This paper presents the first quadrature RF receiver front-end where, in a single stage, low-noise amplifier (LNA), mixer and voltage-controlled oscillator (VCO) share the same bias current. The new structure exploits the intrinsic mixing functionality of a classical LC-tank oscillator providing a compact and low-power solution compatible with low-voltage technologies. A 0.13um CMOS prototype tailored to the GPS application is presented. The experimental results exhibit a noise figure of 4.8 dB, a gain of 36 dB, an IIP3 of -19 dBm with a total power consumption of only 5.4 mW from a voltage supply of 1.2 V.