Divergent Box Integral 10: $I_4^{\{D=4-2\epsilon\}}(0,p_2^2,p_3^2,p_4^2;s_{12},s_{23};0,0,0,m^2)$

Page contributed by R.K. Ellis

The result for this box (see figure) is

$$I_4^{\{D=4-2\epsilon\}}(0,p_2^2,p_3^2,p_4^2;s_{12},s_{23};0,0,0,m^2) = \frac{1}{(s_{12}s_{23}-m^2s_{12}-p_2^2p_4^2+m^2p_2^2)}$$

$$\times \Bigg[\frac{1}{\epsilon}\ln\left(\frac{(m^2-p_4^2)p_2^2}{(m^2-s_{23})s_{12}}\right) + \mathrm{Li}_2\left(1+\frac{(m^2-p_3^2)(m^2-s_{23})}{p_2^2m^2}\right) - \mathrm{Li}_2\left(1+\frac{(m^2-p_3^2)(m^2-p_4^2)}{s_{12}m^2}\right)$$

$$+ \; 2\,\mathrm{Li}_2\left(1-\frac{m^2-s_{23}}{m^2-p_4^2}\right) - 2\,\mathrm{Li}_2\left(1-\frac{p_2^2}{s_{12}}\right) + 2\,\mathrm{Li}_2\left(1-\frac{p_2^2(m^2-p_4^2)}{s_{12}(m^2-s_{23})}\right)$$

$$+ \; 2\ln\left(\frac{\mu m}{m^2-s_{23}}\right)\ln\left(\frac{(m^2-p_4^2)p_2^2}{(m^2-s_{23})s_{12}}\right)\Bigg] + \mathcal{O}(\epsilon)$$

See the file on notation.

References

[1] R. K. Ellis and G. Zanderighi, "Scalar one-loop integrals for QCD," arXiv:0712.1851 [hep-ph]