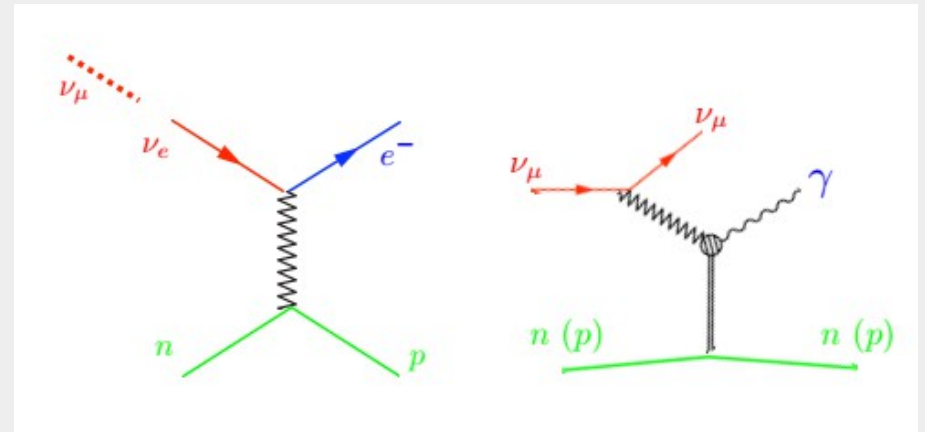


INT-2013 workshop

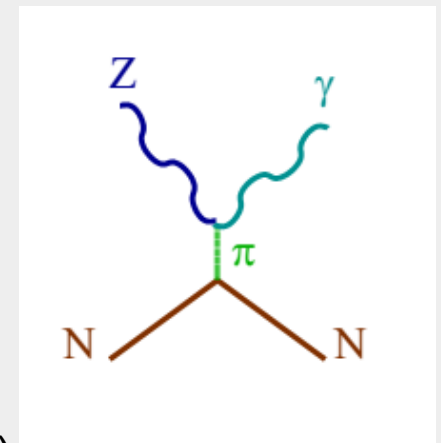
NCphoton summary

- Important process to understand/measure/model as it competes with $\sigma(\nu_e \text{CCQE}) \cdot P(\text{sterile oscillations})$
- Possibly important for proton decay, neutron star cooling
- Should be present with size $\sim G_F^2 \cdot \alpha$

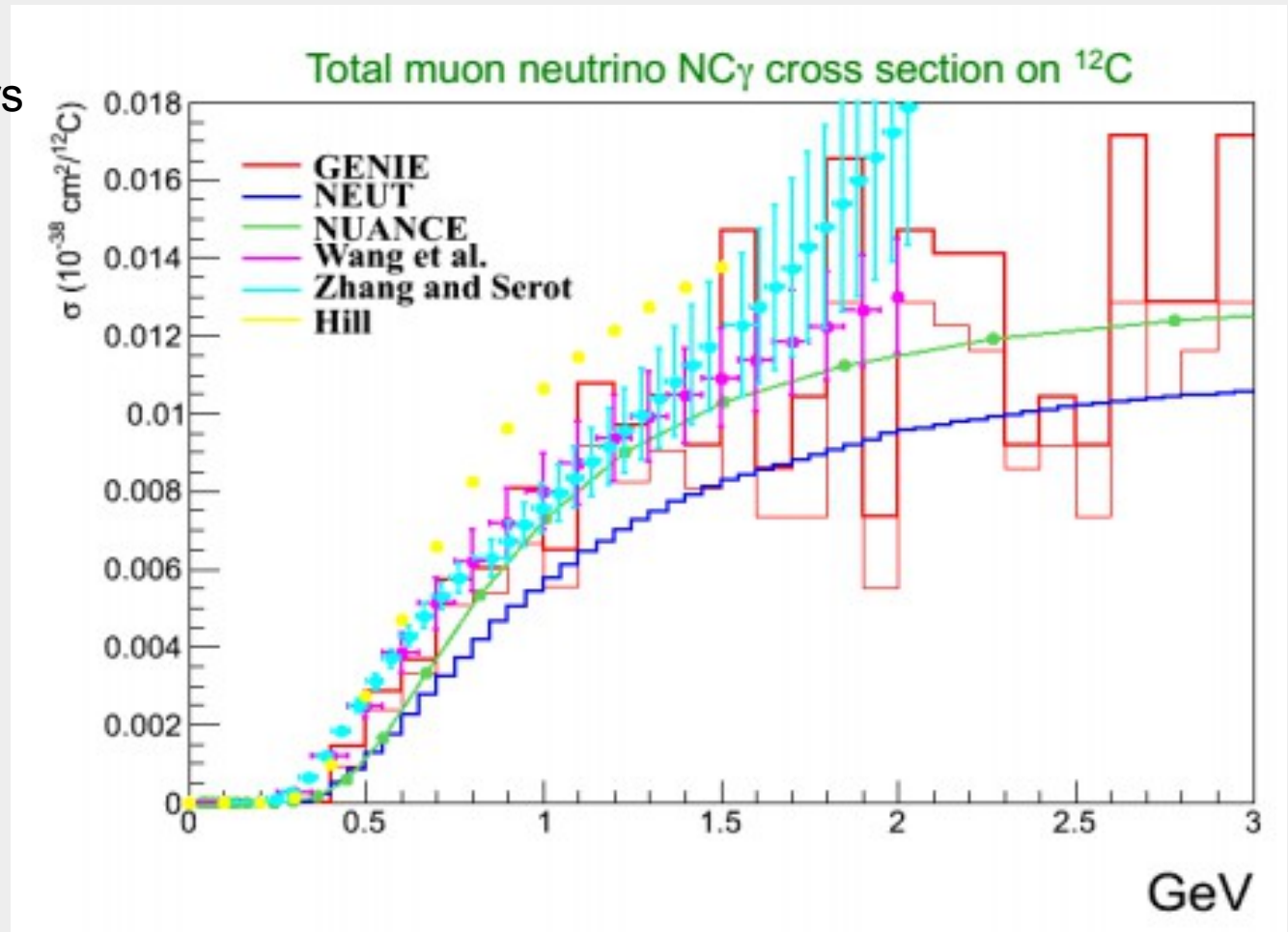


Models:

- 3 groups have investigated recently with fairly thorough treatments
- results are in good agreement in 100-1000 MeV E_ν range
 - incoherent Delta contribution dominates
 - coherent calculated .. ~10-20% of Delta
 - free N also
 - “contact term” tough to calculate, but small
- models in good agreement with MB estimate and have predictions for T2K (small compared to sin²θ₁₃).
- nucleon final state content analyzed for MB+, microBooNE(perhaps)

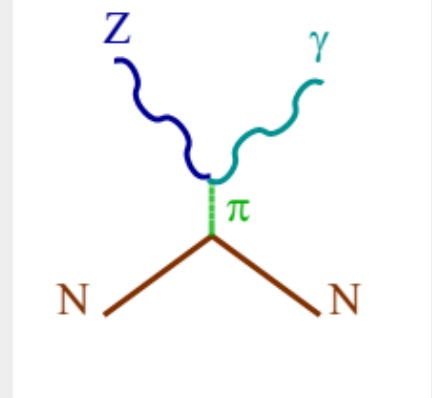


Models also fairly consistent with generators



Questions/worries/comments:

- What more should/could be done to take this further?



Measurements:

- seen in Gargamelle,
- not seen in NOMAD (a problem?)

2. NOMAD

Result

- no excess, set limit, $x_s(\text{NC}\gamma/\text{CC}) < 4 \times 10^{-4}$

Future:

- tough to separate from NCpi0, nueCCQE
- but perhaps in fine-grained detectors such as T2K, Minerva
- separation of NCpho+NCpi0 from nueCCQE (for oscillations) is a different problem (easier?), and looks to be possible via n/p, hadron energy and has been estimated by models.

