

# GDR-InF ANNUAL MEETING 2020

## (28 September - 16 October)

### WEEK 1

#### Monday Sept 28

- 9h45-10h => introduction
- 10h-11h => invited speaker seminar
- 11h-12h => students and postdocs talks
- 14h-18h => Lectures on Flavio

#### Wednesday Sept 30

- 10h-11h => invited speaker seminar
- 11h-12h => students and postdocs talks
- 14h-15h => Hands-on projects start up (in parallel meetings)
- 16h-17h => Coffee discussion on ANR & ERC projects

### WEEK 2

#### Tuesday Oct 6

- 10h-11h => invited speaker seminar
- 11h-12h => students and postdocs talks

#### Thursday Oct 8

- 10h-11h => invited speaker seminar
- 11h-12h => students and postdocs talks
- 14h-15h => Hands-on projects mid-term report (in parallel meetings)
- 16h-17h => Coffee discussion on discriminations in our field

### WEEK 3

#### Monday Oct 12

- 10h-11h => invited speaker seminar
- 11h-12h => students and postdocs talks

#### Friday Oct 16

- 10h-13h => Wrap up session with report on the projects and conclusion

During the weeks, sessions for working on “hands-on projects” will take place in parallel during the afternoons. Each project will have a coordinator, a dedicated parallel room and a chat channel. Apart from the start-up and mid-term report parallel sessions, projects will have the freedom to organize the time slots for their own discussions in the rooms during the three weeks.

## PROPOSITIONS RECUES

### STUDENTS/POSTDOCS TALKS

- **Jacopo Cerasoli**: "Search for the  $B_0 \rightarrow K^* \tau^+ \tau^-$  decay at the LHCb experiment" (28 sep or any other day)
- **Raul Rabadan**: "Exclusive doubly charmed B decays into excited charmed mesons." (any day)
- **Resmi PK**: "Anomalies in  $b \rightarrow c \tau \nu$  transitions at LHCb" (prefers Oct 6, 8, 12).
- **Martin Novoa & Carla**: "prospects for NP searches with  $L_b \rightarrow L(1520) \mu \mu$  decays" (arXiv:2005.09602)
- **Martin Novoa**: "constraints on  $b \rightarrow s \nu \nu$  and  $s \rightarrow d \nu \nu$  coming from  $b \rightarrow s \mu \mu$  mode by using Minimal flavour violation" (based on arXiv:2005.03734)
- **Coraline Stasser** (etudiante Michaël Sarrazin de l'Université de Bourgogne-Franche-Comté. Je suis néanmoins rattachée à l'Université de Namur en Belgique, MURMUR collaboration): "Constraining sterile or hidden copies of the Standard Model as dark matter candidates with passing-through-walls neutron experiments"
- **Tristan Fillinger** (IPHC, Strasbourg) & **Güney Polat** (CPPM, Marseille): "tracking performance in the Belle II experiment." (title might change; they are PhD students).
- **Siavash Nehatpour** (postdoc at Lyon University, Institut de Physique des 2 Infinis de Lyon (IP2I)): "Rare B-decay anomalies"

### INVITED SPEAKERS

Carla: **Gino Isidori**, **Yuval Grossman** and/or **Gudrun Hiller**

Diego: - Dark Matter and flavour: Stefano Profumo (UCSC)

- axions and flavour: Diego Redigolo (CERN)

- flavour and model building: Riccardo Barbieri (SNS Pisa) or Luca Di Luzio (INFN Pisa) or Admir Greljo (CERN)

- flavour and physics beyond colliders: Michele Papucci (UC Berkeley) or Maxim Pospelov (Perimeter).

Comment from Diego: In connection with such talks we could put together Zoom breakout rooms with one or two moderators, to discuss and develop possible ideas emerging from the talks. These rooms could be such that each participant can enter only one of them. So people will have to choose, and will participate more actively. In alternative, the breakout rooms could take place in different moments.

## COFFEE DISCUSSIONS

Diego: On the first subject, I would try to *invite people who are or have been closely involved in the ANR/ERC selection process.*

We could even aim for a short intervention by **Philippe Lecheminant (DAS INP)** and/or **Reynald Pain (IN2P3)**.

## HANDS ON PROJECTS

Flavio based (to be defined)

CKM Fitter (to be defined)

Carla's proposal: GPU programming for ML, trigger or amplitude fits (expert to be found)

Martin Novoa: "project on c $\bar{c}$ bar contributions that could require some experimental theorist collaboration"  
(to be thought more...)

- project BooST derived (Julien Cogan): combination (Belle 2/ LHCb) and interpretation of b $\rightarrow$ s tau tau ( $\mu$ ) searches

## NOTE ON UPCOMING WORKSHOPS

Emi: The workshop organisation is advancing well (with excellent speakers!) <https://indico.in2p3.fr/event/21156/> and we are hoping to open registration very soon. We should get the budget line to send the money by the end of this week.

## OTHER NOTES

### **Constraining sterile or hidden copies of the Standard Model as dark matter candidates with passing-through-walls neutron experiments**

Stasser Coraline for the MURMUR collaboration

Some scenarios beyond the Standard Model (SM) of particles and the  $\Lambda$ CDM cosmological model involve sterile or hidden copies of the SM. These scenarios aim at offering dark matter candidates. These sterile particles could be a duplication of the SM content – such as mirror partners of the SM particles. A hidden sector could also have a geometrical meaning such as a hidden braneworld in a multidimensional bulk.

During the last decade, theoretical works [1-3] have shown that such scenarios could lead to fast neutron oscillations between the visible and the hidden sectors, bringing a new way to probe hidden sector hypothesis [3]. A visible neutron  $n$  can convert into a hidden neutron  $n'$  when scattered by a nucleus, with a cross section  $\sigma(n \rightarrow n') \propto \sigma_E(n \rightarrow n) \times p$ , where  $\sigma_E$  is the usual elastic cross-section and  $p$  the neutron swapping probability [4]. The reverse process is also possible, making possible to regenerate hidden neutrons into visible ones [4].

In order to exploit this phenomenon, new kind of low-noise experiments – called neutron passing-through-wall experiments – have been carried out near nuclear reactors, first at the ILL (Grenoble, France) [4,5], and then at the SCK.CEN (Mol, Belgium) [6]. These experiments make possible to probe the hidden sector hypothesis by constraining the neutron swapping probability  $p$  related to the coupling constant  $g$  of such scenarios.

The general setup of these experiments is introduced and their results crossed with theoretical work in order to bound braneworld scenarios [7].

[1] F. Petit, M. Sarrazin, Phys. Lett. B612 (2005) 105-114

[2] M. Sarrazin, F. Petit, Phys. Rev. D 81 (2010) 035014

[3] M. Sarrazin, F. Petit, Eur. Phys. J. C 72 (2012) 2230

[4] M. Sarrazin, G. Pignol, J. Lamblin, F. Petit, G. Terwagne, V. V. Nesvizhevsky, Phys. Rev. D 91 (2015) 075013

[5] M. Sarrazin, G. Pignol, J. Lamblin, J. Pinon, O. Meplan, G. Terwagne, P.-L. Debarsy, F. Petit, V. V. Nesvizhevsky, Phys. Lett. B758 (2016) 14-17

[6] C. Stasser, M. Sarrazin, G. Terwagne, EPJ web conf. 219, 07004 (2019)

[7] C. Stasser, M. Sarrazin, Int. J. Mod. Phys. A 34 (2019) 1950029