Mathematics > Algebraic Geometry

Chern classes of graph hypersurfaces and deletion-contraction

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We study the behavior of the Chern classes of graph hypersurfaces under the operation of deletion-contraction of an edge of the corresponding graph. We obtain an explicit formula when the edge satisfies two technical conditions, and prove that both these conditions hold when the edge is multiple in the graph. This leads to recursions for the Chern classes of graph hypersurfaces for graphs obtained by adding parallel edges to a given (regular) edge.

Analogous results for the case of Grothendieck classes of graph hypersurfaces were obtained in previous work. Both Grothendieck classes and Chern classes were used to define `algebro-geometric' Feynman rules. The results in this paper provide further evidence that the polynomial Feynman rule defined in terms of the Chern-Schwartz-MacPherson class of a graph hypersurface reflects closely the combinatorics of the corresponding graph.The key to the proof of the main result is a more general formula for the Chern-Schwartz-MacPherson class of a transversal intersection, which may be of independent interest. We also describe a more geometric approach, using the apparatus of `Verdier specialization'.

Subjects: **Algebraic Geometry (math.AG)**; High Energy Physics - Theory (hep-th); Mathematical Physics (math-ph)

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