

New Physics Search Highlights at ATLAS and CMS

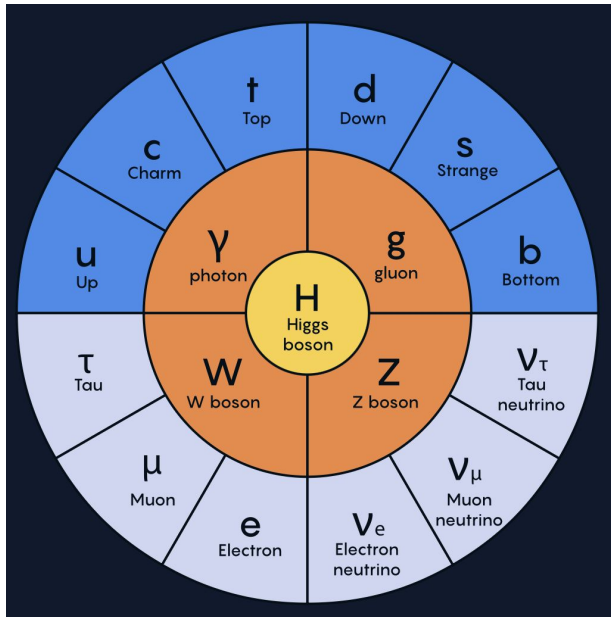
Shuo Han (韩朔)

CLHCP 2025, Xinxiang, China

2025-10-31

Introduction

The Theory



The SM is remarkably successful, major components are established, but..

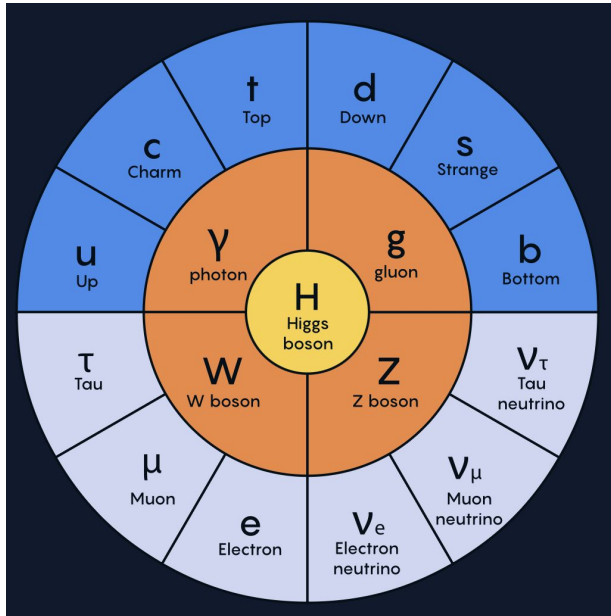
The Puzzles

Big Questions

Elementary vs. Composite
New Forces
Origin of Flavor
Origin of Matter
Unification
Naturalness
Origin of EWSB
Dark Matter

Introduction

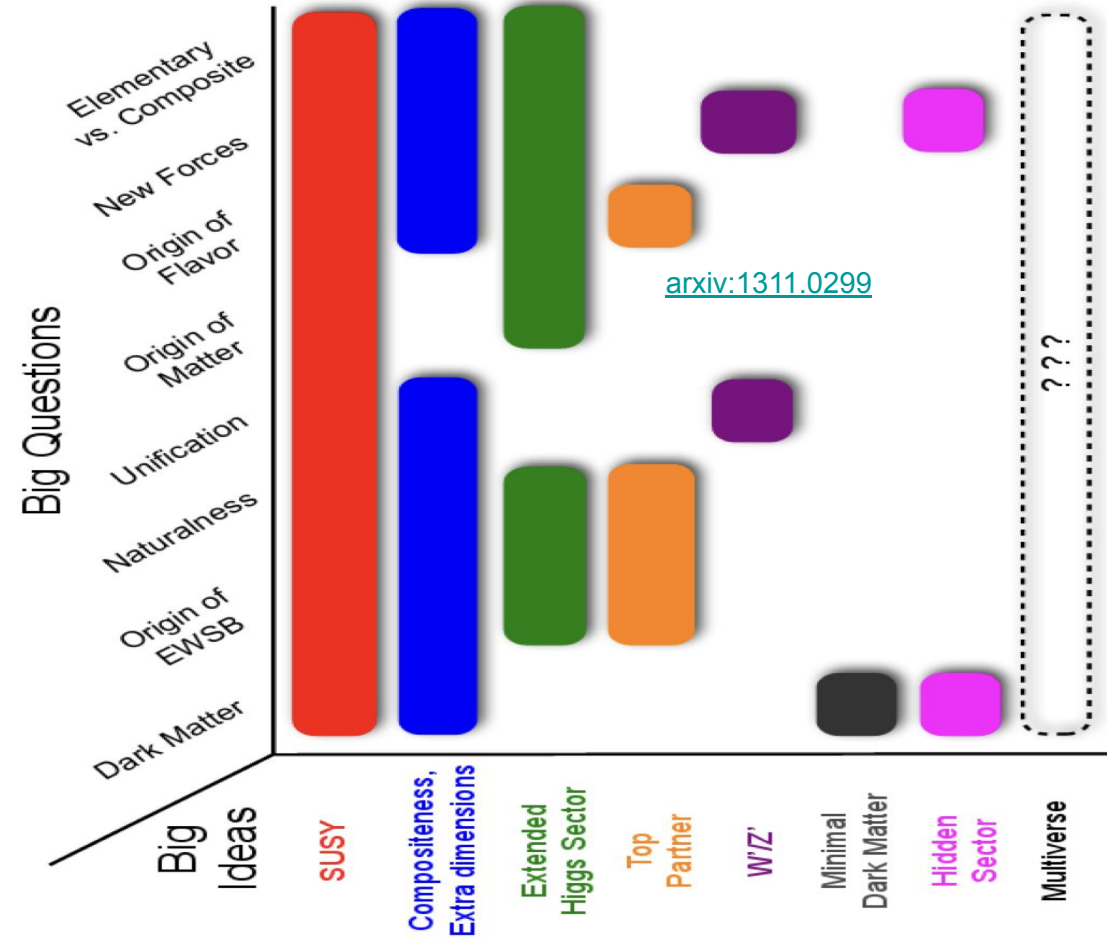
The Theory



The SM is remarkably successful, major components are established

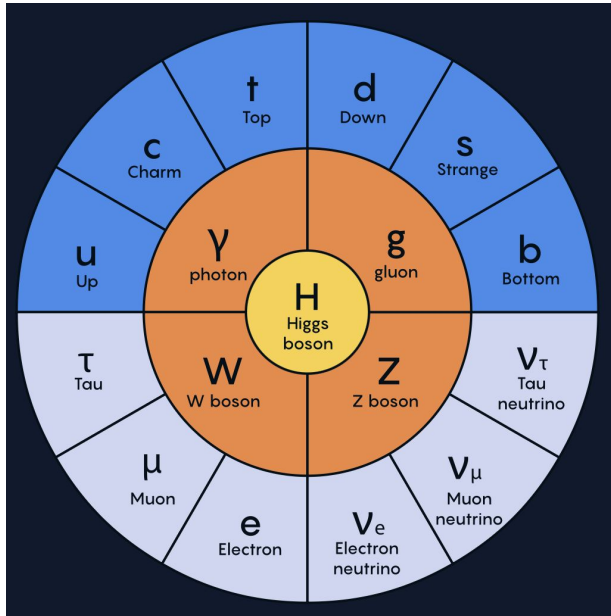
The Puzzles

The Hypothesis



Introduction

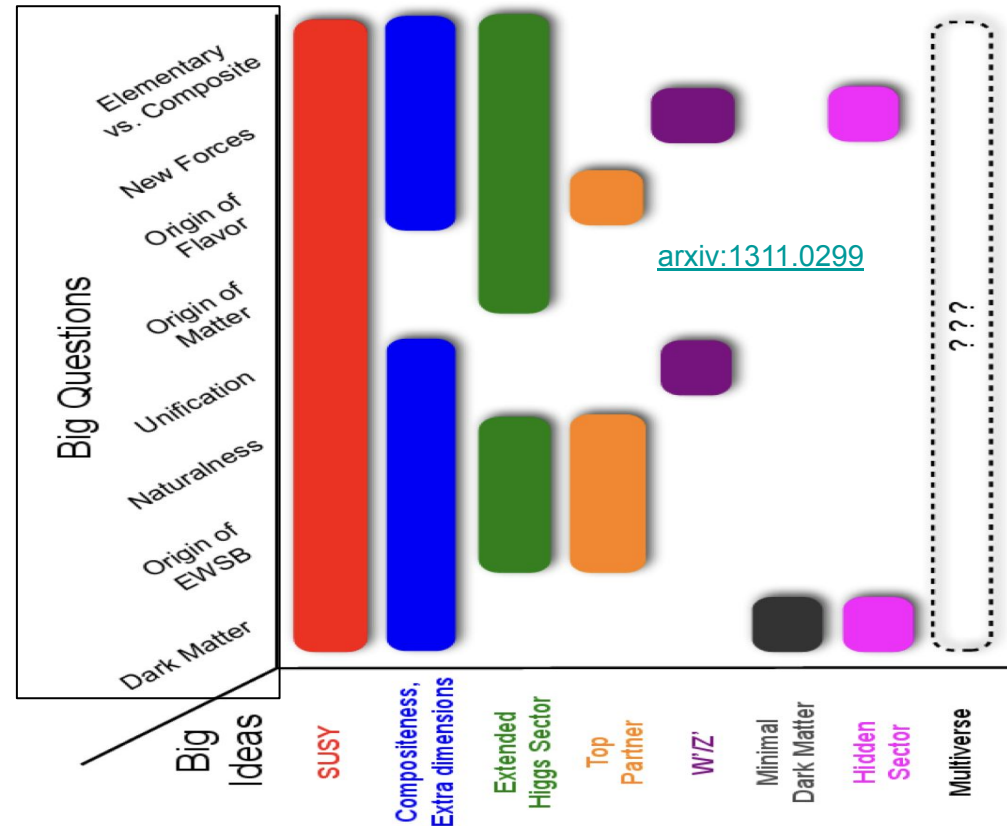
The Theory



The SM is remarkably successful, major components are established

The Puzzles

The Hypothesis



The Experiments

Precise Measurements of the SM (other talks)

Searches for New Phenomenon:

1: Exotic searches
2: SUSY searches

The Exotic summary plots (2023)

ATLAS Heavy Particle Searches* - 95% CL Upper Exclusion Limits

Status: March 2023

Model	ℓ, γ	Jets†	E_T^{miss}	$\int \mathcal{L} dt [\text{fb}^{-1}]$	Limit	Reference
Extra dimen.						
ADD $G_{KK} + g/q$	$0\ e, \mu, \tau, \gamma$	1-4 j	Yes	139	M_0	2102.10874
ADD non-resonant $\gamma\gamma$	$2\ \gamma$	-	-	139	M_S	1707.04147
ADD OBH	-	$\geq 2\ j$	-	139	M_{BH}	1910.08447
ADD BH multijet	-	$\geq 3\ j$	-	139	M_{BH}	1512.02586
RS1 $G_{KK} \rightarrow \gamma\gamma$	$2\ \gamma$	-	-	139	$k/M_{\text{Pl}} = 0.1$	2102.13405
Bulk RS $G_{KK} \rightarrow WW/ZZ$	multi-channel	-	-	36.1	$G_{KK} \text{ mass}$	1808.02380
Bulk RS $G_{KK} \rightarrow tt$	$1\ e, \mu$	$\geq 1\ b, \geq 1/2\ j$	Yes	36.1	$G_{KK} \text{ mass}$	1804.10823
2UED / RPP	$1\ e, \mu$	$\geq 2\ b, \geq 3\ j$	Yes	36.1	$k/M_{\text{Pl}} = 15\%$	1803.09678
Gauge bosons						
SSM $Z' \rightarrow \ell\ell$	$2\ e, \mu$	-	-	139	Z' mass	1903.06248
SSM $Z' \rightarrow \tau\tau$	$2\ \tau$	-	-	36.1	Z' mass	1709.07242
Leptophobic $Z' \rightarrow bb$	-	$2\ b$	-	36.1	Z' mass	1805.09299
Leptophobic $Z' \rightarrow tt$	$0\ e, \mu$	$\geq 1\ b, \geq 2\ j$	Yes	139	Z' mass	2005.05138
SSM $W' \rightarrow \ell\nu$	$1\ e, \mu$	-	Yes	139	W' mass	1906.05609
SSM $W' \rightarrow \tau\nu$	$1\ \tau$	-	Yes	139	W' mass	ATLAS-CONF-2021-025
SSM $W' \rightarrow tb$	-	$\geq 1\ b, \geq 1\ j$	Yes	139	W' mass	ATLAS-CONF-2021-043
HVT $W' \rightarrow WZ$ model B	$0-2\ e, \mu$	$2/1\ j$	Yes	139	W' mass	2004.14636
HVT $W' \rightarrow WZ \rightarrow \ell\nu \ell'\ell'$ model C	$3\ e, \mu$	$2\ j$ (VBF)	Yes	139	W' mass	2207.03925
HVT $Z' \rightarrow WW$ model B	$1\ e, \mu$	$2/1\ j$	Yes	139	Z' mass	2004.14636
LRSM $W_R \rightarrow \mu N_R$	$2\ \mu$	$1\ j$	-	80	W_R mass	1904.12679
CI						
CI $q\bar{q}q\bar{q}$	-	$2\ j$	-	37.0	A	1703.09127
CI $\ell\ell q\bar{q}$	$2\ e, \mu$	-	-	139	A	2006.12946
CI $e\bar{e}b\bar{b}$	$2\ e, \mu$	$1\ b$	-	139	A	2105.13847
CI $\mu\bar{\mu}b\bar{b}$	$2\ \mu$	$1\ b$	-	139	A	2105.13847
CI $t\bar{t}t\bar{t}$	$\geq 1\ e, \mu$	$\geq 1\ b, \geq 1\ j$	Yes	36.1	A	1811.02305
DM						
Axial-vector med. (Dirac DM)	-	$2\ j$	-	139	m_{med}	ATL-PHYS-PUB-2022-036
Pseudo-scalar med. (Dirac DM)	$0\ e, \mu, \tau, \gamma$	1-4 j	Yes	139	m_{med}	2102.10874
Vector med. Z' -2HDM (Dirac DM)	$0\ e, \mu$	$2\ b$	Yes	139	m_{med}	2106.13391
Pseudo-scalar med. 2HDM-a	multi-channel	-	-	139	m_{med}	ATLAS-CONF-2021-036
LQ						
Scalar LQ 1 st gen	$2\ e$	$\geq 2\ j$	Yes	139	LQ mass	2006.05872
Scalar LQ 2 nd gen	$2\ e$	$\geq 2\ j$	Yes	139	LQ mass	2006.05872
Scalar LQ 3 rd gen	$1\ \tau$	$2\ b$	Yes	139	LQ mass	2303.01294
Scalar LQ 3 rd gen	$0\ e, \mu$	$\geq 1\ \tau, \geq 2\ b$	Yes	139	LQ mass	2004.14060
Scalar LQ 3 rd gen	$\geq 2\ e, \mu, \geq 1\ \tau, \geq 1\ j$	$\geq 1\ b$	Yes	139	$\beta(LQ_{\ell}^* \rightarrow \tau\tau) = 1$	2101.11582
Scalar LQ 3 rd gen	$0\ e, \mu, \geq 1\ \tau, 0-2\ j, 2\ b$	$\geq 1\ b$	Yes	139	$\beta(LQ_{\ell}^* \rightarrow b\tau) = 1$	2101.12527
Vector LQ mix gen	multi-channel	$\geq 1\ j, \geq 1\ b$	Yes	139	$\beta(LQ_{\ell}^* \rightarrow t\mu) = 1, Y\text{-M coupl.}$	ATLAS-CONF-2022-052
Vector LQ 3 rd gen	$2\ e, \mu, \tau$	$\geq 1\ b$	Yes	139	$\beta(LQ_{\ell}^* \rightarrow b\tau) = 1, Y\text{-M coupl.}$	2303.01294
Vector-like fermions						
VLO $T\bar{T} \rightarrow Zt + X$	$2e/2\mu/2\tau/2e, \mu, \tau, \gamma$	$\geq 1\ b, \geq 1\ j$	-	139	T mass	2210.15413
VLO $B\bar{B} \rightarrow Wt/Zb + X$	multi-channel	-	-	36.1	B mass	1808.02343
VLO $T_{5/3} T_{3/3} \rightarrow Wt + X$	$2(S\bar{S})/2\bar{3}e, \mu, \tau, \gamma$	$\geq 1\ b, \geq 1\ j$	Yes	36.1	$T_{5/3}$ mass	1807.11883
VLO $T \rightarrow Ht/Zt$	$1\ e, \mu$	$\geq 1\ b, \geq 1\ j$	Yes	139	T mass	ATLAS-CONF-2021-040
VLO $Y \rightarrow Wb$	$1\ e, \mu$	$\geq 1\ b, \geq 1\ j$	Yes	36.1	Y mass	1812.07343
VLO $Z \rightarrow Hb$	$0\ e, \mu$	$\geq 2\ b, \geq 1\ j, \geq 1\ j$	-	139	B mass	ATLAS-CONF-2021-018
VLL $\bar{t} \rightarrow Z\tau/H\tau$	multi-channel	$\geq 1\ j$	Yes	139	$\bar{t}$ mass	2303.05441
Exotic ferm.						
Excited quark $q^* \rightarrow qg$	-	$2\ j$	-	139	q^* mass	1910.08447
Excited quark $q^* \rightarrow q\gamma$	$1\ \gamma$	$1\ j$	-	36.7	q^* mass	1709.10440
Excited quark $b^* \rightarrow bg$	-	$1\ b, 1\ j$	-	139	b^* mass	1910.08447
Excited lepton e^*	$2\ \tau$	$\geq 2\ j$	-	139	e^* mass	2303.09444
Other						
Type III Seesaw	$2, 3, 4\ e, \mu$	$\geq 2\ j$	Yes	139	N^0 mass	2202.02039
LRSM Majorana ν	$2\ \mu$	$2\ j$	-	36.1	N^0 mass	1809.11105
Higgs triplet $H^{\pm\pm} \rightarrow W^{\pm} W^{\pm}$	$2, 3, 4\ e, \mu$ (SS)	various	Yes	139	$H^{\pm\pm}$ mass	2101.11961
Higgs triplet $H^{\pm} \rightarrow \ell\ell$	$2, 3, 4\ e, \mu$ (SS)	-	-	139	$H^{\pm}$ mass	2211.07505
Multi-charged particles	-	-	-	139	multi-charged particle mass	ATLAS-CONF-2022-034
Magnetic monopoles	-	-	-	34.4	monopole mass	1905.10130

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

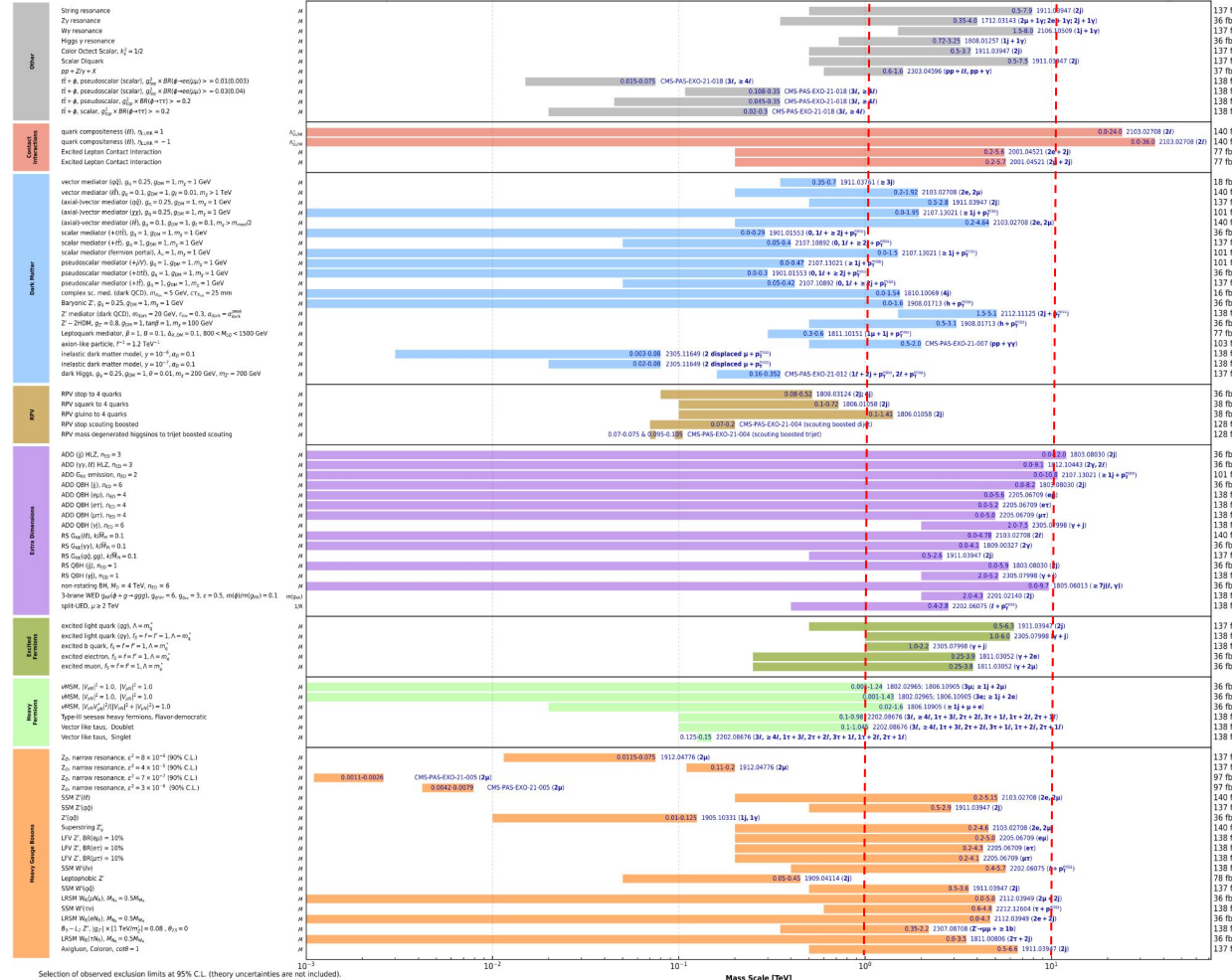
†Small-radius (large-radius) jets are denoted by the letter l (J).

ATLAS summary plots

ATLAS Preliminary

$\sqrt{s} = 13\ \text{TeV}$

$\int \mathcal{L} dt = (3.6 - 139)\ \text{fb}^{-1}$



CMS summary plots

Highlights of New Exotic Results

CMS

Resonant searches

di-jet with data scouting [EXO-23-004 \(arxiv:2510.21641\)](#)
 di-jet with anomalous jet structure [ROPP 88 \(2025\) 067802](#)
 pairs of di-jet resonance [EXO-24-038 \(arxiv:2507.17884\)](#)
 heavy Z' resonance to $\tau\tau$ /WW [PRL 135 \(2025\) 061803](#)
 heavy neutral resonances to $\tau\tau$ [PRD 111 \(2025\) 112004](#)
 *Heavy resonance in gWW [JHEP 02 \(2025\) 199](#)
 H+X $\gamma\gamma$ [B2G-24-001 \(arxiv:2508.11494\)](#) X-ZH [JHEP 02 \(2025\) 089](#)
 ZH/A-ttZ [PLB 866 \(2025\) 139568](#) X-tg [EPJC 85 \(2025\) 342](#)

Long live particles (LLP)

b to LLP with muon detector [EXO-24-004 \(arxiv:2508.06363\)](#)
 VLL to LLP with muon detector [JHEP 08 \(2025\) 156](#)
 LLP with ionization energy loss [JHEP 04 \(2025\) 109](#)
 LLP with displaced jets [ROPP 88 \(2025\) 037801](#)
 long-lived HNL with displaced lep-jet [JHEP 02 \(2025\) 036](#)

Dark Matters (DM) Leptoquark Excited leptons Non-resonant

DM with tops [JHEP 08 \(2025\) 085](#)
 t-channel Leptoquark dilepton [EXO-22-013 \(2503.20023\)](#)
 Excited τ [JHEP 06 \(2025\) 006](#)
 Vector-Like top [B2G-23-009](#)
 non-resonant $bbll/bsll$ [EXO-23-010 \(arxiv:2506.13565\)](#)
 anomalous jet + Hbb [B2G-2024-015 \(2509.13635\)](#)

ATLAS

di-jet trigger level [EXOT-2018-39 \(arXiv:2509.01219\)](#)
 anomaly search in multilepton [EXOT-2021-34 \(arxiv:2508.19778\)](#)
 *semi-visible jets [PRD 112 \(2025\) 012021](#)
 ttH/A-tttt [EPJC 85 \(2025\) 573](#)
 Low-mass resonance + photon [JHEP 01 \(2025\) 099](#)

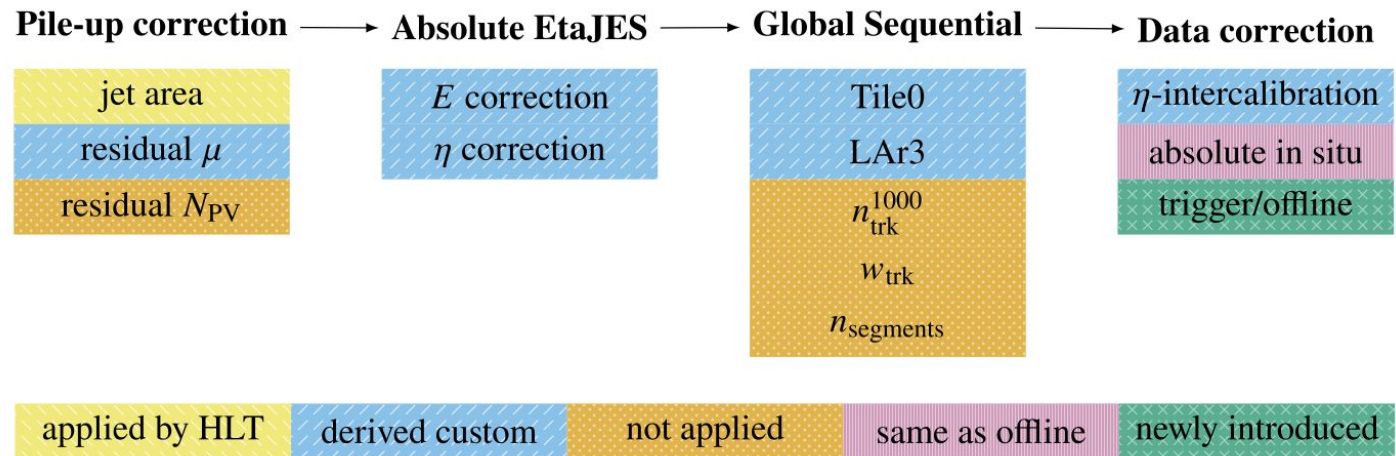
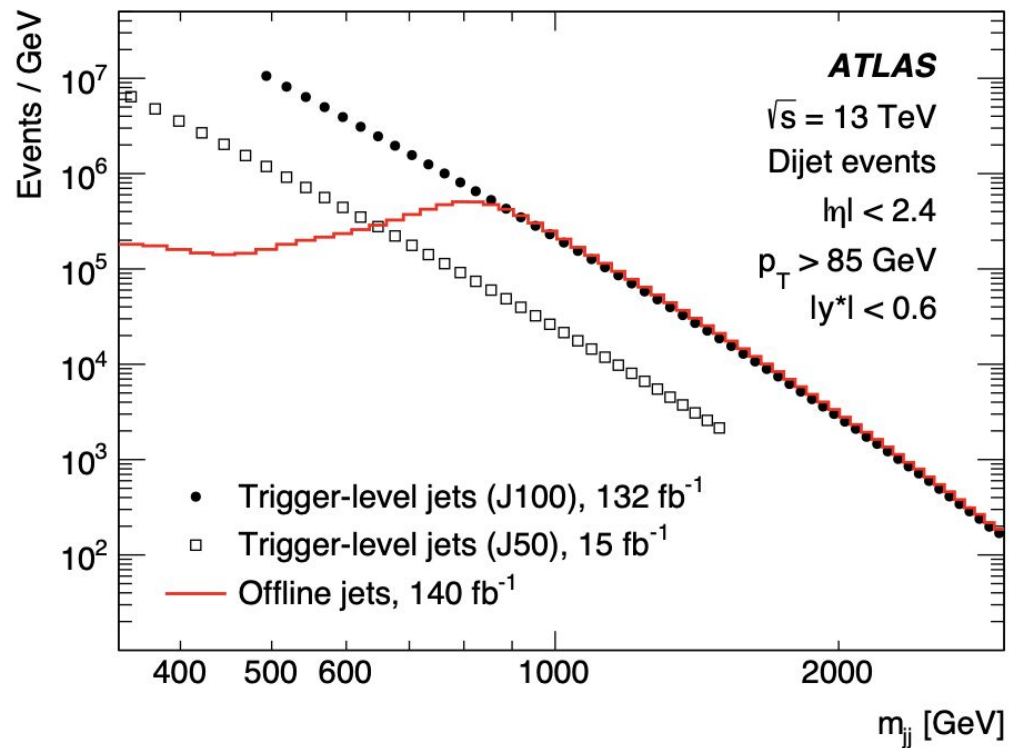
LLP with displaced jets [EXOT-2022-17 \(arxiv:2503.20445\)](#)
 Long-lived HNL in W [JHEP 07 \(2025\) 196](#)

*Dark Higgs with bb [PRL 134 \(2025\) 121801](#)
 Dark photon in leptons [EPJC 85 \(2025\) 335](#)
 *Emerging jets [EXOT-2018-20 \(arXiv:2510.12347\)](#), [ROPP 88 \(2025\) 097801](#)
 Prompt HNL in W [EXOT-2019-35 \(arxiv:2508.20929\)](#)
 *Leptoquark with lep-jet [EXOT-2024-12 \(arxiv:2507.03650\)](#)
 VLQ in W+b (lep) [EXOT-2018-60 \(arxiv:2506.15515\)](#)
 VLQ in W+b (had) [JHEP 02 \(2025\) 075](#)
 VLL in τ +b [EXOT-2022-27 \(arxiv:2503.22581\)](#)
 VLL in leptons [JHEP 05 \(2025\) 075](#)
 Vector-Like top [PRD 111 \(2025\) 012012](#)
 High-mass $\tau\tau$ [JHEP 10 \(2025\) 54](#)

~30 [CMS PAS](#) not included (e.g. *[HIG-24-014](#), [B2G-24-007](#), [B2G-24-010](#), [B2G-24-009](#), [B2G-24-003](#))
 resonant HH / HHH searches are not included
 End of 2024 results not included

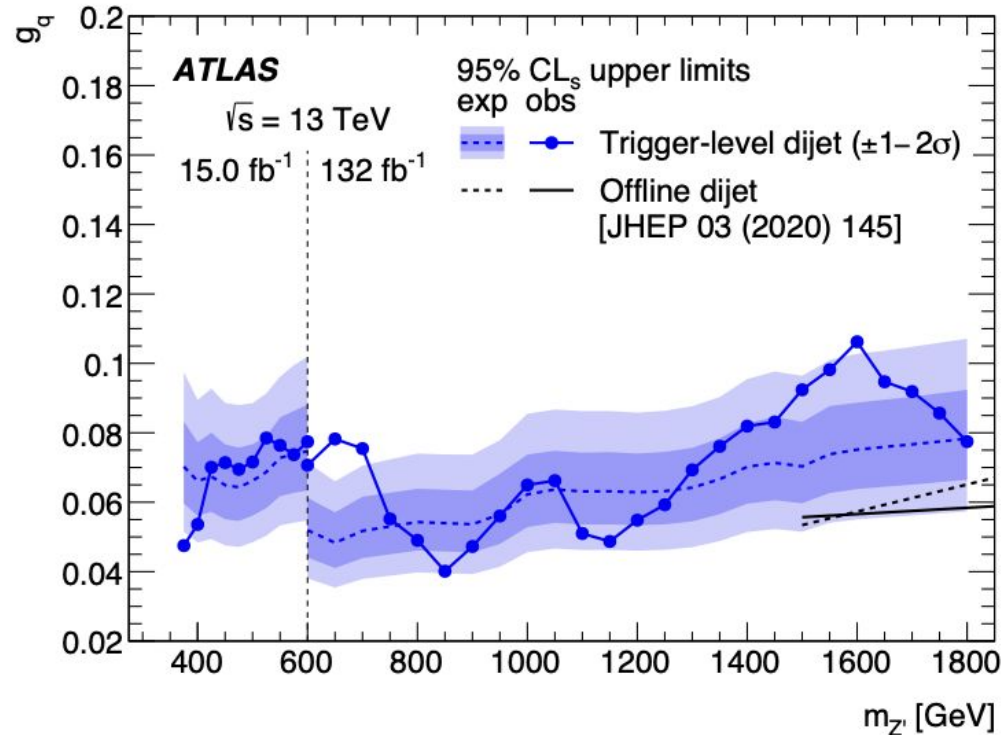
Resonances search with trigger-level analysis

- Trigger-level analysis makes it possible to utilize the **data rejected by offline triggers**
- ATLAS searched for dijet resonances in the 375–1800 GeV range with 132 fb^{-1} of 13 TeV data, extending sub-TeV coverage via L1Topo and low-threshold triggers [EXOT-2018-39 \(arXiv:2509.01219\)](#)
- Improved trigger-jet calibration, and a single-function, data-driven background model.

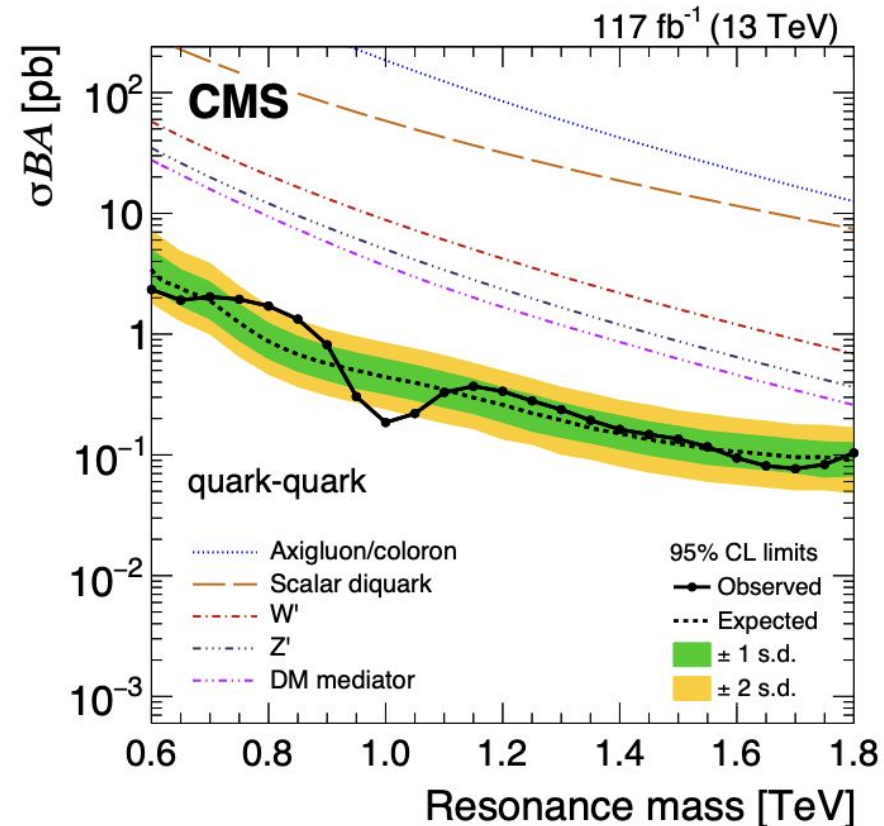


Resonances search with trigger-level analysis

- No significant localized excess is observed (global p-values: 0.55 for J50 and 0.27 for J100)
- However, it sets limits in lower mass range, superseding the offline di-jet result
- CMS presented similar study using scouting data, and set limits in a sub-TeV mass range too



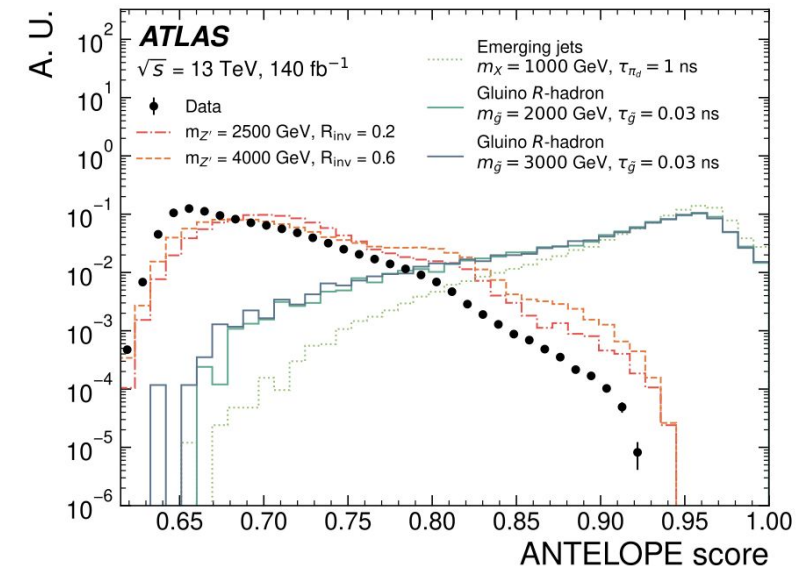
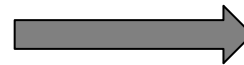
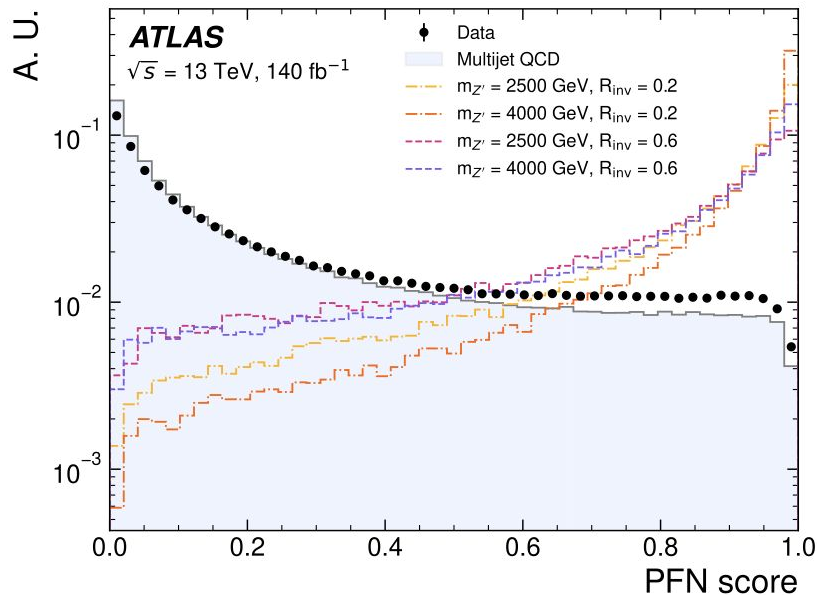
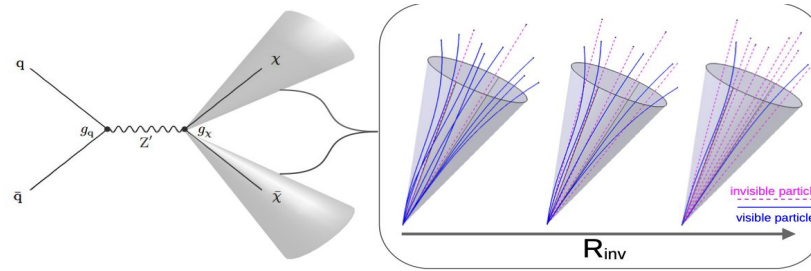
[EXOT-2018-39 \(arXiv:2509.01219\)](#)



[EXO-23-004 \(arxiv:2510.21641\)](#)

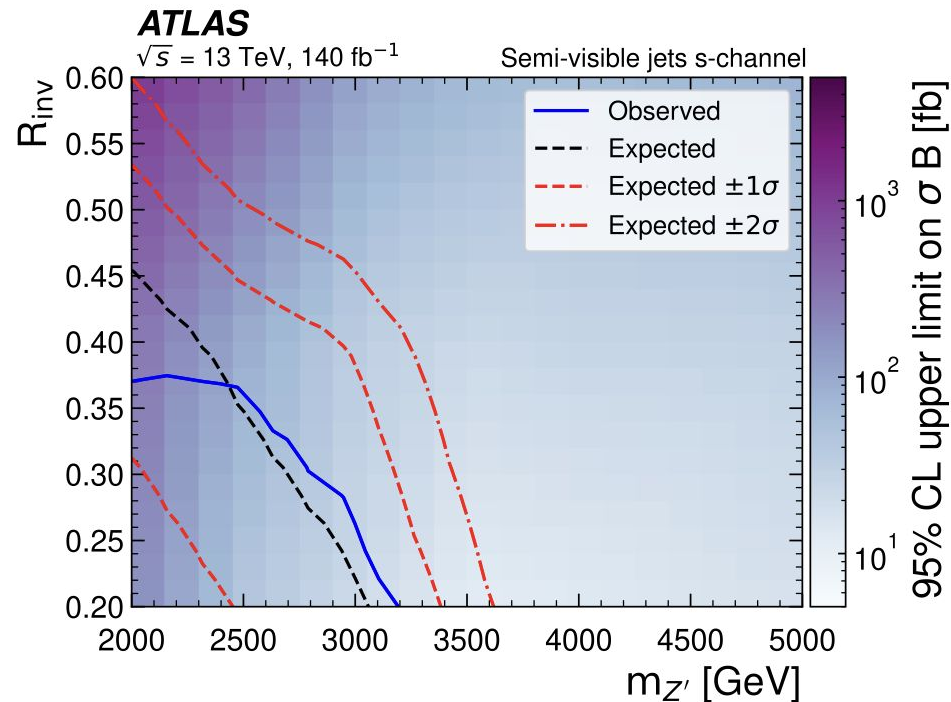
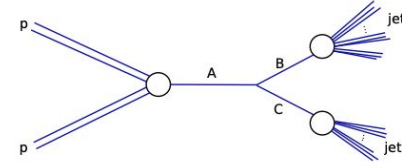
Anomaly search with machine learning

- Anomaly search with ML is crucial to uncover **new physics with unconventional signatures**
- ATLAS searches for semi-visible jets from a strongly-coupled dark sector via a Z' mediator
- The analysis uses ANTELOPE for semi-visible jets, which first learns jet features with a PFN, then performs anomaly detection in latent space using an auto-encoder [PRD 112 \(2025\) 012021](#)

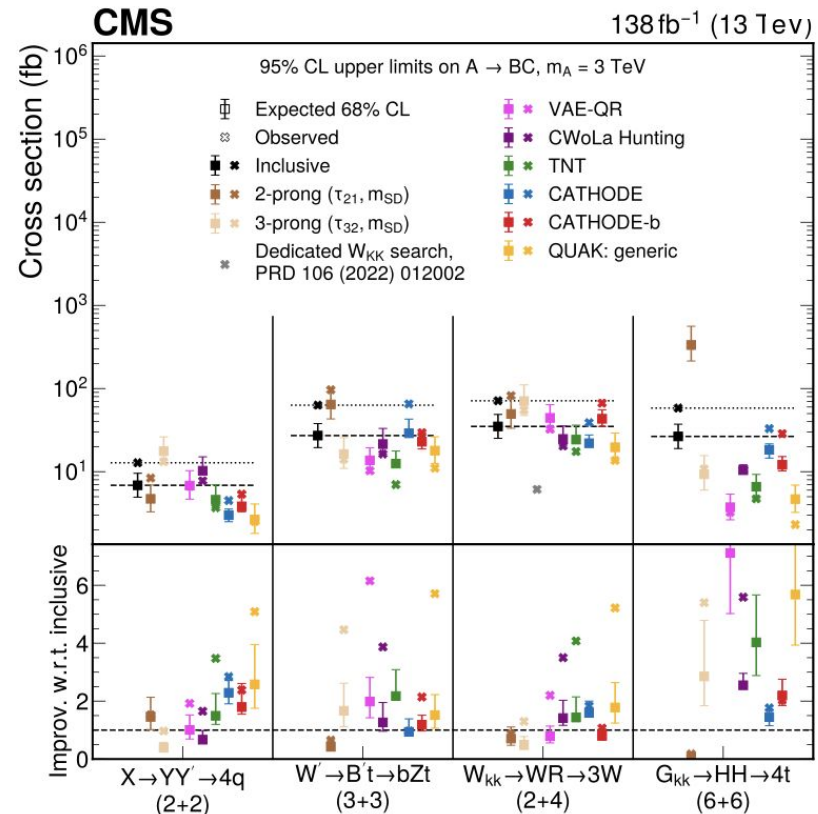


Anomaly search with machine learning

- No excess observed in semi-visible jet search; Z' masses 2.0–3.2 TeV excluded at 95% CL for invisible fraction (R_{inv}) = 0.2 – 0.37
- CMS also presents an anomaly search for di-jet resonance with jet substructure
 - 3 ML strategies are studies, and results are presented with all methods



[PRD 112 \(2025\) 012021](#)

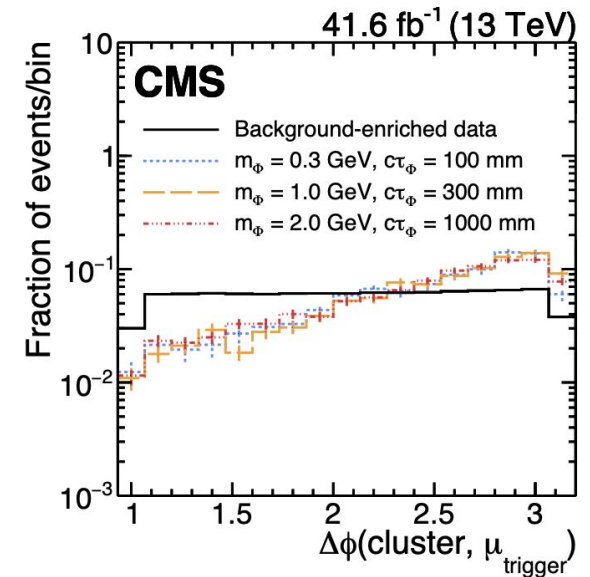
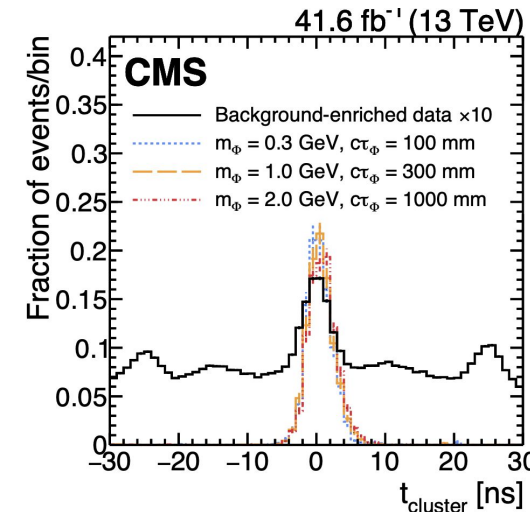
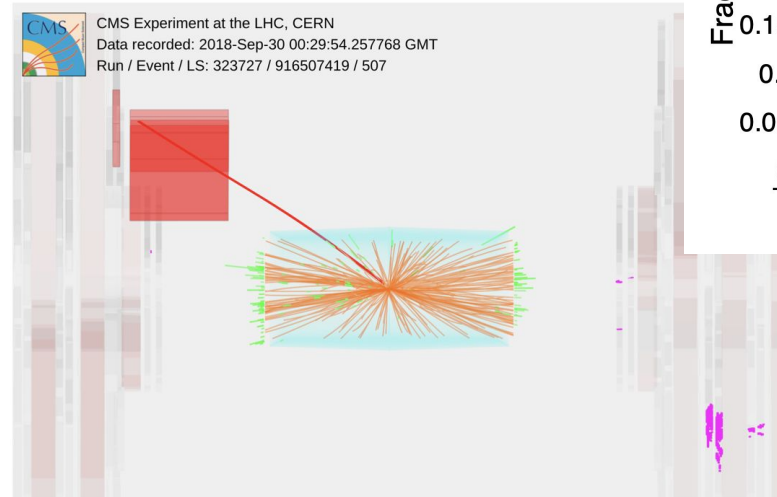
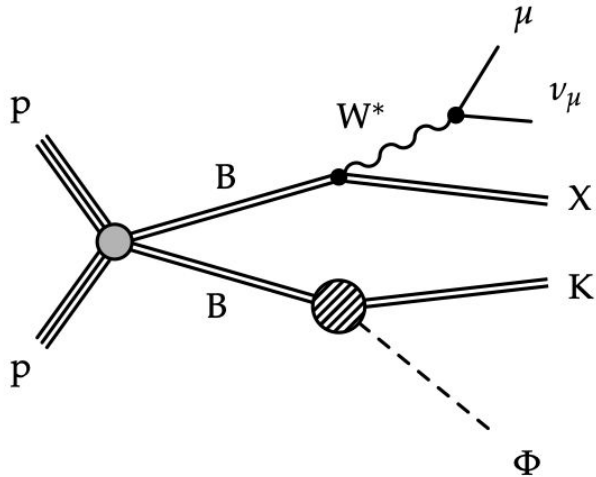


[ROPP 88 \(2025\) 067802](#)

Long live particle searches with detector timing

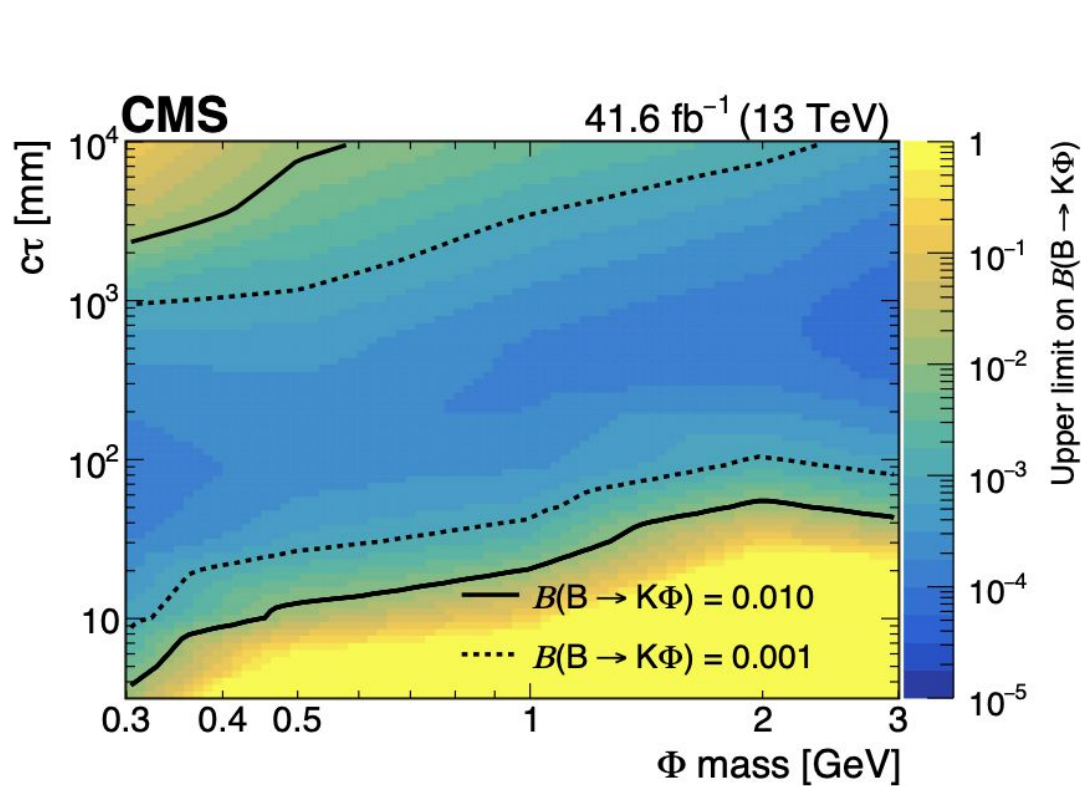
- BSM hypothesis predicting long-live particles, searching for LLP required to utilize the detector timing
- CMS performs a search for b hadron decays to long-lived particles using end-cap muon detector
 - relies on CMS CSC cluster timing (5ns resolution) and hit topology (400-500 um resolution)

[EXO-24-004 \(arxiv:2508.06363\)](#)

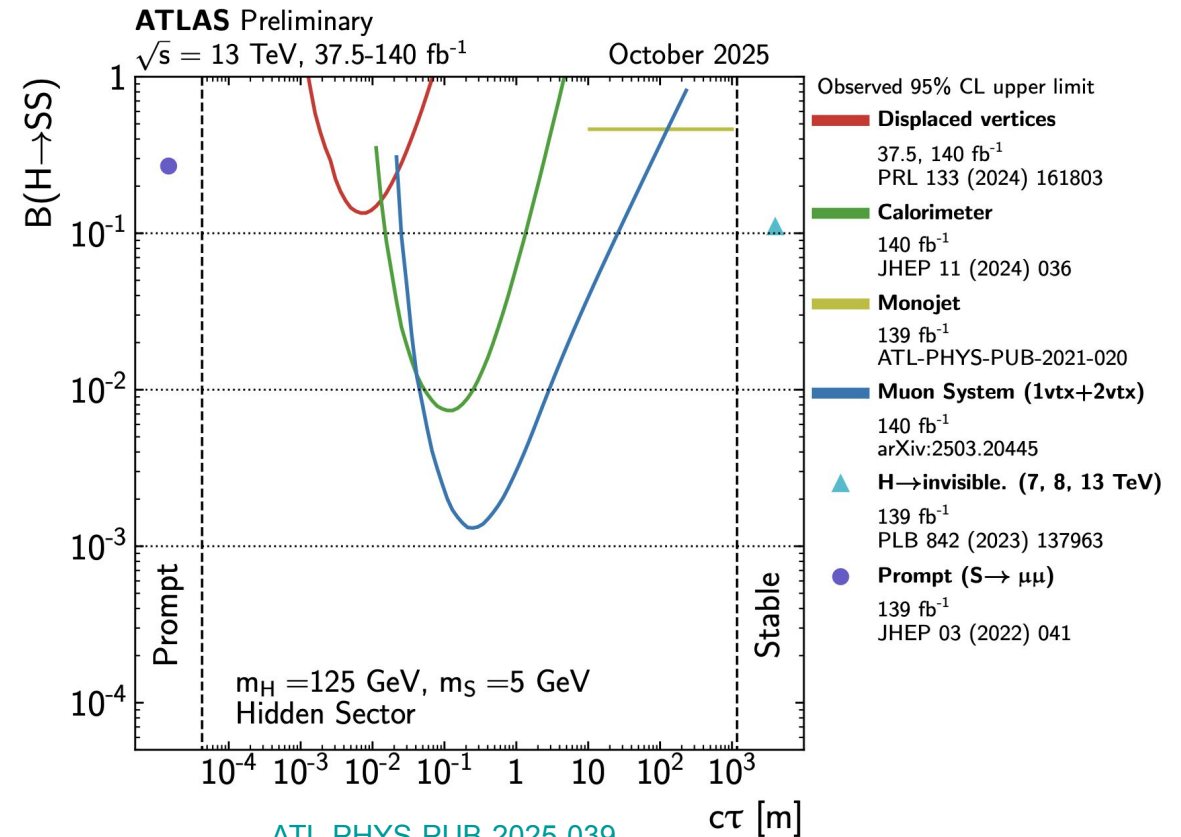


Long live particle searches with detector timing

- No excess found and limits are set on decay length and new particle mass
- The previous studies has covered various types of LLP using tracker, calorimeter and muon system



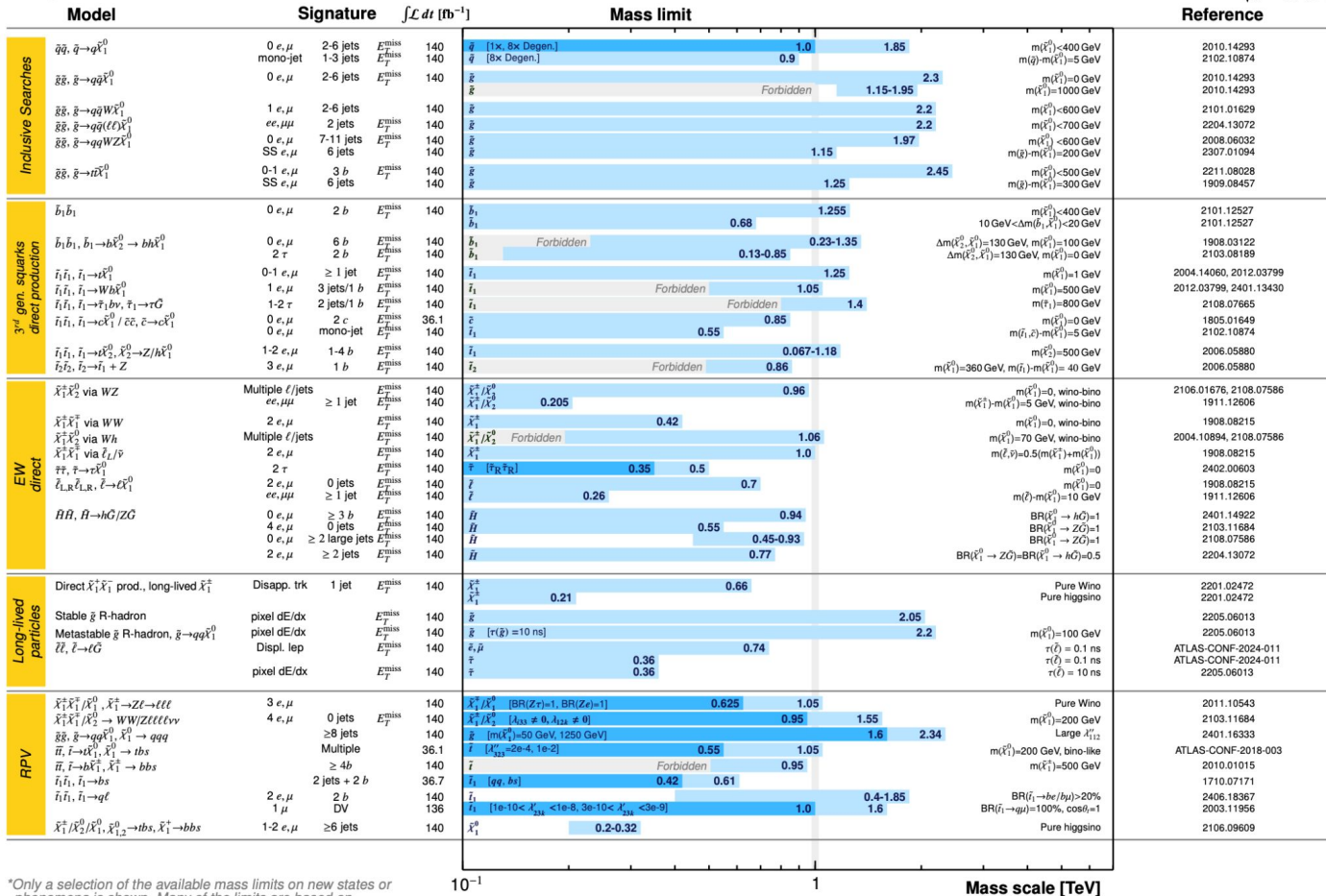
[EXO-24-004 \(arxiv:2508.06363\)](#)



The SUSY summary plots (up to 2024)

ATLAS SUSY Searches* - 95% CL Lower Limits

July 2024



*Only a selection of the available mass limits on new states or phenomena is shown. Many of the limits are based on simplified models, c.f. refs. for the assumptions made.

ATLAS summary plots

ATLAS Preliminary

$\sqrt{s} = 13$ TeV

CMS Preliminary

June 2023

Overview of SUSY results: electroweak production

137 fb⁻¹ (13 TeV)

pp $\rightarrow \tilde{\chi}_2^0\tilde{\chi}_1^{\pm}$

2 ℓ same-sign and 3 ℓ : arXiv:2106.14246 flavour democratic, $x = 0.5$

2 ℓ same-sign and $\geq 3\ell$: arXiv:2106.14246 flavour democratic, $x = 0.05$

2 ℓ same-sign and $\geq 3\ell$: arXiv:2106.14246 flavour democratic, $x = 0.95$

pp $\rightarrow \tilde{\chi}_2^0\tilde{\chi}_1^{\pm} \rightarrow \tilde{\tau}\nu\tilde{\ell} \rightarrow \tau\nu\ell\tilde{\chi}_1^0\tilde{\chi}_1^0$ 2 ℓ same-sign and 3 ℓ/η_h : arXiv:2106.14246 τ enriched, $x = 0.5$

3 ℓ/η_h : arXiv:2106.14246 τ enriched, $x = 0.05$

3 ℓ/η_h : arXiv:2106.14246 τ enriched, $x = 0.95$

pp $\rightarrow \tilde{\chi}_2^0\tilde{\chi}_1^{\pm} \rightarrow \tilde{\tau}\nu\tau\tilde{\tau} \rightarrow \tau\nu\tau\tau\tilde{\chi}_1^0\tilde{\chi}_1^0$ $\geq 3\ell/\eta_h$: arXiv:2106.14246 τ dominated, $x = 0.5$

pp $\rightarrow \tilde{\chi}_2^0\tilde{\chi}_1^{\pm} \rightarrow \text{WH}\tilde{\chi}_1^0\tilde{\chi}_1^0$ 2 ℓ same-sign and $\geq 3\ell/\eta_h$: arXiv:2106.14246

1 ℓ +jets: arXiv:2107.12553

0 ℓ W+X: arXiv:2205.09597

Combination: SUS-21-008

pp $\rightarrow \tilde{\chi}_2^0\tilde{\chi}_1^{\pm} \rightarrow \text{WZ}\tilde{\chi}_1^0\tilde{\chi}_1^0$ 2 ℓ opposite-sign: arXiv:2012.08600

2 ℓ same-sign and 3 ℓ : arXiv:2106.14246

2 ℓ and 3 ℓ soft: arXiv:2111.06296 $\Delta M = 5$ –10 GeV

0 ℓ W+X: arXiv:2205.09597

Combination: SUS-21-008

pp $\rightarrow \tilde{\chi}_2^0\tilde{\chi}_1^{\pm}/\tilde{\chi}_1^0\tilde{\chi}_1^{\pm}, \tilde{\chi}_1^{\pm}/\tilde{\chi}_2^0 \rightarrow (\text{W}^*/\text{Z}^*)\tilde{\chi}_1^0$ 2 ℓ and 3 ℓ soft: arXiv:2111.06296 higgsino simplified model, $\Delta M = 5$ –10 GeV

pp $\rightarrow \tilde{\chi}_1^{\pm}\tilde{\chi}_1^{\pm}$ 2 ℓ opposite-sign: arXiv:1807.07799 $M_{\tilde{\chi}_1^0} = 1$ GeV ($\mathcal{L} = 35.9$ fb⁻¹)

0 ℓ W+X: arXiv:2205.09597

pp $\rightarrow \tilde{\chi}_1^{\pm}\tilde{\chi}_1^{\pm} \rightarrow (\tilde{\ell}\nu/\tilde{\ell}\bar{\nu}) \rightarrow \ell\nu\tilde{\chi}_1^0$ 2 ℓ opposite-sign: arXiv:1807.07799 BF($\tilde{\ell}\nu$) = 50%, $x = 0.5$ ($\mathcal{L} = 35.9$ fb⁻¹)

pp $\rightarrow \tilde{\ell}_L\tilde{\ell}_R/\tilde{\ell}_R\tilde{\ell}_L, \tilde{\ell} \rightarrow \ell\tilde{\chi}_1^0$ e⁺e⁻, $\mu^+\mu^-$: arXiv:2012.08600

Selection of observed limits at 95% C.L. (theory uncertainties are not included). Probe up to the quoted mass limit for light LSPs unless stated otherwise. The quantities ΔM and x represent the absolute mass difference between the primary sparticle and the LSP, and the difference between the intermediate sparticle and the LSP relative to ΔM , respectively, unless indicated otherwise.

CMS

Moriond 2021

Overview of SUSY results: gluino pair production

137 fb⁻¹ (13 TeV)

pp $\rightarrow \tilde{g}\tilde{g}$

0 ℓ : arXiv:1909.03460;1908.04722,2103.01290

1 ℓ : arXiv:1911.07558

2 ℓ same-sign and $\geq 3\ell$: arXiv:2001.10086

0 ℓ : arXiv:1909.03460;1908.04722

0 ℓ : arXiv:1909.03460;1908.04722

0 ℓ : arXiv:1908.04722 BF($\tilde{\chi}_1^{\pm}:\tilde{\chi}_2^0$) = 2:1, $x = 0.5$

2 ℓ same-sign and $\geq 3\ell$: arXiv:2001.10086 BF($\tilde{\chi}_1^{\pm}:\tilde{\chi}_2^0$) = 2:1, $x = 0.5$

Highlights of New SUSY Results

CMS

ATLAS

Compressed

Compressed general search [SUS-23-003 \(arXiv:2508.13900\)](#)

compressed electroweakinos in VBF [JHEP 12 \(2024\) 116](#)

Dark Matter (DM),
2HDM + S / a

DM with b + ll [SUS-23-018 \(arxiv:2510.12396\)](#)
H to light pseudoscalar [SUS-24-002 \(arxiv:2508.06947\)](#)
DM with H $\tau\tau$ [SUS-23-012 \(arXiv:2506.04431\)](#)
DM via FCNC single-top [JHEP 09 \(2025\) 141](#)
Heavy Higgs to bb with 2HDM [JHEP 06 \(2025\) 144](#)
b-jets + MET in 2HDM+a [JHEP 02 \(2025\) 050](#)

SUSY review [Phys. Rep. 1116 \(2025\) 261-300](#)

Charm-tagged,
GMSB higgsino
search LLP..

stop/scharm $\rightarrow$ c $\tilde{\chi}$ [JHEP 02 \(2025\) 193](#)
displaced leptons [PRD 112 \(2025\) 012016](#)
GMSB higgsino search in bbyy [PLB 856 \(2024\) 138938](#)

RPV

stop in RPV [SUS-23-001 \(arXiv:2506.08825\)](#)
RPV with jet-scaling in mult-L [SUS-23-015 \(arxiv:2503.06726\)](#)

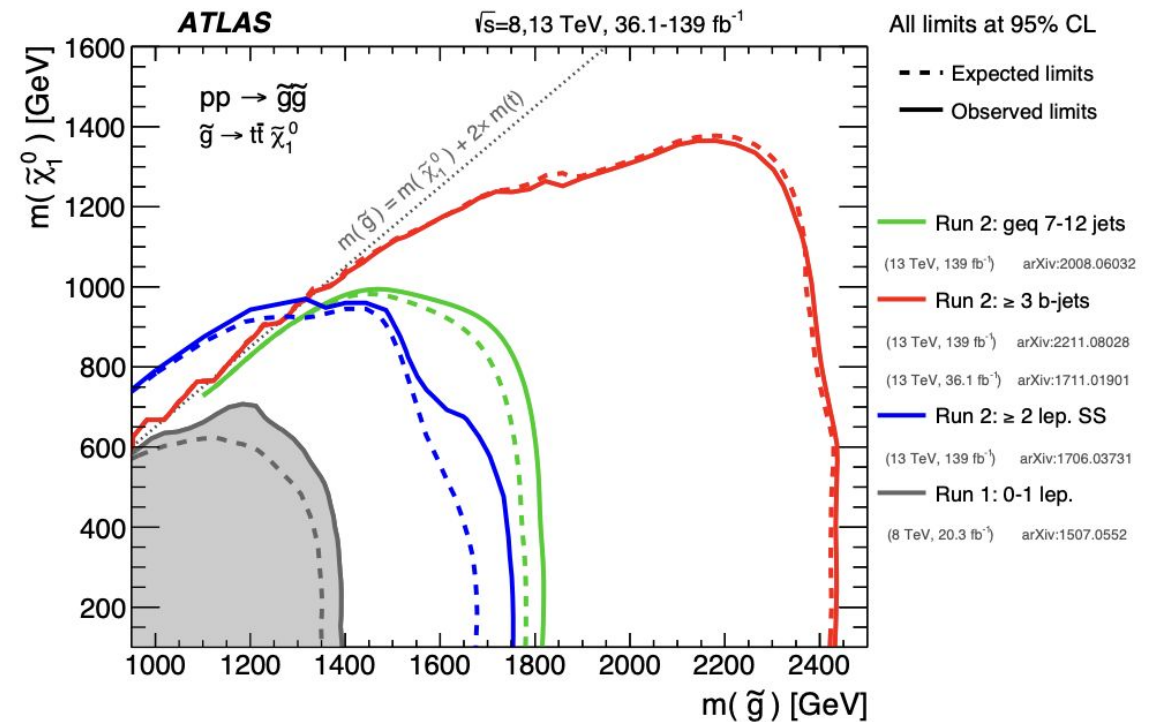
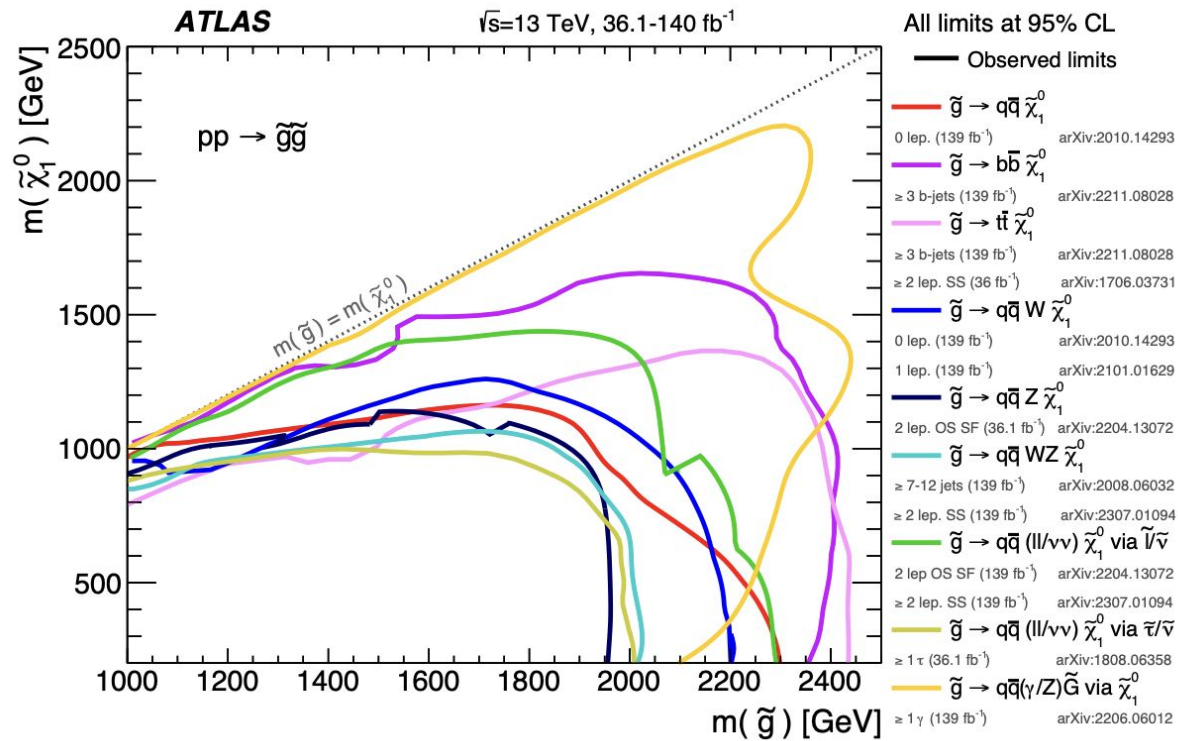
stop in RPV [PRD 110 \(2024\) 092004](#)

9 [CMS PAS](#) not included

Only 2025 results for CMS, and post-Moriond 2024 results for ATLAS

SUSY review of ATLAS

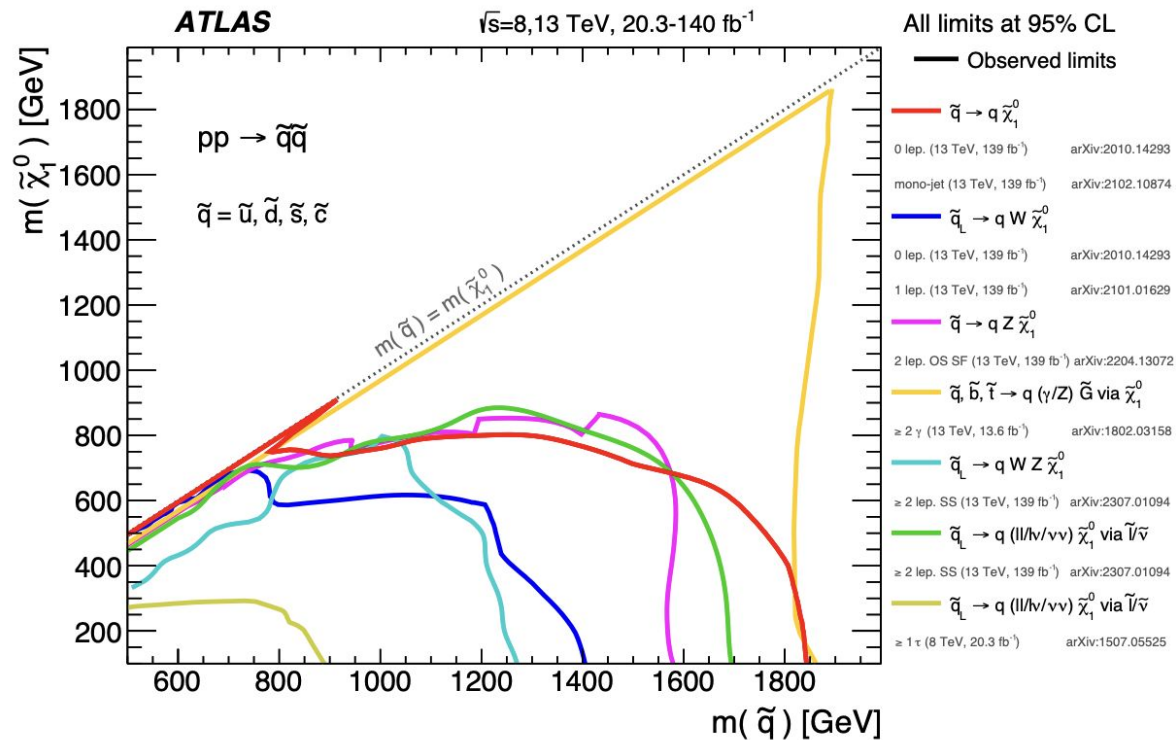
- ATLAS Run2 delivers broad, state-of-the-art SUSY limits across RPC, RPV, LLP scenarios
- [Phys. Rep. 1116 \(2025\) 261-300](#) summarize the Run2 results



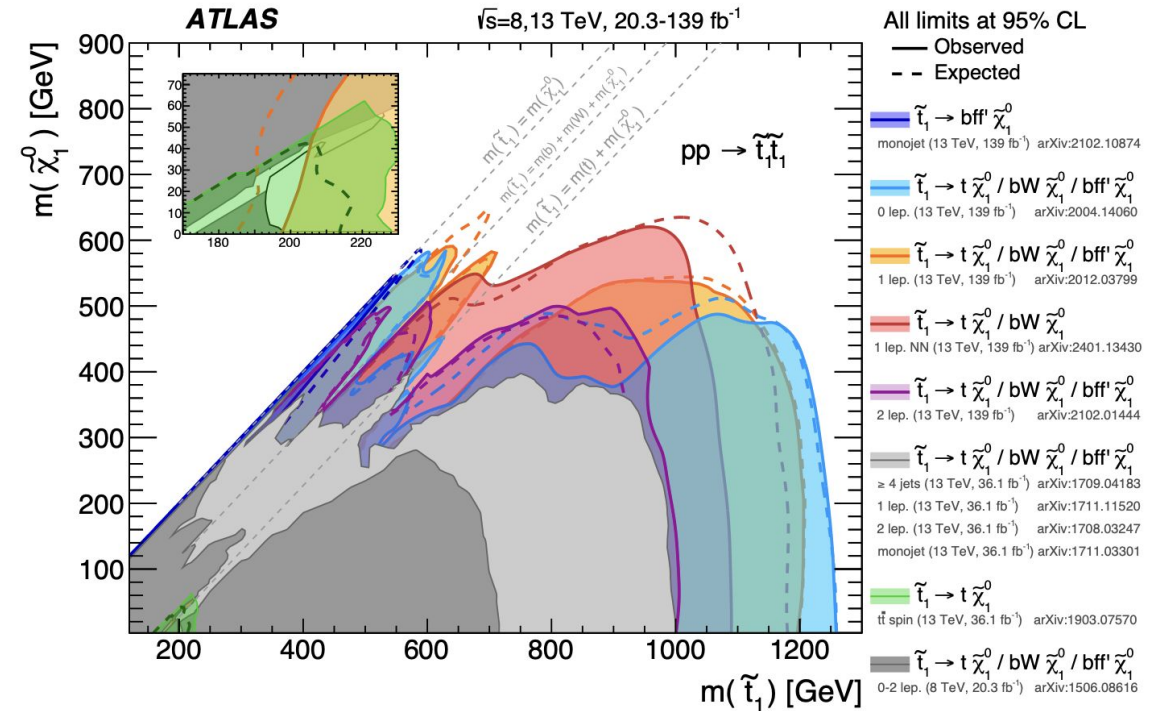
Limits on gluino - LSP mass

SUSY review of ATLAS

- ATLAS Run2 delivers broad, state-of-the-art SUSY limits across RPC, RPV, LLP scenarios
- [Phys. Rep. 1116 \(2025\) 261-300](#) summarize the Run2 results



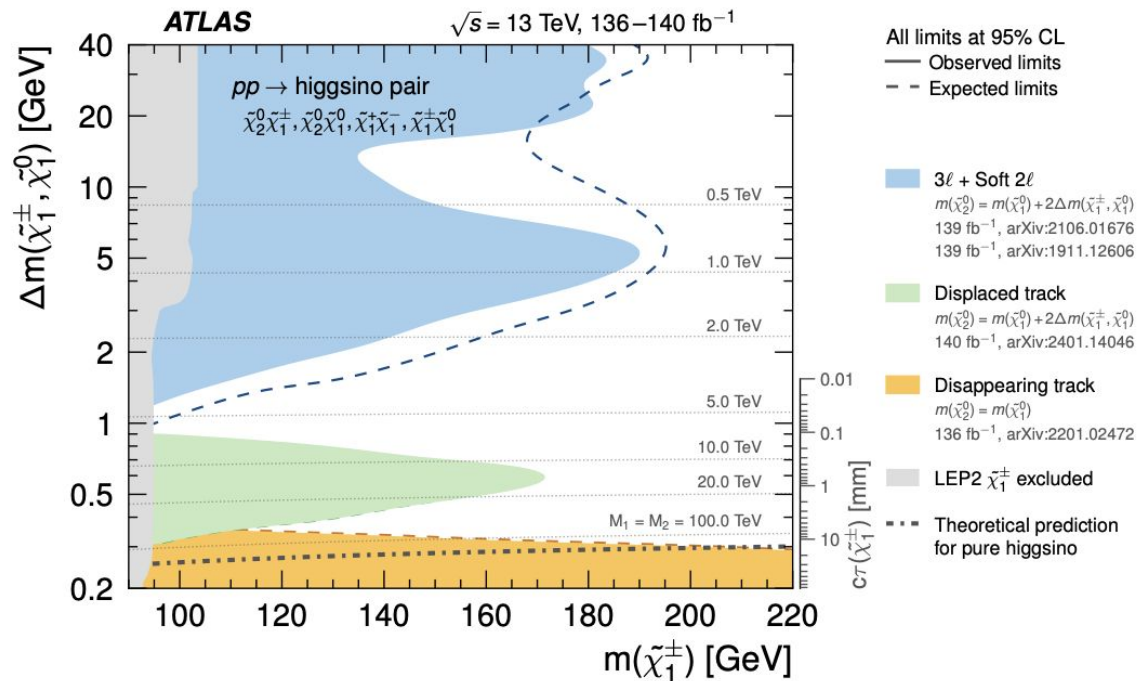
Limits on squark - LSP mass



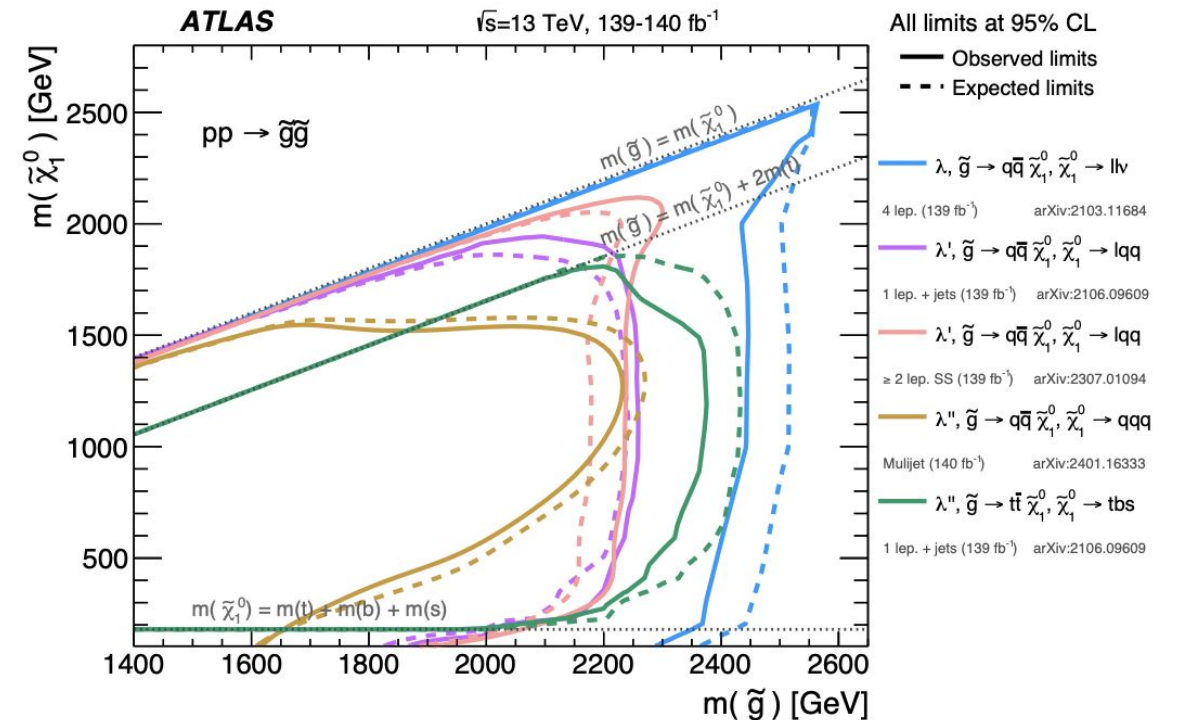
Limits on stop - LSP mass

SUSY review of ATLAS

- ATLAS Run2 delivers broad, state-of-the-art SUSY limits across RPC, RPV, LLP scenarios
- [Phys. Rep. 1116 \(2025\) 261-300](#) summarize the Run2 results
- more models / results in the paper



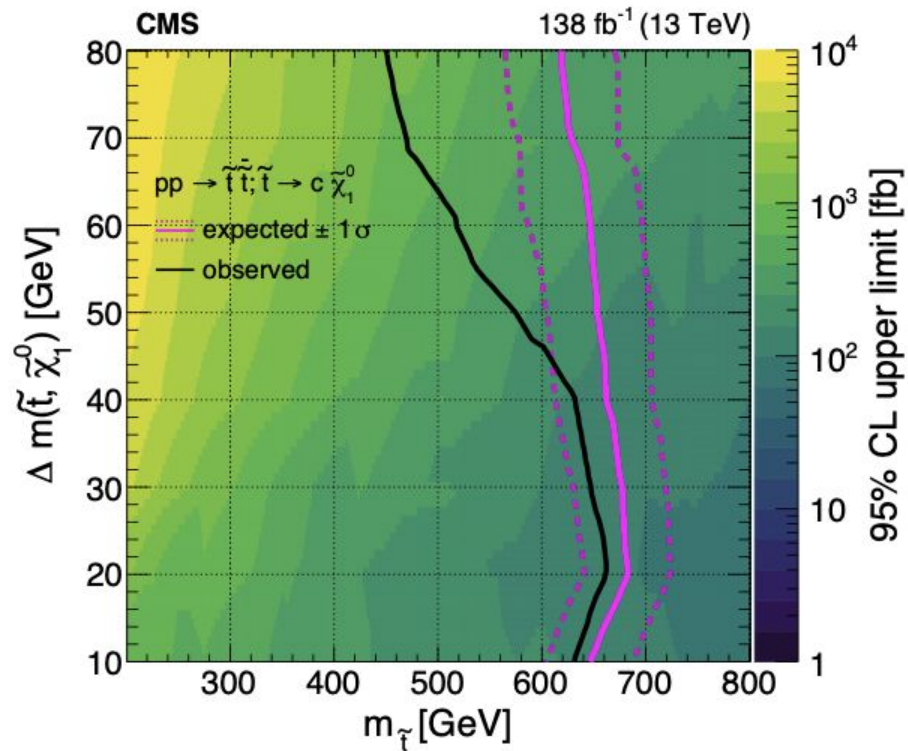
Limits on higgsino pair



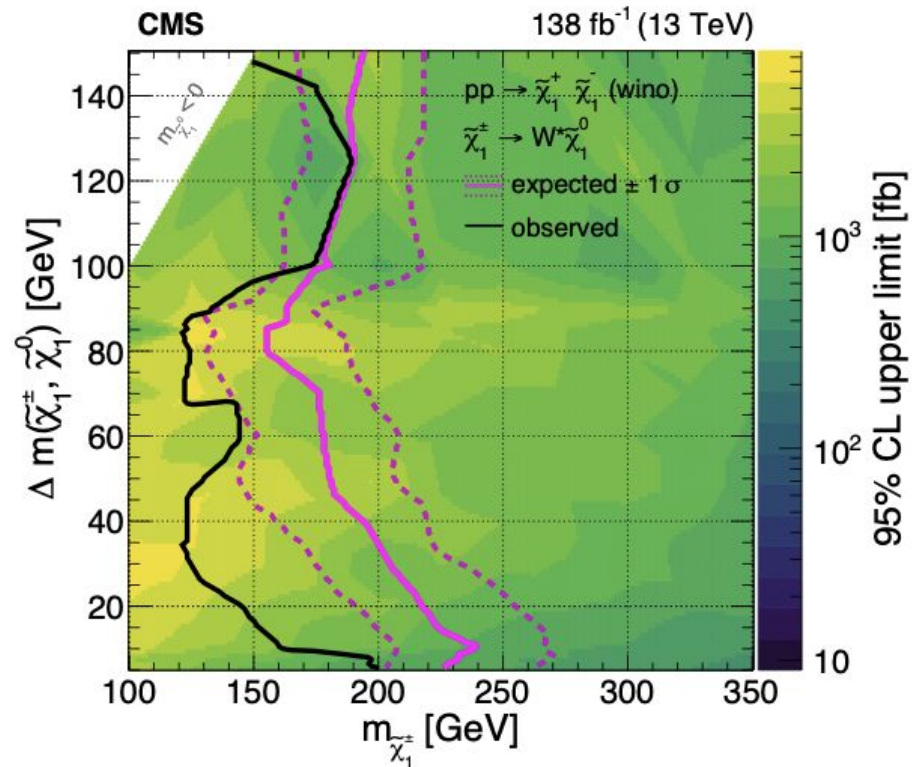
Limits on gluonio - LSP mass

CMS RPC SUSY general search

- CMS also presents general search for RPC SUSY [SUS-23-003 \(arXiv:2508:13900\)](#)
- Limits are set for electroweakinos, sleptons, and top squarks



Limits on stop - LSP mass

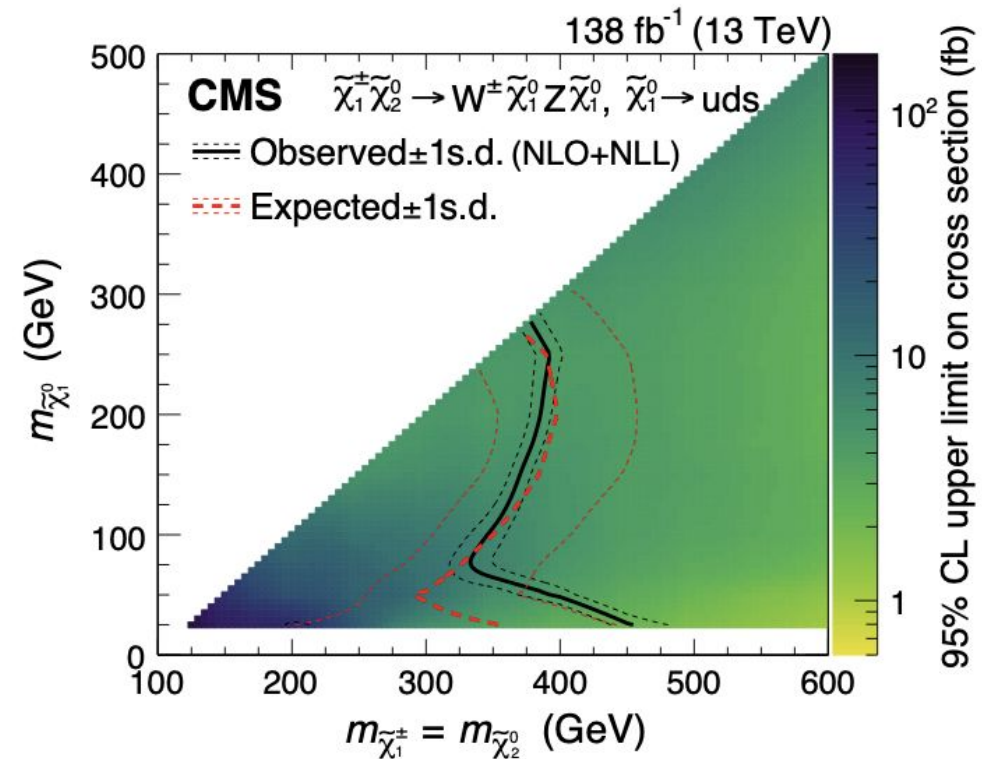
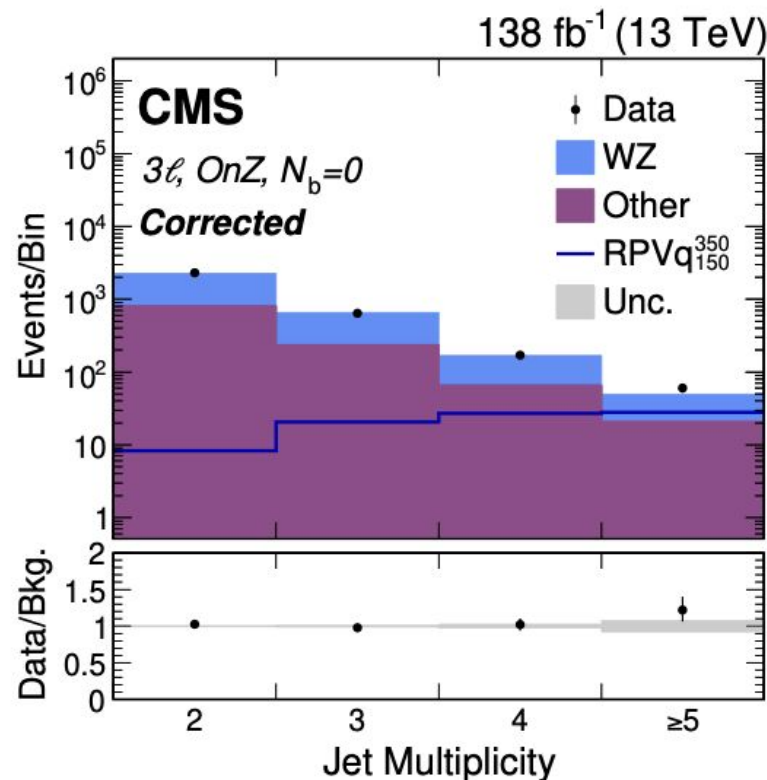


Limits on chargino-neutralino production

First Jet-scaling search in multilepton events

- CMS performed the first jet-scaling search for RPV in multilepton events, and finds no deviation
- Solves the simulation difficulty by a data-driven jet-scaling strategy to accurately model high-multiplicity jets in multilepton events
- Constrains electroweak RPV SUSY with prompt hadronic decays.

[SUS-23-015 \(arxiv:2503.06726, submitted to PRL\)](#)



Summary

- Searches for new phenomena are a critical of the LHC physics program
- From a theoretical perspective, testing hypotheses such as SUSY, compositeness, and extended Higgs sectors is essential for addressing the puzzles of the Standard Model
- From an experimental perspective, SUSY & Exotic searches have motivates significant advances in analysis strategies, including the use of scouting data, anomaly detection with unsupervised machine learning, and improved detector timing and spatial resolution
- Both ATLAS and CMS have been highly productive in 2024–2025 with many new results.
- More details can be found in the parallel session presentations.