

Career Development Plan – Year 1

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Name of Supervisor: Pawel Bruckman de Renstrom

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In accordance with the main goal of Initial Training Network, I will concentrate on the development of high-precision predictions for Higgs physics, including signal, background and their interference in Standard Model-like Higgs scenarios and also in beyond standard electroweak symmetry breaking scenarios, therefore my research work during the next year will be primarily focused on the following main topics:

- I. Study of TauSpinner algorithm in order to develop high precision prediction for Higgs physics in $2 \rightarrow 2$ processes.
- II. Installation and validation of TauSpinner algorithm including $2 \rightarrow 4$ processes in the framework of the ATLAS experiment. Using TauSpinner algorithm including $2 \rightarrow 4$ processes for validation of TauSpinner algorithm including $2 \rightarrow 2$ processes.
- III. Precision calculation for vector boson scattering in order to construct the observables and testing the observables with TauSpinner algorithm
- IV. Optimisation of observables for vector boson scattering processes in ATLAS experiment
- V. Evaluation of necessity of TauSpinner including $2 \rightarrow 3$ process, development of such algorithm if needed.
- VI. Optimisation of selection of the charged Higgs signal in its decays to tau leptons
- VII. Background estimation for the charged Higgs search in ATLAS.

LONG –TERM CAREER OBJECTIVES (over 5 years):

- I. Successful completion of thesis and defence in 2019 leading to award PhD.
- II. Original research leading to publication in high-impact peer review journals.
- III. Presentation of research at conferences/workshops in the field to gain exposure in the community.
- IV. Continuing research in the field with a post-doctoral position.

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

- I. Full-blown participation in ATLAS data analysis searching for extended Higgs sector.
- II. Secondment to CERN(Geneva) for training on experimental aspects and benefits from research experience of co-workers.
- III. Secondment to one of Private Sector Partner to gain insight and inspiration from a commercial environment.

- IV. Secondment to Warsaw University to study the theoretical aspects of the research.
- V. TauSpinner training with Richter-Was at Jagiellonian University.

SHORT-TERM OBJECTIVES (1-2 years):

1. Research results

- Anticipated publications:

- I. The earliest publication should be the result for the TauSpinner related work.
- II. The next publication will be the result for the experimental work on the BSM Higgs search in ATLAS (subject to ATLAS authorship qualification).

- Anticipated conference, workshop attendance, courses, and/or seminar presentations:

- I. Attending all HiggsTools meeting , Young Researcher meeting, Annual meeting, Annual school, etc.
- II. Presentation at TauSpinner work at Cracow Epiphany conference 2016.
- III. Attending the Zakopane school of theoretical physics at 2016.
- IV. Presentation of work at HiggsTools annual meeting and Young researcher meeting.
- V. Giving seminars within Cracow and at the other nodes of the network.

2. Research Skills and techniques:

- Training in specific new areas, or technical expertise etc.:

- I. Training on theoretical aspect and tools during the planned secondment in Warsaw University
- II. Training on experimental software tools used for simulation and data analysis both in Cracow and during planned secondment at CERN.

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.)

- I. Application for the stipend from the international PhD studies at institute of Nuclear Physics for the period after the end of HiggsTools funding.
- II. Participation in future research grants.

4. Other professional training (course work, teaching activity)

- I. Further training in computational methods.
- II. Training in writing scientific paper and book.

5. Anticipated networking opportunities: (Anticipated collaborations)

I. With members of Jagiellonian University in Cracow in the field of computer science to further development of TauSpinner algorithm.

II. With research group in Warsaw for theoretical aspects involved in VBF processes to be included in TauSpinner code.

Date & Signature of ESR: 15/10, 2015 *Maryzesh Bahmani*

Date Signature of Supervisor: 15/10/2015 *[Signature]*