Short report on the testing of the time retarded implementation

Report nr.2, L'Aquila

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Half wavelength dipole

Intro

A 40 cm $\frac{\lambda}{2}$dipole, crossection 0.1×0.1 mm. Theroetical resonance frequency 375MHz.

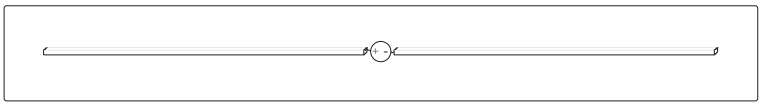

Figure 1: The $\frac{\lambda}{2}$dipole

Simulation of resonance frequency

Results

1. For the simple dipole the retardation time is of importance to correctly simulate the resonance frequency.

2. The time retardation also introduces a 'natural' damping in the PEEC model, as noted by Ruehli years ago.

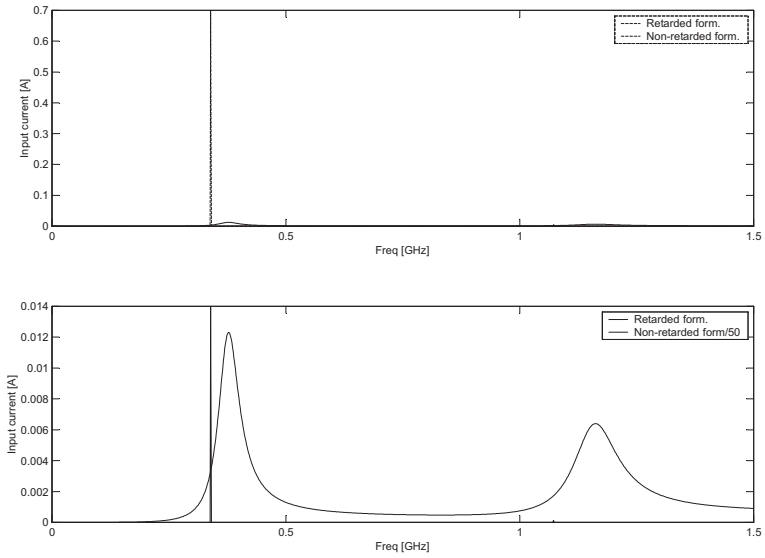

Figure 2: Resonance frequency

Transmission line #1

Intro

A 40 cm transmission line, figure 3, excited by a current source pulse.

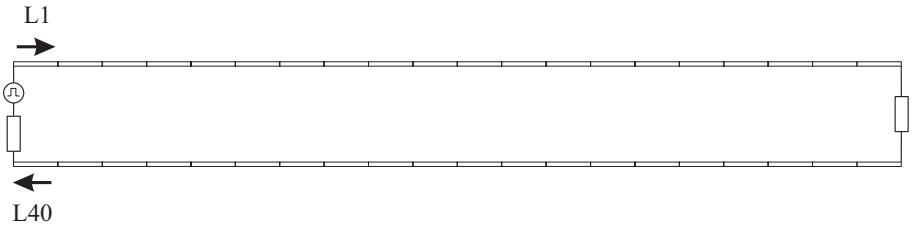

Figure 3: The transmission line

Simulation of 'travelling' current pulse

The current through the first, L1, and last, L40, inductance is displayed in the figure.

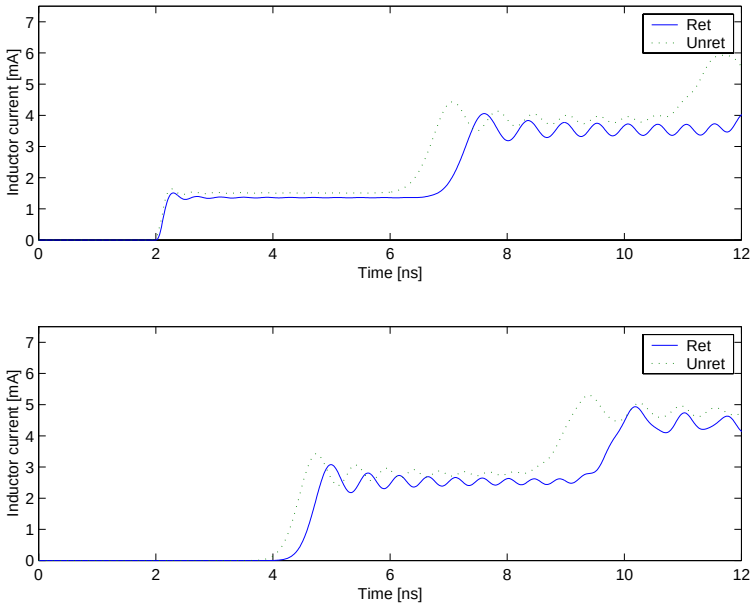

Figure 4: Current pulse

Transmission line #2

Intro

A 80 cm transmission line, figure 3, excited by a current source pulse.

Simulation of 'travelling' current pulse

The current through the first, L1, and last, L40, inductance is displayed in the figure.

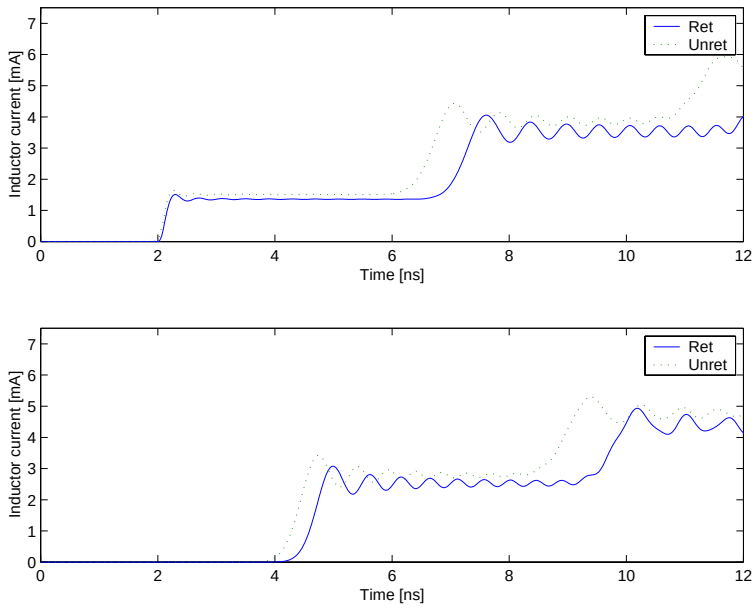

Figure 5: The $\frac{\lambda}{2}$dipole

Results for transmission line simulations

1. The retardation is important for the transmission line simulation also.
2. The retarded transmission line PEEC models are not stable, for t $>$ 80ns the models becomes unstable.

Delay line

Intro

A delay line, figure 6, used to syncronize pulses on PCB's have been simulated. For the typical delay line, the traces are very near and the inductive/capacitive couplings are of great importance. The time retarded couplings becomes important mainly for high frequencies.

Simulation

The current through inductance L1 and L31 are displayed in the figure.

Results

For the delay line the inclusion of time retardation is noted, but as for the transmission line problem the PEEC model becomes unstable for the transient simulation. For a frequency sweep the two implementations differs considerably, but no useful information can be extracted from the result.

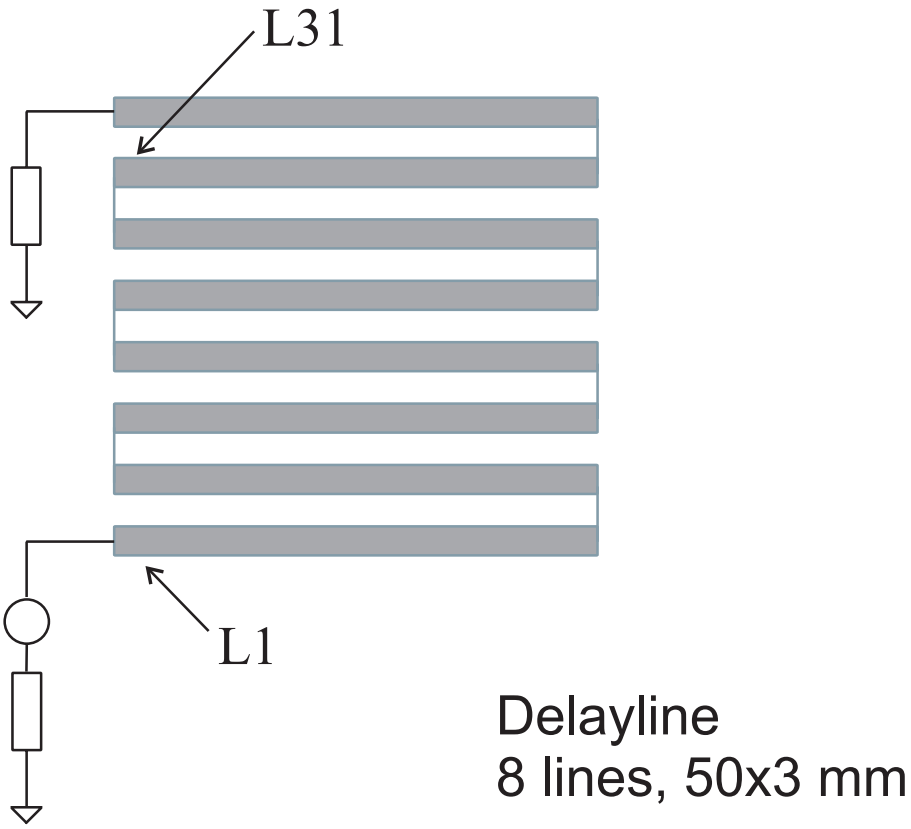

Figure 6: The delay line

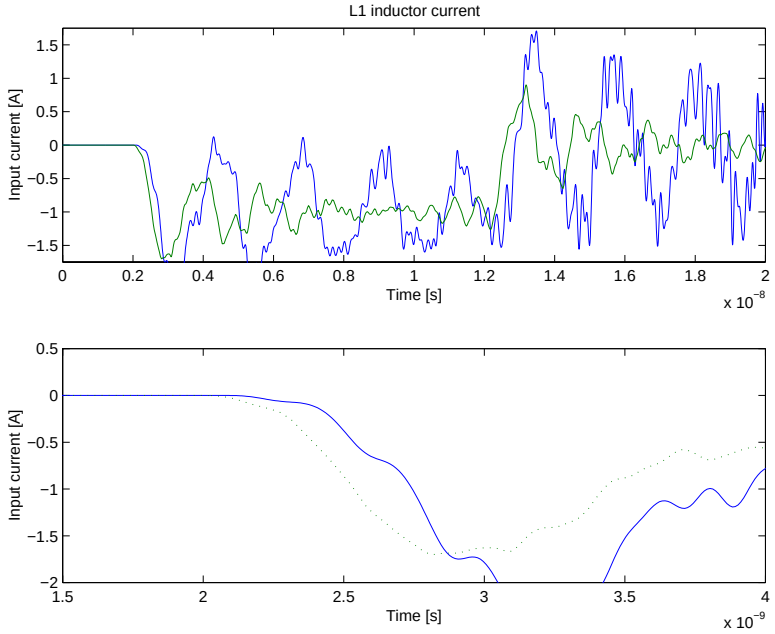

Figure 7: Current through L1

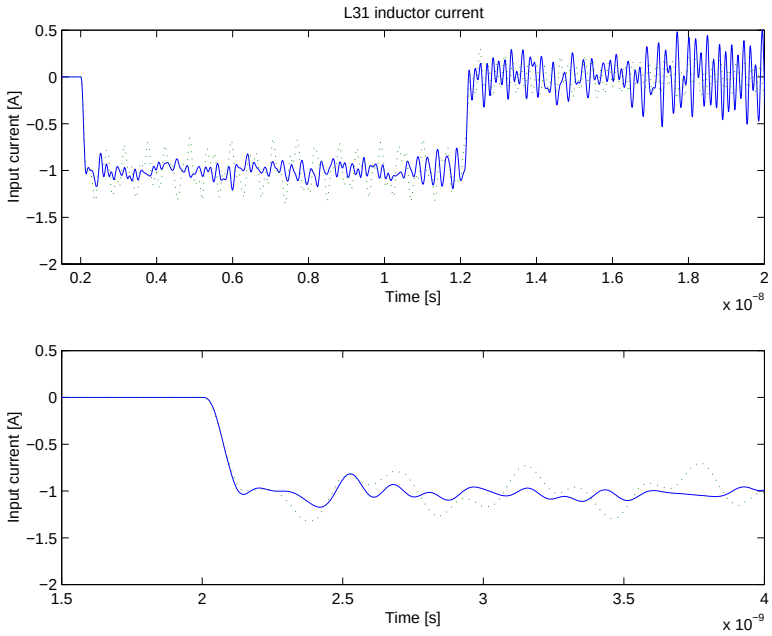

Figure 8: Current through L31