Annual Meeting 2024

VA1-NLOAccess, J.P. LANSBERG (CNRS)

Context

- Since the beginning of the first extension (June 2022), **no more STRONG-2020 funds for HR for NLOAccess**
- We managed to **recycle some unused travel money** because of Covid to hire *C. Flore* again for 2 months before his new postdoctoral contract in *Cagliari U*. with *C. Pisano.*
- *C. Flore* and *O. Mattelaer* (UCLouvain) continue to work on the VA as a **service to the community**
- In addition, one PhD student from IJCLab in Co-PhD with *Groningen U.* (*J. Bor*) contributes to it 1/6 of his time until the end of 2024
- All efforts are dedicated to website/database **maintenance** and **communication/dissemination actions**
- In parallel, **3 ongoing PhDs** (*WUT, D. Kikola*) on Madgraph5 are expected to have outcomes for the VA within one year (See talk of *L. Manna* this week)

- **Additional funds** received in May to support the visit of collaborators and organise a workshop in ECT* in July on the synergies between EIC and LHC for quarkonium physics (emphasis of the computational needs): (https://indico.ectstar.eu/e/EIC-LHC-Quarkonium-Synergies-2024)

NLOAccess

- Installation of dedicated servers and hard disks

- Creation of user and job databases, a queue system handling user requests, a file-storage cloud server

- NLOAccess **website** (https://nloaccess.in2p3.fr):
    - 2-step **registration**, creation of a cloud folder; system-wide password protection
    - Run-status **management**. Run history
    - Possibility to delete the account

So far access to **2 multi-purpose codes** :

- **HELAC-Onia Web** (https://nloaccess.in2p3.fr/HO/):
    - Remote computation of quarkonia-related observables via graphical user interface or via file upload;
    - Plot creation. Various output-file generation

- **MG5aMC@NLO** (MG5) (https://nloaccess.in2p3.fr/MG5/):
    - Code generation for any (B)SM process up to NLO
    - Code-process database; user cards uploadable
    - Plot creation. Various output-file generation. Interface to external codes (e.g. PYTHIA)

- Repository for a selection of LHAPDF grids

- 378 new users, 1611 new runs :
  For the RP3 period only (01/06/2022 to 31/07/2024):

  NLOAccess users (as of 13/06/24)
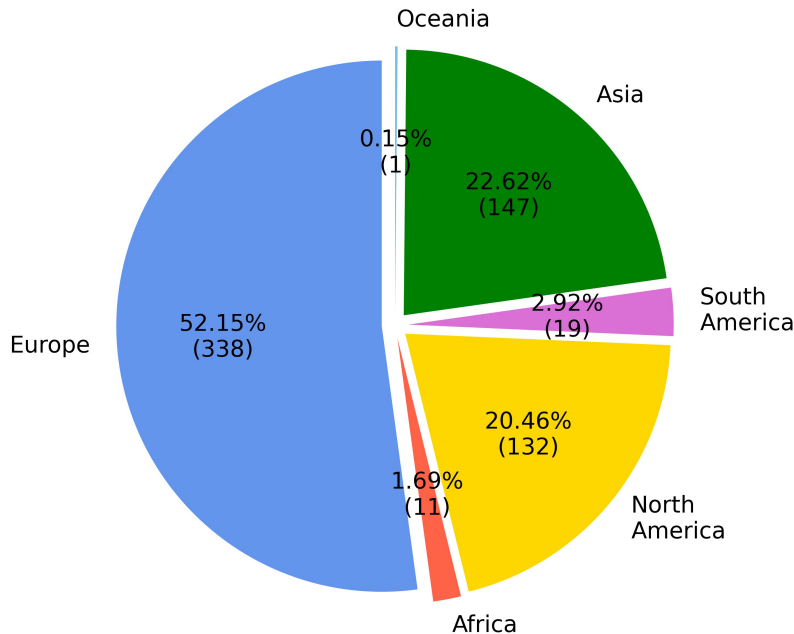
- e-infrastracture service provided:

  - **Common services**: data generation (cross section computation) & storage of the generated data;

  - **Thematic services**: access to self-generated codes based on the user request.

- More 5000 runs (30% just for RP3)

- A community of 650 users ! (~50 % new users just for RP3)

Progress achieved by the WP during the last year (since november 2023)

- 1 **paper** in EPJC on the solution to perturbative instabilites of NLO quarkonium photoproduction computation → consider inclusion of an adapted code

- 2 **proceedings** for EPS-HEP 2023

- A **dozen of talks** given since 11/2023 : DIS 2024, QCD Evolution, QWG 2024, ...

- Organisation of **2 international workshops** :

  - *Quarkonia as Tools 2024*, Jan 2024, Aussois, France

  - *Synergies between LHC and EIC for quarkonium physics*, July 2024, ECT*, Italy

- Several papers being drafted

Check update

Special Article - New Tools and Techniques

NLOAccess: automated online computations for collider physics

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STRONG-2020

MG5 standard version based on **symmetric** hadronic collisions (enough for the pp and "PbPb" @ LHC)

$$\sigma_{AA\to X} = \sum_{i,j} \int dx_i dx_j f_i^A(x_i, \mu_F; \text{LHAID}) f_j^A(x_j, \mu_F; \text{LHAID}) \hat{\sigma}_{ab\to X}(x_i, x_j, \mu_F, \mu_R)$$

Extension to direct **photoproduction** (L. Manna) (needed for EIC, LHeC, FCC-eh and UPC @ LHC)

$$\sigma_{eh\to X} = \sum_{j} \int dx_\gamma dx_j f_\gamma^e(x_\gamma, Q_{\max}^2) f_j^h(x_j, \mu_F; \text{LHAID}) \hat{\sigma}_{\gamma j\to X}(x_\gamma, x_j, \mu_F, \mu_R)$$

Extension to **asymmetric** hadronic collisions (A. Safronov) (needed for pPb, PbXe @ LHC & πA @ AMBER, resolved-photon)

$$\sigma_{AB\to X} = \sum_{i,j} \int dx_i dx_j f_i^A(x_i, \mu_F; \text{LHAID1}) f_j^B(x_j, \mu_F; \text{LHAID2}) \hat{\sigma}_{ab\to X}(x_i, x_j, \mu_F, \mu_R)$$

Tasks and achievements beyond the initial Work Program
Tasks which could not be carried out

- **More users** than foreseen

- Online version of MG5 also includes **BSM** capabilities

- A very large number of **talks** given to advert the VA and its capabilities

- **3 PhDs** on the VAs with external funding

- No interface yet with the GRID : lack of HR and not yet needed

- LO MG5 version for **quarkonium** production soon ready (A. Colpani-Serri, C. Flett, L. Simon)

- **NLO** MG5 version for quarkonium production still requires some effort

- Plans for LO MG5 version for **TMD factorisation** (A. Colpani-Serri, C. Flore, C. Flett)

- Plans for **2-3 publications in 2024**

- Effectively **enlarged consortium** beyond IJCLab & UCLouvain with **WUT** and **Cagliari U.**

- **Ready for the post-Strong2020 era**