

“Multitone intermodulation and RF stability analysis of MEMS switching circuits by a globally convergent harmonic-balance technique”, pp.45-54

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Abstract – The paper introduces an extended harmonic-balance (HB) technique allowing the efficient computation of distortion effects due to MEMS nonlinearities in RF circuits containing microelectromechanical components. The ordinary HB equations are complemented by an auxiliary set of equations describing the nonlinear dynamics of the moving bridges, and the two sets are solved simultaneously by an inexact Newton iteration. Convergence problems are solved by advanced numerical techniques including special state variables and globalisation by a trust-region technique coupled to the GMRES iteration with restarting. The responses of a basic MEMS switching structure to multitone excitations and to digitally modulated RF signals are examined in detail. RF stability is investigated by a numerical implementation of bifurcation theory.