System Identification for the Digital RF Control for the TESLA Test Facility, M. HÜNING, RWTH AACHEN, and <u>S.N. SIMROCK</u>, DESY - The rf control system for the TESLA Test Facility employs a digital feedback system to provide flexibility in the choice of feedback algorithms and extensive diagnostics for rf system operation and exception handling. The control algorithm makes use of the state space formalism where the state describes the real and imaginary part of the cavity voltage (vector of the accelerating field) and the cavity detuning. The cavity detuning - which is time dependent due to the dynamics of lorentz detuning in a pulsed cavity - cannot be measured directly. Knowledge about the time-varying cavity detuning is however necessary for the implementation of the kalman filter and the smith-predictor in the feedback loop as well as for the cavity tuner control. The time-varying cavity detuning and other rf system parameters such as beam phase are derived by application of system identification to the uncalibrated measured cavity field and incident and reflected wave. In this process the calibrations for incident and reflected wave are determined which includes compensation for the finite directivity of the directional couplers.