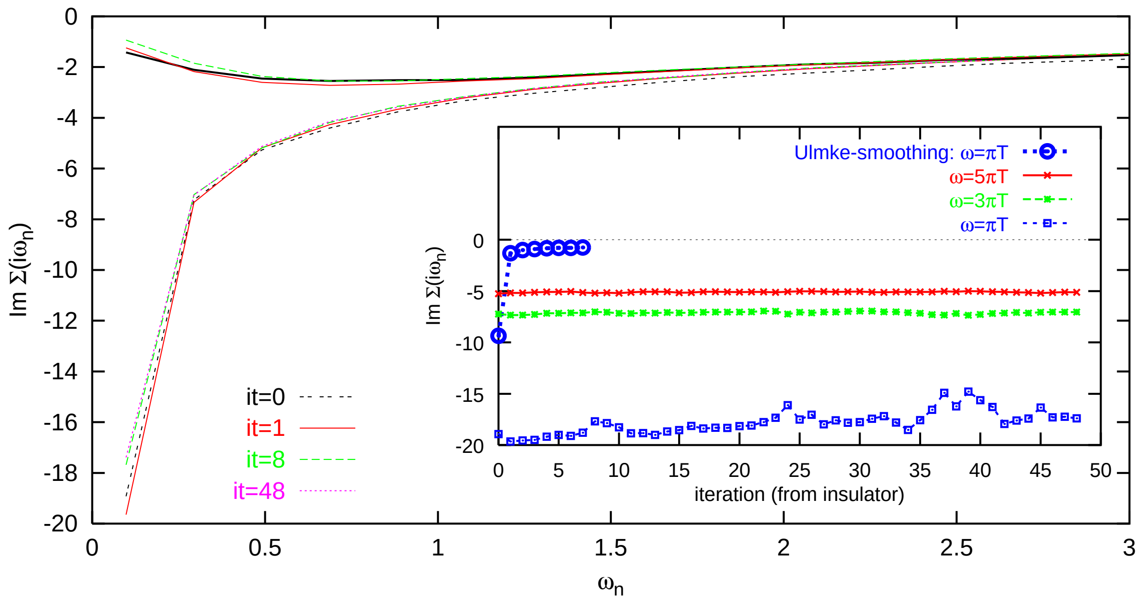

Figure 3.12: Behavior of the smoothing-corrected Ulmke code upon iteration, initialized with Rozenberg's solutions for $\beta = 32$, $U = 4.92$, and $\Delta\tau = 0.25$. The main part shows the input (it=0) plus snapshots after 1, 8, and 48 iterations. In the inset, $\mathrm{Im}\,\Sigma$ of the insulating solution for the first 3 Matsubara frequencies is presented as function of iteration number. For $\omega_n = \pi T$, results of the uncorrected ("Ulmke") code are also included.

while it shares the high-frequency behavior with the result of the original version ("Ulmke"). For additional comparisons, see App. C.

It can be seen in Fig. 3.12 that this improvement indeed stabilizes the insulating solution. Using Rozenberg's solutions (both for metal and insulator) as input, 8 iterations using the improved code were performed for the metal and 48 for the insulator. Both solutions are indeed stable in spite of relatively large fluctuations in the insulating phase.[17] In contrast, the insulating solution is lost and approaches the metallic solution within a few iterations when the code with uncorrected smoothing ("Ulmke") is used.

The insulating solution was also found to be stable upon iteration with Krauth's and Jarrell's code (not shown). Consequently, the coexistence of metallic and insulating phases for $\beta = 32$, $U = 4.92$, and $\Delta\tau = 0.25$ is established as a result of this subsection. Furthermore, we have identified and corrected the problem in Ulmke's code. Since our improved version of the code works so well even in the numerically difficult coexistence region and for a comparatively large discretization $\Delta\tau$, we continue to use it for the rest of our numerical studies.

[17]For the insulating phase, the accuracy was increased in later iterations. In iterations 1-16, 10 starting configurations of the Ising field with 5000 warmup and 45000 measurement sweeps each were used. Iterations 17-32 used 10 times 5000+150000 sweeps, iterations 33-48 used 10 times 15000+150000 sweeps.