Dual-band Reconfigurable RF Transmitter for 5G/6G Communications

Team members: Hojun kim, Eunji jung, Yeonghun yoon

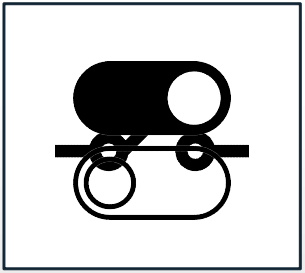
Prof: Seongwoog oh

Content

1. Introduction

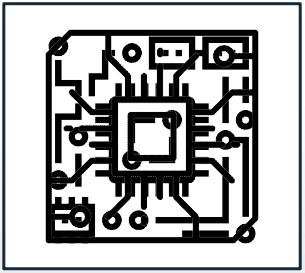
5 G & 6 G

Extended C-band



Dual – band

SPDT Switch

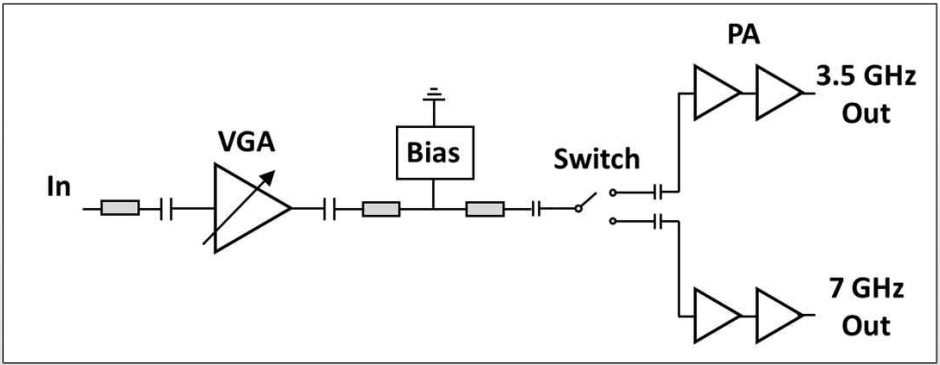


VGA

Two- stage PA

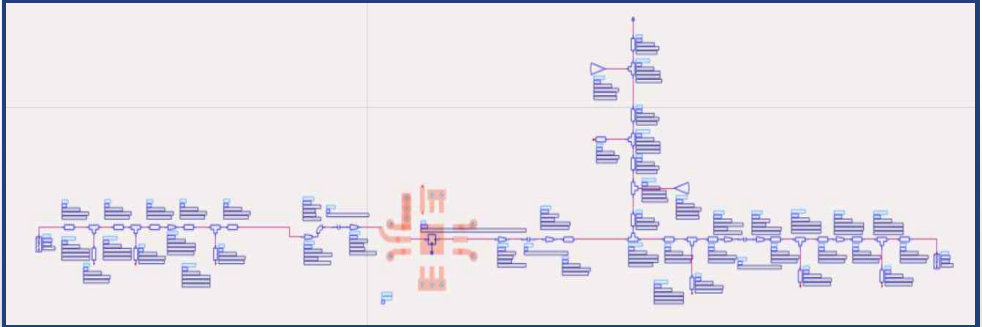
2. System Architecture

• **Block Diagram**



- **VGA, SPDT Switch, Drive PA, Main PA**

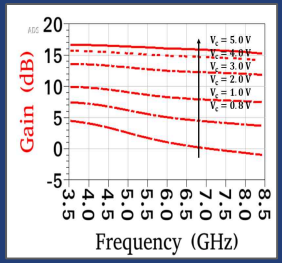
3.1. Circuit_VGA



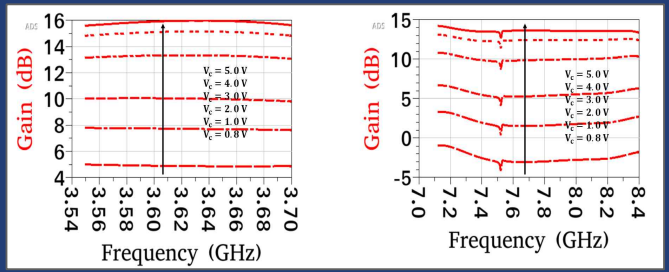
Full schematic circuit

3.1. Circuit_VGA

Before matching

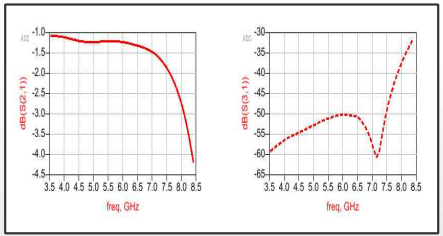


After matching

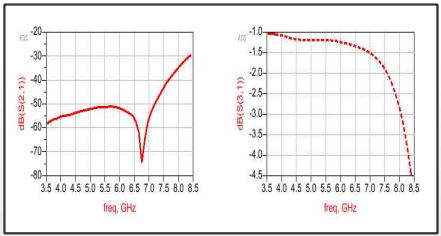


3.2. SPDT Switch

- **Control Voltage = 0V**

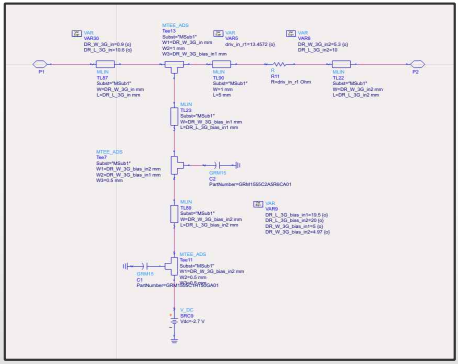


- **Control Voltage = 3V**

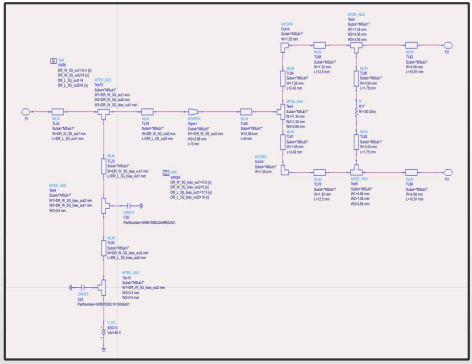


3.3. Circuit_Drive PA

- **3.6GHz band (3.55GHz to 3.7GHz)**



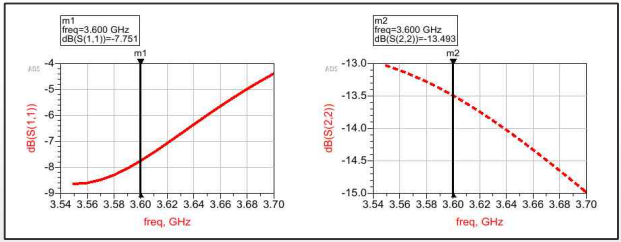
<Input Matching Circuit>



<Output Matching Circuit>

3.3. Circuit_Drive PA

- 3.6GHz band (3.55GHz to 3.7GHz)



< Input&Output Return Loss >

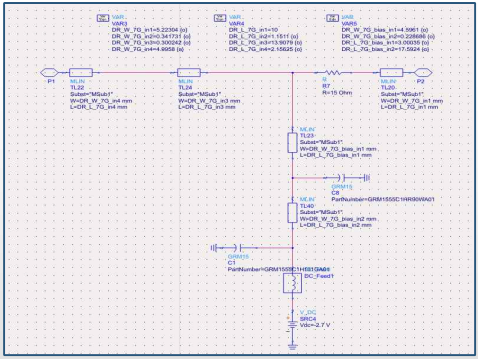
< Gain>

- Input Return Loss: -7.75 dB
- Output Return Loss : -13.49 dB

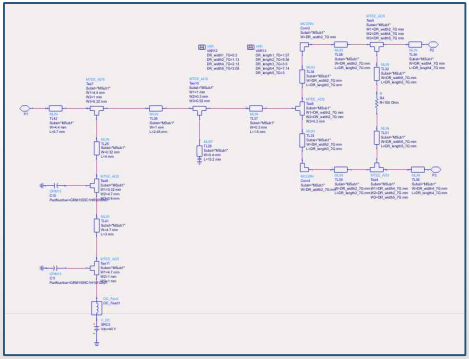
- Gain: 14.2 dB

3.3. Circuit_Drive PA

- **7.7GHz band (7.1GHz to 8.4GHz)**



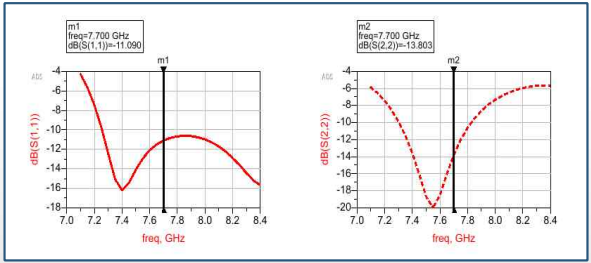
<Input Matching Circuit>



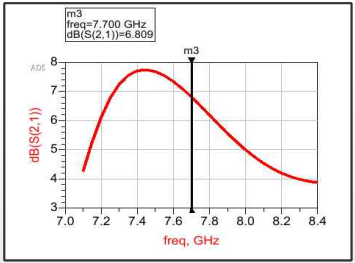
<Output Matching Circuit>

3.3. Circuit_Drive PA

- 7.7GHz band (7.1GHz to 8.4GHz)



< Input&Output Return Loss >

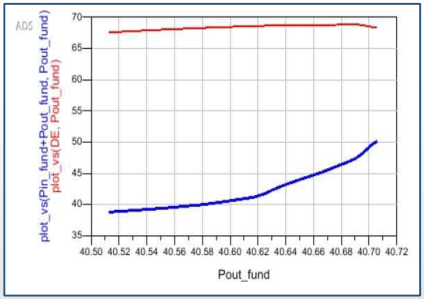


< Gain>

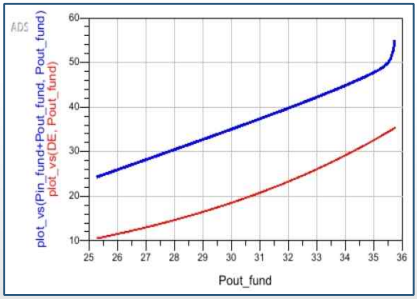
- Input Return Loss: -11.1 dB
- Output Return Loss : -13.8 dB

- Gain: 6.8 dB

3.4. Circuit_Main PA

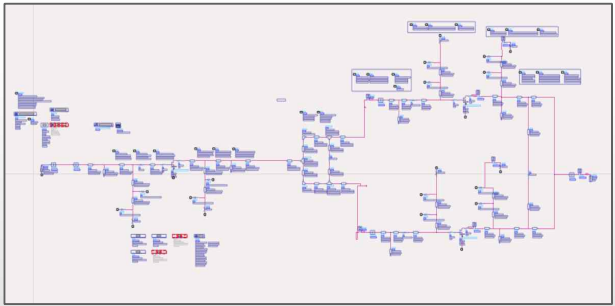


3.6 GHz band Efficiency

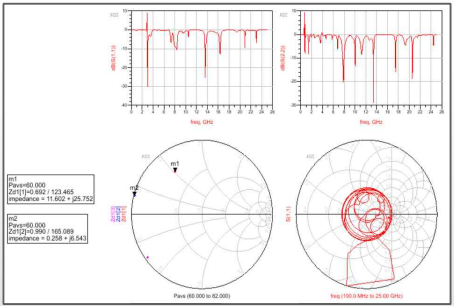


7.7 GHz band Efficiency

3.4. Circuit_Main PA



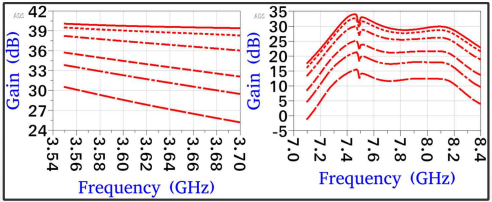
Main PA Full Schematic



Oscillating at 7.5GHz

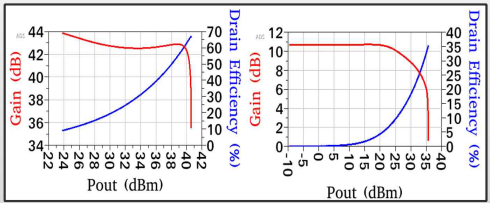
4. Conclusion

- **3.6GHz and 7.7GHz band Small Signal Gain response**



- 3.55 GHz ~ 3.7 GHz : 40.0 dB
- 7.125 GHz ~ 8.4 GHz : 34 dB

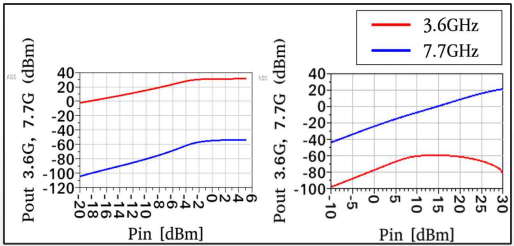
- **3.6GHz and 7.7GHz band Small Signal Gain vs Drain Efficiency**



- 68 % at 3.6 GHz
- 35.7 % at 7.7 GHz

4. Conclusion

- **3.6GHz and 7.7GHz band Pin vs Pout**



- 3.55 GHz ~ 3.7 GHz : 40.6 dBm

- 7.125 GHz ~ 8.4 GHz : 18.4 dBm

5. Reference

[1] S. Oh, K. -S. Seo and J. Oh, "Low Phase Noise Concurrent Dual-Band (5/7 GHz) CMOS VCO Using Gate Feedback on Nonuniformly Wound Transformer," in IEEE Microwave and Wireless Components Letters, vol. 31, no. 2, pp. 177-180, Feb. 2021.

[2] H. J. Qian, J. O. Liang, N. Zhu, P. Gao and X. Luo, "A 3–7GHz 4-element digital modulated polar phased-array transmitter with 0.35˚ phase resolution and 38.2% peak system efficiency," 2017 IEEE Custom Integrated Circuits Conference (CICC), Austin, TX, USA, 2017, pp. 1-4.

[3] J. G. Lee, T. H. Jang, G. H. Park, H. S. Lee, C. W. Byeon and C. S. Park, "A 60-GHz Four-Element Beam-Tapering Phased-Array Transmitter With a Phase-Compensated VGA in 65-nm CMOS," in IEEE Transactions on Microwave Theory and Techniques, vol. 67, no. 7, pp. 2998-3009, July 2019.