***L*-Subshell experimental Coster–Kronig probabilities and Auger Yields for elements in the atomic number range**

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**Abstract**. This article compiles an extensive dataset on the *L* subshell Coster-Kronig (CK) transitions and Auger Yields (AY). This paper's primary objective is to aggregate 1058 experimental values from literature covering the years 1955 to 2024, incorporating derived from 130 scholarly articles and presenting them in seven tables. The reported values, provided with two to fourth-digit format with their associated errors, are systematically organized. Additionally, the tables include computed weighted average values, uncertainty values, combined standard deviations, and average *z*-scores for CK and AY transitions. The dataset refers to elements from 28Ni to 100Fm, investigated under photon bombardment. The compiled experimental data distribution includes the majority of elements. Nevertheless, there were some isolated cases where either no data or fewer than two data points were present.

**Keywords:** X-rays, atomic parameters, Coster Kronig, Auger yields, weighted average values.

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1. **Introduction**

X-ray generation cross-sections, intensity ratios, fluorescence yields, and vacancy transition probabilities are essential fundamental atomic parameters that are becoming increasingly significant across several domains. They are extensively used in non-destructive material testing, radiation dosimetry, radiation oncology, and contribute to nuclear safety, plasma research, and optimizing radiation-related industries [1,2]. Studying *K*, *L*, and *M*-shell fluorescence cross-sections is crucial for understanding basic physical processes and testing theoretical models. More accurate data is also needed to support applications. Technological advances, including synchrotron radiation and high-resolution spectroscopy, have further emphasized the importance of these parameters, driving scientific and industrial innovations, enabling new applications in fields like spectroscopy, medical technology, electrical device innovation, materials analysis, and improving environmental and industrial processes. Non-radiative transport mechanisms, including Coster-Kronig transitions and Auger events, are crucial to understanding and leveraging the internal dynamics of chemical elements.

K-shell fluorescence values show the chance that an atom's K-shell will fill an empty space formed after an electron is ejected, leading to radiative transitions that emit X-rays. This process happens when an atom is hit by radiation from the outside, like X-rays or electrons. The empty space left by the radiation is filled by electrons moving from higher energy areas [3].

When an atomic inner-shell vacancy is created the system is left in an excited state. Non-radiative transitions are among the possible subsequent de-excitation processes. The initial vacancy moves to a higher shell (or sub-shell) and an electron is ejected from the system, leaving it with two vacancies. An alternative description of this process would be: a higher-shell electron fills the initial vacancy and another electron is ejected into the continuum. If the initial vacancy moves between sub-shells of the same shell, and the ejected electron comes from a higher shell the process is called a Coster-Kronig transition (or a super-Coster-Kronig transition if the ejected electron comes from still another sub-shell of the same shell). If the initial vacancy moves between two different shells, it is called an Auger transition [4].

For instance, a vacancy can be moved from subshell to sub-shells or (or, equivalently, an electron can be moved from sub-shells or to sub-shell). The Coster-Kronig yield

, where 𝑖 and 𝑗 denote the subshells involved in the move, quantifies how likely this process is to happen. Thus, is the probability that a vacancy will move from to , and an electron being ejected from a higher shell. Similarly, is the probability of a vacancy moving from to , and is the probability of a vacancy moving from to [5]. The Auger yield quantifies the probability of occurrence of an Auger transition when the initial vacancy is in shell *i*. Krause [5] presented a comprehensive set of experimental and theoretical estimates for Coster-Kronig and Auger yields for elements with atomic numbers ranging from . His research was important for standardizing the values associated with radiative and non-radiative transitions, contributing to the development of a database that served as the foundation for subsequent studies on *L*-shell dynamics in heavy elements. The work of Öz *et al*., [6] offered a thorough examination of the Auger yields and Coster-Kronig effects for elements with atomic numbers ranging from 59La to 85Bi. They concentrated on applying analytical methods using mathematical models fitted to data to smoothly describe or represent radiative and non-radiative yields. For some elements in the atomic numbers range, Öz *et al*., [7] compared the inferred values with theoretical models and previous semi-empirical values as well as with measured values of Coster-Kronig yields.

The fluorescence yield is the relative probability of deexcitation of the *i*-level through a radiative process (photon emission). Campbell, [8] compiled comprehensive data on Coster-Kronig and fluorescence yields for the *L* sub-shells, which were re-evaluated later based on new data [9]. The methodological differences among empirical techniques were emphasized, underscoring the necessity for enhanced measurement methods to refine current models and minimize result variability. Özdemir *et al.*, [10] used of 59.54 keV gamma radiation from 241Am sources to investigate the radiative and non-radiative yields of elements with atomic numbers between 55 and 92. Bansal *et al*., [11] emphasized Coster-Kronig effects in their study regarding X-ray fluorescence (XRF) measurements of the *L*-shell in rare-earth elements with atomic numbers . High-resolution synchrotron radiation at photon energies near the *L*-shell absorption threshold was employed to selectively excite electrons. Three specific photon energies at the absorption energy thresholds of the *L*-shell (,, and ) were employed to investigate nonradiative electron vacancy transitions. The researchers observed that the Coster-Kronig probability varies considerably with photon energy, illustrating the sensitivity of these processes to excitation circumstances. These findings are crucial for enhancing theoretical models of Coster-Kronig transitions and their applications in spectroscopy and atomic physics.

As a continuation of our previous systematic works on the fundamental atomic parameters databases [2,3,12-21] and [22], the findings from these studies deepen our comprehension of the dynamics involved in Auger Yields and Coster-Kronig transitions, as well as their influence on radiative and non-radiative yields. These databases comprise a total of 130 published values from 1955 to 2024 and cover elements with atomic numbers in the range . The weighted mean values, average *z*-scores, and combined standard deviations have been calculated for each element and the parameters and are also presented in the databases.

1. **Survey of experimental works**

Table 1 presents an overview of non-radiative transitions Coster-Kronig and Auger Yields published between 1955 and 2024, using a variety of experimental methods and under various experimental conditions. This table lists the atomic parameters for elements ranging from Nickel Z=28 to Fermium Z=100 ionized by incident photons, It includes the references to the original articles from which they were extracted, the nature of the target sample used, and the X-ray detector types. Photon sources commonly involve the use of 59.5 keV γ-rays emitted from a 241Am radioactive source whenever feasible, the 122 keV gamma rays emitted from a 57Co radioactive source, and the 22.69 keV X-rays emitted from a 109Cd radioactive source, although various other radioactive sources have also been used. Target samples come in the form of pure elements, alloys, or compounds, and can usually be found as powder samples, foils, pellets, or circular discs. Similarly, many detector types have been deployed to measure the emitted fluorescence X-rays, but single crystal semi-conductors, like Silicon Si(Li) and Germanium Ge(Li) whose resolution varies depending on the manufacturer and the model, are the most popular. Si(Li) Low Energy Spectrometers and Ultra-LEGe detectors are often used to extend the energy range down to a few hundred electron volts. High-purity Germanium (HPGe), Germanium (Ge), and Thallium-doped Sodium Iodide (NaI(Tl)) detectors have been also employed. HPGe detectors have better energy resolution than Ge (Li) and NaI (Tl) detectors, making them better at distinguishing closely spaced emission lines and identifying different nuclear materials.

1. **Data analysis**

Auger and Coster-Kronig yields taken from the referenced papers, are tabulated in two- to four-digit format, accompanied by measurement error estimates stated at the standard deviation level. The compilation of these parameters is summarized in seven tables (Table 2-9), encompassing elements within the atomic number range of 28Ni to 100 Fm. Each table includes the C-K and AY data and references to their origin. Additionally, comprehensive statistical analyses were conducted for each element and parameter, leading to the determination of weighted mean values, mean *z*-scores, and combined standard deviations. It is important to note that some of the papers cited in Tables 7-9 did not directly report the values of Auger Yields. We calculated these values using standard equations and the quadratic standard deviation [23]:

, (1)

with

. (2)

(3)

with

(4)

and

, (5)

with

. (6)

In these expressions the are the Auger yields, is the atomic L-subshell Coster–Kronig probability, and , and are L-subshell fluorescence yields. Also, the compound quantity and are obtained as:

, (7)

with:

(8)

and

(9)

with:

(10)

We note that the quantity is needed to write the final vacancy distribution in terms of the primary vacancy distribution using the appropriate Coster Kronig yields [23,24] . Also is used to deduce some of important atomic parameters like the average L-subshell fluorescence yields and L X-ray production cross-sections. Here is the sum of the total *L1* Coster–Kronig probability.

|  |  |
| --- | --- |
|  | (11) |

The formulae employed for computing the weighted average values in this study is as follows [18,19,21,22,25] :

In Eq. (11),  represents the *n*th experimental value of the Coster-Kronig transition or and Auger yield being considered, *N* stands for the overall number or count of experimental data points, denotes the uncertainty (standard deviation) associated with the *n*th experimental value, and , denotes the resulting estimate for the internal standard deviation.

A simple and natural way to visually present the deviation of the individual experimental points from the corresponding weighted mean for the element is to plot the signed deviation in multiples of the combined internal and external standard deviation defined by [21,22]:

(12)

(13)

Where, refer to the *n*th experimental and corresponding elemental weighted average values, respectively. , is the associated assigned standard deviation, with the external standard deviation being given by the equation [22]:

(14)

The idea is to quantify the deviation of each point from the weighted mean in multiples of a distance measure comprising the quadrature sum of a contribution associated with the experiment and an estimate for how tightly the global average is defined. The metric is simple in the sense that we have not excluded the point in question from the internal and external standard deviation calculations, but hold them fixed across the data set. In the technical literature, note that the internal and external standard deviations computed according to Eqs. (11, 14) are referred to as internal and external standard errors. They quantify confidence on the result based on all of the data rather than on an individual determination.

The average *z*-score is calculated as [21,22]:

|  |  |
| --- | --- |
| (15) |  |
| (16) |  |

where represents the number of experimental points for each element.

Tables 2–9 include several important notes regarding the sources and accuracy of the values ​​reported. For example, two average values ​​for 82Pb are reported based on Campbell *et al*. [26], while the specific value for 56Ba as reported by Burford and Haynes [27], and later cited by Fink *et al*. [23] is used with the same error rate. For 91Pa, Richard *et al*. [28] eported an error of 100%, the same as that reported by Karttunen [29] for 96Cm and Weksler and Pinho [30] , Bayrn *et al*. [31] for 92U. Other values ​​were obtained from indirect sources because they were difficult to extract directly, such as the value of 100Fm documented by Friedman and Porter [30] and cited by Krause [5] and the value of 94Pu reported by Salgueiro *et al*. [32] and later cited in Bayrn [31]. In addition, the work of Sojkowski and Melin [33] contributed the 81Tl data cited by Vleuri [34], and Holmes *et al*. [35] provided the 67Ho data as reported in Baymbenk *et al.* [24] and Burhop [36], and the thesis of Mohan [37], which documented the 70Yb data. The 65Tb data were also reported in the work of Douglas [38], later cited in Nix and Fink [39]. There are also contributions by Persson [40] and, Sojkowski and Mellin [33] for 81Tl, as well as data from Akalaev [41] for 93Np, while the value for 96Cm is used in the work of Mcgeorge and Fink [42] as cited in Bambynek *et al*. [24]. Finally, Freund and Fink [43] provide the data for 83Bi as cited by Weksler and Pinho [30]. The values in the table in bold represent the calculations we performed using Eq.s (3-10). These notes show the multiplicity and diversity of sources on which the values ​​are based, which goes someway towards ensuring their reliability and traceability.

The distribution of the number of data points for the experimental Coster Kronig transition,, ,, and as a function of atomic number *Z* (28 ≤ *Z* ≤ 100) are illustrated in Fig. 1. The analysis of this figure enables us to draw the following conclusions:

* Nearly all the targets from 28 ≤ Z ≤ 96 (for , ,, and ) and from 98Cf to 100Fm (for ) are covered except for some isolated cases with no data or less than two  
  data.
* For the elements 28Ni, 29Cu, 40Zr, 42Mo, 44Ru, 45Rh, 46Pd, 47Ag, 50Sn, 51Sb, 54Xe, 56Ba, 57La, 59Pr, 60Nd, 62Sm there are between one to four measurements per element.
* The most exploited targets are in the region 63 ≤ Z ≤ 83 and comprise an important number of data such as 64Cu, 65Zn, 66Ga, 67Ge, 70Se, 74W, 79Au, 80Hg, 81Tl, 83Bi. . It has also been observed that the two elements 73Ta and 82Pb have a substantial amount of data.
* We have recorded several experimental data values, ranging from one to thirteen for a number of elements in the range between 83Bi to 100Fm.

The distribution of the number of data points for experimental Auger Yields , , and , as a function of atomic number targets between 40Zr to  96Cm is illustrated in Fig. 2. The analysis of this figure enables us to draw the following conclusions:

* Almost all targets fall within the range 40 ≤ Z ≤ 96 (for , , and ), except for some isolated cases due to the lack of data or because they have less than two data points.
* Elements 40Zr, 42Mo, 44Ru, 46Pd, 47Ag, 50Sn, 51Sb, 54Xe, 55Cs, 56Ba, 57La, 58Ce, 59Pr, 60Nd, 62Sm range 40≤ Z ≤ 63 from one to three data.
* Most of the targets fall within the range of atomic number 64 ≤ Z ≤ 83, and contribute a large amount of data, including 64Cu, 65Zn, 66Ga, 67Ga, 67Ge, 70Se, 74Se, 74W, 79Au, 80Hg, 81Tl, and 83Bi.
* The metallic targets are the most exploited and comprise the largest numbers of data, like 64Cu, 83Bi.
* The number of values range from one to five, between 86 ≤ Z ≤ 96, with elements **92U, 94Pu** recording 10 and 7 points, respectively.
* Data for **41Nb, 43Tc, 45Rh, 48Cd, 49In, 52Te, 53I, 61Pm, 69Tm, 75Re, 80Hg, 84Po, 85At, 86Rn, 87Fr, 88Ra, 89Ac, 91Pa, and** 95Am , are not yet reported due to difficulty in target preparation and handling, being radioactive elements, and/or not being readily available.

Fig. 3 shows the histograms of the number of reported experimental values for ,, , and between 1955 and 2024, these histograms are ordered by the year of publication of the original work. From these figures, we note the following:

* There are 139 experimental values for the Coster-Kronig transition probabilities, averaging 2.01% per year. The average of the measurements in the first five decades was 0.94% per year. In 1988, seven values were published. In 2001, the values increased exponentially until they peaked in 2003. In 2004, the values dropped sharply and then increased slightly. Furthermore, the data points increased in 2016 and 2017, and from 2018 to 2024, they decreased from 12 to 1 point.
* For the , there are 222 experimental values, with average values of 3.21 % per year. The experimental values then increased until they peaked in 1975 at 20 data points. Moving to the period from 1976 to 2024, there was a decrease in the availability of experimental data. With the exception of 1988, 2001, 2001, 2016, 2017, and 2021, there were 58 experimental values.
* From 1955 to 2024, the publication of experimental data for was modest. The first decade saw little data, followed by a small rise in 1965. After this, little activity was observed, with data fluctuating from year to year. The early 1970s saw modest growth, peaking in 1975. The 1980s showed some increase in experimental data, but erratic activity. Between 1995 and 2024, there was a significant increase in publishing activity, peaking in 2001. After 2004, there was a decrease in in the rate at which values were published with continuous fluctuations, with a significant increase in 2016 and 2017.
* The and the publication rate over the period from 1955 to 2024 was relatively stable. The second period, from 1976 to 2010, saw significant fluctuations. Notable years with large number jumps included 1988 and 2001, accounting for the largest proportion of total values. The last period from 2012 to 2024 saw significant increases in some years, such as 2016 and 2021, while values decreased in other years. The average number of values during this period were 4.3, higher than the previous two periods.

Fig. 4 show the histograms of the number of reported experimental values for between 1954 and 2024, and for and between 1955 and 2024, these histograms are ordered by the year of publication of the original work. From this figure, we note the following:

* The distribution of the experimental data of , , and are studied over 70 years. The early periods (1954-1981) saw very limited publishing activity, with most years recording only a single value. We observed a slight increase in activity during 1969 and 1973. Between 1985 and 1999, publishing continued slowly, with a slight increase in 1988. At the beginning of the 21st century, a significant jump in publication was recorded, mainly due to the work of Öz et al., [6] and Özdemir, [10], reflecting a marked increase in research activity at that time. We observe a fluctuation in activity from 2010 to 2024, with some slight spikes in 2017 and 2021, but the numbers have declined in recent years, with 2 values published in 2023 and one in 2024.

Following the calculation of the weighted average value of *(*), (), and *(* for all elements using Eq. (11), we proceeded to determine the parameters of experimental,,, andCoster-Kronig and Auger Yields relative to their corresponding weighted averages values for each element. These parameters, are denoted as:

, (17)

(18)

(19)

, (20)

These ratios was then graphed as a function of the atomic number *Z*, as illustrated in Fig. 5 for , Fig. 6 for , Fig. 7 for , Fig. 8 for , Fig. 9 for , Fig. 10 for , Fig. 11 for , and Fig. 12 for .

* It is clear that the vast majority of values in the range of (0.3 to 1.2) are near unity. Furthermore, notable difference in certain values from the weighted values exist. This is particularly apparent in the research of Ménesguen et al. [44] for ₅₀Sn, Tousset and Moussa [45] for 83Bi, Rao et al. [46] for ₈₂Pb, Jitschin et al. [47] for ₄₇Ag, and Öz et al. [7] for ₇₄W and ₇₉Au. The rest are in the range of (1.2-2.54).Concerning , which has been studied in different papers, it is obvious that the majority of the values fall within a narrow range of [0.43, 1.64]. But there are some values that are clearly not in this range. For example, the high values of ₇₉Au Päschke *et al*. [48], ₈₁Tl Sujkowski and Melin, [33], Byrne *et al*. [31], ₆₆Dy (Bansal *et al.* [11]; Kaur *et al.* [49]; Öz *et al*. [7]; Şimşek, [50]), and ₈₈Ra Gill *et al*., [51]. Regarding it is noteworthy that the values of range between 0.57 and 1.44 reflecting generally good agreement with reference values. However, some values fall outside this range, such as high values of ₅ Ménesguen *et al*. [44] for and Bansal *et al*. [11] for ₆₂Sm,Sorensen *et al*. [52] for 28Ni, which exceed the acceptable range. Some very low values, such as Guerra *et al*. [53] for ₂₈Ni, are also unusual deviations. In nearly most of the values of and , tend to be within [0.71-1.7]. Although, there is a remarkable exception in the research of Ménesguen et al. [44] for element 50Sn, where the result departs considerably from this range.
* Most of the,values are reasonably close to unity (ranging from ). Furthermore, it is important to emphasize that some values ​​differ significantly from the weighted values. This is particularly evident in (Kolbe and Hönicke, [54]; Werner and Jitschin, [55]; Jitschin *et al*., [56]) for ₇₉Au, ₇₈Pt and in Rich [57] for **₈₁Tl,** most values of are within the expected range, but some high values and very low values are not within this range. For example, the high values of ​​Gil *et al*. [51]. On the other hand, we observe also some very low values (​​Byrne *et al*. [31]. Most values are closely clustered around unity, typically ranging from the expected range based on the weighted values. These values of reflect comparatively excellent agreement with the data. Upon closer examination of the weighted average values, most experimental data points for Auger Yields closely align with the weighted average value for all elements.

Plotting the signed deviation in multiples of the combined standard deviation was calculated using formula (12-13), which is the divergence of the individual experimental points from the associated weighted mean for the element. The distribution of Eqs. (12-15) as a function of atomic number Z are represented in Fig.s 13-20. The values ​​of and the average in the eight databases are also given. Based on the published experimental uncertainty for some atomic elements, the analysis of these figures shows a much larger dispersion than expected. For example, looking at Fig. 13 for , where values ​​range from -5.89 [58] to 5.72 [59], it is important to note that there are some values ​​that appear to be significantly different from the rest and fall outside the range. Then, moving to Fig. 14 for , we notice that the internal standard deviation values ​​range from -6.27 for element ₆₆Dy [49] to 7.16 for element **₈₂Pb** [60], and the majority of values ​​fall in the range , where values ​​range from . After analyzing Fig. 15 for , it is clear that the mean standard score values ​​range from -0.48 to 0.54, and for the pooled internal standard deviation the majority of the values ​​fall in the range. Some of the values ​​that appear to be significantly different from the rest fall outside this range. Next, turning one’s attention to the , and , it is remarkable that one value of observed which are located very far from this range , are for ₇₃Ta [55].

For, , and, the average z-score values appear to range from -1.62 to 3.05, based on the published experimental uncertainty for some atomic elements, an analysis of these numbers shows some scatter and for the pooled internal standard deviation the majority of values for fall in the range , except for the data of [55] for 74W, 78Ptand 79Au, and [6] for 83Bi and 74W. Almost all standard deviation values for , fall in the range except for the data of [6]for ₇₉Au, [43] for 83Bi [49,44] for 50Sn Also for in the range , except the data of [38] for 64Gd,[10] for  92U, and, [61] for the element 79Au, where the values of range from -2.47 to 3.05.

Figures from 21 to 28 presents the distribution of Eq.s (13 and 16) as a function of the atomic number Z, the values ​​of and are also included. After analyzing these numbers, we notice that for , there seem to be some values ​​that diverge significantly by being within the range [-4.86, 2.6] such as 90Th [62], 47Ag [47], 50Sn [44], 82PB [45], 83Bi [57], 51Sb [63] But for , the values ​​of the external standard deviation range from -4.24 for element ₇₃Ta [55] to 6.17 for element ₇₉Au [64], almost all values ​​fall within the range [-2, 2], and for , the range is from 0 to 0.2. We can see that most of the values of for fall within the range [-4, 4]. The values for ,range from -3.88 to 2.09 .

After analyzing these Fig.s (26-28), we notice that for the values of external standard deviation vary between -3.5 for the element  81Tl [57] to 4.42 for 74W [55]. For , it is clear that majority of the values of are located in the range . Next, turning our attention to , it is noticeable that the values of are tightly bound in the range [-3.8, 3.01] and for span the range from 0 to 0.12.

Experimenters report uncertainty that may not be fully or effectively evaluated. The data drawn from the literature and may contain contributions subject to unrecognized error at one or several excitation energies. The larger than expected dispersion revealed by the present broad survey, which is quantified by standard scores that are higher than two or three, indicates that such uncertainty is likely present. Based on the data shown in Fig.s 13–28, it appears that in order to assist in the resolution of the inconsistencies and to enhance the quality of experimental guidance, it will be necessary to have new high-quality experimental data in addition to better described and more accurate uncertainty assessments. On the other hand, the stated uncertainty might not be evaluated in a self-consistent manner; it might also be under-reported, and it might also include an erroneous contribution that is not acknowledged. To resolve this topic, it is necessary to collect fresh and improved experimental data in order to investigate this option.

1. **Conclusion**

A comprehensive examination and presentation, including tables of Coster-Kronig transitions and Auger Yields data induced by photons, has been finalized. A total of 1058 values have been released from 1955 to 2024. This represents the inaugural effort to compile a thorough overview of experimental data values for Coster Kronig of lines in the atomic range from 28Ni to 96Cm, 28Ni to 100Fm, 28Ni to 98Cf , 28Ni to 96Cm for , , ,, and , for Auger Yields all targets between 40Zr to 93Np, 40Zr to 94Pu, 40Zr to 96Cm for 1, 2 and 3, respectively. comprising some 139 values for , 222 values for , 145 values for ,101 values for , 114 values for ,along with 105, 146, and 131 data points for , , and . Weighted means, pooled standard deviations, and mean z-score values were computed for each element. Research deficiencies and requirements have been recognized. This compilation offers an overview of the present state of atomic data. It is a valuable resource to guide future experimental and theoretical studies in this area to further advance scientific applications across spectroscopy, electronic device development, medical, and environmental fields.

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**Figures captions**

**Fig. 1.** Distribution of the experimental , , , and values according to the atomic number Z.

**Fig. 2.** Distribution of the experimental 1, 2, and 3 values according to the atomic number Z.

**Fig. 3.** Histogram of data for experimental , , , and values as compiled in this work.  
**Fig. 4.** Histogram of data for experimental 1, 2 and 3 values as compiled in this work.

**Fig. 5.** The distribution of for each reference from which the databases are extracted according to the atomic number *Z* (from 1955 to 2024). ●: [52];●: [53]; ●: [65];●: [54];●: [66];○: [67]; ○: [68];○: [59];○: [69];~~○~~: [47];~~○~~: [44];~~○~~: [70];~~○~~: [71];▲: [72];▲: [73];▲: [74];▲: [75];▲: [7];△: [76];△: [77];△: [11];△: [78]; ~~△~~: [79];~~△~~: [80];~~△~~: [81]; ~~△~~: [82];■: [83];■: [84];■: [49];■: [85];■: [86];□: [87];□: [55];□: [88];□: [89]; ~~□~~: [90]; ~~□~~: [91];~~□~~: [92];~~□~~: [58];▼: [93];▼: [48];▼: [94];▼: [33];▼: [95];▽: [46];▽: [96];▽: [60];▽: [45];~~▽~~: [97]; ~~▽~~: [43]; ~~▽~~ : [30];~~▽~~ : [98];◀ : [99];◀ : [62];◀ : [29];◁ : [32];◁ :[42];◁ :[56];◁ :[41];~~◁~~ :[100];~~◁~~: [101] .

**Fig. 6.** The distribution of for each reference from which the databases are extracted according to the atomic number *Z* (from 1978 to 2023). ●: [52];●: [53];●: [65]; ●: [54];●: [66];○: [67];○: [68];○: [59];○: [69];~~○~~: [47];~~○~~: [44];~~○~~: [70];~~○~~: [72];▲: [71];▲: [102];▲: [73];▲: [27];▲: [103];△: [75];△: [104];△: [105];△: [106];~~△~~: [76];~~△~~: [7];~~△~~: [11];~~△~~: [34]; ■: [107];■: [38]; ■: [108];■: [79];□: [81]; □: [82];□: [83];□: [109];~~□~~: [84]; ~~□~~: [110];~~□~~: [85]; ~~□~~: [49];▼: [35];▼: [111];▼: [112];▼: [113];▼: [86];▽: [87];▽: [55]; ▽: [88];▽: [114];~~▽~~: [115] ;~~▽~~: [90];~~▽~~: [116];~~▽~~: [58];◀: [117];◀: [48];◀: [64];◀: [39]; ◁: [33]; ◁: [95];~~◁~~: [118]; ~~◁~~: [60];▶: [26]; ▶: [119];▶: [97];▶: [46];▶: [120]; ▷: [30];▷: [121];▷: [99]; ▷: [122];~~▷~~: [51];~~▷~~: [123]; ~~▷~~: [124]; ~~▷~~: [125]; ◆: [62];◆: [28]; ◆: [31]; ◆: [126];◇: [127];◇: [29]; ◇: [32];◇: [100];~~◇~~: [128]; ~~◇~~: [74]; ~~◇~~: [129];~~◇~~: [130];🞼: [131];🞼: [132];🞼: [133];🞼: [50];⬟: [134];⬟: [135];⬟: [37];⬟: [136];⬟: [137];■: [138].

**Fig. 7** The distribution of for each reference from which the databases are extracted according to the atomic number *Z* (from 1955 to 2024). ●: [52]; ●: [53];●: [139];●: [65];●: [54];○: [69];○: [47];○: [44];○: [67];~~○~~: [70];~~○~~: [71];~~○~~: [72];~~○~~: [73];▲: [74];▲: [75];▲: [7];▲: [76];▲: [11];△: [78]; △: [79];△: [80];△: [81];~~△~~: [82];~~△~~: [83];~~△~~: [84] ~~△~~: [85];■: [49];■: [88];■: [86];■: [87];■: [140];□: [55];□: [141];□: [142];~~□~~: [66];~~□~~: [90];~~□~~: [92];~~□~~: [58];▼: [143];▼: [144];▼: [48];▼: [56];▼: [33];▽: ▽: [40];▽: [95];▽: [46];▽: [96];~~▽~~: [60];~~▽~~: [145];~~▽~~: [133];~~▽~~: [97];◀: [43];◀: [30];◀: [98];◀: [99];◀: [45];◁: [126];◁: [41];◁: [29];~~◁~~: [146];~~◁~~: [32];~~◁~~: [68];~~◁~~: [100].

**Fig. 8.** The distribution of for each reference from which the databases are extracted according to the atomic number *Z* (from 1955 to 2023). ●: [52];●: [53];●: [65];●: [54];●: [66];○: [67];○: [68];○: [59];○: [47];~~○~~: [44];~~○~~: [70];~~○~~: [71];~~○~~: [72];▲: [73];▲: [74];▲: [75];▲: [7];▲: [76];△: [11];△: [79];△: [81];△: [82];~~△~~: [83];~~△~~: [84];~~△~~: [85];~~△~~: [49];■: [88];■: [86];■: [87];■: [55];■: [90];□: [58];□: [48];□: [56] □: [33];~~□~~: [95];~~□~~: [46];~~□~~: [60];~~□~~: [97];▼: [43];▼: [30];▼: [99];▼: [29];▼: [89];▽: [100];▽: [78];▽: [69];▽: [133].

**Fig.9.** The distribution of for each reference from which the databases are extracted according to the atomic number *Z* (from 1955 to 2024). ●: [52];●: [53];●: [65];●: [54];●: [66];○: [67];○: [68];○: [59];○: [69];~~○~~: [47];~~○~~: [44];~~○~~: [70];~~○~~: [71];▲: [72];▲: [73];▲: [74];▲: [75];▲: [7];△: [76];△: [11];△: [79];△: [81];~~△~~: [82];~~△~~: [83];~~△~~: [84];~~△~~: [85];■: [49];■: [88];■: [86];■: [87];■: [55];□: [90];□: [58];□: [48];□: [56];~~□~~: [33];~~□~~: [95];~~□~~: [46];~~□~~: [60];▼: [97];▼: [43];▼: [30];▼: [99];▼: [29];▽: [41];▽: [98];▽: [96];▽: [147];~~▽~~: [92];~~▽~~: [142];~~▽~~: [80];~~▽~~: [27];◀: [78];◀: [100];◀: [89];◁: [62];◁:[133] .

**Fig.10.** The distribution of for each reference from which the databases are extracted according to the atomic number *Z* (from 1958 to 2024). ●: [65];●: [54];●: [66];●: [67];●: [100];○: [47];○: [70];○: [71];○: [73];~~○~~: [10];~~○~~: [74];~~○~~: [6];~~○~~: [76];▲: [11];▲: [78];▲: [79];▲: [81];▲: [82];△: [84];△: [88];△: [86];△: [55];~~△~~: [92];~~△~~: [58];~~△~~: [89];■: [56];■:[147];■:[57];■:[95];■:[148];□:[96];□:[97];□:[43];□:[30];~~□~~:[98];~~□~~:[44];~~□~~:[90];▼:[29];▼: [60];▼ :[89];▼ :[80] .

**Fig. 11.** The distribution of for each reference from which the databases are extracted according to the atomic number *Z* (from 1955 to 2024). ●: [65];●: [54];●: [66];●: [67];●: [47];○: [70];○: [71];○: [10];○: [74];~~○~~: [103];~~○~~: [105];~~○~~: [76];~~○~~: [11];▲: [38];▲: [79];▲: [6];▲: [81];△: [82];△: [83];△: [84];△: [35];~~△~~: [113];~~△~~: [86];~~△~~: [88];~~△~~: [55];■: [115];■: [90];■: [117];■: [61];■: [48];□: [56];□: [112];□: [147];□: [64];~~□~~: [57];~~□~~: [95];~~□~~: [46];~~□~~: [60];▼: [97];▼: [43];▼: [120];▼: [30];▼: [121];▽: [122];▽: [51];▽: [123];▽: [124];~~▽~~: [31];~~▽~~: [125];~~▽~~: [126];~~▽~~: [41];◀: [29];◀: [32];◀: [100];◀: [44];◁: [49];◁: [135];◁: [133];~~◁~~: [58];▲: [138].

**Fig. 12.** The distribution of for each reference from which the databases are extracted according to the atomic number *Z* (from 1955 to 2024). ●: [65];●: [54];●: [66];●: [67];●: [47];○: [70];○: [71] ○: [103];○: [10];~~○~~: [74];~~○~~: [105];~~○~~: [76];~~○~~: [11];▲: [38];▲: [79];▲: [6];▲: [81];△: [82];△: [83];△: [133];△: [135];~~△~~: [86];~~△~~: [149];~~△~~: [150];~~△~~: [55];■: [115];■: [123];■: [90];■: [117];■: [61];□: [48];□: [56];□: [112];□: [64];~~□~~: [147];~~□~~: [95];~~□~~: [81];~~□~~: [46];▼: [43];▼: [97];▼: [151];▼: [30];▼: [121];▽: [122];▽: [123];▽: [62];▽: [126];~~▽~~: [100];▲: [138].

**Fig. 13.** Distribution of Eq.s (12) and (15) for according to the atomic number *Z*.

**Fig. 14.** Distribution of Eq.s (12) and (15) for according to the atomic number *Z*.

**Fig. 15.** Distribution of Eq.s (12) and (15) for according to the atomic number *Z*.

**Fig.16.** Distribution of Eq.s (12) and (15) for according to the atomic number *Z*

**Fig.17.** Distribution of Eq.s (12) and (15) for according to the atomic number Z.

**Fig. 18.** Distribution of Eq.s (12) and (15) for according to the atomic number *Z*.

**Fig. 19.** Distribution of Eq.s (12) and (15) for according to the atomic number *Z*.

**Fig. 20.** Distribution of Eq.s (12) and (15) for according to the atomic number *Z*.

**Fig. 21.** Distribution of Eq.s (13) and (16) for according to the atomic number *Z*.

**Fig. 22.** Distribution of Eq.s (13) and (16) for according to the atomic number *Z*.

**Fig. 23.** Distribution of Eq.s (13) and (16) for according to the atomic number *Z*.

**Fig. 24.** Distribution of Eq.s (13) and (16) for according to the atomic number *Z.*

**Fig.25.** Distribution of Eq.s (12) and (15) for according to the atomic number *Z*

**Fig. 26.** Distribution of Eq.s (13) and (16) for according to the atomic number *Z*.

**Fig. 27.** Distribution of Eq.s (13) and (16) for according to the atomic number *Z*.

**Fig. 28.** Distribution of Eq.s (13) and (16) for according to the atomic number *Z*.

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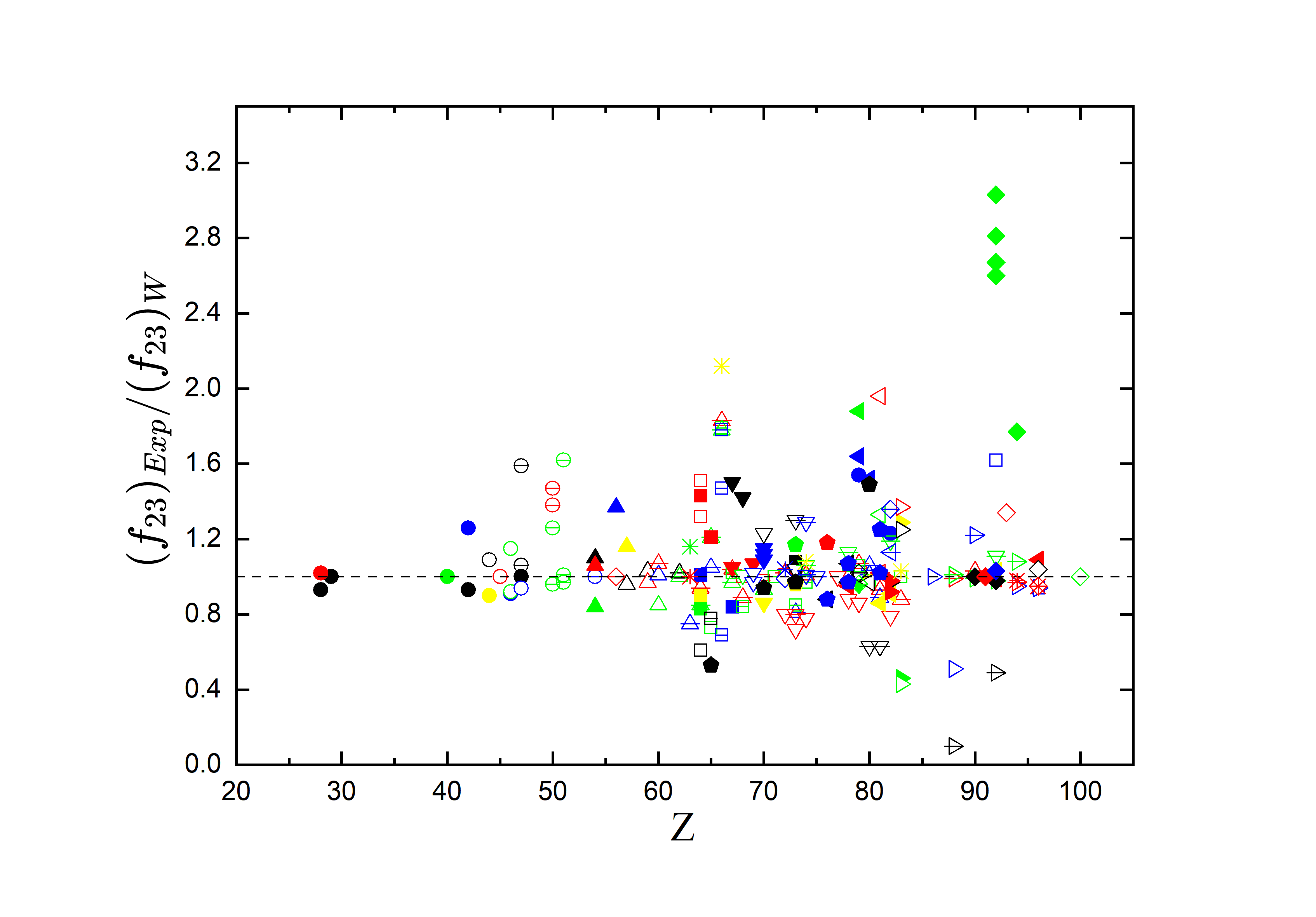
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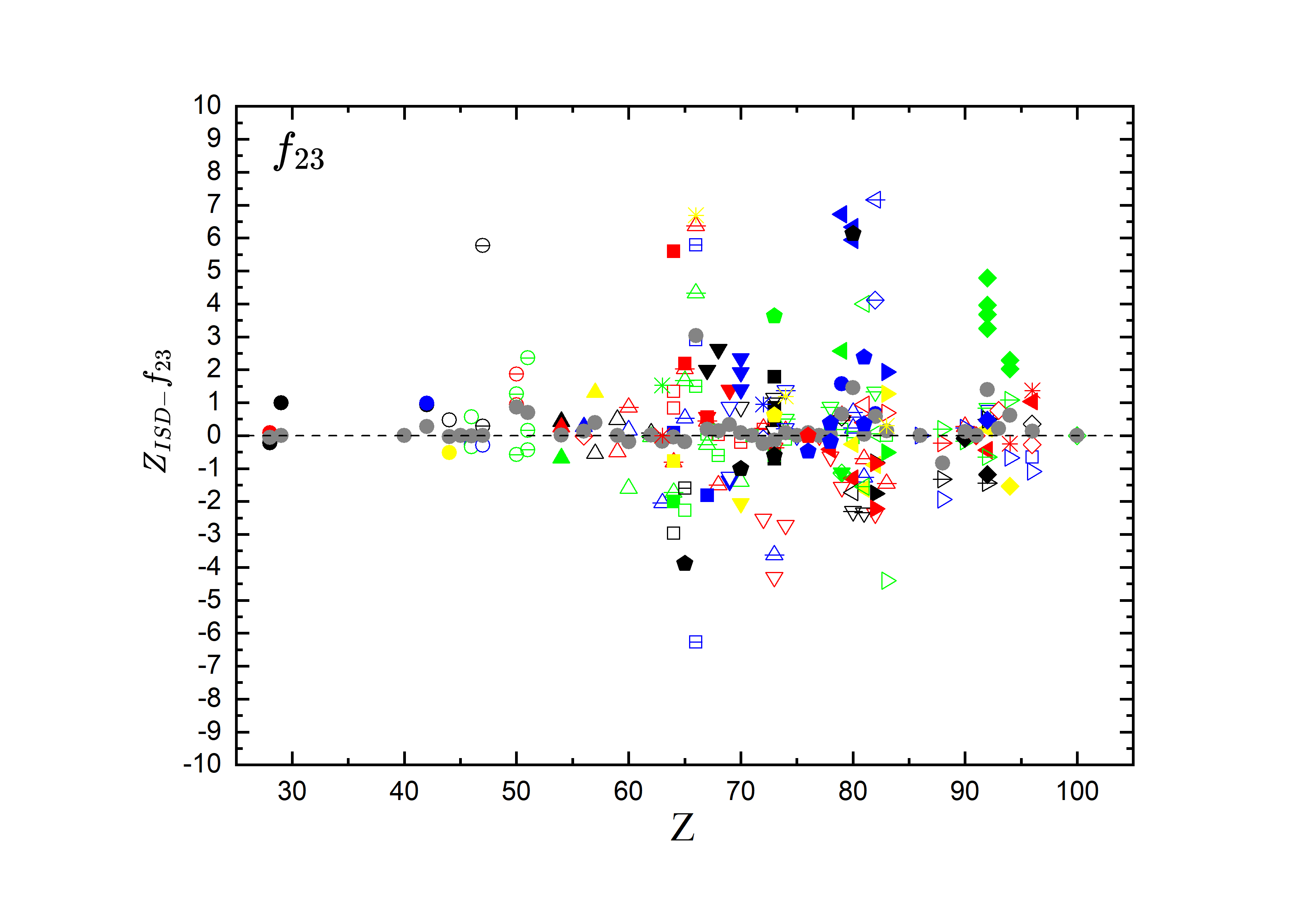
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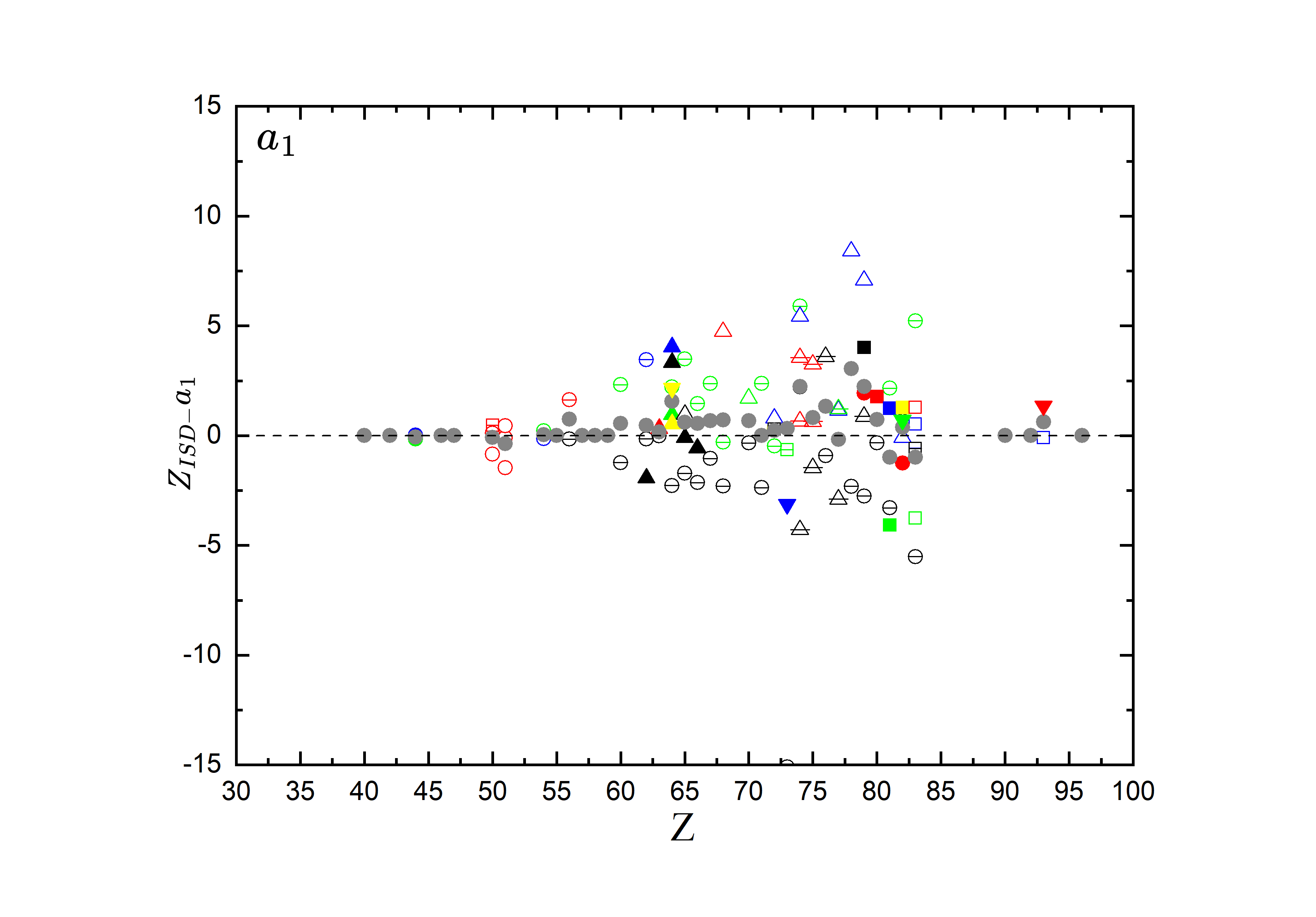
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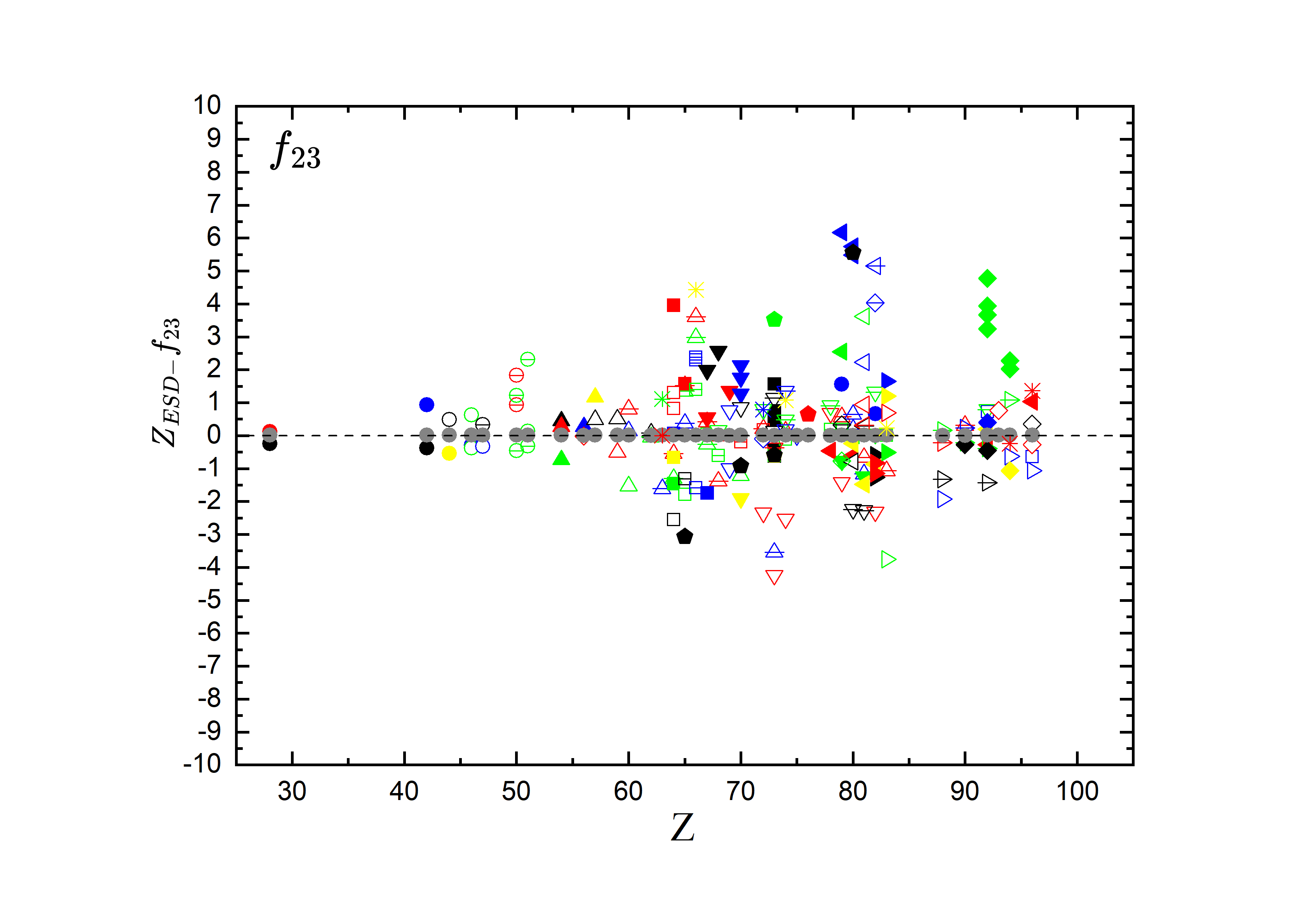
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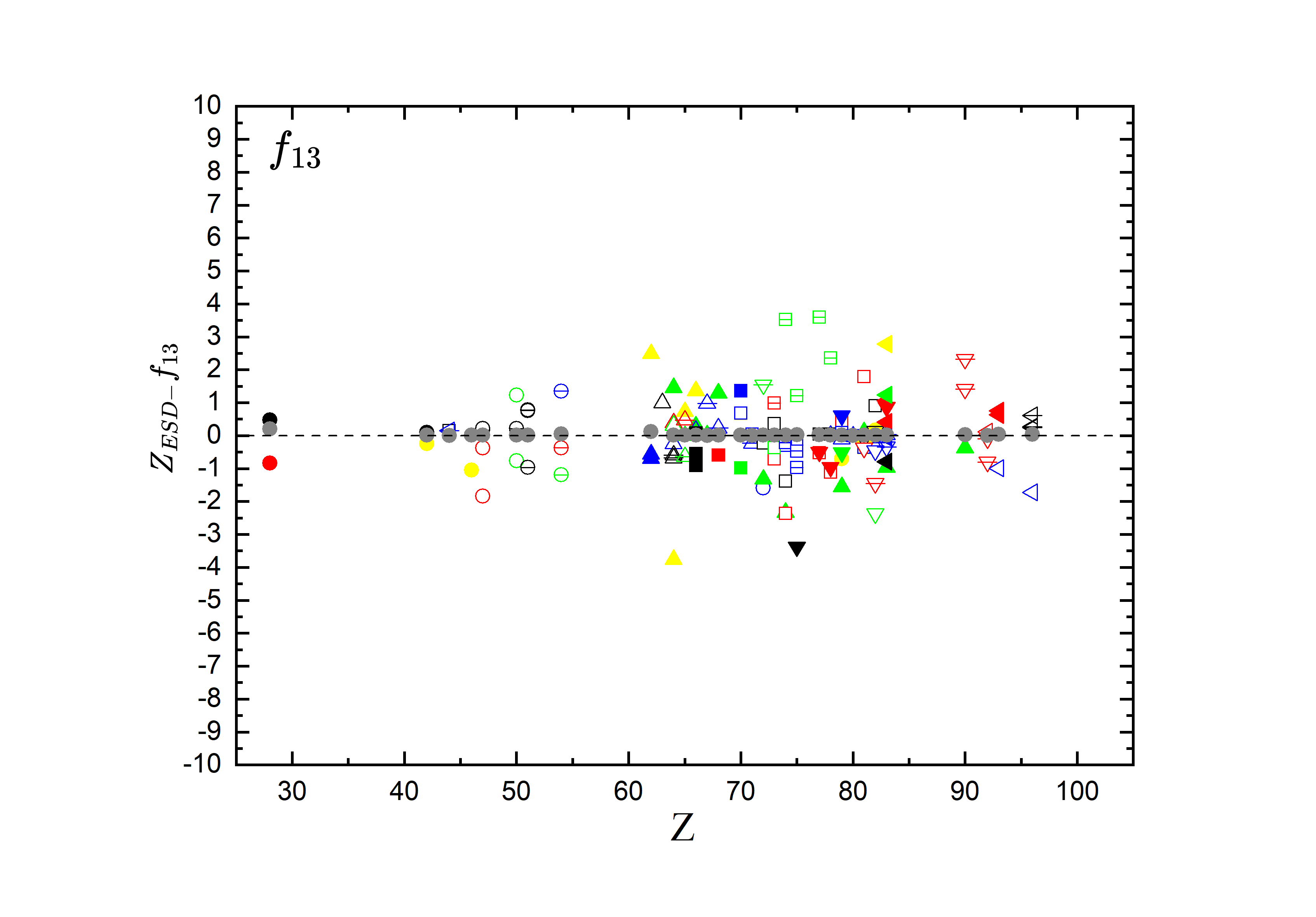
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**Figure 23:**

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**Explanation of Tables**

**Table 1**.

|  |  |
| --- | --- |
| References | References from which the data were extracted. |
| Atomic parameters | The atomic parameters available in the references. |
| Target samples | The target sample used during the measurement of Auger and Coster Kronig transition parameters ​. |
| Excitation sources | The excitation sources used to bombard the samples. |
| Detectors | The detectors employed for the detection of the X rays. |

**Table 2 to 9**.

|  |  |
| --- | --- |
| *Z* | Atomic number of the target element. |
| Symbol | Symbol of the target element. |
| ,,, | The , and experimental Coster Kronig and Auger Yields. |
| , | The uncertainty of the *n*th , and experimental Coster Kronig and Auger Yields. |
| References | References from which the database is obtained. |
| ,,, | Weighted average and experimental Coster Kronig and Auger Yields. |
|  | Internal standard deviation associated with the calculated weighted average  ,, and experimental Coster Kronig and Auger Yields.  the combined standard deviation  The average *z*-score |
|  | The external standard deviation |

**Table 1.** Summary of the atomic parameters for elements ranging from 28Ni to  96Cm, the excitation sources, the target samples and the detectors. The references from which these data are obtained is also included.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| References | Atomic parameters | Excitation sources | Target samples | Detectors |
| [58] | ​, ,,  **(calculated)** | Synchrotron radiation at various energies (10.0-14.0 keV). | ₇₄W, ₇₅Re. | Silicon Drift Detector (SDD) with a resolution of 131 eV at 5.89 keV and super light element window (SLEW) |
| |  | | --- | | [11] |  |  | | --- | |  | | ​, ,,  **(calculated)** | Synchrotron radiation (9 photon energies at 0.1 keV intervals). | Thin targets of ₆₂Sm, ₆₃Eu, ₆₄Gd, ₆₅Tb, ₆₆Dy, ₆₇Ho  (Deposited on Mylar foils). | SDD (Vortex, USA) photon detector with an energy resolution of 138 eV at 5.959 keV. |
| [88] | ​, ,*,*  **(calculated)** | Energy was tuned between 3 and 14 keV using a monochromatized X-ray beam from synchrotron radiation. | Pure 68Er thick foil. | Si(Li) solid state detector with a resolution of 165 eV at 5.9 keV and a 0.0127 cm thick beryllium window. |
| [133] | ​, ,,  **(calculated)** | Energy was tuned between 3 and 14 keV using amonochromatized  X-ray beam from synchrotron radiation. | Pure 72Hf thick foil. | Detector, 5 mm thick, 5 mm diameter, resolution of 165 eV at 5.9 keV with a 0.0127 cm thick beryllium window. |
| [75] | ​, ,  **(calculated)** | Energy was tuned between 3 and 14 keV using a monochromatized X-ray beam from synchrotron radiation. | for 57La and 59Pr. | Detector, 5 mm thick, 5 mm diameter, resolution of 165 eV at 5.9 keV with a 0.0127 cm thick beryllium window. |
| [74] | ​, ,,  **(calculated)** | Energy was tuned between 3 and 14 keV using a monochromatized X-ray beam from synchrotron radiation. | 56Ba chloride (BaCl2). | Detector, 3 mm thick, 30 mm² active area, resolution of 165 eV at 5.9 keV with a 8 µm thick beryllium windo. |
| [92] | ​, | Polychromatic radiation from BSV-29 Ag x-ray tube with U = 35 kV and I = 30 mA. | 74W,75 Re, 76Os, 76Ir, 77Pt (99.9% purity). | DRS-2 x-ray spectrograph with Johann-bent quartz single crystal. |
| [153] | ​, | 242Cm decays with an alpha particle energy of **6.115 MeV.** | Composed initially of 76%242Cm, 13.9% 244Cm, and 10% 238Pu. | Silicon surface barrier detector for alpha particles, NaI(Tl) crystal for L x-rays detection. |
| [31] | ​, | Decays of 244Cm,240Pu, 238Pu, alpha particles energies between 5.587 MeV and 12.83 keV. | 94Pu, and 92U  Carrier-free sources of Cm244, Pu240, and Pu238. | Silicon detector,NaI (Tl) crystal, Proportional counter, Curved-crystal spectrograph. |
| [98] | ​, | 46.5 keV Decays of 210Pb. | 83Bi | Si(Li) detector with a thickness of 4.3 mm and a resolution of 145 eV at 5.9 keV. |
| [123] |  | Decays of 224Ra and 238Pu with an energy of 84.5 keV. | 224Ra and 238Pu purified using ion exchange and evaporated onto beryllium backing. | Si(Li) X-ray spectrometer. |
| [26] |  | Radionuclide sources generating X-ray photons with a gamma ray energy of 66.7 keV. | About 1.2 μCi of bismuth chloride solution on 0.05-mm-thick beryllium foil with insulin. | High-resolution x-ray detectors, Ge (germanium) detector, Si(Li) detector. |
| [112] |  | 5.9 keV X-ray sources used include 195Au, 203Hg, 204Tl, and  207Bi. | ₇₈Pt, ₈₀Hg, ₈₁Tl, ₈₂Pb. | Coincidence measurements were recorded by a planar Ge detector and a Si(Li) detector. |
| [59] | ​, ,,  **(calculated)** | Synchrotron radiation used for selective photoionization of the L Subshells. | Self-supported 1.66-μm-thick ₄₆Pd metallic foil and 114-μm-thick ₄₆Pd. | Si(Li) detector, CCD detector, ionization chambers. |
| [73] | ​, ,,  **(calculated)** | Energy-tunable synchrotron radiation between 4500 and 5800 eV. | **₅₄Xe** gas contained in a **10-mm-long stainless-steel cell** sealed with **12.5-µm-thick Kapton foils.** | High-resolution Johansson-type curved crystal spectrometer, CCD detector, ionization chambers. |
| [119] |  | 207Bi, which decays to Pb by electron capture, X-ray energies of 7497 keV and 7280 keV.  Ge(HP) detector and Si(Li). | |  | | --- | | ₈₂Pb. |  |  | | --- | |  | | Ge(HP) detector and Si(Li). |
| [106] |  | Radioactive source of 195Pm decaying to 147Nd by electron capture. | ₆₀Nd | Ge(HP) detector with energy resolution of 487 eV at 122 keV for K X-rays, and Si(Li) detector with energy resolution of 146 eV at 5.9 keV for L X-rays. |
| [114] |  | Radioactive source of 169Yb, which decays to Thulium 169Tm by electron capture, produces energies ranging from 7.18 keV to 50.74 keV. | ₆₉Tm. | Ge(HP) detector with energy resolution of 480 eV, and Si(Li) r with energy resolution of 180 eV. |
| [79] | ​, ,,  **(calculated)** | 62.2 keV electron capture decays of radioactive sources 157Tb,158Tb . | ₆₄Gd mass-separated and chemically-separated ₆₅Tb isotopes. | Small Si(Li) diode for high-resolution X-ray detection and hyperpure germanium detectors. |
| [111] | ​ | Gamma radiation with an energy of 59.54 keV, emitted from 241Am source. | ₆₇Ho and ₆₉Tm. | Ge(Li) detectors. |
| [103] |  | Isotope 139Ce decays by electron capture to 139La. | ₅₇La with isotope 139Ce forming a satisfactory source of La X rays. | High-resolution solid-state Ge(Li) X-ray detectors were employed. |
| [38] |  | 155Eu (half-life 4.9 years), with energies up to 105.30 keV. | ₆₄Gd. | Si(Li) detector (30 mm², 0.002 in. Be window), Ge(Li) detector (80 mm², 0.005 in. Be window). |
| ​[129] |  | 90.3 keV Synchrotron radiation from Argonne's Advanced Photon Source (APS). | Very thin **₇₉Au** foils. | Germanium solid state detectors at specific angles to the beam. |
| [104] |  | Fe-55 radioisotope emitting Mn Kβ photons at 6.492 keV. | High-purity (99.9%) Pr2O3 with thickness 35 mg/cm². | Si(Li) detector (FWHM = 160 eV at 5.96 keV, active area = 12.5 mm², sensitivity depth = 3.5 cm. |
| [94] |  | 59.5 keV gamma rays emitted from a point source of Am-241. | **₈₀Hg**, **₇₉Au** high purity (99.9%) samples with thickness ranging from **5 to 20 mg/cm².** | Si(Li) detector with active area of 12 mm², sensitive depth of 3 mm, Be window thickness of 12.5 μm, and energy resolution of about 160 eV at 5.96 keV. |
| [125] | , | 57.9 keV Alpha decay of 232U. | ₉₀Th. | Surface barrier detector (Ortec) for alpha particles, NaI(Tl) scintillation counter for L X-rays, Si(Li) detector for measuring relative intensity of LX photons |
| [141] |  | Electron bombardment, with an energy exceeding 40 keV. | ₇₃Ta, ₇₄W, ₇₇Ir, ₇₈Pt, ₇₉Au, ₈₁Tl. | Spectrograph with quartz crystal, Ilfex films, Hilger and Watts microphotometer. |
| [120] | , | Decay of 210Pb. | ₈₃Bi. | Ge(Li) and Si(Li) detectors for the x-ray. |
| [51] | , | Alpha decay of 238Pu and 232Th, with associated energies ranging from 43.5 keV to 84.4 keV. | **₉₂U, ₈₈Ra** | Surface-barrier detector for alpha particles, Si(Li) L x-ray spectrometer, NaI(Tl) scintillation counter. |
| [138] |  | 155Eu (4.68 years half-life) and 165Er (10.4 hours half-life). | ₆₃Eu, ₆₈Er. | Ge(HP) with 340 eV resolution at 46 keV. L x-ray detector: Si(Li) with 240 eV FWHM resolution at 5.9 keV. |
| [53] | ​, ,,  **(calculated)** | Synchrotron Radiation between 845 and 1300 eV. | ₂₈Ni. | Grating Spectrometer,  Calibrated Photodiode. |
| [116] |  | A low-power x-ray tube with Rh anode was used as the photon source, operating within an energy range of 20 to 25 kV and a current of 0.5 mA. | Pure metallic targets of ₇₄W, ₈₂Pb, and ₉₂U. | Peltier-cooled Si-PIN detectors, a resolution of approximately 200 eV at 5.959 keV. |
| [61] | ,, | β-radiation from the decay of the 199Au isotope,​within an energy range from 5 keV to 500 keV. | Almost pure 199Au. | A β-ray spectrometer and a magnetic lens detector. |
| [84] | ​, ,,  **(calculated)** | Synchrotron radiation was used, with spectra recorded at photon energies of 7.7 keV, 8.4 keV, and 8.9 keV. | Pure-element foil of ₆₅Tb with a thickness of 0.127 nm. | Si(Li) solid-state detector, fast amplifier, analog-to-digital converter, and 4K multichannel buffer. |
| [87] | ​, ,,  **(calculated)** | Synchrotron radiation provides tunable photon energy. | Pure-element foils of ₇₀Yb and ₇₃Ta, each with a thickness of 0.100 mm.Haut du formulaire  Bas du formulaire | Solid-state detector with Si(Li) crystal. |
| [71] | ​, ,,  **(calculated)** | Electron gun of a triode type with a tungsten filament, providing beam currents of about 100 μA​. | Free ₅₄Xe atoms.  Haut du formulaire  Bas du formulaire | Si(Li) x-ray detectors with an energy resolution of 200 eV at 5.9 keV​. |
| [67] | ​, ,,  ,,,  **(calculated)** | Monochromatic radiation between 1.75 keV and 10.5 keVThis radiation is provided by the four-crystal monochromator beamline at PTB in the BESSY II electron. | ₄₄Ru coated silicon nitride membrane. | Calibrated photodiodes,Energy-dispersive  (SDD). |
| [89] | ​, ​, | Beta decay of 194Os, emitting gamma rays Radioactive 194Os in equilibrium with its daughter 194Ir. | 194Os in equilibrium with its decay product 194Ir (Iridium). | Si(Li) detector with a depletion depth of approximately 4 mm and an energy resolution of 240 eV (FWHM) at 6.4 keV Fe K x-rays. |
| ​[142] | ​, | Electron capture decay of 181W (193 keV) results in the production of Ta L x-rays, as well as gamma rays with energies of 136 keV and 159 keV. | ₇₃Ta. | Si(Li) detector having a resolution of 240 eV at 6.4 keV Fe K x-rays. |
| ​[139] |  | Synchrotron radiation from (BESSY), photon energy range from 2 to 2.5 keV. | 39Y foil | Commercial hemispherical electron analyzer (CLAM 100). |
| [47] | ,,,  **(calculated)**  ,, | Synchrotron radiation, monochromatized with a double-crystal spectrometer, with energy ranging from 3.4 to 4.9 keV. | ₄₇Ag foil was 1 mm thick and the ₁₃Al foil was 0.8 mm thick. | Si(Li) detector for detecting induced x-ray fluorescence, located at 90° to incoming beam. |
| [56] | ​, ,,  **(calculated)** | Photons of varying energies, Hard synchrotron radiation from DORIS II (5 GeV electron energy, 25-40 mA storage ring current). | foil ₇₉Au. | Si(Li) detector with 210 eV FWHM energy resolution at 5.9 keV, mounted at 90° observation angle. |
| [72] | ​, ,,  **(calculated)** | Monochromatized synchrotron radiation. Primary radiation energy set at approximately 50 energy points within the range of the L edges of Xenon. | ₅₄Xe. | Si(Li) detector for resolution at 160 eV FWHM. |
| [124] |  | Proton bombardment with 1.5 MeV. | ₈₈Ra, ₉₀Th, ₉₂U, ₉₄Pu. | Si(Li) X-ray detector, diameter 6 mm, depth 3 mm, 30 µm Be window, resolution 150 eV at 5.9 keV. |
| [7] | ​, ,,  **(calculated)** | ELETTRA synchrotron radiation, 4.0 keV–5.0 keV photon beam. | ₅₀Sn (~5.57 mg/cm²) and thin target of Sb on Mylar foil (~10.50 µg/cm²). | Silicon drift detector (XFlash 5,030), 30 mm² area, 450 µm thickness, FWHM 131 eV resolution at 5.89 keV. |
| [49] | ​, ,,  **(calculated)** | Synchrotron radiation facility, with an electron storage ring operated at 2.0 GeV and a nominal current of 309 mA. | Pure thin target of ₆₆Dy, ~5.9 µg/cm² on a 6.3 µm thick mylar backing. | Silicon drift detector (XFlash 5030), 30 mm² area, 450 µm thickness, 131 eV resolution at 5.89 keV; Silicon photodiode (SXUV100). |
| [63] | ​, ,,  **(calculated)** | **3.7–14.0 keV.** This energy range was achieved using a monochromatic photon beam provided by a Si (111) double crystal monochromator (DCM). | Pure thin target of ₅₁Sb and ₅₀Sn were used, with thicknesses of **10.50 μg/cm²** and **5.57 mg/cm².** | (SDD), XFlash 5030 model with an area of 30 mm² × 450 μm and FWHM of ∼131 eV at 5.89 keV. |
| [85] | ​, ,,  **(calculated)** | Synchrotron radiation, RRCAT, ranging from 8.00 to 17.00 keV. | ₇₃Ta, ₇₄W, ₇₈Pt, ₇₉Au, ₈₂Pb (metallic) ₆₇Ho, ₇₁Lu, ₆₆Dy, ₆₈Er, ₈₀Hg, ₈₃Bi (oxides/powders). | Peltier-cooled vortex solid-state detector 138 eV at 5.959 keV X-rays. |
| [82] | ​, ,,  **(calculated)** | Monochromatized synchrotron radiation, 7.2 keV to 9.0 keV. | ₆₄Gd. | Energy-dispersive detector (SDD) and full-cylinder von Hamos spectrometer with HAPG crystal. |
| [54] | ​, ,,  **(calculated)** | Photons energies ranging from 12.019 to 18.0 keV from synchrotron radiation. | Free-standing one-elemental foils of ₇₉Au and ₈₂Pb,(2 μm thick), thin-metal depositions of ₄₂Mo and ₄₆Pd.(250 nm thick) on 500 nm silicon nitride membranes. | (Si(Li) detector or Silicon Drift Detector (SDD). |
| [65] | ​, ,,  **(calculated)** | Four-crystal monochromator beamline providing monochromatized radiation with energies from 1.75 to 10.5 keV. | High-purity single element ₄₀Zr foil (500 nm thick). | Calibrated energy-dispersive (SDD) placed behind a calibrated diaphragm. |
| [145] |  | 241Am radioactive, which emits 59.54 keV  γ-rays. | ₄₂Mo K x-rays were used as the secondary  ₉₀Th, ₉₂U | Si(Li) detector with a resolution of 180 eV at 5.89 keV was used for detecting the x-ray spectra. |
| [62] |  | 59.54 keV gamma-rays from a 241Am source, Rb K X-rays from RbNO3. | ₈₂Pb. | Si(Li) detector, 180 eV resolution at 5.96 keV. |
| [101] |  | Electron and photon  spectra. | Approximately 10 mg of electromagnetically enriched 192Os (99.4%). | (SDD) for conversion-electron spectrometry. Ge for spectral measurements of photons and x-rays. |
| [121] | ​, | X-rays, the decay of226Ra en équilibre avec ses produits de désintégration, produisant principalement du bismuth (214Bi) between 74.8 keV and 77.1 keV. | ₈₃Bi. | Ge(Li) coaxial (25,1 cm³) et Si(Li) plan (diamètre actif de 6 mm). |
| [68] | ​, ,,  **(calculated)** | 103Pd decaying to  103Rh (39.75 keV level) via electron capture. | ₄₅Rh. | Si(Li) Detector, Ge(Li) Detector, Proportional Counter. |
| [93] | ​ | X-ray radiation, generated from the radioactive decay of the isotopes producing energies of 30.9 keV and 98.9 keV, as well as from the decay of 199Au. | Very pure ₇₈Pt (99.999%) . | Si(Li) X-ray detector, 10 mm diameter, 5 mm depth, 0.025 mm Be window, 185 eV FWHM at 6.4 keV. |
| [109] |  | X-rays, produced from the decay of Radioactive source 249Cf, 244Cm, and 238Pu. | 249Cf, 244Cm, and 238Pu prepared by electrodeposition onto beryllium disks. | Si(Li) and Ge(Li) x-ray detectors: Si(Li) with 180 eV FWHM at 5.9 keV, Ge(Li) with 343 eV FWHM at 6.4 keV. |
| [83] | ​, ,,  **(calculated)** | Electron Capture (EC) radiation, leading to the emission of X-rays from the L-shell. | ₆₅Tb. | Ge(Li) detector with 8 mm diameter, 5 mm depth, and 440 eV FWHM at 14.4 keV; Si(Li) detector with 6 mm diameter, 3 mm depth, 260 eV FWHM at 6.4 keV, fitted with a 0.5 mm Be window. |
| [137] |  | ​, and Kβ​, The L x-ray spectra were taken in coincidence with ​, and Kβ​, x-rays | ₆₅Tb, ₇₀Yb, ₇₃Ta, ₈₀Hg. | Si(li) detectors with 260 eV FWHM resolution at 6.4. |
| [126] | ​, ,,  **(calculated)** | Decay energy Q\_EC of the isotope 235Np, which was determined to be 123.6 keV. | ₉₂U. | Ge(HP) detector had a resolution of 204 eV FWHM at 5.9 keV, and the Si(Li) detector had a resolution of 180 eV FWHM at 5.9 keV. |
| [126] | , | Energy of 388 keV was used in the decay of ²⁴⁹Cf. | ₉₆Cm. | Si(Li) detectors for L x-rays and conversion electrons, Ge(Li) detector for gamma rays. |
| [122] |  | 243Am-239Np, electrodeposited on aluminized Mylar. | ₈₆Rn, ₈₈Ra, ₉₄Pu, ₉₆Cm. Specific sources included 243Am-239Np and 227Th. | High-purity intrinsic Ge(HP) and Si(Li) x-ray detectors in a fast-slow coincidence system. |
| [117] |  | X-rays emitted from the decay of radionuclides. | ₇₈Pt, ₈₀Hg, ₈₁Tl, ₈₂Pb, ₉₂U, ₉₆Cm. | Si(Li) detector for L x-rays (area 30 mm², thickness 5 mm), and Ge(Li) detector for K x-rays (area 200 mm², thickness 10 mm). |
| [86] | ​, ,,  **(calculated)** | 171Tm, a low-energy beta emitter. | 73Ta. | Si(Li) spectrometer, proportional counter, Chalk River β spectrometer. |
| [81] | ​, ,,  **(calculated)** | Monochromatic photon beam with energies from 3 to 30 keV, provided by SOLEIL synchrotron. | 10 μm thick ₆₄Gd foil, 10.664(10) mg mass, 135.52(10) mm² area. | Energy-dispersive spectrometer (SDD) with 128 eV resolution at 5.9 keV, set at 90° from the incident beam. |
| [44] | ​, ,,  **(calculated)** | Photon sources to cover an energy range from 100 eV to 35 keV. | Metal foils with high purity (better than 99.95%), with thicknesses ranging from 0.2 µm to 20 µm. | . AXUV photodiode for transmission measurements.  . Silicon drift detector (SDD) for fluorescence radiation.  . Calibrated photodiodes for monitoring photon flux. |
| [99] | ​, ,,  **(calculated)** | Synchrotron radiation, covering the energy range from 100 eV to 30 keV. | ₈₃Bi foils. | Fast SDD from Amptek for energy-dispersive detection; AXUV100G photodiode for monitoring incoming photon flux. |
| [135] | , | Decay of 181W produces a transition energy of 187 keV, and the coincidence rates between L X-rays, K X-rays, and 153 keV gamma rays were measured. | ₇₃Ta. | Si(Li) detector with 260 eV FWHM at 6.4 keV for L x-ray spectra, Ge(Li) x-ray spectrometer with 470 eV FWHM at 6.4 keV for Ta K x-rays. |
| [113] |  | Radioactive decay sources: 170 Tm and 171Tm. | ₇₀Yb. | Ge(Li) and Si(Li) x-ray detectors with 404 eV and 290 eV FWHM at 6.4 keV, respectively. |
| [147] | ,,,  **(calculated)**  ,,, | 199Au (in chlorides solution with dilute HCl). | Thin sources of ₇₉Au on 10 μg/cm² Formvar film. | Double-focusing spectrometer with continuous flow Geiger counters and very thin organic-film windows. |
| [90] | ​, ,,  **(calculated)** | Monochromatic X-ray synchrotron radiation from BAMline at BESSY II, with a photon energy range from 5 keV to 60 keV. | A 250 nm thick ₇₃Ta deposition on a silicon nitride (Si₃N₄) membrane, which is 1000 nm thick. | Energy-dispersive silicon drift detector and calibrated photodiodes. |
| [66] | ​, ,,  **(calculated)** | The X-ray beam with graded energy from 2.1 keV to 4 keV. | 150 nm thin film of ₄₄Ru on a 500 nm Si3N4 membrane. | Silicon drift detector (SDD), radiometrically calibrated. |
| [39] |  | Gamma rays with an energy of 59.5 keV from a 241Am source were observed, as well as gamma rays with an energy of 88 keV from 109Cd decay​. | Thin, uniform sources of ¹⁹⁸Au, ²⁰³Hg, ²⁰⁷Bi, and ²³³Pa. | Si(Li) detector for L x-rays (resolution 169 eV), Ge(HP) detector for K x-rays (resolution 204 eV) FWHM at 5.9 keV. |
| [127] |  | The radioactive isotope ²⁴⁹Cf. | ₉₆Cm. | Si(Li) X-ray Detector (resolution of 169 eV FWHM at 5.9 keV), Ge(Li) Spectrometer (resolution of 730 eV FWHM at 122 keV). |
| [6] | ,, | 59.5 keV gamma-rays from a 100-mCi 241Am point source. | ₅₉Pr, ₆₀Nd, ₆₂Sm, ₆₄Gd, ₆₅Tb, ₆₆Dy, ₆₇Ho, ₆₈Er, ₇₂Hf, ₇₄W, ₇₈Pt, ₈₁Tl, ₈₂Pb, ₈₃Bi. | Si(Li) X-ray Spectrometer FWHM: 160 eV at 5.96 keV . |
| [7] | ​, ,,  **(calculated)** | 59.5 keV γ -rays obtained from a 100 mCi 241Am. | ₅₉Pr, ₆₀Nd, ₆₄Gd, ₆₅Tb, ₆₆Dy, ₆₇Ho, ₆₈Er, ₇₂Hf, ₇₄W, ₇₉Au, ₈₁Tl, ₈₃Bi, ₉₀Th.Bas du formulaire | FWHM = 160 eV at 5.96 keV, active area = 12.5 mm2, sensitivity depth = 3.5 cm, Be window thickness = 12.5 µm. |
| [10] | ,, | γ-ray with an energy of 59.54 keV, emitted from an 241 Am. | ₅₅Cs, ₅₆Ba, ₅₇La, ₅₈Ce, ₅₉Pr, ₆₀Nd, ₆₂Sm, ₆₃Eu, ₆₄Gd, ₆₅Tb, ₆₆Dy, ₆₇Ho, ₆₈Er, ₇₀Yb, ₇₁Lu, ₇₂Hf, ₇₃Ta, ₇₄W, ₇₆Os, ₇₈Pt, ₇₉Au, ₈₀Hg, ₈₁Tl, ₈₂Pb, ₈₃Bi, ₉₀Th, ₉₂U pure samples with an area of 1.72 cm² and thickness from 3 to 35 mg/cm². | Si(Li) detector, active area of 12.5 mm², crystal depth of 3 mm, Be window thickness of 0.025 mm, energy resolution of 188 eV at 5.9 keV peak of Fe-55. |
| [64] |  | Nternal conversion (412-keV transition in 198Hg) and electron capture (decay of 204Tl to 204Hg). | ₈₀Hg. | Si(Li): 3.6 mm depletion depth, 290 eV FWHM for 6.4-keV Fe Kα x-rays from 57Co.  Ge(Li) x-ray detector: 410 eV FWHM at 6.4 keV. |
| [80] | ​, | X-rays emitted from electron capture decay of the radionuclide 157Tb. | ₆₄Gd. | Si(Li) with a 3 mm thickness, 6 mm diameter, 0.025 mm thick beryllium window, and a resolution of 140 eV. |
| [48] | ​, | 55 kV electron beam. | Thin metallic foils (gold ~50 Å). Calibration with copper and selenium. | X-ray spectrometer with photomultiplier. |
| [115] |  | X-ray radiation from the radioactive sources 204Tl and 181W was observed, with the energy of the emitted electrons ranging from 0.7 to 1.5 keV. | ₈₀Hg (Mercury) and ₇₃Ta. | NaI(Tl) scintillation counter for K X-rays and an argon-methane proportional counter for L X-rays. |
| [46] | ​, ,,  **(calculated)** | 207 Bi isotope, which undergoes electron capture decay (EC) and emits x-rays with a primary energy of approximately 14.4 keV. | ₈₂Pb, Carrier-free sources of Bi207 in strengths of 0.1 and 1.0 µCi, evaporated in dilute HNO3. | Si(Li) and Ge(Li) detectors, ORTEC Series 7110 and 8010 respectively. |
| [28] |  | Gamma rays from a radioactive source ¹57Co emitting at 122 keV and other energies. | ₉₁Pa, metal foils for some elements, powdered metal or oxide samples mixed with polystyrene for others. | Ge(Li) Detector: Used for detecting Kα lines.  NaI(Tl) Detector: Used for detecting L-series radiation. |
| [57] | ,,. | Thorium B (ThB) radiation, **Magnetic lens spectrometer** energy range was between **1 keV to 15 keV.** | ₈₃Bi. | Geiger-Müller counter with a thin entrance window made of Zapon lacquer or Formvar. |
| [151] |  | X-rays was **25 kV.** Y₂O₃ (Yttrium Oxide) anodes and Ag (Silver) anodes. | Thin layer of ₈₃Bi deposited on a 500 Å thick Formvar foil. The bismuth layer was approximately 100 Å thick. | A magnetic lens spectrometer was employed to measure the electron spectrum, focusing on the energy, transition, and relative intensity of the lines. |
| [97] | ​, ,,  **(calculated)**  ,,. | Soft X-rays (Ag K radiation), RaD Disintegration which is around 46.5 keV. | ₈₃Bi. | Proportional Counter, Crystal Spectrometer, Scintillation Counter. |
| [32] | , | X-ray photons in coincidence with α-particles from 242Cm. | ₉₄Pu samples covered with 14.5 mg/cm² aluminum foil. | Ionization chamber; photons detected using a sodium iodide crystal with a window of 5 mg/cm² aluminum, 7 mg/cm² araldite, and 6 mg/cm² MgO; ionization chamber's window made of 3.1 mg/cm² polyethylene. |
| [91] |  | Electron beam from an x-ray tube with energy of 42 keV and current of 5 mA. | ₇₄W, ₇₅Re, ₇₇Ir, ₇₉Au, ₉₀Th.  . | Scintillation crystal through a beryllium window and 'Philips' recorder, using a curved crystal spectrometer with a quartz crystal. |
| [128] |  | Gamma rays with an energy of 88 keV from a radioactive 109Cd source. | Pure ₇₉Au Foil | K x-rays: ORTEC LEPS HPGe detector (160 eV at 5.9 keV); L x-rays: DSG Si(Li) detector (140 eV at 5.9 keV); Relative angle between detectors: 125° |
| [102] |  | 9.69-day 137Cs prepared by irradiating Ba(NO3)2 in a thermal neutron flux. | ₅₄Xe. | K X-ray Detector: Ruggedized ion-implanted planar Ge (HP) with 230 eV FWHM at 14.4 keV,L X-ray Detector: Planar Si(Li) with 240 eV FWHM at 5.9 keV. |
| [140] |  | 59.54 keV gamma rays from a 241Am source | Thin, spectroscopically pure foils of 3YbF​, 3LuF​, 3W,O ​, Re, Au, and TlCl evaporated on Mylar backing. Thick targets of ₇₀Yb, ₇₅Re, ₇₉Au, ₈₀Hg. | Si(Li) detector with dimensions 28.27 mm x 35.5 mm, full width at half maximum of 180 eV at 5.89 keV |
| [50] |  | 59.54-keV gamma rays from a 241Am source. | ₆₆Dy, ₇₄W, ₈₃Bi. | Si(Li) x-ray detector with a resolution of approximately 160 eV at 5.9 keV. |
| [134] |  | 59.54 keV gamma-rays from a 241Am source. | ₇₆Os, ₈₁T .  Haut du formulaire | Si(Li) detector with a resolution of 160 eV at 5.9 keV. |
| [110] |  | 59.54 keV gamma rays from filtered annular radioactive source of 241Am (100 mCi). | ₆₈Er, ₇₀Yb, ₇₂Hf. | Si(Li) x-ray detector with 160 eV resolution at 5.9 keV. |
| [144] |  | 241Am annular source (300 mCi) emitting 59.5 keV gamma-rays. | ₇₇Ir, ₇₈Pt, ₈₃Bi. | Si(Li) detector (28.27 mm2 x 5.5 mm, FWHM = 180 eV at 5.89 keV). |
| [77] |  | γ-photons produced by 75 mCi 241Am radioisotope, which produced 59.5 keV γ-photons​. | TeO₂, NH₄I, CsNO₃, BaO, La₂O₃, CeO₂, 62Sm, 67Ho, 68Er, YbO₂, 72Hf, ₇₃Ta, ₇₄W, ₇₅Re, ₇₈Pt, ₇₉AuBas du formulaire, HgO, Tl₂O₃, 82Pb, BiOCl, ThO₂, and 92U. | Si(Li) detector with FWHM = 155 eV at 5.9 keV, active area = 12.5 mm², sensitivity depth = 3.5 cm, and Be window thickness = 12.5 mm. |
| [6] | ​, ,,  **(calculated)** | Synchrotron radiation, X-rays employed had an energy range from 3380 to 3850 electron volts (eV). | ₄₇Ag Bas du formulaire(Silver) evaporated onto an 13Al substrate. | Physical Electronics Model 15-255 double-pass cylindrical-mirror analyzer. |
| [52] | ​, ,,  **(calculated)** | Synchrotron radiation The energy range used was from approximately 0.8 keV to 3 keV. | ₂₈Ni, ₂₉Cu, ₄₂Mo. | Double-pass cylindrical-mirror analyzer measured electrons at 100 eV.with a spiraltron electron multiplier. |
| [76] | ​, ,,  **(calculated)**  ,, | Monochromatized synchrotron radiation from 6.5 keV to 8.5 keV. | **₆₂Sm and ₂₂Ti foils.** | Si(Li) detector with a Be window of 0.025 mm thickness and a resolution of 210 eV FWHM at 5.9 keV |
| [60] | ​, ,,  **(calculated)** | Radioactive decay of 207Bi (33.4 y), which provides Pb L-shell vacancies created by internal conversion and electron capture tansritions. | **₈₂Pb.** | ORTEC Ge(HP) detector, Kevex Si (Li) detector, Coaxial Ge(Li) detector. |
| [105] |  | Gamma radiation resulting from the decay of these radioactive isotopes. | ₆₀Nd, ₇₀Yb. | Ge(HP) planar detector with 230eV FWHM at 14.4keV and planar Kevex Si(Li) detector with 240 eV FWHM at 5.9 keV. |
| [78] | ​, , | Gamma radiation with an energy of 21.54 keV. | ₆₃Eu. | Si(Li) detector with energy resolution of 260 eV (FWHM) at 6.4 keV for detecting Eu L x rays, Ge(Li) detector for detecting 174.68 keV . |
| [34] |  | Gamma radiation and x-rays emitted during the electron capture and internal conversion processes of the radioactive isotopes. | ₆₃Eu, ₆₅Tb, ₇₃Ta, ₈₀Hg, ₈₁Tl, Radioactive isotopes: 151Gd, 159Dy, 181W, 198Au, 204Tl, and 203Hg. | Si(Li) detectors with depletion depths of 2.5 mm and 4.0 mm, FWHM of 200-400 eV. |
| [100] | ​, ,,  **(calculated)**  ,, | X-ray radiation, specifically photon energy 24 keV. | Thin film depositions of HfO2 on silicon nitride membranes with a nominal membrane thickness of 1000 nm. | (SDD) and Calibrated photodiode. |
| [30] | ​, ,,  **(calculated)**  ,,. | **Gamma rays** from the radioactive decay of 210 Pb and 241Am, energy values ranging between **8 to 22 keV.** | ₈₃Bi, ₉₃Np. | ORTEC Si(Li) spectrometer, 180 eV resolution, 3 mm depth, 4 mm diameter, 0.025 mm Be window, 200A gold contact. |
| [55] | ​, , | Synchrotron radiation from HASYLAB, monochromatized using a Si(111) nondispersive double-crystal monochromator. | ₇₂Hf, ₇₃Ta, ₇₄W, ₇₇Ir, ₇₈Pt, ₇₉Au, ₈₂Pb. | Si(Li) detectors for fluorescence detection, Ionization chamber for photoattenuation measurements. |
| [95] | ​, ,,  **(calculated)** | 279 keV transition resulting from the decay of 203Hg to 203Tl. | ₈₁Tl. | Si(Li) detector with a resolution of 290 eV FWHM at 6.4 keV.  - Ge(Li) detector with a resolution of 460 eV FWHM at 14.4 keV. |
| [130] |  | **Electron capture decay** of Bi207. | ₈₂Pb. | Ge(Li) detector for Pb K x-rays, Si(Li) detector for Pb L x-rays. |
| [107] |  | Radioactive sources that decay via electron capture or alpha decay. | ₆₃Eu, ₉₄Pu, ₉₆Cm. | A Ge(Li) detector was used to detect K x-rays, and a Si(Li) detector was used for L x-rays. |
| [131] |  | **Beta radiation**. The radioactive source 179W undergoes **electron capture.** | ₇₃Ta. | Ge(Li) detector and a Si(Li) detector. |
| [43] | ​, ,  , | Nuclear radiation from carrier-free radioactive sources of 210Pb (RaD). | Pb210 (RaD). | Ge(Li) x-ray spectrometer (resolution of 436 eV FWHM at 14.4 keV) and Si(Li) x-ray spectrometer (resolution of 600 eV FWHM at 14.4 keV). |
| [96] | ​, | Radioactive isotope radiation. | ₈₂Pb. | Si(Li) detectors with different resolutions, including those with 155 eV to 260 eV FWHM. |

**Table 2.** Summary of the experimental  from 28Ni to  96Cm is presented according to their target atomic numbers. The weighted average values, the references from which the databases are extracted,, , the internal and external standard deviation (,), and their means () are also listed.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Elements |  | References |  |  |  |  |  |  |  |
| 28Ni | 0.35±0.20  0.82±0.23 | [52]  [53] | 0.5524 | 0.1509 | -0.81 0.97 | 0.08 | 0.2327 | -0.66 0.82 | 0.23 |
| 29Cu | 0.44±0.06 | [52] | 0.4400 | 0.0600 | 0.00 | 0.00 | - | - | - |
| 40Zr | 0.145±0.148 | [65] | 0.1450 | 0.1480 | 0.00 | 0.00 | - | - | - |
| 42Mo | 0.15±0.02  0.182± 0.096 | [52]  [54] | 0.1513 | 0.0196 | -0.05 0.31 | 0.13 | 0.0064 | -0.06 0.32 | 0.01 |
| 44Ru | 0.173±0.073  0.1673±0.012 | [66]  [67] | 0.1674 | 0.0118 | 0.08 -0.01 | 0.03 | 0.0009 | 0.08 -0.01 | 0.00 |
| 45Rh | 0.10±0.02 | [68] | 0.1000 | 0.0200 | 0.00 | 0.00 | - | - | - |
| 46Pd | 0.047±0.001  0.072±0.004  0.08±0.08 | [59]  [59]  [54] | 0.0485 | 0.0010 | -1.06  5.72  0.39 | 1.68 | 0.0042 | -0.34  4.07  0.39 | 0.00 |
| g47Ag | 0.044±0.004  0.14±0.03  0.14 | [52]  [47]  [47] | 0.0457 | 0.0040 | -0.30 3.12 23.79 | 1.41 | 0.0126 | -0.13 2.90 7.50 | 0.01 |
| 50Sn | 0.39±0.03  0.10±0.10  0.070±0.004  0.144±0.023 | [44]  [44]  [70]  [70] | 0.0776 | 0.0039 | 10.33 0.22 -1.36 2.85 | 3.01 | 0.0247 | 8.03 0.22 -0.30 1.97 | 0.02 |
| 51Sb | 0.079±0.004  0.106±0.008  0.161±0.026 | [70]  [70]  [70] | 0.0858 | 0.0035 | -1.28 2.31 2.86 | 1.30 | 0.0105 | -0.61 1.53 2.68 | 0.01 |
| 54Xe | 0.19±0.038  0.12±0.03  0.096±0.016 | [71]  [72]  [73] | 0.1121 | 0.0132 | 1.94 0.24 -0.77 | 0.47 | 0.0215 | 1.78 0.21 -0.60 | 0.02 |
| 56Ba | 0.156±0.02 | [74] | 0.1560 | 0.0200 | 0.00 | 0.00 | - | - | - |
| 57La | 0.212±0.02 | [75] | 0.2120 | 0.0200 | 0.00 | 0.00 | - | - | - |
| 59Pr | 0.185 ± 0.015  0.147±0.01 | [7]  [75] | 0.1587 | 0.0083 | 1.53  -0.90 | 0.32 | 0.0175 | 1.14  -0.58 | 0.02 |
| 60Nd | 0.188 ± 0.011 | [7] | 0.1880 | 0.0110 | 0.00 | 0.00 | - | - | - |
| 62Sm | 0.19±0.03  0.214±0.034  0.196±0.019 | [76]  [77]  [11] | 0.1979 | 0.0145 | -0.243  0.44  -0.08 | 0.04 | 0.0057 | -0.26  0.47  -0.09 | 0.01 |
| 63Eu | 0.26±0.10  0.21±0.021 | [78]  [11] | 0.2508 | 0.0090 | 0.69 -1.78 | -0.55 | 0.0194 | 0.42 -1.43 | 0.02 |
| 64Gd | 0.200±0.030  0.166±0.020  0.190 ± 0.011  0.233±0.023  0.053±0.023  0.169±0.096  0.148±0.043 | [79]  [80]  [7]  [11]  [81]  [82]  [82] | 0.1746 | 0.0078 | 0.82  -0.40  1.14  2.40  -5.00  -0.06  -0.61 | -0.24 | 0.0196 | 0.71  -0.31  0.69  1.93  -4.02  -0.06  -0.56 | 0.02 |
| 65Tb | 0.41±0.36  0.201±0.014  0.191 ± 0.013  0.203±0.020 | [83]  [84]  [7]  [11] | 0.1971 | 0.0086 | 0.59  0.24  -0.39  0.27 | 0.18 | 0.0043 | 0.59  0.27  -0.45  0.29 | 0.00 |
| 66Dy | 0.212 ± 0.034  0.180 ± 0.009  0.195 ± 0.012  0.207±0.062  0.194±0.019  0.183 ± 0.013 | [49]  [49]  [7]  [85]  [11]  [49] | 0.1867 | 0.0059 | 0.73  -0.63  0.62  0.33  0.37  -0.26 | 0.19 | 0.0036 | 0.74  -0.69  0.66  0.33  0.38  -0.28 | 0.00 |
| 67Ho | 0.187 ± 0.013  0.194±0.033  0.216±0.065  0.19±0.019 | [7]  [77]  [85]  [11] | 0.1892 | 0.0101 | -0.13  0.14  0.41  0.04 | 0.11 | 0.0027 | -0.17  0.15  0.41  0.04 | 0.00 |
| 68Er | 0.143±0.01  0.196±0.034  0.142±0.043 | [88]  [77]  [85] | 0.1470 | 0.0094 | -0.29  1.39  -0.11 | 0.33 | 0.0099 | -0.28  1.38  -0.11 | 0.01 |
| 70Yb | 0.16±0.03  0.249±0.021 | [86]  [87] | 0.2197 | 0.0172 | -1.73  1.08 | -0.32 | 0.0418 | -1.16  0.63 | 0.04 |
| 71Lu | 0.139±0.043 | [85] | 0.1390 | 0.0430 | 0.00 | 0.00 | - | - | - |
| 72Hf | 0.141±0.015  0.182±0.015  0.123±0.01  0.185±0.031  0.1923±0.0155 | [55]  [7]  [133]  [77]  [100] | 0.1519 | 0.0064 | -0.66  1.85  -2.43  1.05  2.41 | 0.44 | 0.0147 | -0.52  1.44  -1.62  0.97  1.89 | 0.01 |
| 73Ta | 0.23±0.05  0.104±0.015  0.168±0.039  0.187±0.034  0.131±0.039  0.14±0.11 | [89]  [55]  [87]  [77]  [85]  [90] | 0.1300 | 0.0119 | 1.95  -1.36  0.93  1.58  0.02  0.09 | 0.54 | 0.0174 | 1.89  -1.13  0.89  1.49  0.02  0.09 | 0.02 |
| 74W | 0.260±0.063  0.102±0.015  0.183 ± 0.013  0.156±0.004  0.188±0.033  0.129±0.039  0.138±0.022  0.109±0.005 | [91]  [55]  [7]  [92]  [77]  [85]  [58]  [58] | 0.1392 | 0.0029 | 1.92  -2.44  3.29  3.39  1.47  -0.26  -0.05  -5.22 | 0.26 | 0.0097 | 1.89  -2.08  2.70  1.59  1.42  -0.25  -0.05  -2.76 | 0.01 |
| 75Re | 0.286±0.070  0.141±0.004  0.094±0.033  0.128±0.020  0.103±0.005 | [91]  [92]  [77]  [58]  [58] | 0.1403 | 0.0039 | 2.08  0.12  -1.39  -0.60  -5.89 | 0.05 | 0.0058 | 2.07  0.10  -1.38  -0.59  -4.86 | 0.01 |
| 76Os | 0.108±0.004 | [92] | 0.1080 | 0.0040 | 0.00 | 0.00 | - | - | - |
| 77Ir | 0.157±0.035  0.11±0.04  0.091±0.011  0.058±0.020  0.088±0.004 | [91]  [89]  [101]  [55]  [92] | 0.0883 | 0.0037 | 1.95  0.54  0.24  -1.49  -0.05 | 0.24 | 0.0047 | 1.95  0.54  0.23  -1.47  -0.04 | 0.00 |
| 78Pt | 0.15±0.04  0.066±0.020  0.076±0.015  0.078±0.004  0.053±0.016 | [93]  [55]  [77]  [92]  [85] | 0.0781 | 0.0038 | 1.79  -0.59  -0.13  -0.02  -1.53 | 0.26 | 0.0041 | 1.79  -0.59  -0.13  -0.02  -1.52 | 0.00 |
| 79Au | 0.25±0.13  0.207±0.051  0.047±0.010  0.047±0.020  0.152 ± 0.014  0.127±0.006  0.073±0.015  0.064±0.040  0.050±0.015 | [48]  [91]  [56]  [55]  [7]  [94]  [77]  [54]  [85] | 0.1007 | 0.0043 | 1.15  2.08  -4.94  -2.63  3.51  3.58  -1.78  -0.91  -3.25 | -0.36 | 0.0143 | 1.14  2.01  -3.08  -2.19  2.57  1.70  -1.34  -0.86  -2.45 | 0.01 |
| 80Hg | 0.128±0.007  0.051±0.015 | [94]  [85] | 0.1142 | 0.0063 | 1.46  -3.88 | -1.21 | 0.0295 | 0.45  -1.91 | 0.03 |
| 81Tl | 0.17±0.05  0.14±0.03  0.148 ±0.012 | [33]  [95]  [7] | 0.1480 | 0.0109 | 0.43  -0.25  0.00 | 0.06 | 0.0040 | 0.44  -0.26  0.00 | 0.00 |
| 82Pb | 0.15±0.04  0.17±0.05  0.105±0.026  0.040 ±0.015  0.064±0.013  0.010±0.009  0.053±0.016 | [46]  [96]  [60]  [55]  [77]  [54]  [85] | 0.0414 | 0.0059 | 2.69  2.56  2.39  -0.08  1.59  -2.92  0.68 | 0.99 | 0.0143 | 2.56  2.47  2.15  -0.07  1.17  -1.86  0.54 | 0.01 |
| 83Bi | 0.19±0.05  0.18±0.02  0.093±0.009  0.10±0.02  0.101 ± 0.010  0.069±0.008  0.052±0.016  0.032±0.021  0.16 | [97]  [43]  [30]  [30]  [7]  [98]  [85]  [99]  [45] | 0.0865 | 0.0045 | 2.06  4.56  0.64  0.66  1.32  -1.91  -2.08  -2.54  16.35 | 0.34 | 0.0114 | 2.02  4.06  0.44  0.58  0.95  -1.26  -1.76  -2.28  6.42 | 0.01 |
| 90Th | 0.080 ± 0.010  0.086±0.020  0.058 | [7]  [91]  [62] | 0.0812 | 0.0089 | -0.09  0.22  -2.59 | 0.06 | 0.0024 | -0.12  0.24  -9.67 | 0.00 |
| 92U | 0.064±0.012  0.051 | [77]  [62] | 0.0640 | 0.0120 | 0.00  -1.08 | 0.00 | - | -  - | - |
| 93Np | 0.10±0.04  0.10±0.02  0.10±0.01  0.10±0.05 | [41]  [30]  [30]  [29] | 0.1000 | 0.0086 | 0.00  0.00  0.00  0.00 | 0.00 | 0.0000 | 0.00 0.00 0.00 0.00 | 0.00 |
| 95Am | 0.16±0.03 | [32] | 0.1600 | 0.0300 | 0.00 | 0.00 | - | - | - |
| 96Cm | 0.038±0.022  0.05±0.05 | [42]  [29] | 0.0399 | 0.0201 | -0.07  0.19 | 0.06 | 0.0044 | -0.09  0.20 | 0.00 |

**Table 3:** Summary of the experimental  from 28Ni to 100Fm is presented according to their target atomic numbers. The weighted average values , the references from which the databases are extracted,, , the internal and external standard deviation (,), and their means () are also listed.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Elements |  | References |  |  |  |  |  |  |  |
| 28Ni | 0.6±0.2  0.66±0.10 | [52]  [53] | 0.6480 | 0.0894 | -0.22  0.09 | -0.06 | 0.0240 | -0.24  0.12 | 0.02 |
| 29Cu | 0.8±0.1 | [52] | 0.8000 | 0.1000 | 0.00 | 0.00 | - | - | - |
| 40Zr | 0.218±0.055 | [65] | 0.2180 | 0.0550 | 0.00 | 0.00 | - | - | - |
| 42Mo | 0.15±0.02  0.203± 0.039 | [52]  [54] | 0.1610 | 0.0178 | -0.41  0.98 | 0.28 | 0.0215 | -0.38  0.94 | 0.02 |
| 44Ru | 0.177±0.032  0.2144±0.0296 | [66]  [67] | 0.1972 | 0.0217 | -0.52  0.47 | -0.03 | 0.0186 | -0.54  0.49 | 0.02 |
| 45Rh | 0.15±0.03 | [68] | 0.1500 | 0.0300 | 0.00 | 0.00 | - | - | - |
| 46Pd | 0.164±0.033  0.130±0.030  0.129±0.044 | [59]  [59]  [54] | 0.1421 | 0.0198 | 0.57  -0.34  -0.27 | -0.01 | 0.0117 | 0.63  -0.37  -0.29 | 0.01 |
| 47Ag | 0.16±0.03  0.17±0.03  0.18±0.03  0.27 | [69]  [52]  [47]  [47] | 0.1700 | 0.0173 | -0.29  0.00  0.29  5.77 | 0.00 | 0.0058 | -0.33  0.00  0.33  17.32 | 0.01 |
| 50Sn | 0.18±0.03  0.17±0.05  0.118±0.006  0.155±0.025 | [44]  [44]  [70]  [70] | 0.1228 | 0.0057 | 1.87  0.94  -0.58  1.26 | 0.87 | 0.0086 | 1.83  0.93  -0.46  1.22 | 0.01 |
| 51Sb | 0.124±0.006  0.129±0.009  0.206±0.033 | [70]  [70]  [70] | 0.1273 | 0.0049 | -0.43  0.16  2.36 | 0.70 | 0.0086 | -0.32  0.13  2.31 | 0.01 |
| 54Xe | 0.14±0.02  0.154±0.031  0.148±0.029  0.118±0.029 | [72]  [71]  [102]  [73] | 0.1396 | 0.0130 | 0.01  0.43  0.26  -0.68 | 0.01 | 0.0069 | 0.02  0.45  0.28  -0.73 | 0.01 |
| 56Ba | 0.26±0.26  0.189±0.01 | [27]  [74] | 0.1891 | 0.0100 | 0.27  -0.01 | 0.13 | 0.0027 | 0.27  -0.01 | 0.00 |
| 57La | 0.21±0.02  0.174±0.01 | [103]  [75] | 0.1812 | 0.0089 | 1.31  -0.54 | 0.39 | 0.0144 | 1.17  -0.41 | 0.01 |
| 59Pr | 0.166±0.01  0.178±0.01 | [104]  [75] | 0.1720 | 0.0071 | -0.49  0.49 | 0.00 | 0.0060 | -0.51  0.51 | 0.01 |
| 60Nd | 0.123± 0.013  0.146±0.005  0.155±0.011 | [105]  [106]  [7] | 0.1449 | 0.0043 | -1.60  0.17  0.86 | -0.19 | 0.0059 | -1.53  0.15  0.81 | 0.01 |
| 62Sm | 0.14±0.03  0.137±0.014 | [76]  [11] | 0.1375 | 0.0127 | 0.08  -0.03 | 0.02 | 0.0011 | 0.08  -0.04 | 0.00 |
| 63Eu | 0.129±0.019  0.199±0.015  0.172±0.015 | [34]  [132]  [131] | 0.1721 | 0.0093 | -2.04  1.53  0.00 | -0.17 | 0.0189 | -1.61  1.11  0.00 | 0.02 |
| 64Gd | 0.223±0.011  0.130±0.012 0.157± 0.012  0.140±0.020  0.147 ± 0.010  0.132±0.013  0.095±0.020  0.235±0.059  0.206±0.060 | [38]  [138]  [108]  [79]  [7]  [11]  [81]  [82]  [82] | 0.1558 | 0.0048 | 5.6  -2  0.09  -0.77  -0.8  -1.72  -2.96  1.34  0.83 | -0.04 | 0.0129 | 3.96  -1.46  0.07  -0.66  -0.54  -1.3  -2.55  1.31  0.82 | 0.01 |
| 65Tb | 0.090±0.014  0.066±0.014  0.150±0.011  0.130±0.011  0.097±0.016  0.150 ± 0.012  0.15±0.015 | [83]  [137]  [38]  [34]  [84]  [7]  [11] | 0.1237 | 0.0049 | -2.27  -3.89  2.19  0.53  -1.59  2.03  1.67 | -0.19 | 0.0125 | -1.79  -3.07  1.58  0.38  -1.31  1.52  1.35 | 0.01 |
| 66Dy | 0.168±0.013  0.145 ± 0.010  0.142±0.042  0.141±0.021  0.117± 0.006  0.055± 0.003  0.141±0.014 | [50]  [7]  [85]  [49]  [49]  [49]  [11] | 0.0794 | 0.0025 | 6.69  6.37  1.49  2.91  5.79  -6.27  4.33 | 3.04 | 0.0152 | 4.43  3.61  1.40  2.38  2.30  -1.58  2.98 | 0.02 |
| 67Ho | 0.205±0.034  0.143±0.010  0.115±0.011  0.141± 0.011  0.142± 0.011  0.139±0.042  0.133±0.013 | [35]  [111]  [138]  [108]  [7]  [85]  [11] | 0.1367 | 0.0049 | 1.99  0.56  -1.81  0.35  0.44  0.05  -0.27 | 0.19 | 0.0059 | 1.98  0.54  -1.74  0.34  0.42  0.05  -0.26 | 0.01 |
| 68Er | 0.225±0.025  0.159±0.012  0.141±0.011  0.160±0.005  0.134±0.040 | [35]  [110]  [7]  [88]  [85] | 0.1587 | 0.0042 | 2.62  0.03  -1.50  0.20  -0.61 | 0.15 | 0.0066 | 2.56  0.02  -1.38  0.16  -0.61 | 0.01 |
| 69Tm | 0.148±0.007  0.1344±0.0024  0.1406±0.0024 | [111]  [114]  [114] | 0.1381 | 0.0016 | 1.38  -1.26  0.86 | 0.33 | 0.0027 | 1.32  -1.01  0.69 | 0.00 |
| 70Yb | 0.142±0.009  0.170±0.009  0.174±0.009  0.165±0.009  0.142±0.009  0.130±0.010  0.141±0.007  0.186±0.040  0.149±0.013 | [37]  [113]  [113]  [113]  [137]  [86]  [105]  [87]  [110] | 0.1517 | 0.0032 | -1.01  1.92  2.34  1.40  -1.01  -2.06  -1.39  0.86  -0.20 | 0.09 | 0.0054 | -0.92  1.75  2.13  1.27  -0.92  -1.91  -1.21  0.85  -0.19 | 0.01 |
| 71Lu | 0.135±0.040 | [85] | 0.1350 | 0.0400 | 0.00 | 0.00 | - | - | - |
| 72Hf | 0.109±0.010  0.138±0.010  0.139 ±0.013  0.142±0.005  0.1343±0.0186 | [55]  [110]  [7]  [133]  [100] | 0.1360 | 0.0038 | -2.53  0.18  0.22  0.95  -0.10 | -0.25 | 0.0056 | -2.35  0.17  0.21  0.79  -0.10 | 0.01 |
| 73Ta | 0.20±0.04  0.148±0.010  0.180±0.007  0.150±0.007  0.125±0.008  0.160±0.003  0.155±0.003  0.165±0.021  0.160±0.021  0.167±0.027  0.157±0.003  0.152±0.003  0.153±0.002  0.111±0.010  0.161±0.053  0.131±0.039  0.123±0.084 | [115]  [136]  [135]  [137]  [34]  [107]  [107]  [107]  [107]  [107]  [107]  [107]  [107]  [55]  [87]  [85]  [90] | 0.1543 | 0.0011 | 1.14  -0.62  3.63  -0.60  -3.62  1.79  0.23  0.51  0.27  0.47  0.85  -0.71  -0.55  -4.30  0.13  -0.60  -0.37 | -0.14 | 0.0021 | 1.14  -0.61  3.52  -0.59  -3.54  1.57  0.20  0.51  0.27  0.47  0.75  -0.62  -0.44  -4.24  0.13  -0.60  -0.37 | 0.00 |
| 74W | 0.106±0.010  0.146±0.008  0.144±0.017  0.137±0.010  0.131±0.039  0.174±0.028  0.137±0.007 | [55]  [50]  [116]  [7]  [85]  [58]  [58] | 0.1353 | 0.0040 | -2,72  1.19  0.50  0.15  -0.11  1.37  0.21 | 0.08 | 0.0059 | -2.53  1.08  0.48  0.14  -0.11  1.35  0.18 | 0.01 |
| 75Re | 0.113±0.018  0.113±0.006 | [58]  [58] | 0.1130 | 0.0057 | 0.00  0.00 | 0.00 | 0.0000 | 0.00  0.00 | 0.00 |
| 76Os | 0.106±0.023  0.142±0.029 | [37]  [134] | 0.1199 | 0.0180 | -0.48  0.65 | 0.09 | 0.0175 | -0.48  0.65 | 0.02 |
| 77Ir | 0.103±0.010 | [55] | 0.1030 | 0.0100 | 0.00 | 0.00 | - | - | - |
| 78Pt | 0.114±0.020  0.126±0.020  0.112±0.012  0.104±0.020  0.133±0.016  0.125±0.037 | [37]  [37]  [117]  [55] [116]  [85] | 0.1178 | 0.0072 | -0.18  0.38  -0.42  -0.65  0.86  0.19 | 0.03 | 0.0044 | -0.19  0.40  -0.46  -0.68  0.91  0.19 | 0.00 |
| 79Au | 0.22±0.04  0.192±0.011  0.100±0.009  0.112±0.004  0.101±0.010  0.125 ± 0.013  0.119±0.003  0.112±0.004  0.180±0.040  0.124±0.037 | [48]  [64]  [56]  [112]  [55]  [7]  [128]  [129]  [54]  [85] | 0.1170 | 0.0019 | 2.57  6.72  -1.85  -1.13  -1.57  0.61  0.56  -1.13  1.57  0.19 | 0.65 | 0.0052 | 2.55  6.17  -1.64  -0.77  -1.42  0.57  0.33  -0.77  1.56  0.19 | 0.01 |
| 80Hg | 0.22±0.04  0.080±0.02  0.190±0.010  0.192±0.011  0.188±0.010  0.134±0.011  0.128±0.008  0.123±0.012  0.122±0.001  0.123 ±0.002  0.124±0.037 | [147]  [115]  [64]  [64]  [137]  [34]  [34]  [39]  [112]  [117]  [85] | 0.1261 | 0.0013 | 2.35  -2.30  6.33  5.94  6.13  0.71  0.23  -0.26  -1.72  -1.30  -0.06 | 1.46 | 0.0049 | 2.33  -2.24  5.74  5.48  5.56  0.65  0.20  -0.24  -0.79  -0.60  -0.06 | 0.00 |
| 81Tl | 0.25±0.13  0.08±0.02  0.169±0.010  0.159±0.013  0.130±0.007  0.130±0.006  0.113±0.011  0.109±0.011  0.117±0.006  0.118 ± 0.013  0.122±0.026 | [33]  [115]  [95]  [37]  [37]  [118]  [34]  [39]  [117]  [7]  [134] | 0.1273 | 0.0029 | 0.94  -2.34  4.00  2.38  0.35  0.40  -1.26  -1.61  -1.55  -0.70  -0.20 | 0.04 | 0.0057 | 0.94  -2.28  3.62  2.23  0.29  0.32  -1.16  -1.48  -1.25  -0.66  -0.20 | 0.01 |
| 82Pb | 0.164±0.016  0.156±0.010  0.105±0.011  0.130±0.002  0.111±0.002  0.113±0.002  0.1055±0.011  0.112 ±0.001  0.115 ±0.004  0.091±0.010  0.136±0.016  0.141±0.040  0.115±0.035 | [148]  [130]  [39]  [60]  [26]  [26]  [119]  [119]  [117]  [55]  [116]  [54]  [85] | 0.1148 | 0.0007 | 3.07  4.11  -0.89  7.16  -1.76  -0.82  -0.84  -2.22  0.06  -2.37  1.33  0.66  0.01 | 0.58 | 0.0022 | 3.05  4.03  -0.87  5.15  -1.27  -0.59  -0.83  -1.15  0.05  -2.32  1.32  0.66  0.01 | 0.00 |
| 83Bi | 0.06±0.14  0.164±0.016  0.17±0.03  0.164±0.016  0.18±0.018  0.18±0.07  0.135±0.011  0.115 ± 0.010  0.103±0.031  0.057±0.016 | [97]  [46]  [120]  [30]  [30]  [121]  [50]  [7]  [85]  [99] | 0.1314 | 0.0053 | -0.51  1.93  1.27  1.93  2.59  0.69  0.30  -1.45  -0.90  -4.41 | 0.14 | 0.0116 | -0.51  1.65  1.20  1.65  2.27  0.69  0.23  -1.07  0.86  -3.76 | 0.01 |
| 86Rn | 0.105±0.011 | [122] | 0.1050 | 0.0110 | 0.00 | 0.00 | - | - | - |
| 88Ra | 0.01±0.07  0.102±0.006  0.053±0.026  0.104±0.002 | [51]  [123]  [122]  [124] | 0.1035 | 0.0019 | -1.33  -0.23  -1.94  0.20 | -0.83 | 0.0026 | -1.33  -0.22  -1.93  0.16 | 0.00 |
| 90Th | 0.13±0.10  0.105±0.007  0.110 ±0.011  0.106 | [125]  [124]  [7]  [62] | 0.1065 | 0.0059 | 0.23  -0.17  0.28  -0.09 | 0.12 | 0.0019 | 0.23  -0.21  0.31  -0.28 | 0.00 |
| 91Pa | 0.13±0.13 | [28] | 0.1300 | 0.1300 | 0.00 | 0.00 | - | - | - |
| 92U | 0.38±0.06  0.23±0.12  0.37±0.07  0.40±0.07  0.43±0.06  0.147±0.010  0.07±0.05  0.146±0.018  0.139±0.004  0.140±0.004  0.158±0.019  0.139 | [31]  [109]  [31]  [31]  [31]  [126]  [51]  [39] [124]  [117]  [116]  [62] | 0.1421 | 0.0027 | 3.96  0.73  3.25  3.68  4.79  0.47  -1.44  0.21  -0.65  -0.44  0.83  -1.18 | 1.40 | 0.0069 | 3.94  0.73  3.24  3.67  4.77  0.40  -1.43  0.20  -0.39  -0.27  0.79  -0.45 | 0.01 |
| 93Np | 0.223±0.020  0.22±0.022  0.30±0.10 | [30]  [30]  [29] | 0.2233 | 0.0146 | -0.01  -0.13  0.76 | 0.21 | 0.0081 | -0.01  -0.14  0.76 | 0.01 |
| 94Pu | 0.22±0.08  0.42±0.08  0.42±0.09  0.226±0.016  0.229±0.004  0.233±0.015  0.225±0.006 | [32]  [31]  [31]  [122]  [123]  [131]  [124] | 0.2369 | 0.0032 | -0.21  2.29  2.03  -0.67  -1.54  -0.25  2.67 | 0.62 | 0.0062 | -0.21  2.28  2.03  -0.63  -1.07  -0.24  2.10 | 0.01 |
| 96Cm | 0.188±0.019  0.188±0.010  0.226±0.017  0.209±0.022  0.219±0.016  0.19±0.04 | [109]  [122]  [131]  [127]  [117]  [29] | 0.2010 | 0.0066 | -0.65  -1.09  1.37  0.35  1.04  -0.27 | 0.13 | 0.0071 | -0.64  -1.06  1.36  0.35  1.03  -0.27 | 0.01 |
| 100Fm | 0.18±0.04 | [32] | 0.1800 | 0.0400 | 0.00 | 0.00 | - | - | - |

**Table 4:** Summary of the experimental  Coster Kronig from 28Ni to  96Cm is presented according to their target atomic numbers. The weighted average values , the references from which the databases are extracted, , , the internal and external standard deviation (,), and their means () are also listed.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Elements |  | References |  |  |  |  |  |  |  |
| 28Ni | 0.5±0.2 0.06±0.30 | [52]  [53] | 0.3646 | 0.1664 | 0.52  -0.89 | -0.18 | 0.2031 | 0.47  -0.84 | 0.20 |
| 29Cu | 0.3±0.2 | [52] | 0.3000 | 0.2000 | 0.00 | 0.00 | - | - | - |
| 39Y | 0.49±0.09 | [139] | 0.4900 | 0.0900 | 0.00 | 0.00 | - | - | - |
| 40Zr | 0.529±0.178 | [65] | 0.5290 | 0.1780 | 0.00 | 0.00 | - | - | - |
| 42Mo | 0.61±0.06 0.57±0.14 | [52]  [54] | 0.6038 | 0.0551 | 0.08 -0.22 | -0.07 | 0.0145 | 0.10 -0.24 | 0.01 |
| 44Ru | 0.528±0.090 0.5134±0.0204 | [66]  [67] | 0.5141 | 0.0199 | 0.15 -0.03 | 0.06 | 0.0031 | 0.15 -0.03 | 0.00 |
| 45Rh | 0.60±0.09 | [68] | 0.6000 | 0.0900 | 0.00 | 0.00 | - | - | - |
| 46Pd | 0.730±0.039 0.743±0.045 0.589±0.131 | [59] [59] [54] | 0.7285 | 0.0288 | 0.03 0.27 -1.04 | -0.25 | 0.0226 | 0.03 0.29 -1.05 | 0.02 |
| 47Ag | 0.61±0.05 0.61±0.06 0.58±0.05 0.58 | [69]  [52]  [47]  [47] | 0.5989 | 0.0305 | 0.19  0.17  -0.32  -0.62 | 0.01 | 0.0102 | 0.22  0.18  -0.37  -1.84 | 0.01 |
| 50Sn | 0.85±0.36 0.29±0.15 0.405±0.028  0.428±0.107 | [44]  [44]  [70]  [70] | 0.4052 | 0.0266 | 1.23  -0.76  -0.01  0.21 | 0.17 | 0.0226 | 1.23  -0.76  0.01  0.21 | 0.02 |
| 51Sb | 0.297±0.021 0.247±0.022  0.343±0.085 | [70]  [70]  [70] | 0.2753 | 0.0150 | 0.84 -1.06 0.78 | 0.19 | 0.0194 | 0.76 -0.97 0.78 | 0.02 |
| 54Xe | 0.28±0.042  0.23±0.04  0.383±0.037 | [71]  [72]  [73] | 0.3029 | 0.0228 | -0.48  1.58  1.84 | -0.07 | 0.0465 | -0.37  -1.19  1.35 | 0.05 |
| 56Ba | 0.296±0.03 | [74] | 0.2960 | 0.0300 | 0.00 | 0.00 | - | - | - |
| 57La | 0.358±0.03 | [75] | 0.3580 | 0.0300 | 0.00 | 0.00 | - | - | - |
| 59Pr | 0.268±0.02 | [75] | 0.2680 | 0.0200 | 0.00 | 0.00 | - | - | - |
| 60Nd | 0.306 ± 0.018 | [7] | 0.3060 | 0.0180 | 0.00 | 0.00 | - | - | - |
| 62Sm | 0.18±0.03  0.19±0.03  0.44±0.044 | [76]  [76]  [11] | 0.2331 | 0.0191 | -1.49 -1.21 4.31 | 0.54 | 0.0706 | -0.69 -0.56 2.49 | 0.12 |
| 63Eu | 0.27±0.03 | [78] | 0.2700 | 0,0300 | 0.00 | 0.00 | - | - | - |
| 64Gd | 0.289±0.015  0.287±0.014  0.310 ± 0.012  0.186±0.019  0.27±0.04  0.197±0.121  0.193±0.147 | [79]  [80]  [7]  [11]  [81]  [82]  [82] | 0.2804 | 0.0071 | 0.52  0.42  2.13  -4.66  -0.26  -0.69  -0.59 | -0.45 | 0.0164 | 0.39  0.31  1.46  -3.76  -0.24  -0.68  -0.59 | 0.02 |
| 65Tb | 0.43±0.28  0.281±0.027  0.299 ±0.015  0.323±0.032 | [83]  [84]  [7]  [11] | 0.2991 | 0.0121 | 0.47  -0.61  0.00  0.70 | 0.14 | 0.0077 | 0.47  -0.64  0.00  0.73 | 0.01 |
| 66Dy | 0.302 ±0.018  0.311±0.092  0.344±0.034  0.268 ± 0.030  0.302 ±0.076  0.284 ± 0.020 | [7]  [85]  [11]  [49]  [49]  [49] | 0.2962 | 0.0113 | 0.27  0.16  1.33  -0.88  0.08  -0.53 | 0.07 | 0.0093 | 0.29  0.16  1.36  -0.90  0.08  -0.55 | 0.01 |
| 67Ho | 0.314 ±0.025  0.306±0.092 | [7]  [85] | 0.3134 | 0.0241 | 0.02 -0.08 | -0.03 | 0.0020 | 0.02 -0.08 | 0.00 |
| 68Er | 0.309 ±0.016  0.277±0.009  0.306±0.092 | [7]  [88]  [85] | 0.2848 | 0.0078 | 1.36  -0.66  0.23 | 0.31 | 0.0097 | 1.29  -0.59  0.23 | 0.01 |
| 70Yb | 0.297±0.020  0.408±0.055  0.348 ±0.021 | [86]  [87]  [140] | 0.3269 | 0.0140 | -1.22  1.43  0.84 | 0.35 | 0.0231 | -0.98  1.36  0.68 | 0.02 |
| 71Lu | 0.338±0.021  0.316±0.092 | [140]  [85] | 0.3369 | 0.0205 | 0.04  -0.22 | -0.09 | 0.0048 | 0.05  -0.23 | 0.00 |
| 72Hf | 0.309±0.010  0.290±0.012  0.337±0.01  0.2562±0.0333 | [55]  [7]  [133]  [100] | 0.3126 | 0.0060 | -0.31  -0.69  2.09  -1.67 | -0.39 | 0.0122 | -0.23  -1.32  1.54  -1.59 | 0.01 |
| 73Ta | 0.19±0.20  0.32±0.03  0.339±0.02  0.322±0.072  0.323±0.097  0.328±0.152 | [141]  [142]  [55]  [87]  [85]  [90] | 0.3314 | 0.0159 | -0.70  -0.34  0.30  -0.13  -0.09  -0.02 | -0.16 | 0.0064 | -0.71  -0.37  0.36  -0.13  -0.09  -0.02 | 0.01 |
| 74W | 0.27±0.03  0.325±0.010  0.288±0.020  0.457±0.012  0.354±0.024  0.328±0.098  0.358±0.089  0.360±0.025 | [141]  [55]  [7]  [92]  [140]  [85]  [58]  [58] | 0.3612 | 0.0064 | -2.97  -3.05  -3.49  7.03  -0.29  -0.34  -0.04  -0.05 | -0.40 | 0.0243 | -2.36  -1.38  -2.33  3.53  -0.21  -0.33  -0.03  -0.04 | 0.02 |
| 75Re | 0.510±0.015  0.450±0.027  0.30±0.04  0.428±0.030  0.437±0.109 | [92]  [140]  [143]  [58]  [58] | 0.4693 | 0.0114 | 2.16  -0.66  -4.07  -1.29  -0.29 | -0.83 | 0.0302 | 1.21  -0.48  -3.38  -0.97  -0.29 | 0.03 |
| 76Os | 0.55±0.02 | [92] | 0.5500 | 0.0200 | 0.00 | 0.00 | - | - | - |
| 77Ir | 0.467±0.025  0.496±0.010  0.46±0.06  0.64±0.03  0.37±0.03 | [144]  [55]  [141]  [92]  [89] | 0.4944 | 0.0084 | -0.70  0.12  -0.57  4.67  -3.99 | -0.09 | 0.0272 | -0.50  0.05  -0.52  3.60  -3.07 | 0.03 |
| 78Pt | 0.50±0.05  0.562±0.020  0.527±0.027  0.67±0.04  0.563±0.169 | [141]  [55]  [144]  [92]  [85] | 0.5609 | 0.0142 | -1.17  0.04  -1.11  2.57  0.01 | 0.07 | 0.0231 | -1.11  0.04  -0.96  2.36  0.01 | 0.02 |
| 79Au | 0.51±0.13  0.61±0.07  0.590±0.020  0.582±0.010  0.542 ±0.022  0.580±0.030  0.524±0.075  0.561±0.168 | [48]  [141]  [56]  [55]  [7]  [140]  [54]  [85] | 0.5774 | 0.0079 | -0.52  0.46  0.59  0.36  -1.51  0.08  -0.71  -0.10 | -0.17 | 0.0061 | -0.52  0.46  0.60  0.39  -1.55  0.09  -0.71  -0.10 | 0.01 |
| 80Hg | 0.582±0.030  0.578±0.173 | [140]  [85] | 0.5819 | 0.0296 | 0.00 -0.02 | -0.01 | 0.0007 | 0.00 -0.02 | 0.00 |
| 81Tl | 0.56±0.07  0.57±0.10  0.76±0.10  0.56±0.05  0.582±0.018  0.568±0.030 | [33]  [40]  [141]  [95]  [7]  [140] | 0.5796 | 0.0141 | -0.27  -0.09  1.79  -0.38  0.11  -0.35 | 0.13 | 0.0121 | -0.28  -0.09  1.79  -0.38  0.11  -0.36 | 0.01 |
| 82Pb | 0.57±0.03  0.61±0.08  0.658±0.086  0.661±0.010  0.60±0.03  0.664±0.100  0.606±0.182 | [46]  [96]  [60]  [55]  [145]  [54]  [85] | 0.6469 | 0.0089 | -2.46  -0.46  0.13  1.06  -1.50  0.17  -0.22 | -0.47 | 0.0122 | -2.37  -0.46  0.13  0.90  -1.45  0.17  -0.22 | 0.01 |
| 83Bi | 0.58±0.05  0.58±0.02  0.61±0.03  0.63±0.03  0.579 ±0.017  0.620±0.025  0.66 ± 0.05  0.603±0.181  0.59±0.12  0.62 | [97]  [43]  [30]  [30]  [7]  [144]  [98]  [85]  [99]  [45] | 0.5899 | 0.0104 | -0.34  -0.77  0.41  1.04  -0.93  0.85  1.23  0.03  -0.06  2.37 | 0.38 | 0.0082 | -0.34  -0.79  0.41  1.06  -0.96  0.87  1.24  0.03  -0.06  2.78 | 0.01 |
| 90Th | 0.577±0.017 0.66±0.04 0.659 | [7]  [62]  [62] | 0.5897 | 0.0156 | -0.55 1.64 4.43 | 0.54 | 0.0299 | -0.37 1.41 2.32 | 0.03 |
| 92U | 0.67± 0.05 0.66±0.04 0.660 | [126]  [62]  [62] | 0.6639 | 0.0312 | 0.10 -0.08 -0.12 | 0.01 | 0.0049 | 0.12 -0.10 -0.80 | 0.00 |
| 93Np | 0.55±0.09 0.707±0.065 0.70±0.07 0.55±0.09 | [41]  [30]  [30]  [29] | 0.6486 | 0.0381 | -1.01 0.78 0.65 -1.01 | -0.15 | 0.0426 | -0.99 0.75 0.63 -0.99 | 0.04 |
| 96Cm | 0.69±0.08 0.68±0.04  0.72±0.08 0.50±0.09 | [146]  [146]  [146]  [29] | 0.6664 | 0.0307 | 0.28 0.27 0.63 -1.75 | -0.15 | 0.0358 | 0.27 0.25 0.61 -1.72 | 0.04 |
| 98Cf | 0.63±0.07 | [32] | 0.6300 | 0.0700 | 0.00 | 0.00 | - | - | - |

**Table 5:** Summary of the experimental Coster Kronig from 28Ni to 92Cm is presented according to their target atomic numbers. The weighted average values , the references from which the databases are extracted, , , the internal and external standard deviation (,), and their means () are also listed.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Elements |  | References |  |  |  |  |  |  |  |
| 28Ni | **0.71±**0.224  **0.601±0.346** | [52] [53] | 0.6778 | 0.1880 | 0.11  -0.20 | -0.04 | 0.0497 | 0.14  -0.22 | 0.05 |
| 29Cu | **0.652±**0.210 | [52] | 0.6520 | 0.2**100** | 0.00 | 0.00 | - | - | - |
| 40Zr | **0.561±0.181** | [65] | 0.5610 | 0.**1810** | 0.00 | 0.00 | - | - | - |
| 42Mo | **0.633±0.060**  **0.607±0.142** | [52] [54] | 0.6291 | 0.0553 | 0.05  -0.14 | -0.05 | 0.0093 | 0.06  -0.16 | 0.01 |
| 44Ru | **0.559±0.091**  **0.594±0.021** | [66]  [67] | 0.5922 | 0.0205 | -0.36  0.06 | -0.15 | 0.0077 | -0.36  0.08 | 0.01 |
| 45Rh | **0.615±0.090** | [68] | 0.6150 | 0.09**00** | 0.00 | 0.00 | - | - | - |
| 46Pd | **0.752±0.045 0.738±0.039 0.599±0.131** | [59] [59] [54] | 0.7370 | 0.0288 | 0.28  0.02  -1.03 | -0.24 | 0.0225 | 0.30  0.02  -1.04 | 0.02 |
| 47Ag | **0.617±0.060 0.617±0.050 0.605±0.050 0.618** | [52] [69] [47] [47] | 0.6133 | 0.0320 | 0.05  0.06  -0.13  0.15 | 0.00 | 0.0039 | 0.06  0.07  -0.14  1.19 | 0.00 |
| 50Sn | **0.413±0.028 0.376±0.085 0.920±0.360 0.307±0.151** | [70] [70] [44] [44] | 0.4090 | 0.0261 | 0.10  -0.37  1.42  -0.67 | 0.12 | 0.0245 | 0.11  -0.37  1.42  -0.67 | 0.02 |
| 51Sb | **0.307±0.021 0.261±0.022 0.450±0.107** | [70] [70] [70] | 0.2883 | 0.0150 | 0.72  -1.03  1.50 | 0.40 | 0.0228 | 0.60  -0.86  1.48 | 0.02 |
| 54Xe | **0.309±0.043 0.247±0.040 0.394±0.037** | [71] [72] [73] | 0.3213 | 0.0230 | -0.25  -1.61  1.67 | -0.06 | 0.0442 | -0.20  -1.25  1.26 | 0.04 |
| 56Ba | **0.325±0.030** | [74] | 0.0350 | 0.03**00** | 0.00 | 0.00 | - | - | - |
| 57La | **0.395±0.030** | [75] | 0.3940 | 0.03**00** | 0.00 | 0.00 | - | - | - |
| 59Pr | **0.294±0.020** | [75] | 0.2940 | 0.02**00** | 0.00 | 0.00 | - | - | - |
| 60Nd | **0.335±0.018** | [7] | 0.3350 | 0.0**180** | 0.00 | 0.00 | - | - | - |
| 62Sm | **0.207±0.031 0.467±0.044** | [76] [11] | 0.2932 | 0.0253 | -2.15  3.42 | 0.63 | 0.1224 | -0.68  1.34 | 0.12 |
| 63Eu | 0.30±0.03 | [78] | 0.3000 | 0.0300 | 0.00 | 0.00 | - | - | - |
| 64Gd | **0.317±0.016 0.338±0.012 0.217±0.019 0.275±0.040 0.237±0.123 0.223±0.148** | [79] [7] [11] [81] [82] [82] | 0.3054 | 0.0083 | 0.64  2.23  -4.26  -0.74  -0.56  -0.42 | -0.52 | 0.0207 | 0.44  1.36  -3.15  -0.68  -0.55  -0.42 | 0.02 |
| 65Tb | 0.47±0.28 **0.300±0.027 0.328±0.015 0.353±0.032** | [83] [84] [7] [11] | 0.3262 | 0.0121 | 0.51  -0.89  0.09  0.78 | 0.13 | 0.0097 | 0.51  -0.91  0.10  0.80 | 0.01 |
| 66Dy | **0.330±0.018 0.340±0.094 0.332±0.076 0.305±0.020 0.278±0.030 0.371±0.034** | [7]  [85]  [49]  [49] [49] [11] | 0.3194 | 0.0113 | 0.50  0.22  0.16  -0.63  -1.29  1.44 | 0.07 | 0.0115 | 0.50  0.22  0.16  -0.62  -1.29  1.44 | 0.01 |
| 67Ho | **0.341±0.025 0.336±0.093** | [7] [85] | 0.3407 | 0.0241 | 0.01  -0.05 | -0.02 | 0.0013 | 0.01  -0.05 | 0.00 |
| 68Er | **0.300±0.009 0.325±0.092** | [88] [85] | 0.3002 | 0.0090 | -0.02  0.27 | 0.12 | 0.0024 | -0.03  0.27 | 0.00 |
| 70Yb | 0.318±0.020 **0.454±0.056** | [86] [87] | 0.3344 | 0.0188 | -0.56  2.04 | 0.74 | 0.0431 | -0.32  1.71 | 0.04 |
| 71Lu | **0.335±0.095** | [85] | 0.3350 | 0.**0950** | 0.00 | 0.00 | - | - | - |
| 72Hf | 0.324±0.010 **0.315±0.012 0.354±0.010 0.282±0.034** | [55] [7] [133] [100] | 0.3312 | 0.0060 | -0.62  -0.21  1.95  -1.43 | -0.33 | 0.0107 | -0.49  -0.01  1.55  -1.38 | 0.01 |
| 73Ta | 0.351±0.020 **0.349±0.073 0.340±0.097 0.345±0.153** | [55] [87] [85] [90] | 0.3504 | 0.0188 | 0.02  -0.02  -0.10  -0.03 | -0.03 | 0.0013 | 0.03  -0.02  -0.11  -0.04 | 0.00 |
| 74W | 0.336±0.010 **0.313±0.020 0.345±0.098 0.382±0.089 0.375±0.025** | [55] [7] [85] [58] [58] | 0.3368 | 0.0084 | -0.06  -1.10  0.08  0.51  1.45 | 0.18 | 0.0084 | -0.06  -1.10  0.08  0.51  1.45 | 0.01 |
| 75Re | **0.440±0.030 0.451±0.109** | [58] [58] | 0.4408 | 0.0289 | -0.02  0.09 | 0.04 | 0.0028 | -0.03  0.09 | 0.00 |
| 77Ir | 0.38±0.030.502±0.010 | [89] [55] | 0.4898 | 0.0095 | -3.49  0.89 | -1.30 | 0.0366 | -2.32  0.32 | 0.04 |
| 78Pt | 0.569±0.020 **0.570±0.169** | [55] [85] | 0.5690 | 0.0199 | 0.00  0.01 | 0.00 | 0.0001 | 0.00  0.01 | 0.00 |
| 79Au | **0.565±0.133 0.595±0.020** 0.587±0.010 **0.561±0.022 0.536±0.075 0.567±0.168** | [48] [56] [55] [7] [54] [85] | 0.5840 | 0.0082 | -0.14  0.51  0.23  -0.98  -0.64  -0.10 | -0.19 | 0.0051 | -0.14  0.53  0.27  -1.02  -0.64  -0.10 | 0.01 |
| 80Hg | **0.584±0.018** | [85] | 0.5840 | 0.0**180** | 0.00 | 0.00 | - | - | - |
| 81Tl | **0.603±0.074 0.584±0.050 0.599±0.018** | [33] [95] [7] | 0.5976 | 0.0165 | 0.07  -0.26  0.06 | -0.04 | 0.0034 | 0.07  -0.27  0.08 | 0.00 |
| 82Pb | **0.672±0.086** 0.665±0.010 **0.595±0.031 0.665±0.100 0.612±0.182** | [60]  [55] [46]  [54] [85] | 0.6585 | 0.0094 | -0.60  0.47  -1.96  0.06  -0.26 | -0.45 | 0.0102 | 0.16  0.45  -1.95  0.06  -0.26 | 0.01 |
| 83Bi | **0.61**0**±0.02**0 **0.648±0.030 0.645±0.032 0.591±0.017 0.591±0.057 0.608±0.181 0.592±0.120** | [43]  [30]  [30]  [7] [97] [85] [99] | 0.6104 | 0.0109 | -0.02  1.18  1.02  -0.96  -0.33  -0.01  -0.15 | 0.10 | 0.0091 | -0.02  1.20  1.04  -1.01  -0.34  -0.01  -0.15 | 0.01 |
| 90Th | **0.586±0.017** | [7] | 0.5860 | 0.0**170** | 0.00 | 0.00 | - | - | - |
| 93Np | **0.722±0.007 0.580±0.092** | [30]  [29] | 0.7212 | 0.0070 | 0.08  -1.53 | -0.72 | 0.0107 | 0.06  -1.52 | 0.01 |
| 96Cm | **0.510±0.091** | [29] | 0.5100 | 0.**0910** | 0.00 | 0.00 | - | - | - |

**Table 6:** Summary of the experimental Coster Kronig from 28Ni to 92Cm is presented according to their target atomic numbers. The weighted average values , the references from which the databases are extracted, , , the internal and external standard deviation (,), and their means () are also listed.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Elements |  | References |  |  |  |  |  |  |  |
| 28Ni | **0.85±0.283 0.88±0.378** | [52] [53] | 0.8608 | 0.2265 | -0.03  0.04 | 0.01 | 0.0144 | -0.04  0.05 | 0.01 |
| 29Cu | 0.74±0.209 | [52] | 0.7400 | 0.2090 | 0.00 | 0.00 | - | - | - |
| 40Zr | **0.674±0.231** | [65] | 0.6740 | 0.2310 | 0.00 | 0.00 | - | - | - |
| 42Mo | **0.76±0.063 0.752±0.170** | [52] [54] | 0.7590 | 0.0591 | 0.01  -0.04 | -0.01 | 0.0026 | 0.02  -0.04 | 0.00 |
| 44Ru | **0.701±0.116 0.6807±0.0324** | [66] [67] | 0.6822 | 0.0312 | 0.16  -0.03 | 0.06 | 0.0053 | 0.16  -0.04 | 0.01 |
| 45Rh | **0.7±0.092** | [68] | 0.7000 | 0.0920 | 0.00 | 0.00 | - | - | - |
| 46Pd | **0.777±0.039 0.815±0.045 0.669±0.153** | [59] [59] [54] | 0.7889 | 0.0289 | -0.24  0.49  -0.77 | -0.18 | 0.0209 | -0.27  0.53  -0.78 | 0.02 |
| 47Ag | **0.654±0.060 0.72±0.058 0.72** | [69]  [47]  [47] | 0.6881 | 0.0417 | -0.47  0.45  1.76 | -0.01 | 0.0330 | -0.50  0.48  0.97 | 0.03 |
| 50Sn | **1.24±0.361 0.39±0.180 0.475±0.028 0.572±0.109** | [44] [44]  [70] [70] | 0.4832 | 0.0267 | 2.09  -0.51  -0.21  0.79 | 0.54 | 0.0359 | 2.09  -0.51  -0.18  0.77 | 0.04 |
| 51Sb | **0.376±0.021 0.353±0.023 0.504±0.089** | [70] [70]  [70] | 0.3696 | 0.0153 | 0.25  -0.60  1.49 | 0.38 | 0.0184 | 0.23  -0.56  1.48 | 0.02 |
| 54Xe | **0.47±0.057 0.35±0.050 0.479±0.040** | [71]  [72] [73] | 0.4382 | 0.0274 | 0.50  -1.55  0.84 | -0.07 | 0.0409 | 0.45  -1.37  0.71 | 0.04 |
| 56Ba | 0.66±0.07 **0.452±0.036** | [27] [74] | 0.4955 | 0.0320 | 2.14  -0.90 | 0.62 | 0.0846 | 1.50  -0.47 | 0.08 |
| 57La | **0.57±0.036** | [75] | 0.5700 | 0.0360 | 0.00 | 0.00 | - | - | - |
| 59Pr | **0.415±0.022** | [75] | 0.4150 | 0.0220 | 0.00 | 0.00 | - | - | - |
| 60Nd | **0.494±0.021** | [7] | 0.4940 | 0.0210 | 0.00 | 0.00 | - | - | - |
| 62Sm | **0.37±0.042 0.636±0.048** | [76]  [11] | 0.4853 | 0.0316 | -2.19  2.62 | 0.21 | 0.1318 | -0.83  1.07 | 0.13 |
| 63Eu | **0.53±0.104** | [78] | 0.5300 | 0.1040 | 0.00 | 0.00 | - | - | - |
| 64Gd | **0.489±0.034 0.453±0.024 0.5±0.016 0.419±0.030 0.323±0.046 0.366±0.154 0.341±0.153** | [79] [80] [7] [11] [81] [82] [82] | 0.4661 | 0.0111 | 0.64  -0.50  1.74  -1.47  -3.02 -0.65  -0.82 | -0.58 | 0.0194 | 0.59  -0.42  1.35  -1.32  -2.87 -0.64  -0.81 | 0.02 |
| 65Tb | **0.84±0.456 0.482±0.030 0.49±0.020 0.526±0.038** | [83] [84] [7] [11] | 0.4941 | 0.0152 | 0.76  -0.36  -0.16  0.78 | 0.25 | 0.0107 | 0.76  -0.38  -0.18  0.81 | 0.01 |
| 66Dy | **0.497±0.022 0.518±0.112 0.538±0.039 0.514±0.083 0.464±0.022 0.451±0.033** | [7] [85] [11]  [49] [49]  [49] | 0.4836 | 0.0130 | 0.52  0.30  1.32  0.36  -0.77  -0.92 | 0.14 | 0.0121 | 0.53  0.31  1.33  0.36  -0.78  -0.93 | 0.01 |
| 67Ho | **0.522±0.113 0.501±0.028** | [85] [7] | 0.5022 | 0.0272 | 0.17  -0.03 | 0.07 | 0.0049 | 0.17  -0.04 | 0.00 |
| 68Er | **0.42±0.013 0.448±0.102** | [88] [85] | 0.4204 | 0.0129 | -0.02  0.27 | 0.12 | 0.0035 | -0.03  0.27 | 0.00 |
| 70Yb | **0.457±0.036 0.657±0.059** | [86] [87] | 0.5113 | 0.0307 | -1.15  2.19 | 0.52 | 0.0889 | -0.57  1.37 | 0.09 |
| 71Lu | **0.455±0.104** | [85] | 0.4550 | 0.1040 | 0.00 | 0.00 | - | - | - |
| 72Hf | **0.45±0.018 0.472±0.019 0.46±0.014 0.4485±0.037** | [55] [7] [133]  [100] | 0.4595 | 0.0092 | -0.47  0.59  0.03  -0.29 | -0.03 | 0.0048 | -0.51  0.64  0.03  -0.29 | 0.00 |
| 73Ta | **0.55±0.058 0.443±0.025 0.49±0.082 0.454±0.105 0.468±0.188** | [142] [55] [87] [85] [90] | 0.4617 | 0.0215 | 1.43  -0.57  0.33  -0.07  0.03 | 0.23 | 0.0186 | 1.45  -0.60  0.34  -0.07  0.03 | 0.02 |
| 74W | **0.427±0.018 0.471±0.024 0.613±0.004 0.457±0.105 0.496±0.092 0.469±0.025** | [55] [7] [92] [85] [58] [58] | 0.5974 | 0.0038 | -9.26  -5.20  2.83  -1.34  -1.10  -5.08 | -3.19 | 0.0216 | -6.05  -3.91  0.71  -1.31  -1.07  -3.88 | 0.02 |
| 75Re | **0.651±0.016 0.565±0.111 0.531±0.030** | [92] [58] [58] | 0.6235 | 0.0140 | 1.29  -0.52  -2.79 | -0.67 | 0.0353 | 0.71  -0.50  -1.99 | 0.04 |
| 76Os | **0.658±0.020** | [92] | 0.6580 | 0.0200 | 0.00 | 0.00 | - | - | - |
| 77Ir | **0.48±0.050 0.554±0.022 0.728±0.030** | [89] [55] [92] | 0.5998 | 0.0167 | -2.27  -1.66  3.73 | -0.06 | 0.0629 | -1.49  -0.69  1.84 | 0.06 |
| 78Pt | **0.628±0.028 0.748±0.040 0.616±0.170** | [55] [92] [85] | 0.6665 | 0.0227 | -1.07  1.77  -0.29 | 0.14 | 0.0398 | -0.79  1.44  -0.29 | 0.04 |
| 79Au | **0.76±0.184 0.637±0.022 0.629±0.022 0.694±0.026 0.588±0.085 0.611±0.169** | [48] [56] [55] [7] [54] [85] | 0.6480 | 0.0131 | 0.61  -0.43  -0.74  1.58  -0.70  -0.22 | 0.02 | 0.0132 | 0.61  -0.43  -0.74  1.58  -0.70  -0.22 | 0.01 |
| 80Hg | 0.74±0.04 **0.629±0.023** | [147] [85] | 0.6566 | 0.0199 | 1.87  -0.91 | 0.48 | 0.0480 | 1.34  -0.52 | 0.05 |
| 81Tl | **0.7±0.058 0.73±0.086 0.73±0.022** | [95] [33] [7] | 0.7264 | 0.0200 | -0.43  0.04  0.12 | -0.09 | 0.0069 | -0.45  0.04  0.15 | 0.01 |
| 82Pb | **0.72±0.050 0.78±0.094 0.763±0.090 0.701±0.018 0.659±0.183  0.674±0.100** | [46]  [96]  [60]  [55] [85] [54] | 0.7063 | 0.0161 | 0.26  0.77  0.62  -0.22  -0.32  -0.26 | 0.14 | 0.0084 | 0.27  0.78  0.63  -0.26  -0.32  -0.26 | 0.01 |
| 83Bi | **0.77±0.071 0.76±0.028 0.703±0.031 0.73±0.034 0.68±0.020 0.729±0.051 0.655±0.182 0.622±0.122** | [97]  [43] [30]  [30]  [7] [98] [85] [99] | 0.7116 | 0.0125 | 0.81  1.58  -0.26  0.51  -1.34  0.33  -0.31  -0.73 | 0.07 | 0.0128 | 0.81  1.57  -0.26  0.51  -1.33  0.33  -0.31  -0.73 | 0.01 |
| 90Th | **0.657±0.020** 0.717 | [7] [62] | 0.6570 | 0.0270 | 0.00  2.22 | 0.00 | - | - | - |
| 93Np | 0.65±0.13 **0.65±0.103 0.8±0.073** | [41] [29] [30] | 0.7325 | 0.0541 | -0.59  -0.71  0.74 | -0.18 | 0.0528 | -0.59  -0.71  0.75 | 0.05 |
| 96Cm | **0.55±0.103** | [29] | 0.5500 | 0.1030 | 0.00 | 0.00 | - | - | - |

**Table 7.** Summary of the experimental  Auger Yields from 40Zr to  92U is presented according to their target atomic numbers. The weighted average values , the references from which the databases are extracted, , , the internal and external standard deviation (,), and their means () are also listed.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Elements |  | References |  |  |  |  |  |  |  |
| 40Zr | **0.318±0.231** | [65] | 0.3180 | 0.2310 | 0.00 | 0.00 | - | - | - |
| 42Mo | **0.239±0.170** | [54] | 0.2390 | 0.1700 | 0.00 | 0.00 | - | - | - |
| 44Ru | **0.2881±0.116**  0.3086±0.0329 | [66]  [67] | 0.3071 | 0.0317 | -0.16 0.03 | -0.06 | 0.0054 | -0.16  0.05 | 0.01 |
| 46Pd | **0.316±0.131** | [54] | 0.3160 | 0.1311 | 0.00 | 0.00 | - | - | - |
| 47Ag | 0.270±0.08 | [47] | 0.2700 | 0.0800 | 0.00 | 0.00 | - | - | - |
| 50Sn | **0.489±0.028**  **0.389±0.110**  **0.572±0.180** | [70]  [70]  [44] | 0.4849 | 0.0268 | 0.11 -0.85 0.48 | -0.09 | 0.0191 | 0.12  -0.86  0.48 | 0.02 |
| 51Sb | **0.584±0.022**  **0.6±0.024**  **0.454±0.089** | [70]  [70]  [70] | 0.5869 | 0.0160 | -0.11  0.45  -1.47 | -0.37 | 0.0180 | -0.10  0.44  -1.46 | 0.02 |
| 54Xe | **0.484±0.057**  **0.462±0.040** | [71]  [73] | 0.4693 | 0.0327 | 0.22  -0.14 | 0.04 | 0.0103 | 0.25  -0.18 | 0.01 |
| 55Cs | 0.424±0.005 | [10] | 0.4240 | 0.0050 | 0.00 | 0.00 | - | - | - |
| 56Ba | 0.418±0.005  **0.480±0.037** | [10]  [74] | 0.4191 | 0.0050 | -0.16  1.63 | 0.74 | 0.0082 | -0.12  1.61 | 0.01 |
| 57La | 0.416±0.006 | [10] | 0.4160 | 0.0060 | 0.00 | 0.00 | - | - | - |
| 58Ce | 0.411±0.006 | [10] | 0.4110 | 0.0060 | 0.00 | 0.00 | - | - | - |
| 59Pr | 0.414±0.007 | [10] | 0.4140 | 0.0070 | 0.00 | 0.00 | - | - | - |
| 60Nd | 0.440±0.013  0.393±0.008 | [6]  [10] | 0.4059 | 0.0068 | 2.32  -1.23 | 0.55 | 0.0210 | 1.38  -0.57 | 0.02 |
| 62Sm | 0.56±0.05  0.384±0.007  **0.292±0.048** | [76]  [10]  [11] | 0.3854 | 0.0069 | 3.46 -0.15 -1.93 | 0.46 | 0.0194 | 3.25  -0.07  -1.80 | 0.02 |
| 63Eu | **0.410±0.106**  0.375±0.006 | [78]  [10] | 0.3751 | 0.0060 | 0.33  -0.01 | 0.16 | 0.0020 | 0.33  -0.02 | 0.00 |
| 64Gd | **0.427±0.037**  **0.446±0.025**  0.422±0.013  0.373±0.006  **0.496±0.031**  **0.578±0.046**  **0.475±0.155** | [79]  [80]  [6]  [10]  [11]  [81]  [82] | 0.3910 | 0.0052 | 0.96  2.16  2.22  -2.27  3.34  4.04  0.54 | 1.57 | 0.0147 | 0.90  1.90  1.58  -1.13  3.06  3.87  0.54 | 0.01 |
| 65Tb | **0.416±0.033**  0.426±0.011  0.370±0.006  **0.38±0.039** | [84]  [6]  [10]  [11] | 0.3836 | 0.0052 | 0.97  3.49  -1.72  -0.09 | 0.66 | 0.0136 | 0.91  2.42  -0.91  -0.09 | 0.01 |
| 66Dy | 0.409±0.012  0.365±0.009  **0.366±0.040**  **0.396±0.085**  **0.445±0.023**  **0.463±0.034** | [6]  [10]  [11]  [49]  [49]  [49] | 0.3890 | 0.0066 | 1.46  -2.14  -0.57  0.08  2.34  2.14 | 0.55 | 0.0135 | 1.11  -1.47  -0.54  0.08  2.10  2.02 | 0.01 |
| 67Ho | 0.413±0.017  0.356±0.009 | [6]  [10] | 0.3685 | 0.0080 | 2.37  -1.04 | 0.67 | 0.0236 | 1.53  -0.49 | 0.02 |
| 68Er | 0.387±0.005  **0.463±0.015**  0.364±0.010 | [6]  [88]  [10] | 0.3890 | 0.0043 | -0.30  4.74  -2.30 | 0.72 | 0.0168 | -0.11  3.29  -1.28 | 0.02 |
| 70Yb | **0.417±0.037**  0.347±0.010 | [86]  [10] | 0.3518 | 0.0097 | 1.71  -0.34 | 0.68 | 0.0176 | 1.59  -0.24 | 0.02 |
| 71Lu | 0.398±0.010  0.340±0.010 | [6]  [10] | 0.3690 | 0.0071 | 2.37  -2.37 | 0.00 | 0.0290 | 0.95  -0.95 | 0.03 |
| 72Hf | 0.425±0.025  0.398±0.010  **0.409±0.015**  0.4216±0.0547 | [55]  [6]  [133]  [100] | 0.4041 | 0.0078 | 0.80  -0.48  0.29  0.32 | 0.23 | 0.0051 | 0.82  -0.54  0.31  0.32 | 0.01 |
| 73Ta | **0.3±0.062**  0.758±0.011  0.324±0.009  **0.375±0.188** | [142]  [6]  [10]  [90] | 0.4954 | 0.0069 | -3.13  20.21  -15.10  -0.64 | 0.33 | 0.1226 | -1.42  2.13  -1.39  -0.54 | 0.12 |
| 74W | 0.443±0.026  0.386±0.014  0.320±0.008  **0.273±0.005**  **0.363±0.095**  **0.401±0.028** | [55]  [6]  [10]  [92]  [58]  [58] | 0.3003 | 0.0040 | 5.43  5.89  2.21  -4.28  0.66  3.56 | 2.24 | 0.0192 | 4.42  3.61  -0.95  -1.38  0.65  2.97 | 0.02 |
| 75Re | **0.242±0.016**  **0.384±0.031**  **0.346±0.112** | [92]  [58]  [58] | 0.2730 | 0.0141 | -1.46 3.26  0.65 | 0.82 | 0.0411 | -0.70  2.15  0.61 | 0.04 |
| 76Os | 0.146±0.007  **0.234±0.021** | [10]  [92] | 0.1548 | 0.0066 | -0.91  3.60 | 1.34 | 0.0264 | -0.32  2.35 | 0.03 |
| 77Ir | **0.36±0.064**  0.307±0.018  **0.18±0.031** | [89]  [55]  [92] | 0.2797 | 0.0151 | 1.22  1.16  -2.89 | -0.17 | 0.0403 | 1.06  0.62  -1.96 | 0.04 |
| 78Pt | 0.242±0.014  0.102±0.005 | [55]  [10] | 0.1178 | 0.0047 | 8.41 -2.31 | 3.05 | 0.0443 | 2.67  -0.35 | 0.04 |
| 79Au | **0.228±0.024**  0.234±0.014  **0.166±0.041**  0.111±0.005  **0.295±0.085** | [56]  [55]  [92]  [10]  [54] | 0*.*1297 | 0*.*0046 | 4.02  7.08  0.88  -2.75  1.94 | 2.23 | 0*.*0218 | 3.03  4.02  0.78  -0.83  1.88 | 0*.*02 |
| 80Hg | 0.16±0.02  0.121±0.005 | [147]  [10] | 0*.*1233 | 0*.*0049 | 1.78 -0.33 | 0*.*73 | 0*.*0092 | 1.67  -0.22 | 0*.*01 |
| 81Tl | 0.07±0.02  **0.23±0.062**  0.164±0.004  0.127±0.007 | [57]  [95]  [6]  [10] | 0.1526 | 0.0034 | -4.07  1.25  2.16  -3.29 | -0.99 | 0.0125 | -3.50  1.22  0.87  -1.79 | 0.01 |
| 82Pb | **0.21±0.054**  **0.133±0.092**  0.154±0.009  0.128±0.008  **0.212±0.101** | [148]  [60]  [55]  [10]  [54] | 0.1405 | 0.0059 | 1.28  0.71  -0.08  1.25  -1.26 | 0.38 | 0.0078 | 1.27  0.71  -0.08  1.13  -1.13 | 0.01 |
| 83Bi | 0.11±0.03  0.133±0.009  0.18±0.02  0.15±0.0225  0.202±0.005  0.121±0.008  **0.14±0.051** | [97]  [43]  [30]  [30]  [6]  [10]  [98] | 0.1695 | 0.0037 | -1.97  -3.76  0.52  -0.86  5.23  -5.51  -0.58 | -0.99 | 0.0151 | -1.77  -2.08  0.42  -0.72  2.05  -2.84  -0.56 | 0.02 |
| 90Th | 0.126±0.007 | [10] | 0.1260 | 0.0070 | 0.00 | 0.00 | - | - | - |
| 92U | 0.102±0.011 | [10] | 0.1020 | 0.0110 | 0.00 | 0.00 | - | - | - |
| 93Np | 0.01±0.01  0.16**±**0.11 | [30]  [29] | 0,0112 | 0,0100 | -0.09 1.35 | 0.63 | 0.0135 | -0.07  1.34 | 0.01 |
| 96Cm | 0.24**±**0.11 | [29] | 0.2400 | 0.1100 | 0.00 | 0.00 | - | - | - |

**Table 8.** Summary of the experimental  Auger Yields from 40Zr to  92U is presented according to their target atomic numbers. The weighted average values , the references from which the databases are extracted, , , the internal and external standard deviation (,), and their means () are also listed.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Elements |  | References |  |  |  |  |  |  |  |
| 40Zr | **0.753±0.005** | [65] | 0.7530 | 0.0050 | 0.00 | 0.00 | - | - | - |
| 42Mo | **0.765±0.039** | [54] | 0.7650 | 0.0390 | 0.00 | 0.00 | - | - | - |
| 44Ru | **0.7815±0.041**  0.7438±0.0311 | [66]  [67] | 0.7576 | 0.0248 | 0.50 -0.35 | 0.08 | 0.0182 | 0.53  -0.38 | 0.02 |
| 46Pd | **0.825±0.005** | [54] | 0.8250 | 0.0050 | 0.00 | 0.00 | - | - | - |
| 47Ag | 0.75±0.04 | [47] | 0.7500 | 0.0400 | 0.00 | 0.00 | - | - | - |
| 50Sn | **0.812±0.008**  **0.779±0.027**  **0.770±0.050**  **0.929±0.005** | [70]  [70]  [44]  [44] | 0.8925 | 0.0042 | -8.92 -4.15 -2.44 5.61 | -2.47 | 0.0322 | -2.43  -2.70  -2.06  1.12 | 0.03 |
| 51Sb | **0.792±0.010**  **0.793±0.013**  **0.715±0.035** | [70]  [70]  [70] | 0.7886 | 0.0077 | 0.27  0.29  -2.05 | -0.50 | 0.0118 | 0.22  0.25  -1.99 | 0.01 |
| 54Xe | **0.763±0.032** | [71] | 0.7630 | 0.032**0** | 0.00 | 0.00 | - | - | - |
| 55Cs | 0.729±0.009 | [10] | 0.7290 | 0.0090 | 0.00 | 0.00 | - | - | - |
| 56Ba | 0.726±0.010  **0.691±0.014** | [10]  [74] | 0.7142 | 0.0081 | 0.92  -1.43 | -0.26 | 0.0166 | 0.61  -1.07 | 0.02 |
| 57La | **0.678±0.022**  0.727±0.011 | [103]  [10] | 0.7172 | 0.0098 | -1.63  0.66 | -0.48 | 0.0196 | -1.33  0.44 | 0.02 |
| 58Ce | 0.718±0.011 | [10] | 0.7180 | 0.0110 | 0.00 | 0.00 | - | - | - |
| 59Pr | 0.712±0.013 | [10] | 0.7120 | 0.0130 | 0.00 | 0.00 | - | - | - |
| 60Nd | **0.749±0.018**  0.711±0.014 | [105]  [10] | 0.7253 | 0.0111 | 1.12  -0.80 | 0.16 | 0.0184 | 0.92  -0.62 | 0.02 |
| 62Sm | 0.71±0.03  0.698±0.013  **0.715±0.021** | [76]  [10]  [11] | 0.7036 | 0.0104 | 0.20 -0.34 0.49 | 0.12 | 0.0053 | 0.21  -0.40  0.53 | 0.01 |
| 63Eu | 0.695±0.012 | [10] | 0.6950 | 0.0120 | 0.00 | 0.00 | - | - | - |
| 64Gd | **0.595±0.014**  **0.705±0.025**  **0.675±0.028**  0.697±0.017  0.682±0.013  **0.693±0.022**  **0.743±0.020**  **0.601±0.060** | [38]  [138]  [79]  [6]  [10]  [11]  [81]  [82] | 0.6725 | 0.0067 | -4.99  1.26  0.09  1.34  0.65  0.89  3.34  -1.18 | 0.17 | 0.0179 | -3.41  1.06  0.08  0.99  0.43  0.72  2.63  -1.14 | 0.02 |
| 65Tb | **0.750±0.023**  **0.694±0.043**  0.677±0.017  0.674±0.013  **0.664±0.024** | [83]  [84]  [6]  [10]  [11] | 0.6849 | 0.0086 | 2.65  0.21  -0.41  -0.70  -0.82 | 0.19 | 0.0134 | 2.45  0.20  -0.36  -0.58  -0.76 | 0.01 |
| 66Dy | 0.673±0.014  0.674±0.019  **0.660±0.024**  **0.677±0.037**  **0.691±0.018**  **0.761±0.020** | [6]  [10]  [11]  [49]  [49]  [49] | 0.6892 | 0.0079 | -1.01  -0.74  -1.16  -0.32  0.09  3.34 | 0.03 | 0.0144 | -0.81  -0.64  -1.05  -0.31  0.08  2.91 | 0.01 |
| 67Ho | **0.625±0.065**  **0.699±0.025**  0.669±0.017  0.653±0.020  **0.647±0.026** | [35]  [138]  [6]  [10]  [11] | 0.6652 | 0.0104 | -0.61  1.25  0.19  -0.54  -0.65 | -0.07 | 0.0092 | -0.61  1.27  0.20  -0.56  -0.66 | 0.01 |
| 68Er | **0.59±0.065**  0.657±0.016  **0.620±0.011**  0.656±0.019 | [35]  [6]  [88]  [10] | 0.6356 | 0.0081 | -0.70  1.19  -1.14  0.99 | 0.08 | 0.109 | -0.69  1.10  -1.01  0.93 | 0.01 |
| 70Yb | **0.648±0.014**  **0.631±0.012**  **0.642±0.031**  0.639±0.025 | [113]  [86]  [105]  [10] | 0.6386 | 0.0083 | 0.58  -0.52  0.11  0.02 | 0.05 | 0.0044 | 0.64  -0.59  0.11  0.02 | 0.00 |
| 71Lu | 0.619±0.025 | [10] | 0.6190 | 0.0250 | 0.00 | 0.00 | - | - | - |
| 72Hf | 0.596±0.015  0.589±0.022  0.648±0.039  **0.585±0.011**  0.5928±0.0313 | [6]  [10]  [55]  [133]  [100] | 0.5915 | 0.0078 | 0.27  -0.11  1.42  -0.48  0.04 | 0.23 | 0.0062 | 0.28  -0.11  1.43  -0.51  0.04 | 0.01 |
| 73Ta | **0.550±0.045**  **0.57±0.015**  0.627±0.038  0.576±0.022  **0.599±0.085** | [115]  [135]  [55]  [10]  [90] | 0.5759 | 0.0113 | -0.56  -0.31  1.29  0.01  0.27 | 0.14 | 0.0087 | -0.56  -0.34  1.31  0.01  0.27 | 0.01 |
| 74W | 0.620±0.037  0.588±0.012  0.562±0.019  0.528±0.058  0.568±0.027 | [55]  [6]  [10]  [58]  [58] | 0.5802 | 0.00091 | 1.04  0.52  -0.87  -0.89  -0.43 | -0.13 | 0.0085 | 1.05  0.53  -0.88  -0.89  -0.43 | 0.01 |
| 75Re | 0.684±0.038  0.686±0.018 | [58]  [58] | 0.6856 | 0.0163 | -0.04  0.02 | -0.01 | 0.0008 | -0.04  0.02 | 0.00 |
| 76Os | 0.549±0.021 | [10] | 0.5490 | 0.0210 | 0.00 | 0.00 | - | - | - |
| 77Ir | 0.574±0.034 | [55] | 0.5740 | 0.0340 | 0.00 | 0.00 | - | - | - |
| 78Pt | 0.543±0.022  0.547±0.033  **0.546±0.018** | [10]  [55]  [117] | 0.5451 | 0.0128 | -0.08  0.05  0.04 | 0.00 | 0.0011 | -0.10  0.06  0.05 | 0.00 |
| 79Au | 0.577±0.09  0.52±0.05  **0.499±0.022**  **0.546±0.011**  0.681±0.010  0.537±0.025  **0.623±0.042** | [61]  [48]  [56]  [112]  [6]  [10]  [54] | 0.6014 | 0.0066 | -0.27  -1.61  -4.46  -4.32  6.65  -2.49  0.51 | -0.86 | 0.0295 | -0.26  -1.40  -2.87  -1.76  2.56  -1.67  0.42 | 0.03 |
| 80Hg | **0.530±0.036**  0.520±0.025  0.46±0.04  **0.494±0.014**  **0.507±0.009**  **0.506±0.009** | [115]  [10]  [147]  [64]  [112]  [117] | 0.5049 | 0.0055 | 0.69  0.59  -1.11  -0.72  0.20  0.11 | -0.04 | 0.0041 | 0.69  0.60  -1.12  -0.75  0.21  0.11 | 0.00 |
| 81Tl | 0.520±0.013  0.516±0.029  0.46±0.09  **0.512±0.014**  **0.492±0.012**  **0.492±0.010** | [6]  [10]  [57]  [95]  [117]  [112] | 0.5020 | 0.0058 | 1.26  0.47  -0.47  0.66  -0.75  -0.86 | 0.05 | 0.0056 | 1.27  0.47  -0.47  0.66  -0.75  -0.87 | 0.01 |
| 82Pb | 0.511±0.028  0.487**±0.010**  0.501±0.030  **0.473±0.022**  **0.487±0.010**  **0.346±0.044**  **0.504±0.026** | [10]  [112]  [55]  [46]  [117]  [54]  [105] | 0.4858 | 0.0061 | 0.88  0.10  0.49  -0.56  0.10  -3.15  0.68 | -0.21 | 0.0087 | 0.86  0.09  0.49  -0.54  0.09  -3.12  0.66 | 0.01 |
| 83Bi | 0.62±0.14  0.61±0.02  0.45±0.02  0.478±0.038  0.48±0.010  0.46±0.08  0.499±0.013  0.449±0.029 | [97]  [43]  [120]  [30]  [30]  [121]  [6]  [10] | 0.4943 | 0,0066 | 0.90  5.50  -2.10  -0.42  -1.19  -0.43  0.32  -1.52 | 0,13 | 0,0166 | 0.89  4.46  -1.70  -0.39  -0.74  -0.42  0.22  -1.36 | 0,02 |
| 86Rn | **0.436±0.027** | [122] | 0.4360 | 0.0270 | 0.00 | 0.00 | - | - | - |
| 88Ra | 0.571±0.084  **0.4±0.028**  **0.454±0.040**  **0.416±0.005** | [51]  [123]  [122]  [124] | 0.4166 | 0.0049 | 1.83  -0.58  0.93  -0.09 | 0.52 | 0.0061 | 1.83  -0.58  0.92  -0.08 | 0.01 |
| 90Th | 0.43±0.10  **0.411±0.009**  0.437±0.026 | [125]  [124]  [10] | 0.4139 | 0.0085 | 0.16 -0.23 0.84 | 0.26 | 0.0057 | 0.16  -0.27  0.87 | 0.01 |
| 92U | 0.11±0.06  0.09±0.11  0.09±0.10  0.07±0.07  **0.293±0.034**  0.571±0.084  0.522±0.056  **0.359±0.006**  **0.403±0.014**  0.352±0.032 | [31]  [31]  [31]  [31]  [126]  [51]  [51]  [124]  [117]  [10] | 0.3608 | 0.0053 | -4.16  -2.46  -2.70  -4.14  -1.97  2.50  2.87  -0.23  2.82  -0.27 | -0.78 | 0.0153 | -4.05  -2.44  -2.68  -4.06  -1.82  2.46  2.78  -0.11  2.03  -0.25 | 0.02 |
| 93Np | 0.20±0.06  0.20±0.011  0.29±0.029 | [41]  [29]  [30] | 0.2110 | 0.0101 | -0.18  -0.74  2.57 | 0.55 | 0.0208 | -0.17  -0.47  2.21 | 0.02 |
| 94Pu | 0.37±0.08  0.35±0.08  0.11±0.08  0.11±0.09  **0.286±0.026**  **0.261±0.027**  **0.299±0.008** | [32]  [32]  [31]  [31]  [123]  [122]  [124] | 0.2935 | 0.0072 | 0.95  0.70  -2.28  -2.03  -0.28  -1.16  0.51 | -0.51 | 0.0106 | 0.95  0.70  -2.27  -2.02  -0.27  -1.12  0.42 | 0.01 |
| 96Cm | 0.23**±**0.09  0.298**±0.028** | [29]  [117] | 0.2920 | 0.0267 | -0.66  0.16 | -0.25 | 0.0193 | -0.67  0.18 | 0.02 |

**Table 9:** Summary of the experimental Auger Yields from 40Zr to  92U is presented according to their target atomic numbers. The weighted average values , the references from which the databases are extracted, , , the internal and external standard deviation (,), and their means () are also listed.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Elements |  | References |  |  |  |  |  |  |  |
| 40Zr | **0.966±0.002** | [65] | 0.9660 | 0.0020 | 0.00 | 0.00 | - | - | - |
| 42Mo | **0.968±0.001** | [54] | 0.9680 | 0.0010 | 0.00 | 0.00 | - | - | - |
| 44Ru | **0.9541±0.002**  0.9556±0.0016 | [66]  [67] | 0.9550 | 0.0012 | -0.39 0.29 | -0.05 | 0.0007 | -0.43  0.33 | 0.00 |
| 46Pd | **0.95±0.002** | [54] | 0.9500 | 0.0020 | 0.00 | 0.00 | - | - | - |
| 47Ag | 0.944±0.007 | [47] | 0.9440 | 0.0070 | 0.00 | 0.00 | - | - | - |
| 50Sn | **0.933±0.006**  **0.934±0.011**  **0.928±0.003** | [70]  [70]  [44] | 0.9293 | 0.0026 | 0.57 0.42 -0.32 | 0.22 | 0.0016 | 0.60  0.42  -0.38 | 0.00 |
| 51Sb | **0.919±0.008**  **0.924±0.009**  **0.923±0.012** | [70]  [70]  [70] | 0.9216 | 0.0054 | -0.27  0.23  0.11 | 0.03 | 0.0017 | -0.31  0.27  0.12 | 0.00 |
| 54Xe | **0.915±0.0085** | [71] | 0.9150 | 0.0085 | 0.00 | 0.00 | - | - | - |
| 55Cs | 0.911±0.005 | [10] | 0.9110 | 0.0050 | 0.00 | 0.00 | - | - | - |
| 56Ba | 0.903±0.006  **0.89±0.01** | [10]  [74] | 0.8996 | 0.0051 | 0.44  -0.85 | -0.21 | 0.0057 | 0.41  -0.83 | 0.01 |
| 57La | 0.899±0.007  **0.908±0.008** | [10]  [103] | 0.9029 | 0.0053 | -0.45  0.53 | 0.04 | 0.0045 | -0.47  0.56 | 0.00 |
| 58Ce | 0.892±0.007 | [10] | 0.8920 | 0.0070 | 0.00 | 0.00 | - | - | - |
| 59Pr | 0.886±0.007 | [10] | 0.8860 | 0.0070 | 0.00 | 0.00 | - | - | - |
| 60Nd | 0.875±0.008  **0.892±0.01** | [10]  [105] | 0.8816 | 0.0062 | -0.65  0.88 | 0.11 | 0.0083 | -0.58  0.80 | 0.01 |
| 62Sm | 0.864±0.007  0.86±0.01  **0.859±0.014** | [10]  [76]  [11] | 0.8622 | 0.0053 | 0.21 -0.19 -0.21 | -0.06 | 0.0015 | 0.26  -0.21  -0.22 | 0.00 |
| 63Eu | 0.855±0.007 | [10] | 0.8550 | 0.0070 | 0.00 | 0.00 | - | - | - |
| 64Gd | **0.813±0.006**  **0.839±0.019**  **0.817±0.015**  0.842±0.017  0.846±0.008  **0.842±0.016**  **0.841±0.003**  **0.841±0.007**  **0.841±0.003** | [38]  [138]  [79]  [6]  [10]  [11]  [81]  [82]  [82] | 0.8383 | 0.0018 | -4.04  0.04  -1.41  0.22  0.94  0.23  0.76  0.37  0.76 | -0.24 | 0.0031 | -3.76  0.04  -1.39  0.21  0.90  0.23  0.62  0.35  0.62 | 0.00 |
| 65Tb | **0.812±0.016**  0.831±0.017  0.837±0.007  **0.839±0.016** | [83]  [6]  [10]  [11] | 0.8335 | 0.0056 | -1.27  -0.14  0.39  0.32 | -0.17 | 0.0048 | -1.29  -0.14  0.41  0.33 | 0.00 |
| 66Dy | 0.830±0.012  0.825±0.011  **0.827±0.017** | [6]  [10]  [11] | 0.8272 | 0.0073 | 0.20  -0.17  -0.01 | 0.01 | 0.0016 | 0.23  -0.20  -0.01 | 0.00 |
| 67Ho | **0.82±0.02**  0.819±0.012  0.816±0.010  **0.796±0.02** | [138]  [6]  [10]  [11] | 0.8151 | 0.0068 | 0.23  0.28  0.07  -0.91 | -0.08 | 0.0041 | 0.24  0.31  0.08  -0.94 | 0.00 |
| 68Er | 0.811±0.016  **0.806±0.008**  0.807±0.010 | [6]  [88]  [10] | 0.8070 | 0.0058 | 0.23  -0.10  0.00 | 0.04 | 0.0012 | 0.25  -0.12  0.00 | 0.00 |
| 70Yb | **0.817±0.011**  **0.78±0.007**  **0.773±0.022**  0.782±0.016 | [113]  [86]  [105]  [10] | 0.7886 | 0.0054 | 2.32  -0.98  -0.69  -0.39 | 0.06 | 0.0092 | 1.98  -0.75  -0.66  -0.36 | 0.01 |
| 71Lu | 0.81±0.05  **0.749±0.035**  0.776±0.013 | [149]  [150]  [10] | 0.7748 | 0.0118 | 0.68 -0.70 0.07 | 0.02 | 0.0086 | 0.69  -0.72  0.08 | 0.01 |
| 72Hf | **0.772±0.013**  **0.778±0.031**  0.774±0.012  **0.762±0.01**  0.756±0.012  0.7549±0.0119 | [150]  [55]  [6]  [133]  [10]  [100] | 0.7638 | 0.0051 | 0.59  0.45  0.78  -0.16  -0.60  -0.68 | 0.06 | 0.0035 | 0.61  0.46  0.82  -0.17  -0.62  -0.72 | 0.00 |
| 73Ta | **0.73±0.01**  **0.746±0.025**  **0.772±0.029**  0.767±0.031  0.749±0.012  **0.753±0.012** | [115]  [150]  [135]  [55]  [10]  [90] | 0.7446 | 0.0060 | -1.25  0.05  0.92  0.71  0.33  0.62 | 0.23 | 0.0055 | -1.28  0.05  0.93  0.71  0.33  0.63 | 0.01 |
| 74W | **0.728±0.037**  0.755±0.030  0.745±0.011  0.736±0.010 | [150]  [55]  [6]  [10] | 0.7405 | 0.0071 | -0.33  0.47  0.35  -0.36 | 0.03 | 0.0034 | -0.34  0.48  0.39  -0.42 | 0.00 |
| 75Re | **0.716±0.043** | [150] | 0.7160 | 0.0430 | 0.00 | 0.00 | - | - | - |
| 76Os | **0.71±0.03**  0.715±0.011 | [150]  [10] | 0.7144 | 0.0103 | -0.14 0.04 | -0.05 | 0.0016 | -0.15  0.05 | 0.00 |
| 77Ir | **0.738±0.036**  0.718±0.029 | [150]  [55] | 0.7259 | 0.0226 | 0.29 -0.21 | 0.04 | 0.0098 | 0.33  -0.26 | 0.01 |
| 78Pt | **0.683±0.029**  **0.714±0.007**  0.706±0.028  0.710±0.013 | [150]  [117]  [55]  [10] | 0.7115 | 0.0059 | -0.96  0.27  -0.19  -0.11 | -0.25 | 0.0036 | -0.98  0.31  -0.20  -0.11 | 0.00 |
| 79Au | 0.658±0.01  0.76±0.02  **0.683±0.025**  0.693±0.027  **0.68±0.01**  **0.714± 0.007**  0.689±0.014  **0.69±0.011** | [61]  [48]  [150]  [55]  [56]  [112]  [10]  [54] | 0.6939 | 0.0041 | -3.32  3.24  -0.43  -0.03  -1.29  2.47  -0.34  -0.33 | 0.00 | 0.0091 | -2.66  3.01  -0.41  -0.03  -1.03  1.75  -0.29  -0.27 | 0.01 |
| 80Hg | **0.633±0.056**  **0.7±0.01**  **0.688±0.006**  0.669±0.016 | [150]  [64]  [112]  [10] | 0.6887 | 0.0049 | -0.99  1.02  -0.09  -1.18 | -0.31 | 0.0055 | -0.99  0.99  -0.08  -1.16 | 0.01 |
| 81Tl | 0.59±0.05  **0.614±0.053**  **0.694±0.01**  **0.678±0.005**  0.653±0.010  0.660±0.016 | [147]  [150]  [95]  [117]  [6]  [10] | 0.6746 | 0.0039 | -1.69  -1.14  1.80  0.53  -2.01  -0.89 | -0.57 | 0.0066 | -1.68  -1.14  1.62  0.41  -1.81  -0.85 | 0.01 |
| 82Pb | **0.646±0.028**  **0.685±0.013**  0.654±0.026  0.66±0.007  0.636±0.018  0.631±0.013 | [150]  [46]  [55]  [117]  [10]  [54] | 0.6567 | 0.0051 | -0.38  2.02  -0.10  0.38  -1.11  -1.84 | -0.17 | 0.0074 | -0.37  1.89  -0.10  0.32  -1.07  -1.72 | 0.01 |
| 83Bi | 0.60±0.05  0.64±0.004  **0.638±0.015**  0.655±0.018  0.660±0.018  0.680±0.020  0.673±0.020  0.67±0.02  0.68±0.034  0.630±0.010  0.630±0.015 | [97]  [151]  [150]  [43]  [120]  [30]  [30]  [121]  [55]  [6]  [10] | 0.6424 | 0.0032 | -0.85  -0.47  -0.29  0.69  0.96  1.86  1.51  1.36  1.10  -1.18  -0.81 | 0.35 | 0.0038 | -0.85  -0.43  -0.28  0.69  0.96  1.85  1.50  1.36  1.10  -1.16  -0.80 | 0.00 |
| 86Rn | **0.616±0.02** | [122] | 0.6160 | 0.0200 | 0.00 | 0.00 | - | - | - |
| 88Ra | **0.562±0.022**  **0.592±0.027** | [123]  [122] | 0.5740 | 0.0171 | -0.43  0.56 | 0.07 | 0.0147 | -0.45  0.59 | 0.01 |
| 90Th | **0.483±0.042**  **0.57±0.03**  0.536±0.014 | [150]  [62]  [10] | 0.5371 | 0.0121 | -1.24 1.02 0.06 | -0.09 | 0.0145 | -1.22  0.99  -0.06 | 0.01 |
| 92U | **0.5±0.040**  **0.516±0.029**  **0.602±0.006**  **0.56±0.03**  0.482±0.013 | [150]  [126]  [117]  [62]  [10] | 0.5768 | 0.0052 | -1.90  -2.06  3.17  -0.55  -6.77 | -1.62 | 0.0233 | -1.66  -1.64  1.05  -0.44  -3.56 | 0.02 |
| 93Np | 0.52±0.026 | [30] | 0.5200 | 0.0260 | 0.00 | 0.00 | - | - | - |
| 94Pu | **0.491±0.029**  **0.516±0.017** | [122]  [123] | 0.5096 | 0.0147 | -0.57  0.28 | -0.14 | 0.0109 | -0.60  0.32 | 0.01 |
| 96Cm | **0.541±0.012** | [117] | 0.5410 | 0.0120 | 0.00 | 0.00 | - | - | - |