Discussion of global analysis

Alain BOUDARD (CEA/Irfu/SPhN)
as convener

Aim of our discussions:

We try here to **understand how to progress** to build good tools for "spallation observables"

There is **not A model emerging** as obviously better than others in all sectors …… and this is GOOD!

Since:

1. The needs are frequently different
   - Fast computing capability, specific interest (n?, chemical residues?...)
   - Generators (all channels computed and reasonable)
   - Physics behind. Our models as "classical reasonable backgrounds" for other researches (ie; physics of radioactive ions, specific few body channels as (p,2p) (p,pπ) …)
   - Extrapolation capabilities
2. Different approaches are needed for stimulation
   Weight between empirical or fitting approaches and more fundamental ones with few parameters.
3. There is large room for improvements sometimes still to invent!

Informal discussion, extension and comments of the previous talks

Three talks on intercomparison of models

1. We have very good tools — Common selection of experimental data; Models plotted in the same way

   (Pity that the lowest energy was not the same for excitation functions)

2. Plotting capability — May be too late for a full use of it

3. Figures of merit — Rigorous but difficult to use

   R. Michel annex to be investigated?

   More confidence in human judgment of experienced physicists

-> Judgment may be biased

So here is the right place for you to express a different view !

(Detailed comments on failures and success of the various models will appear during the week)

Judgment could be biased by the selection of data?

Targets (Pb and Fe, some U)

Projectiles p (n)   no π beams, light projectiles (d…α)

Range of energies (50 MeV… 1 GeV… 3 GeV)

Out going channels (d…α…Be double diff cross sections

Correlations of outgoing particles

…by the extension capability of models?

Beam energies: Higher (multi pions, various mesons…)

Lower (collective effects, giant resonances compound nucleus….)

Light targets: (as C, He…d?)

How to disentangle Cascade from De-excitation?

Specific data directly sensitive to the cascade

N above ~20-30 MeV
(also other light ions above E=?)

Residues close to the projectile

Specific reactions (p,2p) (p,pπ) etc.

De-excitation ALWAYS influenced by the cascade (+ pre-equilibrium)

In principle any coupling should be easy:

Cascade -> (Ar, Zr ,E* ,J , Pvect) -> De-excitation

This intermediate stage could (should?) be more analyzed?
…. but what is the real meaning of it?

When? At which stage we stop the cascade?

Do we have compensations between the end of the cascade and the beginning of the de-excitation?

More specifically what comes from….

Cascade: Interaction: Elastic; Inelastic (π and meson physics)

Target description: Shape; Medium considered at which level?

… **Pre-equilibrium** We all know the limits of cascade hypothesis transgressed!
….and the difficulties of non empirical P.E., angular distributions…

De-excitation Evaporation: Weisskopf-Ewing, Hausser-Feshbach, intermediate?

Fission: "Classical fission" symmetric and asymmetric in mass
(here U and Pb targets helps!)

Binary decay "à la Moretto"

Multifragmentation: (Various beam energies are helpful!)

(An additional difficulty is that the 3 points are linked together)

Could we do something more to disentangle these various contributions?

(There is an experimental aspect which will be treated later in the workshop (S. Leray)