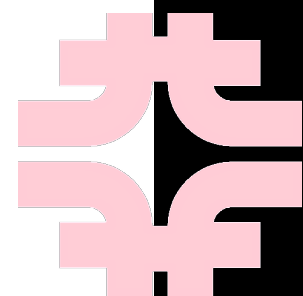




CMS Experiment at LHC, CERN  
Data recorded: Fri Mar 25 10:14:24 2016 CET  
Run/Event: 267928 / 267  
Lumi section: 79

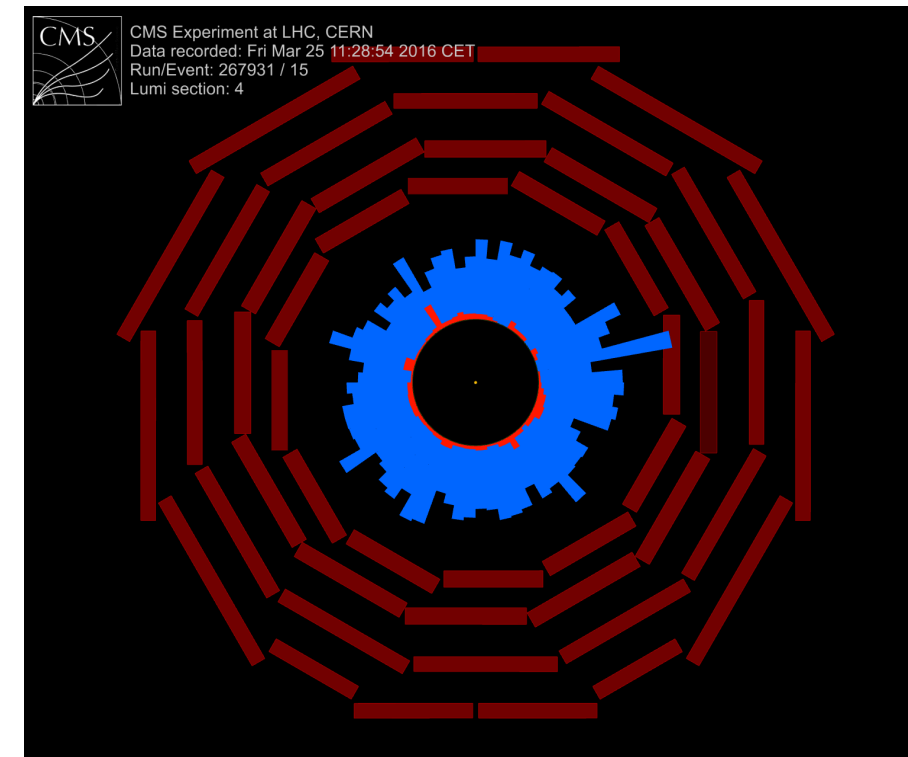
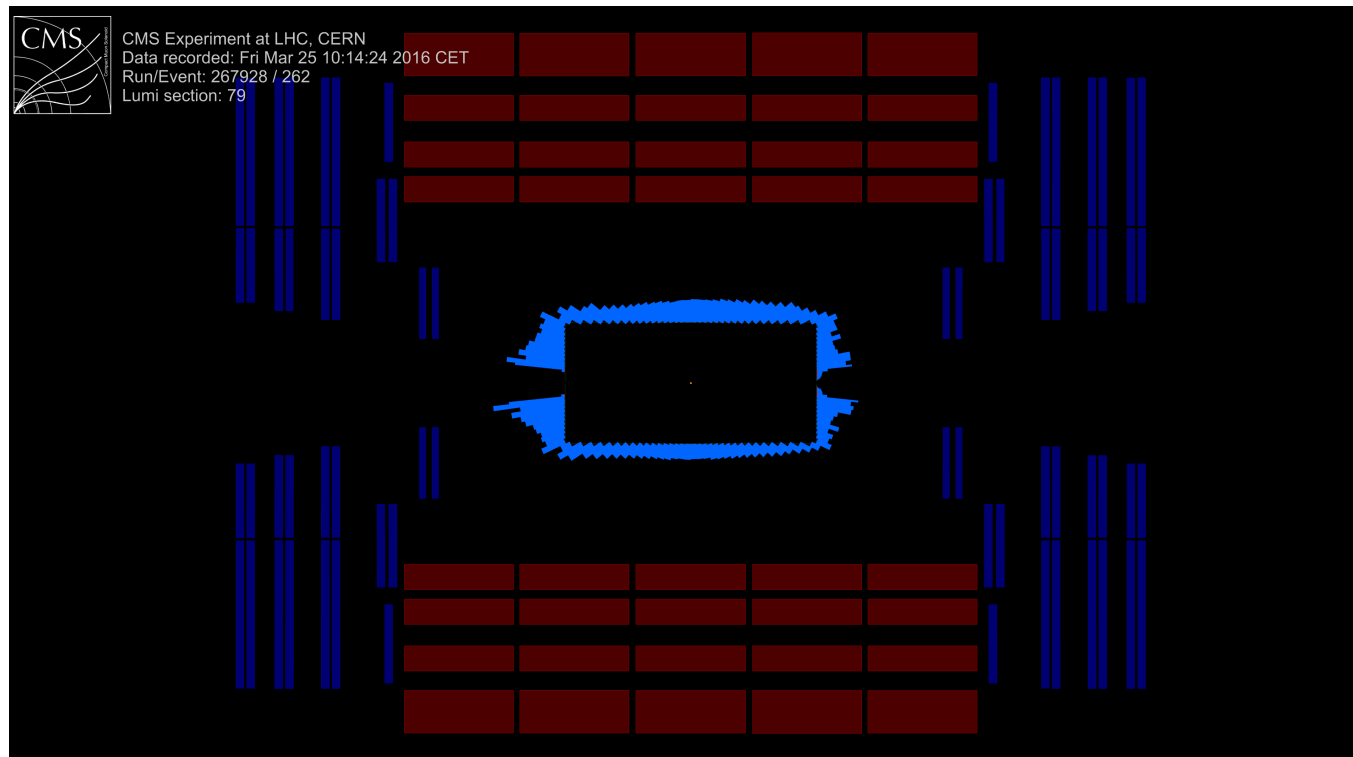
# CMS Report - all experimenters meeting

Caterina Vernieri  
April 4th 2016



# we have beam!

Since last report on 03/7/2015 ...



2016 will be a production year with  $\sqrt{s}=13$  TeV and 25ns bunch spacing:

- $\beta^*=40$  cm
- peak luminosities of  $\sim 1.2 \cdot 10^{34}/\text{cm}^2/\text{s}$  (pileup $\sim 30$ )

CMS aims to start with the full Phase I upgraded trigger

All of HCAL trigger generation and Readout is now fully  $\mu$ TCA based.



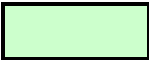


# LHC schedule 2016 - draft

- \* Closing for beam
- \* Cryogenics
  - cold box on schedule
  - compressor hall work (oil removal) a few days ahead
  - earliest cryo-ready: week of 18 Apr
  - earliest “magnet ready” could be in week of 25 April
- First beam March 29th, stable beams April 25
- $25 \text{ fb}^{-1}$  at lumi which might exceed  $1.2 \cdot 10^{34} / \text{cm}^2 / \text{s}$

	Jan				Feb				Mar				
Wk	1	2	3	4	5	6	7	8	9	10	11	12	13
Mo	4	11	18	25	1	8	15	22	29	7	14	21	Easter Mon 28
Tu													
We													
Th				Year end technical stop						Powering tests			
Fr								DSO test				Machine checkout	G. Friday
Sa													
Su													

	Apr				May				June				
Wk	14	15	16	17	18	19	20	21	22	23	24	25	26
Mo		21 Apr “cryo-ready”	28	25	2	9	16	23	30	7	14	21	28
Tu									beta* 2.5 km dev.				
We							VdM			TS1			
Th		Recommissioning with beam			Ascension								
Fr					May Day								
Sa									MD 1				
Su				1st May		02 May 1st physics							

**stable beams**

	Technical Stop		Machine development
	Recommissioning with beam		Special physics runs - schedule to be established
	Scrubbing (indicative - dates to be established)		

# Recall: 2016 Global Running

January						
Mo	Tu	We	Th	Fr	Sa	Su
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	★	30	31			

4 Mid Week Global Runs (MWGR)

April						
Mo	Tu	We	Th	Fr	Sa	Su
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
★	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			



= 1<sup>st</sup> beams in



= Stable Beams

During the **4MWGRs**:

- 1) Reestablish 2015 run conditions
- 2) Global run with Upgraded trigger (2016 Release)
- 3-4)
  - \* Commission Upgraded trigger
  - \* Collect Cosmics for alignment/calibration

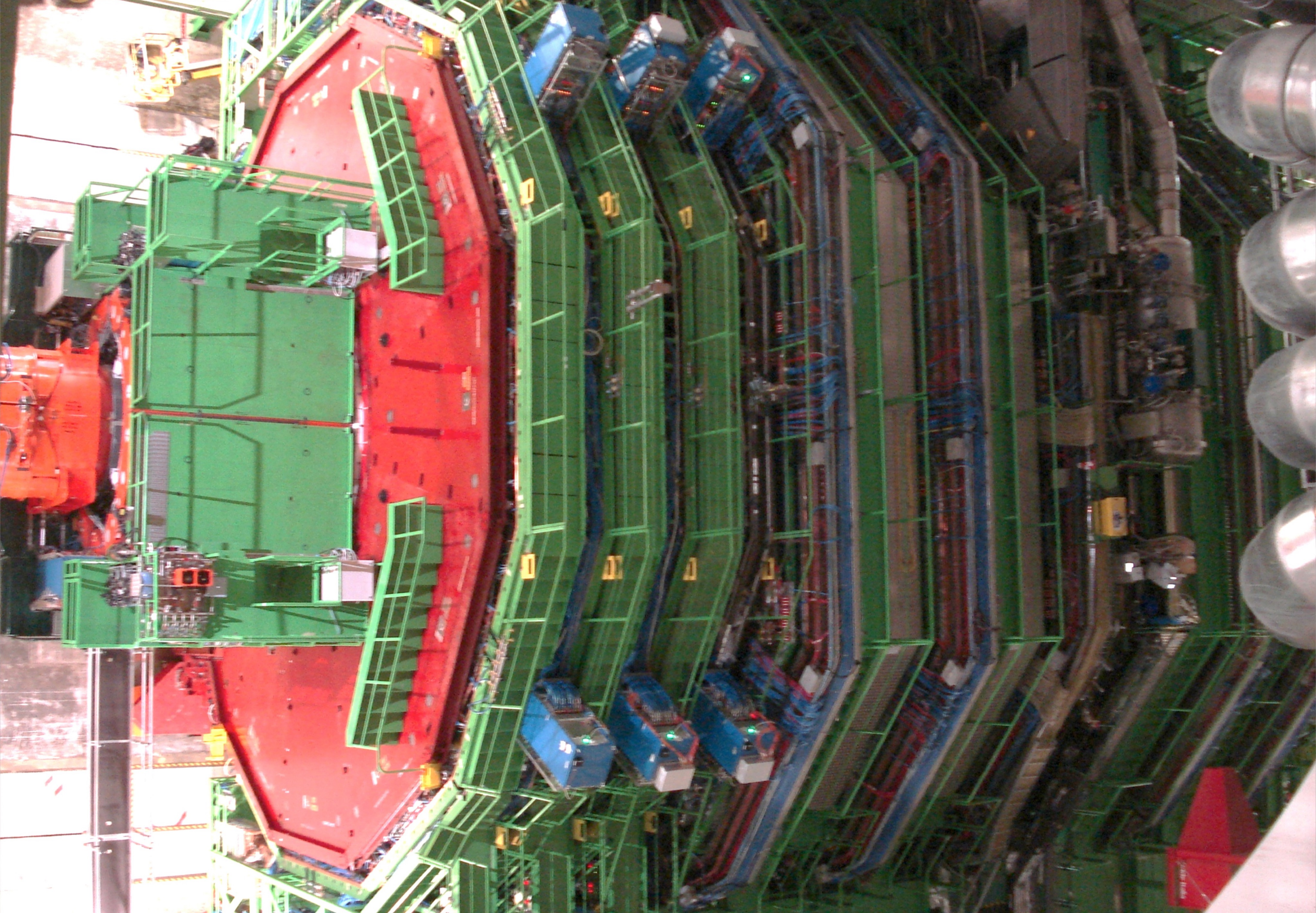
## Upcoming items...

Run 24/7 ~1 weeks

Stable Beams ~4 weeks

B= 3.8T ~6 weeks







# CMS during Year End Technical Stop

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Closing of the detector has gone well

ready for calibration with magnetic field

- ◆ All repair/maintenance work to optimize for 2016 run has been completed

Cryo status:

- ◆ Magnet cool down starts this week
- ◆ Aiming for  $B=3.8$  T on or before 02 May

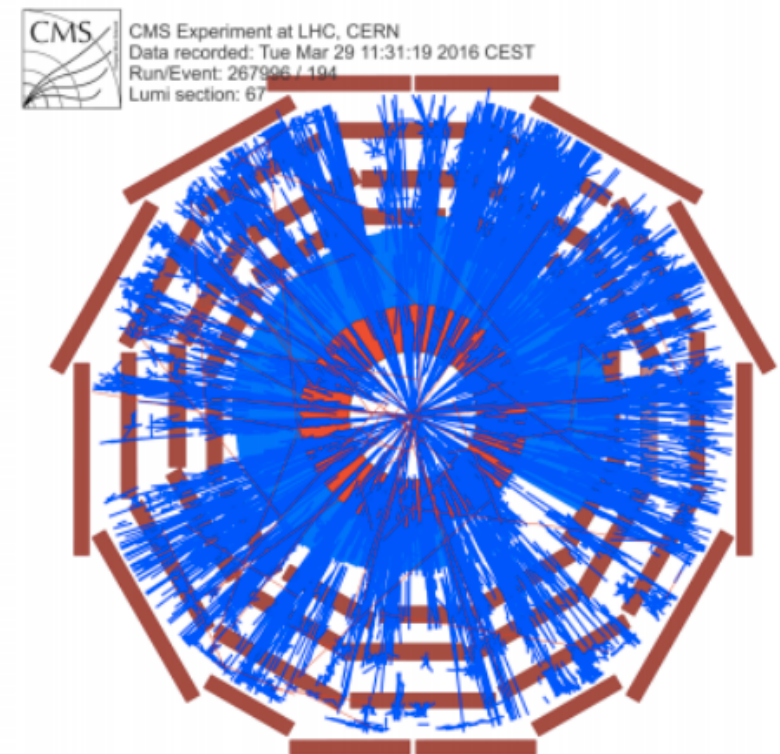
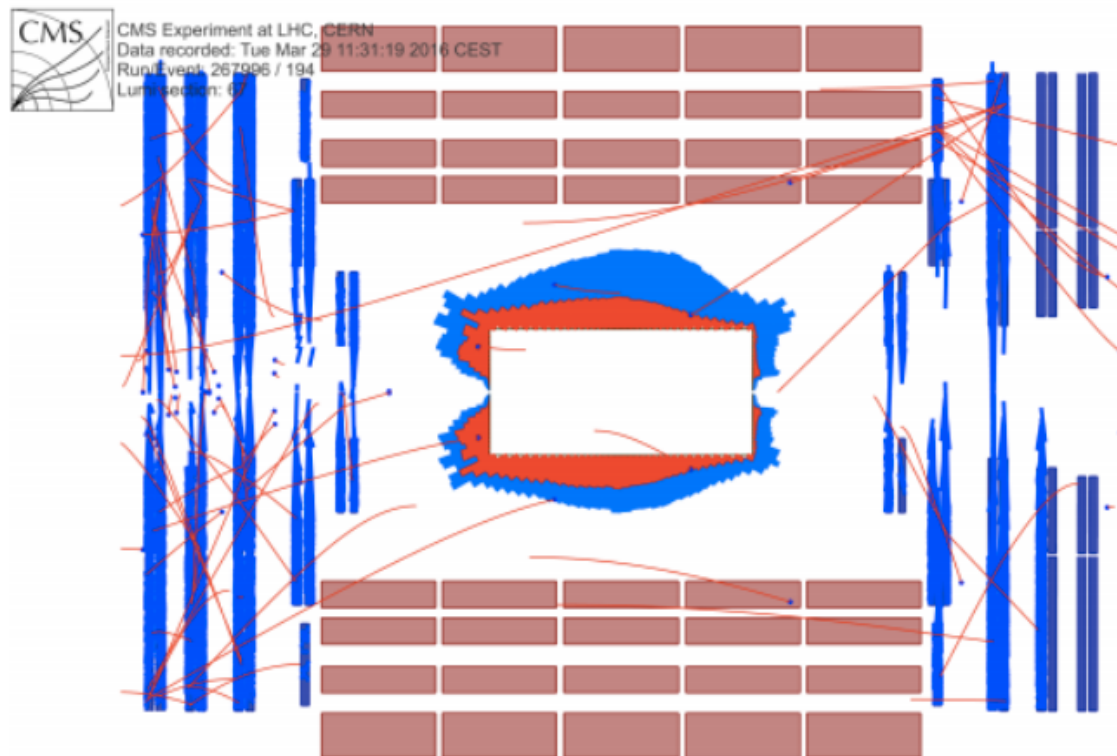
# Beam, again!

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- First beams on Friday 25 March, then splashes 29 March
- Day 1: 1-2 splashes as LHC initially threads through the machine
  - Goal: Confirm timing of CMS physics triggers
- 29 March: ~10 splashes from each side
  - Goals: Re-confirm timing of CMS physics triggers
- At a convenient point during the 2nd-3rd week of beam commissioning, LHC will provide collisions with 2-3 nominal bunches at  $\sqrt{s}=13$  TeV with conditions suitable for CMS to determine x-y beamspot with outer Tracker.
- The aim is to set the beam spot to the ~same position as 2015.

# LHC & CMS Running

- LHC beam operations:
  - ♦ optics measurements performed
  - ♦ unidentified lying object (ULO) in ~same place as at end of 2015,
- ♦ CMS configured to trigger on E-gamma fed by ECAL only  $\pm 2$  central towers for good timing.
  - ♦ Large HCAL activity, very little ECAL activity
  - ♦ New algorithms in calorimeter trigger have new 'shapes' to recognize electrons [from IP].
    - ♦ Hypothesis confirmed by running emulator on 2015 splashes
  - ♦ Changed trigger menu to trigger on E-gamma, Jets, HTT, ETT
  - ♦ Dedicated splash session: Apr5 (~10 splashes/side)





# Detector

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**Tracker:** overall in good shape.

- ◆ Strips and Pixels OFF since the start of LHC beam setup.
  - ◆ Preceding cosmic data taking: smooth and data are ok; a few open questions to be settled before collisions.
  - ◆ Phase I upgrade:
    - ◆ Strip Tracker took data. Data will be analyzed in the coming days.
    - ◆ Forward Pixel welding review → several recommendations on welding procedure.
      - ◆ New welding company has been contacted and a testing campaign started last week.
      - ◆ More automation, and of the inert gas protection to avoid oxidation of the welded region.
- ➡ Expect start of production of the cooling loops for the detector in two weeks.

**ECAL** Overall timing looks OK (readout and trigger well aligned, channel timing OK).

CMS well aligned with LHC BC# (got the splashes in the correct BC)

# Trigger news

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- Work is ongoing to integrate all the developments in the CMS software
- Trigger Coordination:
  - Level1 (L1) MET computation fixed. Rates look good both with and without L1 corrections
  - Calibrations in L1 suspect: they worsen slightly EG resolution (~20% higher rates) and impact the isolated EG turn-on.
- This week: physics groups are presenting their HLT requests based on the Stage-2 L1 trigger
- Physics groups are discussing to re-tune thresholds for the single and multi lepton triggers, MET, etc.
  - These requests will be incorporated into the version of the menu to be deployed for collisions.
- Waiting for L1 trigger menu (key missing element: MET-related bits)



# Recent CMS publications

## Run 2 Publications

6	<a href="#">SUS-15-003</a>	Search for new physics with the $M_{T2}$ variable in all-jets final states produced in pp collisions at $\sqrt{s} = 13$ TeV	Submitted to JHEP	13 March 2016
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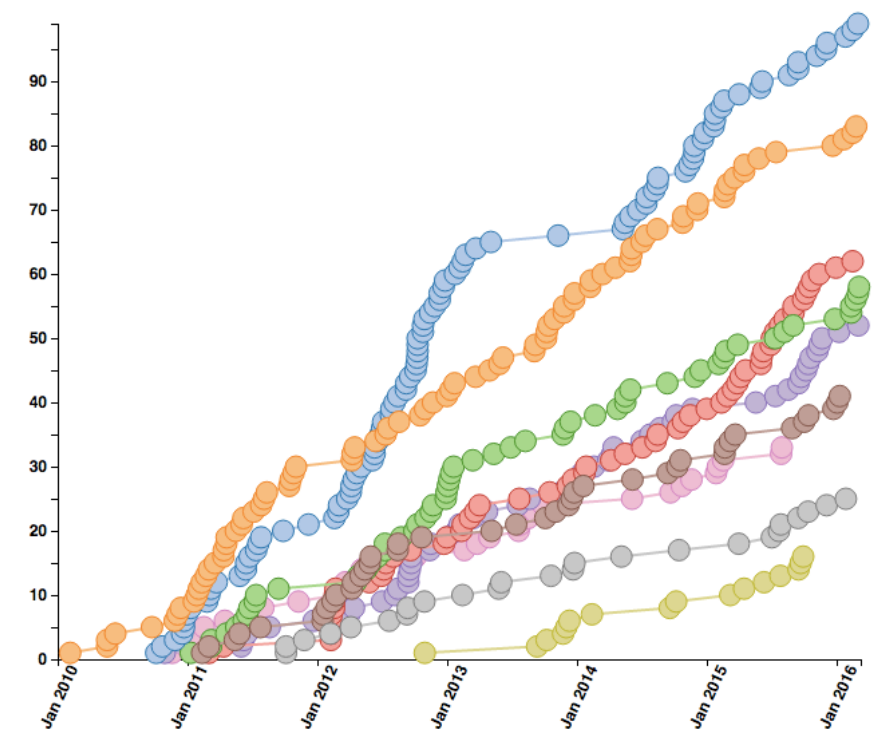
## CMS Publications

519	<a href="#">EXO-14-004</a>	Search for dark matter particles in proton-proton collisions at $\sqrt{s} = 8$ TeV using the razor variables	Submitted to JHEP	29 March 2016
518	<a href="#">HIG-13-032</a>	Search for two Higgs bosons in final states containing two photons and two bottom quarks	Submitted to PRD	22 March 2016
517	<a href="#">TOP-12-030</a>	Measurement of the top quark mass using charged particles in pp collisions at $\sqrt{s} = 8$ TeV	Submitted to PRD	21 March 2016
516	<a href="#">TOP-15-009</a>	Measurements of $t\bar{t}$ charge asymmetry using dilepton final states in pp collisions at $\sqrt{s} = 8$ TeV	Submitted to PLB	20 March 2016
515	<a href="#">SUS-15-003</a>	Search for new physics with the $M_{T2}$ variable in all-jets final states produced in pp collisions at $\sqrt{s} = 13$ TeV	Submitted to JHEP	13 March 2016
514	<a href="#">HIG-15-001</a>	Search for neutral resonances decaying into a Z boson and a pair of b jets or $\tau$ leptons	Submitted to PLB	9 March 2016
513	<a href="#">HIN-15-003</a>	$\Upsilon(nS)$ polarizations versus particle multiplicity in pp collisions at $\sqrt{s} = 7$ TeV	Submitted to PLB	9 March 2016
512	<a href="#">TOP-13-009</a>	Search for s channel single top quark production in pp collisions at $\sqrt{s} = 7$ and 8 TeV	Submitted to JHEP	8 March 2016

519 papers submitted

Show all Total Exotica Standard Model Supersymmetry Higgs  
Top Physics Heavy Ion B Physics Forward Physics Beyond 2 Generations

468 papers submitted as of 2016-03-05



# Summary and Outlook

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During Year End Technical Stop:

- The repairs ( Cold Box, Dewar valve, Water leak...) are completed
  - Magnet should be ready just in time for the first physics collisions by May 2nd

First beams!

Detector is responding well and calibrations are on going.

Given the LHC is promising  $25 \text{ fb}^{-1}$  (possibly) at lumi which might exceed  $1.2 \cdot 10^{34}/\text{cm}^2/\text{s}$

- \* The **main short term goal is ICHEP in August in Chicago**
- \* We are engaged on multiple fronts:
  - \* Phase I upgrades (pixel and HCAL) are reaching critical stages
  - \* Phase II: the process leading to the TDRs is engaged and engaging resources