

SEMINAR

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Efficient use of Gain-bandwidth product in active filters: Gm-C and Active-R alternatives

by

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Abstract: Conventional Active-RC filters require large GB/ ω_0 ratio to operate properly. This means a lot of power and bandwidth are wasted. This work explores two alternative implementation types which are more GB/ ω_0 efficient. Thus, a comparison between Active-R and Gm-C low pass filters is presented. For this purpose, a first order and a biquad low pass structure was implemented using both techniques; analysis and simulations allow to compare their performance in terms of power, linearity and noise. The effects of the amplifier non-ideal behavior are also addressed for both topologies, and we show how to leverage on those non-idealities. As an example, the two biquads were designed for $f_0=10\text{MHz}$, $Q=2$ and same power consumption; then, the performance is compared by simulation using IBM 130nm CMOS technology. Under this conditions, both topologies have similar performance in terms of input referred noise, however the Active-R shows better linearity since it achieves an in-band IIP3 of 21.3dBm, compared with 3.3dBm of the Gm-C implementation. Therefore the dynamic range (DR) of the Active-R topology is 1.4 times larger.

Adriana Sanabria Borbon was born in Bogotá, Colombia. She received her bachelor degree as Electronic Engineer from Santo Tomas University at Bogotá in 2012. In 2014 she obtained her Master degree at Instituto Nacional de Astrofisica, Optica y Electronica (INAOE) at México. Currently, she is pursuing a PhD in the Analog and Mixed Signal Center at Texas A&M University. Her areas of interest include analog integrated circuit design, active filters, optimization algorithms, analog built-in self-test and design automation tools.