



ATLAS Searches for non-SUSY Exotics at the LHC

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IFIC Valencia

*On behalf of the
ATLAS Collaboration*



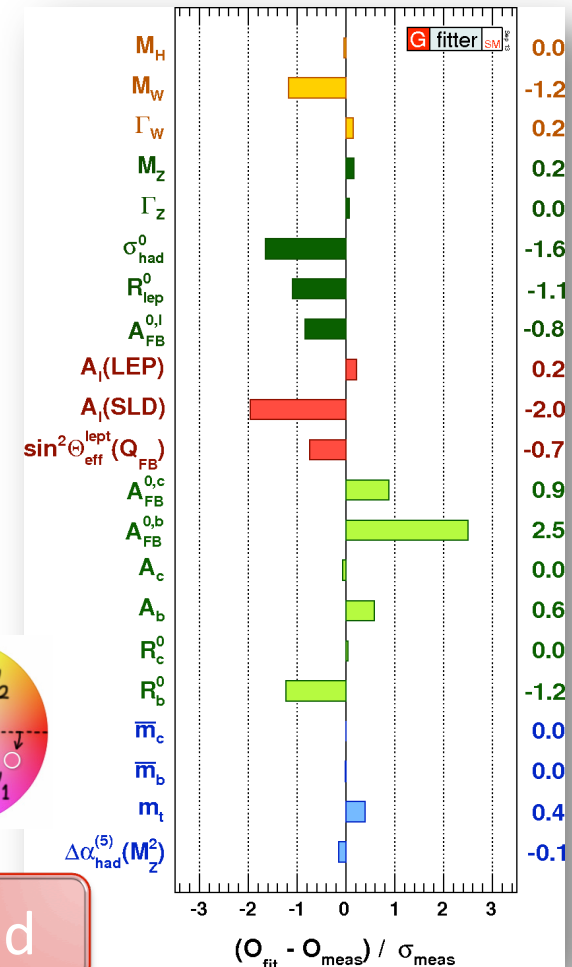
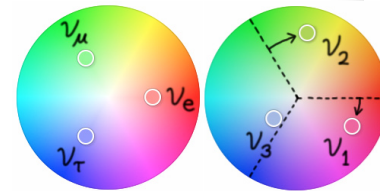
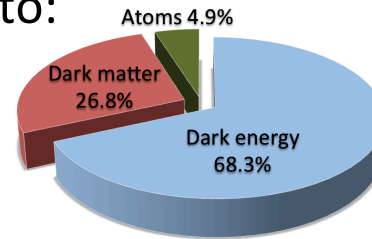
SUSY2014

**22nd International Conference on
Supersymmetry and
Unification of Fundamental Interactions**

21 - 26 July 2014, Manchester, England

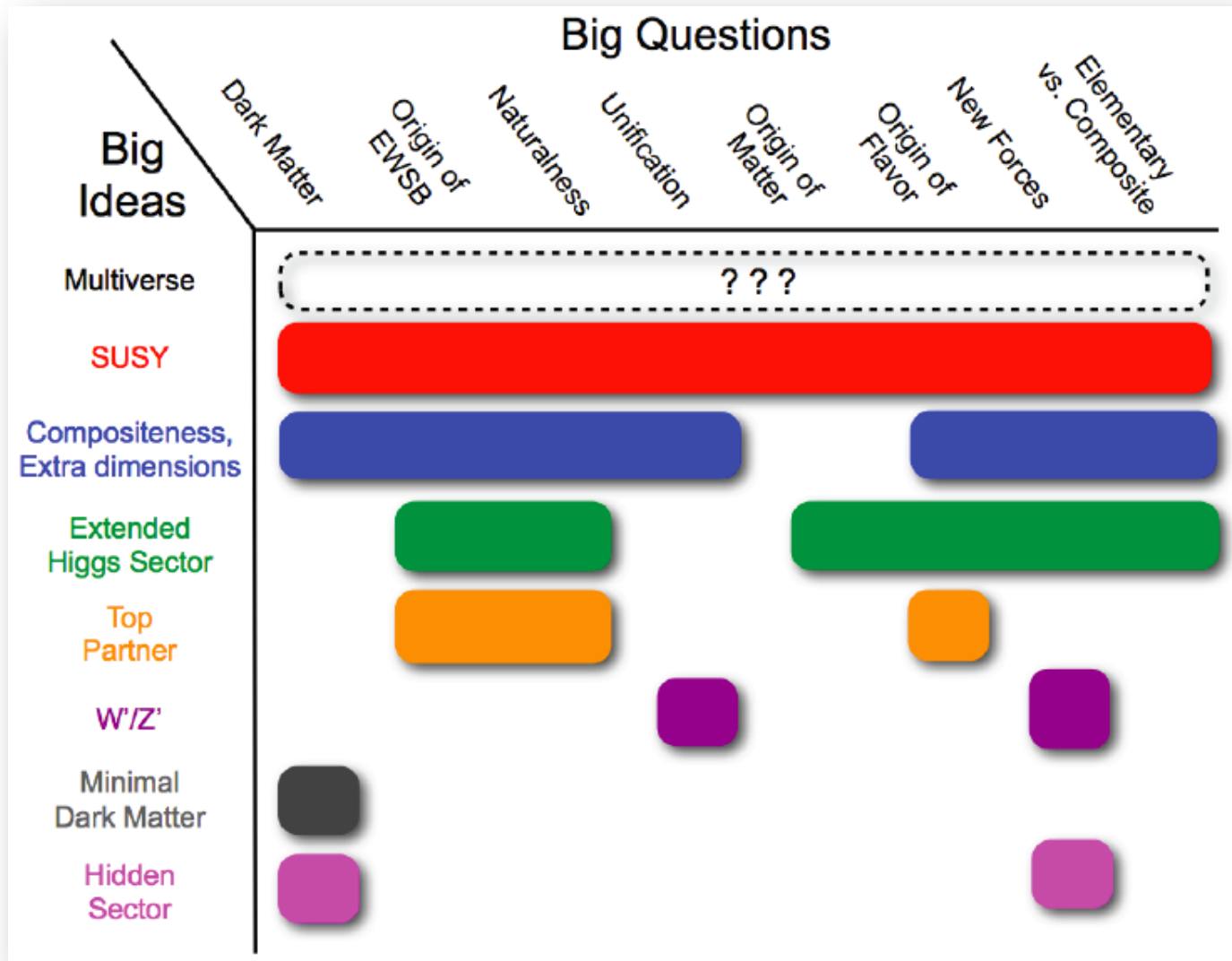
Why going beyond the Standard Model?

- SM provides an excellent description of the experimental data so far
 - QCD and hadronic structure
 - precision EW physics
 - top quark
 - flavour physics
- yet... it does not provide an answer to:
 - hierarchy / fine tuning problem
 - matter-antimatter asymmetry
 - dark matter & dark energy
 - neutrino masses
 - unification of EW interactions & QCD
 - gravitation
 - more than one fermion generation



 An extension of the Standard Model is needed

(some) ideas beyond Standard Model



Signatures probing model predictions

- Resonances

- dijets
- dileptons
- $W' \rightarrow \ell\nu$ [Christopher Marino's talk](#)
- dibosons
- top/bottom [Jiahang Zhong's talk](#)
- ...

- Non-resonant final states

- dileptons
- leptons+jets
- generic searches
- mono-X + E_T^{miss} [David Salek's talk](#)
- ...

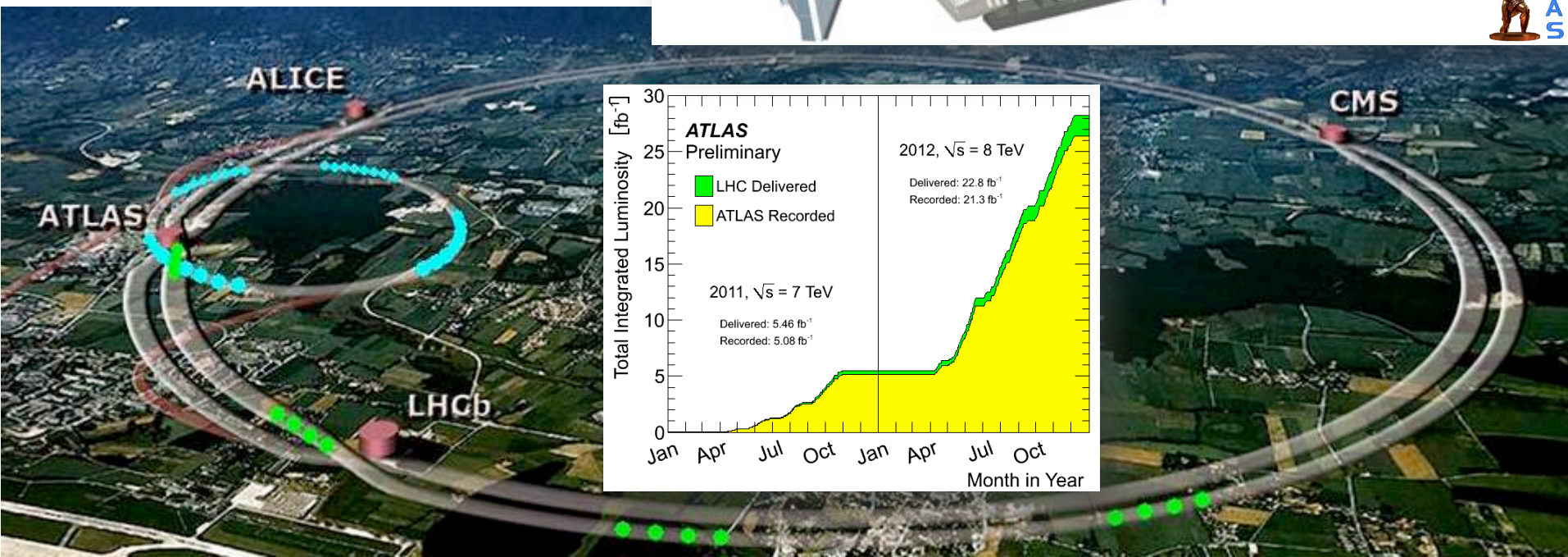
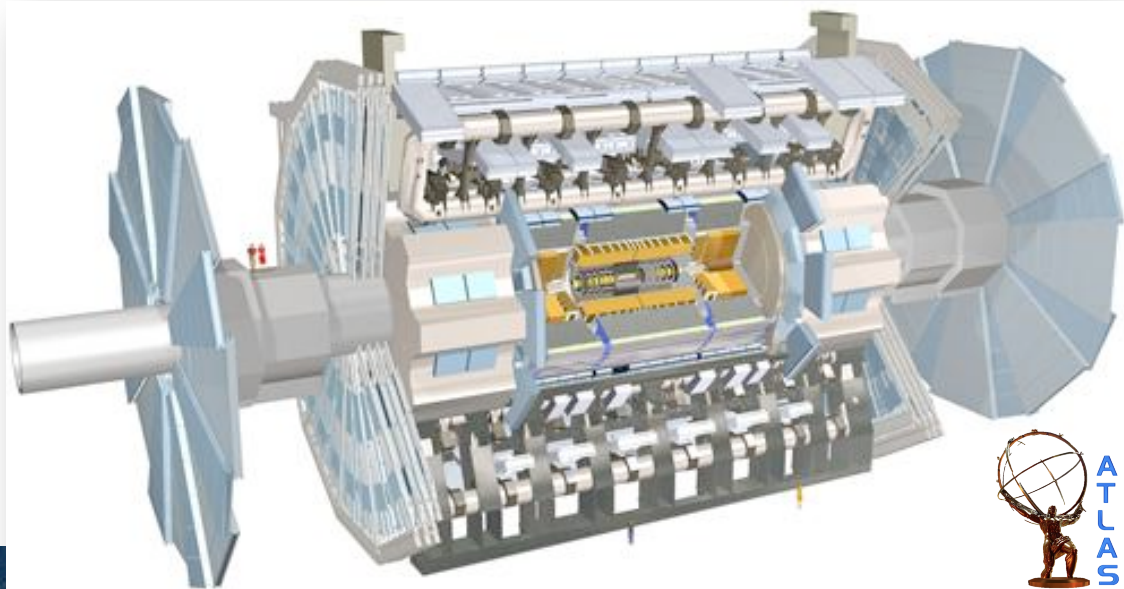
- Long-lived particles

- high ionisation
- unusual energy depositions in calorimeters
- ...

- Signature-based searches cover multitude of theoretical scenarios
- Emphasis given on most recent results here

ATLAS at the LHC

- **Spectacular LHC performance**
- Run 1: 2010 – 2012
 - $\sim 5 \text{ fb}^{-1}$ pp collisions at $\sqrt{s} = 7 \text{ TeV}$
 - $\sim 20 \text{ fb}^{-1}$ pp collisions at $\sqrt{s} = 8 \text{ TeV}$
- Physics run will resume in 2015 with 13-14 TeV collisions

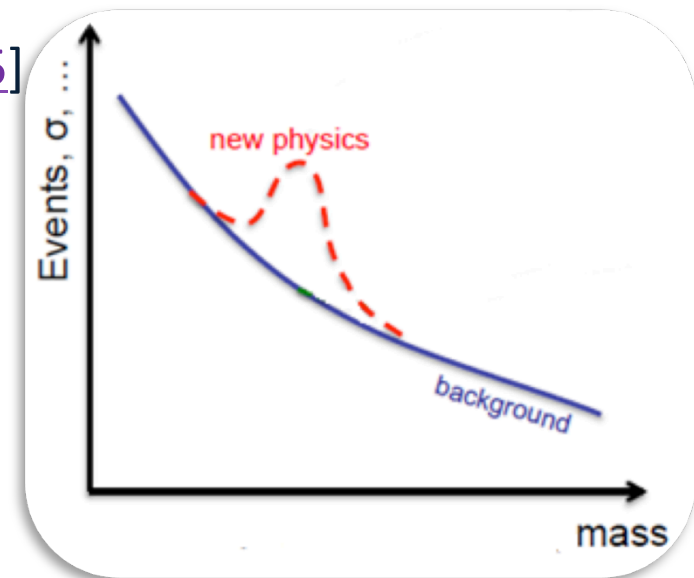


Beyond SM searches strategy

- ① Pursue signature-driven analyses:
 - resonances: dileptons, jets, photons, ...
 - tails in kinematic distributions
 - special particles: slow-moving, long-lived, ...
 - ...
 - ② Search for excess of events over the expected SM background
 - ③ If no significant excess is observed
 - set cross-section upper limits
 - interpret in specific models to obtain limits on masses, couplings, ...
- 👉 Background estimate: data-driven techniques for main; MC for smaller
- 👉 Blind analysis: first define and validate analysis, then open signal box

Looking for resonances

- Dijets [[arXiv:1407.1376](https://arxiv.org/abs/1407.1376)]
- Dileptons [[arXiv:1405.4123](https://arxiv.org/abs/1405.4123)]
- $X \rightarrow HH \rightarrow b\bar{b}b\bar{b}$ [[ATLAS-CONF-2014-005](https://arxiv.org/abs/ATLAS-CONF-2014-005)]
- $ZV \rightarrow \ell\ell q\bar{q}$ [[ATLAS-CONF-2014-039](https://arxiv.org/abs/ATLAS-CONF-2014-039)]
- $WZ \rightarrow \ell\nu\ell'\ell'$ [[arXiv:1406.4456](https://arxiv.org/abs/1406.4456)]
- leptonic W/Z + γ
[to be published soon in PLB]
- Top/bottom resonances

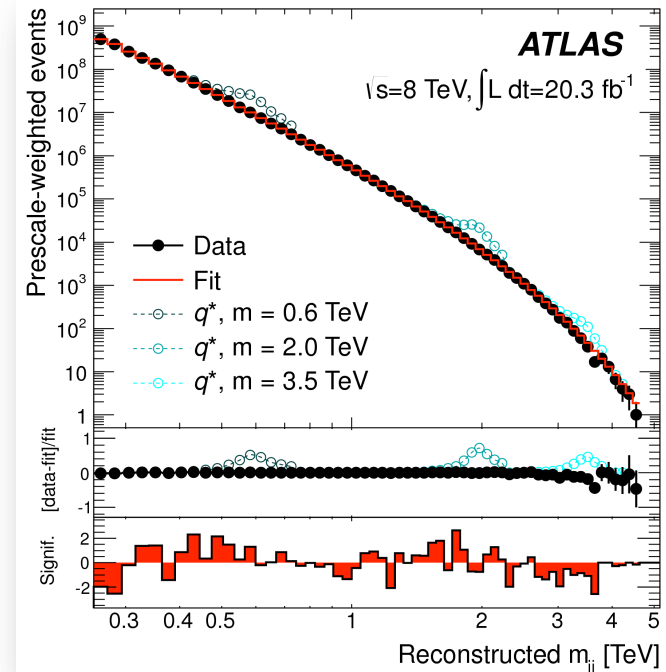
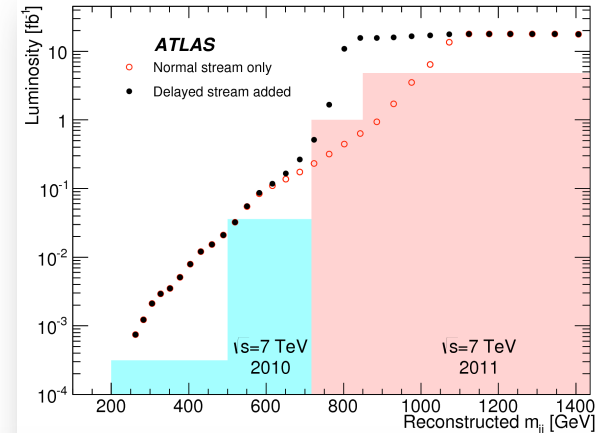




Resonance in dijet distribution

- Large statistics, yet high background level (QCD)
- New: data sample enriched by data recorded yet reconstructed later ('delayed stream')
 - increased statistics at $0.75 < m_{jj} < 1.0$ TeV
- Event selection
 - combination of single-jet triggers
 - only good-quality jets
 - at least 2 jets with $p_T > 50$ GeV & $|y| < 2.8$
 - $\frac{1}{2}|y_1 - y_2| < 0.6$ & $m_{jj} > 250$ GeV
- Looking for bump above phenomenological fit of the data

20.3 fb⁻¹ @ 8 TeV



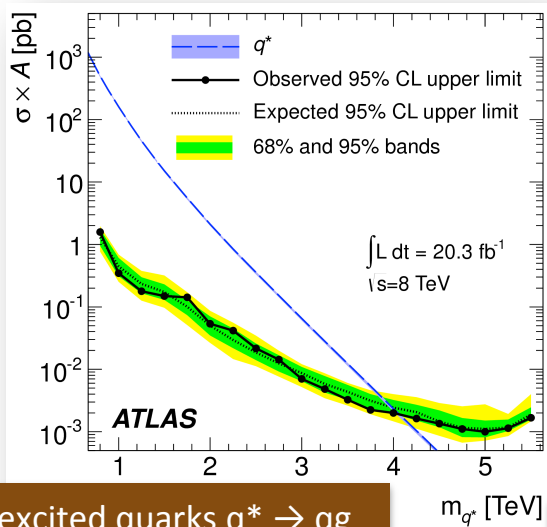
- ➔ No resonance-like features observed up to dijet masses of 4.5 TeV



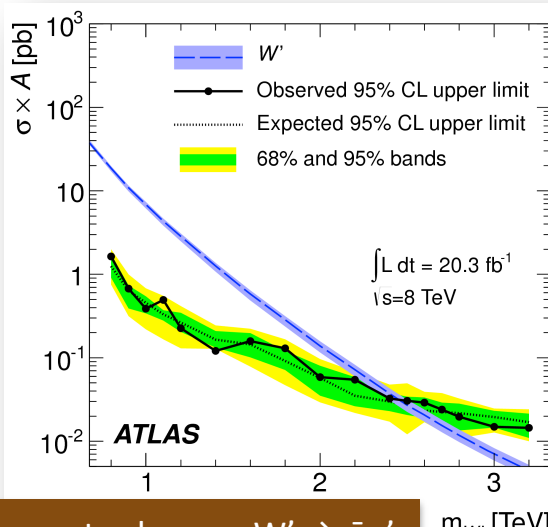
Dijets: interpretation

20.3 fb⁻¹ @ 8 TeV

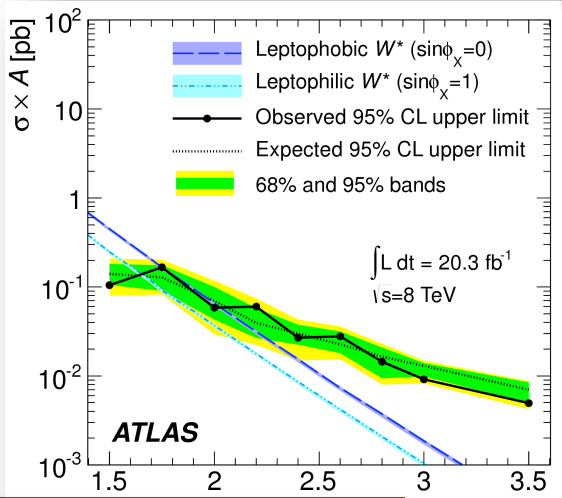
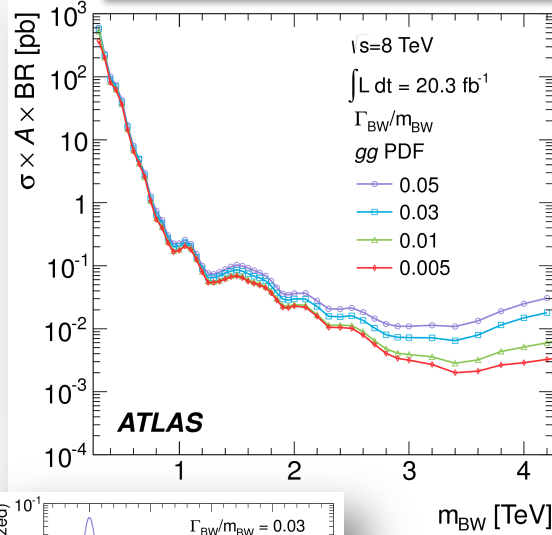
gg to Breit-Wigner resonance decaying to dijets



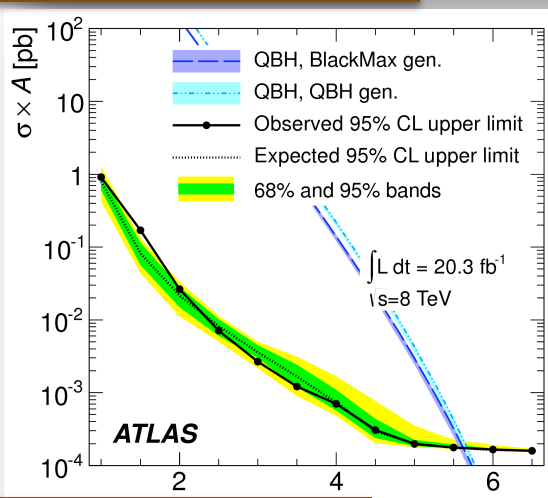
excited quarks $q^* \rightarrow qg$



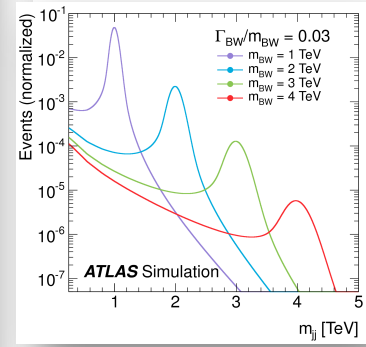
heavy vector bosons $W' \rightarrow \bar{q}q'$



excited vector bosons W^*



quantum black holes

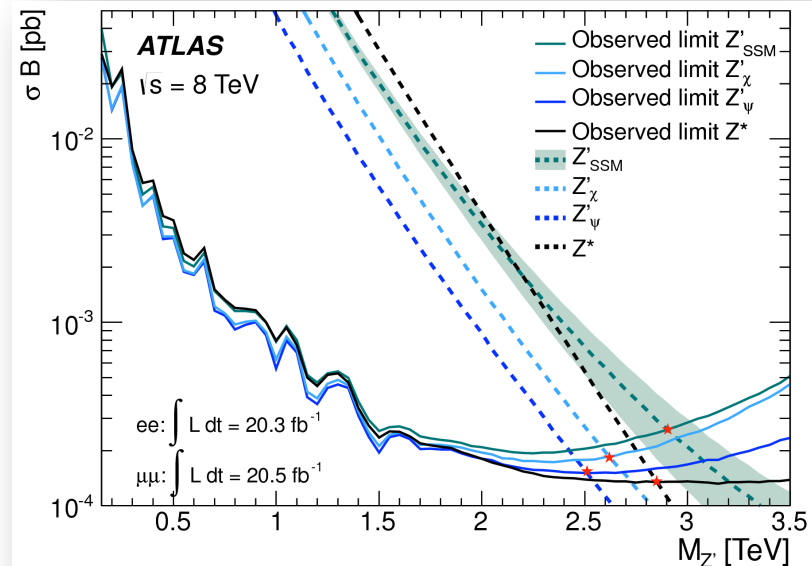
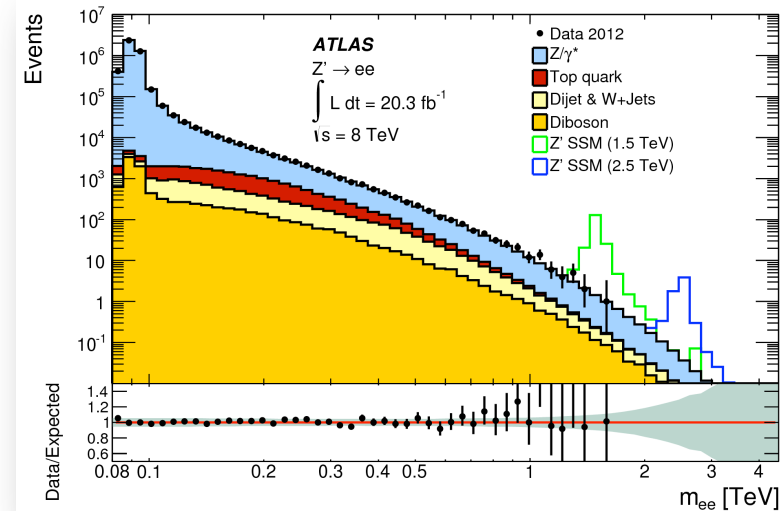




Dilepton resonance

- Selection
 - 2 electrons with $E_T > 40, 30$ GeV
OR 2 muons with $p_T > 25$ GeV
- Background
 - Drell-Yan, diboson, photon-induced, top and jets (fake rate from data)
 - total MC background scaled to data at Z-peak
- Data consistent with SM processes
- Interpretation on various models
 - SSM Z' ; minimal Z' , E_6 -motivated Z'_ψ and Z'_χ
 - chiral excited Z (Z^*)
 - Randall-Sundrum graviton G^*
 - Quantum Black Holes in ADD extra dimension model
 - Minimal Walking Technicolor

20.3 fb⁻¹ (e), 20.5 fb⁻¹ (μ) @ 8 TeV

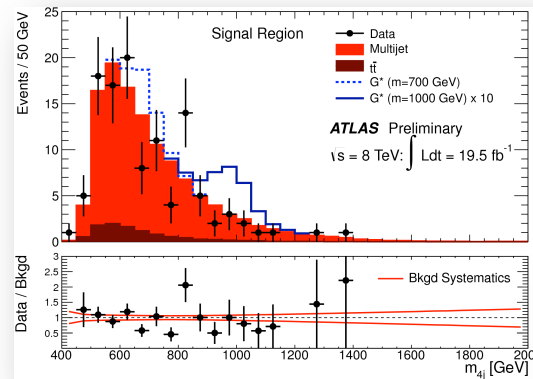


Diboson resonance: $X \rightarrow HH \rightarrow b\bar{b}b\bar{b}$

- Event selection
 - four b-tagged jets, each with $p_T > 40$ GeV
 - 2 nearby ($\Delta R < 1.5$) tagged $b\bar{b}$ pairs with $p_T(\text{dijet}) > 200$ GeV & m_{dijet} near Higgs mass
 - “ $t\bar{t}$ veto”
 - elliptical signal region (HH)

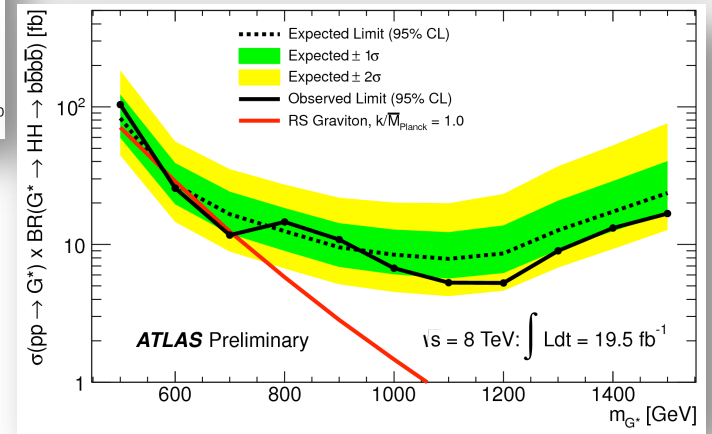
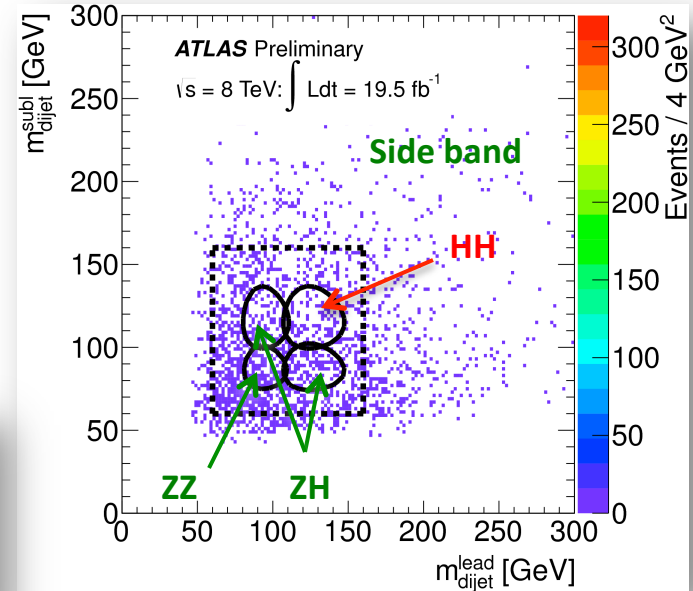
- Multijets background estimated by side band

- Data compatible with SM hypothesis



- Limits set on bulk RS graviton G^* (first KK excitation)
 - $\text{Br}(G^* \rightarrow HH) \approx 7\%$

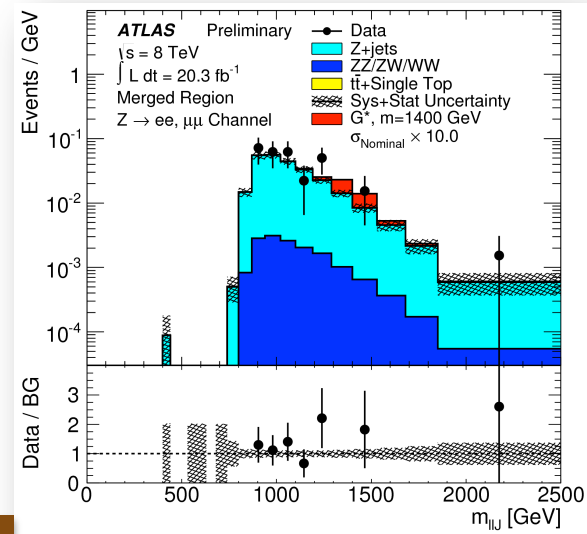
19.5 fb⁻¹ @ 8 TeV





Diboson resonance: $ZV \rightarrow \ell\ell q\bar{q}$

- Allows full reconstruction of invariant mass $X \rightarrow ZV$
- Consider both resolved (jj) and “merged” (J)
 - if highly boosted– dijet system
 - jet substructure information optimised for longitudinally polarised high- p_T boson
- Search for bump in $m(\ell\ell jj)$ or $m(\ell\ell J)$ distributions

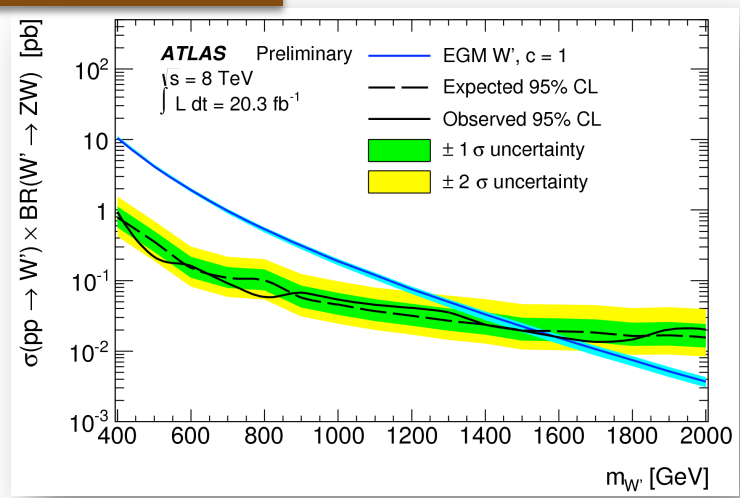
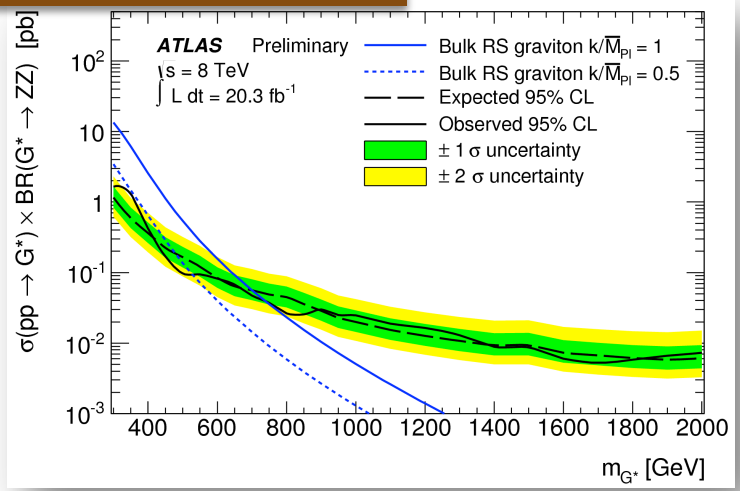


[ATLAS-CONF-2014-039](#)

20.3 fb⁻¹ @ 8 TeV

extended bulk RS
spin-2 KK graviton $G^* \rightarrow ZZ$

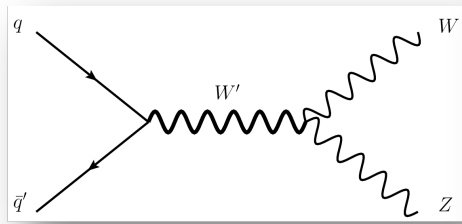
Extended Gauge Model
 $W' \rightarrow ZW$





Diboson resonance: $WZ \rightarrow \ell\nu\ell'\ell'$

- Fully leptonic channel \rightarrow good sensitivity due to smaller background compared to other channels



- Event selection

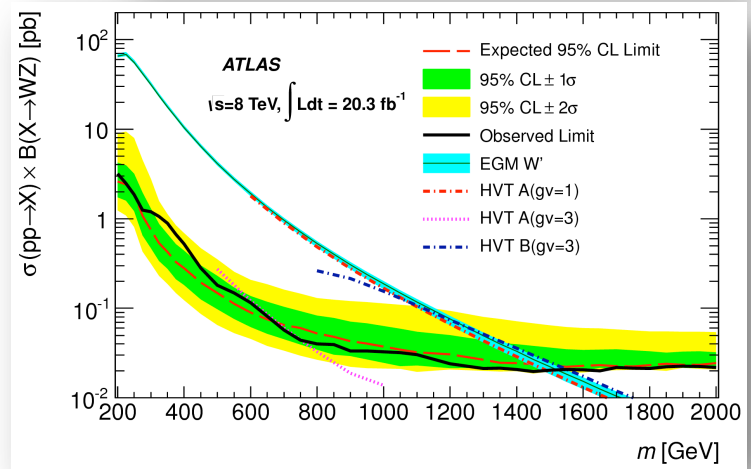
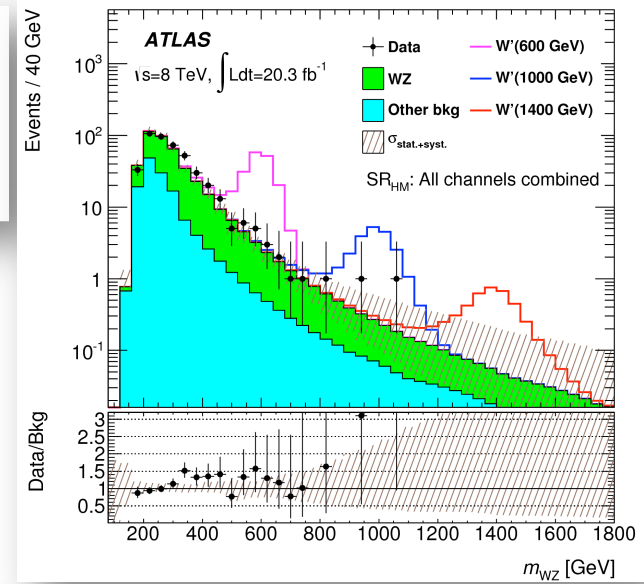
- exactly 3 charged leptons with $p_T > 25$ GeV
- $E_T^{\text{miss}} > 25$ GeV
- $|m_{\ell+\ell^-} - m_Z| < 20$ GeV
- $\Delta y(W,Z) < 1.5$
- $\Delta\phi(\ell, E_T^{\text{miss}}) < 1.5$ (> 1.5) for high (low) W' mass

20.3 fb⁻¹ @ 8 TeV

- No excess of events over SM expectation seen

- Interpretation

- Extended Gauge Model (EGM) with W' boson
- phenomenological Lagrangian for Heavy Vector Triplet (HVT) \rightarrow limits on couplings



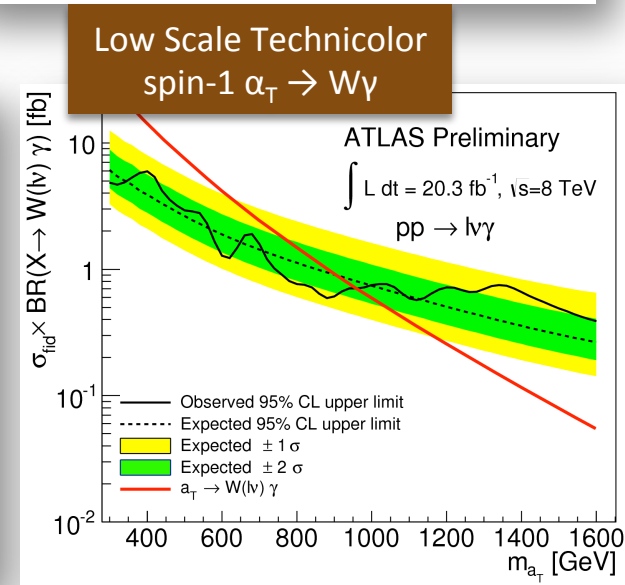
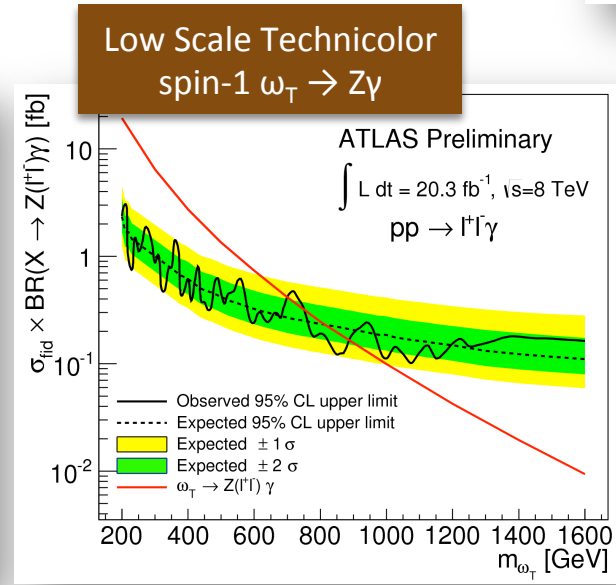
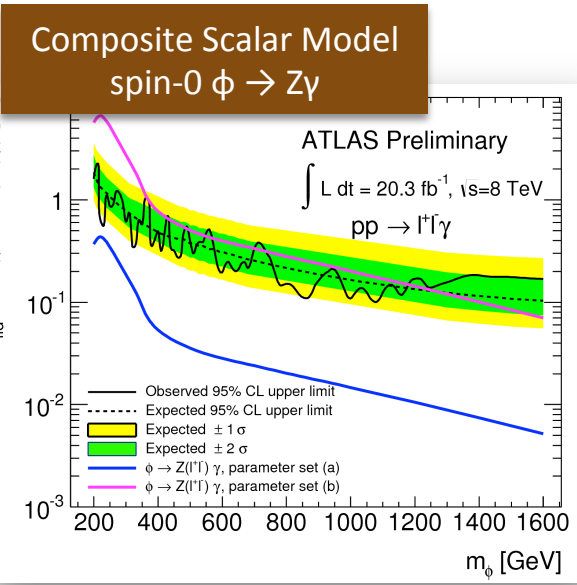
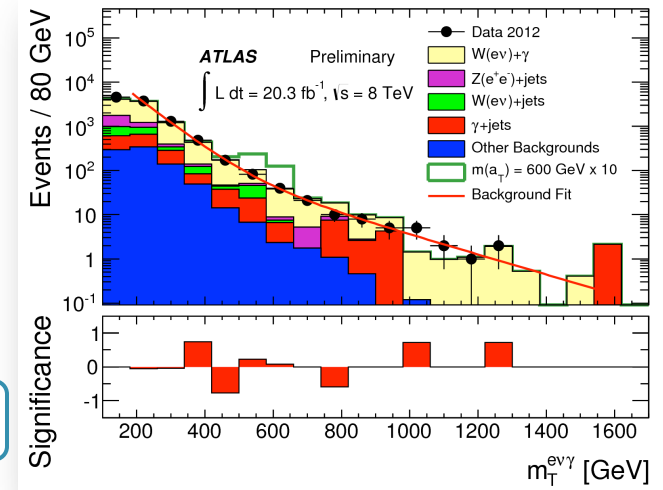


Diboson resonance: leptonic $V\gamma$

- $W\gamma \rightarrow \ell\nu\gamma, Z\gamma \rightarrow \ell\ell\gamma$
- Event selection
 - 1 (or 2) isolated e/μ with $p_T > 25$ GeV
 - 1 isolated photon $E_T > 40$ GeV, $\Delta R(\ell\gamma) > 0.7$
 - $W\gamma$: $E_T^{\text{miss}} > 35$ GeV, $p_T(\ell\nu) > 40$ GeV
 - $Z\gamma$: $65 < m(\ell\ell) < 115$ GeV
- Background
 - $Z\gamma, W\gamma, Z+\text{jets}, W+\text{jets}, \gamma+\text{jets}$

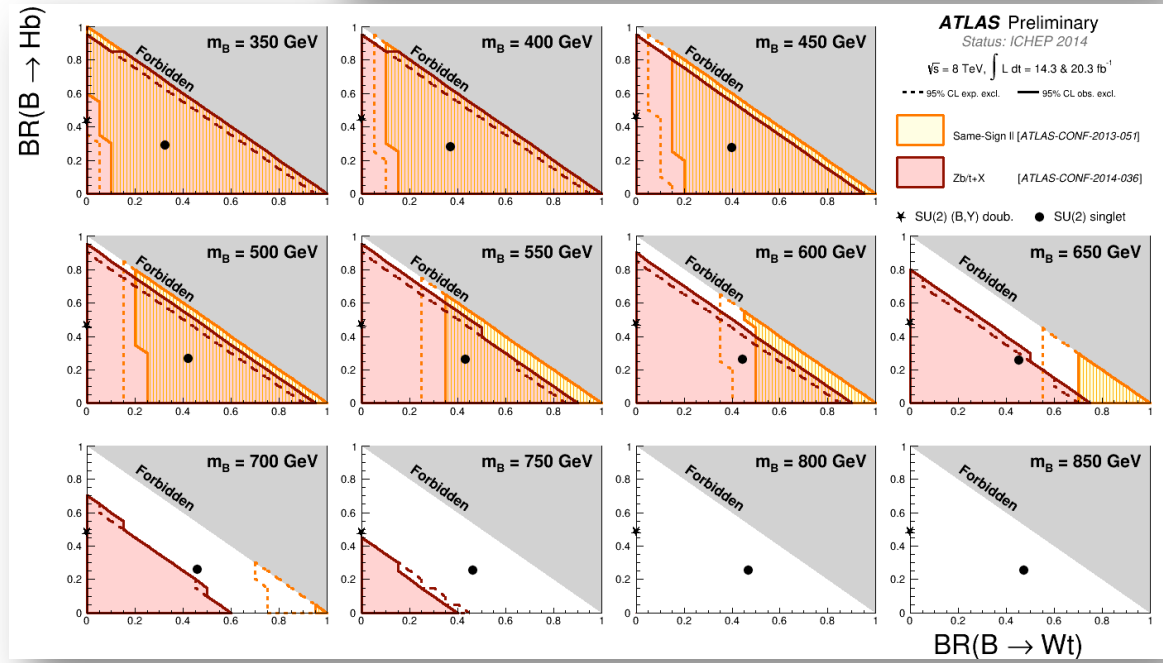
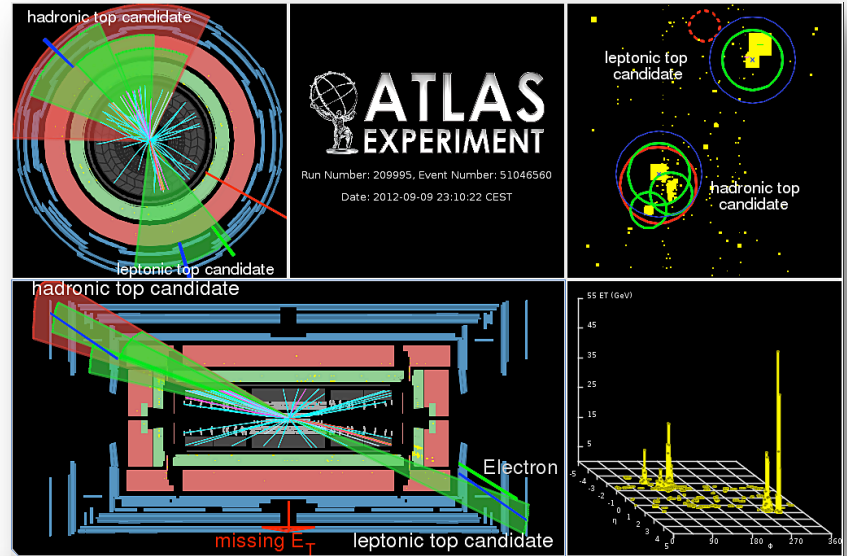
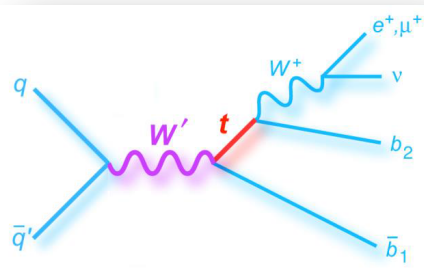
20.3 fb⁻¹ @ 8 TeV

Results to be published soon in PLB



Top/bottom resonances

- Heavy bosons searches
 - $t\bar{t}$ resonances
 - $W' \rightarrow t\bar{b}$ resonance
- Vector-Like Quarks (VLQs) searches
 - $Zt+X$
 - $Ht+X$
 - same-sign dilepton



See Jiahang Zhong's talk in Friday's parallel session on Alternative Theories

Probing BSM physics in tails

- Non-resonant dileptons [[arXiv:1407.2410](#)]
- Leptons & jets [[arXiv:1405.4254](#)]
- Generic search for New Physics [[ATLAS-CONF-2014-006](#)]
- Mono- X plus E_T^{miss} signatures



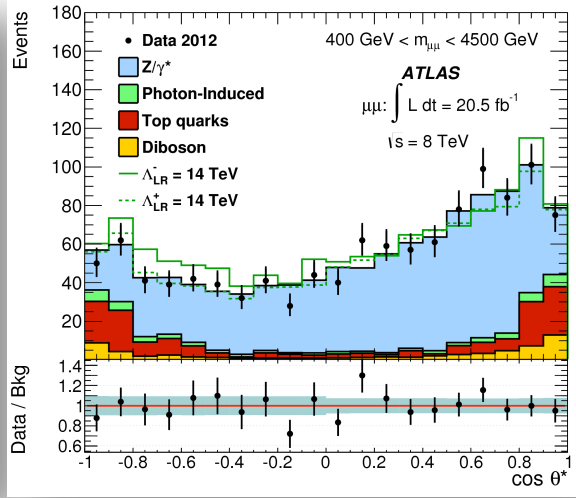
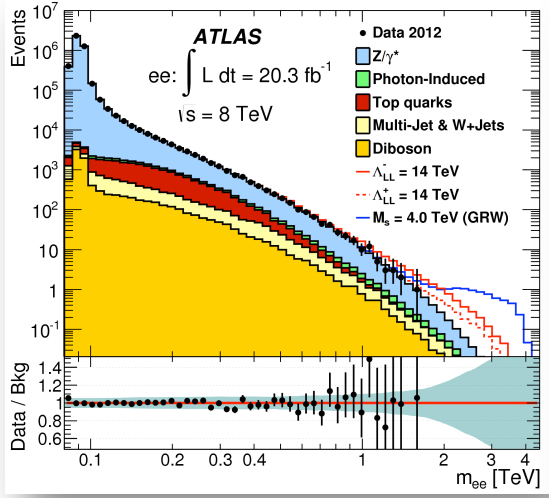
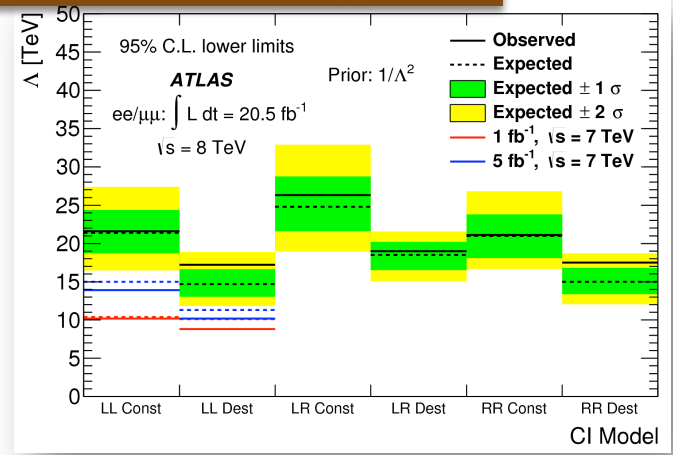
Non-resonant dileptons

- Event selection and background similar to resonant dilepton [arXiv:1405.4123]
- $m(\ell\ell)$ search bins optimised differently for contact interactions, CI, and for large extra dimension models
- Forward-backward asymmetry used as discriminant for CI search
- No significant deviations from the SM expectation is observed
 - ① Contact Interactions due to quark and lepton compositeness
 - ② Large flat spatial extra dimensions (ADD)
 - continuous dilepton production via virtual KK gravitons

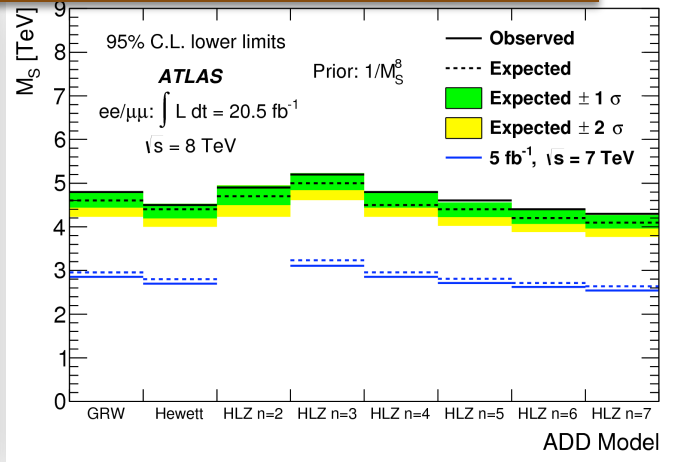
20.3 fb⁻¹ @ 8 TeV

arXiv:1407.2410

Contact Interactions $q\bar{q} \rightarrow \ell^+\ell^-$



Large Extra Dimensions $q\bar{q}/g\bar{g} \rightarrow \ell^+\ell^-$





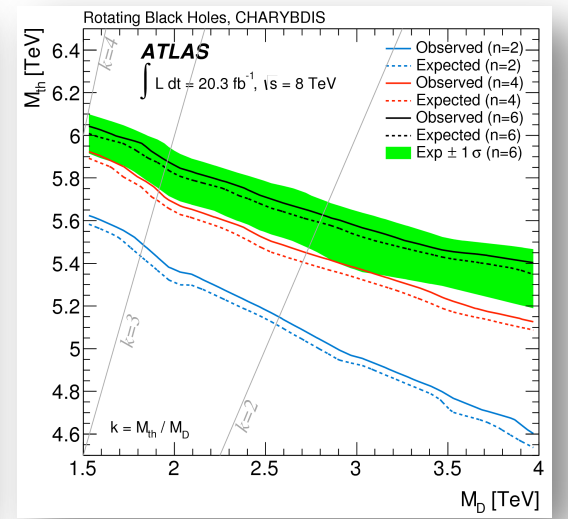
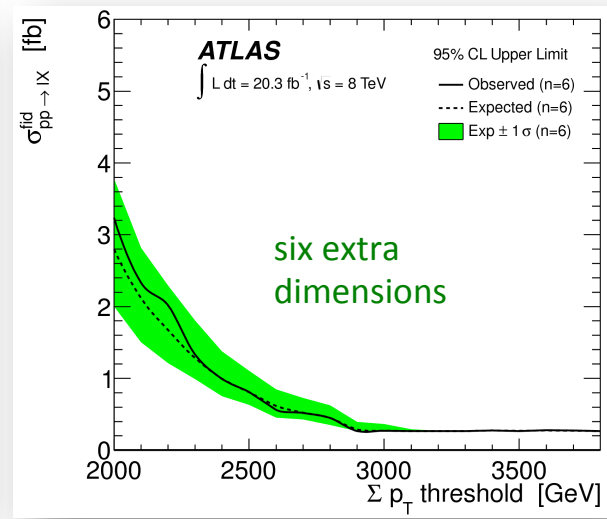
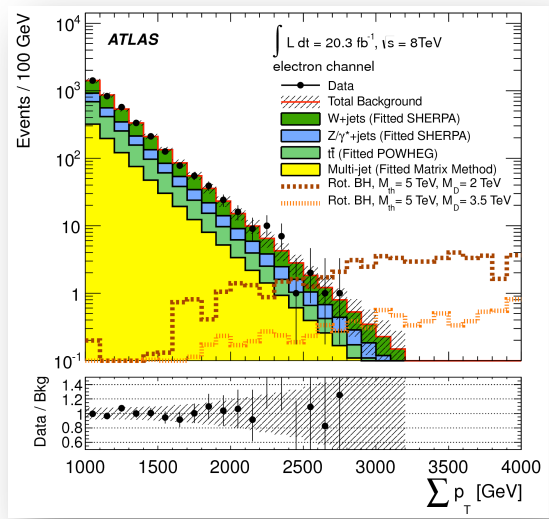
Black holes: leptons + jets

20.3 fb⁻¹ @ 8 TeV

- Microscopic BH evaporation or BH-remnant decay leads to high mass, high object multiplicity (large BR to leptons)
- Event selection
 - at least 3 high-p_T objects (jets + leptons) of p_T > 100 GeV
 - scalar p_T sum of selected objects, Σp_T > 2 TeV
- Main background: W/Z+jets, t \bar{t} , multijets (e channel) ← estimated from data for each component
- Slice signal region in order to be sensitive to wide range of signal phenomenologies
- No significant excess of events seen
 - model independent limits on signal cross section
 - limits on 11 Black Hole / String Ball models

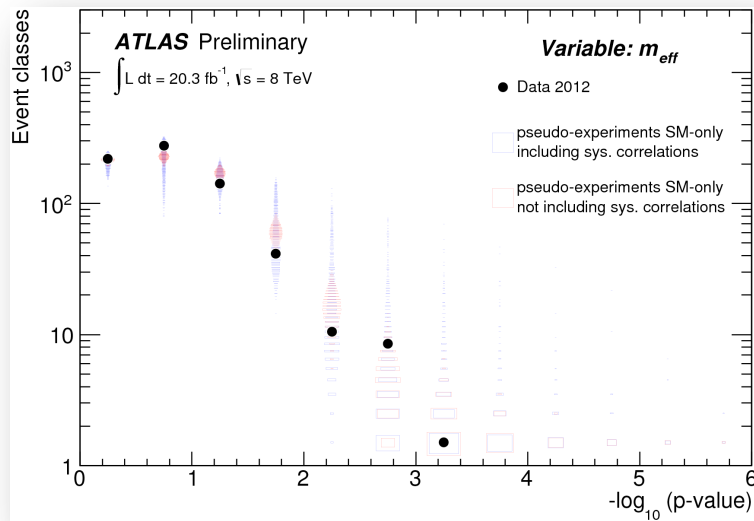
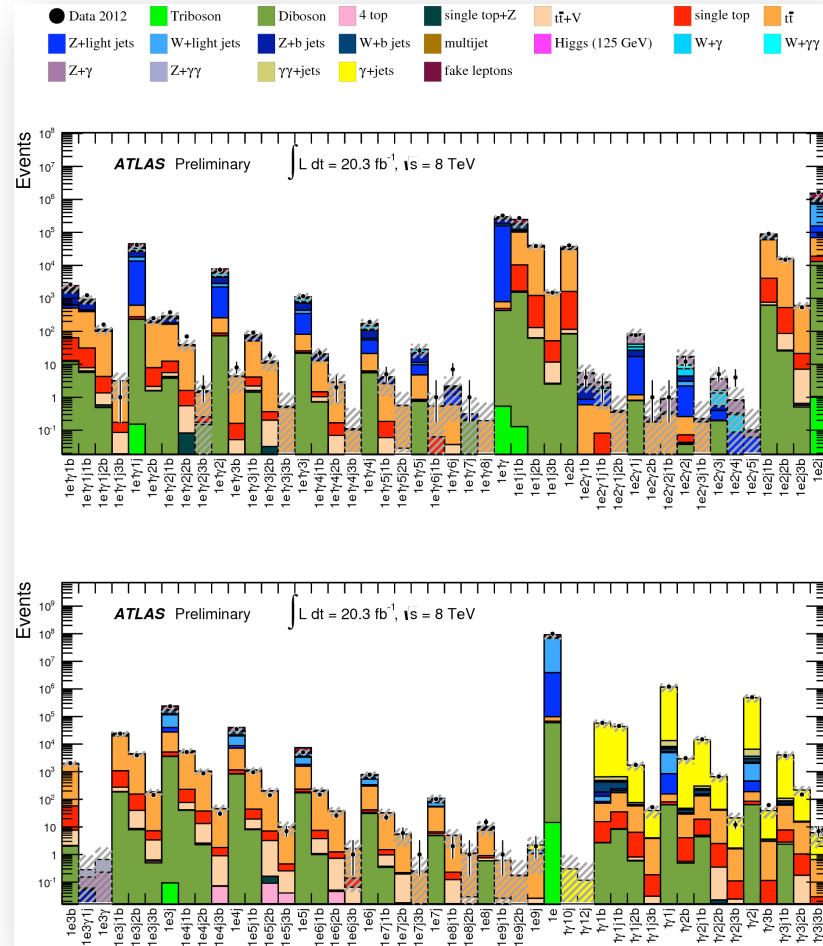
For search in same-sign dimuons:
[PRD88 \(2013\) 072001](#)

[arXiv:1405.4254](#)



General search for new phenomena

- Provides generic investigation for New Physics
 - not motivated/optimised by specific model
- Study topologies with isolated electrons, muons, photons, jets, b-jets, E_T^{miss}
- 697 search classes with SM expectation > 0.1 events
- MC-based background estimation, except for lepton fakes
- Three kinematic BSM-sensitive variables: m_{eff} , visible invariant mass & E_T^{miss}

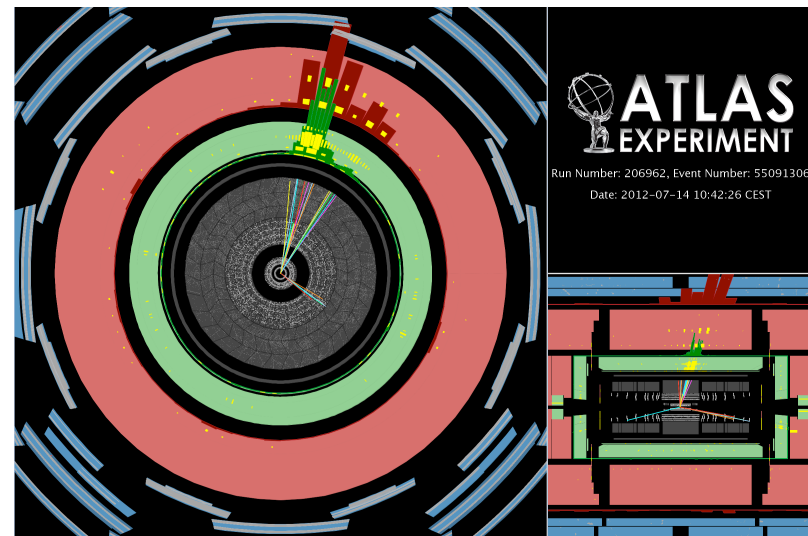
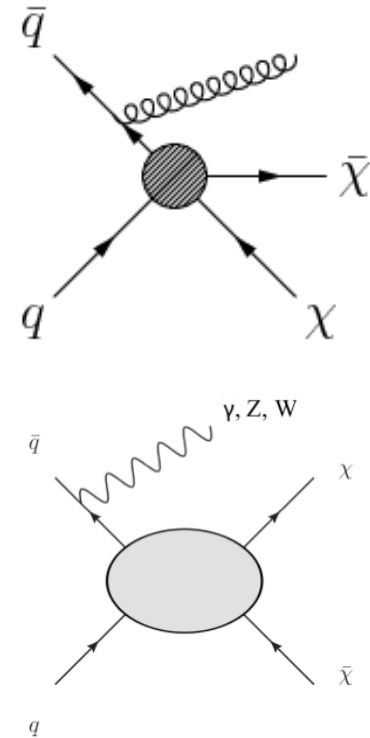


20.3 fb⁻¹
@ 8 TeV

➔ No significant deviation from SM expectation is found in data overall

Mono-X signatures

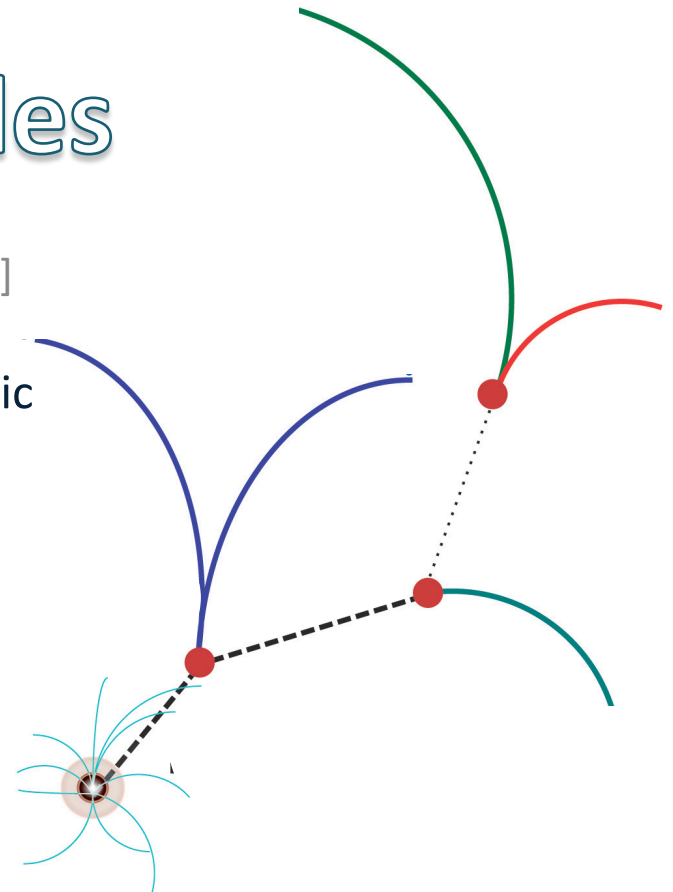
- Main motivation: dark matter (WIMP) production at LHC
 - search also sensitive to large extra dimension models
- Such events are tagged via the presence of an energetic jet or a photon or a W/Z coming from initial state radiation (ISR)
 - provide highly energetic object
 - balance two-WIMPs' momentum
→ high missing transverse energy E_T^{miss}
- → **Mono-jet, mono-photon, mono-W/Z distinctive signatures**



👉 See David Salek's talk in Thursday's parallel session on Particle Cosmology

Even more exotic ... long-lived particles

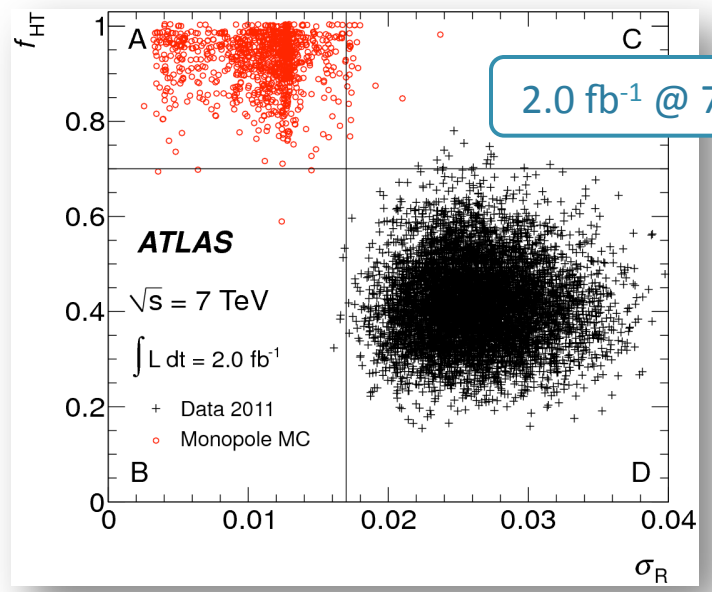
- Highly-ionising particles
 - magnetic monopoles [[PRL109 \(2012\) 261803](#)]
 - multi-charged particles [[PLB 722 \(2013\) 305](#)]
- Neutral long-lived particles (LLPs) in hadronic calorimeter [[ATLAS-CONF-2014-041](#)]



Highly-ionising particles

Magnetic monopoles

- Exploit distinct signals in Transition Radiation Tracker (high-threshold hit) and EM calorimeter (large localized energy deposit)
- Upper cross-section limits set for Dirac monopoles of mass of 200 – 1200 GeV

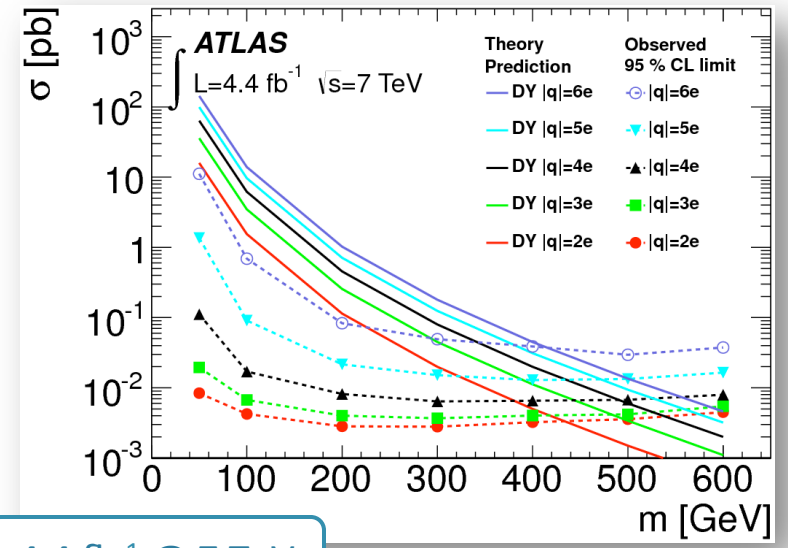


High-threshold TRT hit fraction, f_{HT} , versus EM cluster dispersion, σ_R

PRL109 (2012) 261803

Multi-charged particles

- Predicted in almost-commutative models and the walking technicolour model
- Search based on specific energy loss, dE/dx , measurements in the TRT and the Muon Spectrometer
- Limits set assuming a simplified Drell-Yan production model



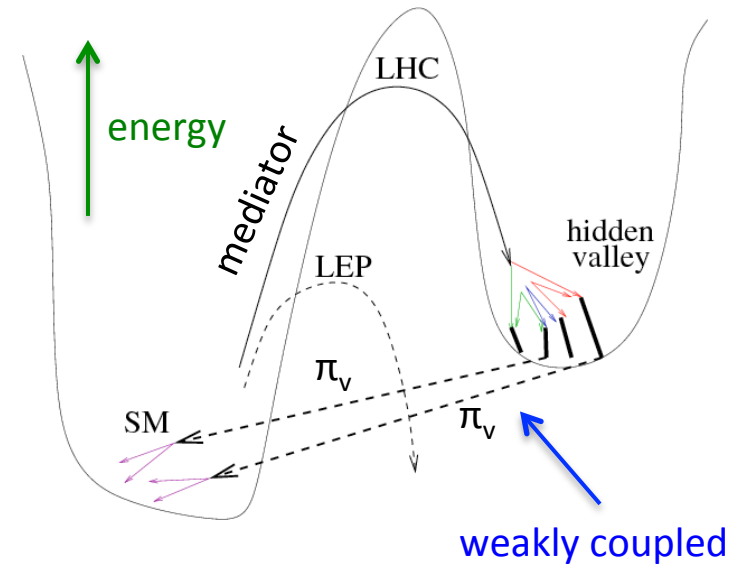
4.4 fb^{-1} @ 7 TeV

PLB 722 (2013) 305

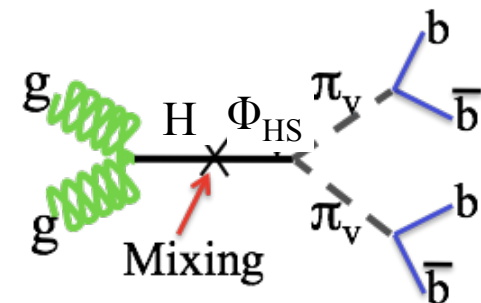


Neutral LLP: motivation & signature

- Hidden Sector (HS) weakly coupled to SM via heavy communicator scalar Φ_{HS}
- Benchmark: Hidden Valley model with the Higgs or a Higgs-like scalar decaying to a pair of neutral pseudoscalars (π_v) which in turn decay to pairs of SM fermions: $b\bar{b}$, $c\bar{c}$, $\tau^+\tau^-$
 - Hidden Valley can alter the branching fractions for Higgs decay
- Signature: If π_v is long-lived, it will give rise final states with π_v decaying in the **hadronic calorimeter (HCal)** or the outer edge of the **electromagnetic (EM) calorimeter**



M. Strassler, arXiv:hep-ph/0607160

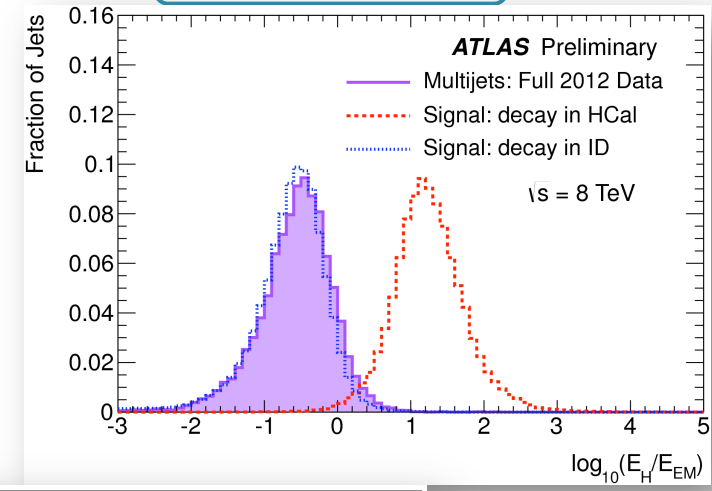




20.3 fb⁻¹ @ 8 TeV

Event selection & results

- Each heavy fermion pair from π_ν decay reconstructed as single jet with
 - ① narrow radius
 - ② no tracks from charged particle pointing to the jet
 - ③ little or no energy deposited on the EM calorimeter
- Dedicated *CalRatio* trigger developed to select events with these features [JINST 8 (2013) P07015]



- Event selection
 - $E_T^{\text{miss}} < 50 \text{ GeV}$, against cosmic rays & beam-halo events
 - Require two jets passing:
 - $\log_{10}(E_H/E_{EM}) > 1.2$, $|\eta| < 2.5$
 - no good tracks within $\Delta R = 0.2$ of jet
 - $-1 < |t| < 5 \text{ ns}$, against out-of-time events
 - One jet must have fired the trigger & $E_T > 60 \text{ GeV}$; the other $E_T > 40 \text{ GeV}$

Samples	Expected yields
MC sample m_Φ, m_{π_ν} [GeV]	
100, 10	297 ± 19
100, 25	379 ± 33
126, 10	357 ± 15
126, 25	793 ± 37
126, 40	400 ± 34
140, 10	343 ± 13
140, 20	724 ± 29
140, 40	645 ± 30
SM Multijets	23.2 ± 8.0
Cosmic rays	0.3 ± 0.2
Total Expected Background	23.5 ± 8.0
Data	24

statistics only

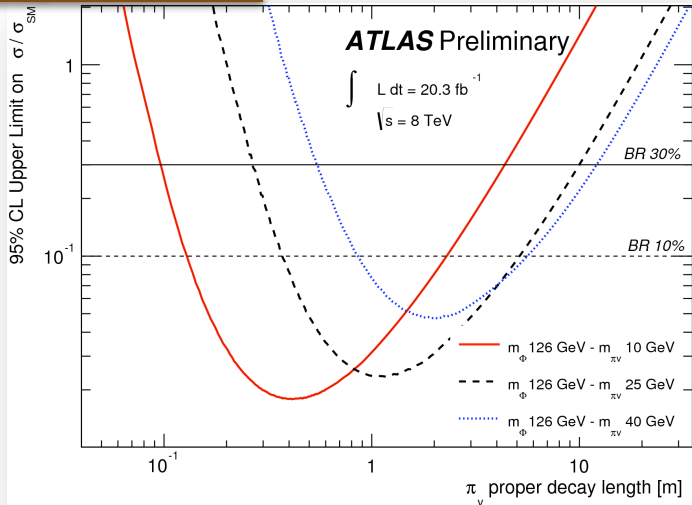
statistics + systematics



LLP: interpretation

No significant excess was observed
 → limits set in Hidden Valley scenario

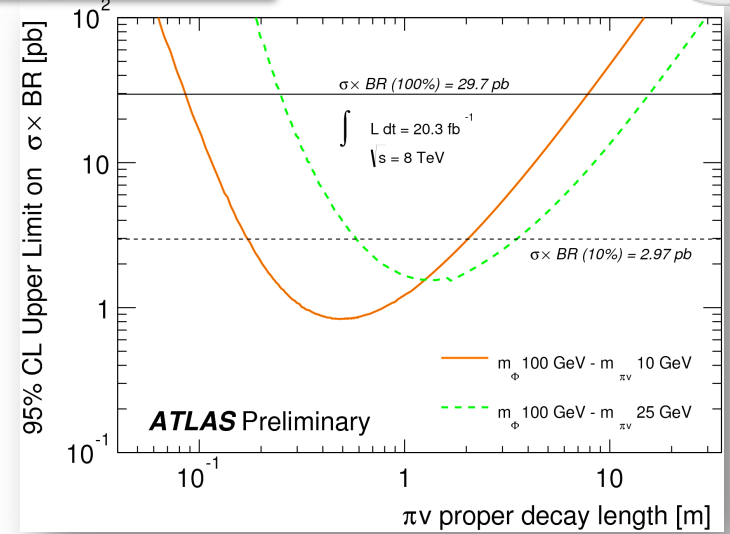
$m_\Phi = 126 \text{ GeV}$



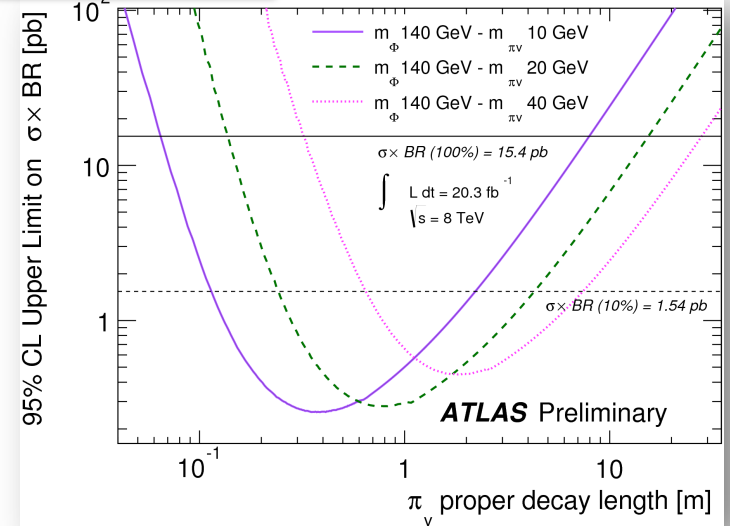
20.3 fb⁻¹
 @ 8 TeV

MC sample $m_\Phi, m_{\pi\nu}$ [GeV]	excluded range 30% BR $\Phi_{HS} \rightarrow \pi_\nu \pi_\nu$ [m]	excluded range 10% BR $\Phi_{HS} \rightarrow \pi_\nu \pi_\nu$ [m]
126, 10	0.10 - 4.38	0.13 - 2.30
126, 25	0.27 - 10.01	0.37 - 5.12
126, 40	0.54 - 12.11	0.86 - 5.62

$m_\Phi = 100 \text{ GeV}$



$m_\Phi = 140 \text{ GeV}$





All results in a nutshell

SUSY2014 V.A. Mitsou

ATLAS Exotics Searches* - 95% CL Exclusion

Status: ICHEP 2014

ATLAS Preliminary

$\int \mathcal{L} dt = (1.0 - 20.3) \text{ fb}^{-1}$ $\sqrt{s} = 7, 8 \text{ TeV}$

Model	ℓ, γ	Jets	E_T^{miss}	$\int \mathcal{L} dt [\text{fb}^{-1}]$	Mass limit	Reference	
Extra dimensions	ADD $G_{KK} + g/q$	-	1-2 j	Yes	4.7	M_D 4.37 TeV	$n = 2$ 1210.4491
	ADD non-resonant $\ell\ell$	$2e, \mu$	-	-	20.3	M_S 5.2 TeV	$n = 3 \text{ HLZ}$ ATLAS-CONF-2014-030
	ADD QBH $\rightarrow \ell q$	$1e, \mu$	1 j	-	20.3	M_{th} 5.2 TeV	$n = 6$ 1311.2006
	ADD QBH	-	2 j	-	20.3	M_{th} 5.82 TeV	$n = 6$ to be submitted to PRD
	ADD BH high N_{trk}	2μ (SS)	-	-	20.3	M_{th} 5.7 TeV	$n = 6, M_D = 1.5 \text{ TeV}$, non-rot BH 1308.4075
	ADD BH high $\sum p_T$	$\geq 1e, \mu$	$\geq 2j$	-	20.3	M_{th} 6.2 TeV	$n = 6, M_D = 1.5 \text{ TeV}$, non-rot BH 1405.4254
	RS1 $G_{KK} \rightarrow \ell\ell$	$2e, \mu$	-	-	20.3	G_{KK} mass 2.68 TeV	$k/\overline{M}_{Pl} = 0.1$ 1405.4123
	RS1 $G_{KK} \rightarrow WW \rightarrow \ell\nu\ell\nu$	$2e, \mu$	-	Yes	4.7	G_{KK} mass 1.23 TeV	$k/\overline{M}_{Pl} = 0.1$ 1208.2880
	Bulk RS $G_{KK} \rightarrow ZZ \rightarrow \ell\ell q\bar{q}$	$2e, \mu$	2 j / 1 J	-	20.3	G_{KK} mass 730 GeV	$k/\overline{M}_{Pl} = 1.0$ ATLAS-CONF-2014-039
	Bulk RS $G_{KK} \rightarrow HH \rightarrow b\bar{b}b\bar{b}$	-	4 b	-	19.5	G_{KK} mass 590-710 GeV	$k/\overline{M}_{Pl} = 1.0$ ATLAS-CONF-2014-005
	Bulk RS $g_{KK} \rightarrow t\bar{t}$	$1e, \mu$	$\geq 1b, \geq 1J/2j$	Yes	14.3	g_{KK} mass 2.0 TeV	BR = 0.925 ATLAS-CONF-2013-052
	S^1/Z_2 ED	$2e, \mu$	-	-	5.0	$M_{KK} \approx R^{-1}$ 4.71 TeV	1209.2535
UED	2γ	-	Yes	4.8	Compact, scale R^{-1} 1.41 TeV	ATLAS-CONF-2012-072	
Gauge bosons	SSM $Z' \rightarrow \ell\ell$	$2e, \mu$	-	-	20.3	Z' mass 2.9 TeV	1405.4123
	SSM $Z' \rightarrow \tau\tau$	2τ	-	-	19.5	Z' mass 1.9 TeV	ATLAS-CONF-2013-066
	SSM $W' \rightarrow \ell\nu$	$1e, \mu$	-	Yes	20.3	W' mass 3.28 TeV	ATLAS-CONF-2014-017
	EGM $W' \rightarrow WZ \rightarrow \ell\nu\ell'\ell'$	$3e, \mu$	-	Yes	20.3	W' mass 1.52 TeV	1406.4456
	EGM $W' \rightarrow WZ \rightarrow qq\ell\ell$	$2e, \mu$	2 j / 1 J	-	20.3	W' mass 1.59 TeV	ATLAS-CONF-2014-039
	LRSM $W'_R \rightarrow t\bar{b}$	$1e, \mu$	2 b, 0-1 j	Yes	14.3	W'_R mass 1.84 TeV	ATLAS-CONF-2013-050
LRSM $W'_R \rightarrow t\bar{b}$	$0e, \mu$	$\geq 1b, 1j$	-	20.3	W'_R mass 1.77 TeV	to be submitted to EPJC	
CI	CI $qqqq$	-	2 j	-	4.8	Λ 7.6 TeV	$\eta = +1$ 1210.1718
	CI $qq\ell\ell$	$2e, \mu$	-	-	20.3	Λ 21.6 TeV	$\eta_{LL} = -1$ ATLAS-CONF-2014-030
	CI $uutt$	$2e, \mu$ (SS)	$\geq 1b, \geq 1j$	Yes	14.3	Λ 3.3 TeV	$ C = 1$ ATLAS-CONF-2013-051
DM	EFT D5 operator (Dirac)	$0e, \mu$	1-2 j	Yes	10.5	M_* 731 GeV	at 90% CL for $m(\chi) < 80 \text{ GeV}$ ATLAS-CONF-2012-147
	EFT D9 operator (Dirac)	$0e, \mu$	1 J, $\leq 1j$	Yes	20.3	M_* 2.4 TeV	at 90% CL for $m(\chi) < 100 \text{ GeV}$ 1309.4017
LQ	Scalar LQ 1 st gen	$2e$	$\geq 2j$	-	1.0	LQ mass 660 GeV	$\beta = 1$ 1112.4828
	Scalar LQ 2 nd gen	2μ	$\geq 2j$	-	1.0	LQ mass 685 GeV	$\beta = 1$ 1203.3172
	Scalar LQ 3 rd gen	$1e, \mu, 1\tau$	1 b, 1 j	-	4.7	LQ mass 534 GeV	$\beta = 1$ 1303.0526
Heavy quarks	Vector-like quark $TT \rightarrow Ht + X$	$1e, \mu$	$\geq 2b, \geq 4j$	Yes	14.3	T mass 790 GeV	T in (T,B) doublet ATLAS-CONF-2013-018
	Vector-like quark $TT \rightarrow Wb + X$	$1e, \mu$	$\geq 1b, \geq 3j$	Yes	14.3	T mass 670 GeV	isospin singlet ATLAS-CONF-2013-060
	Vector-like quark $TT \rightarrow Zt + X$	$2/\geq 3e, \mu$	$\geq 2/\geq 1b$	-	20.3	T mass 735 GeV	T in (T,B) doublet ATLAS-CONF-2014-036
	Vector-like quark $BB \rightarrow Zb + X$	$2/\geq 3e, \mu$	$\geq 2/\geq 1b$	-	20.3	B mass 755 GeV	B in (B,Y) doublet ATLAS-CONF-2014-036
	Vector-like quark $BB \rightarrow Wt + X$	$2e, \mu$ (SS)	$\geq 1b, \geq 1j$	Yes	14.3	B mass 720 GeV	B in (T,B) doublet ATLAS-CONF-2013-051
Excited fermions	Excited quark $q^* \rightarrow q\gamma$	1γ	1 j	-	20.3	q^* mass 3.5 TeV	only u^* and d^* , $\Lambda = m(q^*)$ 1309.3230
	Excited quark $q^* \rightarrow qg$	-	2 j	-	20.3	q^* mass 4.09 TeV	only u^* and d^* , $\Lambda = m(q^*)$ to be submitted to PRD
	Excited quark $b^* \rightarrow Wt$	1 or 2 e, μ	1 b, 2 j or 1 j	Yes	4.7	b^* mass 870 GeV	left-handed coupling 1301.1583
	Excited lepton $\ell^* \rightarrow \ell\gamma$	$2e, \mu, 1\gamma$	-	-	13.0	ℓ^* mass 2.2 TeV	$\Lambda = 2.2 \text{ TeV}$ 1308.1364
Other	LSTC $a_T \rightarrow W\gamma$	$1e, \mu, 1\gamma$	-	Yes	20.3	a_T mass 960 GeV	to be submitted to PLB
	LRSM Majorana ν	$2e, \mu$	2 j	-	2.1	N^0 mass 1.5 TeV	$m(W_R) = 2 \text{ TeV}$, no mixing 1203.5420
	Type III Seesaw	$2e, \mu$	-	-	5.8	N^\pm mass 245 GeV	$ V_{\tau 1} =0.055, V_{\tau 2} =0.063, V_{\tau 3} =0$ ATLAS-CONF-2013-019
	Higgs triplet $H^{\pm\pm} \rightarrow \ell\ell$	$2e, \mu$ (SS)	-	-	4.7	$H^{\pm\pm}$ mass 409 GeV	DY production, BR($H^{\pm\pm} \rightarrow \ell\ell$)=1 1210.5070
	Multi-charged particles	-	-	-	4.4	multi-charged particle mass 490 GeV	DY production, $ q = 4e$ 1301.5272
Magnetic monopoles	-	-	-	2.0	monopole mass 862 GeV	DY production, $ g = 1g_D$ 1207.6411	

$\sqrt{s} = 7 \text{ TeV}$ $\sqrt{s} = 8 \text{ TeV}$

10⁻¹ 1 10 Mass scale [TeV]

*Only a selection of the available mass limits on new states or phenomena is shown.

Summary

- Standard Model limitations imperatively call for Physics beyond it, extending and complementing it
- ATLAS has searched for physics BSM at TeV scale in a variety of signatures inspired by a multitude of theoretical scenarios
- **No significant deviation from SM expectations observed so far**
- **LHC Run 2 may reveal hints of New Physics thanks to higher accessible energy**
 - ATLAS is well-prepared to make the most of it



**... for 13-14 TeV
run in 2015**

Continuously updated public results:

<https://twiki.cern.ch/twiki/bin/view/AtlasPublic/ExoticsPublicResults>

**Thank you for
your attention!**

