Noise Shaping All Digital Phase Locked Loops Modeling Simulation Analysis And Design Analog Circuits And Signal Processing

This book describes the design and implementation of an electronic subsystem called the frequency synthesizer, which is a very important building block for any wireless transceiver. The discussion includes several new techniques for the design of such a subsystem which include the usage modes of the wireless device, including its support for several leading-edge wireless standards. This new perspective for designing such a demanding subsystem is based on the fact that optimizing the performance of a complete system is not always achieved by optimizing the performance of its building blocks separately. This book provides “hands-on” examples of this sort of co-design of optimized subsystems, which can make the vision of an always-best-connected scenario a reality.

Advances in Analog and RF IC Design for Wireless Communication Systems gives technical introductions to the latest and most significant topics in the area of circuit design of analog/RF ICs for wireless communication systems, emphasizing wireless infrastructure rather than handsets. The book ranges from very high performance circuits for complex wireless infrastructure systems to selected highly integrated systems for handsets and mobile devices. Coverage includes power amplifiers, low-noise amplifiers, modulators, analog-to-digital converters (ADCs) and digital-to-analog converters (DACs), and even single-chip radios. This book offers a quick grasp of emerging research topics in RF integrated circuit design and their potential applications, with brief introductions to key topics followed by references to specialist papers for further reading. All of the chapters, compiled by editors well known in their field, have been authored by renowned experts in the subject. Each includes a complete introduction, followed by the relevant most significant and recent results on the topic at hand. This book gives researchers in industry and universities a quick grasp of the most important developments in analog and RF integrated circuit design. Emerging research topics in RF IC design and its potential application Case studies and practical implementation examples Covers fundamental building blocks of a cellular base station system and satellite infrastructure Insights from the experts on the design and the technology trade-offs, the challenges and open questions they often face References to specialist papers for further reading

The digital subscriber line (DSL) industry is expanding rapidly and a technology once thought to be only transitional will soon clear $100 billion in total annual service revenue. From the world’s leading DSL experts, Implementation and Application of DSL Technologies builds upon the theory presented in Fundamentals of DSL Technologies to address issues fundamental to the success of DSL technology, including those that sustain DSL development, constraints, and challenges. This highly practical text peers into the blossoming sub-industries, all born of the DSL. The editors lead with a discussion on splitter circuits and micro-filters and continue by addressing digital chipsets and the capabilities required to mix and match them with various other components. Since testing has become an industry in its own, several chapters describe the various types of testing necessary for service qualification, the evolution of
testing and provisioning of services from plain old telephone service, loop qualification, and regulator’s decree of spectrum management. The book gives adequate coverage of DSM technology and describes networks for multiple applications in video, telephony, and Internet data areas and the associated network architectures. In addition, a section on security discusses packet transfer mechanism and voice-over DSL. Offering a vast array of information not currently in the public domain, Implementation and Application of DSL Technologies provides a rigorous survey of DSL applications that illustrates the profound effect this technology is having on the communications industry. When combined with Fundamentals of DSL Technology, this is the most comprehensive and authoritative source of information on DSL. Modern transceiver systems require diversified design aspects as various radio and sensor applications have emerged. Choosing the right architecture and understanding interference and linearity issues are important for multi-standard cellular transceivers and software-defined radios. A millimeter-wave complementary metal–oxide–semiconductor (CMOS) transceiver design for multi-Gb/s data transmission is another challenging area. Energy-efficient short-range radios for body area networks and sensor networks have recently received great attention. To meet different design requirements, gaining good system perspectives is important. Wireless Transceiver Circuits: System Perspectives and Design Aspects offers an in-depth look at integrated circuit (IC) design for modern transceiver circuits and wireless systems. Ranging in scope from system perspectives to practical circuit design for emerging wireless applications, this cutting-edge book: Provides system design considerations in modern transceiver design Covers both systems and circuits for the millimeter-wave transceiver design Introduces four energy-efficient short-range radios for biomedical and wireless connectivity applications Emphasizes key building blocks in modern transceivers and transmitters, including frequency synthesizers and digital-intensive phase modulators Featuring contributions from renowned international experts in industry and academia, Wireless Transceiver Circuits: System Perspectives and Design Aspects makes an ideal reference for engineers and researchers in the area of wireless systems and circuits. The book will address the-state-of-the-art in integrated circuit design in the context of emerging systems. New exciting opportunities in body area networks, wireless communications, data networking, and optical imaging are discussed. Emerging materials that can take system performance beyond standard CMOS, like Silicon on Insulator (SOI), Silicon Germanium (SiGe), and Indium Phosphide (InP) are explored. Three-dimensional (3-D) CMOS integration and co-integration with sensor technology are described as well. The book is a must for anyone serious about circuit design for future technologies. The book is written by top notch international experts in industry and academia. The intended audience is practicing engineers with integrated circuit background. The book will be also used as a recommended reading and supplementary material in graduate course curriculum. Intended audience is professionals working in the integrated circuit design field. Their job titles might be: design engineer, product manager, marketing manager, design team leader, etc. The book will be also used by graduate students. Many of the chapter authors are University Professors. Many digital control circuits in current literature are described using analog transmittance. This may not always be acceptable, especially if the sampling frequency
and power transistor switching frequencies are close to the band of interest. Therefore, a digital circuit is considered as a digital controller rather than an analog circuit. This helps to avoid errors and instability in high frequency components. Digital Signal Processing in Power Electronics Control Circuits covers problems concerning the design and realization of digital control algorithms for power electronics circuits using digital signal processing (DSP) methods. This book bridges the gap between power electronics and DSP. The following realizations of digital control circuits are considered: digital signal processors, microprocessors, microcontrollers, programmable digital circuits. Discussed in this book is signal processing, starting from analog signal acquisition, through its conversion to digital form, methods of its filtration and separation, and ending with pulse control of output power transistors. The book is focused on two applications for the considered methods of digital signal processing: an active power filter and a digital class D power amplifier. The major benefit to readers is the acquisition of specific knowledge concerning discussions on the processing of signals from voltage or current sensors using a digital signal processor and to the signals controlling the output inverter transistors. Included are some Matlab examples for illustration of the considered problems.

Designed to make life a little easier by providing all the theoretical background necessary to understand sound reproduction, backed up with practical examples. Specialist terms - both musical and physical - are defined as they occur and plain English is used throughout. Analog and digital audio are considered as alternatives, and the advantages of both are stressed. Audio is only as good as the transducers employed, and consequently microphone and loudspeaker technology also feature heavily - making this the most comprehensive, up-to-date text currently available on all aspects of sound reproduction.

Noise-Shaping All-Digital Phase-Locked Loops: Modeling, Simulation, Analysis and Design
Springer Science & Business Media

Mixed-Signal Circuits offers a thoroughly modern treatment of integrated circuit design in the context of mixed-signal applications. Featuring chapters authored by leading experts from industry and academia, this book: Discusses signal integrity and large-scale simulation, verification, and testing Demonstrates advanced design techniques that enable digital circuits and sensitive analog circuits to coexist without any compromise Describes the process technology needed to address the performance challenges associated with developing complex mixed-signal circuits Deals with modeling topics, such as reliability, variability, and crosstalk, that define pre-silicon design methodology and trends, and are the focus of companies involved in wireless applications Develops methods to move analog into the digital domain quickly, minimizing and eliminating common trade-offs between performance, power consumption, simulation time, verification, size, and cost Details approaches for very low-power performances, high-speed interfaces, phase-locked loops (PLLs), voltage-controlled oscillators (VCOs), analog-to-digital converters (ADCs), and biomedical filters Delineates the respective parts of a full system-on-chip (SoC), from the digital parts to the baseband blocks, radio frequency (RF) circuitries, electrostatic-discharge (ESD) structures, and built-in self-test (BIST)
architectures Mixed-Signal Circuits explores exciting opportunities in wireless communications and beyond. The book is a must for anyone involved in mixed-signal circuit design for future technologies.

“This book describes these new technologies (circuit design and software-oriented approaches) in all aspects of radio transmitter design including wireless telecommunication, satellite, radar, military and other specific applications”--Provided by publisher.

This thesis presents a 3.6-GHz, 500-kHz bandwidth digital [delta][sigma] frequency synthesizer architecture that leverages a recently invented noise-shaping time-to-digital converter (TDC) and an all-digital quantization noise cancellation technique to achieve excellent in-band and out-of-band phase noise, respectively. In addition, a passive digital-to-analog converter (DAC) structure is proposed as an efficient interface between the digital loop filter and a conventional hybrid voltage-controlled oscillator (VCO) to create a digitally-controlled oscillator (DCO). An asynchronous divider structure is presented which lowers the required TDC range and avoids the divide-value-dependent delay variation. The prototype is implemented in a 0.13-am CMOS process and its active area occupies 0.95 mm². Operating under 1.5 V, the core parts, excluding the VCO output buffer, dissipate 26 mA. Measured phase noise at 3.67 GHz achieves -108 dBc/Hz and -150 dBc/Hz at 400 kHz and 20 MHz, respectively. Integrated phase noise at this carrier frequency yields 204 fs of jitter (measured from 1 kHz to 40 MHz). In addition, a 3.2-Gb/s delay-locked loop (DLL) in a 0.18-[mu]m CMOS for chip-to-chip communications is presented. By leveraging the fractional-N synthesizer technique, this architecture provides a digitally-controlled delay adjustment with a fine resolution and infinite range. The provided delay resolution is less sensitive to the process, voltage, and temperature variations than conventional techniques. A new [delta][sigma] modulator enables a compact and low-power implementation of this architecture. A simple bang-bang detector is used for phase detection. The prototype operates at a 1.8-V supply voltage with a current consumption of 55 mA. The phase resolution and differential rms clock jitter are 1.4 degrees and 3.6 ps, respectively.

This book is based on the 18 tutorials presented during the 26th workshop on Advances in Analog Circuit Design. Expert designers present readers with information about a variety of topics at the frontier of analog circuit design, with specific contributions focusing on hybrid ADCs, smart sensors for the IoT, sub-1V and advanced-node analog circuit design. This book serves as a valuable reference to the state-of-the-art, for anyone involved in analog circuit research and development.

The book offers unique insight into the modern world of wireless communication that included 5G generation, implementation in Internet of Things (IoT), and emerging biomedical applications. To meet different design requirements, gaining perspective on systems is important. Written by international experts in industry and academia, the intended audience is practicing engineers with some
electronics background. It presents the latest research and practices in wireless communication, as industry prepares for the next evolution towards a trillion interconnected devices. The text further explains how modern RF wireless systems may handle such a large number of wireless devices. Covers modern wireless technologies (5G, IoT), and emerging biomedical applications Discusses novel RF systems, CMOS low power circuit implementation, antennae arrays, circuits for medical imaging, and many other emerging technologies in wireless co-space. Written by a mixture of top industrial experts and key academic professors.

In less than one decade after their introduction into radio-frequency applications, digital fractional-N phase-locked loops (PLLs) have become a relevant topic in microelectronic research and a practical solution for products. In addition to the well-known advantages, such as their silicon area occupation scaling as technology node and their easier portability to new nodes, digital PLLs enable easy and low-cost implementation of calibration techniques, which substantially reduce spurious tones and remove other major analog impairments. In wideband PLLs, the ultimate level of spur performance is often bounded by the time resolution and the linearity of the time-to-digital converter within the digital PLL. Methods for mitigating its nonlinearity such as those based on element randomization and large-scale dithering are discussed. The use of fractional-N dividers based on digital-to-time converters, as a means to relax the design of the time-to-digital converter, is also reviewed. This concept is extended to the limit case of a single-bit time-to-digital converter, which provides best PLL noise-power trade-off with good spur performance.

This book focuses on the design of a Mega-Gray (a standard unit of total ionizing radiation) radiation-tolerant ps-resolution time-to-digital converter (TDC) for a light detection and ranging (LIDAR) system used in a gamma-radiation environment. Several radiation-hardened-by-design (RHBD) techniques are demonstrated throughout the design of the TDC and other circuit techniques to improve the TDC's resolution in a harsh environment are also investigated. Readers can learn from scratch how to design a radiation-tolerant IC. Information regarding radiation effects, radiation-hardened design techniques and measurements are organized in such a way that readers can easily gain a thorough understanding of the topic. Readers will also learn the design theory behind the newly proposed delta-sigma TDC. Readers can quickly acquire knowledge about the design of radiation-hardened bandgap voltage references and low-jitter relaxation oscillators, which are introduced in the content from a designer's perspective. · Discusses important aspects of radiation-tolerant analog IC design, including realistic applications and radiation effects on ICs; · Demonstrates radiation-hardened-by-design techniques through a design-test-radiation assessment practice; · Describes a new type of Time-to-Digital (TDC) converter designed for radiation-tolerant application; · Explains the design and measurement of all functional blocks (e.g., bandgap reference, relaxation...
oscillator) in the TDC.

This modern, pedagogic textbook from leading author Behzad Razavi provides a comprehensive and rigorous introduction to CMOS PLL design, featuring intuitive presentation of theoretical concepts, extensive circuit simulations, over 200 worked examples, and 250 end-of-chapter problems. The perfect text for senior undergraduate and graduate students.

This book presents a novel approach to the analysis and design of all-digital phase-locked loops (ADPLLs), technology widely used in wireless communication devices. The authors provide an overview of ADPLL architectures, time-to-digital converters (TDCs) and noise shaping. Realistic examples illustrate how to analyze and simulate phase noise in the presence of sigma-delta modulation and time-to-digital conversion. Readers will gain a deep understanding of ADPLLs and the central role played by noise-shaping. A range of ADPLL and TDC architectures are presented in unified manner. Analytical and simulation tools are discussed in detail. Matlab code is included that can be reused to design, simulate and analyze the ADPLL architectures that are presented in the book.

Achieve enhanced performance with this guide to cutting-edge techniques for digitally-assisted analog and analog-assisted digital integrated circuit design. • Discover how architecture and circuit innovations can deliver improved performance in terms of speed, density, power, and cost • Learn about practical design considerations for high-performance scaled CMOS processes, FinFet devices and architectures, and the implications of FD SOI technology • Get up to speed with established circuit techniques that take advantage of scaled CMOS process technology in analog, digital, RF and SoC designs, including digitally-assisted techniques for data converters, DSP enabled frequency synthesizers, and digital controllers for switching power converters. With detailed descriptions, explanations, and practical advice from leading industry experts, this is an ideal resource for practicing engineers, researchers, and graduate students working in circuit design.

Time-mode circuits, where information is represented by time difference between digital events, offer a viable and technology-friendly means to realize mixed-mode circuits and systems in nanometer complementary metal-oxide semiconductor (CMOS) technologies. Various architectures of time-based signal processing and design techniques of CMOS time-mode circuits have emerged; however, an in-depth examination of the principles of time-based signal processing and design techniques of time-mode circuits has not been available—until now. CMOS Time-Mode Circuits and Systems: Fundamentals and Applications is the first book to deliver a comprehensive treatment of CMOS time-mode circuits and systems. Featuring contributions from leading experts, this authoritative text contains a rich collection of literature on time-mode circuits and systems. The book begins by presenting a critical comparison of voltage-mode, current-mode, and time-mode signaling for mixed-mode signal processing and
then: Covers the fundamentals of time-mode signal processing, such as voltage-to-time converters, all-digital phase-locked loops, and frequency synthesizers. Investigates the performance characteristics, architecture, design techniques, and implementation of time-to-digital converters. Discusses time-mode delta-sigma-based analog-to-digital converters, placing a great emphasis on time-mode quantizers. Includes a detailed study of ultra-low-power integrated time-mode temperature measurement systems. CMOS Time-Mode Circuits and Systems: Fundamentals and Applications provides a valuable reference for circuit design engineers, hardware system engineers, graduate students, and others seeking to master this fast-evolving field.

This concise overview of digital signal generation will introduce you to powerful, flexible, and practical digital waveform generation techniques. These techniques, based on phase-accumulation and phase-amplitude mapping, will enable you to generate sinusoidal and arbitrary real-time digital waveforms to fit your desired waveshape, frequency, phase offset and amplitude, and to design bespoke digital waveform generation systems from scratch. Including a review of key definitions, a brief explanatory introduction to classical analogue waveform generation and its basic conceptual and mathematical foundations, coverage of recursion, DDS, IDFT and dynamic waveshape and spectrum control, a chapter dedicated to detailed examples of hardware design, and accompanied by downloadable Mathcad models created to help you explore ‘what if?’ design scenarios, this is essential reading for practitioners in the digital signal processing community, and for students who want to understand and apply digital waveform synthesis techniques.

A new and innovative paradigm for RF frequency synthesis and wireless transmitter design. Learn the techniques for designing and implementing an all-digital RF frequency synthesizer. In contrast to traditional RF techniques, this innovative book sets forth digitally intensive design techniques that lead the way to the development of low-cost, low-power, and highly integrated circuits for RF functions in deep submicron CMOS processes. Furthermore, the authors demonstrate how the architecture enables readers to integrate an RF front-end with the digital back-end onto a single silicon die using standard ASIC design flow. Taking a bottom-up approach that progressively builds skills and knowledge, the book begins with an introduction to basic concepts of frequency synthesis and then guides the reader through an all-digital RF frequency synthesizer design: Chapter 2 presents a digitally controlled oscillator (DCO), which is the foundation of a novel architecture, and introduces a time-domain model used for analysis and VHDL simulation. Chapter 3 adds a hierarchical layer of arithmetic abstraction to the DCO that makes it easier to operate algorithmically. Chapter 4 builds a phase correction mechanism around the DCO such that the system’s frequency drift or wander performance matches that of the stable external frequency reference. Chapter 5 presents an application of the all-digital RF synthesizer. Chapter 6 describes the behavioral modeling and
simulation methodology used in design. The final chapter presents the implementation of a full transmitter and experimental results. The novel ideas presented here have been implemented and proven in two high-volume, commercial single-chip radios developed at Texas Instruments: Bluetooth and GSM. While the focus of the book is on RF frequency synthesizer design, the techniques can be applied to the design of other digitally assisted analog circuits as well. This book is a must-read for students and engineers who want to learn a new paradigm for RF frequency synthesis and wireless transmitter design using digitally intensive design techniques.

The latest frequency synthesis techniques, including sigma-delta, Diophantine, and all-digital Sigma-delta is a frequency synthesis technique that has risen in popularity over the past decade due to its intensely digital nature and its ability to promote miniaturization. A continuation of the popular Frequency Synthesis by Phase Lock, Second Edition, this timely resource provides a broad introduction to sigma-delta by pairing practical simulation results with cutting-edge research. Advanced Frequency Synthesis by Phase Lock discusses both sigma-delta and fractional-n—the still-in-use forerunner to sigma-delta—employing Simulink® models and detailed simulations of results to promote a deeper understanding. After a brief introduction, the book shows how spurs are produced at the synthesizer output by the basic process and different methods for overcoming them. It investigates how various defects in sigma-delta synthesis contribute to spurs or noise in the synthesized signal. Synthesizer configurations are analyzed, and it is revealed how to trade off the various noise sources by choosing loop parameters. Other sigma-delta synthesis architectures are then reviewed. The Simulink simulation models that provided data for the preceding discussions are described, providing guidance in making use of such models for further exploration. Next, another method for achieving wide loop bandwidth simultaneously with fine resolution—the Diophantine Frequency Synthesizer—is introduced. Operation at extreme bandwidths is also covered, further describing the analysis of synthesizers that push their bandwidths close to the sampling-frequency limit. Lastly, the book reviews a newly important technology that is poised to become widely used in high-production consumer electronics—all-digital frequency synthesis. Detailed appendices provide in-depth discussion on various stages of development, and many related resources are available for download, including Simulink models, MATLAB® scripts, spreadsheets, and executable programs. All these features make this authoritative reference ideal for electrical engineers who want to achieve an understanding of sigma-delta frequency synthesis and an awareness of the latest developments in the field.

With the advent of integrated circuits (IC), digital systems have become widely used in modern electronic devices, including communications and measurement equipment. Direct Digital Frequency Synthesizers (DDS) are used in communications as transmitter exciters and local oscillators in receivers. The advantages are superior frequency stability, the same as that of the driving
clock oscillator, and short switching times. The difficulties are lower output frequencies and rather large spurious signals. Compiled for practicing engineers who do not have the prerequisite of a specialist's knowledge in Direct Digital Frequency Synthesizers (DDS), this collection of 40 important reprinted papers and 9 never-before published contributions presents a comprehensive introduction to DDS properties and a clear understanding of actual devices. The information in this volume can lead to easier computer simulations and improved designs. Featured topics include: * Discussion of principles and state of the art of wide-range DDS * Investigation of spurious signals in DDS * Combination of DDS with Phase Lock Loops (PLL) * Examination of phase and background 'noise' in DDS * Introduction to Digital to Analog Conversion (DAC) * Analysis of mathematics of quasiperiodic omission of pulses DDFS can also serve as a textbook for students seeking essential background theory.

In this dissertation, time-based signal processing techniques and their applications in oversampling and noise-shaping data converters are examined. These techniques demonstrate the ability to shift the burden of high performance analog circuits from the compressed voltage-domain to the augmented time-domain. First, the potential of high order noise-shaping and phase-domain feedback in time-to-digital converters (TDCs) is explored. A prototype phase reference, second-order continuous-time delta-sigma TDC for sensor applications was fabricated in 90nm CMOS and achieves 64 dB dynamic range in 1MHz signal bandwidth. Second, an ultra-high performance oscillator-based delta-sigma modulator architecture is investigated. The proposed circuit is a third-order continuous-time PLL-Based Delta-Sigma Modulator with simulated 77 dB SNDR in 40MHz signal bandwidth with OSR of 16, and is fabricated in 65nm CMOS.

Micro-electronics and so integrated circuit design are heavily driven by technology scaling. The main engine of scaling is an increased system performance at reduced manufacturing cost (per system). In most systems digital circuits dominate with respect to die area and functional complexity. Digital building blocks take full - vantage of reduced device geometries in terms of area, power per functionality, and switching speed. On the other hand, analog circuits rely not on the fast transition speed between a few discrete states but fairly on the actual shape of the trans- tor characteristic. Technology scaling continuously degrades these characteristics with respect to analog performance parameters like output resistance or intrinsic gain. Below the 100 nm technology node the design of analog and mixed-signal circuits becomes perceptibly more difficult. This is particularly true for low supply voltages near to 1V or below. The result is not only an increased design effort but also a growing power consumption. The area shrinks considerably less than p- dicted by the digital scaling factor. Obviously, both effects are contradictory to the original goal of scaling. However, digital circuits become faster, smaller, and less power hungry. The fast switching transitions reduce the susceptibility to noise, e. g. icker noise in the transistors. There are also a few drawbacks like the generation of power supply noise or the lack of power supply rejection.

This book is based on the 18 presentations during the 21st workshop on Advances in Analog Circuit Design. Expert designers provide readers with information about a variety of topics at the frontier of analog circuit design, including Nyquist analog-to-digital converters, capacitive sensor interfaces, reliability, variability, and connectivity. This book serves as a valuable
Online Library Noise Shaping All Digital Phase Locked Loops Modeling Simulation Analysis And Design Analog Circuits And Signal Processing

This book explains concepts behind fractional subsampling-based frequency synthesis that is re-shaping today’s art in the field of low-noise LO generation. It covers advanced material, giving clear guidance for development of background-calibrated environments capable of spur-free synthesis and wideband phase modulation. It further expands the concepts into the field of subsampling polar transmission, where the newly developed architecture enables unprecedented spectral efficiency levels, unquestionably required by the upcoming generation of wireless standards.

With the proliferation of wireless networks, there is a need for more compact, low-cost, power efficient transmitters that are capable of supporting the various communication standards, including Bluetooth, WLAN, GSM/EDGE, WCDMA and 4G of 3GPP cellular. This book describes a novel idea of RF digital-to-analog converters (RFDAC) and demonstrates how they can realize all-digital, fully-integrated RF transmitters that support all the current multi-mode and multi-band communication standards. With this book the reader will: Understand the challenges of realizing a universal CMOS RF transmitter Recognize the design issues and the advantages and disadvantages related to analog and digital transmitter architectures Master designing an RF transmitter from system level modeling techniques down to circuit designs and their related layout know-hows Grasp digital polar and I/Q calibration techniques as well as the digital predistortion approaches Learn how to generate appropriate digital I/Q baseband signals in order to apply them to the test chip and measure the RF-DAC performance.

Highlights the benefits and implementation challenges of software-defined transmitters using CMOS technology Includes various types of analog and digital RF transmitter architectures for wireless applications Presents an all-digital polar RFDAC transmitter architecture and describes in detail its implementation Presents a new all-digital I/Q RFDAC transmitter architecture and its implementation Provides comprehensive design techniques from system level to circuit level Introduces several digital predistortion techniques which can be used in RF transmitters Describes the entire flow of system modeling, circuit simulation, layout techniques and the measurement process

This book introduces the concept of voltage-controlled-oscillator (VCO)-based analog-to-digital converters (ADCs). Detailed explanation is given of this promising new class of high resolution and low power ADCs, which use time quantization as opposed to traditional analog-based (i.e. voltage) ADCs.

High Frequency Communication and Sensing: Traveling-Wave Techniques introduces novel traveling wave circuit techniques to boost the performance of high-speed circuits in standard low-cost production technologies, like complementary metal oxide semiconductor (CMOS). A valuable resource for experienced analog/radio frequency (RF) circuit designers as well as undergraduate-level microelectronics researchers, this book: Explains the basics of high-speed signaling, such as transmission lines, distributed signaling, impedance matching, and other common practical RF background material Promotes a dual-loop coupled traveling wave oscillator topology, the trigger mode distributed wave oscillator, as a high-frequency multiphase signal source Introduces a force-based starter mechanism for dual-loop, even-symmetry, multiphase traveling wave oscillators, presenting a single-loop version as a force mode distributed wave antenna (FMDWA) Describes higher-frequency, passive inductive, and quarter-wave-length-based pumped distributed wave oscillators (PDWOs) Examines phased-array transceiver architectures and front-end circuits in detail, along with distributed oscillator topologies Devotes a chapter to THz sensing, illustrating a unique method of traveling wave frequency multiplication and power combining Discusses various data converter topologies, such as digital-to-analog converters (DACs), analog-to-digital converters (ADCs), and GHz-bandwidth sigma-delta modulators Covers critical circuits including phase rotators and
interpolators, phase shifters, phase-locked loops (PLLs), delay-locked loops (DLLs), and more. It is a significantly challenging task to generate and distribute high-speed clocks. Multiphase low-speed clocks with sharp transition are proposed to be a better option to accommodate the desired timing resolution. High Frequency Communication and Sensing: Traveling-Wave Techniques provides new horizons in the quest for greater speed and performance. This book, building on the author's previous work, presents new communication and networking technologies, challenges and opportunities of information/data processing and transmission. It also discusses the development of more intelligent and efficient communication technologies, which are an essential part of current day-to-day life. Information and Communication Technologies (ICTs) have an enormous impact on businesses and our day-to-day lives over the past three decades and continue to do so. Modern methods of business information processing are opening exciting new opportunities for doing business on the basis of information technologies. The book contains research that spans a wide range of communication and networking technologies, including wireless sensor networks, optical and telecommunication networks, storage area networks, error-free transmission and signal processing.

This book is a collection of papers presented by renowned researchers, keynote speakers, and academicians in the International Conference on VLSI, Communication, Analog Designs, Signals & Systems and Networking (VCASAN-2013), organized by B.N.M. Institute of Technology, Bangalore, India during July 17–19, 2013. The book provides global trends in cutting-edge technologies in electronics and communication engineering. The content of the book is useful to engineers, researchers, and academicians as well as industry professionals. Time-to-digital converter (TDC) circuits are a key component for achieving high-performance digital phase-locked loops (PLLs) which offer lower area and greater flexibility than their analog PLL counterparts. This chapter focuses on a recently developed TDC architecture known as the gated ring oscillator (GRO) which offers first-order shaping of its quantization noise and delay stage mismatch. To provide context for the GRO discussion, background on general TDC implementation techniques is described along with key performance issues related to digital frequency synthesizers. The GRO concept is then presented, followed by implementation details and measured results. Finally, recent variations on the GRO concept are described such as a MASH TDC structure which achieves higher-order noise shaping and a switched ring oscillator (SRO) TDC which improves robustness to dead zones encountered by the GRO TDC.

· In-depth coverage of modern digital implementations of frequency synthesis architectures
· Numerous design examples drawn from actual engineering projects

Digital frequency synthesis is used in modern wireless and communications technologies such as radar, cellular telephony, satellite communications, electronic imaging, and spectroscopy. This is book is a comprehensive overview of digital frequency synthesis theory and applications, with a particular emphasis on the latest approaches using fractional-N phase-locked loop technology. In-depth coverage of modern digital implementations of frequency synthesis architectures Numerous design examples drawn from actual engineering projects

This book describes the digitally intensive time-domain architectures and techniques applied to millimeter-wave frequency synthesis, with the objective of improving performance and reducing the cost of implementation. Coverage includes system architecture, system level modeling, critical building block design, and digital calibration techniques, making it highly suitable for those who want to learn about mm-wave frequency generation for communication and radar applications, integrated circuit
implementation, and time-domain circuit and system techniques. Highlights the challenges of frequency synthesis at mm-wave band using CMOS technology

Compares the various approaches for mm-wave frequency generation (pros and cons)

Introduces the digitally intensive synthesizer approach and its advantages

Discusses the proper partitioning of the digitally intensive mm-wave frequency synthesizer into mm-wave, RF, analog, digital and software components

Provides detailed design techniques from system level to circuit level

Addresses system modeling, simulation techniques, design-for-test, and layout issues

Demonstrates the use of time-domain techniques for high-performance mm-wave frequency synthesis

CMOS Integrated Analog-to-Digital and Digital-to-Analog Converters describes in depth converter specifications like Effective Number of Bits (ENOB), Spurious Free Dynamic Range (SFDR), Integral Non-Linearity (INL), Differential Non-Linearity (DNL) and sampling clock jitter requirements. Relations between these specifications and practical issues like matching of components and offset parameters of differential pairs are derived. CMOS Integrated Analog-to-Digital and Digital-to-Analog Converters describes the requirements of input and signal reconstruction filtering in case a converter is applied into a signal processing system. CMOS Integrated Analog-to-Digital and Digital-to-Analog Converters describes design details of high-speed A/D and D/A converters, high-resolution A/D and D/A converters, sample-and-hold amplifiers, voltage and current references, noise-shaping converters and sigma-delta converters, technology parameters and matching performance, comparators and limitations of comparators and finally testing of converters.

Giving a basic overview of the technologies supporting cognitive radio this introductory-level text follows a logical approach, starting with the physical layer and concluding with applications and general issues. It provides a background to advances in the field of cognitive radios and a new exploration of how these radios can work together as a network. Cognitive Radio Networks starts with an introduction to the fundamentals of wireless communications, introducing technologies such as OFDM & MIMO. It moves onto cover software defined radio and explores and contrasts wireless, cooperative and cognitive networks and communications. Spectrum sensing, medium access control and network layer design are examined before the book concludes by covering the topics of trusted cognitive radio networks and spectrum management. Unique in providing a brief but clear tutorial and reference to cognitive radio networks this book is a single reference, written at the appropriate level for newcomers as well as providing an encompassing text for those with more knowledge of the subject. One of the first books to provide a systematic description of cognitive radio networks Provides pervasive background knowledge including both wireless communications and wireless networks Written by leading experts in the field Full network stack investigation

Radio Design in Nanometer Technologies is the first volume that looks at the integrated radio design problem as a "piece of a big puzzle", namely the entire chipset or single chip that builds an entire wireless system. This is the only way to successfully design radios to meet the stringent demands of today’s increasingly complex wireless systems.

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