Status and Future plans within WP1 and WP2

FP7-EEPN2 Meeting

30-7-2014

Ahmed Abdelalim

on behalf Helwan Uni. and Zewail City groups

outlook

- Heavy Neutrino and Z' (B-L) phenomenology studies.
- Measuring the muon efficiencies (data/MC- Scale factors) using TnP with W events.
- H -> ZZ* -> 4 lepton analysis
- Mu* analysis (two channels: mu+mu* -> mu mu gamma, and mu+mu*-> mu mu Z -> 4 mu)
- Higgs differential cross-section H->ZZ*-> 4 lepton
- Z' -> mu mu analysis.

- Proposal for Semiconductor detector lab. at Zewail City
- Delphes very fast simulation studies for Muon System high Eta region.

Heavy Neutrino and Z' (B-L) phenomenology

Ahmed Ali Abdelalim, Ahmed Hammad, Shabaan Khalil http://arxiv.org/abs/1405.7550

In this paper we studied the possible signatures at LHC of the heavy neutrinos and neutral gauge bosons Z' in a TeV scale B-L extension of the SM. We showed that because of the new decay channels of Z' into heavy and/or inert neutrinos current bounds on Z' mass can be relaxed. We analyzed several signatures in detail:

- $4\,l + 2\,\upsilon_l$
- $4\,j + 2\,l$
- $3\,l + 2\,j + \upsilon_l$

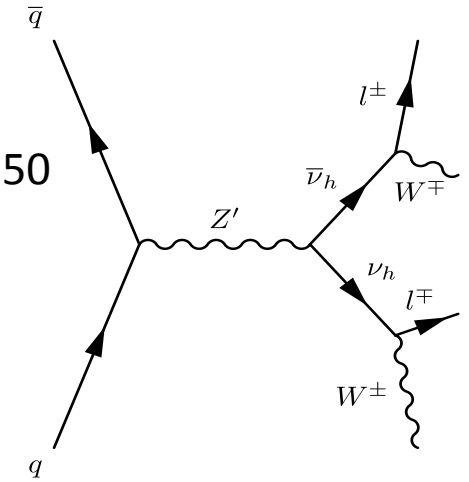
We showed that the most promising channel is $4\,l + 2\,\upsilon_l$.

A comparison with the proper SM background. Moreover a comparison with the SSM were also done.

Acknowledgments

http://arxiv.org/abs/1405.7550

This work was partially supported by ICTP grant AC-80. The work of A. A. Abdelalim was supported by EENP2 FP7-PEOPLE-2012-IRSES grant. We would like also to acknowledge Florian Staub for the useful discussion.



Tag and Probe with W events

Asmaa Hassan, Ahmed Ali Abdelalim, Nicola De Filipes

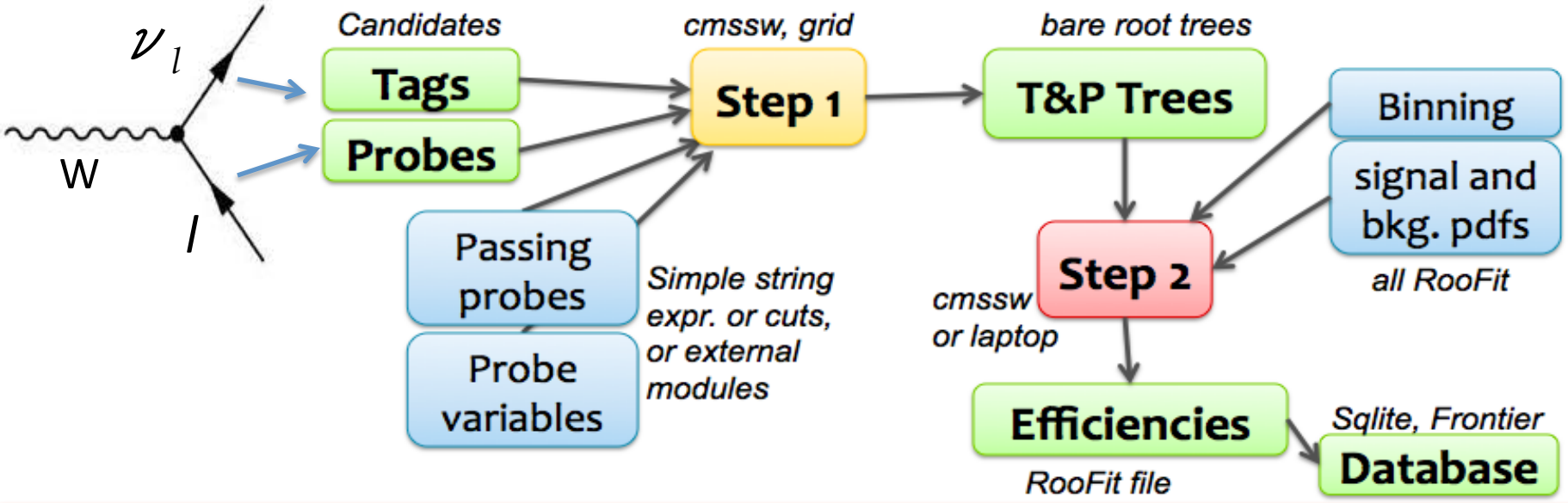
TnP:

- is: a data driven method to calculate efficiency of identification, isolation or trigger.
- needs: a mass resonance (J/psi, upsilon or Z already used by the current package).
- Tag has very tight selection criteria hence a very low fake rate (lepton if one used dilepton mass resonance, MET in our case).
- Probe has looser criteria (lepton).
- Passing Probe has tighter criteria than the probe, but not tighter than the Tag.

Tag and Probe with W events

Asmaa Hassan, Ahmed Ali Abdelalim, Nicola De Filipes

Tag and Probe Workflow



TnP is done in two steps

- **make TnP trees combining tags and probes into TnP pairs.**
- **analyze TnP trees defining the binnings, and num and denom definitions, then make the efficiency plots.**

Need Corrected and Clean MET (see Asmaa's Talk)

Higgs -> ZZ*-> 4 l

Nicola De Filipes, Reham Aly

Reproduce limits for SM Higgs and do the same for the high mass Higgs

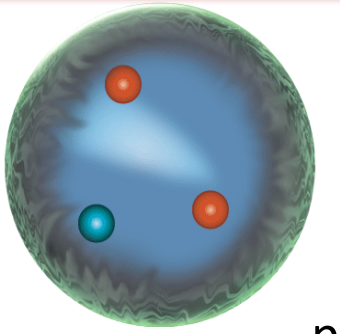
See Reham's talk

Mu* analysis

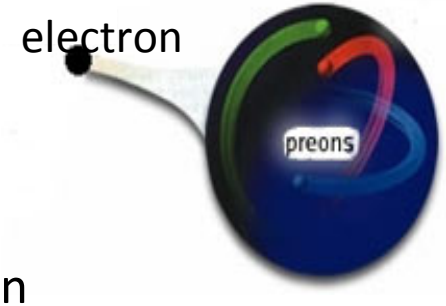
Waleed Ahmed, Walaa Elmetenawee, Amr Mohammed, Ahmed Ali Abdelalim

Compositeness model: leptons and quarks are agglomeration of smaller constituents called preons. The constituents could be 3 fermions or a fermion and a boson. These features are visible above a characteristic energy scale Λ below which quarks/leptons appear point like. Compositeness model can address some of the SM shortcomings like:

- **Fermion generations and their masses hierarchy**
- **Free parameters:** it may explain parameters such as electric charge, and color charge.

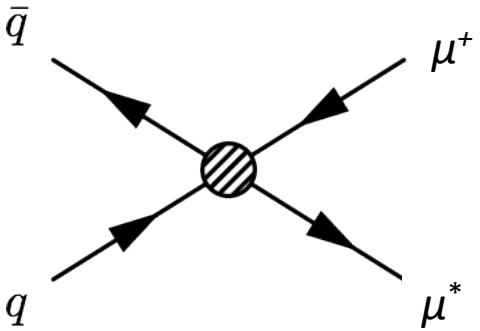


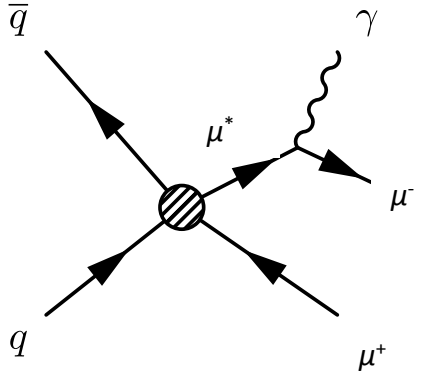
proton

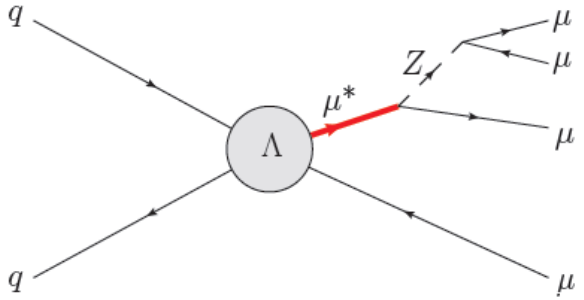


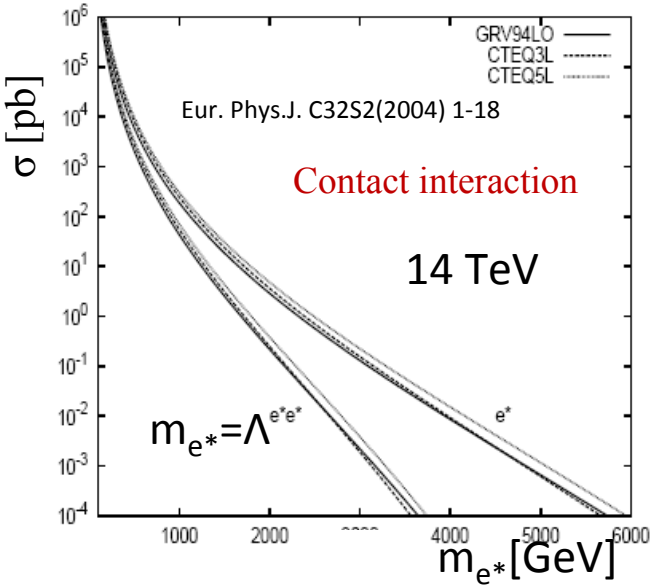
Only 2 free parameters Λ and m_{μ^*}

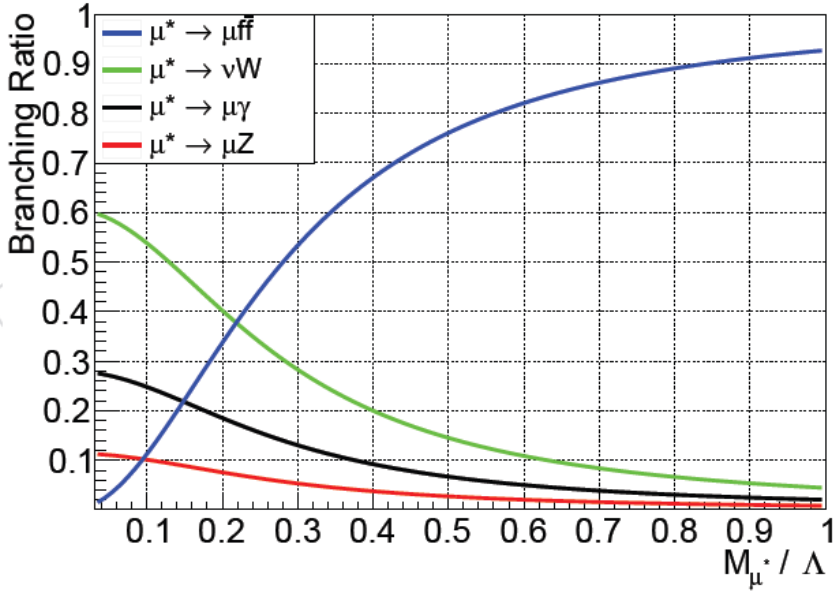
μ*: Production and decay











Mu* analysis (3)

Waleed Ahmed, Walaa Elmetenawee, Amr Mohammed, Ahmed Ali Abdelalim

Coated from Waleed's talk for the status of mu+mu*->mu mu Z-> 4 mu
https://indico.cern.ch/event/331528/contribution/0/material/slides/1.pdf

"I have used the data collected in 2012 with center of mass energy 8TeV, and corresponding luminosity 19.7fb^{-1}.
Dataset name: **DoubleMuParked/Run2012A-22Jan2013-v1/AOD.**
Trigger**: dimuon trigger HLT_Mu17_Mu8_v**
Number of events**:** 6432930
Release used**: CMSSW_5_3_14"**

Status of mu+mu* -> mu mu gamma analysis is in Walaa latest talk
https://indico.cern.ch/event/331528/contribution/0/material/slides/3.pdf

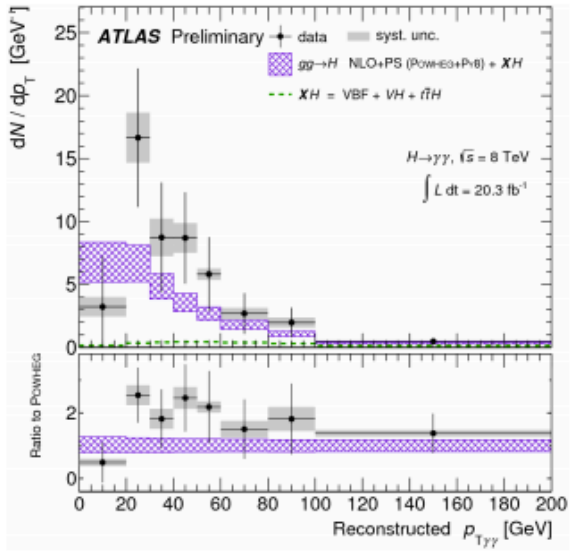
Higgs differential cross-section

Aim: is to measure the Higgs boson differential cross-sections in the H->ZZ*->4l decay channel.

Nicola De Filipes,
Ahmed Ali Abdelalim

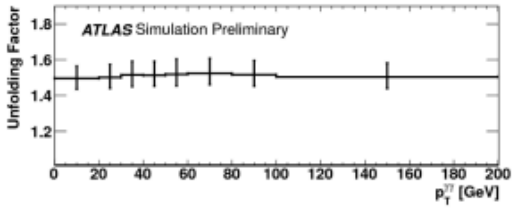
Strategy:

- Pick some distribution at reconstruction level after full selection.
- Unfolding the distribution to particle level:
  - Bin-by-bin multiplicative factor: $c_{bin\_i} = (n_{bin\_i})^{part}/(n_{bin\_i})^{reco}$
  - Both of $(n_{bin\_i})^{part}$ and $(n_{bin\_i})^{reco}$ will be determined from simulation.
  - Define fiducial region at particle level (close to the reco. level), i.e., same kinematic cuts as reco. level, remove cracks, dead regions…
- Unfolded distributions allow for direct comparison with theory prediction.

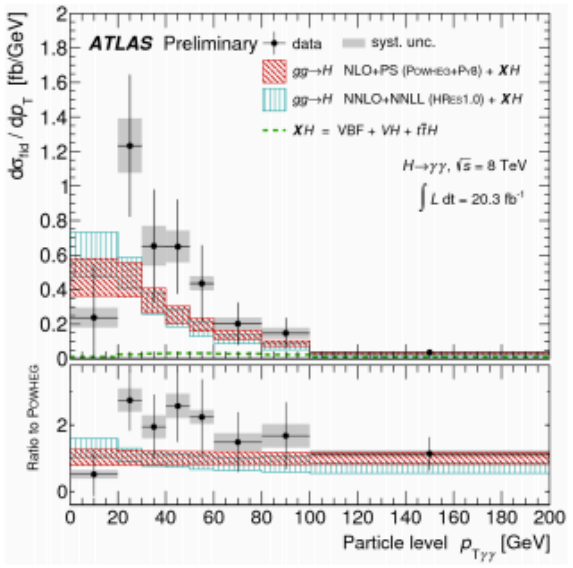


Atlas H to diphoton analysis

Correction of detector effect



$\times \quad \times \frac{1}{\mathcal{L}} =$



Z' -> mu mu analysis

- Nicola De Filipes, Sherif Elgammal (also Z'->ee), Ahmed Fouad
- Amr Mohammed, Ahmed Ali Abdelalim, Ashraff Kassem.

Z' –> 2 mu analysis Italian group: several (mostly) Italian institutions willing to participate to the next run analysis. For the status and plans see Paolo Spagnolo talk in the 7th of July 2014 HEEP meeting
https://indico.cern.ch/event/328743/contribution/2/material/slides/0.pdf

Step 0: is to reproduce the results of Z'-> mu mu at 8 TeV analysis (AN 12 422).

- Sherif is developing his own code (producing flat root trees and analyze them) and the code is used by Ahmed Fouad.

Here is the results from Sherif from the last group meeting
https://indico.cern.ch/event/317911/contribution/2/material/slides/0.pdf

- I am looking at the existing code (Zprime2muAnalysis) package (also others in the Zprime 2 mu italian group, Raffaella Radogna, Bari)

Here is the slides from my last talk during the Italian group meeting.
https://indico.cern.ch/event/317911/contribution/0/material/slides/1.pdf

- Ashraf started this week to do the exercise of Z'-> 2mu analysis (see his 2nd talk).

Proposal for Semiconductor detector lab. at Zewail City

- Giuseppe Iaselli, Gabriella Pugliese, Salvatore My
- Ali Abdou, Amr Mohammed, Ahmed Ali Abdelalim, Waleed Ahmed, Ashraff Kassem.

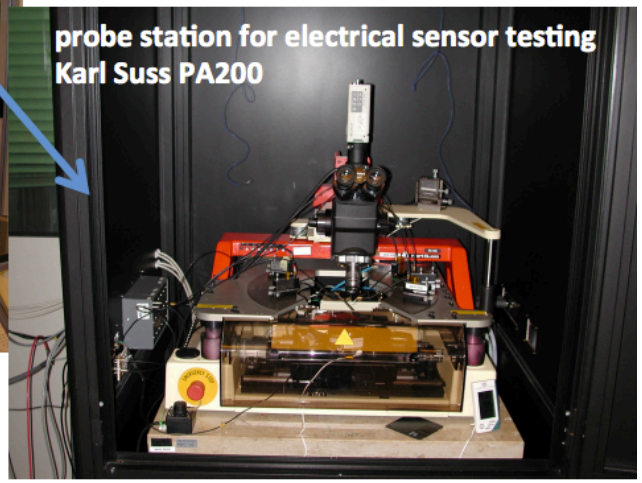
Zewail City has already a Clean room, we need to make use of it to do R&D for CMS ID next campaign.

Silicon Detector Development

Salvatore My

Poliba + INFN clean room for silicon sensor electrical test

(40 m^2 class 10000 clean room)



main equipment:

- modular DC source/monitor HB4142B
- LCR meter HP4284A
- Keithley 590 CV Analyzer
- oscilloscope Tektronix TDS3054B
- NI Labview for automatic measurements
- possibility to make test from -25 ^{0}C to +80 ^{0}C

backup