

Contents

Notation	<i>page</i> vii
Abbreviations	viii
Preface	xii
1 Overview of power amplifier modelling	1
1.1 Introduction	1
1.2 Power amplifier modelling basics	2
1.3 System-level power amplifier models	10
1.4 Circuit-level power amplifier models	20
References	23
2 Properties of behavioural models	27
2.1 Introduction	27
2.2 Model-structure-based properties of behavioural models	29
2.3 Application-based model properties	30
2.4 Amplifier-based model properties	35
2.5 Amplifier characterisation	45
References	79
3 Memoryless nonlinear models	86
3.1 Introduction	86
3.2 Overview of memoryless behavioural models	90
3.3 A comparison of behavioural models based on PA performance prediction	95
3.4 Complex power series model	99
3.5 Saleh models	103
3.6 Modified Saleh models	106
3.7 Fourier series model	116
3.8 Bessel–Fourier models	117
3.9 Hetrakul and Taylor model	125
3.10 Berman and Mahle model	127
3.11 The Wiener expansion	127
3.12 Other comparative considerations	131
References	133

vi	Contents
4	Nonlinear models with linear memory 136
4.1	Introduction 136
4.2	Two-box models 136
4.3	Three-box models 145
4.4	Parallel-cascade models 157
4.5	Summary 160
	References 161
5	Nonlinear models with nonlinear memory 163
5.1	Introduction 163
5.2	Memory polynomial model 164
5.3	Time-delay neural network model 168
5.4	Nonlinear autoregressive moving-average model 174
5.5	Parallel-cascade Wiener model 179
5.6	Volterra-series-based models 184
5.7	State-space-based model 199
	References 212
6	Validation and comparison of PA models 215
6.1	Introduction 215
6.2	General-purpose metric 215
6.3	Figures of merit based on real-world test signals 220
	References 232
7	Aspects of system simulation 233
7.1	Introduction 233
7.2	Some relevant simulation terminology 234
7.3	Analogue-signal behavioural simulators for wireless communication systems 235
7.4	Figure of merit considerations in behavioural simulations 238
7.5	Circuit-level techniques 239
7.6	System-level techniques 242
7.7	Digital-logic simulation 244
7.8	Analogue signal – representation, sampling and processing considerations 244
7.9	Heterogeneous simulation 248
	References 250
	Appendix A Recent wireless standards 253
	Appendix B Authors and contributors 260
	Index 262