Black-Box Parametric Estimation Methods for Longitudinal Beam Transfer Function Measurements, N. RASMUSSEN, H. SCHÖNAUER, M. SJÖSTRÖM, E. WILDNER, CERN - In the PS Booster, longitudinal Beam Transfer Function (BTF) measurements are used to determine the energy spectrum of the Linac beam injected and coasting on an extended flat bottom of the magnet cycle. The short duration (about 10 ms) of the measurement and coherent signals from density structure of the injected beam yielded strongly fluctuating results, and the system fell into disuse for a while. BTF measurements can be infected by different kinds of noises, e.g. Schottky noise, thermal noise in amplifier, quantisation noise in DAC's, etc. These, together with low excitations to avoid alteration of the beam, give a big variance of the BTF results. Particularly in the PS Booster, this is seen as a fluctuation of the base-line offset of the momentum distribution, whose variance we show to be due to the noise and to be independent of the data length using empirical transfer function estimate (Fourier transform estimates of both excitation and beam response). Different signal processing techniques are investigated to reduce the variance, where black-box parametric estimation methods are shown to have significantly lower values of the base line offset than other signal processing methods applied in the field.