Recent Results from Omar Benhar's Group

Omar Benhar

INFN and Department of Physics
"Sapienza" Università di Roma. I-00185 Roma, Italy

Contributors

Alessandro Lovato, Davide Meloni, Noemi Rocco, and Erica Vagnoni

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Tests of the Spectral Function Formalism

★ The validity of the factorisation *ansatz*, underlying the spectral function formalism, has been tested comparing the electromagnetic responses of carbon computed using a realistic spectral function to those obtained from the Green's Function Monte Carlo method, providing very accurate predictions in the non relativistic regime
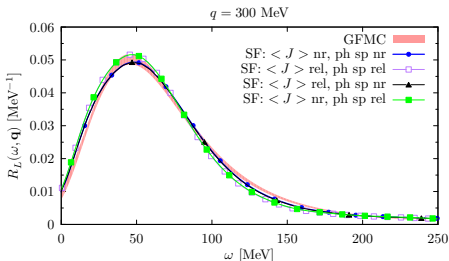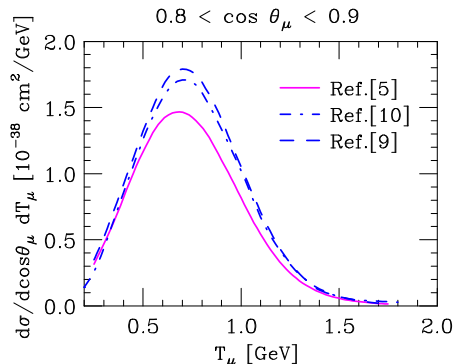

- Electromagnetic response of carbon in the longitudinal channnel, at momentum transfer |**q**| = 300 MeV. Phys. Rev. C **94**, 065501 (2016)

★ The close agreement between the results of the two approaches suggests that—provided corrections arising from final state interactions are taken into account—the spectral function approach can be safely employed down to momentum transfer as low as ∼ 300 MeV

Interpretation of the Neutrino-Nucleus Cross section

★ In spite of the progress in the understanding of more complex processes, such as those involving two-nucleon currents, the description of single-nucleon knock out leading to 1p1h final states, that provides the dominant contribution to the cross section at $E_\nu \lesssim 1$ GeV, is often inconsistent with $(e, e'p)$ data

$0.8 < \cos\theta_\mu < 0.9$

Ref.[5]
Ref.[10]
Ref.[9]

$\frac{d\sigma}{d\cos\theta_\mu \, dT_\mu} \; [10^{-38} \; \mathrm{cm}^2/\mathrm{GeV}]$

T_μ [GeV]

★ double-differential ν_μ-carbon cross section in the CCQE channel, averaged over the MiniBooNE flux. arXiv:1612.01473 [nucl-th]

- Ref. [5] Spectral Function approach [consistent with $(e, e'p)$ data]
- Ref. [9] Valencia model
- Ref. [10] Superscaling approach

Inelastic Neutrino-Carbon Cross section

★ Being based on an intrinsic property of the nuclear target, the spectral function approach can be used in any channels, provided the elementary neutrino-nucleon cross section is known

$\nu + {}^{12}C \to \mu^- + X$
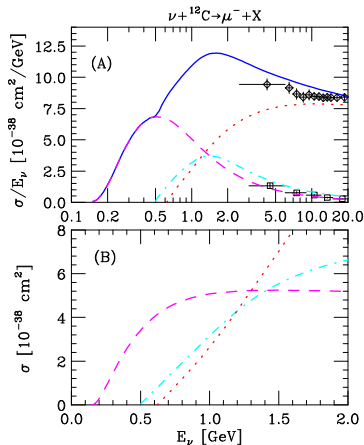
★ CC ν_μ-carbon cross section, as a function of neutrino energy. arXiv:1701.01718 [nucl-th]

- dashed line: CCQE
- dot-dash line: resonance production (RES)
- dotted line: DIS
- solid line: CCQE + RES + DIS

★ Diamonds and open squares correspond to NOMAD data