CMS aTGC Analysis

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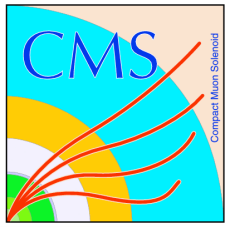
Vγ



- Includes Wγ and Zγ,
  - Z→ νν may be included
- Analysis selection
  - Et(γ) > 15 GeV, |η| < 2.5
  - ΔR(γ,l) > 0.7
  - W: pT(e,μ) > 35 GeV, |η(e, μ)| < 2.5, 2.4, mT(W) > 70 GeV
  - Z: pT(e,μ) > 20 GeV, |η(e, μ)| < 2.5, 2.4, m(Z) > 50 GeV
- Define inclusive cross section with only photon Et and ΔR cuts and in Zγ case M(Z) cut
  - Considering whether to define fiducial cross section
  - Et(γ) > 15 GeV, |η| < 2.5
  - ΔR(γ,l) > 0.7
  - W: pT(e,νν) > 35 GeV, |η(e, μ)| < 2.5
  - Z: pT(e,μ) > 20 GeV, |η(e, μ)| < 2.5, m(Z) > 50 GeV
  - Unifies lepton definitions

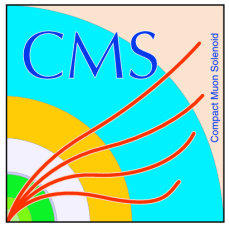
WW

- Currently includes only fully leptonic decays
  - May develop WW,WZ semileptonic analysis
- Analysis selection
  - pT(e, μ) > 20 GeV, |η(e, μ)| < 2.5, 2.4
  - Jet veto: Et > 30GeV
- No cuts for inclusive cross section
  - Considering whether to define fiducial cross section with unified pT and η cuts.

WZ

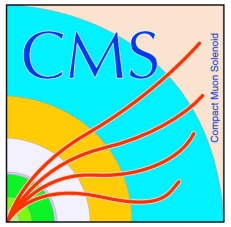
- Currently includes only fully leptonic decays
  - May develop WW,WZ semileptonic analysis
- Analysis selection
  - W: pT(e,μ) > 20 GeV, |η(e, μ)| < 2.5, 2.4
  - Z: pT(e) > 20/10, pT(μ) 15/15 GeV, |η(e, μ)| < 2.5, 2.4
  - m(Z): 60-120 GeV
- Inclusive cross section with only m(Z) selection
  - Considering whether to define fiducial cross section with unified pT > 10GeV and η cuts.

ZZ



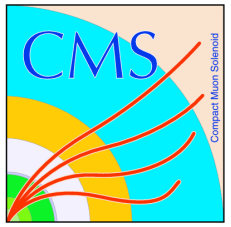
- Currently includes only charge leptonic decays
  - Developing Z→ νν anlaysis
  - May develop semileptonic analysis
- Analysis selection
  - Z1: pT(e, μ) > 20/10 GeV, |η(e, μ)| < 2.5, 2.4
  - Z2 pT(e) 7/7, pT(μ) 5/5 GeV, |η(e, μ)| < 2.5, 2.4
  - m(Z): 60-120 GeV
- Inclusive cross section with only m(Z) selection
  - Considering whether to define fiducial cross section with unified pT > 20/10, 5/5 and η cuts.

VV Cross Sections



- Some issues to consider
- Unify selection
  - When requirements on inclusive cross section are necessary
    - Et(γ), ΔR(γ,l), M(Z)
  - Unify fiducial cross section. Min lepton pT and max η
- Define cross sections using the same programs and techniques:
  - We are quoting different SM predictions for WW and Wγ, it would be good to resolve it!
- All this would also help with comparing and combining aTGC measurements

Note on aTGCs

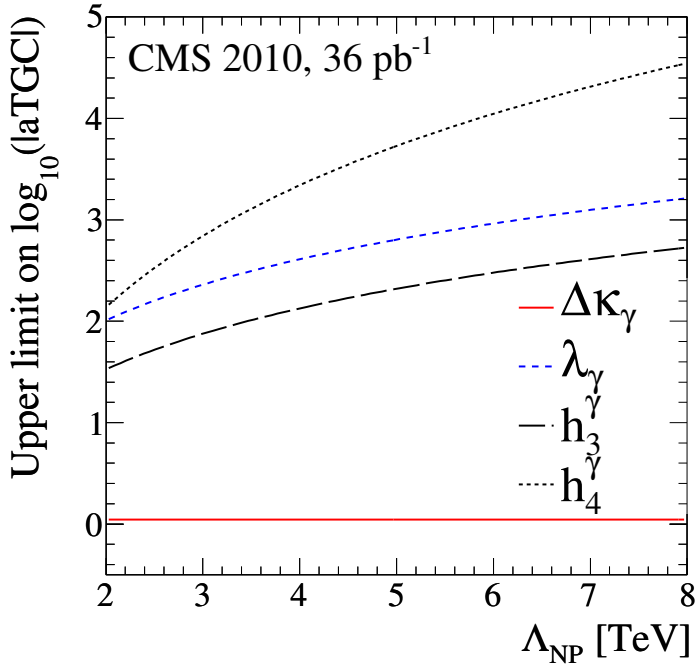


- Traditionally, form factors were used to save unitarity
- CMS decided not to use form factors in the presentation of aTGC results:
  - Why do we want to save unitarity of what is anyway an effective theory?
  - We are not doing this in any other searches, where we also write a lagrangian that would violate unitarity, e.g. search for contact interactions in dijets
  - Even if we use form factors, comparison with Tevatron results is not quite valid, as we are looking at different energy scales
- This approach was welcomed at the LHC EWWG Meeting in December
- For a more in depth justification, see e.g. Juan Alcaraz' talk in the LHC EWWG meeting on TGCs on 13.10.2011
  https://indico.cern.ch/getFile.py/access?contribId=0&resId=0&materialId=slides&confId=158876

aTGC Result presentation (2)

- Another approach, used in our Wγ and Zγ paper
- In usual parameterization, non SM terms in lagrangian are scaled with α/M_V^n
  - V: W or Z (this choice is arbitrary!)
  - n: chosen to ensure right dimensionality
- Proposal: reformulate with new physics scale Λ_{NP}: $\frac{\alpha}{M_V^n} \rightarrow \frac{\alpha'}{\Lambda_{NP}^n}$
- Set limits on alpha' as a function of LNP

PLB 701 (2011) 535–555



aTGC parameters in CMS Analyses

Summary of aTGC configurations used for the most important channels

Channel	Fted aTGC parameters	Observable	Reference	Form Factor
WW➔llνν	$\lambda_Z, \Delta g_1^Z, \Delta\kappa_\gamma$	Pt(leading lepton)	PLB 699 (2011) 25–47	No
Wg➔lνγ	$\lambda_\gamma, \Delta\kappa_\gamma$	ET(photon)	PLB 701 (2011) 535–555	No
Zg➔llγ	h^γ_3, h^γ_4, h^Z_3, h^Z_4	ET(photon)	PLB 701 (2011) 535–555	No
WZ➔lllν	$\lambda_Z, \Delta g_1^Z, \Delta\kappa_Z$	Pt(Z)	Processing…	No
ZZ➔4l	h^γ_3, h^γ_4, h^Z_3, h^Z_4	Studying…	Processing…	No

Considering other channels, notably ZZ -> llνν