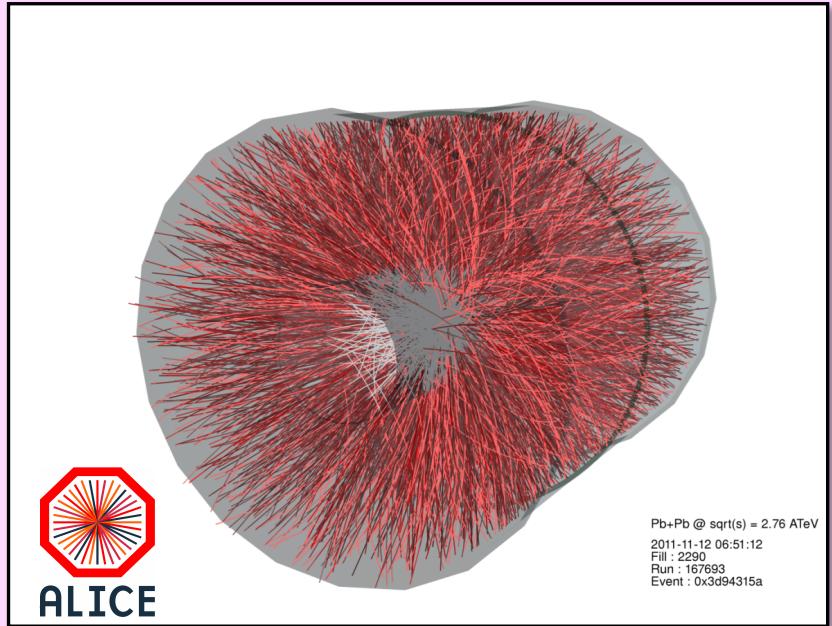


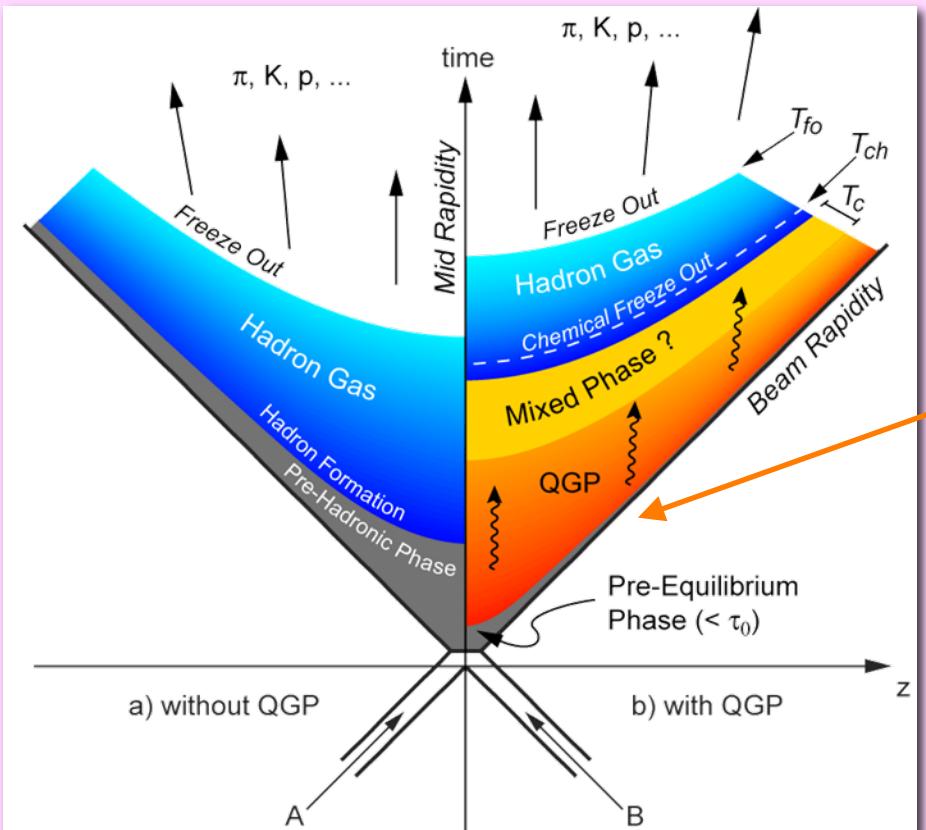
Status of ALICE detector



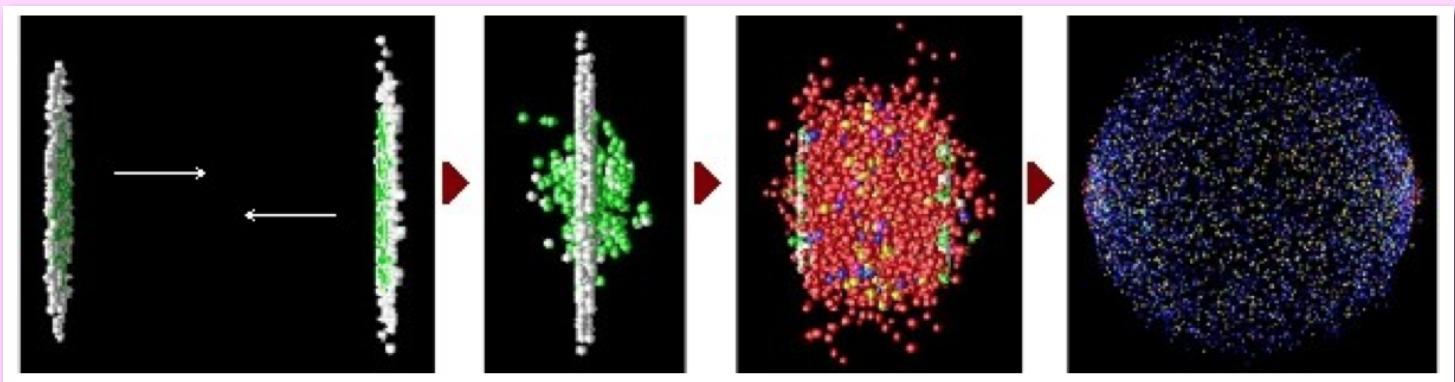
- The aim of the ALICE experiment
- ALICE detector layout and status
- ALICE data
- pPb highlights (performance, trigger statistics, high-level trigger)
- ALICE results and observables (now and in future)



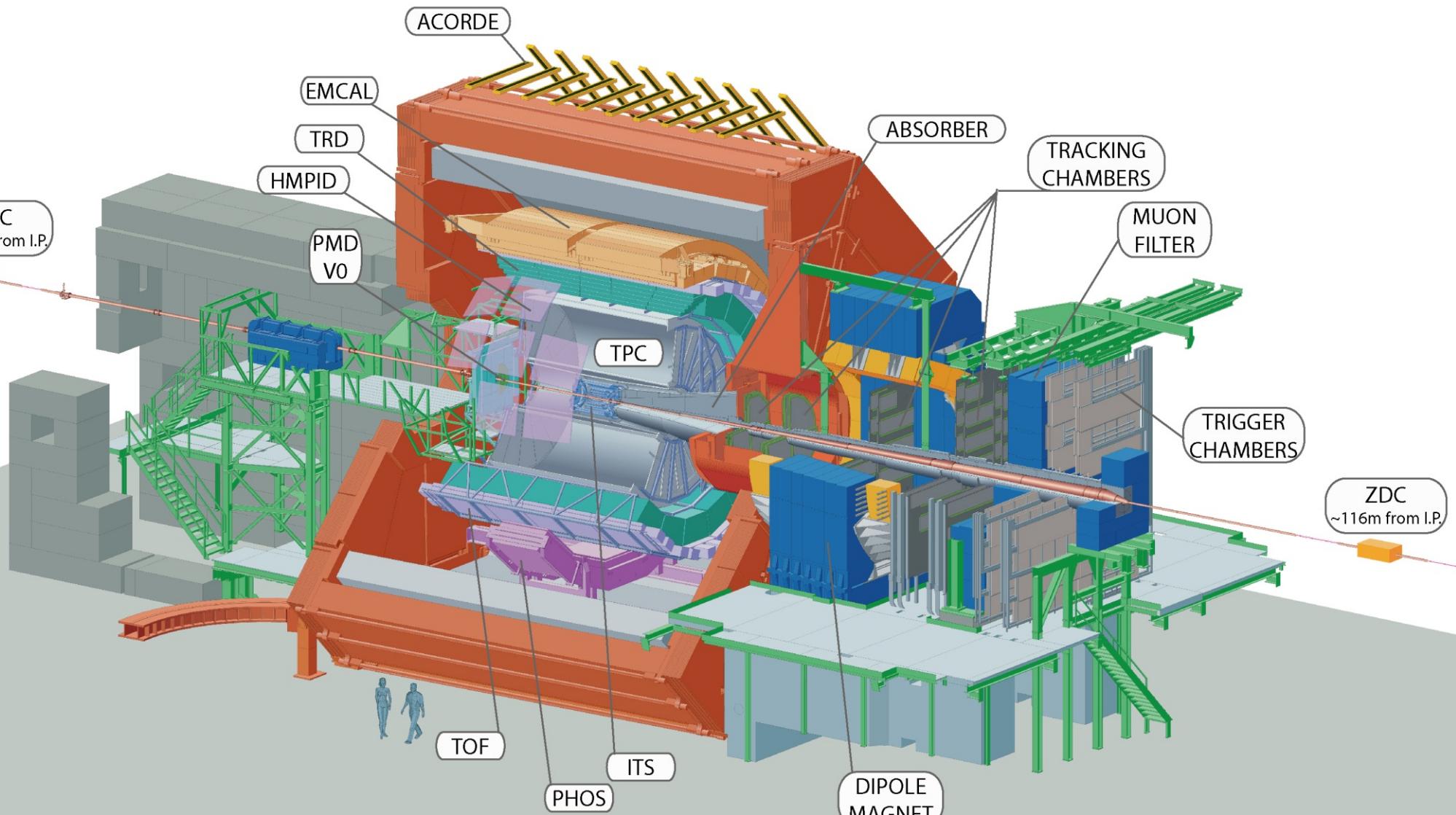
The aim of ALICE



Studying the properties of the QGP phase
Comparing collisions of different systems
(pp , pA , AA)



ALICE detector



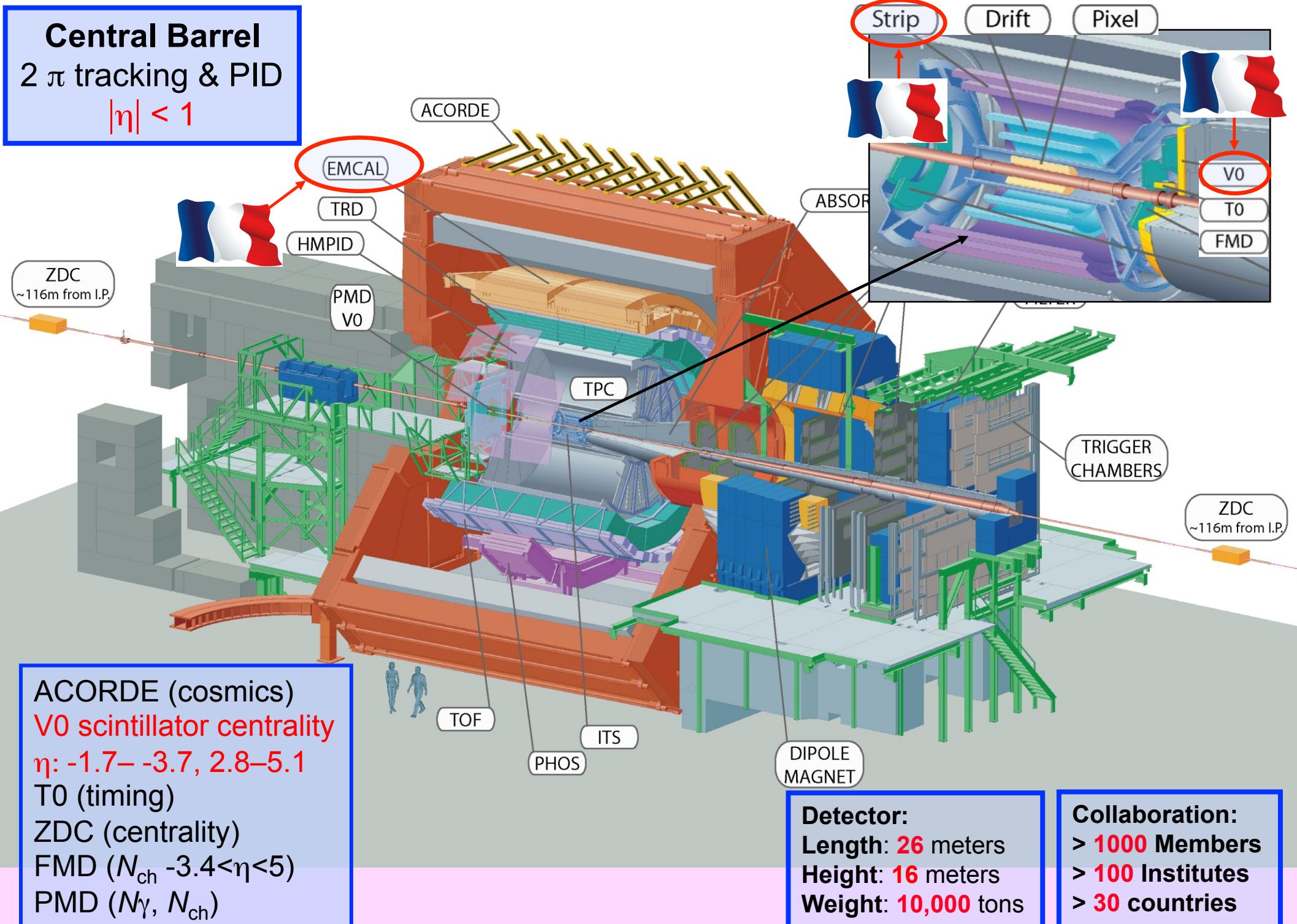
Detector:
Length: **26** meters
Height: **16** meters
Weight: **10,000** tons

Collaboration:
> 1000 Members
> 100 Institutes
> 30 countries

Central Barrel

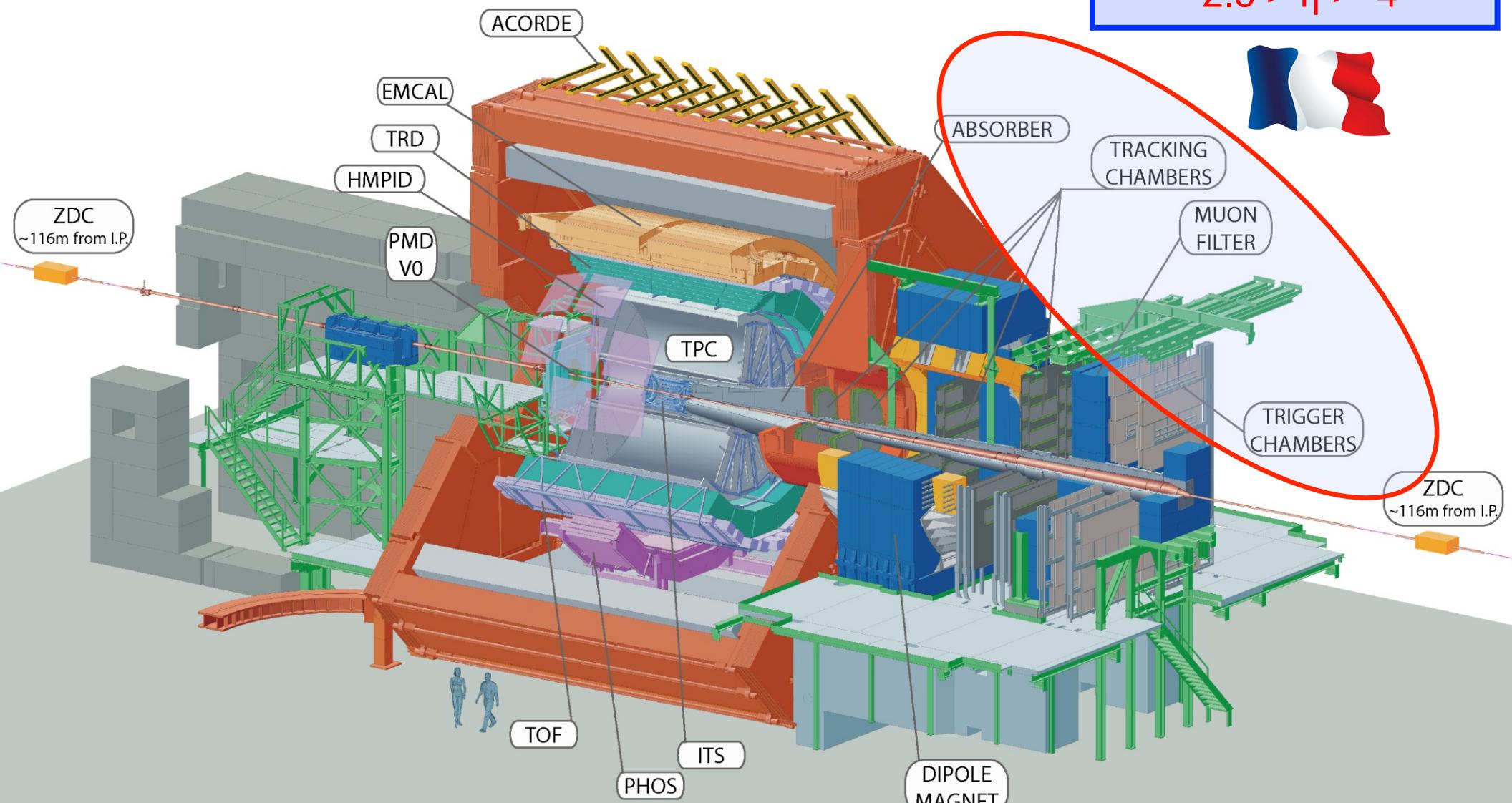
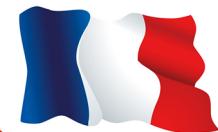
2 π tracking & PID

$$|\eta| < 1$$



Muon Spectrometer

$-2.5 > \eta > -4$



Detector:
Length: 26 meters
Height: 16 meters
Weight: 10,000 tons

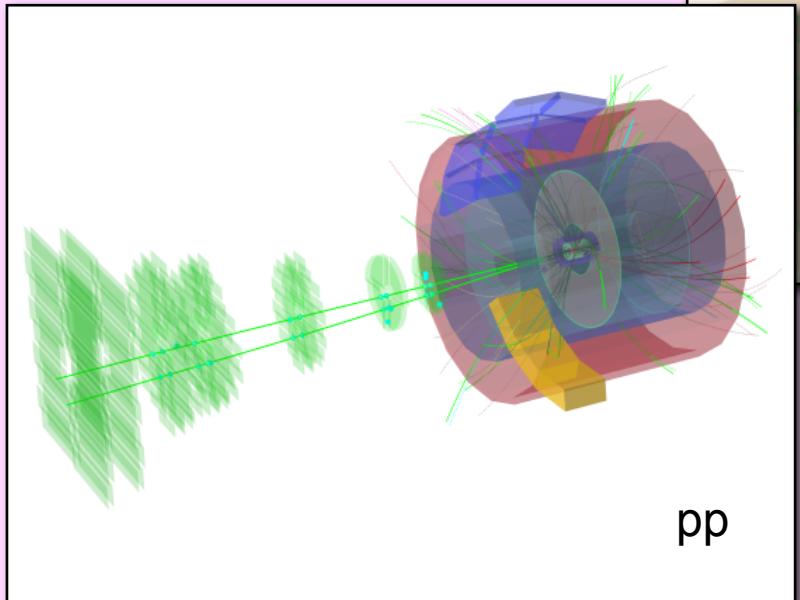
Collaboration:
> 1000 Members
> 100 Institutes
> 30 countries

Status of MUON

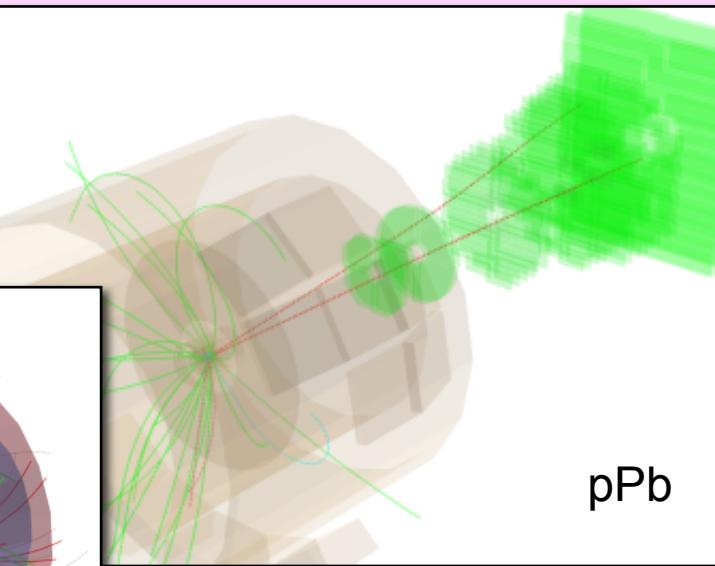


France has large implications on hardware, software, analysis and also management

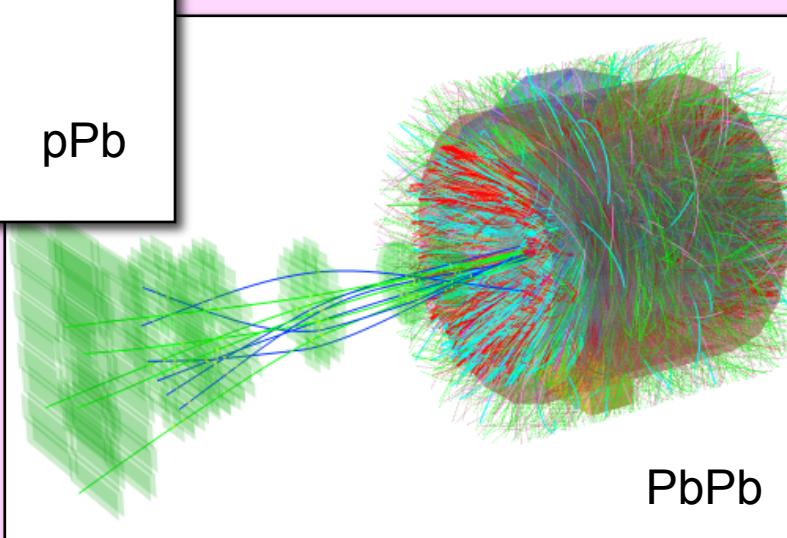
- Triggering efficiency: ~98%
- Tracking efficiency: ~90%



pp



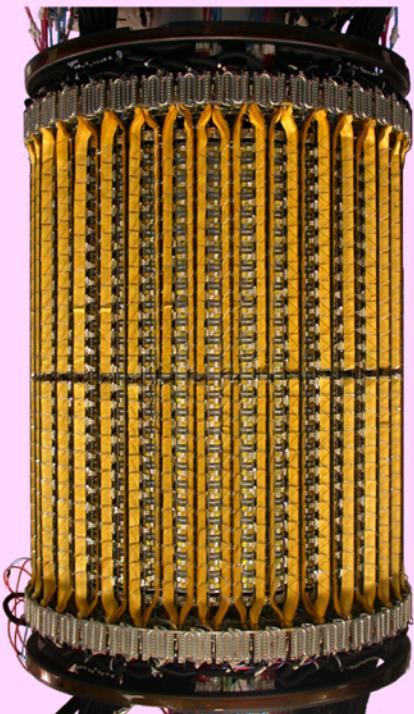
pPb



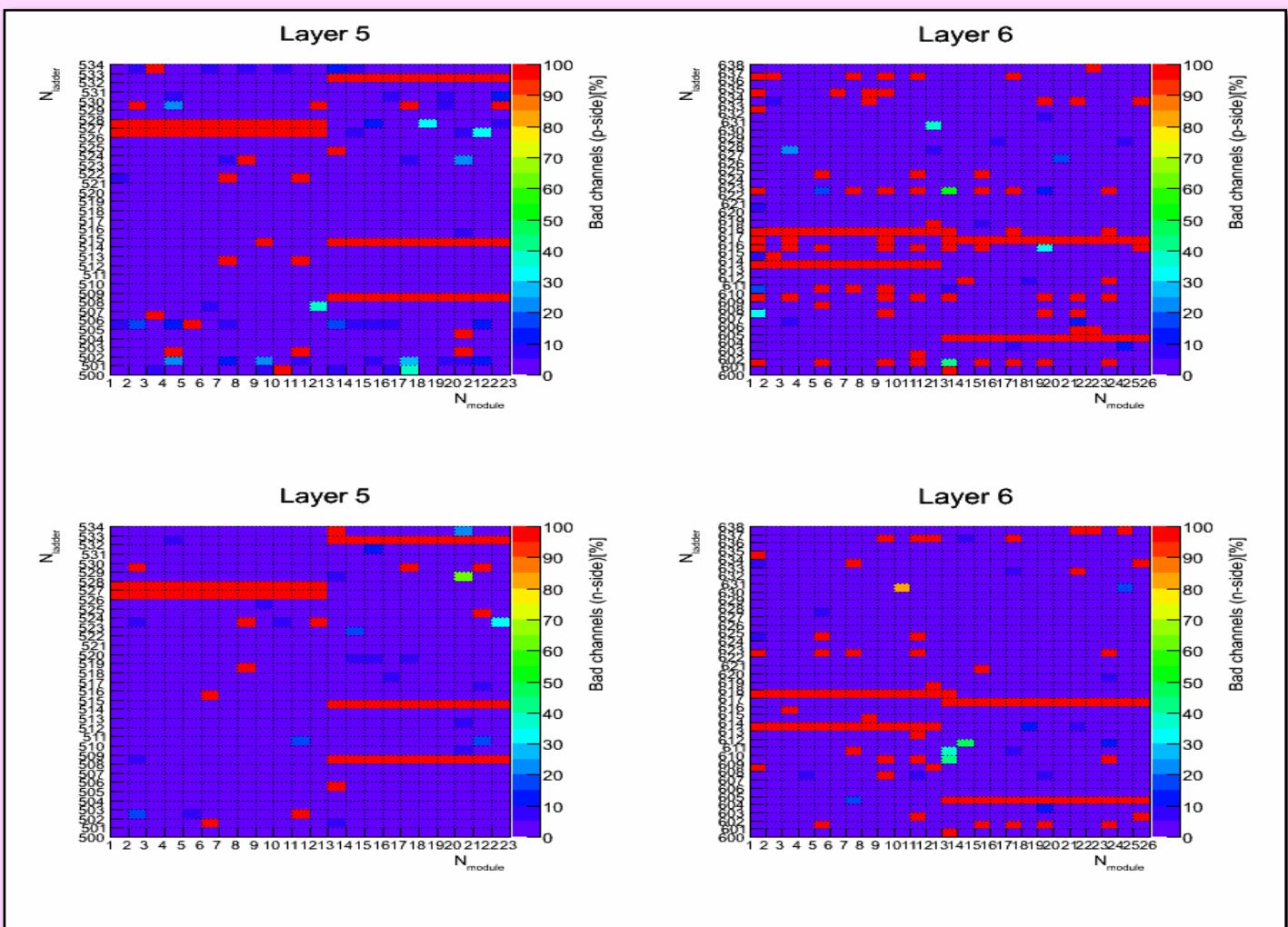
PbPb

Status of SSD

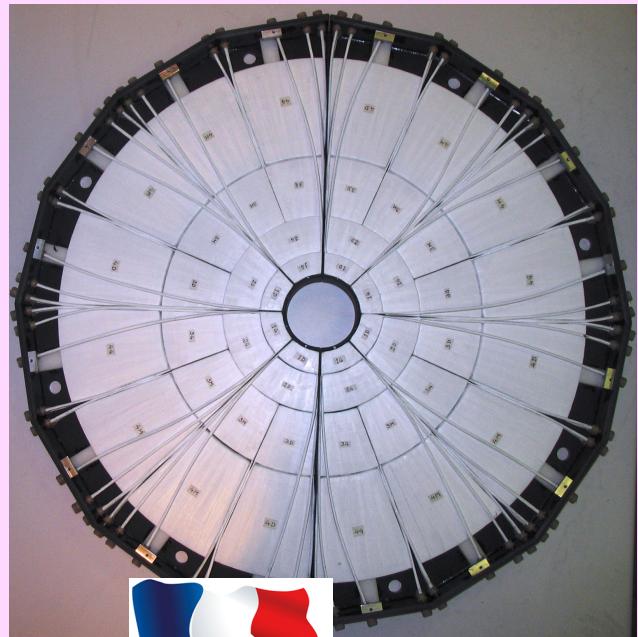
(Oct. 2012)



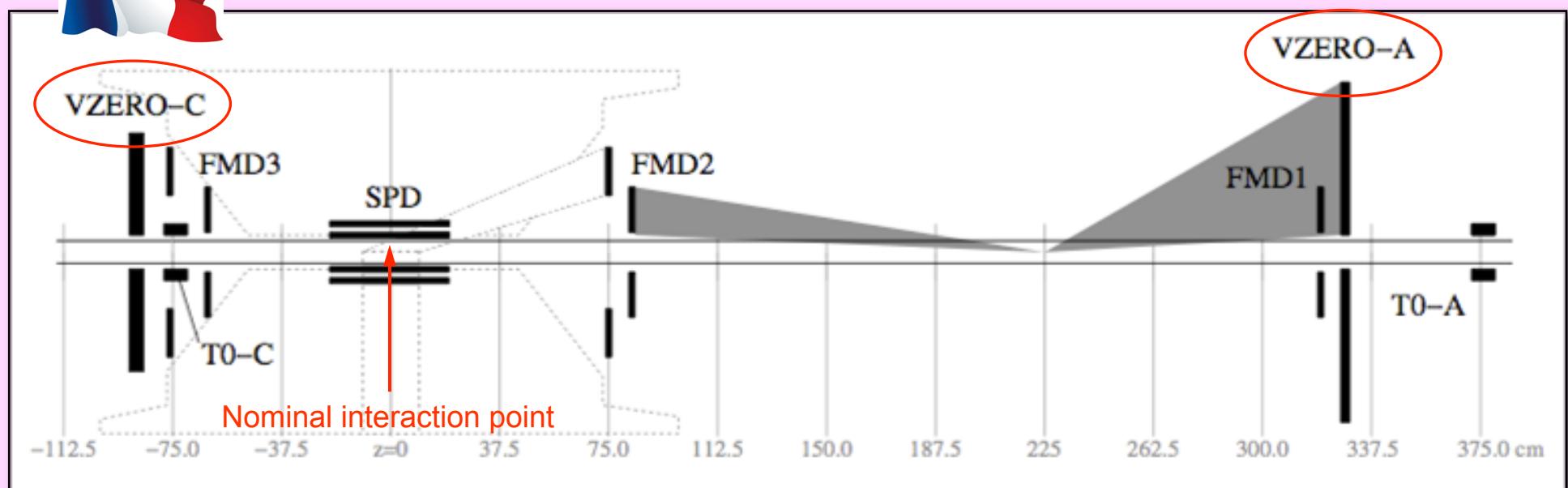
- Operational half-ladders: 135/144 ~ 94%
- Active modules: 1547/1698 ~ 91%
- Overall efficiency ~90%



Status of VZERO



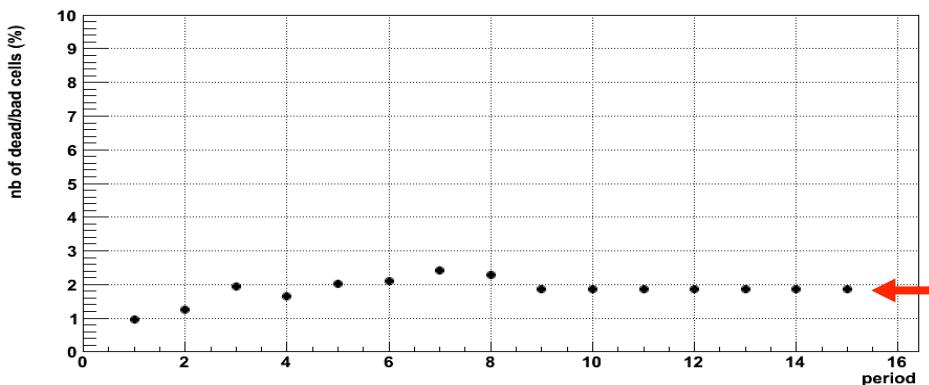
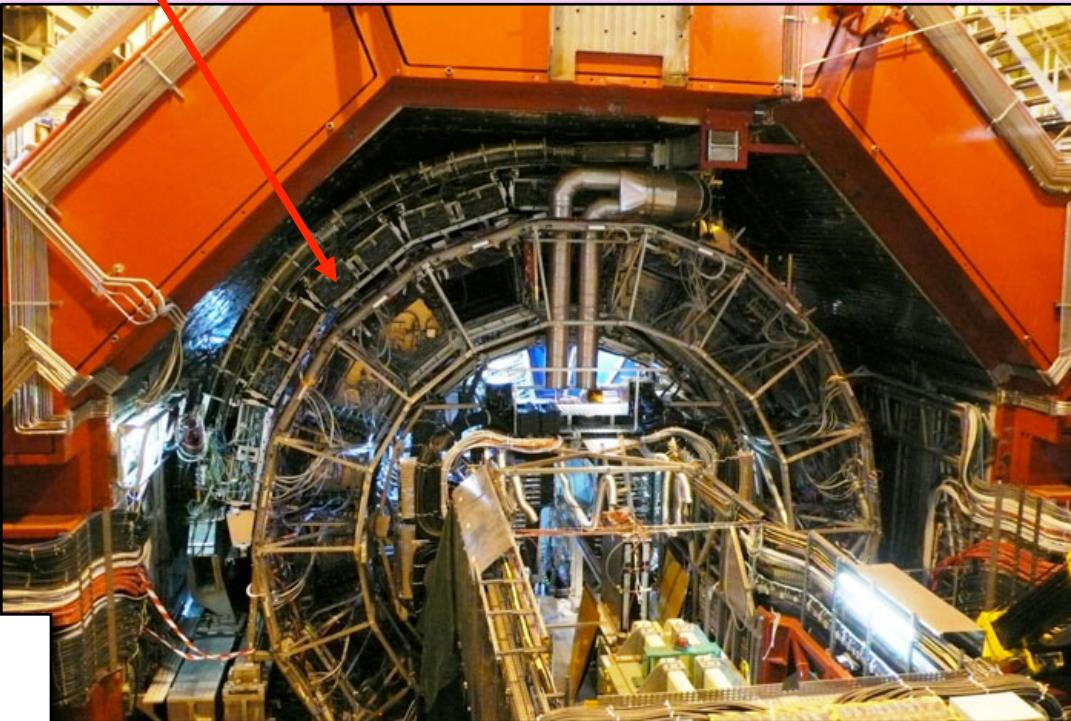
- 100% of continuous operation over 4 years
- All channels are active
- ~40% decrease of signal in a few channels (PMT ageing ?)
- The PMT's to be replaced



Status of EMCAL

January 2012: Insertion of 2x1/3 EMCAL Supermodules at $\phi = 110^\circ$

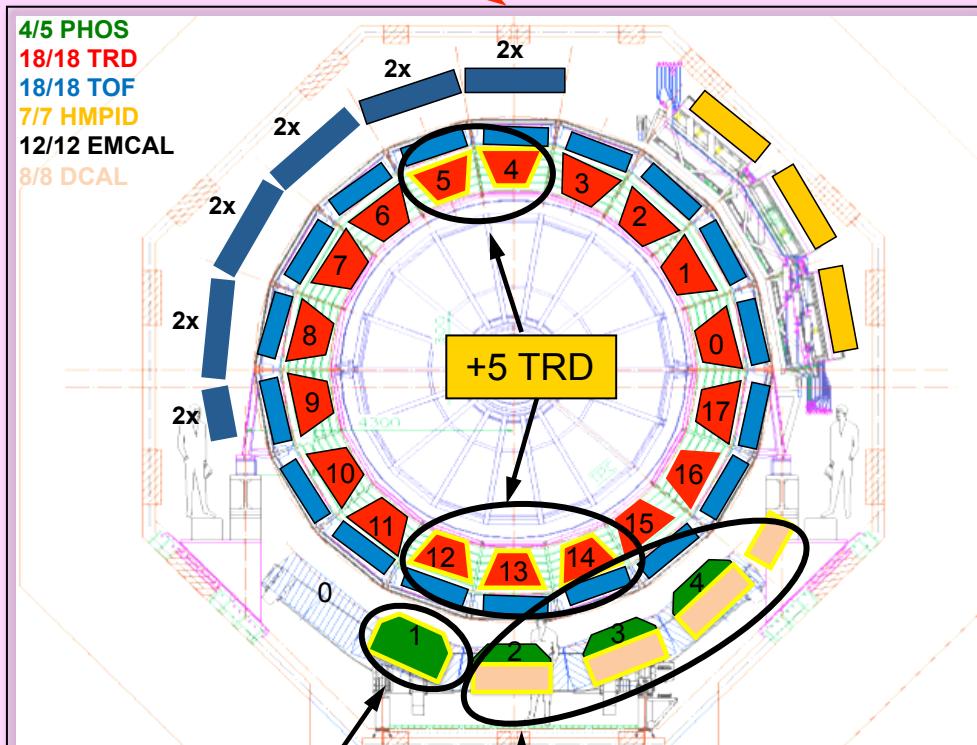
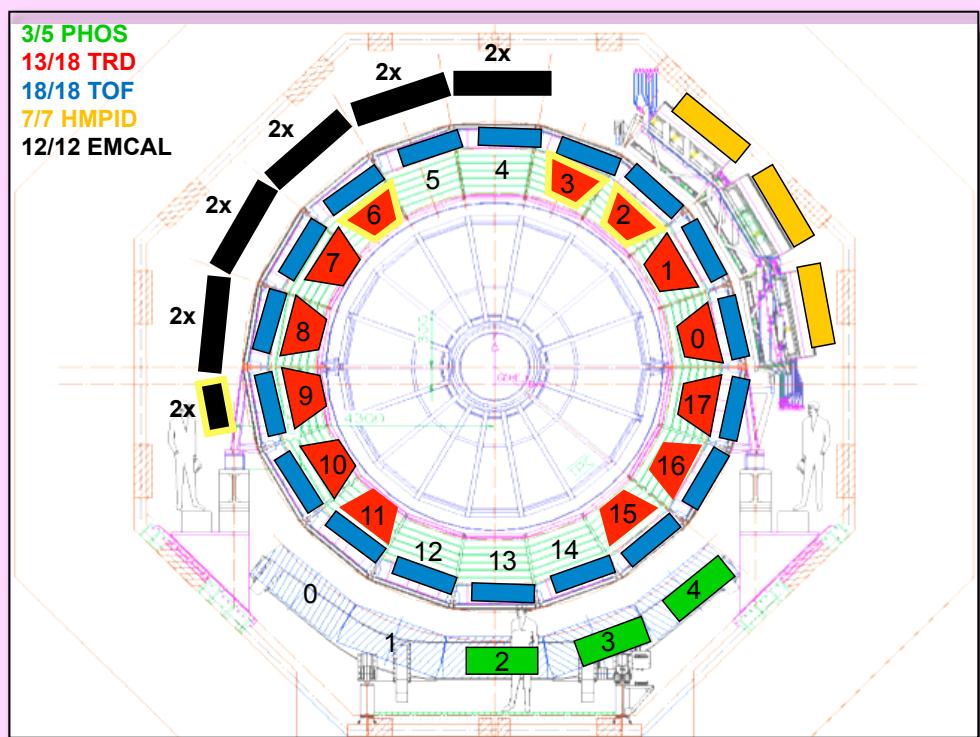
EMCal completed



11520 active cells in EMCAL in 10 Supermodules

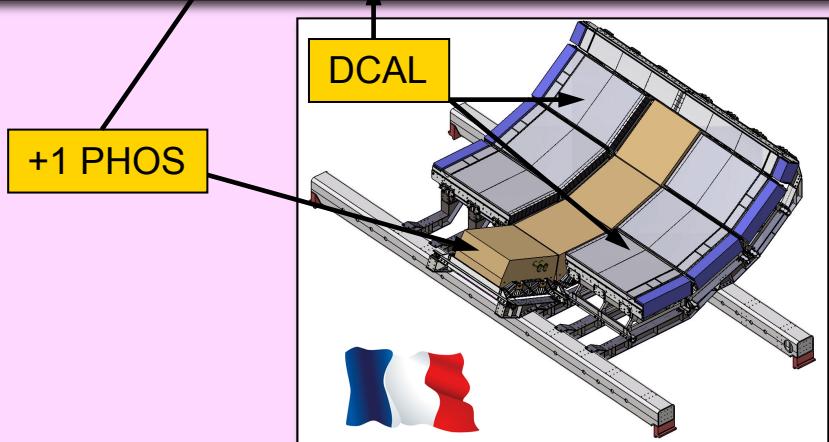
~30 dead cells and less than 200 bad cells over the whole RUN I (some may be recoverable)

ALICE now and after LS1



Main activities planned for LS1:

- Complete TRD detector (+5 Supermodules)
- Install DCAL calorimeter (8 Supermodules)
Including support structure and support beams
- Install +1 PHOS Supermodule
- Numerous detector consolidation efforts



ALICE data



- Two heavy-ion runs at the LHC so far:
 - in 2010 – commissioning and the first data taking
 - in 2011 – already above nominal instant luminosity
- pp since 2009: 0.9, 2.36, 2.76, 7 and 8 TeV
- pPb run just finished at the beginning of this year

Year	System	Energy $\sqrt{s_{\text{NN}}}$ (TeV)	Integrated luminosity
2010	Pb – Pb	2.76	$\sim 10 \mu\text{b}^{-1}$
2011	Pb – Pb	2.76	$\sim 0.1 \text{ nb}^{-1}$
2013	pPb	5.02	$\sim 30 \text{ nb}^{-1}$

Period	Configuration	Beam	B field	N. of runs	N. of events (*)
LHC13b	MB	pA	-0.5 T	12	33 M (MB)
LHC13c	MB	pA	-0.5 T	14	101 M (MB)
LHC13d	rare	pA	-0.5 T	23	1.67 M (MB) (**)
LHC13e	rare	pA	+0.5 T	32	2.5 M (MB) (**)
LHC13f	rare	Ap	+0.5 T	85	6.3 M (MB) (**)

2013 pPb run:
39 fills,
197 h stable beams

** and many rare triggers !

Trigger statistics, pPb 2013

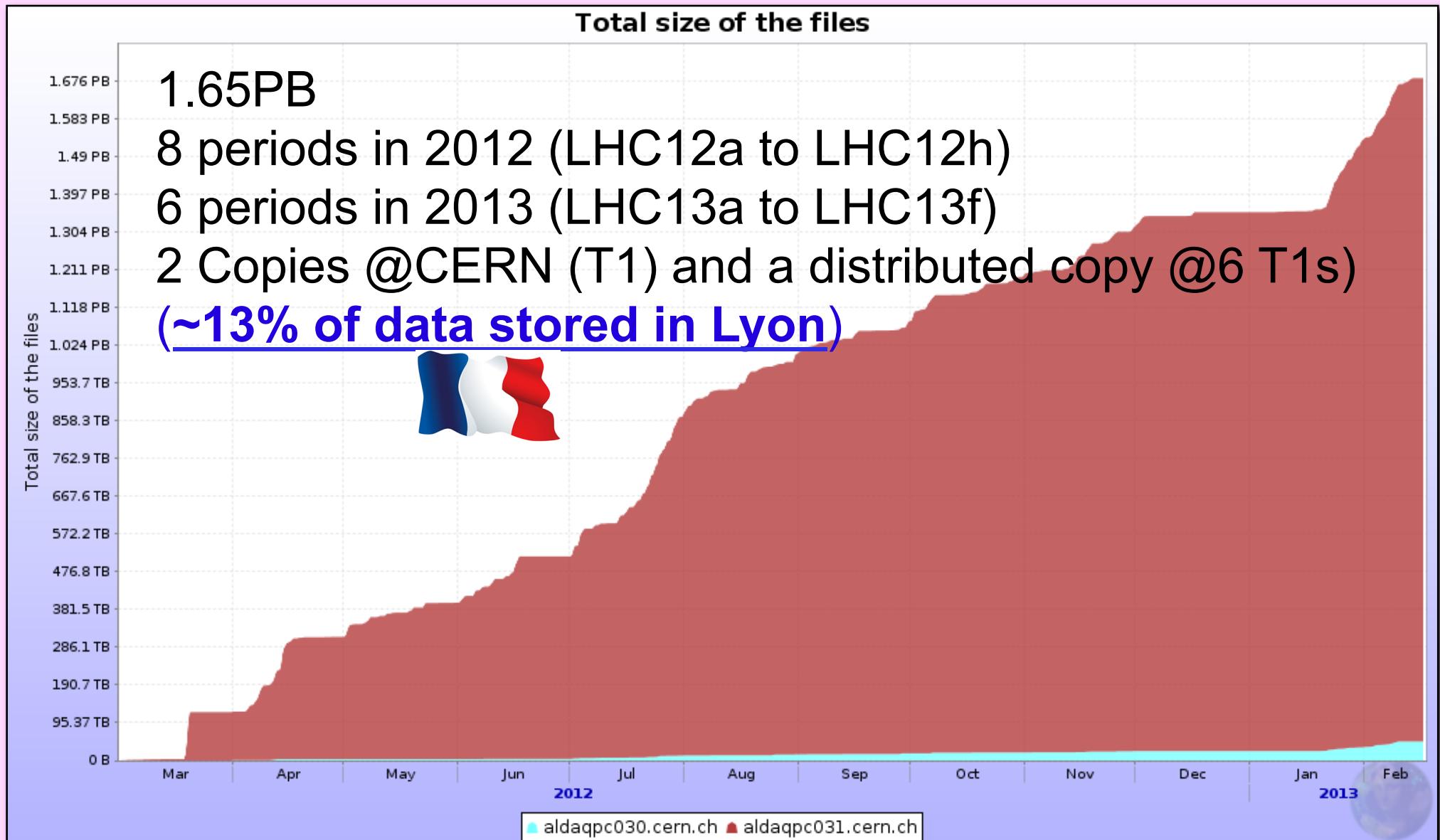
Short name	Description	Total events	13b,c	13d	Lumi, nb-13e	13f	Total	Average L0a rate**	Target	Ratio
Delivered	Luminosity delivered by LHC		0.891	6.357	7.615	17.077	31.940		30 nb-1	106%
COTVX	Luminosity seen during runs		0.794	4.706	5.493	12.942	23.935			
COTVX - pause	Luminosity seen excluding PAC		0.790	3.884	4.756	11.781	21.211			
CINT1	Min. bias SPD VOA VOC	9,299,835	0.002	0.000	0.000	0.001	0.002		10000000 ev	93%
CINT7	Min. bias VOAND	143,475,184	0.067	0.003	0.001	0.003	0.074		130000000 ev	110%
TZED	ZDC EM dissociation trigger	1,058,246	-	0.001	0.000	0.000	0.001		1000000 ev	106%
CSHM7	SPD high multiplicity, 20Hz	4,248,077	-	0.218	0.273	0.818	1.308	13.4	20 Hz	
CMSL7-ALL	Single muon low-pt, 15 Hz	4,207,249	-	0.014	0.014	0.023	0.050	13.9	15 Hz	
CMSL7-MUON	Single muon low-pt, ds ~1/40	42,669,389	-	0.084	0.131	0.276	0.491			
CMSH7	Single muon high-pt	27,858,327	-	2.469	2.882	6.228	11.578		19.2 nb-1	60%
CMUL7	Dimuon unlike-sign	33,044,012	-	2.468	2.880	6.230	11.578		19.2 nb-1	60%
CMUP6	UPC forward	329,626	-	2.030	2.303	0.058	4.391		8.4 nb-1	52%
CMUP3/8	UPC forward		-	0.000	0.000	5.053	5.053		8.4 nb-1	60%
CMUP7	UPC semi-forward	653,315	-	1.829	2.284	0.056	4.169		8.4 nb-1	50%
CMUP5/9	UPC semi-forward		-	0.000	0.000	5.053	5.053		8.4 nb-1	60%
CCUP7	UPC central	1,839,234	-	0.308	2.604	6.380	9.292		19 nb-1	49%
CEMC7	EMCAL L0, ds ~1/400	1,489,111	-	0.010	0.014	0.045	0.069	4.7	5 Hz	
EG1	EMCAL gamma high threshold	3,217,656	-	2.457	2.730	7.086	12.136		19 nb-1	64%
EG2	EMCAL gamma low threshold, ds ~1/20	1,509,090	-	0.202	0.316	0.887	1.405	4.8	5 Hz	
EJ1	EMCAL jet high threshold	3,786,573	-	2.319	2.730	7.086	12.136		19 nb-1	64%
EJ2	EMCAL jet low threshold, ds ~ 1/200	1,474,037	-	0.020	0.039	0.146	0.205	4.6	5 Hz	
CPHI7	PHOS L0, 10 Hz	2,950,045	-	0.333	1.158	2.296	3.787		10 Hz	
HJT-CENT	TRD L1 jet trigger, 10 kHz L0 inspection	1,381,528	-	0.167	0.328	0.906	1.402	9312	1.4 nb-1	100%
HJT-FAST	TRD L1 jet trigger	1,631,886	-	0.195	0.396	1.064	1.656			
HEE	EMCAL-TRD trigger	760,266	-	-	-	6.822	6.822		9 nb-1	76%
CCUP2	Double gap diffractive trigger	542,843	-	-	-	0.077	0.077		500000 ev	109%

* Total running time excluding pauses

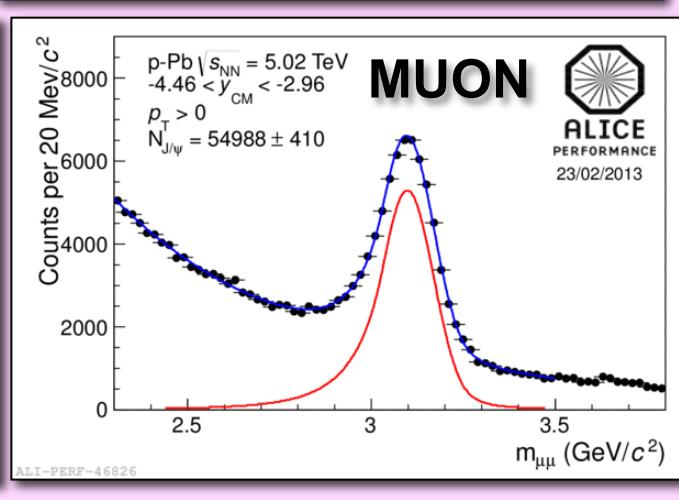
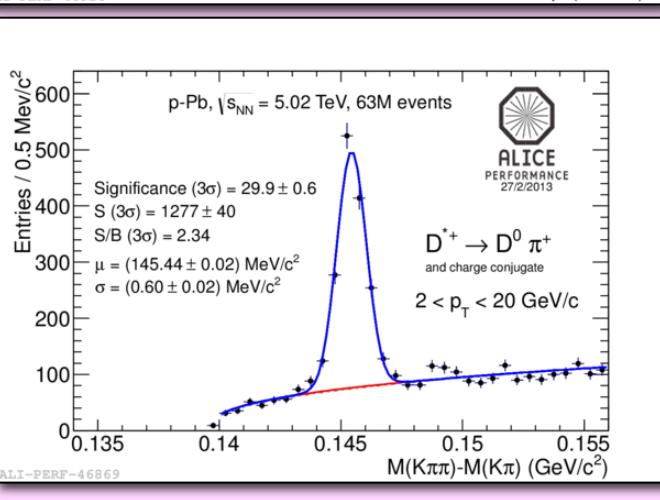
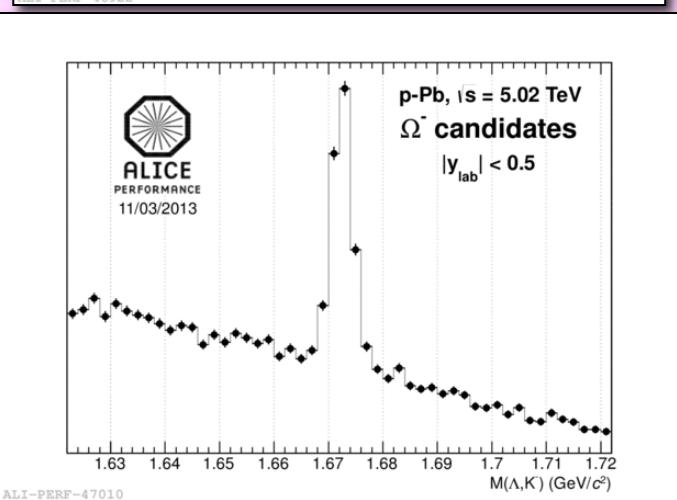
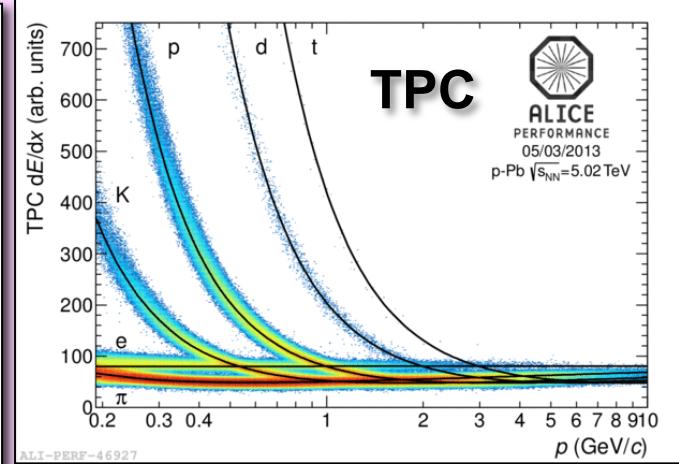
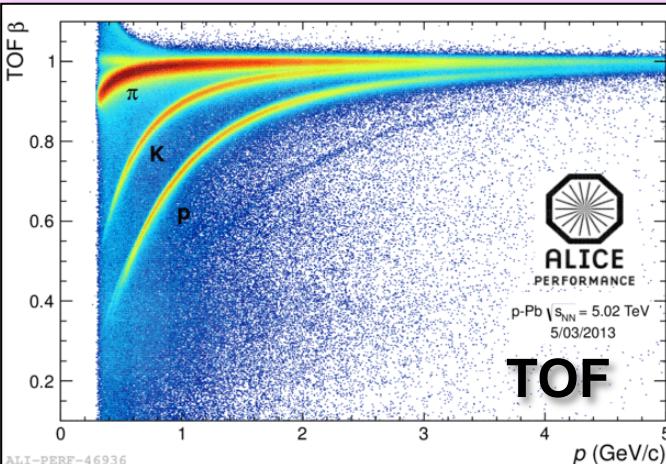
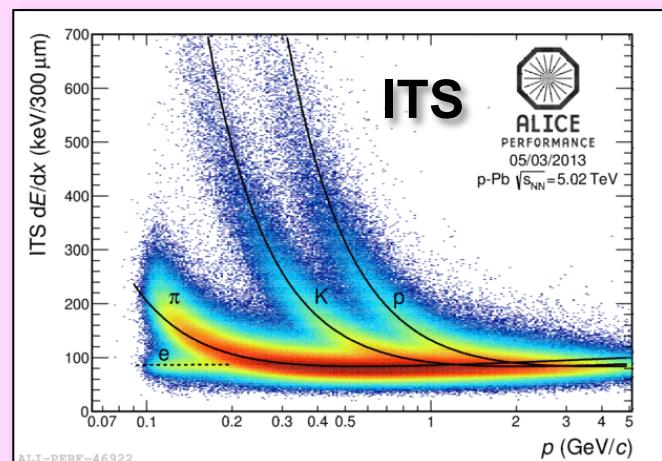
** Average rate = Total events/Total running time excluding pauses

Minimum bias, and “rare triggers” data taking (muon, gamma, jet, UPC, ...)

Recorded data 2012/2013



ALICE detector performance, pPb 2013



- particle identification (practically all known techniques)
- extremely low-mass tracker $\sim 10\%$ of X_0
- excellent vertexing capability
- efficient low-momentum tracking – down to $\sim 100 \text{ MeV}/c$ ($\rightarrow 0$ in MUON)

High-Level Trigger (HLT)

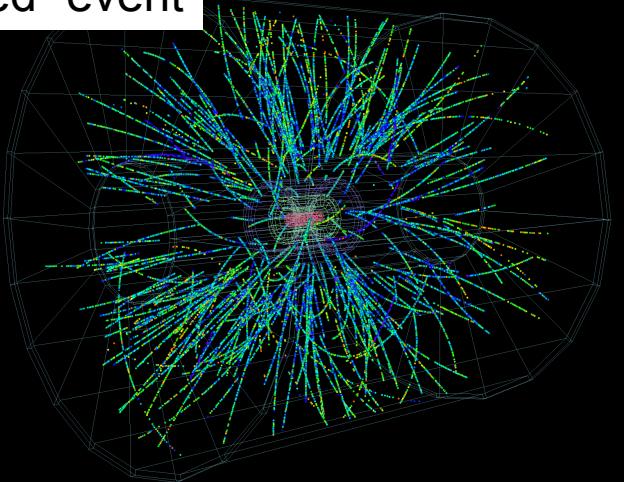
“Mode C” : TPC cluster finding, discard TPC raw data
data reduction factor ~ 4.3

(Worked extremely well, QA-ed with 1% of raw data)

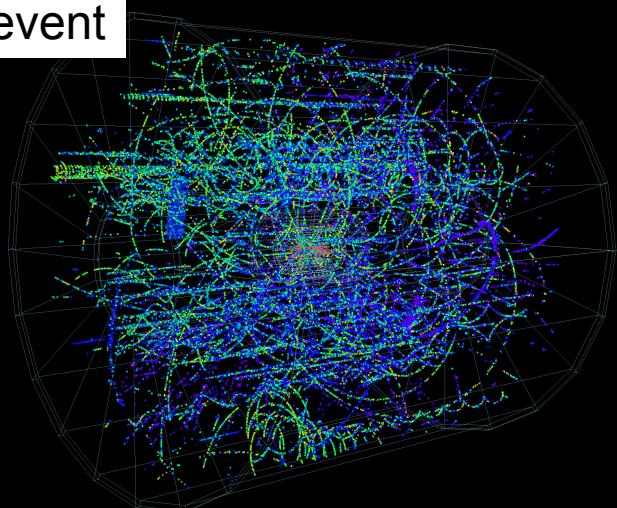
Only ALICE can do this:

- TPC full tracking, running on GPUs (4x faster, 3x less modules)

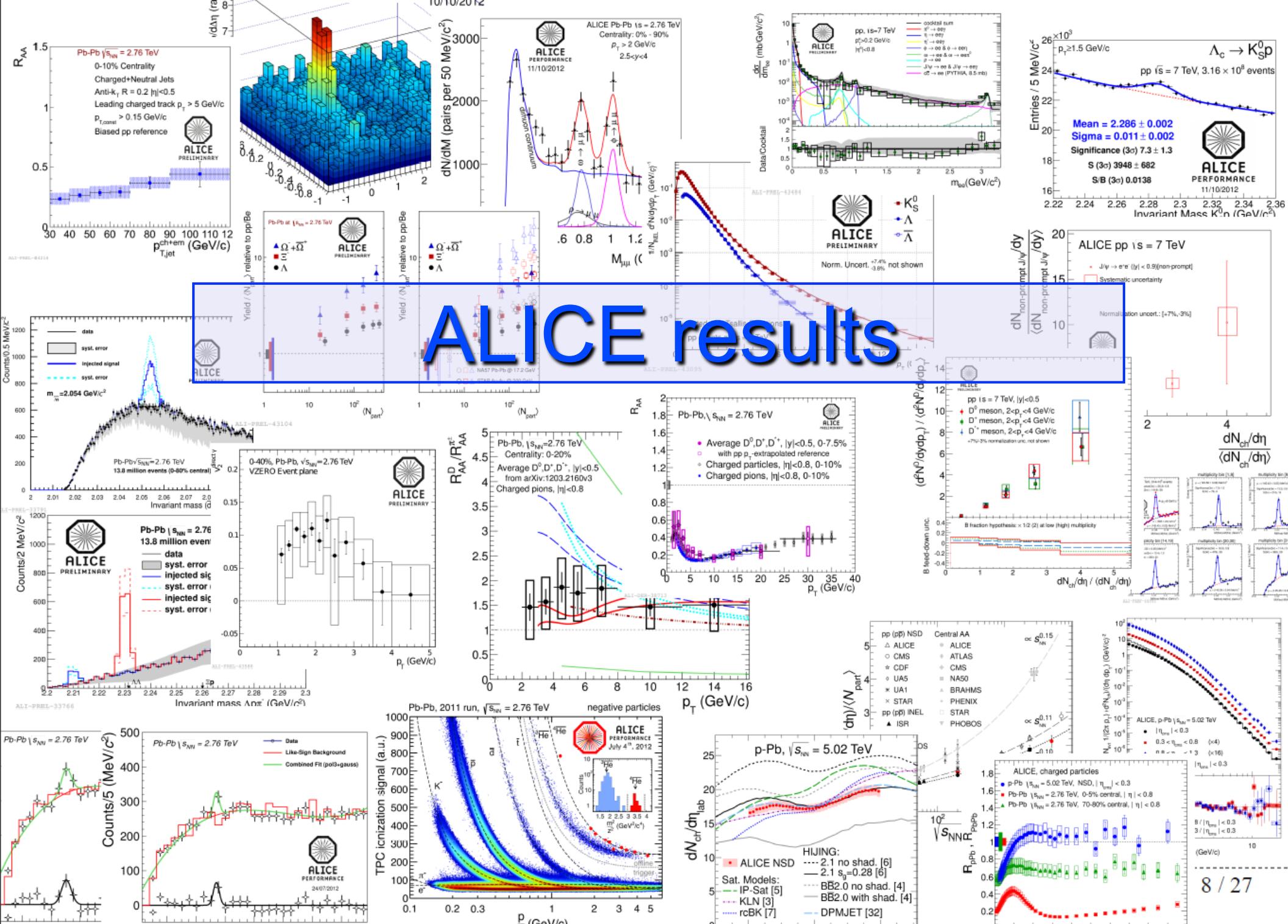
“Cleaned” event



“Raw” event



ALICE results



ALICE observables

(now and in future)



Errors are statistical at min p_T of a measurement

Topic	Observable	Approved (1/nb delivered, 0.1/nb m.b.)	Upgrade (10/nb delivered, 10/nb m.b.)
Heavy flavour	D meson R_{AA}	$p_T > 1$, 10%	$p_T > 0$, 0.3%
	D from B R_{AA}	$p_T > 3$, 30%	$p_T > 2$, 1%
	D meson elliptic flow (for $v_2=0.2$)	$p_T > 1$, 50%	$p_T > 0$, 2.5%
	D from B elliptic flow (for $v_2=0.1$)	not accessible	$p_T > 2$, 20%
	Charm baryon/meson ratio (Λ_c/D)	not accessible	$p_T > 2$, 15%
	$D_s R_{AA}$	$p_T > 4$, 15%	$p_T > 1$, 1%
Charmonia	$J/\psi R_{AA}$ (forward y)	$p_T > 0$, 1%	$p_T > 0$, 0.3%
	$J/\psi R_{AA}$ (central y)	$p_T > 0$, 5%	$p_T > 0$, 0.5%
	J/ψ elliptic flow (forward y, for $v_2 = 0.1$)	$p_T > 0$, 15%	$p_T > 0$, 5%
	ψ'	$p_T > 0$, 30%	$p_T > 0$, 10%
Dielectrons	Temperature IMR	not accessible	10% on T
	Elliptic flow IMR (for $v_2=0.1$)	not accessible	10%
	Low-mass vector spectral function	not accessible	$p_T > 0.3$, 20%
Heavy nuclei	hyper(anti)nuclei, H-dibaryon	35% (${}^4\Lambda H$)	3.5% (${}^4\Lambda H$)

Talks:

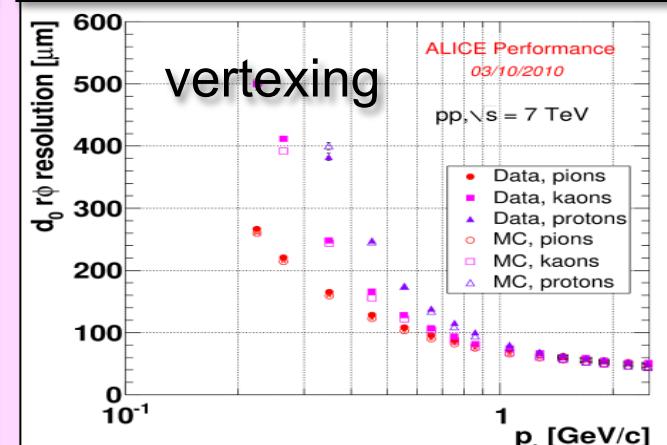
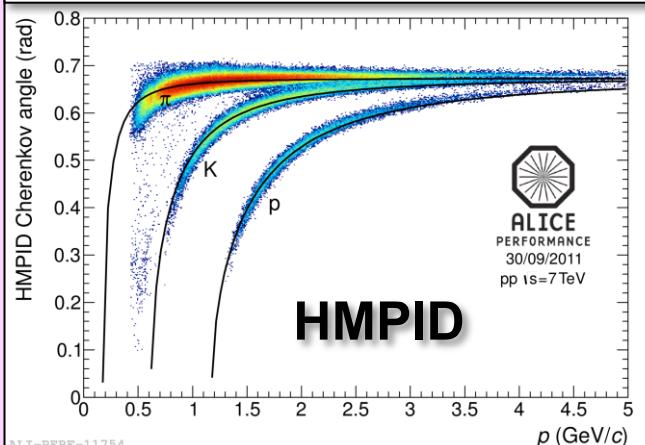
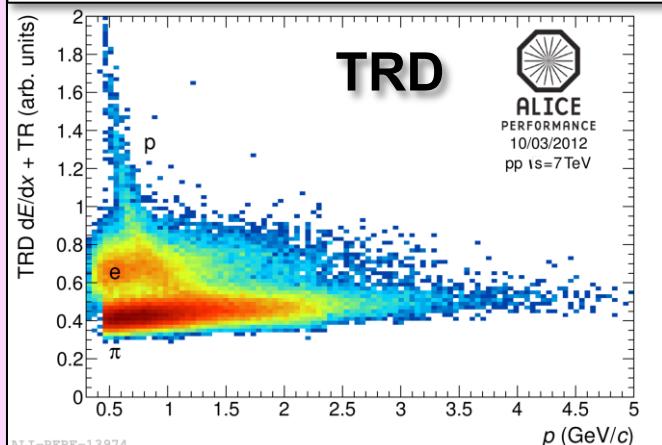
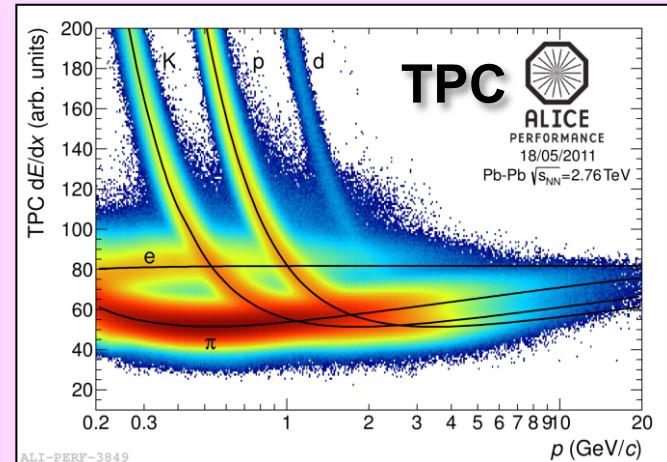
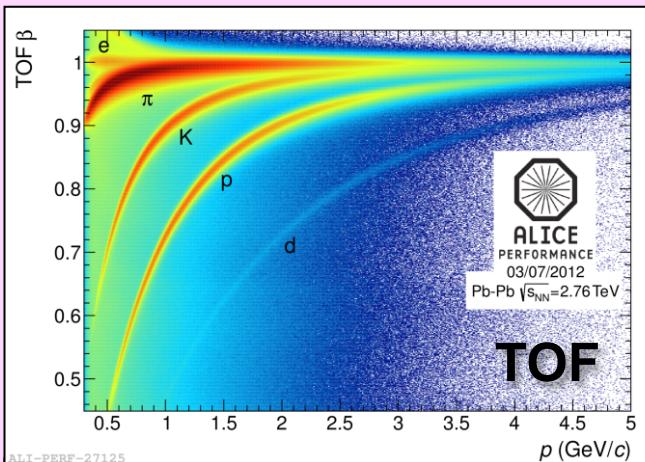
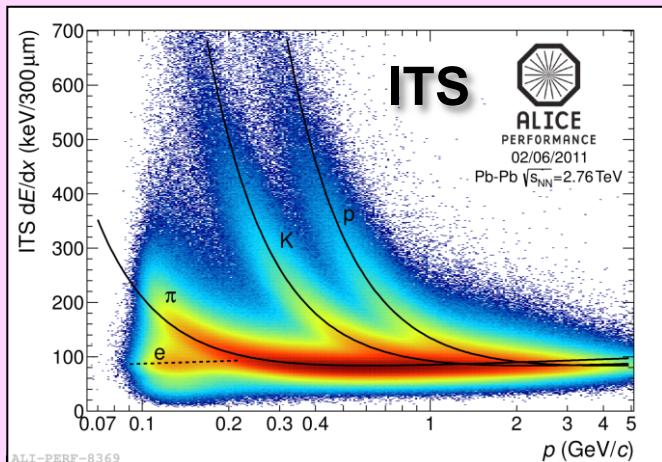
- Charged particle production in Pb-Pb and pPb with ALICE, M. Guilbaud (IPNL)
- Prompt photon measurements with ALICE, A. Mas (SUBATECH)
- Toward jet tomography of QGP in ALICE, N. Arbor (LPSC)
- Quarkonium and open heavy flavors in pp with ALICE, L. Valencia Palomo (IPNO)
- Quarkonia and heavy flavors in Pb-Pb with ALICE, M. Marchisone (LPC)
- J/ ψ elliptic flow measurement in Pb-Pb with ALICE, L. Massacrier (SUBATECH)
- Soft QCD regime, di- μ resonances in pp, pPb, Pb-Pb with ALICE, A. Uras (IPNL)
- Low-x structures of nuclei with J/ ψ prod. in Ultra-Peripheral Pb-Pb with ALICE, D. Tapia Takaki (IPNO)
- ALICE upgrade, L. Molnar (IPHC)

Posters:

- Neutral meson prod. in pp and Pb-Pb with ALICE, G. Conesa Balbastre (LPSC)
- Study of prod. mechanisms of K0s, Λ and anti- Λ in Pb-Pb, X. Sanchez Castro (IPHC)
- J/ ψ studies in pPb with ALICE, I. Lakomov (IPNO)
- Others...

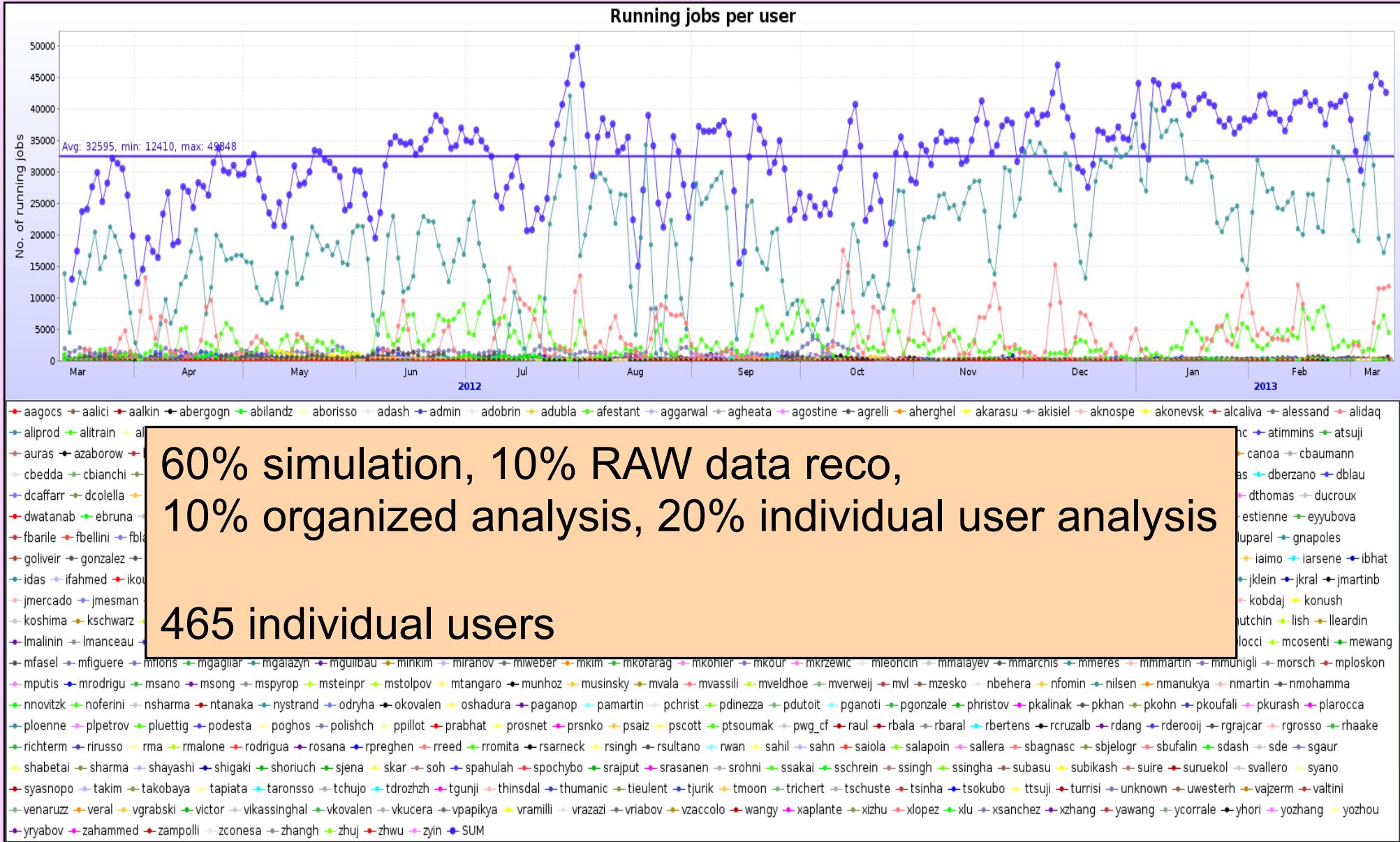
Backup slides

ALICE performance in Pb-Pb and pp



- particle identification (practically all known techniques)
- extremely low-mass tracker $\sim 10\%$ of X_0
- excellent vertexing capability
- efficient low-momentum tracking – down to $\sim 100 \text{ MeV}/c$

Offline operations 2012/2013



Precision measurement of the QGP parameters at $\mu_b = 0$
to fully exploit scientific potential of the LHC

Main physics topics, uniquely accessible with the ALICE detector:

- measurement of heavy-flavour transport parameters
 - study of QGP properties via transport coefficients (η/s , $\hat{\eta}$)
 - hadronization mechanisms via baryon/meson ratio
- measurement of low-mass and low- p_T di-leptons
 - study of chiral-symmetry restoration
 - space-time evolution and equation of state of the QGP
- J/ψ , ψ' , and χ_c states down to zero p_T in wide rapidity range
 - statistical hadronization versus dissociation/recombination

For main physics program: factor > 100 increase in statistics
(maximum readout with present ALICE ~ 500 Hz)

For triggered probes: increase in statistics by factor > 10