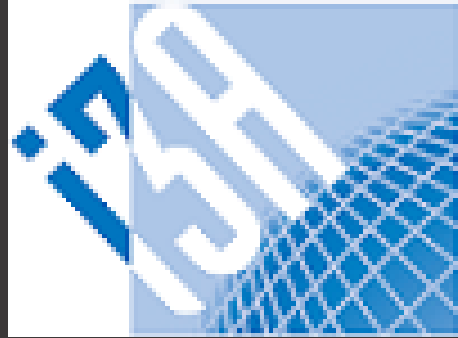


Design and Simulation-Based Validation of Embedded Algorithms for Resonance Search and Tracking

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1. Introduction

The increase in power density in power converts requires accurate characterization of losses in magnetic materials. These losses depend on the operating point and on the excitation waveform; therefore, test bench capable of generating sinusoidal excitation are required.

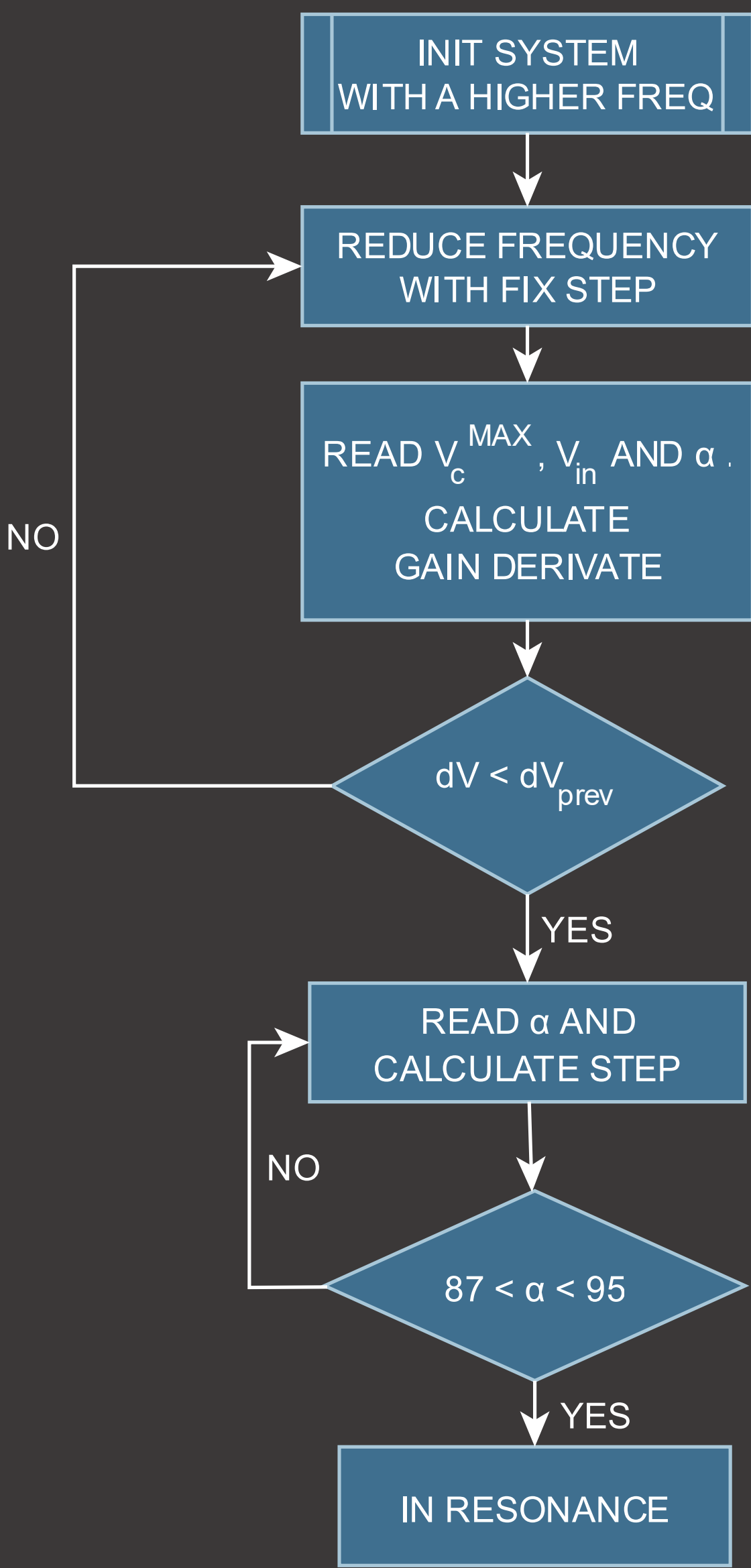
One way to generate these excitation is through resonance. In such system, the permeability of the inductors change with the temperature. For this reason, algorithms to searching and maintaining the resonance point are required.

The algorithms are validate using a **hardware-in-the-loop** setup. That is, the resonance system is simulated on the computer, while the algorithms runs on the microcontroller.

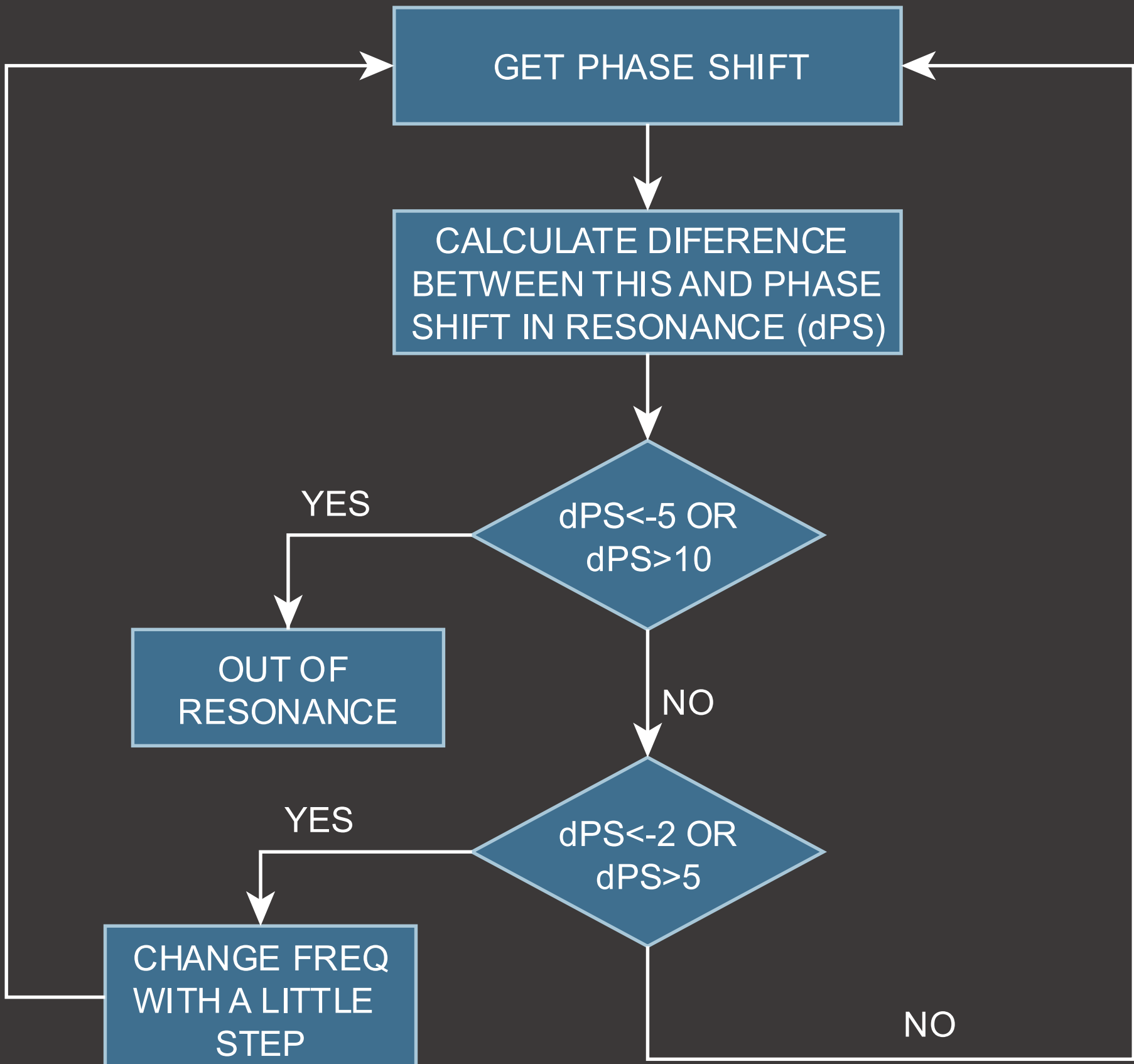
For the results, a capacitance of $C=1\mu\text{F}$ and an initial inductance of $L=250\mu\text{H}$ were considered. In this conditions, the theoretical resonance frequency is 10.06 kHz and the quality factor, Q , is 7.9.

2. Methodology

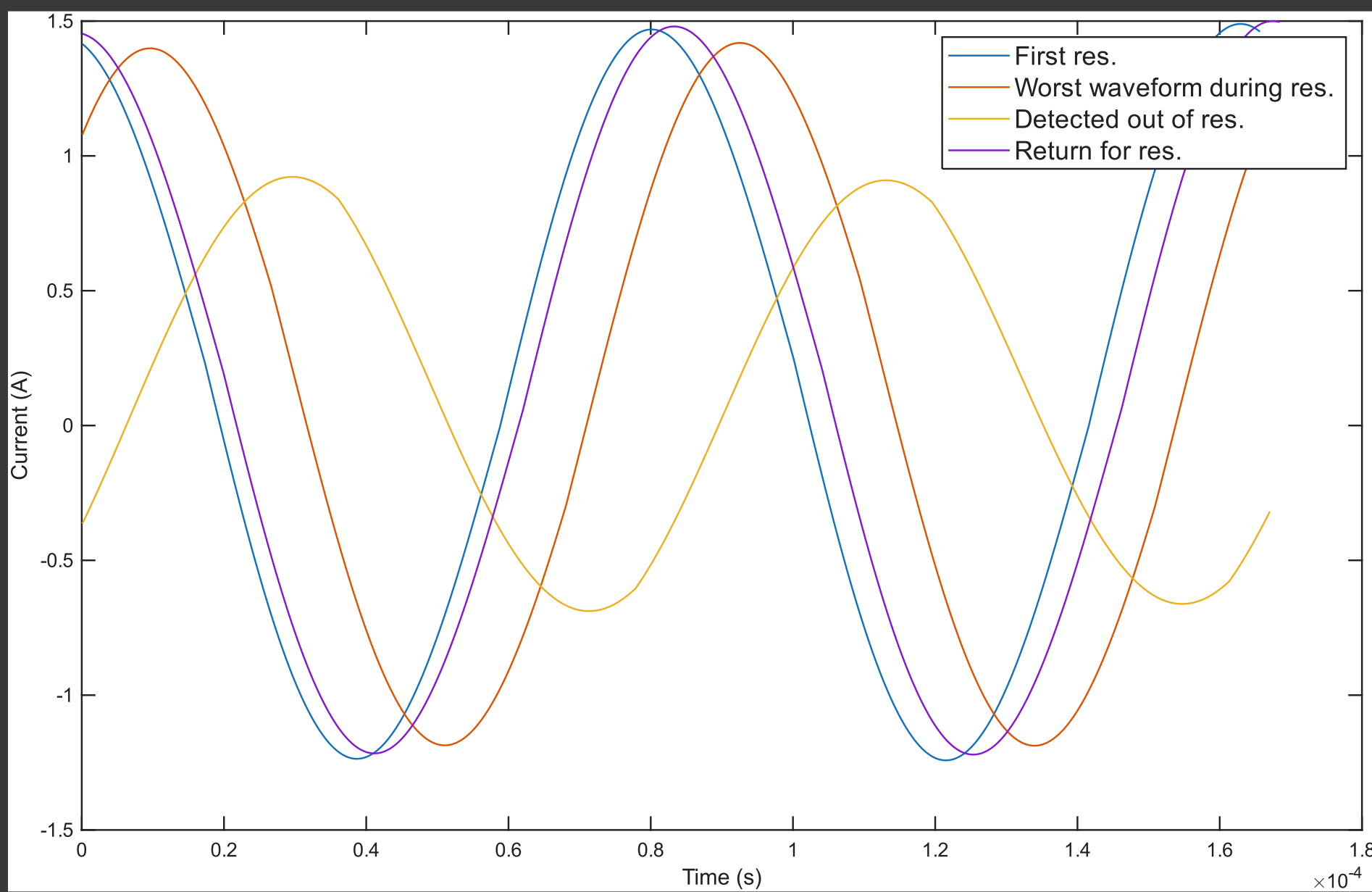
Resonance Search



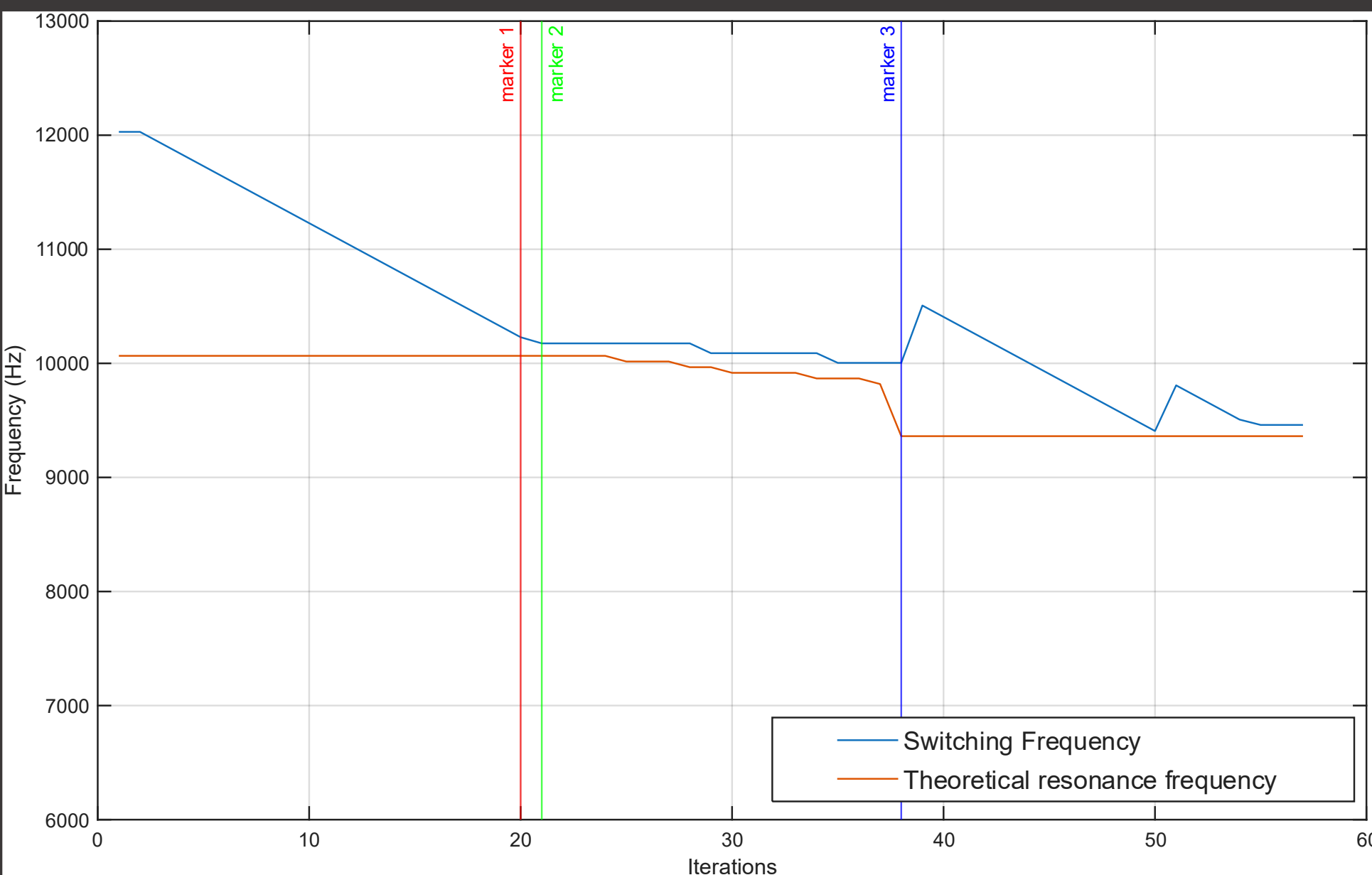
Resonance Tracking



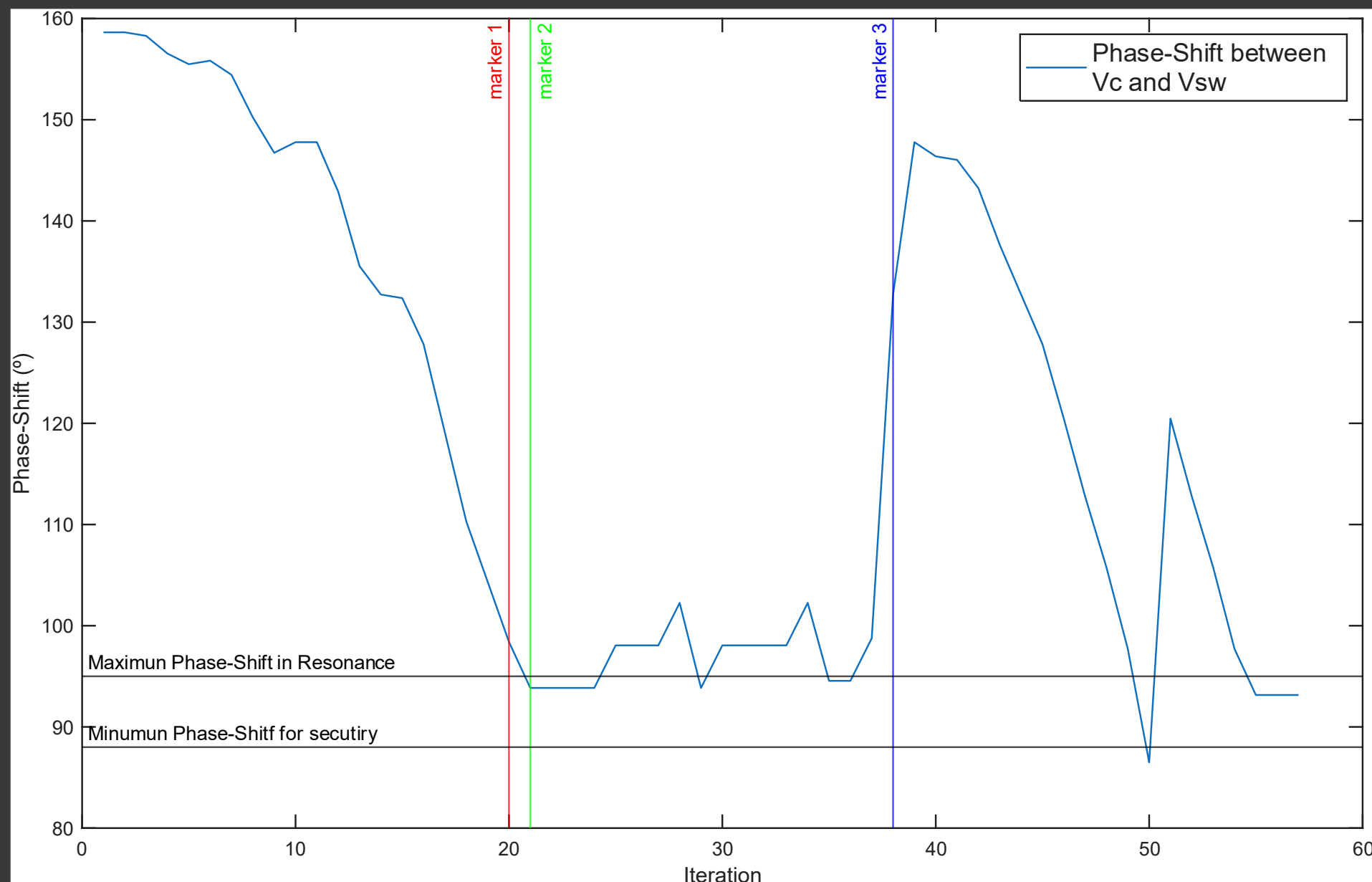
4. Experimental Results



Current wave-form in different moments



Frequency variation during resonance search and tracking



Phase-shift variation during resonance search and tracking

5. Conclusions

- The control strategy enables resonance frequency identification through simple system measurements.
- Resonance frequency is maintained under slow inductance variations
- Resonance loss caused by abrupt inductance change is detected, triggering a new resonance search.
- Low THD waveforms are obtained.

6. References

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