

## ABSTRACT

Charge Pumping Techniques in Ultra-Low-Current Transconductor Design. (May 2002)

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The purpose of this thesis is to introduce the use of interface-trap charge pumping devices (ITCP) in an analog application based in ultra-low-current transconductors. This application naturally exploits the continuous nature of the current generated by the interface-trap charge pump. An interface-trap charge-pump has been used as an ultra low current source for biasing an operational transconductance amplifier in both single-ended and fully differential configurations. Source degeneration techniques have been applied to reduce the total harmonic distortion.

The history, physics and a primary model of ITCP are presented as background material. The analysis has been extended for the design of analog circuits based in ultra-low frequency OTA filters. A novel technique based on ITCP for a floating current source is presented as an alternative solution for fully differential structures. The performance of the proposed techniques and circuit implementations has been characterized. The proposed filters have been fabricated in two different technologies 1.2 $\mu$ m and 0.5 $\mu$ m n-well CMOS process. The fabricated filters have programmable frequencies of operation in the range of 0.1 to 100 Hz. Experimental results of the test chips were very satisfactory and are in agreement with the theoretical basis.