Decay Heat After One Fission Pulse

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(Calculations courtesy of T. Yoshida)
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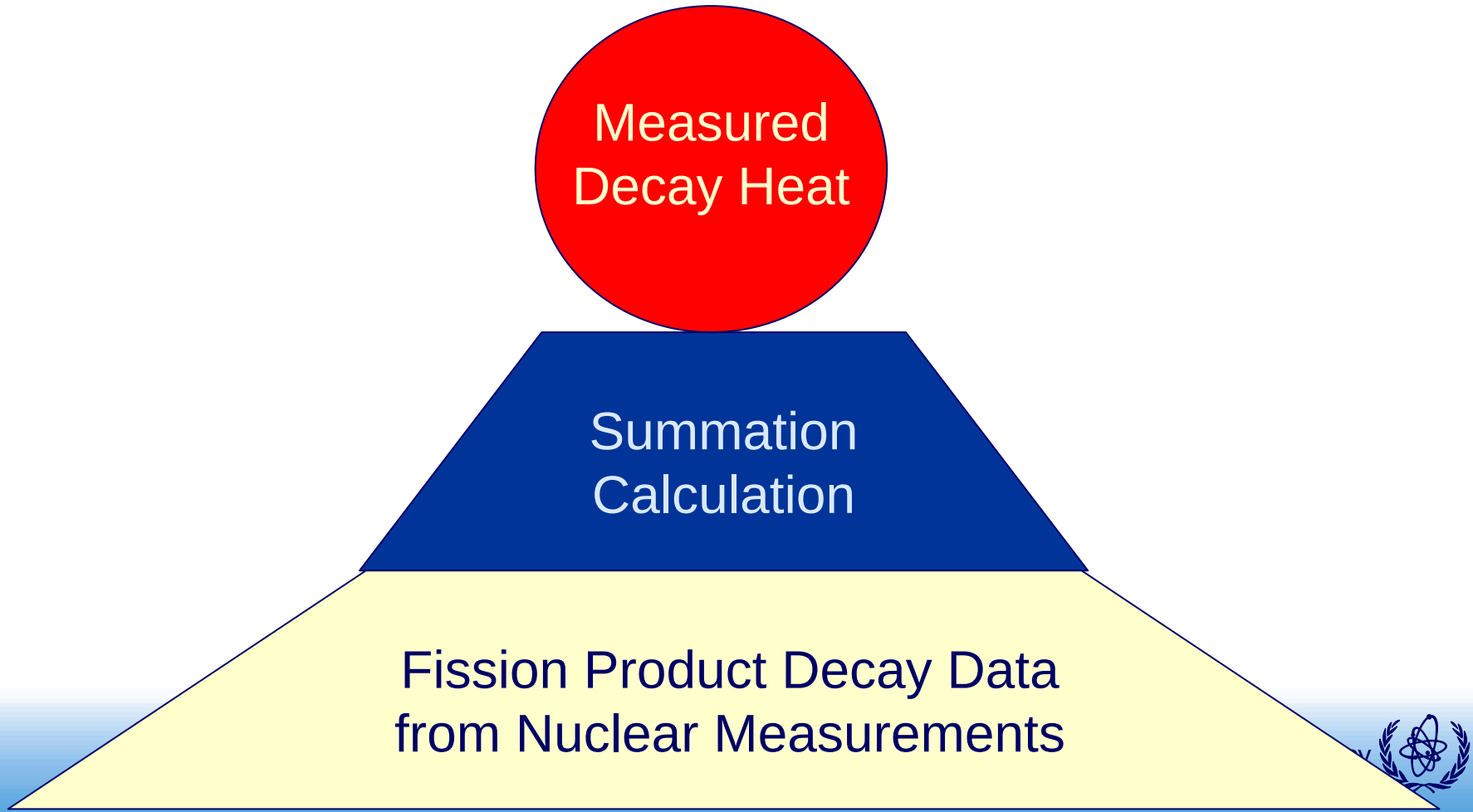
Our Objective:

Achieve an Ideal Situation for the Summation Calculation of the Fission Product Decay Heat



Summation Calculation of FP Decay Heat

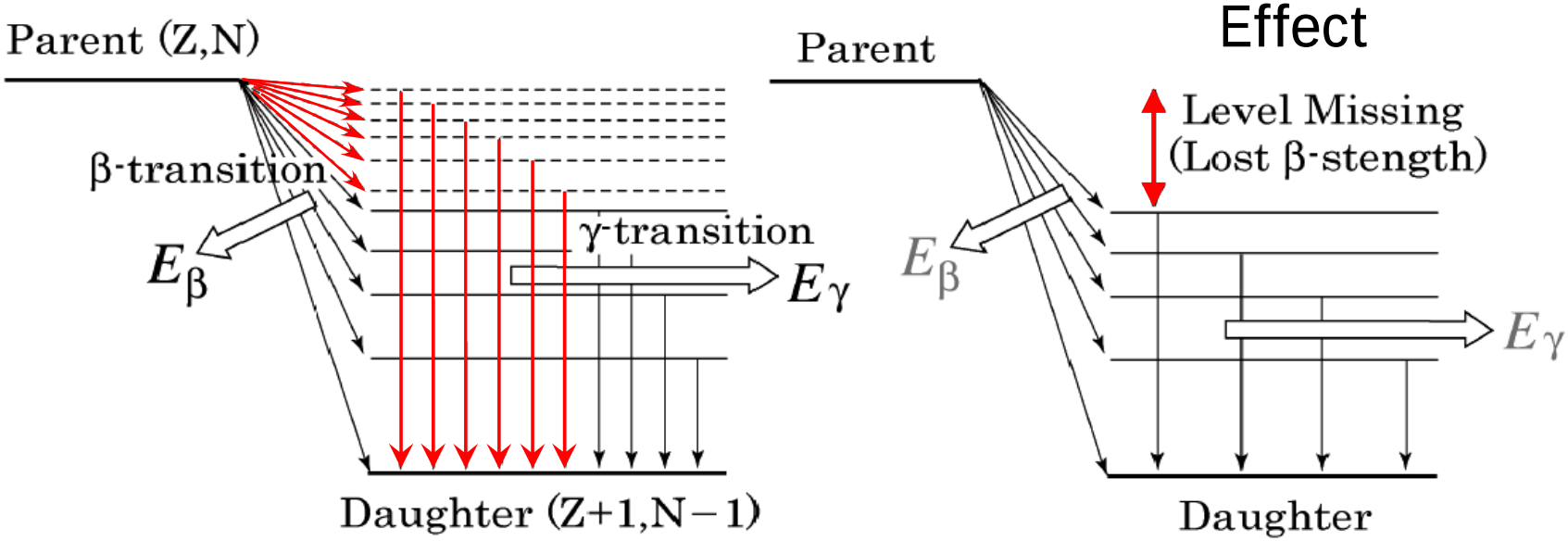
$P_\beta(t) = \sum \lambda_i N_i E^i_\beta$ (β-ray Component)

$P_\gamma(t) = \sum \lambda_i N_i E^i_\gamma$ (γ-ray Component)

λ_i : Decay Constant

E^i_β, E^i_γ : Average β- and γ-ray energy per decay

The Pandemonium Effect



The Pandemonium Effect

Resulting from high energy gammas not being measured (Ge detector limitations) resulting in:

- no evidence for the highest levels,
- no allocation of beta transitions to highest levels,

and hence:

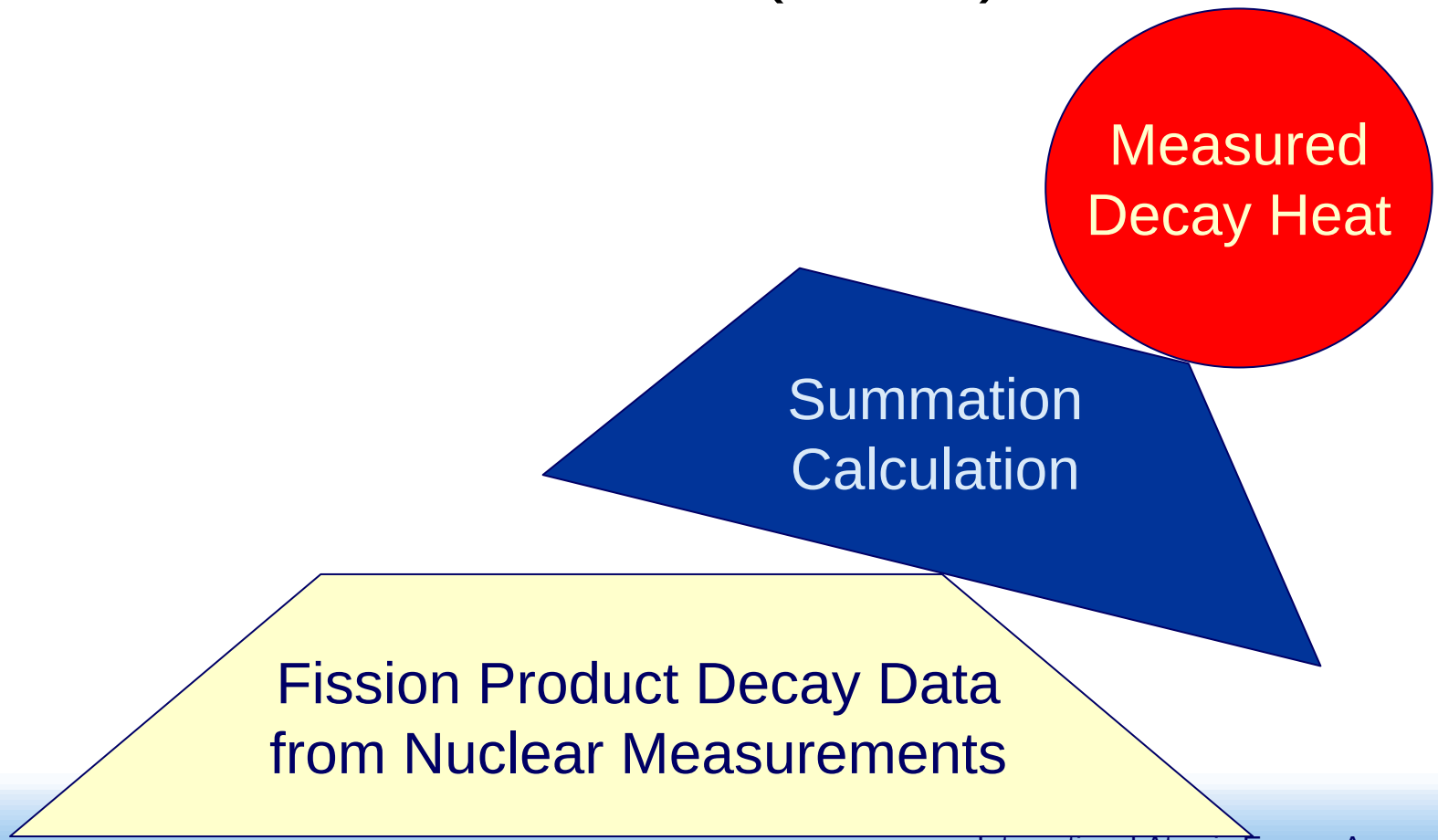
- missing depopulation via high energy gammas,

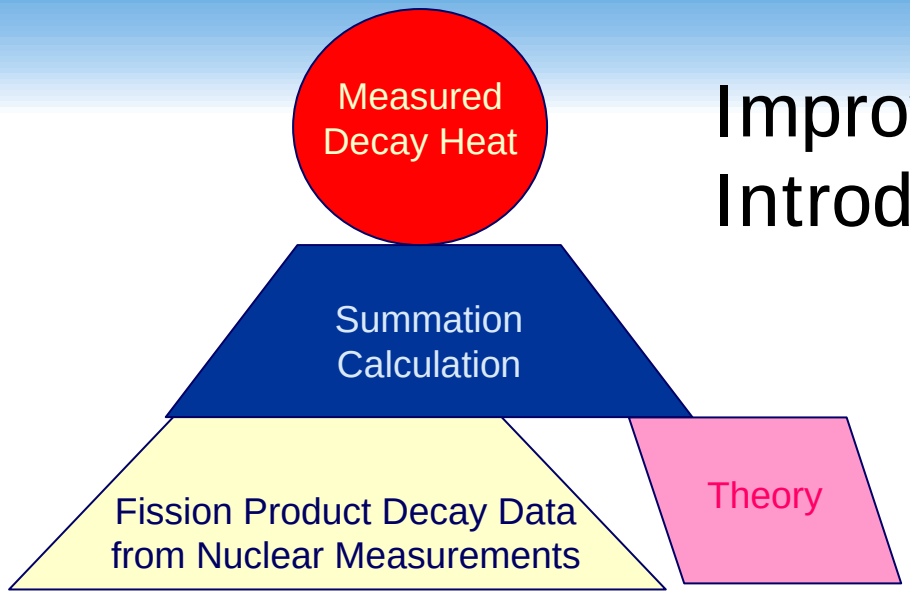
therefore;

- increased beta energies in the balancing of decay scheme.

Early Stage of the FPDD File Development

At the end of 1970's: JNDC(JENDL), UKFPDD, ENDF-B

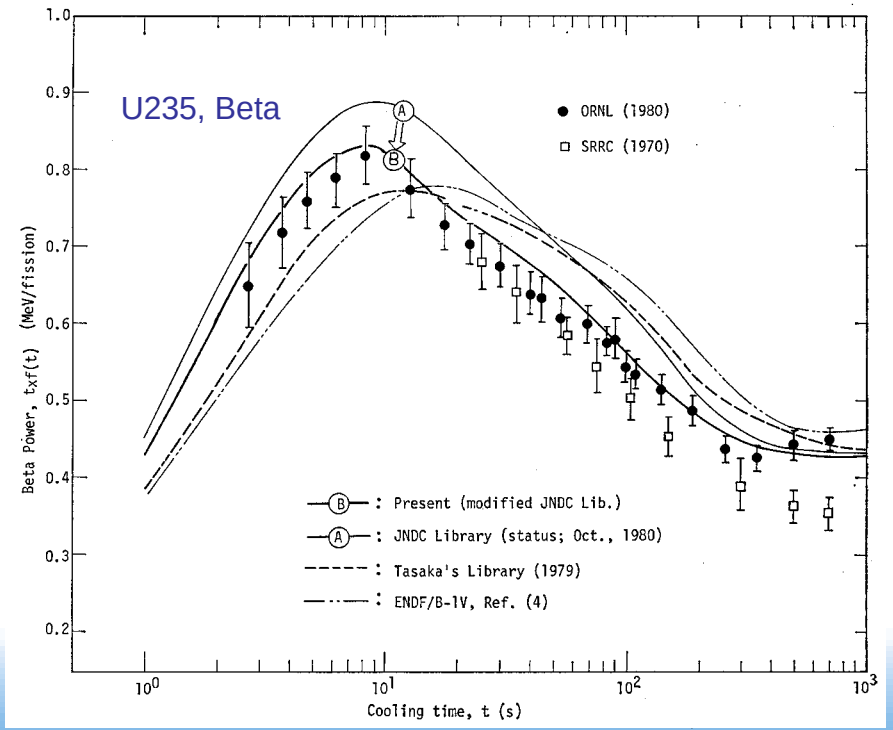


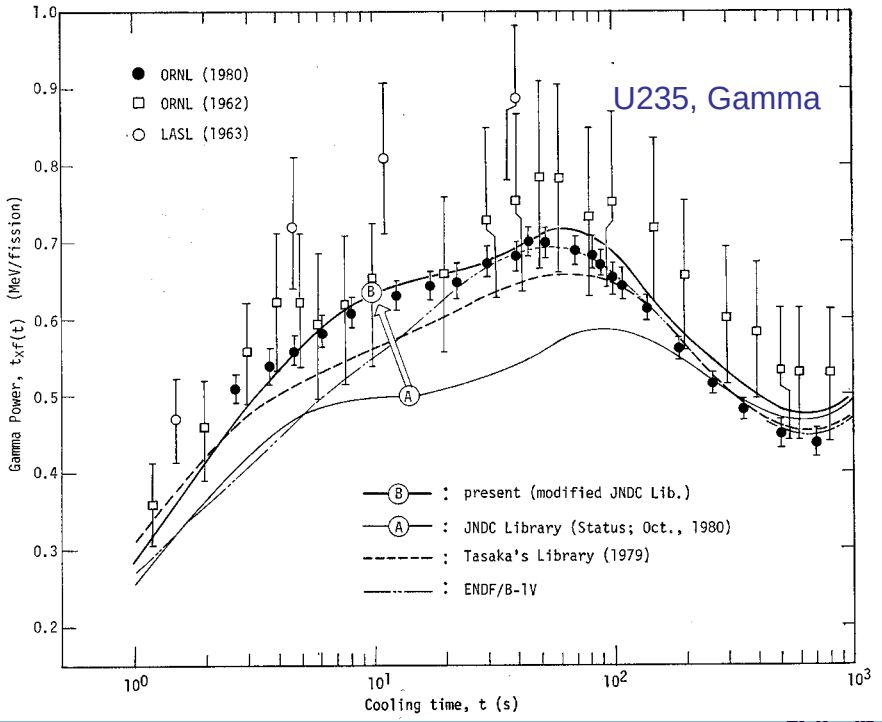


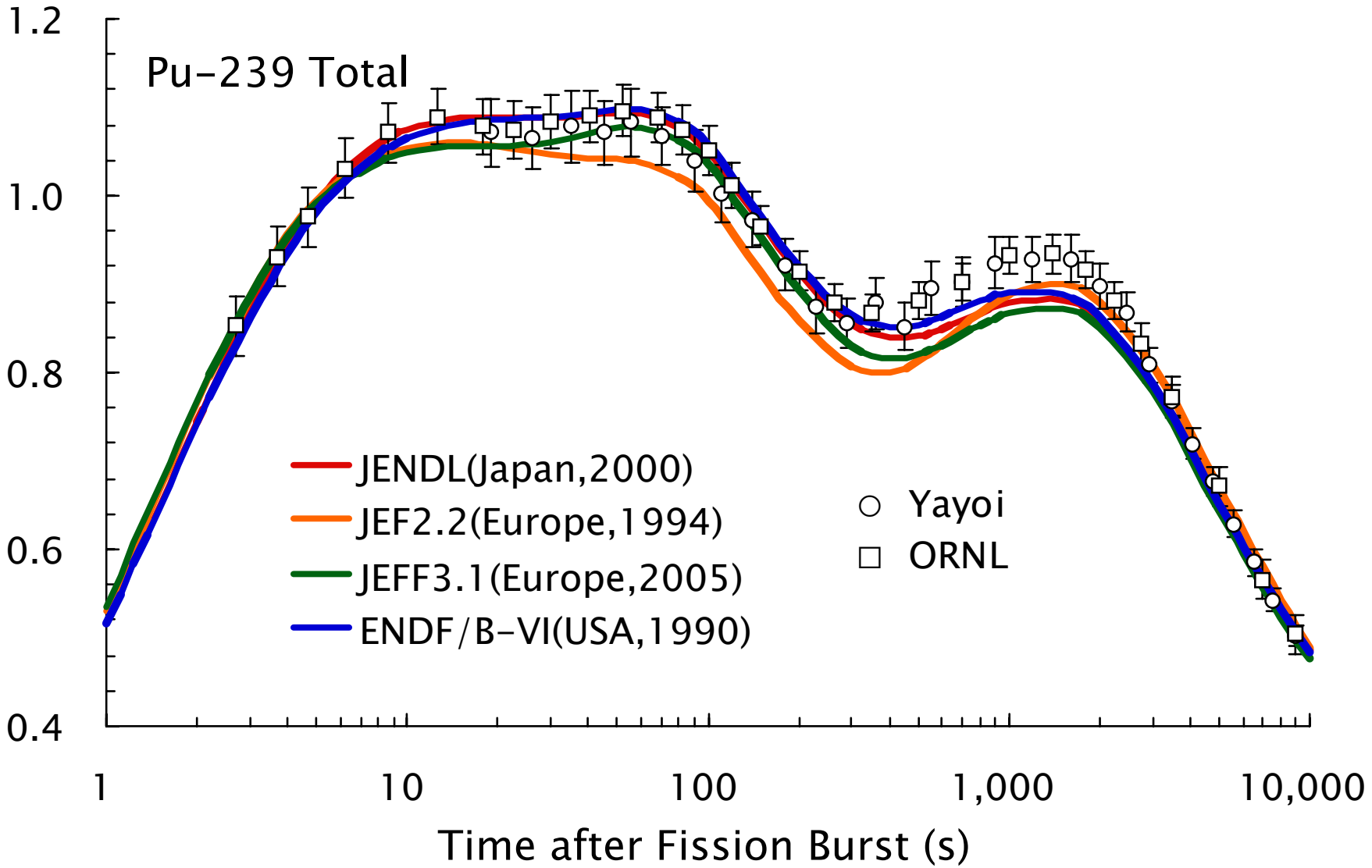
Improvement Achieved by Introduction of Beta-decay Theory

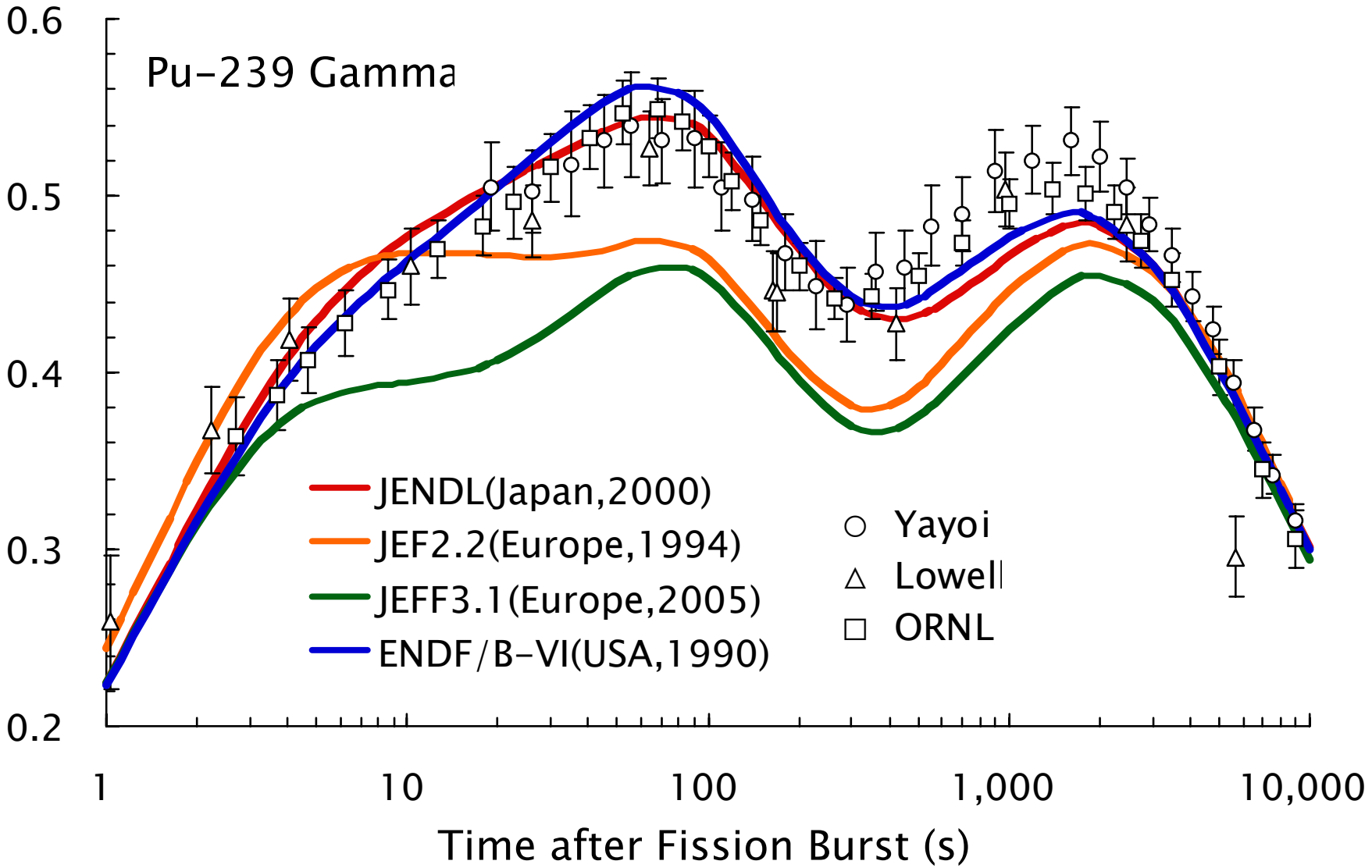
JENDL, ENDF/B-V,-VI

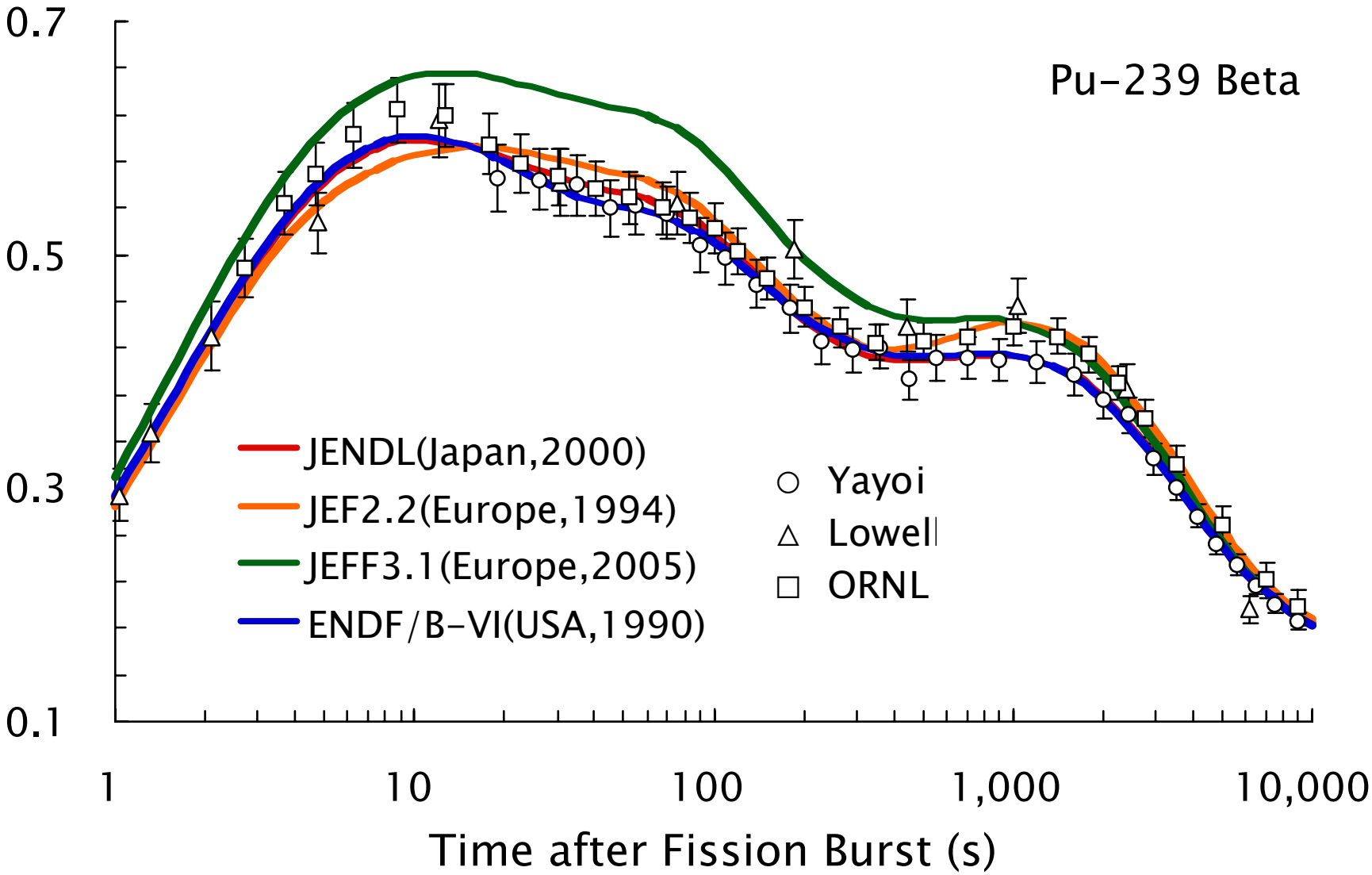
Gross Theory of Beta-decay

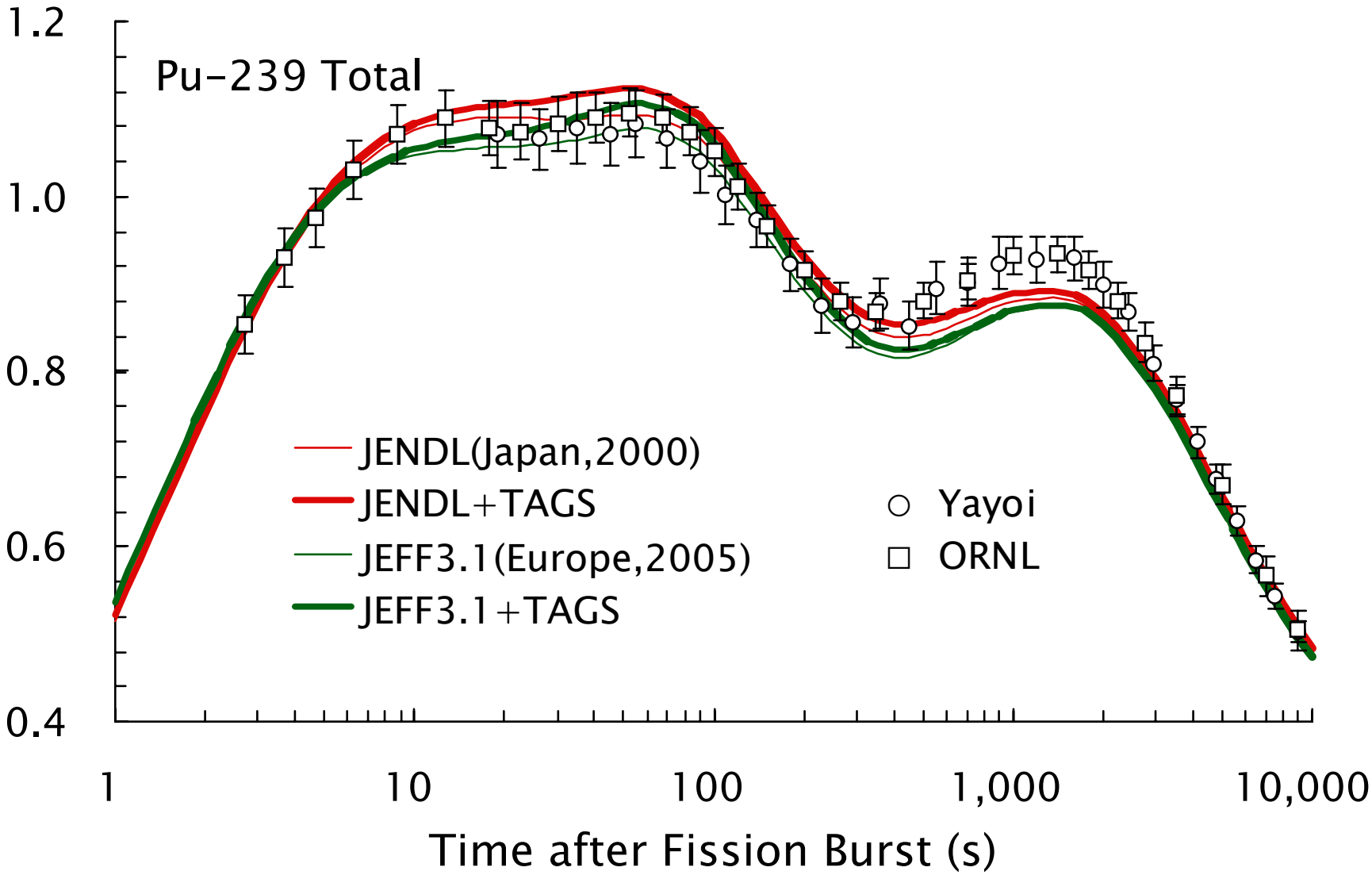


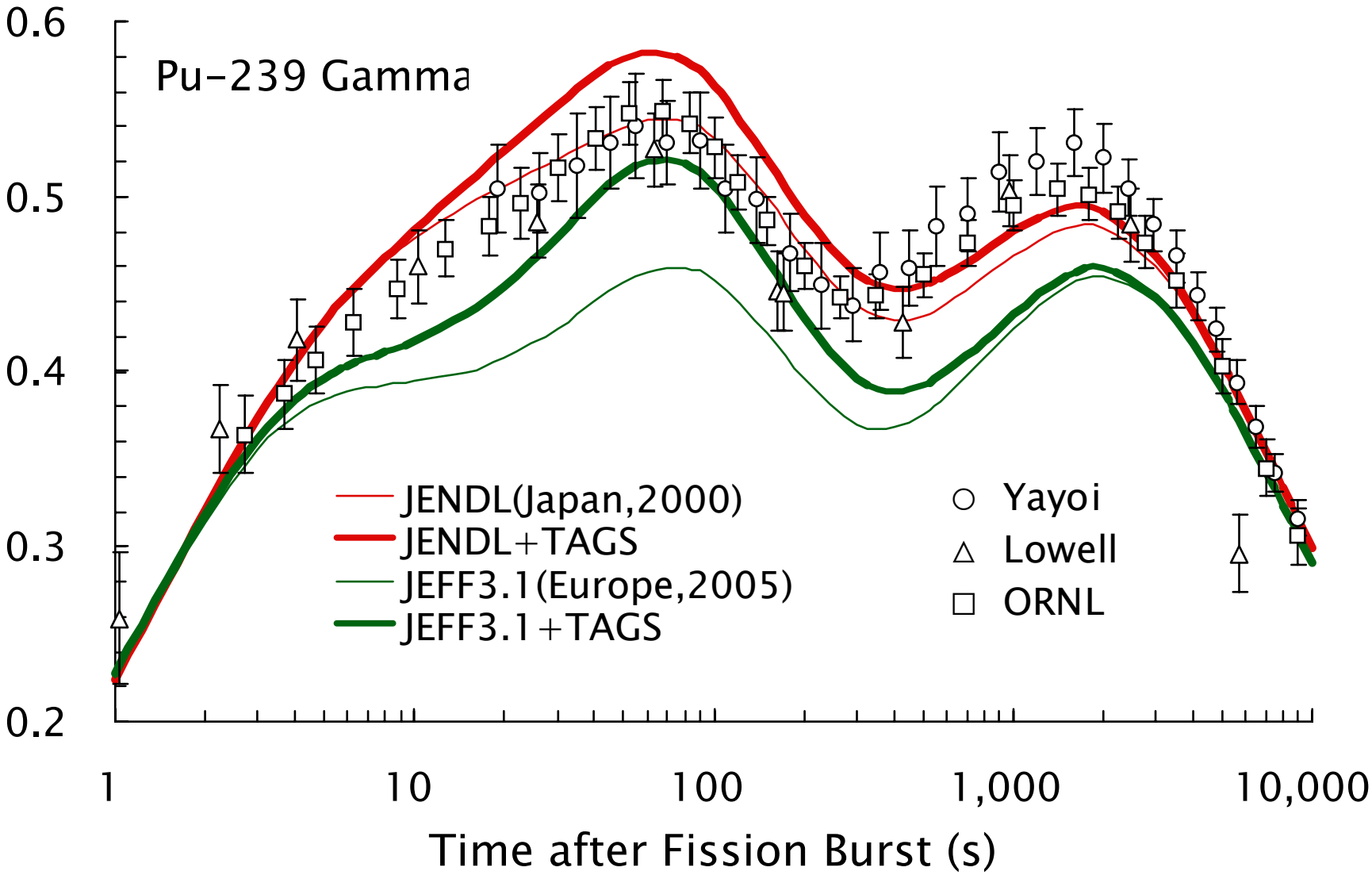



Pu-239 Total
1.2
1.0
0.8
0.6
0.4
1
10
100
1,000
10,000
Time after Fission Burst (s)
JENDL(Japan,2000)
JEF2.2(Europe,1994)
JEFF3.1(Europe,2005)
ENDF/B-VI(USA,1990)
Yayoi
ORNL

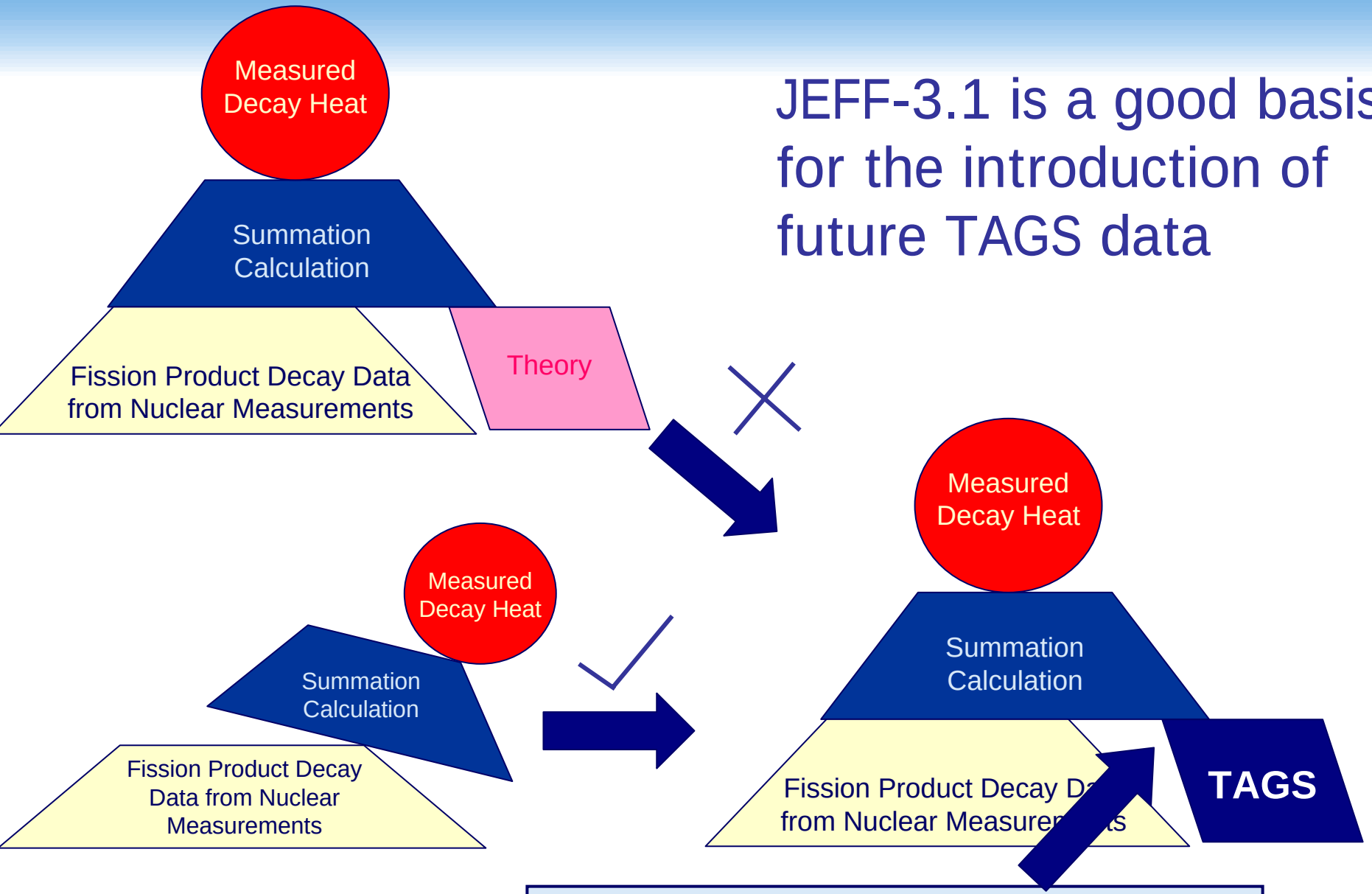

Pu-239 Gamma
0.6
0.5
0.4
0.3
0.2
1
10
100
1,000
10,000
Time after Fission Burst (s)
JENDL(Japan,2000)
JEF2.2(Europe,1994)
JEFF3.1(Europe,2005)
ENDF/B-VI(USA,1990)
Yayoi
Lowell
ORNL


Pu-239 Beta
0.7
0.5
0.3
0.1
JENDL(Japan,2000)
JEF2.2(Europe,1994)
JEFF3.1(Europe,2005)
ENDF/B-VI(USA,1990)
Yayoi
Lowell
ORNL
1
10
100
1,000
10,000
Time after Fission Burst (s)


Pu-239 Total
1.2
1.0
0.8
0.6
0.4
JENDL(Japan,2000)
JENDL+TAGS
JEFF3.1(Europe,2005)
JEFF3.1+TAGS
Yayoi
ORNL
1
10
100
1,000
10,000
Time after Fission Burst (s)


Pu-239 Gamma
0.6
0.5
0.4
0.3
0.2
JENDL(Japan,2000)
JENDL+TAGS
JEFF3.1(Europe,2005)
JEFF3.1+TAGS
Yayoi
Lowell
ORNL
1
10
100
1,000
10,000
Time after Fission Burst (s)

JEFF-3.1 is a good basis for the introduction of future TAGS data



Gap to be filled by future TAGS