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Modeling SET Effect on Charge Pump Phase Locked Loop

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Abstract : Cosmic Ray effects in microelectronics such as single event effect (SET) and total dose ionization (TID) have been of major concern in space electronics since 1970. Advanced CMOS technologies have demonstrated reduced sensitivity to TID effect. However, charge pump Phase Locked Loop is very much vulnerable to single event transient effect. This paper presents an SET analysis model, where the SET is modeled as a double exponential pulse. The time domain analysis reveals that the settling time of the voltage controlled oscillator (VCO) depends on the SET pulse strength, setting the time constant and the damping factor. The analysis of the proposed SET analysis model is confirmed by the simulation results.

Keywords : charge pump, phase locked loop, SET, VCO
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