

**“Broadband highly selective bandpass filter based on a Tapered Coupled-Resonator (TCR) CRLH structure”, pp.44-51**

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**Abstract** – A highly selective bandpass filter (BPF) based on a tapered coupled-resonator (TCR) composite right/left-handed (CRLH) structure is presented. This filter exhibits a measured fractional bandwidth in excess of 110% and can therefore be used in ultra wideband (UWB) applications. The TCR CRLH BPF is in effect a CRLH transmission line (TL) structure in which each cell is loaded by a coupled resonator. An extremely sharp cutoff is achieved at the lower stopband as a direct consequence of the increasingly strong slow-wave response of the CRLH structure in its low-frequency/left-handed (LH) band toward low frequencies. In order to achieve high selectivity at the higher stopband, the resonant frequencies of the coupled resonators are designed so as to form a tapered distribution of attenuation poles canceling the corresponding attenuation zeros in an iterative manner. The proposed TCR CRLH BPF is implemented in a metal-insulator-metal (MIM) configuration both to achieve high compactness and to avoid the spurious transverse resonances typically existing in the interdigital implementation of CRLH structures. Comparison with a conventional equal-ripple filter of same size and same substrate with comparable insertion loss shows that a 70% broader bandwidth obtained with the TCR CRLH BPF.