

CMS status report

XXXVII RADPyC , Cinvestav MX

June 12th, 2023

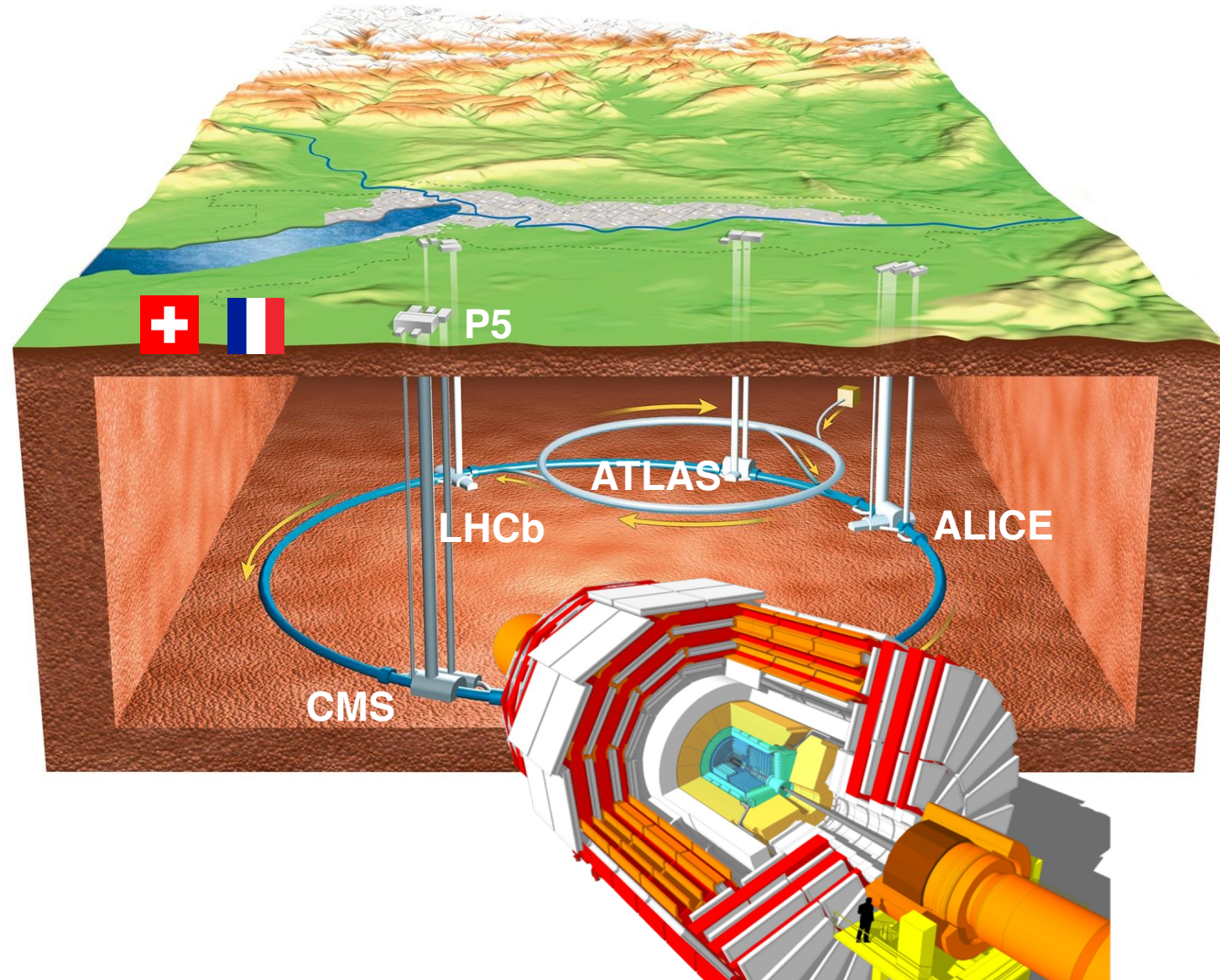
Rogelio Reyes-Almanza,
on behalf of CMS Collaboration

Outline

- CMS Detector Overview
- Upgrades Phase-2 and HL-Luminosity
- Run 3 is underway!
- Physics
- CMS Mexico Collaboration

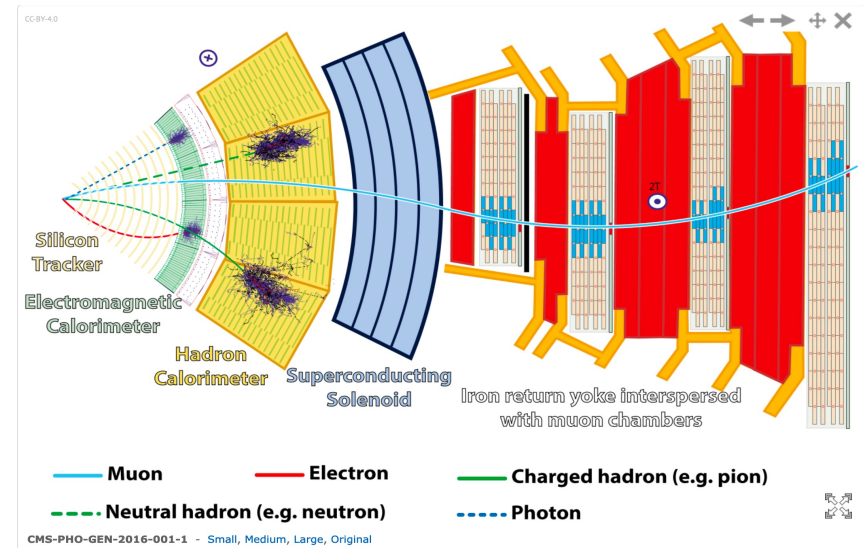
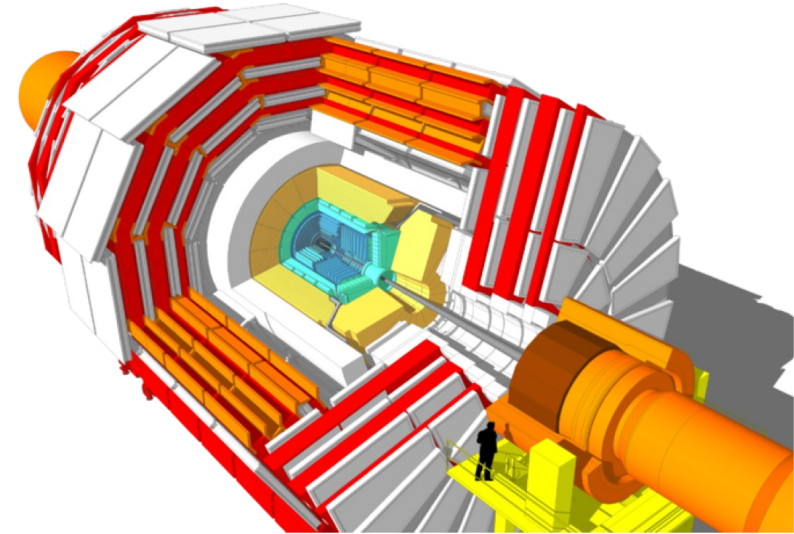
CMS Detector Overview

- **Compact Muon Solenoid** detector
 - one of the 4 biggest detectors at CERN.
 - general-purpose detector;
 - designed to observe any new physics phenomena that the LHC might reveal.
- 15 m high & 21 m long, quite **compact** for all the detector material it contains,
- Designed to detect **muons** very accurately,
- It has the most powerful **solenoid** magnet ever made.
- 4T ~ 100 000 times MF of the earth
- 30 years-old last December 6th , 2022



CMS Detector Overview

- **Bending Particles:** Positively and negatively charged particles bend in opposite directions in a magnetic field. It allows us to measure the momentum of the particle.
 - **Solenoid,**
 - **Return yoke** interleaved with the muon chambers.
- **Identifying tracks:** identify the paths taken by these bent charged particles with a very high precision.
 - **Tracker, inner part; Pixel (Bpix) and SiStrip,**
 - 75 million individual electronic sensors arranged in concentric layers.
 - Particle interacts electromagnetically with the silicon and produces a hit
- **Measuring energy:** crucial to understanding what occurred at the collision point.
 - **Electronic calorimeter ECAL,**
 - **Hadron calorimeter HCAL.**
- **Detecting Muons:** The outer part of the detector; a muon is observed directly by gas chambers:
 - **Drift Tubes, DT,**
 - **Cathode Strip Chambers, CSC,**
 - **Resistive Plate Chambers, RPC,**
 - **Gas Electron Multiplier, GEM.**



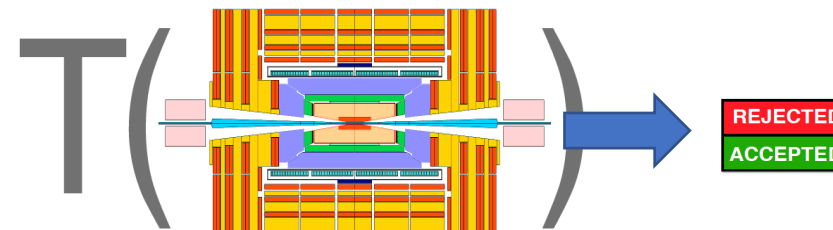
CMS Detector Overview

- **Trigger**

- Look at (almost) all LHC bunch crossings; 25 ns, with rate up to 40 MHz ($4 \cdot 10^7$ Hz).
- Select most interesting ones.
- Collect all detector information and store/sort it for off-line analysis.

- **Two levels to reduce the data volume ~ 1MB per event**

- **L1**; extremely fast, recognize parameters as charge, time, patterns, etc.
- **HLT**; algorithms to filter L1 objects, and build complete events.



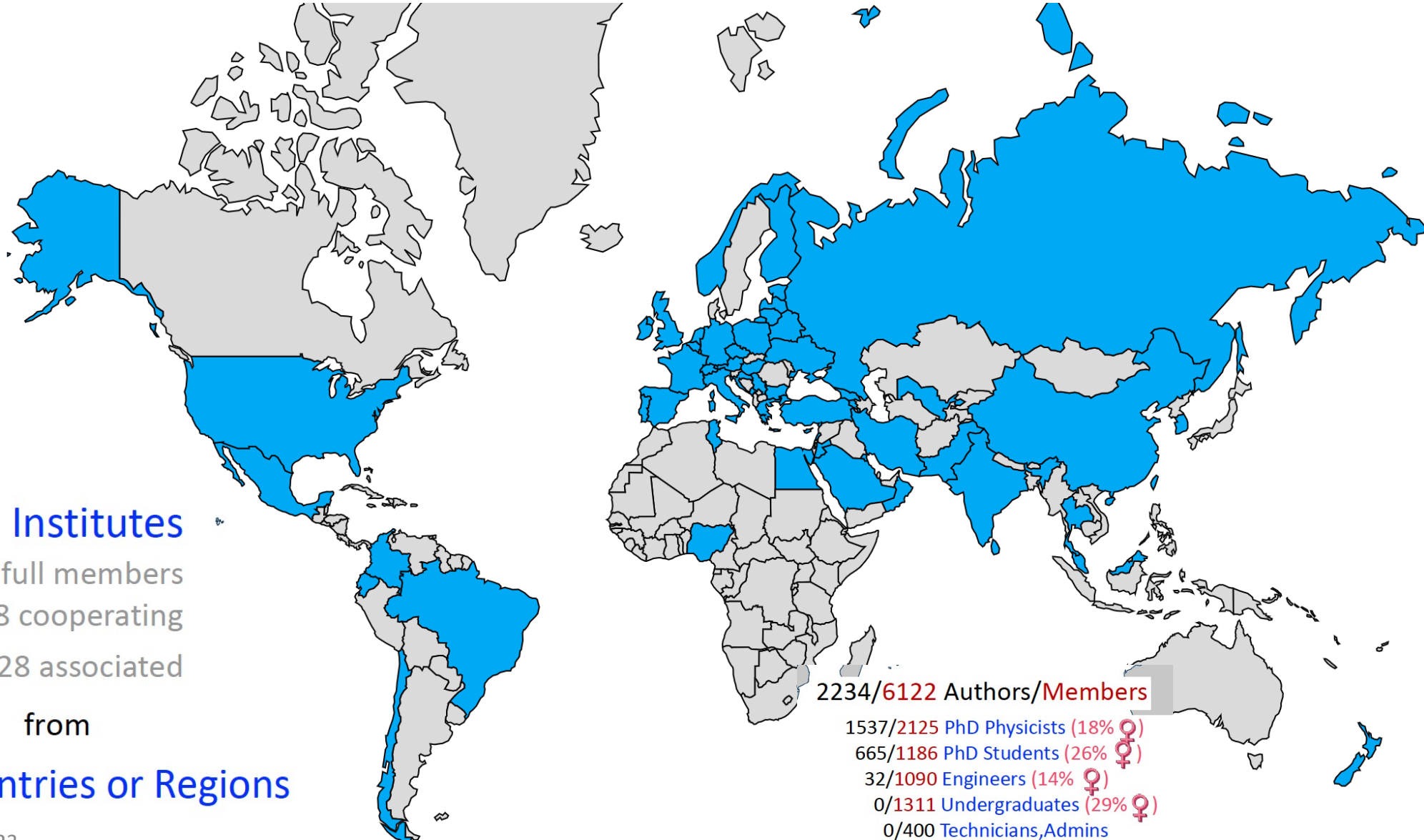
- **Trigger menus**; sum of all detectors information and algorithms to take a decision and build an event of interest.

- Adjust thresholds to be sensitive to new physics.

- **Different strategies to store data:**

- **Prompt reconstruction**: data are reconstructed and available within 48 hours of being collected.
- **Scouting**: reconstructed raw data, online, loose selection.
- **Parking**: Parking of the full RAW data.

CMS Collaboration



251 Institutes

215 full members

8 cooperating

28 associated

from

57 Countries or Regions

2234/6122 Authors/Members

1537/2125 PhD Physicists (18% ♀)

665/1186 PhD Students (26% ♀)

32/1090 Engineers (14% ♀)

0/1311 Undergraduates (29% ♀)

0/400 Technicians, Admins

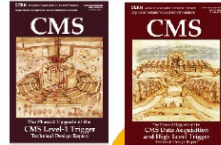
Upgrades Phase-2 and HL

Progress on the Upgrades

L1 Trigger/HLT/DAQ

<https://cds.cern.ch/record/2283192>
<https://cds.cern.ch/record/2283193>

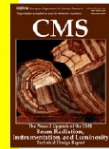
- L1 40 MHz in/750 kHz out
- Tracking for PF-like selection
- HLT 7.5 kHz out



Beam Radiation and Luminosity

<https://cds.cern.ch/record/2020886>

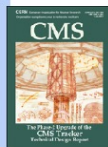
- Bunch-wise Luminosity
- Beam Monitoring



Tracker

<https://cds.cern.ch/record/2272264>

- Si Strip **O**uter Tracker designed for L1 Track Trigger
- Pixelated Inner Tracker extends coverage to $|\eta| < 3.8$

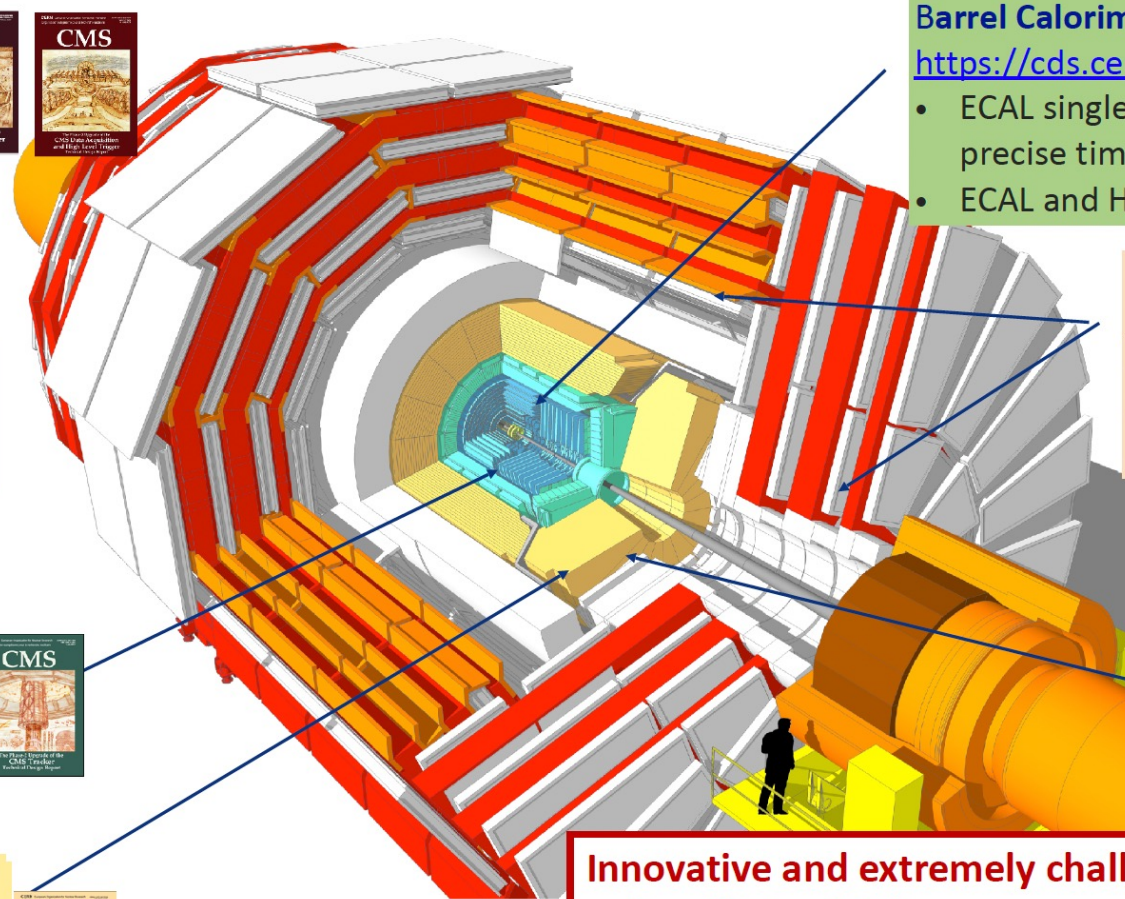
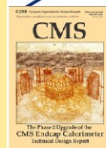


Calorimeter Endcap

Also known as HGCal

<https://cds.cern.ch/record/2293646>

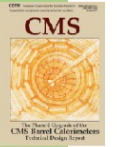
- Si, Scint + SiPM in Pb-W-SS
- 3D shower imaging with precise timing



Barrel Calorimeters

<https://cds.cern.ch/record/2283187>

- ECAL single crystal granularity in L1 Trigger v precise timing for e/γ at 30 GeV
- ECAL and HCAL new back-end electronics



Muon Systems

<https://cds.cern.ch/record/2283189>

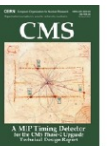
- DT & CSC new FE/BE readout
- New GEM/RPC $1.6 < |\eta| < 2.4$
- Extended coverage to $|\eta| < 3.0$



MIP Timing Detector

<https://cds.cern.ch/record/2296612>

- < 75 ps resolution
- Barrel: Crystals + SiPMs
- Endcap: LGADs



Innovative and extremely challenging new capabilities:

- **Level 1 track trigger**
- **Timing detector**
- **Highly granular endcap calorimeter**

Progress on the Upgrades

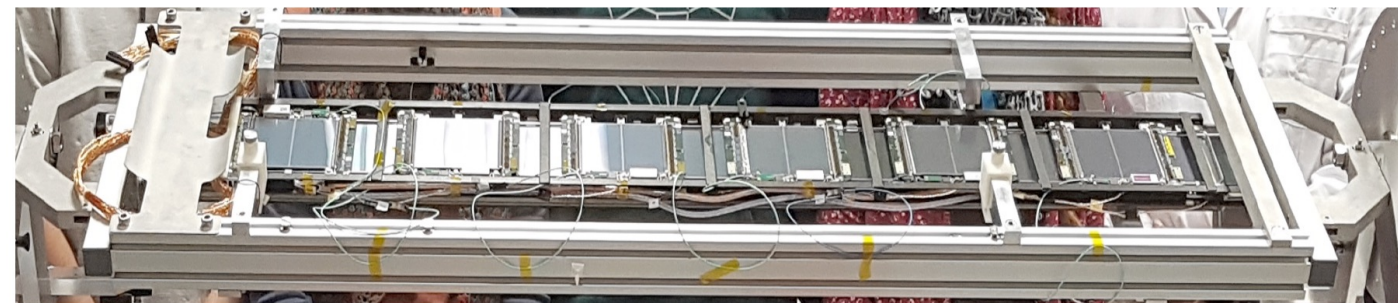
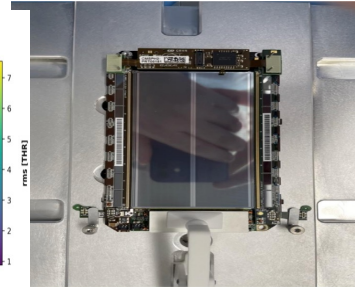
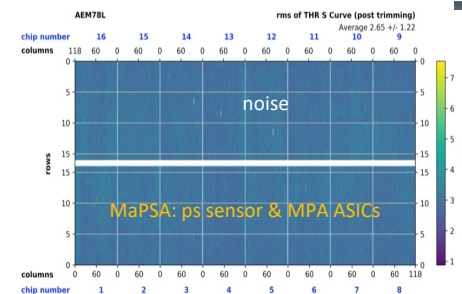
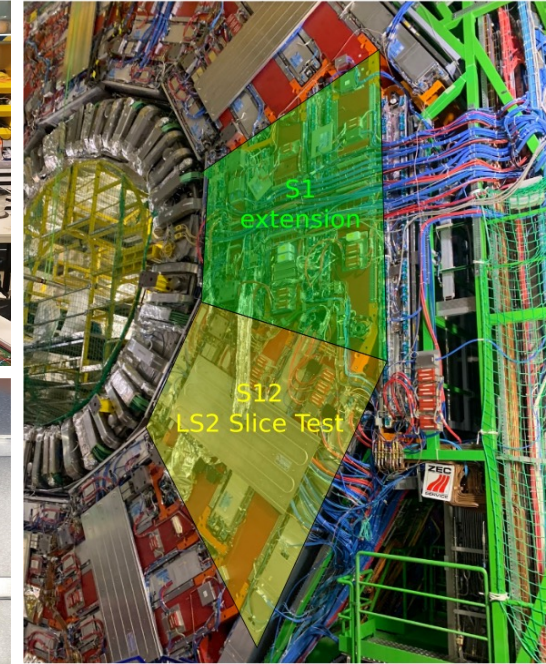
- Phase 2 and HL-Lumi,
- **Taken from the last report on April:**

Muons

- DT: extension of Slice Test with final Phase 2 board installed
- iRPC and GEM: Chamber production ongoing – **on track**
- CSC: final boards passed all tests

Tracker

- Outer Tracker: sensors >60% received
 - All OT ASICs are in production
- Inner Tracker: sensor contracts ready
- Inner Tracker system integration:
 - Thermal, electrical, mechanical **OK**



First Outer Tracker ladder fully equipped with 12 functional 2S modules (strip-strip)

- Growing needs are a consequence of the changes in the projected LHC running conditions for 2023 and 2024, and emphasis on precision measurements.
- **Reco time and HLT rate increase linearly with PU.**
 - Tier-0 capacity needs to increase quadratically with higher PU.
- **Need 2x MC per unit luminosity** for precision physics.
- Today, for the first time, the CPU is used for the baseline physics program to mitigate increased CPU needs.
- HPC contributions have been growing since 2018 (US/EU). CMS expects at least a fraction of the **CPU resources used in 2022 will be available in 2024.**
 - Shortened run
 - Significant reduction of time per event, Prompt Reco.

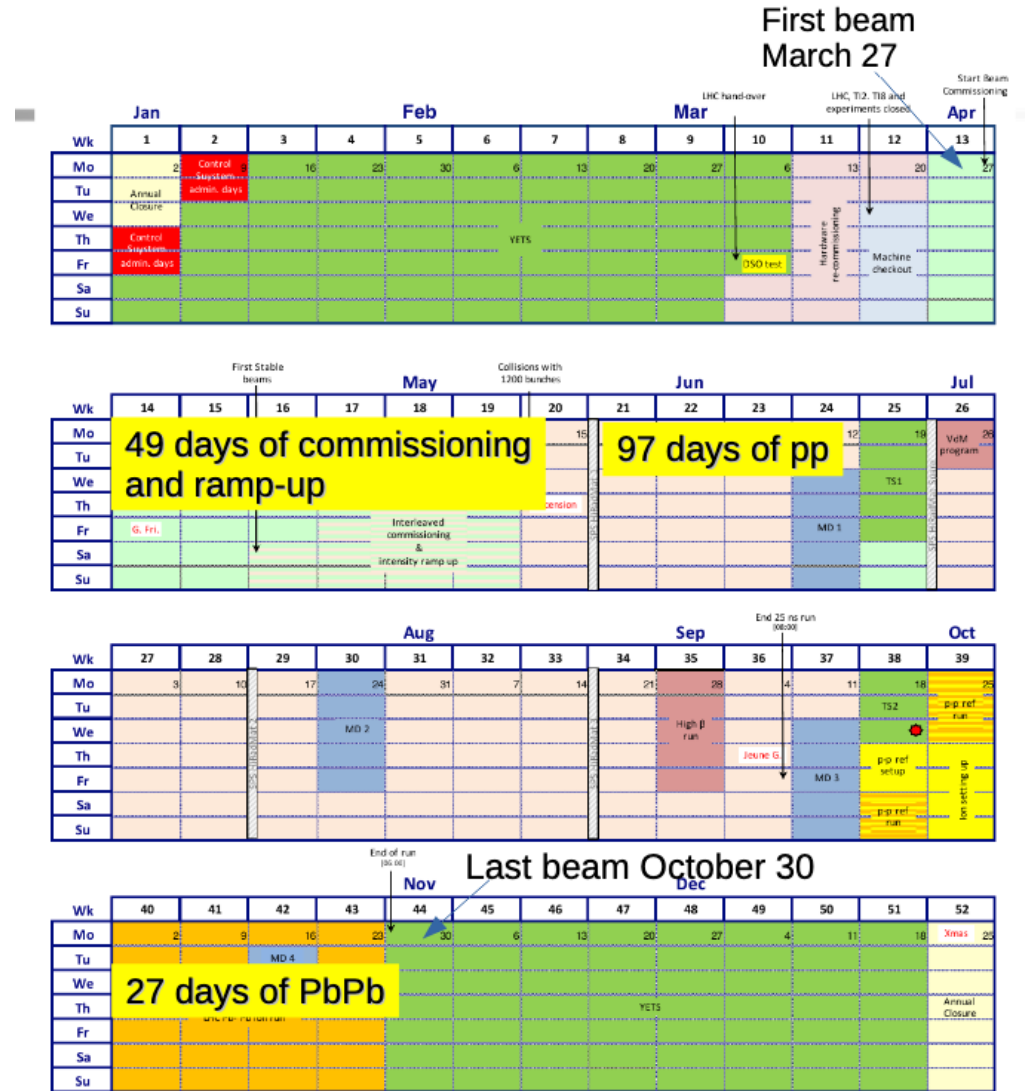
Parameter	Appr. 2023	New 2023	2024
<i>LHC</i>			
LHC Energy pp [TeV]	14*	13.6	
Average pileup	50	62 (peak at 65)	
Integrated luminosity / year [fb^{-1}]	100	90	110
Livetime pp / year [$\text{s}/10^6$]	6	4.2	5.2
Livetime HI / year [$\text{s}/10^6$]	1.2	1.7	1.7
Heavy Ion run type	Pb-Pb		
<i>CMS-Specific</i>			
Prompt HLT Rate [kHz]	1.7	2.6	
Parked HLT Rate [kHz]	3		
Scouting Rate [kHz]	30		
Run 3 MC events / year in billions	29	45	53
Phase-2 MC events / year in billions	0.5		

Run 3 is underway!

LHC Schedule

Important dates:

- First beam on March 28th ✓
- End of March splashes ✓
- First Stable beams @900 GeV on April 6th ✓
- First stable beams @ 13.6 TeV on April 19-22nd ✓
- **Start of physics runs on May 15th and for 97 days**
- Last day of pp physics: September 12th
- Start of pp reference run on September 21st. Beam @ 5.36 TeV
- Start of ion physics on October 2nd. Beams @ 5.36 TeV
- Last day of beam in 2023: October 30th
- Start YETS: November until 2024

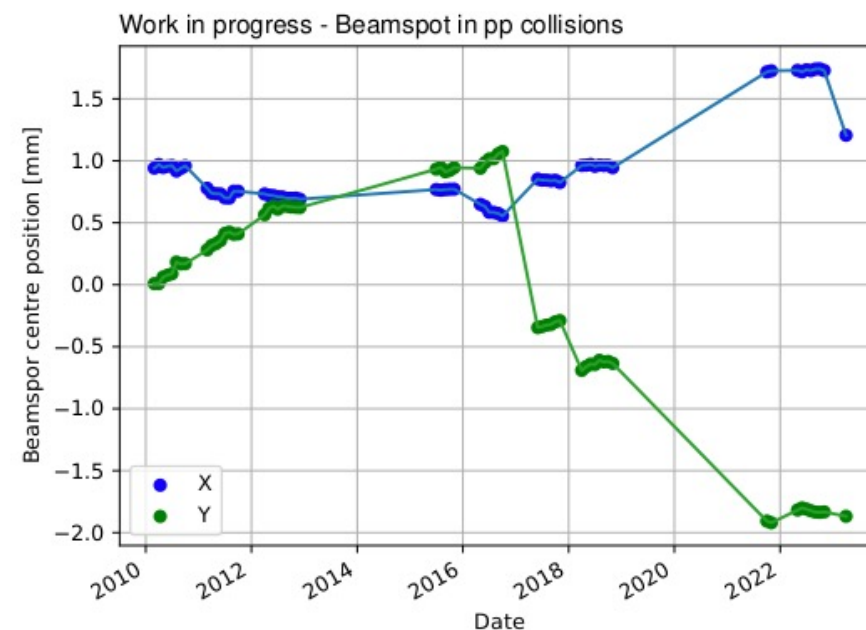


Previously: Beam spot was found not to be in the best position along X direction.

- Not well centered, therefore could induce an asymmetric radiation effect, in particular for 1st layer of BPIX
- Y-position is good, as expected.

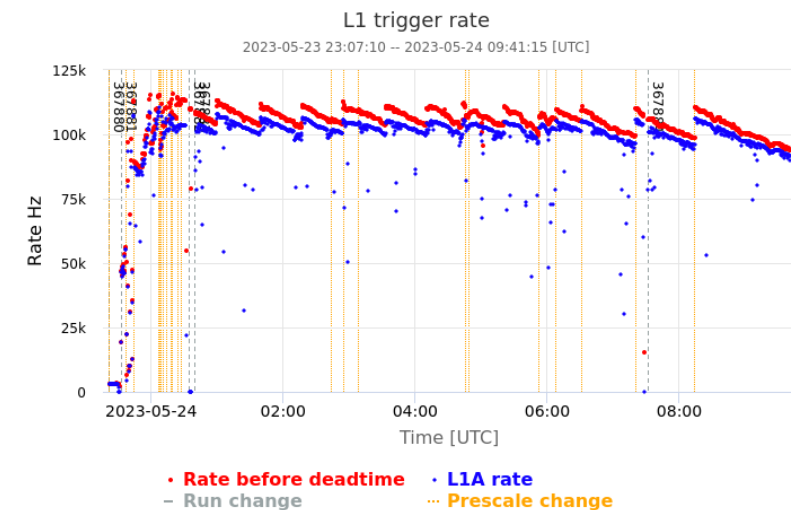
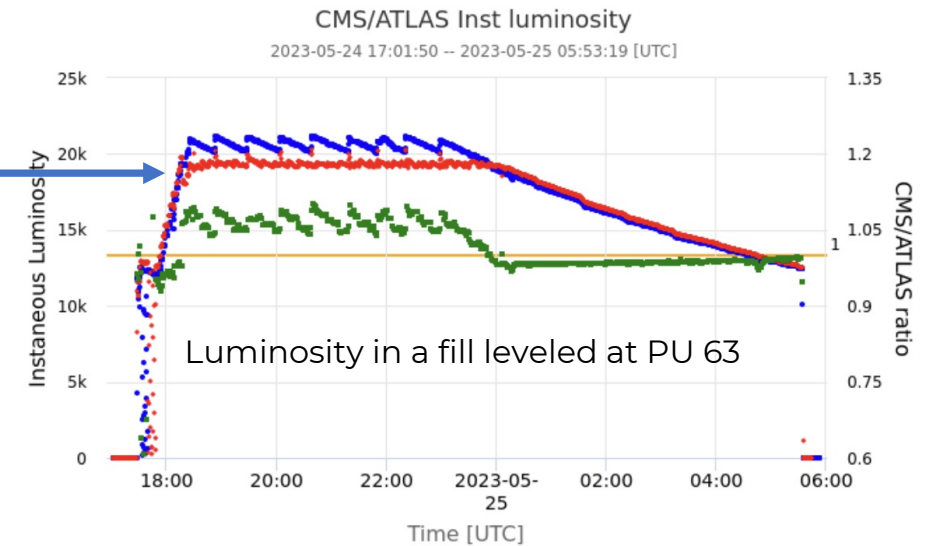
CMS is taking data:

- 900 GeV collisions over Easter weekend: the position has been measured.
 - The new position is in line with respect to the movement performed by LHC.
 - Ongoing analysis to check that this is enough to sustain run 3 (pixel detector).
- 13.6 TeV stable beams from April 19-22.



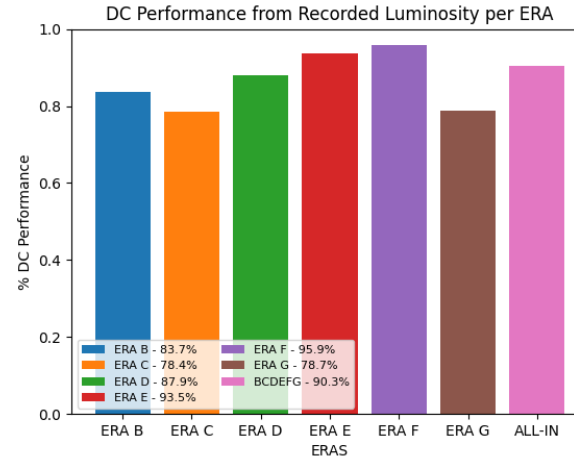
Challenging conditions!

- **Inst. Lumi leveling above $2 \times 10^{34} \text{cm}^{-2} \text{s}^{-1}$**
 - **Leveling for 5 hours at PU 62-63**
 - ATLAS generally requesting PU 57-59; there have been constraints from LHC on PU difference between CMS/ ATLAS.
- Stable running with standard menu, but with limited margin
- Peak L1T rate 112-113k Hz
- **HLT output: ~2.5 kHz prompt, ~3.5 kHz parking, and ~20 kHz scouting**
 - Introduced new parking streams dedicated to VBF, LLP, and HH

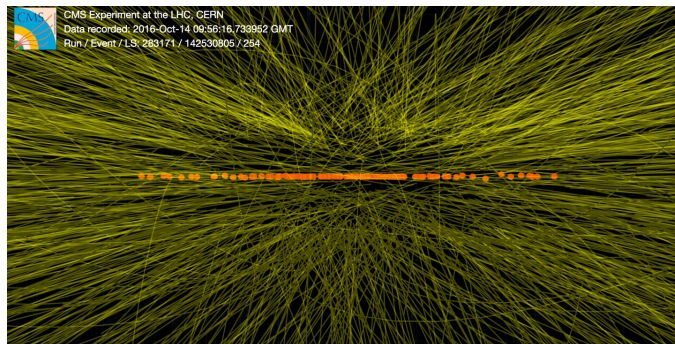
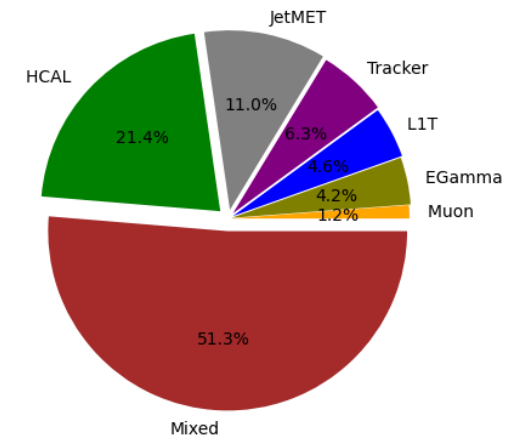


CMS Is Taking Data

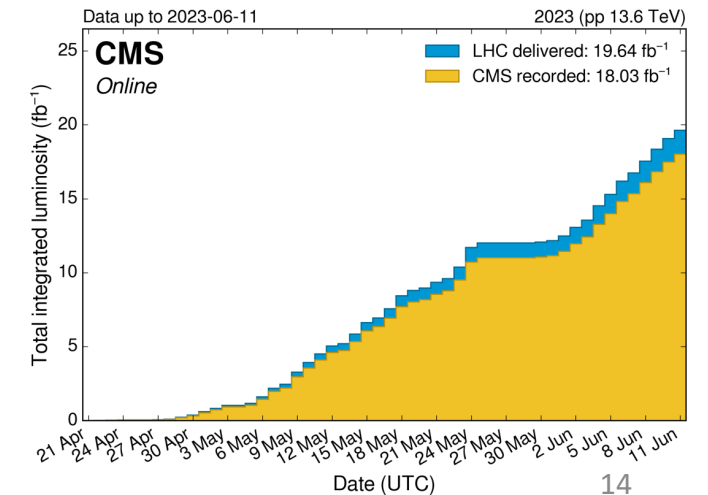
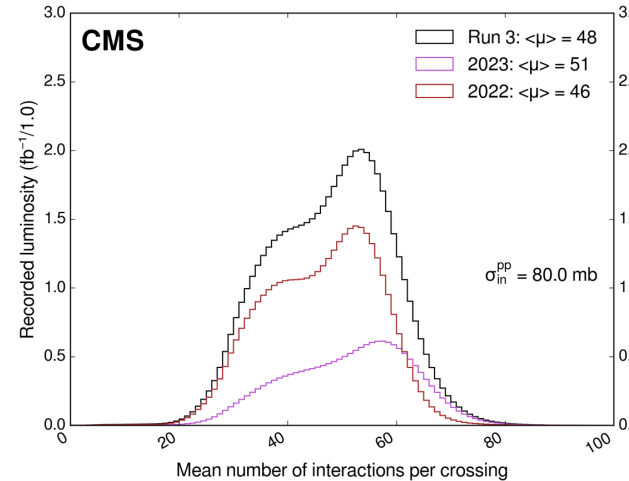
- First data from 2022 is almost certified to be analyzed.
 - 37.5 fb-1 were collected
 - Subdetectors failed at most 21 % (HCAL), and 51% mixed
 - Minimal losses for physics analysis
- **Right now, physics runs** are happening from May 15th:
 - 20 fb-1 have been collected, up today.
 - At the end of pp collisions the target ~ 75 fb-1
 - Pile up at least 60



Fraction of Exclusive Loss from Each CMS Subsystem



6/12/23

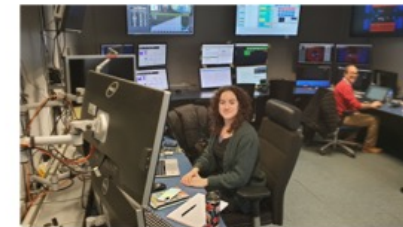


- **Follow closely:**
- The shift situation is beyond critical
- CMS has to come up with a new strategy.
 - New incentives for shifts, lower the barriers to training, improve transportation, etc.
 - Set quotas (with consequences)
- **Look for more opportunities to take advantage of remote operations.**

Slide from the April Management Board meeting, but this has become the new normal.

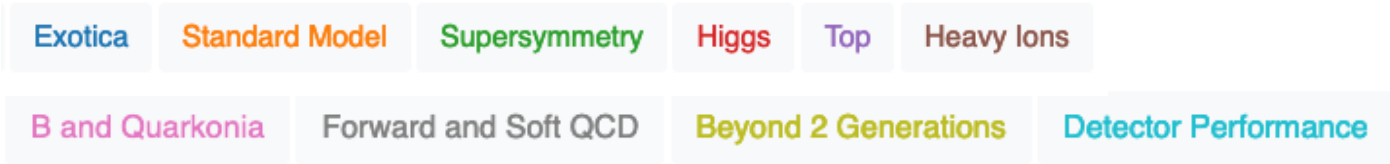
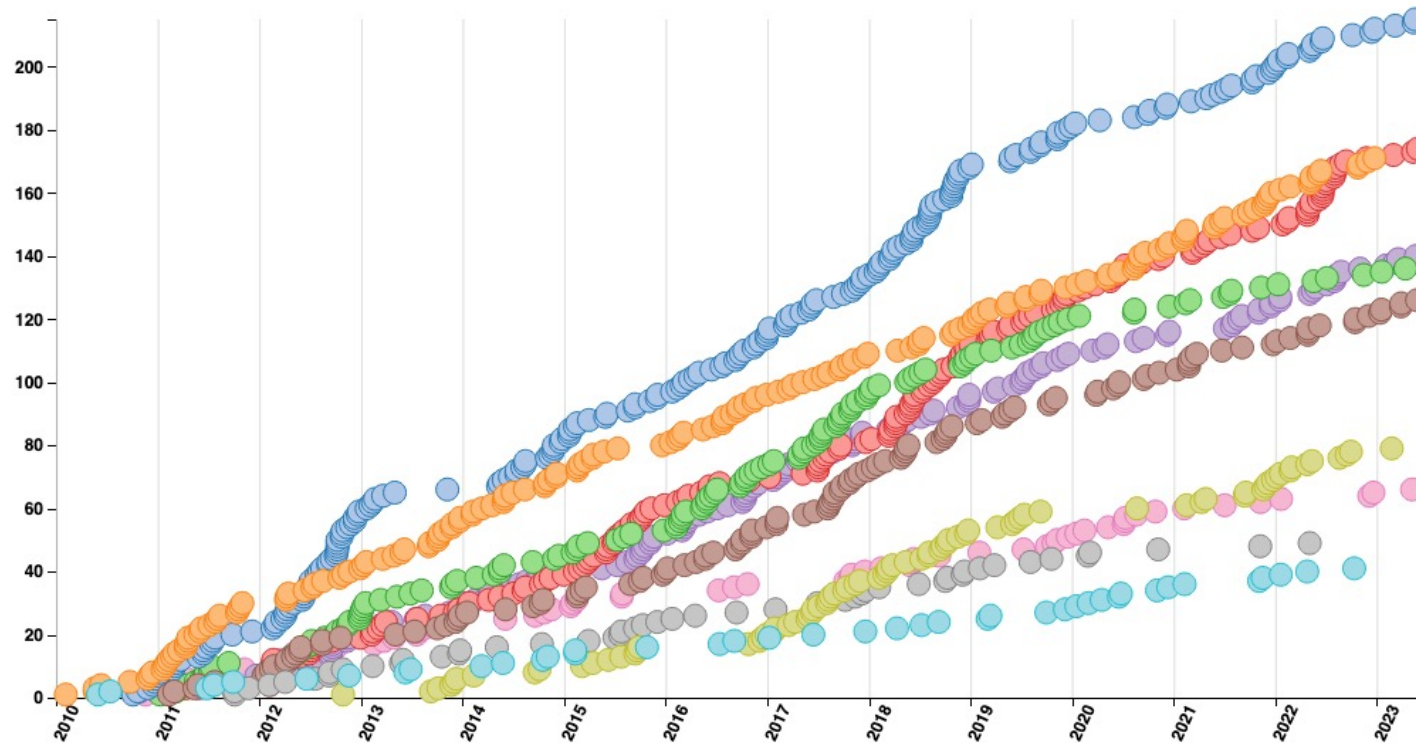
Status of Shifts (comp

- **THIS WEEK :**
 - Missing 8 Shift leaders – 2 Technical shifters (10 slots) : 80 hours to cover
- **NEXT WEEK :**
 - Missing 7 Shift leaders – 9 Technical shifters (16 slots) : 128 hours to cover
- **The WEEK AFTER :**
 - Missing 8 Shift leaders – 13 Technical shifters (21 slots) : 168 hours to cover
- Reminder a week is $7\text{days} * 3(8\text{-hours}) * 3(\text{shifters}) = 63$ slots
- Relying on (still enthusiastic) shifters to answer urgent calls



Physics

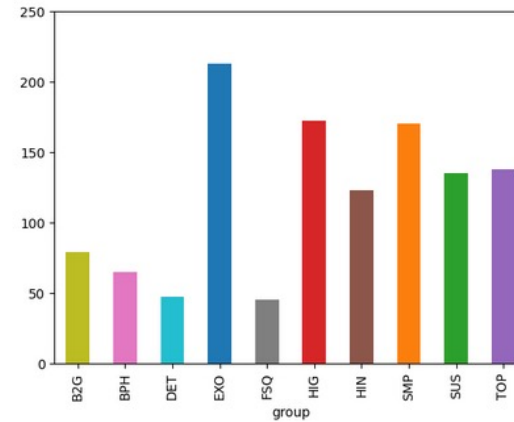
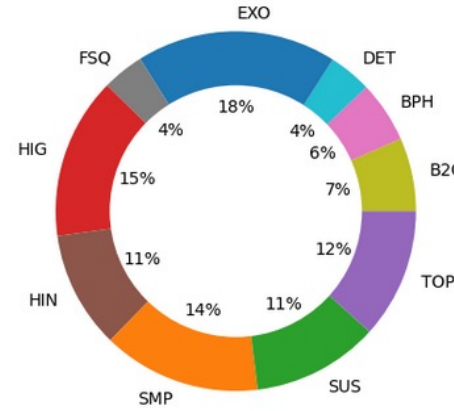
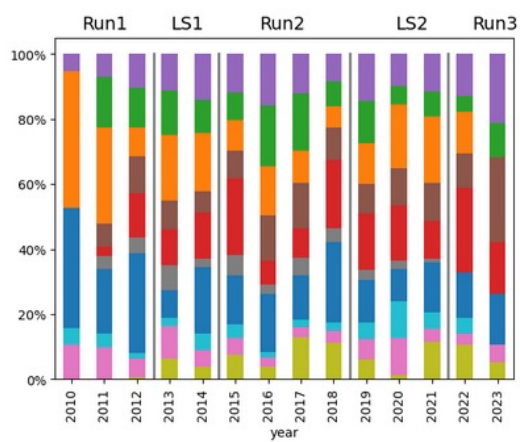
Publication Statistics



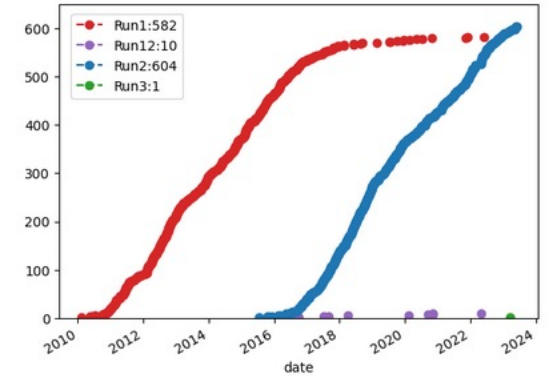
- **1197 papers** on collider data published or submitted to a journal
- **115 analyses** in CWR or beyond
 - 35 CWR – ReadyforSub
 - 26 SUB – Accept (54)
- **155 analyses** in progress
 - 74 in AWG
 - 42 GoingToPrepApp
 - 32 PreApp
 - 7 ARC-Green-Light

Publication Statistics

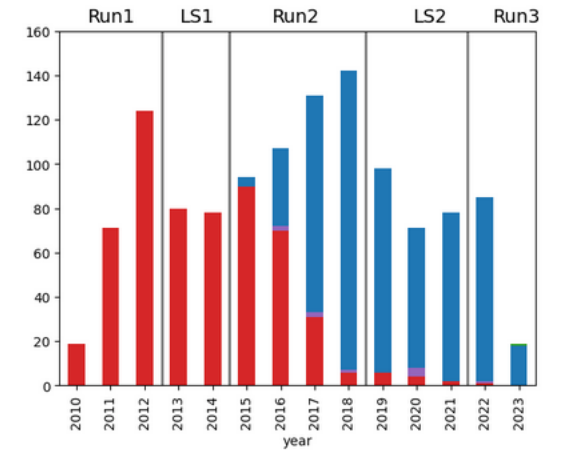
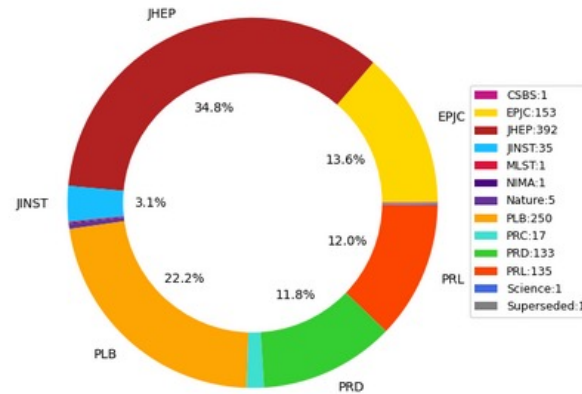
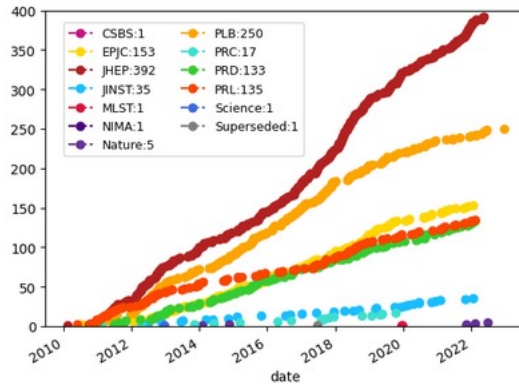
Publications per category



Publications per Run



Publications per journal



B and Quarkonia Forward and Soft QCD Beyond 2 Generations Detector Performance

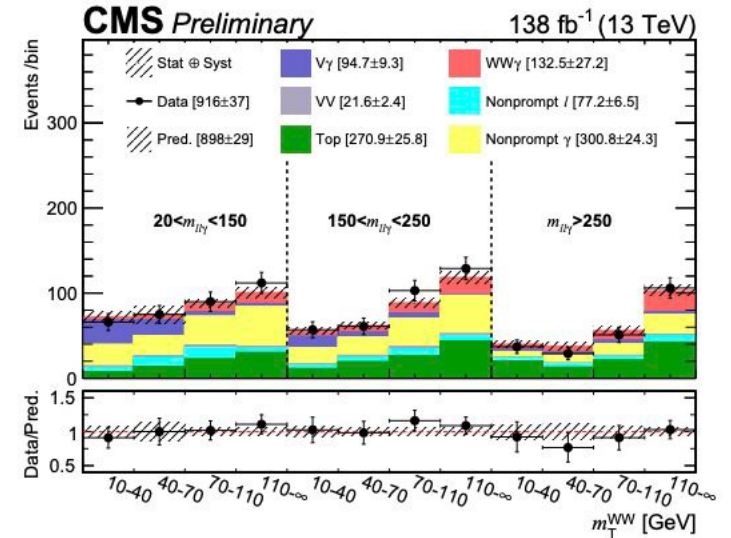
Exotica Standard Model Supersymmetry Higgs Top Heavy Ions 18

Hot topics on Physics

WW γ production

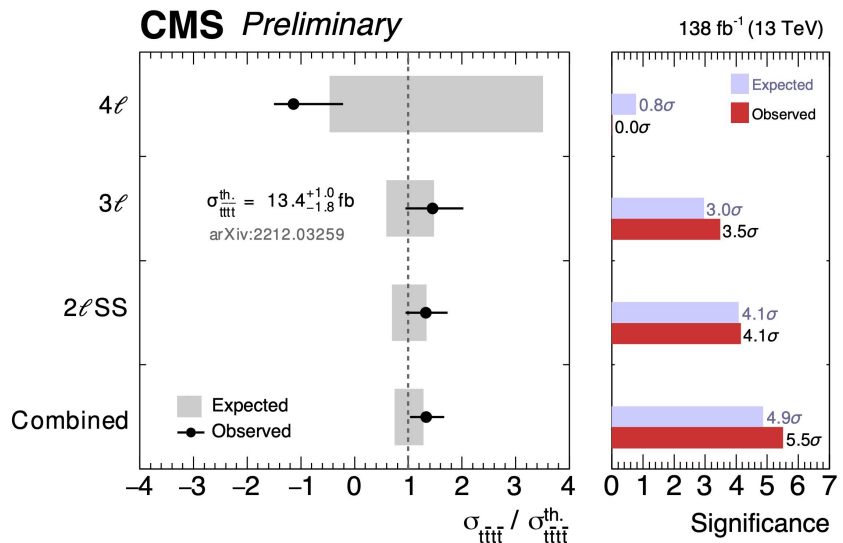
- Already observed WWV, WWW and evidence of W $\gamma\gamma$ and Z $\gamma\gamma$
- The observed (expected) signal significance is 5.6 (4.7) σ
 μ obs. = 1.31 ± 0.17 (stat) ± 0.21 (syst)

and using NLO QCD MADGRAPH5 aMC@NLO
 $\sigma = 6.0 \pm 1.7\text{fb} = 6.0 \pm 1.0$ (stat) ± 1.0 (syst) ± 0.9 (theo)fb



SMP-22-006

TOP-22-013



4-top quark production

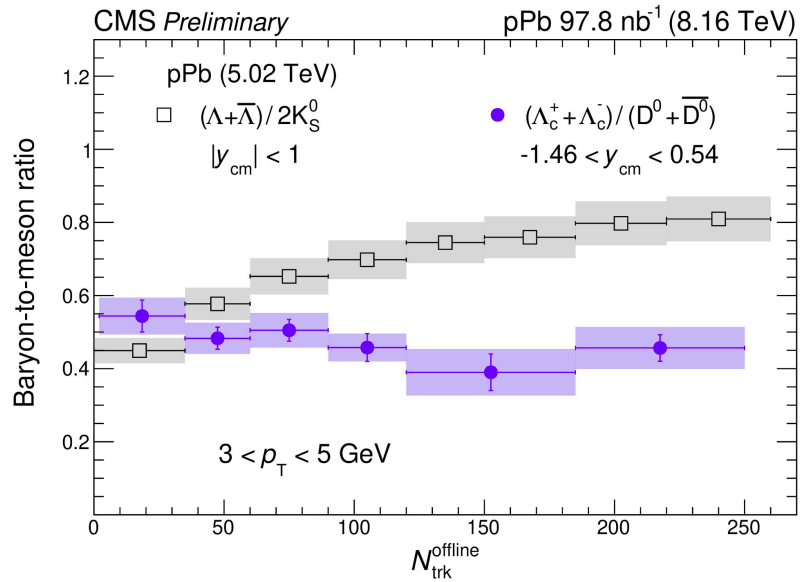
- Events with 2 same-sign, 3, and 4 electrons and muons plus jets
- Analysis supersedes our previous results from the same data set (found 2.6 (2.7) σ observed (expected) significance)
- Notable improvements include the use of MVA in the lepton identification, and DeepJet for b-tagging, and UL samples

$$\sigma_{\text{tt}\bar{\text{t}}\bar{\text{t}}} = 17.9_{-3.5}^{+3.7} \text{ (stat.) } +2.4_{-2.1} \text{ (syst.) fb}$$

$$S_{\text{tt}\bar{\text{t}}\bar{\text{t}}} = 5.5 \text{ (4.9) } \sigma$$

Hot topics on Physics

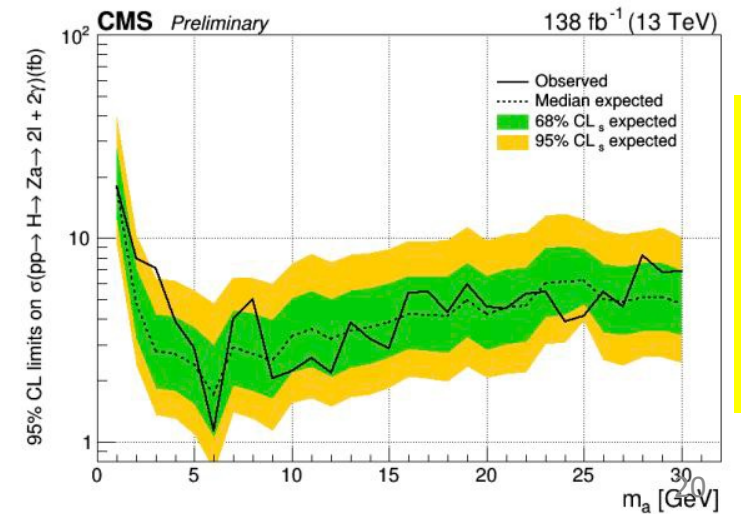
HIN-21-016



- Multiplicity dependence of charm baryon and meson production in pPb collisions at 8.16 TeV
- the first measurements of $\Lambda+c$ baryons and $D0$ mesons and their yield ratios in proton-lead collisions, as a function of p_T , and multiplicity.
- No strong multiplicity dependence is observed for charm hadrons within the experimental uncertainties
- The difference between these results for charm quarks and previous ones for light quarks might indicate coalescence processes of heavy quarks saturate earlier than those of light quarks

- Exotic decay of the Higgs boson to an axion-like particle (ALP) and a Z boson, $H \rightarrow Za \rightarrow l\bar{l}\gamma\gamma$,
- ALP decays to a pair of photons, Z boson decays to electrons or muons
- On-shell, only the mass range $m_a < m_H - m_Z \approx 35$ GeV is kinematically possible
- Probes masses (m_a) between 1 and 30 GeV

6/12/23



HIG-22-007

Run 3 data taking

Data expected for 2022+2023 should be about Run 2 data:

- Average Pile up:
- 2022 was about 50
- 2023 is expected to be 60

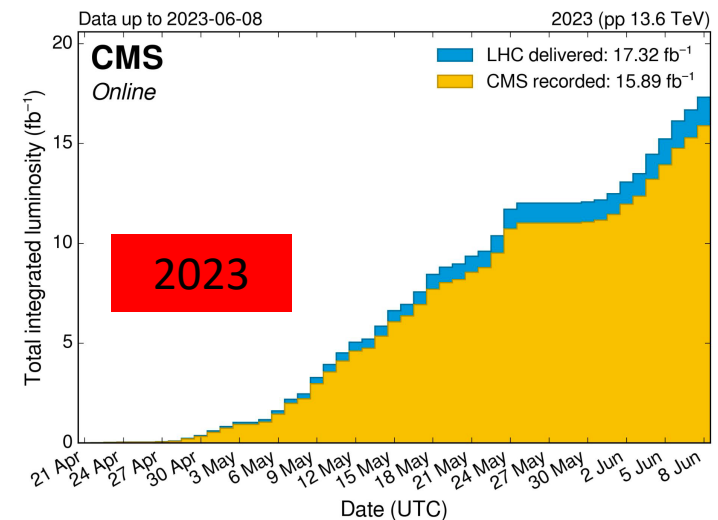
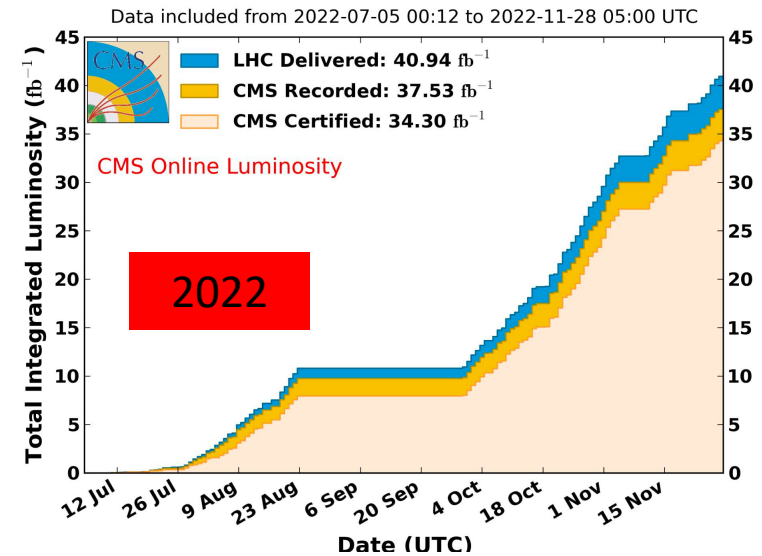
2022:

- ~41 fb⁻¹ collected;
- Data-taking eff 92%;
- Data-certification eff 92%;

2023:

- ~ 12 fb⁻¹ collected so far (½ already certified good, the rest is under scrutiny);
- Data-taking eff 92%;
- Data-certification eff 90% (98% after commissioning phase)

CMS Integrated Luminosity, pp, 2022, $\sqrt{s} = 13.6$ TeV



Run 3 Analysis Effort

- Data analysis effort is mainly on Run 2 (about 90 analysis going through approval process)
- Physics coordination stresses the importance of starting the Run 3 analysis campaign:
 - Important as end-to-end data quality investigation;
 - And to produce physics results;
- Remeasuring x-sections with Run 3 is a priority
 - 13.6 TeV
 - Imperative to look at data earlier, get detector/objects understood, to avoid discovering problems too late.
- By the end of 2023, many analyses will benefit from (close to) doubling the statistics analyses with excesses, new triggers, etc.
- L2s have a list of 225 analyses in progress pre-cadi (many are in early stages) - most of these are aiming to use Run 2 data
- Depending on analysis and timescale consider adding 2022 + 2023.

CMS Mexico



BUAP



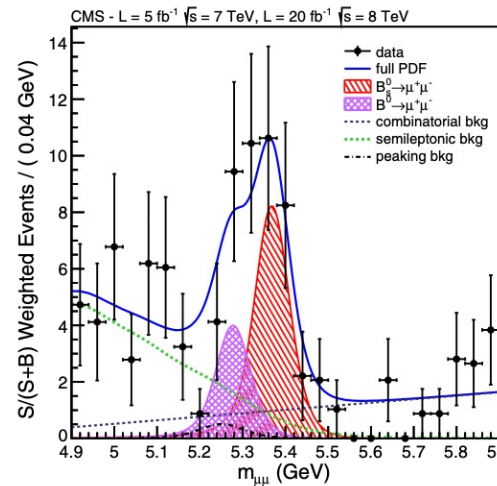
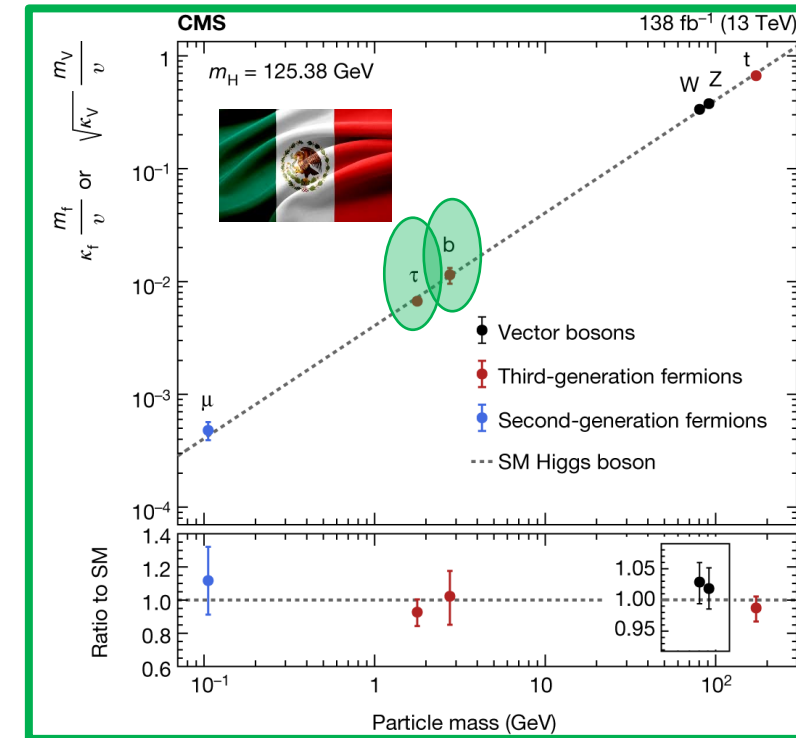
Team:

- 5 Profesors:
 - Heriberto Castilla-Valdez
 - Eduard De la Cruz Burelo
 - Ivan Heredia de La Cruz
 - Ricardo Lopez Fernandez
 - Alberto Sanchez Hernandez
- 2 PostDocs:
 - Jhovanny Mejia-Guisao
 - Rogelio Reyes-Almanza
- 4 PhD students:
 - Gabriel Ayala Sanchez
 - Horacio Crotte Ledesma
 - Rodrigo Alarcon
 - Johan Vazquez

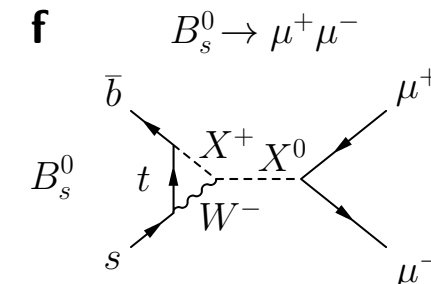
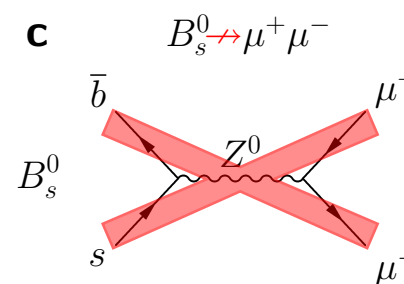
Main activities:

- Physics analysis:
 - b-quark physics,
 - Higgs
 - Quarkonium
 - Rare decays
 - Exotic Hadrons
 - Heavy ion collisions
 - Precision measurements
 - More than 25 published papers
- Operations:
 - Run Coordination: shifts.
- Technical work (see next slides):
 - RPC Performance
 - Trigger Performance in BPH group

Nature 607, 2022



Nature 522, 2015 &
Phys.Rev.Lett. 111 (2013)

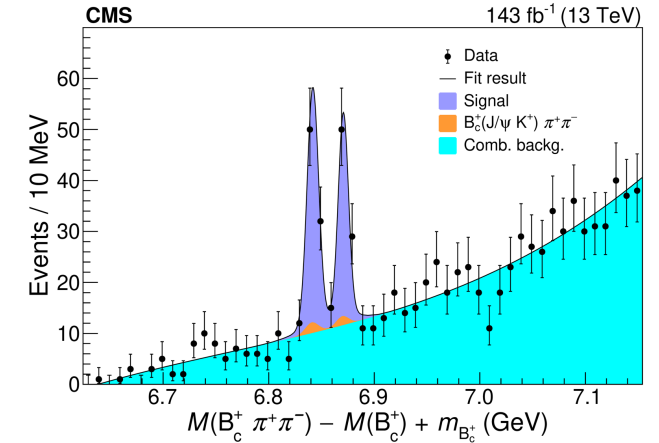
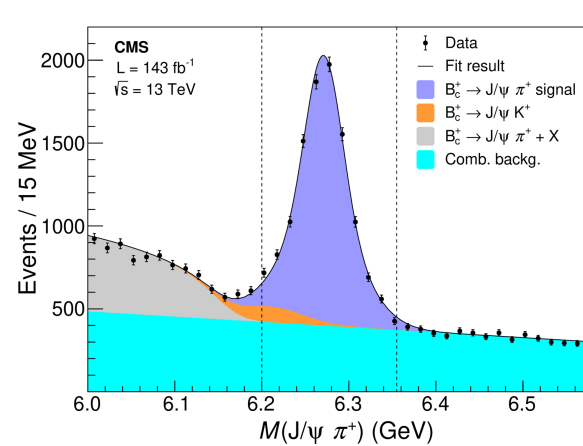


Leads high quality physics analysis:

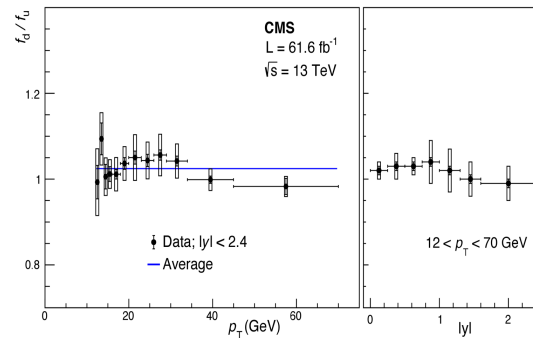
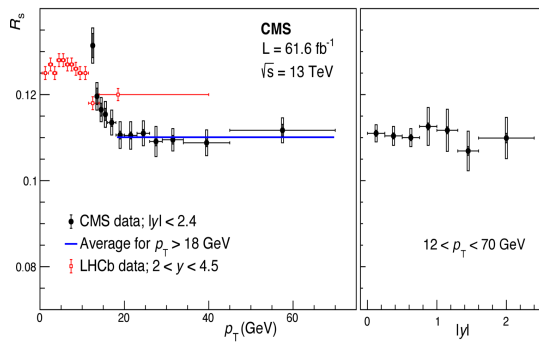
Measurement of $B_c(2S)^+ B_c(2S)^+$ and $B^*c(2S)^+$ cross section ratios

- B^+c significant smaller than $c\bar{c}$ & $b\bar{b}$ states
- First time, detailed studies regarding the production and properties of B_c^+ quarkonia.
- Probe the existence of possible intermediate structure analogous to the ones observed in decays between the 2S and 1S states of charmonium and bottomonium.
- Stimulate new theoretical aimed at reaching a better understanding B_c^+ quarkonium

Phys. Rev. D 102, 092007



BPH-19-001



Measurement of the dependence of the hadron production fraction ratio f_s/f_u on B meson k -var

- The fragmentation fractions: f_u , f_d , and f_s -> probability of b -quark to hadronize to B -mesons or b -baryons such as B^+ (f_u), B_d (f_d), B_s (f_s)
- Measure **ratio f_s/f_u** Very useful when measuring branching fraction of B_s (e.g., $B_s \rightarrow \mu^+ \mu^-$)

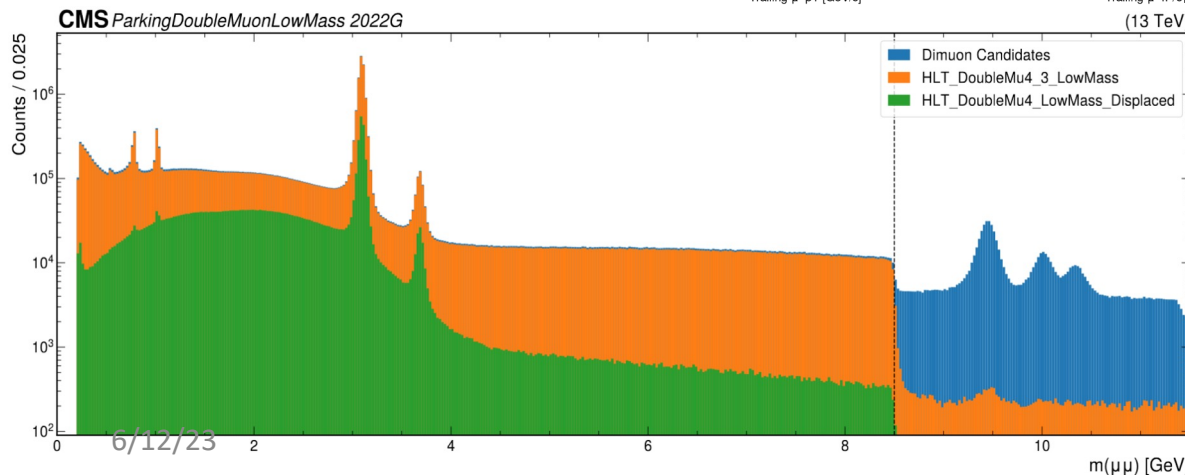
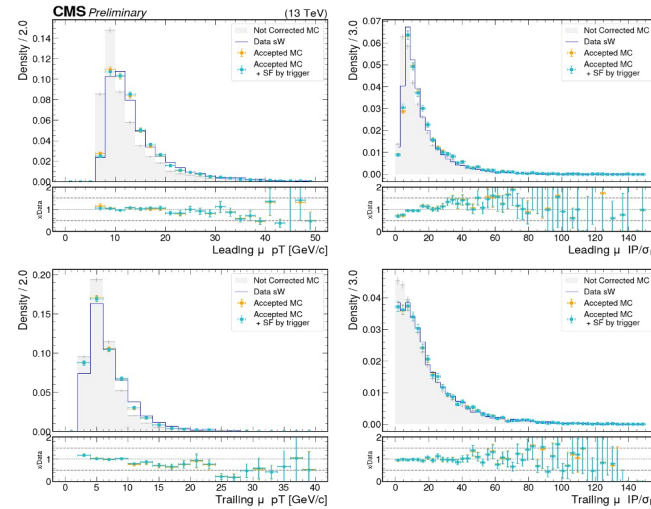
BPH-21-001

Submitted to Physics Review Letters

Cinvestav is actively involved on activities of:

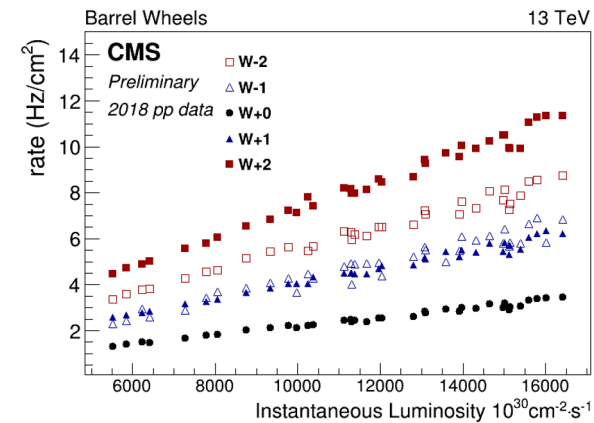
- Trigger performance in the B-Physics group

Composite Efficiency		M 2	
		Trig	not Trig
M 1	Trig	$\epsilon_{\mu 1} \epsilon_{\mu 2}$	$\epsilon_{\mu 1} (1 - \epsilon_{\mu 2})$
	not Trig	$(1 - \epsilon_{\mu 1}) \epsilon_{\mu 2}$	$(1 - \epsilon_{\mu 1}) (1 - \epsilon_{\mu 2})$



Plots from:
Gabriel Ayala Sanchez
Horacio Crotte Ledesma

- Detector performance on RPC

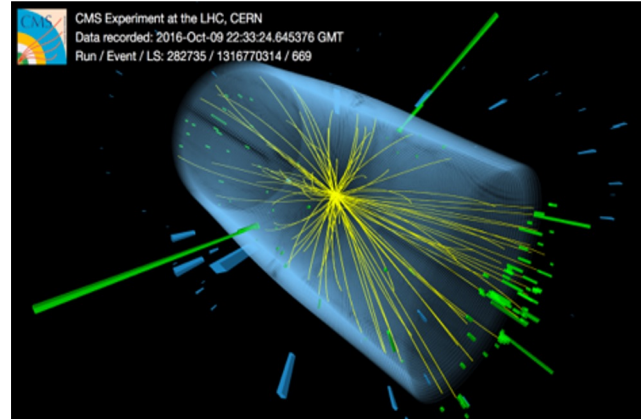


RPC Hit Rates dependence on luminosity.

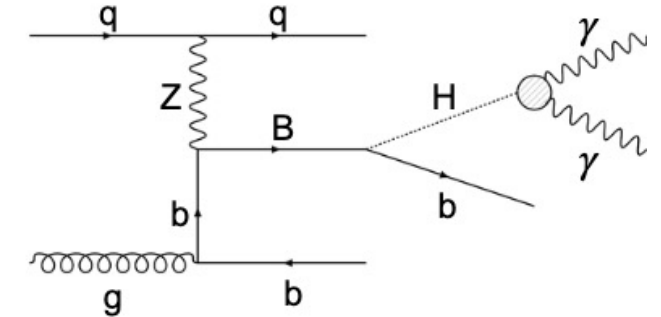
For run 2 there are very nice results, but we want to produce new studies.

Team:

- 3 Faculty:
 - Cristina Oropeza Barrera
 - Mateo Ramírez García
 - Fabiola Vázquez Valencia
- 3 PhD students:
 - Severiano Carpinteyro Bernardino
 - Víctor Ramírez Beltrán
 - Dalia Ramírez Guadarrama
- Several undergraduate students



Slides from Cristina Oropeza Barrera



Main activities:

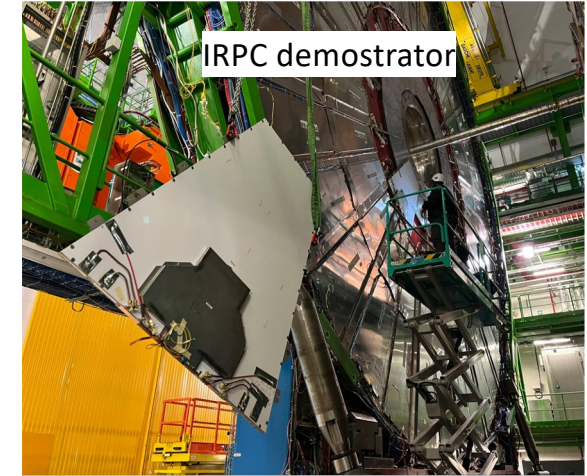
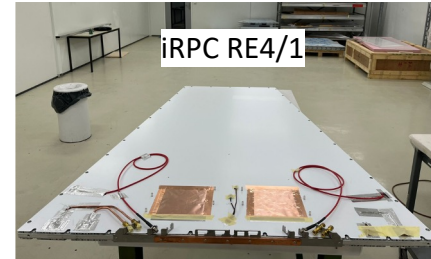
- Physics analysis:
 - Higgs decay to two photons. [\[Published\]](#)
Development of tHq tagger, in collaboration with UNISON.
 - Searches for vector-like quarks. [\[Ongoing\]](#)
Single production of B' decaying to bH , with the Higgs decaying to two photons.
- Operations:
 - Run Coordination: shift leader and technical shifter training and shifts.
 - BRIL shifts.
- Technical work (see next slides):
 - RPC
 - BRIL

6/12/23



Slides from Cristina Oropeza Barrera

The CMS-RPC group is working on updating the RPC detector subsystem of the experiment for the high luminosity program. New improved RPC (iRPC) was developed for rings RE3/1 and RE4/1, and Ibero is participating on this process.



Ibero is involved on activities of:

- Construction and testing of detectors.
- Studies of performance and consolidation for RPC and iRPC.
- Search for new gas mixtures.

A laboratory at Ibero was prepared as a construction site for CMS-RPC group. Ready for RPC detectors development and close to request certification

- Up to 6 double-gap iRPC detectors at same time.
- CMS and CO2 based gas mixtures.
- Max. 100 L/h CMS mixture and ± 12 KV power supply.



Slides from Cristina Oropeza Barrera

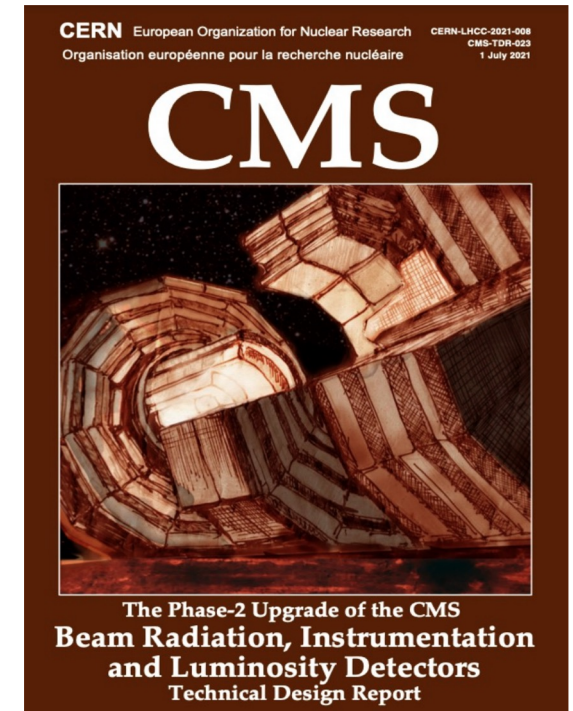
BRIL

The CMS BRIL project is responsible for measuring the luminosity and for monitoring the beam conditions as well as the levels of radiation in the experimental cavern.

Luminosity is an essential quantity for every physics analysis so it is of fundamental importance to be able to measure it precisely. To measure luminosity, BRIL uses data from several CMS subsystems, as well as dedicated and independent detectors.

Ibero contributes on many fronts to this project:

- Involvement in Technical Design Report for the Phase-2 upgrade of the BRIL project: Chapter editors, simulations, linearity studies.
- Run 2 luminosity measurement using the DT subsystem.
- L3 coordination of the simulation efforts for Phase-2 studies.
- L3 coordination of the ‘Luminosity from CMS frontends’ group, which focuses on the REMUS, Scouting and DT systems.
- Associate members of the BRIL Institute Board.





CMS Sonora Group



Team:

- 4 Faculty:

Jose Feliciano Benitez Rubio
 Alfredo Castaneda Hernandez
 Javier Murillo Quijada
 Lizardo Valencia Palomo

- 6 PhD students:

Hedwin Aaron Encinas Acosta
 Luis Gabriel Gallegos Martinez
 Moises David Leon Coello
 Antonio Paredes Sotelo
 Antonio Rodriguez Cota
 Ashish Sehrawat

- Main activities:

- Physics analysis:

- Higgs
- Heavy ion physics
- Top quark

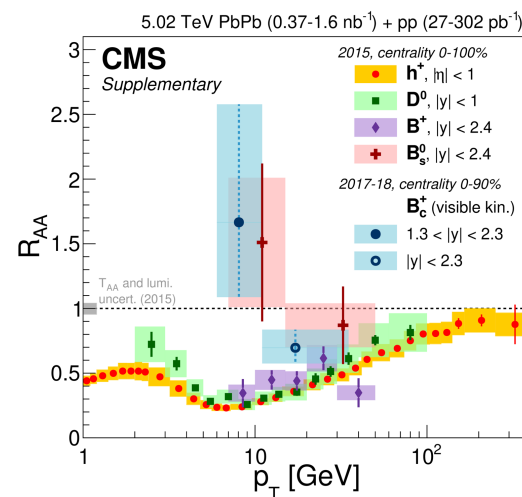
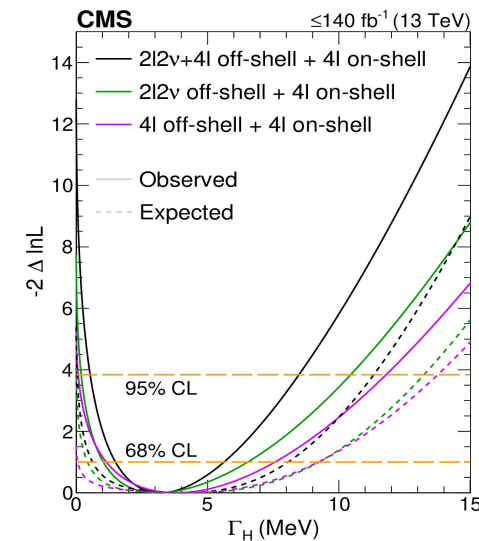
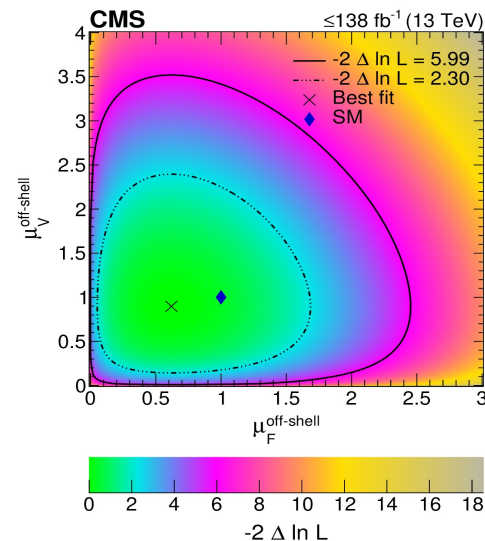
- Operations:

- Run Coordination: shifts.

- Technical work (see next slides):

- Luminosity measurements

Nature Physics volume 18, pages 1329–1334 (2022)



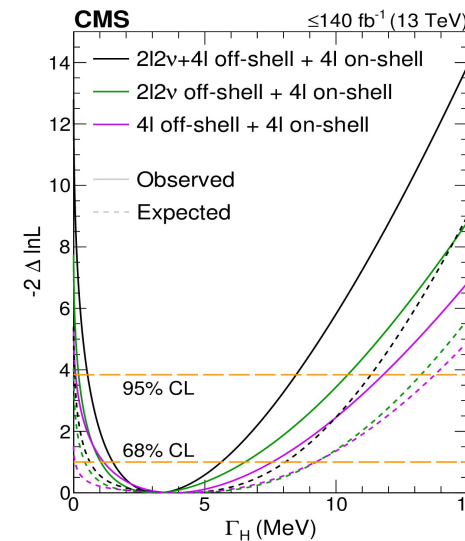
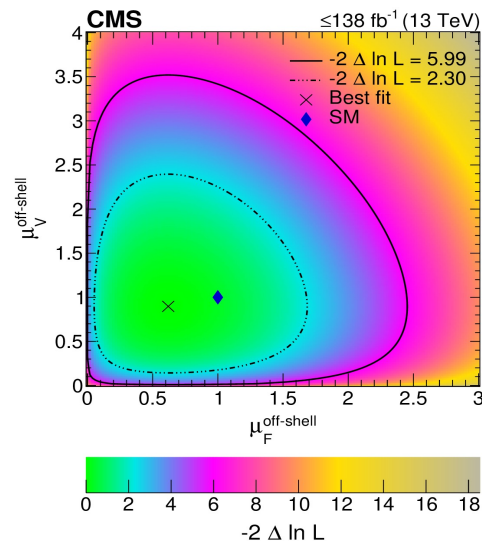
PRL 128 (2022) 252301 30

Nature Physics volume 18, pages 1329–1334 (2022)

Leads high quality physics analysis:

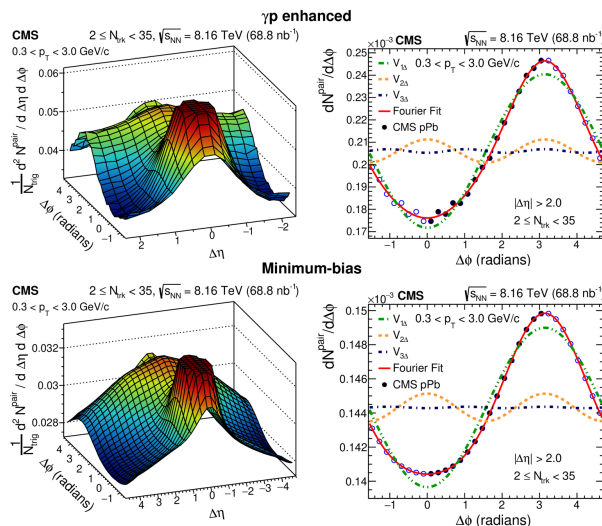
Measurement of the Higgs boson width and evidence of its off-shell contributions to ZZ production

- Report evidence for off-shell contributions to the production cross section of two Z bosons
- The scenario with no off-shell contribution is excluded at 3.6 standard deviations
- Measure the width of the Higgs boson as $\Gamma_H = 3.2 + 2.4 - 1.7$ MeV



HIG-21-013

HIN-18-008



Two-particle azimuthal correlations in γp interactions using pPb collisions at $\sqrt{s_{NN}} = 8.16$ TeV

- For the first time, the study of long-range particle correlations has been extended to photon-proton
- No evidence for a long-range near-side ridge-like structure was found for either the γp or hadronic minimum bias pPb (MB) samples within this multiplicity range.
- these models do not have collective effects, suggest the absence of collectivity in the γp system over the multiplicity range explored.

Submitted to *Physics Review Letters*
6/12/23



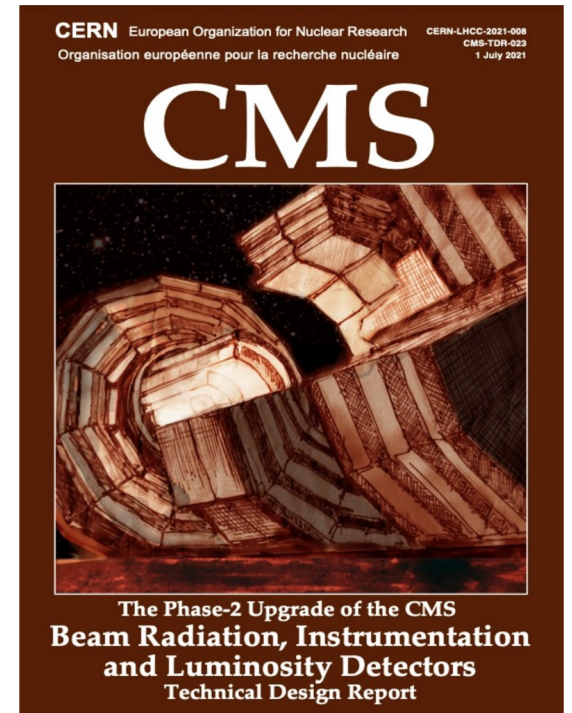
CMS Sonora Group



BRIL

UNISON contribute on many fronts to this project:

- Involvement in Technical Design Report for the Phase-2 upgrade of the BRIL project: Chapter editors, simulations, linearity studies.
- Run 2 luminosity measurement using the DT subsystem.
- Phase-2 studies.
- Associate members of the BRIL Institute Board.



[Link](#) to TDR.



CMS BUAP Group



Slides from Irais Bautista Guzmán

Team:

7 Associated PIs :

Humberto Salazar Ibargüen (CIIEC-FCFM)

Isabel Pedraza Morales (CIIEC-FCFM)

Irais Bautista Guzmán (CIIEC-FCFM)

Jhovanny Mejia Guisao (CIIEC)

Cecilia Uribe Estrada (ICUAP)

J. Lorenzo Díaz Cruz (CIIEC_FCFM)

Ponce Lancho Epifanio (CIIEC_FCFM)



Entusiastic associated Students

Fernando Neri Huerta

Nestor Macilla Xinto

Nadia Leal Reyes

Michell Ramos Regino

Pablo Fierro Rojas

Juan Antonio Carpintero
Hernández

Felipe Abdiel Pérez Cruz

Michell Alejandra Osornio Plancart

Fernando Garza Landa

Luis Rey Vargas Guadarrama

Mariana Briteño Parra

Deisy Casas Sánchez



CMS BUAP Group



Slides from Irais Bautista Guzmán

Ongoing Analysis

Dark Higgs searches as Dark Matter in the CMS detector at the LHC-CERN

Collaboration in the group of dark matter searches with final state containing energy loss and two b's quarks (I. Pedraza, et al.)

Implementation of the trigger algorithm for the optimize heavy stable charged particles detection (HSCP)

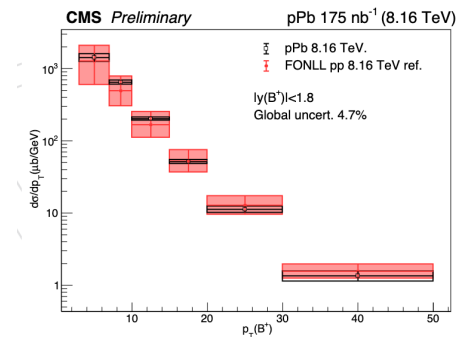
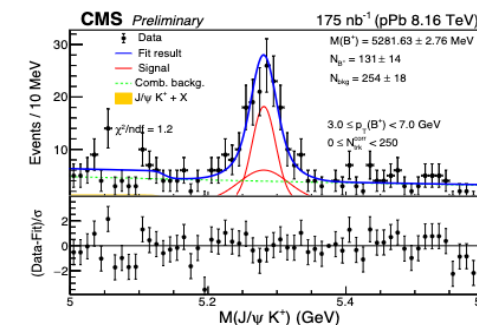
Collaboration with the RPCs Group to implement the trigger algorithm for the HSCP detection with the muon detector improvement (I. Pedraza, Nadia Leal, et al)

Small systems collectivity studies with the CMS detector (HIN-HF Spectra Group)

Measurement of the B^+ differential cross section and the modification factor in pPb collisions at 8.16 TeV (I. Bautista, J. Mejia, in collaboration with CMS-CINVESTAV)

Measurement of the B^+ differential cross section in pp collisions at 5.02 TeV (I. Bautista, J. Mejia, F. Neri, in collaboration with CMS-CINVESTAV)

Measurement of the differential cross section of B^+ as a function of transverse momentum in multiplicity classes in pPb collisions at 8.17 TeV (I. Bautista, J. Mejia, et al.)



HIN-22-001, CMS AN-21-178



CMS BUAP Group



Slides from Irais Bautista Guzmán

- Operation and organization and analysis in the Gamma radiation zone (GIF++) during muon test beam
- Test to validate iRPCs and longevity studies of the 1st generation RPCs, Font End board test
- Validation and set on of the demonstrator prototype install on CMS
- Contribution to trigger level 1
- GIF++ Shifts
- Software PPS Run control, XDAQ and legacy online software
- Detector simulation Studies
- Rate and current studies
- Offline & MWGRs analysis

Detector notes

CMS-DN-2022-09, R&Back-End Electronics for iRPC towards CMS Upgrade, (I. Pedraza, C. Uribe, et al.)



Slides from Irais Bautista Guzmán

BUAP-CMS ECOCAMPUS RPC LAB

- Arrival of the 1st real size RPC prototype to Eco-campus Valsequillo BUAP from CERN, with the CERN and BUAP support.
- Gas system installation is being completed in the Eco-campus Valsequillo Lab (collaboration with members of CMS- IBERO)
- Test using the and RPC prototype (30cmx30cm) had been made 30cmx30cm
- Test on the real size RPCs prototypes are in progress



Summary

- CMS is a general-purpose detector
 - Wide range of topics can be explored
- Run 3 is underway:
 - Running very well
 - We are living exciting days
 - More analyses should start planning to include this data.
 - Needs are growing with LHC running conditions
- Mexico: 4 institutes are actively involved in CMS
 - High quality physics analysis have been development
 - Participation is getting bigger and more important in the next.

Thanks