Abstract Submitted
for the APR11 Meeting of
The American Physical Society

Weak Pion and Photon Production from Nuclei in a Chiral Effective Field Theory (Update)[1] XILIN ZHANG, BRIAN D. SEROT, Indiana University — Neutrino-induced pion and photon production from nucleons and nuclei are important for the interpretation of neutrino-oscillation experiments. [A. A. Aquilar-Arevalo *et al.* (MiniBooNE Collaboration), Phys. Rev. Lett. **100**, 032301 (2008)]. We have been working on these problems in a Lorentz-covariant effective field theory (known as QHD EFT), which contains nucleons, pions, Deltas (Δ), isoscalar scalar (σ) and vector (ω) fields, and isovector vector (ρ) fields and has nonlinear chiral symmetry built in. Here we update our results on weak pion and photon production from nuclei, including both incoherent and coherent scattering. Connections between our results and the background analysis from MiniBooNE will be presented. In particular, coherent production of photons will be emphasized, and the possible relevance to the low-energy excess events at MiniBooNE will be explored. To justify our approximation scheme, we compare our results with data for inclusive electron scattering off nuclei up to the Δ peak and with coherent photoproduction of pions. Finally, we focus on the approximation scheme used and discuss the important Δ dynamics in the medium. An interesting mechanism to generate the Δ's spin-orbit coupling in the nucleus will be introduced, together with its possible consequences.

[1]Supported in part by the Department of Energy under Contract No. DE-FG02-87ER40365.

Brian Serot
Indiana University

Date submitted: 18 Jan 2011 Electronic form version 1.4