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FabienneSandBox

Introduction

This page summarizes models for Z' and W' as used in searches performed by ATLAS and CMS.

Bibliography

Review

- P. Langacker, The Physics of Heavy Z' Gauge Bosons, *Rev. Mod. Phys.* 81 (2009) 1199. [ref ATLAS; includes SSM, LFV, E_6 leptophobic,...]

SSM/EGM:

- E. Eichten, I. Hinchliffe, K. D. Lane, and C. Quigg, Supercollider physics, *Rev. Mod. Phys.* 56 (1984) 579, erratum [ref CMS for dijet searches]
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GUT/ E_6 (superstring inspired):

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- D. London and J. L. Rosner, Extra Gauge Bosons in $E(6)$, *Phys. Rev. D* 34 (1986) 1530.
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- D. Duffy and Z. Sullivan, Model independent reach for W' bosons at the LHC *Phys. Rev. D* 86 (2012) 075018, arXiv:1208.4858. [ref ATLAS for $W' \rightarrow tb$]
- C.-W. Chiang, T. Nomura and K. Yagyu, Phenomenology of E_6 -inspired leptonphobic Z' boson at the LHC, *JHEP* 05 (2014) 106, arXiv:1402.5579. [ref ATLAS for $V' \rightarrow bb, jb$]

Effective model describing the couplings of the W' boson to fermions:

- Z. Sullivan *Phys. Rev. D* 66 (2002) 075011, arXiv:hep-ph/0207290

Minimal Models:

- E. Salvioni, G. Villadoro, and F. Zwirner, *JHEP* 0911 (2009) 068, arXiv:0909.1320.

Non-universal gauge interaction models (NUGIM):

- C.-W. Chiang, N. G. Deshpande, X.-G. He, and J. Jiang, Family $SU(2)_l \times SU(2)_h \times U(1)$ model, *Phys. Rev. D* 81 (2010) 015006. arxiv:0911.1480 [ref CMS for $W' \rightarrow \tau \nu$]
- X. Li and E. Ma, Gauge Model of Generation Nonuniversality, *Phys. Rev. Lett.* 47 (1981) 1788. inspire record [ref CMS for $W' \rightarrow \tau \nu$]
- D. J. Muller and S. Nandi, Top flavor: A separate $SU(2)$ for the third family, *Phys. Lett. B* 383 (1996) 345

Topcolor assisted Technicolor (ATLAS tag: Z'_{TC2} , CMS tag: TAT):

- C. T. Hill and S. J. Parke, Top production: Sensitivity to new physics, *Phys. Rev. D* 49 (1994) 4454, hep-ph/9312324. [ref ATLAS]
- C. T. Hill, Topcolor assisted technicolor, *Phys. Lett. B* 345 (1995) 483, hep-ph/9411426
- K. Lane, A new model of topcolor-assisted technicolor, *Phys. Lett. B* 433 (1998) 96 [ref CMS for $Z' \rightarrow \tau \tau$]
- R. M. Harris, C. T. Hill, and S. J. Parke, Cross-section for topcolor Z' decaying to $t\bar{t}$: Version 2.6, hep-ph/9911288

- R. M. Harris and S. Jain, Cross sections for leptophobic topcolor Z' decaying to top-antitop, Eur. Phys. J. C 72 (2012) 2072

Dark Matter Mediator / "Leptophobic Z' " (ATLAS)

- D. Abercrombie et al., Dark matter benchmark models for early LHC Run-2 searches: report of the ATLAS/CMS Dark Matter Forum, 2015, arXiv: 1507.00966 [ref ATLAS]
- M. Chala et al., Constraining Dark Sectors with Monojets and Dijets, JHEP 07 (2015) 089, arXiv: 1503.05916. [ref ATLAS]
- J. Abdallah et al., Simplified models for dark matter searches at the LHC, Phys. Dark Univ. 9-10 (2015) 8, arXiv:1506.03116. [ref CMS]
- A. Boveia et al., Recommendations on presenting LHC searches for missing transverse energy signals using simplified s-channel models of dark matter, (2016). arXiv:1603.04156 [ref CMS]

[Z' resonance with axial-vector couplings to quarks (g_q , universal in quark flavour) and to a fermion dark matter candidate ($m \gg m(Z')$). Mixing with SM Z assumed negligible]

See also DarkMatterInfo

Extra-dimensions (Z_{KK} , W_{KK}):

- I. Antoniadis, A Possible new dimension at a few TeV, Phys. Lett. B 246 (1990) 377.
- I. Antoniadis, K. Benakli and M. Quirós, Direct collider signatures of large extra dimensions, Phys. Lett. B 460 (1999) 176, hep-ph/9905311.
- see also ExtraDimInfo

Extra-dimensions (LFV):

- J. M. Frere, M. V. Libanov, E. Y. Nugaev, and S. V. Troitsky, Fermions in the vortex background on a sphere, JHEP 06 (2003) 009 [ref CMS]
- J. M. Frere, M. V. Libanov, E. Y. Nugaev, and S. V. Troitsky, Searching for family number conserving neutral gauge bosons from extra dimensions, JETP Lett. 79 (2004) 598 [ref CMS]

Heavy Vector Triplet (HVT):

- D. Pappadopulo et al., Heavy Vector Triplets: Bridging Theory and Data, JHEP 1409 (2014) 060, arXiv:1402.4431
- see also TechCHVTInfo

Hidden Valley:

- Z' is a frequent mediator in Hidden Valley scenarios. The possible ATLAS and CMS publications are not listed here.

PDG reviews

- W' searches [↗](#)
- Z' searches [↗](#)

Analyses

Most recent results from ATLAS and CMS are listed in the table below. The last update was made on 31 May 2017.

LPX	Channel	Paper/Conf	Model	Event Generator	PDF Set	Comments
ATLAS	Z'--> ll	ATLAS-CONF-2017-027	SSM, E_6, Minimal Models	Pythia8	NNPDF23LO	
ATLAS	Z'--> ll	EXOT-2012-23	SSM, E_6, Minimal Models	Pythia8	MSTW2008LO	8 TeV
ATLAS	Z'--> ll	EXOT-2012-01	SSM, E_6, Minimal Models, Z_KK	Pythia6	MRST2007LO**	7 TeV
CMS	Z'--> ll	EXO-16-031	SSM, E_6	Pythia8	?	
CMS	Z'--> ll	EXO-15-005	SSM, E_6	Pythia8	CTEQ6.1	8+13 TeV
ATLAS	Z'--> tautau--> full had	EXOT-2014-05	SSM	Pythia8	CTEQ6L1	8 TeV
CMS	Z'--> tautau-->eu,eh,uh,hh	EXO-16-008	SSM, TAT	Pythia8	NNPDF30	
ATLAS	Z'--> ll'	EXOT-2015-20	LFV	Pythia8	NNPDF23LO	
CMS	Z'--> ll'	EXO-13-002	XD LFV	MadGraph	CTEQ6L1	
CMS	Z'--> phi phi --> 4l	EXO-14-006	leptophobic	CalcHEP3.4.1 + Pythia6	CTEQ6L	8 TeV
ATLAS	W'--> lv	ATLAS-CONF-2017-016	SSM/EGM	Pythia8	NNPDF23LO	
CMS	W'--> lv	EXO-15-006	SSM/EGM	Pythia8	NNPDF30	
CMS	W'--> tauv	EXO-12-011	SSM/EGM, NUGIM	MadGraph + Pythia	CTEQ6L1	8 TeV
CMS	ll+E_Tmiss	EXO-16-038	spin-1 DM mediator	MadGraph5 + Pythia8	NNPDF32	

HQT	Channel	Paper/Conf	Model	Event Generator	PDF Set	Comments
ATLAS	Z'-->tt--> semi-lep	ATLAS-CONF-2016-014	leptophobic topcolor	Pythia8	NNPDF23LO	
CMS	Z'-->tt--> all had	CMS-PAS-B2G-15-003	SSM			
CMS	Z'-->tt-->ll, semi-lep, had	B2G-13-008	leptophobic topcolor	MadGrah4	?	8 TeV
ATLAS	W'-->tb--> semi-lep	TOPQ-2012-19	W'_R, W'_L	MadGraph5 + Pythia8	CTEQ6L1	8 TeV
CMS	W'-->tb--> semi-lep	CMS-PAS-B2G-17-010	W'_R, W'_L			
CMS	W'-->tb--> semi-lep	CMS-PAS-B2G-16-017	W'_R	CompHEP4.5.2rc10	CTEQ611	
ATLAS	W'-->tb--> had	EXOT-2013-14	W'_R, W'_L	MadGraph5 + Pythia8	CTEQ6L1	8 TeV
CMS	W'-->tb--> had	CMS-PAS-B2G-16-009	W'_R	CompHEP4.5.2rc10	CTEQ611	
CMS	W'-->tb--> lep	CMS-PAS-B2G-15-004	W'_R	CompHEP4.5.2rc10	CTEQ611	

CMS	$W' \rightarrow tb \rightarrow had$	CMS-B2G-12-009	$W'_R,$ $W'_L,$ W'_{LR}	CompHEP4.4	?	8 TeV
CMS	$Z' \rightarrow t\bar{t} \rightarrow ttZ$	CMS-PAS-B2G-16-001		MadGraph5.2 + Pythia8	NNPDF3.0	

JDM	Channel	Paper/Conf	Model	Event Generator	PDF Set	Comments
ATLAS	$W', Z' \rightarrow jj$	EXOT-2016-21	SSM/EGM, leptophobic	Pythia8, MadGraph5_aMC@NLO		
ATLAS	$Z', W' \rightarrow jj$	ATLAS-CONF-2016-069	SSM, leptophobic	Pythia8	NNPDF23LO	
CMS	$Z' \rightarrow jj$	EXO-16-030	leptophobic	MadGraph + Pythia8	?	
ATLAS	$Z' \rightarrow jj + j/\gamma$	ATLAS-CONF-2016-070	leptophobic	MadGraph5_aMC@NLO + Pythia8	NNPDF3.0 LO	
ATLAS	$Z' \rightarrow jj$ TLA	ATLAS-CONF-2016-030	leptophobic	MadGraph5_aMC@NLO + Pythia8	NNPDF3.0 LO	
CMS	$Z', W' \rightarrow jj$	EXO-16-032	SSM, DM mediator	Pythia8	CTEQ611	
ATLAS	$Z' \rightarrow bb, bj$	ATLAS-CONF-2016-060	SSM, E_6 leptophobic	Pythia8	NNPDF23LO	
CMS	$Z', W' \rightarrow bb$	EXO-11-094	SSM	Pythia6	CTEQ611?	7 TeV

DBL	Channel	Paper/Conf	Model	Event Generator	PDF Set	Comments
ATLAS	$W' \rightarrow ZV \rightarrow ll\ qq, vv\ qq$	ATLAS-CONF-2016-082	HVT Model A	MadGraph5	NNPDF23LO	
ATLAS	$V' \rightarrow WW/WZ \rightarrow JJ$	ATLAS-CONF-2016-055	HVT Model A and B	MadGraph5_aMC@NLO + Pythia8	NNPDF23LO	$g_V =$ (mod and 3 B)
ATLAS	$V' \rightarrow WW/WZ \rightarrow lv\ qq$	ATLAS-CONF-2016-062	HVT Model A and B	MadGraph-2.2.2 + Pythia8	NNPDF23LO	$g_V =$ (m and 3)
CMS	$V' \rightarrow WW, WZ, ZZ \rightarrow lv\ qq, qq\ qq$	CMS-PAS-B2G-16-004	HVT Model A and B	MadGraph5_aMC@NLO	NNPDF 3.0	$g_V =$ (mod and 3 B)
ATLAS	$W' \rightarrow WZ \rightarrow lv\ ll', qq\ ll, lv\ qq$	EXOT-2014-18	SSM/EGM	Pythia8	CTEQ6L1	8 TeV comb
ATLAS	$V' \rightarrow VH \rightarrow bb\ ll/lv/vv$	EXOT-2015-18	HVT Model A and B	MadGraph5_aMC@NLO + Pythia8	NNPDF23LO	$g_V =$ (mod and 3 B)
ATLAS	$V' \rightarrow VH \rightarrow qq\ bb$	ATLAS-CONF-2017-018	HVT Model A and B	MadGraph5_aMC@NLO + Pythia8	NNPDF23LO	$g_V =$ (mod and 3 B)
CMS	$V' \rightarrow VH \rightarrow qq\ bb$	CMS-PAS-B2G-17-002	HVT Model B			$g_V =$
CMS	$W' \rightarrow WZ, WH \rightarrow lv\ bb$	EXO-14-010	HVT Model B	MadGraph	CTEQ6L	8 TeV
CMS	$V' \rightarrow WV \rightarrow all\ had$	CMS-PAS-B2G-17-001				$g_V =$

			HVT Model B			
CMS	V ['] -->HV--> all jets	EXO-14-009 ↗	HVT Model B	MadGraph5	?	8 TeV

Any W[']--> tB or Tb?

Upgrade

Experiment	cms	Channel	Note	Model
ATLAS	14 TeV	$Z' \rightarrow tt$	ATL-PHYS-PUB-2017-002	leptophobic topcolor
ATLAS	14 TeV	$Z' \rightarrow ll$	ATL-PHYS-PUB-2013-003	SSM
CMS	14 TeV	$Z' \rightarrow ll, W' \rightarrow ev$	EXO-14-007	SSM

Major updates:

-- FabienneLedroit - 2017-01-30

%RESPONSIBLE% FabienneLedroitSecondary

%REVIEW% **Never reviewed**

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