Design Project #2: *Coupled Line Couplers*

Project Scope

Design a **coupled-line coupler** with the following specifications:

Number of sections	5
Center frequency	5 GHz
Coupling	10 dB
Port impedance	50 Ω
Frequency response	Maximally Flat

Project Tasks:

1) Indicate the odd and even mode impedances for each of the 5 sections.

2) If this design were implemented in stripline, with ε_r = 9.0 and thickness b = 4.0 mm, what should be the conductor width W, spacing S, and length ℓ of the **center** section **?**

3) For a matched coupler, plot $|S_{11}|^2$, $|S_{21}|^2$, $|S_{31}|^2$ and $|S_{41}|^2$ from 0 to 11 GHz. **Compare** the values at 0 GHz to those at 10 GHz. **Explain this result.**

4) If the coupling must be at least 13 dB to satisfy specifications, what (according to your plot) is the **bandwidth** of your design?

5) Place a short circuit on port 4 and replot $|S_{11}|^2$, $|S_{21}|^2$, $|S_{31}|^2$ from 0 to 10 GHz. **Compare** to the matched case and **explain the results**.

6) Place a short circuit on port 2 and replot $|S_{11}|^2$, $|S_{31}|^2$ and $|S_{41}|^2$ from 0 to 10 GHz. **Compare** to the matched case and **explain the results**.

ADS Information

You will need to use **four** ADS "Term" elements (one for each coupler port), as well as **five** "CLIN" elements, which are the ideal coupled transmission lines found in the "TLines-Ideal" element category.

Grading and Evaluation

The same as project 1.