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Sandia National Laboratories

COMPARISON OF IDEAL TRANSFORMER METHOD AND DAMPING IMPEDANCE METHOD FOR PV POWER-HARDWARE-IN-THE-LOOP EXPERIMENTS

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Objective

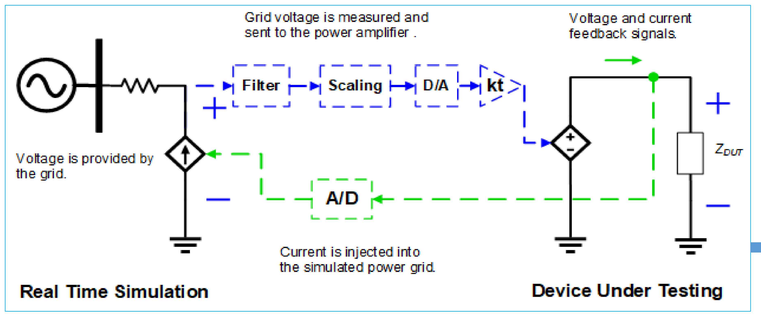
Investigate four methods of connecting a PV inverter to a RT- PHIL Simulation and evaluate the stability and accuracy of each method.

- Damping Impedance Low Pass Filter-DIM LPD
- Damping Impedance Low Pass Filter and Lead Filter- DIM LPF LD
- Ideal Transformer Low Pass Filter- ITM LPF
- Ideal Transformer Low Pass Filter and Lead Filter-ITM LPF LD

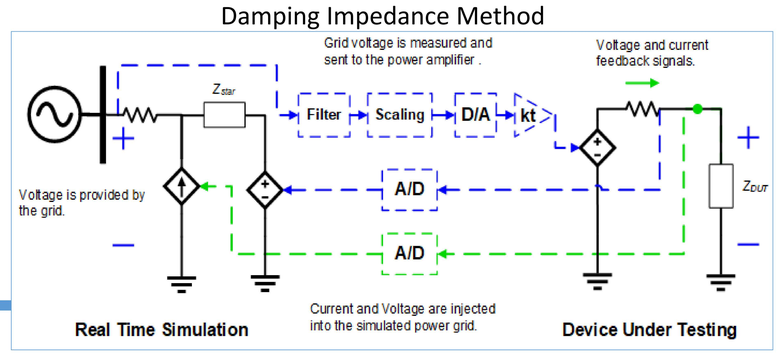
Conclusions

- All interface methods were stable and successfully connected the inverter during unity and non-unity power factor settings and curtailed active power.
- The DIM LPF LD provided the most realistic representation of the inverter.
- The ITM LPF LD provided an easily implementable representation of the inverter.
- DIM methods incur a higher CPU usage compared to the ITM methods.

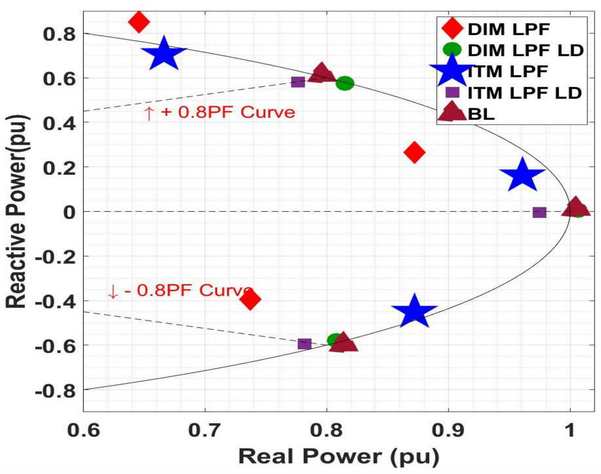
Ideal Transformer Method

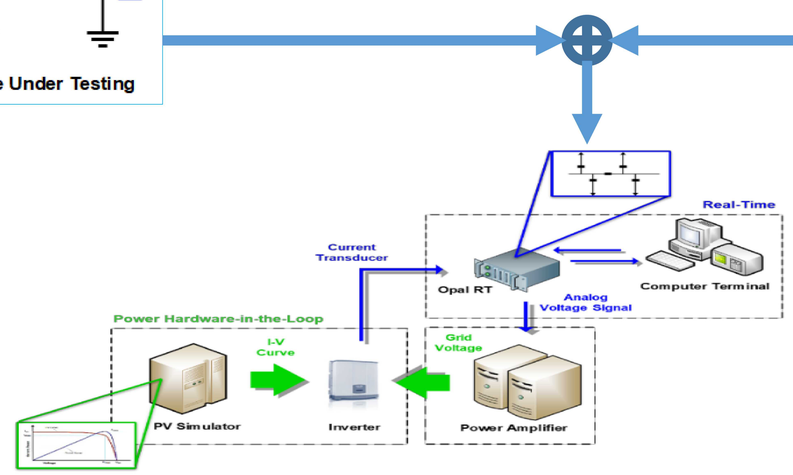


Damping Impedance Method

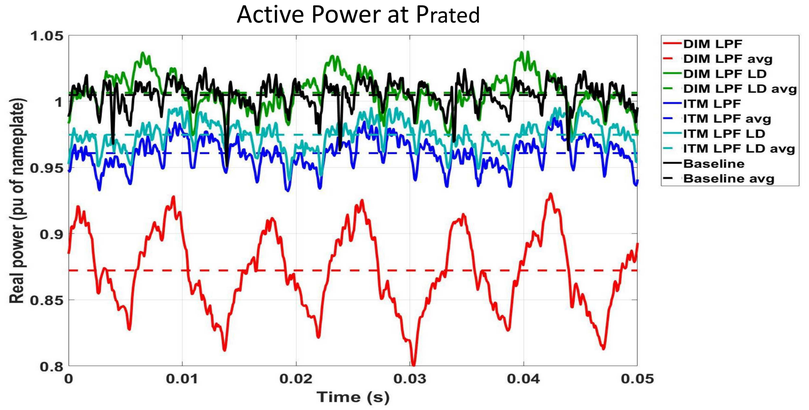


Rated Power

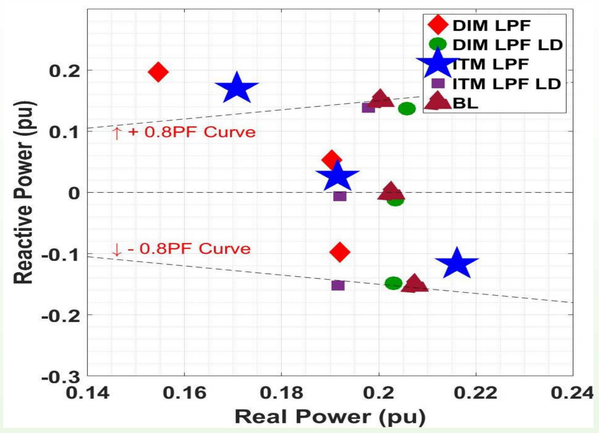




Active Power at Prated



De-Rated Power



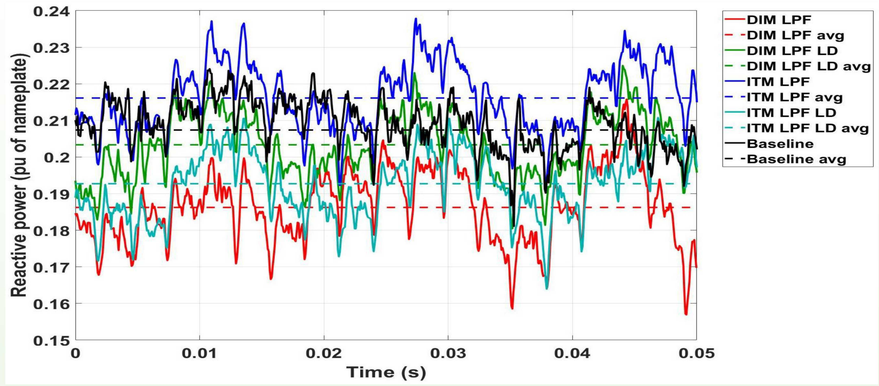
Average Relative Error

Method	Average Error (%)
DIM LPF	27.755
DIM LPF LD	3.303
ITM LPF	14.940
ITM LPF LD	4.507

RT Simulation Interface Method Computational (%) Usage for One Core

Method	Execution Cycle (%)	Major Computation Time (%)
DIM LPF	62.21	49.19
DIM LPF LD	65.99	52.16
ITM LPF	49.20	42.71
ITM LPF LD	49.46	42.99

Reactive Power at 20% Prated, -0.8PF



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