ABSTRACT

This thesis is about the noise study of microwave active filters. In particular, noise analysis for a class of lumped and transversal filter will be developed both in discrete and monolithic implementation and a noise reduction scheme will also be proposed with the consideration of the practical filtering response and structure.

Moreover, a simple design technique to determine the noise reduction element for conventional lumped and transversal filter is proposed and validated. The low noise figure is achieved through the use of source degeneration inductor that reduces the noise generated by transversal elements in the filter. In addition, the element value of the source degeneration inductor is determined as function of the filter's specification parameters. To verify this noise suppression scheme and its simple design technique usefulness, two prototype *L*-band lumped and transversal filters centered @1.6 GHz with about 10% 3-dB BW are implemented. One of these two filters is based on GaAs FETs and microstrip lines. And the other one is implemented in 0.6 μm BiCMOS process. The experimental results of the first filter report a 3.2 dB noise figure improvement for the filter with source degeneration inductor when compared with the conventional ones, demonstrating that the proposed noise reduction scheme and design methodology usefulness. For monolithic verification, the second filter reports a simulated 4.7 dB as noise figure and its large signal and temperature effect on noise are also analyzed to confirm the design practical.