Exploring supersymmetry through gauginos with FCC-hh

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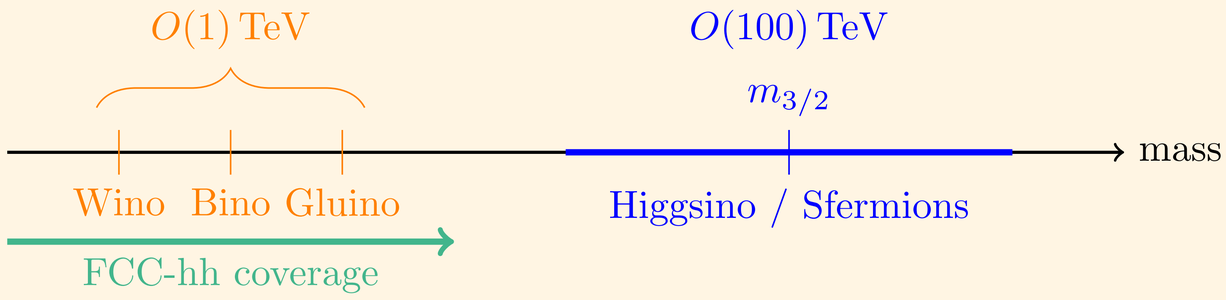
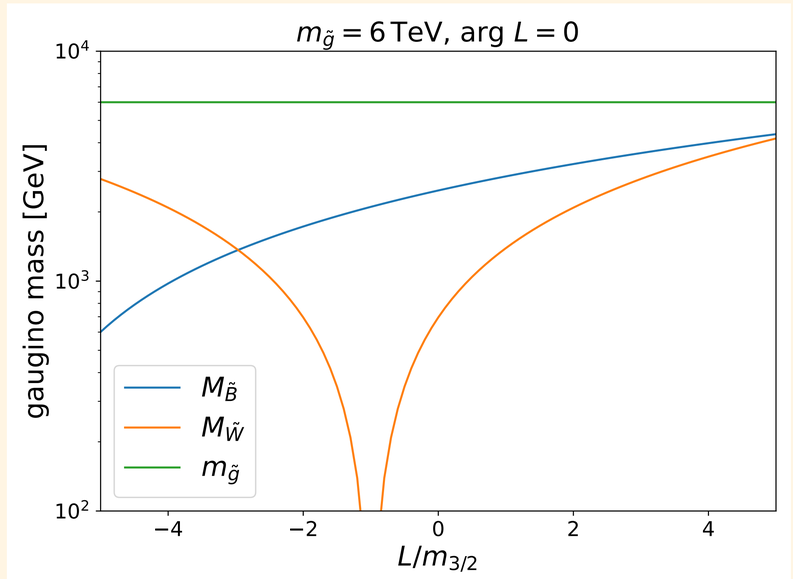
Pure gravity mediation with anomaly-mediated supersymmetry breaking

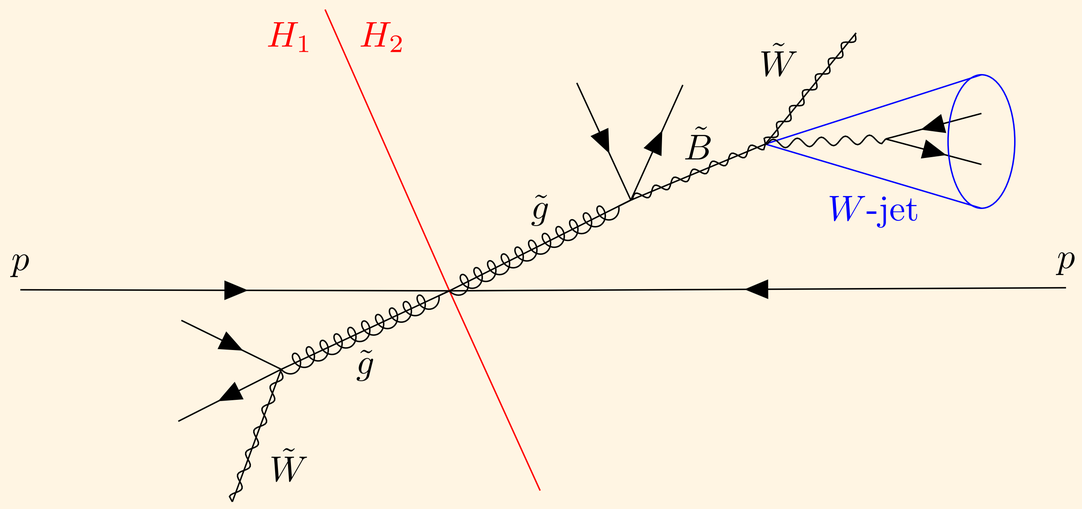
- Split spectrum with heavy sfermions + light gauginos
  - Compatible with the Higgs mass $\mathbf{M_h \simeq 125\,GeV}$
- Natural realization of the Wino LSP
  - Good candidate of dark matter
  - ~~100 % thermal abundance with ~ 3 TeV mass~~

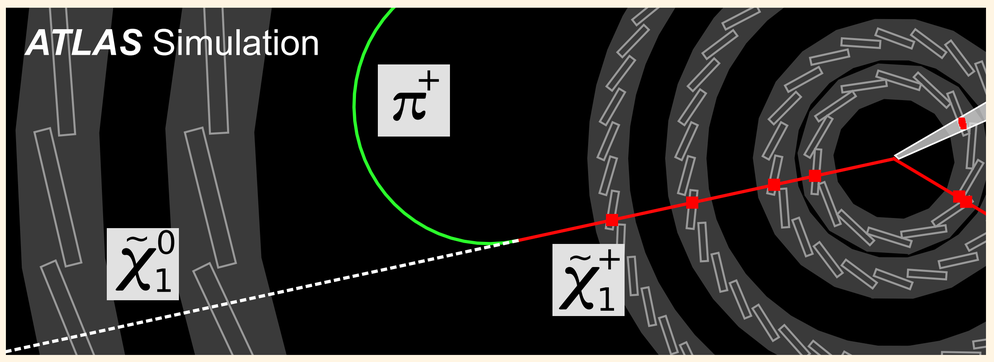
Ibe, Yanagida '12 & Ibe, Matsumoto, Yanagida '12
Arvanitaki, Craig, Dimopoulos, Villadoro '12





Gaugino mass reconstruction up to ~ 100 GeV uncertainties



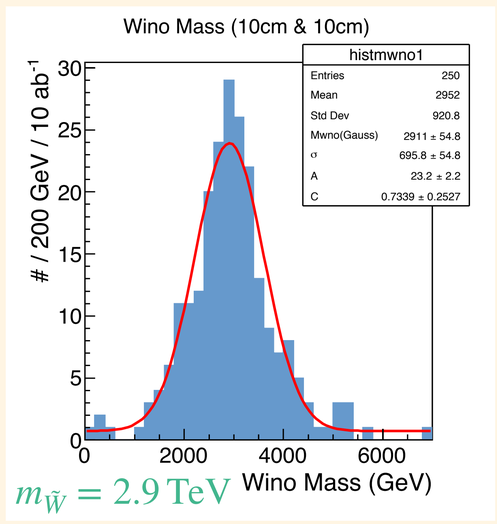


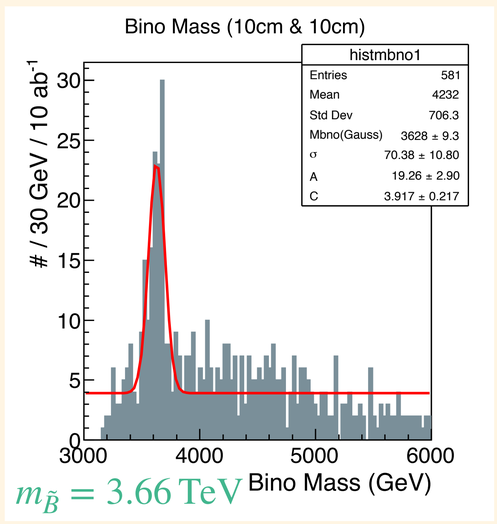
ATLAS
[1712.02118]

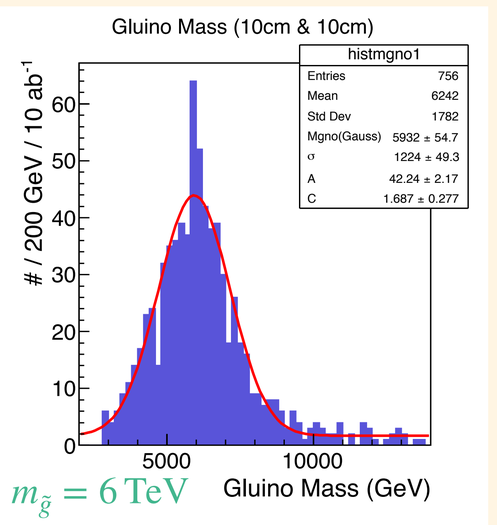
- Two disappearing tracks to reduce background
- Full kinematics reconstruction
  - Track geometry
  - Momentum conservation

Saito, et al.
[1901.02987]

- Wino velocity reconstruction
  - Track timing information
- Bino decay into Wino + a fat W-jet
- Gluino decay into Wino + jets in each hemisphere





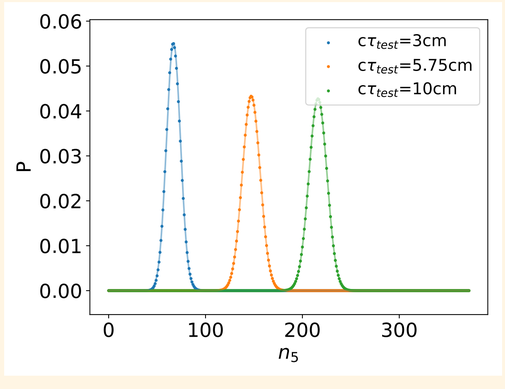


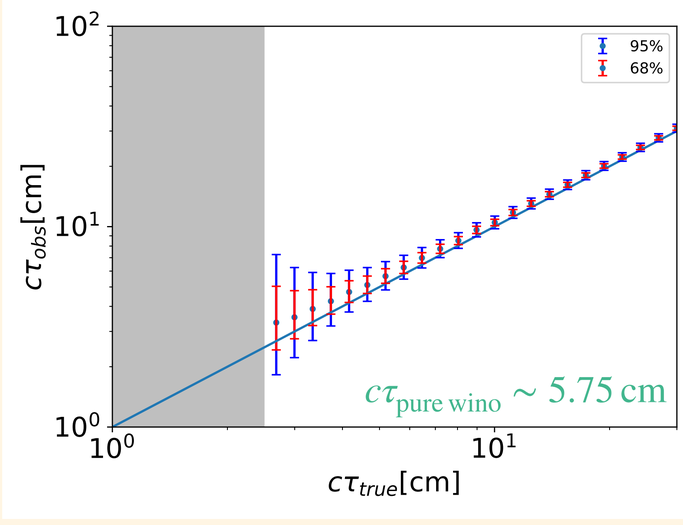
Wino lifetime & squark spectrum

- Surviving probability of Wino from the 4th → 5th layer

$$p_{4\to5}(\tau) \equiv \exp\left[-\frac{L_T^{(5)} - L_T^{(4)}}{\tau\beta\gamma\sin\theta}\right]$$

- $L_T^{(4)} = 10\,\text{cm}, L_T^{(5)} = 15\,\text{cm}$





- Gluino branching ratio contains information of squark masses
  - $x \equiv \sum_q \text{Br}(\tilde{g} \to \tilde{B}q\bar{q})$
    - ➡ $r_R \equiv m_{\tilde{q}_R}/m_{\tilde{q}_L}$
  - $y \equiv \sum_{q,q'=t,b} \left[\text{Br}(\tilde{g} \to \tilde{B}q\bar{q}') + \text{Br}(\tilde{g} \to \tilde{W}q\bar{q}')\right]$
    - ➡ $r_3 \equiv m_{\tilde{q}_3}/m_{\tilde{q}_{1,2}}$