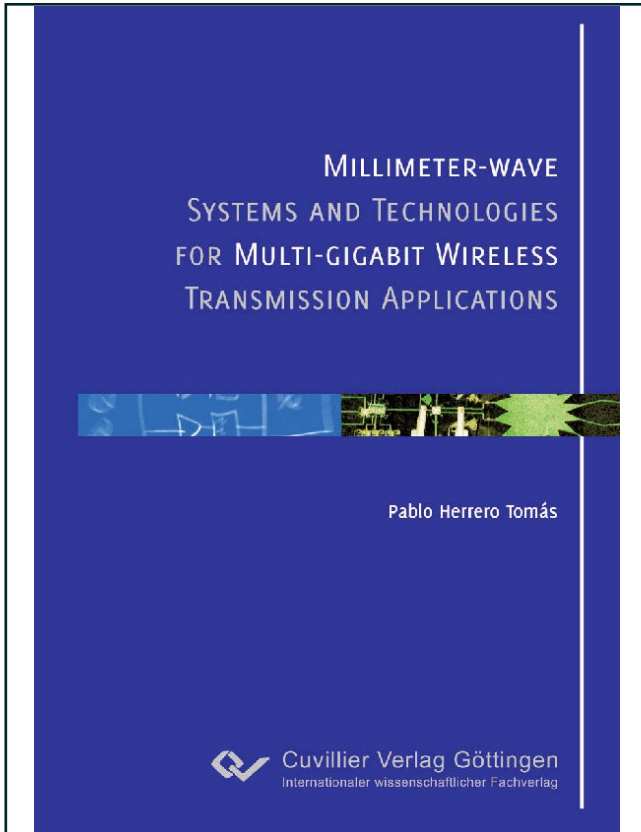




Pablo Herrero Tomás (Autor)

Millimeter-wave Systems and Technologies for Multi-gigabit Wireless Transmission Applications



<https://cuvillier.de/de/shop/publications/622>

Copyright:

Cuvillier Verlag, Inhaberin Annette Jentsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen, Germany

Telefon: +49 (0)551 54724-0, E-Mail: info@cuvillier.de, Website: <https://cuvillier.de>

Contents

Abstract	ix
Kurzfassung	xi
Glossary	xvi
1 Introduction	1
1.1 Wireless Communications	1
1.1.1 Millimeter-wave frequencies and applications	1
1.2 Millimeter-wave systems	2
1.3 Outline of the thesis	3
1.4 Contributions	4
2 Interconnection Technology	7
2.1 Introduction	7
2.2 State of the art in high frequency interconnections	8
2.2.1 Coaxial interconnection	8
2.2.2 Millimeter-wave probe interconnection	10
2.3 Interconnections for upper millimeter-wave frequencies	11
2.3.1 A WR6 waveguide to microstrip transition	11
2.3.2 Substrate selection	13
2.3.3 Theoretical electromagnetic modeling	14
2.3.4 Transition characterization	26
2.4 Comparative analysis of state of the art interconnections	28
2.5 Conclusions	28

3	Planar Antenna Elements for Millimeter-wave Frequencies	31
3.1	Introduction	31
3.2	Technology considerations	32
3.3	Patch antennas	32
3.3.1	Circular polarized patch antenna design	33
3.3.2	Comparison of circular and linear polarized patches	34
3.4	Omnidirectional antennas	34
3.5	A planar antipodal dipole antenna	36
3.5.1	Modeling of the antipodal dipole antenna	38
3.6	Conclusions	40
4	Antenna Measurement System for Millimeter-wave Antennas	41
4.1	Introduction	41
4.2	Measurement system description	42
4.3	Horn antenna	42
4.4	Measurements of planar antennas at 122 GHz	44
4.4.1	Patch antenna	45
4.4.2	Monopole antenna	46
4.4.3	Dipole antenna	46
4.5	System adaptation to the 60 GHz band	49
4.6	60 GHz measurement system verification with the patch antenna	49
4.7	Conclusions	51
5	Patch Antenna Arrays for 'Hot' Millimeter-wave Applications	53
5.1	Introduction	53
5.2	Patch Antenna Arrays at D band	54
5.2.1	Planar antenna array for multi-gigabit communications	54
5.2.2	Patch antenna array for automotive radar	56
5.2.3	Scanning and angle determination arrays for sensing	58
5.3	Patch Antenna Arrays at V band	60
5.3.1	Planar antenna array for ultrafast data transfer	60
5.3.2	Circular polarized array for high throughput WLAN	62
5.4	Conclusions	64
6	Beamforming Devices for Quality of Service Enabled Communication Systems	65
6.1	Introduction	65
6.2	The Quality of Service issue	66
6.3	Beamforming	67

6.4	The Rotman lens	68
6.5	Beamforming planar antenna array for radar	69
6.6	Beamforming for ultrafast communication systems	70
6.6.1	Rotman lens with large beamforming angles	70
6.6.2	Patch antenna array	71
6.6.3	Patch array with integrated switch	73
6.6.4	Dipole antenna array	74
6.7	Full scan two plane configurable beamforming structures	76
6.7.1	Characterization of a prototype for full scan beamforming	79
6.8	Conclusions	80
7	Millimeter-wave Front Ends for Ultrafast Communications	83
7.1	Introduction	83
7.2	Qstream project background	84
7.3	A complete 60 GHz system demonstrator with QoS: The System Enabler . . .	84
7.3.1	Use cases for System Enabler	85
7.3.2	Frequency plan and power budget	85
7.3.3	System architecture	90
7.3.4	System simulation	92
7.3.5	Simulation of the impact of RF impairments on system performance .	93
7.4	Characterization of the front end	96
7.4.1	Technology	96
7.4.2	Wire bond interconnection	97
7.4.3	Test structures	99
7.4.4	Integration and final assembly	105
7.5	Measurements of the RF demonstrator	106
7.6	Baseband subsystem integration	107
7.7	Conclusions	108
8	Conclusions	109
8.1	General conclusions	109
8.2	Future work	110
8.2.1	Components for future front ends	111
8.2.2	122GHz integrated receiver	111
	Bibliography	113
	List of publications	121