

Photoproduction of two mesons with dressed hadrons

H. Haberzettl^(a), K. Nakayama^(b), Yongseok Oh^(b)

^(a)Center for Nuclear Studies, Department of Physics,
The George Washington University, Washington, DC 20052, USA

^(b)Department of Physics and Astronomy,
University of Georgia, Athens, GA 30602, USA

A formalism is presented that describes the photoproduction process $\gamma N \rightarrow M_1 M_2 N$ of two generic scalar mesons M_1 and M_2 off a nucleon N . The general conditions are given to satisfy gauge invariance for fully dressed hadrons. From these, a prescription is extracted that preserves gauge invariance for phenomenological descriptions in terms of hadronic form factors and contact-type currents that simulate the neglected effect of hadronic final-state interactions. Specific examples treated in detail comprise processes involving intermediate spin-1/2 baryons of both positive and negative parity, intermediate spin-3/2 resonances, and intermediate scalar and vector bosons. The description of all intermediate particles may explicitly include their resonant behavior in terms of phenomenological width functions, while still preserving gauge invariance. Physically relevant applications include, for example, all two-pion and two-kaon production processes off the nucleon. Numerical results for the reaction $\gamma N \rightarrow K K \Xi$ recently measured at JLab are shown. The formalism is generalized to apply to all photoproduction processes that can be described in terms of graphs of an arbitrary network of dressed hadronic three-point functions.

E-mail: helmut.haberzettl@gwu.edu