



**División de Partículas y Campos
Sociedad Mexicana de Física**



Summary and Acknowledgments

XXXVI Reunión Anual

September 08-10 , 2022

<http://indico.nucleares.unam.mx/e/RADPyC2022>

Participants

115 registered participants

Students: ~27%

Prof./Dr.: ~73%

Daily participation:

**~30-40 connected in zoom
per session**

**~5 via Facebook (~100
views)**



XXXVI Reunión Anual de la División de Partículas y Campos
8-10 September 2022
Virtual
Mexico/General timezone

XXXVI Annual Meeting of the Division of Particles and Fields

- Overview
- Call for Abstracts
- [View my Abstracts](#)
- [Submit Abstract](#)
- Timetable
- Speaker List

Participant List

Number of participants: 115

name	institution	position	city	country/region
Dr. AGUILAR-AREVALO, Alexis	Instituto de Ciencias Nucleares,		CDMX	Mexico

Talks and Posters

- Total of 51 presentations:

- 10 invited talks
- 34 contributed talks
- 7 poster presentations



Invited talks:

- Female: 6 (60%)
- Male: 4 (40%)

Contributed talks and posters

- Female: 9 (~22%)
- Male: 35 (~78%)

Participant:s

- Female: 25 (~22%)
- Male: 90 (~78%)

Reunión Anual de Partículas y Colores
ANÁLISIS DE LA DISPERSIÓN EN EL CASO DE LA MATERIA OSCURA

Search for dark matter with the CMS detector of the LHC at CERN
Nestor Raúl Manilla Ximé, María Isabel Pedraza Morales¹
¹Benemérita Universidad Autónoma de Puebla
nestor.manilla@uap.mx, mpedraza@cfm.uap.mx

Scale factors
The study aims to obtain the scale factors to correct the tagging Monte Carlo (MC) for the case of a single jet. We will discuss the identification and reconstruction algorithms used for the identification of the jets and the scale factors used to correct the MC for the case of a single jet.

Double tagging efficiency
The study aims to obtain the scale factors to correct the tagging Monte Carlo (MC) for the case of a double jet. We will discuss the identification and reconstruction algorithms used for the identification of the jets and the scale factors used to correct the MC for the case of a double jet.

Results
To perform the study, we used the data from the Run 2. This simplified data set was used to obtain the scale factors to correct the tagging Monte Carlo (MC) for the case of a single jet. We will discuss the identification and reconstruction algorithms used for the identification of the jets and the scale factors used to correct the MC for the case of a single jet.

Conclusions
Applying our double tagging, we obtain an MC to correct the efficiency of the event tags used for the study of the LHC. However, the method could be applied for other analyses that require efficient tagging.

References
1. The CMS Experiment. CMS "CMS-TDR" Document from: <https://cms.cern.org/tdr/>
2. CMS-TDR. CMS "CMS-TDR" Document from: <https://cms.cern.org/tdr/>
3. Larkoski, A.J., Mehta, S., Soper, G. et al. *High Energy Phys.* 2014, 160 (2014).
4. CMS-TDR. CMS "CMS-TDR" Document from: <https://cms.cern.org/tdr/>
5. CMS-TDR. CMS "CMS-TDR" Document from: <https://cms.cern.org/tdr/>

Exclusive Photo-production of J/Ψ and $\Psi(2s)$ as a tool to explore the transition to high and saturated gluon densities at the LHC.

Dr. Martin Hentschinski & Marco Antonio Alcaraz Paredo
martin.hentschinski@uclap.mx, marco.alcaraz@uclap.mx

Department of Actuarial Science, Physics and Mathematics - Universidad de las Américas Puebla
XXXVI Annual Meeting of the Division of Particles and Fields



Our Investigation

We study the energy dependence of the cross-section for exclusive photo-production of vector mesons J/Ψ and $\Psi(2s)$ with the goal to find possible signs for the onset of non-linear QCD dynamics.

Our study is based on two dipole models: Color Dipole, Vector Meson (CDM) and the Goussier, Kowalski, Brodeur (GKB) model. Both models have been simulated through exponentiating the leading order QCD description, where the Ψ is treated as a valence quark.

We have also enhanced for the ratio of $\Psi(2s)$ and J/Ψ photo-production cross-sections.

To identify better the ratio of the photo-production cross-sections we provide a simple tool to characterize the size of non-linear QCD effects at current collider energies.

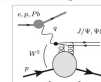


Fig. 1. Kinematics of exclusive photo-production of a vector meson.

Exclusive Photo-production of Vector Mesons

The exclusive photo-production of vector mesons (J/Ψ and $\Psi(2s)$) produced by the interaction between a photon and a proton is described by the interaction between a photon and a proton.

Fig. 2. Kinematics of exclusive photo-production of a vector meson.

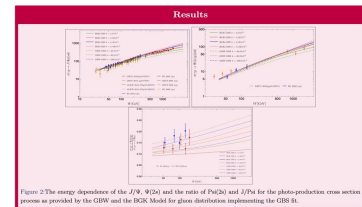


Fig. 2. The energy dependence of the J/Ψ and $\Psi(2s)$ for the photo-production cross-section process as provided by the CDM and the GKB Model for gluon distributions implementing the GKS fit.

Exclusive Photo-Production Cross-Section

The dominant imaginary part of the scattering amplitude can be obtained as a convolution of the exclusive dipole cross-section and the form factor F_V^2 which defines the time structure of a transverse oriented photon with a vector meson V .

$$\sigma_{\text{excl}}(\gamma p \rightarrow V p) = \int d^2r \int d^2r' |F_V^2(r, r')|^2 \sigma_{\text{dipole}}(r, r', x)$$

where r_{\perp} and r'_{\perp} are the transverse hadron radii for the proton.

Fig. 3. Kinematics of exclusive photo-production of a vector meson.

Dipole and Saturation Models

The Dipole Model is used to provide an elegant description of QCD structure at large and low Q^2 regions. It is used to implement and modified the following models:

- Non-linear Vector
- BK Model
- BK Model
- Non-linear Vector

In a scale that grows with the energy, $(\ln x \rightarrow +\infty)$

Conclusions

- Comparing to both HERA and LHC data we find that differences between linear and non-linear implementations are relatively small at the level of photo-production cross-sections, in particular if both theoretical and experimental uncertainties are taken into account.
- We find that the ratio grows with energy in the present non-linear effects, which is somewhat approximately constant if non-linear effects are absent.
- The structure parameter k which allows to vary the strength of non-linear corrections in the dipole models. This parameter has an effect on the final result, but it is not as important as the non-linear corrections.

References

SpaceMath:

Una paquetería de Mathematica para la búsqueda del espacio de parámetros más allá del Modelo Estándar

Desarrolladores: M. A. Arroyo Ureña
T. A. Valencia Pérez

Colaboradores: M. Mondragón Ceballos
R. Gaitán

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XXXVI Reunión Anual / División de Partículas y Campos / SMF

CIEC
IFUNAM

Invited speakers and session conveners

INVITED SPEAKERS:

- Ana Avilez-López (BUAP)
- Minerba Betancourt (FERMILAB)
- Marco Cirelli, LPTHE (CNRS and Sorbonne University, Paris)
- Catalina Espinoza, Conacyt (IFUNAM)
- Melina Gomez-Bock
- Guillermo Gomez-Ceballos (MIT)
- Jaime Hernández Sánchez (BUAP)
- Mike Lamont (CERN)
- JeongEun Lee (Seoul National University)
- Ivonne Maldonado (Join Institute of Nuclear Research, Dubna)

SESSION CONVENERS:

- Dra. Isabel Pedraza (BUAP)
- Dr. Alfredo Castañeda (UNISON)
- Dra. Ana Avilez (BUAP)
- Dr. Carlos Vaquera (UG)
- Dr. Félix González (BUAP)
- Dra. Luz Adriana Cordero Cid (BUAP)
- Dra. Estela Garcés (UNAM)
- Dr. Cecilia Uribe (BUAP)
- Dr. Halim Montes de Oca (UNAM)
- Dra. Alba Carrillo (UAEH)
- Dr. Carlos Honorato (BUAP)
- Dr. Javier Murillo (UNISON)
- Dr. Juan Barranco (UG)
- Dr. Selim Gómez (UAEH)

Awards

DPyC 2022 medal

Prof. ROYON, Christophe



Poster Awards

Best Poster

- Marco Antonio Alcázar (UDLAP) **Exclusive Photo-production of J/Ψ and $\Psi(2s)$ as a tool to explore the transition to high and saturated gluon densities at the LHC**

Honorable Mention

- Alejandra Cervantes (BUAP) **Análisis de la dispersión nuclear de Dark matter WIMP-nucleón**

Exclusive Photo-production of J/Ψ and $\Psi(2s)$ as a tool to explore the transition to high and saturated gluon densities at the LHC.

Dr. Martin Hentschinski & Marco Antonio Alcázar Peredo
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Division of Actual Science, Physics and Mathematics - Universidad de las Américas Puebla
XXXVI Annual Meeting of the Division of Particles and Fields



Our Investigation

- We study the energy dependence of the cross-sections for exclusive photo-production of vector mesons J/Ψ and $\Psi(2s)$ in order to constrain the gluon density in the proton and to find the possible signs for the onset of non-linear QCD dynamics.
- Our goal is to test two different models: the Color-Flavor-Locked (CFL) and the Color-Flavor-Singlet (CFS) models.
- In both models, non-linear effects are introduced through recombination of the leading order QCD diagrams, where the BFKL ladder is replaced by a BFKL-KLN ladder.
- Differences between linear and non-linear approaches are the clear sign for the onset of non-linear QCD effects at small nuclear energy.

Figure 1: An ultra-peripheral collision occurring between a future colliding heavy ion beam where they produce the ultra-peripheral photo-production of vector mesons. The incoming photon γ and the outgoing vector meson V are shown in the rapidity center-of-mass frame.

Exclusive Photo-production of Vector Mesons

- The exclusive photo-production of vector mesons J/Ψ and $\Psi(2s)$ is produced by the interaction between a photon and a proton.
- Figure 2: An ultra-peripheral collision occurring between a future colliding heavy ion beam where they produce the ultra-peripheral photo-production of vector mesons.

Results

Figure 3: The energy dependence of the J/Ψ ($\Psi(2s)$) and the ratio of the J/Ψ and $\Psi(2s)$ for the photo-production cross section versus $\ln W$ as predicted by the CFS and the CFL Model for gluon densities representing the CFL model.

Objectives

- Determine the photo-production cross-section and the LHC.
- Determine the photo-production cross-section and the LHC.

Figure 4: The energy of the dark energy QCD is $Q^2 = 1.14 \text{ GeV}^2$.

Figure 5: The energy of the dark energy QCD is $Q^2 = 1.14 \text{ GeV}^2$.

Dipole and Saturation Models

The Dipole Model can be used to predict an elegant description of QCD reactions at low and high Q^2 regimes. In this study, we implement and modified the dipole model.

Non-linear Vector Mesons

$$\sigma_{\text{tot}}(s) = \sigma_0 \left(1 + \frac{1}{2} \left(\frac{s}{s_0} \right)^{\lambda} \right)$$

In order that agrees with the energy $(s = s_0)$ BFKL Model

Non-linear Vector Mesons

$$\sigma_{\text{tot}}(s) = \sigma_0 \left(1 + \frac{1}{2} \left(\frac{s}{s_0} \right)^{\lambda} \right)$$

Conclusions

Observing the ratio J/Ψ and $\Psi(2s)$ in our study, we find that the difference between linear and non-linear approaches are relatively small in the level of photo-production cross-sections, in particular if both theoretical and experimental uncertainties are taken into account.

We find that the ratio grows with energy in the present and future colliders, which is not experimentally confirmed if the linear effect are absent.

We conclude a parameter λ is still absent in our study, the strength of one linear correction to the dipole model. This parameter can be fixed in future work, but it will be a low parameter in our future measurements.

References

1. J. Hentschinski, M. Alcázar, *Exclusive Photo-production of Vector Mesons at the LHC*, *Phys. Rev. D* **104**, 034011 (2021).
2. J. Hentschinski, M. Alcázar, *Exclusive Photo-production of Vector Mesons at the LHC*, *Phys. Rev. D* **104**, 034011 (2021).
3. J. Hentschinski, M. Alcázar, *Exclusive Photo-production of Vector Mesons at the LHC*, *Phys. Rev. D* **104**, 034011 (2021).
4. J. Hentschinski, M. Alcázar, *Exclusive Photo-production of Vector Mesons at the LHC*, *Phys. Rev. D* **104**, 034011 (2021).
5. J. Hentschinski, M. Alcázar, *Exclusive Photo-production of Vector Mesons at the LHC*, *Phys. Rev. D* **104**, 034011 (2021).

ANÁLISIS DE LA DISPERSIÓN NUCLEAR DE MATERIA OSCURA WIMP-NUCLEÓN

Resumen Anual de Partículas y Campos

El estudio de la dispersión nuclear de materia oscura WIMP-nucleón es un tema de gran relevancia en el contexto de la física de partículas y la cosmología. Este artículo presenta un análisis detallado de los modelos de dispersión nuclear de WIMPs, considerando tanto los efectos de la dispersión elástica como inelástica. Se discuten los límites experimentales actuales y se exploran las perspectivas futuras de esta área de investigación.

El modelo de dispersión elástica de WIMPs se describe mediante el potencial de Yukawa:

$$V(r) = -\frac{g^2}{4\pi} \frac{e^{-m_\pi r}}{r}$$

donde g es el acoplamiento de WIMP-nucleón, m_π es la masa del pión y r es la distancia entre la WIMP y el nucleón.

El potencial de dispersión inelástica se describe mediante el potencial de contacto:

$$V(r) = \frac{g^2}{4\pi} \delta^3(\mathbf{r})$$

donde g es el acoplamiento de WIMP-nucleón y $\delta^3(\mathbf{r})$ es la función delta de Dirac en tres dimensiones.

El estudio de la dispersión nuclear de WIMPs es esencial para comprender la naturaleza de la materia oscura y su interacción con la materia ordinaria.

Experimentos de detección directa

Los experimentos de detección directa buscan observar la dispersión elástica de WIMPs por parte de núcleos de los materiales de los detectores. Este tipo de experimentos requiere una gran sensibilidad y una gran capacidad de recolección de datos.

El experimento DAMIC-II es uno de los más sensibles actualmente en curso. Este experimento utiliza un detector de silicio de gran área para detectar la dispersión de WIMPs por parte de los núcleos de los átomos de silicio.

El experimento LUX-ZEPLIN (LZ) es otro de los experimentos más sensibles actualmente en curso. Este experimento utiliza un detector de xenón líquido de gran área para detectar la dispersión de WIMPs por parte de los núcleos de los átomos de xenón.

El experimento PandaX-II es otro de los experimentos más sensibles actualmente en curso. Este experimento utiliza un detector de xenón líquido de gran área para detectar la dispersión de WIMPs por parte de los núcleos de los átomos de xenón.

Congratulations!

XXXVI Reunión Anual / División de Partículas y Campos / SMF

Election committees

- **DPyC 2022 Medal election committee**
- **Best-poster selection committee**

Thanks for the hard work!

Technical, Administrative, Design

Jesús Avalos, Marco Bedolla

**Zoom, Recording, Live Stream,
Facebook, Youtube**

Patricia Carranza Díaz, Alfonso Alcocer Acevedo

Registration, Fees/Invoices

Lukas Nellen (ICN-UNAM)

Alberto Sánchez (CINVESTAV)

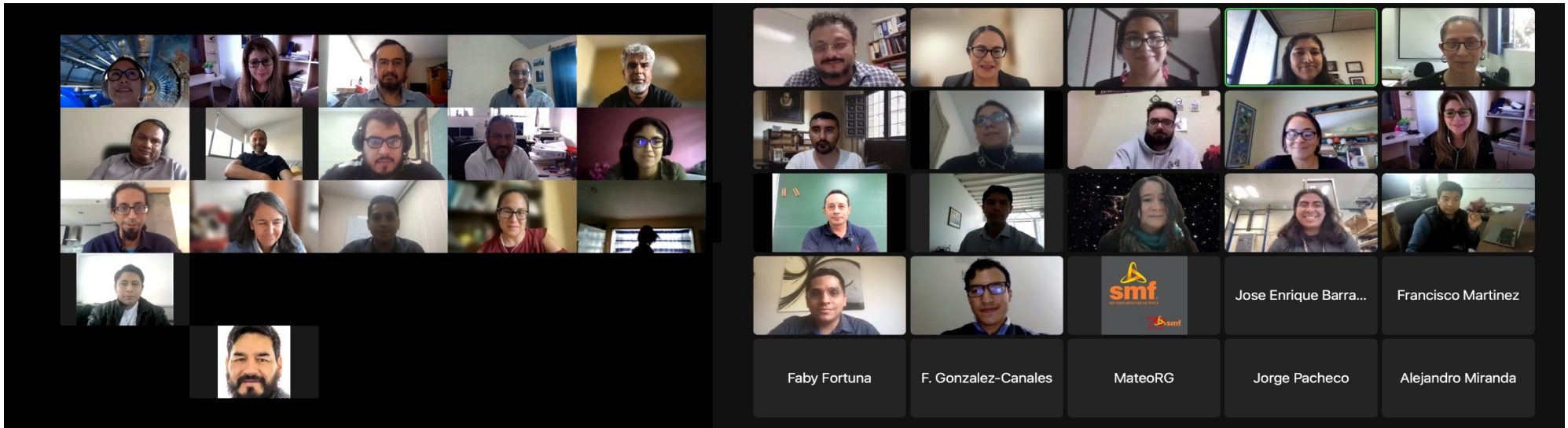
Isabel Pedraza (BUAP)

Humberto Martínez Huerta (U. de Monterrey)

Indico system, Mailing Lists, Design

Thanks for the hard work!

Group photo



Facebook & Meeting Recordings

ICARUS
Current Status

Started collecting data taking with the BNB & NuMI beams since March 2021, in parallel with commissioning activities. Cosmics, ν_μ , and ν_e samples were collected for trigger, calibration, event reconstruction studies, etc.

Contained BNB ν_μ CC candidate: $\nu_\mu + n \rightarrow \mu^- + p$

Contained NuMI ν_e CC candidate: $\nu_e + n \rightarrow e^- + p$

The commissioning period is over and the physics run started this June 9th 2022!

commissioning period eh has ended fisica

Guadalupe Moreno (Cinvestav)

División de Partículas y Campos - SMF was live.

XXXVI Annual Meeting of the Division of Particles and Fields - ...

173 People reached

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Olga Gpe. Felix · 14:14
You can ask in Spanish or English! Your questions on this platform are answered in real time during the presentations.

División de Partículas y Campos - SMF was live.

16h ·

XXXVI Annual Meeting of the Division of Particles and Fields - Viernes 2da Sesión
8-10 September 2022
Virtual

Lepton Flavour Violation in Hadron Decays of the Tau Lepton within the Littlest Higgs Model with T-parity

Iván Pacheco Zamudio
XXXVI Annual Meeting of the Division of Particles and Fields
September 9, 2022

The Center for Research and Advanced Studies of the National Polytechnic Institute

The W Boson Mass Measurement Excitement: Status and Perspectives for LHC

LHCb Fit Measurement

$\phi^* = \tan\left(\frac{\pi - \Delta\phi}{2}\right) \sin(\theta_n^*)$, $\cos(\theta_n^*) = \tanh\left(\frac{\Delta\eta}{2}\right)$

Simultaneous fit of the q/p_T^ℓ distribution of W boson candidates and the ϕ^* distribution of Z boson candidates

División de Partículas y Campos - SMF was live.

September 8 at 9:04 ·

XXXVI Annual Meeting of the Division of Particles and Fields

274 People reached

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Comments

Olga Gpe. Felix · 1:07:28
your questions on this platform are answered in real time!

You, Melina Gómez, Pablo Roig Garcés and 3 others

2 Comments

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XXXVI

Annual Meeting
Division of Particles and Fields
Mexican Physical Society
September 8-10, 2022, Virtual

Organizing Committee:

Olga Félix, BUAP

Isabel Pedraza, BUAP

Mario Rodríguez, BUAP

Félix González, BUAP

Juan Barranco, UG

Estela A. Garcés, UNAM

Javier Murillo, UNISON

Karen S. Caballero, UNACH

**Thanks for your
participation
See you at the
next event!**



XVIII Mexican Workshop on Particles and Fields 2022

November 21st - 25th,
Puebla - México

Scientific Program

- Higgs physics
- Beyond the Standard Model
- Neutrinos
- QCD and Hadronic Physics
- High energy heavy ion collisions
- Future experiments
- Particle detectors
- Flavour physics
- Astroparticle physics
- HEP applications in industry

IMPORTANT DATES

Registration deadline
Nov. 10th 2022

Abstract submission deadline
Nov. 1st 2022

Fellowships application deadline
Oct. 31st 2022



Organizing committee

- Karen S. Caballero (FCFM-UNACH, President of DPyC-SMF)
- Juan Barranco Monarca (U. de Guanajuato, Vice-President of DPyC-SMF)
- Eleazar Cuautele (ICN-UNAM)
- Olga Felix (FCE-BUAP)
- Arturo Fernández (VIEP/FCFM-BUAP)
- Roger Hernández (FCFM-UAS)
- Héctor Novales (FCFM-BUAP)
- Mario Iván Martínez (FCFM-BUAP)
- Luis Manuel Montañó (CINVESTAV)
- Mario Rodríguez (FCFM-BUAP, chair)
- Guillermo Tejeda (FCFM-BUAP)
- Lizardo Valencia (UNISON)
- Heber Zepeda (FCFM-BUAP)

Registration and more information at

<https://indico.nucleares.unam.mx/event/1933/>



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