Second HEP Graduate Workshop

University of Mohamed Boudiaf (UMB) M'sila, Algeria

03-05 April 2021

ONLINE
VIA ZOOM

Topics:

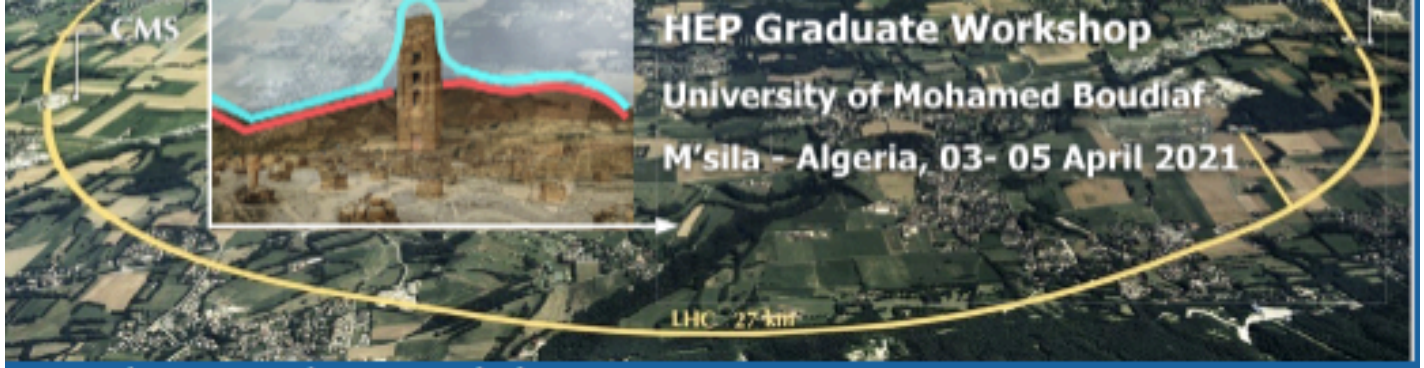
- Standard Model and Beyond
- Collider Physics
- Dark Matter Searches.
- Cosmology
- HEP Tools
- Machine Learning (ML) in HEP
-

Speakers:

Marjorie Shapiro (University of California Berkeley USA)
Amine Ahriche (University of Sharjah and ICTP).
Salah Nasri (UAE University and ICTP)
Cherifa Sabrina Amrouche (University of Geneva Switzerland).
Rachid Mazini (Academia Sinica, Taiwan)
Adil Jueid (Konkuk University South Korea)
Dalila Salamani (University of Geneva Switzerland).
Rachik Soualah (Univeristy of Sharjah and ICTP)

Further information:

https://indico.cern.ch/e/HEP-MSILA-2021
hepmsilacourse@gmail.com



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جامعة محمد بوضياف - المسيلة
Université Mohamed Boudiaf - M'sila

Second HEP Graduate Workshop

3-5 April 2021
M'sila
Africa/Algiers timezone

Search...

- Overview
- Timetable
- Registration
- Participant List
- ML workshop
- Hands-on HEP Tools
- Instructions for the ZOOM Connection
- Workshop Poster

Contact
msilahepcourse@gmail....

Timetable

Sat 03/04 | Sun 04/04 | Mon 05/04 | All days

Print | PDF | Full screen | Detailed view | Filter
Session legend

Sat 3/4

07:00

08:00

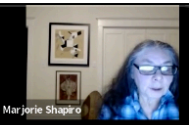
Workshop Opening — *Exona Redouane Salah*
M'sila — 08:30 - 09:00

09:00

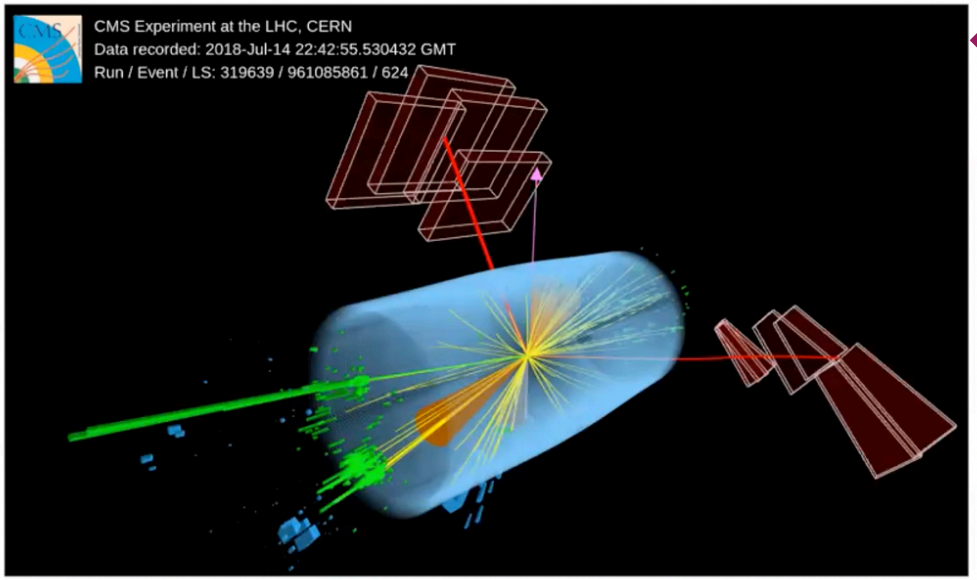
Introduction to Hadron Collider Physics: 1 — Marjorie Shap
M'sila — 09:00 - 10:00

10:00

Neutrino Physics: 1 — Amine Ahric
M'sila — 10:00 - 11:00



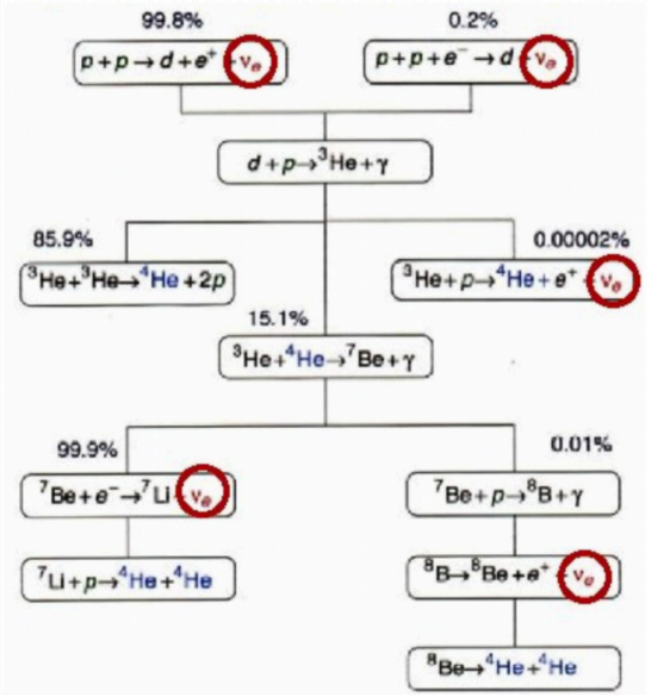
LHC can play an especially critical role

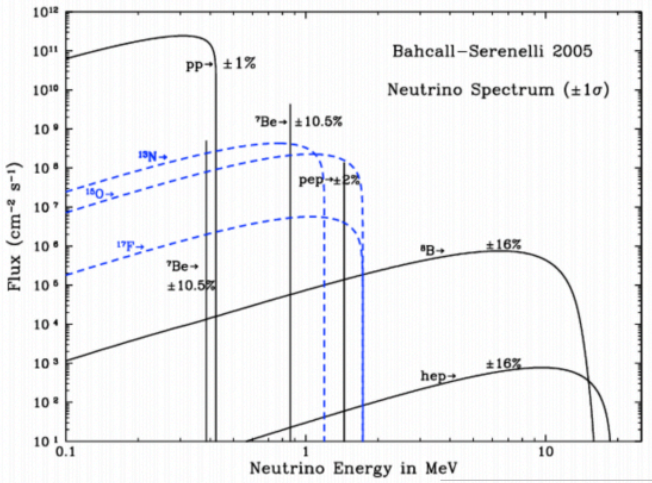


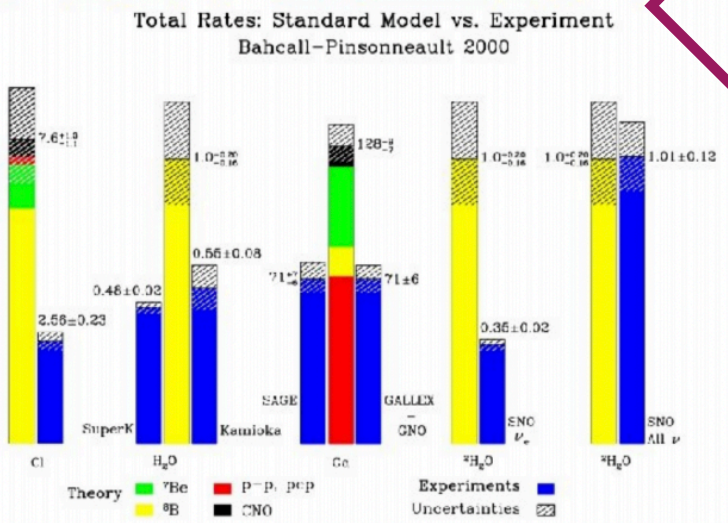
LHC Physics

- Highest achievable energy
  - Reproduce conditions of the early Universe
- TeV energy scale
  - Where fundamental particles obtain their mass
- Many theoretical possibilities
  - But need data to distinguish between them

Neutrino Oscillations



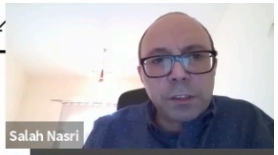




Neutrino Physics

The solution = neutrinos change their flavor during when traveling ... this is possible only if they are massive; and the mass eigenstates and the falvor eigenstates are DIFFERENT!!

Cosmology



Hubble measured the Doppler effect of light : $\frac{\Delta\lambda}{\lambda} =: z = \frac{v}{c}$

and distances d of cepheid (variable) stars. He found:

$c\,z = v = H_0\, d$ ← Hubble – Lemaitre Law (1927)

IAU (2018)

Hubble measured $H_0 \simeq 500$ km/s/Mpc

sets a time scale for the age of the Universe

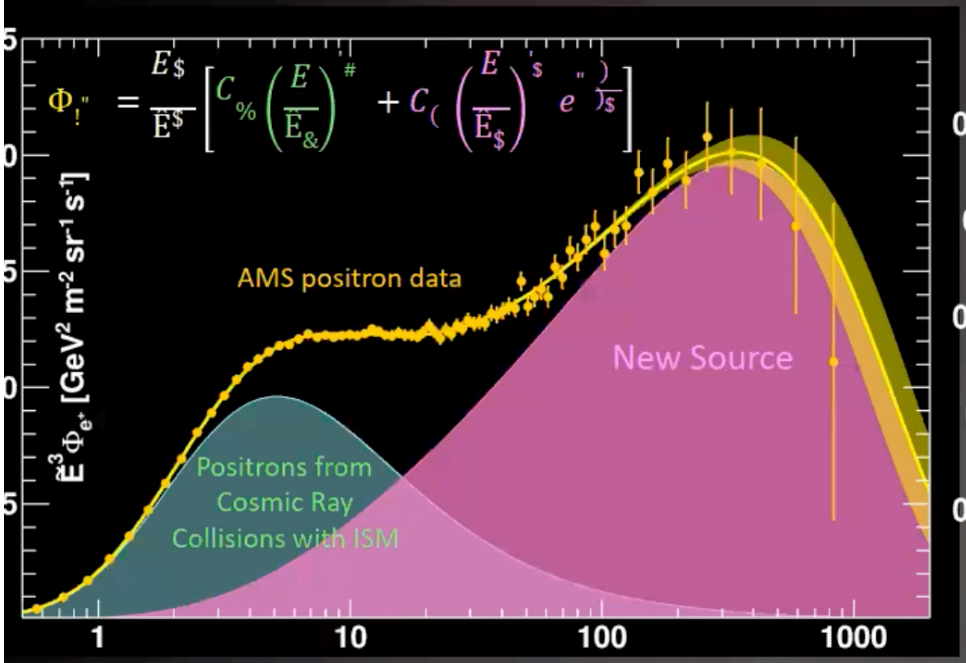
$\Rightarrow \tau_{universe} \sim 2$ Gyrs !! ← However, in 1920's and 1930's it was known that there were significant geological evidence that $\tau_{Earth} \gg 2$ Gyrs !!

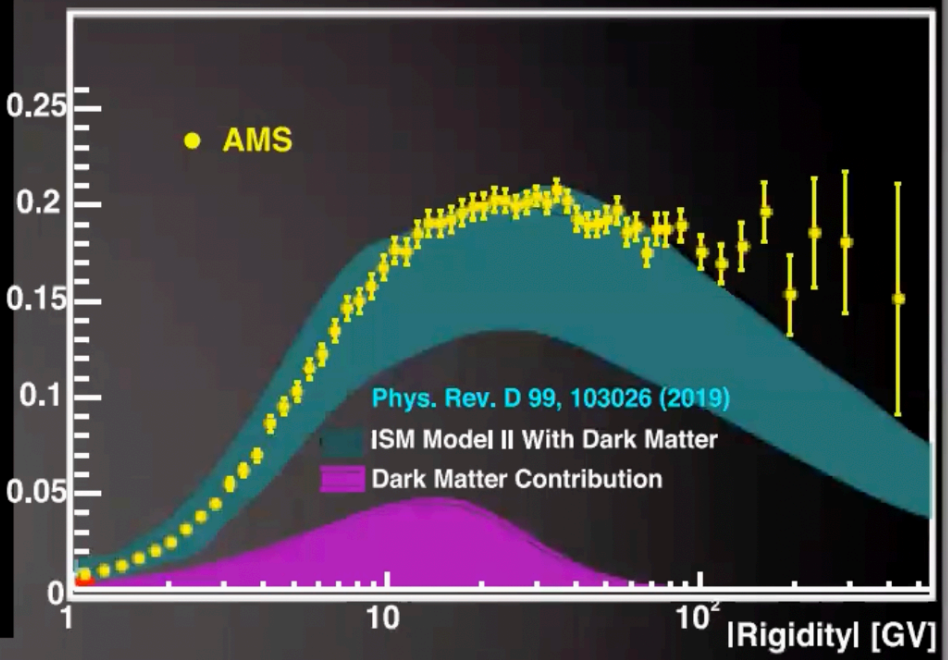
Recent measurement : $H_0 \simeq 70$ km/s/Mpc with precision $< 10\%$

DM at Colliders

Indirect detection

$\bar{p}$ and e^+ from DM annihilations in halo





Current uncert allow a definitive inter

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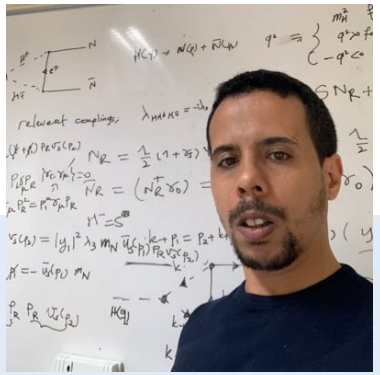
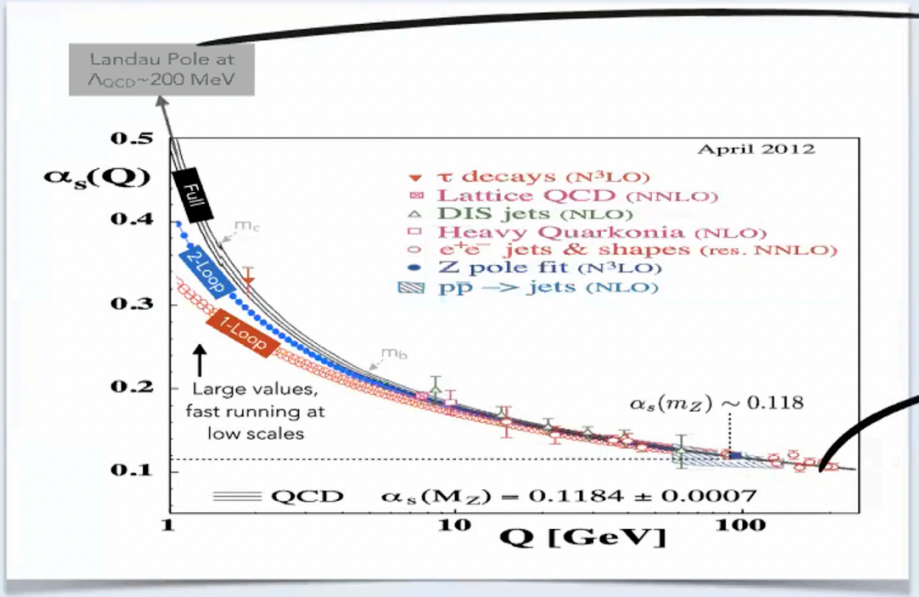
QCD Physics



The strong coupling constant

The strong coupling is the **main parameter** of perturbative QCD calculations. It controls:

- The size of **QCD cross sections** (& QCD **partial widths** for decays).
- The overall amount of **QCD radiation** (extra jets + **recoil effects** + jet substructure).
- Sizeable **QCD "K Factors"** to essentially all processes at LHC, and **ditto uncertainties**.

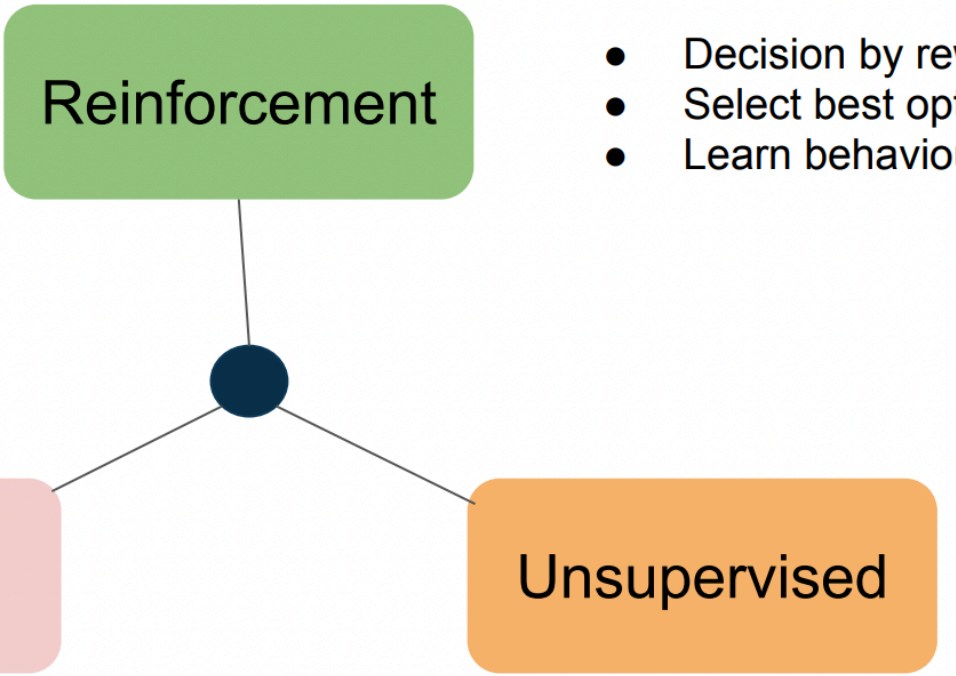


Confinement (IR slavery?) in the infrared

Asymptotic freedom in the ultraviolet

Machine learning in a nutshell

ML in HEP



- Decision by reward
- Select best option
- Learn behaviour

- Labeled data
- Classification (discrete values)
- Regression (real values)

- No data labels
- Clustering

BIG THANKS TO OUR SPEAKERS !!

For their contribution, time and the EXCELLENT slides !

Check the workshop indico page for more details:
http://tiny.cc/jbnvtz

Second HEP Graduate Workshop Speakers and Organizers

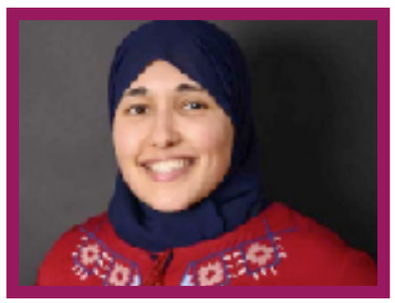
Marjorie Shapiro

Amine Ahrich

Salah Nasri

Adil Jueid

Sabrina Amrouch

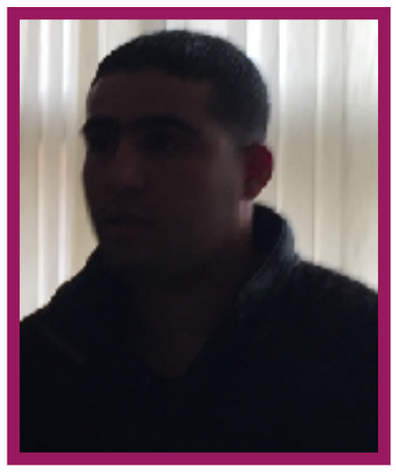


Dalila Salamani

Rachid Mazini

Rachik Soualah

Sakina Boudissa



Marouane Heraiz

Essma Redouane Salah


Thank you !
Keep Safe