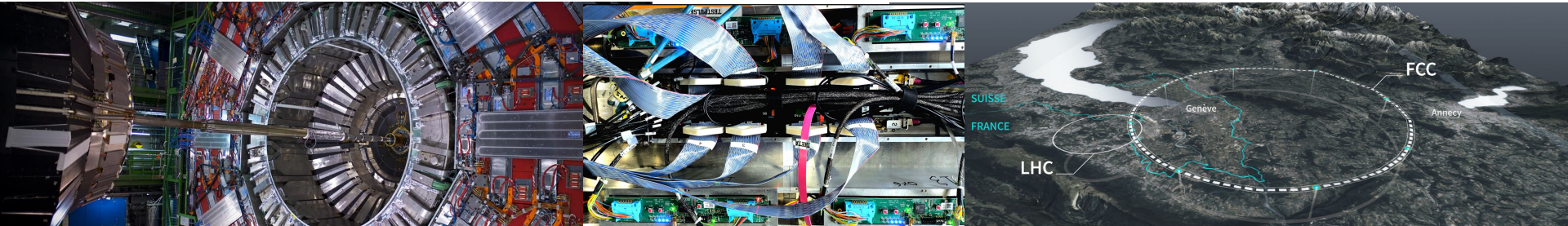
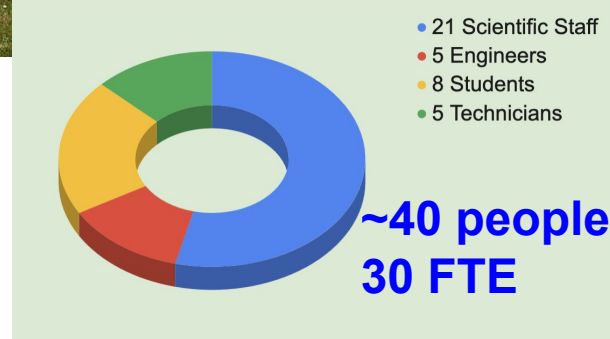
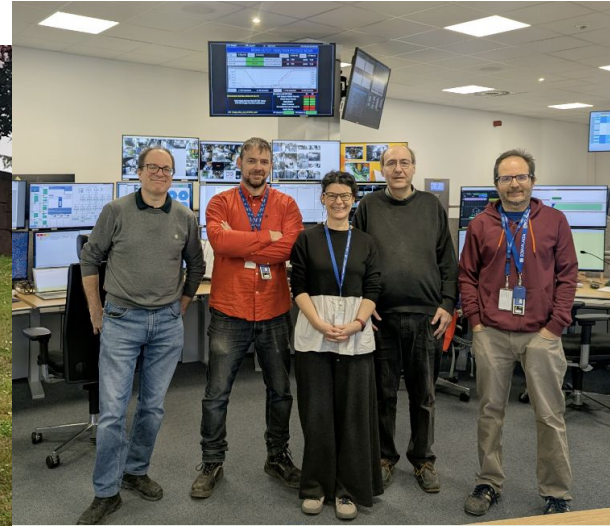


High Energy Colliders: Probing the Constituents of Matter

Silvia Goy López on behalf of the Colliders group



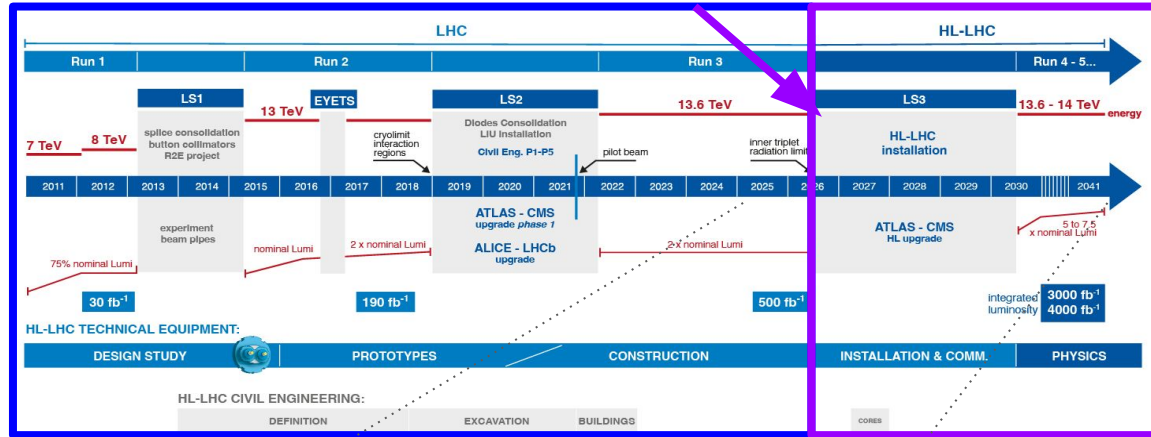
People: CIEMAT, CERN, PIC



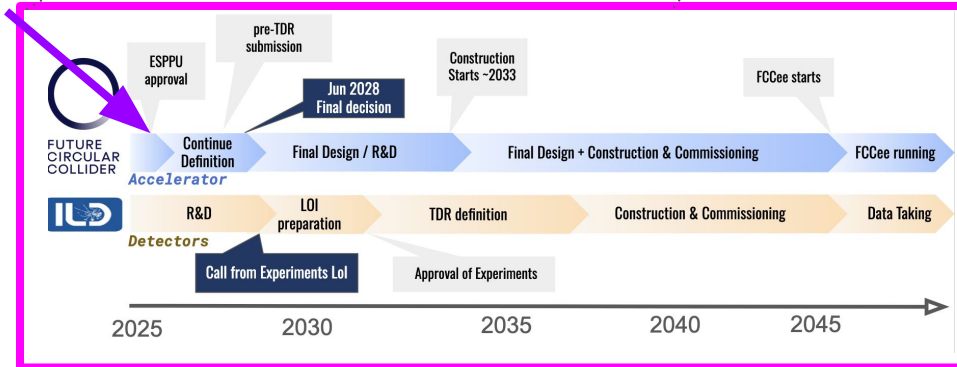


Three main areas

1. Scientific exploitation of the Compact Muon Solenoid (CMS) experiment at LHC
2. High Luminosity-LHC: towards a new CMS
3. Future Colliders



FCc recommendation
to Council



Long term vision

Coordinated effort for current (LHC),
'near' (HL-LHC) and long term
(Future Colliders) physics at colliders



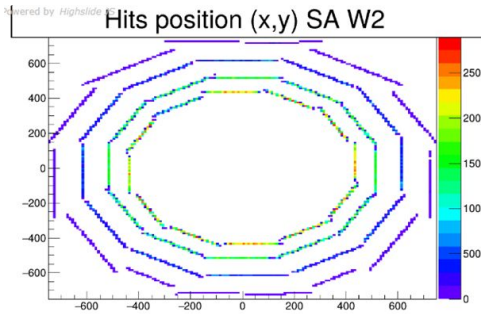
Scientific exploitation of CMS

- Detector maintenance and operation
- Performance studies, calibrations, development of tools and algorithms
- Physics analysis

Maintenance and operation of the CMS detector

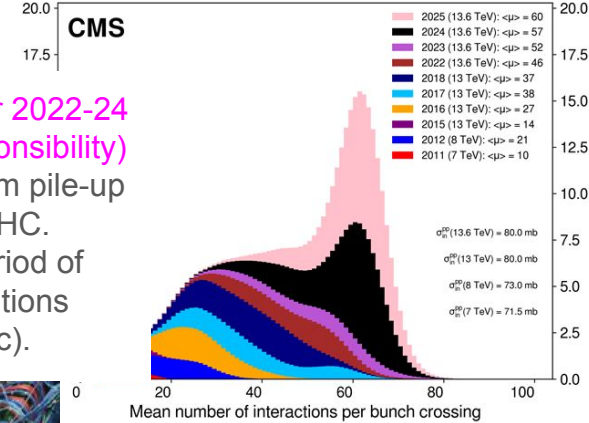
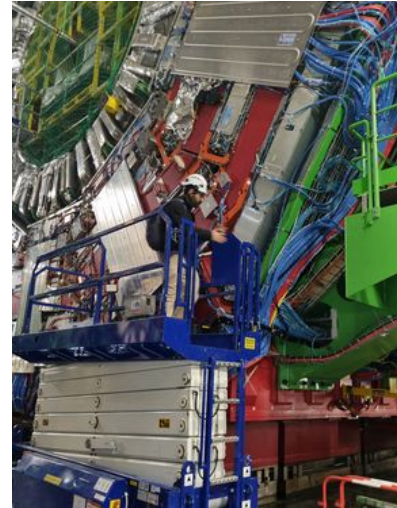
> 15 years since first LHC collisions

- **Continuous support to the CMS operation**
(participating to central shifts, exceeding +20% of Experimental Responsibilities)
- **Particular investment in the Muon Drift Tube (DT) detector** (99% alive channels, negligible downtime)



Continued support to the Muon DT Offline performance monitoring software and to Online SW (uROS, Twinmux and DT TCDS systems)

Trigger Coordinator 2022-24
(CMS Level 1 responsibility)
during the maximum pile-up
achieved at LHC.
Complicated period of
changing conditions
(levelling, etc).



Devoted team of experts
for reparations and 24
hours expert call

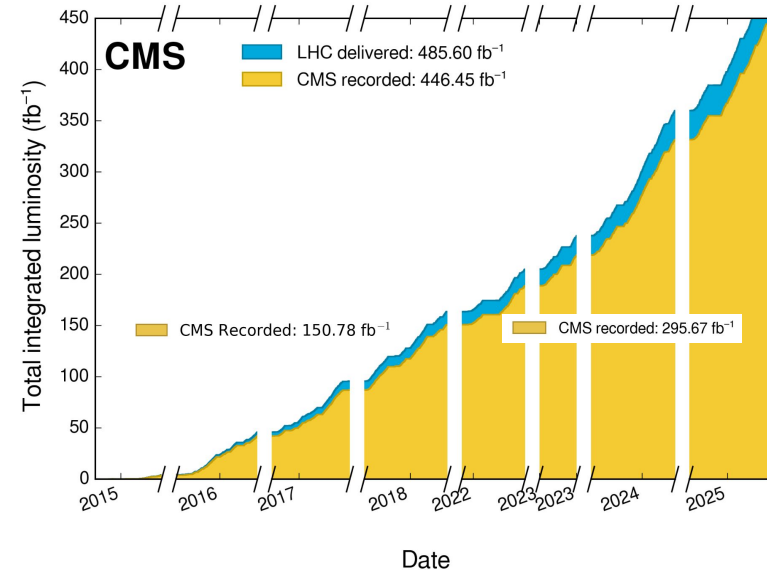
Participated in DT
chamber extraction,
intended for RPC gas
repairs during YETs.

A large dataset

- Successful contribution to CMS papers with Run 1, Run 2 data (with new analysis opportunities)
- Working to maximize the physics output from Run 3
 - Run 3 dataset two times larger than Run 2

Several new results currently in approval process

- **Three main analysis lines:**
 - **Precision measurements of Standard Model processes,**
 - **Higgs boson physics,**
 - **Searches for Beyond the Standard Model Physics.**
- **Performance studies, calibration and development of tools and algorithms**

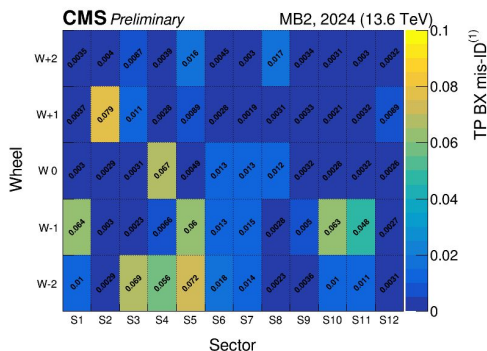


Performance studies

Muon triggering in Drift Tubes

Trigger efficiencies and Bunch Crossing assignment in Run 3

[DPS Note DP2025-008](#)



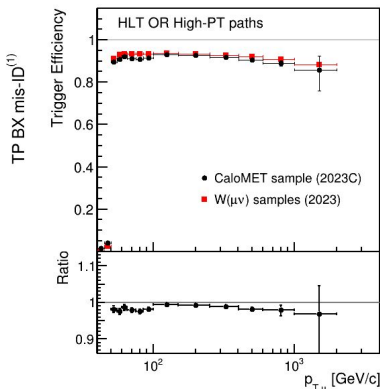
Map of Trigger Primitive Bunch Crossing misidentification fraction per MB2 DT muon chamber for all 5 wheels (η) and 12 sectors (ϕ)

(O.M. Carretero PhD Thesis)

High p_T muon measurements

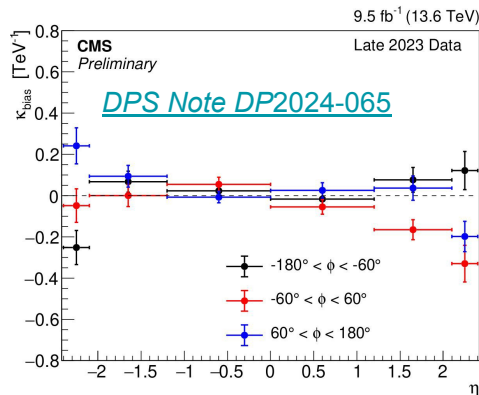
Very energetic muon characterization with Run 3 data

- Trigger efficiency for muons up to $p_T \sim 1.5$ TeV
- High p_T muon momentum scale and resolution



Trigger efficiency for very energetic muons, comparing data and simulation

Coordinator of the Selection subgroup of the CMS Muon



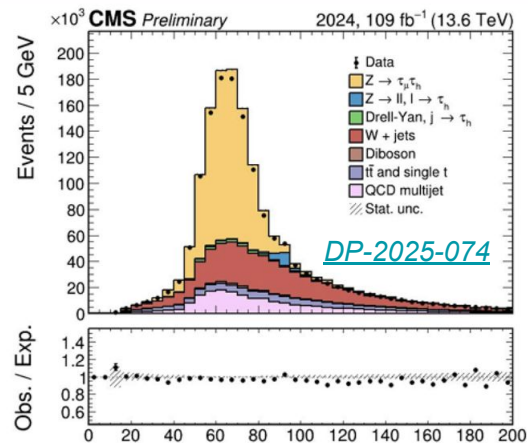
Muon momentum scale bias as a function of η and ϕ of high-pT muons. in $Z \rightarrow \mu^+ \mu^-$ events, for muons with $p_T > 200$ GeV

(D. Fernández PhD Thesis)

Evaluation of Tau identification performance

Prompt analysis of $Z \rightarrow \tau\tau$ benchmark channel

- State-of-the-art ML taggers.



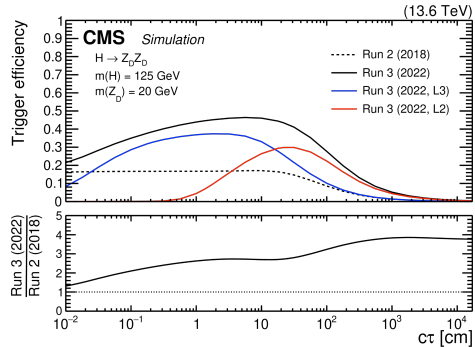
Visible mass in $Z \rightarrow \tau\tau$ using DeepTau identification algorithm

(E. Martín PhD Thesis)

Developments: Trigger, Monte Carlo Modelling, Analysis Tools

Triggering and reconstructing displaced muons

Trigger development for LLP
exploited in Run 3 [CMS--EXO-23-016](#)

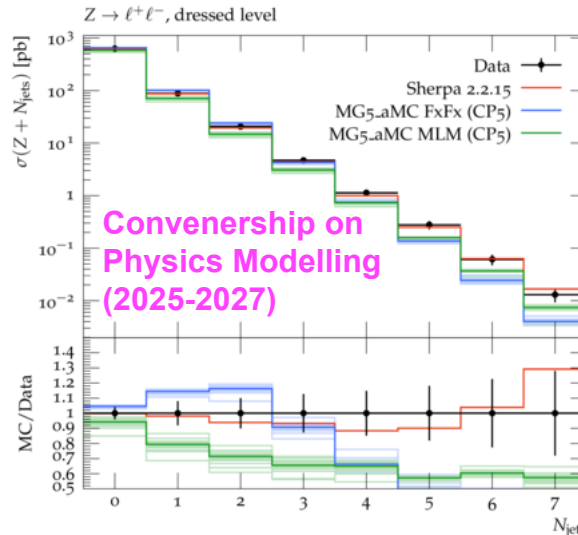


Trigger efficiencies of various displaced-dimuon triggers as a function of ct for LLP signals

(M. Sonawane,
M. Alcalde PhD Theses)

Leading contributions to Monte Carlo Modelling

In-depth study of Monte Carlo
generators for the precision frontier



Convenership on
Physics Modelling
(2025-2027)

Process simulation using Sherpa generator
improvement with respect to state-of-the-art in CMS

Analysis Tools

Improve the efficiency
and standardization of
the analysis tools and
frameworks

- statistical-interpretation tools
- analysis frameworks
- use of the most recent approaches to data processing to face the rapidly increasing amount of data.

Convenership on Data
Processing Tools
(2024-2026)

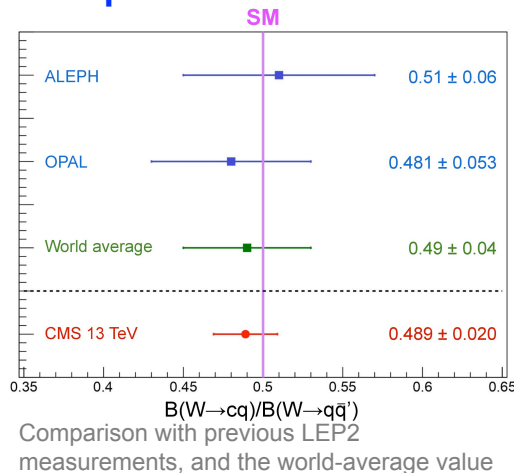
Precision measurements of SM processes

Reference group for Vector boson + b/c jets

W+charm jets associated production

- Sustained effort providing valuable inputs for the determination of the strange quark content of the proton (8 and 13 TeV). [Eur. Phys. J. C 84 \(2024\) 27](#) (S. Sánchez PhD Thesis)

Most precise measurement of $B(W \rightarrow cq)/B(W \rightarrow qq')$



[PLB 868 \(2025\) 139754](#)
(J. Vázquez PhD Thesis)

Vector + jets Standard
Model Physics Group
convenorship
(2023-2024)

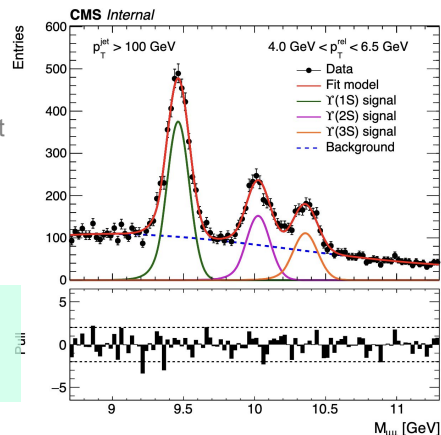
Key contributions for QCD studies in different regimes

- Fragmentation function of $Y(nS)$ mesons testing quarkonia production in jets (currently not well understood)

Fits to the invariant mass distributions of $Y(nS)$ candidates

[SMP-25-005](#)

New for Moriond 2026



- Measurement of ratio of $t\bar{t}$ +jet to $t\bar{t}$ cross sections and comparison to predictions (M. González PhD Thesis).
 - Goal: Improved precision on top mass and strong coupling α_s .

Higgs Boson physics

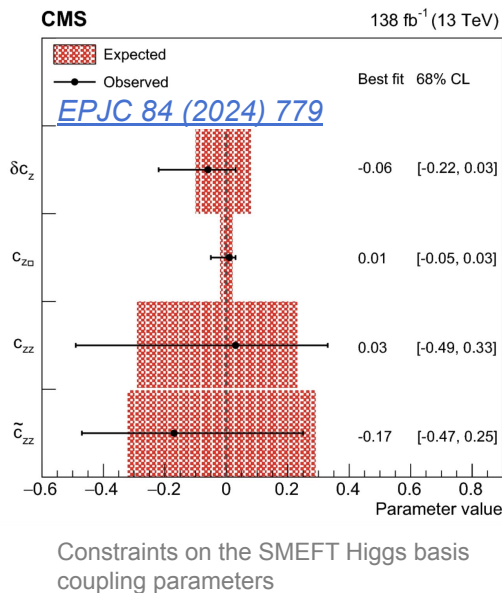
Strong participation in SM Higgs boson studies, BSM Higgs searches and HH production

$H \rightarrow WW$

- Precise measurement of Higgs boson properties: cross-sections, couplings
- Differential Measurements
- Extensive Anomalous Higgs couplings + EFT interpretations (*L. Urda PhD Thesis*)
- Aim to include contributions from $H\gamma\gamma$ and $HZ\gamma$ at VBF and VH production vertices.
(*C. García PhD Thesis*)

Our Run 2 results included in the CMS grand combinations of Higgs
([CMS-HIG-21-018](#))

Convenorship $H \rightarrow WW$ until 2022, continued leadership in the team
CMS Convenor of the LHC Higgs cross-section and branching ratios Working Group



LFV $H \rightarrow \mu\tau$, $H \rightarrow e\tau$, $H \rightarrow e\mu$

[Phys. Rev. D 108 \(2023\) 072004](#)

- Search for the lepton-flavor violating decay of the Higgs boson
- Probe of BSM Yukawa
- New ML approaches for Run 3 search (ID/tagging/sel)
(*E. Sánchez PhD Thesis*)

Higgs Boson physics

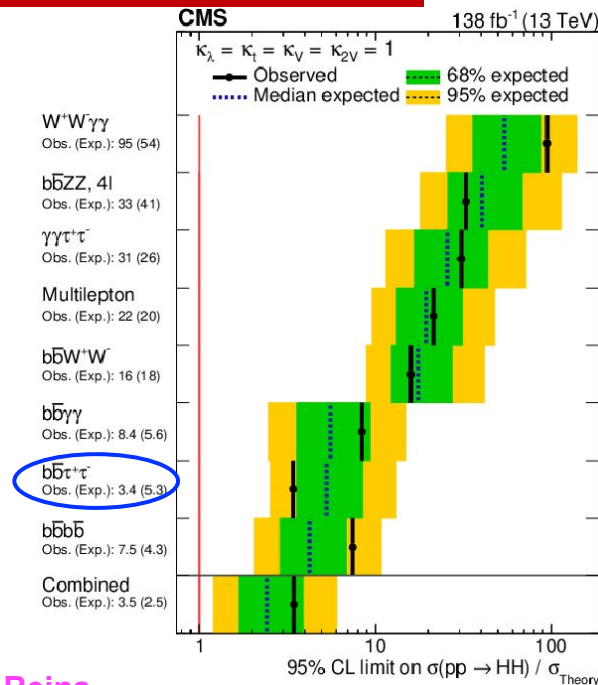
Strong participation in SM Higgs boson studies, BSM Higgs searches and HH production

HH production (E. Martín PhD Thesis)

- Access to the Higgs self-coupling: fundamental measurement at LHC
- Focus on key $HH \rightarrow b\bar{b}\tau\tau$ channel and SM and BSM interpretations
- Optimization through ML
- ZZ/ZH and resonant searches as bonus
([B2G-25-004](#))

[Phys. Lett. B 842 \(2023\) 137531](#)

Our Run 2 results (J. León PhD Thesis) are included in the CMS grand combinations of HH production ([CMS-HIG-20-011](#))

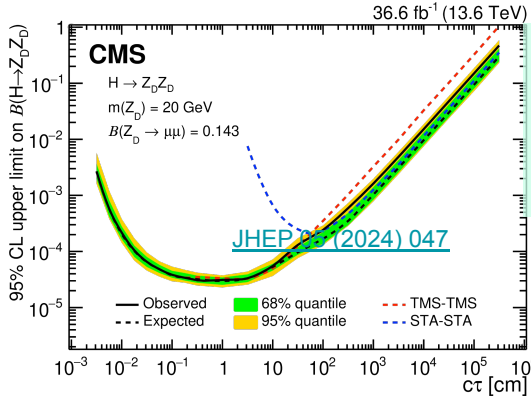


PDG review of Higgs boson physics, [edition 2025](#): M.Cepeda, P. Savard, L. Reina

Searches for new particles/interactions

Reference group for searches for long-lived particles and Higgs portal to dark sectors

Unconventional signatures with displaced $\mu^+\mu^-$ vertex



First Run 3 search at the LHC, enabled thanks to new LLP triggers

CMS Convenor of the LHC Long-lived Particles WG

95% CL upper limits on $B(H \rightarrow Z_D Z_D)$ as a function of $ct (Z_D)$ in the HAHM model

- New search with x7 larger dataset and possibly expand sensitivity to lower masses (< 10 GeV)
- Expand to charged LLPs, where muons do not come from a common vertex (*M. Alcalde Martínez PhD*)

Reference group for searches with high p_T leptons all along Run 2 and Run 3

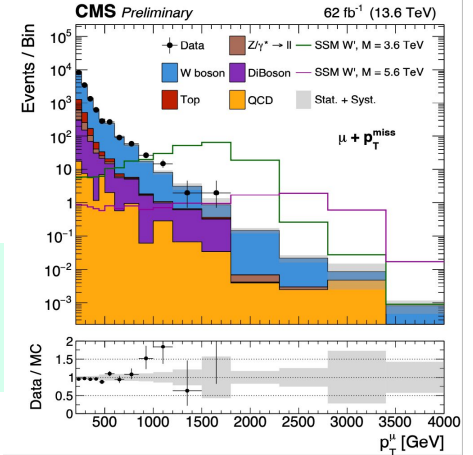
Searches in dilepton final states; charged, neutral

- Complementary info from 2 perspectives: $l+p_T^{\text{miss}}$ (*D. Fernández del Val PhD*) and $l+l-$ (*O.M. Carretero PhD*)
 - Resonant / non-resonant signals
 - Precise test of SM: EWK oblique parameters.
 - Higgs compositeness

[JHEP 07 \(2022\) 067](#)

Muon transverse momentum with 2022+2023 data

New Run 3 result for Moriond 2026
[EXO-24-021](#)



Upgraded Trigger and Data Acquisition system:

- Tracking in L1 at 40 MHz. Output rate 750 kHz.
- Latency 12.5 μ s, longer pipelines.
- High Level Trigger output 7.5 kHz

NEW

Inner Tracker, coverage up to $|\eta| = 3.8$, reduced material

NEW

High-granularity calorimeter endcap

Trigger requirements are driving most of the electronics upgrades

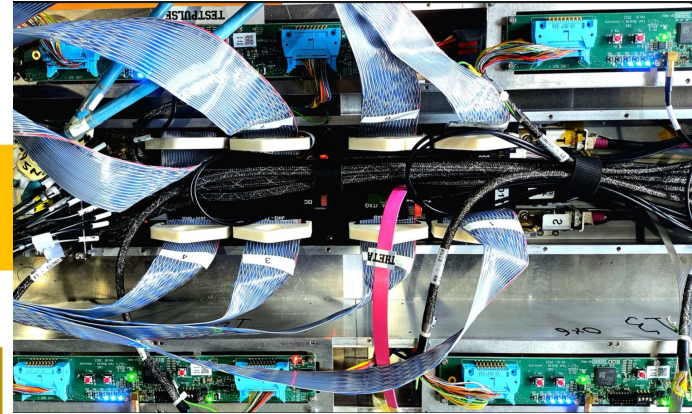
Electronics upgrade: Barrel Calorimeter and muon system

NEW

MIP Timing detector precision timing for pileup mitigation

NEW

Muon detector GEM/RPC $1.6 < \eta < 2.4$



8

High Luminosity LHC

- Muon detector
- Trigger system
- High granularity calorimeter

Challenge: cold operation
→ bi-phase CO₂ cooling at -35°C

CMS Muon Drift Tubes Upgrade

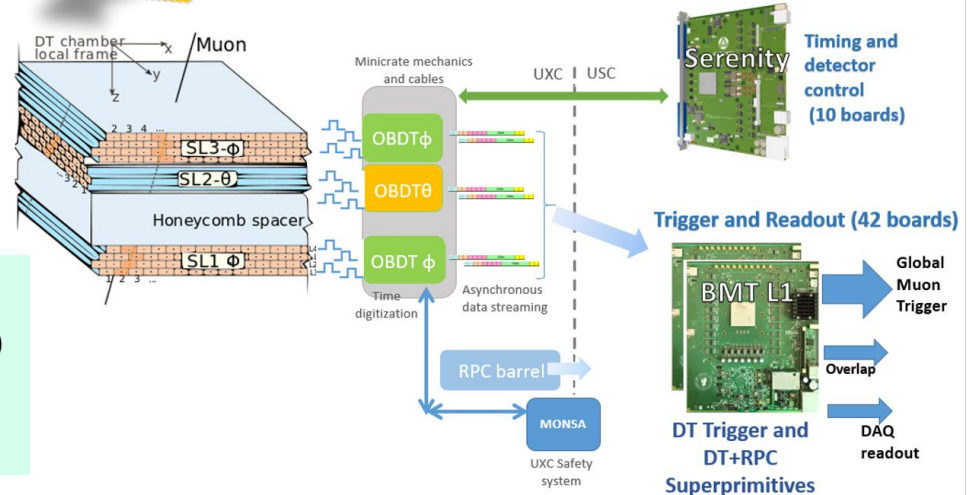
*Drift tube chambers will remain,
Full electronics needs to be replaced*



- Chamber Longevity: several years of radiation campaigns at GIF++ to validate performance at HL-LHC. (*D. Redondo PhD Thesis*)
- Electronics needs to be replaced to stand L1 trigger rate, occupancy, radiation
 - Only digitization on the chamber.
 - TDC with < 1 ns resolution in radiation tolerant FPGA (Microsemi Polarfire).
 - Architectural change to a full streaming of detector information up to ~ 50 Gbps/board to the counting room

CIEMAT's responsibility:

- On detector board theta view (OBDT-theta)
- Mechanics fabrication and assembly
- Trigger and readout backend

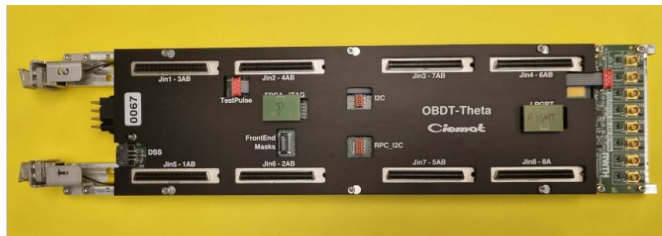


New electronics for Drift Tubes: OBDT-theta board

OBDT-theta board: designed and produced at CIEMAT

OBDT-theta:

- Versatile and flexible readout board (FPGA-based),
- large throughput (50 Gbps),
- radiation tolerant.

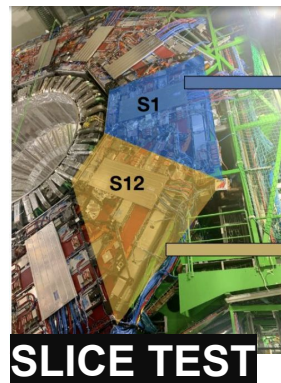


Excellent
performance of
the board

Radiation
tests
performed at
CHARM
(100Gy)



Boards passed burn-in tests (2 weeks@50°C) to discard infant mortality on components

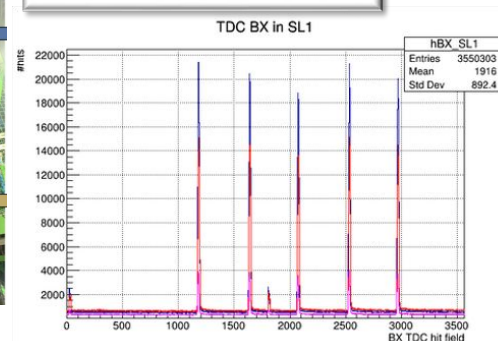


SLICE TEST

Production, quality control
and assembly 2025-2026



OBDT time measurements
of chamber hits coming
from LHC collisions in CMS



Minirates fabrication and assembly

Minirates parts and cabling : large production over 2 years. Final assembly and tested on 5 sites, including CIEMAT

Large collaboration with the Spanish industry



ROMPAL®

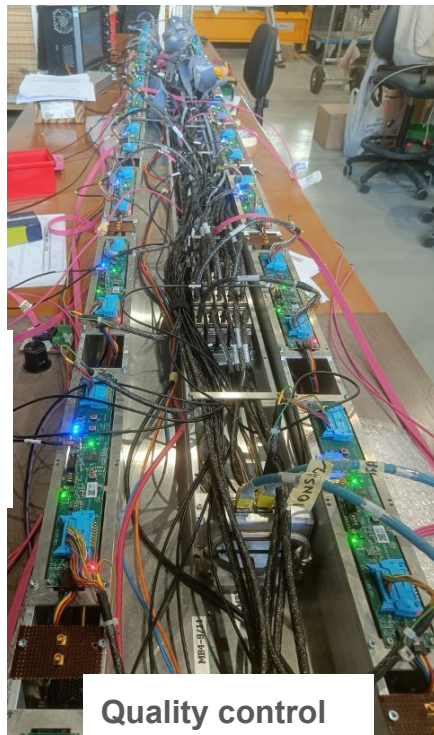
**Mechanics
fabrication 250
Minirates (2 m
long)
+ 800 different
pieces**



**Intensive use
of CIEMAT's
General
Workshops.**



**Mechanics, cabling
fabrication and
assembly.**



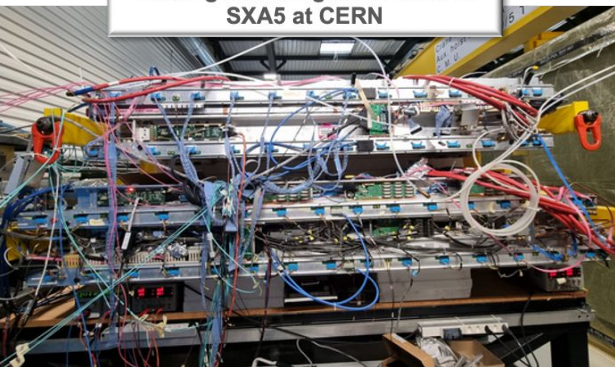
**Quality control
at CIEMAT**

- Production well on track.
- First shipment expected this month.



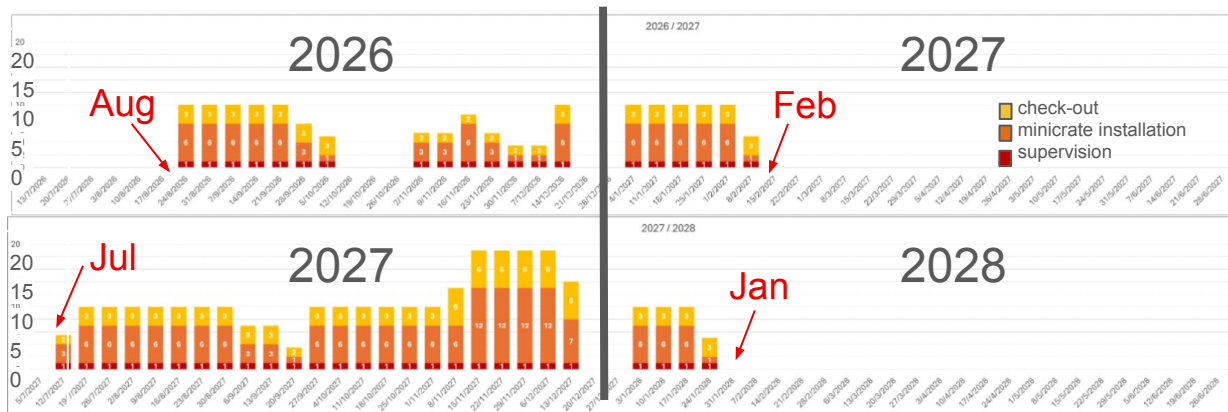
CMS DT upgrade: installation and commissioning

Cabling and integration tests at SXA5 at CERN



Quality control at CERN

CIEMAT personnel to participate on installation and commissioning efforts



Installation exercises at CERN

Slice Test: two CMS sectors working in parallel with upgrade electronics

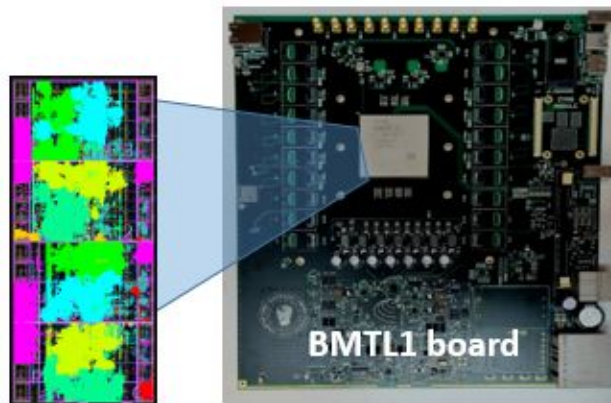
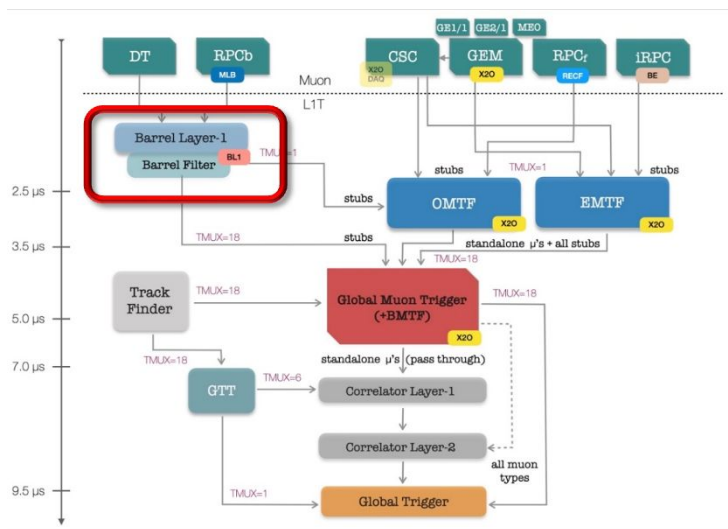


Considerable amount of personnel required for commissioning and installation.

CMS Level 1 Trigger Phase 2 upgrade: HW

CIEMAT responsible for part of the CMS Muon Barrel Trigger primitive HW system

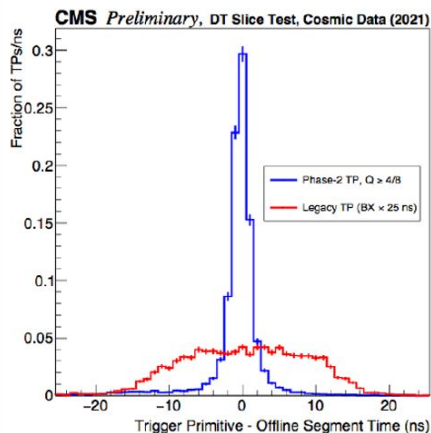
- **Construction of 3/5 of the 42 ATC-based hardware in Spanish companies** (installation & commissioning in 2027-2030)
- Muon Trigger Primitives (**DT plus RPC detectors**) plus readout
- High performance FPGAs AMD VU13P
- O(100) Firefly optical channels: very high data throughput (3.8 Tbps)
- **Prototype successful, production in 2026** (60% CIEMAT, PCB&assembly from Spanish companies)
- **Responsibles of the BMTL1 algorithm firmware**



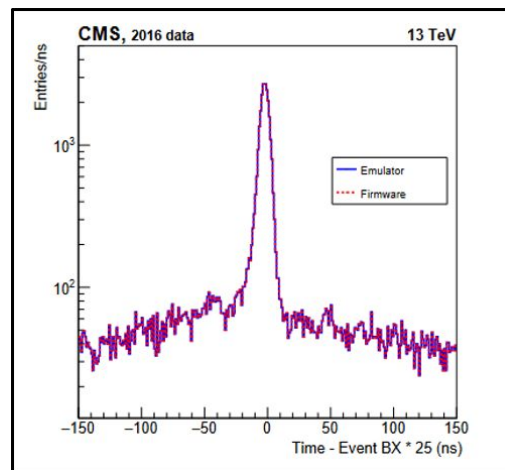
CMS Level 1 Trigger Phase 2 upgrade: DT Trigger algorithm

CIEMAT responsible of the BMTL firmware implementation for Trigger Primitive generation

- Algorithm accepts all generated DT data at maximum resolution and builds segments.
- **Excellent latency and resolution**, comparable to offline reconstruction algorithms
- **Validated with proton-proton collisions at the CMS slice test**
- Precise Firmware-Emulator agreement developed over the years
- Further developments ongoing, with **focus on displaced and exotic signatures**



Difference between TP time and the offline segment time, for Phase-2 and for Legacy trigger



TP time- $BX \cdot 25$ ns for firmware and emulator
Input DT hits from 2016 Z- $\rightarrow\mu\mu$ events

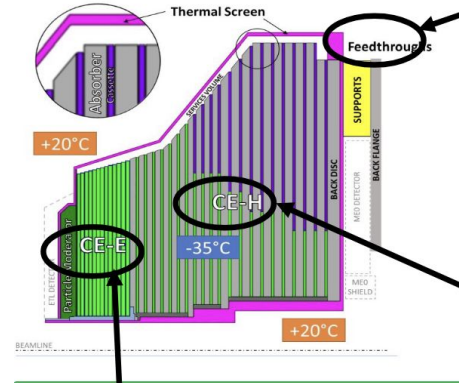
CMS HGICAL (High Granularity Calorimeter) construction

Several contributions taking place that involve Spanish industries

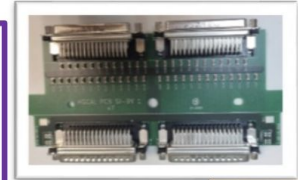
- HGICAL CMS replaces the Endcap Calorimeters with new high granularity calorimetry techniques pioneered by the CALICE R&D collaboration
- Since October 2022 CIEMAT, among others, has answered the call from CMS Upgrade management to help HGICAL (after Ukraine invasion)

CIEMAT's responsibility:

- constructed all the thermal screen electronics feedthroughs
- fabricating part of the CE-H stainless-steel cassette covers
- machining a fraction of the CE-E CuW module baseplates



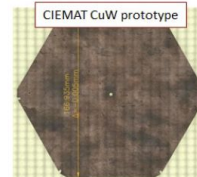
~1200 PCB of different types for helping services to cross the thermal screen. Delivered.



Produce a fraction of steel protection covers of the CE-H HGICAL cassettes. Pre-production on going.



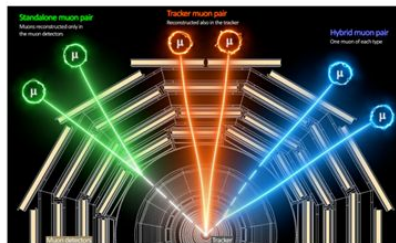
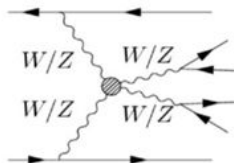
Machine ~1000 CuW thermal interface baseplates for HGICAL Si modules (7%). Production imminent.



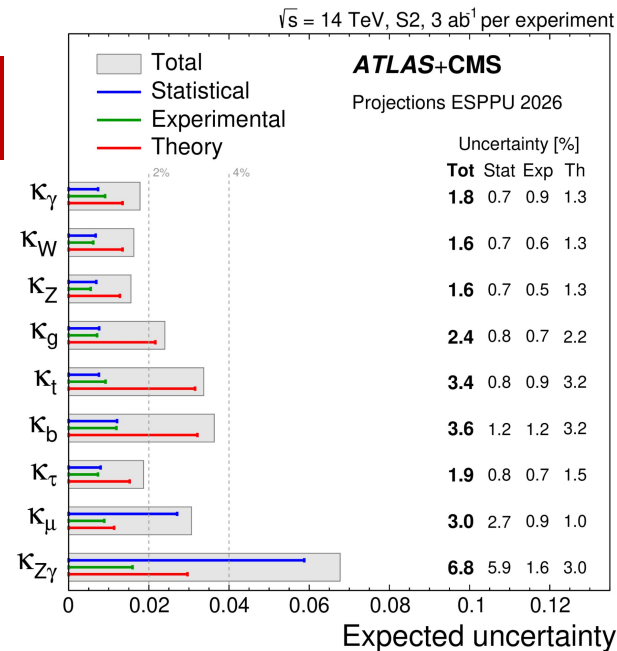
HL-LHC Physics Opportunities

Huge opportunities for new measurements and searches that build on our Run 3 expertise and will expand our understanding of fundamental physics.

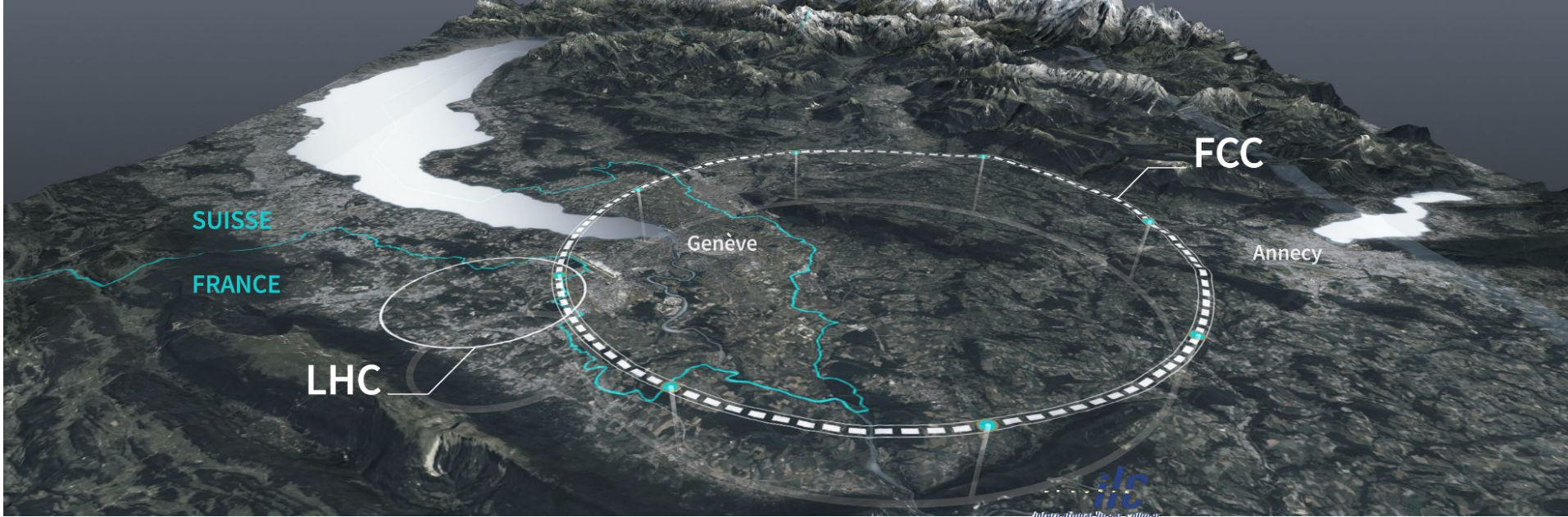
- **Increased luminosity, improved triggers and upgraded detectors** is the way to squeeze out all the discovery sensitivity from an hadron collider for **New Physics**
 - Complex offline algorithms in the online running **L1 trigger**
 - **HGCAL** gives access to **forward jets** from VBF processes with excellent timing
 - **Larger acceptance** of the detectors (tracker + muons)
- New phase spaces, new opportunities for high impact research. Eg:
 - Rare production and decay modes
 - **Long lived**: Large potential improvement for displaced muons topologies using new triggers and ML algorithms



Precision on Higgs Couplings



+ A shot at **di-Higgs**: looking forward to the first measurement of the $\kappa\lambda$ (30% precision): window to the Higgs potential



Future Colliders

- Detector R&D
- Physics Studies



Overview of activities for Future Colliders

Long-standing contributions to future collider developments through detector R&D and physics studies.



R&D on highly segmented calorimetry



- Members of CALICE since 2007
- Now fully integrated in [DRD6-Calo](#)

- ILD (International Large Detector) concept for ILC and FCCee (R&D & physics studies)
- Participation in [DRD7-Electronics](#)



- developments on precise timing capabilities, with focus on rad-tolerant FPGAs
- Trigger-DAQ tools for next gen challenges

- Participation in [DRD1-gas](#)

- Physics studies related to ILD and CLD for FCCee
- Participation in the ECFA Higgs, electroweak, and top factory study [CERN Yellow Rep. Monogr. 5 \(2025\)](#)

Co-convener ECFA WG3: Detector R&D

Co-convener ECFA WG1: Physics (2021/22)



- readout electronic chains
- novel gas detector concepts

Objective to strengthen present R&D and physics activities in the coming years to actively contribute to the physics and detector definition for the next collider

Calorimetry R&D

From SDHCAL - Semi-Digital Hadronic CALorimeter to t-SDHCAL for 5D-calorimetry (space, energy & timing)

SDHCAL - **S**emi-**D**igital **H**adronic **CAL**orimeter. Mechanics: Long R&D to reduce module deformations during assembly.

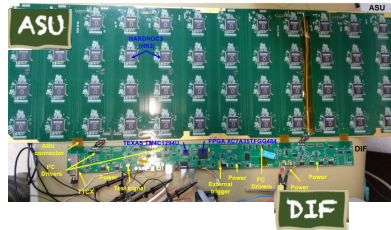
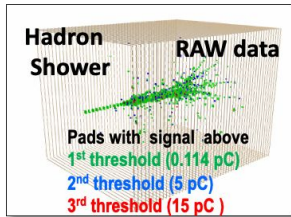
Stainless steel absorber layers.

1.5cm thickness (tolerance 50 mm) up to $\sim 3 \times 1$ m²
(Surface planarity < 1mm)

Glass Resistive Plate Chambers (GRPCs)

Pads 1x1cm²,

Semi-Digital Readout, 2bits - 3 thresholds



Technology proposed for ILD (LC & FCCee)



t-SDHCAL (time-SDHCAL): New generation of **SDHCAL** including precise timing (~ 100 ps) for a **5D-calorimetry (space, energy & timing)**

New detectors: Multi-gap RPCs

New FE Electronics & DAQ with precise timing capabilities

+ accommodation to FCC-ee requirements (e.g. cooling ...)

Physics and optimization studies

Detector Design, reconstruction optimization and general Physics Studies

Focus on ILD Detector

Monte Carlo studies of physics channels for:

- Optimization of the t-SDHCAL detector
- Development of reconstruction algorithms and Particle Identification (PID)
- Optimization of ParticleFlow (Pandora vs ML approaches)
- Physics prospects and analysis strategies

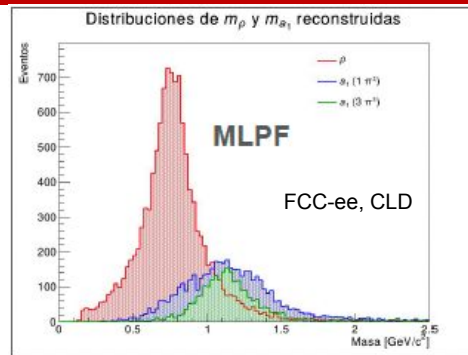
General physics studies

Aimed at Higgs precision (HZ), precision in the Z pole (final states with tau leptons), and searches for long Lived Particle: (LLP, ALPs) .

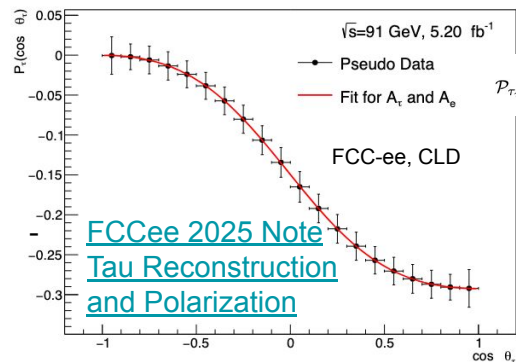
<https://arxiv.org/abs/2601.11383>

(O. Arquero PhD Thesis)

(H→ $\pi\pi$ at FCCee)

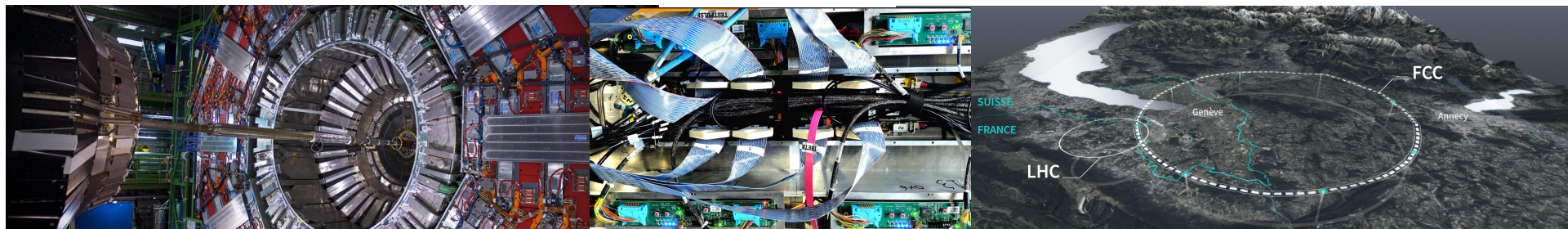


Training of state-of-the-art MLPF algo done at CIEMAT GPU cluster



$$\mathcal{P}_{\tau\tau}(\cos\theta_\tau) = -\frac{\mathcal{A}_\tau(1 + \cos^2\theta_\tau) + 2\mathcal{A}_\rho\cos\theta_\tau}{1 + \cos^2\theta_\tau + 2\mathcal{A}_\rho\mathcal{A}_\tau\cos\theta_\tau}$$

First full simulation study at FCC. Benchmark for performance.



Responsibilities and Funding

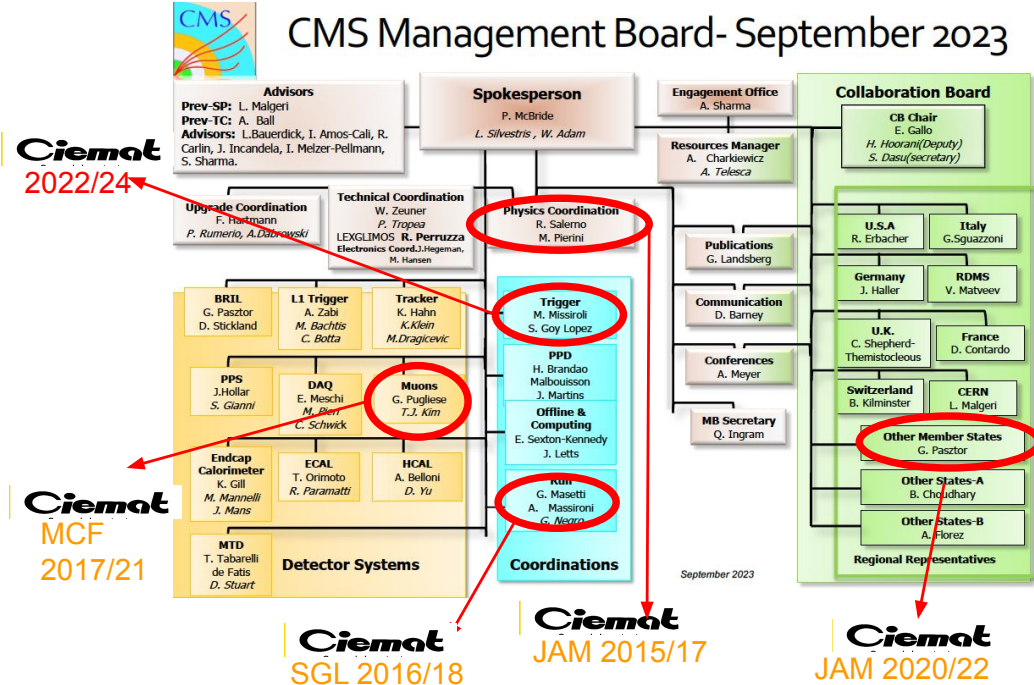
Major responsibilities in CMS, LHC, CERN

Sustained **leadership role** in the CMS experiment, with relevant positions in operation, trigger, detector performance, computing, and leading important physics analyses.

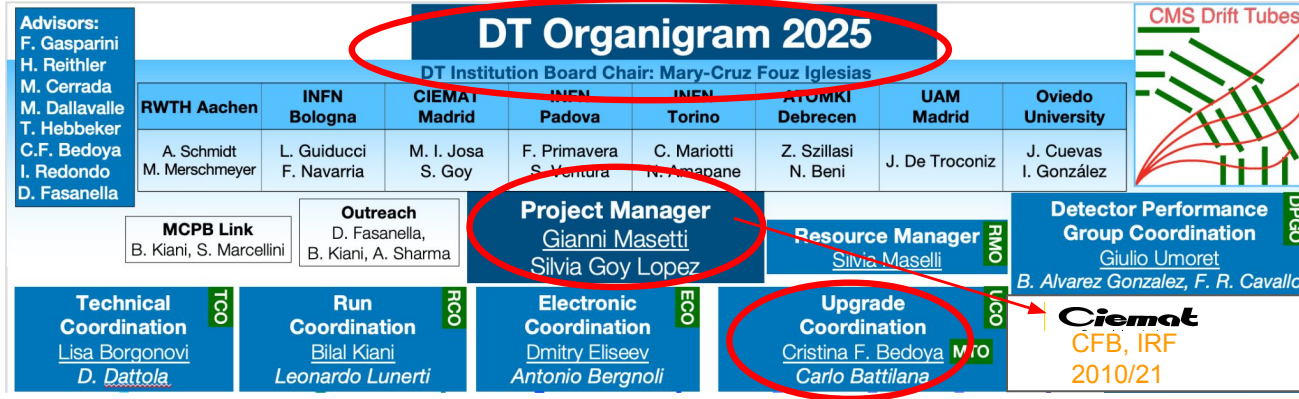
Active participation in panels, boards, committees, task forces

Presence in international Committees and Advisory Bodies

Juan Alcaraz Maestre - CERN Scientific Policy Committee (SPC)



Major responsibilities in CMS: DT and L1T



During the years, CIEMAT has held very important responsibilities:

DT Project Manager for over a decade (2010 to 2021)

Historically, covered all relevant responsibilities in DT

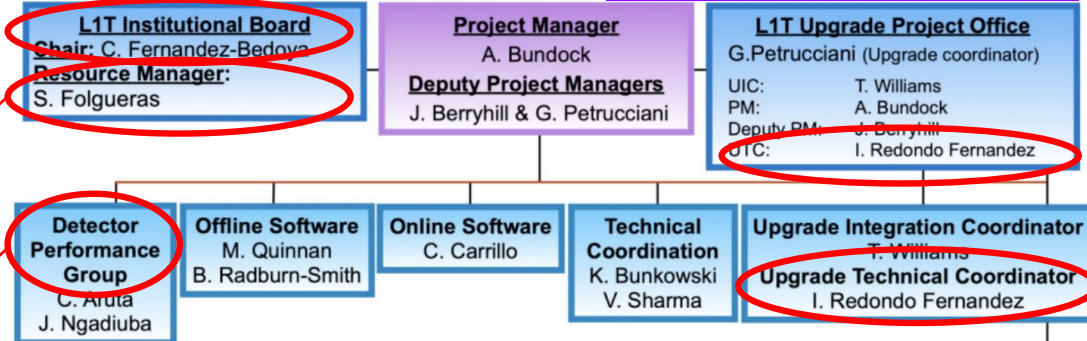
Participation in the L1 Trigger Project since 2017

Major responsibilities in Institutional Board, Upgrade Technical Coordination and Performance Group

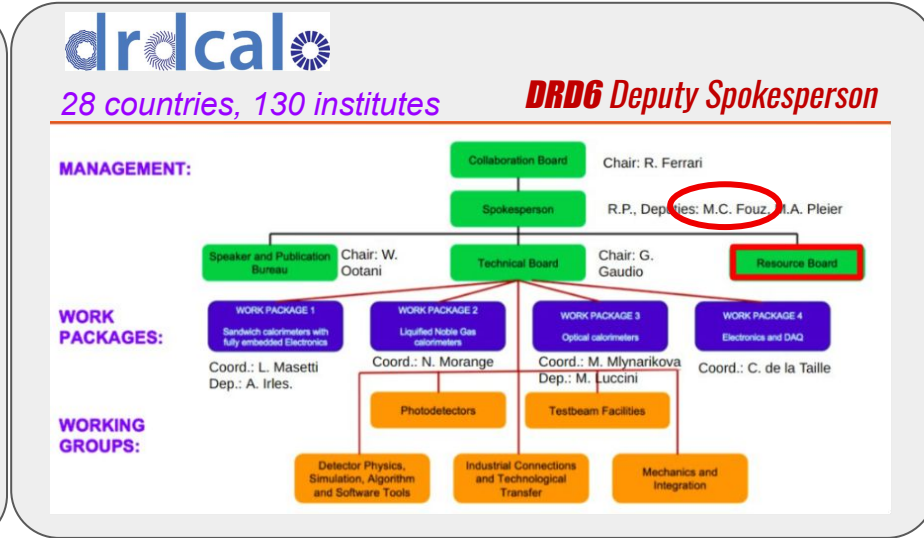
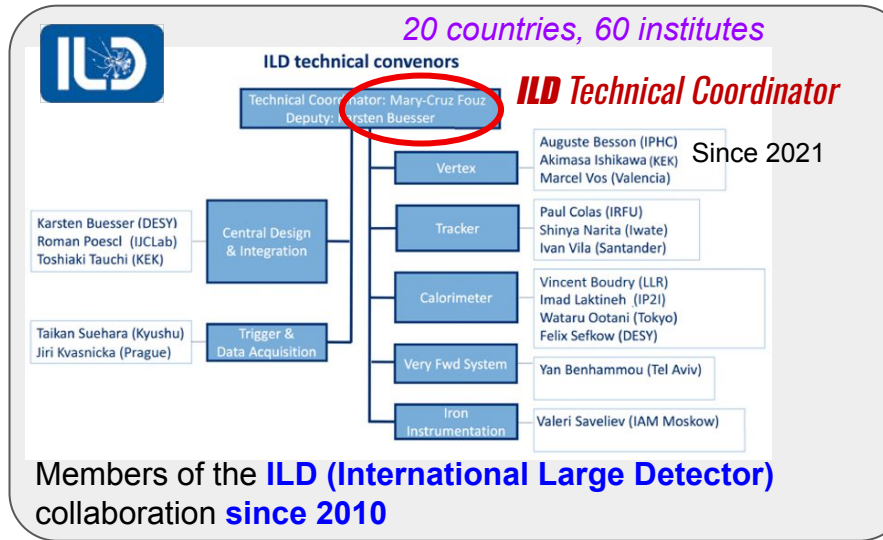
Ciemat
CFB
2020/25

MC 2023

L1T Organigram 2025



Major responsibilities related to R&D and Future Colliders collaborations



- C. Fdez Bedoya, **DRD7 Deputy Collaboration Board Chair**
- M.C Fouz, Co-coordinator of the **Spanish Network for Future Colliders**
- M. Cepeda, Co-convenor of the **Tau + Selected Electroweak group under the Flavour physics at FCC**



CIEMAT contributions to CMS Offline & Computing

- **L2 coordination in CMS Computing**

- Resource Management (J. Flix)
- Computing Resources Board (J.M Hernández)
- Submission Infrastructure (A. Pérez-Calero)

- **Integration/deployment of new resources for CMS**

- MN5 for offline data simulation and processing campaigns
- CIEMAT Analysis Facility for enhanced support to last-stage physics analyses

- **Contributions to R&D**

- Cache deployments (C. Pérez PhD Thesis)
- Analysis Facility deployment and performance (C. Morcillo PhD Thesis)

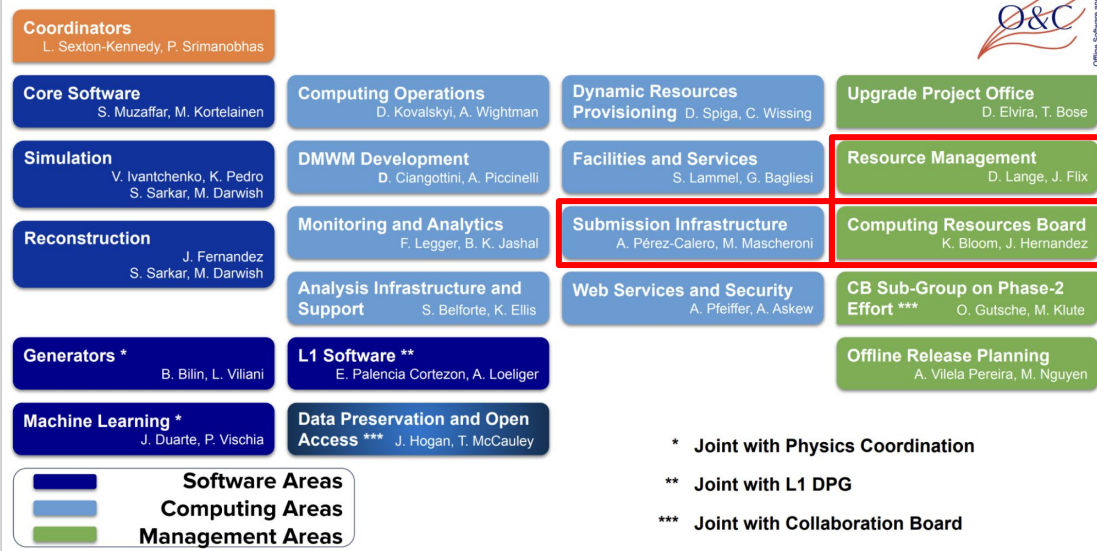
- **CMS Computing Model Upgrade for HL-LHC** Editorial team for CMS Computing Conceptual Design Report

- Evolution of Workload Management System (A. Pérez-Calero)

ESPP: Computing as key enabler to HEP research programmes

Update 2026: The computing challenges of the next decade are not solved

CMS Offline Software and Computing



Three CIEMAT members in the CMS O&C management board for 10+ years, unique leadership contribution amongst Spanish participation to the experiment

High Energy Colliders Funding (2014-2025)

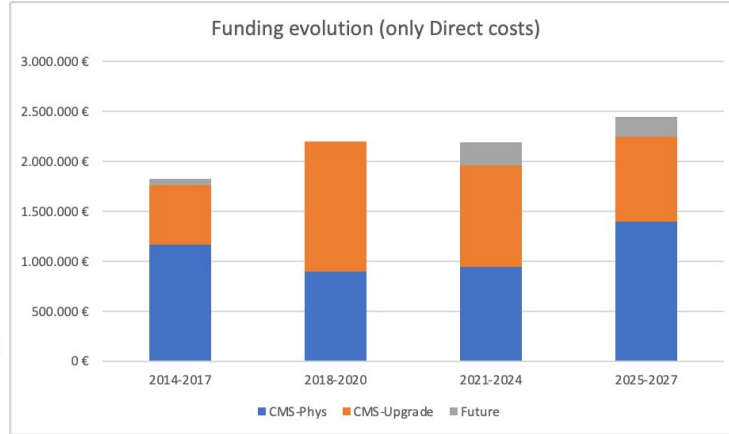


**Plan de Recuperación,
Transformación
y Resiliencia**
Financiado por la Unión Europea
NextGenerationEU

Comunidad de Madrid
Dirección General de Investigación
e Innovación Tecnológica
CONSEJERÍA DE CIENCIA,
UNIVERSIDADES E INNOVACIÓN



Yearly fund approximately 800.000 €/year from Spanish National Projects (AEI)



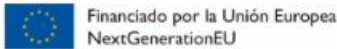
Direct costs only (+ ~21% additional funds granted)
A significant fraction to cover MOU and Common Fund contributions

	CMS-Phys	CMS-Upgrade	Future	All
2014-2017	1.164.300	595.000	65.000	1.824.300
2018-2020	900.000	1.300.000		2.200.000
2021-2024	944.600	1.019.100	227.000	2.190.700
2025-2027	1.396.900	849.700	196.300	2.442.900

High Energy Colliders Additional Funding (2020-2025)



- 2021-2025 - UE H2020-INFRAINNOV-2020-2 (Grant Agreement 101004761) (25 k€)
- 2021-2023 - Proof of concept (Spanish Research Plan) PDC2021-121715-C21/C22 (88 k€ /2 years)
- 2023-2025 - TAU-CM (EU - Next Generation Funds + CM) (125 k€/2 years)
- 2023-2025 - EU - Next generation Funds 1 M€ / 2 years



Personnel:

- 2019-2023 - Ramón y Cajal Fellowship RYC (1 postdoc)
- 2025-2029 - Ramón y Cajal Fellowship RYC (1 postdoc)
- 2023-2028 - Atracción de Talento - Comunidad de Madrid (1 postdoc+1 PhD student)
- 2023-2028 - Atracción de Talento - Comunidad de Madrid (1 postdoc+1 PhD student)
- 2024-2029 - Atracción de Talento - Comunidad de Madrid (1 postdoc+1 PhD student)
- 2021-2023 - Ayudante de Investigación PEJ-CAM (1 ayudante 2 y)
- 2026-2027 - Ayudante de Investigación INVESTIGO (1 ayudante 1 y)
- 2024-2026 - Consolidación Investigadora AEI (1 postdoc 2 y)
- 2025-2027 - Consolidación Investigadora AEI (1 postdoc 2 y)

Summary

- Long standing and solid participation in high energy colliders since many decades, reference center in Spain and internationally.
- **Fruitful physics program. Covers the most interesting phase space of physics at colliders.**
- LHC participation spans from physics analysis, operation to strong contribution to the upgrades.
- HL-LHC is really here!
- Involvement in future colliders is consolidated and evolving over several fronts in parallel.

Completing the LHC and securing the HL-LHC is THE priority in particle physics at the European level.

Program fully aligned with the European strategy and that of CERN

Backup

High Energy Colliders Funding (2020-2025)



R Plan de Recuperación,
Transformación
y Resiliencia

Financiado por la Unión Europea
NextGenerationEU

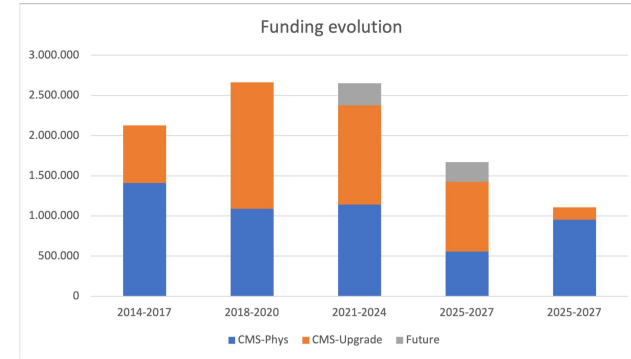


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Yearly fund approximately 800.000 €/year from Spanish National Projects (AEI)

	CMS-Phys	CMS-Upgra de	Future	All
2014-2017	1 408 803	719 950	65 000	2 128 753
2018-2020	1 089 000	1 573 000		2 662 000
2021-2024	1 142 966	1 233 111	274 670	2 650 747
2025-2027	554 875	868 375	245 375	1 668 625
2025-2027	953 000	155 000		1 108 000



PhD Theses since 2023

David Daniel Redondo Ferrero	UCM	Study and Mitigation of the Radiation Aging of the Drift Tube Chambers of the Compact Muon Solenoid at the Large Hadron Collider	Cristina Fdez. Bedoya & Ignacio Redondo Fdez.	05/2025
Julia Vázquez Escobar	UAM	Measurement of the $W \rightarrow cq/W \rightarrow qq'$ decay branching fraction ratio with the CMS detector at the LHC and Uncertainty estimation of machine learning models in particle physics	José María Hernández Calama & Miguel Cárdenas Montes	12/2024
Mangesh Sonawane	TU Viena	Exploring Long-Lived Particles decaying into Displaced Dimuons with the CMS experiment	Alberto Escalante & Robert Schöffbeck	10/2024
Lourdes Urda Gómez	UCM	Anomalous couplings of the Higgs boson in the WW decay channel with the CMS experiment at the LHC	María Cepeda & Dermot Moran	10/2023
Jaime León Holgado	UCM	Search for Higgs boson pair production at the CMS experiment of the LHC and studies of a new trigger algorithm for the muon chambers in HL-LHC	Silvia Goy López	09/2023
Sergio Sánchez Navas	UCM	Measurement of the associated production of a W boson and a charm quark in proton-proton collisions at $\sqrt{s} = 13$ TeV with the CMS detector at the LHC	Juan Pablo Fdez Ramos & José María Hernández Calama	07/2023
Héctor García Cabrera	UAM	High granularity calorimetry for future high precision physics in the context of the e^+e^- International Linear Collider and prospect of the ZH hadronic channel	MaryCruz Fouz	03/2023

Ongoing PhD topics

Olmo Arquero	UCO	Highly segmented Calorimetry for a future Higgs Factory	Mary-Cruz Fouz/Jorge Berenguer (UCO)
Eva Sánchez	UAM	Lepton-flavor violating decay of the Higgs boson Run 3	Cristina Martín
Carlos García	UCM	Higgs couplings to EW vector bosons in the $H \rightarrow WW$ channel	Dermot Moran
Manuel González	UCM	Ratio of $t\bar{t}$ +jet to $t\bar{t}$ cross sections, top mass, α_S	Javier Llorente
Martín Alcalde	UAM	Search for charged LLPs decaying to displaced dimuons with Run 3 data	Alberto Escalante
Elvira Martín	UAM	$HH \rightarrow b\bar{b} \tau\tau$ Run 3	María Cepeda/Silvia Goy López
Oliver Manzanilla	UCM	Searches in dilepton final states $l+l-$ Run 3	Juan Alcaraz
Diego Fernández	UAM	Searches in dilepton final states $l+p_T^{\text{miss}}$ Run 3	Begoña de la Cruz/Óscar González
Cecilia Morcillo	UCM	Computing and analysis in B Physics with Run 3 data	Antonio Delgado/ Antonio Pérez-Calero

Leadership in international initiatives (2023-2025)

- JAM - CERN Scientific Policy Committee (SPC), 2025 -
- SGL - Coordinator of the **Trigger Study Group in charge of the general High Level trigger system (CMS Level 1)**, Sept. 2022 - Sept. 2024.
- CFB - CMS L1 Trigger Resource manager (**CMS Level 2**). Up to 01/06/2025.
- MC - Coordinator of the CMS L1 Trigger Detector Performance Group for Phase-2 developments (**CMS Level 2**), 2023.
- JPF - Coordinator of the **Standard Model Vector boson + jets physics group (CMS Level 3)**, Sept. 2023 – Aug. 2024.
- CFB - **CMS DT Upgrade Coordinator (CMS Level 3)**. Sept. 2020 -.
- AEV - (**CMS**) **Convenor of the LHC Long-lived Particles Working Group (LHC LLP WG)**. Sept. 2022 -.
- DFV - Coordinator of the **Selection subgroup of the CMS Muon Physics object group (CMS Level 3)**, Sept. 2023 – Aug. 2025.
- OGL - Coordinator of the **Data Processing Tools subgroup of the CMS Common Analysis Tools group (CMS Level 3)**, Sept. 2024 – Aug. 2026.
- MCF - **CMS Muon DT Institutional Board chair**, Sept. 2024 – Aug. 2026.
- CMP - Coordinator of the **CMS L1 Muon Trigger Detector Performance Group for Phase-2 developments (CMS Level 3)**, Sept. 2024 – Aug. 2026.
- IRF - **CMS L1 Trigger Upgrade Technical Coordinator (CMS Level 2)**, Sept. 2024 – Aug. 2026.
- IRF - **CMS Coordinator of the Detector Safety System Upgrade group for “Warm” detectors (CMS Level 3)**, 2023 –
- CFB - **CMS L1 Trigger Institutional Board chair**, Sept. 2025 -
- CFB - **Spanish National Contact Physicist for CMS**. Jan. 2025 –
- MCF - Member of the **P2UG (Phase-II Upgrade Group) panel for ATLAS**, Dec. 2023 -.
- BdC - Member of the **CMS Theses Awards Committee**, Sept 2024 -.
- AEV - Member of the **Task Force Optimization on Time to Publication in CMS**, 2023-2024.
- SGL - Member of the **Collaboration Board Advisory Committee**, Sept. 2025 - Aug. 2027.
- SGL - Member of the **CMS Task Force on Deadtime**, Sept. 2024.
- SGL - **Deputy DT Project Manager**, Sept. 2025 - Aug. 2027.
- JLIM - Coordinator of the **Physics Modelling and Validation group in CMS (CMS Level 3)**, Sept. 2025 - Aug. 2027.
- MCF - **ILD Technical coordinator**, March 2021 - .
- MCF - **Convenor WG3 - ECFA initiative towards an e+e- Higgs/top/EWK factory**, May 2022 - .
- MCF - **Spanish national contact for the ECFA Detector R&D Roadmap Panel**, Dec. 2020 - .
- MCF - **Deputy Spokesperson DRD6 collaboration**, Sept. 2024 -
- MCF - **Member of the DRD1 Collaboration Board Chair Advisory Group**, June 2024 -
- CFB - **DRD7 Deputy Collaboration Board Chair**, 2024-...