

Hong Yu

CONTACT INFORMATION

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RESEARCH INTERESTS

Mixed signal/RF circuit and communication system design using CMOS technology, Radio frequency identification system, Biomedical micro-systems implementation, Lowpower electronics design.

EDUCATION

Ph.D candidate, Sep.2004 – Present Gainesville, FL
Department of Electrical Engineering University of Florida
Thesis Advisor: Dr. Rizwan Bashirullah
Dissertation Title: "*Electronic Pills for Medical Compliance Monitoring*"
Expected graduation date, Summer 2009

Master of Science, Sep.2001 - Feb.2004, Amherst, MA
Department of Electrical Engineering, University of Massachusetts

Bachelor of Science, with Honor, Sep.1996 - Aug.2001 Hefei, China
Department of Electrical Engineering, University of Science and Technology of China (USTC)

EXPERIENCE

Integrated Circuits Research Group, University of Florida. Sep.2004 -Present

Design of electronic pill (RF system and IC design)

****Results published in major circuit conferences as VLSI Symposium, RFIC, etc.*

--A small electronic device composed of an IC and a miniature cylindrical antenna. When attached onto the outer surface of a standard size capsule, the device makes the capsule trackable inside the human body. To complete the 915MHz system, system level (ADS) and analog/RF circuit level design (Cadence) were included. The chips were laid out and fabricated using CMOS 90nm and 130nm technology, and the functionality of all the fabricated chips were tested both on probe station and packaged (wire-, or flip-chip bonding to a custom-designed PCBoard).

- ***Backscattering sensor design/measurement:*** Compatible with frontier UHF (915MHz) RFID technology, the integrated electronics are powered by the captured AC power, and the chip ID can be sent back to the reader by amplitude/phase modulating the tag antenna. Chip building blocks include: *RF multiplier, low power voltage regulator, bias generator, ASK modulator, Op-Amp comparator, power-on-reset circuit, tunable ring oscillator, and baseband digital circuit.*
- ***E-burst sensor design/measurement:*** Captured AC power (13.56MHz) is stored, and once the stored energy reaches a threshold, the chip generates high power RF bursts (915MHz) to show its presence. Command word from the reader is demodulated /decoded through the integrated demodulator/CDR chain, which is used to control the tag (chip) functionality. Chip circuit blocks include: *RF multiplier, Op-Amp hysteresis comparator, digital controlled LC oscillator (VCO), class-D power amplifier, ASK demodulator/CDR, FIFO with 3-bit CRC check.*
- ***Miniature RFID antenna design/measurement:*** Miniature antennas operating at various frequency bands, which can be wrapped around the standard sized capsules, are designed using HFSS/XFDTD/ADS Momentum. The antenna designs are verified through S parameter/range measurement.

Integration of the Implantable Neural Recording System (low power TX/RX and IC design)

******Results published in major circuit conferences as VLSI Symposium, CICC, etc.***

--The integrated system is a mixed signal chip including various RF/analog/digital functionalities. When implanted, the system records multiple neural signals simultaneously, which is packaged by a integrated microprocessor, and sends out wirelessly to a receiver at 5m range. Downlink from the reader control the chip functionality. The chip was laid out and fabricated using CMOS 0.5um and 130nm technology, and the fabricated chips were tested both on probe station and packaged (wire bonding to a custom-designed PCBoard). Designed circuit blocks include: *low noise amplifier array, low power ASK-PWM demodulator, Op-Amp comparator with active inductor peaking, CDR, 915MHz ASK modulator/power transmitter, micro-controller, and low-jitter ring oscillator.*

Antennas and Propagation Laboratory, University of Massachusetts. Sep, 2001- Feb,2004

Research-- A two-frequency, dual-polarized antenna was designed for a weather profiling radar, which will perform polarimetric cloud measurements at 13.4 GHz, 35.6 GHz and 94.92 GHz. The dual band antenna is composed of a 13.4GHz corrugated horn antenna and a 35.6GHz dielectric rod waveguide located at the center of the horn antenna, and is able to generate parallel and vertical polarized radiation simultaneously at both bands. The fabricated antenna shows high polarization purity (less than -30dB cross-polarized product at both frequency bands).

Teaching--Assisted in teaching undergraduate courses of about 100 students. Duties included giving lectures, specifying and grading homework, programming assignments and exams, assisting students during office hours.

COMPUTER SKILLS

- ***IC design and layout:*** Cadence (Spectre, Virtuoso, Caliber, Assura), ADS.
- ***EM simulation:*** HFSS, XFDTD, ADS Momentum, Asitic.
- ***DSP and programming:*** Matlab, C, Fortune.

SELECTED COURSE

- ***Circuits related:*** MOSFET Analog IC Design, Bipolar Analog IC Design, Radio Frequency Circuits and Systems, RF Integrated Circuits and Technology, Active Microwave Circuits.
- ***Antenna related:*** Microwave Meteorology, Phased array antenna, Electromagnetic field theory, Introductory to RADAR systems.
- ***DSP related:*** Noise in Linear Systems, Digital Communication.

PUBLICATION

Hong Yu, ChunMing Tang and Rizwan Bashirullah, "Asymmetric RF tagging IC for Ingestible Medication Compliance Capsules", IEEE J. of Solid State circuit.

Hong Yu and Rizwan Bashirullah, "The Feasibility Study of Using Capsule Antennas for Digestible Electronic Devices", IEEE Trans. on Biomedical Engineering.

Hong Yu, Chun-Ming Tang and Rizwan Bashirullah, "Asymmetric RF tags for Ingestible Medication Compliance Capsules", pp. 34-35, Symposium on VLSI Technology and Circuit, Jun. 2009, Kyoto, Japan.

Zhiming Xiao, Chun-Ming Tang, Hong Yu, Chung-Ching Peng and Rizwan Bashirullah, "A 190μW-915MHz active neural transponder with 4-channel time multiplexed AFE", pp.58-59, Symposium on VLSI Technology and Circuit, Jun.2009, Kyoto, Japan.

Hong Yu, Chun-Ming Tang and Rizwan Bashirullah, "An Asymmetric RF tagging IC for Ingestible Medication Compliance Capsules", Page(s):101 – 104, RFIC Symposium, Jun., 2009.

Hong Yu, Pengfei Li, Zhiming Xiao, Chung-Ching Peng and Rizwan Bashirullah, "A Multi-Channel Instrumentation System for Biosignal Recording". pp.2020-2023, IEEE Engineering in Medicine and Biology Conference, Vancouver, 2008.

H. Yu, G.S. Irby, D.M. Peterson, M.-T. Nguyen, G. Flores, N. Euliano and R. Bashirullah, "A Printed Capsule Antenna for Medication Compliance Monitoring ", IEE Electronics Letters, Volume: 43, Issue: 22, 2007

H. Yu, G. Flores, S. Reza, G.S. Irby, Vikas Meka, D. M. Peterson, C. Batich, N. Euliano, R. Bashirullah, "Feasibility Study of Printed Capsule Antennas for Medication Compliance Monitoring", Page(s):41 - 44, Proceeding of Biomedical Circuits and Systems Conference, 2007.

R. Bashirullah, H.Yu, G. Flores, V. Meka and N. Euliano, "Feasibility Study of Printed Passive Electronic Pills for Medication Compliance Monitoring", International Union of Radio Science (URSI), Manitoba Canada, 2007. (invited)

H.Yu, R. Bashirullah, "A Low Power ASK Clock and Data Recovery Circuit for Wireless Implantable Electronics", pp.249-252, IEEE Custom Integrated Circuits Conf., Sept. 2006.

Yu Hang, Zhu Qi, Ding Wen-Wu, "A new method to analyze micromachining aperture coupled micro-strip antennas", IEEE APS International Symposium, pp. 426- 429, vol.1, 2002

HONORS AND AWARDS

- Research Assistantship, University of Florida, 2004-present.
- Research Assistantship, University of Massachusetts, Amherst, 2002-2004.
- Excellent undergraduate Thesis award of USTC, University of Science and Technology of China, 2001.
- Excellent student scholarship, University of Science and Technology of China, 1997.

PROFESSIONAL ACTIVITIES

- Reviewer of IEEE Transactions on Microwave Theory and Techniques.
- Reviewer of IEEE Transactions on Biomedical Engineering.
- IEEE student Member (Solid-State Circuit Section).

REFERENCE (UPON REQUEST)

Dr. Rizwan Bashirullah, Assistant Professor, Dept. of ECE, University of Florida
Dr. Jenshan Lin, Professor, Dept. of ECE, University of Florida