HELAC-Onia and web generation with NLOAccess

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Quarkonia as tools
Centre Paul Langevin, Aussois
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Outline

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1. Introduction
Introduction

Quarkonia as tools
Introduction

A tool for quarkonia
Introduction - Key concepts
Introduction - Key concepts

Automation
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Virtual Access
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Automation

Virtual Access

User friendliness
2. HELAC-Onia

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- based on off-shell recursion relations
NRQCD factorisation:

\[
\sigma(pp \rightarrow Q + X) = \sum_{i,j,n} \int dx_1 dx_2 f_{i/p}(x_1) f_{j/p}(x_2) \hat{\sigma}(ij \rightarrow Q\bar{Q}[n] + X) \langle O^Q_n \rangle
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- \( \langle O_{n}^{Q} \rangle \) are the LDMEs
HELAC-Onia - Main features

- **Standard Model** calculations but BSM extension is feasible
- different kind of calculation: multiple quarkonia production, event generation, yields vs polarisation, angular distributions of quarkonia decays...
- reweighting method for estimating renormalisation/factorisation scale and PDF uncertainties
- interface with LHAPDF
- interface with PYTHIA 8, QEDPS
3. NLOAccess and HELAC-Onia Web
The NLOAccess project

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  - everyone would be able to evaluate physical observables related to hadron scatterings
  - no need to pre-code
  - test the code
  - any code that could be compiled and launched via bash could be added
  - MADGRAPH and extension for nPDFs to be included
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HELAC-Onia Web

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- note: preliminary!
- built with Flask Python microframework
- file input as first way to launch a job
Automated perturbative NLO calculation with HELAC-Onia Web

Welcome to HELAC-Onia Web!

HELAC-Onia is an automatic matrix element generator for the calculation of the heavy quarkonium helicity amplitudes in the framework of NRQCD factorization. The program is able to calculate helicity amplitudes of multi P-wave quarkonium states production at hadron colliders and electron-positron colliders by including new P-wave off-shell currents. Besides the high efficiencies in computation of multi-leg processes within the Standard Model, HELAC-Onia is also sufficiently numerical stable in dealing with P-wave quarkonia and P-wave color-octet intermediate states.

Already registered to the portal? Please login.

Do you not have an account? Make a registration request.
HELAC-Onia Web - Homepage

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Dear user,

You started the HELAC-Onia WEB profile creation process. To continue, you need to verify that this address is yours. To do so, please click here. Please note that this link will expire in 24 hours.

Best regards,

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The NLOAccess Team

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Dear Carlo,

your account is now active. Welcome to HELAC-Onia WEB!

From now on you can generate processes on the portal and get your results in your OwnCloud folder at this link. The folder is protected with a password, and the password is the same one that you choose during your registration to the website.

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The NLOAccess Team
1. Upload your input file

Choose your file:  Select file

- Input file syntax example (e.g.: gluon gluon \(\rightarrow\) J/\(\Psi\) g at 14 TeV):

  ```
  generate g g \rightarrow c\bar{c}(1S) g
  set energy beam1 = 7.03 #7 TeV beam energy
  set energy beam2 = 7.03 #7 TeV beam energy
  launch
  ```

- Take a look at the syntax for Standard Model particles and for quarkonia in HELAC-Onia.

- Syntax tip: want to generate a quark pair? Don't forget to put a space between both particles: write just e- e- or b- b-.

More examples? See this reference.
HELAC-Onia Web - Generate Process

1. Upload your input file

Choose your file: 

Submit

- Input file syntax example (e.g.: gluon gluon \(\rightarrow\) J/\(\Psi\) g at 14 TeV):

```plaintext
generate g g > c\bar{c}(3S11) g
set energy_beam1 = 7.03 # TeV beam energy
set energy_beam2 = 7.03 # TeV beam energy
launch
```

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- Syntax tip: want to generate a quark pair? Don't forget to put a space between both particles: write just \(c \bar{c} -\) or \(b \bar{b} -\)

More examples? See this reference.
HELAC-Onia Web - Job submission

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Choose your file:

- Input file syntax example (e.g.: gluon gluon → J/ψ g at 14 TeV):

  ```
  generate g g > cc-(3S11) g
  set energy_beam1 = 7.0 D3
  set energy_beam2 = 7.0 D3
  launch
  ```

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- Syntax tip: want to generate a quark pair? Don't forget to put a space between both particles: write just c c~ or b b~

More examples? See this reference.
Dear Carlo,

your latest results are now stored in your OwnCloud folder. You can find them in the subdirectory PROC_HO_140.

Best regards,

--

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HELAC-Onia Web - Job submission
User friendliness is a key concept:

- manage registration and job submission via simple procedures
- protected cloud storage is given
- plots are ready to be seen and downloaded
- no CPU cost for the user, just wait for mail updates and get back the results!
HELAC-Onia Web - The future

- management of user jobs
- live job status not viewable
- online user guide is missing
- new way for launching jobs
- ...

Still a lot of work to do, but we need your feedback!
4. Conclusions
Conclusions

- HELAC-Onia: automated perturbative calculation for quarkonia production
- HELAC-Onia Web: new - preliminary - portal is online
- NLOAccess:
  - aim to create a single portal for hadronic physics
  - automation and virtual access to a dynamical library
Thank you
Backup
References

- **HELAC-Onia:**
  - download at http://hshao.web.cern.ch/hshao/helaconia.html

- **NLOAccess:** https://nloaccess.in2p3.fr

- **Flask:** http://flask.pocoo.org/