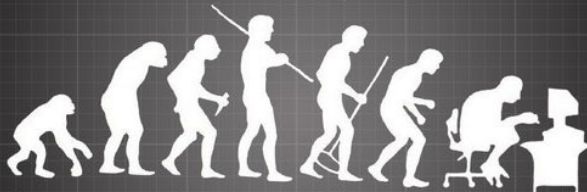


# 21st International Conference on Computing in High Energy and Nuclear Physics - CHEP

April 13 - 17, 2015, Okinawa, Japan



the evolution of ~~man~~ geek  
ATLAS conditions data and its  
management for LHC Run-2

Michael Böhler (Albert-Ludwigs-Universität Freiburg),  
Misha Borodin (Moscow State Engineering Physics Institute),  
Andrea Formica (CEA/IRFU, Centre d'étude de Saclay Gif-sur-Yvette),  
Elizabeth Gallas (University of Oxford),  
Voica Radescu (Deutsches Elektronen-Synchrotron)

on behalf of the ATLAS Collaboration

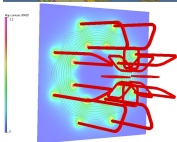
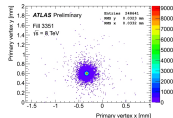
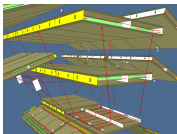


# ATLAS Detector Conditions

- ▶ 'Conditions' data encompass a wide variety of information
  - ▶ characterize the state of all ATLAS subsystems during specific intervals
  - ▶ is not generally stored event-wise but during an interval of validity
  - ▶ essential for data taking and/or event processing

- ▶ examples for conditions data

- ▶ alignment
- ▶ beam position
- ▶ b-field
- ▶ cabling
- ▶ calibration
- ▶ corrections
- ▶ channel offset
- ▶ detector status
- ▶ noise
- ▶ pulseshapes
- ▶ timing ...



- ▶ ATLAS conditions are grouped by logical or physical subsystem:

- ▶ **Calorimeter:** CALO, LAR, TILE
- ▶ **Muon:** MUONALIGN, MDT, CSC, TGC, RPC
- ▶ **Tracking:** TRT, INDET, SCT, PIXEL
- ▶ **Other:** TRIGGER, FWD, GLOBAL, TDAQ, DCS



## Conditions Concepts: Evolution for Run 2

The ATLAS Conditions Database is based on LCG Conditions DB infrastructure

- ▶ With Run 1 experience, we've exploited its features and enhanced it with customized ATLAS tools for conditions entry, manipulation, collection, verification

Separate Conditions DB '[Instances](#)' are used for distinct purposes:

- ▶ Online data taking and Offline processing/analysis split by data period:
  - ▶ Run 1 Conditions "COMP200"
  - ▶ Run 2 Conditions "CONDBR2"
- ▶ Monte Carlo Simulation Conditions "OFLP200"

Conditions during an interval of validity (IOV) may be:

- ▶ constant (eg: configuration) – immutable values
- ▶ versioned (eg: calibration) – improved sets of values determined over time
  - ▶ each version is assigned a '[tag](#)' (tag identification string)

Distinct sets of tags are collected into '[global tags](#)':

- ▶ We form '[Best Knowledge](#)' (BK) global tags for specific purposes
- ▶ These BK tags: used to collect or process data using those selected conditions
- ▶ This model gives experts a well ordered model for tag management, provides a standardization over time, and ensures the reproducibility of data processing

Additionally, a running experiment demands dynamic conditions collection

- ▶ Conditions for new IOVs must be added continuously, but allow for BK evolution
  - ▶ Introduce: concept of '[Current](#)' (production) and '[Next](#)' (development) tags



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## Workflow of global Tag coordination

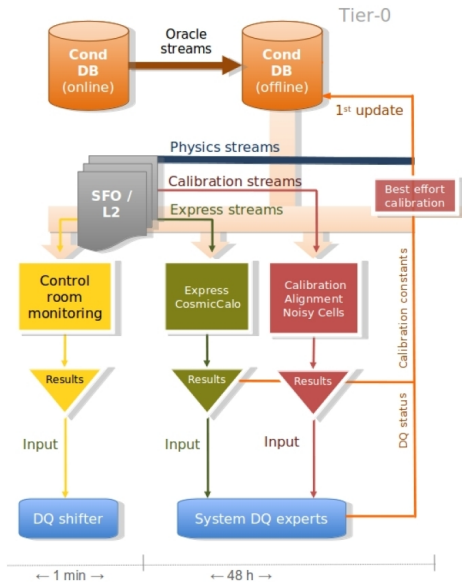


- ▶ JIRA Project ATLAS Conditions Database: [ATCONDDDB](#)
- ▶ [CoolTagBrowser](#) / [COMA web browser](#)
- ▶ internal twiki documentation for users:
  - ▶ AtICoolTag tool - python script which contains global tag operations
  - ▶ ATHENA test recipes - for technical validation
  - ▶ Summary of all available global conditions tags

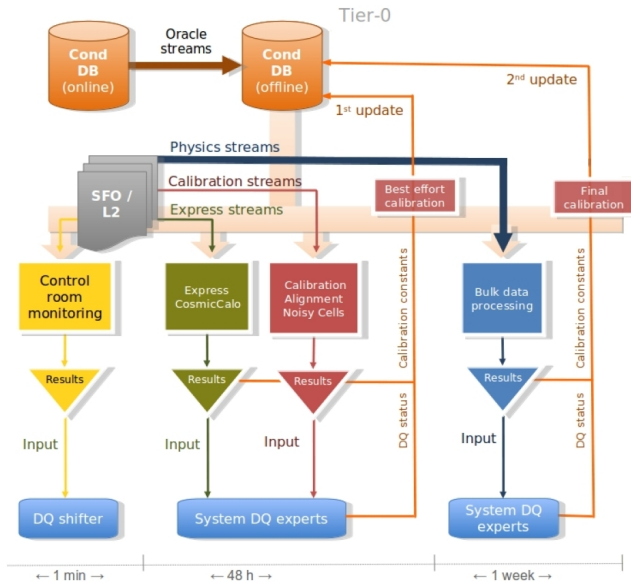




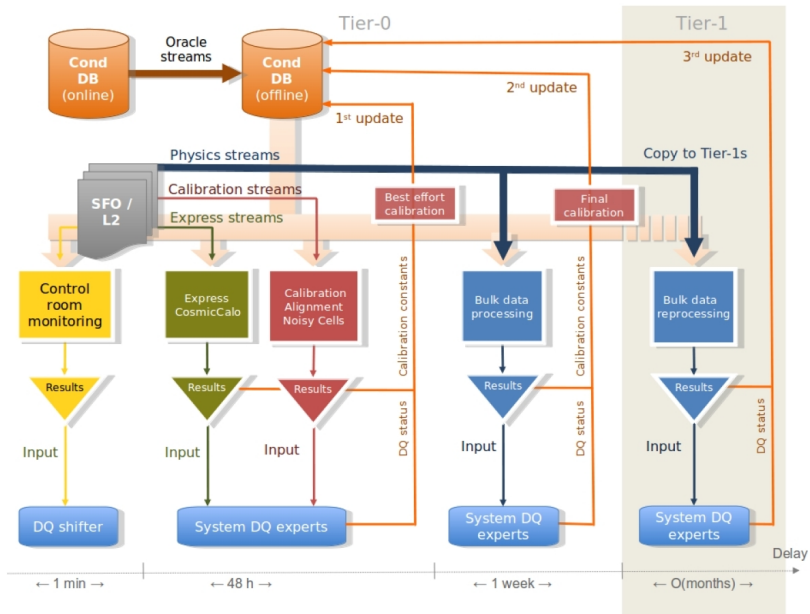
# ATLAS Data Quality Operation Scheme



## ATLAS Data Quality Operation Scheme

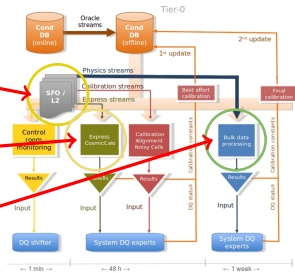
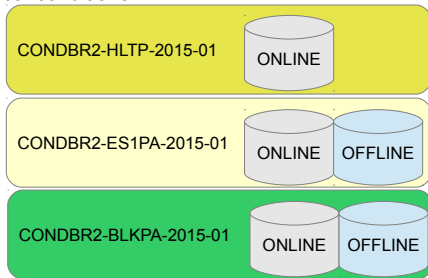


## ATLAS Data Quality Operation Scheme



## Global Tag Overview Data - DB access

## Data global conditions



- ▶ HLT global tag used for high-level trigger ONLINE at P1, **must** be completely decoupled from OFFLINE DB (maximum availability)
- ▶ other data global tags include OFFLINE information e.g. beam position



## New conditions DB for run-2

### Motivation:

- ▶ Run-1 DB:
  - ▶ big folders size
  - ▶ mixing in online/offline folders
  - ▶ big amount of obsolete conditions
  - ▶ long term maintenance difficult
  - ▶ hard to understand the DB structure for incoming experts
- ▶ new DB for Run-2
  - ▶ gives experts possibility for fresh start in Run-2
  - ▶ benefits from knowledge gained during Run-1

### Setup:

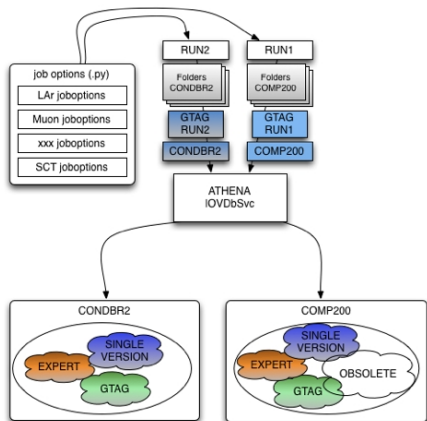
- ▶ Run-1
  - ▶ use COMP200 for conditions updates
- ▶ Run-2
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- ▶ No change in schema names
- ▶ Software release
  - ▶ have to read both instances
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## Global Conditions Tags for Data in 2015

2015

Jan

Feb

Mar

Apr

May

June

July

Aug

Sep

Oct

Nov

Dec

## Key milestones in 2015:

- ▶ **April:** first beam
- ▶ **DR1:** Aiming for minbias tuning, just after ID alignment available
- ▶ **June:** 50 ns data up to  $9 \cdot 10^{33}$ ,  $\langle \mu \rangle \approx 40$  (and up to  $1 \text{ fb}^{-1}$ )
- ▶ **DR2:** Reprocessing of 50ns data for summer conferences
- ▶ **July:** start of 25 ns collisions
- ▶ **DR3:** Reprocessing of the data with new release (???)
  - ▶ Need to be decided in July 2015
- ▶ **End of the year:** Switchover from pp to HI program
- ▶ **DR4:** Final Reprocessing of 2015 data with final conditions and new release

## Legend:

- ▶ **blue:** data taking
- ▶ **green:** data reprocessing campaign



## Global Tag Overview MC - DB access

## MC global conditions

OFLCOND-RUN12-SDR-22

OFFLINE

- ▶ **only one** main multi-purpose global conditions tag for MC
- ▶ additional test global conditions tags (e.g. for upgrade studies)
- ▶ **must not** access ONLINE DB
  - guarantee DB availability for critical online applications during data-taking
    - ▶ this was not the case during run-1: several MC conditions had ONLINE access
    - ▶ by removing all dependencies from the ONLINE DB
      - (re)-introduced security layer as defined in the original design

## 1. copy ONLINE conditions to OFFLINE

OFLCOND-RUN12-SDR-07

System	SubSystem	Folder Tag Count	COOLOFL Count	COOLONL Count
Calorimeter	CALO	114	54	60
"	LAR	21	21	0
"	TILE	27	27	0
Muon	CSC	8	8	0
"	MDT	9	7	2
"	MUONALIGN	5	5	0
"	RPC	5	5	0

OFLCOND-RUN12-SDR-08

System	SubSystem	Folder Tag Count	COOLOFL Count
Calorimeter	CALO	54	54
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Now:  
no online folders in  
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## 2. removed 62 ONL folders from ONLINE → software adjustments needed





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## MC global conditions tags - IOV dependent

2009		2010				2011			
0.9 TeV	2 TeV	7 TeV	0.9 TeV	7 TeV	HI	7 TeV	2.76 TeV	7 TeV	HI
(0,142308)	(142308, 152166)	(152166, 154465)	(154465, 154813)	(154813, 168665)	(168665, 177531)	(177531, 178163)	(178163, 178264)	(178264, 193211)	(193211, 195847)

2012					
8 TeV	HIP z=0	HIP z=+50	8 TeV	8 TeV 25ns	8 TeV
(195847, 210184)	(210184, 210185)	(210185, 210187)	(210187, 216399)	(216399, 216432)	(216432, 217946)

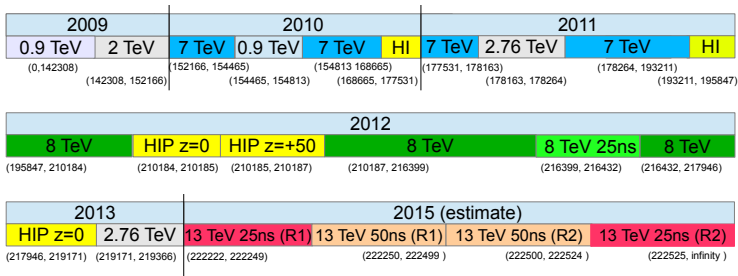
  

2013	
HIP z=0	2.76 TeV
(217946, 219171)	(219171, 219366)

- ▶ IOV dependent MC conditions allow to use **one global conditions tag**
  - ▶ for all periods with rather different conditions
  - ▶ IOV ranges are defined according to IOV ranges measured in data
- ▶ run numbers for 2015 are predefined in order to provide MC conditions for run-2 in advance:
  - ▶ run number chosen for MC production determine: bunch spacing & ATLAS geometry
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(195847,

## ▶ IOV Monitoring implemented in new Cool Tag Browser:



(217946,

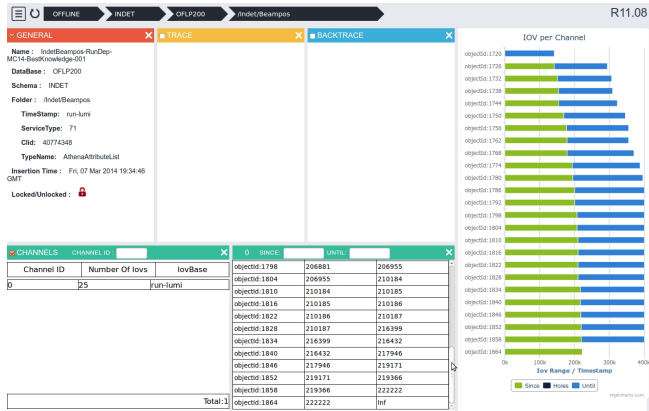
## ▶ IOV



## ▶ run in a



## ▶ late cor



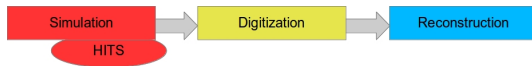
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ry



## Global Conditions Tags for Monte-Carlo in 2015

2015
Jan
Feb
Mar
Apr
May
June
July
Aug
Sep
Oct
Nov
Dec



## Key milestones in 2015:

- ▶ **MC15 HITS:** same HITS could be used in principle during the whole 2015
- ▶ **MC15a:** initial data ramp-up and preparation of early analysis
- ▶ **MC15b:** analysis of 50+25ns data for summer conferences
- ▶ **MC15c:** most likely needed if new HITS production is needed (???)
  - ▶ can collect improvements in:
    - ▶ conditions
    - ▶ digitization
    - ▶ new software release
    - ▶ trigger simulation & menu
  - ▶ Need to be decided by June 2015
- ▶ **MC15d:** with final conditions and pileup at the end of the data taking



## Summary and Outlook

### Summary:

- ▶ **detector conditions needed both for data reconstruction and MC production**
- ▶ 3 different global conditions tags need to be maintained - for data
- ▶ IOV dependent MC global conditions tag allow one single tag for different environments

### Outlook:

- ▶ many tasks ahead for 2015
- ▶ data
  - ▶ data with 25 & 50 ns bunchspacing
- ▶ MC
  - ▶ one campaign before data taking
  - ▶ at least one afterwards

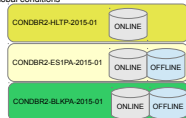


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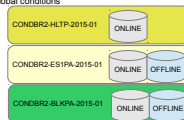


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(S12239)	(12239, 12739)	(2139, 2639)	(2639, 2839)	(2839, 2939)	(2939, 3139)	(3139, 3239)	(3239, 3339)	(3339, 3439)	(3439, 3539)
2012									
8 TeV	HIP z=0	HIP z=+50	8 TeV	8 TeV	25ns	8 TeV	25ns	8 TeV	25ns
(3639, 3739)	(3739, 3839)	(3839, 3939)	(3939, 4039)	(4039, 4139)	(4139, 4239)	(4239, 4339)	(4339, 4439)	(4439, 4539)	(4539, 4639)
2013					2015 (estimate)				
HIP z=0	2.76 TeV	13 TeV	25ns (R1)	13 TeV	50ns (R1)	13 TeV	50ns (R2)	13 TeV	25ns (R2)
(4739, 4839)	(4839, 4939)	(4939, 5039)	(5039, 5139)	(5139, 5239)	(5239, 5339)	(5339, 5439)	(5439, 5539)	(5539, 5639)	(5639, 5739)

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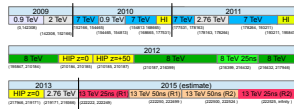
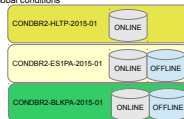


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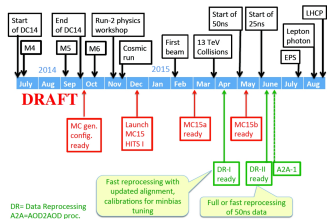
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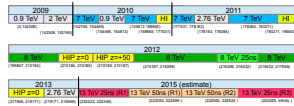
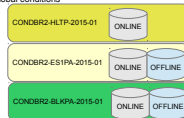


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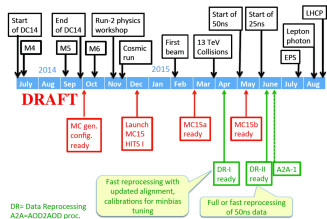
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  - ▶ at least one afterwards



# Thanks for your attention!



## Backup



## Schema classification

- ▶ all conditions data folders have been classified in the following categories:
  - ▶ allRuns
  - ▶ run-1 only
  - ▶ obsolete
- ▶ according to this classification, folders have been copied/not copied to the new conditions DB (CONDBR2)
- ▶ COMA Browser shows the corresponding tags and classification

Global Tag **COMCOND-BLKPA-RUN1-06** includes 266 Folder Tags meeting input criteria.  
 A summary of folder tag count per subsystem is shown here.  
 Use links here to jump down this page to the folder tag detail.

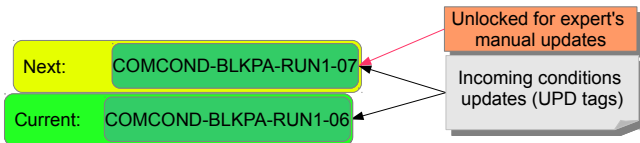
System	SubSystem	Folder Tag Count	COOLOFL Count	COOLONL Count
Calorimeter	<a href="#">CALO</a>	79	4	75
*	<a href="#">LAB</a>	28	17	11
*	<a href="#">TILE</a>	53	27	26
Muon	<a href="#">CSC</a>	20	8	12
*	<a href="#">MDT</a>	9	5	4
*	<a href="#">MUONALIGN</a>	5	5	0
*	<a href="#">RPC</a>	5	1	4
*	<a href="#">TGC</a>	1	0	1
Other	<a href="#">FWD</a>	1	1	0
*	<a href="#">GLOBAL</a>	17	14	3
*	<a href="#">TRIGGER</a>	1	1	0
Tracking	<a href="#">INDET</a>	4	4	0
*	<a href="#">PIXEL</a>	10	10	0
*	<a href="#">SCT</a>	3	1	2
*	<a href="#">TRT</a>	10	15	15

### CALO

Cool Schema	Folder	General, GlobalTag Class	Folder Tag	Lock Stat	Rows	Created / Last Insert
COOLOFL_CALOj COMP200	<a href="#">/CALO/Off/HadCalibration2/CaloJetEnergyScale</a>	Run1Only Run1BKGT	<a href="#">CaloOffHadJESCorr2-GE016-QGSP-BERT</a>	1	1	10Dec16_16:28
*	<a href="#">/CALO/Off/Noise/CellNoise</a>	Run1 Only	<a href="#">CaloOffNoiseCellnoise-UPD4-09</a>	1	7	14Jan23_19:56
*	<a href="#">/CALO/Off/Noise/PileUpNoiseLumi</a>	AllRuns	<a href="#">CALOOffNoisePileUpNoiseLumi-LUPD4-02</a>	1	24	13Mar22_12:38



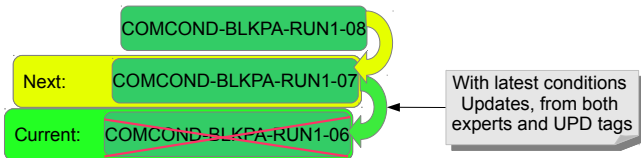
## Current and Next - Mechanism



- ▶ both current and next global tag (data) receive automatic conditions updates
- ▶ for experts: current tag is locked; only next tag can be opened for manual updates
- ▶ thus both manual and automated go into the next global tag
- ▶ when production moves to a new global tag:
  - ▶ next → current
  - ▶ and a new next will be created
- ▶ this mechanism is (will be) handled by [AMI interface](#) :



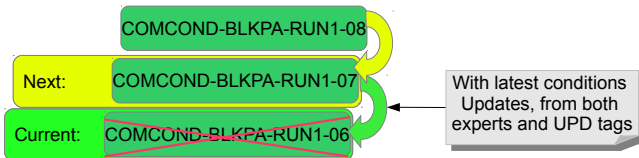
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ami Solveig Albrand et al.

## new AMI interface for CURRENT / NEXT changes

Tools: [COMA Global Tags](#)

- Campaigns
- COMA Periods
- COMA Global Tags
- Event Count Comparator
- Dataset Number Breaker
- Databases
- Monitoring
- AMI command line

**TEST VERSION**

See GlobalTag States

History of Current,Next Global Tags	History of CurrentES,NextES Global Tags	History of CurrentHLT,NextHLT Global Tags
Current COMCOND-BLKP-005-05	CurrentES COMCOND-ES1PA-005-05	CurrentHLT COMCOND-HLTP-004-03
Next <input type="text"/>	NextES <input type="text"/>	NextHLT <input type="text"/>
Next to Current <input type="button" value="Next to Current"/>	NextES to CurrentES <input type="button" value="NextES to CurrentES"/>	NextHLT to CurrentHLT <input type="button" value="NextHLT to CurrentHLT"/>
<input type="button" value="Replace Next"/>	<input type="button" value="Replace NextES"/>	<input type="button" value="Replace NextHLT"/>





## Towards Run-2 changes in MC global Tags - IOV Ranges check for holes/data

- ▶ check IOV dependent data via *At/CoolConsole.py*

Using tag selection: IndetBeampos-ES1-UPD2-08

```
[0,0] - [141749,0] (0) [status (Int32) : 0], [posX (Float) : 0], [posY (Float) : 0], [posZ (Float) : 0],
[sigmaX (Float) : 30], [sigmaY (Float) : 30], [sigmaZ (Float) : 500],
[tiltX (Float) : 0], [tiltY (Float) : 0], [sigmaXY (Float) : 0],
[posXErr (Float) : 0], [posYErr (Float) : 0], [posZErr (Float) : 0],
[sigmaXErr (Float) : 0], [sigmaYErr (Float) : 0], [sigmaZErr (Float) : 0],
[tiltXErr (Float) : 0], [tiltYErr (Float) : 0], [sigmaXYErr (Float) : 0]

[141749,0] - [141749,11] (0) [status (Int32) : 83], [posX (Float) : -0.22424], [posY (Float) : 1.04335], [posZ (Float) : -35.2592],
[sigmaX (Float) : 30], [sigmaY (Float) : 30], [sigmaZ (Float) : 500],
[tiltX (Float) : 0.000521409], [tiltY (Float) : 0.00019282], [sigmaXY (Float) : 0],
[posXErr (Float) : 0], [posYErr (Float) : 0], [posZErr (Float) : 0],
[sigmaXErr (Float) : 0], [sigmaYErr (Float) : 0], [sigmaZErr (Float) : 0],
[tiltXErr (Float) : 0], [tiltYErr (Float) : 0], [sigmaXYErr (Float) : 0]
```

...

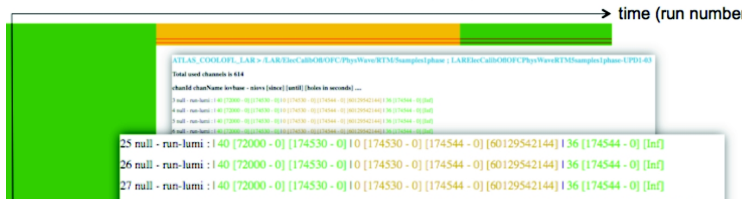
- ▶ IOV-Tool from Andrea e.g.:  
[http://voatl135.cern.ch:8080/JBRestCool/rest/cooltag/ATLAS.COOLFL\\_MUONALIGN/COMP200/COMCOND-BLKPA-RUN1-02/svg/summary](http://voatl135.cern.ch:8080/JBRestCool/rest/cooltag/ATLAS.COOLFL_MUONALIGN/COMP200/COMCOND-BLKPA-RUN1-02/svg/summary)

## IOV coverage, example 1: LAr

Andrea Formica

ATLAS\_COOLFL\_LAR > /LAR/ElecCalibOf/OFC/PhysWave/RTM/5samples1phase ; LARElecCalibOf/OFC/PhysWave/RTM/5samples1phase-UPD1-03

Number of channels used 614 | Info in ichan 0: niows=76 from 309237645312000 / 749600642170880 to 7496660771713024 / 9223372036854775807



## Towards Run-2 changes in MC global Tags - IOV Ranges check for holes/data

► check IOV dependent data via *At/CoolConsole.py*

Using tag selection: IndetBeamos-ES1-UPD2-08

```
[0,0] - [141749,0] (0) [status (Int32) : 0], [posX (Float) : 0], [posY (Float) : 0], [posZ (Float) : 0],
[sigmaX (Float) : 30], [sigmaY (Float) : 30], [sigmaZ (Float) : 500],
[tiltX (Float) : 0], [tiltY (Float) : 0], [sigmaXY (Float) : 0],
[posXErr (Float) : 0], [posYErr (Float) : 0], [posZErr (Float) : 0],
[sigmaXErr (Float) : 0], [sigmaYErr (Float) : 0], [sigmaZErr (Float) : 0],
[tiltYErr (Float) : 0], [tiltZErr (Float) : 0], [sigmaYVerr (Float) : 0]
```

[141749,0] - [1417 ► also available in latest version of CoolTagBrowser: R11.08

► IOV-Tools  
<http://voat.RUN1-02/>

**ioV coverage**  
 ATLAS\_COOLOFLA

Number of channels used 6141 list

**GENERAL**

Name: IndetBeamos-RunDep-MC14-BestKnowledge-001  
 DataBase: OFLP200  
 Schema: INDET  
 Folder: /mdet/Beamos  
 TimeStamp: run-lumi  
 ServiceType: 71  
 CId: 40774348  
 TypeName: AthenaAttributeList  
 Insertion Time: Fri, 07 Mar 2014 19:34:46 GMT  
 Locked/Unlocked:

**CHANNELS**

Channel ID	Number Of Iovs	IovBase
0	25	run-lumi

**CHANNLES**

OBJECT ID	SINCE	UNTIL
objectid:1798	206881	206955
objectid:1804	206955	210184
objectid:1810	210184	210185
objectid:1816	210185	210186
objectid:1822	210186	210187
objectid:1828	210187	216399
objectid:1834	216399	216432
objectid:1840	216432	217946
objectid:1846	217946	219171
objectid:1852	219171	219366
objectid:1858	219366	222222
objectid:1864	222222	inf

**IOV per Channel**

objectid:1720  
 objectid:1726  
 objectid:1732  
 objectid:1738  
 objectid:1744  
 objectid:1750  
 objectid:1756  
 objectid:1762  
 objectid:1768  
 objectid:1774  
 objectid:1780  
 objectid:1786  
 objectid:1792  
 objectid:1798  
 objectid:1804  
 objectid:1810  
 objectid:1816  
 objectid:1822  
 objectid:1828  
 objectid:1834  
 objectid:1840  
 objectid:1846  
 objectid:1852  
 objectid:1858  
 objectid:1864

Legend: Since (green), Holes (black), Until (blue)