

Divergent Box Integral 6: $I_4^{\{D=4-2\epsilon\}}(0, 0, m^2, m^2; s_{12}, s_{23}; 0, 0, 0, m^2)$

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The result for this box (see [figure](#)). The expression is valid for $s_{12}, s_{23} < 0$. Continuation as usual by $s_{ij} \rightarrow s_{ij} + i\epsilon$.

$$I_4^{\{D=4-2\epsilon\}}(0, 0, m^2, m^2; s_{12}, s_{23}; 0, 0, 0, m^2) = -\frac{1}{s_{12}(m^2 - s_{23})} \left(\frac{\mu^2}{m^2}\right)^\epsilon \\ \times \left[\frac{2}{\epsilon^2} - \frac{1}{\epsilon} \left(2 \ln\left(\frac{m^2 - s_{23}}{m^2}\right) + \ln\left(\frac{-s_{12}}{m^2}\right) \right) + 2 \ln\left(\frac{m^2 - s_{23}}{m^2}\right) \ln\left(\frac{-s_{12}}{m^2}\right) - \frac{\pi^2}{2} \right] + \mathcal{O}(\epsilon)$$

See the file on [notation](#). This integral can also be obtained from an expression in Eq. (A4) of ref.[[2](#)] (note differing definition of ϵ) and Eq. (6.68) of ref.[[3](#)].

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References

- [1] P. Nason, S. Dawson and R. K. Ellis, (unpublished)
- [2] W. Beenakker, H. Kuijf, W. L. van Neerven and J. Smith, Phys. Rev. D **40**, 54 (1989). [Inspire](#)
- [3] R. Höpker, Hadroproduction and decay of squarks and gluinos, (in german), DESY Internal report DESY-T-96-02, ([Relevant excerpt](#))