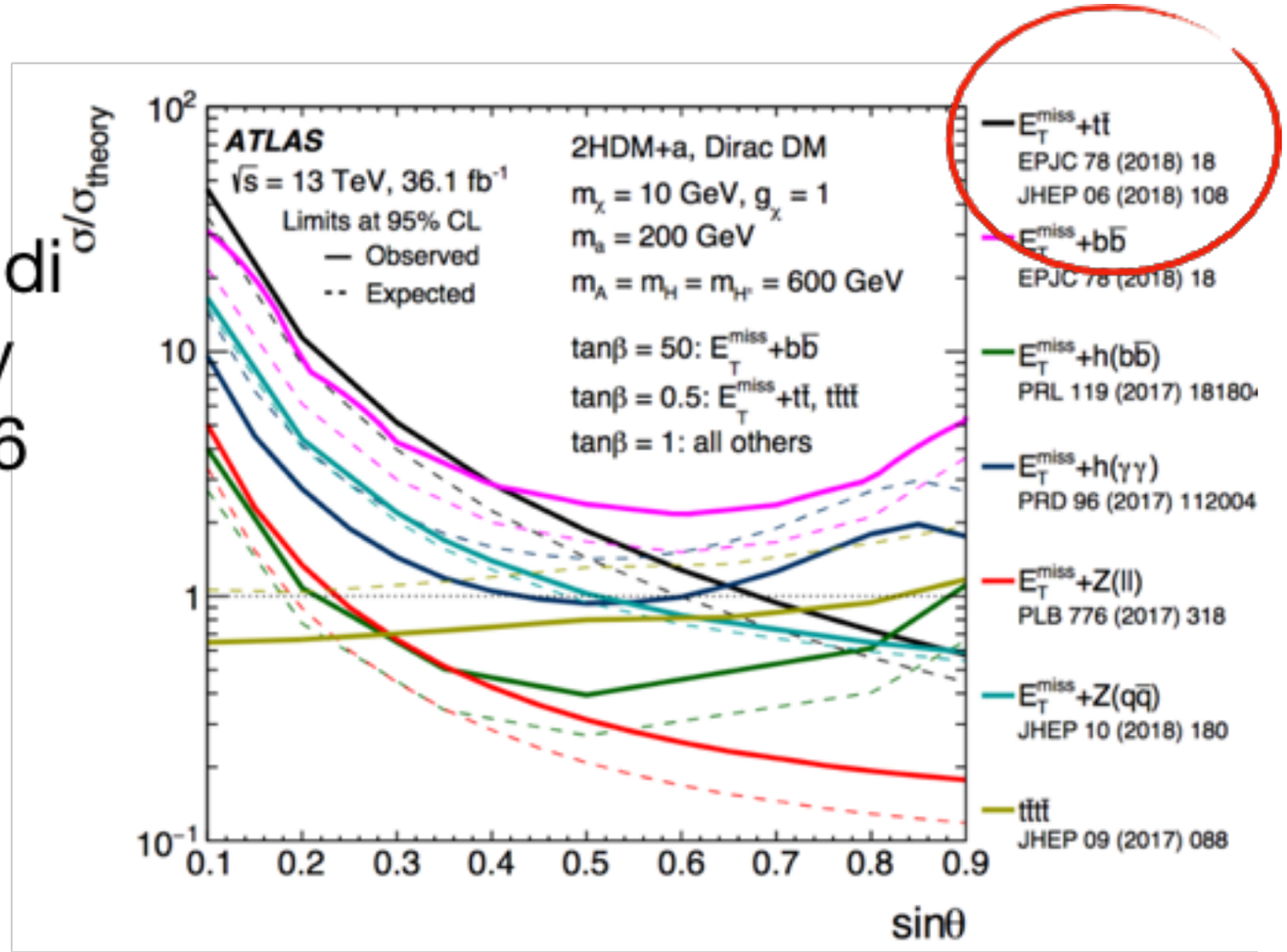
ATLAS Dark Matter Summary Paper

- **Obiettivo**: riunire in un unico articolo tutti i limiti sperimentali ottenuti nel contesto di modelli di Dark Matter (DM) e Dark Energy con i dati raccolti nel 2015-2016

- **Contributi**: analisi DM+tt, reinterpretazione risultati di DM +tt e DM+bb da modello semplificato a modello con due doppietti di Higgs e mediatore pseudoscalare (2HDMa)

- **Stato**: sottomesso a JHEP, in fase di revisione

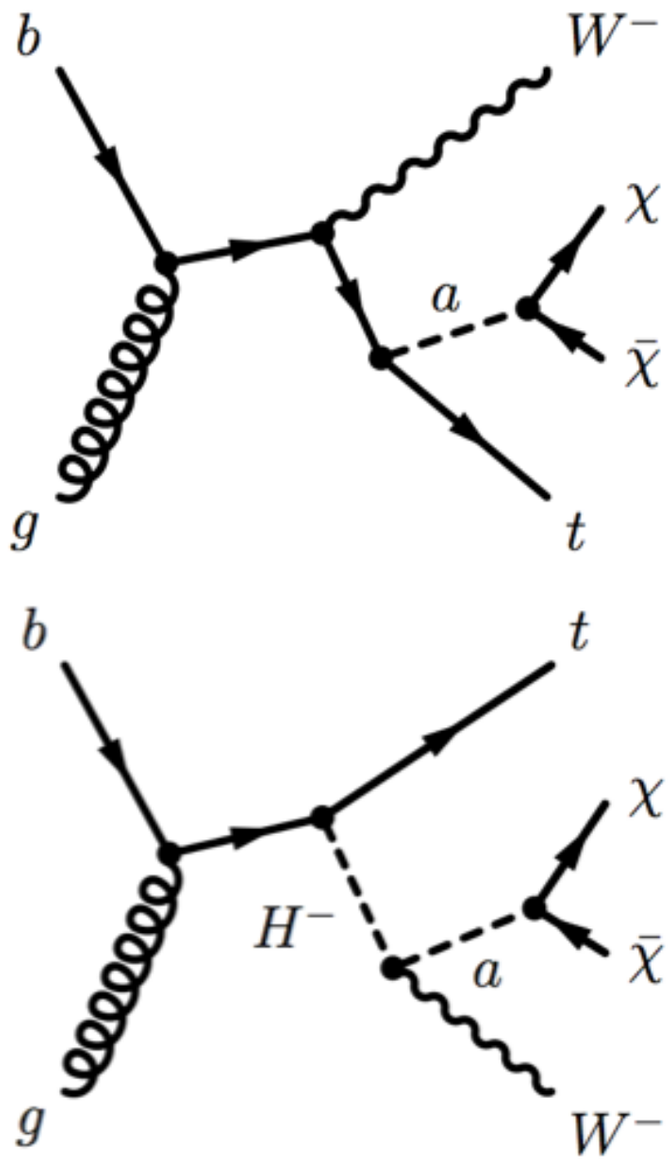


ATLAS analysis: Wt +DM

- **Obiettivo**: esplorare segnature di Wt+MET nel framework teorico del modello 2HDMa

- Analisi con un solo leptone nello stato finale condotta da gruppi di DESY e Liverpool, analisi a 2 leptoni fatta da gruppo pavese

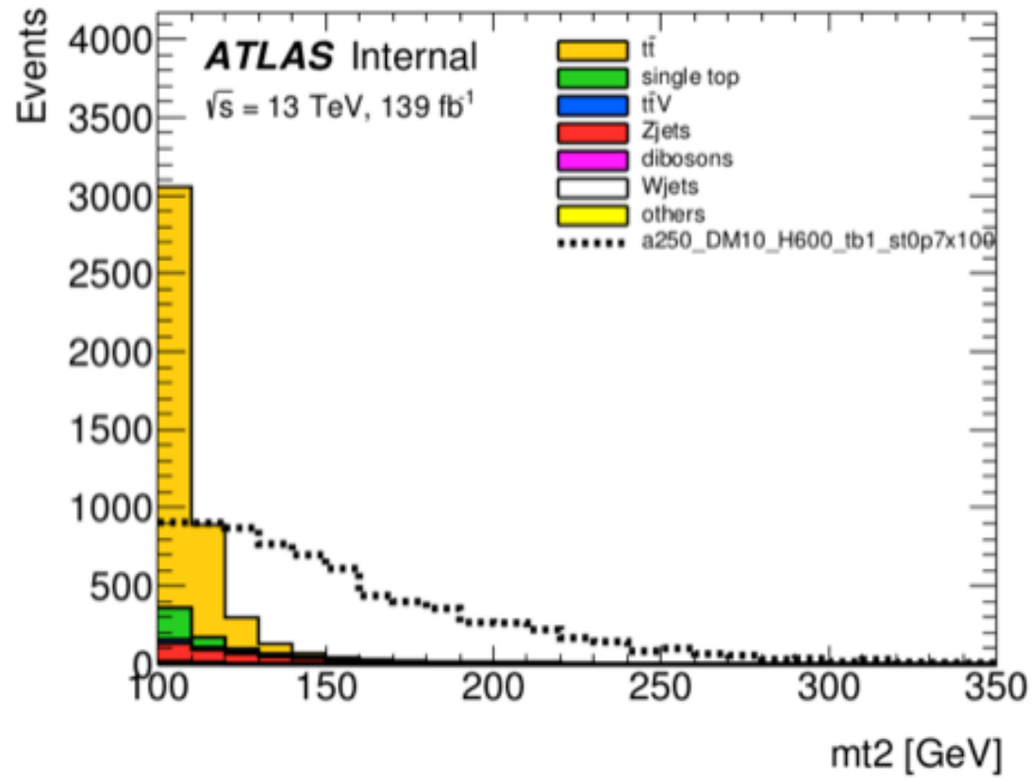
- **Stato**: in corso, a breve inizierà il processo di approvazione in ATLAS



ATLAS analysis: Wt +DM

Contributi:

- sviluppo strategia analisi a 2 leptoni
- studi di generazione del segnale
- confronto data-MC
- sviluppo di nuove variabili di discriminazione
- definizione di signal e control region
- mantenimento codice



Dark Matter White Paper

- **Obiettivi**:
  - Fornire delle raccomandazioni per ricerche future di DM nel contesto del modello 2HDMa
  - Analizzare i vincoli sui parametri del modello derivanti da risultati teorici e sperimentali esistenti
  - Evidenziare le segnature sperimentali più promettenti

- **Stato**: pubblicato (https://arxiv.org/pdf/1810.09420.pdf)

CERN-LPCC-2018-02

LHC Dark Matter Working Group:

Next-generation spin-0 dark matter models

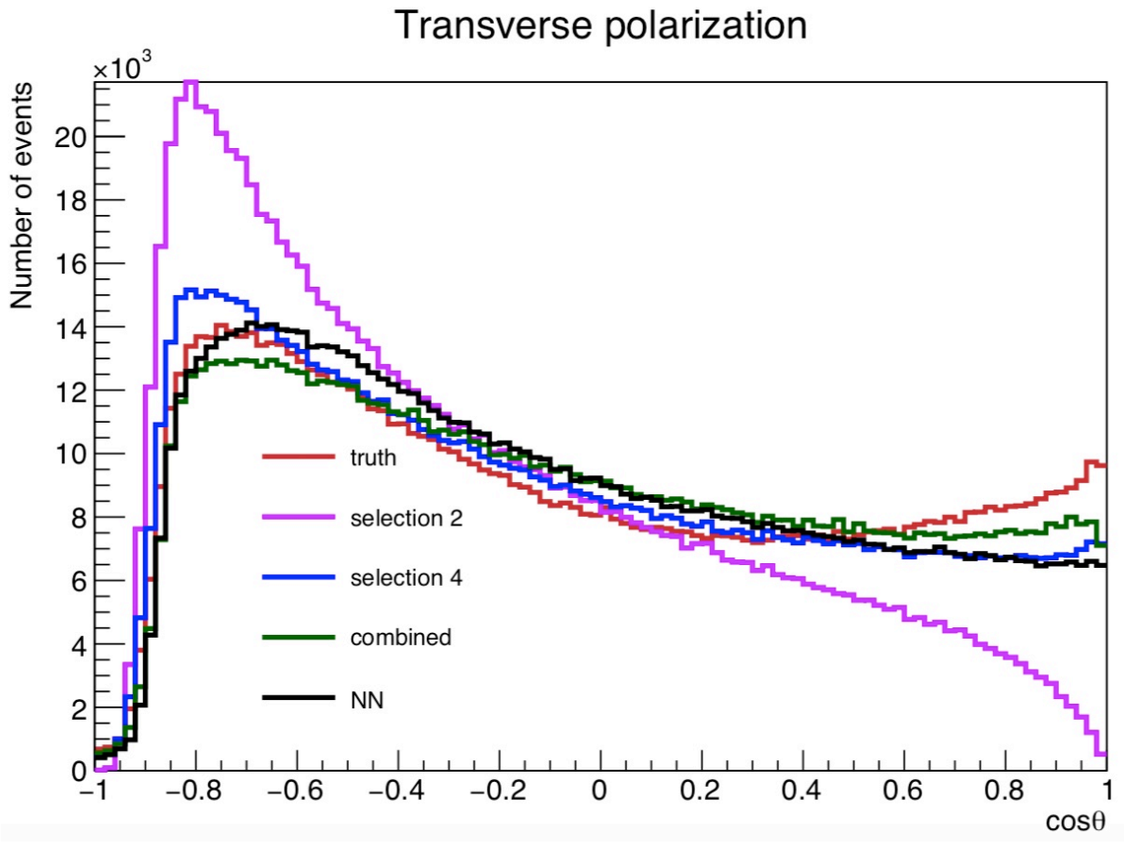
COST ACTION - VBS

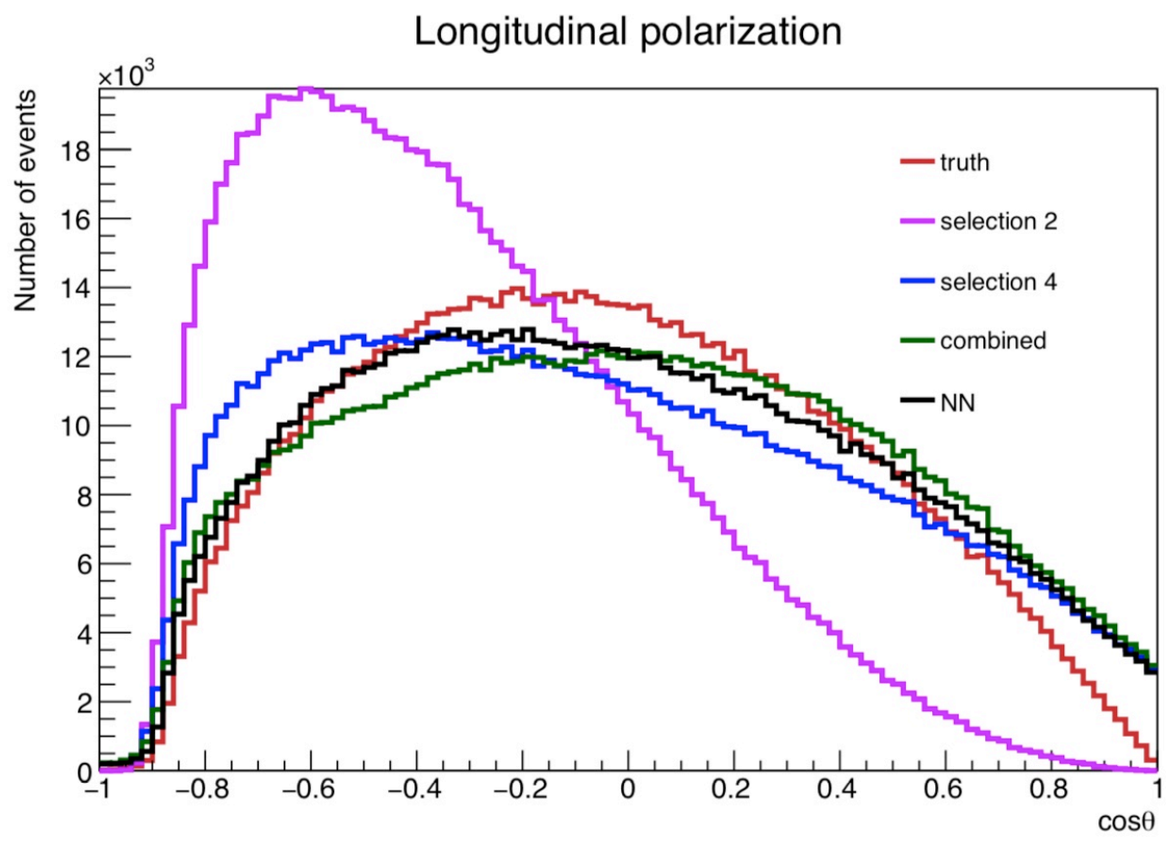
COST Action (supported by the EU Framework Program Horizon 2020)
Vector Boson Scattering Coordination and Action Network (VBSCan)

- Approved by the EU with the highest score:
- crucial areas where to investigate the intimate structure of EWSB in LHC phase 2 era
- International research consortium with Italy as main proposer and several European and extra-European countries
  https://www.cost.eu/actions/CA16108/#tabs|Name:overview
- DR representative for Italy in the Management Committee and involved in two working group activities

https://vbscanaction.web.cern.ch/Default.html

COST ACTION – VBS





W polarization reconstruction:

- W with longitudinal polarization is connected with scattering amplitude which could violate unitary in case of non-SM Higgs
- Different reconstruction technique are studied among which Neural Network

Higgs-related activity

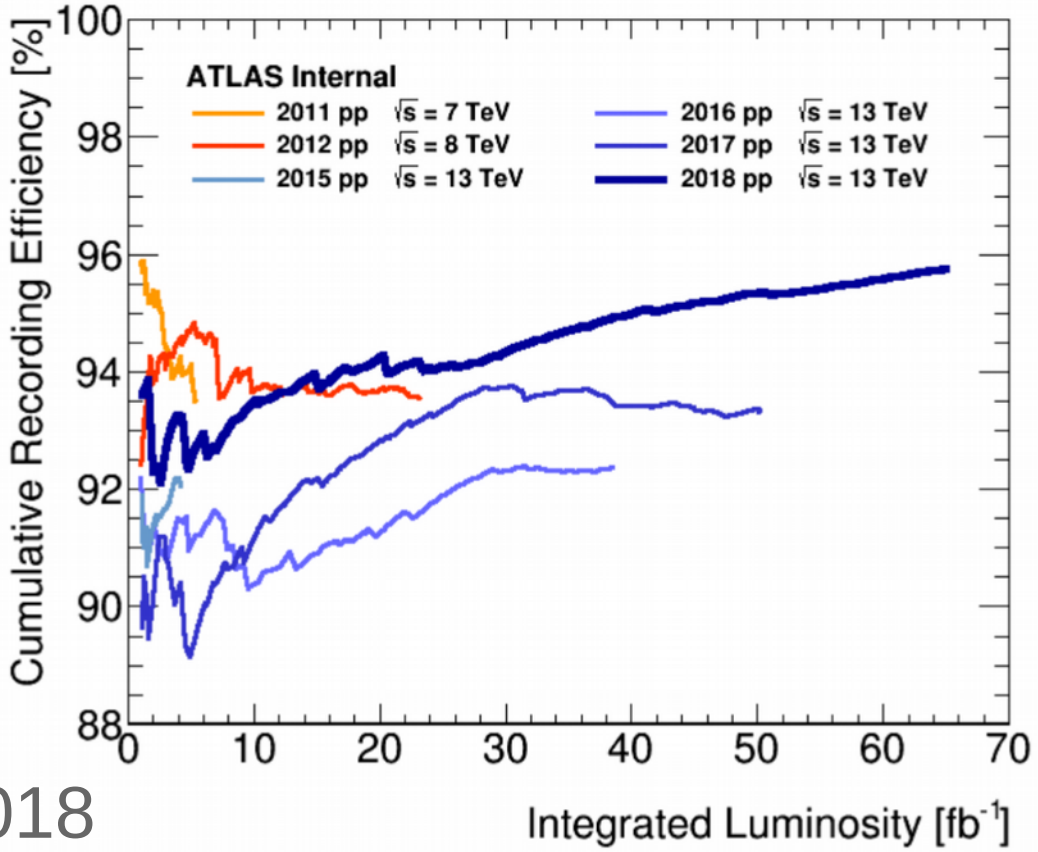
- LHC Higgs Cross Sections WG
  - Work for the combination of ATLAS and CMS results together with theory predictions
  - the fourth CERN Yellow Report book ('*Deciphering the nature of the Higgs sector*') published at the end of last year

- ATLAS Higgs MonteCarlo manager
  - Gather the requests from all Higgs subgroups and prepare priority lists
  - Prepare Higgs MonteCarlo requests (jobOptions, input files, etc.) and submit them to the Physics Coordinator for approval
  - Coordinate the MC validation efforts
  - Inform the Higgs group about the latest developments in MC and their tunings
  - Member of the Higgs Coordination board - weekly reports at the Higgs coordination meetings, monthly reports at the Higgs plenary
- This task is considered part of the Higgs management

Data flow & operation

A.Negri

- Operation
  - turni expert on call (~ 1 mese)
  - Trigger/DAQ: efficienza ~ 95 %
- Data flow
  - Responsabilità pavese
  - Nessun problema nel 2018
  - Aggiornamenti in base alle esigenze di operazione
- Fase I
  - Adattamenti in corso per integrazione del nuovo framework di ricostruzione Athena-MT



Phase I

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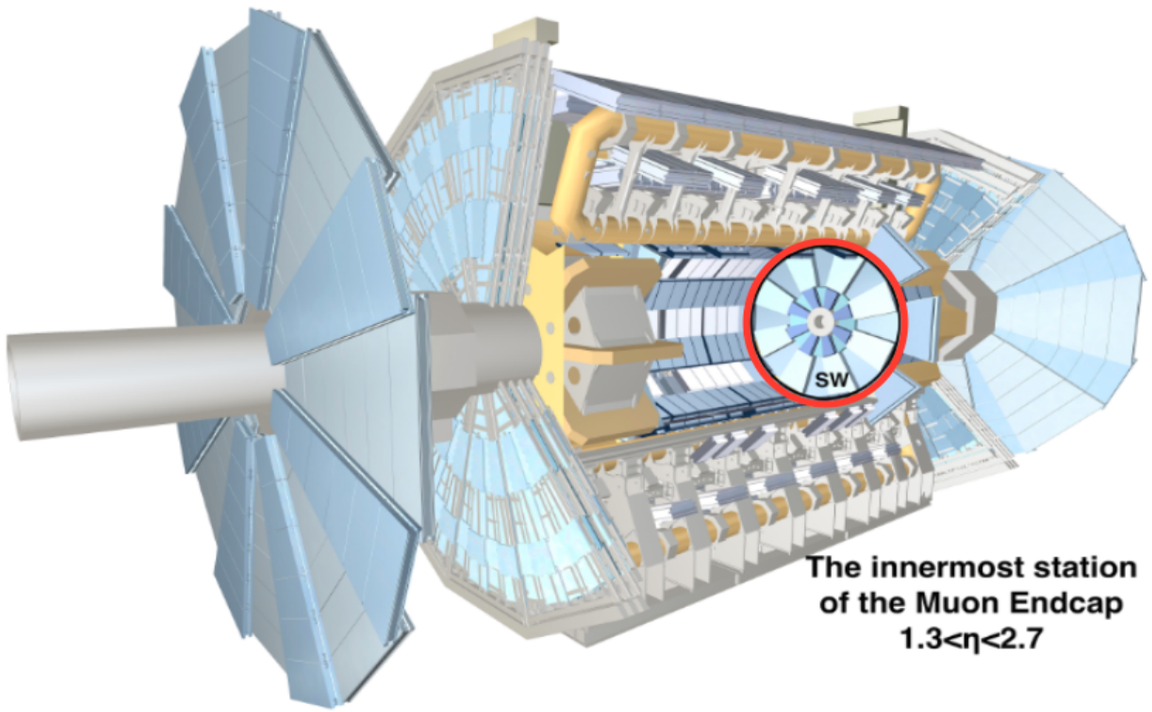
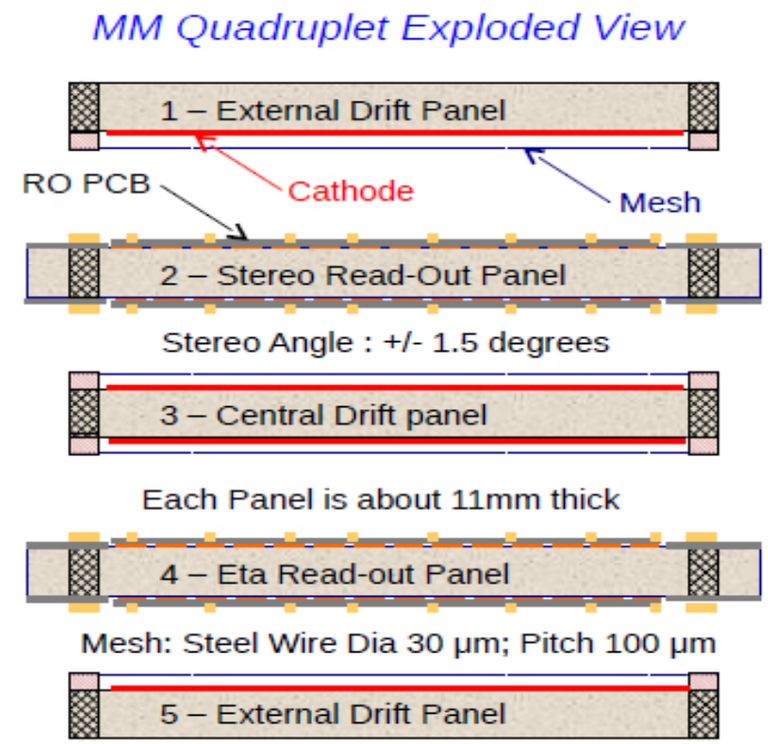
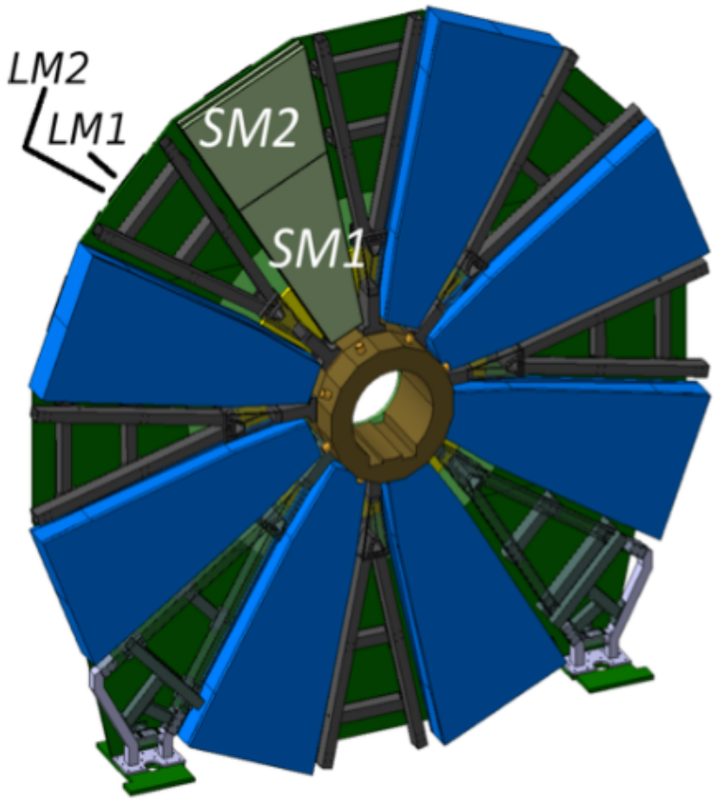
ATLAS New Small Wheels Upgrade



The innermost station of the Muon Endcap
1.3<η<2.7



Five panels joined to make a detector unit (Quadruplet) with 4 gas layers.



SM1 quadruplets is INFN responsibility
Pavia responsible for Readout Panels construction

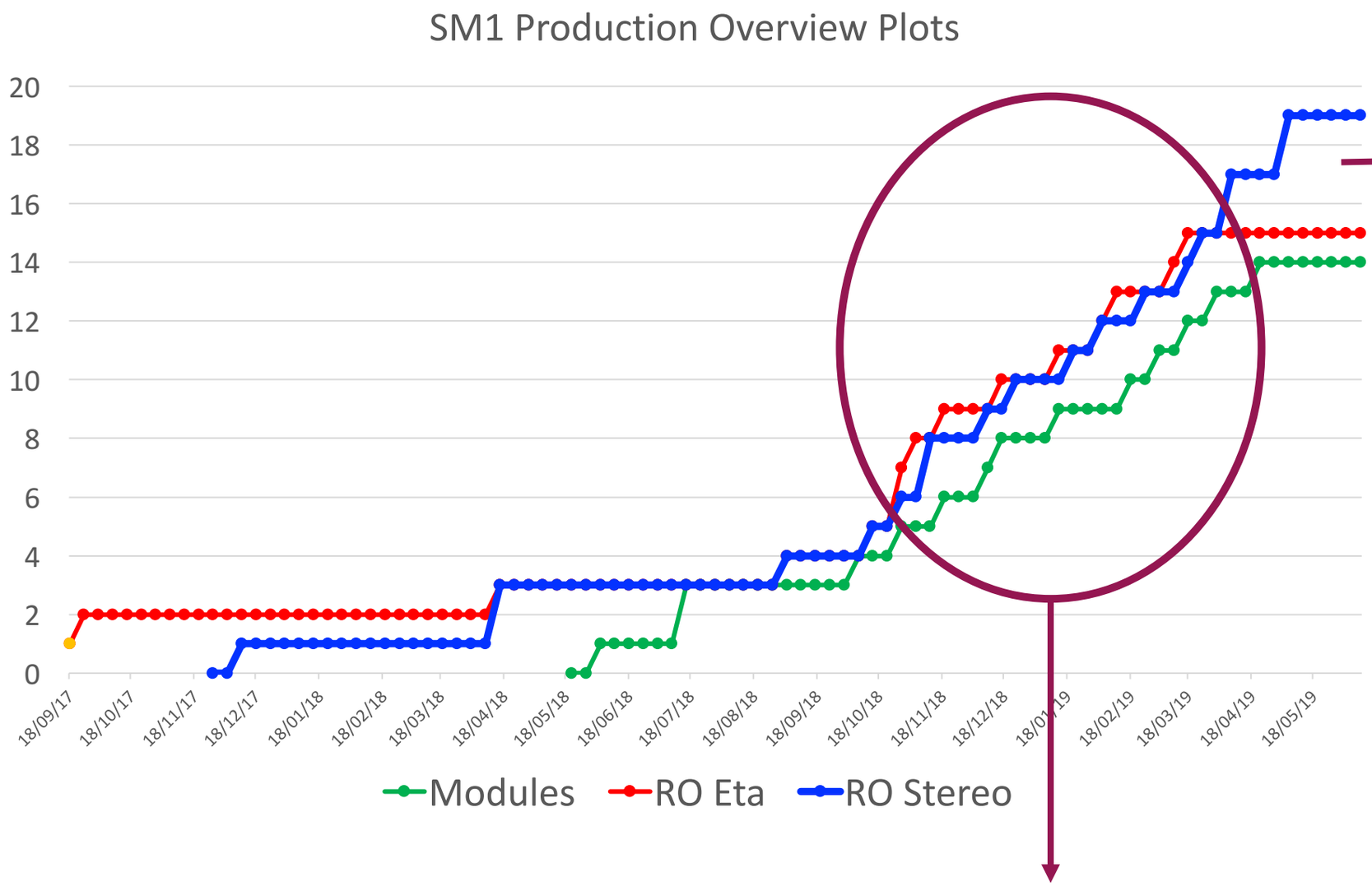
Micromegas – RO Panels

- First Prod. Module (M1) in December 2017 (all sites)
  - Persistency in HV stability problem observed in M0/M0.5 originally ascribed to bad PCB quality
  - Review in Jan. 2018 and following tests pointed out possible problem with cleanliness of the panels (all type)
  - Dedicated task force and test at cern with experts

- New task force established beg. 2018 with large impact on production
  - Halt on RO panel (and Module) production until summer 2018
  - Foreseen only panels for 4 quadruplets needed for electronics, integration test, TestBeam/GIF++ test

- Micromegas Technical Review in September 2018
  - Analized results obtained in all construction site
  - Review of cleaning and conditioning procedure
  - New HV working point (compromising HV stability and acceptable efficiency)
  - Restart of RO panel and modules construction
  - At present only SM1 has a significant rate of working module ready

Micromegas – RO Panels



Problem with PCB production lead to a stop in the last month

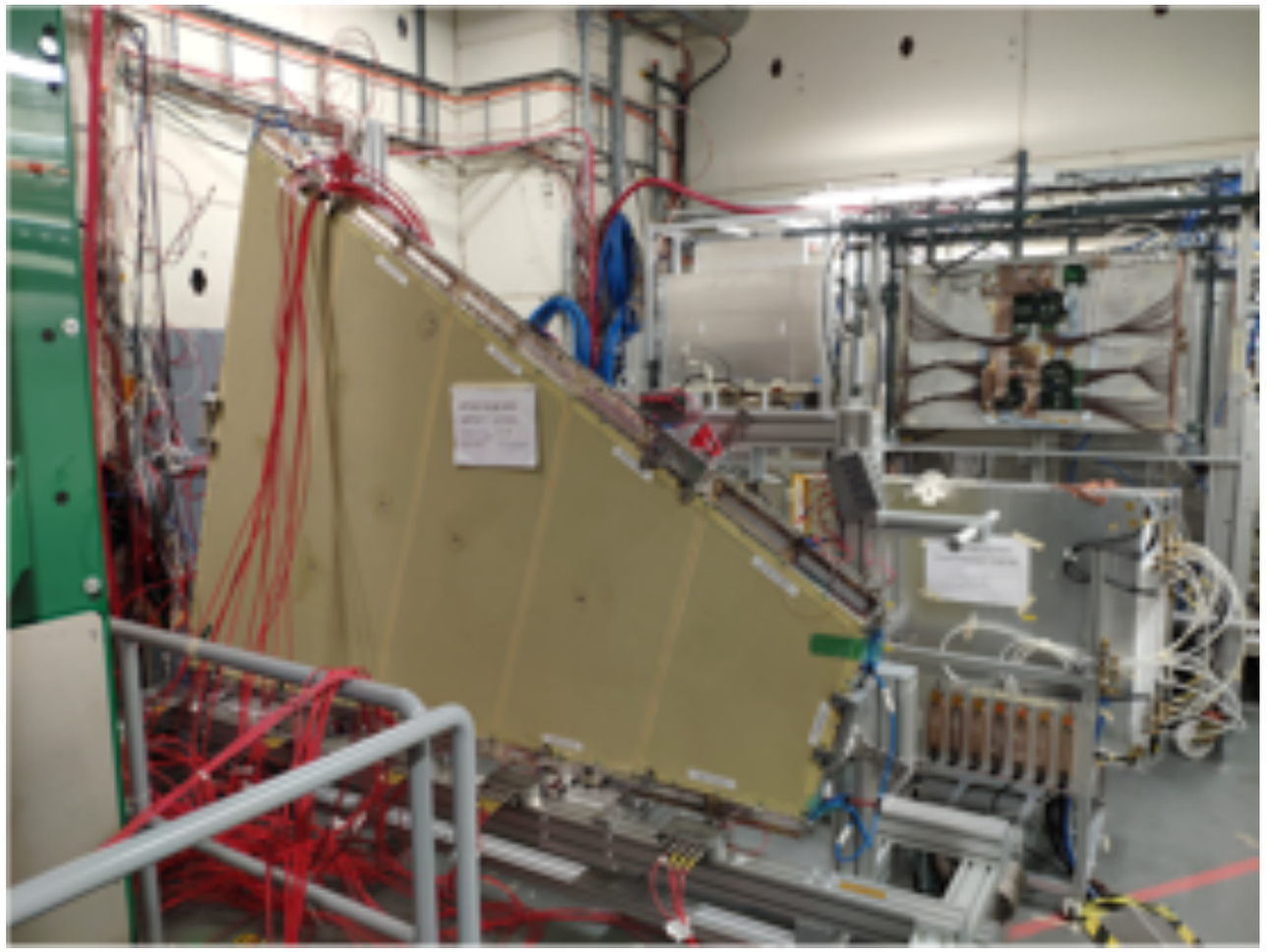
4 panels are missing for wheel A construction

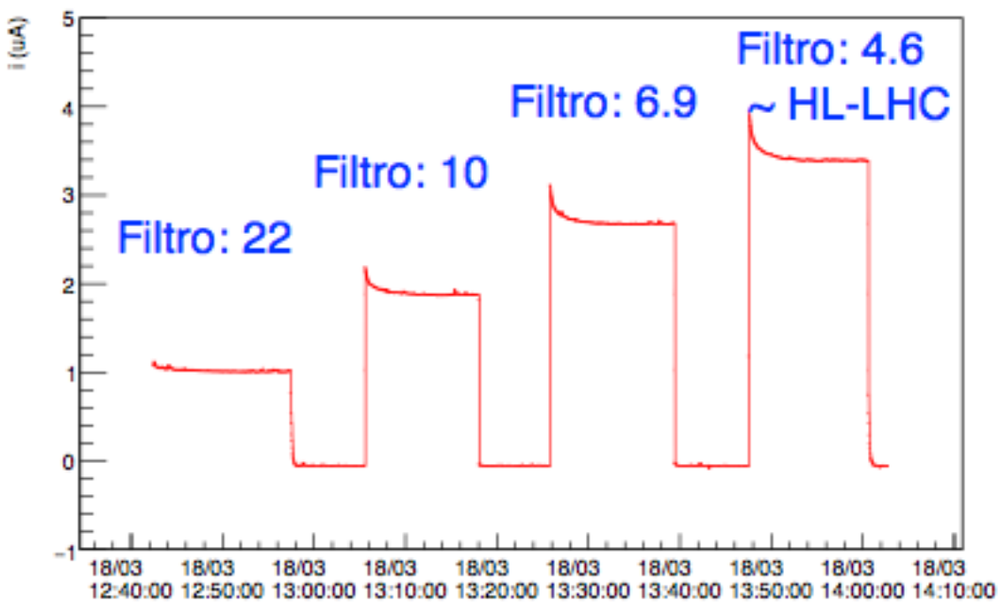
- A one-panel-per-week construction rate, as required to keep on the schedule, established since September 2018
- Whole ATLAS group participating in the effort
- Key role of the mechanical & electronic workshop

NSW - Integration

Test di integrazione alla GIF++ delle camere MicroMegas

- Iniziata la fase di integrazione delle camere MicroMegas in vista dell'installazione della New Small Wheel.
- Ad oggi, circa 10 camere sono state testate in condizioni di alto irraggiamento alla Gamma Ray Irradiation Facility (GIF++) del CERN con buoni risultati in termini di stabilità di tensione/corrente e (non-)saturazione delle camere.

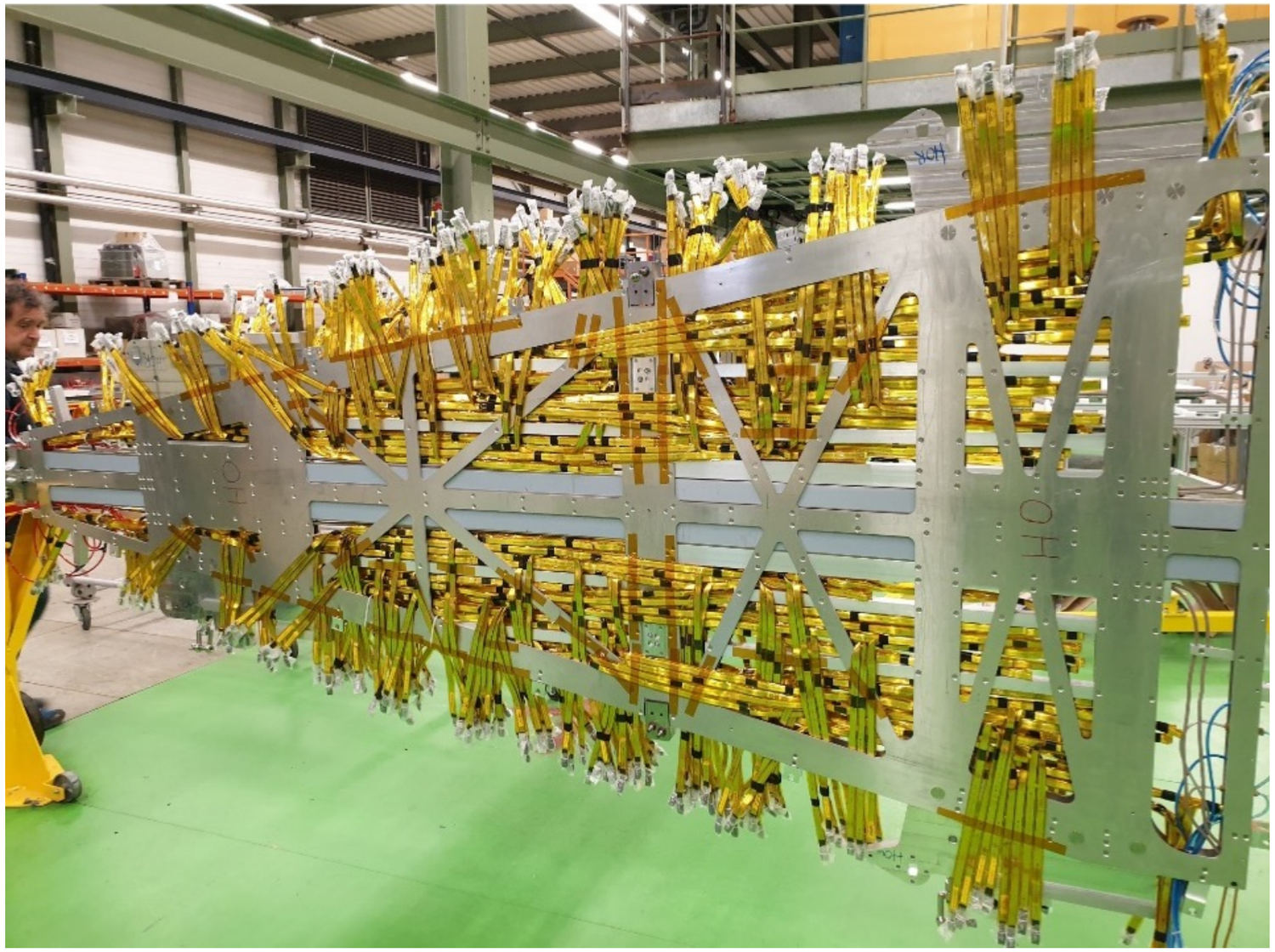




NSW - Integration

Test di integrazione alla GIF++ delle camere MicroMegas

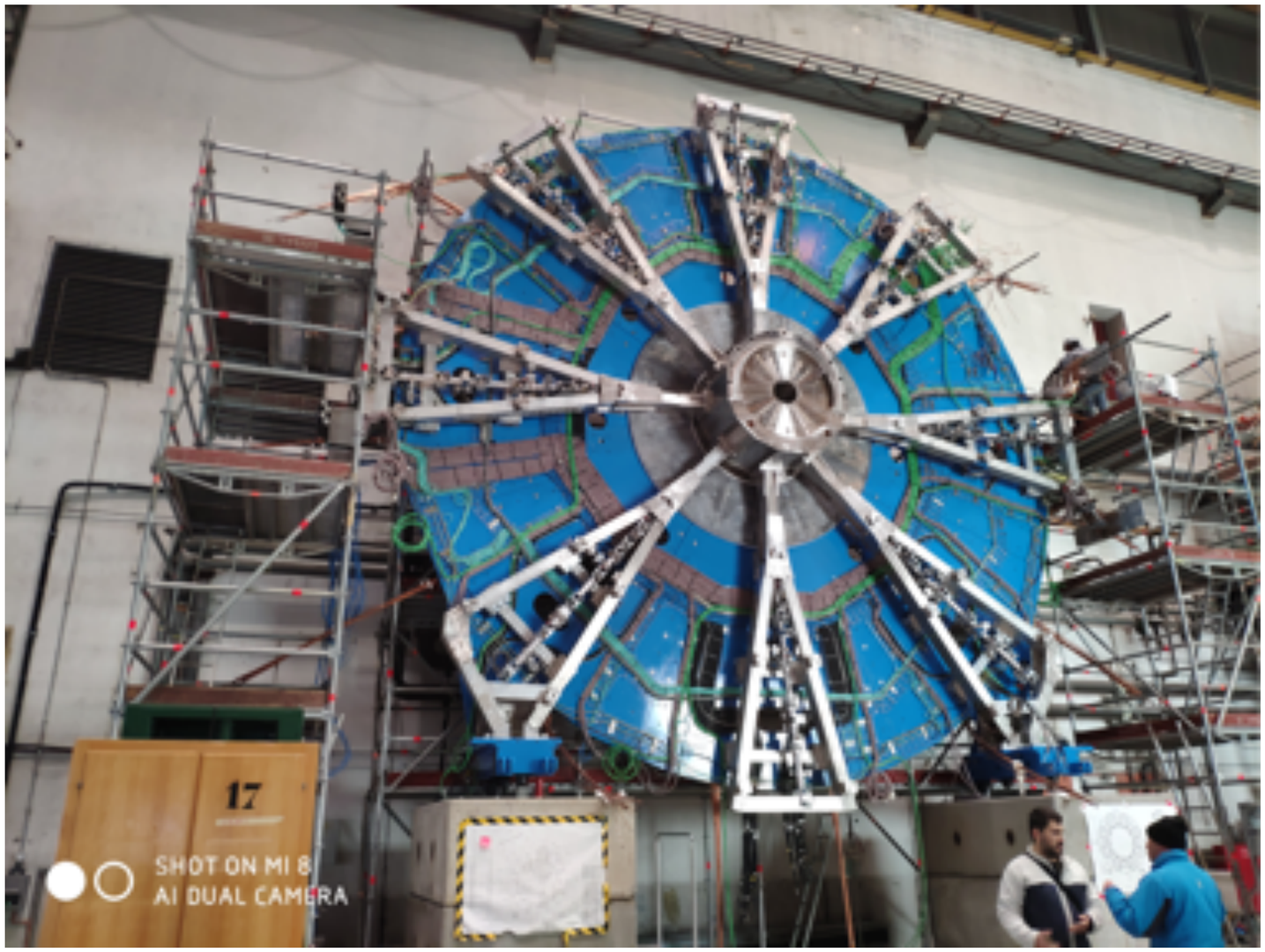
- Realizzato il primo settore (double-wedge) completo della NSW.
- Superato con successo il Project Readiness Review



NSW - Services

Installazione su NSW (NJD)

- Caveria e tuberia di raffreddamento e gas installati al 95% su entrambe le ruote;
- Connettorizzazioni da fare dal lato rivelatore, ad esclusione della caveria di HV.



NSW - Services

- **Installazione in caverna**
  - Tutta la caveria acquistata (ma non tutta disponibile) e pronta per l'installazione da parte del team del TC;
  - L'installazione e' al momento programmata per gennaio 2020 per il lato A. Da decidere entro ottobre 2019 se installare anche il lato C senza rimuovere l'attuale caveria;
  - Installazione del sistema HV per sTGC da iniziare (nel 2020).

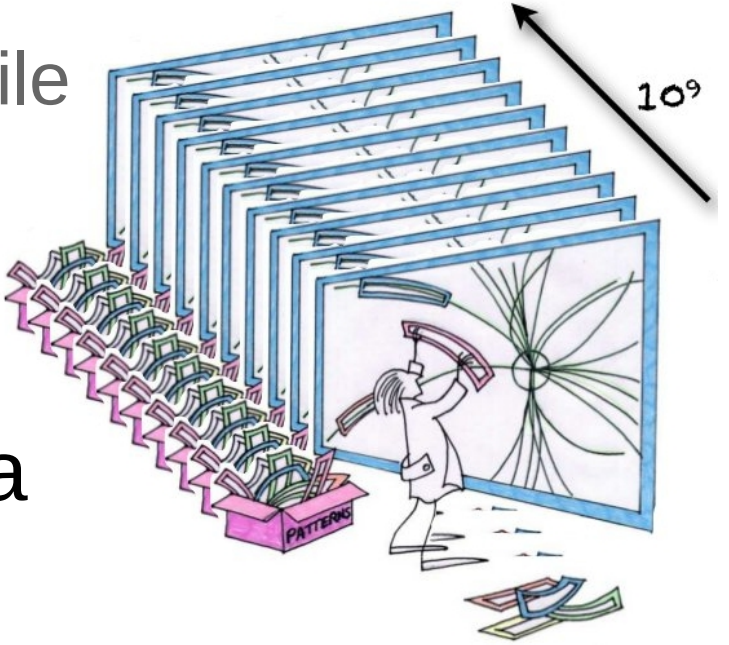
- **Installazione in USA15 (sala elettronica)**
  - Layout dei rack non ancora dettagliato completamente. Si iniziera' nel 2020;
  - Elettronica di gestione dei segnali DSS da progettare (Pavia nel 2020).

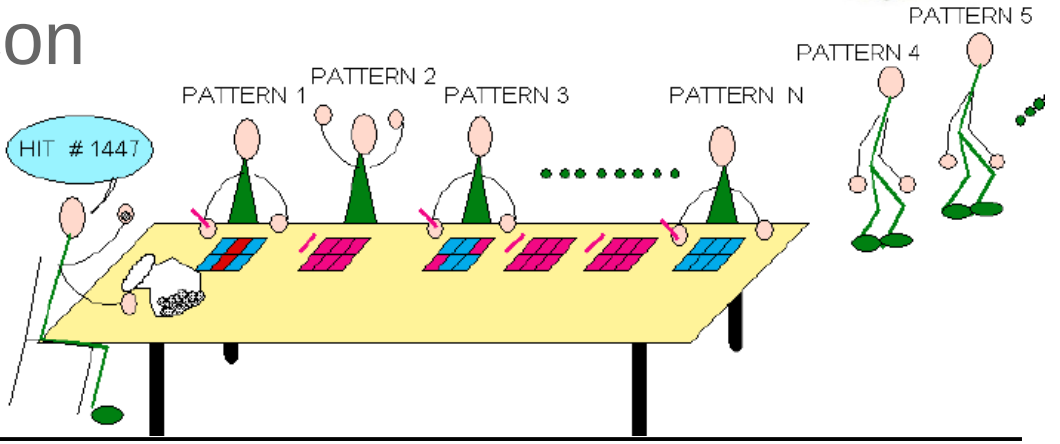
- **Installazione in US15 (sala generatori)**
  - Layout dei rack definito. L'installazione sia dell'HV MM che dei generatori primari sara' iniziata nel 2020.

FTK

S.Sottocornola, A. Lanza, E.Farina[2019], A.Negri

- Tracciatore HW basato su memorie associative e successivo fit con FPGA delle road identificate
  - Tracce con risoluzione comparabile con l'offline, disponibili all'inizio degli algoritmi di HLT (pochi μs)
- Goal originale: ampia fetta del sistema completamente validata durante il run 2
  - Ma ... solo pochi run con sistema incompleto ed a basso rate
- Commissiong in LS2!

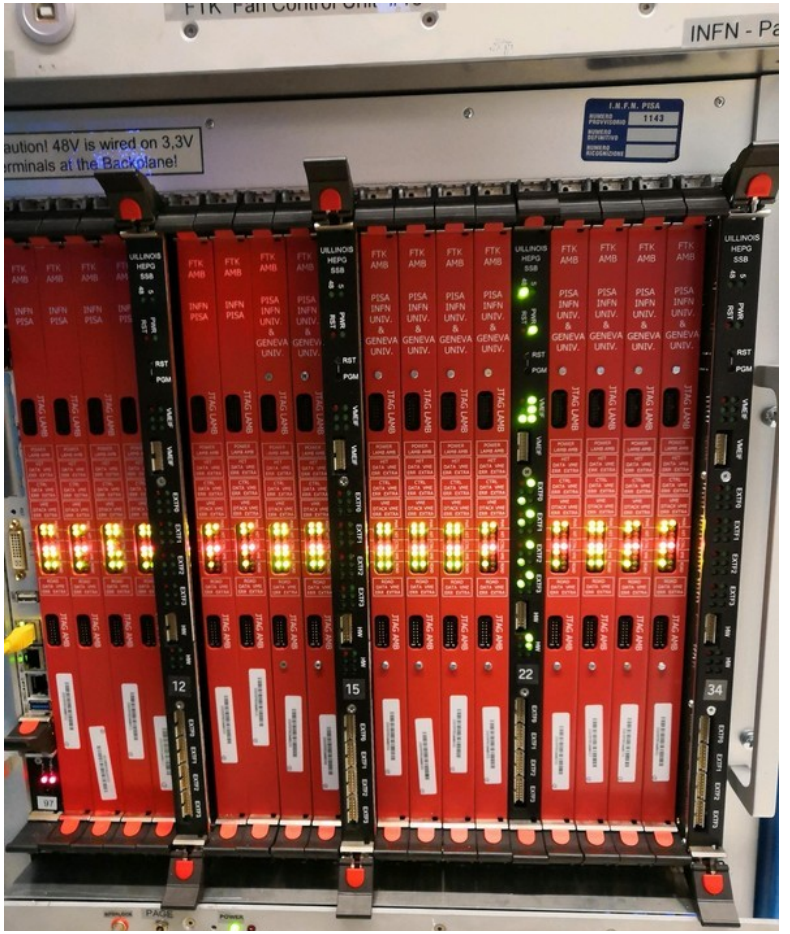




FTK@Pavia

S.Sottocornola, A. Lanza, E.Farina[2019], A.Negri

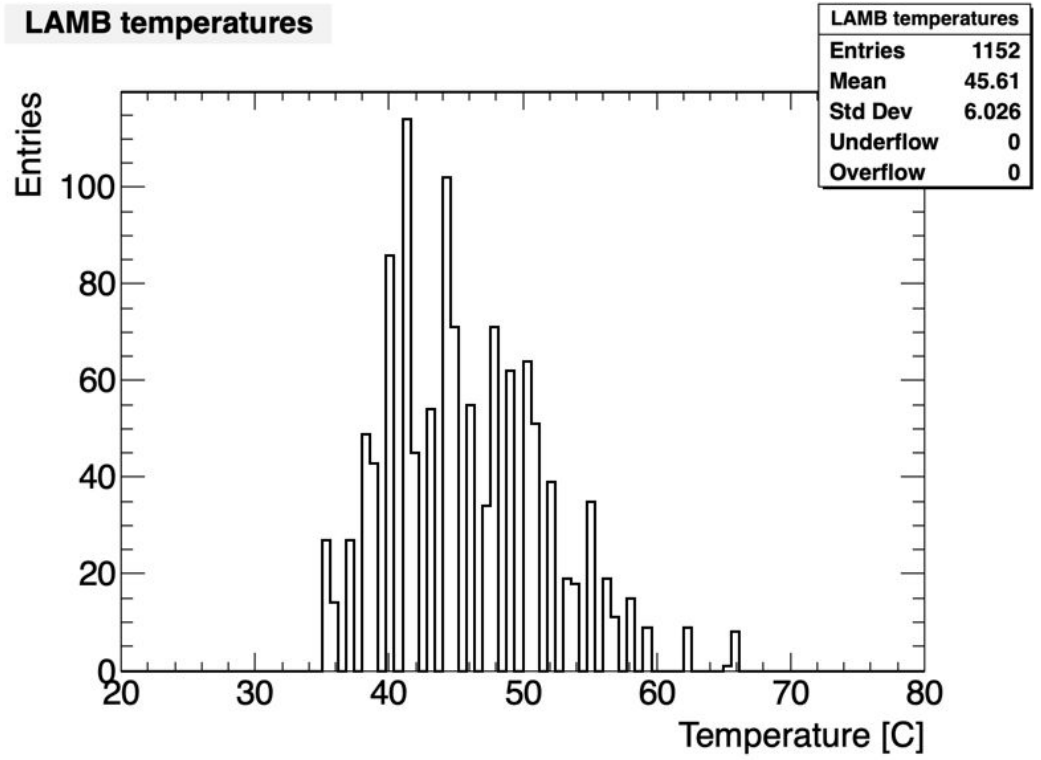
- Online SW
  - Gestione delle release
  - Interfacciamento con le infrastrutture di configuration, run control e monitoring
  - Operation: turni expert on call
- Infrastruttura VME
  - Configurazione dei rack e DCS
  - Sistema di cooling
  - Fondamentale apporto di Emanuele Romano
- Attività pavesi in linea con le tempistiche

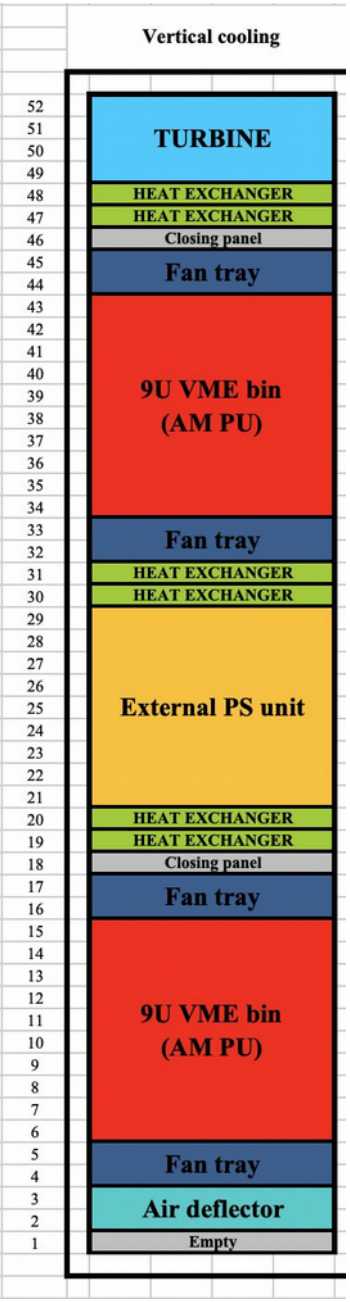


Cooling tests

S.Sottocornola, A. Lanza

- Svolte due campagne di tests
  - Con configurazione finale
  - Temperature al di sotto del limite: 80°
  - Non è necessario raddoppiare il numero di rack per distribuire la potenza dissipata





Stato di FTK: critico

- Significativo ritardo nel commissioning
  - Problemi principalmente dovuti al FW
- Motivi: man power qualificato
  - Mancanza di ingegneri per il FW
  - Giovani sul progetto per troppo poco tempo
- Proposto piano di descoping
  - Riduzione del rate: 100 kHz → 35 kHz
    - FTK sono per segnature più significative
    - Non esclusa possibilità di 100 kHz
  - Rimozione di un elemento (FLIC)
- In attesa decisione del comitato di review

Phase II

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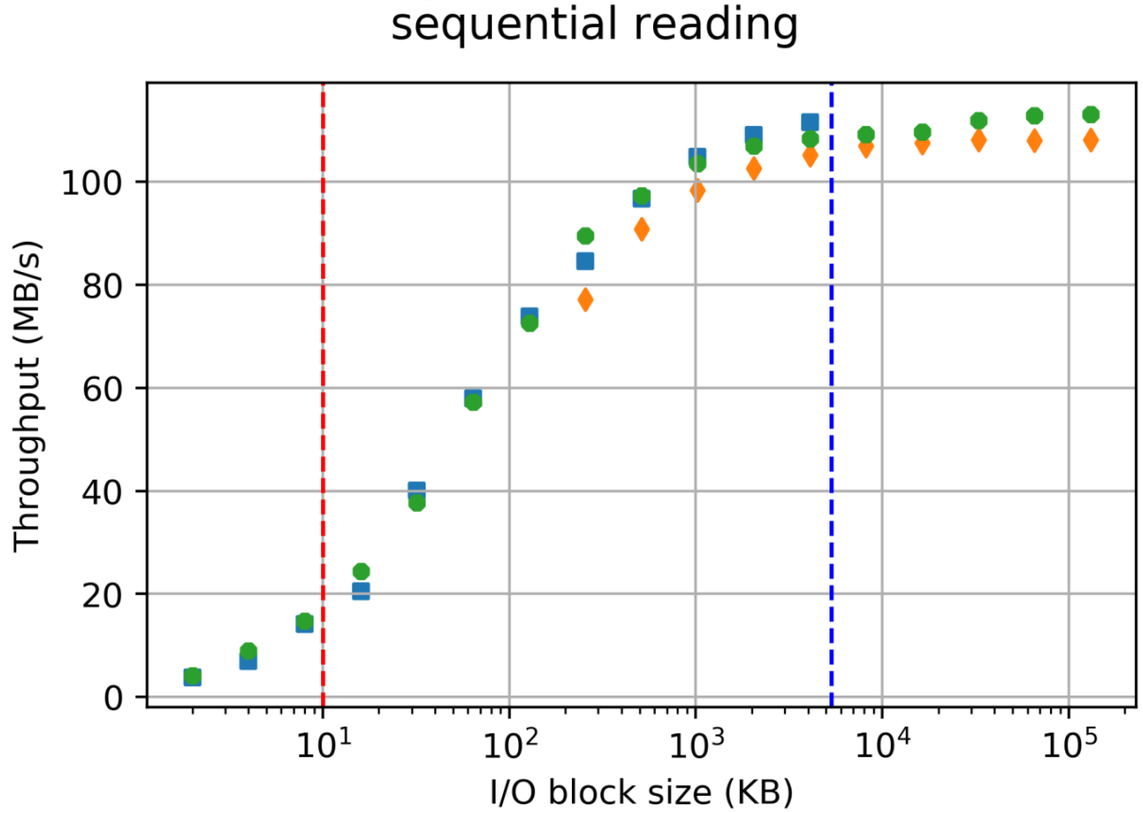
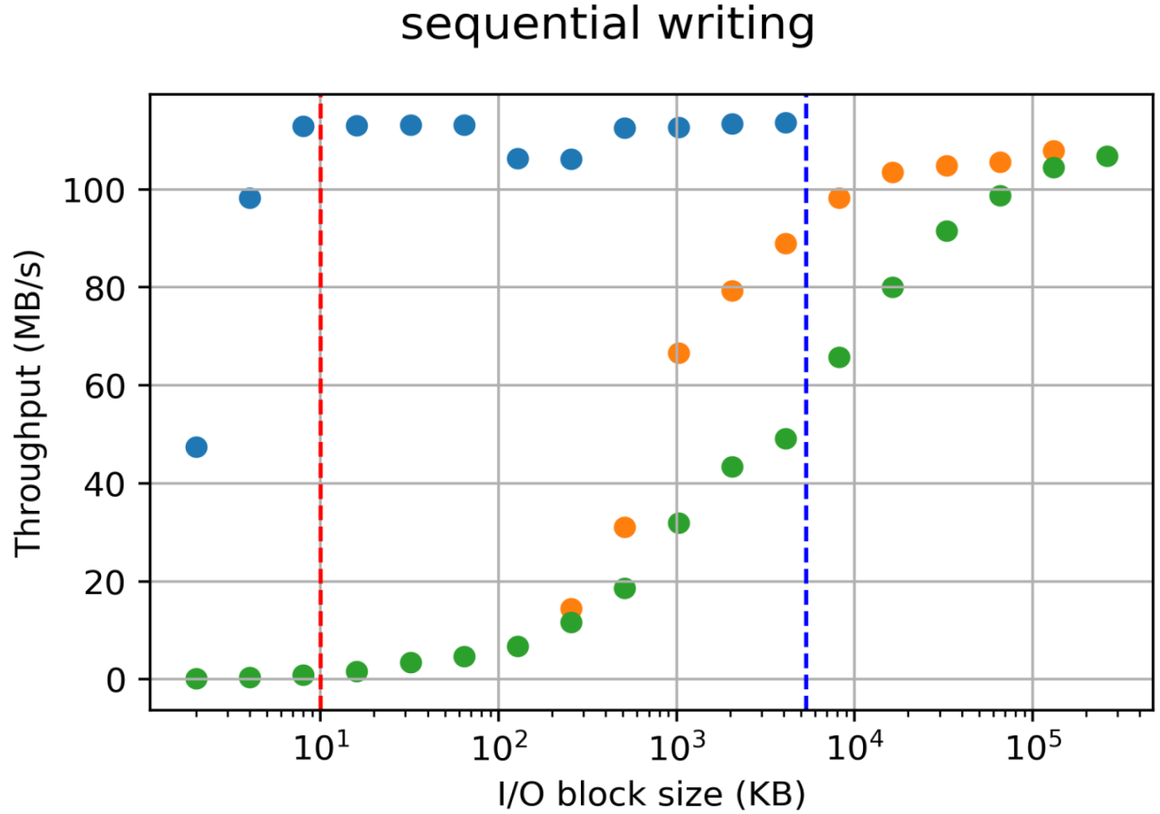
Data Flow for TDAQ Phase-II Upgrade

- Dataflow system: Large buffer provisioning system to decouple Readout from Event Filter
- Distributed File Systems (DFS) as a possible implementation of the Dataflow system
- Testing goals: Investigate how DFS perform against different controllable parameters (e.g. block-size, access pattern, cluster size, parallelism)
- Technologies tested: Gluster, Ceph, Hadoop
- Getting familiar with configuration and deployment of the systems
- Results will be published in the proceedings of the ACAT conference

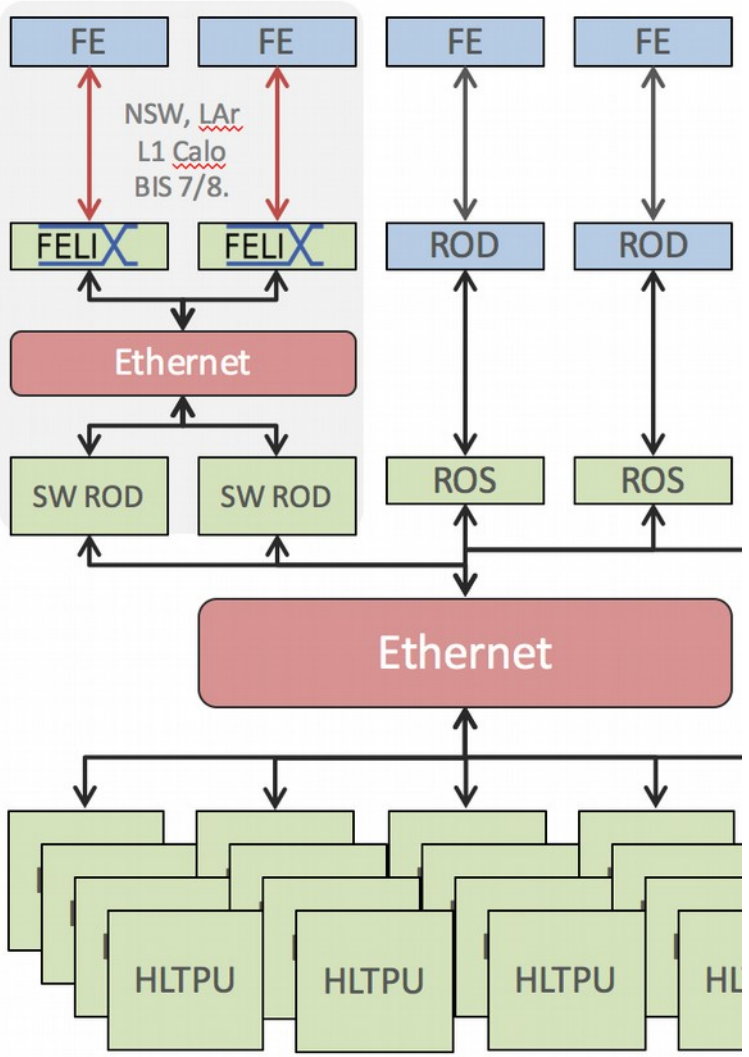




Readout

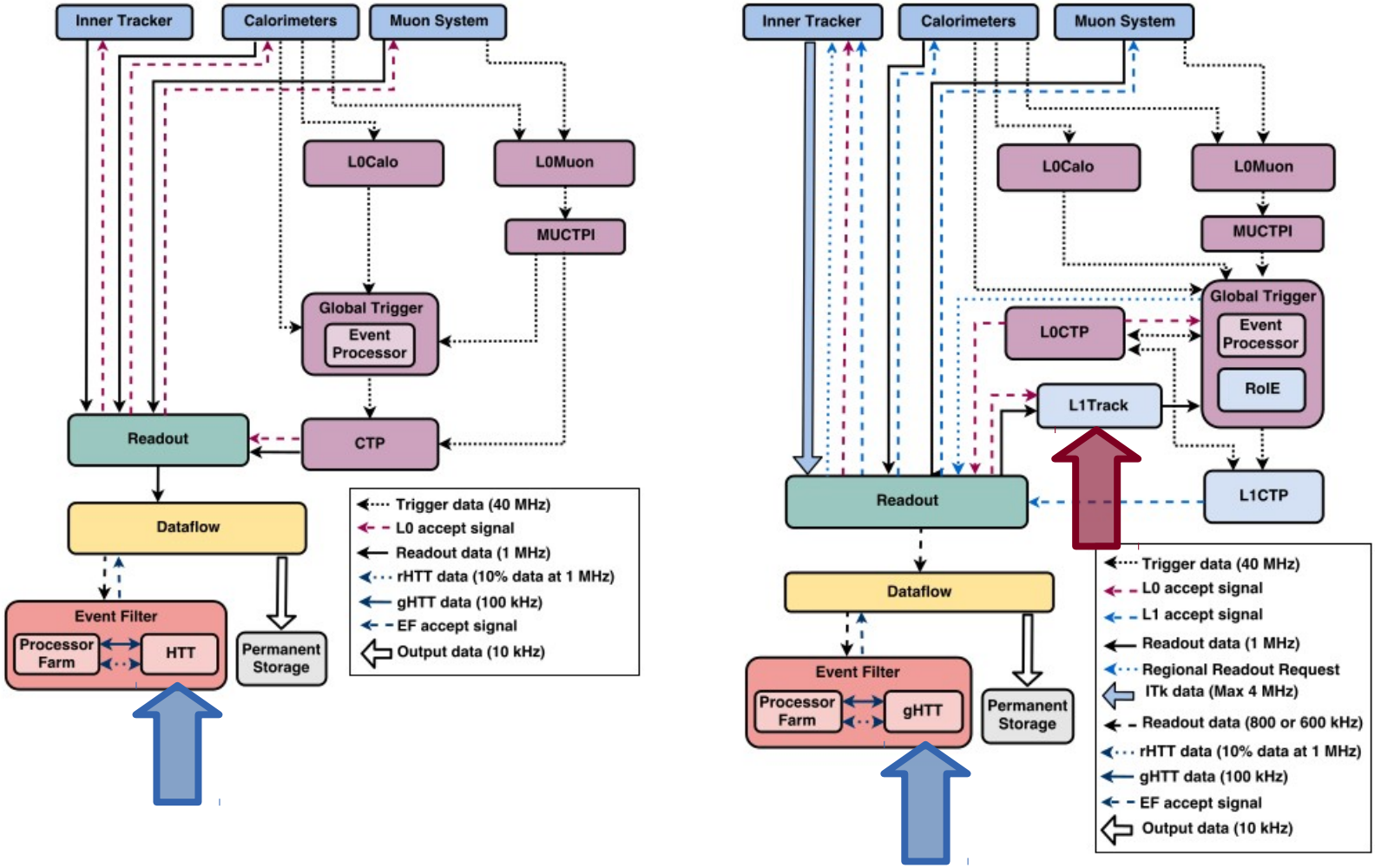
R. Ferrari

- Co-responsabilità attività di detector readout
- Definition and refinement of detector interfaces and requirements
- technology watch and benchmarking for COTS
  - i.e.: servers and network interfaces
- prototyping for non-COTS elements
  - i.e.: “FELIX” boards



Coprocessore per HLT o L1

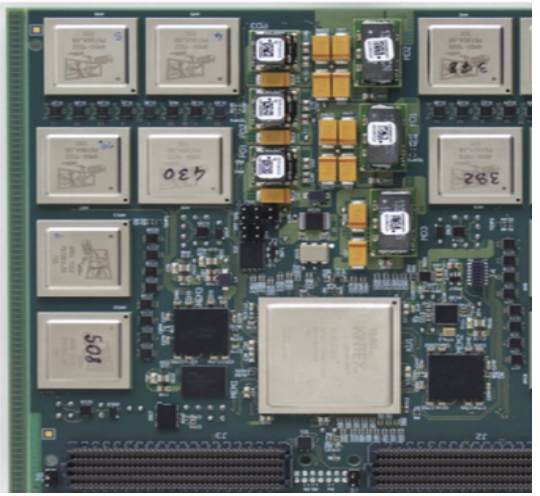
- Baseline: L0-only (left), L0+L1 on the right
  - **EFTrack** (HTT) and **L1Track** using same HW

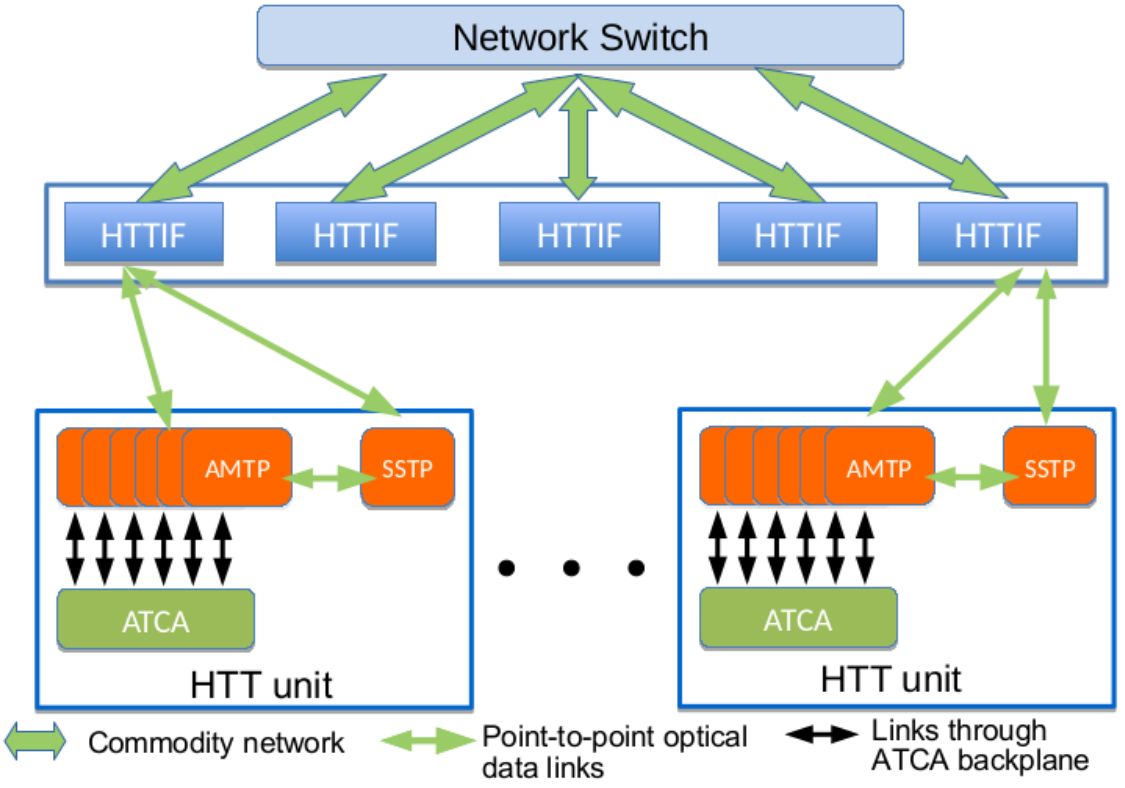


HTT@Pavia

S.Sottocornola, A.Negri, E.Farina[2019]

- Contributo pavese
  - online SW e possibilmente FW
- Definiti gli items nel project development tool di ATLAS
  - 2019 → 2024 (!!)
- Prossimi passi
  - Raccolta user requirements
  - Creazione infrastruttura SW
  - Prima release





Muon Phase-II Power System

Nel 2018 si e' conclusa la definizione degli MoU, che saranno firmati dalle agenzie partecipanti nel 2019.

Finanziamenti per il Power System (solo CORE 2024 – 2026, ovvero il 60% del totale. Il restante 40% sara' su M&O dal 2027 al 2029):

PBS	Item	CORE Value [kCHF]
5.8	Power System	7'076
5.8.1	Mainframes and branch controllers*	
5.8.2	Power generators*	
5.8.3	MDT HV/LV	2'060
5.8.4	RPC HV/LV, DCS	2'821
5.8.5	TGC HV/LV	1'919
5.8.6	sTGC HV	210
5.8.7	Installation	65

* Cost included in items 8.3 to 8.6

Sharing:

	MDT HV/LV	RPC HV/LV	TGC HV/LV	sTGC HV	Installation	Total
	5.8.3	**5.8.4**	**5.8.5**	**5.8.6**	**5.8.7**	**5.8**
China	-	2.80%	-	-	-	1.12%
France CEA	17.17%	-	-	-	-	5.00%
Germany BMBF	10.80%	-	-	-	-	3.14%
Greece	23.04%	16.83%	-	-	-	13.42%
Italy	-	31.91%	-	-	-	12.72%
Japan	-	-	65.44%	-	-	17.75%
Netherlands	5.43%	-	-	-	-	1.58%
JINR	-	3.86%	-	-	-	1.54%
CERN	43.56%	44.60%	34.56%	100.00%	100.00%	43.73%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Muon Phase-II Power System

Responsabilità:

5.8.1	Mainframes and branch controllers	
	Specifications, procurement, testing	Pavia, Frascati
5.8.2	Power generators	
	Specifications, procurement, testing	Pavia, Frascati
5.8.3	(s)MDT HV and LV	
	Specifications, procurement, testing for (s)MDT HV Barrel	Freiburg
	for MDT HV Endcap	Pavia, Frascati
	for (s)MDT LV Barrel	Athens NTU, Athens NKUA, Demokritos, Thessaloniki, Aegean, Patras HOU
	for MDT LV Endcap	Pavia, Frascati
5.8.4	RPC LV/HV, DCS	
	Specifications, procurement, testing	Roma II, Hefei, Shandong, Shanghai, TDLI
5.8.5	TGC HV, LV	
	Specifications, procurement, testing	KEK, Tokyo ICEPP, Nagoya, Kyoto, Kobe, Shinshu, Tokyo MU
5.8.6	sTGC HV	
	Specifications, procurement	Pavia, Frascati
5.8.7	Installation	all

Schedula per il 2019:

54	Power system overview	3,131d	01/01/2019	31/12/2030		0%	Yes	No	0d	0d
55	Design	499.5d	01/01/2019	30/11/2020		0%	No	No	2,631.5d	2,631.5d
56	Prototyping and tendering	543.5d	01/12/2020	30/12/2022		0%	No	No	2,087.5d	2,087.5d
57	Pre-production and acceptance	174.5d	02/01/2023	01/09/2023		0%	No	No	1,912.5d	1,912.5d
58	Core Production	868.5d	04/09/2023	31/12/2026		0%	No	Yes	1,043.5d	1,043.5d
59	M&O Production	521.5d	01/01/2027	01/01/2029		0%	No	No	521.5d	521.5d

ATLAS Pavia 2018: responsibilities

Responsibilities in ATLAS experiment:

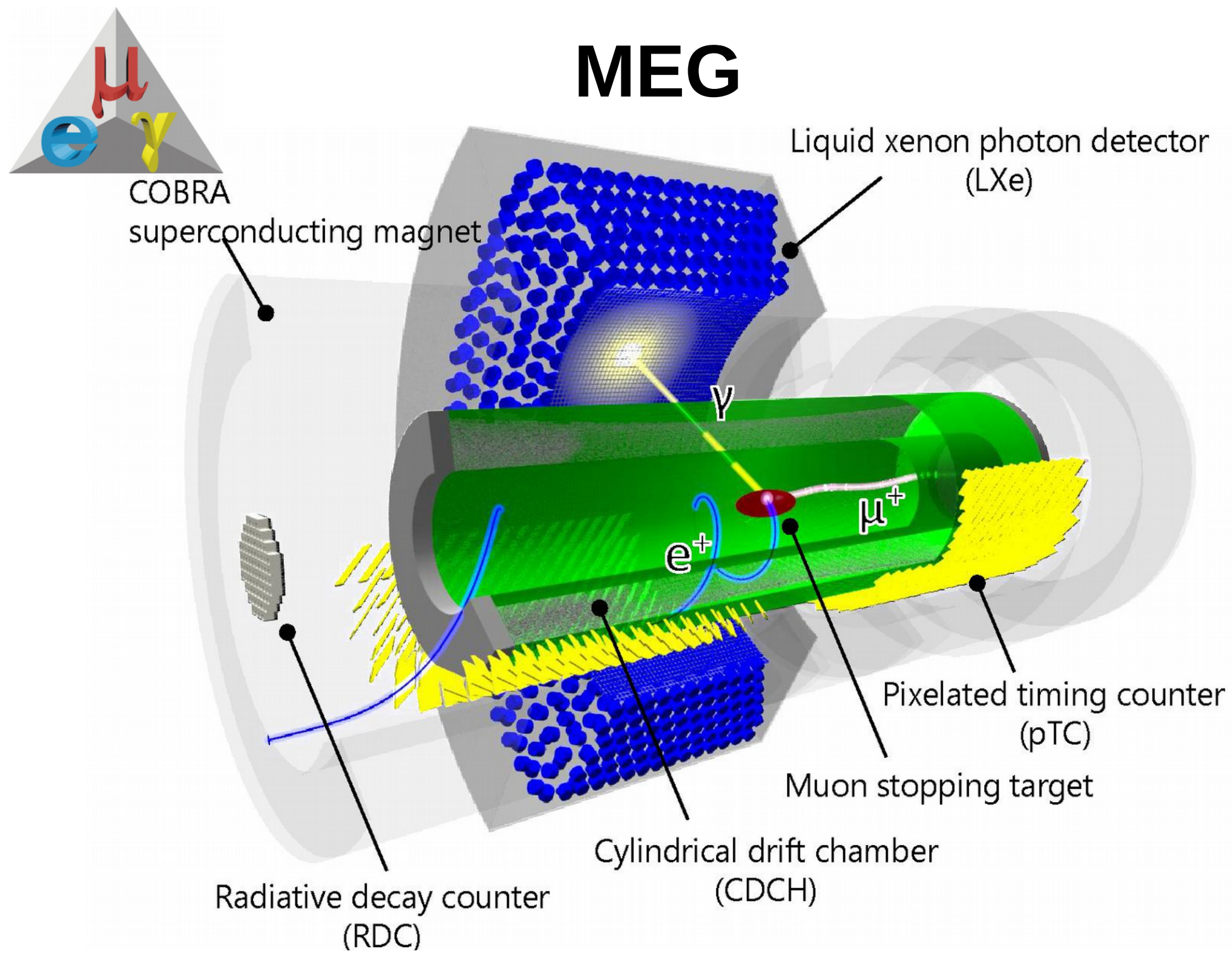
- Ferrari:
  - Phase-2 TDAQ Readout
  - MDT online monitoring

- Lanza:
  - NSW services coordinator and steering group member
  - FTK VME rack integration and power supplies
  - Muon Phase-2 L2 coordinator (Power Supply project) and steering group member

- Negri:
  - Responsabile dataflow ATLAS
  - Responsabile online SW FTK
  - Responsabile online SW HTT

- Rebuzzi: Member of the ATLAS Speakers Committee

MEG


Liquid xenon photon detector
(LXe)
COBRA
superconducting magnet
γ
μ+
e+
Pixelated timing counter
(pTC)
Muon stopping target
Cylindrical drift chamber
(CDCH)
Radiative decay counter
(RDC)

MEG II Pavia: Attivita' 2018

- MEGII pre-engineering run: Novembre-Dicembre
- Test con sistema calibrazione laser del pTC
- Articolo su design di MEGII (accettato Maggio 2018)
- Articoli su pTC laser, irraggiamento di SiPM e proceedings Vienna conference 2019 in preparation
- Conferenza PhiPsi2019 Novosibirsk e proceedings

MEG II Anagrafica 2018

Paolo W. Cattaneo	1 Ric INFN	40%
Gianluigi Boca	Prof. acc.	30%
Antonio De Bari	Ric. Uni.	20%
Massimo Rossella	Tec. INFN	30%
Massimo Oddone	Prof. Ass.	40%
Antonio Agnesi	Prof. Ass.	40%
Federico Pirzio	Ric. Uni.	40%

Totale FTE 2.4

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find a cattaneo,p and a rossella,m and d>2017 and d<201 | Brief format | Search | Easy Search | Advanced Search

find j "Phys.Rev.Lett.,105*" :: more

Sort by: earliest date | desc. | - or rank by - | Display results: 25 results | single list

HEP **2** records found Search took 15.37 seconds.

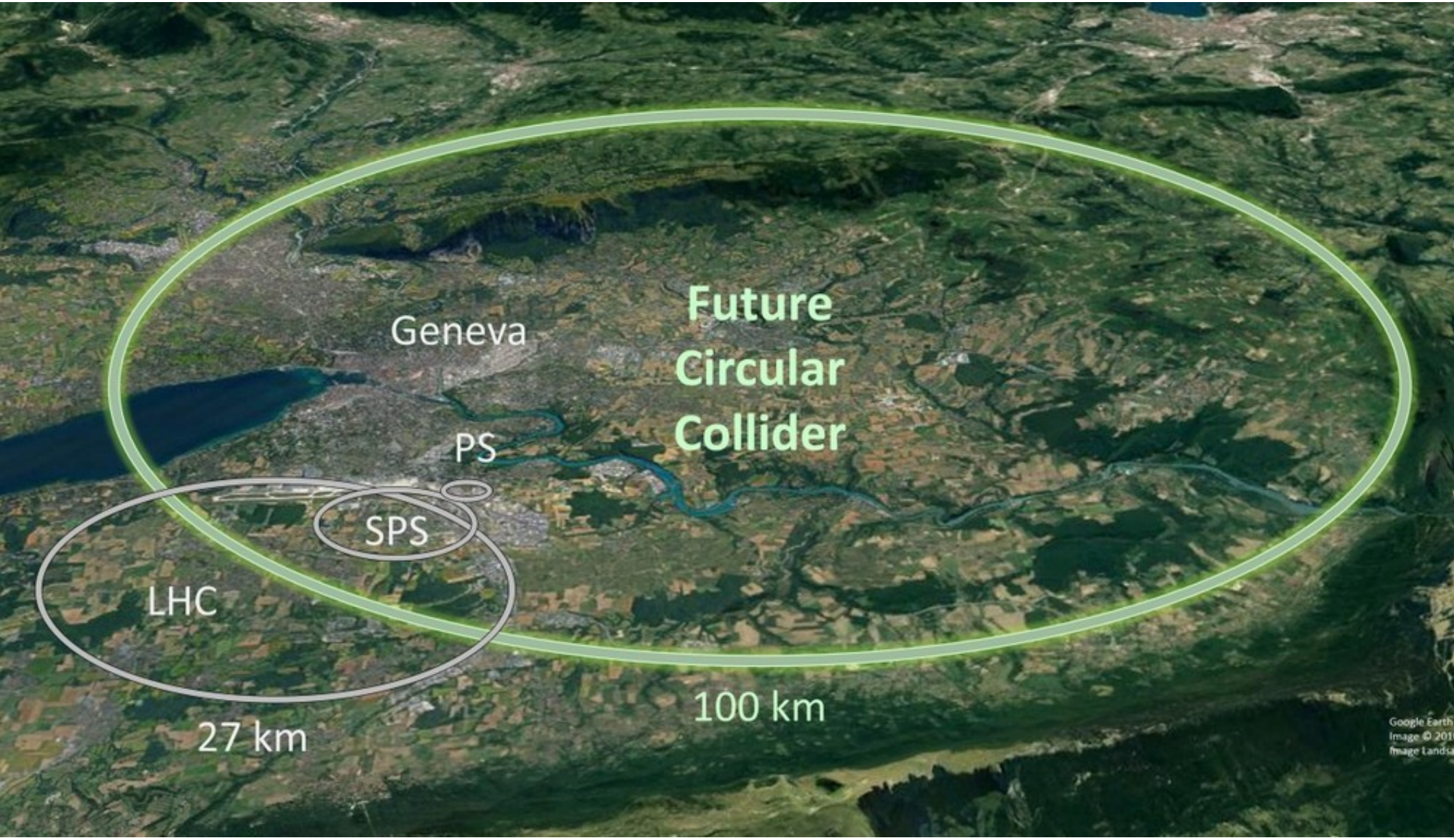
1. **Results from Pilot Run for MEG II Positron Timing Counter**
   M. Nakao (Tokyo U.) *et al.*. Aug 22, 2018. 5 pp.
   Published in **Springer Proc.Phys. 213 (2018) 237-241**
   DOI: 10.1007/978-981-13-1316-5_44
   Conference: C17-05-22.3 (Springer Proc. Phys. 213 (2018) 237-241) Proceedings
   e-Print: **arXiv:1808.07279 [physics.ins-det]** | **PDF**
   References | BibTeX | LaTeX(US) | LaTeX(EU) | Harvmac | EndNote
   ADS Abstract Service
   Detailed record - Cited by 3 records

2. **The design of the MEG II experiment**
   MEG II Collaboration (A.M. Baldini (INFN, Pisa) *et al.*). Jan 15, 2018. 64 pp.
   Published in **Eur.Phys.J. C78 (2018) no.5, 380**
   DOI: 10.1140/epjc/s10052-018-5845-6
   e-Print: **arXiv:1801.04688 [physics.ins-det]** | **PDF**
   References | BibTeX | LaTeX(US) | LaTeX(EU) | Harvmac | EndNote
   ADS Abstract Service; Link to Article from SCOAP3
   Detailed record - Cited by 42 records

Stato di MEG II

- Run tecnico fine 2018 con il ptC sia UD che DS inseriti e sistema laser funzionante
- Solo il mock up della camera inserito al test
- Numero limitato di canali di lettura WaveDream disponibili

RD_FA



RD_FA

- Incubatore per nuove tecnologie a futuri acceleratori
  - FCC-hh, FCC-ee, CepC, SppC, CLIC, ILC, muon collider, ...
- Pavia coinvolta in
  - Calorimetria per detector IDEA
  - Fisica e simulazione
- Anagrafica
  - Con altre persone coinvolte (es: Carlo Carloni)

SEZIONE	NOME COGNOME	TIPO	CONTRATTO	QUALIFICA	RICERCATORI	TECNOLOGI	TOT. PERS.	FTE	FTE / PERS.
PV	Ferrari Roberto				x			20	
	Gaudio Gabriella				x			10	
	Pezzotti Lorenzo				x			30	
	Piccinini Fulvio				x			10	
	Polesello Giacomo				x			10	
PV					**0.8 fte**	**5 pers.**	**0 fte**	**pers.** **5**	**0.8**	**0.160**

RD-FA: Theory activity (highlights)

- Talks:
  - ⇝ F. Piccinini, EW precision as a probe to scenarios of New PHysics 2nd FCC Physics Workshop 15-19 January 2018
  - ⇝ F. Piccinini, Radiative corrections at the Z pole High Energy Physics Conference, Beijing, 12-14 November 2018
  - ⇝ F. Piccinini, International School on future colliders, Pisa, 17-21 September 2018
    Lecture 1: Experimental status and future collider opportunities
    Lecture 2: Physics at future e^+e^- colliders
  - ⇝ F. Piccinini, Theory scenario, RD_FA meeting, 5-6 July 2018, Milan
  - ⇝ C.M. Carloni Calame, $e^+e^- \to \gamma\gamma$ at large angle for FCC-ee luminometry, 11th FCC-ee workshop: Theory & Experiment, 8-11 January 2019, CERN
- Editorship
  - ⇝ F. Piccinini, Co-editor of Chapter 11 "Physics Performance with Benchmark Processes", Section 2 "W and Z boson physics" CEPC Physics and Detector Conceptual Design Report `arXiv:1811.10545`
- CDR's
  C.M. Carloni Calame, G. Montagna, O. Nicrosini, F. Piccinini:
  CEPC CDR, FCC CDR [Vols. 1,2,3,4], Higgs Physics at the HL-LHC and HE-LHC [Report of the "Physics of the HL-LHC Working Group" `arXiv:1902.00134`]
- Convenership
  - ⇝ F. Piccinini: co-convener of the WG1 (Z-pole) and WG2 (Dibosons) of the FCC-ee design study group

RD-FA: Theory activity (highlights)

- Publications:

⇝ M. Greco, G. Montagna, O. Nicrosini, F. Piccinini, G. Volpi,
ISR corrections to associated HZ production at future Higgs factories,
Phys. Lett. B777 (2018) 294

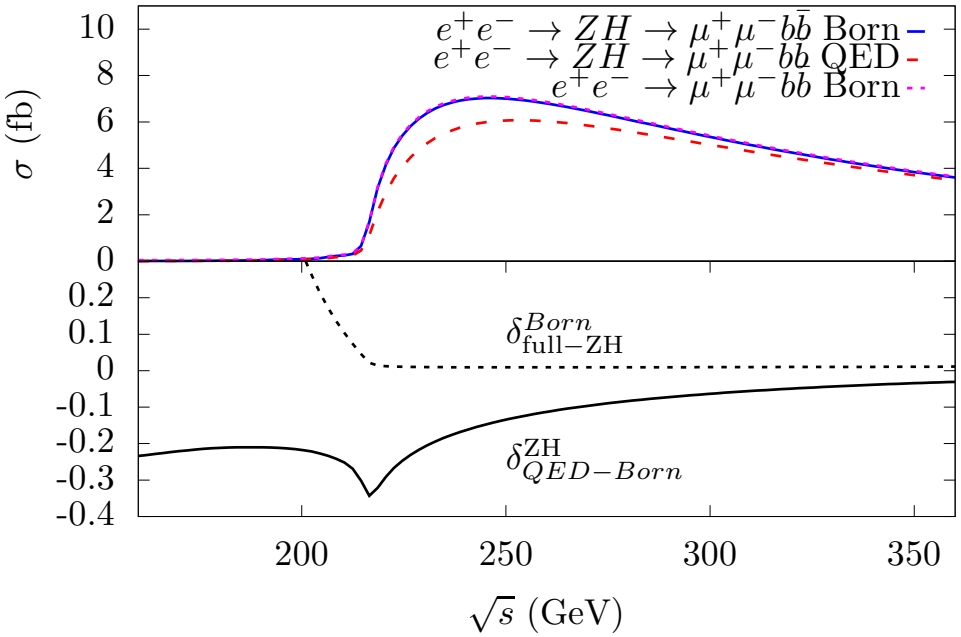


Figure: Effects of QED corrections on $e^+e^- \to ZH \to \mu^+\mu^- b\bar{b}$

Searches for new physics with photonic channels

Try to understand whether FCC-ee can provide coverage beyond HL-LHC in direct searches for new physics

Concentrate on channels where new phisics couples to photons/leptons, less favourable for LHC

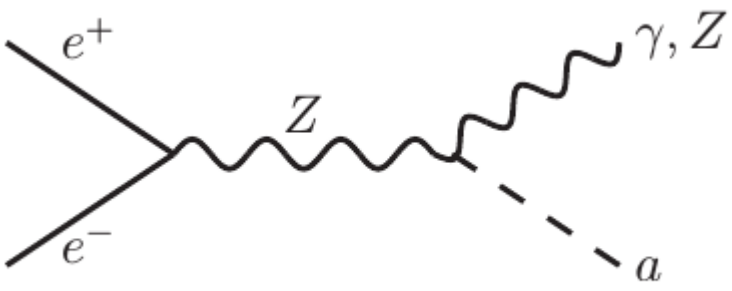
Concentrate on final states with photons, in order to determine the requirements on high-precision calorimetry, such as the dual readout calorimeter.

A few examples from literature:

- Dark photon produced in association with photon
- Higgsino produced in association with a photon and with radiative decay of chi02
- Leptophilic dark matter produced in association with a photon
- Axion-Like particles (ALP)

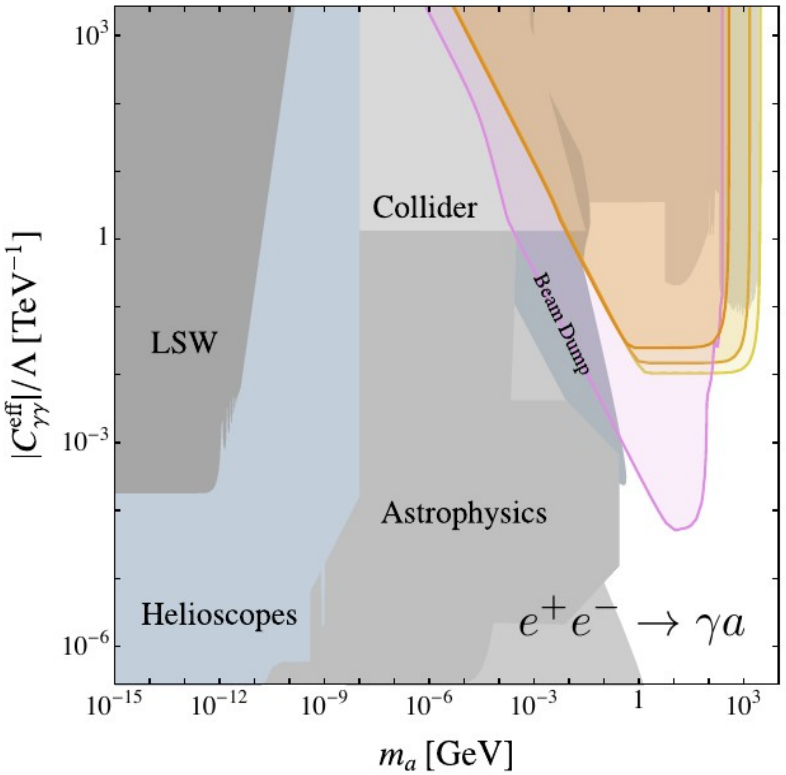
Preliminary studies with fast simulation performed for dark photons and ALPs

Axion-Like particles



Study ALP associated with a photon,
Which in turn decays into 2 photons
→ 3 photons final state

ArXiv:1808.10323



Theory reach as a function of the
ALP mass and couplings calculated
With no consideration of backgrounds

Exercise ongoing to assess reach once
Overwhelming e+e- → 3 γ background
considered

Main experimental handle: 2-photon
mass peak from ALP decay

RD_FA - IDEA

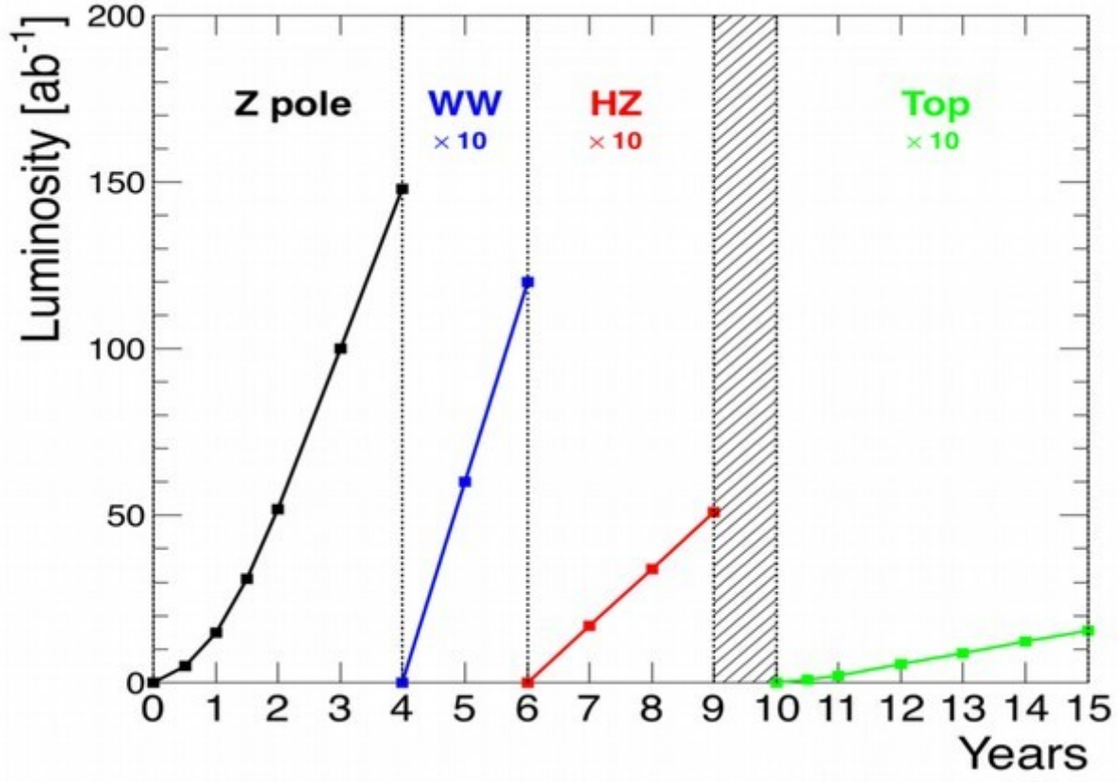
Detector IDEA

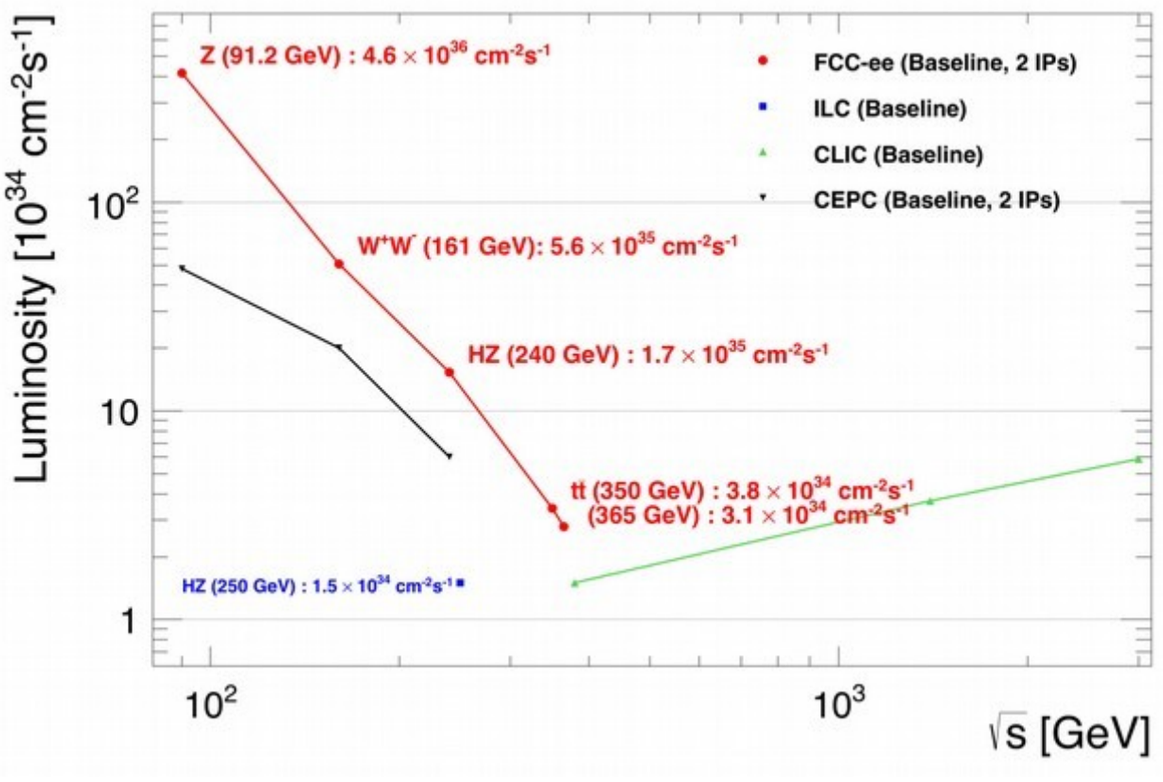
Il Detector IDEA, a guida INFN, è stato ideato per esperimenti a futuri collider e^+e^- ed è stato integrato con successo nei Conceptual Design Report di CepC ed FCC-ee recentemente pubblicati.

Risultati

FCC-ee CDR:

CEPC CDR: *arXiv:1811.10545*





Roberto Ferrari, Gabriella Gaudio, Lorenzo Pezzotti

RD_FA - IDEA

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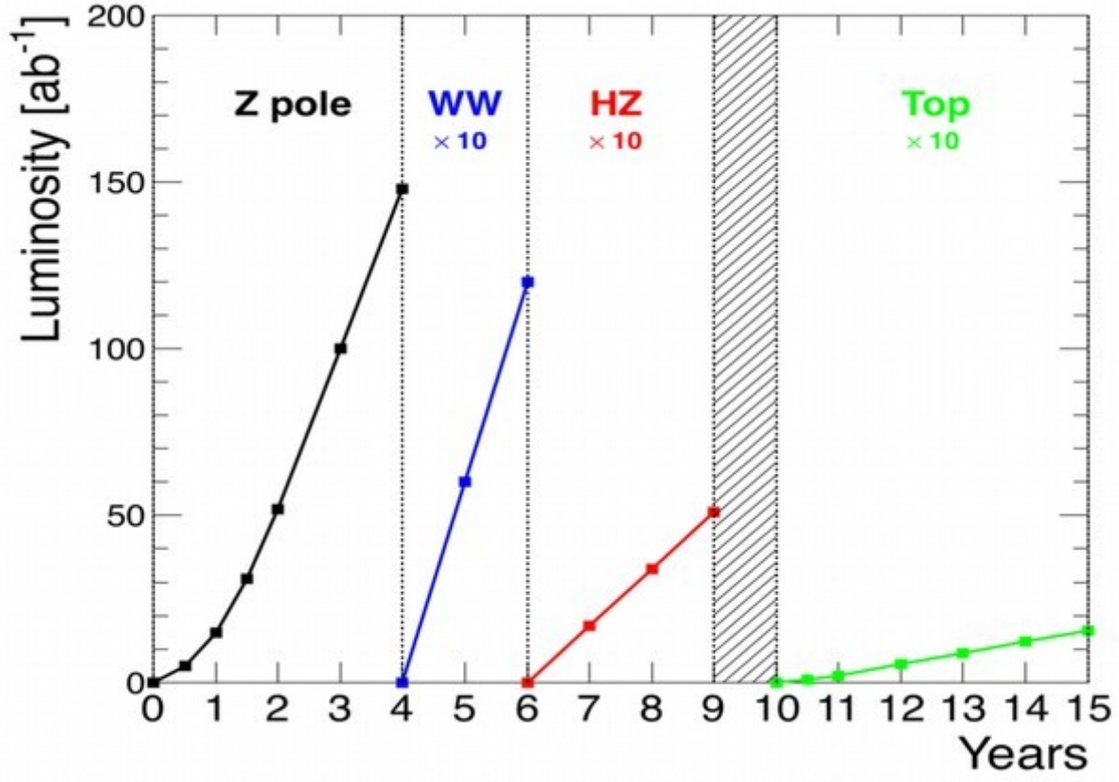
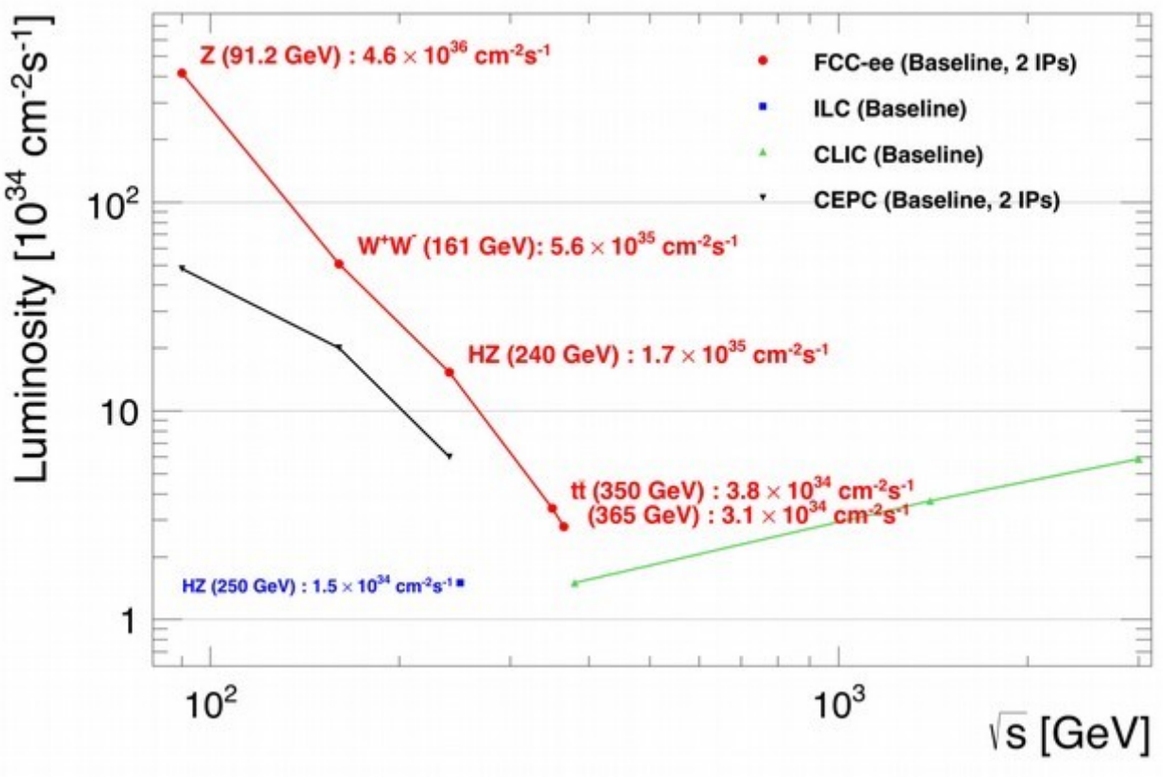
CEPC CDR: *arXiv:1811.10545*





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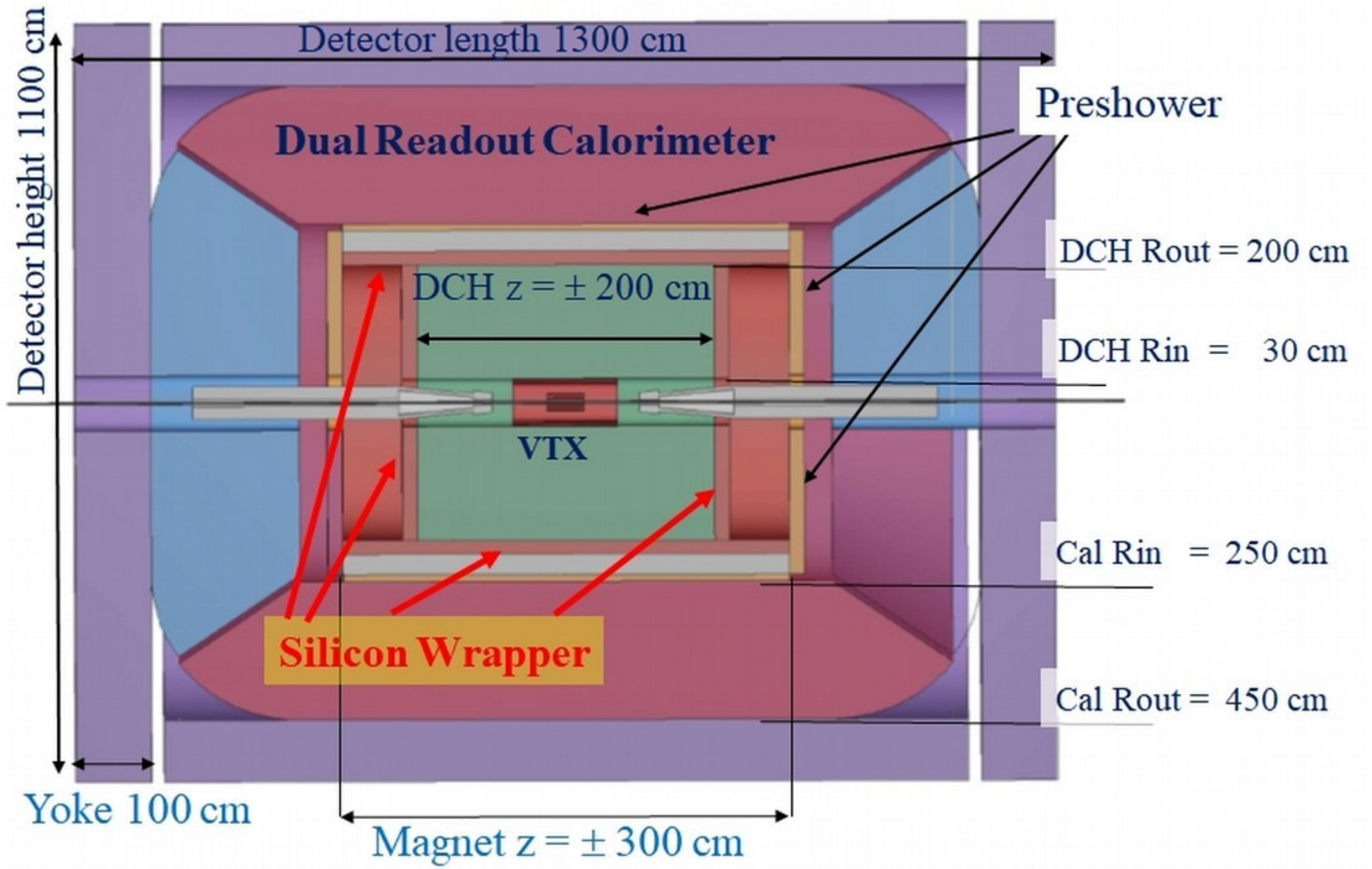
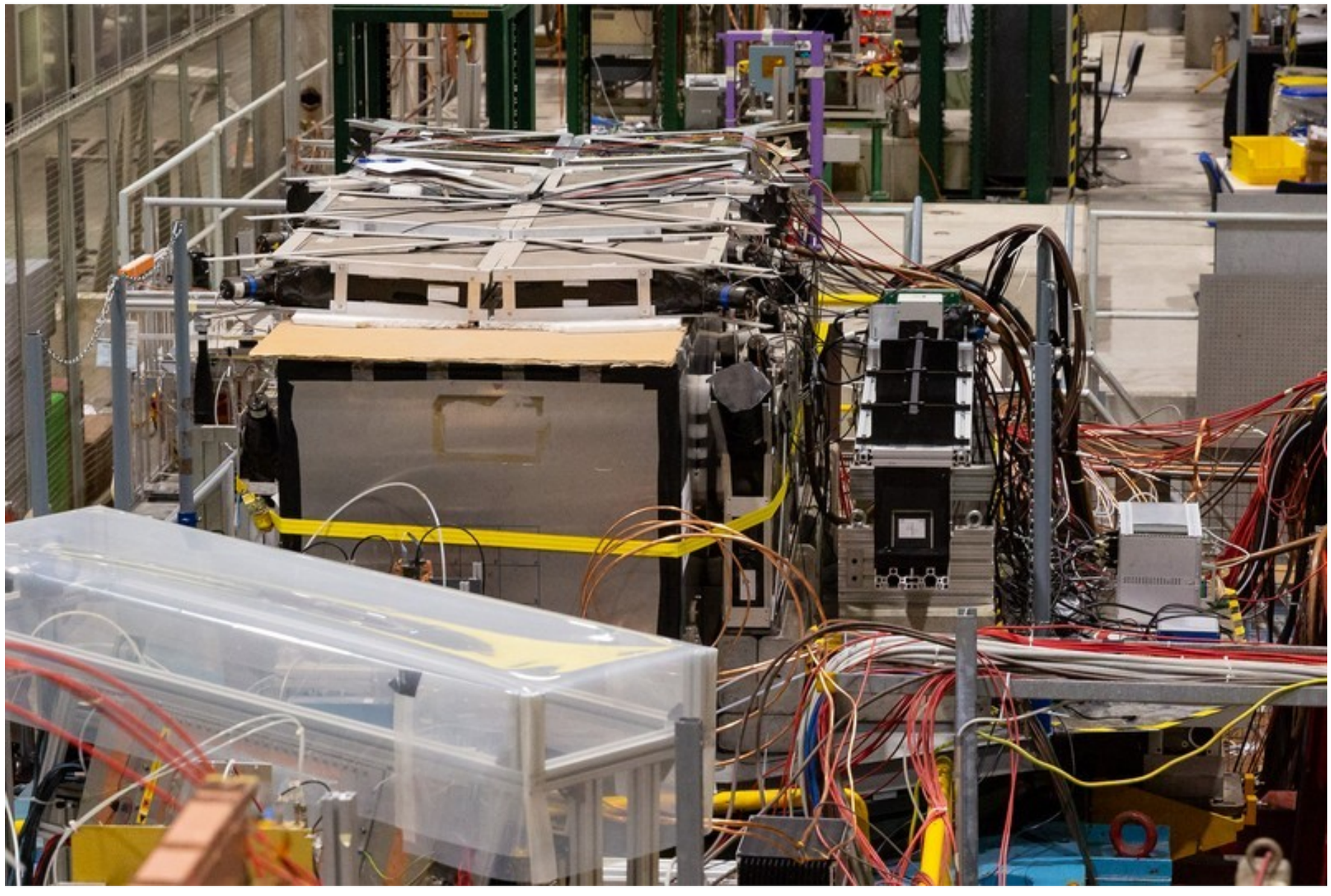
RD_FA - IDEA


Detector length 1300 cm
Detector height 1100 cm
Dual Readout Calorimeter
Preshower
DCH z = ± 200 cm
DCH Rout = 200 cm
DCH Rin = 30 cm
VTX
Cal Rin = 250 cm
Silicon Wrapper
Cal Rout = 450 cm
Yoke 100 cm
Magnet z = ± 300 cm

RD_FA - IDEA Activities

IDEA Combined test-beam

- Primo test-beam combinato di una slice di IDEA: Settembre 2018 all'SPS
- Primo test-beam specificamente indirizzato ai collider leptonic post lhc!



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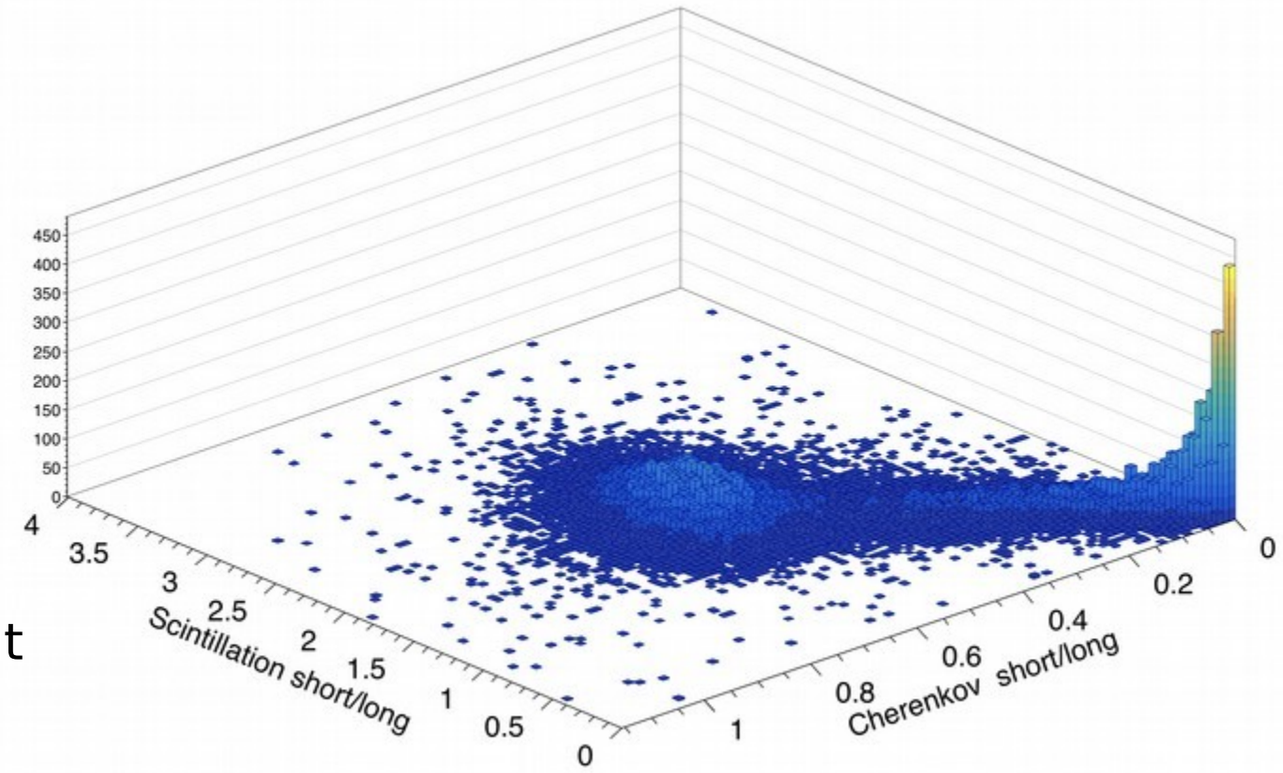
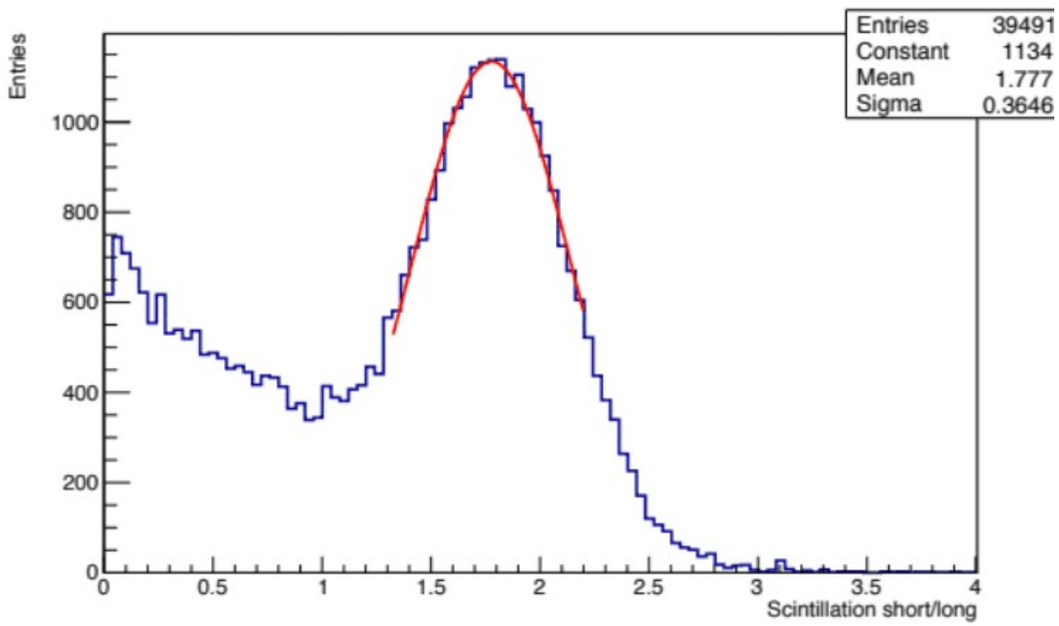
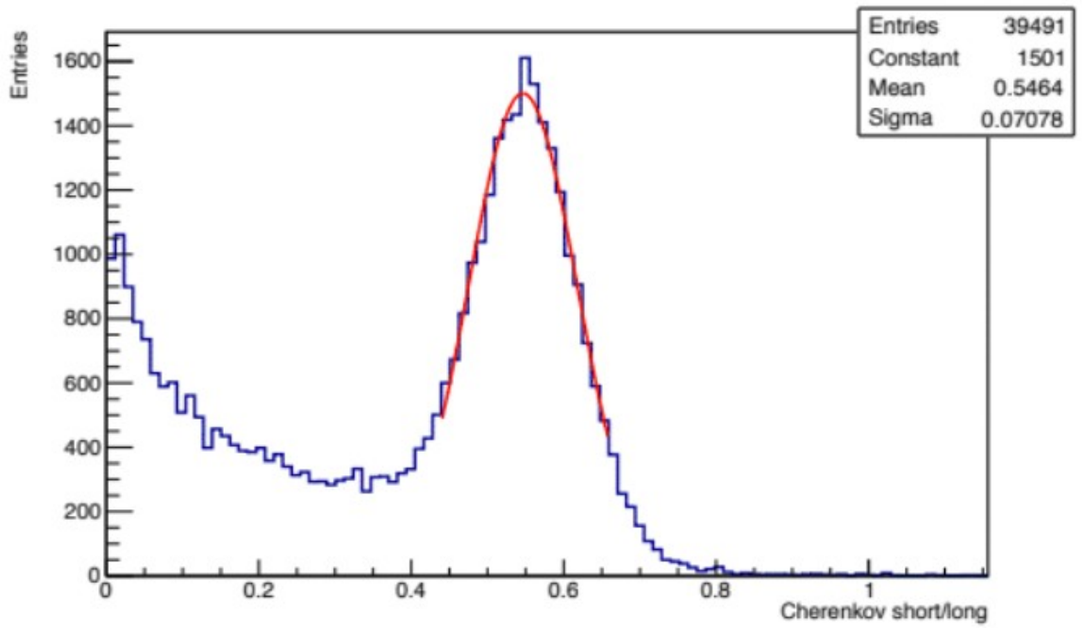
RD_FA - IDEA Activities

IDEA Combined test-beam

- Testati in sequenza una camera a fili, due rivelatori GEM per il l'identificazione delle particelle prima del calorimetro (pre-shower), un calorimetro dual-readout e due rivelatori GEM per il tracciamento dei muoni.
- Dimostrata per la prima volta la possibilità di ottenere una segmentazione longitudinale in un calorimetro dual-readout a fibre.







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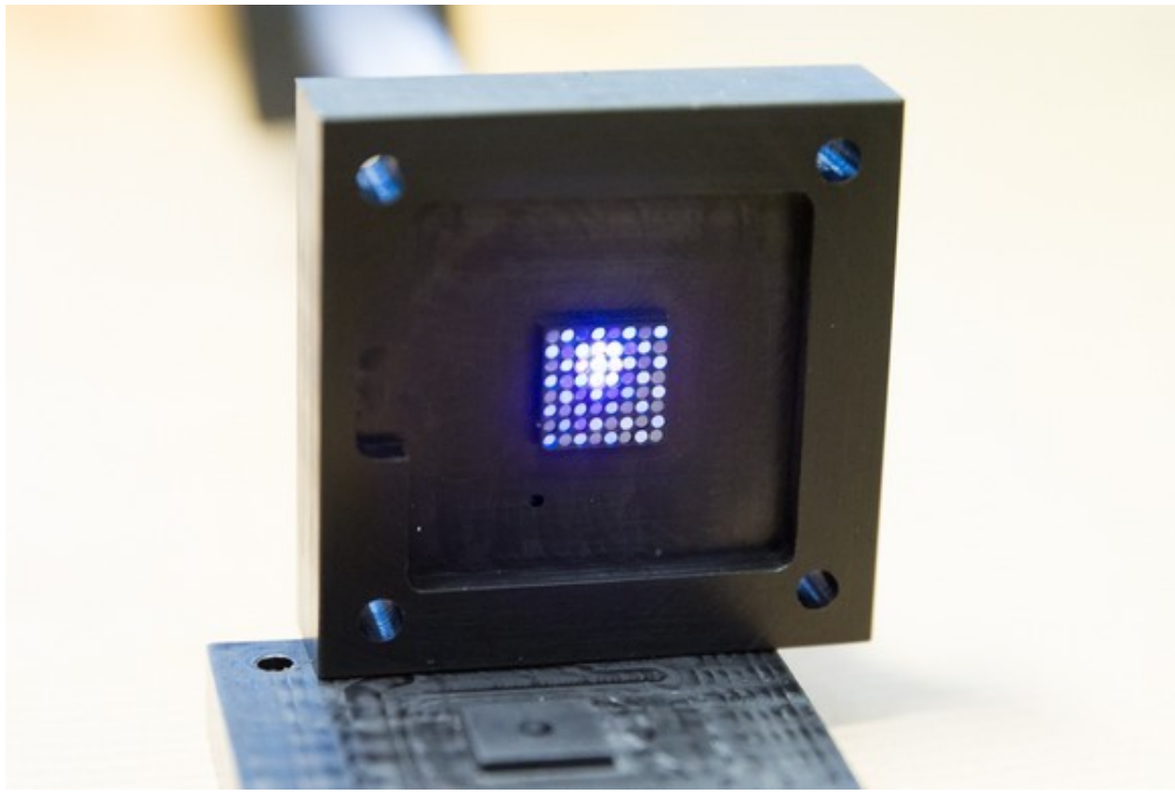
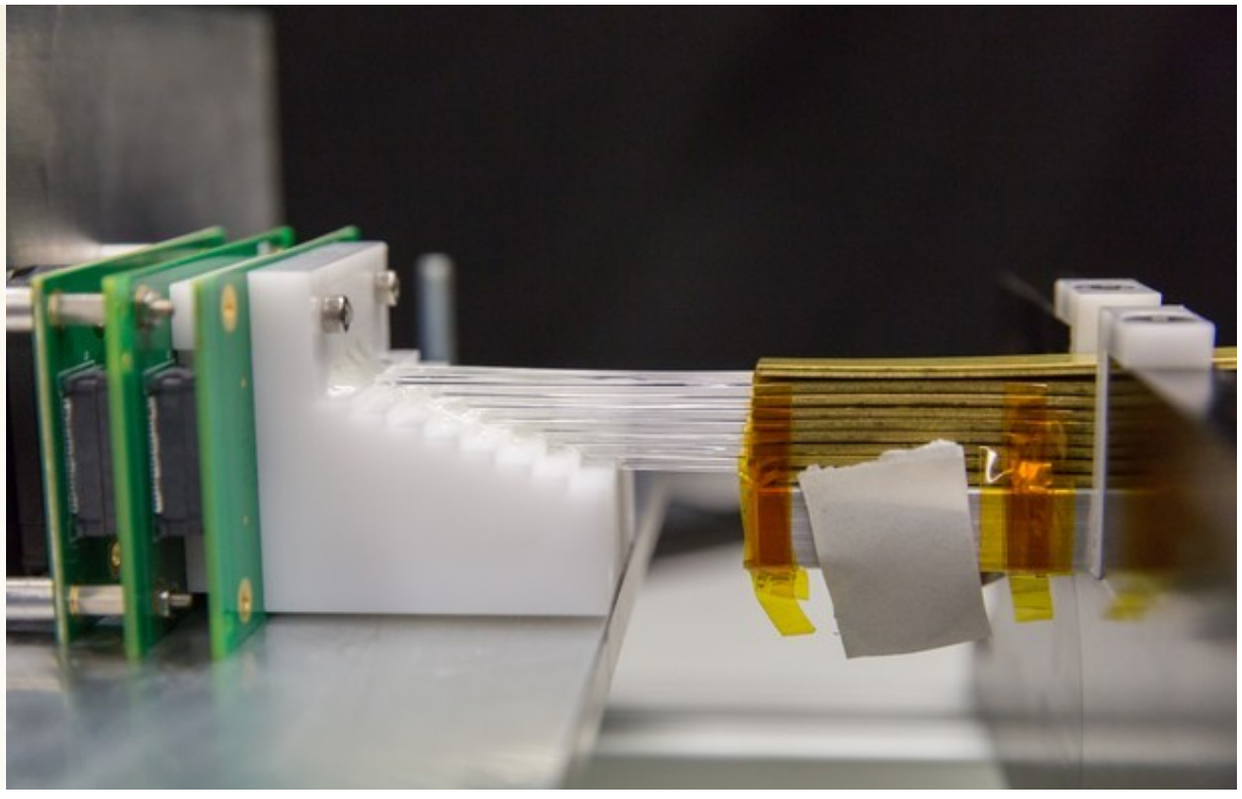
RD_FA - IDEA calorimetry

Ricerca e sviluppo in calorimetria
Studio del primo prototipo di calorimetro dual-readout equipaggiato con SiPM. Caratterizzazione dei parametri di utilizzo ottimali di rivelatori al silicio per misure calorimetriche.





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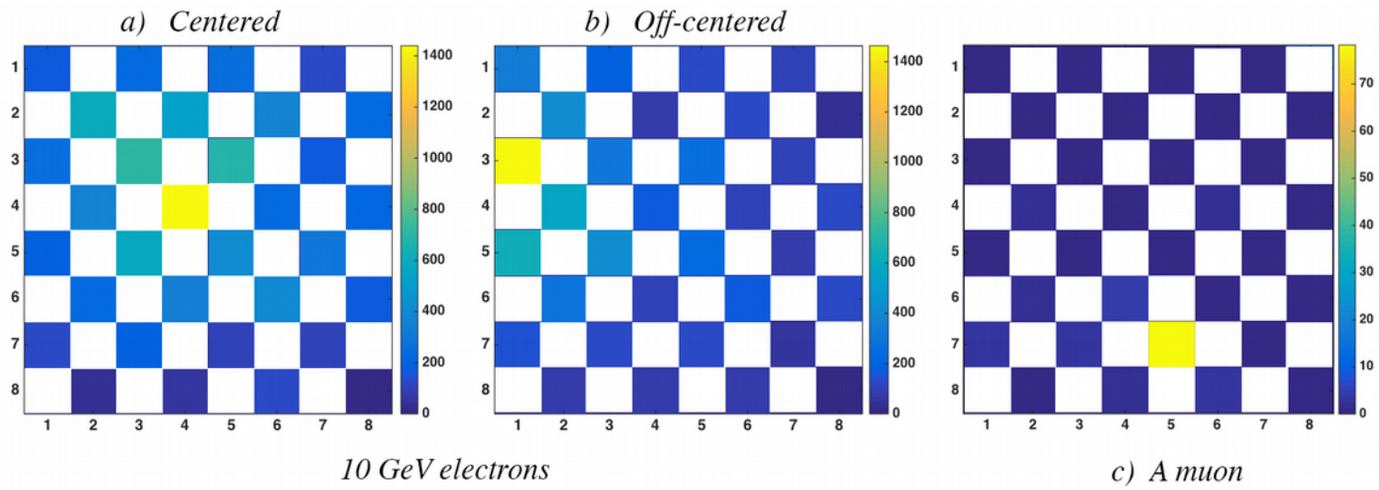

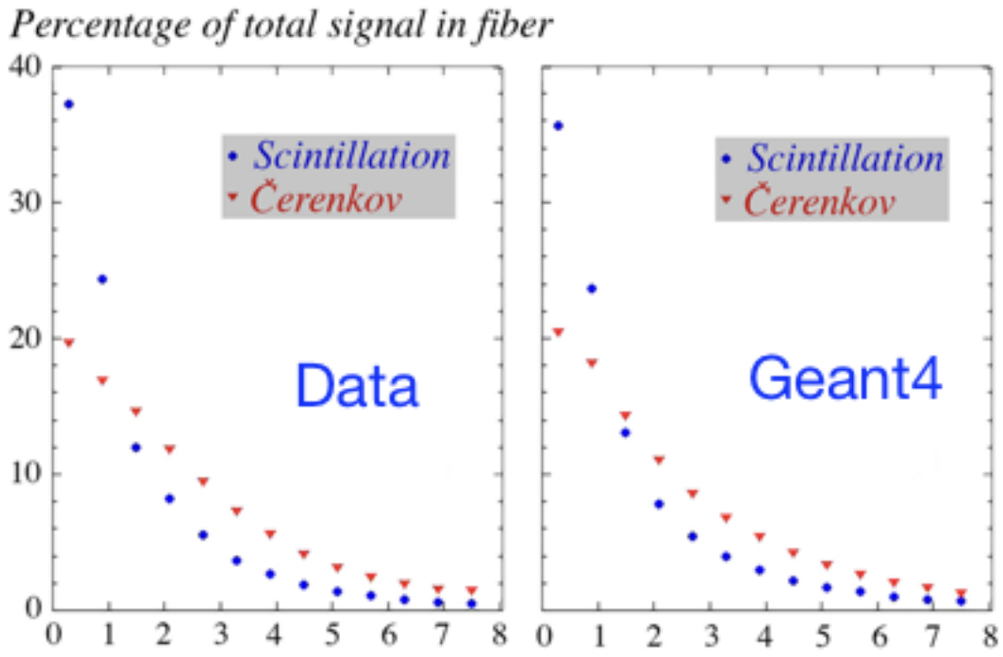

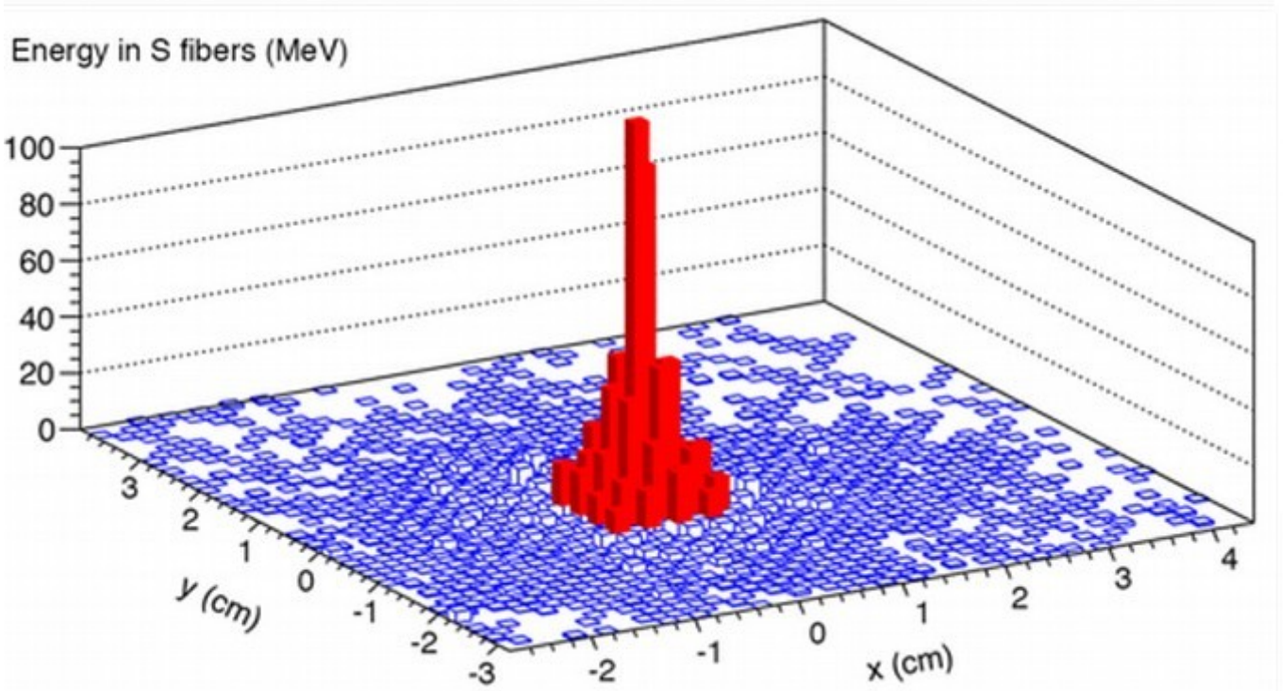

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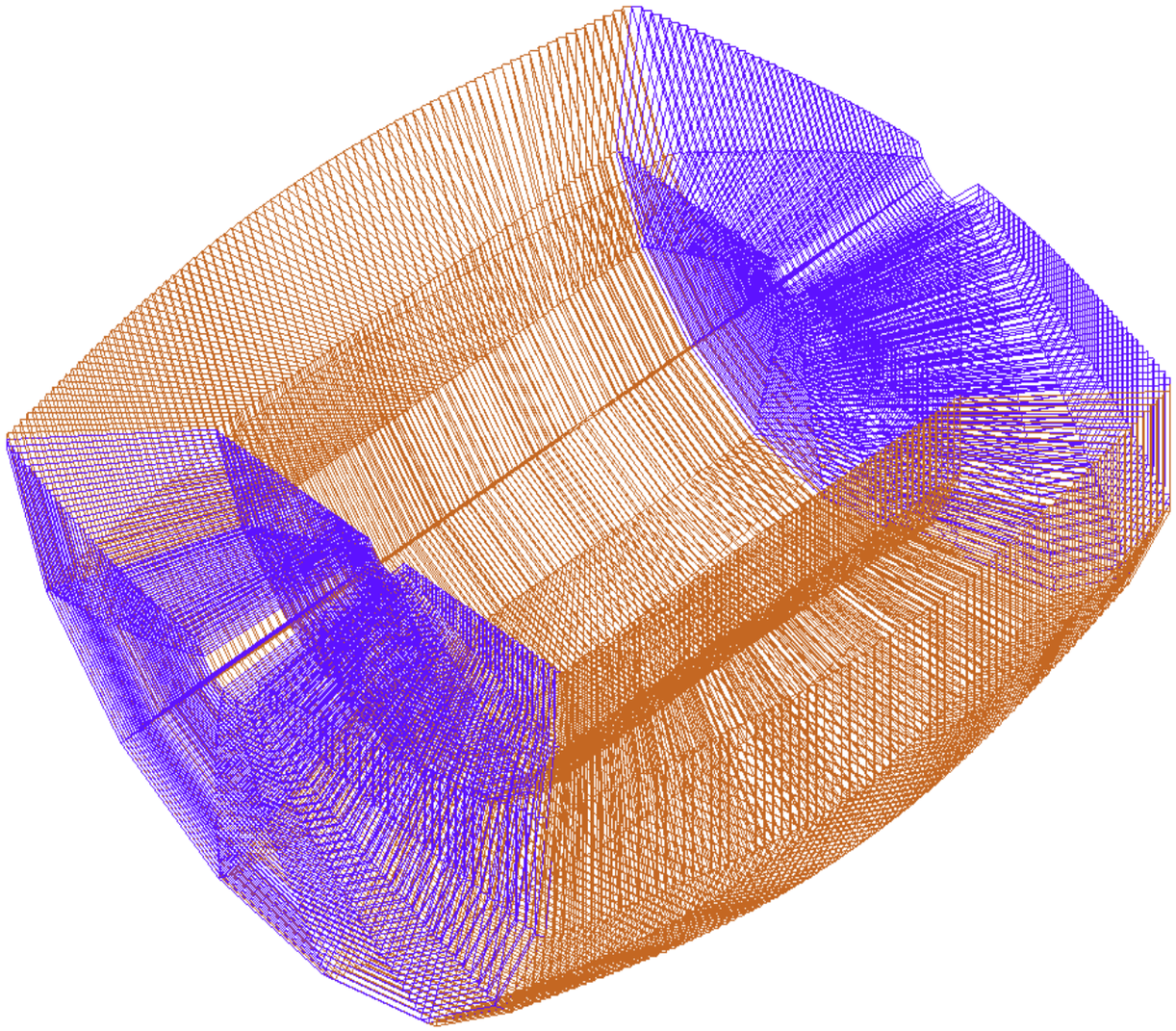
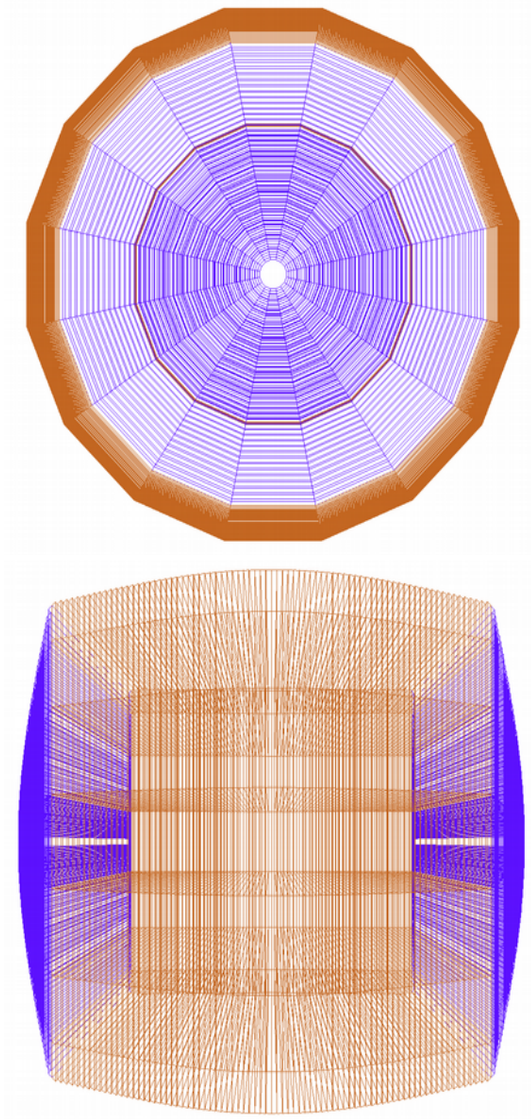
RD_FA - IDEA calorimetry

IDEA Simulazione

Sviluppo del primo software di full-sim per la simulazione di un calorimetro dual-readout proiettivo per l’esperimento IDEA.





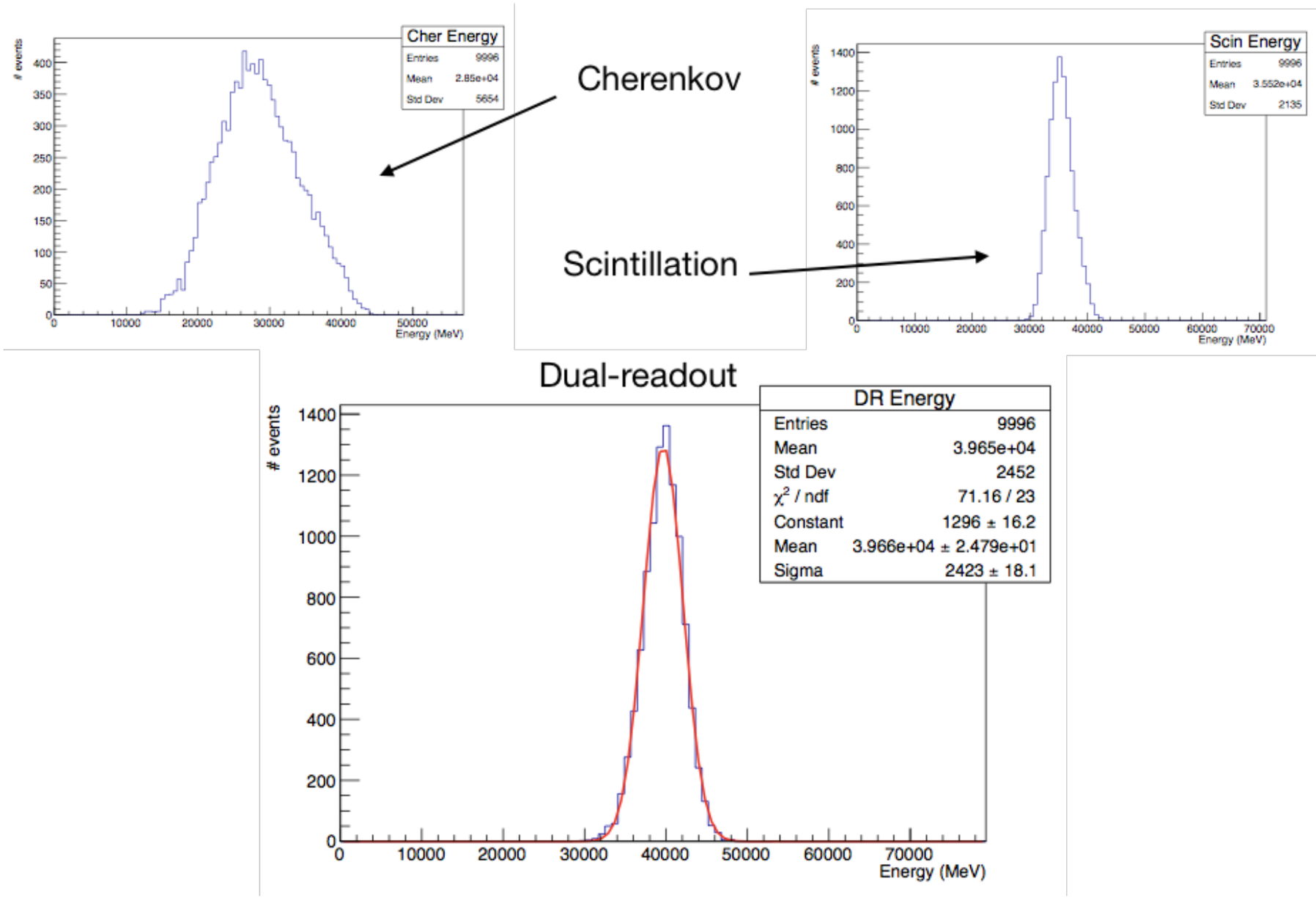
Fully projective dual-readout geometry in GEANT4

Roberto Ferrari, Gabriella Gaudio, Lorenzo Pezzotti

RD_FA - IDEA calorimetry

IDEA Simulazione

Sviluppo del primo software di full-sim per la simulazione di un calorimetro dual-readout proiettivo per l'esperimento IDEA.



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Conferences and Pubblications

Talk:

- Ferrari "**Dual-Readout Calorimetry**" HKUST IAS HEP Program Conference, (24.1.2018 Hong Kong)
- Ferrari "**DR full simulation**" Workshop on the Circular Electron-Positron collider (24-26.5.2018, Roma)
- Pezzotti "**Dual-readout fibre-sampling calorimetry with SiPM light sensors**" CALOR2018 (22.5.2018 Oregon)
- Pezzotti "**Report on Dual Readout Calorimeter**" The 2018 International Workshop on the High Energy Circular Electron Positron Collider (12-14.11.2018 Beijing)

Poster:

- Pezzotti "IDEA Dual-Readout calorimetry hardware" FCC week 2018 (9-13.4.2018 , Amsterdam)
- Pezzotti "The IDEA Detector Concept" The 2018 International Workshop on the High Energy Circular Electron Positron Collider (12-14.11.2018 Beijing)

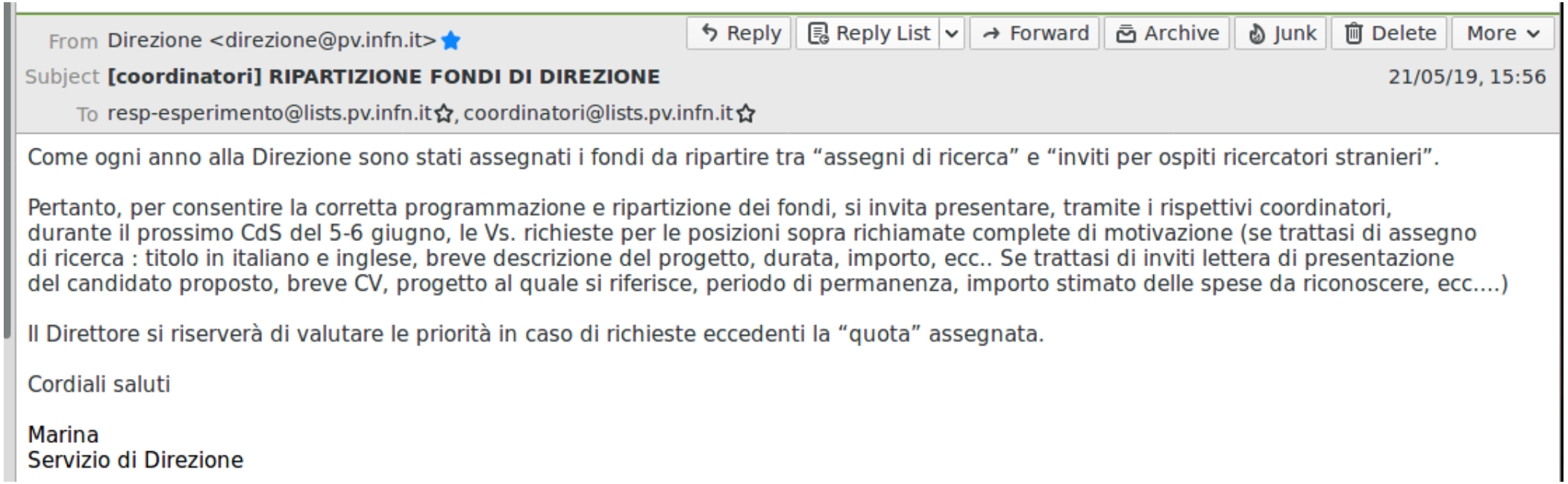
Papers:

- M. Antonello et al., "**Linearity response measurement of a SiPM-based dual-readout calorimeter for future leptonic colliders**", NIM A (2019), https://doi.org/10.1016/j.nima.2019.04.090.
- M. Antonello et al., **"First test-beam results obtained with IDEA, a detector concept designed for future lepton colliders",** NIM A (2019), https://doi.org/10.1016/j.nima.2019.04.042
- M. Antonello, et al., "**Test of a dual-readout fiber calorimeter with SiPM light sensors**", NIM A 899 (2018) 52
- M. Antonello, et al., "**Development of a Silicon Photomultiplier based dual readout calorimeter: The pathway beyond the proof-of-concept**", NIM A (2018), https://doi.org/10.1016/j.nima.2018.10.169.
- L. Pezzotti et al 2019 J. Phys.: Conf. Ser. 1162 012014, proceeding of the CALOR 2018 Conference talk
- M. Antonello, et al., "**Dual-readout calorimetry, an integrated high-resolution solution for energy measurements at future electron-positron colliders",** NIM A (2019), https://doi.org/10.1016/j.nima.2019.04.017

3ª missione@GR1

- Masterclasses ATLAS e CMS
- Talk divulgativi: scuole, collegi, eventi, ecc
- Gita al cern
- Notte dei ricercatori e suoi “spinoff”

Richiesta assegni



From Direzione <direzione@pv.infn.it>
Reply | Reply List | Forward | Archive | Junk | Delete | More
Subject **[coordinatori] RIPARTIZIONE FONDI DI DIREZIONE** 21/05/19, 15:56
To resp-esperimento@lists.pv.infn.it, coordinatori@lists.pv.infn.it

Come ogni anno alla Direzione sono stati assegnati i fondi da ripartire tra “assegni di ricerca” e “inviti per ospiti ricercatori stranieri”.

Pertanto, per consentire la corretta programmazione e ripartizione dei fondi, si invita presentare, tramite i rispettivi coordinatori, durante il prossimo CdS del 5-6 giugno, le Vs. richieste per le posizioni sopra richiamate complete di motivazione (se trattasi di assegno di ricerca : titolo in italiano e inglese, breve descrizione del progetto, durata, importo, ecc.. Se trattasi di inviti lettera di presentazione del candidato proposto, breve CV, progetto al quale si riferisce, periodo di permanenza, importo stimato delle spese da riconoscere, ecc....)

Il Direttore si riserverà di valutare le priorità in caso di richieste eccedenti la “quota” assegnata.

Cordiali saluti

Marina
Servizio di Direzione

Richiesta assegni

- Titolo: “Performance del trigger track-based per l’Upgrade dell’esperimento ATLAS”
  - “Track trigger performance for ATLAS upgrade”
- Descrizione
  - In the coming runs, ATLAS will make use of track-based trigger in order to increase purity of signal physics processes over background. A track-based trigger will provide offline quality tracks to the trigger system enhancing the rejection capability of the pile-up and improving the object reconstruction and identification for the trigger selection. Performance studies are crucial to assess system capability of improving analysis acceptance. In particular final states containing b-jet or tau will be studied in detail.