Abstracts

A wide-band tunable filter technique based on double-diplexing and low-Q tuning elements

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We propose the use of a pair of lowpass-highpass filter cascades, combined at both ends to form what is called a double-diplexer. This two-port network can display either bandpass or bandstop characteristics, depending on the cutoff frequencies chosen for the low- and high-pass elements. A very important feature of the double-diplexed configuration, tuning of center frequency and bandwidth is accomplished by varying only capacitors. This allows cascade of simple, low-order blocks, to form higher order tunable filters in which bandwidth is preserved over a wide range of center frequency. In this paper, each of the two lowpass filters consists of a 2 inductor, 1 capacitor pi-connected network, while each highpass consists of a 2 capacitor, 1 inductor tee-connected network. The configuration is chosen to maximize the number of capacitors and minimize the number of inductors. The filter design does not require the use of high-Q components and thus is potentially a candidate for chip-level integration. Thus, such filters can be tuned using a variety of variable capacitor types, including mechanical, varactor, optically or electrically switched PIN types. No variation of inductance is required. The effect results from the pseudocomplementary nature of two of the four lowpass-highpass junctions, at the common input and output of this double-diplexer "module". Any number of such modules can be cascaded to implement tunable filters with greater selectivity as each cascade represents a doubling of the filter order.

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