Transmission measurements for ^{197}Au at GELINA

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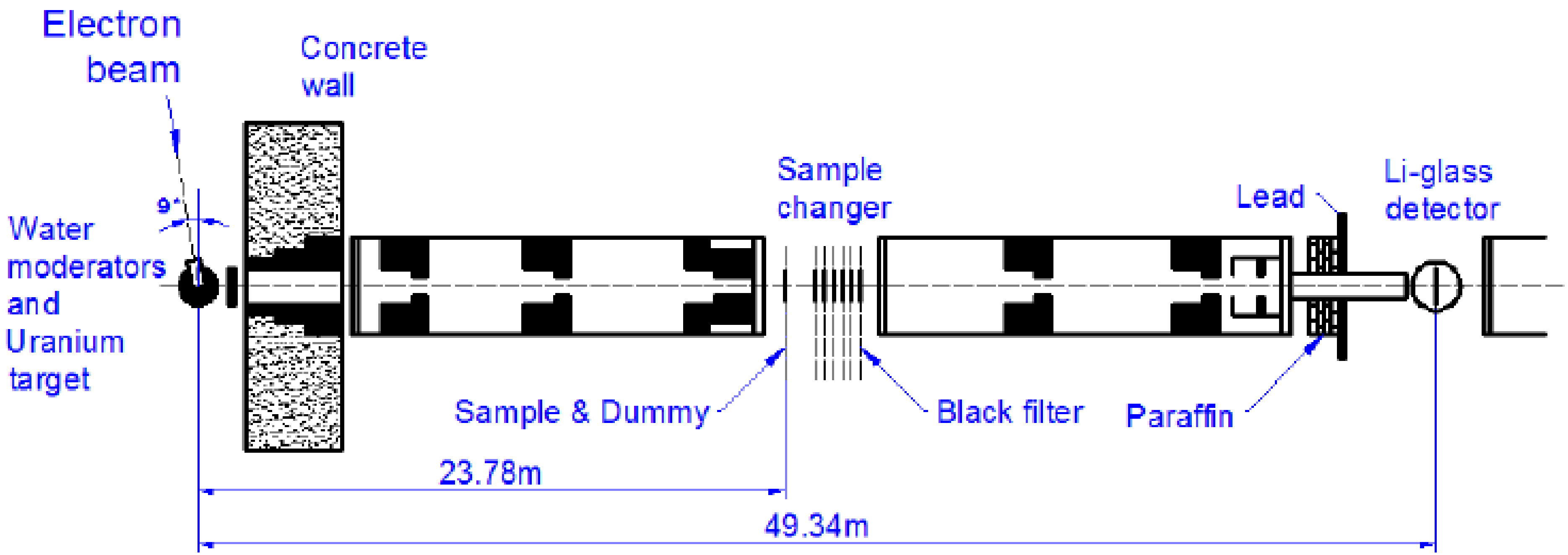
Nuclear Data Center

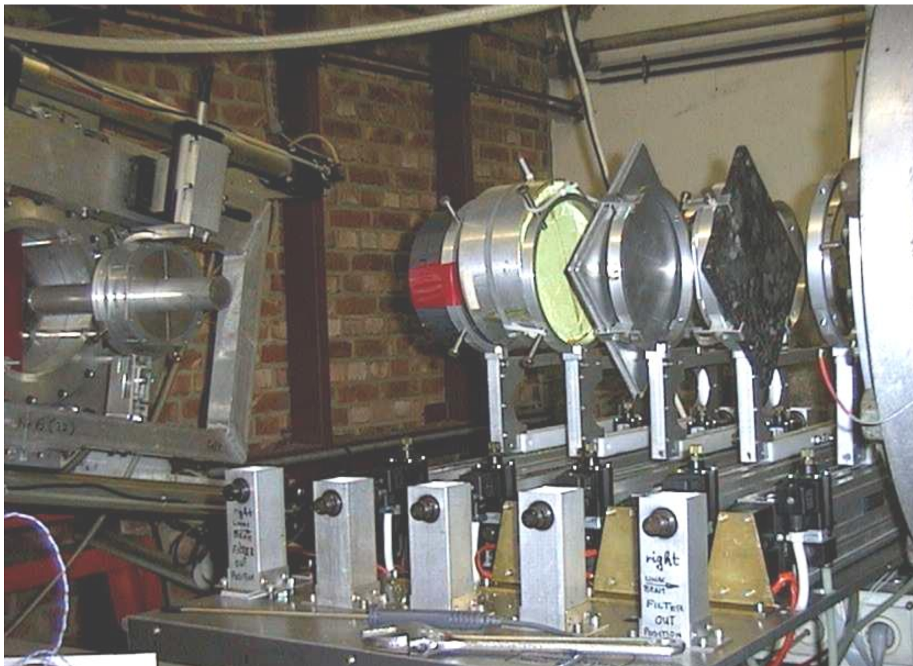
Transmission: experimental set-up (50 m)

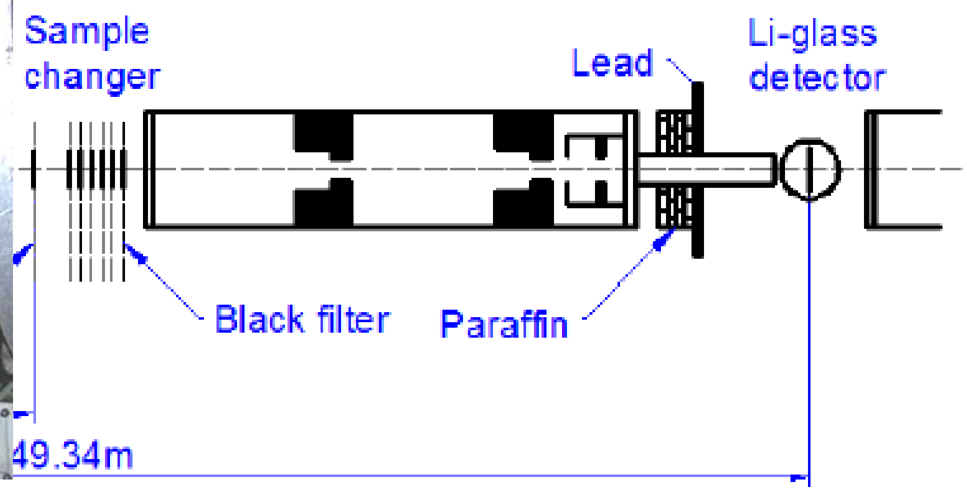
$$T = e^{-n\,\sigma_{tot}}$$



Transmission: experimental set-up (50 m)

Sample & Background Filters
at 25 m



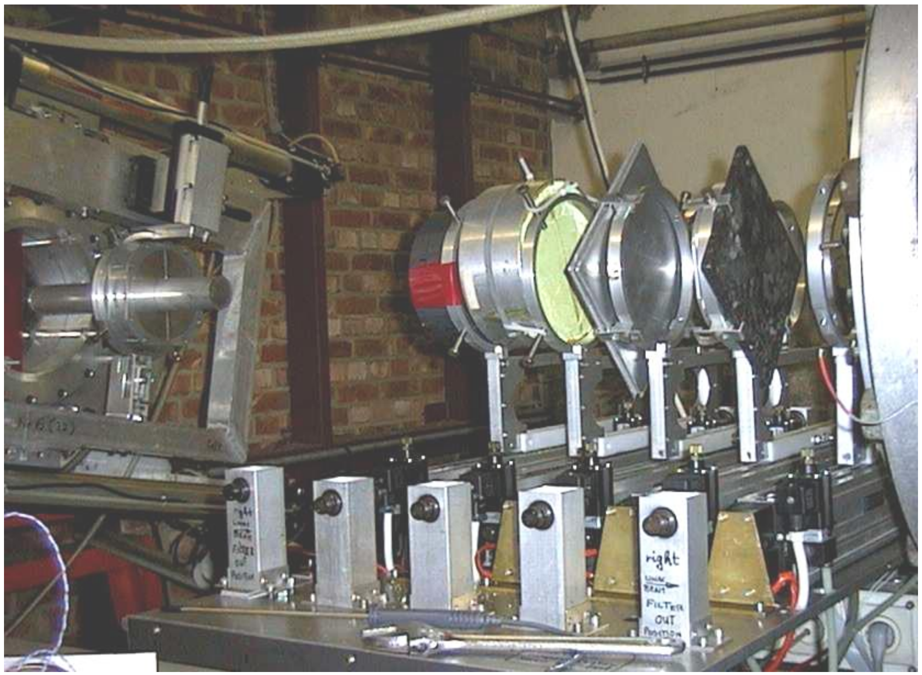


KAERI

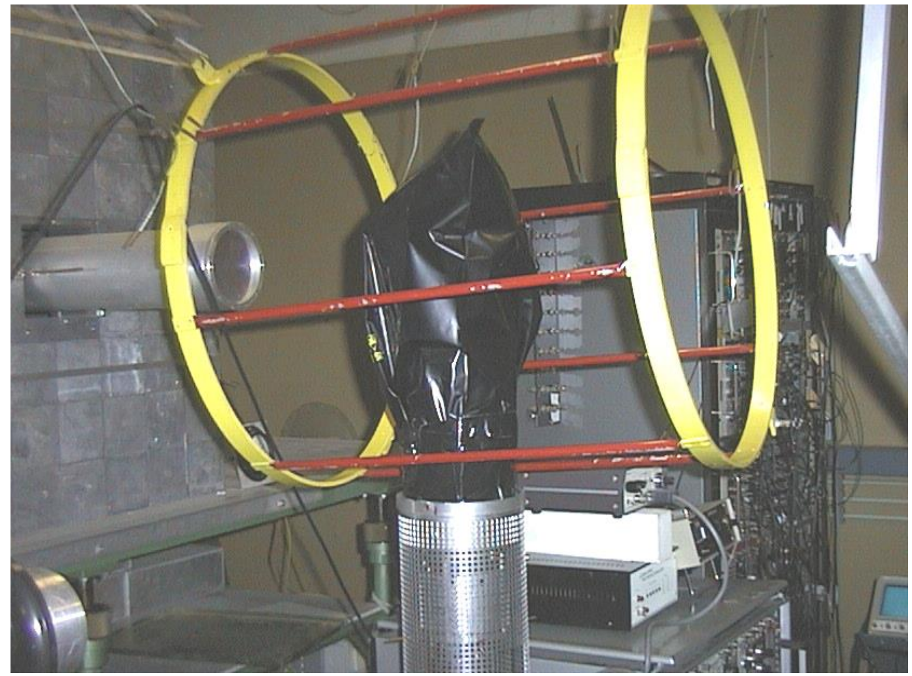
Transmission: experimental set-up (50 m)

European Commission

Sample & Background Filters
at 25 m

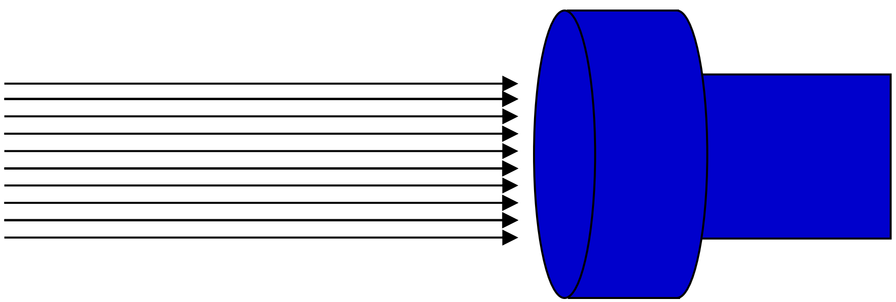


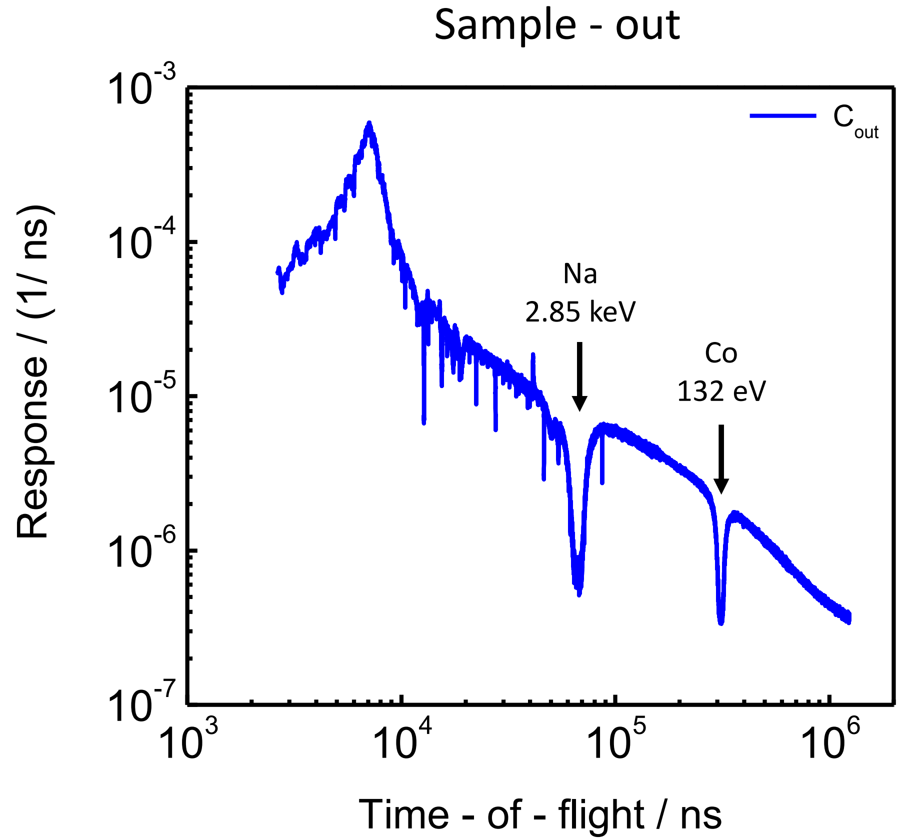
Li-glass scintillator
at 50 m



Transmission : sample-out

- Detector
  - NE912 Li-glass scintillator, 95% enriched in ^{6}Li
  - diameter : 101.1 mm
  - thickness : 6.35 mm
  - at 49.34 m from neutron source





Transmission : sample-in

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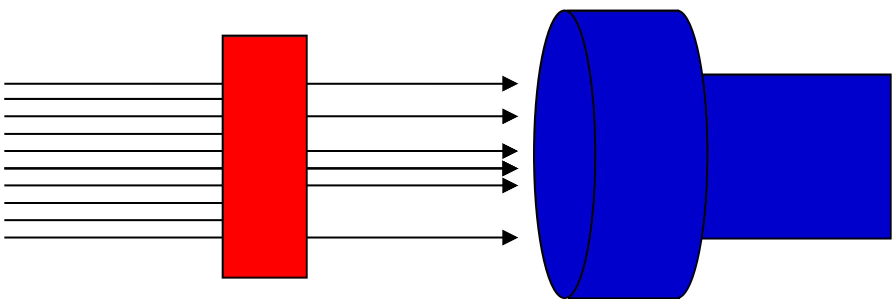
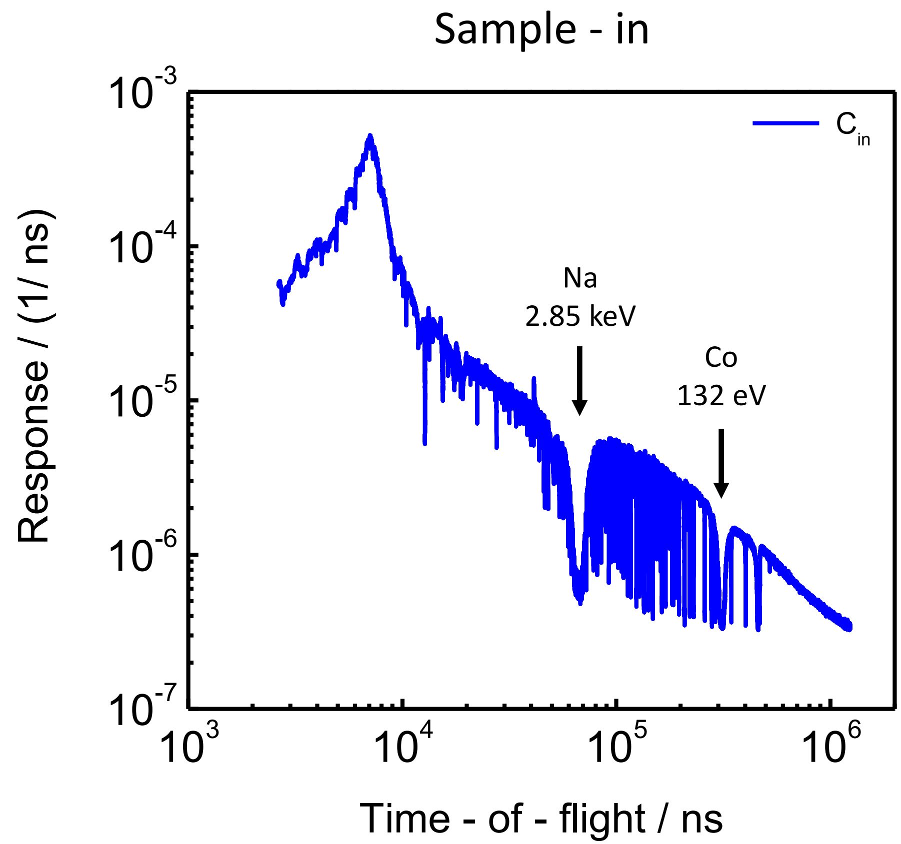


- Sample
  - Au metal foil
  - 50 mm x 50 mm x 3 mm
  - 1.757 (0.004) 10^{-2} at/b
  - at 23.78 m from neutron source

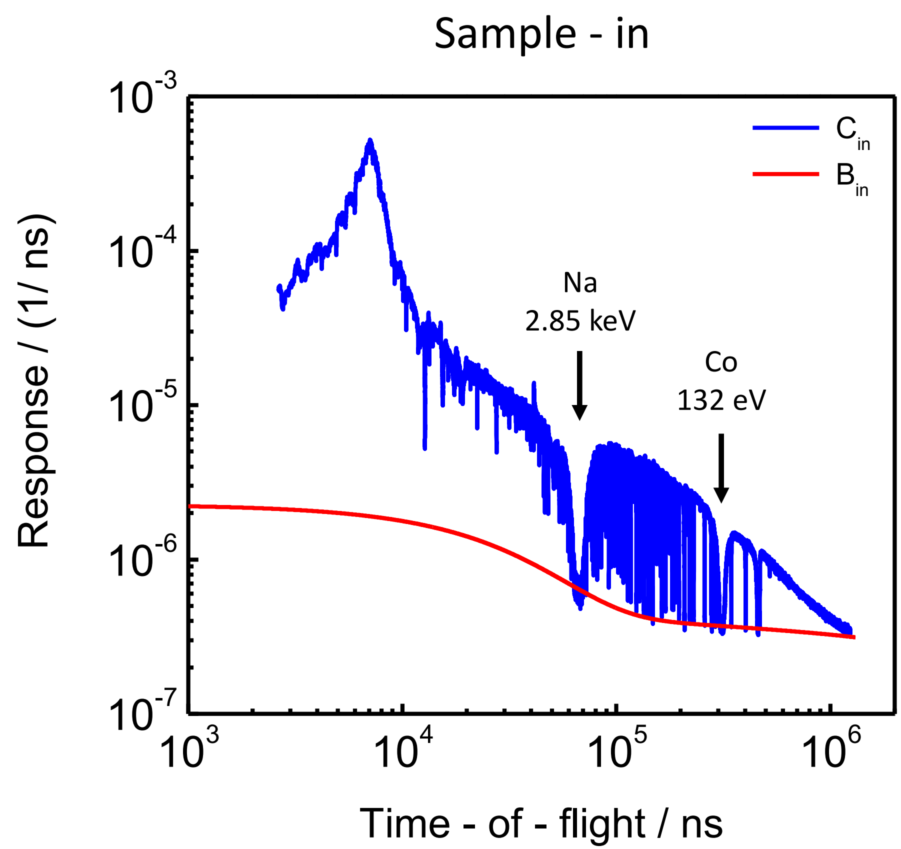


Transmission data reduction

Background determination

⇒ Black resonance technique

B(t)

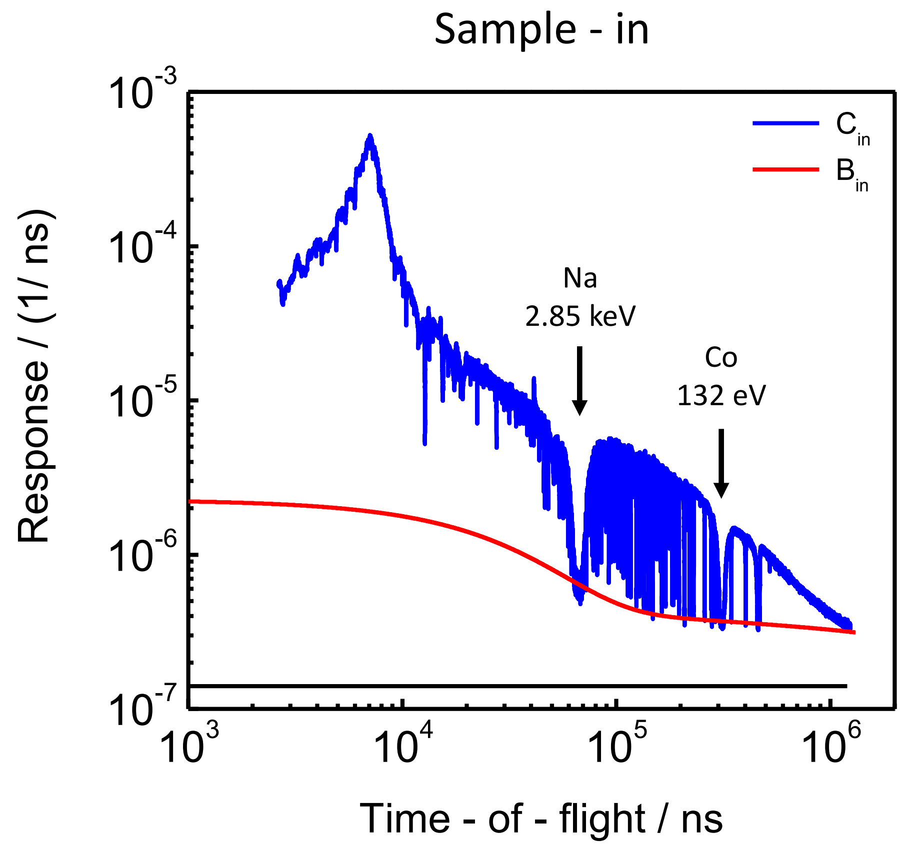


Transmission data reduction

Background determination
$\Rightarrow$ Black resonance technique

$B(t) = b_0$

- b_o time independent



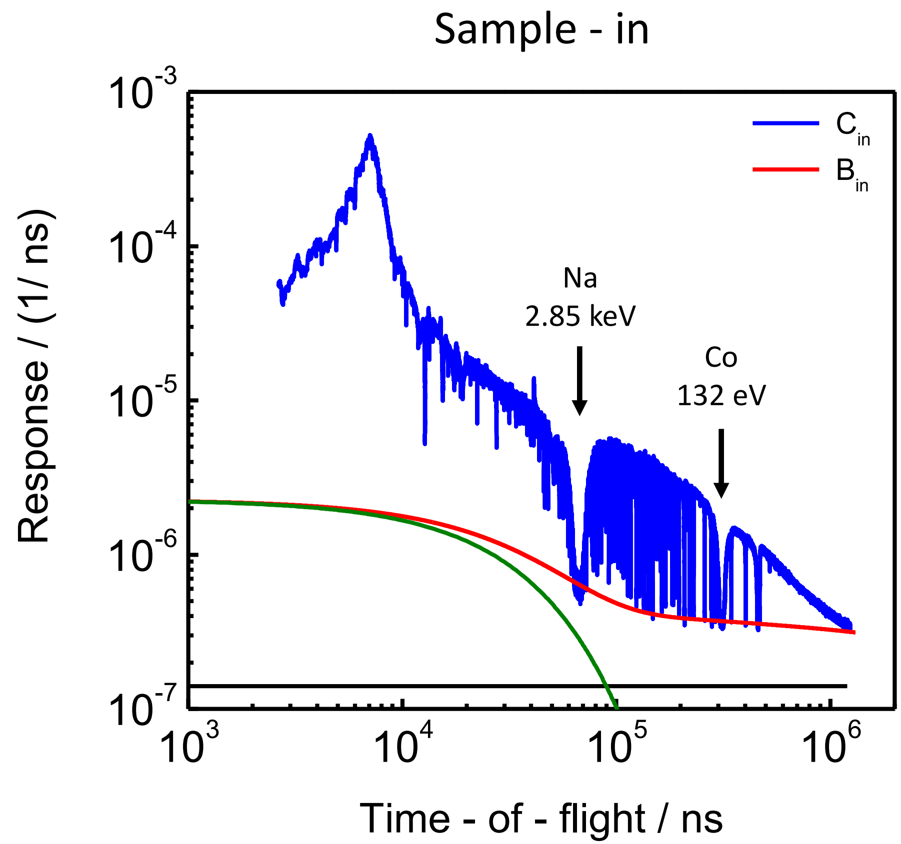
Transmission data reduction

Background determination

$\Rightarrow$ Black resonance technique

$B(t) = b_0 + B_\gamma(t)$

- b_o time independent
- $B_\gamma(t)$ $^1H(n, \gamma)$ $E_\gamma = 2.2$ MeV
  $b_1 e^{-\lambda_1 t}$



Transmission data reduction

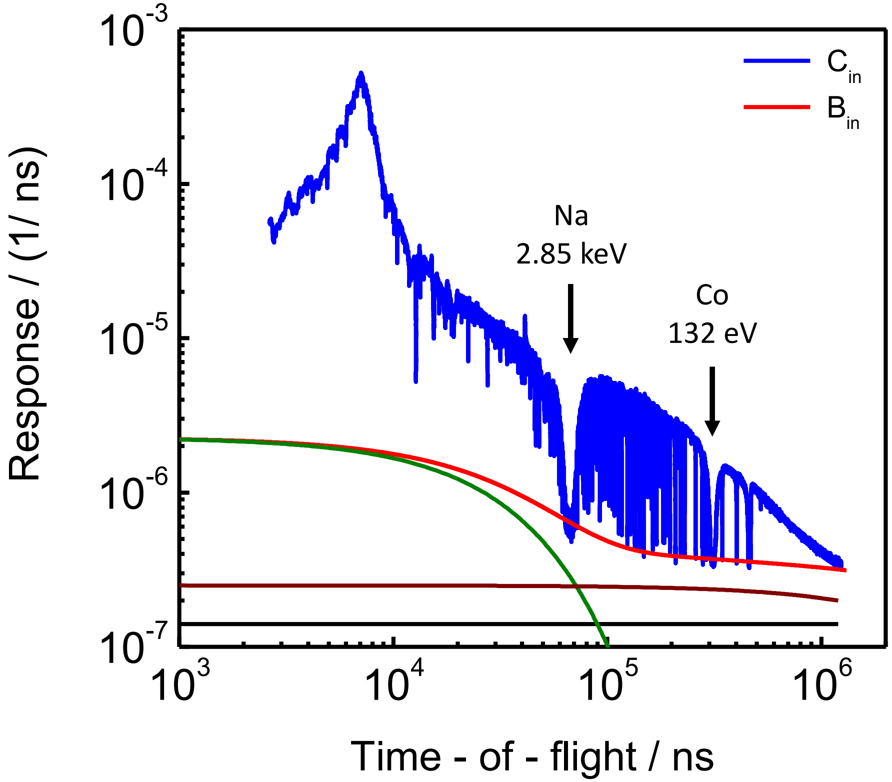
Background determination

⇒ Black resonance technique

$B(t) = b_0 + B_\gamma(t) + B_n(t)$

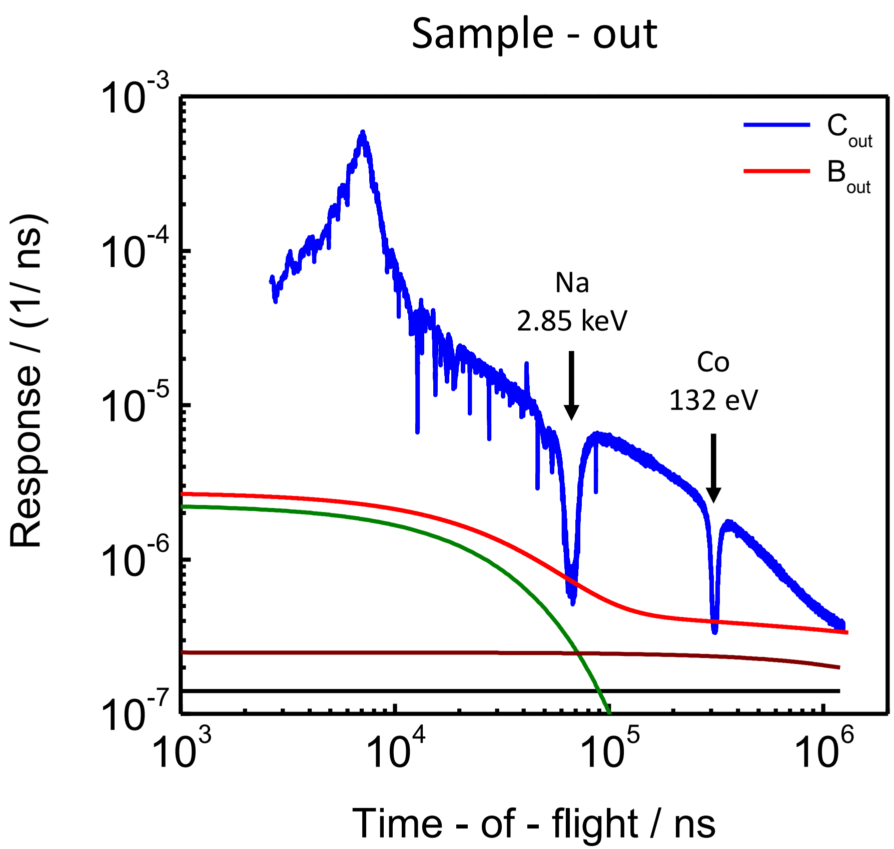
- b_o time independent
- $B_\gamma(t)$ $^{1}H(n, \gamma)$ $E_\gamma = 2.2$ MeV
  $b_1 e^{-\lambda_1 t}$
- $B_n(t)$ scattered neutrons
  $b_2 e^{-\lambda_2 t}$

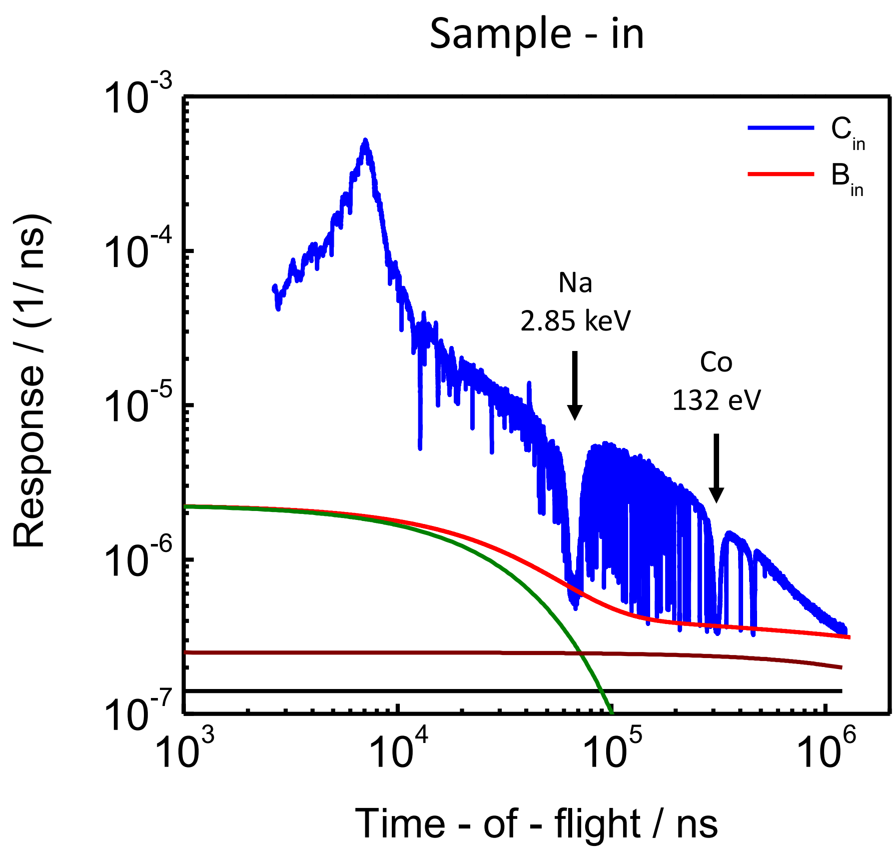
Sample - in



$$B = b_0 + b_1 e^{-\lambda_1 t} + b_2 e^{-\lambda_2 t}$$

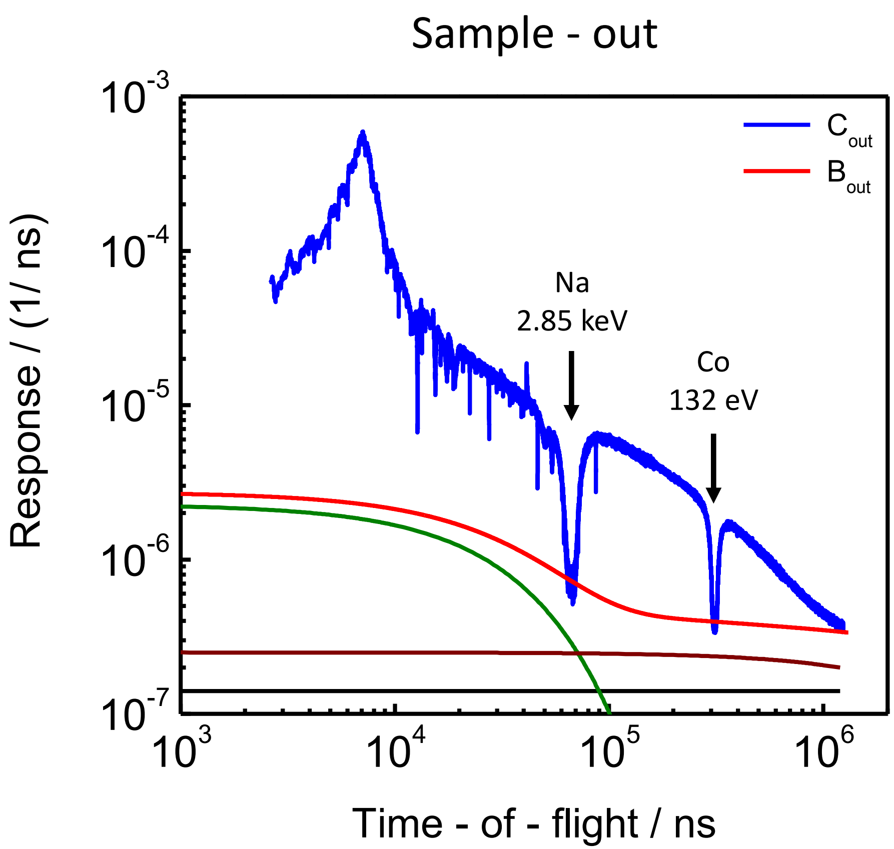
Transmission data reduction

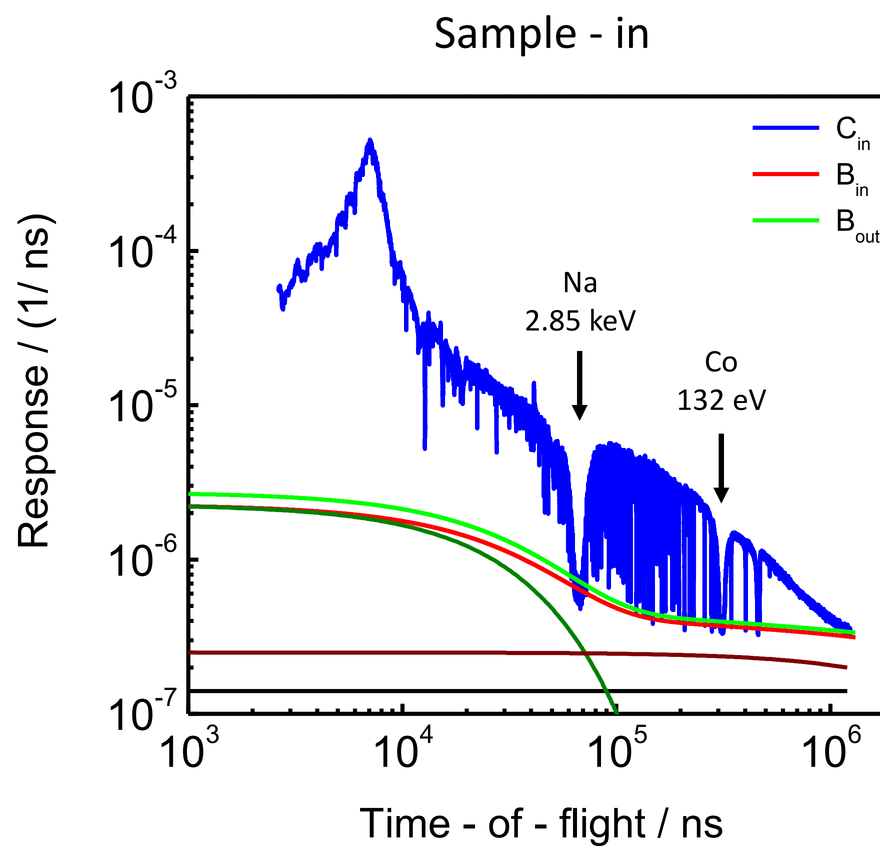




$$B = b_0 + b_1 \ e^{-\lambda_1 t} + b_2 \ e^{-\lambda_2 t}$$

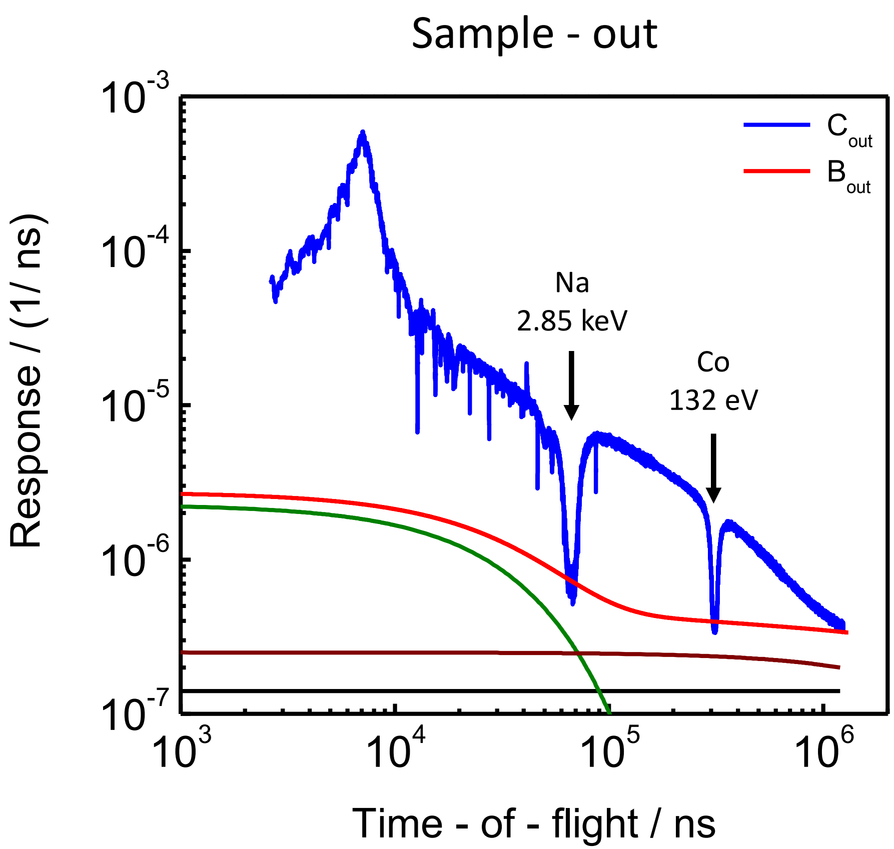
Transmission data reduction

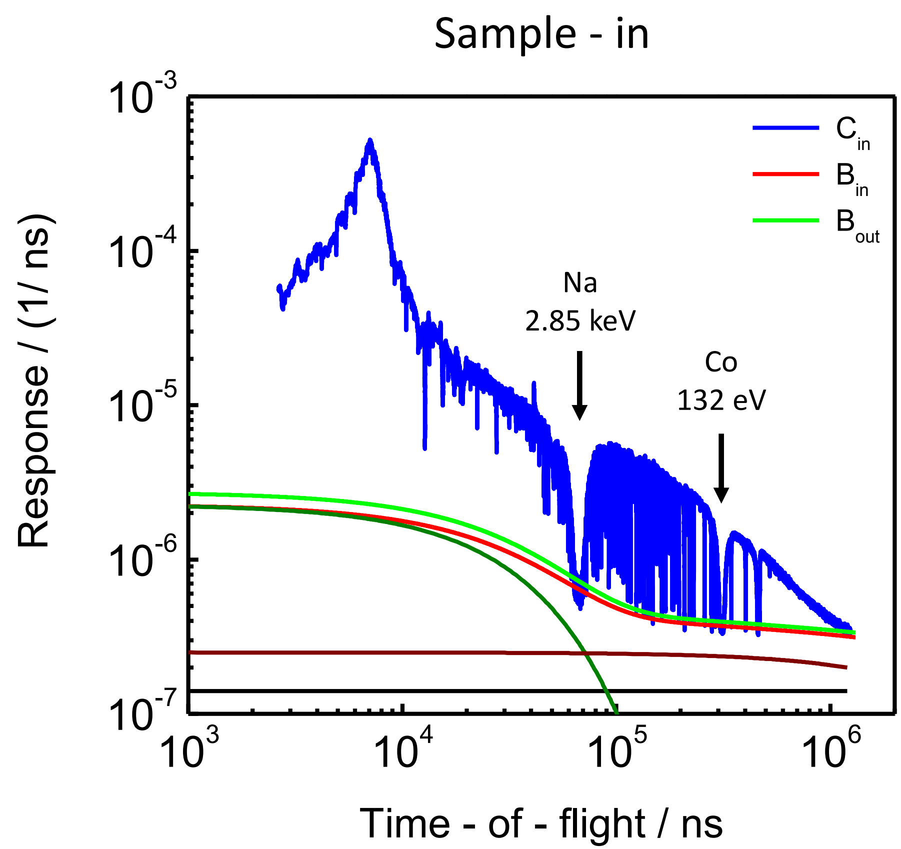




$$B = b_0 + b_1 \; e^{-\lambda_1 t} + b_2 \; e^{-\lambda_2 t}$$

Transmission data reduction



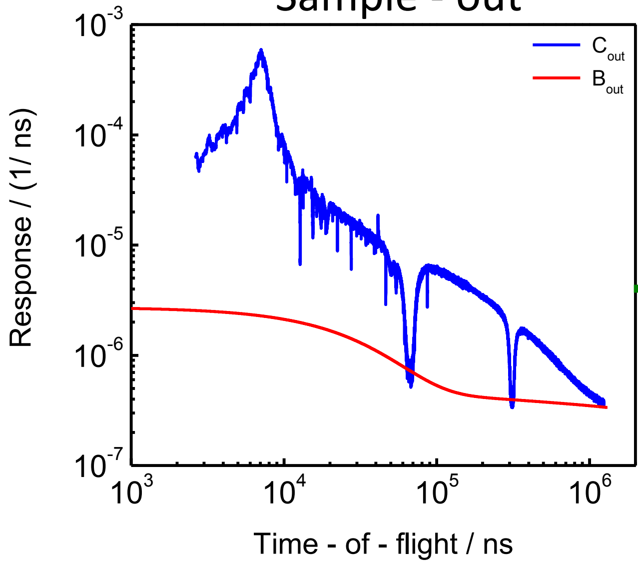


Background influenced by sample
$\Rightarrow$ use of fixed background filters to adjust b_1 and b_2

$$B = b_0 + b_1 \, e^{-\lambda_1 t} + b_2 \, e^{-\lambda_2 t}$$

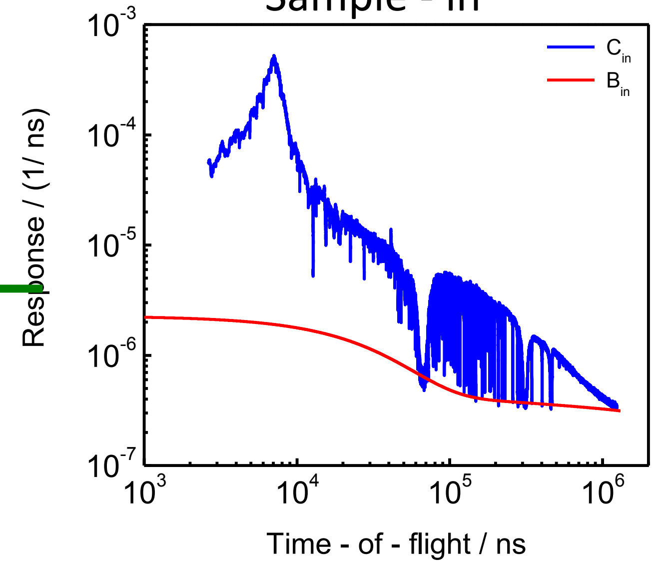
TOF-spectra ⇒ T_{exp}

Sample - out



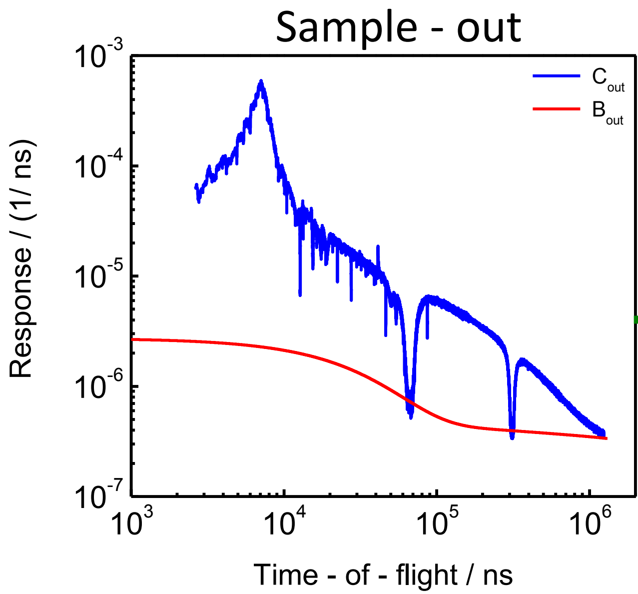
$$T_{exp} = \frac{C_{in} - B_{in}}{C_{out} - B_{out}}$$

Sample - in

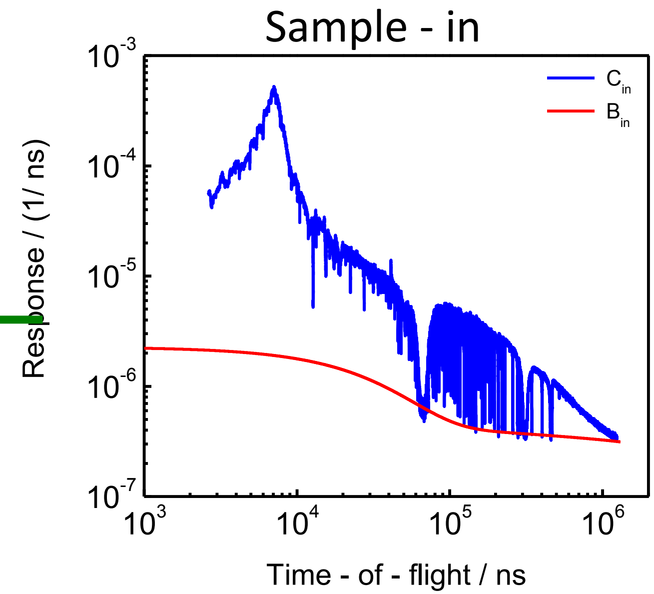


Sample - in

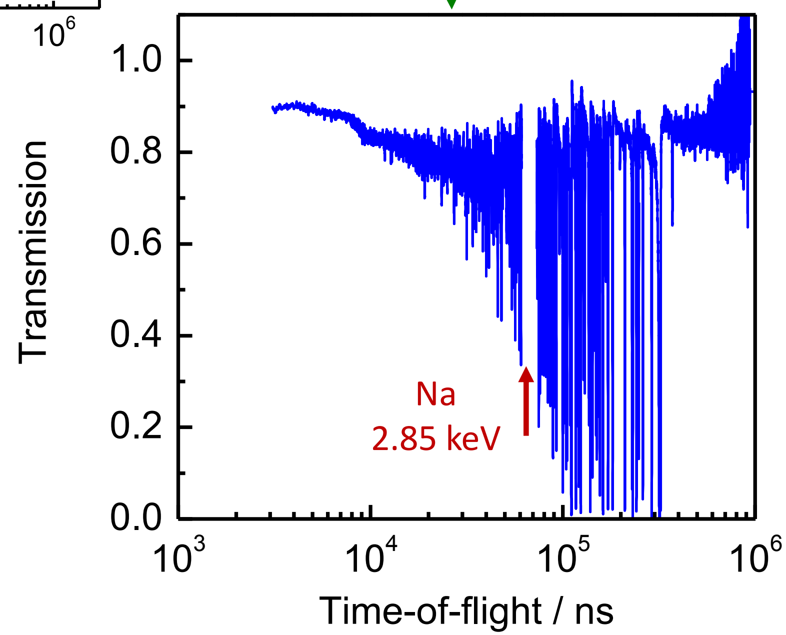
TOF-spectra ⇒ T_{exp}



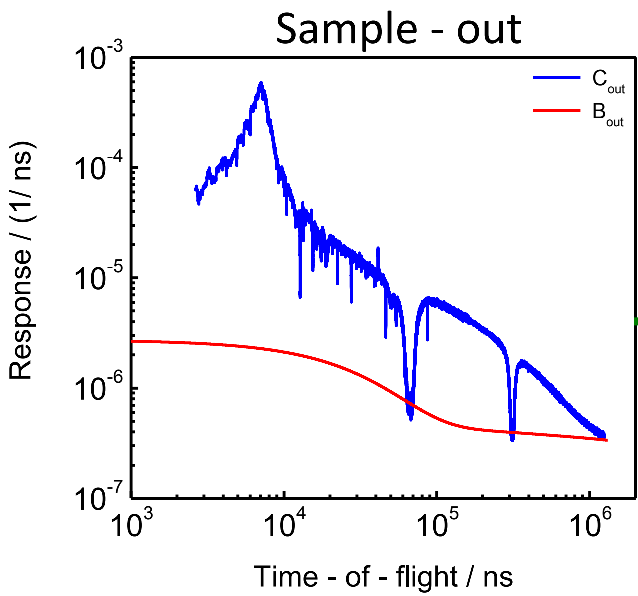
$$T_{exp} = \frac{C_{in} - B_{in}}{C_{out} - B_{out}}$$



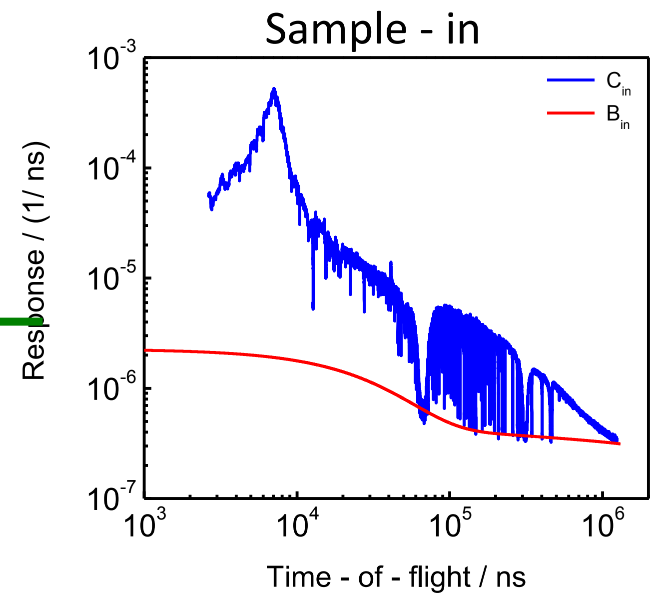
Sample - in

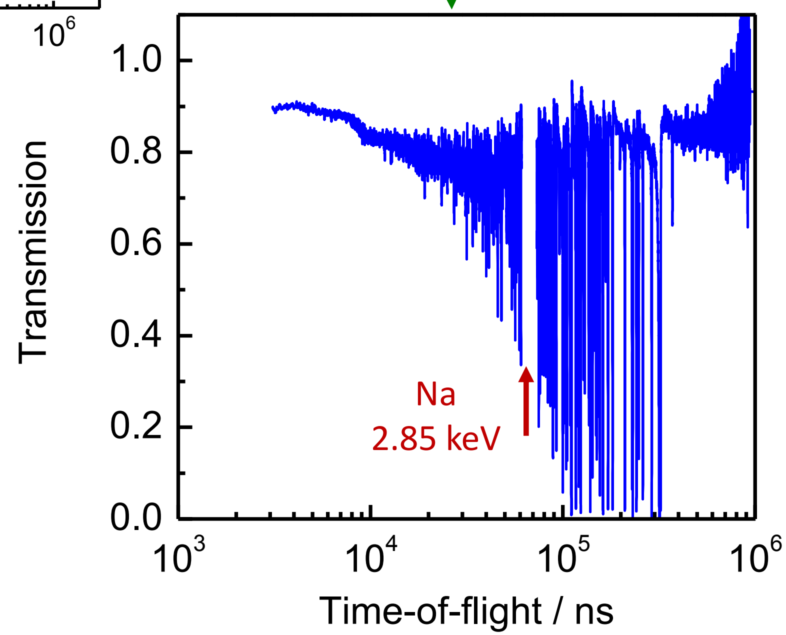


TOF-spectra ⇒ T_{exp}



$$T_{exp} = \frac{C_{in} - K B_{in}}{C_{out} - K B_{out}}$$



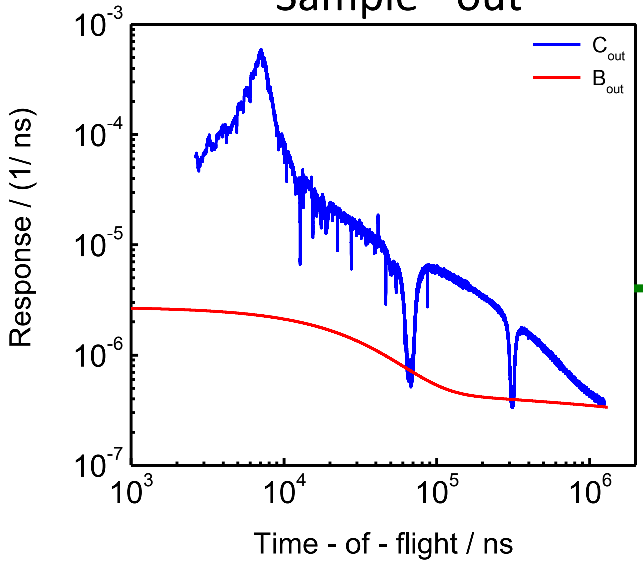


Sample - in

K = 1.00 ± 0.03

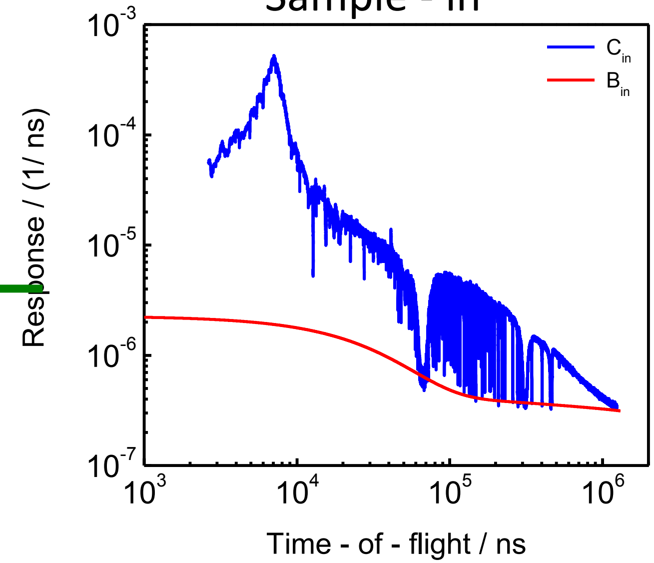
TOF-spectra $\Rightarrow T_{exp}$

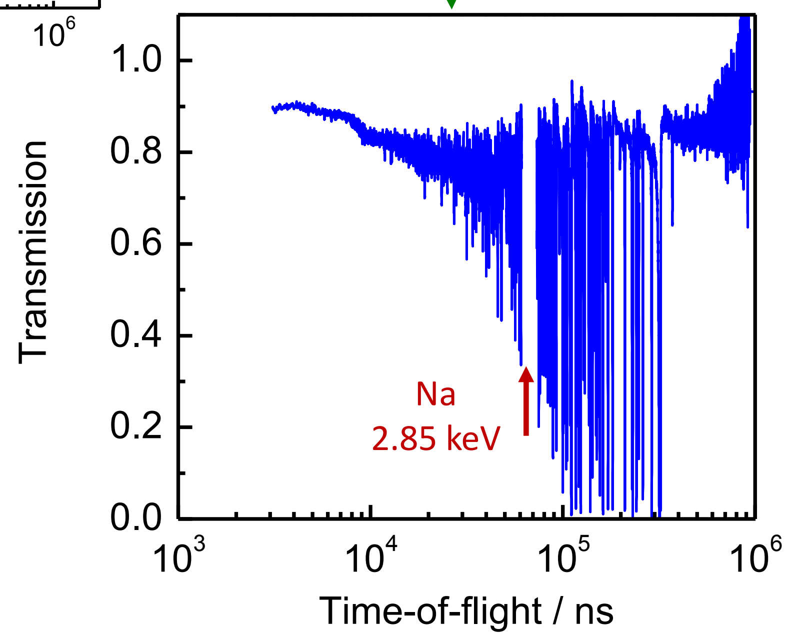
Sample - out



$$T_{exp} = N \frac{C_{in} - K B_{in}}{C_{out} - K B_{out}}$$

Sample - in



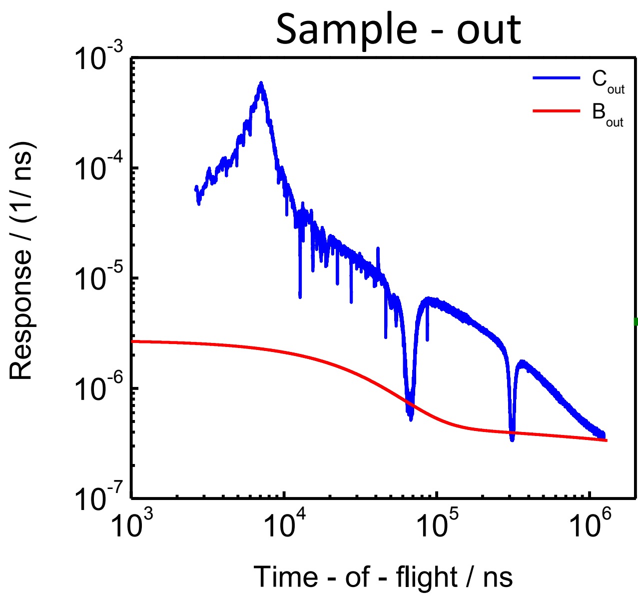


Sample - in

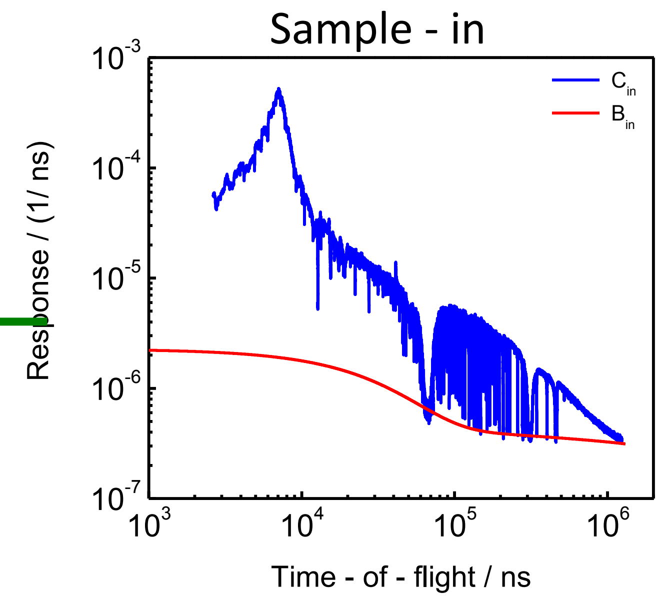
K = 1.00 ± 0.03

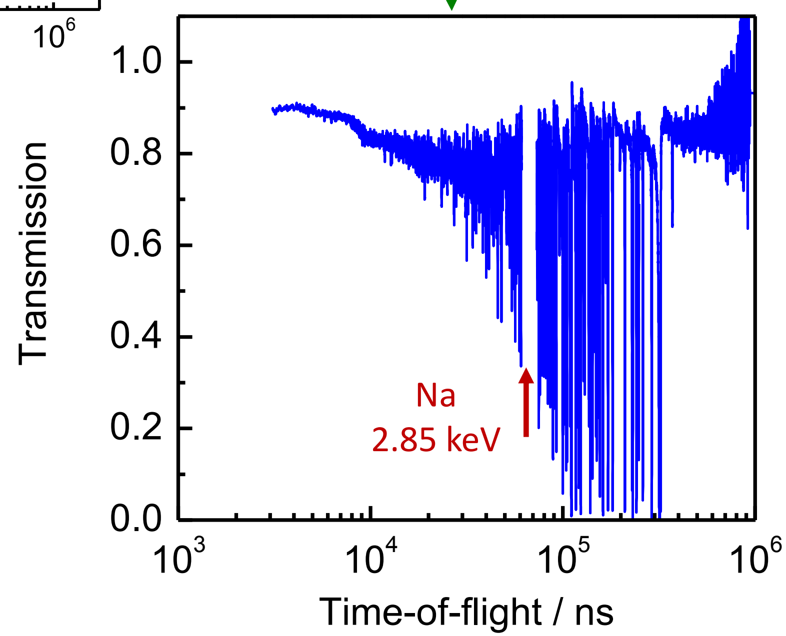
N = 1.0000 ± 0.0025

TOF-spectra $\Rightarrow T_{exp}$



$$T_{exp} = N \frac{C_{in} - K\,B_{in}}{C_{out} - K\,B_{out}}$$



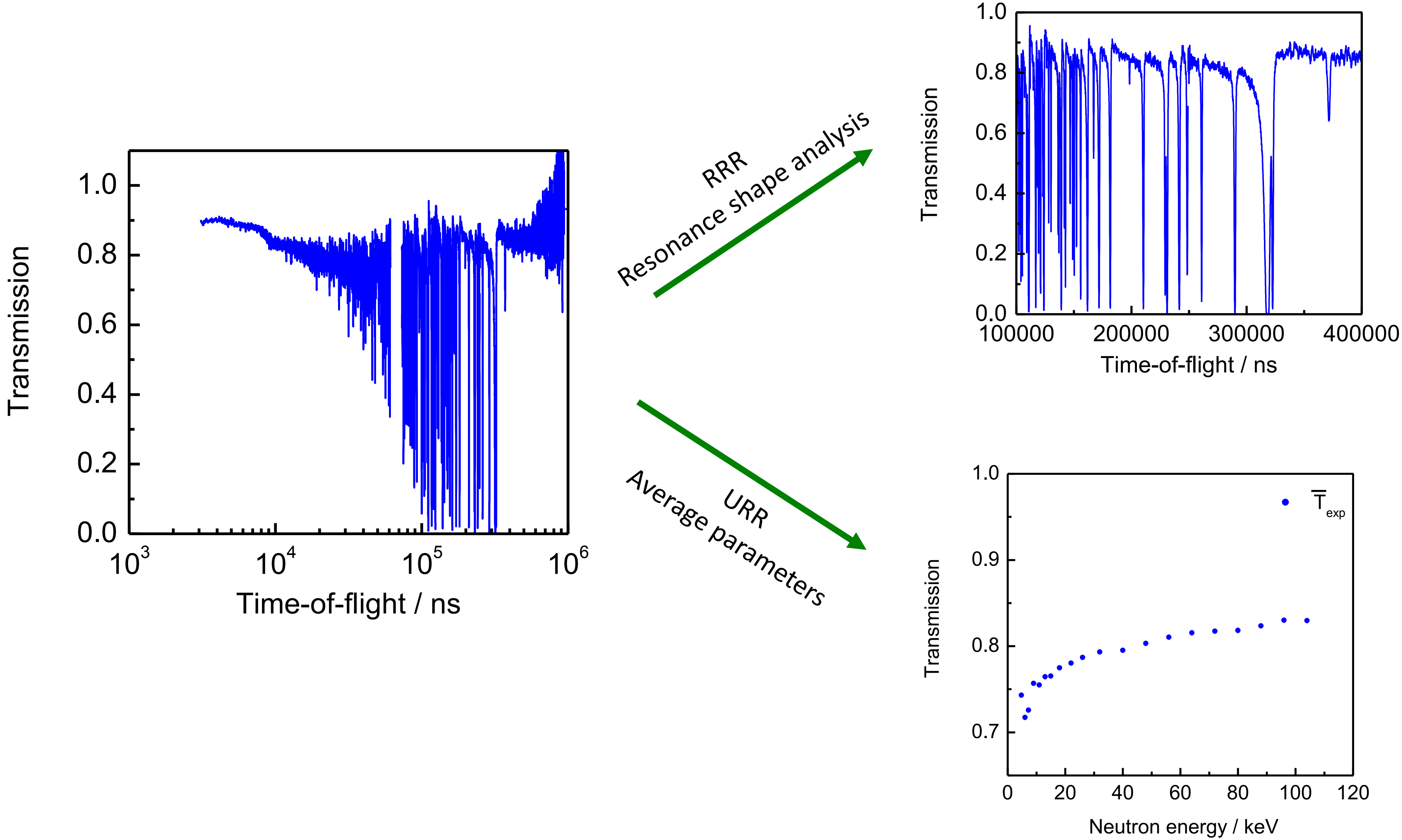


Sample - in

$$\frac{u_K}{K} \approx 3\%$$

$$\frac{u_N}{N} \approx 0.25\%$$

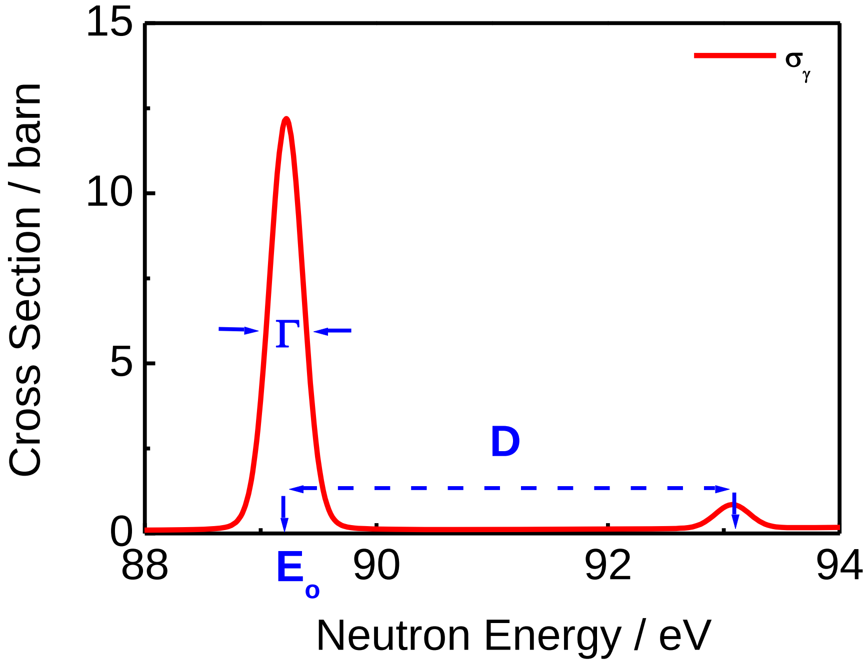
Data analysis

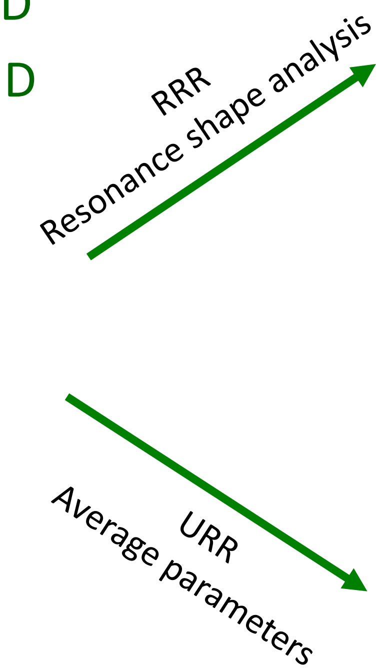


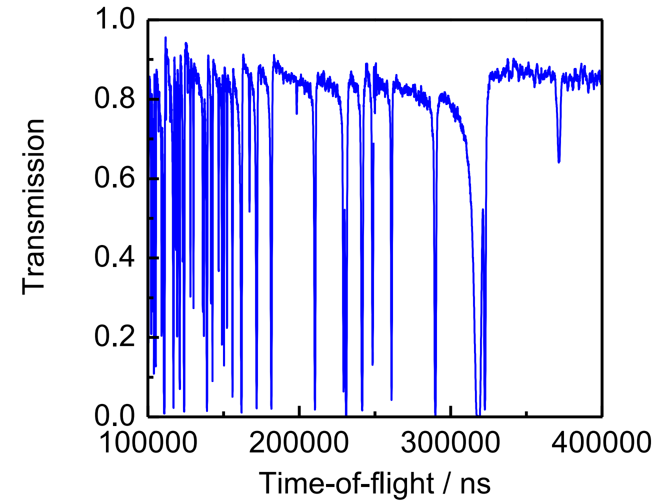
Data analysis

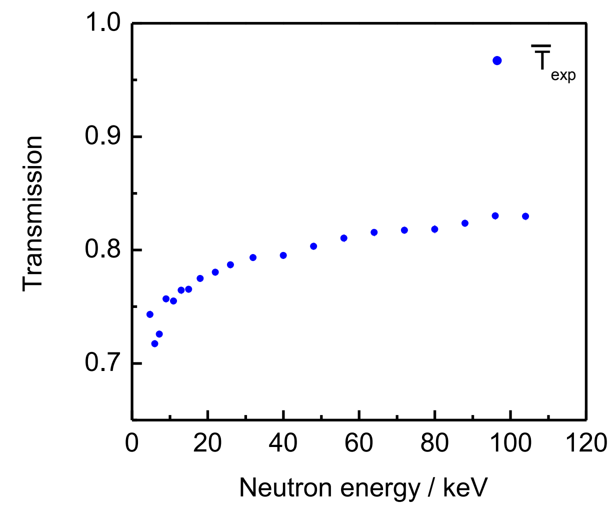
Resonance Region   D > Γ

- Resolved Resonance Region $\Delta_R < D$
- Unresolved Resonance Region $\Delta_R > D$

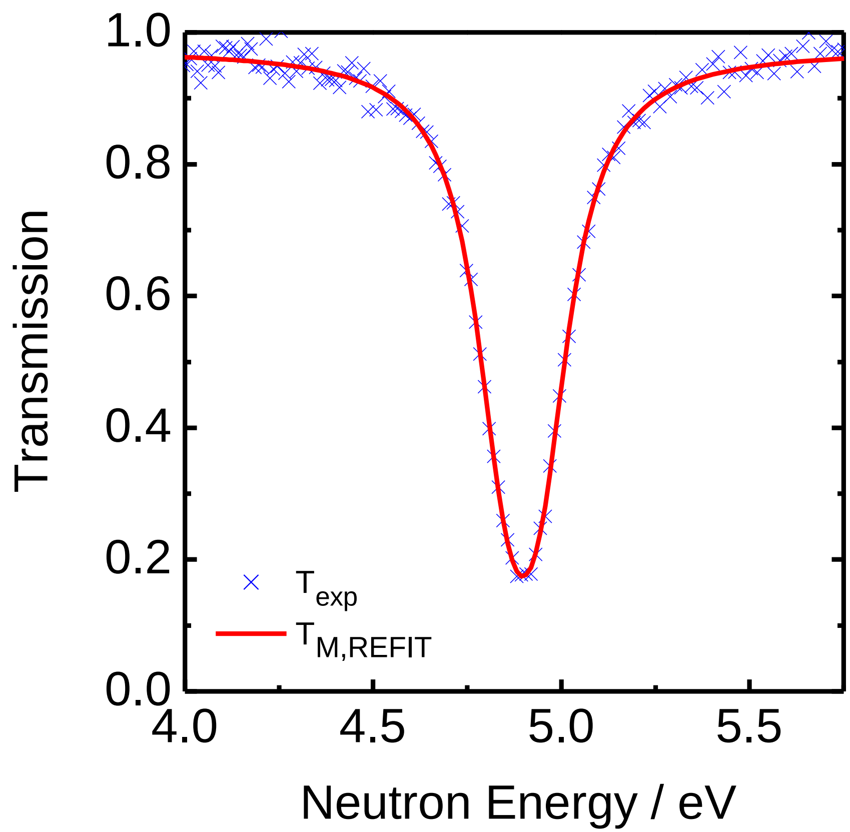


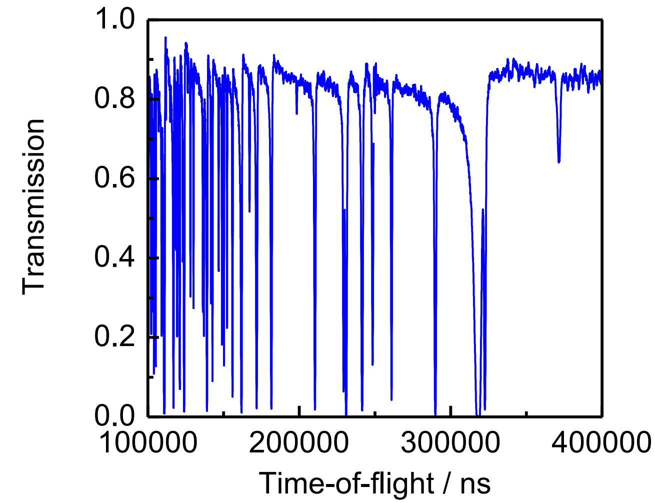






Data analysis





Resolved Resonance Region

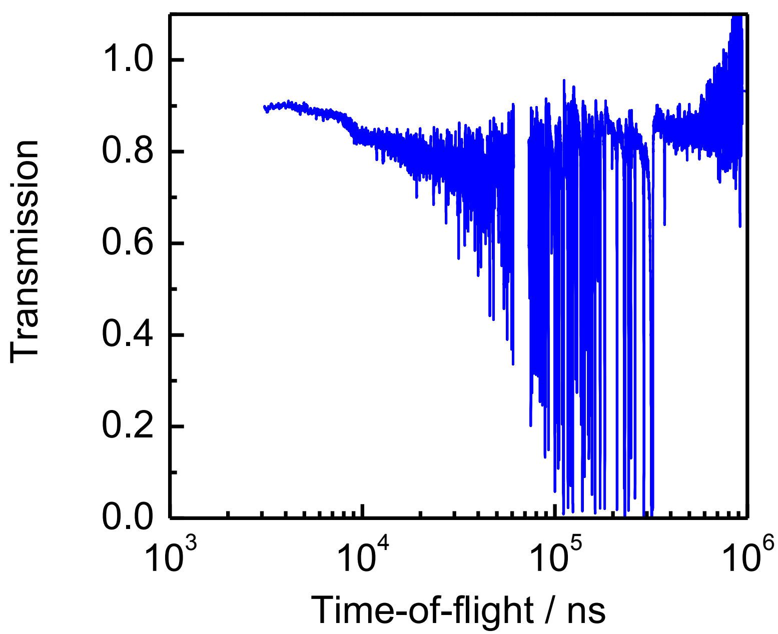
Resonance Shape Analysis
determine $(E_R, \Gamma_n, \Gamma_\gamma)_j$

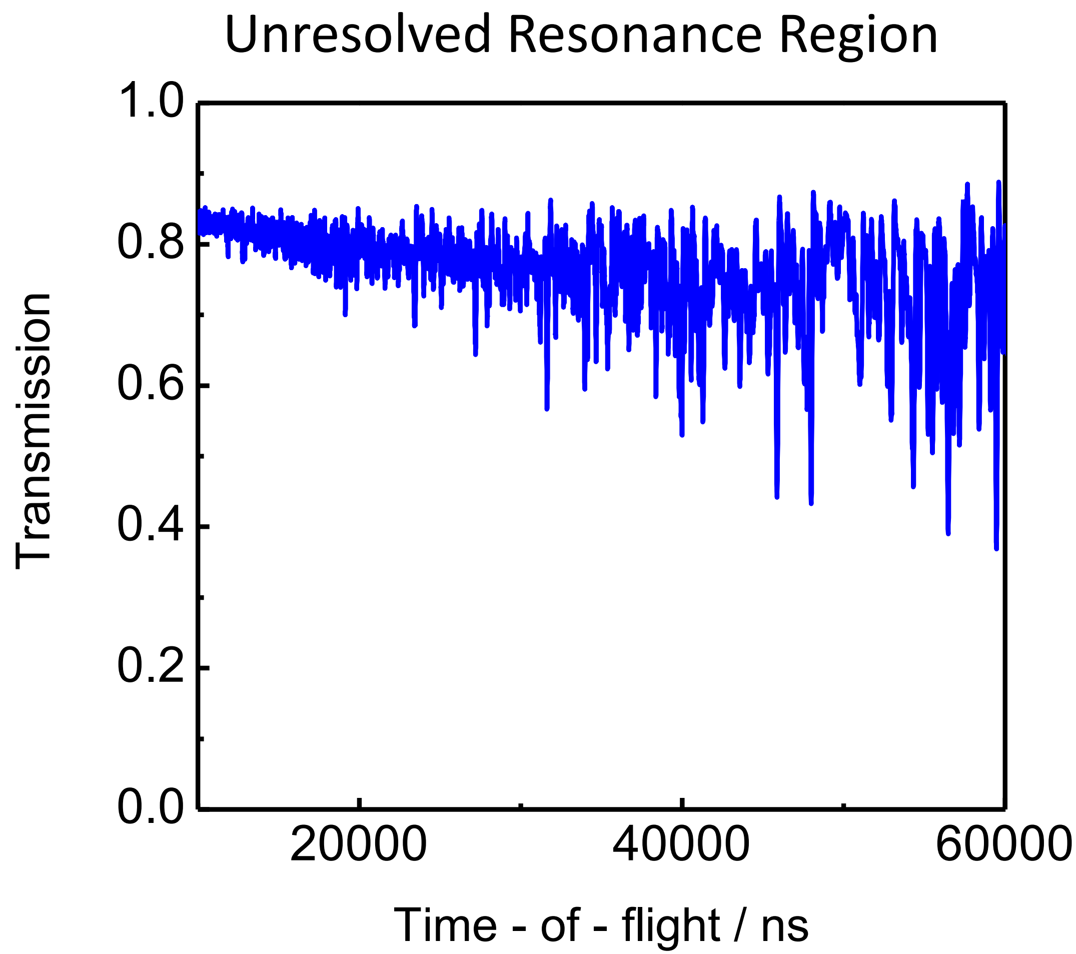
Γ_n = (15.26 ± 0.17) meV

Γ_γ = (118.9 ± 1.4) meV

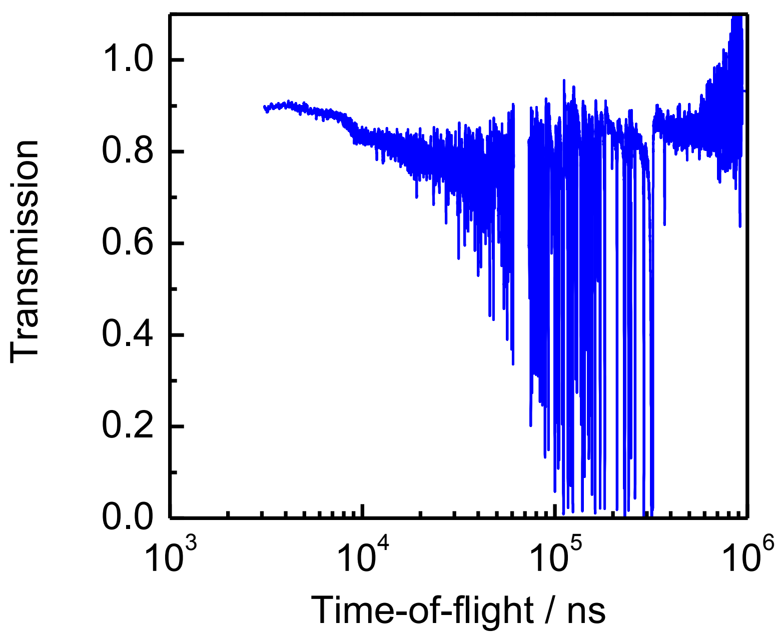
R-matrix theory
next week

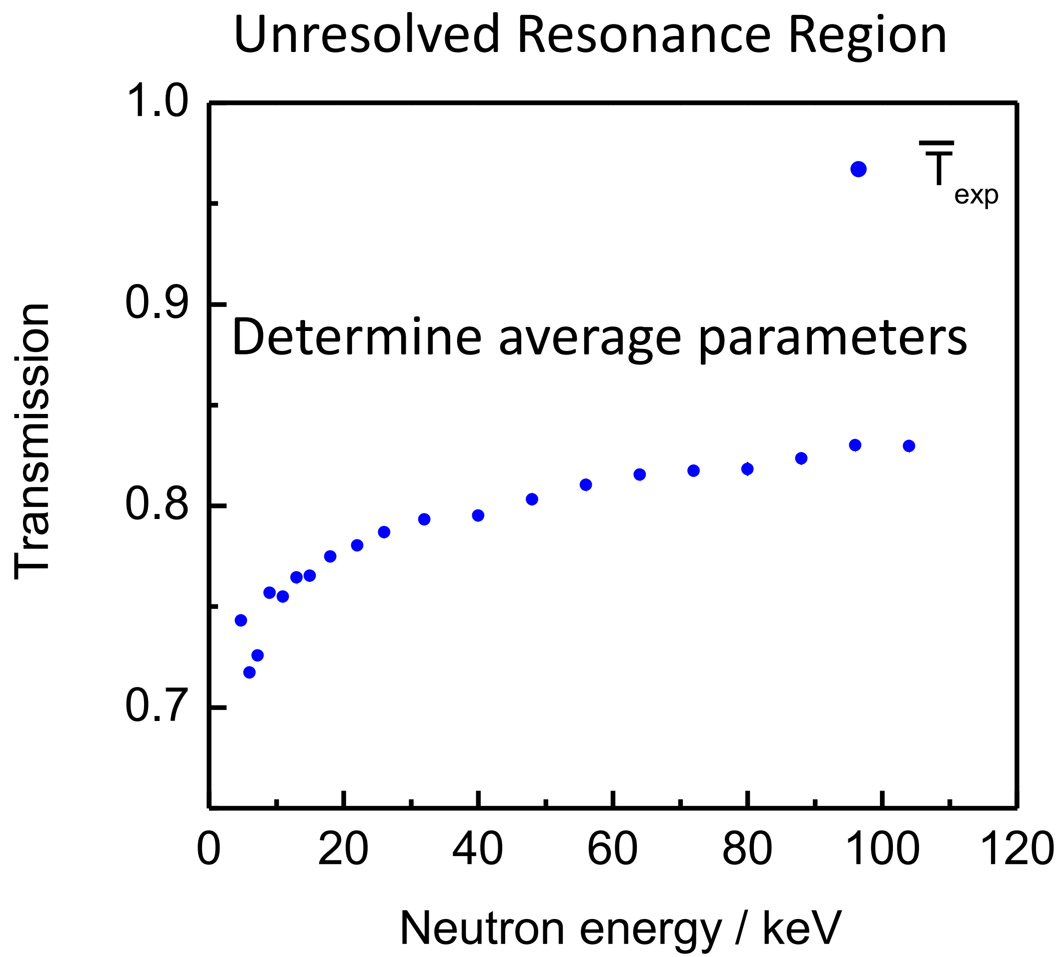
From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$





From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$





From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$

$$T = e^{-n\,\sigma_{tot}}$$

$$\overline{T} = \overline{e^{-n\sigma_{tot}}} = e^{-n\,\overline{\sigma}_{tot}} \left(1 + \frac{n^2}{2} \mathrm{var}(\sigma_{tot}) + \ldots \right)$$

From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$

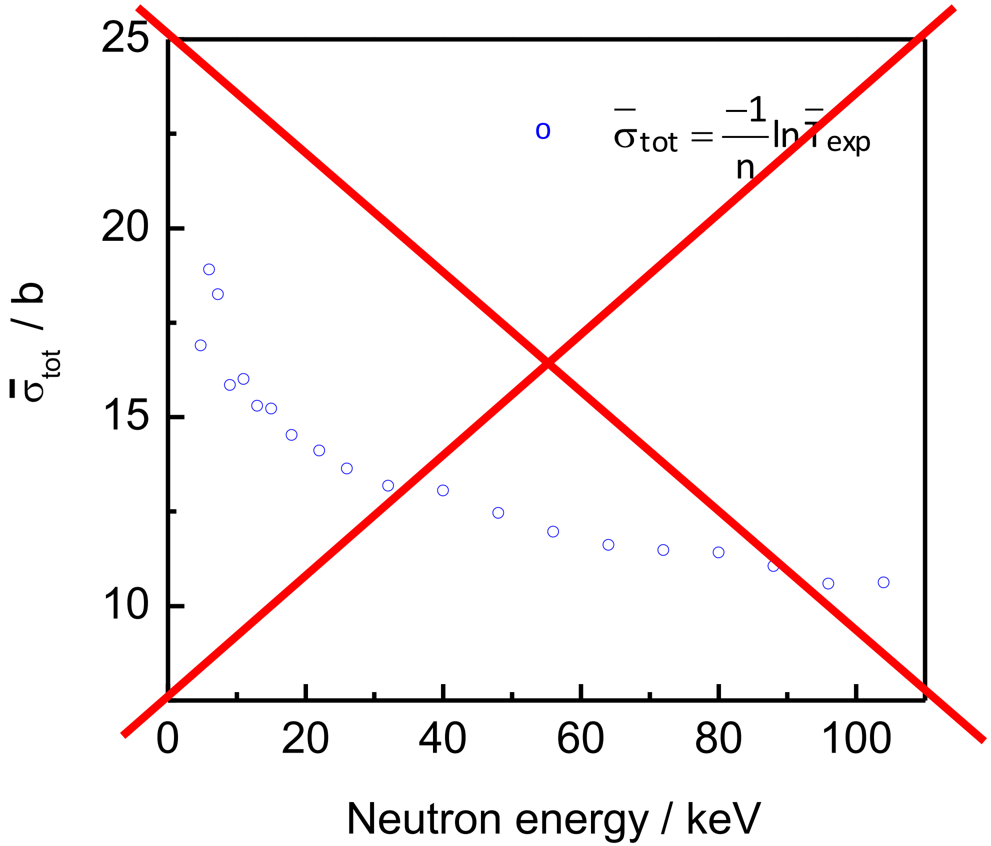
$$T = e^{-n\sigma_{tot}}$$

$$\overline{T} = \overline{e^{-n\sigma_{tot}}} = e^{-n\overline{\sigma}_{tot}}\left(1 + \frac{n^2}{2}\mathrm{var}(\sigma_{tot}) + \dots\right)$$

$$\overline{T} \neq e^{-n\overline{\sigma}_{tot}}$$

$$\overline{\sigma}_{tot} \neq \frac{-1}{n}\ln \overline{T}_{exp}$$

From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$



$$T = e^{-n\sigma_{tot}}$$

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$$\overline{\sigma}_{tot} \neq \frac{-1}{n}\ln \overline{T}_{exp}$$

From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$

$$T = e^{-n\sigma_{tot}}$$

$$\overline{T} = \overline{e^{-n\sigma_{tot}}} = e^{-n\overline{\sigma}_{tot}}\left(1 + \frac{n^2}{2}\mathrm{var}(\sigma_{tot}) + \ldots\right)$$

$$\overline{T} \neq e^{-n\overline{\sigma}_{tot}}$$

$$F_T = \frac{\overline{e^{-n\sigma_{tot}}}}{e^{-n\overline{\sigma}_{tot}}} = 1 + \frac{n^2}{2}\mathrm{var}(\sigma_{tot}) + \ldots$$

From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$

$$T = e^{-n\sigma_{tot}}$$

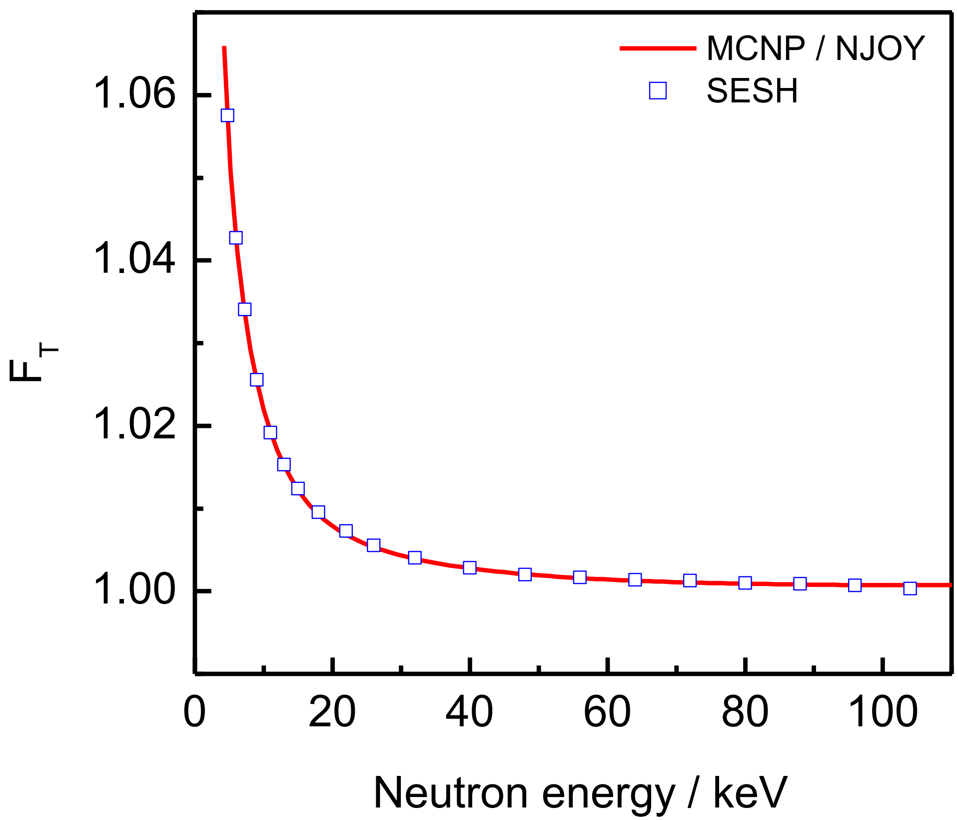
$$\overline{T} = \overline{e^{-n\sigma_{tot}}} = e^{-n\overline{\sigma}_{tot}}\left(1 + \frac{n^2}{2}\mathrm{var}(\sigma_{tot}) + \ldots\right)$$

$$\overline{T} \neq e^{-n\overline{\sigma}_{tot}}$$

$$F_T = \frac{\overline{e^{-n\sigma_{tot}}}}{e^{-n\overline{\sigma}_{tot}}} = 1 + \frac{n^2}{2}\mathrm{var}(\sigma_{tot}) + \ldots$$

$$\overline{\sigma}_{tot} = \frac{-1}{n}\ln\frac{\overline{T}_{exp}}{F_T}$$

From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$



$$T = e^{-n\sigma_{tot}}$$

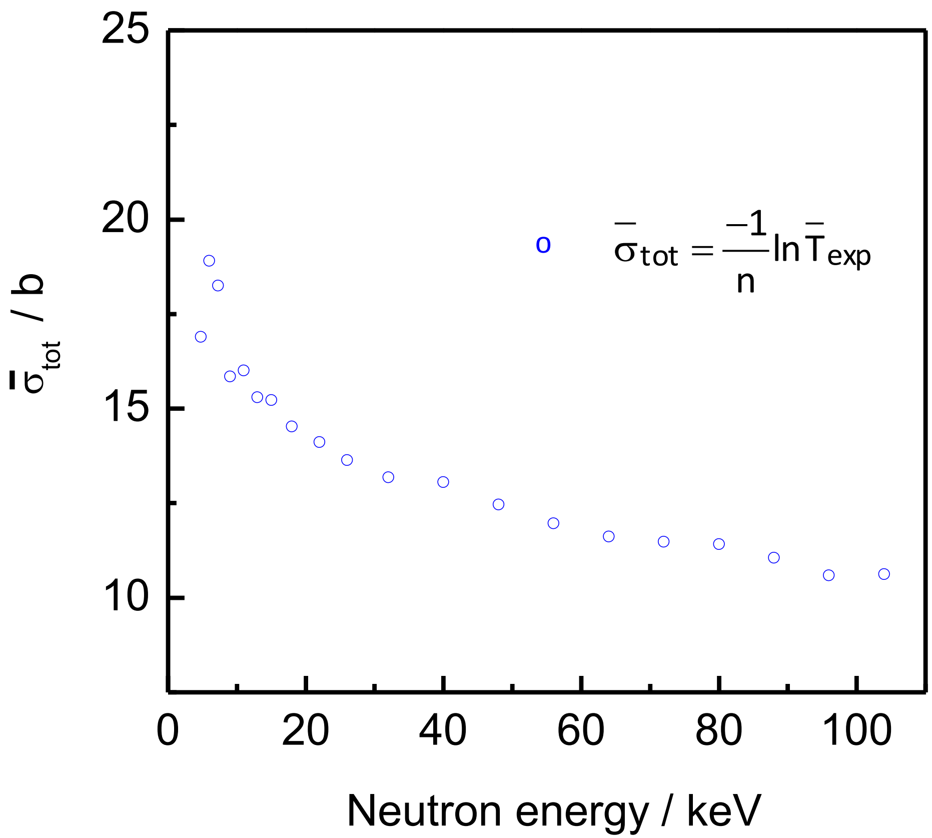
$$\overline{T} = \overline{e^{-n\sigma_{tot}}} = e^{-n\overline{\sigma}_{tot}}\left(1 + \frac{n^2}{2}\mathrm{var}(\sigma_{tot}) + \ldots\right)$$

$$\overline{T} \neq e^{-n\overline{\sigma}_{tot}}$$

$$F_T = \frac{\overline{e^{-n\sigma_{tot}}}}{e^{-n\overline{\sigma}_{tot}}} = 1 + \frac{n^2}{2}\mathrm{var}(\sigma_{tot}) + \ldots$$

$$\overline{\sigma}_{tot} = \frac{-1}{n}\ln\frac{\overline{T}_{exp}}{F_T}$$

From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$

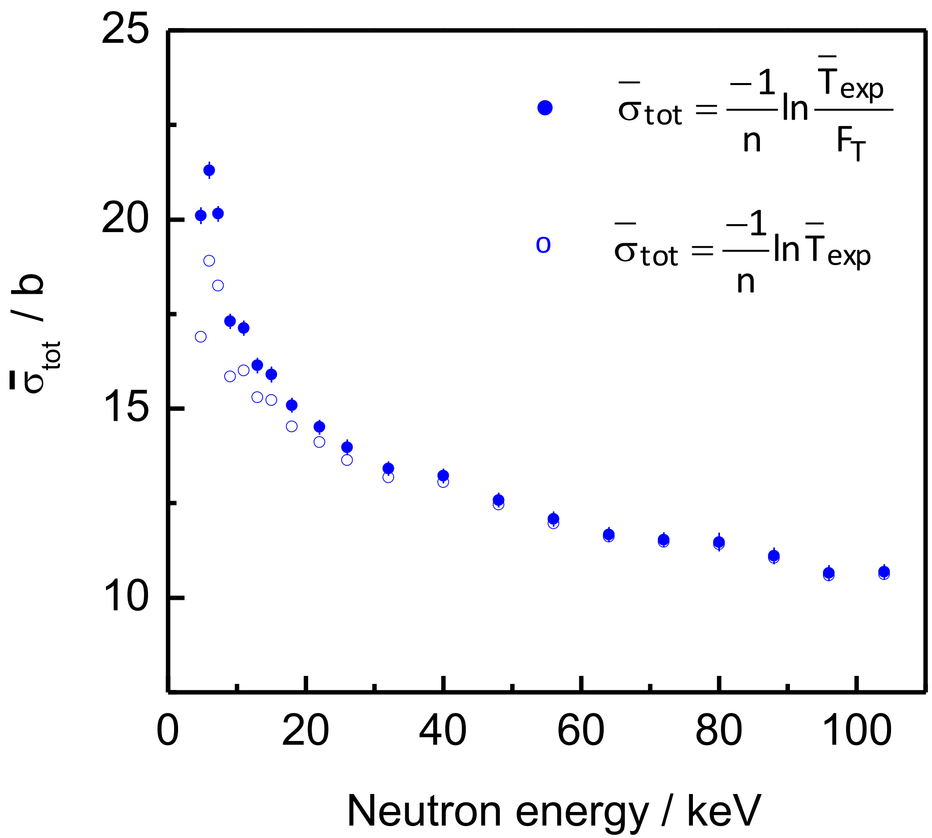


$$T = e^{-n\sigma_{tot}}$$

$$\overline{T} = \overline{e^{-n\sigma_{tot}}} = e^{-n\overline{\sigma}_{tot}} \left(1 + \frac{n^2}{2} var(\sigma_{tot}) + \ldots\right)$$

$$\overline{T} \neq e^{-n\overline{\sigma}_{tot}}$$

From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$



$$T = e^{-n\sigma_{tot}}$$

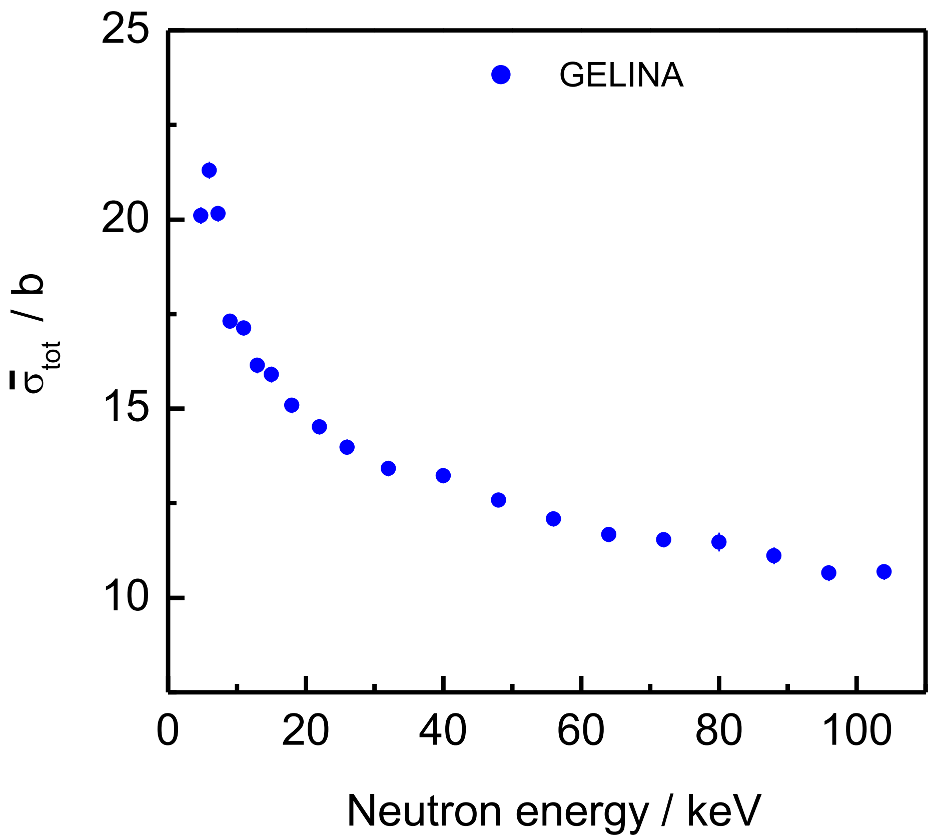
$$\overline{T} = \overline{e^{-n\sigma_{tot}}} = e^{-n\overline{\sigma}_{tot}} \left(1 + \frac{n^2}{2} var(\sigma_{tot}) + \ldots\right)$$

$$\overline{T} \neq e^{-n\overline{\sigma}_{tot}}$$

$$F_T = \frac{\overline{e^{-n\sigma_{tot}}}}{e^{-n\overline{\sigma}_{tot}}} = 1 + \frac{n^2}{2} var(\sigma_{tot}) + \ldots$$

$$\overline{\sigma}_{tot} = \frac{-1}{n} \ln \frac{\overline{T}_{exp}}{F_T}$$

From average $\overline{T}_{exp}$ to average $\overline{\sigma}_{tot}$



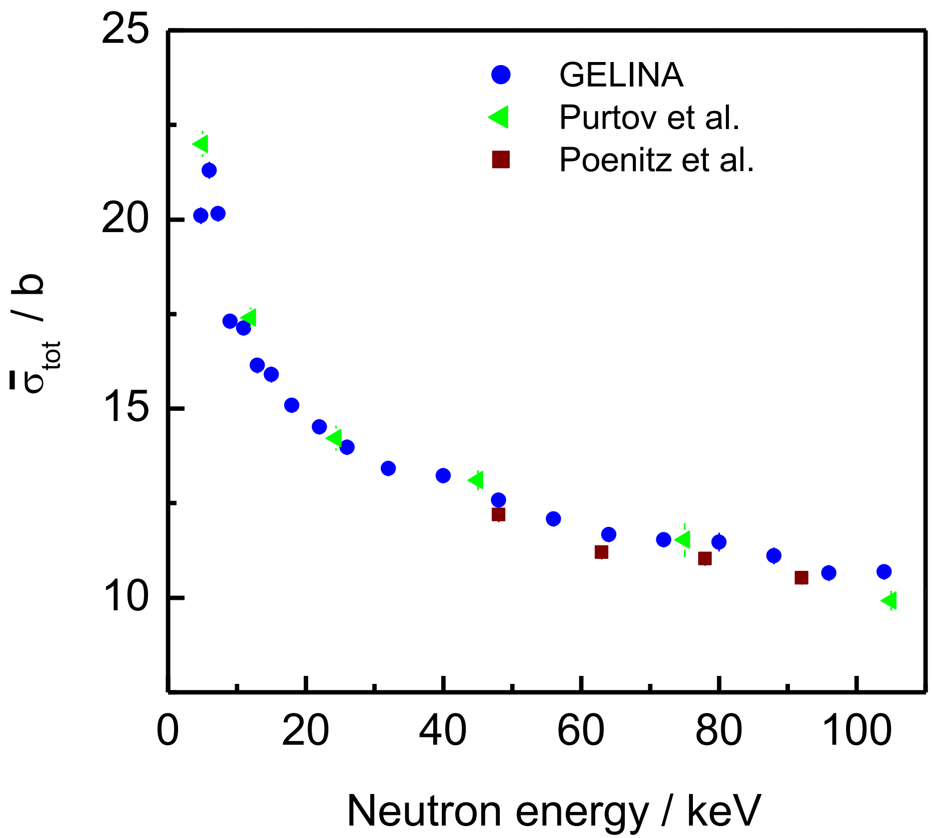
$$T_{exp} = N \frac{C_{in} - K B_{in}}{C_{out} - K B_{out}}$$

$$\frac{u_K}{K} \approx 3\% \qquad \frac{u_N}{N} \approx 0.25\%$$

$$\frac{u_n}{n} \approx 0.2\%$$

$$\overline{\sigma}_{tot} = \frac{-1}{n} \ln \frac{\overline{T}_{exp}}{F_T} \qquad \frac{u_{\overline{\sigma}_{tot}}}{\overline{\sigma}_{tot}} \approx 1-2\%$$

Comparison with data in the literature



$$\frac{u_{\bar{\sigma}_{tot}}}{\bar{\sigma}_{tot}} \approx 1-2\%$$

Reporting $\bar{\sigma}_{tot}$

Table 1. Average total cross section ($\bar{\sigma}_{tot}$) and total uncertainty derived from the data obtained in this work. The information to derive the full covariance matrix based on the AGS concept (eq. (21)) is given: the diagonal elements of the uncorrelated components, $u_u = \sqrt{U_u}$ are in column 6 whereas columns 7–9 represent the matrix $S_{\eta=\{K,N,n\}}$. A high precision is given to ensure that the resulting covariance matrix can be inverted. The correction factor F_T (eq. (20)) is also given.

E_l/eV	E_h/eV	F_T	$\bar{\sigma}_{tot}$/b	$u_{\bar{\sigma}_{tot}}$/b	AGS			
					u_u/b	S_K/b	S_N/b	S_n/b
4000	5500	1.058	20.10	0.22	0.12	0.11486	−0.14226	0.04020
5500	6500	1.043	21.30	0.23	0.15	0.09843	−0.14226	0.04259
6500	8000	1.034	20.15	0.20	0.12	0.07380	−0.14226	0.04030
8000	10000	1.026	17.31	0.20	0.12	0.06558	−0.14226	0.03462
10000	12000	1.020	17.13	0.20	0.13	0.06282	−0.14226	0.03424
12000	14000	1.015	16.14	0.21	0.13	0.05627	−0.14226	0.03227
14000	16000	1.012	15.90	0.21	0.14	0.05469	−0.14226	0.03180
16000	20000	1.010	15.09	0.19	0.12	0.05188	−0.14226	0.03017
20000	24000	1.007	14.51	0.20	0.12	0.04578	−0.14226	0.02901
24000	28000	1.006	13.98	0.20	0.13	0.04452	−0.14226	0.02796
28000	36000	1.004	13.41	0.19	0.11	0.04412	−0.14226	0.02682
36000	44000	1.003	13.22	0.20	0.13	0.04263	−0.14226	0.02643
44000	52000	1.002	12.58	0.20	0.13	0.03287	−0.14226	0.02516
52000	60000	1.002	12.08	0.20	0.14	0.03249	−0.14226	0.02416
60000	68000	1.001	11.67	0.20	0.13	0.02258	−0.14226	0.02335
68000	76000	1.001	11.53	0.20	0.14	0.02152	−0.14226	0.02305
76000	84000	1.001	11.47	0.25	0.20	0.04124	−0.14226	0.02293
84000	92000	1.001	11.11	0.22	0.17	0.02326	−0.14226	0.02221
92000	100000	1.001	10.65	0.21	0.15	0.01676	−0.14226	0.02130
100000	108000	1.001	10.68	0.21	0.15	0.01376	−0.14226	0.02135

(C_{in}, C_{out})

↓

$$T_{exp} = N \frac{C_{in} - K\, B_{in}}{C_{out} - K\, B_{out}}$$

↓

$\bar{T}_{exp}$

↓

$$\bar{\sigma}_{tot} = \frac{-1}{n} \ln \frac{\bar{T}_{exp}}{F_T}$$

Reporting $\overline{\sigma}_{tot}$ + covariance data (AGS-formalism)

Table 1. Average total cross section ($\overline{\sigma}_{tot}$) and total uncertainty derived from the data obtained in this work. The information to derive the full covariance matrix based on the AGS concept (eq. (21)) is given: the diagonal elements of the uncorrelated components, $u_u = \sqrt{U_u}$ are in column 6 whereas columns 7–9 represent the matrix $S_{\eta=\{K,N,n\}}$. A high precision is given to ensure that the resulting covariance matrix can be inverted. The correction factor F_T (eq. (20)) is also given.

E_l/eV	E_h/eV	F_T	$\overline{\sigma}_{tot}$/b	$u_{\overline{\sigma}_{tot}}$/b	AGS			
					u_u/b	S_K/b	S_N/b	S_n/b
4000	5500	1.058	20.10	0.22	0.12	0.11486	−0.14226	0.04020
5500	6500	1.043	21.30	0.23	0.15	0.09843	−0.14226	0.04259
6500	8000	1.034	20.15	0.20	0.12	0.07380	−0.14226	0.04030
8000	10000	1.026	17.31	0.20	0.12	0.06558	−0.14226	0.03462
10000	12000	1.020	17.13	0.20	0.13	0.06282	−0.14226	0.03424
12000	14000	1.015	16.14	0.21	0.13	0.05627	−0.14226	0.03227
14000	16000	1.012	15.90	0.21	0.14	0.05469	−0.14226	0.03180
16000	20000	1.010	15.09	0.19	0.12	0.05188	−0.14226	0.03017
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60000	68000	1.001	11.67	0.20	0.13	0.02258	−0.14226	0.02335
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76000	84000	1.001	11.47	0.25	0.20	0.04124	−0.14226	0.02293
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92000	100000	1.001	10.65	0.21	0.15	0.01676	−0.14226	0.02130
100000	108000	1.001	10.68	0.21	0.15	0.01376	−0.14226	0.02135

(C_{in}, C_{out})

↓

$$T_{exp} = N \frac{C_{in} - K\ B_{in}}{C_{out} - K\ B_{out}}$$

↓

$\overline{T}_{exp}$

↓

$$\overline{\sigma}_{tot} = \frac{-1}{n} \ln \frac{\overline{T}_{exp}}{F_T}$$ + covariance

u_u and $S_{(K,N,n)}$

$$\underline{V}_{\vec{Z}} = \underline{D}_{\vec{Z}} + \underline{S}_{\vec{Z}} \underline{S}_{\vec{Z}}^T$$

Reporting $\overline{\sigma}_{tot}$ + covariance data (AGS-formalism)

Table 1. Average total cross section ($\overline{\sigma}_{tot}$) and total uncertainty derived from the data obtained in this work. The information to derive the full covariance matrix based on the AGS concept (eq. (21)) is given: the diagonal elements of the uncorrelated components, $u_u = \sqrt{U_u}$ are in column 6 whereas columns 7–9 represent the matrix $S_{\eta=\{K,N,n\}}$. A high precision is given to ensure that the resulting covariance matrix can be inverted. The correction factor F_T (eq. (20)) is also given.

E_l/eV	E_h/eV	F_T	$\overline{\sigma}_{tot}$/b	$u_{\overline{\sigma}_{tot}}$/b	AGS			
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4000	5500	1.058	20.10	0.22	0.12	0.11486	−0.14226	0.04020
5500	6500	1.043	21.30	0.23	0.15	0.09843	−0.14226	0.04259
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.12	0.07380	−0.14226	0.04030
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.12	0.06558	−0.14226	0.03462
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.13	0.06282	−0.14226	0.03424
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.13	0.05627	−0.14226	0.03227
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.14	0.05469	−0.14226	0.03180
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.12	0.05188	−0.14226	0.03017
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28000	36000	1.004	13.41	0.19	0.11	0.04412	−0.14226	0.02682
36000	44000	1.003	13.22	0.20	0.13	0.04263	−0.14226	0.02643
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52000	60000	1.002	12.08	0.20	0.14	0.03249	−0.14226	0.02416
60000	68000	1.001	11.67	0.20	0.13	0.02258	−0.14226	0.02335
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76000	84000	1.001	11.47	0.25	0.20	0.04124	−0.14226	0.02293
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92000	100000	1.001	10.65	0.21	0.15	0.01676	−0.14226	0.02130
100000	108000	1.001	10.68	0.21	0.15	0.01376	−0.14226	0.02135

Propagation of uncorrelated uncertainties due to counting statistics

(C_{in}, C_{out})

↓

$$T_{exp} = N \, \frac{C_{in} - K\,B_{in}}{C_{out} - K\,B_{out}}$$

↓

$\overline{T}_{exp}$

↓

$$\overline{\sigma}_{tot} = \frac{-1}{n} \ln \frac{\overline{T}_{exp}}{F_T} \quad + \quad \text{covariance}$$

u_u and $S_{(K,N,n)}$

$$\underline{V}_{\vec{Z}} = \underline{D}_{\vec{Z}} + \underline{S}_{\vec{Z}}\,\underline{S}_{\vec{Z}}^{T}$$

Reporting $\overline{\sigma}_{tot}$ + covariance data (AGS-formalism)

Table 1. Average total cross section ($\overline{\sigma}_{tot}$) and total uncertainty derived from the data obtained in this work. The informatior to derive the full covariance matrix based on the AGS concept (eq. (21)) is given: the diagonal elements of the uncorrelated components, $u_u = \sqrt{U_u}$ are in column 6 whereas columns 7–9 represent the matrix $S_{\eta=\{K,N,n\}}$. A high precision is given tc ensure that the resulting covariance matrix can be inverted. The correction factor F_T (eq. (20)) is also given.

E_l/eV	E_h/eV	F_T	$\overline{\sigma}_{tot}$/b	$u_{\overline{\sigma}_{tot}}$/b	AGS			
					u_u/b	S_K/b	S_N/b	S_n/b
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5500	6500	1.043	21.30	0.23	0.15	0.09843	−0.14226	0.04259
6500	8000	[illegible]	[illegible]	[illegible]	0.12	0.07380	−0.14226	0.04030
8000	10000	[illegible]	[illegible]	[illegible]	0.12	0.06558	−0.14226	0.03462
10000	12000	[illegible]	[illegible]	[illegible]	0.13	0.06282	−0.14226	0.03424
12000	14000	[illegible]	[illegible]	[illegible]	0.13	0.05627	−0.14226	0.03227
14000	16000	[illegible]	[illegible]	[illegible]	0.14	0.05469	−0.14226	0.03180
16000	20000	[illegible]	[illegible]	[illegible]	0.12	0.05188	−0.14226	0.03017
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92000	100000	1.001	10.65	0.21	0.15	0.01676	−0.14226	0.02130
100000	108000	1.001	10.68	0.21	0.15	0.01376	−0.14226	0.02135

$$S_K = \frac{\partial \overline{\sigma}_{tot}}{\partial K} u_K$$

(C_{in}, C_{out})

$$T_{exp} = N \frac{C_{in} - K B_{in}}{C_{out} - K B_{out}}$$

$\overline{T}_{exp}$

$$\overline{\sigma}_{tot} = \frac{-1}{n} \ln \frac{\overline{T}_{exp}}{F_T} \quad + \quad \text{covariance}$$

u_u and $S_{(K,N,n)}$

$$\underline{V}_{\vec{Z}} = \underline{D}_{\vec{Z}} + \underline{S}_{\vec{Z}} \underline{S}_{\vec{Z}}^T$$

Reporting $\overline{\sigma}_{tot}$ + covariance data (AGS-formalism)

Table 1. Average total cross section ($\overline{\sigma}_{tot}$) and total uncertainty derived from the data obtained in this work. The information to derive the full covariance matrix based on the AGS concept (eq. (21)) is given: the diagonal elements of the uncorrelated components, $u_u = \sqrt{U_u}$ are in column 6 whereas columns 7–9 represent the matrix $S_{\eta=\{K,N,n\}}$. A high precision is given to ensure that the resulting covariance matrix can be inverted. The correction factor F_T (eq. (20)) is also given.

E_l/eV	E_h/eV	F_T	$\overline{\sigma}_{tot}$/b	$u_{\overline{\sigma}_{tot}}$/b	AGS			
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12000	14000	[illegible]	[illegible]	[illegible]	0.13	0.05627	−0.14226	0.03227
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100000	108000	1.001	10.68	0.21	0.15	0.01376	−0.14226	0.02135

$$S_N = \frac{\partial \overline{\sigma}_{tot}}{\partial N} u_N$$

(C_{in}, C_{out})

$$T_{exp} = N \frac{C_{in} - K\ B_{in}}{C_{out} - K\ B_{out}}$$

$\overline{T}_{exp}$

$$\overline{\sigma}_{tot} = \frac{-1}{n} \ln \frac{\overline{T}_{exp}}{F_T} \quad + \quad \text{covariance}$$

u_u and $S_{(K,N,n)}$

$$\underline{V}_{\vec{Z}} = \underline{D}_{\vec{Z}} + \underline{S}_{\vec{Z}}\, \underline{S}_{\vec{Z}}^{T}$$

Reporting $\bar{\sigma}_{tot}$ + covariance data (AGS-formalism)

Table 1. Average total cross section ($\overline{\sigma}_{tot}$) and total uncertainty derived from the data obtained in this work. The information to derive the full covariance matrix based on the AGS concept (eq. (21)) is given: the diagonal elements of the uncorrelated components, $u_u = \sqrt{U_u}$ are in column 6 whereas columns 7–9 represent the matrix $S_{\eta=\{K,N,n\}}$. A high precision is given to ensure that the resulting covariance matrix can be inverted. The correction factor F_T (eq. (20)) is also given.

E_l/eV	E_h/eV	F_T	$\overline{\sigma}_{tot}$/b	$u_{\overline{\sigma}_{tot}}$/b	AGS			
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$$S_n = \frac{\partial \bar{\sigma}_{tot}}{\partial n} u_n$$

(C_{in}, C_{out})

$$T_{exp} = N \frac{C_{in} - K\ B_{in}}{C_{out} - K\ B_{out}}$$

$\bar{T}_{exp}$

$$\bar{\sigma}_{tot} = \frac{-1}{n} \ln \frac{\bar{T}_{exp}}{F_T} \quad + \quad \text{covariance}$$

u_u and $S_{(K,N,n)}$

$$\underline{V}_{\vec{Z}} = \underline{D}_{\vec{Z}} + \underline{S}_{\vec{Z}} \underline{S}_{\vec{Z}}^T$$

Reporting $\bar{\sigma}_{tot}$ + covariance data (AGS-formalism)

Table 1. Average total cross section ($\bar{\sigma}_{tot}$) and total uncertainty derived from the data obtained in this work. The information to derive the full covariance matrix based on the AGS concept (eq. (21)) is given: the diagonal elements of the uncorrelated components, $u_u = \sqrt{U_u}$ are in column 6 whereas columns 7–9 represent the matrix $S_{\eta=\{K,N,n\}}$. A high precision is given to ensure that the resulting covariance matrix can be inverted. The correction factor F_T (eq. (20)) is also given.

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76000	84000	1.001	11.47	0.25	0.20	0.04124	−0.14226	0.02293
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92000	100000	1.001	10.65	0.21	0.15	0.01676	−0.14226	0.02130
100000	108000	1.001	10.68	0.21	0.15	0.01376	−0.14226	0.02135

$$S_{\bar{\sigma}_{tot}} = (S_K, S_N, S_n)$$

matrix with dimension (20,3)

$$(C_{in}, C_{out})$$

$$T_{exp} = N\,\frac{C_{in} - K\,B_{in}}{C_{out} - K\,B_{out}}$$

$$\bar{T}_{exp}$$

$$\bar{\sigma}_{tot} = \frac{-1}{n}\ln\frac{\bar{T}_{exp}}{F_T}$$ + covariance

u_u and $S_{(K,N,n)}$

$$\underline{V}_{\vec{Z}} = \underline{D}_{\vec{Z}} + \underline{S}_{\vec{Z}}\,\underline{S}_{\vec{Z}}^{T}$$

Reporting $\overline{\sigma}_{tot}$ + covariance data (AGS-formalism)

Table 1. Average total cross section ($\overline{\sigma}_{tot}$) and total uncertainty derived from the data obtained in this work. The information to derive the full covariance matrix based on the AGS concept (eq. (21)) is given: the diagonal elements of the uncorrelated components, $u_u = \sqrt{U_u}$ are in column 6 whereas columns 7–9 represent the matrix $S_{\eta=\{K,N,n\}}$. A high precision is given to ensure that the resulting covariance matrix can be inverted. The correction factor F_T (eq. (20)) is also given.

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					u_u/b	S_K/b	S_N/b	S_n/b
4000	5500	1.058	20.10	0.22	0.12	0.11486	−0.14226	0.04020
5500	6500	1.043	21.30	0.23	0.15	0.09843	−0.14226	0.04259
6500	8000	1.034	20.15	0.20	0.12	0.07380	−0.14226	0.04030
8000	10000	1.026	17.31	0.20	0.12	0.06558	−0.14226	0.03462
10000	12000	1.020	17.13	0.20	0.13	0.06282	−0.14226	0.03424
12000	14000	1.015	16.14	0.21	0.13	0.05627	−0.14226	0.03227
14000	16000	1.012	15.90	0.21	0.14	0.05469	−0.14226	0.03180
16000	20000	1.010	15.09	0.19	0.12	0.05188	−0.14226	0.03017
20000	24000	1.007	14.51	0.20	0.12	0.04578	−0.14226	0.02901
24000	28000	1.006	13.98	0.20	0.13	0.04452	−0.14226	0.02796
28000	36000	1.004	13.41	0.19	0.11	0.04412	−0.14226	0.02682
36000	44000	1.003	13.22	0.20	0.13	0.04263	−0.14226	0.02643
44000	52000	1.002	12.58	0.20	0.13	0.03287	−0.14226	0.02516
52000	60000	1.002	12.08	0.20	0.14	0.03249	−0.14226	0.02416
60000	68000	1.001	11.67	0.20	0.13	0.02258	−0.14226	0.02335
68000	76000	1.001	11.53	0.20	0.14	0.02152	−0.14226	0.02305
76000	84000	1.001	11.47	0.25	0.20	0.04124	−0.14226	0.02293
84000	92000	1.001	11.11	0.22	0.17	0.02326	−0.14226	0.02221
92000	100000	1.001	10.65	0.21	0.15	0.01676	−0.14226	0.02130
100000	108000	1.001	10.68	0.21	0.15	0.01376	−0.14226	0.02135

(C_{in}, C_{out})

↓

$$T_{exp} = N \frac{C_{in} - K\,B_{in}}{C_{out} - K\,B_{out}}$$

↓

$\overline{T}_{exp}$

↓

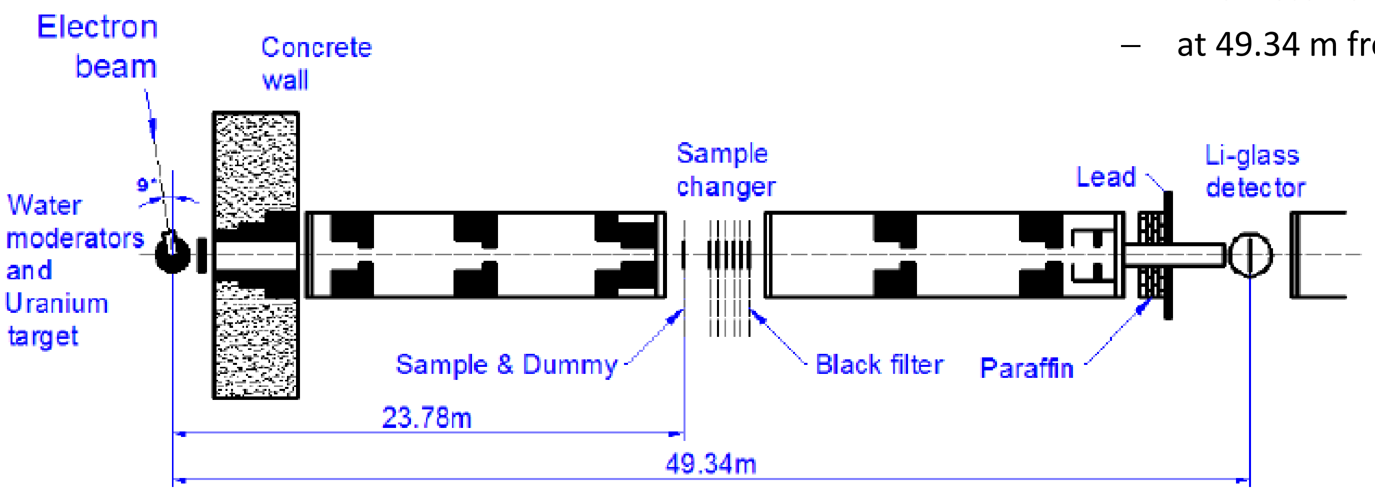
$$\overline{\sigma}_{tot} = \frac{-1}{n} \ln \frac{\overline{T}_{exp}}{F_T} \quad + \text{ covariance}$$

u_u and $S_{(K,N,n)}$

$$\underline{V}_{\vec{Z}} = \underline{D}_{\vec{Z}} + \underline{S}_{\vec{Z}}\,\underline{S}_{\vec{Z}}^{T}$$

EXFOR reporting : experimental details

- Neutron source
  - moderated neutron beam
  - 9° with normal of moderator face viewing FP4
- Filters
  - ^{10}B (0.008 at/b) overlap filter
  - 8-mm thick Pb filter (γ-ray flash)
  - Co and Na fixed black resonance filter
- Sample
  - Au metal foil
  - 50 mm x 50 mm x 3 mm
  - 1.757 (0.004) 10^{-2} at/b
  - at 23.78 m from neutron source
- Detector
  - NE912 Li-glass scintillator, 95% enriched in ^{6}Li
  - diameter : 101.1 mm
  - thickness : 6.35 mm
  - at 49.34 m from neutron source



EXFOR reporting : template (see report)

A. EXPERIMENT DESCRIPTION

1. Main Reference		[1,2]
2. Facility	GELINA	[3]
3. Neutron production		
Neutron production beam	Electron	
Nominal average beam energy	100 MeV	
Nominal average peak current	70 μA	
Repetition rate (pulses per second)	800 Hz	
Pulse width	1 ns	
Primary neutron production target	Mercury cooled depleted uranium	
Target nominal neutron production intensity	3.4×10^{13} s^{-1}	
4. Moderator		
Primary neutron source position in moderator	Above and below uranium target	
Moderator material	2 H_2O filled Be-containers around U-target	
Moderator dimensions (internal) (thickness, height×width×depth,...)	2 x (14.6 cm x 21 cm x 3.9 cm)	
Density (moderator material)	1 g/cm^3	
Temperature (K)	Room temperature	
Moderator-room decoupler (Cd, B, ...)	None	
5. Other experimental details		
Measurement type	Transmission	
Method (total energy, total absorption, ...)	Good transmission geometry	[4]
Flight path length (m) (moderator –detector)	L = 49.3445 m	
Flight path direction	9º with respect to normal of the moderator face viewing the flight path	
Neutron beam dimensions at sample position (mm × mm, diameter in mm, ...)	35 mm in diameter	
Neutron beam profile	-	
Overlap suppression (Filter material and thickness, chopper, ...)	^{10}B overlap filter (0.008 at/b)	
Other fixed beam filters	Na, Co, Pb (8 mm)	
6. Detector		
Type	Scintillator (NE912)	
Material	Li-glass	
Surface Dimensions (mm × mm. diameter in mm, ...)	101.6 mm in diameter	
Thickness (mm)	6.35 mm in thick	
Distance from samples (mm)	125 mm	
Detector(s) position relative to neutron beam	In the beam	
Detector(s) solid angle	-	
7. Sample		
Type (metal, powder, liquid, crystal)	Metal	
Chemical composition	^{197}Au (100%)	
Sample composition (at/b)	^{197}Au: (1:757 ± 0:004) x 10^{-2} at/b	
Temperature	22° C	
Sample mass (g)	-	
Geometrical shape (cylinder, sphere, ...)	Foil	
Surface dimension (mm × mm, diameter in mm, ...)	50 mm x 50 mm	
Nominal thickness (mm)	3 mm	
Containment description	None	
Additional comment	Stack of 2 foils and 1 disc	

8. Data Reduction Procedure		[4, 5]
Dead time correction	Done (< factor 1.2)	
Back ground subtraction	Black resonance technique	
Flux determination (reference reaction, ...)	-	
Normalization	1.0000 ± 0.0025	
Detector efficiency	-	
Self-shielding	-	
Time-of-flight binning	Zone length bin width	
	1024 4 ns	
	1024 2 ns	
	4096 1 ns	
	5120 2 ns	
	5120 4 ns	
	5120 8 ns	
	5120 16 ns	
	5120 32 ns	
	5120 64 ns	
	5120 128 ns	
9. Response function		
Initial pulse	Normal distribution, FWHM = 2 ns	
Target / moderator assembly	Numerical distribution from MC simulations entry RF.NNNN1	[6, 7]
Detector	Analytical function defined in REFIT manual entry RF.NNNN2	[8]

B. DATA FORMAT

Column	Content	Unit	Comment
1	Energy	eV	Relativistic relation using a fixed FP length of 49.345 m and average TOF
2	t_l	ns	
3	t_h	ns	
4	T_{exp}		Transmission
5	Total Uncertainty		
6	Uncorrelated uncertainty		Uncorrelated uncertainty due to counting statistics
7	AGS-vector (K)		Background model (u_K/K = 3%)
8	AGS-vector (N)		Normalization (u_N/N = 0.25%)

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Students opportunities

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Questions ?

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