

CCS A 50

JJF

**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

JJF 1059.2-2012

**Monte Carlo Method for Evaluation of Measurement Uncertainty
(English Translation)**

Issued on: January 1, 1970

Implemented on: January 1, 1970

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine**

Table of Contents

Introduction (II)

1 Scope (1)

2. References (1)

3 Terms and definitions (2)

4 Monte Carlo method (5)

4.1 Monte Carlo method of step (5)

4.2 To establish the model (6)

4.3 Monte Carlo trials (6)

4.4 Input sample value and the probability distribution model calculation (6)

4.5 Discrete output distribution function representation (7)

4.6 Output and standard uncertainty (7)

4.1 Monte Carlo method of step (5)

4.2 to establish the model (6)

4.6 Output and standard uncertainty (7)

The output of the interval containing 4.7 (7)

6.2 Monte Carlo is used to verify the number of trials (11) GUM law

Appendix A Common input probability density function (12)

Appendix B Examples of distribution by Monte Carlo method propagation probability (16)

Comparison C MCM and the GUM method appendix (31) Appendix D distribution of the basic principle of propagation (32) Appendix E basic symbols (33) Appendix F Glossary of English-Chinese (36)

Introduction

This specification defines the Monte Carlo method (MonteCarloMethod, referred MCM) evaluation and expression of measurement Uncertainty methods, its core is the use of MCM in the establishment of the measurement model probability distributions Biography broadcast. This instruction applies to having a plurality of inputs and a single output of the measurement model.

This specification is JJF 1059.1-2012 "Evaluation and Expression of Uncertainty in

Measurement," the supplement, equivalent to the use of international Standard ISO/IEC GUIDE98-3:2008 (GUM) Annex 1. "Monte Carlo method propagation probability distribution" (Supplement1. PropagationofdistributionusingaMonteCarlomethod), but in the structure of series Rafts made major changes.

MCM described in this specification is particularly suitable for the following three conditions.

- Obviously nonlinear measurement model;
- Input probability density function (probabilitydensityfunction, abbreviated PDF) obviously asymmetrical;
- Output of PDF obvious deviation from normal or t-distribution, in particular, distribution is significantly asymmetric occasion.

In the above case, according to its standard output estimate uncertainty identified may become JJF 1059.1 Reliable, or is likely to cause or to estimate the expanded uncertainty interval contains unrealistic.

In JJF 1059.1, enter the amount of information is the best estimate of the standard uncertainty, freedom and covariance.

In the present specification, the input information is input in PDF.

In JJF 1059.1, the combined standard uncertainty is determined by the amount of output uncertainty propagation law. In the present Specification, using MCM propagation probability distribution to determine an estimated value measured and contain intervals.

Appendix A of this specification "Common input probability density function," Appendix B "using the Monte Carlo method propagation probability

Examples of distribution ", Appendix C" Compare MCM and GUM Law "and Appendix D" distribution of the basic principles of spread "is the Specification of supplemental content, the use of basic symbols, from the GUM and related ISO , IEC standards. Appendix E "group this symbol, "and Appendix F" Glossary of English-Chinese "were a reference file.

This specification is the first release.

Monte Carlo method for evaluation of measurement uncertainty

1 Scope

1.1 Measurement Uncertainty specification provides a general numerical method can be applied to any number having Model inputs and a single output by the probability density function (PDF) representation.

1.2 specification relates generally well-defined, and can be characterized by a unique value measurement uncertainty of the estimates.

1.3 specification PDF output provides a representation. Because generally can not

determine the output of PDF Solutions Analysis of expression, so this method is estimated PDF of three main features in the amount specified tolerance values under.

- 1) output estimate;
- 2) standard uncertainty of the estimate;
- 3) contains the output of the agreed probability of containing the interval (including arbitrary inclusion probabilities, and the probability symmetrical interval contains and the shortest interval containing).

1.4 specification is particularly applicable to assess the following typical conditions Measurement Uncertainty.

- a) the size of the various components of uncertainty not close;
- b) the application of the law of propagation of uncertainty, model partial derivative difficult or inconvenient;
- c) the amount of output PDF to a large extent deviate from the normal distribution, t distribution;
- d) the estimated value of the output quantity and its standard uncertainty of comparable size;
- e) measuring non-linear model is obvious;
- f) Enter the amount of PDF obviously asymmetrical.

1.5 specification provides a verification method to check whether the law applies GUM. GUM method obviously if applicable, will remain it is the main method of uncertainty evaluation.

Note:

Consider the case of a specification does not define the output is not the only model. For example, do not specify a quadratic equation which take solution.

After 2 specification does not consider the amount of output obtained a priori PDF of the case, but the method used in the present specification can make appropriate changes to deal with this Scenario.

2. References

JJF 1059.1-2012 Evaluation and Expression of Uncertainty in Measurement GB/T 3358.1-2009 Statistics Vocabulary and symbols - Part 1. General statistical terms and for the probability the term GB/T 8170-2008 revised value represents about rules and limit values and judgment ISO/IEC GUIDE98-3.2008 Measurement Uncertainty - Part 3. Guide to the Expression of Uncertainty in Measurement (GUM.1995)
(Uncertaintyofmeasurement-Part 3. Guidetotheexpressionofuncertaintyinmeasurement

(GUM.1995)) ISO/IEC GUIDE98-3/Suppl.1.2008 Measurement Uncertainty Measurement
Uncertainty Part 3 Guide to the Expression (GUM.1995) Annex 1. Monte Carlo propagation
probability distribution (Uncertaintyof