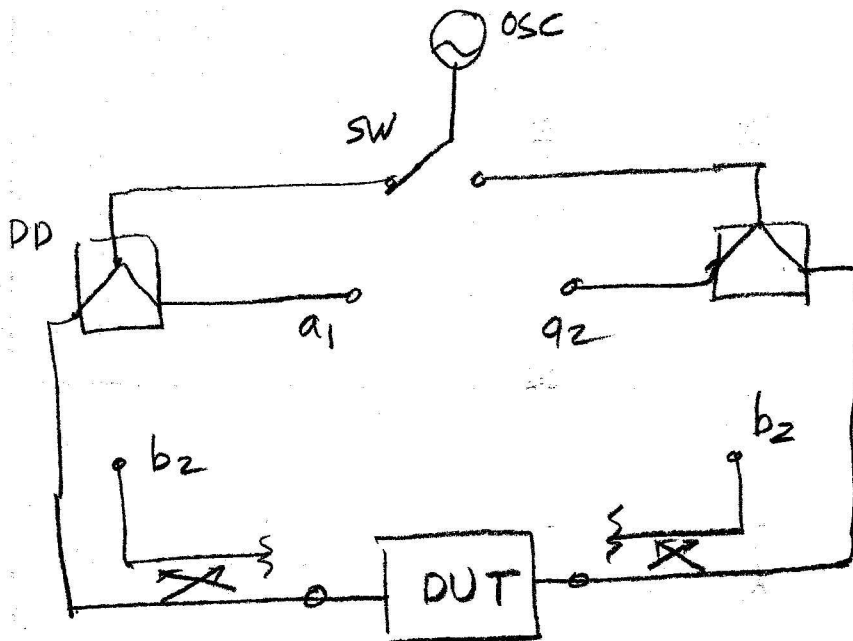


마이크로파 CAD 및 측정

1. VNA Block Diagram



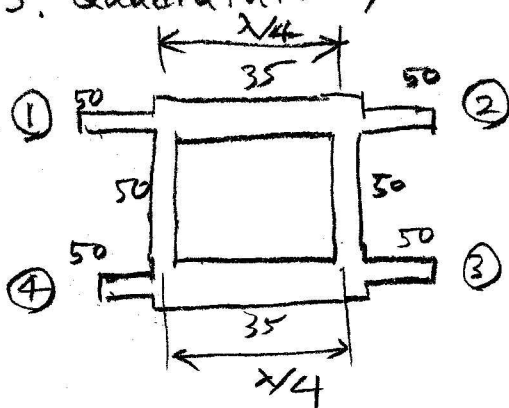
Measure $S_{11} = \frac{b_1}{a_1}$ using microwave receiver with phase measurement capability.

2. Power Balance

$$1 = |S_{11}|^2 + |S_{21}|^2 + \frac{P_{\text{Loss}}}{P_{\text{inc}}}$$

$$\frac{P_{\text{Loss}}}{P_{\text{inc}}} = 1 - 0.6^2 - 0.9^2 = -0.17 \quad (\text{amplification})$$

3. Quadrature Hybrid



4. [S] of a BHA

$$[S] = \frac{1}{\sqrt{2}} \begin{bmatrix} 0 & -j & -1 & 0 \\ -j & 0 & 0 & -1 \\ -1 & 0 & 0 & -j \\ 0 & -1 & -j & 0 \end{bmatrix}$$