Leading Order Neutralino Calculation

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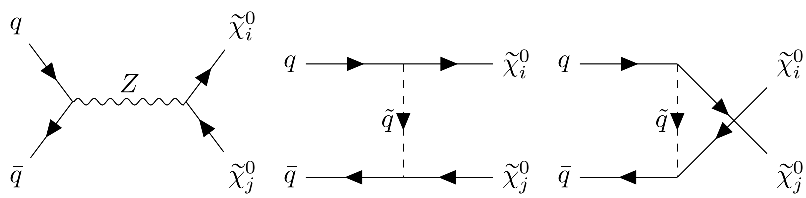

$$s = (p_1 + p_2)^2 = (k_1 + k_2)^2 \tag{1a}$$
$$t = (p_1 - k_1)^2 = (p_2 - k_2)^2 \tag{1b}$$
$$u = (p_1 - k_2)^2 = (p_2 - k_1)^2 \tag{1c}$$
$$s + t + u = m_i^2 + m_j^2 \tag{1d}$$

$$(p_1 \cdot p_2) = \frac{s}{2} \qquad (k_1 \cdot k_2) = \frac{s - m_i^2 - m_j^2}{2} \tag{2a}$$
$$(p_1 \cdot k_1) = \frac{m_i^2 - t}{2} \qquad (p_2 \cdot k_2) = \frac{m_j^2 - t}{2} \tag{2b}$$
$$(p_1 \cdot k_2) = \frac{m_j^2 - u}{2} \qquad (p_2 \cdot k_1) = \frac{m_i^2 - u}{2} \tag{2c}$$

$$\begin{aligned}\mathcal{M}_s &= -\frac{g^2}{2c_W^2} D_Z(s) \left[\bar{u}_i \gamma^\mu \left(O_{ij}^{''L} P_L + O_{ij}^{''R} P_R\right) v_j\right] \\ &\qquad \times \left[\bar{v}_2 \gamma_\mu \left(C_{Zqq}^L P_L + C_{Zqq}^R P_R\right) u_1\right]\end{aligned} \tag{3a}$$
$$\begin{aligned}\mathcal{M}_t &= -2g^2 D_{\tilde{q}}(t) \left[\bar{u}_i \left(C_i^{L*} P_L + C_i^{R*} P_R\right) u_1\right] \\ &\qquad \times \left[\bar{v}_2 \left(C_j^R P_L + C_j^L P_R\right) v_j\right]\end{aligned} \tag{3b}$$
$$\begin{aligned}\mathcal{M}_u &= -2g^2 D_{\tilde{q}}(u) \left[\bar{u}_j \left(C_j^{L*} P_L + C_j^{R*} P_R\right) u_1\right] \\ &\qquad \times \left[\bar{v}_2 \left(C_i^R P_L + C_i^L P_R\right) v_i\right]\end{aligned} \tag{3c}$$

$$\begin{aligned}I_{ss} = \sum_{\text{spins}} |\mathcal{M}_s|^2 = \frac{g^4}{c_W^2} |D_Z(s)|^2 \left((C_Z^L)^2 + (C_Z^R)^2\right) \Big\{ &\left|O_{ij}^L\right|^2 \left[(m_i^2 - t)^2 + (m_j^2 - t)^2\right] \\ &- 2\,\mathrm{Re}\left\{\left(O_{ij}^L\right)^2\right\} m_i m_j s \Big\}\end{aligned} \tag{4a}$$