



The CMS Group at LLR CNRS / IN2P3

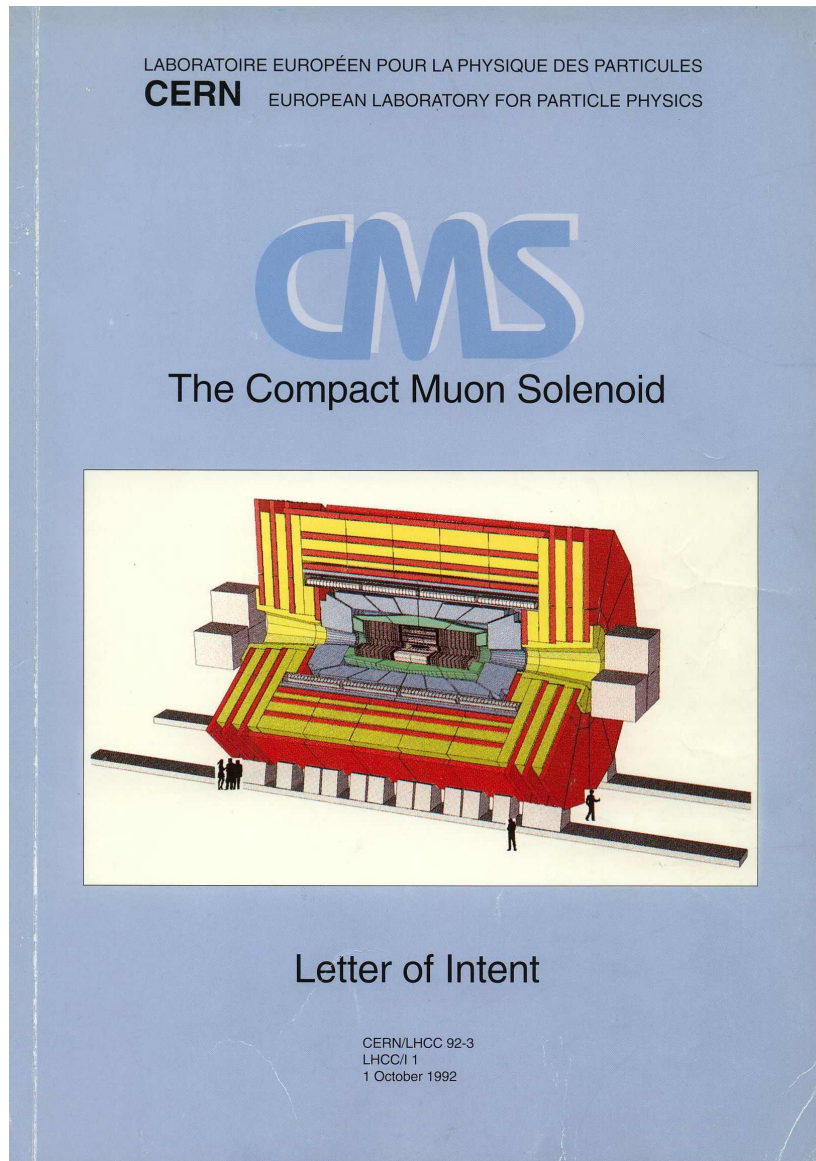
Y. Sirois
On behalf of the CMS-LLR Group

Foundation
Organization
Physics
Upgrades & Perspectives

Foundation

1999-2009

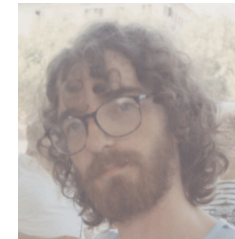
LLR as a founding member of CMS



LOI 1992

J. Badier, G. Bonneaud, A. Busata,
Ph. Busson, C. Charlot, B. Chaurand,
L. Dobrzynski, Ch. Dechandol, Ch. Gregory,
A. Karar, L. Kluberg, Ch. Lemoine,
P. Matricon, G. Morinaud, A. Romana,
R. Tanaka

2 original members still active in CMS !



Responsible for CMS-France (CEA+CNRS):

1992-1999 J. Badier (LLR)

1999-2005 L. Dobrzynski (LLR)

2006-2017 Y. Sirois (LLR)

Major contributions to the CMS ECAL and e/γ projects:

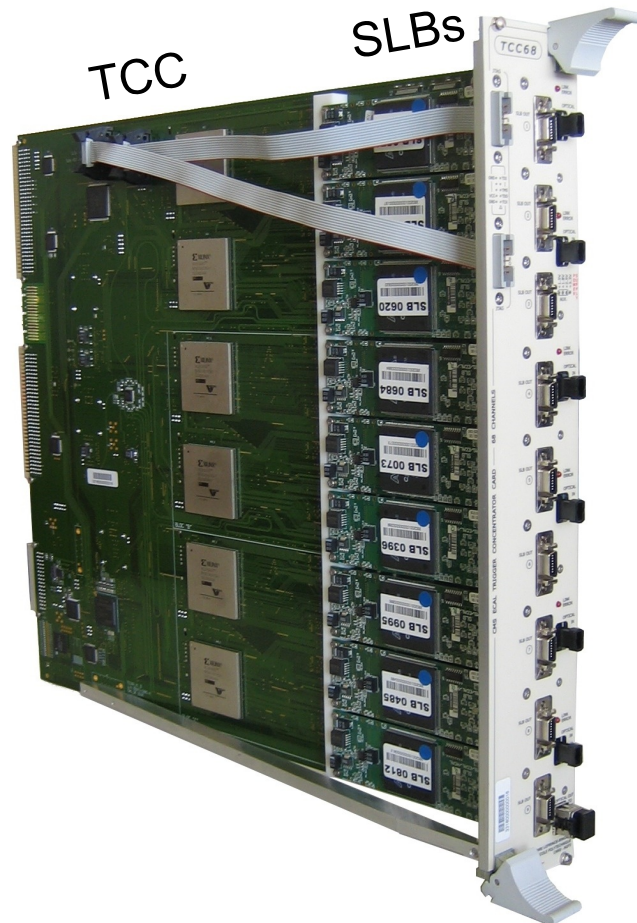
- **ECAL Mechanics** (design, alveoli)
- Tests of the ECAL Front-end cards
- **ECAL Trigger conception and construction**
- **ECAL Test Beam** campaigns, **e/γ reconstruction & Id.**

Contributions to the CMS Computing Projects:

- Contributions to CMS Software model & reconstruction
(ORCA, CMSSW, ...)
- Development of the Fast Simulation (FAMOS)
- Development of major "GRID" facilities (**LLR-GRIF** CC IN2P3)

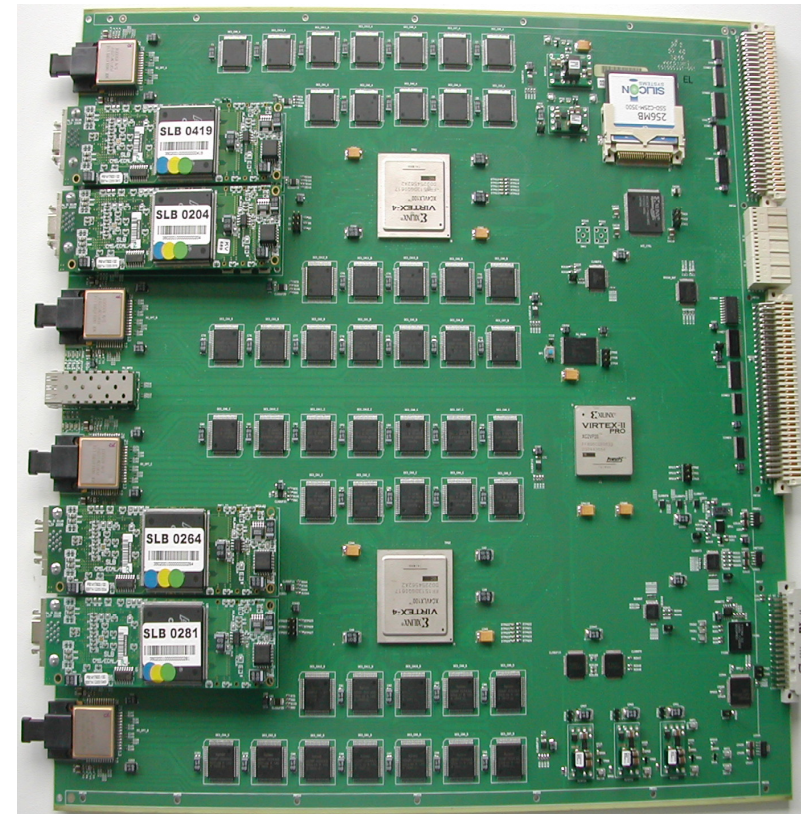
ECAL Trigger Conception and Construction

TCC-EB (« TCC68 »)
36 boards, 68 trigger towers



Engineers: M. Bercher, D. Lecouturier,
Y. Geerebaert
Physicists: Ph. Busson, P. Paganini

EE Trigger Concentrator Card:
72 boards, 48 « pseudo-strips »



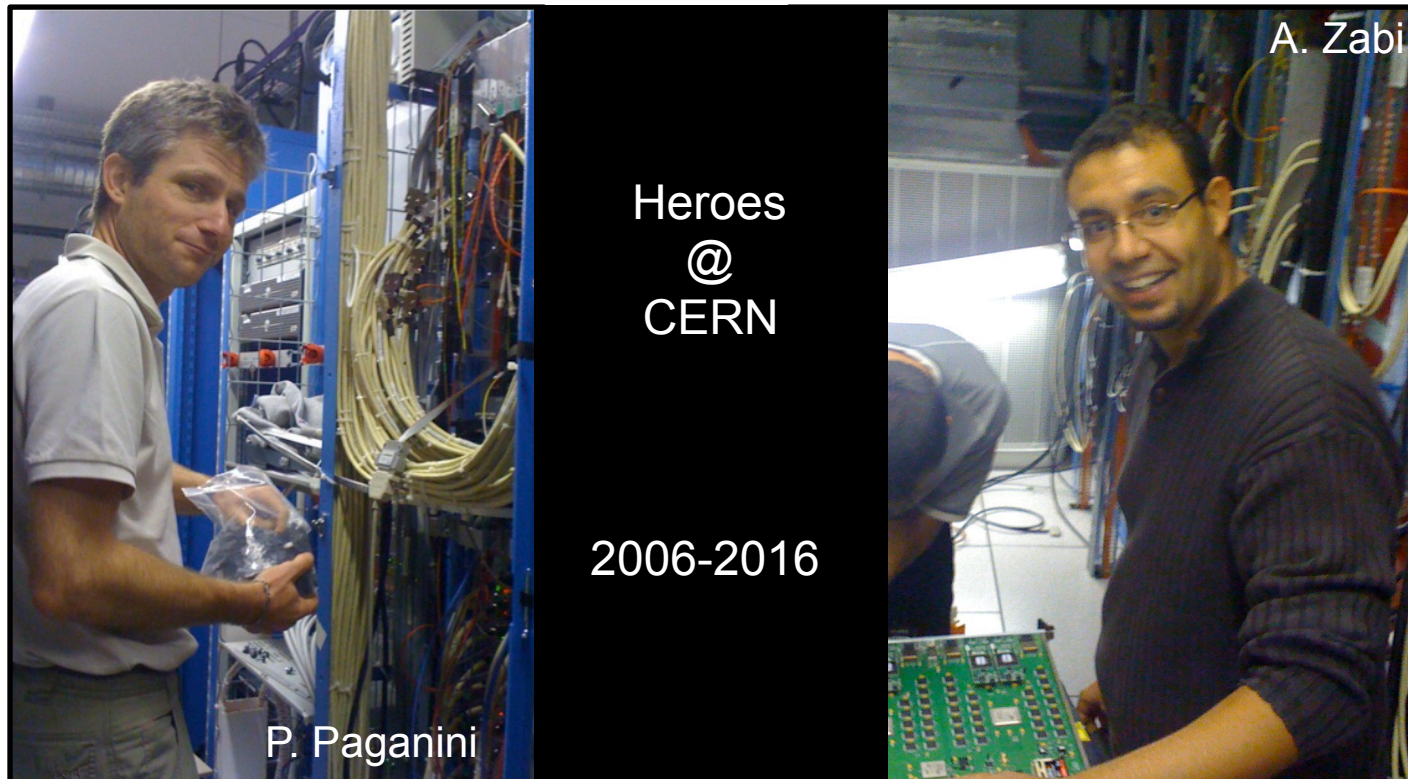
Engineer.: T. Romanteau
Physicist: Ph. Busson

See back-up slides for additional info.

The CMS ECAL Trigger Electronics

Invention of the ECAL trigger primitives (Ph. Busson)
and Selective Readout concept (Ph. Busson/J. Varela)

Construction of the Trigger Concentration Cards (Ph. Busson, P. Paganini et al.)
Integration and Commissioning at CERN (P. Paganini/A. Zabi et al.)



Responsible @ CERN
2006-2010

Responsible @ CERN
2010-2016

Maintenance and operation @ CERN : A. Zghiche (2016-2018), I. Kucher (2018)

e/ γ reconstruction and Pflow techniques

- **Reference paper from 2007 ... cited in the H boson discovery paper of 2012 !**

Eur. Phys. J. C 49, 1099–1116 (2007)
DOI 10.1140/epjc/s10052-006-0175-5

**THE EUROPEAN
PHYSICAL JOURNAL C**

Special Article – Scientific Note

Electron reconstruction in CMS

S. Baffioni¹, C. Charlot¹, F. Ferri^{1,2}, D. Futyan³, P. Meridiani⁴, I. Puljak^{5,a}, C. Rovelli^{1,2}, R. Salerno^{1,2}, Y. Sirois¹

¹ Laboratoire Leprince-Ringuet, Ecole Polytechnique and IN2P3-CNRS, 91128 Palaiseau Cedex, France

² Università degli Studi Milano-Bicocca and INFN-Sezione di Milano, 20216 Milano, Italy

³ University of California, Riverside, CA 92521, USA

⁴ Università “La Sapienza”, Dipartimento di Fisica and INFN-Sezione di Roma, 00185 Roma, Italy

⁵ Technical University of Split, FESB, 21000 Split, Croatia

- **Reference paper from 2015 ... served all CMS papers since then (> 550 citations !)**

Jinst

PUBLISHED BY IOP PUBLISHING FOR SISSA MEDIALAB

RECEIVED: February 9, 2015

ACCEPTED: April 14, 2015

PUBLISHED: June 10, 2015

Performance of electron reconstruction and selection with the CMS detector in proton-proton collisions at $\sqrt{s} = 8$ TeV

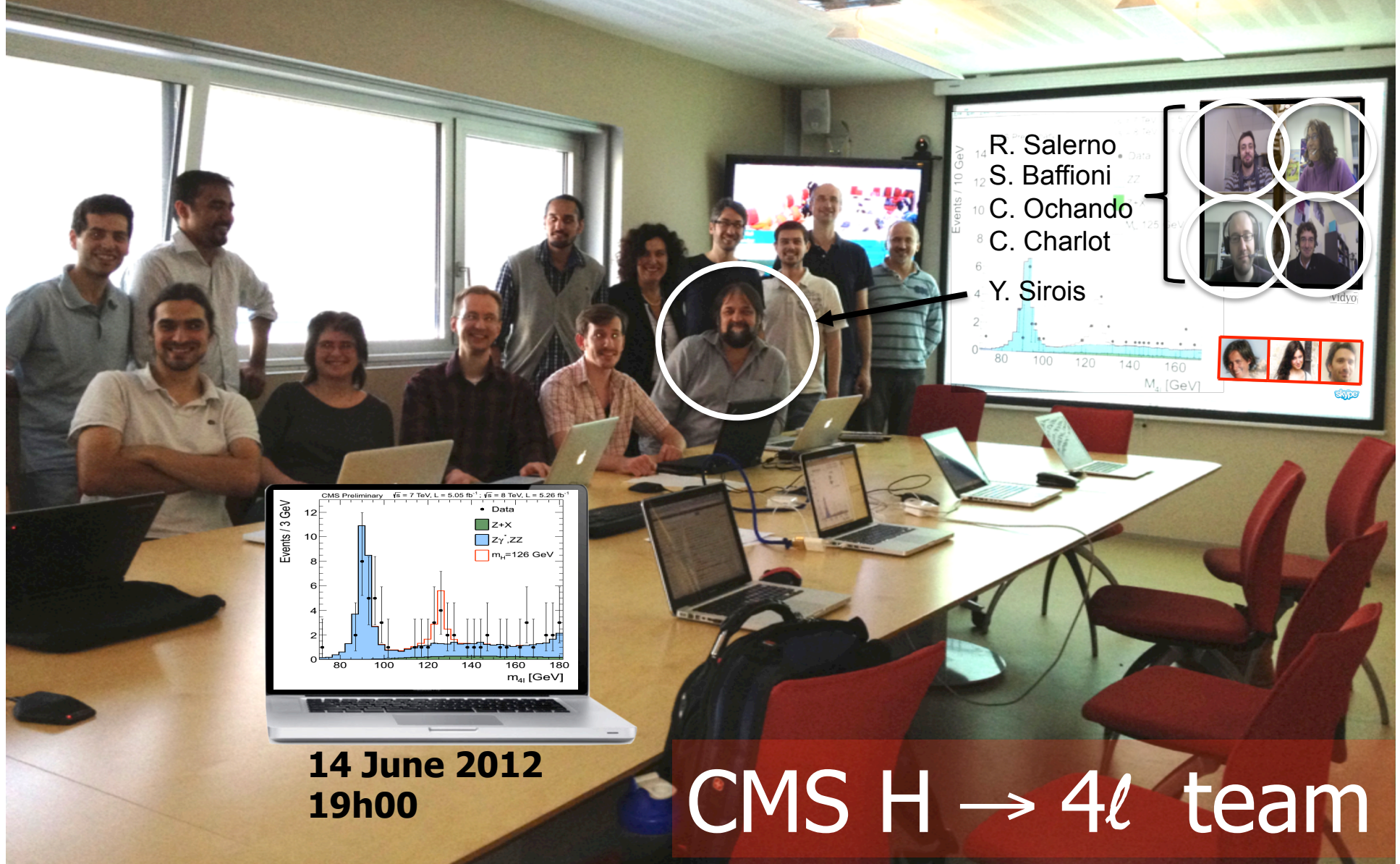
- Contributions to the developments of the early Pflow techniques at LLR from (C. Bernet, F. Beaudette, ... LLR PhD Students)

H boson discovery

2009-2013

5 photo-memories

Analysis groups meet separately around mid-June 2012 CMS unblinds the critical masse range ...



14 June 2012
19h00

CMS $H \rightarrow 4\ell$ team

Rencontres de Moriond QCD and High Energy Interactions

La Thuille, March 9-16, 2013

Thursday
March 14th 9h30

C. Ochando

Conclusion

Evidence for SM Higgs candidate at $\sim m_H=126$ GeV is growing

- > 3 major $H \rightarrow VV$ channels updated with full dataset. + rare modes (in back-up)
- > Significance of observation:
 - $H \rightarrow ZZ \rightarrow 4l$: 6.7σ (7.2 exp.)
 - $H \rightarrow WW$: 4.1σ (5.1 exp.)
 - $H \rightarrow \gamma\gamma$: 3.2σ (4.2 exp.)

So far, all individual channels are consistent with the SM, within uncertainties (statistically dominated)

Moving to precise measurement of properties:

- Mass: $m_H = 125.8 \pm 0.5$ (stat.) ± 0.2 (syst.) $H \rightarrow ZZ \rightarrow 4l$
- Mass: $m_H = 125.4 \pm 0.5$ (stat.) ± 0.6 (syst.) $H \rightarrow \gamma\gamma$
- Production Mechanisms: See Andrew's talk.
- Spin-Parity hypothesis tests:

**CERN Press Release – March 14th 10H30 – Rolf Heuer (CERN Director)
« New results indicate that particle discovered at CERN is a Higgs boson »**

Stockholm – July 2013

Convey my congratulations
to ATLAS, CMS and to the
LLR Group from X/CNRS !



EPS HEP 2013 Prize is awarded to

ATLAS and CMS Collaborations

« for the discovery of a Higgs boson, as predicted by the Brout-Englert-Higgs mechanism »



The Nobel Prize in Physics 2013

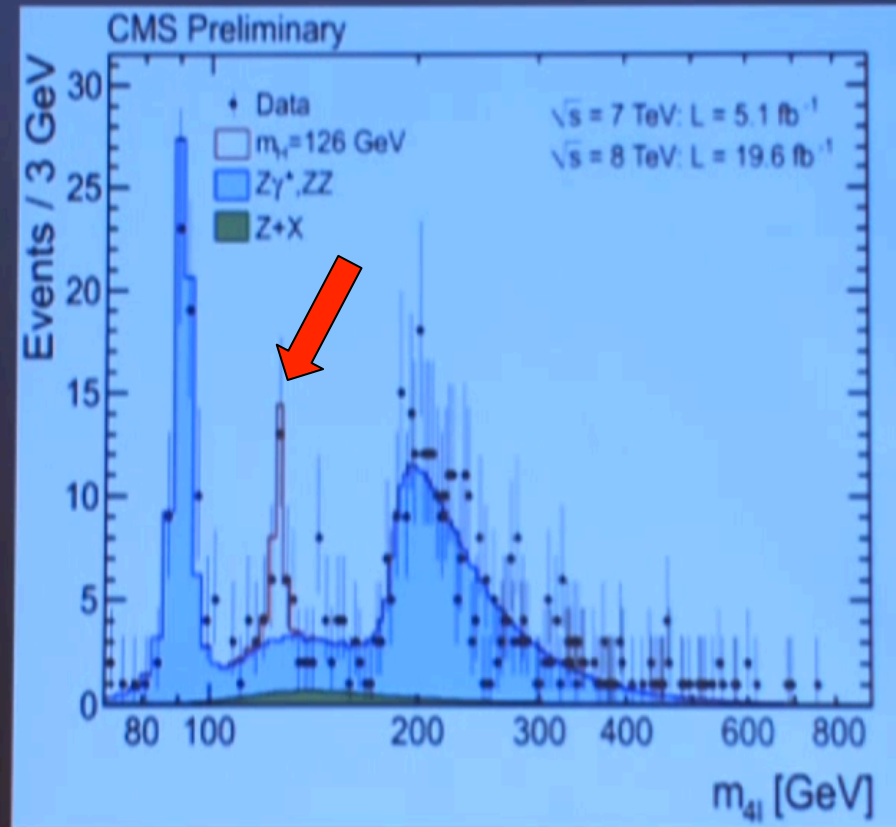
The Nobel Prize 2013



Figure courtesy of R. Salerno



LLR post-doc



<https://twiki.cern.ch/twiki/bin/view/CMSPublic/Hig13002TWiki>

Evolution of the signal for the new particle in 2011 and 2012



François Englert, Peter Higgs

#NobelPrize

Nobelprize.org



Pot LLR pour le « Prix Nobel »
Octobre 2013

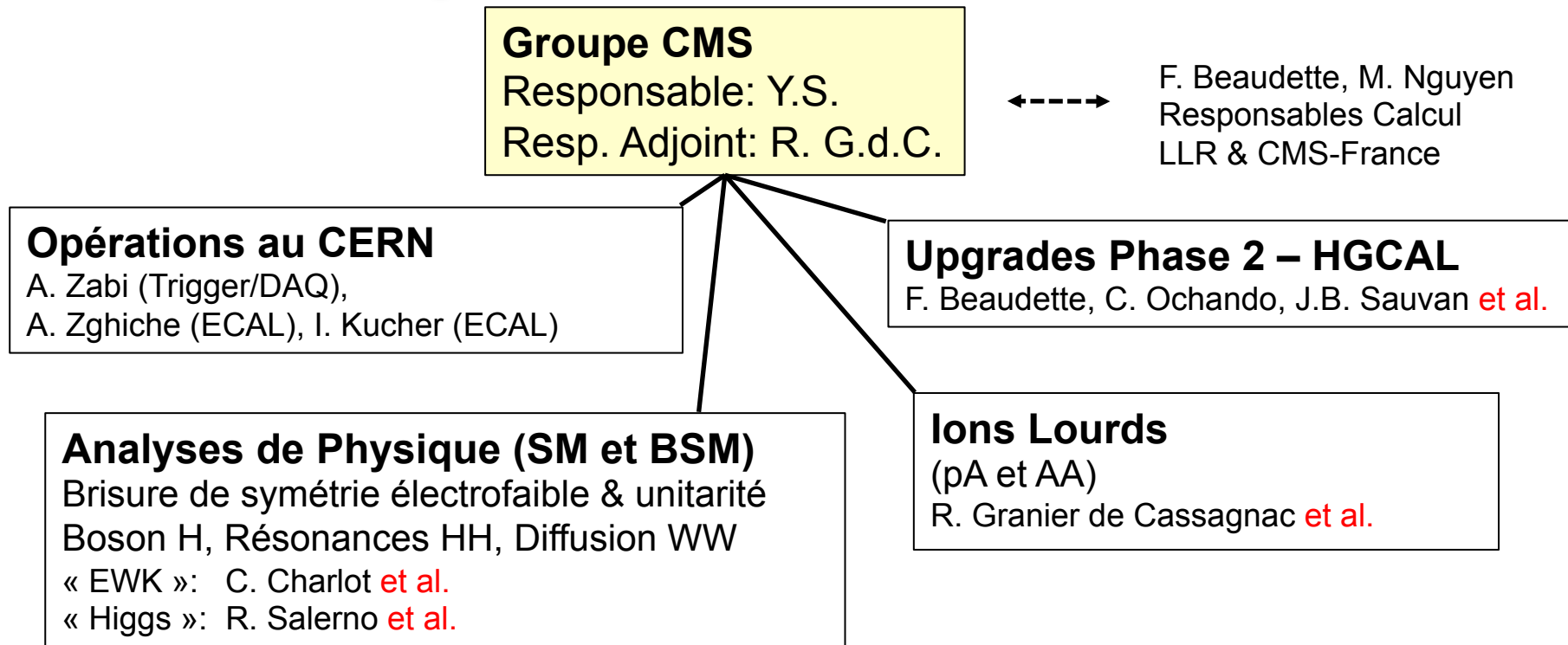
Groupe CMS au LLR
Expérience CMS:
Prix EPS HEP 2013, Prix Nobel 2013

CMS-LLR

2013-2018

Tourniquet 2018

Organisation de CMS au LLR



Le groupe encourage fortement la porosité entre les activités pour garantir

- flexibilité (capacité à réagir aux « coups de feu », e.g. trigger, publications)
- activités cohérentes partagées (trigger, « workflow » d'analyse complets, expertise partagée sur le trigger, HLT, les électrons, les tau, les MEM etc.),
- une forte implication partagée dans la R&D ...

CMS LLR ↔ Des détecteurs jusqu'aux publications de physique

Note: Le Tier2/3 local (A. Sartirana) est un atout absolument essentiel

Responsabilités Officielles dans CMS-Monde

CMS at CERN:

A. Zghiche	Resp. ECAL Detector Performance Group (L2)	09/2018-09/2020
I. Kucher	Resp. for ECAL Trigger/DAQ (L2)	2018
A. Zabi	Phase 2 L1 trigger upgrade co-coordinator (L2)	09/2017-09/2019

DETECTOR UPGRADES (HGCAL):

C. Ochando	Resp. for E-CAL cassettes (L2)	
J.-B. Sauvan	Resp. HGCAL trigger TPG subgroup (L3)	
A. Lobanov	Resp. for HGCAL Systems Validation (L2)	

PHYSICS:

R. Salerno	Resp. for CMS Higgs PAG (L2)	09/2017-09/2019
C. Ochando	Resp. for HZZ subgroup (L3)	09/2018-09/2020
A. Stahl	Resp. for « Hl di-leptons » subgroup (L3)	2018

Effectifs actuels de CMS au LLR

- **9 chercheurs permanents « pp » + 2 « HI » (CNRS)**

^{pp}

F. Beaudette, P. Busson, C. Charlot,, Ch. Ochando. R. Salerno*, J.-B. Sauvan,
Y. Sirois, A. Zabi*, A. Zghiche

* Currently « CERN associate »

^{ions lourds}

R. Granier de Cassagnac, M. Nguyen (+ F. Arléo, Théorie QGP, non-M&O)

- **1 post-docs « pp » + 1 « HI »**

A. Lobanov (< 31/05/2019, P2IO), **I. Kucher (<31/08/2020, ANR)**

- **6 doctorant(e)s « pp » + 1 « HI »**

7 thèses en cours dont 2 débutant en 2018 et 2 co-tutelles (**LHC Run II full datasets**):

Trigger and object ID, HGAL, H boson, HH production, VV Scattering, etc...

Chiara Amendola, **Batoul Diab**, Duje Giljanovic*, Cristina Martin Perez, Marina Prvan*,
Jonas Rembser, and Matteo Bonanomi

* Co-tutelle with FESB and U. Zagreb, Croatia

21 thèses complétées au sein de CMS-LLR de 1998 à 2015 (**R&D et LHC Run I**)

+ 7 thèses complétées en 2017 et 2018 (**Upgrade Phase I et LHC Run II**)

- Taux de chômage chez les anciens doctorant(e)s : 0%

- Déjà, une dizaine de permanents en recherche fondamentale:

CNRS, CEA, FESB et Univ. Split, U. Roma «L Sapeinza» , U. Milano Bicocca, U. Pisa ...

Evolution RH dans CMS au LLR

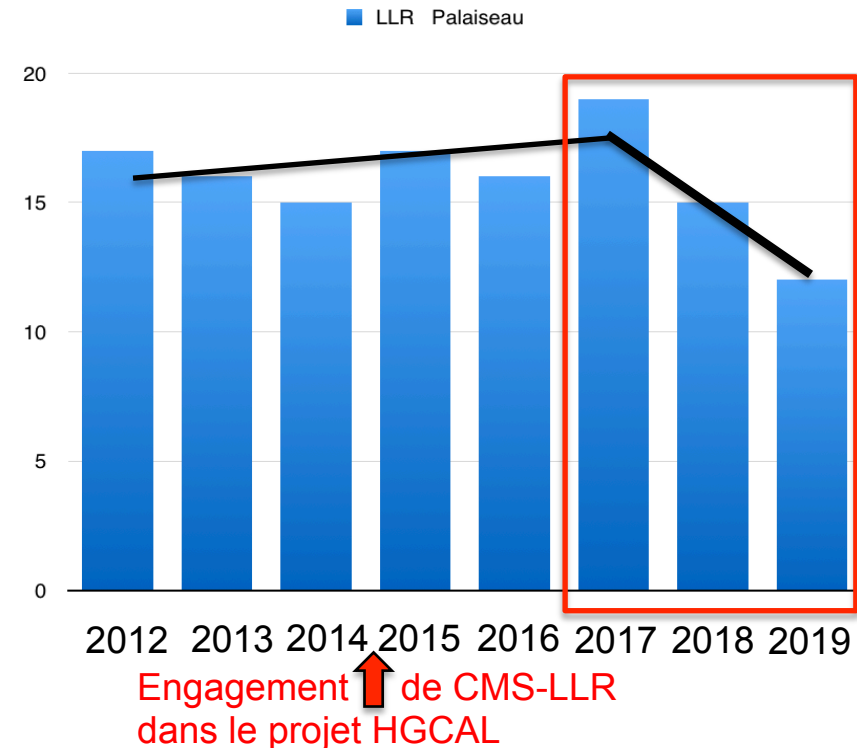
- Forte **Diminution** récente des M&O !

M&O = permanents + post-docs

- **Migration** de 2 HDR en 2017
- **Fins de divers contrats** post-docs (ANR, LabEX, ERC, IN2P3)

La baisse des effectifs M&O est contraire aux engagements pris en 2014-15 avec l'IN2P3 de maintenir un effectif constant pour assurer nos engagements:

Opération + Analyses + **Upgrades**



Nous souffrons d'un ratio post-doc / thésard(e)s = 1/6 beaucoup trop faible !!!

Un support en poste de chercheur CNRS & post-docs est essentiel pour poursuivre avec succès nos recherches et engagements LHC et HL-LHC

Le remplacement Thierry Romanteau (firmware/trigger) + 1 physicien-ingénieur (HGAL system tests) + respect des engagement du LLR (CTRP etc.) pour les RHs en mécanique sont sur le chemin critique de l'upgrade de CMS pour HL-LHC

Ramifications nationales et internationales

(relations privilégiées de CMS-LLR)

- Collaboration étroite depuis 20 ans avec **FESB Split**, Croatie
 - co-tutelles, HGAL Trigger et tests HGAL, analyses HZZ et de diffusion VV
- Collaboration avec **IC London, UK** pour le déclenchement (ECAL, HGAL)
- Collaboration forte depuis ~ 7 ans avec **John Hopkins U.**, Torino U., FESB Split, et Florida U. pour HZZ
 - déclenchement, reconstruction et identification des électrons; framework « CJLST » pour tous les résultats officiels de CMS, adaptation pour analyses de diffusion di-bosons
- Collaboration forte depuis ~ 3 ans avec **U. de Pisa** et Milano B. pour la production HH
 - déclenchement, reconstruction et identification des leptons tau; framework pour tous les résultats $bb\tau\tau$ officiels de CMS et combinaison HH
- Participation au **VBSCan**: Vector Boson Scattering Coord. and Action Network
 - Workshop international au LLR en octobre 2018 !
- Participation au « **Google Summer of Code** » avec un étudiant indien.
- Démarrage du **ANR « HiGrants »** de J.-B. Sauvan

Applications pour:

- Projet **PRC CNRS-DST** pour une Collaboration avec l'U. of Bangalore, India.
- Projet **ERC** pour la diffusion VV avec Mariarosaria D'Alfonso

Visibilité et Rayonnement du groupe CMS au LLR

- Contributions majeures à la construction du détecteur ECAL et du système de déclenchement ECAL; développement des méthodes de reconstruction e/γ , τ et Pflow; stratégie d'analyse et **principaux protagonistes CMS de la découverte du boson H dans la voie $H \rightarrow 4$ leptons**; mesure de m_H , S^{CP} , et largeur intrinsèque Γ_H ; **évidence pour $H \rightarrow 2$ tau**; découverte ttH , ...
- Dans CMS, les présentations « on behalf of CMS » sont d'abord et avant tout attribuées en fonction du mérite explicite sur le sujet traité:

132 présentations en conférences nationales et internationales au cours de la période 2013 – septembre 2018 !

- **En moyenne, un « Prix de Thèse de CMS » tous les cinq ans !**
NDLR: 1 prix chaque année pour les thèses avec analyses de physique; CMS-LLR récolte 22 % des prix de thèse de CMS depuis les origines pour 1% de la Collaboration !
+ de **nombreux autres prix pour nos thésards et post-docs**
- **Auteur ou éditeur principal d'une cinquantaine de publications de physique « pp » de CMS depuis la découverte en 2012**
(liste de 20 représentatives en « back-up » pour la période 2013-2017)
- **Organisation de 51 conférences ou écoles internationales de physique entre 2013 et 2017**
(liste en « back-up » pour la période 2013-2017)

As decided back in the 2000's:

Main focus on the Spontaneous Electroweak Symmetry Breaking

- Existence of short and long distances interactions
- Origin of the particle masses (H field, single H production)
- Characterisation of the H boson
- How to stabilize the H boson mass (hierarchy problem)
- Explore extended (BSM) scalar sector (needed e.g. in SUSY)

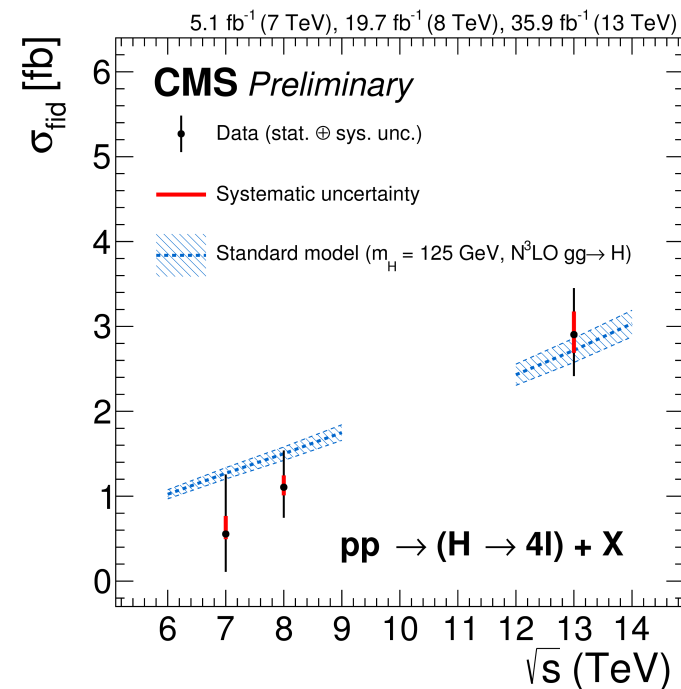
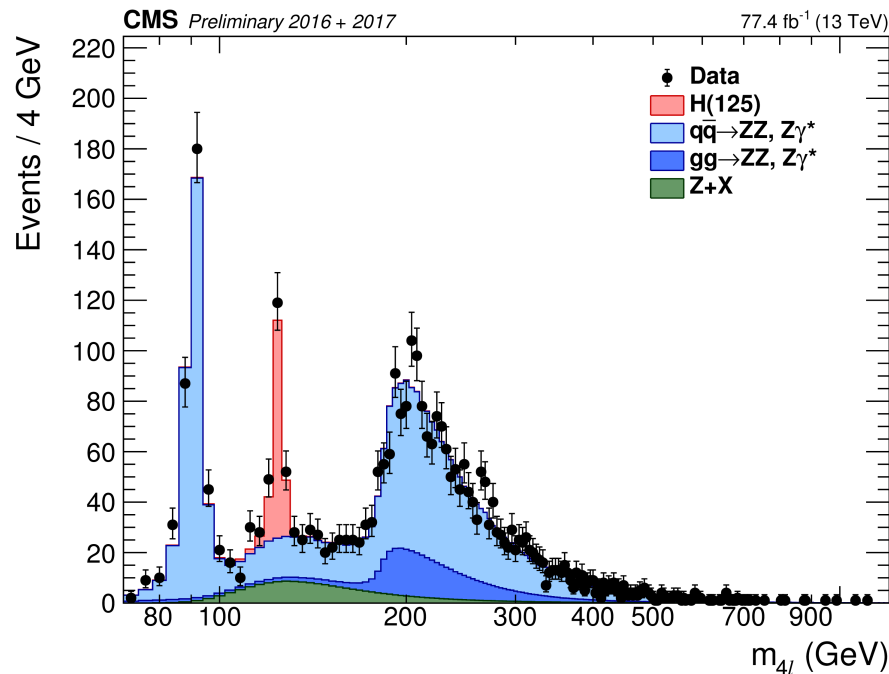
- Understand and constrain the Higgs potential (HH production)
- Verify unitarization of the Standard Model at the TeV scale
- Study VV scattering in the goldstone boson regime
- Interplay of H with VV and trilinear and quartic couplings

- Connection with reheating in cosmology or early Universe
- Possible connection with the scalar field of the inflation

NOUVEAU!

Caractérisation du boson H via $H \rightarrow 4\ell$

- Objectifs: M_H , Γ_H , S^{CP} , distributions différentielles, ...
- Principal résultat récent de CMS présenté à Moriond 2017
[CMS-LLR: co-auteurs et co-éditeurs de toutes les publication $H \rightarrow 4\ell$ depuis la découverte]
- Toutes catégories de production et désintégrations (dont VH ; $H \rightarrow bb$)
- Amélioration récente de la précision sur la masse: $m_H = 126.25 \pm 0.2$ (1.6 ‰)



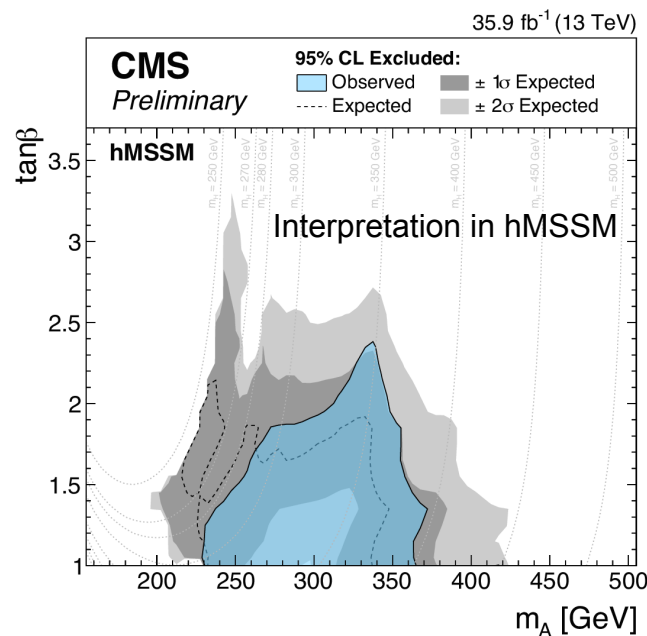
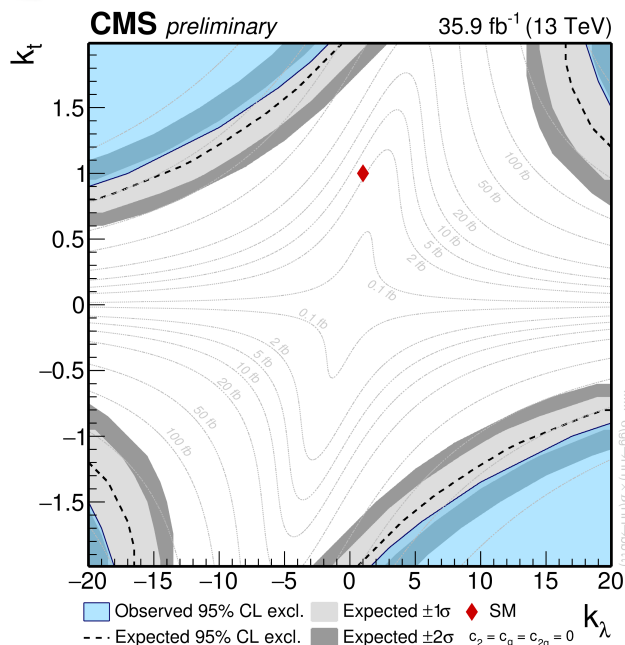
Note: Thèse de doctorat H @ 4 ℓ de **Simon Regnard** terminée en 2016
Thèse de doctorat H @ 4 ℓ de **Toni Sculac** prévue en 2018
Thèse de doctorat H/HH de **Matteo Bonanomi** en cours

Production de paires HH

NOUVEAU!

- Extraire une valeur du couplage (ou des contraintes) sur le couplage tri-linéaire λ_{HHH} et accéder ainsi à la forme du potentiel scalaire (EWSB)

- e.g. {
- Seul résultat CMS présenté à Moriond 2017 concernant la production HH !
[CMS-LLR: auteurs, éditeurs + orateur désigné à Moriond 2017; soumis à PLB]
 - Analyse complète des données 13 TeV dans la voie $HH \rightarrow b\bar{b} \tau\tau$ interprété en terme de contraintes de couplage au top κ_t et auto-couplage κ_λ
 - Meilleure sensibilité pour l'auto-couplage au LHC (« highlight EPS HEP 2017 ») !

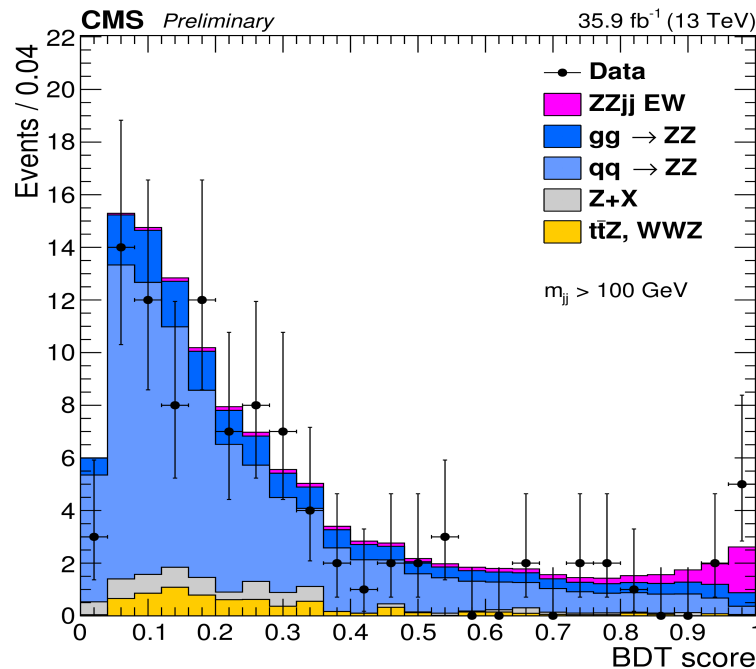


Note: Thèse de doctorat HH de **Luca Cadamuro** terminée en 2017
Thèse de doctorat HH de **Chiara Amendola** en cours

NOUVEAU!

Diffusion de bosons vecteurs (VBS)

- Première évidence pour la production électrofaible de paires ZZ (diffusion de bosons vecteurs) – signal à 2.7σ
[CMS-LLR: auteurs, éditeurs + orateur désigné à LHCP 2017]



Coupling	Exp. lower	Exp. upper	Obs. lower	Obs. upper	Unitarity bound
f_{T_0}/Λ^4	-0.53	0.51	-0.46	0.44	0.6
f_{T_1}/Λ^4	-0.72	0.71	-0.61	0.61	0.6
f_{T_2}/Λ^4	-1.4	1.4	-1.2	1.2	0.6
f_{T_8}/Λ^4	-0.99	0.99	-0.84	0.84	2.8
f_{T_9}/Λ^4	-2.1	2.1	-1.8	1.8	2.9

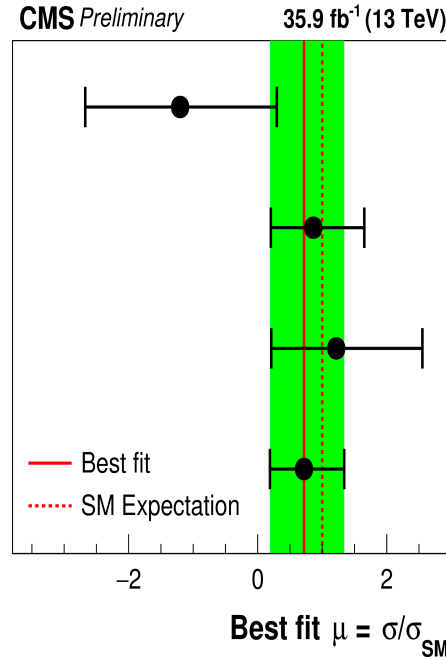
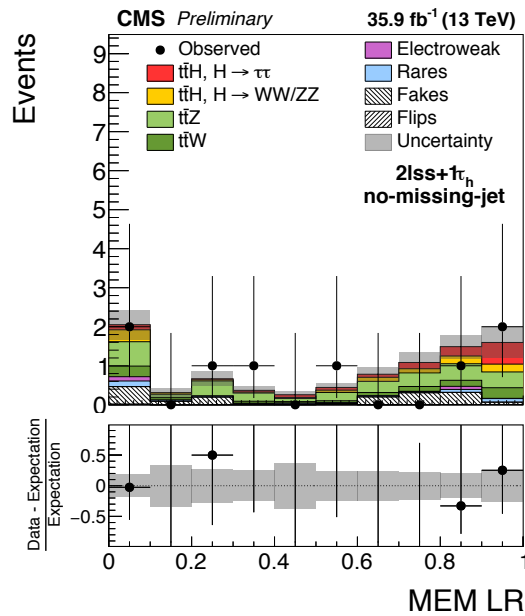
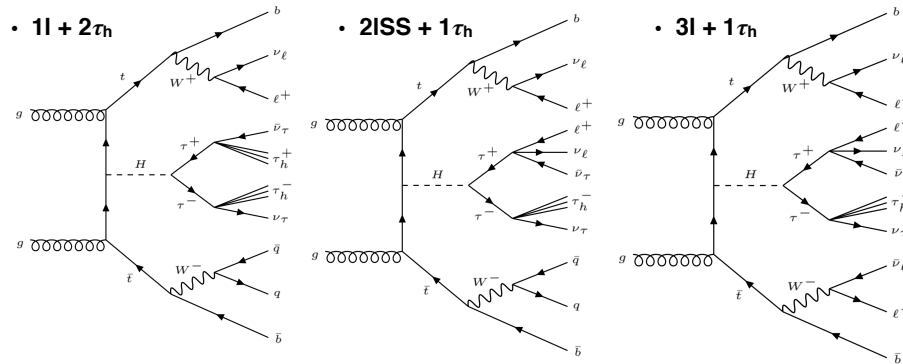
Limites à 95% CL que les opérateurs quartiques (aTGC) en unité TeV^{-4}

Note: Thèse de doctorat VBS de **Ph. Piggard** terminée en 2017
Thèse de doctorat VBS ZZ de **Duje Giljanovic** en cours
Thèse de doctorat WWZ prod. de **Jonas Rembser** en cours

NOUVEAU!

« Découverte » ttH

- Développement d'une analyse par éléments de matrice + GPU pour les catégories $2\ell SS+1\tau$ et $3\ell+1\tau$ (PAS et publication)



$$1l+2\tau_h$$

$$\mu = -1.20^{+1.50}_{-1.47}$$

$$2lss+1\tau_h$$

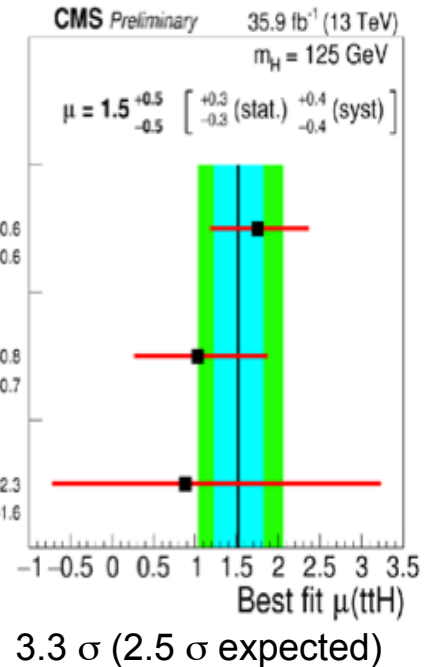
$$\mu = 0.86^{+0.79}_{-0.66}$$

$$3l+1\tau_h$$

$$\mu = 1.22^{+1.33}_{-1.01}$$

$$\text{Combined}$$

$$\mu = 0.72^{+0.62}_{-0.53}$$



$$m_H = 125 \text{ GeV}$$

$$\mu = 1.5^{+0.5}_{-0.5} \left[\begin{matrix} +0.3 & +0.4 \\ -0.3 & -0.4 \end{matrix} \right] \text{ (stat.) (syst.)}$$

$$2l$$

$$\mu = 1.8^{+0.6}_{-0.6}$$

$$3l$$

$$\mu = 1.0^{+0.8}_{-0.7}$$

$$4l$$

$$\mu = 0.9^{+2.3}_{-1.6}$$

3.3 σ (2.5 σ expected)

Note: Thèse de doctorat sur la production ttH de **Th. Strebler** terminée en 2017
Thèse de doctorat ttH de **Cristina Martin Perez** en cours



Replace two End-Caps for HL-LHC
(radiation damage of the PbWO_4 crystals)

Need to sustain

- Up to 10^{16} neutrons/cm²
- Up to ~ 200 pile-up events

Need for a High Granularity
Calorimeter with E, P and
Timing capabilities

HGCAL



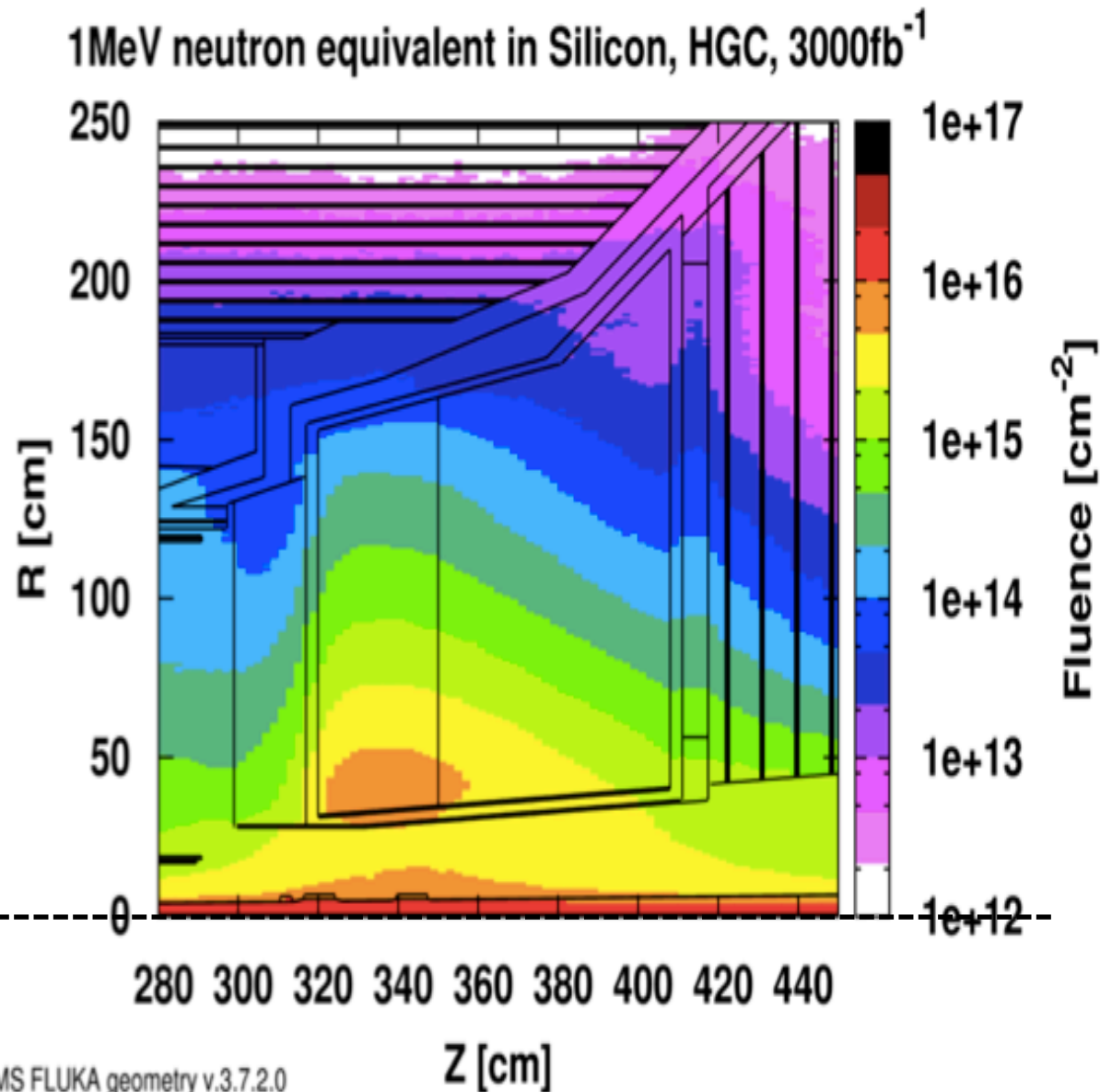
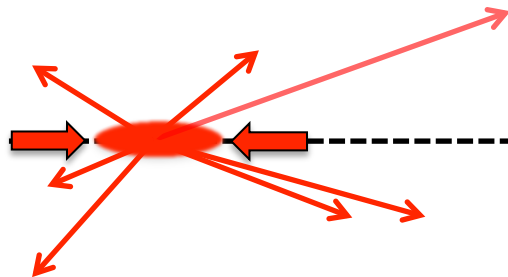
High Granularity for CMS at HL-LHC

To cope with neutrons:

adapt Si thickness vs η

adapt cell size vs η

maintain S/N $\gg 2$ over full η range up to 3000 fb⁻¹





High Granularity for CMS at HL-LHC

A new generation of calorimeter:

“5D” measurements

E by calorimetry

x,y,z by tracking

t with $\sigma = 50$ ps/cell

In total

6 million channels

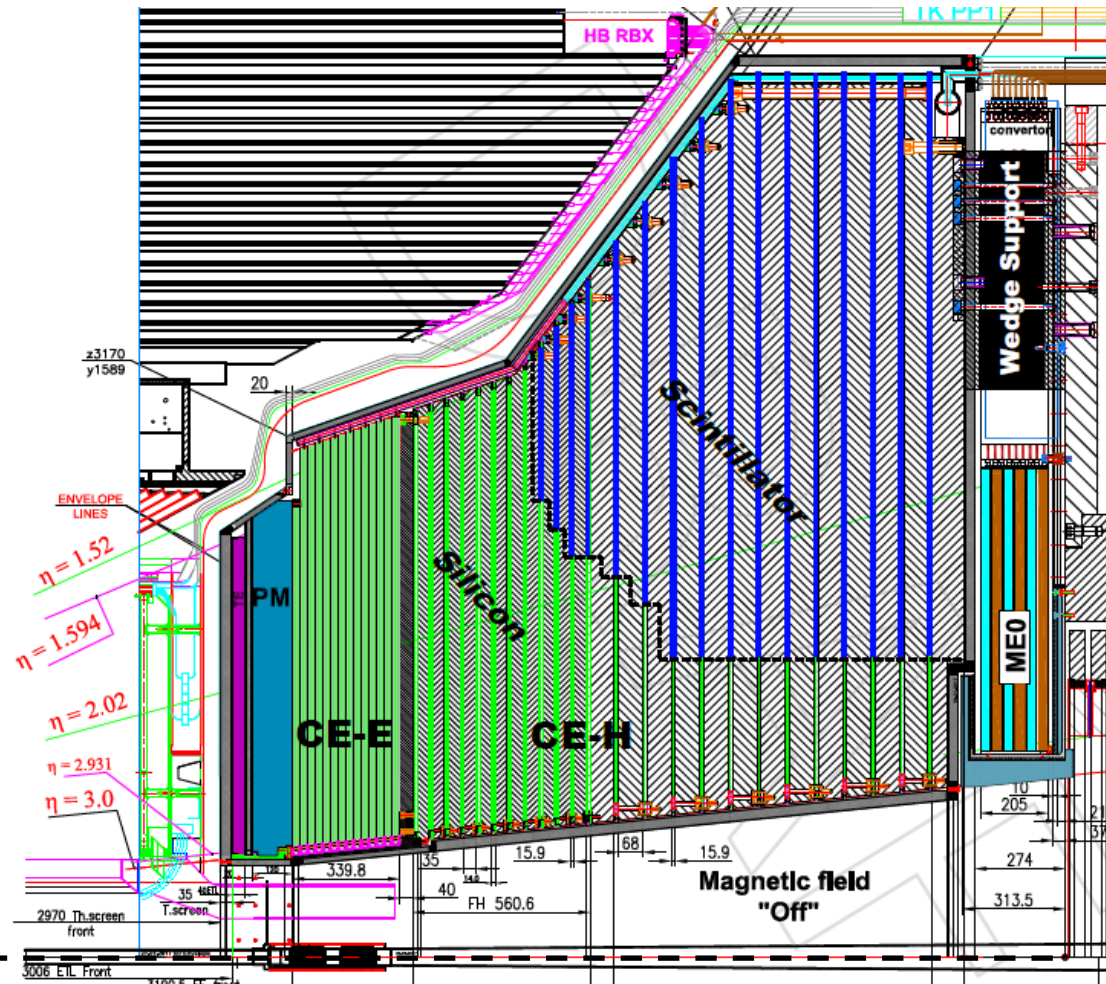
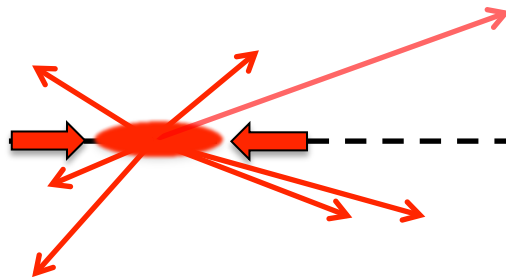
600 m² of Si + 500 m² of scintillator

Each end-cap

230 tons / -30° C

CE-E: 26.3 X0 / 28 layers

CE-H: 10.7 λ / 24 layers



TDR: CERN-LHCC-2017-023

EDR Mechanics: expected end 2019

LR

Mechanics of the ECAL:
CE-E Cassettes

T. Pierre-Emile (resp. CE-E mechanics)
C. Ochando (resp. CE-E cassettes),
A. Cauchois, A. Bonnemaïson, Y. Sirois
+ *support atelier, collaboration CERN, FNAL*

Fin 2019: Design complet + EDR

Back-End Trigger Electronics:
Architecture and algorithms

J-B. Sauvan (resp. TPG algos),
E. Becheva, P. Busson, L. Pacheco,
M. Prvan, F. Thiant, T. Romanteau,
A. Zabi
+ *collaboration Split, IC, FNAL*

2020 : TDR Trigger

System Tests,
Test Beam and
Reconstruction Performances

A. Lobanov (resp. **System Tests**), **F. Beaudette**, A. Chiron, F. Gastaldi, Y. Geerebaert, G. Grasseau, F. Magniette, A. Zabi,
+ *collaboration Split, CERN, ...*

- *Octobre 2018 : test beams*
- *2019/2020: testing/validating new 8" modules in 2019/2020 with SKIROC2cms/HGCROC*

Omega

Front-End Electronics:
Main FE ASIC (HGCROC)

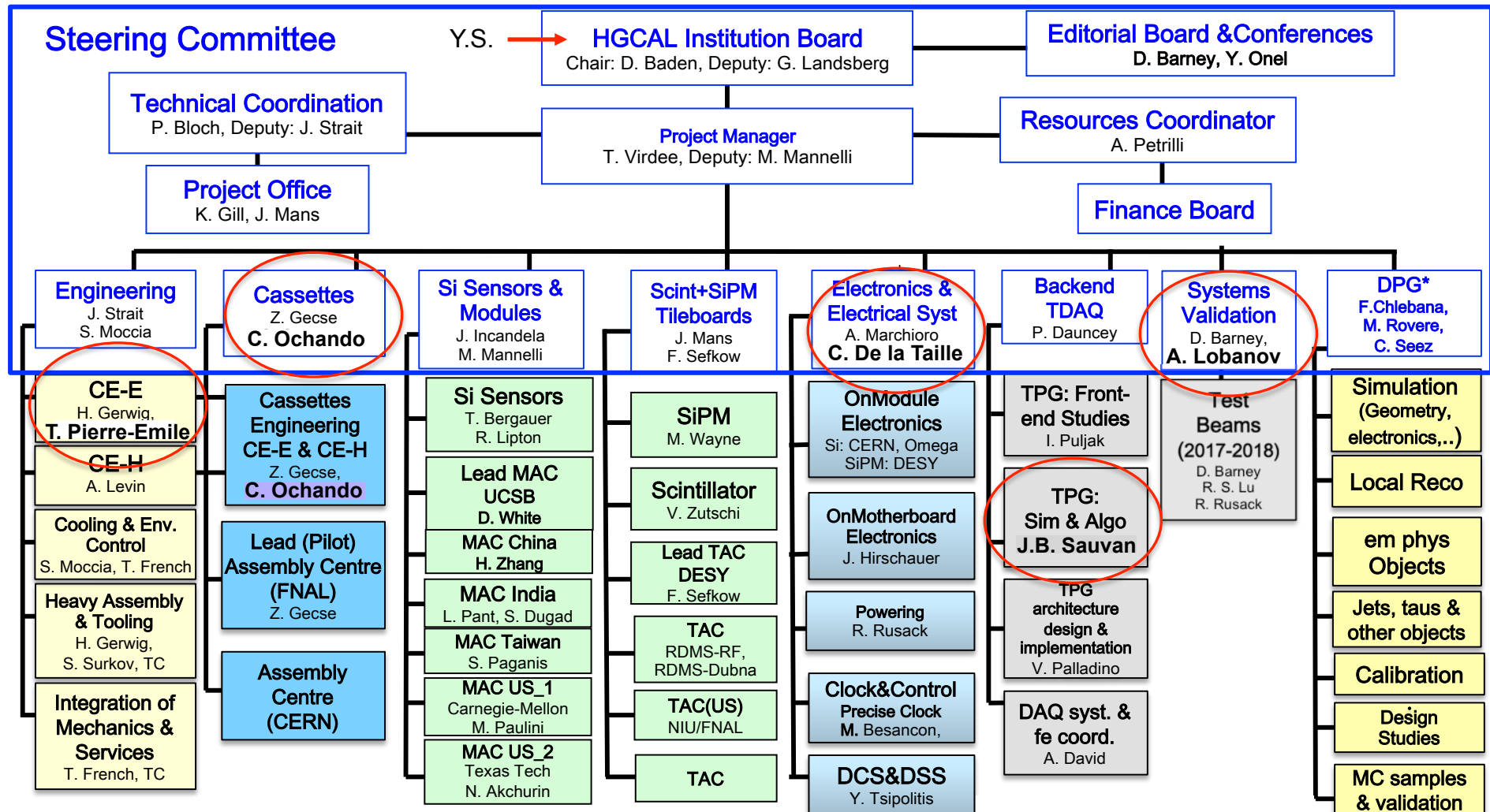
Stéphane CALLIER, **Christophe DE LA TAILLE** (resp. FE),
Frédéric DULUCQ, Ludovic RAUX, Damien THIENPONT

Décembre 2018 : HGROCDV1

Financing : Labex P2IO (< 2019) and « TGI » (2017-2026)



HGCAL Project Organization



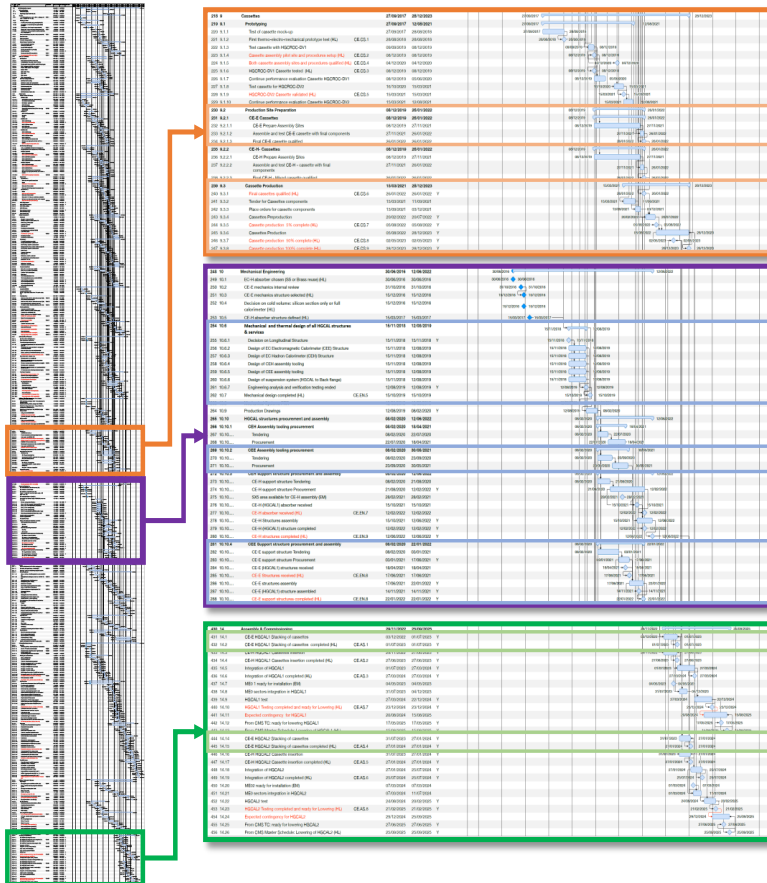
HGCAL Mechanics GANTT Chart

Reminders

WBS code : 9

WBS code : 10

WBS code : 14



21/09/2018

PIERRE-EMILE Thomas

3

231	9.2.1	CE-E Cassettes	08/12/2019	26/01/2022					
232	9.2.1.1	CE-E Prepare Assembly Sites	08/12/2019	27/11/2021					
233	9.2.1.2	Assemble and test CE-E cassette with final components	27/11/2021	26/01/2022					
234	9.2.1.3	Final CE-E cassette qualified	26/01/2022	26/01/2022					

Objective: final CE-E cassette qualified in January 2022

239	9.3	Cassette Production	15/03/2021	28/12/2023					
240	9.3.1	Final cassettes qualified (HL)	CE CS.6	26/01/2022	26/01/2022	Y			
241	9.3.2	Tender for Cassette components		15/03/2021	11/09/2021				
242	9.3.3	Place orders for cassette components		15/09/2021	03/12/2021				
243	9.3.4	Cassettes Preproduction		20/02/2022	20/07/2022	Y			
244	9.3.5	Cassette production 5% complete (HL)	CE CS.7	05/08/2022	05/08/2022	Y			
245	9.3.6	Cassettes Production		05/08/2022	28/12/2023	Y			
246	9.3.7	Cassette production 50% complete (HL)	CE CS.8	02/05/2023	02/05/2023	Y			
247	9.3.8	Cassette production 100% complete (HL)	CE CS.9	28/12/2023	28/12/2023	Y			

Objective: 100% cassettes produced in December 2023

254	10.6	Mechanical and thermal design of all HGCAL structures & services	15/11/2018	12/08/2019					
255	10.6.1	Decision on Longitudinal Structure	15/11/2018	15/11/2018	Y				
256	10.6.2	Design of EC Electromagnetic Calorimeter (CEC) Structure	15/11/2018	12/08/2019					
257	10.6.3	Design of EC Hadron Calorimeter (CEH) Structure	15/11/2018	12/08/2019					
258	10.6.4	Design of CEH assembly tooling	15/11/2018	12/08/2019					
259	10.6.5	Design of CEE assembly tooling	15/11/2018	12/08/2019					
260	10.6.6	Design of suspension system (HGCAL to Back flange)	15/11/2018	12/08/2019					
261	10.6.7	Engineering analysis and verification testing ended	12/08/2019	12/08/2019	Y				
262	10.7	Engineering design completed (HL)	CE EN.5	15/10/2019	15/10/2019	Y			
263	10.8	Mechanical Systems PFR		12/08/2019	12/08/2019	Y			
264	10.9	Production Drawings		12/08/2019	08/02/2020	Y			

Objective: mechanical design completed by EDR in October 2019

269	10.10.2	CEE Assembly tooling procurement	08/02/2020	30/05/2021					
270	10.10...	Tendering	08/02/2020	23/09/2020					
271	10.10...	Procurement	23/09/2020	30/05/2021					

Objective: CE-E assembly tooling in May 2021

281	10.10.4	CEE Support structure procurement and assembly	08/02/2020	22/01/2022					
282	10.10...	CE-E support structure Tendering	08/02/2020	03/01/2021					
283	10.10...	CE-E support structure Procurement	03/01/2021	17/06/2021	Y				
284	10.10...	CE-E (HGCAL) structures received	18/04/2021	18/04/2021	Y				
285	10.10...	CE-E Structures received (HL)	CE EN.6	17/06/2021	17/06/2021	Y			
286	10.10...	CE-E structures assembly		17/06/2021	22/01/2022	Y			
287	10.10...	CE-E (HGCAL) structure assembled		14/11/2021	14/11/2021	Y			
288	10.10...	CE-E support structures completed (HL)	CE EN.8	22/01/2022	22/01/2022	Y			

Objective: CE-E support structure completed in January 2022

431	14.1	CE-E HGCAL Stacking of cassettes	03/12/2023	01/07/2024	Y				
432	14.2	CE-E HGCAL Stacking of cassettes completed (HL)	CE AS.1	01/07/2023	01/07/2023	Y			

Objectives: first CE-E stacking done in July 2023

444	14.14	CE-E HGCAL2 Stacking of cassettes	31/07/2023	27/01/2024	Y				
445	14.15	CE-E HGCAL2 Stacking of cassettes completed (HL)	CE AS.4	27/01/2024	27/01/2024	Y			

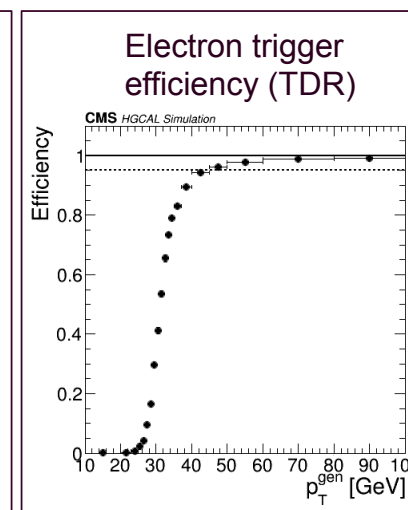
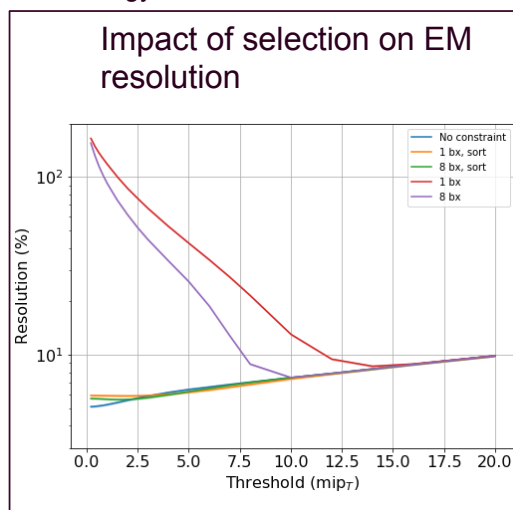
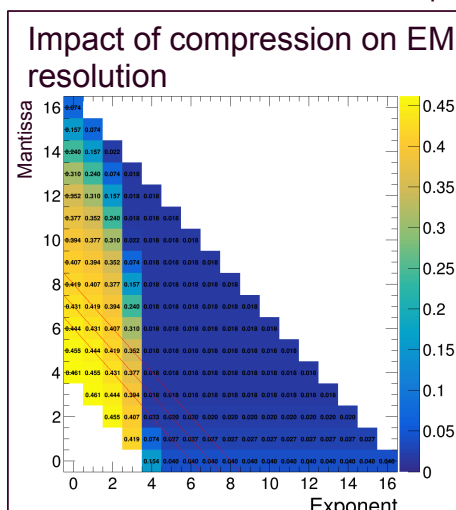
Objectives: second CE-E stacking done in January 2024



HGCAL: Trigger and Back-End



- Principaux groupes impliqués: CERN, **FESB Split***, **LLR polytechnique***, U. Bangalore, **IC London***, U. Bristol, FNAL, MIT
 - * Principales collaboration de CMS-LLR (avec aussi Saclay pour aspects timing)
- Nécessité absolue d'assurer la continuité avec le remplacement de Thierry Romanteau (retraite) pour les aspects firmware (e.g. Laura Pacheco-Rodriguez) (Besoin de 2 FTE, 1 IR + 1 post-doc physicien sur la période 2018-2016)
- Responsabilités pour le déclenchement HGCAL:
 - Design de l'architecture et développement du "firmware" pour les primitives
 - Développement de la chaîne complète d'émulation/simulation



- Le groupe CMS-LLR doit maintenir une forte activité concernant les performances de HGCAL et l'impact sur la physique
- Rôle exceptionnel pour le HGCAL-monde de notre post-doc Artur Lobanov (voir "The King Artur Lobanov slide" en back-up)
- Petit set-up test de chip FE HGCROC + participation aux HGCAL Test beam

- Previous HGCAL test beams:
 - 2016: up to **16** EE layers with SKIROC2 @ CERN/Fermilab (Paper accepted!)
 - 2017: ~**20** modules with SKIROC2cms in EE & FH + AHCAL @ CERN
 - 2018: full **28** layer EE @ CERN & single modules @ DESY
- October 2018
 - 2 weeks (10 - 24.10) at CERN H2 with mu/e/pi of 20-300 GeV
 - 94 modules in the EE + FH and 39 layer AHCAL (as BH/Scintillator CE-H)
 - Final major test beam before LS2 ... A. Lobanov et al.

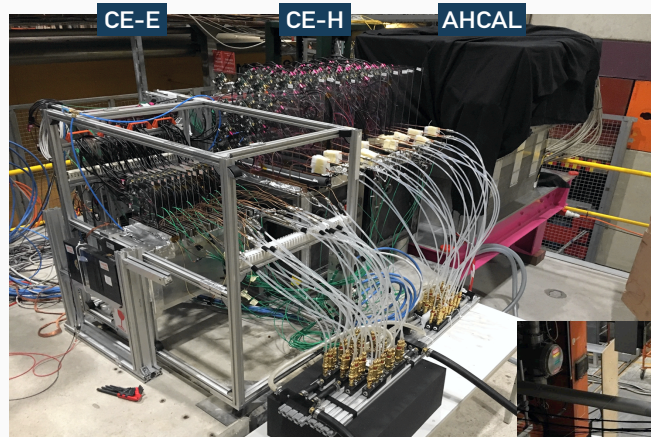
- Contributions to the e/γ , Pflow and reconstruction algorithms (excellent support du groupe informatique du LLR !)

The October 2018 Test

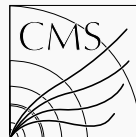
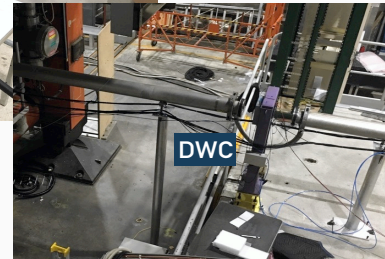


The Detectors

THE DETECTORS



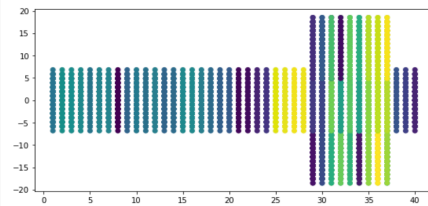
- HGCAL: silicon CE-E (ECAL) and CE-H (HCAL) with 94 modules, up to 40 layers
- AHCAL: SiPM-on-scintillator tile in 39 layers
- DWC: Delay wire chambers for tracking
- XCET: Cherenkov counters for π/p ID
- MCP-PMT: as timing reference ($\sigma \sim 30ps$)



The Set-ups

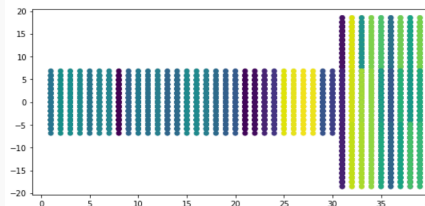
Configuration 1:

- EE: 28 layers x 1 module
- FH: 9 x 7 + 3 x 1
 - FH absorbers between all layers



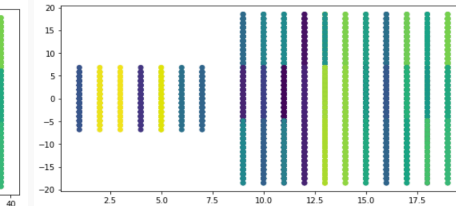
Configuration 2:

- EE: 28 layers x 1 module
- FH: 2 x 1 + 9 x 7
 - No FH absorbers between 2 x 1 layers



Configuration 3:

- EE: 8 layers x 1 module
- FH: 12 layers x 7 modules
 - FH absorbers between all layers

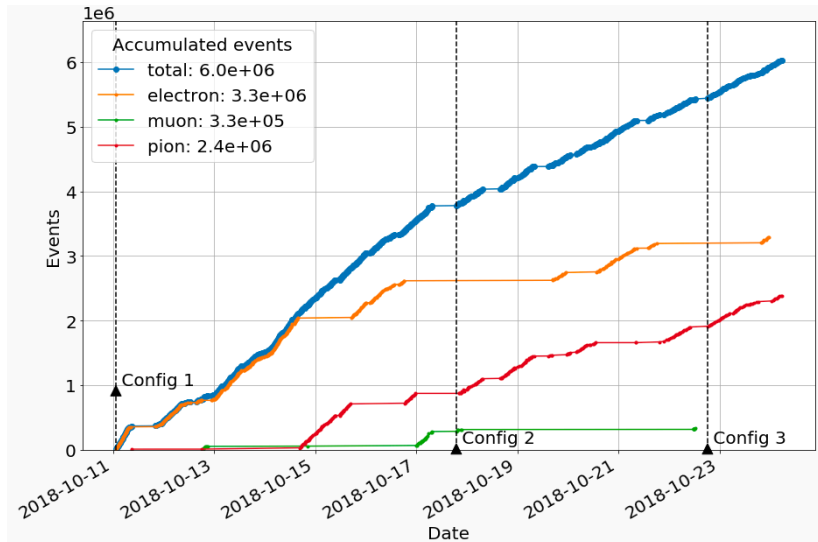


Focus on EM showers

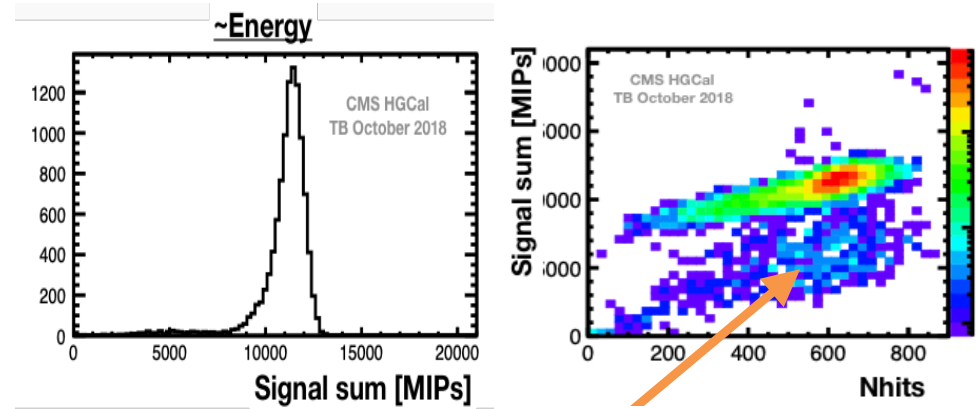
Focus on hadronic showers

A First View from October 2018 Test

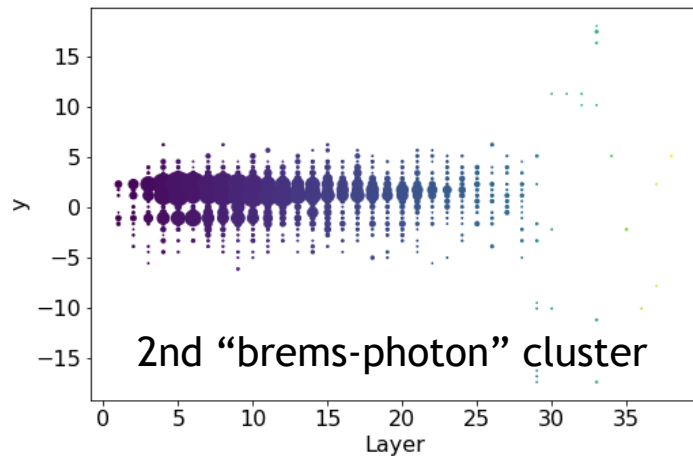
Datasets: > 6 million events collected



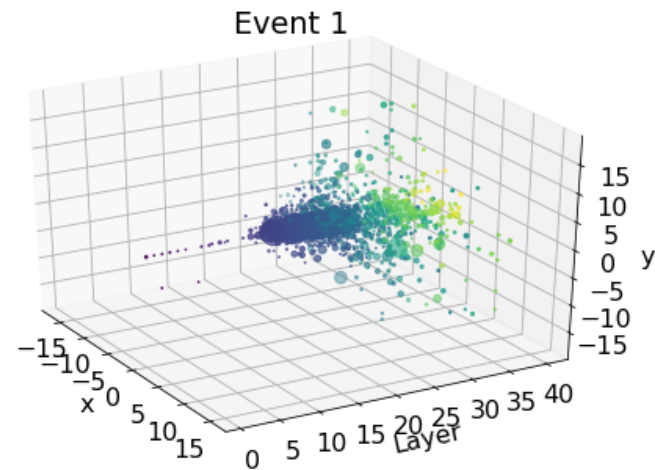
150 GeV electron with pion veto



300 GeV electron with 1 brems. γ



300 GeV pion



- **HL-LHC declared a physics priority for the IN2P3 + for LLR**
- **CMS received strong financial support from France via the TGI**

National investments for CMS at HL_LHC: **17,3 M €**
of which about 3,5 M € is for non-core investments and 2.8 M € for CDD*

HGCAL represents about 2/3 of the core investment: 6,2 M €

- CMS-LLR received strong support from the LaBex P2IO

Projet « emblématique » P2IO: **664 k Euros**
With 221 k€ is for investments at LLR + additional 75 k€ (IN2P3/X) for $\frac{3}{4}$ of a CDD

But the support in terms of human resources IS INSUFFICIENT for a high priority projet, both at the IN2P3 level and at the LLR level

- TGI forbids employment CDD of post-docs or engineers (as was learnt a posteriori)
- The CMS-LLR pp/HGCAL group profit at this moment (5/11/2018) from only ... 1 post-doc !!!
- About only 23% of the LLR resources in mechanics (IR+IE+AI) are actually committed to the HGCAL project with only one IR firmly committed
- About only 25% of the LLR resources in electronics (IR+IE+AI) are actually committed to the HGCAL project with only one permanent IR fully committed
- The critical period for the project before construction is between 2018 and 2022

The support in terms of human resources at IN2P3 and the LLR is currently NOT at the scale of a high priority project

Conclusions et Perspectives

(physique pp + HGICAL)

CMS-LLR:

- Forte implication dans le fonctionnement de CMS au CERN
- Leadership depuis les premières données pour des analyses de premier plan pour le secteur scalaire et la diffusion de bosons vecteurs (EWSB); responsabilités pour plusieurs analyses «Run legacy »
- Responsabilités pour la mécanique et le déclenchement HGICAL
- Rôle de premier plan pour les études de performances HGICAL
- Implications dans les perspectives de physique à HL-LHC

Support largement insuffisant en post-docs

1 post-doc pour en moyenne 5 à 7 thèse de doctorat en cours !

1 post-doc (au total !) actuellement dans CMS-LLR (physique pp + HGICAL)

Nécessité d'avoir de la lisibilité sur plusieurs années pour les engagement IE, IR et AI au LLR

Un tiers des physiciens de CMS-LLR ont presque atteint ou dépassé les 60 ans !

Un soutien adéquat, planifié et concerté, au niveau IN2P3 et du LLR pour les activités de CMS à LHC et HGL-LHC est sur le chemin critique de notre implication de premier plan en physique des hautes énergies et des particules; un pourvoyeur majeur de publications et de visibilité pour le CNRS et de l'École polytechnique au niveau mondial

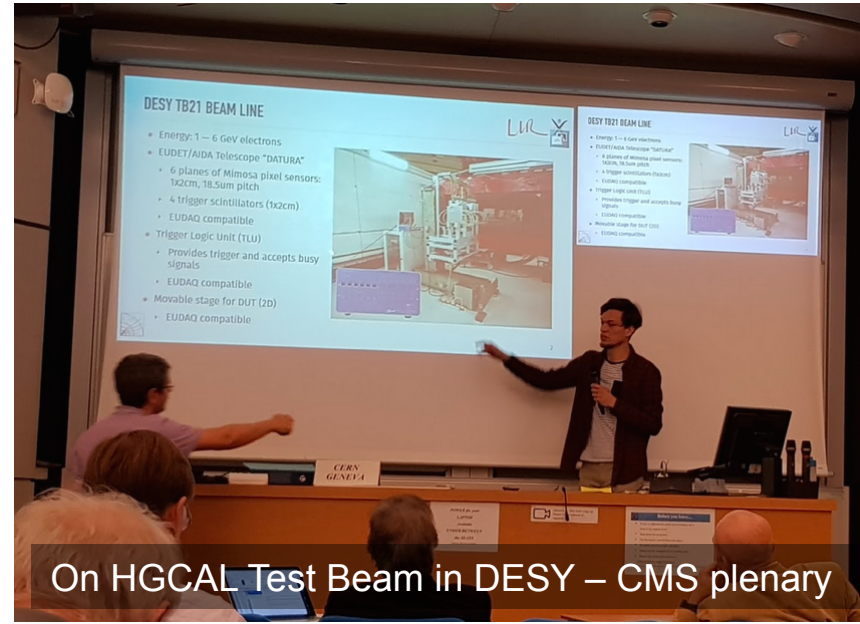
A detailed 3D rendering of a heavy-duty metal safe door. The door is circular and features a complex locking mechanism with multiple bolts and a central handle. The text "Backup Réserve" is overlaid in white on the door.

Backup Réserve

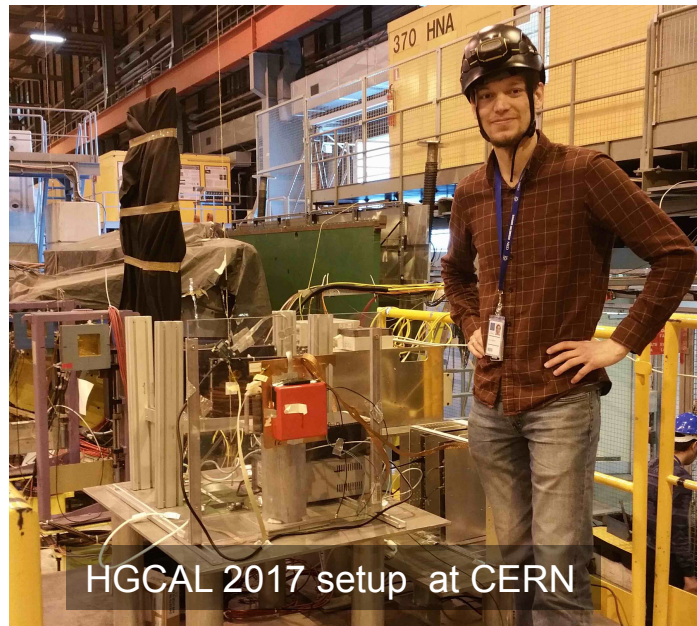
The “king” Artur Lobanov slide



On HGCAL electronics – CMS plenary



On HGCAL Test Beam in DESY – CMS plenary



HGCAL 2017 setup at CERN



Photos courtesy of A. Zabi

Artur Lobanov

Matteo Bonanomi
PhD Student

HGCAL 2018 setup at CERN

Thèses soutenues au sein de CMS-LLR

Ordre chronologique

End	Name	Supervisor(s)	Topic	Current Status
1998	Laurent Buiron	Ph. Busson	R&D L1, trilinear $Z\gamma$ prod.	Ingénieur nucléaire CEA
2001	Geun-Bom Kim	Ph. Busson	R&D L1, Sparticles in GMSB	Phys. Staff, KIRAMS, Seoul
2001	Ivica Puljak	C. Charlot	$H \rightarrow 4l$ prospects, ECAL build.	Phys. Professor FESB Split
2004	Alessio Ghezzi*	S. Ragazzi / C. Charlot	Ecal perf., extra dim. ADD mod.	Phys. Staff U. Milano B. INFN
2006	Stéphane Bimbot	L. Dobrzynski / P. Paganini	Trigger primitives, N.Net for H	Unknown
2006	Federico Ferri*	Y. Sirois / T. Tabarelli	E reco. And ID, $H \rightarrow ZZ^*$	Physicist Staff CEA
2006	C. Rovelli*	Ph. Busson / S. Ragazzi	ECAL perf. , $H \rightarrow WW^*$	Phys. Staff U. Roma INFN
2006	R. Salerno*	C. Charlot / M. Paganoni	ECAL, $H \rightarrow ZZ^*$	Physicist Staff CNRS
2011	C. Broutin	C. Charlot / Y. Sirois	e meas., $H^{\pm\pm} \rightarrow t\bar{t}l^{\pm}$	Prof. De Lycée
2012	A. Martelli*	C. Charlot / M. Paganoni	WZ Prod. Cross-section	Research Asso. IC London
2012	A. Benaglia	S. Ragazzi / Y. Sirois	ECAL calib., $H \rightarrow WW$	Phys. Staff U. Milano B. INFN
2012	L. Bianchini	Y. Sirois	τ -Pflow, Evidence $H \rightarrow \tau\tau$	Prof. U. Pisa & INFN
2012	D. Sabes	C. Charlot	e reco., $H \rightarrow ZZ^*$	Banque de France, Paris
2013	R. Plestina*	Y. Sirois / I. Puljak	H observation via $H \rightarrow ZZ^*$	Private Industry
2013	N. Daci	A. Zabi	e Trigger, $H \rightarrow \tau\tau$	Fellow CERN
2014	I.N. Naranjo-Fong	P. Paganini	τ reco. & $H \rightarrow \tau\tau$	Private Industry
2014	A. Florent	R. Granier de C.	$pPb \rightarrow W^+ x$	Post-doc. UCLA
2014	M. Dalchenko	S. Baffioni / C. Charlot	e reco. & Γ_H via $H \rightarrow 4l$	Post-doc. Texas-TAMU
2015	M. Kovac*	Y. Sirois / I. Puljak	e ID, $S^{CP}(H)$	Prof. Adj., U. of Split

R&D & construction

Run I analyses

* = co-tutelle

Thèses soutenues au sein de CMS-LLR

Ordre chronologique

End	Name	Supervisor(s)	Topic	Current Status
2015	Luca Mastrolorenzo	F. Beaudette	τ trigger, $H \rightarrow \tau\tau$ MEM	Post-doc, HGICAL Aachen
2015	Nicola Filipovic	R. Granier de C.	PbPb, epsilon suppress.	Post-doc, Budapest
2016	Stanislav Lisniak	M. Nguyen	PbPb, b-jets	Bank in London, UK
2016	Simon Regnard	Y. Sirois / R. Salerno	$H \rightarrow 4l$ & properties	Post-doc. UCLA
2017	Philipp Pigard	C. Charlot	e Id. , $VV \rightarrow 2q 4l$	Private industry
2017	Thomas Strebler	P. Paganini	Trigger, ttH MEM	Physicist Staff CNRS
2017	Luca Cadamuro	Y. Sirois / R. Salerno	Trigger, HH \rightarrow bb $\tau\tau$	Post-doc, U. Florida
2018	A. Stahl		pPb \rightarrow W + X, PbPb	Post-doc. Rice U. USA
2018	Toni Sculac*	Y. Sirois / I. Puljak	e reco. eff., $H \rightarrow 4l$	Post-doc FESB Split
2019	Marina Prvan*	J.B Sauvan / C. Charlot	HGICAL Trig./DAQ	On-going thesis
2019	Chiara Amendola	F. Beaudette	Trigger, VBF HH prod.	On-going thesis
2019	Cristina Martin-Perez	A. Zabi	Trigger, ttH	On-going thesis
2019	Batoul Diab	M. Nguyen	PbPb J/psi suppress.	On-going thesis
2020	Jonas Rembser	Ph. Busson	e reco., WWZ prod.	On-going thesis
2021	Matteo Bonanomi	R. Salerno / Y. Sirois	HGICAL, H impact on HH	On-going thesis
2021	Duje Gijanovic*	C. Charlot / D. Lela	VBS ZZ production	On-going thesis

Up. 1 Run II analyses HGICAL, Run II « legacy »

Prix de Thèse CMS (historique)

- 2000 Pascal **Vanlaer** U. Libre de Bruxelles
- 2001 Ivica **Puljak** **LLR Polytechnique**
- 2002 Giacomo **Bruno** U. di Pavia
- 2003 Riccardo **Ranieri** U. di Firenze
- 2004 Filip **Moorgat** U. Antwerp
- 2005 Christophe **Delaere** U. Cath. Louvain
- 2006 Chiara **Rovelli** **LLR Polytechnique**
- 2007 Steven **Lowette** VUB Brussels
- 2008 Jan **Heyninck** Vrije Brussels
- 2009 Jérémy **Andrea** IPHC Strasbourg
- 2010 Léa **Caminada** ETH Zurich
- 2011 Pasquale **Musela** U. Tecnica de Lisboa
- 2012 Michail **Bactis** U. of Wisconsin
- 2013 Lorenzo **Bianchini** **LLR Polytechnique**
- 2014 Shervin **Nourbakhsh** U. of Roma
- 2015 Valentin **Knuenz** Australian Acad. of Science
- 2016 E. **Bouvier** IPN Lyon / C. **Caillol** (U. Libre de Bruxelles)
- 2017 Luca **Cadamuro** **LLR Polytechnique**

Groupe CMS au LLR

Autres prix de thèse

- 2013 Prix de thèse Polytechnique: Lorenzo **Bianchini**
- 2016 Prix de thèse Polytechnique: Luca **Mastrolorenzo**
- 2018 Prix de thèse PHENIICS: Thomas **Strebler**

Autres prix « CMS »:

- | | |
|---|---------------------|
| 2011 CMS ECAL Young Person Awards: | Andrea Benaglia |
| 2012 CMS Achievement Awards (L1 Trigger): | Nadir Daci |
| 2013 EPS HEP Prize (H boson discovery): | <i>et al.</i> |
| 2014 Médaille d'Argent du CNRS: | Yves Sirois |
| 2014 Prix Georges Charpak de l'Académie (< 35 ans): | Christophe Ochando |
| 2016 CMS Achievement Awards (L1 Trig. Upgrade): | Thomas Strebler |
| 2016 CMS Achievement Awards (Mécanique): | Thomas Pierre-Émile |
| 2017 CMS ECAL detector awards: | Thierry Romanteau |
| 2017 CMS ECAL detector awards: | Floris Thiant |
| 2018 CMS Young Researcher's Prize : | Matthew Nguyen |

20 publications parmi les principales de CMS

2013-2017

- [1] **“Measurement of vector boson scattering and constraints on anomalous quartic couplings from events with four leptons and two jets in proton-proton collisions at $\sqrt{s} = 13$ TeV”**, CMS Collaboration, Physics Letters B 774 (2017) 682.
- [2] **“Observation of the Higgs boson decay to a pair of τ leptons”**, CMS Collaboration, Accepted by Physics Letters B (2017).
- [3] **“Search for Higgs boson pair production in events with two bottom quarks and two tau leptons in proton-proton collisions at $\sqrt{s} = 13$ TeV”**, CMS Collaboration, Physics Letters B 778 (2018) 101. [CMS HIG-17-002 (July 2018)]
- [4] **“Measurements of properties of the Higgs boson decaying into the four-lepton final state in pp collisions at $\sqrt{s} = 13$ TeV”**, CMS Collaboration, Journal of High Energy Physics 11 (2017) 047.
- [5] **“Particle-flow reconstruction and global event description with the CMS detector”**, CMS Collaboration, JINST 12 (2017) P10003.
- [6] **“Measurement of the ZZ production cross section and $Z \rightarrow \ell^+ \ell^- \ell^+ \ell^-$ branching fraction in pp collisions at $\sqrt{s} = 13$ TeV”**, CMS Collaboration, Physics Letters B 763 (2016) 280.
- [7] **“Search for Higgs boson off-shell production in proton-proton collisions at 7 and 8 TeV and derivation of constraints on its total decay width”**, CMS Collaboration, Journal of High Energy Physics 09 (2016) 051.
- [8] **“Search for two Higgs bosons in final states containing two photons and two bottom quarks”**, CMS Collaboration, Physical Review D 94 (2016) 052012.
- [9] **“Measurement of differential and integrated fiducial cross sections for Higgs boson production in the four-lepton decay channel in pp collisions at $\sqrt{s} = 7$ and 8 TeV”**, CMS Collaboration, Journal of High Energy Physics 04 (2016) 005.
- [10] **“Precise determination of the mass of the Higgs boson and tests of compatibility of its couplings with the standard model predictions using proton collisions at 7 and 8 TeV”**, CMS Collaboration, The European Physical Journal 75 (2015) 212.
- [11] **“Constraints on the spin-parity and anomalous HVV couplings of the Higgs boson in proton collisions at 7 and 8 TeV”**, CMS Collaboration, Physical Review D 92 (2015) 012004.
- [12] **“Combined Measurement of the Higgs Boson Mass in pp Collisions at $\sqrt{s} = 7$ and 8 TeV with the ATLAS and CMS Experiments”**, ATLAS and CMS Collaborations, Phys. Rev. Lett. 114 (2015) 191803; 45pp.
- [13] **“Discovery and Measurements of the H boson with ATLAS and CMS Experiments at the LHC”**, Y. Sirois, in “The H Boson”, C. Bachas, B. Duplantier, V. Rivasseau (Ed.), Springer International, 133pp.
- [14] **“Constraints on the Higgs boson width from off-shell production and decay to Z-boson pairs”**, CMS Collaboration, Physics Letters B736 (2014) 64.
- [15] **“Evidence for the direct decay of the 125 GeV Higgs boson to fermions”**, CMS Collaboration, Nature Phys. 10 (2014) 557-560.
- [16] **“Evidence for the 125 GeV Higgs boson decaying to a pair of τ leptons”**, CMS Collaboration, Journal of High Energy Physics 1405 (2014) 104.
- [17] **“Measurement of the properties of a Higgs boson in the four-lepton final state”**, CMS Collaboration, Physical Review D89 (2014) 092007.”
- [18] **“Observation of a new boson with mass near 125 GeV in pp collisions at $\sqrt{s} = 7$ and 8 TeV”**, CMS Collaboration, Journal of High Energy Physics (2013) 81.
- [19] **“Study of the mass and spin-parity of the Higgs boson candidate via its decays to Z boson pairs”**, CMS Collaboration, Physical Review Letters 110 (2013) 081803.
- [20] **“Measurement of the ZZ production cross section and search for anomalous couplings in 2l2l’ final states in pp collisions at $\sqrt{s} = 7$ TeV”**, CMS Collaboration, Journal of High Energy Physics 1301 (2013) 063.

Liste des contributions à des conférences internationales pour CMS : 2013-2017

- [1] **“GDR Terascale”**, 13-15 Décembre 2017, Marseille (France) C.Ochando (Membre du comité de programme)
- [2] **“Journées de Rencontres Jeunes Chercheurs (édition 2017)”**, 26 Novembre-2 Décembre 2017, La Pommeraie (France),
C. Ochando (Membre du Comité d’organisation)
- [3] **“New tools and observables for jet physics in Heavy Ion collisions”**, 21 August - 1 Septembre 2017, CERN, Geneva (Switzerland), M. Nguyen (Membre du comité d’organisation)
- [4] **“Higgs Hunting 2017 International Workshop”**, 24 - 26 July 2017, LAL & Paris (France), Y. Sirois (Membre du Comité d’Organisation et de Programme)
- [5] **Ecole d’été P2IO-P2IS 2017”**, 17-27 Juillet 2017, Orsay-Palaiseau-Paris-Saclay (France), A. Zabi (Membre du comité d’organisation)
- [6] **“Trans-European School of High Energy Physics 2017”**, 13-20 July 2017, Cerklje na Gorenjskem (Slovenia),
F. Beaudette (Membre du comité de programme), A. Zabi (cours)
- [7] **“International Europhysics Conference on High Energy Physics (EPS HEP 2017)”**, 5-12 July 2017, Venice (Italy);
Y. Sirois (Président du Comité International Scientifique et d’Organisation), R. Granier de Cassagnac (Organisateur des sessions parallèles Ions Lourds)
- [8] **“GDR Terascale”**, 3-5 Juillet 2017, Montpellier (France),
C. Ochando (Membre du comité de programme)
- [9] **“Sarajevo School of High Energy Physics 2017”**, 15-20 mai 2017, University of Sarajevo (Bosnia and Herzegovina)
C. Charlot (organisation), L. Dobrzynski (cours)
- [10] **“European School of Instrumentation in Particle and Astroparticle Physics (ESIPAP) 2017”**, 13-14 February, Archamps (France),
C. Ochando (cours)
- [11] **“Journées de Rencontres Jeunes Chercheurs (édition 2016)”**, 4-10 Décembre 2016, La Pommeraie (France),
C. Ochando (Membre du Comité d’organisation)
- [12] **“The 6th Egyptian School of High Energy Physics (ESHEP2016) ”**, 3-18 December 2016, The British University, Caire, (Egypt)
L. Dobrzynski (organisation et cours), Pascale Hennion (cours)
- [13] **“GDR Terascale, 23-25 Novembre 2016, Paris (France),**
C. Ochando (Membre du comité de programme)
- [14] **“Tomography of the Quark-Gluon Plasma with Heavy Quarks”**,
10-14 October 2016, Leiden (The Netherlands),
R. Granier de Cassagnac (membre du comité scientifique et d’organisation)
- [15] **“The Second International Workshop on recent LHC Physic’s results and related topics”**, 26 - 27 September 2016, University of Tirana Tirana (Albania),
L. Dobrzynski (organisation et conférencier invité)
- [16] **“Higgs Hunting 2016 International Workshop”**, 31 August - 2 September 2016, LAL & Paris (France),
Y. Sirois (Membre du Comité d’Organisation et de Programme)
- [17] **“4th Heavy-Ion Jet Worskhop”**, 25-27 July 2016, Ecole polytechnique, Palaiseau,
M. Nguyen (Président du comité d’organisation)
- [18] **Ecole d’été P2IO-P2IS 2016”**, 11-22 Juillet 2016, Orsay-Palaiseau-Paris-Saclay (France),
A. Zabi (Membre du comité d’organisation)
- [19] **“Trans-European School of High Energy Physics 2016”**, 7-14 July 2016, Yaremche (Ukraine),
F. Beaudette (Membre du comité de programme), A. Zabi (cours)
- [20] **“GDR Terascale,**
23-25 Mai 2016, Nantes (France),
C. Ochando (Membre du comité de programme)
- [21] **“Journées de Rencontres Jeunes Chercheurs (édition 2015)”**, 15-21 Décembre 2015, Chédigny (France),
C. Ochando (Membre du Comité d’organisation)
- [22] **“GDR Terascale, 23-25 Novembre 2015, Grenoble (France),**
C. Ochando (Membre du comité de programme)
- [23] **“The 5th Egyptian School of High Energy Physics (ESHEP2015) ”**, 14-19 November 2015, Giza (Egypt)
L. Dobrzynski (organisation et cours), Ph. Miné, et A. Sartirana (cours)
- [24] **“Split School of Energy Physics”**, 14-18 septembre 2015, University FESB Split (Croatia),
L. Dobrzynski (cours)

- [25] “**Journées de Rencontres Jeunes Chercheurs 2015 CNRS/CEA**”, C. Ochando (Organisation)
- [26] “**Ecole d’été P2IO-P2IS 2015**”, 13-24 Juillet 2015, Orsay-Palaiseau-Paris-Saclay (France), A. Zabi (Membre du comité d’organisation)
- [27] “**Trans European School of High Energy Physics**”, 9-16 July 2015, Morsko (Poland), F. Beaudette (Organisation), L. Dobrzynski (création), A. Zabi (cours)
- [28] “**Higgs Hunting 2015 International Workshop**”, 30 July - 1 August 2015, LAL & Paris (France), Y. Sirois (Membre du Comité d’Organisation et de Programme)
- [29] “**International Europhysics Conference on High Energy Physics (EPS HEP 2015)**”, 22-29 July 2015, Vienna (Austria) Y. Sirois (Secrétaire du Comité International Scientifique et d’Organisation), M. Nguyen (Organisateur des sessions parallèles Ions Lourds)
- [30] “**GDR Terascale**, 30 Mars-1 Avril 2015, Saclay (France), C. Ochando (Membre du comité de programme)
- [31] “**Journées Jeunes Chercheurs (édition 2014)**”, 7-13 Décembre 2014, Sète (France), C. Ochando (Membre du Comité d’organisation)
- [32] “**GDR Terascale**, 11-13 Décembre 2014, Heidelberg (Allemagne), C. Ochando (Membre du comité de programme)
- [33] “**Mini Workshop on LHC Physics results and future prospects**”, 13 October 2014, Podgorica (Monte Negro), L. Dobrzynski (organisation et conférencier)
- [34] “**International Workshop on LHC, Astrophysics, Medical and Environmental Physics**”, 6-8 October 2014, Shkodra (Albania) L. Dobrzynski (Président et conférencier)
- [35] “**Ecole d’été P2IO-P2IS 2014**”, 15-25 Juillet 2014, Orsay-Palaiseau-Paris-Saclay (France), A. Zabi (Membre du comité d’organisation), Y. Sirois (cours),
- [36] “**Rencontres du Vietnam 2014: Physics at LHC and beyond**”, 10-17 Août 2014, Quy-Nhon (Vietnam), F. Beaudette (Organisateur des sessions parallèles ”Boson de Brout-Englert-Higgs”)
- [37] “**Trans-European School of High Energy Physics 2014**”, 17-24 July 2014, Basivka (Ukraine), F. Beaudette (Membre du comité de programme), A. Zabi (cours)
- [38] “**Higgs Hunting 2014 International Workshop**”, 21 - 23 July 2014, LAL & Paris (France), Y. Sirois (Membre du Comité d’Organisation et de Programme)
- [39] “**GDR Terascale**, 2-4 Juin 2014, Palaiseau (France), C. Ochando (Organisateur et Membre du comité de programme)
- [40] “**Sarajevo School of High Energy and Medical Physics (SSHEMP 2014)**”, 19-24 mai 2014, University of Sarajevo (Bosnia and Herzegovina) L. Dobrzynski (organisation et cours)
- [41] “**The 4th Egyptian School of High Energy Physics (ESHEP2014)**”, 26 April - 5 May 2014, Ain Shams University (ASU) and The British University Giza (Egypt), L. Dobrzynski (organisation et cours), Ph. Miné (cours)
- [42] “**Journées de Rencontres Jeunes Chercheurs (édition 2013)**”, 1-7 Décembre 2013, Barbaste (France), C. Ochando (Membre du Comité d’organisation)
- [43] “**GDR Terascale**, 28-30 Octobre 2013, Annecy (France), C. Ochando (Membre du comité de programme)
- [44] “**47^{ième} Ecole de Gif - 2015 Quel Futur pour le MS après la découverte du H**”, 21-25 septembre 2015, IPHC, Strasbourg (France), Y. Sirois (Cours)
- [45] “**Higgs Hunting 2013 International Workshop**”, 25 - 27 July 2013, LAL & Paris (France), Y. Sirois (Membre du Comité d’Organisation et de Programme)
- [46] “**Ecole d’été P2IO-P2IS 2013**”, 15-26 Juillet 2013, Orsay-Palaiseau-Paris-Saclay (France), A. Zabi (Membre du comité d’organisation)
- [47] “**International Europhysics Conference on High Energy Physics (EPS HEP 2013)**”, 18-24 July 2013, Stockholm (Sweden) Y. Sirois (Membre du Comité International Scientifique et d’Organisation)
- [48] “**Trans-European School of High Energy Physics 2013**”, 9-16 July 2013, Vognyk Resort (Ukraine), F. Beaudette (Membre du comité de programme et d’organisation), A. Zabi (cours)
- [49] “**The 6th Sarajevo School of High Energy Physics (SSHEMP 2013)**”, 21-25 mai 2013, University of Sarajevo (Bosnia and Herzegovina) L. Dobrzynski (cours)
- [50] “**GDR Terascale**, 13-15 Mai 2013, Annecy (France), C. Ochando (Membre du comité de programme)
- [51] “**International Conference on Calorimetry for High Energy Frontier 2013 (CHEF 2013)**”, 22-25 avril 2013, Paris (France), Y. Sirois (Membre du Comité International Scientifique et d’Organisation, *proceedings*: J.C. Brient, R. Salerno, and Y. Sirois (editors),

Liste des contributions à des conférences internationales pour CMS : 2013-2018

Groupe CMS

Laboratoire Leprince-Ringuet (LLR)
Ecole Polytechnique, Palaiseau, CNRS-IN2P3

Octobre 2018

(chronologie inversée)

NDLR: Liste des présentations en conférences nationales majeures ou en conférences internationales.

References

- [1] **“Performance and upgrades of CMS” at the “Split2018: 2018 LHC days in Split”**, Alexandre Zabi, SPLIT2018: 2018 LHC days in Split, 17-22 Septembre 2018.
- [2] **“SM Higgs boson results CMS”**, Christophe Ochando, SPLIT2018: 2018 LHC days in Split, 17-22 Septembre 2018.
- [3] **“Associated production of Higgs boson with top quarks at CMS”**, Cristina Martin Perez, Higgs Hunting 2018, 23-25 Juillet 2018.
- [4] **“Closing down to the HH production (CMS)”**, Chiara Amendola, Higgs Hunting 2018, 23-25 Juillet 2018,
- [5] **“Measurements of Higgs boson production and properties in the ZZ decay channel using the CMS detector”**, Toni Sculac, ICHEP2018: 39th International Conference on High Energy Physics, Seoul, Republic of Korea, 4-11 Juillet 2018,
- [6] **“The CMS HGCal detector for HL-LHC upgrade”**, Artur Lobanov, ICHEP2018: 39th International Conference on High Energy Physics, Seoul, Republic of Korea, 4-11 Juillet 2018,
- [7] **“The Matrix Element Method for the associated production of the H boson with top quarks and decaying into τ leptons”**, Alexandre Zabi, ICHEP2018: 39th International Conference on High Energy Physics, Seoul, Republic of Korea, 4-11 Juillet 2018.
- [8] **“VBS Experiment - SS WW, ZZ, WZ”**, Claude Charlot, Workshop on the physics of HL-LHC, and perspectives at HE-LHC, 18-20 juin 2018,
- [9] **“Measurements in Higgs decays to diboson final states at the ATLAS and CMS experiments”**, Giacomo Ortona, The Sixth Annual Large Hadron Collider Physics conference LHCP 2018, 3-9 juin 2018.
- [10] **“Higgs 2016 combination (CMS)”**, Giacomo Ortona, IRNstrasbg2018: IRN Terascale, Strasbourgconference 30 may -1 Juin 2018.

- [11] **“CMS: Higgs”**,
Roberto Salerno, IRNstrasbg2018: IRN Terascale, Strasbourgconference 30 may -1 Juin 2018,
- [12] **“Status of ATLAS and CMS upgrades on calorimetry and timing and future prospects”**,
Jean-Baptiste Sauvan, The Sixth Annual Large Hadron Collider Physics conference LHCP 2018, 3-9 juin 2018
- [13] **“The CMS Level-1 tau lepton and Vector Boson Fusion triggers for the LHC Run II”**
(poster),
Cristina Martin Perez, 14th Pisa Meeting on Advanced Detectors, 27 May-2 Juin 2018,
- [14] **“J/psi in jets in pp collisions at 5.02 TeV with the CMS experiment”** (poster),
Batoul Diab, Quark Matter 2018: 27th International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions, 14-19 mai 2018,
- [15] **“nPDF studies with electroweak bosons in pPb collisions at 8.16 TeV with the CMS detector”**,
Andre G. Stahl Leiton, Quark Matter 2018: 27th International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions, 14-19 mai 2018,
- [16] **“CMS electron and photon performance at 13 TeV”**,
Jonas Rembser, CALOR 2018, University of Oregon, 21-25 mai 2018,
- [17] **“Design of the CMS upgraded calorimeter trigger from Phase I to Phase II of the LHC**,
Alexandre Zabi, CALOR 2018, University of Oregon, 21-25 mai 2018,
- [18] **“Performance of the CMS electromagnetic calorimeter during the LHC Run II”**
Amina Zghiche, CALOR 2018, University of Oregon, 21-25 mai 2018,
- [19] **“Double Higgs Searches with Run 2 data**,
Giacomo Ortona, DIS2018: XXVI International Workshop on Deep Inelastic Scattering and Related Objects, U. of Kobe, Japan, 16-20 Avril 2018,
- [20] **“Measurements of Higgs differential cross-sections at CMS”**,
Giacomo Ortona, DIS2018: XXVI International Workshop on Deep Inelastic Scattering and Related Objects, U. of Kobe, Japan, 16-20 Avril 2018,
- [21] **“The role of the CMS trigger in the study of the Higgs sector and searches for new resonances during LHC Run II”**,
Chiara Amendola, Lake Louise Winter Institute 2018, Canada, 18-24 Fvrier,
- 2017:**
- [22] **“Status and Prospects for HH at the LHC”**,
A. Zghiche, Plenary talk, International Research Network (IRN) Terascale 2017, 13-15 December, 2017, Marseille (France)
- [23] **“Higgs production (main channels)”**,
G. Ortona, Talk, Workshop on the physics of HL-LHC, and perspectives at HE-LHC (HLHE-LHC2017), 30 October - 1 November 2017, CERN, Geneva (Switzerland)
- [24] **“Le boson de Higgs, une porte vers l’au-delà ? ”**
Y. Sirois, Conférence pour la Société Astronomique de Nantes, Vendredi 17 novembre 2017, Nantes,.
- [25] **“Higgs boson results from the CMS experiment”**,
C. Charlot, Plenary talk, 2nd Iran & Turkey conference on LHC Physics, Octobre 2017, Thran, Iran
- [26] **“The CMS HG CAL detector for HL-LHC upgrade”**,
J.B. Sauvan, Plenary talk, CHEF2017 Calorimetry for the High Energy Frontier, Octobre 2017, Lyon (France); *with proceedings*
- [27] **“Electronics and triggering challenges for the CMS High Granularity Calorimeter”**,
A. Lobanov, Plenary talk, CHEF2017 Calorimetry for the High Energy Frontier, Octobre 2017, Lyon (France); *with proceedings*
- [28] **“Predicting the performance of the CMS precision PbWO4 e.m. calorimeter at HL-LHC”**,
A. Zghiche, Plenary talk, SCINT 2017, 18-22 Septembre 2017, Chamonix (France)
- [29] **“Higgs results from the CMS experiment”**,
G. Ortona, Plenary talk, HEP MAD 17 Septembre 2017, Madagascar
- [30] **“ttH searches at ATLAS and CMS”**,
T. Strebler, ””, Talk at the QCD@LHC 2017, Aot 2017, Debrecen (Hungary)
- [31] **“Charmonium production in pPb and PbPb collisions at 5.02 TeV with CMS”**,
J. Martin Blanco, Talk, International on Strangeness in Quark Matter 2017, 10-15 July 2017, Utrecht (The Netherlands)
- [32] **“Jets and particle correlations in heavy ion collisions”**,
M. Nguyen, ” Plenary talk, EPS International Conference on High Energy Physics (EPS HEP 2017), 5-12 July 2017, Venice, Italy; *with proceedings*
- [33] **“Charmonium production in pPb and PbPb collisions at 5.02 TeV with CMS”**,
A. Stahl, Talk, EPS International Conference on High Energy Physics (EPS HEP 2017), 5-12 July 2017, Venice, Italy; *with proceedings*
- [34] **“The CMS Level-1 tau lepton and VBF Triggers for the LHC Run II”**,
C. Amendola, Poster, EPS International Conference on High Energy Physics (EPS HEP 2017), 5-12 July 2017, Venice, Italy; *proceedings published in PoS (EPS-HEP2017) 773*

- [35] **“Le boson de Higgs et les nouvelles perspectives de physique au LHC” (25’)**
Y. Sirois, Conférence-débat de l’Académie des sciences sur la “Physiques des particules: le Modèle Standard et au-delà”
18 avril 2017, Institut de France, Paris
- [36] **“Search for HH with 13 TeV data and prospects”**,
L. Cadamuro, Plenary talk at the 52nd Moriond Electroweak International Conference, 18-25 March 2017 La Thuile (Italy); /it with proceedings
- [37] **“Latest CMS results on Higgs boson production in association with top quarks”**,
T. Strebler, Plenary talk at the Lake Louise Winter Institute 2017, 19-25 February 2017 (Canada)
- [38] **“Higgs couplings to bosons and fermions”**,
G. Ortona, Plenary talk, Lake Louise Winter Institute 2017, 19-25 February 2017 (Canada)
- [39] **“Calorimetry”**,
C. Ochando, Cours, European School of Instrumentation in Particle & Astroparticle Physics (ESIPAP) 2017, 13-14 February, Archamps (France)
- [40] **“Psi (2s) et J/Psi modification in pPb et PbPb collisions at 5.02 TeV”**,
J. Martin Blanco, Talk, Quark Matter 2017, 6-11 February 2017, Chicago, USA
- 2016:**
- [41] **“HH review for ATLAS and CMS”**,
L. Cadamuro, Plenary talk, GDR Terascale Paris, 23-25 Novembre 2016, Paris (France)
- [42] **“The CMS L1 trigger for the LHC Run II”**,
L. Cadamuro, IPRD16, Octobre 2016, Bologne, Italie - Plenary; *proceedings published in JINST 12 (2017) no.03, C03021*
- [43] **“The CMS Level-1 Calorimeter Trigger for LHC Run II”**,
A. Zabi, Plenary talk on behalf the CMS Collaboration, TWEPP 2016, 26-30 Septembre 2016, Karlsruhe, Allemagne; *proceedings by A. Zabi et al. published in JINST 12 (2017) no.01, C01065*
- [44] **“Performance and Upgrade of CMS”**,
A. Zabi, Plenary talk, LHC Days at Split, 19-24 September 2016, Split, Croatia
- [45] **“SM Higgs boson results from CMS”**,
C. Ochando, Plenary talk, LHC Days at Split, 19-24 September 2016, Split, Croatia
- [46] **Tau lepton trigger and identification at CMS in Run II**,
O. Davignon, Plenary talk, The 14th International Workshop on Tau Lepton Physics, 19-23 September 2016, Beijing (China)
- [47] **“Charmonium in pp and PbPb collisions”**,
A. Stahl Leiton, Plenary talk, Hot Quarks 2016, 12-17 Septembre 2016, Texas, USA
- [48] **“Charmonium production and phenomena in pp, pPb and PbPb collisions?”**,
E. Chapon, ”, Talk at the HARD Probes 2016, September 2016, Wuhan, Chine
- [49] **“Non-prompt J/psi V2 and RAA in PbPb collisions at 2.76 TeV”**,
M. Jo, Talk at the HARD Probes 2016, September 2016, Wuhan, Chine
- [50] **“Hard processes in pA collisions”**,
F. Arléo, Plenary talk, HARD Probes 2016, September 2016, Wuhan, Chine
- [51] **“Measurements of H boson production and properties in the ZZ decay channel in CMS”**,
S. Regnard, Talk, The 38th International Conference on High Energy Physics (ICHEP 2016), 3-10 August 2016, Chicago, IL (United States)
- [52] **“Searches for double Higgs production or decay using the CMS detector”**,
G. Ortona, Talk, The 38th International Conference on High Energy Physics (ICHEP 2016), 3-10 August 2016, Chicago, IL (United States)
- [53] **“Instrumentation in High Energy Physics”**,
A. Zabi, Cours, Trans Europe school of High Energy Physics TESHEP 2016, 6-15 July, Kharkov (Ukraine)
- [54] **“The role of the CMS electron and photon trigger in the study of the H boson and other resonances**,
T. Strebler, Plenary Talk, 17th International Conference on Calorimetry in Particle Physics (CALOR2016), 15-20 May 2016, Kyungpook National University , Daegu (Republic of Korea); *proceedings published in J. Phys. Conf. Ser. 928 (2017) no.1, 012007 (2017-11-27)*
- [55] **“HGCAL: A High-Granularity Calorimeter for the E,cdcaps of CMS at HL-LHC**
C. Ochando, Plenary talk, 17th International Conference on Calorimetry in Particle Physics (CALOR2016), 15-20 May 2016, Kyungpook National University , Daegu (Republic of Korea); *with proceedings*
- [56] **“Concepts and design of the CMS High Granularity Calorimeter Level 1 Trigger**
J.B. Sauvan, Plenary talk, 17th International Conference on Calorimetry in Particle Physics (CALOR2016), 15-20 May 2016, Kyungpook National University , Daegu (Republic of Korea); *with proceedings*
- [57] **“Search for resonant Higgs boson pair production at CMS”**,
L. Cadamuro, Talk at the Phenomenology 2016 Symposium, University of Pittsburgh, 9-11 May 2016, Pittsburgh (USA)
- [58] **“(Recent) Results from the LHC** C. Ochando, Plenary talk, Quatrième Journée Collisionneur Linéaire, 24 Mars 2016, Paris (France)

2015:

- [59] **“Quarkonium measurements in pPb and PbPb in CMS”**,
N. Filipovic, Course, 15th Zimanyi Winter School on Heavy Ion Physics, 7-11 December 2015, Wigner RCP and Eotvos University, Budapest (Hungary)
- [60] **“Discovery and Measurements of the H boson with ATLAS and CMS Experiments at the LHC”**,
Y. Sirois, Plenary talk, Séminaire Poincaré XIX”, Institut Henri Poincaré”, 29 Novembre 2014, Paris (France); *with proceedings*
- [61] **“Search for a MSSM Higgs Boson decaying to tau pairs with CMS”**,
Olivier Davignon, Plenary Talk, GDR Terascale Grenoble 23-25 November 2015, LPSC, Grenoble (France)
- [62] **“ATLAS+CMS: Higgs boson self-interactions in SM and BSM”**,
R.Salerno, Higgs Couplings 2015 (HC 2015), 12-15 October 2015, IPPP, Durham (United Kingdom)
- [63] **“Higgs Boson Spin/Parity and Tensor Structure (ATLAS+CMS)”**,
M. Kovac, Plenary talk, Higgs Coupling 2015, 12-15 October 2015, IPPP, Durham (United Kingdom)
- [64] **“Triggering on electrons, jets and tau lepton with the LHC Run II upgraded trigger”**,
A. Zabi, Poster, Topical Workshop on Electronics for Particle Physics (TWEPP 2015), 28 September-2 October 2015, Lisbon (Portugal); *proceedings published in JINST 11 (2016) no.02, C02008*
- [65] **“An experimental review of neutral and charged hadrons”**,
M. Nguyen, Invited talk, XXV International conference on ultra-relativistic nucleus-nucleus collisions (Quark Matter 2015), 27 September - 3 October 2015, Kobe (Japan)
- [66] **“W and Z bosons in pp, pPb and PbPb wit..”**,
E. Chapon, Talk at the XXV International conference on ultra-relativistic nucleus-nucleus collisions (Quark Matter 2015), 27 September - 3 October 2015, Kobe (Japan)
- [67] **“CMS bottomonia results from Run I”**,
Mihee Jo, Talk at the XXV International conference on ultra-relativistic nucleus-nucleus collisions (Quark Matter 2015), 27 September - 3 October 2015, Kobe (Japan)
- [68] **“Higgs Boson and Electroweak Physics”**,
Y. Sirois, Cours à l'école de GIF 2015 - Quel future pour le MS après la découverte du boson de Higgs ?, 21-25 Septembre 2015, IPHC, Strasbourg
- [69] **“Nouvelles données et performances du détecteur CMS auprès du LHC 13 TeV”**,
O. Davignon, Plenary Talk, XXIIIe Congr Gnral de la Socit Franaise de Physique, 24-28 August 2015, Strasbourg (France)
- [70] **“Level-1 trigger selection of electrons and photons with CMS for LHC Run II”**,
T. Strebler, Poster, XXVII International Symposium on Lepton Photon Interactions at High Energies (LP2015), 17-22 August 2015, Ljubljana (Slovenia)
- [71] **“Heavy ions: flavour production and QGP”**,
R. Granier De Cassagnac, Invited talk, European Physical Society Conference on High Energy Physics 2015 (EPS-HEP 2015), 22-29 July 2015, Vienna (Austria); *with proceedings*
- [72] **“Searches for neutral and charged Higgs bosons at ATLAS and CMS”**,
O. Davignon, Talk at the European Physical Society Conference on High Energy Physics 2015 (EPS-HEP 2015) 22-29 July 2015, Vienna (Austria); *with proceedings*
- [73] **“The CMS Level-1 Tau algorithm for the LHC Run II”**,
L. Cadamuro, Poster, European Physical Society Conference on High Energy Physics 2015 (EPS-HEP 2015) 22-29 July 2015, Vienna (Austria); *proceedings published in PoS(EPS-HEP2015)226*
- [74] **“Instrumentation in High Energy Physics”**,
A.Zabi, Cours, Trans Europe school of High Energy Physics TESHEP 2015, 9-16 July, Kharkov (Ukraine)
- [75] **“Quarkonia in pp, pPb and PbPb collision with CMS”**,
N. Filipovic Talk at the 7th International Conference on Hard and Electromagnetic Probes of High Energy Nuclear Collisions (HardProbes2015), 29 June - 3 July 2015, McGill University, Montreal (Canada)
- [76] **“Jets in ion collisions at LHC”**,
Y. Yilmaz, Invited talk, 16th conference on Elastic and Diffractive Scattering (EDS Blois 2015), 29 June - 3 July 2015, Borgo (France)
- [77] **“Results on HI physics from ATLAS and CMS”**,
E. Chapon Talk at the 27th Rencontres de Blois: Particle Physics and Cosmology (Blois2015), 31 May-5 June 2015, Blois (France)
- [78] **“Matrix Element Method for High Performance Computing Platforms.”**,
D. Chamont, Talk at the 21st International Conference on Computing in High Energy and Nuclear Physics (CHEP2015), 13-17 April 2015, Okinawa Institute of Science and Technology, Okinawa (Japan)
- [79] **“Combination of couplings and mass in ATLAS and CMS”**,
G. Ortona, Plenary talk, GDR Terascale Saclay, March - 1 April 2015, IPhT Saclay CEA, Saclay (France)
- [80] **“Rare Higgs decays results”**,
L. Mastrolorenzo, Plenary talk, Lake Louise Winter Institute 2015 (LWI 2015), 15-21 February 2015, University of Alberta, Lake Louise (Canada)
- [81] **“Du boson de Higgs au Big Bang”**
Y. Sirois, Conférence à l'invitation de la Fondation Humaniste du Québec (FHQ) Centre Pierre-Péladeau, 27 février 2015, Montréal, Québec.

[82] **“Le boson H et le futur au LHC”**
Y. Sirois, “Journée de la SFP sur le futur de la physique des particules”, Université Pierre et Marie Curie, 23 Janvier 2015, Paris.

[83] **“The H Boson and the Aftermaths @ LHC and HL-LHC”**
Y. Sirois, “40th Anniversary Conference of the LPTENS”, 21-23 January 2015.

2014:

[84] **“CMS H- γ VV Interactions”**,
J.B. Sauvan, Plenary talk, Terascale Heidelberg, 11-13 December 2014, I. of Heidelberg, Germany

[85] **“CMS upgrades”**,
M. Nguyen, Invited talk, Second SaporeGravis Workshop (SGW2014), 9-12 December 2014, Padova University, Padua (Italy)

[86] **“Bottomonia in A-A at the LHC”**,
C. Mironov, Invited talk, Second SaporeGravis Workshop (SGW2014), 9-12 December 2014, Padova University, Padua (Italy)

[87] **“Experimental results on quarkonia in Heavy-Ion collisions”**,
R. Granier De Cassagnac, Invited talk, Second SaporeGravis Workshop (SGW2014), 9-12 December 2014, Padova University, Padua (Italy)

[88] **“Upgrade and future of CMS”**,
Y. Sirois, Plenary talk, LHC days in Split (Split2014), 29 September - 4 October 2014, University of Split (Croatia)

[89] **“Results on the H boson intrinsic width”**,
C. Charlot, Plenary talk, Higgs Couplings 2014, 1-3 October 2014, Torino University (Italy)

[90] **“Overview of CMS heavy ion results”**,
M. Nguyen, Plenary talk, LHC days in Split (Split2014), 29 September - 4 October 2014, University of Split (Croatia)

[91] **“Measurement of Higgs properties in CMS”**,
J.-B. Sauvan, Plenary talk, LHC days in Split (Split2014), 29 September - 4 October 2014, University of Split (Croatia)

[92] **“The CMS Level-1 Calorimeter Trigger Electronics System for the LHC Run II”**,
T. Romanteau, Poster, Topical Workshop on Electronics for Particle Physics (TWEPP2014), 22-26 September 2014, Aix-en-Provence (France)

[93] **“W boson studies in pPb and PbPb collisions with CMS”**,
E. Chapon, Plenary talk, Hot Quarks Workshop 2014 (HQ2014), 21-28 September 2014 Las Negras - Cabo de Gata Natural Park, Andalusia (Spain)

[94] **“Bottomonia in pp, pPb and PbPb collisions”**,
N. Filipovic Plenary talk, Hot Quarks Workshop 2014 (HQ2014), 21-28 September 2014 Las Negras - Cabo de Gata Natural Park, Andalusia (Spain)

[95] **“Identification of hadronic tau decays in CMS”**,
C. Veelken Plenary talk, 13th International Workshop on Tau Lepton Physics (Tau'14), 15-19 September 2014, RWTH-Aachen, Aachen (Germany)

[96] **“Studies of high-pT jet and hadron produ..”**,
Y. Yilmaz, Plenary talk, 10th International Workshop on High-pT Physics in the RHIC/LHC era (10High-pT) 9-12 September 2014, Nantes (France)

[97] **“Le CERN, la découverte du boson de Higgs, et les perspectives”**,
Y. Sirois Cours à la 4^{ième} l'Ecole d'été de P2IO, Paris, Août 2014 (France)

[98] **“Instrumentation in High Energy Physics”**,
A.Zabi, Cours, Trans Europe school of High Energy Physics TESHEP 2014, 16-24 July, Kharkov (Ukraine)

[99] **“Young Scientist Forum: Bounding the Higgs boson Width..”**,
M. Dalchenko, Plenary talk, Higgs Hunting 2014 (HH2014), 21-23 July 2014, LAL, Orsay (France)

[100] **“Heavy flavour production at CMS in heavy ion collisions”**,
M. Nguyen, Talk at the 15th International Conference on B-Physics at Frontier Machines (BEAUTY-2014), 14-18 July 2014, University of Edinburgh, Edinburgh (United Kingdom)

[101] **“Overview of heavy quark experimental results in HI collisions”**,
M. Nguyen, Plenary talk, 3rd Heavy Ion Jet Workshop, 9-11 July 2014, Lisbon (Portugal)

[102] **“Instrumentation in High Energy Physics”**,
A.Zabi, Cours, Trans Europe school of High Energy Physics TESHEP 2014, 9-17 July, Kharkov (Ukraine)

[103] **“The CMS Level-1 Tau algorithm for the LHC Run II”**,
L. Mastrolorenzo, Poster, 37th International Conference on High Energy Physics (ICHEP 2014), 2-9 July 2014, Valencia (Spain)

[104] **“Searches for MSSM and NMSSM Higgs bosons with the CMS detector”**, C. Veelken, Talk at the 37th International Conference on High Energy Physics (ICHEP 2014), 2-9 July 2014, Valencia (Spain)

[105] **“A tight constraint on the Higgs width from off-shell production, for H decay to ZZ**,
C. Charlot, Plenary, GDR Terascale Palaiseau, 2-4 June 2014, Ecole Polytechnique, Palaiseau (France)

[106] **“H $\rightarrow \tau\tau$ in CMS”**,
O. Davignon, Plenary, GDR Terascale Palaiseau, 2-4 June 2014, Ecole Polytechnique, Palaiseau (France)

- [107] **“The CMS Level-1 calorimeter trigger upgrade for the run II of the LHC**,
A. Zabi, Poster, 3rd International Conference on Technology and Instrumentation in Particle Physics (TIPP 2014), 2-6 June 2014, Amsterdam (Netherlands), *proceedings published in PoS TIPP2014 (2014) 414*
- [108] **“Preparing Electrons and Photons High Level Trigger Reconstruction in CMS for Run II”**,
S. Regnard Poster, 3rd International Conference on Technology and Instrumentation in Particle Physics (TIPP 2014), 2-6 June 2014, Amsterdam (Netherlands)
- [109] **“Latest CMS results on heavy flavor and electroweak bosons”**,
A.H. Florent, Talk at the Large Hadron Collider Physics Conference (LHCP 2014), 2-7 June 2014, Columbia University, New York, NY (United States)
- [110] **“Highlights from CMS”**,
R. Granier De Cassagnac, Plenary, Quark Matter 2014 (QM2014), 19-24 May 2014, Darmstadt (Germany)
- [111] **“Hough transform for charged particle tracking in CMS”**,
S. Lisniak Poster, Plenary, Quark Matter 2014 (QM2014), 19-24 May 2014, Darmstadt (Germany)
- [112] **“Review of Higgs and EWK physics”**,
Y. Sirois, Invited talk, XXII International Workshop on Deep-Inelastic Scattering and Related Subjects (DIS 2014), 28 April - 2 May 2014, Warsaw (Poland); *with proceedings*
- [113] **“Measurement of the Higgs boson mass, width and spin-CP quantum numbers”**,
M., Dalchenko, Plenary talk, Standard Model at LHC 2014 (SM LHC 2014) 8-11 April 2014, CIEMAT, Madrid (Spain)
- [114] **“Performance and upgrade of the CMS electromagnetic calorimeter trigger for run II”**,
J.-B. Sauvan, Plenary Talk, 16th Int. Conf. on Calorimetry for High-Energy Physics, 6-11 April 2014, Justus-Liebig University, Giessen (Germany)
- [115] **“Higgs Properties at CMS”**,
J.-B. Sauvan, Plenary talk, XXVIIIth Rencontres de Physique de la Vallée d’Aoste (LaThuile 2014), 23 February - 1 March 2014, La Thuile (Italy)
- [116] **“Centrality dependent measurements in pPb from CMS”**,
Y. Yilmaz, Invited talk, Workshop on the determination of centrality in pA collisions at the LHC, 14 February 2014, CERN, LPCC, Geneva (Switzerland)
- 2013:**
- [117] **“Search for the SM Higgs boson decaying to tau lepton pairs in CMS”**,
I. Naranjo, Plenary talk, International Conference on High Energy Physics in the LHC Era, 16-20 December 2013, Valparaiso (Chile)
- [118] **“Production of W and Z bosons in heavy-ion collisions with CMS**,
A. Florent, Talk at the 6th International Conference on Hard and Electromagnetic Probes of High-Energy Nuclear Collisions (HardProbes2013), 4-8 November 2013, Stellenbosch, Western Cape (South Africa)
- [119] **“pA and AA Centrality”**,
Y. Yilmaz, Talk at the 6th International Conference on Hard and Electromagnetic Probes of High-Energy Nuclear Collisions (HardProbes2013), 4-8 November 2013, Stellenbosch, Western Cape (South Africa)
- [120] **“Study of the Higgs Boson decaying into $\tau\tau$ in CMS”**,
M. Bluj, Talk at the 2013 European Physical Society Conference on High Energy Physics (EPSHEP 2013) Stockholm, Sweden, 18-24 July, 2013, *with proceedings*
- [121] **“Probing pPb collisions with jets in CMS**,
M. Nguyen, Talk at the 2013 European Physical Society Conference on High Energy Physics (EPSHEP 2013) Stockholm, Sweden, 18-24 July, 2013; *with proceedings*
- [122] **“Search for the Higgs boson decaying into tau leptons in the semi-leptonic final states”**,
N. Daci, Poster, 2013 European Physical Society Conference on High Energy Physics (EPSHEP 2013) Stockholm, Sweden, 18-24 July, 2013; *with proceedings*
- [123] **“Properties of the Higgs boson with $H \rightarrow ZZ \rightarrow 4$ leptons channel”**,
C. Ochando, Poster, 2013 European Physical Society Conference on High Energy Physics (EPSHEP 2013) Stockholm, Sweden, 18-24 July, 2013; *with proceedings*
- [124] **“Heavy flavour and quarkonia experimental overview”**,
R. Granier de Cassagnac, Invited talk, International Conference on Strangeness in Quark Matter (SQM2013), 22-27 July 2013, University of Birmingham, Birmingham (United Kingdom)
- [125] **“Higgs Boson(s): Di-boson Decay Channels”**
Y. Sirois, Invited review talk presented at the 25th Rencontres de Blois - International Conference on Particle Physics and Cosmology, Blois, France (26-31 May 2013); *with proceedings*.
- [126] **“Recent HI results with CMS”**
M. Nguyen, Invited review talk presented at the 25th Rencontres de Blois - International Conference on Particle Physics and Cosmology, Blois, France (26-31 May 2013); *with proceedings*.
- [127] **“The CMS particle flow algorithm”**,
F. Beaudette, Talk presented at the International Conference on Calorimetry for High Energy Frontier (CHEF2013), 22-25 April 2013, Paris (France); *with proceedings*.
- [128] **“Triggering on electrons and photons with the CMS experiment at the LHC”**,
A. Zabi, Talk presented at the International Conference on Calorimetry for High Energy Frontier (CHEF2013), 22-25 April 2013, Paris (France); *with proceedings*.

- [129] **”Upsilon melting in CMS and ALICE at the LHC”**,
T. Dahms, Review talk at the 14th International Conference on B-Physics at Hadron Machines (BEAUTY 2013) , 8-12 April 2013, Bologna U. (Italy). *with proceedings*
- [130] **“Higgs boson in the $H \rightarrow ZZ \rightarrow 4l$ channel in CMS”**,
C. Ochando, Plenary talk, LHC France meeting, 2-6 Avril 2013, Annecy (France)
- [131] **“Study of Higgs production in Bosonic Decays Channels in CMS”**,
C. Ochando, review talk presented at the ”Moriond, QCD and High Energy Interactions” international conference, La Thuile (9-16 March 2013); *with proceedings*.
- [132] **“Role of the CMS electron and photon trigger in the Higgs boson searches”**,
N. Daci, Talk presented at the Lake Louise Winter Institute, Alberta (Canada) 17-23 February 2013.

Le choc de simplification

Liste de nos sources de financement ou ressources humaines, tutelles et instances (du plus petit au plus grand ... chacun avec ses comités de revue, ses classements, comités de sélection, conseil scientifique, et autre comités techniques)

- Laboratoire Leprince-Ringuet
 - Ecole Polytechnique
 - Université Paris-Saclay / Département P2I / PHENIICS
 - Laboratoire d'excellence P2IO [ne pas confondre avec P2I]
 - Fédération LAL [LLR, APC, LPNHE]
 - IN2P3 et ses journées projets etc.
 - EAOM (pour le laboratoire avec ensemble de nos tutelles)
 - LCG-France (sous la tutelle de l'IN2P3) ... et qui co-finance notre Tier2
 - CNRS avec son CSI
 - CoNRS - commission 01, postes et avancement etc.
 - TGIR [construction CMS, Upgrades ...]
 - HCÉRES ... pour l'évaluation des laboratoires ...
 - ANR
 - ERC
- ... sans oublier les « engineering reviews » de CMS, le LHCC, les TP, TDR, etc.

Travailler dans une expérience LHC, en principe une priorité, c'est vivre **héroïquement dans un environnement extrêmement hostile**

- The Trigger Primitives algorithms were conceived by Ph. Busson (LLR).
- In the experiment, the primitives for the ECAL Barrel are mainly produced in the ECAL FE cards and the algorithms are installed in the FENIX chips; for the End-Caps, they are shared between the FE and the TCC48 cards.
- Thousands of FE cards were produced by Hitachi – France under the responsibility of L. Dobrzynski (LLR); they were tested on a test bench made by A. Debraine and Th. Romanteau under the « XFEST project ».
- Posters and papers describing TCC68 and XFEST projects can be found here:
Publication: <http://polywww.in2p3.fr/IMG/pdf/PaperHeidelberg2.pdf>
Poster: http://polywww.in2p3.fr/IMG/pdf/ElecPoste2005_A4.pdf
- After commissioning, CMS realized that there was a problem with the APDs glued to the PbWO_4 which randomly reacted to single heavy ionising particles producing “spikes” (large signal in a single crystal).
Treating the problem which was not in the original trigger specifications required new firmware and efforts involving A. Zabi (LLR) and his doctor degree students with heavy involvement by LLR engineers like Y. Geerebaert and Th. Romanteau.