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

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*Noise-Shaping All-Digital Phase-Locked Loops -* Francesco Brandonisio 2014-01-08
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.

**Measurement, Instrumentation, and Sensors Handbook** - John G. Webster
2017-12-19
The Second Edition of the bestselling Measurement, Instrumentation, and Sensors Handbook brings together all aspects of the design and implementation of measurement, instrumentation, and sensors. Reflecting the current state of the art, it describes the use of instruments and techniques for performing practical measurements in engineering, physics, chemistry, and the life sciences and discusses processing systems, automatic data acquisition, reduction and analysis, operation characteristics, accuracy, errors, calibrations, and the incorporation of standards for control purposes. Organized according to measurement problem, the Electromagnetic, Optical, Radiation, Chemical, and Biomedical Measurement volume of the Second Edition: Contains contributions from field experts, new chapters, and updates to all 98 existing chapters Covers sensors and sensor technology, time and frequency, signal processing, displays and

recorders, and optical, medical, biomedical, health, environmental, electrical, electromagnetic, and chemical variables A concise and useful reference for engineers, scientists, academic faculty, students, designers, managers, and industry professionals involved in instrumentation and measurement research and development, Measurement, Instrumentation, and Sensors Handbook, Second Edition: Electromagnetic, Optical, Radiation, Chemical, and Biomedical Measurement provides readers with a greater understanding of advanced applications.

*Advanced Frequency Synthesis by Phase Lock* - William F. Egan 2011-08-09
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.

**Introduction to Digital Audio** - John Watkinson 2013-07-24
Master the basics from first principles: the physics of sound, principles of hearing etc, then progress onward to fundamental digital principles, conversion, compression and coding and then onto transmission, digital audio workstations, DAT and optical disks. Get up to speed with how digital audio is used within DVD, Digital Audio Broadcasting, networked audio and MPEG transport streams. All of the key technologies are here: compression, DAT, DAB, DVD, SACD, oversampling, noise shaping and error correction theories are treated in a simple yet accurate form. Thoroughly researched, totally up-to-date and technically accurate this is the only book you need on the subject.

**Radiation Hardened CMOS Integrated Circuits for Time-Based Signal Processing** - Jeffrey Prinzie 2018-04-26
This book presents state-of-the-art techniques for radiation hardened high-resolution Time-to-Digital converters and low noise frequency

synthesizers. Throughout the book, advanced degradation mechanisms and error sources are discussed and several ways to prevent such errors are presented. An overview of the prerequisite physics of nuclear interactions is given that has been compiled in an easy to understand chapter. The book is structured in a way that different hardening techniques and solutions are supported by theory and experimental data with their various tradeoffs. Based on leading-edge research, conducted in collaboration between KU Leuven and CERN, the European Center for Nuclear Research Describes in detail advanced techniques to harden circuits against ionizing radiation Provides a practical way to learn and understand radiation effects in time-based circuits Includes an introduction to the underlying physics, circuit design, and advanced techniques accompanied with experimental data

**Digital Subsampling Phase Lock Techniques for Frequency Synthesis and Polar**

**Transmission** - Nereo Markulic 2019-01-30 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.

*Advances in Analog and RF IC Design for Wireless Communication Systems* - Gabriele Manganaro 2013-05-13 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

## MicroCMOS Design - Bang-Sup Song 2017-12-19

MicroCMOS Design covers key analog design methodologies with an emphasis on analog systems that can be integrated into systems-on-chip (SoCs). Starting at the transistor level, this book introduces basic concepts in the design of system-level complementary metal-oxide semiconductors (CMOS). It uses practical examples to illustrate circuit construction so that readers can develop an intuitive understanding rather than just assimilate the

usual conventional analytical knowledge. As SoCs become increasingly complex, analog/radio frequency (RF) system designers have to master both system- and transistor-level design aspects. They must understand abstract concepts associated with large components, such as analog-to-digital converters (ADCs) and phase-locked loops (PLLs). To help readers along, this book discusses topics including: Amplifier basics & design Operational amplifier (Opamp) Data converter basics Nyquist-rate data converters Oversampling data converters High-resolution data converters PLL basics Frequency synthesis and clock recovery Focused more on design than analysis, this reference avoids lengthy equations and instead helps readers acquire a more hands-on mastery of the subject based on the application of core design concepts. Offering the needed perspective on the various design techniques for data converter and PLL design, coverage starts with abstract concepts—including discussion of bipolar junction transistors (BJTs) and MOS transistors—and builds up to an examination of the larger systems derived from microCMOS design.

*VCO-Based Quantizers Using Frequency-to-Digital and Time-to-Digital Converters* - Samantha Yoder 2011-08-28
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.

**Measurement, Instrumentation, and Sensors Handbook, Second Edition** - John G. Webster 2014-02-03
The Second Edition of the bestselling Measurement, Instrumentation, and Sensors Handbook brings together all aspects of the design and implementation of measurement, instrumentation, and sensors. Reflecting the

current state of the art, it describes the use of instruments and techniques for performing practical measurements in engineering, physics, chemistry, and the life sciences and discusses processing systems, automatic data acquisition, reduction and analysis, operation characteristics, accuracy, errors, calibrations, and the incorporation of standards for control purposes. Organized according to measurement problem, the Electromagnetic, Optical, Radiation, Chemical, and Biomedical Measurement volume of the Second Edition: Contains contributions from field experts, new chapters, and updates to all 98 existing chapters Covers sensors and sensor technology, time and frequency, signal processing, displays and recorders, and optical, medical, biomedical, health, environmental, electrical, electromagnetic, and chemical variables A concise and useful reference for engineers, scientists, academic faculty, students, designers, managers, and industry professionals involved in instrumentation and measurement research and development, Measurement, Instrumentation, and Sensors Handbook, Second Edition: Electromagnetic, Optical, Radiation, Chemical, and Biomedical Measurement provides readers with a greater understanding of advanced applications.

*Digital Signal Processing* - Zahir M. Hussain 2011-02-26

In three parts, this book contributes to the advancement of engineering education and that serves as a general reference on digital signal processing. Part I presents the basics of analog and digital signals and systems in the time and frequency domain. It covers the core topics: convolution, transforms, filters, and random signal analysis. It also treats important applications including signal detection in noise, radar range estimation for airborne targets, binary communication systems, channel estimation, banking and financial applications, and audio effects production. Part II considers

selected signal processing systems and techniques. Core topics covered are the Hilbert transformer, binary signal transmission, phase-locked loops, sigma-delta modulation, noise shaping, quantization, adaptive filters, and non-stationary signal analysis. Part III presents some selected advanced DSP topics.

**IEICE Transactions on Electronics** - 2004

**Cognitive Radio Networks** - Kwang-Cheng Chen 2009-03-30
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

Data Converters, Phase-Locked Loops, and Their Applications - Tertulien Ndjountche 2018-09-06

With a focus on designing and verifying CMOS analog integrated circuits, the book reviews design techniques for mixed-signal building blocks, such as Nyquist and oversampling data converters, and circuits for signal generation, synthesis, and recovery. The text details all aspects, from specifications to the final circuit, of the design of digital-to-analog converters, analog-to-digital converters, phase-locked loops, delay-locked loops, high-speed input/output link transceivers, and class D amplifiers. Special emphasis is put on calibration methods that can be used to compensate circuit errors due to device mismatches and semiconductor process variations. Gives an overview of data converters, phase- and delay-locked loop architectures, highlighting basic operation and design trade-offs. Focus on circuit analysis methods useful to meet requirements for a high-speed and power-efficient operation. Outlines design challenges of analog integrated circuits using state-of-the-art CMOS processes. Presents design methodologies to optimize circuit performance on both transistor and architectural levels. Includes open-ended circuit design case studies. Millimeter-Wave Digitally Intensive Frequency Generation in CMOS - Wanghua Wu 2015-09-23 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

**Advances in Analog and RF IC Design for Wireless Communication Systems** - Salvatore Levantino 2013-05-13
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.

**Advanced Circuits for Emerging Technologies** - Krzysztof Iniewski 2012-04-17
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.

**Management Information And Optoelectronic Engineering - Proceedings Of The 2015 International Conference On Management, Information And Communication And The 2015 International Conference On Optics And Electronics Engineering** - Yongsheng Gao 2016-04-28 This book, Management Information and Optoelectronic Engineering, is a collection of papers presented at the 2015 International Conference on Management, Information and Communication and the 2015 International Conference on Optics and Electronics Engineering which was held on October 24-25, 2015 in Xia Men, China. The book provides state-of-the-art research results and development activities in Optics and Electronics Engineering, Management, Information and Communication and will benefit researchers and practitioners in the field.
Modern Communications Receiver Design and

Technology - Cornell Drentea 2010
This comprehensive sourcebook thoroughly explores the state-of-the-art in communications receivers, providing detailed practical guidance for constructing an actual high dynamic range receiver from system design to packaging. You also find clear explanations of the technical underpinnings that you need to understand for your work in the field . This cutting-edge reference presents the latest information on modern superheterodyne receivers, dynamic range, mixers, oscillators, complex coherent synthesizers, automatic gain control, DSP and software radios.You find in-depth discussions on system design, including coverage of all pertinent data and tools. Moreover, the book offers you a solid understanding of packaging and mechanical considerations, as well as a look at tomorrowOCOs receiver technology, including new Bragg-cell applications for ultra-wideband electronic warfare receivers. This one-stop resource is packed with over 300 illustrations that support critical topics throughout."

**CMOS Time-Mode Circuits and Systems** - Fei Yuan 2018-09-03
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.

## Ultra-Low-Voltage Frequency Synthesizer and Successive-Approximation Analog-to-Digital Converter for Biomedical Applications - Chung-Chih Hung 2022

This book introduces the origin of biomedical signals and the operating principles behind them and presents the characteristics of common biomedical signals for subsequent signal measurement and judgment. Since biomedical signals are captured by wearable devices, sensor devices, or implanted devices, these devices are all battery-powered to maintain long working time. We hope to reduce their power consumption to extend service life, especially for implantable devices, because battery replacement can only be done through surgery. Therefore, we must understand how to design low-voltage low-power integrated circuits. Provides necessary background information on biomedical signals and proceeds with design considerations for low supply voltage analog circuits; Describes design techniques for not only frequency synthesizers and ADCs, but also the ultra-low voltage design techniques of these

circuits; Demonstrates examples to overcome typical design challenges.

**Wireless Transceiver Architecture** - Pierre Baudin 2014-12-15
A fully comprehensive reference combining digital communications and RFIC (Radio Frequency Integrated Circuits) in one complete volume There are many books which focus on the physical implementation of the RF/analog part of transceivers, such as the CMOS design, or the signal processing involved in digital communications. However, there is little material dedicated to transceiver architecture and system design. Similarly, much of the existing literature looks at concepts useful for dimensioning, yet offers little practical information on how to proceed for dimensioning a line-up from scratch, and on the reasons for proceeding that way. This book redresses the balance by explaining the architecture of transceivers and their dimensioning from the perspective of a RFIC architect from within industry. It bridges the gap between digital communication systems and radiofrequency integrated circuit design, covering wireless transceiver architecture and system design from both system level and circuit designer aspects. • Covers digital communication theory, electromagnetism theory and wireless networks organization, from theories to implementation, for deriving the minimum set of constraints to be fulfilled by transceivers • Details the limitations in the physical implementation of transceivers to be considered for their dimensioning, in terms of noise, nonlinearity, and RF impairments • Presents transceiver architecture and system design in terms of transceivers budgets, transceivers architectures, and algorithms for transceivers

*RF and Microwave Transmitter Design* - Andrei Grebennikov 2011-07-12
RF and Microwave Transmitter Design is unique in its coverage of both historical transmitter design and cutting edge technologies. This text

explores the results of well-known and new theoretical analyses, while informing readers of modern radio transmitters' pracitcal designs and their components. Jam-packed with information, this book broadcasts and streamlines the author's considerable experience in RF and microwave design and development.

*Digital Signal Processing in Power Electronics Control Circuits* - Krzysztof Sozański 2013-07-03 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.
**CMOS PLL Synthesizers: Analysis and**

**Design** - Keliu Shu 2005-01-03
Thanks to the advance of semiconductor and communication technology, the wireless communication market has been booming in the last two decades. It evolved from simple pagers to emerging third-generation (3G) cellular phones. In the meanwhile, broadband communication market has also gained a rapid growth. As the market always demands hi-performance and low-cost products, circuit designers are seeking hi- integration communication devices in cheap CMOS technology. The phase-locked loop frequency synthesizer is a critical component in communication devices. It works as a local oscillator for frequency translation and channel selection in wireless transceivers and broadband cable tuners. It also plays an important role as the clock synthesizer for data converters in the analog-and-digital signal interface. This book covers the design and analysis of PLL synthesizers. It includes both fundamentals and a review of the state-of-the-art techniques. The transient analysis of the third-order charge-pump PLL reveals its locking behavior accurately. The behavioral-level simulation of PLL further clarifies its stability limit. Design examples are given to clearly illustrate the design procedure of PLL synthesizers. A complete derivation of reference spurs in the charge-pump PLL is also presented in this book. The in-depth investigation of the digital CA modulator for fractional-N synthesizers provides insightful design guidelines for this important block.

**Radiation-Tolerant Delta-Sigma Time-to-Digital Converters** - Ying Cao 2015-02-09
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.

*All-Digital Frequency Synthesizer in Deep-Submicron CMOS* - Robert Bogdan Staszewski 2006-09-22
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.

**Delta-Sigma Modulators** -

**Design of CMOS Phase-Locked Loops** - Behzad Razavi 2020-01-30 Using a modern, pedagogical approach, this textbook gives students and engineers a comprehensive and rigorous knowledge of CMOS phase-locked loop (PLL) design for a wide range of applications. It features intuitive presentation of theoretical concepts, built up gradually from their simplest form to more

practical systems; broad coverage of key topics, including oscillators, phase noise, analog PLLs, digital PLLs, RF synthesizers, delay-locked loops, clock and data recovery circuits, and frequency dividers; tutorial chapters on high-performance oscillator design, covering fundamentals to advanced topologies; and extensive use of circuit simulations to teach design mentality, highlight design flaws, and connect theory with practice. Including over 200 thought-provoking examples highlighting best practices and common pitfalls, 250 end-of-chapter homework problems to test and enhance the readers' understanding, and solutions and lecture slides for instructors, this is the perfect text for senior undergraduate and graduate-level students and professional engineers who want an in-depth understanding of PLL design.
*IoT and Low-Power Wireless* - Christopher Siu 2018-06-14
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.

**A Digital Phase Locked Loop based Signal**

**and Symbol Recovery System for Wireless Channel** - Basab Bijoy Purkayastha 2015-01-29 The book reports two approaches of implementation of the essential components of a Digital Phase Locked Loop based system for dealing with wireless channels showing Nakagami-m fading. It is mostly observed in mobile communication. In the first approach, the structure of a Digital phase locked loop (DPLL) based on Zero Crossing (ZC) algorithm is proposed. In a modified form, the structure of a DPLL based systems for dealing with Nakagami-m fading based on Least Square Polynomial Fitting Filter is proposed, which operates at moderate sampling frequencies. A sixth order Least Square Polynomial Fitting (LSPF) block and Roots Approximator (RA) for better phase-frequency detection has been implemented as a replacement of Phase Frequency Detector (PFD) and Loop Filter (LF) of a traditional DPLL, which has helped to attain optimum performance of DPLL. The results of simulation of the proposed DPLL with Nakagami-m fading and QPSK modulation is discussed in detail which shows that the proposed method provides better performance than existing systems of similar type.

**Time-to-Digital Converters** - Stephan Henzler 2010-03-10 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 dif cult. 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.

**Proceedings** - 2002

**Art of Digital Audio** - John Watkinson
2013-04-26
Described as "the most comprehensive book on digital audio to date", it is widely acclaimed as an industry "bible". Covering the very latest developments in digital audio technology, it provides an thorough introduction to the theory as well as acting as an authoritative and comprehensive professional reference source. Everything you need is here from the fundamental principles to the latest applications, written in an award-winning style with clear explanations from first principles. New material covered includes internet audio, PC audio technology, DVD, MPEG audio compression, digital audio broadcasting and audio networks. Whether you are in the field of audio engineering, sound recording, music technology, broadcasting and communications media or audio design and installation, this book has it all. Written by a leading international audio specialist, who conducts professional seminars and workshops around the world, the book has been road tested for many years by professional seminar attendees and students to ensure their

needs are taken into account, and all the right information is covered. This new edition now includes: Internet audio PC Audio technology DVD MPEG Audio compression Digital Audio Broadcasting Audio networks Digital audio professionals will find everything they need here, from the fundamental principles to the latest applications, written in an award-winning style with clear explanations from first principles. John Watkinson is an international consultant in audio, video and data recording. He is a Fellow of the AES, a member of the British Computer Society and a chartered information systems practitioner. He presents lectures, seminars, conference papers and training courses worldwide. He is the author of many other Focal Press books, including: the Kraszna-Krausz award winning MPEG-2; The Art of Digital Audio; An Introduction to Digital Video; The Art of Sound Reproduction; An Introduction to Digital Audio; TV Fundamentals and Audio for Television. He is also co-author, with Francis Rumsey, of The Digital Interface Handbook, and contributor to the Loudspeaker and Headphone Handbook, 3rd edition.

**Data-Centric Business and Applications** - Dmytro Ageyev 2021-06-04
This book, building on the authors' 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.

Wireless Transceiver Circuits - Woogeun Rhee 2018-09-03
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.

**Noise-Shaping All-Digital Phase-Locked Loops** - Francesco Brandonisio 2013-12-17

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.

*Time-encoding VCO-ADCs for Integrated Systems-on-Chip* - Georges Gielen 2022
This book demonstrates why highly-digital CMOS time-encoding analog-to-digital converters incorporating voltage-controlled oscillators (VCOs) and time-to-digital converters (TDCs) are a good alternative to traditional switched-capacitor S-D modulators for power-efficient sensor, biomedical and communications applications. The authors describe the theoretical foundations and design methodology of such time-based ADCs from the basics to the latest developments. While most analog designers might notice some resemblance to PLL design, the book clearly highlights the differences to standard PLL circuit design and illustrates the design methodology with practical circuit design examples. Describes in detail the design methodology for CMOS time-encoding analog-to-digital converters that can be integrated along with digital logic in a nanometer System on Chip; Assists analog designers with the necessary change in design paradigm, highlighting differences between designing time-based ADCs and traditional analog circuits like switched-capacitor

converters and PLLs; Uses a highly-visual, tutorial approach to the topic, including many practical examples of techniques introduced.

Phase-Locked Loops for Wireless Communications - Donald R. Stephens 2007-05-08

Phase-Locked Loops for Wireless Communications: Digitial, Analog and Optical Implementations, Second Edition presents a complete tutorial of phase-locked loops from analog implementations to digital and optical designs. The text establishes a thorough foundation of continuous-time analysis techniques and maintains a consistent notation as discrete-time and non-uniform sampling are presented. New to this edition is a complete treatment of charge pumps and the complementary sequential phase detector. Another important change is the increased use of MATLAB®, implemented to provide more familiar graphics and reader-derived phase-locked loop simulation. Frequency synthesizers and digital divider analysis/techniques have been added to this second edition. Perhaps most distinctive is the chapter on optical phase-locked loops that begins with sections discussing components such as lasers and photodetectors and finishing with homodyne and heterodyne loops. Starting with a historical overview, presenting analog, digital, and optical PLLs, discussing phase noise analysis, and including circuits/algorithms for data synchronization, this volume contains new techniques being used in this field. Highlights of the Second Edition: Development of phase-locked loops from analog to digital and optical, with consistent notation throughout; Expanded coverage of the loop filters used to design second and third order PLLs; Design examples on delay-locked loops used to synchronize circuits on CPUs and ASICS; New material on digital dividers that dominate a frequency synthesizer's noise floor. Techniques to analytically estimate the phase noise of a divider; Presentation of optical phase-locked

loops with primers on the optical components and fundamentals of optical mixing; Section on automatic frequency control to provide frequency-locking of the lasers instead of phase-locking; Presentation of charge pumps, counters, and delay-locked loops. The Second Edition includes the essential topics needed by wireless, optics, and the traditional phase-locked loop specialists to design circuits and software algorithms. All of the material has been updated throughout the book.

## High Frequency Communication and Sensing - Ahmet Tekin 2014-11-24

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.