



Yi-Fan Tsao (Autor)

# Transceiver Technologies for Millimeter-Wave Beam Steering Applications



<https://cuvillier.de/de/shop/publications/8724>

Copyright:  
Cuvillier Verlag, Inhaberin Annette Jentsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen,  
Germany  
Telefon: +49 (0)551 54724-0, E-Mail: [info@cuvillier.de](mailto:info@cuvillier.de), Website: <https://cuvillier.de>

# List of Contents

Abstract .....	I
Zusammenfassung .....	II
List of Contents .....	2
Acknowledgements .....	4
List of Abbreviations.....	5
General.....	5
Symbols ( <i>e.g. for mathematical equations</i> ) .....	6
List of publications ( <i>cumulative case only</i> ).....	7
1. Introduction.....	8
1.1. Motivation.....	8
1.2. Requirements for beam steering mm-wave transceivers.....	14
1.3. State-of-the-Art in transceiver technology.....	16
1.4. Outline of dissertation.....	20
2. Design and Implementation of Transceivers.....	21
2.1. Transceiver system overview.....	21
2.2. SPDT switch design.....	22
2.2.1. Switch configurations.....	23
2.2.2. Design rules for optimizing SPDT performance .....	25
2.2.3. Analysis and Simulations .....	31
2.2.4. Technological implementation.....	42
2.2.5. Measurement Results .....	42
2.3. Low-Noise Power Amplifier (LNPA) Design .....	46
2.3.1. Concept of LNPA.....	46
2.3.2. Analysis and Simulations .....	48
2.3.3. Technological implementation.....	53
2.3.4. Measurement Results .....	55
2.4. Ka-band Dual-band Power Amplifier Design.....	62
2.4.1. Concept of dual-band power amplifier.....	63
2.4.2. Analysis and simulations.....	65
2.4.3. Measurement results.....	76
3. Antenna design and module integration.....	84
3.1. Antenna configurations.....	84
3.1.1. Dual exponential taper slot antenna (DE TSA) design and simulation.....	89

---

3.1.2. Technological implementation and measurement results.....	93
3.2. Beam steering network configurations.....	98
3.2.1. Butler matrix with Single-Pole-Four-Throw switch.....	101
3.2.2. Technological implementation and measurement results.....	107
3.3. Module integration and characterization of complete module.....	108
4. Conclusion and future works .....	118
5. References .....	121