Introduction to Measurement

Lizhi Ouyang

Department of Physics and Mathematics, Tennessee State University

3500 John A. Merritt Blvd, Nashville, TN 37209

Abstract

 Physics is a quantitative science largely based on measurements. In this essay, we

1. Introduction

Let us start from the basic of measurement. Measurement involves assigning a mathematical construction to a target which we call *measurand*. A mathematical construction can be an integer, a real number, a vector, a tensor, *etc*. In general, the assignment is carried out by comparing a *measurand* to a *reference* which is known to us. If the mathematical construction is a real number, the comparison yields three results: *equal*, *lesser*, and *greater*. If we use multiple order *references*, we may be able to confine the assignment to an *interval*. An *equal* result from comparison can hardly be exact since no *reference* is known exactly. In practice, measurement of *measurand* represented by number always results in an *interval*. The range of this *interval* is called *uncertainty*.

1. Probability Distribution Function
2. GUM
3. Error Analysis
4. Case Analysis
5. Summary