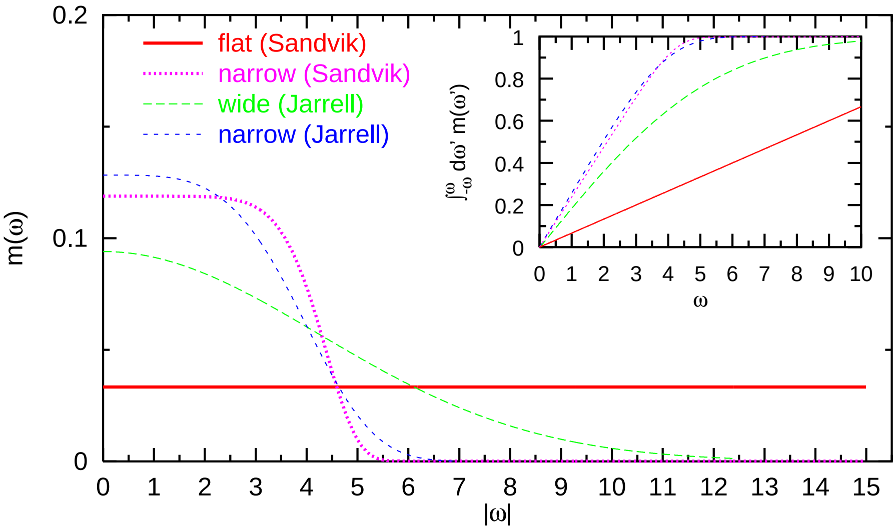

Figure 3.71: Default models used within this section: flat model $m(\omega) = 1/(2 * \omega_c)$ (solid line) and narrow model $m(\omega) = \left(\exp[-(0.22437\omega)^8]+0.001\right)/8.4246$ (dotted line) as used in connection with Sandvik's algorithm (both for a cutoff frequency $\omega_c = 15$) and wide model $m(\omega) = \exp[-(w/6)^2]/(6\sqrt{\pi})$ and narrow model $m(\omega) = 0.128281 \exp[-(\omega/4.3002)^4]$ as used in connection with Jarrell's code (dashed lines). The inset shows the corresponding integrated spectral weights $\int_{-\omega}^{\omega} d\omega' m(\omega')$.

a constant default model should guarantee results with minimal bias. On the other hand, QMC data cannot provide sufficient information at large frequencies according to the Nyquist theorem. While the entropic ansatz prevents the MEM from producing artificial structures in this range, it often predicts too much weight at large (absolute) frequencies. This tendency can be reduced by choosing a default model which decays towards the edges of the frequency grid. Ideally, such a model should only incorporate exactly known analytic properties and should not introduce artificial features. In the case of a single-band model with sharp band edges the following observation is useful in this respect: if the total extent of the DOS is $W > 0$, the total extent of the interacting spectrum is bounded by $|U| + W$. This implies for the present symmetric case and $U > 0$:

$$A(\omega) = 0 \quad \text{for} \quad |\omega| > \frac{U + W}{2}\,. \tag{3.68}$$

Since most spectra will be computed for $U \leq 5$ and since $W = 4$ for the Bethe DOS, a good default model should essentially cut off the spectrum at $U \approx 4.5$. This is achieved by the narrow model shown as a dotted line in Fig. 3.71 which is essentially proportional to $\exp(-\omega^8)$; a small offset is necessary for numerical stability.[63] Additional default models used in connection with Jarrell's MEM code

[63] As a constant default model was initially hard-coded in Sandvik's code (as previously used within our group), the usage of nonconstant default model required a slightly generalized version of the program. In our version, important parameters of the default model can be chosen at runtime.