Career Development Plan - Year 1

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Name of Supervisor: Karl Jakobs
Date: 10/12/2014

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED (half page should be sufficient)

The overall goal of the project is the investigation of vector-boson scattering with pp-collision data of the ATLAS experiment at a centre-of-mass energy of $\sqrt{s}$ = 13 TeV. The WW scattering cross section should be measured and compared to theoretical predictions within the Standard Model and a first assessment of the quartic gauge couplings should be made.
To achieve this goal, an optimal analysis strategy should be developed during the first year. As a starting point for this, the analysis carried out within the ATLAS collaboration based on the data collected at $\sqrt{s}$ = 8 TeV can be used. The analysis should be optimized for the different signal-to-background conditions with the new data and data-driven background estimation techniques should be developed. It is foreseen to base the analysis on final states with like-sign leptons (e and μ). Therefore the lepton identification and in particular the charge mis-identification is a key issue. In order to address this important issue, it is foreseen that the candidate works during the first phase of the new data taking on the measurement of the electron reconstruction efficiencies and on the determination of the charge misidentification probability as a function of the transverse momentum (p_T) and pseudorapitidy (η) of the lepton. This work will be carried out in collaboration with the so-called combined-performance working group of the ATLAS collaboration.
Various Monte Carlo generators will be used for background estimates and for the estimation of systematic uncertainties. Among them, the SHERPA generator plays a key role, given the collaboration with Prof. Frank Krauss (Durham). Visits at IPPP Durham are planned with the goal to maximise the output and to intensify the collaboration. Short term stays at CERN are also foreseen.
Depending on the progress of the project and on estimates of signal-to-background conditions, different final states might be investigated in the second half of the project to enhance the statistical significance of the WW cross section measurement and to tighten constraints on quartic gauge couplings.

LONG –TERM CAREER OBJECTIVES (over 5 years):

1. *Goals*:

   - ✓ Successful completion of thesis and defence in 2018 leading to award of PhD
   - ✓ Original research leading to publications in high impact peer reviewed journals
   - ✓ Presentation of research at conferences/workshops in the field to gain exposure to the community
   - ✓ First Post-Doctoral research position

2. *What further research activity or other training is needed to attain these goals?*

   - ✓ Presentation skills.
   - ✓ Networking and communication skills.
   - ✓ Training in writing research papers.
   - ✓ Training in writing applications for scientific positions/research grants.
   - ✓ Secondment to Durham to benefit from research experience of co-workers based there.
   - ✓ Secondment to Private Sector Partner to learn about research in a commercial environment.
   - ✓ Learning how to effectively communicate with scientists who are using different methods to explore the same physics – specifically theoretical particle physicists.

SHORT-TERM OBJECTIVES (1-2 years):

1. *Research results*:

   - *Anticipated publications:*
     - ✓ Presentation of preliminary results at Summer conferences in 2016
     - ✓ Publication on electron performance towards end of 2016
     - ✓ Final journal publication of the WW scattering cross-section measurement in 2018.
   - *Anticipated conference, workshop attendance, courses, and/or seminar presentations:*
     - ✓ Attending all HiggsTools meetings – Young Researcher meetings, Annual Meetings, Annual Schools, etc
     - ✓ Attending major conferences in related areas for example "Large Hadron Collider Physics" conference in 2016, a workshop in 2017 as well as meetings related to Higgs boson and WW scattering, such as "Higgs Couplings" 2015.
     - ✓ Presentation of work at HiggsTools Annual Meetings and Young Researcher Meetings. Giving Seminars within Freiburg, Durham and at other nodes of the network.

2. *Research Skills and techniques:*

   - *Training in specific new areas, or technical expertise etc.:*
     - ✓ Further training in statistical analyses methods.
     - ✓ Further training on Monte Carlo generators and on the application of theory to experiment.

3. *Research management:*

   - *Fellowship or other funding applications planned (indicate name of award if known; include fellowships with entire funding periods, grants written/applied for/received, professional society presentation awards or travel awards, etc.)*

     ✓ Aim is to make application for a CERN fellowship or a EU Marie Skłodowska-Curie Fellowship in 2018.

4. *Communication skills:*

   see above

5. *Other professional training (course work, teaching activity)*

   ✓ Possibly training in teaching and assessing undergraduate students. Useful for a longer term career in academia, and also for improving presentation skills.

6. *Anticipated networking opportunities*

   ✓ Looking forward to networking with the other ESRs within the network and building up support structures that will help the research activity.

7. *Other activities (community, etc.) with professional relevance:*

   ✓ Training in how to communicate science effectively to young people in order to share the excitement of particle physics and inspire them to study science.

Date & Signature of ESR: 10.12.2017 Julia Gonski

Date Signature of Supervisor: 10.12.17 K. Zając