P004 Two new techniques to measure magnitude and locate a chaotic parametric response for Systems Biology

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Two new techniques are presented here to assess the magnitude and location of chaotic oscillations in biological systems. These techniques have been specially designed to assess responses in systems biology where evolution of data is slow. As a consequence the number of complete cycles at a given time are less than in other systems such as cardiology or respiration. The Ueda system and Brusselator are the systems chosen for analysis with respect to increasing data length. These new techniques termed spectral detrended fluctuation analysis and spectral multi-taper method are assessed here. Later they are evaluated for parametric sensitivity.

This is then developed to locate and elicit chaotic responses in such systems using forced oscillations. In practice these may be light-dark stimulus in cyanobacteria for hydrogen production. Alternatively it could be applied to metabolic engineering to develop higher yields of pharmaceuticals. Two examples are discussed, the Brusselator and Yeast Glycolysis. In both cases a chaotic parametric response can be established and measured with fewer iterations than with existing optimization techniques due to greater parametric sensitivity of these two new techniques.