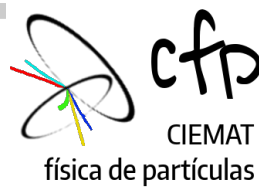




GOBIERNO
DE ESPAÑA

MINISTERIO
DE CIENCIA
E INNOVACIÓN

Ciemat
Centro de Investigaciones
Energéticas, Medioambientales
y Tecnológicas



CFP
CIEMAT
física de partículas

UAM Universidad Autónoma
de Madrid

Experimental High Energy Physics Division (CIEMAT) & Theoretical Physics Dept. (UAM)

M.I. Josa (CIEMAT)

CIEMAT:

In CMS since the Lol stage. Main contribution: 25% of DT muon detector, mechanics, RO electronics, alignment, physics analysis. Phase 1 Upgrade: SC relocation, μ TCA trigger and readout. Now: upgrade of the DT RO&trigger electronics, upgrade of L1 muon trigger algorithms.

Physics analysis, Maintenance and Operation of DT muon detector, and DT Upgrade for HL-LHC

Personnel: 11 staff, 3 long-term temporary contracts, 1 RyC, 2 senior postdoc, 5 students, + 2 people from Technology Division, + collaboration from LHC-CMS Computing group

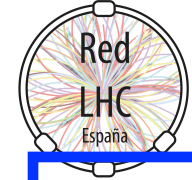
UAM:

In CMS since 2003. Main contribution: L1 muon trigger (drift tube track finder), physics analysis. Now: upgrade of L1 muon trigger algorithms

Personnel: 1 staff, 1 postdoc

Plans for Run 3: Further exploit our areas of expertise





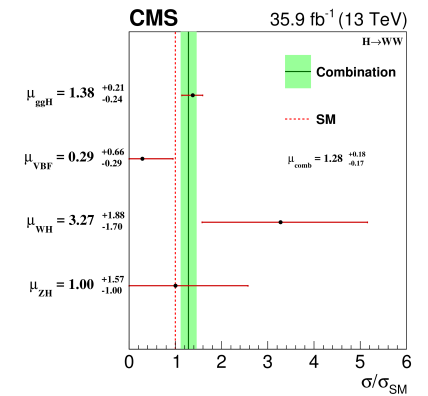
Higgs Physics

Precise studies of Higgs boson ($m_H=125$ GeV) properties in the HWW channel (Adrian's talk)

Involved now in the measurement/exclusion of Anomalous Couplings (no CMS HWW results from Run2).

Run 3: Improved precisión & finer granularity of the measurements: Inclusive, differential, STXS cross sections, couplings.... Searches of additional scalars.

Interpretation in terms of EFT.



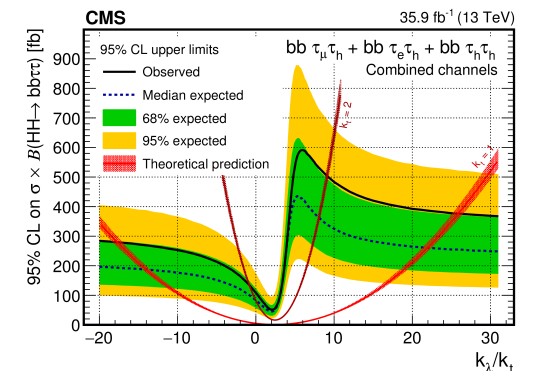
DiHiggs production in the bbtau tau channel

Currently analysing full Run 2 data: first CMS study of VBF channel in $bb\tau\tau$ final state (probing C_{2V})

Extension to resonant $X \rightarrow HH$ searches

Combination with all channels

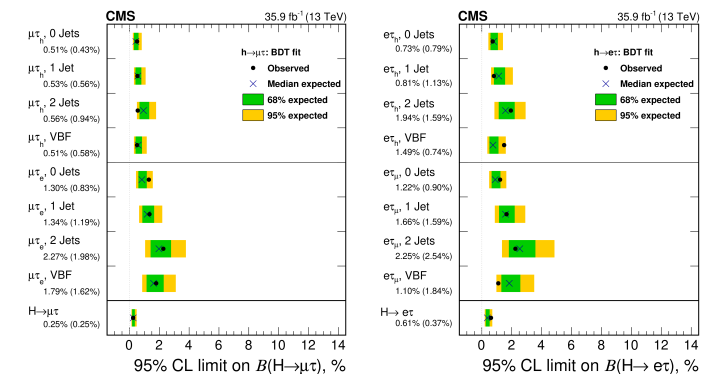
Run3: Review/improve methods

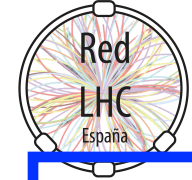


Searches for exotic decays of Higgs boson (LFV) (Lourdes' talk)

Currently analysing full Run 2 data

Run3: Extension to new signatures ($H \rightarrow e\mu$, $Z \rightarrow LFV$).





High Mass searches

Searches for high-mass resonances in final states with a lepton and missing transverse momentum

$M(W') \leq 5.2$ TeV in lepton(e, μ) + MET (2016 data). Full Run 2 results under internal CMS review.

$\sqrt{s}=14$ TeV \rightarrow Increase of parton luminosities ~ 2.6 times at 6 TeV mass.

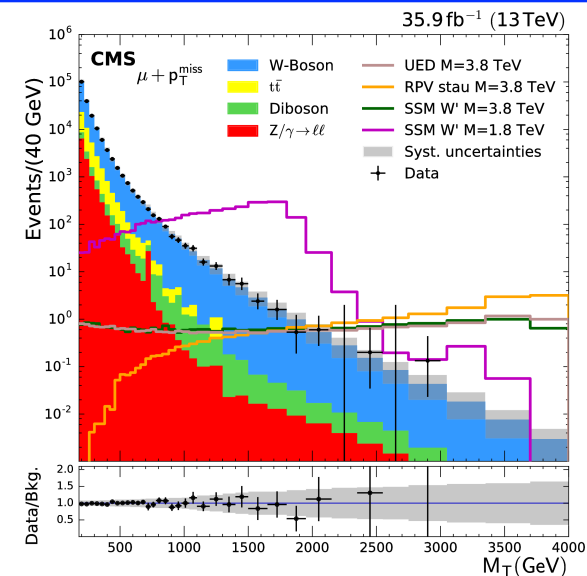
Roughly double lumi collected

\rightarrow Direct impact on high mass limits.

Extension to **charged dilepton topologies.**

\rightarrow Extend to new interpretations.

Recommissioning of CMS for triggering, reconstruction and identification of high p_T muons



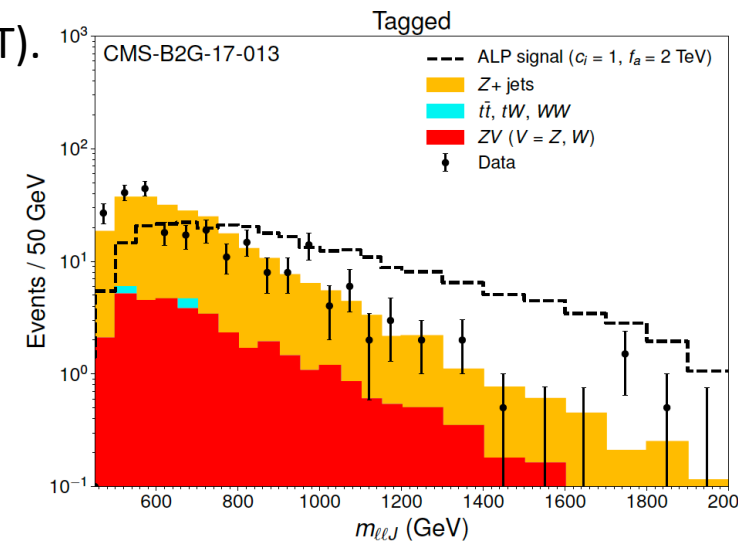
Searches for BSM at CMS using ZX diboson channels (UAM in collaboration with CIEMAT).

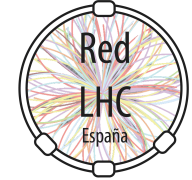
Published strong limits on the production of new spin 0, 1, 2 narrow resonances with masses up to 2 TeV. Now analysing full Run 2 data.

Plan to extend CMS searches in Run 2, Run 3 and HL-LHC with new BSM models with no resonances. Studied explicit ALP models with non-resonant diboson, dijet and ttbar production at LHC, in collaboration with theorists (B. Gavela, et al.).

Currently analysing ggF ALP channels at CMS. Involved other CMS and ATLAS groups.

VBF ALP channels will follow.





Other plans

Physics with Heavy Quarks, SM studies

Expertise in c- and b-tagging: Performance studies & application to Standard Model Vector

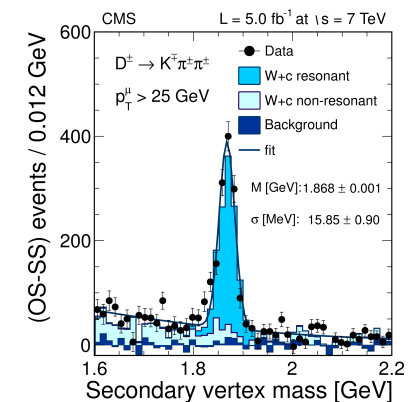
Bosons + HF jets studies

Recommissioning of c- and b-tagging in Run 3

New SMP analysis: WW production with W->cs.

New searches in topologies involving Vector Bosons and HF quarks (W'+b, Z'+b?)

Possible extension of HVV studies to more general SM/EFT analysis

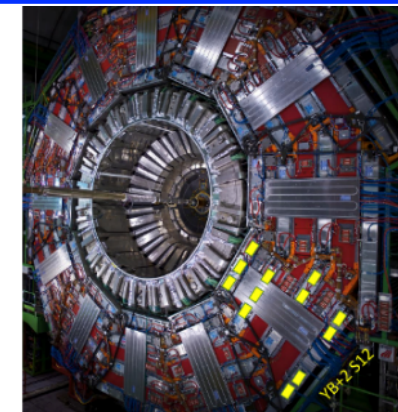


Detector operation

Insure optimal operation of DT detector in Run3. Recommissioning of the DT system after maintenance work during LS2.

Slice test: One sector instrumented with new electronics prototypes for HL-LHC. Extensively tested since 2019, continue tests with new prototypes, B field and collision data.

Development and validation in Slice Test of new trigger algorithms and firmware for HL-LHC Muon trigger.



HL-LHC

Detector side: Fabrication of new DT electronics and Trigger system. Continue studies on DT chambers longevity at GIF++.

L1 Trigger algorithms performance studies and software development.

Focus on performance of muon objects for physics

Not very defined plans yet for physics. Main interests: (di)Higgs physics, searches, ...

CIEMAT:

Physics:

Juan Alcaraz, Marcos Cerrada, Nicanor Colino, Begoña de la Cruz, Silvia Goy, Juan Pablo Fernández, Óscar González, M^aIsabel Josa (staff). María Cepeda (RyC), Dermot Moran (postdoc).

Upgrade:

Cristina F. Bedoya, M^aCruz Fouz, Ignacio Redondo (staff). Álvaro Navarro, Jesús Puerta, David Redondo (temporary contracts), Camilo Carrillo (postdoc), +2 from Technology Dept.

Students:

Adrián Álvarez, Irene Bachiller, Jaime León, Sergio Sánchez, Lourdes Urda.

UAM:

Jorge Fernández de Trocóniz (staff), Rogelio Reyes (postdoc)