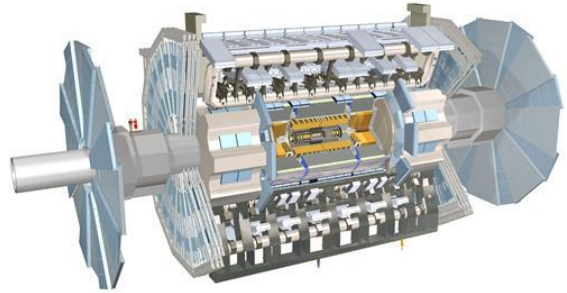
ATLAS EXPERIMENT



Поиск темной материи в эксперименте ATLAS

Восьмые Черенковские Чтения,
14 апреля 2015г., ФИАН, Москва

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МГУ имени М.В.Ломоносова

Главный результата первого сеанса БАК

Открытие новой частицы в 2012г. и ее идентификация с бозоном Хиггса стандартной модели (СМ) в экспериментах ATLAS и CMS

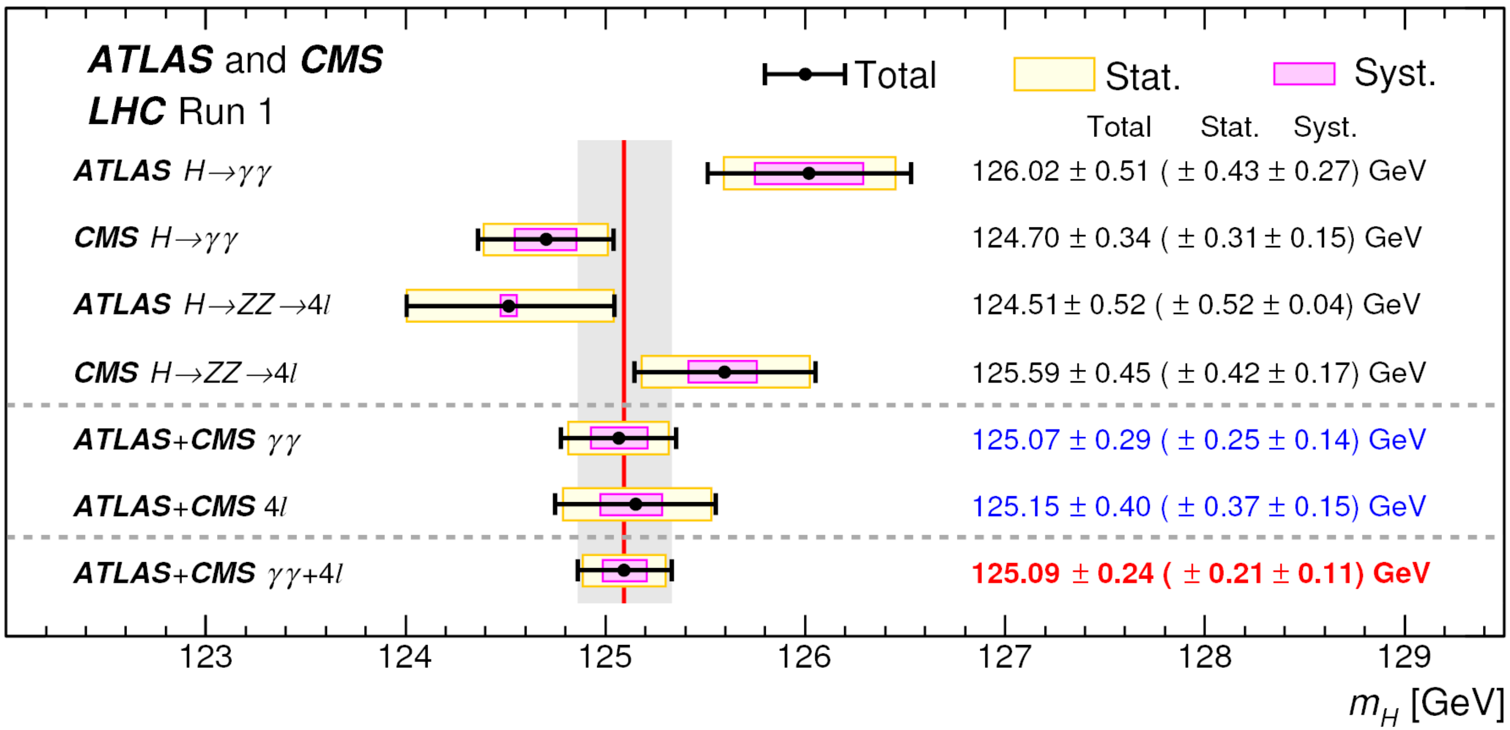
Присуждение Нобелевской премии продемонстрировало признание значимости этого события:

Nobel prize 2013 in physics
statement :

François Englert (left) and Peter Higgs at CERN on 4 July 2012, on the occasion of the announcement of the discovery of a Higgs boson by the ATLAS and CMS experiments (Image: Maximilien Brice/CERN)

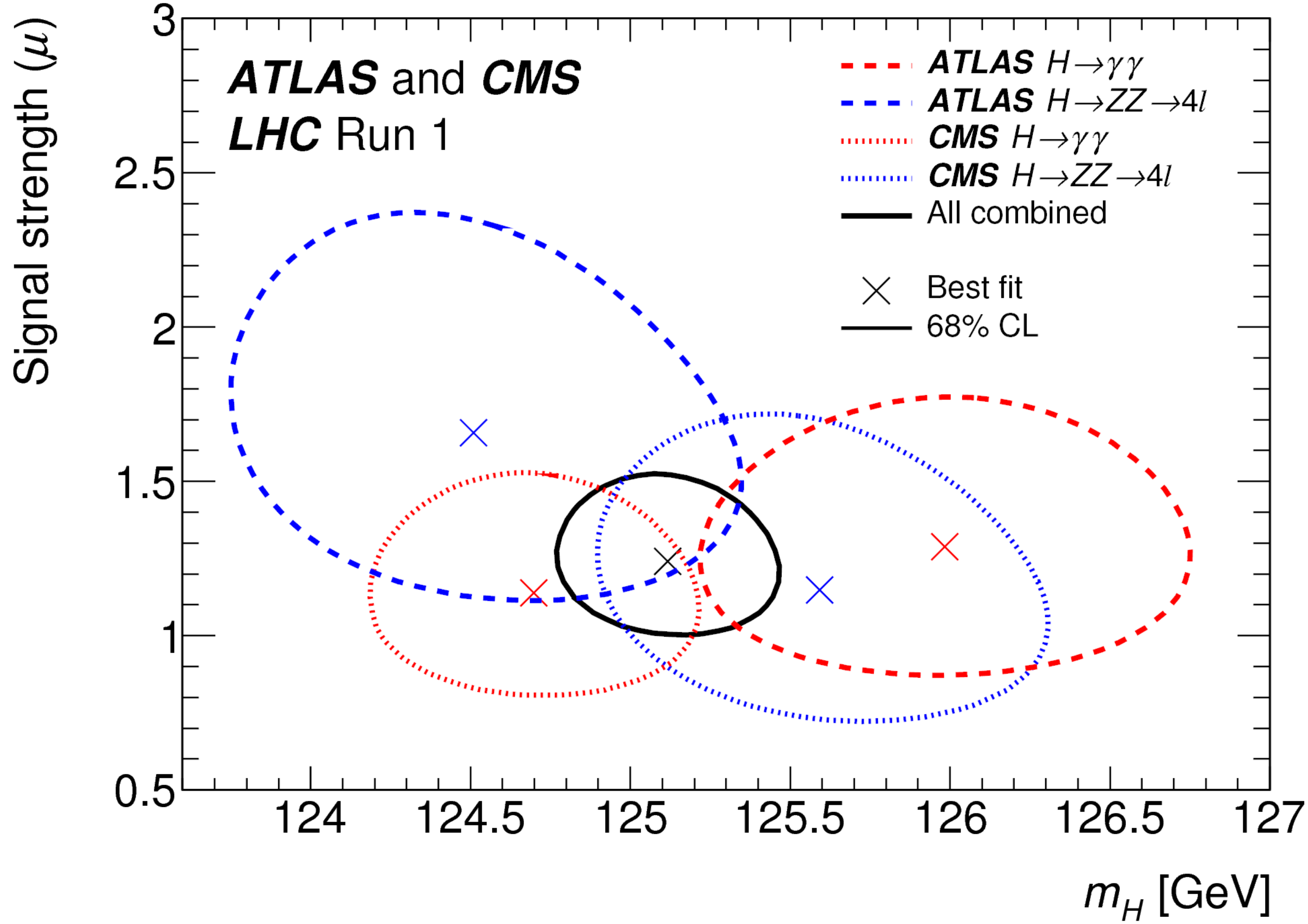
Новые объединенные результаты измерения массы бозона Хиггса

$M_H = 125.09 \pm 0.24$ ГэВ (0.2%)

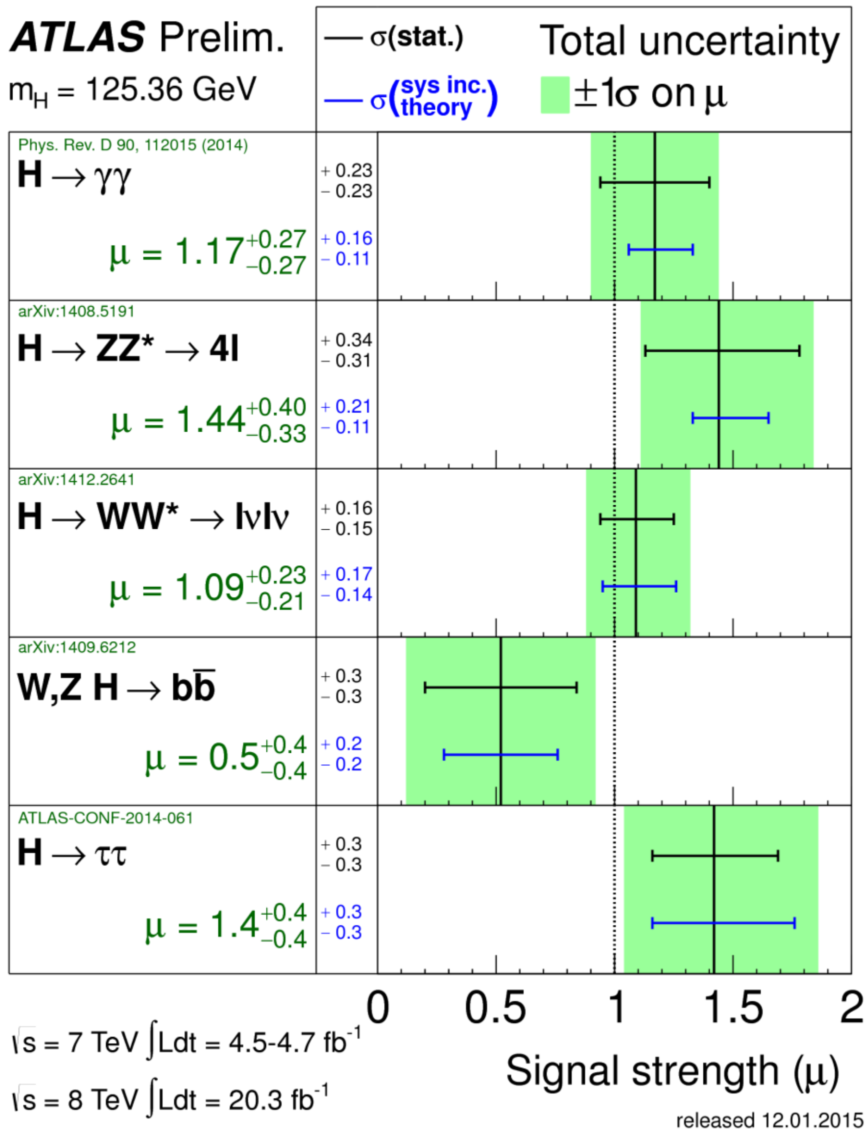


arxiv.:1503.07589, 25 марта 2015

Объединенные результаты для массы и силы сигнала бозона Хиггса



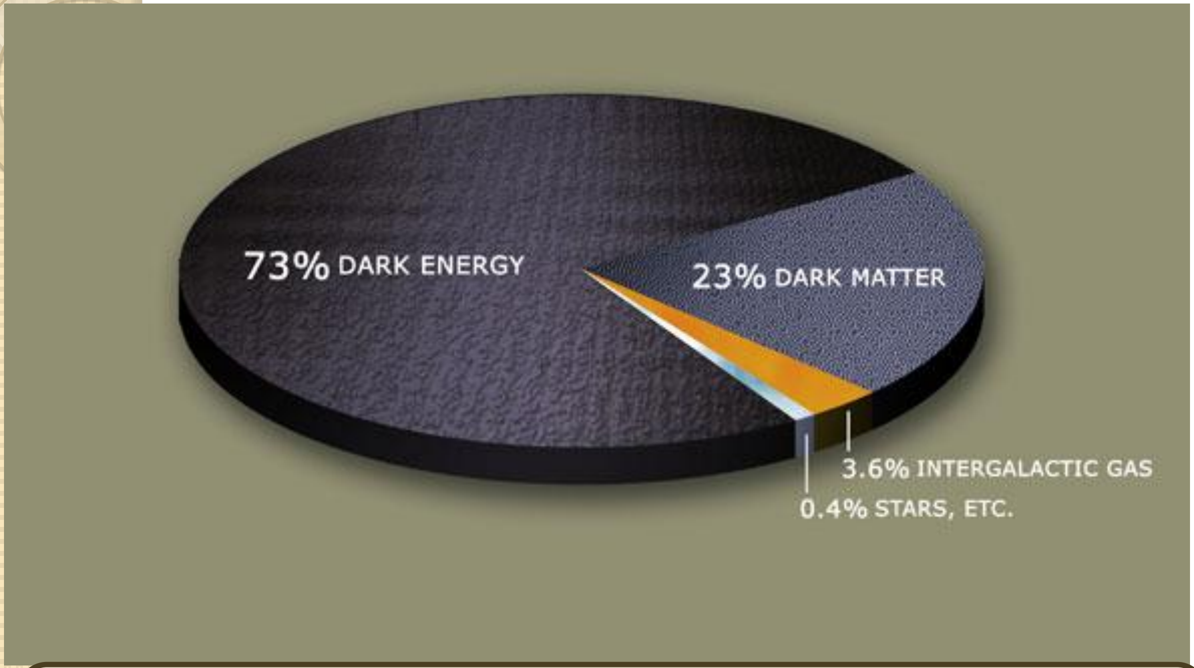
Результаты ATLAS по сигналу в других каналах распада



Следующий этап – сеанс 2 (2015 -2018)

- Открытие следующей новой частицы будет открытием Новой физики за пределами СМ
- Поиск частиц темной материи является частью этой программы поисков
- Эксперименты БАК могут дать прямые свидетельства о природе темной материи

Темная материя во Вселенной



Estimated distribution of dark matter and dark energy in the universe. Image Credit: NASA

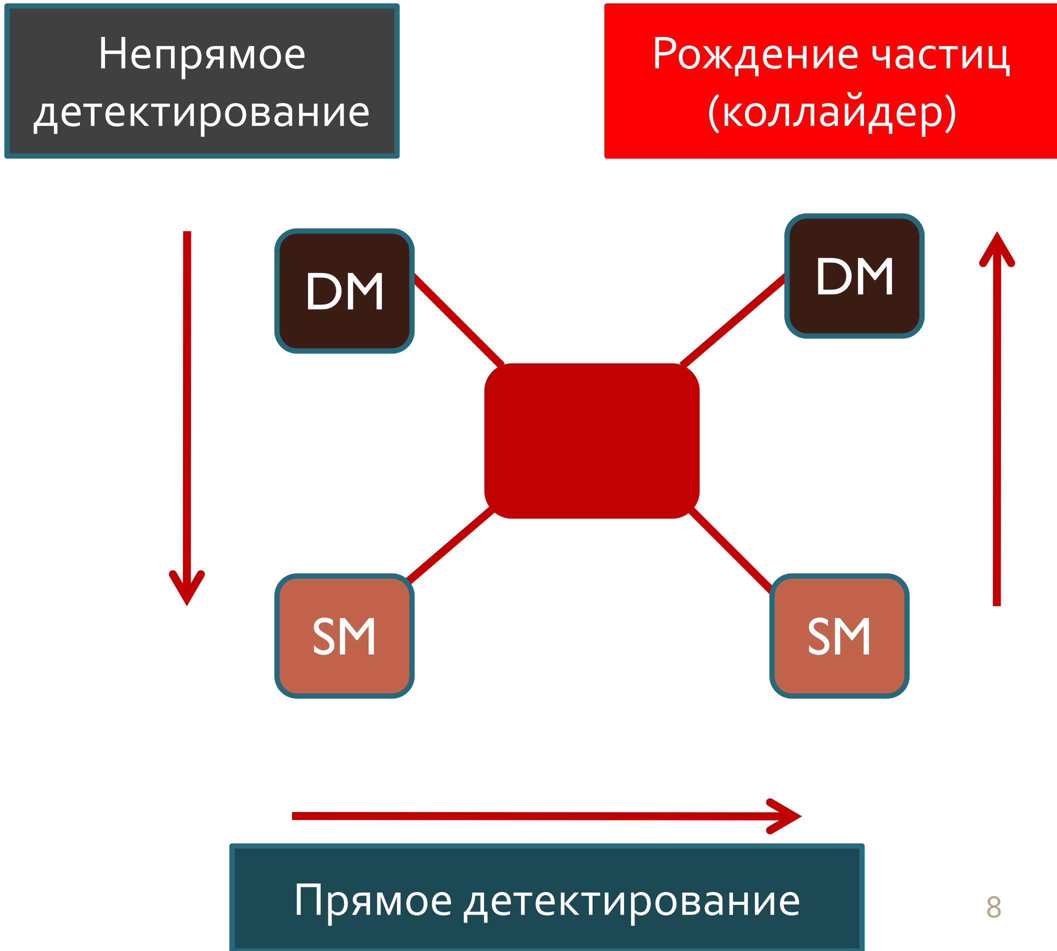
This image shows the distribution of dark matter, galaxies, and hot gas in the core of the merging galaxy cluster Abell 520. The result could present a challenge to basic theories of dark matter.

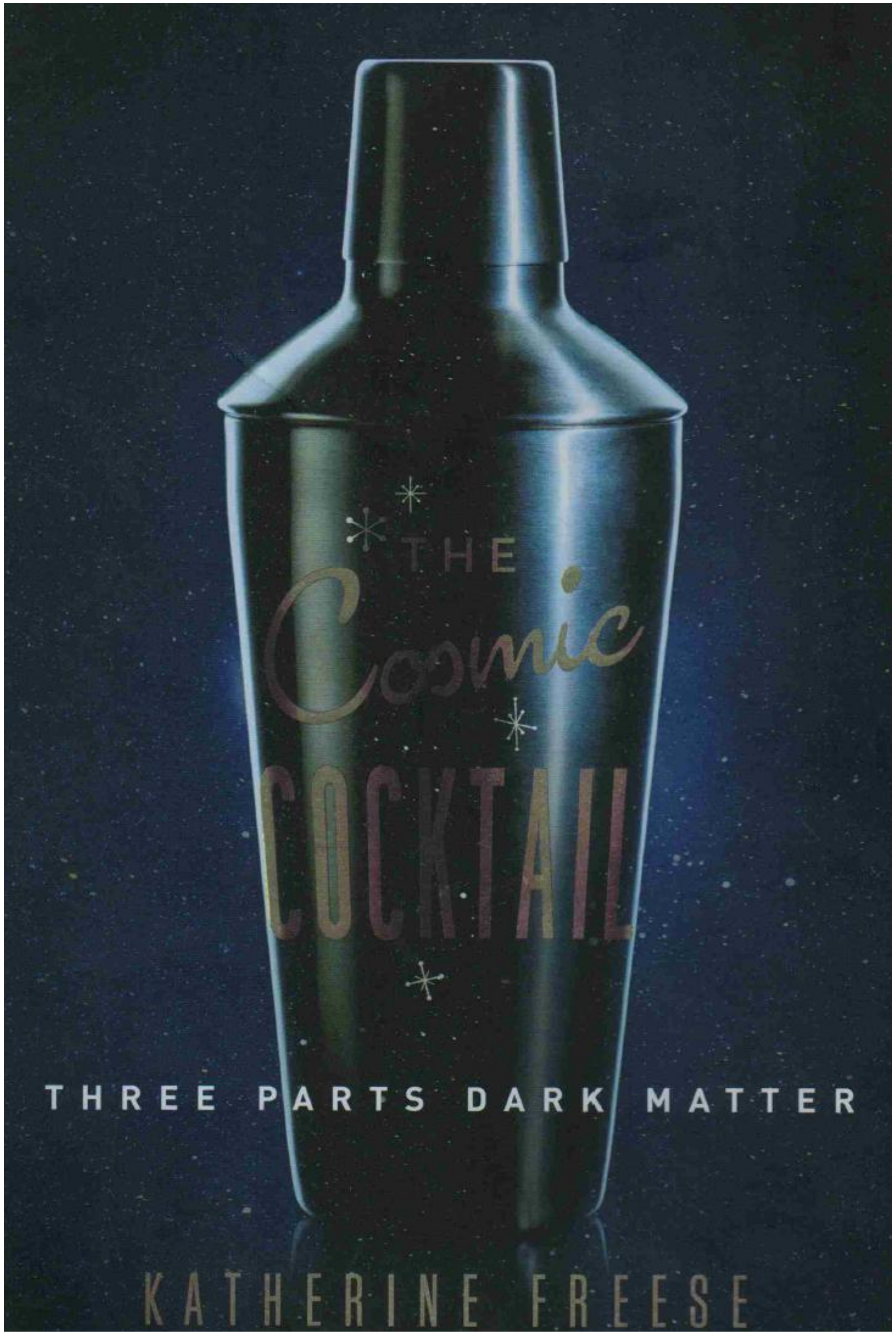
Many theories say the dark matter particles would be light enough to be produced at the LHC.

Варианты экспериментального поиска темной материи

- Прямое детектирование
- Непрямое детектирование
- Рождение частиц на коллайдере

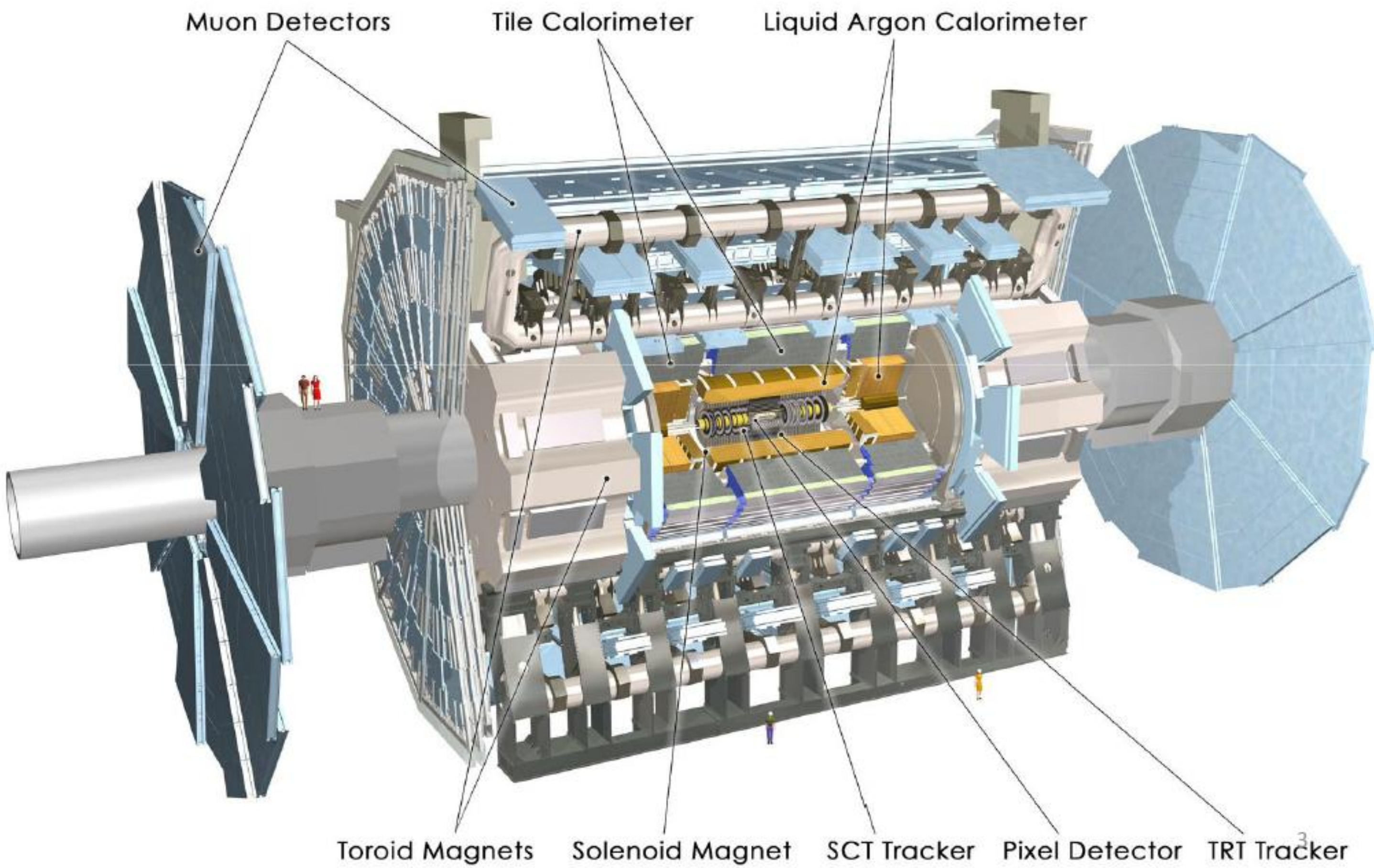
(К.Фриз «Космический коктейль», 2014)




THE
Cosmic
COCKTAIL
THREE PARTS DARK MATTER
KATHERINE FREESE

ATLAS detector

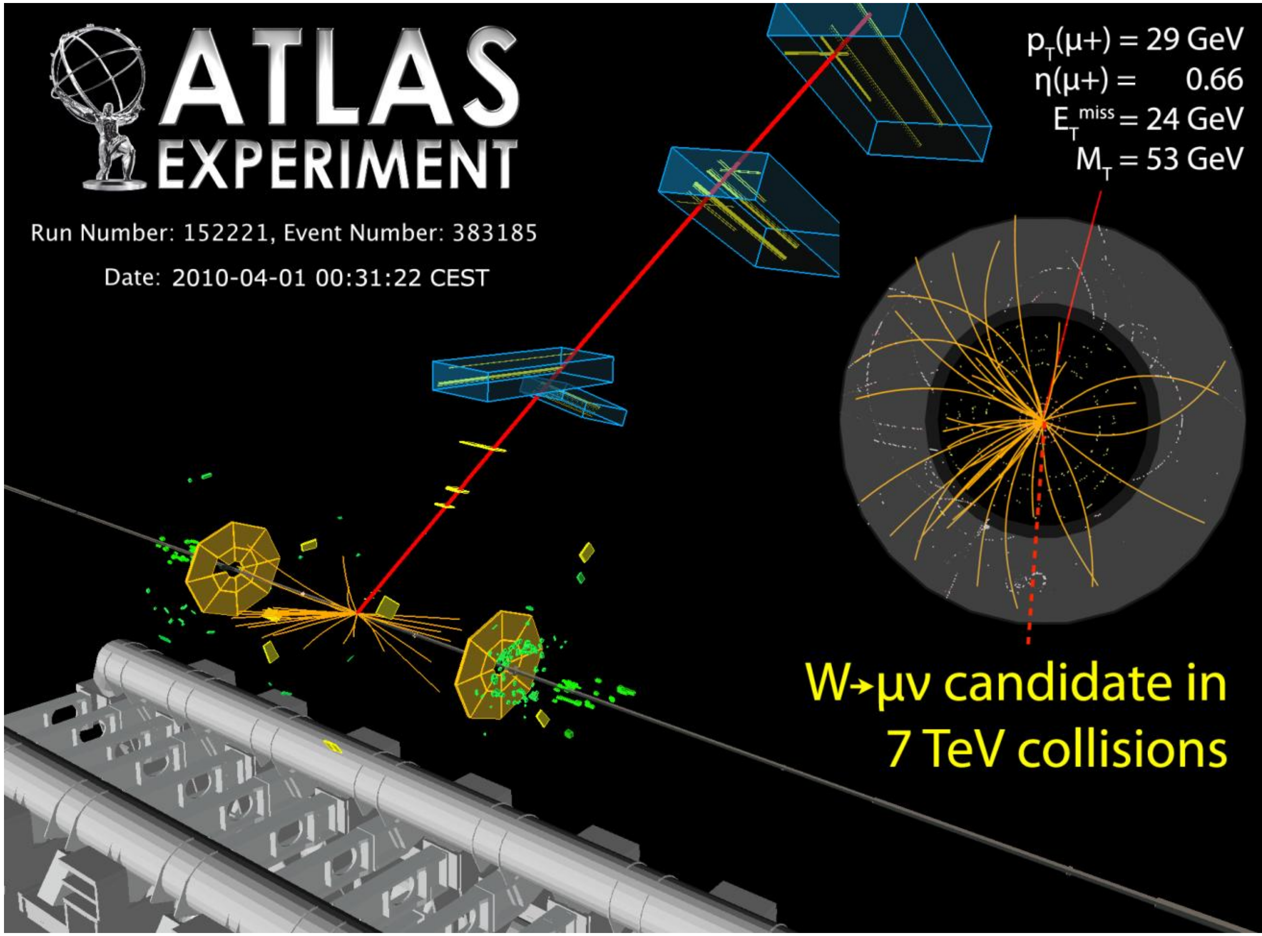
- tracker: $\sigma(p_T)/p_T \sim 5 \cdot 10^{-4}\, p_T + 0.01$
- ECal: $\sigma_E/E \sim 10\%/\sqrt{E[\mathrm{GeV}]} \oplus 0.7\%$
- HCal: $\sigma_E/E \sim 50\%/\sqrt{E[\mathrm{GeV}]} \oplus 3\%$
- trk+Mu: 2%@50GeV–10%@1TeV



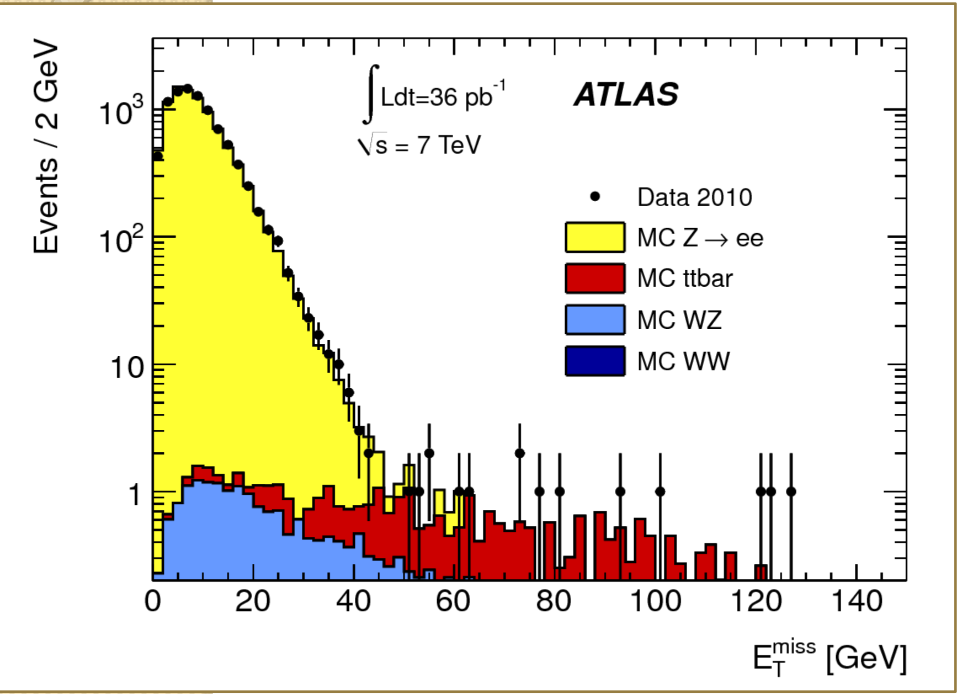
Сигналы рождения частиц темной материи - WIMP

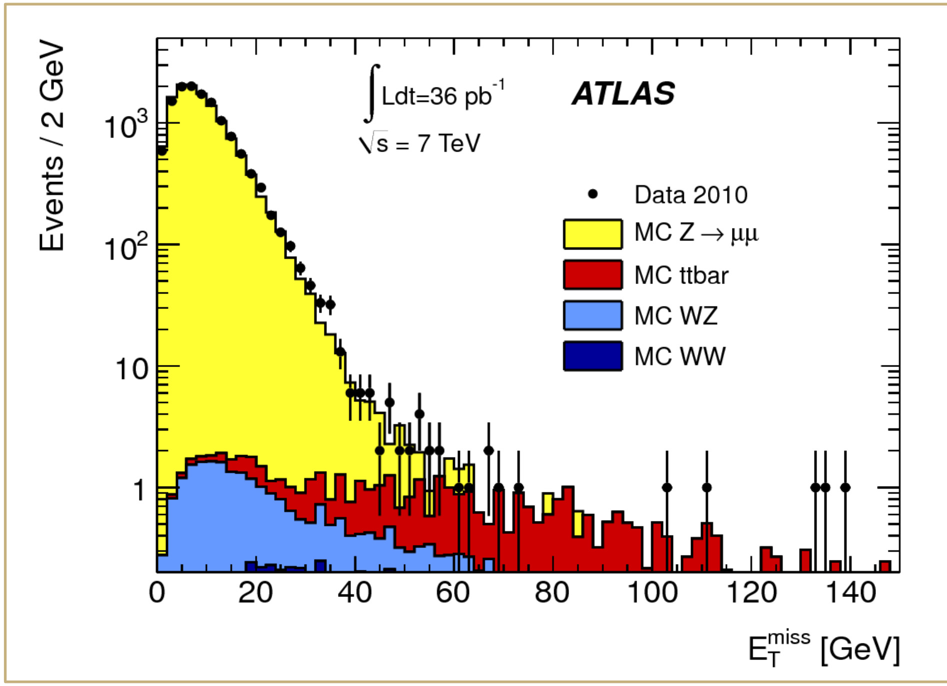
Основной индикатор – измерение недостающей поперечной энергии Eтmis =

- $\sum_i E_{Ti}$



Missing energy measurement





Distribution of Etmiss as measured in a data sample of Z(ee) –left, and Z(μμ) – right, in comparison with MC.

Collider searches for dark matter

Popular dark matter candidate –

Weakly Interacting Massive Particle (WIMP, χ)

Production and detection at LHC:

Reaction $pp \rightarrow \chi\bar{\chi} + X$

These studies are sensitive to low DM masses ($m\chi \leq 10$ GeV), and therefore provide information complementary to direct DM searches, which are most sensitive to larger DM masses.

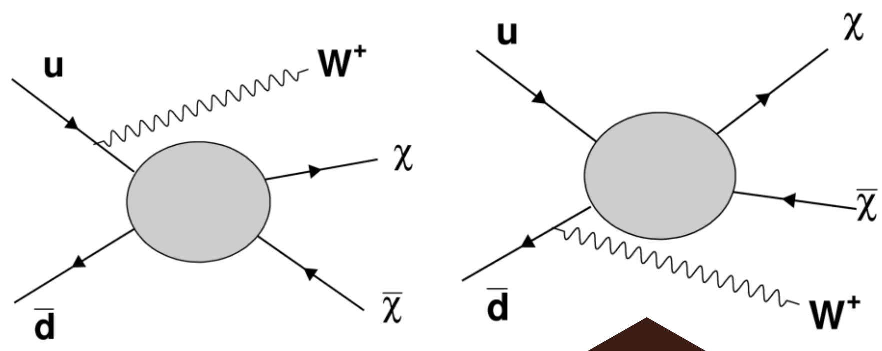


Diagram example →

Some unknown intermediate state

Outlines

Results in pp collisions at $\sqrt{s}$ = 8 TeV:

- Search for dark matter in events with a hadronically decaying W or Z boson and missing transverse momentum – Phys.Rev.Lett. 112, 041802 (2014)
- Search for dark matter in events with a Z boson and missing transverse momentum – Phys.Rev.D 90, 012004 (2014)
- Search for dark matter in events with heavy quarks and missing transverse momentum – arXiv:1410.4031, subm. to EPJC
- Search for new particles in events with one lepton and missing transverse momentum – JHEP 09 (2014) 037
- Searches with SUSY
- Search for new phenomena in final states with an energetic jet and large missing transverse momentum in pp collisions at 8 TeV with the ATLAS detector, arXiv:1502.01518v1

Описание взаимодействия

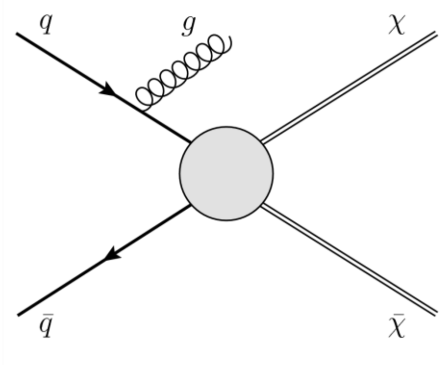
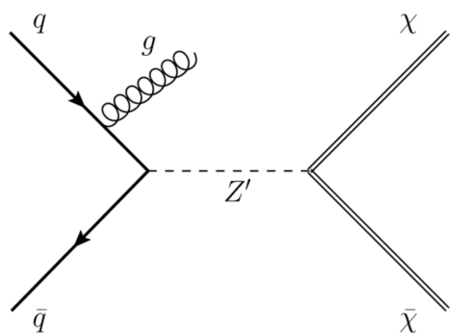


Диаграмма рождения пары WIMPs в событии с излучением глюона в начальном состоянии (ISR) через контактное взаимодействие EFT



То же в упрощенной модели с Z' бозоном

Взаимодействие описывается в рамках эффективной теории поля (EFT) с помощью двух параметров:
M_* - масса шкалы подавление и m_χ - массы DM (WIMP) частицы для разных операторов (типов) взаимодействия

Операторы эффективного взаимодействия DM с кварками и глюонами, используемые для расчета результатов наблюдений

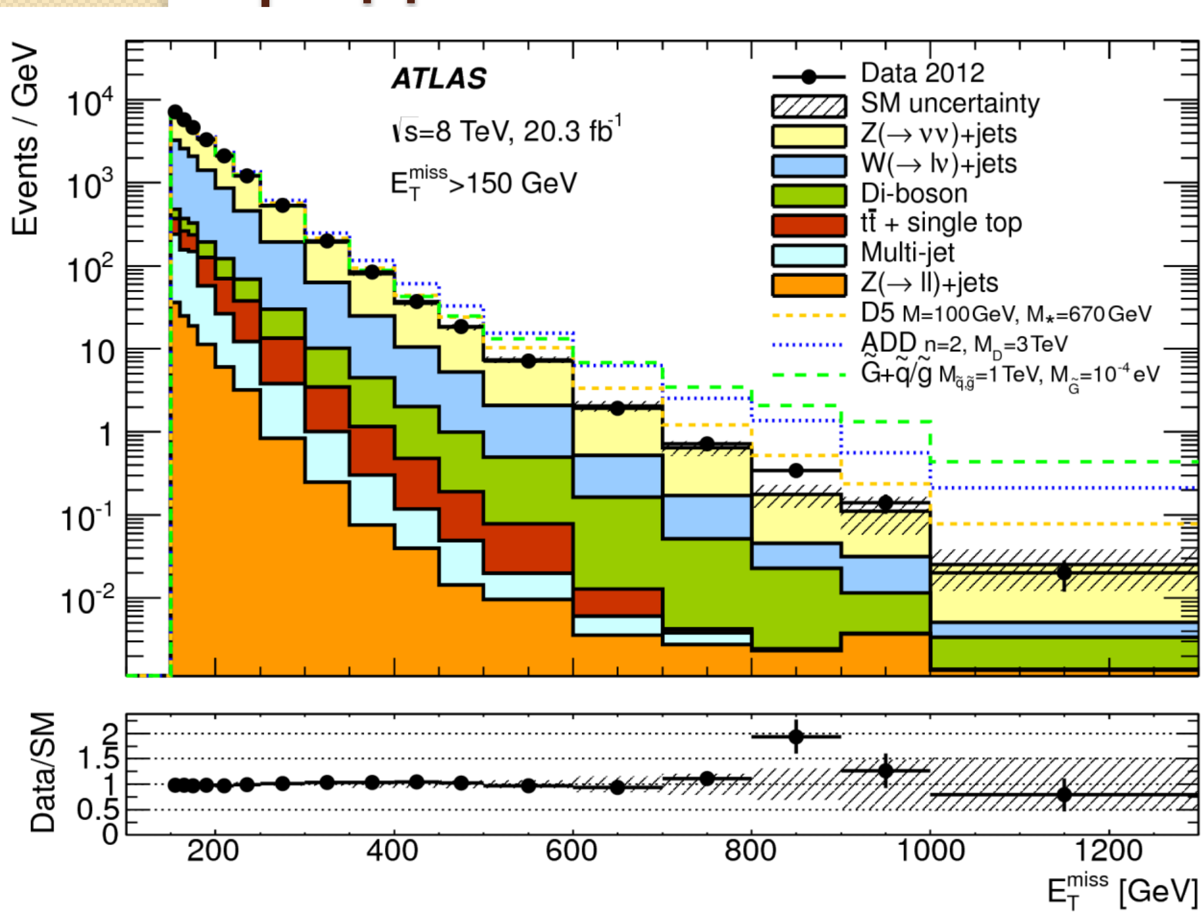
Name	Initial state	Type	Operator
C1	qq	scalar	$\frac{m_q}{M_\star^2}\chi^\dagger\chi\bar{q}q$
C5	gg	scalar	$\frac{1}{4M_\star^2}\chi^\dagger\chi\alpha_s(G^a_{\mu\nu})^2$
D1	qq	scalar	$\frac{m_q}{M_\star^3}\bar{\chi}\chi\bar{q}q$
D5	qq	vector	$\frac{1}{M_\star^2}\bar{\chi}\gamma^\mu\chi\bar{q}\gamma_\mu q$
D8	qq	axial-vector	$\frac{1}{M_\star^2}\bar{\chi}\gamma^\mu\gamma^5\chi\bar{q}\gamma_\mu\gamma^5 q$
D9	qq	tensor	$\frac{1}{M_\star^2}\bar{\chi}\sigma^{\mu\nu}\chi\bar{q}\sigma_{\mu\nu}q$
D11	gg	scalar	$\frac{1}{4M_\star^3}\bar{\chi}\chi\alpha_s(G^a_{\mu\nu})^2$

M* - эффективная шкала, операторы:
D – дираковский фермион WIMP
C- скалярный WIMP

Отбор событий (pp 8 ТэВ)

- Наличие струи (анти-k_T с R = 0.4) с рт > 120 ГэВ
- Значение недостающей Ет > 150 ГэВ
- Отсутствуют треки мюонов, электронов
- События разделены на 9 интервалов в зависимости от минимального значения недостающей Ет
- Последний 9-й интервал соответствует недостающей Ет > 700 ГэВ

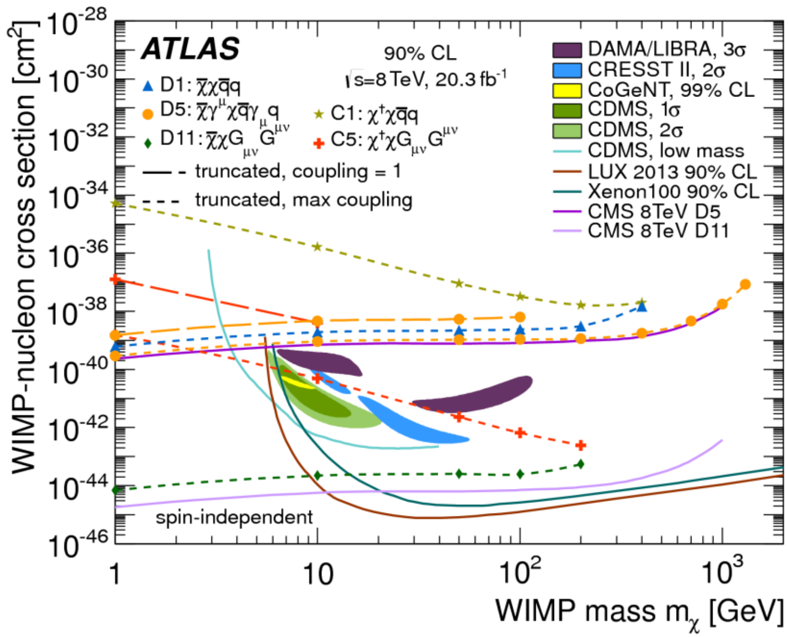
Распределение событий с недостающей энергией Eт > 150 ГэВ – видно согласие с предсказаниями СМ

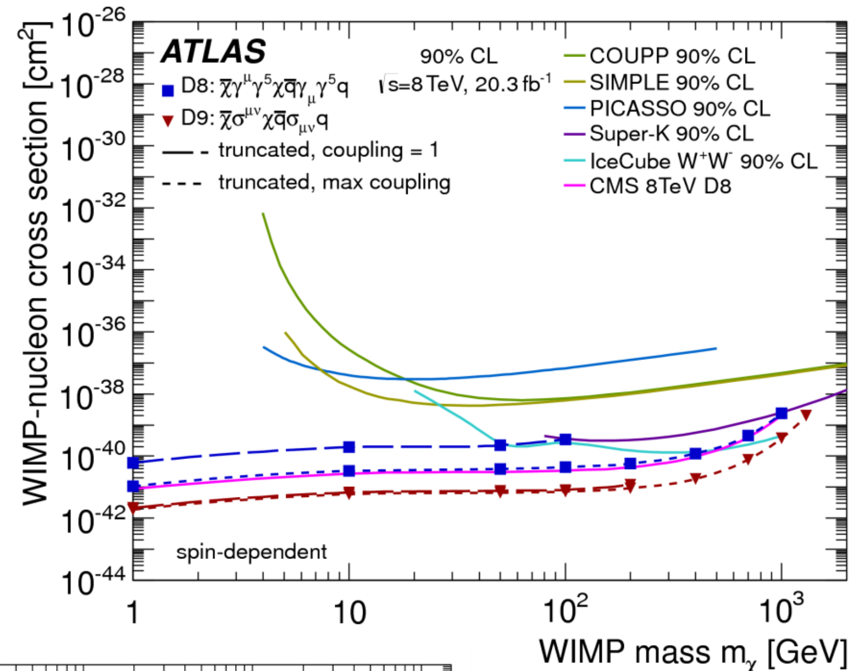


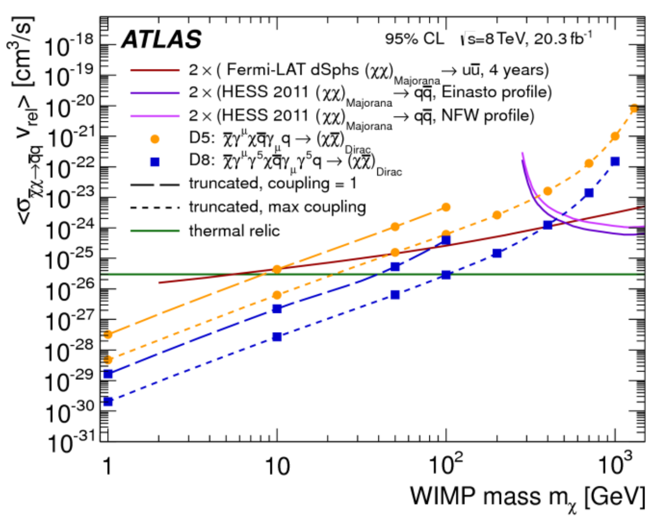
<u>Недост. Eт > 150 ГэВ</u>
Наблюдается **364378** с
Расчет СМ **372100** ± **9900**

<u>Недост. Eт> 700 ГэВ</u>
Наблюдается **126** соб.
Расчет СМ **97** ± **14**

Пересчет результата в сечения χ-N







Скорость $\chi\bar{\chi}$ аннигиляции

$< \sigma\ v >$

Итог

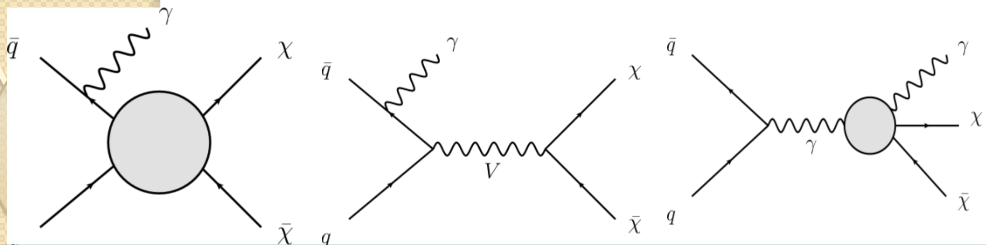
In summary, results are reported from a search for new phenomena in events with an energetic jet and large missing transverse momentum in proton–proton collisions at $\sqrt{s} = 8$ TeV at the LHC, based on ATLAS data corresponding to an integrated luminosity of 20.3 fb^{-1}. The measurements are in agreement with the SM expectations. The results are translated into model-independent 90% and 95% confidence-level upper limits on $\sigma \times A \times \epsilon$ in the range 599–2.9 fb and 726–3.4 fb, respectively, depending on the selection criteria

considered. The results are presented in terms of limits on the fundamental Planck scale, M_D, versus the number of extra spatial dimensions in the ADD LED model, upper limits on the spin-independent and spin-dependent contributions to the WIMP–nucleon elastic cross section as a function of the WIMP mass, and upper limits on the production of very light gravitinos in gauge-mediated supersymmetry. In addition, the results are interpreted in terms of the production of an invisibly decaying Higgs boson for which the analysis shows a limited sensitivity.

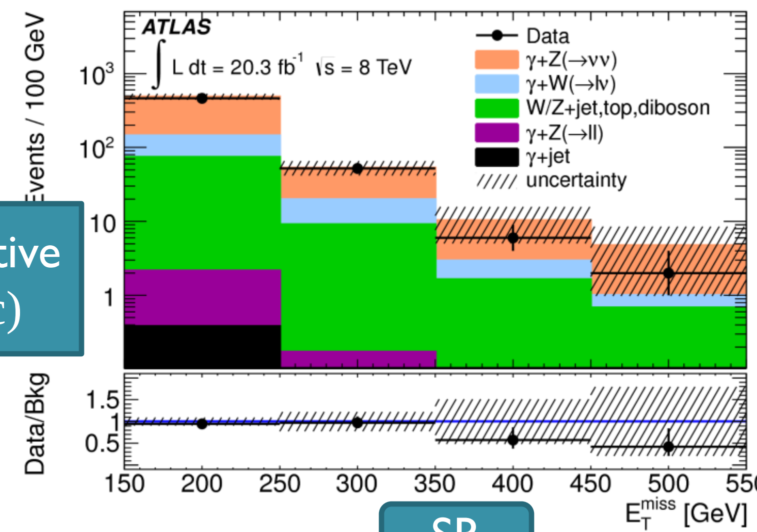
Результаты наблюдений согласуются с предсказаниями СМ

Получены различные количественные ограничения в рамках теоретических подходов на уровне 599-2.9 фб на 90% CL

Events with photon and E_{tmiss} (arXiv:1411.1559, 6 Nov.2014)

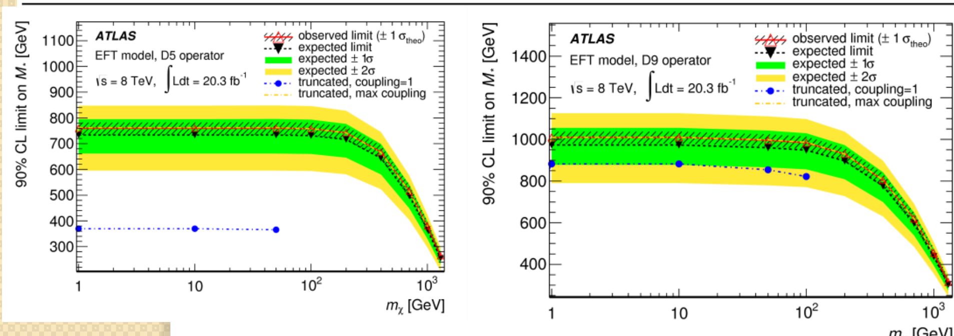


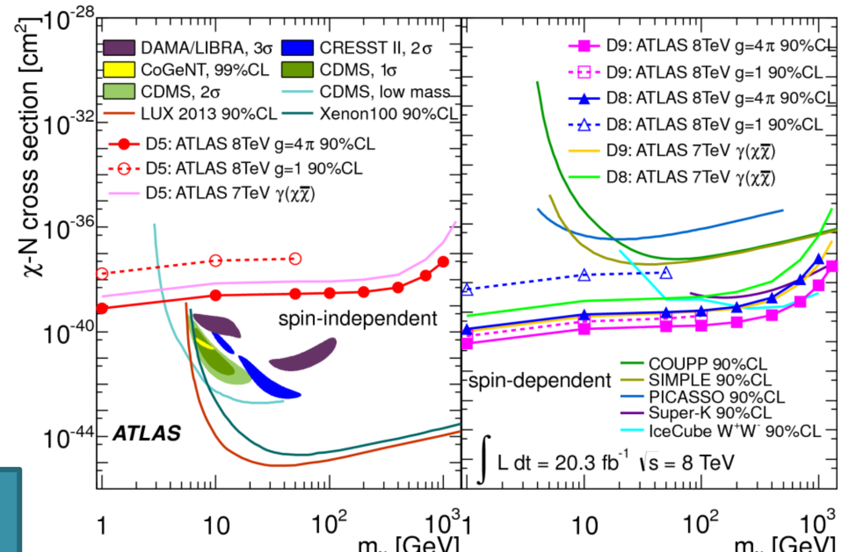
Production of pairs of dark-matter particles ($\chi\bar{\chi}$) via effective $q\bar{q}\ \chi\bar{\chi}$-vertex(a), s-channel mediator V(b), $\gamma\gamma\chi\bar{\chi}$-vertex(c)



SR

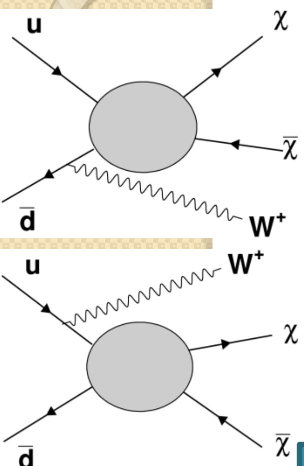
Process	Event yield (SR)	Event yield (VR)
$Z(\rightarrow \nu\nu)+\gamma$	$389 \pm 36 \pm 10$	$153 \pm 16 \pm 10$
$W(\rightarrow \ell\nu)+\gamma$	$82.5 \pm 5.3 \pm 3.4$	$67 \pm 5 \pm 5$
$W/Z+\text{jet}, t\bar{t}$, diboson	$83 \pm 2 \pm 28$	$47 \pm 2 \pm 14$
$Z(\rightarrow \ell\ell)+\gamma$	$2.0 \pm 0.2 \pm 0.6$	$2.9 \pm 0.3 \pm 0.6$
$\gamma+\text{jet}$	$0.4^{+0.3}_{-0.4}$	$2.5^{+4.0}_{-2.5}$
Total background	$557 \pm 36 \pm 27$	$272 \pm 17 \pm 14$
Data	521	307

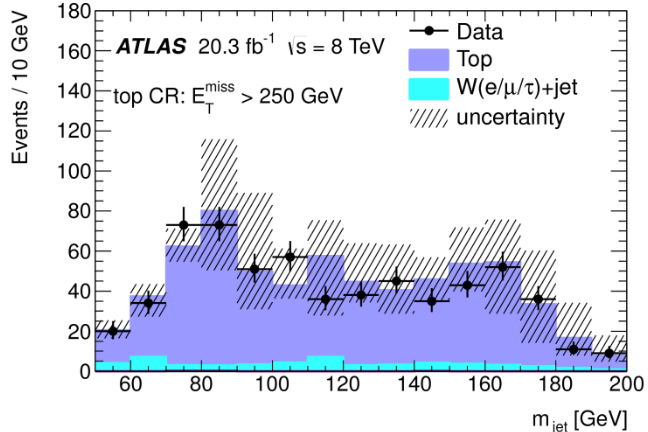




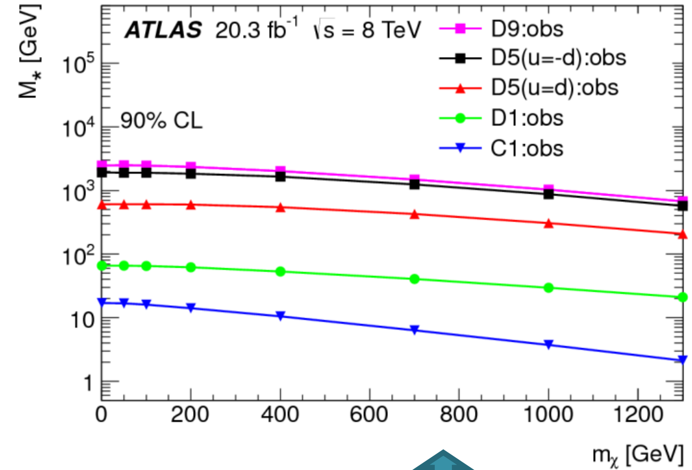
Limits at 90% CL on the EFT suppression scale M_* as a function of the WIMP mass mχ for the vector operator D5 (left) and D9.

Hadronically decaying W or Z boson and missing transverse momentum

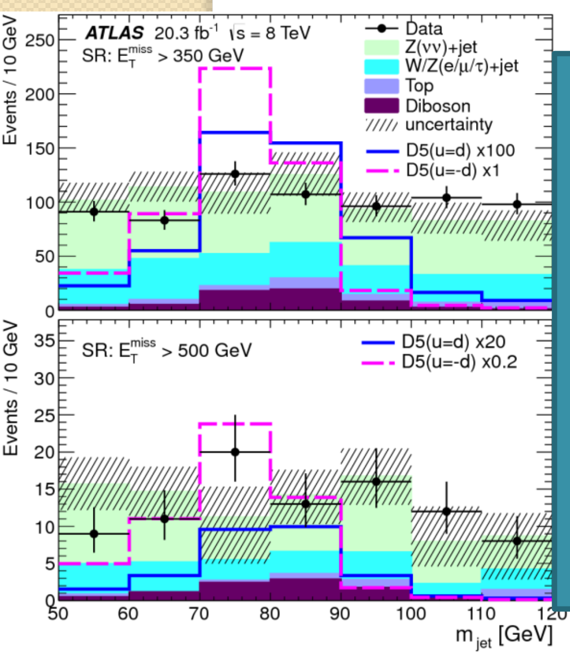




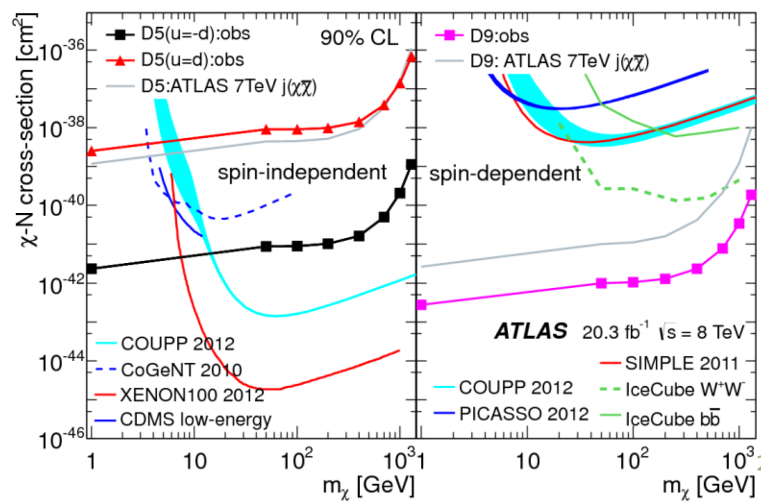
Data and different MC in CR



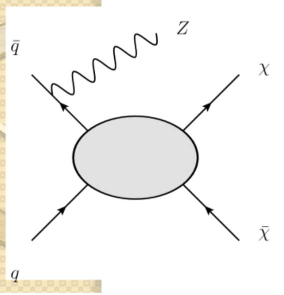
Observed limits on the effective theory mass scale M_* as a function of m_χ at 90% CL from combined mono-W-boson and mono-Z-boson signals for various operators. For each operator, the values below the corresponding line are excluded.

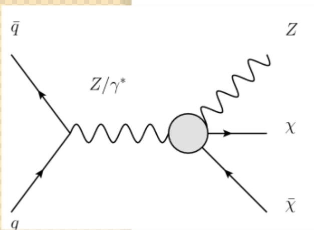


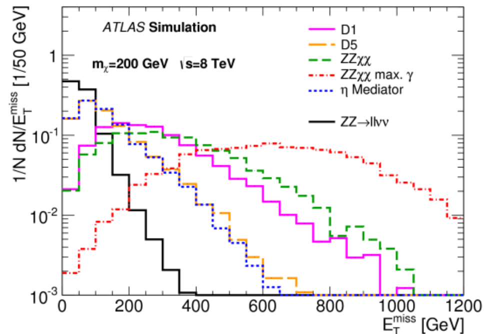
Distribution of m_{jet} in the data and for BG in the SR with E_T^{miss} > 350 GeV (top) and E_T^{miss} > 500 GeV (bottom). Also shown are the combined mono-W-boson and mono-Z-boson signal distributions with m_χ=1 GeV and M_*=1 TeV for the D5 destructive and D5 constructive cases, scaled by factors defined in the legends.



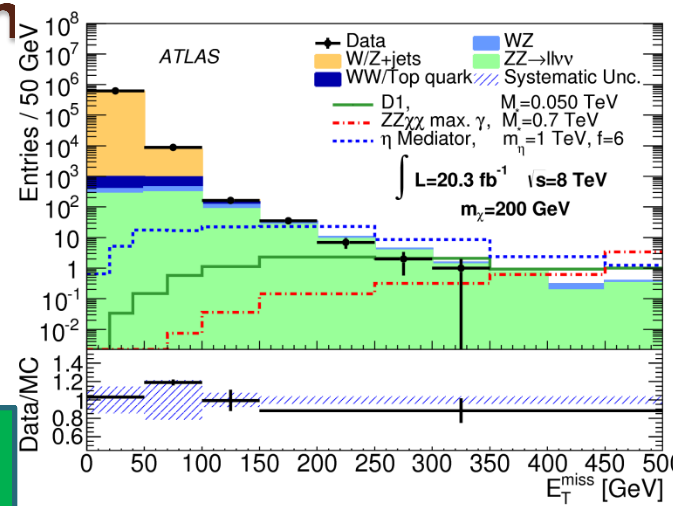
Dark matter in events with a Z boson and missing transverse momentum





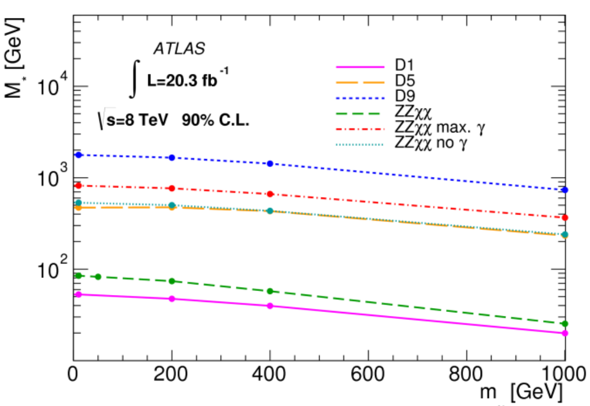


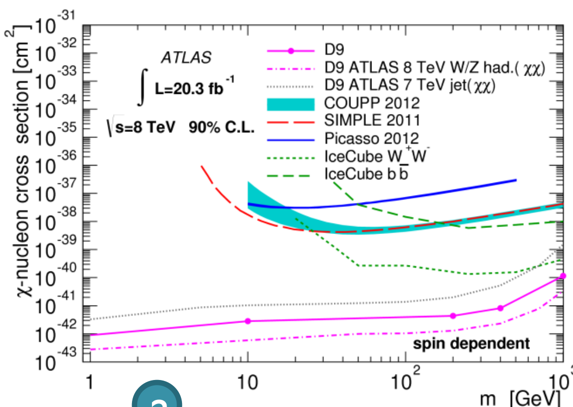
Simulated samples of ZZ background, effective field theories of dark-matter interaction with a qq initial state (D1, D5, and D9 and interaction with a Z/gamma* intermediate state, and the scalar-mediator theory.



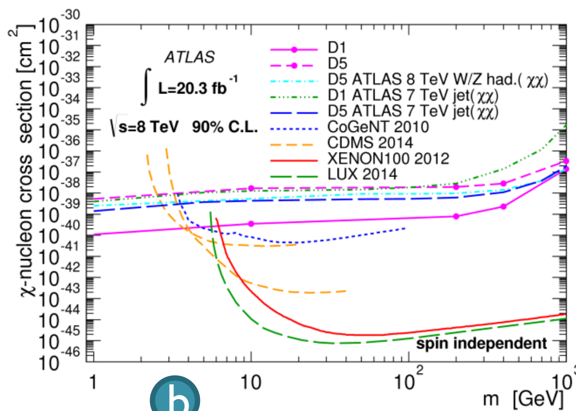
M ET distributions after all event selections other than the MET thresholds for the observed data;

90% C.L. lower limits on the mass scale, M* of considered EFTs as a function of mχ For each operator, the values below the corresponding line are excluded.





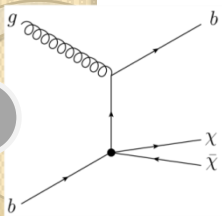
a

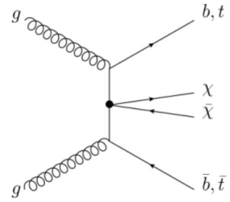


b

Observed 90% C.L. upper limits on the chi-nucleon scattering cross section as a function of m_{chi} for the spin-dependent (a) and spin-independent (b) D9 effective operators mediating the interaction of the dark-matter particles with the qq initial state.

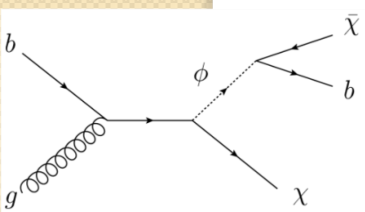
Events with heavy quarks and missing transverse momentum



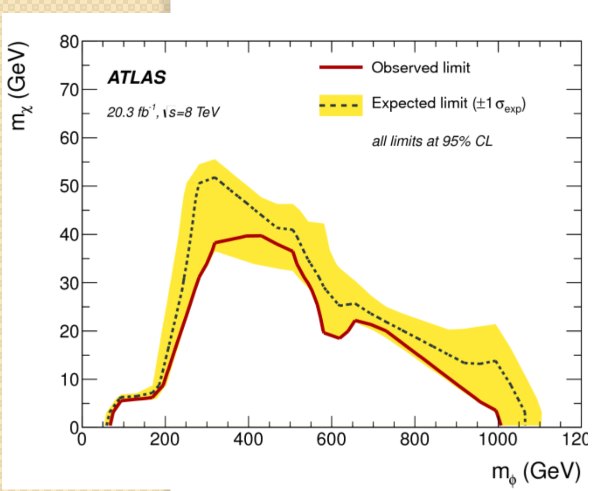


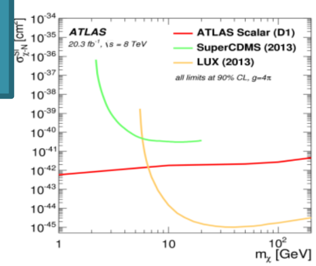
Dominant Feynman diagrams for DM production in conjunction with (a) a single b-quark and (b) a heavy quark (bottom or top) pair using an effective field theory approach.

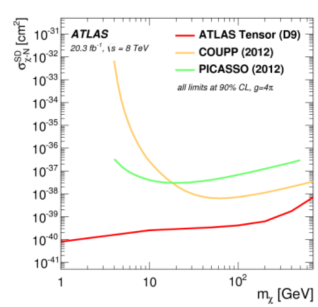
Background source	SR1	SR2	SR3	SR4
$Z(\nu\bar{\nu})$+jets	190 ± 26	90 ± 25	1^{+6}_{-1}	–
$W(\ell\nu)$+jets	133 ± 23	75 ± 13		1.3 ± 0.3
$t\bar{t}$	39 ± 5	71 ± 9	87 ± 11	3 ± 1
Single top			8 ± 3	0.7 ± 0.3
$t\bar{t}$ +Z/W	–	–	–	1.4 ± 0.4
Diboson	22 ± 4	8 ± 1	–	0.8 ± 0.4
Total expected background	385 ± 35	245 ± 30	96 ± 13	7 ± 1
Data	440	264	107	10
Expected signal – D1	10 ± 2	49 ± 8	28 ± 2	35 ± 5 antomx
Expected signal – C1	17 ± 2	61 ± 9	45 ± 4	51 ± 12
Expected signal – D9	147 ± 25	69 ± 12	2 ± 1	2 ± 1
Expected signal – b-FDM	192 ± 24	61 ± 8	1.0 ± 0.2	–
p-**Value**	0.09	0.29	0.24	0.18
Allowed non SM events - Obs.	124	79	41	10
Allowed non SM events - Exp.	81	67	33	7

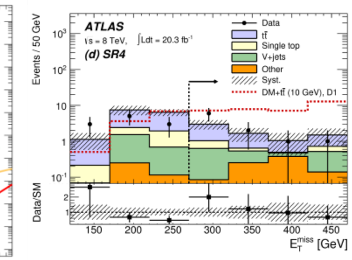


Example of DM production in the b-FDM model.

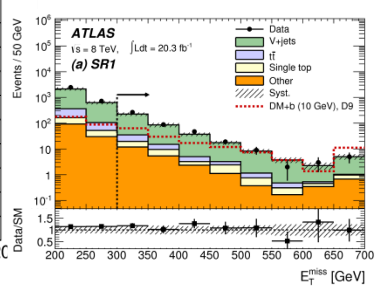




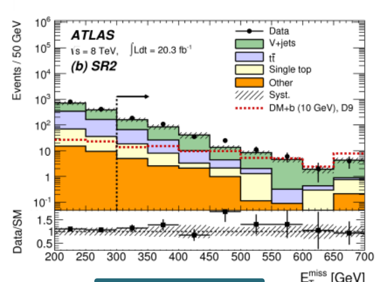




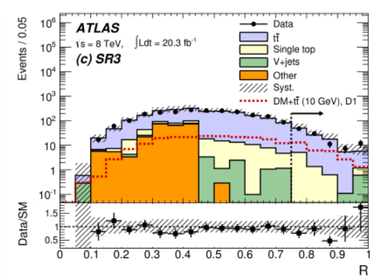
SR4



SR1



SR2

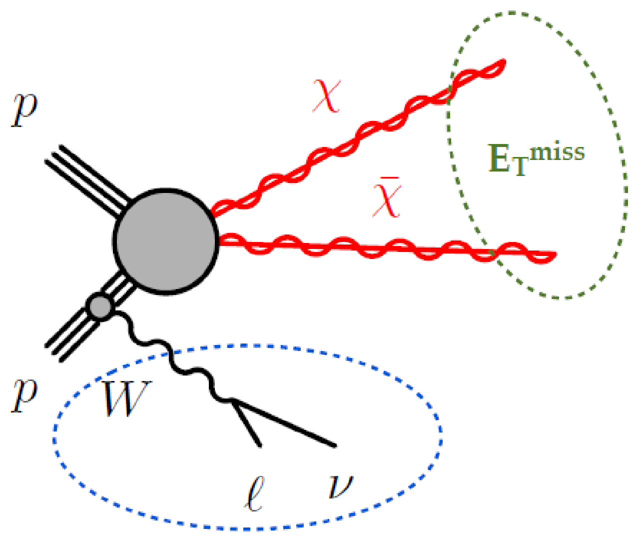


SR3

Search for new particles in events with one lepton and missing transverse momentum

JHEP 09 (2014) 037

Direct pair-production



Leptonically decaying *W* recoiling against dark matter

Pros:
Lepton allows highly efficient triggering
Low and reasonably well understood SM background

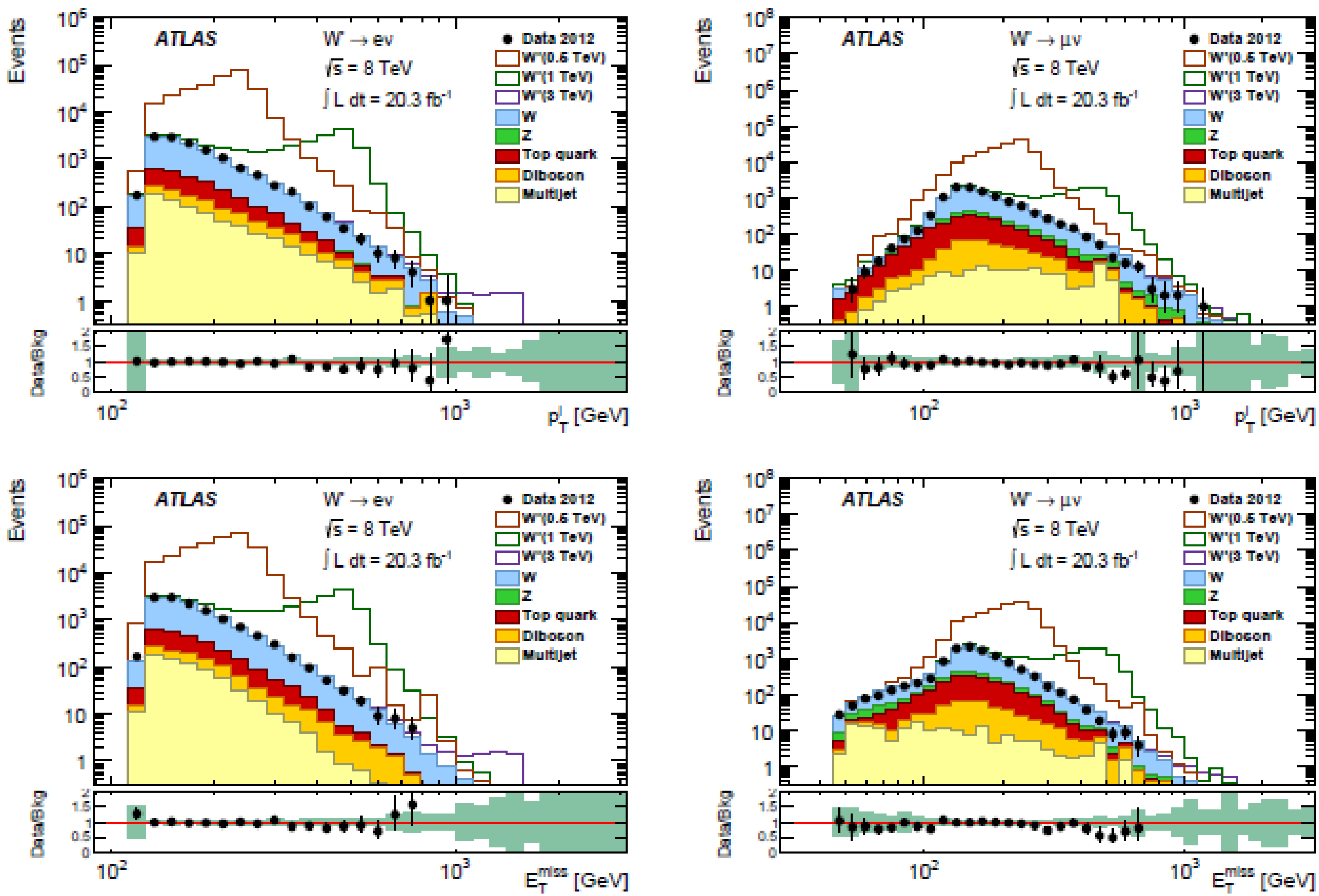
Strategy for searching:

- Select events with exactly one high p_T / E_T lepton (muon or electron)
  - ATLAS : E_T (p_T) > 125 (45) GeV in the e (μ)-channel
- Exploit p_T^{lepton} vs E_T^{miss} balance by requiring:
  - ATLAS : E_T^{miss} > 125 (45) GeV in the e (μ)-channel
- Use transverse mass, $m_T = [2 \cdot p_T^{lepton} \cdot E_T^{miss}(1-\cos\phi_{l\nu})]^{1/2}$, as the main discriminator:
  - ATLAS : Perform "single-bin counting experiment" using events with $m_T \geq m_{T,min}$
    - $m_{T,min}$ is optimized for each model separately for best expected sensitivity
    - Same thresholds are used in both e/μ-channels

Alaettin Serhan Mete
UC Irvine

Experimental data with muons (right) and electrons (left) for $m_T > 252$ GeV

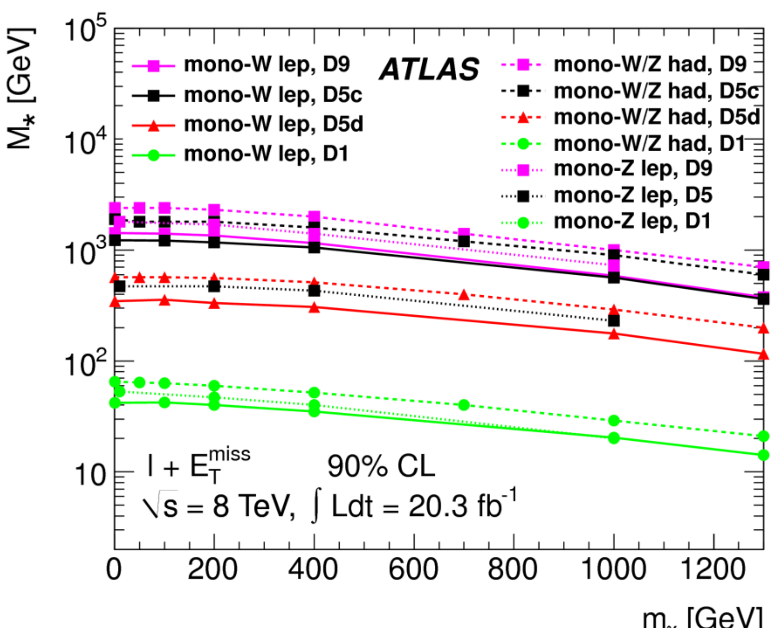
Open histograms are $W' \to \ell\nu$ signals added to the background

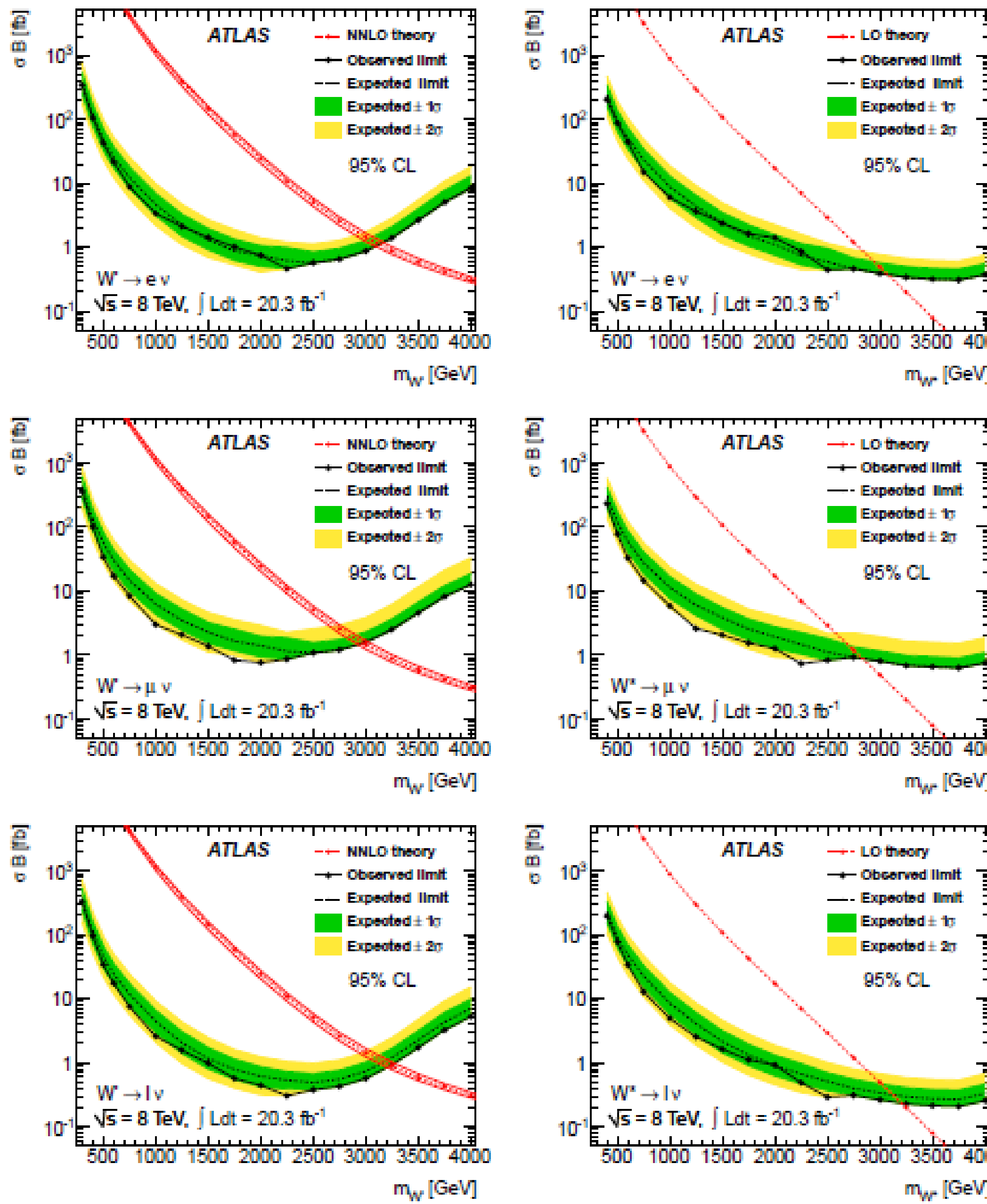


Results (I)

Expected and observed mass limits for W’ and W*

Decay	$m_{W'}$ [TeV] Exp.	$m_{W'}$ [TeV] Obs.	m_{W^*} [TeV] Exp.	m_{W^*} [TeV] Obs.
$e\nu$	3.13	3.13	3.08	3.08
$\mu\nu$	2.97	2.97	2.83	2.83
Both	3.17	3.24	3.12	3.21





No significant excess above SM expectations

Results (2)

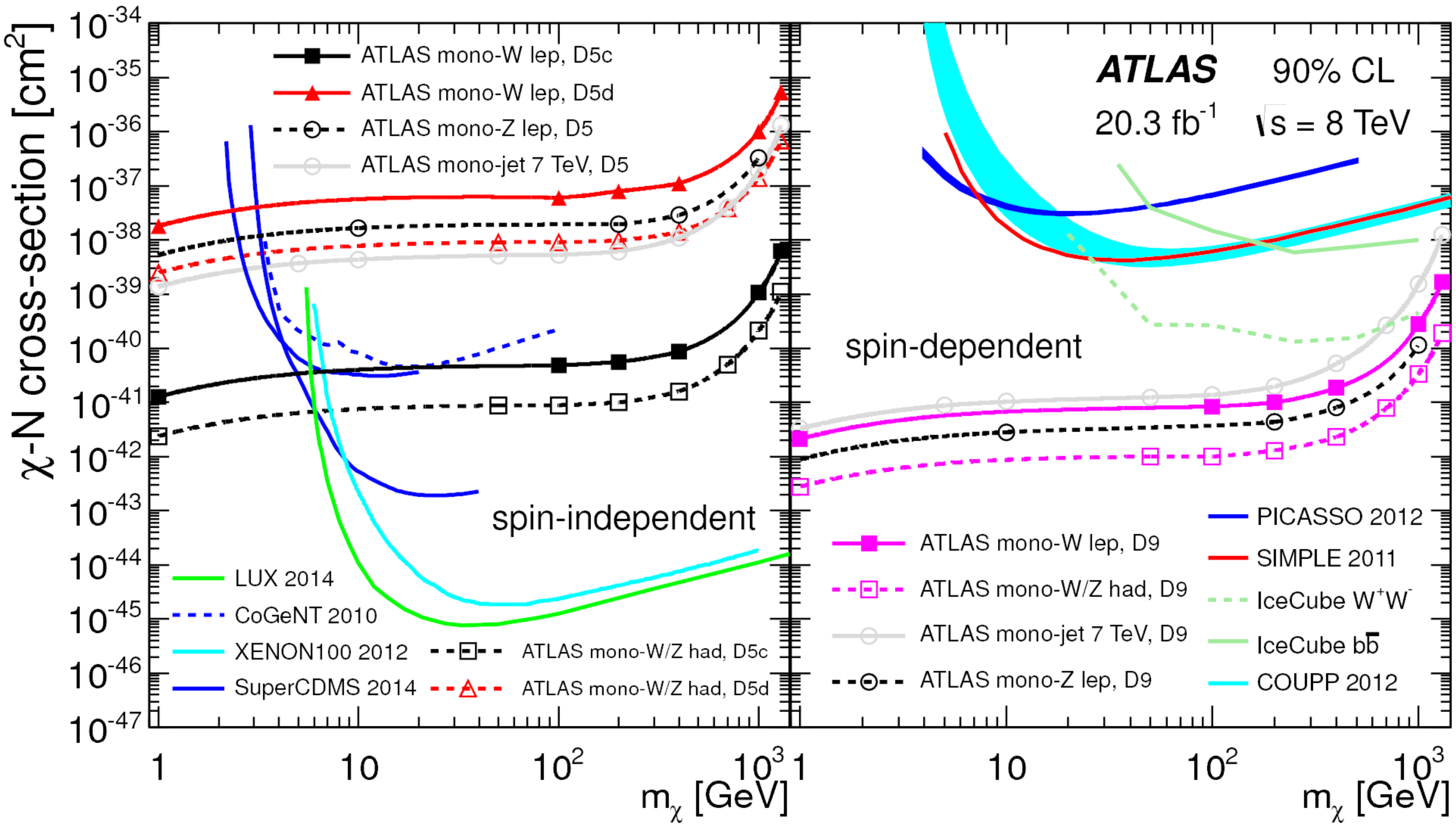


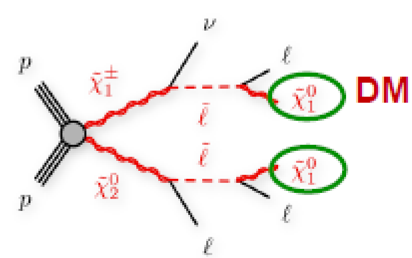
Figure 4. Observed limits on the DM–nucleon scattering cross-section as a function of m_χ at 90% CL for spin-independent (left) and spin-dependent (right) operators in the EFT. Results are compared with the previous ATLAS searches for hadronically decaying W/Z [19], leptonically decaying Z [20], and $j + \chi\chi$ [15], and with direct detection searches by CoGeNT [75], XENON100 [76], CDMS [77, 78], LUX [79], COUPP [80], SIMPLE [81], PICASSO [82] and IceCube [83]. The comparison between direct detection and ATLAS results is only possible within the limits of the validity of the EFT [84].

Experimental summary of SUSY Dark Matter searches at the LHC

Dark Matter @ LHC 2014
25-27/09/2014, Merton College, Oxford

Yu Nakahama (CERN/KEK)
for ATLAS and CMS collaborations

- Search for LSP at the LHC
  - Direct LSP pair production is not accessible due to low cross-sections.
  - **The LSP is typically produced at the end of cascade decays of heavier sparticles.**
    Constrains on the LSP mass depends on the considered mass spectrum.



ATLAS SUSY Searches* - 95% CL Lower Limits

Status: ICHEP 2014

ATLAS Preliminary

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

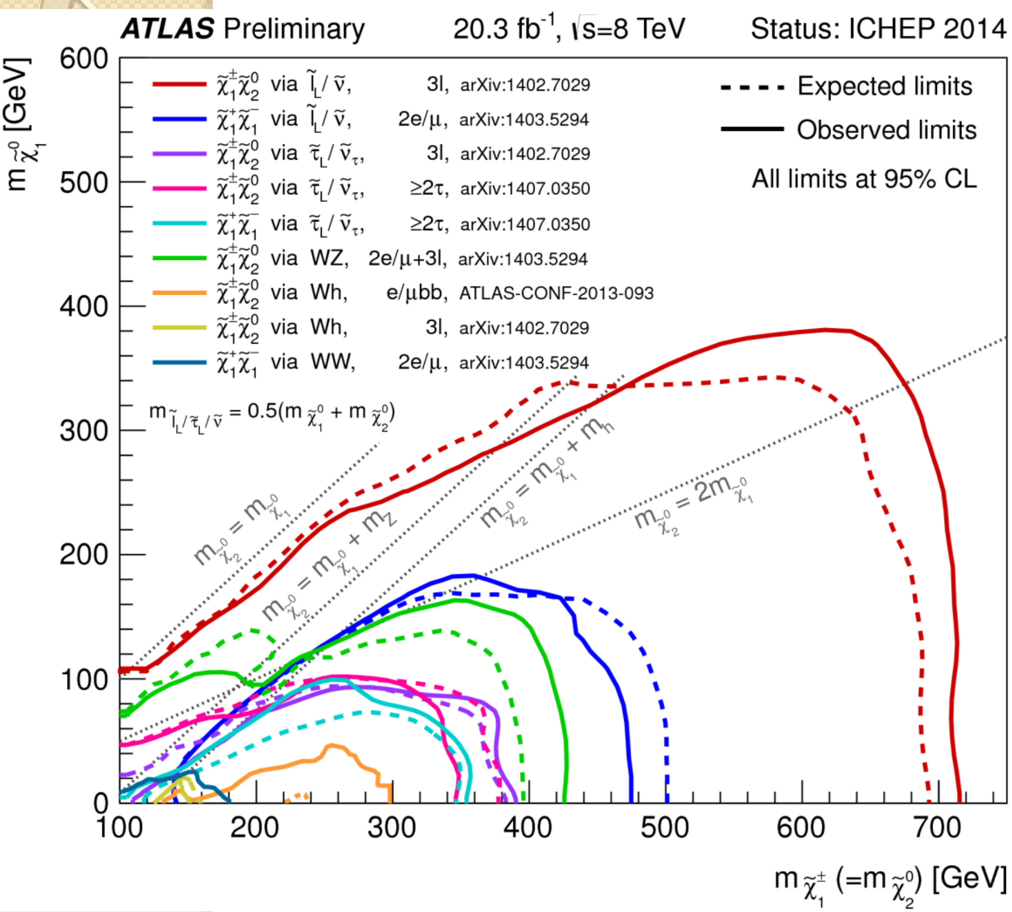
	Model	e,μ,τ,γ	Jets	E_T^{miss}	$\int\mathcal{L}\,dt[\mathrm{fb}^{-1}]$	Mass limit		Reference
Inclusive Searches	MSUGRA/CMSSM	0	2-6 jets	Yes	20.3	$\tilde{q},\tilde{g}$ 1.7 TeV	$m(\tilde{q})=m(\tilde{g})$	1405.7875
	MSUGRA/CMSSM	1 e,μ	3-6 jets	Yes	20.3	$\tilde{g}$ 1.2 TeV	any $m(\tilde{q})$	ATLAS-CONF-2013-062
	MSUGRA/CMSSM	0	7-10 jets	Yes	20.3	$\tilde{g}$ 1.1 TeV	any $m(\tilde{q})$	1308.1841
	$\tilde{q}\tilde{q}$, $\tilde{q}\rightarrow q\tilde{\chi}^0_1$	0	2-6 jets	Yes	20.3	$\tilde{q}$ 850 GeV	$m(\tilde{\chi}^0_1)$=0 GeV, m(1st gen. $\tilde{q}$)=m(2nd gen. $\tilde{q}$)	1405.7875
	$\tilde{g}\tilde{g}$, $\tilde{g}\rightarrow q\bar{q}\tilde{\chi}^0_1$	0	2-6 jets	Yes	20.3	$\tilde{g}$ 1.33 TeV	$m(\tilde{\chi}^0_1)$=0 GeV	1405.7875
	$\tilde{g}\tilde{g}$, $\tilde{g}\rightarrow qq\tilde{\chi}^\pm_1\rightarrow qqW^\pm\tilde{\chi}^0_1$	1 e,μ	3-6 jets	Yes	20.3	$\tilde{g}$ 1.18 TeV	$m(\tilde{\chi}^0_1)$<200 GeV, $m(\tilde{\chi}^\pm)$=0.5($m(\tilde{\chi}^0_1)$+$m(\tilde{g})$)	ATLAS-CONF-2013-062
	$\tilde{g}\tilde{g}$, $\tilde{g}\rightarrow qq(\ell\ell/\ell\nu/\nu\nu)\tilde{\chi}^0_1$	2 e,μ	0-3 jets	-	20.3	$\tilde{g}$ 1.12 TeV	$m(\tilde{\chi}^0_1)$=0 GeV	ATLAS-CONF-2013-089
	GMSB ($\tilde{\ell}$ NLSP)	2 e,μ	2-4 jets	Yes	4.7	$\tilde{g}$ 1.24 TeV	tanβ<15	1208.4688
	GMSB ($\tilde{\ell}$ NLSP)	1-2 τ + 0-1 ℓ	0-2 jets	Yes	20.3	$\tilde{g}$ 1.6 TeV	tanβ >20	1407.0603
	GGM (bino NLSP)	2 γ	-	Yes	20.3	$\tilde{g}$ 1.28 TeV	$m(\tilde{\chi}^0_1)$>50 GeV	ATLAS-CONF-2014-001
	GGM (wino NLSP)	1 e,μ + γ	-	Yes	4.8	$\tilde{g}$ 619 GeV	$m(\tilde{\chi}^0_1)$>50 GeV	ATLAS-CONF-2012-144
	GGM (higgsino-bino NLSP)	γ	1 b	Yes	4.8	$\tilde{g}$ 900 GeV	$m(\tilde{\chi}^0_1)$>220 GeV	1211.1167
	GGM (higgsino NLSP)	2 e,μ (Z)	0-3 jets	Yes	5.8	$\tilde{g}$ 690 GeV	m(NLSP)>200 GeV	ATLAS-CONF-2012-152
	Gravitino LSP	0	mono-jet	Yes	10.5	$F^{1/2}$ scale 645 GeV	$m(\tilde{G})>10^{-4}$ eV	ATLAS-CONF-2012-147
3rd gen. $\tilde{g}$ med.	$\tilde{g}\rightarrow b\bar{b}\tilde{\chi}^0_1$	0	3 b	Yes	20.1	$\tilde{g}$ 1.25 TeV	$m(\tilde{\chi}^0_1)$<400 GeV	1407.0600
	$\tilde{g}\rightarrow t\bar{t}\tilde{\chi}^0_1$	0	7-10 jets	Yes	20.3	$\tilde{g}$ 1.1 TeV	$m(\tilde{\chi}^0_1)$ <350 GeV	1308.1841
	$\tilde{g}\rightarrow t\bar{t}\tilde{\chi}^0_1$	0-1 e,μ	3 b	Yes	20.1	$\tilde{g}$ 1.34 TeV	$m(\tilde{\chi}^0_1)$<400 GeV	1407.0600
	$\tilde{g}\rightarrow b\bar{t}\tilde{\chi}^+_1$	0-1 e,μ	3 b	Yes	20.1	$\tilde{g}$ 1.3 TeV	$m(\tilde{\chi}^0_1)$<300 GeV	1407.0600
3rd gen. squarks direct production	$\tilde{b}_1\tilde{b}_1$, $\tilde{b}_1\rightarrow b\tilde{\chi}^0_1$	0	2 b	Yes	20.1	$\tilde{b}_1$ 100-620 GeV	$m(\tilde{\chi}^0_1)$<90 GeV	1308.2631
	$\tilde{b}_1\tilde{b}_1$, $\tilde{b}_1\rightarrow t\tilde{\chi}^\pm_1$	2 e,μ (SS)	0-3 b	Yes	20.3	$\tilde{b}_1$ 275-440 GeV	$m(\tilde{\chi}^\pm_1)$=2 $m(\tilde{\chi}^0_1)$	1404.2500
	$\tilde{t}_1\tilde{t}_1$(light), $\tilde{t}_1\rightarrow b\tilde{\chi}^\pm_1$	1-2 e,μ	1-2 b	Yes	4.7	$\tilde{t}_1$ 110-167 GeV	$m(\tilde{\chi}^0_1)$=55 GeV	1208.4305, 1209.2102
	$\tilde{t}_1\tilde{t}_1$(light), $\tilde{t}_1\rightarrow Wb\tilde{\chi}^0_1$	2 e,μ	0-2 jets	Yes	20.3	$\tilde{t}_1$ 130-210 GeV	$m(\tilde{\chi}^0_1)$ =$m(\tilde{t}_1)$-$m(W)$-50 GeV, $m(\tilde{t}_1)$<<$m(\tilde{\chi}^\pm_1)$	1403.4853
	$\tilde{t}_1\tilde{t}_1$(medium), $\tilde{t}_1\rightarrow t\tilde{\chi}^0_1$	2 e,μ	2 jets	Yes	20.3	$\tilde{t}_1$ 215-530 GeV	$m(\tilde{\chi}^0_1)$=1 GeV	1403.4853
	$\tilde{t}_1\tilde{t}_1$(medium), $\tilde{t}_1\rightarrow b\tilde{\chi}^\pm_1$	0	2 b	Yes	20.1	$\tilde{t}_1$ 150-580 GeV	$m(\tilde{\chi}^0_1)$<200 GeV, $m(\tilde{\chi}^\pm_1)$-$m(\tilde{\chi}^0_1)$=5 GeV	1308.2631
	$\tilde{t}_1\tilde{t}_1$(heavy), $\tilde{t}_1\rightarrow t\tilde{\chi}^0_1$	1 e,μ	1 b	Yes	20	$\tilde{t}_1$ 210-640 GeV	$m(\tilde{\chi}^0_1)$=0 GeV	1407.0583
	$\tilde{t}_1\tilde{t}_1$(heavy), $\tilde{t}_1\rightarrow t\tilde{\chi}^0_1$	0	2 b	Yes	20.1	$\tilde{t}_1$ 260-640 GeV	$m(\tilde{\chi}^0_1)$=0 GeV	1406.1122
	$\tilde{t}_1\tilde{t}_1$, $\tilde{t}_1\rightarrow c\tilde{\chi}^0_1$	0	mono-jet/c-tag	Yes	20.3	$\tilde{t}_1$ 90-240 GeV	$m(\tilde{t}_1)$-$m(\tilde{\chi}^0_1)$<85 GeV	1407.0608
	$\tilde{t}_1\tilde{t}_1$(natural GMSB)	2 e,μ (Z)	1 b	Yes	20.3	$\tilde{t}_1$ 150-580 GeV	$m(\tilde{\chi}^0_1)$>150 GeV	1403.5222
	$\tilde{t}_2\tilde{t}_2$, $\tilde{t}_2\rightarrow\tilde{t}_1+Z$	3 e,μ (Z)	1 b	Yes	20.3	$\tilde{t}_2$ 290-600 GeV	$m(\tilde{\chi}^0_1)$<200 GeV	1403.5222
EW direct	$\tilde{\ell}_{L,R}\tilde{\ell}_{L,R}$, $\tilde{\ell}\rightarrow\ell\tilde{\chi}^0_1$	2 e,μ	0	Yes	20.3	$\tilde{\ell}$ 90-325 GeV	$m(\tilde{\chi}^0_1)$=0 GeV	1403.5294
	$\tilde{\chi}^+_1\tilde{\chi}^-_1$, $\tilde{\chi}^+_1\rightarrow\tilde{\ell}\nu(\ell\tilde{\nu})$	2 e,μ	0	Yes	20.3	$\tilde{\chi}^\pm_1$ 140-465 GeV	$m(\tilde{\chi}^0_1)$=0 GeV, $m(\tilde{\ell},\tilde{\nu})$=0.5($m(\tilde{\chi}^\pm_1)$+$m(\tilde{\chi}^0_1)$)	1403.5294
	$\tilde{\chi}^+_1\tilde{\chi}^-_1$, $\tilde{\chi}^+_1\rightarrow\tilde{\tau}\nu(\tau\tilde{\nu})$	2 τ	-	Yes	20.3	$\tilde{\chi}^\pm_1$ 100-350 GeV	$m(\tilde{\chi}^0_1)$=0 GeV, $m(\tilde{\tau},\tilde{\nu})$=0.5($m(\tilde{\chi}^\pm_1)$+$m(\tilde{\chi}^0_1)$)	1407.0350
	$\tilde{\chi}^\pm_1\tilde{\chi}^0_2\rightarrow\tilde{\ell}_L\nu\tilde{\ell}_L\ell(\tilde{\nu}\nu)$, $\ell\tilde{\nu}\tilde{\ell}_L\ell(\tilde{\nu}\nu)$	3 e,μ	0	Yes	20.3	$\tilde{\chi}^\pm_1,\tilde{\chi}^0_2$ 700 GeV	$m(\tilde{\chi}^\pm_1)$=$m(\tilde{\chi}^0_2)$, $m(\tilde{\chi}^0_1)$=0, $m(\tilde{\ell},\tilde{\nu})$=0.5($m(\tilde{\chi}^\pm_1)$+$m(\tilde{\chi}^0_1)$)	1402.7029
	$\tilde{\chi}^\pm_1\tilde{\chi}^0_2\rightarrow W\tilde{\chi}^0_1Z\tilde{\chi}^0_1$	2-3 e,μ	0	Yes	20.3	$\tilde{\chi}^\pm_1,\tilde{\chi}^0_2$ 420 GeV	$m(\tilde{\chi}^\pm_1)$=$m(\tilde{\chi}^0_2)$, $m(\tilde{\chi}^0_1)$=0, sleptons decoupled	1403.5294, 1402.7029
	$\tilde{\chi}^\pm_1\tilde{\chi}^0_2\rightarrow W\tilde{\chi}^0_1h\tilde{\chi}^0_1$	1 e,μ	2 b	Yes	20.3	$\tilde{\chi}^\pm_1,\tilde{\chi}^0_2$ 285 GeV	$m(\tilde{\chi}^\pm_1)$=$m(\tilde{\chi}^0_2)$, $m(\tilde{\chi}^0_1)$=0, sleptons decoupled	ATLAS-CONF-2013-093
	$\tilde{\chi}^0_2\tilde{\chi}^0_3$, $\tilde{\chi}^0_{2,3}\rightarrow\tilde{\ell}_R\ell$	4 e,μ	0	Yes	20.3	$\tilde{\chi}^0_{2,3}$ 620 GeV	$m(\tilde{\chi}^0_2)$=$m(\tilde{\chi}^0_3)$, $m(\tilde{\chi}^0_1)$=0, $m(\tilde{\ell},\tilde{\nu})$=0.5($m(\tilde{\chi}^0_2)$+$m(\tilde{\chi}^0_1)$)	1405.5086
Long-lived particles	Direct $\tilde{\chi}^+_1\tilde{\chi}^-_1$ prod., long-lived $\tilde{\chi}^\pm_1$	Disapp. trk	1 jet	Yes	20.3	$\tilde{\chi}^\pm_1$ 270 GeV	$m(\tilde{\chi}^\pm_1)$-$m(\tilde{\chi}^0_1)$=160 MeV, $\tau(\tilde{\chi}^\pm_1)$=0.2 ns	ATLAS-CONF-2013-069
	Stable, stopped $\tilde{g}$ R-hadron	0	1-5 jets	Yes	27.9	$\tilde{g}$ 832 GeV	$m(\tilde{\chi}^0_1)$=100 GeV, 10 μs<$\tau(\tilde{g})$<1000 s	1310.6584
	GMSB, stable $\tilde{\tau}$, $\tilde{\chi}^0_1\rightarrow\tilde{\tau}(\tilde{e},\tilde{\mu})+\tau(e,\mu)$	1-2 μ	-	-	15.9	$\tilde{\chi}^0_1$ 475 GeV	10<tanβ<50	ATLAS-CONF-2013-058
	GMSB, $\tilde{\chi}^0_1\rightarrow\gamma\tilde{G}$, long-lived $\tilde{\chi}^0_1$	2 γ	-	Yes	4.7	$\tilde{\chi}^0_1$ 230 GeV	0.4<$\tau(\tilde{\chi}^0_1)$<2 ns	1304.6310
	$\tilde{q}\tilde{q}$, $\tilde{\chi}^0_1\rightarrow qq\mu$ (RPV)	1 μ, displ. vtx	-	-	20.3	$\tilde{q}$ 1.0 TeV	1.5 <$c\tau$<156 mm, BR(μ)=1, $m(\tilde{\chi}^0_1)$=108 GeV	ATLAS-CONF-2013-092
RPV	LFV $pp\rightarrow\tilde{\nu}_\tau+X$, $\tilde{\nu}_\tau\rightarrow e+\mu$	2 e,μ	-	-	4.6	$\tilde{\nu}_\tau$ 1.61 TeV	λ'_{311}=0.10, λ_{132}=0.05	1212.1272
	LFV $pp\rightarrow\tilde{\nu}_\tau+X$, $\tilde{\nu}_\tau\rightarrow e(\mu)+\tau$	1 e,μ + τ	-	-	4.6	$\tilde{\nu}_\tau$ 1.1 TeV	λ'_{311}=0.10, $\lambda_{1(2)33}$=0.05	1212.1272
	Bilinear RPV CMSSM	2 e,μ (SS)	0-3 b	Yes	20.3	$\tilde{q},\tilde{g}$ 1.35 TeV	$m(\tilde{q})=m(\tilde{g})$, $c\tau_{LSP}$<1 mm	1404.2500
	$\tilde{\chi}^+_1\tilde{\chi}^-_1$, $\tilde{\chi}^+_1\rightarrow W\tilde{\chi}^0_1$, $\tilde{\chi}^0_1\rightarrow ee\tilde{\nu}_\mu, e\mu\tilde{\nu}_e$	4 e,μ	-	Yes	20.3	$\tilde{\chi}^\pm_1$ 750 GeV	$m(\tilde{\chi}^0_1)$>0.2×$m(\tilde{\chi}^\pm_1)$, $\lambda_{121}\neq0$	1405.5086
	$\tilde{\chi}^+_1\tilde{\chi}^-_1$, $\tilde{\chi}^+_1\rightarrow W\tilde{\chi}^0_1$, $\tilde{\chi}^0_1\rightarrow\tau\tau\tilde{\nu}_e, e\tau\tilde{\nu}_\tau$	3 e,μ + τ	-	Yes	20.3	$\tilde{\chi}^\pm_1$ 450 GeV	$m(\tilde{\chi}^0_1)$>0.2×$m(\tilde{\chi}^\pm_1)$, $\lambda_{133}\neq0$	1405.5086
	$\tilde{g}\rightarrow qqq$	0	6-7 jets	-	20.3	$\tilde{g}$ 916 GeV	BR(t)=BR(b)=BR(c)=0%	ATLAS-CONF-2013-091
	$\tilde{g}\rightarrow\tilde{t}_1t$, $\tilde{t}_1\rightarrow bs$	2 e,μ (SS)	0-3 b	Yes	20.3	$\tilde{g}$ 850 GeV		1404.250
Other	Scalar gluon pair, sgluon$\rightarrow q\bar{q}$	0	4 jets	-	4.6	sgluon 100-287 GeV	incl. limit from 1110.2693	1210.4826
	Scalar gluon pair, sgluon$\rightarrow t\bar{t}$	2 e,μ (SS)	2 b	Yes	14.3	sgluon 350-800 GeV		ATLAS-CONF-2013-051
	WIMP interaction (D5, Dirac χ)	0	mono-jet	Yes	10.5	M* scale 704 GeV	$m(\chi)$<80 GeV, limit of<687 GeV for D8	ATLAS-CONF-2012-147

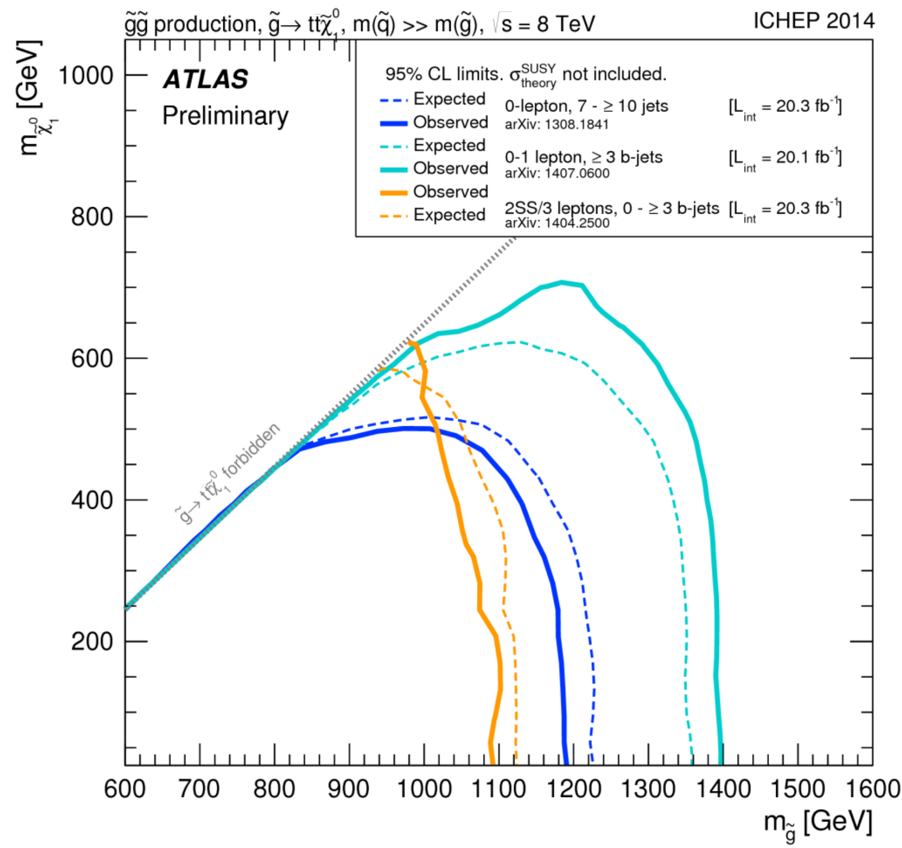
$\sqrt{s}$ = 7 TeV full data | $\sqrt{s}$ = 8 TeV partial data | $\sqrt{s}$ = 8 TeV full data

10^{-1} | 1 | **Mass scale [TeV]**

*Only a selection of the available mass limits on new states or phenomena is shown. All limits quoted are observed minus 1σ theoretical signal cross section uncertainty.

Summary of ATLAS searches for electroweak production of charginos and neutralinos (left)





Exclusion limits at 95% CL for 8 TeV analyses in the (m(gluino), m(neutralino1)) plane for the *Gtt* simplified model where a pair of gluinos decays promptly via off-shell stop to four top quarks and two lightest neutralinos (LSP) (right)

Model independent general search for new phenomena

ATLAS-CONF-2014-006

4 March, 2014

The data collected with the ATLAS experiment during the year 2012 in pp collisions at $\sqrt{s} = 8$ TeV, corresponding to an integrated luminosity of 20.3 fb^{-1}, have been used to search for deviations from the SM prediction at high p_T with a model independent approach. Event topologies involving isolated electrons, muons, photons, jets, b-jets and E_T^{miss} have been systematically classified. All event classes have been scanned looking for deviations from the SM prediction in the effective mass, the visible invariant mass and the missing transverse momentum distributions. No significant excess above the SM prediction has been observed.

We look forward for new data at energy 13-14 TeV in Run 2!