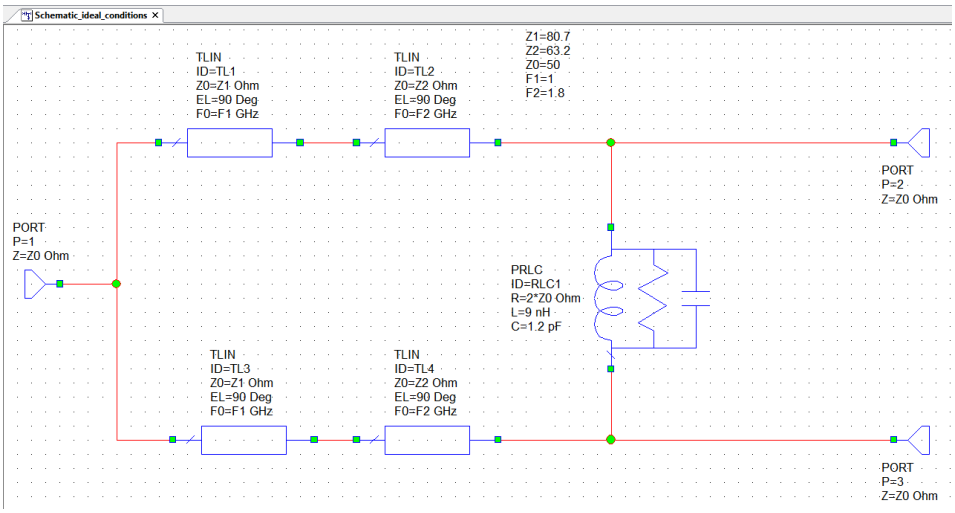
Design Lab	field of study: E&T	Date: 06.02.2025
Project Title: Wilkinson Power Divider	Name: Michał Ferens Jakub Banach	

1.Description

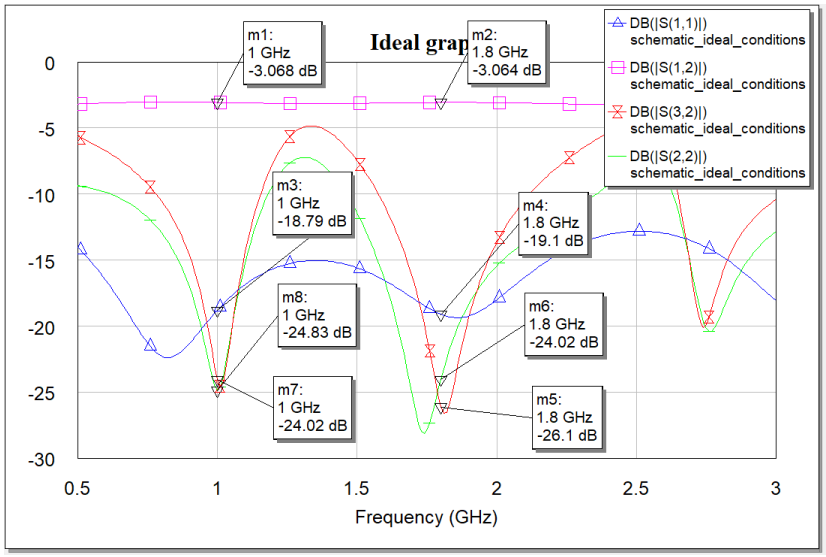
The goal of the project was to design a Wilkinson power divider operating at two frequencies: 1 GHz and 1.8 GHz. The main stages of the project included selecting appropriate components, simulating the circuit, designing the layout, fabricating the PCB and measuring obtained physical circuit.

2. Ideal Schematic in AWR

Schematic using ideal lines and components:



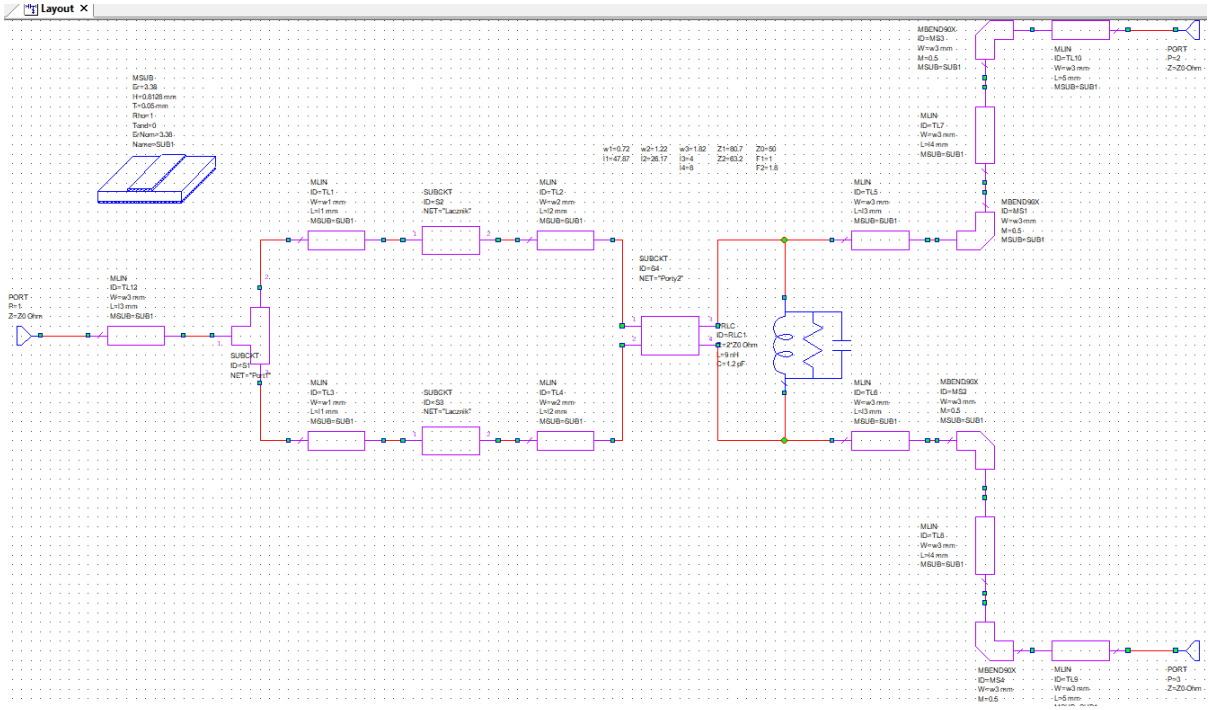
and the result of the simulation:



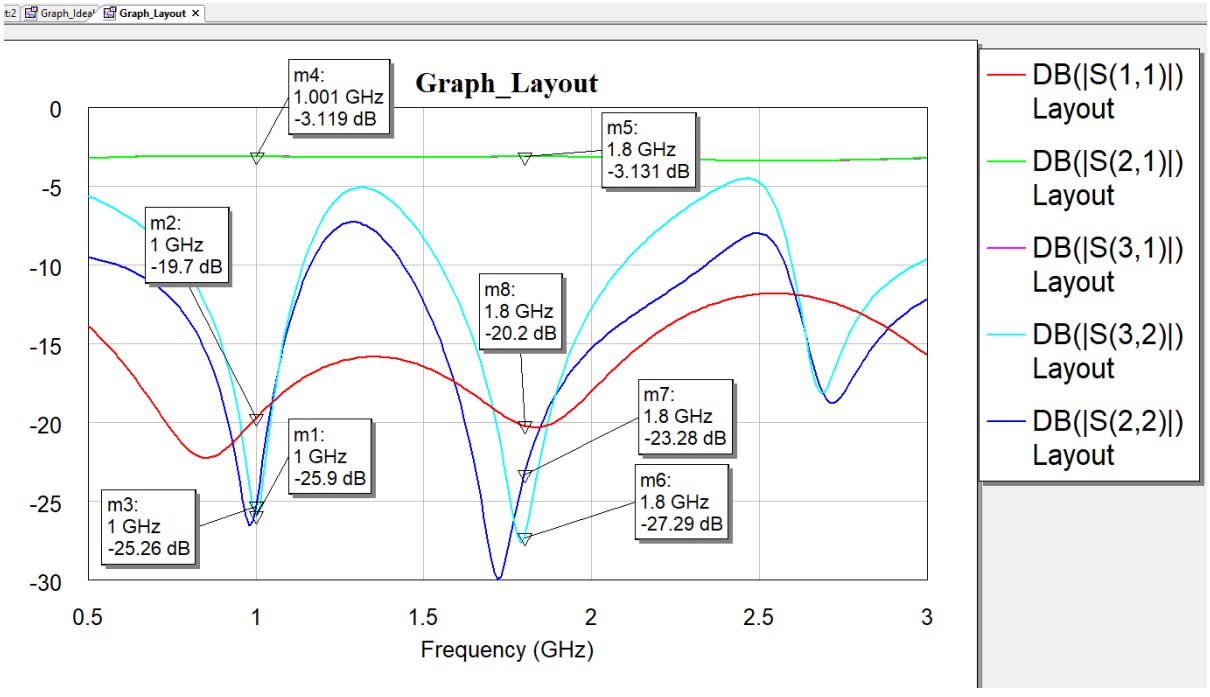
In order to achieve the best possible results, we used *the Tune tool*, which allowed us to observe real-time changes in response to adjusting the values of the passive components. This helped us select the most suitable capacitances and inductances.

3. Scheme for layout design

Diagram using microstrip lines:



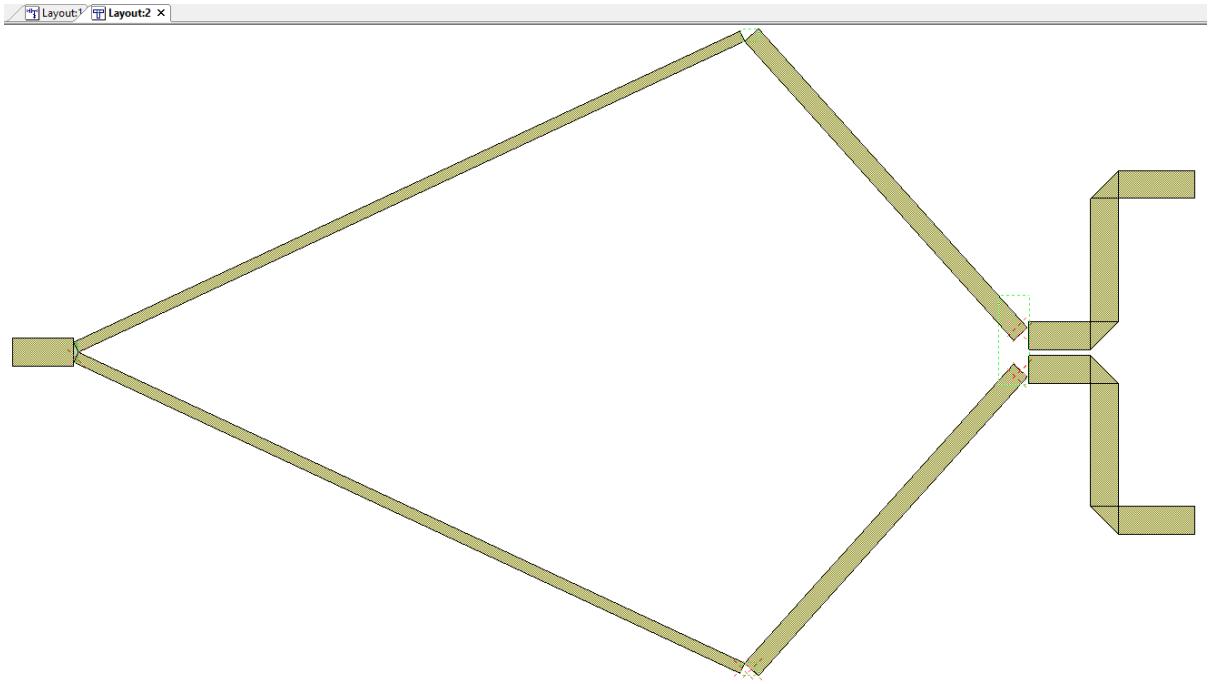
And the result of the simulation:



We selected the dimensions of the two main lines using the *TXLine* tool. Then we added further elements step by step using the *Freeze* tool, thanks to which we could see how much the graphs of the scatter matrix parameters deviated and correct them immediately.

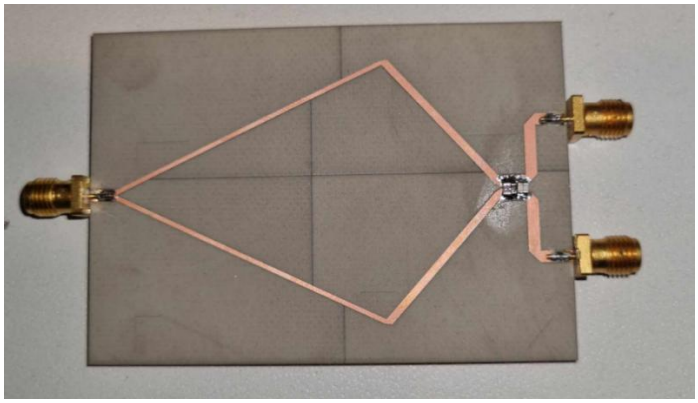
4. Layout

We added the necessary elements to properly connect the lines and designed the ports interfaces.

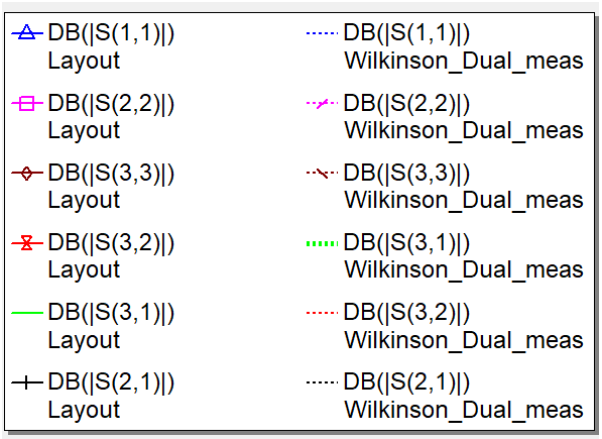


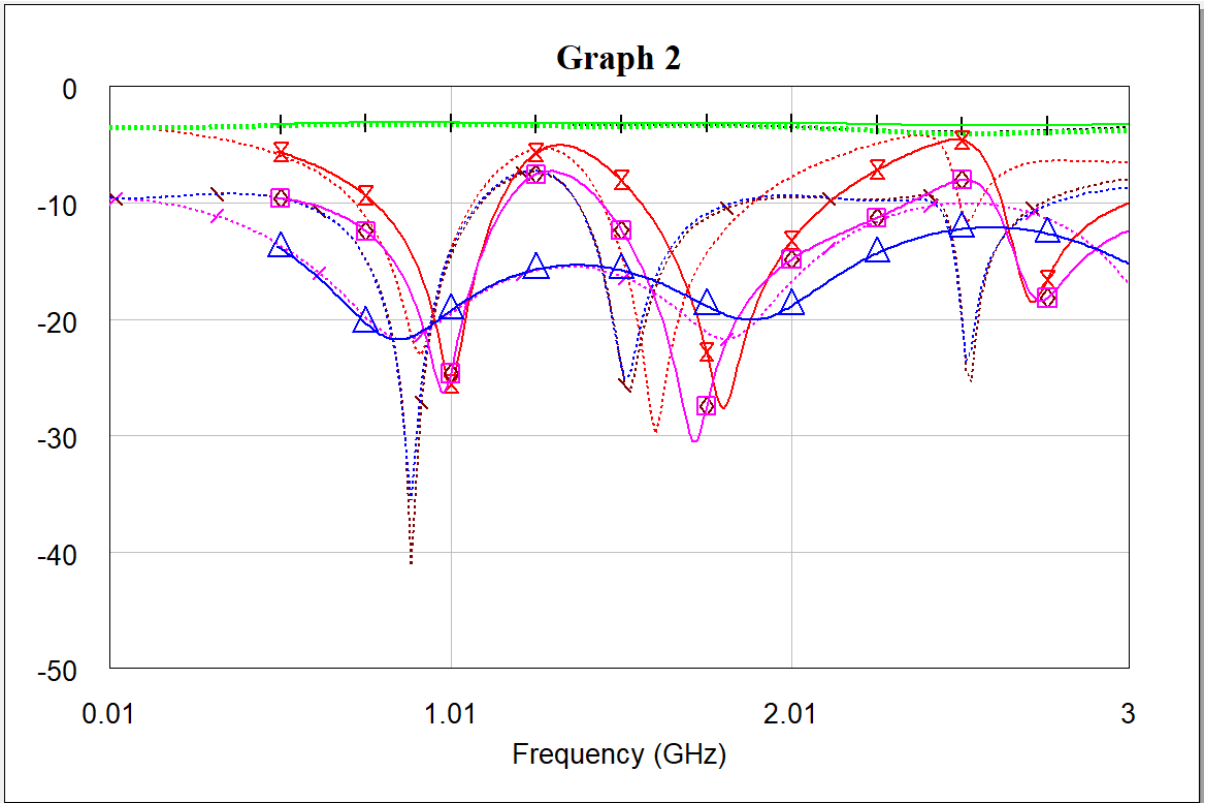
5. Final Outcome

After PCB fabrication, which was performed by the instructor using RO4003C laminate (ε = 3.38, h = 32 mils), we soldered the passive components (C = 1.2 pF, R= 100 Ohm). Due to the lack of availability of an L = 9 nF inductor, we soldered two inductors in parallel, obtaining an equivalent inductance of Lz = 8.3 nH.
We also soldered the ports. Here is the final result of the fabricated divider:



The final step involved measuring the real circuit and comparing the results with our initial design goals.





As you can see, there has been a shift in the graphs, so our divider has the best parameters at 0.9 GHz and 1.55 GHz instead of 1 GHz and 1.8 GHz.

The differences between the simulation results and those measured on our board are due to differences in capacitance and inductance. In the end, the equivalent inductance was 8.3 nF instead 9 nF, and the capacitance has increased due to the presence of solder used during component assembly.

The entire project was based on a scientific paper we found on the ieeexplore.ieee.org portal, accessed via bg.agh.edu.pl:

"A Dual-Frequency Wilkinson Power Divider" by Lei Wu, Zengguang Sun, Hayattin Yilmaz, and Manfred Berroth, Senior Member, IEEE.