



ATLAS PUB Note
ATL-PHYS-PUB-2021-009
March 19, 2021



Summary Plots for Heavy Particle Searches and Long-lived Particle Searches

The ATLAS Collaboration

The results of searches for heavy particles from the Exotics and HDBS physics groups and long-lived particles from the Exotics and SUSY physics groups are summarized in plots for a representative set of models. The latest results, up to March 2021, are included.

ATL-PHYS-PUB-2021-009
22 March 2021



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1 Heavy Particle Searches Summary Plot

Searches for heavy new particles have been carried out with the Run 1 and Run 2 datasets in proton–proton collisions at $\sqrt{s} = 8$ and 13 TeV.

A representative set of the most sensitive recent results is included in the summary plot shown in Figure 1. Some changes are made to include updated references and to supersede older results with new ones. New entries relative to the May 2020 version of the summary plot are as follows.

- The search for heavy spin-2 resonance decays into $\gamma\gamma$ [1].
- The search for heavy Z' resonance decays into ZH in events with either two leptons + b -tagged jets or E_T^{miss} + b -tagged jets [2].
- The search for contact interactions in flavor-changing $b \rightarrow s\ell\ell$ transitions with a dilepton + b -tagged jet signature [3].
- The search for dark matter and extra dimensions with a mono-jet signature [4]. Both axial-vector and pseudo-scalar mediator limits are included.
- The search for dark matter with a mono-Higgs(bb) signature [5]. Both Z' -2HDM and 2HDM+a limits are included.
- The search for leptoquarks of first and second generation in jet+ ℓ [6].
- The search for leptoquarks of third generation in $(b)\text{jets}+E_T^{\text{miss}}$ [7].
- The search for leptoquarks of third generation in $(b)\text{jets}+\tau$ [8].
- The search for leptoquarks of third generation in $(b)\text{jets}+\tau$ [9].
- The search for leptoquarks of third generation in b -tagged jets+ E_T^{miss} [10].
- The search for Type-III Seesaw heavy leptons in events with a pair of leptons, jets and E_T^{miss} [11].

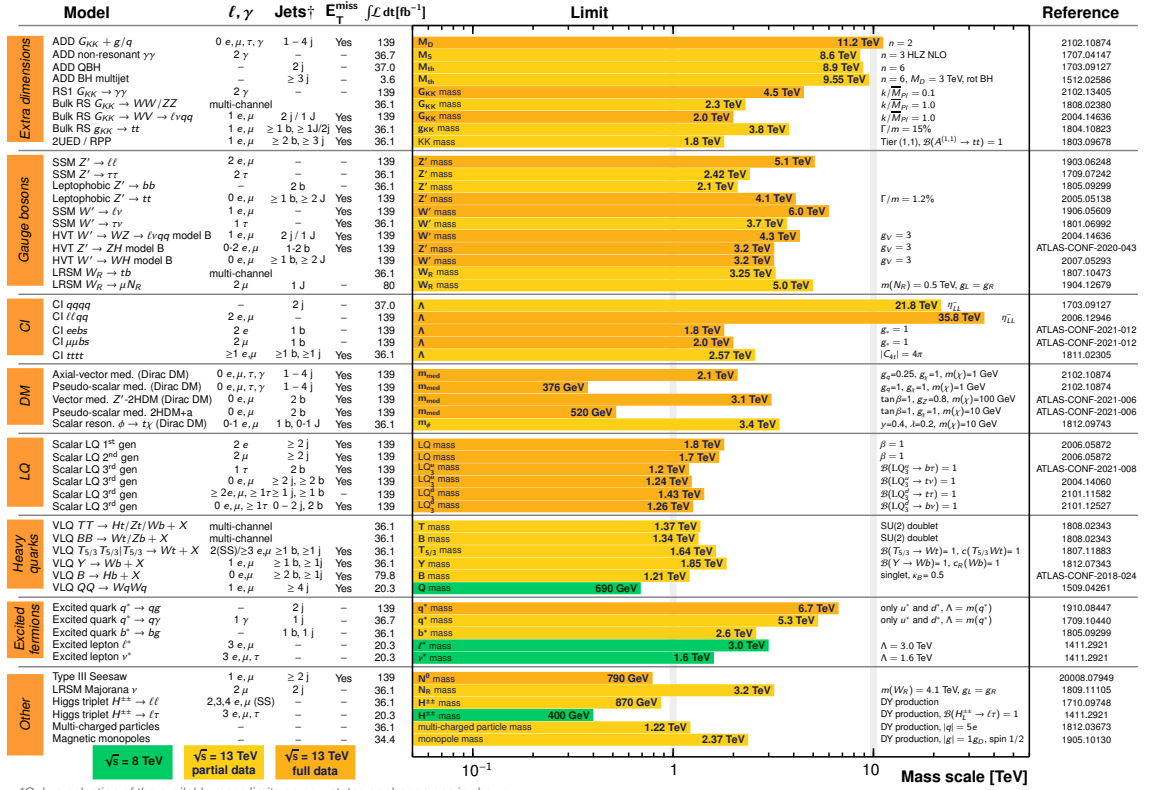
ATLAS Exotics Searches* - 95% CL Upper Exclusion Limits

Status: March 2021

ATLAS Preliminary

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

$$\sqrt{s} = 8, 13 \text{ TeV}$$



2 Long-lived Particle Searches Summary Plot

Searches for long-lived particles have been carried out with the Run 1 and Run 2 datasets in proton–proton collisions at $\sqrt{s}$ of 8 and 13 TeV.

Recent updates of the results are included in the summary plot shown in Figure 2. Some changes are made to include updated references and to supersede older results with new ones. New entries relative to the May 2020 version of the summary plot are as follows.

- The search for long-lived charginos in AMSB SUSY with a disappearing track signature [12].
- The search for long-lived sleptons in GMSB SUSY with large-impact parameter charged leptons [13].
- The search for long-lived scalars in VH production with $H \rightarrow ss \rightarrow bb \bar{b}\bar{b}$ [14].

ATLAS Long-lived Particle Searches* - 95% CL Exclusion

Status: March 2021

ATLAS Preliminary

$$\int \mathcal{L} dt = (18.4 - 139) \text{ fb}^{-1}$$

$\sqrt{s} = 8, 13 \text{ TeV}$

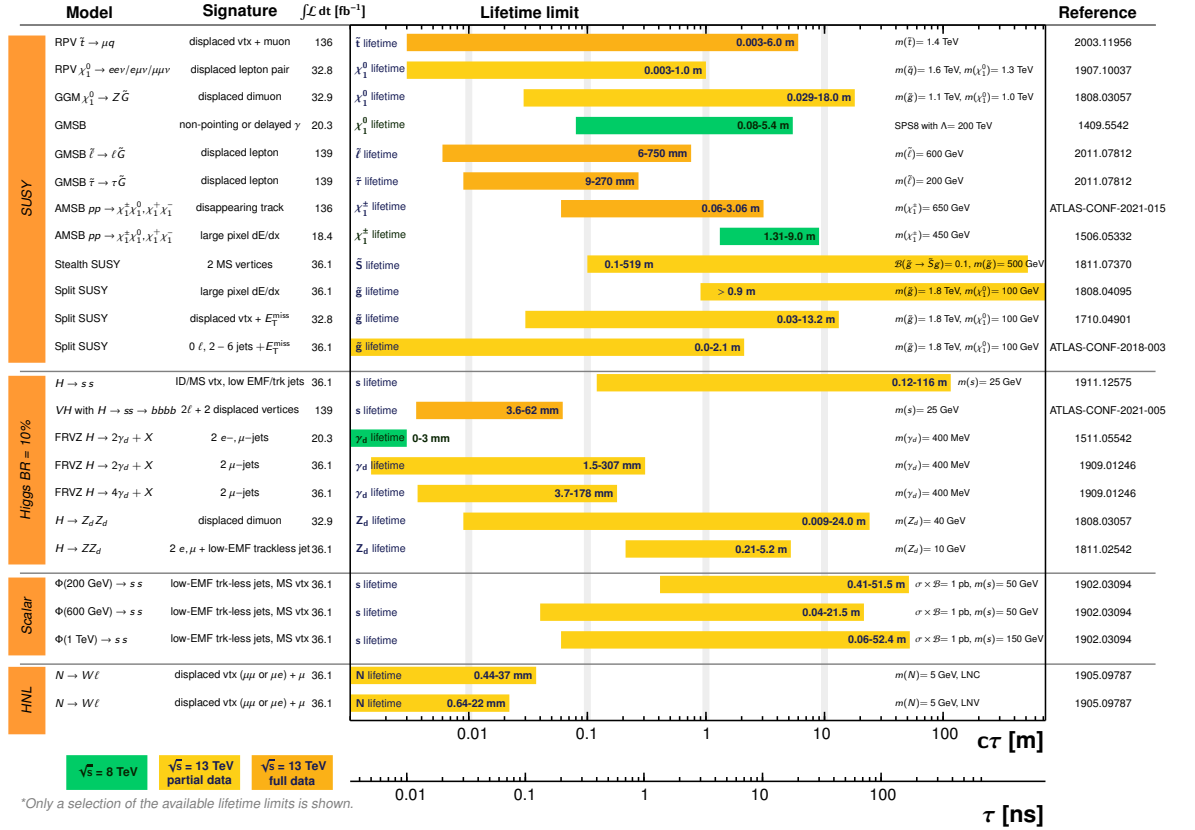


Figure 2: Ranges of new particle lifetimes excluded at the 95% confidence level.

References

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- [12] ATLAS Collaboration, *Search for long-lived charginos based on a disappearing-track signature in pp collisions at $\sqrt{s} = 13\text{ TeV}$ with the ATLAS detector*, ATLAS-CONF-2021-015, 2021 (cit. on p. 3).
- [13] ATLAS Collaboration, *Search for displaced leptons in $\sqrt{s} = 13\text{ TeV}$ pp collisions with the ATLAS detector*, (2020), arXiv: [2011.07812 \[hep-ex\]](#) (cit. on p. 3).
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