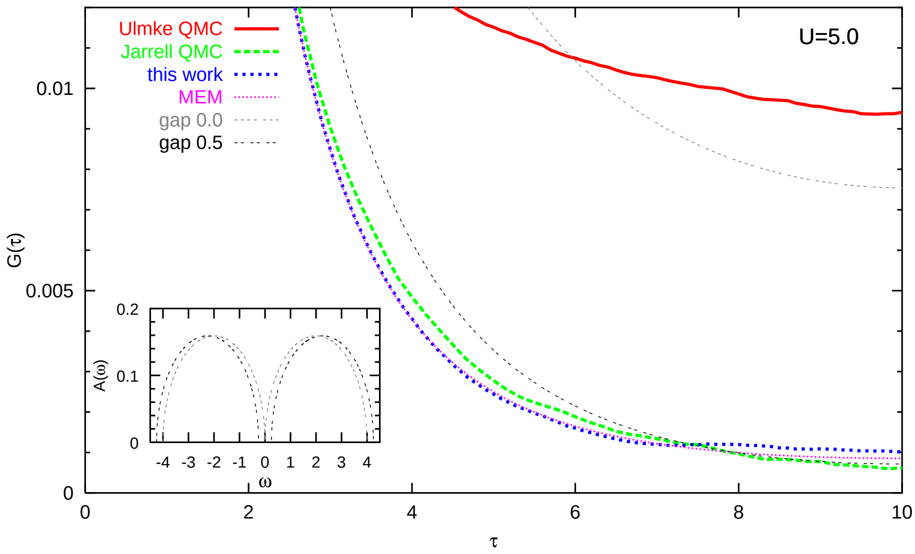

Figure 3.70: QMC estimates of $G(\tau)$ for Bethe DOS, $T = 1/20$, and $U = 5.0$ (thick lines) in comparison with the form of $G(\tau)$ corresponding to the MEM spectrum shown in Fig. 3.80 (dotted line) and with $G(\tau)$ corresponding to the spectra shown in the inset (thin dashed lines). Results of this work (for $\Delta\tau = 0.1$) essentially agree with results obtained by Jarrell (for $\Delta\tau = 0.167$); deviations of results obtained using Ulmke's smoothing trick (for $\Delta\tau = 0.1$) are almost two orders of magnitude larger. While the former are consistent with a spectral gap of about 0.5, the result of Ulmke's QMC method implies a gapless spectrum.

is accurate QMC data obtained using a state-of-the-art QMC algorithm. A full application of the advanced aspects of MEM can only lead to improved results once systematic errors are under control, i.e., are significantly smaller than statistical errors. As we will see in the following, this condition is not always met in this work due to the high precision of the data, i.e., the small statistical errors. By taking the systematic errors into account, we will nevertheless be able to compute quite accurate spectra.

3.8.2 Algorithmic Choices and Numerical Tests

In this subsection, we compare various approaches and perform numerical tests in order to establish a robust and accurate method for the analytic continuation of imaginary-time data obtained using the particular QMC code improved and used as part of this thesis.

Default Models

One decision that has to be made within all variants of the MEM is the choice of a default model. The simplest possibility is a constant default model $m(\omega) \equiv m_0$ (solid line in Fig. 3.71). Its only parameter is the extent of the frequency grid which should be chosen large enough that it is numerically irrelevant. Then, the usage of