



## **Presentation of the Decay Data Group Activities at LPRI. (Links with International Evaluation Works)**

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The Primary Ionizing Radiation Laboratory (LPRI) is affiliated with the French National Bureau of Metrology (BNM) which is responsible for organizing metrology in France. The LPRI is in charge of the establishment, preservation and improvement of national standards for the units used in ionizing radiations measurements. The LPRI is also a laboratory of the Commissariat à l'Energie Atomique (CEA) which is in charge of all the activities relating to atomic energy.

The LPRI working program comprises: evaluation of decay data, absolute activity measurements, X- and gamma-ray spectrometry, development of new measuring techniques, etc.

In the field of decay data evaluation, LPRI is primarily working on the following three subjects:

### **1) NUCLEIDE software**

The evaluation of decay data for the "Table de Radionucléides" by BNM-CEA/LPRI began in 1974, continued to 1987 and four volumes were published.

*NUCLEIDE is the computerized form of this "Table de Radionucléides".*

The NUCLEIDE software was entirely developed by LPRI with the objectives of making it easier to update and add data and, obviously, to offer easy access to the nuclear and atomic decay data to the user by "click on the button" facilities.

The aim of this Table is to provide recommended data for nuclides of special interest for metrology or practical applications like nuclear medicine, monitoring and reactor shielding, etc.

Primary recommended data comprise half-lives, decay modes, X-rays, gamma-rays, electron emissions, alpha- and beta-particle transitions and emissions, and their uncertainties. All the references used for the evaluations are given.

In order to update the data of the nuclides already present and to add new evaluations, the Laboratoire Primaire des Rayonnements Ionisants (LPRI, France) and the Physikalisch-Technische Bundesanstalt (PTB, Germany) established a cooperative agreement; they were then joined by the Idaho National Engineering and Environmental Laboratory (INEEL, USA), the Lawrence Berkeley National Laboratory (LBNL, USA) and the Khlopin Radium Institute (KRI, Russia). This international collaboration is based on an informal agreement, the initial work of this group was to discuss and to agree on a methodology to be used in these evaluations. The data and associated uncertainties were evaluated from all available experiments and taking into account theoretical considerations.

The main steps for the evaluation of the data and their uncertainties are:

- a critical analysis of all available original publications in order to accept or not each value and its uncertainty reduced to the combined standard uncertainty ;
- the determination of the best value which is either the weighted or the unweighted average of the retained values, this is decided after examination of the reduced  $\chi^2$  value. With a weighted average, each weight is limited to 50%. The uncertainty, designated uc, is the greatest of the internal or external uncertainty values. For a discrepant set of data, it may be expanded to cover the most precise input value.

Following this works:

- a CD-ROM with the NUCLEIDE software and the complete database will be distributed at the beginning of 1999;
- a report with the new evaluated nuclides will be published in February 1999. The layout of this report is the same as those of the previous Table (see Bi-207 as example). It will include:

Na-22, K-40, Ce-139, Co-60, Zn-65, Nb-95, Zr-95, Sn-113, Cs-137, Al-26, Se-75, Re-188, Ir-192, Ir-194, Ge-68, Ga-68, I-125, Ce-141, Fe-55, Bi-207, Co-58, Te-123m, C-14, Cl-36, H-3, In-111, S-35.

## 2) Internal Conversion Coefficients

Up to now LPRI has used the Rösler et al. tables and an interpolation program (working under Windows PC) to calculate the ICC values.

Work to create a database with all the experimental values has begun with the purpose of comparing these values with those deduced from Rösler et al., Band et al. and Hager et al. tables.

Recently, a group which includes Dr. Band and Dr. Raman has developed a new program based on the Dirac-Fock atomic model. This program tries to resolve the cases where the theoretical values given by the previous models and the experimental values differ by several percents, for example in the case of low gamma energy and high L transitions.

In order to check this new program and use it to calculate easily the ICC, contacts with Dr. Band have been established.

## 3) Nuclide evaluations

The status is:

- Finished evaluations: Fe-55, Bi-207;
- On progress: Mo-99, Tc-99m, Tc-99
- Planned for 1999: Yb-169 (this evaluation will be done with PTB and after the end of the Euromet exercise);
- Later: Fe-59, Kr-85, I-129, I-131.