HIGGSTOOLS MIDTERM REVIEW

Tim Wolf - Nikhef

OUTLINE

- about me
- me inside HiggsTools / context
- research
- training and talks
- besides the PhD
- plans and outlook

ABOUT ME

- Bachelor: Heidelberg University (2011), theoretical work on neutrino masses

- Master: Heidelberg University (2014), thesis: "Standard Model Vacuum Stability and some Implications for Higgs Inflation"

- Université Paris XI (2011-2012)

- PhD: (2014 - ongoing) at Nikhef Amsterdam, member of HiggsTools

ME INSIDE HIGGSTOOLS

Task 1.4: Future European strategy for particle physics

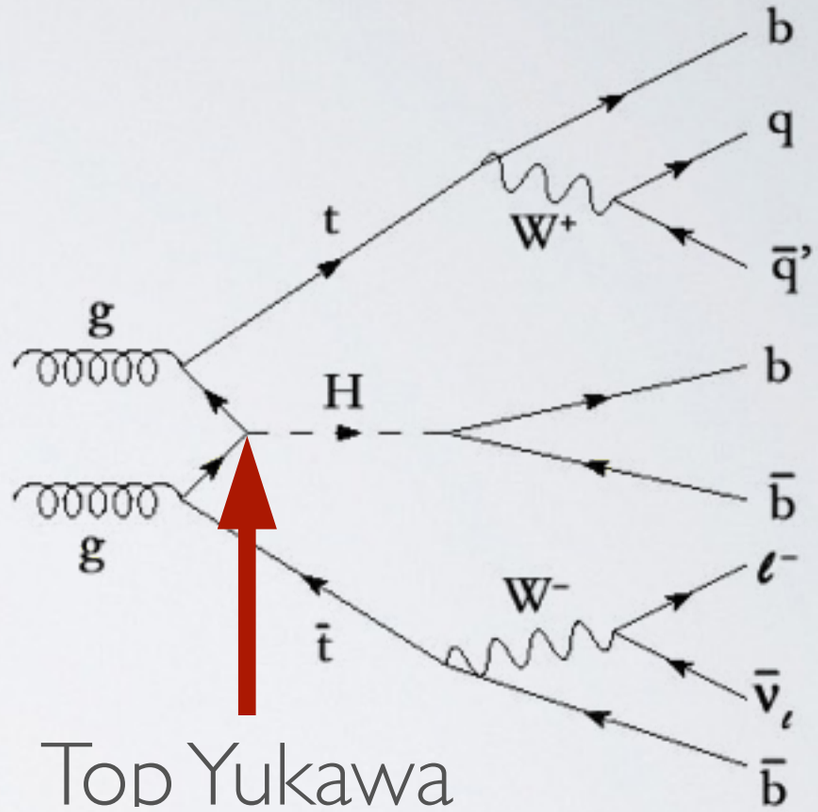
- M1.2.1 Extraction of constraints on Higgs couplings from fits to all available data, discussion of model dependence
- M1.4.1 Review of the current state and future directions in Higgs boson physics

Task 2.1: Improved predictions for Standard Model-like Higgs scenarios

- M2.1.1 Specialised codes for the SM-like Higgs boson scenario
- M2.3.1 Validation of key Higgs background processes and evaluation of uncertainties derived from extrapolating them to signal regions

CONTEXT

- Why is this interesting? - Top-Yukawa coupling determines stability of the vacuum in the Standard Model



Top Yukawa

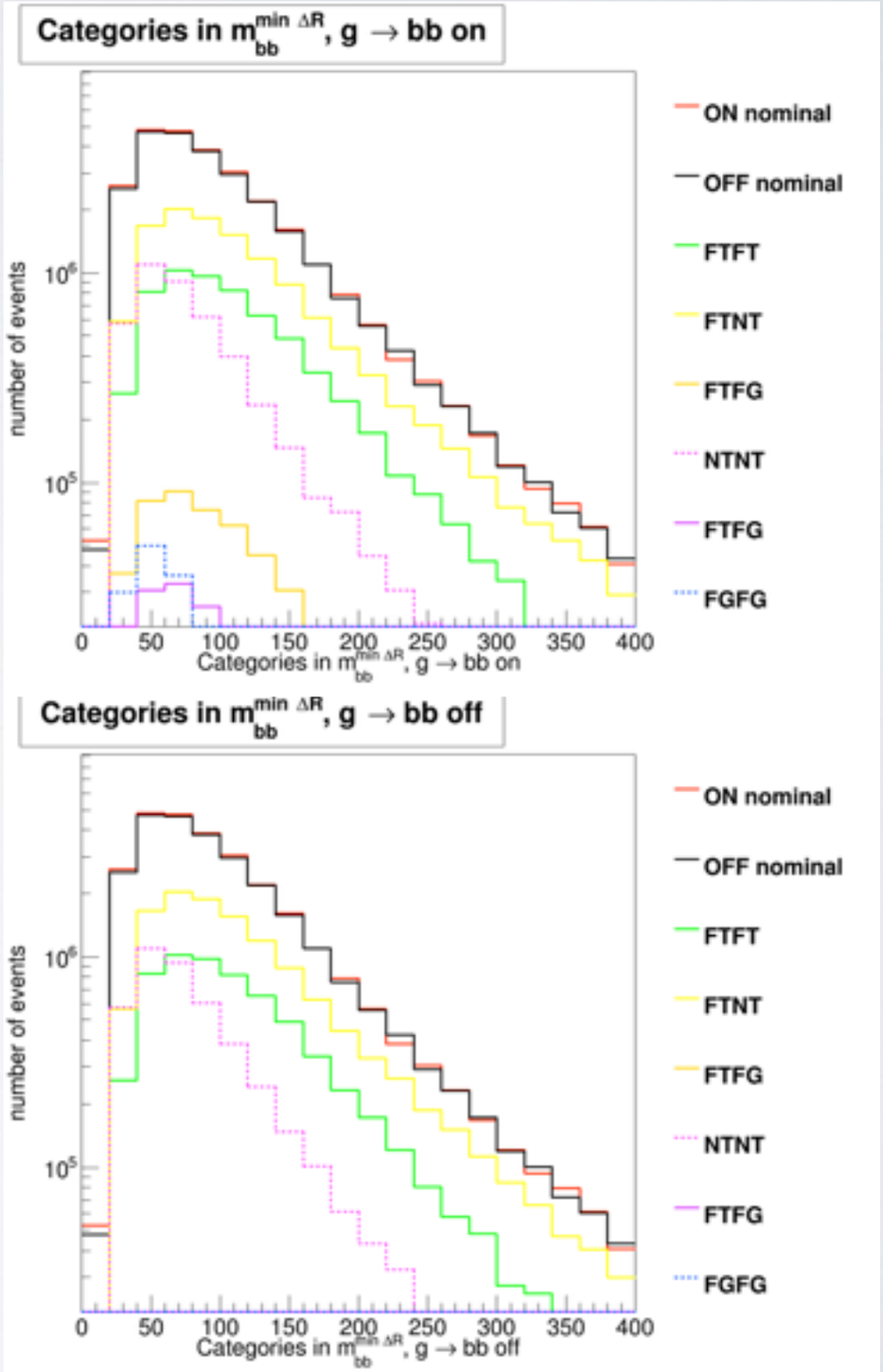
- Most important background:
  ttbb - final state which could fake the signal

- very challenging final state with up to 8 jets in the final state

- good handle on tagging of b-jets is crucial to be able to observe this process

RESEARCH

- simulation of ttbb (ttH(bb) - background) and study impact of gluon-splitting
- tools used: aMC@NLO and Pythia8
- the better one understands the details related to the background of the process the more precise one can assess the uncertainties
- aim: estimate and understand uncertainties related to the background
- status reports in HiggsCoffee meeting at Nikhef



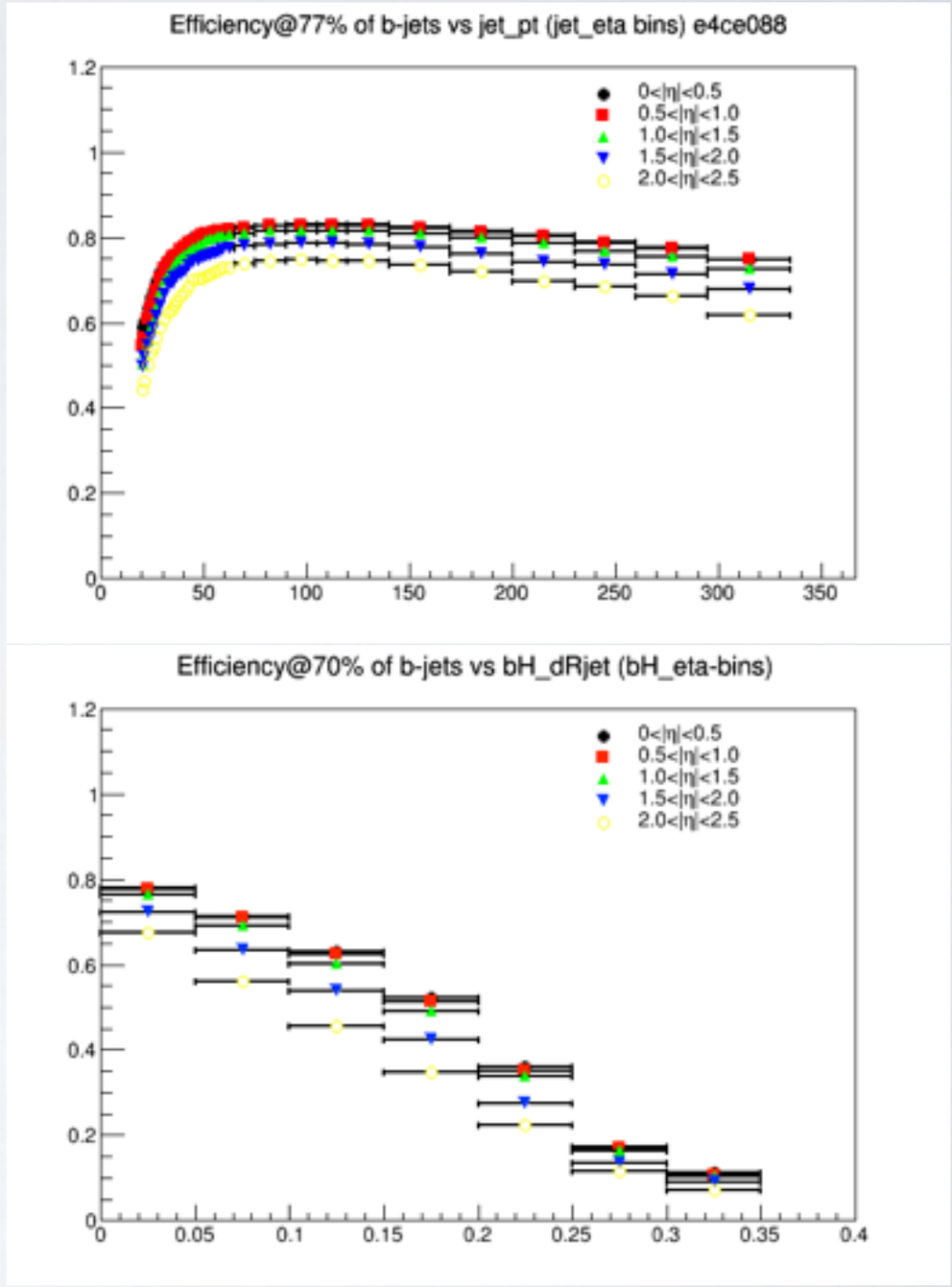
RESEARCH

- authorship qualification as an Atlas author: study of efficiency maps to analyse the dependencies of b-tagging

- important input for several tools which are applied throughout the analysis

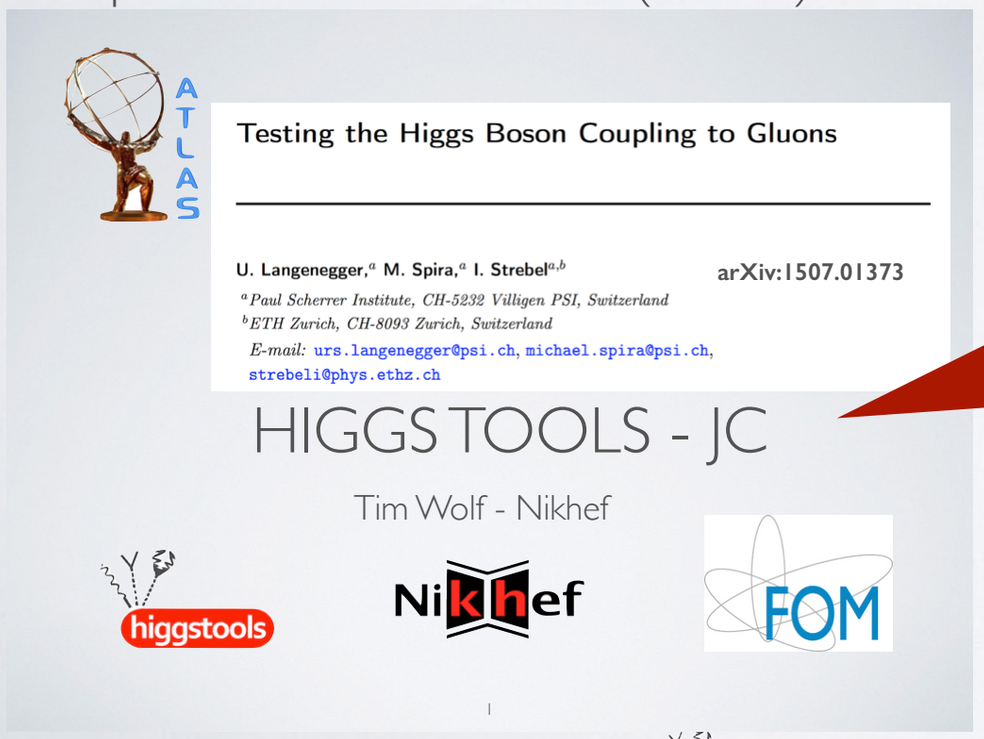
- good handle on efficiency maps enables one to gain higher precision

- status reports in flavor-tagging weekly meeting at CERN (authorship qualification)



TRAINING AND TALKS

- C++-course at Nikhef
- taking charge of you PhD-coure (FOM)
- saving time by writing better code (FOM)
- software tutorial at CERN
- Atlas outing Nikhef
- topical lectures at Nikhef (3 total)



- First HiggsTools Young Researchers Meeting (YRM) (Durham, UK, 2015)
- First HiggsTools Annual Meeting (Freiburg, DE, 2015)
- Second HiggsTools YRM (Brussels, BE, 2015)
- First HiggsTools Summer School (Pre Saint-Didier, IT, 2015)
- Talk in HiggsTools Journal Club
- Talk in HiggsCoffee meeting (Nikhef)
- Talks in flavour-tagging weekly (CERN)

HARD TECHNICAL POINTS AND POSSIBLE STRATEGIES TO CIRCUMVENT THEM

authorship qualification:

- currently analysing different samples from the same generators
- unexpected behaviour of the efficiency curves
- unknown if that is due to not understood physics or due to wrong technical setup
- foreseen end of the qualification November 2015

LHC data-taking:

- run-II has been started and data-taking is ongoing
- more data is needed to carry out the analysis we plan to do
- in the light of run I and the good performance there we do not expect major problems with the machine
- MC-studies carried out are independent of that

BESIDES THE PHD

- secondment at Shell (Rijswijk):
  - estimation of computing time of simulations which aim to search for oil or gas
  - application of computing skills which I have already acquired during my PhD
  - experience that there is a world outside of academia which needs/wants our skills
- outreach:
  - production of a movie at the First HiggsTools Young Researchers Meeting in Lumely castle

PLANS - MIDTERM

- Oct.-Dec. 2015 secondment at Shell (private sector secondment)
- Jan.-Feb. 2016 preparation of the secondment at CERN, writing up the results obtained so far
- Mar. 2016 start of the secondment at CERN (scientific secondment)
- contribution to the analysis of ttH(bb)
- continuation of the work related with efficiency studies in b-tagging
- end of contract Aug. 2018
- PhD defense within that time-frame

THE FUTURE AND BEYOND

- Nikhef is a well-recognised institution inside Atlas and a driving force in particle physics on a theoretical and experimental level
- a PhD from Nikhef together with the Network activity within HiggsTools is definitely going to make a future career in science easier
- plan A:
  - career in science, i.e. permanent position at CERN or some other place with regular visits at CERN
- plan B:
  - career in science where computing is important (i.e. medical physics)
  - career in industry (secondment is an excellent opportunity to see how this might be)