**Lab 5：Wilkinson Power Divider**

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| **Author** | Name： 曹子惠 Student ID:12112441 |
| **Introduction**  The 3dB Wilkinson power divider, also known as a Wilkinson splitter, is a type of power divider used in RF and microwave systems. It is used to divide an input signal into two output signals with equal amplitude and 180-degree phase difference.  The principle of operation of the 3dB Wilkinson power divider is based on the use of quarter-wave transformers and a resistor. The divider consists of three transmission lines connected to a common junction. The input signal is first passed through a quarter-wave transformer, which introduces a 90-degree phase shift. At the common junction, the signal is split into two paths by a resistor. The resistor acts as a terminating impedance, which ensures proper power division and isolation between the output ports. The quarter-wave transformers at the output ports then recombine the signals, resulting in two output signals with equal amplitude and 180-degree phase difference.  The key advantage of the 3dB Wilkinson power divider is its ability to provide wide bandwidth, high isolation between output ports, and good return loss. It is commonly used in applications such as test and measurement equipment, communication systems, and radar systems.  The operation of the 3dB Wilkinson power divider can be described by the following equations:  For the input port:  Zs = Zo /√2  For the output ports:  Zo’ = Zo  Where:  Zs = characteristic impedance of the input transmission line  Zo = characteristic impedance of the output transmission line  **Lab results & Analysis**：   1. ADS schematic simulation results, ADS optimization results (S11, S21, S22, S32) 2. Calculate w0, w1     Get w0 = 3.019230, w1 = 1.571460   1. circuit diagram     Simulate，and get s-parameter is below：    It is obviously that some of them are wrong.   1. Make superior   Set goal as：    Then update：    All s-parameters are correct.  And the variant l is 24.5836mm      Layout. In EM, we get：         1. HFSS simulation results (S11, S21, S22, S32), and ADS results comparison   Import the dwg file, and modeling, we get:    Simulate, get    It is similar to the results we get in ADS: | |
| **Experience**      **Experience**  During the modeling and simulation of the 3dB Wilkinson power divider, I encountered challenges in accurately capturing the behavior of the quarter-wave transformers and the resistor in the divider. These components require precise modeling of their electrical properties, and ensuring the simulation matches the real-world performance can be difficult.  Through this experience, I learned the importance of thorough understanding of the operating principles of the power divider and the need for accurate component modeling. I also gained valuable insights into the significance of proper termination impedance for achieving desired power division and isolation in the design. Overall, this experience has enhanced my skills in RF and microwave circuit simulation and deepened my understanding of power divider design principles. | |
| **Score** | 97 |