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Electromagnetic Solutions

Comparison of S-parameters of 90-deg. with two 45-deg. bends in microstrip line

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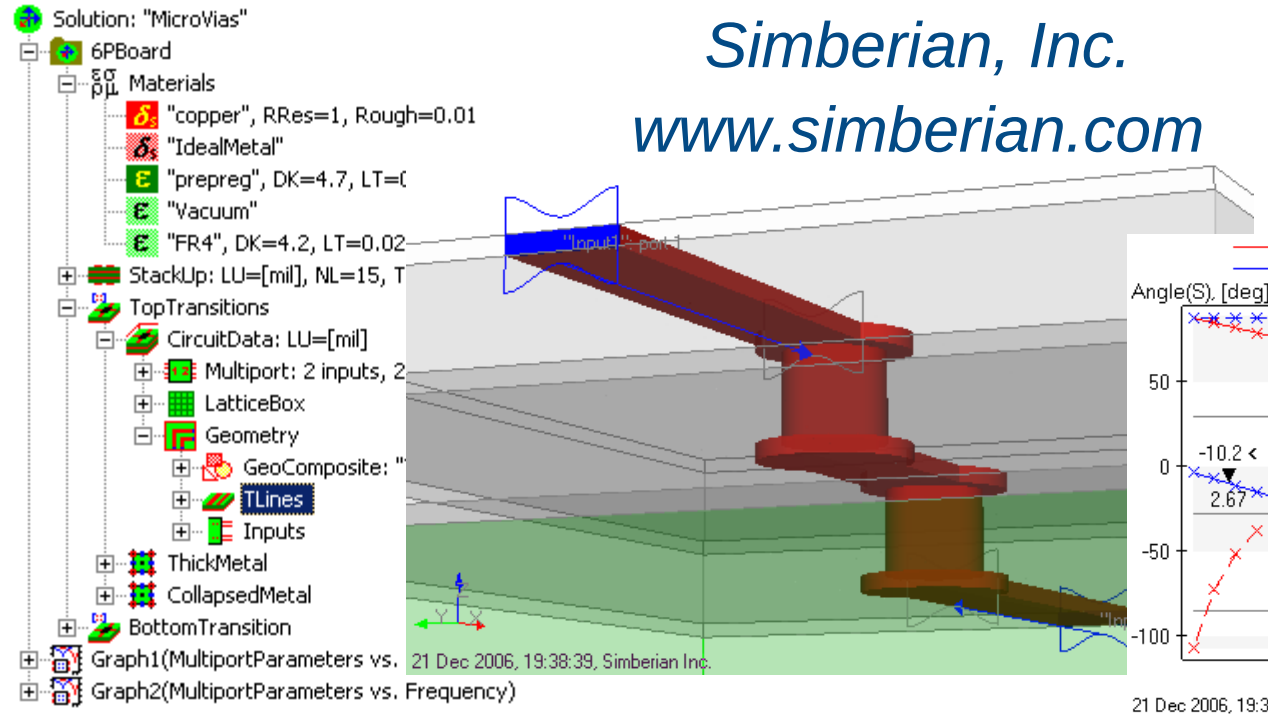
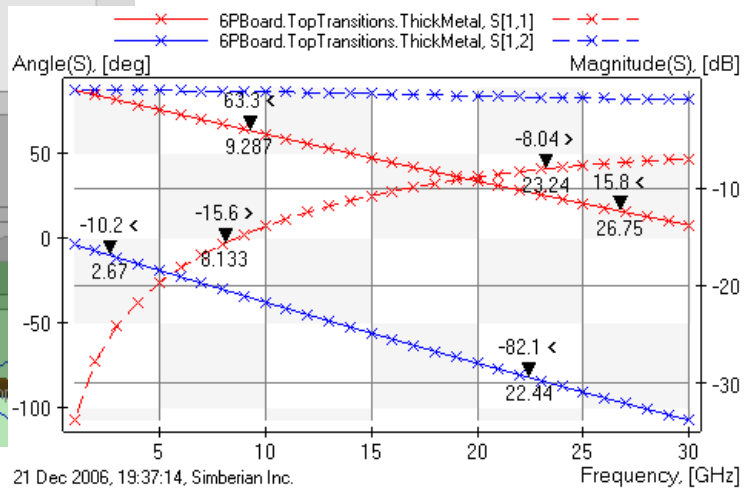
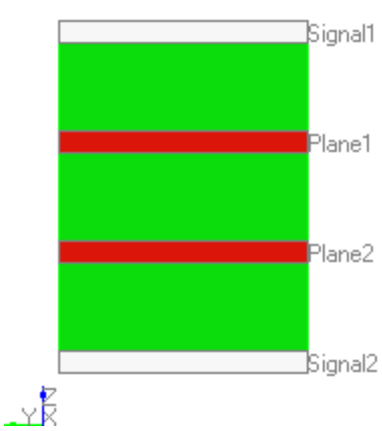




StackUp

- StackUp from Tutorial 1



Signal layer 1.2 mil;

Medium layer of “FR4”, 4.5 mil;

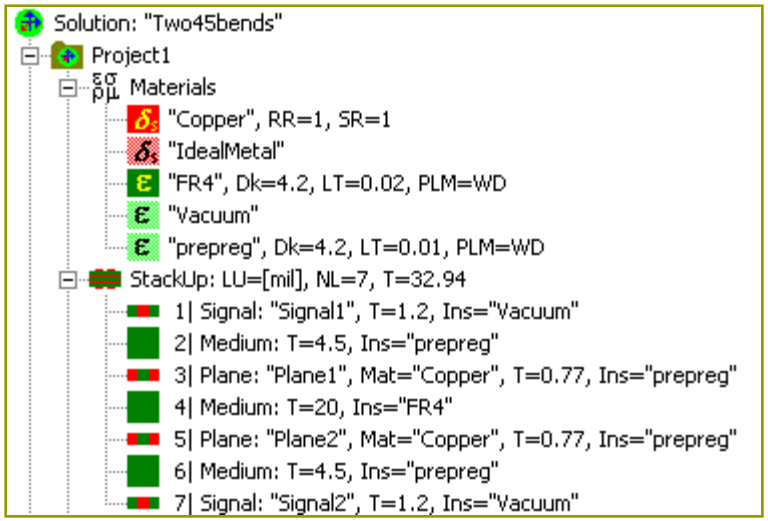
Plane layer, 0.77 mil;

Medium layer of “FR4”, 20 mil;

Plane layer, 0.77 mil thick;

Medium layer of “FR4”, 4.5 mil;

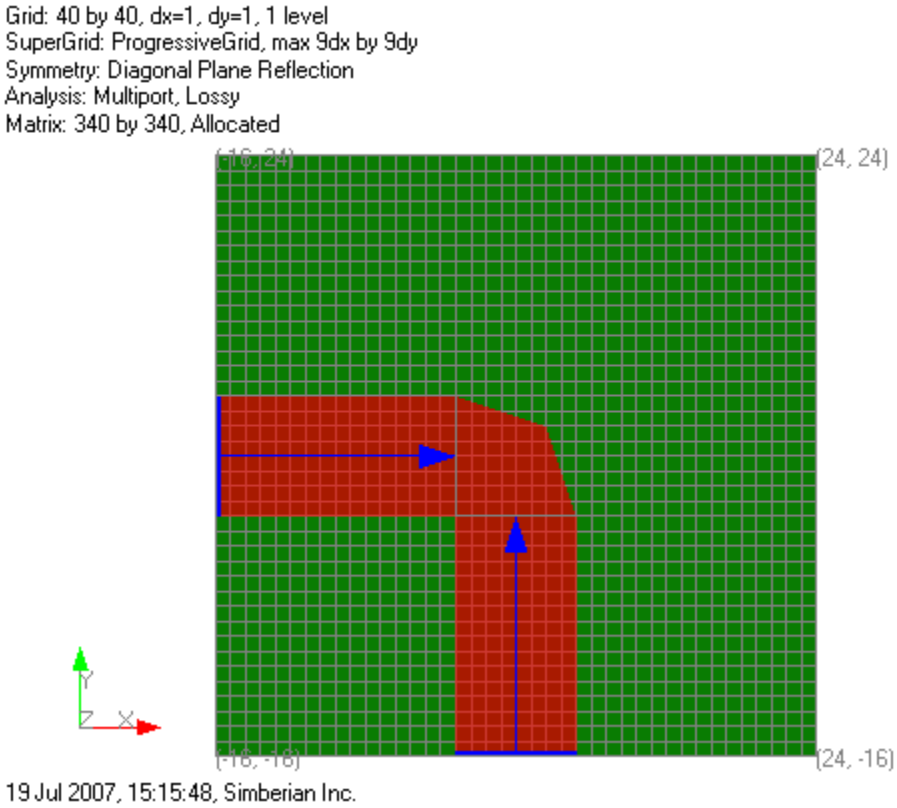
Signal layer 1.2 mil;



Circuit Bend0

- 90-degree bend in 8-mil microstrip line in layer “Signal1”, bend is slightly rounded-off

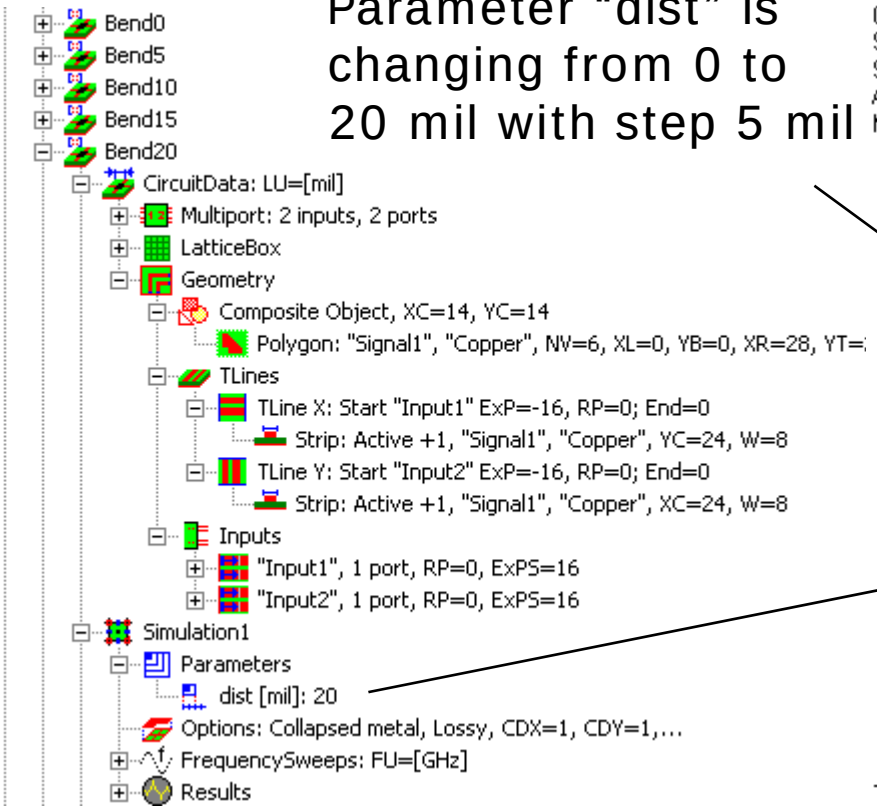
Circuit Bend0, Parameter dist=0 mil

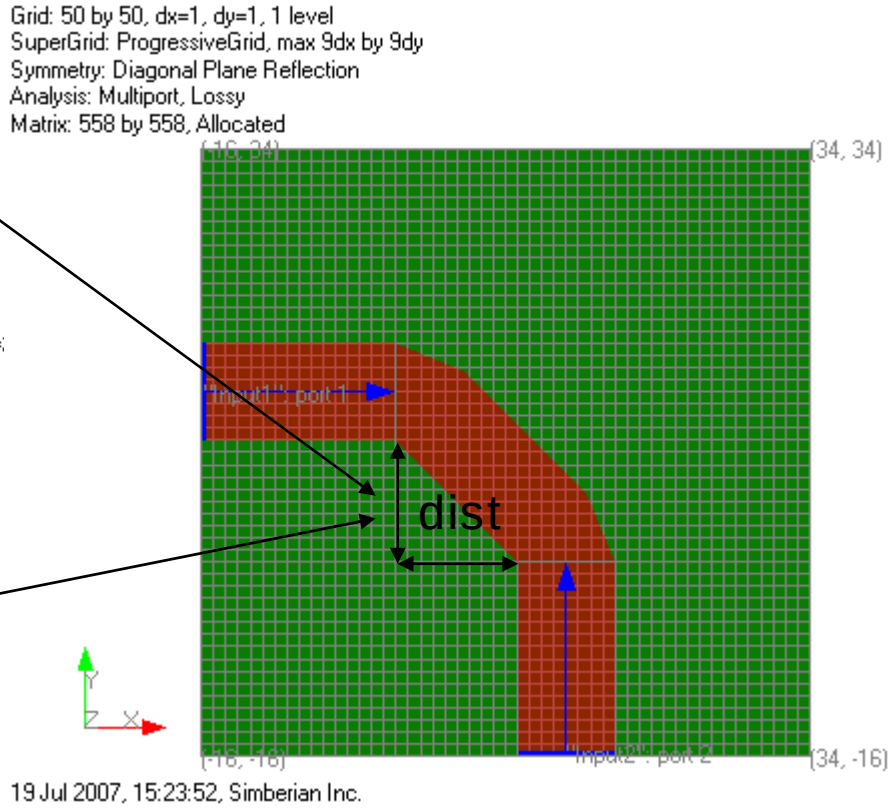


Circuits Bend5-Bend20

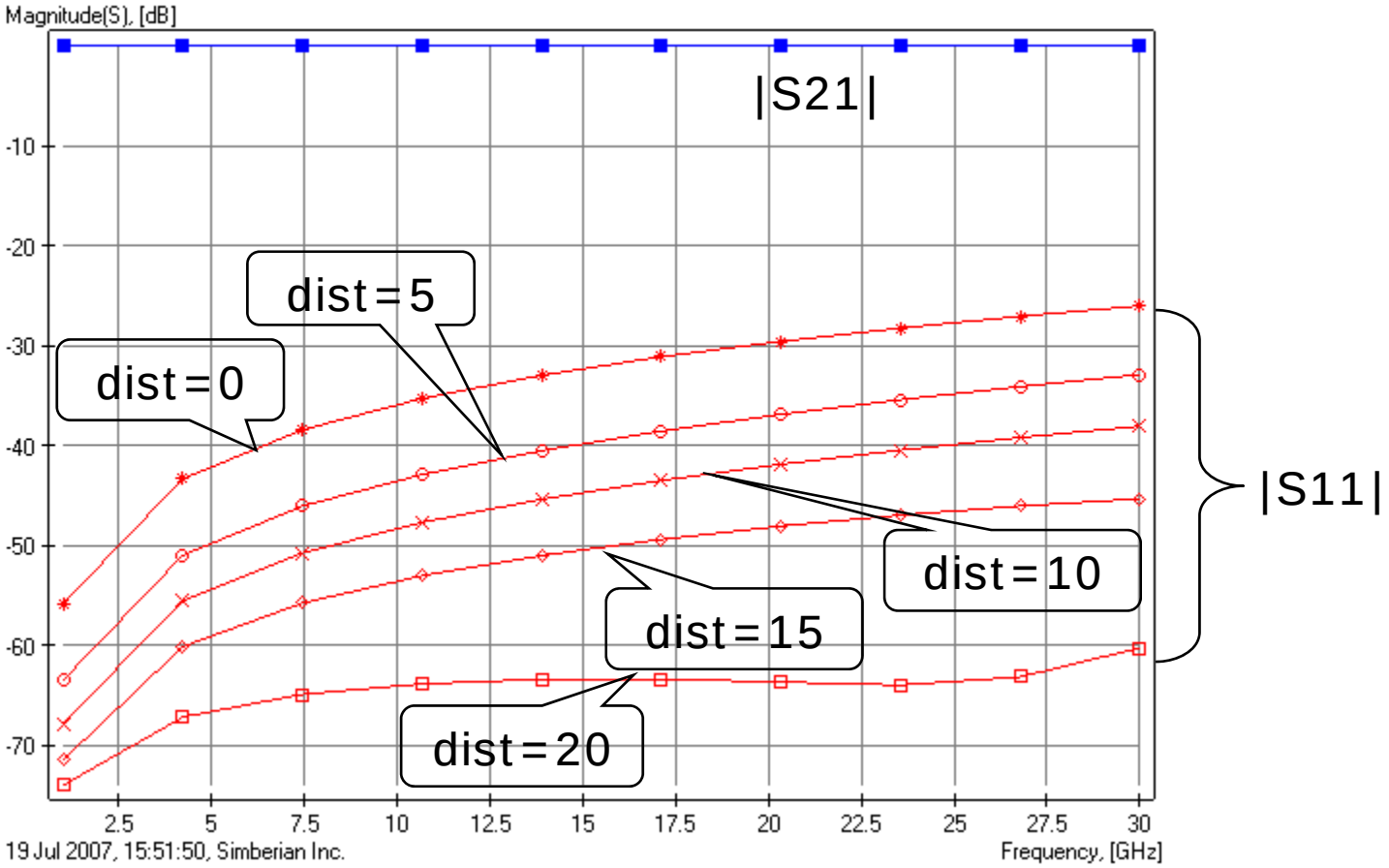
- Two 45-degree bends in 8-mil microstrip line in layer “Signal1”

Parameter “dist” is changing from 0 to 20 mil with step 5 mil

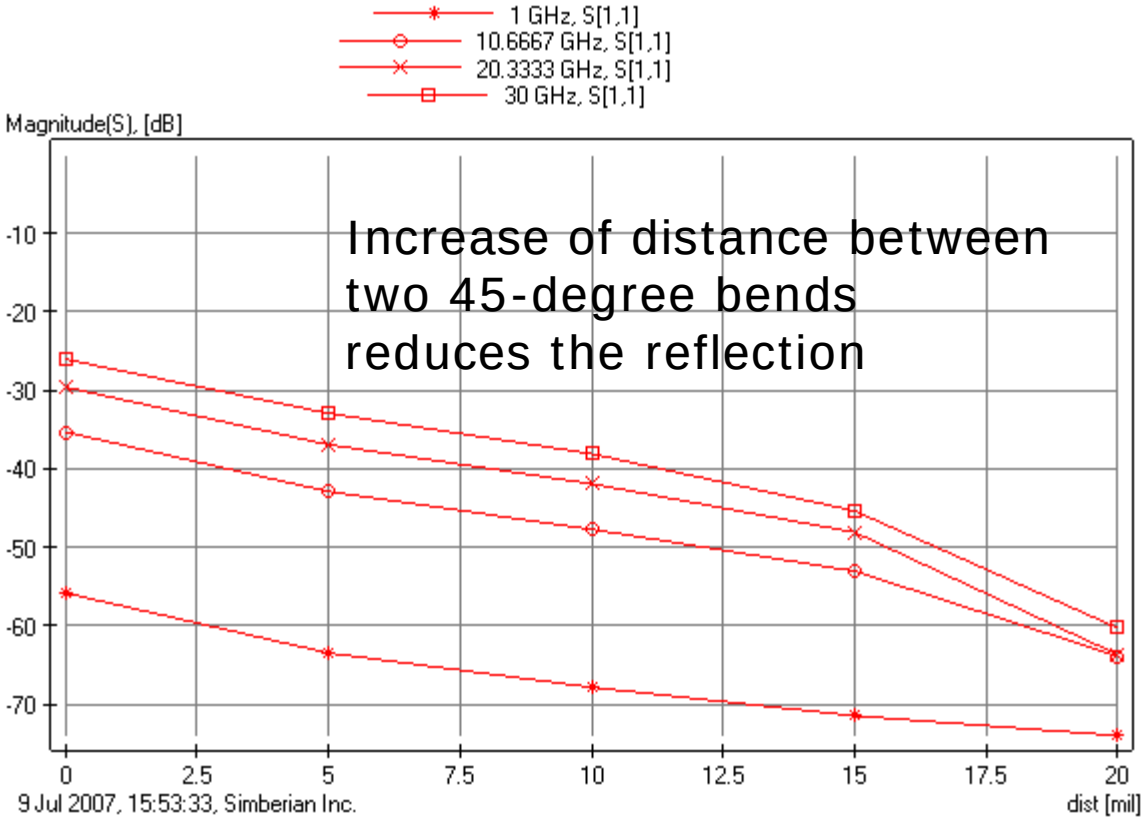


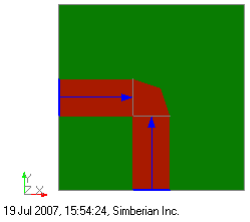


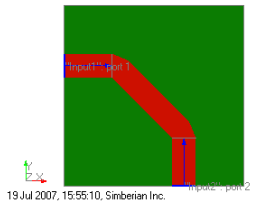
S-parameters vs. frequency



|S11| vs. parameter “dist”

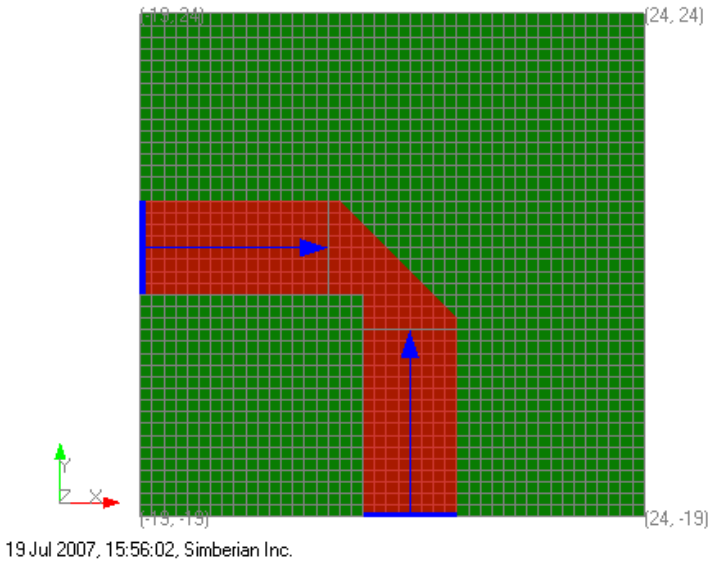


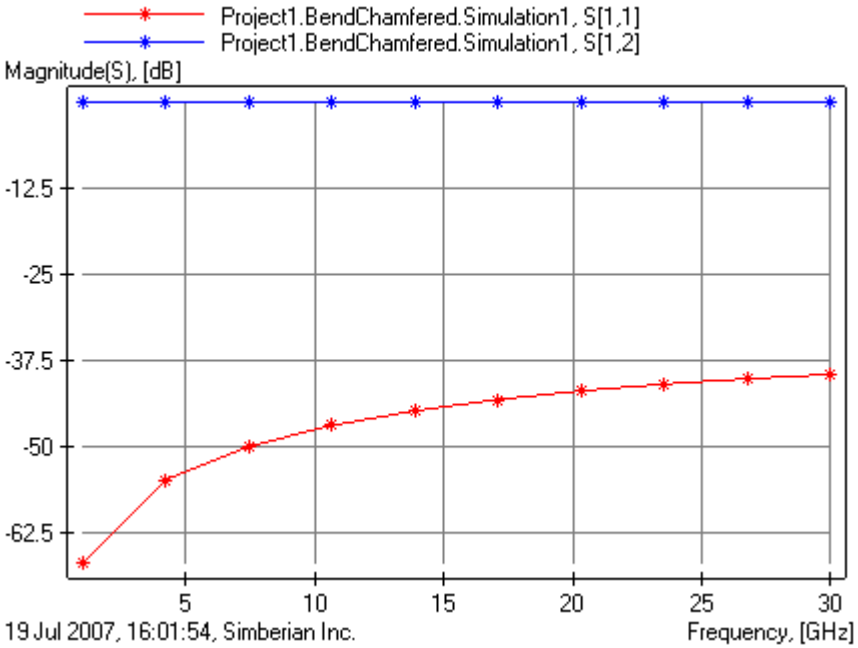




Chamfered bend

- Smaller footprint almost the same performance as two widely spaced 45-degree bends





Conclusion

- Reflection coefficients are very small for all investigated configurations – the effect may be not even visible on TDR
- Discontinuity effect comes mostly from the excessive capacitance of the bend
- Two 45-degree bends are better than non-chamfered 90-degree bend
- Chamfered 90-degree bend is a good alternative and is comparable with two widely spaced 45-degree bends

Solution and contact

- Solution Two45Bends.esx and project files, used to illustrate these notes, are available after installation of Simbeor 2007 in My Documents / Simbeor Solutions / PCB_MCM / Two45Bends
- Send questions and comments to
  - General: info@simberian.com
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