

- **Laboratory/ research team:**
Laboratoire Leprince-Ringuet (LLR) / CMS, ions lourds
- **Title:** Novel studies of the quark-gluon plasma with the CMS detector
- **Overview of the research:** The CMS heavy-ion team at LLR has produced landmark publications from the first heavy-ion campaign at the LHC. Among them are first observations (in heavy-ion collisions) of Z and W bosons, of the three upilon states, as well as non-prompt J/ ψ and b jets, both reflecting the fate of b quarks in the quark-gluon plasma. At the end of 2015, new heavy-ion data will be collected, with hopefully ten times more luminosity and twice more energy, raising by a factor of ≈ 20 the yields of hard probes. This will open a lot of analyses in the CMS heavy-ion community. The exact subject of the thesis will be decided with the student, depending on his/her own taste and on the current best opportunities. Examples are: first observation of the top quark in heavy-ion collisions, Z+jet measurements providing a precise handle on quark/gluon energy loss, detailed studies of the suppression pattern of upilon states (often seen as a plasma thermometer), or inclusive beauty cross-section measurement (an interesting reference for the latter). The student will start by going to CERN for the data taking, to familiarize him/herself with the CMS detectors, tools and collaboration. He/she will then participate to an analysis of 2015 data, and will be expected to lead an analysis of the 2016 data, his/her PhD subject. The presence in the team of a CMS-associated theorist (François Arleo) also opens the possibility of phenomenological work.
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