

QCD at short distances: experiment, theory and tools

Conveners: J.P. Lansberg, L. Massacrier, E. Re

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Who are we?

- **Jean-Philippe Lansberg** (IJCLab -Orsay):
 - Theorist
 - Quarkonium production: QCD corrections & pheno
 - Fixed-target programme at the LHC: physics case & pheno
 - + TMD factorisation, DPS, nuclear PDFs, GPDs ...
- **Laure Massacrier** (IJCLab - Orsay):
 - Experimentalist in the ALICE collaboration (also former member of LHCb)
 - Quarkonium production in all systems (pp, pPb, PbPb UPC) and QGP physics
 - Fixed-target programme at the LHC: physics performance, implementation
- **Emanuele Re** (LAPTH - Annecy):
 - Theorist
 - Monte Carlo generators (POWHEG)
 - Resummation
 - + LHC Phenomenology (Higgs physics, ...)

QCD at short distances: evolution of the WG

- **Until now** the WG focused on **jets** and **quarkonia**
- Strengthen the focus on **perturbative** QCD
- Aim to widen the scope to include intrinsic aspects to **pQCD techniques and tools** w/o restricting to a specific set of observables:
 - Computations with **multi loop** corrections
 - Inclusion of effect at **all orders (resummation)**
 - **Automation** of such computations
 - Merging and matching techniques to **interface** them to **event generators**
 - Definition of **new experimental observables**
- Build a **community** following the example of the lattice QCD community
- Keep the specificity of a strong implication of the **heavy-ion community**
- **New opportunities** of collaboration between theorists working on pQCD at colliders and LHC & EIC experimentalists

QCD at short distances: building a wishlist

- Started to contact individuals from the WG to build a wishlist from experimentalists regarding the work to be conducted inside the GDR WG
- This inventory work will be consolidated during the first kick-off meeting of the WG
- Similar work need to be conducted from the theory side
- Please contact us if you have suggestions
- Already Contacts from : CMS (jets, quarkonia, others?), ATLAS (Higgs, W/Z, Top, jets, others?), ALICE (quarkonia, W, Z, others?), LHCb (quarkonia, others?)
- Still looking for contacts from LHCb (W/Z) and EIC

Main objectives of the WG

- Bring closer the theorists working on pQCD (we are not that many, it'd be nice to explore areas where there's an overlap):
 - quarkonium \leftrightarrow resummation / event generators
 - amplitudes \leftrightarrow multiloop computations \leftrightarrow pheno predictions
 - boundary pQCD / non-perturbative effects / TMD
 - common numerical/algorithmical challenges
 - HI \leftrightarrow TH (e.g. jet substructure, quarkonium flow at high p_T ...)
- Foster TH-EXP contacts among people working on predictions and measurements where pQCD is particularly relevant.

Events planned in 2021

What ?

- Kick-off meeting: review the state of the art, identify the main common interests of the French community
- 2-3 day meeting about the computing tools and platforms:
 - POWHEG (E. Re); HELAC-Onia (H.S. Shao), MadGraph, ...
 - NLOAccess (J.P. Lansberg); PARTONS (H. Moutarde), ...
 - Collect the wishes/ideas/needs from experimentalists and theorists

→ Might be coupled into a single event

When ?

- Initial plan at CERN in June co-funded by STRONG-2020:
 - unlikely given the sanitary situation
- Alternative(s) :
 - Short workshop at IJCLab (May 30 - June 2) [or at LAPP/LAPTH]
 - Merge with Quarkonium as Tools in Aussois (June 20)
 - later in the year in Annecy

Thank you for your attention!

...and do not hesitate to contact us!

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