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Internal conversion coefficients

By M. Raja Rao and K. Parthasaradhi

The Laboratories for Nuclear Research, Andhra University, Waltair, India

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Studies on the Internal Conversion Coefficients (ICC) are useful for an understanding of nuclear structure. One of the accurate methods for the determination of these coefficients is the Internal External Conversion (IEC) technique. In this method the conversion electron intensity and the gamma ray intensity are measured separately. For the measurement of gamma ray intensity the photoelectron intensity is measured using an external converter. Assuming the theoretical photoelectric cross-section, the gamma ray intensity is determined from the measured photoelectron intensity.

In previous investigations by Raja Rao (1965) and Raja Rao & Jnanananda (1965, 1966, 1967) conversion coefficients for a few transitions are measured utilising scintillation technique and the IEC method. However, the theoretical photoelectric cross-sections are taken from the data of Grodstein (1957). These values are within an accuracy ranging from 5 to 15%. However, very recently accurate theoretical total photoelectric cross-sections of 0.5% accuracy are reported by Schmickley & Pratt (1967). So it is of interest to improve the accuracy of the ICC by using the new theoretical photoelectric cross-sections.

In the mentioned investigations of Raja Rao and Raja Rao & Jnanananda various external converters are used. So these values are corrected using the recent and accurate theoretical photoelectric cross-sections of Schmickley & Pratt (1967). In the cases where there are no reported cross-sections, the values are obtained by interpolations. The mean value of the ICC's obtained from various converters are estimated and from these the K-conversion coefficients are deduced using the available ratios of the conversion coefficients among different shells (Raja Rao 1965; Raja Rao & Jnanananda 1965, 1966, 1967). These values along with the theoretical values of Rose (1958) and with other experimental data are given in table 1. It can be seen from the table that the accuracy in the measured ICC's is greatly improved.

It can be seen from table 1 that there is satisfactory agreement between the present values and those of Rose (1958) except in the case of ^{134}Ba where the experimental value is a little bit higher. However, in all the cases, there is agreement at least with some of the available experimental data.

TABLE 1. K-INTERNAL CONVERSION COEFFICIENTS

Present	Theoretical (Rose 1958)	Other experimental
I ^{137}Ba (Gamma energy 662 keV) converters : Pb, Au, Sn, Ag and Cu		
0.096±0.005	0.090	0.0920 (Wapstra 1954)
0.0925±10%)		0.0976 (Yoshizawa 1958)
		0.0930 (Hultberg 1959)
		0.0930 (Daniel 1962)
		0.0894 (Hamilton 1965)
		0.0940 (Hamilton 1965)
II. ^{203}Tl (Gamma energy 279 keV) converters . Pb, Sn and Cu		
0.160±0.008	0.160	0.163 (Nijgh *et al* 1959)
(0.154±15%)		0.164 (Wapstra *et al* 1956)
		0.150 (O'Friel *et al* 1956)
		0.160 (Stockendal 1956)
		0.162 (Croft 1965)
		0.163 (Hamilton 1965)
III. ^{114}In (Gamma energy 192 keV) converters Ta, Cd		
2.00±0.16	2.18	2.16 (Steffen 1951)
(1.95±15%)		2.15 (Boehm *et al* 1959)
		2.17 (Hoffman 1957)
IV ^{134}Ba (Gamma energy 800 keV) converters : Au, Ta		
0.0030±0.0002	0.0026	0.0026 (Trehan *et al* 1963)
(0.00285±10%)		0.0030 (Keister *et al* 1955)
		0.0021 (Schmidt *et al* 1952)

The values in the brackets are of Raja Rao (1965) and Raja Rao & Jnanananda (1965, 1966, 1967)

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Radiation damping of electromagnetic waves in plasmas

By R. Burman

Department of Physics, University of Western Australia

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The non-relativistic equation of motion of a point electron, with radiation damping included is $-m\tau\dot{\boldsymbol{r}} + m\boldsymbol{r} = \boldsymbol{F}$. The electron is at $\boldsymbol{r}$ at time t, and is acted on by an external force F; in MKS units, $\tau = (1/4\pi\epsilon_0)\ (2e^2/3mc^3)$ in standard notation.

With collisions neglected, the electron distribution function $f(\boldsymbol{r}, \boldsymbol{v}, t)$, where $\boldsymbol{v} = \boldsymbol{r}$, is described by the Vlasov equation

$$\frac{\partial f}{\partial t} + \boldsymbol{v}.\ \frac{\partial f}{\partial \boldsymbol{r}} + \frac{\partial \boldsymbol{v}}{\partial t} \cdot \frac{\partial f}{\partial \boldsymbol{v}} = 0. \qquad \text{...(1)}$$