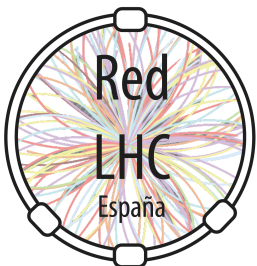


GROUP IFCA(CSIC-UC) in CMS

- We have been working on the CMS detector for almost 30 years
- We are 28 people of which 19 sign the CMS articles:
- J.A. Brochero, I.J. Cabrillo, A. Calderon, J. Duarte Campderros, C. Fernandez Madrazo, M. Fernandez, P.J. Fernandez Manteca, A. García Alonso, G. Gomez, C. Martinez Rivero, P. Martinez Ruiz del Arbol, F. Matorras, J. Piedra Gomez, C. Prieels, A. Ruiz-Jimeno, L. Scodellaro, N. Trevisani, I. Vila, J.M. Vizan Garcia
- We work on analysis and computation -T2- of Run2, Run3 and HL-LHC in addition to the design of new detectors for CMS Phase-2 (Inner Tracker and Mip Timing Detector –MTD-)



IFCA: Analysis and operation plans in RUN-3

Objects as a tool

Statistics and Machine Learning

MUONS

- Efficiencies, validation, certification and DQM
- Improvement of the high values measurement of pt (ML)
- Improvement of current Long Lived muon algorithms (trigger, ID)

B-TAGGING:

- Optimization of algorithms and definition of working points and measurement of efficiencies.

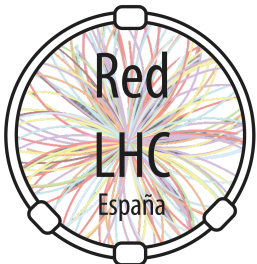
MET: important since it is a key element is all the signatures to study

Not only applied to analysis but to reconstruction of objects and trigger.

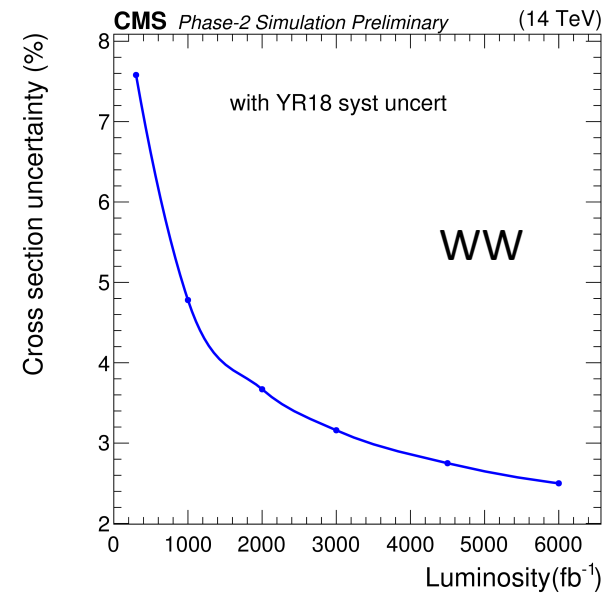
Precision measurements in EWK, Higgs

W+W- , Higgs y Top

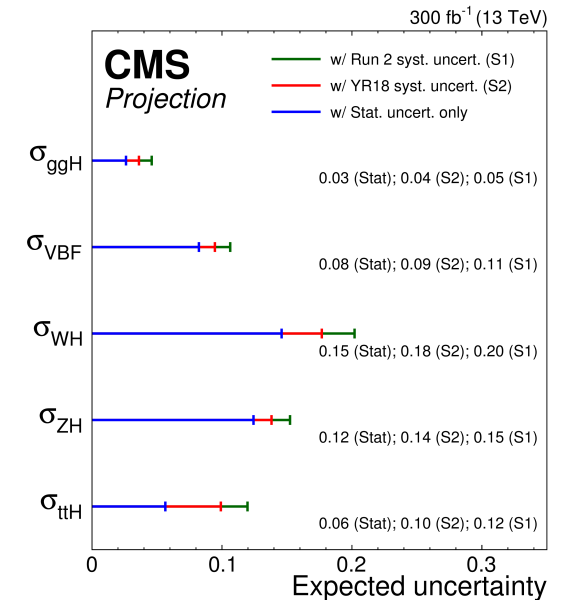
- Sensitive to new physics, irreducible background for Higgs and new searches.
- A 13-> 14TeV energy change will imply a new measurement of the Xsec (ggH: significant increase in the production cross section: ~ 13%)
- Exploit connection between top → Higgs → DM



Expected uncertainty on the cross section for W+W- with luminosity CMS-PAS-FTR-18-005



Expected uncertainty on the cross section for Higgs at run3 in 3 different cases. CMS-PAS-FTR-18-011



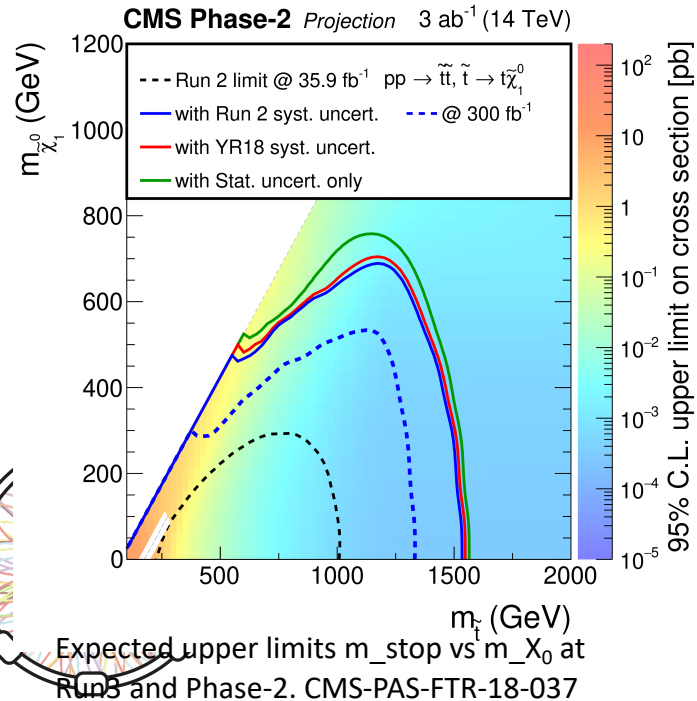
IFCA: Analysis and operation plans in RUN-3

Searching for BSM

Objective are signatures with at least 1 lepton in the final state (not only di-leptons): study of the backgrounds, increase of the statistics and the Xsec

SUSY

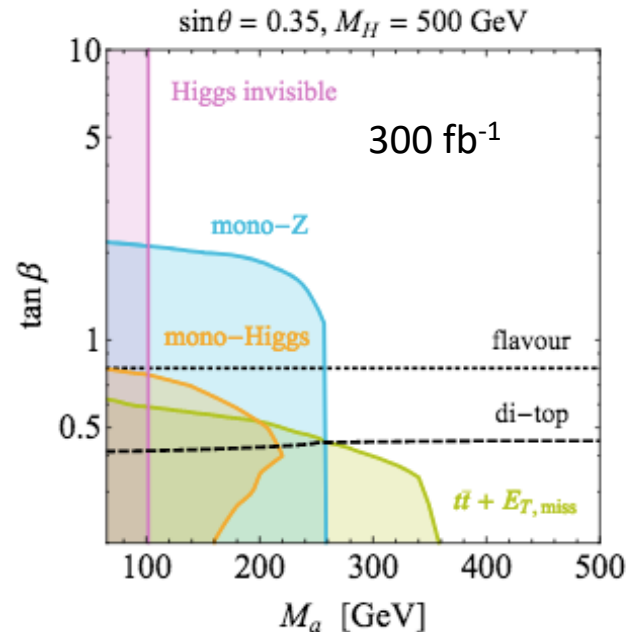
- Search for stop pairs.
- gluino and sbottom: edge-shaped or resonances
- Direct production of neutralino and chargino.



Dark Matter

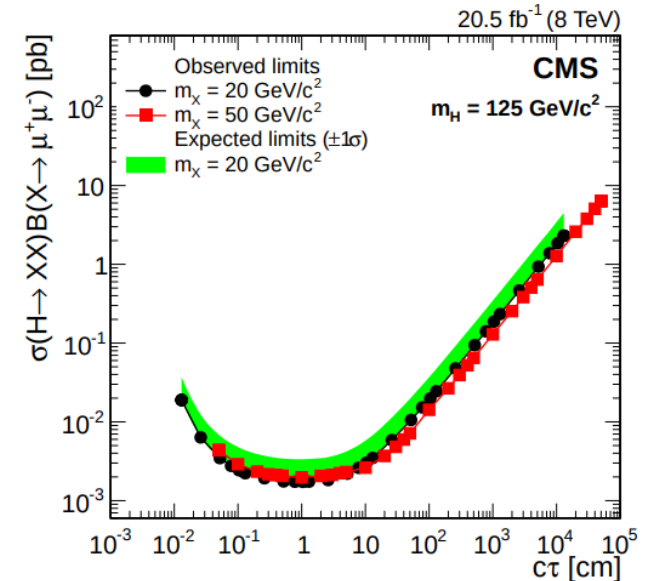
- DM produced alongside a Higgs from SM, tt, single top.
- Dark Higgs portal: target WW
- Invisible Higgs
- New signatures in the search for dark photon associated with heavy quarks.

CERN-TH-2017-011: 40 fb^{-1} , 13 TeV, MET cut > 100 GeV



Long-Lived particles

- Great effort in triggering and reconstruction of LL muons
- BSM Higgs and RPV SUSY model



Upgrade activities: HL-LHC

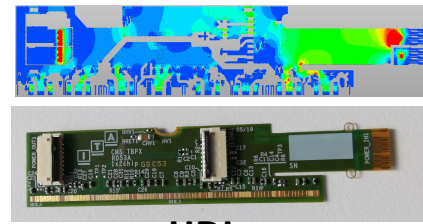
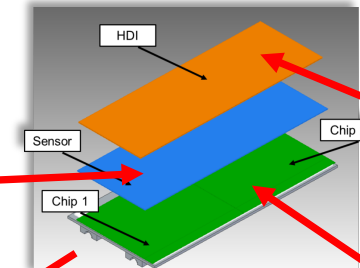
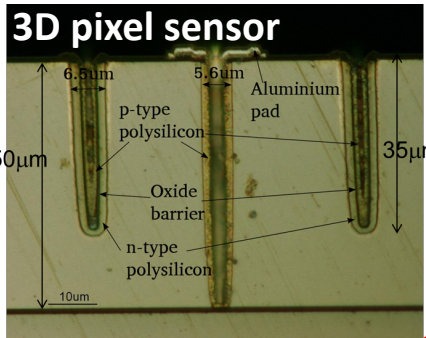
IFCA + CNM-IMB + ITAINNOVA coordinated project

CMS Inner Tracker (IT)

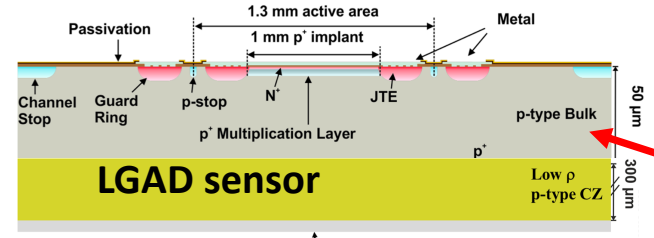
- Design production and characterization of Silicon 3D pixel sensors
- Simulation of 3D pixels in detector geometry and reconstruction
- Design of power distribution system and EMC + grounding studies
- HDI design and RD53 Readout ASIC power stage design and QA
- Inner Tracker module assembly

CMS Endcap Timing Layer (ETL)

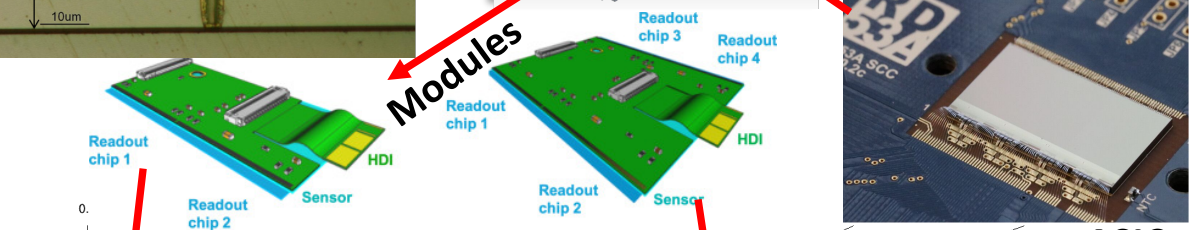
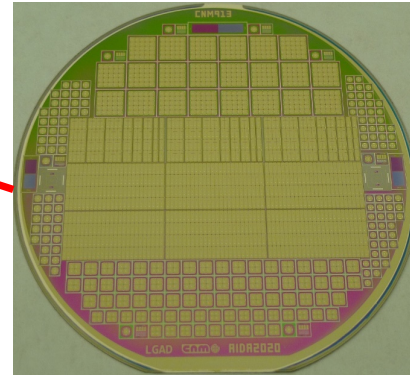
- Design production and characterization of Silicon LGAD sensors (Low Gain Avalanche Diodes)
- ETL module assembly
- DPG: geometry, reconstruction and physics simulation



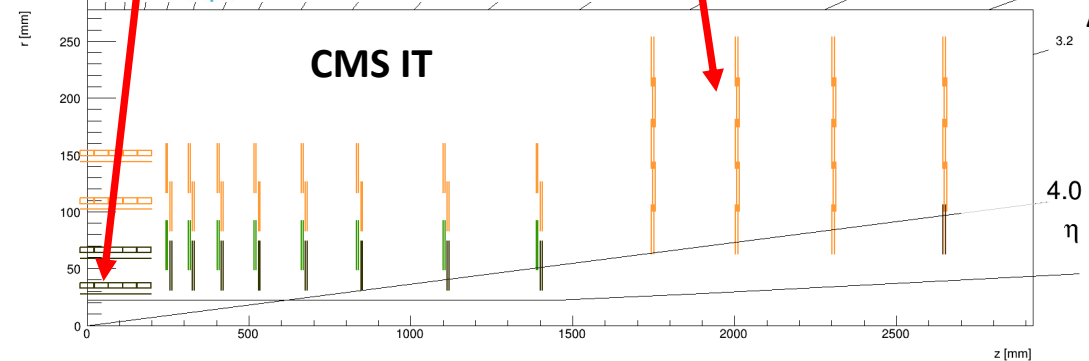
HDI



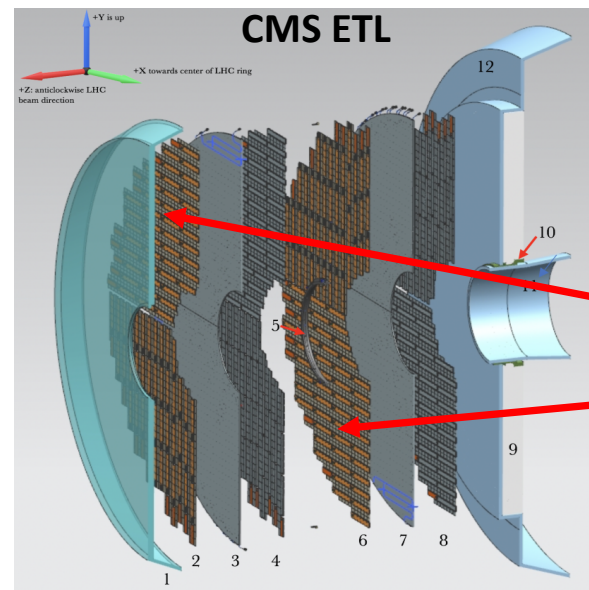
LGAD sensor



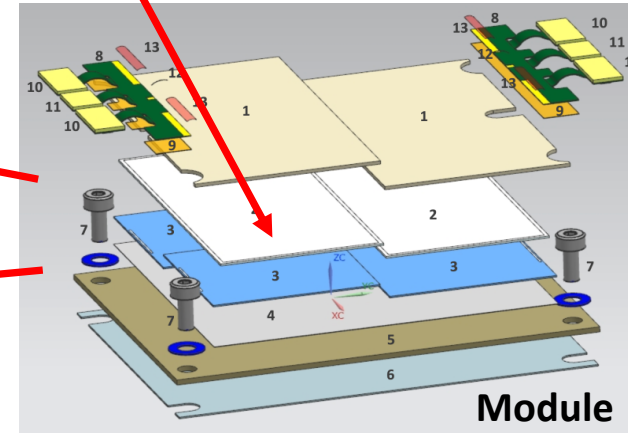
ASIC



CMS IT



CMS ETL



Module

- We have the best machine in the world! LHC can bring us really new discoveries in any moment due to the increase in Luminosity and/or energy up to 2036...
- Run3 preparation is focused on innovation, exploration of new phase space and test bench for HL-LHC. **It will not be just accumulation of luminosity!** (Luca Malgeri)

We will be focused in 2021-2027

