

Intermodulation Based Non-linear Behavior Prediction Towards Electronic Waste Reduction

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Abstract— Electronic waste piles up at an accelerating pace, causing environmental damage as well as health issues. Instead of recycling, which is energy- and labor intensive, re-usage could mitigate this impact. However, it requires precise identification, sorting and verification strategies, which the industry currently lacks. This paper proposes a novel approach for the characterization of non-linear devices using two-tone stimulation and self-mixing. It presents a wireless-enabling method allowing the recovery of DC SPICE parameters of the device under test by simulative adaption. The proposed strategy is validated by comparing the extracted parameters of a Schottky diode with manufacturer data as well as classical diode measurements. This work achieves a normalized root mean square error of 4.26% compared to conventional DC characterization methods and is able to accurately predict the harmonic and current voltage behavior of a diode. This work enables rapid, large scale identification of non-linear devices which allows for a reuse of electrical components, thus reducing the environmental impact of electronic devices.

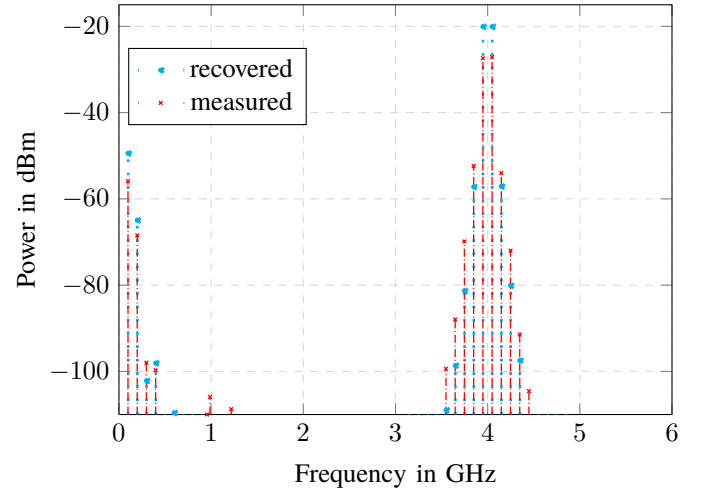


Fig. 2. Comparison of measured vs. recovered harmonic characteristic

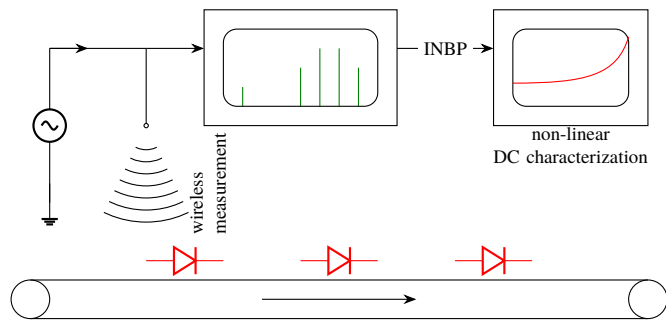


Fig. 1. Proposed characterization setup for contactless part identification

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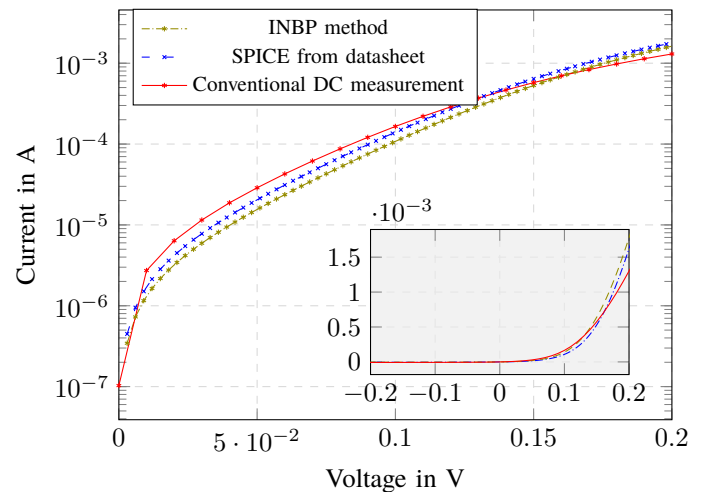


Fig. 3. Comparison of the current voltage behavior of the diode in log and linear scale