Follow-up from September GENIE Forum

- Slides from DUNE interaction model effort ("DIRT-II")
  - https://genie-docdb.pp.rl.ac.uk/cgi-bin/private/ShowDocument?docid=330
- Several requests made for an upcoming GENIE release
- NuWro-like radial dependence in LFG nucleon removal energy (slide 9)
  - Code looks reasonable, needs to be XML-configurable to harmonize with other options
- Add Benhar SF table for ^{40}Ar (in NEUT?)
  - Doable, unclear if existing SpectralFunc nuclear model has been validated
- hA2018 bug fix (slide 15)
  - "The Steves" checked it, agreement that the fixes should be made as proposed
- Assertion `s>0' failed (slide 6)
  - Hit nucleon rest frame problem

Trouble with the hit nucleon rest frame

- Important parts of the framework work with the rest frame of the initial hit nucleon
  - Probe energy threshold checks
  - Kinematic limits for Q^2, W, etc.
  - Some differential cross sections

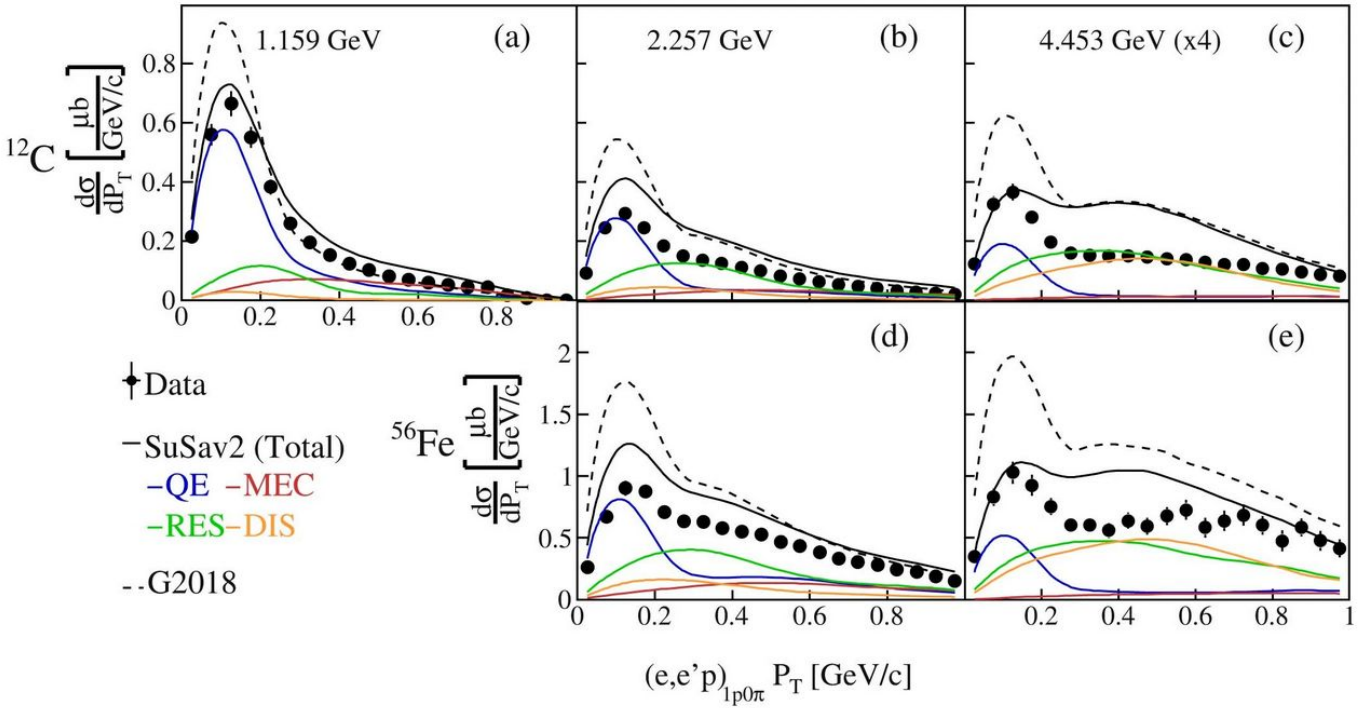
- Bound nucleons are off-shell, and this can be problematic in some cases
  - β for the "into rest frame" boost can exceed 1
  - Invariant mass of the nucleon becomes imaginary
  - Leads to failed assertions in multiple places

- Discussion of solutions ongoing
  - Best strategy seems to be changing the working frame for all relevant checks
  - Overleaf for working out the math: https://www.overleaf.com/project/5fc130f9b8fd2350110f0531
  - Task force: Marco, Afro, Steven
  - More detailed update when we have a full proposal on how to move forward

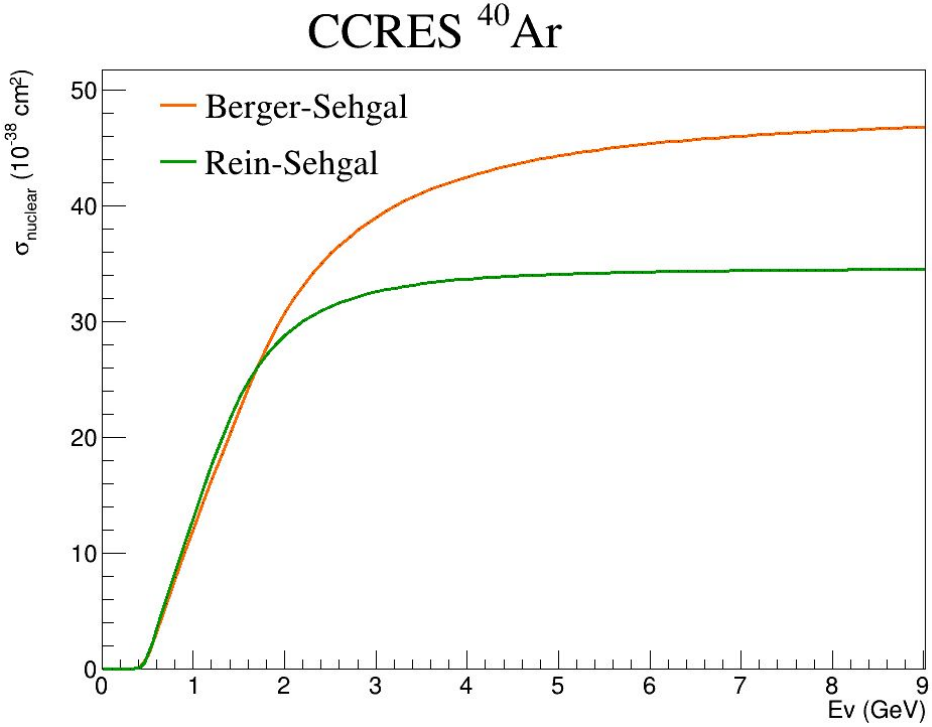
EMRES Overestimation Issue Addressed

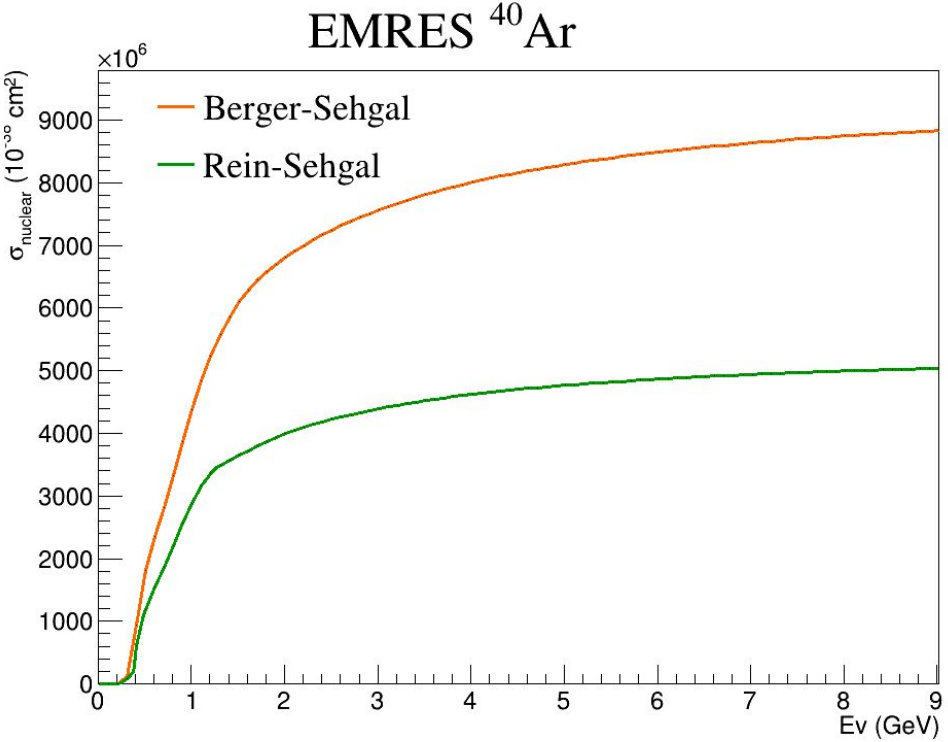
Afroditi Papadopoulou

10/10/2022



Nature 599, 565–570 (2021)


CCRES ^{40}Ar
Berger-Sehgal
Rein-Sehgal
$\sigma_{nuclear}$ (10^{-38} cm^2)
Ev (GeV)

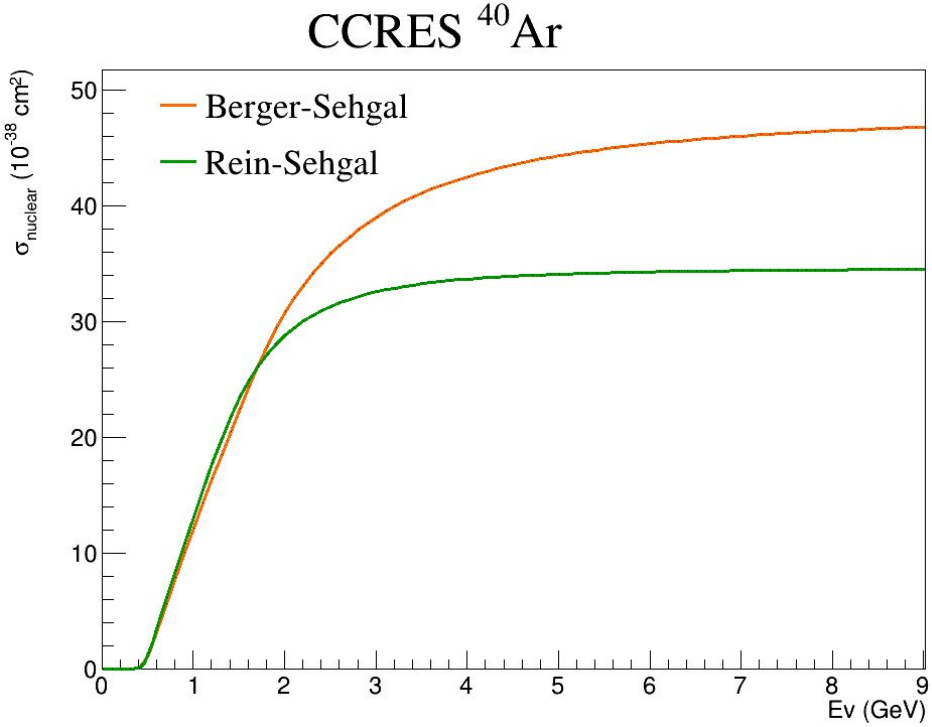

EMRES ^{40}Ar
Berger-Sehgal
Rein-Sehgal
$\sigma_{nuclear}$ (10^{-38} cm^2)
×10^6
Ev (GeV)

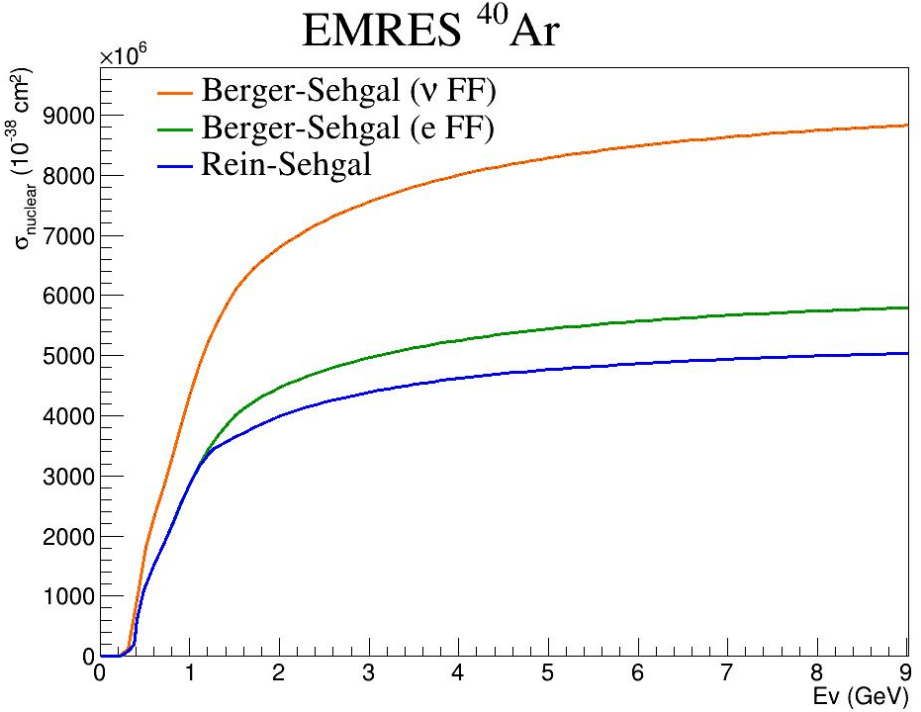
https://github.com/GENIE-MC/Generator/blob/master/src/Physics/Resonance/XSection/BSKLNBaseRESPXSec2014.cxx

Accidentally using neutrino form factors for EM scattering

```
761  void BSKLNBaseRESPXSec2014::LoadConfig(void)
762  {
763    // Cross section scaling factors
764    this->GetParam( "RES-CC-XSecScale", fXSecScaleCC ) ;
765    this->GetParam( "RES-NC-XSecScale", fXSecScaleNC ) ;
766
767    // Load all configuration data or set defaults
768
769    this->GetParam( "RES-Zeta"   , fZeta  ) ;
770    this->GetParam( "RES-Omega"  , fOmega ) ;
771    this->GetParam( "miniboooneGA", fGA    ) ;
772    this->GetParam( "miniboooneGV", fGV    ) ;
```

```
299  if(fGV){
300
301    LOG("BSKLNBaseRESPXSec2014",pDEBUG) <<"Using new GV";
302    double CV0 =  1./(1-q2/fMv2/4.);
303    double CV3 =  2.13 * CV0 * TMath::Power( 1-q2/fMv2,-2);
304    double CV4 = -1.51 * CV0 * TMath::Power( 1-q2/fMv2,-2);
305    double CV5 =  0.48 * CV0 * TMath::Power( 1-q2/fMv2/0.766, -2);
306
307    double GV3 =  0.5 / TMath::Sqrt(3) * ( CV3 * (W + Mnuc)/Mnuc
308                 + CV4 * (W2 + q2 -Mnuc2)/2./Mnuc2
309                 + CV5 * (W2 - q2 -Mnuc2)/2./Mnuc2 );
310
311    double GV1 = - 0.5 / TMath::Sqrt(3) * ( CV3 * (Mnuc2 -q2 +Mnuc*W)/W/Mnuc
312                + CV4 * (W2 +q2 - Mnuc2)/2./Mnuc2
313                + CV5 * (W2 -q2 - Mnuc2)/2./Mnuc2 );
314
315    GV = 0.5 * TMath::Power( 1 - q2/(Mnuc + W)/(Mnuc + W), 0.5-IR)
316         * TMath::Sqrt( 3 * GV3*GV3 + GV1*GV1);
317  }
```


CCRES ^{40}Ar
Berger-Sehgal
Rein-Sehgal
$\sigma_{nuclear}$ (10^{-38} cm^2)
Ev (GeV)


EMRES ^{40}Ar
×10^6
Berger-Sehgal (ν FF)
Berger-Sehgal (e FF)
Rein-Sehgal
$\sigma_{nuclear}$ (10^{-38} cm^2)
Ev (GeV)