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Spin determination of single-produced resonances at the LHC

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We present techniques and analysis tools to study the production and decay of a single resonance produced at the LHC. In a model-independent way, we show how to perform analysis of the resonance decay products to ascertain the spin of the resonance, its parity and production mechanism, and its general couplings to Standard Model matter and gauge fields. Examples of spin-zero, -one, and -two resonances ranging from the Standard Model Higgs boson to the KK Graviton are considered. Though noting implications for other final states, we focus on resonances decaying to a pair of Z bosons in a fully reconstructed final state. Through detailed MC simulation including all spin correlations and major detector effects, we use the multivariate likelihood method to extract the maximal amount of information about the resonance and separate various signal hypotheses.

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