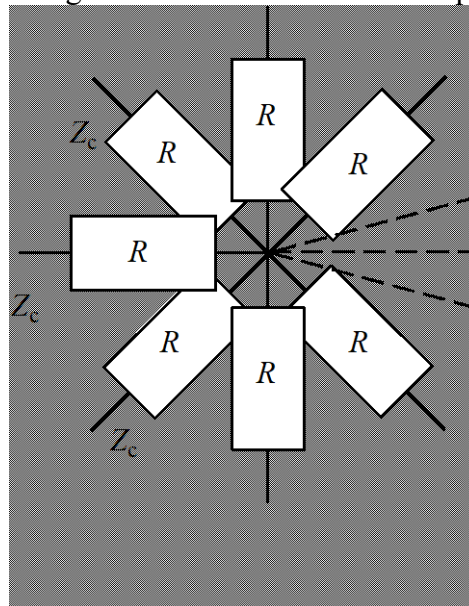


Microwaves

Series 9

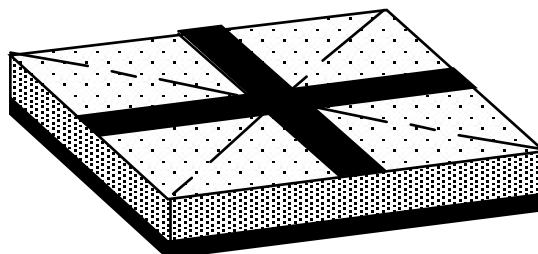
Problem 1

Study the symmetric resistive divider with N ports. Give the value of the N resistors (in series), so that the component is matched at all its ports. Find the scattering matrix of this component, and as a function of N , the power given to each line and the total power absorbed by the divider.



Problem 2

Determine the scattering matrix of the four port made of the crossing of two 50Ω microstrip lines. The lines are supposed lossless, and the impedance at the reference planes is 50 Ohms . The reference planes are located half a wavelength away from the junction.



A reciprocal two port device absorbs the quarter of the incident power and is matched at its two ports. We measure its attenuation using an unmatched detector, which VSWR is equal to 1.6. We know also that the generator used for the measurement reflects 20% of the power which is returned to it. We do however not know the phase shift produced by the two port, nor the phases of the reflection at the detector or the generator. Find between which values the *measured* attenuation will lie.

The diagram shows a closed loop for a quantum system. A green arrow at the top points from left to right, labeled "Sans le composant" (Without the component) above it and "1" below it. On the left, a red arrow points upwards from a blue arrow pointing left, labeled "Générateur" (Generator) to its left. On the right, a red arrow points downwards from a blue arrow pointing right, labeled "Appareil de mesure" (Measurement device) to its right. The vertical red arrows are labeled $|p_g|$ on the left and $|p_t|$ on the right. The bottom horizontal blue arrow is labeled "1" below it.

