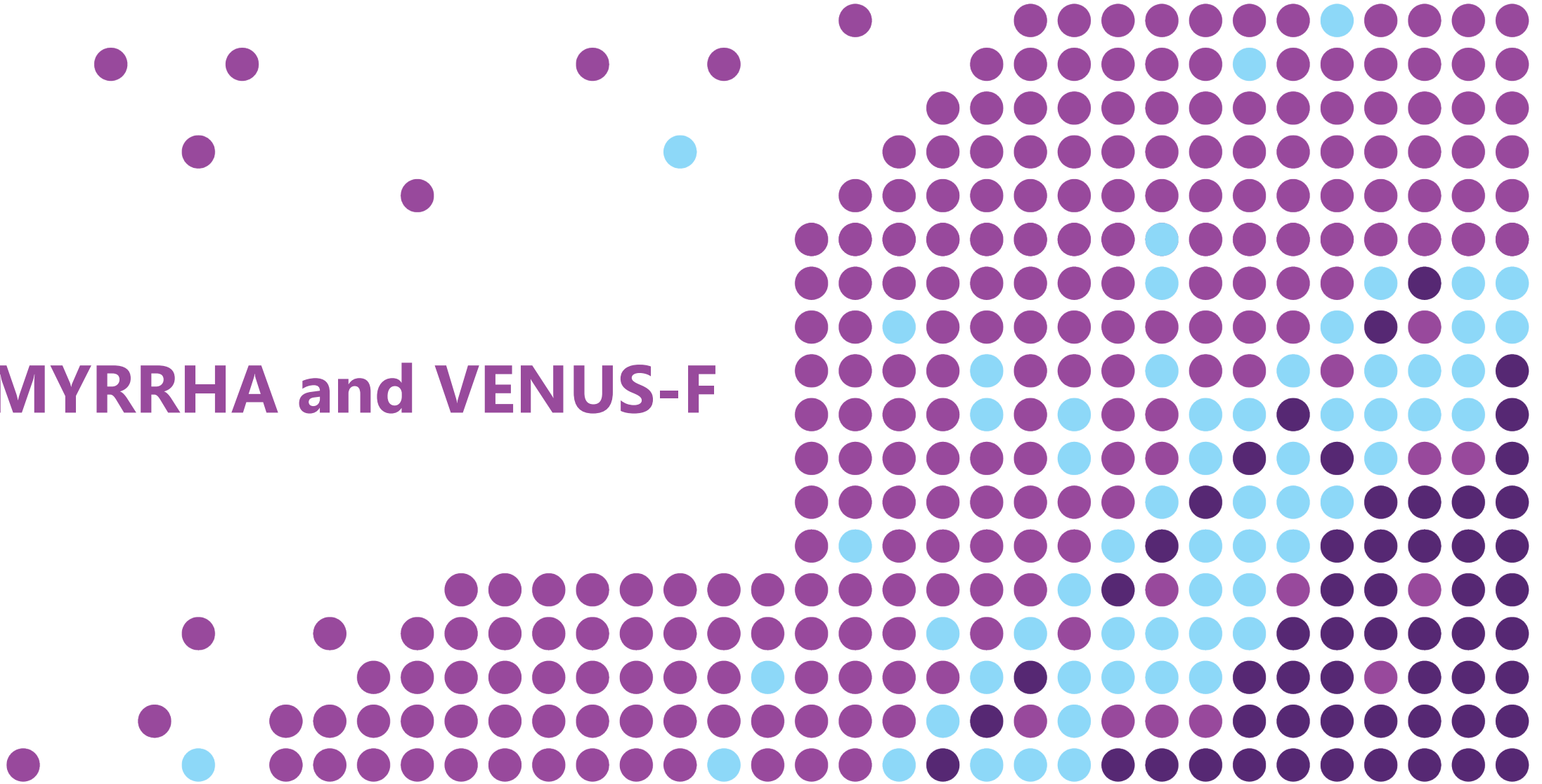


Federico Grimaldi - 23/05/2023

federico.grimaldi@sckcen.be

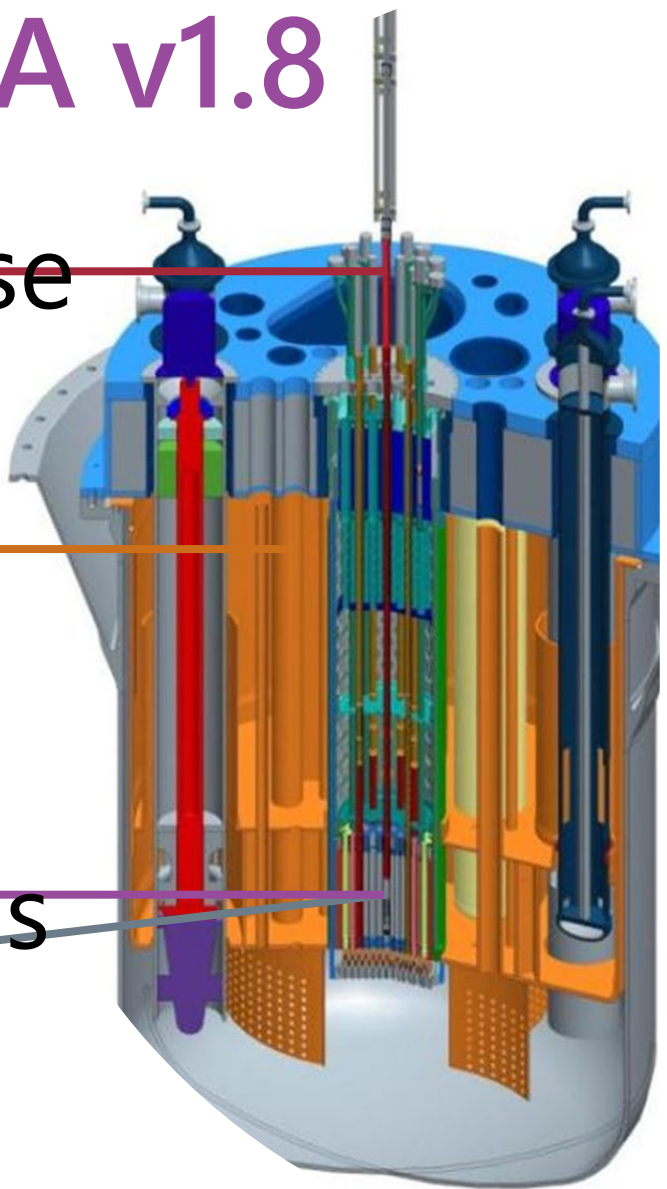
Neutron data benchmarking at the VENUS-F zero power reactor for MYRRHA

MYRRHA and VENUS-F



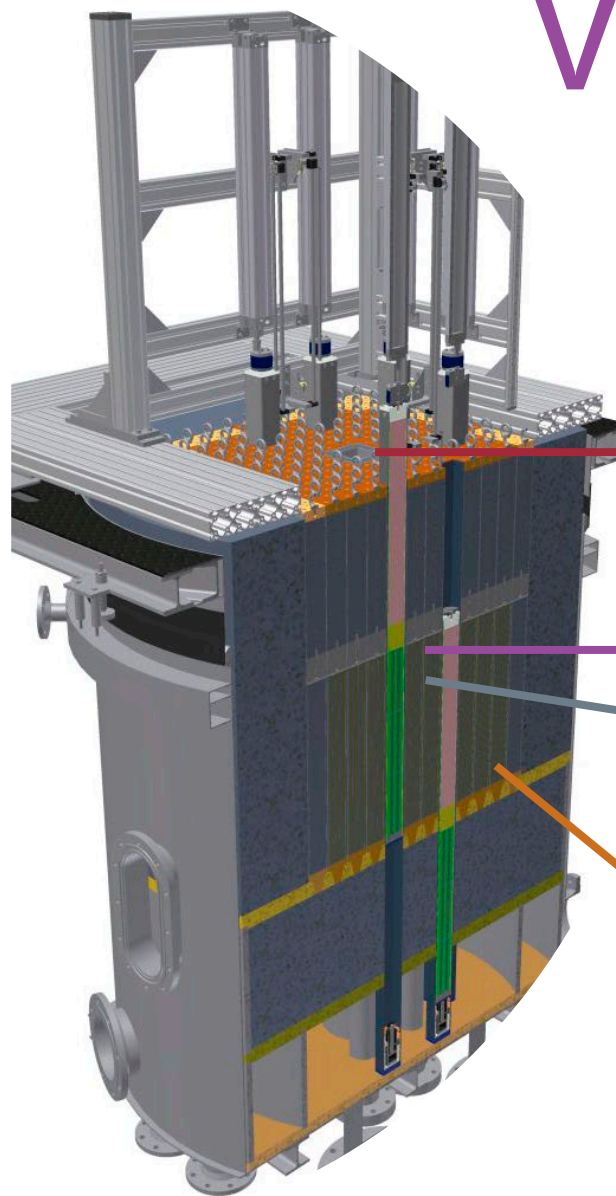
MYRRHA v1.8

ADS
Multipurpose
hybrid
Research
Reactor for
High-Tech
applications
source



VENUS-F

VENUS
Fast
ADS
Zero power
source
Pb + Bi



What do we do at VENUS-F?

Measures of:

- Online subcriticality monitoring
- Criticality
- Control rod worth
- Void effects
- Reaction rate (and spectral indices)
- ...

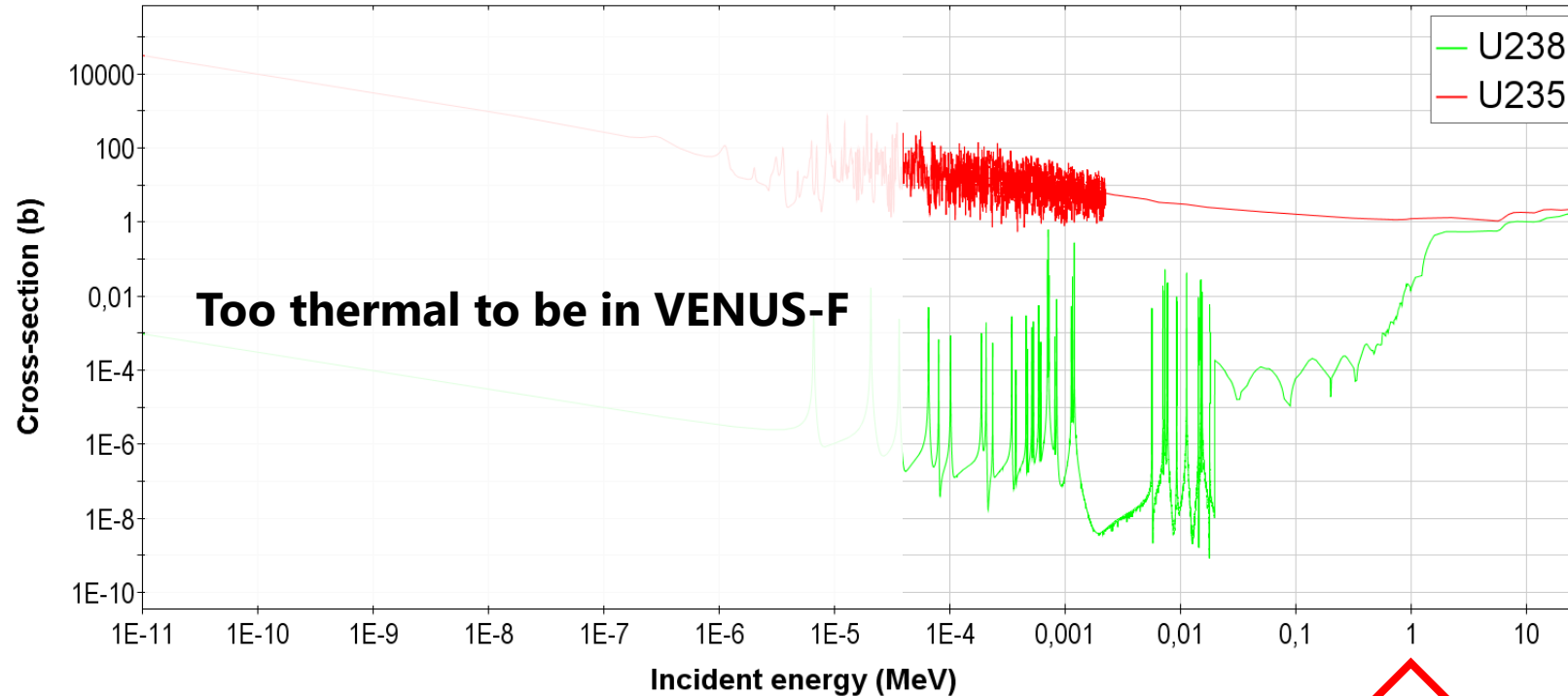
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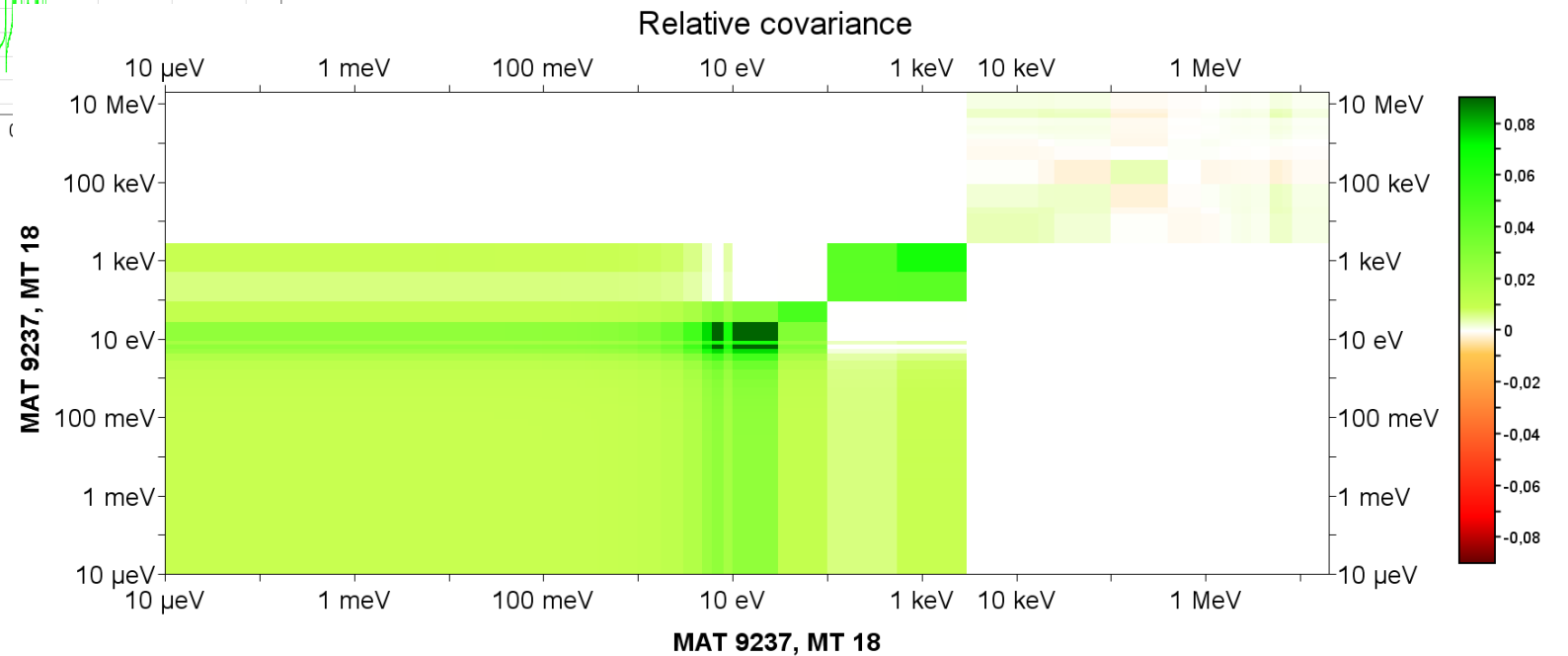
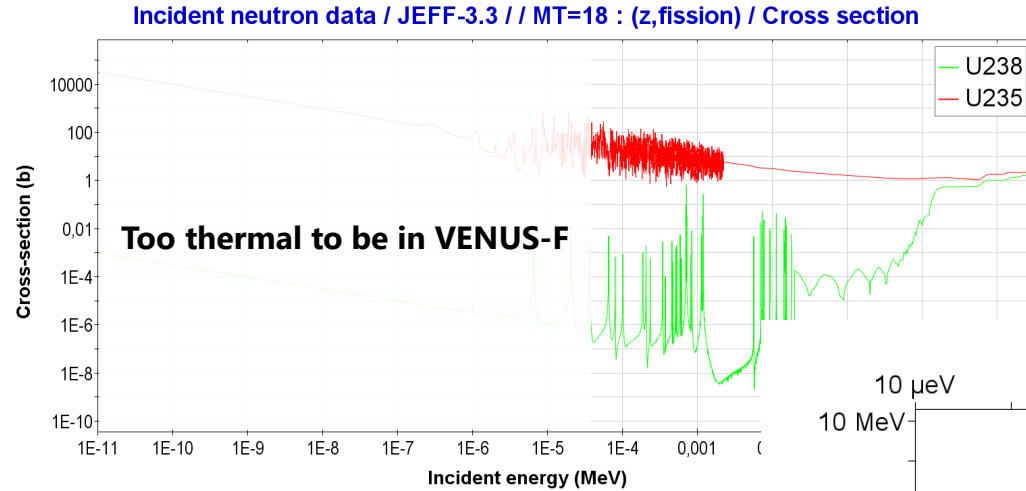
Nuclear data and use

An example of nuclear data

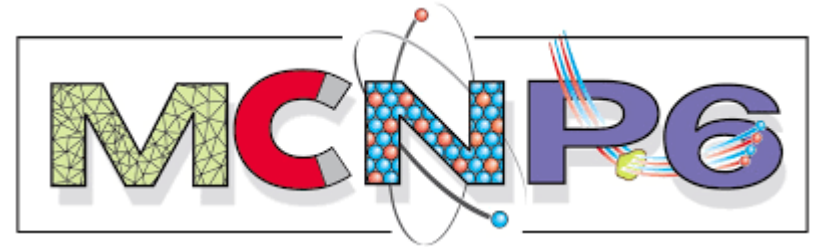
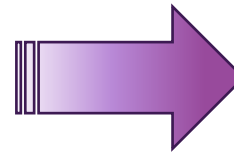
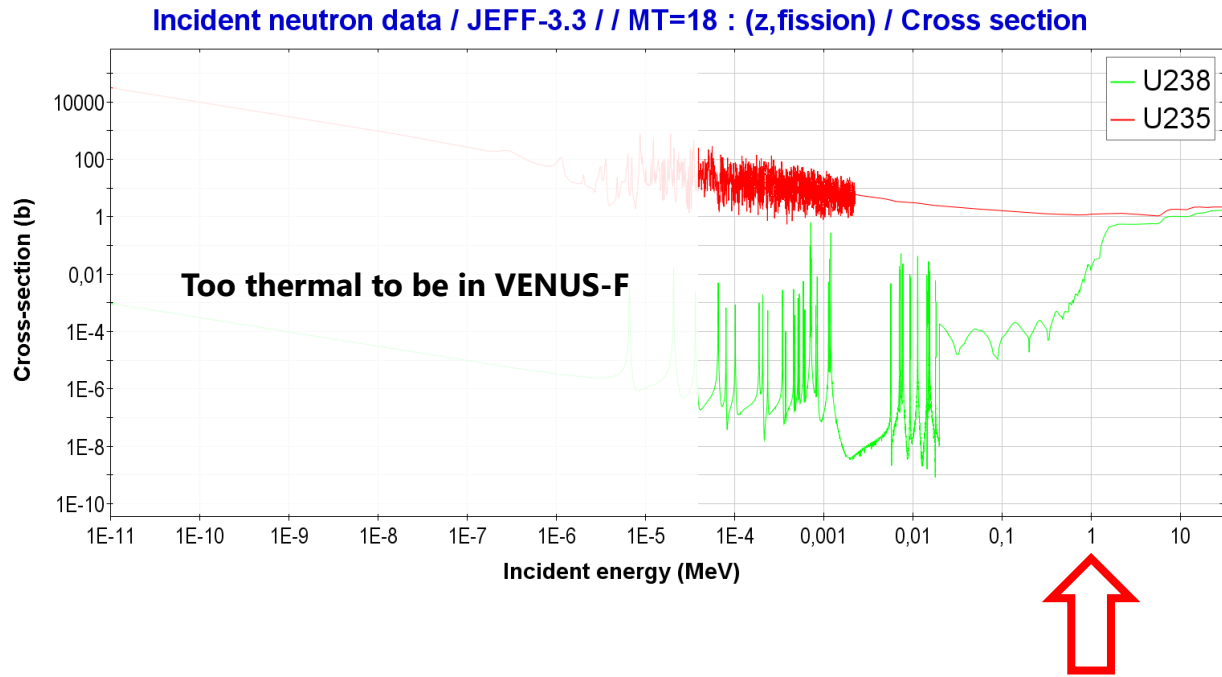
Incident neutron data / JEFF-3.3 // MT=18 : (z,fission) / Cross section



An example of nuclear data



An example of nuclear data use

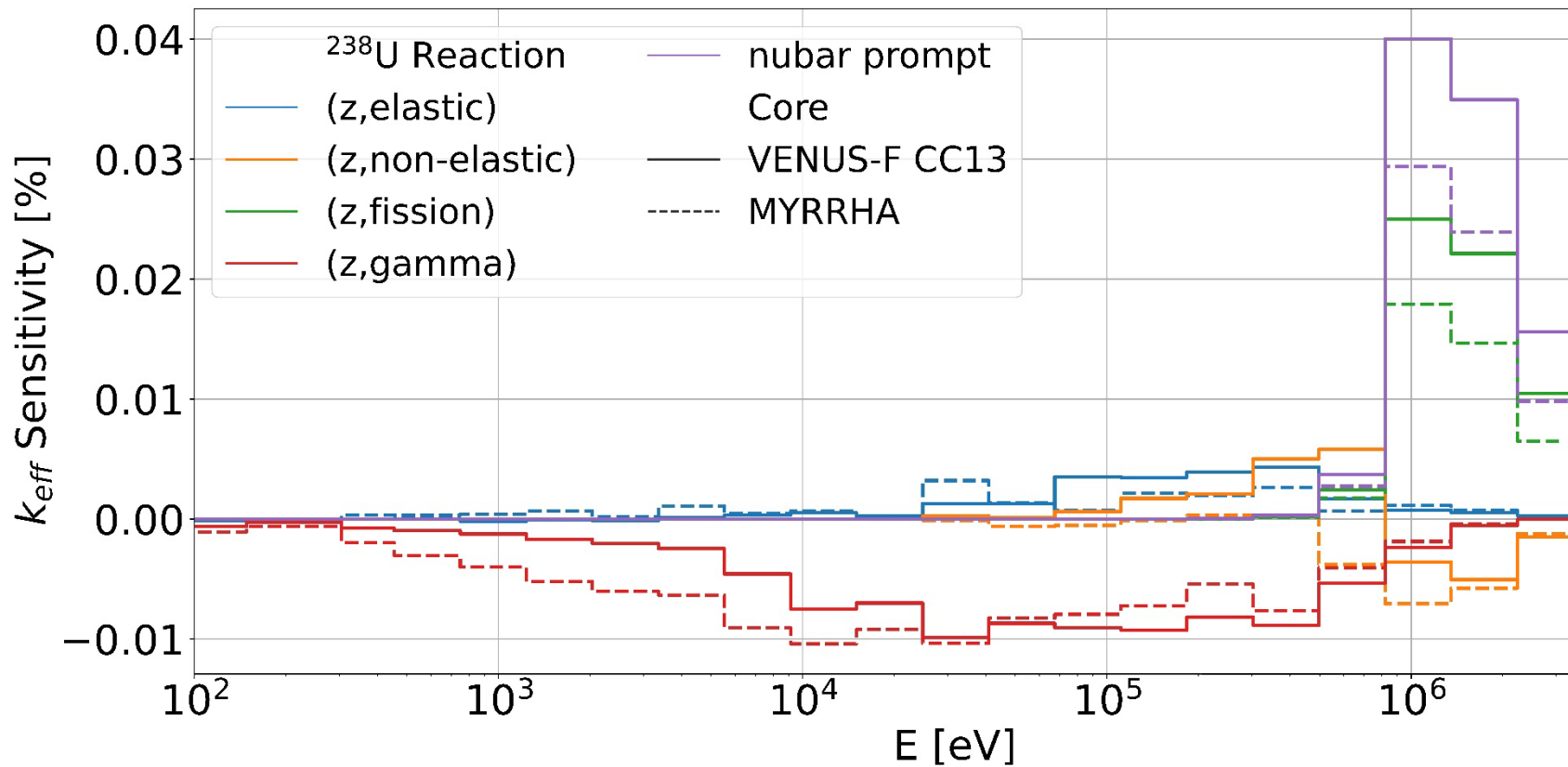


Serpent

a Continuous-energy Monte Carlo neutron and photon transport code

Sensitivity

^{238}U

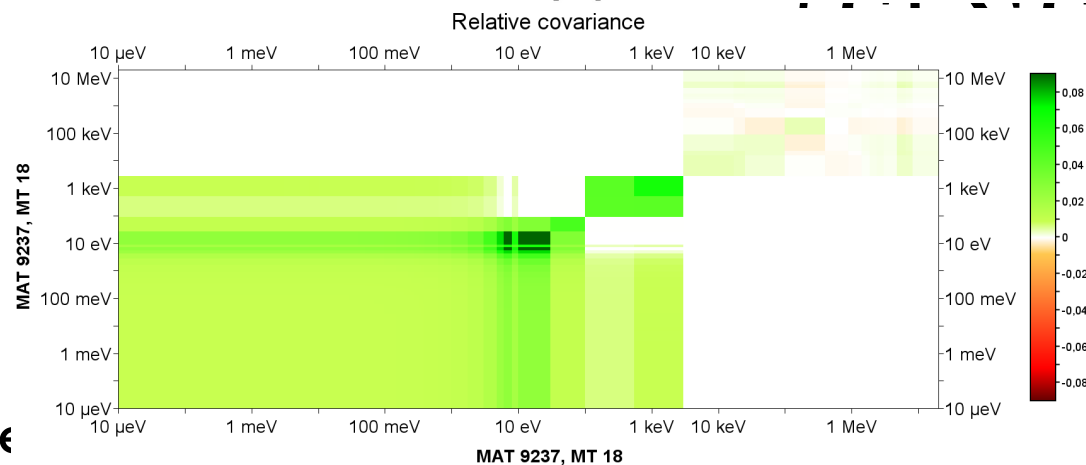
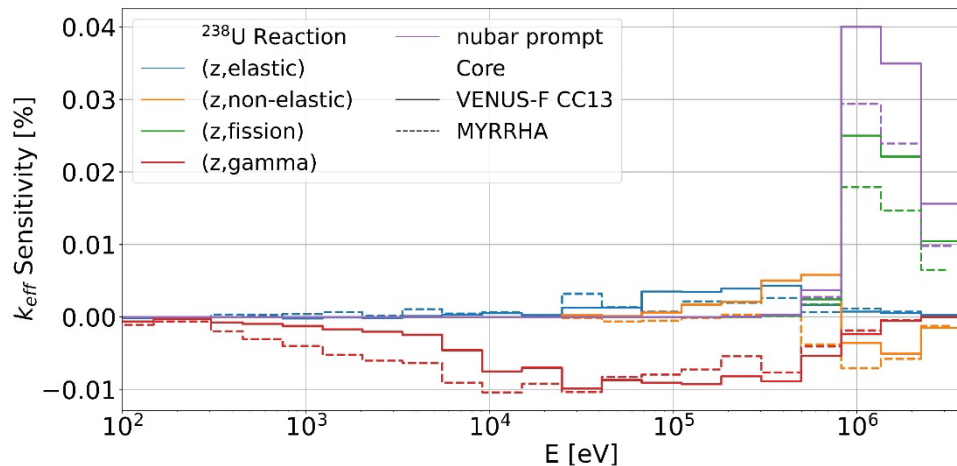


How to compare VENUS-F and MYRRHA?



Representativity

How similar is VENUS-F to the MYRRHA design model?



$$\frac{\Sigma S_M}{\sqrt{S_M^t \Sigma S_M}}$$

Representativity use

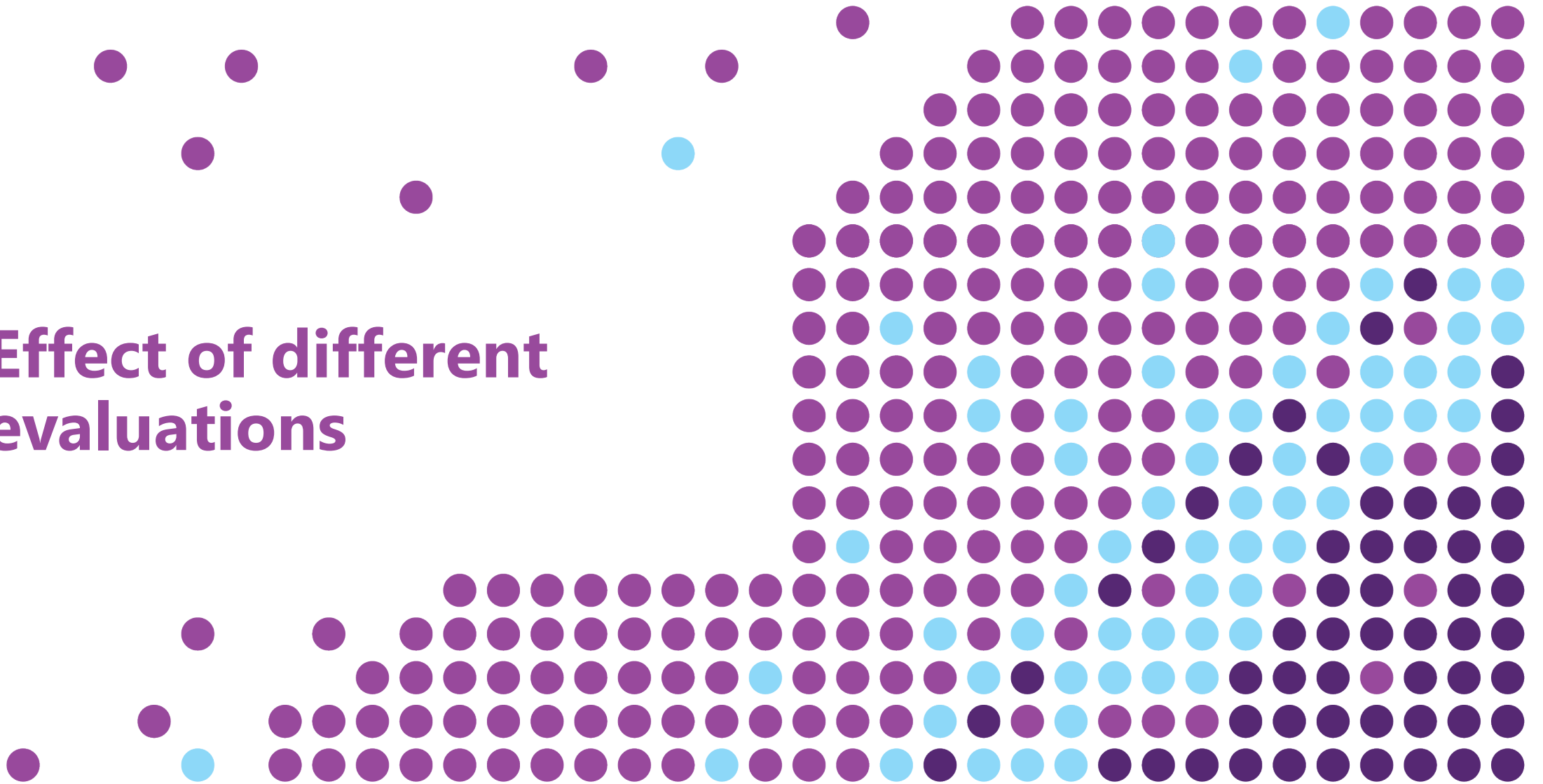
Assessment

- Representativity of past designs
- Past experiments
- Benchmarking

Design

- MOX core loadings
- Tailored experiments
- Support of nuclear data evaluation

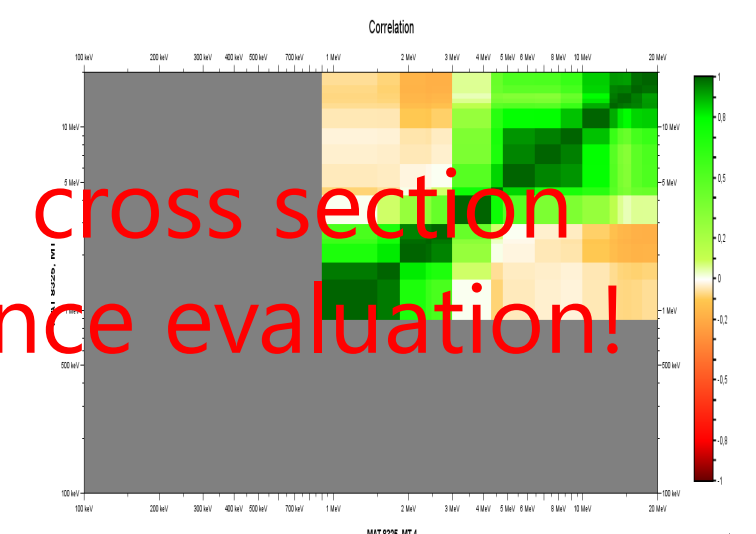
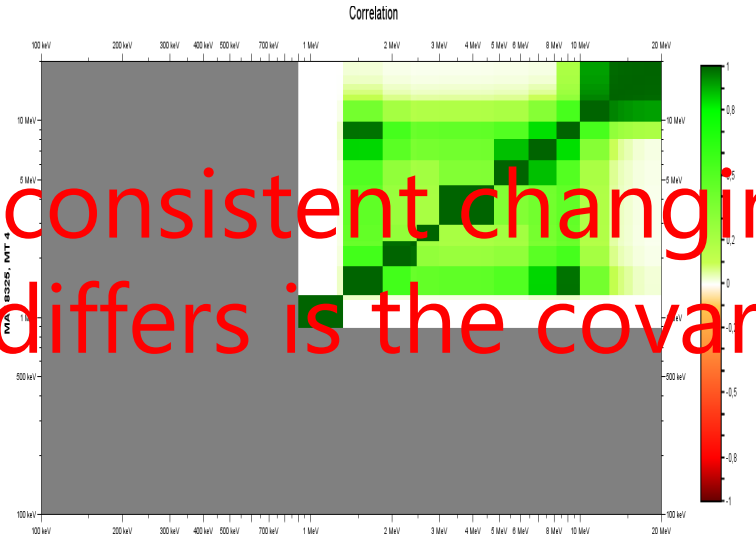
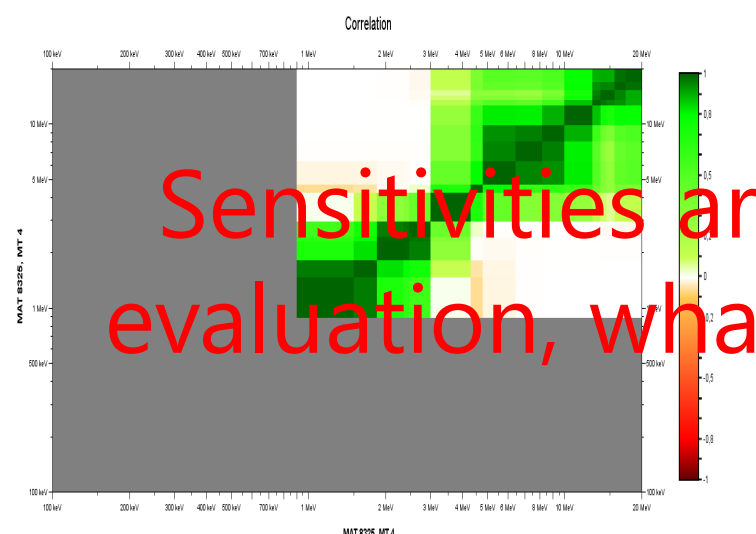
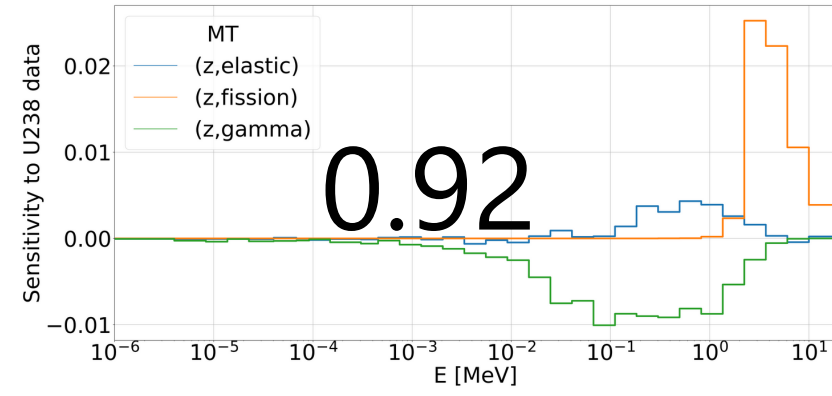
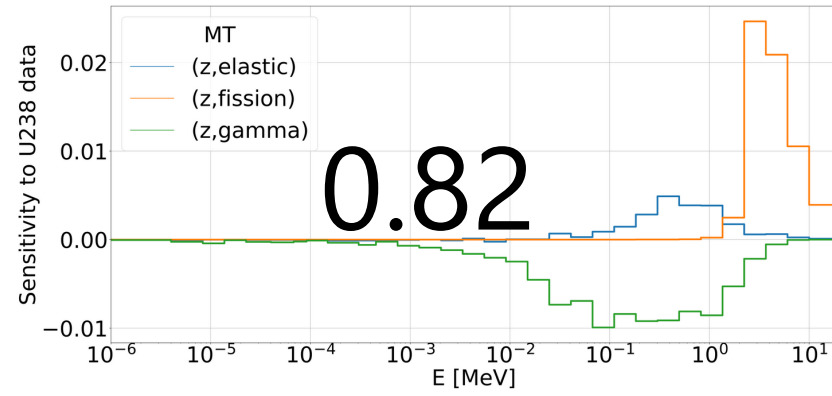
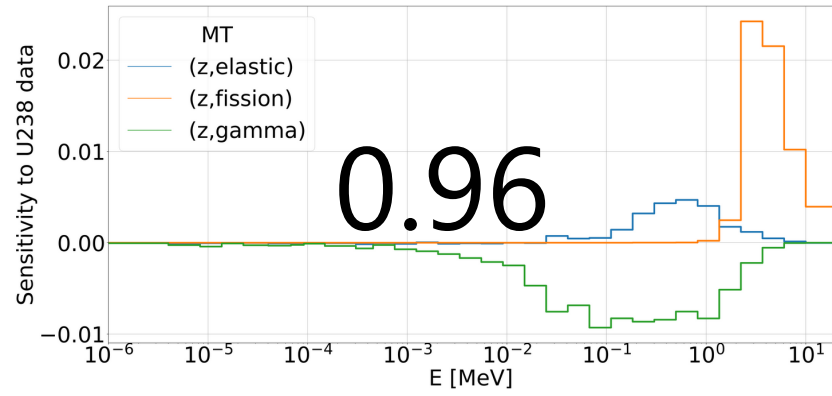
Effect of different evaluations



JEFF-3.3

ENDF/B-VIII.0

JENDL-4.0u



Sensitivities are consistent changing cross section evaluation, what differs is the covariance evaluation!

Conclusions

- The k_{eff} Sensitivity profiles computed with different nuclear data libraries are rather consistent
- Big differences from the evaluated covariance matrices and their availability
- k_{eff} representativity of VENUS-F CC13 to MYRRHA v1.8:
About 0.96 (JEFF-3.3); 0.82 (ENDF/B-VIII.0); 0.92 (JENDL-4.0u)
- MOX experiments are planned at VENUS-F

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