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Generalized Sum Rules of the Nucleon MIKHAIL GORSHTEYN, ADAM SZCZEPANIAK, Indiana University — We consider doubly virtual Compton scattering (VVCS) off the nucleon with the photon virtualities $q_1^2 = q_2^2 = -Q^2$ and formulate the low energy theorem (LET) for this process. We show that the LET can only be defined at finite momentum transfer $t = -2Q^2$ which is at variance with existing studies in the literature. Combining LET with dispersion relations for the forward VVCS amplitude, we obtain the new, correct version of the generalized sum rules of the nucleon that state a correspondence between the low energy constants of VVCS and the moments of the DIS structure functions. We notice that the t-channel unitarity is necessary to translate the forward dispersion relations to the low energy limit. This approach leads to a substantial modification of the generalized GDH sum rule at finite Q^2 that undergoes extensive studies at JLab. For the spin-independent VVCS amplitude, the new sum rule for the generalized magnetic susceptibility $\beta(Q^2)$ is obtained. Our approach provides a consistent, Lorentz invariant formulation of LET for the most general VVCS process that removes inconsistencies that stain the previous studies of the generalized polarizabilities of virtual Compton scattering and the generalized sum rules of the nucleon.

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