Touchstone Topics

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Generalized Mixed Mode Extension

- Notation:
 - SE: Single-ended format as currently exists
 - MM: Mixed Mode with differential and common mode components
 - GMM: Generalized Mixed Mode both SE and MM, or SE only or MM only
- Only one set of data in a file
- Example adaped from power splitter or balun:
 - K. Jung + 7 other authors, "A New Characterization and Calibration Method for 3-dB-coupled On-Wafer Measurements, IEEE Trans on Microwave Theory and Techniques, Vol. 56, no. 5, pp. 1193-1200, May 2008



GMM Features

- Diagonal format syntax shorthand for indices
 - n versus n² sized description
 - Compatible with [Matrix Format] < Upper | Lower> data reduction if Sij = Sji
- Re-positioning of data by index references
- General reference impedance re-mapping

 May lose standard vector relationships
- Data for GMM follows all the SE data formatting rules
- Tabular example illustrates some indexing issues and features with GMM



Diagonal Format Syntax (not final) and Data Mapping



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Differential Ports Expressed with New Indices



Diagonal Information Sufficient and Fixes the Off-diagonal Terms



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Order of Data Selectable



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Default Reference Impedances



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Mapping of Arbitrary Reference Impedances Supported





Two MM Differential Lines



Two MM Differential Lines (Combining Mapping and Diff Indices?)



Observations

- N-port order has no relationship to physical order
- Matrix mapping and GMM indexing can be combined
- Bi-directional mapping to/from SE and GMM
- Default reference impedances conform to traditional definitions
 - Ri=Rj=R, Rd=2*R, Rc=R/2
 - Vi-Vj=Vd, li-lj=Vd
 - (Vi+Vj)/2=Vc, (Ii+Ij)/2=Vc

- Reference impedances
- Differential mode
- Common mode
- General reference impedances supported, but may complicate MM and GMM vector relationships
- May apply for Y, Z
- Still being developed

