

# Reporte de Actividades

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## Contenido

- UPC
- Cósmicos
- DQM
- Tesis

## $J/\psi$ photo production in ultra peripheral heavy ion collisions at forward rapidity with the ALICE experiment

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**Abstract.** Vector meson production in photo-nuclear interactions can be studied in a yet unexplored kinematic regime at LHC energies. In 2011, during the LHC Pb-Pb run, at a centre of mass energy of 2.76 TeV per nucleon pair, dedicated triggers were used by the ALICE Collaboration to select ultra-peripheral collisions (UPC) and measure the  $J/\psi$  production cross section and its rapidity dependence in the  $\mu^+\mu^-$  channel at forward rapidities, using the muon spectrometer. The analysis also used information from the Silicon Pixel and the VZERO scintillator detectors. In this paper the current status of ongoing studies on  $J/\psi$  photo production in UPC events is presented.

### 1 Introduction

The quantum chromodynamics theory predicts a phase transition from hadronic matter to the so called quark gluon plasma (QGP) at strong interactions. Since Matsui and Satz proposed the  $J/\psi$  suppression as a signature of QGP formation [1], some experiments have reported this suppression [2], [3].

The charmonium yields are expected to be considerably suppressed if a deconfined medium is formed in high-energy heavy-ion collisions. In addition, the bottomonium states, with the possible exception of the  $\Upsilon(1S)$  state, are also expected to be suppressed in heavy-ion collisions.

In more recent years, some cold nuclear matter effects have been considered to have a better understanding of the quarkonium suppression: *nuclear absorption* (typically characterized as a final-state effect on the produced quarkonium state) and *shadowing* (the modification of the parton densities in nuclei relative to the nucleon, an initial- state effect). If there were no cold nuclear matter effects on the production cross sections at a given energy, the per nucleon cross sections would all be equal. However, the nuclear parton distributions (nPDFs) are known to be modified with respect to the free proton PDFs as a function of parton momentum fraction  $x$ . At low  $x$ ,  $x < 0.05$  (shadowing region), and high  $x$ ,  $x > 0.2$  (EMC region), the nuclear structure function,  $F_2^A(x)$ , the weighted sum of the charged parton distributions, is suppressed relative to that of the deuteron,  $F_2^d(x)$ , while, in the intermediate  $x$  region, the ratio  $2F_2^A/AF_2^d$  is enhanced (antishadowing) in nuclear deep-inelastic scattering (nDIS). While a combination of nDIS and Drell-Yan data can separate the nuclear valence and sea quark densities, there is no direct probe of the nuclear gluon density, rather it is inferred from the  $\mu^2$  scaling violation [4], [5].

The PHENIX-RHIC experiment observed a  $J/\psi$  suppression beyond cold nuclear matter effects and made a detailed comparison with theoretical calculations including gluon saturation, gluon shadowing, initial-state parton energy loss, cold nuclear matter breakup, color screening, and charm recombination [6].

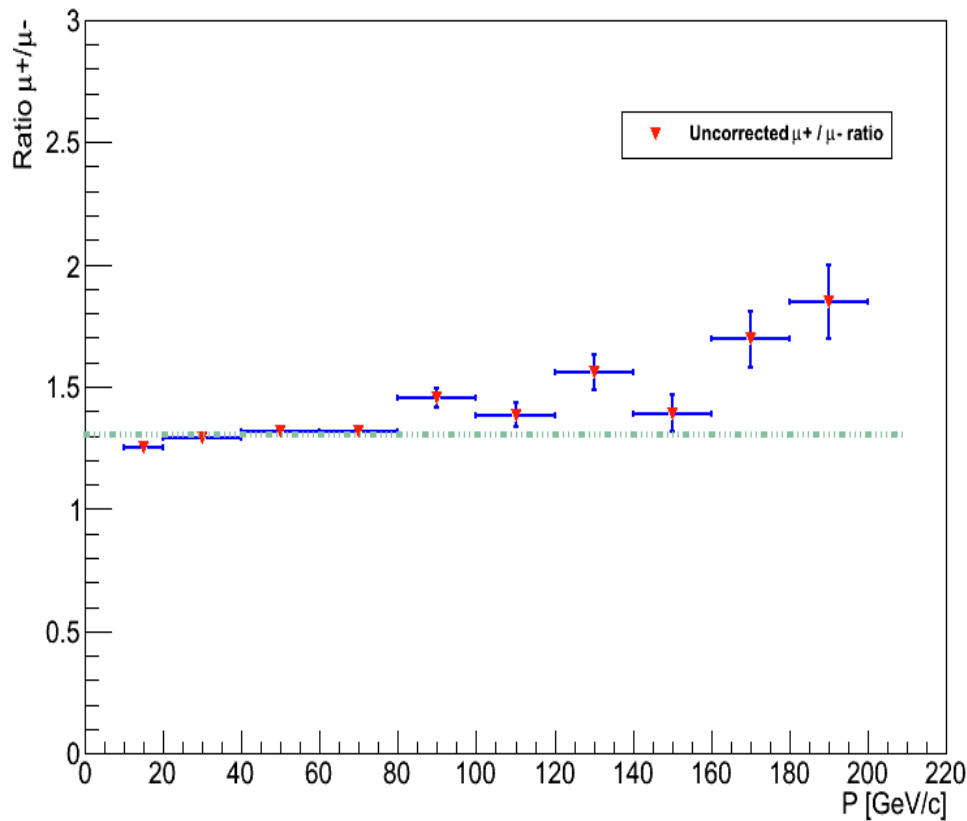
When two nuclei collide at nearly the speed of light in ultra peripheral collisions (impact parameter bigger than twice the nucleus radii), the interaction must be mediated by the electromagnetic field. As it is shown in the figure [7] they can interact through a pure electromagnetic interaction ( $\gamma$ - $\gamma$  process) or

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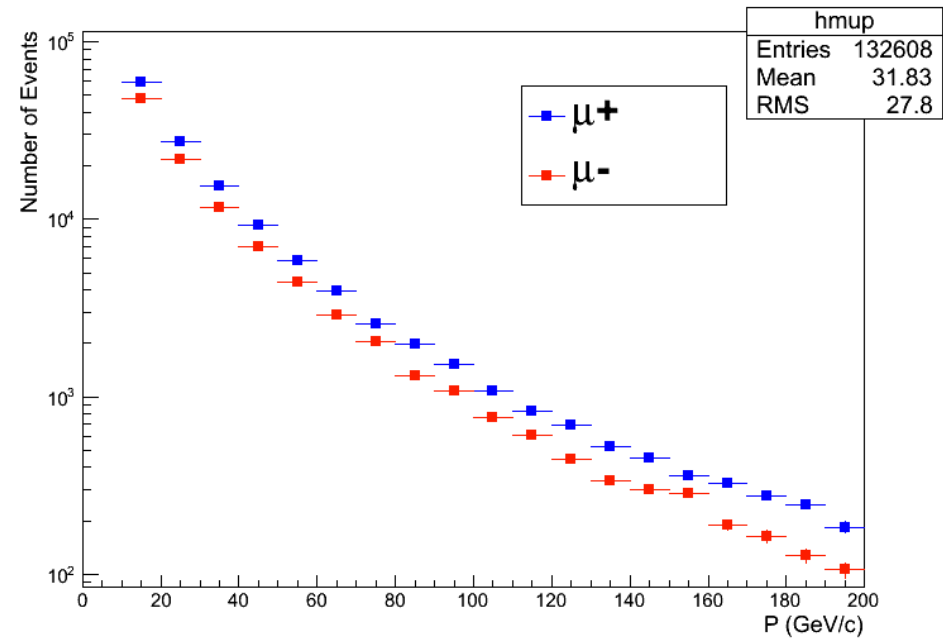
Ya se tiene la introducción y la primera parte de la descripción del detector → esta semana se debe terminar y entregar a Daniel la versión 0.

# DATA ANALYSIS

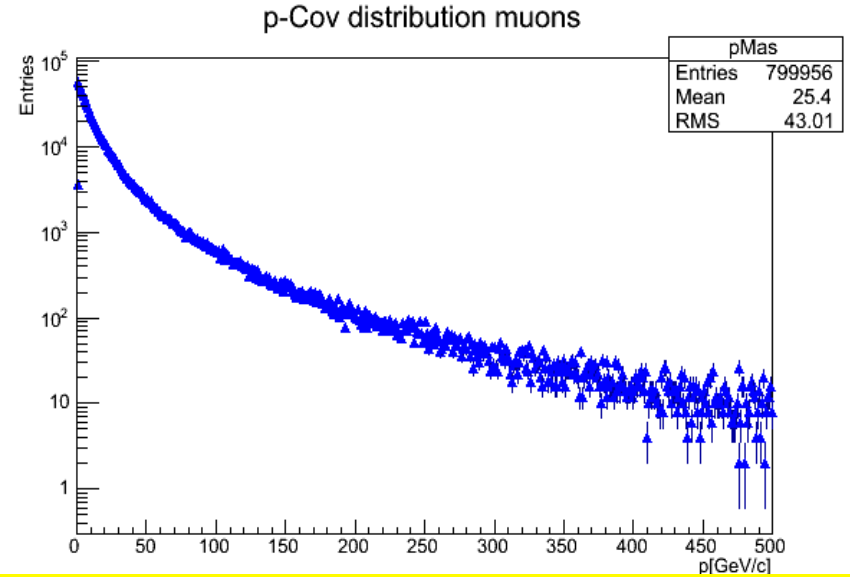
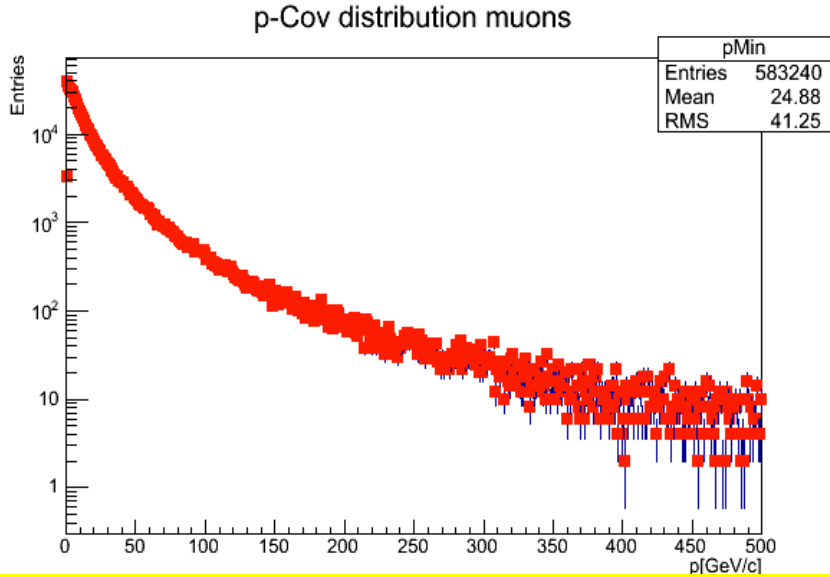
## Uncorrected $\mu^+/\mu^-$ Ratio



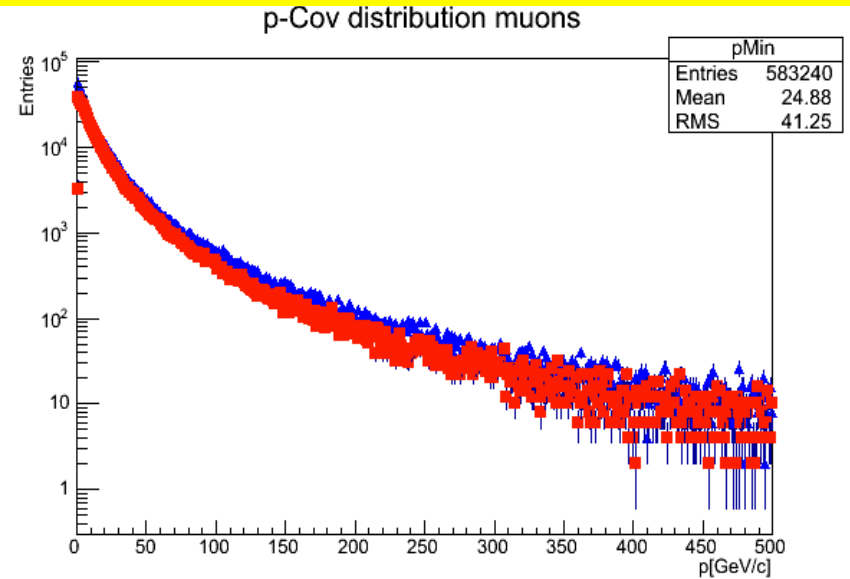
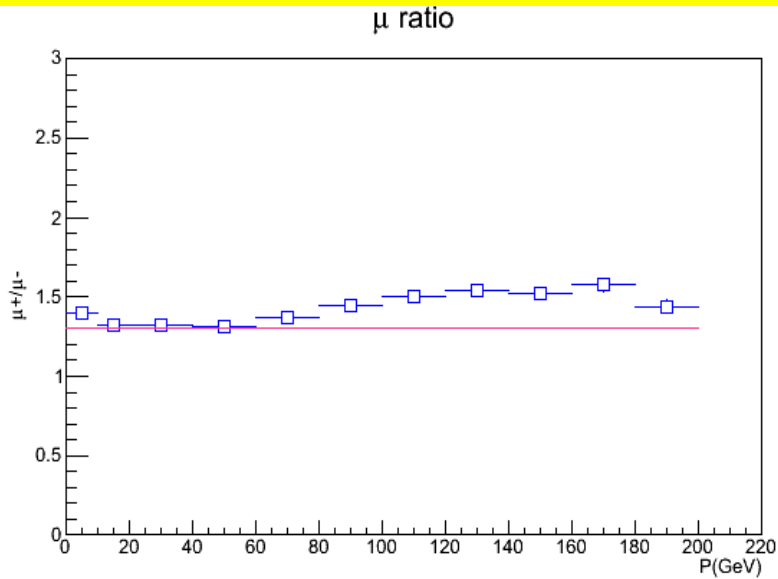
## Uncorrected Momentum Distribution



Última reunión



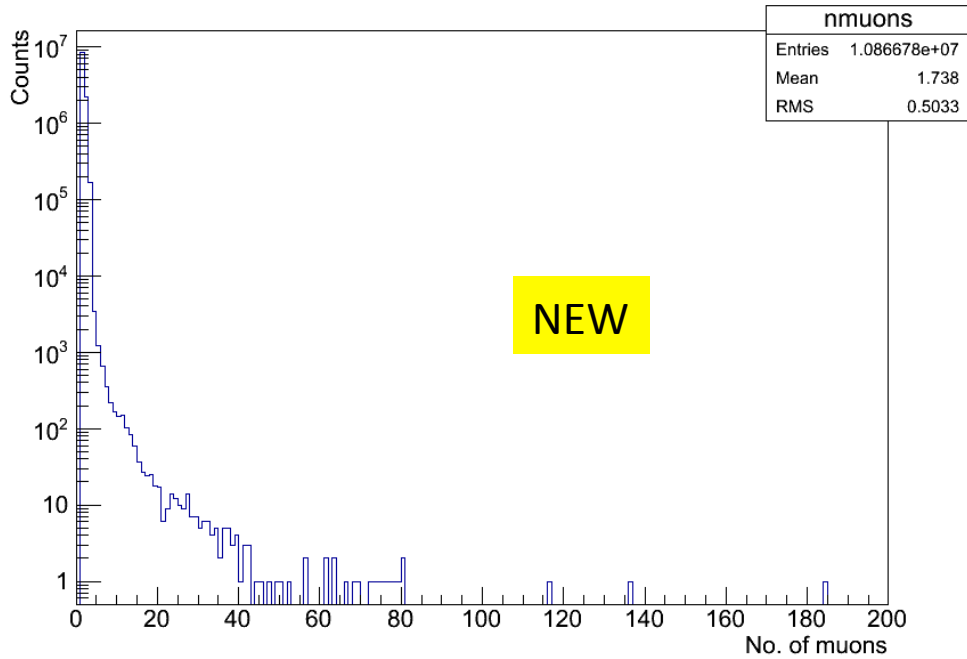
AL PARECER EXISTEN ALGUNAS INCONSISTENCIAS EN EL ARBOL CREADO → SE NECESITA REVISAR



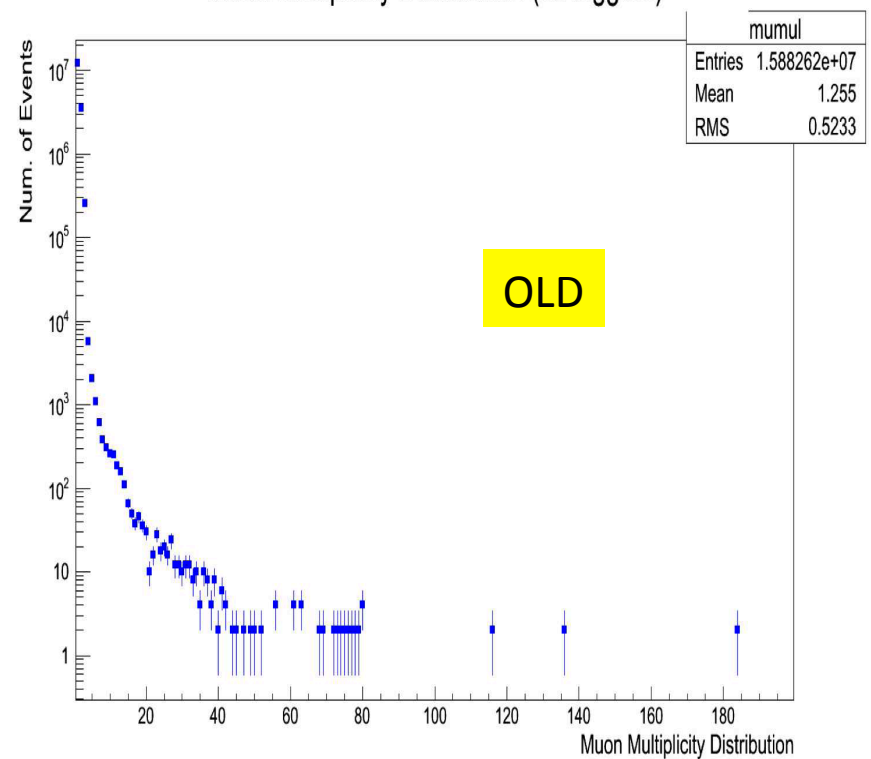
# DATA ANALYSIS

## Gráfica de la tesis corregida

No. of muons



Muon Multiplicity Distribution (all triggers)



AL PARECER EXISTEN ALGUNAS INCONSISTENCIAS EN EL ARBOL CREADO → SE NECESITA REVISAR

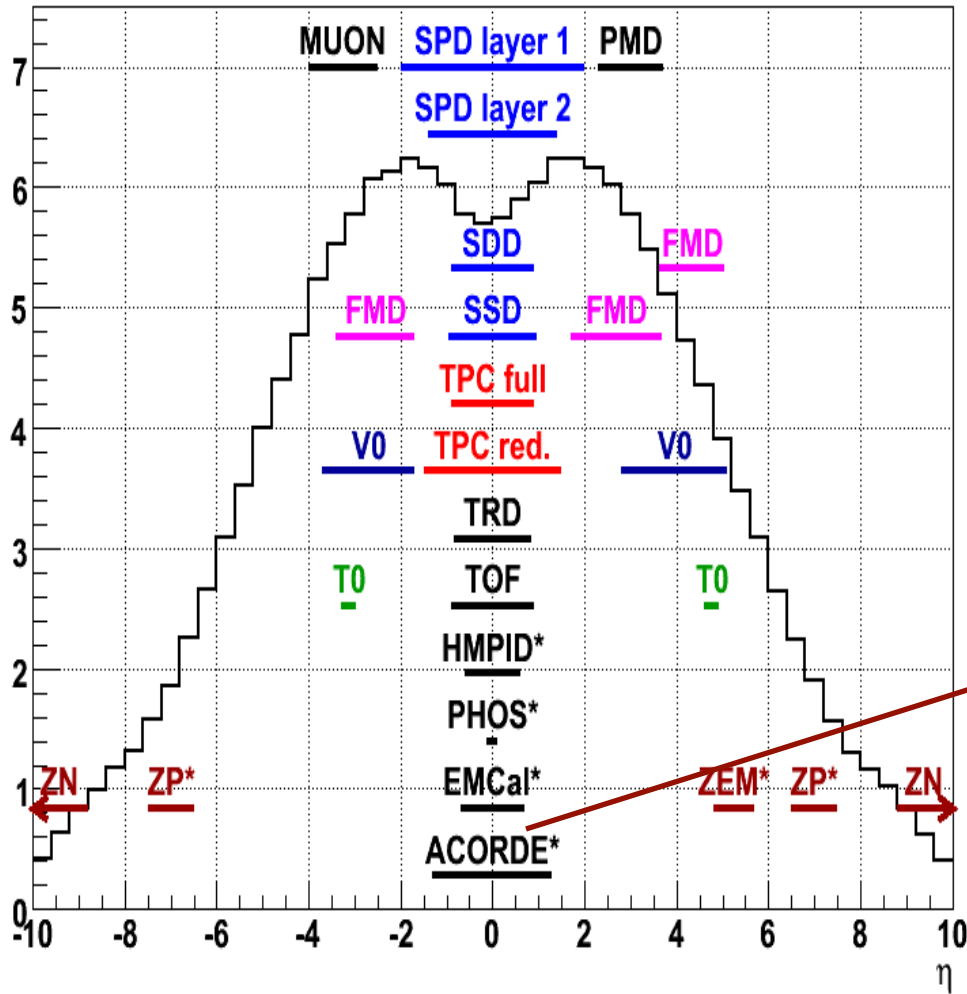
# DATA ANALYSIS

Ya hay algunas corridas reconstruidas del periodo LHC12d (después del TS) → 83 corridas (92.6% reconstruidas)

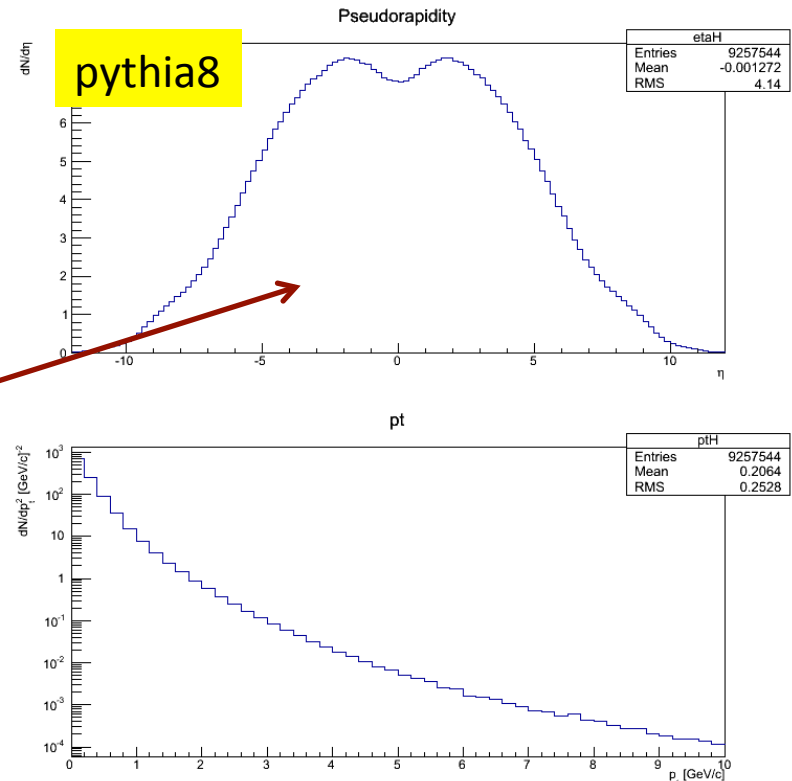
[http://alimonitor.cern.ch/raw/raw\\_details.jsp?timesel=0&filter\\_jobtype=LHC+period+LHC12d+-+CPass1+%28reconstruction%29](http://alimonitor.cern.ch/raw/raw_details.jsp?timesel=0&filter_jobtype=LHC+period+LHC12d+-+CPass1+%28reconstruction%29)

Filters	Chunks		Events (reco)	AliEn job		QA	Software versions		Partition	Pass	Output dir	Comment	Timing		Output Size
	OK/All	%		Job ID	Err		ROOT	ALIROOT					Running	Saving	
185652	441 / 480	91.9%	0	206535833	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185652/cpass1		3d 18:44	9:39	8.424 GB	
185475	742 / 960	77.3%	0	206027851	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185475/cpass1		28d 18:07	1d 6:20	33.8 GB	
185465	747 / 970	77%	0	206072412	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185465/cpass1		43d 7:05	1d 2:51	43.61 GB	
185461	1,895 / 2,864	66.2%	0	206102813	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185461/cpass1		93d 14:27	2d 11:42	97.56 GB	
185375	1,345 / 1,424	94.5%	0	205521181	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185375/cpass1		11d 15:10	2d 19:46	27.43 GB	
185371	1,422 / 1,424	99.9%	0	205477174	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185371/cpass1		13d 9:12	1d 15:03	29.54 GB	
185368	1,404 / 1,424	98.6%	0	205521182	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185368/cpass1		14d 9:32	2d 20:56	31.5 GB	
185363	1,328 / 1,424	93.3%	0	205533395	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185363/cpass1		13d 8:18	2d 15:06	29.73 GB	
185362	1,415 / 1,424	99.4%	0	205533396	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185362/cpass1		12d 19:03	2d 17:28	30.19 GB	
185361	1,374 / 1,424	96.5%	0	205572903	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185361/cpass1		14d 17:37	1d 12:57	29.15 GB	
185360	1,508 / 1,528	98.7%	0	205635444	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185360/cpass1		13d 19:06	2d 10:01	32.19 GB	
185359	1,434 / 1,440	99.6%	0	205615684	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185359/cpass1		63d 14:11	2d 1:51	74.09 GB	
185356	4,283 / 4,776	89.7%	0	205683481	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185356/cpass1		232d 23:59	5d 7:33	238.5 GB	
185351	2,759 / 2,856	96.6%	0	205635247	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185351/cpass1		119d 21:41	3d 16:49	134.9 GB	
185350	947 / 952	99.5%	0	205484433	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185350/cpass1		27d 17:02	1d 1:46	36.24 GB	
185349	943 / 952	99.1%	0	205533397	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185349/cpass1		23d 1:34	1d 18:35	32.36 GB	
185348	471 / 480	98.1%	0	205510364	✓	v5-33-02b	v5-02-Rev-16	LHC12d	1	/alice/data/2012/LHC12d/000185348/cpass1		12d 4:27	13:43	15.39 GB	

# DATA ANALYSIS



- Hacer una generación en pythia 8 e identificar a las partículas finales.
- Obtener la distribución de momento transverso, rapidez, theta y phi para las partículas finales → ¿qué tipo de partículas son? (obtener estas distribuciones para cada tipo de partícula)
- ¿cuáles partículas pueden llegar a la región de ACORDE?; ¿cuáles llegan a la región de cada uno de los módulos de ACORDE?, ¿cuál es la multiplicidad de partículas que llegan a los módulos de ACORDE por evento?



<https://indico.cern.ch/conferenceDisplay.py?confId=201462>

## amoreQA

- Modification in 1.46
  - Before : Set all species in AliQAv1
  - After : Set only the species as specified in the config file
  - Rationales : Allow detectors to know in the QA what species to consider.
  - → bug : the call to ResetDetector() is ineffective
  - → SSD QA Checker gives wrong results
  
- It could be your case as well !
- Please make sure how you use AliQAv1 species.



# TESIS

PRIMERA VERSIÓN DE LA TESIS ENVIADA EL MIÉRCOLES 27 DE JUNIO PARA LA REVISIÓN: SEGUNDA VERSIÓN ENVIADA EL MARTES 10 DE JULIO.

TERCERA VERSIÓN LUNES 16 DE JULIO A MÁS TARDAR

Coloquio: 10 o 13 de Agosto

Examen: 17 o 20 de Agosto (sino es antes de la escuela de rayos cósmicos entonces será hasta el 3 de septiembre)

<http://www.fiumsa.edu.bo/5scra2012/index.html>

Propuesta de Jurado:

Humberto Salazar (FCFM-BUAP)

Oscar Martínez (FCFM-BUAP)

Mario Iván Martínez (FCFM-BUAP)

Bruno Alessandro (INFN-Torino, Italia)

Gerardo Herrera (CINVESTAV) ¿?

Alexis Aguilar (ICN-UNAM) ¿?

Eleazar Cautle (ICN-UNAM)

Arturo Fernández (FCFM-BUAP)

TERCERA REVISIÓN PASADO 9 DE JULIO

→ resumen modificado

→ Conclusiones

→ actualización de capítulos 1,2, 3 y 4

→ NUEVOS COMENTARIOS DE B. ALESSANDRO (FINALIZADOS → VERSION 4)

## Notas finales

- Debemos revisar la estructura del árbol del análisis de cósmicos → en principio debemos evitar usar la macro de B. Alessandro (hay una duplicación de eventos)
- Se debe terminar de escribir el proceeding de la conferencia en Crea.
- Ya se tiene la última versión de la tesis → ¿cuál será la fecha del coloquio? (discusión próxima semana)
- Se van a analizar las corridas reconstruidas de 2012 del periodo LHC12d buscando eventos disparados por ACORDE.
- Se debe escribir el resumen del poster que se llevará al evento en Bolivia.
- Verificar si la nueva modificación en AMORe afectará el DQM de ACORDE → en principio NO.
- Regreso a México próximo 8 de Agosto de 2012.