

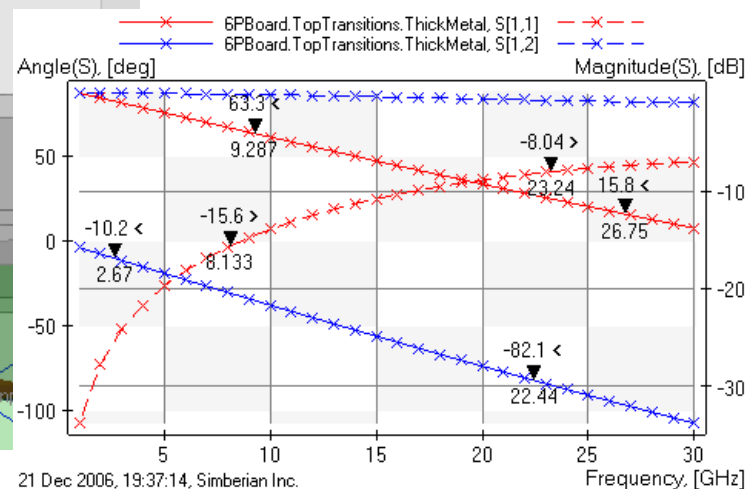
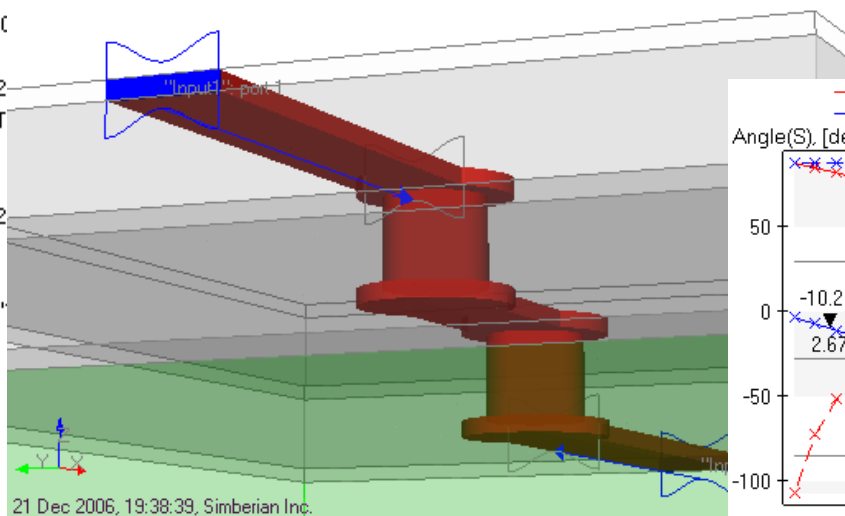
# Comparison of S-parameters of 90-deg. with two 45-deg. bends in microstrip line

Solution: "MicroVias"

- 6PBoard
  - Materials
    - "copper", RRes=1, Rough=0.01
    - "IdealMetal"
    - "prepreg", DK=4.7, LT=C
    - "Vacuum"
    - "FR4", DK=4.2, LT=0.02
  - StackUp: LU=[mil], NL=15, T
  - TopTransitions
    - CircuitData: LU=[mil]
    - Multiport: 2 inputs, 2
    - LatticeBox
    - Geometry
      - GeoComposite: "
      - TLines
      - Inputs
    - ThickMetal
    - CollapsedMetal
    - BottomTransition
  - Graph1(MultiportParameters vs. 21 Dec 2006, 19:38:39, Simberian Inc.)
  - Graph2(MultiportParameters vs. Frequency)

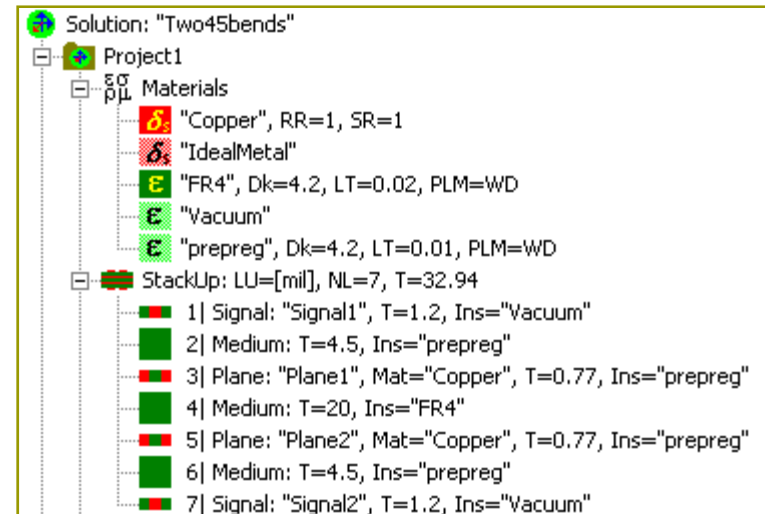
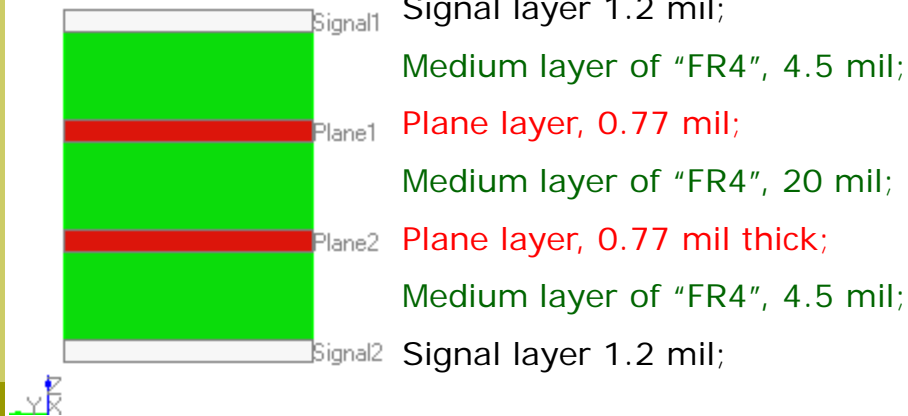
Simberian, Inc.

[www.simberian.com](http://www.simberian.com)



# StackUp

## StackUp from Tutorial 1

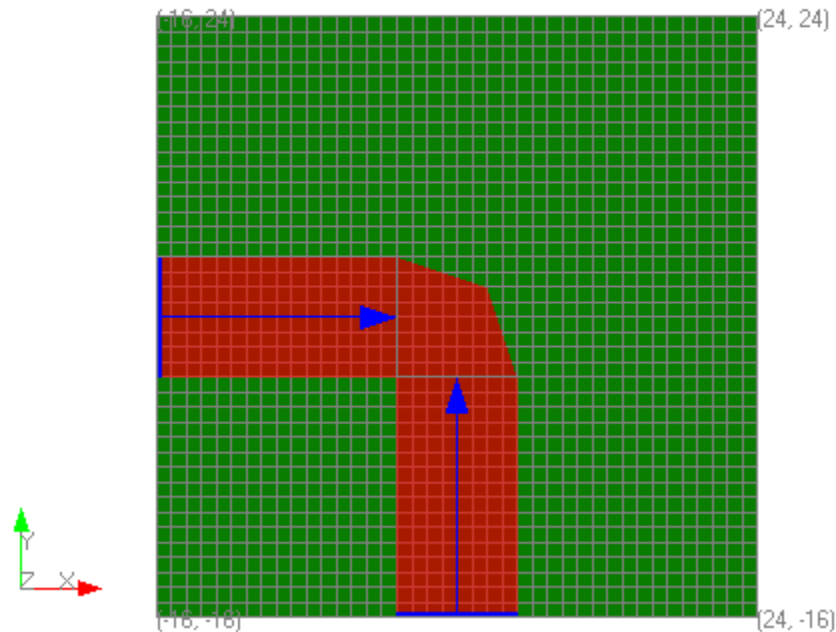


# Circuit Bend0

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

Grid: 40 by 40, dx=1, dy=1, 1 level  
SuperGrid: ProgressiveGrid, max 9dx by 9dy  
Symmetry: Diagonal Plane Reflection  
Analysis: Multiport, Lossy  
Matrix: 340 by 340, Allocated

Circuit Bend0,  
Parameter  
dist=0 mil



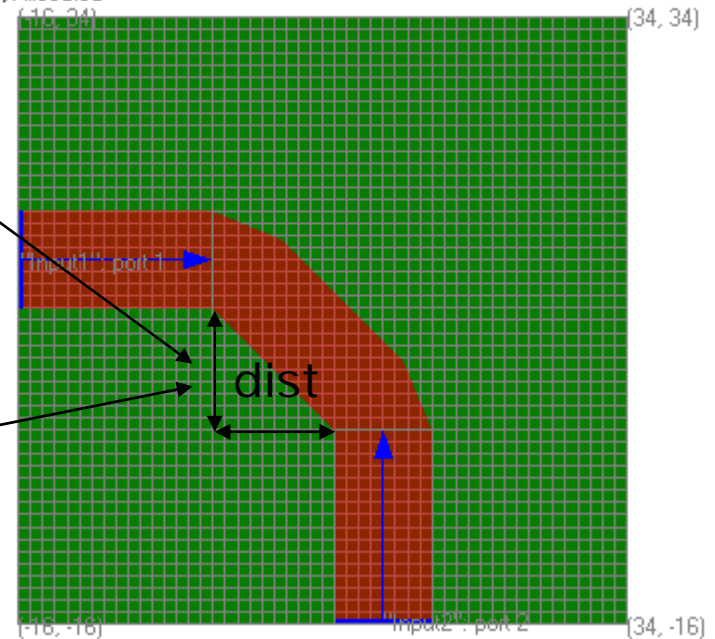
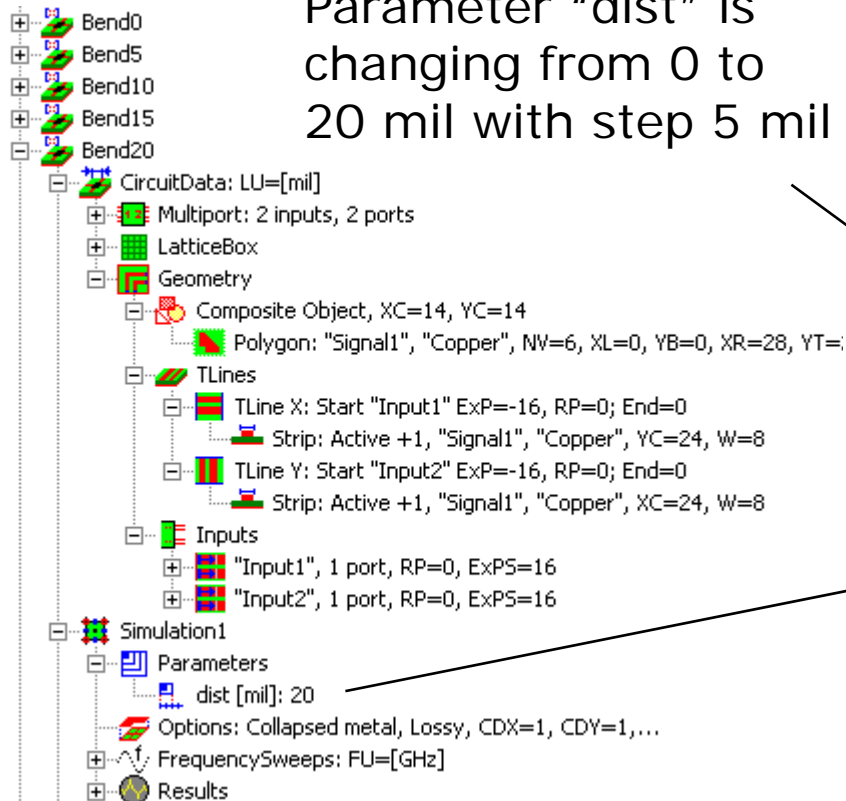
19 Jul 2007, 15:15:48, Simberian Inc.

# Circuits Bend5-Bend20

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

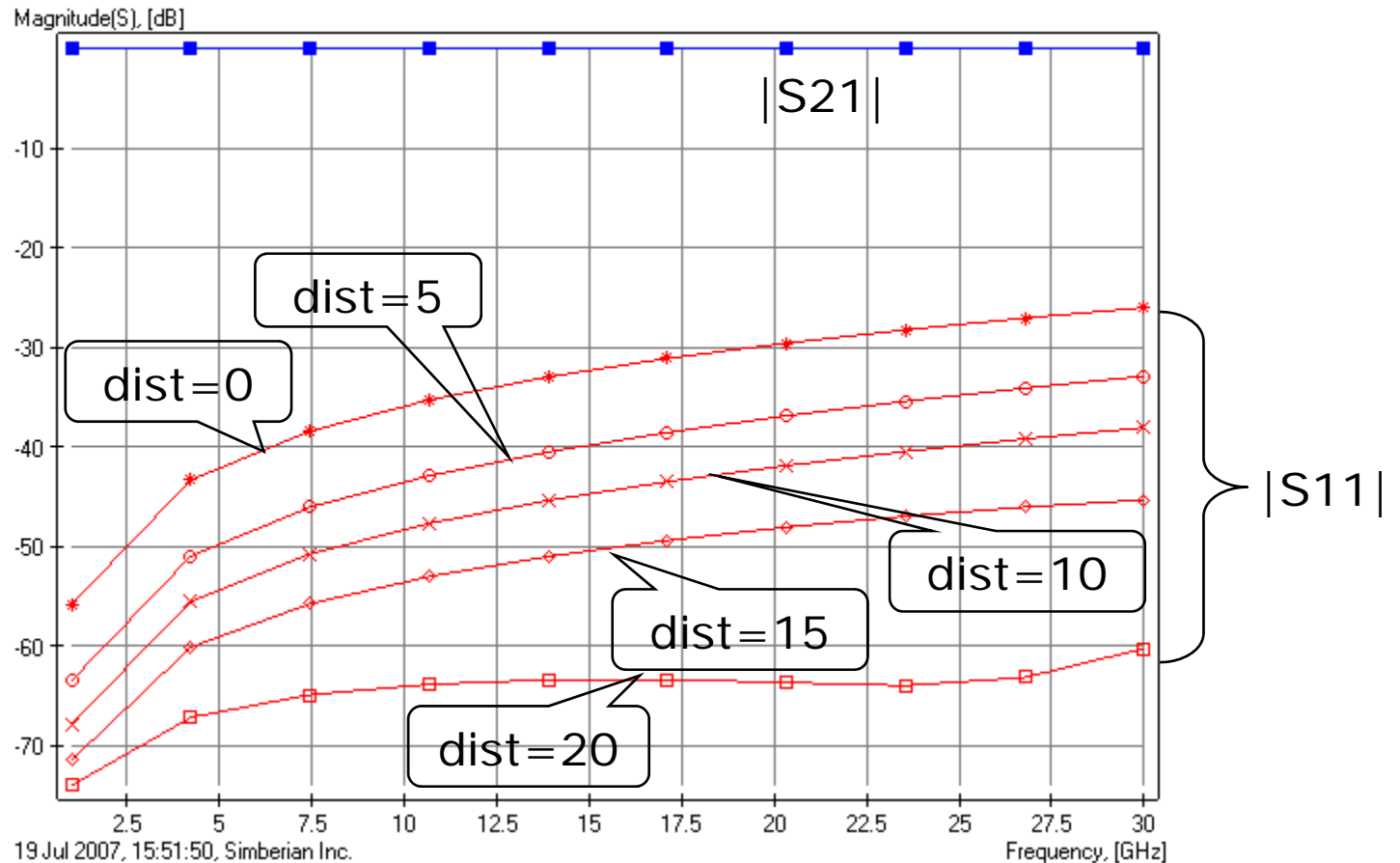
Parameter "dist" is changing from 0 to 20 mil with step 5 mil

Grid: 50 by 50, dx=1, dy=1, 1 level  
SuperGrid: ProgressiveGrid, max 9dx by 9dy  
Symmetry: Diagonal Plane Reflection  
Analysis: Multiport, Lossy  
Matrix: 558 by 558, Allocated

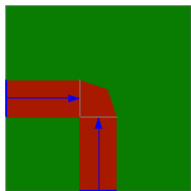
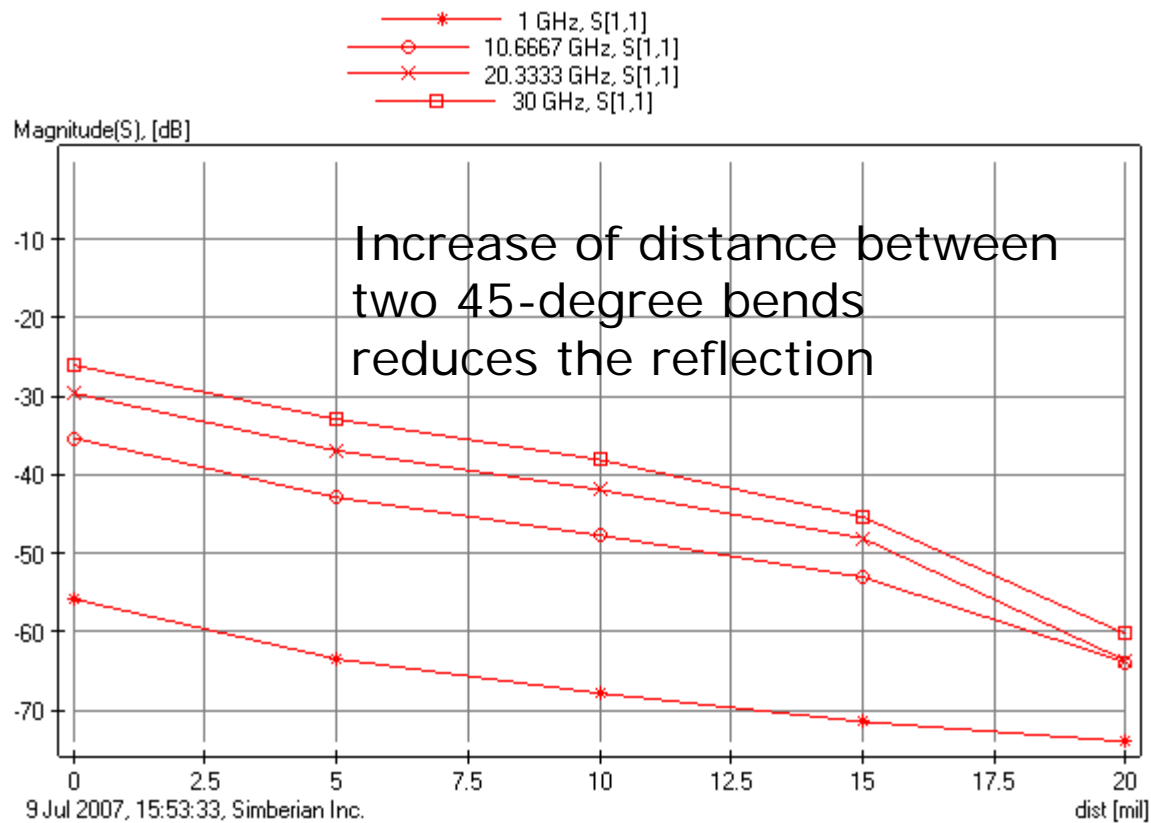


19 Jul 2007, 15:23:52, Simberian Inc.

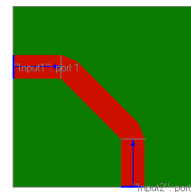
# S-parameters vs. frequency



# |S11| vs. parameter “dist”



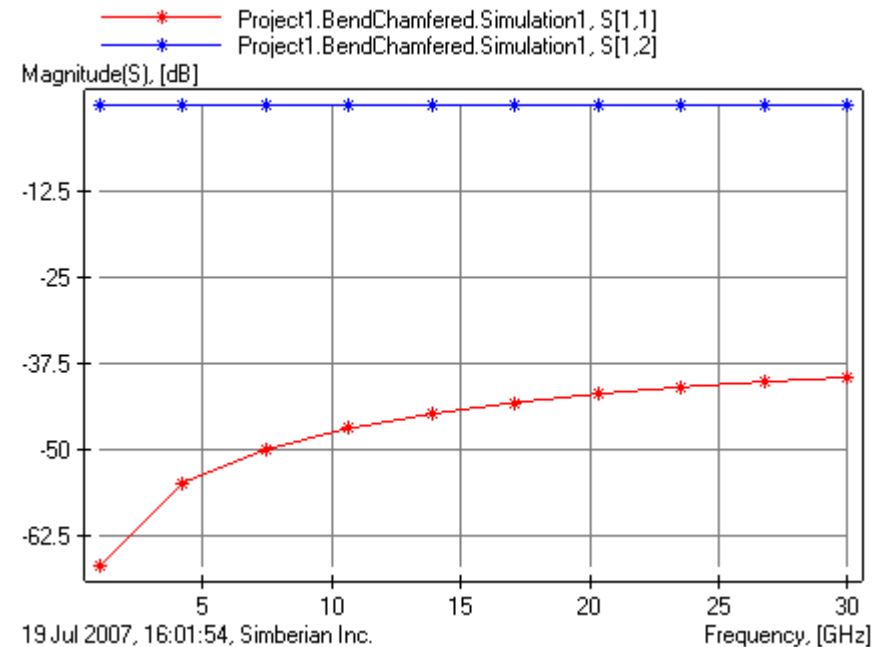
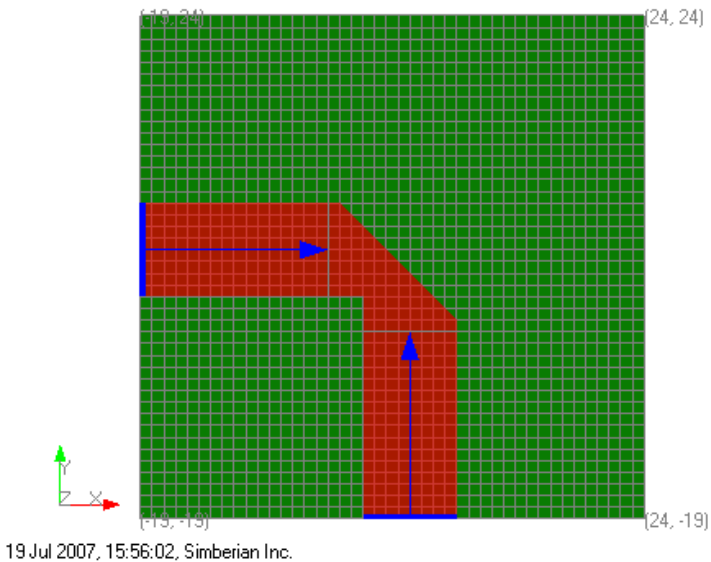
19 Jul 2007, 15:54:24, Simberian Inc.



19 Jul 2007, 15:55:10, Simberian Inc.

# Chamfered bend

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



# Conclusion

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- ❑ 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

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- ❑ 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](mailto:info@simberian.com)
  - Sales: [sales@simberian.com](mailto:sales@simberian.com)
  - Support: [support@simberian.com](mailto:support@simberian.com)
- ❑ Web site [www.simberian.com](http://www.simberian.com)