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Reconfigurable Fully-Integrated RF Receiver Front-Ends

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In wireless receivers, strong out-of-band interferers may accompany the weak desired signal. These interferers must be filtered out prior to reaching the Low-Noise Amplifier (LNA) to avoid gain compression. Due to the limited quality factor (Q) of on-chip inductors, the out-of-band filtering is traditionally attained by off-chip Surface Acoustic Wave (SAW) components. SAW filters are expensive and bulky and since they are not tunable, in multiband applications one filter must be dedicated for each radio standard. With the widespread applications of multiband wireless systems, replacing SAW filters by on-chip counterparts has become the long-pursued goal among circuit designers.

In this talk, I will introduce integrated N-phase filters to replace external SAW filters in wireless receivers. N-phase filters can frequency-translate baseband impedances to synthesize high-Q bandpass filters with center frequencies precisely controlled by the Local Oscillator (LO) clock. Composed of only Metal-Oxide-Semiconductor (MOS) switches and capacitors, these filters are ideal for integration and they follow the technology scaling. The clock-tunable center frequency of the N-phase filters enables fully-integrated reconfigurable receiver architectures for multi-band applications. Some of these architectures will be covered in this talk.

Ahmad Mirzaei received his B.Sc and M.Sc degrees (with honors) from Sharif University of Technology, Tehran, Iran, and the Ph.D. degree from the University of California, Los Angeles, all in Electrical Engineering. He is now an Associate Professor in the Electrical Engineering Department of the Pennsylvania State University. Prior to joining Penn State, he was a Sr. Principal Scientist at the RF research and development group of Broadcom Corporation, Irvine, CA, where he was developing solutions for next generation low-power and multi-band wireless transceivers. He also contributed to a few high-volume wireless products during his seven-year long tenure at Broadcom. He is the author and coauthor of over 45 peer-reviewed journal and conference papers, and two books. He holds over 50 issued/pending patent applications in the field of RF-CMOS. His research is focused on integrated circuits and systems for broad range applications.