

# Progress on EWKino Study

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# ATLAS Run 2 searches for electroweak production of supersymmetric particles interpreted within the pMSSM

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The ATLAS Collaboration

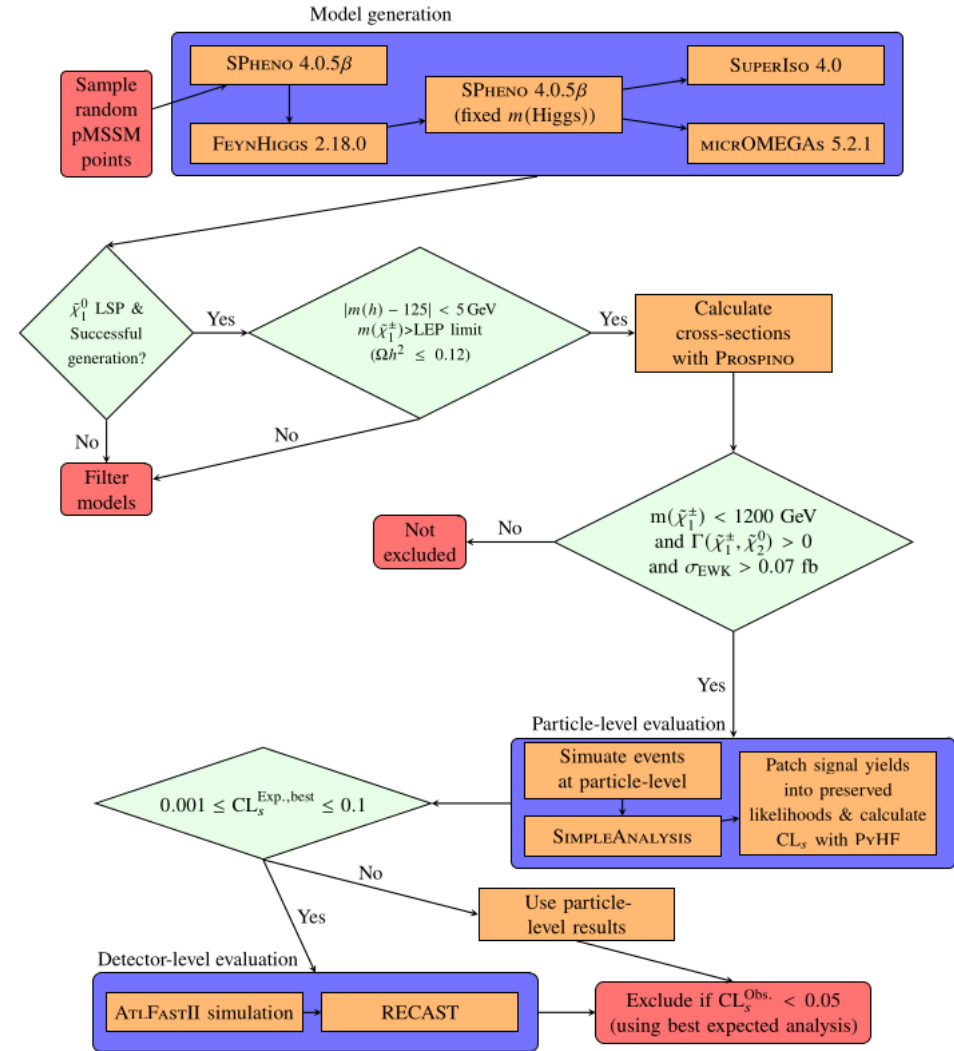
- pMSSM : 19 free parameters considered
- Study of EWKino points as well as Bino DM : 2 sets
- 8 Analysis considered

pMSSM Parameter	Meaning
$\tan \beta$	Ratio of the Higgs vacuum expectation values for the two doublets
$M_A$	Pseudoscalar ( $CP$ -odd) Higgs boson mass parameter
$\mu$	Higgsino mass parameter
$M_1, M_2, M_3$	Bino, wino and gluino mass parameters
$A_t, A_b, A_\tau$	Third generation trilinear couplings
$M_{\tilde{q}}, M_{\tilde{u}_R}, M_{\tilde{d}_R}, M_{\tilde{l}}, M_{\tilde{e}_R}$	First/second generation sfermion mass parameters
$M_{\tilde{Q}}, M_{\tilde{t}_R}, M_{\tilde{b}_R}, M_{\tilde{\tau}_R}$	Third generation sfermion mass parameters

Analysis	Relevant simplified models targeted
FullHad [24]	Wino $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ via $WZ$ , Wino $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ via $Wh$ , Wino $\tilde{\chi}_1^+ \tilde{\chi}_1^-$ via $WW$
1Lbb [15]	Wino $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ via $Wh$
2L0J [19]	Wino $\tilde{\chi}_1^+ \tilde{\chi}_1^-$ via $WW$ , slepton pairs
2L2J [25]	Wino $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ via $WZ$
3L [23]	Wino $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ via $WZ$ , Wino $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ via $Wh$ , higgsino $\tilde{\chi}_1^\pm \tilde{\chi}_2^0 \tilde{\chi}_1^0$
4L [22]	Higgsino GGM
Compressed [20]	Wino $\tilde{\chi}_1^\pm \tilde{\chi}_2^0$ via $WZ$ , higgsino $\tilde{\chi}_1^\pm \tilde{\chi}_2^0 \tilde{\chi}_1^0$
Disappearing-track [27]	Wino $\tilde{\chi}_1^+ \tilde{\chi}_1^-$ and $\tilde{\chi}_1^\pm \tilde{\chi}_1^0$

Analysis ID	Analysis	Smodels ?
SUSY-2018-41	FullHad	Y
SUSY-2019-08	1Lbb	Y
SUSY-2018-32	2L0J	Y
SUSY-2018-05	2L2J	Y
SUSY-2019-09	3L	Y
SUSY-2018-02	4L	SUSY-2017-03
SUSY-2018-16	Compressed	Y
SUSY-2018-19	Disappearing Track	SUSY-2016-06

Scan name	EWKino	BinoDM
$ M_1 $ range	0 – 2 TeV	0 – 500 GeV
LSP type	Neutralino	Bino-like neutralino
<b>Number of models generated:</b>		
Sampled	20 000	437 500
Successful generation	16 667	370 017
Correct LSP type	15 321	286 267
Satisfy DM relic density constraint $\Omega h^2 \leq 0.12$	N/A	11 122
Satisfy LEP chargino mass constraint	13 969	10 174
120 GeV < $m(h)$ < 130 GeV	12 280	8 897
Satisfy non-DM external constraints	7 956	5 752
Satisfy all external constraints	2 460	1 769



# GOALS

- Use the same set of points , compute same precision cross sections : How does SmodelS perform on this set ? Compare Atlas and SmodelS results
- After this first run , combine Analysis and find out

We start here !

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- There are actually 2 more constraints (from higgs physics) applied :
  - h to invisible (h\_to\_inv)
  - Higgs CP odd constraint (mA)
- We take the subset of the 12 280 points which are not excluded by the constraints : 9736 points left
- Compute NLO cross sections with resummino :
  - problem with memory !
- Also an issue with pythia LO precision : short term fix work in progress
- So far 13 TeV LO with pythia (200K events) : updated results today ?
- Resummino apparently fixed, to be continued ...