

Second Advanced Workshop on Model Codes for Spallation Reactions,
CEA-Saclay, France, 8-11 Feb 2010

CEM03.03 RESULTS

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- **General remarks:**

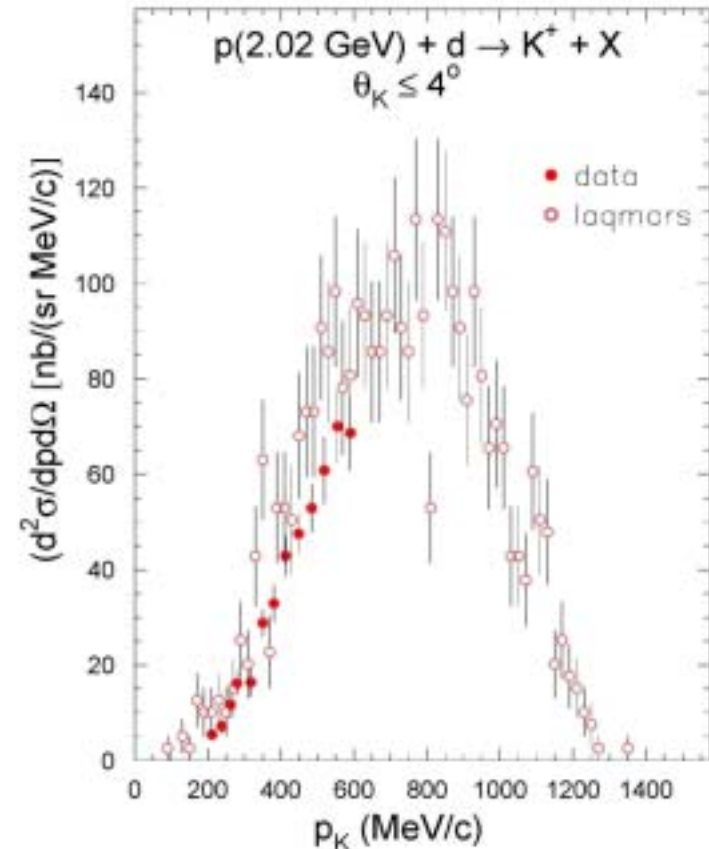
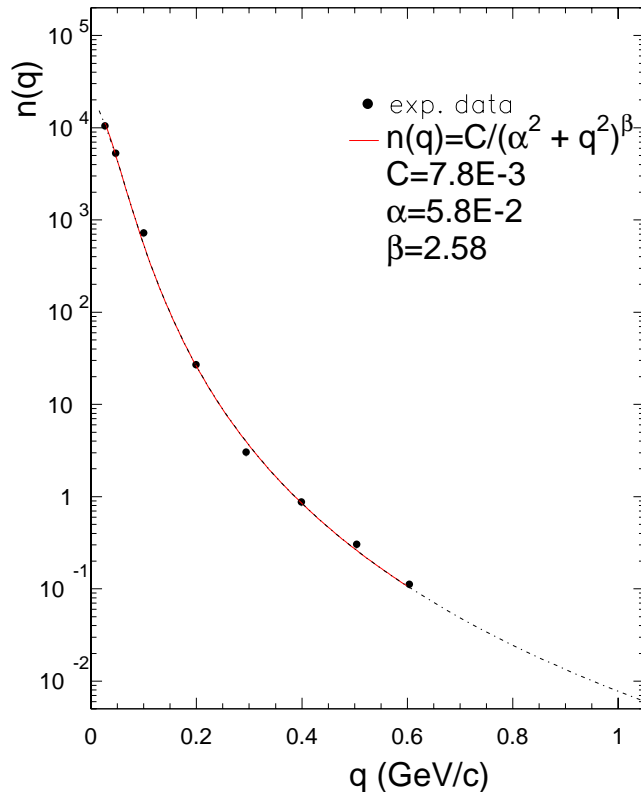
1. CEM03.03 is very similar to CEM03.02 and as we expected their results are essentially the same, therefore we discussed them together in common presentation by Stepan Mashnik.
2. Two versions of the same physical model differs by treatment of unstable fragments with mass number $A < 13$ produced in very asymmetric fission or in the chain of preequilibrium emission or evaporation from residue nuclei after cascade. The CEM03.03 code checks all the products and disintegrates such unstable fragments with the Fermi break-up model.
3. I completely agree with Mashnik's statements and conclusions about the predictive power of the CEM03 codes and with the lessons we are learned from the Intercomparison.

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4. Another problem all versions of our CEM codes have is not accounting the "depletion effect" during the INC. This would be a major modification of the our spatially-based INC requiring a lot of testing, essentially developing a new INC. Our high-energy code LAQGSM (Los Alamos version of the Quark-Gluon String Model) does account for this effect and does not have this problem. This is why we suggest for transport codes using both CEM and LAQGSM, to use CEM for light nuclei only at energies below $\sim 1-2$ GeV (and for actinides, below ~ 5 GeV) and to switch to LAQGSM at higher incident energies, addressing in this way the "depletion effect" problem of CEM.
5. At present the CEM03.03 and the LAQGSM codes are implemented into MARS15 transport code and are used for new projects needs, especially to predict the pion and kaon production by planed high intensity proton accelerator .

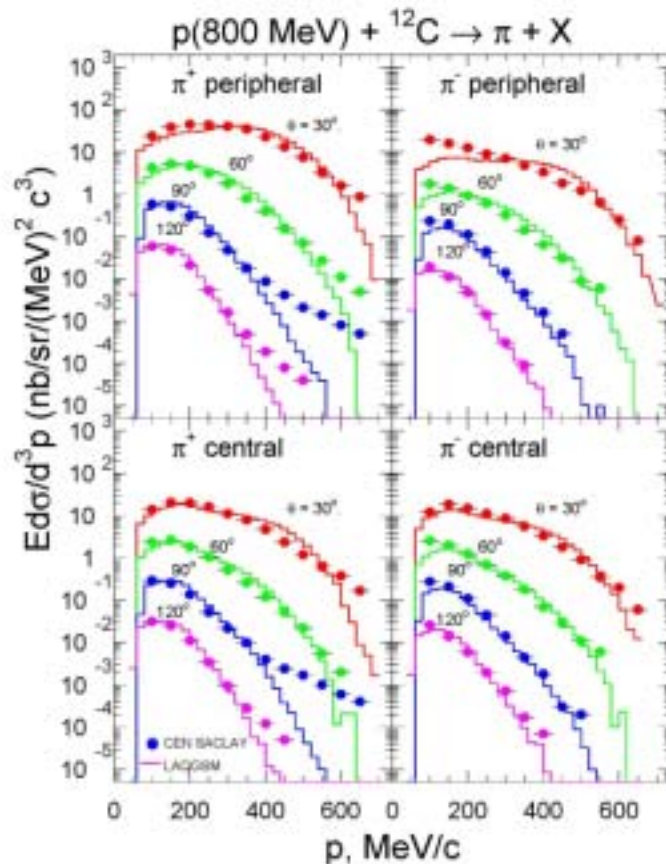
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6. One example I'd like to present here in context of mentioned problem of extension of cascade models to calculate the reactions with light targets . It is extension of LAQGSM code to include the **d** target . (Data are recent ANKE collaboration measurements)



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- Other example is the recent results of LAQGSM calculations for pion spectra compared with experimental data (M.C. Lemaire et al., DPhN Saclay 91-13,02/1991, and PRC 1993) from Intercomparison area, but which were not included in the list of mandatory experimental data.



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Thank you for attention!