



WE WANT YOU FOR $B \rightarrow \mu^+ \mu^-$!

The B_s and B_d decays into muon couples are extremely rare, occurring few times over billions of B decays. They also represent a powerful tool to **investigate physics beyond the Standard Model**, since the measured observables can deviate from the theoretical predictions. For this reason, these channels have always been among the flagship measurements at LHCb and at LHC in general.

The Frascati group has a leading role in the $B_{d,s} \rightarrow \mu^+ \mu^-$ analysis at LHCb since the very first years of the experiment. Last year we observed the $B_s \rightarrow \mu^+ \mu^-$ decay for the first time using the LHCb detector, while the even rarer $B_d \rightarrow \mu^+ \mu^-$ decay is still elusive. In 2018, LHCb will complete the Run 2 data acquisition at LHC: the large amount of collected data will allow to perform a precise measurement of the $B_s \rightarrow \mu^+ \mu^-$ branching fraction and possibly the first evidence of $B_d \rightarrow \mu^+ \mu^-$.

Students interested in participating in this measurement will be directly involved in many advanced and interesting aspects covered in such an important analysis. Subject for the thesis will range from the **optimisation of muon identification algorithms** (a crucial ingredient of the analysis: we all know what a muon is, but have you ever tried detecting one?) to the **rejection of the backgrounds** (since the signal decay is extremely rare, all the background sources have to be carefully investigated: some events even look the same!), and to the **development of machine learning algorithms**, like boosted decision trees or neural networks that are able to distinguish the signal over a huge amount of backgrounds.

Join us for this quest!



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