LNE\_Regpoly : a user-friendly software for estimating the calibration function and the measurement results

**Catherine Yardin 1, Jean Barbe 1**

*LNE, 1 rue Gaston Boissier, 75724 Paris cedex 15, France*

*E-mail (corresponding author):*mailto:catherine.yardin@lne.fr

Abstract:

LNE\_Regpoly first estimates a polynomial calibration function y = f(x) with weighted regression methods (generalized least squares). They take differently into account heteroscedasticity and correlations in variables. These methods issued from the ISO/TS 28037 standard are: ordinary least squares, weighted least squares, generalized least squares (with uncertainty on y only) and Gauss- Markov generalized least squares (with uncertainty on the x and y variables). In this later case, LNE\_Regpoly gives an estimation for the x unknown variables. The user can choose the degree of the polynom from 1 to 6.

Next, the software uses the estimated function to make predictions. The implemented process deals both with direct and inverse evaluation to calculate respectively y0 value (as y0 = f(x0) where x0 is a known predictor) and x0 value (as x0 = f-1(y0) where y0 is a known predictor). The software evaluates the uncertainty of a prediction in propagating uncertainties associated with the estimated function and the predictor.

In LNE\_Regpoly, the input data are loaded from an Excel file. These data are scrupulously checked by the software and especially the uncertainties structure. The sense of the relationship – response value explained by the standard value or the inverse function – is indicated by the user. For analyzing correctly the results, LNE\_Regpoly incorporates statistical tools as the Fisher and the chi-squared tests and also it gives some explanation when the model is not validate. It displays a table of simple and weighted residuals and a graphical representation.

LNE\_Regpoly is a graphical interface simple to use with steps and a lot of help screens. The software was validated with the ISO/TS 28037 examples and it is distributed with a collection of real LNE calibration examples. LNE\_Regpoly is freely available on line (see website LNE).