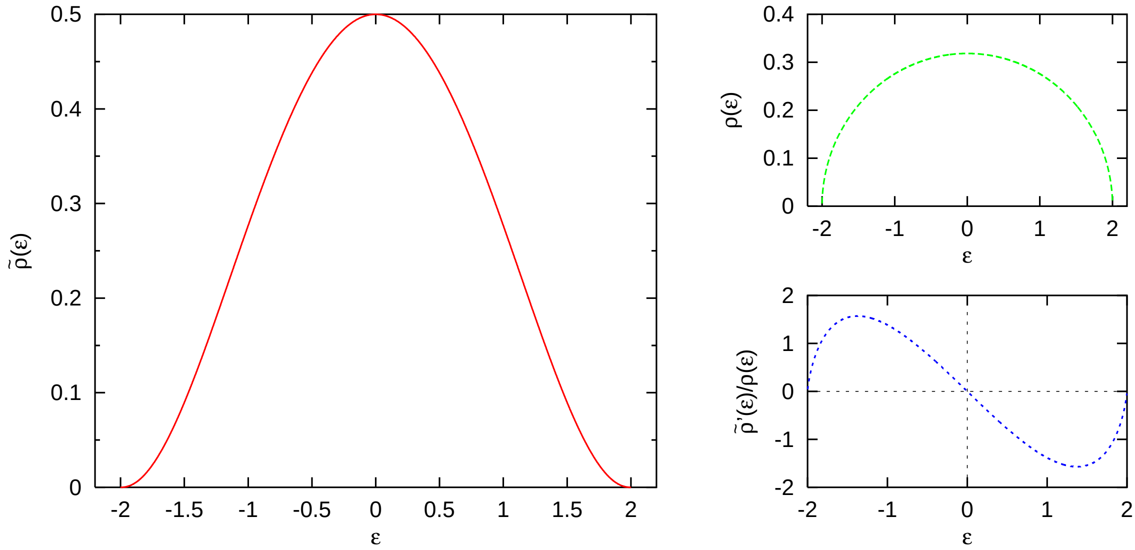

Figure 4.14: DMFT transport characteristics of redefined Bethe lattice in $d = \infty$: for this isotropic, regular lattice, the optical conductivity is well defined by (4.65) using the input $\tilde{\rho}(\epsilon)$ (left) while its semi-elliptic DOS (top right) guarantees local single-particle properties to be identical to that of the Bethe lattice. The f-sum (4.87) can be computed from measurements of the generalized momentum distribution function n_ϵ using the input $\tilde{\rho}'(\epsilon)/\rho(\epsilon)$ (bottom right). At small frequencies, the latter function deviates from the hc form $-\epsilon$ only quantitatively by a factor $\pi/2$ while the decay at the band edges marks a very important qualitative difference.

only similarity one can expect to the hc case is that, for small U and T, changes in the frequency sum will be proportional to changes in the kinetic energy. Let us emphasize that the information collected in Fig. 4.14 gives a complete description of the lattice within the DMFT with respect to local and transport properties. There are several possible choices for the transport input $\tilde{\rho}(\epsilon)$ consistent with the same DOS (which by itself completely determines local properties within the DMFT). The particular choice (4.133) depicted here is the most natural since it is consistent with isotropic hopping matrix elements and since the noninteracting energy increases monotonously from the center of the Brillouin zone. Furthermore, the scaled hopping matrix elements decay very fast for this choice, cf. Table 2.2. Thus, we have found a minimal extension of the formalism developed for the hypercubic lattice which is consistent with a semi-elliptic "Bethe" DOS.

As discussed in chapter 2, one should check whenever possible whether results obtained for $d = \infty$ survive as a reasonable approximation in finite (and not too high) dimensions. Within the framework of the general dispersion method and, thus, for the model at hand, finite dimensionality d implies a finite maximal hopping distance $D_{\max} \leq d$; the selection of hopping matrix elements even relied on $D_{\max} \ll d$. We have already demonstrated in subsection 2.4.2 and subsection 2.4.3 that the effects of a truncation of the hopping range and of finite dimensionality on the DOS, i.e.,