Cross Section Dependence on Scattering Angle

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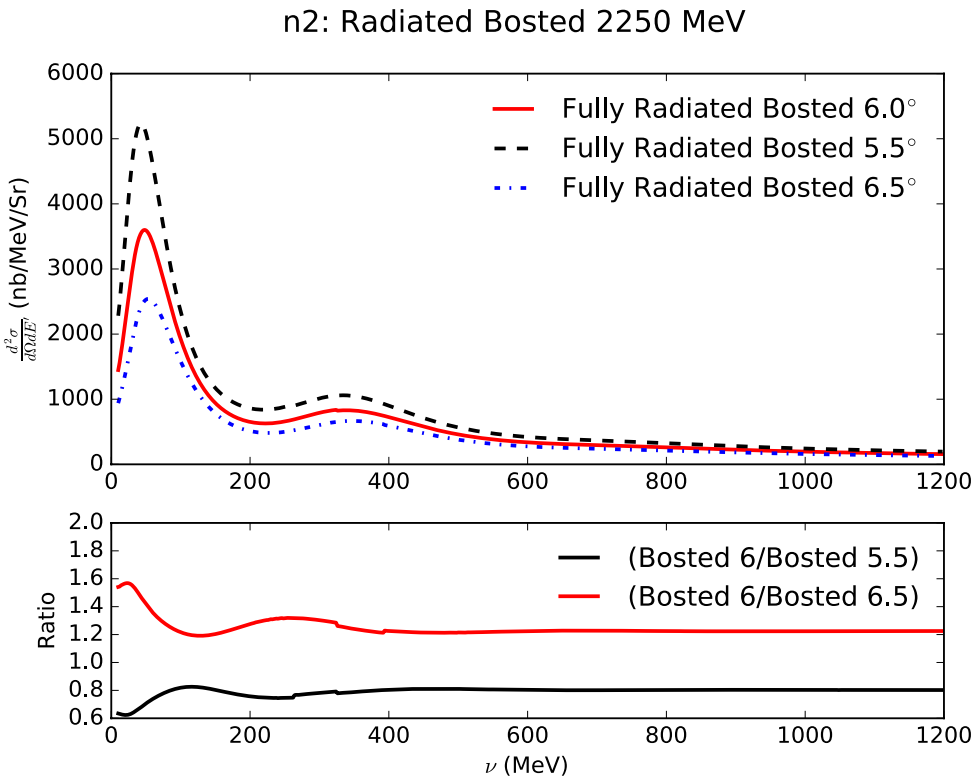
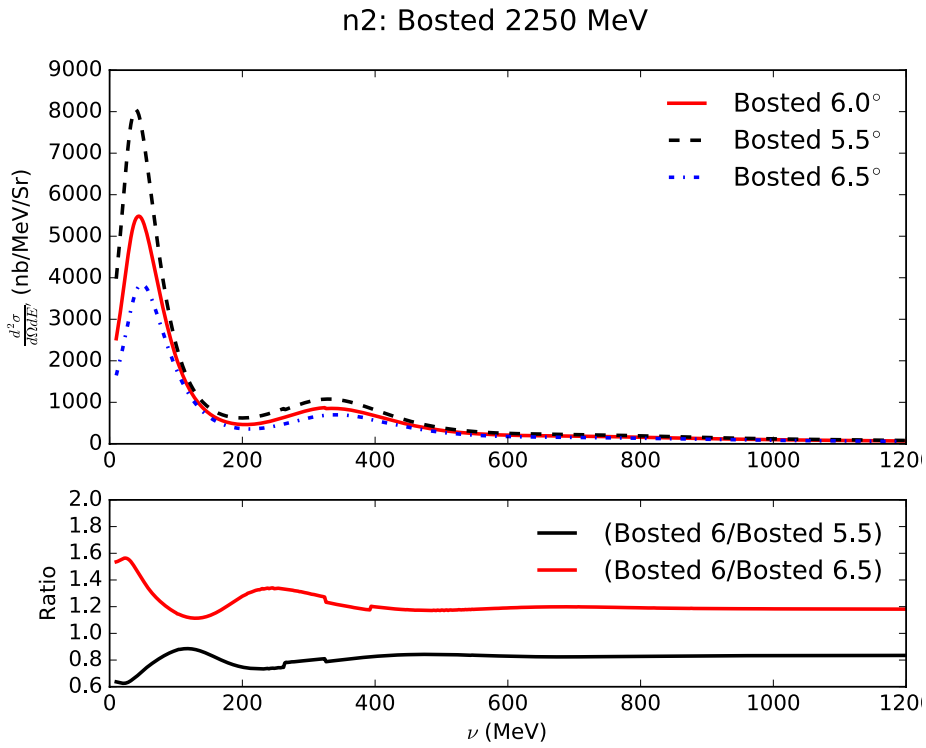
5/11/16

Overview

- Cross section varies rapidly with scattering angle at g2p kinematics
- How sensitive is it?
  - Use a fully radiated Bosted model to test (inelastic + elastic tail)
    - Check potential scattering contributions in a production run
      - Nitrogen
      - Protons
    - Use same radiation lengths for each target (production setting)
      - Tb = 0.02249
      - Ta = 0.02511
- Compare at three scattering angles: 5.5°/6°/6.5°
- Beam Energy = 2250 MeV

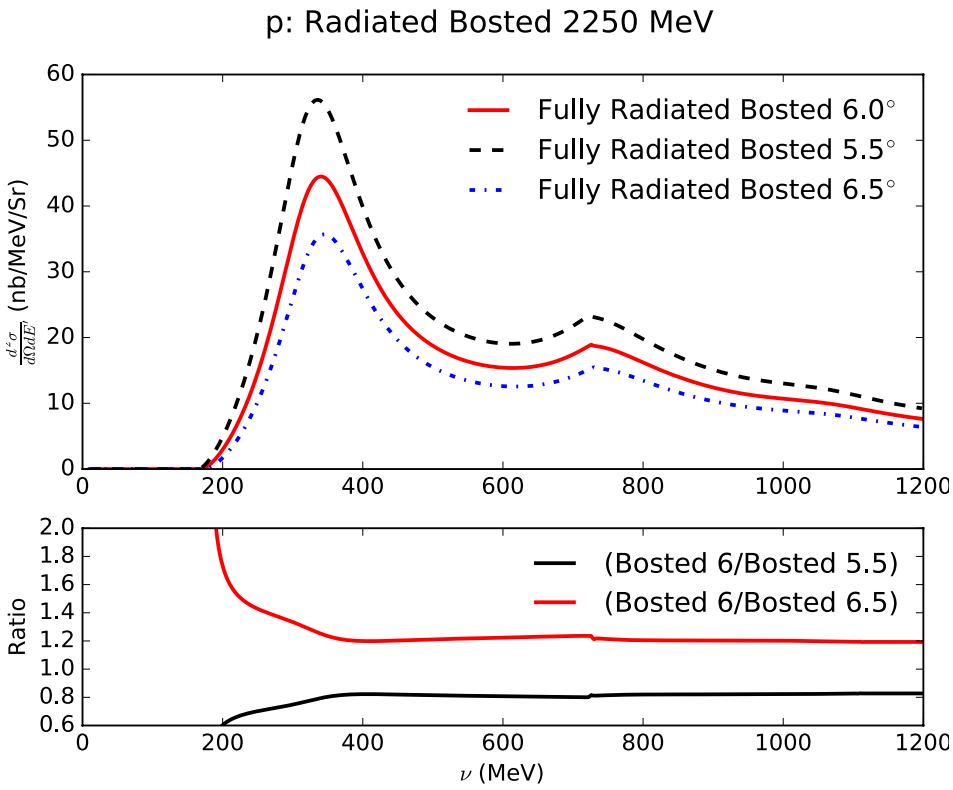
Nitrogen

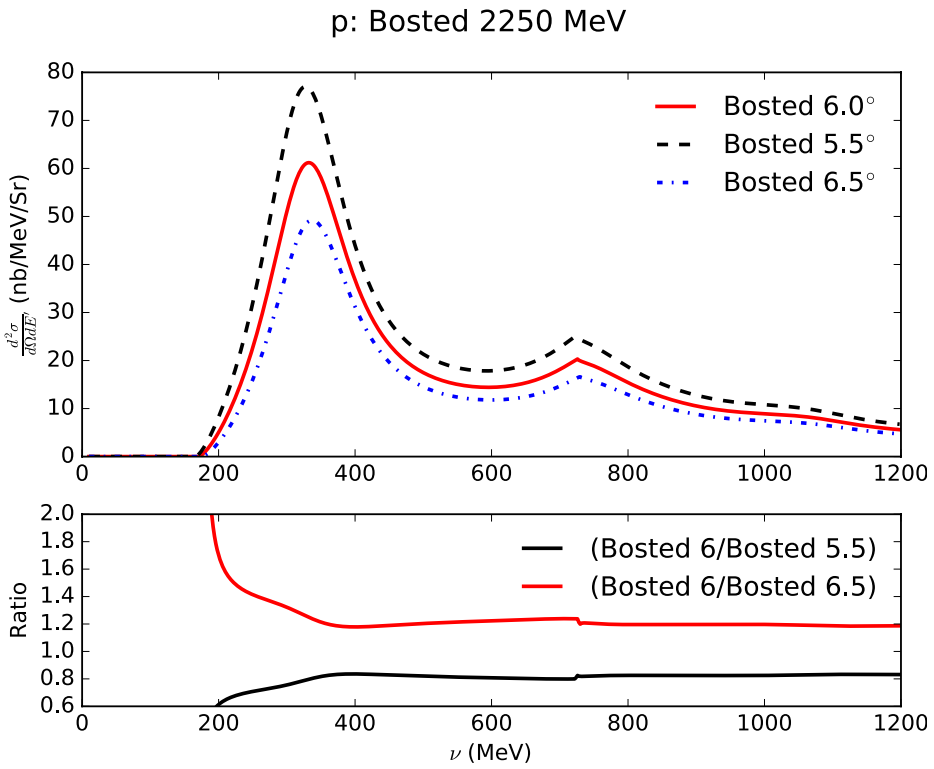




Difference is ~20%

Proton

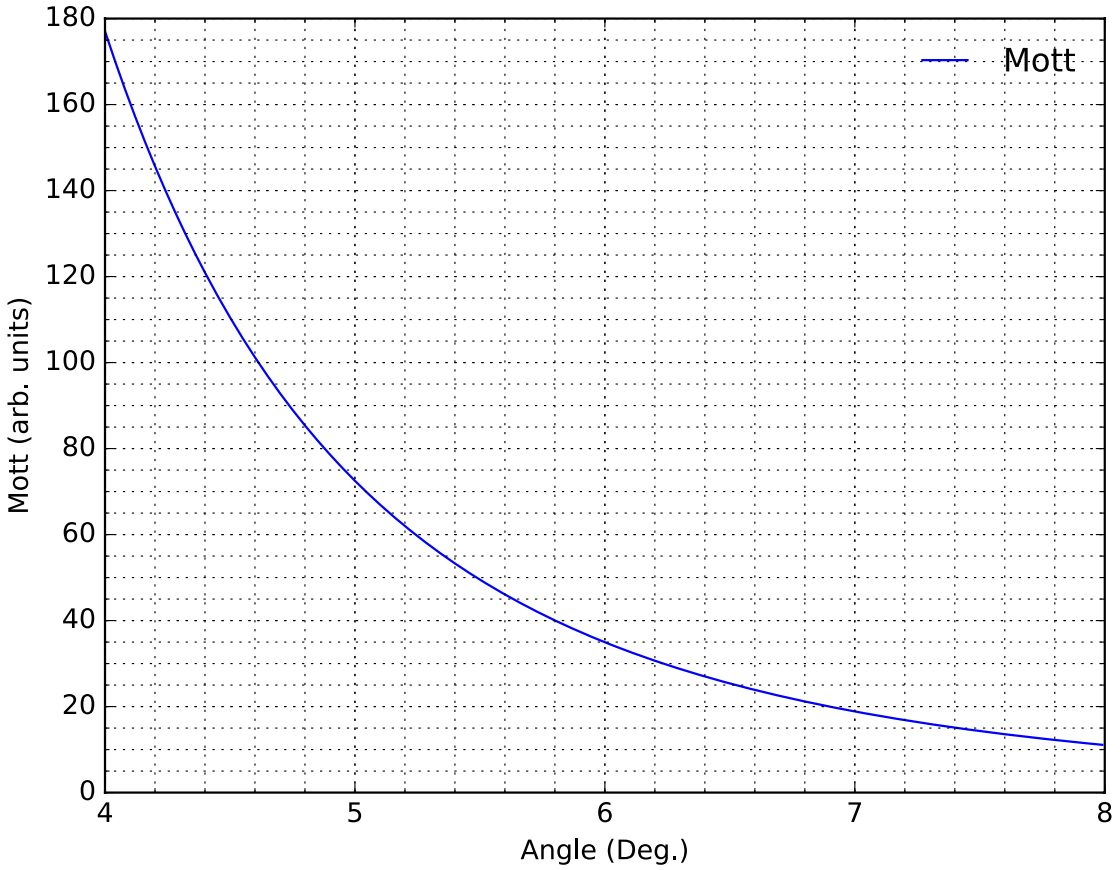




Difference is ~20%

Mott Cross Section Variation

- Nitrogen and proton difference is roughly the same, so hints change is largely due to Mott cross section variation



Conclusion

- Mott XS variation with scattering angle could explain yield jumps
- If the scattering angle can be reliably reconstructed from BPM information than we should be able to correct for it

- ONLY 132 OUT OF 1139 PRODUCTION RUNS ON LHRS ARE ABOVE 50 nA!
  - About 900 are above 40 nA.