

Heavy Ions and New Physics

Virtual ECT*-Trento meeting May 20/21 2021

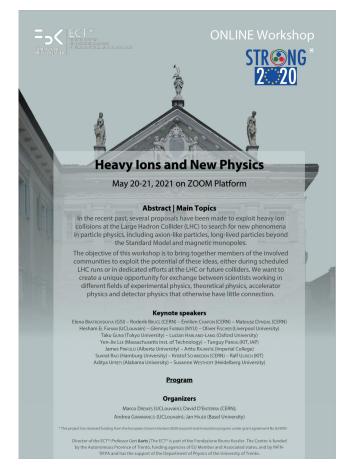
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Welcome to the (unfortunately virtual) Workshop!







https://agenda.irmp.ucl.ac.be/event/3186/

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New physics searches with heavy-ion collisions at the CERN Large Hadron Collider

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This document summarises proposed searches for new physics accessible in the heavy-ion mode at the CERN Large Hadron Collider (LHC), both through hadronic and ultraperipheral $\gamma\gamma$ interactions, and that have a competitive or, even, unique discovery potential compared to standard proton-proton collision studies. Illustrative examples include searches for new particles — such as axion-like pseudoscalars, radions, magnetic monopoles, new long-lived particles, dark photons, and sexaquarks as dark matter candidates — as well as new interactions, such as non-linear or non-commutative QED extensions. We argue that such interesting possibilities constitute a well-justified scientific motivation, complementing standard quark-gluon-plasma physics studies, to continue running with ions at the LHC after the Run-4, i.e., beyond 2030, including light and intermediate-mass ion species, accumulating nucleon-nucleon integrated luminosities in the accessible fb⁻¹ range per month.

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Science Goals

- What new physics signatures can be searched for with heavy ions?
- What new particles can be found (that are less accessible than in pp collisions)?
- Which new exotic phenomena in the Standard Model can be probed?
- Which ion species should be used?
- How can the integrated luminosity in heavy ion runs be optimised?
- How can the experimental triggers be optimised?
- How can one exploit the absence of pile-up in heavy ion collisions?
- Are there well-motivated hardware modifications?
- What are the implications for future colliders?

Community Goals

- Provide a unique opportunity for members of different communities (theorists, experimentalists, and accelerator physicists) who otherwise have no or little exchange with each other to discuss the possibility to search for New Physics in heavy ion collisions
- Discuss a potential dedicated contributed white paper to Snowmass, and how it can be organised. Do we have enough new material?
 Worthful? Interest? If so, deadline: March 2022
 - LOI: https://www.snowmass21.org/docs/files/summaries/EF/SNOWMASS21-EF7_EF8-207.pdf
- https://snowmass21.org/submissions/start#contributed_papers

Meeting agenda: 22 talks (~50/50% TH/EX), 130+ participants



