13th Pisa Meeting on Advanced Detectors
La Biodola, Isola d'Elba (Italy)
May 24 - 30, 2015

ALICE RUN2 Readiness Report

ALICE

LS1:

- **Consolidations**
- **Installations**

- **RUN2: Re-commissioning**
- **ALICE RUN2 Overview**
- **Summary**

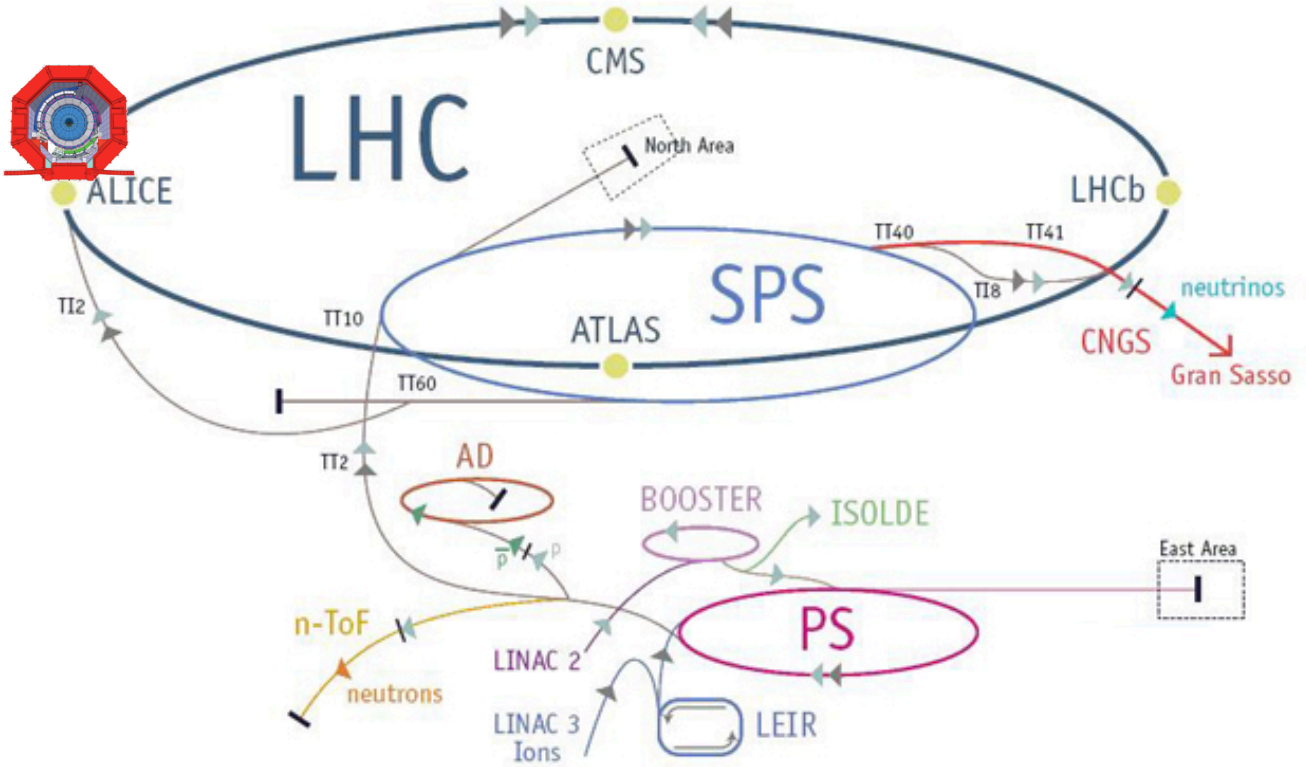
Federico Ronchetti
ALICE Run Coordination

INFN Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

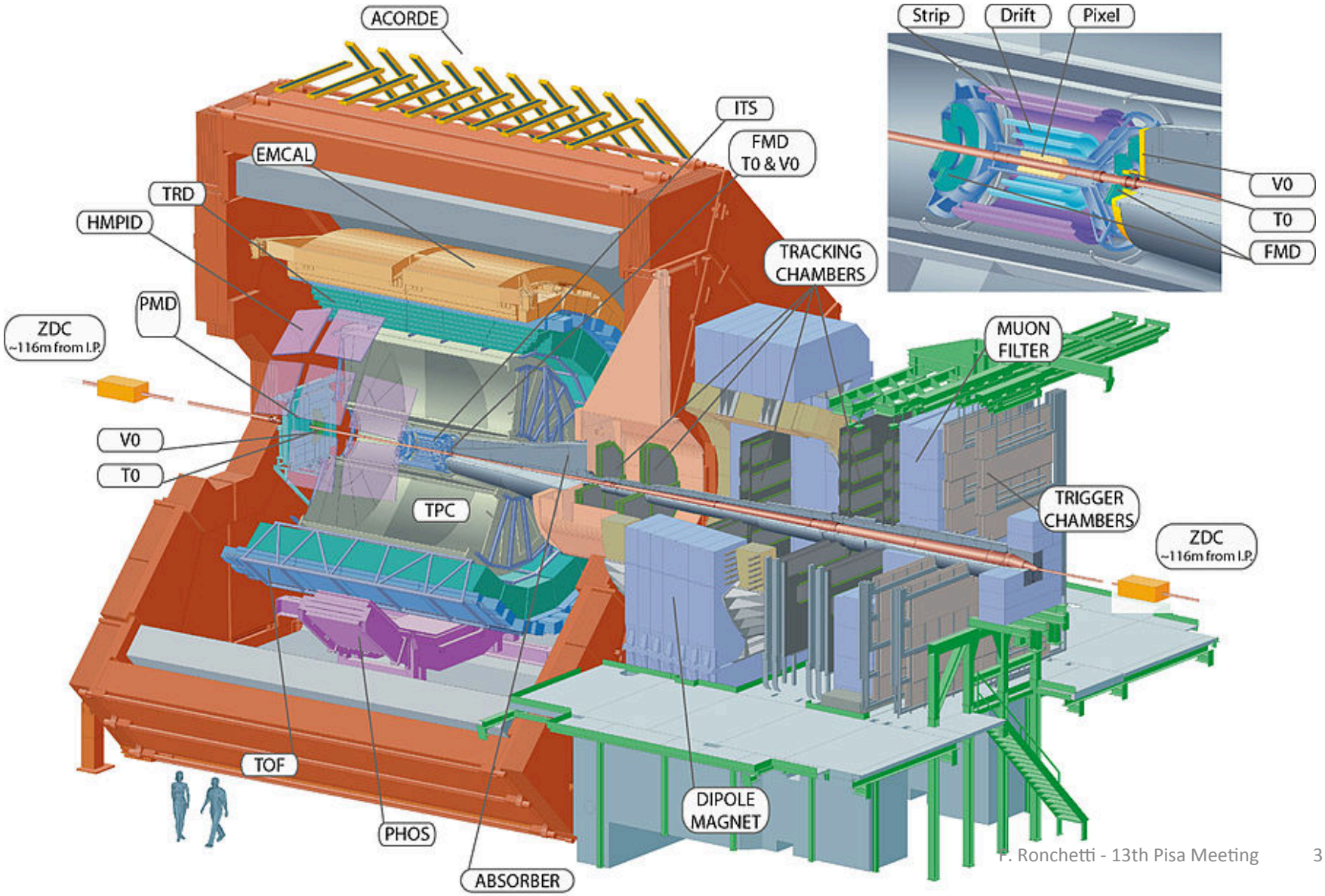
CERN

ALICE: A Large Ion Collider Experiment

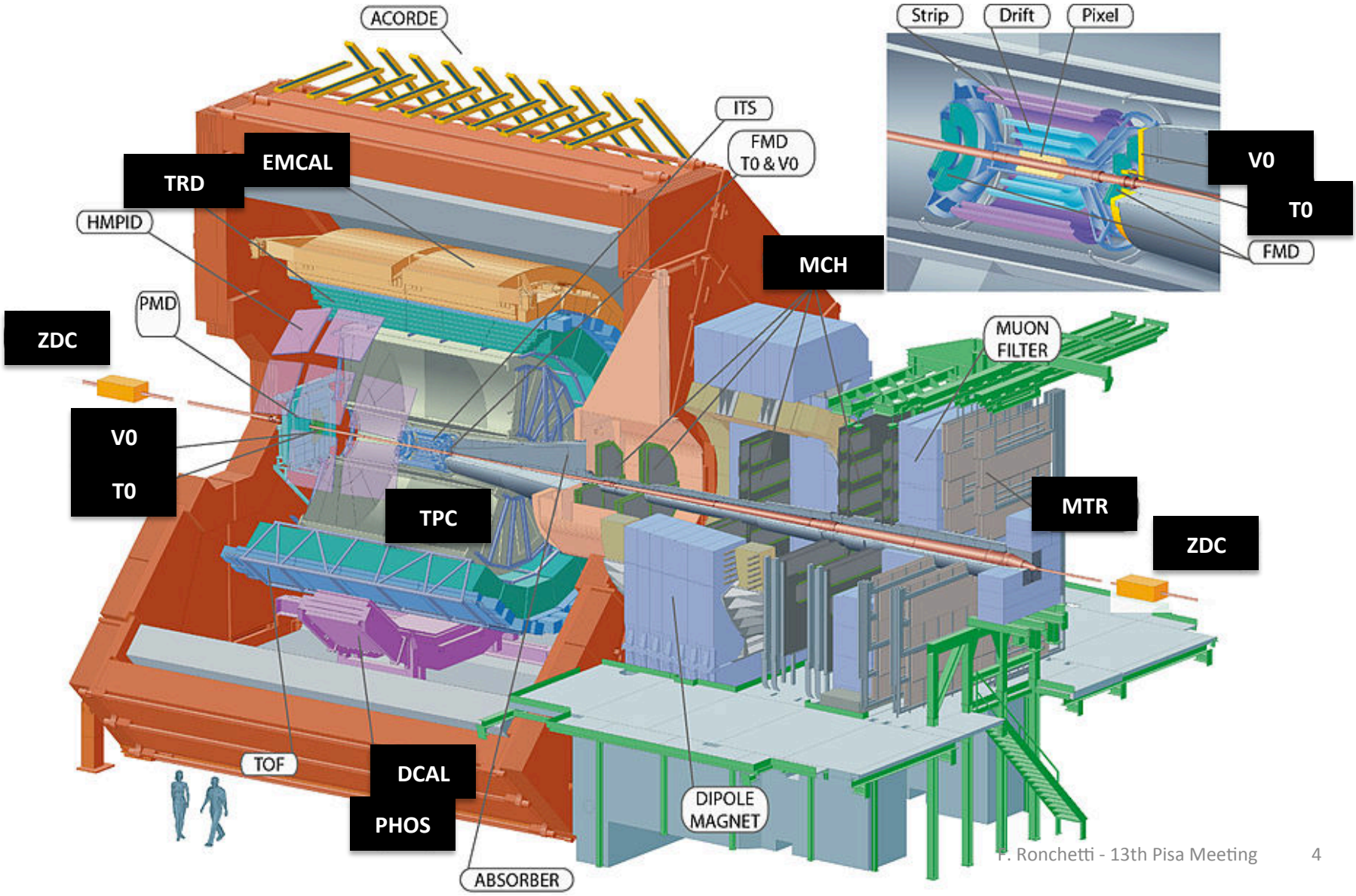
- **ALICE is the dedicated heavy-ion experiment at the CERN LHC**
- **Continuously took data during the first campaign of the machine from fall 2009 until early 2013 with pp, PbPb and pPb collisions systems**



ALICE: Overview

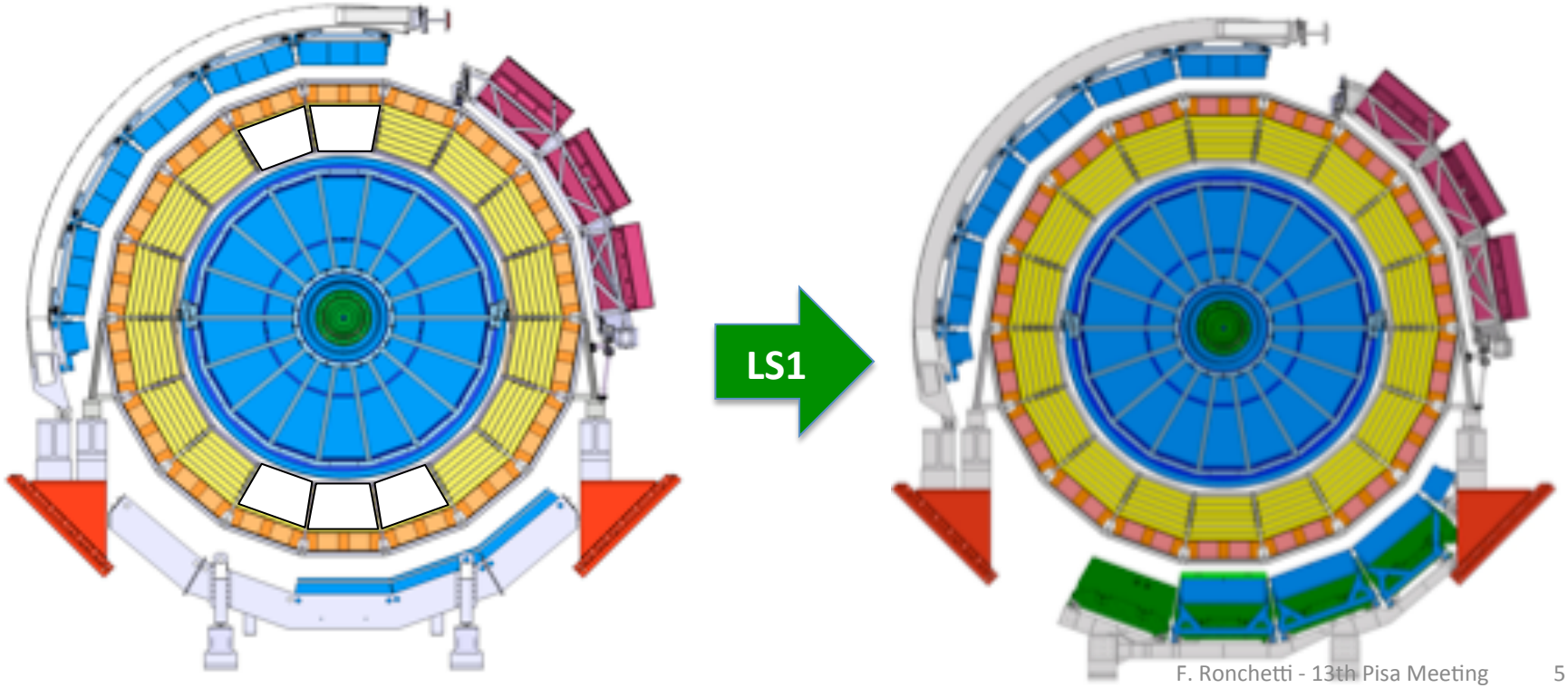


LS1: Consolidation

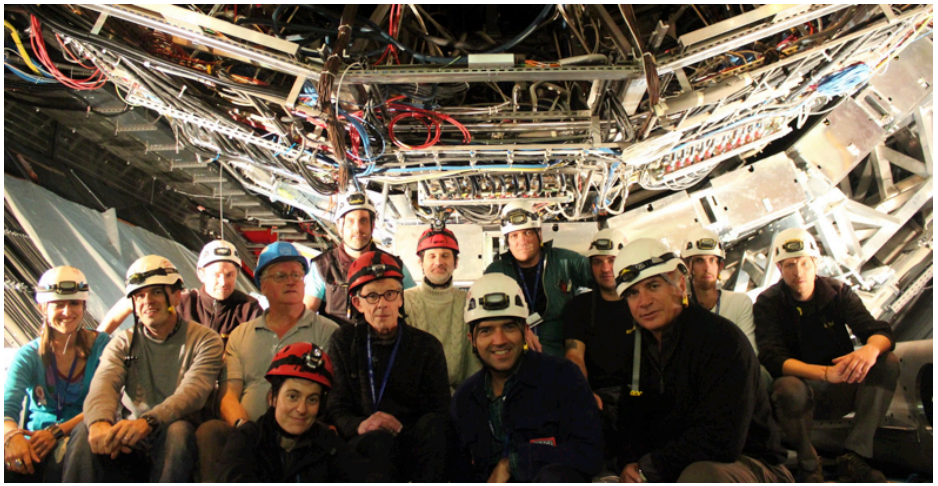


LS1: Installations

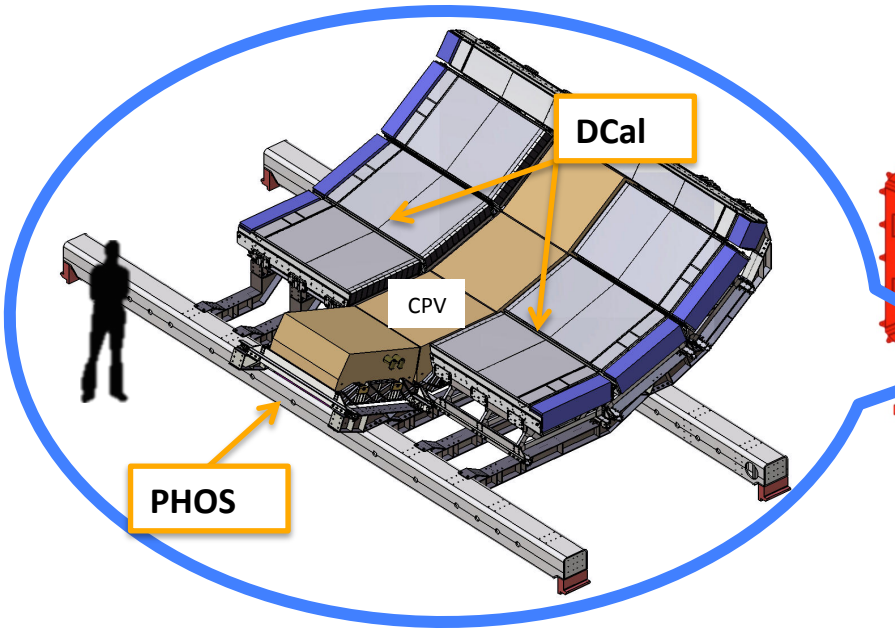
- The final 5/18 TRD modules were produced and installed
- A fourth Module of the PHOS calorimeter was installed
- The 6+2x1/3 modules of the Dijet Calorimeter (DCAL) were installed
- The ALICE Diffractive (AD) detector was installed

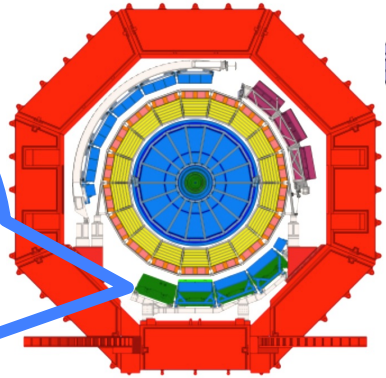


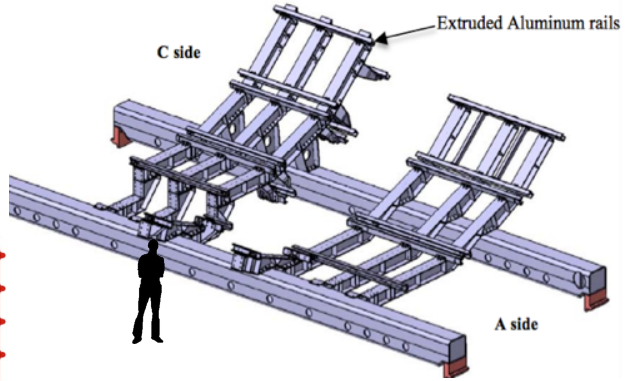
Calorimeters: DCAL & PHOS (re)installation



- Complete reshape of the bottom part of ALICE (modification of existing services and access)
- New dedicated common PHOS/DCAL support structure





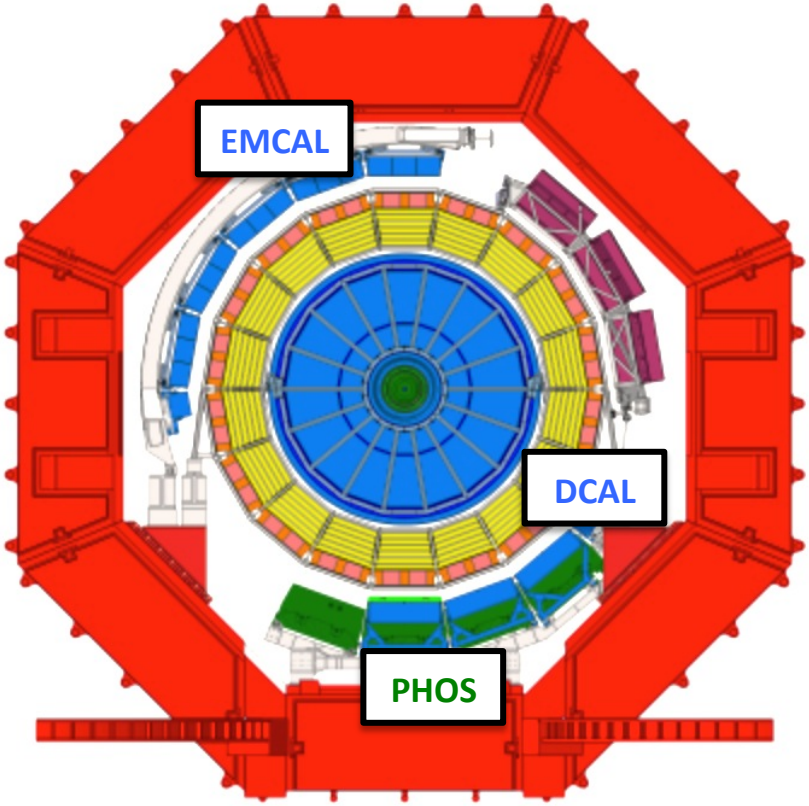


Overall weight: more than 80 tons

Calorimeters: Readout Consolidation

ALICE is equipped with 3 electromagnetic calorimeter systems

- **PHOS: lead-tungstate crystals, I gen. GTL bus R/O → RUN1 1 kHz**
- **EMCAL: lead-scintillator sandwich, II gen. GTL bus R/O → RUN1 4 kHz**
- **DCAL: lead-scintillator sandwich, point-to-point FEE R/O**



LS1

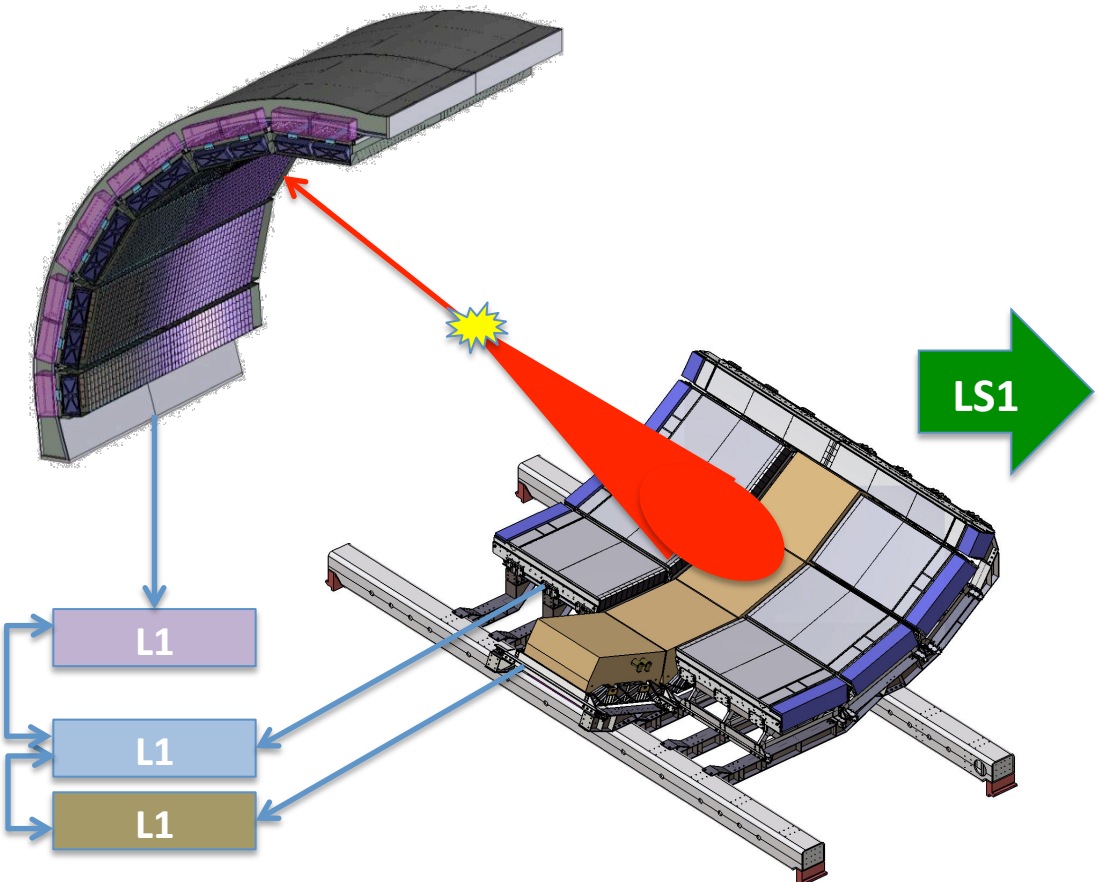
All 3 calorimeters use now the DCAL parallel readout

- **No R/O noise induced in trigger cards**
- **R/O rates capable of coping with 50 kHz of PbPb interaction rate**
- **Basically RUN3-enabled.**

Calorimeters: Trigger Consolidation

ALICE is equipped with 3 electromagnetic calorimeter systems

- **PHOS: Gen I TRU, L0 (shower) trigger only**
- **EMCAL: Gen II TRU, L0 and L1 (gamma, jet) trigger**
- **DCAL: Gen III TRU, L0 and L1(gamma, jet) triggers**

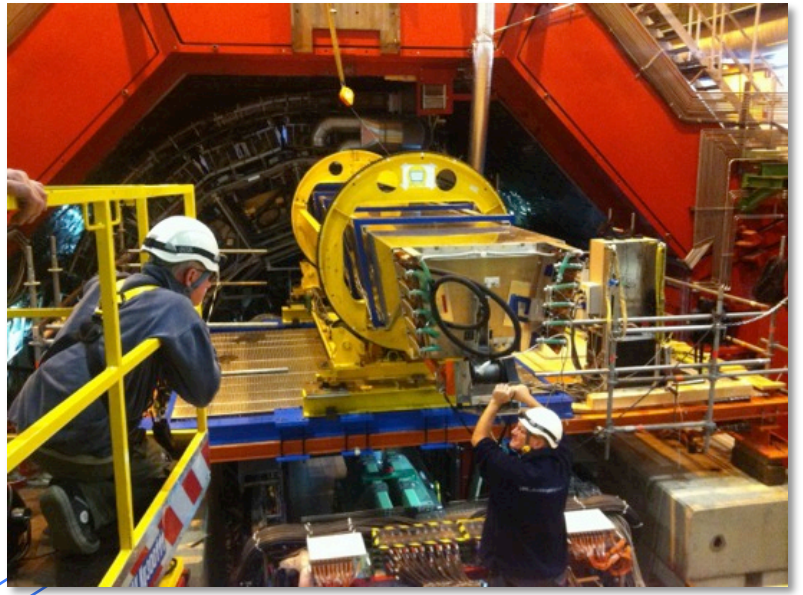


PHOS use now the DCAL trigger cards

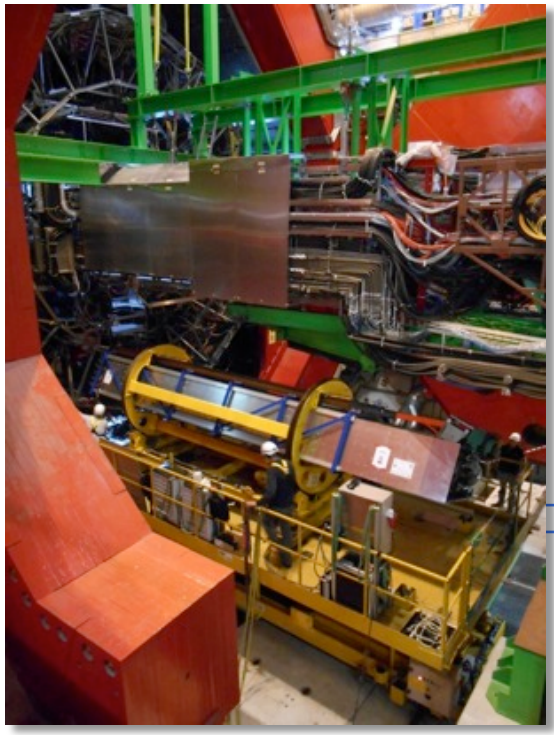
- **All 3 calorimeters can generate L1 triggers**
- **DCAL+PHOS can generate L1 (jet) trigger out of the combined acceptance**
- **EMCAL information can be used for online estimation of the underlying event**

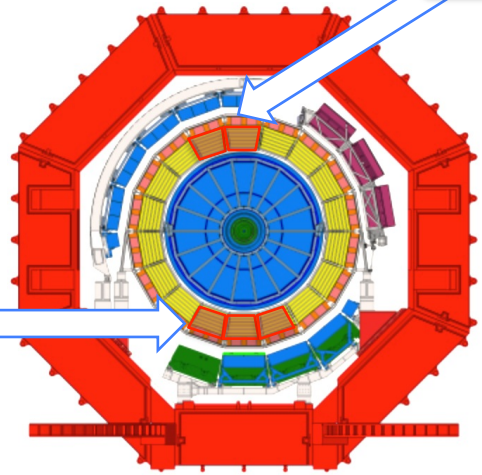
TRD: Installation and Completion

- 5 SM built and installed in 2014
- The miniframe was 'suspended' to install the three bottom modules
- Other 6 SM removed and re-installed in 2013 (LV consolidation work)



Top modules – November 2014





Miniframe 'suspension': bottom modules – May 2014

TRD: Pre-trigger Consolidation

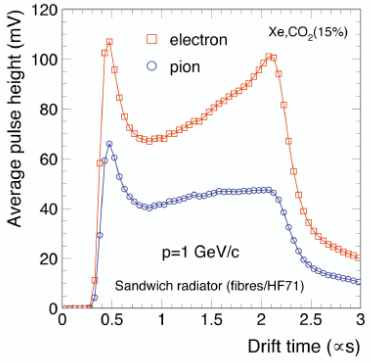
On board physics selection at L1

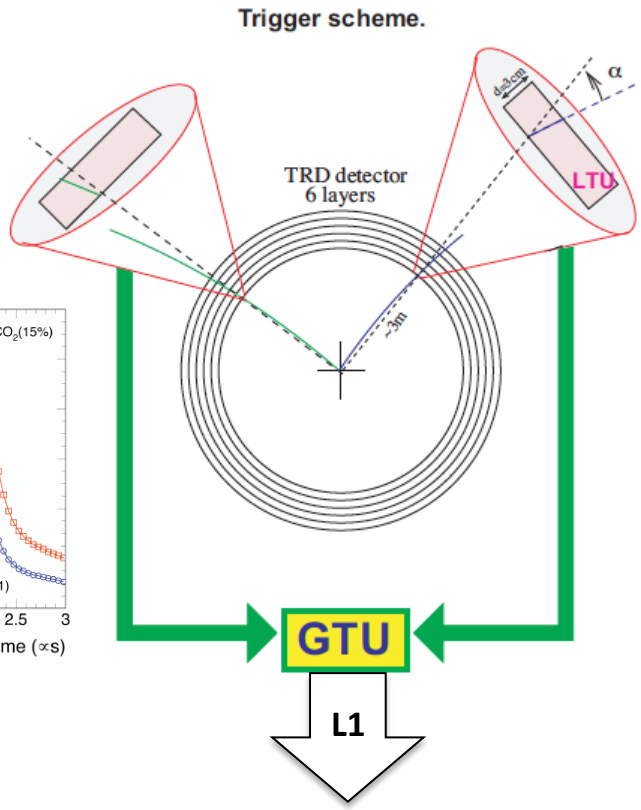
- high p_t e^- pairs with J/Ψ and Υ mass
- high p_t e^- and high p_t μ
- high p_t particles in jet cone

L1-L0 latency: 7 μs

- Need ultra-fast (425 ns) wake up to digitize TRD e^- signature
- ALICE L0 is 800 ns, too slow

Needs wake up from V0 (T0) or TOF (for cosmics trigger)





RUN1: wake up → "private" min. bias or cosmic trigger independent from the ALICE Central Trigger Processor (CTP)

- possibility that TRD starts but CTP doesn't accept L0
- additional trigger "dead-time" (rough signal discrimination)

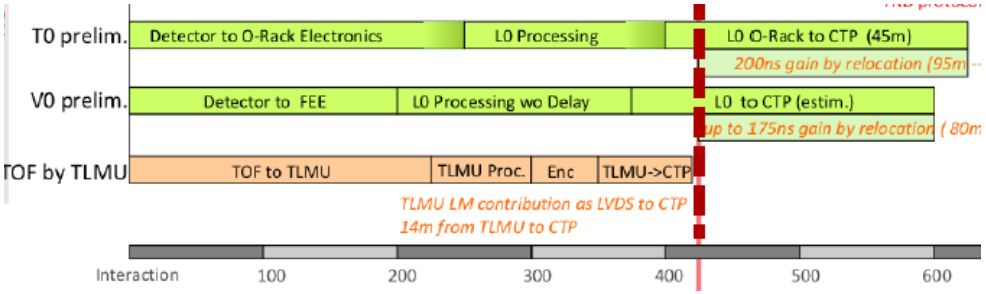
TRD: Pre-trigger Consolidation

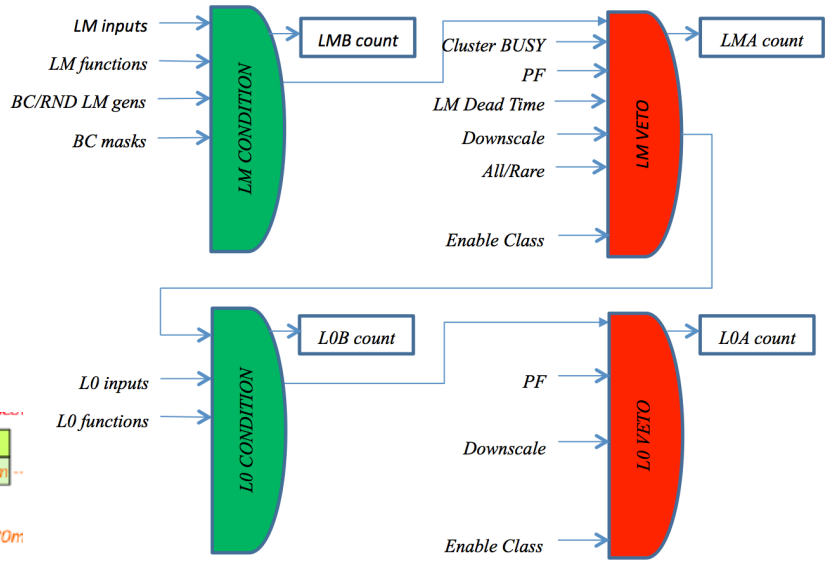
RUN2: wake-up logic at the ALICE Central Trigger Processor (CTP)

- same as standard L0 triggers, but faster
  - with common busy & downscaling logics, in CTP
  - Deployed in ALICE on week 21

Level-minus-1 trigger: LM (sub L0)

- Relocation of T0 and V0 front end electronics closer to CTP
- Optimization of the V0 TDC hits generation
- Shortening of cables (T0 and V0)





TPC: on Argon for RUN2

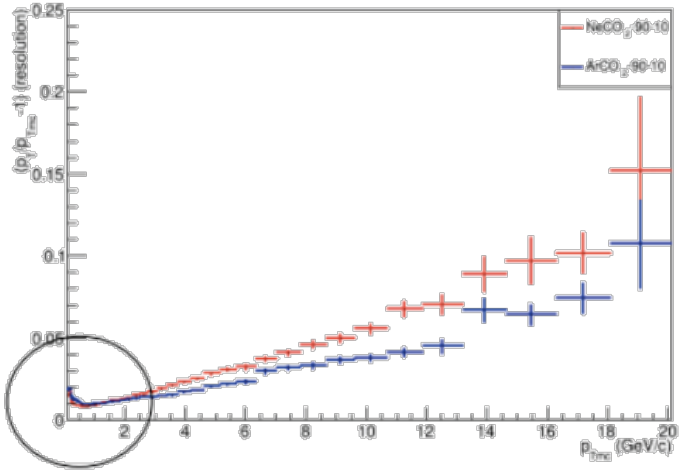
- The ALICE TPC has been running on Ne:CO_2(90:10) in RUN1
- HV trips have been observed in the MWPC readout at high track rates

Species	E [TeV]	L [Hz/cm^2]	Int. Rate [kHz]	Multiplicity	Track Rate [kHz]
pPb 2013	5.02	10^{29}	200	3.5	700
PbPb 2015	5.1/5.02	10^{27}+	8+	75	600+

Ne is prone to self-sustained radiation induced currents

Ar less prone to glow discharge: x2 lower gain for free → x2 primary electrons

- Ar ions ~x2.5 slower → longer clearing times
- Ar has x3 shorter R.L. → multiple scattering
- pp (MB) → dead time from 350 us (Ne) to 500 us (Ar) → L2a from 3 kHz to 2 kHz
- HI(MB) → readout time dominates → L2a 0.5 kHz



Ar performance is transparent in HI
"small" performance penalty in pp
overall higher detector stability → efficiency

TPC: Readout Consolidation


RCU2 - 216 boards

- RCU2 pre-series (v1.2) available since Dec 2014. Test installation on 1 TPC sector done in week 3 2015
- Mass production of RCU2 started
- Installation of all RCUs planned for the LHC TS1

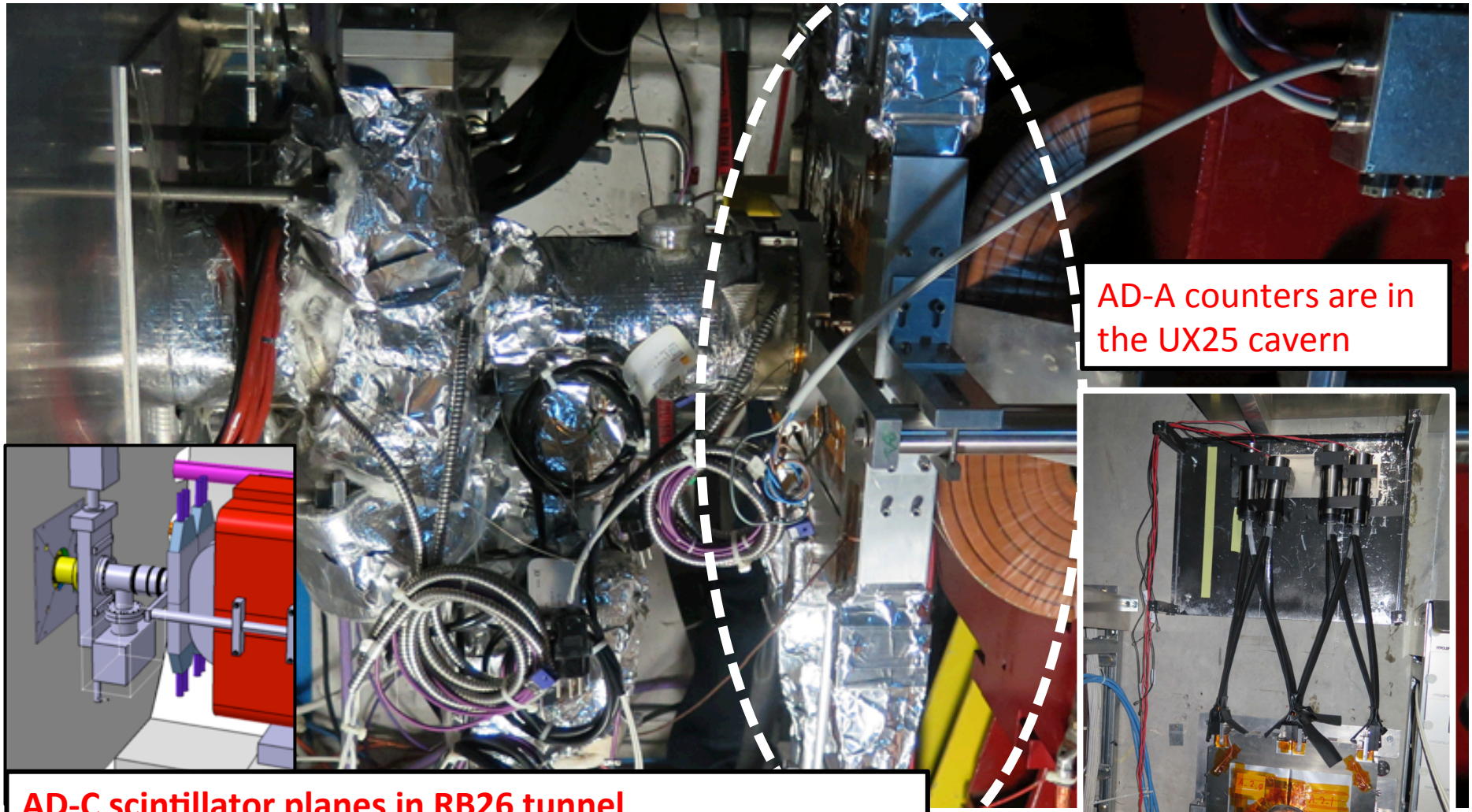
RCU2 Roadmap

- Irradiation tests: Uppsala 17–29 Apr, no signs of latchup.
- Data readout stable
- FEC monitoring stable
- SEU recovery OK
- DEUs: not seen
- Readout core being deployed in test sector this week: validation

W25: Installation in ALICE

…py RCU2 team in front of sector C08

ALICE Diffractive Detector: Installation



AD-A counters are in the UX25 cavern

AD-C scintillator planes in RB26 tunnel

no access for the next 3 years

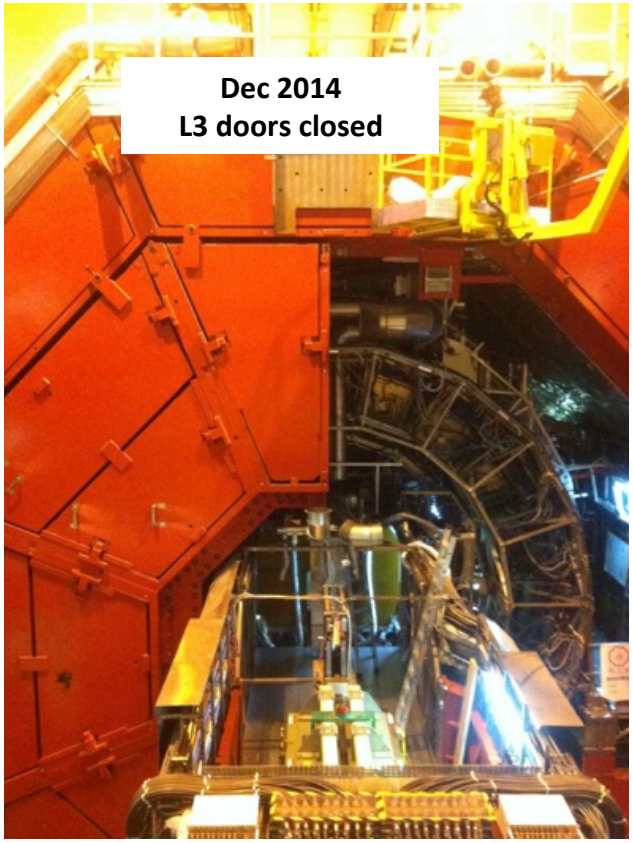
optical fibers for transport of light PMTs are in the cavern

LS1: Infrastructure Readiness

- L3 doors closed in December 2014
- All shielding blocks reinstalled
- Central beampipe under vacuum

ALICE ready for LHC beam operation.

New L3 Magnet Safety System crate



Dec 2014
L3 doors closed

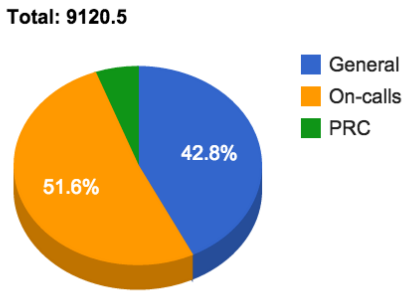
Dec 2014
Re-installation
UX25 shielding

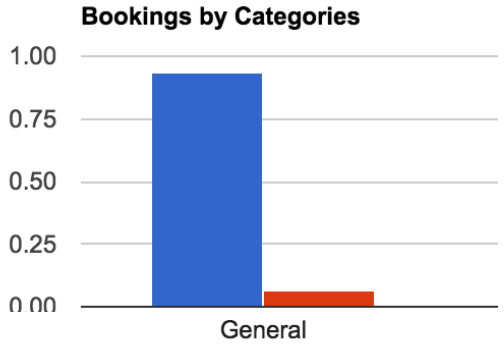
Jan 2015
Re-installation PX24
shielding

LS1: Control Room and Operations

New Shift Schedule and Management System

- Real time institutional quotas
- Overbooking
- Overriding
- Training management
- Reporting



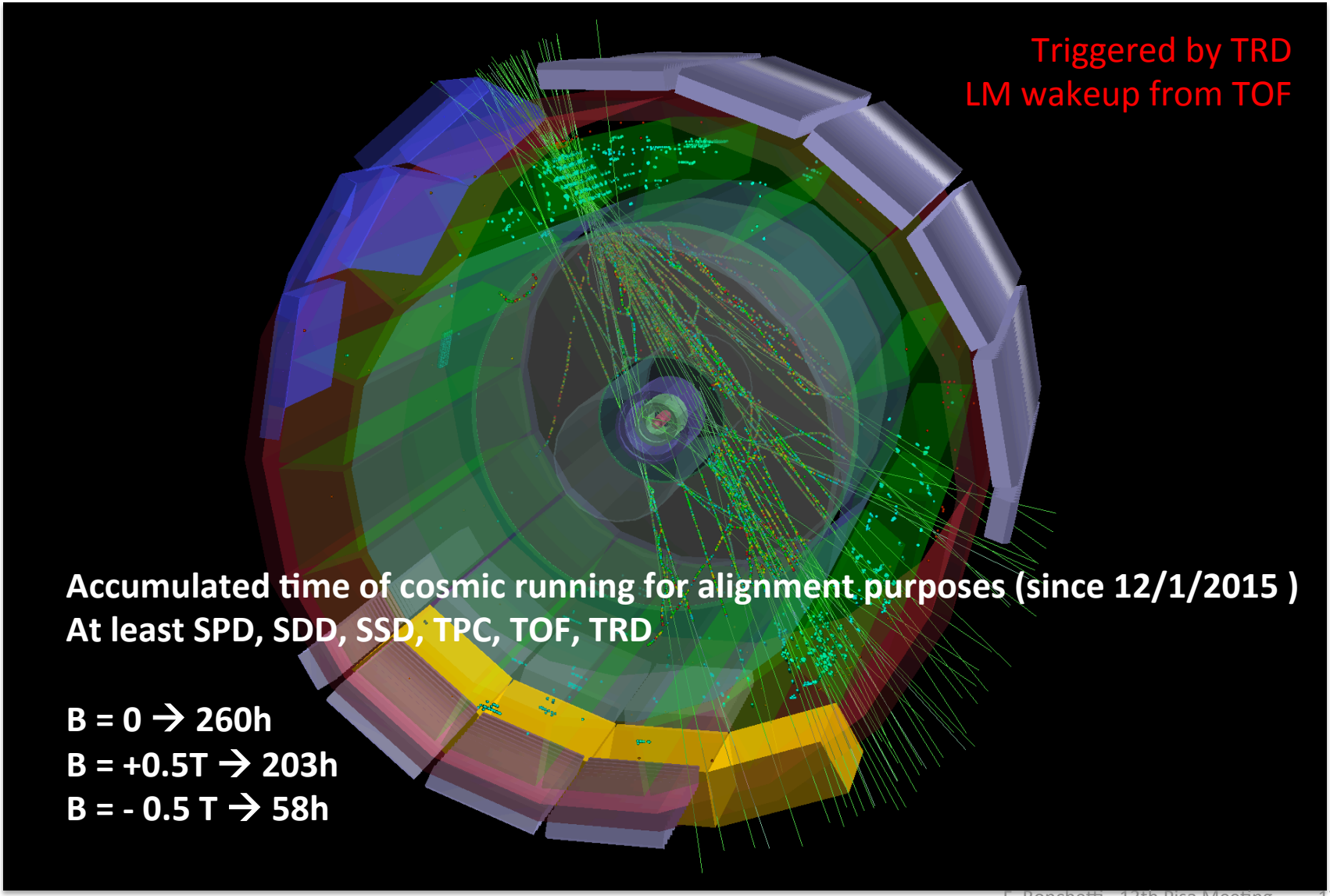


The ALICE Glance Shift Accounting Management System (SAMS)

H. Martins Silva[1], A. Telesca[2], F. Ronchetti[3], C. Maidantchik[1]

Proceedings of CHEP 2015

RUN2: Re-commissioning w/ COSMICS



Accumulated time of cosmic running for alignment purposes (since 12/1/2015)
At least SPD, SDD, SSD, TPC, TOF, TRD

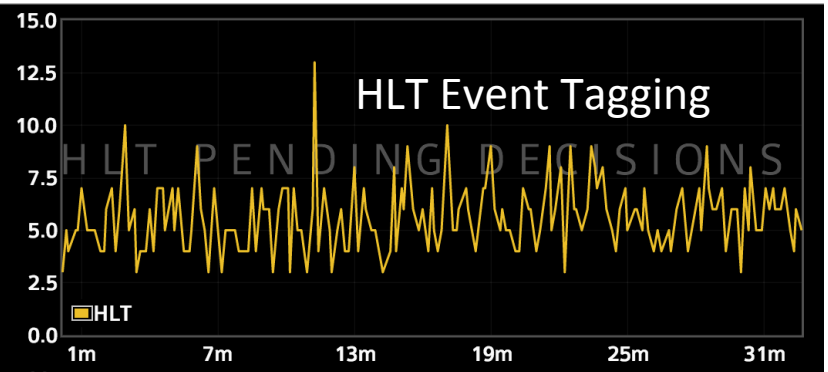
B = 0 → 260h
B = +0.5T → 203h
B = - 0.5 T → 58h

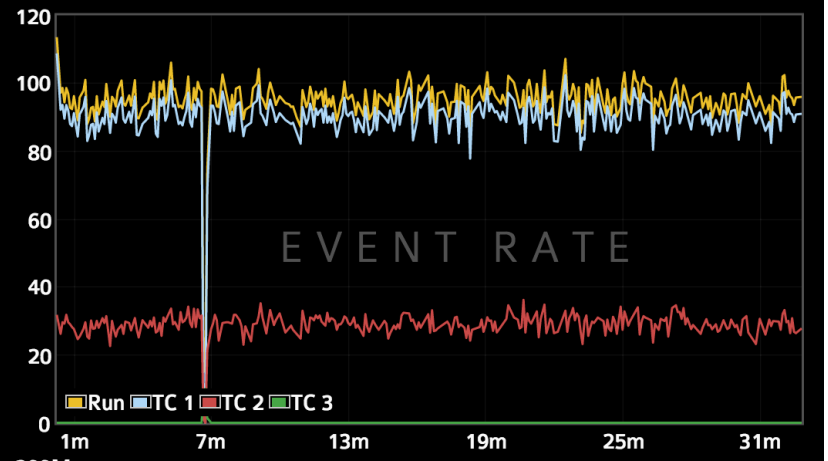
RUN2: Re-commissioning w/ COSMICS

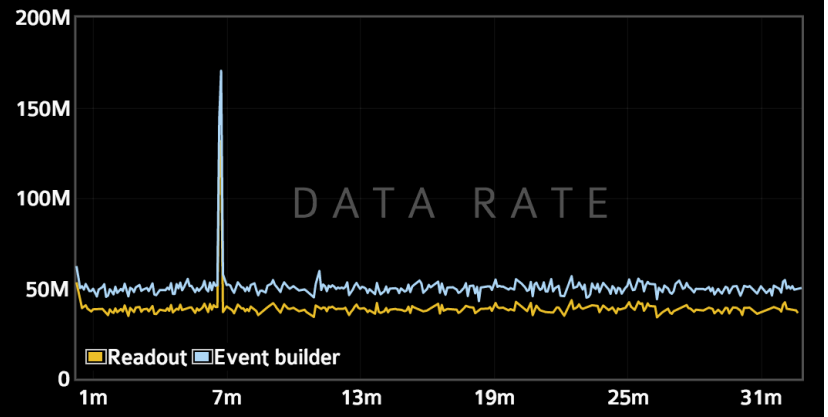
Run	Beam	Partition	Run type	HLT	Rec	Duration	Events
222650	-	PHYSICS_1	PHYSICS	B	Y	00:33:02	187k

CTP Config: cosmic2015 (v6)

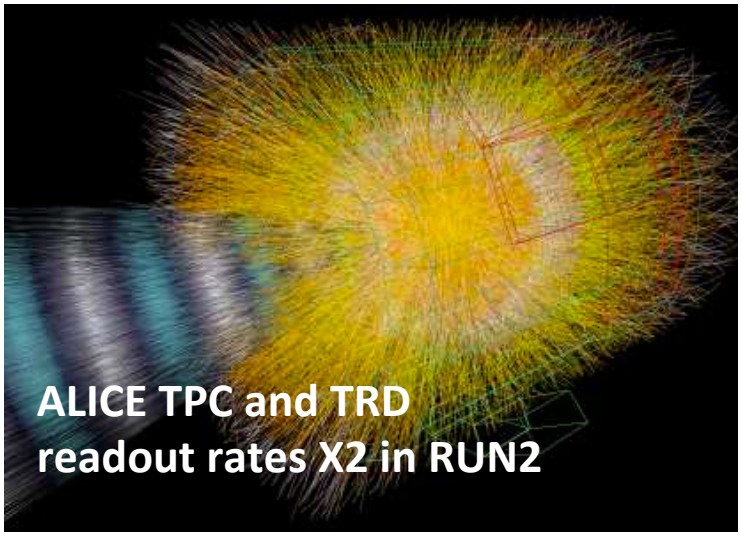
Calib	Bsy	Bck	Name	RUN	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8
	-		-	187k	176k	57k	100	-	-	-	-	-
-	-	-	ACO	✓	✓	✓	-	-	-	-	-	-
00:29 PED	-	-	AD0	✓	✓	✓	-	-	-	-	-	-
07:14 PED	-	-	CPV	✓	✓	✓	-	-	-	-	-	-
-	-	-	EMC	✓	✓	✓	-	-	-	-	-	-
-	-	-	FMD	-	-	-	-	-	-	-	-	-
-	-	-	HMP	-	-	-	-	-	-	-	-	-
-	-	-	MTR	-	-	-	-	-	-	-	-	-
07:11 PED	-	-	MCH	✓	✓	✓	-	-	-	-	-	-
-	-	-	PHS	-	-	-	-	-	-	-	-	-
-	-	-	PMD	-	-	-	-	-	-	-	-	-
07:19 INJ	-	-	SDD	✓	✓	✓	-	-	-	-	-	-
-	-	-	SPD	-	-	-	-	-	-	-	-	-
07:14 PED	-	-	SSD	✓	✓	✓	-	-	-	-	-	-
-	-	-	T00	-	-	-	-	-	-	-	-	-
07:10 NOI	-	-	TOF	✓	✓	✓	-	-	-	-	-	-
07:25 PED	-	-	TPC	✓	✓	✓	✓	-	-	-	-	-
-	-	-	TRD	✓	-	✓	-	-	-	-	-	-
-	-	-	TRI	✓	✓	✓	✓	-	-	-	-	-
-	-	-	TST	-	-	-	-	-	-	-	-	-
-	-	-	V00	✓	✓	✓	-	-	-	-	-	-
-	-	-	ZDC	-	-	-	-	-	-	-	-	-







RUN2: Readout and Online Consolidation



Full hardware upgrade for

- **Data Acquisition cluster**
- **High Level Trigger cluster in terms of CPU, network, and FPGA processing (C-RORCs)**

Augmented Central Trigger Processor capacity

50→100 classes (logical combinations of L0 inputs)

- **Re-design of all detectors R/O firmware**
- **Modifications of the HLT software framework**

Introduction of in-run recovery procedures

Integration work on central systems and detectors

Example: In-Run Recovery Procedure

Run	Beam	Partition	Run type	HLT	Rec	Duration	Events
221888	-	PHYSICS_1	PHYSICS	A	Y	00:16:50	69k
		CTP Config: cosmic2015 (v6)					

Calib	Bsy	Bck	Name	RUN	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8
	-		-	69k	63k	26k	100	-	-	-	-	-
-	-	-	ACO	✓	✓	✓	-	-	-	-	-	-
17:53 PED	-	-	AD0	-	-	-	-	-	-	-	-	-
17:56 PED	-	-	CPV	✓	✓	✓	-	-	-	-	-	-
-	-	-	EMC	✓	✓	✓	-	-	-	-	-	-
-	-	-	FMD	-	-	-	-	-	-	-	-	-
17:50 CAL	-	-	HMP	✓	✓	✓	-	-	-	-	-	-
17:58 CAL	-	-	MTR	✓	✓	✓	-	-	-	-	-	-
17:49 PED	-	-	MCH	✓	✓	✓	-	-	-	-	-	-
-	-	-	PHS	✓	✓	✓	-	-	-	-	-	-
16:47 PED	-	-	PMD	-	-	-	-	-	-	-	-	-
-	-	-	SDD	-	-	-	-	-	-	-	-	-
-	-	-	SPD	✓	✓	✓	-	-	-	-	-	-
17:52 PED	-	-	SSD	✓	✓	✓	-	-	-	-	-	-
-	-	-	T00	-	-	-	-	-	-	-	-	-
17:47 NOI	-	-	TOF	✓	✓	✓	-	-	-	-	-	-
18:13 PUL	-	-	TPC	✓	✓	✓	✓	-	-	-	-	-
-	-	-	TRD	✓	-	✓	-	-	-	-	-	-
-	-	-	TRI	✓	✓	✓	✓	-	-	-	-	-
-	-	-	TST	-	-	-	-	-	-	-	-	-
-	-	-	V00	✓	✓	✓	-	-	-	-	-	-
16:52 SLA	-	-	ZDC	-	-	-	-	-	-	-	-	-

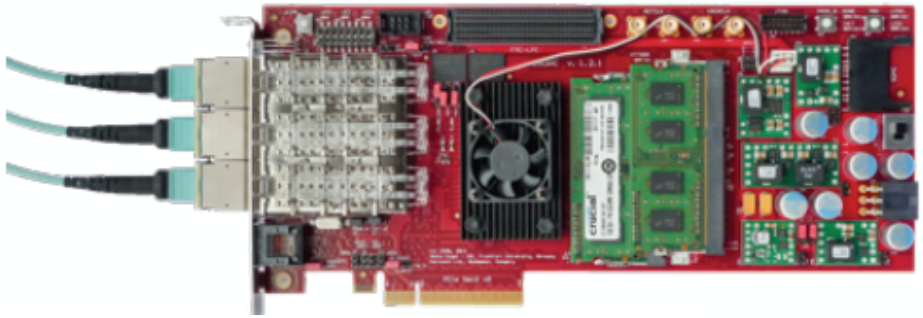
ALICE High Level Trigger: Consolidation

Production Linux Cluster

- 180 nodes: 4320 cores:
  - 2x Intel Xeon E5-2697 CPUs 2.7 GHz, 12 Cores each
  - Infiniband Network for Data transfer between the Nodes in IPoIB Mode

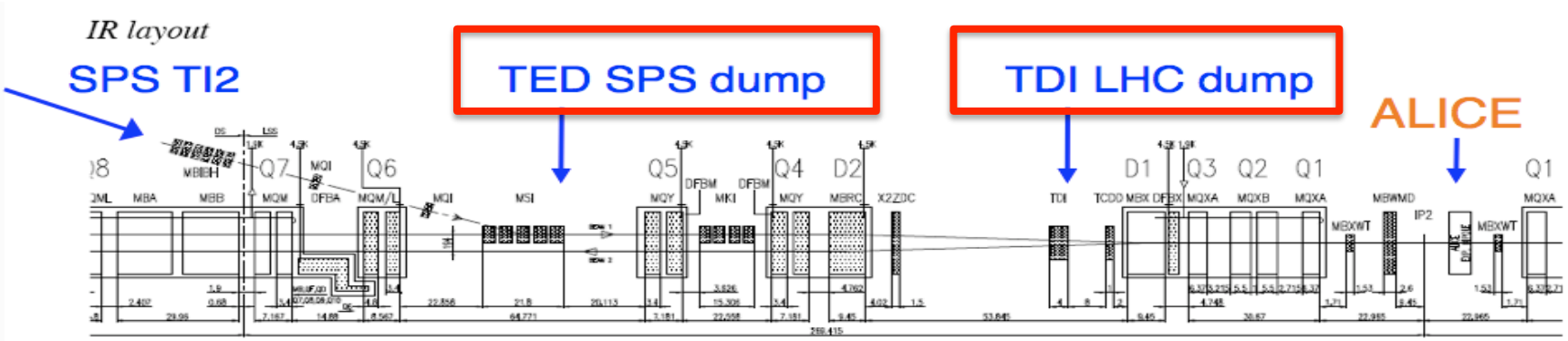
HLT Highlights

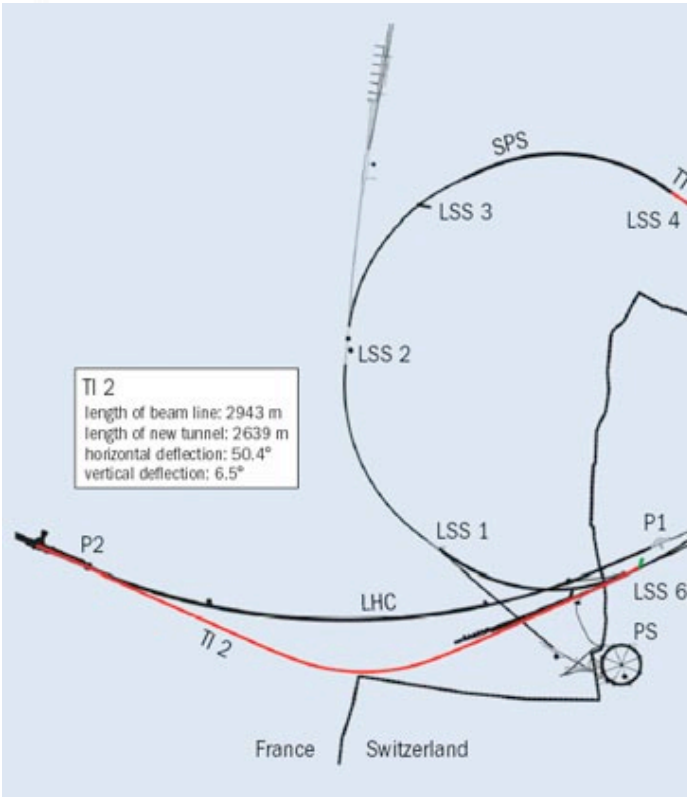
- FPGA Cluster Finder
  - 74 nodes equipped with C-RORCS.
- Online GPU tracking
  - AMD FirePro S9000
- Online Reconstruction
- Online TPC cluster compression (x5 in PbPb)



Hardware Cluster Finder on C-RORC

Commissioning with Beam: November 2014





Transfer Line Test

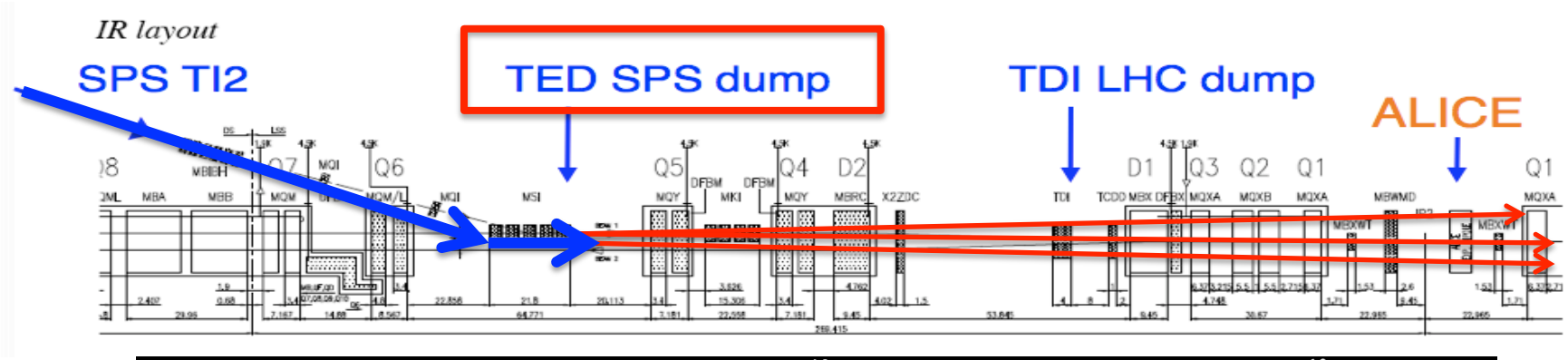
Inject from SPS to LHC

BEAM1 dump in IP2 TED

BEAM2 dump in IP8 TED

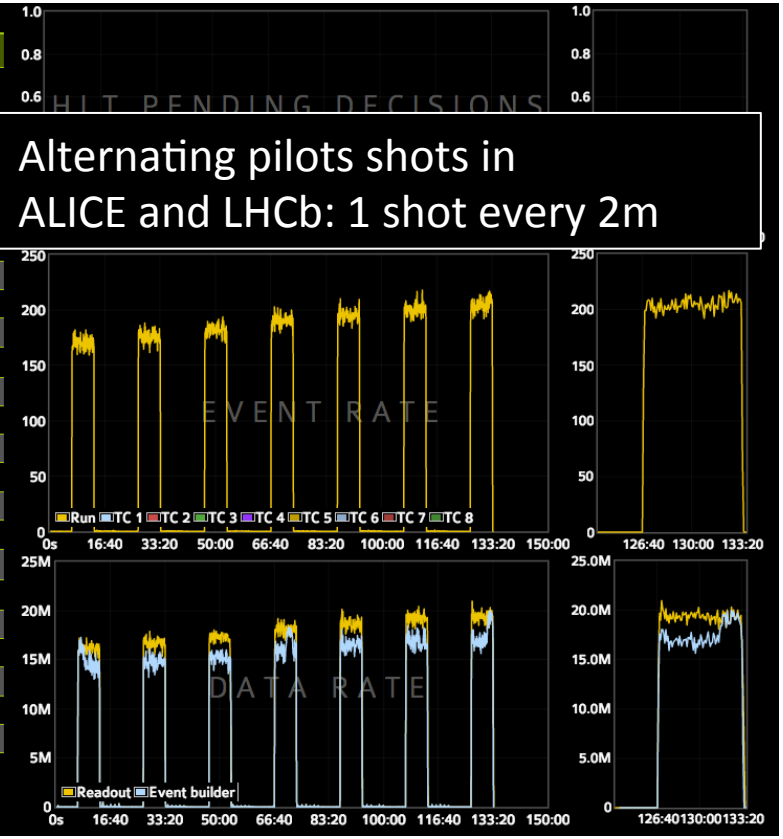
- **TI2 dumps from on TED** (pilots 5E9 p/b)
- **SSD, SDD, T0, V0, MTR, TOF, HMPID**
- **TDI shots for BCM/BLS/RADMOB/BLM tests**
- **Validation of trigger analysis tool**

Commissioning with Beam: November 2014



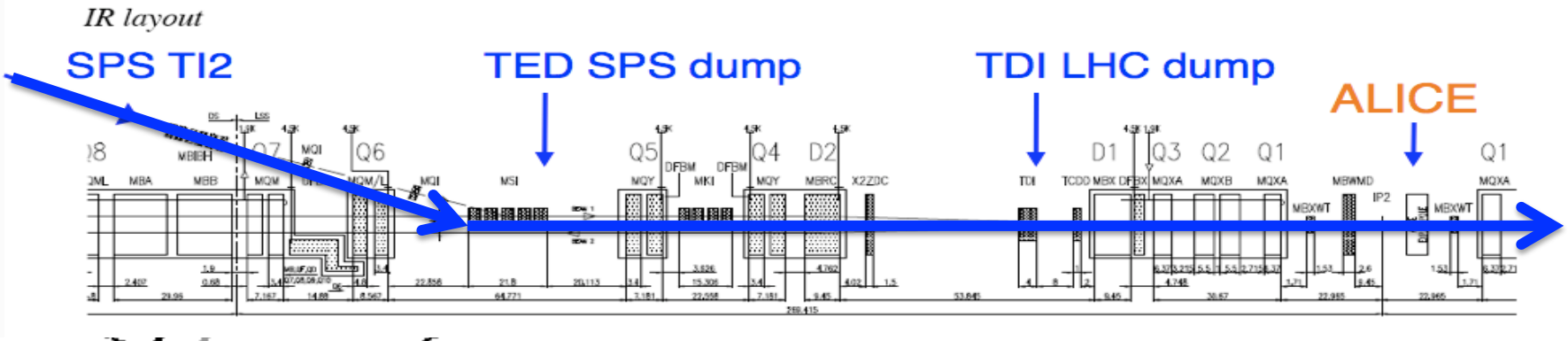
Run N°	Beam	Partition	Run type	HLT	Rec	Duration	Events
206278	-	PHYSICS_1	PHYSICS	A	Y	02:13:58	529k

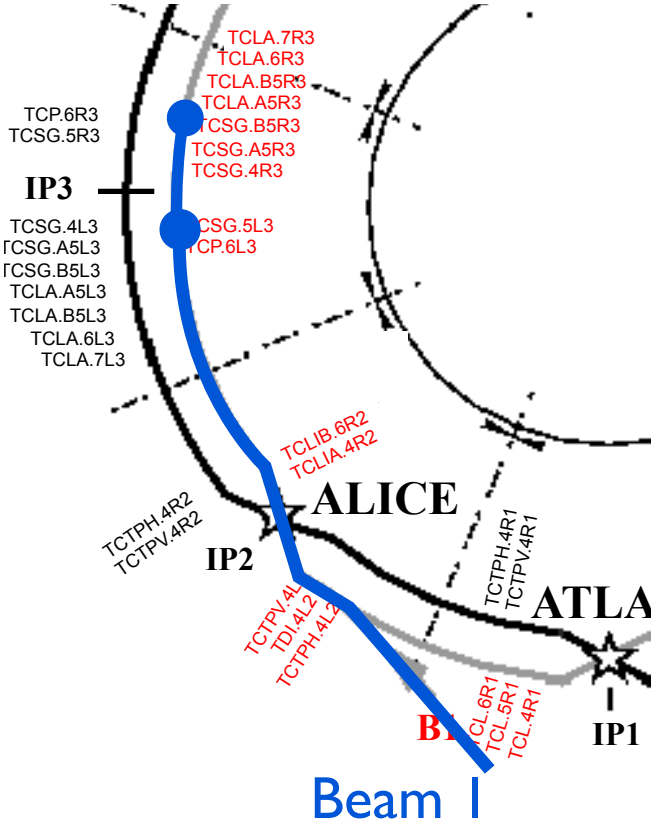
Calib	Bsy	Bck	Name	RUN	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8
-	-		-	529k	-	-	-	-	-	-	-	-
-	-		ACO	-	-	-	-	-	-	-	-	-
-	-		CPV	-	-	-	-	-	-	-	-	-
-	-		EMC	-	-	-	-	-	-	-	-	-
-	-		FMD	-	-	-	-	-	-	-	-	-
-	-		HMP	✓	✓	-	-	-	-	-	-	-
-	-		MTR	✓	✓	-	-	-	-	-	-	-
-	-		MCH	-	-	-	-	-	-	-	-	-
-	-		PHS	-	-	-	-	-	-	-	-	-
-	-		PMD	-	-	-	-	-	-	-	-	-
-	-		SDD	✓	✓	-	-	-	-	-	-	-
-	-		SPD	-	-	-	-	-	-	-	-	-
-	-		SSD	✓	✓	-	-	-	-	-	-	-
-	-		T00	✓	✓	-	-	-	-	-	-	-
-	-		TOF	✓	✓	-	-	-	-	-	-	-
-	-		TPC	-	-	-	-	-	-	-	-	-
-	-		TRD	-	-	-	-	-	-	-	-	-
-	-		TRI	✓	✓	-	-	-	-	-	-	-
-	-		TST	-	-	-	-	-	-	-	-	-
-	-		V00	-	-	-	-	-	-	-	-	-
-	-		ZDC	-	-	-	-	-	-	-	-	-



Alternating pilots shots in ALICE and LHCb: 1 shot every 2m

RUN2: Commissioning w/ Beam, March 2015





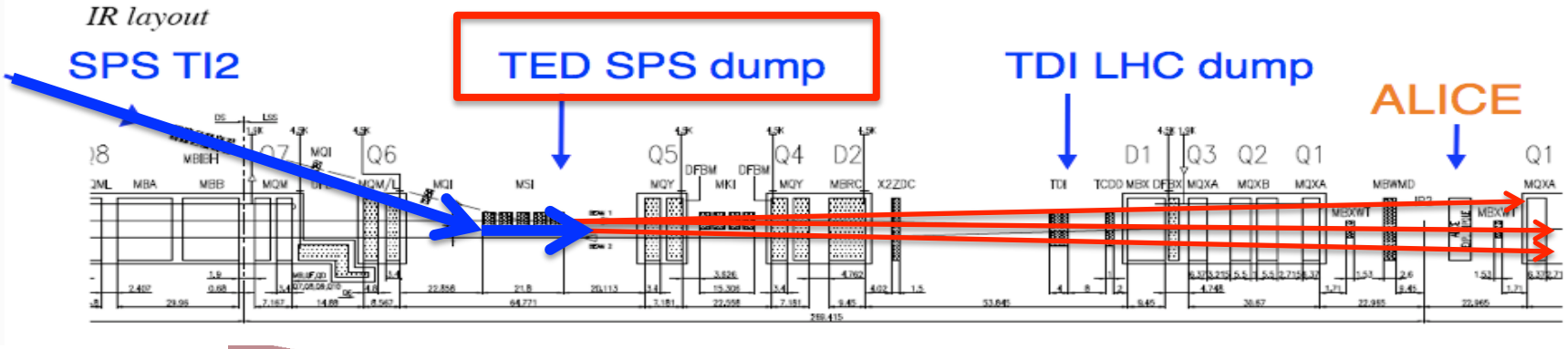
Injection test

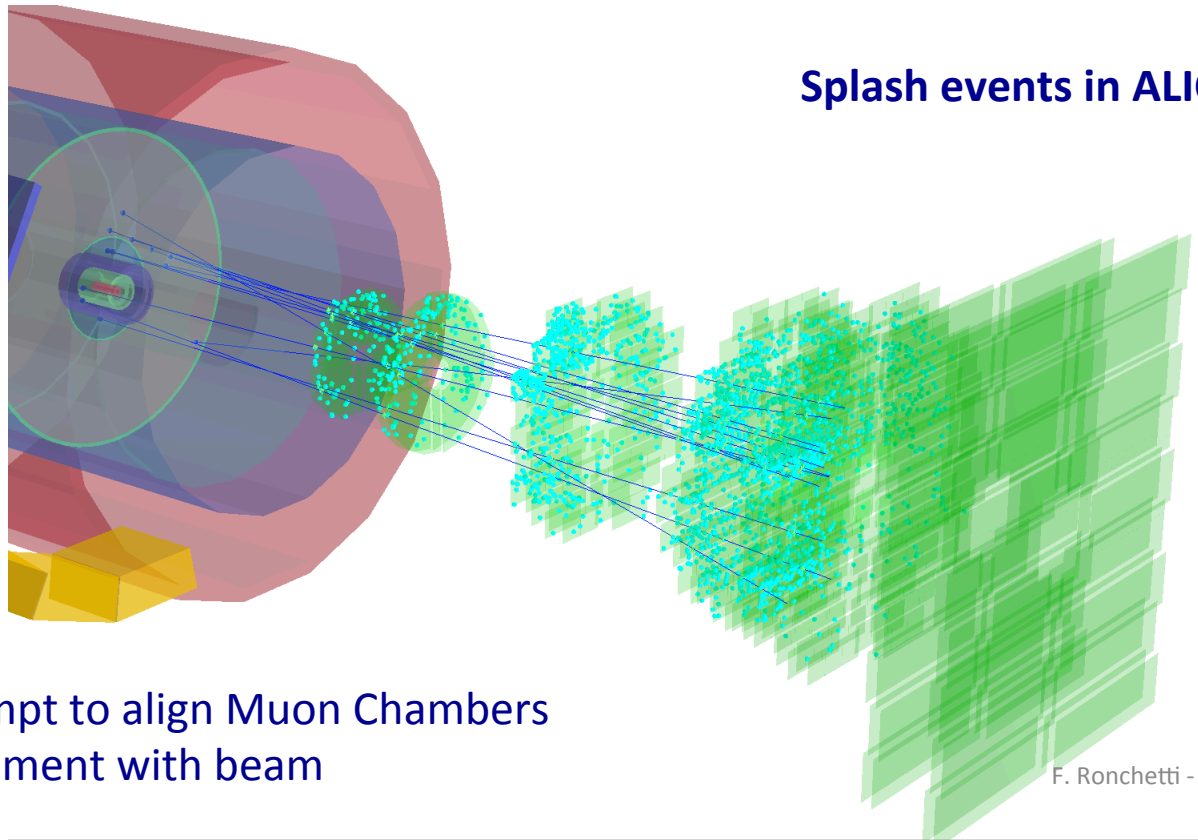
Inject from SPS to LHC
BEAM1 dump in P3 (collimator)
BEAM2 dump in P6 (LHC B2 dump)

TDI shots for BCM/BLS/RADMOB/BLM calibration

- **TI2 dumps from on TED**
  (small pilots 2E9 p/b) **for MUON_ARM alignment**
- **SPD SSD, SDD, T0, V0, MTR, MCH TOF, ACORDE, AD**
- **CTP snapshots during initial TED shots (trigger signals relative alignment)**

RUN2: Commissioning w/ Beam, March 2015

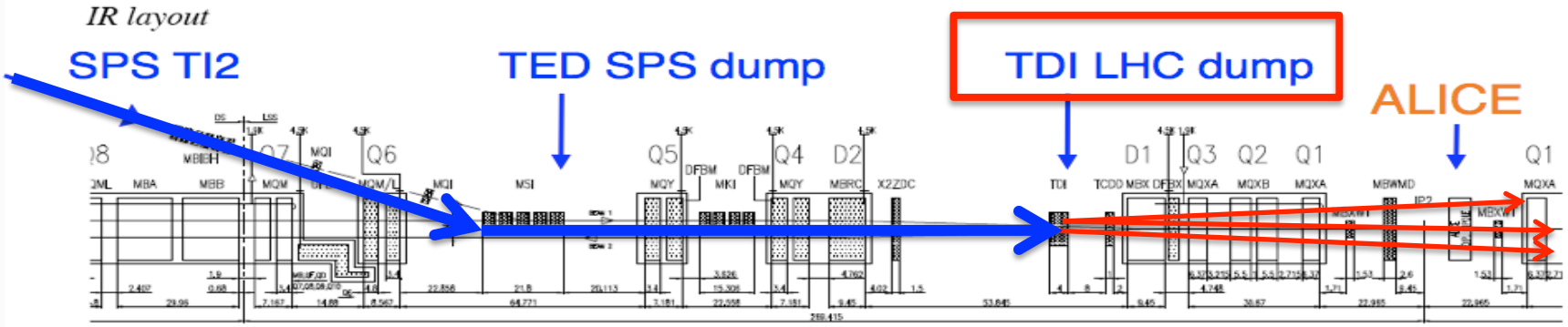




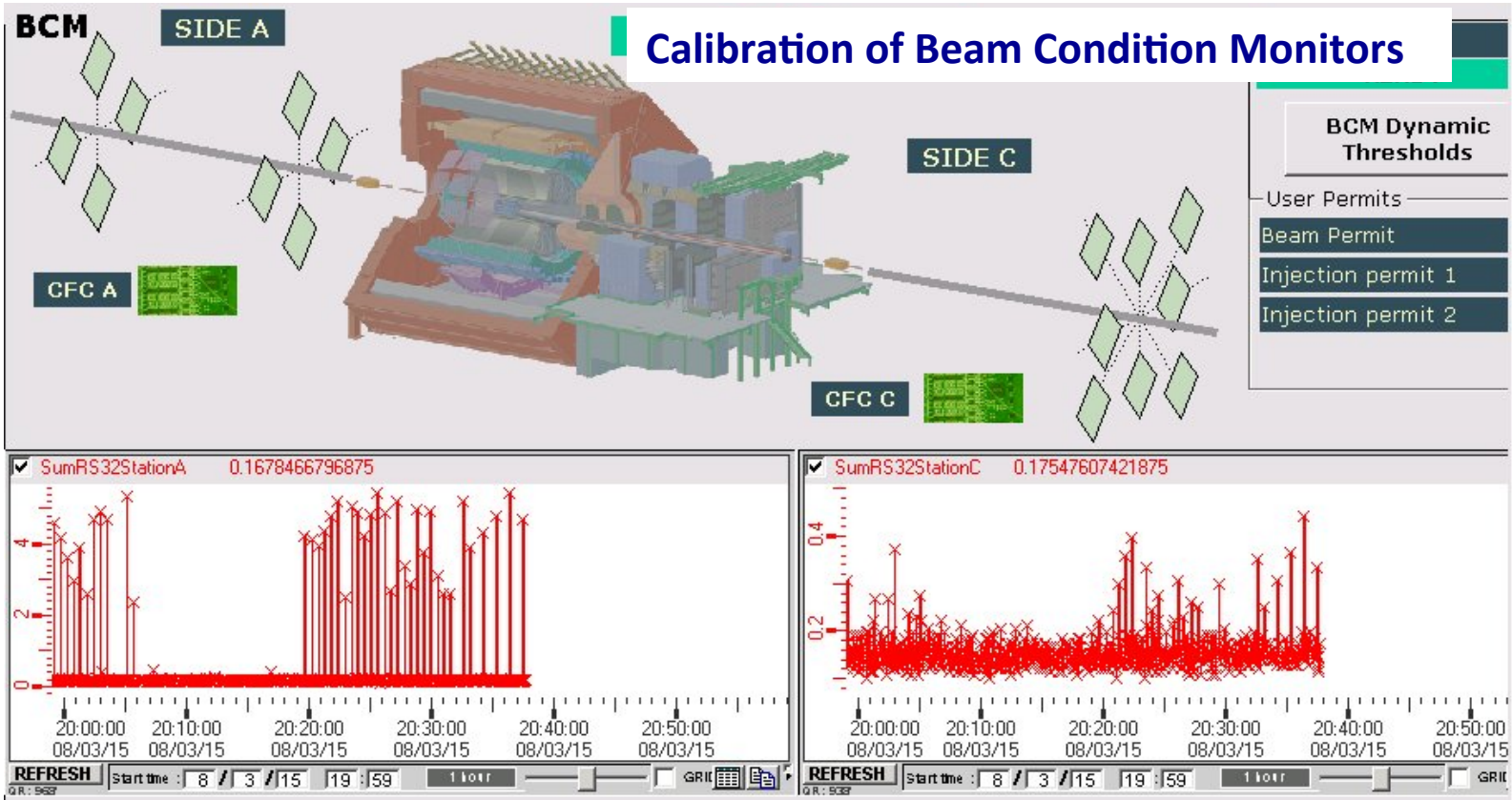
Splash events in ALICE

First attempt to align Muon Chambers
Final alignment with beam

RUN2: Commissioning w/ Beam, March 2015

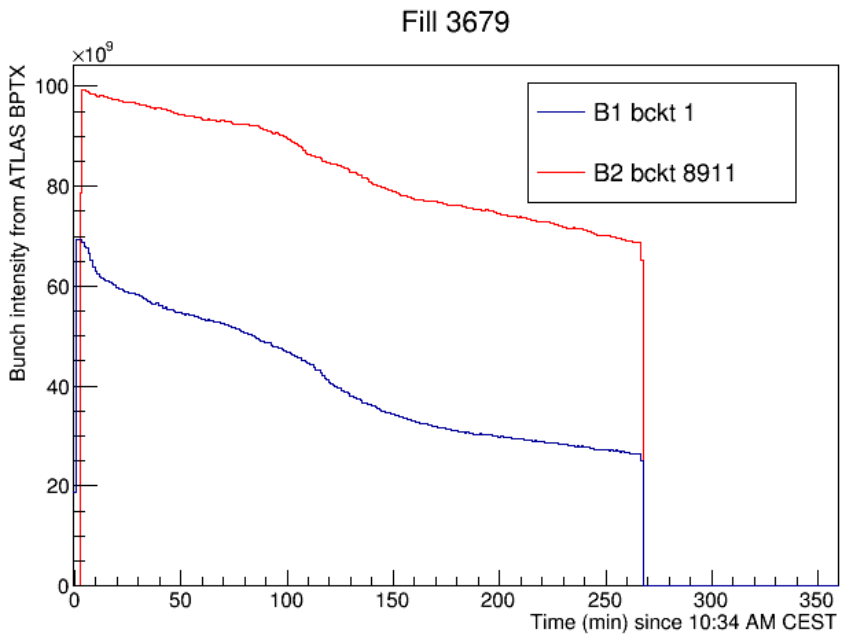


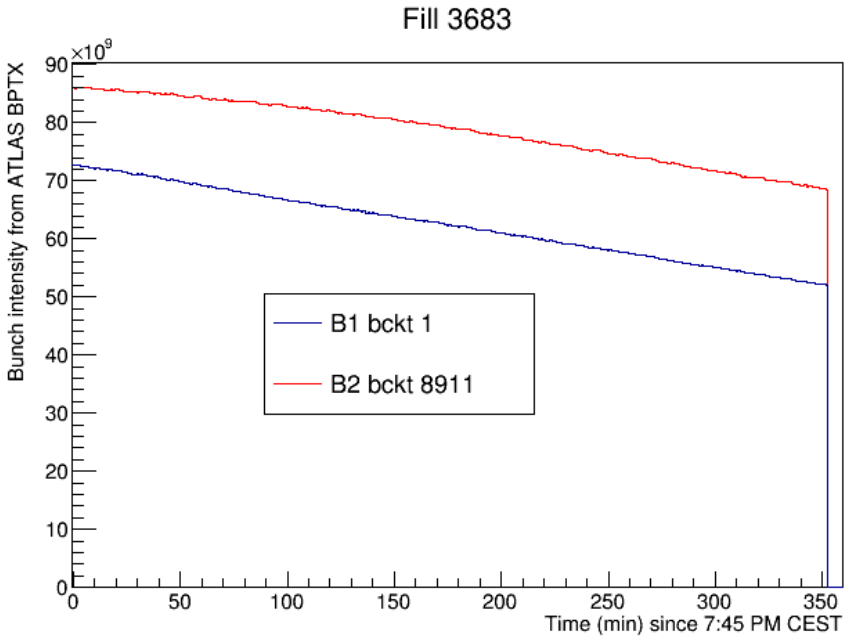
Calibration of Beam Condition Monitors



RUN2: pp quiet Collisions @ 900 GeV

- FS: 2b_1_1_1_pilot
- IP2-8: nominal-pilot / Beta* → 10 m / Rates o(300 Hz)
- Tuesday May 5th → lumi scan: fill 3679
  - AD, T0, V0, SPD and SSD (→ tracks)
- Wednesday May 6th → collisions: fill 3683
  - AD, T0, V0, SPD, SSD, FMD + MCH, MTR + EMCAL, PHOS, ZDC

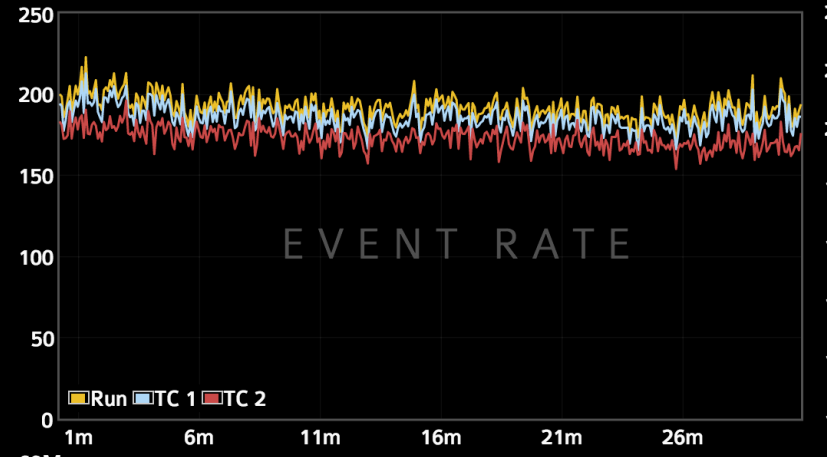




RUN2: pp Collisions @ 900 GeV

	Run	Beam	Partition	Run type	HLT	Rec	Duration	Events
▶	222086	-	PHYSICS_2 CTP Config: pp2015nov0 (v1)	PHYSICS	A	Y	00:48:51	525k
▶	222088	-	PHYSICS_1 CTP Config: pp2015 (v4)	PHYSICS	A	Y	00:31:10	355k

Calib	Bsy	Bck	Name	RUN	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8
	-		-	355k	343k	320k	-	-	-	-	-	-
-	-	-	ACO	-	-	-	-	-	-	-	-	-
-	-	-	AD0	✓	✓	✓	○	-	-	-	-	-
-	-	-	CPV	-	-	-	-	-	-	-	-	-
-	-	-	EMC	✓	✓	-	-	-	-	-	-	-
-	-	-	FMD	✓	✓	-	-	-	-	-	-	-
-	-	-	HMP	-	-	-	-	-	-	-	-	-
-	-	-	MTR	✓	✓	-	-	-	-	-	-	-
00:37 PED	-	-	MCH	✓	✓	-	-	-	-	-	-	-
-	-	-	PHS	✓	✓	-	-	-	-	-	-	-
-	-	-	PMD	-	-	-	-	-	-	-	-	-
-	-	-	SDD	-	-	-	-	-	-	-	-	-
-	-	-	SPD	✓	✓	✓	○	-	-	-	-	-
-	-	-	SSD	✓	✓	-	-	-	-	-	-	-
-	-	-	T00	✓	✓	✓	-	-	-	-	-	-
-	-	-	TOF	-	-	-	-	-	-	-	-	-
-	-	-	TPC	-	-	-	-	-	-	-	-	-
-	-	-	TRD	-	-	-	-	-	-	-	-	-
-	-	-	TRI	✓	✓	✓	✓	-	-	-	-	-
-	-	-	TST	-	-	-	-	-	-	-	-	-
-	-	-	V00	✓	✓	✓	-	-	-	-	-	-
20:22 SPE	-	-	ZDC	✓	-	-	✓	-	-	-	-	-

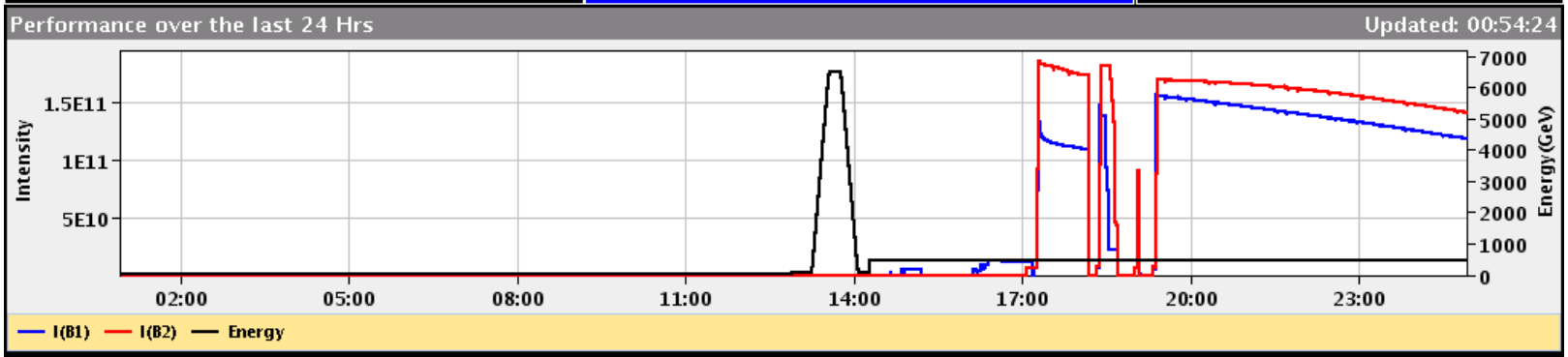


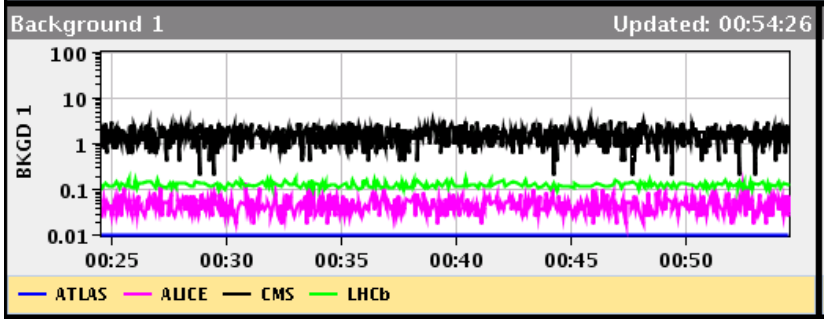
RUN2: pp Collisions @ 900 GeV

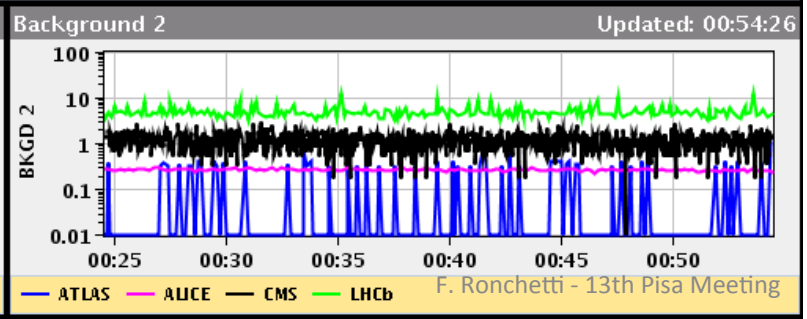
07-May-2015 00:54:26 | Fill #: 3683 | Energy: 450 GeV | I(B1): 1.19e+11 | I(B2): 1.42e+11

	ATLAS	ALICE	CMS	LHCb
Experiment Status	CALIBRATION	CALIBRATION	STANDBY	STANDBY
Instantaneous Lumi [(ub.s)^-1]	0.006	0.002	0.008	0.002
BRAN Luminosity [(ub.s)^-1]	0.0	0.0	1.6	1.5
Fill Luminosity (nb)^-1	0.000	0.000	-	0.000
BKGD 1	0.002	0.036	1.896	0.131
BKGD 2	1.107	0.246	1.589	4.464
BKGD 3	0.014	0.015	3.317	0.050

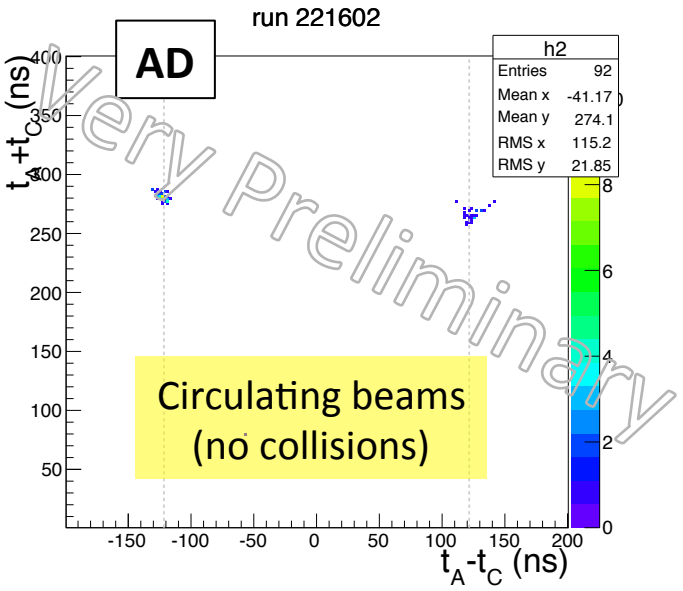
LHCb VELO Position: OUT | Gap: 58.0 mm | ADJUST | TOTEM: STANDBY

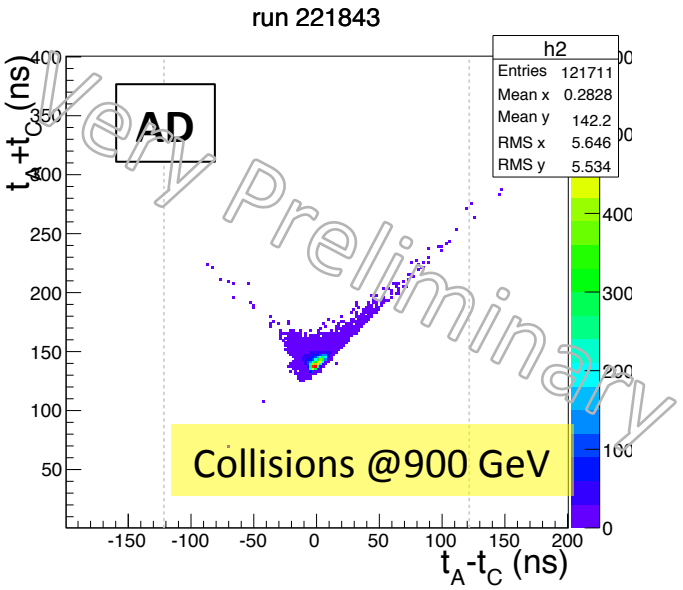


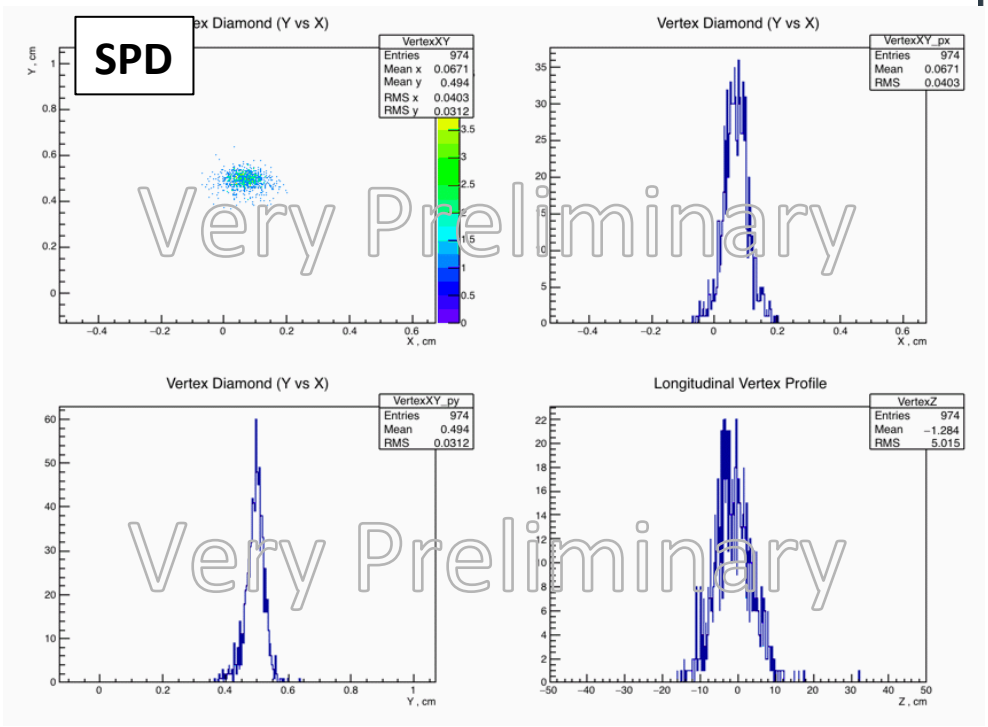


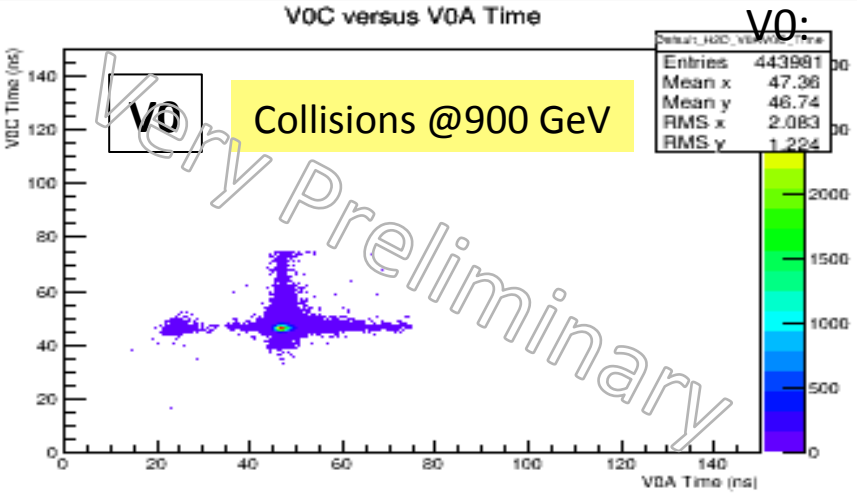


Luminometers









RUN2: pp Collisions @ 900 GeV

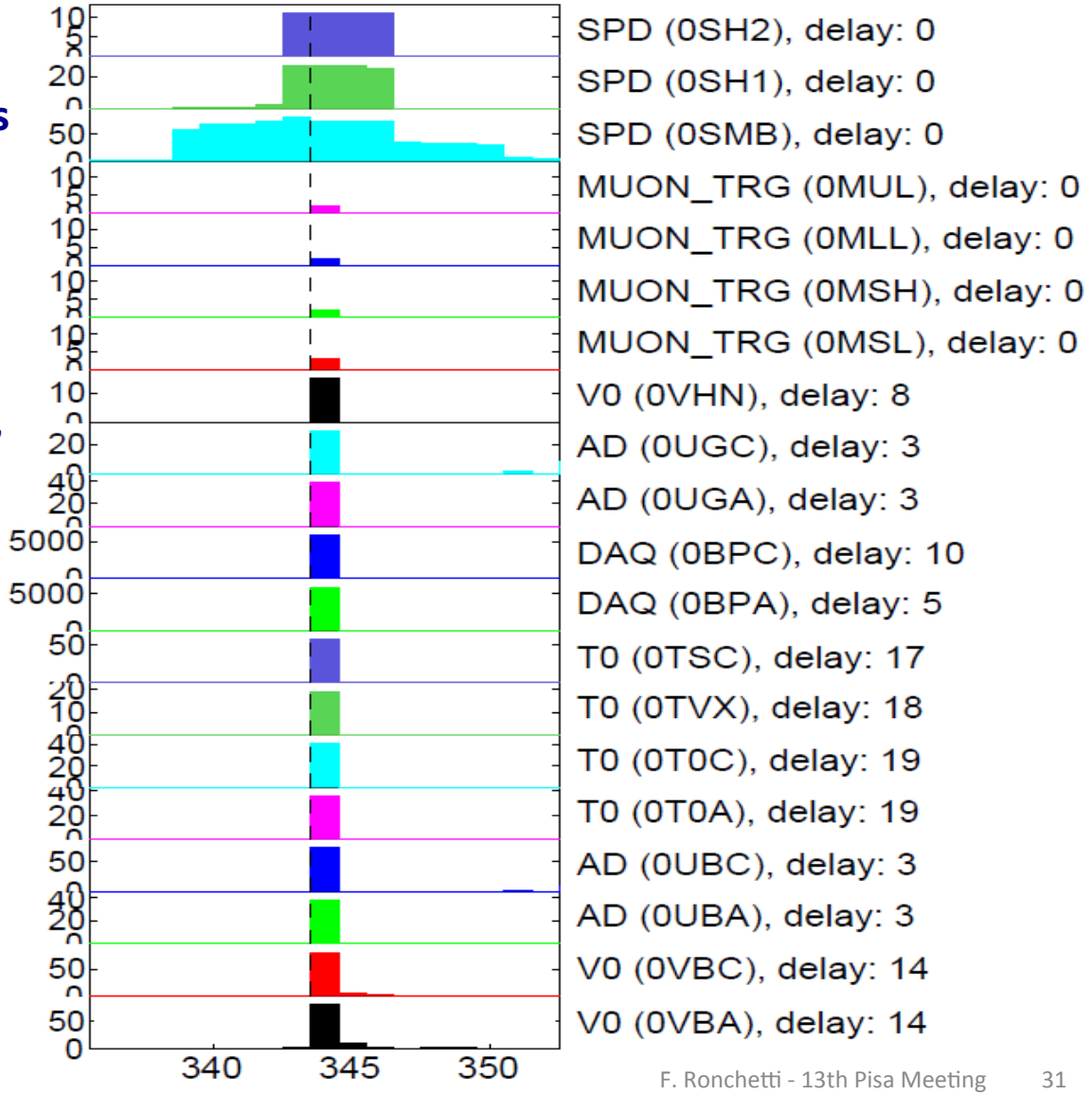
Trigger Analysis

Signals arrive 2 bunch crossings earlier than in RUN1 (removal of CTP switch)

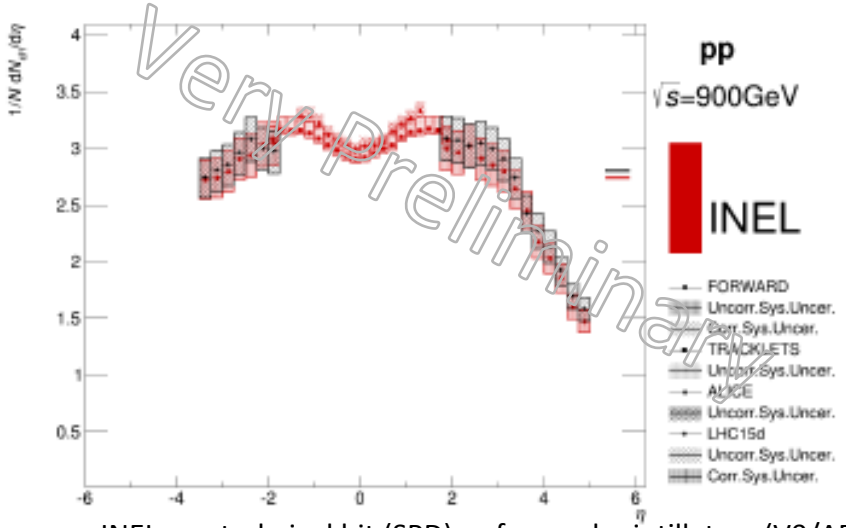
- **Beam1, bucket 1 in bc=344 (was 346 in run1)**
- **Beam2, bucket 1 in bc=3017 (was 3019 in run1)**

Luminometers (V0, T0, AD):

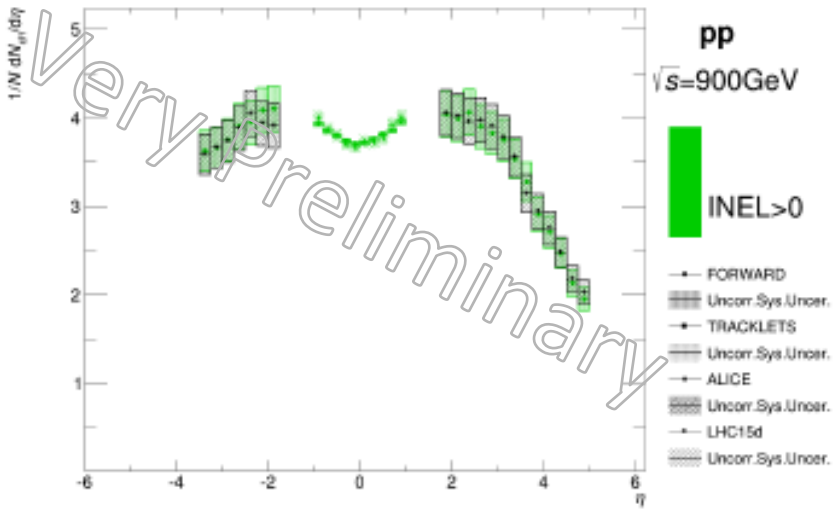
- **Tuning of HV**
- **Tuning of delays**
  DONE



RUN2: 1/N $dN_{ch}/d\eta$ @ 900 GeV

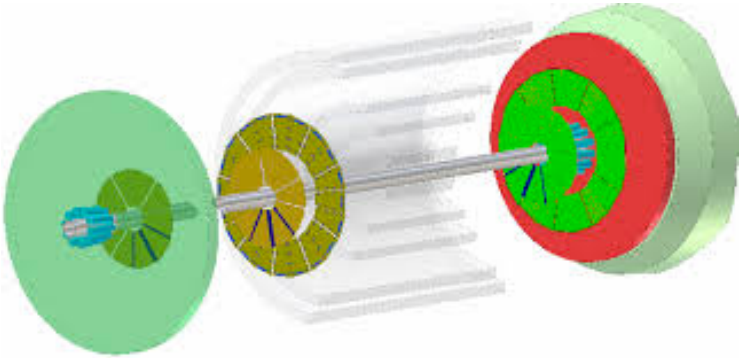


INEL: central pixel hit (SPD) or forward scintillators (V0/AD)



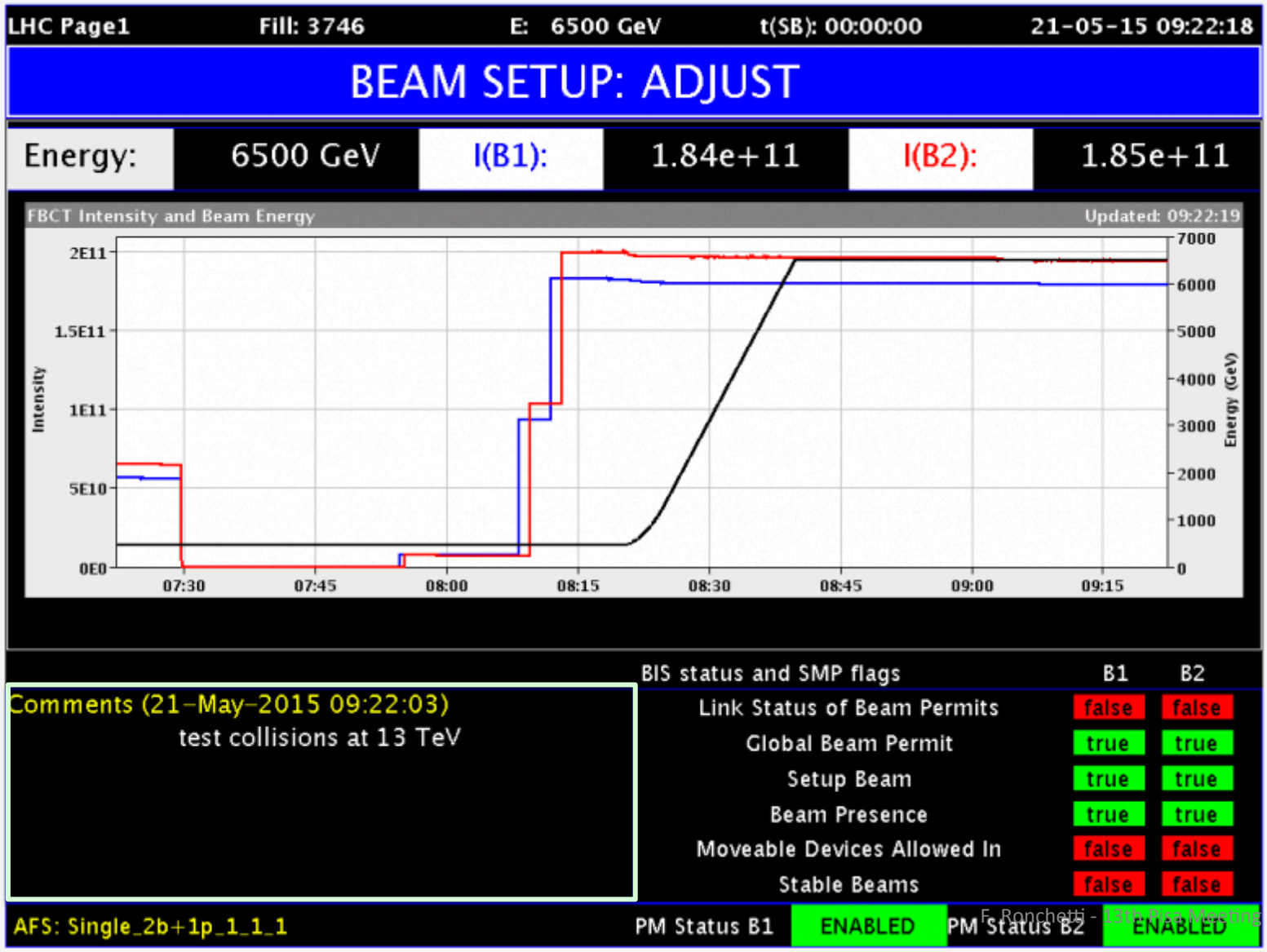
INEL > 0 = INEL with at least 1 track in $-1 < \eta < 1$

- LHC15d shown with black stars and error bars
- Run 222088
- By-pass Physics Selection
  - No VZERO Tender/calib.
  - Hardware triggers used
- Consistent with LHC10c result!



ALICE Forward Multiplicity Detector

RUN2: Quiet pp Collisions @ 13 TeV



RUN2: Quiet pp Collisions @ 13 TeV

23:23
20 May '15

BEAM SETUP : SQUEEZE — Fill 3744 — Energy= 6499 (GeV)

BEAM INFO

Single_2b_1_1_1

Particles Type	PROTON - PROTON	P
Int. Bunches (IP2)	1	
Displaced Coll.	0	
B1 Non-Int.	3	
B2 Non-Int.	4	

Beam Intensity
B1 1.91e+011
B2 1.85e+011

LHC LUMINOSITY

BRAN L2	1.17e+003	Hz/ubarn
BRAN R2	8.62e-001	Hz/ubarn

ALICE STATUS

CALIBRATION

LHC BEAM BACKGROUND

BLS A	Value	Hz
C	Value	Hz

BEAM TIMING

Dt (B1 - B2)	1.14e-001	nsec
RMS Dt	2.80e-002	

ALICE TRIGGER RATES

V0 AND	4392	(Hz)
IR2:0UBA|0UBC	3691	(Hz)
0TVX	1711	(Hz)
IR1:0UBA|0UBC	3519	(Hz)
AD AND (BBA and BBC)	3048	(Hz)

ALICE LUMINOSITY

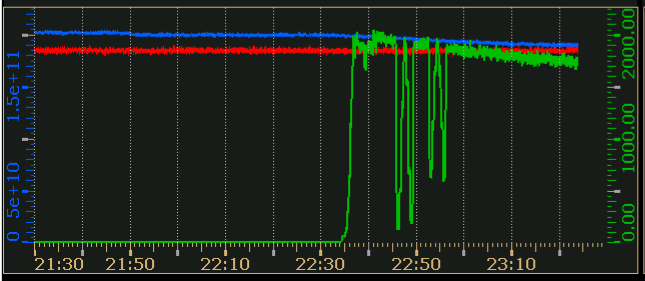
Target Instant.	2.00e+000	Hz/ubarn
Instantaneous	6.19e-002	Hz/ubarn
Delivered Stable	0.00e+000	$pbarn^{-1}$

ALICE BACKGROUND

BKG1 (%/DumpThresh)	0.05
BKG2 (%MaxBKGD)	9.26
BKG3 (%/DumpThresh)	0.01
V0 Tot (Hz)	13653.33

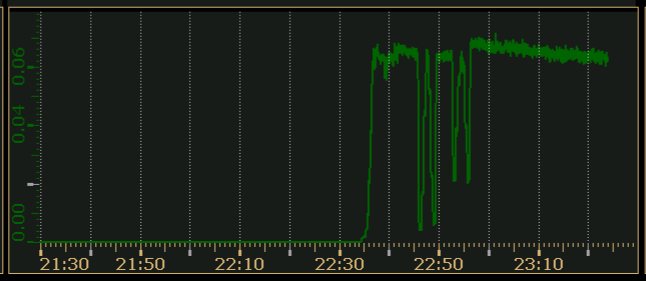
BEAM INTS. - TRIGGER RATES

BEAM 1 BEAM2
0TVX



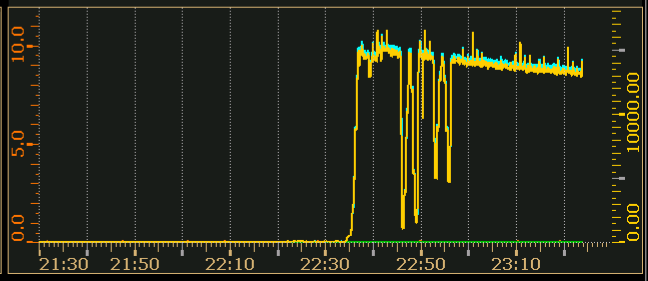
LUMINOSITY

Instantaneous



BACKGROUND

BKGD1 BKGD2 BKGD3 V0 TOT



RUN2: Quiet pp Collisions @ 13 TeV

12:42
21 May '15

BEAM SETUP : ADJUST — Fill 3746 — Energy= 6499 (GeV)

BEAM INFO

Single_2b+1p_1_1_1

Particles Type	PROTON - PROTON	P
Int. Bunches (IP2)	1	
Displaced Coll.	0	
B1 Non-Int.	2	
B2 Non-Int.	2	

Beam Intensity
B1 1.83e+011
B2 1.77e+011

LHC LUMINOSITY

BRAN L2	1.17e+003	Hz/ubarn
BRAN R2	2.79e-001	Hz/ubarn

ALICE STATUS

STANDBY

LHC BEAM BACKGROUND

BLS A	Value	Hz
C	Value	Hz

BEAM TIMING

Dt (B1 - B2)	1.46e-001	nsec
RMS Dt	2.80e-002	

ALICE TRIGGER RATES

V0 AND	1242	(Hz)
IR2:0UBA|0UBC	1547	(Hz)
0TVX	612	(Hz)
IR1:0UBA|0UBC	1482	(Hz)
AD AND (BBA and BBC)	1117	(Hz)

ALICE LUMINOSITY

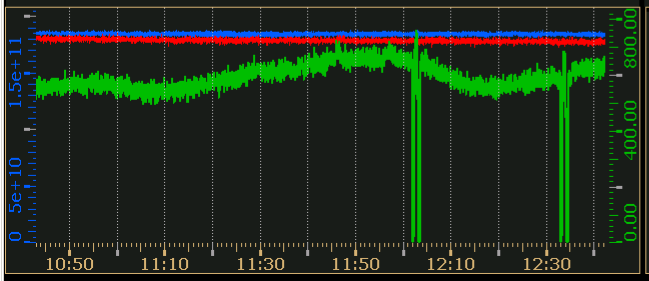
Target Instant.	2.00e+000	Hz/ubarn
Instantaneous	2.10e-002	Hz/ubarn
Delivered Stable	0.00e+000	$pbarn^{-1}$

ALICE BACKGROUND

BKG1 (%/DumpThresh)	0.02
BKG2 (%MaxBKGD)	1.16
BKG3 (%/DumpThresh)	0.01
V0 Tot (Hz)	2400.51

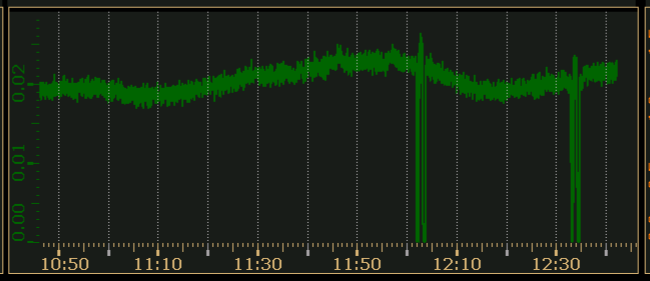
BEAM INTS. - TRIGGER RATES

BEAM 1 BEAM2 0TVX



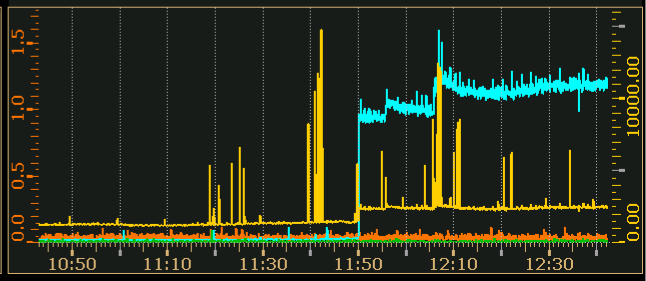
LUMINOSITY

Instantaneous



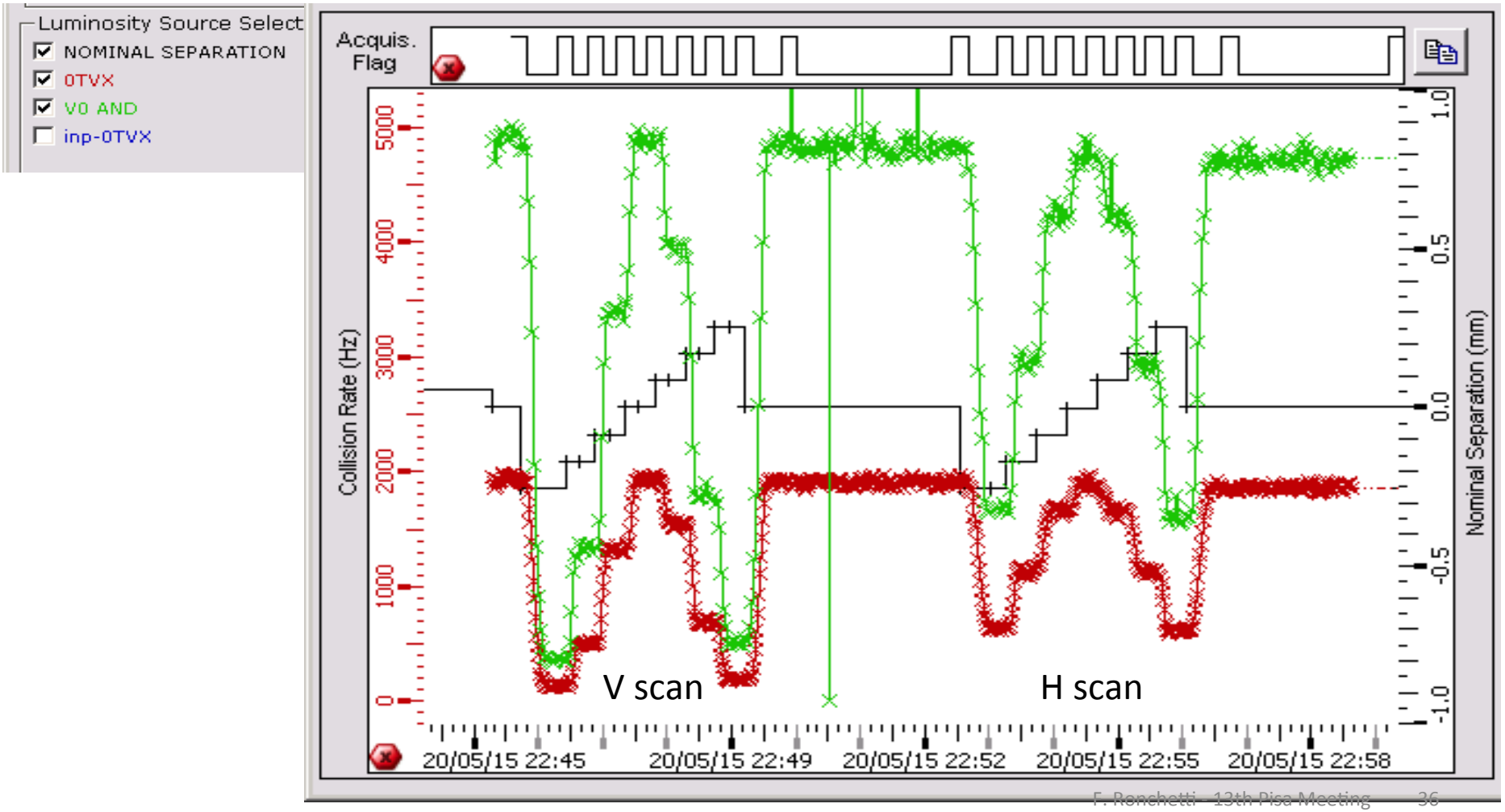
BACKGROUND

BKGD1 BKGD2 BKGD3 V0 TOT



RUN2: Quiet pp Collisions @ 13 TeV

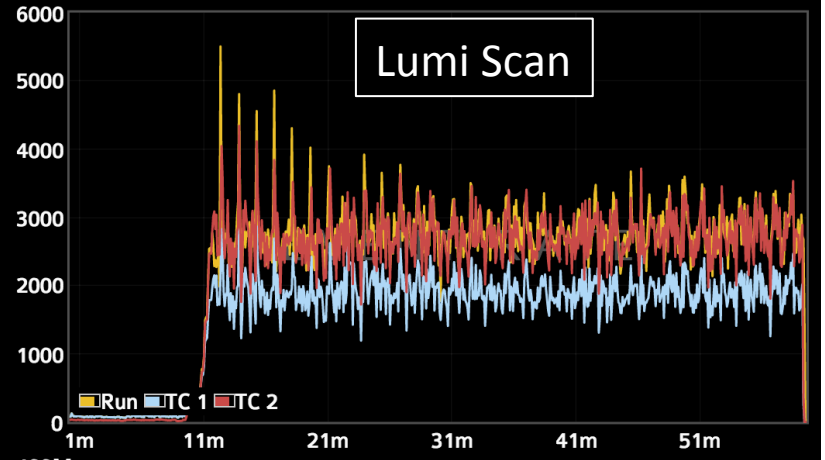
ALICE van de Meer scan application

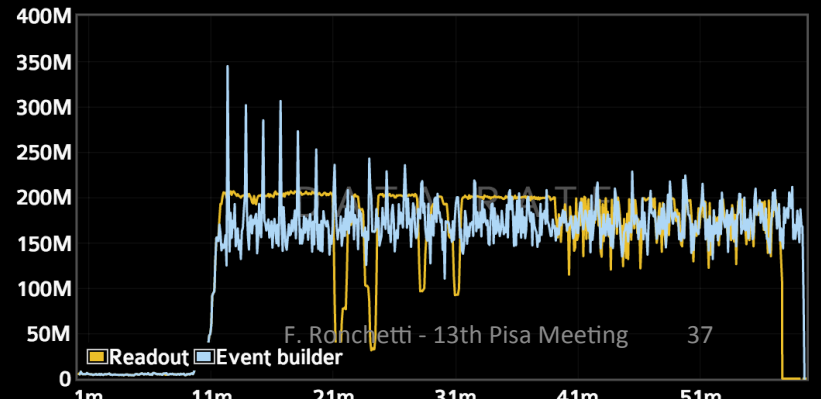


RUN2: Quiet pp Collisions @ 13 TeV

	Run	Beam	Partition	Run type	HLT	Rec	Duration	Events
■	223269	-	PHYSICS_1 CTP Config: pp2015 (v4)	PHYSICS	A	Y	00:25:20	91k
▶	223270	-	PHYSICS_1 CTP Config: pp2015 (v4)	PHYSICS	A	Y	00:59:49	8.1M
■	223272	-	PHYSICS_2 CTP Config: pp2015 (v1)	PHYSICS	A	Y	00:02:30	279k

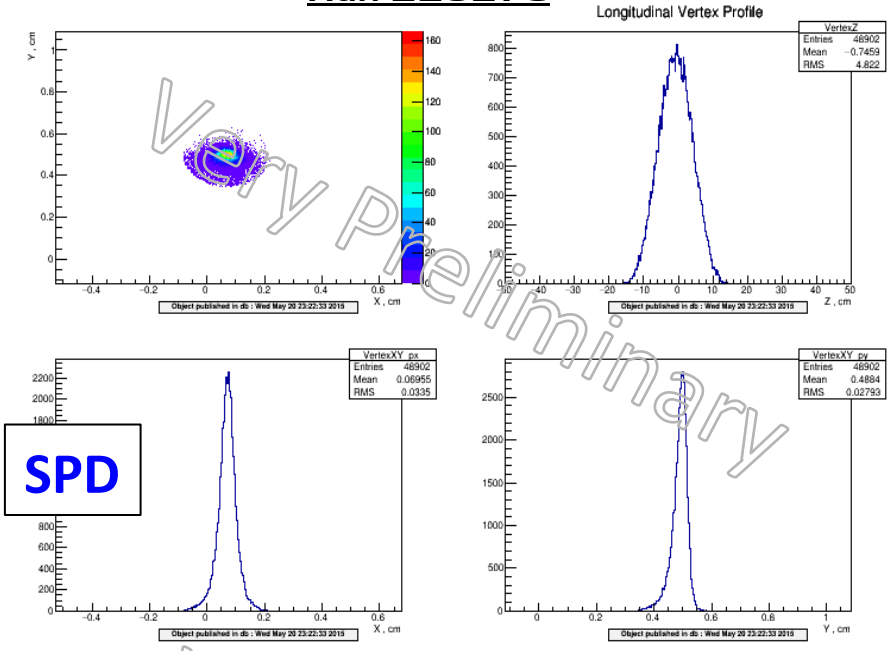
Calib	Bsy	Bck	Name	RUN	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8
	-		-	8.1M	5.6M	7.9M	-	-	-	-	-	-
-	-	-	ACO	-	-	-	-	-	-	-	-	-
21:36 PED	-	-	AD0	✓	✓	✓	-	-	-	-	-	-
-	-	-	CPV	-	-	-	-	-	-	-	-	-
-	-	-	EMC	-	-	-	-	-	-	-	-	-
-	-	-	FMD	-	-	-	-	-	-	-	-	-
20:30 CAL	-	-	HMP	-	-	-	-	-	-	-	-	-
-	-	-	MTR	-	-	-	-	-	-	-	-	-
-	-	-	MCH	-	-	-	-	-	-	-	-	-
-	-	-	PHS	-	-	-	-	-	-	-	-	-
-	-	-	PMD	-	-	-	-	-	-	-	-	-
-	-	-	SDD	-	-	-	-	-	-	-	-	-
-	-	-	SPD	✓	✓	✓	-	-	-	-	-	-
19:43 PED	-	-	SSD	✓	✓	-	-	-	-	-	-	-
-	-	-	T00	✓	✓	✓	-	-	-	-	-	-
-	-	-	TOF	-	-	-	-	-	-	-	-	-
-	-	-	TPC	-	-	-	-	-	-	-	-	-
-	-	-	TRD	-	-	-	-	-	-	-	-	-
-	-	-	TRI	✓	✓	✓	-	-	-	-	-	-
-	-	-	TST	-	-	-	-	-	-	-	-	-
-	-	-	V00	✓	✓	✓	-	-	-	-	-	-
23:17 SPE	-	-	ZDC	-	-	-	-	-	-	-	-	-

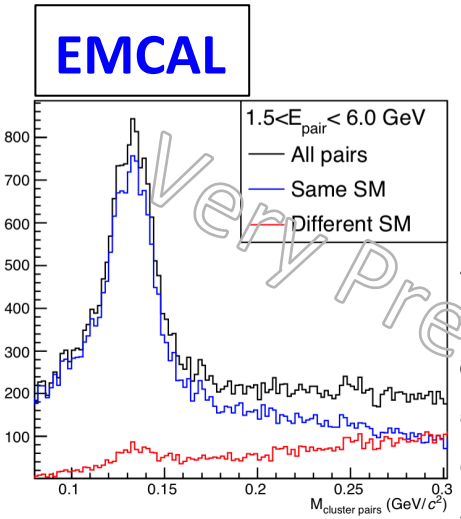


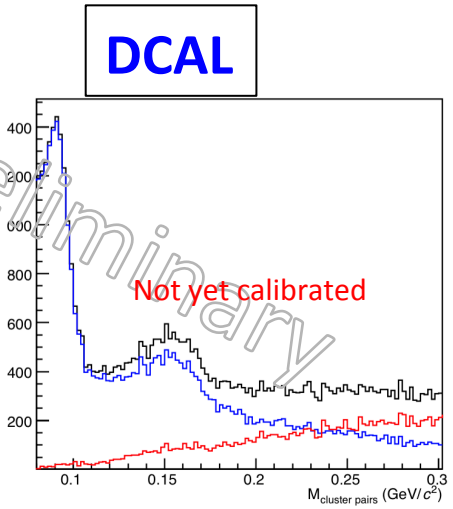


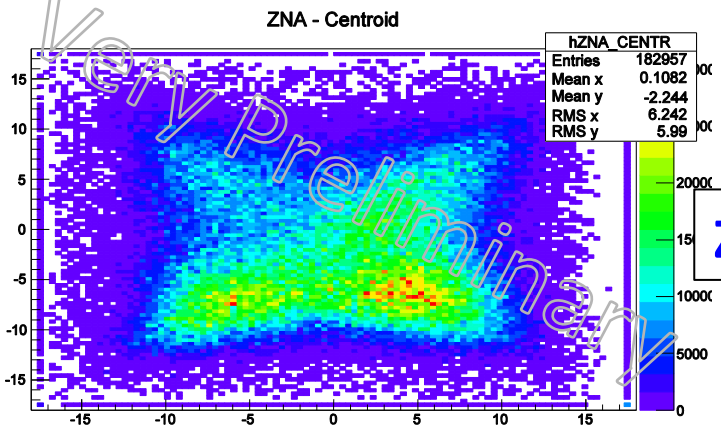
RUN2: First Data QA in pp Collisions @ 13 TeV

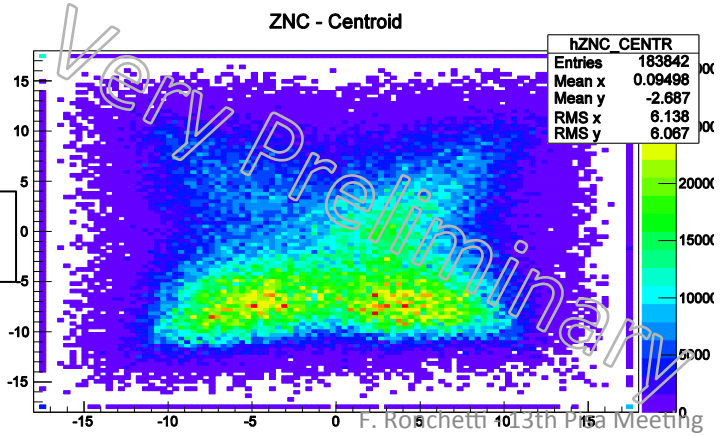
Run 223270











RUN2: Events from pp Collisions @ 13 TeV

http://home.web.cern.ch/about/updates/2015/05/first-images-collisions-13-tev

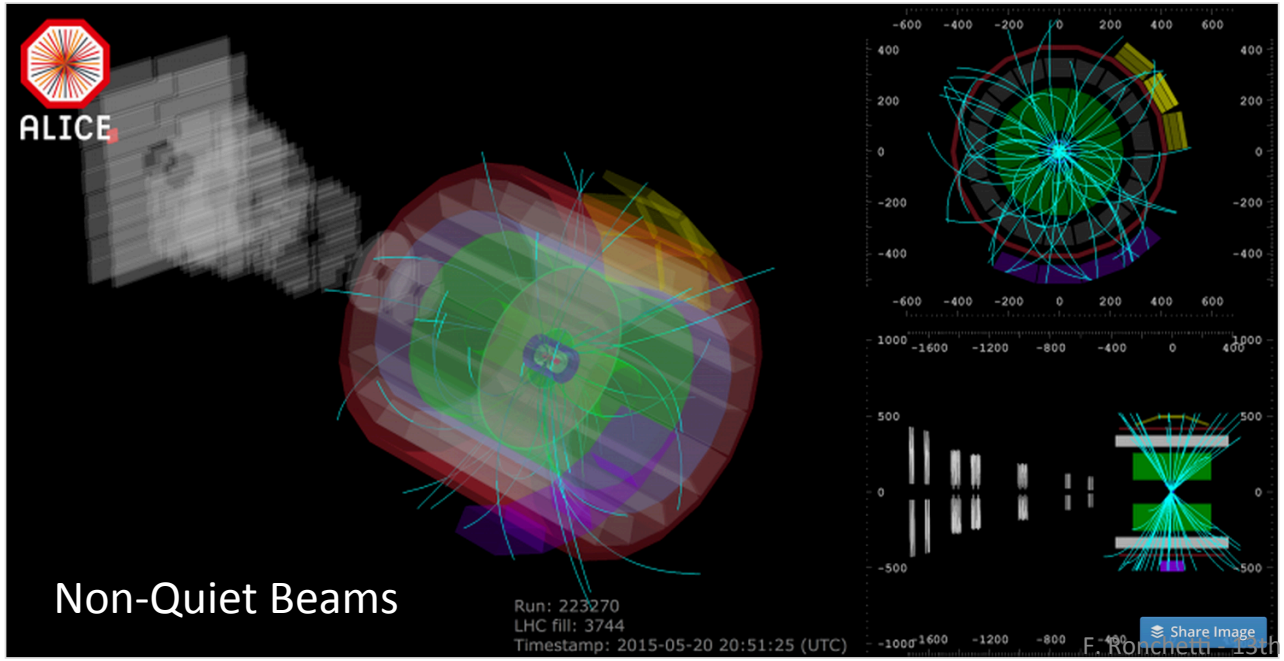
First images of collisions at 13 TeV

Last night, protons collided in the Large Hadron Collider (LHC) at the record-breaking energy of 13 TeV for the first time. These test collisions were to set up systems that protect the machine and detectors from particles that stray from the edges of the beam.

A key part of the process was the set-up of the collimators. These devices which absorb stray particles were adjusted in colliding-beam conditions. This set-up will give the accelerator team the data they need to ensure that the LHC magnets and detectors are fully protected.

Today the tests continue. Colliding beams will stay in the LHC for several hours. The LHC Operations team will continue to monitor beam quality and optimisation of the set-up.

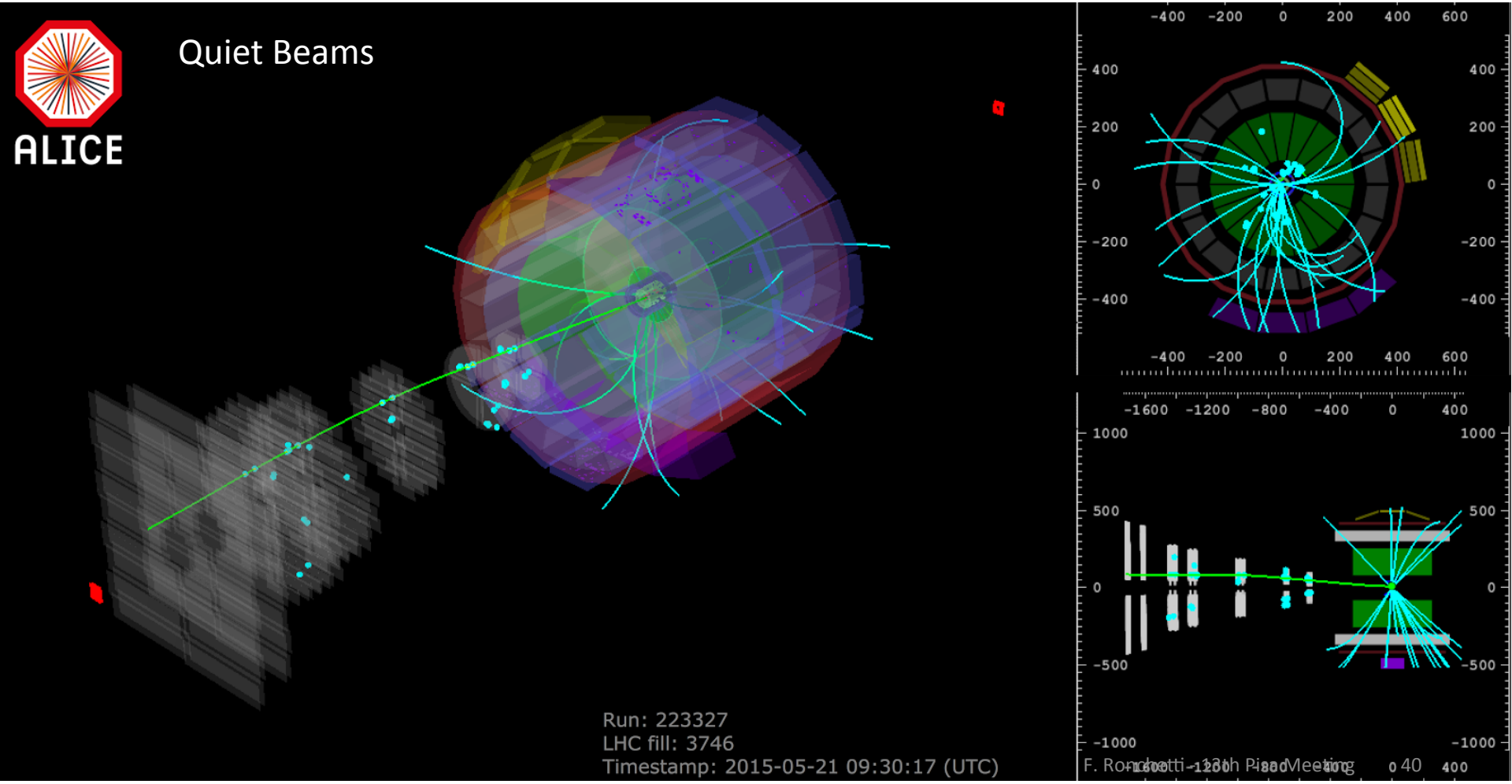
This is an important part of the process that will allow the experimental teams running the detectors ALICE, ATLAS, CMS, LHCb, LHCf, MOEDAL and TOTEM to switch on their experiments fully. Data taking and the start of the LHC's second run is planned for early June.



Protons collide at 13 TeV sending showers of particles through the ALICE detector (Image: ALICE)

RUN2: Events from pp Collisions @ 13 TeV

12 ALICE sub-detectors took data for ~ 2.5h



RUN2: Quiet pp Collisions @ 13 TeV

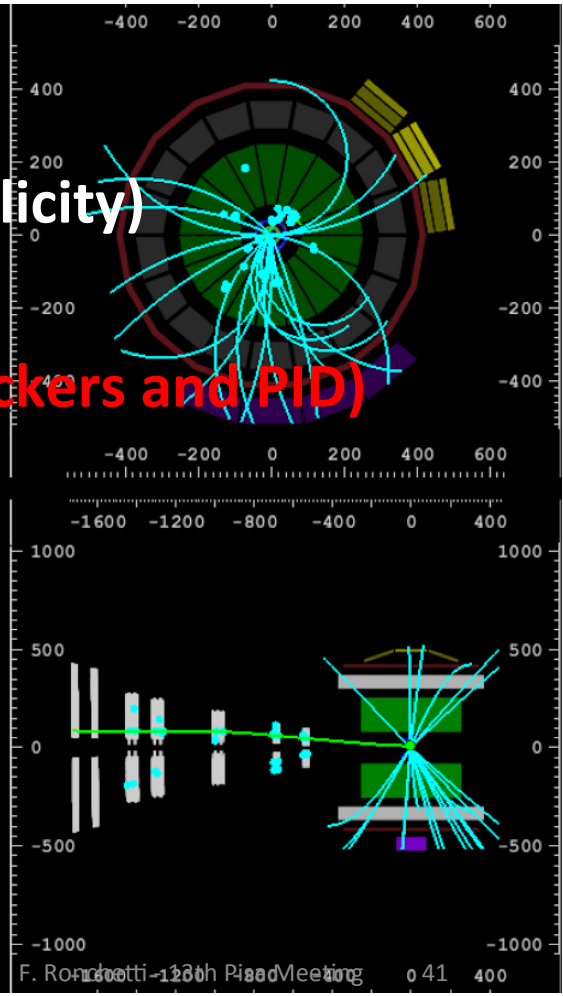
12 ALICE sub-detectors took data with pp collisions at 13 TeV

- AD, V0, T0 (lumi)
- SPD, SDD, SSD, FMD, PMD (Si and multiplicity)
- ZDC, EMCAL, DCAL, PHOS (calos)
- TOF, TPC, TRD, HMPID, CPV (gaseous trackers and PID)
- MCH, MTR (RPC trackers)

→ Central Trigger Processor with full LM functionality

Commissioning and performed for expected 13 TeV conditions

First analysis ongoing….



LHC 2015 Schedule

2015 Milestones

- **June 1>** - first collisions
- **June 8** - vdM
- **Jun 15** - TS1
- **Jun 29** - 50ns ramp-up
- **Aug 8** - 25ns ramp-up
- **Aug 24** - TS2
- **Nov 9** - TS3
- **Nov 16** - Ions

LHC Restart: pp until Technical Stop 1

Step	Filling scheme	nBC	B **	Xing urad	Duration	μ*	RO* Rate, Hz	MB* stat	Comments
Step 1	Single_3b_2_2_2	2	--	-45	20h	0.1	682	49M	with ZDC
Step 2	Single_13b_8_8_8	8	--	-45	20h	0.05	814	59M	with ZDC
Step 3	50ns_50b_38_34_36_12bpi_6inj	34	++	-195	20h	0.01	792	57M	w/o ZDC
vdM ATLAS+CMS	Multi_39b_29_2_6_4bpi13inj	2	00	-120	8h	0.33	803	23M	alignment
vdM ALICE+LHCb	Multi_40b_X_ 20_X_XXXXX, new	20	++	-195	4h				vdM
					4h	0.01	691	10M	w/o ZDC
LHCf run	Multi_39b_37_15_15_4bpi11inj	15	--	-45	24h	0.02	770	66M	with ZDC

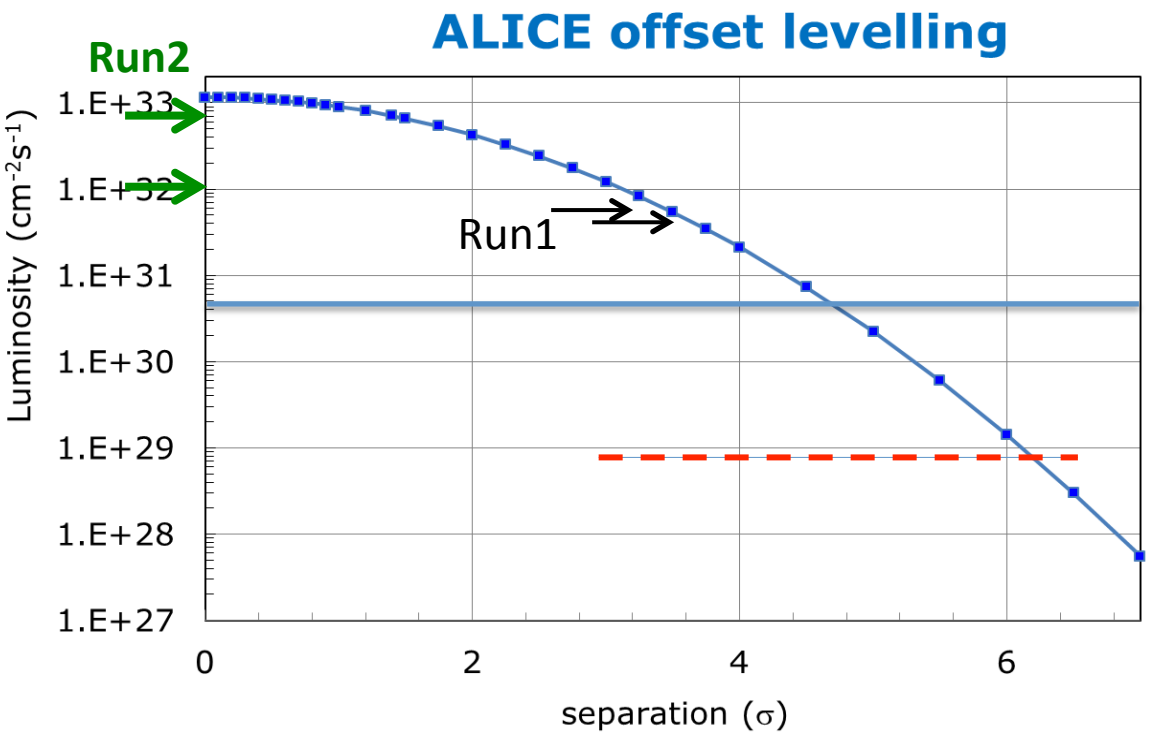
*Here rate, stat and μ values for cross section of 70 mb
** B polarity for vdM and LHCf runs to be requested/confirmed

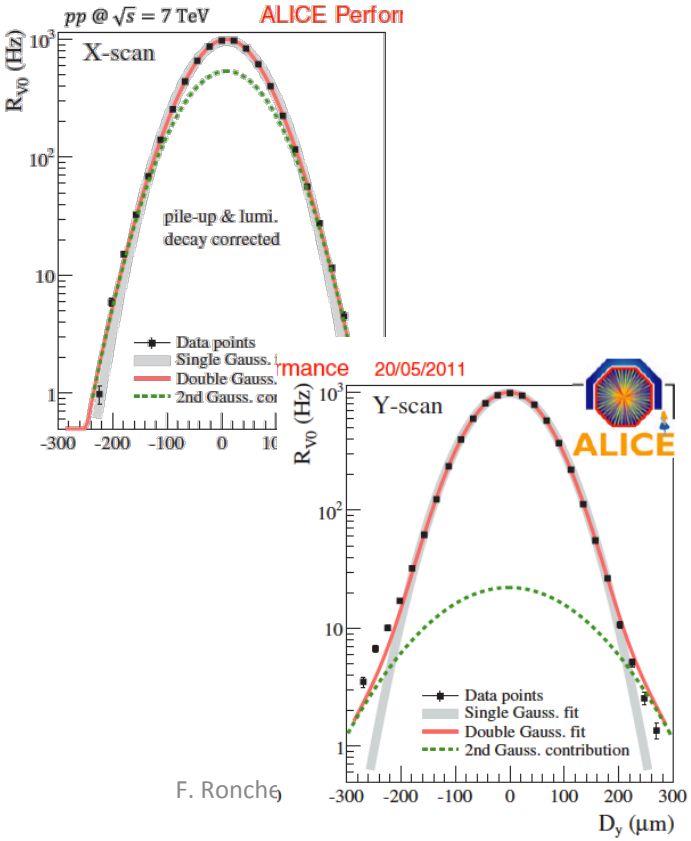
Total: 240M with field on

Year	System	E [TeV]	Lumi [$cm^{-2}s^{-1}$]	R [kHz]	Lev	Time
2015	**pp 50ns**	**13**	**$1x10^{31}$**	~600	YES	3w
	pp	**13**	**$5x10^{30}$**	~300	YES	**10w**
	PbPb	**5.02 (5.1)**	**10^{27}**	8	YES	~25d
	pp-ref	**5.02**	**$5x10^{30}$**	~300	YES	6d

RUN2: 25ns pp Operation

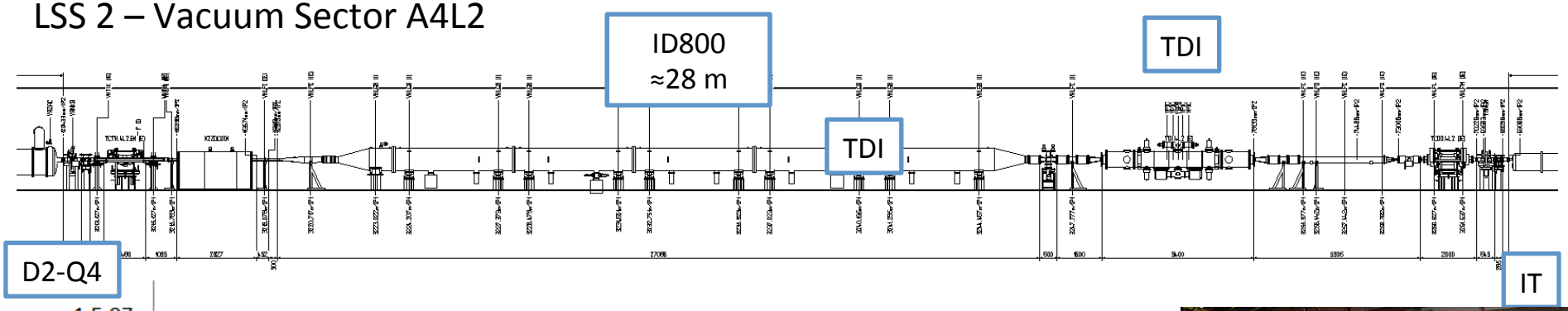
- **Luminosity in ALICE versus total separation of the 2 beams, 6.5 TeV.**
  - **Parameters: N=1.2×10^{11} p, ε = 2 μm, β* = 10 m ⇒ σ = 54 μm**
  - **Increased dump thresholds**
  - **Redundancy between ALICE BCM and LHC Beam Loss Monitors**

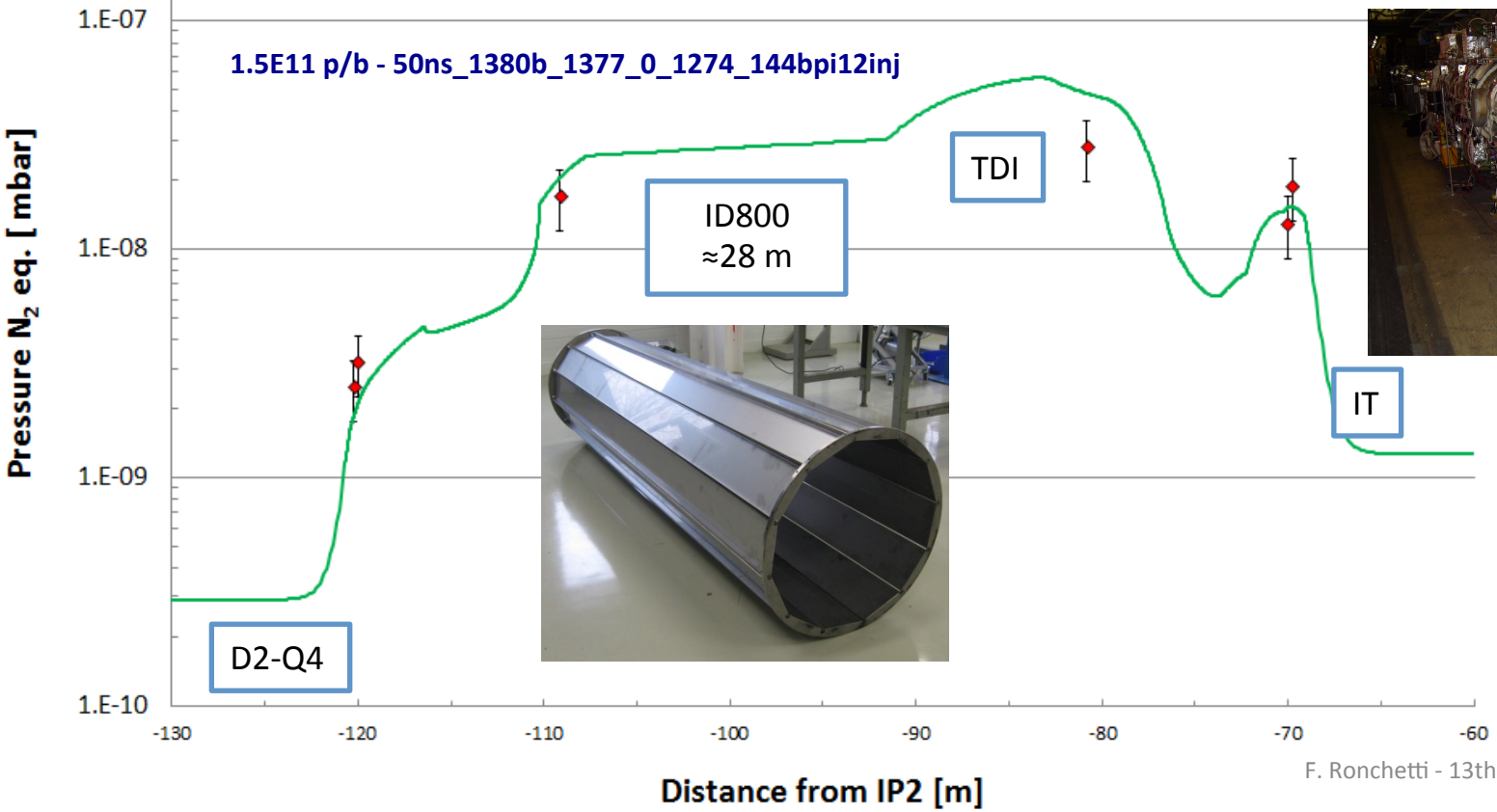


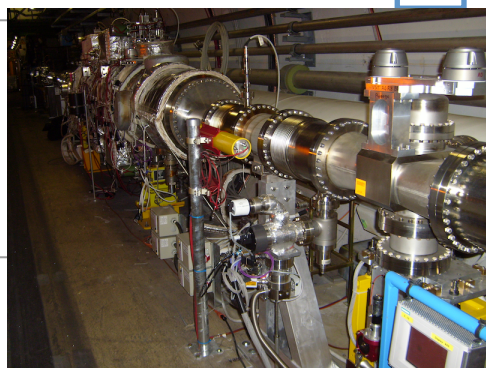


Vacuum Consolidation in 25 ns pp Operation

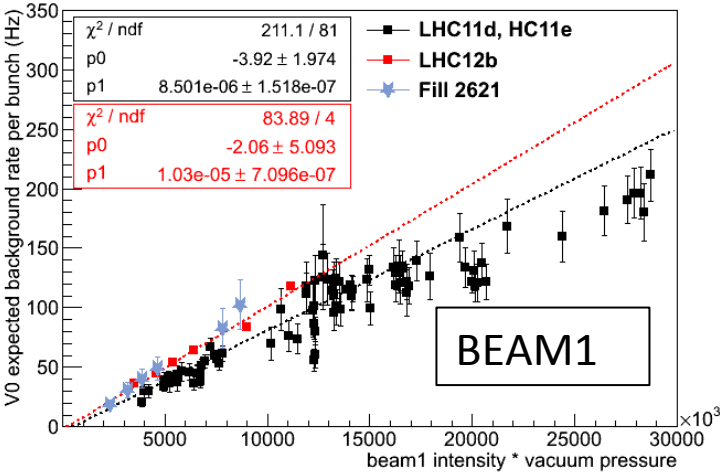
LSS 2 – Vacuum Sector A4L2

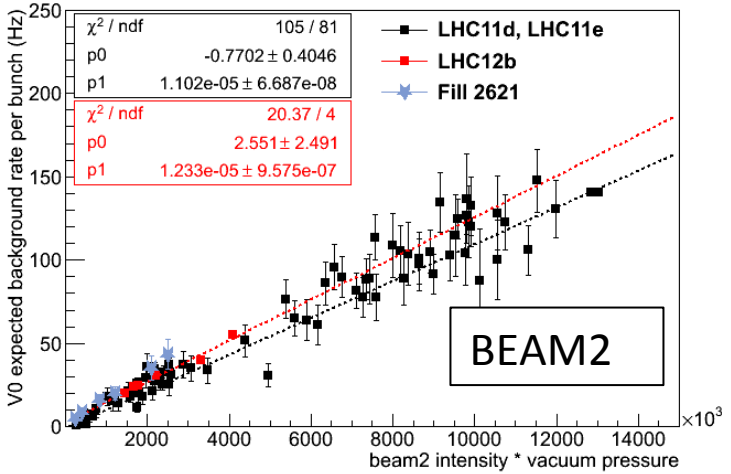






Vacuum Consolidation in 25 ns pp Operation





2015 TDI Consolidation

- Existing 4 Ti sputter ion pumps 400 l/s for N_2 complemented with 2 NEG cartridges 1000 l/s for H_2
- Sectorization
- Longer bake out
- Ti coating of the BN blocks of the collimator jaws

Year	Beam Intensity [p]	Total P in LSS2-L [mbar]	V0 bkgd rate/bunch [Hz]	Total P in LSS2-L [mbar]	V0 bkgd rate/ bunch [Hz]
2011	1.9×10^{14}	1×10^{-7}	157	5×10^{-9}	7
2012	2.3×10^{14}	1×10^{-7}	234	5×10^{-9}	11
2015	3.2×10^{14}	1×10^{-7}	532	5×10^{-9}	26
HL-LHC	5.6×10^{14}	1×10^{-7}	1005	5×10^{-9}	50

HI 2015: Luminosity Scenarios

From John Jowett

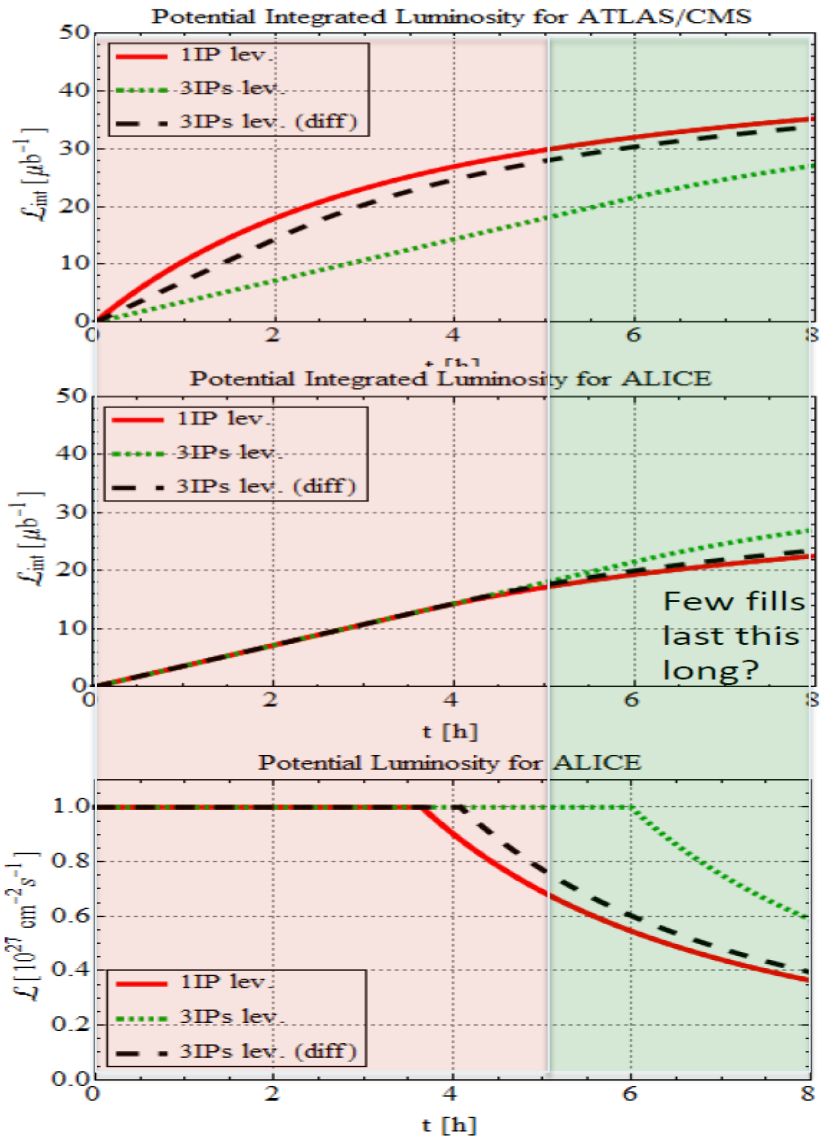
- **ALICE will run with luminosity leveling in IP2 at 1E27 Hz/cm^2**
- **Optimization of the integrated lumi in case of collisions in 3 IPs requires evaluation**
  - **turn-around time for refilling: 3h**
  - **Huebner factor: 50%**

ALICE supports the scenario were:

- **3 IP are differentially leveled**

May be needed for technical reasons
lumi induced dumps in IR1/5

- **Average fill duration of 5h.**
- **ALICE can then integrate 0.54 or 0.56 nb^{-1}**



Summary

Installation

- ALICE detector completed during LS1 (TRD, DCAL/PHOS, CPV,AD)

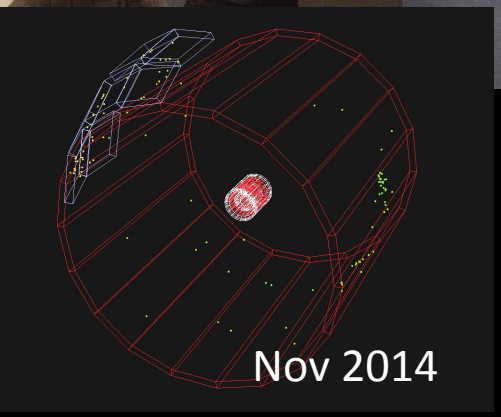
Integration

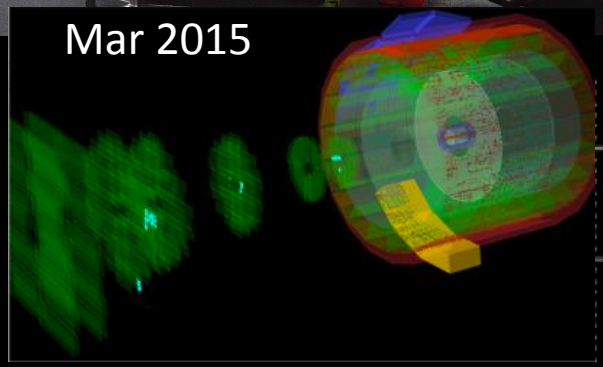
- All ALICE subsystems are integrated in the global DAQ
- Central Trigger system upgraded and validated
- Calorimeter trigger FW being finalized
- HLT integration almost done
- RCU2 validation ongoing

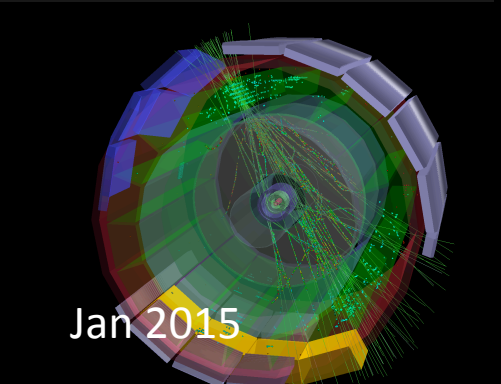
Readiness

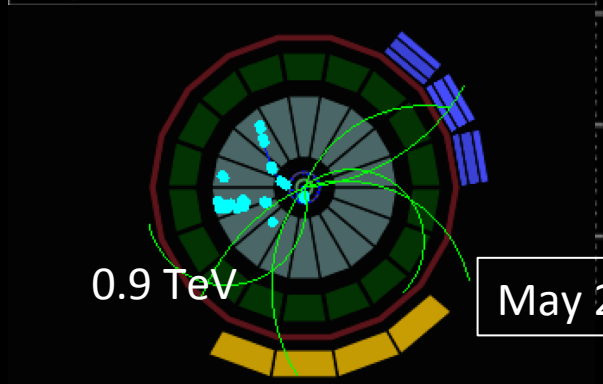
- In cosmic running since January 2015
- LHC injection tests in Nov 2015 and March 2015 successfully used to check basic functionalities
- Low energy pp collisions used to clear first commissioning of the ALICE luminometers and trigger detectors.
- 13 TeV pp collisions data being analyzed for detector fine tuning and first physics
- Ready to take STABLE BEAMS with all detectors

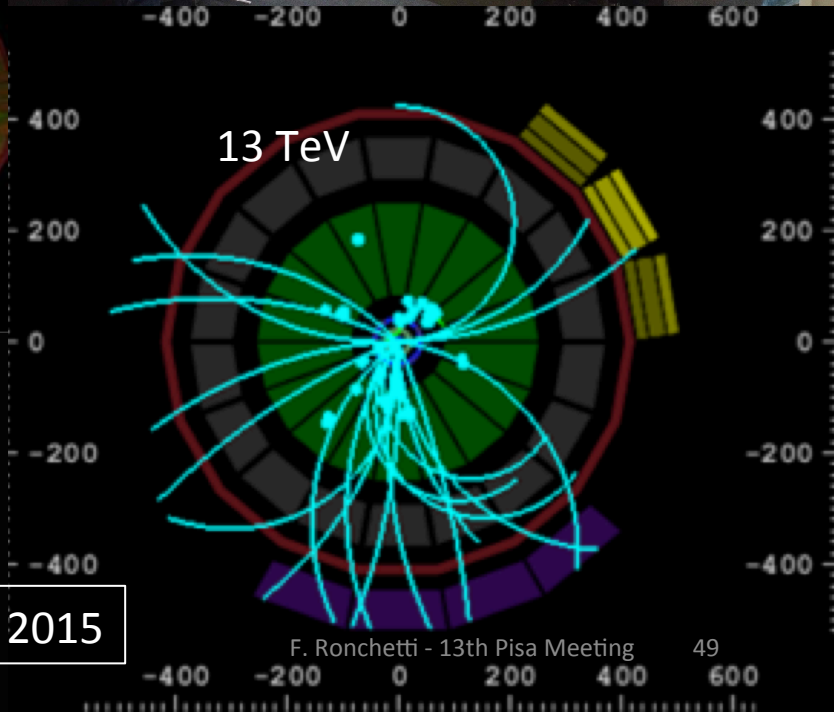
ALICE: A Large Ion Collider Experiment









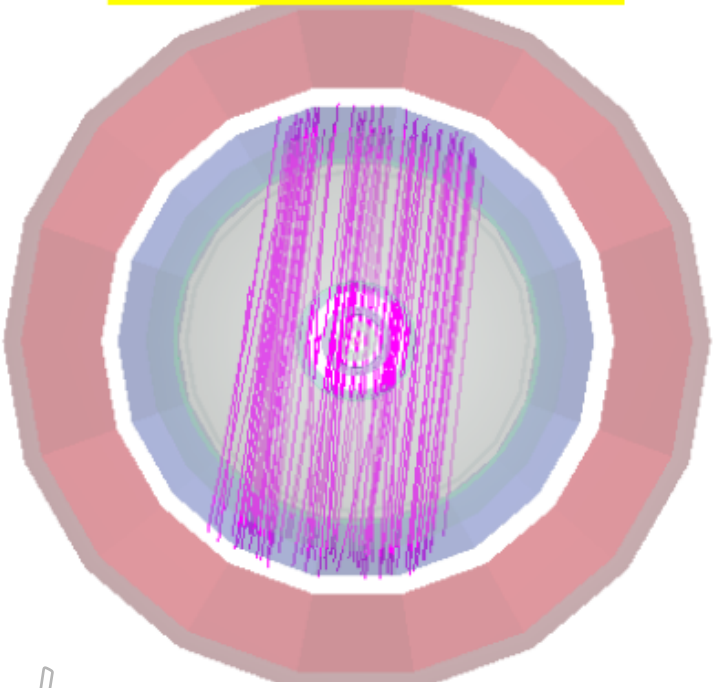


May 2015

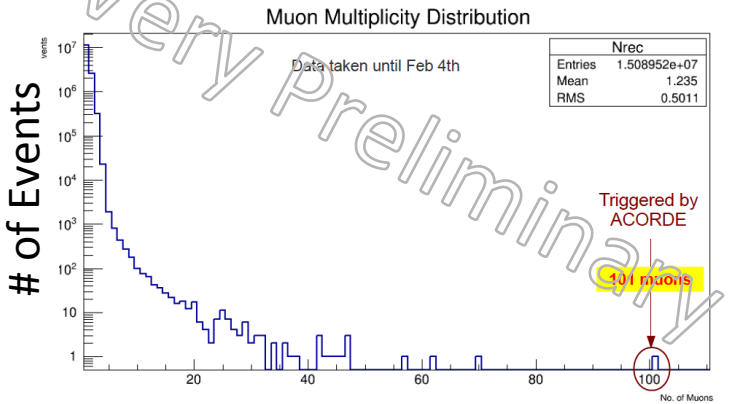
Backup

RUN2: Cosmics Data Analysis

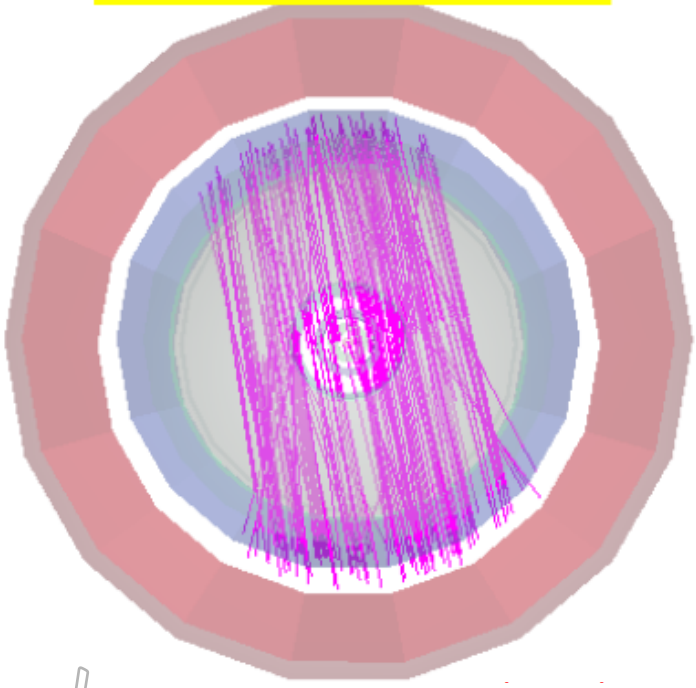
101 muons (B = *ON*)



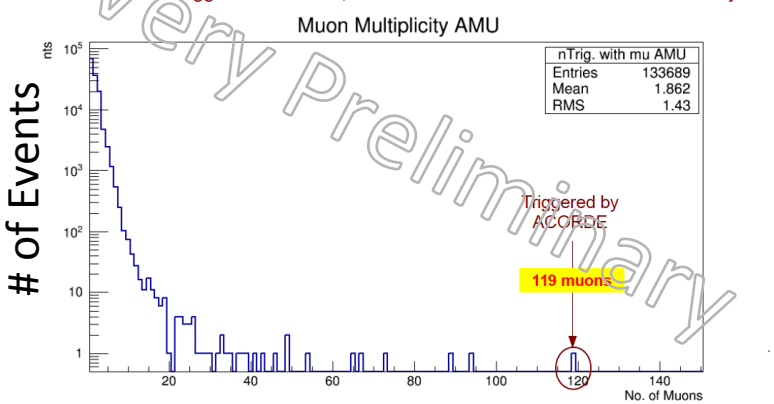
B = *ON* Trigger: TOF – OB3, ACORDE – 2 fold Effective Time: 4.78 days



119 muons (B = *OFF*)



B = *OFF* Trigger: TOF – OB3, ACORDE – 2 fold Effective Time: 6.58 days



Very Preliminary

ALICE's RUN2 View

Year	System	E [TeV]	Lumi [$cm^{-2}s^{-1}$]	R [kHz]	Lev	Time
2015	**pp 50ns**	**13**	**$1x10^{31}$**	~600	YES	3w
	pp	**13**	**$5x10^{30}$**	~300	YES	**10w**
	PbPb	**5.02 (5.1)**	**10^{27}**	8	YES	~25d
	pp-ref	**5.02**	**$5x10^{30}$**	~300	YES	6d
2016	**pp**	**13/14**	**$5x10^{30}$**	~300	YES	22w
	pPb	**5.02**	**10^{29}**	~200	YES	4w
	pp-ref	**5.02**	**$5x10^{30}$**	~300	YES	7d
2017	**pp**	**13/14**	**$5x10^{30}$**	~300	YES	22w
2018	**pp**	**13/14**	**$5x10^{30}$**	~300	YES	6w
	PbPb	**5.02 (5.1)**	**10^{27}**	8	YES	4w
	pp-ref	**5.02**	**$5x10^{30}$**	~300	YES	7d
	LS2 (1/7/18→ 18 months)					

σ(sqrt(s)=5 TeV) ~ 50 mb
σ(sqrt(s)=13 TeV) ~ 60 mb

σhad(PbPb, $\sqrt{s}$=5 ATeV) ~ 8 barn
σhad(pPb, $\sqrt{s}$=5 ATeV) ~ 2 barn