Study on low energy Evaporation

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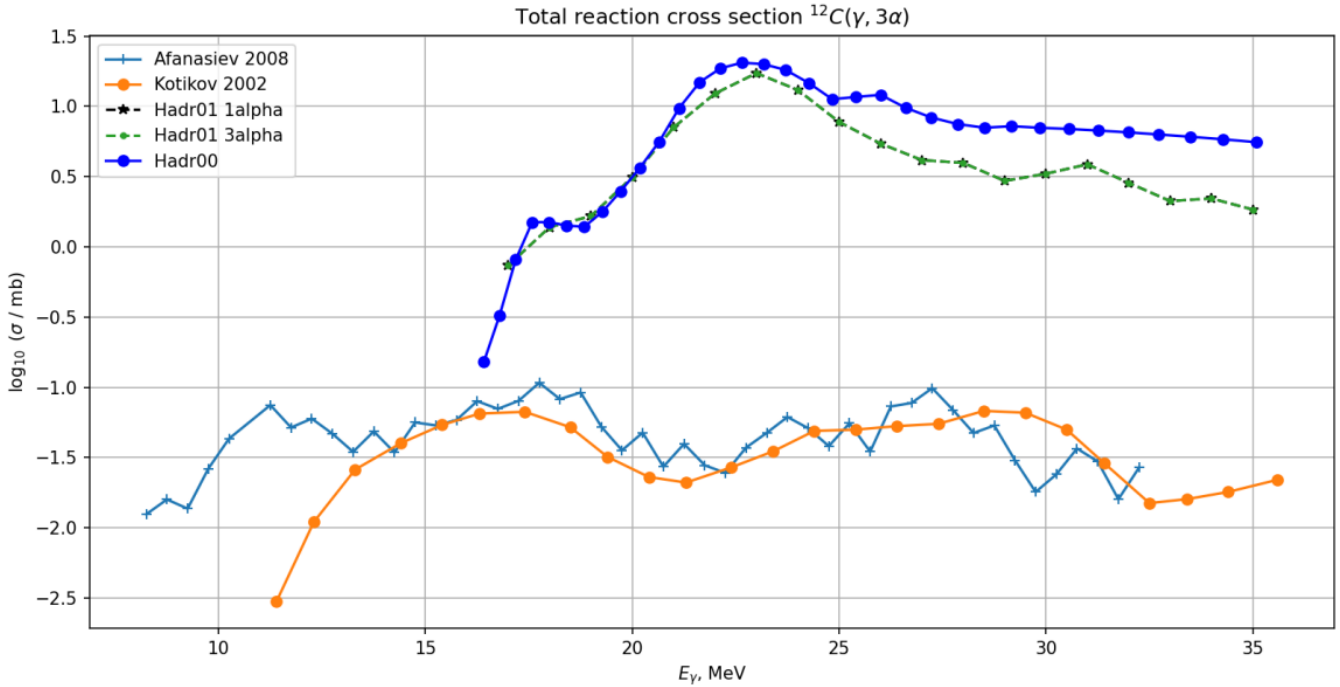
Problem

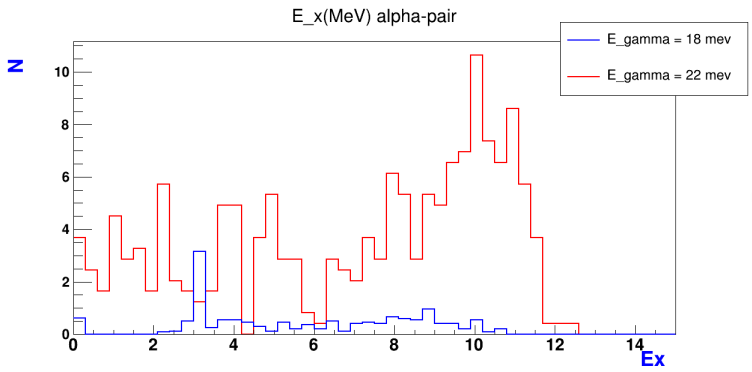
- We continue study of alpha production by gamma projectile



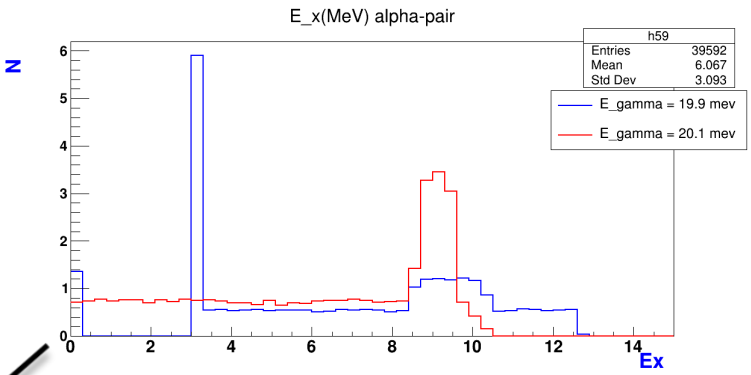
- Version of Geant4: 11.3-beta

Test30 new histogram

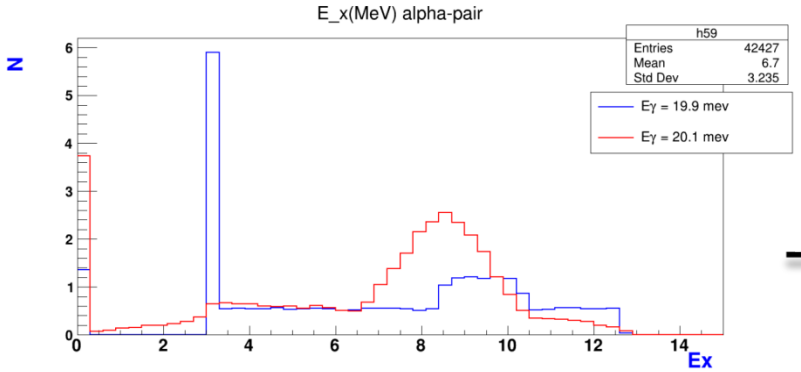
- New histogram for comparing with experimental paper was implemented in test30. Plots was made for two energies of gamma: 19.9 and 20.1 MeV
- We consider Energy of relative motion of two alpha $E_x^{ik} = \frac{(\mathbf{p}_i - \mathbf{p}_k)^2}{4\,m},$



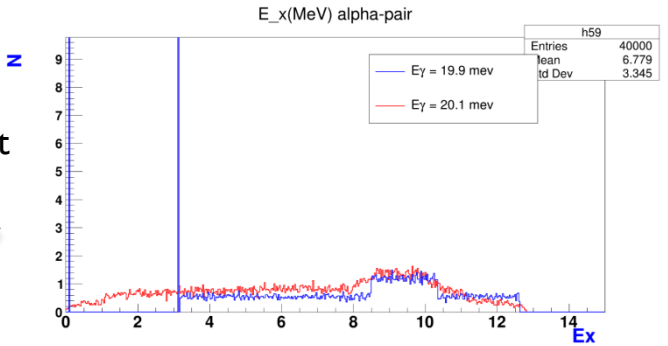
End of April



End of May

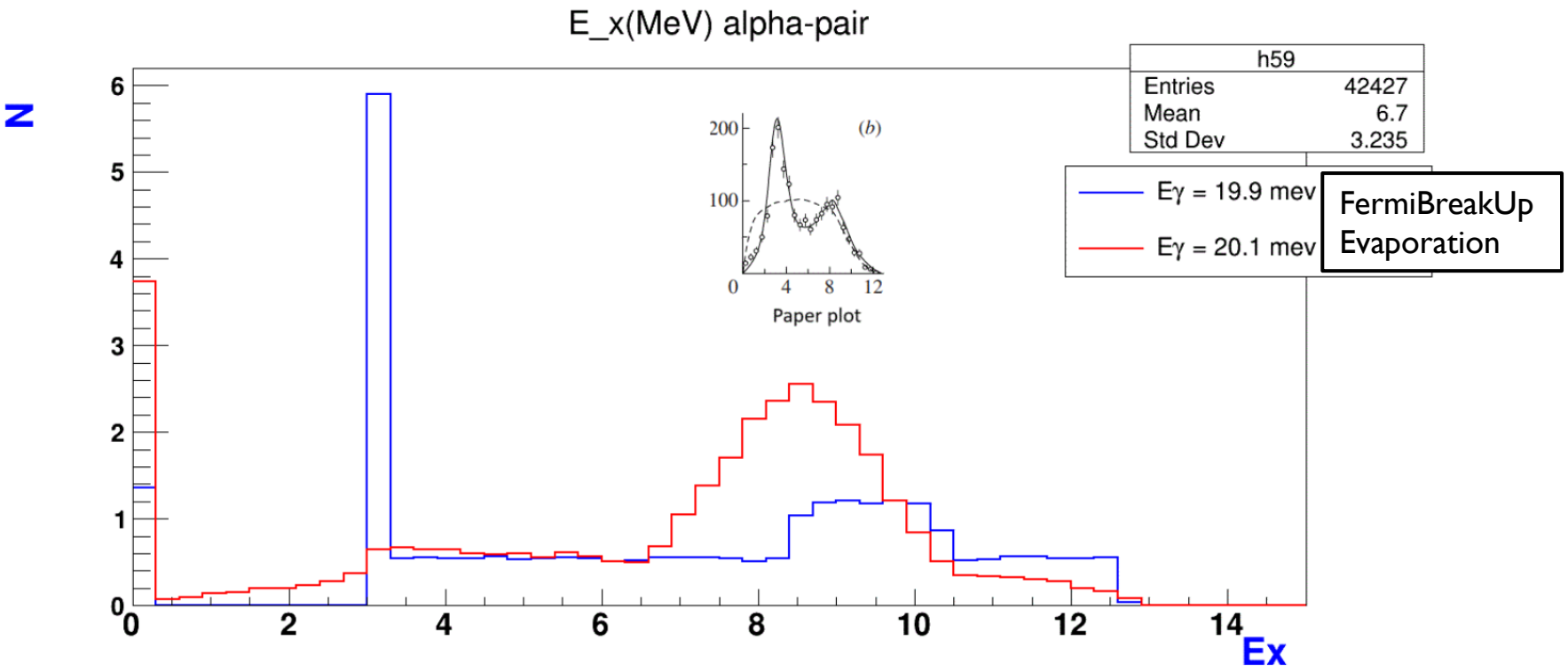


Current state



Test30 new histogram

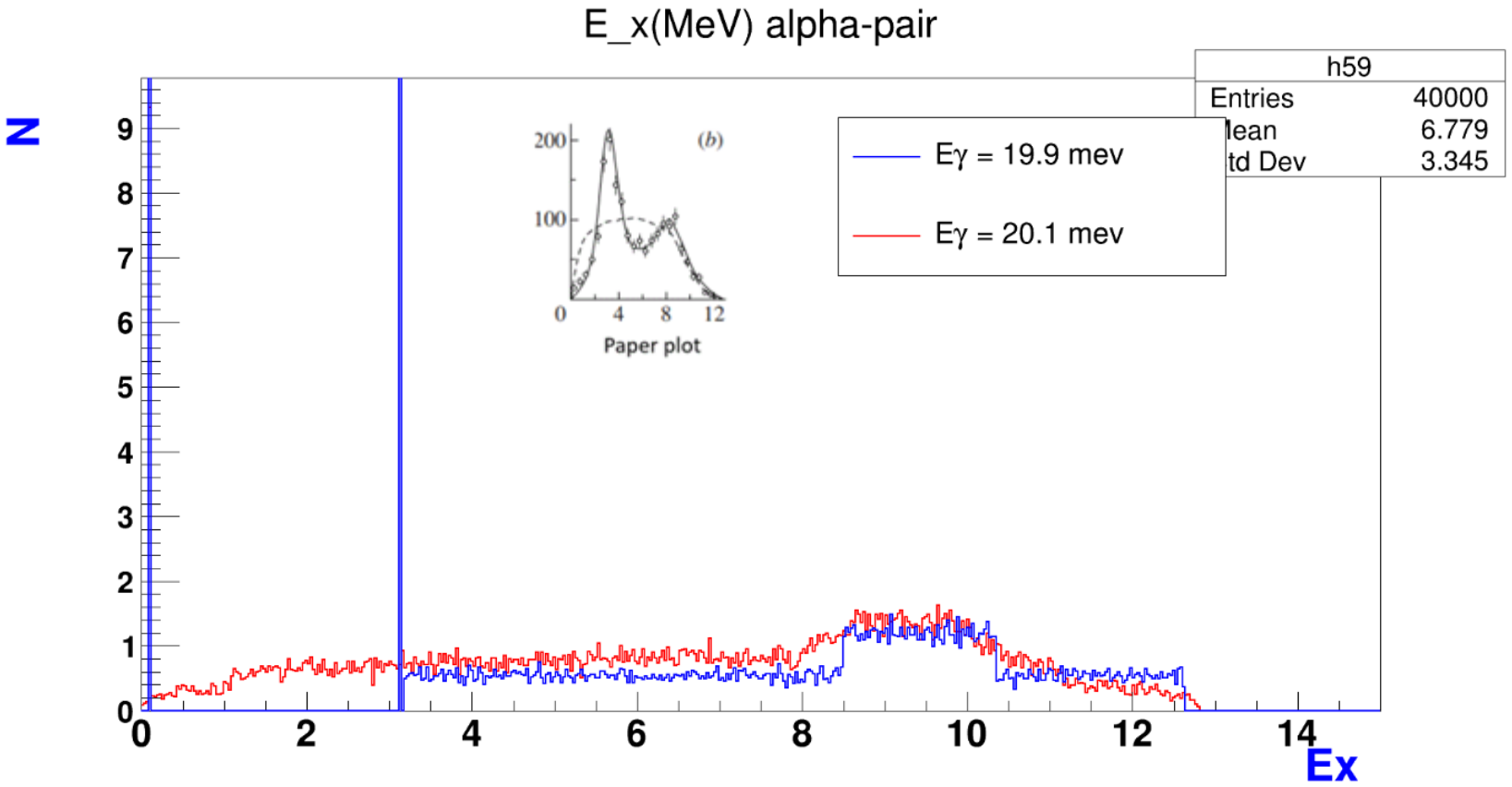
- Evaporation model describe data partially well, especially second peak



- Experimental paper plot taken from: [On the mechanism of formation of excited states of the 8Be nucleus in the reaction 12C(γ, 3α) | Physics of Atomic Nuclei (springer.com)]

Test30 new histogram

- Current state of this plot (number of bins greatly increased)



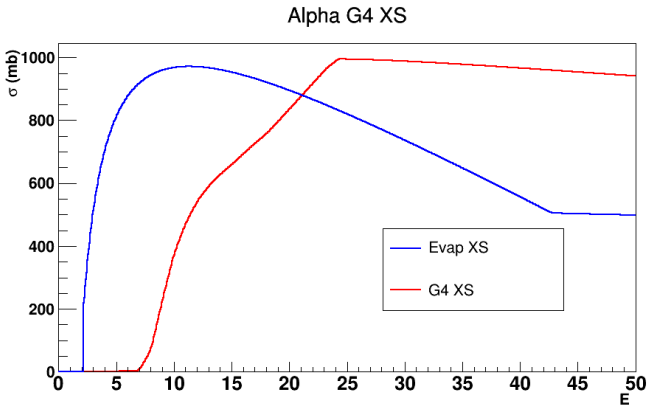
- FermiBreakUp exhibits level-like behavior,

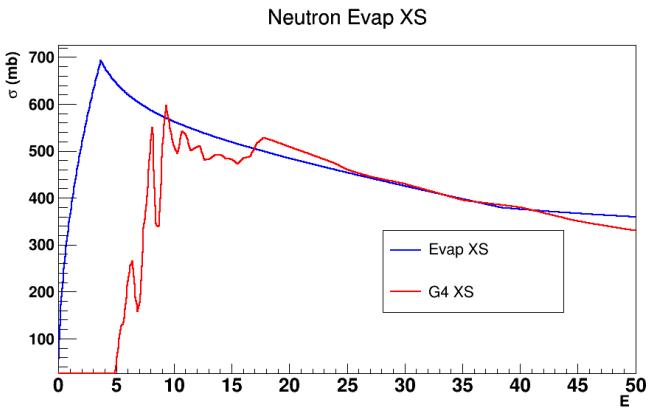
Evaporation test

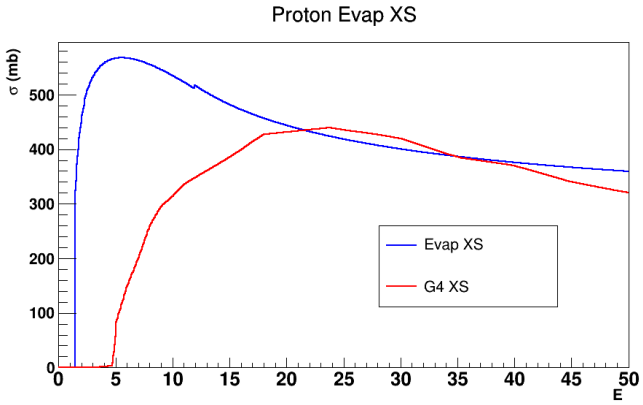
- We decided to study Evaporation model further and created a new test for this model
- This test made for comparison of G4 x-sections and Evaporation model x-sections
- Evaporation test located inside g4test-verification GitLab
- Here we present preliminary results of alpha, proton and neutron XS comparison for C12, Al and Pb
- Evaporation x-section calculate using Kalbach parameterization
- Geant4 x-section taken from G4PARTICLEXS

Evaporation test

- Plots for C12



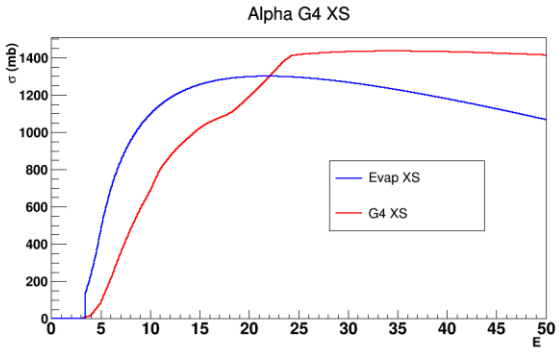


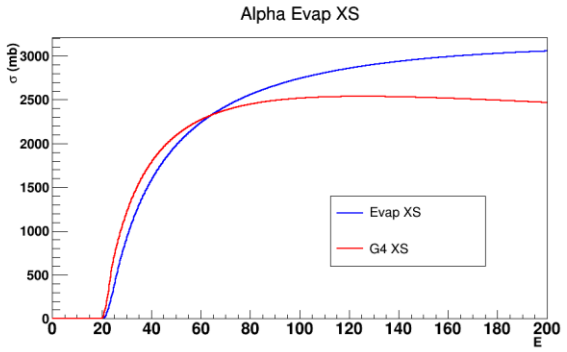


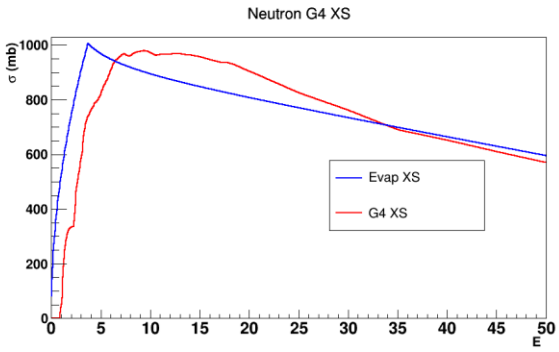
- Alpha XS does not match with data at all. Proton and neutron XS Evap and Data is quite different at low E

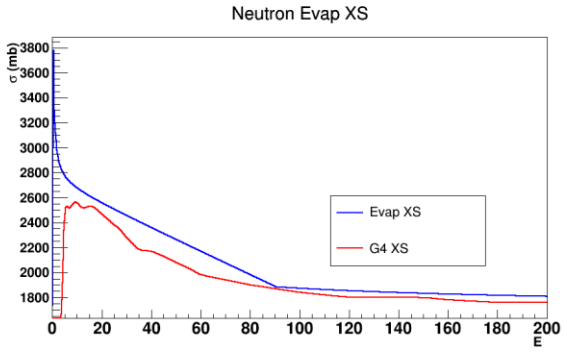
Evaporation test

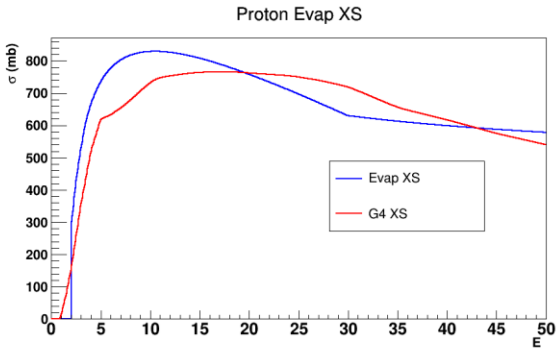
- Plots for Al (left) and Pb (right)
- Less issues at lower E, except neutrons in Pb
- Alpha XS is not accurate above 50 MeV

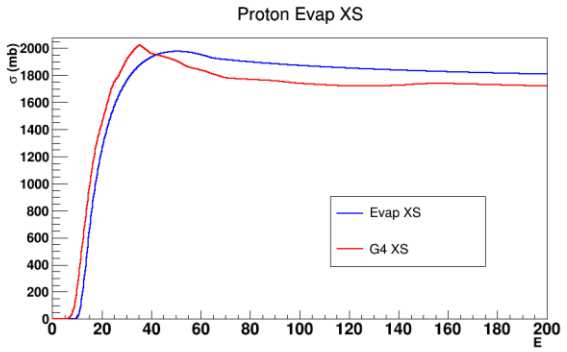












Conclusion

- Parameterization of Evaporation x-sections required a revision
- More problems at low Z targets, less at higher Z
- It might be convenient to test FermiBreakUp model more too

Thank you for your attention!