

# **Power System Frequency Estimation Based On Simulated Annealing. Part I: A Constant Frequency Study**

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## **Summary**

In this paper a new algorithm based on Simulated Annealing (SA) method is used to estimate the signal parameters of a system steady power system, having a constant frequency during data window size. The proposed algorithm does not need any filter or model for the system frequency before and during the estimation process. The nonlinear optimization problem, which is the minimization of the sum of the squares of the errors, as a function of the signal amplitude, frequency and phase angle, is solved using the Simulated Annealing Algorithm (SAA). The problem is a nonlinear optimization problem in continuous variables. An adaptive cooling schedule and a new method for variable discretization are implemented to enhance the speed and convergence of the original SAA. The algorithm uses the samples of the voltage or current signal of one phase at the relay location. The proposed algorithm is tested using simulated and actual recorded data for noise free and harmonics contaminated signals. Effects of the critical parameters, such as sampling frequency and number of samples, on the estimated parameters are tested. It has been shown that the SAA is succeeded to estimate accurately the system frequency from a highly contaminated voltage signal.

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