

D-band CMOS 4-way Power Combiner/Divider

Min-Seok Kwon^o, Hyeon-Jin Son, Ha-Neul Lee, Seung-Jae Kim, Jae-Hyun Lee, Joon-Hyuk Yoon, Jong-Ryul Yang^{*}

Electrical and electronics engineering, Konkuk University

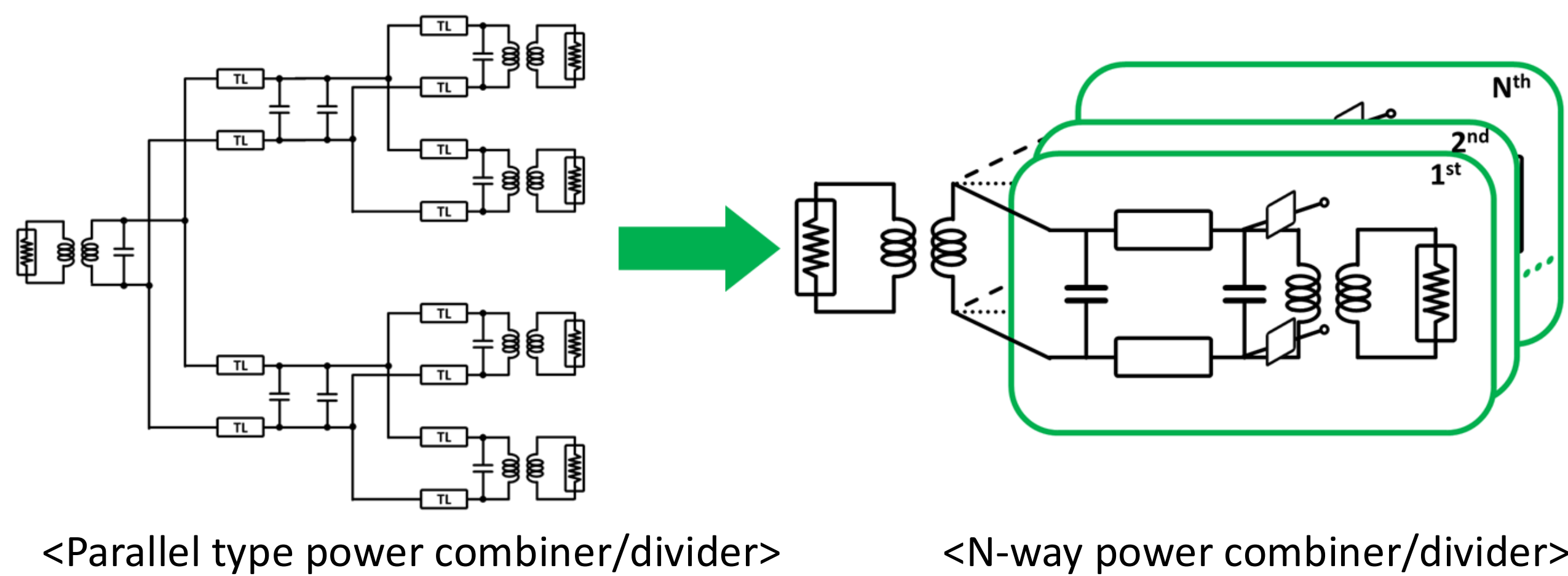
E-mail: ^osuk4215@konkuk.ac.kr , ^{*}jryang@konkuk.ac.kr

Background

1. A power combiner is an important passive device to overcome the limitation of output power in millimeter-wave transmitters.
2. A Wilkinson power combiner is widely used to combine output power of each power amplifier (PA) with high isolation between two input ports. However, an additional matching network is required in the power combining architecture using the conventional WPC because an output impedance of the PA, which is optimized at a low impedance for increasing output power, should be transformed to the reference impedance.
3. In this project, a compact and low-loss power combiner which have both the output combining and impedance matching of the transmitter in the D-band is proposed.

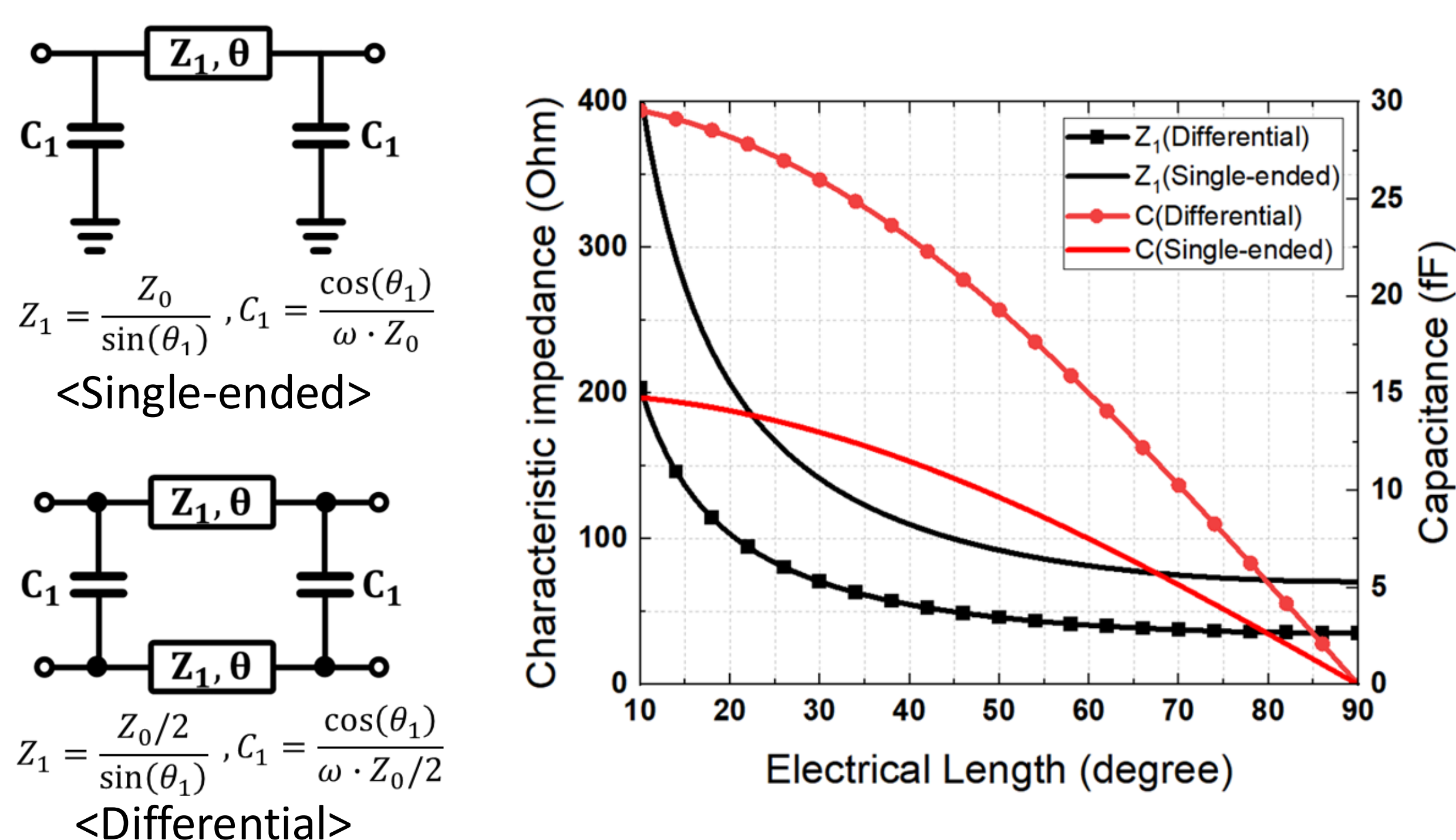
Methods

- A N-way Wilkinson power combiner/divider



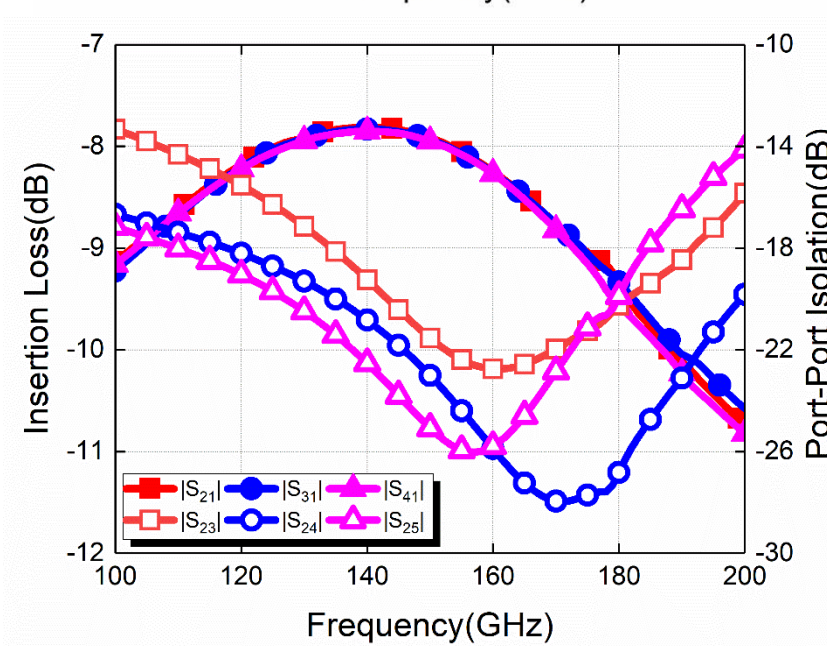
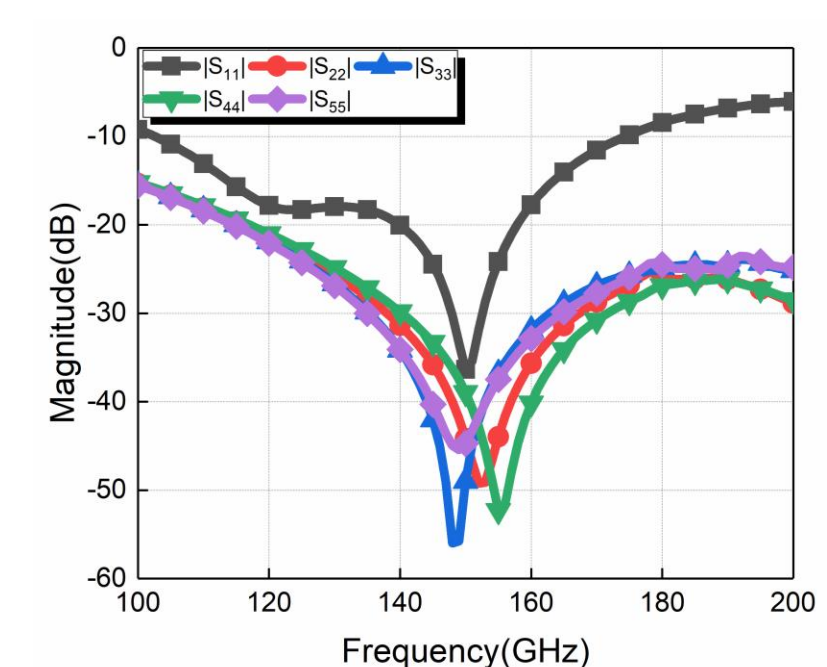
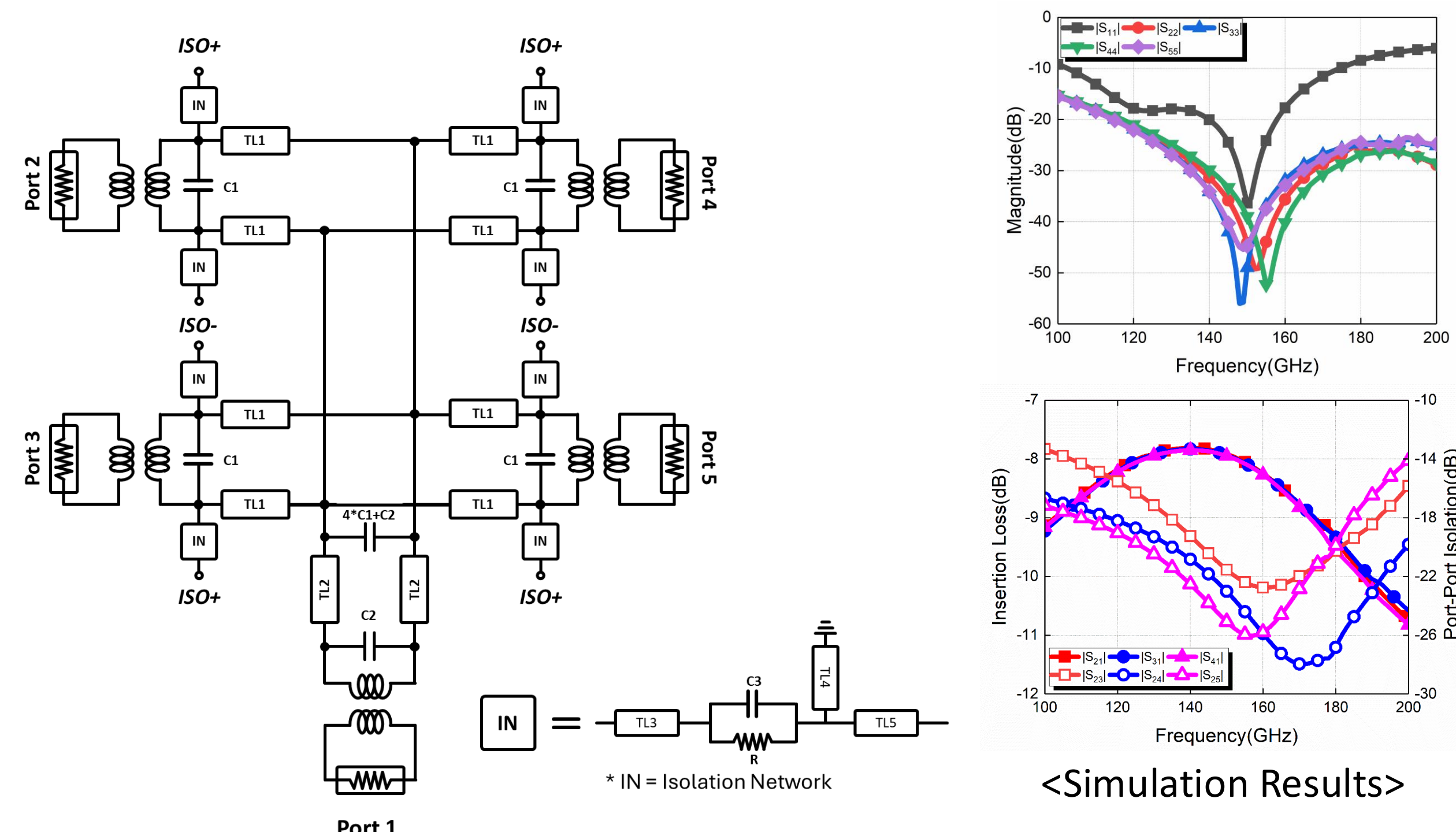
- Design achieves better performance in size and loss characteristic

- Capacitive Loading Technique



- Smaller design is possible in differential structure

- A proposed power combiner/divider

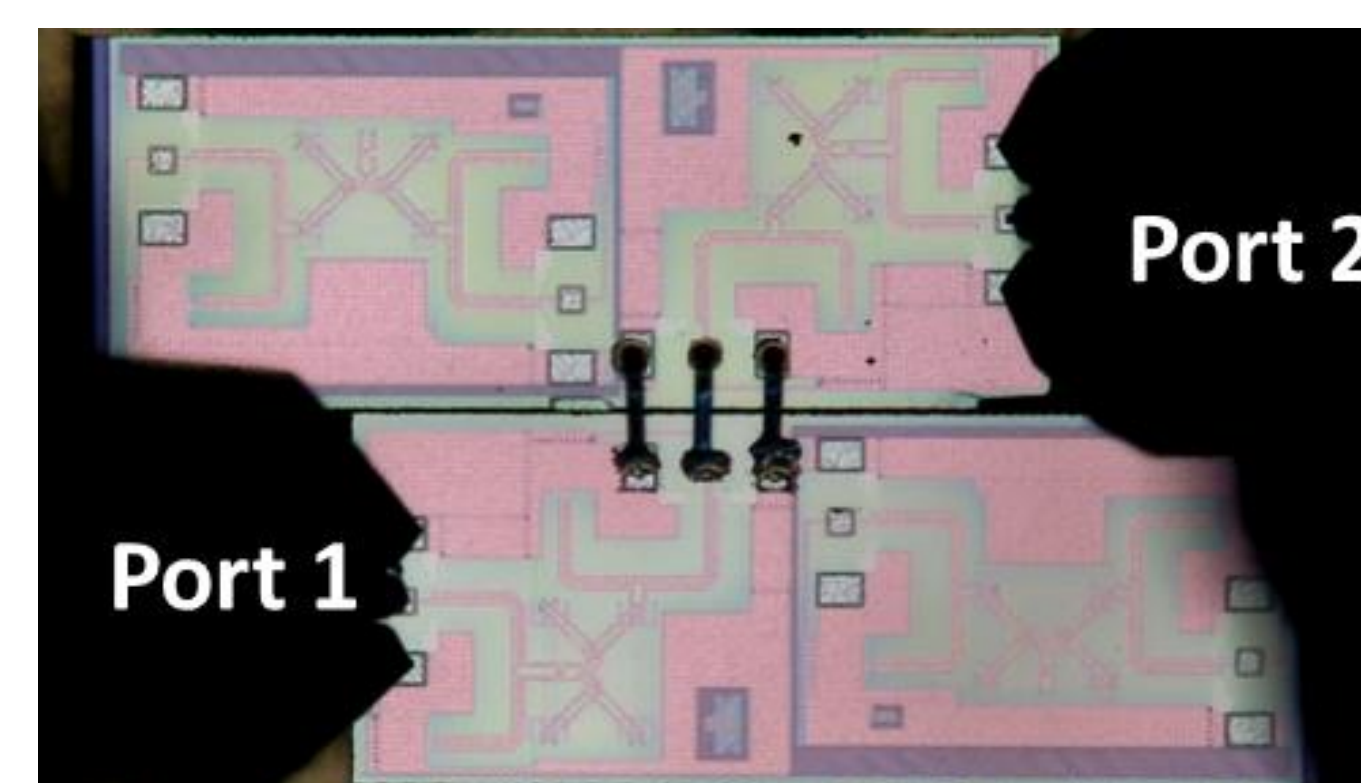


<Simulation Results>

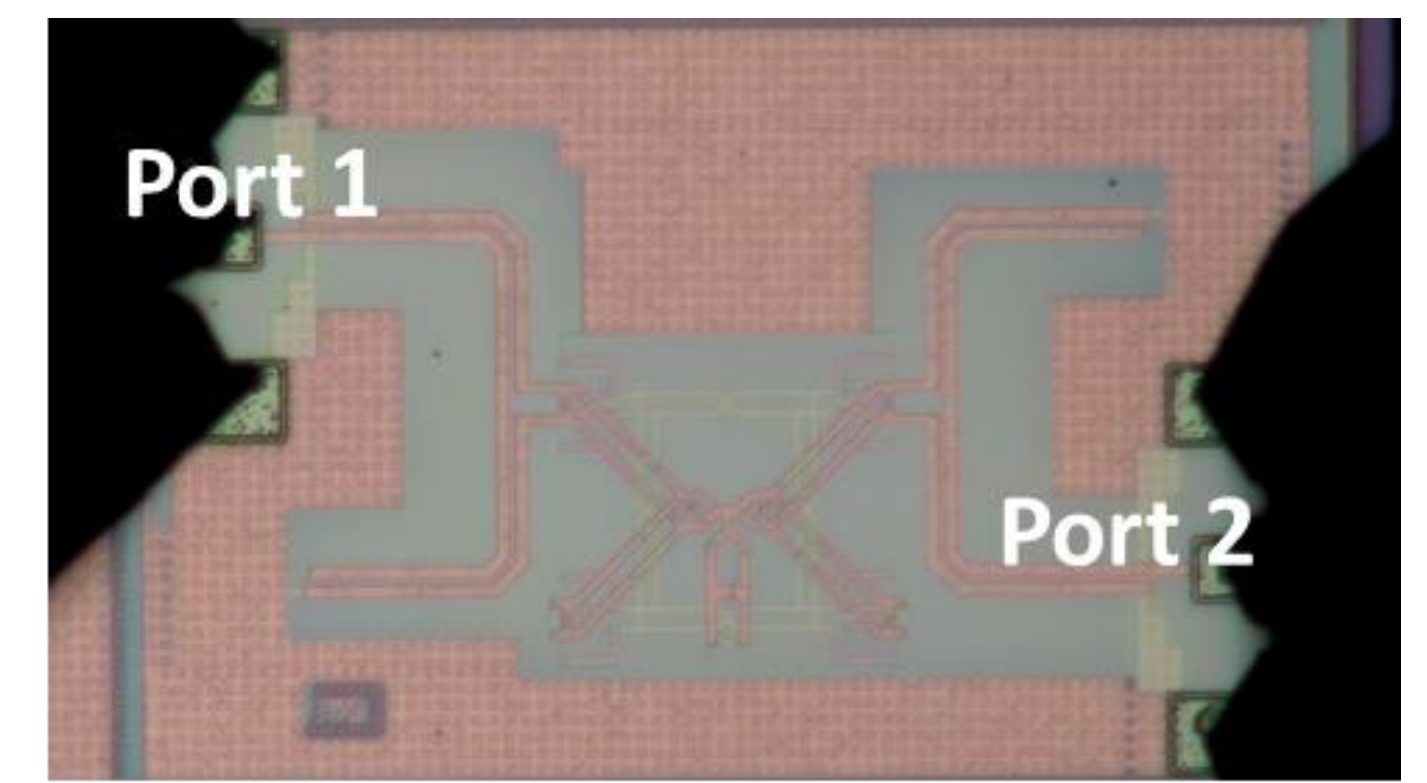
- 4-way Differential Power Combiner/Divider
- 1.79 dB Minimum Loss at 150 GHz

Results

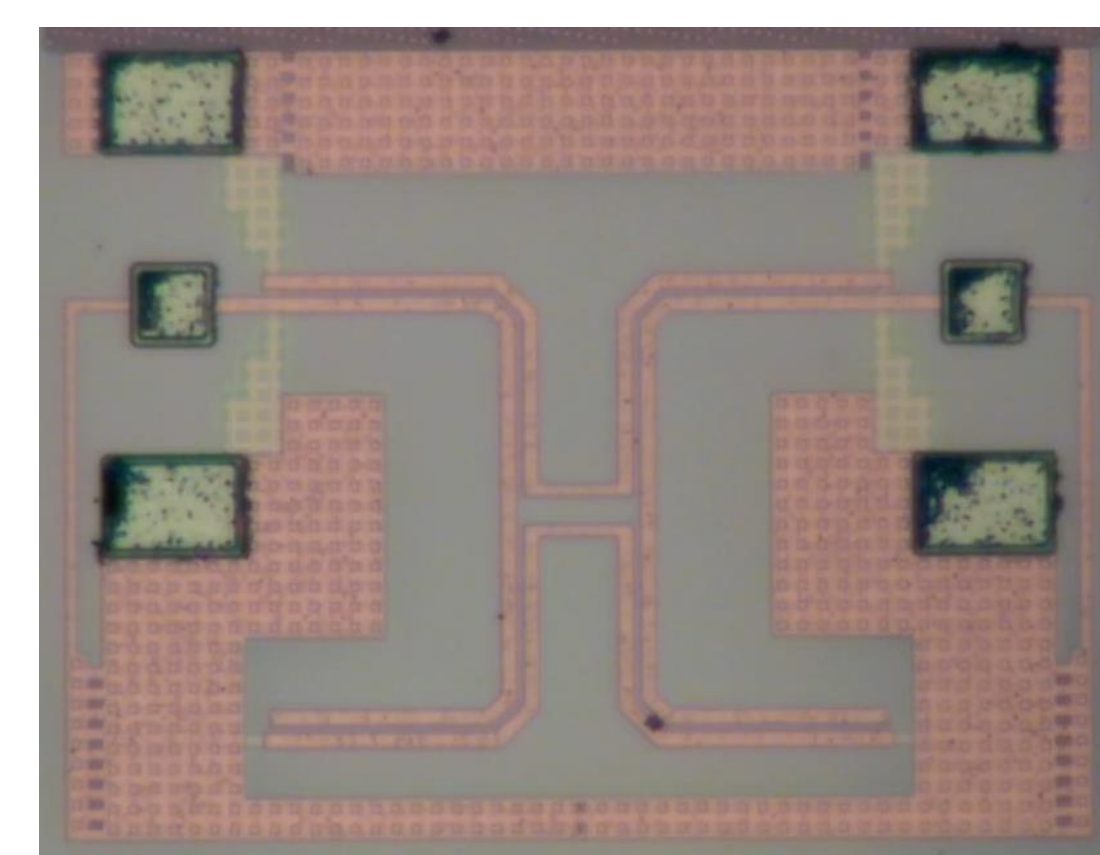
- Chip micrograph



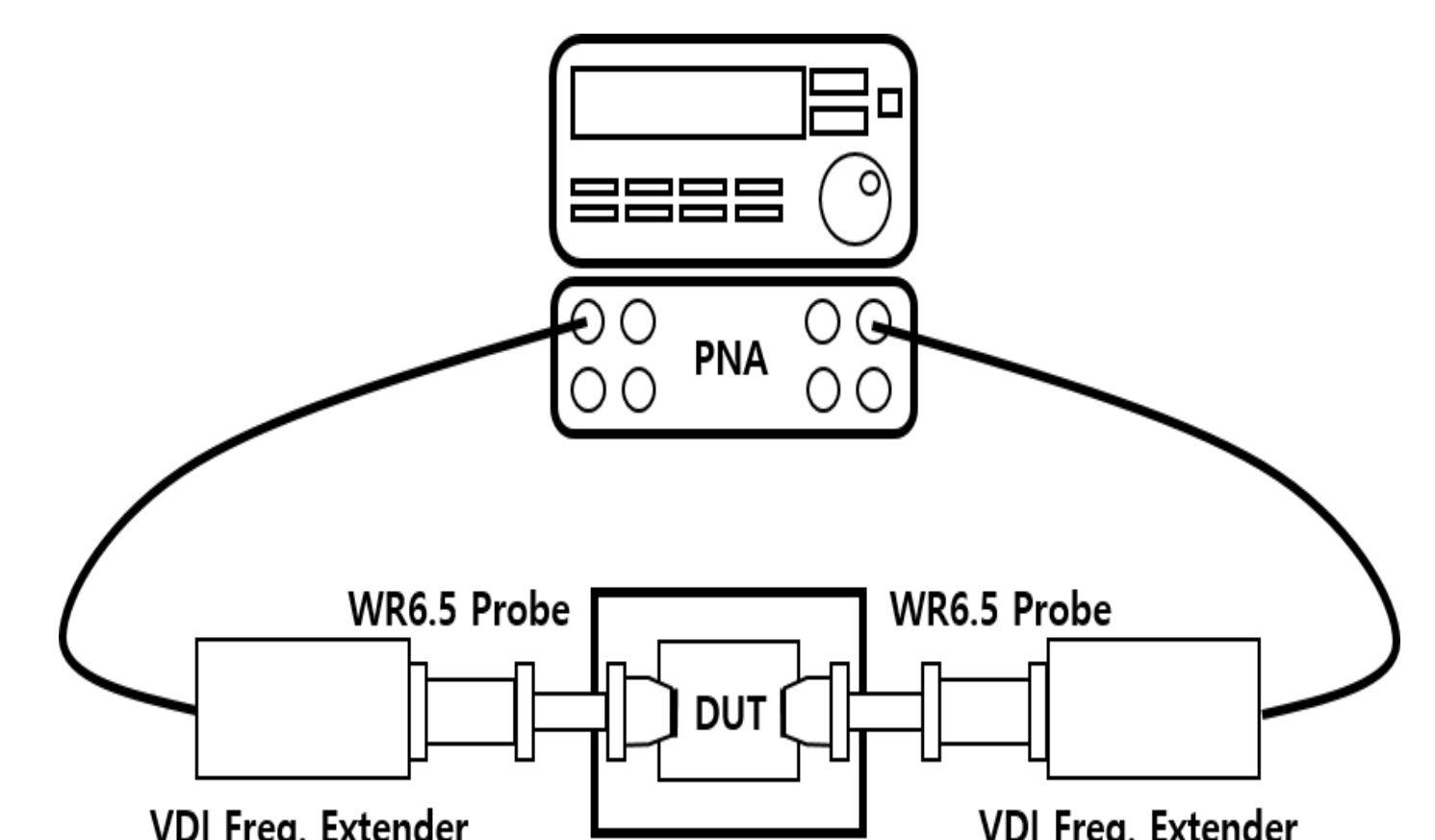
<Insertion loss>



<Port-Port Isolation>

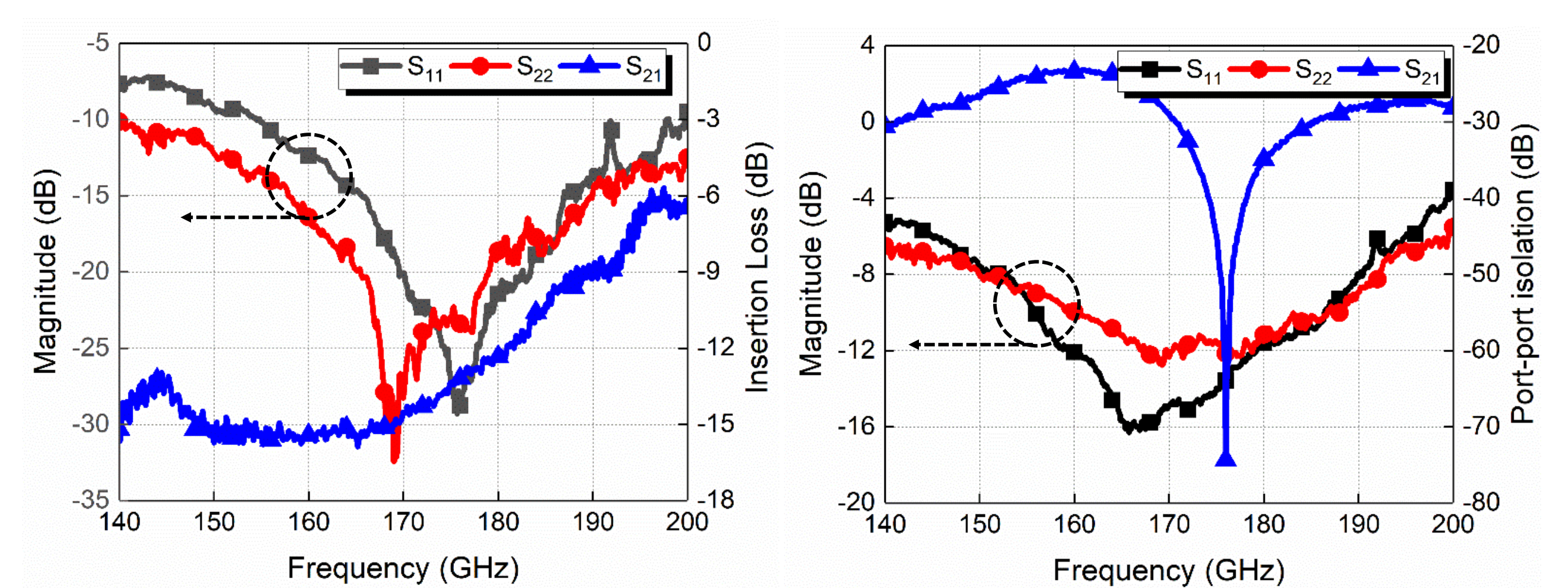


<Balun test pattern>



<Measurement Setup>

- Measurement Results



<S-parameter Results>

- Differences between simulated and measured results were induced by the incorrect balun dimensions and the wire bonding added during the measurement stage

Conclusion

- A compact size and low loss 4-way power combiner using capacitive loading technique is proposed for the D-band high power transmitter

< Acknowledge >

- This work was supported by NRF grant funded by MSIT (No. RS-2023-00219725)
- The chip fabrication and EDA tool were partially supported by IDEC, Korea.