Templates of Expected Measurement Uncertainties and EXFOR

Amanda Lewis

Berkeley
UNIVERSITY OF CALIFORNIA

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EXFOR is an invaluable resource for long-term storage of experimental data, and allows users to quickly find data

- It is often the first place evaluators and experimentalists search for experimental data
- EXFOR represents long term storage of experimental data in a consistent format
- Many entries have uncertainty information, so is a great resource for uncertainties presented over time
  - The ERR-ANALYS section does not have a consistent format

Extracting uncertainty information from EXFOR isn't always easy

13901 – 2004 Fotiades $^{238}U(n,n'g)$

```
ERR-ANALYS (ERR-S) Statistical uncertainty.
           (ERR-1,5.,11.) Uncertainties in the gamma-ray
           absorption in the sample, finite beam size effects,
           well as detector efficiency uncertainties
           (ERR-2) Uncertainties in the fission foil thickness,
           fission cross section, ionization chamber efficiency
           (ERR-3,1.,2.) The uncertainty in the neutron flux
           (ERR-4) Uncertainty in target thickness
           (ERR-5) Uncertainty in dead time corrections for
             the detection of gamma rays
           (ERR-6,0.15,0.2) Uncertainty in dead time correction
             for neutrons in the fission chamber
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Fotiades et al Phys. Rev. C. 69 (2004

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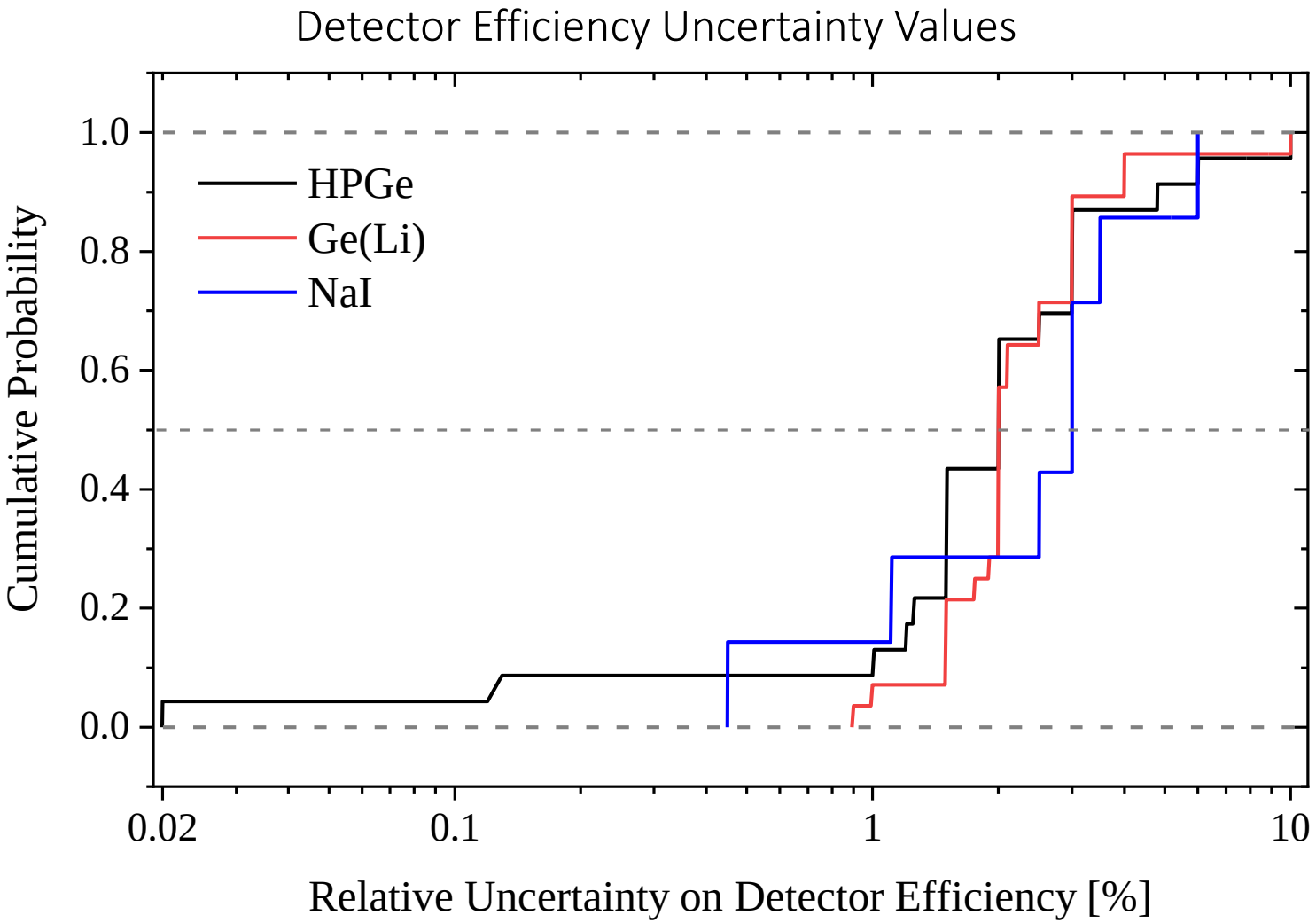
13901 – 2004 Fotiades $^{238}U(n,n'g)$

	1998 Data (%)
E_γ (keV)	$\delta\epsilon_\gamma$ [a]
100–400 (Planars)	5
600–750 (Coaxials)	10
751–900 (Coaxials)	9
901–1200 (Coaxials)	8
>1200 (Coaxials)	7
E_n (MeV)	$\delta\Phi(E_n)$
1–4	1.0
4–8	1.5
9–19	2.0
20–50	1.5
51–100	1.2
δt	0.3
δ Dead T_γ	0.1
δ Dead T_Φ	0.2
Additional fluence uncertainty[b]	5

```
RR-ANALYS (ERR-S) Statistical uncertainty.
(ERR-1,5.,11.) Uncertainties in the gamma-ray
absorption in the sample, finite beam size effects,
well as detector efficiency uncertainties
(ERR-2) Uncertainties in the fission foil thickness,
fission cross section, ionization chamber efficiency
(ERR-3,1.,2.) The uncertainty in the neutron flux
(ERR-4) Uncertainty in target thickness
(ERR-5) Uncertainty in dead time corrections for
  the detection of gamma rays
(ERR-6,0.15,0.2) Uncertainty in dead time correction
  for neutrons in the fission chamber
```

Fotiades et al Phys. Rev. C. 69 (2004)

EXFOR has great uncertainty information for the templates, when it is extracted



These templates can be used to make the EXFOR uncertainty terminology more consistent

But the first step is to make sure that new published articles follow the templates and are complete

- We are interested in a process similar to the checking that the NNDC performs for structure papers published in PRC

- In the resonance region, a template has been created to ensure that EXFOR compilation is consistent and complete:
  - P. Schillebeeckx, B.Becker, Y. Danon et al., Nucl. Data Sheets 113, p. 3054 (2012).
  - F. Gunsing, P. Schillebeeckx and V. Semkova, IAEA ReportINDC(NDS)-0647 (2013)

- This would allow the initial EXFOR compilation to be complete and accurate

- Consistent and complete uncertainty analysis will improve EXFOR as a source of literature uncertainty values and will improve the long-term usability and documentation of expensive experiments and valuable data

Inclusion of the templates into the EXFOR format can also improve machine-parsing of EXFOR files

- For example, one possible format change would be to include “keywords” in the uncertainty description (V. Zerkin)

(ERR-1,,) [keyword] free text

- These keywords can come from the templates

For papers that follow the templates, assigning keywords will be trivial. A bit more work will be required to go back to old data

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1–4	1.0
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20–50	1.5
51–100	1.2
δt	0.3
δ Dead T_γ	0.1
δ Dead T_Φ	0.2
Additional fluence uncertainty[b]	5

```
RR-ANALYS (ERR-S) Statistical uncertainty.
(ERR-1,5.,11.) [efficiency + irr geom + gamma abs]
absorption in the sample, finite beam size effects,
well as detector efficiency uncertainties
(ERR-2) [flux sys] ies in the fission foil thickness,
fission cross section, ionization chamber efficiency
(ERR-3,1.,2.) [flux stat] inty in the neutron flux
(ERR-4) [number density] arget thickness
(ERR-5) [dead time] in dead time corrections for
  the detection of gamma rays
(ERR-6,0.15,0.2) [flux sys] y in dead time correction
  for neutrons in the fission chamber
```

Future work to implement changes like this:

- Start engaging with journal editors about templates in the publication process
- Templates need to be finished and published
- A format will need to be chosen and agreed to (by evaluation, measurement and EXFOR communities)
- Potentially – old EXFOR files can be converted to the new format?
  - This will likely require human intelligence
  - Perhaps it can become part of regular EXFOR entry assessment done by the EXFOR community.

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