MCnetITN3

Overview, focussing on changes relative to MCnetITN

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MCnetITN3

- Funded for four years
  - April 1st 2017 – March 31st 2021
- 540 student months
  - 11 x 36-month PhDs (vs 6PhDs + 8RAs)
  - 144 short-term student-months (vs 142)
- €972,000 research, training & networking
  - 4 schools (+ 2 overseas)
  - 8 meetings
  - 4 training events
  - Training + travel + visitors + secondments

Main Changes

– CERN as Beneficiary

\+ Glasgow as Beneficiary (short-terms)

\+ CERN, Heidelberg, Monash, SLAC as Academic Partners

+ Fermilab?

\+ B12 as Non-Academic Partner

+ (in addition to blue yonder, d-fine, IBA)

Secondments

- No non-academic short-term students
- Non-academic secondment of long-term students instead
  - 11 students, normally 3 months in their second year (September 2018–August 2019)
- Academic secondment of long-term students
  - 11 students, normally 9 months in their third year (September 2019–August 2020)
  - including to Monash & SLAC (non-EU)

Future Directions

- The individual projects have clearly-defined priorities and plans
- Common themes
  - Further precision (NNLO inclusive, NLO multi-jet)
  - Quantification of precision
  - EW corrections / multi-EW boson emission
  - further improvements to BSM simulation
- Opportunities for inter-project collaboration…

Inter-project projects

Validation and tuning against LHC data: This is often done either by experiments tuning to their data alone, or by the generator collaborations alone, but great value would be added by a co-ordinated approach, to allow much clearer generator comparisons and a better quantification of the resulting uncertainties. This inter-project task will lead to an article to be submitted for publication reviewing the models and the description of data. Members of the CEDAR, Herwig, Pythia and Sherpa projects will all contribute.

Heavy quarks and resonances in matching and merging: Events involving heavy quarks are very important at the LHC, not least for Higgs analyses. The handling of such events in NLO matching and merging procedures is non-trivial and needs to be validated for consistency. This applies to bottom quarks and, particularly, top quarks, which are fairly broad resonances. This introduces additional complications for the matching. Members of the Herwig, Pythia, Sherpa, Madgraph and Plugin projects will contribute.

Matching of loop-induced processes: One of the most important processes at the LHC is gluon pair fusion into Higgs, which to leading order involves a top quark loop. At NLO there are additional loops, and current NLO matching and merging schemes need to be supplemented to handle these processes which are formally NNLO. Members of the Herwig, Pythia, Sherpa and Madgraph projects will contribute.

Electroweak corrections: The combination of electroweak and QCD corrections is becoming increasingly important at the LHC. These have been included in fixed order matrix elements in Herwig and Sherpa, automatically in Madgraph, and in the shower in Pythia, but a proper matching procedure is not yet available. Members of the Herwig, Pythia, Sherpa and Madgraph projects will contribute.

Inter-project projects

Online Interactive Tutorial System: For our Annual Schools we have developed a set of interactive tutorials that lead students from the basics of running each generator through to advanced physics topics and detailed comparisons between generators. We will implement this as an online interactive system, dynamically linked with the online interactive review we are developing in the current network, as a lasting output of our training programme.

Visualisation of Particle Collisions: As a major part of our outreach strategy, members of all projects will contribute to the development of tools to better visualize the physics of proton–proton collisions, both to help experimental analyses and as a language for explaining our field to the wider public.

Deliverables

Table 3.1b: Deliverables List

Deliverable Number	Deliverable Title	WP No.	Lead Beneficiary Short Name	Type	Dissemination Level	Due Date
Scientific Deliverables						
D7	Online interactive tutorials	11	UMAN	R	PU	M48

Future Directions

- Google doc