

The reliability evaluation on atomic collision measurement by ISO guide 98-3 (Guide to the expression of Uncertainty in Measurement)

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Synopsis The demand for atomic collision cross sections has been highly increased in recent year. With these needs, numerous researches have been done and are still going on. These scientific measurement results are flooded from the paper, data book, etc. as fast growing of internet. We meet many different measurement results on the same measurand (atomic collision process). But we could not sure about reliability on data. Even expert feel difficulty to distinguish the accurate and reliable scientific data from these measurement results. For this reason, the reliability evaluation on measurement result (data) is getting more important [1]. These movements are wide spread to many areas of science with needs from industrial users and scientists [2]. In this paper, the application of evaluation method (ISO guide 98-3) on atomic collision will be represented briefly.

1. Reliable measurement in Metrology

For the evaluation, several contents should be surveyed such as measurand, measurement method, traceability, reproducibility, uncertainty, etc. Furthermore it is necessary to define the evaluation criteria shown in Fig.1.

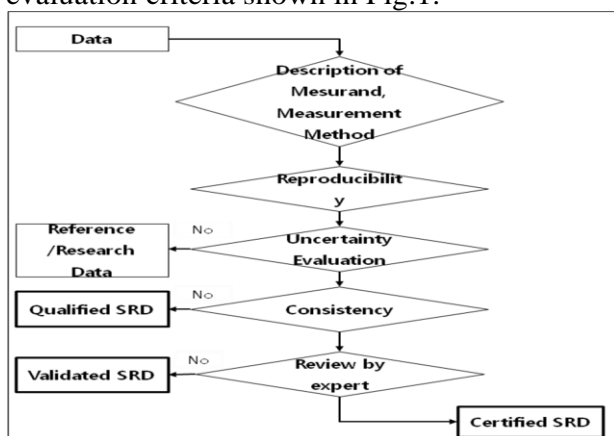


Figure 1. The procedure on evaluation

2. Uncertainty Evaluation by GUM (ISO guide 9-3)

The “Guide to the Expression of Uncertainty in Measurement” (GUM) provides general rules for evaluating and expressing uncertainty in measurement across a broad spectrum of measurements [3]. Whether the individual results of n measurements are statistically different or not, the overall uncertainty can be determined by combining the uncertainties of the individual results [3]. The multiple method will be applicable on the evaluating atomic collision cross section. In this section, the multiple method will be introduced.

3. The Application on atomic collision data

This evaluation method will be applicable on almost photonic, electronic and atomic collisions. For example, the case of total cross section on e+Ar, there are several measurement results on the same measurand as shown in Fig.2. In order to use these results properly, data evaluate has to be done to get recommended value. In this section, evaluation on these results will be introduced.

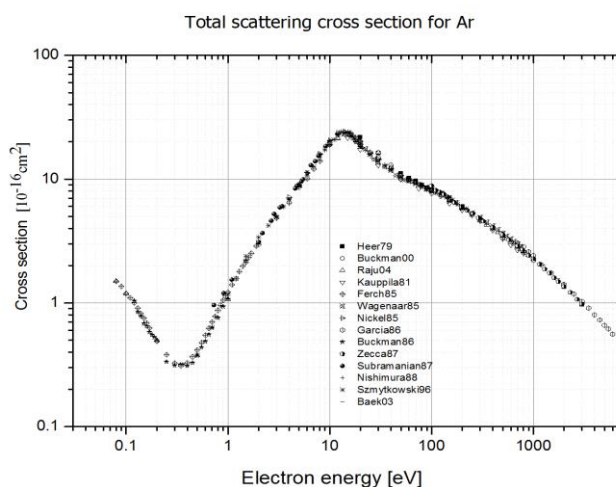


Figure 2. The examples for total cross section on e+Ar

References

- [1] Editorial: Uncertainty Estimates, 2011 *Physical Review A* **83** 040001
- [2] H-K Chung *et al* 2016 *Uncertainty estimates for theoretical atomic and molecular data*, *J. Phys. D:Appl. Phys.* **49** 363002
- [3] ISO 1993 *Guide to the expression of uncertainty in measurement* ISO, Geneva, Switzerland
- [4] J.Choi *et al* 2003 *An uncertainty evaluation for multiple measurements by GUM II* **8** 1205

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