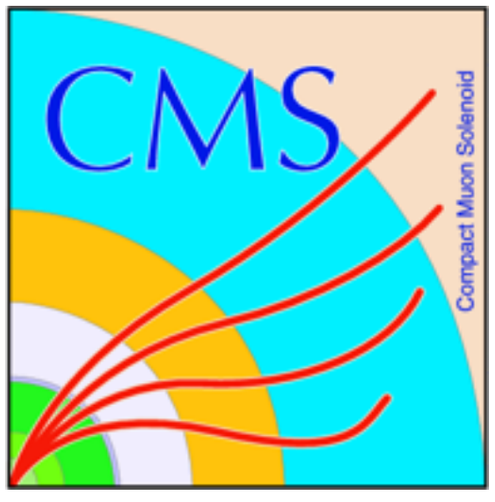
All Experimenters' Meeting: LHC & CMS update

Nadja Strobbe (FNAL)

June 6, 2016



Fermilab

Reminder

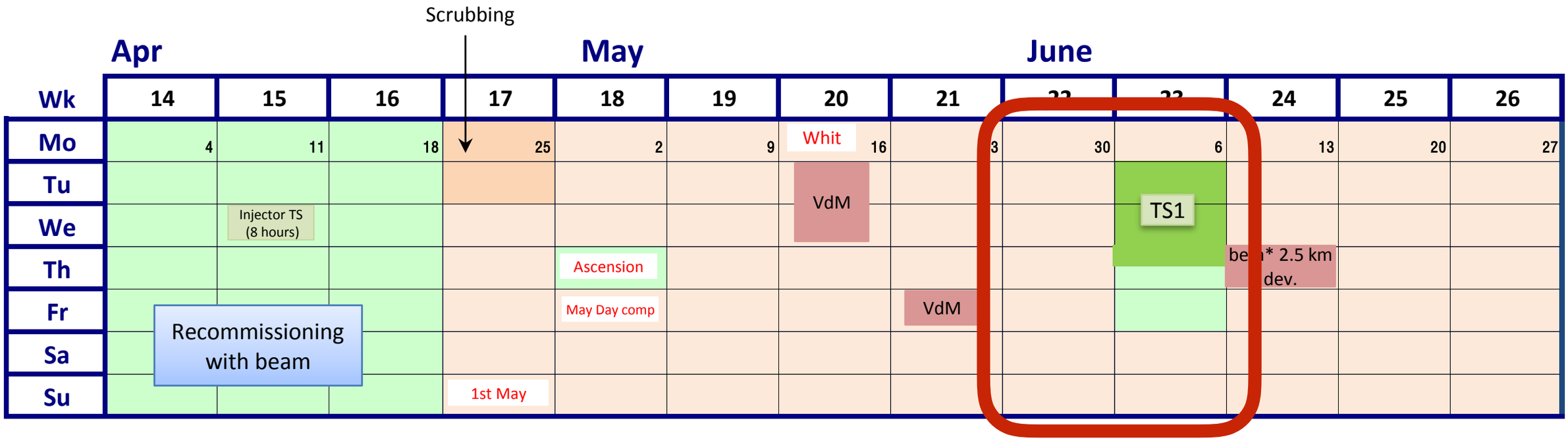
- Last report on May 2, by Zhen Hu
- First stable beams in LHC on April 21 ★
- CMS magnet at full field (3.8T) on April 28 ★

Scrubbing

	Apr				May				June				
Wk	14	15	16	17	18	19	20	21	22	23	24	25	26
Mo	4	11	18	25	2	9	Whit 16	23	30	6	13	20	27
Tu							VdM						
We		Injector TS (8 hours)								TS1			
Th			★	★	Ascension				MD 1				
Fr	Recommissioning with beam				May Day comp								
Sa					Intensity ramp-up Scrubbing as required								
Su				1st May					beta* 2.5 km dev.				

- Beech marten incident (short on 66kV transformer) on April 29 causing about 1 week delay

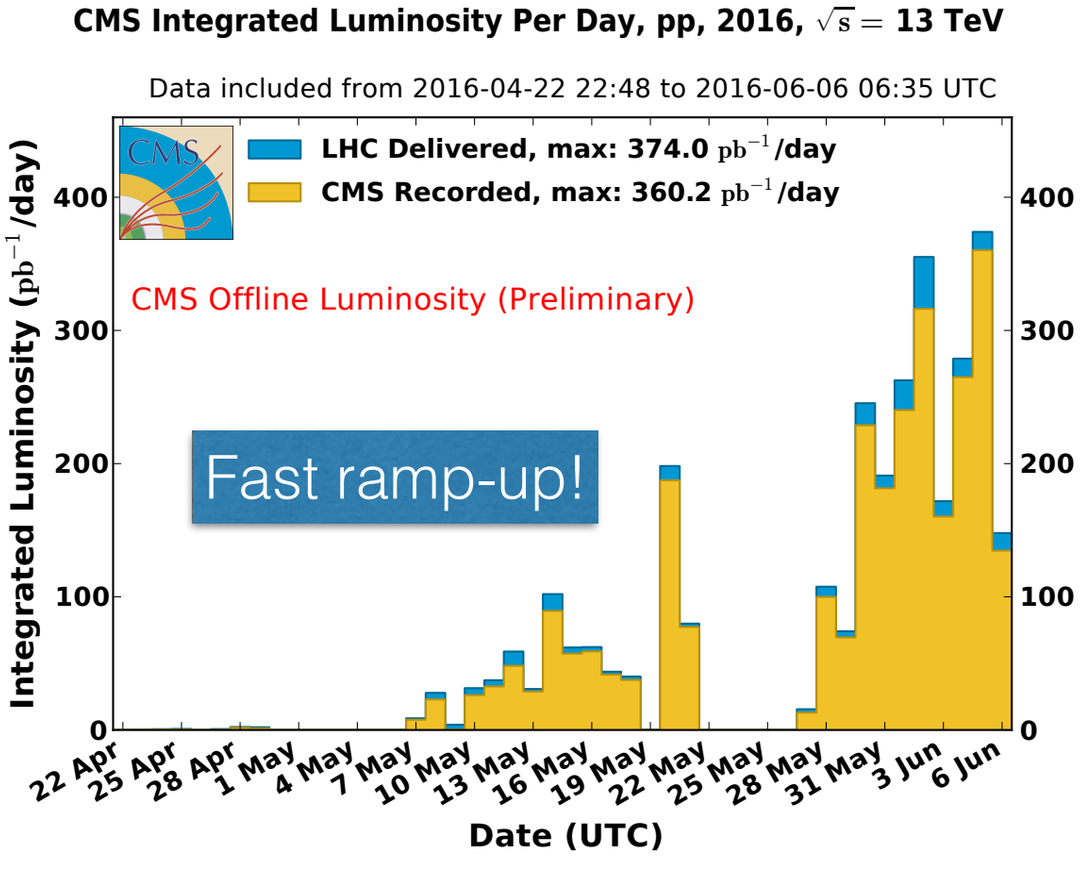
Current LHC schedule

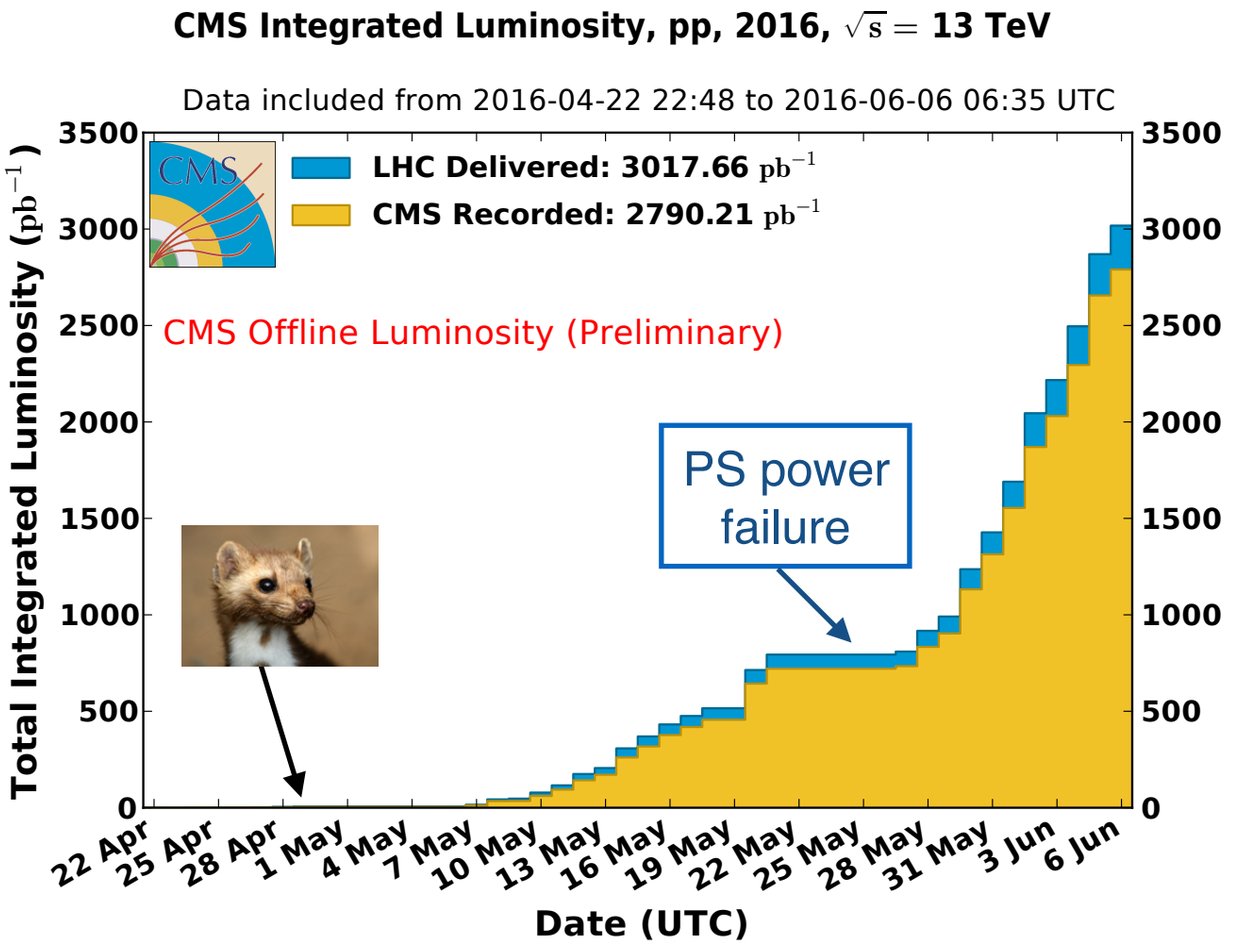


- Changes wrt previous schedule:
  - Machine Development postponed
  - Shortened Technical Stop
  - Extra van der Meer scan for CMS performed on May 27
- **Goal**: maximize delivered luminosity for ICHEP (6-8 fb^{-1})
- ~20 fb^{-1} expected for 2016

LHC Status

- Mostly smooth running in May
  - 5 days lost due to PS power failure
  - Took cosmic data for alignment
- Already **3 fb^{-1} delivered** to CMS!
- Max delivered integrated luminosity per day: 374pb^{-1} (fill of 17.5 h)

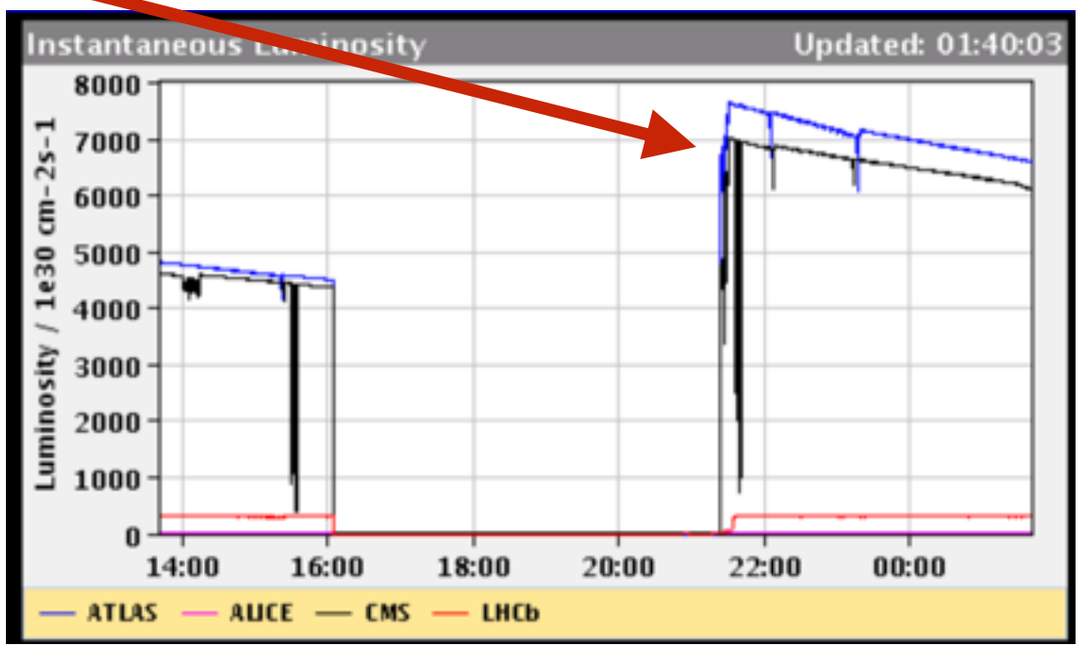




- Max peak luminosity: 7.46x10^{33} cm^{-2}s^{-1}
- No plans to fix SPS beam dump vac. leak, as long as it remains stable
- Injection limited to 72 bunches, and **max of 2024 colliding bunches**
  → lumi expected for this year ~20 fb^{-1}

CMS Status

- **Magnet is stable**, no sign of contamination in cryo system
- **All subsystems working well**
- Took cosmic muon data for alignment during LHC downtime
- Investigating 10% difference in online luminosity between **CMS** & **ATLAS**
  - Cause unknown
  - Observed in 2012 & 2015, was resolved after full offline analysis



Summary of Fills (I)

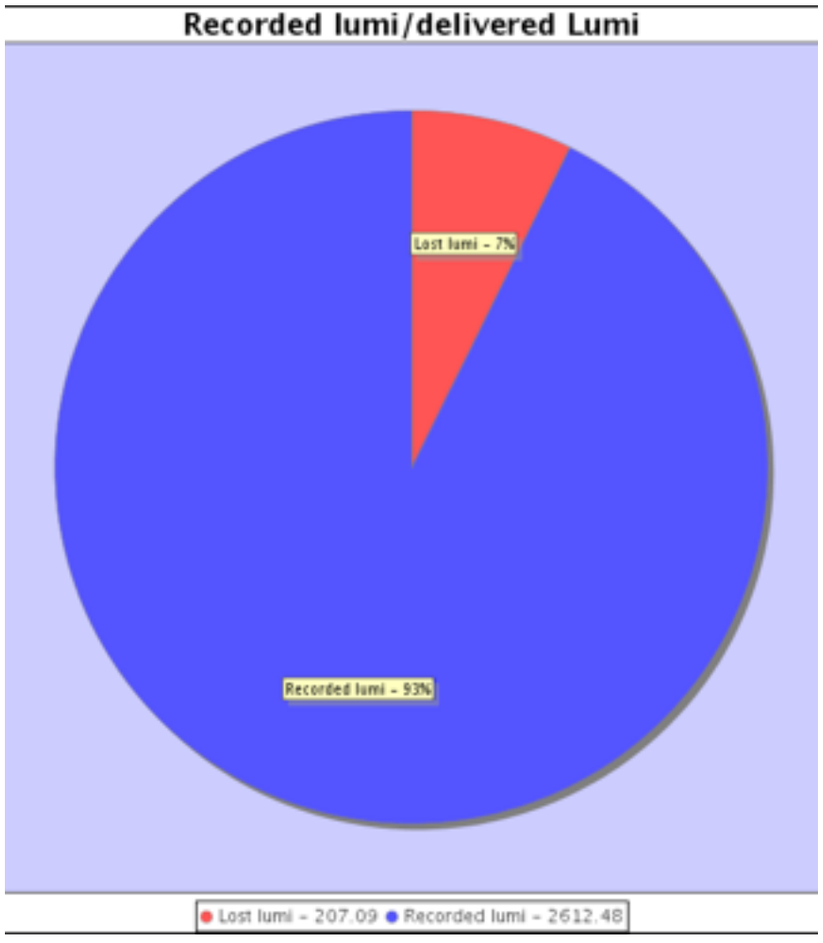
Fill	Begin Time *YYYY.MM.DD HH:MM*	Duration *HH:MM*	PeakInstLumi $\times10^{30}cm^{-2}s^{-1}$ pp $\times10^{24}cm^{-2}s^{-1}$ Ions	DeliveredLumi pb^{-1} pp μb^{-1} PbPb	RecordedLumi pb^{-1} pp μb^{-1} PbPb	EffByLumi %
4888	2016.05.06 21:46	01:26	8	0.0	0.0	76.3
4889	2016.05.07 01:48	02:11	160	1.1	0.9	79.6
4890	2016.05.07 08:16	05:05	158	2.5	2.0	83.4
4892	2016.05.07 16:57	11:13	228	7.5	6.9	92.0
4895	2016.05.08 12:54	07:41	953	23.3	20.0	86.1
4896	2016.05.08 23:25	00:30	1072	1.8	0.4	20.6
4905	2016.05.09 22:55	02:32	1042	9.0	4.0	43.9
4906	2016.05.10 04:02	02:32	1087	9.3	8.2	88.4
4910	2016.05.10 19:18	10:42	1077	28.0	24.6	87.8
4915	2016.05.11 20:22	09:17	2120	59.1	50.4	85.4
4919	2016.05.12 20:16	08:56	1966	54.9	47.7	86.9
4924	2016.05.14 01:48	06:46	1614	33.5	27.9	83.5
4925	2016.05.14 11:16	04:55	1925	31.0	28.5	91.9
4926	2016.05.14 20:02	12:10	2940	103.2	94.1	91.2
4930	2016.05.16 09:06	04:37	2060	31.4	29.5	93.7
4935	2016.05.16 19:58	10:42	2215	72.3	69.0	95.5
4937	2016.05.17 12:10	09:13	1	0.0	0.0	93.5
4942	2016.05.18 05:29	03:36	3225	39.3	36.8	93.7
4945	2016.05.18 16:22	07:34	3	0.1	0.0	87.9

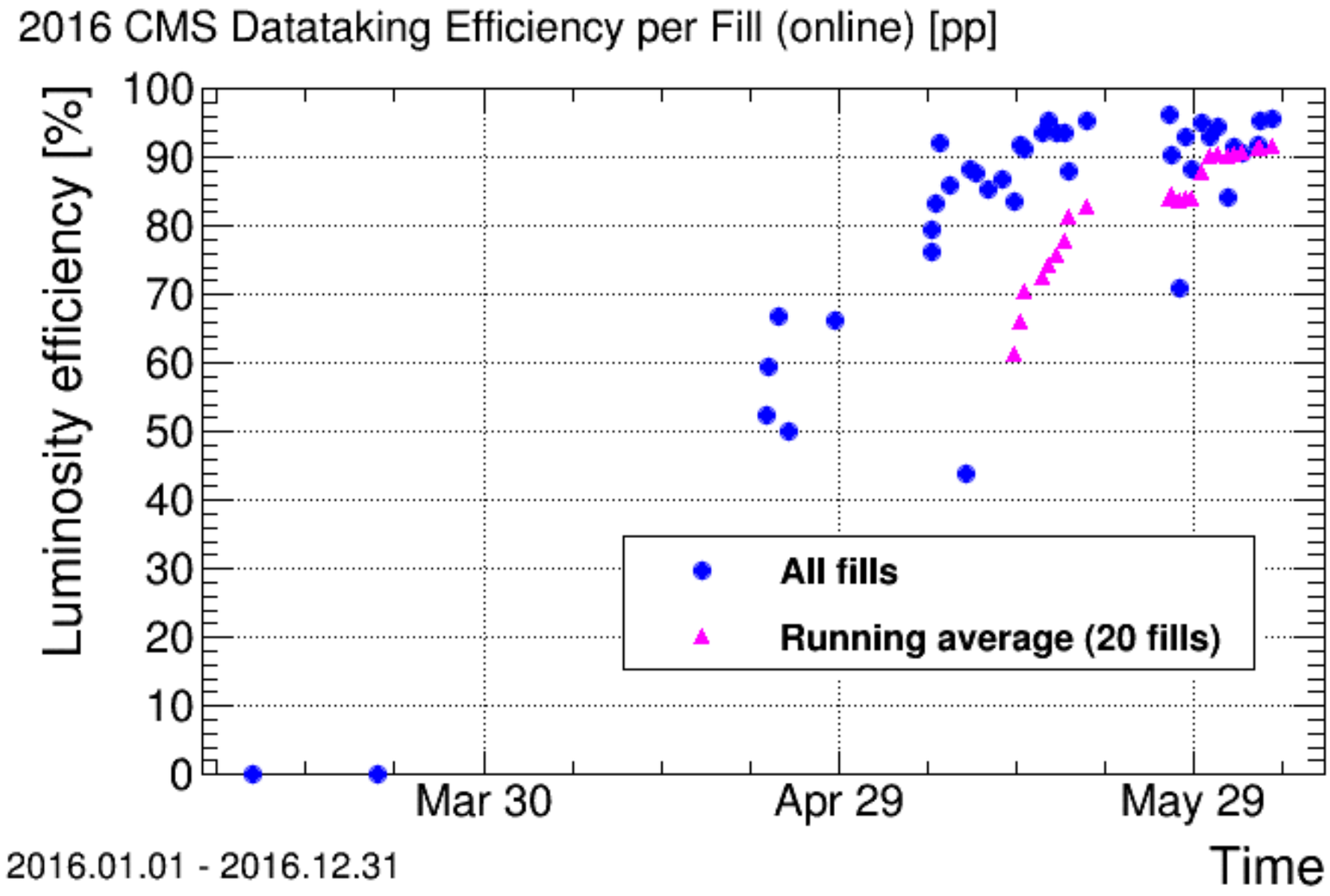
Ramp up # bunches

Summary of Fills (II)

Fill	Begin Time *YYYY.MM.DD HH:MM*	Duration *HH:MM*	PeakInstLumi $\times10^{30}cm^{-2}s^{-1}$ pp $\times10^{24}cm^{-2}s^{-1}$ Ions	DeliveredLumi pb^{-1} pp μb^{-1} PbPb	RecordedLumi pb^{-1} pp μb^{-1} PbPb	EffByLumi %
4947	2016.05.20 02:36	35:23	3419	269.2	256.6	95.3
4953	2016.05.27 02:18	01:30	1949	9.7	9.4	96.2
4954	2016.05.27 07:48	06:14	3	0.0	0.0	90.3
4956	2016.05.27 22:02	00:36	3363	7.1	5.1	71.1
4958	2016.05.28 11:49	07:58	4221	103.1	95.9	93.0
4960	2016.05.29 00:44	00:27	4989	6.7	5.9	88.3
4961	2016.05.29 19:59	09:16	4971	137.5	130.6	94.9
4964	2016.05.30 13:58	12:30	5657	204.2	189.9	93.0
4965	2016.05.31 05:54	08:09	6212	158.6	150.1	94.6
4976	2016.06.01 03:22	02:42	6459	57.9	48.8	84.2
4979	2016.06.01 15:01	11:22	7305	249.3	228.5	91.6
4980	2016.06.02 09:09	17:35	7210	352.8	320.2	90.8
4984	2016.06.03 15:36	00:21	6984	8.0	7.3	91.8
4985	2016.06.03 19:09	14:10	7452	308.5	293.8	95.2
4988	2016.06.04 20:15	17:49	7155	353.9	338.6	95.7
4990	2016.06.05 19:31	11:02	7025	235.9	219.4	93.0
Summary		278:43	7452	**2969.6**	**2751.1**	**92.6**

CMS Data taking efficiency





- 93% efficiency on average (lumi-averaged) since May 2

Summary & Outlook

- **LHC in physics mode** with goal to deliver as much data as possible by ICHEP (early August)
- **CMS** fully commissioned and **taking good data**
- Short Technical Stop coming up:
  - CMS magnet will stay on
  - no major interventions foreseen
- CMS is engaged on multiple fronts
  - Data taking
  - Phase 1 upgrade (pixel, HCAL) to be installed soon
  - Phase 2 upgrade: TDR preparation started