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Empirical parametrizations of the resonance transition amplitudes based on the Siegert's theorem

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The Siegert's theorem states that in a g*N -> N* transition, where N and N*are respectively the nucleon and a nucleon resonance, the electric amplitude, E (defined by the transverse amplitudes) and the scalar amplitude, S, are related in the pseudo-threshold limit by E ~ w/q*S, where w and q are the photon energy and momentum. The pseudo-threshold limit is the limit where q ->0, when the nucleon and the resonance are both at rest. The explicit form of the electric amplitude E and the coefficients depend on the resonance angular momentum-parity state. Some empirical parametrizations of the g*N -> N* transition amplitudes, violate the Siegert's theorem. We will discuss in particular the results for the g*N -> N(1535), and g* N -> Delta and g* N -> N(1520) transition amplitudes. Empirical parametrizations of the data consistent with the Siegert's theorem will be presented, and compared with alternative parametrizations. The physics associated with the parametrizations at low Q^2 will be discussed. Finally new parametrizations will be proposed for large Q^2, compatible with the existent data and with the behavior expected from perturbative QCD.

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