Gathering & analysing bibliography

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DDEP workshop – 21 to 25 October 2024

Bibliography for nuclear data

A rigorous nuclear data evaluation must

- Gather all the available data on the related subject
  - Without any bias on the quality of the considered work
  - Regardless of how much time have passed since the publication
  - Regardless of the language used (even if the evaluator is not capable of understanding it!!)

- Extract appropriately meaningful experimental values from the considered works
  - Identify the measured quantity precisely
  - Correcting the dependence of physical constant if necessary
  - Converting the estimated uncertainty if necessary

- Perform a critical analysis of the dataset

1. Gathering the data

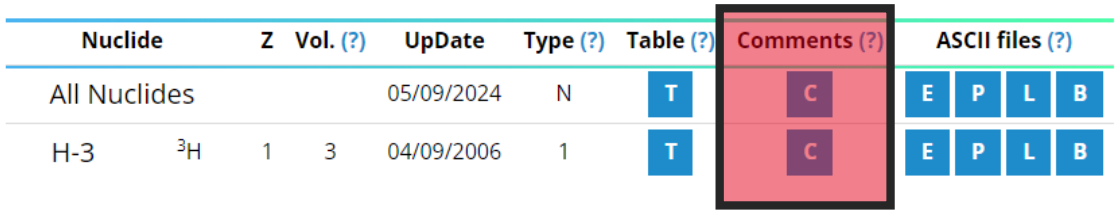
How to find all relevant works?

A tedious but critical part of the evaluation work

1. Look for references in existing evaluation works (DDEP, ENSDF, IUPAC, IUGS...)
2. Search in Bibliography database (NSR, INIS, OSTI)
3. Use your favourite web browser
4. Use your institution library services
5. Look at all references used in the identified works
6. Repeat the process several times

Bibliography in existing evaluation works

- Where to find references in DDEP evaluation?
  - Look to the comment file



Nuclide		Z	Vol. (?)	UpDate	Type (?)	Table (?)	Comments (?)	ASCII files (?)
All Nuclides				05/09/2024	N	T	C	E P L B
H-3	^{3}H	1	3	04/09/2006	1	T	C	E P L B

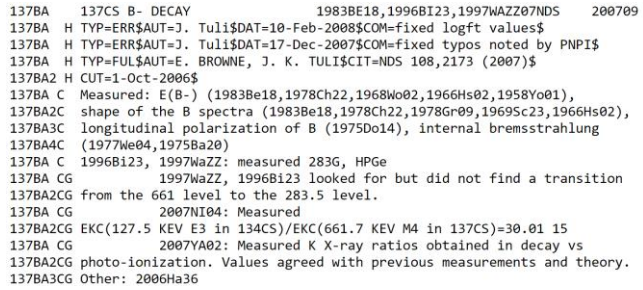
- Where to find references in ENSDF evaluation?
  - Most efficient approach: in the 80 columns format
  - Most convenient way: in the Nuclear Data Sheets

ELSEVIER

Nuclear Data Sheets

Volume 108, Issue 10, October 2007, Pages 2173-2318

Nuclear Data Sheets for A = 137 ☆



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137BA    137CS B- DECAY                1983BE18,1996BI23,1997WAZZ07NDS    200709
137BA  H TYP=ERR$AUT=J. Tuli$DAT=10-Feb-2008$COM=fixed logft values$
137BA  H TYP=ERR$AUT=J. Tuli$DAT=17-Dec-2007$COM=fixed typos noted by PNPI$
137BA  H TYP=FUL$AUT=E. BROWNE, J. K. TULI$CIT=NDS 108,2173 (2007)$
137BA2 H CUT=1-Oct-2006$
137BA C  Measured: E(B-) (1983Be18,1978Ch22,1968Wo02,1966Hs02,1958Yo01),
137BA2C  shape of the B spectra (1983Be18,1978Ch22,1978Gr09,1969Sc23,1966Hs02),
137BA3C  longitudinal polarization of B (1975Do14), internal bremsstrahlung
137BA4C  (1977We04,1975Ba20)
137BA C  1996Bi23, 1997WaZZ: measured 283G, HPGe
137BA CG          1997WaZZ, 1996Bi23 looked for but did not find a transition
137BA2CG from the 661 level to the 283.5 level.
137BA CG          2007NI04: Measured
137BA2CG EKC(127.5 KEV E3 in 134CS)/EKC(661.7 KEV M4 in 137CS)=30.01 15
137BA CG          2007YA02: Measured K X-ray ratios obtained in decay vs
137BA2CG photo-ionization. Values agreed with previous measurements and theory.
137BA3CG Other: 2006Ha36
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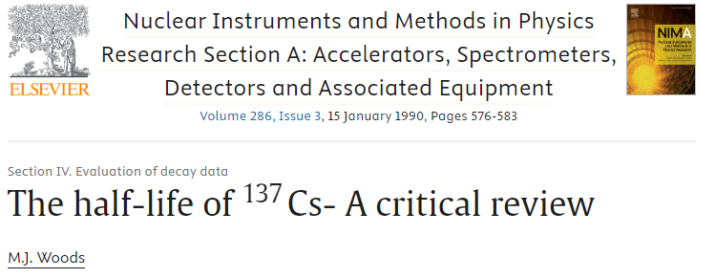
- Don’t forget that evaluation are sometimes also published as scientific work
  - The references can be easily accessed



ELSEVIER

Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment

Volume 286, Issue 3, 15 January 1990, Pages 576-583

Section IV. Evaluation of decay data

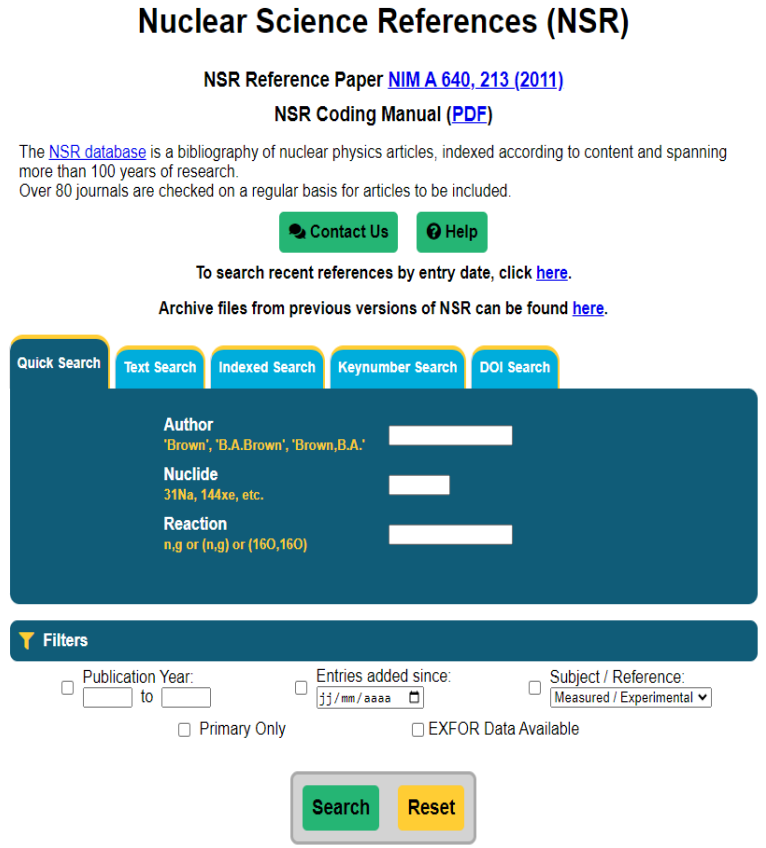
The half-life of ^{137}Cs- A critical review

M.J. Woods

Bibliography database: NSR

https://www.nndc.bnl.gov/nsr/

- NSDD database used by all ENSDF collaborators
- Each article is characterized by a keynumber XXXXYYZZ where
  - XXXX is the year of publication
  - YY are the first two letters of the first author's name
  - ZZ is the number of occurrences matching XXXXYY previously known
- Each entry contains
  - Full reference of article
  - DOI (if available)
  - Keywords



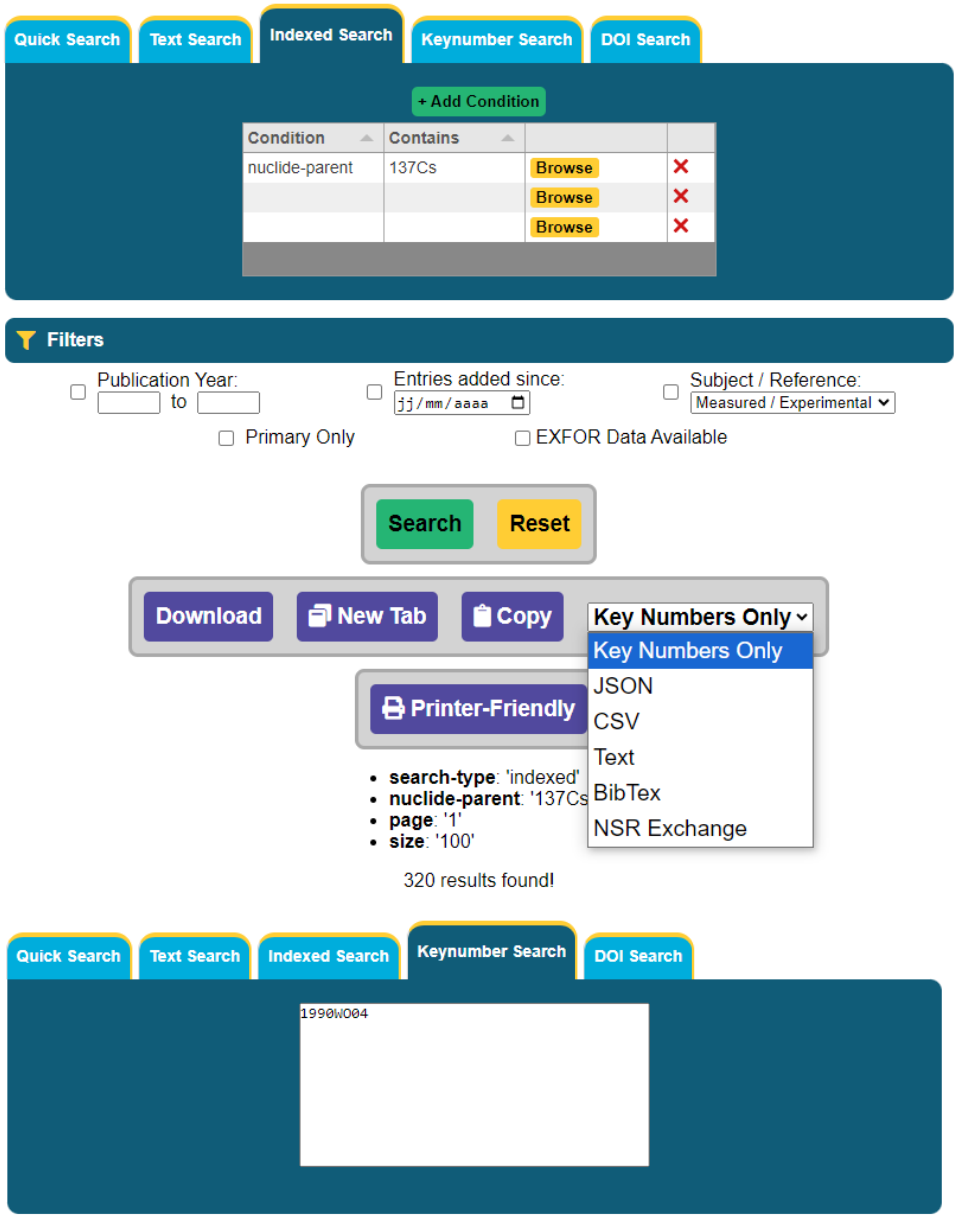
Key #	DOI + Links	Authors	Reference
1990WO04	10.1016/0168-9002(90)90919-W PlumX Metrics	M.J.Woods	Nucl.Instrum.Methods Phys.Res. A286, 576 (1990)
Title	The Half-Life of ^{137}Cs - A Critical Review		
Keywords	• COMPILATION ^{137}Cs(β^-); compiled, evaluated $T_{1/2}$ data.		

How to use NSR efficiently?

- In search for all articles related to a given decay
  - Use indexed search
  - Add a *nuclide-parent* condition with your nucleus of interest
  - Have a look to the relevance of each result…

    (you can export the result of your search in various formats)

- In search from a specific reference
  - If you know the keynumber use the *Keynumber Search*
  - Otherwise use the quick search option using available information
    - Author: carefully check the spelling of some names



Bibliography database: INIS

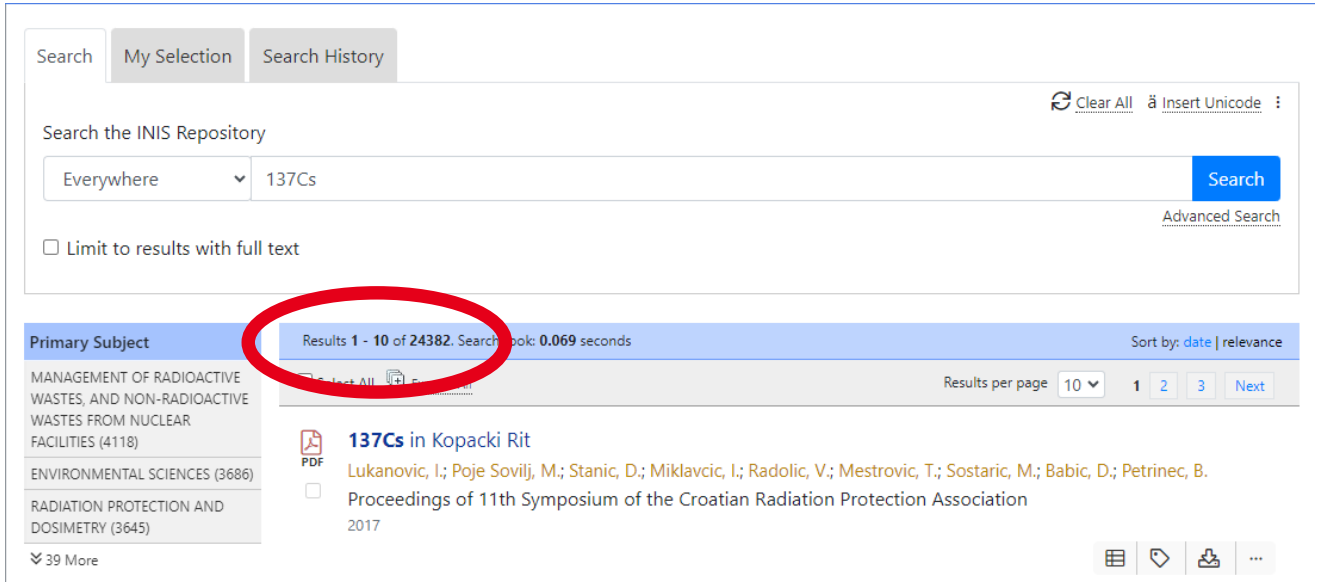
https://www.iaea.org/resources/databases/inis

- AIEA database to collect all nuclear-related information

- Extremely wide and complete database
  - Non conventional conference or workshops
  - Laboratory and institute reports
  - PDF often available

- When to use
  - Looking for unconventional sources
  - Trying to access PDF of a known source

- How to use
  - Refined your search with filters as much as possible



Bibliography database: OSTI

https://www.osti.gov/

- Database containing all (unclassified) reports and documents from the Department of Energy

DOE Office of Scientific and Technical Information (OSTI)

- Extremely wide database
  - Laboratory and institute reports
  - PDF often available
- When to use
  - Looking for specific US work
  - Trying to access PDF of a known source
- How to use
  - Refined your search with filters as much as possible

Bibliography: other advices

- Don’t neglect university / institution libraries
  - They often have more references than you can imagine
  - They might offer support for your search
  - They have access to specific networks and dedicated tools

- When trying to find the PDF of an obscure reference
  - Try OSTI / INIS
  - Look for the specific journal / institution website
  - Ask your fellow evaluator colleagues

- Don’t neglect non-English references
  - A large amount of work has been reported in: Russian, French, German…
  - Retrieval of references is not always easy

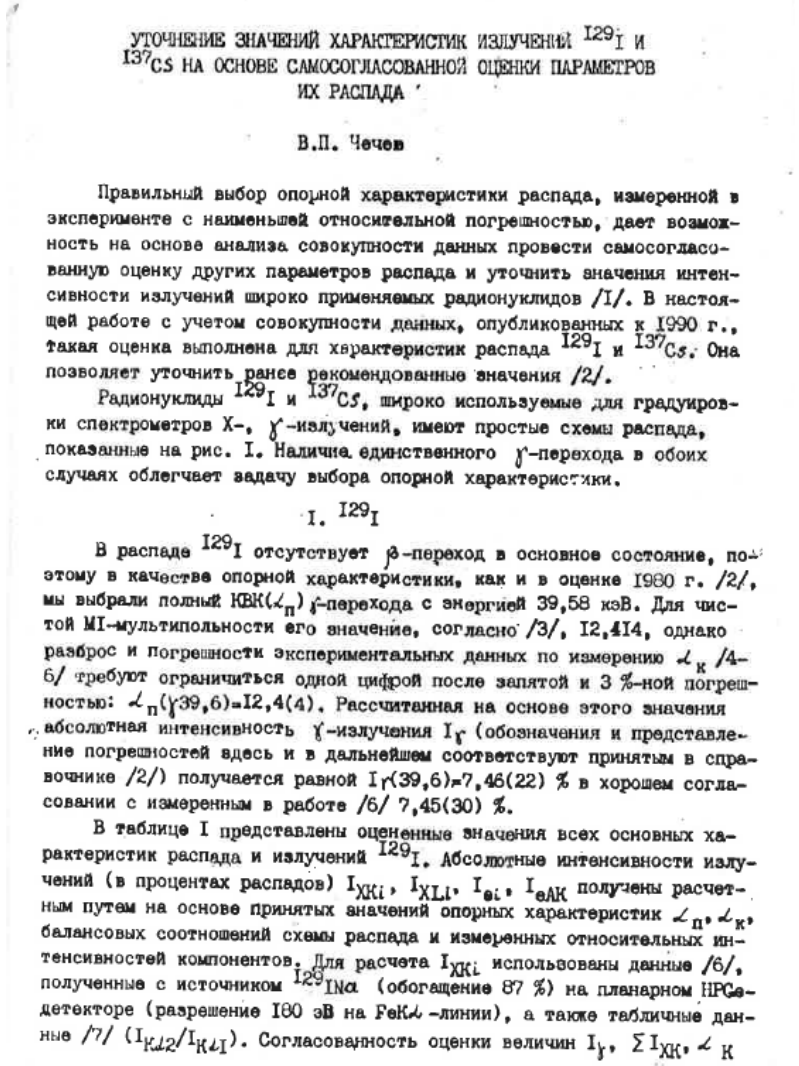
2. Analysing and extracting measured values from a reference

Extracting data from a reference

- Once you have completed your bibliography you can start gathering measured quantities.

- Some general advices
  - Read the article fully
  - Perform the extraction and analysis sequentially for each physical quantities
  - Evaluate the dependency of the measurement on physical constants
    - Correct it to up to date values if possible
    - At the minimum evaluate the effect of any deviation

- The goal of the extraction is to get a measured quantity *reasonably comparable* to other measurements in the field



УТОЧНЕНИЕ ЗНАЧЕНИЙ ХАРАКТЕРИСТИК ИЗЛУЧЕНИЙ ^{129}I И ^{137}Cs НА ОСНОВЕ САМОСОГЛАСОВАННОЙ ОЦЕНКИ ПАРАМЕТРОВ ИХ РАСПАДА

В.П. Чечев

Правильный выбор опорной характеристики распада, измеренной в эксперименте с наименьшей относительной погрешностью, дает возможность на основе анализа совокупности данных провести самосогласованную оценку других параметров распада и уточнить значения интенсивности излучений широко применяемых радионуклидов /I/. В настоящей работе с учетом совокупности данных, опубликованных к 1990 г., такая оценка выполнена для характеристик распада ^{129}I и ^{137}Cs. Она позволяет уточнить ранее рекомендованные значения /2/.

Радионуклиды ^{129}I и ^{137}Cs, широко используемые для градуировки спектрометров X-, γ-излучений, имеют простые схемы распада, показанные на рис. I. Наличие единственного γ-перехода в обоих случаях облегчает задачу выбора опорной характеристики.

I. ^{129}I

В распаде ^{129}I отсутствует β-переход в основное состояние, поэтому в качестве опорной характеристики, как и в оценке 1980 г. /2/, мы выбрали полный КВК(α_n) γ-перехода с энергией 39,58 кэВ. Для чистой MI-мультипольности его значение, согласно /3/, I2,4I4, однако разброс и погрешности экспериментальных данных по измерению α_K /4-6/ требуют ограничиться одной цифрой после запятой и 3 %-ной погрешностью: $\alpha_n(\gamma 39,6)=12,4(4)$. Рассчитанная на основе этого значения абсолютная интенсивность γ-излучения I_γ (обозначения и представление погрешностей здесь и в дальнейшем соответствуют принятым в справочнике /2/) получается равной $I_\gamma(39,6)=7,46(22)$ % в хорошем согласовании с измеренным в работе /6/ 7,45(30) %.

В таблице I представлены оцененные значения всех основных характеристик распада и излучений ^{129}I. Абсолютные интенсивности излучений (в процентах распадов) I_{XKi}, I_{XLi}, I_{ei}, I_{eAK} получены расчетным путем на основе принятых значений опорных характеристик α_n, α_K, балансовых соотношений схемы распада и измеренных относительных интенсивностей компонентов. Для расчета I_{XKi} использованы данные /6/, полученные с источником ^{129}INa (обогащение 87 %) на планарном HPGe-детекторе (разрешение I80 эВ на FeKα -линии), а также табличные данные /7/ ($I_{K\alpha 2}/I_{K\alpha 1}$). Согласованность оценки величин I_γ, ΣI_{XK}, α_K

Some advices when extracting data

- Be careful of extracting value from an article summary or a conclusion
  - Is the reported value a measured quantity?
  - Is it an average of several measurements from the author? If yes, was the average done properly?
  - Is the value reported an average of independent measurements from several teams?

- Extracting the uncertainty of the measurement
  - Identify the reported uncertainty: statistical, systematically, type A, type B, dark heresy…
  - Make sure that the uncertainty is reported at one STD
  - In case of asymmetrical uncertainty, calculate a symmetrical one
    - DDEP recommendation : one of the two methods described in *Audi* et al *Chinese Phys. C 36, 1157 (2012)*
  - If no details are provided, don't hesitate to have a look from other works from the author / team

Final step: critical analysis & selections

Last step before statistical analysis of the dataset

- DDEP guidelines
  - Measurement without uncertainties should be rejected from analysis
  - Reviewed work should be favoured
  - Private communication should be avoided
  - Only one measurement per author / laboratory should be considered
    - In case of multiple choice take the most meaningful one (most recent, accurate, detailed…)

- Make your own opinion
  - Does the author provide enough details on experimental method?
    - Source impurity? Source activity?
    - Comparison to reference measurement? Calibration process?
    - Stability over time?
  - Is the uncertainty estimation robust? Is it reasonable?

Conclusions

Take-away message

A long and tedious process critical for any evaluation

- Gathering the data
  - Be as complete as possible
  - Use all available resources
  - Do not neglect old and rather obscure work

- Analysis and selection
  - Read properly all the references identified
  - Follow DDEP guidelines
  - Assert the estimation of uncertainties
  - Make up your mind