THE PERFORMANCE OF RF DIGITAL CIRCUITS IN THE PRESENCE OF NOISE AND RF INTERFERENCE

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The progress made in silicon-germanium (SiGe) processing has led to a mini revolution in new high speed digital circuits. Some of these circuits are supporting GHz analog to digital conversion (ADC) functions which are getting closer to the rf input. Examples are 1.8 GHz cell phones with integrated GPS, GPS navigation receivers and time-frequency domain measurements. The newer generation of mobile communications relies on digital signal processing to increase receiver versatility and functionality. The key strategy of this software radio concept is the use of high speed analog to digital processing located as close to the rf input as possible, thereby replacing the mixing stages and baseband signal processing, eliminating further signal degradation due to losses in analog stages. For the first time since rf mixers were invented some 80 years ago, we are now seeing rf-front ends without mixers. Such a radical change would have been unheard of just a few years ago. The concern now is whether the new rf digital front-ends are inferior or superior to the conventional rf analog ones. The most important qualities of a superior radio are the signal to noise/distortion ratios and its dynamic range. The dynamic range is the useful operating range between the noise floor and the level of rf intereference causing intermodulation distortion products (IMDs) to exceed the noise. In this paper we review the rf front-end parameters and infer the likely dynamic range values associated with digital rf front-ends as compared to conventional mixers. If rf mixers have been shown to have the highest dynamic range among rf circuits, is it realistic to assume that ADCs can equal or exceed this level of performance? This issue will likely be debated for some time and will bring back memories of similar questions raised in the past, are solid state devices better than vacuum tubes?

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2. E - Electromagnetic Noise and Interference

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4. I - Invited Paper, Program chair: Ira Kolberg

5. No special instructions