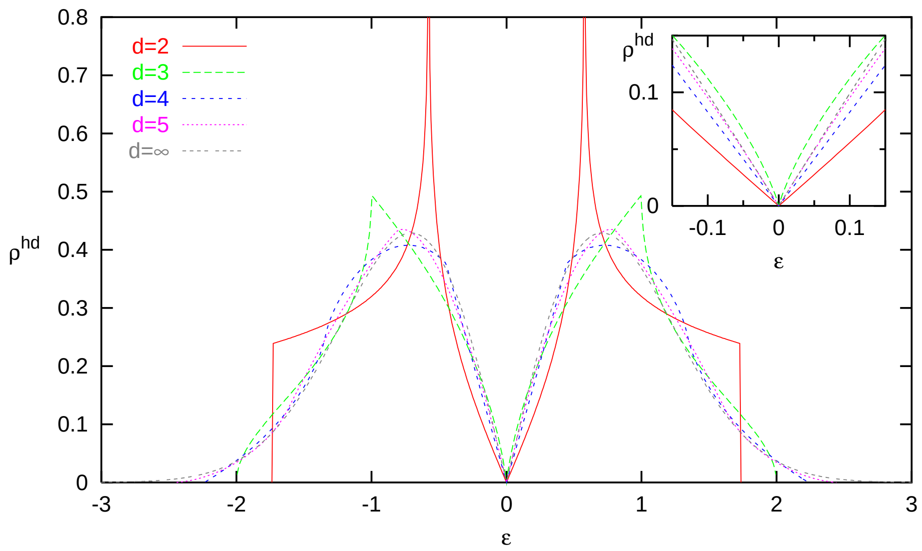

Figure B.2: DOS of the hd lattice.

unit hopping vectors,

$$\boldsymbol{\tau}_l = \sqrt{\frac{d+1}{d}}\left(\tilde{\boldsymbol{\tau}}_l - \frac{1}{\sqrt{d+1}}\mathbf{1}\right) . \tag{B.16}$$

After the projection, these are no longer orthogonal,

$$\boldsymbol{\tau}_l \cdot \boldsymbol{\tau}_m = \frac{d+1}{d}(\tilde{\boldsymbol{\tau}}_l - \frac{1}{\sqrt{d+1}}\mathbf{1})(\tilde{\boldsymbol{\tau}}_l - \frac{1}{\sqrt{d+1}}\mathbf{1}) \tag{B.17}$$

$$= \frac{d+1}{d}(\delta_{lm} - \frac{2}{d+1} + \frac{1}{d+1}) = \begin{cases} 1 & \text{for } l = m \\ -\frac{1}{d} & \text{for } l \neq m \end{cases} , \tag{B.18}$$

but fulfill the original definitions of the hyperdiamond lattice and are therefore identical to those defined in (B.1) up to a rotation.

Computations of tensor-like properties can be easily performed in the new formalism. First we note that in $d+1$ dimensions all cartesic directions are equivalent. Thus, any tensor $\tilde{\boldsymbol{C}}$ in the $d+1$-dimensional representation which is not dependent on coordinates must obey this symmetry and have the form

$$\tilde{\boldsymbol{C}} = \begin{pmatrix} c_1 & c_2 & \cdots & c_2 \\ c_2 & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & c_2 \\ c_2 & \cdots & c_2 & c_1 \end{pmatrix} . \tag{B.19}$$

This matrix has the d fold eigenvalue $c_\parallel = c_1 - c_2$ plus the nondegenerate eigenvalue $c_\perp = c_1 + dc_2$. As expected the eigenvector corresponding to $c_\perp$ is $\mathbf{1}$, the direction orthogonal to the planes. For transport properties, $c_\perp$ must vanish, $c_2 = -c_1/d$, and