# Cross-Sections and Branching Ratios for mSUGRA Benchmark Point D', ISAJET v. 7.69

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# Part I
# Parameters

These are the parameters for mSUGRA benchmark point D', from 'Physics Benchmarks for the ILC Detectors', `http://arxiv.org/abs/hep-ex/0603010`.

| | |
|---|---|
| $M_0$ | 110.000 |
| $M_{1/2}$ | 525.000 |
| $A_0$ | 0.000 |
| $tan(\beta)$ | 10.000 |
| $\mu$ | 657.97 |
| $M_t$ | 175.000 |
| $m_{\tilde{g}}$ | 1205.60 |
| $m_{A^0}$ | 749.93 |
| $m_{\tilde{q}_1}$ | 1050.69 |
| $m_{\tilde{d}_R}$ | 1006.82 |
| $m_{\tilde{u}_R}$ | 1011.75 |
| $m_{\tilde{\ell}_1}$ | 367.59 |
| $m_{\tilde{e}_R}$ | 222.69 |
| $m_{\tilde{q}_3}$ | 975.10 |
| $m_{\tilde{b}_R}$ | 1008.71 |
| $m_{\tilde{t}_R}$ | 835.87 |
| $m_{\tilde{\ell}_3}$ | 363.57 |
| $m_{\tilde{\tau}_R}$ | 218.49 |
| $A_t$ | $-903.38$ |
| $A_b$ | $-1354.49$ |
| $A_\tau$ | $-313.40$ |

**Part II**

# Masses

| | |
|---|---|
| $\widetilde{\chi}_1^0$ | 215.77 |
| $\widetilde{\chi}_2^0$ | 407.42 |
| $\widetilde{\chi}_3^0$ | 662.58 |
| $\widetilde{\chi}_4^0$ | 676.81 |
| $\widetilde{\chi}_1^+$ | 408.17 |
| $\widetilde{\chi}_2^+$ | 676.29 |
| $h^0$ | 115.63 |
| $H^0$ | 755.04 |
| $A^0$ | 749.93 |
| $H^+$ | 759.04 |
| $\widetilde{\nu}_e$ | 362.34 |
| $\widetilde{e}_R^-$ | 226.00 |
| $\widetilde{e}_L^-$ | 374.20 |
| $\widetilde{\tau}_1^-$ | 222.72 |
| $\widetilde{\tau}_2^-$ | 372.56 |
| $\widetilde{t}_1$ | 837.70 |
| $\widetilde{t}_2$ | 1062.16 |
| $\widetilde{b}_1$ | 1020.39 |
| $\widetilde{b}_2$ | 1058.11 |
| $\widetilde{u_R}$ | 1065.38 |
| $\widetilde{u_L}$ | 1105.14 |
| $\widetilde{g}$ | 1205.60 |

**Part III**

# Cross Sections and Branching Ratios

## 1 Cross Sections (fb)

| | Polarization 80%L 60%L | | | Polarization 80%R 60%L | | | Polarization 80%L 60%R | | | Polarization 80%R 60%R | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 500 GeV | 750 GeV | 1000 GeV | 500 GeV | 750 GeV | 1000 GeV | 500 GeV | 750 GeV | 1000 GeV | 500 GeV | 750 GeV | 1000 GeV |
| $\widetilde{\chi}_1^0\widetilde{\chi}_2^0$ | | 6.47 | 11.7 | | 1.03 | 1.75 | | 25.7 | 46.5 | | 2.93 | 5.27 |
| $\widetilde{\chi}_1^0\widetilde{\chi}_3^0$ | | | 0.262 | | | 1.96 | | | 0.234 | | | 0.509 |
| $\widetilde{\chi}_1^0\widetilde{\chi}_4^0$ | | | 0.242 | | | 0.939 | | | 0.582 | | | 0.292 |
| $\widetilde{\chi}_2^0\widetilde{\chi}_2^0$ | | | 9.45 | | | 1.05 | | | 37.8 | | | 4.2 |
| $\widetilde{\chi}_2^0\widetilde{\chi}_3^0$ | | | | | | | | | | | | |
| $\widetilde{\chi}_2^0\widetilde{\chi}_4^0$ | | | | | | | | | | | | |
| $\widetilde{\chi}_3^0\widetilde{\chi}_3^0$ | | | | | | | | | | | | |
| $\widetilde{\chi}_3^0\widetilde{\chi}_4^0$ | | | | | | | | | | | | |
| $\widetilde{\chi}_4^0\widetilde{\chi}_4^0$ | | | | | | | | | | | | |
| $\widetilde{\chi}_1^+\widetilde{\chi}_1^-$ | | | 21 | | | 2.43 | | | 84 | | | 9.36 |
| $\widetilde{\chi}_1^+\widetilde{\chi}_2^-$ | | | | | | | | | | | | |
| $\widetilde{\chi}_2^+\widetilde{\chi}_1^-$ | | | | | | | | | | | | |
| $\widetilde{\chi}_2^+\widetilde{\chi}_2^-$ | | | | | | | | | | | | |
| $\widetilde{e}_R^+\widetilde{e}_R^-$ | 4.35 | 24.6 | 28.6 | 29 | 193. | 234. | 5.41 | 18.8 | 17.1 | 7.72 | 49.5 | 59.5 |
| $\widetilde{e}_R^+\widetilde{e}_L^-$ | | 2.64 | 2.02 | | 23.8 | 18.2 | | 10.6 | 8.1 | | 95.1 | 72.9 |
| $\widetilde{e}_L^+\widetilde{e}_R^-$ | | 95.1 | 72.9 | | 10.6 | 8.1 | | 23.8 | 18.2 | | 2.64 | 2.02 |
| $\widetilde{e}_L^+\widetilde{e}_L^-$ | | 0.011 | 12.3 | | 0.008 | 5.7 | | 0.039 | 47.2 | | 0.006 | 6.31 |
| $\widetilde{\mu}_R^+\widetilde{\mu}_R^-$ | 3.3 | 9.55 | 7.5 | 19.5 | 55.8 | 43.7 | 5.13 | 15.1 | 11.9 | 5.35 | 15.4 | 12 |
| $\widetilde{\mu}_L^+\widetilde{\mu}_L^-$ | | 0.01 | 5.68 | | 0.008 | 4.98 | | 0.035 | 20.9 | | 0.006 | 3.41 |
| $\widetilde{\tau}_1^+\widetilde{\tau}_1^-$ | 3.95 | 9.79 | 7.65 | 22.9 | 56.1 | 43.7 | 6.34 | 15.9 | 12.5 | 6.31 | 15.5 | 12.1 |
| $\widetilde{\tau}_1^+\widetilde{\tau}_2^-$ | | 0.043 | 0.057 | | 0.101 | 0.133 | | 0.133 | 0.174 | | 0.039 | 0.051 |
| $\widetilde{\tau}_2^+\widetilde{\tau}_1^-$ | | 0.043 | 0.057 | | 0.1 | 0.133 | | 0.132 | 0.174 | | 0.039 | 0.051 |
| $\widetilde{\tau}_2^+\widetilde{\tau}_2^-$ | | 0.05 | 5.7 | | 0.045 | 5.21 | | 0.182 | 20.9 | | 0.03 | 3.46 |
| $\widetilde{\nu}_e\overline{\widetilde{\nu}}_e$ | | 5.81 | 84.7 | | 1.12 | 14.4 | | 23.1 | 337. | | 2.68 | 38.6 |
| $\widetilde{\nu}_\mu\overline{\widetilde{\nu}}_\mu$ | | 0.212 | 2.25 | | 0.495 | 5.26 | | 0.65 | 6.9 | | 0.19 | 2.02 |
| $\widetilde{\nu}_\tau\overline{\widetilde{\nu}}_\tau$ | | 0.322 | 2.32 | | 0.751 | 5.41 | | 0.986 | 7.11 | | 0.288 | 2.08 |
| $h^0Z^0$ | 32.4 | 13.1 | 7.08 | 75.4 | 30.6 | 16.5 | 99.1 | 40.1 | 21.7 | 29 | 11.7 | 6.34 |

## 2 Branching Ratios

$\boxed{t}$

$M(t) =$ GeV

**$t$ branching ratios**

| mode | fraction |
|---|---|
| $c\bar{s}b$ | 33.3% |
| $u\bar{d}b$ | 33.3 |
| $\mu^+\nu_\mu b$ | 11.1 |
| $e^+\nu_e b$ | 11.1 |
| $\tau^+\nu_\tau b$ | 11.1 |

$\boxed{\tilde{g}}$

$M(\tilde{g}) = 1205.60$ GeV

**$\tilde{g}$ branching ratios**

| mode | fraction |
|---|---|
| $\tilde{t}_1\bar{t}$ | 12.8% |
| $\bar{\tilde{t}}_1 t$ | 12.8 |
| $\bar{\tilde{b}}_1 b$ | 6.71 |
| $\tilde{b}_1\bar{b}$ | 6.71 |
| $\bar{\tilde{b}}_2 b$ | 4.69 |
| $\tilde{b}_2\bar{b}$ | 4.69 |
| $\bar{\widetilde{d}}_R d$ | 4.36 |
| $\bar{\widetilde{s}}_R s$ | 4.36 |
| $\widetilde{s}_R\bar{s}$ | 4.36 |
| $\widetilde{d}_R\bar{d}$ | 4.36 |
| $\widetilde{c}_R\bar{c}$ | 4.12 |
| $\bar{\widetilde{c}}_R c$ | 4.12 |
| $\bar{\widetilde{u}}_R u$ | 4.12 |
| $\widetilde{u}_R\bar{u}$ | 4.12 |
| $\bar{\widetilde{u}}_L u$ | 2.19 |
| $\bar{\widetilde{c}}_L c$ | 2.19 |
| $\widetilde{u}_L\bar{u}$ | 2.19 |
| $\widetilde{c}_L\bar{c}$ | 2.19 |
| $\bar{\widetilde{s}}_L s$ | 2.06 |
| $\widetilde{s}_L\bar{s}$ | 2.06 |
| $\bar{\widetilde{d}}_L d$ | 2.06 |
| $\widetilde{d}_L\bar{d}$ | 2.06 |
| $\widetilde{\chi}_4^0 t\bar{t}$ | 0.183 |
| $\widetilde{\chi}_1^- t\bar{b}$ | 0.137 |
| $\widetilde{\chi}_1^+ b\bar{t}$ | 0.137 |
| $\widetilde{\chi}_2^0 t\bar{t}$ | 0.119 |
| $\widetilde{\chi}_3^0 t\bar{t}$ | 0.06 |
| $\widetilde{\chi}_2^+ b\bar{t}$ | 0.035 |
| $\widetilde{\chi}_2^- t\bar{b}$ | 0.035 |
| $\widetilde{\chi}_1^0 t\bar{t}$ | 0.019 |
| $\widetilde{\chi}_3^0 g$ | 0.004 |
| $\widetilde{\chi}_4^0 g$ | 0.003 |

$\boxed{\widetilde{u_L}}$

$M(\widetilde{u_L}) = 1105.14$ GeV

**$\widetilde{u_L}$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^+ d$ | 64.7% |
| $\widetilde{\chi}_2^0 u$ | 32.1 |
| $\widetilde{\chi}_2^+ d$ | 1.2 |
| $\widetilde{\chi}_1^0 u$ | 1.17 |
| $\widetilde{\chi}_4^0 u$ | 0.806 |
| $\widetilde{\chi}_3^0 u$ | 0.029 |

$\boxed{\widetilde{d_L}}$

$M(\widetilde{d_L}) = 1108.23$ GeV

**$\widetilde{d_L}$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^- u$ | 62.9% |
| $\widetilde{\chi}_2^0 d$ | 31.8 |
| $\widetilde{\chi}_2^- u$ | 2.64 |
| $\widetilde{\chi}_1^0 d$ | 1.64 |
| $\widetilde{\chi}_4^0 d$ | 1.03 |
| $\widetilde{\chi}_3^0 d$ | 0.048 |

$\boxed{\widetilde{s_L}}$

$M(\widetilde{s_L}) = 1108.23$ GeV

**$\widetilde{s_L}$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^- c$ | 62.9% |
| $\widetilde{\chi}_2^0 s$ | 31.8 |
| $\widetilde{\chi}_2^- c$ | 2.64 |
| $\widetilde{\chi}_1^0 s$ | 1.64 |
| $\widetilde{\chi}_4^0 s$ | 1.03 |
| $\widetilde{\chi}_3^0 s$ | 0.048 |

## $\widetilde{c_L}$

$M(\widetilde{c_L}) = 1105.14$ GeV

**$\widetilde{c_L}$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^+ s$ | 64.7% |
| $\widetilde{\chi}_2^0 c$ | 32.1 |
| $\widetilde{\chi}_2^+ s$ | 1.2 |
| $\widetilde{\chi}_1^0 c$ | 1.17 |
| $\widetilde{\chi}_4^0 c$ | 0.806 |
| $\widetilde{\chi}_3^0 c$ | 0.029 |

## $\widetilde{b}_1$

$M(\widetilde{b}_1) = 1020.39$ GeV

**$\widetilde{b}_1$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^- t$ | 34.4% |
| $\widetilde{\chi}_2^- t$ | 23.9 |
| $\widetilde{\chi}_2^0 b$ | 19.4 |
| $W^- \widetilde{t}_1$ | 16.5 |
| $\widetilde{\chi}_1^0 b$ | 5.23 |
| $\widetilde{\chi}_3^0 b$ | 0.443 |
| $\widetilde{\chi}_4^0 b$ | 0.204 |

## $\widetilde{t}_1$

$M(\widetilde{t}_1) = 837.70$ GeV

**$\widetilde{t}_1$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^+ b$ | 33.3% |
| $\widetilde{\chi}_1^0 t$ | 29.1 |
| $\widetilde{\chi}_2^+ b$ | 23.2 |
| $\widetilde{\chi}_2^0 t$ | 13.3 |
| $\widetilde{\chi}_3^0 t$ | 1.1 |

## $\widetilde{u_R}$

$M(\widetilde{u_R}) = 1065.38$ GeV

**$\widetilde{u_R}$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0 u$ | 99.7% |
| $\widetilde{\chi}_4^0 u$ | 0.194 |
| $\widetilde{\chi}_2^0 u$ | 0.088 |
| $\widetilde{\chi}_3^0 u$ | 0.04 |

## $\widetilde{d_R}$

$M(\widetilde{d_R}) = 1061.21$ GeV

**$\widetilde{d_R}$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0 d$ | 99.7% |
| $\widetilde{\chi}_4^0 d$ | 0.192 |
| $\widetilde{\chi}_2^0 d$ | 0.088 |
| $\widetilde{\chi}_3^0 d$ | 0.04 |

## $\widetilde{s_R}$

$M(\widetilde{s_R}) = 1061.21$ GeV

**$\widetilde{s_R}$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0 s$ | 99.7% |
| $\widetilde{\chi}_4^0 s$ | 0.192 |
| $\widetilde{\chi}_2^0 s$ | 0.088 |
| $\widetilde{\chi}_3^0 s$ | 0.04 |

## $\widetilde{c_R}$

$M(\widetilde{c_R}) = 1065.38$ GeV

**$\widetilde{c_R}$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0 c$ | 99.7% |
| $\widetilde{\chi}_4^0 c$ | 0.194 |
| $\widetilde{\chi}_2^0 c$ | 0.088 |
| $\widetilde{\chi}_3^0 c$ | 0.04 |

## $\widetilde{b}_2$

$M(\widetilde{b}_2) = 1058.11$ GeV

**$\widetilde{b}_2$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_2^- t$ | 30.5% |
| $W^- \widetilde{t}_1$ | 25.3 |
| $\widetilde{\chi}_1^- t$ | 25.1 |
| $\widetilde{\chi}_2^0 b$ | 13.9 |
| $\widetilde{\chi}_1^0 b$ | 2.79 |
| $\widetilde{\chi}_4^0 b$ | 1.61 |
| $\widetilde{\chi}_3^0 b$ | 0.706 |

## $\widetilde{t}_2$

$M(\widetilde{t}_2) = 1062.16$ GeV

**$\widetilde{t}_2$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^+ b$ | 25.2% |
| $\widetilde{\chi}_4^0 t$ | 20.6 |
| $Z^0 \widetilde{t}_1$ | 12.6 |
| $\widetilde{\chi}_2^0 t$ | 11.5 |
| $\widetilde{\chi}_3^0 t$ | 10.8 |
| $\widetilde{\chi}_2^+ b$ | 9.22 |
| $h^0 \widetilde{t}_1$ | 8.24 |
| $\widetilde{\chi}_1^0 t$ | 1.84 |

## $\widetilde{e}_L^-$

$M(\widetilde{e}_L^-) = 374.20$ GeV

**$\widetilde{e}_L^-$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0 e^-$ | 100.% |
| $\widetilde{\tau}_1^+ e^- \tau^-$ | 0.001 |

## $\widetilde{\mu}_L^-$

$M(\widetilde{\mu}_L^-) = 374.20$ GeV

**$\widetilde{\mu}_L^-$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0\mu^-$ | 100.% |
| $\widetilde{\tau}_1^+\mu^-\tau^-$ | 0.001 |

## $\widetilde{\tau}_1^-$

$M(\widetilde{\tau}_1^-) = 222.72$ GeV

**$\widetilde{\tau}_1^-$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0\tau^-$ | 100.% |

## $\widetilde{\nu}_e$

$M(\widetilde{\nu}_e) = 362.34$ GeV

**$\widetilde{\nu}_e$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0\nu_e$ | 100.% |
| $\widetilde{\tau}_1^+e^-\nu_\tau$ | 0.001 |

## $\widetilde{\nu}_\mu$

$M(\widetilde{\nu}_\mu) = 362.34$ GeV

**$\widetilde{\nu}_\mu$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0\nu_\mu$ | 100.% |
| $\widetilde{\tau}_1^+\mu^-\nu_\tau$ | 0.001 |

## $\widetilde{\nu}_\tau$

$M(\widetilde{\nu}_\tau) = 358.18$ GeV

**$\widetilde{\nu}_\tau$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0\nu_\tau$ | 76.8% |
| $W^+\widetilde{\tau}_1^-$ | 23.2 |

## $\widetilde{e}_R^-$

$M(\widetilde{e}_R^-) = 226.00$ GeV

**$\widetilde{e}_R^-$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0e^-$ | 100.% |

## $\widetilde{\mu}_R^-$

$M(\widetilde{\mu}_R^-) = 226.00$ GeV

**$\widetilde{\mu}_R^-$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0\mu^-$ | 100.% |

## $\widetilde{\tau}_2^-$

$M(\widetilde{\tau}_2^-) = 372.56$ GeV

**$\widetilde{\tau}_2^-$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^0\tau^-$ | 70.8% |
| $h^0\widetilde{\tau}_1^-$ | 16.8 |
| $Z^0\widetilde{\tau}_1^-$ | 12.4 |

## $\widetilde{\chi}_2^0$

$M(\widetilde{\chi}_2^0) = 407.42$ GeV

**$\widetilde{\chi}_2^0$ branching ratios**

| mode | fraction |
|---|---|
| $\overline{\widetilde{\nu}}_\tau\nu_\tau$ | 10.4% |
| $\widetilde{\nu}_\tau\bar{\nu}_\tau$ | 10.4 |
| $\overline{\widetilde{\nu}}_e\nu_e$ | 8.8 |
| $\widetilde{\nu}_\mu\bar{\nu}_\mu$ | 8.8 |
| $\widetilde{\nu}_e\bar{\nu}_e$ | 8.8 |
| $\overline{\widetilde{\nu}}_\mu\nu_\mu$ | 8.8 |
| $\widetilde{\tau}_2^+\tau^-$ | 5.7 |
| $\widetilde{\tau}_2^-\tau^+$ | 5.7 |
| $\widetilde{e}_L^+e^-$ | 5.31 |
| $\widetilde{e}_L^-e^+$ | 5.31 |
| $\widetilde{\mu}_L^+\mu^-$ | 5.31 |
| $\widetilde{\mu}_L^-\mu^+$ | 5.31 |
| $\widetilde{\chi}_1^0h^0$ | 4.08 |
| $\widetilde{\tau}_1^+\tau^-$ | 3.22 |
| $\widetilde{\tau}_1^-\tau^+$ | 3.22 |
| $\widetilde{\chi}_1^0Z^0$ | 0.296 |
| $\widetilde{e}_R^-e^+$ | 0.141 |
| $\widetilde{\mu}_R^+\mu^-$ | 0.141 |
| $\widetilde{\mu}_R^-\mu^+$ | 0.141 |
| $\widetilde{e}_R^+e^-$ | 0.141 |

## $\boxed{\widetilde{\chi}_3^0}$

$M(\widetilde{\chi}_3^0) = 662.58$ GeV

**$\widetilde{\chi}_3^0$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^- W^+$ | 29.0% |
| $\widetilde{\chi}_1^+ W^-$ | 29.0 |
| $\widetilde{\chi}_2^0 Z^0$ | 26.1 |
| $\widetilde{\chi}_1^0 Z^0$ | 10.3 |
| $\widetilde{\chi}_1^0 h^0$ | 1.76 |
| $\widetilde{\chi}_2^0 h^0$ | 0.921 |
| $\widetilde{\tau}_1^+ \tau^-$ | 0.671 |
| $\widetilde{\tau}_1^- \tau^+$ | 0.671 |
| $\widetilde{\tau}_2^- \tau^+$ | 0.481 |
| $\widetilde{\tau}_2^+ \tau^-$ | 0.481 |
| $\widetilde{\nu}_\tau \bar{\nu}_\tau$ | 0.074 |
| $\overline{\widetilde{\nu}}_\tau \nu_\tau$ | 0.074 |
| $\overline{\widetilde{\nu}}_e \nu_e$ | 0.072 |
| $\widetilde{\nu}_\mu \bar{\nu}_\mu$ | 0.072 |
| $\overline{\widetilde{\nu}}_\mu \nu_\mu$ | 0.072 |
| $\widetilde{\nu}_e \bar{\nu}_e$ | 0.072 |
| $\widetilde{e}_R^+ e^-$ | 0.035 |
| $\widetilde{\mu}_R^- \mu^+$ | 0.035 |
| $\widetilde{e}_R^- e^+$ | 0.035 |
| $\widetilde{\mu}_R^+ \mu^-$ | 0.035 |
| $\widetilde{\mu}_L^+ \mu^-$ | 0.014 |
| $\widetilde{e}_L^- e^+$ | 0.014 |
| $\widetilde{\mu}_L^- \mu^+$ | 0.014 |
| $\widetilde{e}_L^+ e^-$ | 0.014 |

## $\boxed{\widetilde{\chi}_4^0}$

$M(\widetilde{\chi}_4^0) = 676.81$ GeV

**$\widetilde{\chi}_4^0$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_1^+ W^-$ | 26.8% |
| $\widetilde{\chi}_1^- W^+$ | 26.8 |
| $\widetilde{\chi}_2^0 h^0$ | 22.3 |
| $\widetilde{\chi}_1^0 h^0$ | 8.36 |
| $\widetilde{\chi}_1^0 Z^0$ | 1.63 |
| $\overline{\widetilde{\nu}}_\tau \nu_\tau$ | 1.2 |
| $\widetilde{\nu}_\tau \bar{\nu}_\tau$ | 1.2 |
| $\widetilde{\nu}_\mu \bar{\nu}_\mu$ | 1.18 |
| $\overline{\widetilde{\nu}}_\mu \nu_\mu$ | 1.18 |
| $\overline{\widetilde{\nu}}_e \nu_e$ | 1.18 |
| $\widetilde{\nu}_e \bar{\nu}_e$ | 1.18 |
| $\widetilde{\chi}_2^0 Z^0$ | 1.11 |
| $\widetilde{\tau}_2^- \tau^+$ | 1.06 |
| $\widetilde{\tau}_2^+ \tau^-$ | 1.06 |
| $\widetilde{\mu}_L^+ \mu^-$ | 0.558 |
| $\widetilde{e}_L^- e^+$ | 0.558 |
| $\widetilde{e}_L^+ e^-$ | 0.558 |
| $\widetilde{\mu}_L^- \mu^+$ | 0.558 |
| $\widetilde{\tau}_1^+ \tau^-$ | 0.478 |
| $\widetilde{\tau}_1^- \tau^+$ | 0.478 |
| $\widetilde{\mu}_R^- \mu^+$ | 0.155 |
| $\widetilde{\mu}_R^+ \mu^-$ | 0.155 |
| $\widetilde{e}_R^- e^+$ | 0.155 |
| $\widetilde{e}_R^+ e^-$ | 0.155 |

## $\boxed{\widetilde{\chi}_1^+}$

$M(\widetilde{\chi}_1^+) = 408.17$ GeV

**$\widetilde{\chi}_1^+$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\nu}_\tau \tau^+$ | 22.0% |
| $\widetilde{\nu}_\mu \mu^+$ | 18.6 |
| $\widetilde{\nu}_e e^+$ | 18.6 |
| $\widetilde{\tau}_2^+ \nu_\tau$ | 10.8 |
| $\widetilde{\mu}_L^+ \nu_\mu$ | 10.1 |
| $\widetilde{e}_L^+ \nu_e$ | 10.1 |
| $\widetilde{\tau}_1^+ \nu_\tau$ | 5.86 |
| $\widetilde{\chi}_1^0 W^+$ | 3.88 |

## $\boxed{\widetilde{\chi}_2^+}$

$M(\widetilde{\chi}_2^+) = 676.29$ GeV

**$\widetilde{\chi}_2^+$ branching ratios**

| mode | fraction |
|---|---|
| $\widetilde{\chi}_2^0 W^+$ | 28.2% |
| $\widetilde{\chi}_1^+ Z^0$ | 26.3 |
| $\widetilde{\chi}_1^+ h^0$ | 24.3 |
| $\widetilde{\chi}_1^0 W^+$ | 8.92 |
| $\widetilde{\tau}_2^+ \nu_\tau$ | 2.68 |
| $\widetilde{\mu}_L^+ \nu_\mu$ | 2.36 |
| $\widetilde{e}_L^+ \nu_e$ | 2.36 |
| $\widetilde{\nu}_\tau \tau^+$ | 1.93 |
| $\widetilde{\nu}_\mu \mu^+$ | 1.15 |
| $\widetilde{\nu}_e e^+$ | 1.15 |
| $\widetilde{\tau}_1^+ \nu_\tau$ | 0.672 |

## $\boxed{h^0}$

$M(h^0) = 115.63$ GeV

**$h^0$ branching ratios**

| mode | fraction |
|---|---|
| $b\bar{b}$ | 80.5% |
| $\tau^-\tau^+$ | 5.85 |
| $gg$ | 3.78 |
| $c\bar{c}$ | 3.43 |
| $W^-c\bar{s}$ | 0.922 |
| $W^+\bar{c}s$ | 0.922 |
| $W^+\bar{u}d$ | 0.922 |
| $W^-u\bar{d}$ | 0.922 |
| $W^+\mu^-\bar{\nu_\mu}$ | 0.307 |
| $W^-\tau^+\nu_\tau$ | 0.307 |
| $W^-\mu^+\nu_\mu$ | 0.307 |
| $W^-e^+\nu_e$ | 0.307 |
| $W^+\tau^-\bar{\nu_\tau}$ | 0.307 |
| $W^+e^-\bar{\nu_e}$ | 0.307 |
| $s\bar{s}$ | 0.246 |
| | 0.175 |
| $Z^0s\bar{s}$ | 0.064 |
| $Z^0d\bar{d}$ | 0.064 |
| $Z^0b\bar{b}$ | 0.064 |
| $Z^0c\bar{c}$ | 0.05 |
| $Z^0u\bar{u}$ | 0.05 |
| $Z^0\nu_\tau\bar{\nu_\tau}$ | 0.029 |
| $Z^0\nu_\mu\bar{\nu_\mu}$ | 0.029 |
| $Z^0\nu_e\bar{\nu_e}$ | 0.029 |
| $\mu^-\mu^+$ | 0.02 |
| $Z^0\mu^-\mu^+$ | 0.015 |
| $Z^0e^-e^+$ | 0.015 |
| $Z^0\tau^-\tau^+$ | 0.015 |
| $d\bar{d}$ | 0.001 |

## $\boxed{H^0}$

$M(H^0) = 755.04$ GeV

**$H^0$ branching ratios**

| mode | fraction |
|---|---|
| $b\bar{b}$ | 64.2% |
| $t\bar{t}$ | 22.0 |
| $\tau^-\tau^+$ | 10.7 |
| $\widetilde{\chi}_1^0\widetilde{\chi}_2^0$ | 1.09 |
| $s\bar{s}$ | 0.439 |
| $\widetilde{\chi}_1^0\widetilde{\chi}_1^0$ | 0.409 |
| $\widetilde{\tau}_1^-\widetilde{\tau}_2^+$ | 0.321 |
| $\widetilde{\tau}_2^-\widetilde{\tau}_1^+$ | 0.321 |
| $h^0h^0$ | 0.145 |
| $W^+W^-$ | 0.094 |
| $\widetilde{\tau}_1^-\widetilde{\tau}_1^+$ | 0.082 |
| $Z^0Z^0$ | 0.047 |
| $\mu^-\mu^+$ | 0.037 |
| $\widetilde{\nu}_\tau\bar{\widetilde{\nu}}_\tau$ | 0.027 |
| $\widetilde{\nu}_\mu\bar{\widetilde{\nu}}_\mu$ | 0.024 |
| $\widetilde{\nu}_e\bar{\widetilde{\nu}}_e$ | 0.024 |
| $gg$ | 0.02 |
| $\widetilde{\mu}_R^-\widetilde{\mu}_R^+$ | 0.015 |
| $\widetilde{e}_R^-\widetilde{e}_R^+$ | 0.015 |
| $\widetilde{\mu}_L^-\widetilde{\mu}_L^+$ | 0.003 |
| $\widetilde{e}_L^-\widetilde{e}_L^+$ | 0.003 |
| $d\bar{d}$ | 0.001 |
| $c\bar{c}$ | 0.001 |

## $\boxed{A^0}$

$M(A^0) = 749.93$ GeV

**$A^0$ branching ratios**

| mode | fraction |
|---|---|
| $b\bar{b}$ | 60.4% |
| $t\bar{t}$ | 24.0 |
| $\tau^-\tau^+$ | 10.1 |
| $\widetilde{\chi}_1^0\widetilde{\chi}_2^0$ | 3.72 |
| $\widetilde{\chi}_1^0\widetilde{\chi}_1^0$ | 0.672 |
| $s\bar{s}$ | 0.413 |
| $\widetilde{\tau}_2^-\widetilde{\tau}_1^+$ | 0.327 |
| $\widetilde{\tau}_1^-\widetilde{\tau}_2^+$ | 0.327 |
| $h^0Z^0$ | 0.084 |
| $\mu^-\mu^+$ | 0.035 |
| $gg$ | 0.022 |
| $d\bar{d}$ | 0.001 |

## $\boxed{H^+}$

$M(H^+) = 759.04$ GeV

**$H^+$ branching ratios**

| mode | fraction |
|---|---|
| $t\bar{b}$ | 81.5% |
| $\nu_\tau\tau^+$ | 11.6 |
| $\widetilde{\chi}_1^+\widetilde{\chi}_1^0$ | 5.38 |
| $\widetilde{\tau}_1^+\widetilde{\nu}_\tau$ | 0.83 |
| $c\bar{s}$ | 0.439 |
| $h^0W^+$ | 0.099 |
| $\nu_\mu\mu^+$ | 0.041 |
| $\widetilde{\mu}_L^+\widetilde{\nu}_\mu$ | 0.025 |
| $\widetilde{e}_L^+\widetilde{\nu}_e$ | 0.025 |
| $\widetilde{\tau}_2^+\widetilde{\nu}_\tau$ | 0.008 |
| $u\bar{d}$ | 0.001 |