Argonne NATIONAL LABORATORY

(published)

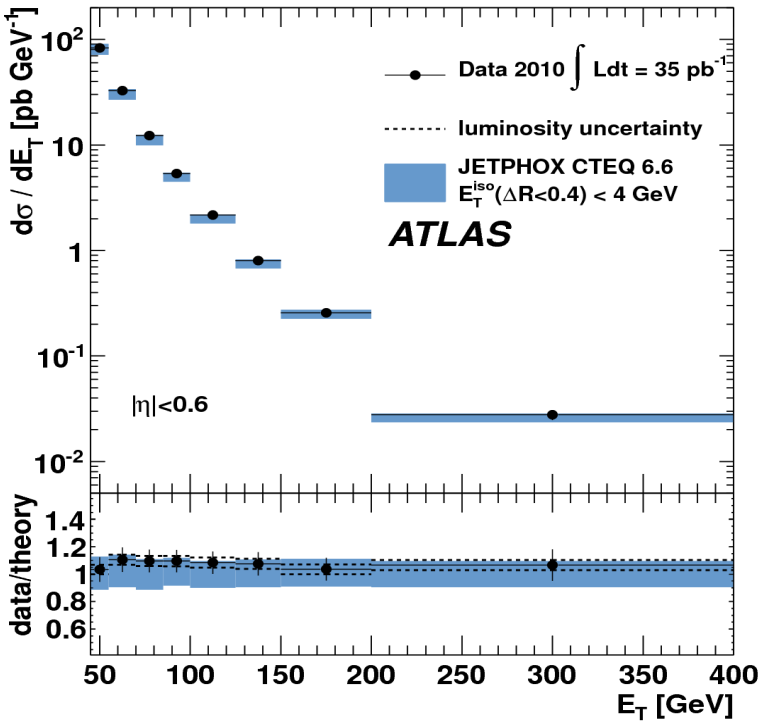
ATLAS data analysis at ANL

S.Chekanov

Direct photons (B.Blair, S.C, S.Norberg)

- extension of the published 2010 results
  - now using ~5 fb^{-1}
- pT(gamma) range: 100 GeV -1 TeV
- Expected stat. uncertainty:
  - ~ 40% at 1 TeV
- Working in many areas:
  - final cross sections
  - systematics
  - extension for JETPHOX 1.3 NLO:
    - From ROOT Trees → Cross sections with all uncertainties.
    - "Realistic" antiKT04 (based on Fastjet)
    - (Can be used for gamma+jets)
    - Parallel processing on many cores

(published)



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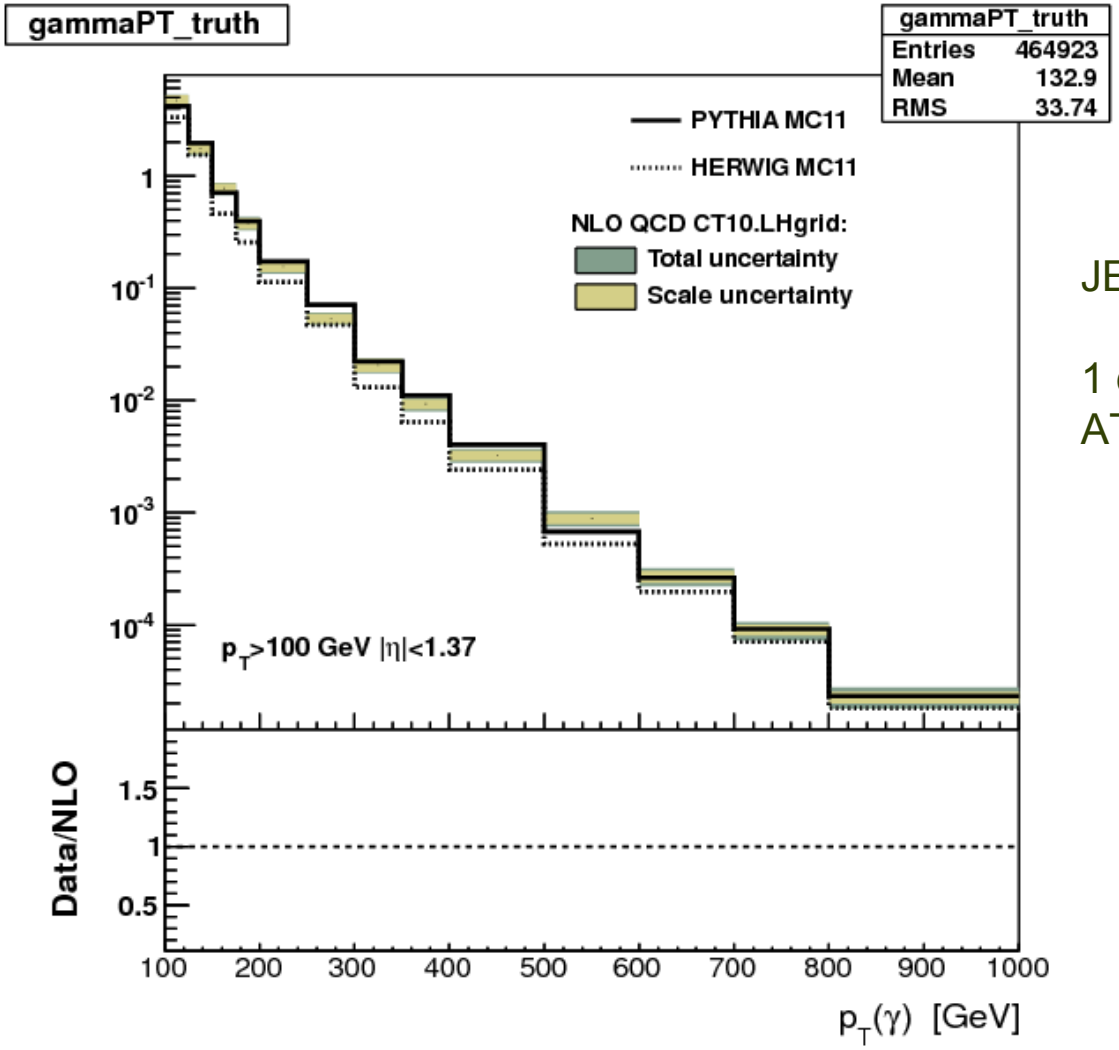
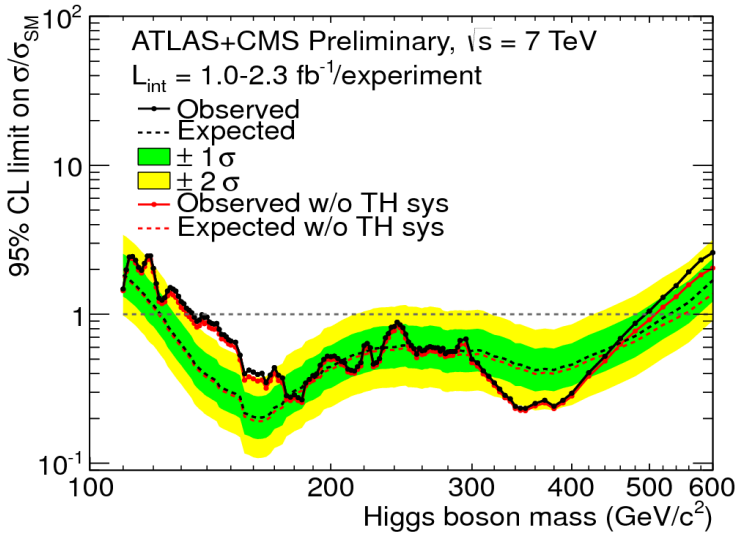


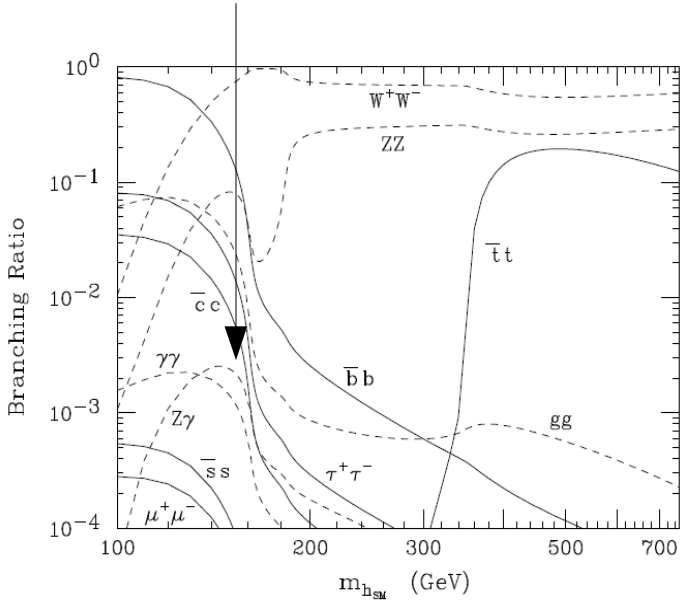
JETPHOX calculations

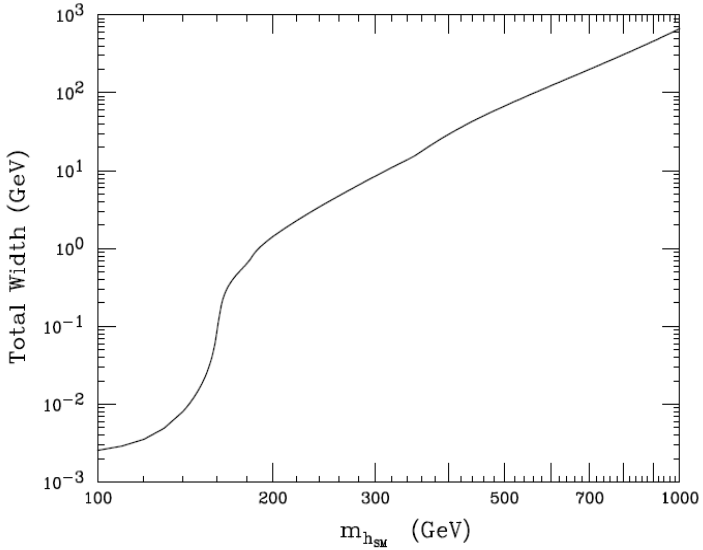
1 day on 400 cores using ATLAS/ANL cluster

Z-γ final state (Benjamin Auerbach,S.C.)

- Initial interest triggered by Ian Low / Jamie Gainer
  - H → Z γ channel
- "Realistic" MC & 5 fb^{-1} shows that it is hard to get competitive results
- Waiting for "official" results for H → γγ channel
  - The analysis will also be converted to the SM cross sections

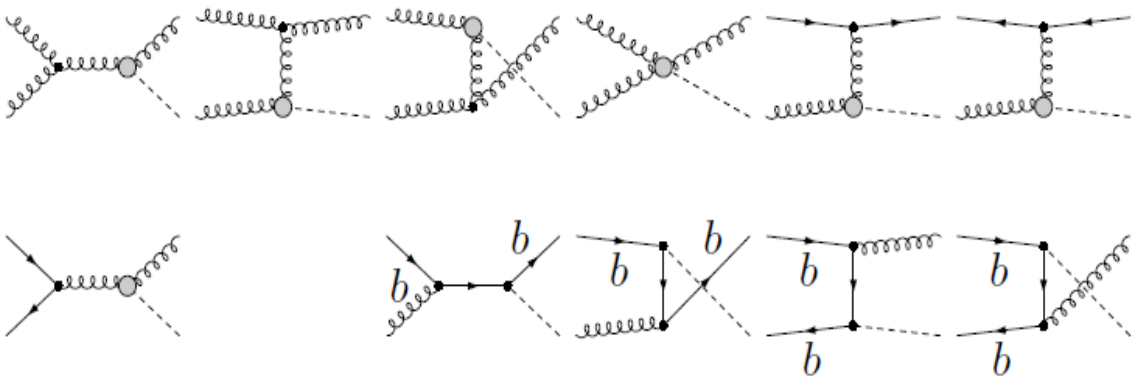






H → γγ+ N jet searches (A.Kruze/B.Mellado)

- Higgs with associated jets
- Richer kinematic structure (compared to H → gamma gamma)
  - refined cuts may help to increase S/B
- But smaller rate



SM jet-shape measurements (Lily Asquith, S.C, Jimmy, Rik)

- Measurements of:
  - jet mass, jet width, eccentricity , planar flow, angularity
- Concentrate on comparison with PYTHIA & HERWIG
- Develop a technique to correct for pile-up (+Toronto group)

Essential study for searches for new particles beyond the TeV scale

S.C., J.Proudfoot, Phys. Rev. D81 (2010) 114038
S.C., C.Levy, J.Proudfoot, R.Yoshida, Phys. Rev. D 82, 094029 (2010)
+ many more!

Boosted top quarks (S.C,C.Chen,Rik,Jimmy, etc.)

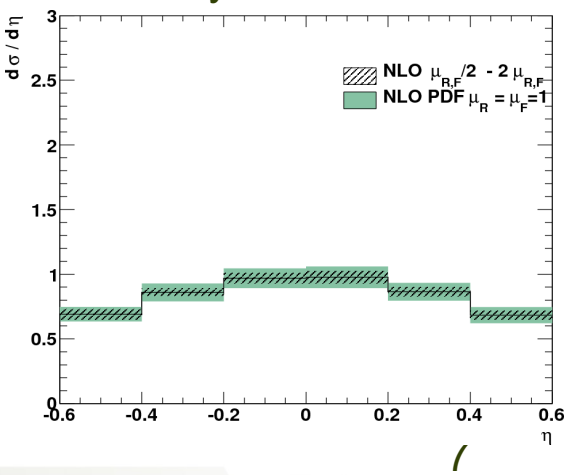
- Look at pT nobody looked before:
  - Start from 1 TeV jets
  - Use “standard” antiKT jet 0.6
  - Look at fully hadronic decays:
    - Use jet masses in combination with jet shapes
- No tops above pT>1 TeV expected from PYTHIA (for 5 fb^{-1}):
  - Expected cross section 0.4 fb for jets with pT > 1 TeV and |eta|<0.6
- Good collaboration with Markus Schulze to calculate NLO cross sections using MCFM:
  - Currently the ATLAS farm is used for scale/PDF uncertainty calculations

NLO top cross section from MCFM:

- pT>1 TeV |eta|<0.6
- 2 scale uncertainties m(top)/2 < mu(F),mu(R)< 2*m(top)
  40 mstw2008nlo.68cl PDF sets (green area)

Total cross section: ~ 1.04 +/- 0.16 (scale) +/- 0.22 (PDF) fb

1 day on 43 CPUs



Boosted W bosons. (C.Chen (Iowa group)+SC)

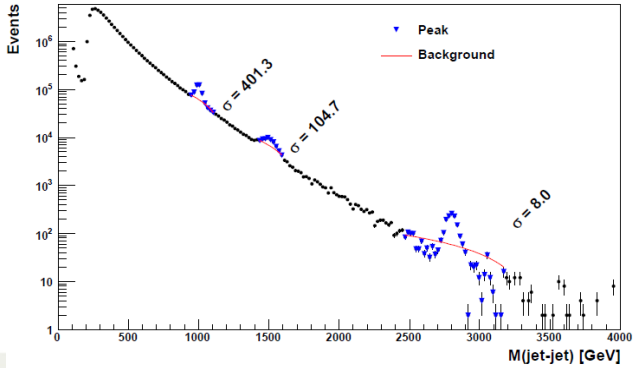
- Use jet-shapes to find boosted W (hadronic decay)
- Start from pT>300 GeV (for jets)
- Build a likelihood function, identify variables with the best sensitivity etc.
- Use a MC template method to extract the W signal

Top reconstruction (R.Calkin/C.Suhr+ NIU)

- b-tagging efficiency for ttbar
- single-tops using the “cut method”

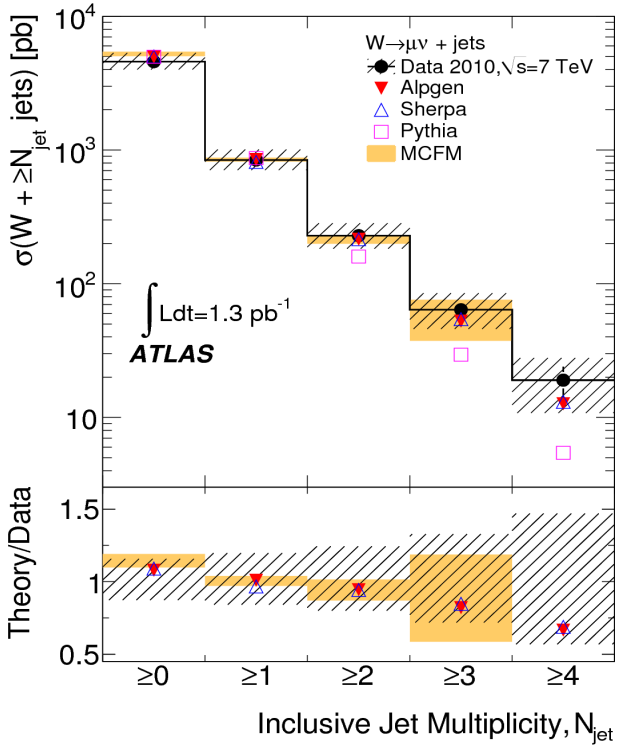
General searches (S.C / J.Boomsma/M.Erickson)

Recent paper:
A non-parametric peak finder algorithm and its application in searches for new physics
E-print: arxiv.org:1110.3772



W/Z + N jets (A.Paramonov/B.Martin)

- The analysis "phase-out"
- Results are public
- New results will be published soon
  - improved systematic uncertainties



Searches for final states with 3 leptons (A.Paramonov/Dong Nguyen)

- SUSY searches
- gluino-gluino → 4 top quarks + 2 neutralinos

Compressed supersymmetry (Tom LeCompte/Dong Nguyen)

- Jet+missET final state.
- Defined the region sensitive to compressed SUSY
- Working on systematic uncertainties
- Paper: http://arxiv.org/abs/1111.6897
  - this hits the edge of my knowledge
  - Tom help!

ANL-HEP-PR-11-77

Compressed supersymmetry after 1 fb^{-1} at the Large Hadron Collider

Thomas J. LeCompte[1] and Stephen P. Martin[2,3,4]