Disrupted bandcount doubling in an AC-DC boost PFC circuit modeled by a time varying map

Power factor correction converters are used in many applications as AC-DC power supplies aiming at maintaining a near unity power factor. Systems of this type are known to exhibit nonlinear phenomena such as sub-harmonic oscillations and chaotic regimes that cannot be described by traditional averaged models. In this paper, we derive a time varying discretetime map modeling the behavior of a power factor correction AC-DC boost converter. This map is derived in closed-form and is able to faithfully reproduce the system behavior under realistic conditions. In the chaotic regime the map exhibits a sequence of bifurcation similar to a bandcount doubling cascade on the low frequency. However, the observed scenario appears in some sense incomplete, with some gaps in the bifurcation diagram, whose appearance to our knowledge has never been reported before. We show that these gaps are caused by high frequency oscillations.