شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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HANAA ALY

A LOW-POWER SUB-SAMPLING ALL-DIGITAL PHASE-LOCKED LOOP WITH FAST FREQUENCY-CORRECTION CAPABILITY

By

Omar Hamada Eid Seif Hassan

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Electronics and Communications Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
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Title of Thesis:

A Low-Power Sub-Sampling All-Digital Phase-Locked Loop with Fast Frequency-Correction Capability

Key Words:
All-digital PLL; Lock-in range extension; Time to Digital Converter; Multi-Path; Digital to Time Converter.

Summary:
In this thesis, a low-power all-digital phase-locked loop (ADPLL) is presented to be used as a frequency synthesizer in low-power applications. The PLL utilizes sub-sampling operation to maintain low power consumption. A novel technique is proposed to extend the loop's lock-in range. This technique allows the loop to tolerate 10x larger frequency disturbances without losing locking. The main analog blocks are designed in a 40nm CMOS technology. A new time to digital converter (TDC) architecture based on a multi-path delay line is introduced. The new architecture allows the TDC to achieve high resolution while keeping a low power consumption. An 8-bit segmented digital to time converter (DTC) is designed. The DTC achieves relatively good linearity while consuming low power. A low-power digitally-controlled oscillator (DCO) is implemented and it achieves better than -114dBc/Hz phase noise at 1MHz offset. The estimated PLL phase noise at 1MHz offset is around -109dBc/Hz.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Omar Hamada Hassan Date:

Signature:

Dedication

To my mother and father for their continuous love and support.

Acknowledgements

First and foremost, praise is to Allah, the most gracious, the most merciful, on whom ultimately we depend for sustenance and guidance.

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