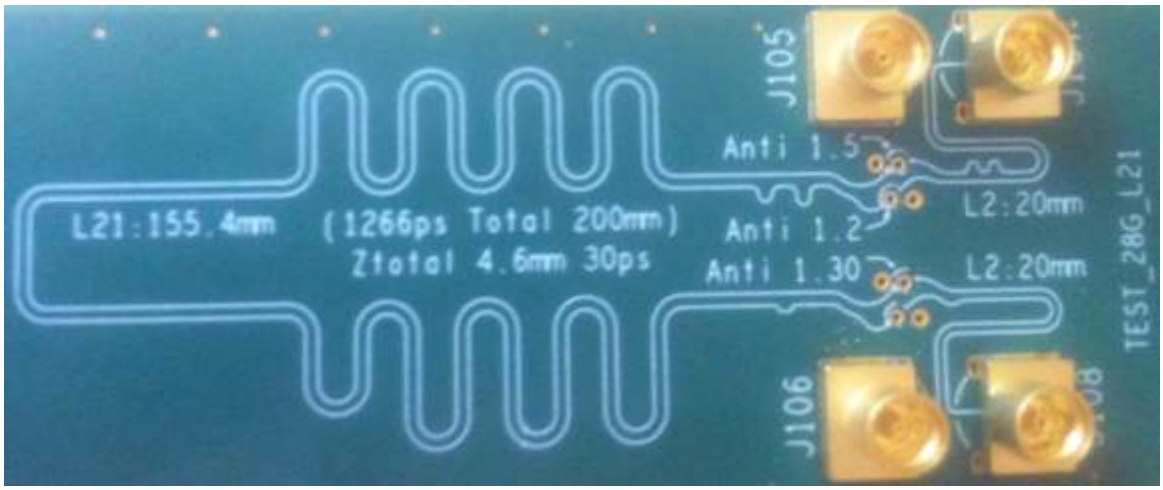
EM modelling of high-speed via transitions (28G FR4 test-board available)
project title
Technical University of Denmark
host institution

Project description:

In this project the influence of high-speed vias on high-speed signal transmission up to 28 Gbit/s should be investigated. The vias connect traces on a 22-layers FR4 printed circuit board. The effect of nearby ground vias on the quality of the signal transmission must be accessed. The project will involve signal processing in Agilent ADS and electromagnetic modelling of the vias using the simulation tool HFSS. Experimental S-parameters measured to 65 GHz are available for several test-structures with and without nearby ground vias.



Figur 1: Test board with via transitions of varying geometry and nearby ground vias.

The following tasks can be proposed for this project:

1) Transform experimental data from frequency to time-domain and extract information about of transmission line parameters and analyze via transitions on the test boards.
2) Investigate plane radiation effects at via transitions using HFSS. What is the effect of nearby ground vias? What is the effect of simulation domain truncation on the parasitic modes? There is the return current path when no nearby ground vias are present?
3) Investigate the influence of ground vias on the Eye diagram quality of a real-world high-speed bit pattern.
4) Propose optimized via transitions for 28Gbit/s transitions.

The project is motivated by the fact that it seems to be a contradiction between EM simulation results showing that it is necessary to include several ground vias near via transitions and real life boards that still function well without these! The physical reason behind this difference must be better understood.