



# Stability Test for a Parabolic Partial Differential Equation

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**Abstract** - The paper describes a stability test applied to coupled parabolic partial differential equations. The PDE's describe the temperature distribution of composite structures with linear inner heat sources. The distributed transfer functions are developed based on the transmission matrix of each layer. To analyse the stability of the system we define a virtual feedback-loop. We give the virtual feedback transfer functions for different boundary conditions. Given an open-loop linear system (the virtual feedback-loop) we can apply the Nyquist stability test to determine the critical gains of the inner heat sources. The method described is easy to use and avoids numerical problems arising from locating the infinite number of system poles by numerical approximation.

**Index terms** - Nyquist stability test, distributed parameter systems, partial differential equations