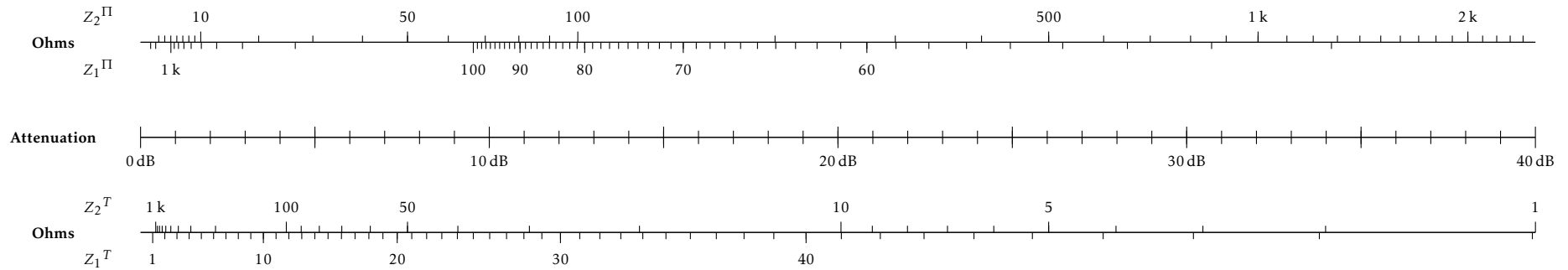


# Matched resistive lumped element two-port attenuators

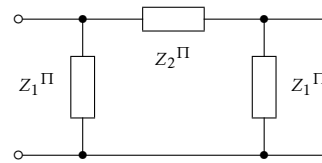


## Description

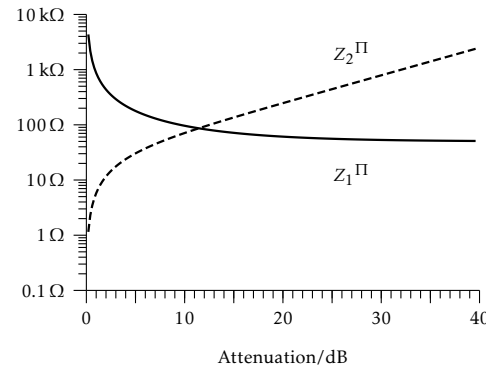
The aim of these nomographs is to help to dimension matched resistive lumped-element two-port attenuators. All values presume a characteristic impedance of the surrounding network of  $Z_0 = 50\Omega$ . Find your desired attenuation on the center scale and read out the needed quantities of the resistors on the upper scale (for  $\Pi$ -structure) and on the lower scale (for T-structure) respectively.

On the right hand side, you can see the exact dimension formulas\*.  $a = \ln|U_1/U_2|$  is the attenuation when terminated with  $Z_0$ . Below each structure, the involved resistances are plotted vs.  $20\log|U_1/U_2|$ .

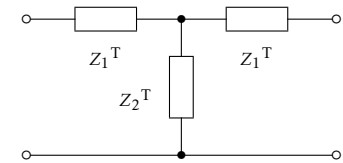
$\Pi$ -structure:



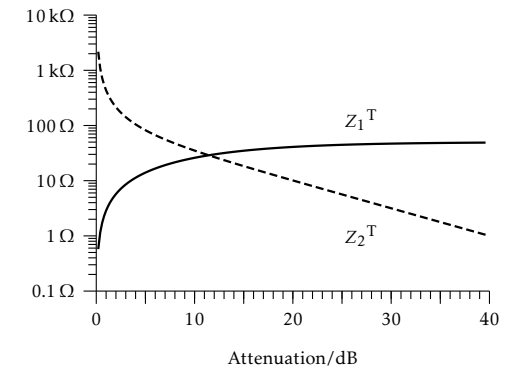
$$Z_1^{\Pi} = \frac{Z_0}{\tanh \frac{a}{2}} \quad Z_2^{\Pi} = Z_0 \cdot \sinh a$$



T-structure:



$$Z_1^{\text{T}} = Z_0 \cdot \tanh \frac{a}{2} \quad Z_2^{\text{T}} = \frac{Z_0}{\sinh a}$$



\*Schüßler, H. W.: Netzwerke, Signale und Systeme. Berlin, Springer, 1990 (in german)