

Theory inputs to analysis

Photon-induced Workshop IPPP Durham •
05.06.2023



Welcome to Durham

- Second workshop on photon-induced processes:
 - November 2022: <https://conference.ippp.dur.ac.uk/event/1143/>
(more experimental focus)
- Today:
 - <https://conference.ippp.dur.ac.uk/event/1193/>
 - Focus more explicitly on tools and tuning of generators
 - How to get the best description/working setup for experiments
(→ in particular needed for unfolding)

Overview over the workshop

General idea

List of topics:

- Interface with Parton Shower

Interfacing photon-induced generators with Pythia is currently done through a set of parameters developed by generator authors and is available only for Pythia. Especially in the case of diffractive events, the way it's done tends to be rather "ad-hoc" and very sensitive to Pythia variations version by version. In practice we also found the final state observables can be very sensitive to the tuning of these parameters (more on this in the tuning topic below).

We would like to explore a robust way to interface photon-induced generators with parton shower programs, building upon the experience we had so far. What is needed from the generator side and what methods the interface with parton shower can offer (e.g. parameters tuning vs user-hooks, etc ...).

- Experimental context

Historically, most of the attention has been given (both from the theory as well as experimental side) to photon-induced processes where the final state protons are detected by dedicated forward detectors. We'd like to summarize the state-of-art techniques for identifying photon-induced processes in p-p collisions using the central-detector information, summarizing and brainstorming about advantages, limitations and complementarity with the more traditional identification of forward protons.

- Custom yy-generators (LPair, gamma-UPC, SuperChic, MadGraph, Pythia, Sherpa)

The current implementation of specific photon-photon generators into a complete set of tools usable by large experiments require custom patches to the code to be applied and, from our experience, has been fragile with respect to changes of versions. Identifying potential developments to address the stability and generality of these programs can ensure the long-term sustainability and larger-base adoption of this interesting physics.

- Tuning

Modelling of diffractive processes is certainly a non-trivial task. While historically a lot of attention has been given to the elastic contribution of photon-induced processes, we'd like to focus on a more inclusive approach and brainstorm of what data is available and what measurements can be done to improve our understanding of the non-elastic component of photon-induced processes.

- Miscellaneous

Other topics could be potentially very interesting, but we have omitted to keep the workshop more focused. These included extending the discussion to synergies with forward detectors, as well as in heavy ion collisions, photon PDFs, leptons in PDFs, etc.. However, we're still very open to suggestions of topics that you think might fit well within the scope of this workshop and/or are high-priority for the field.

Overview over the workshop

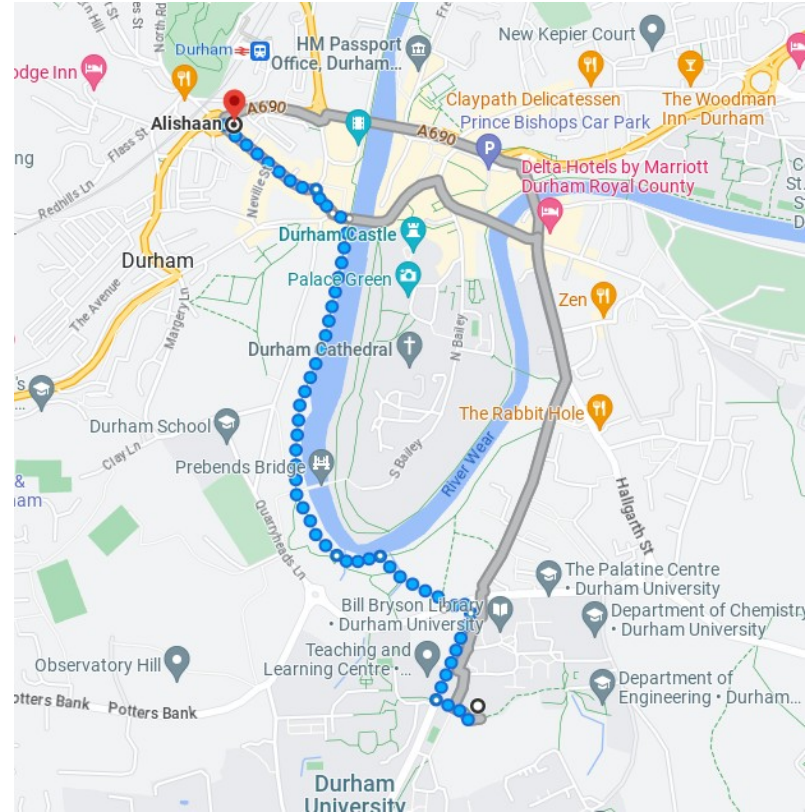
- Start off with a recap of the experimental context, then overview over generators:
 - Pythia
 - Sherpa
 - Herwig
 - Superchic
 - CapGen
 - gamma-UPS

Hands-on sessions

- Hands-on Sessions (Hands-on: Primary focus Parton Shower Interface)
 - Planning and Hackathon-style work on specific topics
 - Guided discussion on tuning
 - Works by using DOCKER containers → can get started straightaway
 - Scope to explore

Workshop dinner: Tuesday 6th (tomorrow)

- 7 pm
- Alishaan (Indian)
- <https://www.alishaandurham.com/>



Thank you!

