

Abstract for ICAMDATA05, Meudon, France
October 15–19, 2006

Towards Better Assessment of Atomic Transition Probabilities

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Domain : Atomic Data

Large amounts of atomic transition probabilities have been obtained from atomic structure calculations, but normally without uncertainty estimates. To obtain some guidance for the expected uncertainties, many authors have undertaken comparisons with available experimental data, usually on a very limited basis, and have, by extrapolation, made risky assumptions for other transitions. This applies especially to extrapolations from strong, prominent lines to weaker transitions.

It is still a great challenge to produce realistic, well-justified uncertainty estimates for theoretical transition probability data. Recently, many calculated results, especially for light elements, have been presented both in the dipole length and dipole velocity forms (which should ideally produce identical results), and it has been suggested that the difference between the two results should be a measure of the uncertainty. We have tested this suggestion for various transitions in light and medium-heavy elements, for which such results as well as experimental comparison data were available. We have found that this measure of uncertainty works fairly well, and could also be further refined.