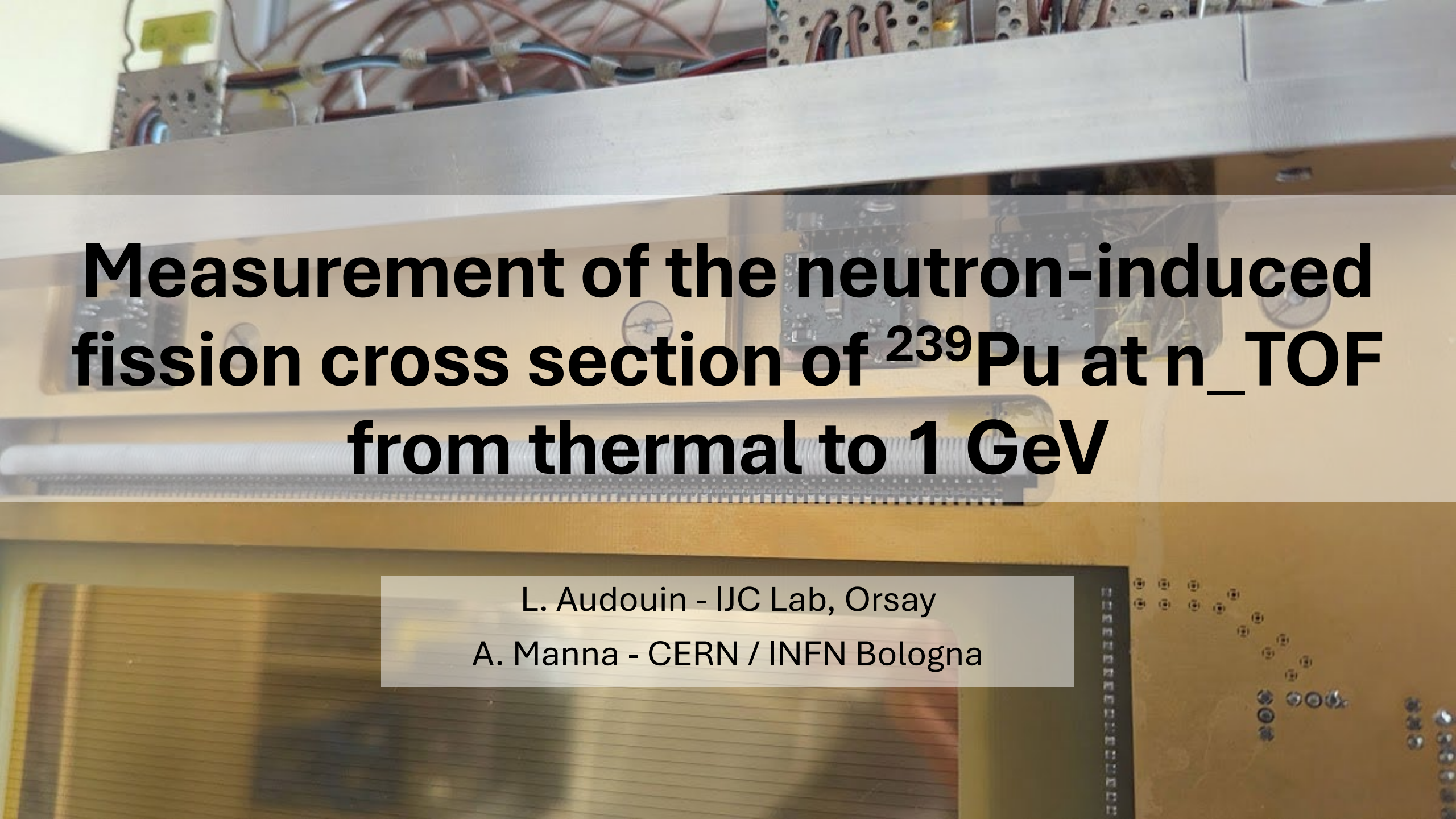


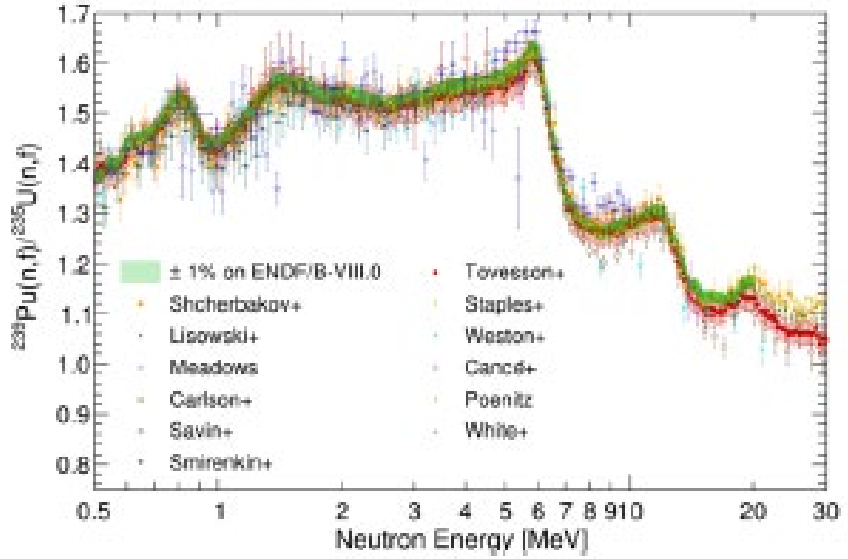
Measurement of the neutron-induced fission cross section of ^{239}Pu at n_TOF from thermal to 1 GeV

L. Audouin - IJC Lab, Orsay

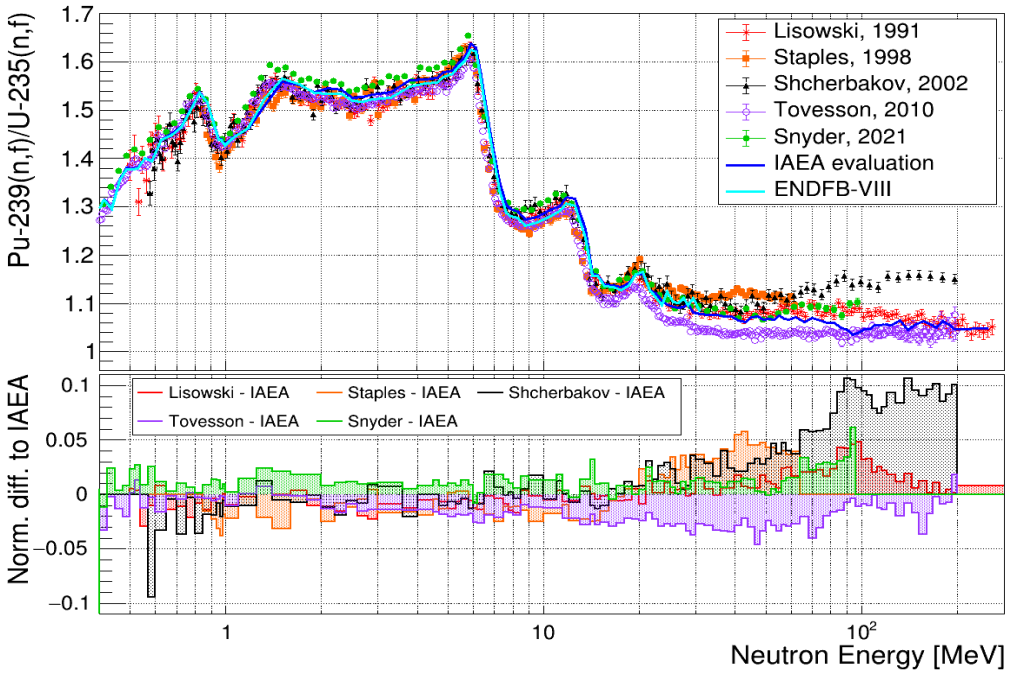
A. Manna - CERN / INFN Bologna

Context and motivation

- Specific importance of $^{239}Pu/^{235}U$ (n,f) XS

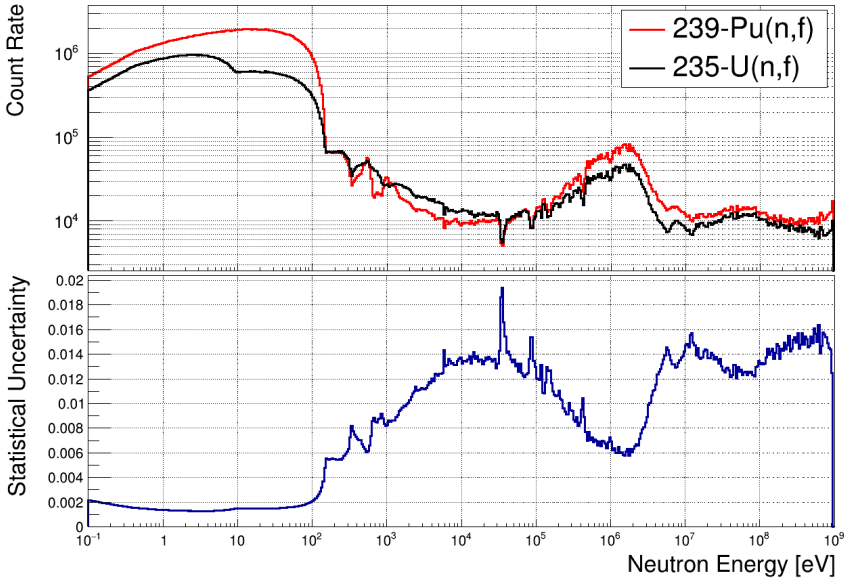


- Many measurements (and evaluations)… but:
  - Old measurements lack information
  - Undocumented uncertainties (data spread)
  - Either limited energy range…
  - … or just shape measurements
- Snyder et al., fission-TPC (Los Alamos)
  - 100 keV to 100 MeV, slightly above evaluation
- Qiu et. al, ionization chamber (CSNS)
  - 4 keV to 100 MeV, error bars >3%

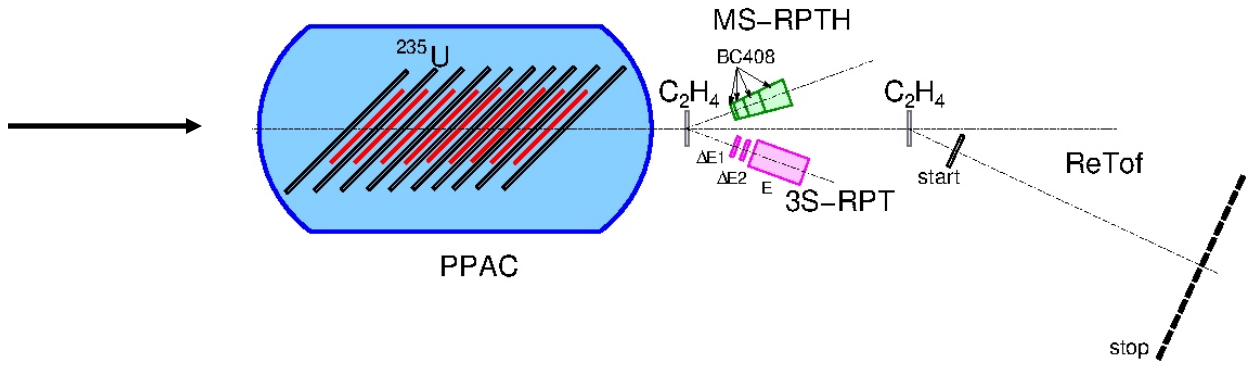


Objectives

- **Measurement of f-XS ratio ^{239}Pu/^{235}U**
- **Unprecedented energy range: th to 1 GeV**
- **Systematic uncertainty ~ 2%**



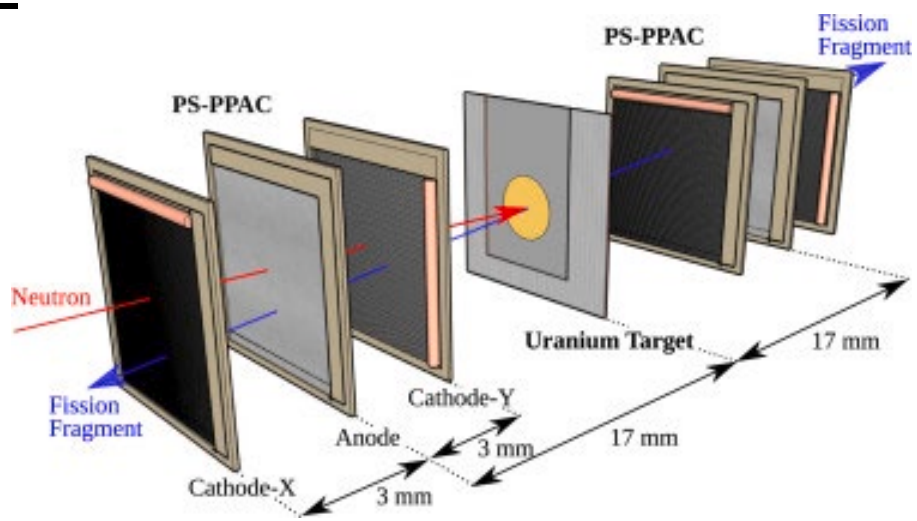
- Possibility to include 1 target (high-energy standards : ^{232}Th, ^{238}U or Bi)
- Additional normalization against (n,p) cross section

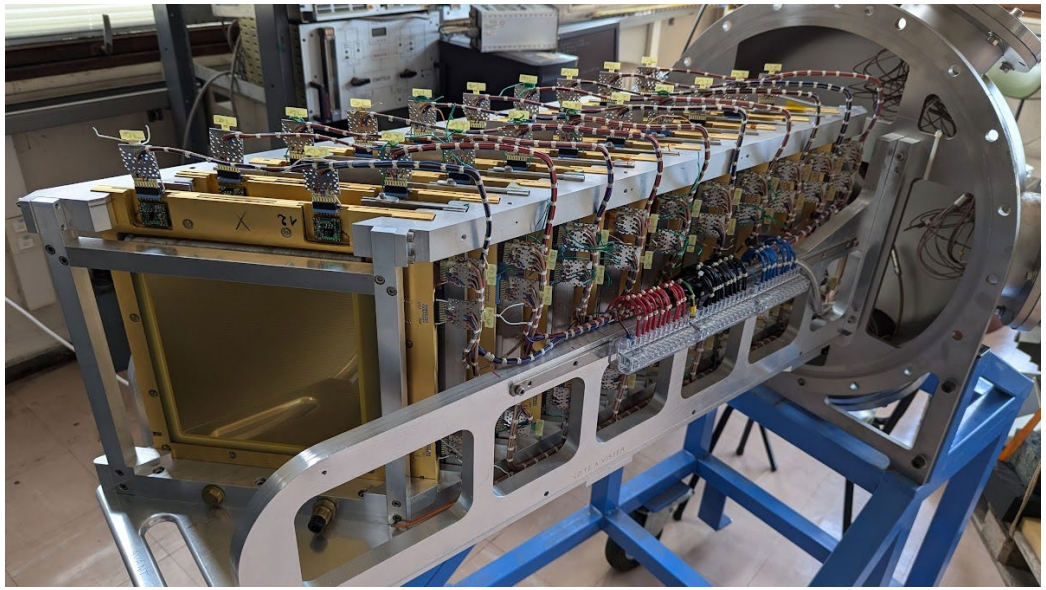


Method : PPAC stack @ n_TOF

- Parallel Plates Avalanche Counters
  - Timing + position
  - Very low budget material

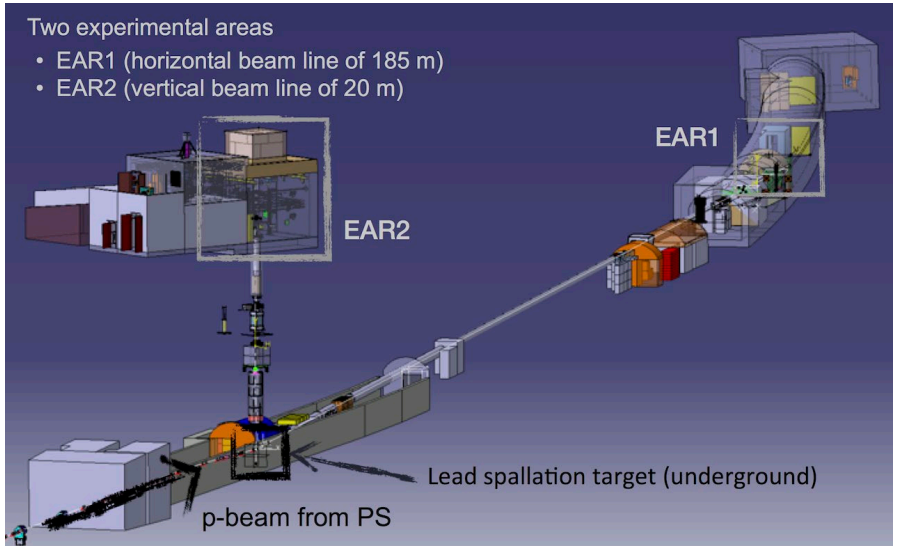
- 10 detectors, 9 targets
  - Coincidence : fission discrimination
  - Tracking : angular distribution
  - Excellent timing
  - Redundancy
  - Self-determined efficiency

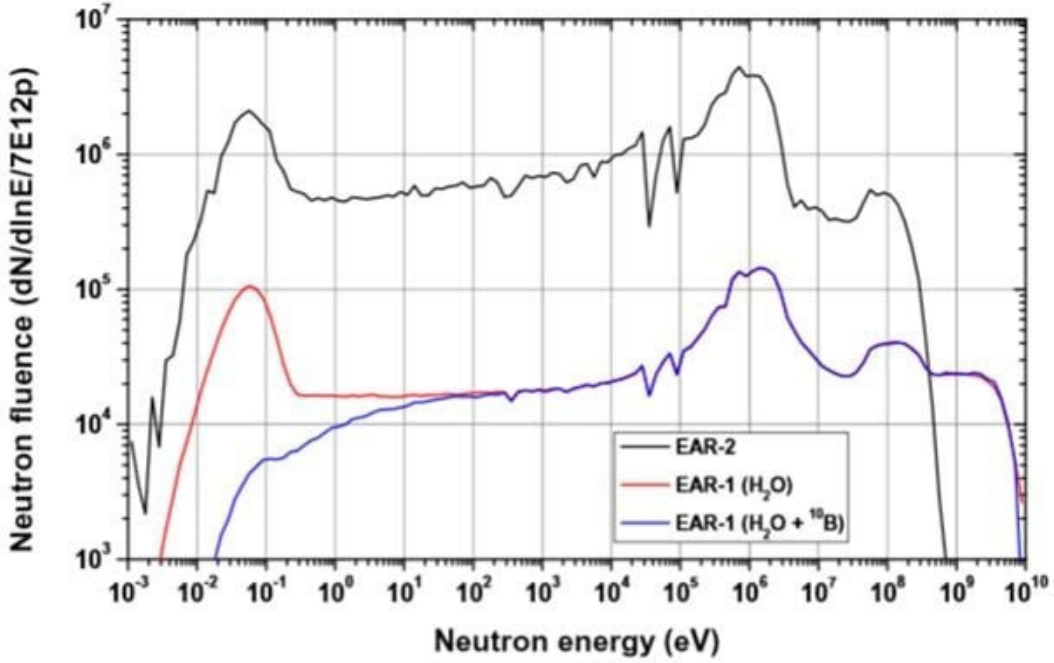




Method : PPAC stack **@ n_TOF**

- Neutrons from thermal to 1 GeV
- No neutron background
- Radioactivity largely suppressed
- 2 lines, 2 beams: more redundancy





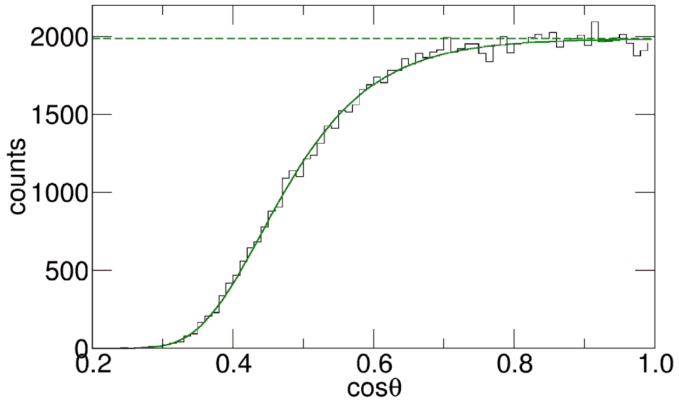
Resources, risks and timeline

- **Detectors and chamber**: in use as we speak
- **Beam line**: n_TOF restarts mid-2028
  - Optimal conditions require a new collimator
  - IN2P3 is not member of n_TOF anymore…
- **Targets**: Orsay or JRC Geel
  - Thin but large targets: development required for Pu
  - Pu samples in « semi-unsealed » conditions: safety pre- and post-experiment
- **RH** : 1 single MCF + 2 years post-doc (PEPR)

Measurement first-half of 2029, data by the end of 2030

[Backup] Self-determined efficiency

- Same neutron flux on all targets (transparent detectors)
- No neutron background (very low duty cycle)



- Geometrical acceptance ?
  → 100% at 0°, then self-determined
- Effect of fission anisotropies ?
  → Measured independently
- Knowledge of targets ?
  → Full characterization