

Doctoral School Course 2019

Title: **Quarkonium-Production Phenomenology**

Teacher :

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Duration : 18h overs 3 days.

Langue du cours: English

Prerequisite: Elementary particle physics

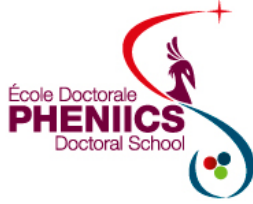
Summary

This course will introduce the students to the different models used to describe quarkonium production in different collision systems both in the inclusive and exclusive cases. Then we will address how they can be used to learn about the nucleon and nucleus structure including their spin content, about the strongly interacting matter produced in ultra-relativistic nucleus-nucleus collisions and more generally about the interface between the perturbative and non-perturbative aspects of QCD. The course will cover the corresponding relevant theoretical, experimental and phenomenological aspects.

Provisional Program

Day 1 – April 16, 2019 – Introduction to quarkonium production

- The November Revolution and the discovery of the charm quark
- What is a quarkonium ?
- Digression about the heavy-quark production
- Introduction to the quarkonium-production models
- Excited states, production modes and decay channels
- Basics of collinear and Transverse Momentum Dependent (TMD) factorisation



Day 2 – April 17, 2019 – Application to the nucleon and nuclear structure

- Quarkonia, Parton Distribution Functions and Generalised Parton Distributions
- TMD studies in quarkonium production
- Double Parton Scattering studies in quarkonium production
- Nuclear effects involved in hard scatterings in proton-nucleus collisions
- The case of the heavy-quarks and the quarkonia

Day 3 – April 18, 2019 – Application to nucleus-nucleus collisions and outlook

- Introduction to the Quark-Gluon Plasma
- “QGP studies” with quarkonia
- Back to proton-nucleus and proton-proton collisions
- Photoproduction in (ultra) peripheral collisions
- Outlook (theory and experiments)

Schedule

| | | 9:30 – 12:30 | 14:00 - 17:00 |
|-----------|-----------|--------------|---------------|
| Tuesday | 16/4/2019 | | |
| Wednesday | 17/4/2019 | | |
| Thursday | 18/4/2019 | | |

Location :

IPN Orsay
Building 100
Room to be fixed