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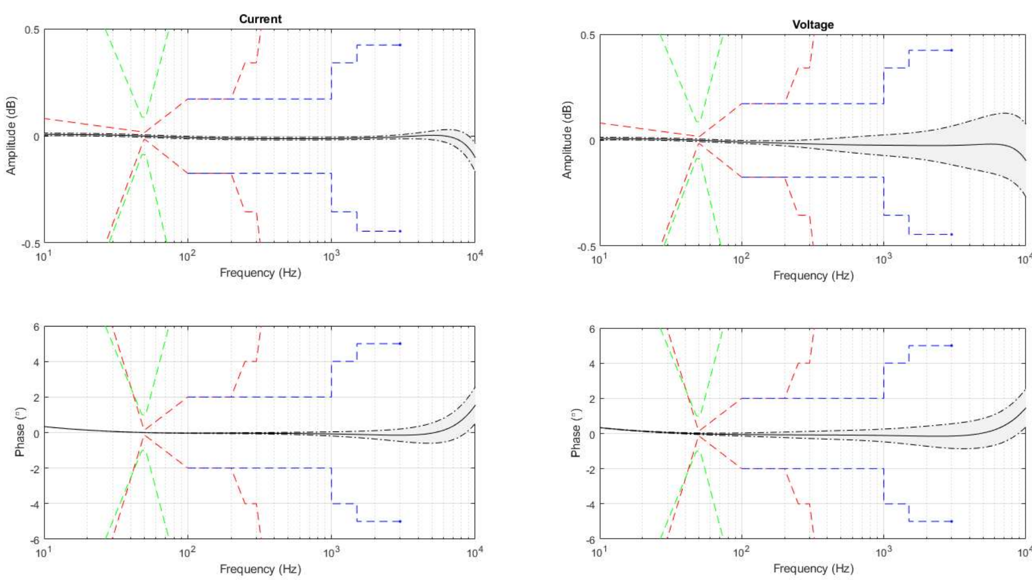
Unlike conventional instrument transformers, LPITs do not utilize ferromagnetic materials, thereby entailing many benefits, including remarkable linearity, wide dynamic range, no saturation, no ferro-resonance effects, and wide frequency bandwidth. The last point is particularly attractive to power quality applications, where signal bandwidth of up to 100th harmonic is often desired.

In reality, to achieve a flat system frequency response across the entire bandwidth (e.g, up to 3 kHz as specified in IEC 61869-6 6A.3) reliably under all possible conditions is no small feat, requiring careful system design and optimization, particularly in the secondary converter and signal processing.

In an LPIT system consisting of a Rogowski coil and capacitive divider, the primary sensors can be well modelled by simple equivalent circuits of well-defined frequency responses. Key sensor parameters can be accurately measured or calibrated. In the secondary converter, the behavior of analog front-end circuitry can be precisely simulated with SPICE tools. Frequency responses of digital signal processing modules can be easily computed. Finally, Monte Carlo simulations can be made to assess frequency response stability with all sorts of system variations such as component tolerances, environmental conditions, etc.

Combining all these and by proper design of front-end circuitry, analog & digital filters and other signal processing components, it is possible to reliably equalize the LPIT system frequency response up to many kHz to satisfy quality metering requirements, as shown in the figures below.



Bode plots of simulated frequency response of a LPIT system in development. The light gray areas enclosed by dot-dash lines indicate 3σ confidence regions, taking into account all system variations such as component tolerances and environmental conditions. The blue dash lines represent quality metering requirements (IEC 61869-6 6A.3)