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**Gauge-invariant theory of two-pion photoproduction off the nucleon** HELMUT HABERZETTL, The George Washington University, KANZO NAKAYAMA, University of Georgia — A field-theoretical description of the photoproduction of two pions off the nucleon is derived that applies to real as well as virtual photons. The Lorentz-covariant theory is complete at the level of all explicit three-body mechanisms of dressed interacting hadrons. The full three-body reaction dynamics of the interacting  $\pi\pi N$  system is accounted for by the Faddeev-type ordering structure of the Alt-Grassberger-Sandhas equations. The formulation is valid for hadronic two-point and three-point functions dressed by arbitrary internal mechanisms provided all associated electromagnetic currents are constructed to satisfy their respective (generalized) Ward-Takahashi identities. It is shown that coupling the photon to the Faddeev structure of the underlying hadronic two-pion production mechanisms results in a natural expansion of the full two-pion photoproduction current  $M_{\pi\pi}^\mu$  in terms of multiple loops involving two-body subsystem scattering amplitudes of the  $\pi\pi N$  system that preserves gauge invariance as a matter of course order by order in the number of loops. A closed-form expression is presented as well for the entire gauge-invariant current  $M_{\pi\pi}^\mu$  with complete three-body dynamics.

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